

Liberty 1998-2003



Exit



SUBARU

LIBERTY

2003 Model Year

PDF Service Manual

GENERAL INFORMATION SECTION (Pub.No.G2300GE1)

ENGINE SECTION 1 (Pub.No.G2300GE2)

ENGINE SECTION 2 (Pub.No.G2300GE3)

ENGINE SECTION 3 (Pub.No.G2301GE4)

TRANSMISSION SECTION (Pub.No.G2300GE5)

CHASSIS SECTION (Pub.No.G2300GE6)

BODY SECTION (Pub.No.G2300GE7)

WIRING SYSTEM SECTION (Pub.No.G2300GE8)

GENERAL INFORMATION SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FOREWORD

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PRE-DELIVERY INSPECTION

PI

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FOREWORD



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1. Foreword

A: FOREWORD

These manuals are used when performing maintenance, repair, or diagnosis of the Subaru Legacy.

Applied model: BE***** and BH***** from 2003MY.

The manuals contain the latest information at the time of publication. Changes in specifications, methods, etc. may be made without notice.

HOW TO USE THIS MANUALS

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1. How to Use This Manuals

A: HOW TO USE THIS MANUALS

1. STRUCTURE

Each section consists of SCT that are broken down into SC that are divided into sections for each component. The specification, maintenance and other information for the components are included, and diagnosis information has also been added where necessary.

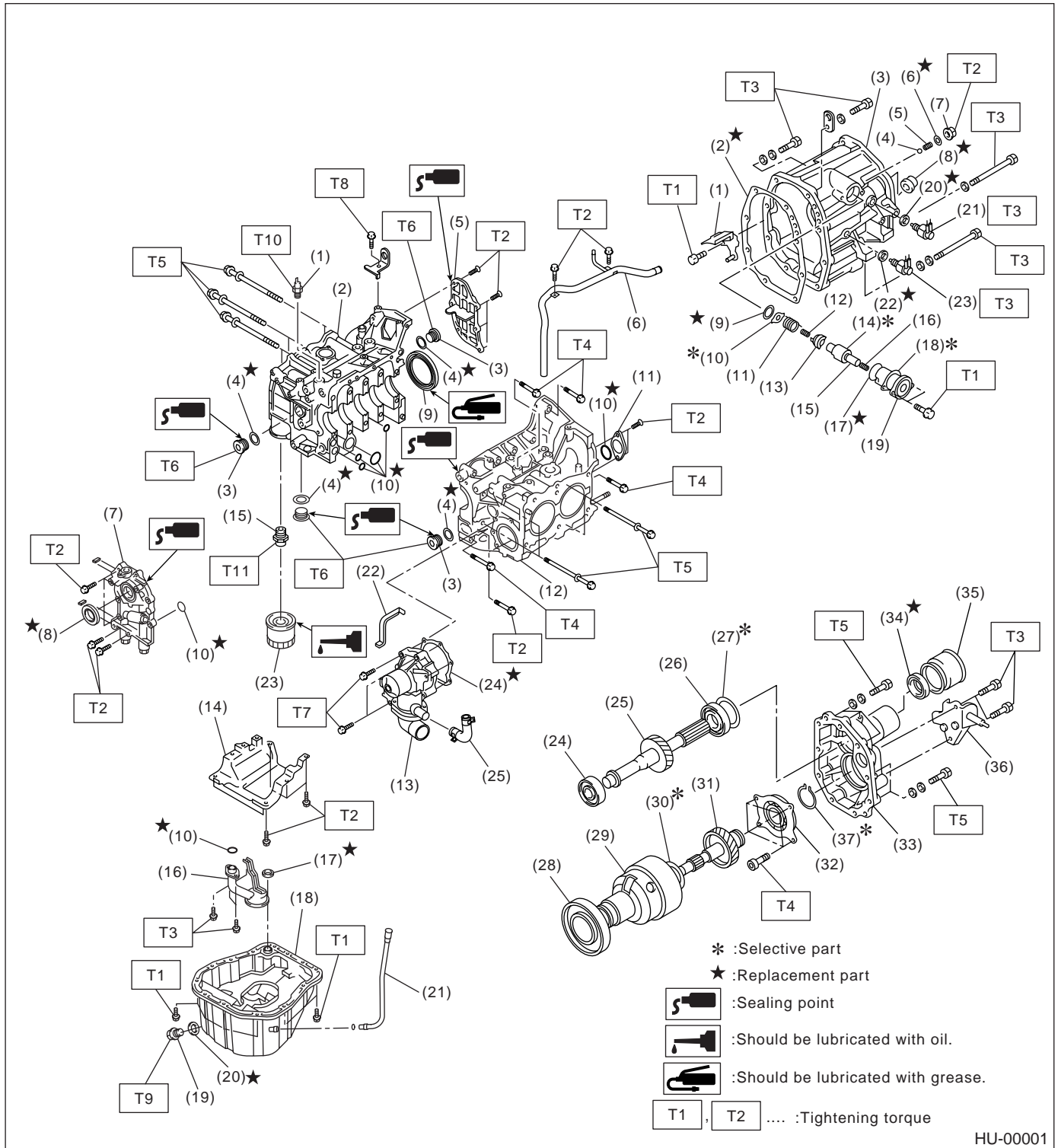
2. INDEX

The first page has an index with tabs.

3. COMPONENTS

Illustrations are listed for each component. The information necessary for repair work (tightening torque, grease up points, etc.) is described on these illustrations. Information is described using symbol. To order the parts, refer to parts catalogue.

Example:



HU-00001

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HOW TO USE THIS MANUALS

4. SPECIFICATIONS

If necessary, specifications are also included.

5. INSPECTION

Inspections are included to be carried out before and after maintenance.

6. MAINTENANCE

- Maintenance instructions for serviceable parts describes work area and detailed steps with illustration. It also describes the use of special tool, tightening torque, cautions for each procedure.
- If many serviceable parts are included in one service procedure, appropriate reference are provided for each part.

Example:

15. Main Shaft Assembly for Single-Range ← (A)

A: REMOVAL ← (B)

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.> ← (C)

11) Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE: ← (D)

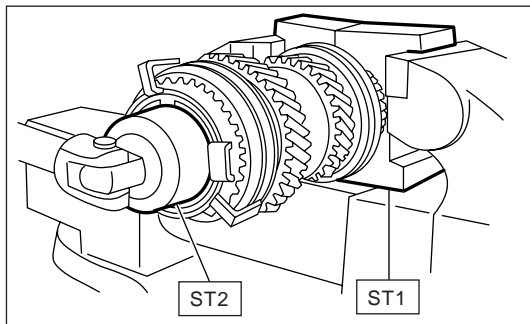
Secure the lock nuts in two Places after tightening.

ST2 499987003 SOCKET WRENCH

ST1 498937000 TRANSMISSION HOLDER ← (E) (F)

Tightening torque:

118 N·m (12.0 kgf·m, 86.8 ft·lb) ← (G)



HU-00002

- (A) Component
(B) Process
(C) Reference

- (D) Caution
(E) Tool number of special tool
(F) Name of special tool

- (G) Tightening torque
(H) Illustration

7. DIAGNOSIS

Tables showing a step-by-step process make it easy to conduct diagnosis.

8. SI UNITS

Measurements in these manuals are according to the SI units. Metric and yard/pound measurements are also included.

Example:

Tightening torque:

44 N·m (4.5 kgf-m, 33 ft-lb)

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MEMO:

SPECIFICATIONS

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LEGACY

SPECIFICATIONS

1. Legacy

A: DIMENSIONS

Model			Sedan	Wagon
			AWD	
Overall length	mm (in)		4,605 (181.3)	4,680 (184.3)
Overall width	mm (in)		1,695 (66.7)	1,695 (66.7)
Overall height (at CW)	mm (in)		1,415 (55.7)	1,515 (59.6)
Compartment	Length	mm (in)	1,965 (77.4)	1,925 (75.8)
	Width	mm (in)	1,440 (56.7), 1,420 (55.9)*1	1,440 (56.7), 1,420 (55.9)*1
	Height	mm (in)	1,155 (45.5)	1,190 (46.9), 1,175 (46.3)*2
Wheelbase	mm (in)		2,650 (104.3)	2,650 (104.3)
Tread	Front	mm (in)	1,460 (57.5)	1,460 (57.5)
	Rear	mm (in)	1,460 (57.5)	1,455 (57.3)
Minimum road clearance	mm (in)		155 (6.1)	155 (6.1)

*1: With leather seat

*2: With sunroof

B: ENGINE

Model		Sedan/Wagon	
		AWD	
		2.0 L Non-TURBO	2.5 L Non-TURBO
Engine type	Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
Valve arrangement	Overhead camshaft type		
Bore × Stroke	mm (in)	92 × 75 (3.62 × 2.95)	99.5 × 79.0 (3.917 × 3.110)
Displacement	cm ³ (cu in)	1,994 (121.67)	2,457 (149.9)
Compression ratio		10.0	
Firing order		1 — 3 — 2 — 4	
Idle speed at Park/ Neutral position rpm	Without OBD	700±100	
	With OBD	650±100	
Maximum output	kW (PS)/rpm	92 (125)/5,600	115 (156)/5,600
Maximum torque	N·m (kgf-m, ft-lb)/rpm	184 (18.8, 136.0)/3,600	223 (22.7, 164.2)/3,600

Model		Sedan	
		AWD	
		2.0 L TURBO	
		5MT	4AT-SS
Engine type	Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
Valve arrangement	Double overhead camshaft type		
Bore × Stroke	mm (in)	92 × 75 (3.62 × 2.95)	
Displacement	cm ³ (cu in)	1,994 (121.67)	
Compression ratio		9.0±0.2	
Firing order		1 — 3 — 2 — 4	
Idle speed at Park/ Neutral position	rpm	700±100	650±100
Maximum output	kW (PS)/rpm	190 (258)/6,400	176 (239)/6,000
Maximum torque	N·m (kgf-m, ft-lb)/rpm	320 (32.6, 235.8)/4,800	309 (31.5, 227.8)/4,800

C: ELECTRICAL

Model			Sedan/Wagon	
			AWD	
			2.0 L Non-TURBO	2.5 L Non-TURBO
Ignition timing at idling speed			BTDC/rpm	
			10°±10°	
Spark plug	Type and manufacturer	Without OBD	NGK: BKR6E (without catalyst) CHAMPION: RC10YC4 (with catalyst)	
			Alternate	NGK: BKR5E-11 (with catalyst)
		With OBD	CHAMPION: RC10YC4	
			Alternate	NGK: BKR6E-11 NGK: BKR5E-11
Generator			12V — 90A	
Battery	Type and capacity (5HR)	For Europe and South America	MT: 12V — 48AH (55D23L) AT: 12V — 52AH (65D23L)	MT: 12V — 48AH (55D23L) AT: 12V — 52AH (75D23L)
		Others	12V — 27AH (34B19L)	

Model		Sedan	
		AWD	
		2.0 L TURBO	
Ignition timing at idling speed		BTDC/rpm	
		14°±10°	
Spark plug		NGK: PFR6G	
Generator		12V — 90A	
Battery	Type and capacity (5HR)	12V— 48AH (55D23L)	

D: TRANSMISSION

Model			Sedan/Wagon			
			AWD			
			2.0 L Non-TURBO		2.5 L Non-TURBO	
Transmission type			5MT	4AT	5MT	4AT
Clutch type			DSPD	TCC	DSPD	TCC
Gear ratio	1st	1st	3.454	2.785	3.454	2.785
		2nd	2.062	1.545	2.062	1.545
		3rd	1.448	1.000	1.448	1.000
		4th	1.088	0.694	1.088	0.694
		5th	0.825	—	0.825*1, 0.780*2	—
		Reverse	3.333	2.272	3.333	2.272
Auxiliary transmission gear ratio		High	1.000	—	1.000	—
		Low	1.447	—	1.196	—
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	3.900	4.111	3.700*1, 4.111*2	4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—	Helical	—
		Gear ratio	1.000	—	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	3.900	4.111	3.700*1, 4.111*2	4.111

LEGACY

SPECIFICATIONS

Model			Sedan	
			AWD	
			2.0 L TURBO	
Transmission type			5MT	4AT-SS
Clutch type			DSPD	TCC
Gear ratio		1st	3.166	2.785
		2nd	1.882	1.545
		3rd	1.296	1.000
		4th	0.972	0.694
		5th	0.738	—
		Reverse	3.333	2.272
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical
		Gear ratio	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid
		Gear ratio	4.111	4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—
		Gear ratio	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid
		Gear ratio	4.111	4.111

5MT: 5 forward speeds with synchromesh and 1-reverse

4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse

DSPD: Dry Single Plate Diaphragm

TCC: Torque Converter Clutch

*1: Except Australia spec. vehicles

*2: Australia spec. vehicles

E: STEERING

Model		2.0 L, 2.5 L Non-TURBO	2.0 L TURBO
Type		Rack and Pinion	
Turns, lock to lock		3.1	3.0
Minimum turning circle	Curb to curb	10.8±1.0 (35.4±3.3)	11.2±1.0 (36.7±3.3)
	Wall to wall	11.5±1.0 (37.7±3.3)	12.0±1.0 (39.4±3.3)

F: SUSPENSION

Model	Conventional suspension
Front	Macpherson strut type, Independent, Coil spring
Rear	Multi-link type, Independent, Coil spring

G: BRAKE

Model	2.0 L, 2.5 L Non-TURBO	2.0 L TURBO
Service brake system	Dual circuit hydraulic with vacuum suspended power unit	
Front	Ventilated disc brake	
Rear	Disc brake	Ventilated disc brake
Parking brake	Mechanical on rear brakes	

H: TIRE

Rim size	15 × 6JJ	16 × 6 ¹ / ₂ JJ	17 × 7JJ
Tire size	195/60R15	205/50R16	215/45ZR17
Type	Steel belted radial, Tubeless		

I: CAPACITY

Model	Sedan/Wagon					
	AWD					
	2.0 L		2.5 L			
	5MT	4AT	5MT	4AT		
Fuel tank	ℓ (US gal, Imp gal)	64 (16.9, 14.1)				
Engine oil (When replacing)	ℓ (US qt, Imp qt)	Approx. 4.0 (4.2, 3.5), 4.5 (4.8, 4.0)*				
Transmission gear oil	ℓ (US qt, Imp qt)	3.5 (3.7, 3.1)	—	3.5 (3.7, 3.1)	—	
Automatic transmission fluid	ℓ (US qt, Imp qt)	—	9.3 – 9.6 (9.8 – 10.1, 8.2 – 8.4)	—	9.3 – 9.6 (9.8 – 10.1, 8.2 – 8.4)	
AT differential gear oil	ℓ (US qt, Imp qt)	—	1.1 – 1.3 (1.2 – 1.4, 1.0 – 1.1)	—	1.1 – 1.3 (1.2 – 1.4, 1.0 – 1.1)	
AWD rear differential gear oil	ℓ (US qt, Imp qt)	0.8 (0.8, 0.6)				
Power steering fluid	ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)				
Engine coolant	ℓ (US qt, Imp qt)	7.0 (7.4, 6.2) 7.7 (8.1, 6.8)*	6.9 (7.3, 6.1) 7.6 (8.0, 6.7)*	6.8 (7.2, 6.0)	6.7 (7.1, 5.9)	

*: TURBO model

J: WEIGHT

1. SEDAN

• LHD Vehicle

Option code *1			EC		K4		KO, KS	
Model			2.0 L					
			AWD					
			GL					
			5MT	4AT	5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kg (lb)	785 (1,730)	810 (1,785)	775 (1,710)	800 (1,765)	790 (1,740)	815 (1,795)
	Rear	kg (lb)	605 (1,335)	605 (1,335)	610 (1,345)	610 (1,345)	610 (1,345)	610 (1,345)
	Total	kg (lb)	1,390 (3,065)	1,415 (3,120)	1,385 (3,055)	1,410 (3,110)	1,400 (3,085)	1,425 (3,140)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	970 (2,140)	970 (2,140)	970 (2,140)	970 (2,140)	970 (2,140)	970 (2,140)
	Rear	kg (lb)	975 (2,150)	975 (2,150)	975 (2,150)	975 (2,150)	975 (2,150)	975 (2,150)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,870 (4,125)	1,870 (4,125)	1,870 (4,125)	1,870 (4,125)	1,870 (4,125)	1,870 (4,125)
Option	Side airbag		○	○	—	—	—	—
	Air conditioner		—	—	—	—	○	○
	Audio		—	—	—	—	○	○
	Cruise control		—	—	—	—	—	—
	Cold weather pack		—	—	—	—	—	—

LEGACY

SPECIFICATIONS

Option code *1		EC		K4		KS		
Model		2.5 L						
		AWD						
		GX						
		5MT	4AT	5MT	4AT	5MT	4AT	
Curb weight (C.W.)	Front	kg (lb)	805 (1,775)	830 (1,830)	795 (1,750)	820 (1,810)	785 (1,730)	810 (1,785)
	Rear	kg (lb)	605 (1,335)	610 (1,345)	610 (1,345)	615 (1,355)	610 (1,345)	615 (1,355)
	Total	kg (lb)	1,410 (3,110)	1,440 (3,175)	1,405 (3,095)	1,435 (3,165)	1,395 (3,075)	1,425 (3,140)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	985 (2,170)	985 (2,170)	985 (2,170)	985 (2,170)	985 (2,170)	985 (2,170)
	Rear	kg (lb)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,910 (4,210)	1,910 (4,210)	1,910 (4,210)	1,910 (4,210)	1,910 (4,210)	1,910 (4,210)
Option	Side airbag		○	○	—	—	—	—
	Air conditioner		○	○	○	○	—	—
	Audio		—	—	—	—	○	○
	Cruise control		—	—	○	○	—	—
	Cold weather pack		—	—	—	—	—	—

*1: For option code, refer to ID section. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

• RHD Vehicle

Option code *1		K1		EK			
Model		2.0 L			2.5 L		
		AWD					
		GL			GX		
		4AT	5MT	4AT	5MT	4AT	
Curb weight (C.W.)	Front	kg (lb)	800 (1,765)	795 (1,750)	820 (1,810)	795 (1,750)	820 (1,810)
	Rear	kg (lb)	605 (1,335)	605 (1,335)	605 (1,335)	605 (1,335)	610 (1,345)
	Total	kg (lb)	1,405 (3,100)	1,400 (3,085)	1,425 (3,145)	1,400 (3,085)	1,430 (3,155)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	970 (2,140)	970 (2,140)	970 (2,140)	985 (2,170)	985 (2,170)
	Rear	kg (lb)	975 (2,150)	975 (2,150)	975 (2,150)	1,000 (2,205)	1,000 (2,205)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,870 (4,125)	1,870 (4,125)	1,870 (4,125)	1,910 (4,210)	1,910 (4,210)
Option	Side airbag		—	○	○	○	○
	Air conditioner		—	○	○	—	—
	Audio		○	○	○	○	○
	Cruise control		—	—	—	—	—
	Cold weather pack		—	—	—	—	—

LEGACY

SPECIFICATIONS

Option code *1			KA			
Model			2.0 L		2.5 L	
			AWD			
			GL (GX)		GX (RX)	
			5MT	4AT	5MT	4AT
Unladen mass (U.M.)	Front	kg (lb)	780 (1,720)	775 (1,710)	775 (1,710)	785 (1,730)
	Rear	kg (lb)	585 (1,290)	585 (1,290)	595 (1,310)	595 (1,310)
	Total	kg (lb)	1,365 (3,010)	1,360 (3,000)	1,370 (3,020)	1,380 (3,040)
Gross vehicle mass (G.V.M.)	Front	kg (lb)	930 (2,050)	930 (2,050)	940 (2,075)	940 (2,075)
	Rear	kg (lb)	970 (2,140)	970 (2,140)	980 (2,160)	980 (2,160)
	Total	kg (lb)	1,900 (4,190)	1,900 (4,190)	1,920 (4,235)	1,920 (4,235)
Option	Side airbag		—	—	—	—
	Air conditioner		○	—	—	—
	Audio		○	○	○	○
	Cruise control		○	—	—	—
	Cold weather pack		—	—	—	—

Option code *1			KA	
Model			2.0 L	
			AWD	
			B4	
			5MT	4AT-SS
Unladen mass (U.M.)	Front	kg (lb)	875 (1,930)	900 (1,985)
	Rear	kg (lb)	620 (1,365)	620 (1,365)
	Total	kg (lb)	1,495 (3,295)	1,520 (3,350)
Gross vehicle mass (G.V.M.)	Front	kg (lb)	1,005 (2,215)	1,005 (2,215)
	Rear	kg (lb)	980 (2,160)	980 (2,160)
	Total	kg (lb)	1,985 (4,375)	1,985 (4,375)
Option	Side airbag		—	—
	Air conditioner		○	○
	Audio		○	○
	Cruise control		—	—
	Cold weather pack		—	—
	Leather trim		○	○
	Rear spoiler		○	○

*1: For option code, refer to ID section. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

LEGACY

SPECIFICATIONS

2. WAGON

• LHD Vehicle

Option code *1		EC		K4		KO, KS		
Model		2.0 L						
		AWD						
		GL						
		5MT	4AT	5MT	4AT	5MT	4AT	
Curb weight (C.W.)	Front	kg (lb)	780 (1,720)	800 (1,765)	775 (1,710)	790 (1,740)	790 (1,740)	805 (1,775)
	Rear	kg (lb)	650 (1,435)	650 (1,435)	655 (1,445)	655 (1,445)	655 (1,445)	655 (1,445)
	Total	kg (lb)	1,430 (3,155)	1,450 (3,200)	1,430 (3,155)	1,445 (3,185)	1,445 (3,185)	1,460 (3,220)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	960 (2,115)	960 (2,115)	960 (2,115)	960 (2,115)	960 (2,115)	960 (2,115)
	Rear	kg (lb)	1,030 (2,270)	1,030 (2,270)	1,030 (2,270)	1,030 (2,270)	1,030 (2,270)	1,030 (2,270)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,920 (4,235)	1,920 (4,235)	1,920 (4,235)	1,920 (4,235)	1,920 (4,235)	1,920 (4,235)
Option	Side airbag		—	○	—	—	—	—
	Air conditioner		—	—	—	—	○	○
	Audio		—	—	—	—	○	○
	Cruise control		—	—	—	—	—	—
	Cold weather pack		—	—	—	—	—	—

Option code *1		EC		K4		KS		
Model		2.5 L						
		AWD						
		GX						
		5MT	4AT	5MT	4AT	5MT	4AT	
Curb weight (C.W.)	Front	kg (lb)	790 (1,740)	820 (1,810)	790 (1,740)	805 (1,775)	780 (1,720)	810 (1,785)
	Rear	kg (lb)	655 (1,445)	655 (1,445)	655 (1,445)	655 (1,445)	655 (1,445)	655 (1,445)
	Total	kg (lb)	1,445 (3,185)	1,475 (3,255)	1,445 (3,185)	1,460 (3,220)	1,435 (3,165)	1,465 (3,230)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	995 (2,195)	995 (2,195)	995 (2,195)	995 (2,195)	995 (2,195)	995 (2,195)
	Rear	kg (lb)	1,050 (2,315)	1,050 (2,315)	1,050 (2,315)	1,050 (2,315)	1,050 (2,315)	1,050 (2,315)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,980 (4,365)	1,980 (4,365)	1,980 (4,365)	1,980 (4,365)	1,980 (4,365)	1,980 (4,365)
Option	Side airbag		○	○	—	—	—	—
	Air conditioner		—	○	○	○	—	○
	Audio		—	—	—	—	○	○
	Cruise control		—	○	○	○	—	○
	Cold weather pack		—	○	—	—	—	—

*1: For option code, refer to ID section. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

LEGACY

SPECIFICATIONS

• RHD Vehicle

Option code *1		K1		EK				
Model		2.0 L				2.5 L		
		AWD						
		GL			GX			
		5MT	4AT	5MT	4AT	5MT	4AT	
Curb weight (C.W.)	Front	kg (lb)	775 (1,710)	790 (1,740)	795 (1,750)	810 (1,785)	790 (1,740)	805 (1,775)
	Rear	kg (lb)	655 (1,445)	655 (1,445)	650 (1,435)	650 (1,435)	655 (1,445)	655 (1,445)
	Total	kg (lb)	1,430 (3,155)	1,445 (3,185)	1,445 (3,185)	1,460 (3,220)	1,445 (3,185)	1,460 (3,220)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	960 (2,115)	960 (2,115)	960 (2,115)	960 (2,115)	995 (2,195)	995 (2,195)
	Rear	kg (lb)	1,030 (2,270)	1,030 (2,270)	1,030 (2,270)	1,030 (2,270)	1,050 (2,315)	1,050 (2,315)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,920 (4,235)	1,920 (4,235)	1,920 (4,235)	1,920 (4,235)	1,980 (4,365)	1,980 (4,365)
Option	Side airbag		—	—	○	○	○	○
	Air conditioner		—	—	○	○	—	—
	Audio		○	○	○	○	○	○
	Cruise control		—	—	—	—	—	—
	Cold weather pack		—	—	—	—	—	—

Option code *1		KA				
Model		2.0 L		2.5 L		
		AWD				
		GL (GX)		GX (RX)		
		5MT	4AT	5MT	4AT	
Unladen mass (U.M.)	Front	kg (lb)	775 (1,710)	775 (1,710)	765 (1,685)	780 (1,720)
	Rear	kg (lb)	635 (1,400)	635 (1,400)	645 (1,420)	645 (1,420)
	Total	kg (lb)	1,410 (3,110)	1,410 (3,110)	1,410 (3,105)	1,425 (3,140)
Gross vehicle mass (G.V.M.)	Front	kg (lb)	930 (2,050)	930 (2,050)	950 (2,095)	950 (2,095)
	Rear	kg (lb)	1,010 (2,225)	1,010 (2,225)	1,040 (2,295)	1,040 (2,295)
	Total	kg (lb)	1,940 (4,275)	1,940 (4,275)	1,990 (4,390)	1,990 (4,390)
Option	Side airbag		—	—	—	—
	Air conditioner		○	—	—	—
	Audio		○	○	○	○
	Cruise control		○	—	—	—
	Cold weather pack		—	—	—	—

*1: For option code, refer to ID section. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

OUTBACK

SPECIFICATIONS

2. OUTBACK

A: DIMENSIONS

Model			OUTBACK	
			AWD	
Overall length	mm (in)	4,720 (185.8)		
Overall width	mm (in)	1,745 (68.7)		
Overall height (at CW)	mm (in)	1,580 (62.2), 1,590 (62.6)*3		
Compartment	Length	mm (in)	1,925 (75.8)	
	Width	mm (in)	1,440 (56.7), 1,420 (55.9)*1	
	Height	mm (in)	1,190 (46.9), 1,175 (46.3)*2	
Wheelbase	mm (in)	2,650 (104.3)		
Tread	Front	mm (in)	1,470 (57.9)	
	Rear	mm (in)	1,460 (57.5)*3 , 1,465 (57.7)	
Minimum road clearance	2.5 L	mm (in)	190 (7.5)	
	3.0 L	mm (in)	200 (7.9)	

*1: With leather seat

*2: With sunroof

*3: Australia spec. vehicles

B: ENGINE

Model		OUTBACK		
		AWD		
		2.5 L		3.0 L
Engine type	Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		Horizontally opposed, liquid cooled, 6-cylinder, 4-stroke gasoline engine	
Valve arrangement	Overhead camshaft type		Double overhead camshaft type	
Bore × Stroke	mm (in)	99.5 × 79.0 (3.917 × 3.110)	89.2 × 80.0 (3.512 × 3.150)	
Displacement	cm ³ (cu in)	2,457 (149.9)	3,000 (183.06)	
Compression ratio		10.0	10.7	
Firing order		1 — 3 — 2 — 4	1 — 6 — 3 — 2 — 5 — 4	
Idle speed at Park/ Neutral position	rpm	Without OBD	700±100	600±100
		With OBD	650±100	
Maximum output	kW (PS)/rpm	115 (156)/5,600		154 (207)/6,000
Maximum torque	N·m (kgf-m, ft-lb)/rpm	223 (22.7, 164.2)/3,600		282 (28.8, 208)/4,400

C: ELECTRICAL

Model		OUTBACK				
		AWD				
		2.5 L		3.0 L		
Ignition timing at idling speed		BTDC/rpm	10°±10°		10°±8°	
Spark plug	Type and manufacturer		CHAMPION: RC10YC4		NGK: PLFR6A-11	
			Alternate	NGK: BKR6E-11 NGK: BKR5E-11		
Generator		12V — 90A		12V — 100A		
Battery	Type and capacity (5HR)		For Europe and South America	MT: 12V — 48AH (55D23L) AT: 12V — 52AH (75D23L)		12V — 52AH (75D23L)
			Others	12V — 27AH (34B19L)		

D: TRANSMISSION

Model		OUTBACK			
		AWD			
		2.5 L		3.0 L	
Transmission type		5MT		4AT	4AT
Clutch type		DSPD		TCC	TCC
Gear ratio	1st	3.454		2.785	
	2nd	2.062		1.545	
	3rd	1.448		1.000	
	4th	1.088		0.694	
	5th	0.825		—	
	Reverse	3.333		2.272	
Auxiliary transmission gear ratio		High	1.000		—
		Low	1.196		—
Reduction gear (Front drive)	1st Reduction	Type of gear	—		Helical
		Gear ratio	—		1.000
	Final reduction	Type of gear	Hypoid		Hypoid
		Gear ratio	3.900*1, 4.111*2		4.444 4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical		—
		Gear ratio	1.000		—
	Final reduction	Type of gear	Hypoid		Hypoid
		Gear ratio	3.900*1, 4.111*2		4.444 4.111

5MT: 5 × 2 forward speeds with synchromesh and 1-reverse

4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse

DSPD: Dry Single Plate Diaphragm

TCC: Torque Converter Clutch

*1: Except Australia spec. vehicles

*2: Australia spec. vehicles

OUTBACK

SPECIFICATIONS

E: STEERING

Model		OUTBACK
Type		Rack and Pinion
Turns, lock to lock		3.0
Minimum turning circle m (ft)	Curb to curb	11.2±1.0 (36.7±3.3)
	Wall to wall	12.0±1.0 (39.4±3.3)

F: SUSPENSION

Model		OUTBACK
Front		Macpherson strut type, Independent, Coil spring
Rear		Multi-link type, Independent, Coil spring

G: BRAKE

Model		OUTBACK
Service brake system		Dual circuit hydraulic with vacuum suspended power unit
Front		Ventilated disc brake
Rear		Disc brake
Parking brake		Mechanical on rear brakes

H: TIRE

Model		OUTBACK
Rim size		16 × 6 ¹ / ₂ JJ
Tire size		215/60R16
Type		Steel belted radial, Tubeless

I: CAPACITY

Model	ℓ (US gal, Imp gal)	OUTBACK		
		AWD		
		2.5 L		3.0 L
		5MT	4AT	
Fuel tank	ℓ (US gal, Imp gal)	64 (16.9, 14.1)		
Engine oil (When replacing)	ℓ (US qt, Imp qt)	Approx. 4.0 (4.2, 3.5)		Approx. 5.6 (5.9, 4.9)
Transmission gear oil	ℓ (US qt, Imp qt)	4.0 (4.2, 3.5)	—	
Automatic transmission fluid	ℓ (US qt, Imp qt)	—	9.3 – 9.6 (9.8 – 10.1, 8.2 – 8.4)	
AT differential gear oil	ℓ (US qt, Imp qt)	—	1.1 – 1.3 (1.2 – 1.4, 1.0 – 1.1)	
AWD rear differential gear oil	ℓ (US qt, Imp qt)	0.8 (0.8, 0.7)		
Power steering fluid	ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)		
Engine coolant	ℓ (US qt, Imp qt)	6.8 (7.2, 6.0)	6.7 (7.1, 5.9)	7.9 (8.4, 7.0)

J: WEIGHT

1. OUTBACK

• LHD vehicle

Option code *1		K4		KS		
Model		2.5 L				
		AWD				
		5MT	4AT	5MT	4AT	
Curb weight (C.W.)	Front	kg (lb)	810 (1,785)	825 (1,820)	815 (1,795)	830 (1,830)
	Rear	kg (lb)	670 (1,475)	670 (1,475)	670 (1,475)	670 (1,475)
	Total	kg (lb)	1,480 (3,265)	1,495 (3,295)	1,485 (3,275)	1,500 (3,310)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	995 (2,195)	995 (2,195)	995 (2,195)	995 (2,195)
	Rear	kg (lb)	1,050 (2,315)	1,050 (2,315)	1,050 (2,315)	1,050 (2,315)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	2,000 (4,410)	2,000 (4,410)	2,000 (4,410)	2,000 (4,410)
Option	Side airbag		—	—	—	—
	Air conditioner		○	○	○	○
	Audio		—	—	○	○
	Cruise control		○	○	○	○
	Cold weather pack		—	—	—	—
	Leather trim		—	—	—	—
	Sunroof		—	—	—	—

Option code *1		EC			
Model		2.5 L		3.0 L	
		AWD			
		5MT	4AT		
Curb weight (C.W.)	Front	kg (lb)	805 (1,775)	830 (1,830)	915 (2,020)
	Rear	kg (lb)	680 (1,500)	675 (1,490)	695 (1,530)
	Total	kg (lb)	1,485 (3,275)	1,505 (3,320)	1,610 (3,550)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	1,010 (2,225)	1,010 (2,225)	1,040 (2,295)
	Rear	kg (lb)	1,060 (2,335)	1,060 (2,335)	1,060 (2,335)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	2,015 (4,445)	2,015 (4,445)	2,085 (4,595)
Option	Side airbag		○	○	○
	Air conditioner		—	○	○
	Audio		○	—	—
	Cruise control		○	—	○
	Cold weather pack		○	—	—
	Leather trim		—	—	○
	Sunroof		—	—	○
	Self-levelizer		○	—	○

*1: For option code, refer to ID section. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

OUTBACK

SPECIFICATIONS

• RHD vehicle

Option code *1		EK			
Model		2.5 L		3.0 L	
		AWD			
		5MT	4AT		
Curb weight (C.W.)	Front	kg (lb)	800 (1,765)	815 (1,795)	915 (2,020)
	Rear	kg (lb)	670 (1,475)	670 (1,475)	695 (1,530)
	Total	kg (lb)	1,470 (3,240)	1,485 (3,275)	1,610 (3,550)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	1,010 (2,225)	1,010 (2,225)	1,040 (2,295)
	Rear	kg (lb)	1,060 (2,335)	1,060 (2,335)	1,060 (2,335)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	2,015 (4,445)	2,015 (4,445)	2,085 (4,595)
Option	Side airbag		—	—	○
	Air conditioner		—	—	○
	Audio		○	○	○
	Cruise control		—	—	○
	Cold weather pack		—	—	○
	Leather trim		—	—	○
	Sunroof		—	—	○
	Self-levelizer		—	—	○

Option code *1		KA			
Model		2.5 L		3.0 L	
		AWD			
		5MT	4AT		
Unladen mass (U.M.)	Front	kg (lb)	790 (1,740)	800 (1,765)	900 (1,985)
	Rear	kg (lb)	650 (1,435)	650 (1,435)	690 (1,520)
	Total	kg (lb)	1,440 (3,175)	1,450 (3,200)	1,590 (3,505)
Gross vehicle mass (G.V.M.)	Front	kg (lb)	970 (2,140)	970 (2,140)	1,035 (2,280)
	Rear	kg (lb)	1,050 (2,315)	1,050 (2,315)	1,050 (2,315)
	Total	kg (lb)	2,020 (4,455)	2,020 (4,455)	2,085 (4,595)
Option	Side airbag		—	—	○
	Air conditioner		—	—	○
	Audio		○	○	○
	Cruise control		—	—	○
	Cold weather pack		—	—	—
	Leather trim		—	—	○
	Sunroof		—	—	○
	Self-levelizer		—	—	○

*1: For option code, refer to ID section. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

PRECAUTION

PC

	Page
1. Precaution	2



PRECAUTION

PRECAUTION

1. Precaution

A: PRECAUTION

Please clearly understand and adhere to the following general precautions. They must be strictly followed to avoid minor or serious injury to the person doing the work or people in the area.

1. ABS

Handle the ABS as a total system. Do not disassemble or attempt to repair individual parts. Doing so could prevent the ABS system from operating when needed or cause it to operate incorrectly and result in injury.

2. BRAKE FLUID

If brake fluid gets in your eyes or on your skin, do the following:

- Wash out your eyes and seek immediate medical attention.
- Wash your skin with soap and then rinse thoroughly with water.

3. ELECTRIC FAN

The electric fan may rotate without warning, even when the engine is not on. Do not place your hand, cloth, tools, or other items near the fan at any time.

4. ROAD TESTS

Always conduct road tests in accordance with traffic rules and regulations to avoid bodily injury and interrupting traffic.

5. AIRBAG

To prevent bodily injury from unexpected deployment of airbags and unnecessary maintenance, follow the instructions in this manual when performing maintenance on airbag components or nearby, and airbag wiring harnesses or nearby.

To prevent unexpected deployment, perform one of the steps below and then wait at least 20 seconds to discharge electricity before beginning work.

- Step 1: Turn the ignition switch OFF.
- Step 2: Remove the negative battery terminal.

6. AIRBAG DISPOSAL

To prevent bodily injury from unexpected airbag deployment, do not dispose airbag modules in the same way as other refuse. Follow all government regulations concerning disposal of refuse.

7. AIRBAG MODULE

Adhere to the following when handling and storing the airbag module to prevent bodily injury from unexpected deployment:

- Do not hold harnesses or connectors to carry the module.
- Do not face the bag in the direction that it opens towards yourself or other people.
- Do not face the bag in the direction that it opens towards the floor or walls.

8. AIRBAG SPECIAL TOOLS

To prevent unexpected deployment, only use special tools.

9. WINDOW

Always wear safety glasses when working around any glass to prevent glass fragments from damaging your eyes.

10. WINDOW ADHESIVE

Always use the specified urethane adhesive when attaching glass to prevent it from coming loose and falling, resulting in accidents and injury.

NOTE

NT



1. Note.....	Page 2
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NOTE

NOTE

1. Note

A: NOTE

This is information that can improve efficiency of maintenance and assure sound work.

1. FASTENER NOTICE

Fasteners are used to prevent parts from damage and dislocation due to looseness. Fasteners must be tightened to the specified torque.

Do not apply paint, lubricant, rust retardant, or other substances to the surface around bolts, fasteners, etc. Doing so will make it difficult to obtain the correct torque and result in looseness and other problems.

2. STATIC ELECTRICITY DAMAGE

Do not touch the ECM, connectors, logic boards, and other such parts when there is a risk of static electricity. Always use a static electricity prevention cord or touch grounded metal before conducting work.

3. IGNITION OFF BATTERY

When removing the battery cables, always be sure to turn the ignition off to prevent electrical damage to the ECM from rush current.

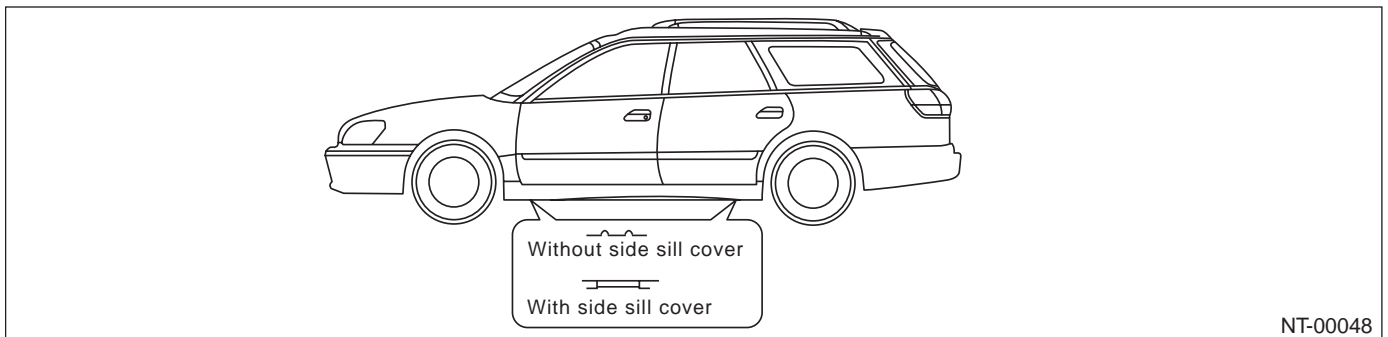
4. SERVICE PARTS

Use authentic service parts for maximum performance and maintenance, when conducting repairs. Subaru/FHI will not be responsible for poor performance resulting from the use of parts not specified by a genuine dealer.

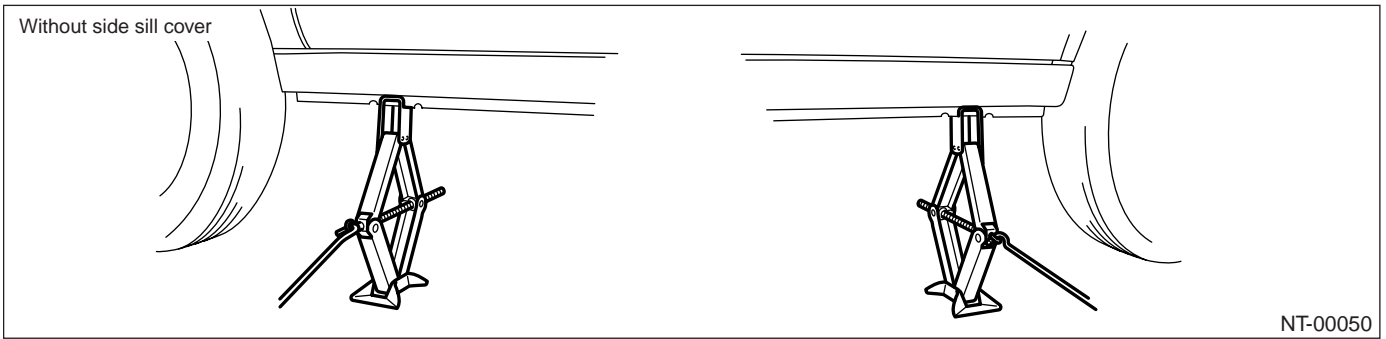
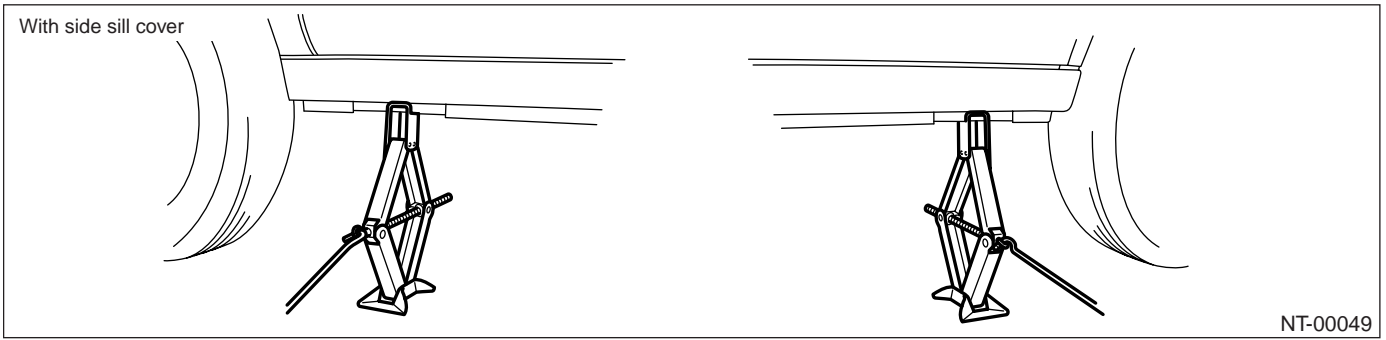
5. LIFTS AND JACKS

When using a lift or jack-ridged rack to raise a vehicle, always follow instructions concerning jack-up points and weight limits to prevent the vehicle from falling, which could result in injury. Be especially careful to make sure the vehicle is balanced before raising it.

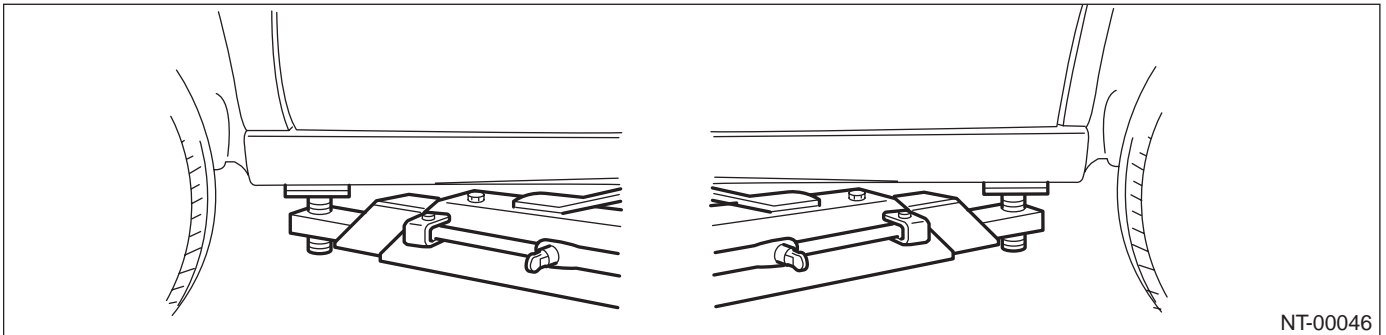
• Support locations



• Pantograph jack



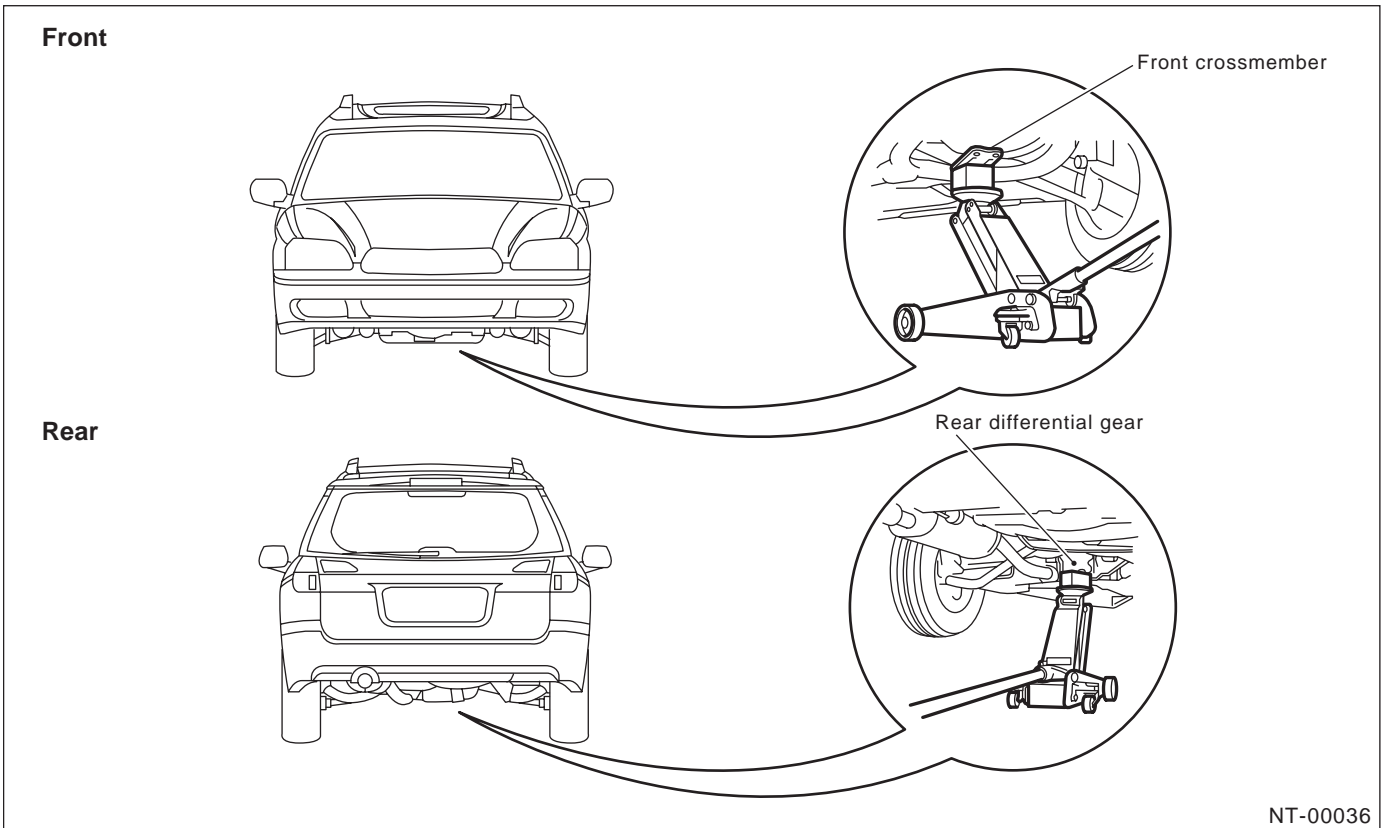
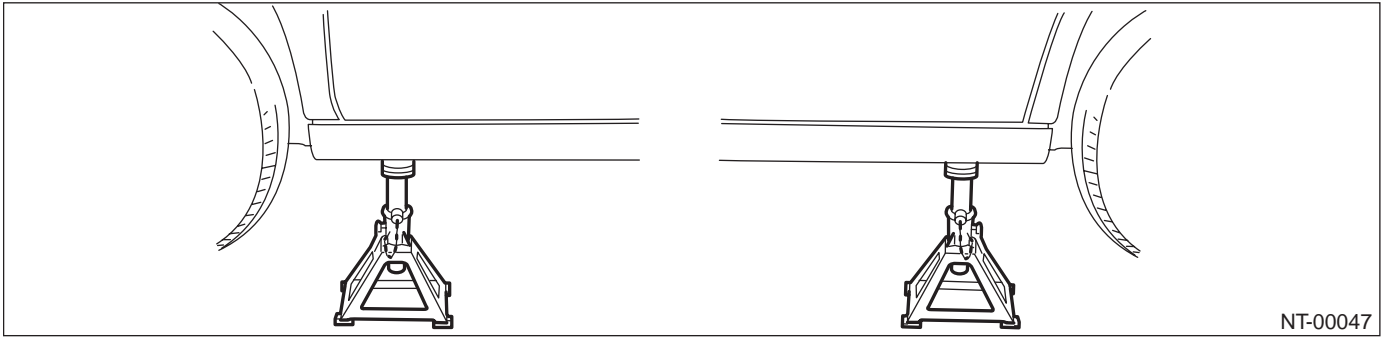
• Lift



NOTE

NOTE

- Safety stand

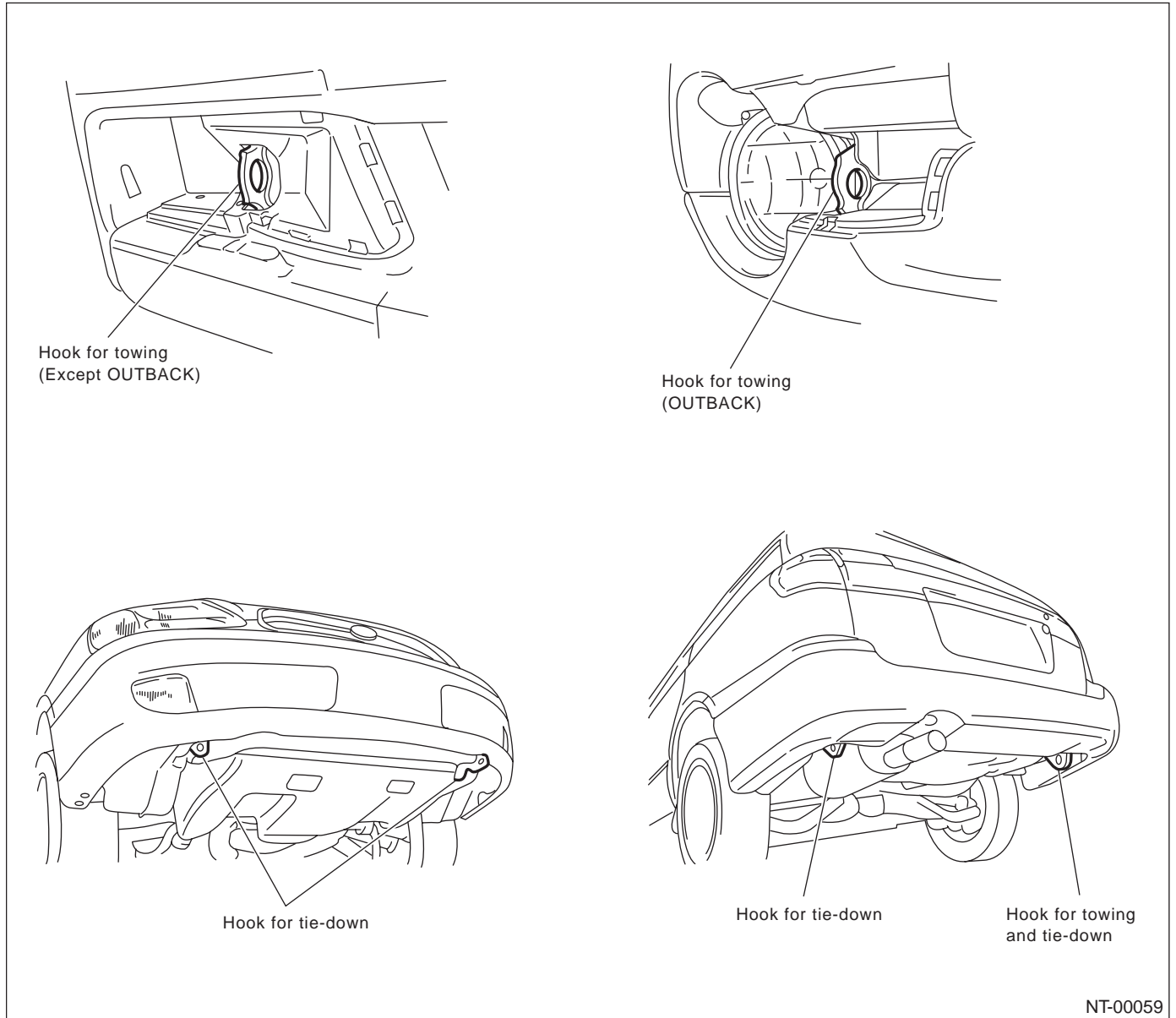


6. TIE DOWNS

Tie-downs are used when transporting vehicles and when using the chassis dynamo.

- **Tie-down points**

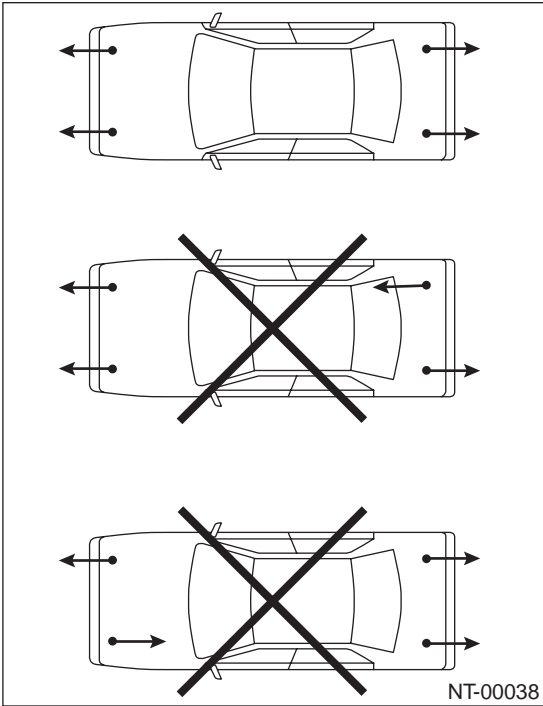
Attach tie-downs only to the specified points on the vehicle.



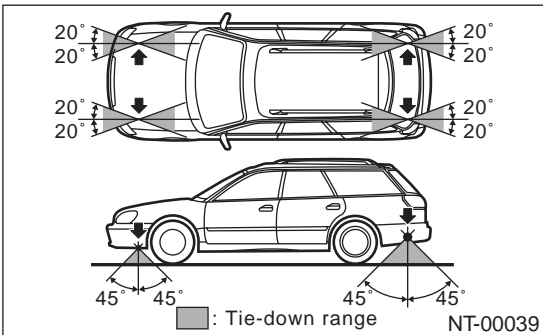
NOTE

NOTE

• Chain direction at tie-down condition

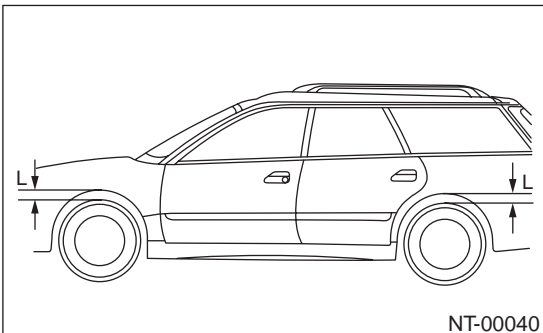


• Chain pulling range at tie-down condition



• Vehicle sinking volume at tie-down condition

Measure distance L between tire highest point to arch highest point before tie-down and after tie-down. Difference of measurement value (drop height) shall be within 50.8 mm (1.97 in). Make sure to fix a vehicle securely.



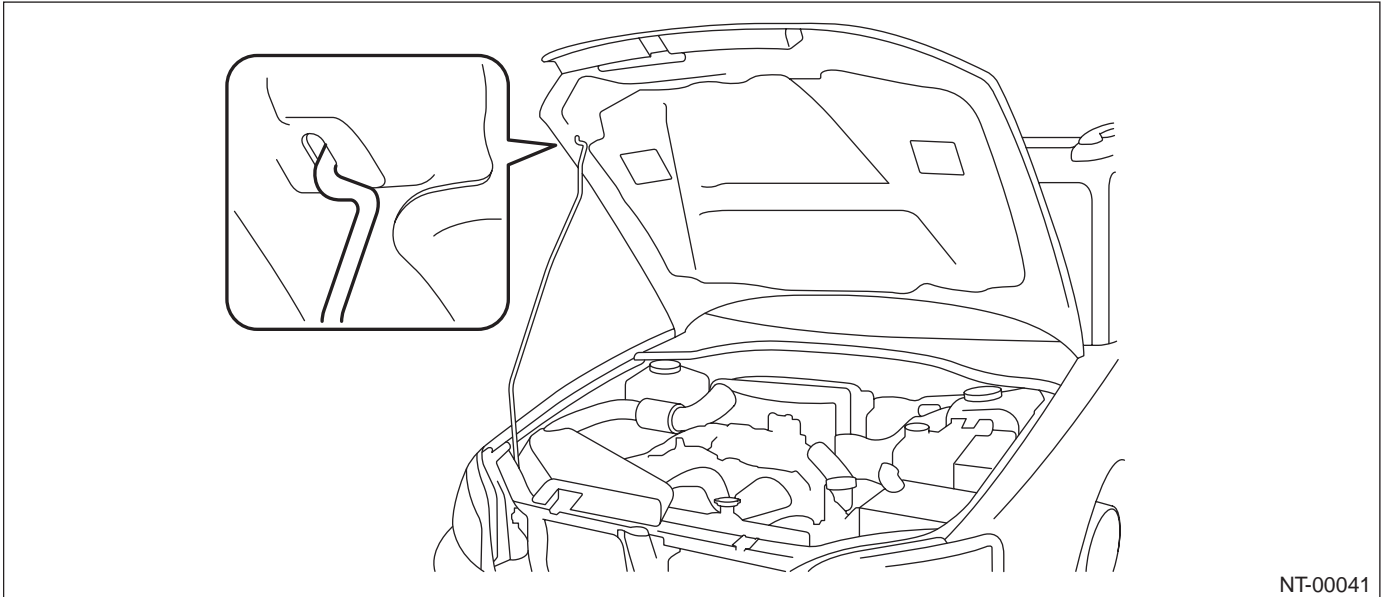
7. TOWING

Avoid towing vehicles except when the vehicle cannot be driven. For vehicles with AWD, AT or VTD, use a loader instead of towing. When towing other vehicles, to prevent excessive weight from damaging the hook or vehicle:

- Do not tow other vehicles with a front towing hook.
- Make sure the vehicle towing is heavier than the vehicle being towed.

8. FRONT HOOD STAY INSTALLATION

- At the check and general maintenance



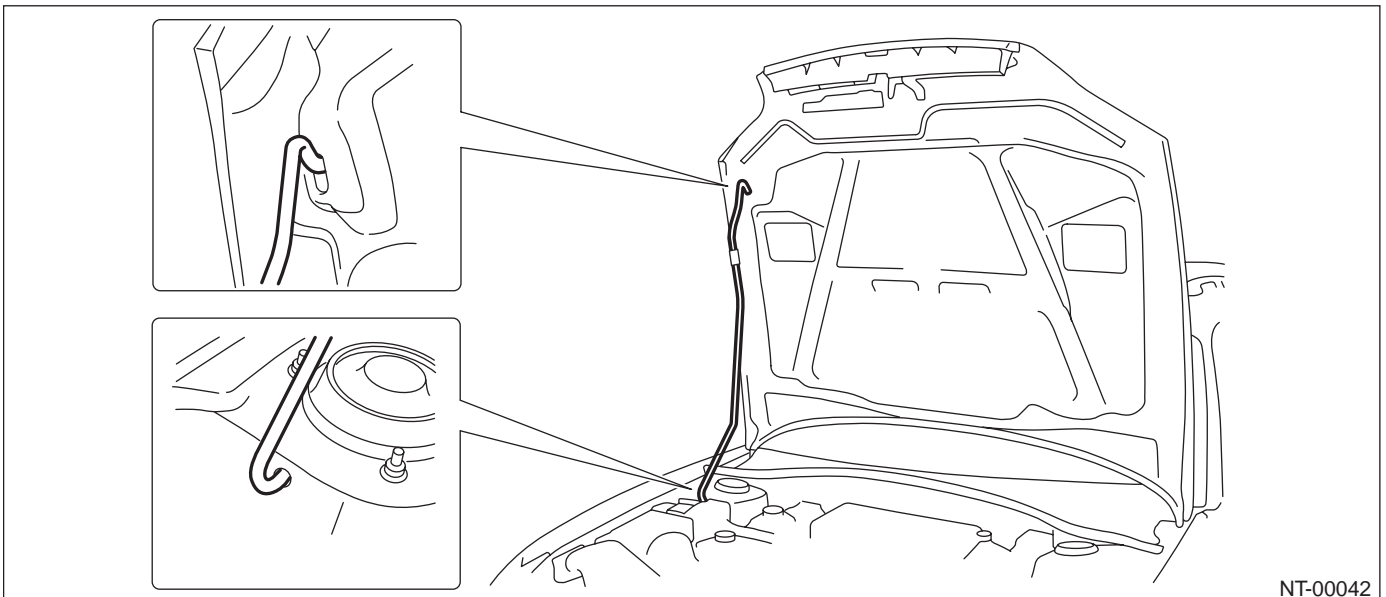
NT-00041

- When wider hood opening is necessary

Set stay into the hole of hood inner as shown in the figure below.

NOTE:

Before setting the hood in this position, remove the windshield washer hose attaching clip from the hood.



NT-00042

9. TRAINING

For information about training, contact a dealer or agent.

10. GENERAL SCAN TOOL

Using general scan tools will greatly improve efficiency of repairing engine electronic controls. The Subaru Select Monitor can be used to diagnose the engine and also the ABS, the air conditioner, and other parts.

NOTE

NOTE

MEMO:

IDENTIFICATION

ID

1. Identification	Page 2
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IDENTIFICATION

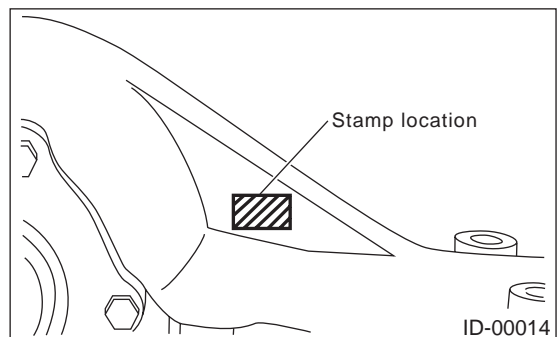
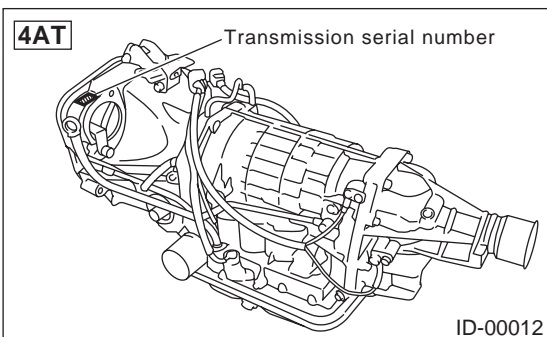
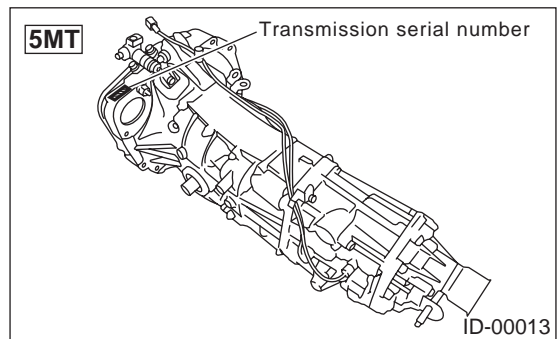
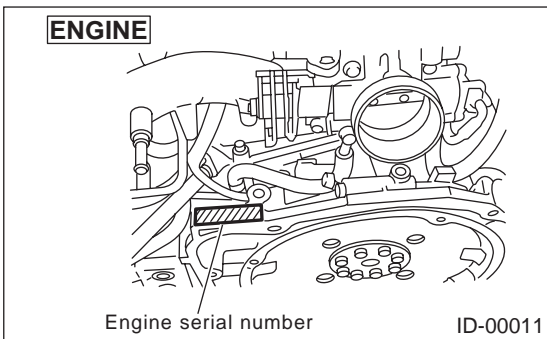
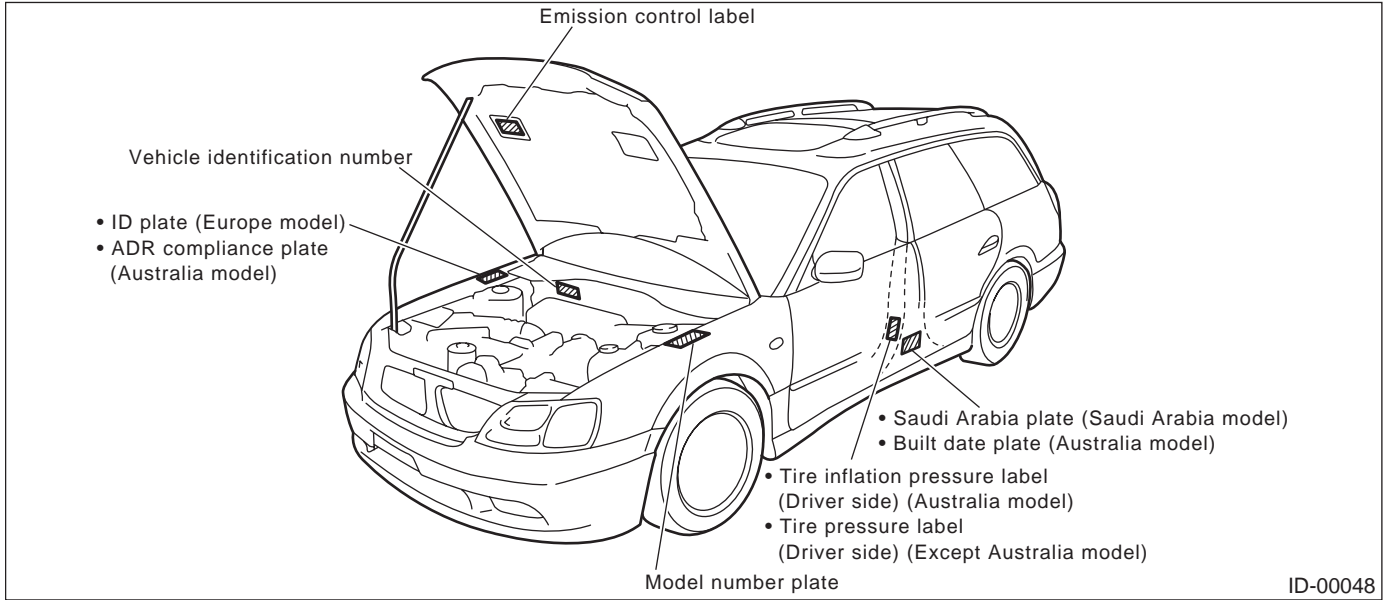
IDENTIFICATION

1. Identification

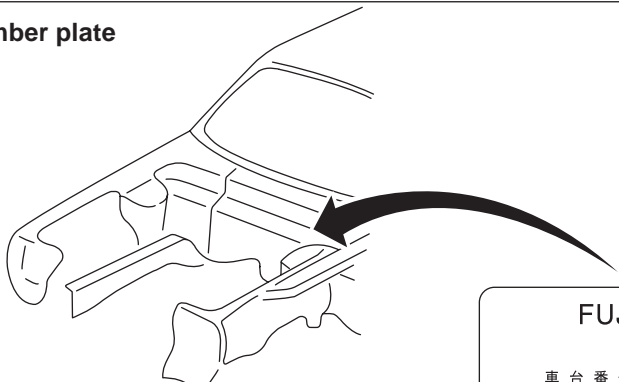
A: IDENTIFICATION

1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

The VIN (Vehicle Identification Numbers) is used to classify the vehicle.
Positioning of the plate label for identification



Model number plate



FUJI HEAVY INDUSTRIES LTD.

型 式

車 台 番 号

VIN

○ アプライトモデル オプションコード ○

○ トリムコード エンジン型式

○ 外装飾コード ミッション型式

富士重工業株式会社

ID-00049

2. MEANING OF V.I.N.

The meaning of the VIN is as follows:

- **Europe, Australia and General (Except GCC)**

JF1BE5LJ33G002001

The starting and ending brackets ([]) are stop marks.

Digits	Code	Meaning	Details
1 to 3	JF1	Manufacturer body area	JF1: Passenger car, FHI made JF2: MPV, FHI made
4	B	Car line	Legacy/OUTBACK series
5	E	Body type	E: Sedan H: Station Wagon/OUTBACK
6	5	Displacement	5: 2.0 L AWD 9: 2.5 L AWD E: 3.0 L AWD
7	L	Steering position	K: RHD (Right-hand drive) L: LHD (Left-hand drive)
8	J	Engine & transmission	E: DOHC MPI 4AT J: SOHC MPI 5F R: SOHC MPI 4AT D: DOHC MPI TURBO 5F T: DOHC MPI TURBO 4AT-SS
9	3	Drive type	3: Full-time AWD 5-speed MT single range 4: Full-time AWD 5-speed MT dual range 5: Full-time AWD 4-speed AT A: Full-time AWD 4-speed AT OUTBACK B: Full-time AWD 5-speed MT dual range OUTBACK
10	3	Model year	3: 2003MY 4: 2004MY 5: 2005MY
11	G	Factory location	G: FHI (Gunma)
12 to 17	002001	Serial number	—

IDENTIFICATION

IDENTIFICATION

• GCC countries (Saudi Arabia, etc.)

]JF1BE54MX3G002001[

The starting and ending brackets (] [) are stop marks.

Digits	Code	Meaning	Details
1 to 3	JF1	Manufacturer body area	JF1: Passenger car, FHI made
4	B	Car line	Legacy/OUTBACK series
5	E	Body type	E: Sedan H: Station Wagon/OUTBACK
6	5	Displacement	5: 2.0 L AWD 9: 2.5 L AWD
7	4	Grade	4: GL 6: GX 8: OUTBACK
8	M	Restraint	M: Manual belts, dual airbag
9	X	Check digit	0 — 9 & X
10	3	Model year	3: 2003MY 4: 2004MY 5: 2005MY
11	G	Transmission type	G: Full-time AWD 5-speed MT single range H: Full-time AWD 4-speed AT J: Full-time AWD 5-speed MT dual range
12 to 17	002001	Serial number	—

3. MODEL NUMBER PLATE

The model number plate indicates: the applied model, the option code, the trim code, the engine type, the transmission type, and the exterior color code. This information is helpful when placing orders for parts.

BE9EL7J

Digits	Code	Meaning	Details
1	B	Series	B: Legacy/OUTBACK
2	E	Body style	E: Sedan H: Station Wagon/OUTBACK
3	9	Engine displacement Drive system Suspension system	5: 2.0 L AWD 9: 2.5 L AWD E: 3.0 L AWD
4	E	Minor change	2003MY
5	L	Destination	K: RHD (Right-hand drive) L: LHD (Left-hand drive)
6	7	Grade	4: GL 7: GX 9: B4 B: OUTBACK C: OUTBACK — 6 cylinders
7	J	Transmission, fuel feed system	E: DOHC MPI 4-speed AT J: SOHC MPI center differential R: SOHC MPI 4-speed AT D: DOHC MPI TURBO center differential T: DOHC MPI TURBO 4-speed AT-SS

IDENTIFICATION

IDENTIFICATION

The engine and transmission type are as follows:

• **Engine**

EJ251NJEAA

Digits	Code	Meaning	Details
1 and 2	EJ	Engine type	EJ: 4 cylinders EZ: 6 cylinders
3 and 4	25	Displacement	20: 2.0 L 25: 2.5 L 30: 3.0 L
5	1	Fuel feed system	1: D-MPI SOHC-A 6: MPI TWIN TURBO 8: MPI HI-POWER TWIN TURBO D: D-MPI DOHC 6 cylinders
6	N	Detailed specifications	—
7	J	Transmission	W: AWD MT (Flexible) J: AWD MT (Dual mass) X: AWD AT
8 to 10	EAA	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• **Transmission**

TY754VFBAA

Digits	Code	Meaning	Details
1	T	Transmission	T: Transmission
2	Y	Transmission type	Y: Full-time AWD MT center differential V: Full-time AWD AT VTD Z: Full-time AWD AT MPT
3 and 4	75	Classification	75: MT 1A, 1B: AT
5	4	Series	4: 5th Generation Legacy
6	V	Transmission specifications	V: Full-time AWD 5-speed MT with viscous coupling center differential single range X: Full-time AWD 5-speed MT with viscous coupling center differential dual range Z: Full-time AWD 4-speed AT with MPT Y: Full-time AWD 4-speed AT with VTD
7	F	Engine type	S, R: 920SO F: 925SO B, N: 920DO TURBO M: 930DO
8 to 10	BAA	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• **Rear differential 1**

VA1REG

Digits	Code	Meaning	Details
1	V	For AWD	V: AWD
2	A	Type	A: A type
3	1	Hypoid gear diameter	1: 152 dia.
4	R	Installation position	R: Rear
5	E	Reduction gear ratio	E: 4.111
6	G	Specification differences	G: Case B H: Case B with cooling fin

IDENTIFICATION

IDENTIFICATION

• Rear differential 2

T1

Code	Reduction gear ratio	LSD
T1	3.900	No
T2	4.111	No
TP	4.444	No
BL	4.444	No (Strengthened type)
VB	3.700	No
CF	4.444	Viscous
JP	4.111	Viscous

• Option code

ECPS

Digits	Code	Meaning	Details
1 to 2	EC	Destination	EC: EC KO: KO K4: K4 KS: KS EK: EK KA: KA K1: K1
3 to 4	PS	Main options on vehicle	–

RECOMMENDED MATERIALS

RM

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1. Recommended Materials	2



RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

1. Recommended Materials

A: RECOMMENDED MATERIALS

1. GENERAL

To insure the best performance, always use the specified oil, gasoline, adhesive, sealant, etc. or a substitute of equivalent quality.

2. FUEL

Always use a gasoline of the same or higher octane value than specified in the owner's manual. Ignoring the specifications below will result in damage or poor operation of the engine and fuel injection system. Use the specified gasoline to correct performance.

3. LUBRICANTS

Use either the lubricants in the table below or equivalent lubricants. See the table below to choose the correct SAE viscosity.

• Unleaded gasoline

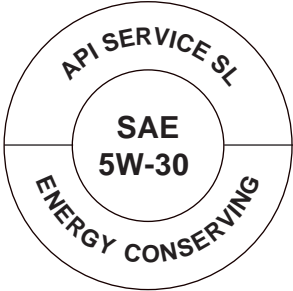

Use unleaded gasoline and not leaded gasoline on vehicles with catalytic converter installed to reduce air pollution. Using leaded gasoline will damage the catalytic converter.

Model	Petrol	RON
2.0 L, 2.5 L	Unleaded	More than 95 RON More than 90 RON*
TURBO	Unleaded	More than 98 RON
3.0 L	Unleaded	More than 95 RON

*: Australia specification

• Leaded gasoline

On vehicles without catalytic converter, use leaded gasoline with an octane value of 90 RON or higher.

Lubricant	Recommended			Alternative
	API Spec.	CCMC Spec.	ACEA Spec.	API Spec.
Engine oil	SL or SJ Grade "Energy conserving"  RM-00001  RM-00002	G4 or G5	A1, A2 or A3	SG,SF
Manual transmission oil	GL-5	—	—	—
AT front differential gear oil	GL-5	—	—	—
Rear differential gear oil	GL-5	—	—	—

RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

SAE viscosity No. and applicable temperature								
Engine oil								
(°C)	-30	-20	-10	0	10	20	30	40
(°F)	-22	-4	14	32	50	68	86	104
<div style="position: relative; width: 100%; height: 100%;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-weight: bold;">10W-30 or 10W-40</div> </div>								
<div style="position: relative; width: 100%; height: 100%;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-weight: bold;">5W-30 Recommend</div> </div>								

RM-00003

Manual transmission oil and rear differential gear oil								
(°C)	-30	-20	-10	0	10	20	30	40
(°F)	-22	-4	14	32	50	68	86	104
<div style="position: relative; width: 100%; height: 100%;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-weight: bold;">90</div> </div>								
<div style="position: relative; width: 100%; height: 100%;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-weight: bold;">85W</div> </div>								
<div style="position: relative; width: 100%; height: 100%;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-weight: bold;">80W</div> </div>								
<div style="position: relative; width: 100%; height: 100%;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-weight: bold;">75W-90</div> </div>								

RM-00004

RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

SAE viscosity No. and applicable temperature								
AT front differential gear oil								
(°C)	-30	-20	-10	0	10	20	30	40
(°F)	-22	-4	14	32	50	68	86	104
								90
								85W
								80W
								80W-90

RM-00005

4. FLUID

Use the fluids specified in the table below. Do not mix two different kinds or makes of fluid.

Fluid	Recommended	Alternative	Remarks
Automatic transmission fluid	DEXRON III	—	
Power steering fluid	DEXRON III	—	
Brake fluid	FMVSS No. 116 DOT3	FMVSS No. 116 DOT4	
Clutch fluid	FMVSS No. 116 DOT3	FMVSS No. 116 DOT4	

5. COOLANT

Use genuine coolant to protect the engine.

Coolant	Recommended	Item number	Alternative
Coolant	SUBARU coolant	000016218	None
Water for dilution	Distilled water	—	Tap water

6. REFRIGERANT

Standard air conditioners on Subaru vehicles use HFC134a refrigerant. Do not mix it with other refrigerants. Also, do not use any air compressor oil except for ZXL200PG.

Air conditioner	Recommended	Item number	Alternative
Refrigerant	HFC134a	—	None
Compressor oil	ZXL200PG	—	None

RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

7. GREASE

Use the grease and supplementary lubricants shown in the table below.

Grease	Application point	Recommended	Item number	Alternative
Supplementary lubricants	<ul style="list-style-type: none"> O2 sensor Bolts, etc. 	SUBARU CRC	004301003	—
Grease	MT main shaft	FX clutch grease	000040901	—
	Clutch master cylinder push rod	Slicolube G-40M	004404003	—
	<ul style="list-style-type: none"> Gear shift lever Select lever Clutch operating cylinder Accelerator pedal Clutch pedal Brake pedal Clutch bearing Clutch release lever Steering shaft bearing 	SUNLIGHT2	003602010	—
	Steering gear box	Valiant grease M-2	003608001	—
	<ul style="list-style-type: none"> Disc brake Drum brake wheel cylinder 	Niglube RX-2	K0779GA102	—
	<ul style="list-style-type: none"> Drum brake Brake shoe 	Molykote No. 7439	003602001	—
	Brake pad	Molykote AS-880N	K0777YA010	—
	Front axle SFJ	SSG-6003	28093TA000	—
	Front axle BJ	NTG2218	28093AA000	—
	Rear axle BJ	Molylex No. 2	003601001	—
	Rear axle DOJ	VU-3A702	23223GA050	—
<ul style="list-style-type: none"> Throttle cable end Door latch Door striker 	Slicolube G-30M	004404002	—	

8. ADHESIVES

Use the adhesives shown in the table below, or equivalent.

Adhesive	Application point	Recommended	Item number	Alternative
Adhesive	Windshield and body	Essex Chemical Crop's Urethane E	—	Sunstar 580
	Soft vinyl	Cemedine 540	—	3M's EC-776 EC-847 or EC-1022 (Spray type)
	Momentary sealant	Cemedine 3000	—	Armstrong's Eastman 910

9. SEAL MATERIAL

Use seal material shown in the table below, or equivalent.

Seal material	Application point	Recommended	Item number	Alternative
	<ul style="list-style-type: none"> Cylinder block Torque converter clutch case 	Three Bond 1215	004403007	Dow Corning's No. 7038
	Transmission oil pan	Three Bond 1217B	K0877YA020	—
	Rear differential	Three Bond 1324	004403042	—
	Rear differential	Three Bond 1105	004403010	Dow Corning's No. 7038
	Steering adjusting screw	Three Bond 1141	004403006	—
	<ul style="list-style-type: none"> Camshaft cap H6 oil pan, chain cover 	Three Bond 1280B	K0877YA018	—
	<ul style="list-style-type: none"> Front sealing cover Rear sealing cover 	3 M Butyl Rubber 8626	—	—

RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

MEMO:

PRE-DELIVERY INSPECTION

PI

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1. Pre-delivery Inspection

A: GENERAL

The purposes of the pre-delivery inspection (PDI) are as follows.

- Remove the additional parts used for ensuring the vehicle quality during transportation and restore the vehicle to its normal state.
- Check if the vehicle before delivery is in a normal state.
- Check for any damage or missing parts that may have taken place during transportation or storage.
- Make sure to provide a complete vehicle to the customer.

Because of the above reasons, all dealerships must always carry out the PDIs before delivering a vehicle.

In addition, all franchised shops and PDI centers must check the status of every vehicle received to identify who is responsible for any possible defects.

B: PDI PROCEDURE

Follow the procedures shown in the table below.

Static Checks Just After Vehicle Receipt

Step	Check point
1. Appearance check	(1) If the vehicle is covered with protective film, visually check the vehicle body for damage and dents. (2) If the protective film has been removed, visually check the body paints for small areas of damage or stains. (3) Visually check the glass and light lenses for any damage and cracks or excessive gaps to the body sheet metal. (4) Visually check the plated parts for any damage.
2. Tire check	(1) Check the tires for damage, abnormal conditions, and dents on the wheels. (2) Check the tire air pressure.
3. Fuse installation	(1) If the vehicle is about to be delivered to the customer, attach a fuse.
4. Connection of air conditioner cut connector	(1) If the vehicle is about to be delivered to the customer, connect air conditioner cut connector or air conditioner harness.
5. Check the doors for lock/unlock and open/close operations.	(1) Using the key, check if the door can be locked and unlocked normally. (2) Open and close the all doors to see that there are no abnormal conditions.
6. Operation check of child lock system	(1) Inspect whether child lock system operates properly.
7. Check the trunk lid open/close operations.	(1) Operate the trunk lock release lever to check that the trunk opens normally. (2) Using the key, check if the trunk lid can be unlocked normally. (3) Open and close the trunk lid to see that there are no abnormal conditions.
8. Check the rear gate for lock/unlock and open/close operations.	(1) Using the key, check if the rear gate can be lock and unlocked normally. (2) Open and close the rear gate to see that there are no abnormal conditions. (3) Operate the power door locking switch to check that the rear gate is locked and unlocked normally.
9. Operation check of fuel lid opener lock release lever	(1) Operate the fuel lid opener to check that the fuel lid is unlocked normally.
10. Accessory check	Check the following accessories are provided: <ul style="list-style-type: none"> • Owner's manual • Warranty booklet • Service booklet • Spare key • Jack • Tool set • Spare tire
11. Operation check of hood lock release system	(1) Operate the hood lock release lever to check that the hood opens normally.
12. Battery	(1) Check the battery for any abnormal conditions such as rust and trace of battery fluid leaks.
13. Brake fluid	(1) Check the fluid amount.
14. Engine oil	(1) Check the oil amount.
15. Transmission fluid	(1) Check the fluid amount.
16. AT front differential oil	(1) Check the AT front differential oil amount.
17. Coolant	(1) Check the coolant amount.
18. Clutch fluid	(1) Check the clutch fluid amount.
19. Window washer fluid	(1) Check the window washer fluid amount.
20. Hood latch check	(1) Check that the front hood is closed and latched securely.
21. Keyless entry system	(1) Check that the keyless entry system operates normally.
22. Seat	(1) Check the seat surfaces for smears or dirt. (2) Check the seat installation conditions and functionality.
23. Seat belt	(1) Check the seat belt installation conditions and functionality.
24. Wheel alignment	(1) Check that the wheel alignments are properly adjusted.

PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

Checks with the Engine Running

Step	Check point
1. Test mode connector	(1) Disconnect the test mode connector.
2. Starting condition	(1) Start the engine and check that the engine starts smoothly.
3. Exhaust system	(1) Check that the exhaust noise is normal and no leaks are found.
4. Indicator light	(1) Check that all the indicator lights operate normally.
5. Clock	(1) Check that the clock operate normally.
6. Radio	(1) Check that the radio system operates normally.
7. Cigarette lighter	(1) Check that the cigarette lighter operates normally.
8. Lighting system	(1) Check that the lighting systems operate normally.
9. Window washer	(1) Check that the window washer system operates normally.
10. Wiper	(1) Check that the wiper system operates normally.
11. Power window operation check	(1) Check the power window for correct operations.

Dynamic Test with the Vehicle Running

Step	Check point
1. Brake test	(1) Check that the foot brake operates normally.
2. Parking brake	(1) Check that the parking brake operates normally.
3. AT shift control	(1) Check the AT shift patterns are correct.
4. Heater & ventilation	(1) Check that the heater & ventilation system operates normally.
5. Air conditioner	(1) Check that the air conditioner operates normally.
6. Cruise control	(1) Check that the cruise control system operates normally.

Checks after Dynamic Test

Step	Check point
1. ATF level	(1) Check that the ATF level is normal.
2. Power steering fluid level	(1) Check that the power steering fluid level is normal.
3. Fluid leak check	(1) Check for fluid/oil leaks.
4. Water leak check	(1) Spray the vehicle with water and check for water leaks.
5. Appearance check 2	(1) Remove the protective film (if any). (2) Check the body paints for damage and smears. (3) Check that no crack and no damage are found on glass or light lens. (4) Check the plated parts for damage and rust.

1. APPEARANCE CHECK

- 1) When vehicle is covered with protective film, inspect visually for damage or dents to vehicle body surface.
- 2) When protective film is removed, check the body paints for small areas of damage or stains and repair as necessary.
- 3) Check the window glass, door glass, and lights for any cracks or damage and repair or replace the parts as necessary.
- 4) Check the plated parts, such as the grilles and door knobs, for damage or loss of gloss and repair or replace the parts as necessary.

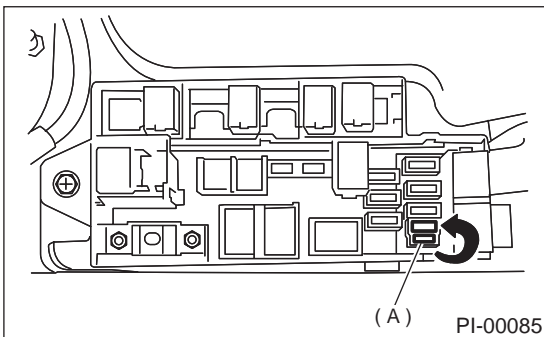
2. TIRE CHECK

- Check the tire outer faces for any damage.
- Check the tire air pressure by referring to the following table.

Tire size	Tire inflation pressure kPa (kg/cm ² , psi)	
	Front	Rear
195/60R15	220 (2.2, 32)	210 (2.1, 30)
205/50R16	230 (2.3, 33)	220 (2.2, 32)
215/60R16	200 (2.0, 29)	190 (1.9, 28)
215/45ZR17	230 (2.3, 33)	220 (2.2, 32)

3. FUSE INSTALLATION

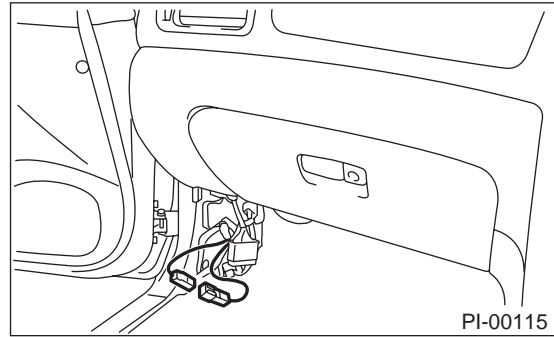
A vehicle just delivered has no fuses for the room lamp circuit to prevent battery discharge. Attach a 15 A fuse as shown in the figure.



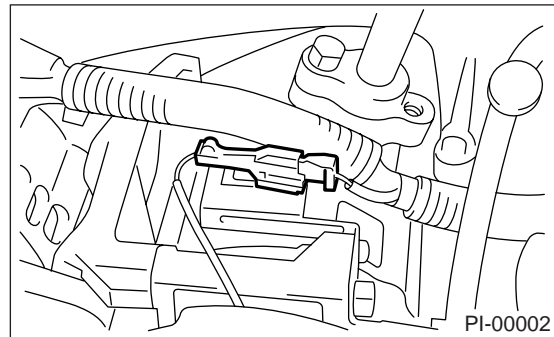
4. CONNECTION OF AIR CONDITIONER CUT CONNECTOR

A vehicle just delivered has its air conditioner cut connector or air conditioner harness disconnected to protect the air conditioner compressor. Connect as shown in the figure.

3.0 L model

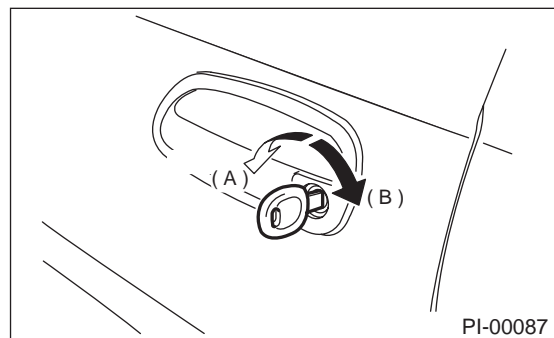


Except 3.0 L model



5. CHECK THE DOOR OPERATIONS, LOCK/UNLOCK AND OPEN/CLOSE, AS FOLLOWS.

Using the key, lock and unlock the door several times to check for normal operation. Open and close the door several times for smooth movement.



(A) Unlock

(B) Lock

• Vehicles with manual door locks:

Sit in all the seats, close the door completely, and move the lock lever to the lock position. Then, pull the inside door handle to ensure the door will not open.

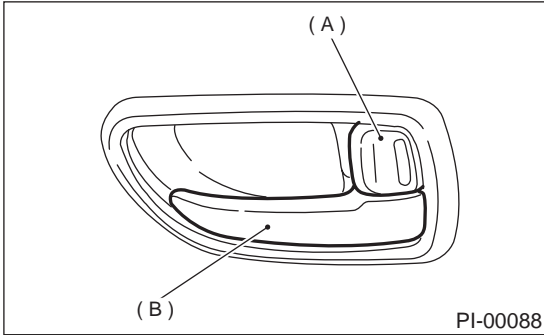
PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

• Vehicles with power door locks:

Sit in the driver seat, close the driver's door completely, and place the lock lever to the lock position. Then pull the all inside door handles to ensure that the all doors will not open.

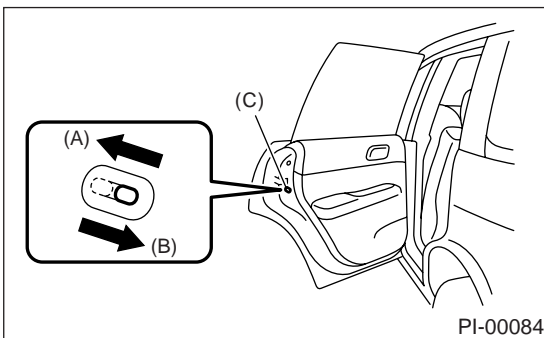
For other doors, place the lock levers to the lock positions and then pull the inside door handles to ensure that the doors will not open.



- (A) Lock lever
- (B) Inside door handle

6. CHECK THE OPERATION OF CHILD SAFETY LOCKS

- 1) Set the child safety lock on both rear doors to the lock positions.
- 2) Close the rear doors completely.
- 3) Check that the lock levers of the rear doors are in the unlock positions. Then, pull the inside door handles of the rear doors to ensure that the doors will open.
- 4) Next, pull the outside door handles of the rear doors to ensure that the doors will open.

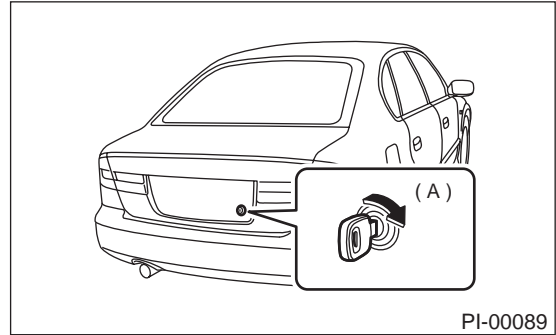


- (A) Unlock
- (B) Lock
- (C) Child safety lock

7. CHECK THE TRUNK LID OPERATIONS, OPEN/CLOSE, AS FOLLOWS.

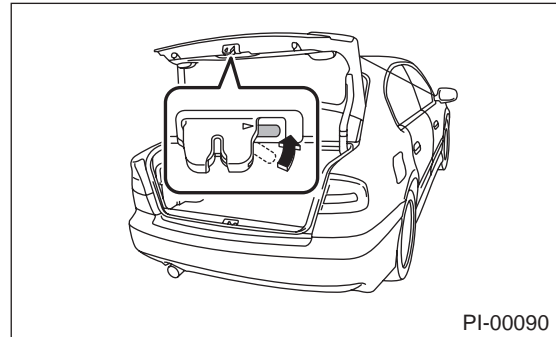
- Operate the trunk lock release lever and verify that the trunk lid opens.

- Using the key, open the trunk lid several times to check for normal operation.
- Open and close the trunk lid several times for smooth movement.



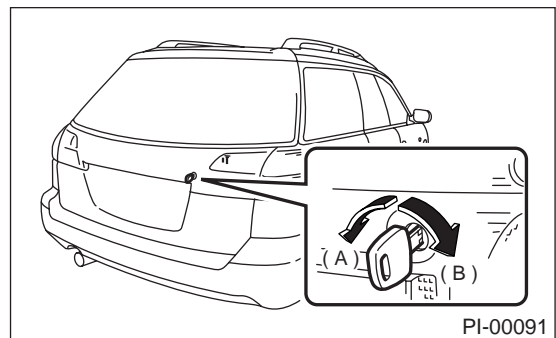
- (A) Open

- Set the trunk lid release lever to the cancel position, and check that the trunk lid can only be opened with the key.



8. CHECK THE REAR GATE OPERATIONS, LOCK/UNLOCK AND OPEN/CLOSE, AS FOLLOWS.

- Using the key, lock and unlock the rear gate several times to check for normal operation.
- Open and close the rear gate several times for smooth movement.



- (A) Lock
- (B) Unlock

- Operate the lock lever to check that the rear gate is locked and unlocked normally.

9. OPERATION CHECK OF FUEL LID OPENER LOCK RELEASE LEVER

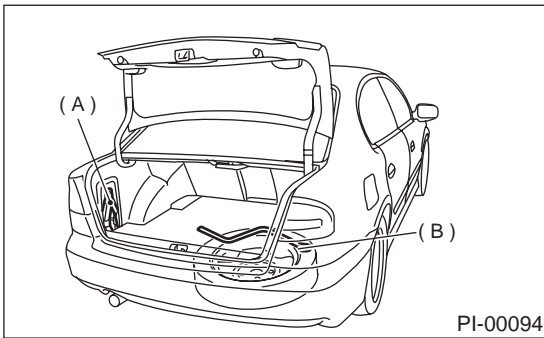
Operate the fuel lid opener and verify that the fuel lid opens normally. Check that the filler cap is securely closed.

10. ACCESSORY CHECK

Check that the following accessories are provided in the luggage compartment or cargo area.

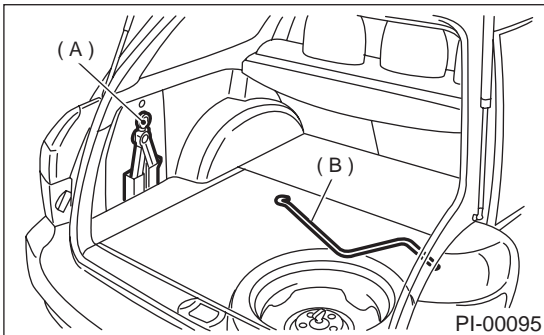
- Owner's manual
- Warranty booklet
- Service booklet
- Spare key
- Jack
- Tool set
- Spare tire

Sedan



- (A) Jack
- (B) Jack handle

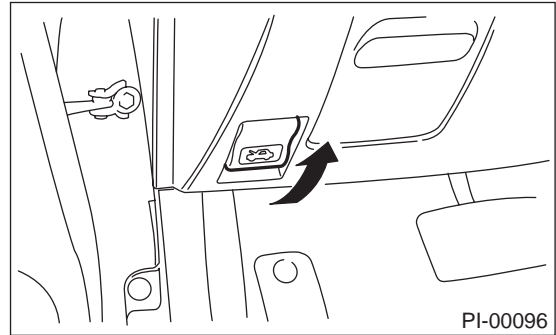
Wagon



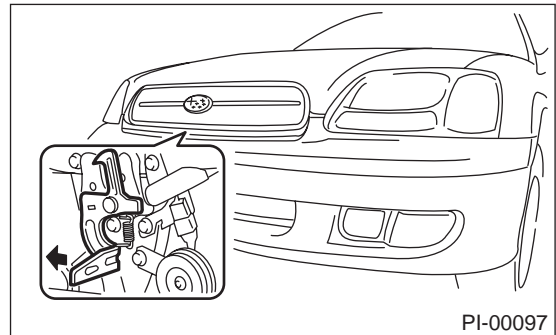
- (A) Jack
- (B) Jack handle

11. OPERATION CHECK OF HOOD LOCK RELEASE SYSTEM

By operating front hood release knob, confirm front hood will unlock properly.

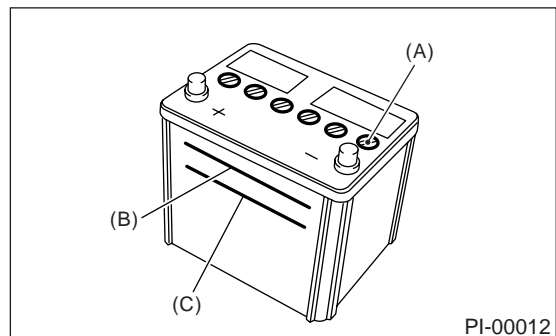


By operating lever, confirm front hood will open properly. Next, support the front hood with front hood stay.



12. BATTERY

Check the battery terminals to make sure that no rust or corruptions due to fluid leaks are found. Check that the battery cap is securely tightened.



- (A) Cap
- (B) Upper level
- (C) Lower level

PRE-DELIVERY INSPECTION

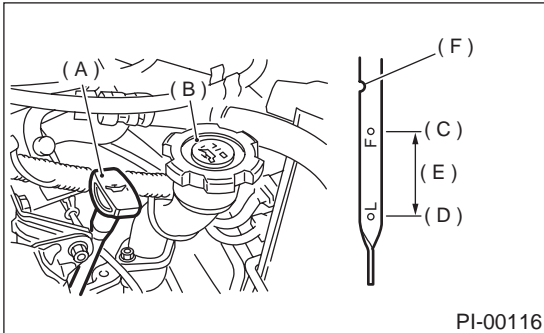
PRE-DELIVERY INSPECTION

13. BRAKE FLUID

Check the brake fluid amount. If the amount is insufficient, carry out a brake line test to identify brake fluid leaks and check the brake operation. After that, refill the brake fluid tank with the specified type of fluid.

14. ENGINE OIL

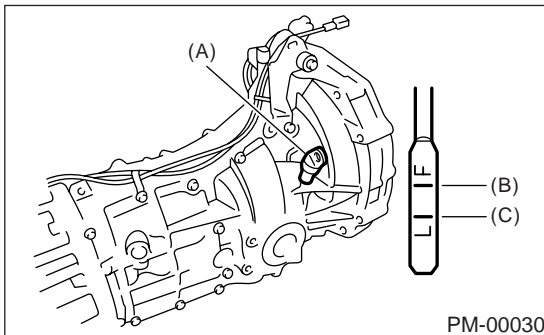
Check the engine oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified engine oil.



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

15. TRANSMISSION FLUID

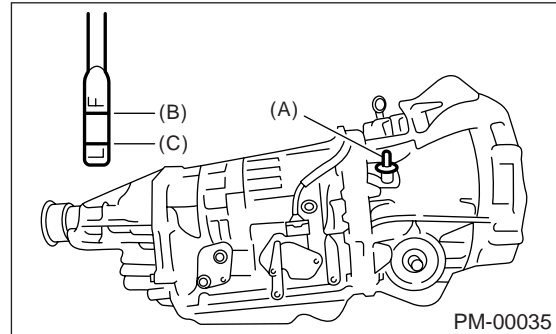
Check the transmission fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

16. AT FRONT DIFFERENTIAL OIL

Check the AT front differential oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified AT front differential oil.



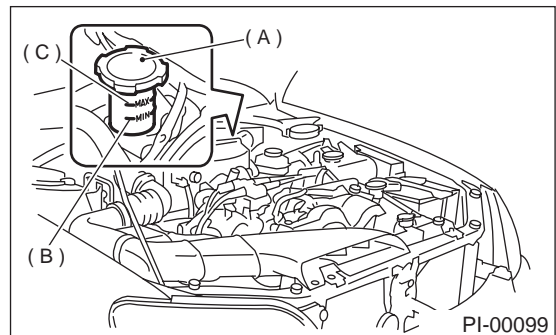
- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

17. COOLANT

Check the coolant amount on the reservoir. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of coolant with the specified concentration.

18. CLUTCH FLUID

Check the clutch fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



- (A) Reservoir tank
- (B) MIN level
- (C) MAX level

19. WINDOW WASHER FLUID

Check the window washer fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of washer fluid commercially available.

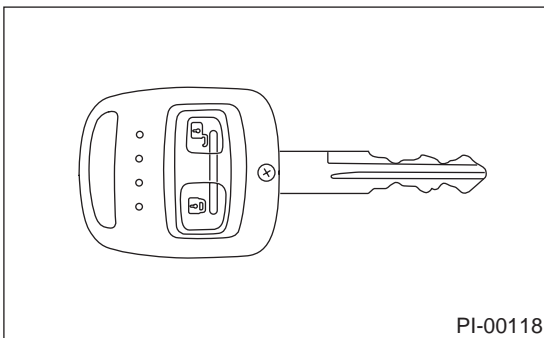
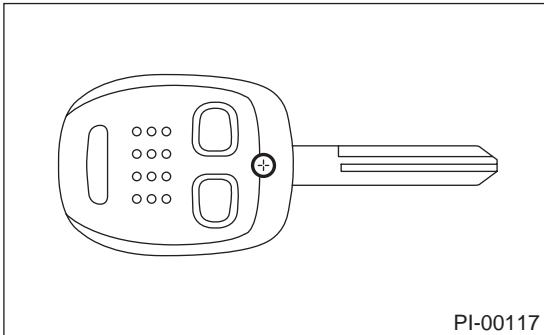
20. FRONT HOOD LATCH CHECK

Retract the front hood stay and close the hood. Check that the front hood is securely latched.

21. KEYLESS ENTRY SYSTEM

Check the keyless entry system operations as follows.

- Remove the key from the ignition switch and close all the doors including rear gate (wagon).
- Press the “LOCK” button on the transmitter momentarily once and check if all the doors are locked and the hazard light flashes ones.



- Press the “OPEN” button on the transmitter momentarily once and check if the driver's door is unlocked, the hazard light flashes twice and the dome light illuminates.
- Close all doors and rear gate, press the “LOCK” button of the transmitter. Press the “OPEN” button of the transmitter and wait for 30 seconds. Check that all doors and the rear gate are automatically locked again.

22. SEAT

Check that each seat provides full functionality in sliding and reclining. Check all available functions of the rear seat such as a trunk-through center arm rest.

23. SEAT BELT

Pull out the seat belt and then release it. Check that the belt webbing retracts smoothly.

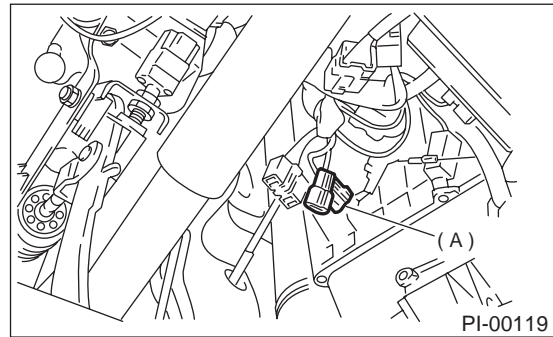
24. WHEEL ALIGNMENT

Check the wheel alignments. <Ref. to FS-6, Wheel Alignment.> and <Ref. to RS-8, Wheel Alignment.>

25. TEST MODE CONNECTOR

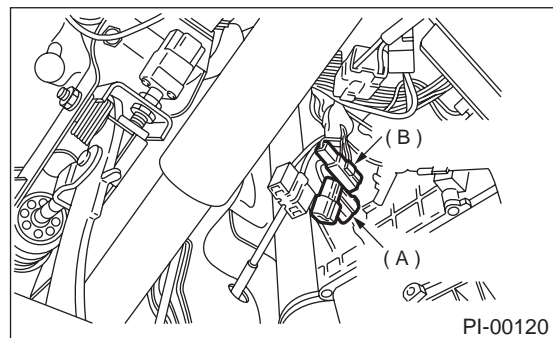
Turn the ignition switch to ON and check that the check-engine light starts blinking. If the light blinks, return the ignition key to LOCK and disconnect the test mode connector. Then, turn the ignition key to ON again. If the check-engine light blinks at that time in spite of the disconnected test mode connector, carry out an engine diagnosis.

With OBD model



(A) Test mode connector (Green)

Without OBD model



(A) Test mode connector (Green)
 (B) Lead memory connector (Black)

PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

26. STARTING CONDITION

Start the engine and check that the engine starts smoothly. If any battery voltage problems are found, recharge or replace the battery. If any abnormal noises are observed, immediately stop the engine and check and repair the necessary components.

27. EXHAUST SYSTEM

Listen to the exhaust noise to see if no abnormal noises are observed.

28. INDICATOR LIGHT

Check that all the indicator lights are off.

29. CLOCK

Check the clock for normal operations and enough accuracy.

30. RADIO

Check the radio for full functionality and normal noise level. Also check the CD unit operations.

31. CIGARETTE LIGHTER

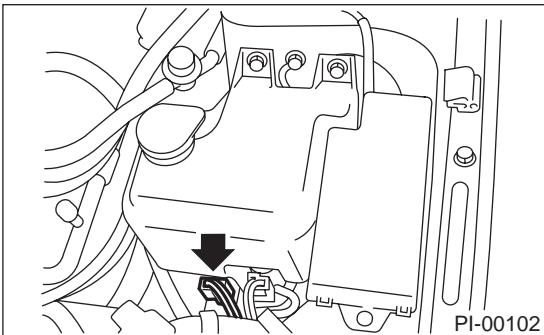
Check that the cigarette lighter operations.

32. LIGHTING SYSTEM

- Check the headlight operations.
- Check the brake light operations.
- Check the other lights for normal operations.

33. WINDOW WASHER

- Before inspection of the window washer system, connect the washer connector to the washer motor.



- Check that the window washer system injects washer fluid to the specified area of the windshield shown in the figure.

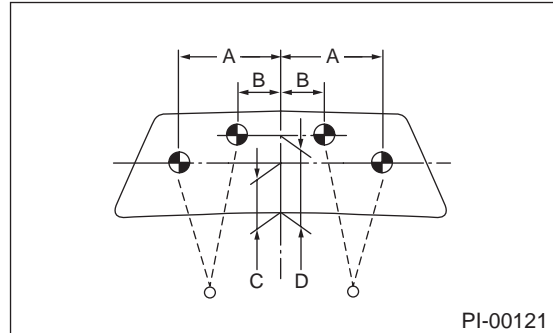
NOTE:

If the washer fluid does not cover the specified area, clean the nozzle.

Front

Injection position:

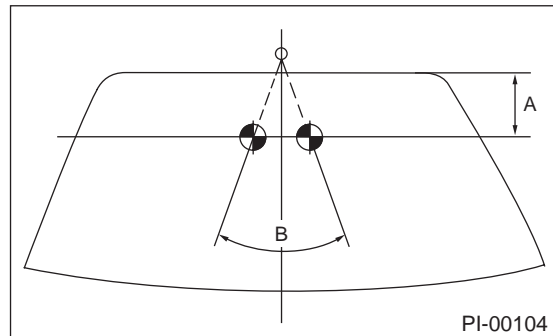
- A: 350 mm (13.78 in)**
- B: 150 mm (5.91 in)**
- C: 300 mm (11.81 in)**
- D: 600 mm (23.62 in)**



Rear

Injection position:

- A: 60 mm (2.36 in)**
- B: 42°**



34. WIPER

Check the front and rear wipers for normal operations.

35. POWER WINDOW OPERATION CHECK

Manipulate the power window switches one by one to check that each of the power windows goes up and down with no abnormal noises.

36. BRAKE TEST

Check the foot brake for normal operations.

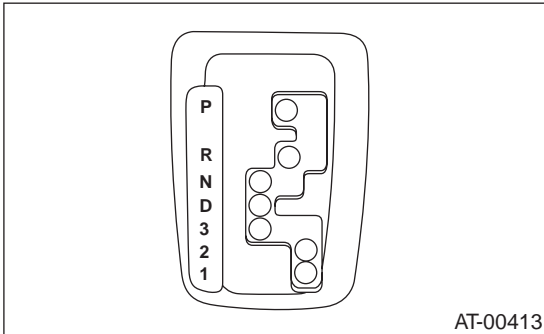
37. PARKING BRAKE

Check the parking brake for normal operations.

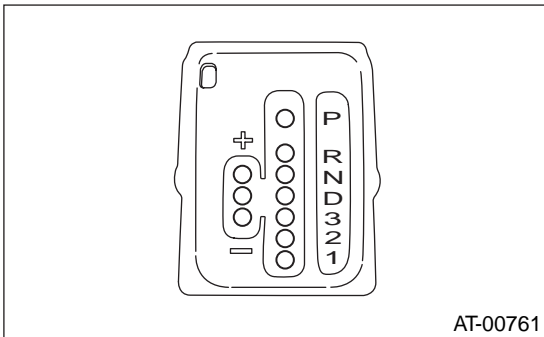
38. AT SHIFT CONTROL

Set the AT select lever to each gear position while checking that the demanded gear position is correctly attained.

- Except SPORT shift



- SPORT shift



Selector Position	Gear Position			
	1st	2nd	3rd	4th
D	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	
2		Yes		
1	Yes			
SPORT shift	Yes	Yes	Yes	Yes

39. HEATER & VENTILATION

Operate the heater and ventilation system to check for normal airflow and heating capacity.

40. AIR CONDITIONER

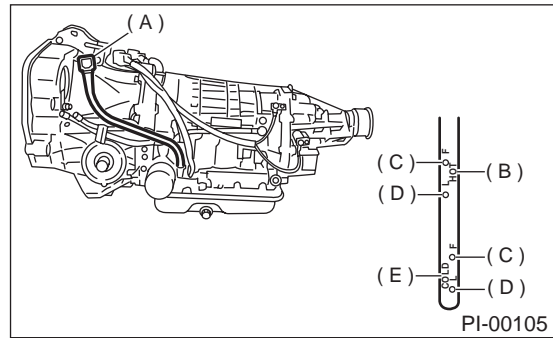
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

41. CRUISE CONTROL

Operate the cruise control system. Check that the system is activated and deactivated correctly.

42. ATF LEVEL

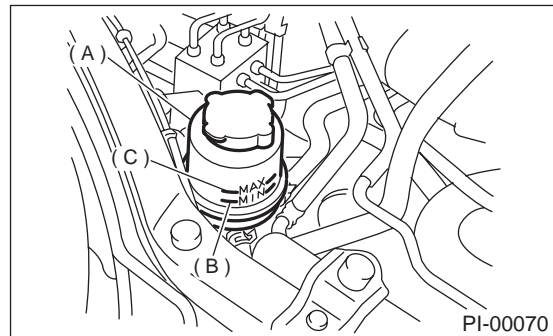
Check that the ATF level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified ATF.



- (A) Level gauge
- (B) "HOT" side
- (C) Upper level
- (D) Lower level
- (E) "COLD" side

43. POWER STEERING FLUID LEVEL

Check that the power steering fluid level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified power steering fluid.



- (A) Reservoir tank
- (B) MIN level
- (C) MAX level

44. FLUID LEAK CHECK

Check the entire areas of the vehicle for any trace of coolant/oil/fluid leaks.

PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

45. WATER LEAK TEST

Spray the vehicle with water and check that no water enters the passenger compartment.

- Before performing the water leakage test, remove anything that may obstruct the operation or which must be kept dry.
- Close all of the windows completely, and then close all of the doors tightly. Close the hood and trunk lid before starting the test.
- Connect a hose to a tap, and spray water on the vehicle. The rate of water discharge must be approx. 20 to 25 liters (5.3 to 6.6 US gal, 4.4 to 5.5 Imp gal) per minute.

When spraying water on areas adjacent to the floor and wheel house, increase the pressure. When directing water on areas other than the floor portion and wheel house, decrease the pressure. But the force of water must be made strong occasionally by pressing the end of the hose.

NOTE:

Be sure to keep the hose at least 10 cm (3.9 in) from the vehicle.

- Check the following areas:
 - Front window and body framework mating portion
 - Door mating portions
 - Glass mating portions
 - Rear quarter window mating portions
 - Rear window and body framework mating portion
 - Around roof drips
- If any dampness in the compartments is discovered after the water has been applied, carefully check all areas that may have possibly contributed to the leak.

46. APPEARANCE CHECK 2

1) Check the paint after removing the paint protective coating and washing the vehicle.

NOTE:

Before removing the protective coating, be sure to wash the vehicle, because the painted surface may be scratched if the surface is rubbed with sand or other hard particles which may be attached to the protective coating.

2) Check the whole vehicle body for stains, flaking, damage caused by transportation, rust, dirt, cracks, or blistering.

NOTE:

- It is better to determine an inspection pattern in order to avoid missing an area, since the total inspection area is wide.

- It is desirable not to make corrections to the body paint unless absolutely needed. However, if any corrections are required to remove scratches or rust, the area to be corrected must be limited as much as possible. Re-painting and spray painting must be avoided whenever possible.

3) Carefully check each window glass for scratches. Slight damage may be removed by polishing with cerium oxide. (Half-fill a cup with cerium oxide, and add warm water to it. Then agitate the content until it turns to wax. Apply this wax to a soft cloth, and polish the glass.)

4) Check each portion of the vehicle body and underside components for the formation of rust. If rust is discovered, remove it with #80 — #180 emery paper, and treat the surface with rust preventive. After this treatment is completed, flush the portion thoroughly, and prepare the surface for repair painting.

5) Check each portion of the body and all of the chrome parts for deformation or distortion. Also check each lamp lens for cracks.

PERIODIC MAINTENANCE SERVICES

PM

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GENERAL DESCRIPTION

PERIODIC MAINTENANCE SERVICES

1. General Description

A: GENERAL

Be sure to perform periodic maintenance in order to maintain vehicle performance and find problems before they become serious.

SCHEDULE

PERIODIC MAINTENANCE SERVICES

2. Schedule

A: MAINTENANCE SCHEDULE 1

1. EUROPE

For periodic maintenance of over 120,000 km (75,000 miles) or 96 months, carry out inspection by referring to the following table. For a maintenance period gone beyond these tables, apply them repeatedly as a set of 120,000 km (75,000 miles) or 96 months.

		Maintenance interval [Number of months or km (miles), whichever occurs first]											Remarks
	Months			12	24	36	48	60	72	84	96		
	× 1,000 km	1.6	5	15	30	45	60	75	90	105	120		
	× 1,000 miles	1	3	9	19	28	38	47	56	66	75		
1	Engine oil	For 3.0 L		R	R	R	R	R	R	R	R	R	
		Others			R	R	R	R	R	R	R	R	
2	Engine oil filter	For 3.0 L		R	R	R	R	R	R	R	R	R	
		Others			R	R	R	R	R	R	R	R	
3	Spark plug	For 3.0 L								R			
		Others				R		R		R		R	
4	Drive belt(s)				I	I	I	I	I	I	I	For 3.0 L model, replace every 160,000 km (100,000 miles).	
5	Camshaft drive belt									R			
6	Fuel line				I		I		I		I		
7	Fuel filter									R			
8	Air cleaner element			I	R	I	R	I	R	I	R		
9	Cooling system				I		I		I		I		
10	Coolant				R		R		R		R		
11	Clutch system				I		I		I		I		
12	Hill-holder system				I		I		I		I		
13	Transmission oil				I		R		I		R		
14	ATF				I		R		I		R		
15	Front & rear differential				I		R		I		R		
16	Brake line				I		I		I		I		
17	Brake fluid				R		R		R		R		
18	Disc brake pads & discs			I	I	I	I	I	I	I	I		
19	Parking brake				I		I		I		I		
20	Suspension				I		I		I		I		
21	Wheel bearing										(I)		
22	Axle boots & joint			I	I	I	I	I	I	I	I		
23	Steering system				I		I		I		I		

Symbols used:

R: Replace

I: Inspection

(I): Recommended service for safe vehicle operation.

NOTE:

(1) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.

(2) ATF filter is maintenance free part. ATF filter needs replacement, when it is physically damaged or ATF leaked.

(3) Periodic inspection and replacement of the camshaft drive chains on the 3.0 L models is not required.

SCHEDULE

PERIODIC MAINTENANCE SERVICES

2. EXCEPT EUROPE

For periodic maintenance of over 50,000 km (30,000 miles) or 48 months, carry out inspections by referring to the following tables. For a maintenance period gone beyond these tables, apply them repeatedly as a set of 50,000 km (30,000 miles) or 48 months.

			Maintenance interval [Number of months or km (miles), whichever occurs first]					Remarks
	Months		12	24	36	48		
	× 1,000 km	5	12.5	25	37.5	50		
	× 1,000 miles	3	7.5	15	22.5	30		
1	Engine oil	For 3.0 L	R	R	R	R	R	
		Others		R	R	R	R	
2	Engine oil filter	For 3.0 L	R	R	R	R	R	
		Others		R	R	R	R	

For periodic maintenance of over 100,000 km (60,000 miles) or 48 months, carry out inspections by referring to the following tables. For a maintenance period gone beyond these tables, apply them repeatedly as a set of 100,000 km (60,000 miles) or 48 months.

			Maintenance interval [Number of months or km (miles), whichever occurs first]					Remarks
	Months		12	24	36	48		
	× 1,000 km	1.6	25	50	75	100		
	× 1,000 miles	1	15	30	45	60		
3	Spark plugs	For Turbo and 3.0 L				R		
		Others		R	R	R	R	
4	Drive belt(s)		I	I	I	I	For 3.0 L model, replace every 160,000 km (100,000 miles).	
5	Camshaft drive belt					R		
6	Fuel line			I		I		
7	Fuel filter					R		
8	Air cleaner element		I	R	I	R		
9	Cooling system			I		I		
10	Coolant			R		R		
11	Idle mixture		I	I	I	I	In case of model without catalytic converter	
12	Clutch system		I	I	I	I		
13	Hill-holder system		I	I	I	I		
14	Transmission oil			R		R		
15	ATF			R		R		
16	Front & rear differential oil			I		I		
17	Brake line			R		R		
18	Brake fluid			R		R		
19	Disc brake pads & discs		I	I	I	I		
20	Parking brake			I		I		
21	Suspension		I	I	I	I		
22	Wheel bearing					(I)		
23	Axle boots & joint		I	I	I	I		
24	Steering system (Power steering)		I	I	I	I		

Symbols used:

R: Replace

I: Inspection

(I): Recommended service for safe vehicle operation.

NOTE:

(1) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.

(2) ATF filter is maintenance free part. ATF filter needs replacement, when it is physically damaged or ATF leaked.

(3) Periodic inspection and replacement of the camshaft drive chains on the 3.0 L models is not required.

SCHEDULE

PERIODIC MAINTENANCE SERVICES

B: MAINTENANCE SCHEDULE 2

1. EUROPE

Item	Every	Repeat short distance drive	Repeat rough/muddy road drive	Extremely cold weather area	Salt or other corrosive used or coastal area	High humidity or mountain area	Repeat towing trailer
Engine oil		Replace more frequently		Replace more frequently			Replace more frequently
Engine oil filter		Replace more frequently		Replace more frequently			Replace more frequently
Fuel line	12 months				I		
	15,000 km						
	9,000 miles						
Transmission oil							Replace more frequently
ATF							Replace more frequently
Front & rear differential oil							Replace more frequently
Brake line	12 months	I	I		I		
	15,000 km						
	9,000 miles						
Brake fluid	12 months					R	
	15,000 km						
	9,000 miles						
Brake pads	12 months	I	I		I		I
	15,000 km						
	9,000 miles						
Parking brake	12 months	I	I		I		I
	15,000 km						
	9,000 miles						
Suspension	12 months		I	I	I		
	15,000 km						
	9,000 miles						
Axle boots & joints	12 months	I	I		I		I
	15,000 km						
	9,000 miles						
Steering system (Power steering)	12 months		I	I	I		
	15,000 km						
	9,000 miles						

SCHEDULE

PERIODIC MAINTENANCE SERVICES

2. EXCEPT EUROPE

Item	Every	Repeat short distance drive	Repeat rough/muddy road drive	Extremely cold weather area	Salt or other corrosive used or coastal area	High humidity or mountain area	Repeat towing trailer
Engine oil		Replace more frequently		Replace more frequently			Replace more frequently
Engine oil filter		Replace more frequently		Replace more frequently			Replace more frequently
Fuel line	6 months 12,500 km 7,500 miles				I		
Transmission oil							Replace more frequently
ATF							Replace more frequently
Front & rear differential oil							Replace more frequently
Brake line	6 months 12,500 km 7,500 miles	I	I		I		
Brake fluid	12 months 25,000 km 15,000 miles					R	
Brake pads	6 months 12,500 km 7,500 miles	I	I		I		I
Parking brake	6 months 12,500 km 7,500 miles	I	I		I		I
Suspension	6 months 12,500 km 7,500 miles		I	I	I		
Axle boots & joints	6 months 12,500 km 7,500 miles	I	I		I		I
Steering system (Power steering)	6 months 12,500 km 7,500 miles		I	I	I		

3. Engine Oil

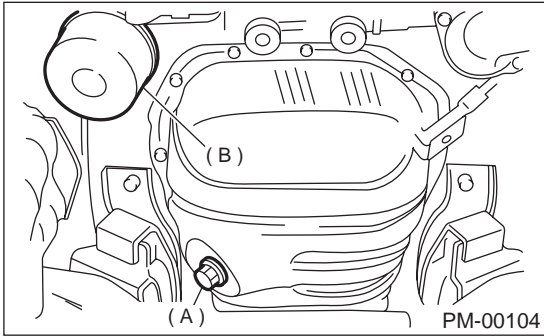
A: REPLACEMENT

NOTE:

Replace engine oil and engine oil filter at the same time.

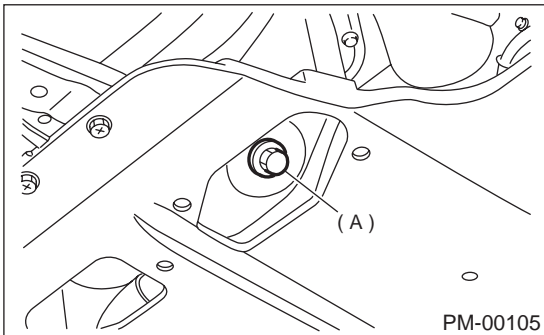
1) Drain engine oil by loosening engine oil drain plug.

Except 3.0 L model



- (A) Drain plug
- (B) Oil filter

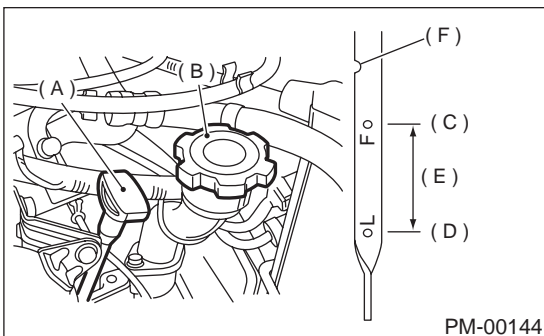
3.0 L model



- (A) Drain plug

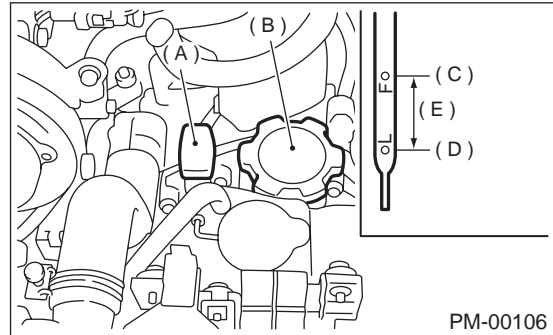
2) Open engine oil filler cap for quick draining of the engine oil.

Except 3.0 L model



PM-00144

3.0 L model



PM-00106

- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) About 1.0 ̅ (1.1 US qt, 0.9 imp qt)
- (F) Notch

3) Replace drain plug gasket.

4) Tighten engine oil drain plug after draining engine oil.

Tightening torque:

44 N·m (4.5 kgf-m, 33 ft-lb)

5) Fill engine oil through filler pipe up to upper point on level gauge. Make sure that vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Engine oil amount for preparation:

2.0 L non-turbo and 2.5 L models

Approx. 4.0 ̅ (4.2 US qt, 3.5 Imp qt)

2.0 L turbo model

Approx. 4.5 ̅ (4.8 US qt, 4.0 Imp qt)

3.0 L model

Approx. 5.6 ̅ (5.9 US qt, 4.9 Imp qt)

SAE Viscosity No. and Applicable Temperature						
(°C)	-30	-20	-15	0	15	30 40
(°F)	-22	-4	5	32	59	86 104
					10W-30, 10W-40	
				5W-30 PREFERRED		

PM-00107

ENGINE OIL

PERIODIC MAINTENANCE SERVICES

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

NOTE:

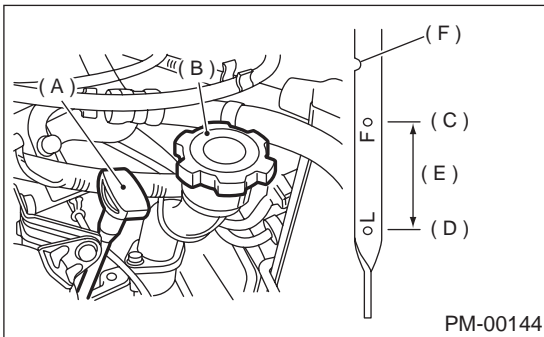
- When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification, and SAE viscosity No. designated by SUBARU.
- If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used:

API classification: SL

SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

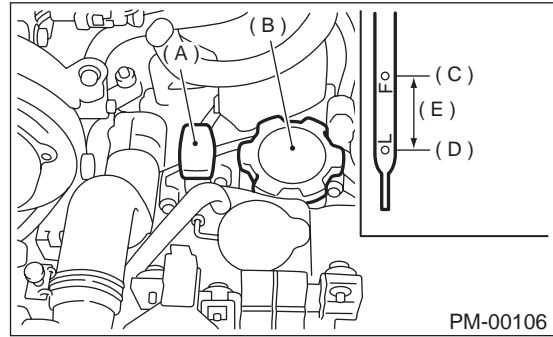
- 6) Close engine oil filler cap.
 - 7) Start engine and warm it up for a time.
 - 8) After engine stops, recheck the oil level.
- If necessary, add engine oil up to upper level on level gauge.

Except 3.0 L model



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1 \varnothing (1.1 US qt, 0.9 Imp qt)
- (F) Notch mark

3.0 L model



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) About 1.0 \varnothing (1.1 US qt, 0.9 imp qt)

B: INSPECTION

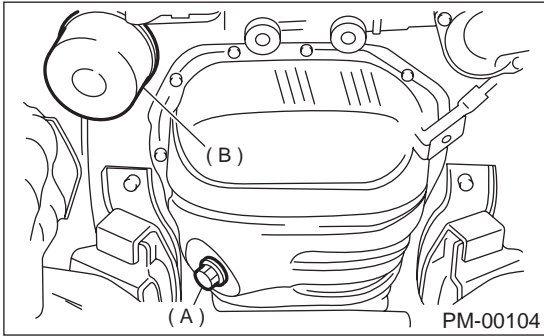
- 1) Park vehicle on a level surface.
- 2) Remove oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.
- 5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
- 6) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and the notch mark. This is caused by thermal expansion of the engine oil.
- 7) To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.

4. Engine Oil Filter

A: REPLACEMENT

1. EXCEPT 3.0 L MODEL

- 1) Remove oil filter with ST.
ST 498547000 OIL FILTER WRENCH



- (A) Drain plug
- (B) Oil filter

- 2) Get a new oil filter and apply a thin coat of engine oil to the seal rubber.
- 3) Install oil filter by turning it by hand, being careful not to damage seal rubber.
- 4) Tighten more (approximately 2/3 to 3/4 turn) after the seal rubber contacts the cylinder block. Do not tighten excessively, or oil may leak.
- 5) After installing oil filter, run engine and make sure that no oil is leaking around seal rubber.

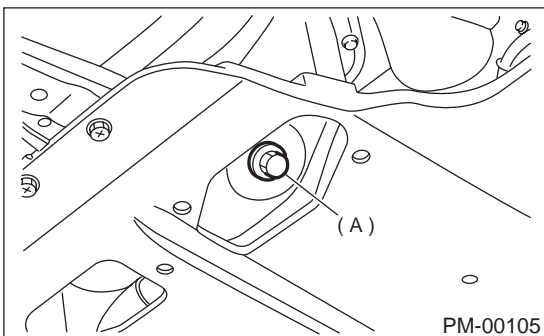
NOTE:

The filter element and filter case are permanently joined; therefore, interior cleaning is not necessary.

- 6) Check the engine oil level. <Ref. to PM-7, Engine Oil.>

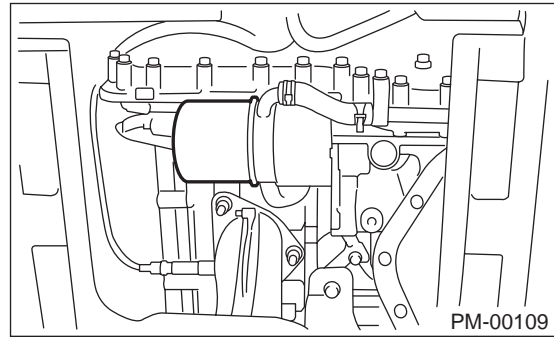
2. 3.0 L MODEL

- 1) Drain engine oil by loosening engine oil drain plug.



- (A) Drain plug

- 2) Remove under cover.
- 3) Remove oil filter with ST.
ST 498547000 OIL FILTER WRENCH



- 4) Get a new oil filter and apply a thin coat of engine oil to the rubber seal.
- 5) Install oil filter by turning it by hand, being careful not to damage rubber seal.
- 6) Tighten more (approximately 2/3 to 3/4 turn) after the rubber seal contacts the oil cooler. Do not tighten excessively, or oil may leak.
- 7) After installing oil filter, run engine and make sure that no oil is leaking around rubber seal.

NOTE:

The filter element and filter case are permanently joined; therefore, interior cleaning is not necessary.

- 8) Fill the engine oil. <Ref. to PM-7, Engine Oil.>

SPARK PLUGS

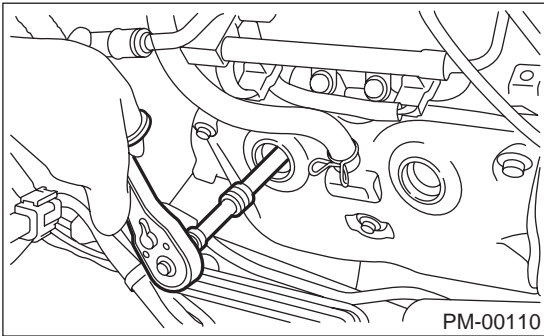
PERIODIC MAINTENANCE SERVICES

5. Spark Plugs

A: REPLACEMENT

1. 2.0 L NON-TURBO AND 2.5 L MODEL

- 1) Disconnect battery ground cable.
- 2) Remove intake duct and intake chamber.
- 3) Remove washer tank and put it aside.
- 4) Disconnect spark plug cord.
- 5) Remove spark plug with a plug-wrench.



- 6) Set new spark plug.

Recommended spark plug :

With OBD

CHAMPION RC10YC4

CHAMPION RC8YC4

NGK BKR6E-11

NIPPONDENSO K20PR-U11

Spark plug gap

1.0 — 1.1 mm (0.039 — 0.043 in)

Without OBD

NGK BKR6E (Without catalytic converter)

CHAMPION RC10YC4 (With catalytic converter)

NGK BKR5E-11 (With catalytic converter)

Spark plug gap

0.7 — 0.8 mm (0.028 — 0.031 in) (Without catalytic converter)

1.0 — 1.1 mm (0.039 — 0.043 in) (With catalytic converter)

- 7) Tighten spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

Tightening torque:

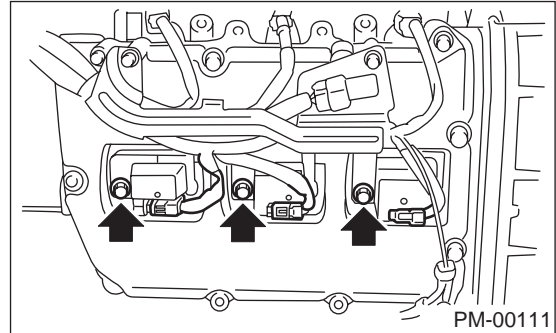
21 N·m (2.1 kgf·m, 15 ft·lb)

NOTE:

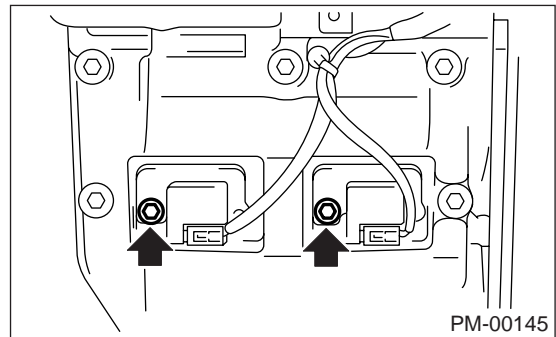
- Be sure to place the gasket between the cylinder head and spark plug.
- If torque wrench is not available, tighten spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

2. 2.0 L TURBO AND 3.0 L MODEL

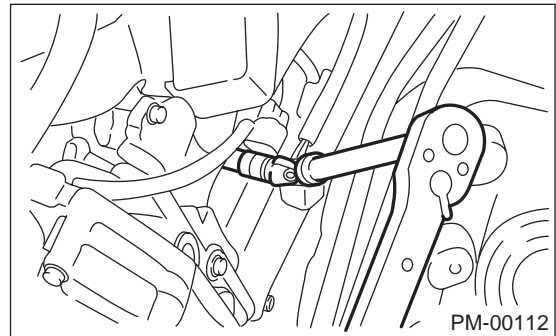
- 1) Disconnect battery cables and then remove battery and battery carrier.
- 2) Remove washer tank and put it aside.
- 3) Remove air cleaner lower case.
- 4) Disconnect connector from ignition coil.
- 5) Remove ignition coil.
- 3.0 L model



- Turbo model



- 6) Remove spark plug with a spark plug socket.



- 7) Set new spark plug.

Recommended spark plug:

- **3.0 L model**

NGK PLFR 6A-11

- **Turbo model**

NGK PFR 6G

- 8) Tighten spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

Tightening torque:

21 N·m (2.1 kgf·m, 15 ft·lb)

9) Tighten ignition coil.

Tightening torque:

16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:

- Be sure to place the gasket between the cylinder head and spark plug.
- If torque wrench is not available, tighten spark plug until gasket contacts cylinder head: then tighten further 1/4 to 1/2 turn.

DRIVE BELT(S)

PERIODIC MAINTENANCE SERVICES

6. Drive Belt(s)

A: INSPECTION

1. EXCEPT 3.0 L MODEL

- 1) Replace belts, if cracks, fraying or wear is found.
- 2) Check drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension

(A)

replaced: 7.0 — 9.0 mm (0.276 — 0.354 in)

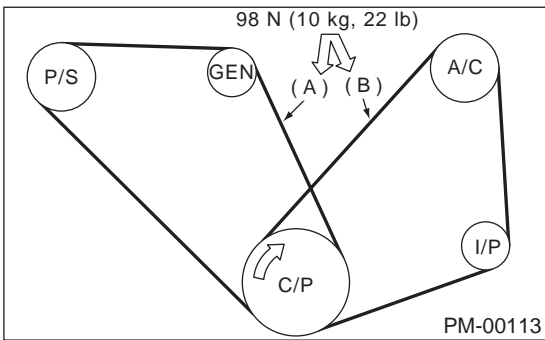
reused: 9.0 — 11.0 mm (0.354 — 0.433 in)

(B)*

replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)

reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

*: There is no belt (B) on models without an air conditioner.



C/P Crankshaft pulley

GEN Generator

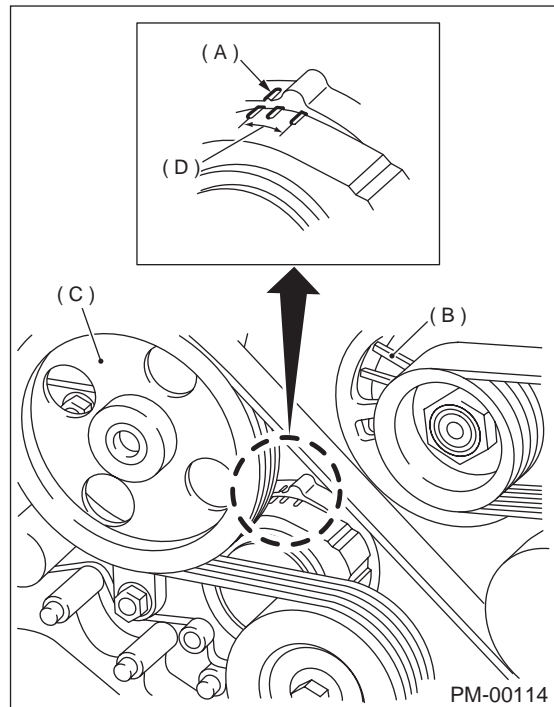
P/S Power steering oil pump pulley

A/C Air conditioning compressor pulley

I/P Idler pulley

2. 3.0 L MODEL

- 1) Replace belts, if cracks, fraying or wear is found.
- 2) Check that the V-belt automatic tensioner indicator is within the range (D).



(A) Indicator

(B) Generator

(C) Power steering oil pump

(D) Service limit

B: REPLACEMENT

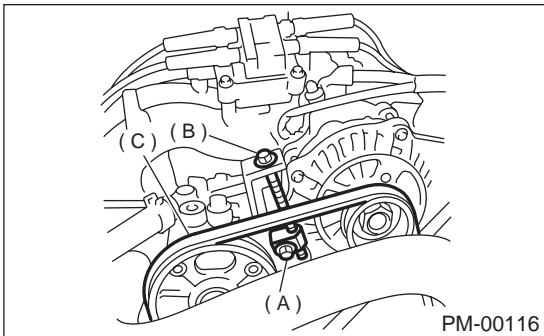
1. EXCEPT 3.0 L MODEL

- 1) Remove V-belt cover.

NOTE:

Wipe off any oil or water on the belt and pulley.

- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).



- 11) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
- 12) Tighten the lock bolt (A).
- 13) Tighten the slider bolt (B).

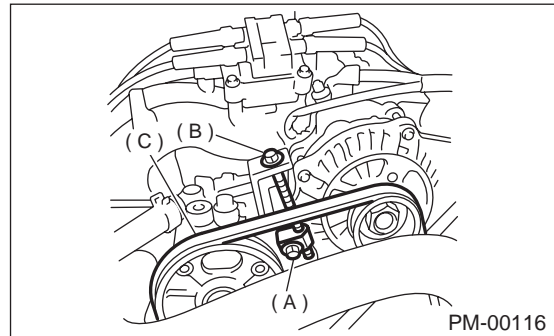
Tightening torque:

Lock bolt:

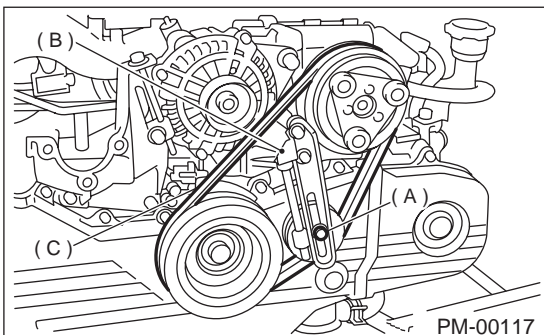
25 N·m (2.5 kgf-m, 18 ft-lb)

Slider-bolt:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



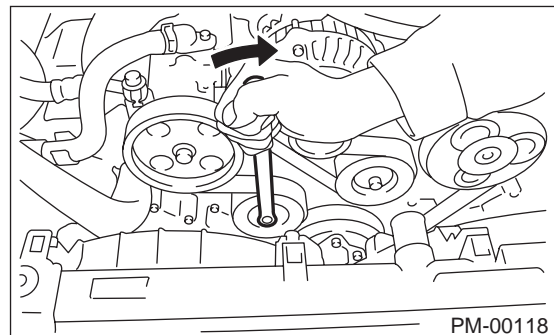
- 5) Loosen the lock nut (A).
- 6) Loosen the through-bolt (B).
- 7) Remove the rear side belt (C).



- 14) Install V-belt cover.

2. 3.0 L MODEL

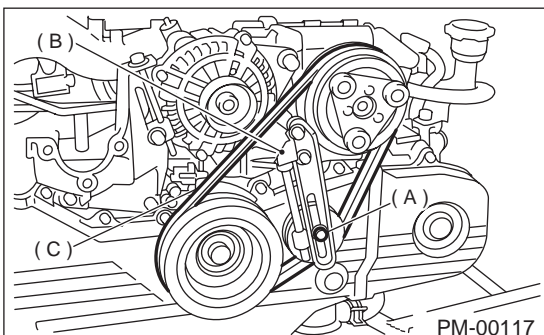
- 1) Fit the tool to the belt tensioner mounting bolt.
- 2) Turn the tool clockwise, and loosen the V-belt to remove.



- 8) Install a new belt, and tighten the through-bolt so as to obtain the specified belt tension.
- 9) Tighten the lock nut (A).

Tightening torque:

22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



- 10) Tighten the through-bolt (B).

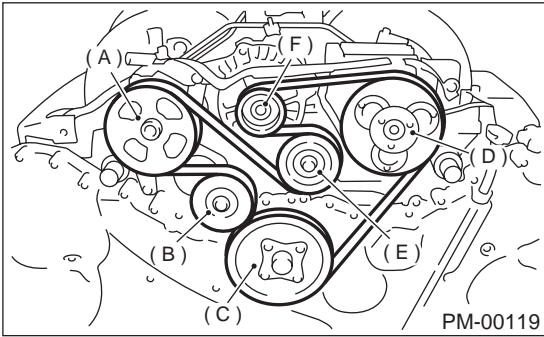
Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

DRIVE BELT(S)

PERIODIC MAINTENANCE SERVICES

3) Install in the reverse order of removal.



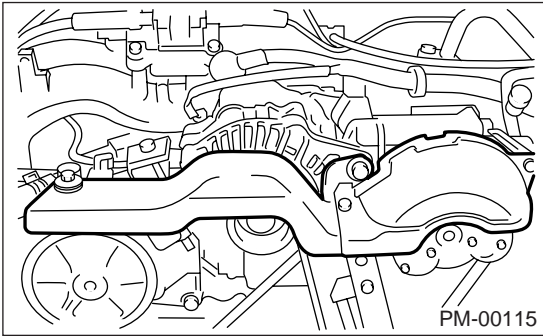
- (A) Power steering oil pump
- (B) Belt tension adjuster
- (C) Crankshaft pulley
- (D) A/C compressor
- (E) Belt idler
- (F) Generator

7. Camshaft Drive Belt

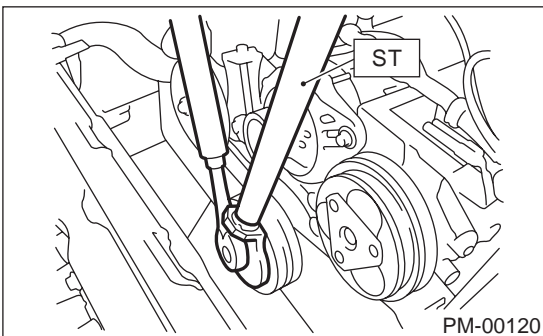
A: REPLACEMENT

1. NON-TURBO MODEL

- 1) Remove radiator fan.
<Ref. to CO(H4SO)-28, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-30, Radiator Sub Fan and Fan Motor.>
- 2) Remove V-belt cover.

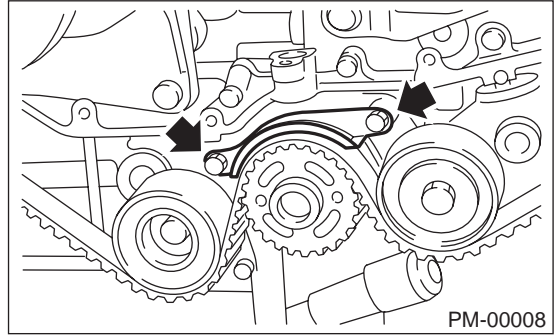


- 3) Remove V-belts.
<Ref. to ME(H4SO)-41, V-belt.>
 - 4) Remove air conditioning compressor drive belt tensioner.
 - 5) Remove pulley bolt. To lock crankshaft use ST.
- 2.0 L model:
ST 499977400 CRANKSHAFT PULLEY WRENCH
- 2.5 L model:
ST 499977100 CRANKSHAFT PULLEY WRENCH

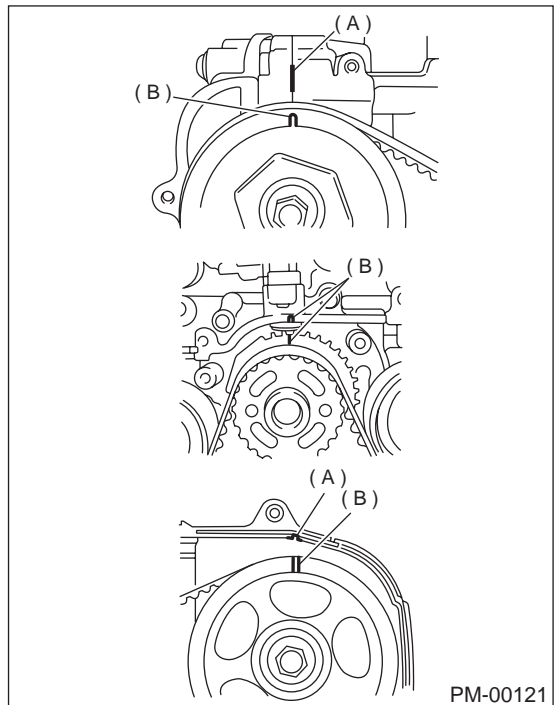


- 6) Remove crankshaft pulley.
- 7) Remove left side belt cover.
- 8) Remove front belt cover.

- 9) Remove timing belt guide. (MT vehicle only)

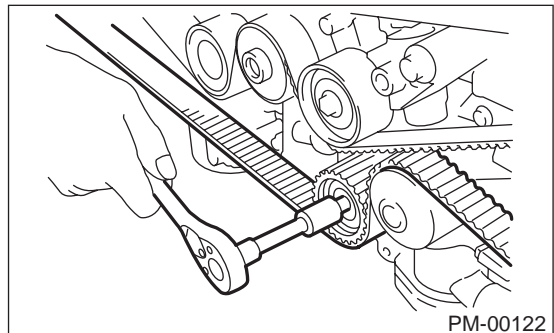


- 10) Turn crankshaft and align alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block:
ST 499987500 CRANKSHAFT SOCKET



- (A) Notch
(B) Alignment mark

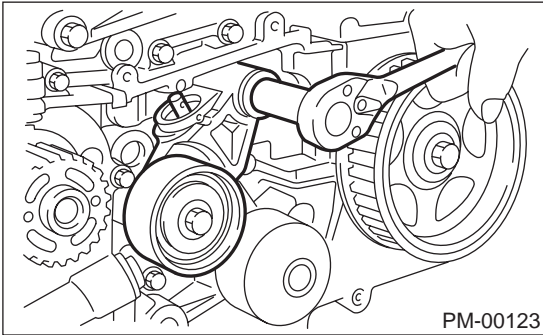
- 11) Remove belt idler.
- 12) Remove belt idler (No. 2).



CAMSHAFT DRIVE BELT

PERIODIC MAINTENANCE SERVICES

- 13) Remove timing belt.
- 14) Remove automatic belt tension adjuster assembly.



- 15) Install in the reverse order of removal.
<Ref. to ME(H4SO)-46, Timing Belt Assembly.>

2. TURBO MODEL

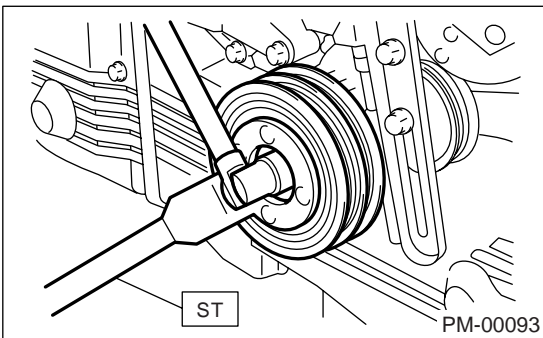
- 1) Remove the radiator fan and air conditioner fan.
<Ref. to CO(H4DOSTC)-28, Radiator Main Fan and Fan Motor.>
<Ref. to CO(H4DOSTC)-30, Radiator Sub Fan and Fan Motor.>
- 2) Remove the V-belts. <Ref. to ME(H4DOSTC)-42, V-belt.>
- 3) Remove the air conditioning compressor drive belt tensioner.
- 4) Remove the pulley bolt. To lock the crankshaft use ST.

MT model:

ST 499977100 CRANKSHAFT PULLEY WRENCH

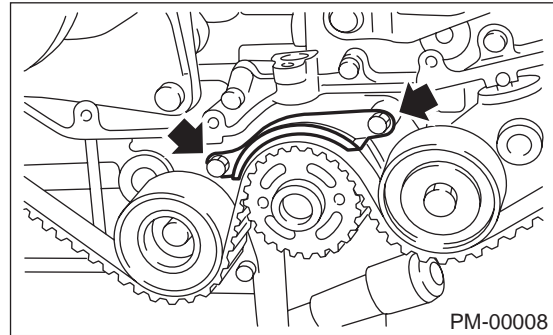
AT model:

ST 499977400 CRANKSHAFT PULLEY WRENCH

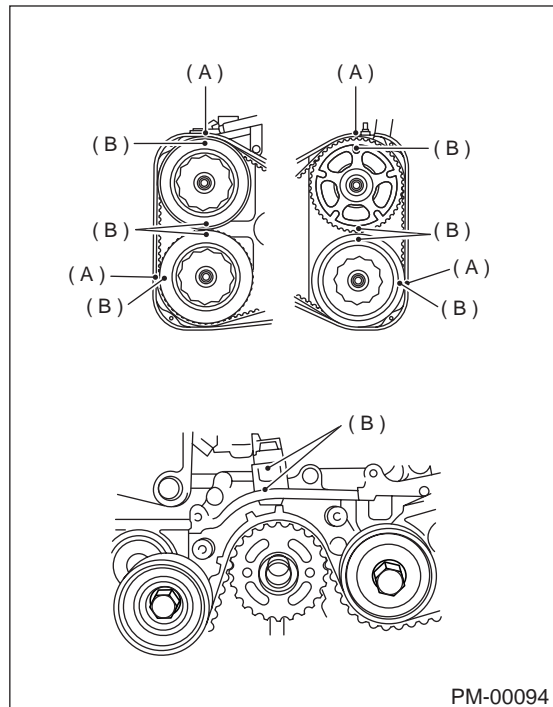


- 5) Remove the crankshaft pulley.
- 6) Remove the air conditioning compressor drive belt tensioner.
- 7) Remove the left side belt cover.
- 8) Remove the right side belt cover.
- 9) Remove the front belt cover.

- 10) Remove timing belt guide. (MT vehicle only)

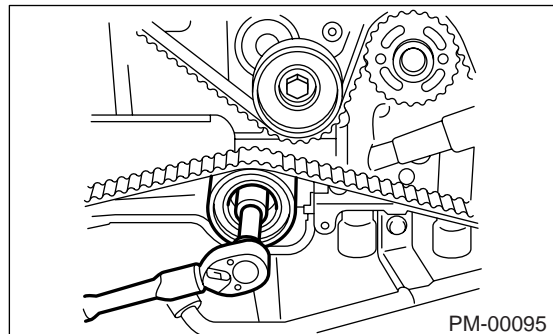


- 11) Turn the crankshaft and align the alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block. To turn the crankshaft, use ST:
ST 499987500 CRANKSHAFT SOCKET

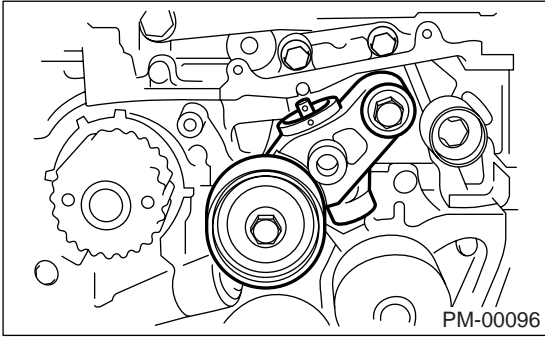


- (A) Notch
(B) Alignment mark

- 12) Remove the belt idler.



- 13) Remove the timing belt.
- 14) Remove the automatic belt tension adjuster assembly.

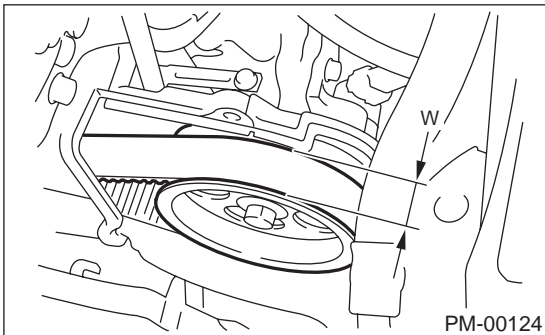


- 15) Install in the reverse order of removal.
<Ref. to ME(H4DOSTC)-47, Timing Belt Assembly.>

B: INSPECTION

1. NON-TURBO MODEL

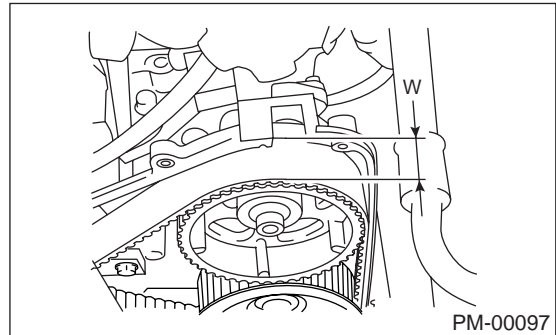
- 1) Remove front timing belt cover and timing belt cover (LH).
- 2) While cranking engine at least four rotations, check timing belt back surface for cracks or damage. Replace faulty timing belt as needed.
- 3) Measure timing belt width W. If it is less than 27 mm (1.06 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace worn timing belt.



- 4) Install front timing belt cover and timing belt cover (LH).

2. TURBO MODEL

- 1) Remove the left and right timing belt covers.
- 2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
- 3) Measure the timing belt width W. If it is less than 30 mm (1.18 in), check the idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.



- 4) Install the left and right timing belt covers.

8. Fuel Line

A: INSPECTION

The fuel line is located mostly internally, so check pipes, areas near pipes, and engine compartment piping for rust, hose damage, loose bands, etc. If faulty parts are found, repair or replace them.

- 2.0 L non-turbo and 2.5 L with OBD models
<Ref. to FU(H4SO)-70, Fuel Delivery, Return and Evaporation Lines.>
- 2.0 L non-turbo and 2.5 L without OBD models
<Ref. to FU(H4SOw/oOBD)-67, Fuel Delivery, Return and Evaporation Lines.>
- 3.0 L model
<Ref. to FU(H6DO)-73, Fuel Delivery, Return and Evaporation Lines.>
- TURBO model
<Ref. to FU(H4DOSTC)-67, Fuel Delivery, Return and Evaporation Lines.>

9. Fuel Filter

A: REPLACEMENT

Refer to Fuel section for replacing fuel filter.

- 2.0 L non-TURBO and 2.5 L with OBD models
<Ref. to FU(H4SO)-67, Fuel Filter.>
- 2.0 L non-TURBO and 2.5 L without OBD models
<Ref. to FU(H4SOw/oOBD)-64, Fuel Filter.>
- 2.0 L TURBO model
<Ref. to FU(H4DOSTC)-64, Fuel Filter.>
- 3.0 L model
<Ref. to FU(H6DO)-70, Fuel Filter.>

B: INSPECTION

- 1) If clogged or exceeds the service limit for replacement, replace the fuel filter.
- 2) If water remains, shake the fuel filter to drain.

AIR CLEANER ELEMENT

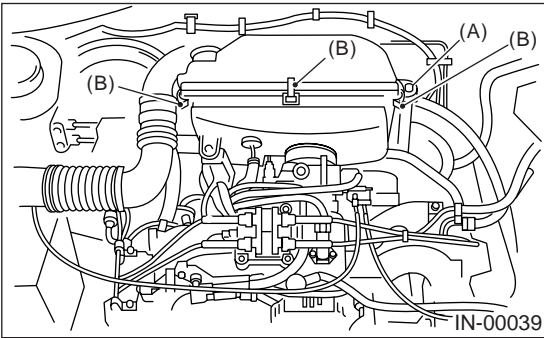
PERIODIC MAINTENANCE SERVICES

10. Air Cleaner Element

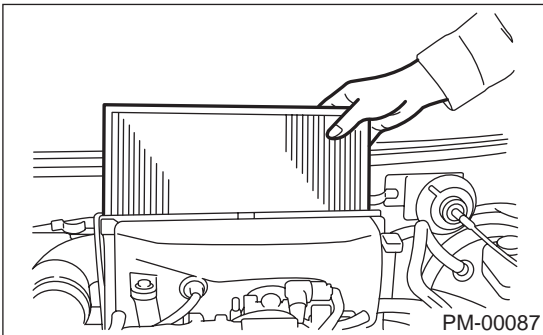
A: REPLACEMENT

1. 2.0 L NON-TURBO AND 2.5 L MODEL

- 1) Remove the air intake duct from air cleaner case.
- 2) Remove the bolt (A) which installs air cleaner case to stays.
- 3) Remove the clip (B) above the air cleaner case.



- 4) Remove the air cleaner element.



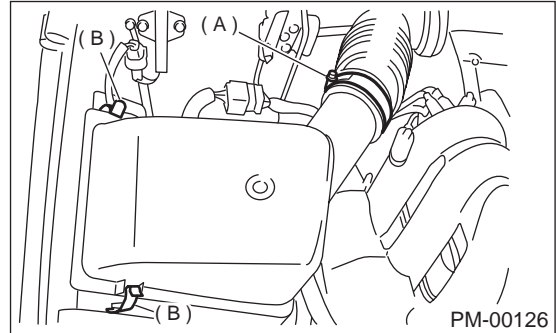
- 5) Install in the reverse order of removal.

NOTE:

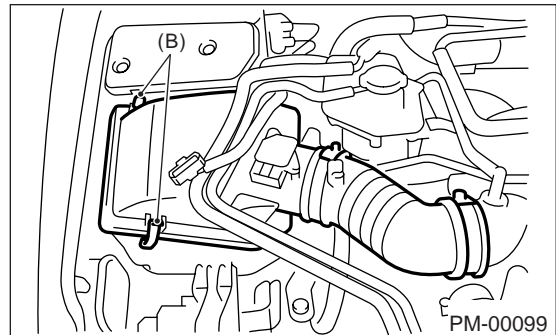
Fasten with a clip after inserting the lower tab of the case.

2. 2.0 L TURBO AND 3.0 L MODEL

- 1) Loosen clamp (A), and separate air cleaner upper cover and air intake boot. (3.0 L model)
 - 2) Remove the clip (B) above the air cleaner upper cover.
- 3.0 L model



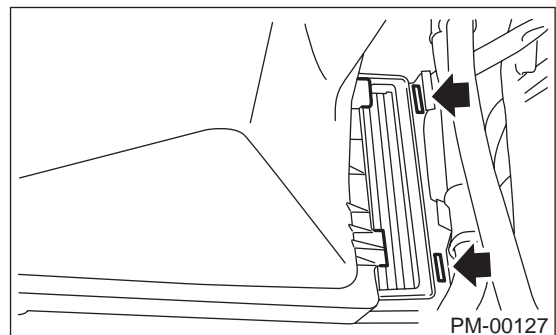
- 2.0 L turbo model



- 3) Remove air cleaner element.
- 4) Install in the reverse order of removal.

NOTE:

Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.



11. Cooling System

A: INSPECTION

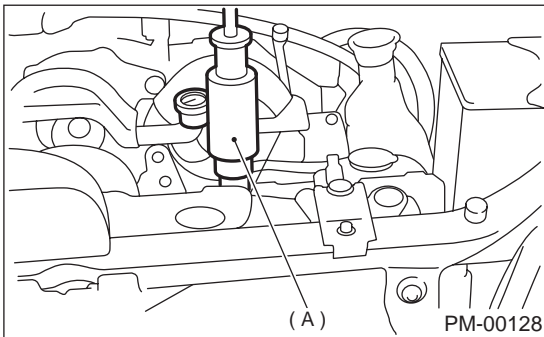
1) Check radiator for leakage, filling it with coolant and attach radiator cap tester (A) to the filler neck. Then apply a pressure of 157 kPa (1.6 kg/cm², 23 psi) and check the following points:

- Each portion of radiator for leakage
- Hose joints and other connections for leakage

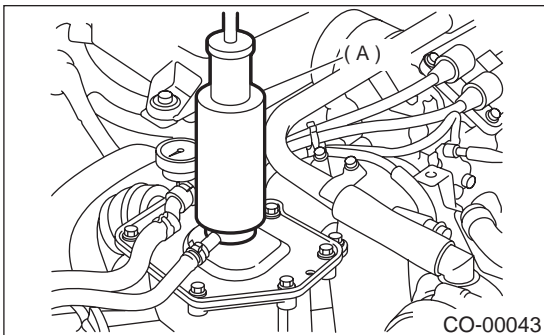
NOTE:

• When attaching or detaching tester and when operating tester, use special care not to deform radiator filler neck.

- Non-turbo model



- Turbo model



- When performing this check, be sure to keep the engine stationary and fill radiator with coolant.
- Wipe off check points before applying pressure.
- Use care not to spill coolant when detaching tester from radiator.

2) Check the radiator cap valve open pressure using radiator cap tester.

NOTE:

Rust or dirt on cap may prevent valve from functioning normally: be sure to clean cap before testing.

Raise the pressure until the needle of gauge stops and see if the pressure can be retained for five to six seconds. The radiator cap is normal if a pressure above the service limit value has been maintained for this period.

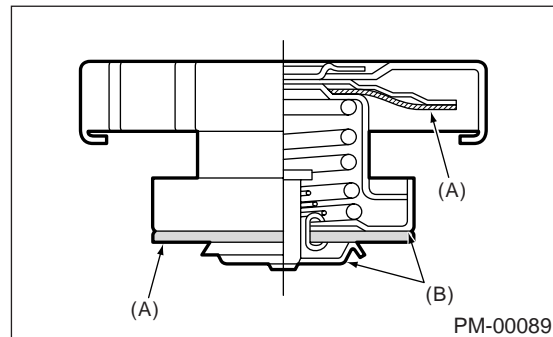
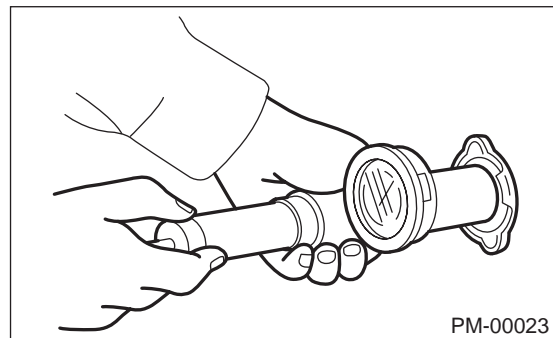
Radiator cap valve open pressure

Standard value:

93 — 123 kPa (0.95 — 1.25 kg/cm², 14 — 18 psi)

Service limit:

83 kPa (0.85 kg/cm², 12 psi)



- (A) Check position for deformation
- (B) Check position for deformation, damage and rust.

3) If the coolant temperature exceeds 76.0 to 80.0°C (169 to 176°F) while radiator is not so hot, check thermostat. If thermostat does not open at 76.0 to 80.0°C (169 to 176°F), replace it with a new one.

4) If electric fan does not operate when coolant temperature exceeds 95°C (203°F), check the electric fan system.

12. Coolant

A: REPLACEMENT

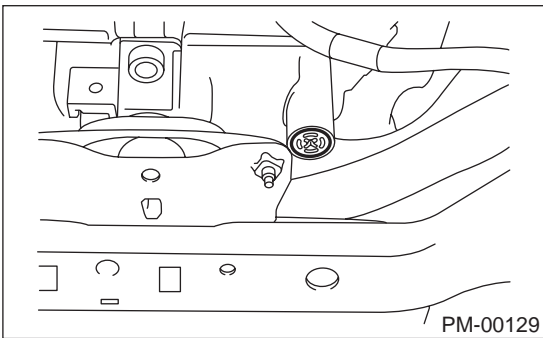
1. REPLACEMENT OF COOLANT

WARNING:

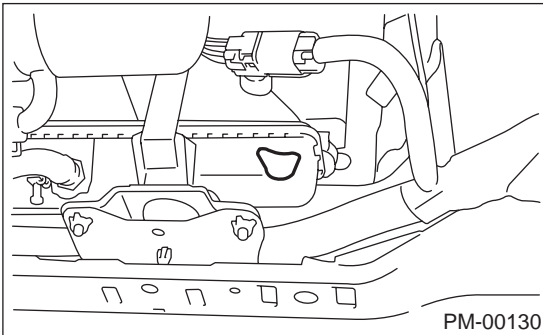
The radiator is of the pressurized type. Do not attempt to open the radiator cap immediately after the engine has been stopped.

- 1) Lift up the vehicle.
- 2) Remove under cover.
- 3) Place a container under drain pipe.
- 4) Loosen and remove drain screw to drain engine coolant into container.

Except 3.0 L model



3.0 L model



- 5) For quick draining, open radiator cap.

CAUTION:

Be careful not to spill coolant on the floor.

- 6) Drain coolant from reservoir tank.
- 7) Tighten radiator drain screw securely after draining coolant.

- 8) Slowly pour prepared coolant from radiator filler port to neck of filler, then pour into reservoir tank up to "FULL" level.

Coolant amount for preparation

2.0 L non-turbo and 2.5 L models

MT model:

Approx. 6.8 ℓ (7.2 US qt, 6.0 Imp qt)

AT model:

Approx. 6.7 ℓ (7.1 US qt, 5.9 Imp qt)

2.0 L turbo model

MT model:

Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)

AT model:

Approx. 7.6 ℓ (8.0 US qt, 6.7 Imp qt)

3.0 L model

Approx. 7.9 ℓ (8.4 US qt, 7.0 Imp qt)

NOTE:

The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crank-case. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

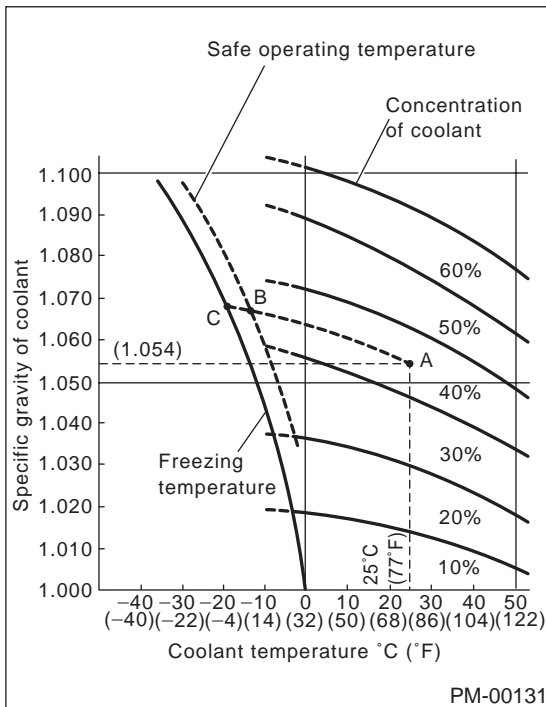
- 9) Securely install radiator cap.
- 10) Run engine for more than five minutes at 2,000 to 3,000 rpm. (Run engine until radiator becomes hot in order to purge air trapped in cooling system.)
- 11) Stop engine and wait until coolant temperature lowers. Then open radiator cap to check coolant level and add coolant up to radiator filler neck. Next, add coolant into reservoir tank up to "FULL" level.
- 12) After adding coolant, securely install radiator and reservoir tank caps.

2. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



3. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

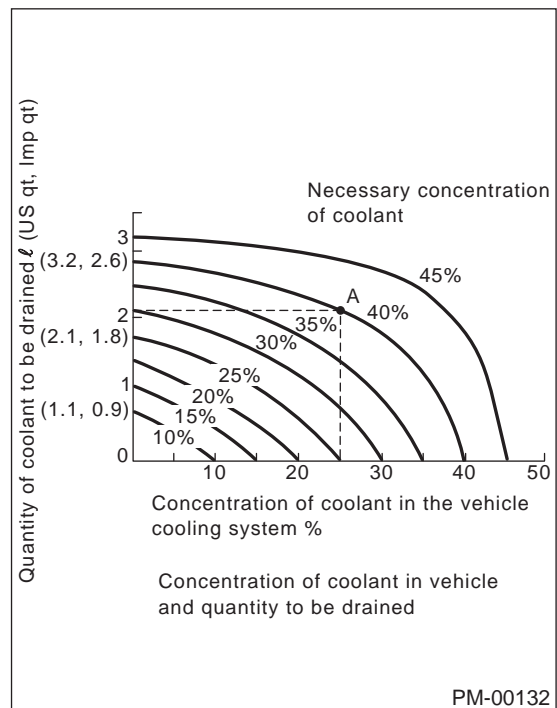
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).

The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



CLUTCH SYSTEM

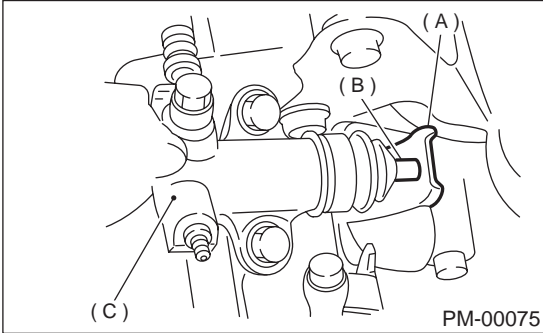
PERIODIC MAINTENANCE SERVICES

13. Clutch System

A: INSPECTION AND ADJUSTMENT

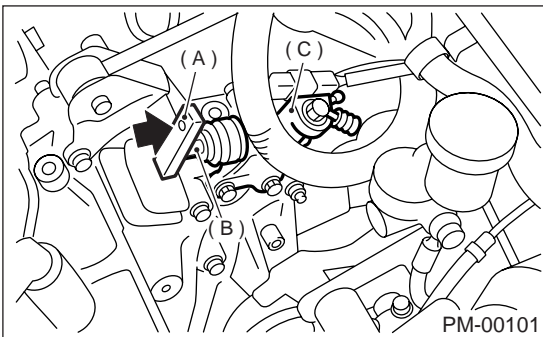
1) Push the release lever to retract the push rod of the operating cylinder and check if the fluid level in the clutch reservoir tank rises or not.

- Non-turbo model



- (A) Release lever
- (B) Push rod
- (C) Operating cylinder

- Turbo model



- (A) Release lever
- (B) Push rod
- (C) Operating cylinder

2) If the fluid level rises, pedal free play is correct.
3) If the fluid level does not rise, or the push rod cannot be retracted, adjust the clutch pedal. <Ref. to CL-33, Clutch Pedal.>
4) Inspect the underside of master cylinder, clutch damper and operating cylinder for clutch system, hoses, piping and their couplings for fluid leaks. If fluid leaks are found, correct them by retightening their fitting bolt and/or replacing their parts.

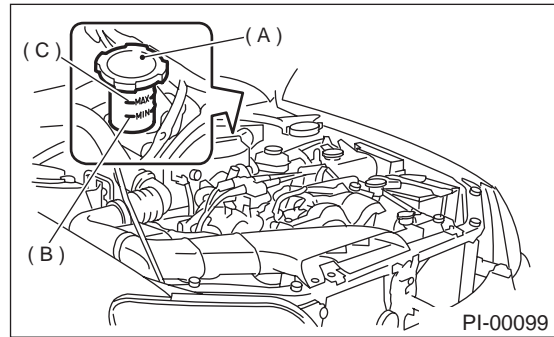
5) Check the fluid level using the scale on the outside of the clutch master cylinder tank (A). If the level is below "MIN" (B), add clutch fluid to bring it up to "MAX" (C).

Recommended clutch fluid:

FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

NOTE:

- Avoid mixing different brands of brake fluid to prevent degradation of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.



- (A) Reservoir tank
- (B) MIN. level
- (C) MAX. level

14.Hill-holder System

A: INSPECTION AND ADJUSTMENT

1) Confirm stopping and starting performance by activating hill-holder on an uphill road of 3° or higher inclination.

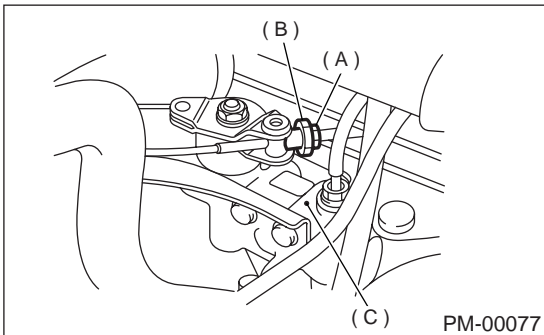
(1) When vehicle does not stop;
Tighten adjusting nut of PHV cable.

(2) When vehicle does not start properly;
A; When hill-holder is released later than engagement of clutch (engine tends to stall): Loosen adjusting nut gradually until smooth starting is enabled.

B; When hill-holder is released earlier than engagement to clutch (vehicle slips down slightly): Tighten adjusting nut so that hill-holder is released later than engagement of clutch (status in A). Then make adjustment the same as in A.

NOTE:

- Whenever turning adjusting nut, hold inner cable with pliers to prevent it from turning.
- Replace pressure hold valve (PHV), return spring of PHV or PHV cable with new one, if they are defective and/or damaged.



- (A) Lock nut
- (B) Adjusting nut
- (C) Pressure hold valve

15. Idle Mixture

A: INSPECTION AND ADJUSTMENT

1. IDLE MIXTURE

Before measuring the idle mixture, make sure that the ignition timing and the engine idle speed are within specifications.

- 1) Set the gear position at "Neutral" for MT, or "N" or "P" for AT.
- 2) Warm up engine sufficiently until cooling fan starts to operate.
- 3) Measure the idle mixture with the CO meter.

Engine idle speed	CO
700±100 rpm	1.0±0.5%

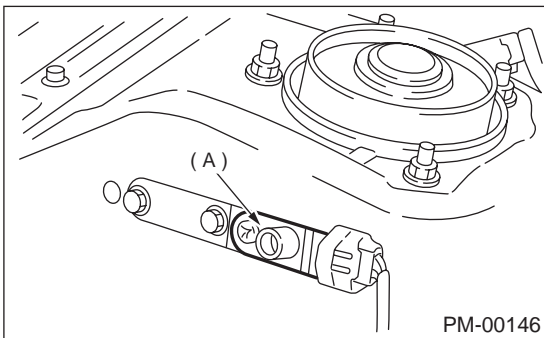
4) If out of specification, adjust the idle mixture using CO adjusting screw of mass air flow sensor.

5) After adjusting the CO value, check and adjust increment coefficient of CO resistor by using Select Monitor.

- (1) Select "Current data display & Save" on the select monitor.
- (2) If out of specified data, adjust the increment coefficient of CO resistor while rotating CO adjusting screw (A).

Specified data:

0.28 — 4.22 V



NOTE:

If driving the vehicle on out of specified data, the "trouble code 49" is indicated in many case.

16. Transmission Oil

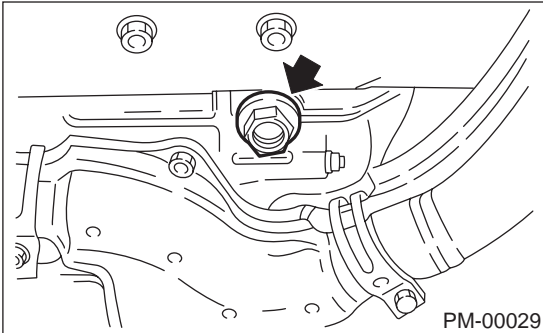
A: REPLACEMENT

1. MANUAL TRANSMISSION

1) Drain gear oil by removing drain plug after allowing the engine to cool for 3 to 4 hours.

NOTE:

- Before starting work, cool off the engine well.
- If transmission gear oil splashes on exhaust pipe, wipe it clean.



2) Reinstall drain plug after draining gear oil and tighten it to the specified torque.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)

NOTE:

- Replace the gasket with a new one.
 - Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.
- 3) Fill transmission gear oil through the oil level gauge up to the upper point of level gauge.

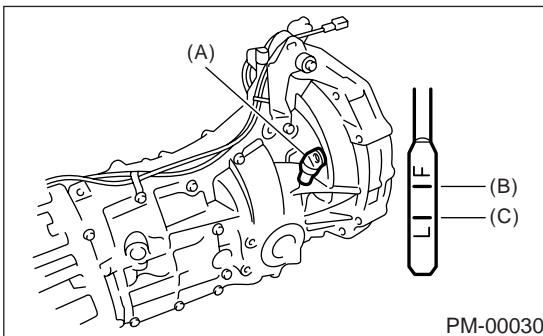
Gear oil capacity:

Single range transmission

3.5 ℓ (3.7 US qt, 3.1 Imp qt)

Dual range transmission

4.0 ℓ (4.2 US qt, 3.5 Imp qt)



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

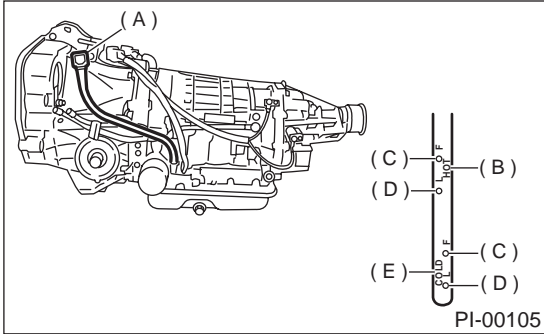
17.ATF

A: INSPECTION

1) Raise ATF temperature to 70 to 80°C (158 to 176°F) by driving for approx. 10 min.

NOTE:

The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking oil level.



- (A) Level gauge
- (B) Check line, HOT condition
- (C) Upper level
- (D) Lower level
- (E) Check line, COLD condition

2) Make sure the vehicle is level. After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in "P" range. Measure fluid level with the engine idling.

NOTE:

After running, idle the engine for one or two minutes before measurement.

3) If the fluid level is below the center between upper and lower marks, add the recommended ATF until the fluid level is found within the specified range (above the center between upper and lower marks). When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

CAUTION:

- Use care not to exceed the upper limit level.
- ATF level varies with temperature. Remember that the addition of fluid to the upper limit mark when the transmission is cold will result in the overfilling of fluid.

4) Fluid temperature rising speed

- By idling the engine

Time for temperature rise to 70°C (158°F) with atmospheric temperature of 0°C (32°F): More than 25 minutes

<Reference>

Time for temperature rise to 30°C (86°F) with atmospheric temperature of 0°C (32°F): Approx. 8 minutes

- By running the vehicle

Time for temperature rise to 70°C (158°F) with atmospheric temperature of 0°C (32°F): More than 10 minutes

5) Method for checking fluid level upon delivery or at periodic inspection

Check fluid level after a warm-up run of approx. 10 minutes. During the warm-up period, the automatic transmission functions can also be checked.

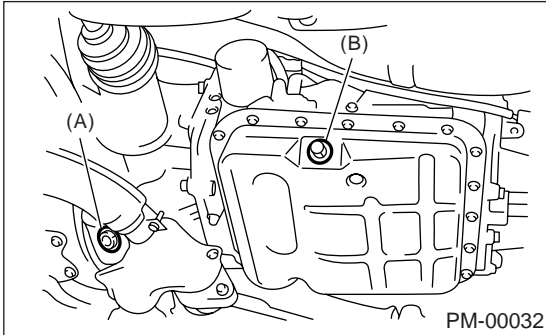
B: REPLACEMENT

1. AUTOMATIC TRANSMISSION FLUID

1) Drain ATF (Automatic Transmission Fluid) by removing drain plug after allowing the engine to cool for 3 to 4 hours.

NOTE:

Before starting work, cool off the engine well.



(A) Front differential drain plug

(B) ATF drain plug

2) Reinstall drain plug after draining ATF, and tighten it to the specified torque.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Pour ATF into the oil charge pipe.

Recommended fluid:

Dexron III type automatic transmission fluid

ATF amount:

Refill with the same amount of ATF that was drained.

4) Check the level of the ATF. Refer to "INSPECTION".

2. ATF FILTER

NOTE:

ATF filter is maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.

For the replacement procedures of the ATF filter:
<Ref. to AT-73, ATF Filter.>

FRONT & REAR DIFFERENTIAL OIL

PERIODIC MAINTENANCE SERVICES

18. Front & Rear Differential Oil

A: REPLACEMENT

1. FRONT DIFFERENTIAL (MANUAL TRANSMISSION)

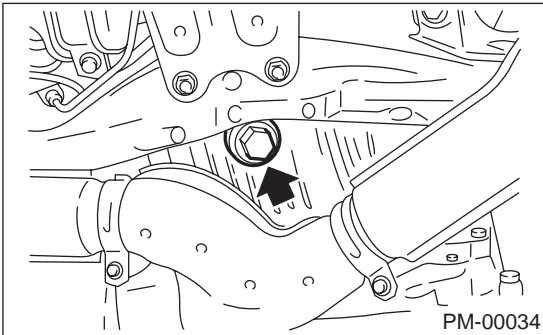
For M/T vehicle, manual transmission oil works as differential oil to lubricate differential. Refer to "Transmission Oil". <Ref. to PM-27, MANUAL TRANSMISSION, REPLACEMENT, Transmission Oil.>

2. FRONT DIFFERENTIAL (AUTOMATIC TRANSMISSION)

1) Drain differential gear oil by removing drain plug after allowing the engine to cool for 3 to 4 hours.

NOTE:

- Before starting work, cool off the engine well.
- If transmission gear oil splashes on exhaust pipe, wipe it clean.



2) Reinstall drain plug after draining differential gear oil and tighten it to the specified torque.

Tightening torque:

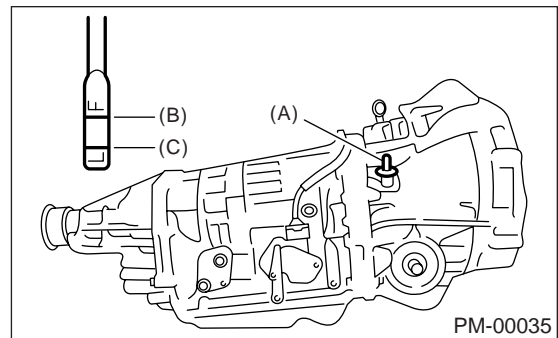
44 N·m (4.5 kgf·m, 32.5 ft·lb)

NOTE:

- Be sure to place a gasket between the transmission case and drain plug.
 - Replace the gasket with a new one.
 - Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.
- 3) Fill differential gear oil through the oil level gauge hole up to the upper point of level gauge.

Differential gear oil capacity:

1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

FRONT & REAR DIFFERENTIAL OIL

PERIODIC MAINTENANCE SERVICES

3. REAR DIFFERENTIAL

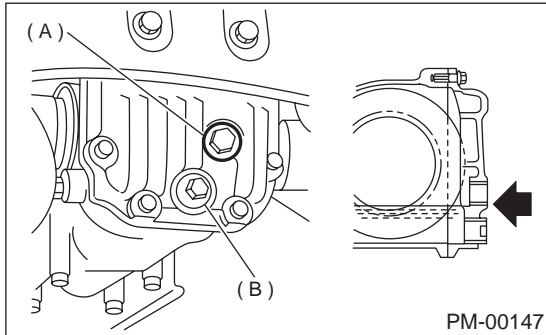
• VA type

- 1) Drain oil by removing drain plug.
- 2) Remove filler plug for quicker draining.
- 3) Replace drain plug gasket with a new one.
- 4) Tighten drain plug to the specified torque.

Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

- 5) After installing drain plug, fill oil fully up to the mouth of filler plug.



- (A) Filler plug
(B) Drain plug

Oil capacity:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)

- 6) Replace filler plug gasket with a new one.
- 7) Install filler plug onto rear differential gear case.

Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

• T type

- 1) Drain oil by removing drain plug.
- 2) Remove filler plug for quicker draining.
- 3) Tighten drain plug after draining oil.

NOTE:

Apply fluid packing to drain plug threads before installation.

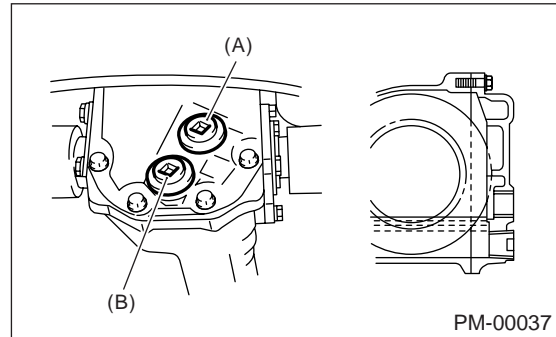
Fluid packing:

Three Bond 1105 (Part No. 004403010)

Tightening torque:

49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

- 4) After installing drain plug onto rear differential gear case firmly, fill oil up fully to the mouth of filler plug.



- (A) Filler plug
(B) Drain plug

Oil capacity:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)

NOTE:

Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

- 5) Install filler plug onto rear differential gear case firmly.

NOTE:

Apply fluid packing to filler plug before installation.

Fluid packing:

Three Bond 1105 (Part No. 004403010)

Tightening torque:

49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

BRAKE LINE

PERIODIC MAINTENANCE SERVICES

19. Brake Line

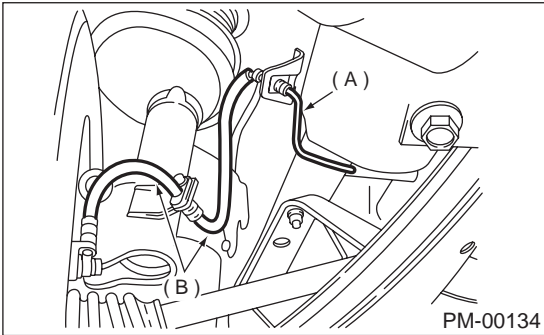
A: INSPECTION

1. BRAKE LINE

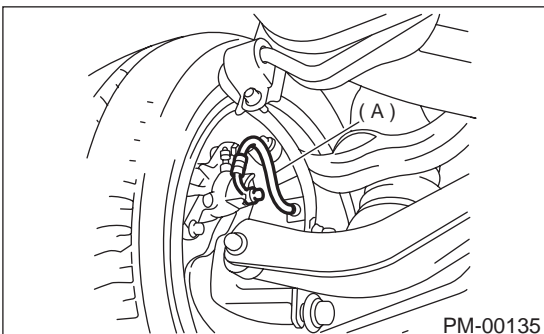
- 1) Check scratches, swelling, corrosion and/or traces of fluid leakage on brake hoses or pipe joints.
- 2) Check the possibility of adjacent parts interfering with brake pipes/hoses during driving, and loose connections/clamps.
- 3) Check any trace of fluid leakage, scratches, etc. on master cylinder, wheel cylinder and pressure control valve.

NOTE:

- When the brake fluid level in the reservoir tank is lower than the specified limit, the brake fluid warning light on the combination meter will come on.
- Visually check brake hose (using a mirror where it is difficult to see) for any damage.



- (A) Front brake pipe
(B) Front brake hose



- (A) Rear brake hose

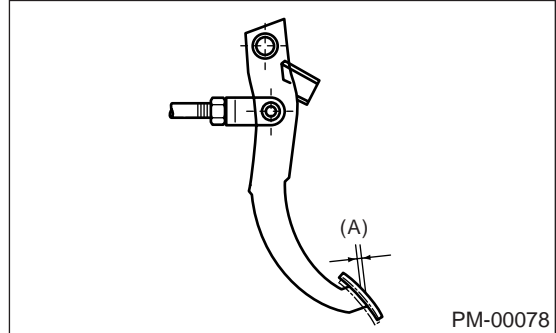
B: CHECKING

1. SERVICE BRAKE

- 1) Check the free play of brake pedal with a force of less than 10 N (1 kgf, 2 lb).

Brake pedal free play:

1 — 3 mm (0.04 — 0.12 in)

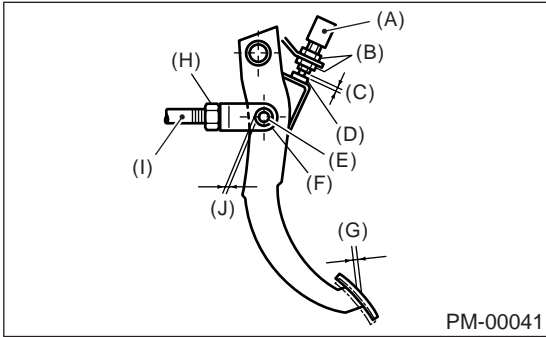


- (A) Pedal play

- 2) If the free play is out of specifications above, adjust the brake pedal as follows:

- (1) Be sure engine is off. (No vacuum is applied to brake booster.)
- (2) There should be play between brake booster clevis and pin at brake pedal installing portion.
- (3) Depress the surface of brake pad by hand. [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb) to a stroke of 1 to 3 mm (0.04 to 0.12 in).]

(4) If there is no free play between clevis pin and clevis, turn brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).

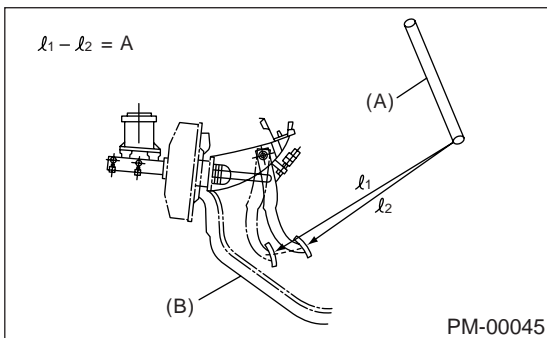


- (A) Brake switch
- (B) Adjusting nut
- (C) 0.3 mm (0.012 in)
- (D) Stopper
- (E) Clevis pin
- (F) Clevis
- (G) Pedal play
1 - 3 mm (0.04 - 0.12 in)
- (H) Lock nut
- (I) Brake booster operating nut
- (J) Play at pin

3) Check the pedal stroke.

While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between the brake pedal and steering wheel. With the brake pedal released, measure the distance between the pedal and steering wheel again. The difference between the two measurements must be less than 95 mm (3.74 in). If the distance is more than specified, there is a possibility air is in the inside of the hydraulic unit.

Brake pedal reserve distance: A more than 95 mm (3.74 in)/ 490 N (50 kgf, 110 lb)



- (A) Steering wheel
- (B) Toe board

4) Check to see if air is in the hydraulic brake line by the feel of pedal operation. If air appears to exist in the line, bleed it from the system.

5) Check for even operation of all brakes, using a brake tester or by driving the vehicle for a short distance on a straight road.

2. BRAKE SERVO SYSTEM

1) With the engine off, depress the brake pedal several times applying the same pedal force: Make sure the travel distance should not change.

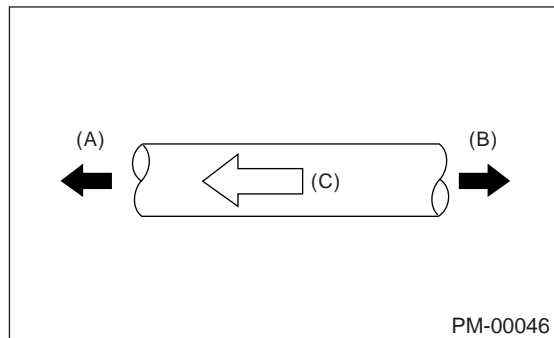
2) With the brake pedal depressed, start the engine: Make sure the pedal should move slightly toward the floor.

3) With the brake pedal depressed, stop the engine and keep the pedal depressed for 30 seconds: Make sure the pedal height should not change.

4) Check valve is built into vacuum hose. Disconnect vacuum hose to inspect function of check valve.

Blow air into vacuum hose from its brake booster side end: Air must flow out of engine side end of hose. Next blow air into hose from engine side: Air should not flow out of hose.

Replace both check valve and vacuum hose if check valve is faulty. Engine side of vacuum hose is indicated by marking "ENG" as shown.



- (A) Engine side
- (B) Brake booster side
- (C) ENG

5) Check vacuum hose for cracks or other damage.

NOTE:

When installing the vacuum hose on the engine and brake booster, do not use soapy water or lubricating oil on their connections.

6) Check vacuum hose to make sure it is tight and secure.

BRAKE FLUID

PERIODIC MAINTENANCE SERVICES

20.Brake Fluid

A: REPLACEMENT

- 1) Either jack up vehicle and place a safety stand under it, or lift up vehicle.
- 2) Remove both front and rear wheels.
- 3) Draw out the brake fluid from master cylinder with syringe.
- 4) Refill reservoir tank with recommended brake fluid.

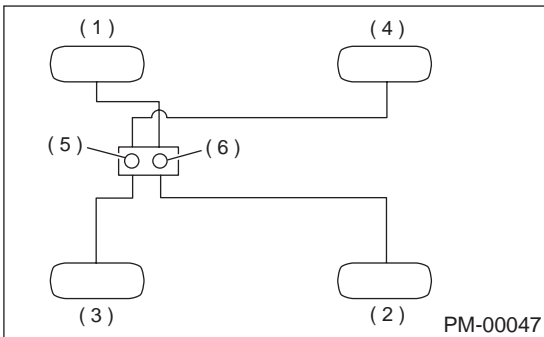
Recommended brake fluid:

FMVSS No. 116, fresh DOT3 or 4 brake fluid

NOTE:

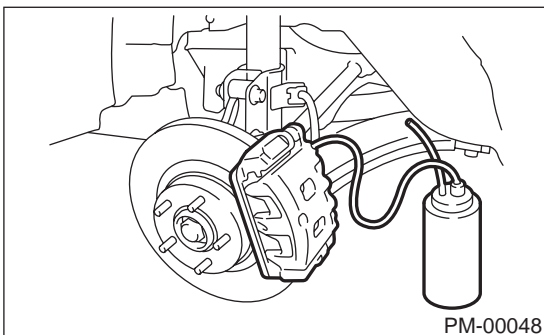
- Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

Bleeding sequence (1) → (2) → (3) → (4)



- (1) Front right
- (2) Rear left
- (3) Front left
- (4) Rear right
- (5) Secondary
- (6) Primary

- 5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.



NOTE:

- Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
 - During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - Brake pedal operation must be very slow.
 - For convenience and safety, it is advisable to have two men working.
 - The amount of brake fluid required is approximately 500 m^l (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.
- 6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
 - 7) Loosen bleeder screw approximately 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten screw.
 - 8) Repeat steps 6) and 7) above until there are no air bubbles in drained brake fluid and new fluid flows through vinyl tube.

NOTE:

- Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.
- 9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)

- 10) Bleed air from each wheel cylinder by following the previous 5 steps.
- 11) Depress brake pedal with a force of approximately 294 N (30 kgf, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it makes any unusual movement. Visually inspect bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
- 12) Install wheels, and drive vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

DISC BRAKE PADS AND DISCS

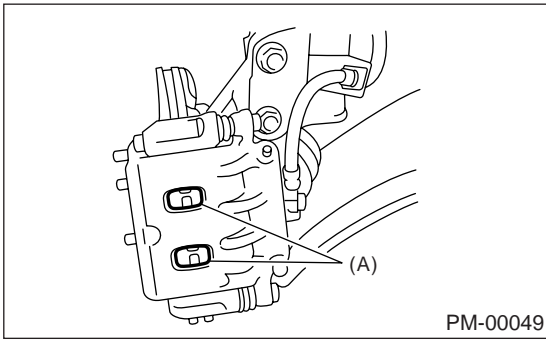
PERIODIC MAINTENANCE SERVICES

21. Disc Brake Pads and Discs

A: INSPECTION

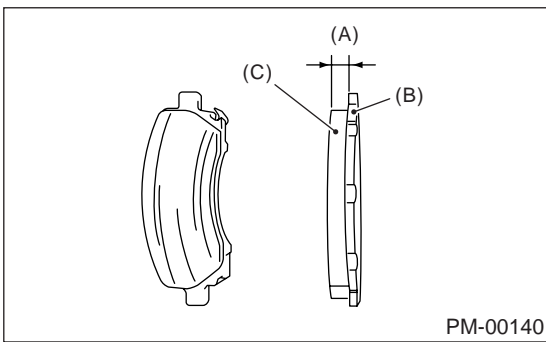
1. DISC BRAKE PAD AND DISC

- 1) Jack up vehicle and support with rigid racks. Then remove wheels.
- 2) Visually check pad thickness through inspection hole of disc brake assembly. Replace pad if necessary.



(A) Inspection hole

Pad thickness mm (in)		
	Front	Rear
Standard	11 (0.43)	9 (0.35)
Service limit	1.5 (0.059)	1.5 (0.059)



- (A) Thickness of pad
- (B) Back metal
- (C) Lining

- 3) Check the disc rotor, and correct or replace if it is damaged or worn.

- Non-turbo model

Brake disc thickness mm (in)		
	Front	Rear
Standard	24 (0.94)	10 (0.39)
Wear limit	22 (0.87)	8.5 (0.335)

- Turbo model

Brake disc thickness mm (in)		
	Front	Rear
Standard	24 (0.94)	18 (0.71)
Wear limit	22 (0.87)	16 (0.63)

- 4) Measure the disc rotor runout at a point less than 10 mm (0.39 in) from the outer periphery of the rotor.

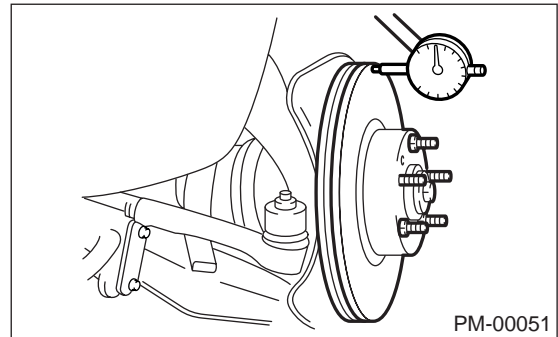
Disc rotor runout limit:

Front: 0.075 mm (0.0030 in)

Rear: 0.070 mm (0.0028 in)

NOTE:

When replacing a pad, always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.



PARKING BRAKE

PERIODIC MAINTENANCE SERVICES

22. Parking Brake

A: INSPECTION

Inspect brake linings and drums of both sides of the rear brake at the same time by removing brake drums.

1) Inspect brake shoes for damage or deformation and check brake linings for wear.

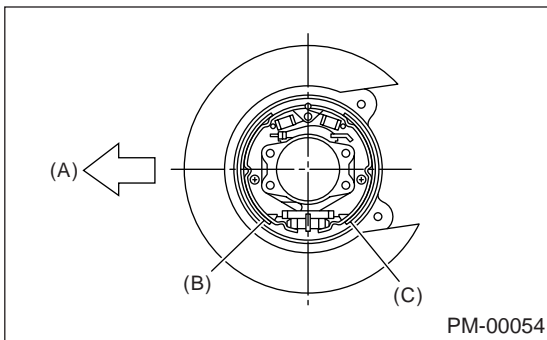
NOTE:

Always replace both primary and secondary brake shoes for the left and right wheels at the same time.

Brake lining thickness excluding back metal

Standard value: 3.2 mm (0.126 in)

Wear limit: 1.5 mm (0.059 in)



(A) Front

(B) Brake shoe (Primary)

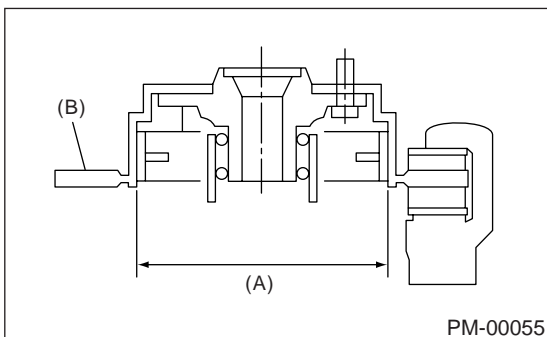
(C) Brake shoe (Secondary)

2) Check brake drum for wear, dents or other damage. If the inside surface of brake drum is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn, tapered, or the outside surface of brake drum is damaged, correct or replace it.

Brake drum inside diameter

Standard value: 170 mm (6.69 in)

Wear limit: 171 mm (6.73 in)



(A) Measuring inside diameter

(B) Disc

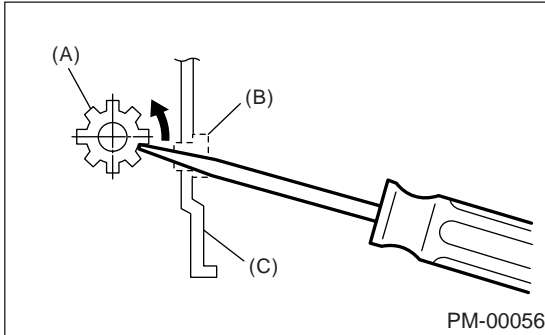
3) If the deformation or wear of back plate, shoe, etc. is noticeable, replace them.

4) When the shoe return spring tension is excessively weakened, replace it, taking care to identify upper and lower springs.

B: ADJUSTMENT

1. SHOE CLEARANCE

- 1) Remove adjusting hole cover from back plate.
- 2) Turn adjusting screw using a slot-type screwdriver until brake shoe is in close contact with disc rotor.

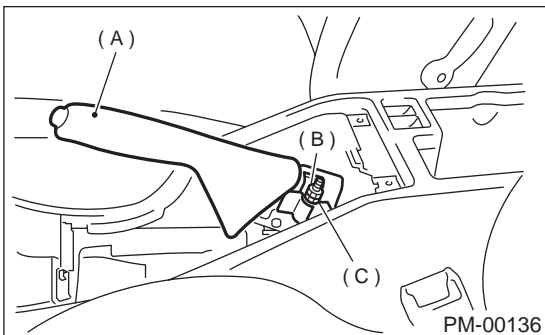


- (A) Adjusting screw
- (B) Cover (rubber)
- (C) Back plate

- 3) Turn back (downward) adjusting screw 3 or 4 notches.
- 4) Install adjusting hole cover to back plate.

2. LEVER STROKE

- 1) Remove console box lid.
- 2) Forcibly pull parking brake lever 3 to 5 times.
- 3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 6 notches with operating force of 196 N (20 kgf, 44 lb).



- (A) Parking brake lever
- (B) Lock nut
- (C) Adjusting nut

- 4) Tighten lock nut.
- 5) Install console box lid.

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Adjuster lock nut):

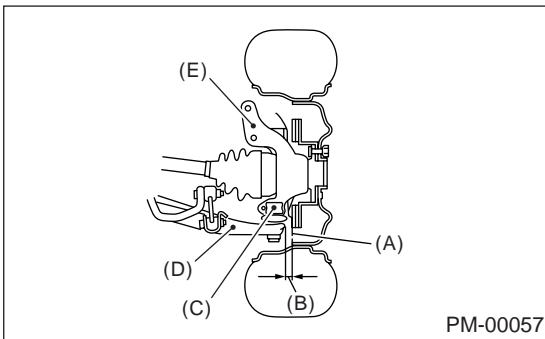
5.9 N-m (0.60 kgf-m, 4.3 ft-lb)

23. Suspension

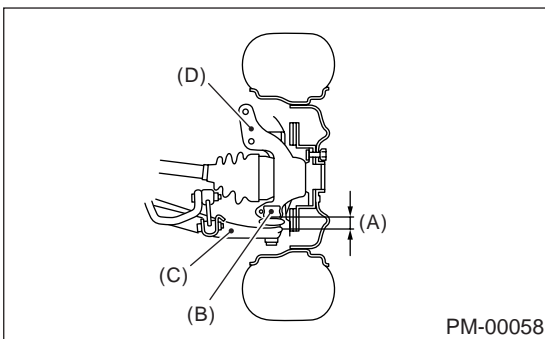
A: INSPECTION

1. SUSPENSION BALL JOINT

- 1) Jack up vehicle until front wheels are off ground.
- 2) Next, grasp bottom of tire and move it in and out. If relative movement is observed between brake disc cover and end of transverse link, ball joint may be excessively worn.
- 3) Next, grasp end of transverse link and move it up and down. Relative movement between housing and transverse link boss indicates ball joint may be excessively worn.
- 4) If relative movement is observed in the immediately preceding two steps, remove and inspect ball joint. If free play exceeds standard, replace ball joint. <Ref. to FS-16, Front Ball Joint.>



- (A) Disc cover
- (B) Relative movement
- (C) Ball joint
- (D) Transverse link
- (E) Housing



- (A) Relative movement
- (B) Ball joint
- (C) Transverse link
- (D) Housing

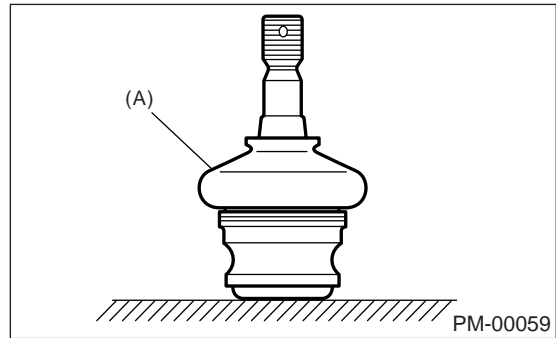
5) Damage of dust seal

Visually inspect ball joint dust seal. If it is damaged, remove transverse link. <Ref. to FS-14, Front Transverse Link.> And measure free play of ball joint. <Ref. to FS-16, Front Ball Joint.>

- (1) When looseness exceeds standard value, replace ball joint.
- (2) If the dust seal is damaged, replace with the new ball joint.

NOTE:

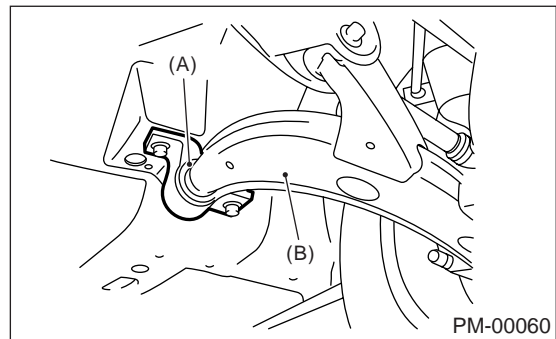
When transverse link ball joint has been removed or replaced, check toe-in of front wheel. If front wheel toe-in is not at specified value, adjust toe-in. <Ref. to FS-6, Wheel Alignment.>



- (A) Dust seal

2. TRANSVERSE LINK'S REAR BUSHING

Check oil leaks at around liquid-filled bushing. If oil leaks, replace bushing.



- (A) Rear bushing
- (B) Transverse link

3. WHEEL ARCH HEIGHT

- 1) Unload cargoes and set vehicle in curb weight (empty) condition.
- 2) Then, check wheel arch height of front and rear suspensions to ensure that they are within specified values.
- 3) When wheel arch height is out of standard, visually inspect following components and replace deformed parts.
 - Suspension components [Front strut assembly and rear shock absorber assembly]
 - Body parts to which suspensions are installed.
- 4) When no components are deformed, adjust wheel arch height by replacing coil spring in the suspension whose wheel arch height is out of standard. <Ref. to FS-6, Wheel Alignment.> <Ref. to RS-8, Wheel Alignment.>

4. WHEEL ALIGNMENT OF FRONT SUSPENSION

- 1) Check alignment of front suspension to ensure that following items conform to standard values.
 - Toe-in
 - Camber angle
 - Caster angle
 - Steering angle<Ref. to FS-6, Wheel Alignment.>
- 2) When caster angle does not conform to standard value, visually inspect following components and replace deformed parts.
 - Suspension components [Strut assembly, crossmember, transverse link, etc.]
 - Body parts to which suspensions are installed.
- 3) When toe-in and camber are out of standard value, adjust them so that they conform to respective service standard.
- 4) When right-and-left turning angles of tire are out of standard, adjust to standard value.

5. WHEEL ALIGNMENT OF REAR SUSPENSION

- 1) Check alignment of rear suspension to ensure that following items are within standard values.
 - Toe-in
 - Camber angle
 - Thrust angle<Ref. to RS-8, Wheel Alignment.>
- 2) When camber angle does not conform to standard value, visually inspect parts listed below. If deformation is observed, replace damaged parts.
 - Suspension components [Shock absorber, link F, link R, link UPR, arm R, sub frame, etc.]
 - Body parts to which suspensions are installed.
- 3) When toe-in and thrust angle are out of standard value, adjust them so that they conform to respective service standard.

6. OIL LEAKAGE OF STRUT AND SHOCK ABSORBER

Visually inspect front strut and rear shock absorber for oil leakage as instructed. Replace front strut and rear shock absorber if oil leaks excessively.

7. TIGHTNESS OF BOLTS AND NUTS

Check bolts and nuts shown in the figure for looseness. Retighten bolts and nuts to specified torque. If self-lock nuts and bolts are removed, replace them with new ones.

Front suspension: <Ref. to FS-3, COMPONENT, General Description.>

Rear suspension: <Ref. to RS-3, COMPONENT, General Description.>

8. DAMAGE TO SUSPENSION PARTS

- 1) Check the following parts and the fastening portion of the vehicle body for deformation or excessive rusting which impairs the suspension. If necessary, replace damaged parts with new ones. If minor rust formation, pitting, etc. are noted, remove rust and apply remedial anti-corrosion measures.
 - Front suspension
 - Transverse link
 - Crossmember
 - Strut
 - Rear suspension
 - Sub frame
 - Link F
 - Link R
 - Link UPR
 - Arm R
 - Shock absorber
 - In the district where salt is sprayed to melt snow on a road in winter and coastal area, check suspension parts for damage caused by rust every months or km (miles) specified in "MAINTENANCE SCHEDULE 2".

WHEEL BEARING

PERIODIC MAINTENANCE SERVICES

24. Wheel Bearing

A: INSPECTION

1. FRONT WHEEL BEARING

NOTE:

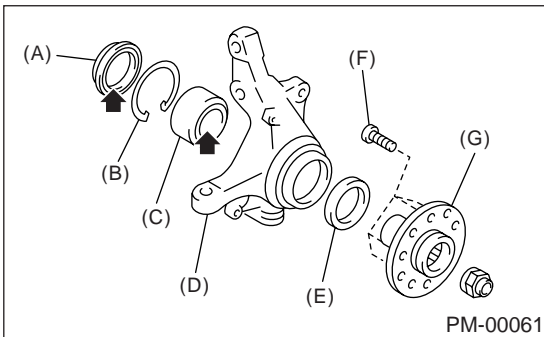
Inspect the condition of front wheel bearing grease.

- 1) Jack up the front of vehicle.
- 2) While holding front wheel by hand, swing it in and out to check bearing free play.
- 3) Loosen wheel nuts and remove front wheel.
- 4) If bearing free play exists in step 2) above, attach a dial gauge to hub and measure axial displacement in axial direction.

Service limit:

Straight-ahead position within 0.05 mm (0.0020 in)

- 5) Remove bolts and self-locking nuts, and extract transverse link from front crossmember.
- 6) While lightly hammering spring pin which secures SFJ to transmission spindle, remove it.
- 7) Extract SFJ from transmission spindle. <Ref. to DS-17, Front Axle.>
- 8) While supporting front drive shaft horizontally with one hand, turn hub with the other to check for noise or binding.
If hub is noisy or binds, disassemble front axle and check condition of oil seals, bearing, etc.



- (A) Inner oil seal
- (B) Snap ring
- (C) Bearing
- (D) Housing
- (E) Outer oil seal
- (F) Hub bolt
- (G) Hub

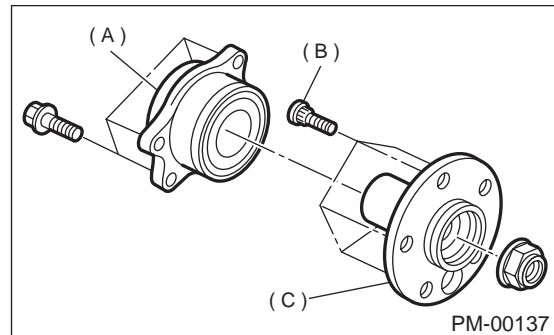
2. REAR WHEEL BEARING

- 1) Jack up the rear of vehicle.
- 2) While holding rear wheel by hand, swing it in and out to check bearing free play.
- 3) Loosen wheel nuts and remove rear wheel.
- 4) If bearing free play exists in step 2) above, attach a dial gauge to hub assembly and measure axial displacement in axial direction.

Service limit:

Straight-ahead position within 0.05 mm (0.0020 in)

- 5) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DS-34, Rear Drive Shaft.>
- 6) While supporting rear drive shaft horizontally with one hand, turn hub assembly with the other to check for noise or binding.
If hub assembly is noisy or binds, disassemble rear axle and check condition of oil seals, bearings, etc.



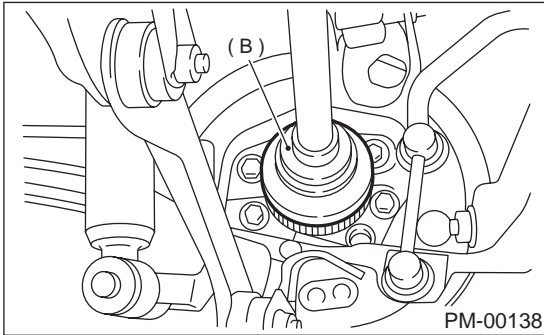
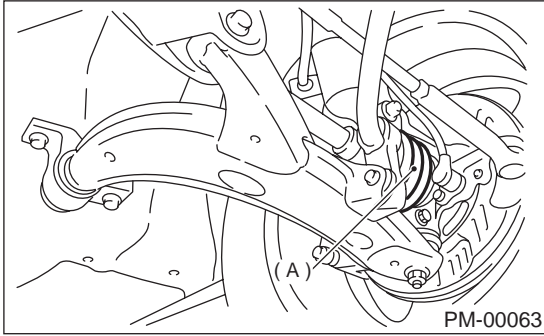
- (A) Hub unit
- (B) Hub bolt
- (C) Hub

25. Axle Boots & Joints

A: INSPECTION

1. FRONT AND REAR AXLE BOOTS

Inspect front axle boots (A) and rear axle boots (B) for deformation, damage or failure. If faulty, replace them with new ones. <Ref. to DS-28, Front Drive Shaft.> <Ref. to DS-34, Rear Drive Shaft.>



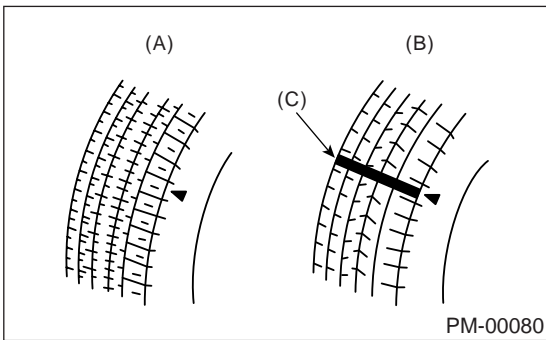
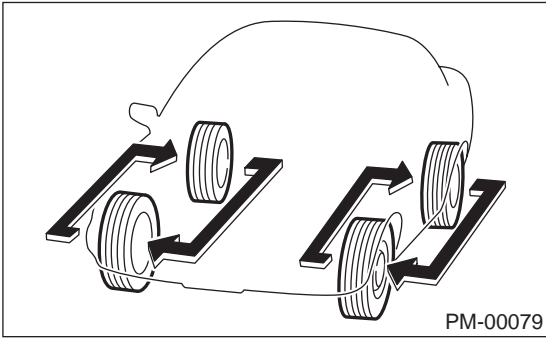
2. PROPELLER SHAFT

Inspect propeller shaft for damage or failure. If faulty, replace with a new one. <Ref. to DS-14, Propeller Shaft.>

26. Tire Rotation

A: INSPECTION

- 1) Replace the tire if the tread depth is less than 1.6 mm (0.063 in) or if wear indicators appear across the tire tread. (It is recommended that both right and left tires are replaced as a set.)
- 2) Adjust the wheel alignment if abnormally uneven tire wear is found.
- 3) Also, rotate the tires between the front and rear tires as illustrated, in order to ensure uniform tire wear.



- (A) New tread
- (B) Worn tread
- (C) Tread wear indicator

27. Steering System (Power Steering)

A: INSPECTION

1. STEERING WHEEL

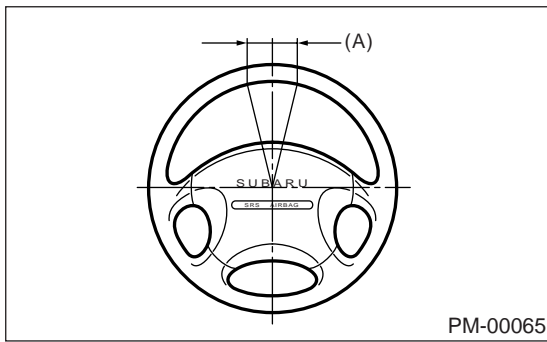
1) Set steering wheel in a straight-ahead position, and check wheel spokes to make sure they are correctly set in their specified positions.

2) Lightly turn steering wheel to the left and right to determine the point where front wheels start to move.

Measure the distance of the movement of steering wheel at the outer periphery of wheel.

Steering wheel free play:

0 — 17 mm (0 — 0.67 in)



(A) Free play

Move steering wheel vertically toward the shaft to ascertain if there is play in the direction.

Maximum permissible play:

0.5 mm (0.020 in)

3) Drive vehicle and check the following items during operation.

(1) Steering force

The effort required for steering should be smooth and even at all points, and should not vary.

(2) Pull to one side

Steering wheel should not be pulled to either side while driving on a level surface.

(3) Wheel runout

Steering wheel should not show any sign of runout.

(4) Return factor

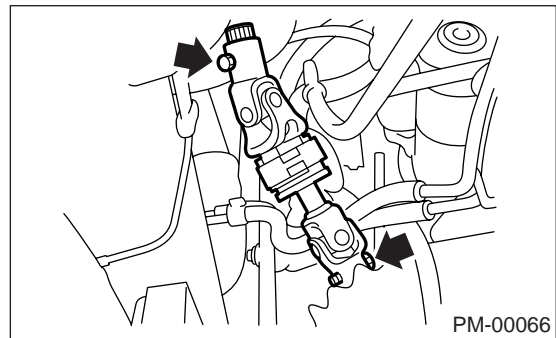
Steering wheel should return to its original position after it has been turned and then released.

2. STEERING SHAFT JOINT

1) When steering wheel free play is excessive, disconnect universal joint of steering shaft and check it for any play and yawing torque (at the point of the crossing direction). Also inspect for any damage to sealing or worn serrations. If the joint is loose, retighten the mounting bolts to the specified torque.

Tightening torque:

24 N·m (2.4 kgf·m, 17.4 ft-lb)



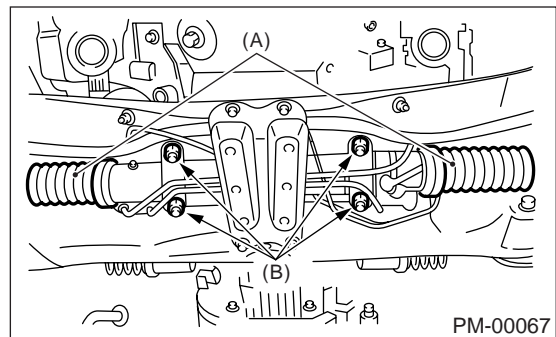
3. GEARBOX

1) With wheels placed on a level surface, turn steering wheel 90° in both the left and right directions.

While wheel is being rotated, reach under vehicle and check for looseness in gearbox.

Tightening torque:

59 N·m (6.0 kgf·m, 43.4 ft-lb)



(A) Boot

(B) Gearbox mounting bolts

2) Check boot for damage, cracks or deterioration.
3) With vehicle on a level surface, quickly turn steering wheel to the left and right.

While steering wheel is being rotated, check the gear backlash. If any unusual noise is noticed, adjust the gear backlash in the following manner.

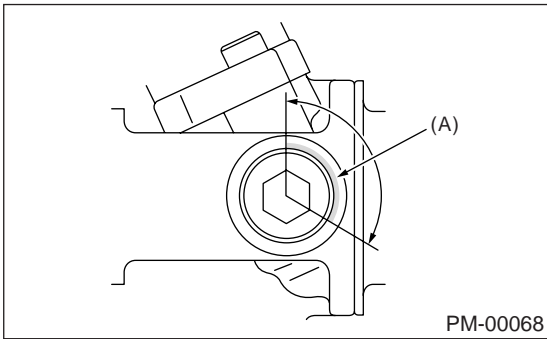
(1) Tighten adjusting screw to 7.4 N·m (0.75 kgf·m, 5.4 ft-lb) and then loosen. Repeat this operation twice.

(2) Retighten adjusting screw to 7.4 N·m (0.75 kgf·m, 5.4 ft-lb) and back off 25°.

STEERING SYSTEM (POWER STEERING)

PERIODIC MAINTENANCE SERVICES

- (3) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.



(A) Apply liquid packing to at least 1/3 of entire perimeter.

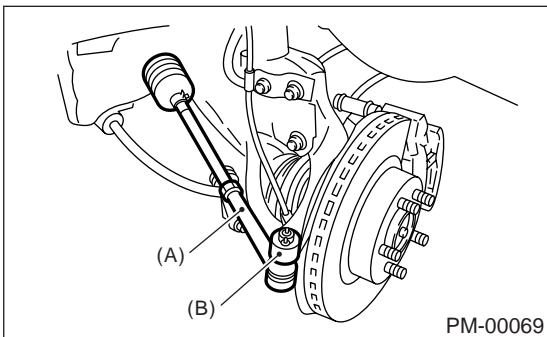
- (4) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST. 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf·m, 29 ft·lb)

Hold the adjusting screw with a wrench to prevent it from turning while tightening the lock nut.

4. TIE-ROD

- 1) Check tie-rod and tie-rod ends for bends, scratches or other damage.



(A) Tie-rod end
(B) Knuckle arm

- 2) Check connections of knuckle ball joints for play, inspect for damage on dust seals, and check free play of ball studs. If castle nut is loose, retighten it to the specified torque, then tighten further up to 60° until cotter pin hole is aligned.

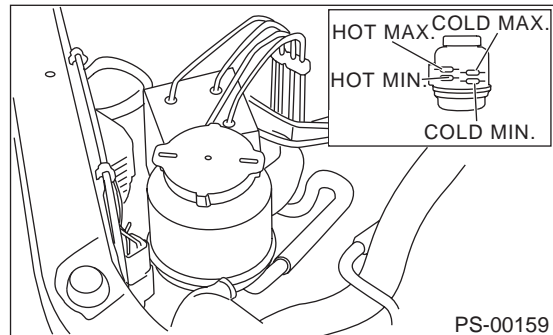
Tightening torque:
27 N·m (2.75 kgf·m, 19.9 ft·lb)

- 3) Check lock nut on the tie-rod end for tightness. If it is loose, retighten it to the specified torque.

Tightening torque:
83 N·m (8.5 kgf·m, 61.5 ft·lb)

5. POWER STEERING FLUID LEVEL

- 1) Place vehicle with engine "off" on the flat and level surface.
- 2) Inspect fluid level by indicator of reservoir tank. If the level is at lower point or below, add fluid to keep the level in the specified range of the indicator. If at upper point or above, drain fluid by using a syringe or the like.
 - (1) Check at temperature 20°C (68°F) on reservoir surface of oil pump; read the fluid level on the "COLD" side.
 - (2) Check at temperature 80°C (176°F) on reservoir surface of oil pump; read the fluid level on the "HOT" side.



- 3) Bleed air when the following cases occur with engine running or stopped:
 - (1) When fluid level varies 3 mm (0.12 in) or more.
 - (2) When foam is produced on the fluid surface.
 - (3) When oil pump produces squeaky noise.

6. POWER STEERING FLUID FOR LEAKS

Inspect the underside of oil pump and gearbox for power steering system, hoses, piping and their couplings for fluid leaks.

If fluid leaks are found, correct them by retightening their fitting bolts (or nuts) and/or replacing their parts.

NOTE:

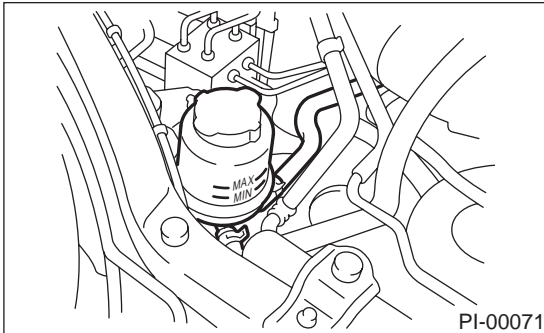
- Wipe the leakage fluid off after correcting fluid leaks, or a wrong diagnosis is taken later.
- Also pay attention to clearances between hoses (or pipings) and other parts when inspecting fluid leaks.

7. HOSES OF OIL PUMP FOR DAMAGES

Check pressure hose and return hose of oil pump for crack, swell or damage. Replace hose with a new one if necessary.

NOTE:

Prevent hoses from revolving and/or turning when installing hoses.



8. POWER STEERING PIPES FOR DAMAGE

Check power steering pipes for corrosion and damage.

Replace pipes with new ones if necessary.

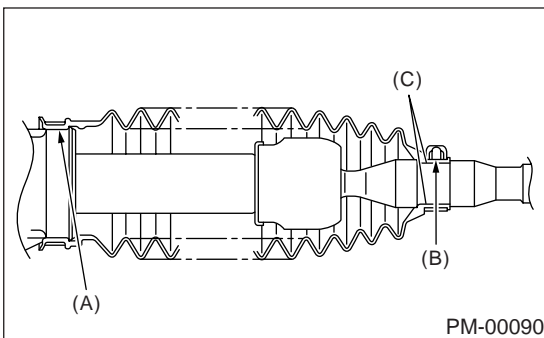
9. GEARBOX BOOTS

Inspect both sides of gearbox boots as follows, and correct the defects if necessary.

- 1) (A) and (B) positions of gearbox boot are fitted correspondingly in (A) and (B) grooves of gearbox and the rod.
- 2) Clips are fitted outside of (A) and (B) positions of boot.
- 3) Boot does not have crack and hole.

NOTE:

Rotate (B) position of gearbox boot against twist of it produced by adjustment of toe-in, etc. Apply grease to the groove (C).



10. FITTING BOLTS AND NUTS

Inspect fitting bolts and nuts of oil pump and bracket for looseness, and retighten them if necessary. Inspect and/or retighten them when engine is cold.

STEERING SYSTEM (POWER STEERING)

PERIODIC MAINTENANCE SERVICES

MEMO:

ENGINE SECTION 1

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUEL INJECTION (FUEL SYSTEMS) FU(H4SO)

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) EC(H4SO)

INTAKE (INDUCTION) IN(H4SO)

MECHANICAL ME(H4SO)

EXHAUST EX(H4SO)

COOLING CO(H4SO)

LUBRICATION LU(H4SO)

SPEED CONTROL SYSTEMS SP(H4SO)

IGNITION IG(H4SO)

STARTING/CHARGING SYSTEMS SC(H4SO)

ENGINE (DIAGNOSTICS) EN(H4SO)

FUEL INJECTION (FUEL SYSTEMS) FU(H4SOw/oOBD)

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) EC(H4SOw/oOBD)

INTAKE (INDUCTION) IN(H4SOw/oOBD)

MECHANICAL ME(H4SOw/oOBD)

EXHAUST EX(H4SOw/oOBD)

COOLING CO(H4SOw/oOBD)

ENGINE SECTION 1

LUBRICATION	LU(H4SOw/oOBD)
SPEED CONTROL SYSTEMS	SP(H4SOw/oOBD)
IGNITION	IG(H4SOw/oOBD)
STARTING/CHARGING SYSTEMS	SC(H4SOw/oOBD)
ENGINE (DIAGNOSTICS)	EN(H4SOw/oOBD)

FUEL INJECTION (FUEL SYSTEMS)

FU(H4SO)

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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

Model		Specification
Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm ² , 53.6 — 98 psi)
	Discharge flow	More than 65 ℓ (17.2 US gal, 14.3 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm ² , 43.5 psi)]
Fuel filter		Cartridge type

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

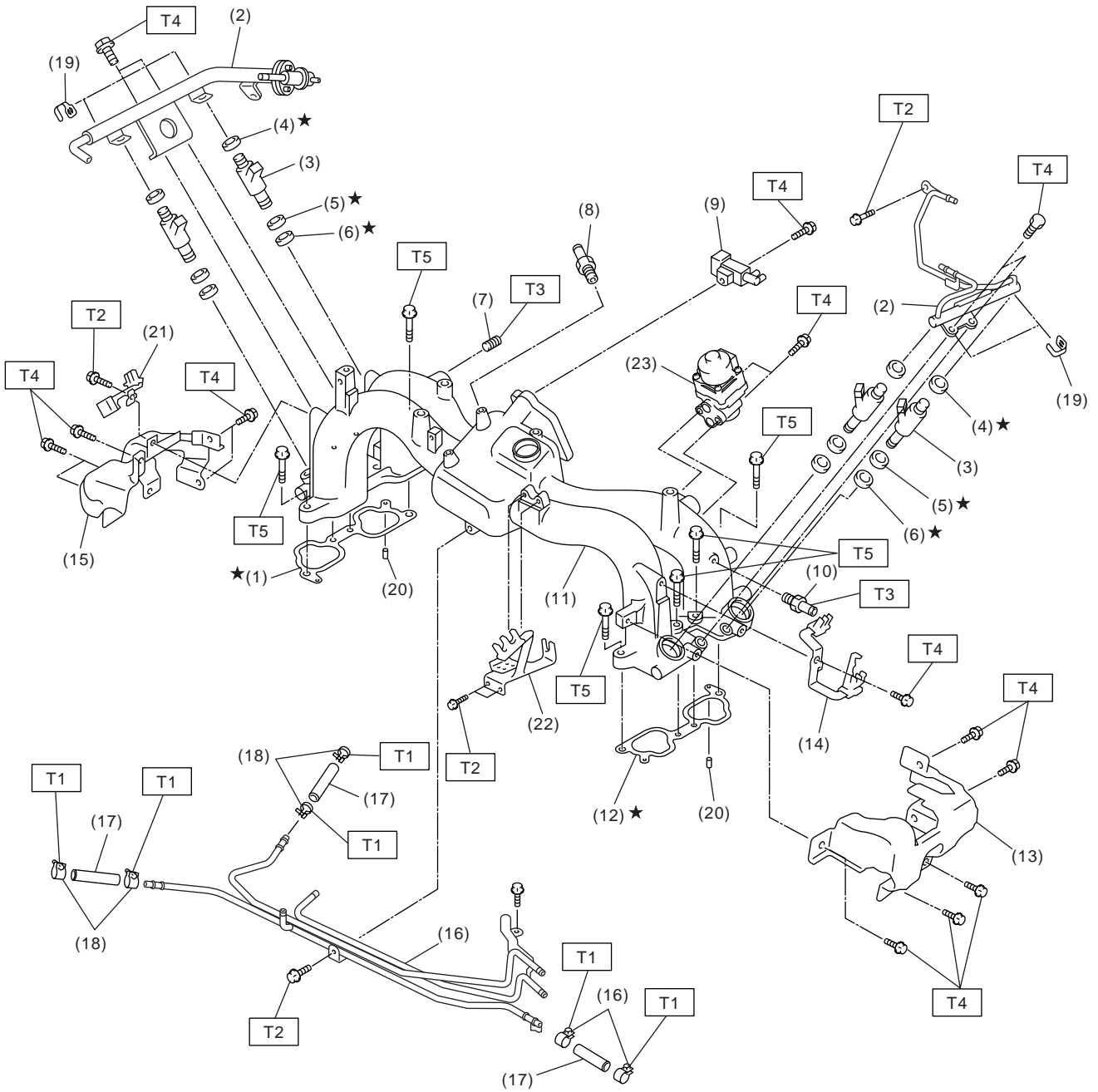
MEMO:

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

B: COMPONENT

1. INTAKE MANIFOLD



FU-00377

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

- (1) Intake manifold gasket RH
- (2) Fuel injector pipe
- (3) Fuel injector
- (4) O-ring
- (5) O-ring
- (6) O-ring
- (7) Plug
- (8) PCV valve
- (9) Purge control solenoid valve
- (10) Nipple

- (11) Intake manifold
- (12) Intake manifold gasket LH
- (13) Fuel pipe protector LH
- (14) Plug cord holder LH
- (15) Fuel pipe protector RH
- (16) Fuel pipe ASSY
- (17) Fuel hose
- (18) Clip
- (19) Clip
- (20) Guide pin

- (21) Plug cord holder RH
- (22) Accelerator cable bracket
- (23) EGR valve

Tightening torque: N-m (kgf-m, ft-lb)

T1: 1.5 (0.15, 1.1)

T2: 5.0 (0.51, 3.7)

T3: 17 (1.7, 12.5)

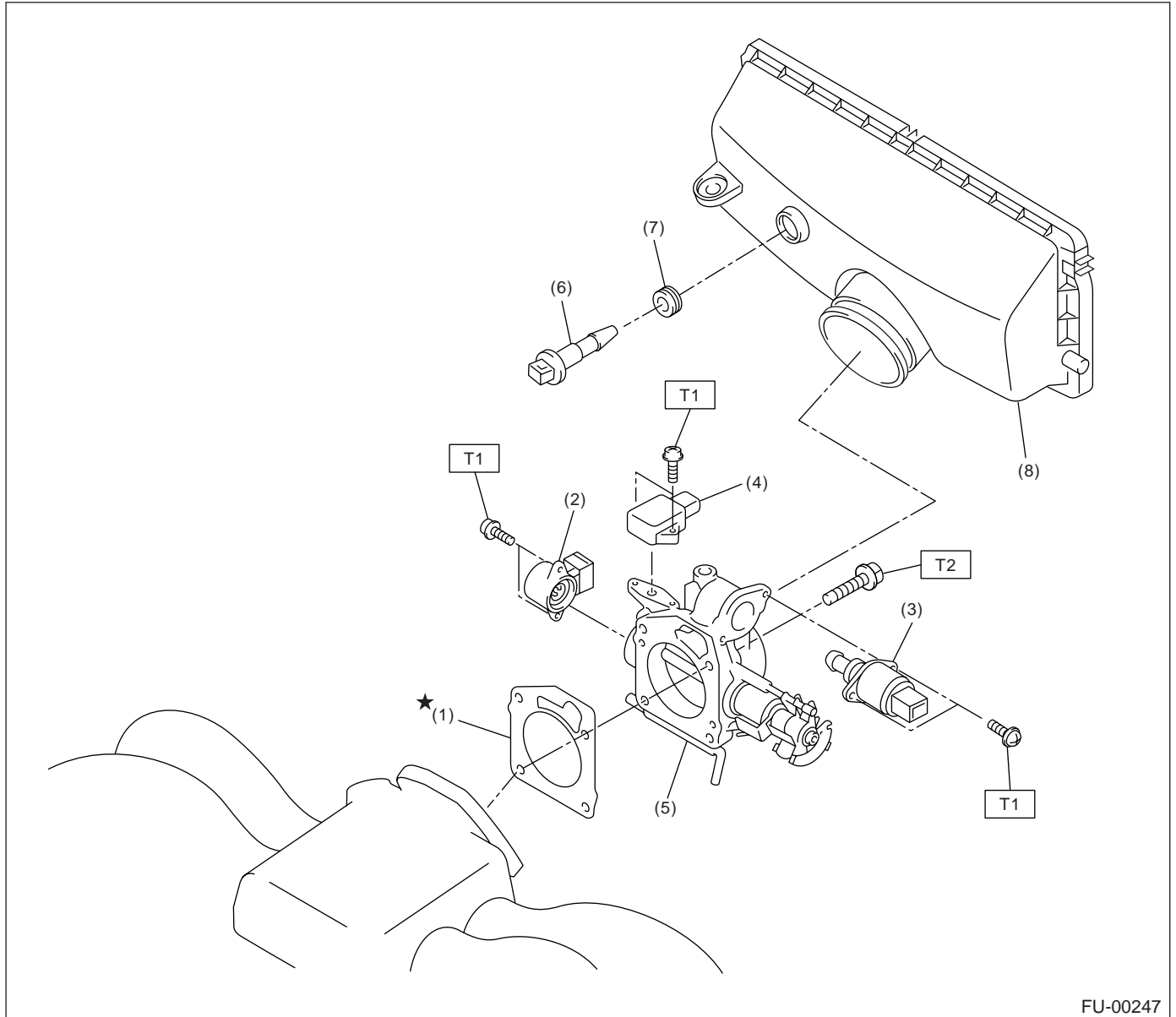
T4: 19 (1.9, 13.7)

T5: 25 (2.5, 18.1)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

2. AIR INTAKE SYSTEM



FU-00247

- | | |
|-------------------------------------|-----------------------------------|
| (1) Gasket | (5) Throttle body |
| (2) Throttle position sensor | (6) Intake air temperature sensor |
| (3) Idle air control solenoid valve | (7) Grommet |
| (4) Pressure sensor | (8) Air cleaner case |

Tightening torque: N·m (kgf·m, ft·lb)

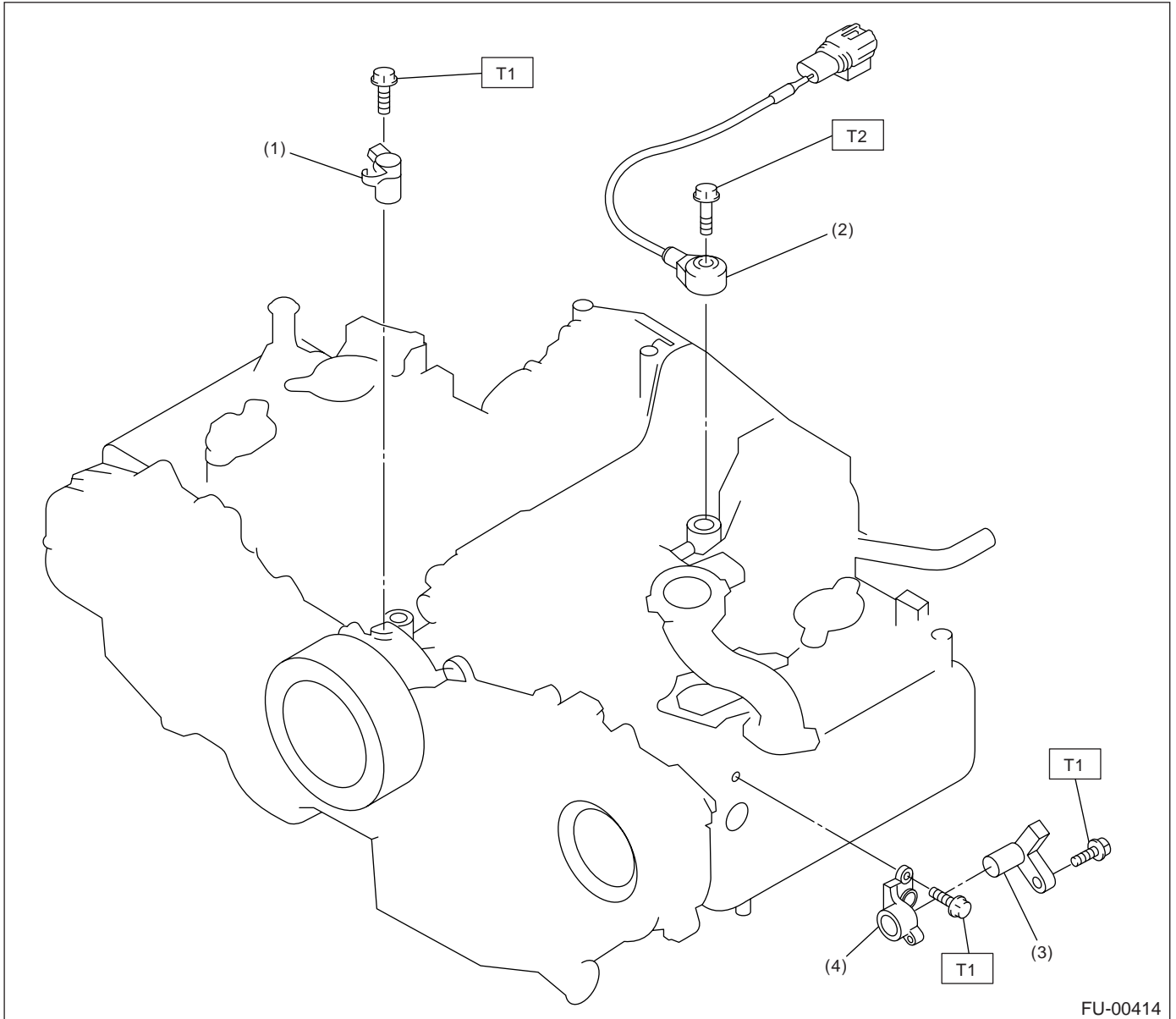
T1: 1.6 (0.16, 1.2)

T2: 22 (2.2, 15.9)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



- (1) Crankshaft position sensor
- (2) Knock sensor
- (3) Camshaft position sensor

- (4) Camshaft position sensor support

Tightening torque: N·m (kgf·m, ft·lb)

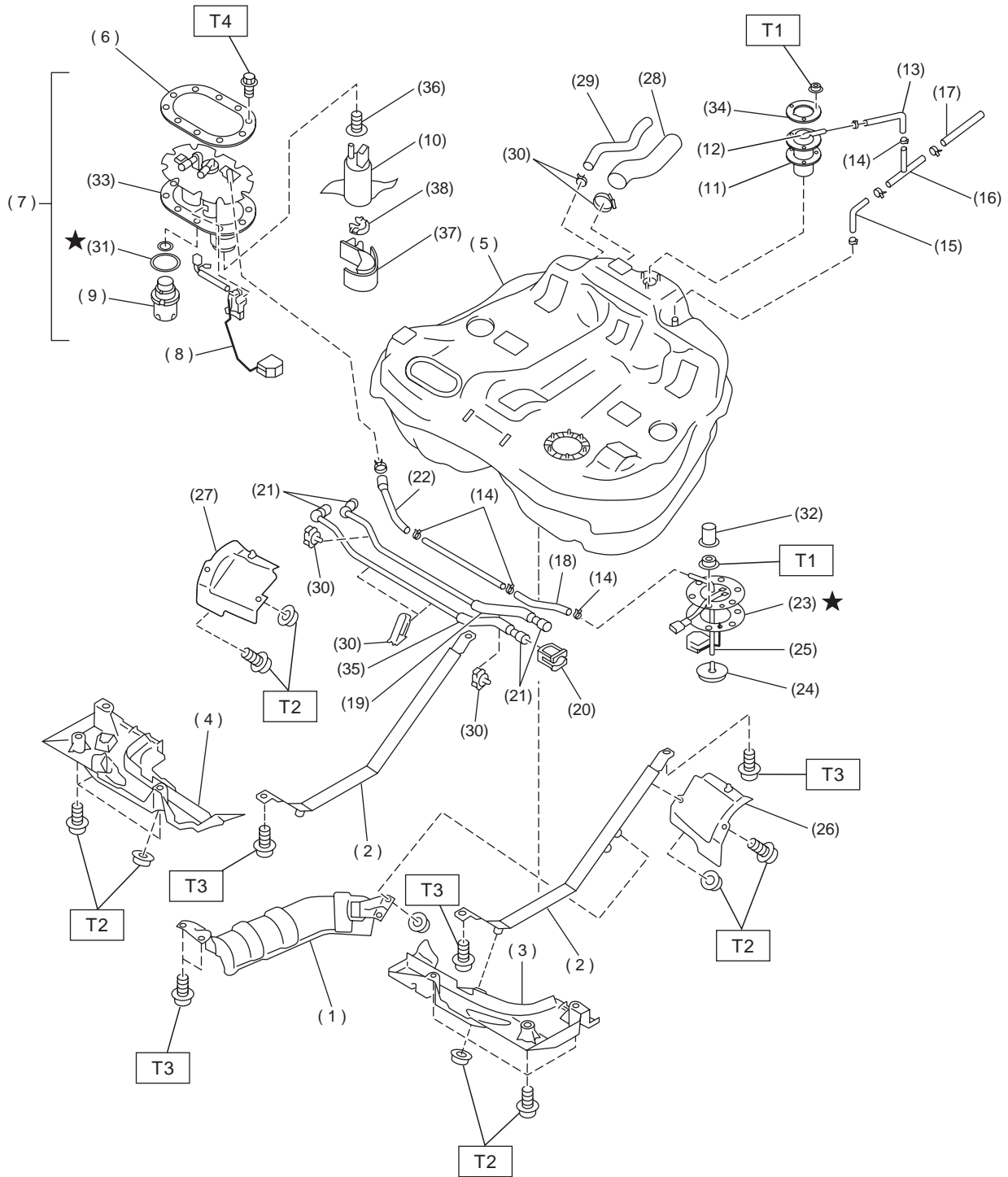
T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK



FU-00626

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

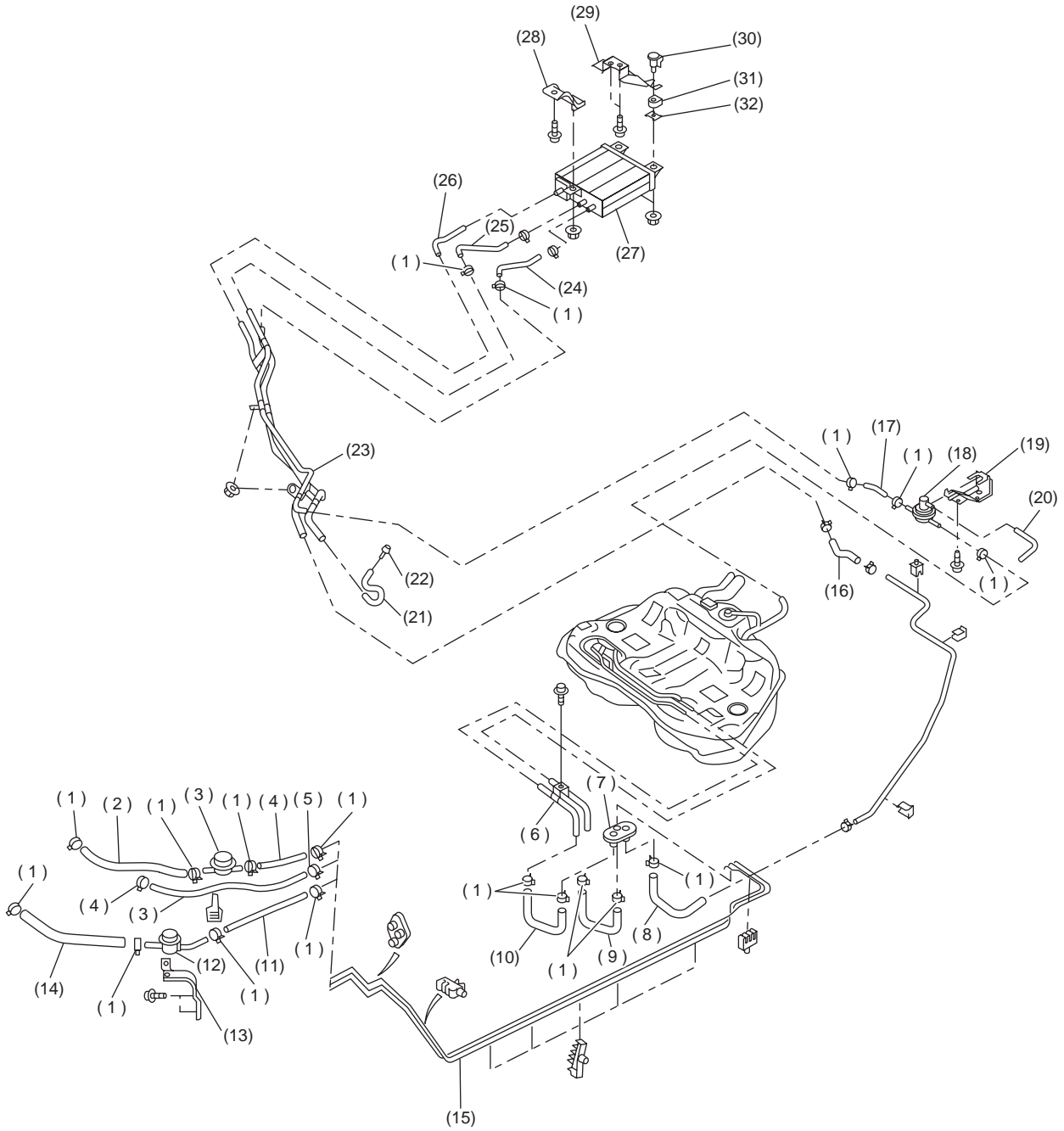
(1) Heat shield cover	(16) Joint pipe	(31) Gasket
(2) Fuel tank band	(17) Evaporation hose B	(32) Cap
(3) Protector LH (Front)	(18) Jet pump hose A	(33) Gasket
(4) Protector RH (Front)	(19) Fuel return tube	(34) Fuel cut valve plate
(5) Fuel tank	(20) Retainer	(35) Fuel delivery tube
(6) Fuel pump plate	(21) Quick connector	(36) Seal
(7) Fuel pump ASSY	(22) Jet pump hose B	(37) Fuel pump holder
(8) Fuel level sensor	(23) Fuel sub level sensor gasket	(38) Grommet
(9) Fuel filter	(24) Jet pump filter	
(10) Fuel pump	(25) Fuel sub level sensor	
(11) Fuel cut valve gasket	(26) Protector LH (Rear)	
(12) Fuel cut valve	(27) Protector RH (Rear)	
(13) Evaporation hose A	(28) Fuel filler hose	
(14) Clip	(29) Vent hose	
(15) Evaporation hose C	(30) Clamp	

Tightening torque: N-m (kgf-m, ft-lb)***T1: 4.4 (0.45, 3.3)******T2: 18 (1.8, 13.0)******T3: 33 (3.4, 25)******T4: 5.9 (0.6, 4.3)***

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

5. FUEL LINE



FU-00627

GENERAL DESCRIPTION

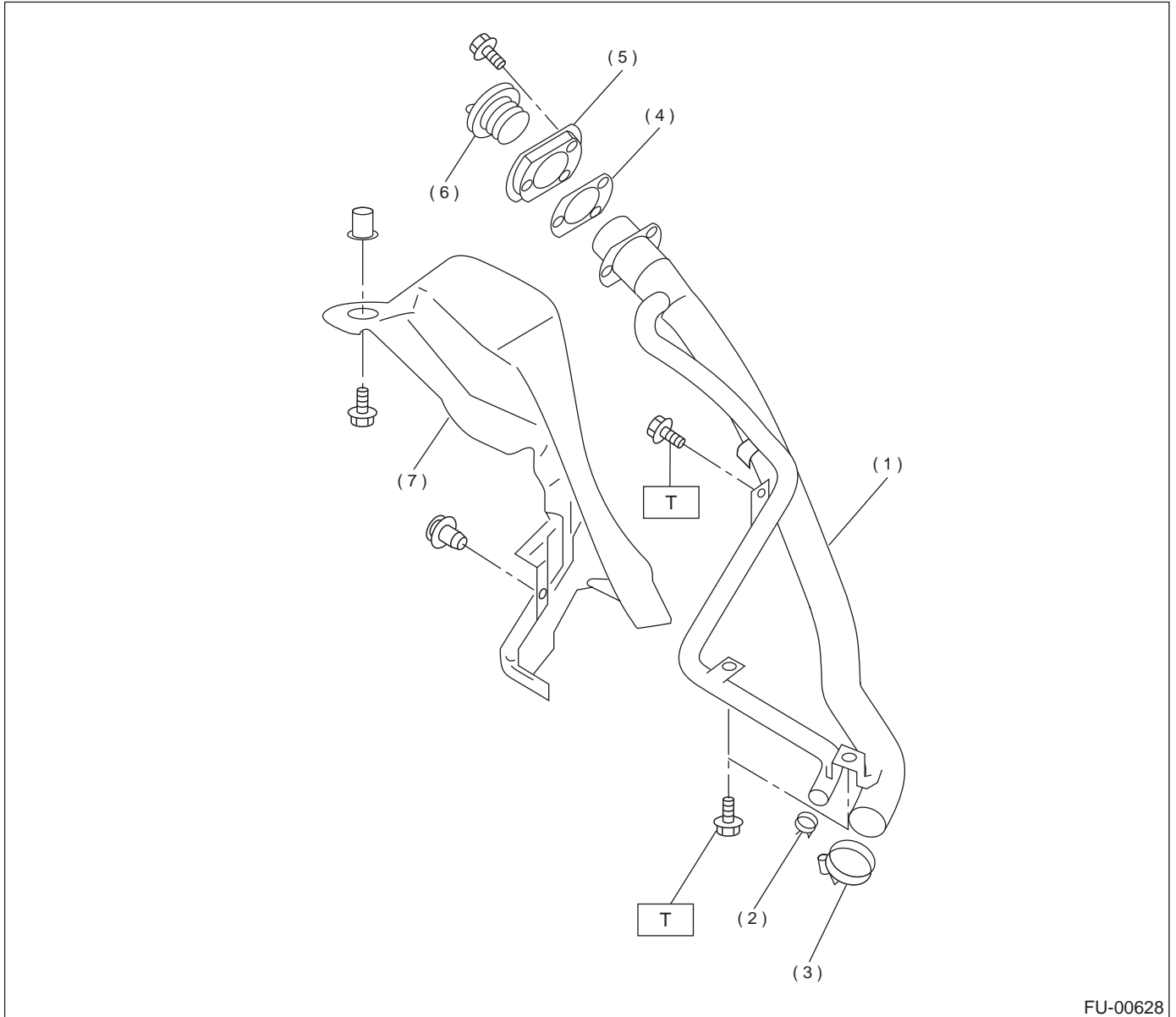
FUEL INJECTION (FUEL SYSTEMS)

- | | | |
|---------------------------|-------------------------------|------------------------------|
| (1) Clamp | (12) Damper valve (Delivery) | (23) Evaporation pipe ASSY |
| (2) Fuel return hose A | (13) Bracket | (24) Purge hose |
| (3) Damper valve (Return) | (14) Fuel delivery hose C | (25) Evaporation hose C |
| (4) Fuel return hose B | (15) Fuel pipe ASSY | (26) Canister drain hose |
| (5) Clip | (16) Evaporation hose B | (27) Canister |
| (6) Fuel pipe ASSY | (17) Two-way valve hose | (28) Front canister bracket |
| (7) Grommet | (18) Two-way valve | (29) Rear canister bracket |
| (8) Evaporation hose A | (19) Two-way valve bracket | (30) Canister bracket spacer |
| (9) Fuel return hose C | (20) Two-way valve drain hose | (31) Cushion |
| (10) Fuel delivery hose A | (21) Drain hose | (32) Canister bracket plate |
| (11) Fuel delivery hose B | (22) Fuel pipe connector | |

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



FU-00628

- | | |
|---------------------------|--------------------------------|
| (1) Fuel filler pipe ASSY | (5) Filler ring |
| (2) Clip | (6) Filler cap |
| (3) Clamp | (7) Fuel filler pipe protector |
| (4) Filler pipe packing | |

Tightening torque: N·m (kgf·m, ft·lb)

T: 7.4 (0.75, 5.4)

GENERAL DESCRIPTION

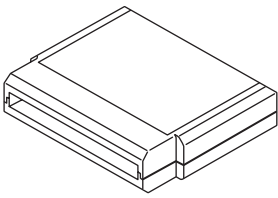

FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect negative terminal from battery.
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none">• English: 22771AA030 (Without printer)• German: 22771AA070 (Without printer)• French: 22771AA080 (Without printer)• Spanish: 22771AA090 (Without printer)

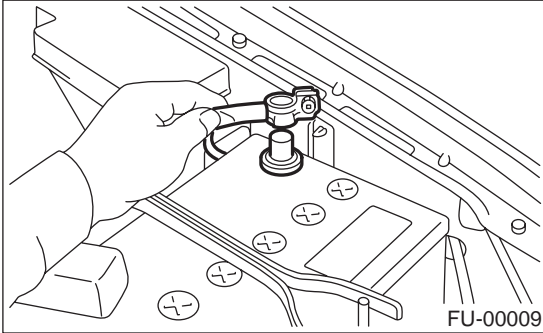
THROTTLE BODY

FUEL INJECTION (FUEL SYSTEMS)

2. Throttle Body

A: REMOVAL

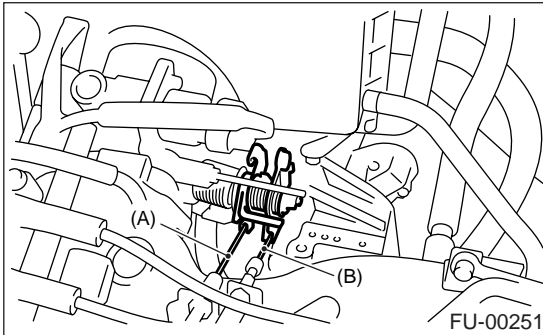
1) Disconnect the ground cable from battery.



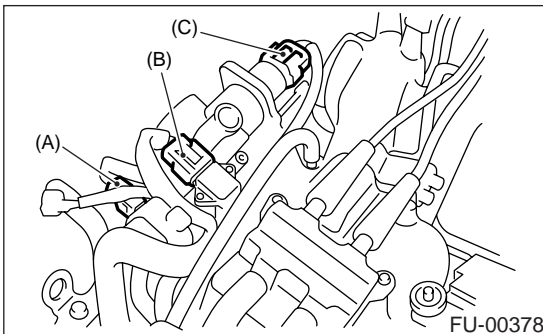
2) Remove the air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>

3) Disconnect the accelerator cable (A).

4) Disconnect the cruise control cable (B). (With cruise control model)



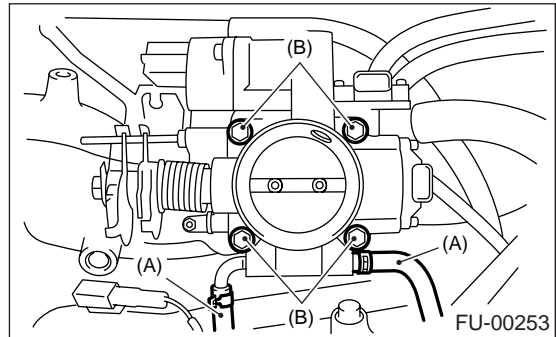
5) Disconnect the connectors from idle air control solenoid valve, throttle position sensor and pressure sensor.



- (A) Throttle position sensor
- (B) Pressure sensor
- (C) Idle air control solenoid valve

6) Disconnect the engine coolant hoses (A) from the throttle body.

7) Remove the bolts (B) which install throttle body to the intake manifold.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:

Replace the gasket with a new one.

Tightening torque:

Throttle body;

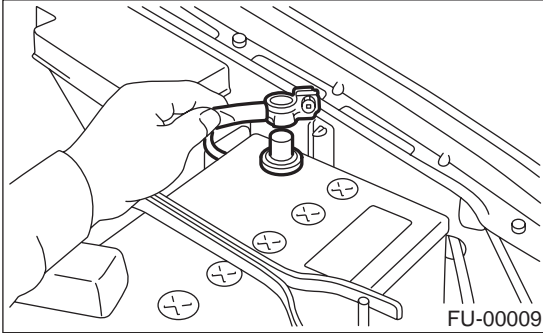
22 N·m (2.2 kgf-m, 15.9 ft-lb)

2) Adjust the accelerator cable play. <Ref. to SP(H4SO)-10, REMOVAL, Accelerator Control Cable.>

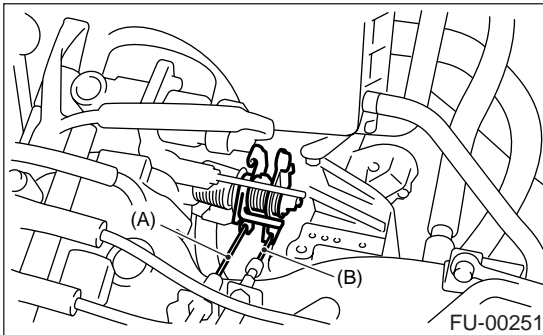
3. Intake Manifold

A: REMOVAL

- 1) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel flap lid, and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



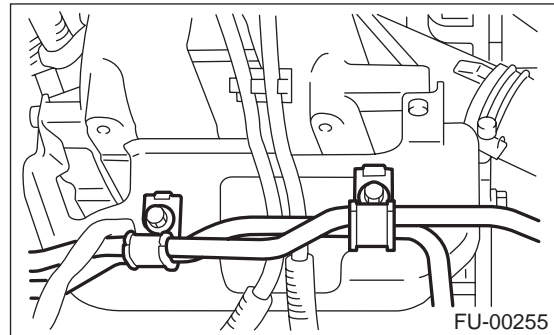
- 4) Remove the air intake duct and air cleaner case. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 5) Disconnect the accelerator cable (A).
- 6) Disconnect the cruise control cable (B). (With cruise control model)



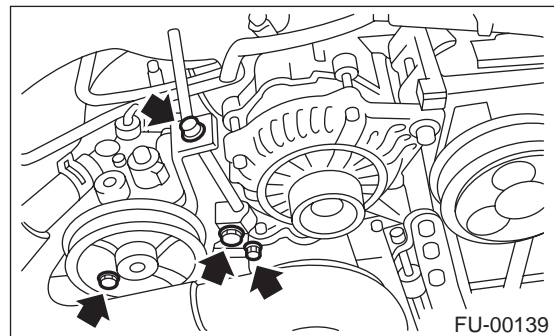
- 7) Remove the power steering pump and reservoir tank from bracket.
 - (1) Remove the resonator chamber. <Ref. to IN(H4SO)-8, REMOVAL, Resonator Chamber.>
 - (2) Remove the front side V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
 - (3) Remove the bolts which hold power steering pipes onto the intake manifold protector.

NOTE:

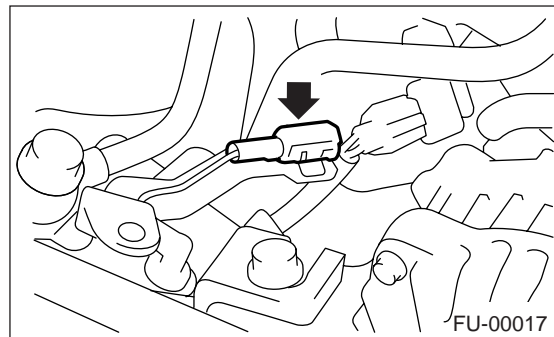
Do not disconnect the power steering hose.



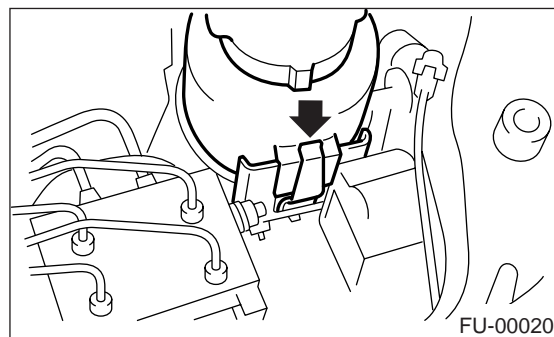
- (4) Remove the bolts which install power steering pump bracket.



- (5) Disconnect the connector from the power steering pump switch.



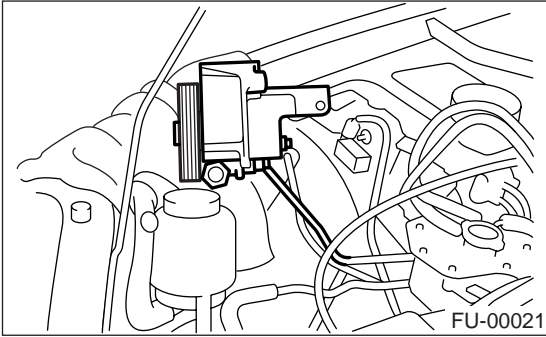
- (6) Remove the power steering tank from the bracket by pulling it upwards.



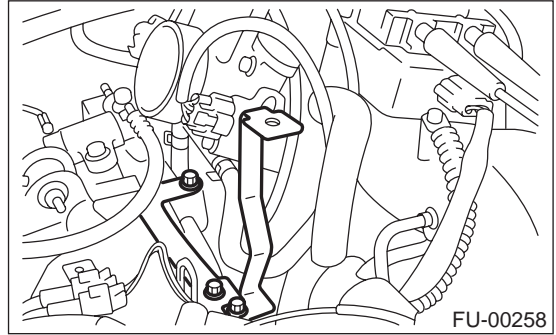
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

(7) Place the power steering pump on the right side wheel apron.

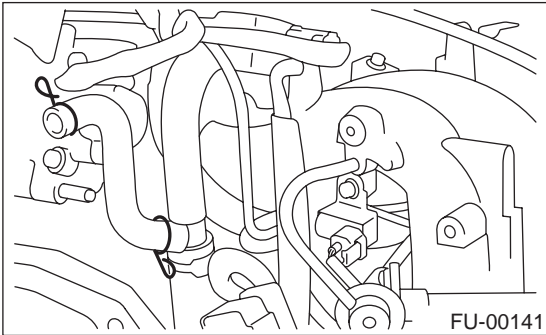


12) Remove the air cleaner case stay RH and engine harness bracket, and disconnect the engine harness connectors from the bulkhead harness connectors.

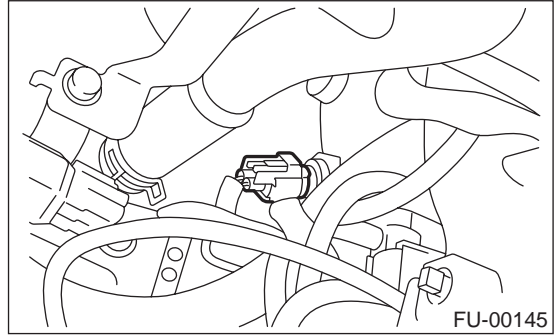


8) Disconnect the spark plug cords from the spark plugs.

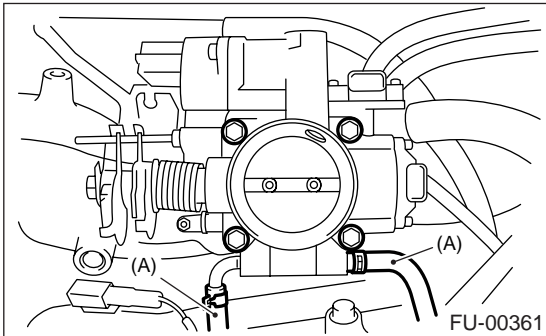
9) Disconnect the PCV hose from the intake manifold.



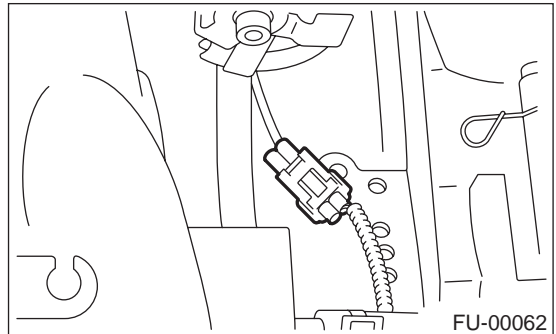
13) Disconnect the connectors from the engine coolant temperature sensor.



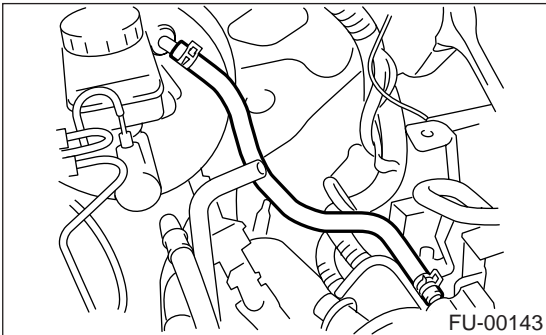
10) Disconnect the engine coolant hose (A) from the throttle body.



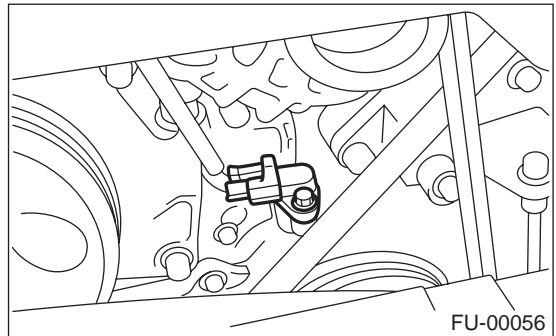
14) Disconnect the knock sensor connector.



11) Disconnect the brake booster hose.



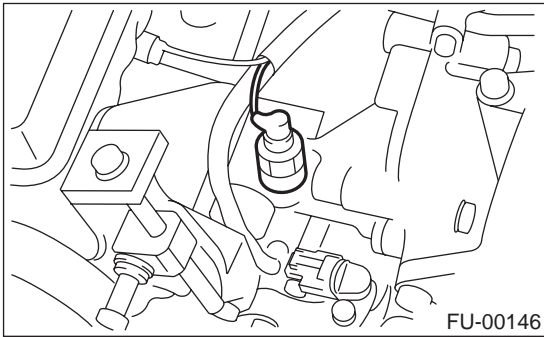
15) Disconnect the connector from the crankshaft position sensor.



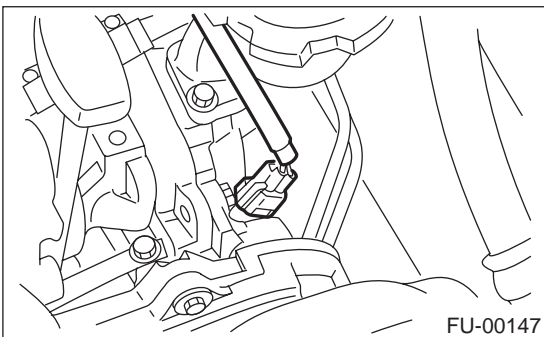
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

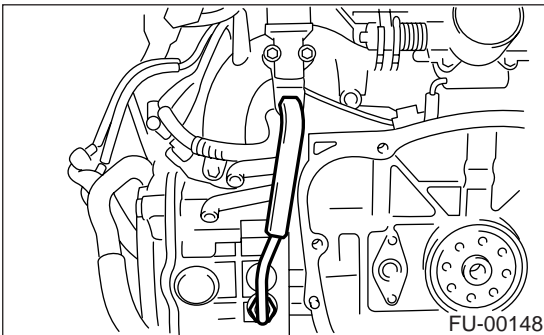
16) Disconnect the connector from the oil pressure switch.



17) Disconnect the connector from the camshaft position sensor.



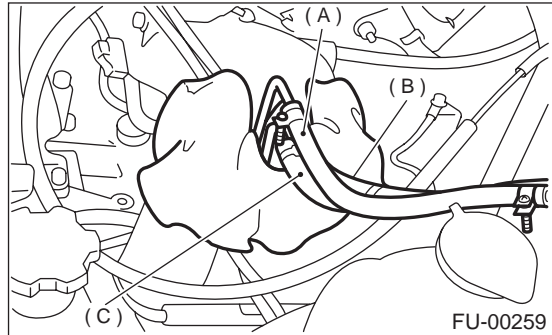
18) Remove the EGR pipe from intake manifold.



19) Disconnect the fuel hoses from the fuel pipes.

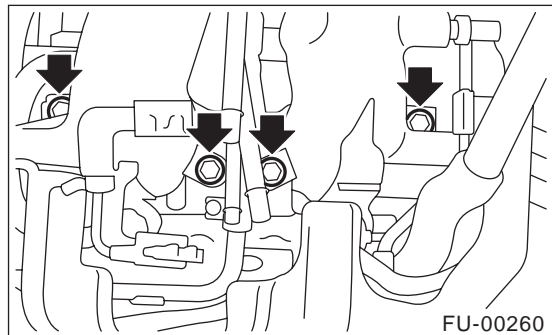
WARNING:

- Do not spill fuel.
- Catch fuel from hoses in a container or cloth.



- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

20) Remove the bolts which hold intake manifold onto the cylinder heads.



21) Remove the intake manifold.

B: INSTALLATION

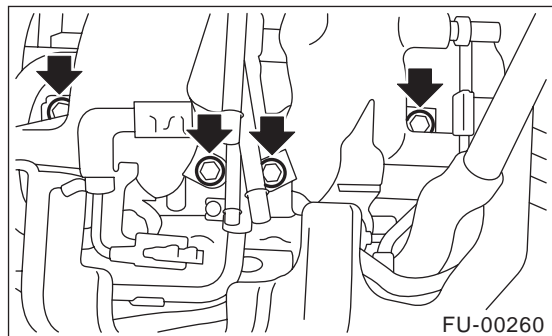
1) Install the intake manifold onto the cylinder heads.

NOTE:

Replace the gaskets with new ones.

Tightening torque:

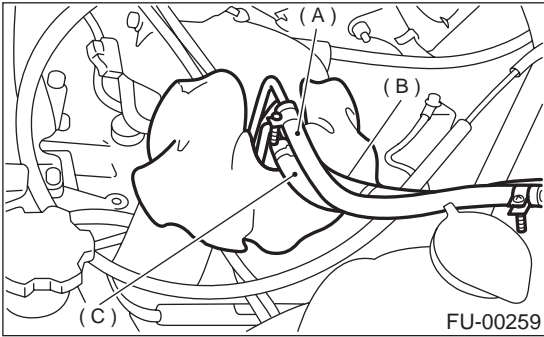
25 N·m (2.5 kgf-m, 18.1 ft-lb)



INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

2) Connect the fuel hoses.

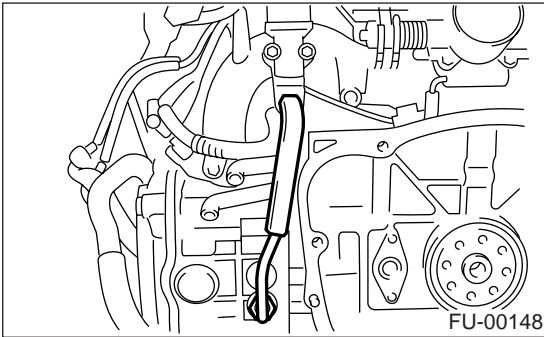


- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

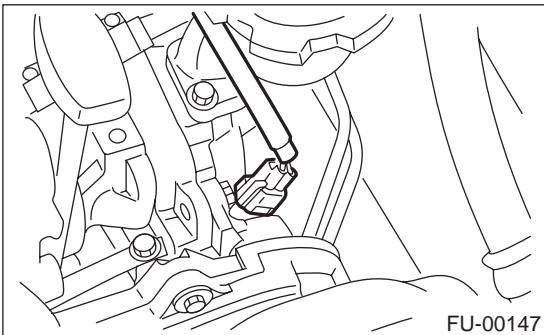
3) Connect the EGR pipe to intake manifold.

Tightening torque:

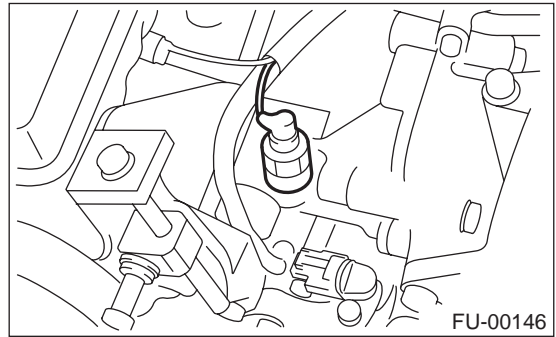
34 N·m (3.4 kgf-m, 24.6 ft-lb)



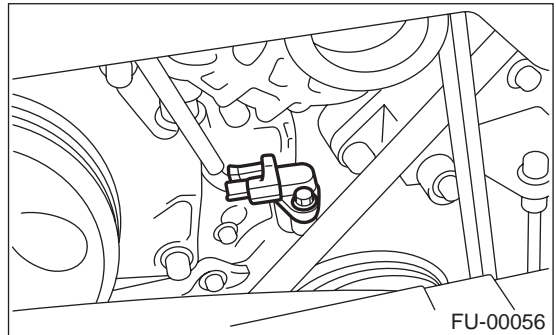
4) Connect the connector to the camshaft position sensor.



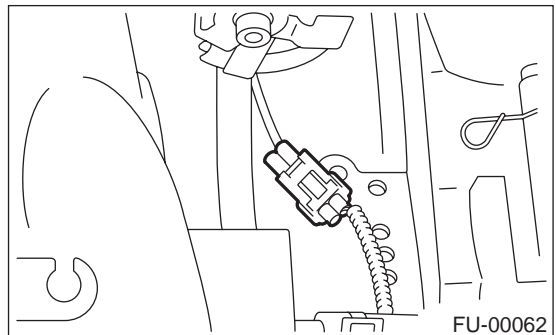
5) Connect the connector to the oil pressure switch.



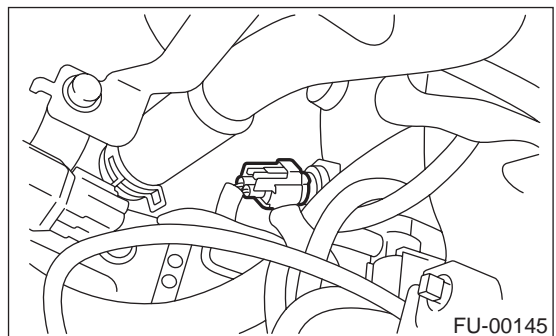
6) Connect the connector to the crankshaft position sensor.



7) Connect the knock sensor connector.



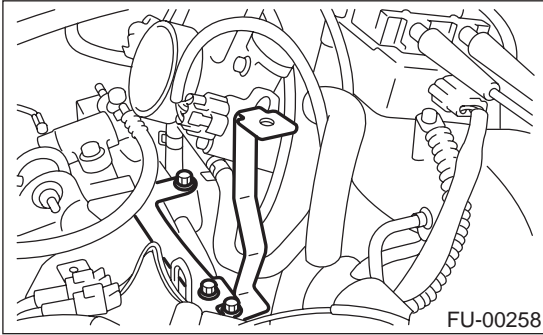
8) Connect the connectors to the engine coolant temperature sensor.



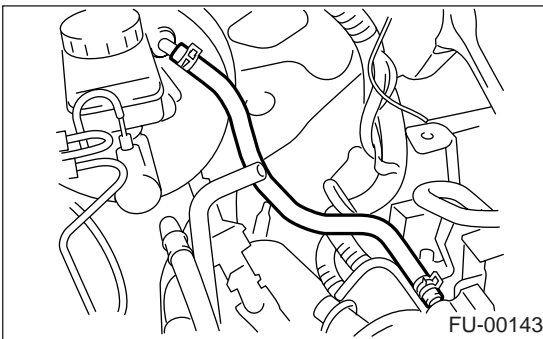
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

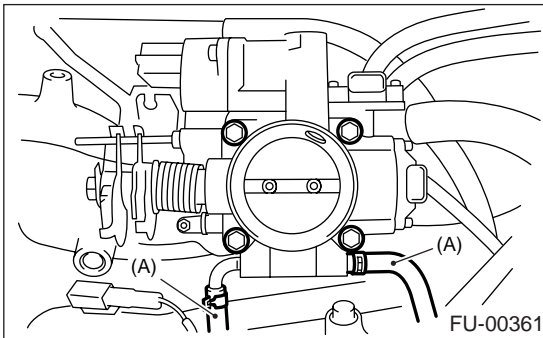
9) Install the air cleaner case stay RH and engine harness bracket, and connect the engine harness connectors to the bulkhead connectors.



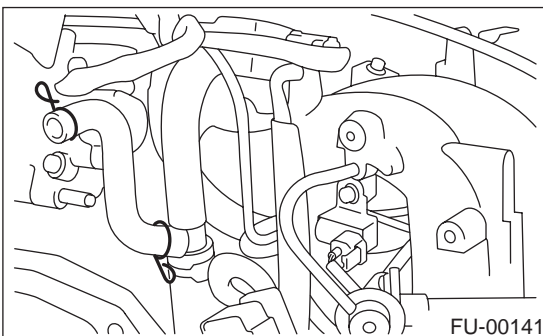
10) Connect the brake booster hose.



11) Connect the engine coolant hose (A) to the throttle body.



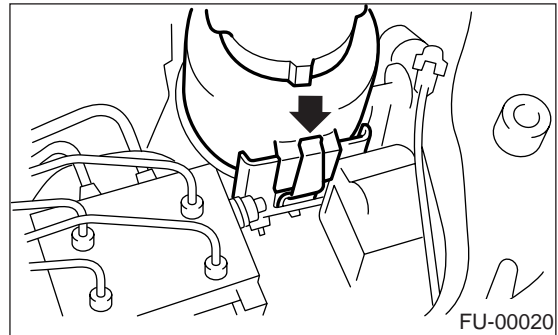
12) Connect the PCV hose to the intake manifold.



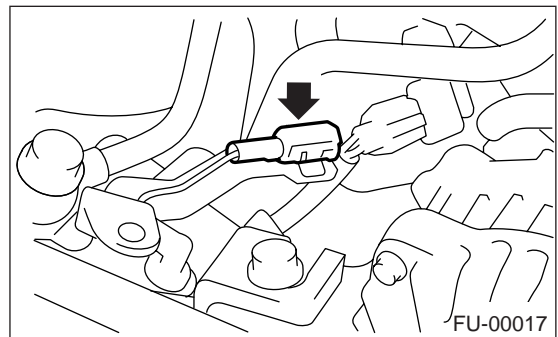
13) Connect the spark plug cords to the spark plugs.

14) Install the power steering pump and reservoir tank to bracket.

(1) Install the reservoir tank to bracket.



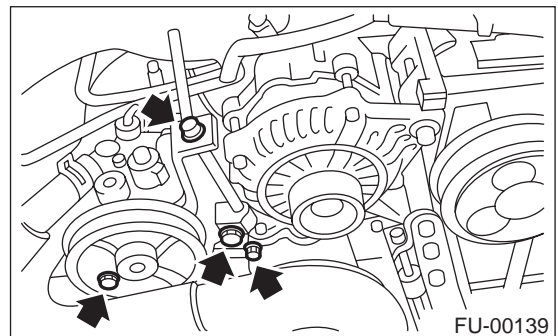
(2) Connect the connector to the power steering pump switch.



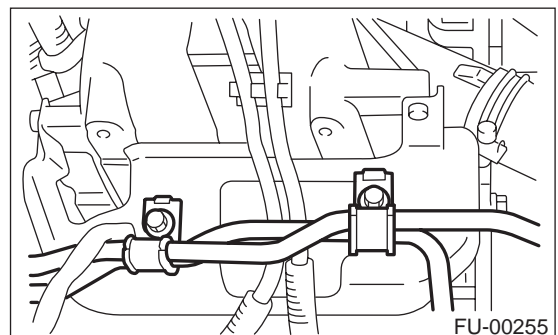
(3) Tighten the bolts which install power steering pump bracket.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



(4) Install the power steering pipes onto the right side intake manifold protector.



INTAKE MANIFOLD

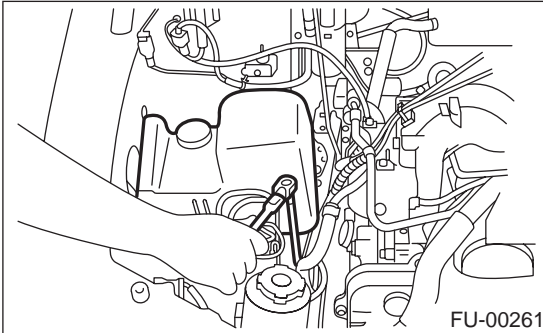
FUEL INJECTION (FUEL SYSTEMS)

(5) Install the front side V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

(6) Install the resonator chamber.

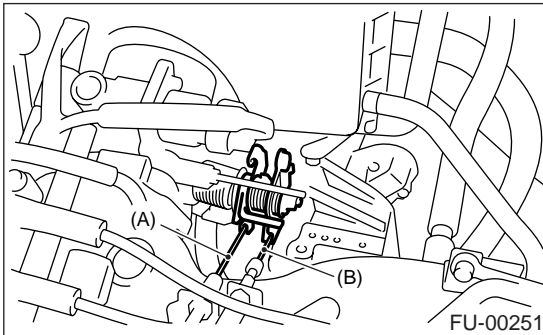
Tightening torque:

33 N·m (3.4 kgf·m, 24.6 ft·lb)



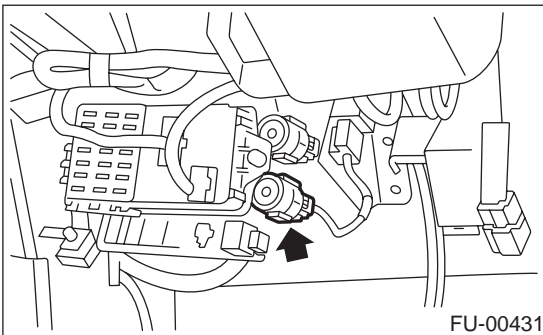
15) Connect the accelerator cable (A). <Ref. to SP(H4SO)-10, INSTALLATION, Accelerator Control Cable.>

16) Connect the cruise control cable (B). (With cruise control models)

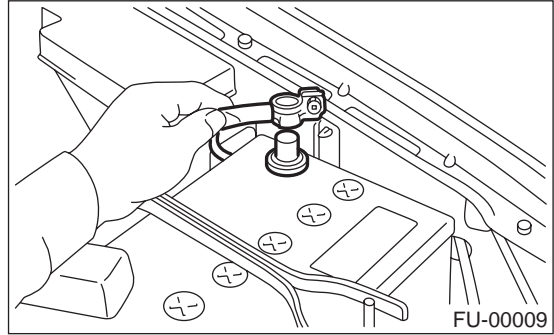


17) Install the air intake duct and air cleaner case. <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

18) Connect the connector to the fuel pump relay.

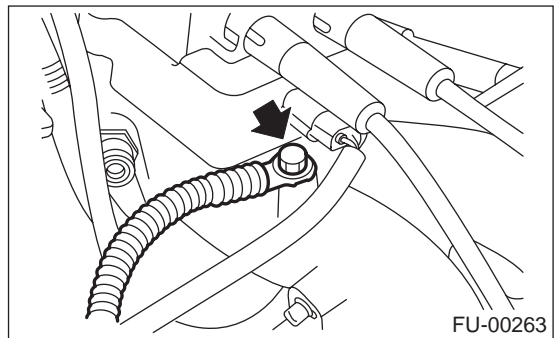


19) Connect the battery ground cable to battery.

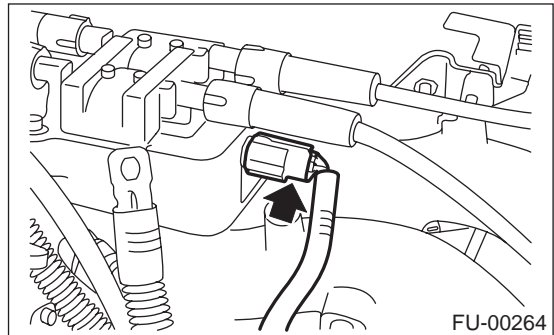


C: DISASSEMBLY

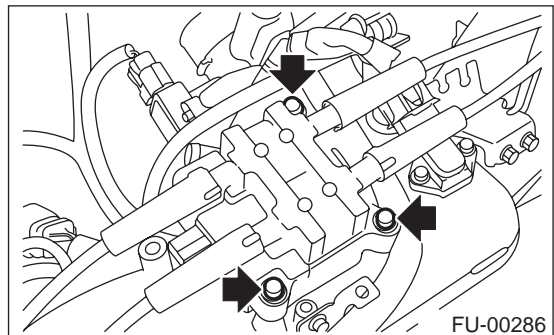
1) Disconnect the engine ground terminal from the intake manifold.



2) Disconnect the connector from the ignition coil and ignitor assembly.



3) Remove the ignition coil and ignitor assembly.



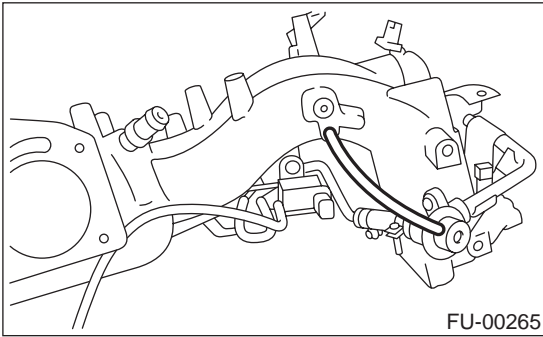
4) Remove the throttle body. <Ref. to FU(H4SO)-14, REMOVAL, Throttle Body.>

5) Remove the EGR valve. <Ref. to FU(H4SO)-35, REMOVAL, EGR Valve.>

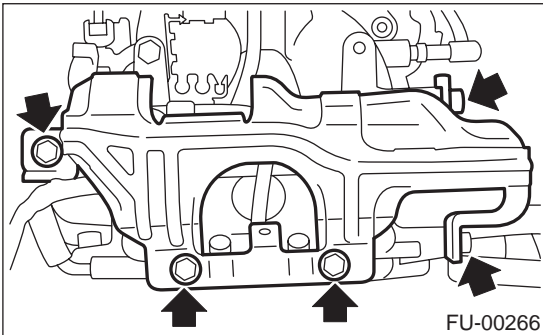
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

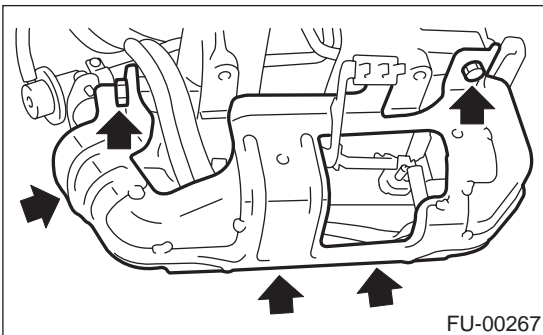
6) Disconnect the pressure regulator vacuum hose from the intake manifold.



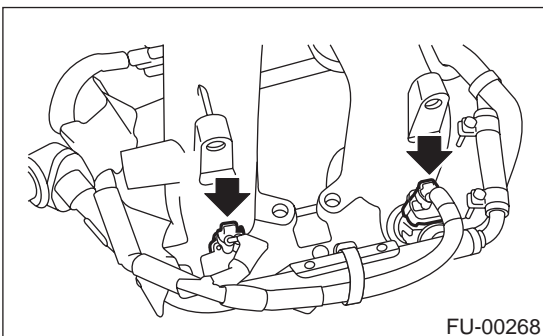
7) Remove the fuel pipe protector LH.



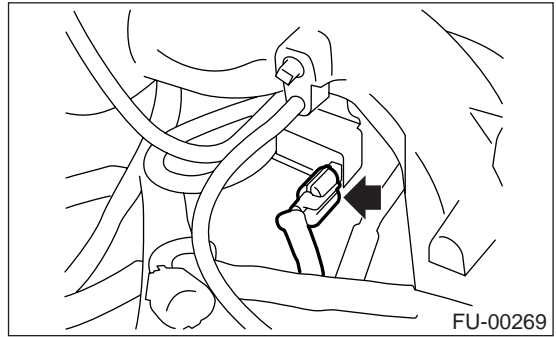
8) Remove the fuel pipe protector RH.



9) Disconnect the connectors from the fuel injectors.

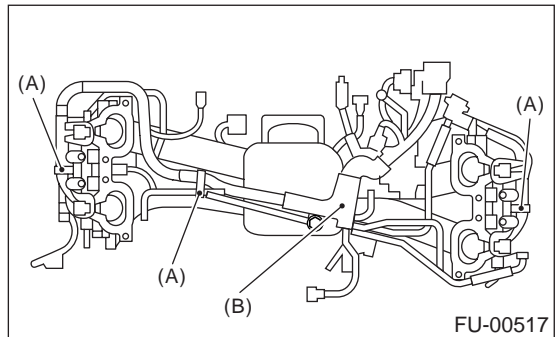


10) Disconnect the connector from the purge control solenoid valve.



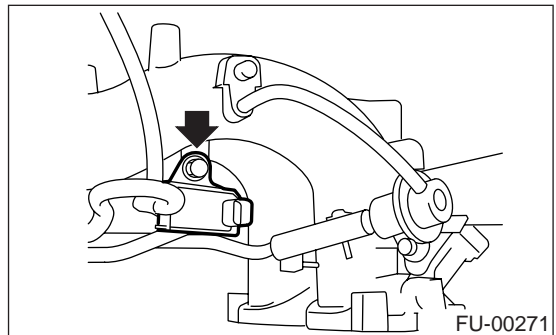
11) Disconnect the air by-pass hose from the purge control solenoid valve.

12) Remove the harness bands (A) and harness bracket (B) which hold engine harness onto the intake manifold.



13) Remove the engine harness from the intake manifold.

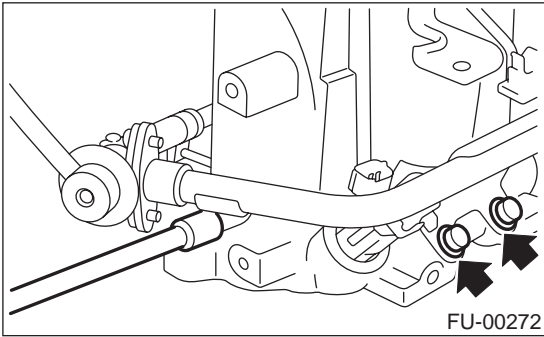
14) Remove the purge control solenoid valve.



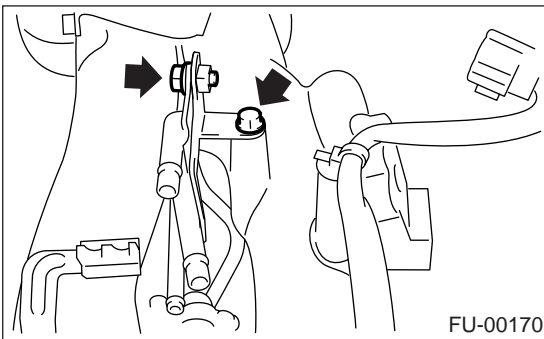
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

15) Remove the bolt which installs injector pipe on the intake manifold as shown in figure.

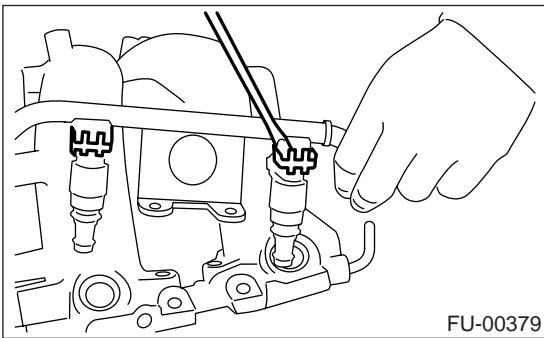


16) Remove the two bolts which hold fuel pipes on the left side of intake manifold.

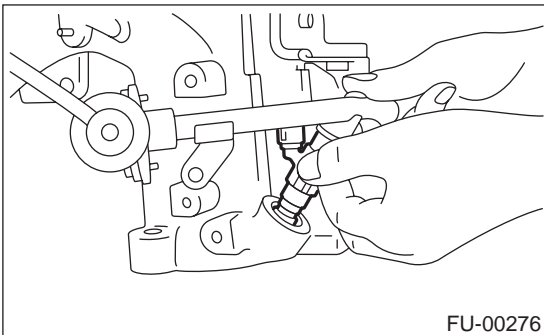


17) Remove the fuel injectors.

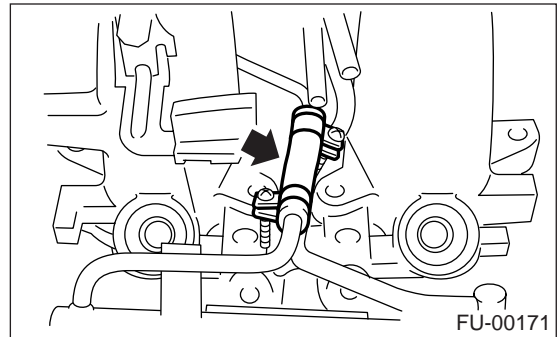
(1) Remove the fuel injector securing clip.



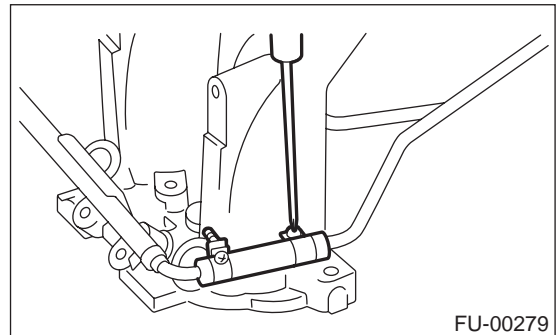
(2) Remove the fuel injector while lifting up the fuel injector pipe.



18) Loosen the clamp which holds the front left side fuel hose to the injector pipe and remove the pipe.

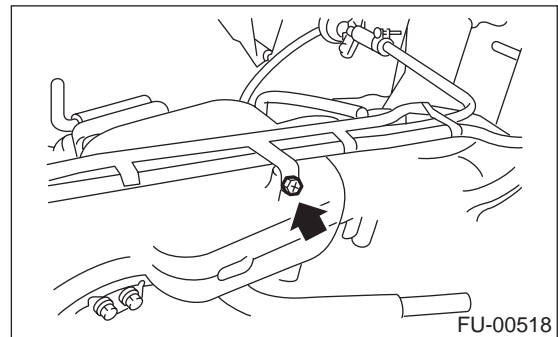


19) Loosen the clamp which holds the front right side fuel hose to the injector pipe and remove the pipe.



20) Remove the fuel injector pipe.

21) Remove the bolt which installs the fuel pipes on the intake manifold.



22) Remove the fuel pipe assembly and pressure regulator, from the intake manifold.

INTAKE MANIFOLD

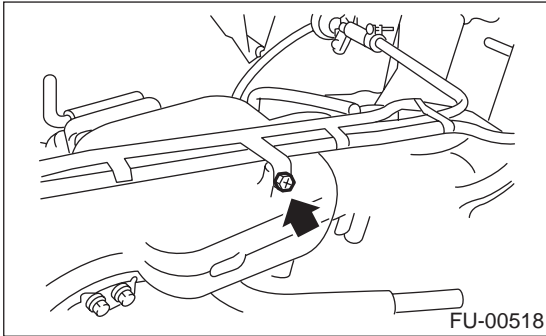
FUEL INJECTION (FUEL SYSTEMS)

D: ASSEMBLY

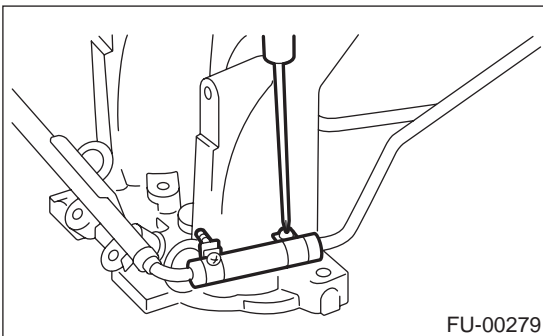
- 1) Install the fuel pipe assembly and pressure regulator, etc. to the intake manifold.
- 2) Tighten the bolt which installs the fuel pipes on the intake manifold.

Tightening torque:

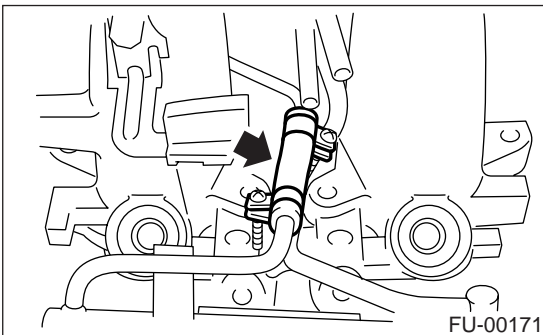
5.0 N·m (0.51 kgf·m, 3.7 ft·lb)



- 3) Connect the right side fuel hose to the injector pipe, and tighten the clamp screw.



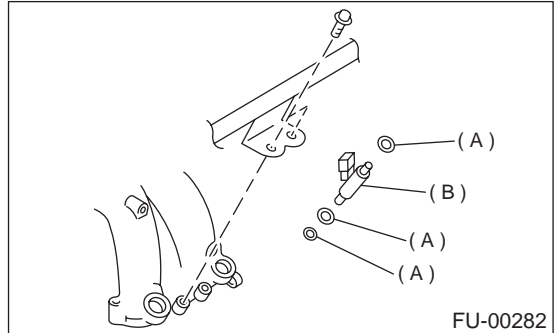
- 4) Install the fuel injector pipe.
- 5) Connect the left side fuel hose to the injector pipe, and tighten the clamp screw.



- 6) Install the fuel injectors.

NOTE:

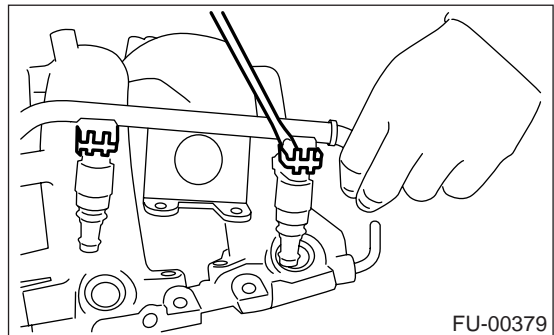
Replace the O-rings with new ones.



- (A) O-ring
- (B) Fuel injector

NOTE:

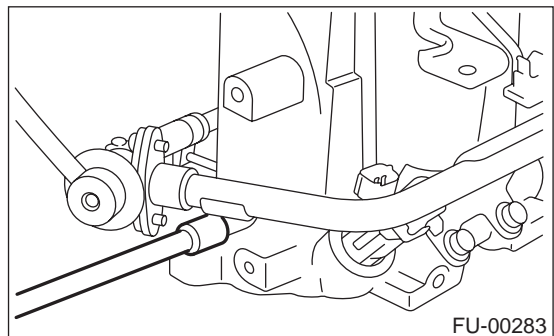
Do not forget to install the fuel injector securing clip.



- 7) Tighten the bolt which installs the injector pipe on the intake manifold.

Tightening torque:

5.0 N·m (0.51 kgf·m, 3.7 ft·lb)

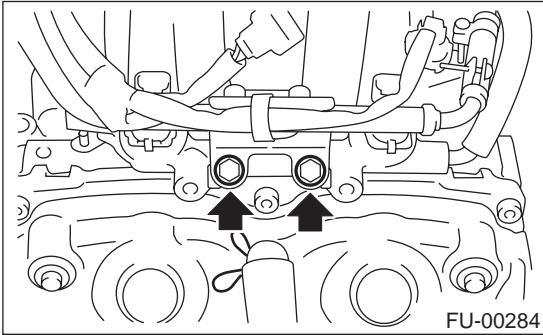


INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

Tightening torque:

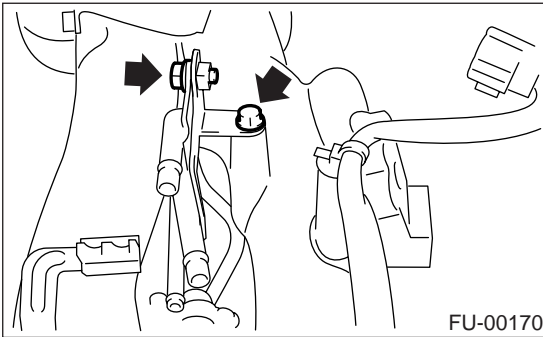
19 N·m (1.94 kgf-m, 13.7 ft-lb)



8) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

Tightening torque:

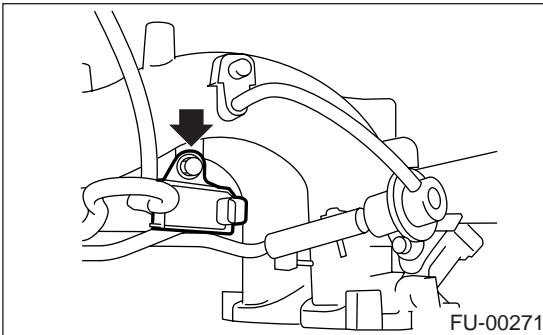
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



9) Install the purge control solenoid valve.

Tightening torque:

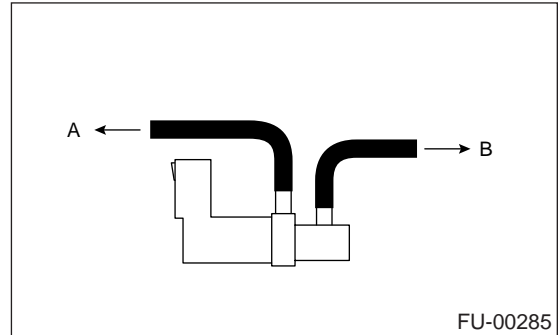
19 N·m (1.94 kgf-m, 13.7 ft-lb)



10) Connect the hoses to the purge control solenoid valve.

NOTE:

Connect the evaporation hose as shown in the figure.



(A) To fuel pipe

(B) To intake manifold

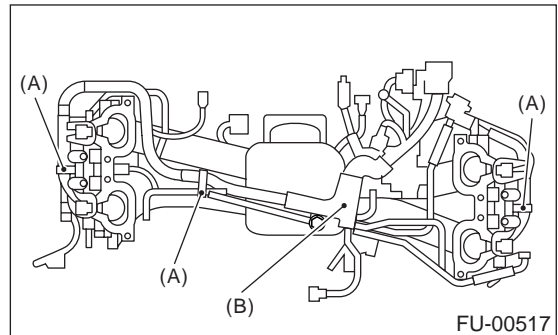
11) Install the engine harness onto the intake manifold.

Tightening torque:

16 N·m (1.6 kgf-m, 11.8 ft-lb)

12) Connect the connectors to the fuel injectors and purge control solenoid valve.

13) Hold the engine harness by harness band (A) and harness bracket (B).



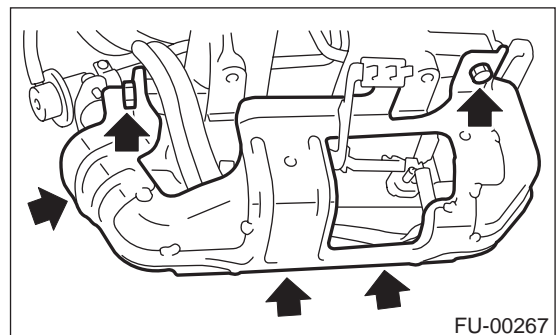
NOTE:

Do not use harness band on harnesses where they are supposed to be protected by the fuel pipe protector.

14) Install the fuel pipe protector RH.

Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



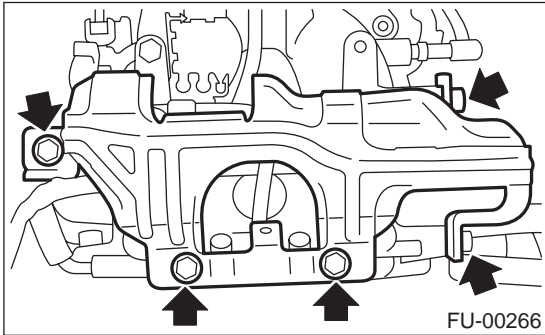
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

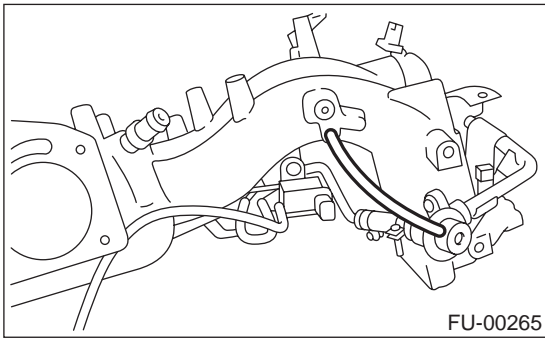
15) Install the fuel pipe protector LH.

Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



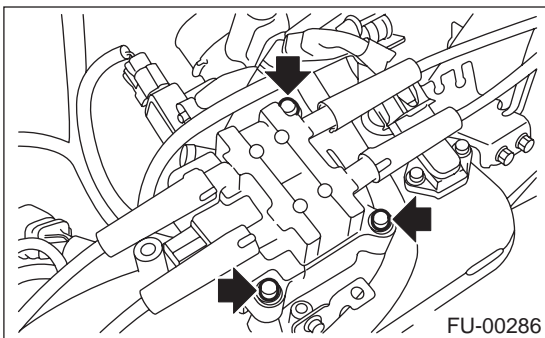
16) Connect the pressure regulator vacuum hose to the intake manifold.



17) Install the EGR valve. <Ref. to FU(H4SO)-35, INSTALLATION, EGR Valve.>

18) Install the throttle body to the intake manifold. <Ref. to FU(H4SO)-14, INSTALLATION, Throttle Body.>

19) Install the ignition coil and ignitor assembly.

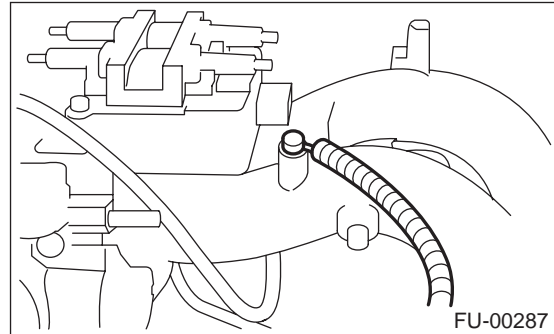


20) Connect the connector to the ignition coil and ignitor assembly.

21) Install the engine ground terminal to the intake manifold.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and that connections are tight.

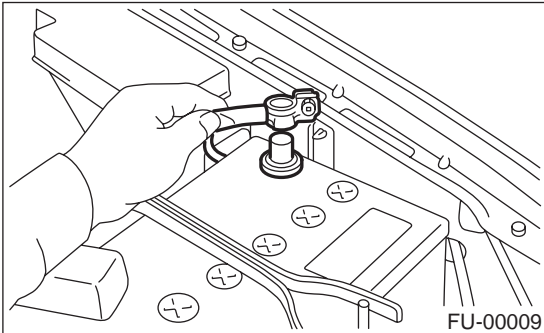
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

4. Engine Coolant Temperature Sensor

A: REMOVAL

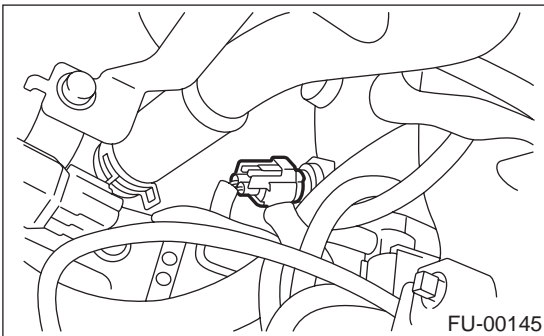
- 1) Disconnect the ground cable from battery.



- 2) Remove the air intake duct and air cleaner assembly.

<Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
& <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>

- 3) Disconnect the connector from the engine coolant temperature sensor.



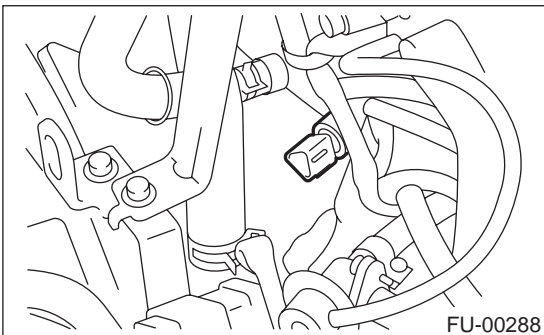
- 4) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



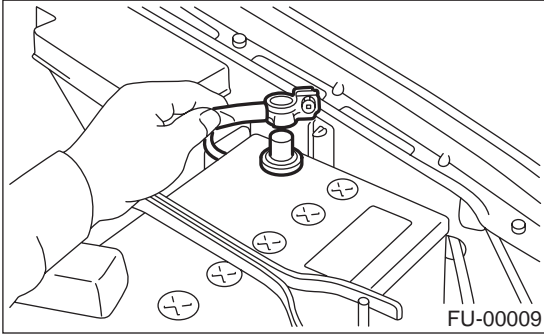
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

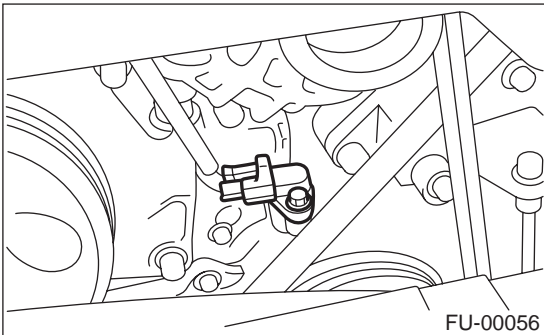
5. Crankshaft Position Sensor

A: REMOVAL

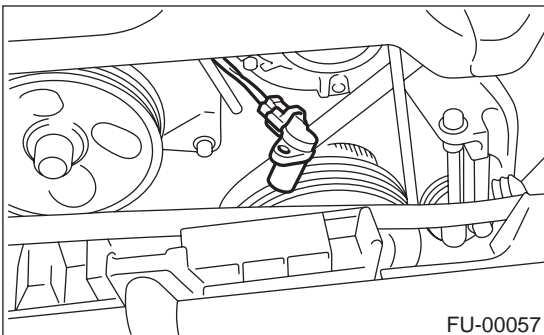
1) Disconnect the ground cable from battery.



2) Remove the bolt which install crankshaft position sensor to the cylinder block.



3) Remove the crankshaft position sensor, and disconnect the connector from it.

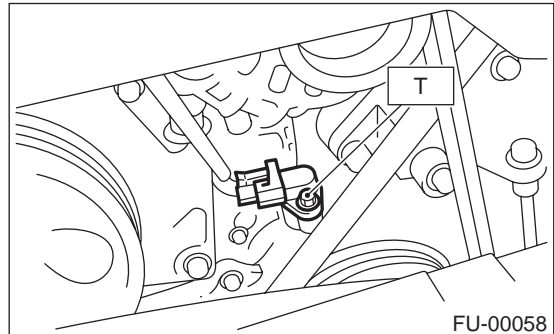


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



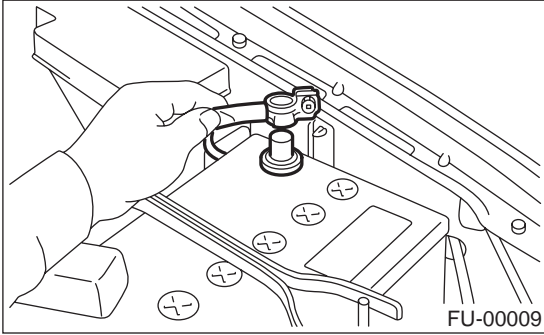
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

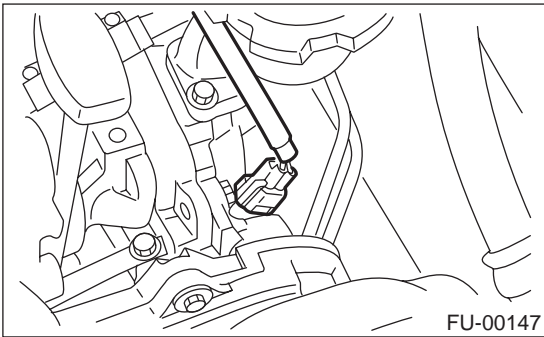
6. Camshaft Position Sensor

A: REMOVAL

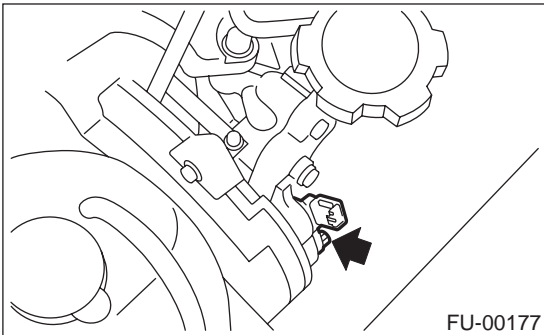
1) Disconnect the ground cable from battery.



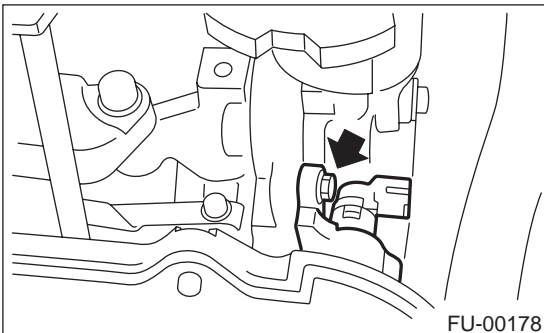
2) Disconnect the connector from the camshaft position sensor.



3) Remove the bolt which installs camshaft position sensor to the camshaft position sensor support.

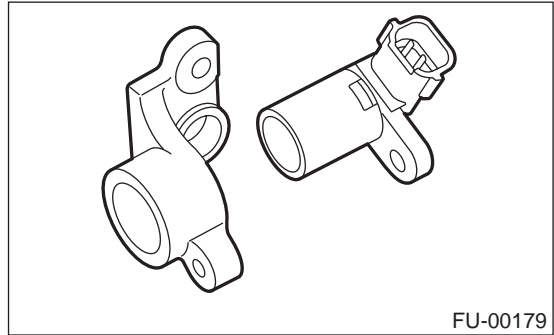


4) Remove the bolt which installs camshaft position sensor support to the camshaft cap LH.



5) Remove the camshaft position sensor and camshaft position sensor support as a unit.

6) Remove the camshaft position sensor itself.



B: INSTALLATION

Install in the reverse order of removal.

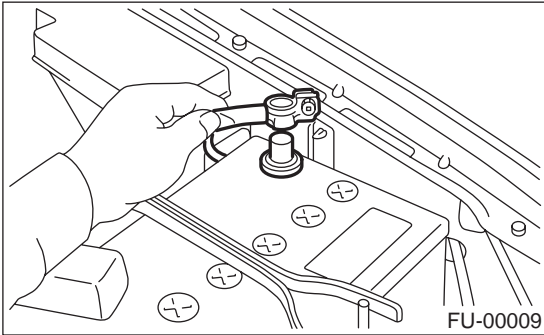
Tightening torque:

- **Camshaft position sensor support;**
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
- **Camshaft position sensor;**
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

7. Knock Sensor

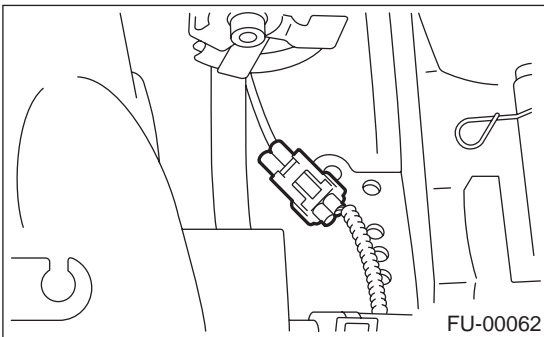
A: REMOVAL

1) Disconnect the ground cable from battery.

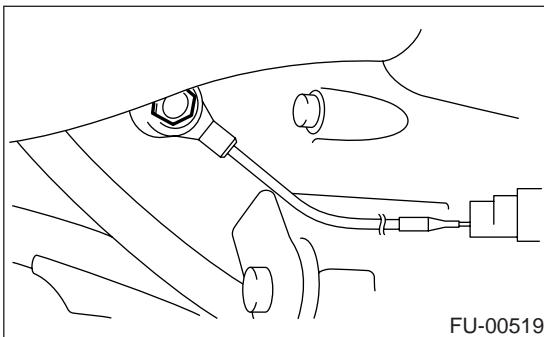


2) Remove the air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>

3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.



B: INSTALLATION

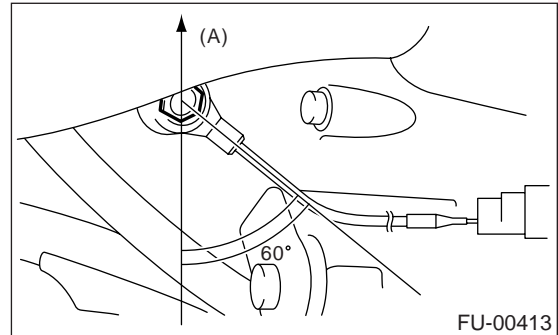
1) Install the knock sensor to the cylinder block.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

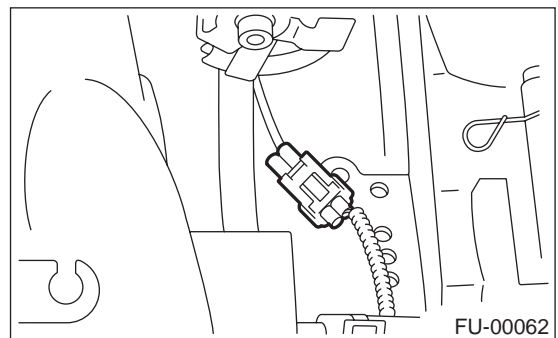
NOTE:

The extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.



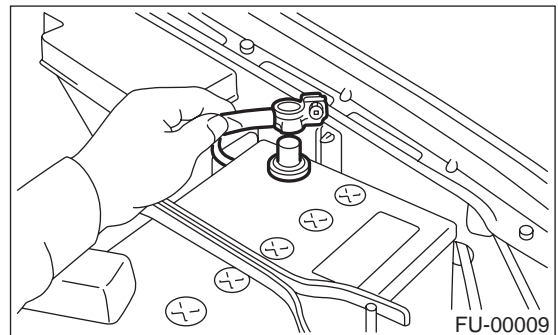
(A) Front side

2) Connect the knock sensor connector.



3) Install the air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>

4) Connect the battery ground cable to battery.



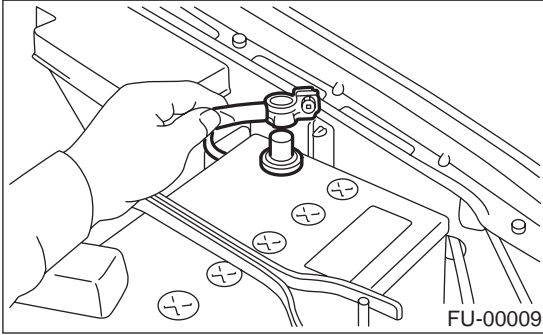
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

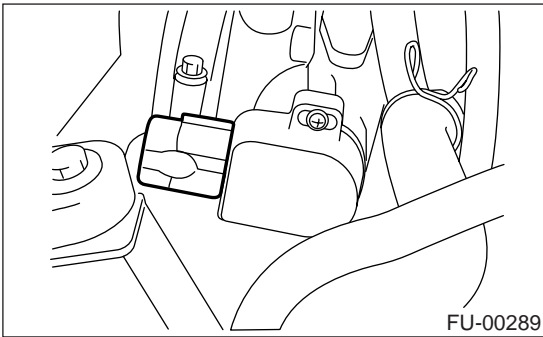
8. Throttle Position Sensor

A: REMOVAL

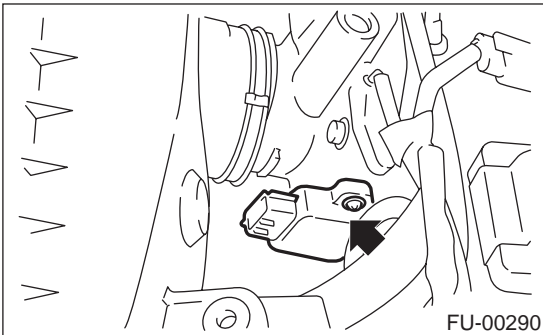
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the throttle position sensor.



3) Remove the throttle position sensor holding screws, and remove it.



B: INSTALLATION

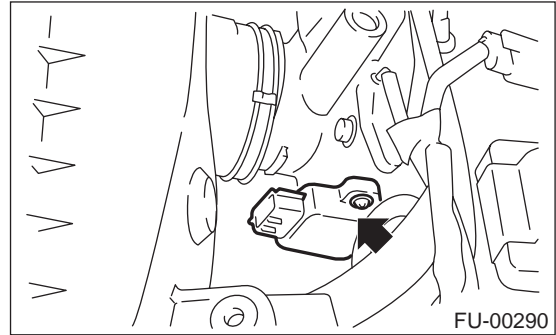
Install in the reverse order of removal.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)

CAUTION:

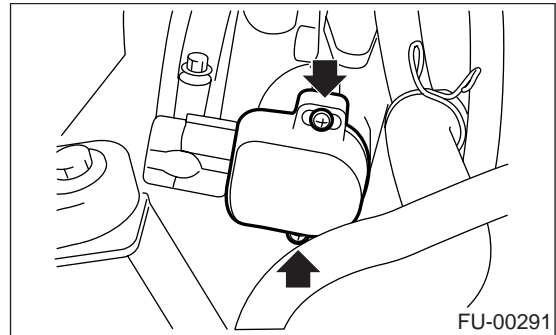
When installing throttle position sensor, adjust to the specified data.



C: ADJUSTMENT

1) Turn the ignition switch to OFF.

2) Loosen the throttle position sensor holding screws.



3) When using voltage meter;

(1) Take out the ECM.

(2) Turn the ignition switch to ON.

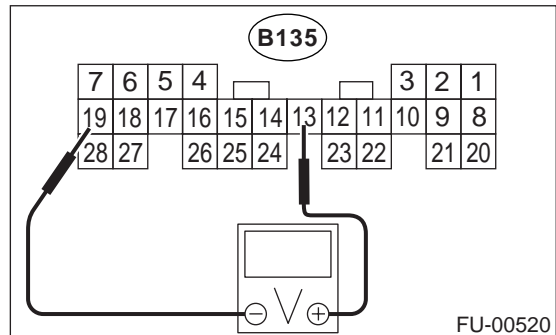
(3) Adjust the throttle position sensor to the proper position to allow the voltage signal to the ECM to be in specification.

Connector & terminal / Specified voltage

(B134) No. 13 (+) — (B134) No. 19 (-) /

0.45 — 0.55 V

[Fully closed.]



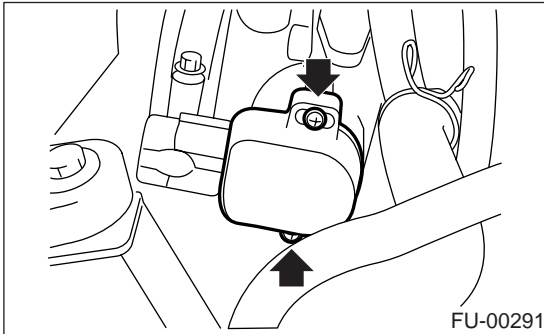
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

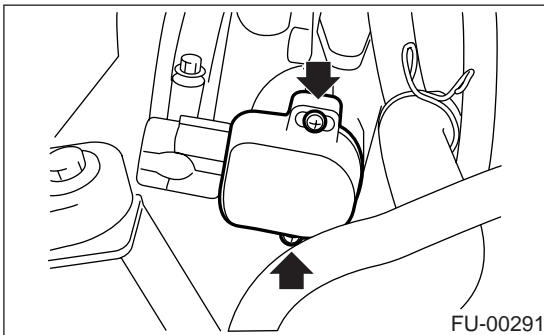
(4) Tighten the throttle position sensor holding screws.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)



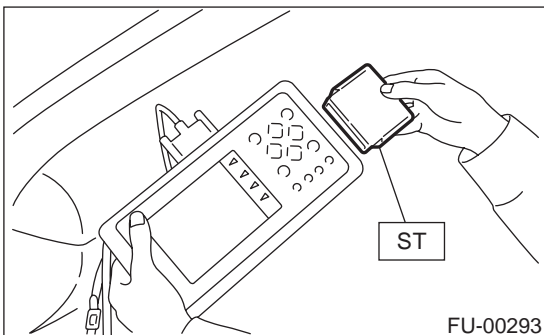
- 4) When using Subaru Select Monitor;
(1) Turn the ignition switch to OFF.
(2) Loosen the throttle position sensor holding screws.



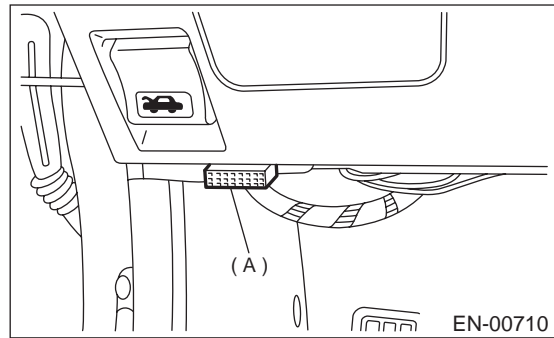
NOTE:

For detailed operation procedures, refer to the Subaru Select Monitor Operation Manual.

- (3) Insert the cartridge to the Subaru Select Monitor.



(4) Connect the Subaru Select Monitor to the data link connector (A).



- 5) Turn the ignition switch to ON, and the Subaru Select Monitor switch to ON.
6) Select the {2. Each System Check} in Main Menu.
7) Select the {Engine Control System} in Selection Menu.
8) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
9) Select the {1.12 Data Display} in Data Display Menu.
10) Adjust the throttle position sensor to the proper position to match with the following specifications.

Condition: Throttle fully closed

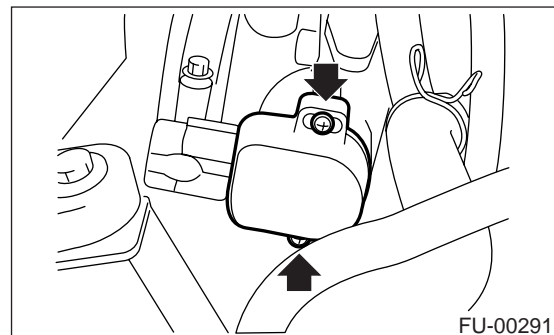
Throttle opening angle 0.00%

Throttle sensor voltage 0.50 V

- 11) Tighten the throttle position sensor holding screws.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)



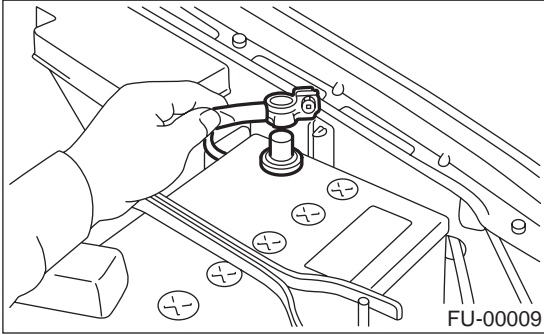
PRESSURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

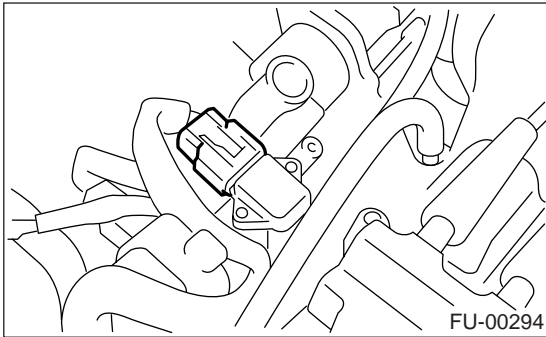
9. Pressure Sensor

A: REMOVAL

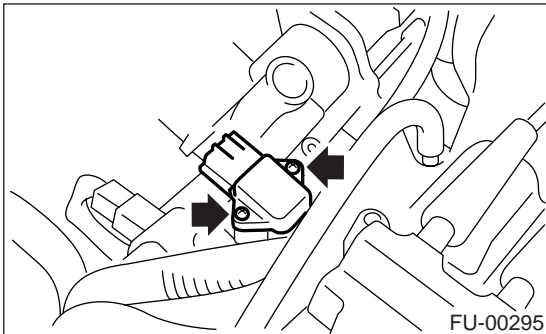
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the pressure sensor.



3) Remove the pressure sensor.

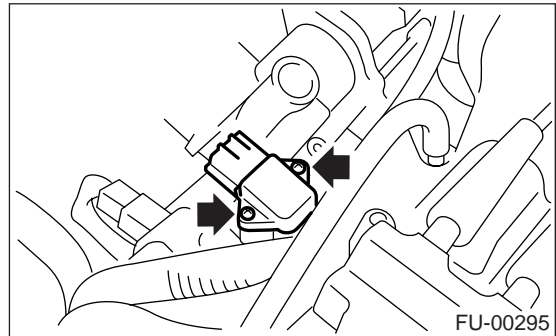


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



NOTE:

Replace the O-ring with a new one.

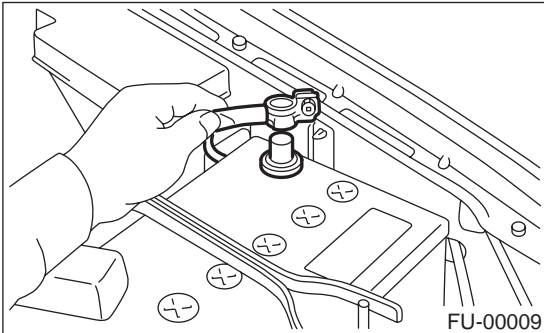
INTAKE AIR TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

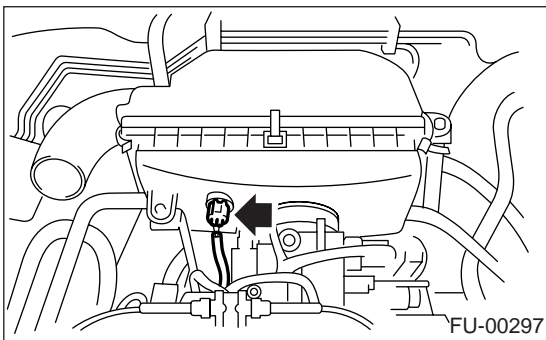
10. Intake Air Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector from the intake air temperature sensor.
- 3) Remove the intake air temperature sensor from air cleaner case.



B: INSTALLATION

Install in the reverse order of removal.

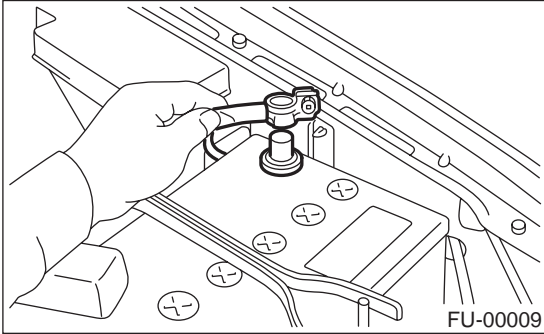
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

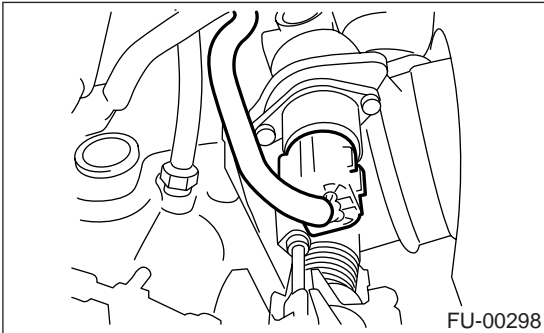
11. Idle Air Control Solenoid Valve

A: REMOVAL

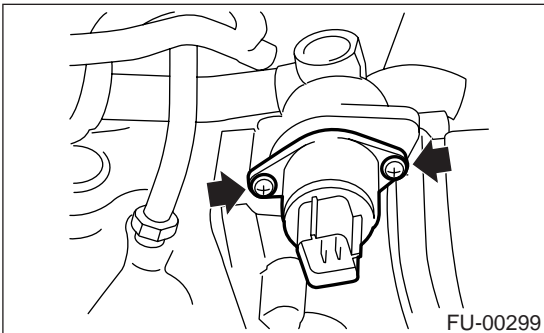
- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector from the idle air control solenoid valve.



- 3) Remove the idle air control solenoid valve from the throttle body.



B: INSTALLATION

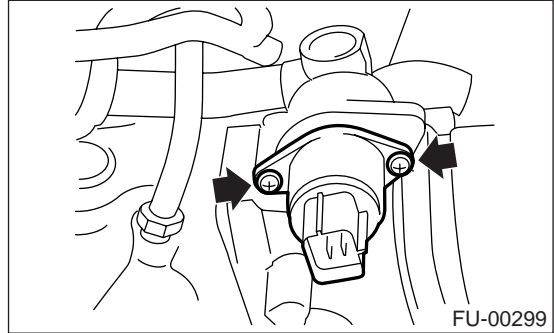
Install in the reverse order of removal.

NOTE:

Always use new gasket.

Tightening torque:

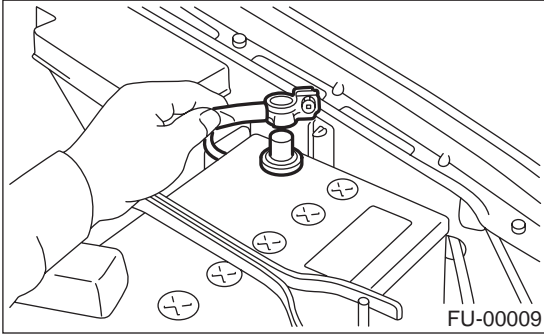
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



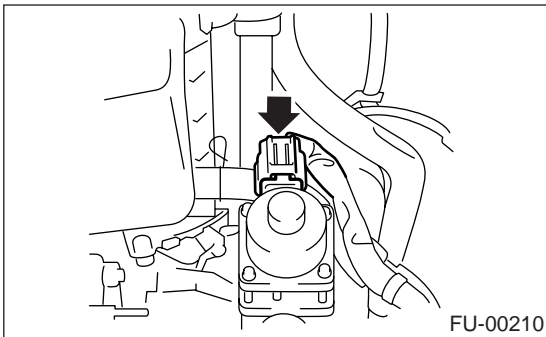
12.EGR Valve

A: REMOVAL

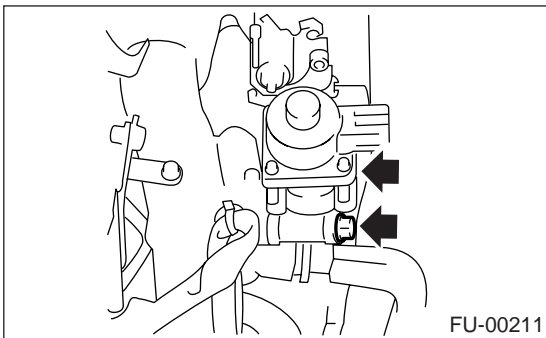
1) Disconnect the ground cable from battery.



2) Disconnect the connector from EGR valve.



3) Remove the EGR valve from intake manifold.

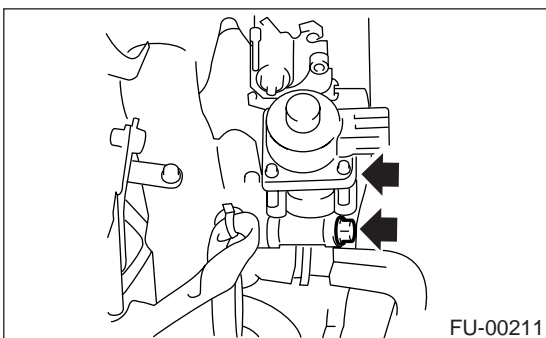


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



FUEL INJECTOR

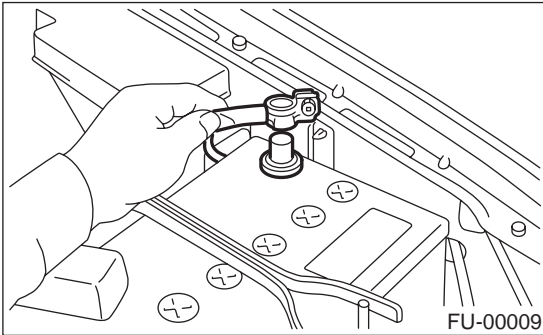
FUEL INJECTION (FUEL SYSTEMS)

13. Fuel Injector

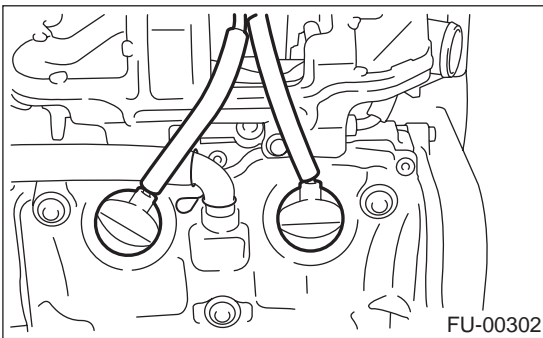
A: REMOVAL

1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel flap lid, and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.

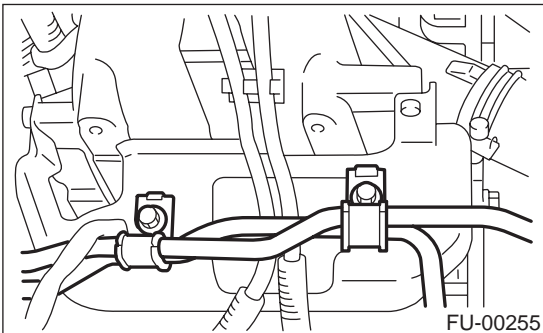


- 4) Remove the resonator chamber. <Ref. to IN(H4SO)-8, REMOVAL, Resonator Chamber.>
- 5) Remove the spark plug cords from the spark plugs (#1 and #3 cylinders).

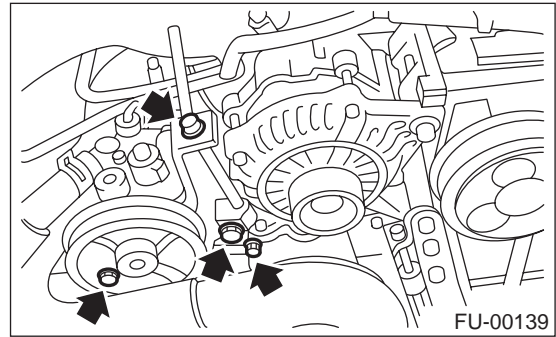


- 6) Remove the power steering pump and tank from the brackets.

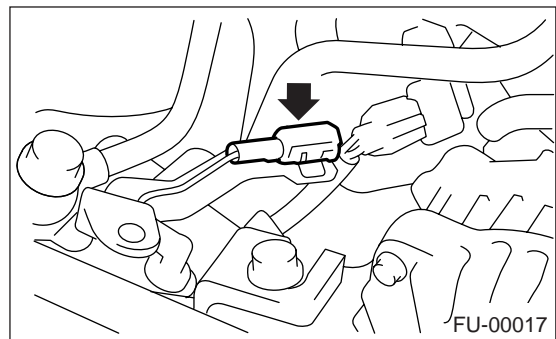
- (1) Remove the front side V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
- (2) Remove the bolts which hold the power steering pipes onto the intake manifold protector.



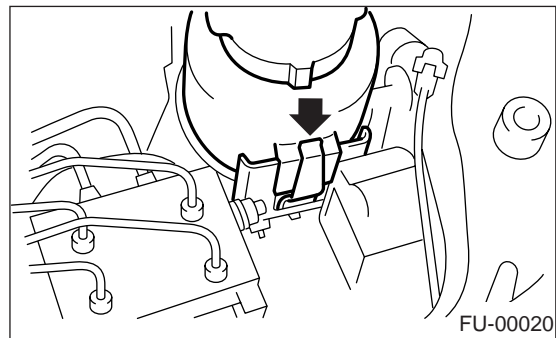
- (3) Remove the bolts which install the power steering pump to the bracket.



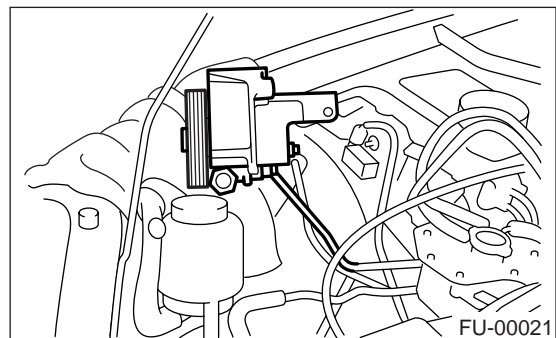
- (4) Disconnect the connector from the power steering pump switch.



- (5) Remove the power steering tank from the bracket by pulling it upwards.



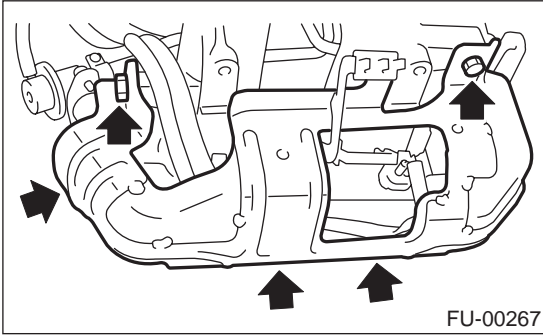
- (6) Place the power steering pump and tank on the right side wheel apron.



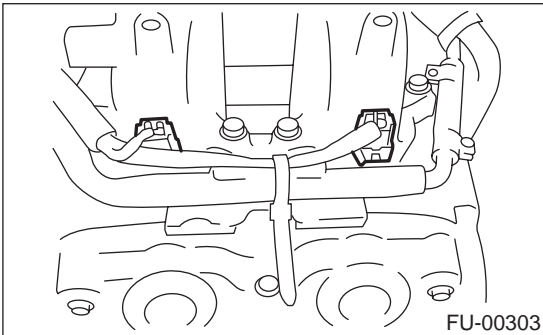
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

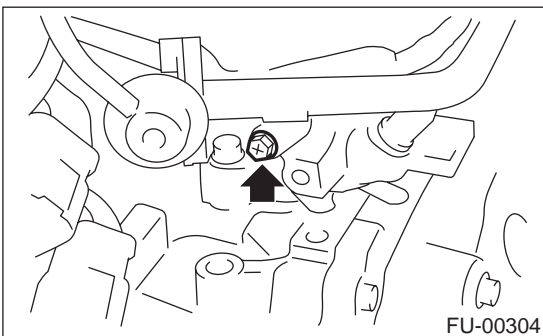
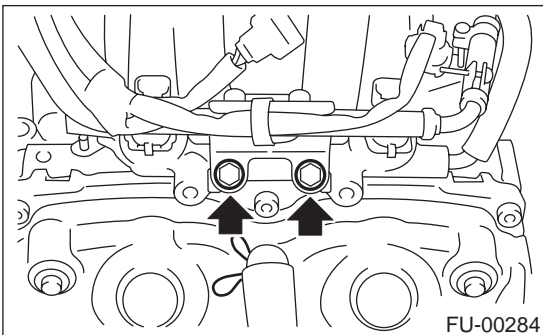
7) Remove the fuel pipe protector RH.



8) Disconnect the connector from fuel injector.

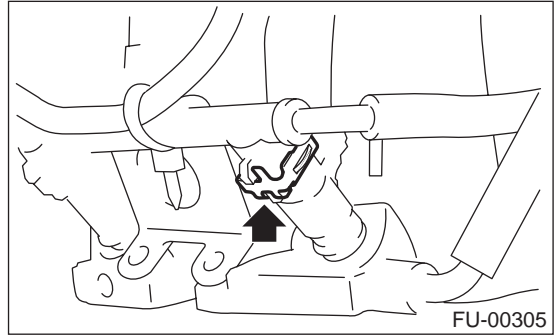


9) Remove the bolt which holds the injector pipe to the intake manifold.

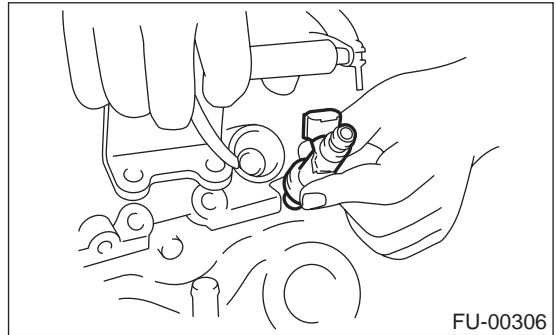


10) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.

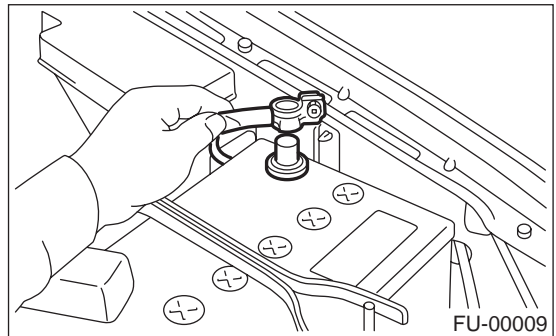


(2) Remove the fuel injector while lifting up the fuel injector pipe.



2. LH SIDE

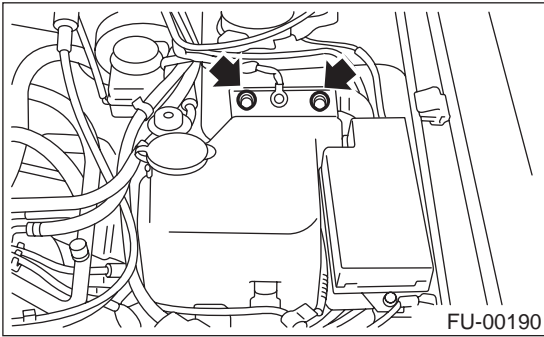
- 1) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel flap lid, and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



FUEL INJECTOR

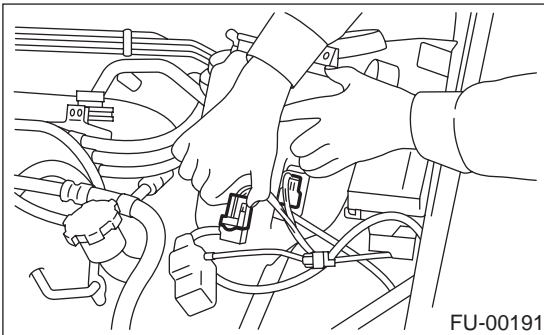
FUEL INJECTION (FUEL SYSTEMS)

4) Remove the two bolts which install the washer tank on the body.



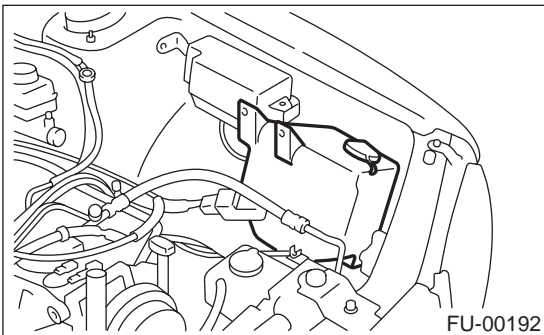
5) Disconnect the connector from the front window washer motor.

6) Disconnect the connector from the rear gate glass washer motor.

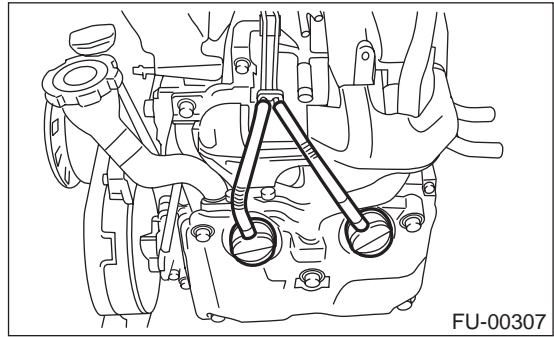


7) Disconnect the rear window glass washer hose from the washer motor, then plug the connection with a suitable cap.

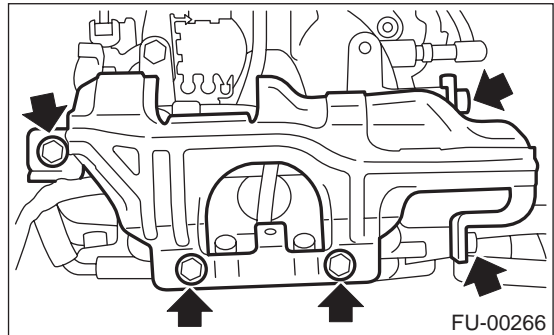
8) Move the washer tank, and secure it away from the working area.



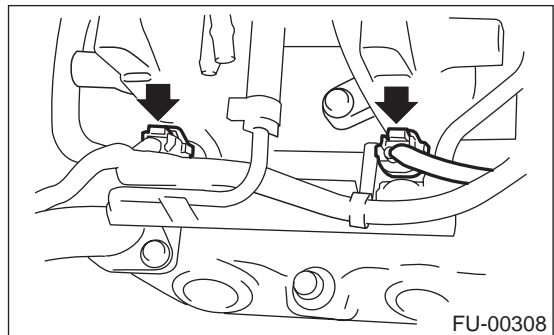
9) Remove the spark plug cords from the spark plugs (#2 and #4 cylinders).



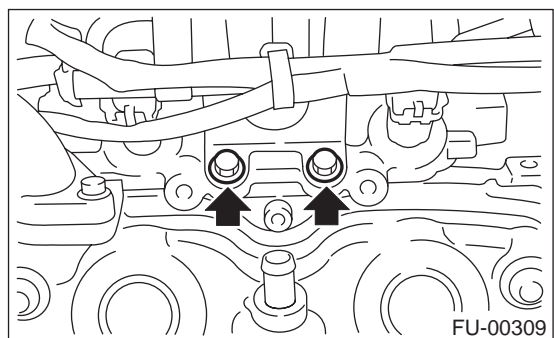
10) Remove the fuel pipe protector LH.



11) Disconnect the connector from the fuel injector.



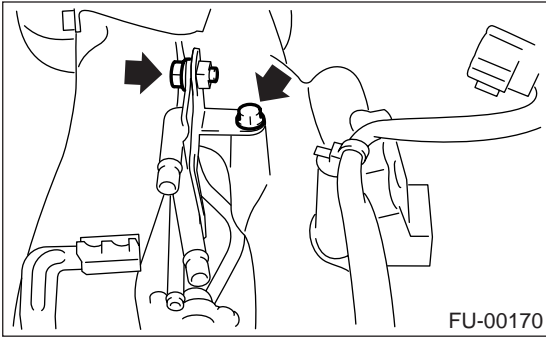
12) Remove the bolt which holds the injector pipe to the intake manifold.



FUEL INJECTOR

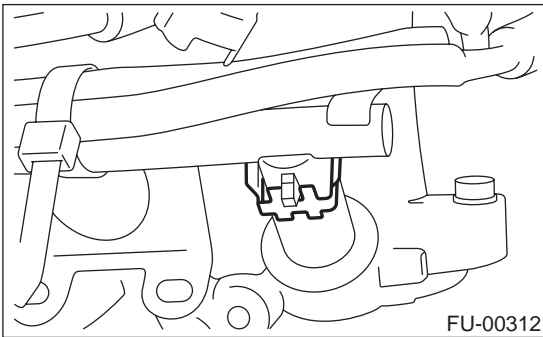
FUEL INJECTION (FUEL SYSTEMS)

13) Remove the bolt which holds the fuel pipe on the left side intake manifold.

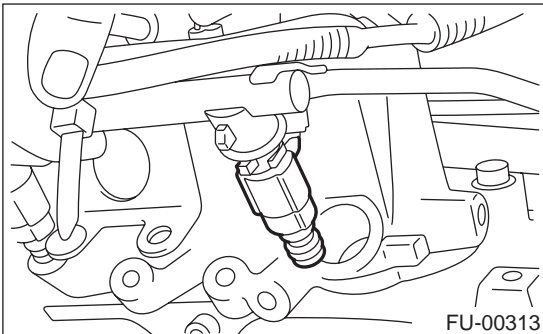


14) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.



(2) Remove the fuel injector while lifting up the fuel injector pipe



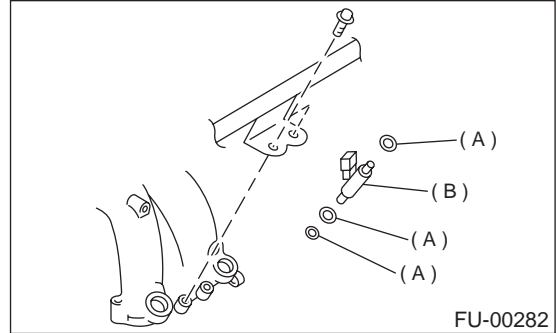
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

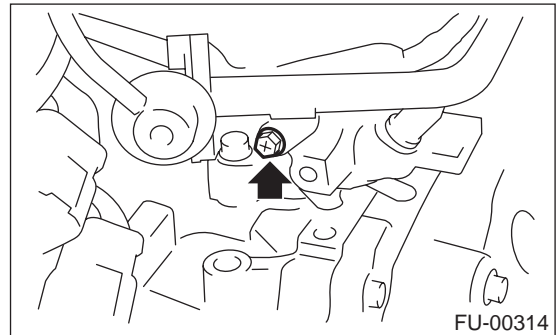
Replace O-rings with new ones.



- (A) O-ring
- (B) Fuel injector

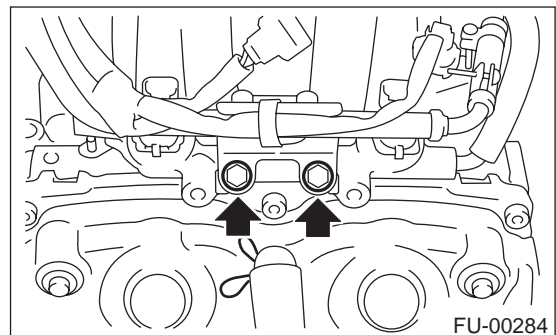
Tightening torque:

5.0 N·m (0.51 kgf·m, 3.7 ft·lb)



Tightening torque:

19 N·m (1.9 kgf·m, 13.7 ft·lb)

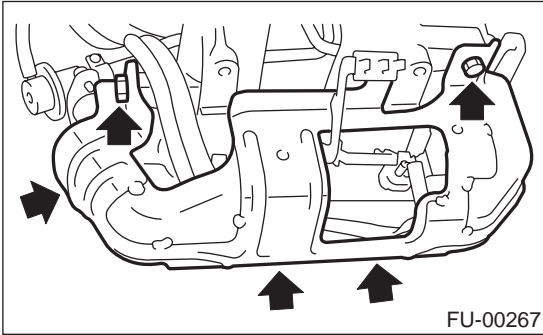


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

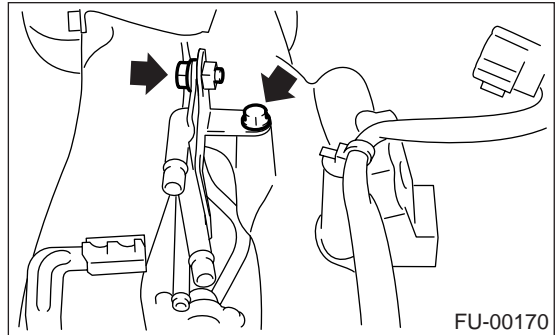
Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



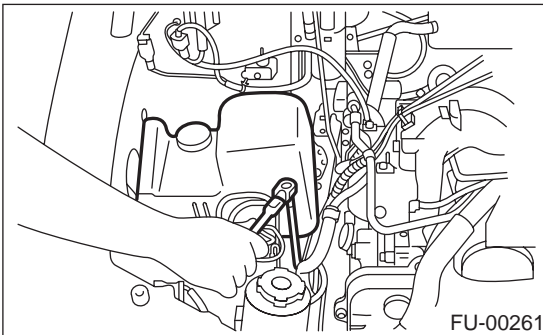
Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



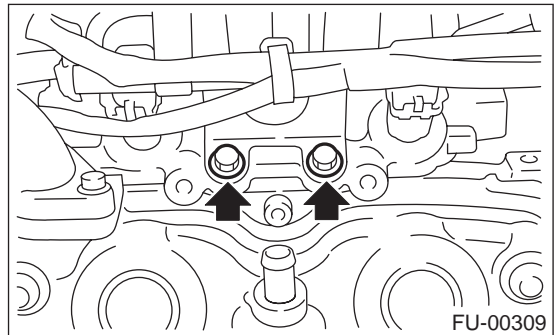
Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)



Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)

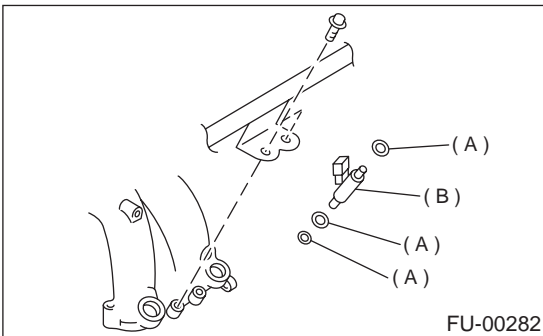


2. LH SIDE

Install in the reverse order of removal.

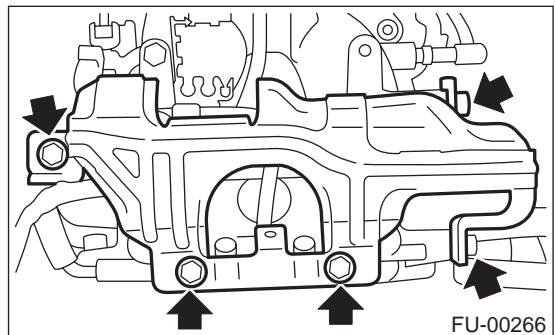
CAUTION:

Replace O-rings with new ones.



Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



- (A) O-ring
- (B) Fuel injector

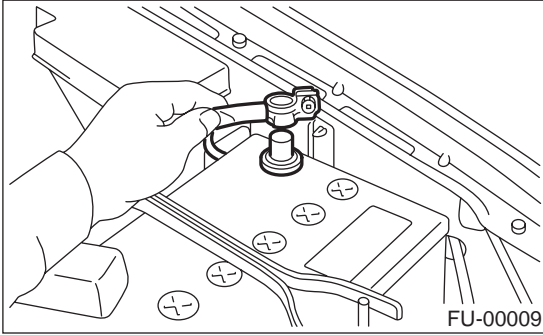
FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

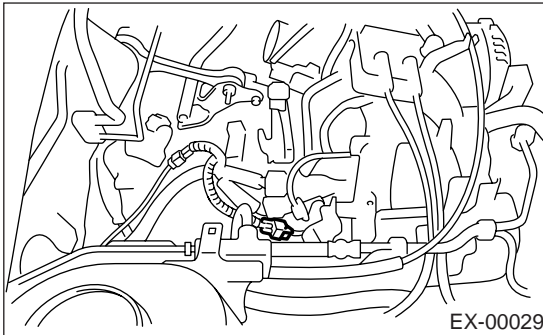
14. Front Oxygen (A/F) Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector from engine hanger, and then disconnect the connector from front oxygen (A/F) sensor.



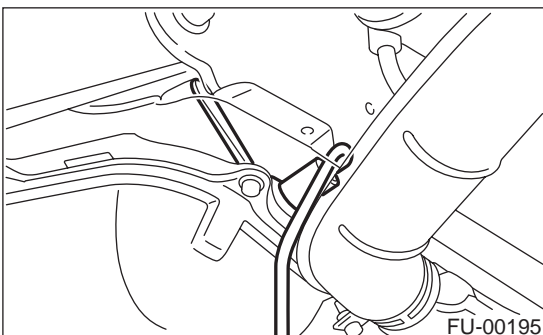
- 3) Lift-up the vehicle.
- 4) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove the front oxygen (A/F) sensor.

CAUTION:

When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



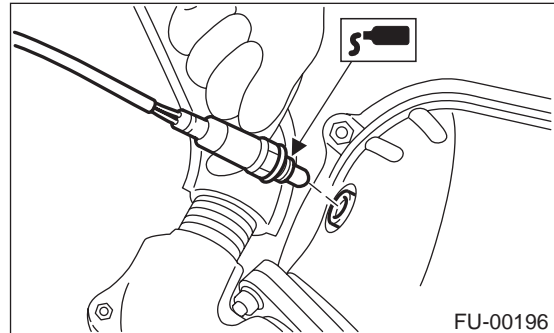
B: INSTALLATION

- 1) Before installing front oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

**Anti-seize compound:
SS-30 by JET LUBE**

CAUTION:

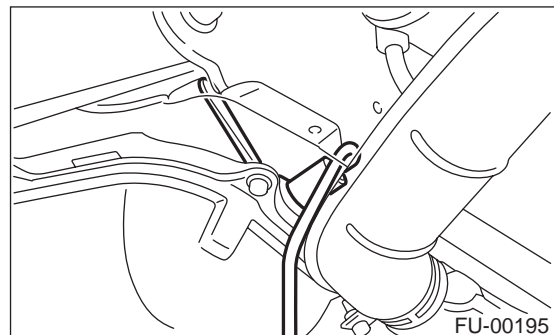
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.



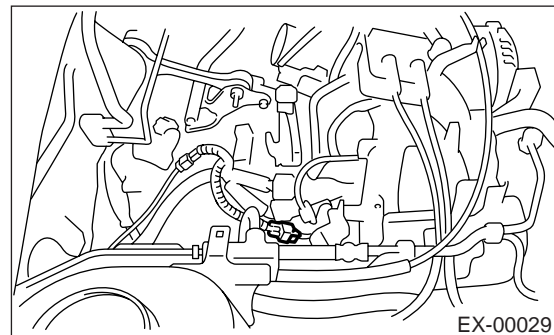
- 2) Install the front oxygen (A/F) sensor.

Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)



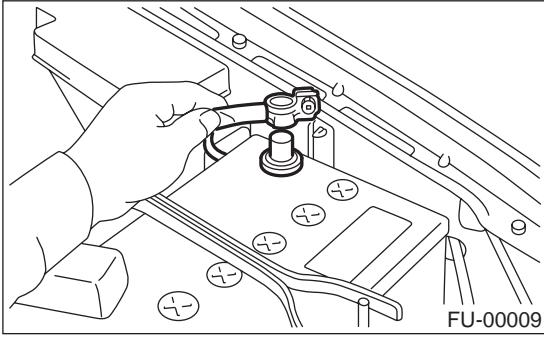
- 3) Lower the vehicle.
- 4) Connect the connector to front oxygen (A/F) sensor, and then connect the connector to engine hanger.



FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

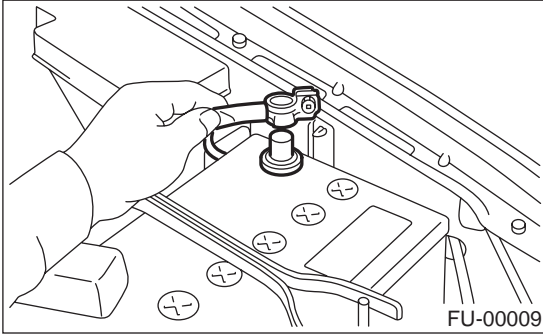
5) Connect the battery ground cable to battery.



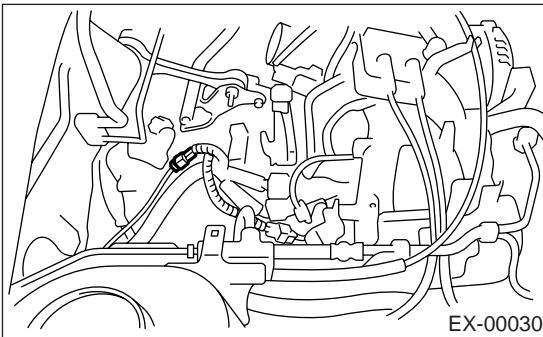
15.Rear Oxygen Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Lift-up the vehicle.
- 3) Disconnect the connector from the rear oxygen sensor.



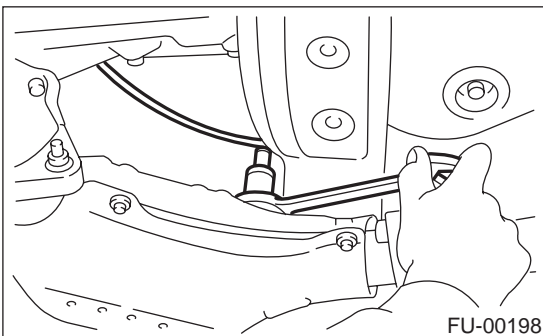
- 4) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove the rear oxygen sensor.

CAUTION:

When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

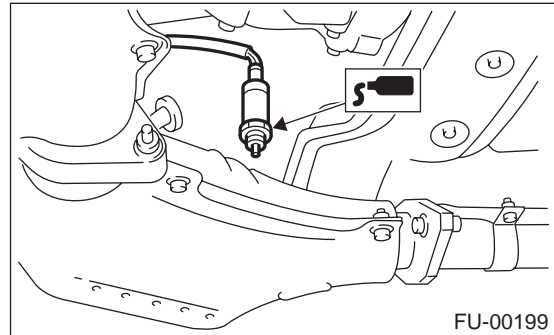
- 1) Before installing rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:

Never apply anti-seize compound to protector of rear oxygen sensor.

Anti-seize compound:

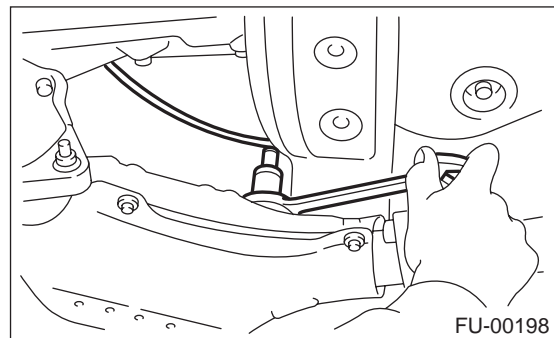
SS-30 by JET LUBE



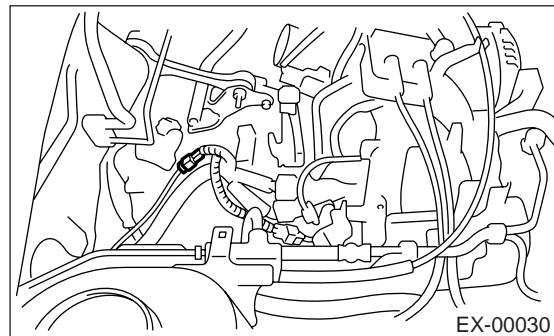
- 2) Install the rear oxygen sensor.

Tightening torque:

21 N·m (2.1 kgf·m, 15.2 ft·lb)



- 3) Connect the connector to the rear oxygen sensor.

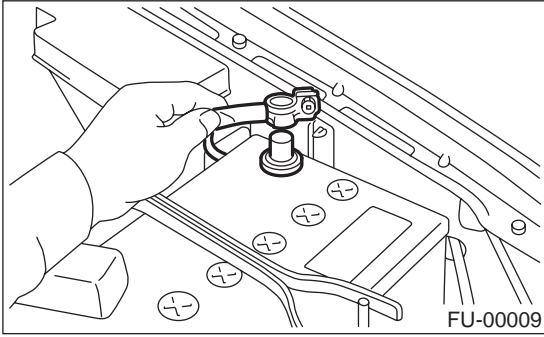


- 4) Lower the vehicle.

REAR OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

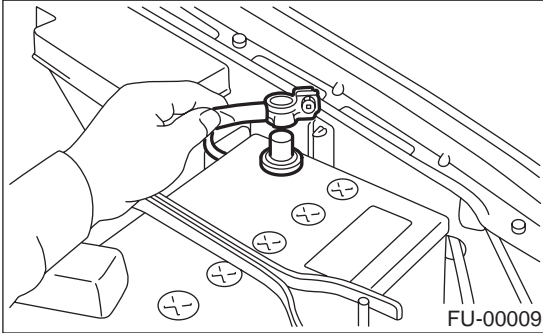
5) Connect the battery ground cable to battery.



16.Engine Control Module

A: REMOVAL

1) Disconnect the ground cable from battery.

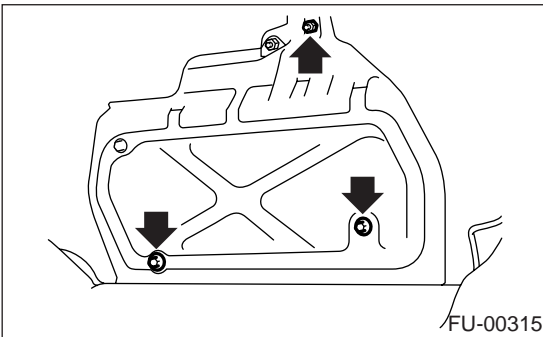


2) Remove the lower inner trim of passenger side.

<Ref. to EI-39, REMOVAL, Lower Inner Trim.>

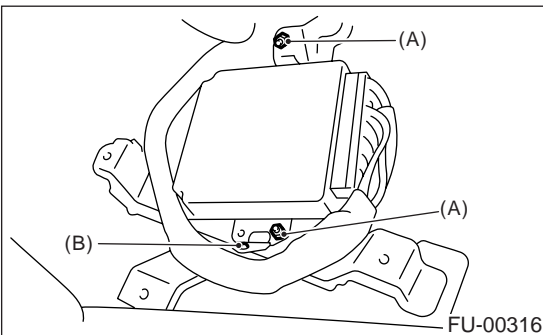
3) Detach the floor mat of front passenger seat.

4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to the bracket.

6) Remove the clip (B) from the bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

Tightening torque:

5 N·m (0.51 kgf·m, 3.7 ft·lb)

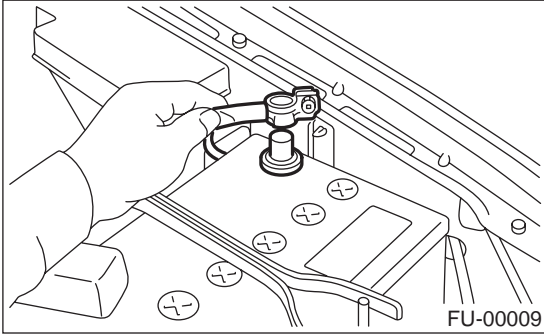
MAIN RELAY

FUEL INJECTION (FUEL SYSTEMS)

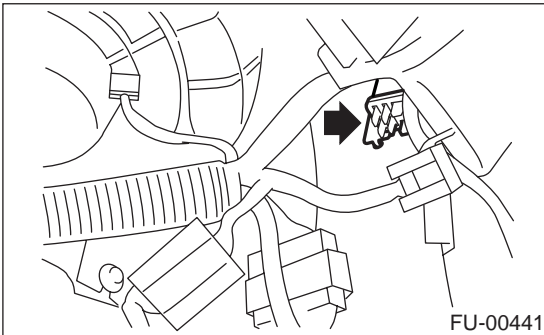
17.Main Relay

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds main bracket on the body.
- 4) Disconnect the connectors from the main relay.



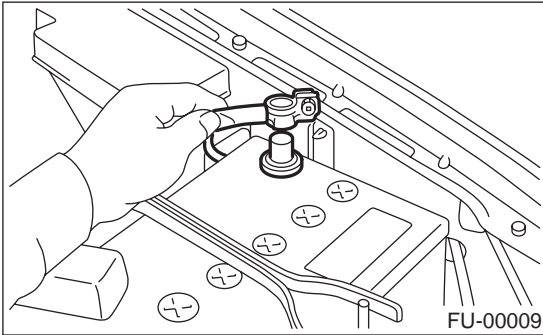
B: INSTALLATION

Install in the reverse order of removal.

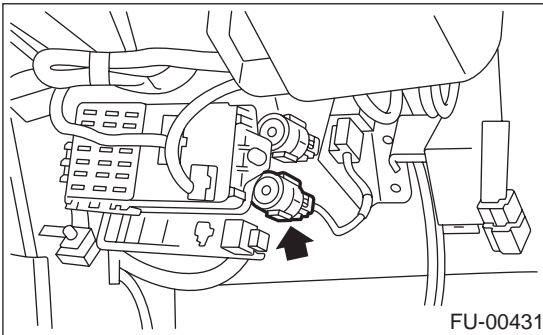
18. Fuel Pump Relay

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds fuel pump relay bracket on the body.
- 4) Disconnect the connector from the fuel pump.



- 5) Remove the fuel pump relay from the mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

FUEL

FUEL INJECTION (FUEL SYSTEMS)

19. Fuel

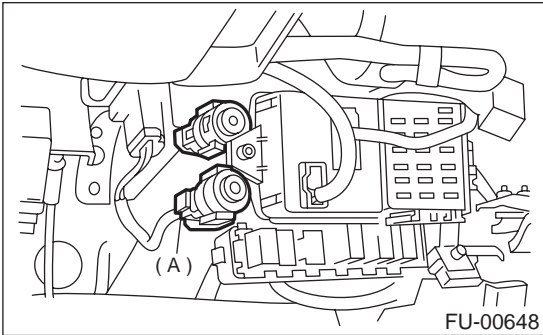
A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Disconnect the connector from fuel pump relay (A).



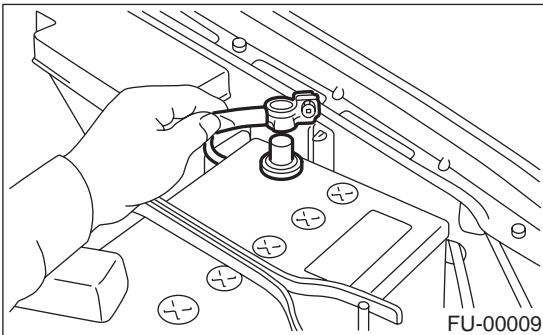
- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for 5 more seconds.
- 4) Turn the ignition switch to OFF.

2. DRAINING FUEL

WARNING:

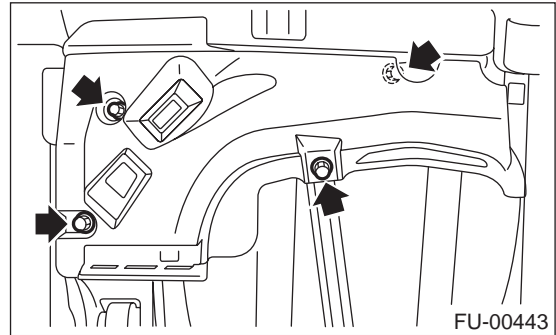
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.

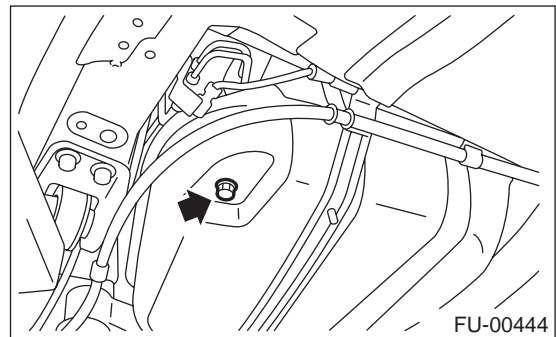


- 3) Lift-up the vehicle.

- 4) Remove the protector RH (Front).



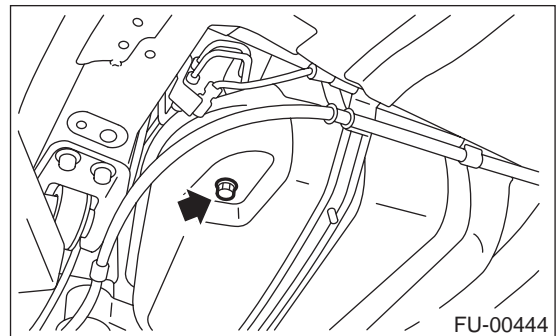
- 5) Drain the fuel from fuel tank.
Set a container under the vehicle, and then remove the drain plug from fuel tank.



- 6) Tighten the fuel drain plug, and then install the protector RH (Front).

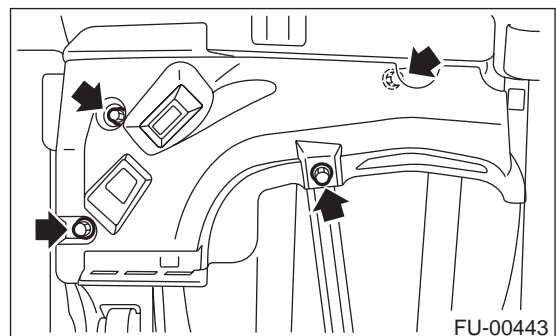
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



Tightening torque:

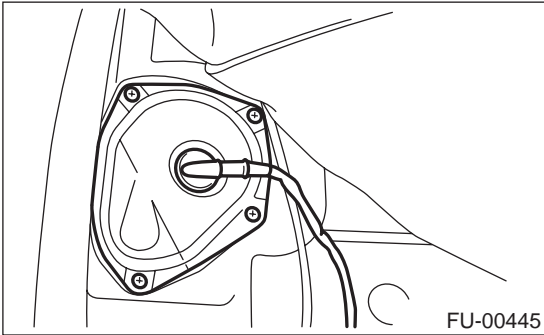
18 N·m (1.8 kgf-m, 13.0 ft-lb)



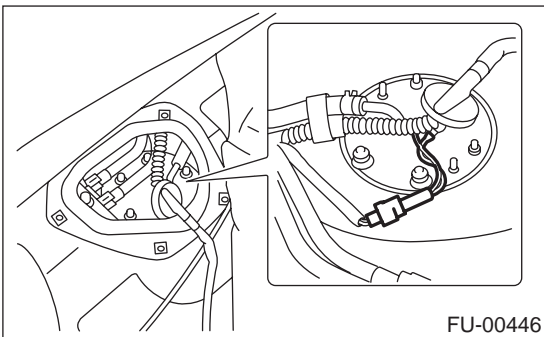
FUEL

FUEL INJECTION (FUEL SYSTEMS)

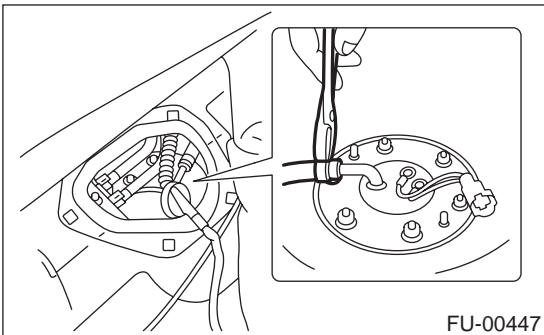
- 7) Lower the vehicle.
- 8) Remove the sub service hole cover.



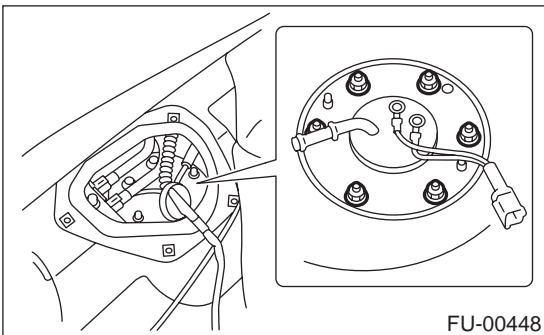
- 9) Disconnect the connector from fuel sub level sensor.



- 10) Disconnect the fuel jet pump hose.



- 11) Remove the fuel sub level sensor.



- 12) Drain the fuel from fuel tank by using a hand pump.

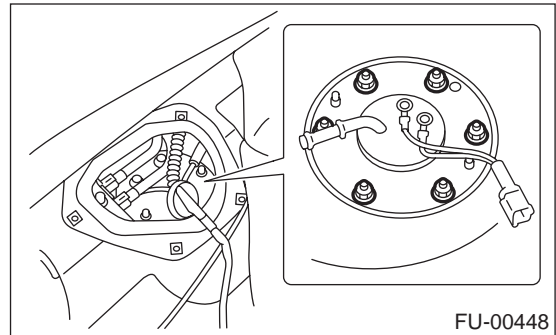
WARNING:

Do not use a motor pump when draining the fuel.

- 13) After draining the fuel, reinstall the fuel sub level sensor.

Tightening torque:

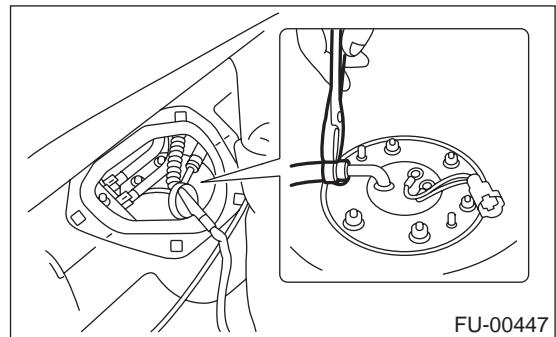
T: 4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



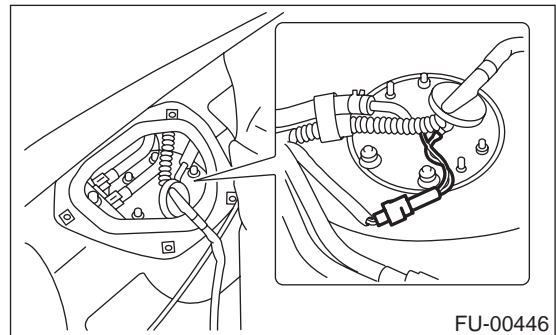
NOTE:

If you have not removed the fuel tank yet, proceed with the procedure below for installation.

- (1) Connect the fuel jet pump hose.



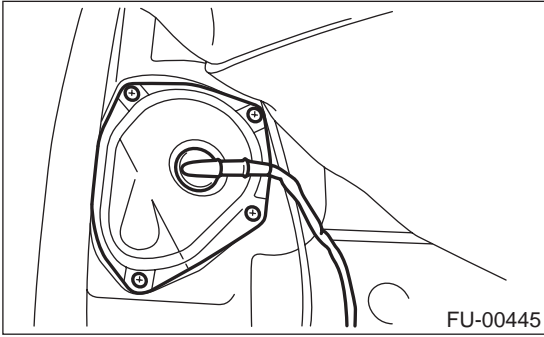
- (2) Connect the connector from fuel sub level sensor.



FUEL

FUEL INJECTION (FUEL SYSTEMS)

- (3) Install the sub service hole cover.

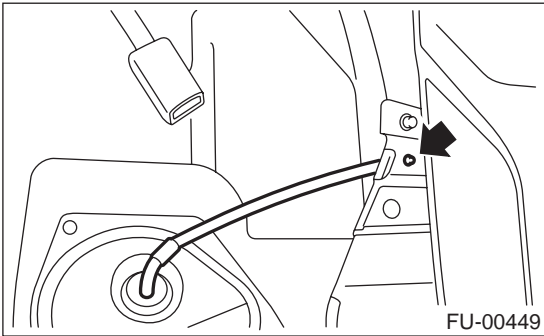


- (4) Set the rear seat and floor mat.

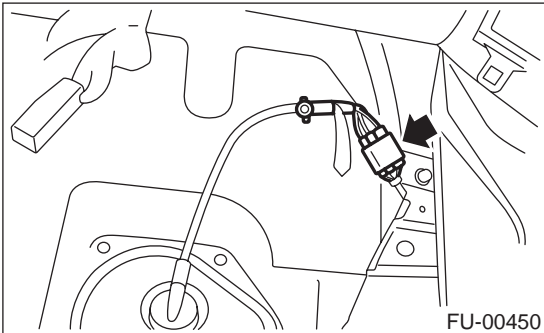
20. Fuel Tank

A: REMOVAL

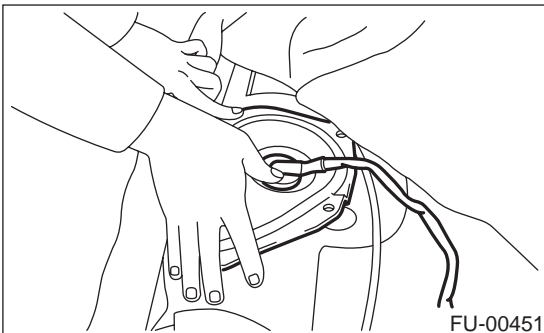
- 1) Set the vehicle on the lift.
- 2) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain the fuel from fuel tank. <Ref. to FU(H4SO)-48, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove the holder clip which secures fuel tank cord on bracket.



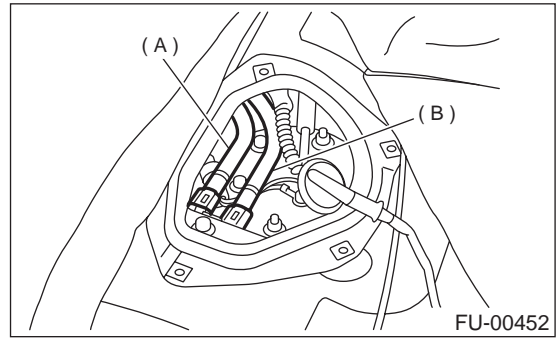
- 5) Disconnect the connector of fuel tank cord to rear harness.



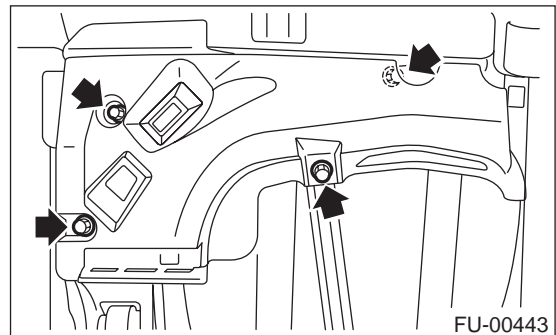
- 6) Push the grommet which holds fuel tank cord on service hole cover into body side.



- 7) Separate the quick connector of fuel delivery (A) and return hose (B). <Ref. to FU(H4SO)-70, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



- 8) Remove the parking brake cable.
 - (1) Remove the console box. <Ref. to EI-34, REMOVAL, Console Box.>
 - (2) Remove the parking brake bracket, and then disconnect the parking brake cable from equalizer. <Ref. to PB-7, REMOVAL, Parking Brake Cable.>
- 9) Remove the wheel nuts from rear wheels.
- 10) Lift-up the vehicle.
- 11) Remove the rear wheel.
- 12) Remove the front side protector.



- 13) Remove the rear exhaust pipe and muffler.

NOTE:

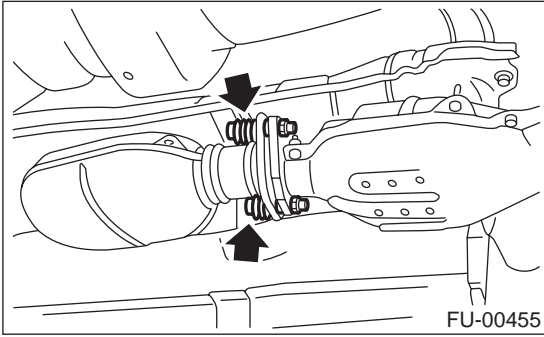
To facilitate the removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

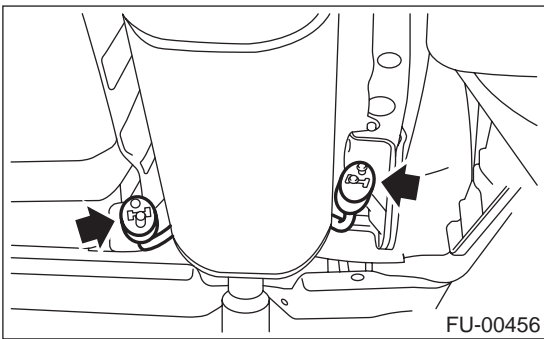
- (1) Separate the rear exhaust pipe from center exhaust pipe.



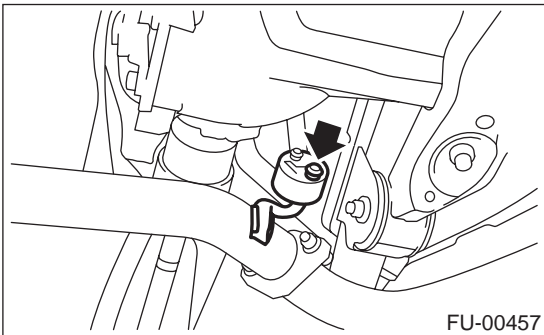
- (2) Remove the right and left rubber cushions.

NOTE:

Be careful not to pull down the muffler.

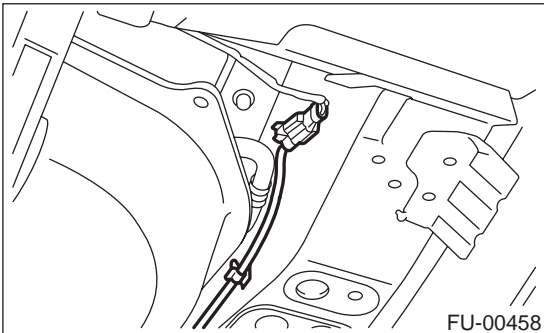


- (3) Remove the front rubber cushion, and then detach the muffler assembly.



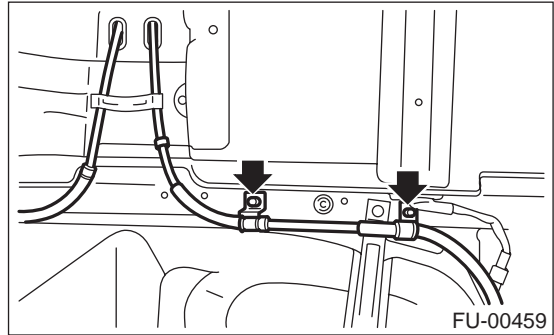
- 14) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

- 15) Disconnect the connector from ABS sensor.

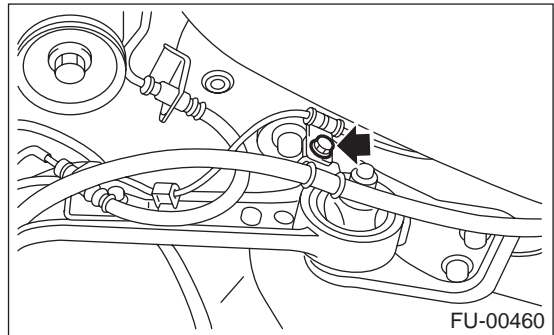


- 16) Remove the bolts which hold parking brake cable holding bracket.

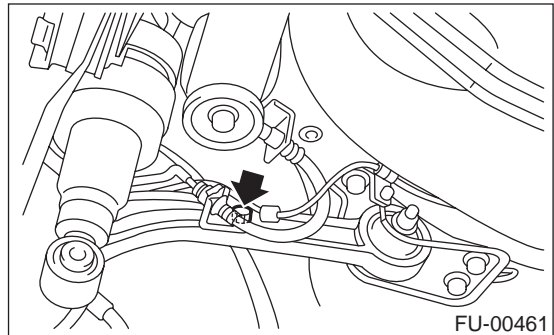
- 17) Remove the parking brake cable from cabin by forcibly pulling it backward.



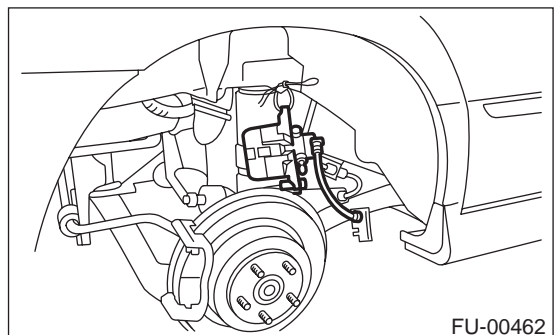
- 18) Remove the bolt which holds parking brake cable holding bracket.



- 19) Remove the bolt which holds rear brake hoses holding bracket.



- 20) Remove the rear brake caliper, and then tie it up to the body side of vehicle as shown in the figure.



FUEL TANK

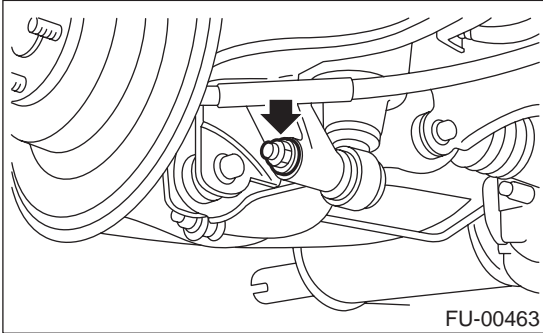
FUEL INJECTION (FUEL SYSTEMS)

21) Remove the rear suspension assembly.

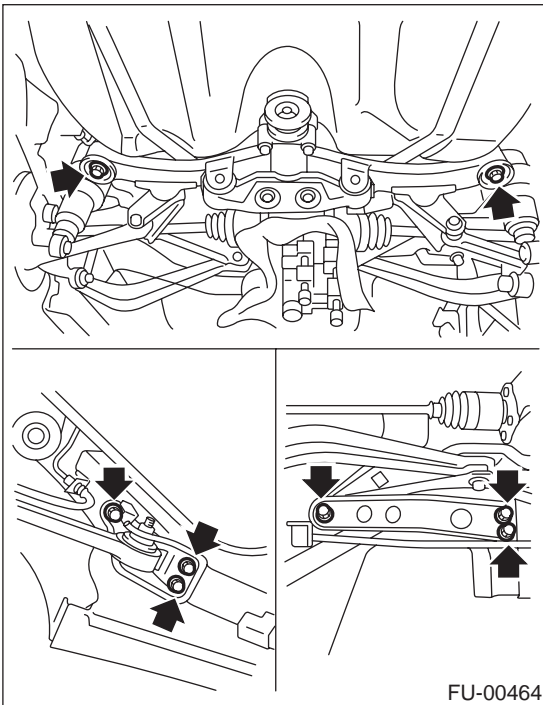
CAUTION:

A helper is required to perform this work.

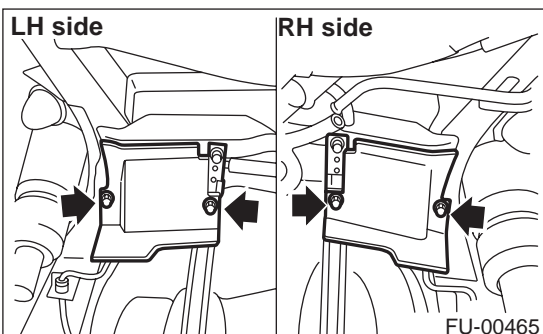
- (1) Support the rear differential with transmission jack.
- (2) Remove the bolt which holds rear shock absorber to rear suspension arm.



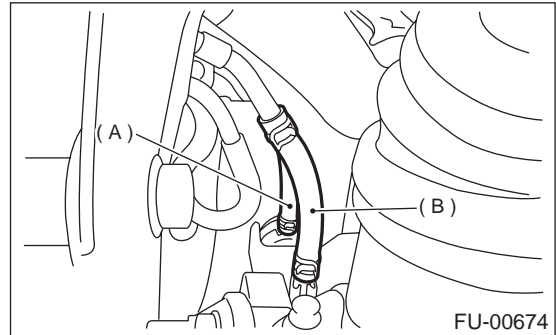
- (3) Remove the bolts which secure rear suspension assembly to body.



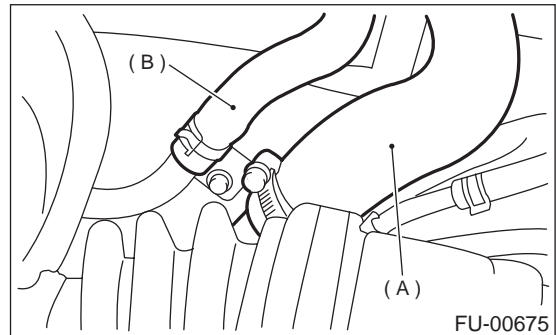
- (4) Remove the rear suspension assembly.
- 22) Remove the rear side protector.



- 23) Disconnect the two-way valve hose (A) from two-way valve, and then disconnect the evaporation hose (B) from evaporation pipe.



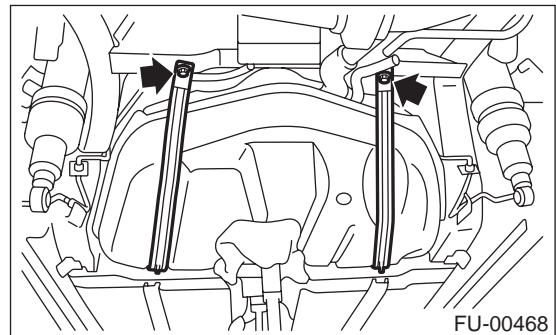
- 24) Loosen the clamp and disconnect the fuel filler hose (A) and air vent hose (B) from fuel filler pipe.



- 25) Support the fuel tank with transmission jack, then remove the bolts from bands and dismount fuel tank from the vehicle.

CAUTION:

A helper is required to perform this work.



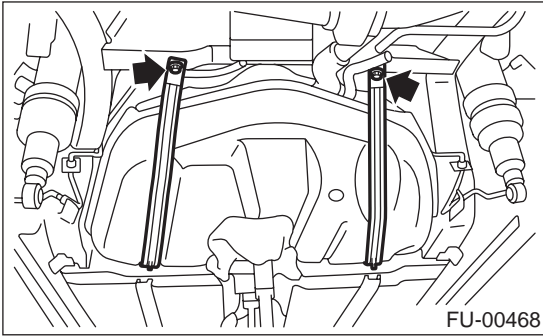
B: INSTALLATION

- 1) Support the fuel tank with transmission jack, and then push the fuel tank harness into access hole with grommet.
- 2) Set the fuel tank, and then temporarily tighten the bolts of fuel tank bands.

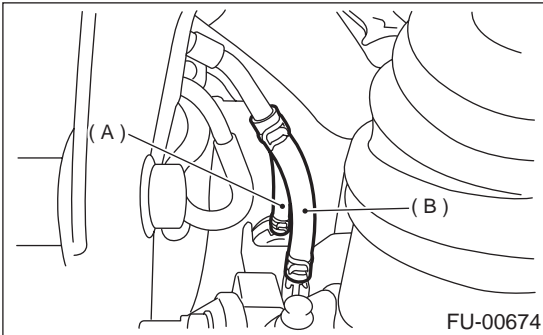
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

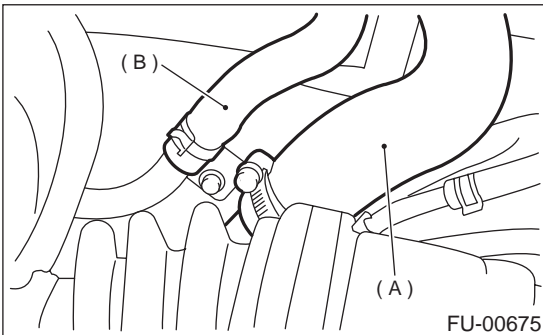
CAUTION:
A helper is required to perform this work.



3) Connect the two-way valve hose (A) to two-way valve, and then connect the evaporation hose (B) to evaporation pipe.

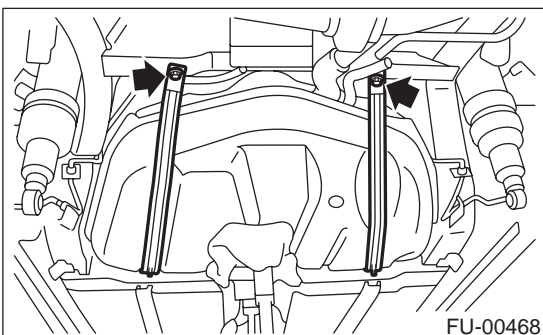


4) Connect the fuel filler hose (A) and air vent hose (B).



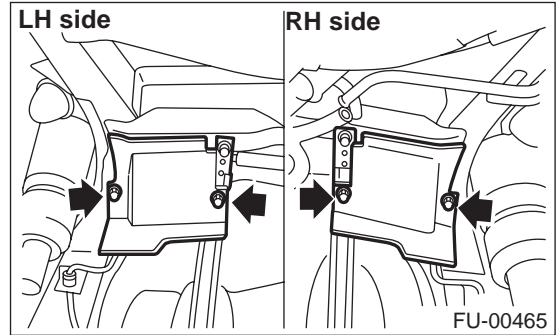
5) Tighten the band mounting bolts.

Tightening torque:
33 N·m (3.4 kgf·m, 25 ft·lb)



6) Install the rear side protector.

Tightening torque:
18 N·m (1.8 kgf·m, 13.0 ft·lb)

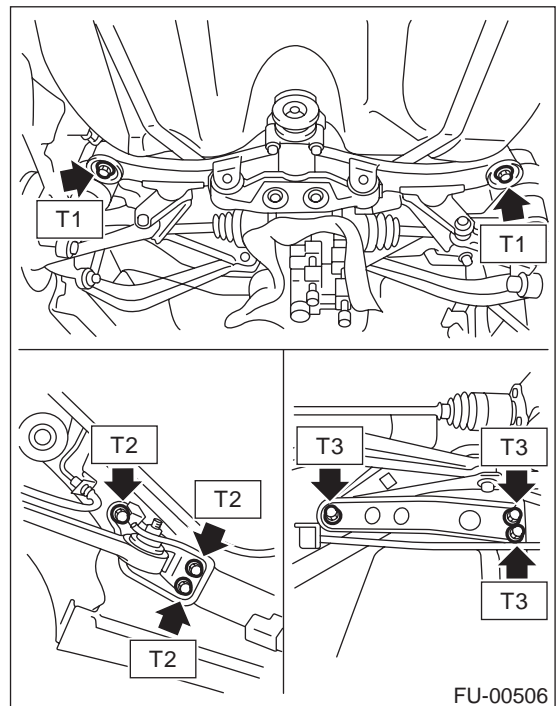


7) Install the rear suspension assembly.

CAUTION:
A helper is required to perform this work.

(1) Support the rear suspension assembly, and then tighten the bolts which secure rear suspension assembly.

Tightening torque:
T1: 172 N·m (17.5 kgf·m, 127 ft·lb)
T2: 108 N·m (11.0 kgf·m, 80 ft·lb)
T3: 66 N·m (6.7 kgf·m, 48 ft·lb)

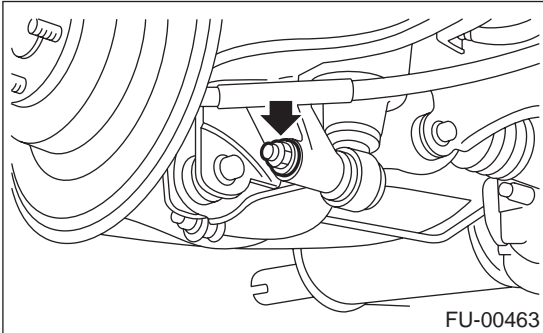


FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

(2) Tighten the bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-11, INSTALLATION, Rear Arm.>

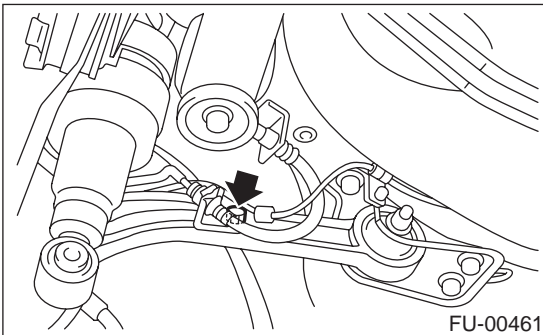
Tightening torque:
157 N·m (16 kgf·m, 116 ft·lb)



8) Install the rear brake caliper. <Ref. to BR-29, INSTALLATION, Rear Disc Brake Assembly.>

9) Tighten the bolt which holds rear brake hoses holding bracket.

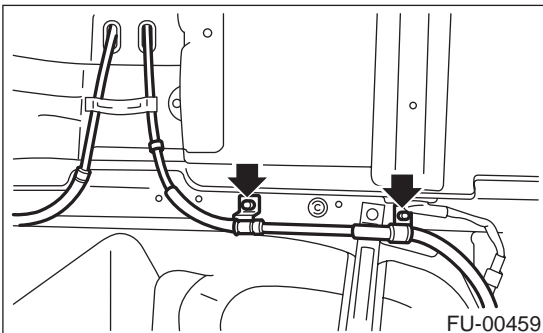
Tightening torque:
33 N·m (3.4 kgf·m, 25 ft·lb)



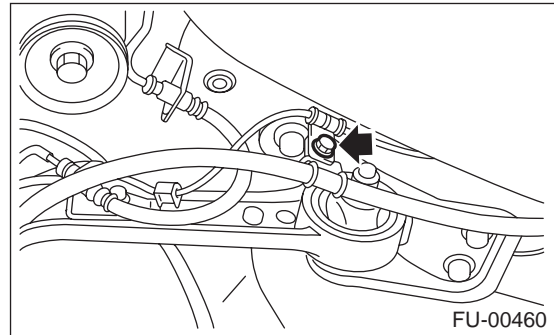
10) Install the parking brake cable to cabin by forcibly pushing it forward.

11) Tighten the bolts which hold parking brake cable holding bracket.

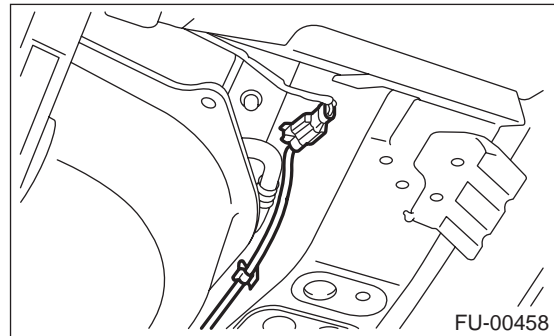
Tightening torque:
18 N·m (1.8 kgf·m, 13.0 ft·lb)



Tightening torque:
32 N·m (3.3 kgf·m, 23.9 ft·lb)



12) Connect the connector to ABS sensor.



13) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>

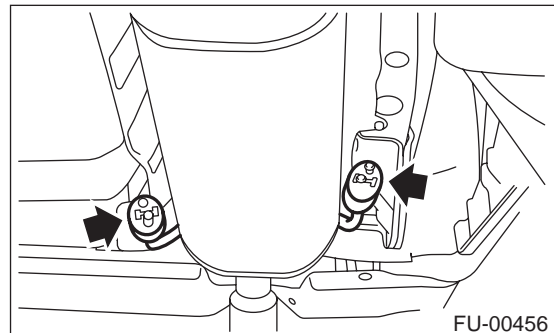
14) Install the rear exhaust pipe and muffler.

NOTE:

To facilitate the procedure, apply a coat of SUBARU CRC to matching area of the rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

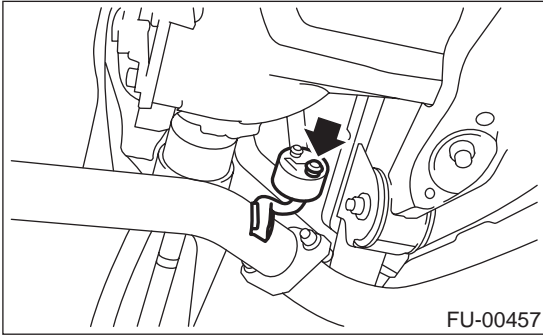
(1) Install the right and left rubber cushions.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

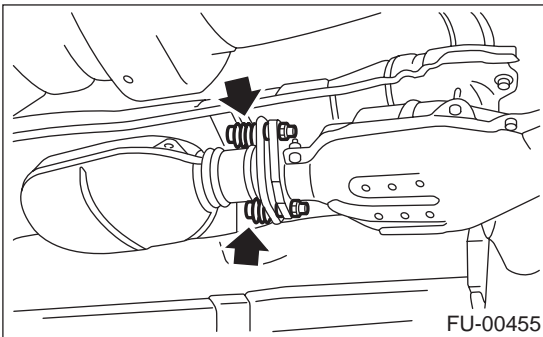
(2) Install the front rubber cushion and attach muffler assembly.



(3) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:

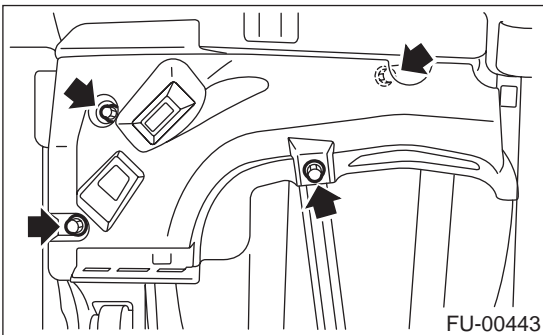
18 N·m (1.8 kgf-m, 13.0 ft-lb)



15) Install the front side protector.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



16) Install the rear wheel.

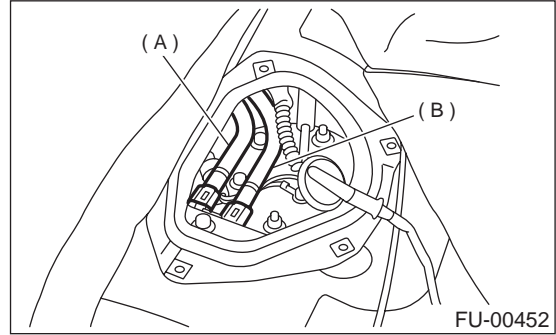
17) Lower the vehicle.

18) Tighten the wheel nuts to rear wheel.

19) Install the parking brake cable. <Ref. to PB-7, INSTALLATION, Parking Brake Cable.>

20) Install the console box. <Ref. to EI-34, INSTALLATION, Console Box.>

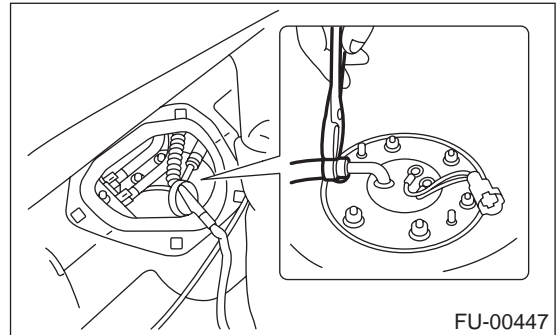
21) Connect the fuel hoses, and then hold them with the quick connector. <Ref. to FU(H4SO)-71, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



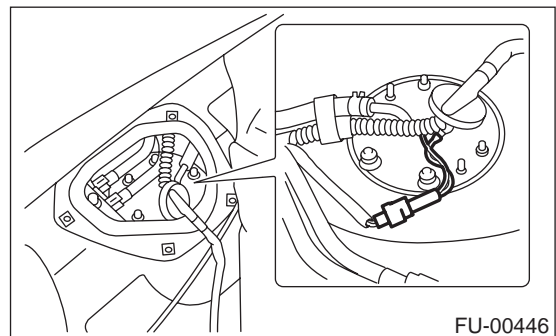
(A) Delivery hose

(B) Return hose

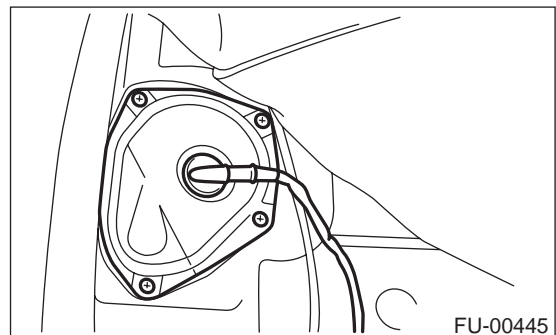
22) Connect the fuel jet pump hose.



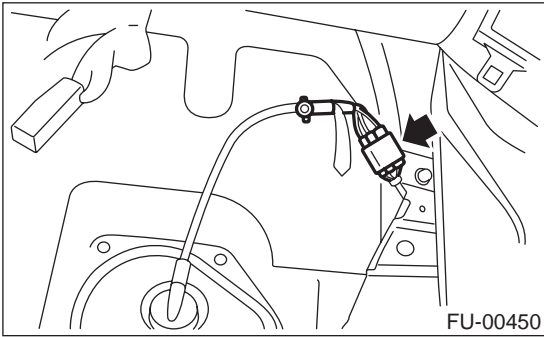
23) Connect the connector to fuel sub level sensor.



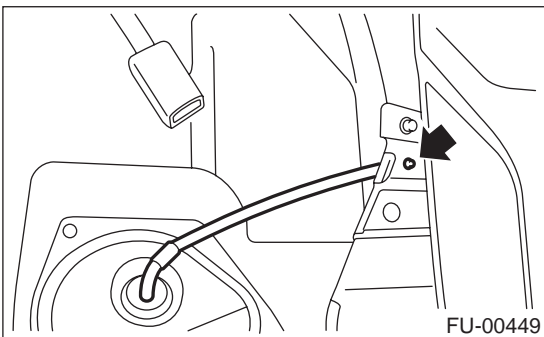
24) Install the sub service hole cover.



25) Connect the connectors to fuel tank cord, and then plug the service hole with grommet.

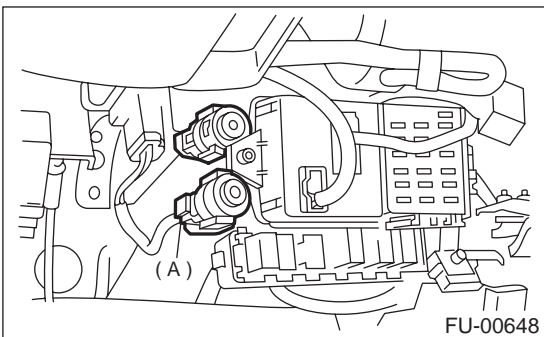


26) Install the holder clip which secures fuel tank cord on bracket.



27) Set the rear seat and floor mat.

28) Connect the connector to fuel pump relay (A).



29) Adjust the parking brake lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

30) Check the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

C: INSPECTION

- 1) Make sure there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

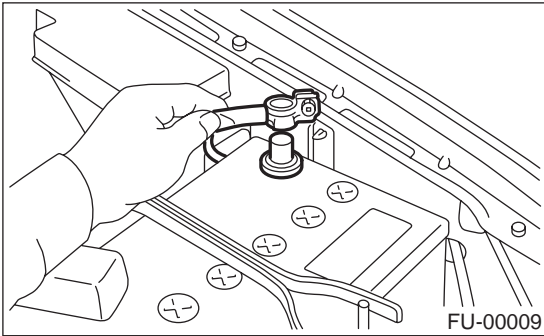
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

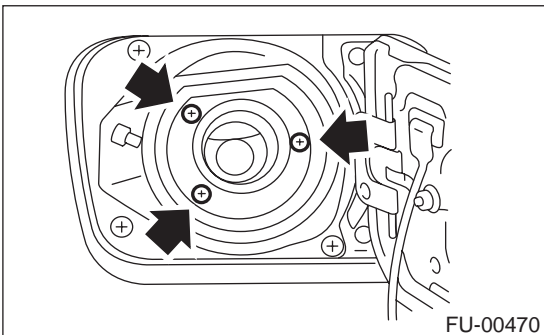
21. Fuel Filler Pipe

A: REMOVAL

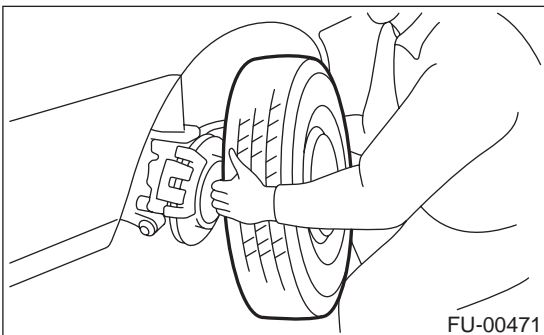
- 1) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid, and then remove the filler cap.
- 3) Disconnect the ground cable from battery.



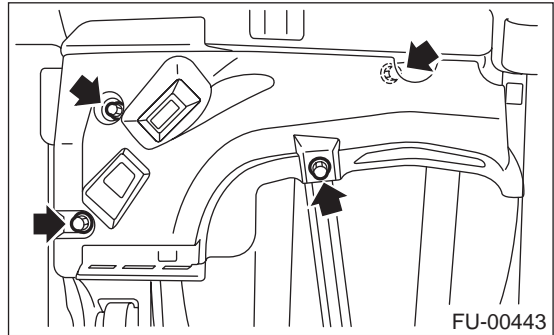
- 4) Remove the screws holding packing in place.



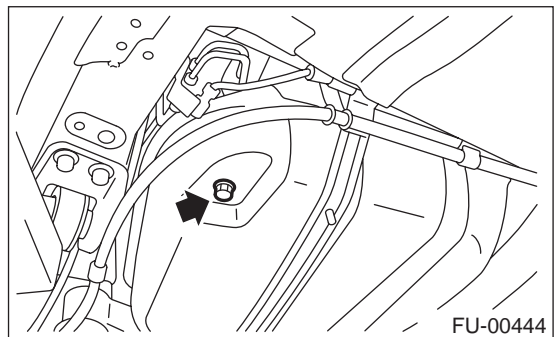
- 5) Lift-up the vehicle.
- 6) Remove the rear right side wheel nuts.
- 7) Remove the wheel RH (Rear).



- 8) Remove the protector RH (Front).

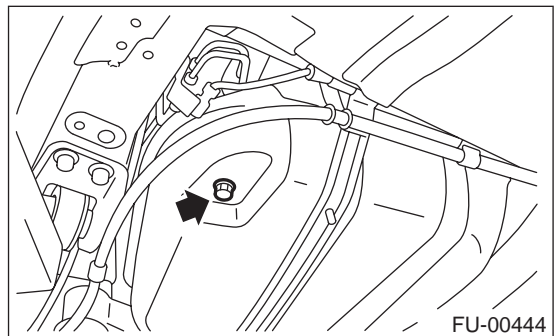


- 9) Drain fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.

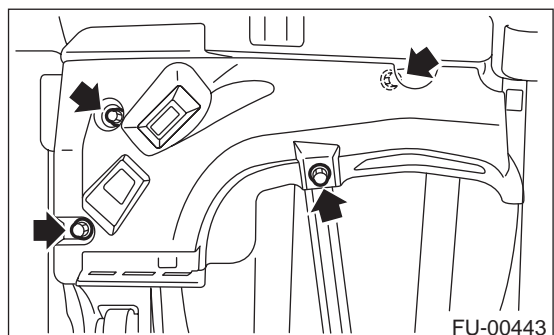


- 10) Tighten the fuel drain plug, and then install the protector RH (Front).

Tightening torque:
26 N·m (2.65 kg-m, 19.2 ft-lb)



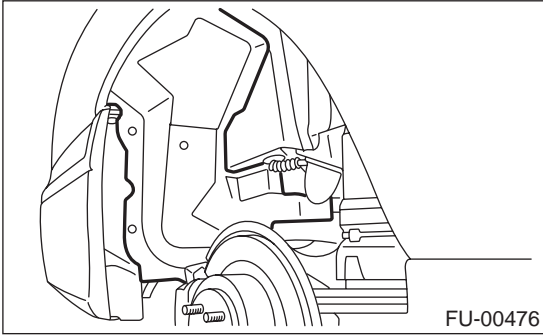
Tightening torque:
18 N·m (1.8 kg-m, 13.0 ft-lb)



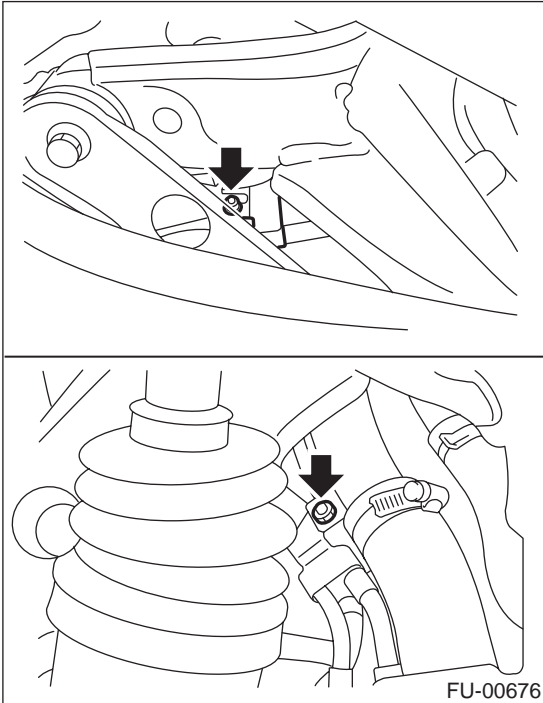
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

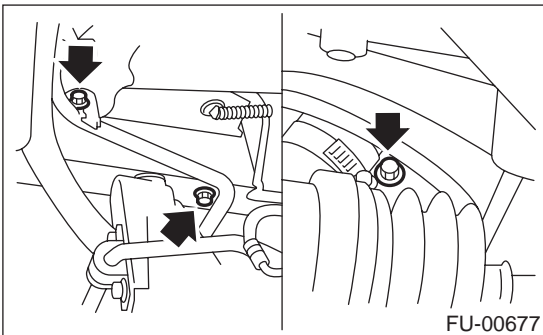
11) Remove the fuel filler pipe protector.



12) Remove the bolts which hold evaporation pipe bracket on fuel filler pipe.

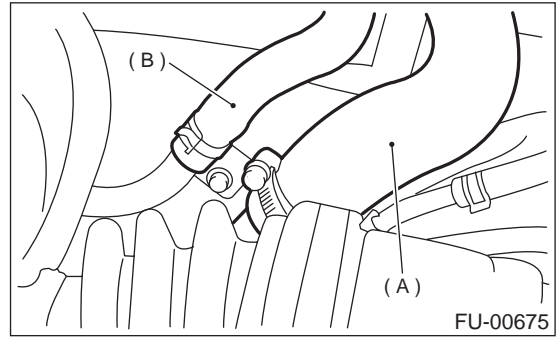


13) Remove the bolts which hold fuel filler pipe bracket on body.



14) Loosen the clamp, and then separate the fuel filler hose (A) from fuel filler pipe.

15) Move the clip, and then separate the air vent hose (B).

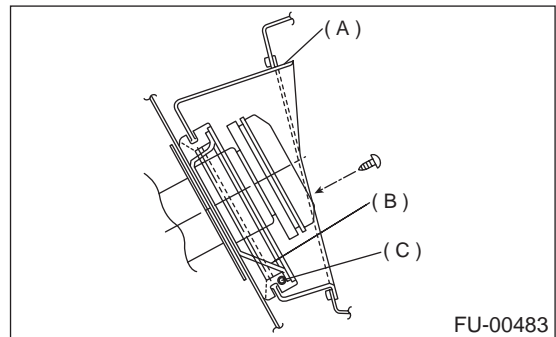


16) Remove the fuel filler pipe to under side of the vehicle.

B: INSTALLATION

1) Hold the fuel filler flap open.

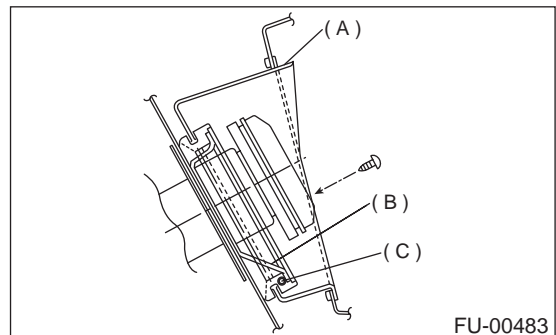
2) Set the fuel saucer (A) with rubber packing (C), and then insert the fuel filler pipe into hole from the inner side of apron.



3) Align holes in the fuel filler pipe neck, and then set the cup (B), and tighten screws.

NOTE:

If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



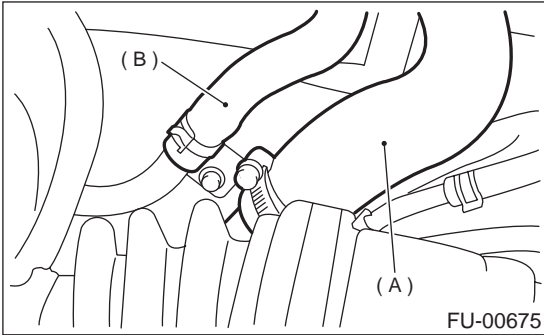
4) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe, and then tighten clamp.

FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

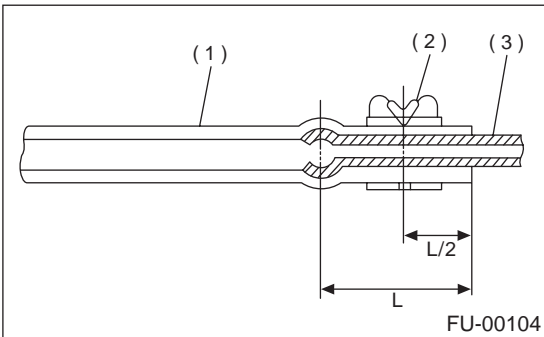
NOTE:

Do not allow clips to touch air vent hose (B) and rear suspension crossmember.



5) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe and hold clip.

$L = 27.5 \pm 2.5 \text{ mm (1.083 \pm 0.098 in)}$

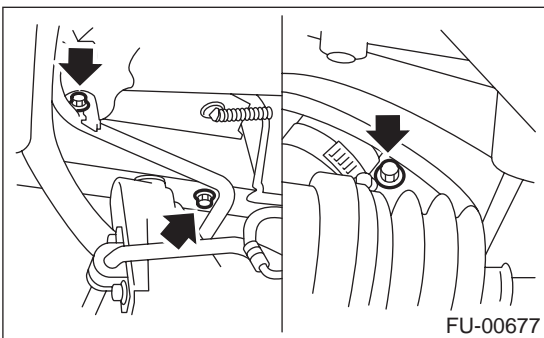


- (1) Hose
- (2) Clip
- (3) Pipe

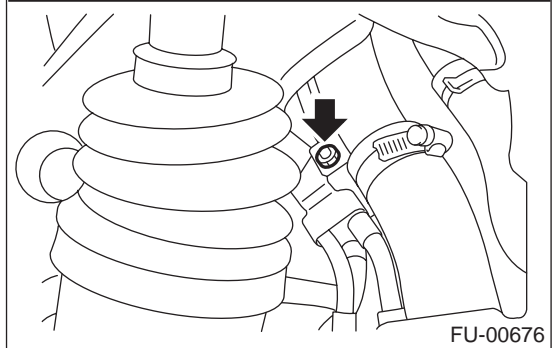
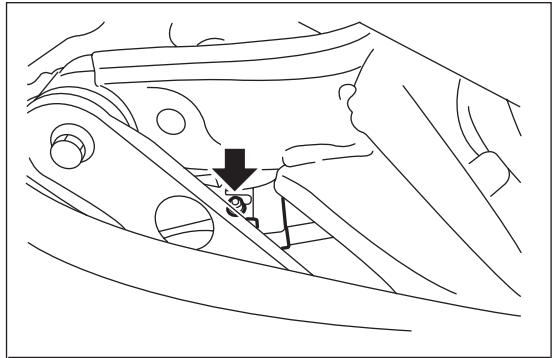
6) Tighten the bolt which holds fuel filler pipe bracket on body.

Tightening torque:

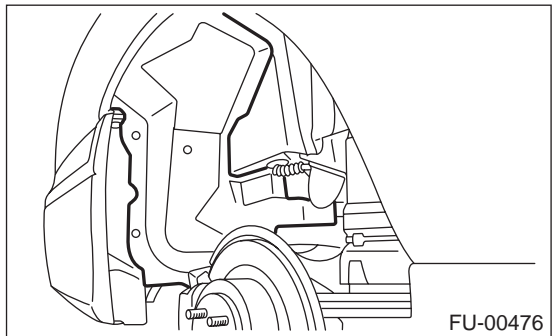
$7.4 \text{ N}\cdot\text{m (0.75 kg}\cdot\text{m, 5.4 ft}\cdot\text{lb)}$



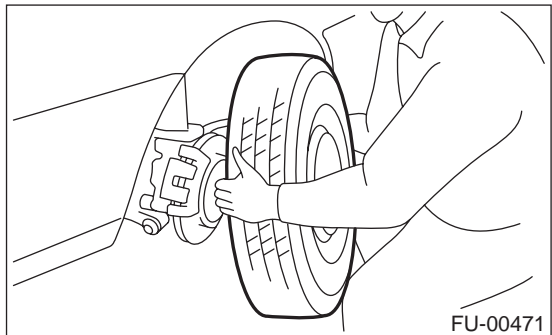
7) Tighten the bolts which hold evaporation pipe bracket on fuel pipe.



8) Install the fuel filler pipe protector.



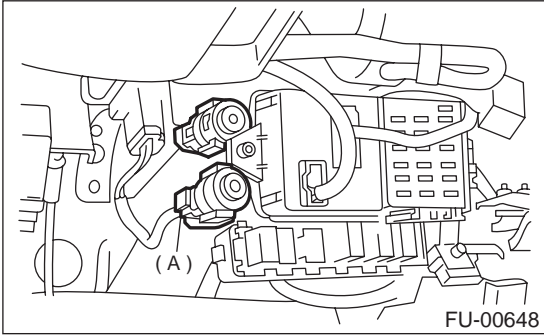
9) Install the rear right wheel.



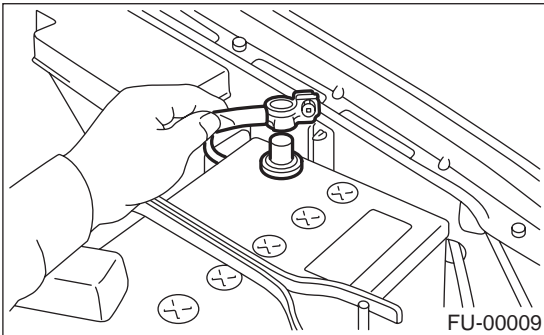
10) Lower the vehicle.

11) Tighten the wheel nuts.

12) Connect the connector to fuel pump relay (A).



13) Connect the battery ground cable to battery.



FUEL PUMP

FUEL INJECTION (FUEL SYSTEMS)

22. Fuel Pump

A: REMOVAL

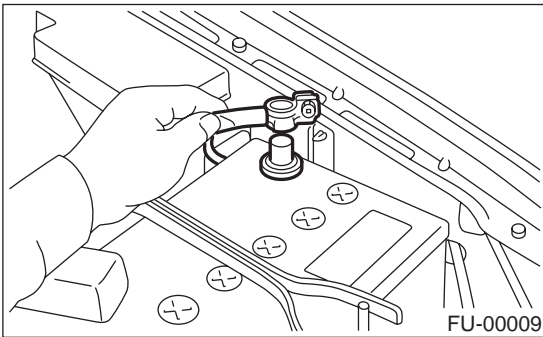
WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

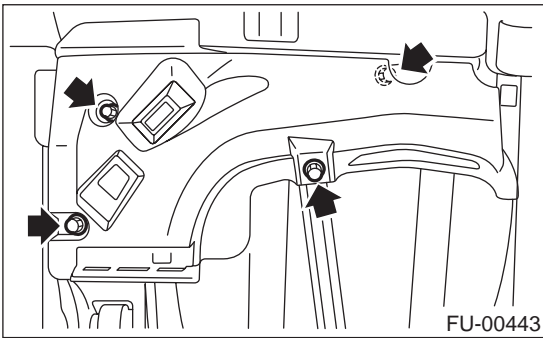
NOTE:

The fuel pump assembly consists of fuel pump and fuel level sensor.

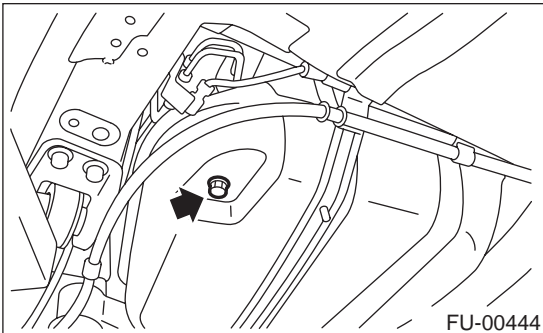
- 1) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid, and then remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



- 4) Lift-up the vehicle.
- 5) Remove the protector RH (Front).



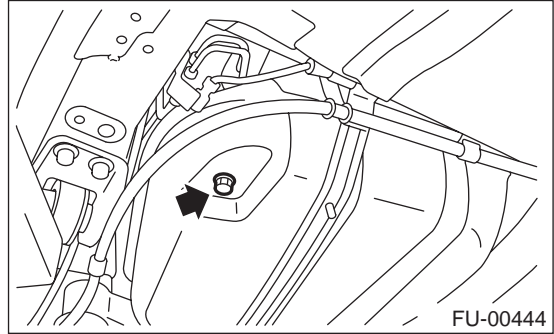
- 6) Drain the fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



- 7) Tighten the fuel drain plug, and then install the protector RH (Front).

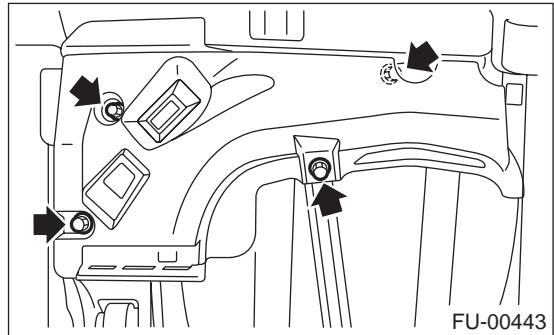
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)

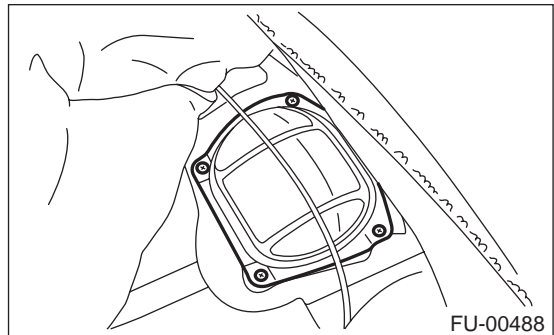


Tightening torque:

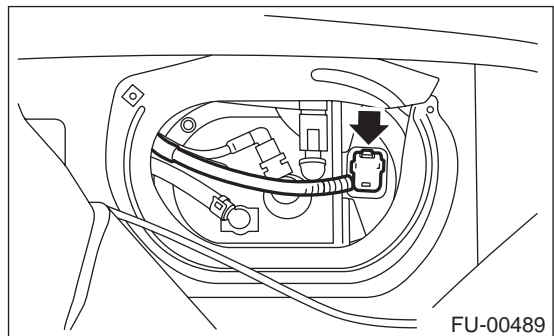
18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 8) Raise the rear seat, and then turn the floor mat up.
- 9) Remove the access hole lid.



- 10) Disconnect the connector from fuel pump.

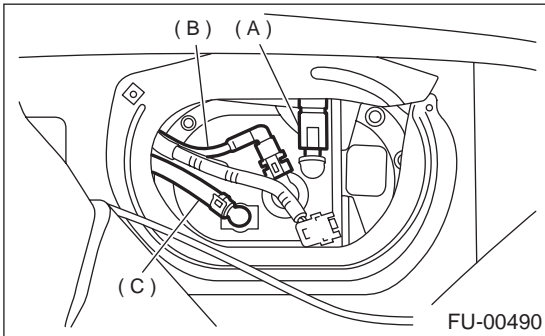


FUEL PUMP

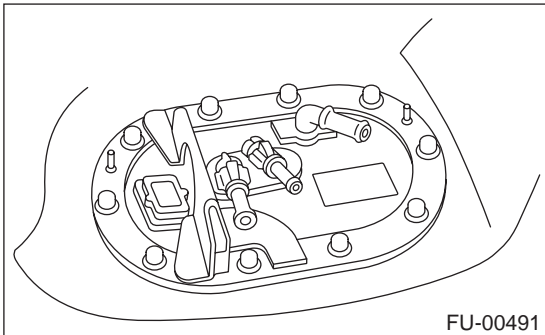
FUEL INJECTION (FUEL SYSTEMS)

11) Move the clips, and then disconnect the jet pump hose (C).

12) Disconnect the quick connector, and then disconnect the fuel delivery hose (A) and return hose (B). <Ref. to FU(H4SO)-70, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



13) Remove the nuts which install fuel pump assembly onto fuel tank.



14) Take off the fuel pump assembly from fuel tank.

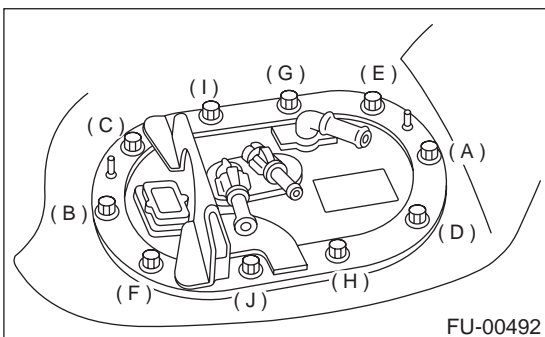
B: INSTALLATION

Install in the reverse order of removal. Do the following:

- (1) Always use new gaskets.
- (2) Ensure the sealing portion is free from fuel or foreign particles before installation.
- (3) Tighten the nuts in alphabetical sequence shown in the figure to specified torque.

Tightening torque:

5.9 N·m (0.6 kgf·m, 4.3 ft·lb)

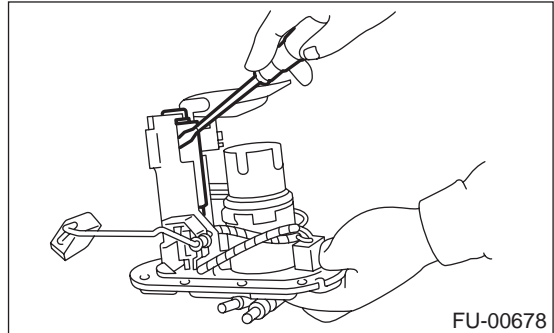


C: DISASSEMBLY

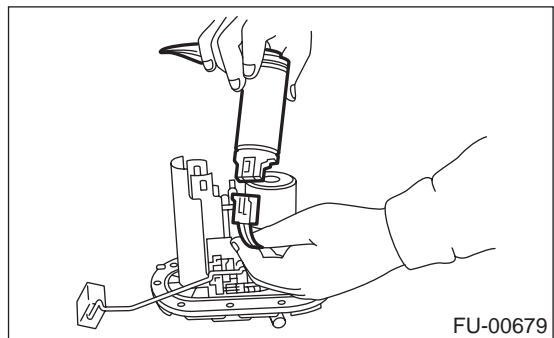
1) Remove the fuel pump and pump holder.

NOTE:

When disassembling the pump holder, be careful as it is installed with two pawls.



2) Disconnect the connector from fuel pump.



D: ASSEMBLY

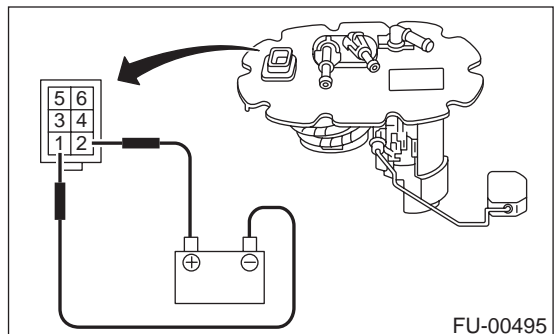
Assemble in the reverse order of disassembly.

E: INSPECTION

Connect the lead harness to connector terminal of fuel pump, and then apply battery power supply to check whether the pump operate.

WARNING:

- Wipe off the fuel completely.
- Keep the battery as far apart from fuel pump as possible.
- Be sure to turn the battery supply ON and OFF on the battery side.
- Do not run the fuel pump for a long time under non-load condition.



FUEL LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

23. Fuel Level Sensor

A: REMOVAL

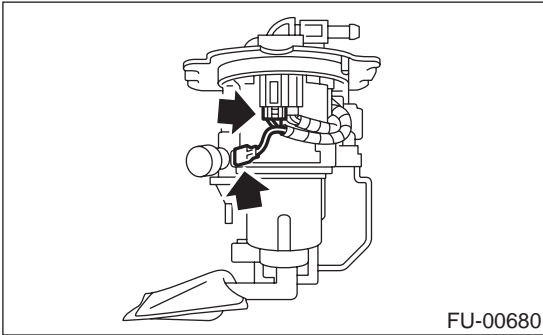
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

NOTE:

The fuel level sensor is built in fuel pump assembly.

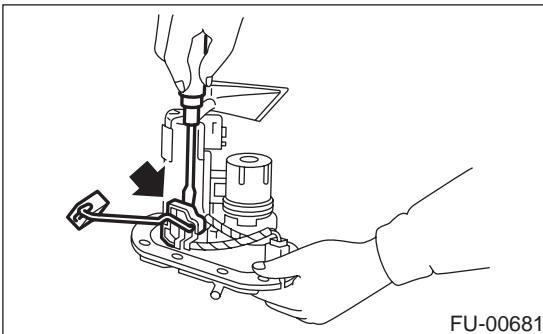
- 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-62, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from fuel pump bracket.



- 3) Pushing the pawls with a screwdriver, remove the fuel meter unit by pulling it downwards.

NOTE:

Replace the fuel filter pawls with new ones as they might brake when removed.

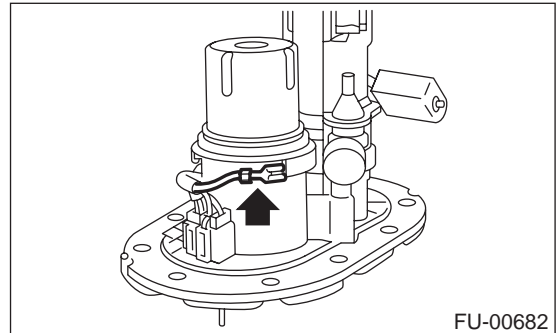


B: INSTALLATION

Install in the reverse order of removal.

WARNING:

- Ground cable must be connected.
- Spark may occur and ignite if fuel is nearby.



FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

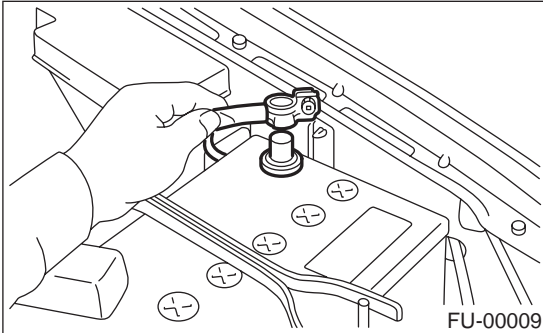
24. Fuel Sub Level Sensor

A: REMOVAL

WARNING:

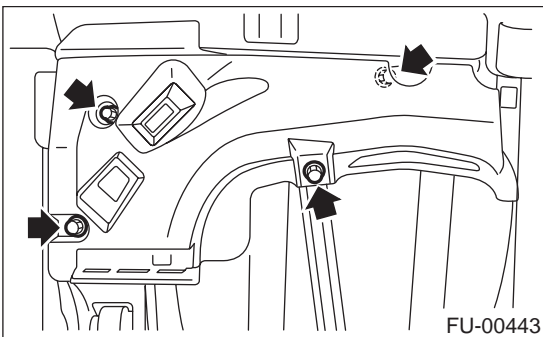
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect the ground cable from battery.

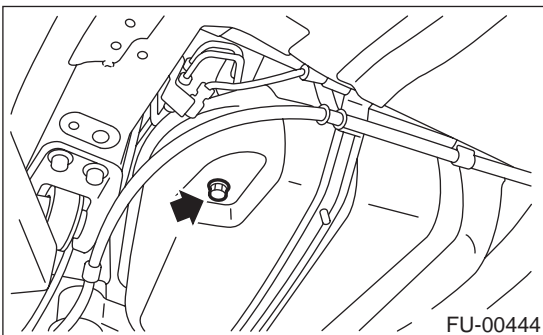


2) Lift-up the vehicle.

3) Remove the front side fuel tank cover.



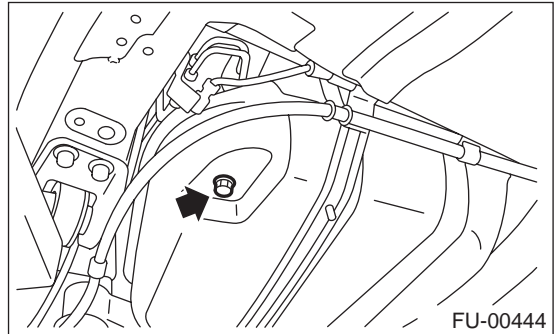
4) Drain fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



5) Tighten the fuel drain plug and install the protector RH (Front).

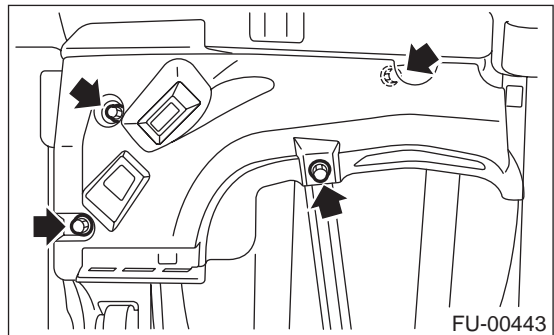
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



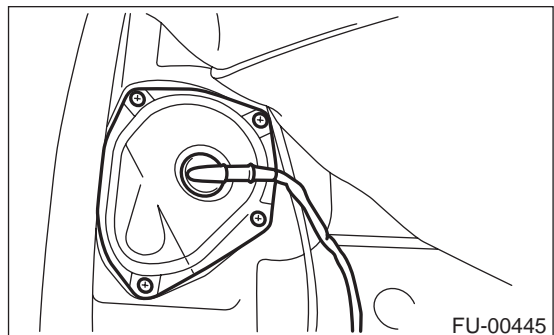
Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

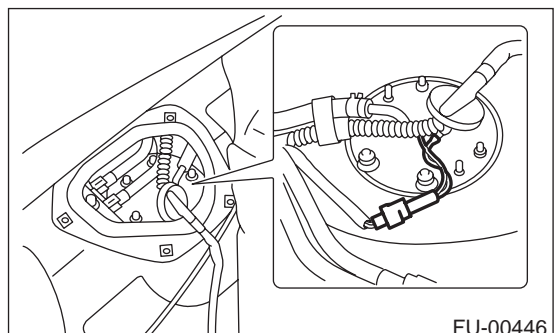


6) Remove the rear seat.

7) Remove the service hole cover.



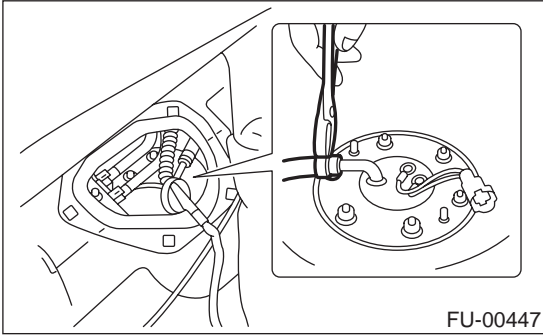
8) Disconnect the connector from fuel sub level sensor.



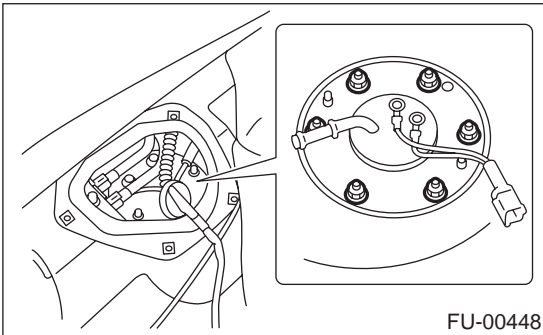
FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

9) Disconnect the fuel jet pump hose.



10) Remove the bolts which install fuel sub level sensor on fuel tank.



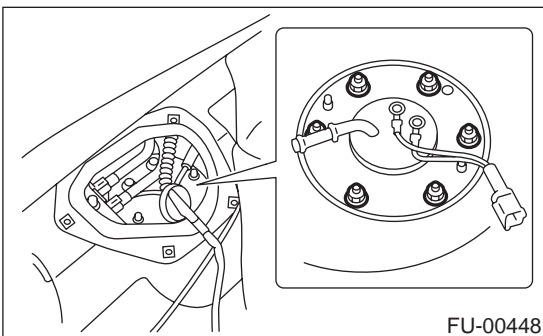
11) Remove the fuel sub level sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



25. Fuel Filter

A: REMOVAL

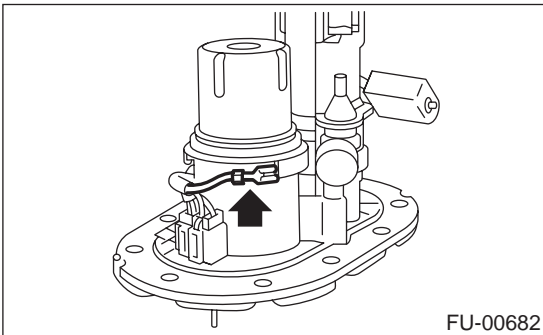
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

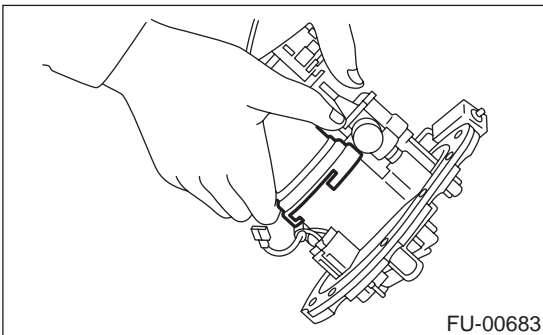
NOTE:

The fuel filter is built in fuel pump assembly.

- 1) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Remove the fuel pump assembly. <Ref. to FU(H4SO)-62, REMOVAL, Fuel Pump.>
- 3) Disconnect the ground cable from filter holder.



- 4) Remove the filter holder by turning it to the left from the body pawls, and then take out the filter.

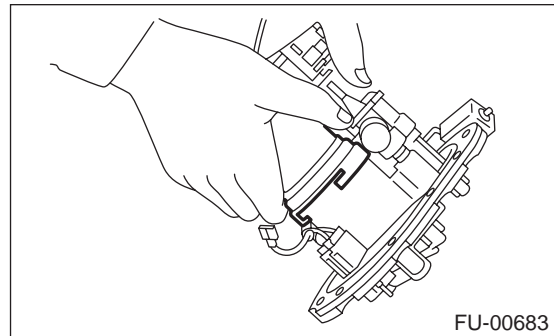


B: INSTALLATION

NOTE:

- If the fuel hoses are damaged at the connecting portion, replace it with a new one.
- If the clamps are badly damaged, replace with new ones.
- Replace the o-ring with new ones.

- 1) Set the O-ring on the filter holder, and then install by turning to the right.



- 2) Install the fuel pump assembly. <Ref. to FU(H4SO)-63, INSTALLATION, Fuel Pump.>

C: INSPECTION

- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if replacement interval has been reached, replace it.

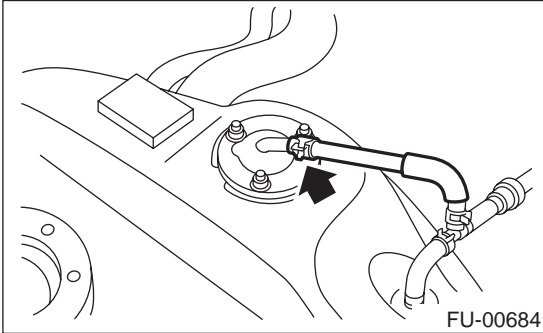
FUEL CUT VALVE

FUEL INJECTION (FUEL SYSTEMS)

26. Fuel Cut Valve

A: REMOVAL

- 1) Remove the fuel tank. <Ref. to FU(H4SO)-51, REMOVAL, Fuel Tank.>
- 2) Move the clip, and then disconnect the evaporation hose from fuel cut valve.



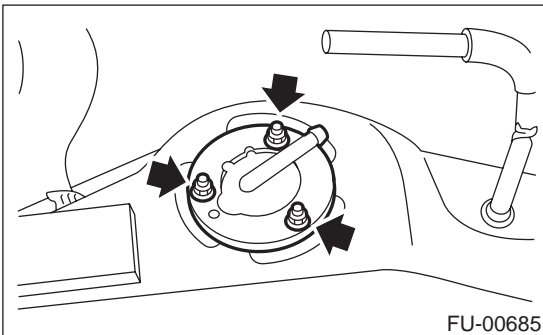
- 3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft-lb)

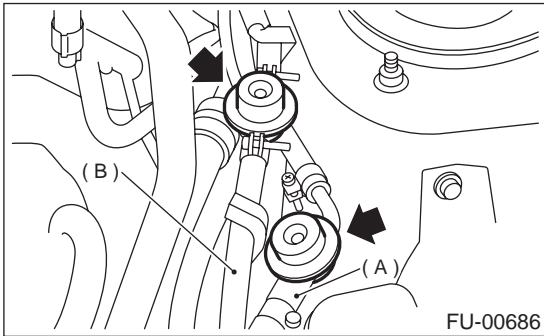


27. Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Remove the fuel damper valve from fuel delivery line (A) and return line (B).



B: INSTALLATION

Install in the reverse order of removal.

FUEL DELIVERY, RETURN AND EVAPORATION LINES

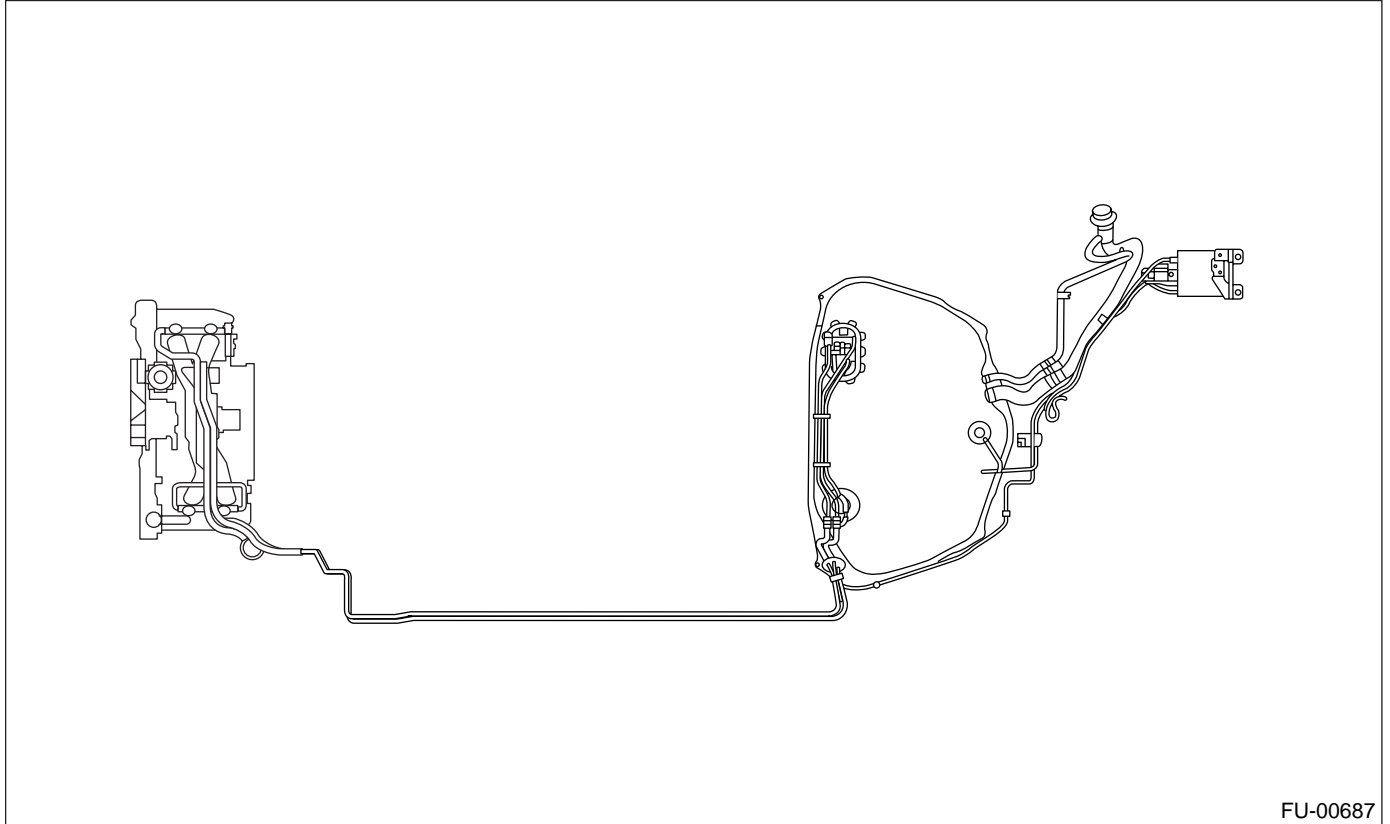
FUEL INJECTION (FUEL SYSTEMS)

28. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

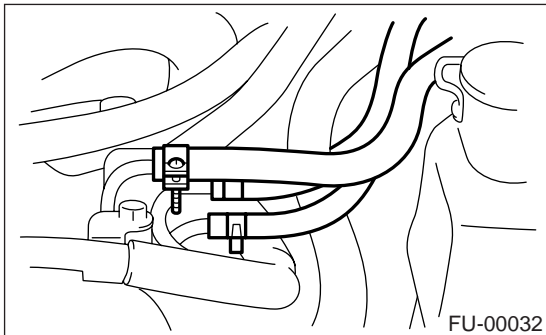
- 1) Set the vehicle on the lift.
- 2) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

- 3) Open the fuel filler flap lid, and then remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-48, REMOVAL, Floor Mat.>
- 5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



FU-00687

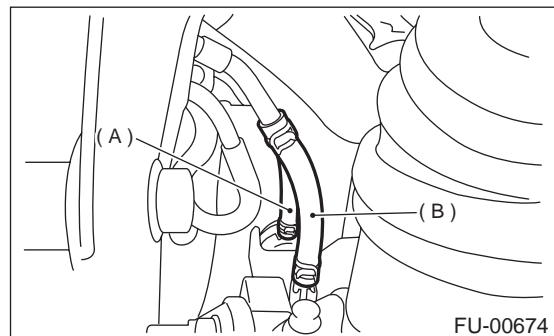
- 6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.



FU-00032

- 7) Lift-up the vehicle.

- 8) Disconnect the two-way valve hose (A) from the two-way valve and disconnect evaporation hose (B) from evaporation pipe.



FU-00674

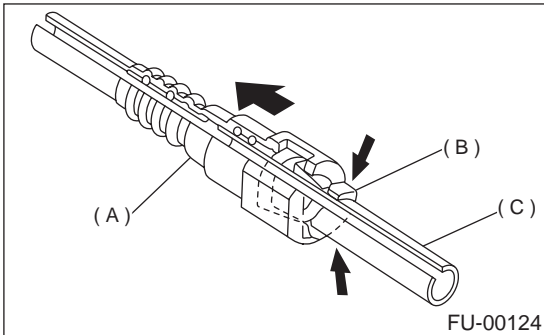
- 9) Separate the quick connector on fuel delivery and return line.
 - (1) Clean the pipe and connector, if they are covered with dust.
 - (2) Hold the connector (A) and push retainer (B) down.
 - (3) Pull out the connector (A) from retainer (B).

FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

NOTE:

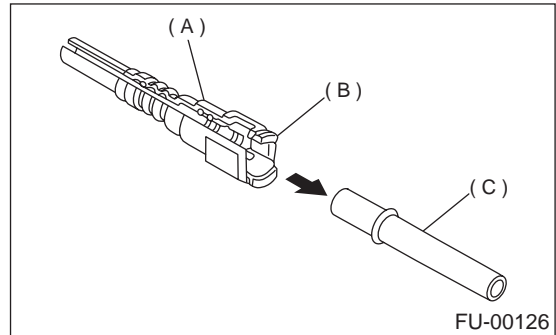
Replace the retainer with new ones.



- (A) Connector
- (B) Retainer
- (C) Pipe

NOTE:

At this time, two clicking sounds are heard.



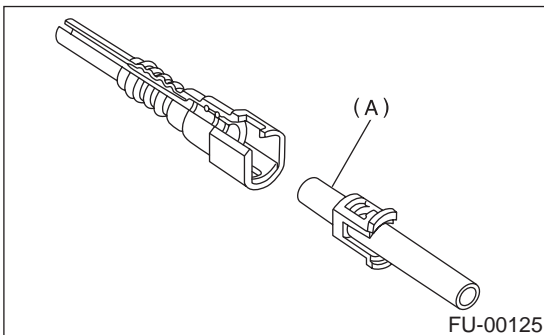
- (A) Connector
- (B) Retainer
- (C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery and return lines.

NOTE:

- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.

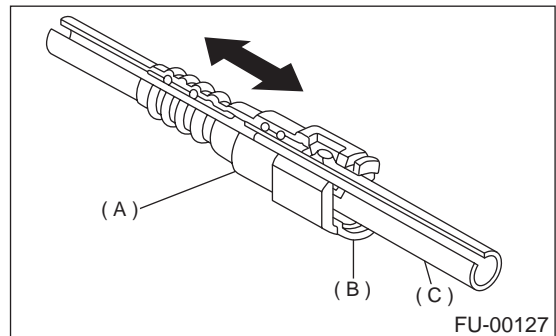


- (A) Seal surface

- (1) Set a new retainer (B) to connector (A).
- (2) Push the pipe into connector completely.

NOTE:

- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.
- Be sure to inspect the hoses and their connections for leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.

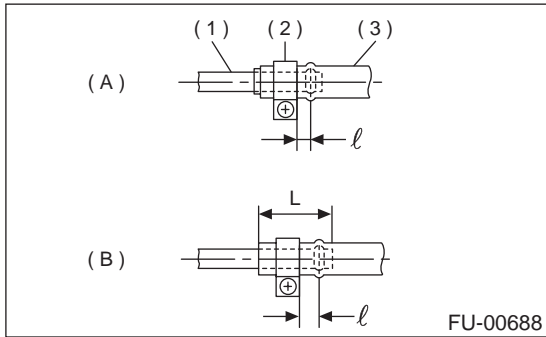
Type B: When fitting length is not specified.

$\varnothing : 2.5 \pm 1.5 \text{ mm } (0.098 \pm 0.059 \text{ in})$

FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

$L: 22.5 \pm 2.5 \text{ mm } (0.886 \pm 0.098 \text{ in})$



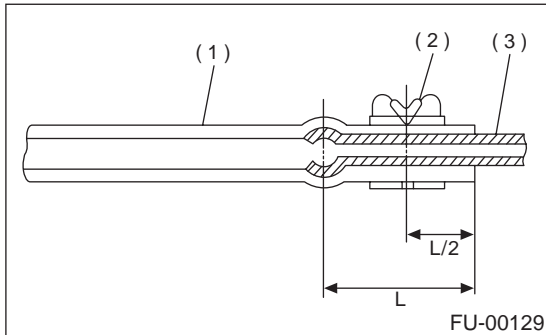
- (1) Fitting
- (2) Clamp
- (3) Hose
- (A) Type A
- (B) Type B

3) Connect the evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

$L = 17.5 \pm 2.5 \text{ mm } (0.689 \pm 0.098 \text{ in})$

NOTE:

Be sure to inspect the hoses and their connections for any leakage of fuel.



- (1) Hose
- (2) Clip
- (3) Pipe

C: INSPECTION

- 1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
- 2) Make sure that the fuel pipe and fuel hose connections are tight.

FUEL SYSTEM TROUBLE IN GENERAL

FUEL INJECTION (FUEL SYSTEMS)

29. Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	○ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	○ Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace the fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace the separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel meter unit.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. To prevent water condensation.

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain water condensation from the fuel filter.

- Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

- Protecting the fuel system against freezing and water condensation.

(1) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

(2) Affected areas

When water condensation is notched in the fuel filter, drain water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

- Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

FUEL SYSTEM TROUBLE IN GENERAL

FUEL INJECTION (FUEL SYSTEMS)

MEMO:

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) *EC(H4SO)*

	Page
1. General Description	2
2. Front Catalytic Converter	3
3. Rear Catalytic Converter	4
4. EGR Valve	5
5. Canister	6
6. Purge Control Solenoid Valve	7
7. Two-way Valve	8

GENERAL DESCRIPTION

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

1. General Description

A: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

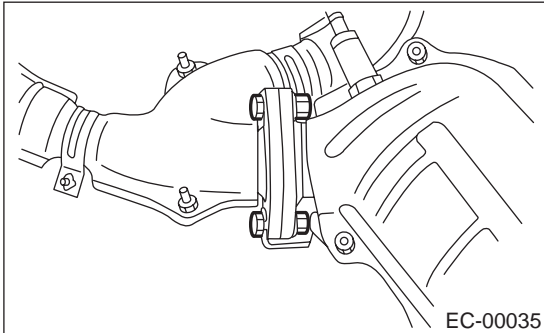
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. Front Catalytic Converter

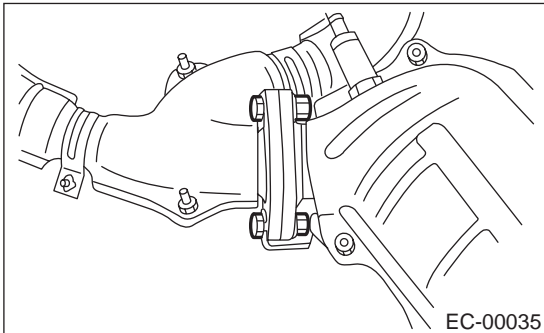
A: REMOVAL

The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal procedure is the same as that for the center exhaust pipe. <Ref. to EX(H4SO)-8, REMOVAL, Center Exhaust Pipe.>



B: INSTALLATION

The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the installation procedure is the same as that for the center exhaust pipe. <Ref. to EX(H4SO)-8, INSTALLATION, Center Exhaust Pipe.>



1) Install front and center exhaust pipes. <Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

REAR CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal procedure is the same as that for the center exhaust pipe. <Ref. to EX(H4SO)-8, REMOVAL, Center Exhaust Pipe.>

B: INSTALLATION

The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the installation procedure is the same as that for the center exhaust pipe. <Ref. to EX(H4SO)-8, INSTALLATION, Center Exhaust Pipe.>

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

EGR VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

4. EGR Valve

A: REMOVAL

For work procedures, refer to "FU(H4SO)" section.
<Ref. to FU(H4SO)-35, REMOVAL, EGR Valve.>

B: INSTALLATION

For work procedures, refer to "FU(H4SOH4SO)" section.
<Ref. to FU(H4SO)-35, INSTALLATION, EGR Valve.>

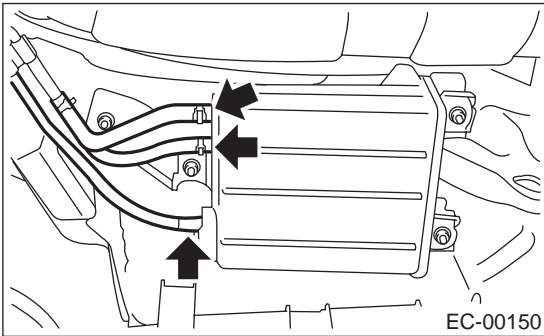
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

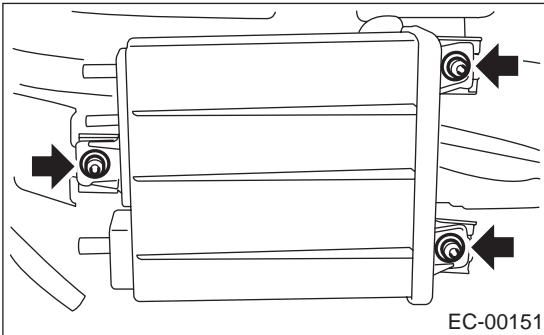
5. Canister

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen two clamps which hold two canister hoses, and disconnect evaporation three hoses from canister.



- 3) Remove canister from body.

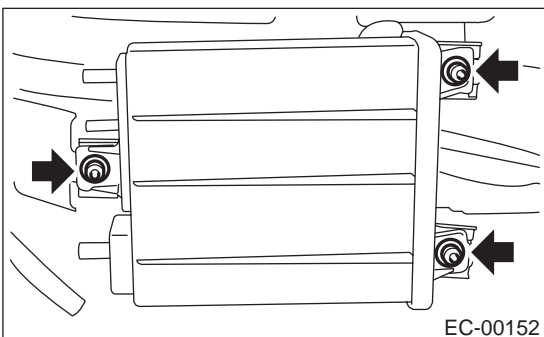


B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

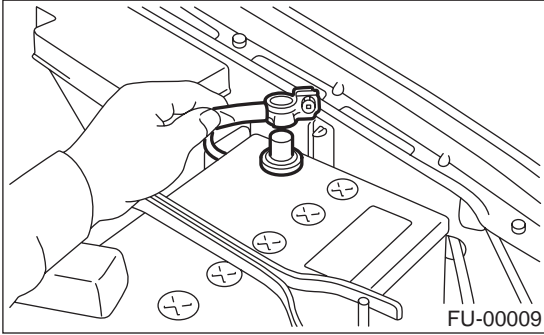
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

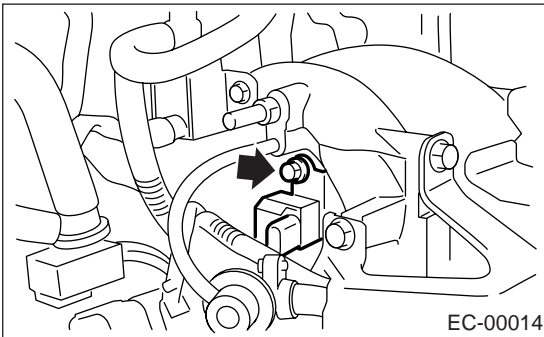
6. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector and hoses from purge control solenoid valve, and then remove the purge control solenoid valve.

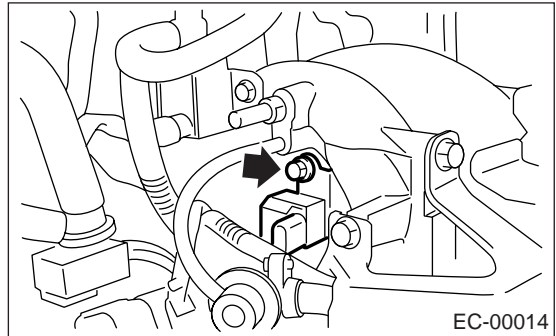


B: INSTALLATION

1) Install in the reverse order of removal.

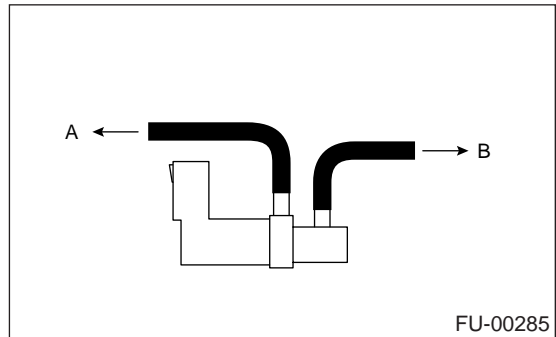
Tightening torque:

19 N·m (1.9 kgf·m, 13.7 ft·lb)



NOTE:

Connect the evaporation hoses as shown in the figure.



(A) To fuel pipe

(B) To intake manifold

C: INSPECTION

Make sure hoses are not cracked or loose.

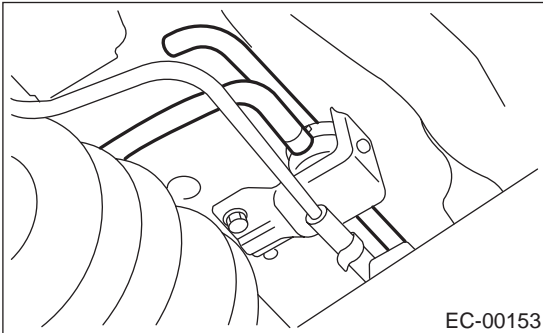
TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

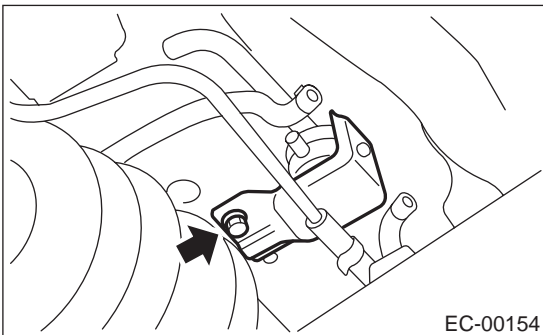
7. Two-way Valve

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Disconnect hoses from two-way valve.



- 3) Remove two-way valve with bracket as a single unit from body.



- 4) Remove two-way valve from bracket.

B: INSTALLATION

- 1) Install in the reverse order of removal.

C: INSPECTION

- 1) Make sure that hoses are not cracked or loose.

INTAKE (INDUCTION)

IN(H4SO)

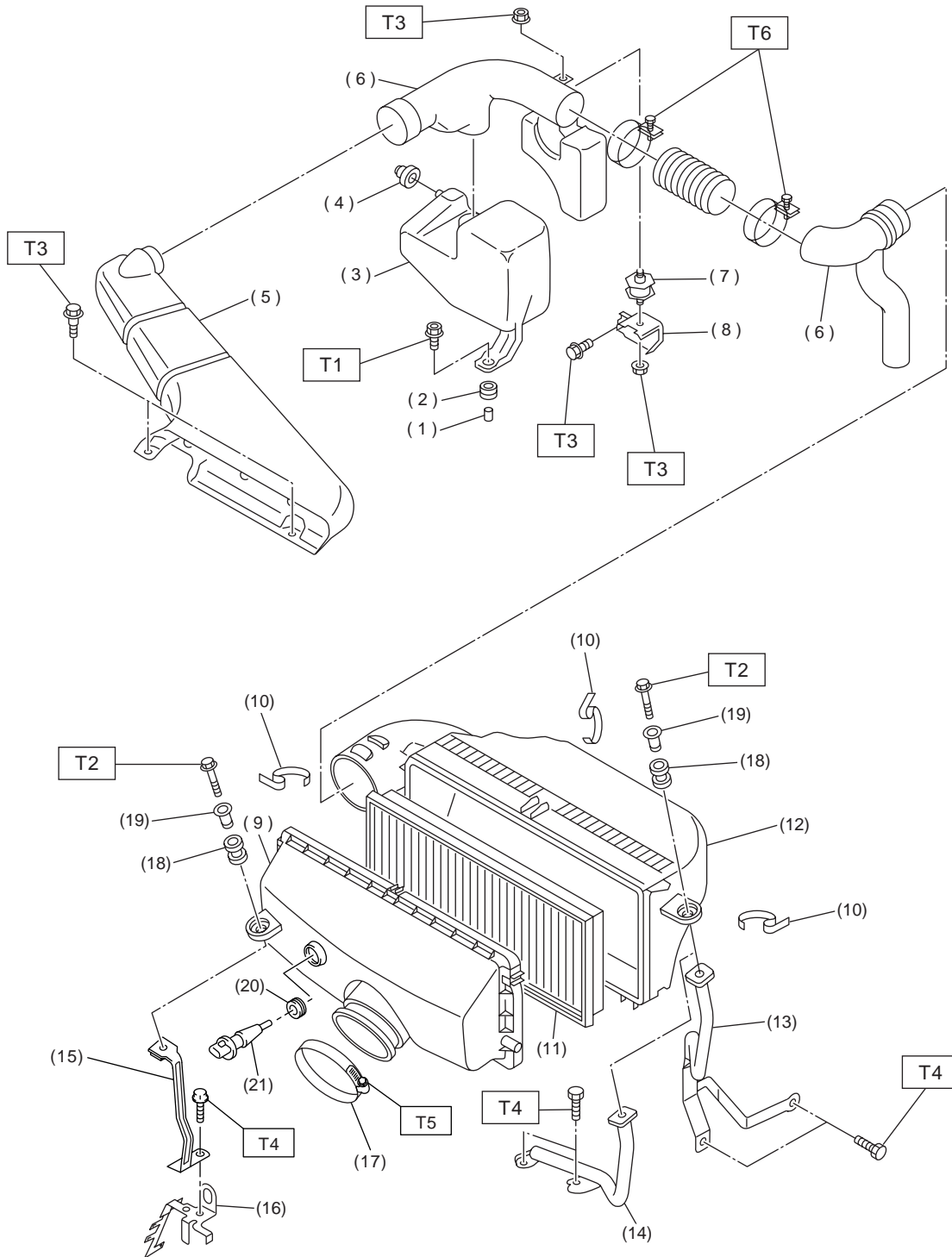
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2. Air Cleaner	5
3. Air Cleaner Case	6
4. Air Intake Duct.....	7
5. Resonator Chamber	8

GENERAL DESCRIPTION

INTAKE (INDUCTION)

1. General Description

A: COMPONENT



IN-00124

IN(H4SO)-2

GENERAL DESCRIPTION

INTAKE (INDUCTION)

(1) Spacer	(11) Air cleaner element	(19) Spacer
(2) Bushing	(12) Air cleaner case B	(20) Grommet
(3) Resonator chamber	(13) Air cleaner case stay LH (MT vehicles)	(21) Intake air temperature sensor
(4) Cushion rubber		
(5) Air intake duct A	(14) Air cleaner case stay LH (AT vehicles)	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(6) Air intake duct B		<i>T1: 33 (3.4, 24.6)</i>
(7) Cushion	(15) Air cleaner case stay RH	<i>T2: 6.5 (0.66, 4.8)</i>
(8) Bracket	(16) Engine harness bracket	<i>T3: 7.5 (0.76, 5.5)</i>
(9) Air cleaner case A	(17) Clamp	<i>T4: 16 (1.6, 11.6)</i>
(10) Clip	(18) Bushing	<i>T5: 3 (0.3, 2.2)</i>
		<i>T6: 2.5(0.25, 1.8)</i>

GENERAL DESCRIPTION

INTAKE (INDUCTION)

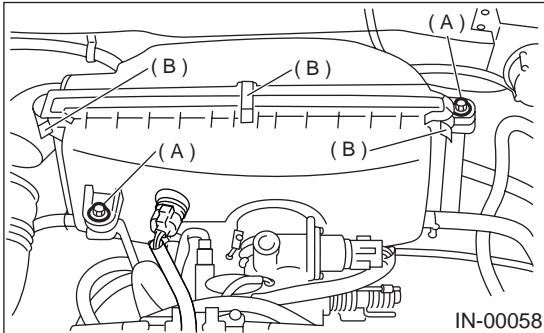
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect ground cable from battery.

2. Air Cleaner

A: REMOVAL

- 1) Remove bolt (A) which install air cleaner case to stays.
- 2) Remove the clip (B) above the air cleaner case.



- 3) Remove air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Fasten with a clip after inserting the lower tab of the case.

C: INSPECTION

Replace if excessively damaged or dirty.

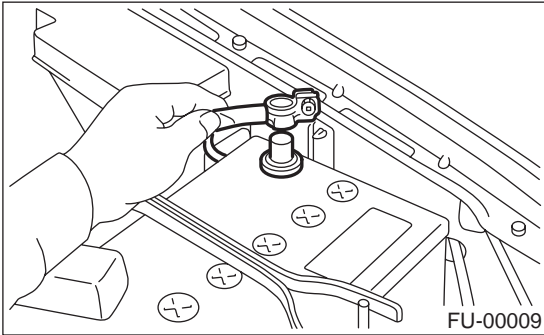
AIR CLEANER CASE

INTAKE (INDUCTION)

3. Air Cleaner Case

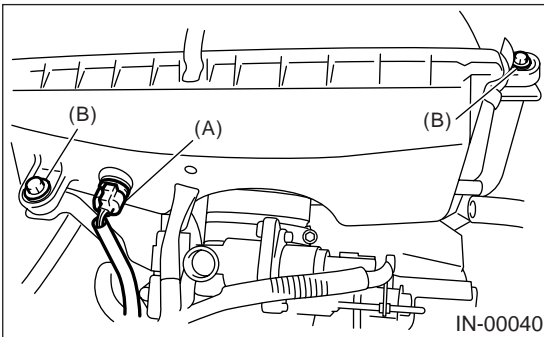
A: REMOVAL

1) Disconnect the ground cable from battery.



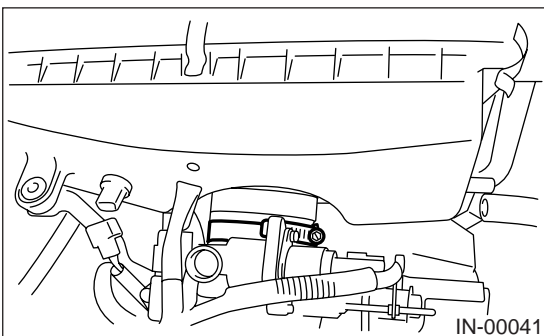
2) Disconnect the connector (A) of intake air temperature sensor.

3) Remove the bolts (B) which install air cleaner case to stay.



4) Disconnect the hoses and intake duct from air cleaner case.

5) Loosen the clamp which connects air cleaner case to throttle body.



6) Remove the air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

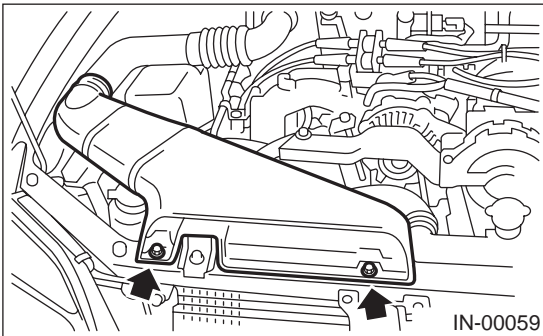
C: INSPECTION

Inspect for cracks and loose connections.

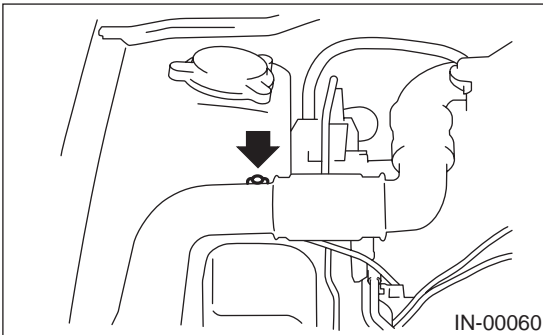
4. Air Intake Duct

A: REMOVAL

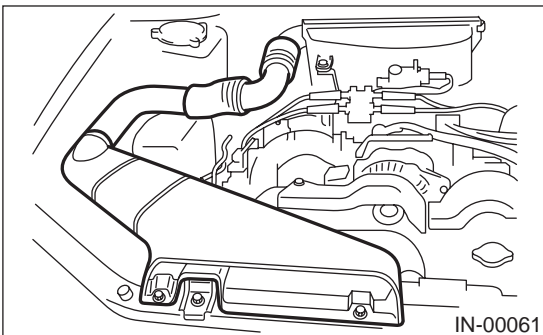
1) Remove bolts which install air intake duct on the front side of body.



2) Remove bolt which installs air intake duct on body.



3) Remove air intake ducts as a unit.



B: INSTALLATION

Install in the reverse order of removal.

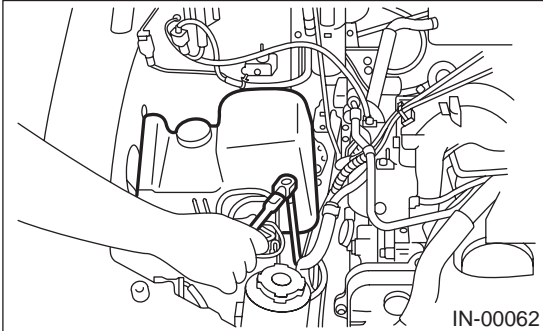
C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the air intake duct.

5. Resonator Chamber

A: REMOVAL

- 1) Remove air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- 2) Remove resonator chamber.

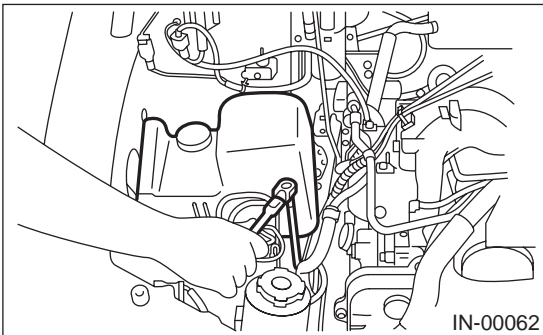


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



C: INSPECTION

Inspect for cracks and loose connections.

MECHANICAL

ME(H4SO)

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GENERAL DESCRIPTION

MECHANICAL

1. General Description

A: SPECIFICATIONS

Engine	Model		2000 cc	2500 cc	
	Type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
	Valve arrangement		Belt driven, single over-head camshaft, 4-valve/cylinder		
	Bore x Stroke		mm (in) 92 x 75 (3.62 x 2.95)	99.5 x 79.0 (3.917 x 3.110)	
	Displacement		cm ³ (cu in) 1,994 (121.67)	2,457 (150)	
	Compression ratio		10.0		
	Compression pressure (at 200 — 300 rpm)		kPa (kg/cm ² , psi) 1,079 — 1,275 (11.0 — 13.0, 156 — 185)		
	Number of piston rings		Pressure ring: 2, Oil ring: 1		
	Intake valve timing		Opening	4° BTDC	1° BTDC
			Closing	48° ABDC	51° ABDC
	Exhaust valve timing		Opening	48° BBDC	50° BBDC
			Closing	4° ATDC	6° ATDC
	Valve clearance		Intake	mm (in) 0.20±0.02 (0.0079±0.0008)	
			Exhaust	mm (in) 0.25±0.02 (0.0098±0.0008)	
	Idling speed [At neutral position on MT, or "P" or "N" position on AT]		rpm	650±100 (No load) 850±100 (A/C switch ON)	
	Firing order		1 → 3 → 2 → 4		
Ignition timing		BTDC/rpm	10°±10°/700	10°±10°/700 (MT) 15°±10°/700 (AT)	

NOTE:

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter US: Undersize OS: Oversize

GENERAL DESCRIPTION

MECHANICAL

Belt tensioner adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)	
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)	
	Tensioner bushing I.D.			18.00 — 18.08 mm (0.7087 — 0.7118 in)	
	Clearance between spacer and bushing		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)	
			Limit	0.175 mm (0.0069 in)	
	Side clearance of spacer		STD	0.20 — 0.55 mm (0.0079 — 0.0217 in)	
Limit			0.81 mm (0.0319 in)		
Valve rocker arm	Clearance between shaft and arm			STD	0.020 — 0.054 mm (0.0008 — 0.0021 in)
				Limit	0.10 mm (0.0039 in)
Camshaft	Bend limit			0.025 mm (0.0010 in)	
	Thrust clearance		STD	0.030 — 0.090 mm (0.0012 — 0.0035 in)	
			Limit	0.10 mm (0.0039 in)	
	Cam lobe height	2000 cc	Intake	STD	38.732 — 38.832 mm (1.5249 — 1.5288 in)
				Limit	38.632 mm (1.5209 in)
		2500 cc	Exhaust	STD	39.257 — 39.357 mm (1.5455 — 1.5495 in)
				Limit	39.157 mm (1.5416 in)
	2500 cc	Intake	STD	39.485 — 39.585 mm (1.5545 — 1.5585 in)	
			Limit	39.385 mm (1.5506 in)	
	2500 cc	Exhaust	STD	39.257 — 39.357 mm (1.5455 — 1.5495 in)	
			Limit	39.157 mm (1.5416 in)	
	Camshaft journal O.D.			31.928 — 31.945 mm (1.2570 — 1.2577 in)	
Camshaft journal hole I.D. (Cylinder head)			32.000 — 32.018 mm (1.2598 — 1.2605 in)		
Journal clearance		STD	0.055 — 0.090 mm (0.0022 — 0.0035 in)		
		Limit	0.10 mm (0.0039 in)		
Cylinder head	Surface warpage limit (mating with cylinder block)			0.05 mm (0.0020 in)	
	Surface grinding limit			0.1 mm (0.004 in)	
	Standard height			97.5 mm (3.84 in)	
Valve set	Refacing angle			90°	
	Contacting width	Intake	STD	1.1 mm (0.043 in)	
			Limit	1.8 mm (0.070 in)	
		Exhaust	STD	1.5 mm (0.059 in)	
			Limit	2.2 mm (0.087 in)	
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)	
	Protrusion above head		Intake	20.0 — 20.5 mm (0.787 — 0.807 in)	
			Exhaust	16.5 — 17.0 mm (0.650 — 0.669 in)	
Valve	Head edge thickness	Intake	STD	1.0 mm (0.039 in)	
			Limit	0.6 mm (0.024 in)	
		Exhaust	STD	1.2 mm (0.047 in)	
			Limit	0.6 mm (0.024 in)	
	Stem diameter		Intake	5.950 — 5.965 mm (0.2343 — 0.2348 in)	
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)	
	Stem oil clearance	STD	Intake	0.035 — 0.062 mm (0.0014 — 0.0024 in)	
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)	
			Limit	— 0.15 mm (0.0059 in)	
Overall length		Intake	120.6 mm (4.75 in)		
		Exhaust	121.7 mm (4.79 in)		

GENERAL DESCRIPTION

MECHANICAL

Valve spring	Free length			54.30 mm (2.1378 in)		
	Squareness			2.5°, 2.4 mm (0.094 in)		
	Tension/spring height			Set	214 — 246 N (22 — 25 kgf, 48 — 55 lb)/ 45.0 mm (1.772 in)	
				Lift	526 — 582 N (54 — 59 kgf, 119 — 130 lb)/ 34.7 mm (1.366 in)	
Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)		
	Surface grinding limit			0.1 mm (0.004 in)		
	Cylinder bore	2000 cc	STD	A	92.005 — 92.015 mm (3.6222 — 3.6226 in)	
				B	91.995 — 92.005 mm (3.6218 — 3.6222 in)	
		2500 cc	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)	
				B	99.495 — 99.505 mm (3.9171 — 3.9175 in)	
	Taper			STD	0.015 mm (0.0006 in)	
				Limit	0.050 mm (0.0020 in)	
	Out-of-roundness			STD	0.010 mm (0.0004 in)	
				Limit	0.050 mm (0.0020 in)	
Piston clearance			STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)		
			Limit	0.050 mm (0.0020 in)		
Enlarging (boring) limit			0.5 mm (0.020 in)			
Piston	Outer diameter	2000 cc	STD	A	91.985 — 91.995 mm (3.6214 — 3.6218 in)	
				B	91.975 — 91.985 mm (3.6211 — 3.6214 in)	
			0.25 mm (0.0098 in) OS		92.225 — 92.235 mm (3.6309 — 3.6313 in)	
			0.50 mm (0.0197 in) OS		92.475 — 92.485 mm (3.6407 — 3.6411 in)	
	2500 cc	STD	A	99.485 — 99.495 mm (3.9167 — 3.9171 in)		
			B	99.475 — 99.485 mm (3.9163 — 3.9167 in)		
		0.25 mm (0.0098 in) OS		99.725 — 99.735 mm (3.9262 — 3.9266 in)		
		0.50 mm (0.0197 in) OS		99.975 — 99.985 mm (3.9360 — 3.9364 in)		
Standard inner diameter of piston pin hole			23.000 — 23.006 mm (0.9055 — 0.9057 in)			
Piston pin	Outer diameter			22.994 — 23.000 mm (0.9053 — 0.9055 in)		
	Standard clearance between piston pin and piston			0.004 — 0.008 mm (0.0002 — 0.0003 in)		
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).		
Piston ring	Piston ring gap	Top ring	STD		0.20 — 0.35 mm (0.0079 — 0.0138 in)	
			Limit		1.0 mm (0.039 in)	
		Second ring	2000 cc	STD	0.35 — 0.50 mm (0.0138 — 0.0197 in)	
				Limit	1.0 mm (0.039 in)	
			2500 cc	STD	0.37 — 0.52 mm (0.0146 — 0.0204 in)	
				Limit	1.0 mm (0.039 in)	
	Oil ring	STD		0.20 — 0.50 mm (0.0079 — 0.0197 in)		
		Limit		1.5 mm (0.059 in)		
	Clearance between piston ring and piston ring groove	Top ring	STD		0.040 — 0.080 mm (0.0016 — 0.0031 in)	
			Limit		0.15 mm (0.0059 in)	
Second ring		STD		0.030 — 0.070 mm (0.0012 — 0.0028 in)		
		Limit		0.15 mm (0.0059 in)		
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit		0.10 mm (0.0039 in)	
	Side clearance		STD		0.070 — 0.330 mm (0.0028 — 0.0130 in)	
			Limit		0.4 mm (0.016 in)	

GENERAL DESCRIPTION

MECHANICAL

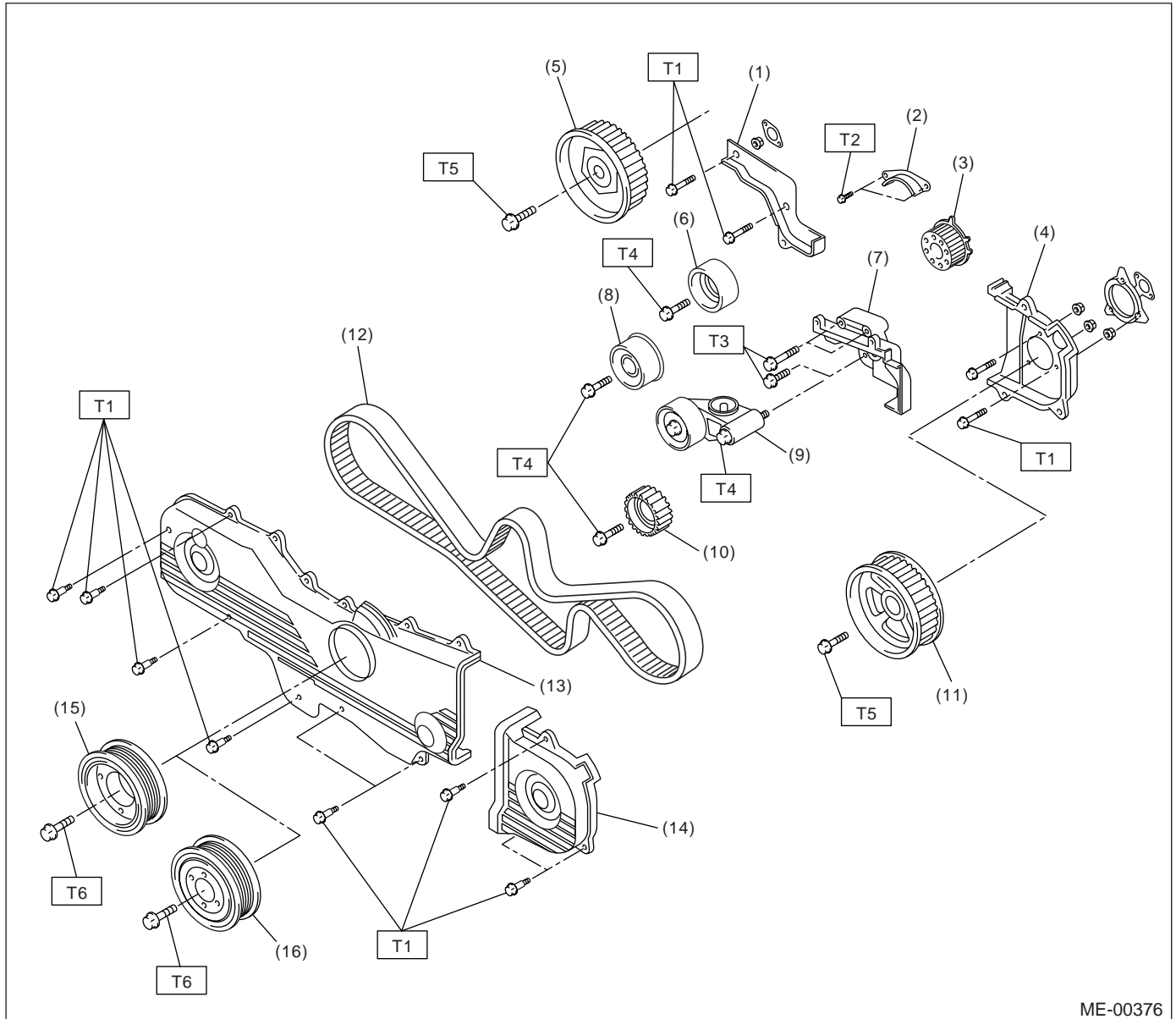
Connecting rod bearing	Oil clearance	2000 cc	STD	0.010 — 0.038 mm (0.0004 — 0.0015 in)
			Limit	0.05 mm (0.0020 in)
		2500 cc	STD	0.012 — 0.038 mm (0.0005 — 0.0015 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion	2000 cc	STD	1.492 — 1.501 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.510 — 1.513 mm (0.0594 — 0.0596 in)
			0.05 mm (0.0020 in) US	1.520 — 1.523 mm (0.0598 — 0.0600 in)
			0.25 mm (0.0098 in) US	1.620 — 1.623 mm (0.0638 — 0.0639 in)
2500 cc		STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)	
		0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)	
		0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)	
		0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)	
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)
Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.250 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
#4		STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)	
		Limit	0.045 mm (0.0018 in)	
#5		STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)	
		Limit	0.040 mm (0.0016 in)	
Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

GENERAL DESCRIPTION

MECHANICAL

B: COMPONENT

1. TIMING BELT



ME-00376

- | | |
|--|--|
| (1) Belt cover No. 2 (RH) | (9) Automatic belt tension adjuster ASSY |
| (2) Timing belt guide (MT vehicles only) | (10) Belt idler No. 2 |
| (3) Crankshaft sprocket | (11) Camshaft sprocket No. 2 |
| (4) Belt cover No. 2 (LH) | (12) Timing belt |
| (5) Camshaft sprocket No. 1 | (13) Front belt cover |
| (6) Belt idler (No. 1) | (14) Belt cover (LH) |
| (7) Tensioner bracket | (15) Crankshaft pulley (2000 cc model) |
| (8) Belt idler (No. 2) | (16) Crankshaft pulley (2500 cc model) |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 5 (0.5, 3.6)

T2: 10 (1.0, 7.2)

T3: 25 (2.5, 18.1)

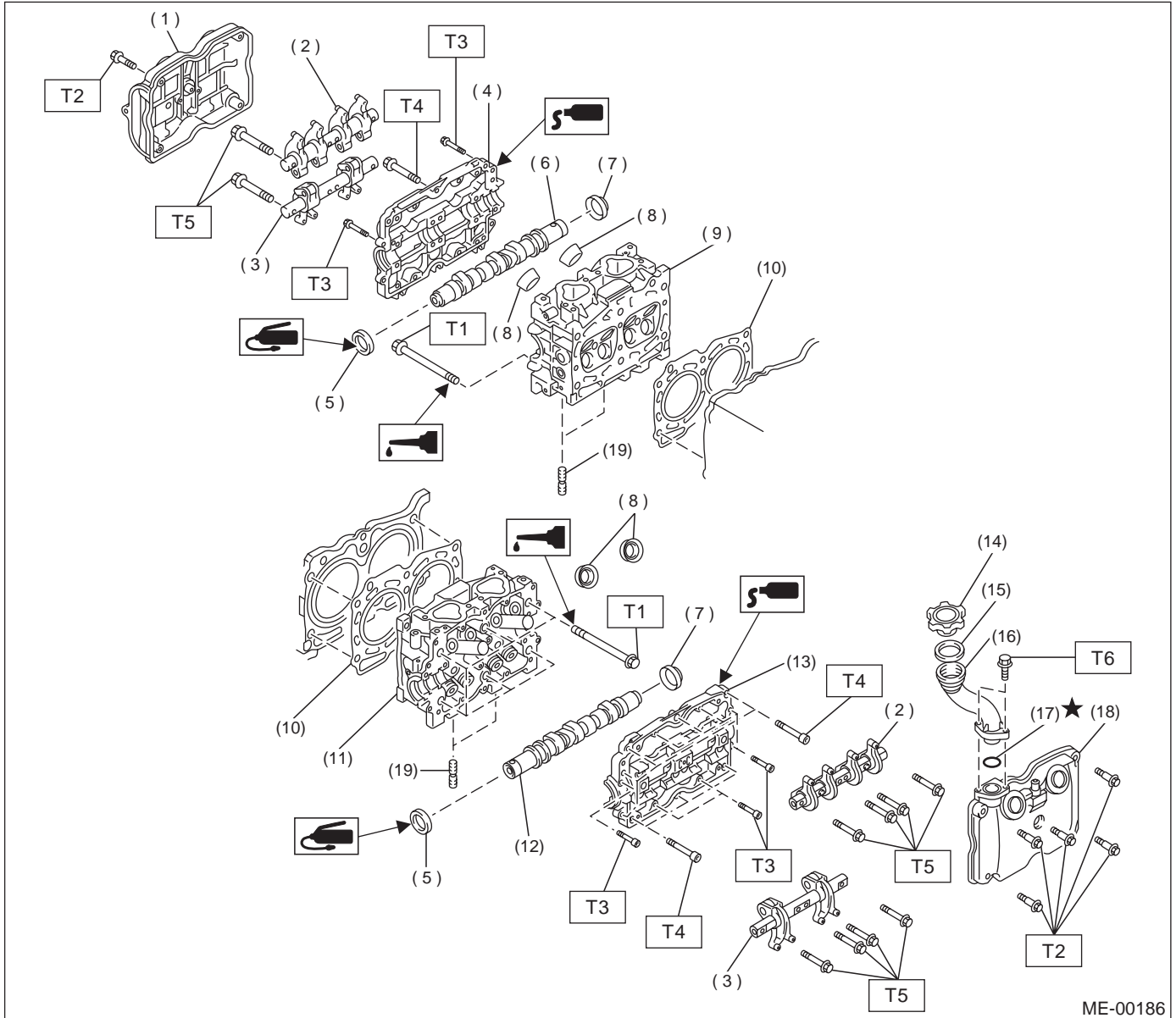
T4: 39 (4.0, 28.9)

T5: 78 (8.0, 57.9)

T6: <Ref. to ME(H4SO)-43, INSTALLATION, CRANKSHAFT PULLEY.>

ME(H4SO)-6

2. CYLINDER HEAD AND CAMSHAFT



ME-00186

- | | |
|-------------------------------|-------------------------|
| (1) Rocker cover (RH) | (11) Cylinder head (LH) |
| (2) Intake valve rocker ASSY | (12) Camshaft (LH) |
| (3) Exhaust valve rocker ASSY | (13) Camshaft cap (LH) |
| (4) Camshaft cap (RH) | (14) Oil filler cap |
| (5) Oil seal | (15) Gasket |
| (6) Camshaft (RH) | (16) Oil filler duct |
| (7) Plug | (17) O-ring |
| (8) Spark plug pipe gasket | (18) Rocker cover (LH) |
| (9) Cylinder head (RH) | (19) Stud bolt |
| (10) Cylinder head gasket | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: <Ref. to ME(H4SO)-60, CYLINDER HEAD, INSTALLATION, CYLINDER HEAD ASSEMBLY.>

T2: 5 (0.5, 3.6)

T3: 10 (1.0, 7.2)

T4: 18 (1.8, 13.0)

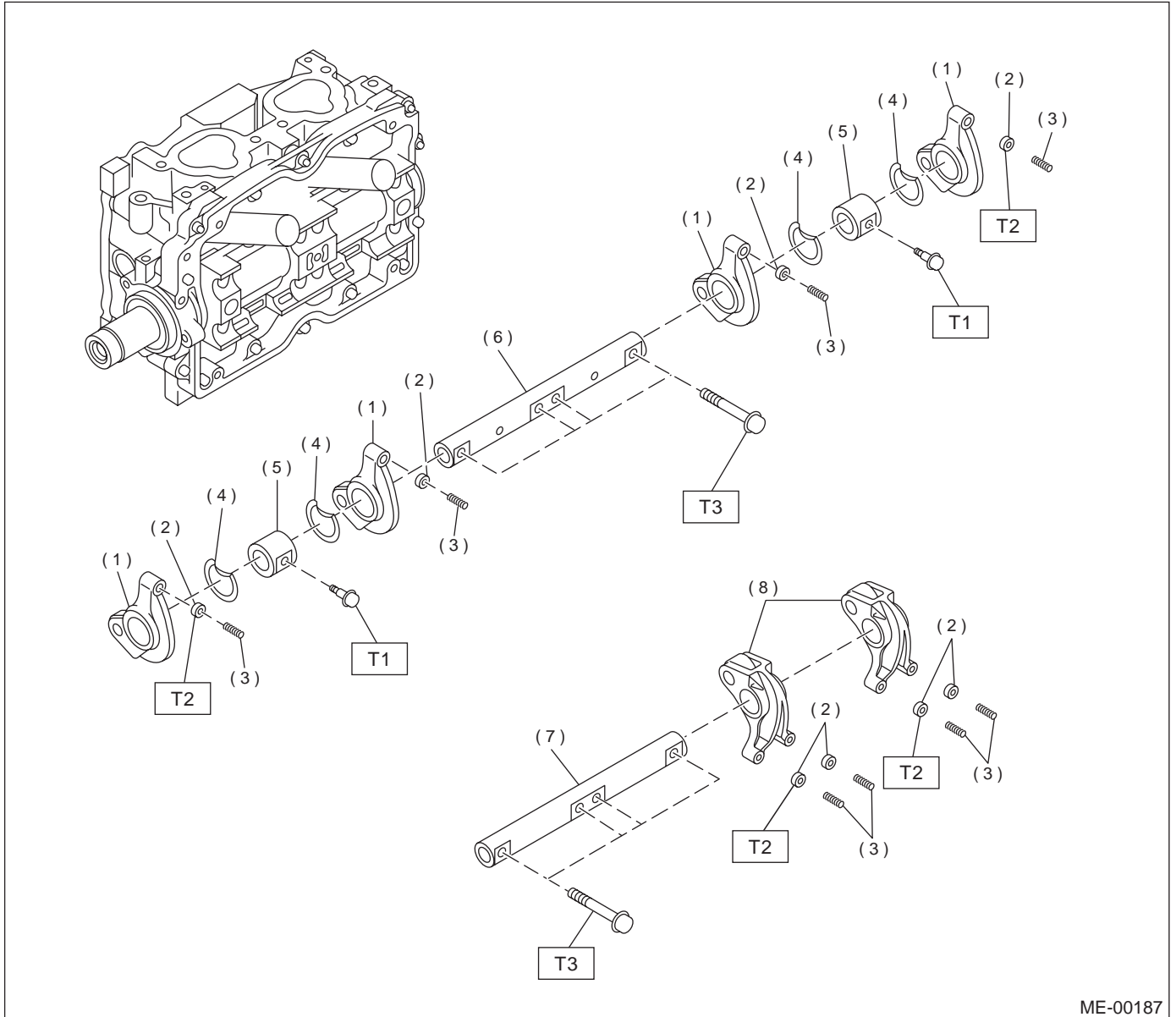
T5: 25 (2.5, 18.1)

T6: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

MECHANICAL

3. VALVE ROCKER ASSEMBLY



ME-00187

- | | |
|---------------------------------|------------------------------|
| (1) Intake valve rocker arm | (5) Rocker shaft support |
| (2) Valve rocker nut | (6) Intake rocker shaft |
| (3) Valve rocker adjuster screw | (7) Exhaust rocker shaft |
| (4) Spring | (8) Exhaust valve rocker arm |

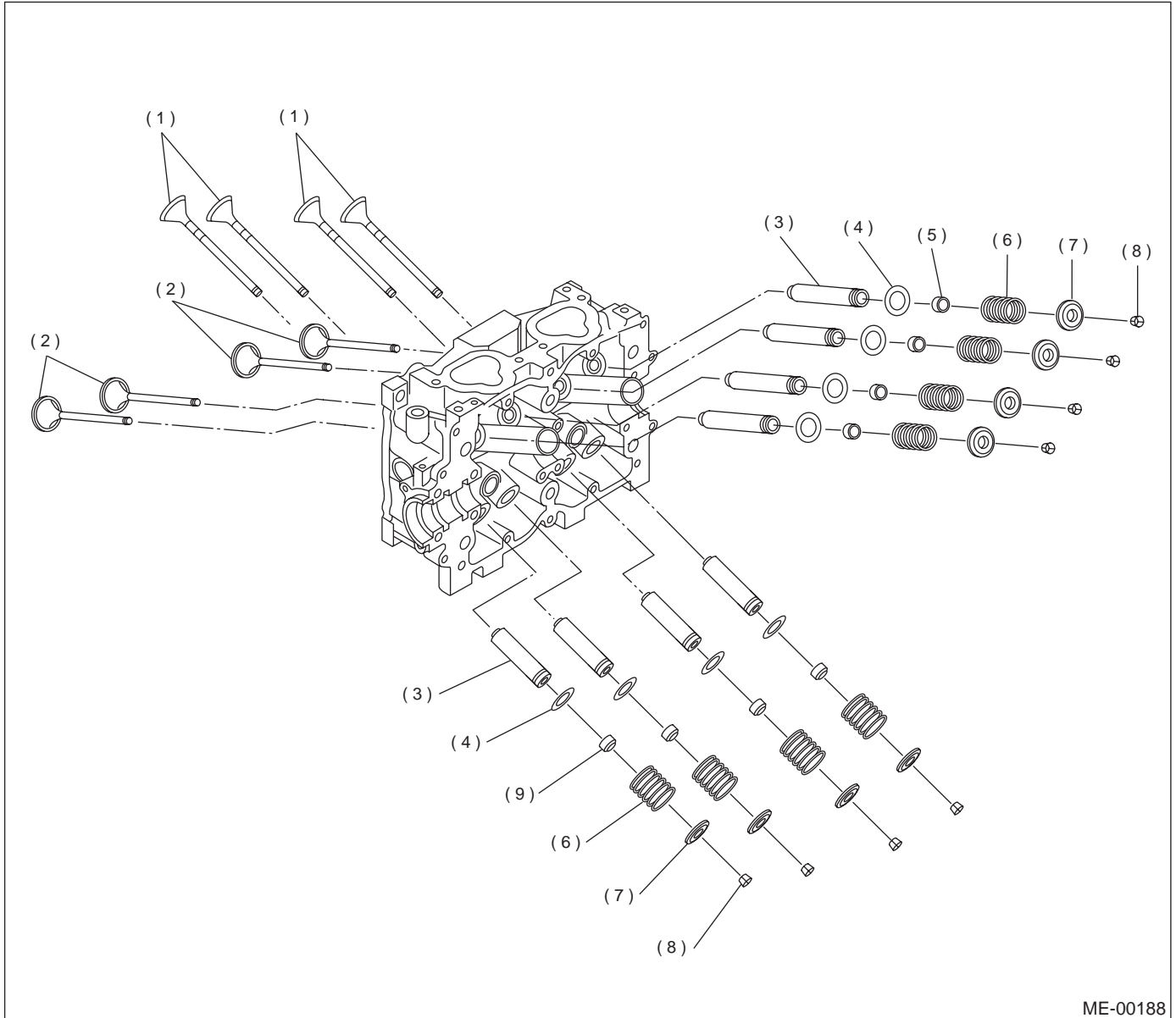
Tightening torque: N·m (kgf·m, ft·lb)

T1: 5 (0.5, 3.6)

T2: 10 (1.0, 7.2)

T3: 25 (2.5, 18.1)

4. CYLINDER HEAD AND VALVE ASSEMBLY



ME-00188

- (1) Exhaust valve
- (2) Intake valve
- (3) Valve guide

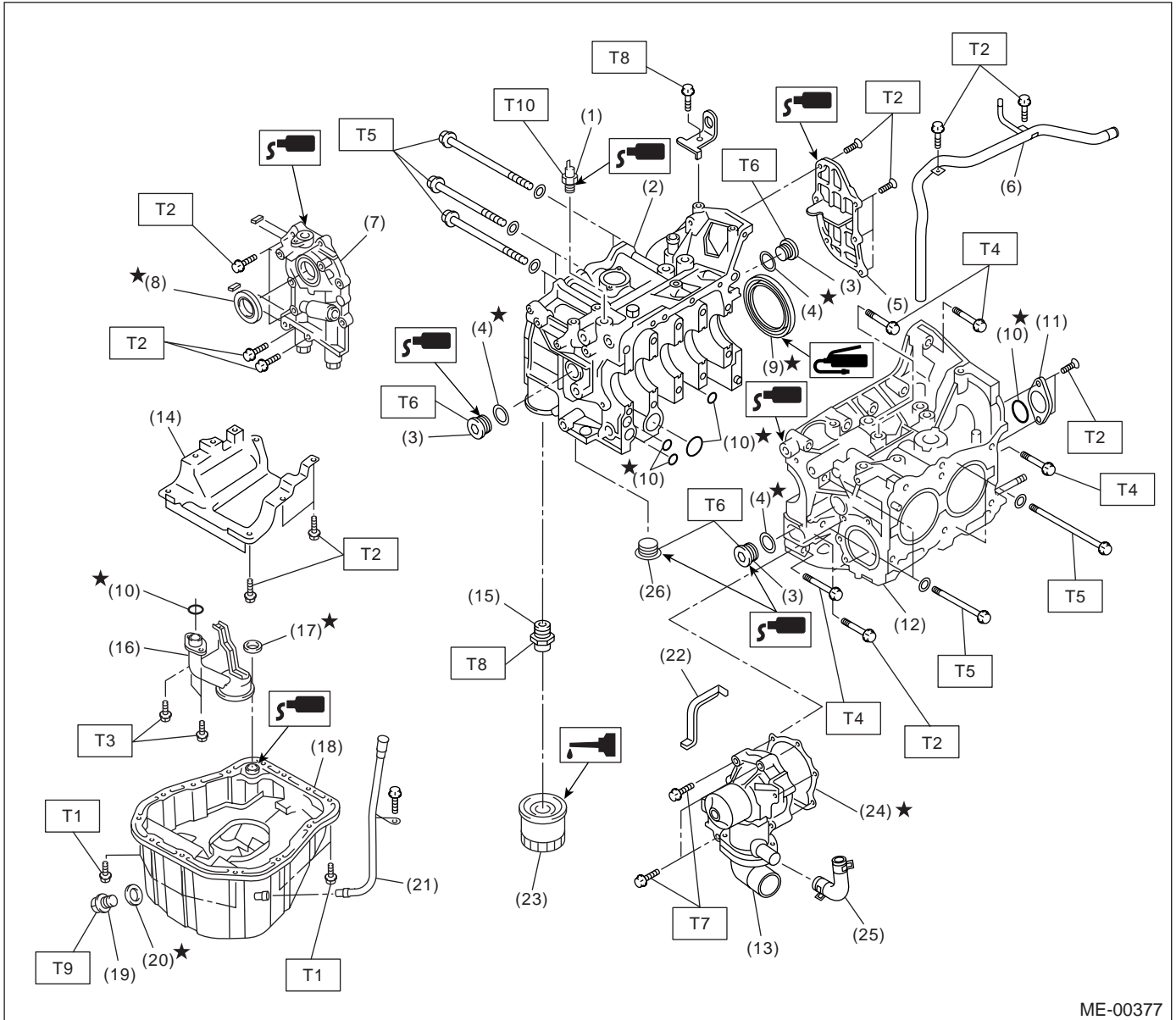
- (4) Valve spring seat
- (5) Intake valve oil seal
- (6) Valve spring

- (7) Retainer
- (8) Retainer key
- (9) Exhaust valve oil seal

GENERAL DESCRIPTION

MECHANICAL

5. CYLINDER BLOCK



ME-00377

- | | |
|--------------------------|----------------------------|
| (1) Oil pressure switch | (14) Baffle plate |
| (2) Cylinder block (RH) | (15) Oil filter connector |
| (3) Service hole plug | (16) Oil strainer |
| (4) Gasket | (17) Gasket |
| (5) Oil separator cover | (18) Oil pan |
| (6) Water by-pass pipe | (19) Drain plug |
| (7) Oil pump | (20) Metal gasket |
| (8) Front oil seal | (21) Oil level gauge guide |
| (9) Rear oil seal | (22) Water pump sealing |
| (10) O-ring | (23) Oil filter |
| (11) Service hole cover | (24) Gasket |
| (12) Cylinder block (LH) | (25) Water pump hose |
| (13) Water pump | (26) Plug |

Tightening torque: N·m (kgf·m, ft·lb)

- | |
|---|
| T1: 5 (0.5, 3.6) |
| T2: 6.4 (0.65, 4.7) |
| T3: 10 (1.0, 7) |
| T4: 25 (2.5, 18.1) |
| T5: <Ref. to ME(H4SO)-72, INSTALLATION, CYLINDER BLOCK.> |
| T6: 70 (7.1, 51) |
| T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7) |
| T8: 45 (4.6, 33) |
| T9: 44 (4.5, 33) |
| T10: 25 (2.5, 18.1) |

ME(H4SO)-10

GENERAL DESCRIPTION

MECHANICAL

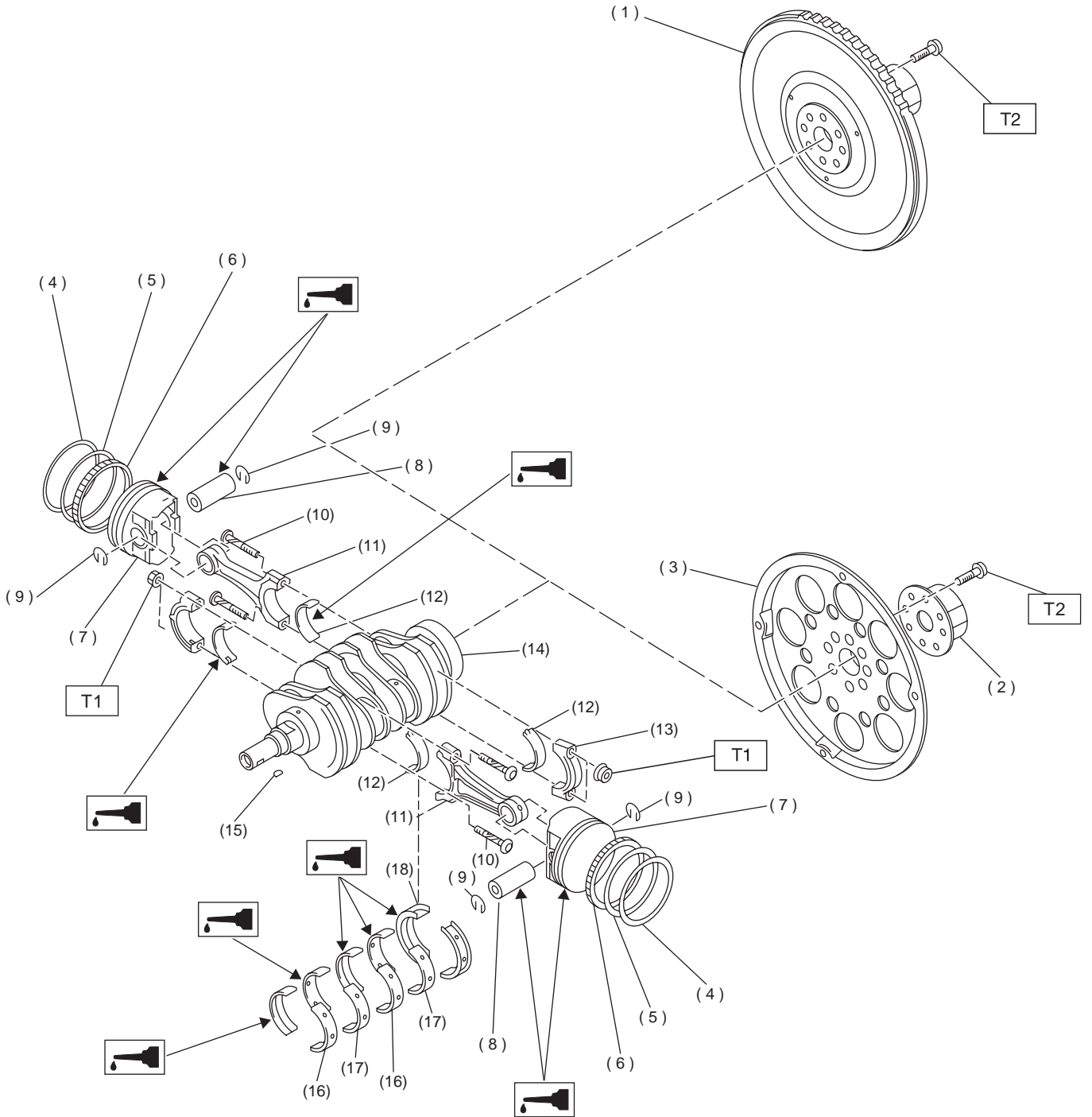
MEMO:

ME(H4SO)-11

GENERAL DESCRIPTION

MECHANICAL

6. CRANKSHAFT AND PISTON



ME-00190

ME(H4SO)-12

GENERAL DESCRIPTION

MECHANICAL

-
- | | | |
|--------------------------------------|--------------------------------|--------------------------------|
| (1) Flywheel (MT vehicles only) | (9) Circlip | (17) Crankshaft bearing #2, #4 |
| (2) Reinforcement (AT vehicles only) | (10) Connecting rod bolt | (18) Crankshaft bearing #5 |
| (3) Drive plate (AT vehicles only) | (11) Connecting rod | |
| (4) Top ring | (12) Connecting rod bearing | |
| (5) Second ring | (13) Connecting rod cap | |
| (6) Oil ring | (14) Crankshaft | |
| (7) Piston | (15) Woodruff key | |
| (8) Piston pin | (16) Crankshaft bearing #1, #3 | |

Tightening torque: N·m (kgf-m, ft-lb)

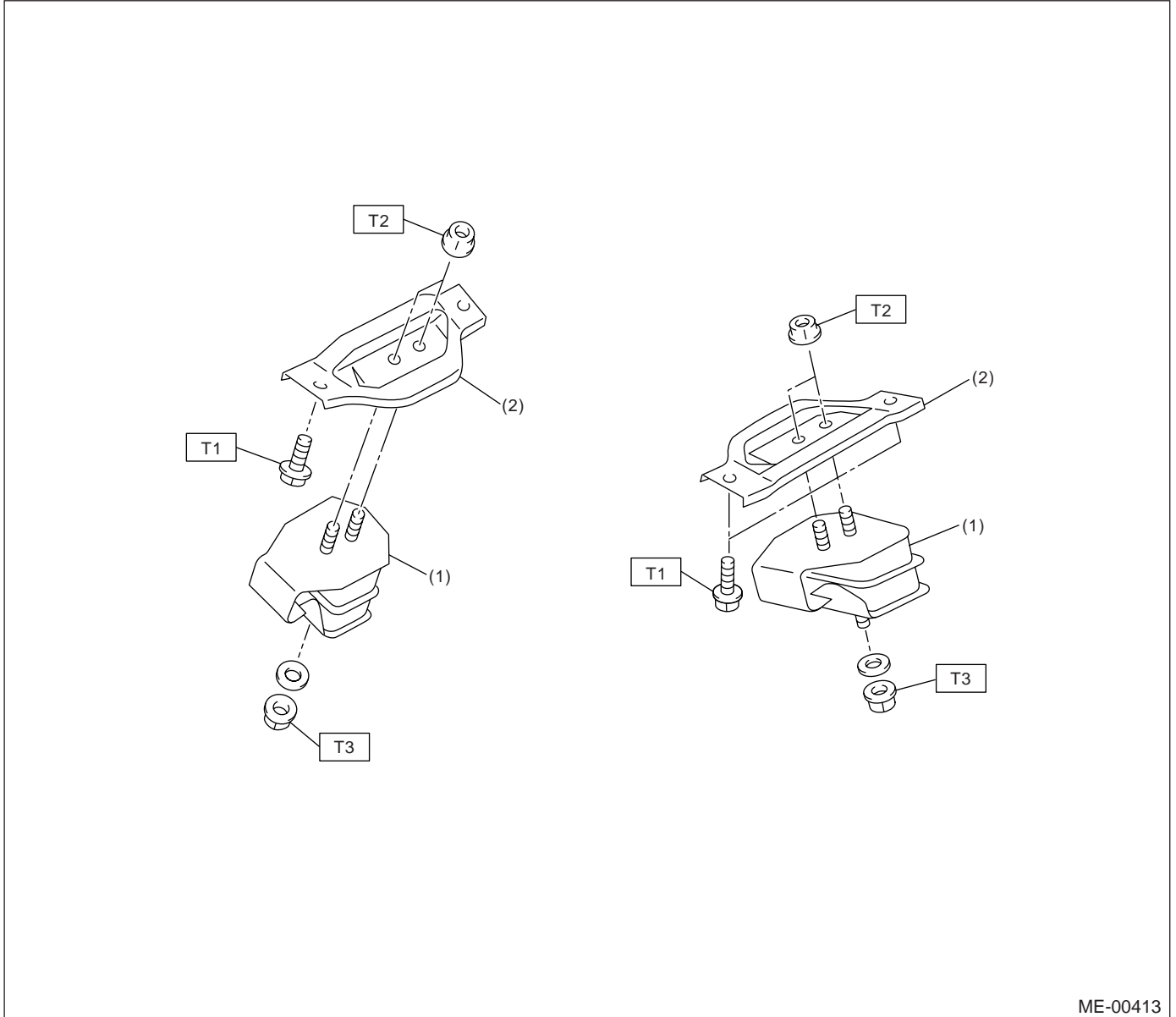
T1: 45 (4.6, 33)

T2: 72 (7.3, 52.8)

GENERAL DESCRIPTION

MECHANICAL

7. ENGINE MOUNTING



ME-00413

(1) Front cushion rubber

(3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)

T1: 35 (3.6, 25.8)

T2: 42 (4.3, 31.0)

T3: 85 (8.7, 63)

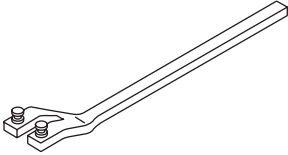
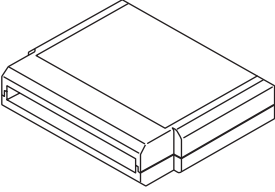
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.

- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be re-installed in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.


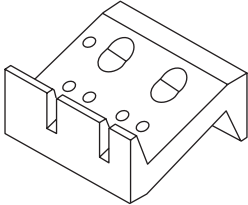
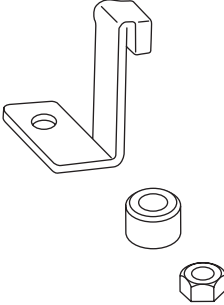
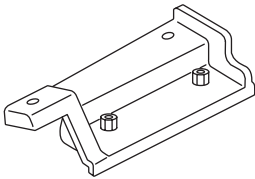
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	<ul style="list-style-type: none"> • Used for removing and installing camshaft sprocket. (LH side) • Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.

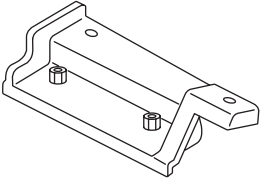
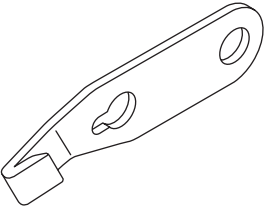
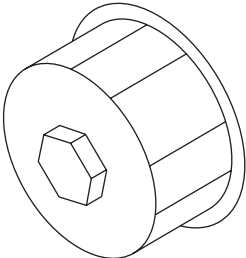
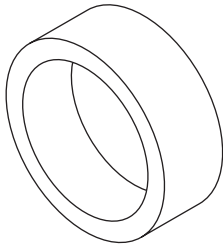
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST22771AA030</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)
 <p style="text-align: center;">ST-498267800</p>	498267800	CYLINDER HEAD TABLE	<ul style="list-style-type: none"> • Used for replacing valve guides. • Used for removing and installing valve springs.
 <p style="text-align: center;">ST-498277200</p>	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 <p style="text-align: center;">ST-498457000</p>	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).

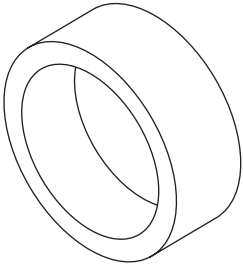
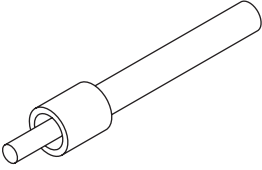
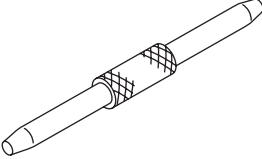
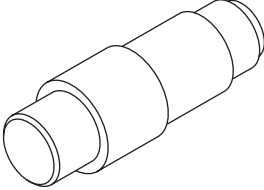
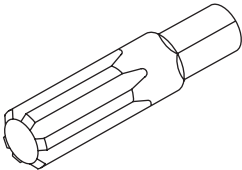
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498457100</p>	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 <p style="text-align: center;">ST-498497100</p>	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 <p style="text-align: center;">ST-498547000</p>	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 <p style="text-align: center;">ST-398744300</p>	398744300 (2000 cc model)	PISTON GUIDE	Used for installing piston in cylinder.

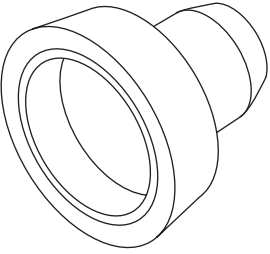
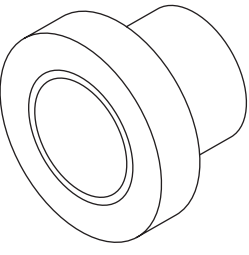
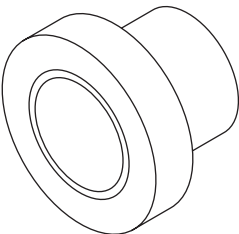
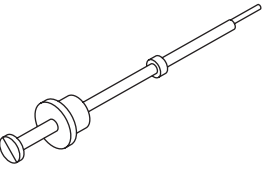
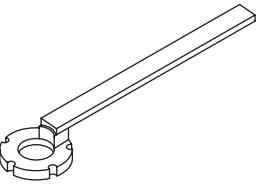
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498747300</p>	<p style="text-align: center;">498747300 (2500 cc model)</p>	<p>PISTON GUIDE</p>	<p>Used for installing piston in cylinder.</p>
 <p style="text-align: center;">ST-498857100</p>	<p style="text-align: center;">498857100</p>	<p>VALVE OIL SEAL GUIDE</p>	<p>Used for press-fitting of intake and exhaust valve guide oil seals.</p>
 <p style="text-align: center;">ST-499017100</p>	<p style="text-align: center;">499017100</p>	<p>PISTON PIN GUIDE</p>	<p>Used for installing piston pin, piston and connecting rod.</p>
 <p style="text-align: center;">ST-499037100</p>	<p style="text-align: center;">499037100</p>	<p>CONNECTING ROD BUSHING REMOVER & INSTALLER</p>	<p>Used for removing and installing connecting rod bushing.</p>
 <p style="text-align: center;">ST-499057000</p>	<p style="text-align: center;">499057000</p>	<p>TORX PLUS</p>	<p>Used for removing flywheel (Dual mass flywheel).</p>

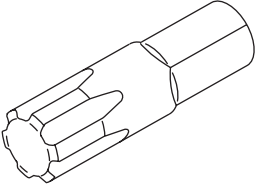
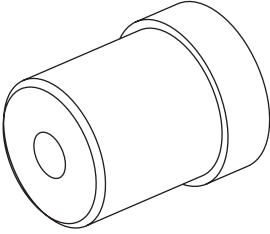
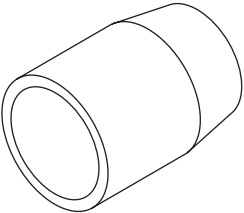
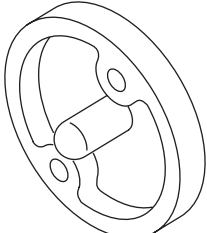
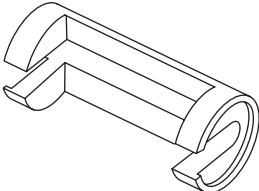
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499587200</p>	499587200	CRANKSHAFT OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 <p style="text-align: center;">ST-499587500</p>	499587500	OIL SEAL INSTALLER	Used for installing camshaft oil seal.
 <p style="text-align: center;">ST-499587700</p>	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.
 <p style="text-align: center;">ST-499097700</p>	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 <p style="text-align: center;">ST-499207400</p>	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (RH side)

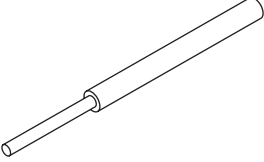
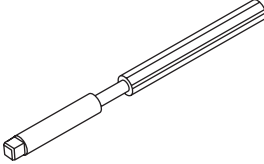
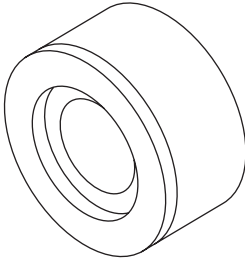
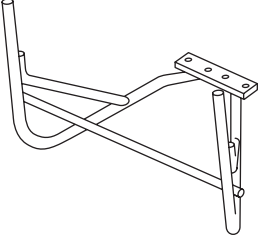
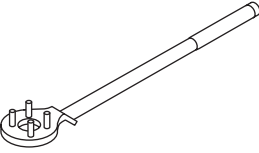
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499497000</p>	499497000	TORX PLUS	Used for removing and installing camshaft cap.
 <p style="text-align: center;">ST-499587100</p>	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 <p style="text-align: center;">ST-499597000</p>	499597000	OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing camshaft oil seal. • Used with CAMSHAFT OIL SEAL INSTALLER (499587500).
 <p style="text-align: center;">ST-499597100</p>	499597100	CRANKSHAFT OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 <p style="text-align: center;">ST-499718000</p>	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

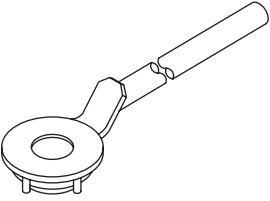
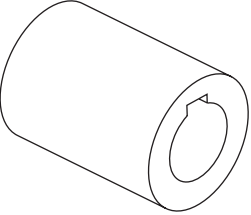
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499767200</p>	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 <p style="text-align: center;">ST-499767400</p>	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 <p style="text-align: center;">ST-499767700</p>	499767700 (Intake side) 499767800 (Exhaust side)	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 <p style="text-align: center;">ST-499817100</p>	499817100	ENGINE STAND	<ul style="list-style-type: none"> • Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 <p style="text-align: center;">ST-499977100</p>	499977100 (2500 cc model)	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.

GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400 (2000 cc model)	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Tachometer (Secondary pick-up type)	Used for measuring idle speed.
Timing Light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Valve Rocker Assembly
- Camshaft
- Cylinder Head

2. Compression

A: INSPECTION

CAUTION:

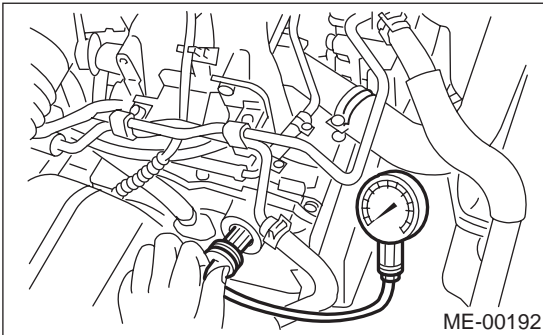
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Lower the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(H4SO)-5, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for suitable performance and operation.
- 7) Hold the compression gauge tight against spark plug hole.

NOTE:

When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

- 8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):

Standard;

1,275 kPa (13.0 kg/cm², 185 psi)

Limit;

1,079 kPa (11.0 kg/cm², 156 psi)

Difference between cylinders;

49 kPa (0.5 kg/cm², 7 psi), or less

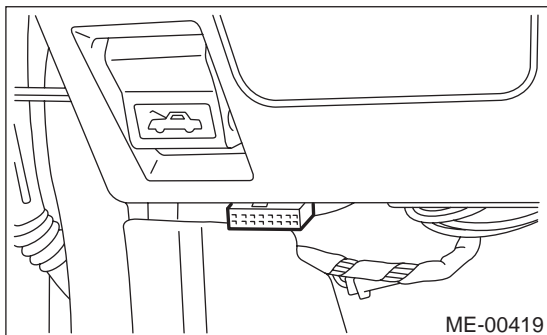
IDLE SPEED

MECHANICAL

3. Idle Speed

A: INSPECTION

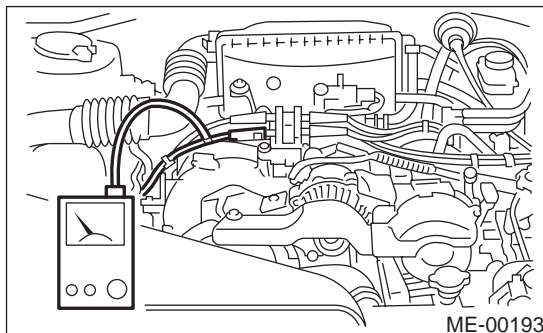
- 1) Before checking idle speed, check the following:
 - (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and the hoses are connected properly.
 - (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
- 2) Warm-up the engine.
- 3) Stop the engine, and then turn the ignition switch to OFF.
- 4) When using the SUBARU SELECT MONITOR <Ref. to ME(H4SO)-15, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
 - (1) Insert the cartridge to SUBARU SELECT MONITOR.
 - (2) Connect the SUBARU SELECT MONITOR to data link connector.



- (3) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
- (4) Select the {2. Each System Check} in Main Menu.
- (5) Select the {Engine Control System} in Selection Menu.
- (6) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
- (7) Select the {1.12 Data Display} in Data Display Menu.
- (8) Start the engine, and then read the engine idle speed.

- 5) When using the tachometer (Secondary pick-up type).

- (1) Attach the pick-up clip to No. 1 cylinder spark plug cord.
- (2) Start the engine, and then read the engine idle speed.



NOTE:

- When using the OBD-II general scan tool, carefully read its operation manual.
 - This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.
- 6) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral (MT vehicles), or N or P (AT vehicles) position]:
650±100 rpm

- 7) Check the idle speed when loaded. (Turn the air conditioning switch to "ON" and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C "ON", no load and gears in neutral (MT vehicles) or N or P (AT vehicles) position]:
850±100 rpm

NOTE:

Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted. If the specified idle speed cannot be maintained, refer to General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

CAUTION:

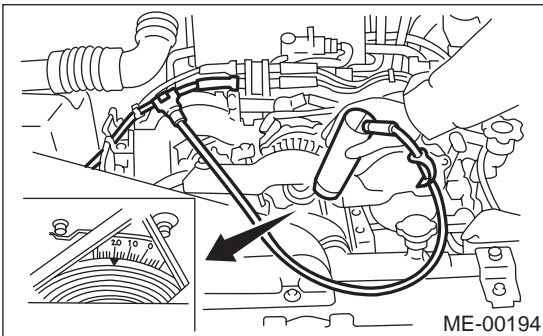
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) Warm-up the engine.
- 2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, and illuminate the timing mark with timing light.
- 3) Start the engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:

$10^{\circ} \pm 10^{\circ} / 700$ (MT vehicles)

$15^{\circ} \pm 10^{\circ} / 700$ (2.5 L AT vehicles)



If the timing is not correct, check the ignition control system.

Refer to Engine Control System. <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>

INTAKE MANIFOLD VACUUM

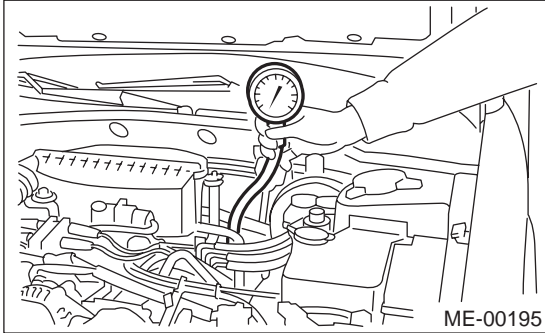
MECHANICAL

5. Intake Manifold Vacuum

A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
- 3) Keep the engine at idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



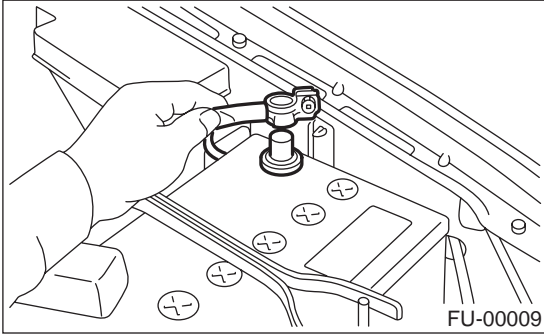
Vacuum pressure (at idling, A/C "OFF"):
Less than -60.0 kPa (-450 mmHg, -17.72 inHg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system.

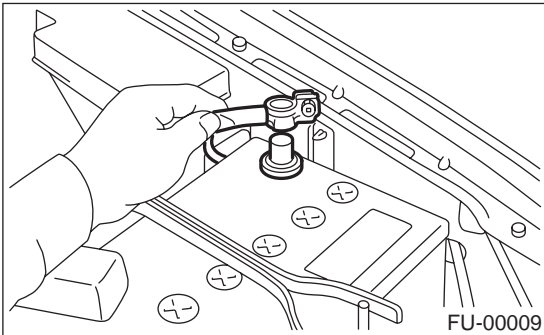
6. Engine Oil Pressure

A: INSPECTION

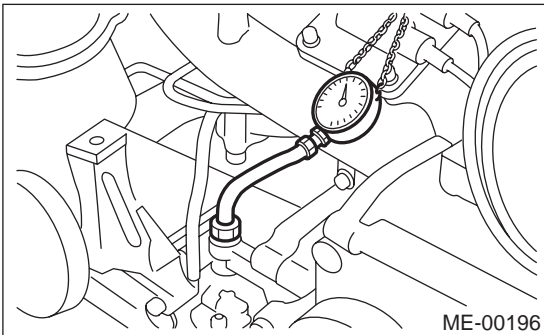
- 1) Disconnect the ground cable from battery.



- 2) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
 3) Disconnect the connector from oil pressure switch.
 4) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(H4SO)-17, REMOVAL, Oil Pressure Switch.>
 5) Connect the oil pressure gauge hose to cylinder block.
 6) Connect the battery ground cable to battery.



- 7) Start the engine, and then measure the oil pressure.



Oil pressure:

88 kPa (0.9 kg/cm², 13 psi) or more at 800 rpm
294 kPa (3.0 kg/cm², 43 psi) or more at 5,000 rpm

CAUTION:

- If the oil pressure is out of specification, check the oil pump, oil filter and lubrication line. <Ref. to LU(H4SO)-19, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(H4SO)-19, Inspection, Engine Lubrication System Trouble in General.>

NOTE:

The specified data is based on an engine oil temperature of 80°C (176°F).

- 8) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4SO)-17, Installation, Oil Pressure Switch.>

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

- 9) Install the generator and V-belt in the reverse order of removal, and then adjust the V-belt deflection. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

FUEL PRESSURE

MECHANICAL

7. Fuel Pressure

A: INSPECTION

WARNING:

Before removing the fuel pressure gauge, lower the fuel pressure.

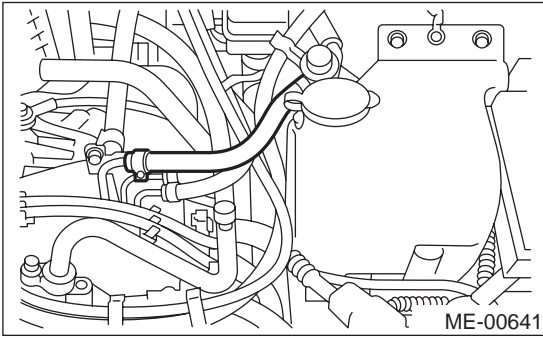
NOTE:

If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

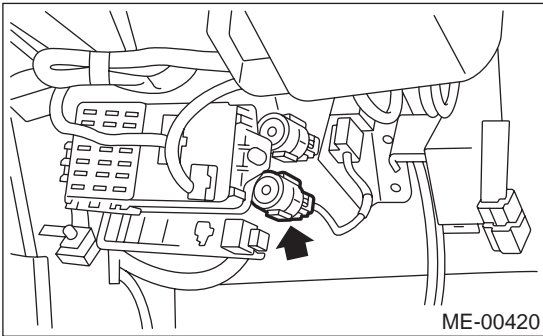
1) Lower the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Open the fuel flap lid, and then remove the fuel filler cap.

3) Disconnect the fuel delivery hoses from fuel damper, and then connect the fuel pressure gauge.



4) Connect the connector of fuel pump relay.

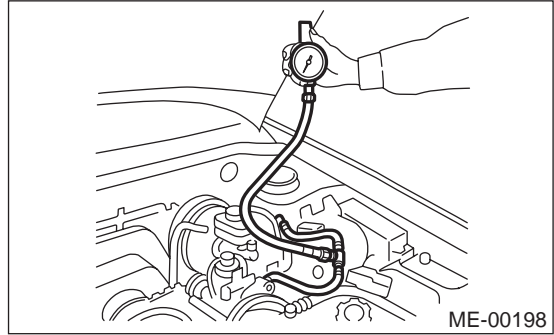


5) Start the engine.

6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:

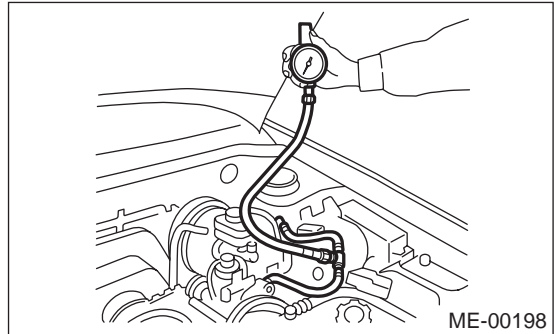
Standard; 284 — 314 kPa (2.9 — 3.2 kg/cm², 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:

Standard; 206 — 235 kPa (2.1 — 2.4 kg/cm², 30 — 34 psi)



NOTE:

The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kg/cm², 1 to 3 psi) higher than standard values during high-altitude operations.

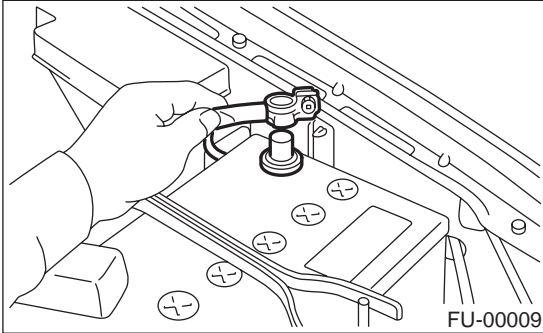
8. Valve Clearance

A: INSPECTION

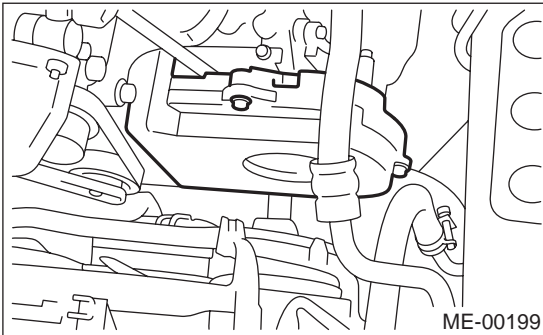
NOTE:

Inspection and adjustment of the valve clearance should be performed while engine is cold.

- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Lower the vehicle.
- 5) Disconnect the ground cable from battery.



- 6) Remove the belt cover (LH).

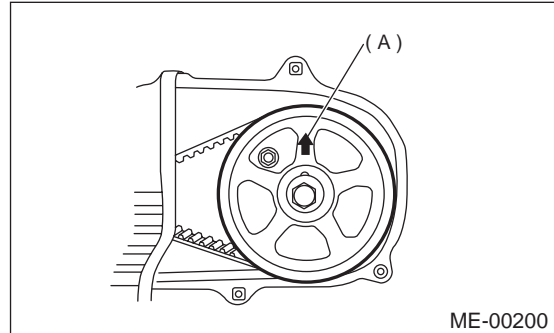


- 7) When inspecting the #1 and #3 cylinders;
 - (1) Disconnect the spark plug cords from spark plugs (RH side).
 - (2) Disconnect the PCV hose from rocker cover (RH).
 - (3) Remove the bolts, and then remove the rocker cover (RH).
- 8) When inspecting the #2 and #4 cylinders;
 - (1) Disconnect the spark plug cords from spark plugs (LH Side).
 - (2) Disconnect the PCV hose from rocker cover (LH).
 - (3) Remove the bolts, and then remove the rocker cover (LH).

- 9) Set the #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise using a socket wrench.

NOTE:

When arrow mark (A) on the camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



- 10) Measure the #1 cylinder valve clearance by using thickness gauge.

CAUTION:

- Insert the thickness gauge (A) in as horizontal a direction as possible with respect to the valve stem end face.
- Measure the exhaust valve clearances while lifting-up the vehicle.

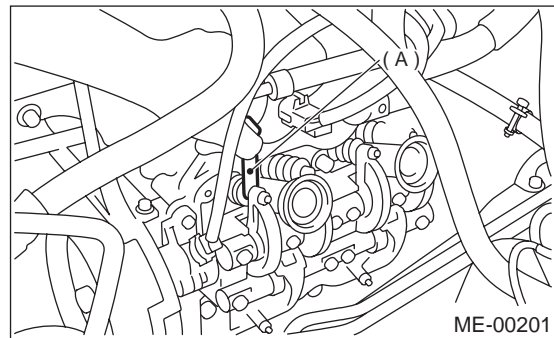
Valve clearance:

Intake;

$0.20 \pm 0.02 \text{ mm (} 0.0079 \pm 0.0008 \text{ in)}$

Exhaust;

$0.25 \pm 0.02 \text{ mm (} 0.0098 \pm 0.0008 \text{ in)}$



- 11) If necessary, adjust the valve clearance. <Ref. to ME(H4SO)-30, ADJUSTMENT, Valve Clearance.>

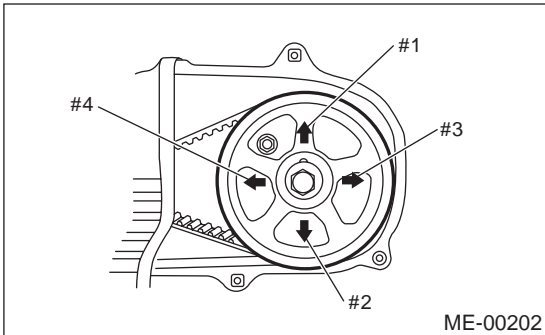
VALVE CLEARANCE

MECHANICAL

12) Similar to measurement procedures used for #1 cylinder, measure the #2, #3 and #4 cylinder valve clearances.

NOTE:

- Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.
- To set the #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn the crankshaft pulley clockwise 90° at a time starting with arrow mark on camshaft sprocket (LH) facing up.

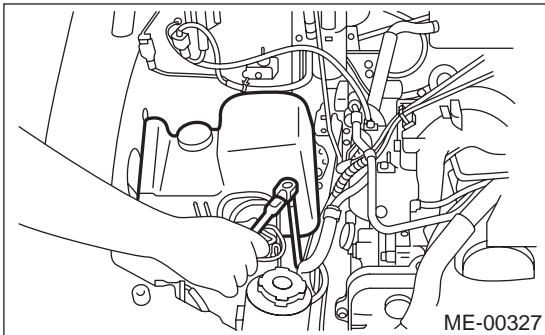


13) After inspection, install the related parts in the reverse order of removal.

Resonator chamber;

Air cleaner case;

33 N·m (3.4 kgf-m, 25 ft-lb)



B: ADJUSTMENT

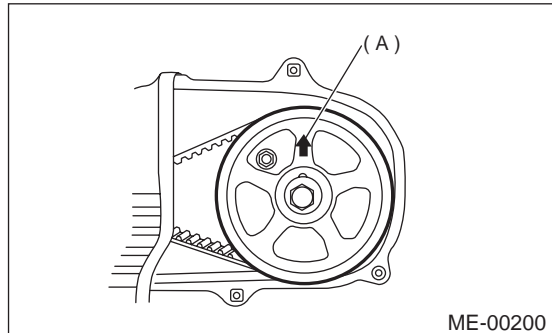
NOTE:

Adjustment of the valve clearance should be performed while engine is cold.

1) Set the #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise using socket wrench.

NOTE:

When arrow mark (A) on the camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



2) Adjust the #1 cylinder valve clearance.

- (1) Loosen the valve rocker nut and screw.
- (2) Place suitable thickness gauge.
- (3) While noting the valve clearance, tighten the valve rocker adjuster screw.
- (4) When specified valve clearance is obtained, tighten the valve rocker nut.

Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)

CAUTION:

- Insert the thickness gauge in as horizontal a direction as possible with respect to the valve stem end face.
- Adjust the exhaust valve clearances while lifting up the vehicle.

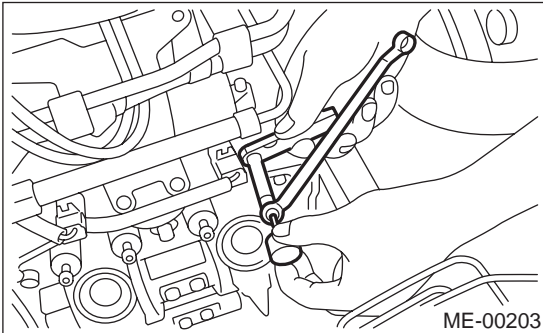
Valve clearance:

Intake;

0.20 ± 0.02 mm (0.0079 ± 0.0008 in)

Exhaust;

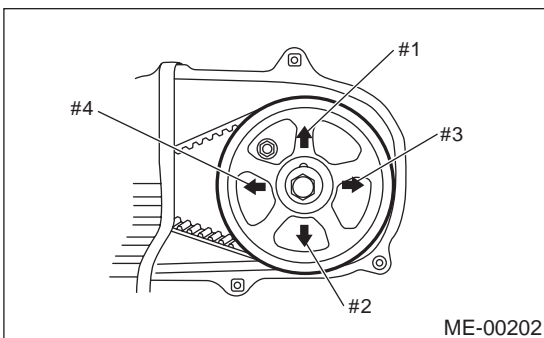
0.25 ± 0.02 mm (0.0098 ± 0.0008 in)



- 3) Ensure the valve clearances are within specifications.
- 4) Turn the crankshaft two complete rotations until #1 cylinder piston is again set to the top dead center on compression stroke.
- 5) Ensure the valve clearances are within specifications. If necessary, readjust the valve clearances.
- 6) Similar to adjustment procedures used for #1 cylinder, adjust the #2, #3 and #4 cylinder valve clearances.

NOTE:

- Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
- To set the #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn the crankshaft pulley clockwise 90° at a time starting with arrow mark on camshaft sprocket (LH) facing up.



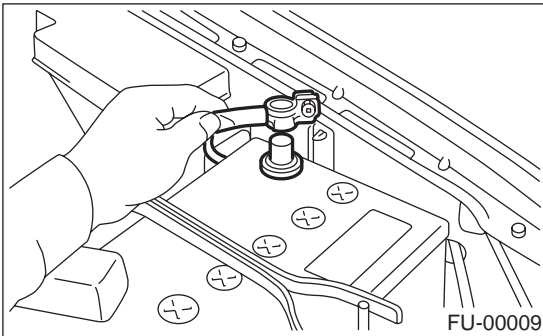
ENGINE ASSEMBLY

MECHANICAL

9. Engine Assembly

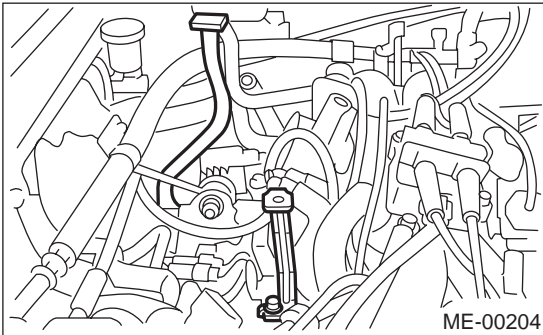
A: REMOVAL

- 1) Set the vehicle on lift arms.
- 2) Open the front hood fully, and then support with the hood stay.
- 3) Lower the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Disconnect the A/C pressure hoses from A/C compressor.
- 5) Remove the fuel filler cap.
- 6) Disconnect the ground cable from battery.

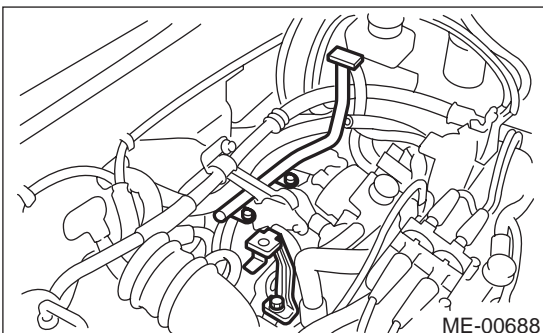


- 7) Remove the air intake duct and air cleaner case. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-6, Removal, Air Cleaner Case.>
- 8) Remove the under cover.
- 9) Remove the radiator from vehicle. <Ref. to CO(H4SO)-23, REMOVAL, Radiator.>
- 10) Remove the air cleaner case stay.

• MT VEHICLES

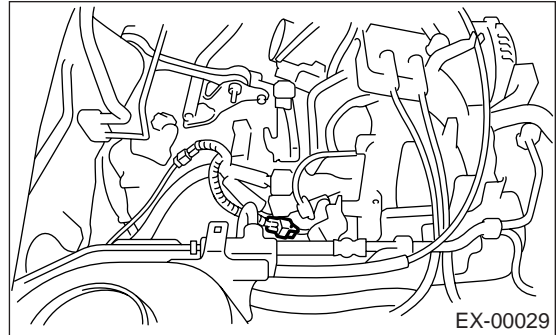


• AT VEHICLES

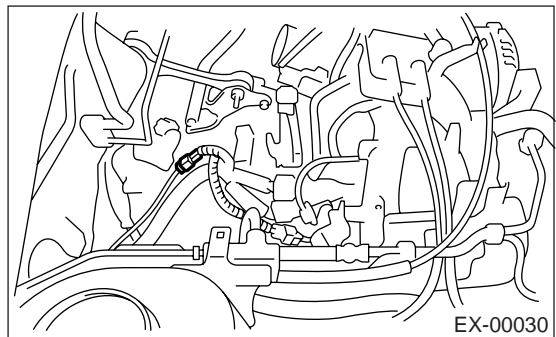


- 11) Disconnect the following connectors and cables.

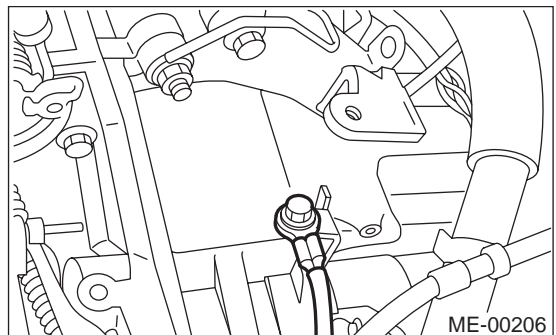
(1) Front oxygen (A/F) sensor connector



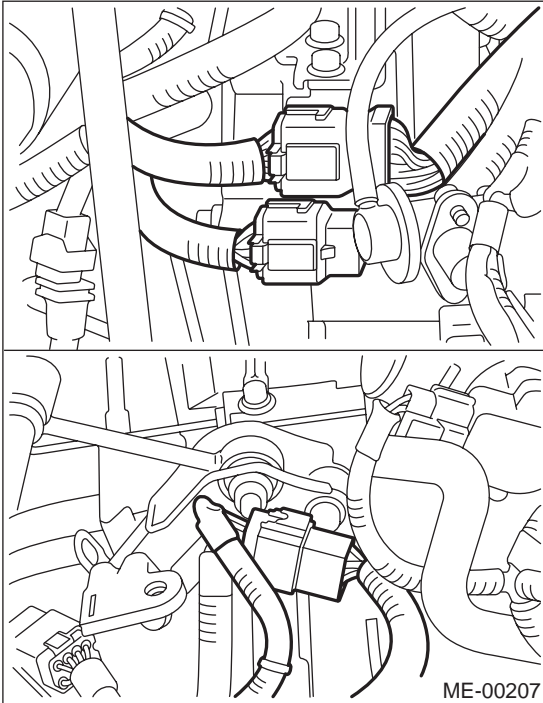
(2) Rear oxygen sensor connector



(3) Engine ground cable

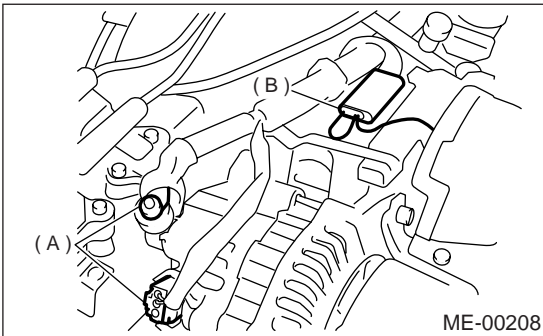


(4) Engine harness connectors



ME-00207

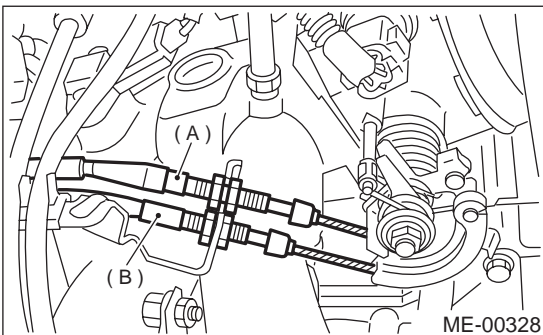
(5) Generator connector, terminal and A/C compressor connector



ME-00208

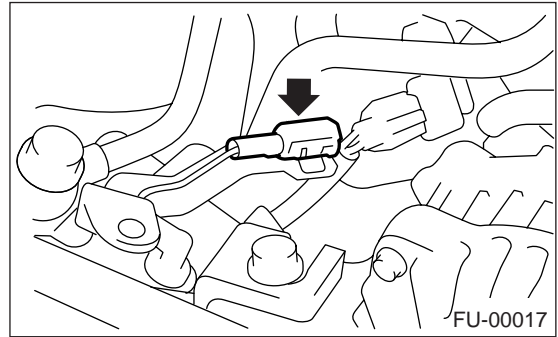
- (A) Generator connector and terminal
- (B) A/C compressor connector

(6) Accelerator cable (A) and cruise control cable (B)



ME-00328

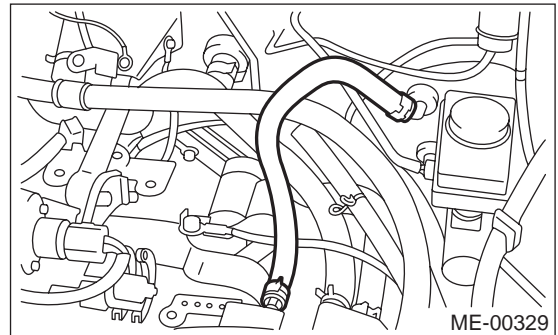
(7) Pressure switch



FU-00017

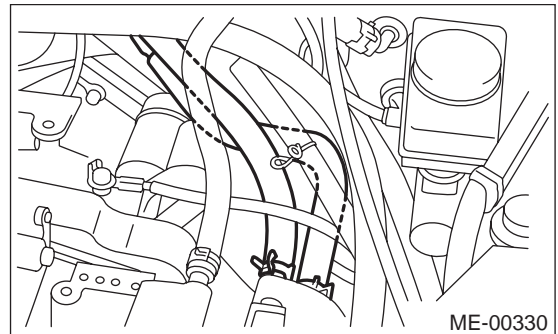
12) Disconnect the following hoses.

- (1) Brake booster vacuum hose



ME-00329

- (2) Heater inlet outlet hose



ME-00330

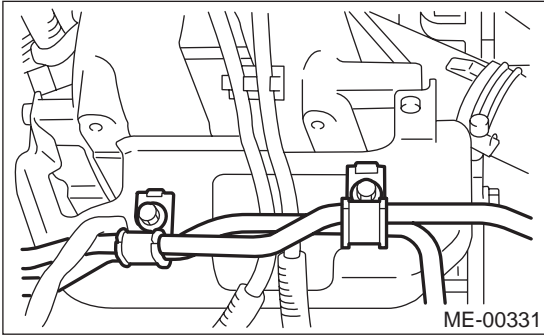
13) Remove the power steering pump from bracket.

- (1) Remove the resonator chamber.
- (2) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(H4SO)-41, FRONT SIDE BELT, REMOVAL, V-belt.>

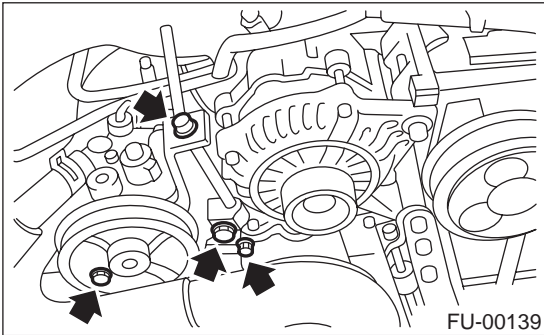
ENGINE ASSEMBLY

MECHANICAL

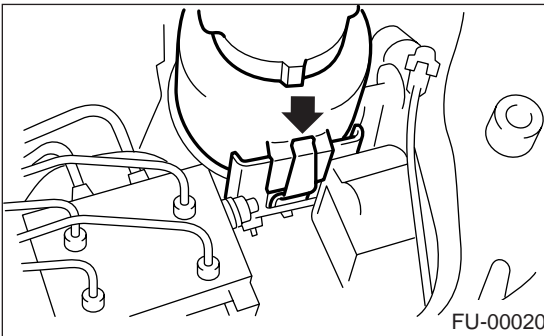
(3) Remove the pipe with bracket.



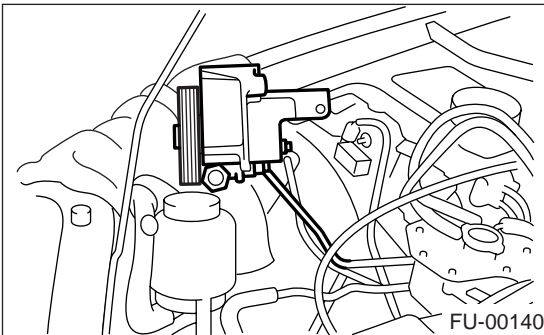
(4) Remove the bolts which install power steering pump bracket.



(5) Remove the power steering tank from the bracket by pulling it upward.

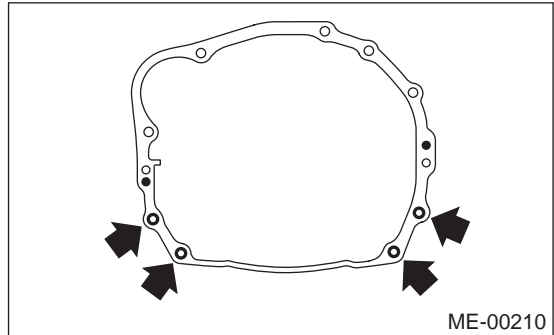


(6) Place the power steering pump on right side wheel apron.

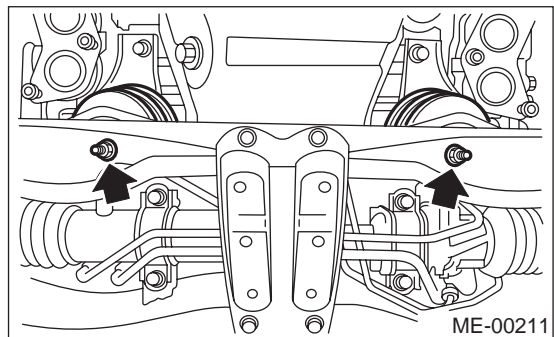


14) Remove the front and center exhaust pipe.
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>

15) Remove the nuts which hold lower side of transmission to engine.

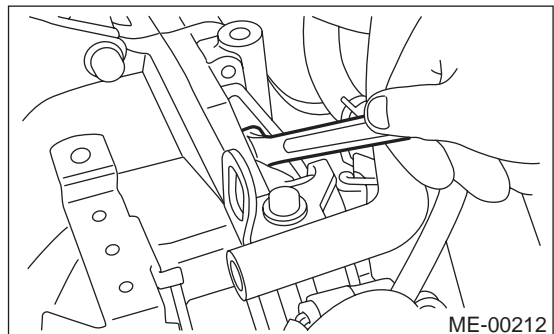


16) Remove the nuts which install front cushion rubber onto front crossmember.

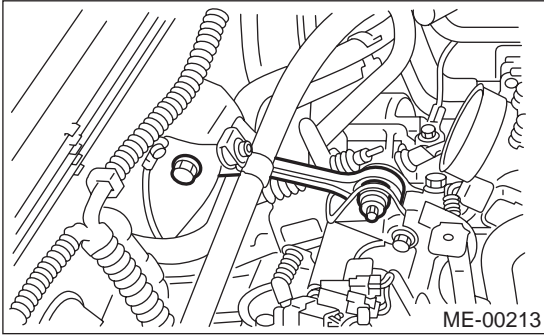


17) Separate the torque converter clutch from drive plate. (AT vehicles)

- (1) Lower the vehicle.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold torque converter clutch to drive plate.
- (4) Remove other bolts while rotating the engine using socket wrench.



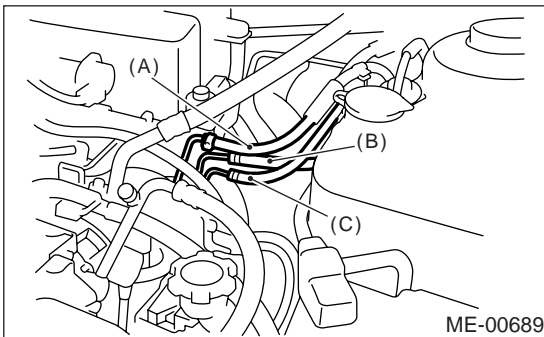
18) Remove the pitching stopper.



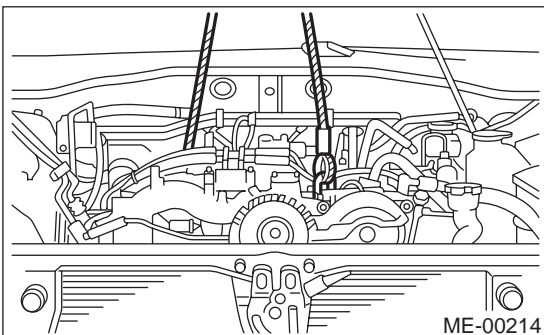
19) Disconnect the fuel delivery hose (A), return hose (B) and evaporation hose (C).

CAUTION:

- Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.
- Catch fuel from the hose into container.



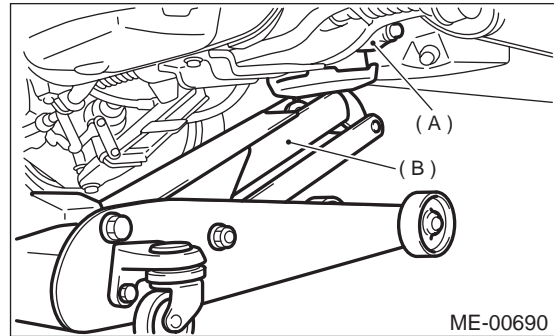
20) Support the engine with a lifting device and wire ropes.



21) Support the transmission with a garage jack.

CAUTION:

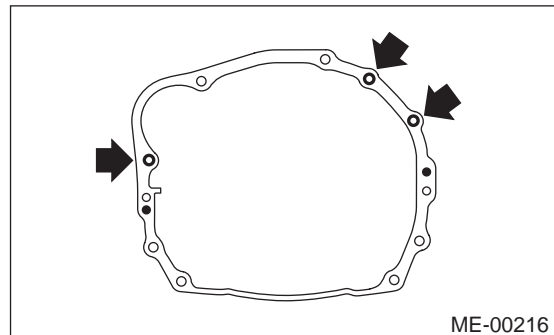
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because the transmission lowers under its own weight.



- (A) Transmission
- (B) Garage jack

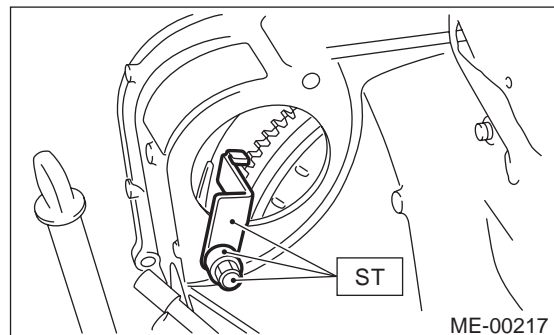
22) Separation of the engine and transmission.

- (1) Remove the starter. <Ref. to SC(H4SO)-6, REMOVAL, Starter.>
- (2) Remove the bolts which hold upper side of transmission to engine.



23) Install the ST to torque converter clutch case. (AT vehicles)

ST 498277200 STOPPER SET



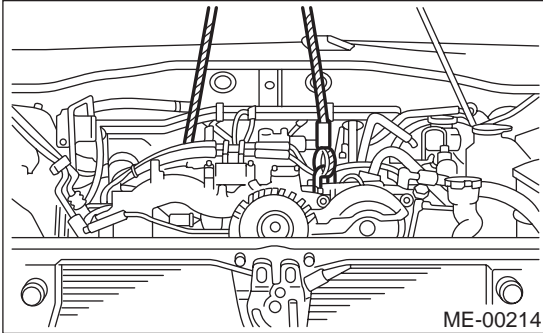
ENGINE ASSEMBLY

MECHANICAL

- 24) Remove the engine from vehicle.
- (1) Slightly raise the engine.
 - (2) Raise the transmission with garage jack.
 - (3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
 - (4) Slowly move the engine away from engine compartment.

NOTE:

Be careful not to damage the adjacent parts or body panels with crankshaft pulley, oil level gauge, etc.



- 25) Remove the front cushion rubbers.

B: INSTALLATION

- 1) Install the front cushion rubbers.

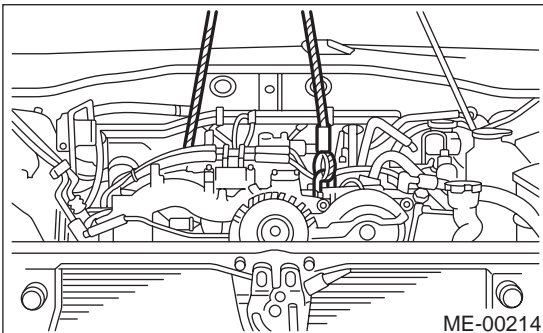
Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

- 2) Install the engine onto transmission.
- (1) Position the engine in engine compartment and align it with transmission.

NOTE:

Be careful not to damage the adjacent parts or body panels with crankshaft pulley, oil level gauge, etc.

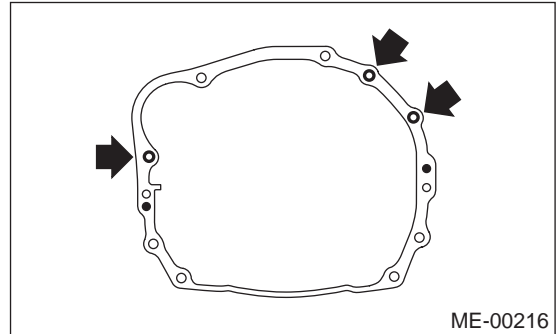


- (2) Apply a small amount of grease to the spline of main shaft. (MT vehicles)

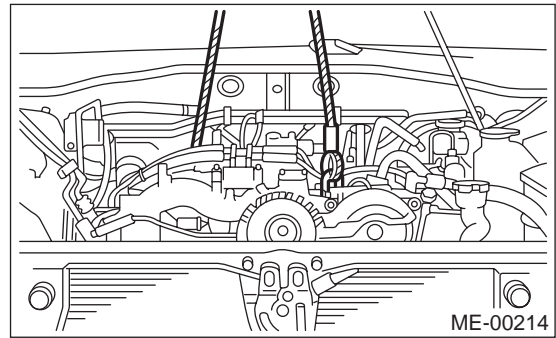
- 3) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



- 4) Remove the lifting device and wire ropes.

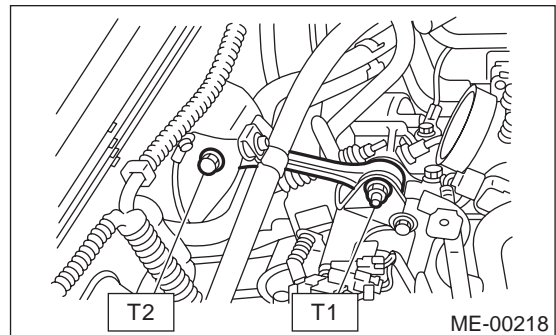


- 5) Remove the garage jack.
6) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



- 7) Remove the ST from torque converter clutch case. (AT vehicles)

NOTE:

Be careful not to drop the ST into torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

- 8) Install the starter. <Ref. to SC(H4SO)-6, Installation, Starter.>

9) Install the torque converter clutch onto drive plate. (AT vehicles)

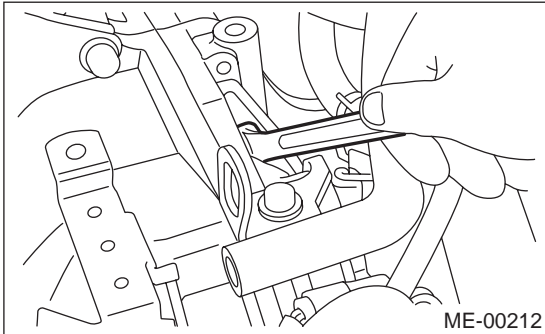
- (1) Tighten the bolts which hold torque converter clutch to drive plate.
- (2) Tighten other bolts while rotating the engine by using a socket wrench.

NOTE:

Be careful not to drop the bolts into torque converter clutch housing.

Tightening torque:

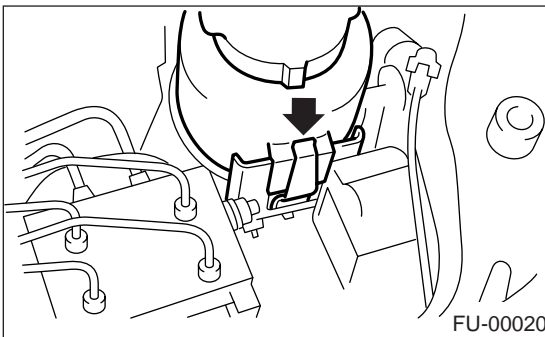
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(3) Clog the plug onto service hole.

10) Install the power steering pump on bracket.

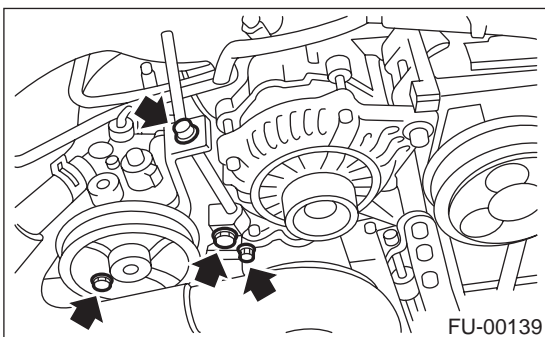
(1) Install the power steering tank on bracket.



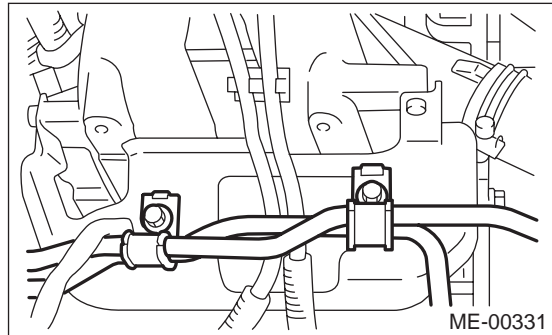
(2) Install the power steering pump on bracket, and then tighten the bolts.

Tightening torque:

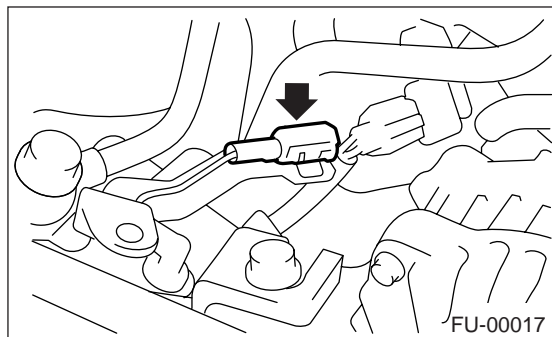
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Tighten the bolts which install power steering pump bracket, and then install the spark plug cords.



(4) Connect the power steering switch connector.

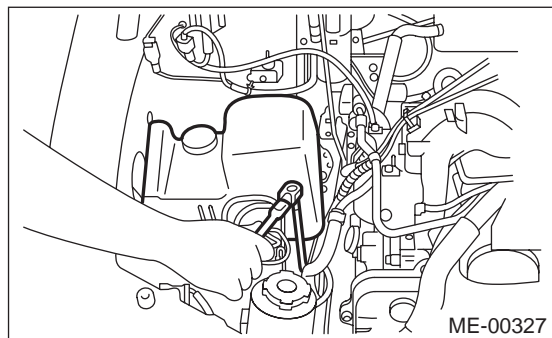


(5) Install the front side V-belt, and adjust it. <Ref. to ME(H4SO)-42, FRONT SIDE BELT, INSTALLATION, V-belt.>

(6) Install the resonator chamber.

Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



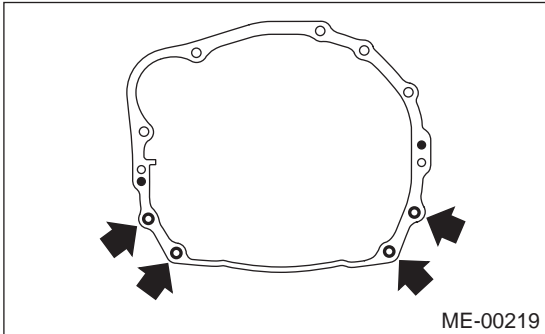
ENGINE ASSEMBLY

MECHANICAL

11) Tighten the nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



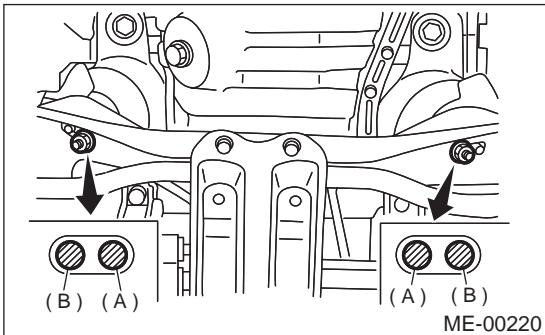
12) Tighten the nuts which install front cushion rubber onto crossmember.

Tightening torque:

85 N·m (8.7 kgf-m, 63 ft-lb)

NOTE:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



13) Install the front and center exhaust pipe. <Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

14) Connect the following hoses.

- (1) Fuel delivery hose, return hose and evaporation hose
- (2) Heater inlet and outlet hoses
- (3) Brake booster vacuum hose

15) Connect the following connectors.

- (1) Engine ground cables

Tightening torque:

14 N·m (1.4 kgf-m, 10.1 ft-lb)

- (2) Engine harness connectors
 - (3) Generator connector and terminal
 - (4) A/C compressor connectors
 - (5) Power steering pressure switch
- 16) Connect the following cables.
- (1) Accelerator cable
 - (2) Cruise control cables (With cruise control)
- 17) Adjust each connected cable.

18) Install the air cleaner case stay.

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)

19) Install the A/C pressure hoses. <Ref. to AC-42, INSTALLATION, Flexible Hose.>

20) Install the radiator to vehicle. <Ref. to CO(H4SO)-24, INSTALLATION, Radiator.>

21) Install the air intake duct and air cleaner case. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

22) Install the under cover.

23) Install battery in the vehicle, and then connect the cables.

24) Fill engine coolant. <Ref. to CO(H4SO)-14, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

25) Check the ATF level and correct if necessary. (AT vehicles) <Ref. to AT-30, INSPECTION, Automatic Transmission Fluid.>

26) Charge the A/C system with refrigerant. <Ref. to AC-24, OPERATION, Refrigerant Charging Procedure.>

27) Remove the front hood stay, and then close the front hood.

28) Take off the vehicle from lift arms.

C: INSPECTION

- 1) Make sure the pipes and hoses are installed correctly.
- 2) Make sure the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

- 1) Remove the engine assembly. <Ref. to ME(H4SO)-32, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Engine mounting;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

C: INSPECTION

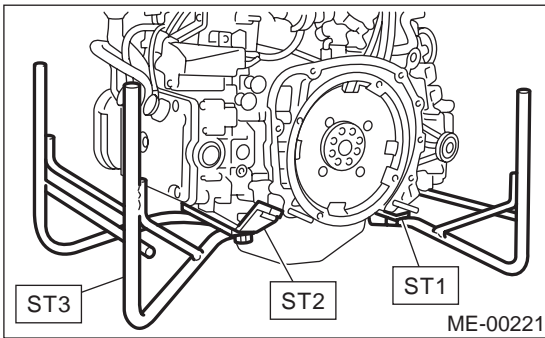
Make sure there are no cracks or other damage.

11. Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817100	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

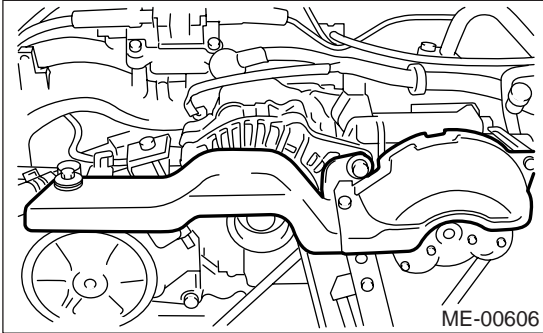
A: REMOVAL

1. FRONT SIDE BELT

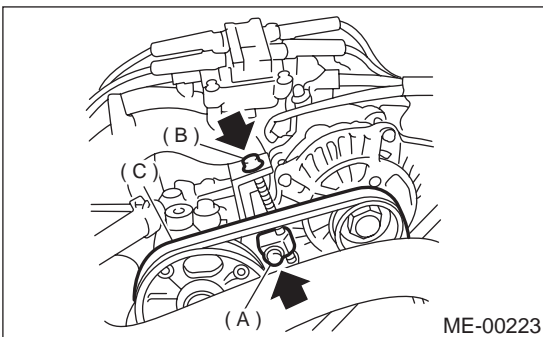
NOTE:

Perform the following procedures 1) to 4) with the engine installed to body.

1) Remove the V-belt cover.

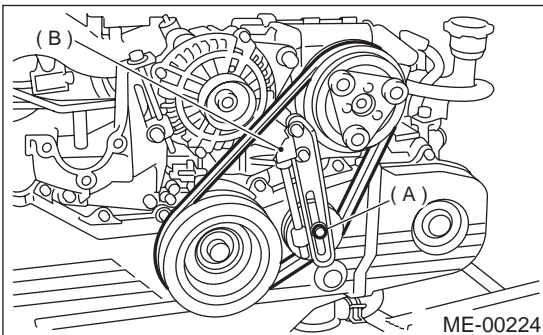


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).



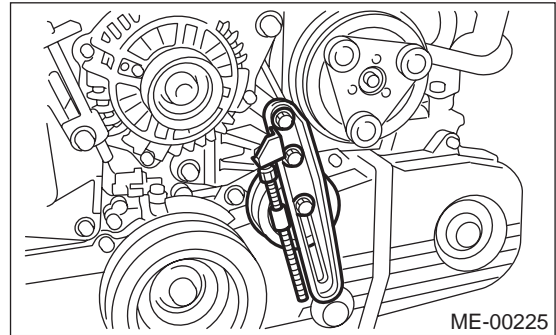
2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



3) Remove the A/C belt.

4) Remove the A/C belt tensioner.



V-BELT

MECHANICAL

B: INSTALLATION

1. FRONT SIDE BELT

- 1) Wipe off any oil or water on the belt and pulley.
- 2) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4SO)-42, INSPECTION, V-belt.>
- 3) Tighten the lock bolt (A).
- 4) Tighten the slider bolt (B).

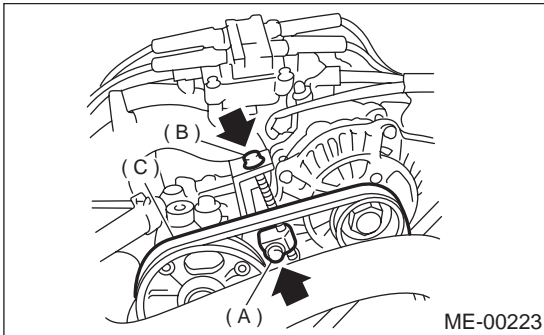
Tightening torque:

Lock bolt through-bolt:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

Slider bolt:

8 N·m (0.8 kgf-m, 5.5 ft-lb)



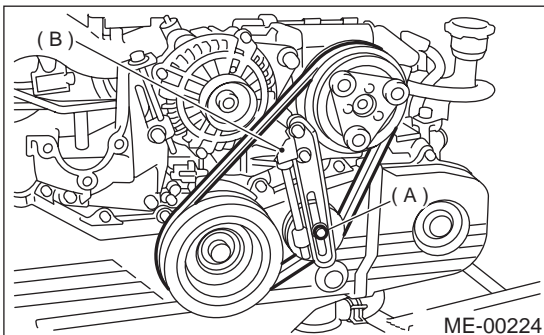
2. REAR SIDE BELT

- 1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4SO)-42, INSPECTION, V-belt.>
- 2) Tighten the lock nut (A).

Tightening torque:

Lock nut (A);

22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



C: INSPECTION

- 1) Replace the belts, if cracks, fraying or wear is found.
- 2) Check the drive belt tension and adjust it if necessary by changing the generator installing position and/or idler pulley installing position.

Belt tension

(A)

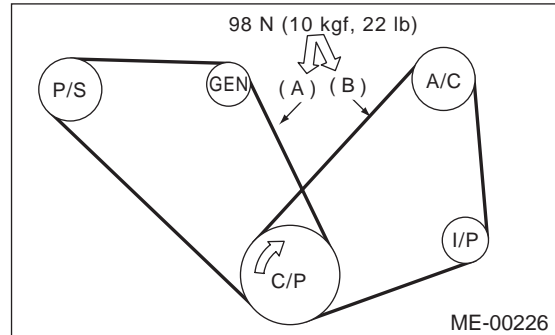
replaced: 7 — 9 mm (0.276 — 0.354 in)

reused: 9 — 11 mm (0.354 — 0.433 in)

(B)

replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)

reused: 9.0 — 10.0 mm (0.354 — 0.394 in)



C/P Crankshaft pulley

GEN Generator

P/S Power steering oil pump pulley

A/C Air conditioning compressor pulley

I/P Idler pulley

13. Crankshaft Pulley

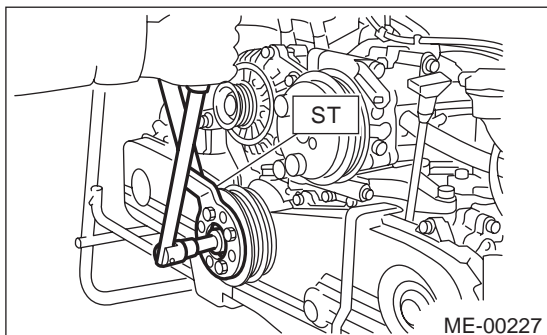
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>

2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977400 CRANKSHAFT PULLEY WRENCH (2000 cc model)

ST 499977100 CRANKSHAFT PULLEY WRENCH (2500 cc model)



3) Remove the crankshaft pulley.

B: INSTALLATION

1. 2000 CC MODEL

1) Install the crankshaft pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977400 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.

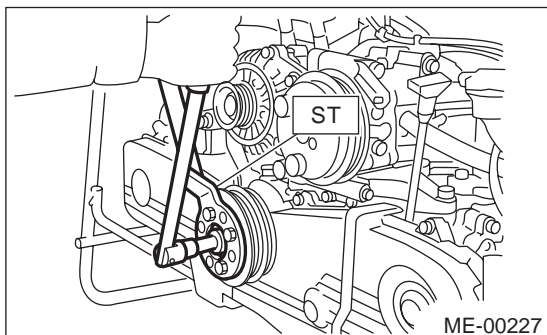
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(4) Tighten the crankshaft pulley bolts.

Tightening torque:

127 N·m (13.0 kgf·m, 94.0 ft·lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 45 degrees or more. If the tightening angle of crankshaft pulley bolt is less than 45 degrees, conduct the following procedures.

(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:

12369AA011

(2) Clean the crankshaft thread using an air gun.

(3) Apply engine oil to the crankshaft pulley bolt seal and thread.

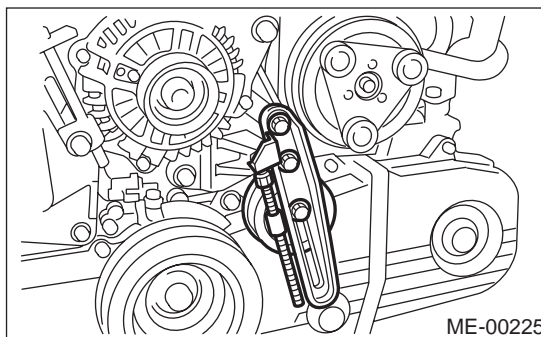
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(5) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

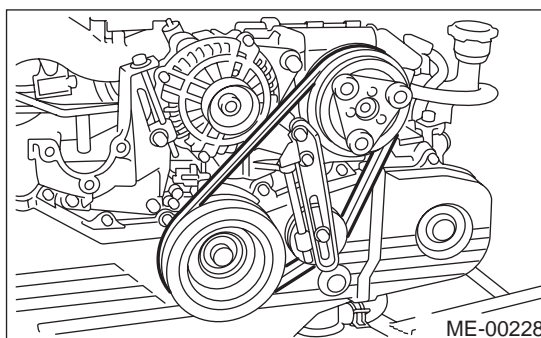
NOTE:

Conduct the tightening procedures by confirming the turning angle of crankshaft pulley bolt referring to the gauge indicated on belt cover.

4) Install the A/C belt tensioner.



5) Install the A/C belt.



2. 2500 CC MODEL

1) Install the crankshaft pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.

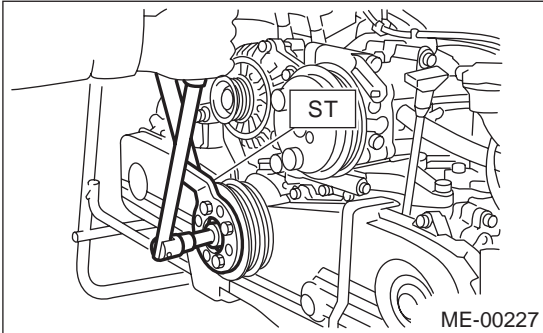
CRANKSHAFT PULLEY

MECHANICAL

- (2) Apply engine oil to the crankshaft pulley bolt seat and thread.
- (3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).
- (4) Tighten the crankshaft pulley bolts.

Tightening torque:

177 N·m (18.0 kgf·m, 130.2 ft·lb)



- 3) Confirm that the tightening angle of crankshaft pulley bolt is 65 degrees or more. If the tightening angle of crankshaft pulley bolt is less than 65 degrees, conduct the following procedures.

- (1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:

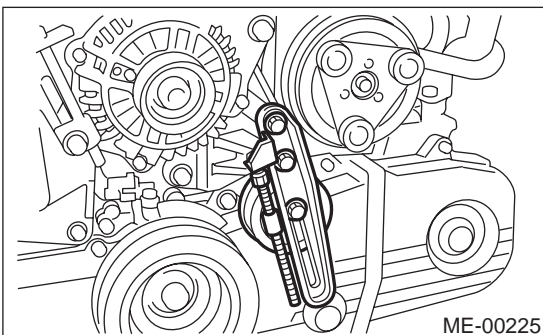
12369AA011

- (2) Clean the crankshaft thread using an air gun.
- (3) Apply engine oil to the crankshaft pulley bolt seat and thread.
- (4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).
- (5) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

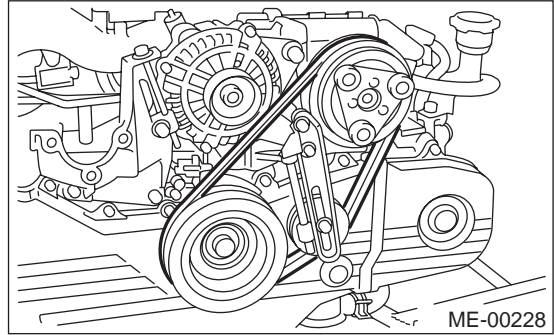
NOTE:

Conduct the tightening procedures by confirming the turning angle of crankshaft pulley bolt referring to the gauge indicated on belt cover.

- 4) Install the A/C belt tensioner.



- 5) Install the A/C belt.



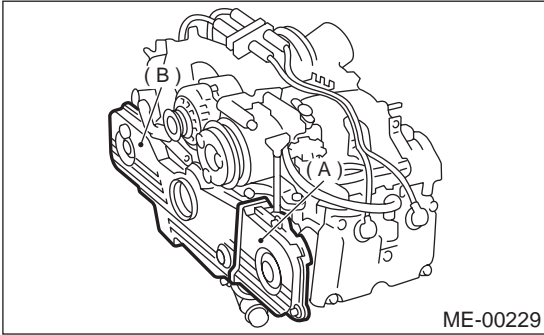
C: INSPECTION

- 1) Make sure the V-belt is not worn or otherwise damaged.
- 2) Check the tension of the belt. <Ref. to ME(H4SO)-42, INSPECTION, V-belt.>

14. Belt Cover

A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover (LH).
- 4) Remove the front belt cover.



- (A) Belt cover (LH)
- (B) Front belt cover

B: INSTALLATION

- 1) Install the front belt cover.

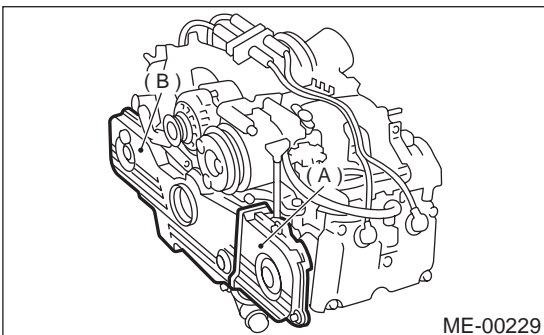
Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

- 2) Install the belt cover (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



- (A) Belt cover (LH)
- (B) Front belt cover

- 3) Install the crankshaft pulley. <Ref. to ME(H4SO)-43, INSTALLATION, CRANKSHAFT PULLEY.>

- 4) Install the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

C: INSPECTION

Make sure the cover is not damaged.

TIMING BELT ASSEMBLY

MECHANICAL

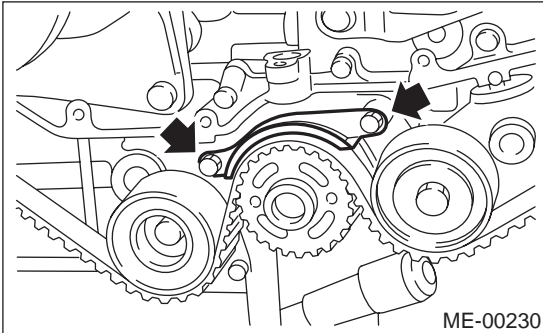
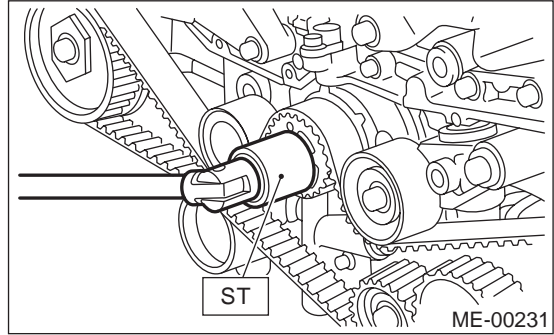
15. Timing Belt Assembly

ST 499987500 CRANKSHAFT SOCKET

A: REMOVAL

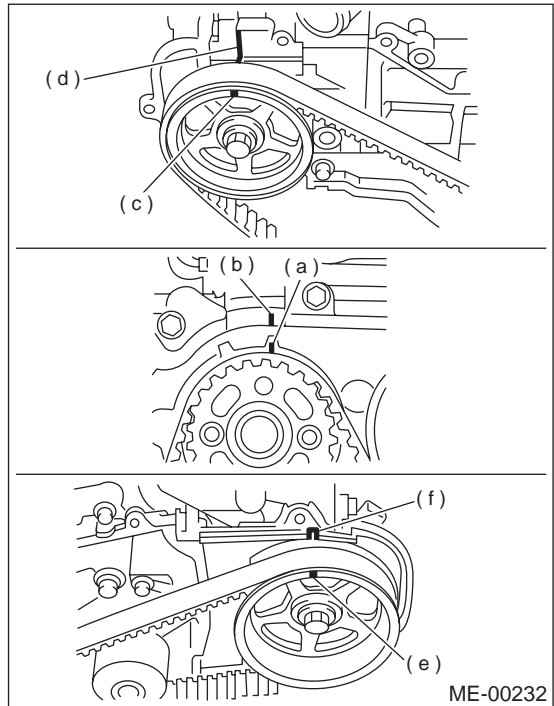
1. TIMING BELT

- 1) Remove the V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(H4SO)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt guide. (MT vehicles)

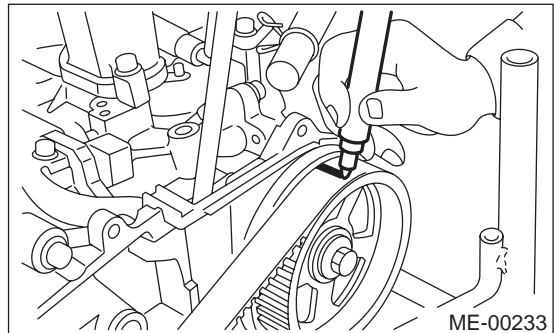


5) If the alignment mark (a) and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.

- (1) Turn the crankshaft using ST. Align the mark (a) of sprocket to cylinder block notch (b) and ensure the right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) and/or left side cam sprocket mark (e) and belt cover notch (f) are properly adjusted.



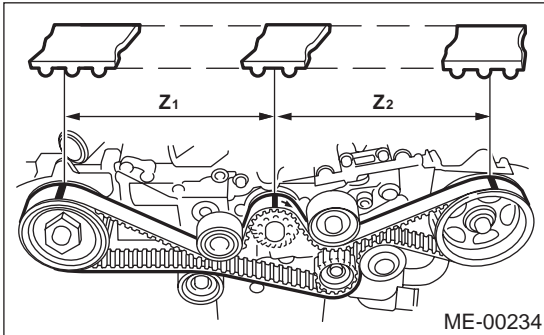
- (2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to crankshaft sprocket and cam sprockets.



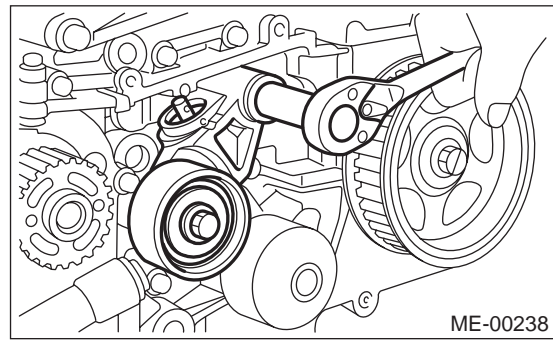
Specified data:

Z₁: 46.8 tooth length

Z₂: 43.7 tooth length

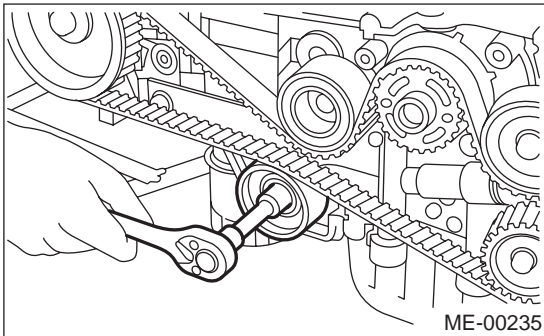


2) Remove the automatic belt tension adjuster assembly.

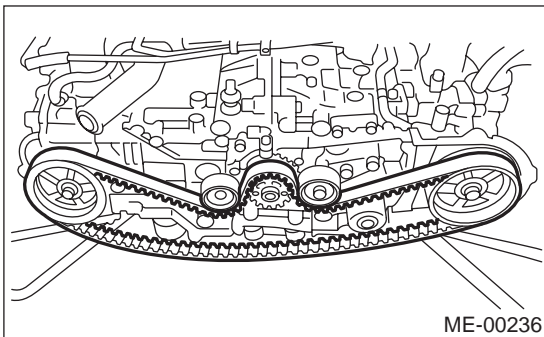


6) Remove the belt idler (No. 2).

7) Remove the belt idler No. 2.

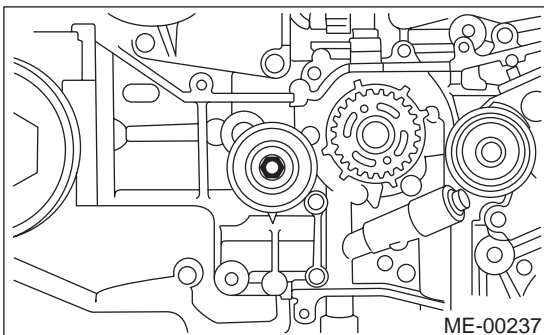


8) Remove the timing belt.



2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (No. 1).



B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUST-ER ASSEMBLY AND BELT IDLER

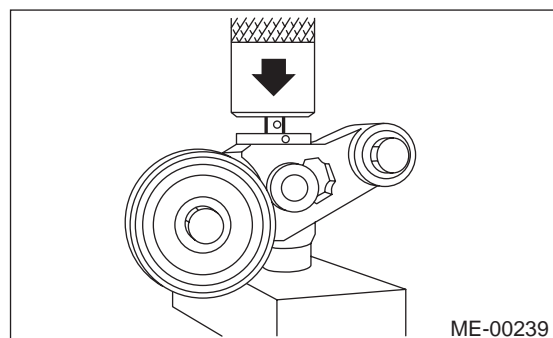
1) Preparation for installation of automatic belt tension adjuster assembly;

NOTE:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
- Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

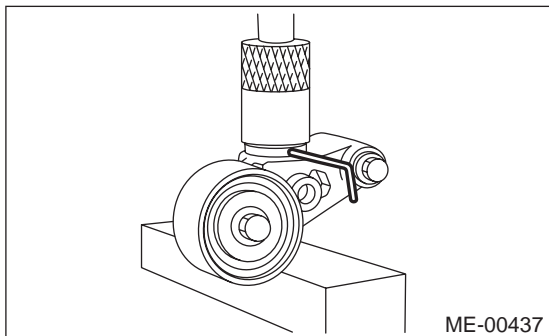
(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



TIMING BELT ASSEMBLY

MECHANICAL

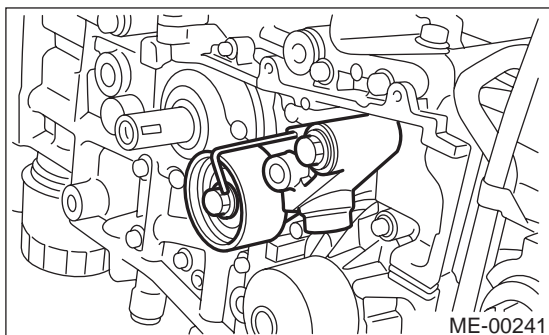
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



2) Install the automatic belt tension adjuster assembly.

Tightening torque:

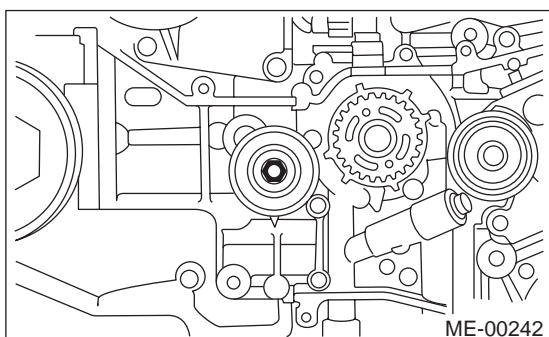
39 N·m (4.0 kgf·m, 28.9 ft·lb)



3) Install the belt idler (No. 1).

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)



2. TIMING BELT

1) Preparation for the installation of automatic belt tension adjuster assembly. <Ref. to ME(H4SO)-47, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

2) Installation of timing belt

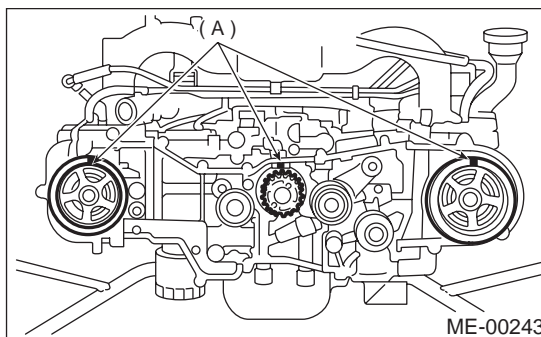
(1) Turn the camshaft sprocket No. 2 using ST1, and then turn the camshaft sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

ST1 18231AA010 CAMSHAFT SPROCKET WRENCH

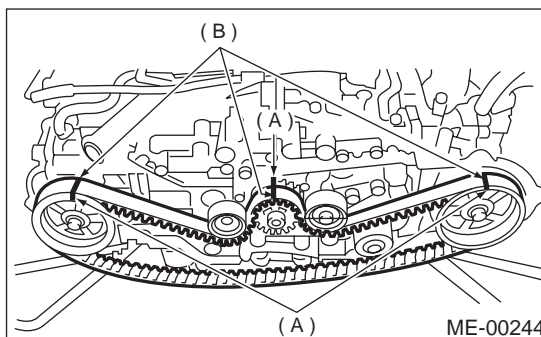
NOTE:

Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

ST2 499207400 CAMSHAFT SPROCKET WRENCH



(2) While aligning alignment marks (B) on the timing belt with marks (A) on sprockets, position the timing belt properly.



3) Install the belt idler No. 2.

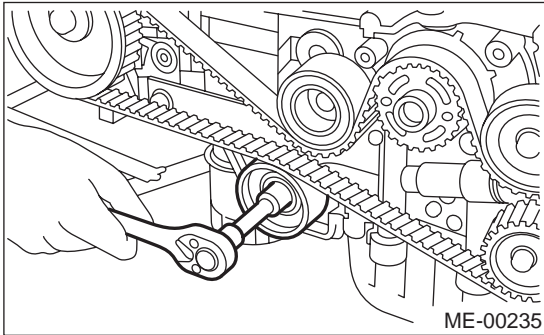
Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

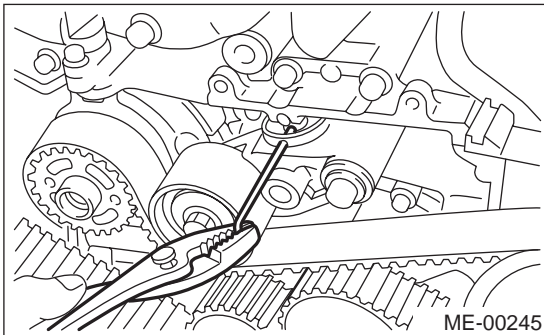
4) Install the belt idler (No. 2).

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

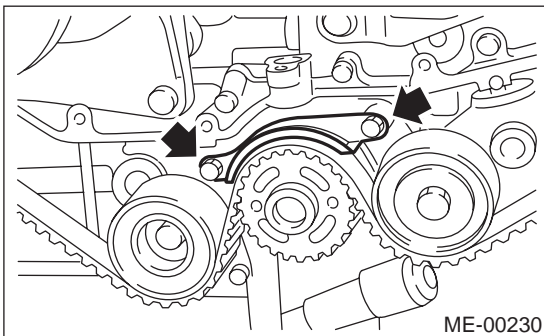


5) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove the stopper pin from belt tensioner adjuster.



6) Install the timing belt guide. (MT vehicles)

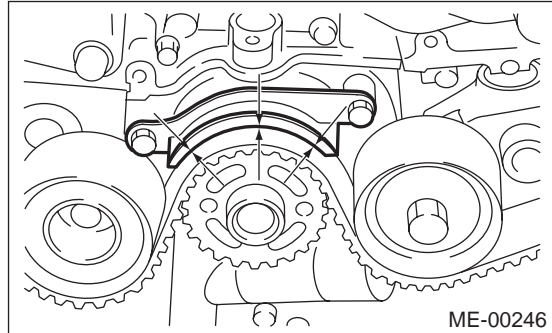
(1) Temporarily tighten the remaining bolts.



(2) Check and adjust the clearance between timing belt and timing belt guide by using thickness gauge.

Clearance:

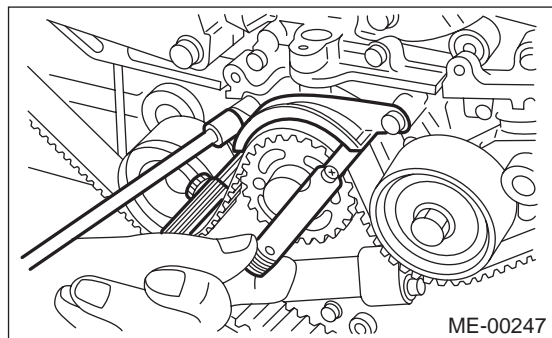
1.0±0.5 mm (0.039±0.020 in)



(3) Tighten the remaining bolts.

Tightening torque:

10 N·m (1.0 kgf·m, 7.2 ft·lb)



7) Install the belt cover. <Ref. to ME(H4SO)-45, INSTALLATION, Belt Cover.>

8) Install the crankshaft pulley. <Ref. to ME(H4SO)-43, INSTALLATION, CRANKSHAFT PULLEY.>

9) Install the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

TIMING BELT ASSEMBLY

MECHANICAL

C: INSPECTION

1. TIMING BELT

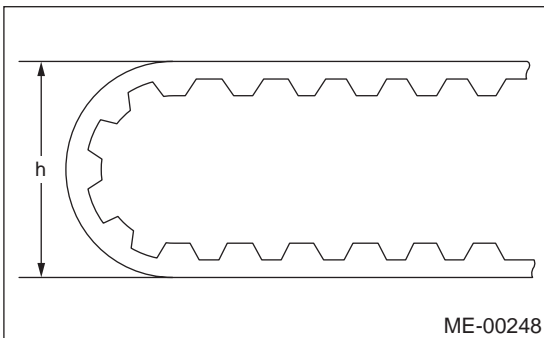
- 1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
- 2) Check the condition of back side of belt; if any crack is found, replace the belt.

NOTE:

- Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
- Do not bend the belt sharply.

Bending radius: h

60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUST-ER

- 1) Visually check oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace faulty parts.
- 2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check adjuster rod stiffness.
- 3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:
 - (1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
 - (2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check adjuster rod stiffness.
 - (3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

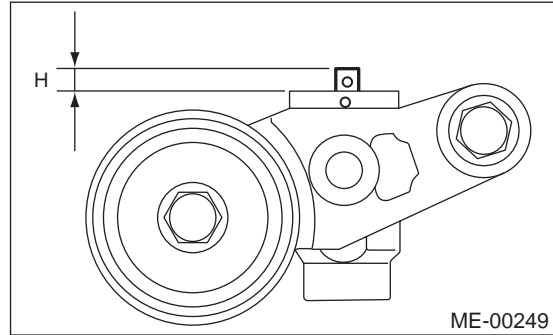
NOTE:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).

- Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- 4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H

5.7 ± 0.5 mm (0.224 ± 0.020 in)



3. BELT TENSION PULLEY

- 1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.
- 2) Check the tension pulley for smooth rotation. Replace if noise or excessive play is noted.
- 3) Check the tension pulley for grease leakage.

4. BELT IDLER

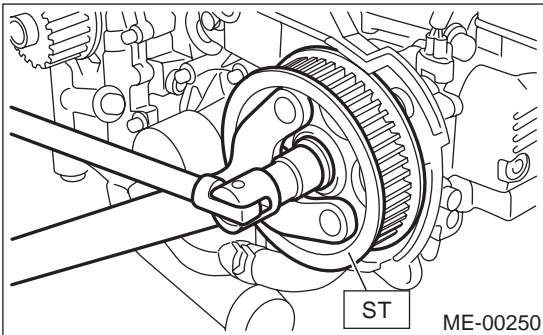
- 1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
- 2) Check the belt outer contacting surfaces of idler pulley for abnormal wear and scratches.
- 3) Check the belt idler for grease leakage.

16. Camshaft Sprocket

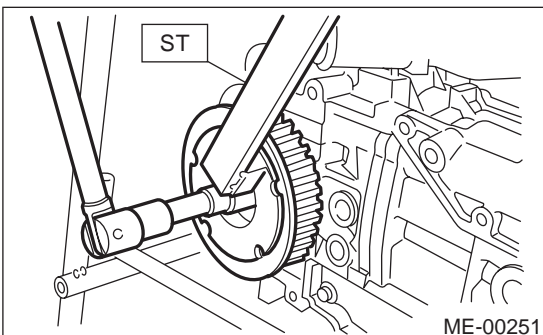
A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(H4SO)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4SO)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft position sensor. <Ref. to FU(H4SO)-28, REMOVAL, Camshaft Position Sensor.>
- 6) Remove the camshaft sprocket No. 2. To lock the camshaft, use ST.
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.



- 7) Remove the camshaft sprocket No. 1. To lock the camshaft, use ST.
ST 499207400 CAMSHAFT SPROCKET WRENCH

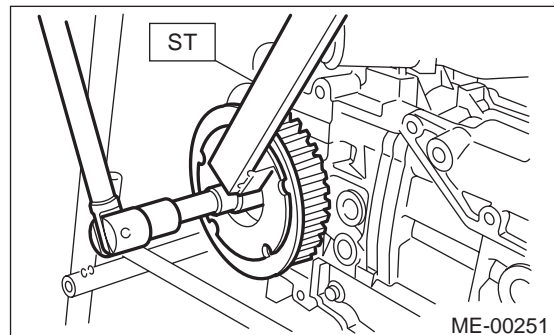


B: INSTALLATION

- 1) Install the camshaft sprocket No. 1. To lock the camshaft, use ST.
ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:
78 N·m (8.0 kgf·m, 57.9 ft·lb)

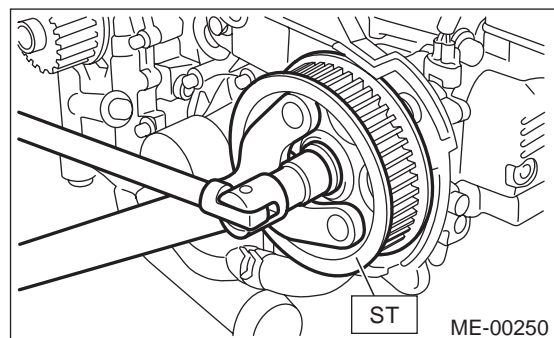
NOTE:
Do not confuse the right and left side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.



- 2) Install the camshaft sprocket No. 2. To lock camshaft, use ST.
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

Tightening torque:
78 N·m (8.0 kgf·m, 57.9 ft·lb)



- 3) Install the camshaft position sensor. <Ref. to FU(H4SO)-28, INSTALLATION, Camshaft Position Sensor.>
- 4) Install the timing belt assembly. <Ref. to ME(H4SO)-47, INSTALLATION, Timing Belt Assembly.>
- 5) Install the belt cover. <Ref. to ME(H4SO)-45, INSTALLATION, Belt Cover.>

CAMSHAFT SPROCKET

MECHANICAL

6) Install the crankshaft pulley. **<Ref. to ME(H4SO)-43, INSTALLATION, CRANKSHAFT PULLEY.>**

7) Install the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

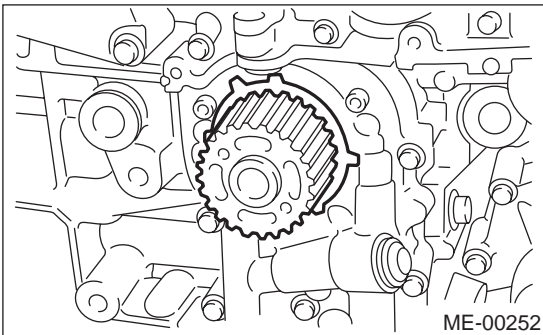
C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

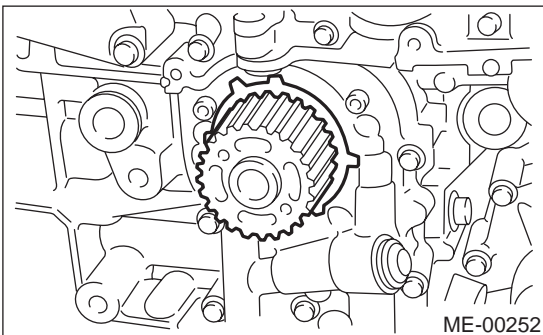
A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(H4SO)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4SO)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(H4SO)-51, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket.



B: INSTALLATION

- 1) Install the crankshaft sprocket.



- 2) Install the camshaft sprocket. <Ref. to ME(H4SO)-51, INSTALLATION, Camshaft Sprocket.>
- 3) Install the timing belt assembly. <Ref. to ME(H4SO)-47, INSTALLATION, Timing Belt Assembly.>
- 4) Install the belt cover. <Ref. to ME(H4SO)-45, INSTALLATION, Belt Cover.>
- 5) Install the crankshaft pulley. **<Ref. to ME(H4SO)-43, INSTALLATION, CRANKSHAFT PULLEY.>**
- 6) Install the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

VALVE ROCKER ASSEMBLY

MECHANICAL

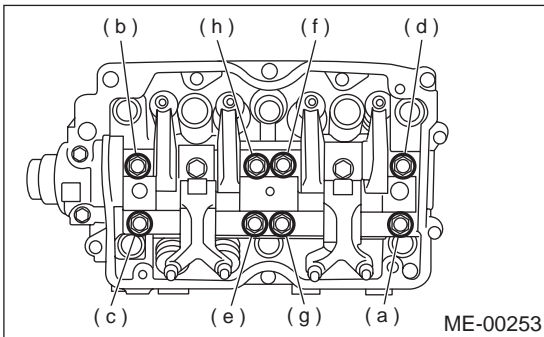
18. Valve Rocker Assembly

A: REMOVAL

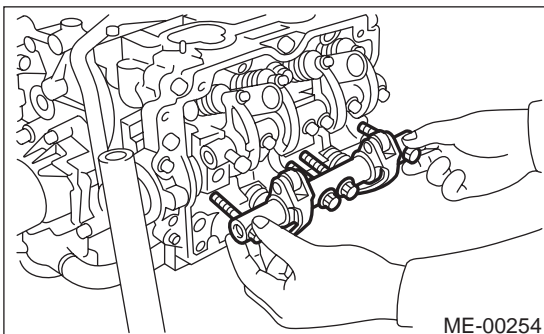
- 1) Remove the V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(H4SO)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4SO)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(H4SO)-51, REMOVAL, Camshaft Sprocket.>
- 6) Disconnect the PCV hose and remove rocker cover.
- 7) Removal of valve rocker assembly
 - (1) Remove the bolts (a) through (h) in alphabetical sequence.

NOTE:

Leave two or three threads of bolts (g and h) engaged to retain the valve rocker assembly.



- (2) Remove the valve rocker assembly.



B: INSTALLATION

- 1) Installation of valve rocker assembly
 - (1) Temporarily tighten the bolts (a) through (d) equally as shown in the figure.

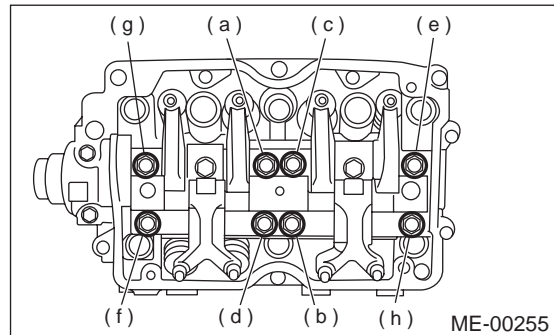
NOTE:

Do not allow the valve rocker assembly to gouge knock pins.

- (2) Tighten the bolts (e) through (h) to specified torque.
- (3) Tighten the bolts (a) through (d) to specified torque.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- 2) Adjust the valve clearances. <Ref. to ME(H4SO)-30, ADJUSTMENT, Valve Clearance.>
- 3) Install the rocker cover and connect PCV hose.
- 4) Install the camshaft sprocket. <Ref. to ME(H4SO)-51, INSTALLATION, Camshaft Sprocket.>
- 5) Install the timing belt assembly. <Ref. to ME(H4SO)-47, INSTALLATION, Timing Belt Assembly.>
- 6) Install the belt cover. <Ref. to ME(H4SO)-45, INSTALLATION, Belt Cover.>
- 7) Install the crankshaft pulley. <Ref. to ME(H4SO)-43, INSTALLATION, CRANKSHAFT PULLEY.>
- 8) Install the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

C: DISASSEMBLY

- 1) Remove the bolts which secure rocker shaft.
- 2) Extract the rocker shaft. Remove the valve rocker arms, springs, plates and shaft supports from rocker shaft.

NOTE:

Arrange all removed parts in order so that they can be installed in their original positions.

- 3) Remove the nut and adjuster screw from valve rocker.

D: ASSEMBLY

- 1) Install the adjuster screw and nut to valve rocker.
- 2) Arrange the valve rocker arms, springs and shaft supports in assembly order and insert valve rocker shaft.

Tightening torque (Shaft supports installing bolts):

5 N·m (0.5 kgf·m, 3.6 ft·lb)

NOTE:

Valve rocker arms, rocker shaft and shaft supports have identification marks. Ensure the parts with same markings are properly assembled.

- 3) Install the valve rocker shaft securing bolts.

E: INSPECTION

1. VALVE ROCKER ARM AND ROCKER SHAFT

- 1) Measure the inside diameter of valve rocker arm and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between arm and shaft:

Standard

0.020 — 0.054 mm (0.0008 — 0.0021 in)

Limit

0.10 mm (0.0039 in)

- 2) If oil clearance exceeds the limit, replace the valve rocker arm or shaft, whichever shows greater amount of wear.

Rocker arm inside diameter:

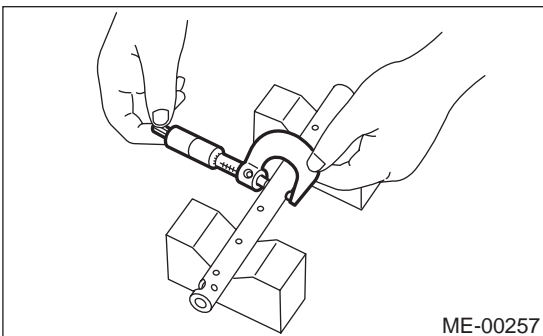
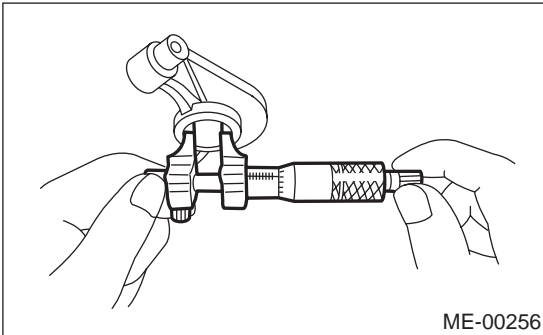
22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:

21.987 — 22.000 mm (0.8656 — 0.8661 in)

- 3) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker arm.

- 4) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker arm.



CAMSHAFT

MECHANICAL

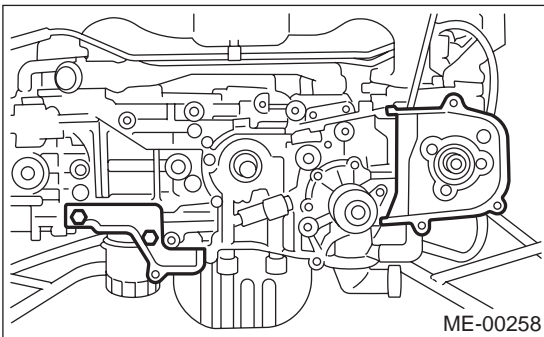
19. Camshaft

A: REMOVAL

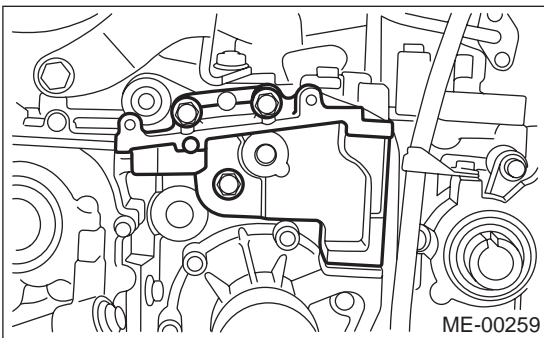
- 1) Remove the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(H4SO)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4SO)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(H4SO)-51, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket. <Ref. to ME(H4SO)-53, REMOVAL, Crankshaft Sprocket.>
- 7) Remove the belt cover No. 2 (LH).
- 8) Remove the belt cover No. 2 (RH).

NOTE:

Do not damage or lose the seal rubber when removing belt covers.

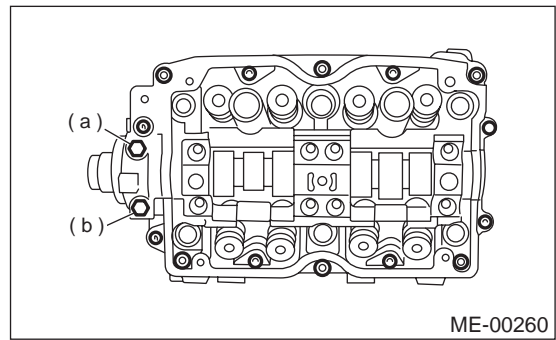


- 9) Remove the tensioner bracket.

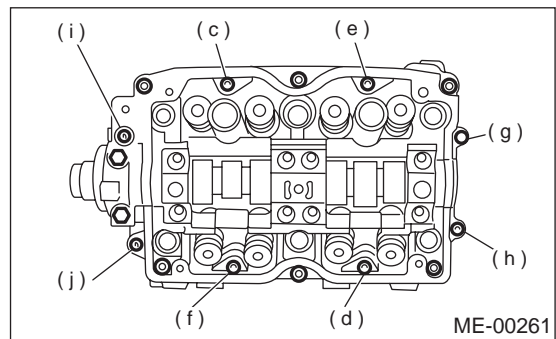


- 10) Remove the camshaft position sensor support. (LH side only)
- 11) Remove the oil level gauge guide. (LH side only)
- 12) Remove the valve rocker assembly. <Ref. to ME(H4SO)-54, REMOVAL, Valve Rocker Assembly.>
- 13) Remove the camshaft cap.

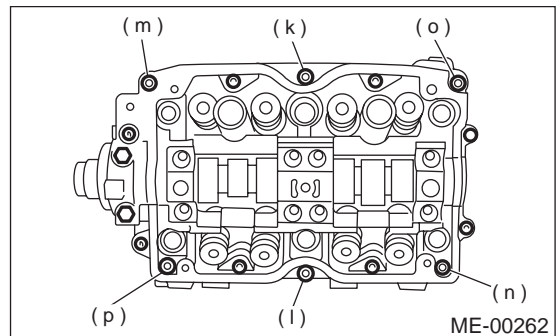
- (1) Remove the bolts (a) through (b) in alphabetical sequence.



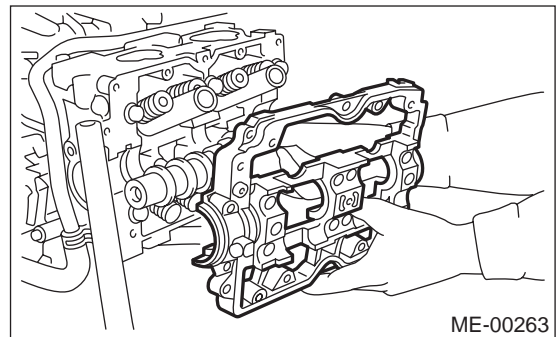
- (2) Equally loosen the bolts (c) through (j) all the way in alphabetical sequence.



- (3) Remove the bolts (k) through (p) in alphabetical sequence using ST.
ST 499497000 TORX PLUS



- (4) Remove the camshaft cap.



- 14) Remove the camshaft.
- 15) Remove the oil seal.

16) Remove the plug from rear side of camshaft.

NOTE:

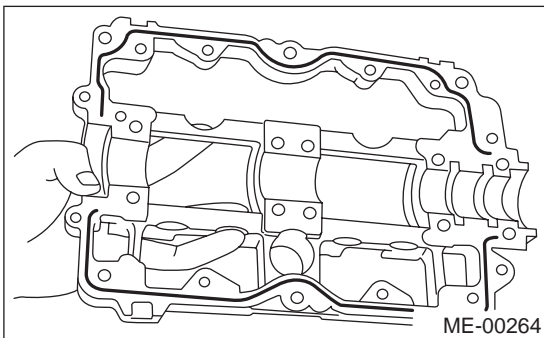
- Do not remove the oil seal unless necessary.
- Do not scratch the journal surface when removing oil seal.

B: INSTALLATION

- 1) Apply a coat of engine oil to the camshaft journals, and then install the camshaft.
- 2) Install the camshaft cap.
 - (1) Apply liquid gasket on the around of camshaft cap.

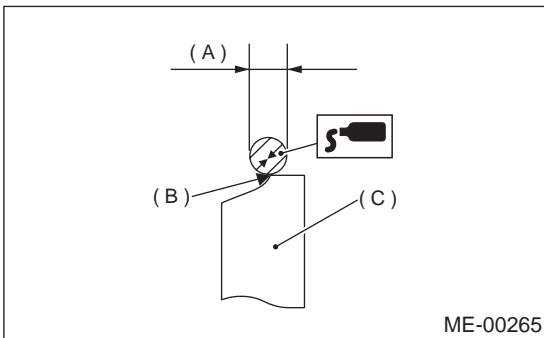
Liquid gasket:

THREE BOND 1280B
P/N K0877YA018

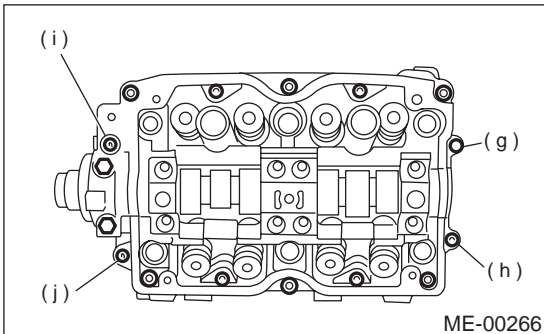


NOTE:

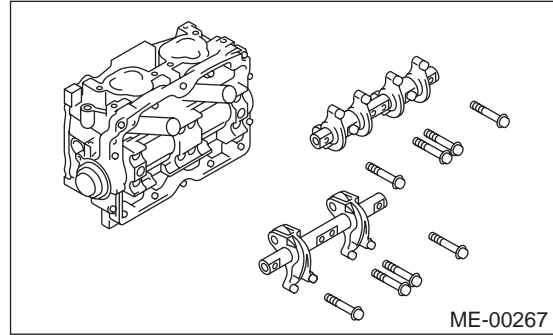
Apply a coat of 3 mm (0.12 in) dia (A). liquid gasket along edge (B) of the camshaft cap (C) mating surface.



(2) Temporarily tighten the bolts (g) through (j) in alphabetical sequence.



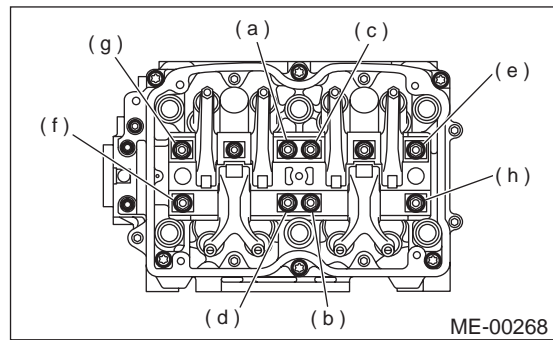
(3) Install the valve rocker assembly.



(4) Tighten the bolts (a) through (h) in alphabetical sequence.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

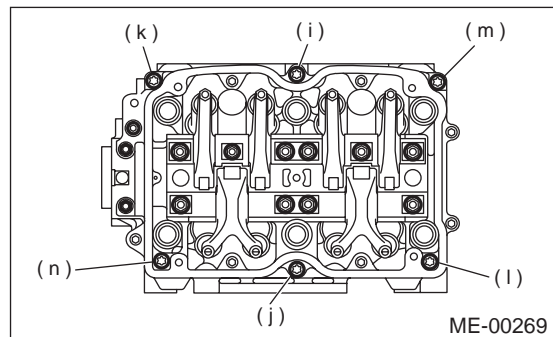


(5) Tighten the TORX bolts (i) through (n) in alphabetical sequence using ST.

ST 499497000 TORX PLUS

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



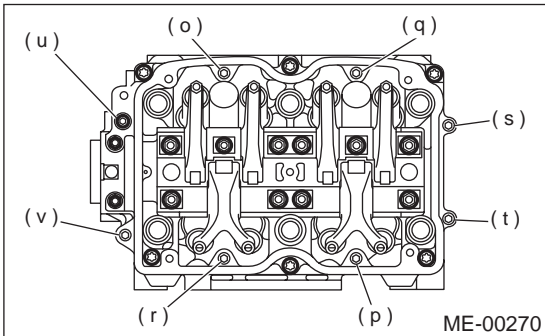
CAMSHAFT

MECHANICAL

(6) Tighten the bolts (o) through (v) in alphabetical sequence.

Tightening torque:

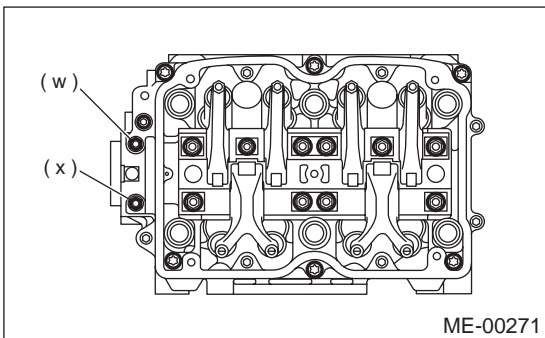
10 N·m (1.0 kgf·m, 7.2 ft·lb)



(7) Tighten the bolts (w) through (x) in alphabetical sequence.

Tightening torque:

10 N·m (1.0 kgf·m, 7.2 ft·lb)

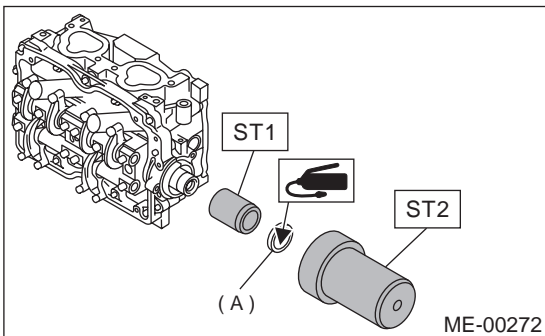


3) Apply a coat of grease to oil seal lips, and then install the oil seal (A) on camshaft using ST1 and ST2.

NOTE:

Use a new oil seal.

ST1	499597000	OIL SEAL GUIDE
ST2	499587500	OIL SEAL INSTALLER



4) Install the plug using ST.

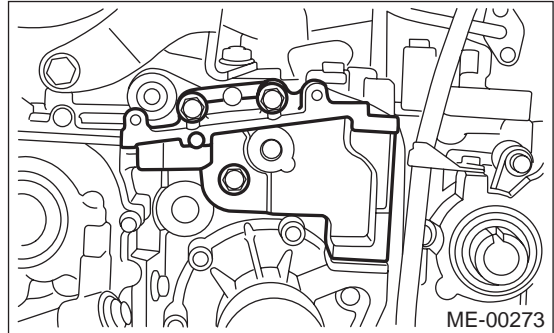
ST	499587700	CAMSHAFT OIL SEAL INSTALLER
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5) Adjust the valve clearance. <Ref. to ME(H4SO)-30, ADJUSTMENT, Valve Clearance.>

- 6) Install the rocker cover and connect PCV hose.
- 7) Install the oil level gauge guide. (LH side only)
- 8) Install the camshaft position sensor support. (LH side only)
- 9) Install the tensioner bracket.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



10) Install the belt cover No. 2 (RH).

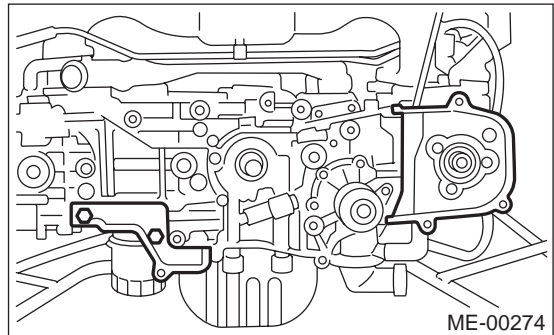
Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

11) Install the belt cover No. 2 (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



12) Install the crankshaft sprocket. <Ref. to ME(H4SO)-53, INSTALLATION, Crankshaft Sprocket.>

13) Install the camshaft sprocket. <Ref. to ME(H4SO)-51, INSTALLATION, Camshaft Sprocket.>

14) Install the timing belt assembly. <Ref. to ME(H4SO)-47, INSTALLATION, Timing Belt Assembly.>

15) Install the belt cover. <Ref. to ME(H4SO)-45, INSTALLATION, Belt Cover.>

16) Install the crankshaft pulley. <Ref. to ME(H4SO)-43, INSTALLATION, CRANKSHAFT PULLEY.>

17) Install the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

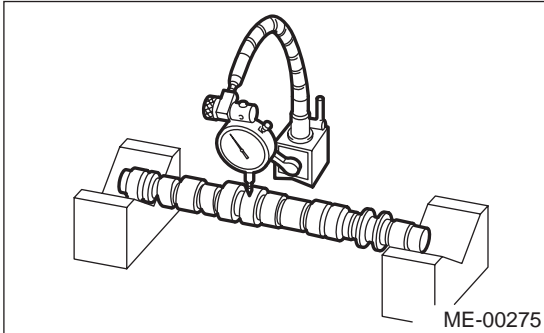
C: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

Limit:

0.025 mm (0.0010 in)



- 2) Check the journal for damage and wear. Replace if faulty.
 3) Measure the outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between two (= oil clearance). If the oil clearance exceeds specifications, replace the camshaft or cylinder head as necessary.

Unit: mm (in)		
Clear- ance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)
	Limit	0.10 (0.0039)
Camshaft journal O.D.		31.928 — 31.945 (1.2570 — 1.2577)
Journal hole I.D.		32.000 — 32.018 (1.2598 — 1.2605)

4) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

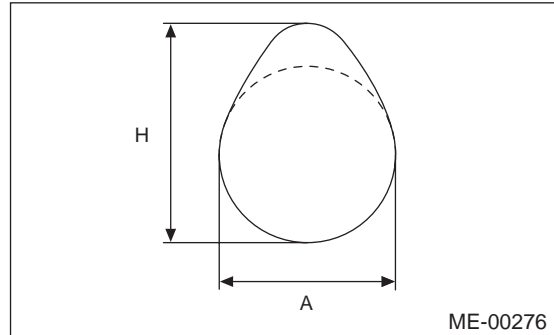
Cam height: H

Model	Item	Unit: mm (in)	
2000 cc	Intake	STD	38.732 — 38.832 (1.5249 — 1.528885)
		Limit	38.632 (1.5209)
	Exhaust	STD	39.257 — 39.357 (1.5455 — 1.5495)
		Limit	39.157 (1.5416)
2500 cc	Intake	STD	39.485 — 39.585 (1.5545 — 1.5585)
		Limit	39.385 (1.5506)
	Exhaust	STD	39.257 — 39.357 (1.5455 — 1.5495)
		Limit	39.157 (1.5416)

Cam base circle diameter A:

IN: 34.00 mm (1.3386 in)

EX: 34.00 mm (1.3386 in)



2. CAMSHAFT SUPPORT

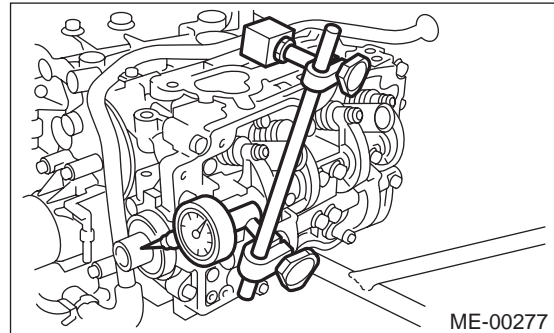
Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the camshaft support.

Standard:

0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:

0.10 mm (0.0039 in)



CYLINDER HEAD ASSEMBLY

MECHANICAL

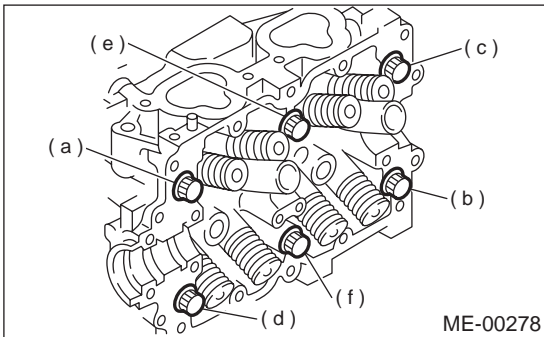
20. Cylinder Head Assembly

A: REMOVAL

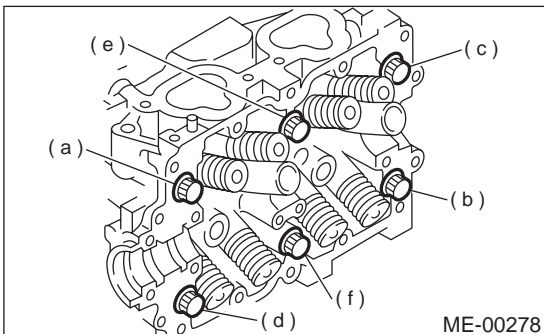
- 1) Remove the V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-43, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(H4SO)-45, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4SO)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(H4SO)-51, REMOVAL, Camshaft Sprocket.>
- 6) Remove the intake manifold. <Ref. to FU(H4SO)-28, REMOVAL, Camshaft Position Sensor.>
- 7) Remove the bolt which installs A/C compressor bracket on cylinder head.
- 8) Remove the valve rocker assembly. <Ref. to ME(H4SO)-54, REMOVAL, Valve Rocker Assembly.>
- 9) Remove the camshaft. <Ref. to ME(H4SO)-56, REMOVAL, Camshaft.>
- 10) Remove the cylinder head bolts in alphabetical sequence shown in figure.

NOTE:

Leave the bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



- 11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
- 12) Remove the bolts (a) and (c) to remove cylinder head.



- 13) Remove the cylinder head gasket.

NOTE:

Do not scratch the mating surface of cylinder head and cylinder block.

- 14) Similarly, remove the right side cylinder head.

B: INSTALLATION

1. CYLINDER HEAD

- 1) Install the cylinder head and gaskets on cylinder block.

NOTE:

- Use new cylinder head gaskets.
 - Be careful not to scratch the mating surface of cylinder block and oil pump.
- 2) Tighten the cylinder head bolts.
 - (1) Apply a coat of engine oil to the washers and bolt threads.
 - (2) Tighten all bolts to 29 N·m (3.0 kgf·m, 22 ft·lb) in alphabetical sequence. Then tighten all bolts to 69 N·m (7.0 kgf·m, 51 ft·lb) in alphabetical sequence.
 - (3) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
 - (4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf·m, 25 ft·lb) in reverse order of installation.
 - (5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf·m, 11 ft·lb).
 - (6) Tighten all bolts by 80 to 90° in alphabetical sequence.

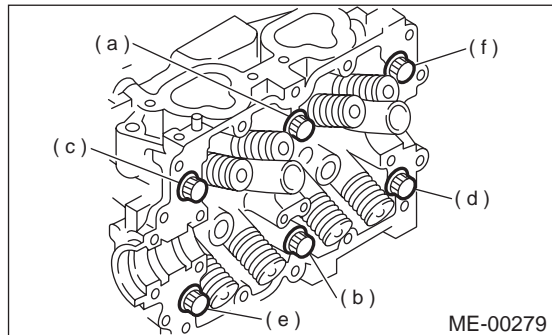
NOTE:

Do not tighten bolts more than 90°.

- (7) Further tighten all bolts by 80 to 90° in alphabetical sequence shown in figure below.

NOTE:

Ensure that the total “re-tightening angle” [in the former two steps], do not exceed 180°.



- 3) Install the camshaft. <Ref. to ME(H4SO)-57, INSTALLATION, Camshaft.>
- 4) Install the valve rocker assembly. <Ref. to ME(H4SO)-54, INSTALLATION, Valve Rocker Assembly.>

CYLINDER HEAD ASSEMBLY

MECHANICAL

- 5) Install the A/C compressor bracket on cylinder head.
- 6) Install the intake manifold. <Ref. to FU(H4SO)-17, INSTALLATION, Intake Manifold.>
- 7) Install the camshaft sprocket. <Ref. to ME(H4SO)-51, INSTALLATION, Camshaft Sprocket.>
- 8) Install the timing belt assembly. <Ref. to ME(H4SO)-47, INSTALLATION, Timing Belt Assembly.>
- 9) Install the belt cover. <Ref. to ME(H4SO)-45, INSTALLATION, Belt Cover.>
- 10) Install the crankshaft pulley. <Ref. to ME(H4SO)-43, INSTALLATION, CRANKSHAFT PULLEY.>
- 11) Install the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

C: DISASSEMBLY

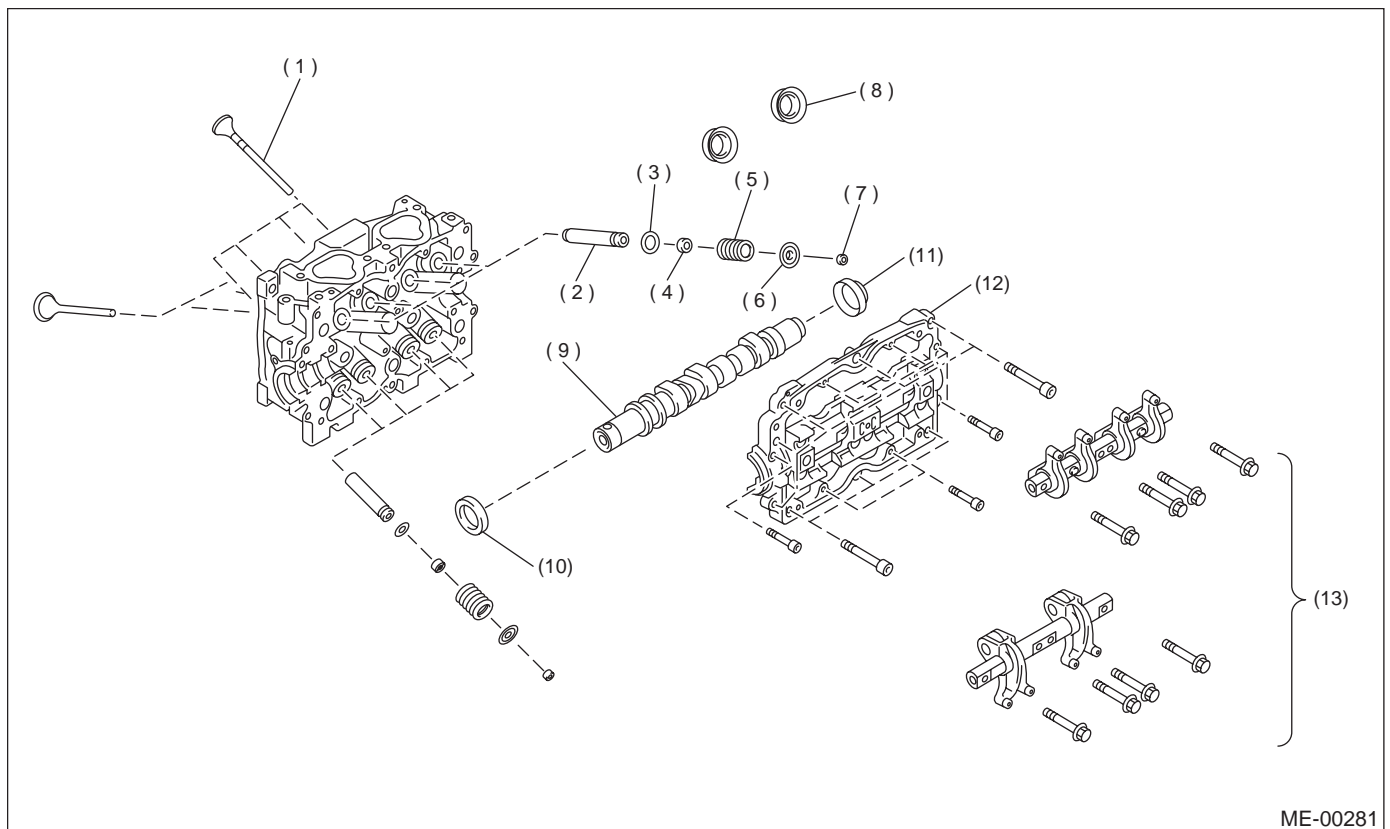
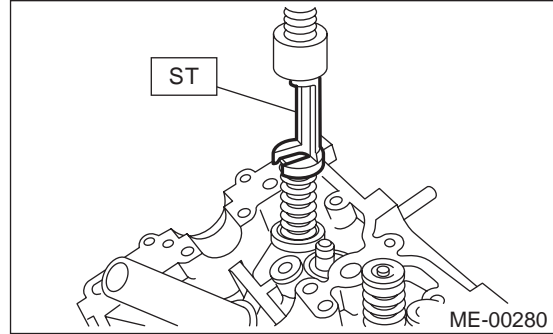
- 1) Place the cylinder head on ST.

D: ASSEMBLY

- ST 498267800 CYLINDER HEAD TABLE
- 2) Set the ST on valve spring. Compress the valve spring, and then remove the valve spring retainer key. Remove each valve and valve spring.
- ST 499718000 VALVE SPRING REMOVER

CAUTION:

- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of intake valve oil seals and exhaust valve oil seals.



- | | | |
|-----------------------|-----------------------|------------------------|
| (1) Valve | (6) Retainer | (11) Plug |
| (2) Valve guide | (7) Retainer key | (12) Camshaft cap |
| (3) Valve spring seat | (8) Spark plug gasket | (13) Valve rocker ASSY |
| (4) Oil seal | (9) Camshaft | |
| (5) Valve spring | (10) Oil seal | |

CYLINDER HEAD ASSEMBLY

MECHANICAL

1) Installation of valve spring and valve

(1) Place cylinder head on ST.

ST 498267800 CYLINDER HEAD TABLE

(2) Coat the stem of each valve with engine oil and insert valve into valve guide.

NOTE:

When inserting the valve into valve guide, use special care not to damage the oil seal lip.

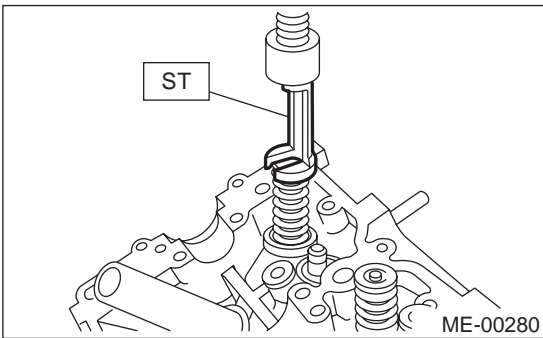
(3) Install the valve spring and retainer.

NOTE:

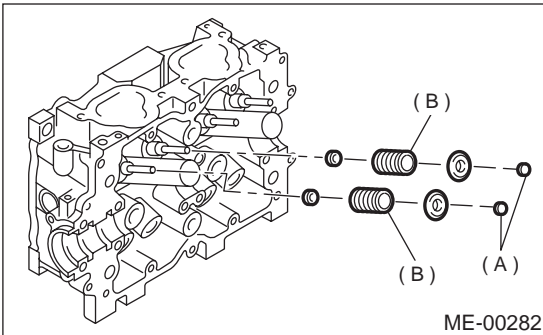
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

(4) Set the ST on valve spring.

ST 499718000 VALVE SPRING REMOVER



(5) Compress the valve spring, and then fit the valve spring retainer key.



- (A) Retainer
- (B) Painted face

(6) After installing, tap the valve spring retainers lightly with plastic hammer for better seating.

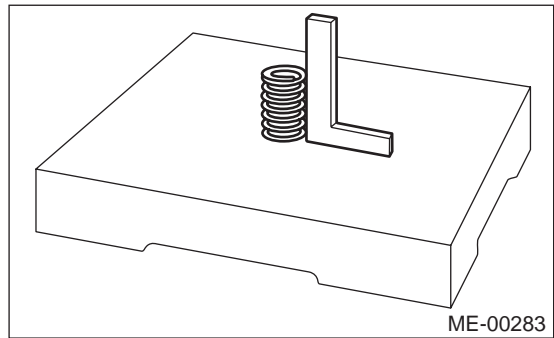
E: INSPECTION

1. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not to the specifications presented below.

2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length	54.30 mm (2.1378 in)
Squareness	2.5°, 2.4 mm (0.094 in)
Tension/spring height	215 — 246 N (21.9 — 25.1 kgf, 48.2 — 55.3 lb)/ 45.0 mm (1.772 in)
	527 — 582 N (53.7 — 59.3 kgf, 118.1 — 130.8 lb)/34.7 mm (1.366 in)



2. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of valve and valve seat are reconditioned or valve guide is replaced. Use pliers to pinch and remove oil seal from valve.

1) Place the cylinder head on ST1.

2) Press-fit oil seal as shown in the figure using ST2.

NOTE:

- Apply engine oil to oil seal before press-fitting.
- When press-fitting oil seal, do not use hammer or strike in.
- Differentiate between intake valve oil seal and exhaust valve oil seal by noting their difference in color.

ST1 498267800 CYLINDER HEAD TABLE

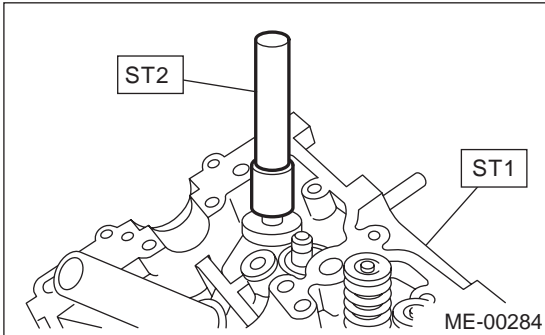
ST2 498857100 VALVE OIL SEAL GUIDE

Color of rubber part:

Intake [Black]

Exhaust [Brown]

Color of spring part:
Intake [Silver]
Exhaust [Silver]



F: ADJUSTMENT

1. CYLINDER HEAD

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.

Also make sure that gasket installing surface shows no trace of gasoline and water leaks.

2) Place the cylinder head on ST.

ST 498267800 CYLINDER HEAD TABLE

3) Measure the warping of the cylinder head surface that mates with crankcase using a straight-edge and thickness gauge.

If the warping exceeds 0.05 mm (0.0020 in), re-grind the surface with a surface grinder.

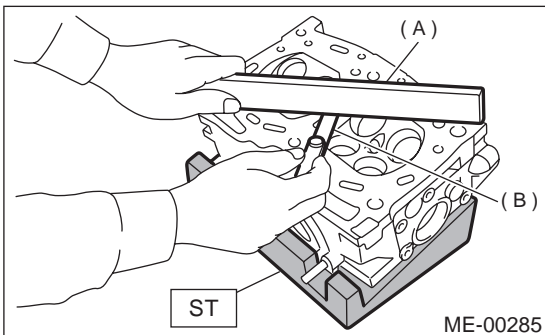
Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
97.5 mm (3.839 in)

NOTE:

Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



- (A) Straightedge
- (B) Thickness gauge

2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: *W*

Intake (A)

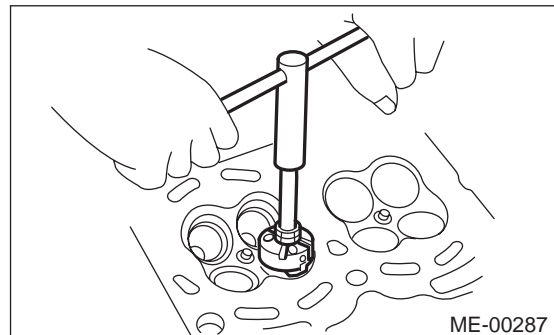
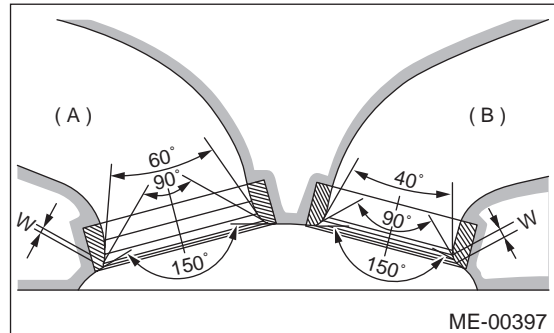
Standard 1.1 mm (0.043 in)

Limit 1.8 mm (0.071 in)

Exhaust (B)

Standard 1.5 mm (0.059 in)

Limit 2.2 mm (0.087 in)



CYLINDER HEAD ASSEMBLY

MECHANICAL

3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

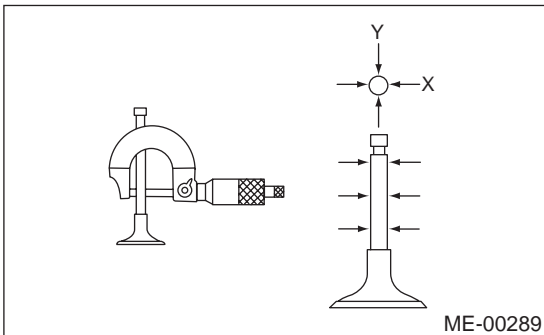
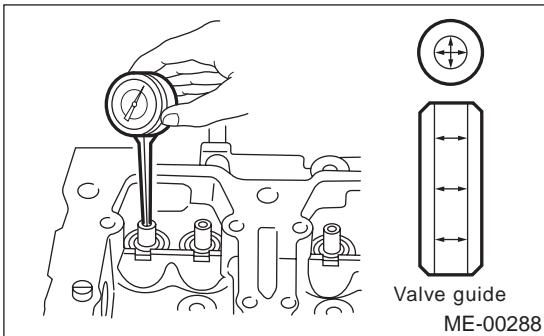
Standard

Intake 0.035 — 0.062 mm (0.0014 — 0.0024 in)

Exhaust 0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit

0.15 mm (0.0059 in)



2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:

Intake

5.950 — 5.965 mm (0.2343 — 0.2348 in)

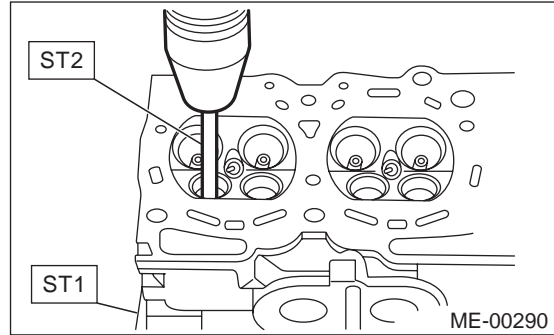
Exhaust

5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

(2) Insert the ST2 into valve guide and press it down to remove valve guide.

ST1 498267800 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



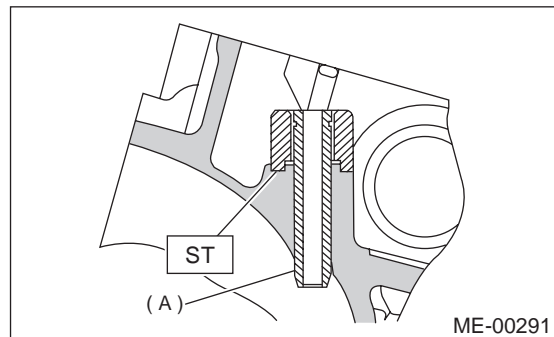
(3) Turn the cylinder head upside down and place ST as shown in the figure.

Intake side:

ST 499767700 VALVE GUIDE ADJUSTER

Exhaust side:

ST 499767800 VALVE GUIDE ADJUSTER



(A) Valve guide

(4) Before installing new oversize valve guide, make sure that neither scratches nor damages exist on the inside surface of valve guide holes in cylinder head.

(5) Put new valve guide, coated with sufficient oil, in the cylinder, and then insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

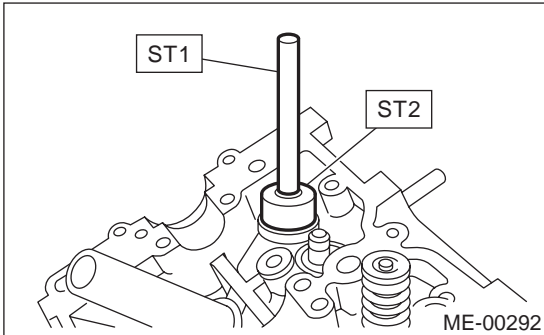
ST1 499767200 VALVE GUIDE REMOVER

Intake side:

ST2 499767700 VALVE GUIDE ADJUSTER

Exhaust side:

ST2 499767800 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

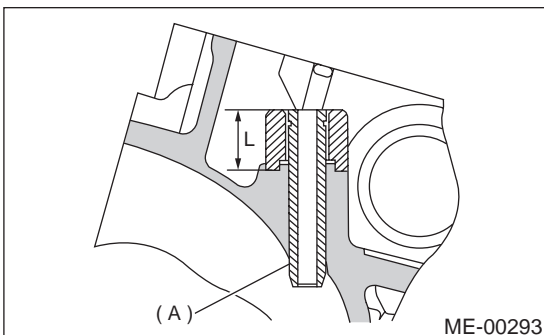
Valve guide protrusion: L

Intake

20.0 — 20.5 mm (0.787 — 0.807 in)

Exhaust

16.5 — 17.0 mm (0.650 — 0.669 in)



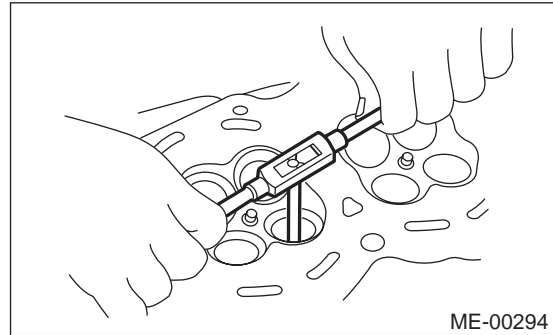
(A) Valve guide

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

NOTE:

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

ST 499767400 VALVE GUIDE REAMER



(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

H:

Intake

Standard 1.0 mm (0.039 in)

Limit 0.6 mm (0.024 in)

Exhaust

Standard 1.2 mm (0.047 in)

Limit 0.6 mm (0.024 in)

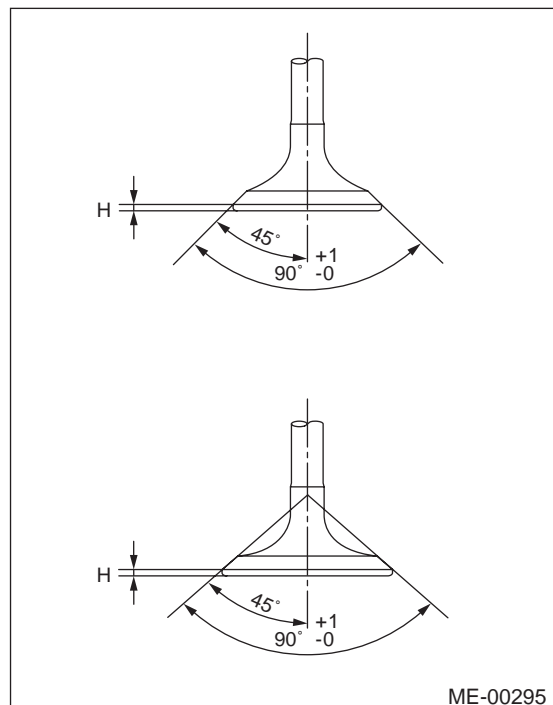
Valve overall length:

Intake

120.6 mm (4.75 in)

Exhaust

121.7 mm (4.79 in)



CYLINDER HEAD ASSEMBLY

MECHANICAL

2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. <Ref. to ME(H4SO)-63, VALVE SEAT, ADJUSTMENT, Cylinder Head Assembly.> Install a new intake valve oil seal after lapping.

21. Cylinder Block

A: REMOVAL

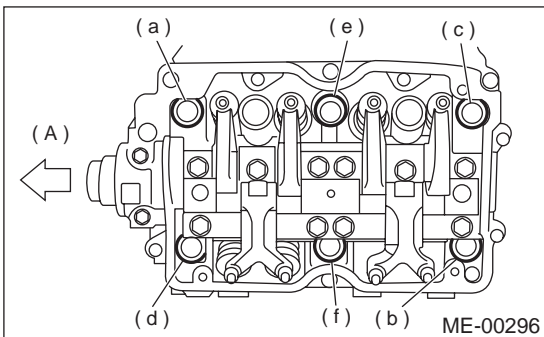
NOTE:

Before conducting this procedure, drain the engine oil completely if applicable.

- 1) Remove the intake manifold. <Ref. to FU(H4SO)-15, REMOVAL, Intake Manifold.>
- 2) Remove the V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
- 3) Remove the crankshaft pulley. <Ref. to ME(H4SO)-43, REMOVAL, Crankshaft Pulley.>
- 4) Remove the belt cover. <Ref. to ME(H4SO)-45, REMOVAL, Belt Cover.>
- 5) Remove the timing belt assembly. <Ref. to ME(H4SO)-46, REMOVAL, Timing Belt Assembly.>
- 6) Remove the camshaft sprocket. <Ref. to ME(H4SO)-51, REMOVAL, Camshaft Sprocket.>
- 7) Remove the crankshaft sprocket. <Ref. to ME(H4SO)-43, REMOVAL, Crankshaft Pulley.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the rocker cover.
- 10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

NOTE:

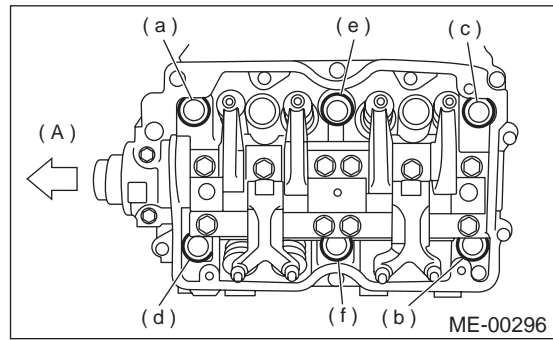
Leave bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



(A) Front

- 11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.

- 12) Remove the bolts (a) and (c) to remove cylinder head.



(A) Front

- 13) Remove the cylinder head gasket.

NOTE:

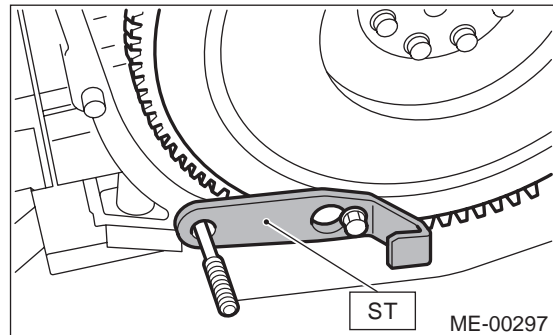
Do not scratch the mating surface of cylinder head and cylinder block.

- 14) Similarly, remove the right side cylinder head.
- 15) Remove the clutch housing cover (MT vehicles).
- 16) Remove the flywheel (MT vehicles) or drive plate (AT vehicles).

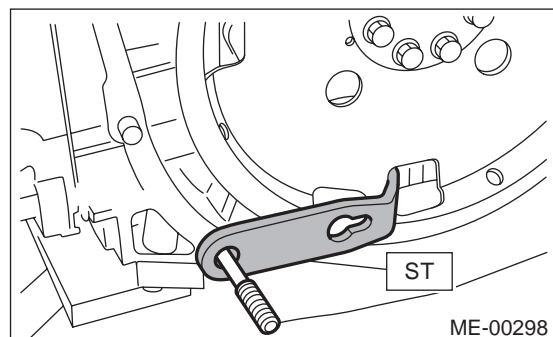
Using the ST, lock the crankshaft.

ST 498497100 CRANKSHAFT STOPPER

- MT VEHICLES



- AT VEHICLES



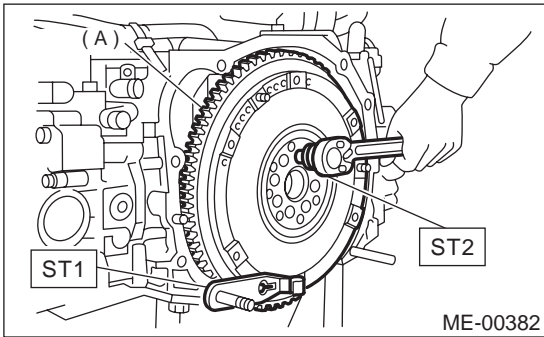
NOTE:

Using STs, remove the flywheel. (2500 cc MT model)

CYLINDER BLOCK

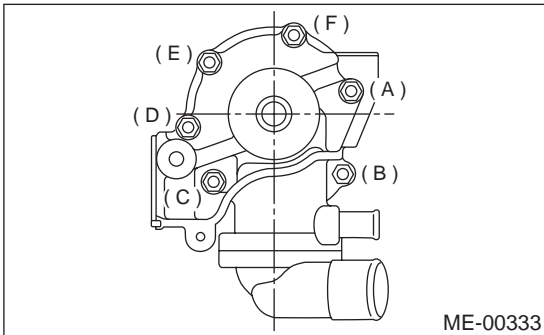
MECHANICAL

ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS



(A) Flywheel

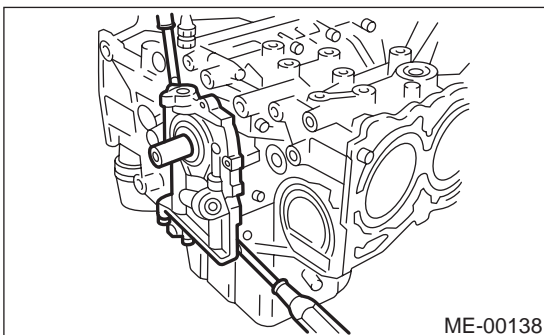
- 17) Remove the oil separator cover.
- 18) Remove the water by-pass pipe for heater.
- 19) Loosen the bolts in alphabetical sequence as shown in the figure, and then remove water pump.



- 20) Remove the oil pump from cylinder block. Use a flat-bladed screwdriver as shown in the figure when removing oil pump.

NOTE:

Be careful not to scratch the mating surface of cylinder block and oil pump.



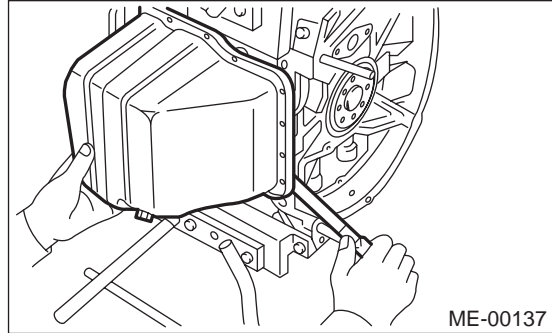
21) Removal of oil pan

- (1) Turn the cylinder block to face the #2 and #4 piston sides upward.
- (2) Remove the bolts which secure oil pan to cylinder block.

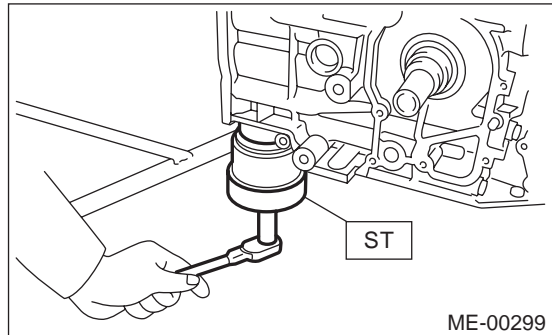
- (3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

NOTE:

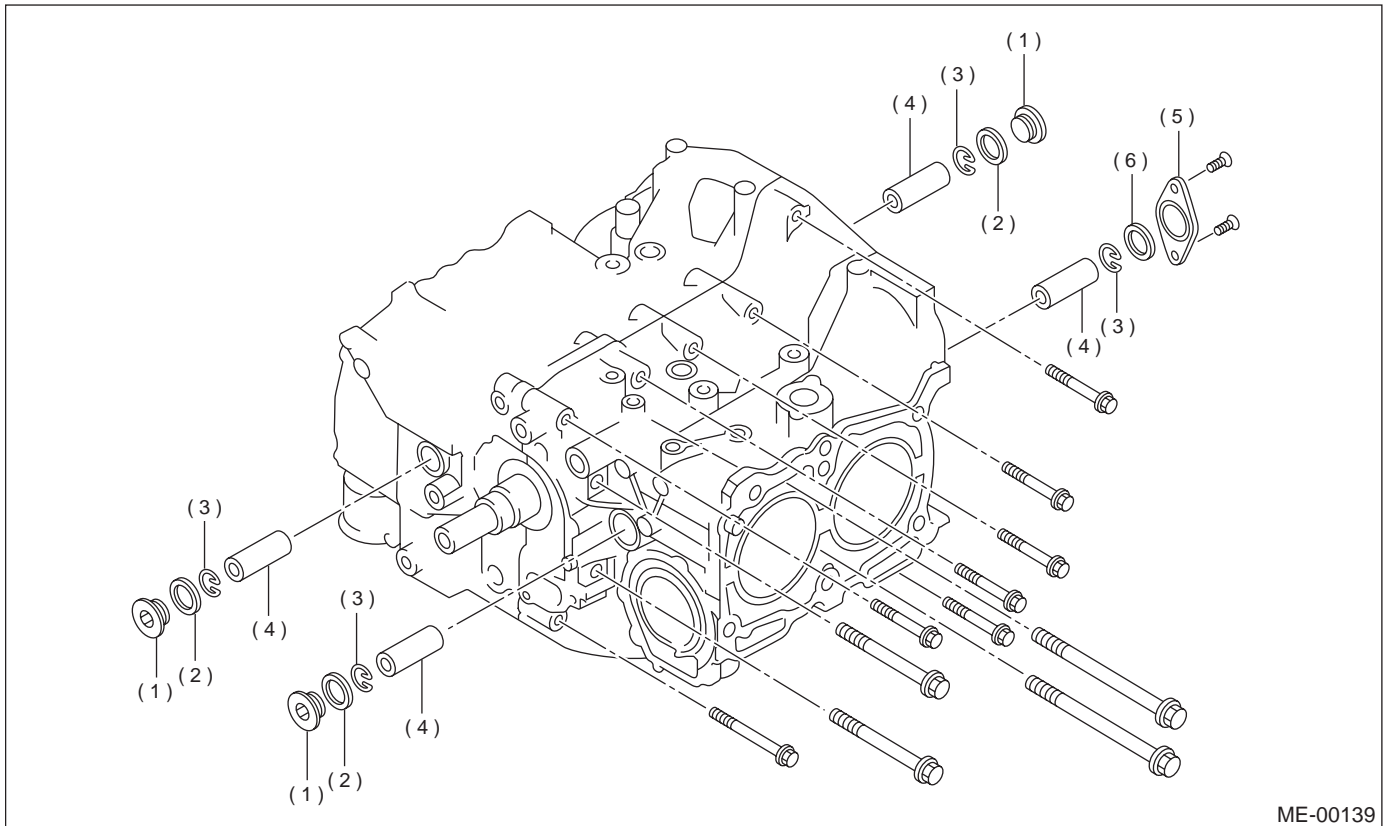
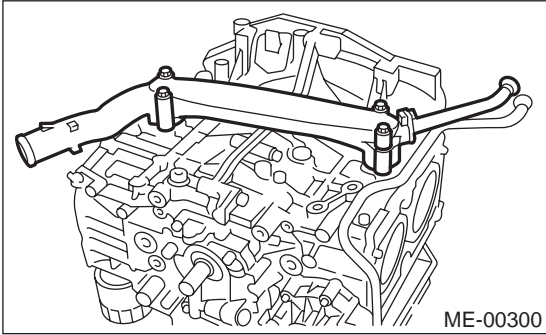
Do not use a screwdriver or similar tool in place of oil pan cutter.



- 22) Remove the oil strainer stay.
 - 23) Remove the oil strainer.
 - 24) Remove the baffle plate.
 - 25) Remove the oil filter using ST.
- ST 498547000 OIL FILTER WRENCH



26) Remove the water pipe.



(1) Service hole plug
(2) Gasket

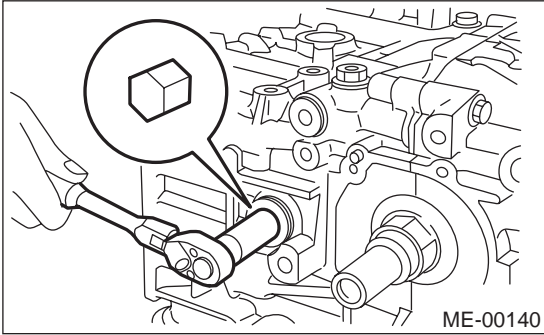
(3) Circlip
(4) Piston pin

(5) Service hole cover
(6) O-ring

CYLINDER BLOCK

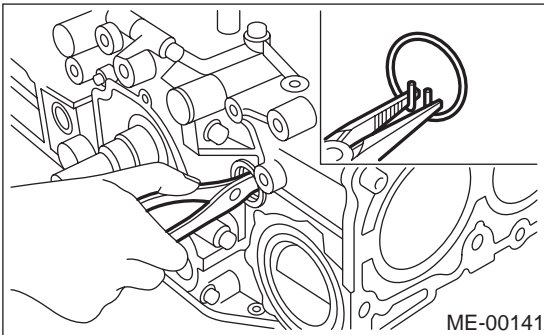
MECHANICAL

27) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].



28) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.

ST 499897200 PISTON SNAP RING PLIER

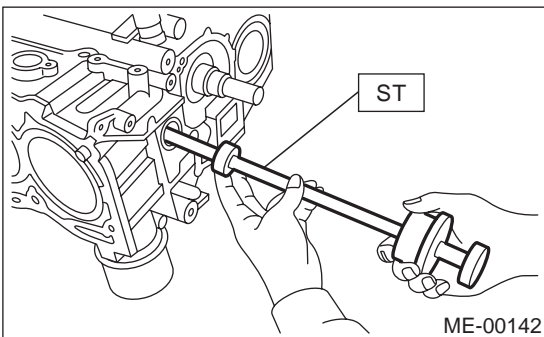


29) Draw out the piston pin from #1 and #2 pistons using ST.

ST 499097700 PISTON PIN REMOVER

NOTE:

Be careful not to confuse the original combination of piston, piston pin and cylinder.



30) Similarly remove the piston pins from #3 and #4 pistons.

31) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.

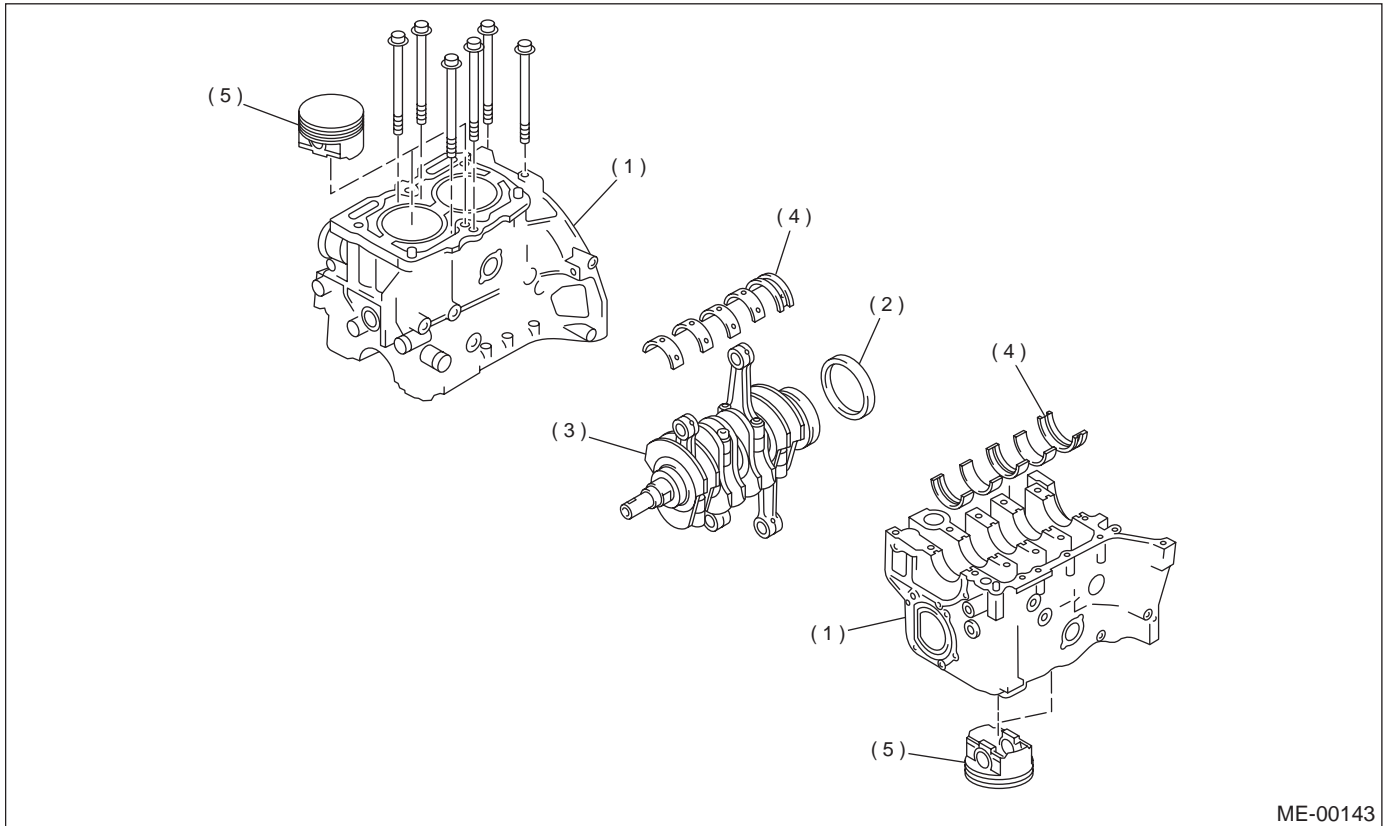
32) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.

33) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, and then remove the cylinder block connecting bolts.

34) Separate the cylinder blocks (RH) and (LH).

NOTE:

When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



ME-00143

(1) Cylinder block

(3) Crankshaft

(5) Piston

(2) Rear oil seal

(4) Crankshaft bearing

35) Remove the rear oil seal.

36) Remove the crankshaft together with connecting rod.

37) Remove the crankshaft bearings from cylinder block using hammer handle.

NOTE:

Do not confuse the combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

38) Draw out each piston from cylinder block using wooden bar or hammer handle.

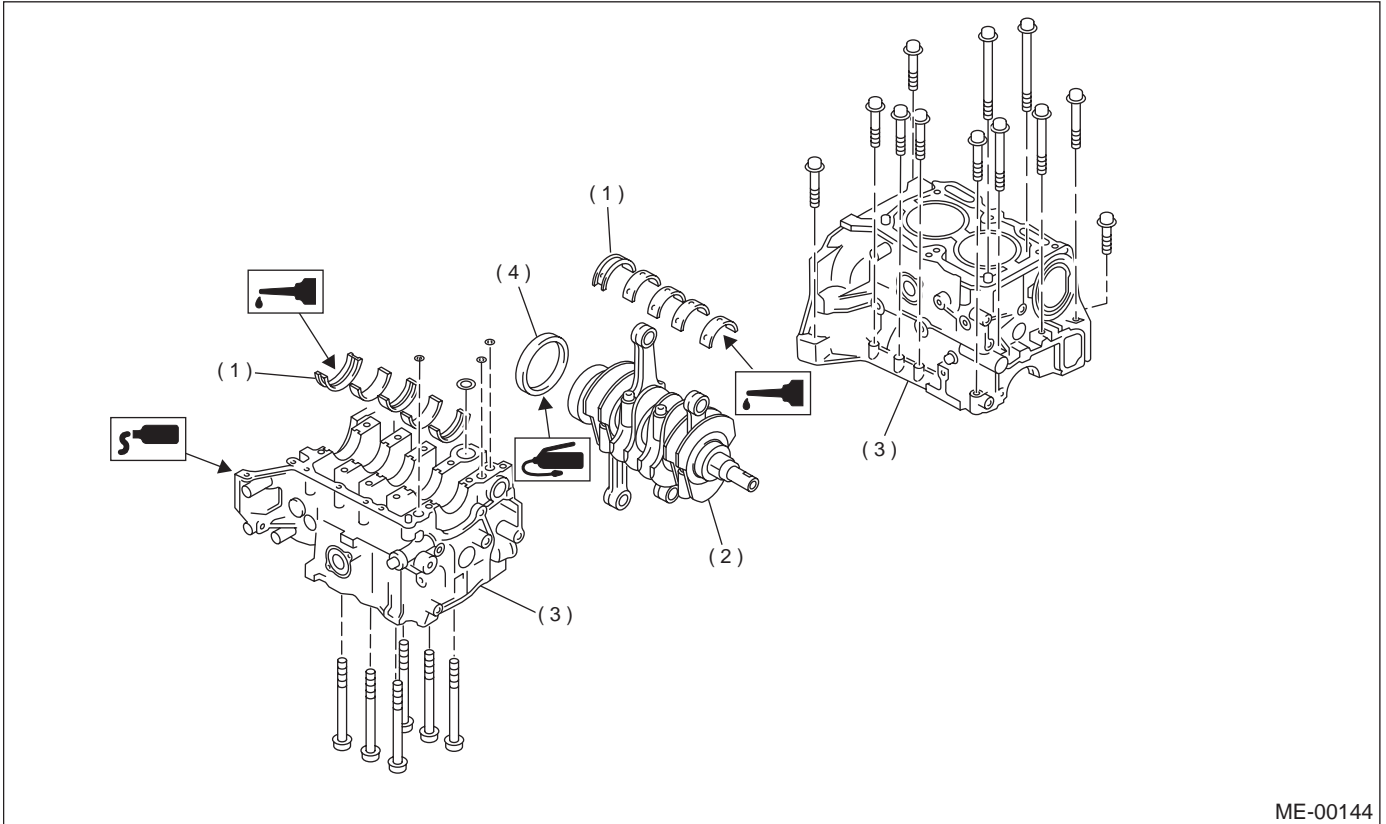
NOTE:

Do not confuse the combination of piston and cylinders.

CYLINDER BLOCK

MECHANICAL

B: INSTALLATION



ME-00144

(1) Crankshaft bearing
(2) Crankshaft

(3) Cylinder block

(4) Rear oil seal

NOTE:

Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

1) Position the crankshaft on #2 and #4 cylinder block.

2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

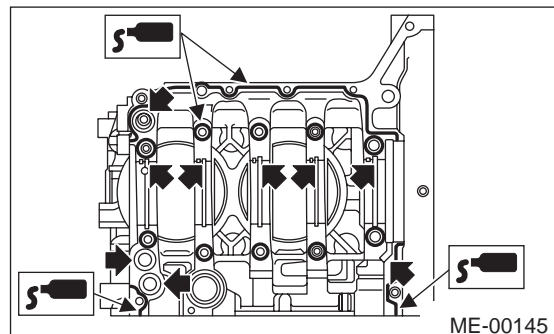
Fluid packing:

Part No. 004403007

THREE BOND 1215 or equivalent

NOTE:

Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



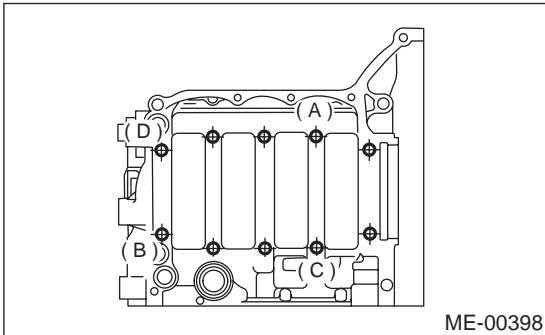
ME-00145

CYLINDER BLOCK

MECHANICAL

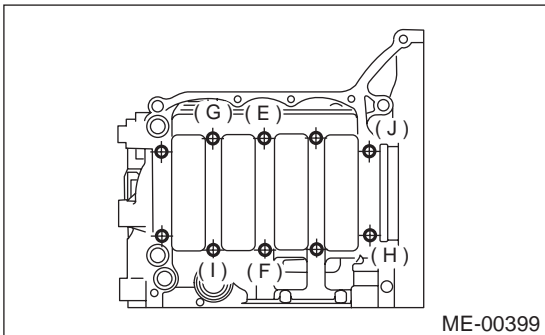
3) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

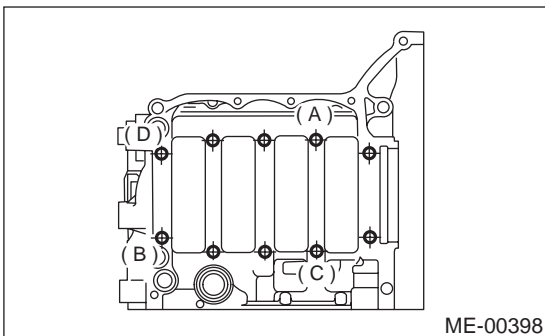


4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

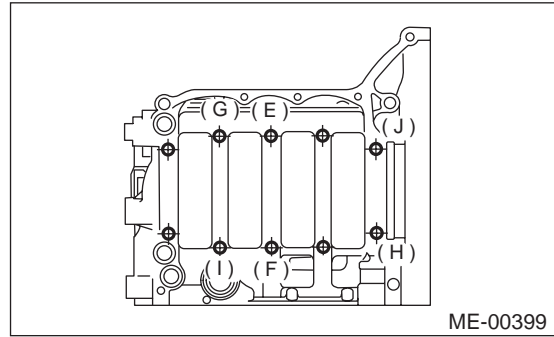
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



5) Further tighten the LH side bolts (A — D) to 90° in alphabetical sequence.

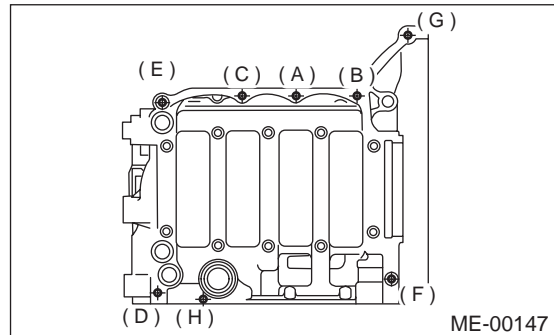


6) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.

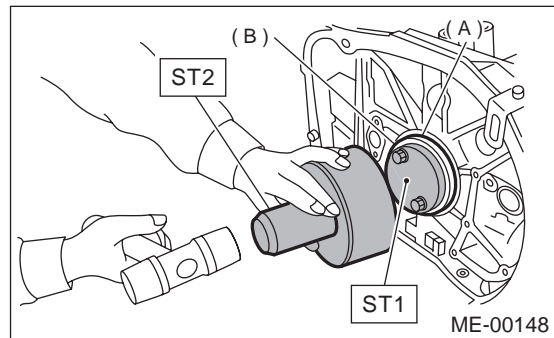


7) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



8) Install the rear oil seal using ST1 and ST2.
 ST1 499597100 OIL SEAL GUIDE
 ST2 499587200 OIL SEAL INSTALLER



(A) Rear oil seal
 (B) Flywheel attaching bolt

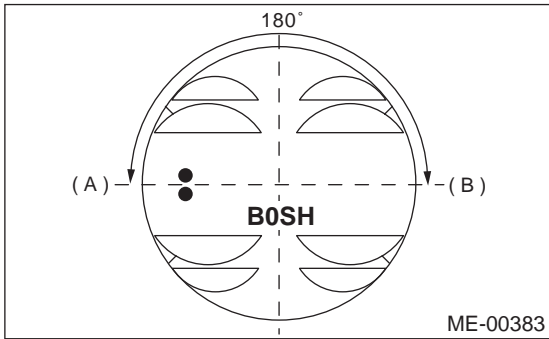
9) Position the top ring gap at (A) or (B) in the figure.

CYLINDER BLOCK

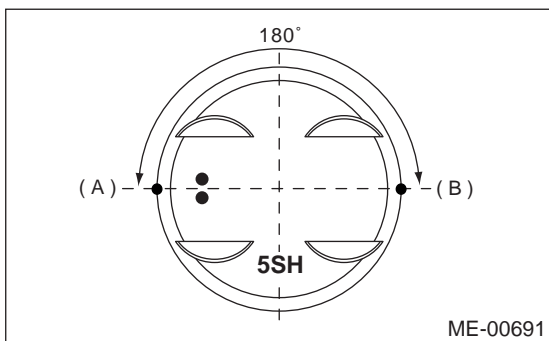
MECHANICAL

10) Position the second ring gap at 180° on the reverse side for top ring gap.

- 2000 cc MODEL

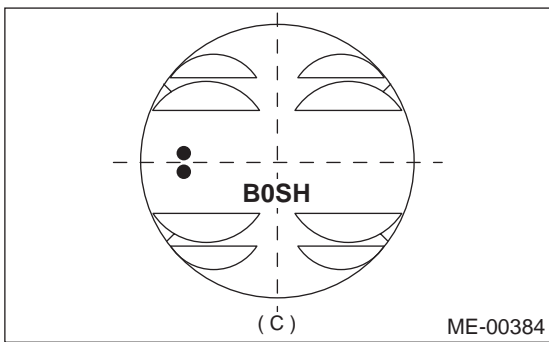


- 2500 cc MODEL

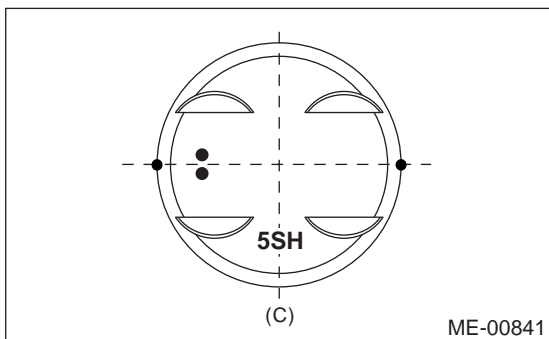


11) Position the expander gap at (C) in the figure.

- 2000 cc MODEL

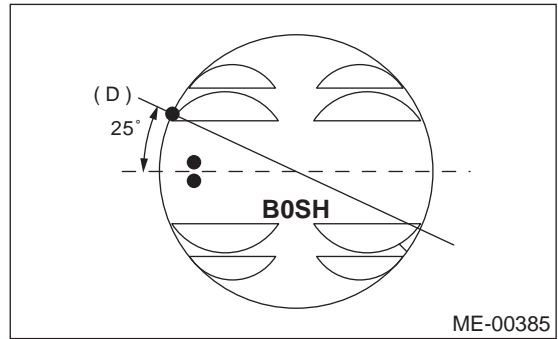


- 2500 cc MODEL

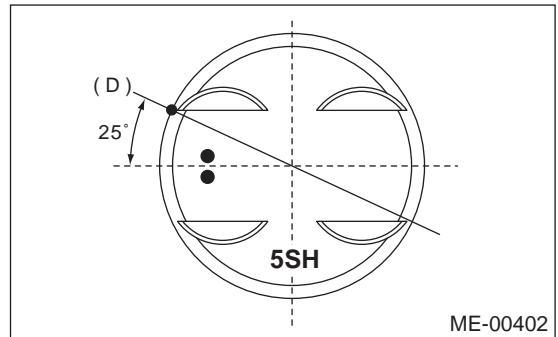


12) Position the lower rail gap at (D) in the figure.

- 2000 cc MODEL

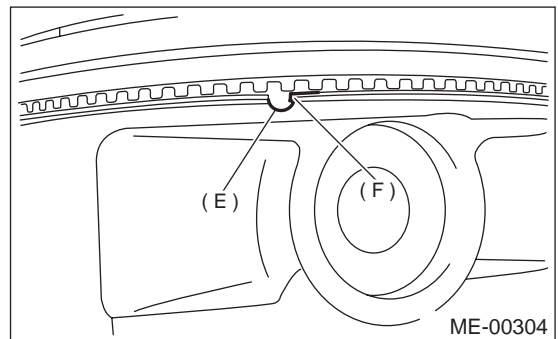


- 2500 cc MODEL



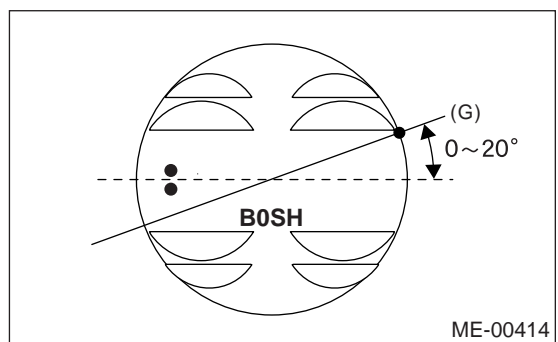
NOTE:

Align the lower rail stopper (F) to the lateral hole (E) on the piston.



13) Position the upper rail gap at (G) in the figure.

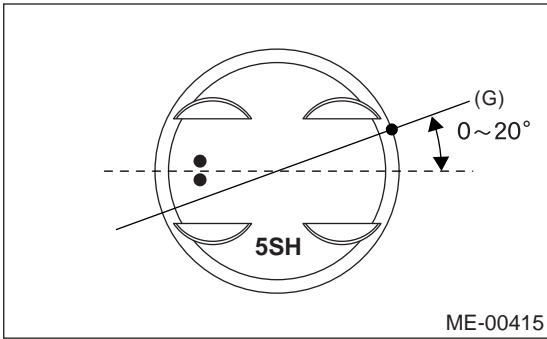
- 2000 cc MODEL



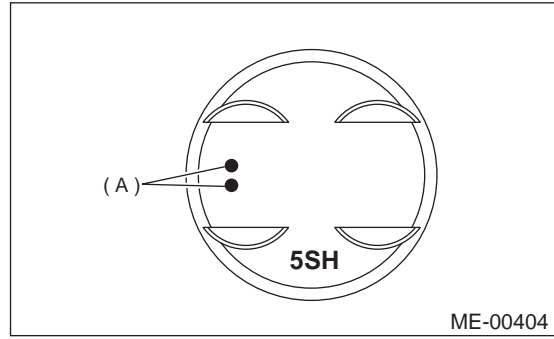
CYLINDER BLOCK

MECHANICAL

• 2500 cc MODEL



• 2500 cc MODEL



NOTE:

- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

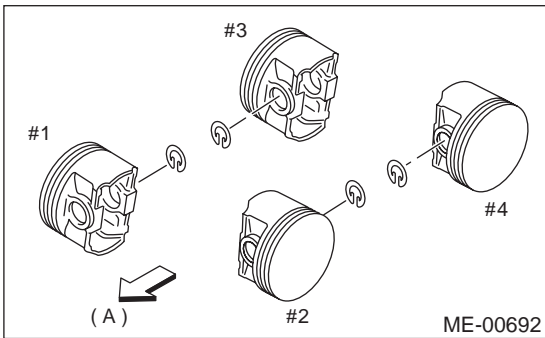
14) Install circlip.

Install circlips in the piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:

Use new circlips.

(A) Front mark

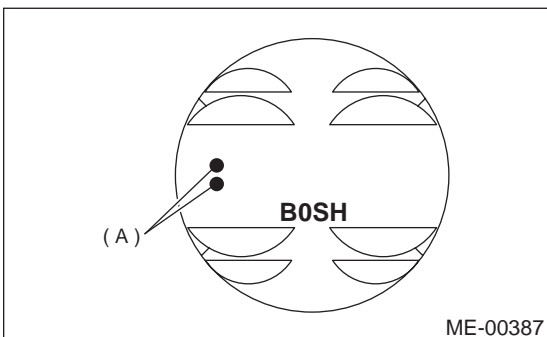


(A) Front side

CAUTION:

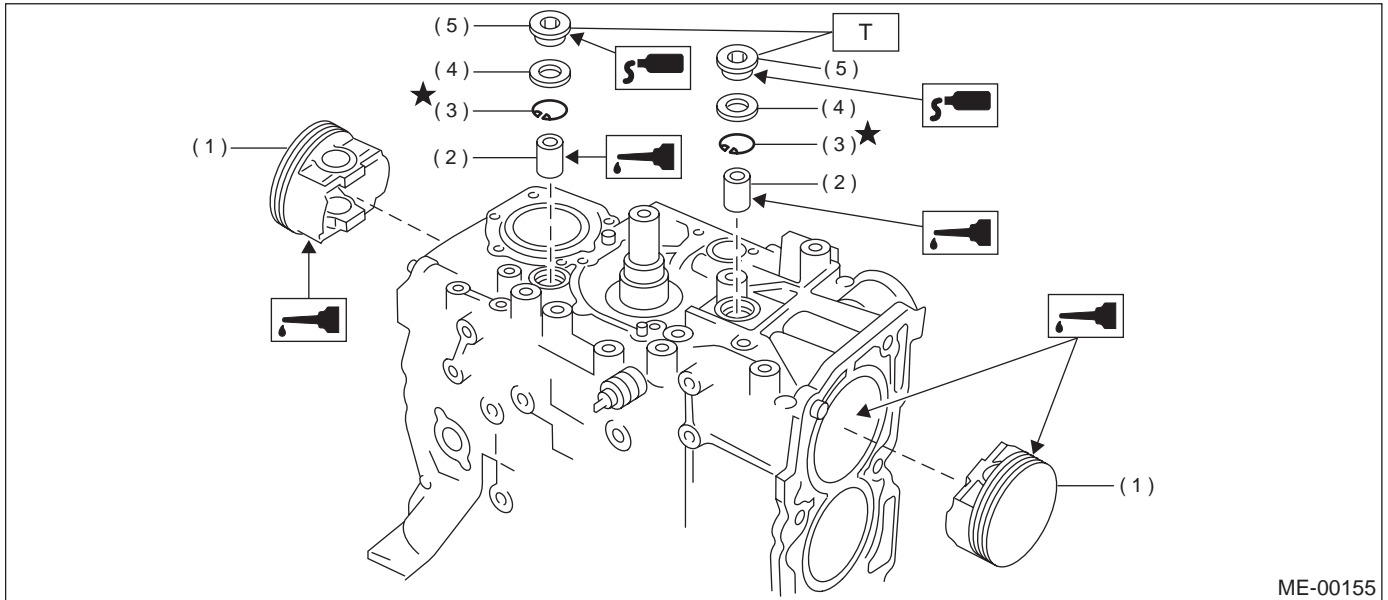
Piston front mark faces towards the front of the engine.

• 2000 cc MODEL



CYLINDER BLOCK

MECHANICAL



ME-00155

- | | |
|----------------|-----------------------|
| (1) Piston | (4) Gasket |
| (2) Piston pin | (5) Service hole plug |
| (3) Circlip | |

Tightening torque: N·m (kgf·m, ft·lb)
T: 70 (7.0, 50.6)

15) Installing piston

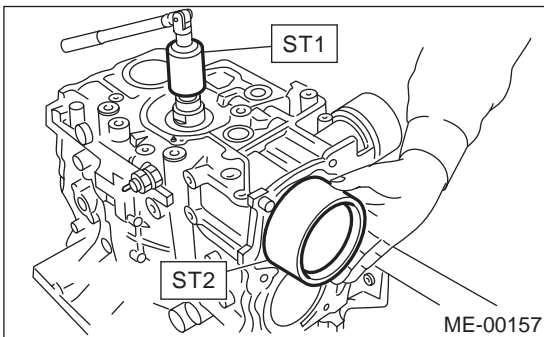
- (1) Turn the cylinder block to face the #1 and #2 piston side upward.
- (2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

- (3) Apply a coat of engine oil to pistons and cylinders, and then insert the pistons in their cylinders using ST2.

ST2 398744300 PISTON GUIDE (2000 cc model)

ST2 498747300 PISTON GUIDE (2500 cc model)

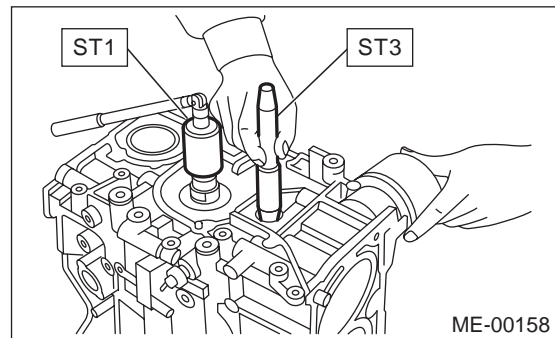


ME-00157

16) Installing piston pin

- (1) Apply a coat of engine oil to the ST3 before insertion.
- (2) Insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



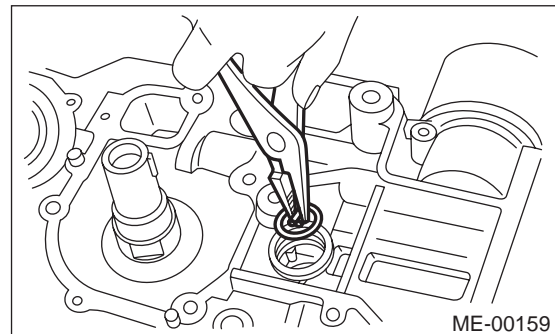
ME-00158

- (3) Apply a coat of engine oil to the piston pin, and then insert the piston pin into piston and connecting rod through service hole.
- (4) Install the circlip.

NOTE:

Use new circlips.

ST3 499897200 PISTON SNAPPING PLIER



ME-00159

CYLINDER BLOCK

MECHANICAL

(5) Apply fluid packing around the service hole plug.

(6) Install the service hole plug and gasket.

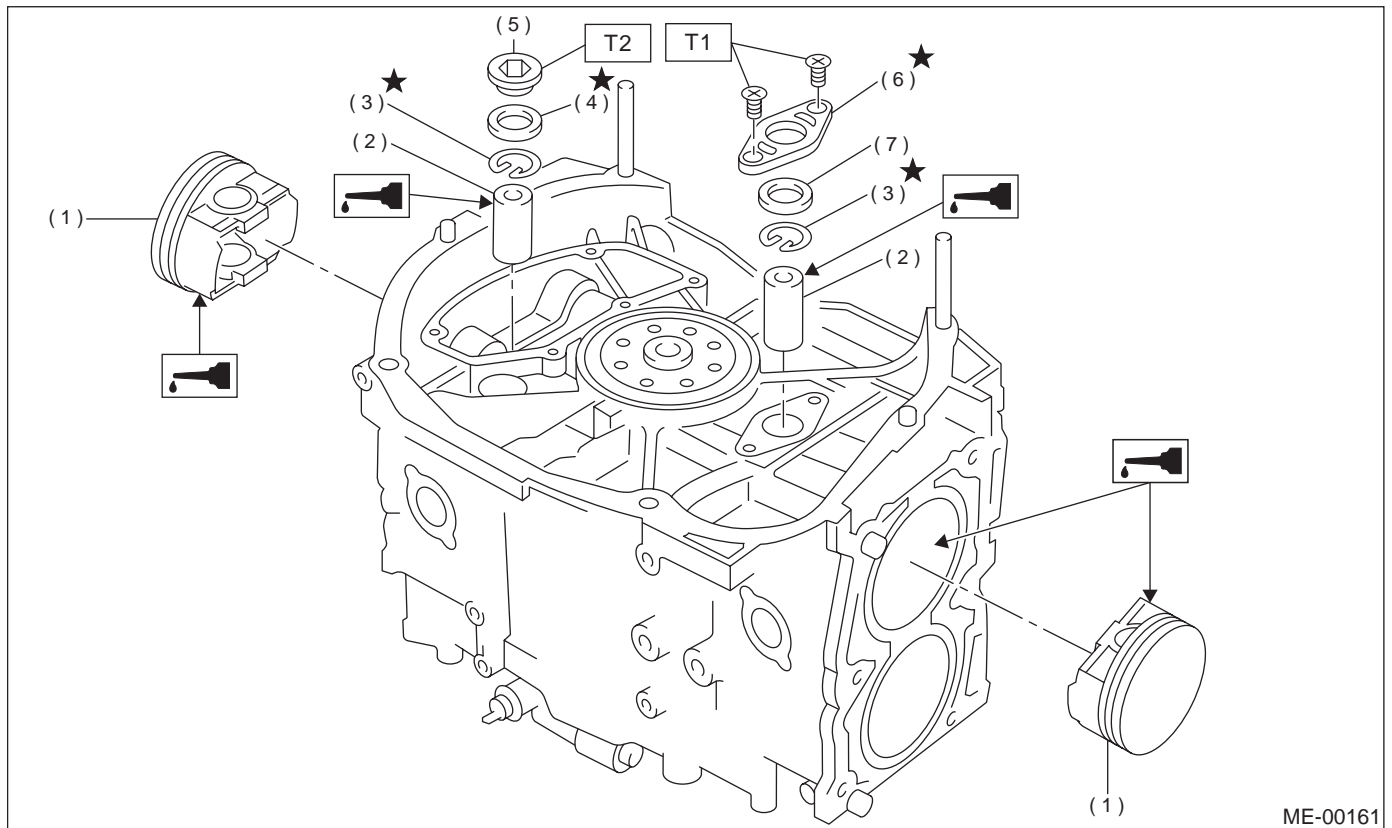
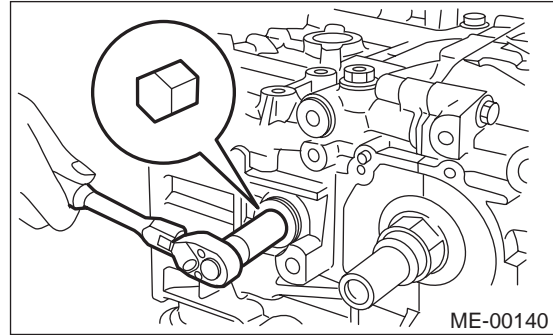
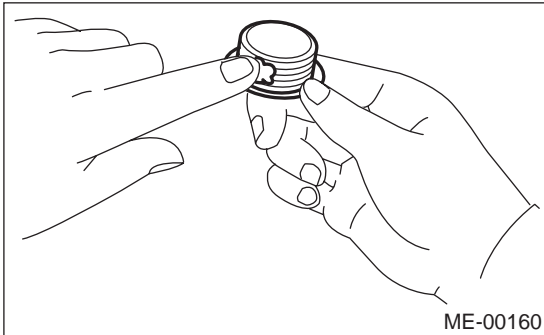
Fluid packing:

Part No. 004403007

THREE BOND 1215 or equivalent

NOTE:

Use a new gasket.



- | | |
|----------------|------------------------|
| (1) Piston | (5) Service hole plug |
| (2) Piston pin | (6) Service hole cover |
| (3) Circlip | (7) O-ring |
| (4) Gasket | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.4 (0.65, 4.7)

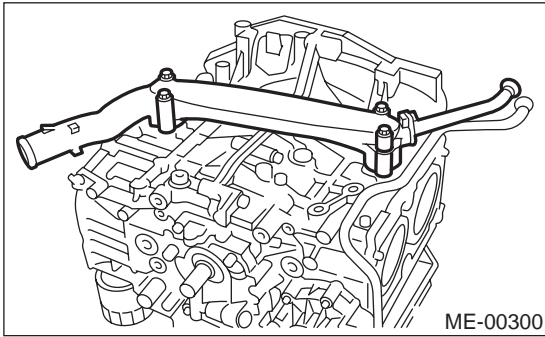
T2: 70 (7.1, 51.4)

(7) Turn the cylinder block to face the #3 and #4 piston side upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

CYLINDER BLOCK

MECHANICAL

17) Install the water pipe.



18) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

19) Install the oil strainer and O-ring.

Tightening torque:

10 N·m (1.0 kgf-m, 7 ft-lb)

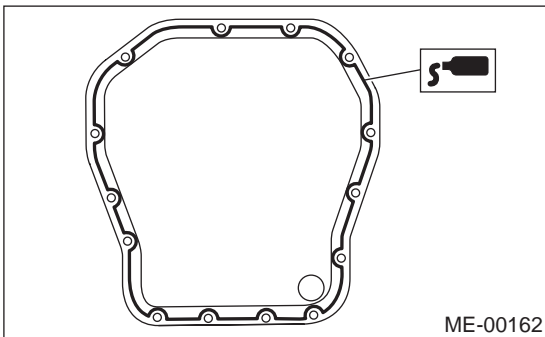
20) Install the oil strainer stay.

21) Apply fluid packing to the matching surfaces, and then install the oil pan.

Fluid packing:

Part No. 004403007

THREE BOND 1215 or equivalent

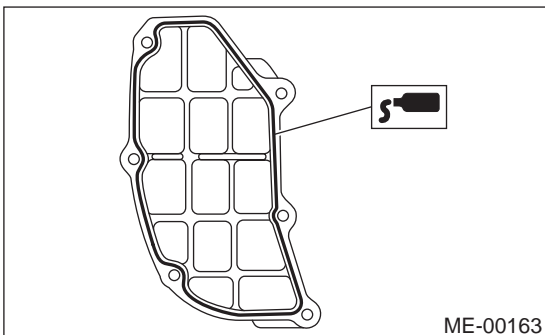


22) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

Fluid packing:

Part No. 004403007

THREE BOND 1215 or equivalent



23) Install the flywheel or drive plate.

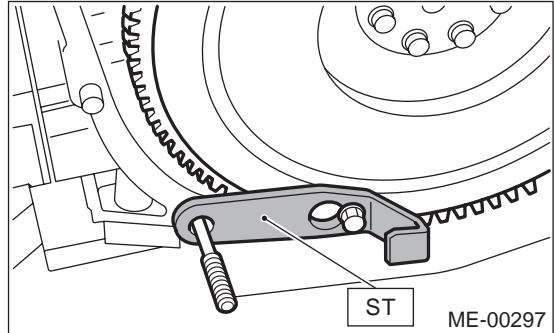
To lock the crankshaft, use ST.

ST 498497100 CRANKSHAFT STOPPER

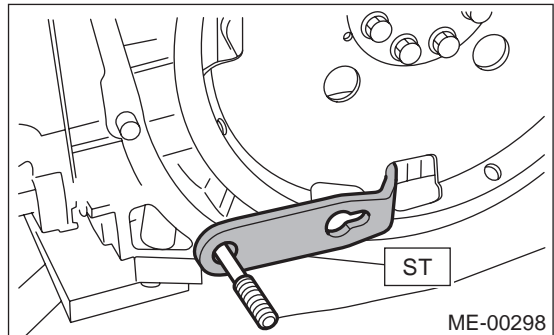
Tightening torque:

72 N·m (7.3 kgf-m, 52.8 ft-lb)

• MT VEHICLES



• AT VEHICLES

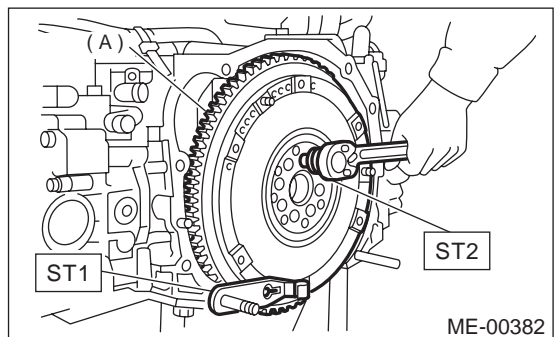


NOTE:

Using STs, remove the flywheel. (2500 cc MT model)

ST1 498497100 CRANKSHAFT STOPPER

ST2 499057000 TORX PLUS



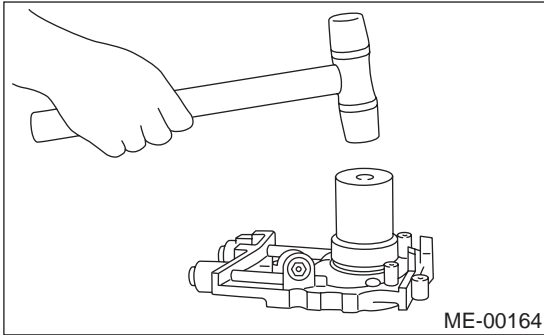
(A) Flywheel

24) Install the housing cover.

25) Installation of oil pump

- (1) Discard the front oil seal after removal. Replace with a new one using the ST.

ST 499587100 OIL SEAL INSTALLER

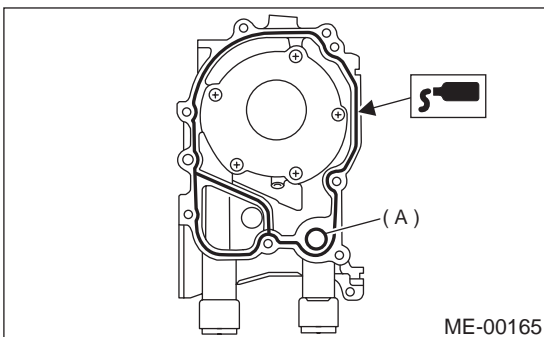


- (2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:

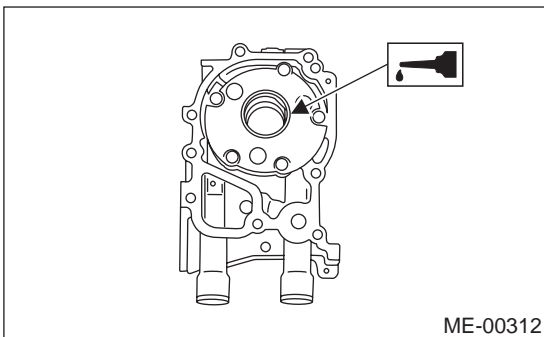
Part No. 004403007

THREE BOND 1215 or equivalent



(A) O-ring

- (3) Apply a coat of engine oil to the inside of oil seal.



- (4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

NOTE:

- Do not forget to install the O-ring and seal when installing oil pump.
- Align flat surface of oil pump's inner rotor with crankshaft before installation.

- 26) Install the water pump and gasket.

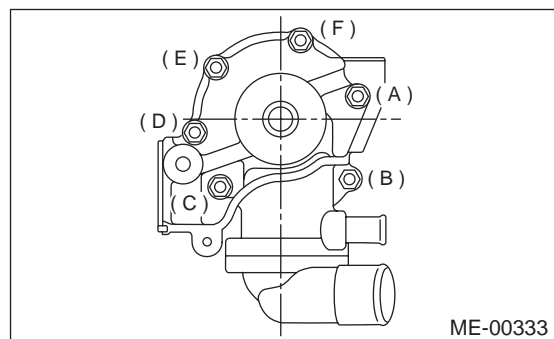
Tightening torque:

First; 12 N·m (1.2 kgf·m, 8.7 ft·lb)

Second; 12 N·m (1.2 kgf·m, 8.7 ft·lb)

NOTE:

- Be sure to use a new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



- 27) Install the water by-pass pipe for heater.

- 28) Install the oil filter using ST.

ST 498547000 OIL FILTER WRENCH

- 29) Tighten the cylinder head bolts.

- (1) Apply a coat of engine oil to the washers and bolt threads.

- (2) Tighten all bolts to 29 N·m (3.0 kgf·m, 22 ft·lb) in alphabetical sequence.

- Then tighten all bolts to 69 N·m (7.0 kgf·m, 51 ft·lb) in alphabetical sequence.

- (3) Back off all bolts by 180° first; back them off by 180° again.

- (4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf·m, 25 ft·lb).

- (5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf·m, 11 ft·lb).

- (6) Tighten all bolts by 80 to 90° in alphabetical sequence.

NOTE:

Do not tighten bolts more than 90°.

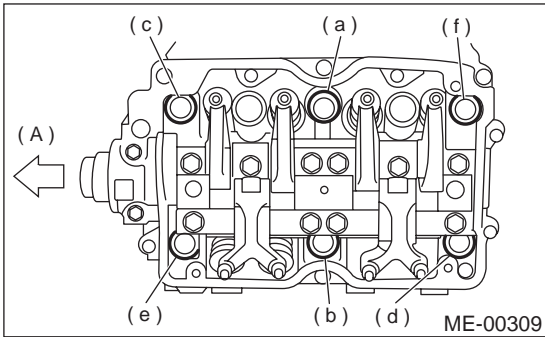
- (7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

CYLINDER BLOCK

MECHANICAL

NOTE:

Ensure that the total "re-tightening angle" [in the former two steps], do not exceed 180°.



(A) Front

- 30) Install the oil level gauge guide, and then tighten the attaching bolt (left side only).
- 31) Install the rocker cover.

32) Install the crankshaft sprocket. <Ref. to ME(H4SO)-53, INSTALLATION, Crankshaft Sprocket.>

33) Install the camshaft sprocket. <Ref. to ME(H4SO)-51, INSTALLATION, Camshaft Sprocket.>

34) Install the timing belt assembly. <Ref. to ME(H4SO)-47, INSTALLATION, Timing Belt Assembly.>

35) Install the belt cover. <Ref. to ME(H4SO)-45, INSTALLATION, Belt Cover.>

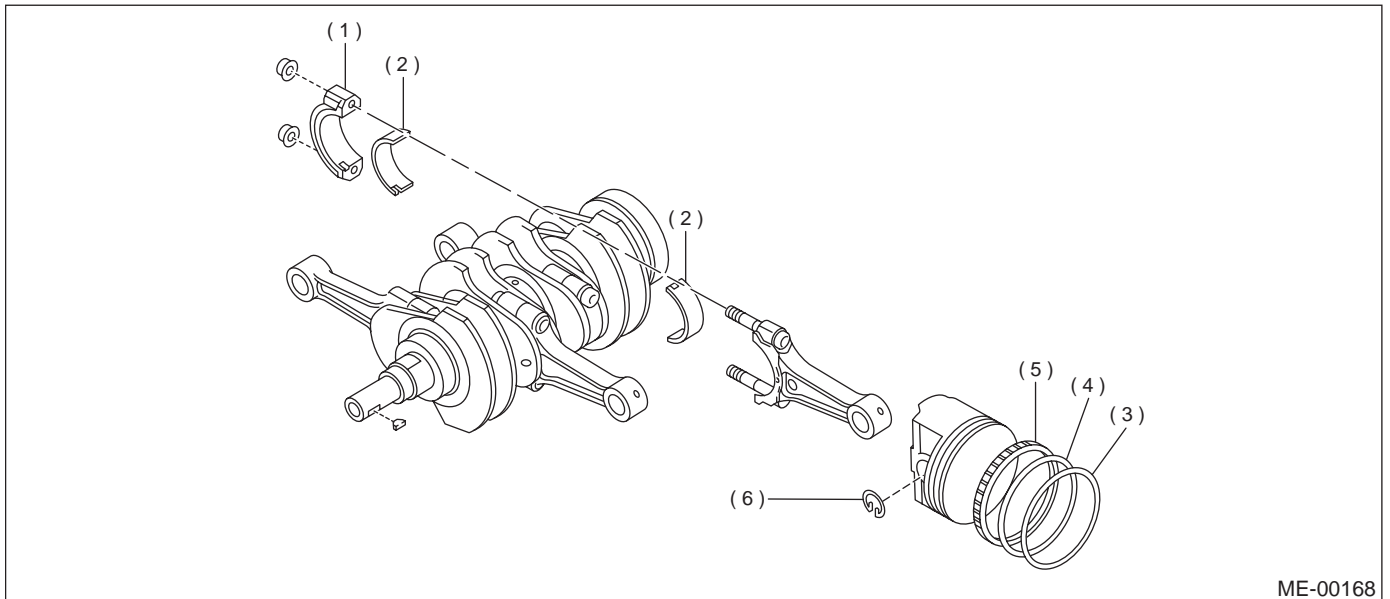
36) Install the crankshaft pulley. **<Ref. to ME(H4SO)-43, INSTALLATION, CRANKSHAFT PULLEY.>**

37) Install the generator and A/C compressor brackets on cylinder head.

38) Install the V-belt. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

39) Install the intake manifold. <Ref. to FU(H4SO)-17, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY



- (1) Connecting rod cap
- (2) Connecting rod bearing

- (3) Top ring
- (4) Second ring

- (5) Oil ring
- (6) Circlip

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

NOTE:

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.

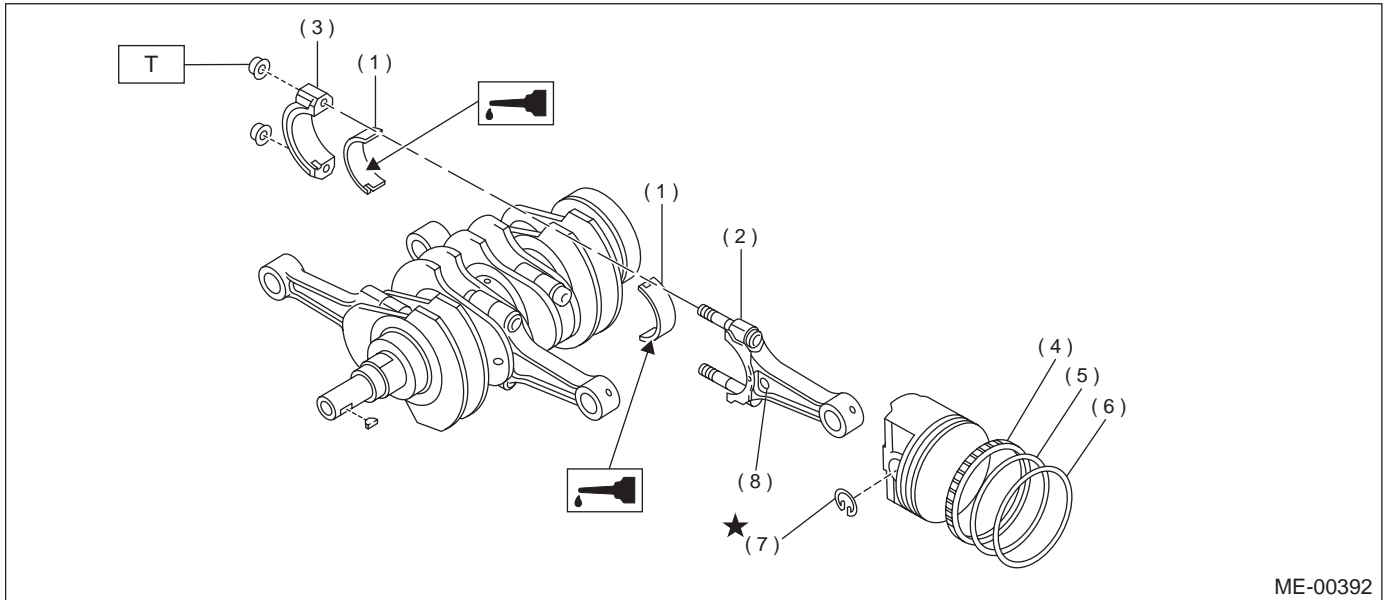
4) Remove the oil ring by hand.

NOTE:

Arrange the removed piston rings in good order to prevent confusion.

5) Remove the circlip.

D: ASSEMBLY



- | | |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod | (6) Top ring |
| (3) Connecting rod cap | (7) Circlip |
| (4) Oil ring | (8) Side mark |

Tightening torque: N-m (kgf-m, ft-lb)

T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings.

2) Install the connecting rod bearings on connecting rods and connecting rod caps.

3) Position each connecting rod with the marked side facing forward, and then install them.

4) Install the connecting rod cap with connecting rod nut.

Ensure the arrow on connecting rod cap faces the front during installation.

NOTE:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.

- When tightening the connecting rod nuts, apply oil on the threads.

5) Install the expander, lower rail and upper rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.

2) Check the oil passages for clogging.

3) Inspect the crankcase surface that mates with cylinder head for warping by using a straightedge, and correct by grinding if necessary.

Warping limit:

0.05 mm (0.0020 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

NOTE:

- Measurement should be performed at a temperature of 20°C (68°F).

- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

CYLINDER BLOCK

MECHANICAL

Standard diameter:

2000 cc model

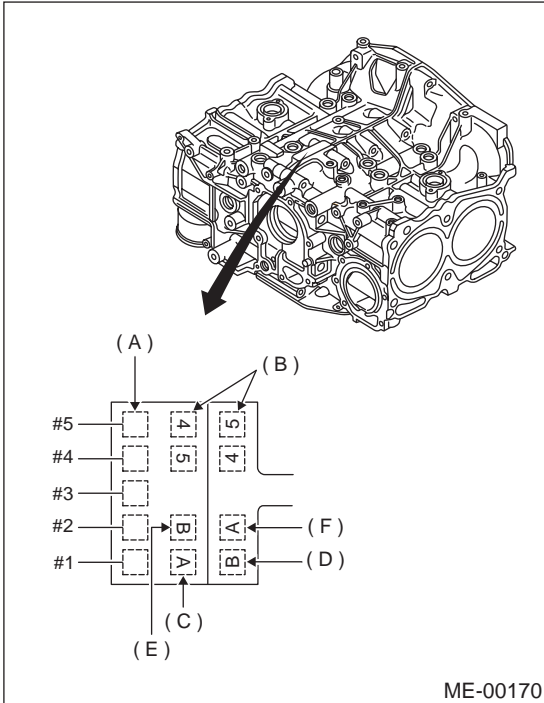
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)

B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)

2500 cc model

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



- (A) Main journal size mark
- (B) Cylinder block RH-LH combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Taper:

Standard

0.015 mm (0.0006 in)

Limit

0.050 mm (0.0020 in)

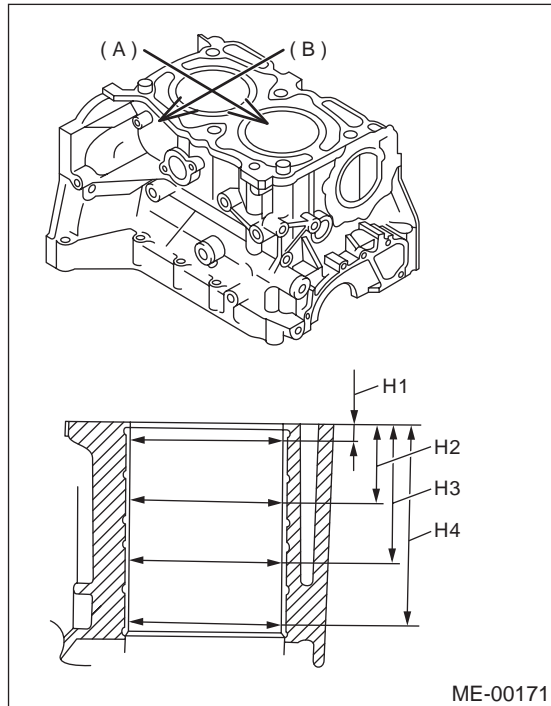
Out-of-roundness:

Standard

0.010 mm (0.0004 in)

Limit

0.050 mm (0.0020 in)



- (A) Piston pin direction
- (B) Thrust direction
- H1 10 mm (0.39 in)
- H2 45 mm (1.77 in)
- H3 80 mm (3.15 in)
- H4 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston

Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:

• 2000 cc model

40.0 mm (1.575 in)

• 2500 cc model

37.0 mm (1.457 in)

Piston outer diameter:

Standard:

• **2000 cc model**

A: 91.985 — 91.995 mm
(3.6214 — 3.6218 in)

B: 91.975 — 91.985 mm
(3.6211 — 3.6214 in)

0.25 mm (0.0098 in) oversize

92.225 — 92.235 mm
(3.6309 — 3.6313 in)

0.50 mm (0.0197 in) oversize

92.475 — 92.485 mm
(3.6407 — 3.6411 in)

• **2500 cc model**

A: 99.485 — 99.495 mm
(3.9167 — 3.9171 in)

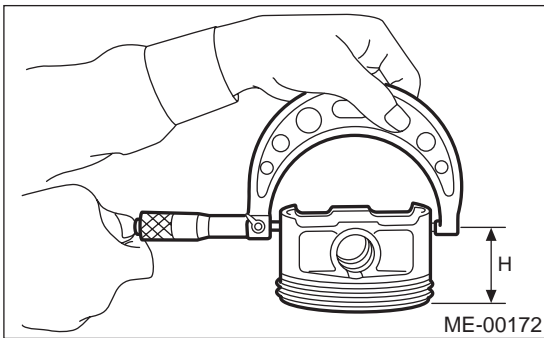
B: 99.475 — 99.485 mm
(3.9163 — 3.9167 in)

0.25 mm (0.0098 in) oversize

99.725 — 99.735 mm
(3.9262 — 3.9266 in)

0.50 mm (0.0197 in) oversize

99.975 — 99.985 mm
(3.9360 — 3.9364 in)



5) Calculate the clearance between cylinder and piston.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):

Standard

0.010 — 0.030 mm (0.0004 — 0.0012 in)

Limit

0.050 mm (0.0020 in)

6) Boring and honing

(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

NOTE:

When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

Limit of cylinder enlarging (boring):

0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4SO)-81, CYLINDER BLOCK, INSPECTION, Cylinder Block.> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.

CYLINDER BLOCK

MECHANICAL

3) Make sure that piston pin can be inserted into piston pin hole with a thumb at 20°C (68°F). Replace if defective.

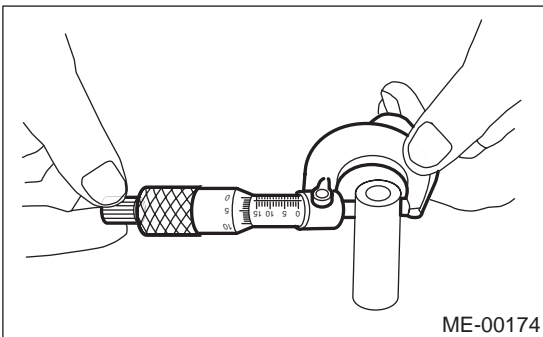
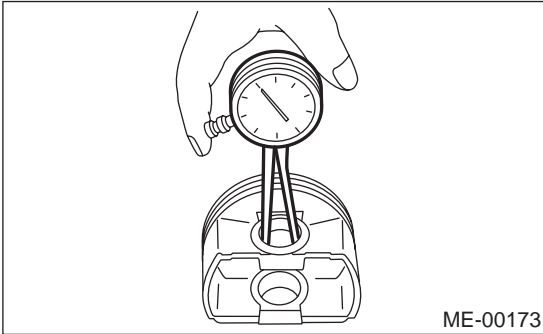
Standard clearance between piston pin and hole in piston:

Standard

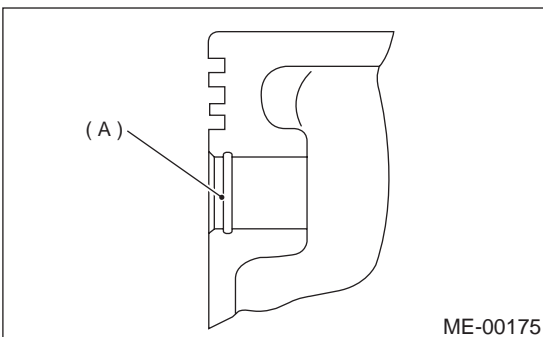
0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

0.020 mm (0.0008 in)



4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that piston pin can lightly move.



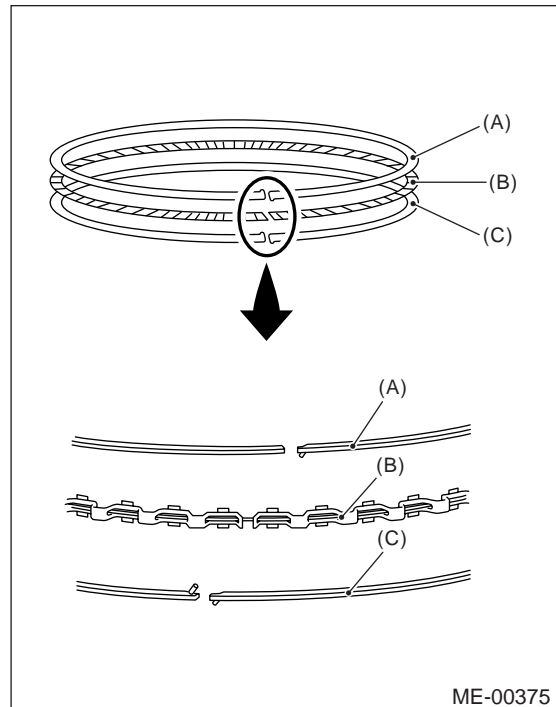
5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

NOTE:

- Marks are shown on the end of top and second rings. When installing the rings to piston, face these marks upward.
- Oil ring is composed of upper rail, expander and lower rail. Be careful of the rail direction when installing oil ring to the piston.

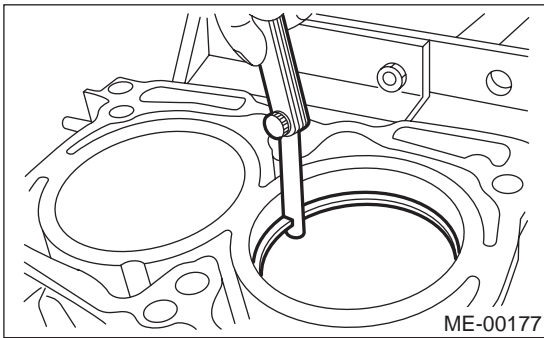


- (A) Upper rail
- (B) Expander
- (C) Lower rail

2) Clean the piston ring groove and piston ring.

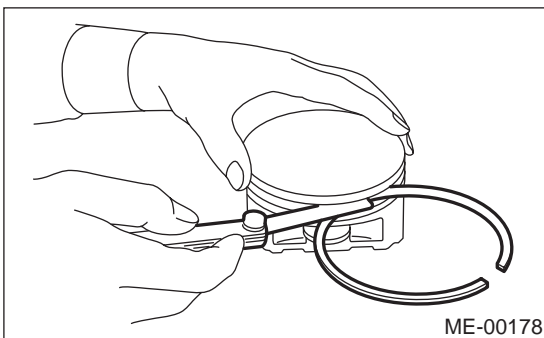
3) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

			Unit: mm (in)	
			Standard	Limit
Piston ring gap	Top ring		0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	2000 cc	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
		2500 cc	0.37 — 0.52 (0.0146 — 0.0204)	
	Oil ring rail		0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)



4) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

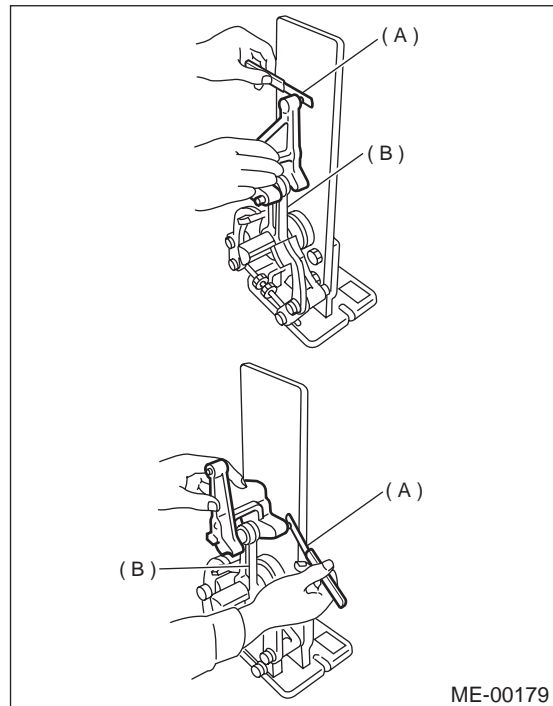
			Unit: mm (in)	
			Standard	Limit
Clearance between piston ring and piston ring groove	Top ring		0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring		0.030 — 0.070 (0.0012 — 0.0028)	



5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



- (A) Thickness gauge
- (B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

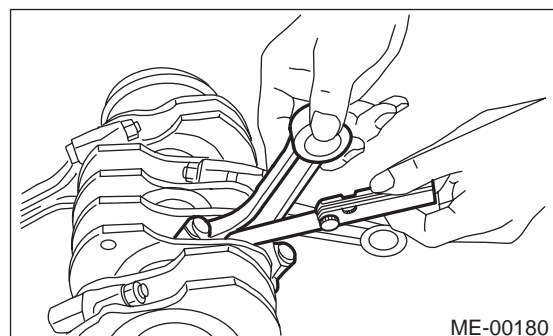
Connecting rod side clearance:

Standard

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Limit

0.4 mm (0.016 in)



CYLINDER BLOCK

MECHANICAL

4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:

• 2000 cc MODEL

Standard

0.010 — 0.038 mm (0.0004 — 0.0015 in)

Limit

0.050 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.492 — 1.501 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

Connecting rod oil clearance:

• 2500 cc MODEL

Standard

0.012 — 0.038 mm (0.0005 — 0.0015 in)

Limit

0.05 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

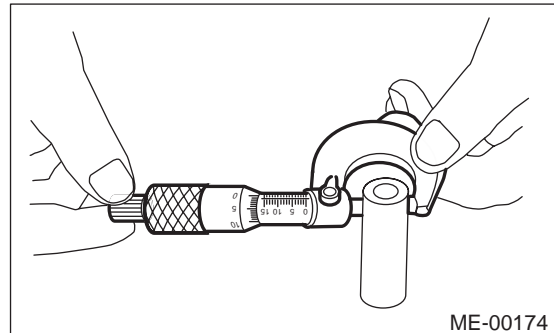
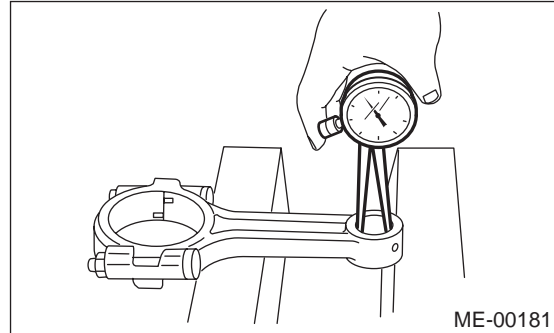
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

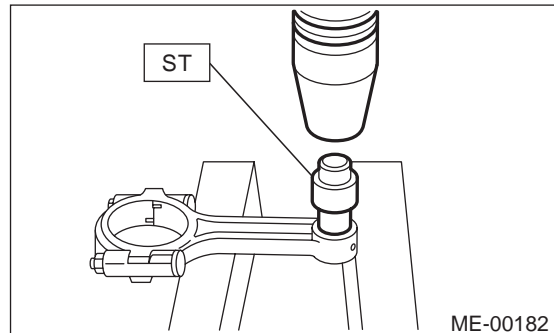
0.030 mm (0.0012 in)



7) Replacement procedure is as follows.

- (1) Remove the bushing from connecting rod with ST and press.
- (2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



- (3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
- (4) After the completion of reaming, clean the bushing to remove chips.

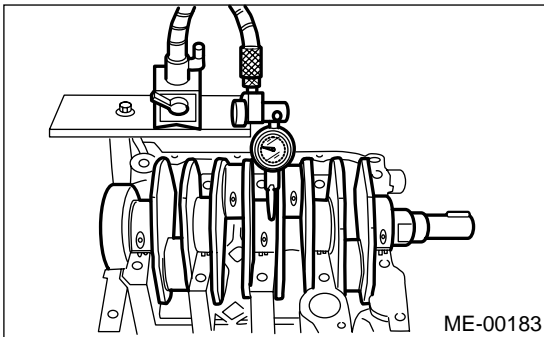
6. CRANKSHAFT AND CRANKSHAFT BEARING

- 1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
- 2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

NOTE:

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

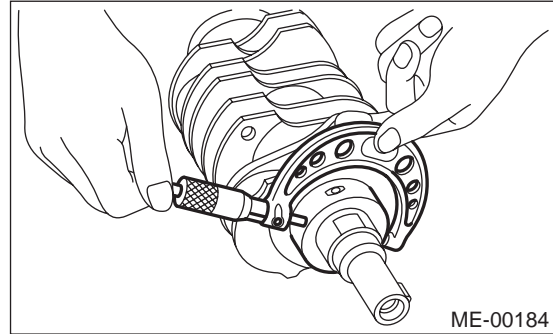
Crankshaft bend limit:
0.035 mm (0.0014 in)



- 3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:

- Out-of-roundness**
0.020 mm (0.0008 in) or less
- Taper limit**
0.07 mm (0.0028 in)
- Grinding limit**
0.250 mm (0.0098 in)



		Unit: mm (in)			
		Crank journal diameter		Crank pin diameter	
		#1, #3	#2, #4, #5	2000 cc	2500 cc
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.492 — 1.501 (0.0587 — 0.0591)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.510 — 1.513 (0.0594 — 0.0596)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0446 — 2.0453)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.520 — 1.523 (0.0598 — 0.0600)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)	1.614 — 1.622 (0.0635 — 0.0639)

O.D. ... Outer Diameter

CYLINDER BLOCK

MECHANICAL

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

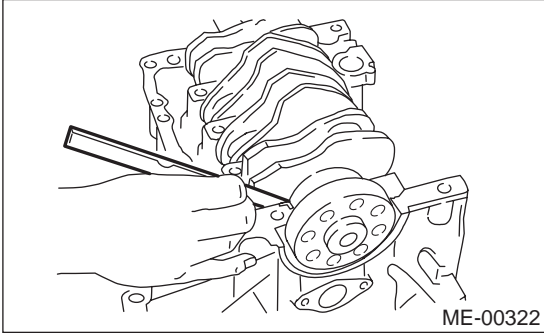
Crankshaft thrust clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)



5) Inspect the individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and then replace or recondition the crankshaft as necessary.

Unit: mm (in)		
Crankshaft oil clearance		
#1	Standard	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#2	Standard	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#3	Standard	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#4	Standard	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#5	Standard	0.010 — 0.031 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)

ENGINE TROUBLE IN GENERAL

MECHANICAL

22.Engine Trouble in General

A: INSPECTION

NOTE:

“RANK” shown in the chart refer to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
• Seized or stuck piston and cylinder		C	
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Fuel line	• Defective fuel pump and relay	A
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
• Improper engine oil (low viscosity)	B		
3) Initial combustion occurs.	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
• Worn or stuck piston rings, cylinder and piston		C	
• Incorrect valve timing		B	
• Improper engine oil (low viscosity)	B		

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	B
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	C
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Dirty air cleaner element	C
	• Fuel line	• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
• Worn or stuck piston rings, cylinder and piston		C	
• Incorrect valve timing		B	
• Improper engine oil (low viscosity)		B	
2. Rough idle and engine stall	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	C
		• Loosened oil filler cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
		• Defective rocker cover gasket	C
	• Cooling system	• Overheating	C
	• Others	• Malfunction of evaporative emission control system	A
		• Stuck or damaged throttle valve	B
		• Accelerator cable out of adjustment	C

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	B
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
• Incorrect valve timing		A	
• Improper engine oil (low viscosity)	B		
• Lubrication system	• Incorrect oil pressure	B	
• Cooling system	• Overheating	C	
	• Over cooling	C	
• Others	• Malfunction of evaporative emission control system	A	
4. Surging	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Improper engine oil (low viscosity)	B	
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	C

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked vacuum hose	A
	• Others	• Stuck or damaged throttle valve	A
		• Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	B
7. After burning in exhaust system	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	C
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	B
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
	• Incorrect valve timing	A	
	• Lubrication system	• Incorrect oil pressure	C
• Cooling system	• Over cooling	C	
• Others	• Malfunction of evaporative emission control system	C	
8. Knocking	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filler seal	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
	• Loosened oil pan fitting bolts or defective oil pan	B	

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK	
10. Excessive fuel consumption	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A	
	• Intake system	• Dirty air cleaner element	A	
	• Belt	• Defective timing	B	
	• Compression	• Incorrect valve clearance		B
		• Loosened spark plugs or defective gasket		C
		• Loosened cylinder head bolts or defective gasket		C
		• Improper valve seating		B
		• Defective valve stem		C
		• Worn or broken valve spring		C
		• Worn or stuck piston rings, cylinder and piston		B
		• Incorrect valve timing		B
	• Lubrication system	• Incorrect oil pressure		C
	• Cooling system	• Over cooling		C
• Others	• Accelerator cable out of adjustment		B	

ENGINE NOISE

MECHANICAL

23.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	<ul style="list-style-type: none"> Valve mechanism is defective. Incorrect valve clearance Worn valve rocker Worn camshaft Broken valve spring
Heavy and dull clank	Oil pressure is low.	<ul style="list-style-type: none"> Worn crankshaft main bearing Worn connecting rod bearing (big end)
	Oil pressure is normal.	<ul style="list-style-type: none"> Loose flywheel mounting bolts Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	<ul style="list-style-type: none"> Ignition timing advanced Accumulation of carbon inside combustion chamber Wrong spark plug Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> Worn crankshaft main bearing Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> Worn cylinder liner and piston ring Broken or stuck piston ring Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	<ul style="list-style-type: none"> Unusually worn valve lifter Worn cam gear Worn camshaft journal bore in crankcase
Squeaky sound	—	<ul style="list-style-type: none"> Insufficient generator lubrication
Rubbing sound	—	<ul style="list-style-type: none"> Defective generator brush and rotor contact
Gear scream when starting engine	—	<ul style="list-style-type: none"> Defective ignition starter switch Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	<ul style="list-style-type: none"> Loose drive belt Defective water pump shaft
Hissing sound	—	<ul style="list-style-type: none"> Loss of compression Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	<ul style="list-style-type: none"> Loose timing belt Belt contacting case/adjacent part
Valve tappet noise	—	<ul style="list-style-type: none"> Incorrect valve clearance

NOTE*:

When disconnecting fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.

Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H4SO)-47, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)-40, Inspection Mode.> after connecting fuel injector connector.

EXHAUST

EX(H4SO)

	Page
1. General Description	2
2. Front Exhaust Pipe.....	5
3. Center Exhaust Pipe	8
4. Rear Exhaust Pipe	9
5. Muffler	10

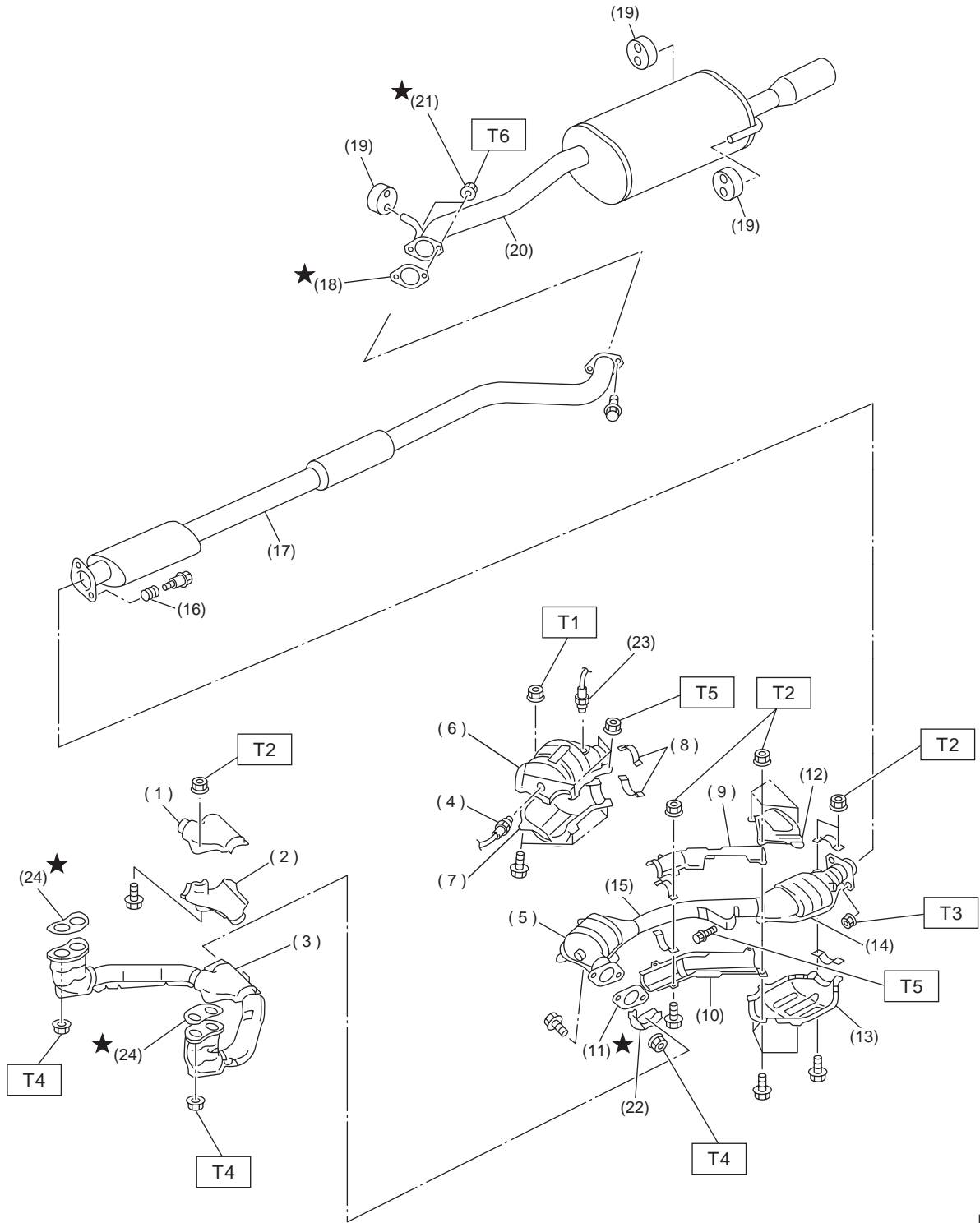


GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT



EX-00104

GENERAL DESCRIPTION

EXHAUST

- | | | |
|---|---|-------------------------|
| (1) Upper front exhaust pipe cover | (12) Upper rear catalytic converter cover | (23) Rear oxygen sensor |
| (2) Lower front exhaust pipe cover | | (24) Gasket |
| (3) Front exhaust pipe | (13) Lower rear catalytic converter cover | |
| (4) Front oxygen (A/F) sensor | | |
| (5) Front catalytic converter | (14) Rear catalytic converter | |
| (6) Upper front catalytic converter cover | (15) Center exhaust pipe | |
| (7) Lower front catalytic converter cover | (16) Spring | |
| (8) Clamp | (17) Rear exhaust pipe | |
| (9) Upper center exhaust pipe cover | (18) Gasket | |
| (10) Lower center exhaust pipe cover | (19) Cushion rubber | |
| (11) Gasket | (20) Muffler | |
| | (21) Self-locking nut | |
| | (22) Protector | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 13 (1.3, 9.4)

T3: 18 (1.8, 13.0)

T4: 30 (3.1, 22.4)

T5: 35 (3.6, 26.0)

T6: 48 (4.9, 35.4)

GENERAL DESCRIPTION

EXHAUST

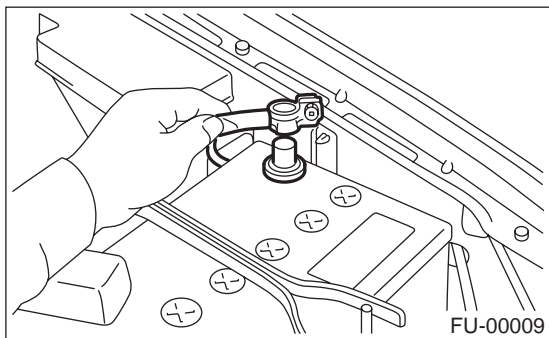
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

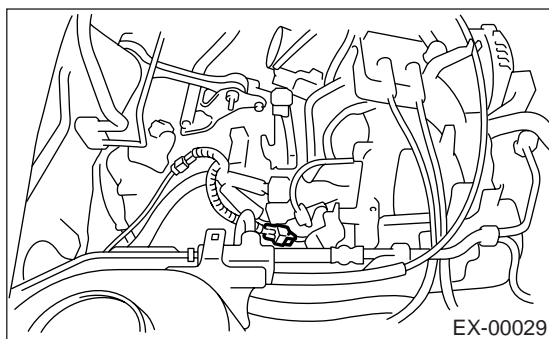
2. Front Exhaust Pipe

A: REMOVAL

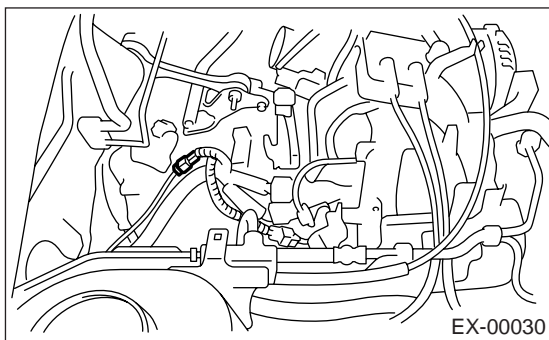
1) Disconnect battery ground cable.



2) Disconnect front oxygen (A/F) sensor connector.



3) Disconnect rear oxygen sensor connector.

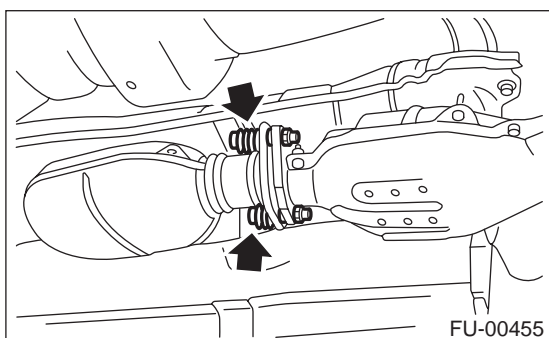


4) Lift-up the vehicle.

5) Separate front and center exhaust pipe assembly from rear exhaust pipe.

WARNING:

Be careful, exhaust pipe is hot.

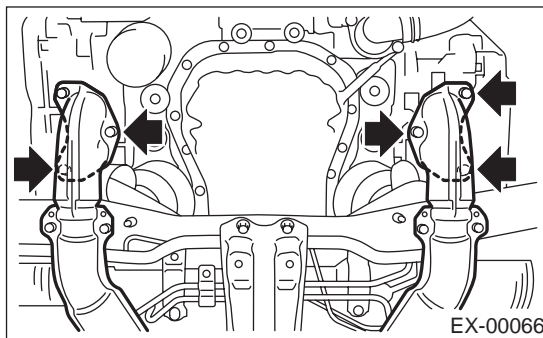


6) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>

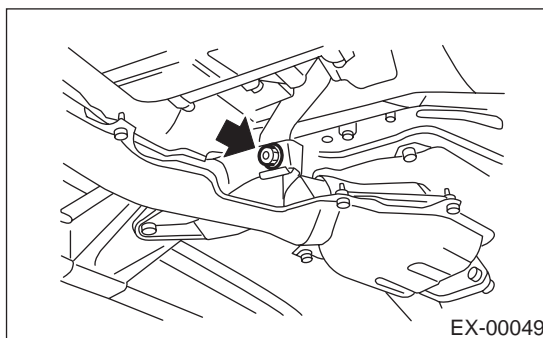
7) Remove nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:

Be careful not to pull down front and center exhaust pipe assembly.



8) Remove bolt which installs front and center exhaust pipe assembly to hanger bracket.



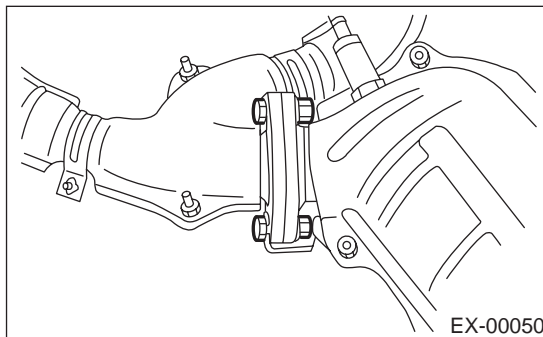
9) Remove front and center exhaust pipe assembly from the vehicle.

CAUTION:

- Be careful not to let front and center exhaust pipe assembly fall off when removing as it is quite heavy.

- After removing front and center exhaust assembly, do not apply excessive pulling force on rear exhaust pipe.

10) Separate front exhaust pipe from center exhaust pipe.



FRONT EXHAUST PIPE

EXHAUST

B: INSTALLATION

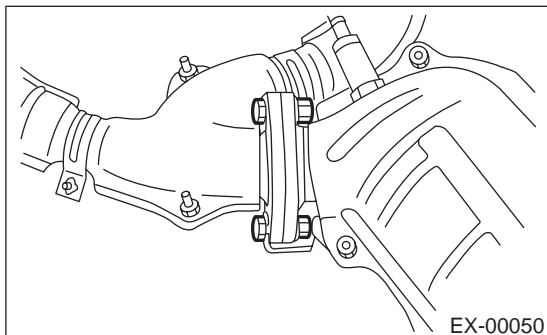
1) Install front exhaust pipe to center exhaust pipe.

NOTE:

Replace gaskets with new ones.

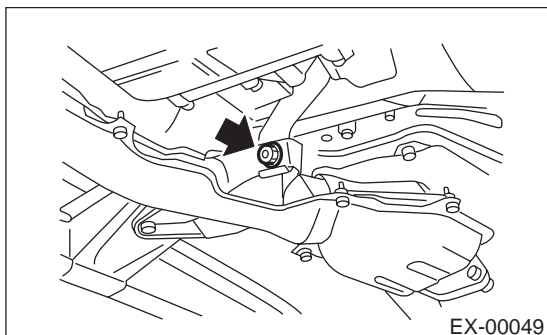
Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)



2) Install front and center exhaust pipe assembly to the vehicle.

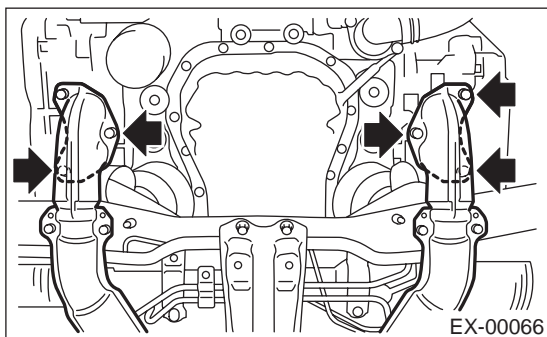
3) Temporarily tighten bolt which installs front and center exhaust pipe assembly to hanger bracket.



4) Tighten nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)

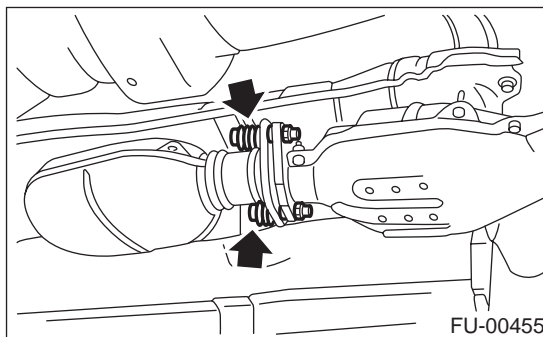


5) Install under cover.<Ref. to EI-13, INSTALLATION, Front Under Cover.>

6) Tighten bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:

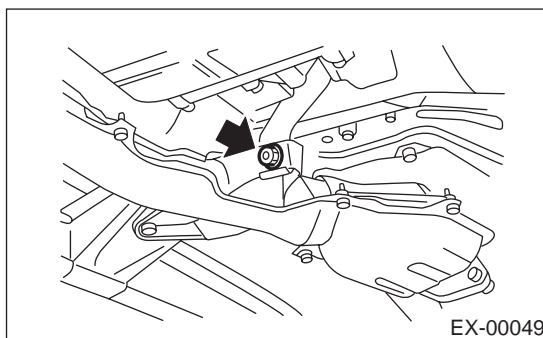
18 N·m (1.8 kgf-m, 13.0 ft-lb)



7) Tighten bolt which holds front and center exhaust pipe assembly to hanger bracket.

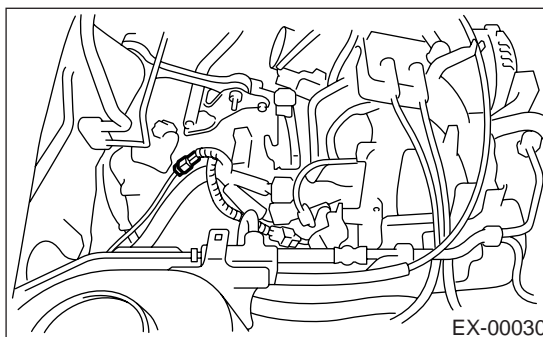
Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)

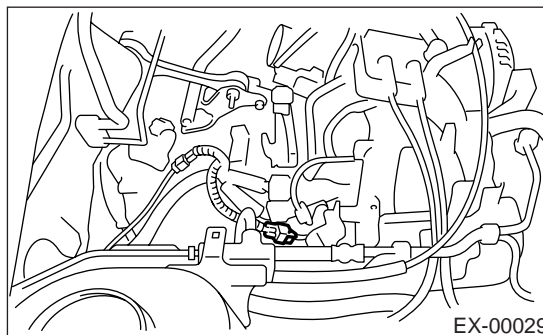


8) Lower the vehicle.

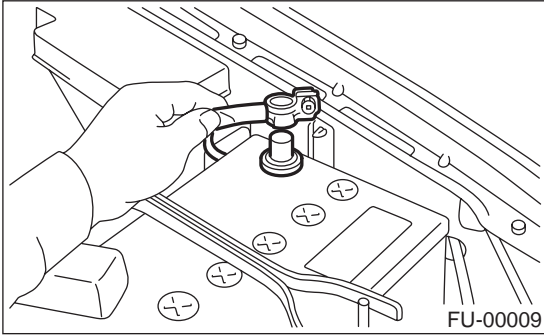
9) Connect rear oxygen sensor connector.



10) Connect front oxygen (A/F) sensor connector.



11) Connect battery ground cable.



C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

3. Center Exhaust Pipe

A: REMOVAL

After removing the center and front exhaust pipes as one unit, separate them. Refer to the procedure for removing the front exhaust pipe. <Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to the procedure for installing the front exhaust pipe. <Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

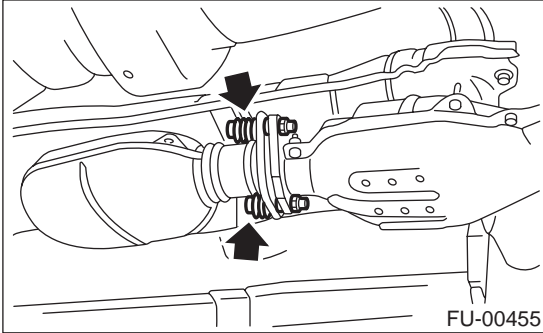
4. Rear Exhaust Pipe

A: REMOVAL

1) Separate rear exhaust pipe from center exhaust pipe.

CAUTION:

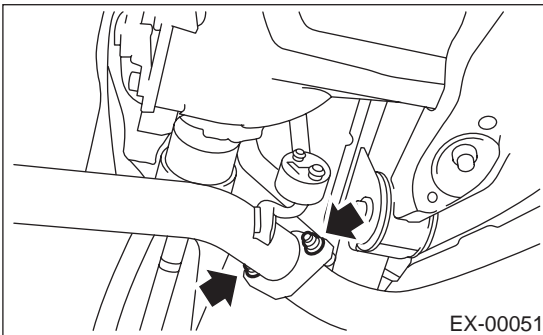
Be careful, exhaust pipe is hot.



2) Separate rear exhaust pipe from muffler.

CAUTION:

Be careful not to pull down rear exhaust pipe.



3) Remove rear exhaust pipe.

B: INSTALLATION

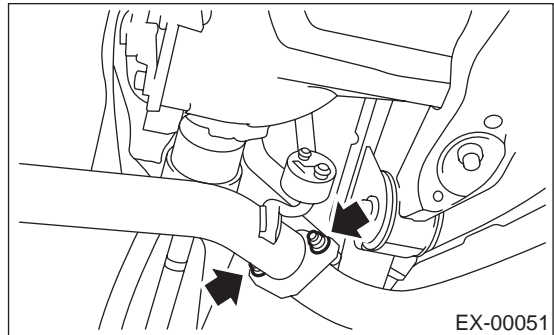
NOTE:

Replace gaskets and self-locking nuts with new ones.

1) Install rear exhaust pipe to muffler.

Tightening torque:

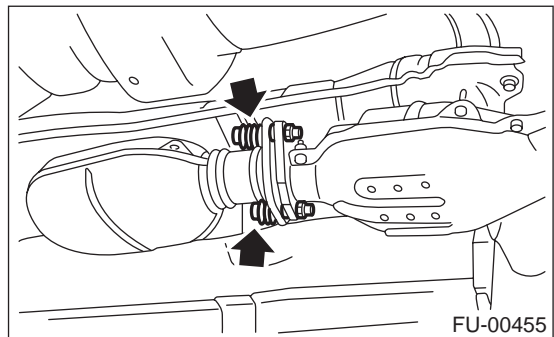
48 N·m (4.9 kgf-m, 35.4 ft-lb)



2) Install rear exhaust pipe to center exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

MUFFLER

EXHAUST

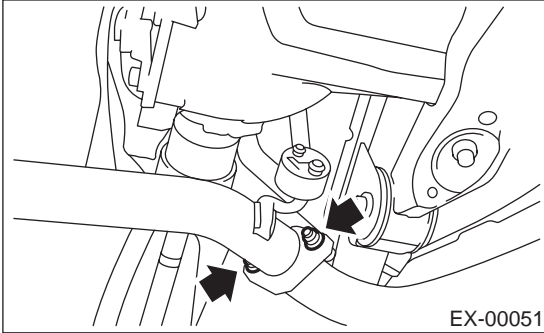
5. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

CAUTION:

Be careful, exhaust pipe is hot.



2) Remove left and right rubber cushions.

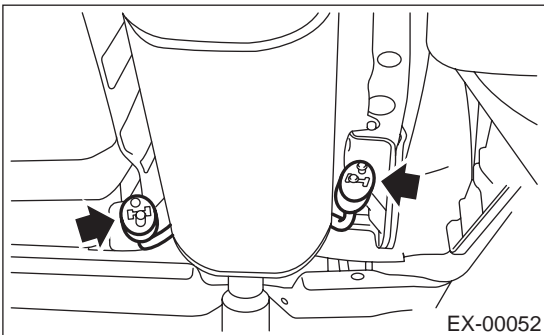
CAUTION:

Be careful not to drop the muffler during removal.

NOTE:

To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

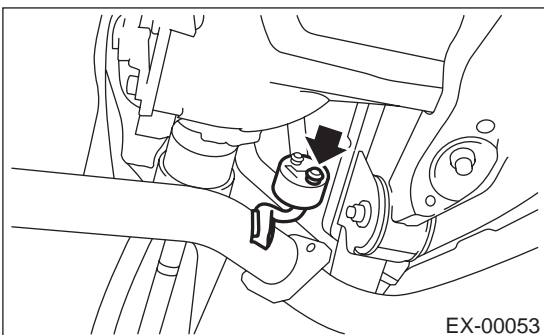


3) Remove front rubber cushion, and detach muffler assembly.

NOTE:

To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)



B: INSTALLATION

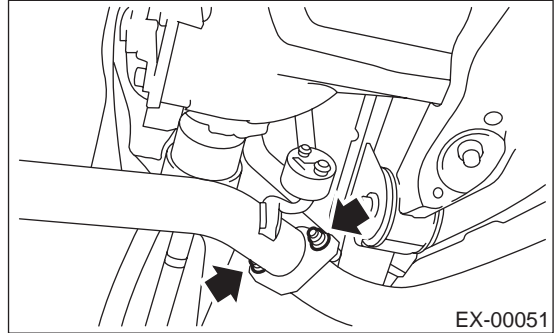
1) Install in the reverse order of removal.

NOTE:

Replace gasket and self-locking nuts with new ones.

Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

3) Make sure the cushion rubber is not worn or cracked.

COOLING

CO(H4SO)

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3. Radiator Sub Fan System	10
4. Engine Coolant.....	14
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6. Thermostat	21
7. Radiator.....	23
8. Radiator Cap	27
9. Radiator Main Fan and Fan Motor	28
10. Radiator Sub Fan and Fan Motor.....	30
11. Reservoir Tank.....	32
12. Engine Cooling System Trouble in General	33

GENERAL DESCRIPTION

COOLING

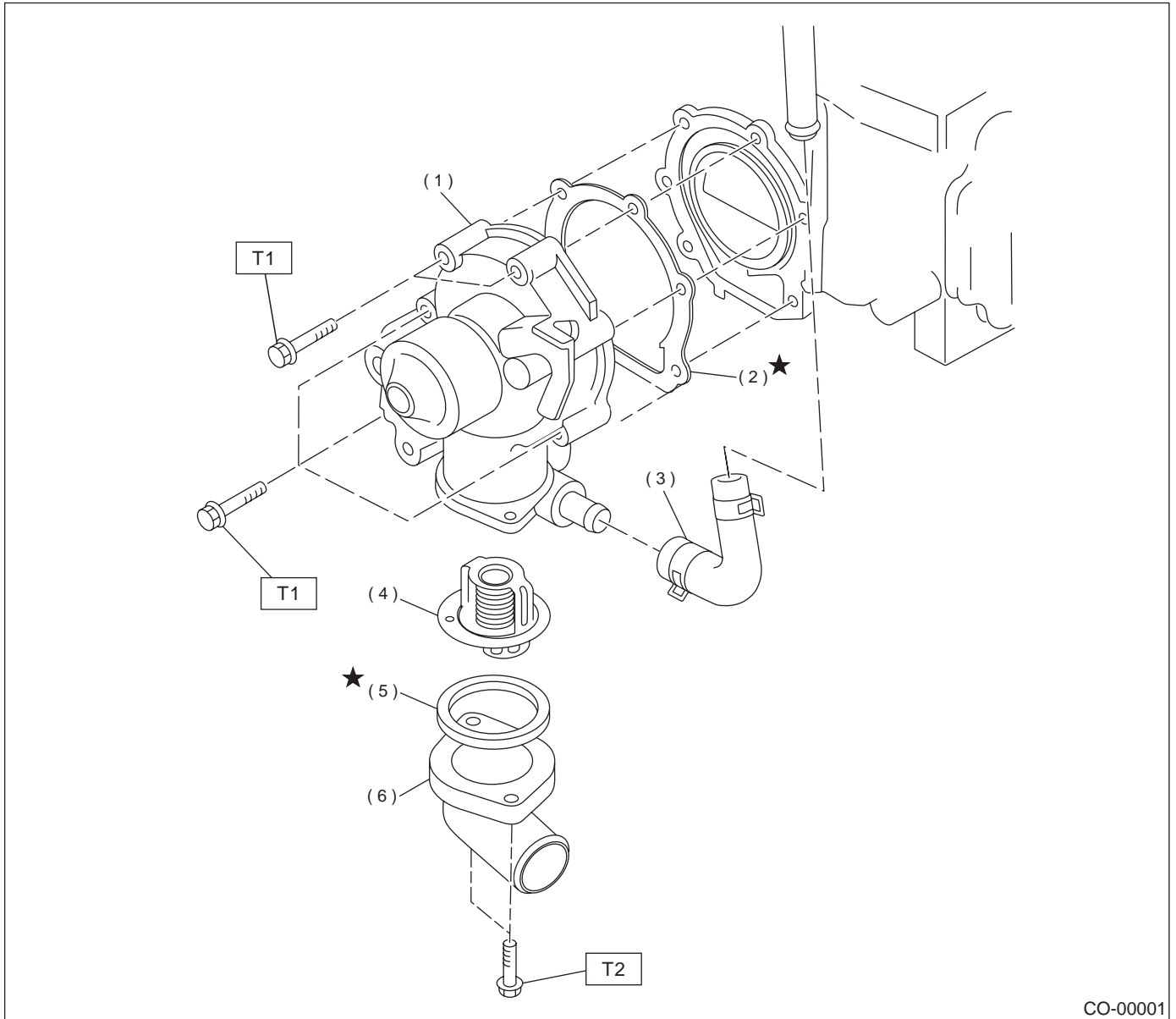
1. General Description

A: SPECIFICATIONS

Cooling system		Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity		ℓ (US qt, Imp qt)	
		2.0 L MT: Approx. 7.0 (7.4, 6.2) 2.0 L AT: Approx. 6.9 (7.3, 6.1) 2.5 L MT: Approx. 6.8 (7.2, 6.0) 2.5 L AT: Approx. 6.7 (7.1, 5.9)	
Water pump	Type	Centrifugal impeller type	
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed—pressure leak	760 rpm — 0.3 mAq (1.0 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed—pressure leak	3,000 rpm — 5.0 mAq (16.4 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed—pressure leak	6,000 rpm — 23.0 mAq (75.5 ftAq)
		Engine coolant temperature	85°C (185°F)
	Impeller diameter	76 mm (2.99 in)	
	Number of impeller vanes	8	
	Pump pulley diameter	60 mm (2.36 in)	
Clearance between impeller and case	Standard	0.5 — 0.7 mm (0.020 — 0.028 in)	
	Limit	1.0 mm (0.039 in)	
“Thrust” runout of impeller end	0.5 mm (0.020 in)		
Thermostat	Type	Wax pellet type	
	Starts to open	With OBD	80 — 84°C (176 — 183°F)
		Without OBD	76 — 80°C (169 — 176°F)
	Fully opened	With OBD	95°C (203°F)
		Without OBD	91°C (196°F)
Valve lift	9.0 mm (0.354 in) or more		
Valve bore	35 mm (1.38 in)		
Radiator fan	Motor	75 W (main fan) 75 W (sub fan)	
	Fan diameter × Blade	300 mm (11.81 in) × 5 (main fan) 300 mm (11.81 in) × 4 (sub fan)	
Radiator	Type	Down flow, pressure type	
	Core dimensions	691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in)	
	Pressure range in which cap valve is open or closed	Above: 108±15 kPa (1.1±0.15 kg/cm ² , 16±2 psi) Below: -1.0 to -4.9 kPa (-0.01 to -0.05 kg/cm ² , -0.1 to -0.7 psi)	
	Fins	Corrugated fin type	
Reservoir tank	Capacity	0.5 ℓ (0.5 US qt, 0.4 Imp qt)	

B: COMPONENT

1. WATER PUMP



CO-00001

- | | |
|-------------------------|----------------------|
| (1) Water pump ASSY | (5) Gasket |
| (2) Gasket | (6) Thermostat cover |
| (3) Heater by-pass hose | |
| (4) Thermostat | |

Tightening torque: N-m (kgf-m, ft-lb)

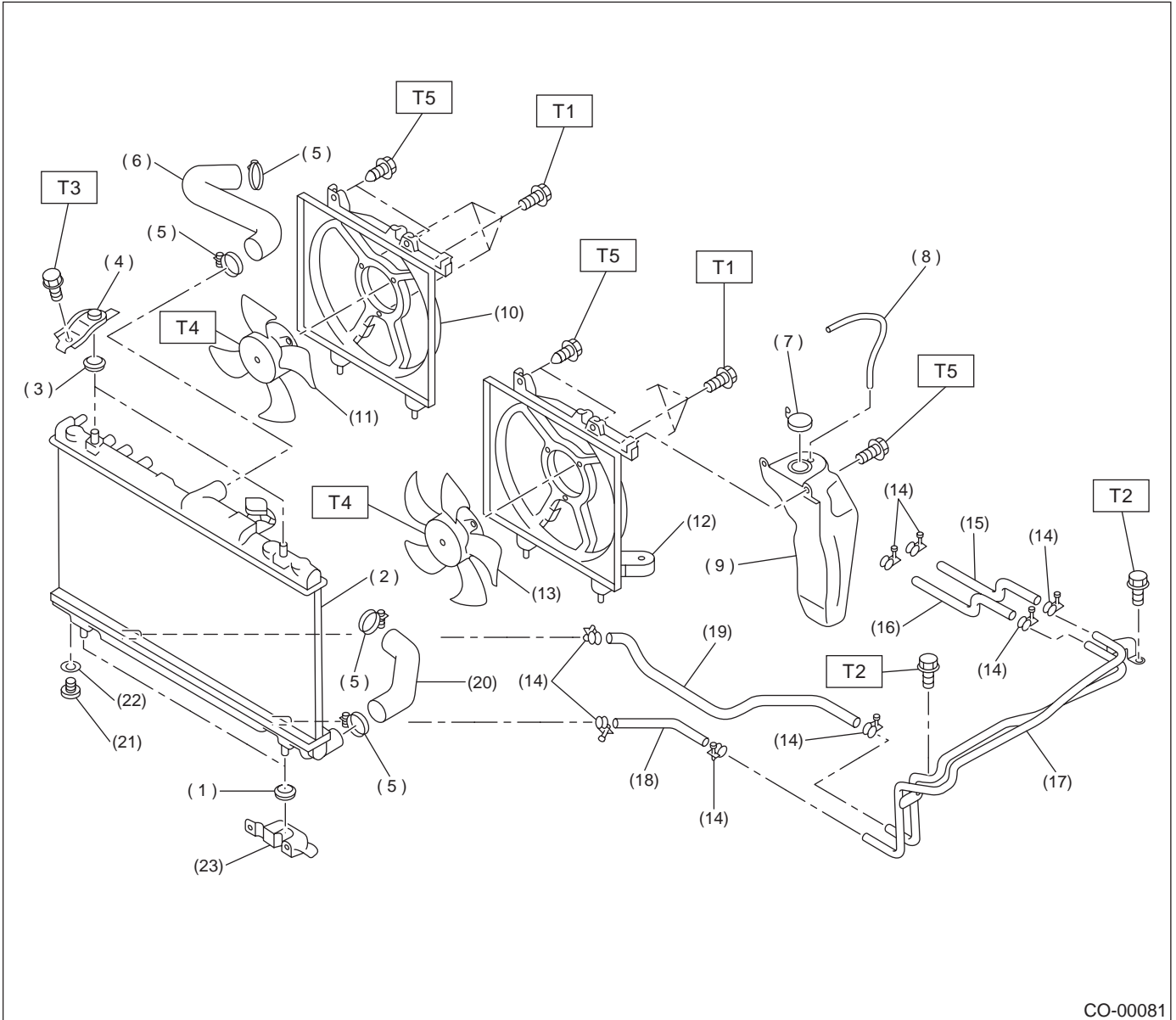
**T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)**

T2: 6.5 (0.66, 4.8)

GENERAL DESCRIPTION

COOLING

2. RADIATOR AND RADIATOR FAN



CO-00081

- | | | |
|--|--|--|
| (1) Radiator lower cushion | (12) Main fan shroud | (19) ATF inlet hose B (AT vehicles only) |
| (2) Radiator | (13) Radiator main fan and main fan motor ASSY | (20) Radiator outlet hose |
| (3) Radiator upper cushion | (14) ATF hose clamp (AT vehicles only) | (21) Radiator drain plug |
| (4) Radiator upper bracket | (15) ATF inlet hose A (AT vehicles only) | (22) O-ring |
| (5) Clamp | (16) ATF outlet hose A (AT vehicles only) | (23) Radiator lower bracket |
| (6) Radiator inlet hose | (17) ATF pipe (AT vehicles only) | |
| (7) Engine coolant reservoir tank cap | (18) ATF outlet hose B (AT vehicles only) | |
| (8) Overflow hose | | |
| (9) Engine coolant reservoir tank | | |
| (10) Sub fan shroud | | |
| (11) Radiator sub fan and sub fan motor ASSY | | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)

T2: 12 (1.2, 8.7)

T3: 18 (1.8, 13.0)

T4: 3.4 (0.35, 2.5)

T5: 4.9 (0.50, 3.6)

GENERAL DESCRIPTION

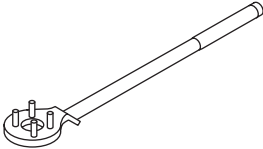
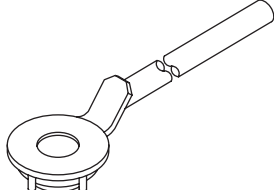
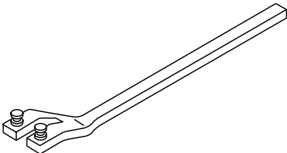
COOLING

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

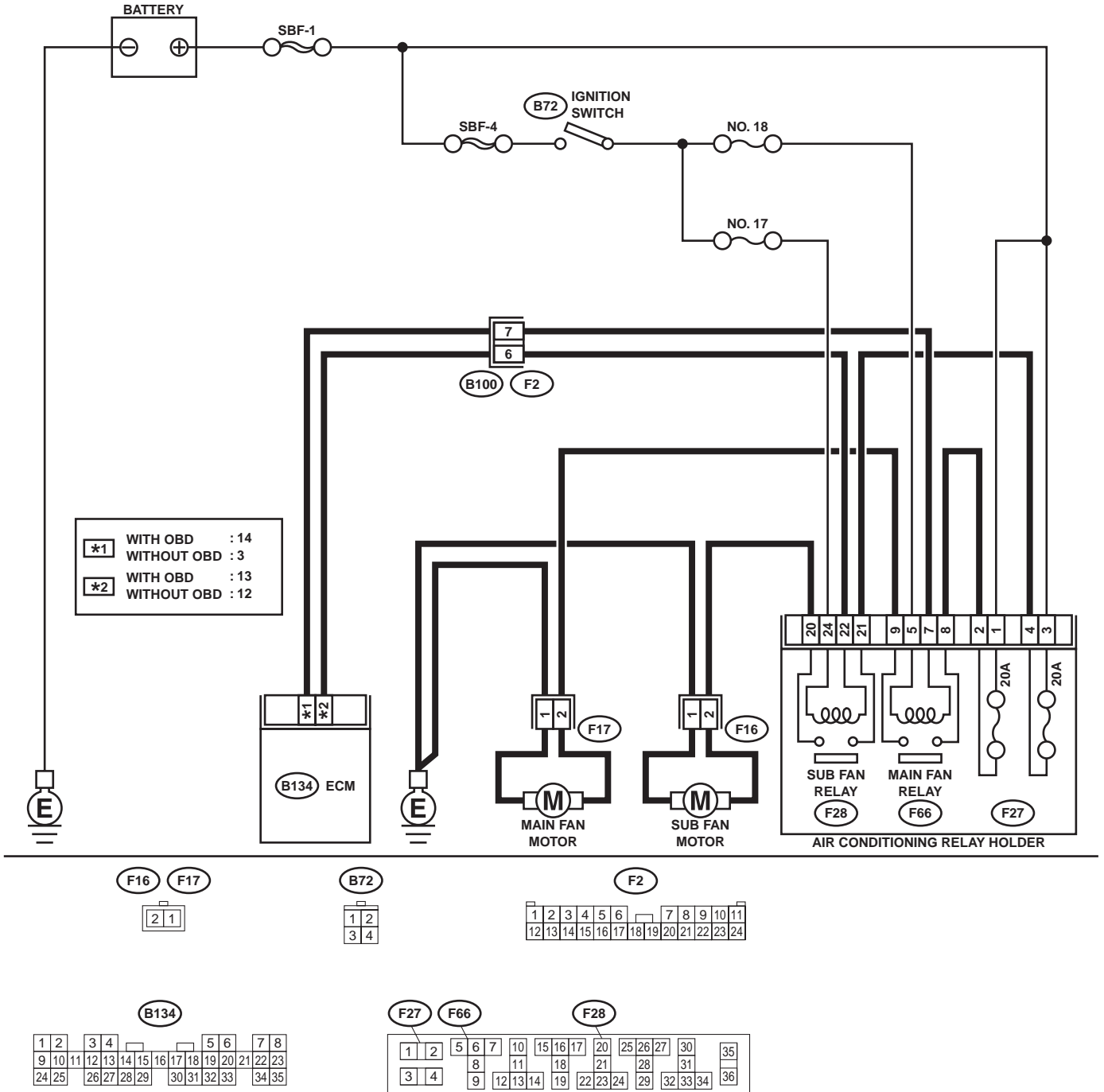
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-499977100</p>	499977100	CRANKSHAFT PULLEY WRENCH	Used for fixing crankshaft pulley when loosening and tightening crankshaft pulley bolts. (2500 cc model)
 <p>ST-499977400</p>	499977400	CRANKSHAFT PULLEY WRENCH	Used for fixing crankshaft pulley when loosening and tightening crankshaft pulley bolts. (2000 cc model)
 <p>ST18231AA010</p>	18231AA010	CAMSHAFT SPROCKET WRENCH	<ul style="list-style-type: none"> • Used for removing and installing camshaft sprocket. • Camshaft sprocket wrench (499207100) is also available.

RADIATOR MAIN FAN SYSTEM

COOLING

2. Radiator Main Fan System

A: SCHEMATIC



CO-00169

B: INSPECTION

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 95°C (203°F).
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY TO MAIN FAN MOTOR.</p> <p>CAUTION: Be careful not to overheat engine during repair.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between main fan motor connector and chassis ground. <p>Connector & terminal (F17) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Go to step 5.
<p>2 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground. <p>Connector & terminal (F17) No. 1 — Chassis ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair open circuit in harness between main fan motor connector and chassis ground.
<p>3 CHECK POOR CONTACT.</p> <p>Check poor contact in main fan motor connector. Is there poor contact in main fan motor connector?</p>	There is poor contact.	Repair poor contact in main fan motor connector.	Go to step 4.
<p>4 CHECK MAIN FAN MOTOR.</p> <p>Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of main fan motor connector. Does the main fan rotate?</p>	The main fan rotates.	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
<p>5 CHECK POWER SUPPLY TO MAIN FAN RELAY.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Remove main fan relay from A/C relay holder. 3) Measure voltage between main fan relay terminal and chassis ground. <p>Connector & terminal (F66) No. 8 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Go to step 7.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Value	Yes	No
6 CHECK POWER SUPPLY TO MAIN FAN RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay terminal and chassis ground. Connector & terminal (F66) No. 5 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 10.	Go to step 9.
7 CHECK 20 A FUSE. 1) Remove 20 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Go to step 8.
8 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. Connector & terminal (F27) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair open circuit in harness between 20 A fuse and main fan relay terminal.	Repair open circuit in harness between main fuse box connector and 20 A fuse terminal.
9 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.
10 CHECK MAIN FAN RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance of main fan relay. Terminal No. 8 — No. 9: Does the measured value exceed the specified value?	1 M Ω	Go to step 11.	Replace main fan relay.
11 CHECK MAIN FAN RELAY. 1) Connect battery to terminals No. 5 and No. 7 of main fan relay. 2) Measure resistance of main fan relay. Terminal No. 8 — No. 9: Is the measured value less than the specified value?	1 Ω	Go to step 12.	Replace main fan relay.
12 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure resistance of harness between main fan motor connector and main fan relay terminal. Connector & terminal (F17) No. 2 — (F66) No. 9: Is the measured value less than the specified value?	1 Ω	Go to step 13.	Repair open circuit in harness between main fan motor connector and main fan relay terminal.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Value	Yes	No
13 CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay connector and ECM connector. Connector & terminal With OBD (F66) No. 7 — (B134) No. 14: Without OBD (F66) No. 7 — (B134) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 14.	Repair open circuit in harness between main fan relay and ECM.
14 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM. Is there poor contact in connector between main fan motor and ECM?	There is poor contact.	Repair poor contact connector.	Contact with SUBARU distributor service.

NOTE:

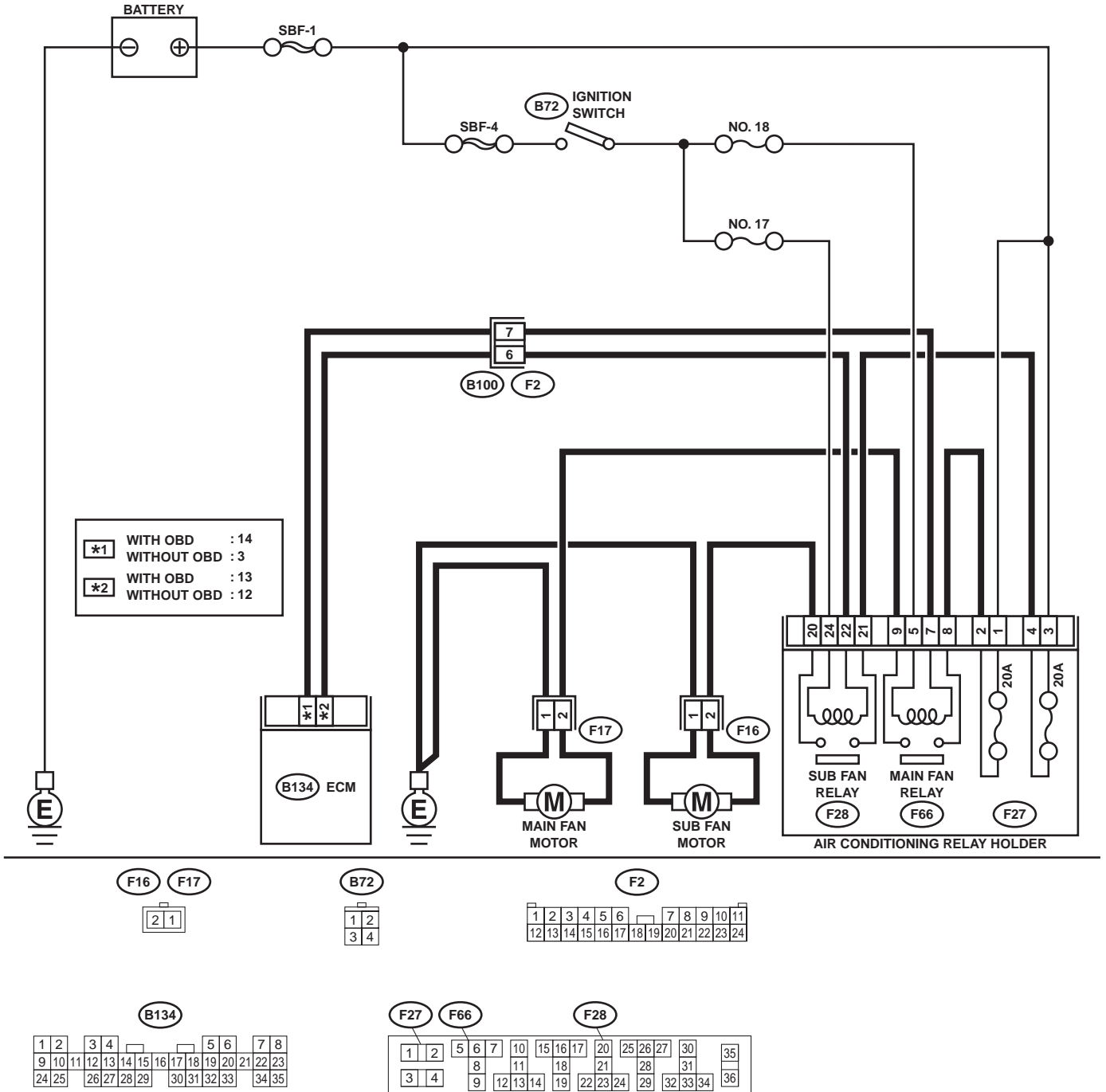
Inspection by SUBARU distributor service is required, because probable cause is deterioration of multiple parts.

RADIATOR SUB FAN SYSTEM

COOLING

3. Radiator Sub Fan System

A: SCHEMATIC



CO-00169

B: INSPECTION

NOTE:

Radiator sub fan system is for model with A/C.

DETECTING CONDITION:

Condition (1):

- Engine coolant temperature is below 95°C (203°F).
- A/C switch is turned ON.
- Vehicle speed is below 19 km/h (12 MPH).

Condition (2):

- Engine coolant temperature is above 100°C (212°F).
- A/C switch is turned OFF.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under conditions (1) and (2) above.

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY TO SUB FAN MOTOR.</p> <p>CAUTION: Be careful not to overheat engine during repair.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor and main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between sub fan motor connector and chassis ground.</p> <p>Connector & terminal (F16) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Go to step 5.
<p>2 CHECK GROUND CIRCUIT OF SUB FAN MOTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground.</p> <p>Connector & terminal (F16) No. 1 — Chassis ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair open circuit in harness between sub fan motor connector and chassis ground.
<p>3 CHECK POOR CONTACT. Check poor contact in sub fan motor connector. Is there poor contact in sub fan motor connector?</p>		Repair poor contact in sub fan motor connector.	Go to step 4.
<p>4 CHECK SUB FAN MOTOR. Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of sub fan motor connector. Does the sub fan rotate?</p>	Sub fan rotates.	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
5 CHECK POWER SUPPLY TO SUB FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove sub fan relay from A/C relay holder. 3) Measure voltage between sub fan relay terminal and chassis ground. Connector & terminal (F28) No. 21 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 6.	Go to step 7.
6 CHECK POWER SUPPLY TO SUB FAN RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay terminal and chassis ground. Connector & terminal (F28) No. 24 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 10.	Go to step 9.
7 CHECK 20 A FUSE. 1) Remove 20 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Go to step 8.
8 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. Connector & terminal (F27) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair open circuit in harness between main fuse box connector and 20 A fuse terminal.
9 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 17 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between sub fan relay and ignition switch.
10 CHECK SUB FAN RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance of sub fan relay. Terminal No. 20 — No. 21: Does the measured value exceed the specified value?	1 M Ω	Go to step 11.	Replace sub fan relay.
11 CHECK SUB FAN RELAY. 1) Connect battery to terminals No. 22 and No. 24 of sub fan relay. 2) Measure resistance of sub fan relay. Terminal No. 20 — No. 21: Is the measured value less than the specified value?	1 Ω	Go to step 12.	Replace sub fan relay.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
<p>12 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure resistance of harness between sub fan motor connector and sub fan relay terminal. Connector & terminal (F16) No. 2 — (F28) No. 20: Is the measured value less than the specified valve?</p>	1 Ω	Go to step 13.	Repair open circuit in harness between sub fan motor and sub fan relay connector.
<p>13 CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay connector and ECM connector. Connector & terminal With OBD (F28) No. 22 — (B134) No. 13: Without OBD (F28) No. 22 — (B134) No. 12: Is the measured value less than the specified valve?</p>	1 Ω	Go to step 14.	Repair open circuit in harness between sub fan relay and ECM.
<p>14 CHECK POOR CONTACT. Check poor contact in connector between sub fan and ECM. Is there poor contact in connector between sub fan motor and ECM?</p>	There is poor contact.	Repair poor contact connector.	Contact with SUBARU distributor service.

NOTE:

Inspection by SUBARU distributor service is required, because probable cause is deterioration of multiple parts.

ENGINE COOLANT

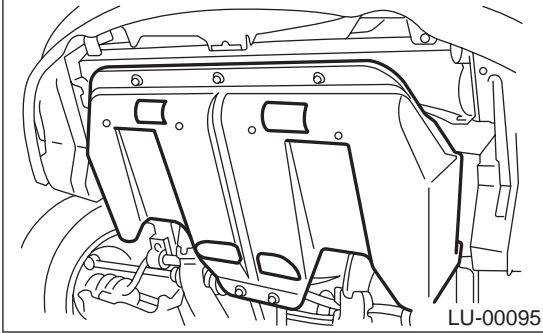
COOLING

4. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

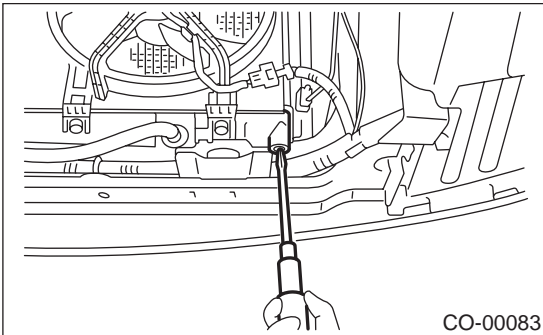
- 1) Lift-up the vehicle.
- 2) Remove under cover.



- 3) Remove drain cock to drain engine coolant into container.

NOTE:

Remove radiator cap so that engine coolant will drain faster.



2. FILLING OF ENGINE COOLANT

- 1) Fill engine coolant into radiator up to filler neck position.

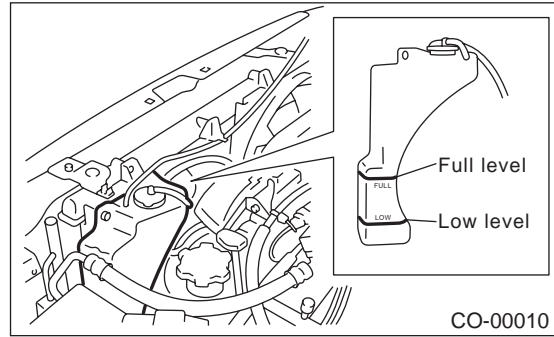
Engine coolant amount for refill:

- 2.0 L MT ;
Approx. 7.0 ℓ (7.4 US qt, 6.2 Imp qt)
- 2.0 L AT ;
Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)
- 2.5 L MT ;
Approx. 6.8 ℓ (7.2 US qt, 6.0 Imp qt)
- 2.5 L AT ;
Approx. 6.7 ℓ (7.1 US qt, 5.9 Imp qt)

CAUTION:

The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

- 2) Fill engine coolant into reservoir tank up to upper level.



- 3) Attach radiator cap and reservoir tank cap properly.
- 4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
- 5) If engine coolant level drops in radiator, add engine coolant to filler neck position.
- 6) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
- 7) Attach radiator cap and reservoir tank cap properly.

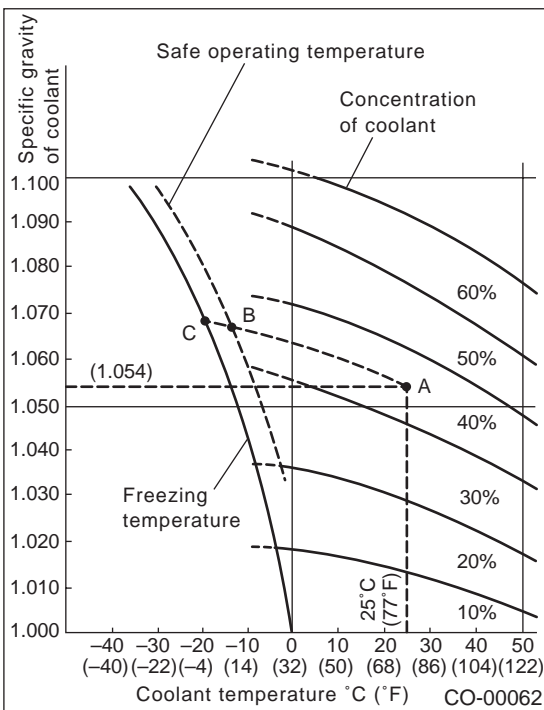
B: INSPECTION

1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

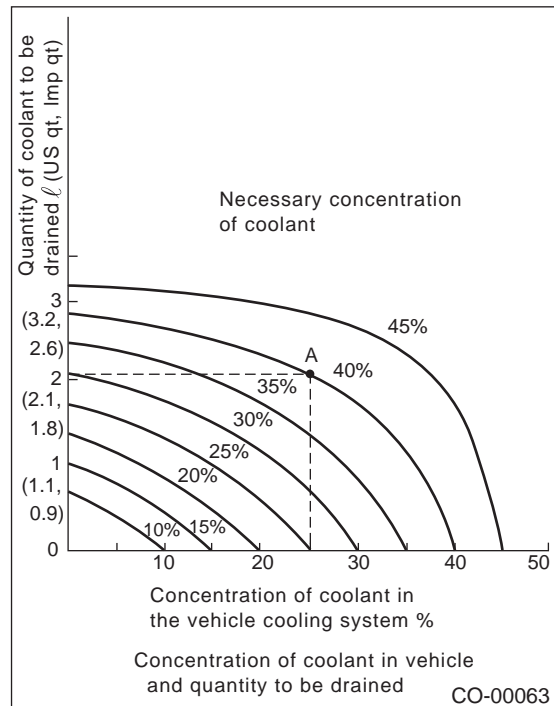
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).

The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



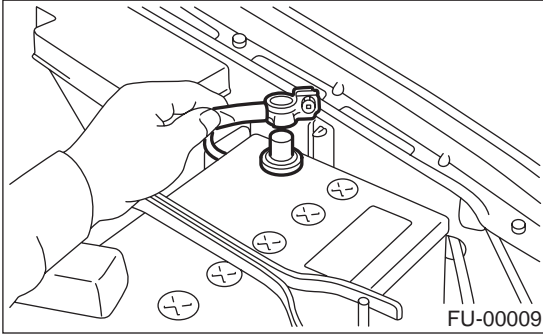
WATER PUMP

COOLING

5. Water Pump

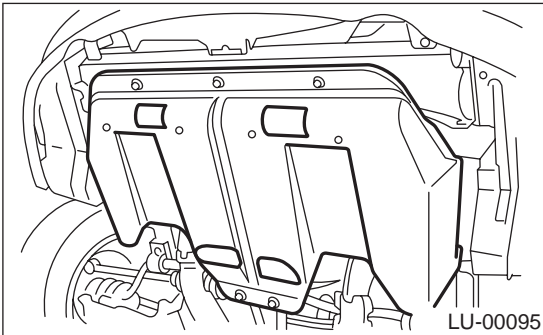
A: REMOVAL

1) Disconnect ground cable from battery.



2) Lift-up the vehicle.

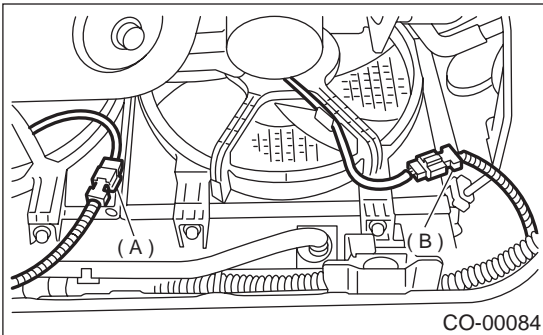
3) Remove under cover.



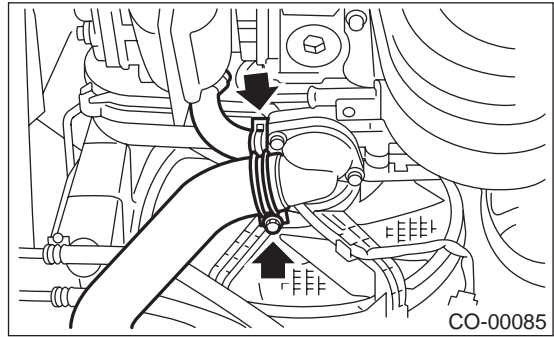
4) Drain engine coolant completely.

<Ref. to CO(H4SO)-14, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

5) Disconnect connectors from radiator main fan (A) and sub fan (B) motors.

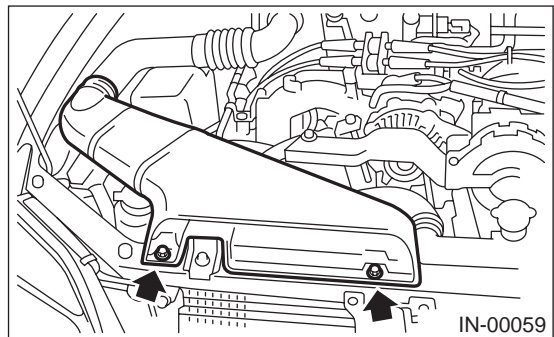


6) Disconnect radiator outlet hose and heater bypass hose from water pump.

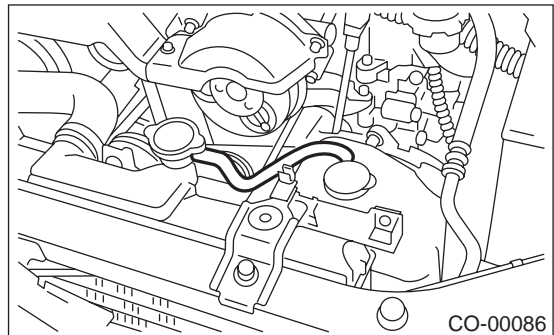


7) Lower the vehicle.

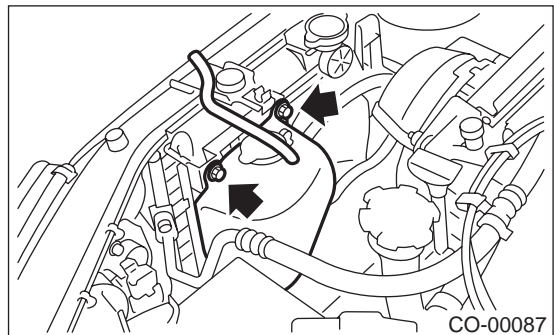
8) Remove air intake duct.



9) Disconnect overflow hose.



10) Remove reservoir tank.



11) Remove radiator main fan and sub fan assemblies. <Ref. to CO(H4SO)-28, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-30, REMOVAL, Radiator Sub Fan and Fan Motor.>

WATER PUMP

COOLING

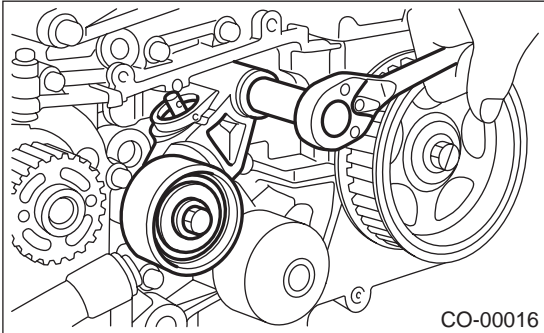
12) Remove V-belts.

<Ref. to ME(H4SO)-41, REMOVAL, V-belt.>

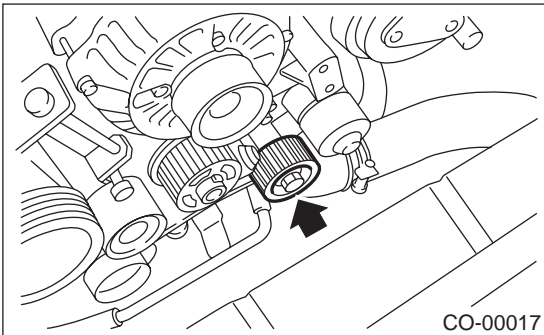
13) Remove timing belt.

<Ref. to ME(H4SO)-46, REMOVAL, Timing Belt Assembly.>

14) Remove automatic belt tension adjuster.



15) Remove belt idler No. 2.

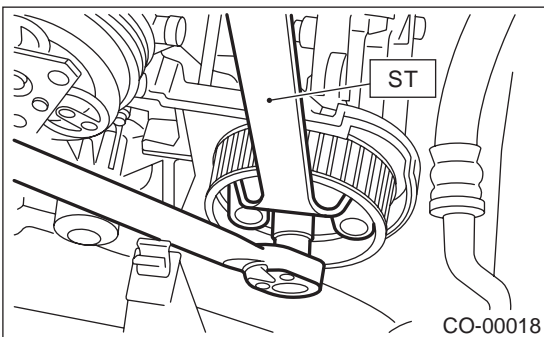


16) Remove left-hand camshaft sprocket by using ST.

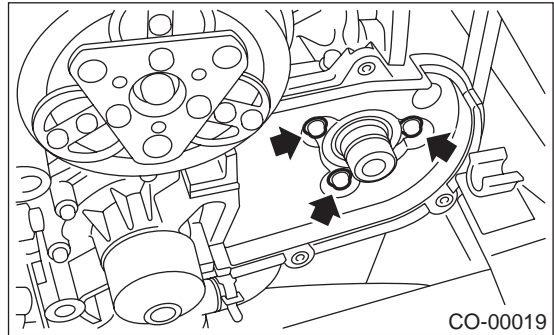
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:

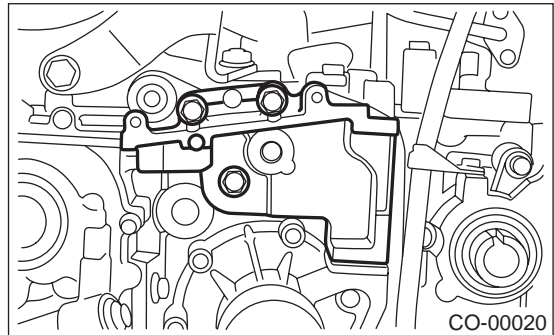
Camshaft sprocket wrench (499207100) is also available.



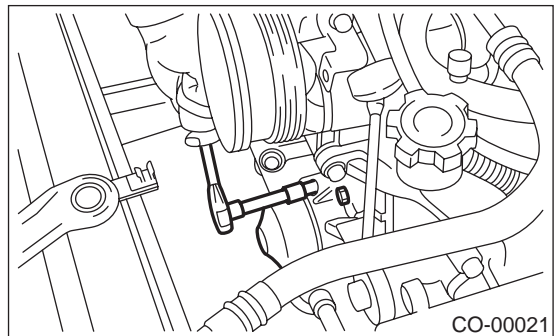
17) Remove left-hand belt cover No. 2.



18) Remove tensioner bracket.



19) Remove water pump.



WATER PUMP

COOLING

B: INSTALLATION

1) Install water pump onto left-hand cylinder block.

NOTE:

- Replace gasket with a new one.
- When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.

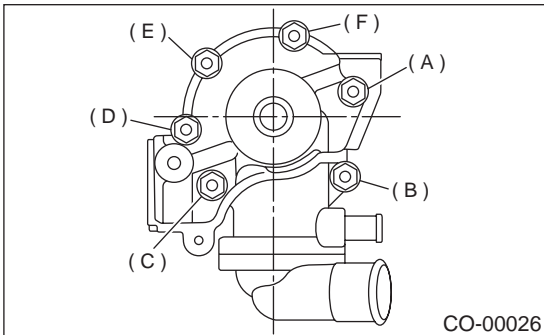
Tightening torque:

First:

12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second:

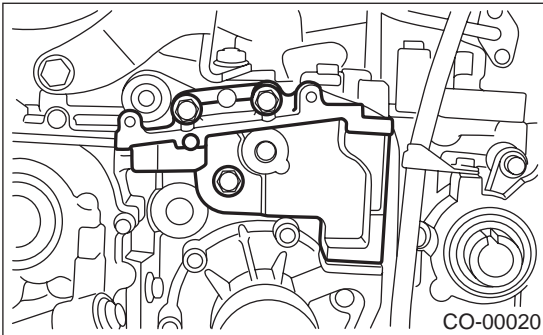
12 N·m (1.2 kgf-m, 8.7 ft-lb)



2) Install tensioner bracket.

Tightening torque:

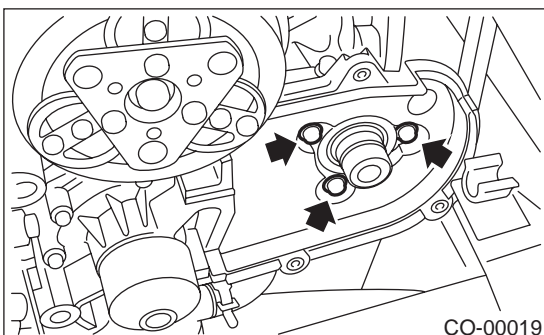
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Install left-hand belt cover No. 2.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



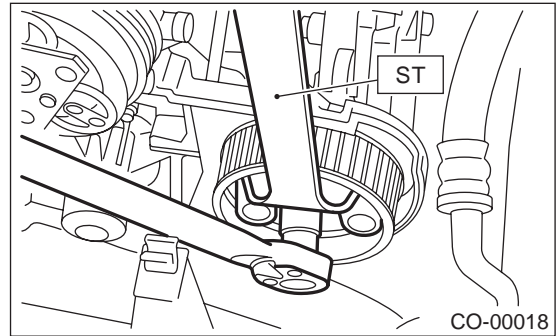
4) Install left-hand camshaft sprockets by using ST. ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:

Camshaft sprocket wrench (499207100) is also available.

Tightening torque:

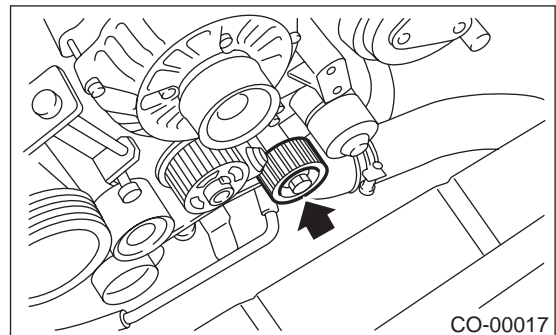
78 N·m (8.0 kgf-m, 57.9 ft-lb)



5) Install belt idler No. 2.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)



6) Install automatic belt tension adjuster which tension rod is held with pin. <Ref. to ME(H4SO)-47, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

7) Install timing belt. <Ref. to ME(H4SO)-48, TIMING BELT, INSTALLATION, Timing Belt Assembly.>

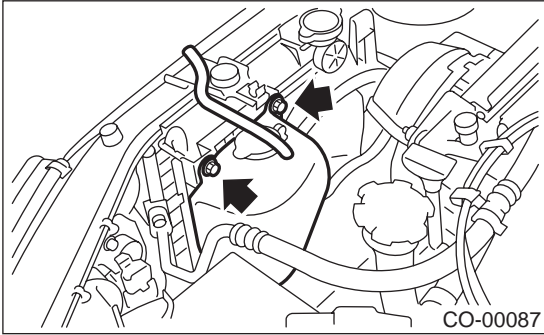
8) Install V-belts. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

9) Install radiator main fan and sub fan motor assemblies. <Ref. to CO(H4SO)-29, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-30, INSTALLATION, Radiator Sub Fan and Fan Motor.>

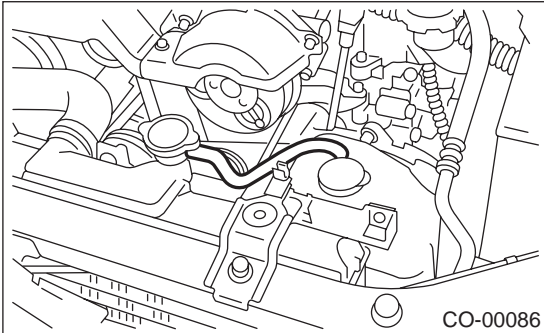
WATER PUMP

COOLING

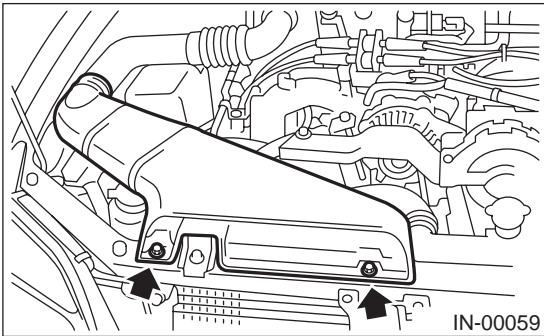
10) Install reservoir tank.



11) Connect overflow hose.

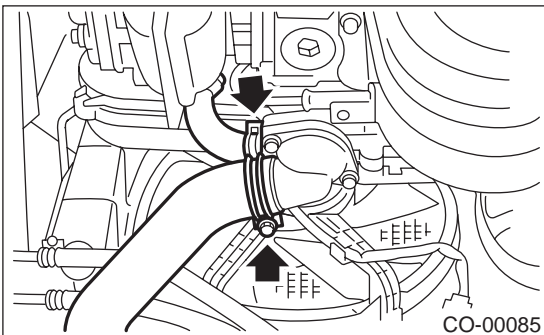


12) Install air intake duct.

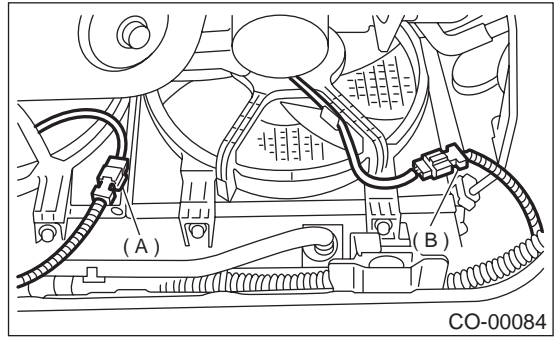


13) Lift-up the vehicle.

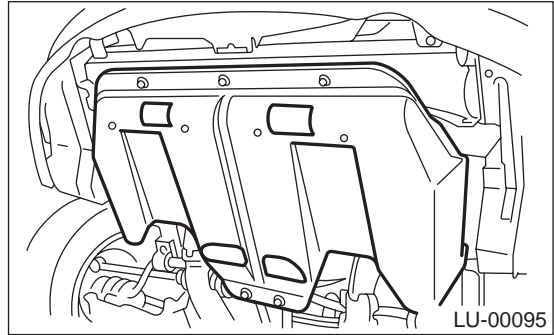
14) Connect radiator outlet hose and heater by-pass hose to water pump.



15) Connect connectors to radiator main fan (A) and sub fan (B) motors.

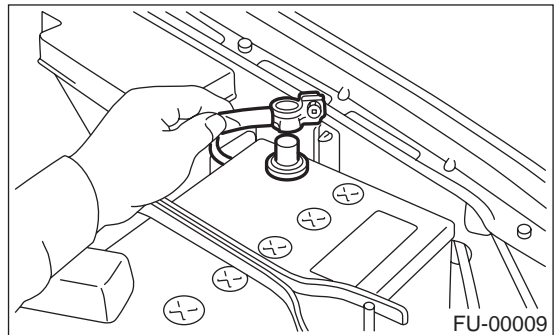


16) Install under cover.



17) Lower the vehicle.

18) Connect battery ground cable.

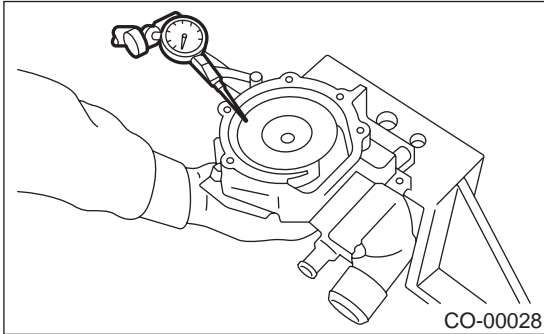


19) Fill coolant. <Ref. to CO(H4SO)-14, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

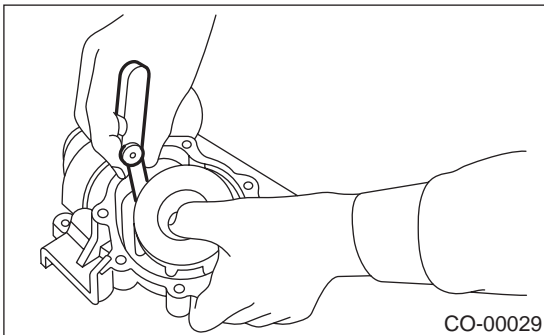
- 1) Check water pump bearing for smooth rotation.
- 2) Check water pump pulley for abnormalities.
- 3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

“Thrust” runout limit:
0.5 mm (0.020 in)



- 4) Check clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 0.7 mm (0.020 — 0.028 in)
Limit
1.0 mm (0.039 in)

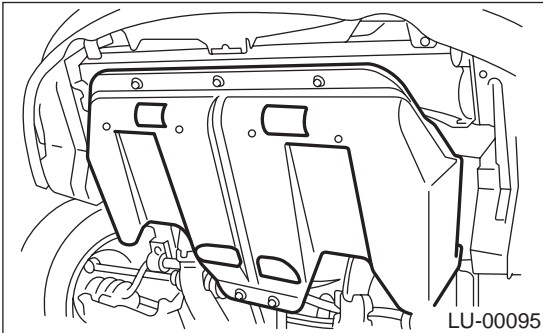


- 5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace water pump assembly.

6. Thermostat

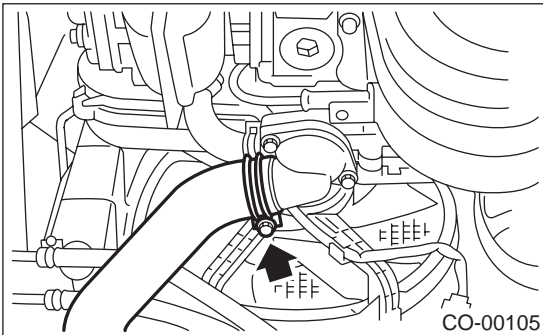
A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove under cover.

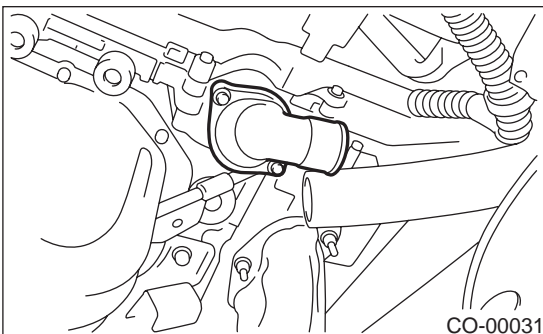


- 3) Drain engine coolant completely. <Ref. to CO(H4SO)-14, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

- 4) Disconnect radiator outlet hose from thermostat cover.



- 5) Remove thermostat cover and gasket, and pull out the thermostat.



B: INSTALLATION

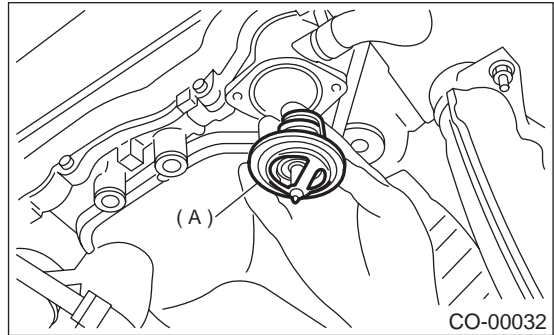
- 1) Install the thermostat in the water pump, and install the thermostat cover together with a gasket.

NOTE:

- Replace gasket with a new one.
- Thermostat must be installed with jiggle pin (A) facing the front side.

Tightening torque:

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



- 2) Fill coolant. <Ref. to CO(H4SO)-14, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. If the measured temperature is within the specified range, the condition of thermostat is normal.

THERMOSTAT

COOLING

Specified value:

Starts to open:

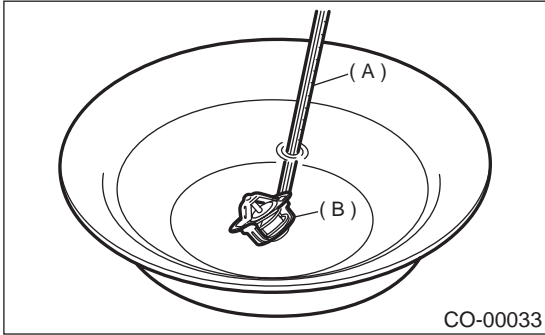
With OBD: 80 — 84°C (176 — 183°F)

Without OBD: 76.0 — 80.0°C (169 — 176°F)

Fully opens:

With OBD: 95°C (203°F)

Without OBD: 91°C (196°F)



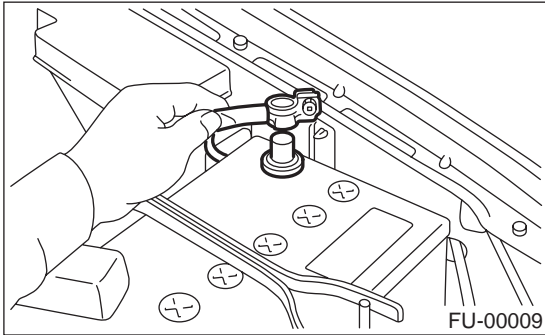
(A) Thermometer

(B) Thermostat

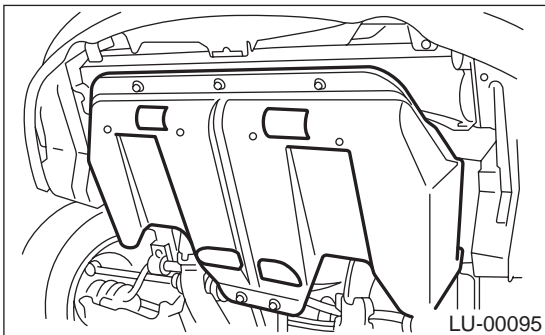
7. Radiator

A: REMOVAL

1) Disconnect battery ground cable.

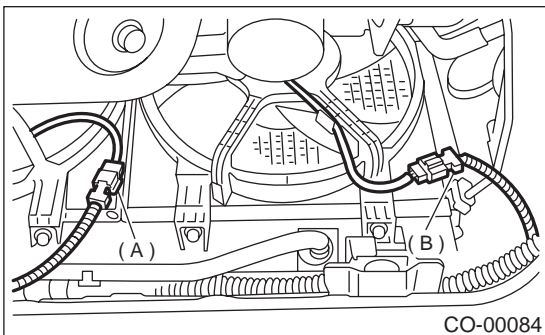


2) Lift-up the vehicle.
3) Remove under cover.

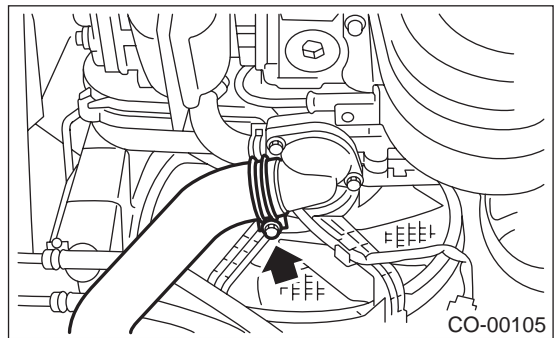


4) Drain engine coolant completely. <Ref. to CO(H4SO)-14, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

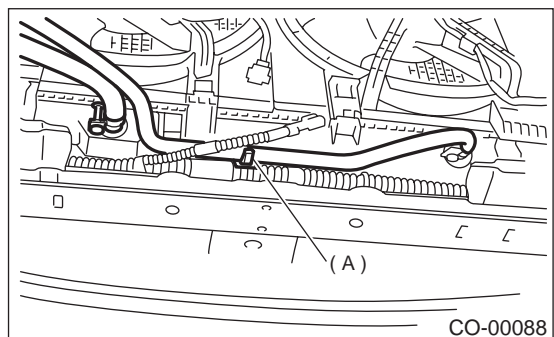
5) Disconnect connectors of radiator main fan (A) and sub fan (B) motor.



6) Disconnect radiator outlet hose from thermostat cover.

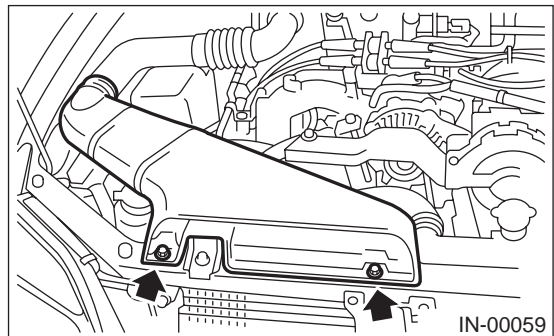


7) Disconnect ATF cooler hoses from radiator. (AT vehicles only)

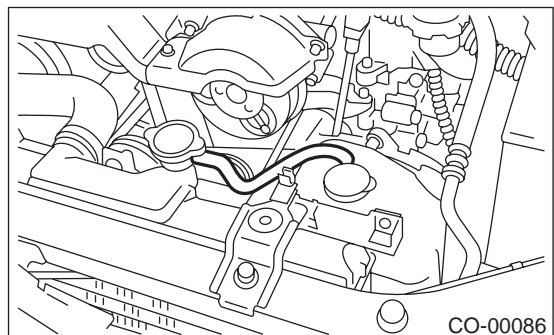


(A) Clip

8) Lower the vehicle.
9) Remove air intake duct.



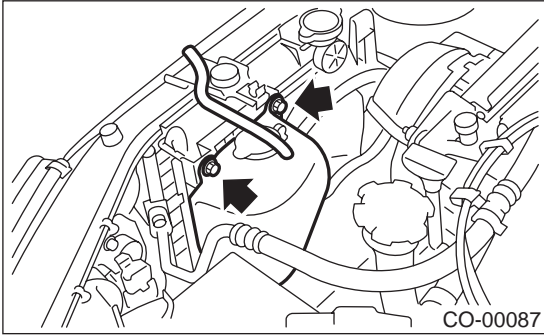
10) Disconnect overflow hose.



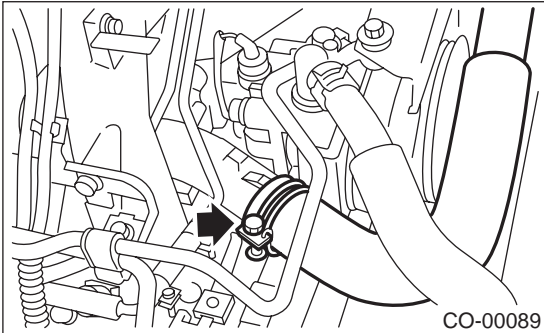
RADIATOR

COOLING

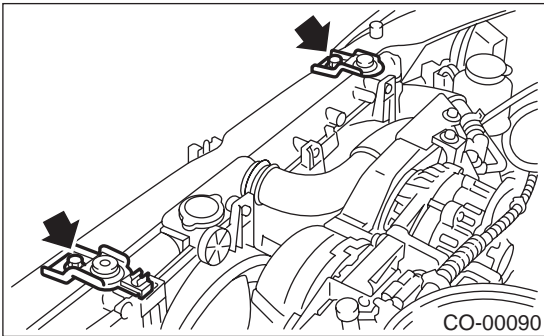
11) Remove reservoir tank.



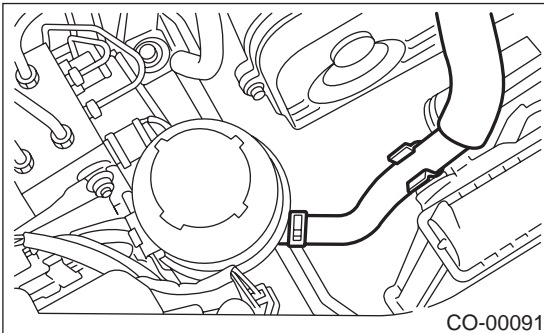
12) Disconnect radiator inlet hose from engine.



13) Remove radiator upper brackets.

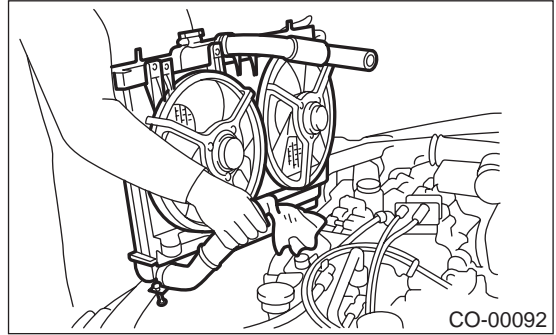


14) Detach power steering hose from the clip on the radiator.



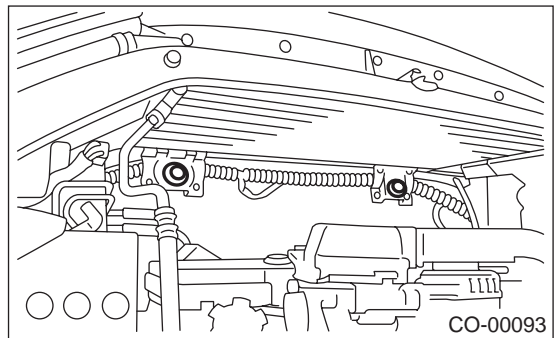
15) While slightly lifting radiator, slide it to left.

16) Lift radiator up and away from vehicle.



B: INSTALLATION

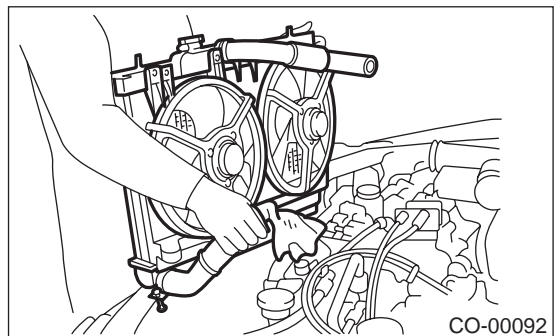
1) Attach radiator mounting cushions to holes on the vehicle.



2) Install radiator while fitting radiator pins to cushions.

NOTE:

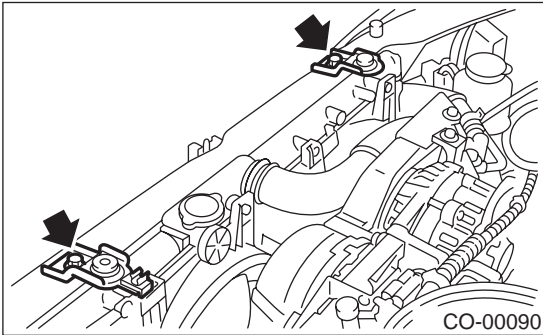
Fit pins on lower side of radiator into cushions on body side.



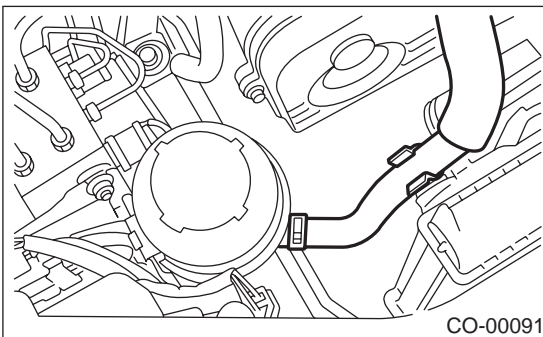
3) Install radiator brackets and tighten bolts.

Tightening torque:

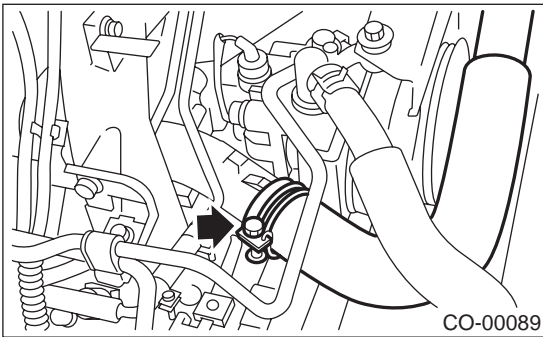
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Attach power steering hose to the radiator.



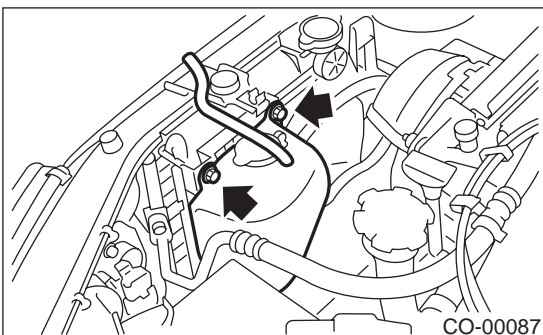
5) Connect radiator inlet hose.



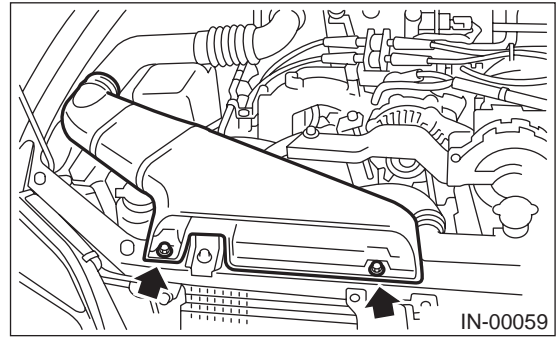
6) Install reservoir tank.

Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

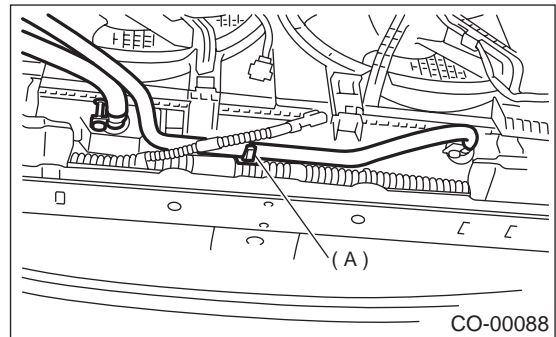


7) Install air intake duct.



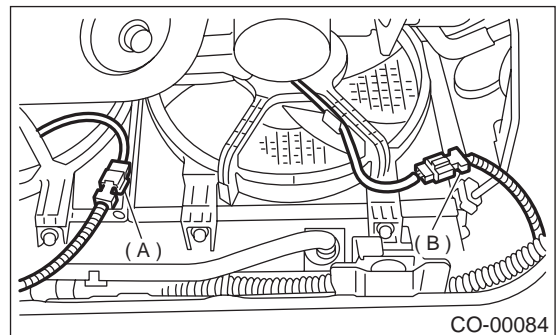
8) Lift-up the vehicle.

9) Connect ATF cooler hoses. (AT vehicles only)

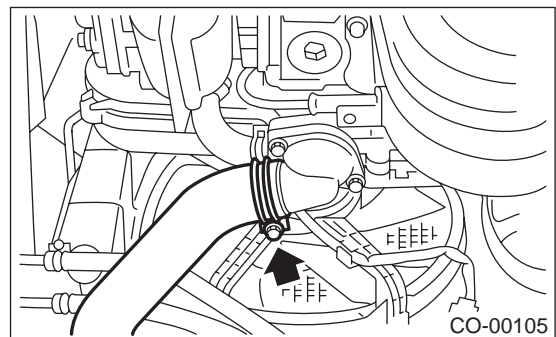


(A) Clip

10) Connect connectors to radiator main fan motor (A) and sub fan motor (B).



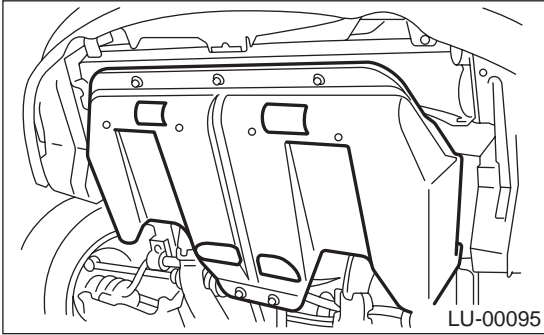
11) Connect radiator outlet hose.



RADIATOR

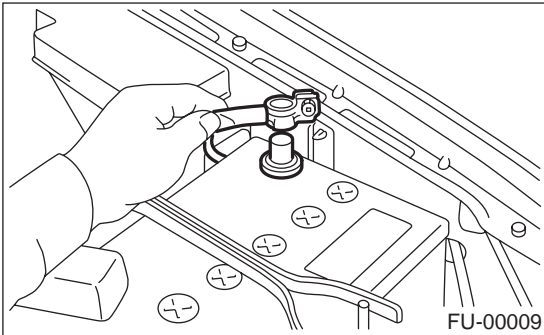
COOLING

12) Install under cover.



13) Lower the vehicle.

14) Connect battery ground cable.

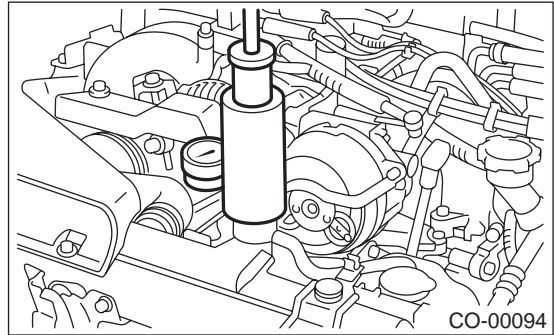


15) Fill coolant. <Ref. to CO(H4SO)-14, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

16) Check ATF level. <Ref. to AT-30, REPLACEMENT, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.



2) Apply a pressure of 157 kPa (1.6 kg/cm², 23 psi) to radiator to check if:

- (1) Engine coolant leaks at/around radiator.
- (2) Engine coolant leaks at/around hoses or connections.

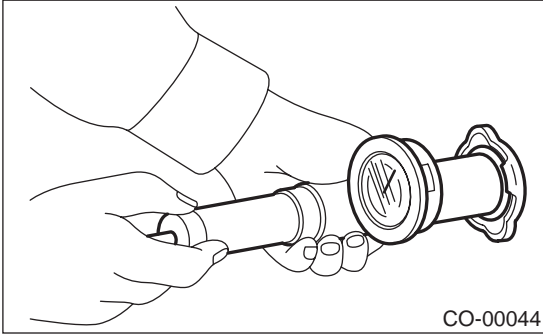
CAUTION:

- Engine should be off.
- Wipe engine coolant from check points in advance.
- Be careful to prevent engine coolant from spurting out when removing tester.
- Be careful also not to deform filler neck of radiator when installing or removing tester.

8. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.



2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:

93 — 123 kPa (0.95 — 1.25 kg/cm², 14 — 18 psi)

Service limit pressure:

83 kPa (0.85 kg/cm², 12 psi)

CAUTION:

Be sure to remove foreign matter and rust from the cap in advance. Otherwise, results of pressure test will be incorrect.

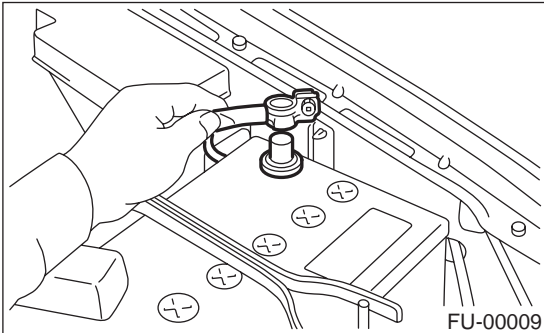
RADIATOR MAIN FAN AND FAN MOTOR

COOLING

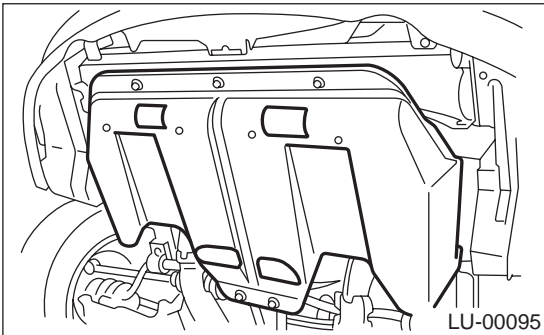
9. Radiator Main Fan and Fan Motor

A: REMOVAL

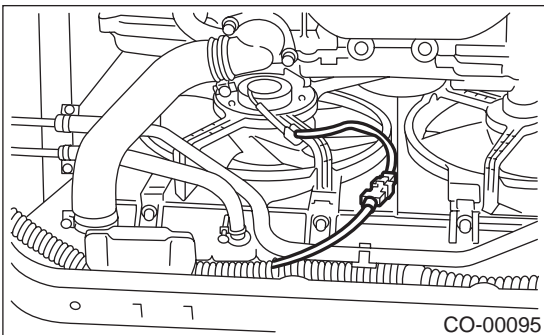
1) Disconnect battery ground cable.



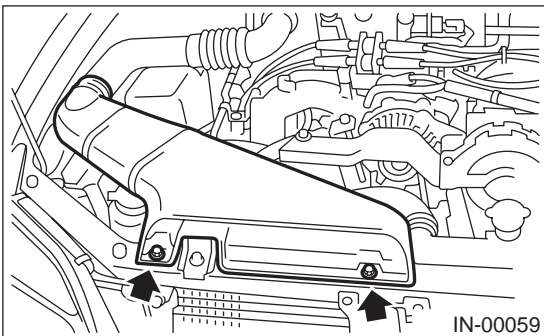
2) Lift-up the vehicle.
3) Remove under cover.



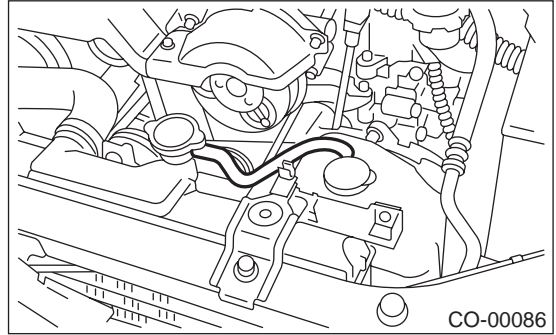
4) Disconnect connector of main fan motor.



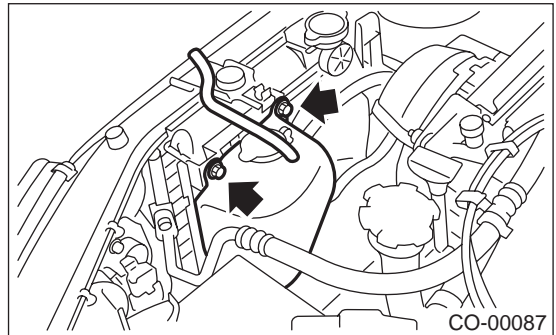
5) Lower the vehicle.
6) Remove air intake duct.



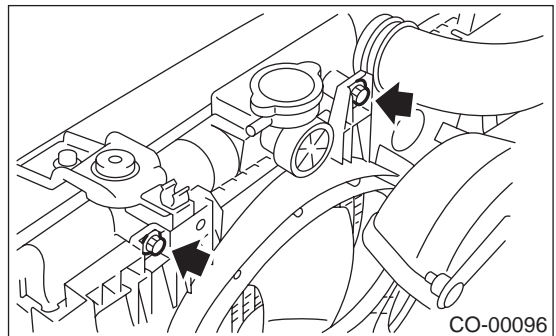
7) Disconnect overflow hose.



8) Remove reservoir tank.



9) Remove radiator main fan motor assembly.



B: INSTALLATION

Install in the reverse order of removal.

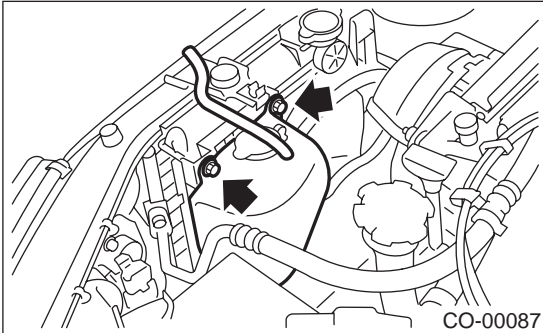
NOTE:

When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.

• Refer to "COMPONENT" for tightening torque.
<Ref. to CO(H4SO)-3, COMPONENT, General Description.>

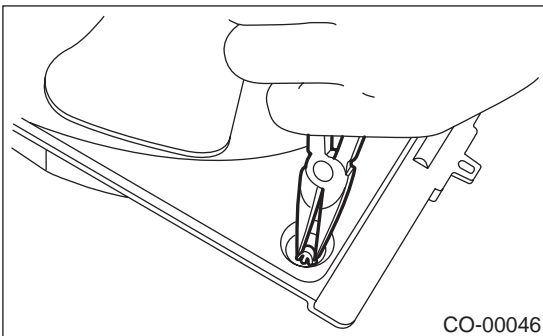
Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

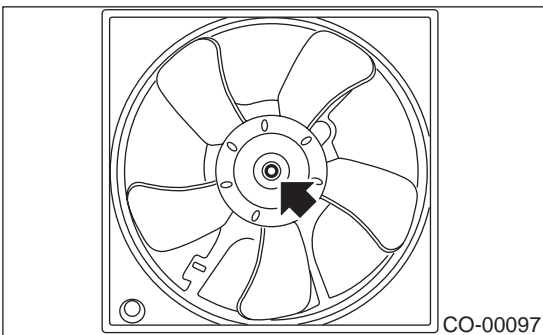


C: DISASSEMBLY

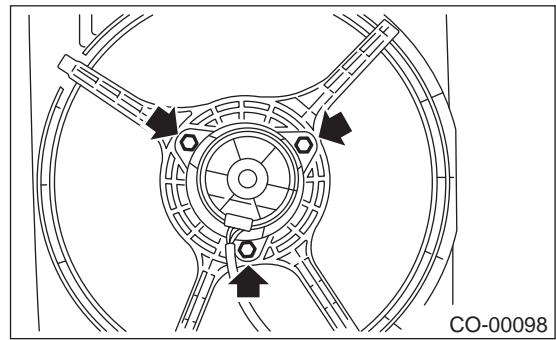
1) Remove clip which holds motor connector onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



3) Remove bolts which install fan motor onto shroud.



D: ASSEMBLY

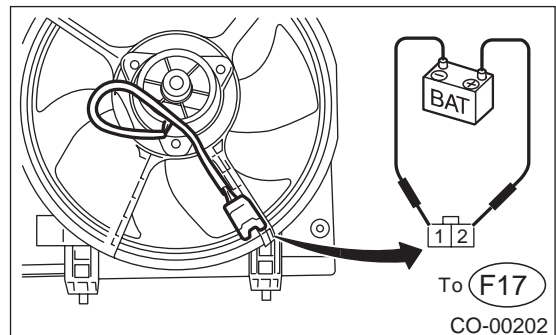
Assemble in the reverse order of disassembly.

NOTE:

• Refer to "COMPONENT" for tightening torque.
<Ref. to CO(H4SO)-3, COMPONENT, General Description.>

E: INSPECTION

- 1) Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1.
- 2) Make sure the main fan motor operates properly. Replace it if it doesn't.



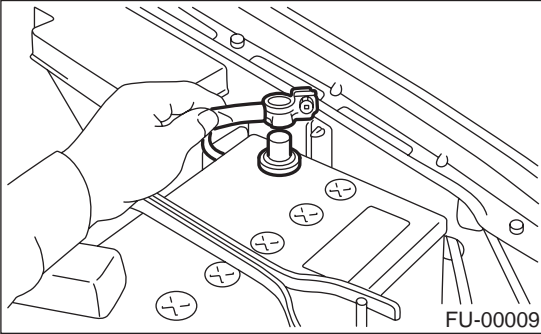
RADIATOR SUB FAN AND FAN MOTOR

COOLING

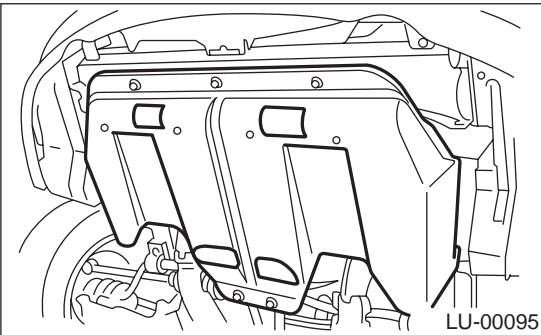
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

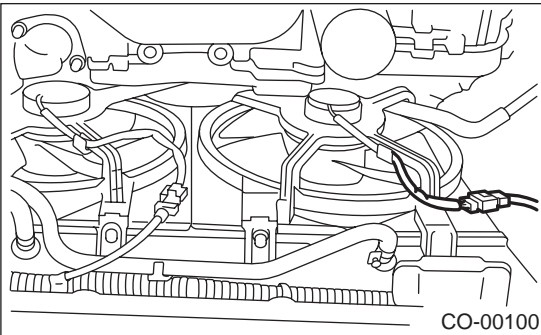
1) Disconnect battery ground cable.



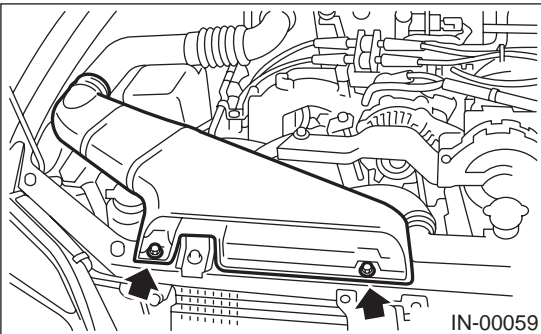
2) Lift-up the vehicle.
3) Remove under cover.



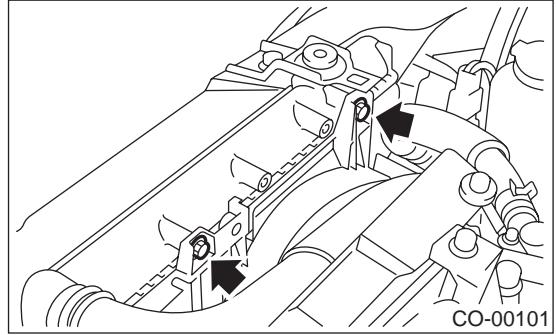
4) Disconnect connector of sub fan motor.



5) Lower the vehicle.
6) Remove air intake duct.



7) Remove bolts which hold sub fan shroud to radiator.
8) Remove radiator sub fan shroud through the under side of vehicle.



B: INSTALLATION

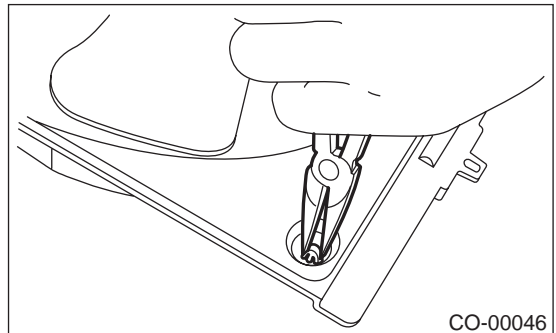
Install in the reverse order of removal.

NOTE:

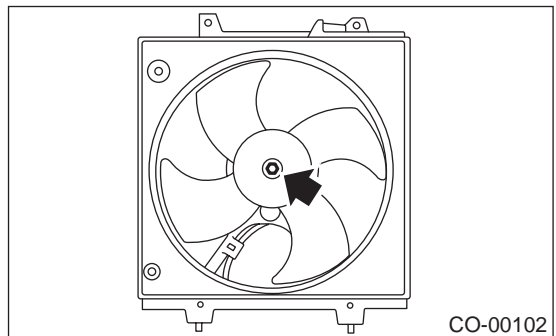
• Refer to "COMPONENT" for tightening torque.
<Ref. to CO(H4SO)-3, COMPONENT, General Description.>

C: DISASSEMBLY

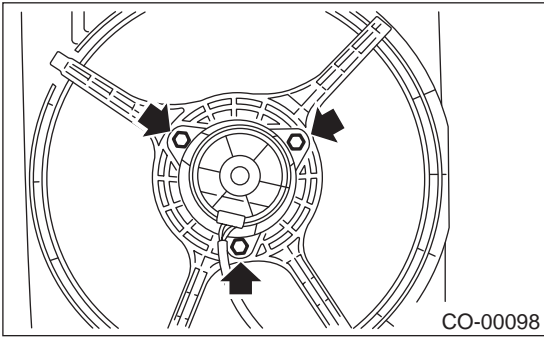
1) Remove clip which holds motor harness onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



3) Remove bolts which install fan motor onto shroud.



D: ASSEMBLY

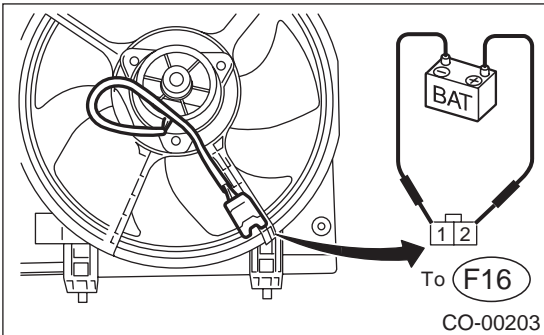
Assemble in the reverse order of disassembly.

NOTE:

• Refer to "COMPONENT" for tightening torque.
<Ref. to CO(H4SO)-3, COMPONENT, General Description.>

E: INSPECTION

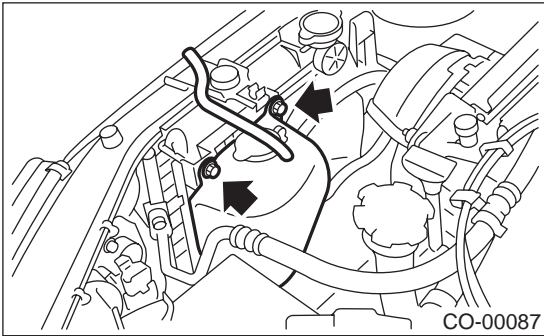
- 1) Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1.
- 2) Make sure the sub-fan motor operates properly. Replace it if it doesn't.



11. Reservoir Tank

A: REMOVAL

- 1) Disconnect overflow hose from radiator filler neck position.
- 2) Remove bolts which install reservoir tank onto radiator main fan shroud.
- 3) Remove reservoir tank.

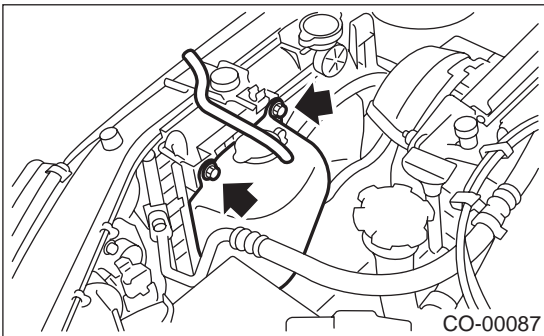


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.9N·m (0.50 kgf-m, 3.6 ft-lb)



C: INSPECTION

Make sure the engine coolant level is between full and low.

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Corrective action	
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H4SO)-2, ENGINE, PROCEDURE, Basic Diagnostic Procedure.> or <Ref. to EN(H4SOw/oOBD)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Engine oil mixed in engine coolant	Replace engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to EN(H4SO)-2, ENGINE, PROCEDURE, Basic Diagnostic Procedure.> or <Ref. to EN(H4SOw/oOBD)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
Over-cooling	o. Improper transmission oil	Replace.
	p. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Engine coolant leaks.	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Malfunction of thermostat	Replace.
	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
Noise	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

ENGINE COOLING SYSTEM TROUBLE IN GENERAL

COOLING

MEMO:

LUBRICATION

LU(H4SO)

	Page
1. General Description	2
2. Oil Pressure System	6
3. Engine Oil.....	8
4. Oil Pump	10
5. Oil Pan and Strainer	14
6. Oil Pressure Switch.....	17
7. Engine Oil Filter.....	18
8. Engine Lubrication System Trouble in General.....	19



GENERAL DESCRIPTION

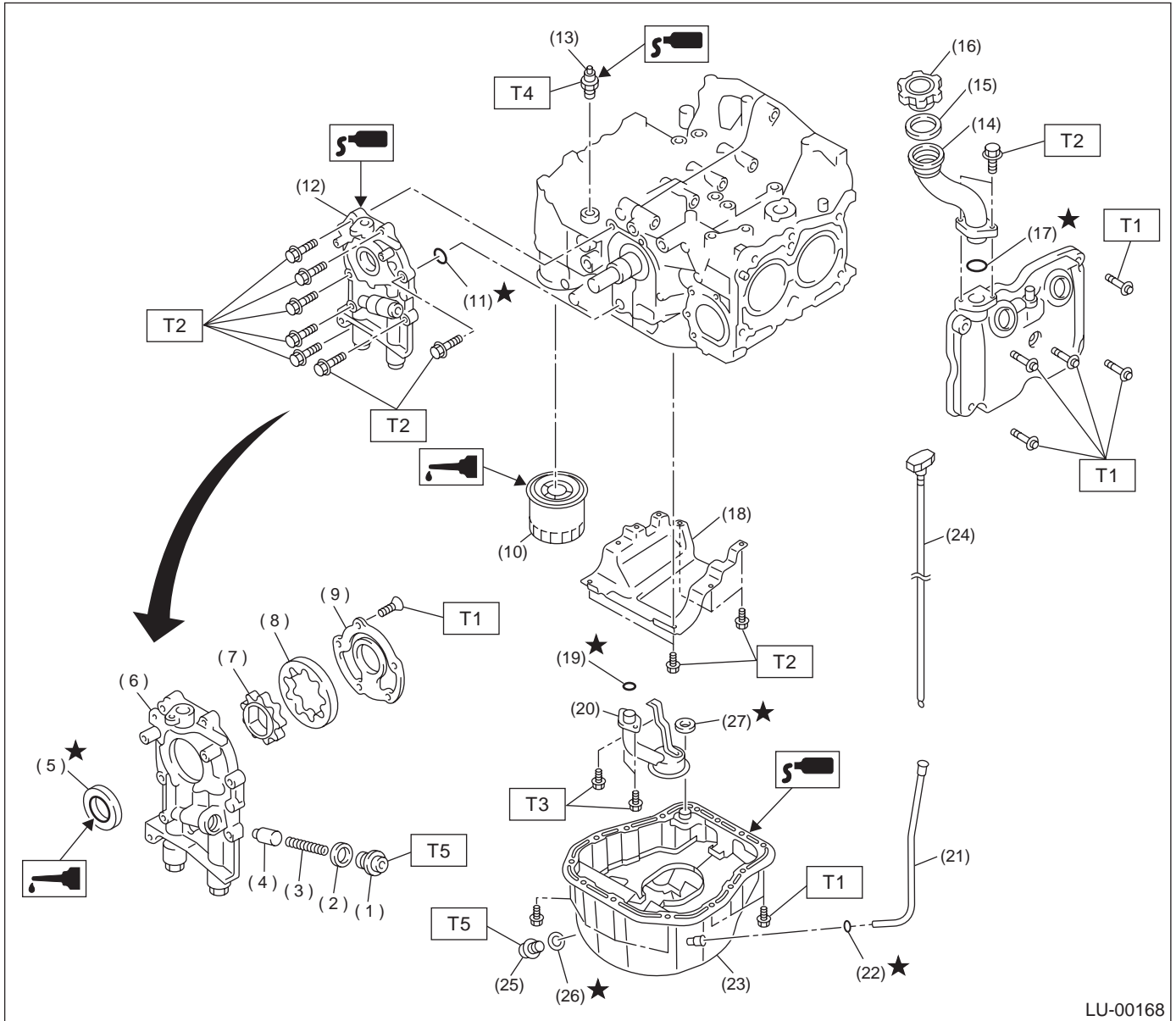
LUBRICATION

1. General Description

A: SPECIFICATIONS

Lubrication method			Forced lubrication
Oil pump	Pump type		Trochoid type
	Number of teeth	Inner rotor	9
		Outer rotor	10
	Outer rotor diameter × thickness		78 × 7 mm (3.07 × 0.28 in)
	Tip clearance between inner and outer rotor	STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
		LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case	STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
		LIMIT	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case	STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
		LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	- Discharge pressure
- Discharge quantity			3.2 ℓ (3.4 US qt, 2.8 Imp qt)/min.
5,000 rpm		- Discharge pressure	294 kPa (3.0 kg/cm ² , 43 psi)
		- Discharge quantity	32.6 ℓ (8.61 US gal, 7.17 Imp gal)/min.
Relief valve operation pressure			490 kPa (5.0 kg/cm ² , 71 psi)
Oil filter	Type		Full-flow filter type
	Filtration area		760 cm ² (118 sq in)
	By-pass valve opening pressure		157 kPa (1.6 kg/cm ² , 22.7 psi)
	Outer diameter × width		80 × 75 mm (3.15 × 2.95 in)
	Installation screw type		M 20 × 1.5
Oil pressure switch	Type		Immersed contact point type
	Working voltage — wattage		12 V — 3.4 W or less
	Warning light activation pressure		14.7 kPa (0.15 kg/cm ² , 2.1 psi)
	Proof pressure		More than 981 kPa (10 kg/cm ² , 142 psi)
Oil capacity (when replacing oil)			Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)

B: COMPONENT



LU-00168

- | | | |
|-------------------------|----------------------------|-------------------|
| (1) Plug | (13) Oil pressure switch | (25) Drain plug |
| (2) Gasket | (14) Oil filler duct | (26) Metal gasket |
| (3) Relief valve spring | (15) O-ring | (27) Gasket |
| (4) Relief valve | (16) Oil filler cap | |
| (5) Oil seal | (17) O-ring | |
| (6) Oil pump case | (18) Baffle plate | |
| (7) Inner rotor | (19) O-ring | |
| (8) Outer rotor | (20) Oil strainer | |
| (9) Oil pump cover | (21) Oil level gauge guide | |
| (10) Oil filter | (22) O-ring | |
| (11) O-ring | (23) Oil pan | |
| (12) Oil pump ASSY | (24) Oil level gauge | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)

T2: 6.4 (0.65, 4.7)

T3: 10 (1.0, 7.2)

T4: 25 (2.5, 18.1)

T5: 44 (4.5, 33)

GENERAL DESCRIPTION

LUBRICATION

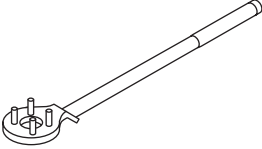
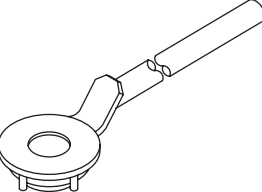
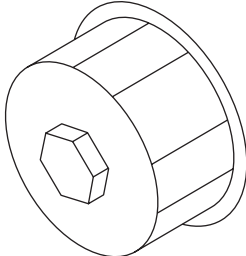
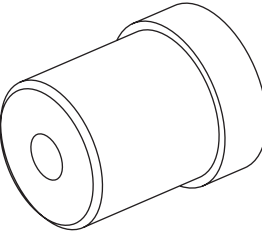
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

GENERAL DESCRIPTION

LUBRICATION

D: PREPARATION TOOL

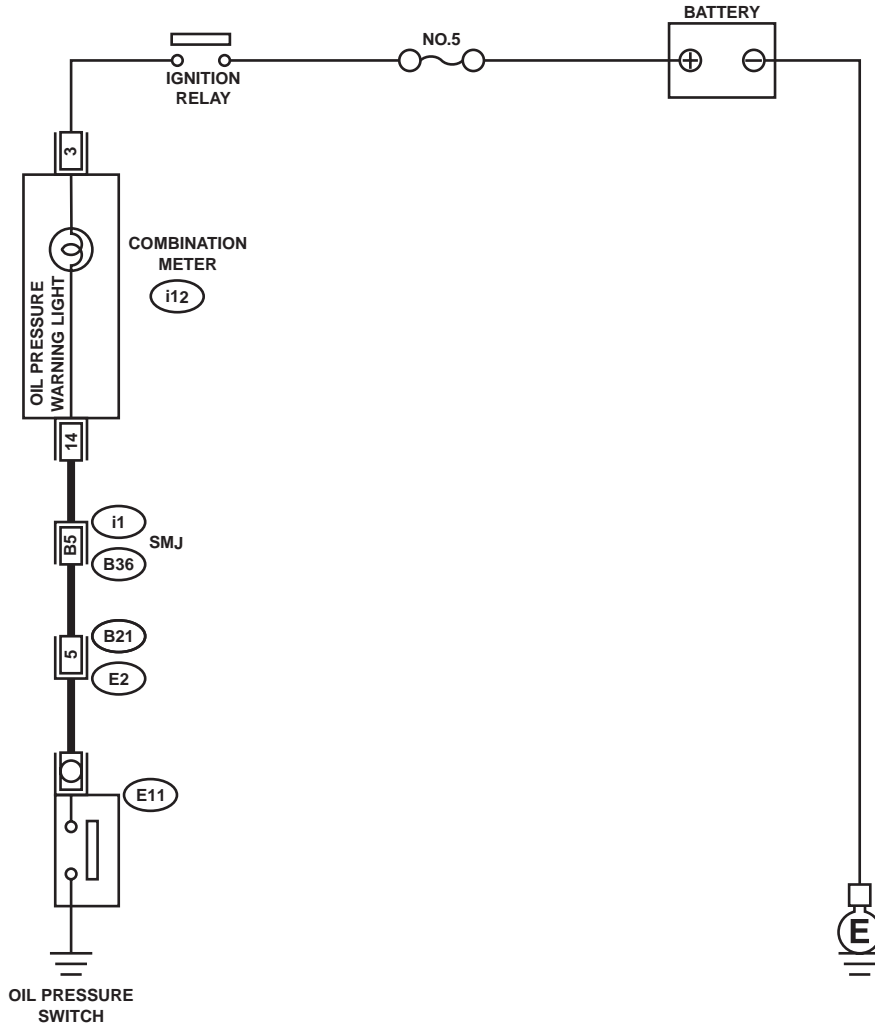
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499977100</p>	499977100	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt. (2500 cc model)
 <p style="text-align: center;">ST-499977400</p>	499977400	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt. (2000 cc model)
 <p style="text-align: center;">ST-498547000</p>	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 <p style="text-align: center;">ST-499587100</p>	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

OIL PRESSURE SYSTEM

LUBRICATION

2. Oil Pressure System

A: SCHEMATIC



i12 (GREEN)

1	2	3	4	5	6
7	8	9	10	11	12
13	14				

B21 (GRAY)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

B36

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C1	C2	C3	C4	C5	C6
D1	D2	D3	D4	D5	D6
E1	E2	E3	E4	E5	E6
F1	F2	F3	F4	F5	F6
G1	G2	G3	G4	G5	G6
H1	H2	H3	H4	H5	H6
I1	I2	I3	I4	I5	I6
J1	J2	J3	J4	J5	J6
K1	K2	K3	K4	K5	K6
L1	L2	L3	L4	L5	L6
M1	M2	M3	M4	M5	M6
N1	N2	N3	N4	N5	N6
O1	O2	O3	O4	O5	O6
P1	P2	P3	P4	P5	P6

LU-00158

B: INSPECTION

Step	Value	Yes	No
1 CHECK COMBINATION METER. 1) Turn ignition switch to ON. (engine OFF) 2) Check other warning lights. Does the warning lights go on?	Warning light goes on.	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connector from the oil pressure switch. 3) Turn ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. Connector & terminal (E11) No. 1 — Chassis ground: Does the measured value exceed the specified value?	10 V	Replace oil pressure switch.	Go to step 3.
3 CHECK COMBINATION METER. 1) Turn ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of the combination meter. Terminal (i12) No. 3 — (i12) No. 14: Is the measured value less than the specified value?	10 Ω	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter and the oil pressure switch warning light bulb.

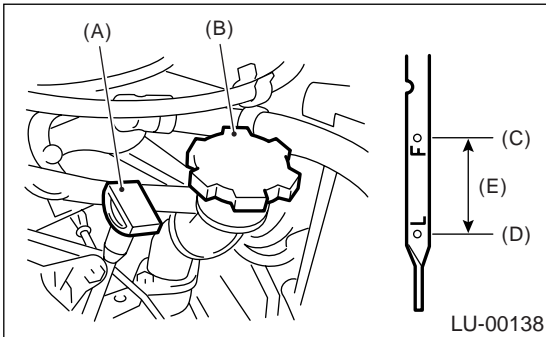
ENGINE OIL

LUBRICATION

3. Engine Oil

A: INSPECTION

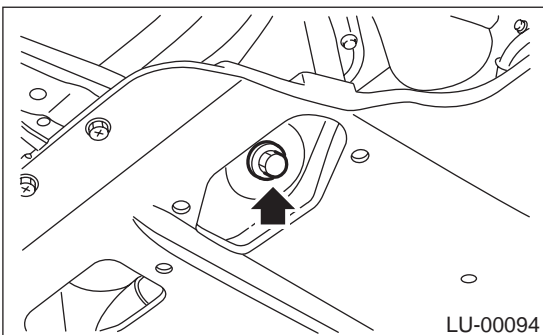
- 1) Park vehicle on a level surface.
- 2) Remove oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.
- 5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
- 6) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and the notch mark. This is caused by thermal expansion of the engine oil.
- 7) To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

- 1) Open engine oil filler cap for quick draining of the engine oil.
- 2) Drain engine oil by loosening engine oil drain plug.

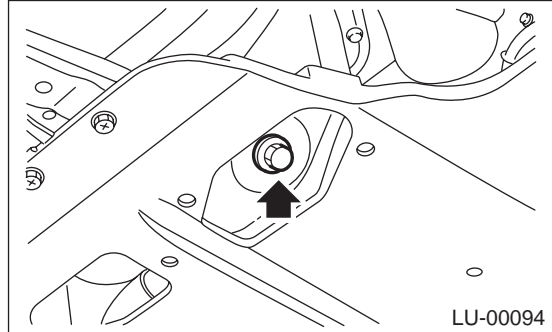


- 3) Replace drain plug gasket.

- 4) Tighten engine oil drain plug after draining engine oil.

Tightening torque:

44 N·m (4.5 kgf·m, 33 ft·lb)



- 5) Fill engine oil through filler pipe up to upper point on level gauge. Make sure that vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil

API classification SL, SJ with the "Energy Conserving" logo is printed (if you cannot obtain the oil with SL, SJ or SH grades, you may use SG, SF grades "ENERGY CONSERVING" oil.)

ACEA specification, A1, A2 or A3

CCMC specification, G4 or G5

New API certification mark (Star bourse mark) label is on the container.

Oil amount for preparation (when replacing engine oil):

Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)

SAE Viscosity No. and Applicable Temperature						
(°C)	-30	-20	-15	0	15	30 40
(°F)	-22	-4	5	32	59	86 104
				10W-30, 10W-40		
				5W-30 PREFERRED		

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:

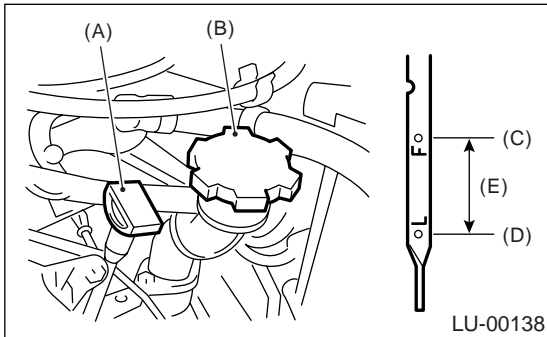
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the ILSAC or API classification and SAE viscosity No. designated by SUBARU.

NOTE:

If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SL, SJ or SH

SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

- 6) Close engine oil filler cap.
- 7) Start engine and warm it up for a time.
- 8) After engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

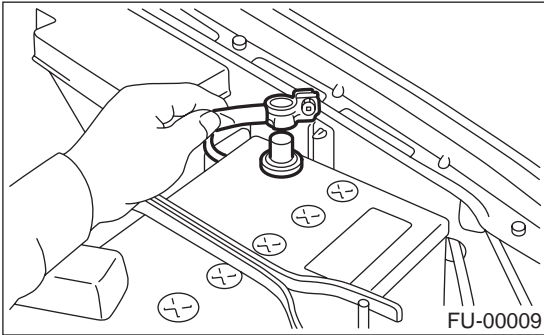
OIL PUMP

LUBRICATION

4. Oil Pump

A: REMOVAL

1) Disconnect battery ground cable.



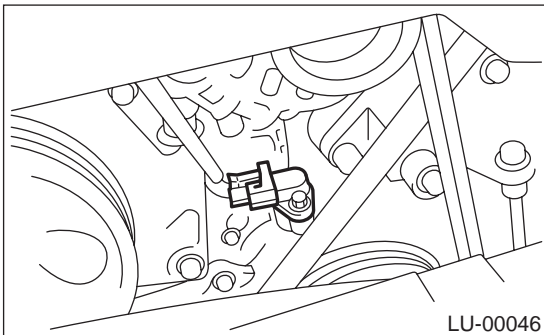
2) Lift-up the vehicle.

3) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>

4) Lower the vehicle.

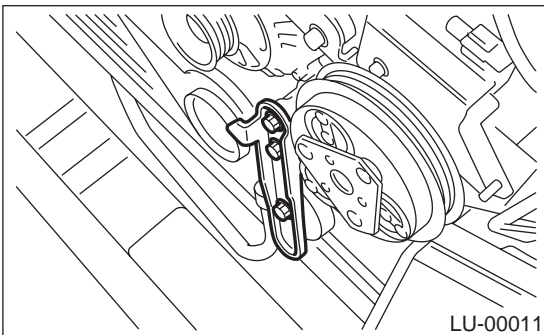
5) Remove radiator. <Ref. to CO(H4SO)-23, REMOVAL, Radiator.>

6) Remove crankshaft position sensor.



7) Remove V-belts. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>

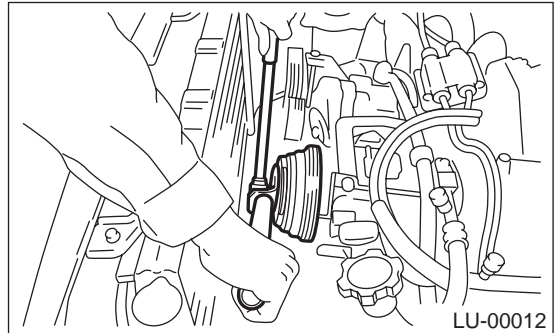
8) Remove rear side V-belt tensioner.



9) Remove crankshaft pulley by using ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH (2500 cc model)

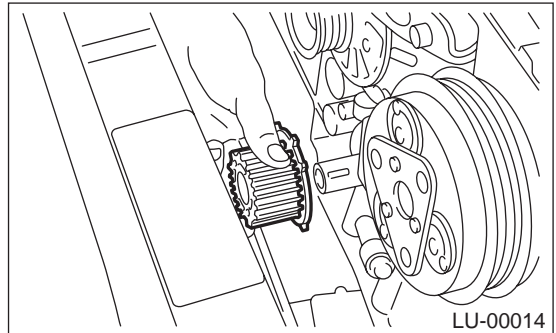
ST 499977400 CRANKSHAFT PULLEY WRENCH (2000 cc model)



10) Remove water pump. <Ref. to CO(H4SO)-16, REMOVAL, Water Pump.>

11) Remove timing belt guide. (MT vehicle)

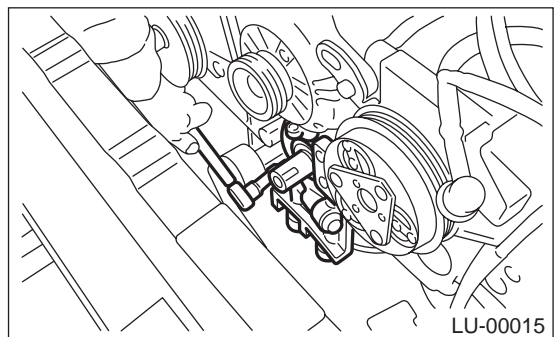
12) Remove crankshaft sprocket.



13) Remove bolts which install oil pump onto cylinder block.

NOTE:

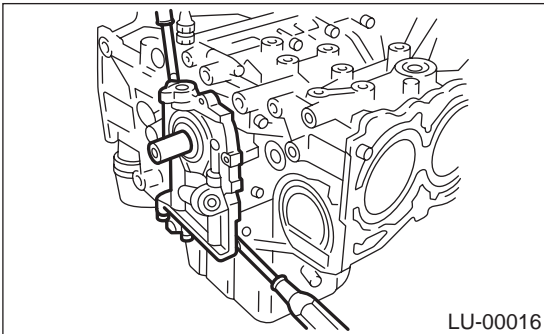
To disassemble and check oil pump, loosen relief valve plug before removing the pump.



14) Remove oil pump by using flat bladed screwdriver.

CAUTION:

Be careful not to scratch mating surfaces of cylinder block and oil pump.



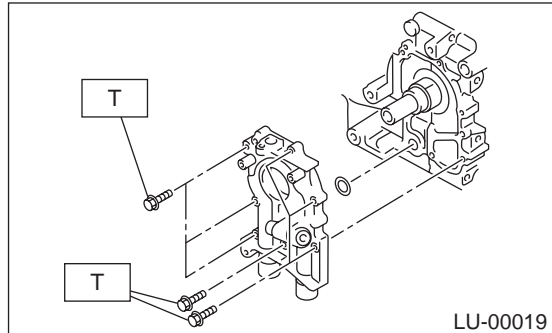
CAUTION:

Make sure the oil seal lip is not folded.

6) Install oil pump.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



B: INSTALLATION

Install in the reverse order of removal.

Do the following:

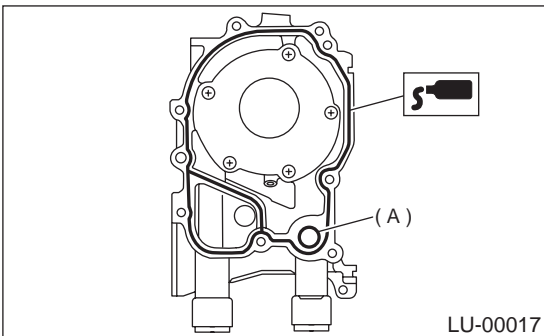
1) Apply fluid gasket to matching surfaces of oil pump.

Fluid gasket:

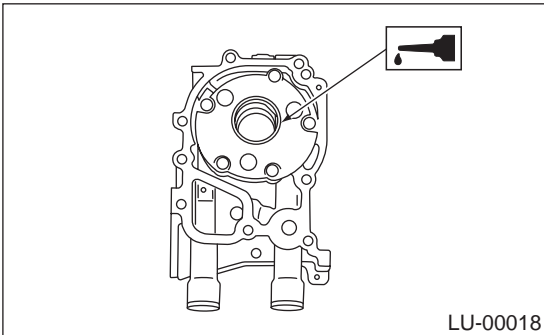
Part No. 004403007

THREE BOND 1215 or equivalent

2) Replace O-ring (A) with a new one.



3) Apply engine oil to the inside of the oil seal.

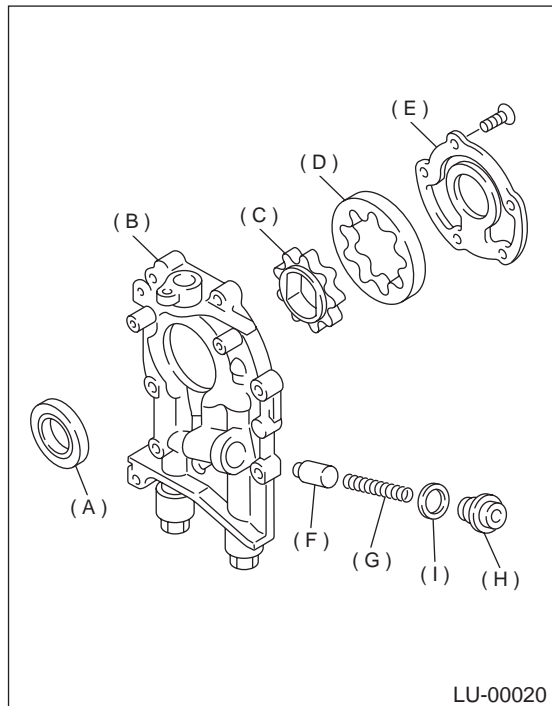


4) Be careful not to scratch oil seal when installing oil pump on cylinder block.

5) Position the oil pump, aligning the notched area with the crankshaft, and push the oil pump straight.

C: DISASSEMBLY

Remove screws which secure oil pump cover and disassemble oil pump. Inscribe alignment marks on inner and outer rotors so that they can be replaced in their original positions during reassembly.



- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

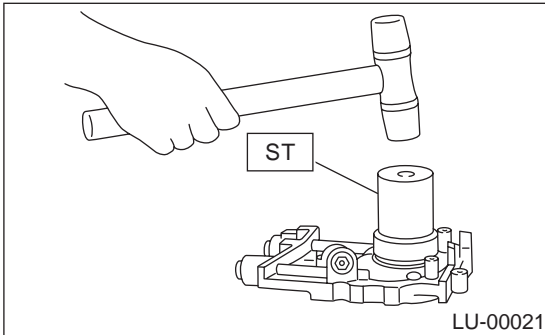
OIL PUMP

LUBRICATION

D: ASSEMBLY

- 1) Install front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.

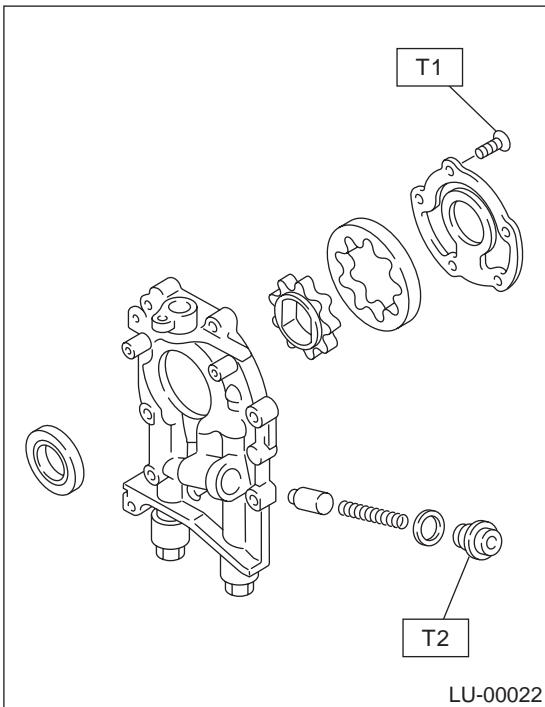


- 2) Apply engine oil to inner and outer rotors.
- 3) Install inner and outer rotors in their original positions.
- 4) Install oil relief valve and relief valve spring.
- 5) Install oil pump cover.

Tightening torque:

T1: 5 N·m (0.5 kgf·m, 3.6 ft·lb)

T2: 44 N·m (4.5 kgf·m, 33 ft·lb)



E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a set.

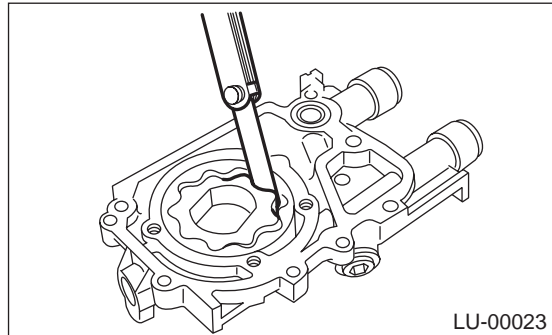
Tip clearance:

Standard

0.04 — 0.14 mm (0.0016 — 0.0055 in)

Limit

0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and the cylinder block rotor housing. If the clearance exceeds the limit, replace the rotor.

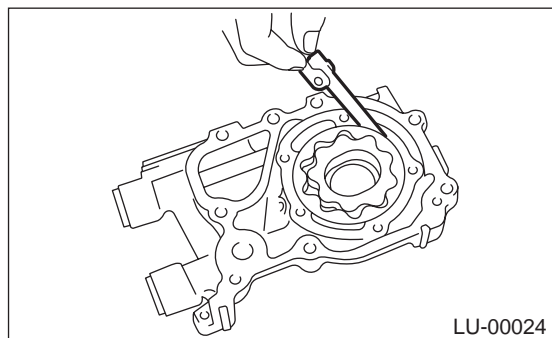
Case clearance:

Standard

0.10 — 0.175 mm (0.0039 — 0.0069 in)

Limit

0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure clearance between oil pump inner rotor and pump cover. If the clearance exceeds the limit, replace rotor or pump body.

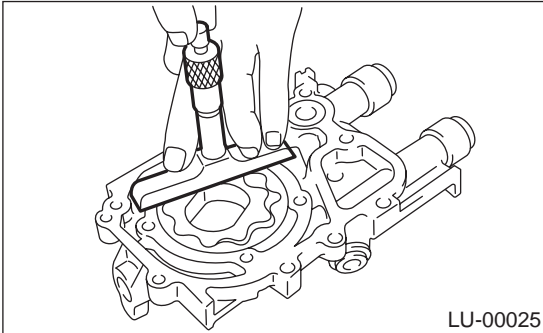
Side clearance:

Standard

0.02 — 0.07 mm (0.0008 — 0.0028 in)

Limit

0.12 mm (0.0047 in)



4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:

Free length

72.8 mm (2.866 in)

Installed length

54.7 mm (2.154 in)

Load when installed

81.3 N (8.29 kgf, 18.28 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

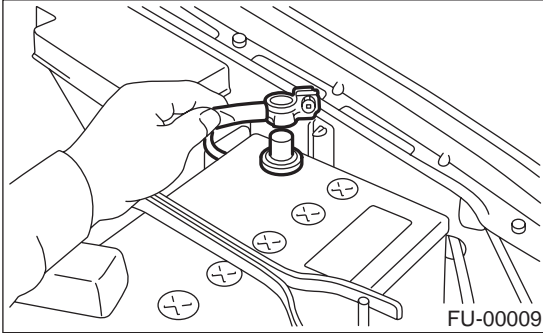
OIL PAN AND STRAINER

LUBRICATION

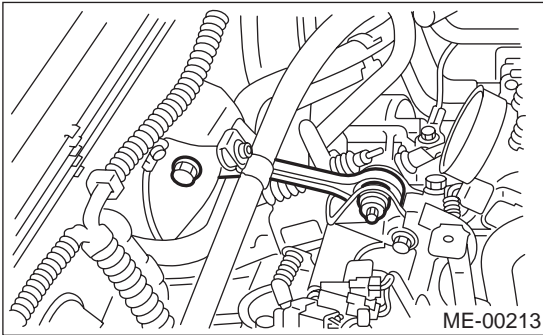
5. Oil Pan and Strainer

A: REMOVAL

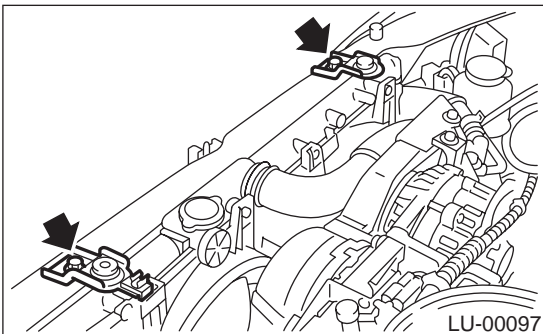
- 1) Set the vehicle on lift arms.
- 2) Remove front wheels.
- 3) Disconnect battery ground cable.



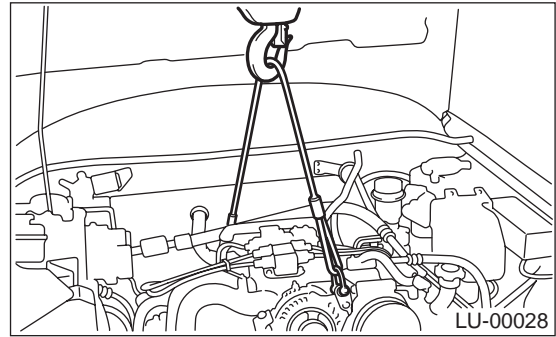
- 4) Remove air intake duct and air cleaner case.
<Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
and <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 5) Remove pitching stopper.



- 6) Remove radiator upper brackets.



- 7) Support engine with a lifting device and wire ropes.

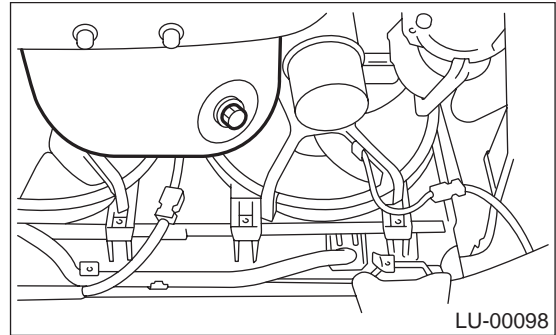


- 8) Lift-up the vehicle.

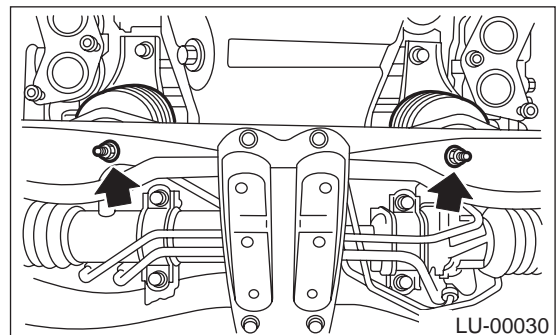
CAUTION:

When lifting up the vehicle, wire rope must be raised at the same time.

- 9) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>
- 10) Drain engine oil.
Set container under the vehicle, and remove drain plug from oil pan.



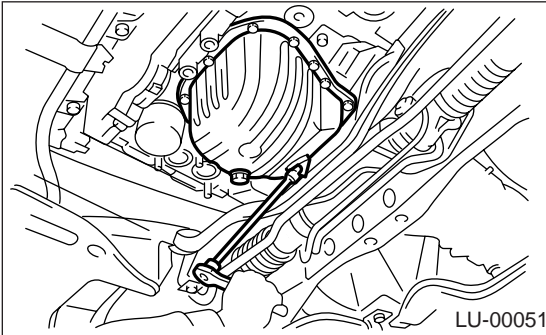
- 11) Remove front and center exhaust pipes. <Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.> or <Ref. to EX(H4SOw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>
- 12) Remove nuts which secure front cushion rubber onto front crossmember.



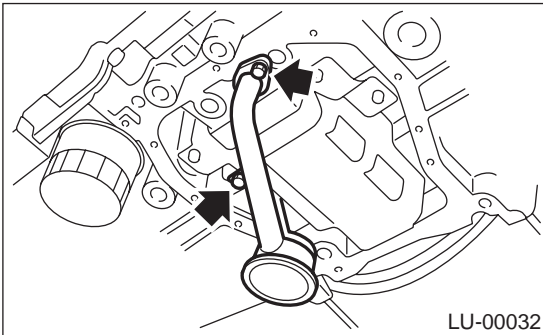
- 13) Remove bolts which secure oil pan on cylinder block while raising up engine.

14) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

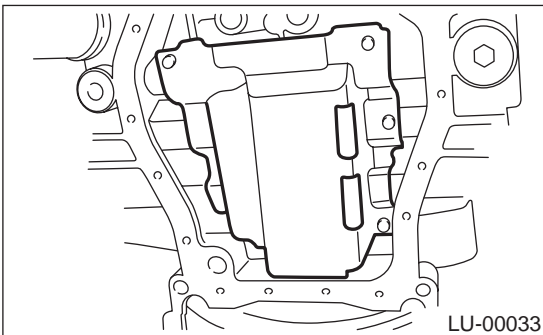
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.



15) Remove oil strainer.



16) Remove baffle plate.

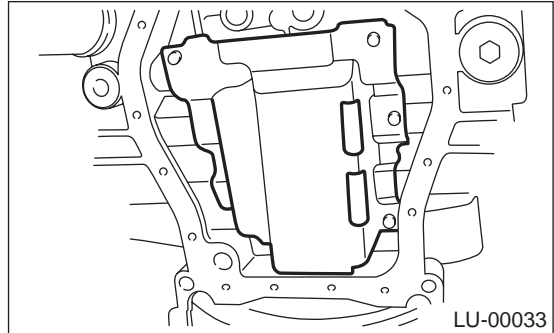


B: INSTALLATION

CAUTION:
Before installing oil pan, clean sealant from oil pan and engine block.

1) Install baffle plate.

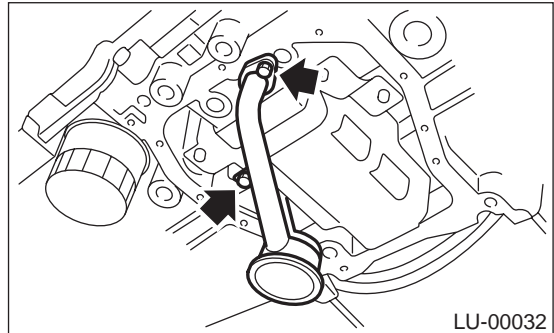
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Install oil strainer onto baffle plate.

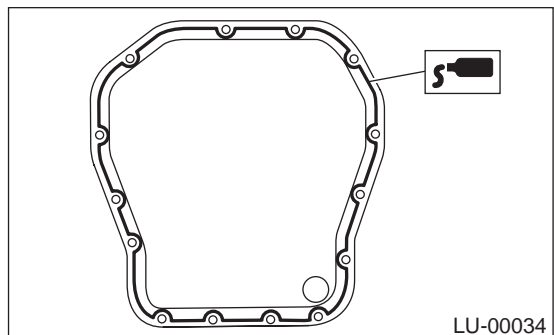
CAUTION:
Replace O-ring with a new one.

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)



3) Apply fluid gasket to mating surfaces and install oil pan.

Fluid gasket:
Part No. 004403007
THREE BOND 1215 or equivalent

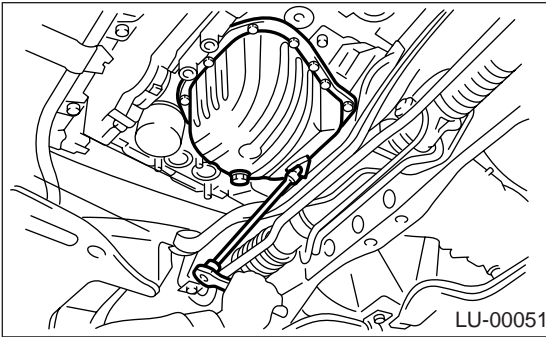


OIL PAN AND STRAINER

LUBRICATION

Tightening torque:

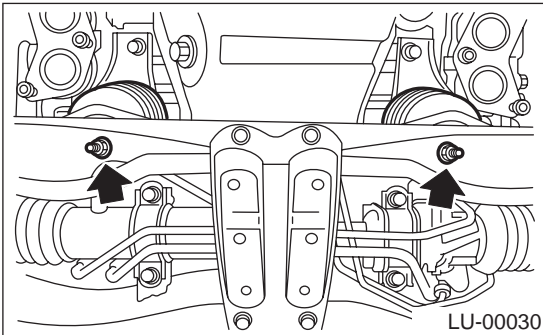
5 N·m (0.5 kgf-m, 3.6 ft-lb)



- 4) Lower engine onto front crossmember.
- 5) Tighten nuts which secure front cushion rubber onto front crossmember.

Tightening torque:

69 N·m (7.0 kgf-m, 51 ft-lb)

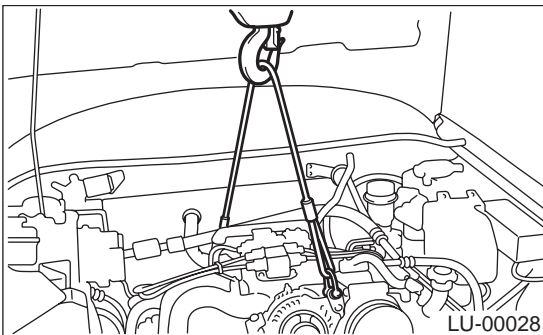


- 6) Install front and center exhaust pipes. <Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.> or <Ref. to EX(H4SOw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>
- 7) Install under cover. <Ref. to EI-13, INSTALLATION, Front Under Cover.>
- 8) Lower the vehicle.

CAUTION:

When lowering vehicle, wire rope must be released at the same time.

- 9) Remove lifting device and steel cables.

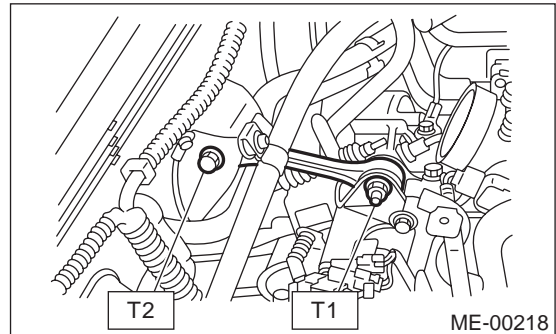


- 10) Install pitching stopper.

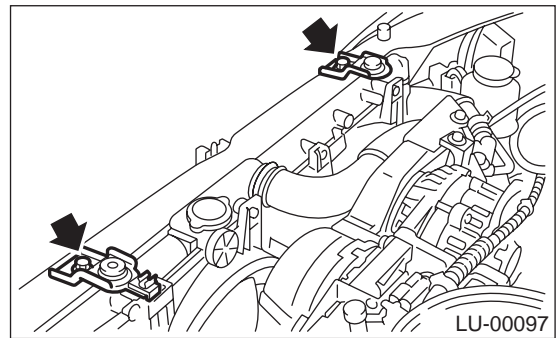
Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



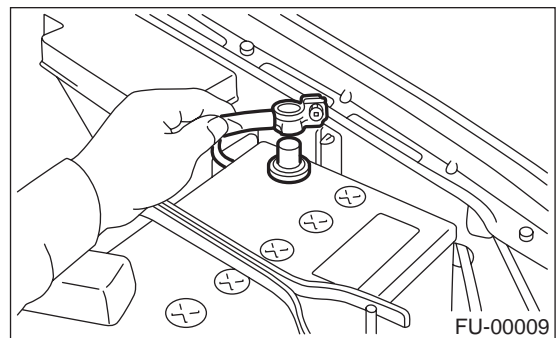
- 11) Install radiator upper brackets.



- 12) Install air intake duct and air cleaner case. <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

- 13) Install front wheels.

- 14) Connect battery ground cable.



- 15) Fill engine oil. <Ref. to LU(H4SO)-8, INSPECTION, Engine Oil.>

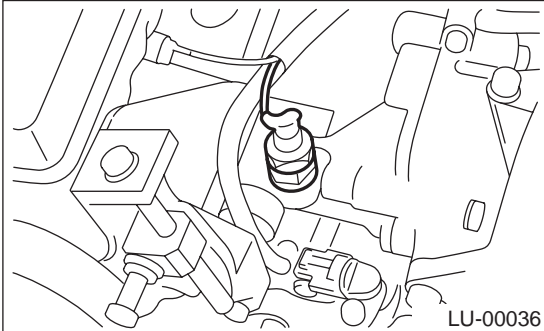
C: INSPECTION

By visual check make sure oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

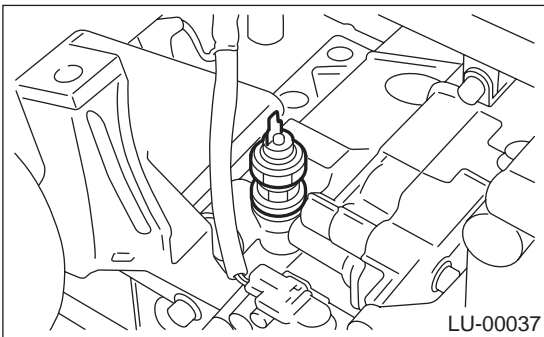
6. Oil Pressure Switch

A: REMOVAL

- 1) Remove generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 2) Disconnect terminal from oil pressure switch.



- 3) Remove oil pressure switch.



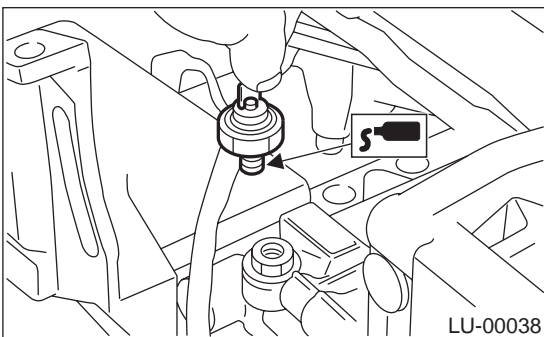
B: INSTALLATION

- 1) Apply fluid gasket to oil pressure switch threads.

Fluid gasket:

Part No. 004403042

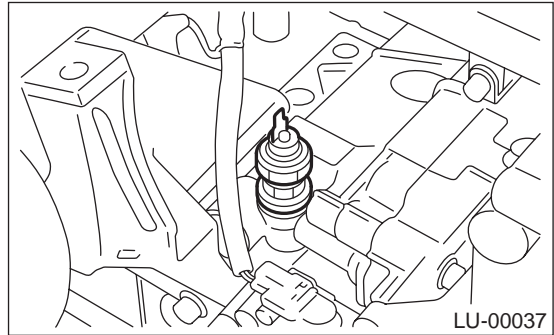
THREE BOND 1324 or equivalent



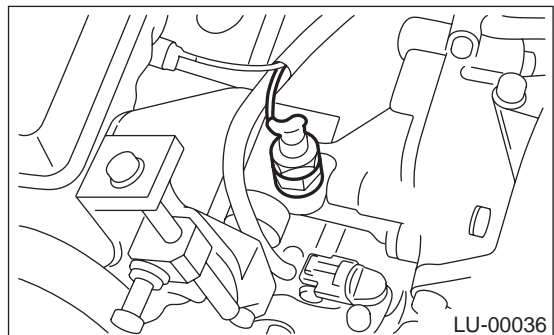
- 2) Install oil pressure switch onto engine block.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- 3) Connect terminal of oil pressure switch.



- 4) Install generator on bracket. <Ref. to SC(H4SO)-14, INSTALLATION, Generator.>

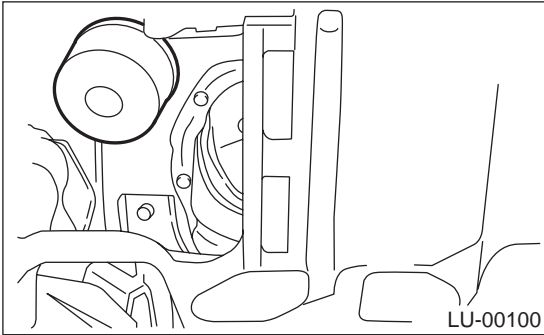
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

7. Engine Oil Filter

A: REMOVAL

- 1) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>
- 2) Remove oil filter with ST.
ST 498547000 OIL FILTER WRENCH



B: INSTALLATION

- 1) Get a new oil filter and thinly apply engine oil to the seal rubber.
- 2) Install oil filter by turning it by hand, being careful not to damage seal rubber.
- 3) Tighten more (approximately 2/3 to 3/4 turn) after the seal rubber contacts the cylinder block. Do not tighten excessively, or oil may leak.

C: INSPECTION

- 1) After installing oil filter, run engine and make sure that no oil is leaking around seal rubber.

NOTE:

The filter element and filter case are integrated therefore, interior cleaning is not necessary.

- 2) Check the engine oil level. <Ref. to LU(H4SO)-8, INSPECTION, Engine Oil.>

8. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunition of oil by-pass valve of oil filter	Clean or replace.
		Malfunition of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
Stuck oil pump rotor		Replace.	
2. Warning light does not go on.	1) Burn-out bulb	Replace.	
	2) Poor contact of switch contact points	Replace.	
	3) Disconnection of wiring	Repair.	
3. Warning light flickers momentarily.	1) Poor contact at terminals	Repair.	
	2) Defective wiring harness	Repair.	
	3) Low oil pressure	Check for the same possible causes as listed in 1.—2).	

ENGINE LUBRICATION SYSTEM TROUBLE IN GENERAL

LUBRICATION

MEMO:

SPEED CONTROL SYSTEMS

SP(H4SO)

	Page
1. General Description	2
2. Accelerator Pedal	5
3. Accelerator Control Cable	10



GENERAL DESCRIPTION

SPEED CONTROL SYSTEMS

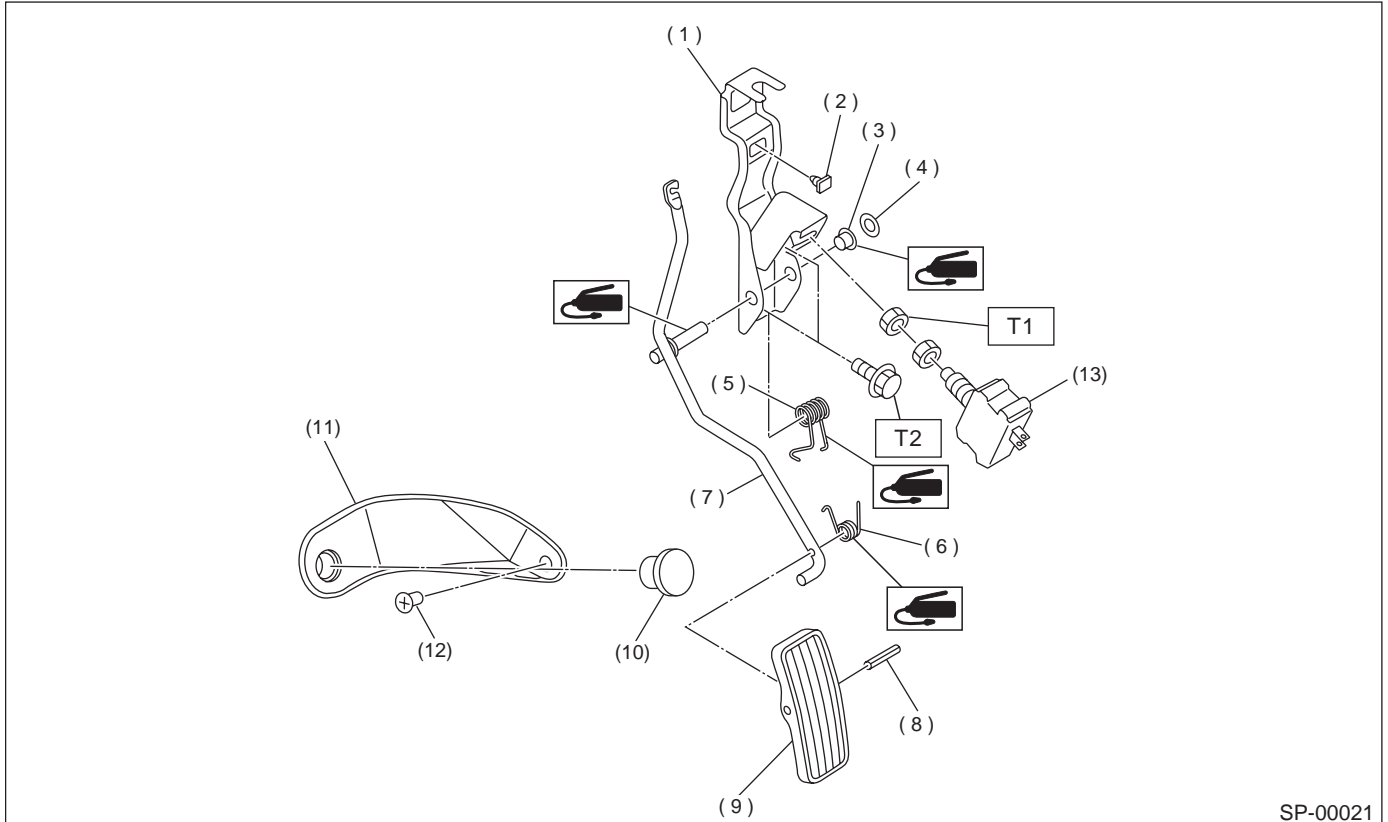
1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	0 — 4 mm (0 — 0.16 in)
	Stroke	At pedal pad	50 — 55 mm (1.97 — 2.17 in)

B: COMPONENT

1. LHD MODEL



- (1) Accelerator bracket
- (2) Stopper
- (3) Bushing
- (4) Clip
- (5) Accelerator spring
- (6) Accelerator pedal spring

- (7) Accelerator pedal lever
- (8) Spring pin
- (9) Accelerator pedal
- (10) Accelerator stopper
- (11) Accelerator plate
- (12) Clip

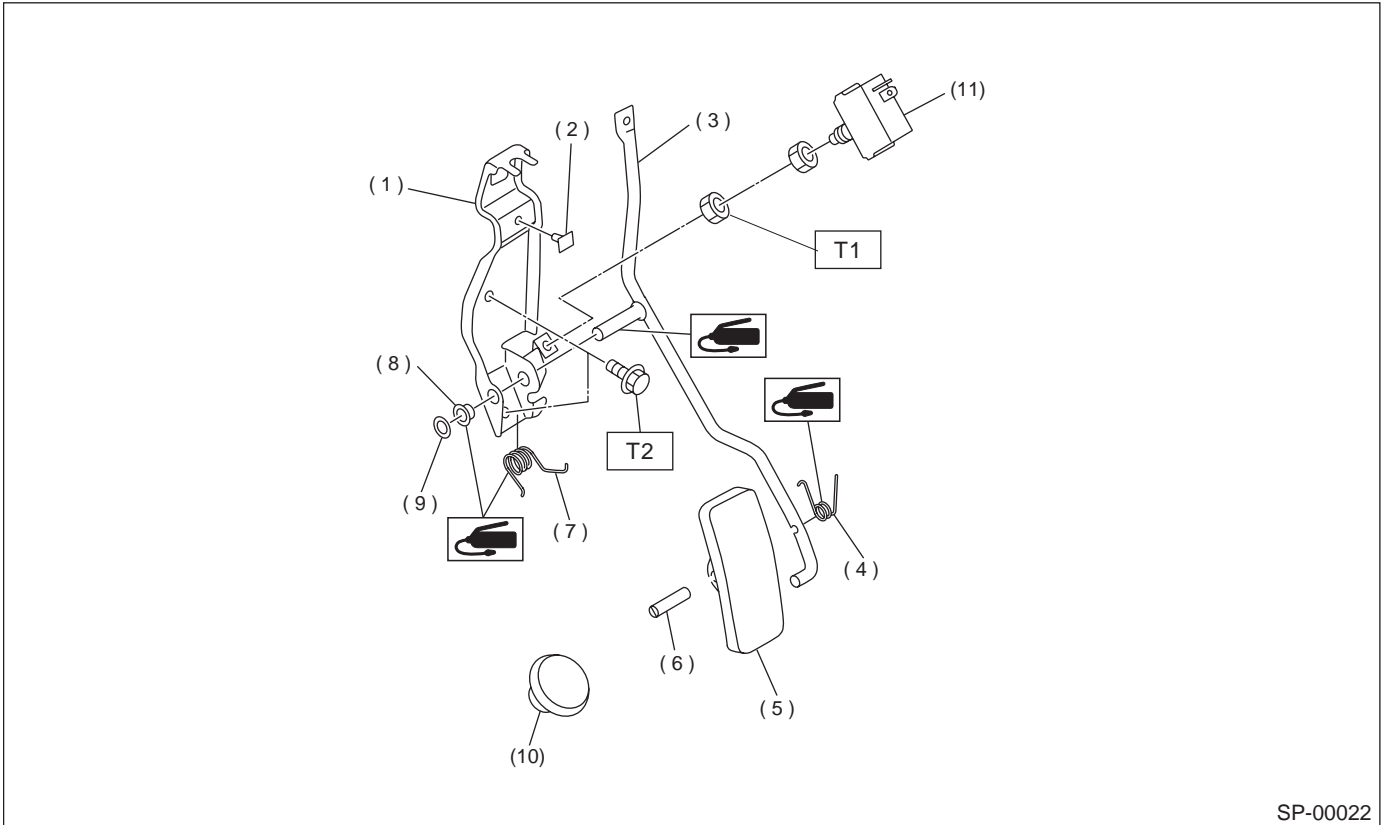
- (13) Kick-down switch (AT vehicles only)

Tightening torque: N·m (kgf·m, ft·lb)

T1: 12 (1.2, 9.0)

T2: 18 (1.8, 13.0)

2. RHD MODEL



SP-00022

- (1) Accelerator bracket
- (2) Stopper
- (3) Accelerator pedal lever
- (4) Accelerator pedal spring
- (5) Accelerator pedal

- (6) Spring pin
- (7) Accelerator spring
- (8) Bushing
- (9) Clip
- (10) Accelerator stopper

- (11) Kick-down switch (AT vehicles only)

Tightening torque: N-m (kgf-m, ft-lb)

T1: 12 (1.2, 9.0)

T2: 18 (1.8, 13.0)

GENERAL DESCRIPTION

SPEED CONTROL SYSTEMS

C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Accelerator Pedal

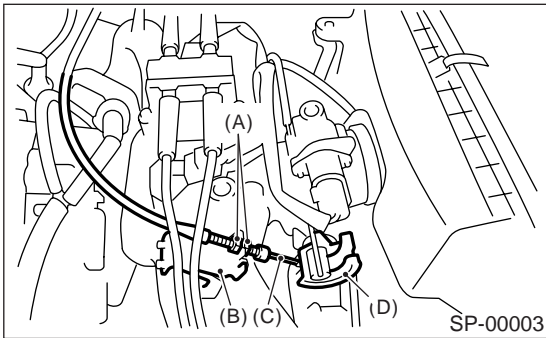
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lock nut from accelerator cable bracket.
- 3) Separate the accelerator cable from bracket.
- 4) Remove the accelerator cable end from throttle cam.

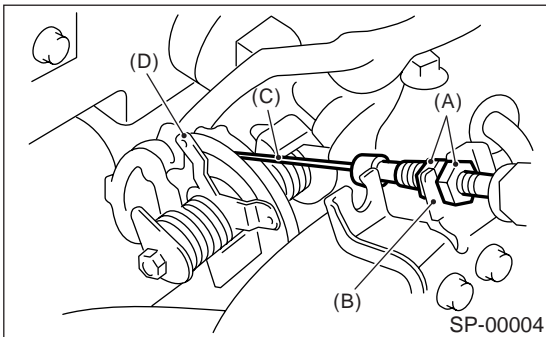
NOTE:

Be careful not to kink the accelerator cable.

- SOHC MODEL



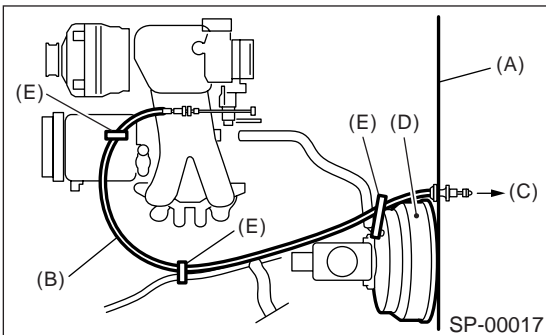
- DOHC turbo MODEL



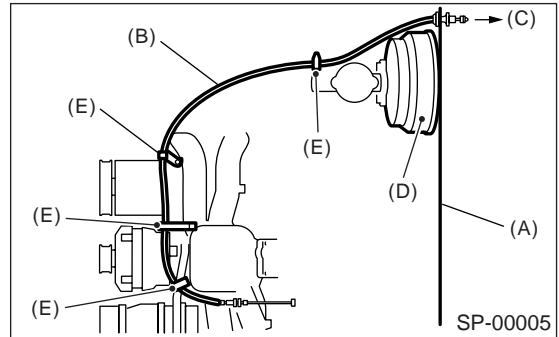
- (A) Lock nut
- (B) Accelerator cable bracket
- (C) Accelerator cable
- (D) Throttle cam

- 5) Remove the clip inside engine compartment.

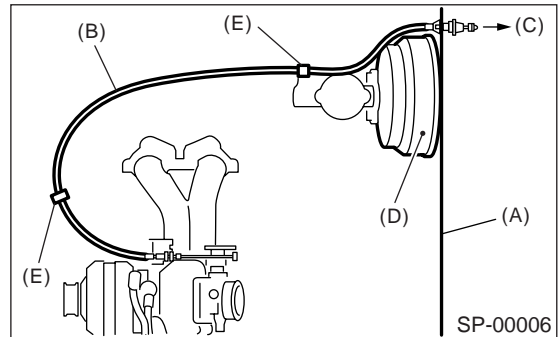
- LHD SOHC MODEL



- RHD SOHC MODEL



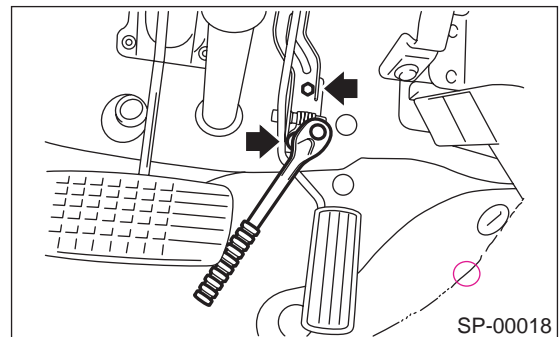
- DOHC turbo MODEL



- (A) Toe board
- (B) Accelerator cable
- (C) To accelerator pedal
- (D) Brake booster
- (E) Clip

- 6) Remove the instrument panel lower cover from instrument panel, and connector.
- 7) Disconnect the connector from kick-down switch. (AT vehicles)
- 8) Remove the accelerator pedal connecting bolt from accelerator pedal bracket.

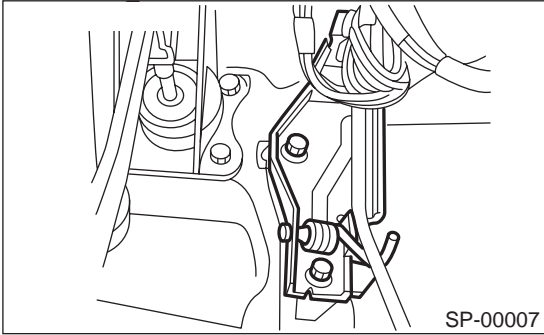
- LHD MODEL



ACCELERATOR PEDAL

SPEED CONTROL SYSTEMS

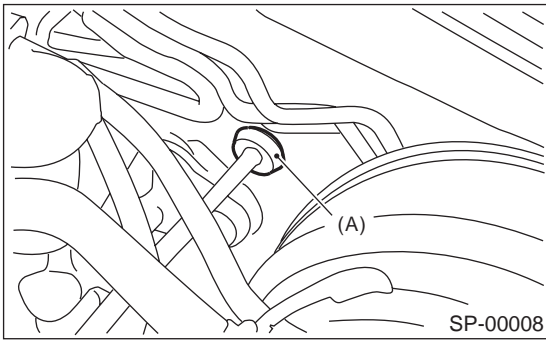
• RHD MODEL



9) Remove the grommet from toe board.

NOTE:

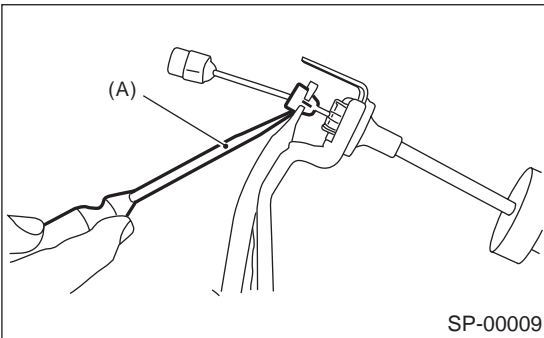
From the inside compartment, push the grommet (A) into hole.



(A) Grommet

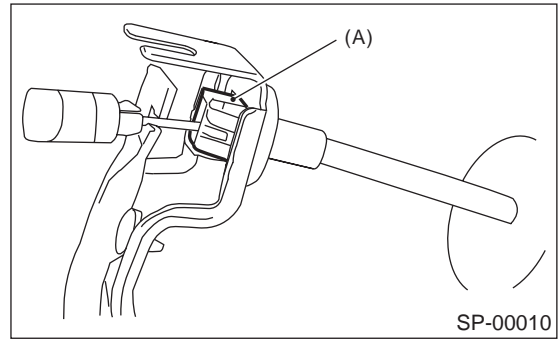
10) Pull out the cable from toe board hole.

11) Disconnect the accelerator cable bushing from accelerator pedal lever.



(A) Flat tip screwdriver

12) Disconnect the accelerator cable stopper from bracket.



(A) Accelerator cable stopper

13) Separate the accelerator cable and bracket.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:

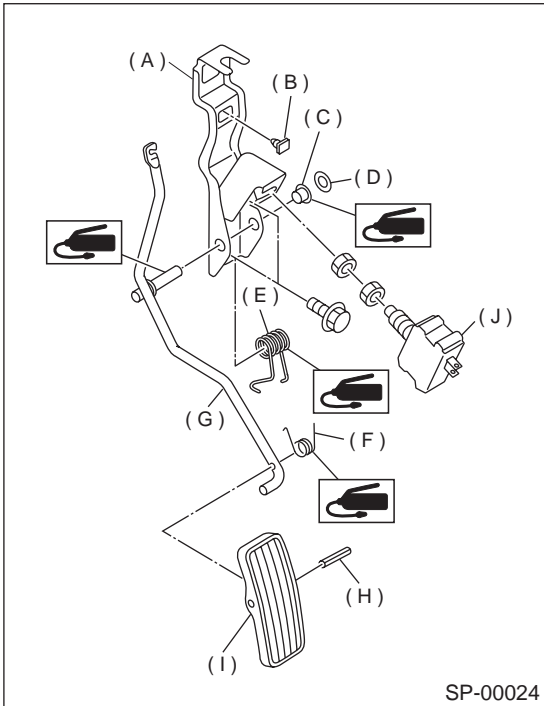
- If the cable clamp is damaged, replace it with a new one.
 - Never fail to cover the outer cable end with boot.
 - Be careful not to kink the accelerator cable.
 - For tightening torque, refer to "COMPONENT".
- <Ref. to SP(H4SO)-2, COMPONENT, General Description.>

2) After installing the accelerator pedal, adjust the pedal position. <Ref. to SP(H4SO)-8, ADJUSTMENT, Accelerator Pedal.>

C: DISASSEMBLY

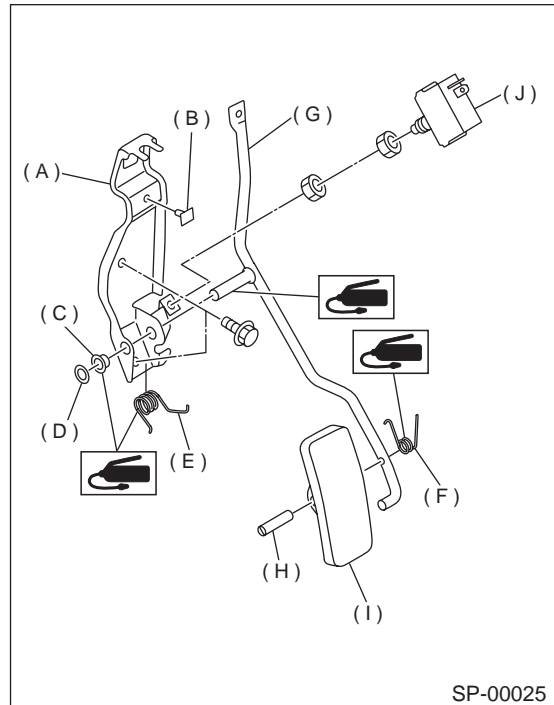
- 1) Remove the clip, and then remove the accelerator pedal from bracket.
- 2) Pull out the spring pin, and then remove the accelerator pedal from accelerator pedal lever.

• LHD MODEL



- (A) Accelerator bracket
- (B) Stopper
- (C) Bushing
- (D) Clip
- (E) Accelerator spring
- (F) Accelerator pedal spring
- (G) Accelerator pedal lever
- (H) Spring pin
- (I) Accelerator pedal
- (J) Kick-down switch (AT model)

• RHD MODEL



- (A) Accelerator bracket
- (B) Stopper
- (C) Bushing
- (D) Clip
- (E) Accelerator spring
- (F) Accelerator pedal spring
- (G) Accelerator pedal lever
- (H) Spring pin
- (I) Accelerator pedal
- (J) Kick-down switch (AT model)

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:

Clean and apply grease to the portions indicated in the figure.

Grease:

Part No. 003602010 (SUNLIGHT No. 2)

ACCELERATOR PEDAL

SPEED CONTROL SYSTEMS

E: INSPECTION

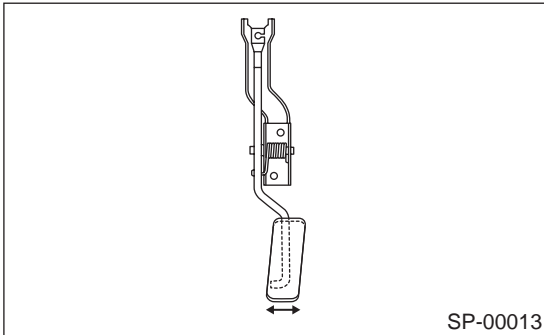
1. ACCELERATOR PEDAL

- 1) Lightly move the pedal pad in lateral direction to ensure that pedal deflection is in specified range.
- 2) If excessive deflection is noted, replace the bushing and clip with new ones.

Deflection of accelerator pedal:

Service limit

$\pm 2.0 \text{ mm (0.079 in)}$ or less

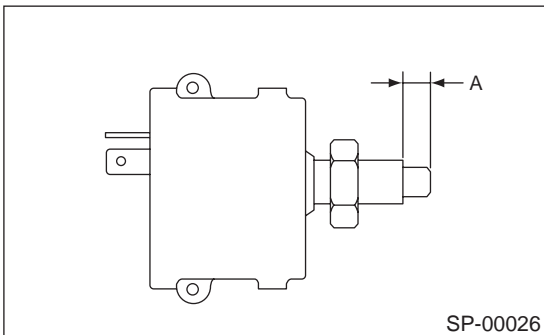


2. KICK-DOWN SWITCH

If the kick-down switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position: A

$2.0 - 3.5 \text{ mm (0.079 - 0.098 in)}$



F: ADJUSTMENT

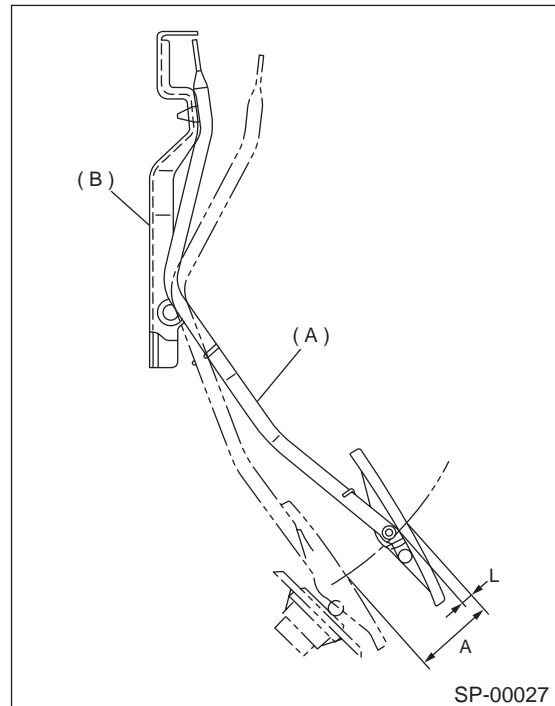
- 1) Check the pedal stroke and free play by operating accelerator pedal by hand.
- 2) If it is not within specified value, adjust it by turning the nut connecting the accelerator cable to throttle body.

Free play at pedal pad: L

$0 - 4 \text{ mm (0 - 0.16 in)}$

Stroke at pedal pad: A

$50 - 55 \text{ mm (1.97 - 2.17 in)}$



(A) Accelerator pedal

(B) Accelerator pedal bracket

Accelerator cable lock nut tightening torque:

$12 \text{ N}\cdot\text{m (1.2 kgf}\cdot\text{m, 9 ft}\cdot\text{lb)}$

3) Check to ensure the kick-down switch operates at the specified value in relation to the stroke of the accelerator pedal.

If it is not within specified value, adjust it by adjusting the position of kick-down switch.

NOTE:

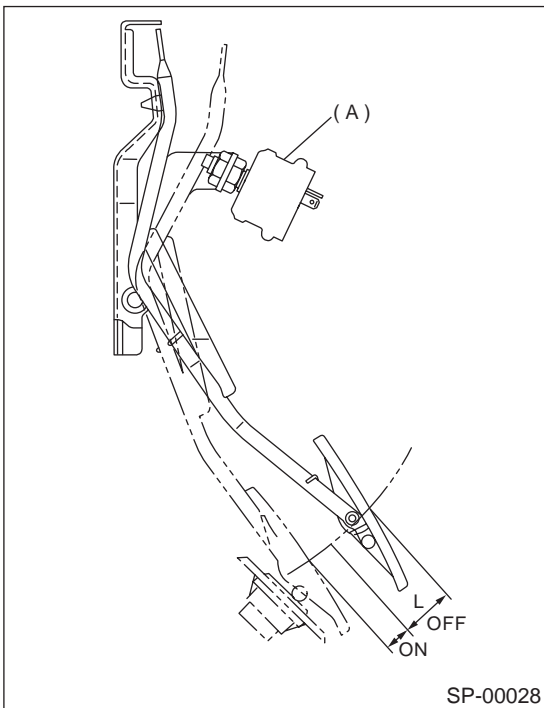
Be careful not to rotate kick-down switch.

Kick-down switch stroke: L

47 — 49 mm (1.85 — 1.93 in)

Kick-down switch tightening torque:

12 N·m (1.2 kgf-m, 9 ft-lb)



(A) Kick-down switch

ACCELERATOR CONTROL CABLE

SPEED CONTROL SYSTEMS

3. Accelerator Control Cable

A: REMOVAL

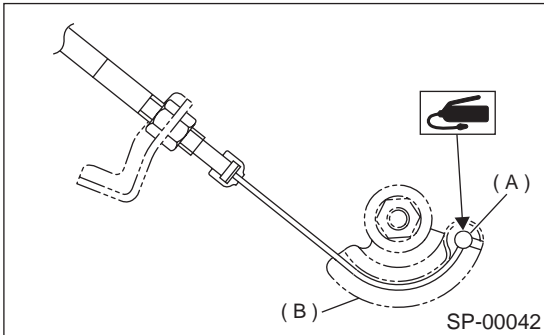
- 1) Remove the accelerator pedal. <Ref. to SP(H4SO)-5, REMOVAL, Accelerator Pedal.>
- 2) Separate the accelerator cable and accelerator pedal.

B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Apply grease to engine side accelerator cable end.

Grease:

Part No. 004404002 (Slicolube G-30M)



- (A) Applying position of grease
(B) Throttle cam

NOTE:

- If the cable clamp is damaged, replace it with a new one.
 - Never fail to cover the outer cable end with boot.
 - Be careful not to kink the accelerator cable.
 - Do not apply grease to except specified part.
- 3) Adjustment after pedal installation. <Ref. to SP(H4SO)-8, ADJUSTMENT, Accelerator Pedal.>

C: INSPECTION

- 1) Make sure the inner cable is not twisted or worn.
- 2) Make sure the outer cable is not cracked.

IGNITION

IG(H4SO)

	Page
1. General Description	2
2. Spark Plug.....	5
3. Ignition Coil and Ignitor Assembly.....	8
4. Spark Plug Cord.....	10



GENERAL DESCRIPTION

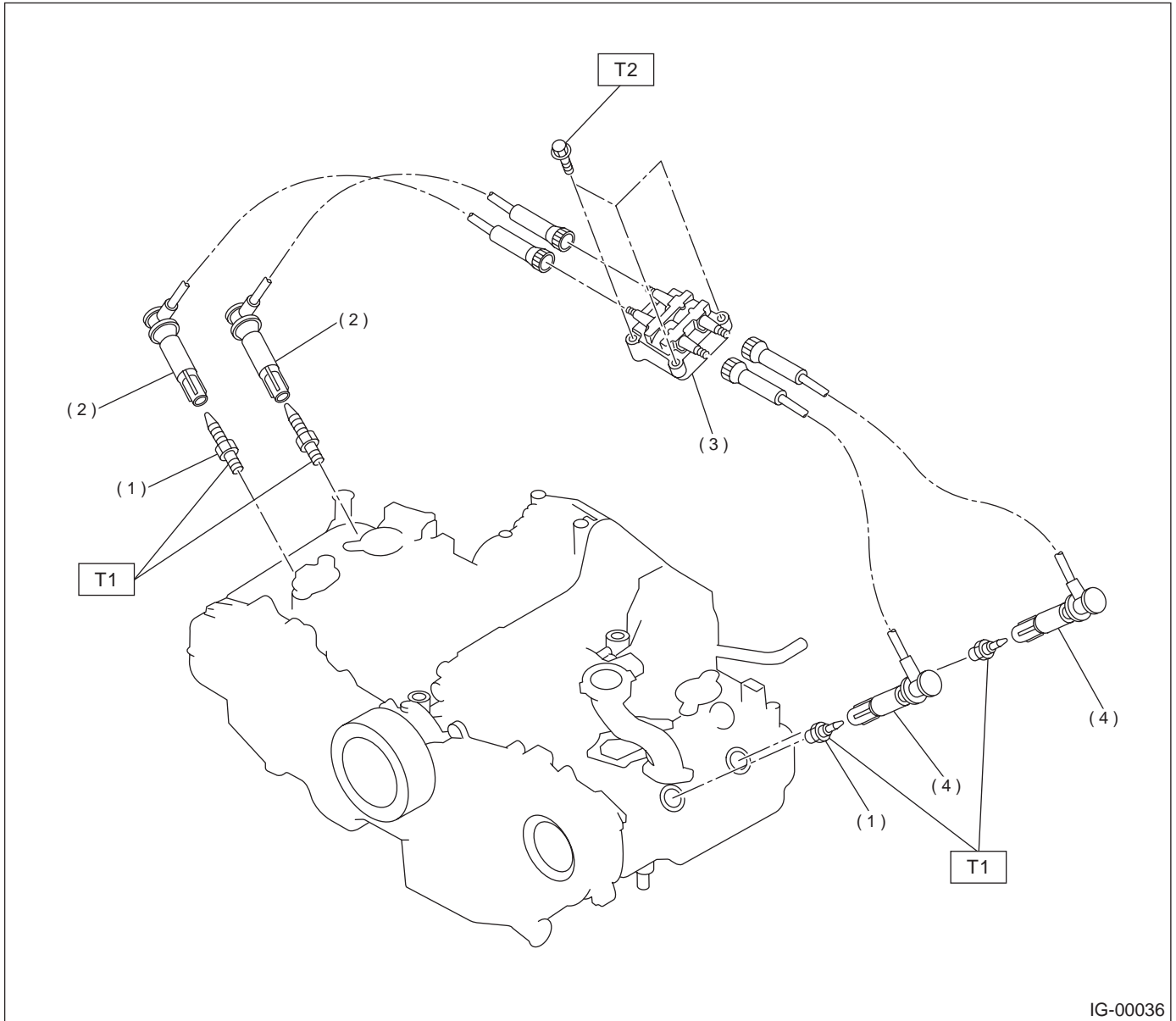
IGNITION

1. General Description

A: SPECIFICATIONS

Item		Designation	
Ignition coil and ignitor assembly	Model	FH0137	
	Manufacturer	DIAMOND	
	Primary coil resistance	0.73 Ω ±10%	
	Secondary coil resistance	12.8 k Ω ±15%	
	Insulation resistance between primary terminal and case	More than 100 M Ω	
Spark plug	Type and manufacturer	RC10YC4 CHAMPION	
	Alternate	BKR5E-11 NGK	
		BKR6E-11 NGK	
	Thread size	mm	14, P = 1.25
Spark gap	mm (in)	1.0 — 1.1 (0.039 — 0.043)	

B: COMPONENT



- (1) Spark plug
- (2) Spark plug cord (#1, #3)
- (3) Ignition coil and ignitor ASSY

- (4) Spark plug cord (#2, #4)

Tightening torque: N-m (kgf-m, ft-lb)

T1: 21 (2.1, 15)

T2: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

IGNITION

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

2. Spark Plug

A: REMOVAL

CAUTION:

All spark plugs installed on an engine, must be of the same heat range.

Spark plug:

CHAMPION: RC10YC4

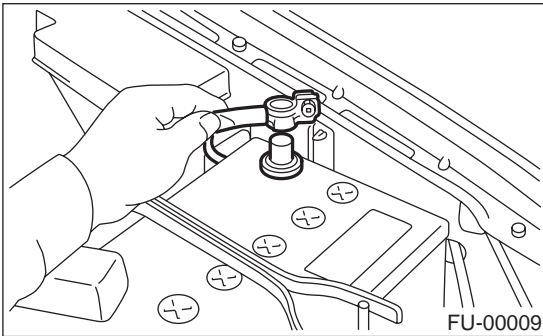
(Alternate)

NGK: BKR5E-11

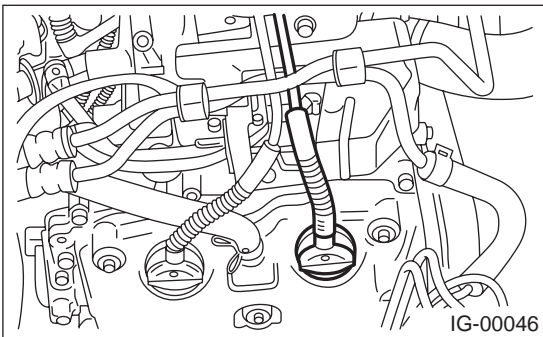
NGK: BKR6E-11

1. RH SIDE

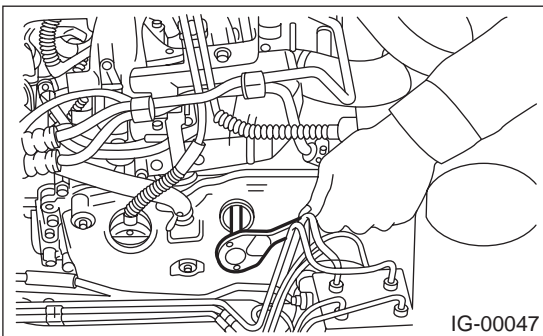
- 1) Disconnect battery ground cable.



- 2) Remove resonator chamber.
<Ref. to IN(H4SO)-8, REMOVAL, Resonator Chamber.>
- 3) Remove spark plug cords by pulling boot, not cord itself.

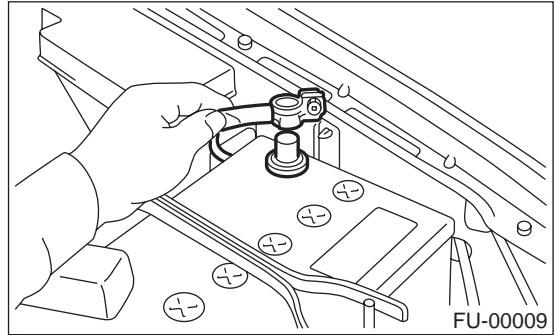


- 4) Remove spark plugs with the spark plug socket.

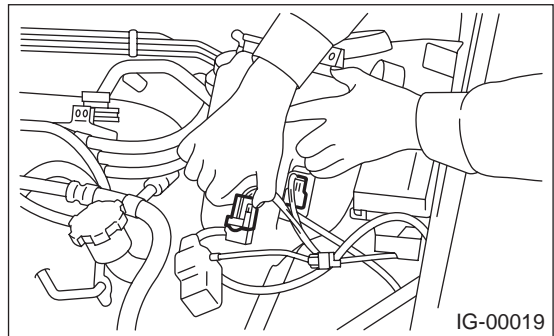


2. LH SIDE

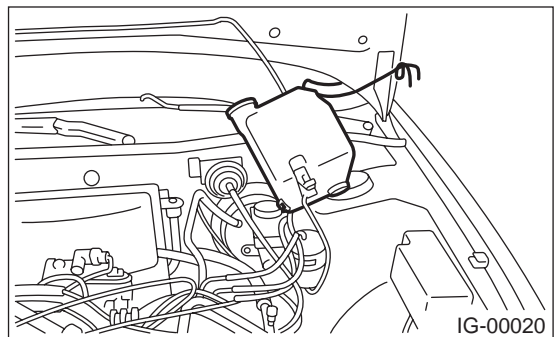
- 1) Disconnect battery ground cable.



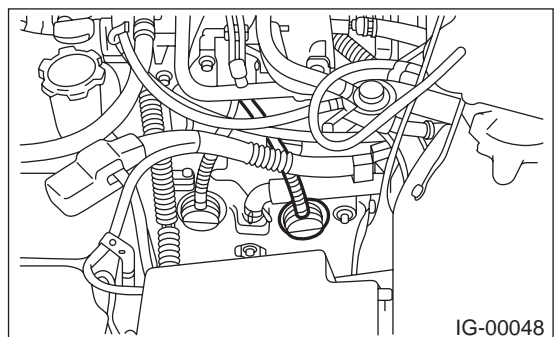
- 2) Disconnect washer motor connector.



- 3) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.
- 4) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



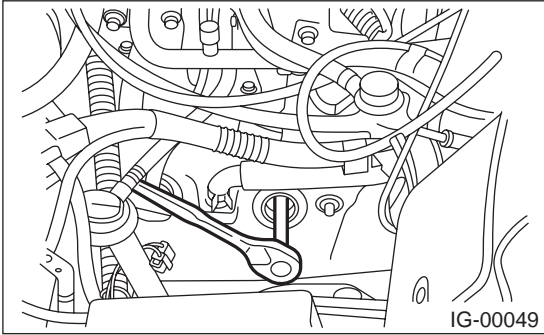
- 5) Remove spark plugs cord by pulling boot, not cord itself.



SPARK PLUG

IGNITION

6) Remove spark plug with the spark plugs socket.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

Tightening torque (Resonator chamber):
33 N·m (3.4 kgf-m, 24.6 ft-lb)

2. LH SIDE

1) Install in the reverse order of removal.

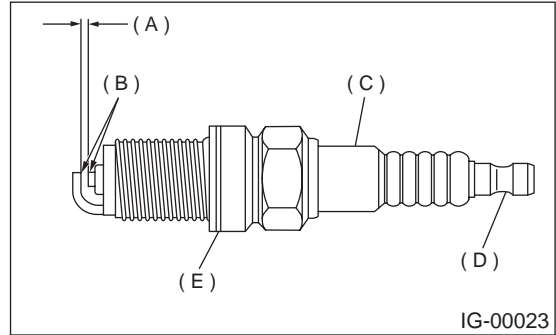
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

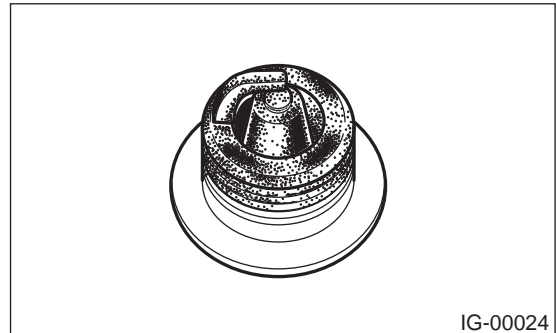
Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal

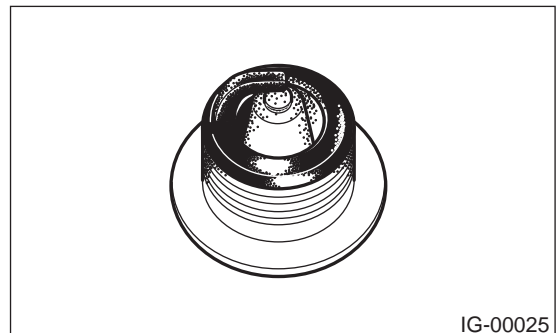
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



2) Carbon fouled

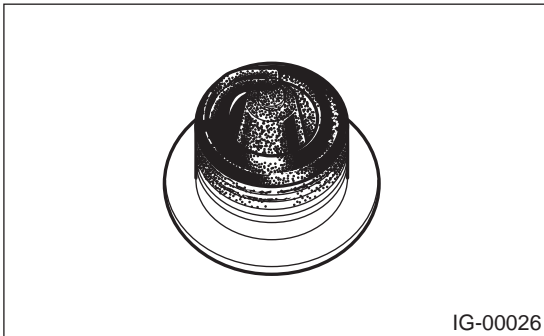
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



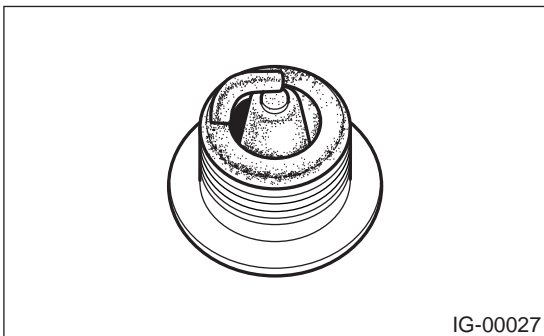
3) Oil fouled

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If same condition remains after repair, use a hotter plug.



4) Overheating

White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.

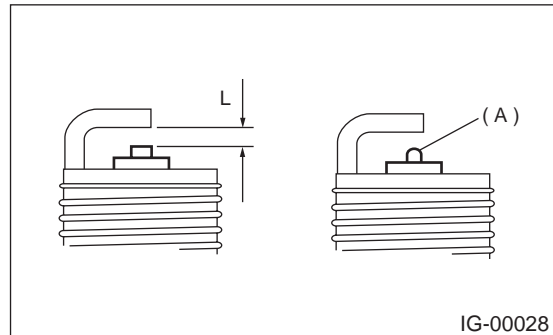


E: ADJUSTMENT

Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

Spark plug gap: L

1.0 — 1.1 mm (0.039 — 0.043 in)



NOTE:

Replace with new spark plug if this area is worn to "ball" (A) shape.

D: CLEANING

Clean spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.

If deposits are too stubborn, replace plugs.

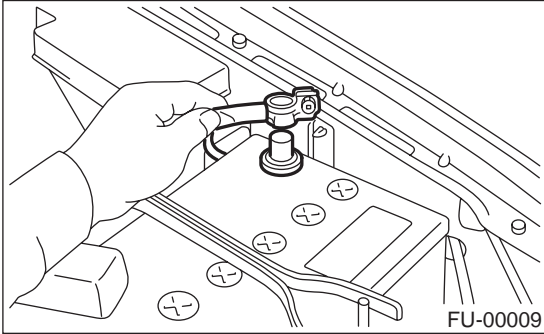
IGNITION COIL AND IGNITOR ASSEMBLY

IGNITION

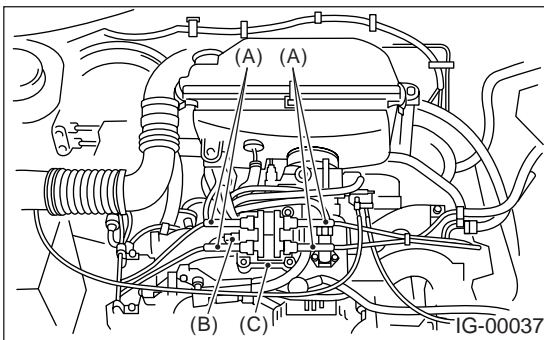
3. Ignition Coil and Ignitor Assembly

A: REMOVAL

- 1) Disconnect battery ground cable.

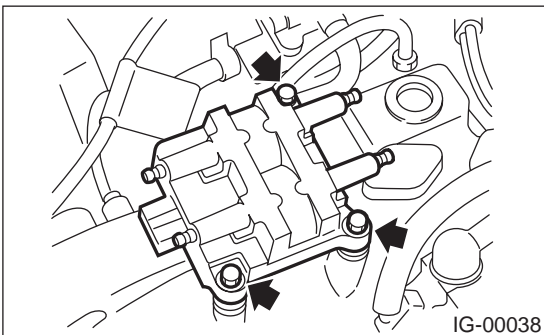


- 2) Disconnect spark plug cords from ignition coil and ignitor assembly.
- 3) Disconnect connector from ignition coil and ignitor assembly.



- (A) Spark plug cord
- (B) Connector
- (C) Ignition coil and ignitor ASSY

- 4) Remove ignition coil and ignitor assembly.



B: INSTALLATION

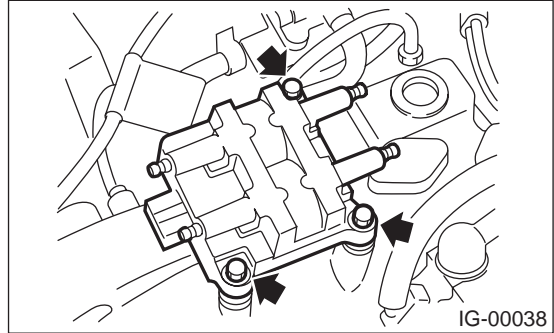
- 1) Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

CAUTION:

Be sure to connect spark plug cords to their proper positions. Failure to do so will damage unit.



C: INSPECTION

Using accurate tester, inspect the following items, and replace if defective.

- 1) Primary resistance
- 2) Secondary coil resistance

CAUTION:

If the resistance is extremely low, this indicates the presence of a short-circuit.

Specified resistance:

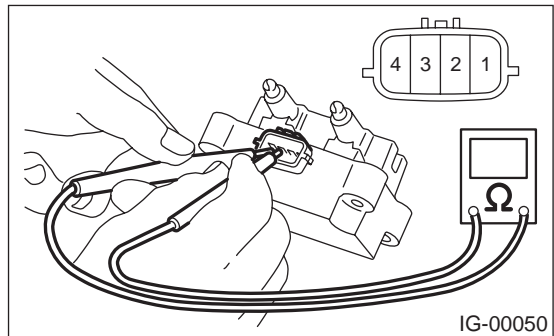
[Primary side]

Between terminal No. 1 and No. 2

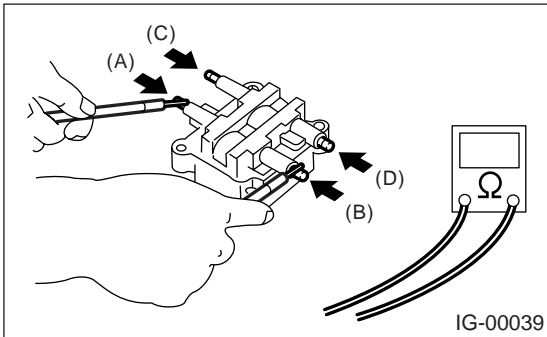
0.73 Ω±10%

Between terminal No. 2 and No. 4

0.73 Ω±10%



[Secondary side]
Between (A) and (B)
12.8 kΩ±15%
Between (C) and (D)
12.8 kΩ±15%



3) Insulation between primary terminal and case:
100 MΩ or more.

4. Spark Plug Cord

A: INSPECTION

Check for:

- 1) Damage to cords, deformation, burning or rust formation of terminals
- 2) Resistance values of cords

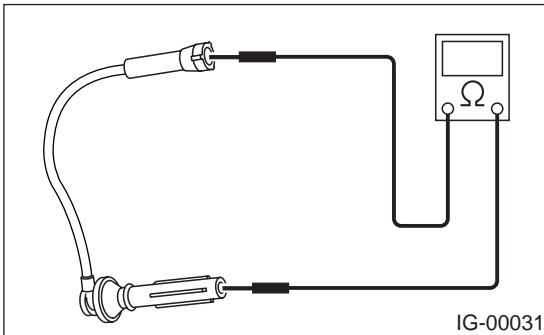
Resistance value:

#1 cord: 5.6 — 10.6

#2 cord: 7.3 — 13.7

#3 cord: 5.9 — 11.1

#4 cord: 7.3 — 13.7



STARTING/CHARGING SYSTEMS

SC(*H4SO*)

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1. General Description	2
2. Starter	6
3. Generator	14
4. Battery	20



GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

1. General Description

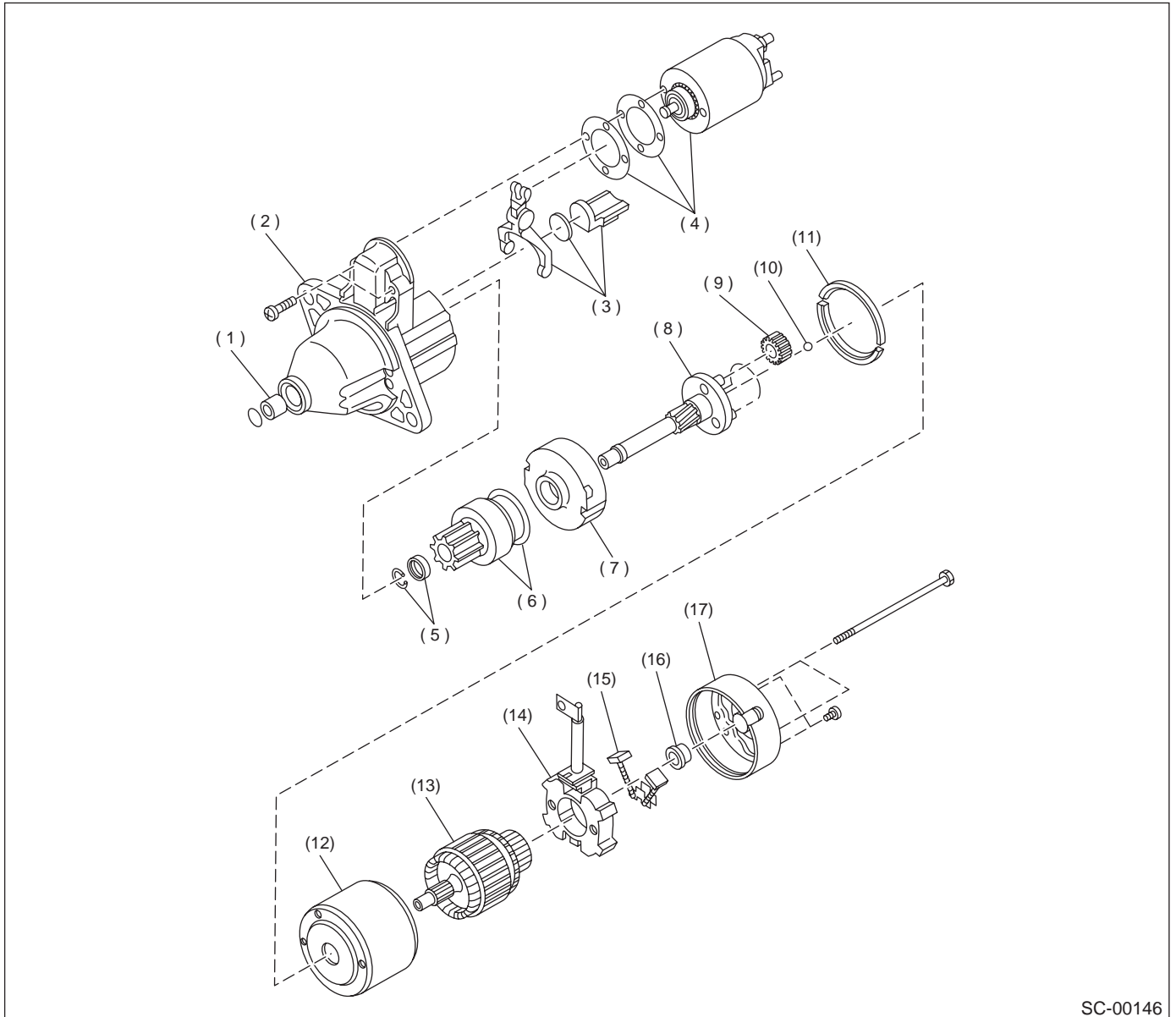
A: SPECIFICATIONS

Item		Designation		
Starter	Type	Reduction type		
	Vehicle model	MT	AT	
	Model	M000T83981	M001T86481	
	Manufacturer	Mitsubishi Electric		
	Voltage and output	12 V — 1.0 kW	12 V — 1.4 kW	
	Direction of rotation	Counterclockwise (when observed from pinion)		
	Number of pinion teeth	8	9	
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	
		Rotating speed	2,800 rpm or more	2,400 rpm or more
	Load characteristics	Voltage	7.5 V	7.7 V
		Current	300 A	400 A
		Torque	8.6 N·m (0.88 kgf-m, 6.4 ft-lb)	16.0 N·m (1.63 kgf-m, 11.8 ft-lb)
		Rotating speed	920 rpm or more	740 rpm or more
	Lock characteristics	Voltage	4 V	3.5 V
Current		650 A or less	940 A or less	
Torque		14.7 N·m (1.50 kgf-m, 10.8 ft-lb)	28.9 N·m (2.95 kgf-m, 21.3 ft-lb) or more	
Generator	Type	Rotating-field three-phase type		
	Model	A002TB6991		
	Manufacturer	Mitsubishi Electric		
	Voltage and output	12 V — 90 A		
	Polarity on ground side	Negative		
	Rotating direction	Clockwise (when observed from pulley side.)		
	Armature connection	3-phase Y-type		
	Output current	1,500 rpm — 36 A or more		
		2,500 rpm — 65 A or more		
5,000 rpm — 86 A or more				
Regulated voltage	14.1 — 14.8 V [20°C (68°F)]			
Battery	Type and capacity	For Europe/Latin America	MT: 12 V — 48 AH (55D23L) AT: 12 V — 52 AH (65D23L) AT: 12 V — 52 AH (75D23L)*	
		Others	12 V — 27 AH (34B19L)	

*: 2.5 L

B: COMPONENT

1. STARTER



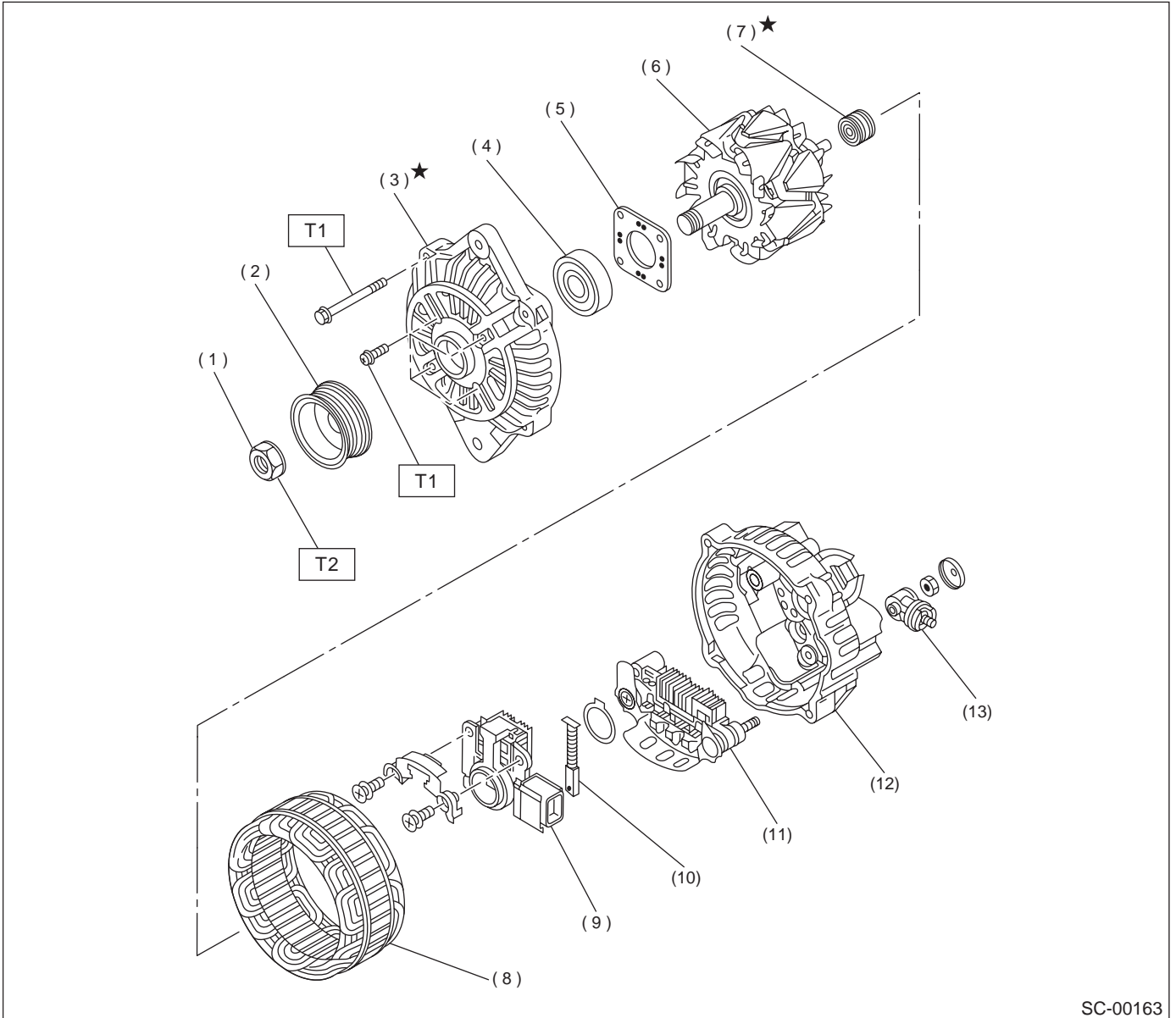
SC-00146

- | | | |
|-------------------------|------------------------|---------------------|
| (1) Sleeve bearing | (7) Internal gear ASSY | (13) Armature |
| (2) Front bracket | (8) Shaft ASSY | (14) Brush holder |
| (3) Lever set | (9) Gear ASSY | (15) Brush |
| (4) Magnet switch ASSY | (10) Ball | (16) Sleeve bearing |
| (5) Stopper set | (11) Packing | (17) Rear bracket |
| (6) Over running clutch | (12) Yoke | |

GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

2. GENERATOR



SC-00163

- | | |
|----------------------|-----------------------------|
| (1) Pulley nut | (7) Bearing |
| (2) Pulley | (8) Stator coil |
| (3) Front cover | (9) IC regulator with brush |
| (4) Ball bearing | (10) Brush |
| (5) Bearing retainer | (11) Rectifier |
| (6) Rotor | (12) Rear cover |

- (13) Terminal

Tightening torque: N·m (kgf·m, ft·lb)

T1: 4.7 (0.48, 3.5)

T2: 108 (11.0, 80)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable terminal.

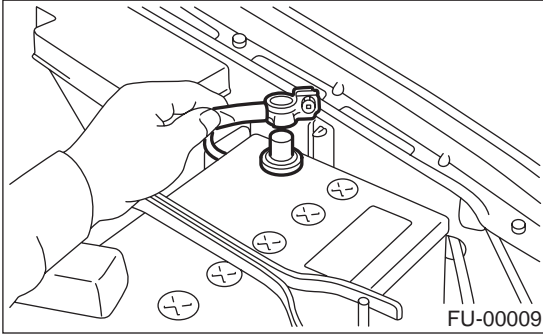
STARTER

STARTING/CHARGING SYSTEMS

2. Starter

A: REMOVAL

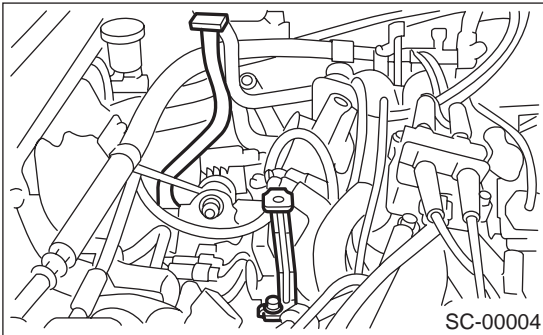
1) Disconnect the ground cable from battery.



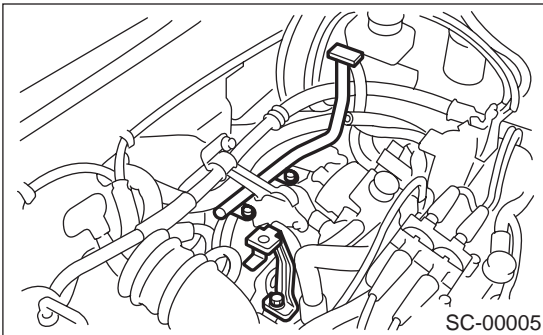
2) Remove the air cleaner case.
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>

3) Remove the air cleaner case stay.

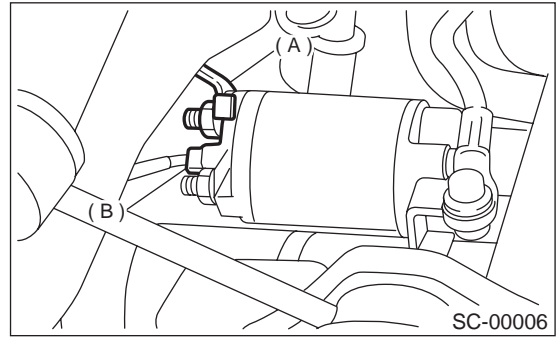
- MT vehicles



- AT vehicles

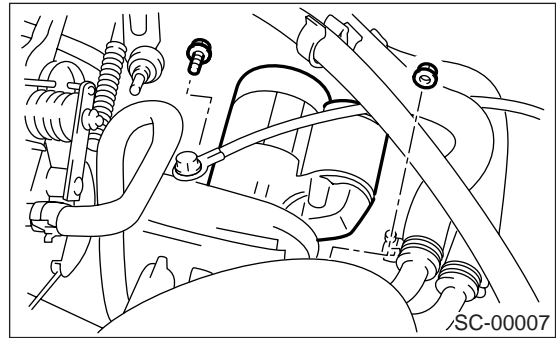


4) Disconnect the connector and terminal from starter.



- (A) Terminal
- (B) Connector

5) Remove the starter from transmission.

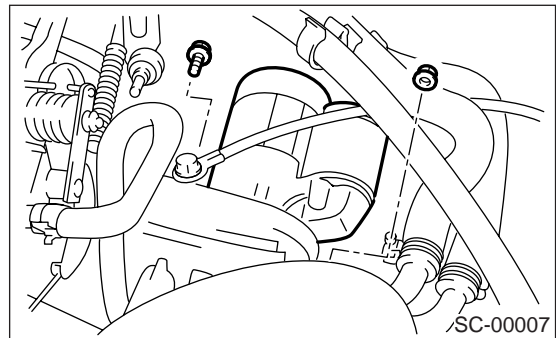


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

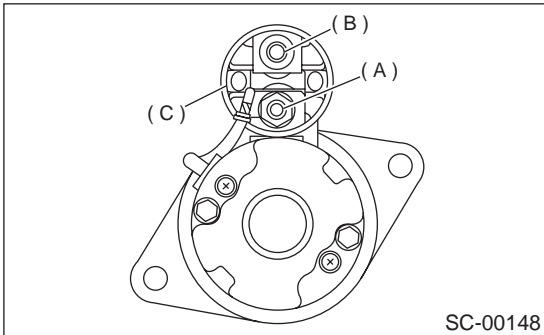
50 N·m (5.1 kgf·m, 37 ft·lb)



C: DISASSEMBLY

1. STARTER ASSEMBLY

1) Loosen nut which holds terminal M of switch assembly, and disconnect connector.

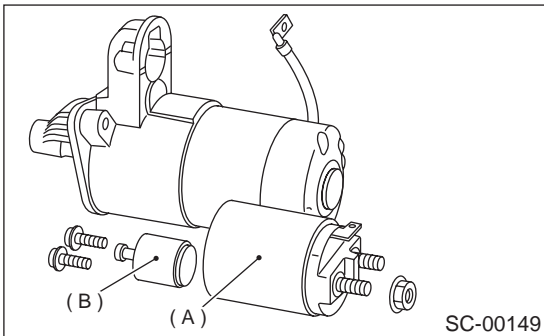


- (A) Terminal M
- (B) Terminal B
- (C) Terminal S

2) Remove bolts which hold switch assembly, and remove switch assembly, plunger and plunger spring from starter as a unit.

NOTE:

Be careful because pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.

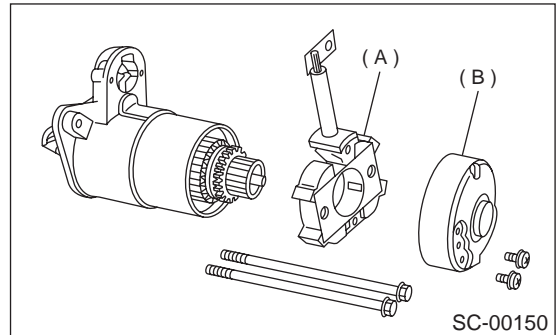


- (A) Switch ASSY
- (B) Plunger

3) Remove both through-bolts and brush holder screws, and detach rear bracket and brush holder.

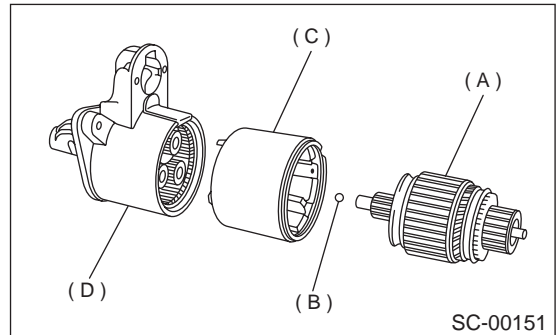
NOTE:

Before removal, confirm the attachment locations of brush holder and rear bracket.



- (A) Brush holder
- (B) Rear bracket

4) Remove armature and yoke from the front bracket.



- (A) Armature
- (B) Ball
- (C) Yoke
- (D) Front bracket

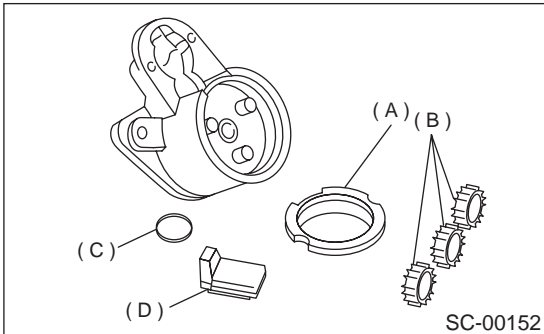
STARTER

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5) Remove packing A, three planetary gears, packing B and plate.

NOTE:

Before removal, confirm the inserting location of packing A.



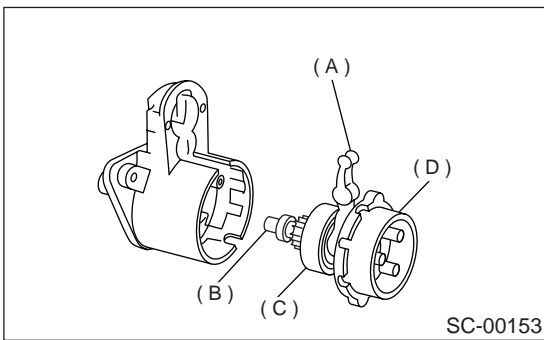
- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

6) Remove shaft assembly and overrunning clutch as a unit.

NOTE:

Before removal, confirm the following:

- Lever direction
- Internal gear assembly position

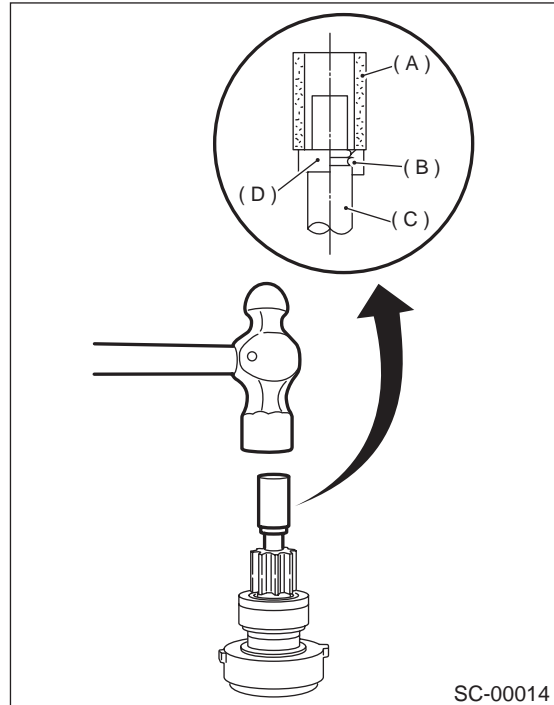


- (A) Lever
- (B) Shaft ASSY
- (C) Overrunning clutch
- (D) Internal gear ASSY

7) Remove overrunning clutch from shaft assembly as follows:

(1) Remove stopper from ring by lightly tapping the stopper with an appropriate tool (such as a socket).

(2) Remove ring, stopper and clutch from shaft.



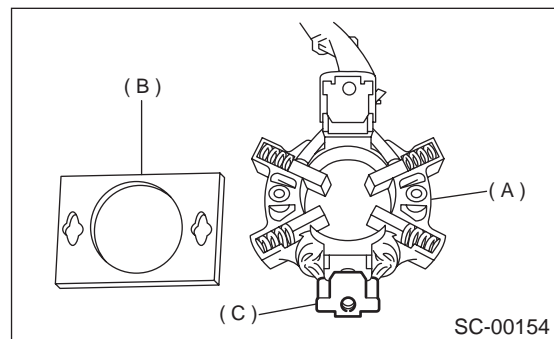
- (A) Socket wrench
- (B) Ring
- (C) Shaft
- (D) Stopper

2. BRUSH HOLDER

Slightly open the metal fitting holding the insulating plate to the brush holder. Remove the insulating plate.

NOTE:

The brush and spring can be easily removed from the brush holder at this time.



- (A) Brush holder
- (B) Insulating plate
- (C) Metal fitting

D: ASSEMBLY

Assemble in the reverse order of disassembly. Do the following:

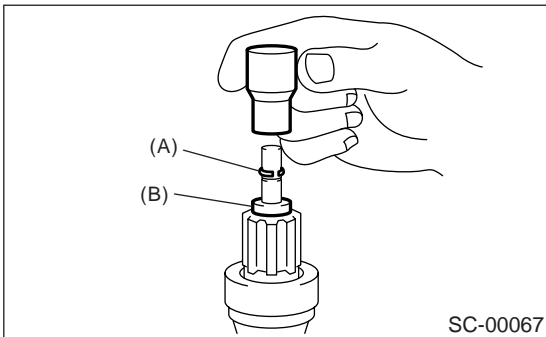
NOTE:

When assembling, apply grease to the following parts.

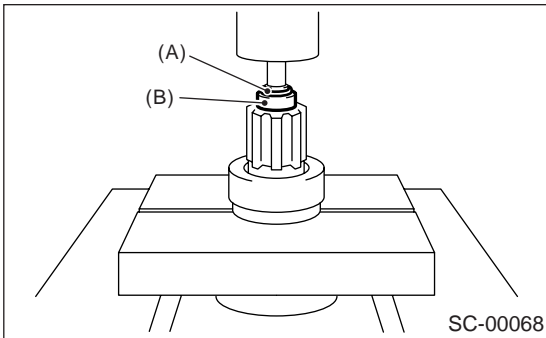
- Front and rear bracket sleeve bearing
- Armature shaft gear
- Outer periphery of plunger
- Mating surface of plunger and lever
- Gear shaft splines
- Mating surface of lever and clutch
- Ball at the armature shaft end
- Internal and planetary gears

- 1) Install overrunning clutch to shaft assembly.
- 2) Install stopper to shaft assembly in the following order.

- (1) Insert the ring into the shaft groove by lightly tapping it with an appropriate tool (such as a fit socket wrench).



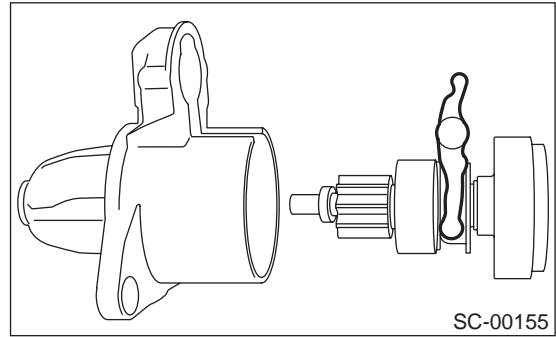
- (2) Install the stopper to ring using a press.



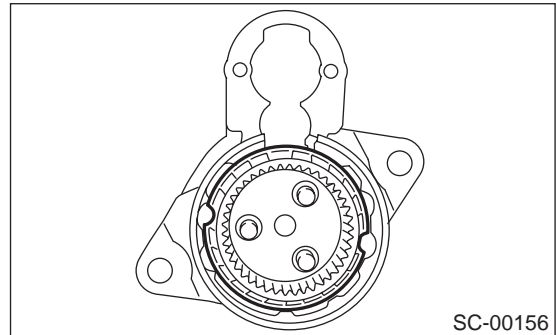
- (A) Ring
- (B) Stopper

- 3) When installing shaft assembly to front bracket, be careful of the following.

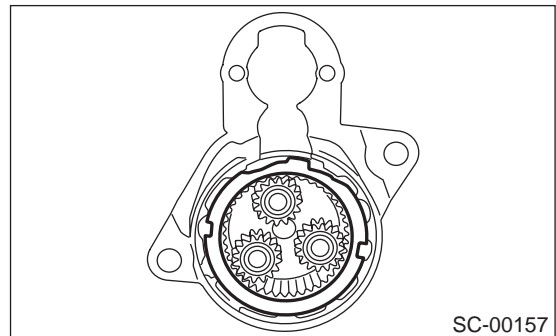
- Lever direction



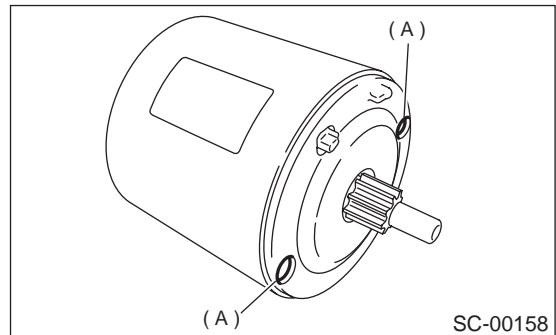
- Internal gear position



- Packing position



- 4) When installing yoke to the front bracket, match bolt hole.

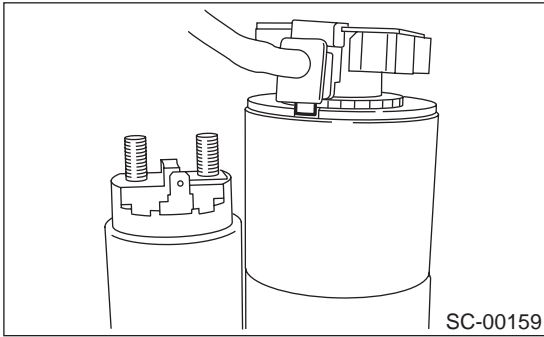


- (A) Bolt hole

STARTER

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5) Install brush holder in alignment with Yoke's groove.



6) Install rear bracket.

7) When installing switch assembly, catch plunger protrusion to lever edge.

8) Install connector to switch assembly terminal M.

9) After assembling parts correctly, make sure starter operates properly.

E: INSPECTION

1. ARMATURE

1) Check commutator for any sign of burns or rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.

2) Run-out test

Check the commutator run-out and replace if it exceeds the limit.

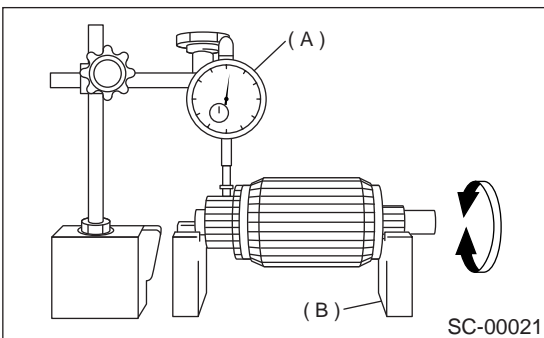
Commutator run-out:

Standard

0.05 mm (0.0020 in)

Service limit

Less than 0.10 mm (0.0039 in)



(A) Dial gauge

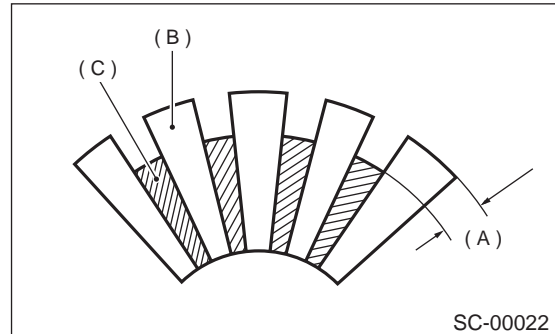
(B) V-block

3) Depth of segment mold

Check the depth of segment mold.

Depth of segment mold:

0.5 mm (0.020 in)



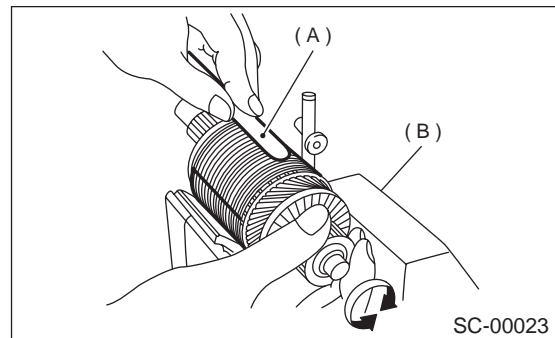
(A) Depth of mold

(B) Segment

(C) Mold

4) Armature short-circuit test

Check the armature for short-circuit by placing it on growler tester. Hold a iron sheet against the armature core while slowly rotating armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



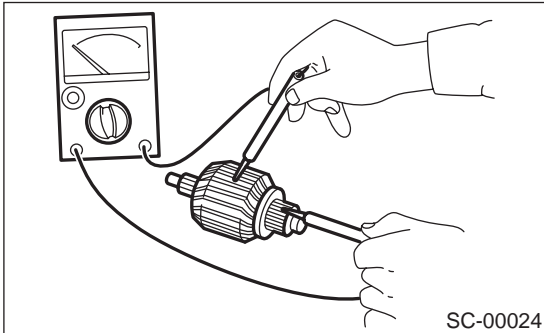
(A) Iron sheet

(B) Growler tester

5) Armature ground test

Using a circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, the armature is grounded.

Replace the armature if it is grounded.



2. YOKE

Make sure pole is set in position.

3. OVERRUNNING CLUTCH

Inspect the teeth of pinion for wear and damage. Replace if it is damaged. Rotate the pinion in direction of rotation (counterclockwise). It should rotate smoothly. But in opposite direction, it should be locked.

CAUTION:

Do not clean overrunning clutch with oil to prevent grease from flowing out.

4. BRUSH AND BRUSH HOLDER

1) Brush length

Measure the brush length and replace if it exceeds the service limit.

Replace if abnormal wear or cracks are noticed.

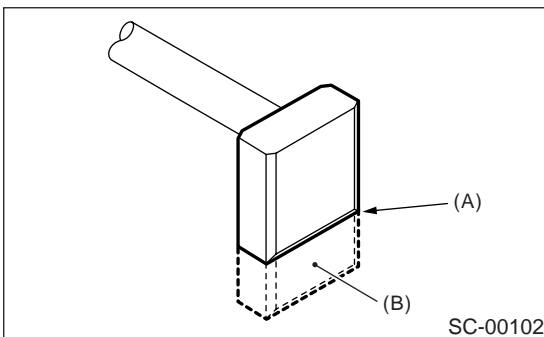
Brush length:

Standard

12.3 mm (0.484 in)

Service limit

7.0 mm (0.276 in)



(A) Service limit line

(B) Brush

2) Brush movement

Be sure brush moves smoothly inside brush holder.

3) Brush spring force

Measure brush spring force with a spring scale. If it is less than the service limit, replace brush holder.

Brush spring force:

Standard

21.6 N (2.2 kgf, 4.9 lb) (when new)

Service limit

5.9 N (0.6 kgf, 1.3 lb)

5. SWITCH ASSEMBLY

Be sure there is continuity between terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm").

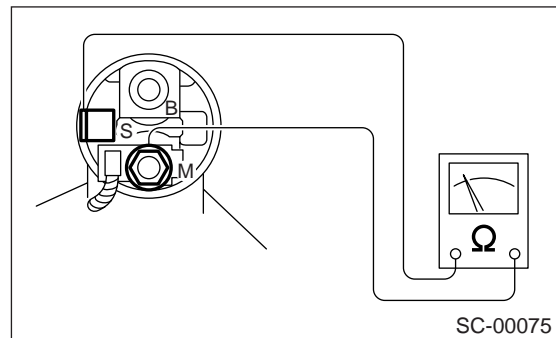
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:

S — M / Less than 1 Ω

S — Ground / Less than 1 Ω

M — B / More than 1 MΩ



6. SWITCH ASSEMBLY OPERATION

1) Connect the terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. The pinion should be forced endwise on shaft.

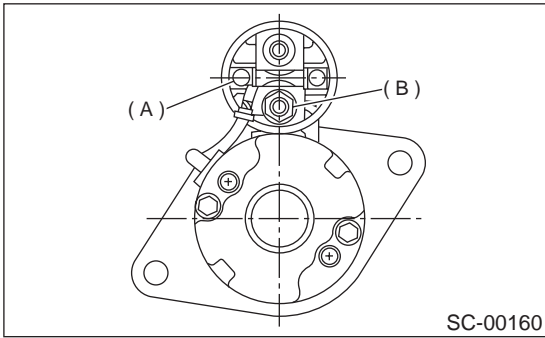
CAUTION:

With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

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2) Disconnect the connector from terminal M, and then connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.



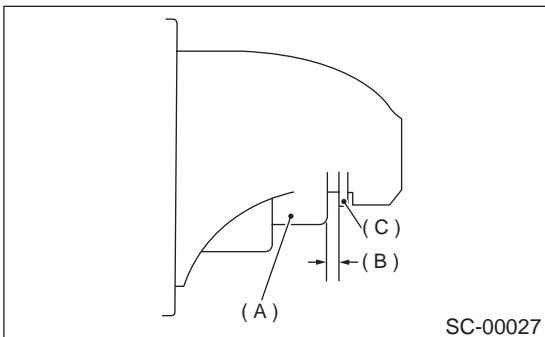
- (A) Terminal S
- (B) Terminal M

7. PINION GAP

1) Measure pinion gap while the pinion is pulled out as shown in the figure.

Pinion gap:

0.5 — 2.0 mm (0.020 — 0.079 in)



- (A) Pinion
- (B) Gap
- (C) Stopper

If the motor is running with the pinion forced end-wise on shaft, disconnect the connector from terminal M of switch assembly, and then connect terminal M to ground terminal (-) of battery with a lead wire. Next, gently push the pinion back with your fingertips, and then measure the pinion gap.

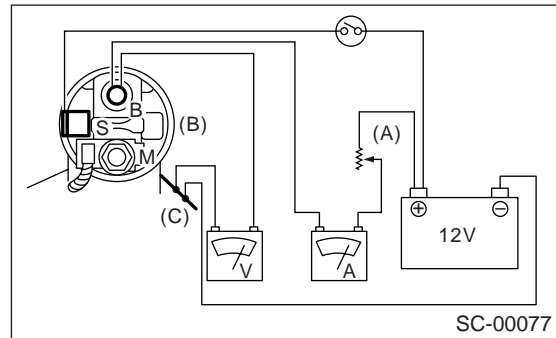
2) If the pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.

8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.

Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.

For these performance tests, use the circuit shown in figure.



- (A) Variable resistance
- (B) Magnetic switch
- (C) Starter body

1) No-load test

With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading and measure the starter speed. Compare these values with the specifications.

No-load test (Standard):

Voltage / Current

11 V / 90 A max.

Rotating speed

AT: 2,400 rpm or more

MT: 2,800 rpm or more

2) Load test

Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within specifications.

Load test (Standard):

Voltage / Load

AT: 7.7 V / 16.0 N·m (1.63 kgf-m, 11.8 ft-lb)

MT: 7.5 V / 8.6 N·m (0.88 kgf-m, 6.4 ft-lb)

Current / Speed

AT: 400 A / 740 rpm or more

MT: 300 A / 920 rpm or more

3) Lock test

With starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (Standard):

Voltage / Current

AT: 3.5 V / 940 A or less

MT: 4 V / 650 A or less

Torque

AT: 28.9 N·m (2.95 kgf-m, 21.3 ft-lb) or more

MT: 14.7 N·m (1.50 kgf-m, 10.8 ft-lb) or more

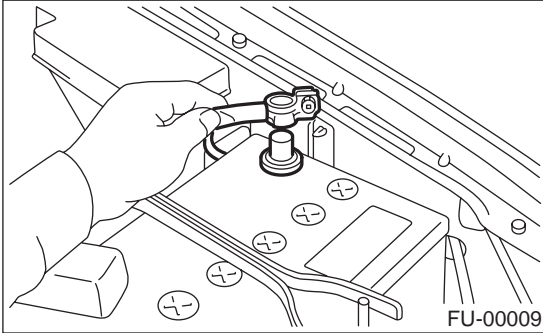
GENERATOR

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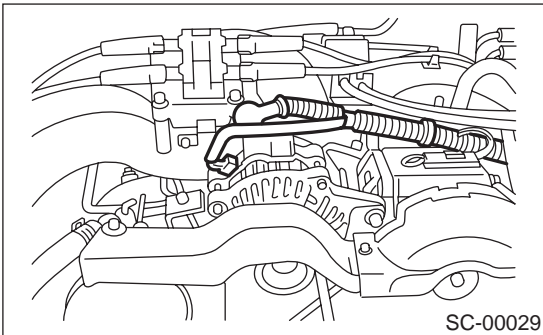
3. Generator

A: REMOVAL

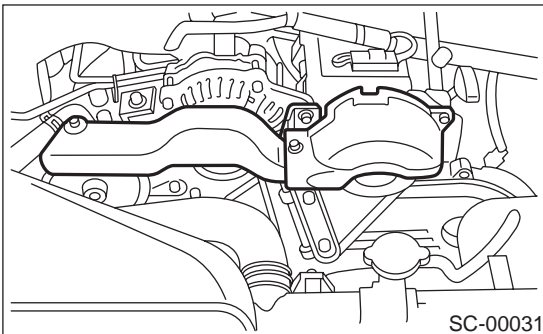
- 1) Disconnect the ground cable from battery.



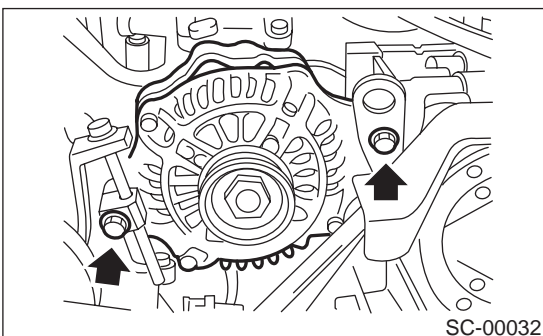
- 2) Disconnect the connector and terminal from generator.



- 3) Remove the V-belt cover.



- 4) Remove the front side V-belt.
<Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
- 5) Remove the bolts which install generator onto bracket.

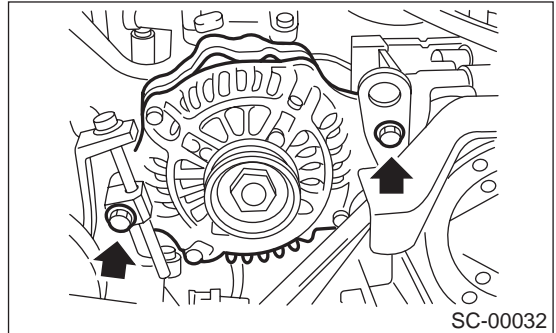


B: INSTALLATION

Install in the reverse order of removal.

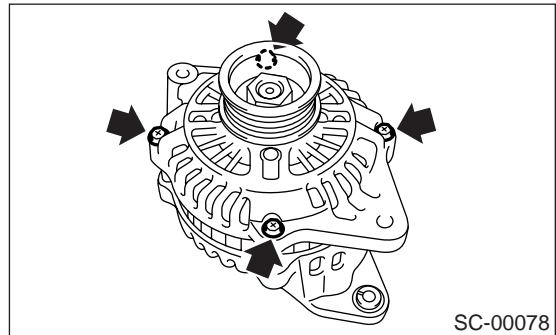
CAUTION:

Check and adjust the V-belt tension. <Ref. to ME(H4SO)-42, INSPECTION, V-belt.>

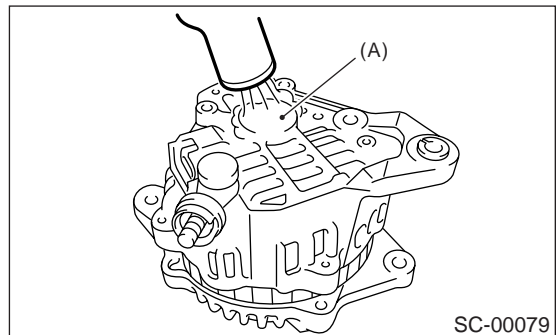


C: DISASSEMBLY

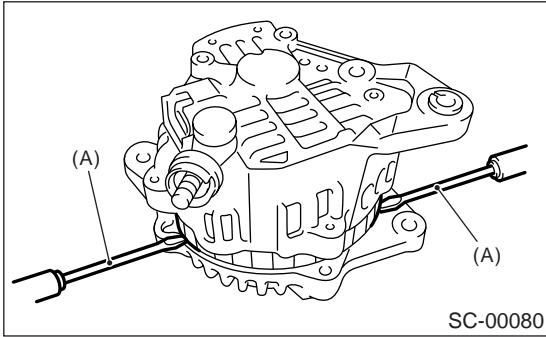
- 1) Remove the four through-bolts.



- 2) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.

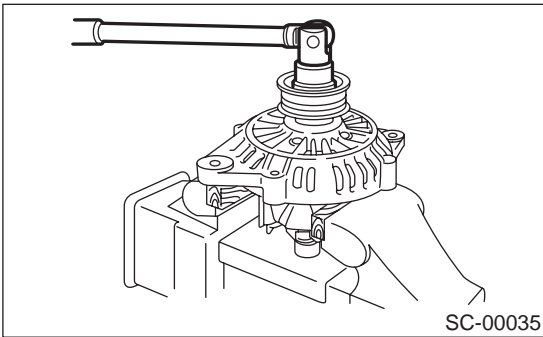


3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.

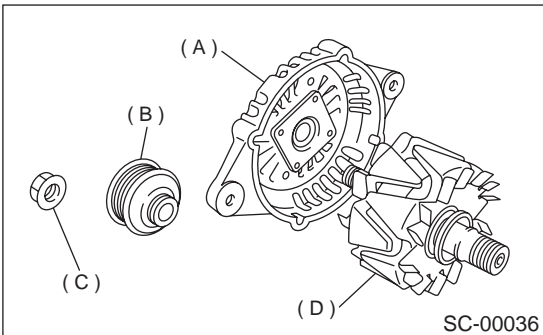


(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.



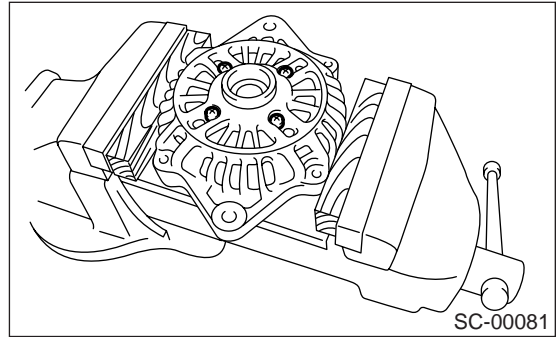
CAUTION:
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of vise to prevent rotor from damage.



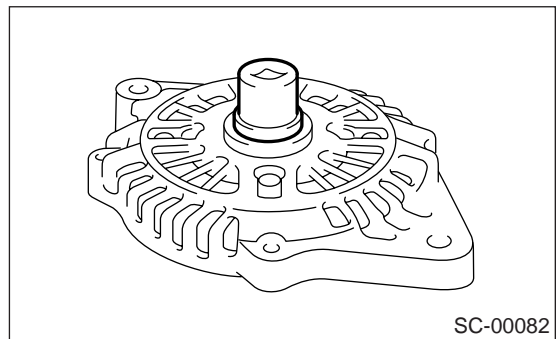
- (A) Front cover
- (B) Pulley
- (C) Nut
- (D) Rotor

5) Remove the ball bearing as follows.

(1) Remove the bolt, and then remove the bearing retainer.

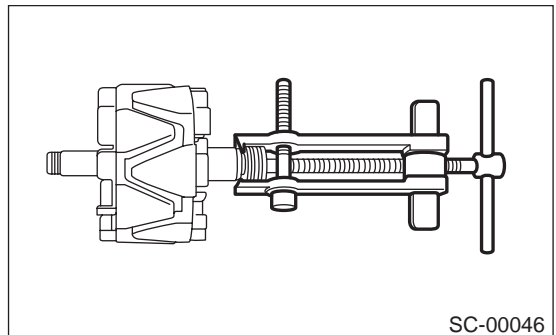


(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.



(3) Push the ball bearing off the front cover using a press.

6) Remove the bearing from rotor using a bearing puller.



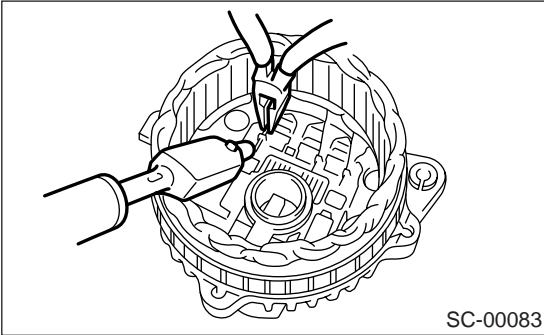
7) Unsolder connection between rectifier and stator coil to remove the stator coil.

CAUTION:
Do not allow the 180 — 270 W soldering bit to contact the terminals for more than 5 seconds at a

GENERATOR

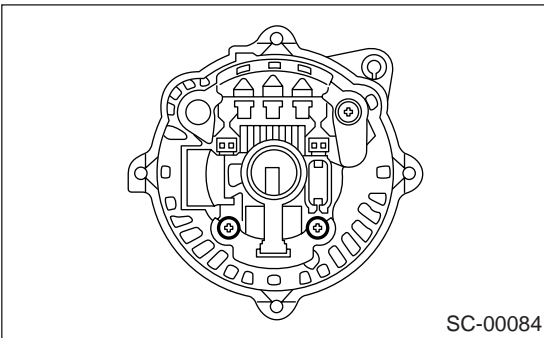
STARTING/CHARGING SYSTEMS

time because the rectifier cannot withstand heat very well.

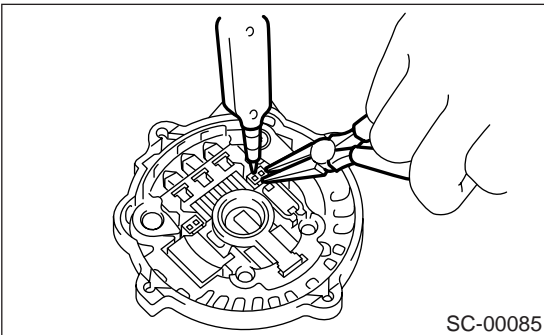


8) Remove the IC regulator as follows.

(1) Remove the screws which secure IC regulator to rear cover.

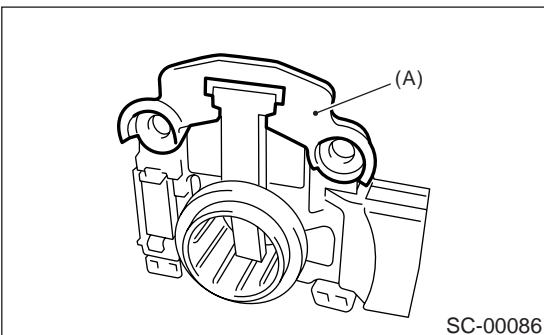


(2) Unsolder the connection between IC regulator and rectifier to remove the IC regulator.



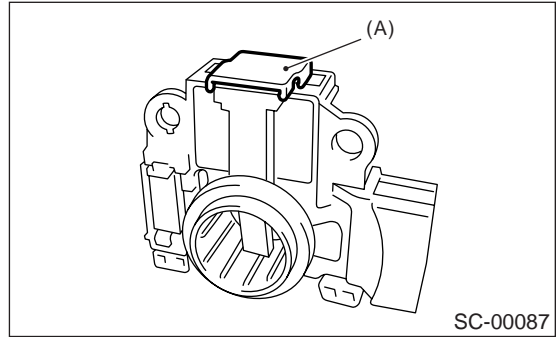
9) Remove the brush as follows.

(1) Remove cover A.



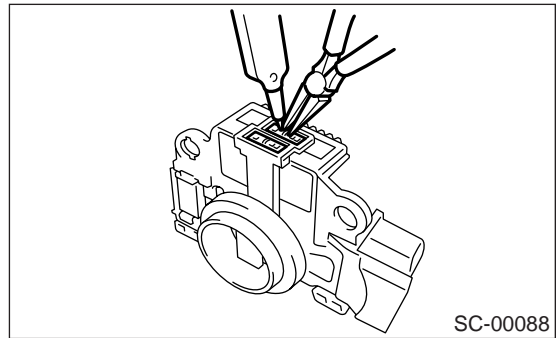
(A) Cover A

(2) Remove the cover B.



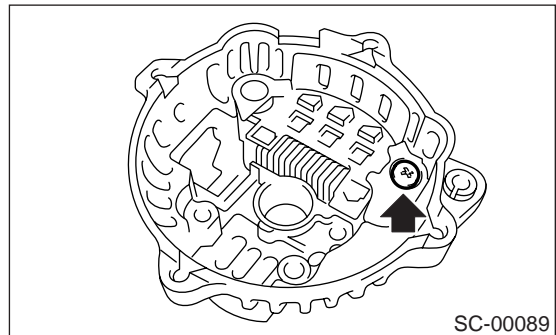
(A) Cover B

(3) Separate the brush from connection to remove.

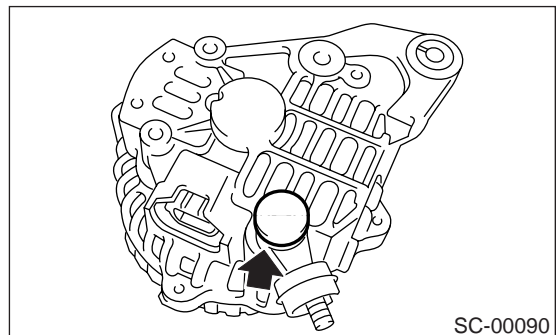


10) Remove the rectifier as follows.

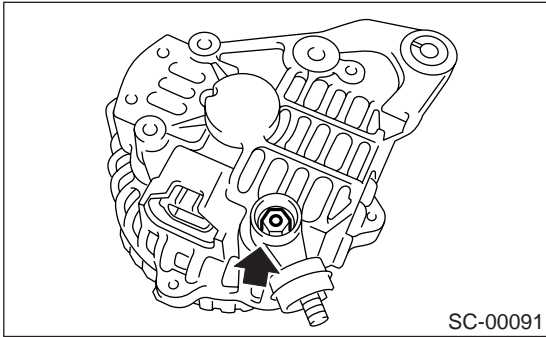
(1) Remove the bolts which secure the rectifier.



(2) Remove the cover of terminal B.



(3) Remove the nut of terminal B, and then remove the rectifier.



D: ASSEMBLY

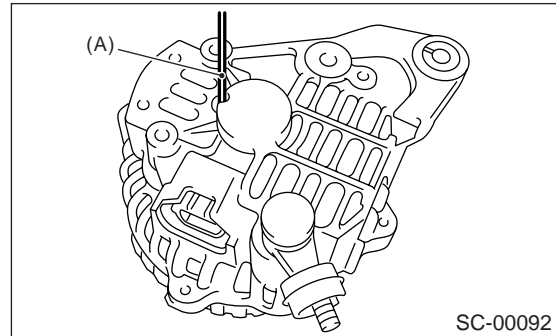
To assemble, reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.04 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:

Be sure to remove the wire after reassembly.



(A) Wire

2) Install the ball bearing.

(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.

(2) Press the ball bearing into the specified position using a press.

(3) Install the bearing retainer.

3) Press the bearing (rear side) into the rotor shaft using a press to install.

4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

CAUTION:

Grease should not be applied to rear bearing. Remove the oil completely if it is found on bearing box.

5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

GENERATOR

STARTING/CHARGING SYSTEMS

E: INSPECTION

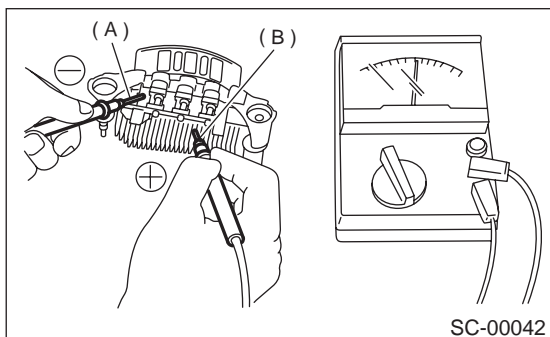
1. DIODE

CAUTION:

Never use a mega tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.

1) Checking positive diode

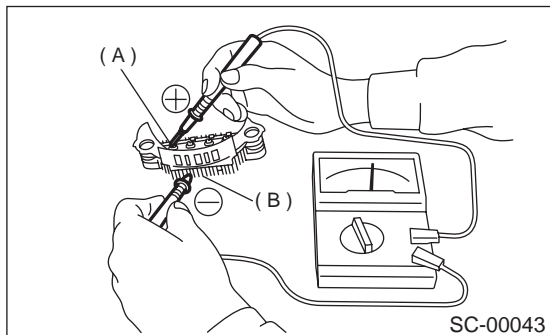
Check for continuity between the diode lead and positive side heat sink. The positive diode is in good condition if resistance is $1\ \Omega$ or less only in the direction from the diode lead to heat sink.



- (A) Diode lead
- (B) Heat sink (Positive side)

2) Checking negative diode

Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is $1\ \Omega$ or less only in the direction from the heat sink to diode lead.



- (A) Diode lead
- (B) Heat sink (Negative side)

2. ROTOR

1) Slip ring surface

Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter

Measure the slip ring outer diameter. If the slip ring is worn replace rotor assembly.

Slip ring outer diameter:

Standard

22.7 mm (0.894 in)

Limit

22.1 mm (0.870 in)

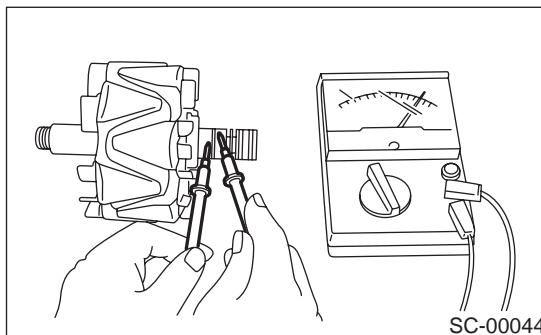
3) Continuity test

Check the resistance between slip rings using circuit tester.

If the resistance is not within specification, replace the rotor assembly.

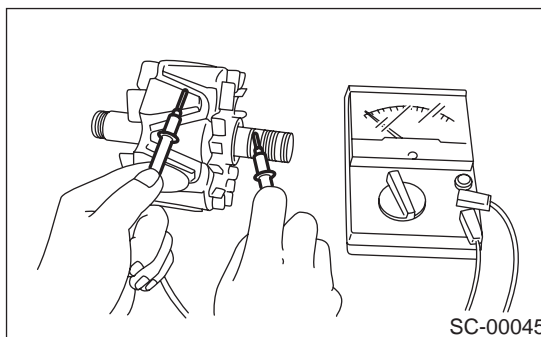
Specified resistance:

Approx. 1.8 — 2.2 Ω



4) Insulation test

Check the continuity between slip ring and rotor core or shaft. If resistance is $1\ \Omega$ or less, the rotor coil is grounded, and so replace the rotor assembly.



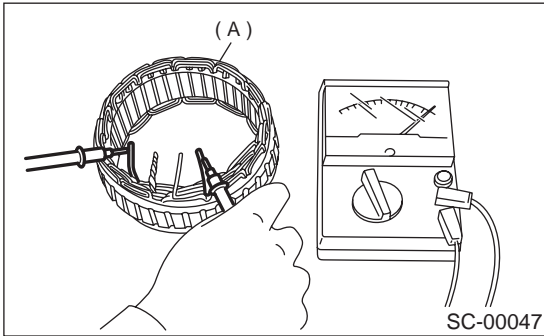
5) Ball bearing (rear side)

Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

3. STATOR

1) Continuity test

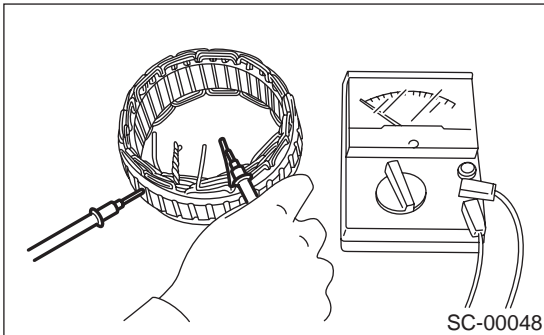
Inspect the stator coil for continuity between each end of the lead wires. If resistance is 1 M Ω or more, the lead wire is broken, and so replace the stator assembly.



(A) Stator

2) Insulation test

Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is 1 Ω or less, the stator coil is grounded, and so replace the stator assembly.



4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

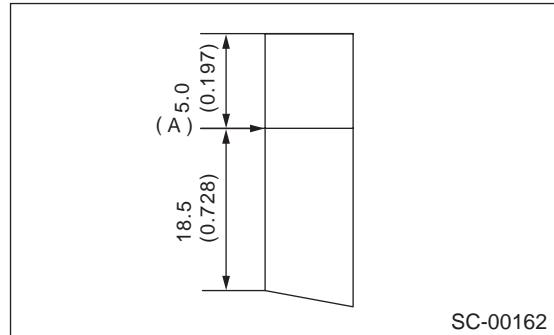
Brush length:

Standard

18.5 mm (0.728 in)

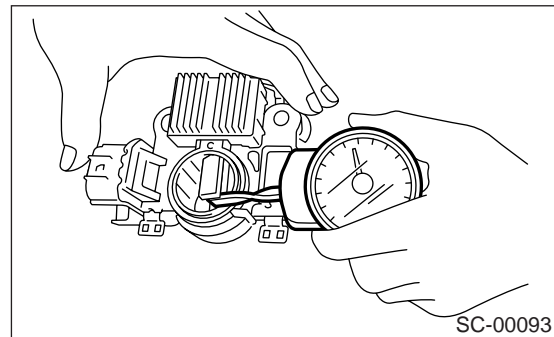
Service limit

5.0 mm (0.197 in)



2) Checking brush spring for proper pressure

Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is less than 2.2 N (224 g, 7.91 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.8 to 6.0 N (489 to 612 g, 17.26 to 21.60 oz).



5. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

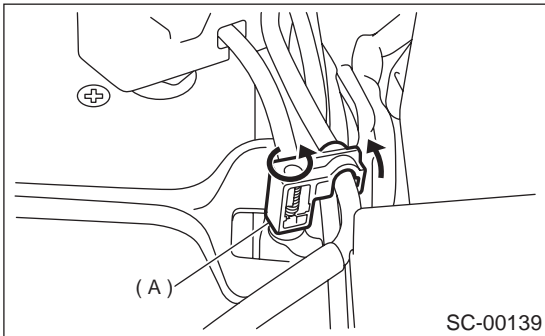
BATTERY

STARTING/CHARGING SYSTEMS

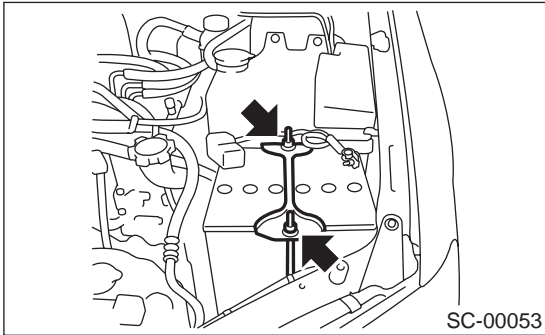
4. Battery

A: REMOVAL

1) Remove battery cable holder (A) from battery rod.



2) Disconnect the positive (+) cable after disconnecting the negative (-) cable of battery.
3) Remove flange nuts from battery rods and take off battery holder.



4) Remove battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

3.4 N·m (0.35 kgf·m, 2.5 ft·lb)

NOTE:

- Clean battery cable terminals and apply grease to prevent corrosion.
- Connect the positive (+) cable of battery and then the negative (-) cable of the battery.

C: INSPECTION

WARNING:

- Electrolyte has toxicity; be careful handling the fluid.
- Avoid contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.
- Batteries produce explosive gases. Keep sparks, flame, cigarettes away.
- Ventilate when charging or using in enclosed space.

- For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.

- Do not let battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.

- To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on the battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.

Apply a thin coat of grease on the terminal posts to prevent corrosion.

2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.

Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

$$S_{20} = S_t + 0.0007 \times (t - 20)$$

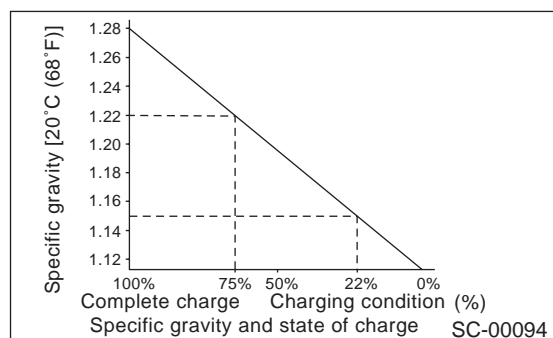
S_{20} : Specific gravity corrected at electrolyte temperature of 20°C

S_t : Measured specific gravity

t : Measured temperature (°C)

Determine whether or not battery must be charged, according to corrected specific gravity.

Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in figure.

D: MEASUREMENT

WARNING:

- Do not bring an open flame close to the battery at this time.

CAUTION:

- Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
- Be careful since battery electrolyte overflows while charging the battery.
- Observe instructions when handling battery charger.
- Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

- 1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
- 2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)
*: Check electrical system before replacement.		

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.

Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).

It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:

- Observe the items in 3. NORMAL CHARGING.
- Never use more than 10 amperes when charging the battery because that will shorten battery life.

BATTERY

STARTING/CHARGING SYSTEMS

MEMO:

ENGINE (DIAGNOSTICS)

EN(H4SO)

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BASIC DIAGNOSTIC PROCEDURE

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

Step	Value	Yes	No
1 CHECK ENGINE START FAILURE. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4SO)-4, CHECK, Check List for Interview.> 2) Start the engine. Does the engine start?	Engine starts.	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4SO)-62, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI). Does CHECK ENGINE malfunction indicator lamp illuminate?	MI illuminates.	Go to step 3.	Inspection using "General Diagnostics Table". <Ref. to EN(H4SO)-304, INSPECTION, General Diagnostic Table.>
3 CHECK INDICATION OF DTC ON DISPLAY. 1) Turn ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read DTC on the Subaru Select Monitor or OBD-II general scan tool. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	DTC indicated.	Go to step 4.	Repair the related parts. NOTE: If DTC is not shown on display although the MI illuminates, perform diagnostics of MI (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(H4SO)-50, Engine Malfunction Indicator Lamp (MI).>
4 PERFORM THE DIAGNOSIS. 1) Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H4SO)-90, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: Carry out the basic check, only when DTC about automatic transmission is shown on display. <Ref. to EN(H4SO)-39, Read Diagnostic Trouble Code.> 2) Repair the trouble cause. 3) Perform the clear memory mode. <Ref. to EN(H4SO)-47, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to EN(H4SO)-40, Inspection Mode.> Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	DTC indicated.	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H4SO)-90, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

- 1) ATF level check <Ref. to AT-30, Automatic Transmission Fluid.>
- 2) Differential gear oil level check <Ref. to AT-31, Differential Gear Oil.>
- 3) ATF leak check <Ref. to AT-30, Automatic Transmission Fluid.>
- 4) Differential gear oil leak check <Ref. to AT-31, Differential Gear Oil.>
- 5) Stall test <Ref. to AT-33, Stall Test.>
- 6) Line pressure test <Ref. to AT-36, Line Pressure Test.>
- 7) Transfer clutch pressure test <Ref. to AT-38, Transfer Clutch Pressure Test.>
- 8) Time lag test <Ref. to AT-35, Time Lag Test.>
- 9) Road test <Ref. to AT-32, Road Test.>
- 10) Shift characteristics <Ref. to AT-38, Transfer Clutch Pressure Test.>

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Outdoor temperature	°F (°C)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Cooling fan	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CB	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF		

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MI turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostics indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> VDC warning light <input type="checkbox"/> Engine oil pressure warning light
b) Fuel level
<ul style="list-style-type: none">Lack of gasoline: <input type="checkbox"/> Yes/<input type="checkbox"/> NoIndicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">What:
e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">What:Where:
f) Occurrence of noise: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">From where:What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">From where:What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> No shift <input type="checkbox"/> Excessive shift shock

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:

- All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery terminals while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing ECM from the located position, disconnect two cables on battery.

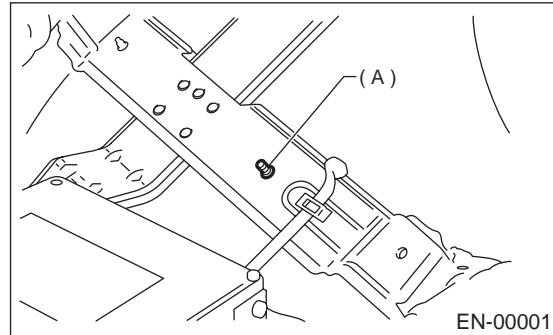
- Otherwise, the ECM may be damaged.

CAUTION:

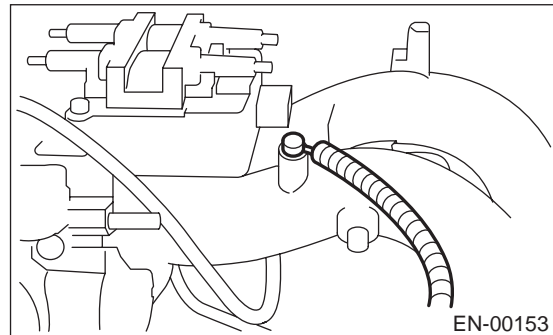
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

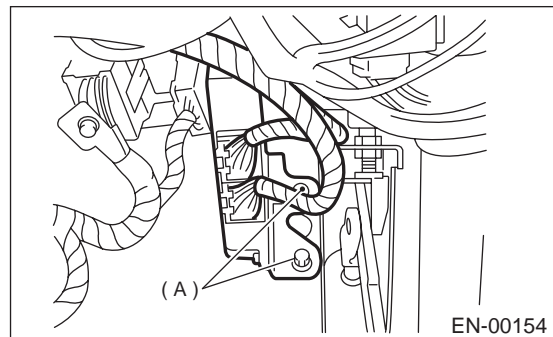
8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.

14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.

15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.

16) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).

17) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

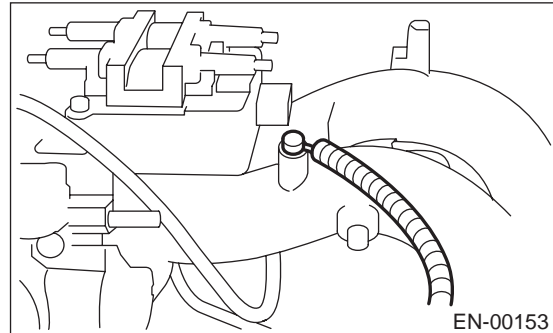
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. DESCRIPTION

- The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MI) in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
- The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
- When the system decides that a malfunction occurs, MI illuminates. At the same time of the MI illumination or blinking, a diagnostic trouble code (DTC) and a freeze frame engine conditions are stored into on-board computer.
- The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
- If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
- When the malfunction does not occur again for three consecutive driving cycles, MI is turned off, but DTC remains at on-board computer.
- The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

• The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting OBD-II vehicles, connect Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.

With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large

improved adaptability, easier addition of compensating element, etc.

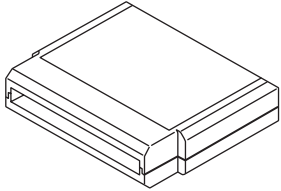

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST24082AA210</p>	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 <p>ST22771AA030</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

MEMO:

ELECTRICAL COMPONENTS LOCATION

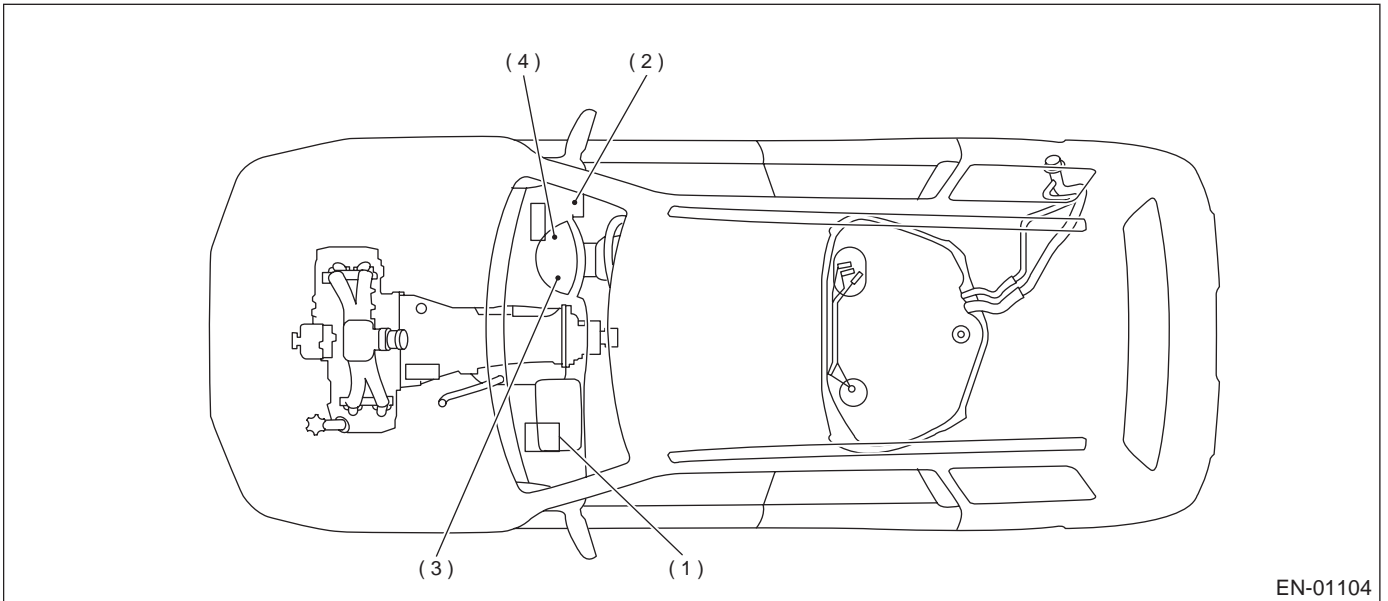
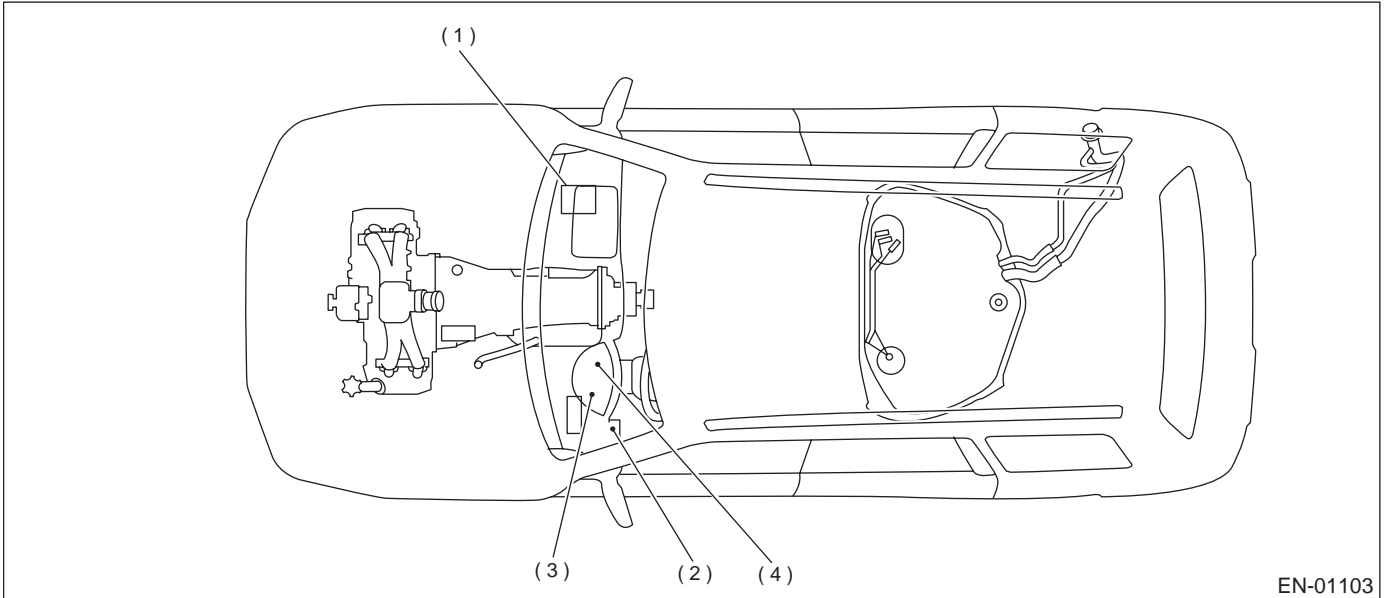
ENGINE (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

1. ENGINE

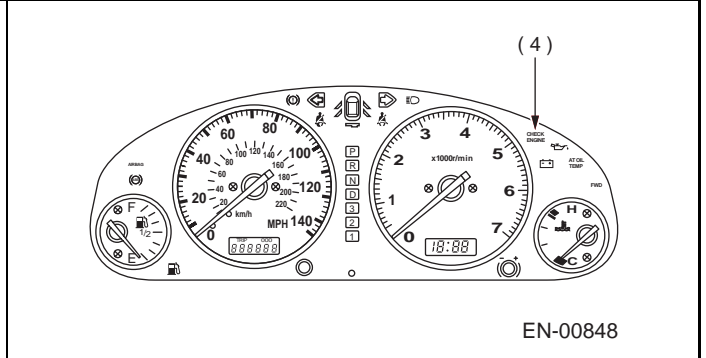
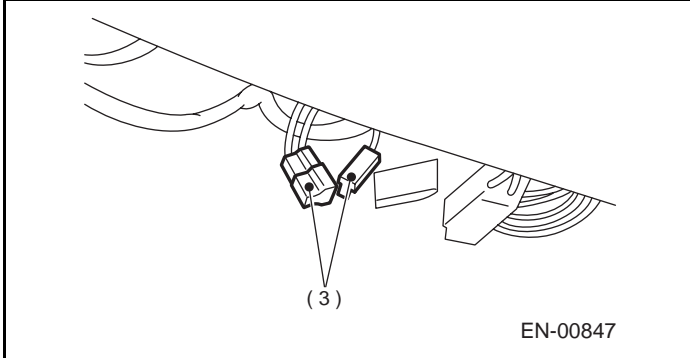
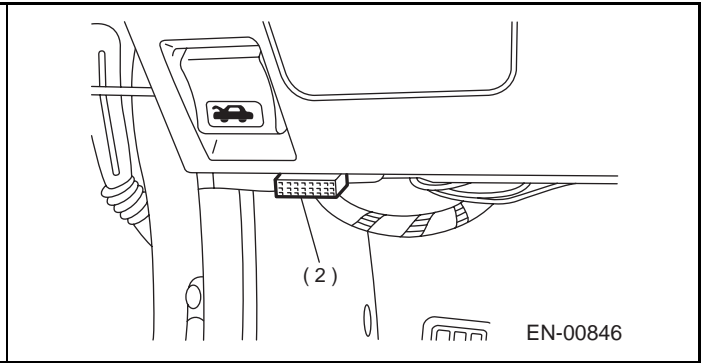
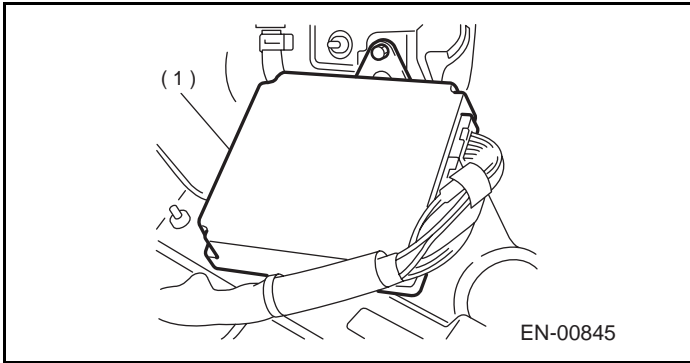
• MODULE



- | | |
|--|--|
| (1) Engine control module (ECM) | (3) Test mode connector |
| (2) Data link connector (for Subaru Select Monitor and OBD-II general scan tool) | (4) CHECK ENGINE malfunction indicator lamp (MI) |

ELECTRICAL COMPONENTS LOCATION

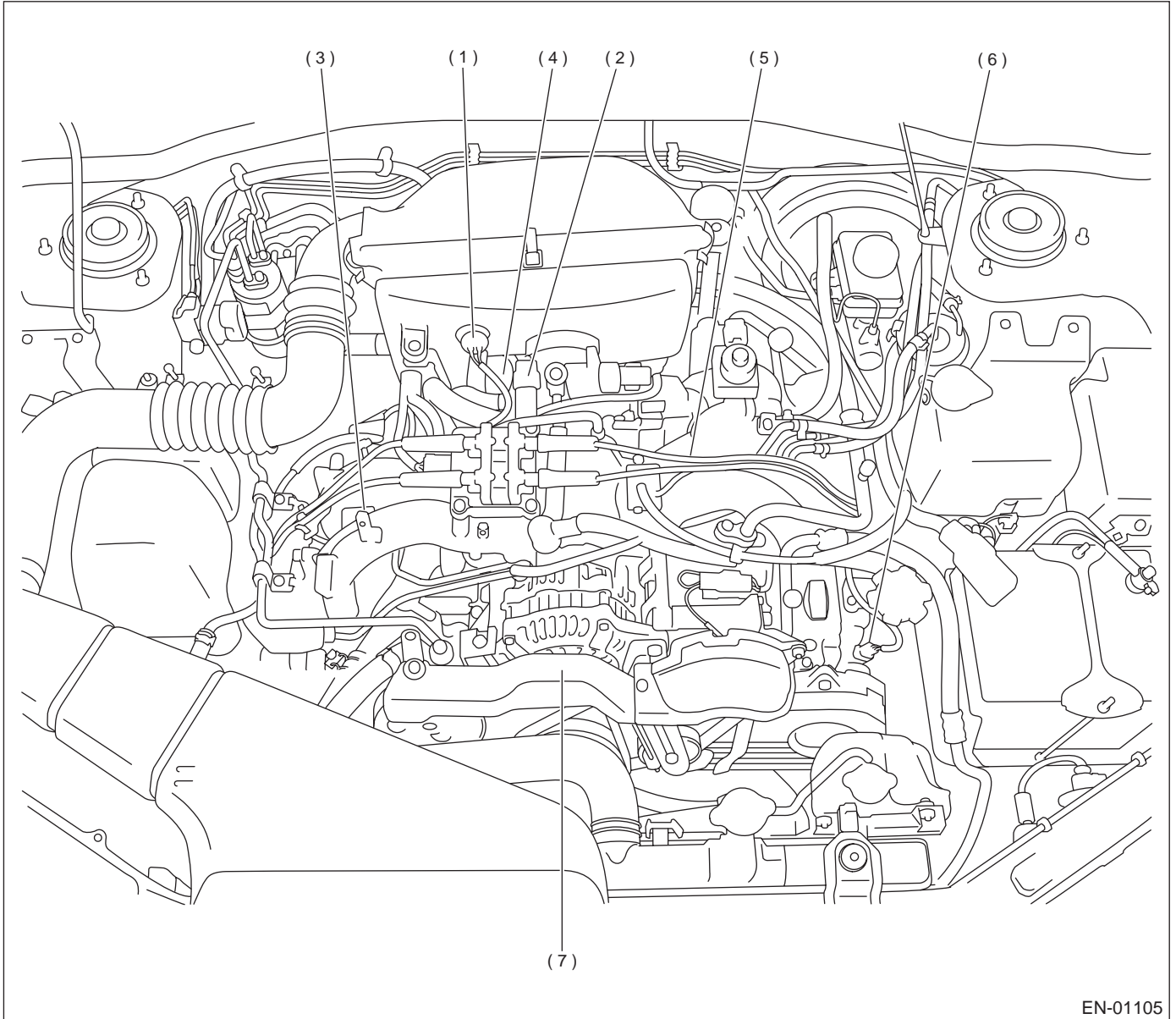
ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SENSOR

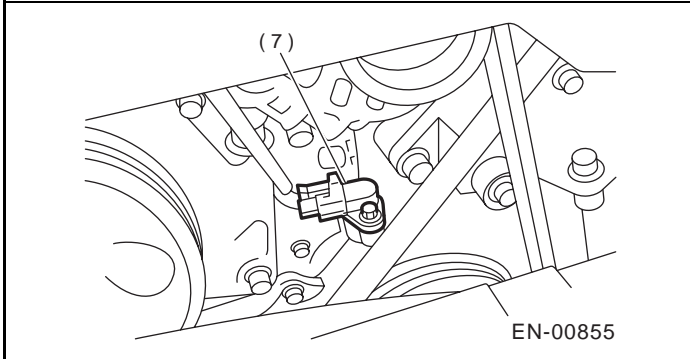
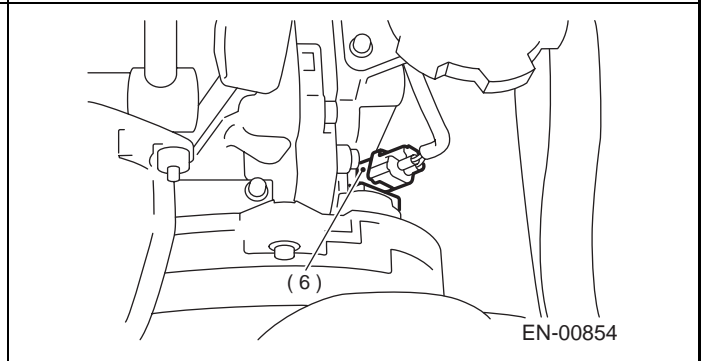
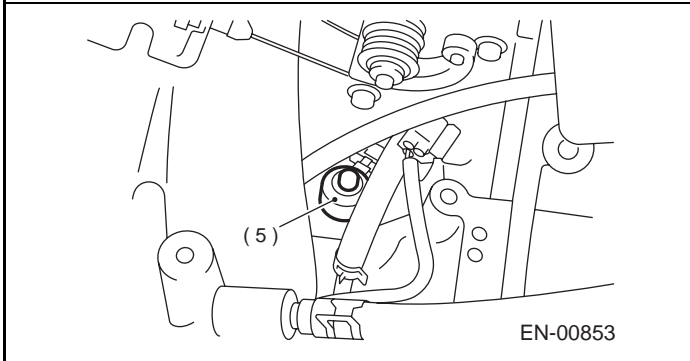
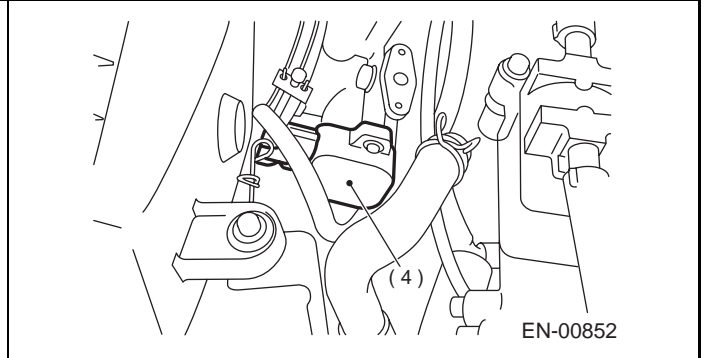
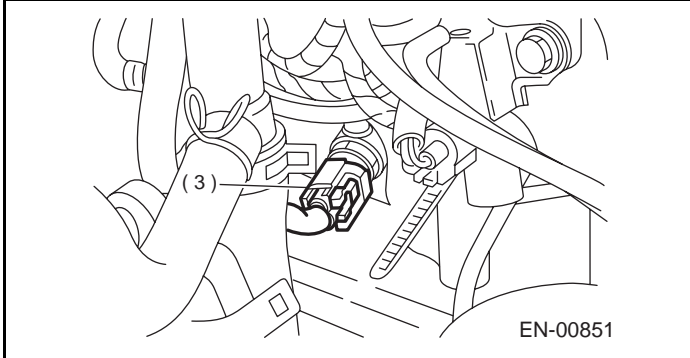
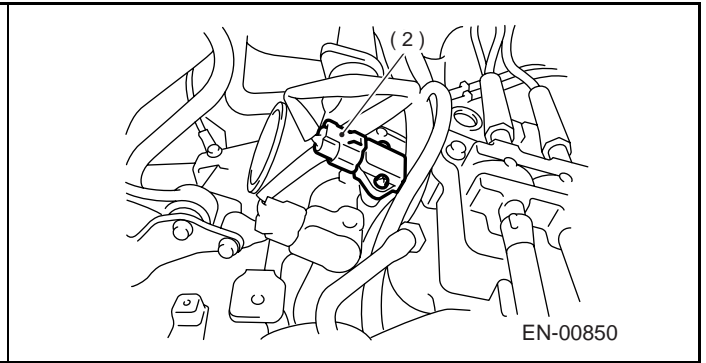
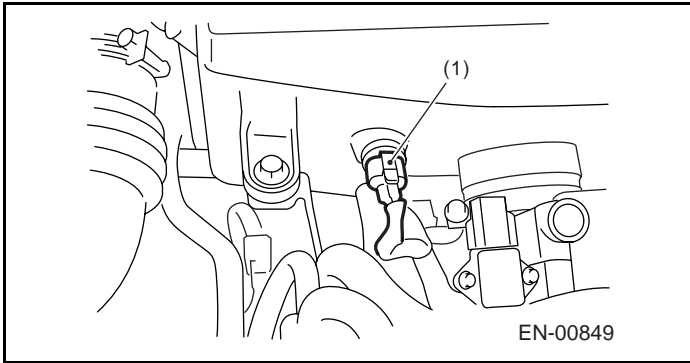


EN-01105

- | | |
|---------------------------------------|--------------------------------|
| (1) Intake air temperature sensor | (5) Knock sensor |
| (2) Pressure sensor | (6) Camshaft position sensor |
| (3) Engine coolant temperature sensor | (7) Crankshaft position sensor |
| (4) Throttle position sensor | |

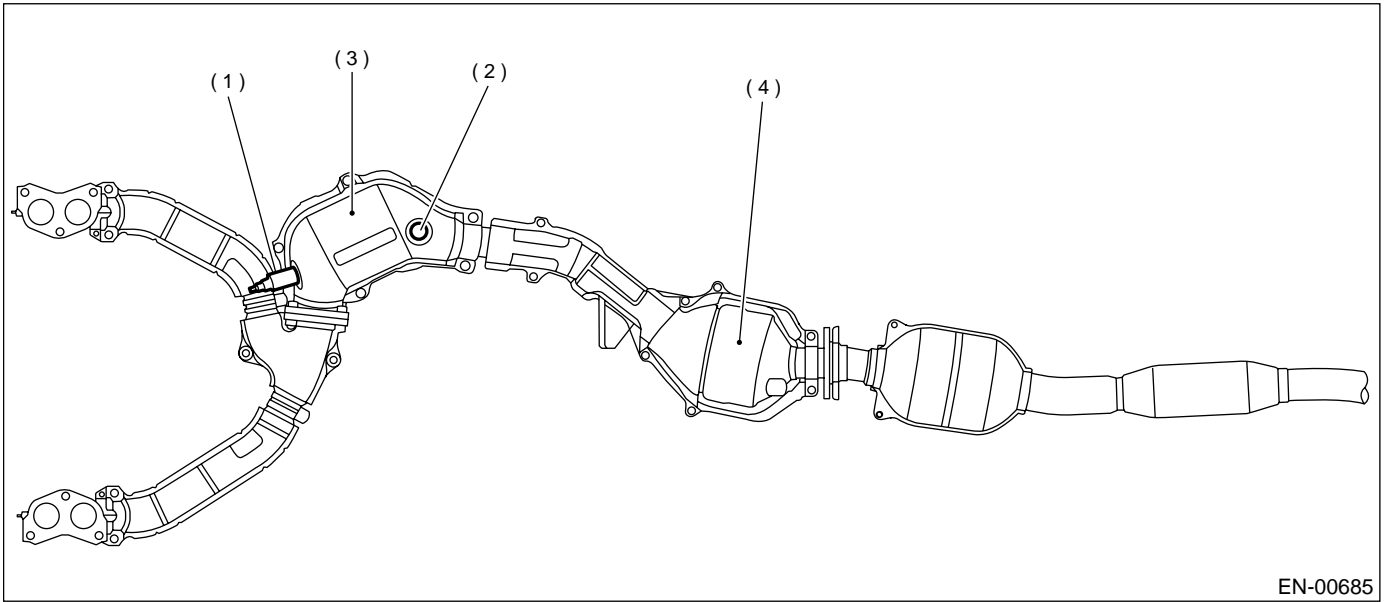
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

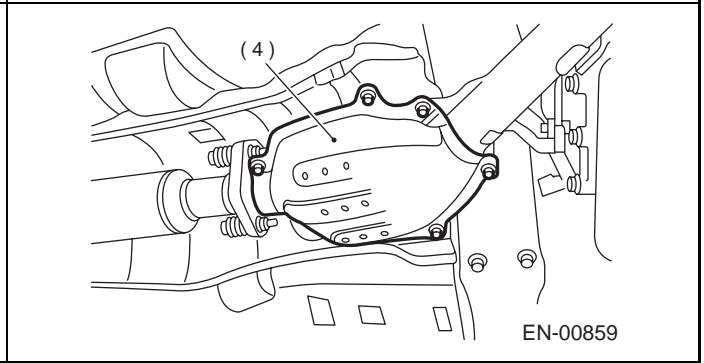
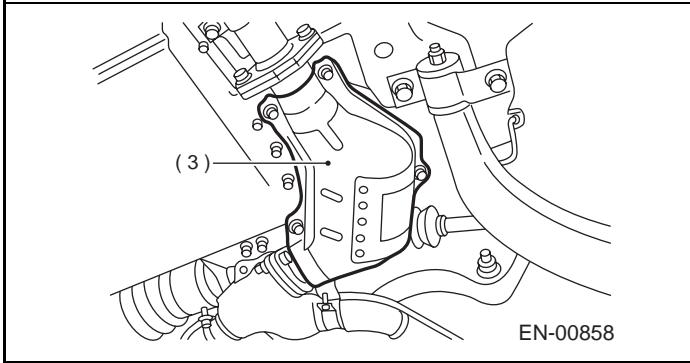
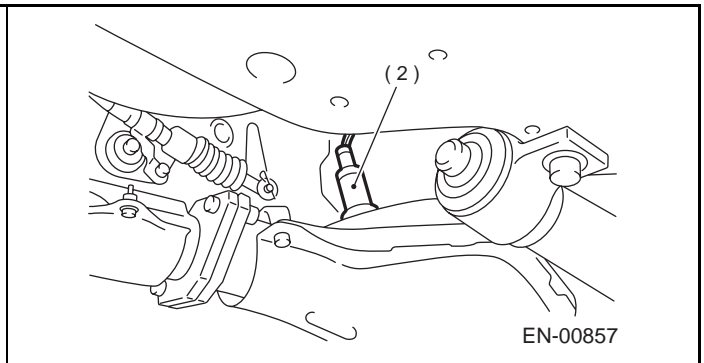
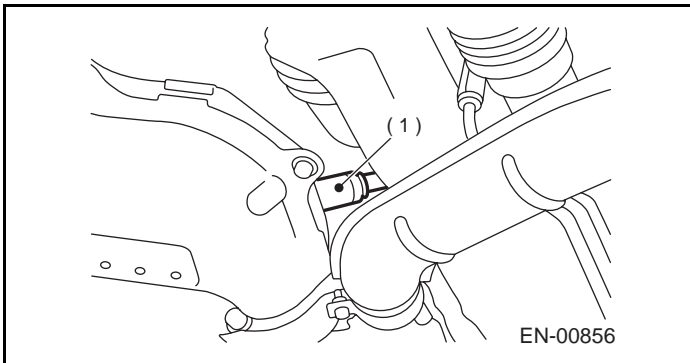


ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

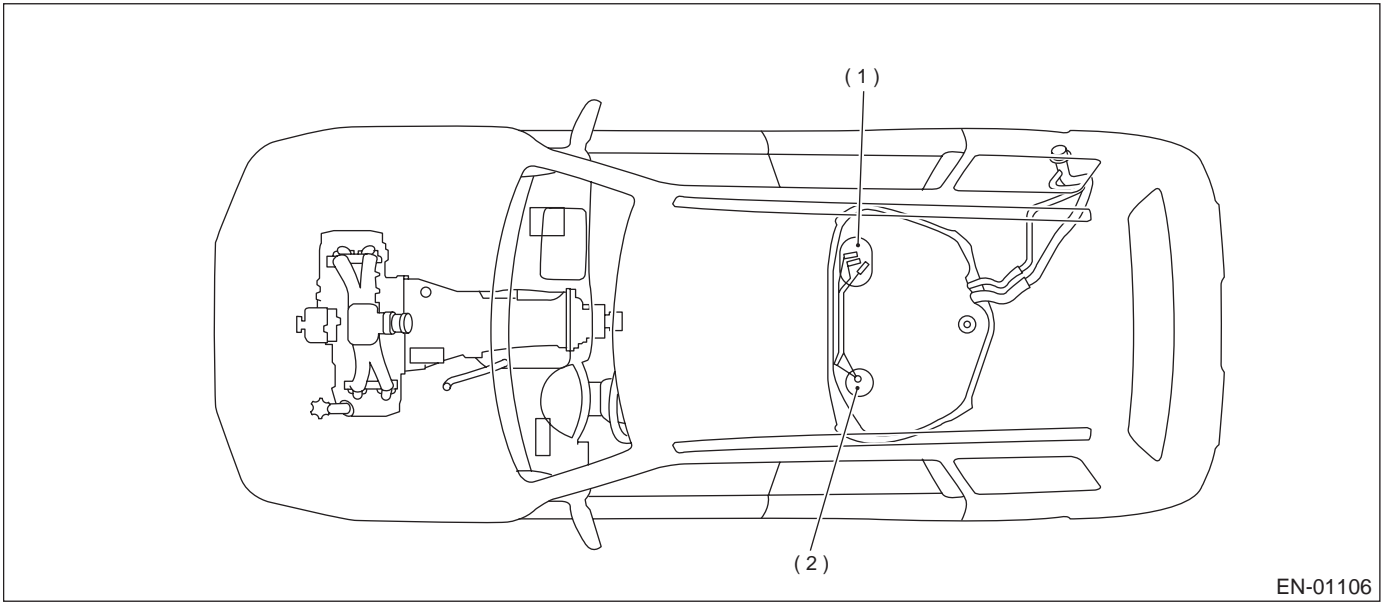


- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Front catalytic converter
- (4) Rear catalytic converter

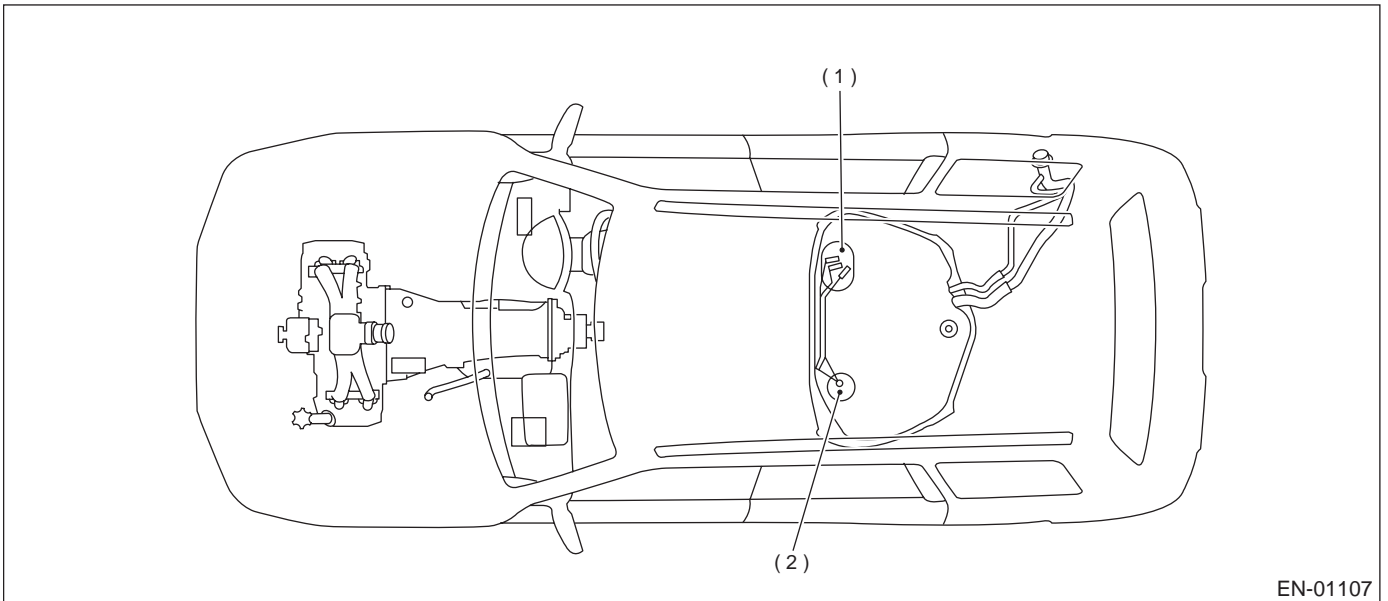


ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



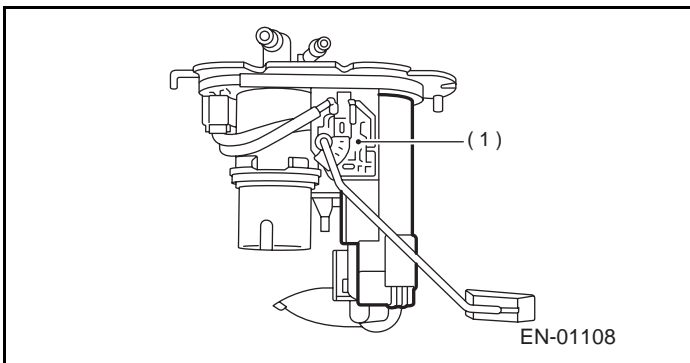
EN-01106



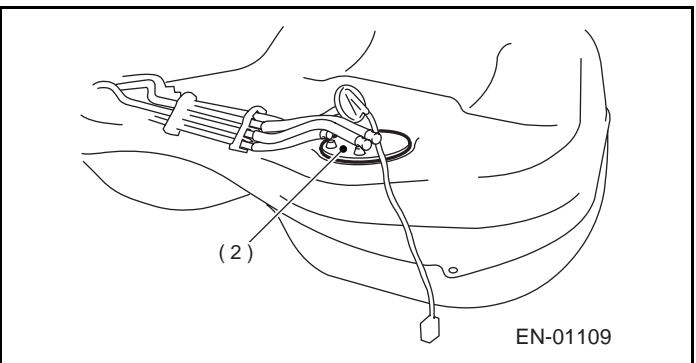
EN-01107

(1) Fuel level sensor

(2) Fuel sub level sensor



EN-01108

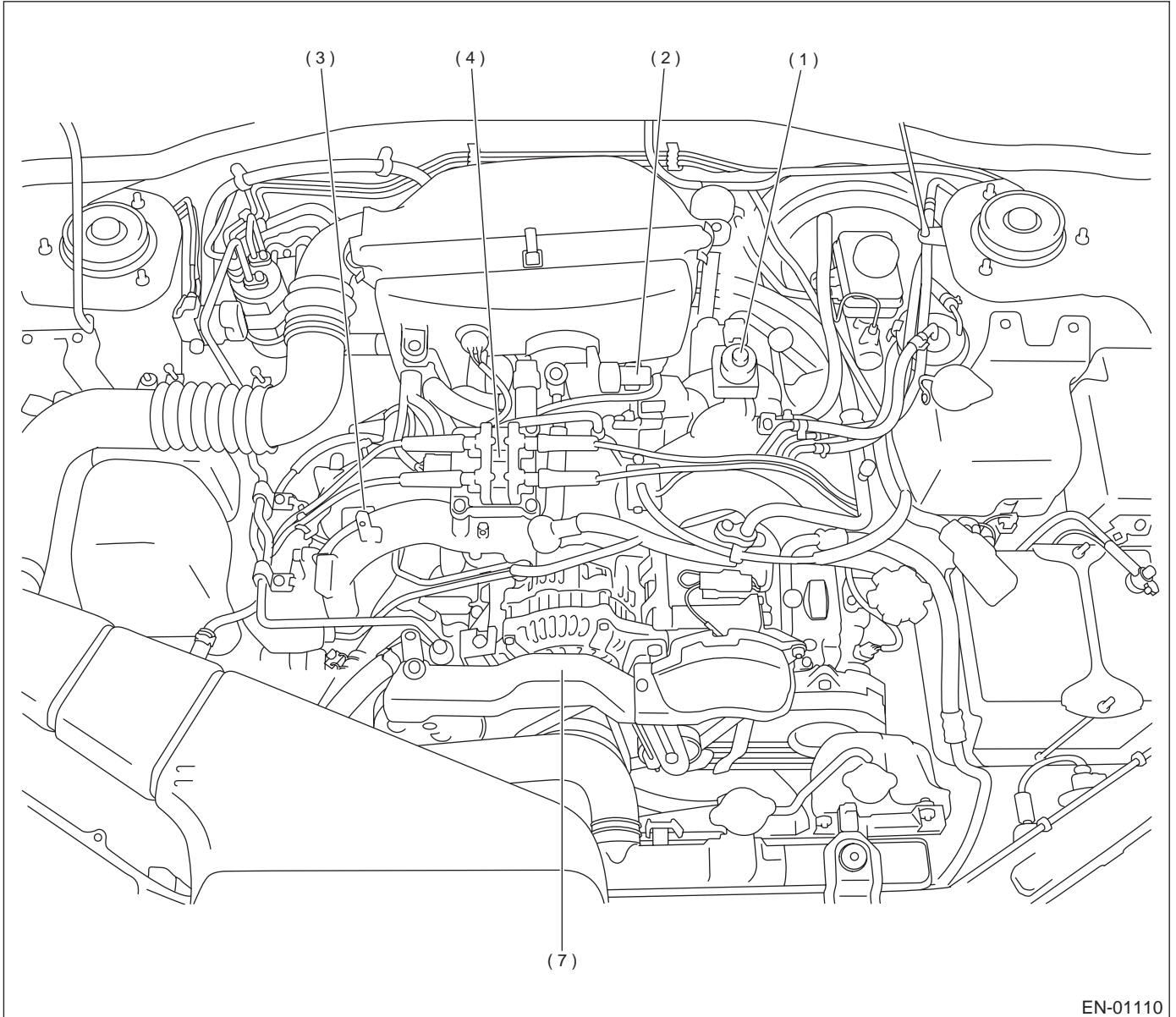


EN-01109

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS

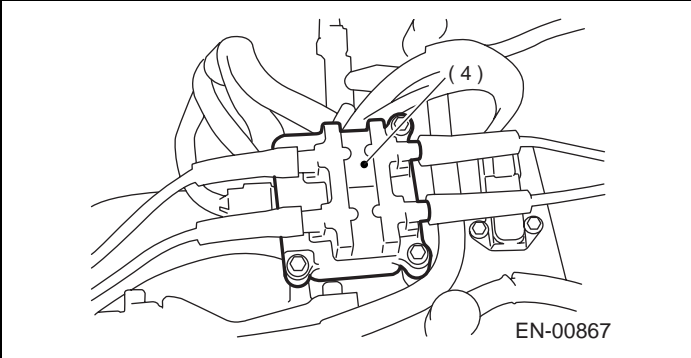
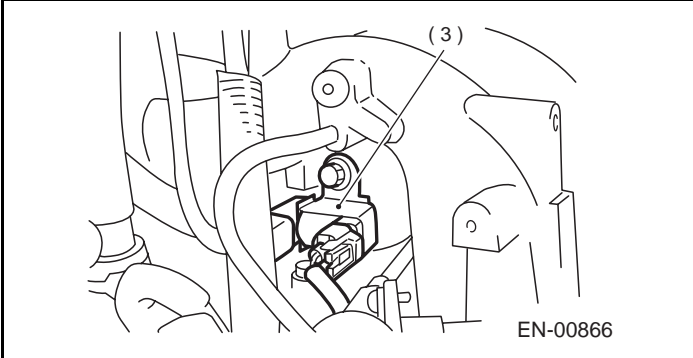
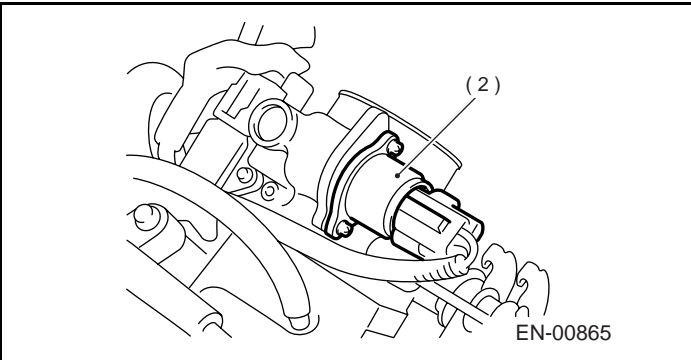
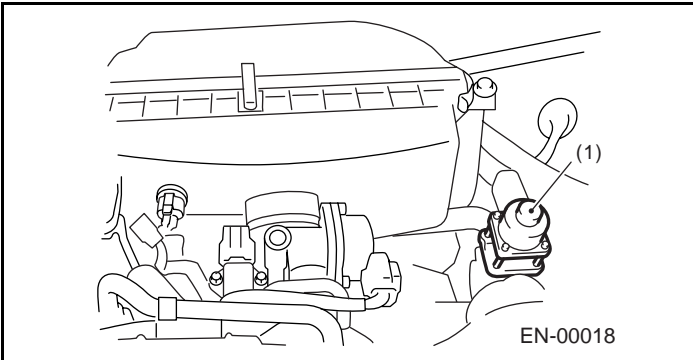


EN-01110

- | | |
|-------------------------------------|----------------------------------|
| (1) EGR valve | (3) Purge control solenoid valve |
| (2) Idle air control solenoid valve | (4) Ignition coil & ignitor ASSY |

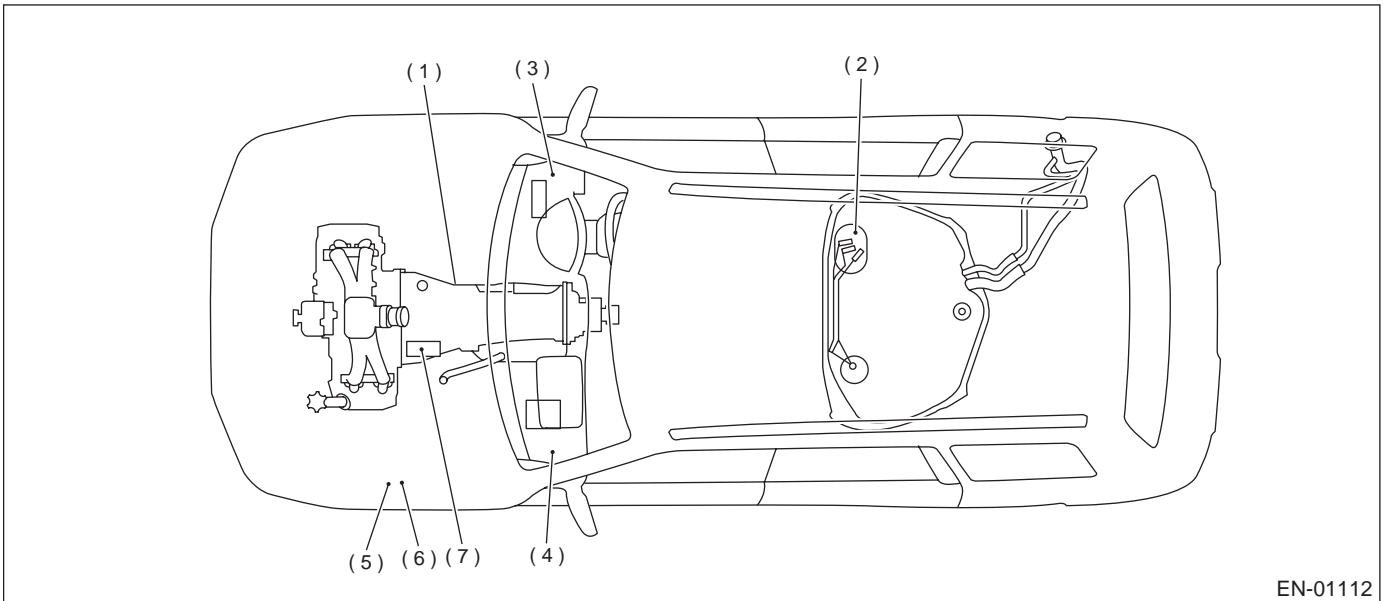
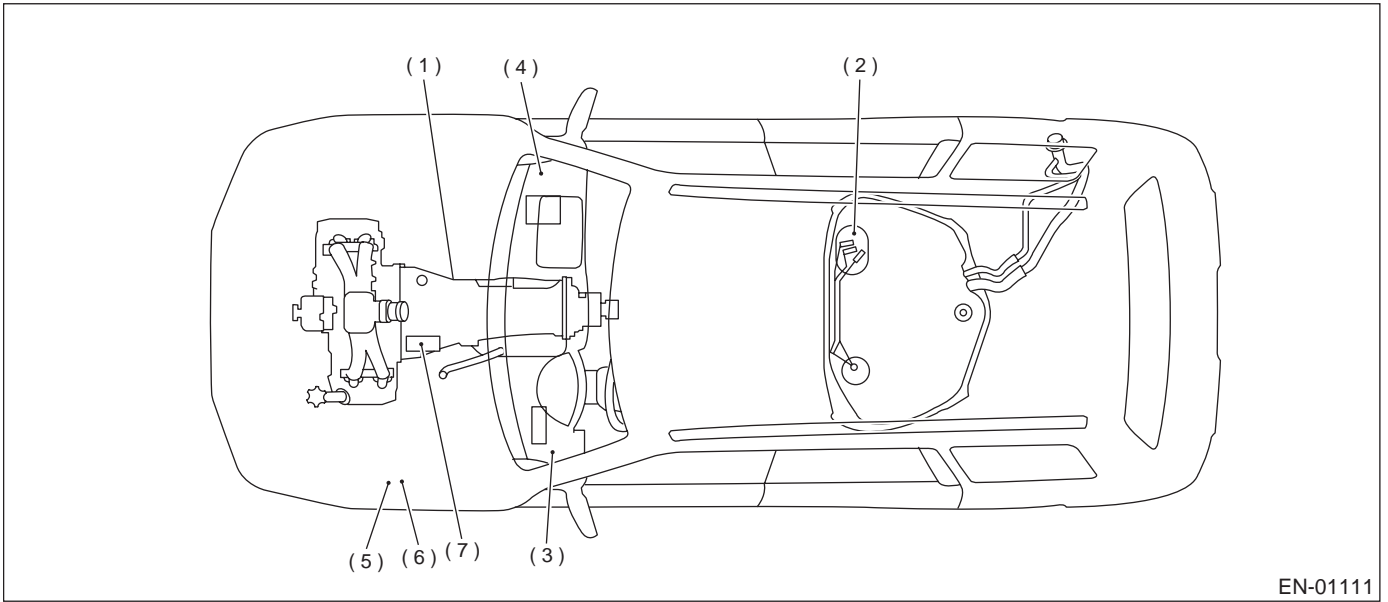
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



(1) Inhibitor switch

(2) Fuel pump

(3) Main relay

(4) Fuel pump relay

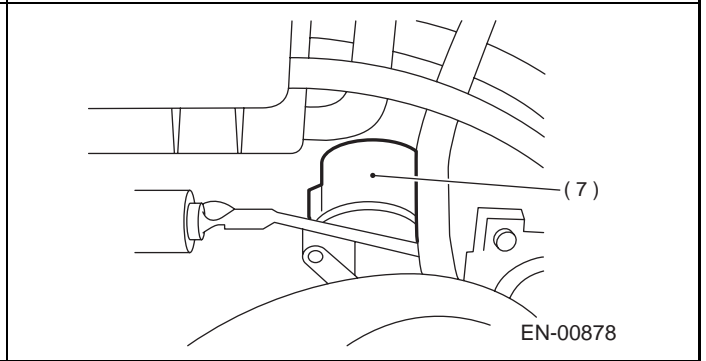
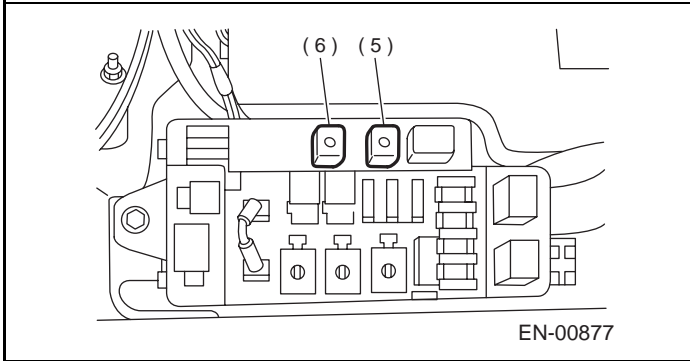
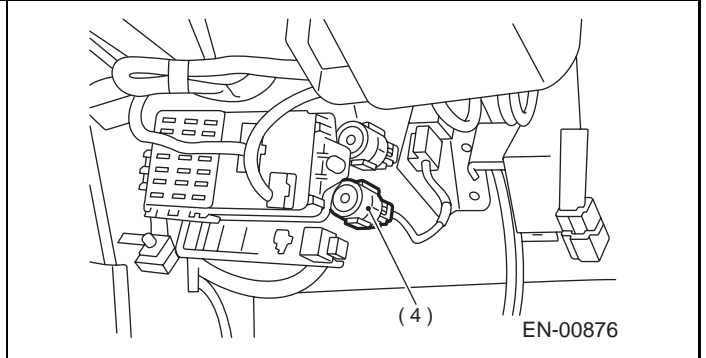
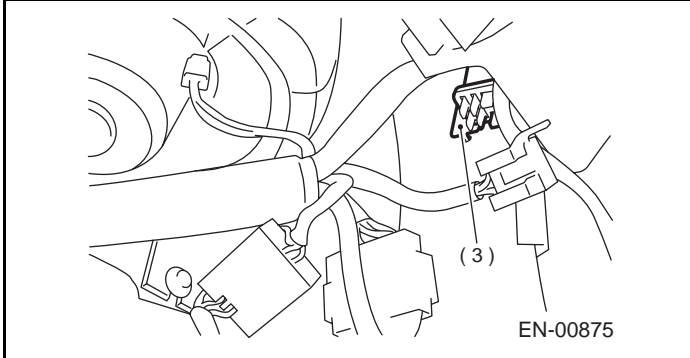
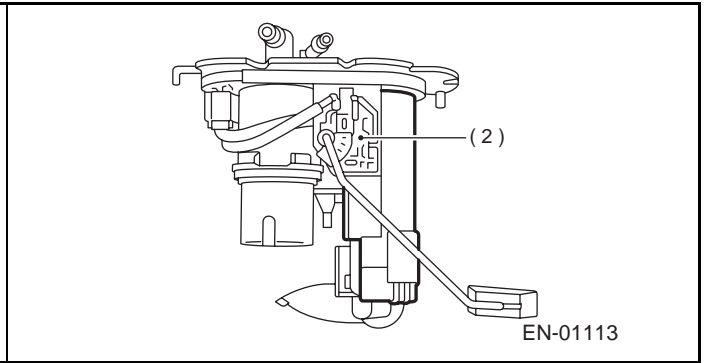
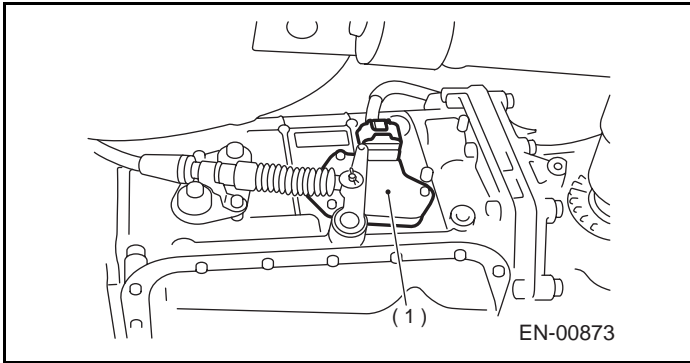
(5) Radiator main fan relay

(6) Radiator sub fan relay

(7) Starter

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

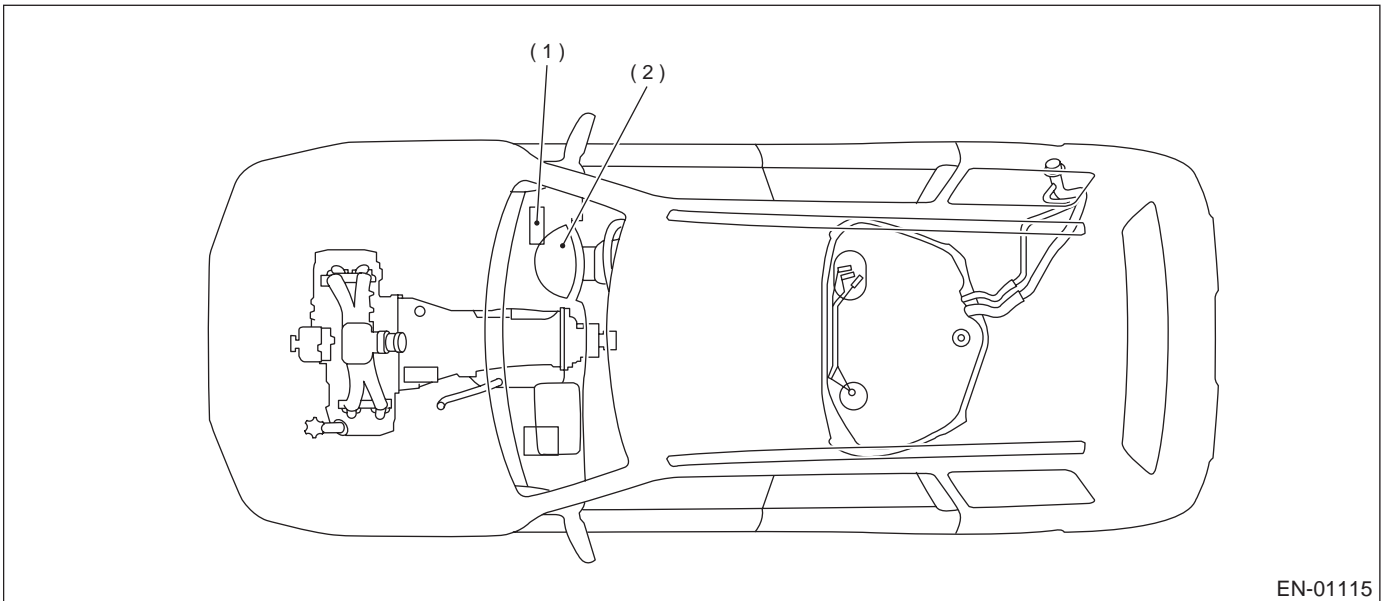
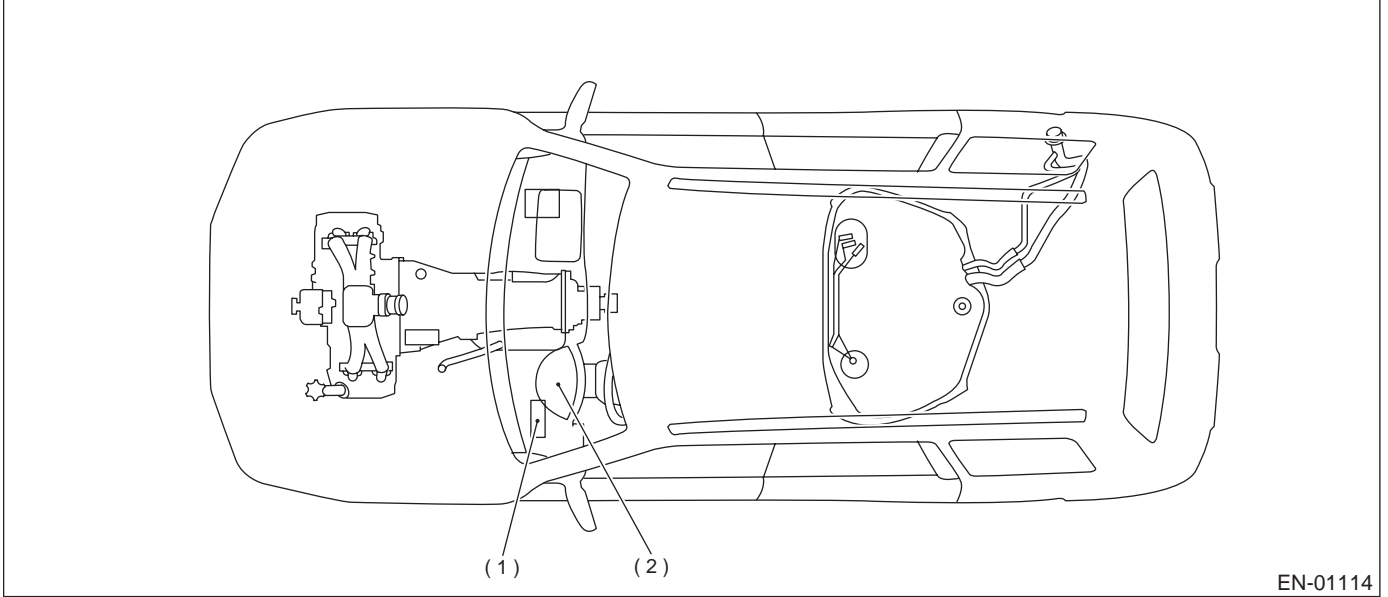


ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

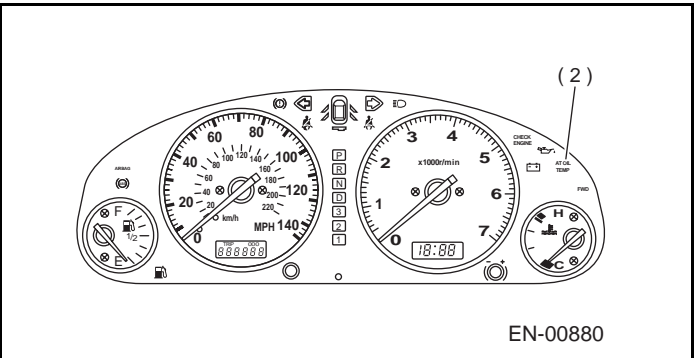
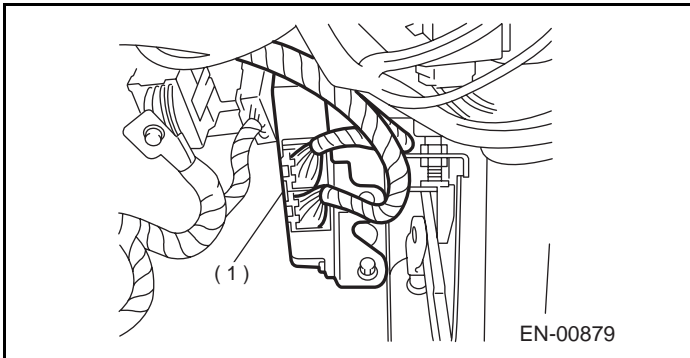
2. TRANSMISSION

• MODULE



(1) Transmission Control Module (TCM) (for AT vehicles)

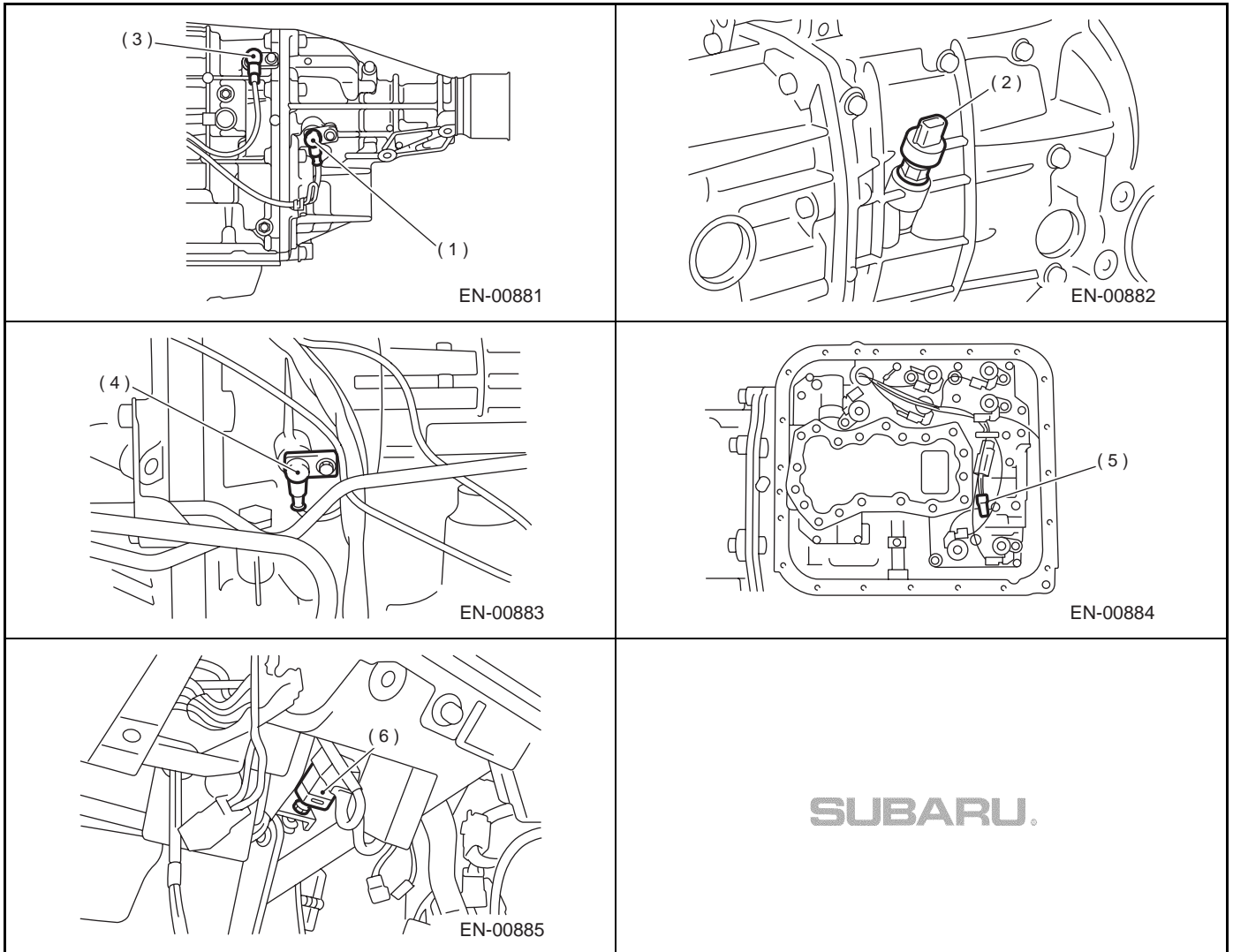
(2) AT diagnostic indicator light (for AT vehicles)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SENSOR

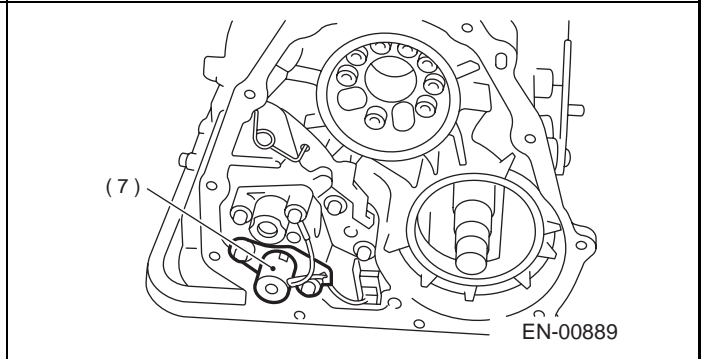
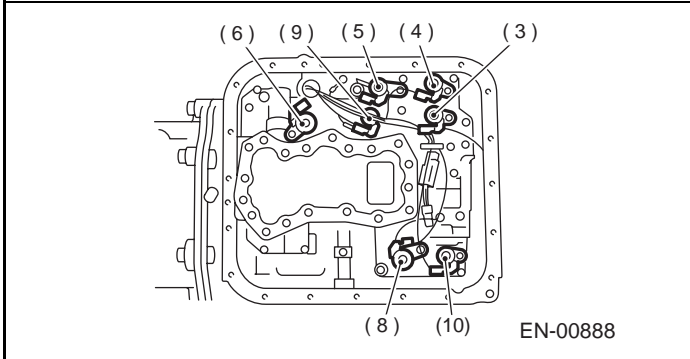
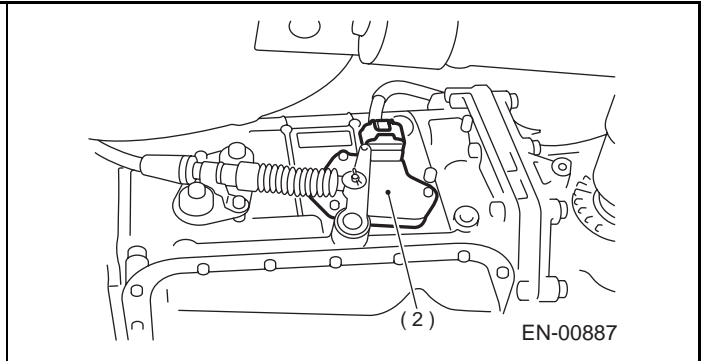
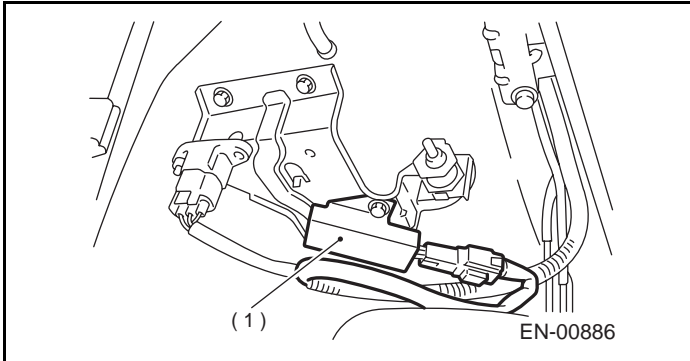


- (1) Rear vehicle speed sensor (for AT vehicles)
- (2) Front vehicle speed sensor (for MT vehicles)
- (3) Front vehicle speed sensor (for AT vehicles)
- (4) Torque converter turbine speed sensor
- (5) ATF temperature sensor (for AT vehicles)
- (6) Brake light switch

ELECTRICAL COMPONENTS LOCATION

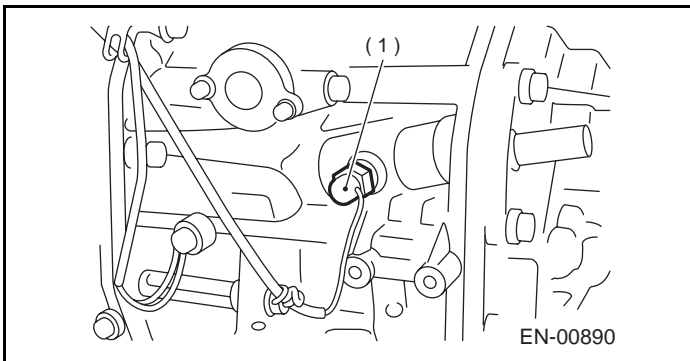
ENGINE (DIAGNOSTICS)

• SOLENOID VALVE AND SWITCH (AT VEHICLES)



- (1) Dropping resistor
- (2) Inhibitor switch
- (3) Shift solenoid valve 1
- (4) Shift solenoid valve 2
- (5) Line pressure duty solenoid
- (6) Lock-up duty solenoid
- (7) Transfer duty solenoid
- (8) 2-4 brake duty solenoid
- (9) Low clutch timing solenoid valve
- (10) 2-4 brake timing solenoid valve

• SOLENOID VALVE AND SWITCH (MT VEHICLES)



- (1) Neutral position switch

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

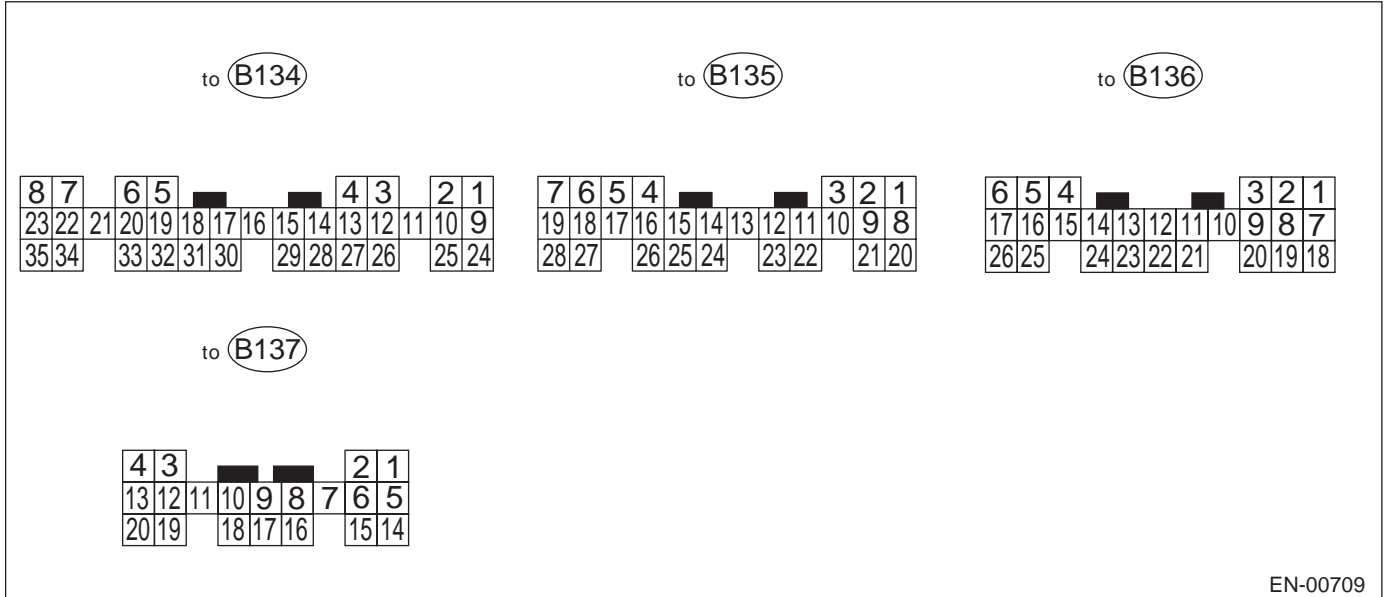
MEMO:

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



EN-00709

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crank- shaft posi- tion sensor	Signal (+)	B135	6	0	-7 — +7	Sensor output waveform
	Signal (-)	B135	17	0	0	—
	Shield	B135	28	0	0	—
Camshaft position sensor	Signal (+)	B135	7	0	-7 — +7	Sensor output waveform
	Signal (-)	B135	18	0	0	—
	Shield	B135	28	0	0	—
Throttle position sensor	Signal	B135	13	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	3	5	5	—
	GND (sen- sor)	B135	19	0	0	—
Rear oxy- gen sen- sor	Signal	B135	14	0	0 — 0.9	—
	Shield	B137	15	0	0	—
	GND (sen- sor)	B135	19	0	0	—
Front oxy- gen (A/F) sensor heater	Signal 1	B136	6	0 — 1.0	0 — 1.0	—
	Signal 2	B136	17	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B136	4	0 — 1.0	0 — 1.0	—
Engine coolant tempera- ture sen- sor	Signal	B135	12	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sen- sor)	B135	19	0	0	After warm-up the engine.
Vehicle speed signal		B137	10	0 or 5	0 or 5	"5" and "0" are repeatedly dis- played when vehicle is driven.
Starter switch		B136	20	0	0	Cranking: 8 — 14

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
A/C switch		B136	11	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B136	10	10 — 13	13 — 14	—
Neutral position switch (MT)		B136	21	ON: 5 OFF: 0		Switch is ON when gear is in neutral position.
Neutral position switch (AT)		B136	21	ON: 0 OFF: 5		Switch is ON when shift is in "N" or "P" position.
Test mode connector		B136	3	5	5	When connected: 0
Knock sensor	Signal	B135	16	2.8	2.8	—
	Shield	B135	27	0	0	—
Back-up power supply		B135	9	10 — 13	13 — 14	Ignition switch "OFF": 10 — 13
Control unit power supply		B135	1	10 — 13	13 — 14	—
		B135	2	10 — 13	13 — 14	—
Sensor power supply		B135	3	5	5	—
Ignition control	#1, #2	B134	33	0	1 — 3.4	Waveform
	#3, #4	B134	32	0	1 — 3.4	Waveform
Fuel injector	#1	B134	34	10 — 13	1 — 14	Waveform
	#2	B134	23	10 — 13	1 — 14	Waveform
	#3	B134	22	10 — 13	1 — 14	Waveform
	#4	B134	8	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal 1	B134	20	—	1 — 13	Waveform
	Signal 2	B134	6	—	1 — 13	Waveform
	Signal 3	B134	5	—	1 — 13	Waveform
	Signal 4	B134	19	—	1 — 13	Waveform
Fuel pump relay control		B134	2	ON: 0.5, or less OFF: 10 — 13	0.5, or less	—
A/C relay control		B134	9	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B134	14	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B134	13	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Self-shutoff control		B136	12	10 — 13	13 — 14	—
Malfunction indicator lamp		B134	28	—	—	Light "ON": 1, or less Light "OFF": 10 — 14
Engine speed output		B134	10	—	0 — 13, or more	Waveform
Torque control 1 signal		B136	1	5	5	—
Torque control 2 signal		B136	18	5	5	—
Torque control cut signal		B136	5	8	8	—
Purge control solenoid valve		B134	29	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
EGR solenoid valve	Signal 1	B134	18	0 or 10 — 13	0 or 10 — 13	—
	Signal 2	B134	17	0 or 10 — 13	0 or 10 — 13	—
	Signal 3	B134	16	0 or 10 — 13	0 or 10 — 13	—
	Signal 4	B134	15	0 or 10 — 13	0 or 10 — 13	—
AT diagnosis input signal		B137	19	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	Waveform
Small light switch		B137	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Blower fan switch	B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch	B137	4	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal 1	B136	13	—	2.05 — 2.25	—
Front oxygen (A/F) sensor signal 2	B136	22	—	1.75 — 1.95	—
Pressure sensor	B135	15	4.0 — 4.8	1.1 — 1.9	—
Intake air temperature sensor	B137	6	3.15 — 3.33	3.15 — 3.33	Intake air temperature: 25°C (75°F)
Immobilizer input/output 1	B137	17	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
Immobilizer input/output 2	B137	18	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
SSM/GST communication line	B137	16	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
GND (sensors)	B135	19	0	0	—
GND (injectors)	B134	35	0	0	—
GND (ignition system)	B136	26	0	0	—
GND (power supply)	B134	7	0	0	—
GND (control systems)	B137	14	0	0	—
	B135	21	0	0	—
GND (oxygen sensor heater 1)	B136	5	0	0	—
GND (oxygen sensor heater 2)	B136	16	0	0	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:

- After warm-up the engine.
- Gear position is in “N” or “P” position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

<Ref. to AT-14, Transmission Control Module (TCM) I/O Signal.>

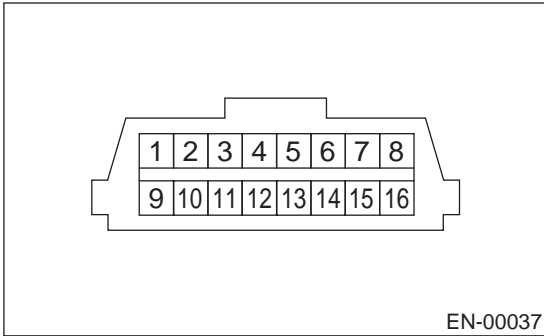
8. Data Link Connector

A: NOTE

This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.

CAUTION:

Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Blank	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

OBD-II GENERAL SCAN TOOL

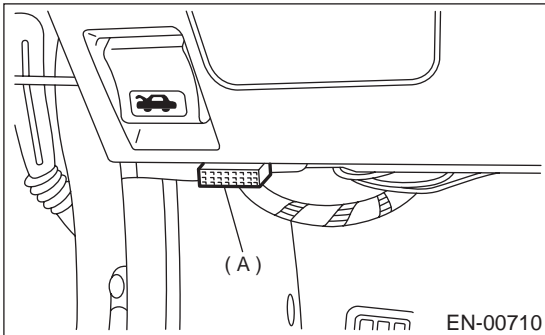
ENGINE (DIAGNOSTICS)

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

- 1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
- 2) Connect the OBD-II general scan tool to the data link connector (A) located in the lower portion of the instrument panel (on the driver's side).



2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.

A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and MI status	ON/OFF and number
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
14	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
1C	On-board diagnosis system	—

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE \$01).

- 3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) and freeze frame data.

OBD-II general scan tool functions consist of:

- (1) MODE \$01: Current powertrain diagnostic data
- (2) MODE \$02: Powertrain freeze frame data
- (3) MODE \$03: Emission-related powertrain diagnostic trouble codes
- (4) MODE \$04: Clear/Reset emission-related diagnostic information

Read out data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:

For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>

3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

4. MODE \$03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE)

Refer to Read Diagnostic Trouble Code for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(H4SO)-39, Read Diagnostic Trouble Code.>

5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

10. Subaru Select Monitor

A: OPERATION

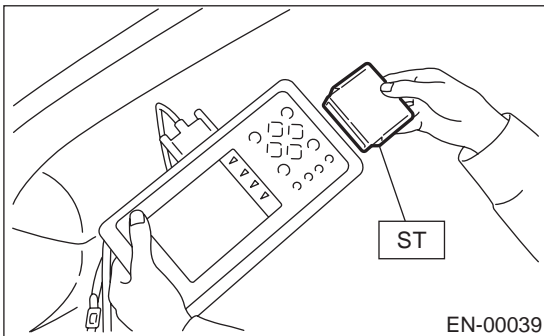
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru Select Monitor kit. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>



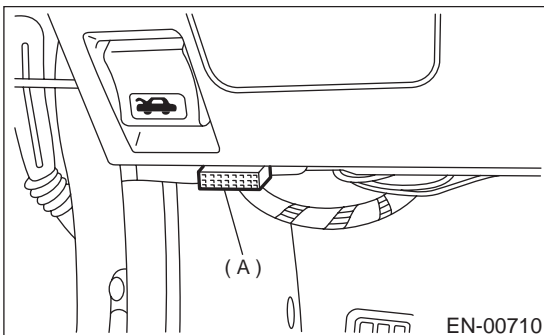
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

(1) Data link connector (A) located in the lower portion of the instrument panel (on the driver's side).

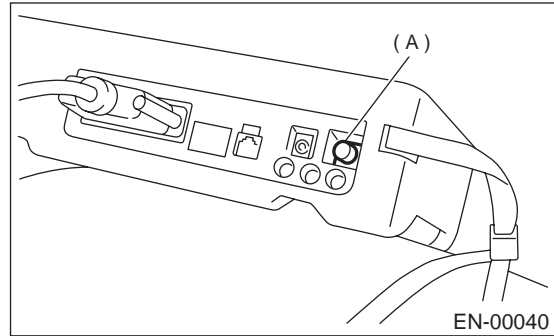


(2) Connect diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using Subaru Select Monitor, call up diagnostic trouble code(s) and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H4SO)-39, Read Diagnostic Trouble Code.>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H4SO)-39, Read Diagnostic Trouble Code.>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection Width Pulse	ms
Idle air control signal	ISC Valve Step	STEP
Engine load data	Engine Load	%
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
Front oxygen (A/F) sensor resistance value	A/F Sensor #1 resistance	ohm
Rear oxygen sensor output signal	Rear O2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psig
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psig
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Front oxygen (A/F) sensor heater current	Front O2 Heater #1	A
Rear oxygen sensor heater voltage	Rear O2 Heater Voltage	A
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Learned ignition timing	Learned Ignition Timing	deg
EGR control signal	No. of EGR Steps	STEP
Identification signal of AT vehicle	AT vehicle ID Signal	AT/MT
Alternator duty ratio	ALT Duty Ratio	%
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning compressor signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF
Rear oxygen sensor rich signal	Rear O2 Rich Signal	Rich/lean
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger Switch	ON or OFF
Blower fan switch signal	Blower Fan Switch	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Wiper switch signal	Wiper Switch	ON or OFF

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For select monitor display details, refer to the following.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 7) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diag. Code	—
Malfunction indicator lamp status	MI	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O2 Heater Diagnosis	Complete or incomplete
Air fuel ratio control system for bank 1	Fuel System for Bank 1	ON or OFF
Engine load data	Calculated load valve	—
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount signal	Mass Air Flow	g/s
EGR signal	EGR System	No support
Throttle position signal	Throttle Opening Angle	%
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
Front oxygen (A/F) sensor equipment	Oxygen sensor #11	Supported
Oxygen sensor equipment	Oxygen sensor #12	Supported
Front oxygen (A/F) sensor output signal	A/F Sensor #11	V

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank 1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Front oxygen (A/F) sensor rich signal	Front O2 Rich Signal #1	ON or OFF	When front oxygen (A/F) sensor mixture ratio is rich.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Pressure control solenoid valve	PCV Solenoid Valve	ON or OFF	When pressure control solenoid valve is in function.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

8. READ CURRENT DATA FOR AT.

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of transmission type.
 - 4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Stop lamp switch signal	Stop Lamp Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	AT Diagnosis Lamp	ON or OFF

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
For select monitor display details, refer to the following.

11. Read Diagnostic Trouble Code

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
 - For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
- <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
- 6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes.

For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (MODE \$03).

INSPECTION MODE

ENGINE (DIAGNOSTICS)

12. Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.

When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.
<Ref. to EN(H4SO)-45, Drive Cycle.>

DTC No.	Item
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)
P0068	Manifold absolute pressure/barometric pressure circuit range/performance
P0107	Manifold absolute pressure/barometric pressure circuit low input
P0108	Manifold absolute pressure/barometric pressure circuit high input
P0112	Intake air temperature circuit low input
P0113	Intake air temperature circuit high input
P0117	Engine coolant temperature circuit low input
P0118	Engine coolant temperature circuit high input
P0122	Throttle/pedal position sensor/switch "A" circuit low input
P0123	Throttle/pedal position sensor/switch "A" circuit high input
P0129	Barometric pressure too low
P0131	O2 sensor circuit low voltage (Bank 1 Sensor 1)
P0132	O2 sensor circuit high voltage (Bank 1 Sensor 1)
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)
P0327	Knock sensor 1 circuit low input (Bank 1 or Single sensor)
P0328	Knock sensor 1 circuit high input (Bank 1 or Single sensor)
P0335	Crankshaft position sensor "A" circuit
P0336	Crankshaft position sensor "A" circuit range/performance
P0340	Camshaft position sensor "A" circuit (Bank 1 or Single sensor)
P0341	Camshaft position sensor "A" circuit range/performance (Bank 1 or Single sensor)
P0458	Evaporative emission control system purge control valve circuit low
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0502	Vehicle speed sensor circuit low input
P0503	Vehicle speed sensor intermittent/erratic/high
P0512	Starter request circuit
P0513	Incorrect immobilizer key
P0519	Idle air control circuit system performance
P0565	Cruise control on signal
P0604	Internal control module random access memory (RAM) error
P0691	Cooling fan 1 control circuit low
P0692	Cooling fan 1 control circuit high
P0703	Torque converter/brake switch "B" circuit
P0705	Transmission range sensor circuit (PRNDL input)
P0710	Transmission fluid temperature sensor circuit
P0716	Input/turbine speed sensor circuit range/performance
P0720	Output speed sensor circuit
P0726	Engine speed input circuit range/performance
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio

INSPECTION MODE

ENGINE (DIAGNOSTICS)

DTC No.	Item
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0741	Torque converter clutch circuit performance or stuck off
P0743	Torque converter clutch circuit electrical
P0748	Pressure control solenoid "A" electrical
P0753	Shift solenoid "A" electrical
P0758	Shift solenoid "B" electrical
P0771	Shift solenoid "E" performance or stuck off
P0778	Pressure control solenoid "B" electrical
P0785	Shift/timing solenoid
P0851	Neutral switch input circuit low
P0852	Neutral switch input circuit high
P0864	TCM communication circuit range/performance
P0865	TCM communication circuit low
P0866	TCM communication circuit high
P1110	Atmospheric pressure sensor circuit malfunction (low input)
P1111	Atmospheric pressure sensor circuit malfunction (high input)
P1492	EGR solenoid valve signal #1 circuit malfunction (low input)
P1493	EGR solenoid valve signal #1 circuit malfunction (high input)
P1494	EGR solenoid valve signal #2 circuit malfunction (low input)
P1495	EGR solenoid valve signal #2 circuit malfunction (high input)
P1496	EGR solenoid valve signal #3 circuit malfunction (low input)
P1497	EGR solenoid valve signal #3 circuit malfunction (high input)
P1498	EGR solenoid valve signal #4 circuit malfunction (low input)
P1499	EGR solenoid valve signal #4 circuit malfunction (high input)
P1510	ISC solenoid valve signal #1 circuit malfunction (low input)
P1511	ISC solenoid valve signal #1 circuit malfunction (high input)
P1512	ISC solenoid valve signal #2 circuit malfunction (low input)
P1513	ISC solenoid valve signal #2 circuit malfunction (high input)
P1514	ISC solenoid valve signal #3 circuit malfunction (low input)
P1515	ISC solenoid valve signal #3 circuit malfunction (high input)
P1516	ISC solenoid valve signal #4 circuit malfunction (low input)
P1517	ISC solenoid valve signal #4 circuit malfunction (high input)
P1518	Starter switch circuit low input
P1560	Back-up voltage circuit malfunction
P1570	Antenna
P1571	Reference code incompatibility
P1572	IMM circuit failure
P1574	Key communication failure
P1576	EGI control module EEPROM
P1577	IMM control module
P1698	Engine torque control cut signal circuit malfunction (low input)
P1699	Engine torque control cut signal circuit malfunction (high input)
P1700	Throttle position sensor circuit malfunction for AT
P1711	Engine torque control signal #1 circuit malfunction
P1712	Engine torque control signal #2 circuit malfunction

INSPECTION MODE

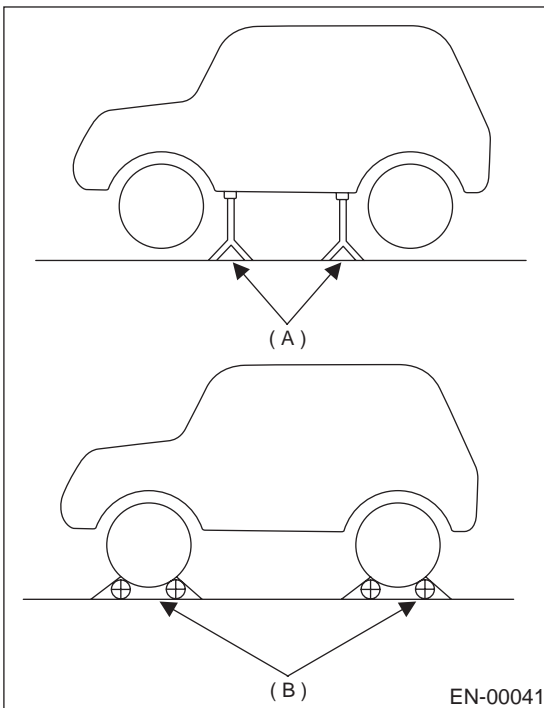
ENGINE (DIAGNOSTICS)

1. PREPARATION FOR THE INSPECTION MODE

- 1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
- 2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

WARNING:

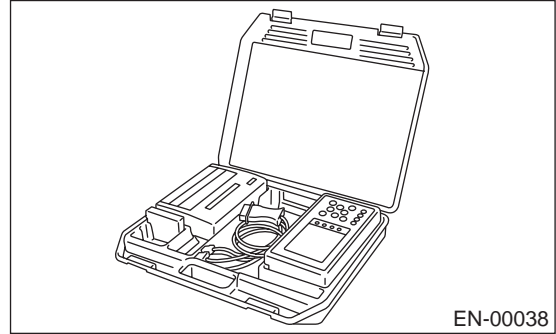
- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



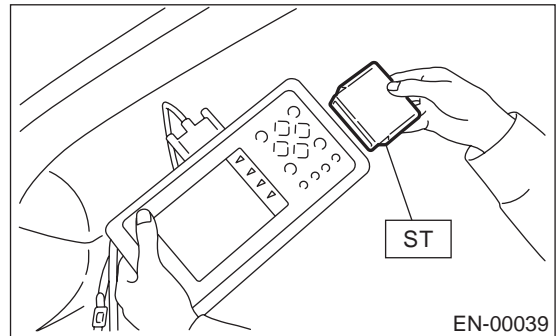
- (A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

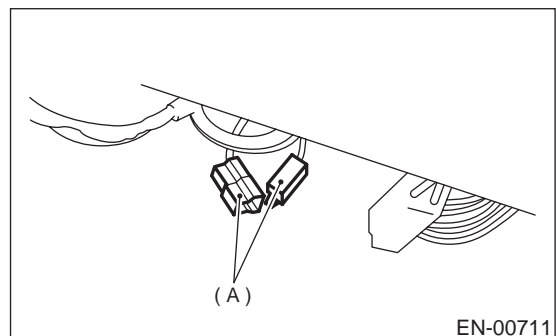
- 1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)-47, Clear Memory Mode.>
- 2) Warm up engine.
- 3) Prepare Subaru Select Monitor kit. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>



- 4) Connect diagnosis cable to Subaru Select Monitor.
- 5) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>

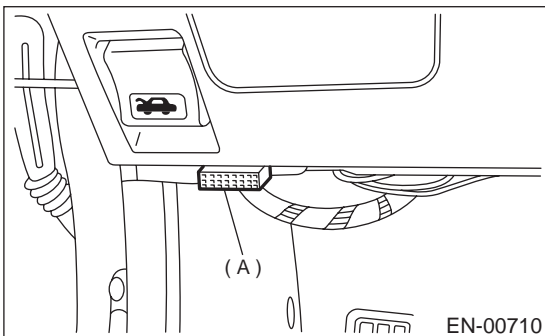


- 6) Connect test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



7) Connect Subaru Select Monitor to data link connector.

(1) Connect Subaru Select Monitor to data link connector (A) located in the lower portion of the instrument panel (on the driver's side).

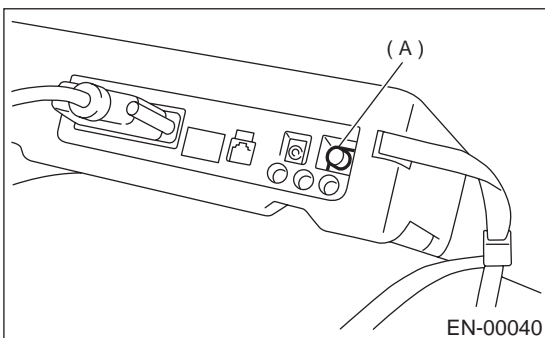


(2) Connect diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

8) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

9) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

10) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

11) Press the [YES] key after displayed the information of engine type.

12) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.

13) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [YES] key.

14) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>

- Release the parking brake.

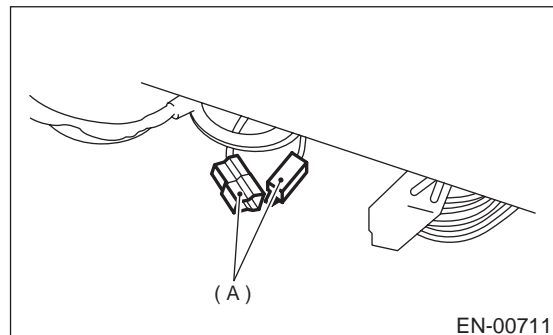
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

3. OBD-II GENERAL SCAN TOOL

1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data: <Ref. to EN(H4SO)-47, Clear Memory Mode.>

2) Warm up engine.

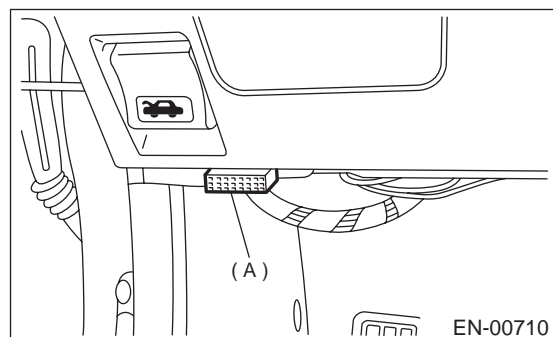
3) Connect test mode connector (A) at the lower side of the instrument panel (on the driver's side), to the side of the center console box.



4) Connect the OBD-II general scan tool to its data link connector (A) in the lower portion of the instrument panel (on the driver's side).

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



INSPECTION MODE

ENGINE (DIAGNOSTICS)

5) Start the engine.

NOTE:

- Ensure the selector lever is placed in the “P” position before starting. (AT vehicles)
- Depress clutch pedal when starting the engine. (MT vehicles)

6) Using the selector lever or shift lever, turn the “P” position switch and the “N” position switch to ON.

7) Depress the brake pedal to turn the brake switch ON. (AT vehicles)

8) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

9) Place the selector lever or shift lever in the “D” position (AT vehicles) or “1st” gear (MT vehicles) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:

- On AWD vehicles, release the parking brake.
- The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the OBD-II general scan tool, check for diagnostic trouble code(s) and record the result(s).

NOTE:

- For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>

13. Drive Cycle

A: OPERATION

There are 3 drive patterns for trouble diagnosis. Driving in the specified pattern allows to diagnose the malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

DTC No.	Item	Condition
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)	Coolant temperature at start is less than 30°C (86°F).
*P0111	Intake air temperature circuit range/performance	Coolant temperature at start is less than 30°C (86°F).
*P0125	Insufficient coolant temperature for closed loop fuel control	Coolant temperature at start is less than 20°C (68°F).
*P0130	O2 Sensor circuit (Bank 1 Sensor 1)	—
*P0133	O2 Sensor circuit slow response (Bank 1 Sensor 1)	—
*P0420	Catalyst system efficiency below threshold (Bank 1)	—
P0459	Evaporative emission control system purge control valve circuit high	—
*P0461	Fuel level sensor circuit range/performance	—
*P0464	Fuel level sensor circuit intermittent	—
*P1137	O2 Sensor circuit (Bank 1 Sensor 1)	—

3. IDLE FOR 10 MINUTES

NOTE:

Before diagnosis, drive vehicle at 4 km/h (6 MPH) or more.

DTC No.	Item	Condition
*P0483	Cooling fan rationality check	—
*P0506	Idle control system RPM lower than expected	—
*P0507	Idle control system RPM higher than expected	—

2) After performing diagnostics and cleaning the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)-47, Clear Memory Mode.>

3) Separate test mode connector.

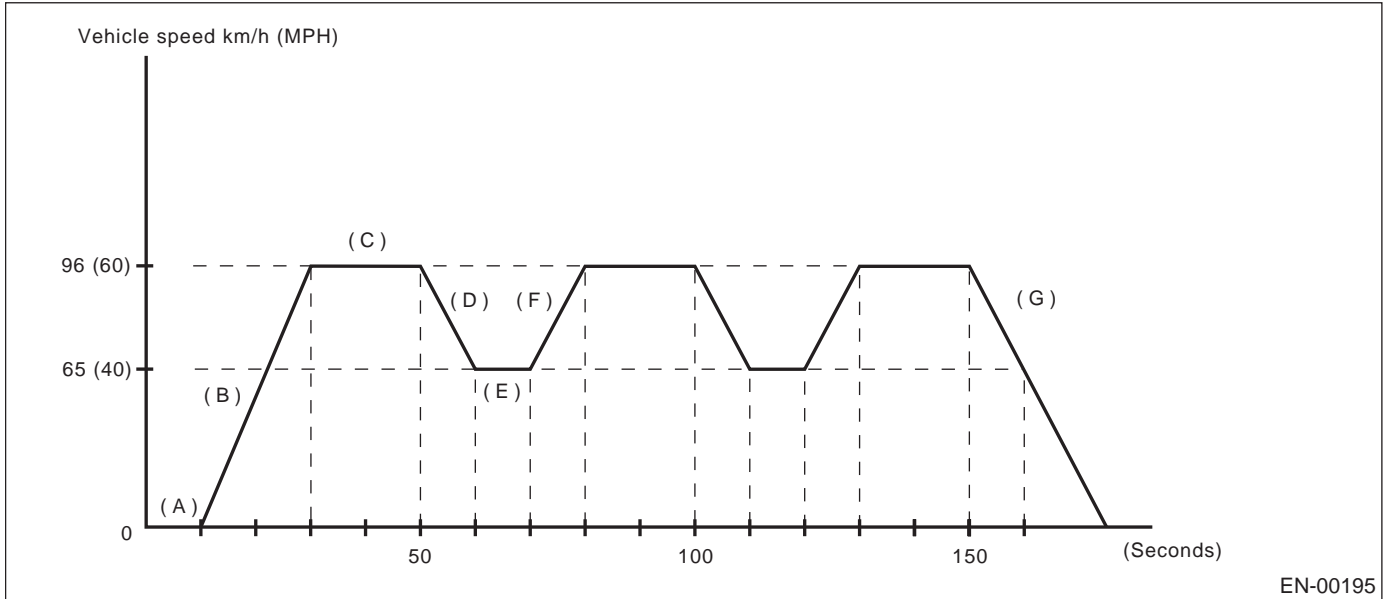
NOTE:

- Except for water temperature specified items at starting, diagnosis is carried out after engine warm up.
- Carry out diagnosis which is marked * on DTC twice, Then, after finishing 1st diagnosis, stop engine and do the second time at the same condition.

DRIVE CYCLE

ENGINE (DIAGNOSTICS)

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



- | | | |
|---|--|---|
| (A) Idle engine for 1 minute. | (D) Decelerate with fully closed throttle to 64 km/h (40 MPH). | (F) Accelerate to 97 km/h (60 MPH) within 10 seconds. |
| (B) Accelerate to 97 km/h (60 MPH) within 20 seconds. | (E) Drive vehicle at 64 km/h (40 MPH) for 10 seconds. | (G) Stop vehicle with throttle fully closed. |
| (C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds. | | |

DTC No.	Item	Condition
*P0121	Throttle/pedal position sensor/switch "A" circuit range/performance	—
*P0139	O2 Sensor circuit slow response (Bank 1 Sensor 2)	—
*P0171	System too lean (Bank 1)	—
*P0172	System too rich (Bank 1)	—
*P0301	Cylinder 1 misfire detected	—
*P0302	Cylinder 2 misfire detected	—
*P0303	Cylinder 3 misfire detected	—
*P0304	Cylinder 4 misfire detected	—
*P0400	Exhaust gas recirculation flow	—

14. Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the `Done' and `Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- After the memory has been cleared, the ISC must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
- 6) When the `Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
- 7) Turn Subaru Select Monitor and ignition switch to OFF.

NOTE:

- After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.

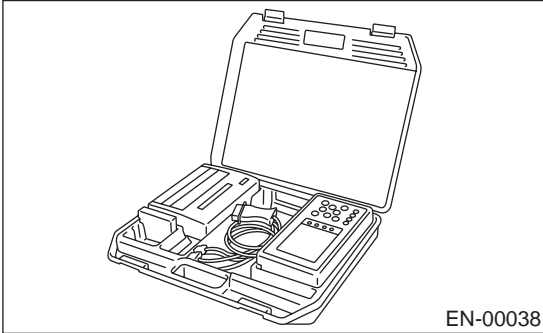
COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

15. Compulsory Valve Operation Check Mode

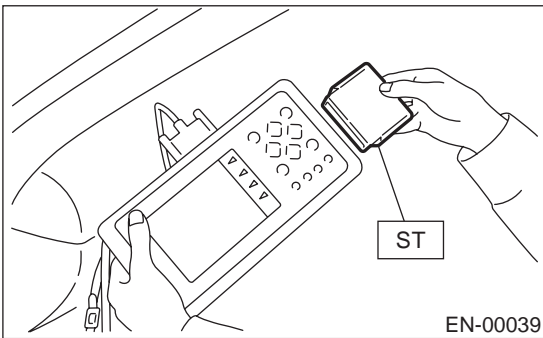
A: OPERATION

1) Prepare Subaru Select Monitor kit. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>

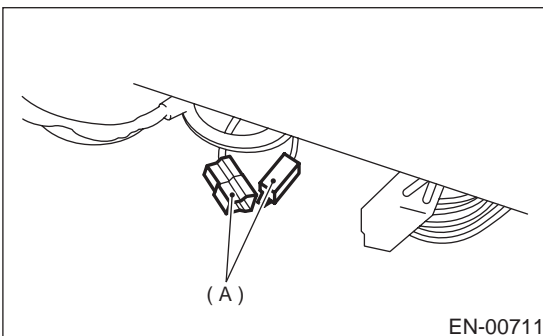


2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>

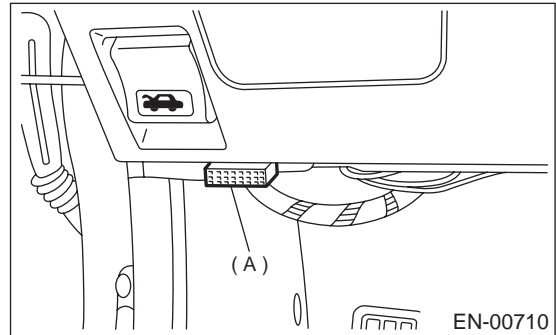


4) Connect test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



5) Connect Subaru Select Monitor to data link connector.

(1) Connect Subaru Select Monitor to data link connector (A) located in the lower portion of the instrument panel (on the driver's side).

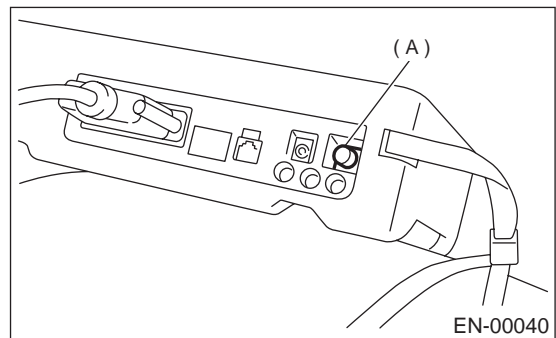


(2) Connect diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

9) Press the [YES] key after displayed the information of engine type.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve

NOTE:

- The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve
PCV Solenoid Valve
Vent Control Solenoid Valve
Fuel Tank Sensor Control Valve

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

16.Engine Malfunction Indicator Lamp (MI)

A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MI). <Ref. to EN(H4SO)-50, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI), Engine Malfunction Indicator Lamp (MI).>
2. Check engine malfunction indicator lamp (MI) does not come on. <Ref. to EN(H4SO)-52, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MI).>
3. Check engine malfunction indicator lamp (MI) does not go off. <Ref. to EN(H4SO)-56, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MI).>
4. Check engine malfunction indicator lamp (MI) does not blink at a cycle of 3 Hz. <Ref. to EN(H4SO)-58, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MI).>
5. Check engine malfunction indicator lamp (MI) remains blinking at a cycle of 3 Hz. <Ref. to EN(H4SO)-60, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MI).>

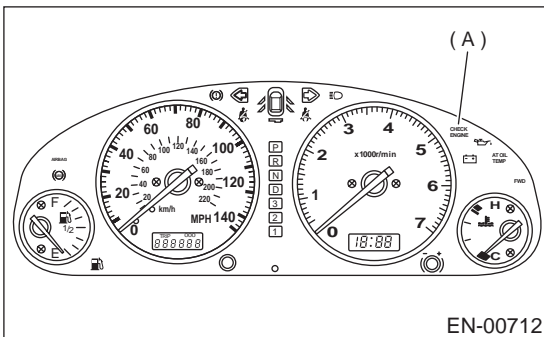
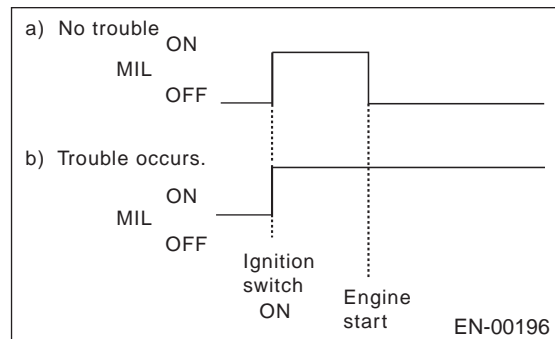
B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI)

1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MI) in the combination meter illuminates.

NOTE:

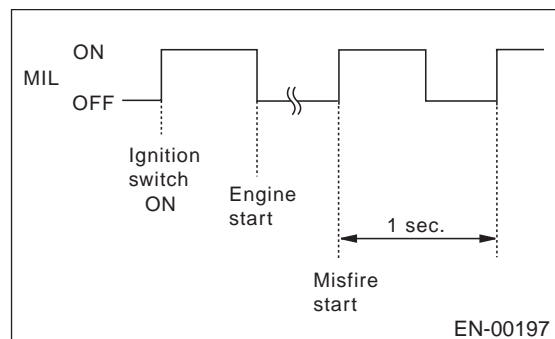
If the MI does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(H4SO)-52, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MI).>

2) After starting the engine, the MI goes out. If it does not, either the engine or the emission control system is malfunctioning.



(A) Malfunction indicator lamp (MI)

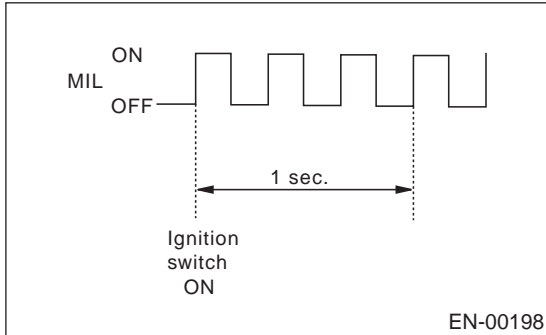
3) If the diagnosis system senses a misfire which could damage the catalyzer, the MI will blink at a cycle of 1 Hz.



ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

4) When ignition switch is turned to ON (engine off) or to "START" with the test mode connector connected, the MI blinks at a cycle of 3 Hz.

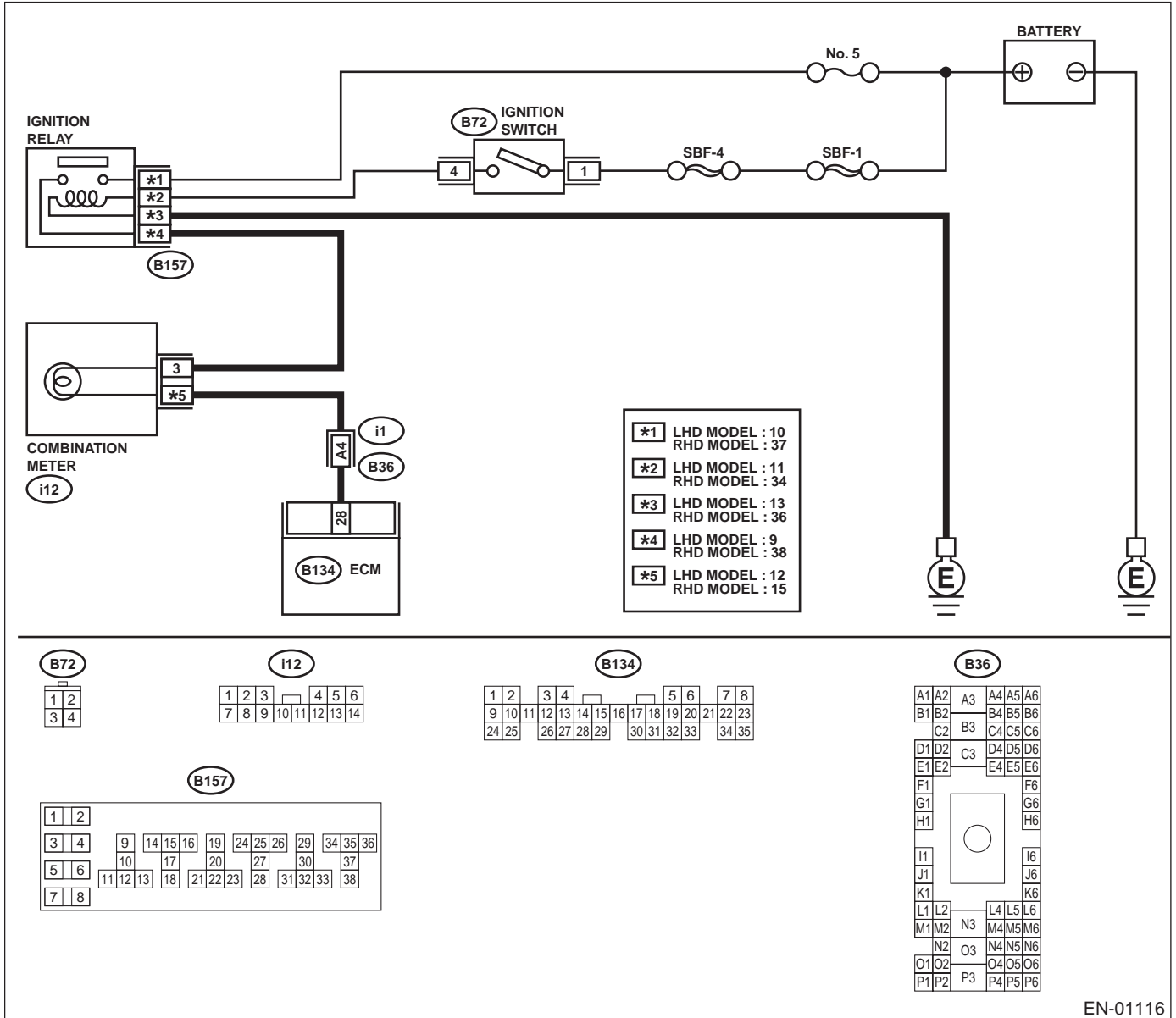


ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON.

- **DIAGNOSIS:**
 - The CHECK ENGINE malfunction indicator lamp (MI) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
 - When ignition switch is turned ON (engine OFF), MI does not come on.
- **WIRING DIAGRAM:**



EN-01116

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 28 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 4.	Go to step 2.
2 CHECK POOR CONTACT. Does the MI come on when shaking or pulling ECM connector and harness?	MI illuminates.	Repair poor contact in ECM connector.	Go to step 3.
3 CHECK ECM CONNECTOR. Is ECM connector correctly connected?	Connected.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Repair connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Remove combination meter. <Ref. to IDI-14, Combination Meter Assembly.> 3) Disconnect connector from ECM and combination meter. 4) Measure resistance of harness between ECM and combination meter connector. Connector & terminal (B134) No. 28 — (i12) No. 12: (LHD model) (B134) No. 28 — (i12) No. 15: (RHD model) Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact in combination meter connector. Is there poor contact in combination meter connector?	There is poor contact.	Repair poor contact in combination meter connector.	Go to step 6.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between combination meter connector and chassis ground.</p> <p>Connector & terminal (i12) No. 3 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	<p>Check the following and repair if necessary.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Broken down ignition relay. • Blown out fuse (No. 5). • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
<p>7 CHECK LAMP BULB.</p> <p>Remove engine malfunction indicator lamp bulb.</p> <p>Is lamp bulb condition OK?</p>	OK	Repair combination meter connector.	Replace lamp bulb.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

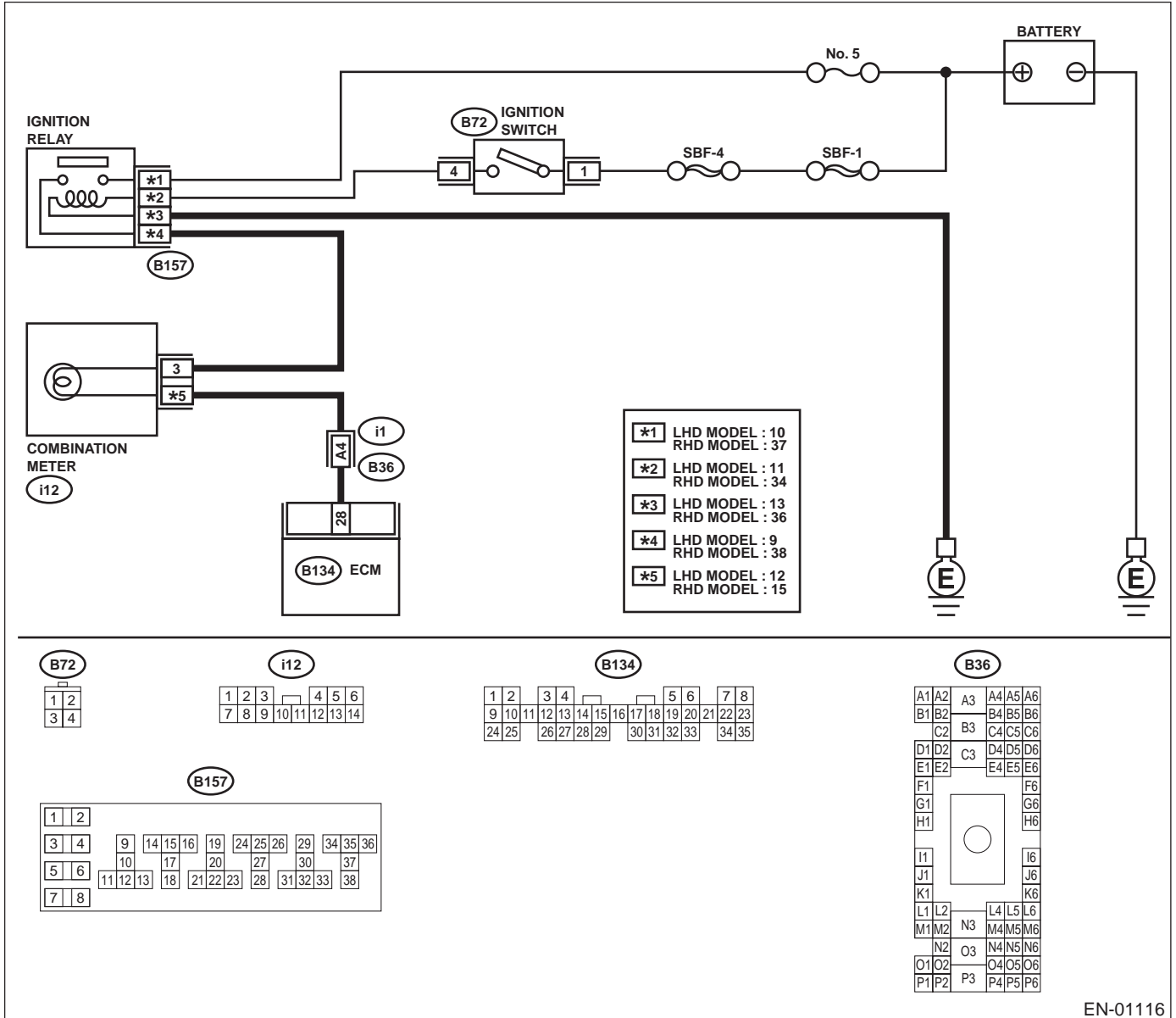
MEMO:

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT GO OFF.

- **DIAGNOSIS:**
 - The CHECK ENGINE malfunction indicator lamp (MI) circuit is shorted.
- **TROUBLE SYMPTOM:**
 - Although MI comes on when engine runs, trouble code is not shown on Subaru select monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**



EN-01116

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON. Does the MI come on?	MI illuminates.	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT BLINK AT A CYCLE OF 3 HZ.

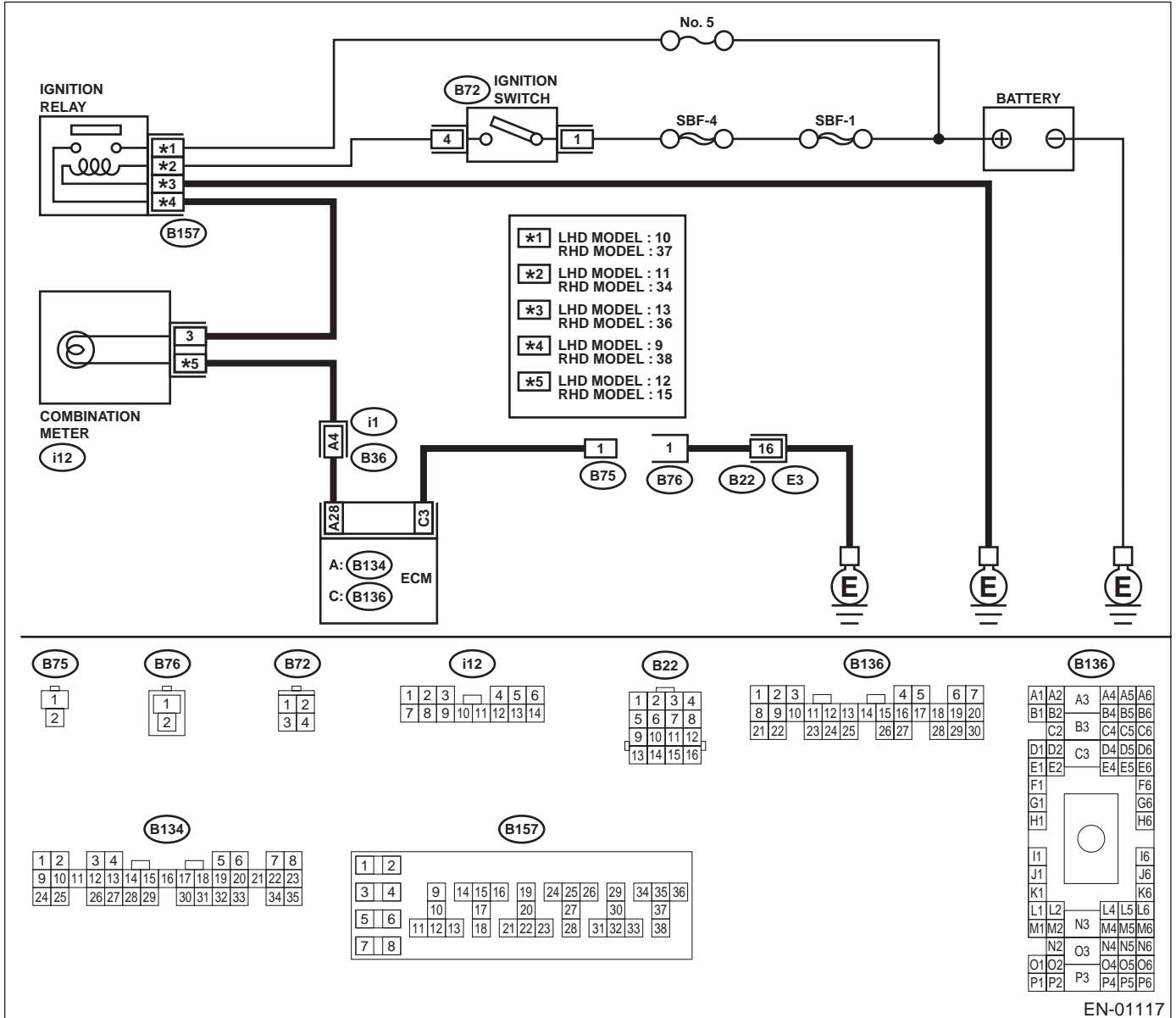
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MI) circuit is open or shorted.
- Test mode connector circuit is in open.

• TROUBLE SYMPTOM:

- When inspection mode, MI does not blink at a cycle of 3 Hz.

• WIRING DIAGRAM:



EN-01117

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

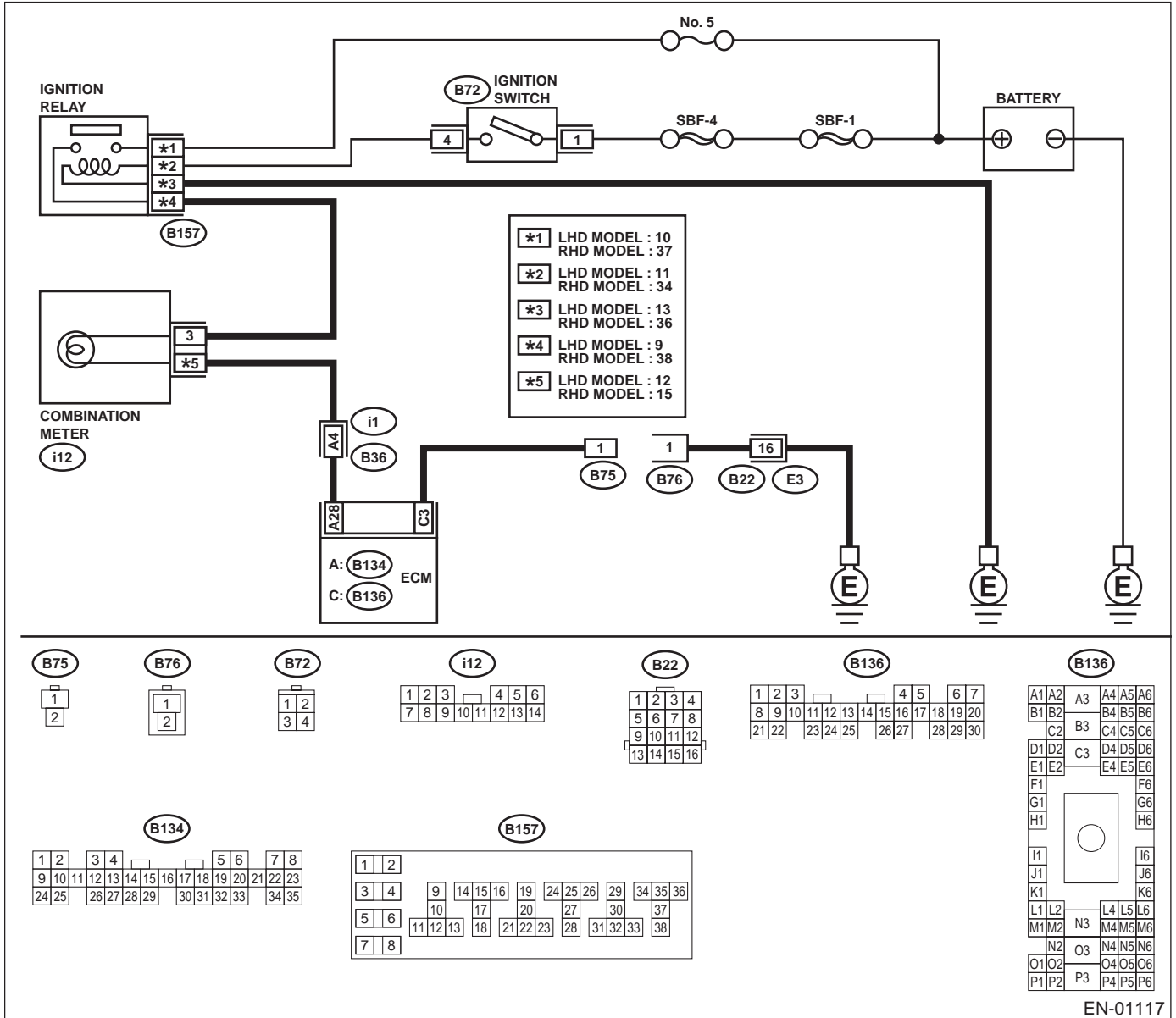
Step	Value	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI). 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Turn ignition switch to ON. (engine OFF) Does the MI come on?	MI illuminates.	Go to step 2.	Repair the MI circuit. <Ref. to EN(H4SO)-52, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MI).>
2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON. Does the MI come on?	MI illuminates.	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between test mode connector and chassis ground. Connector & terminal (B76) No. 1 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR. 1) Connect test mode connector. 2) Measure resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 3 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair open circuit in harness between ECM and test mode connector.
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
 - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
 - MI blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**



ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK TEST MODE CONNECTOR. 1) Disconnect test mode connector. 2) Turn ignition switch to ON. Does MI flash on and off?	MI illuminates.	Go to step 2.	System is in good order. NOTE: MI blinks at a cycle of 3 Hz when test mode connector is connected.
2 CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 3 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Repair short circuit in harness between ECM and test mode connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

17. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(H4SO)-64, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H4SO)-68, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H4SO)-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H4SO)-76, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H4SO)-80, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR ENGINE STARTING FAILURE

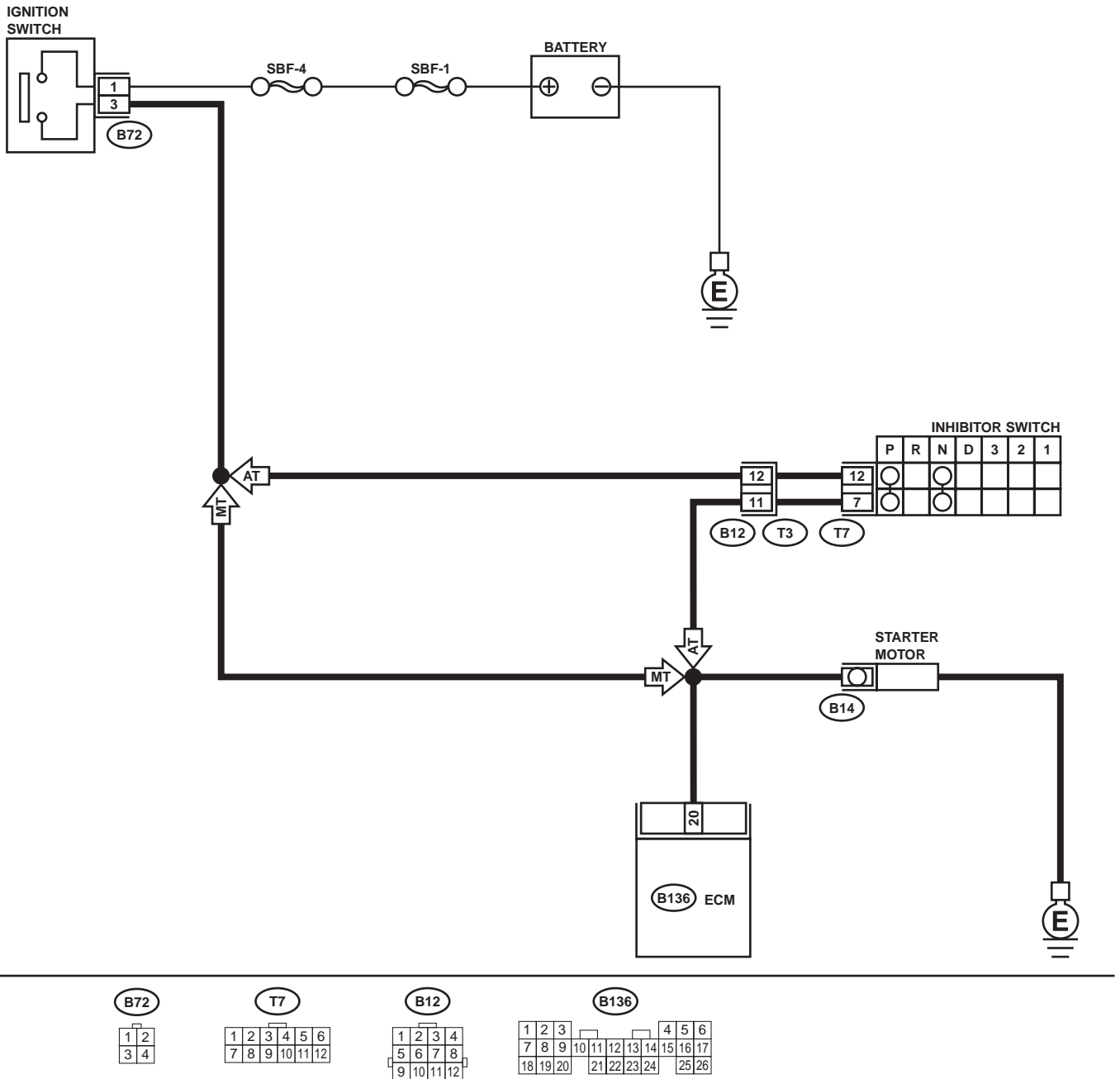
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)-47, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)-40, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01118

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. Does the starter motor operates, when the switch is ON?	Operates.	Go to step 2.	Go to step 3.
2 CHECK DTC. Is DTC displayed?	DTC indicated.	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Repair poor contact in ECM connector.
3 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to ST. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. Connector & terminal (B14) No. 1 (+) — Engine ground (-): Is the measured value more than specified value? NOTE: •On AT vehicles, place the selector lever in the "P" or "N" position.	10 V	Go to step 4.	Go to step 5.
4 CHECK GROUND CIRCUIT OF STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground. Is the measured value less than specified value?	5 Ω	Check the starter motor. <Ref. to SC(H4SO)-6, Starter.>	Repair open circuit of ground cable.
5 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 6.	Repair open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
6 CHECK IGNITION SWITCH. 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to the "ST" position. Terminals No. 1 — No. 3: Is the measured value less than specified value?	5 Ω	Go to step 7.	Replace the ignition switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK TRANSMISSION TYPE. Is the target AT vehicle?	Target is AT vehicle.	Go to step 8 .	Repair open or short to ground between ignition switch and starter motor.
8 CHECK INPUT VOLTAGE OF INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to ST. Connector & terminal (B12) No. 12 (+) — Engine ground (-): Does the measured value exceed the specified value?	10 V	Go to step 9 .	Repair open or ground short circuit in harness between inhibitor switch and ignition switch.
9 CHECK INHIBITOR SWITCH. 1) Place the selector lever in the “P” or “N” position. 2) Measure the resistance between inhibitor switch terminals. Connector & terminal (T3) No. 11 — No. 12: Is the measured value less than specified value?	1 Ω	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace the inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR ENGINE STARTING FAILURE

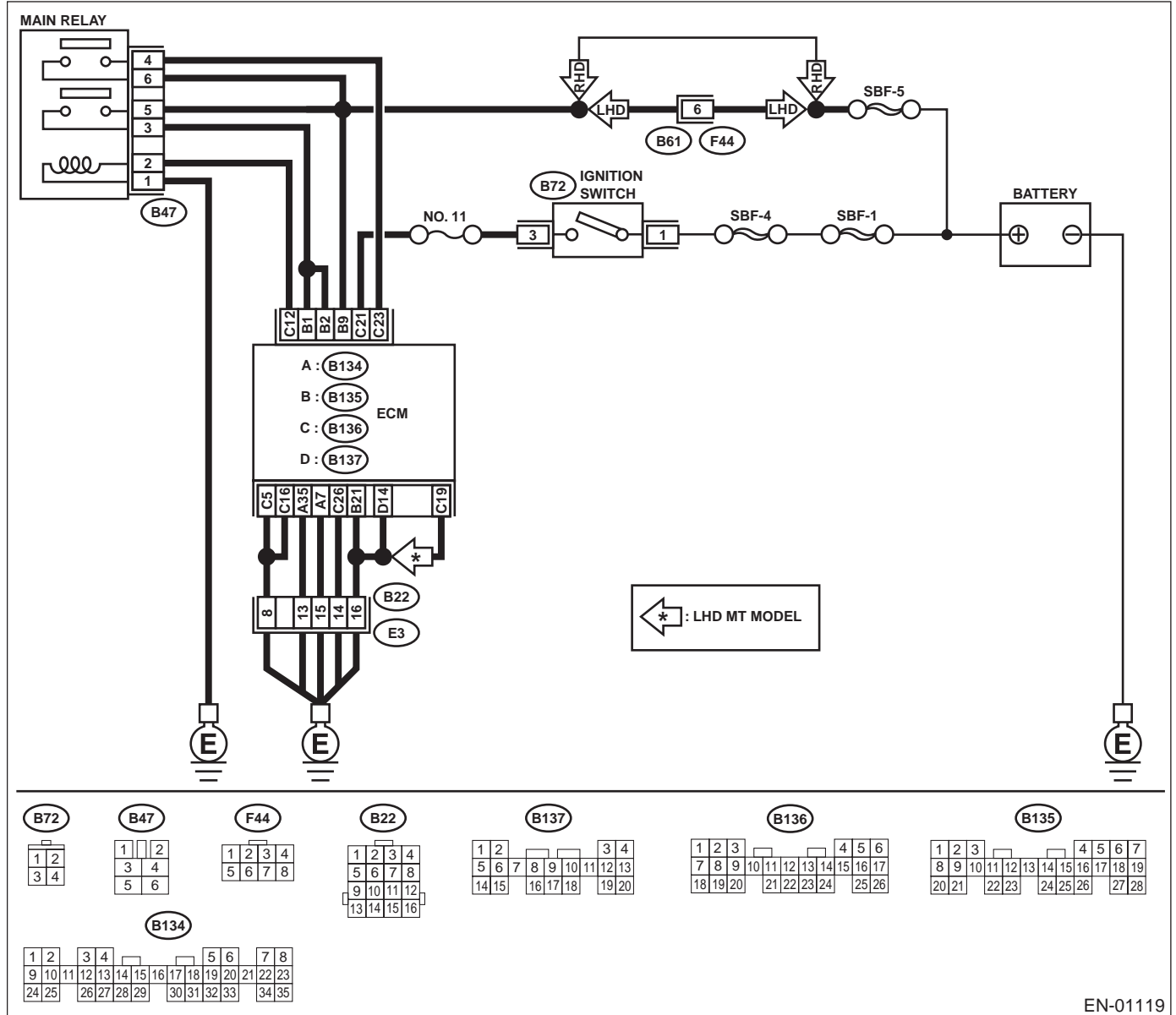
ENGINE (DIAGNOSTICS)

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode. <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01119

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK MAIN RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove main relay. 3) Connect battery to main relay terminals No. 1 and No. 2. 4) Measure resistance between main relay terminals.</p> <p>Terminals No. 3 — No. 5: No. 4 — No. 6:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 2.	Replace main relay.
<p>2 CHECK GROUND CIRCUIT OF ECM.</p> <p>1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 7 — Chassis ground: (B134) No. 35 — Chassis ground: (B135) No. 21 — Chassis ground: (B136) No. 5 — Chassis ground: (B136) No. 16 — Chassis ground: (B136) No. 26 — Chassis ground: (B137) No. 14 — Chassis ground: (B136) No. 19 — Chassis ground (LHD MT model):</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair open circuit in harness between ECM connector and engine grounding terminal.
<p>3 CHECK INPUT VOLTAGE OF ECM.</p> <p>Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 9 (+) — Chassis ground (-): (B135) No. 23 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Repair ground short circuit of power supply circuit.
<p>4 CHECK INPUT VOLTAGE OF ECM.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 21(+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 5.	Repair open or ground short circuit of power supply circuit.
<p>5 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 12 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair ground short circuit in harness between ECM connector and main relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK OUTPUT VOLTAGE FROM ECM. 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Replace ECM.
<p>7 CHECK INPUT VOLTAGE OF MAIN RELAY. Check voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 8.	Repair open circuit in harness between ECM connector and main relay connector.
<p>8 CHECK GROUND CIRCUIT OF MAIN RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between main relay connector and chassis ground. Connector & terminal (B47) No. 1 — Chassis ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 9.	Repair open circuit between main relay and chassis ground.
<p>9 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 5 (+) — Chassis ground (-): (B47) No. 6 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 10.	Repair open or ground short circuit in harness of power supply circuit.
<p>10 CHECK INPUT VOLTAGE OF ECM. 1) Connect main relay connector. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 1 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Check ignition control system. <Ref. to EN(H4SO)-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR ENGINE STARTING FAILURE

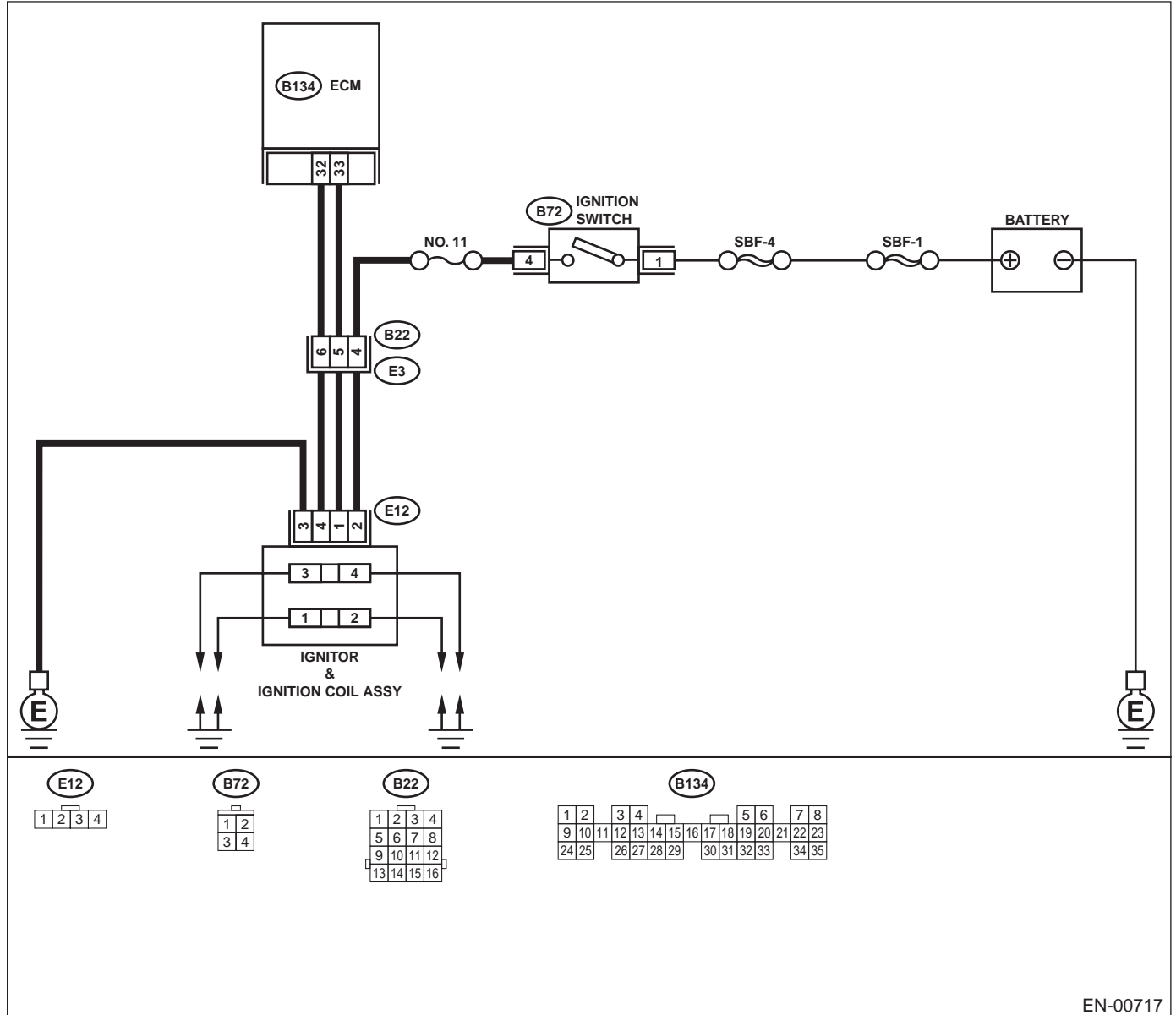
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00717

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPARK PLUG CONDITION. 1) Remove the spark plug. <Ref. to IG(H4SO)-5, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4SO)-6, INSPECTION, Spark Plug.> Is the spark plug's status OK?	OK	Go to step 2.	Replace the spark plug.
2 CHECK IGNITION SYSTEM FOR SPARKS. 1) Remove plug cord cap from each spark plug. 2) Install new spark plug on plug cord cap. CAUTION: Do not remove spark plug from engine. 3) Contact spark plug's thread portion on engine. 4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder. Does spark occur at each cylinder?	Spark occurs.	Check fuel pump system. <Ref. to EN(H4SO)-76, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 3.
3 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY. 1) Turn ignition switch to OFF. 2) Disconnect connector from ignition coil & ignitor assembly. 3) Turn ignition switch to ON. 4) Measure power supply voltage between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E12) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4 CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn ignition switch to OFF. 2) Measure resistance between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E12) No. 3 — Engine ground: Is the measured value less than the specified value?	5 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
5 CHECK IGNITION COIL & IGNITOR ASSEMBLY. 1) Remove spark plug cords. 2) Measure resistance between spark plug cord contact portions to check secondary coil. Terminals No. 1 — No. 2: No. 3 — No. 4: Is the measured value within the specified range?	10 - 15 kΩ	Go to step 6.	Replace ignition coil & ignitor assembly. <Ref. to IG(H4SO)-8, Ignition Coil and Ignitor Assembly.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY.</p> <p>1) Connect connector to ignition coil & ignitor assembly.</p> <p>2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal (E12) No. 1 (+) — Engine ground (-): (E12) No. 4 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Replace ignition coil & ignitor assembly. <Ref. to IG(H4SO)-8, Ignition Coil and Ignitor Assembly.>
<p>7 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from ECM.</p> <p>3) Disconnect connector from ignition coil & ignitor assembly.</p> <p>4) Measure resistance of harness between ECM and ignition coil & ignitor assembly connector.</p> <p>Connector & terminal (B134) No. 33 — (E12) No. 1: (B134) No. 32 — (E12) No. 4:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector
<p>8 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <p>Measure resistance of harness between ECM and engine ground.</p> <p>Connector & terminal: (B134) No. 32 — Engine ground: (B134) No. 33 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9.	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
<p>9 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM connector.</p> <p>Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H4SO)-76, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR ENGINE STARTING FAILURE

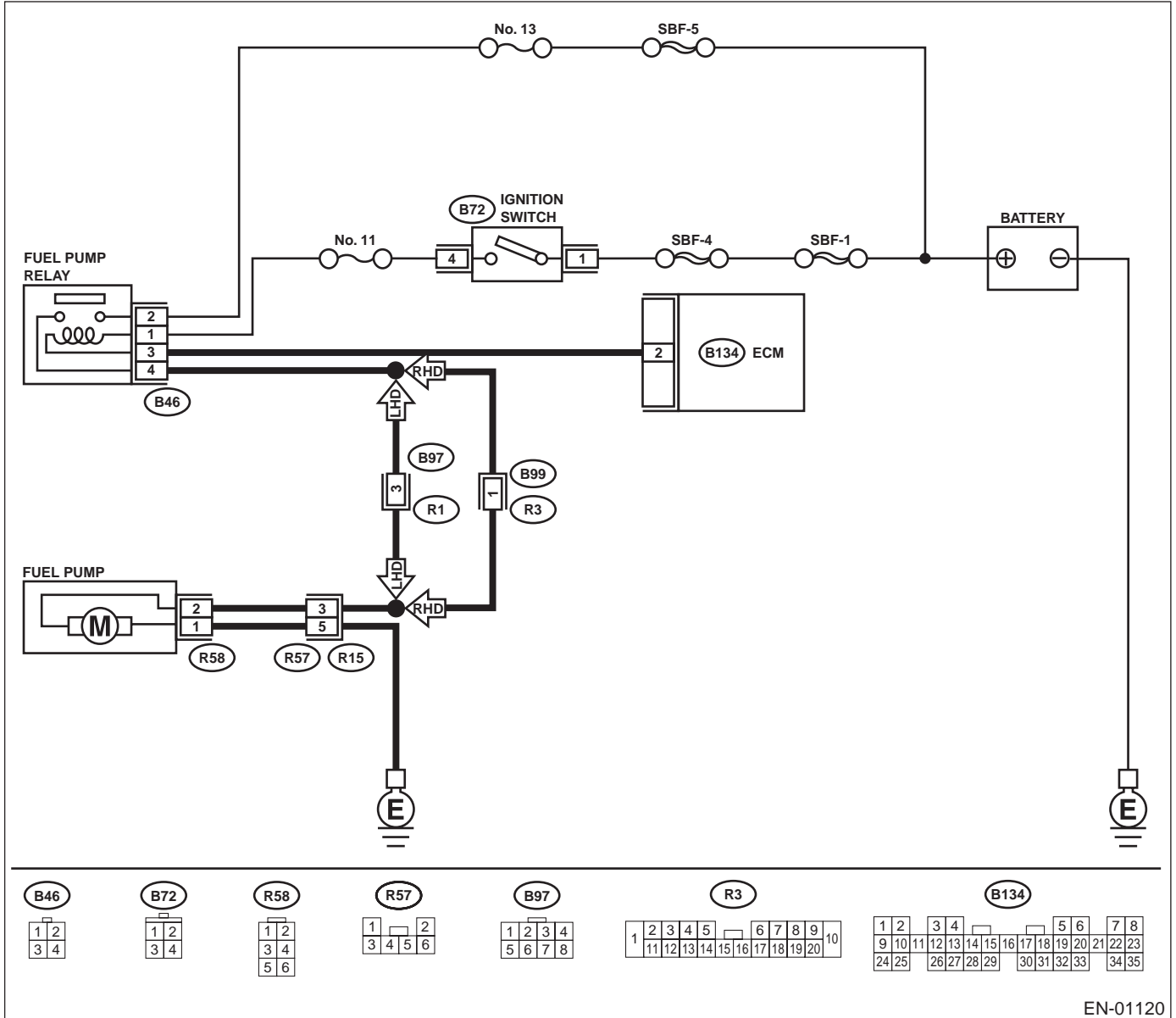
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01120

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OPERATING SOUND OF FUEL PUMP. Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON. Does fuel pump produce operating sound? NOTE: Fuel pump operation can also be executed using Subaru Select Monitor (Function mode: FD01). For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-48, Compulsory Valve Operation Check Mode.></p>	Operating sound produced.	Check fuel injector circuit. <Ref. to EN(H4SO)-80, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
<p>2 CHECK GROUND CIRCUIT OF FUEL PUMP. 1) Turn ignition switch to OFF. 2) Remove fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon). 3) Disconnect connector from fuel pump. 4) Measure resistance of harness connector between fuel pump and chassis ground. Connector & terminal (R58) No. 1 — Chassis ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector
<p>3 CHECK POWER SUPPLY TO FUEL PUMP. 1) Turn ignition switch to ON. 2) Measure voltage of power supply circuit between fuel pump connector and chassis ground. Connector & terminal (R58) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Replace fuel pump. <Ref. to FU(H4SO)-62, Fuel Pump.>	Go to step 4.
<p>4 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness connector between fuel pump and fuel pump relay. Connector & terminal (R58) No. 2 — (B46) No. 4: Is the measured value less than the specified value?</p>	1 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connectors
<p>5 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR. Measure resistance of harness between fuel pump and fuel pump relay connector. Connector & terminal (R58) No. 2 — Chassis ground: Is the measured value less than the specified value?</p>	1 MΩ	Go to step 6.	Repair short circuit in harness between fuel pump and fuel pump relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK FUEL PUMP RELAY. 1) Disconnect connectors from fuel pump relay and main relay. 2) Remove fuel pump relay and main relay with bracket. 3) Connect battery to fuel pump relay connector terminals No. 1 and No. 3. 4) Measure resistance between connector terminals of fuel pump relay. Terminals No. 2 — No. 4: Is the measured value less than the specified value?	10 Ω	Go to step 7.	Replace fuel pump relay. <Ref. to FU(H4SO)-47, Fuel Pump Relay.>
7 CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR. 1) Disconnect connectors from ECM. 2) Measure resistance of harness between ECM and fuel pump relay connector. Connector & terminal (B134) No. 11 — (B46) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 8.	Repair open circuit in harness between ECM and fuel pump relay connector.
8 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(H4SO)-80, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

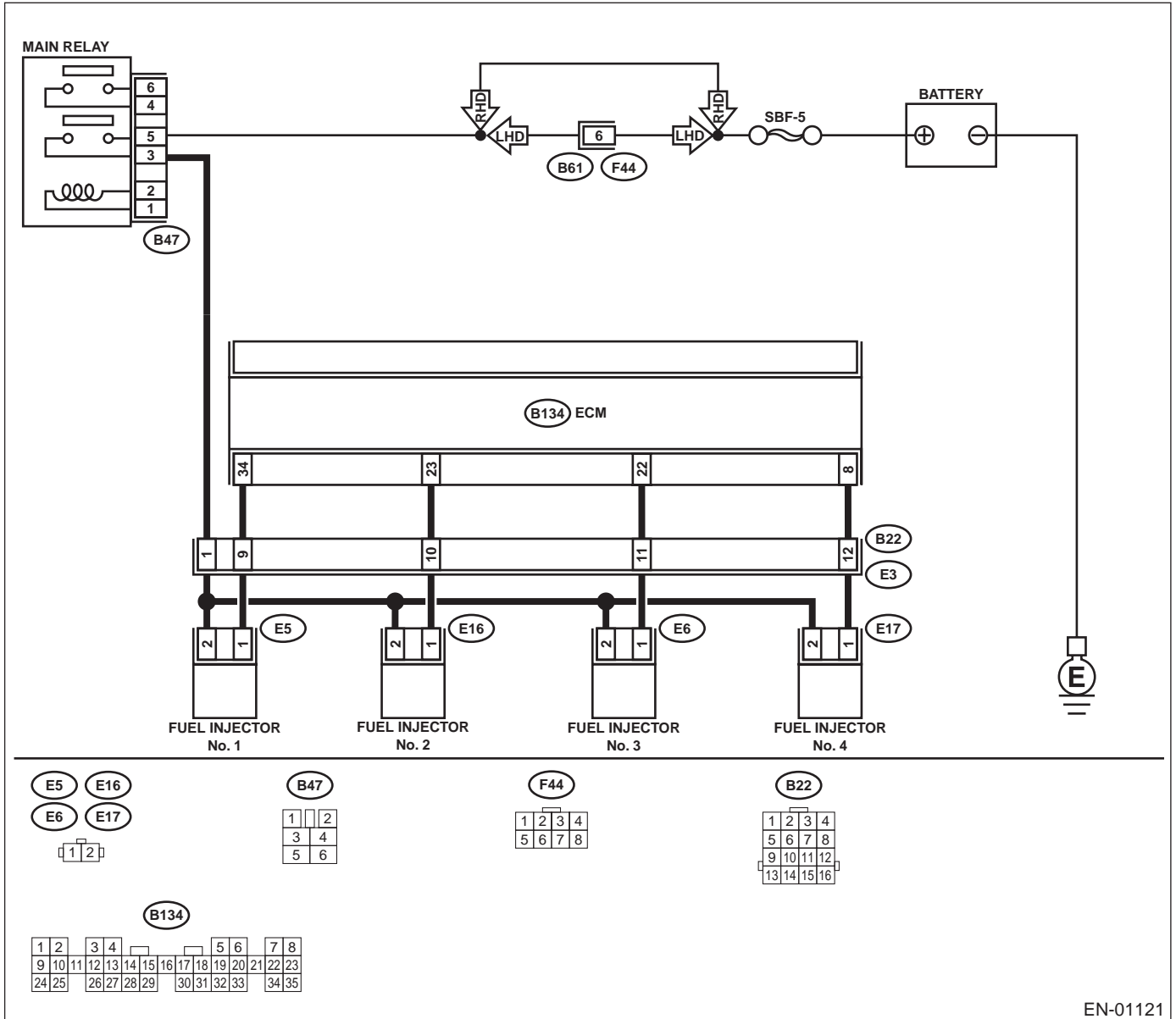
DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Check or repair only faulty parts.
- After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode. <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.>
- WIRING DIAGRAM:



EN-01121

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OPERATION OF EACH FUEL INJECTOR. While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check. Does the fuel injector produce “operating” sound?</p>	Operating sound produced.	Check fuel pressure. <Ref. to ME(H4SO)-28, INSPECTION, Fuel Pressure.>	Go to step 2.
<p>2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector. 3) Turn ignition switch to ON. 4) Measure power supply voltage between the fuel injector terminal and engine ground. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
<p>3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect connector from ECM and fuel injector. 2) Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 34 — (E5) No. 1: (B134) No. 23 — (E16) No. 1: (B134) No. 22 — (E6) No. 1: (B134) No. 8 — (E17) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
<p>4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 34 — Chassis ground: (B134) No. 23 — Chassis ground: (B134) No. 22 — Chassis ground: (B134) No. 8 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Repair ground short circuit in harness between ECM and fuel injector connector.
<p>5 CHECK EACH FUEL INJECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between each fuel injector terminals. Terminals No. 1 — No. 2: Is the measured value within the specified range?</p>	5 - 20 Ω	Go to step 6.	Replace faulty fuel injector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(H4SO)-304, INSPECTION, General Diagnostic Table.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

18. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-90, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-92, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-96, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-98, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-102, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold absolute pressure/barometric pressure circuit range/performance	<Ref. to EN(H4SO)-104, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold absolute pressure/barometric pressure circuit low input	<Ref. to EN(H4SO)-106, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold absolute pressure/barometric pressure circuit high input	<Ref. to EN(H4SO)-110, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature circuit range/performance	<Ref. to EN(H4SO)-114, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature circuit low input	<Ref. to EN(H4SO)-116, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature circuit high input	<Ref. to EN(H4SO)-118, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature circuit low input	<Ref. to EN(H4SO)-122, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature circuit high input	<Ref. to EN(H4SO)-124, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle/pedal position sensor/switch "A" circuit range/performance	<Ref. to EN(H4SO)-128, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/pedal position sensor/switch "A" circuit low input	<Ref. to EN(H4SO)-130, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/pedal position sensor/switch "A" circuit high input	<Ref. to EN(H4SO)-134, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0125	Insufficient coolant temperature for closed loop fuel control	<Ref. to EN(H4SO)-136, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Barometric pressure too low	<Ref. to EN(H4SO)-138, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O2 sensor circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-140, DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O2 sensor circuit low voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-144, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O2 sensor circuit high voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-146, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 sensor circuit slow response (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-148, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-150, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-152, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-156, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O2 sensor circuit slow response (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-160, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too lean (Bank 1)	<Ref. to EN(H4SO)-162, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too rich (Bank 1)	<Ref. to EN(H4SO)-164, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(H4SO)-167, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(H4SO)-167, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(H4SO)-167, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(H4SO)-168, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor 1 circuit low input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)-176, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor 1 circuit high input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)-178, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0335	Crankshaft position sensor "A" circuit	<Ref. to EN(H4SO)-180, DTC P0335 — CRANKSHAFT POSITION SENSOR "A" CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft position sensor "A" circuit range/performance	<Ref. to EN(H4SO)-182, DTC P0336 — CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft position sensor "A" circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)-184, DTC P0340 — CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft position sensor "A" circuit range/performance (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)-186, DTC P0341 — CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust gas recirculation flow	<Ref. to EN(H4SO)-190, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst system efficiency below threshold (Bank 1)	<Ref. to EN(H4SO)-194, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative emission control system purge control valve circuit low	<Ref. to EN(H4SO)-196, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative emission control system purge control valve circuit high	<Ref. to EN(H4SO)-200, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance	<Ref. to EN(H4SO)-204, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(H4SO)-206, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel level sensor circuit high input	<Ref. to EN(H4SO)-210, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor circuit intermittent	<Ref. to EN(H4SO)-214, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT—, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan rationality check	<Ref. to EN(H4SO)-216, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle speed sensor circuit low input	<Ref. to EN(H4SO)-220, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle speed sensor intermittent/erratic/high	<Ref. to EN(H4SO)-222, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(H4SO)-226, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle control system RPM higher than expected	<Ref. to EN(H4SO)-228, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0512	Starter request circuit	<Ref. to EN(H4SO)-230, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect immobilizer key	<Ref. to IM-24, DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY), Diagnostic Procedure with Trouble Code (DTC).>
P0519	Idle air control circuit system performance	<Ref. to EN(H4SO)-232, DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0565	Cruise control on signal	<Ref. to EN(H4SO)-234, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal control module random access memory (RAM) error	<Ref. to EN(H4SO)-236, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling fan 1 control circuit low	<Ref. to EN(H4SO)-238, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling fan 1 control circuit high	<Ref. to EN(H4SO)-242, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque converter/brake switch “B” circuit	<Ref. to EN(H4SO)-246, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit (PRNDL Input)	<Ref. to AT-132, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit	<Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Input/turbine speed sensor circuit range/performance	<Ref. to AT-64, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor circuit	<Ref. to AT-58, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine speed input circuit range/performance	<Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(H4SO)-248, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(H4SO)-248, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(H4SO)-248, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN(H4SO)-250, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch circuit performance or stuck off	<Ref. to EN(H4SO)-252, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque converter clutch circuit electrical	<Ref. to AT-96, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure control solenoid “A” electrical	<Ref. to AT-88, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0753	Shift solenoid "A" electrical	<Ref. to AT-72, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid "B" electrical	<Ref. to AT-76, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Shift solenoid "E" performance or stuck off	<Ref. to AT-80, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure control solenoid "B" electrical	<Ref. to AT-92, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/timing solenoid	<Ref. to AT-84, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral switch input circuit low	<Ref. to EN(H4SO)-254, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and <Ref. to EN(H4SO)-256, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral switch input circuit high	<Ref. to EN(H4SO)-258, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and <Ref. to EN(H4SO)-262, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM communication circuit range/performance	<Ref. to EN(H4SO)-266, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM communication circuit low	<Ref. to EN(H4SO)-268, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM communication circuit high	<Ref. to EN(H4SO)-270, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor circuit malfunction (low input)	<Ref. to EN(H4SO)-138, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor circuit malfunction (high input)	<Ref. to EN(H4SO)-273, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F sensor micro-computer problem	<Ref. to EN(H4SO)-274, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1137	O2 sensor circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-276, DTC P1137 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1492	EGR solenoid valve signal #1 circuit malfunction (low input)	<Ref. to EN(H4SO)-279, DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1493	EGR solenoid valve signal #1 circuit malfunction (high input)	<Ref. to EN(H4SO)-279, DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1494	EGR solenoid valve signal #2 circuit malfunction (low input)	<Ref. to EN(H4SO)-279, DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1495	EGR solenoid valve signal #2 circuit malfunction (high input)	<Ref. to EN(H4SO)-279, DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1496	EGR solenoid valve signal #3 circuit malfunction (low input)	<Ref. to EN(H4SO)-279, DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)—, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1497	EGR solenoid valve signal #3 circuit malfunction (high input)	<Ref. to EN(H4SO)-279, DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1498	EGR solenoid valve signal #4 circuit malfunction (low input)	<Ref. to EN(H4SO)-280, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1499	EGR solenoid valve signal #4 circuit malfunction (high input)	<Ref. to EN(H4SO)-282, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1510	ISC solenoid valve signal #1 circuit malfunction (low input)	<Ref. to EN(H4SO)-220, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1511	ISC solenoid valve signal #1 circuit malfunction (high input)	<Ref. to EN(H4SO)-284, DTC P1511 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1512	ISC solenoid valve signal #2 circuit malfunction (low input)	<Ref. to EN(H4SO)-284, DTC P1512 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1513	ISC solenoid valve signal #2 circuit malfunction (high input)	<Ref. to EN(H4SO)-284, DTC P1513 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1514	ISC solenoid valve signal #3 circuit malfunction (low input)	<Ref. to EN(H4SO)-284, DTC P1514 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1515	ISC solenoid valve signal #3 circuit malfunction (high input)	<Ref. to EN(H4SO)-284, DTC P1515 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1516	ISC solenoid valve signal #4 circuit malfunction (low input)	<Ref. to EN(H4SO)-286, DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1517	ISC solenoid valve signal #4 circuit malfunction (high input)	<Ref. to EN(H4SO)-288, DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(H4SO)-290, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(H4SO)-294, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1570	Antenna	<Ref. to IM-26, DTC P1570 ANTENNA, Diagnostic Procedure with Trouble Code (DTC).>
P1571	Reference code incompatibility	<Ref. to IM-17, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Trouble Code (DTC).>
P1572	IMM circuit failure	<Ref. to IM-18, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Trouble Code (DTC).>
P1574	Key communication failure	<Ref. to IM-23, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Trouble Code (DTC).>
P1576	EGI control module EEPROM	<Ref. to IM-25, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Trouble Code (DTC).>
P1577	IMM control module	<Ref. to IM-25, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Trouble Code (DTC).>
P1698	Engine torque control cut signal circuit malfunction (low input)	<Ref. to EN(H4SO)-296, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine torque control cut signal circuit malfunction (high input)	<Ref. to EN(H4SO)-298, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle position sensor circuit malfunction for AT	<Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine torque control signal #1 circuit malfunction	<Ref. to EN(H4SO)-300, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine torque control signal #2 circuit malfunction	<Ref. to EN(H4SO)-302, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

19. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

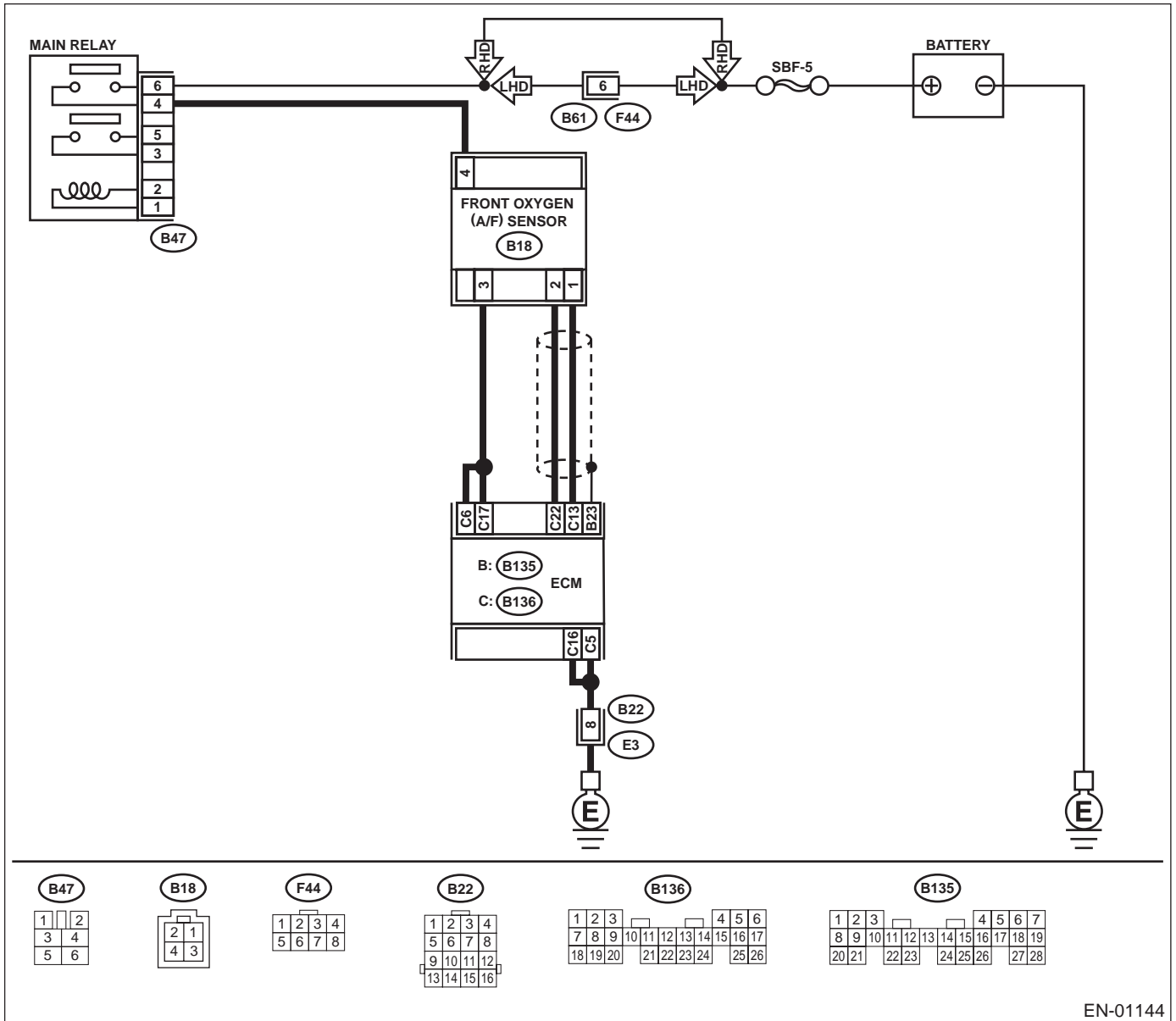
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Start and warm-up engine. 2) Turn ignition switch to OFF. 3) Disconnect connectors from ECM and front oxygen (A/F) sensor. 4) Measure harness resistance between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B136) No. 6 - (B18) No. 3: (B136) No. 17 - (B18) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair open circuit between ECM and front oxygen (A/F) sensor connector.
<p>2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>Measure harness resistance between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B136) No. 13 - (B18) No. 1: (B136) No. 22 - (B18) No. 2:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	Repair open circuit between ECM and front oxygen (A/F) sensor connector.
<p>3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>Measure harness resistance between main relay and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B47) No. 4 — (B18) No. 4:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair open circuit between ECM and front oxygen (A/F) sensor connector.
<p>4 CHECK FRONT OXYGEN (A/F) SENSOR.</p> <p>Measure resistance between terminals in front oxygen (A/F) sensor connector.</p> <p>Terminal No.3 - No.4:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 5.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-41, Front Oxygen (A/F) Sensor.>
<p>5 CHECK POOR CONTACT.</p> <p>Check ECM and front oxygen (A/F) sensor connector for poor contact.</p> <p>Is there any poor contact in ECM and front oxygen (A/F) sensor connector.</p>	There is poor contact.	Repair poor contact in ECM and front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-41, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

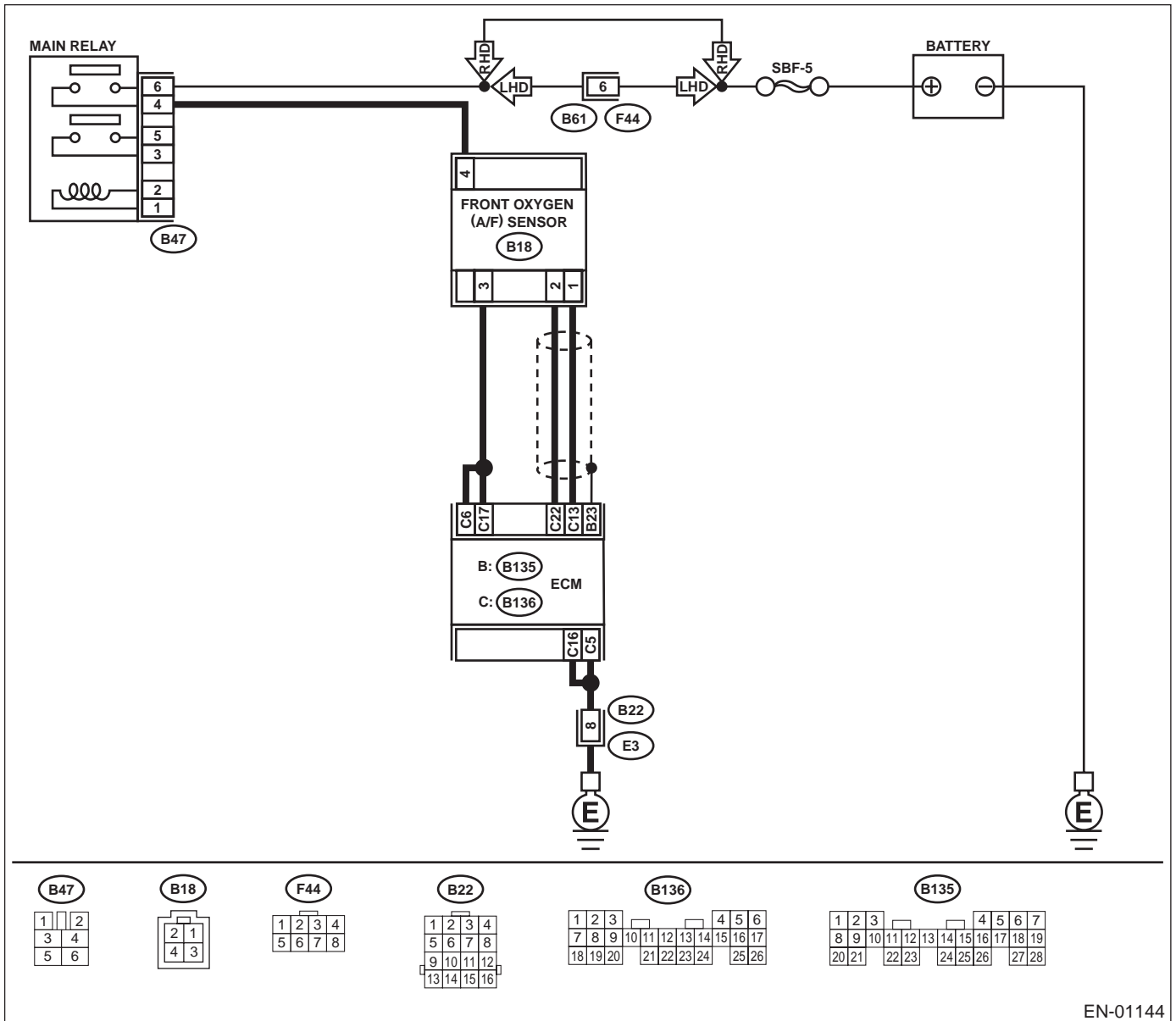
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031 and P0037 at the same time?	Indicated.	Go to step 2.	Go to step 5.
2 CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from front oxygen (A/F) sensor. 3) Turn ignition switch to ON. 4) Measure voltage between front oxygen (A/F) sensor connector and engine ground. Connector & terminal (B18) No. 4 (+) — Engine ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Repair power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
3 CHECK GROUND CIRCUIT OF ECM. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 5 — Chassis ground: (B136) No. 16 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK CURRENT DATA. 1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.2 A	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step 6.
5 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 6 (+) — Chassis ground (-): (B136) No. 17 (+) — Chassis ground (-): Is the measured value less than the specified value?	1.0 V	Go to step 7.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 6 (+) — Chassis ground (-): (B136) No. 17 (+) — Chassis ground (-): Is the measured value less than the specified value shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	1.0 V	Repair poor contact in ECM connector.	Go to step 7.
<p>7 CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn ignition switch to OFF. 2) Measure resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 3— No. 4: Is the measured value less than the specified value?</p>	10 Ω	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-41, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

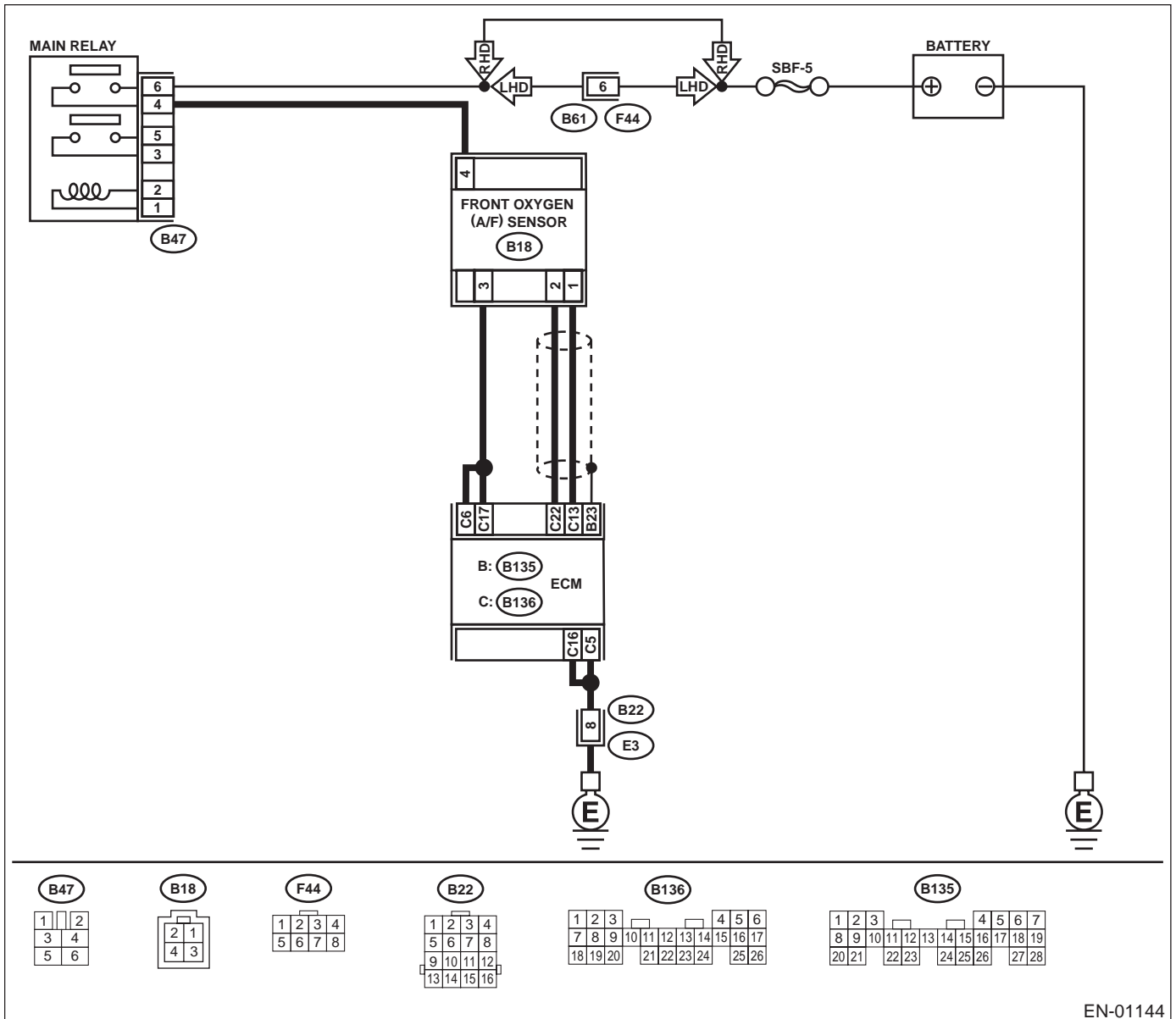
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 6 (+) — Chassis ground (-): (B136) No. 17 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	8 V	Go to step 3.	Go to step 2.
<p>2 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT. 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	2.3 A	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	END
<p>3 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 6 (+) — Chassis ground (-): (B136) No. 17 (+) — Chassis ground (-): Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value?</p>	8 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

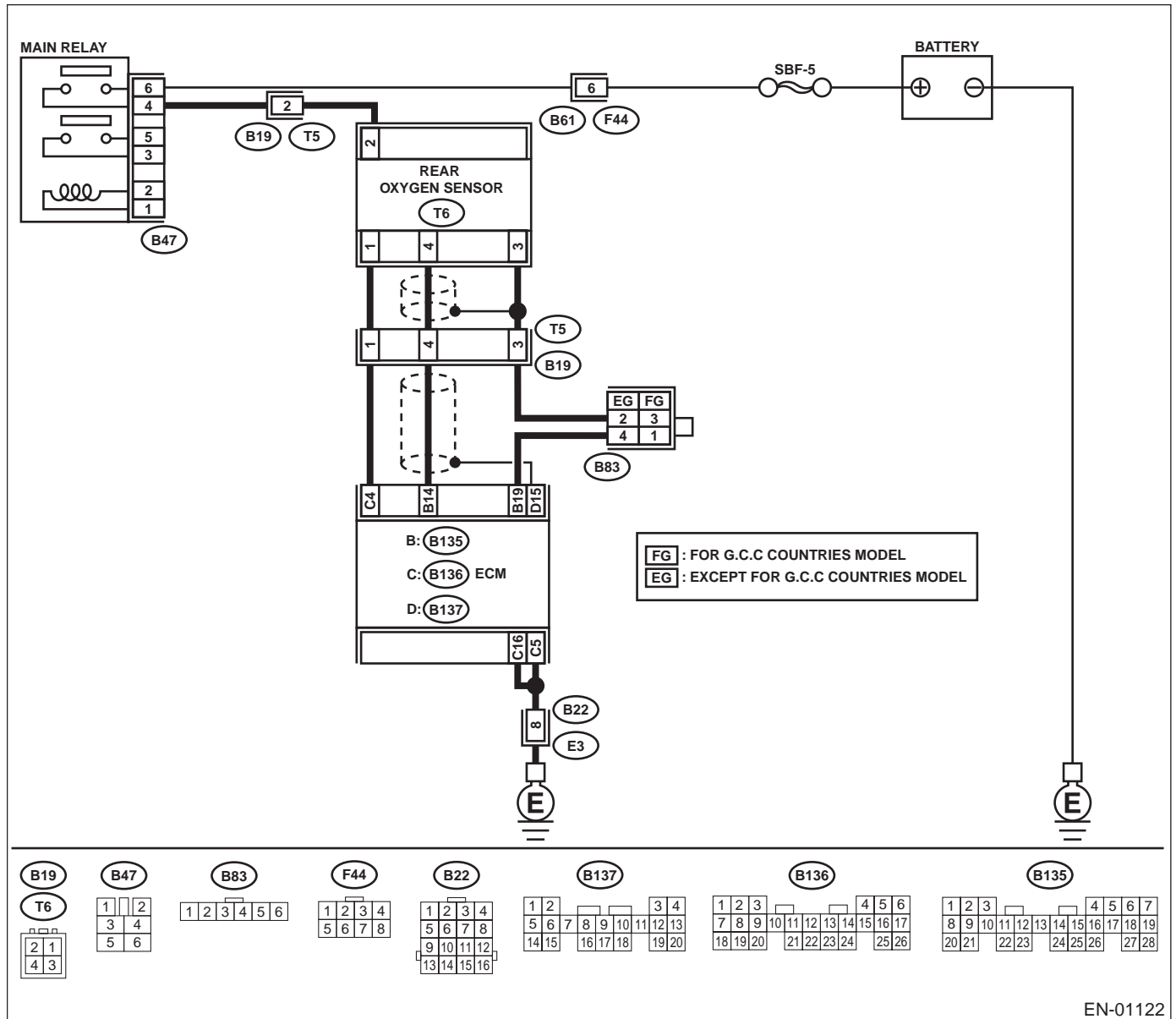
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN-01122

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND CIRCUIT OF ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 5 — Chassis ground: (B136) No. 16 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Go to step 2.
<p>2 CHECK CURRENT DATA. 1) Start engine. 2) Read data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	0.2 A	Repair connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step 3.
<p>3 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 4 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Go to step 6.	Go to step 4.
<p>4 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 4 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value by shaking harness and connector of ECM while monitoring the value?</p>	1.0 V	Repair poor contact in ECM connector.	Go to step 5.
<p>5 CHECK OUTPUT SIGNAL FROM ECM. 1) Disconnect connector from rear oxygen sensor. 2) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 4 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK POWER SUPPLY TO REAR OXYGEN SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor connector and engine ground or chassis ground.</p> <p>Connector & terminal (T6) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Repair power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
<p>7 CHECK REAR OXYGEN SENSOR. 1) Turn ignition switch to OFF. 2) Measure resistance between rear oxygen sensor connector terminals.</p> <p>Terminals No. 1 — No. 2: Is the measured value less than the specified value?</p>	30 Ω	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector 	Replace rear oxygen sensor. <Ref. to FU(H4SO)-43, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

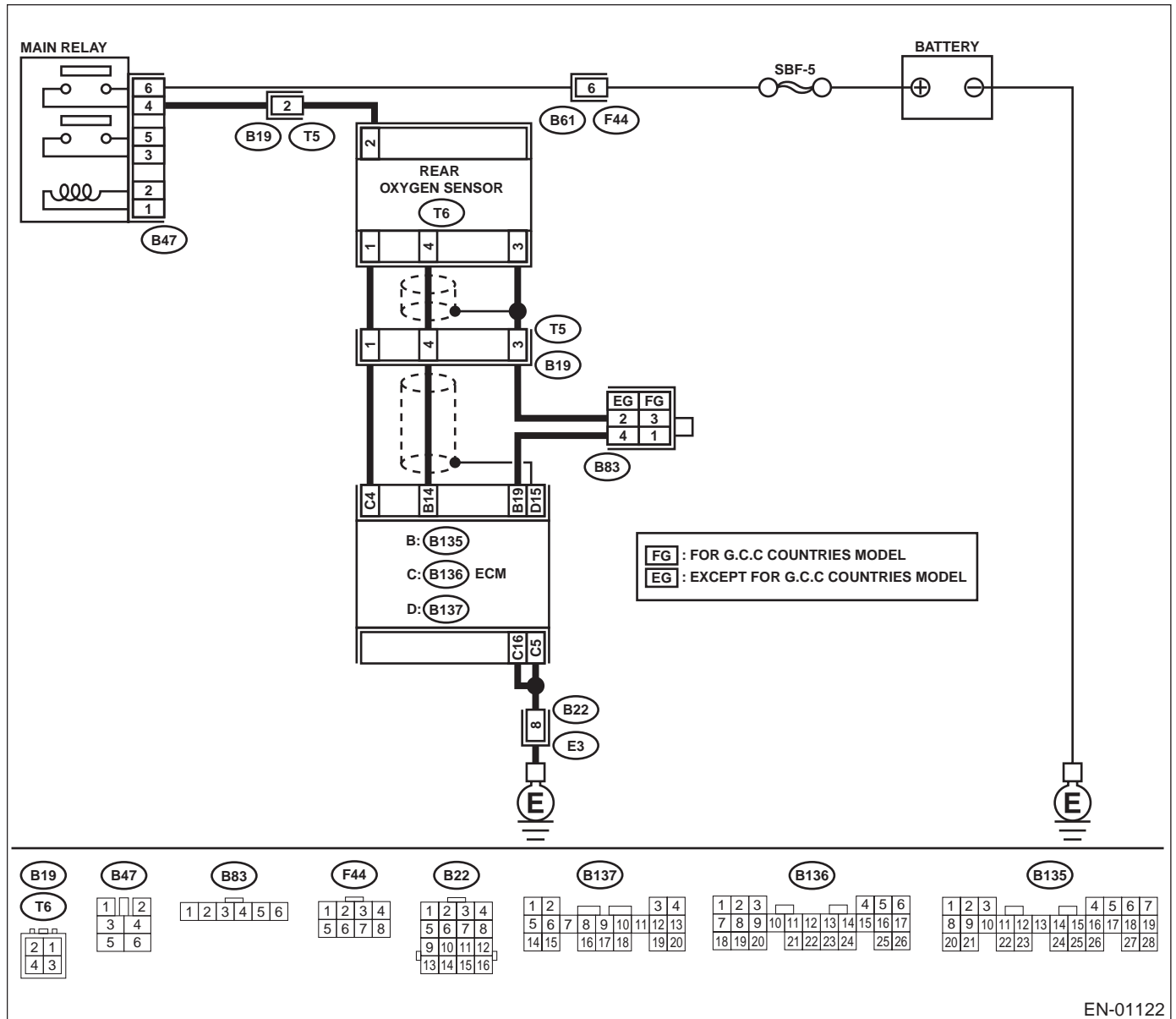
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01122

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 4 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 2.	Go to step 3.
2 CHECK CURRENT DATA. 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and rear oxygen sensor connector. 3) Turn ignition switch to ON. 4) Read data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	7 A	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	END
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	END

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

F: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

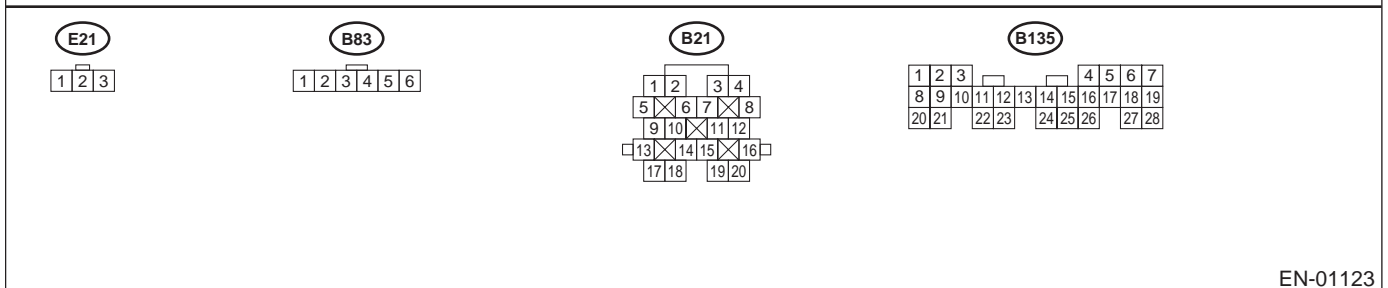
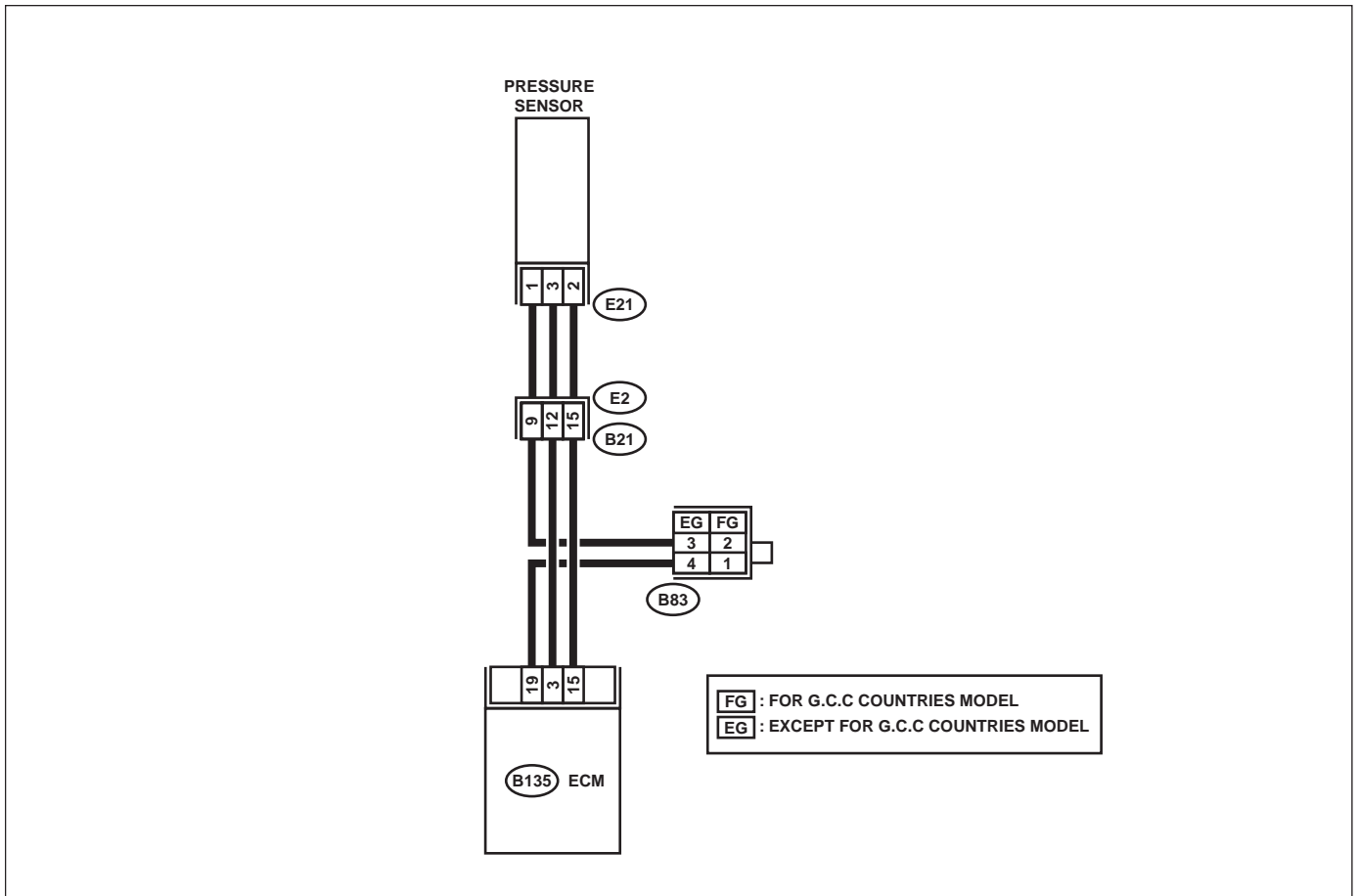
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01123

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. Are there holes, loose bolts or disconnection of hose on air intake system?	There are holes, loose bolts or disconnection of hose on air intake system.	Repair air intake system.	Go to step 3.
3 CHECK PRESSURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in the selector lever in "N" or "P" position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Ignition ON 73.3 - 106.6 kPa (550 - 800 mmHg, 21.65 - 31.50 inHg), Idling 20.0 - 46.7 kPa (150 - 350 mmHg, 5.91 - 13.78 inHg)	Go to step 4.	Replace intake air temperature sensor and pressure sensor. <Ref. to FU(H4SO)-32, Pressure Sensor.>
4 CHECK THROTTLE POSITION. Read data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	5% when throttle is fully closed.	Go to step 5.	Adjust or replace throttle position sensor. <Ref. to FU(H4SO)-30, Throttle Position Sensor.>
5 CHECK THROTTLE POSITION. Does the measured value exceed the specified value?	85% when throttle is fully open.	Replace pressure sensor. <Ref. to FU(H4SO)-32, Pressure Sensor.>	Replace throttle position sensor. <Ref. to FU(H4SO)-30, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

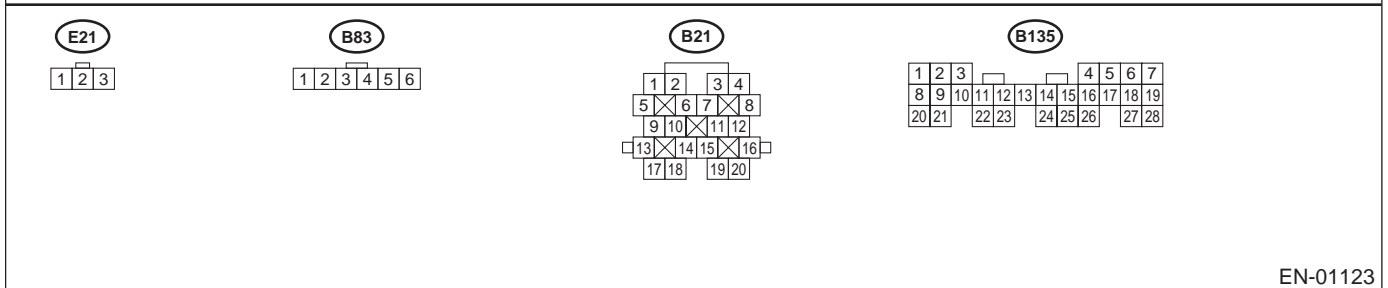
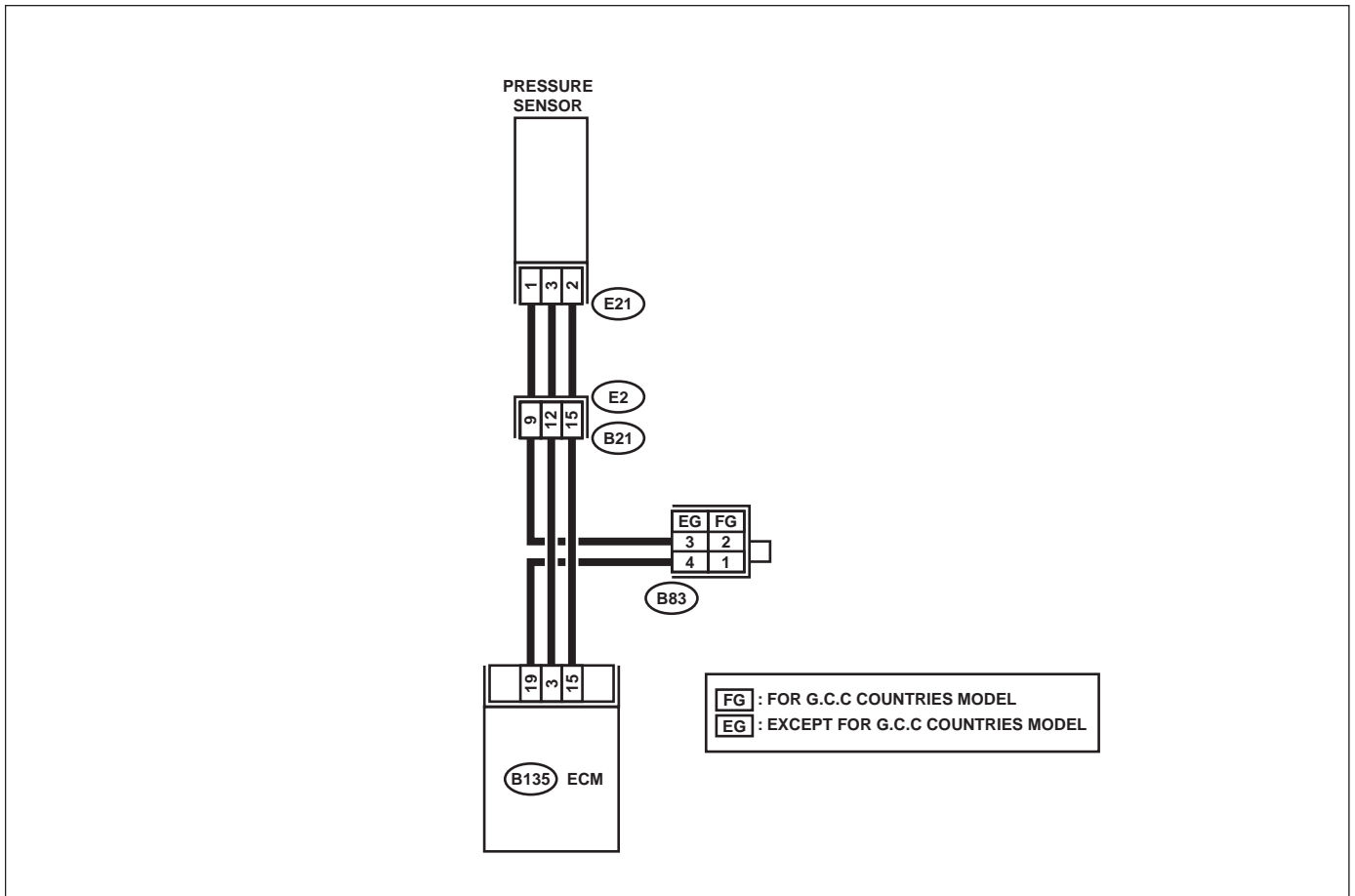
G: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN-01123

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA. 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	13.3 kPa (100 mmHg, 3.94 inHg)	Go to step 3.	Go to step 2.
<p>2 CHECK POOR CONTACT. Check poor contact in ECM and pressure sensor connector. Is there poor contact in ECM or pressure sensor connector?</p>	There is poor contact.	Repair poor contact in ECM or pressure sensor connector.	Even if MI lights up, the circuit has returned to a normal condition at this time.
<p>3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 5.	Go to step 4.
<p>4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	4.5 V	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
<p>5 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 15 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.2 V	Go to step 7.	Go to step 6.
<p>6 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read data of atmospheric absolute pressure signal using Subaru Select Monitor. Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.></p>	13.3 kPa (100 mmHg, 3.94 inHg)	Repair poor contact in ECM connector.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between intake air temperature sensor and pressure sensor connector and engine ground. Connector & terminal (E21) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 8 .	Repair open circuit in harness between ECM and pressure sensor connector.
<p>8 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and pressure sensor connector. Connector & terminal (B135) No. 19 — (E21) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 9 .	Repair open circuit in harness between ECM and pressure sensor connector.
<p>9 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. Measure resistance of harness between pressure sensor connector and engine ground. Connector & terminal (E21) No. 2 — Engine ground: Does the measured value exceed the specified value?</p>	500 kΩ	Go to step 10 .	Repair ground short circuit in harness between ECM and intake air temperature and pressure sensor connector.
<p>10 CHECK POOR CONTACT. Check poor contact in intake manifold pressure sensor connector. Is there poor contact in intake manifold pressure sensor connector?</p>	There is poor contact.	Repair poor contact in pressure sensor connector.	Replace pressure sensor. <Ref. to FU(H4SO)-32, Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

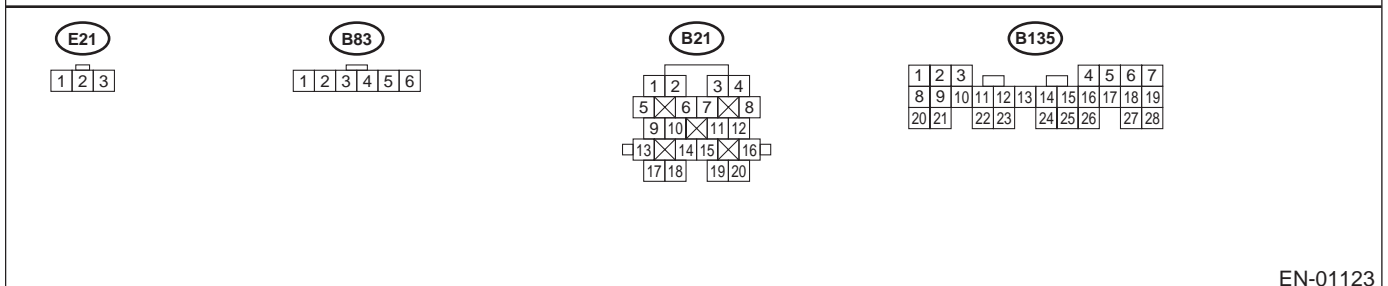
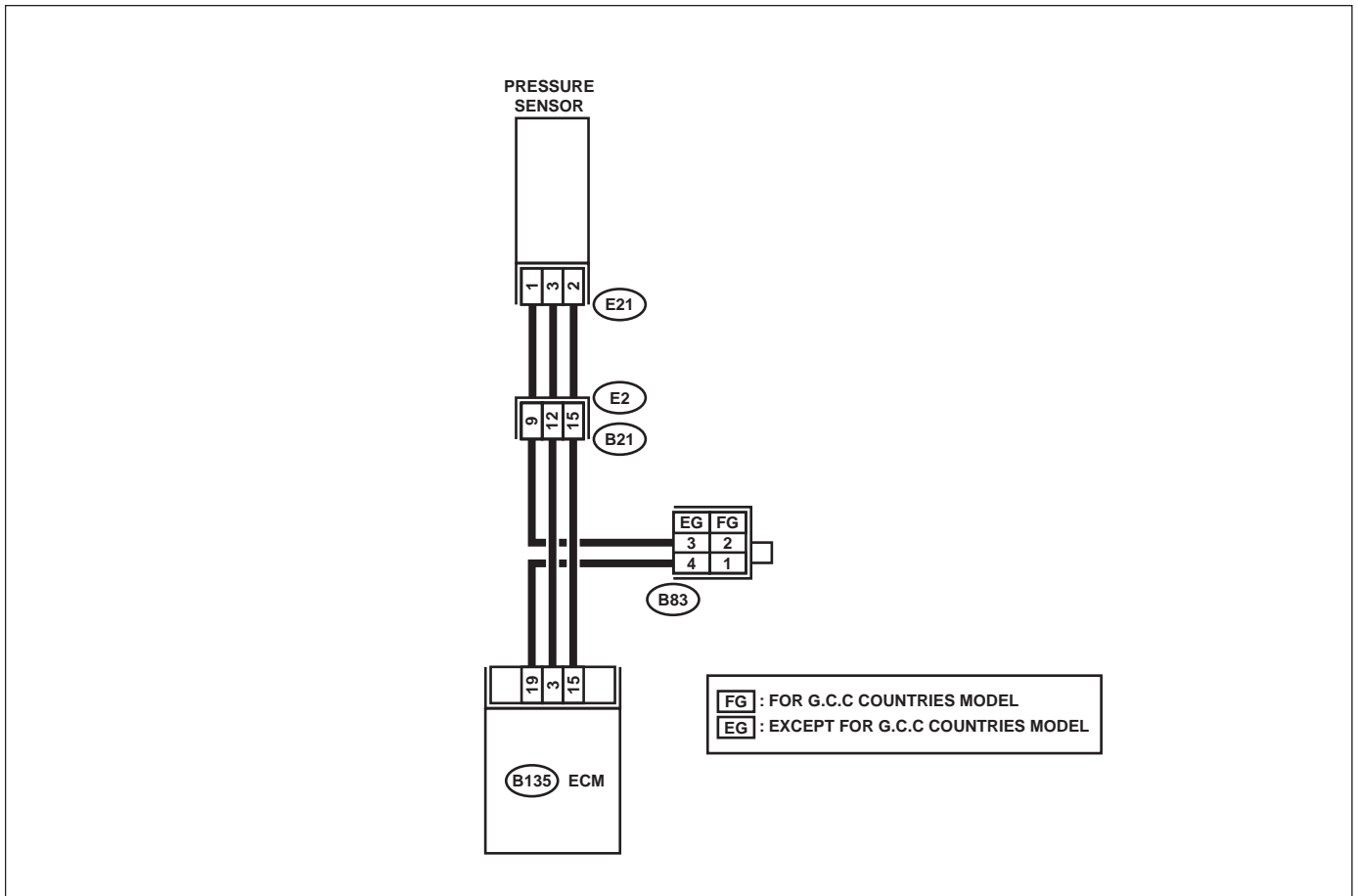
H: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN-01123

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA. 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	119.5 kPa (896.5 mmHg, 35.29 inHg)	Go to step 9.	Go to step 2.
<p>2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 4.	Go to step 3.
<p>3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	4.5 V	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
<p>4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 15 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.2 V	Go to step 6.	Go to step 5.
<p>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read data of atmospheric absolute pressure signal using Subaru Select Monitor. Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.></p>	13.3 kPa (100 mmHg, 3.94 inHg)	Repair poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect connector from pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between pressure sensor connector and engine ground. <p>Connector & terminal (E21) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 7.	Repair open circuit in harness between ECM and pressure sensor connector.
<p>7 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and pressure sensor connector. <p>Connector & terminal (B135) No. 15 — (E21) No. 2: (B135) No. 1 — (E21) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair open circuit in harness between ECM and pressure sensor connector.
<p>8 CHECK POOR CONTACT.</p> <p>Check poor contact in pressure sensor connector.</p> <p>Is there poor contact in pressure sensor connector?</p>	There is poor contact.	Repair poor contact in pressure sensor connector.	Replace pressure sensor. <Ref. to FU(H4SO)-32, Pressure Sensor.>
<p>9 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect connector from pressure sensor. 3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. <p>Does the measured value exceed the specified value?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	119.5 kPa (896.5 mmHg, 35.29 inHg)	Repair battery short circuit in harness between ECM and pressure sensor connector.	Replace pressure sensor. <Ref. to FU(H4SO)-32, Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

I: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

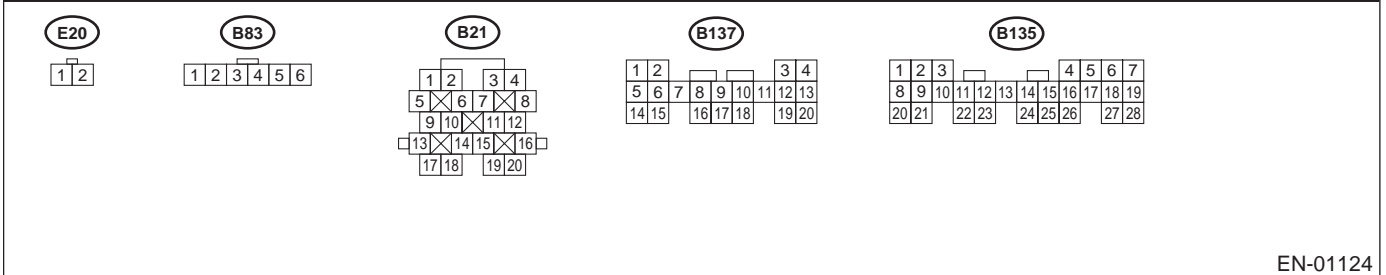
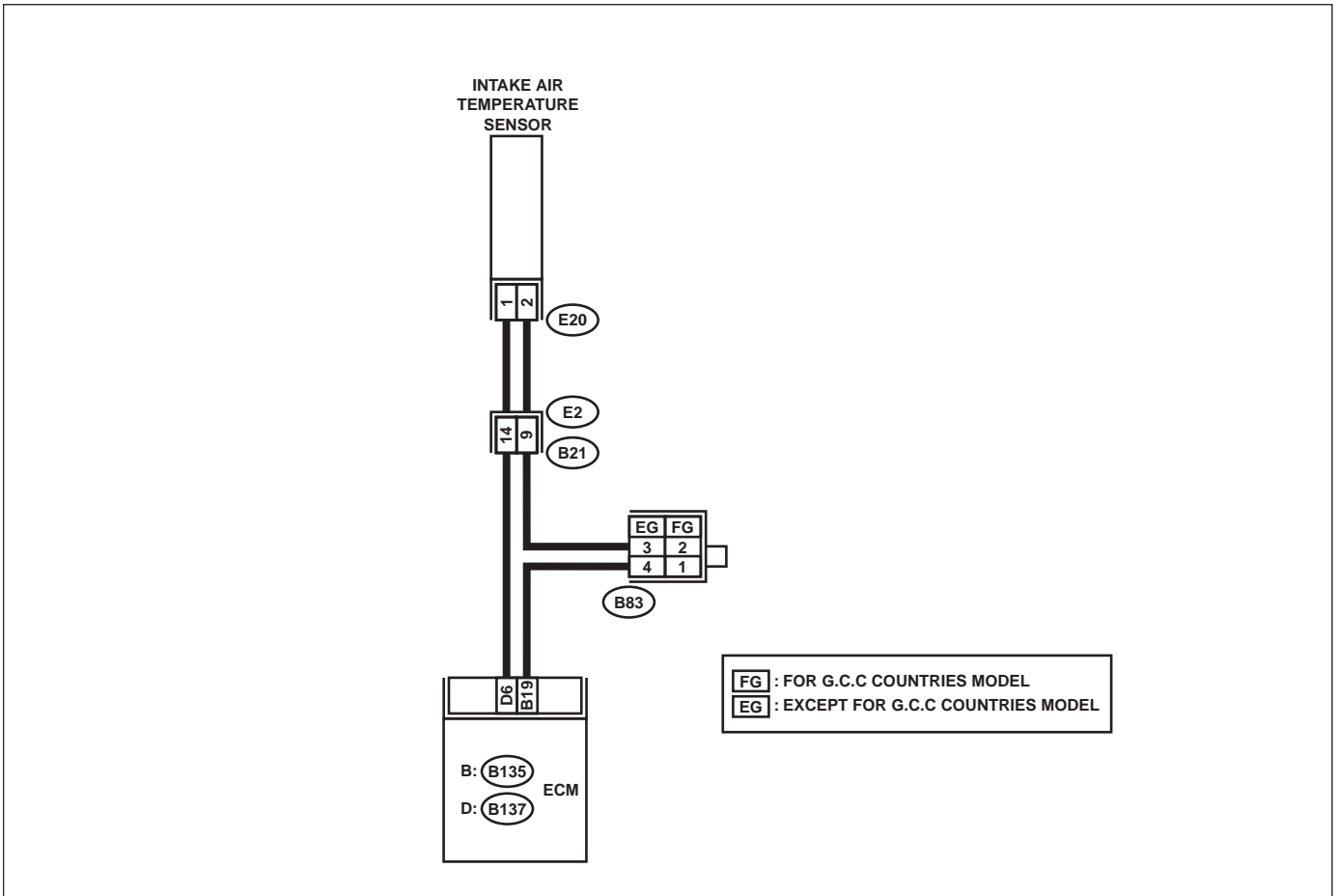
• TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01124

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?</p>	DTC indicated.	<p>Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).></p> <p>NOTE: In this case, it is not necessary to inspect DTC P0111.</p>	Go to step 2.
<p>2</p> <p>CHECK ENGINE COOLANT TEMPERATURE. 1) Start the engine and warm it up completely. 2) Measure engine coolant temperature using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	75 - 95°C (167 - 203°F)	Replace intake air temperature sensor. <Ref. to FU(H4SO)-33, REMOVAL, Intake Air Temperature Sensor.>	Inspect DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

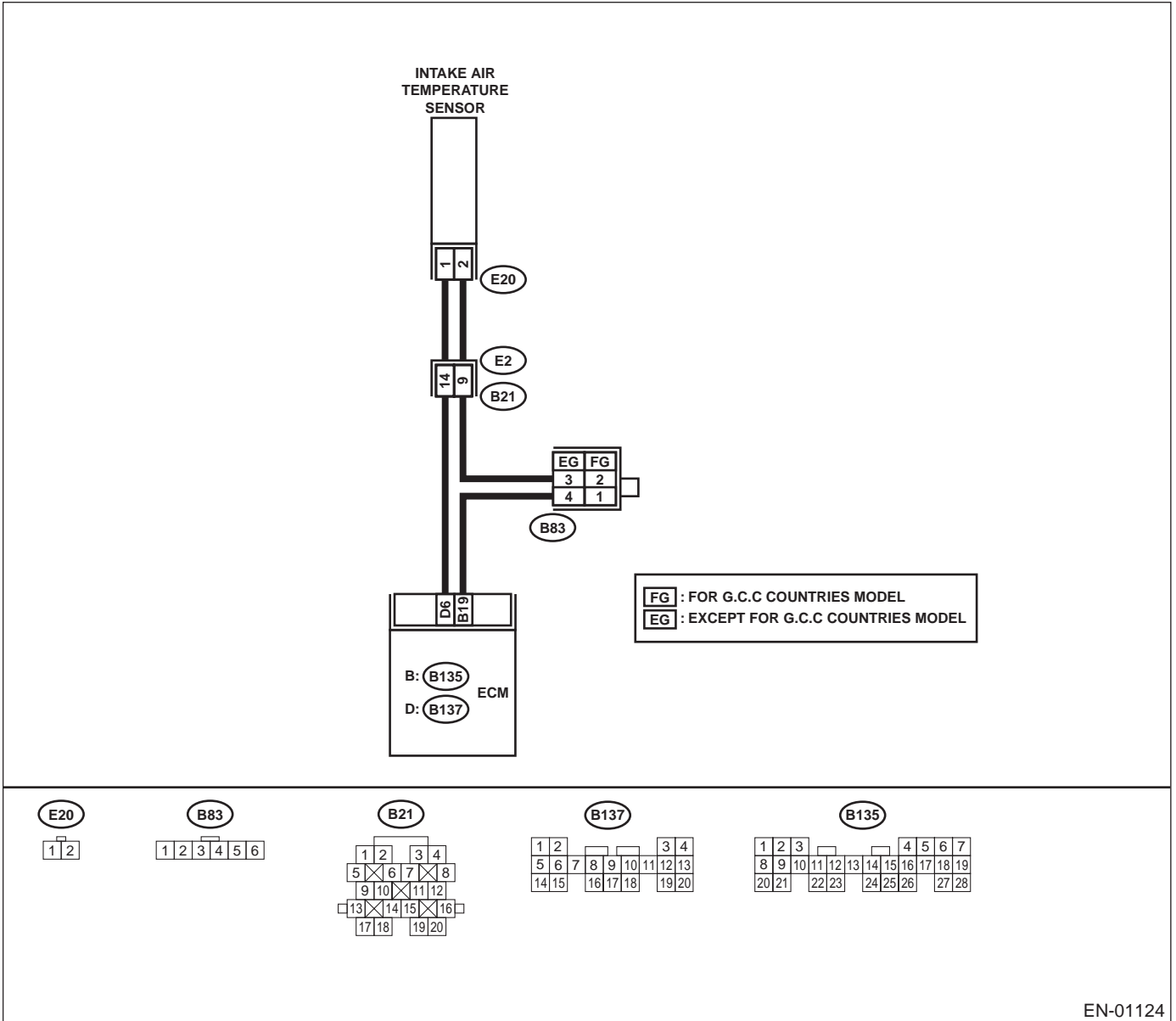
J: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01124

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start engine.</p> <p>2) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>Does the measured value exceed the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H4SO)-32, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>120°C (248°F)</p>	<p>Go to step 2.</p>	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from intake air temperature and pressure sensor.</p> <p>3) Turn ignition switch to ON.</p> <p>4) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>Is the measured value less than the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H4SO)-32, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>-40°C (-40°F)</p>	<p>Replace intake air temperature sensor. <Ref. to FU(H4SO)-33, REMOVAL, Intake Air Temperature Sensor.></p>	<p>Repair ground short circuit in harness between intake air temperature sensor and ECM connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

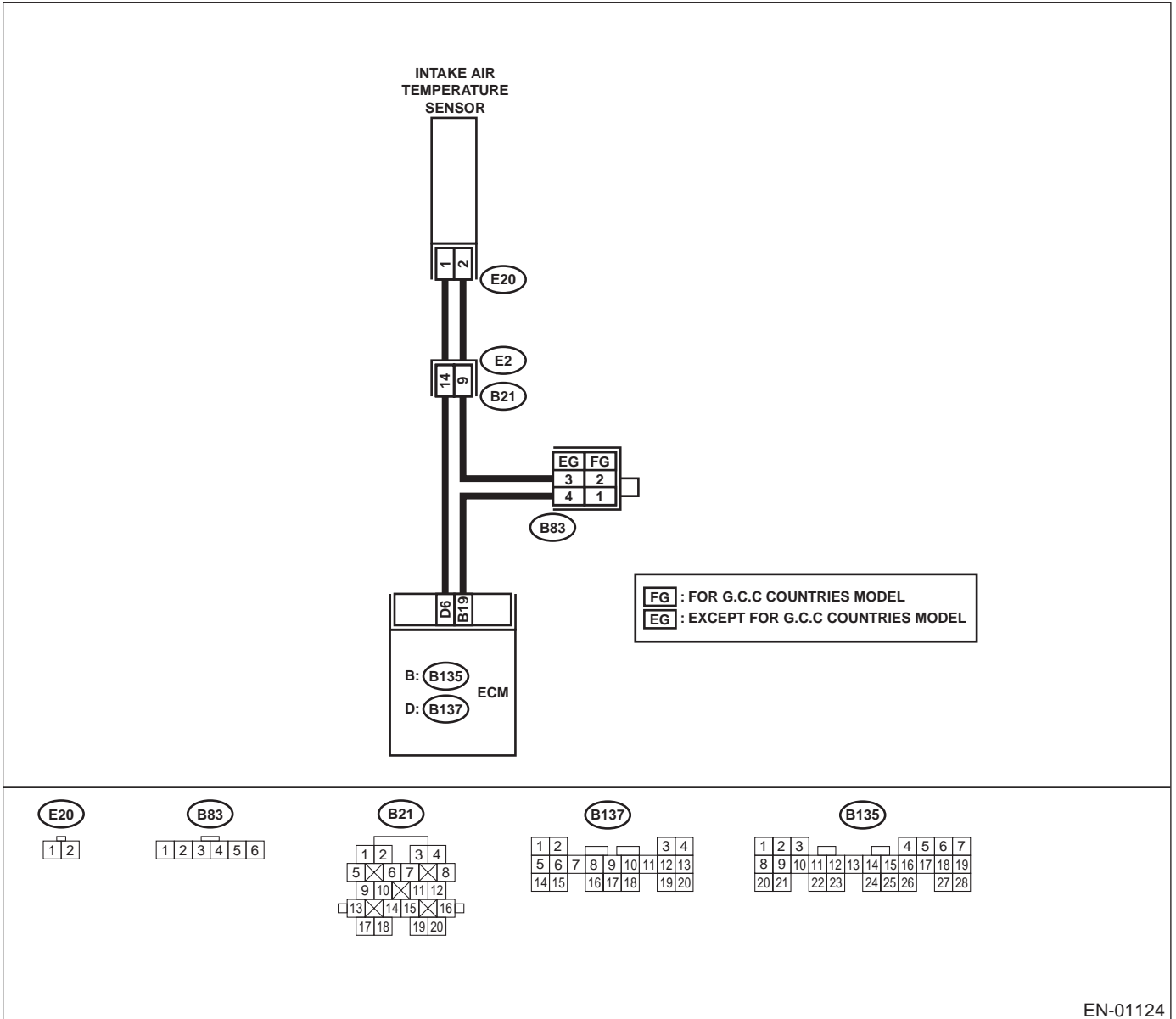
K: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01124

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA.</p> <p>1) Start engine.</p> <p>2) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>Is the measured value less than the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H4SO)-32, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	-40°C (-40°F)	Go to step 2.	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from intake air temperature sensor.</p> <p>3) Measure voltage between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal</p> <p>(E20) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step 3.
<p>3 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to ON.</p> <p>2) Measure voltage between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal</p> <p>(E20) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step 4.
<p>4 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure voltage between intake air temperature and pressure sensor connector and engine ground.</p> <p>Connector & terminal</p> <p>(E20) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	3 V	Go to step 5.	<p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance of harness between intake air temperature and pressure sensor connector and engine ground.</p> <p>Connector & terminal (E20) No. 2 — Engine ground: Is the measured value less than the specified value?</p>	5 Ω	Replace intake air temperature sensor. <Ref. to FU(H4SO)-33, REMOVAL, Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

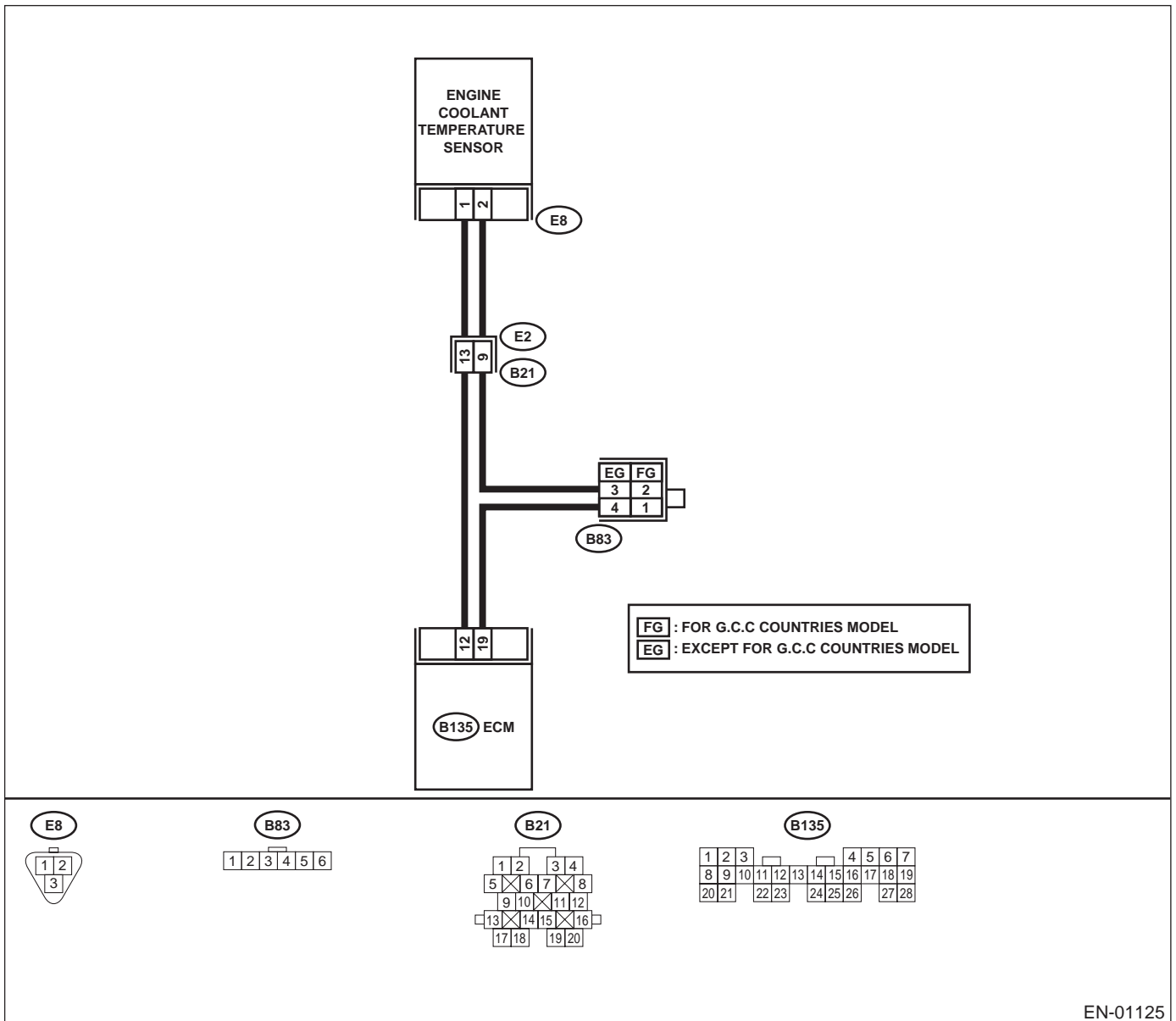
L: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Hard to start
 - Erroneous idling
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-01125

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start engine.</p> <p>2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>Does the measured value exceed the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H4SO)-32, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>120°C (248°F)</p>	<p>Go to step 2.</p>	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from engine coolant temperature sensor.</p> <p>3) Turn ignition switch to ON.</p> <p>4) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>Is the measured value less than the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H4SO)-32, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>-40°C (-40°F)</p>	<p>Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-26, REMOVAL, Engine Coolant Temperature Sensor.></p>	<p>Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

M: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

• **DTC DETECTING CONDITION:**

- Immediately at fault recognition

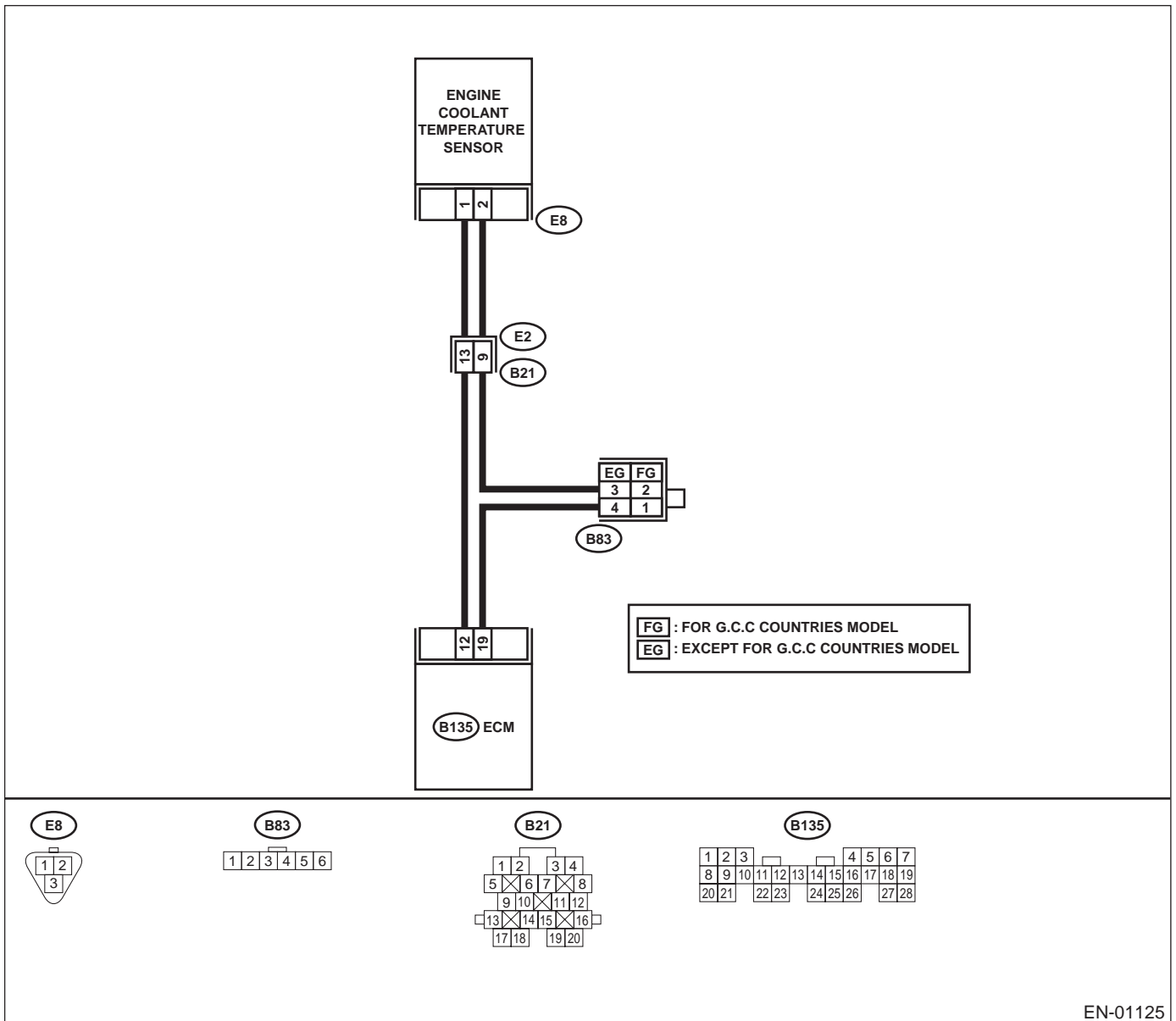
• **TROUBLE SYMPTOM:**

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01125

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start engine.</p> <p>2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>Is the measured value less than the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H4SO)-32, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>-40°C (-40°F)</p>	<p>Go to step 2.</p>	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from engine coolant temperature sensor.</p> <p>3) Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal</p> <p>(E8) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	<p>10 V</p>	<p>Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to ON.</p> <p>2) Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal</p> <p>(E8) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	<p>10 V</p>	<p>Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 4.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>4</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	<p>4 V</p>	<p>Go to step 5.</p>	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>5</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	<p>5 Ω</p>	<p>Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-26, Engine Coolant Temperature Sensor.></p>	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

N: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

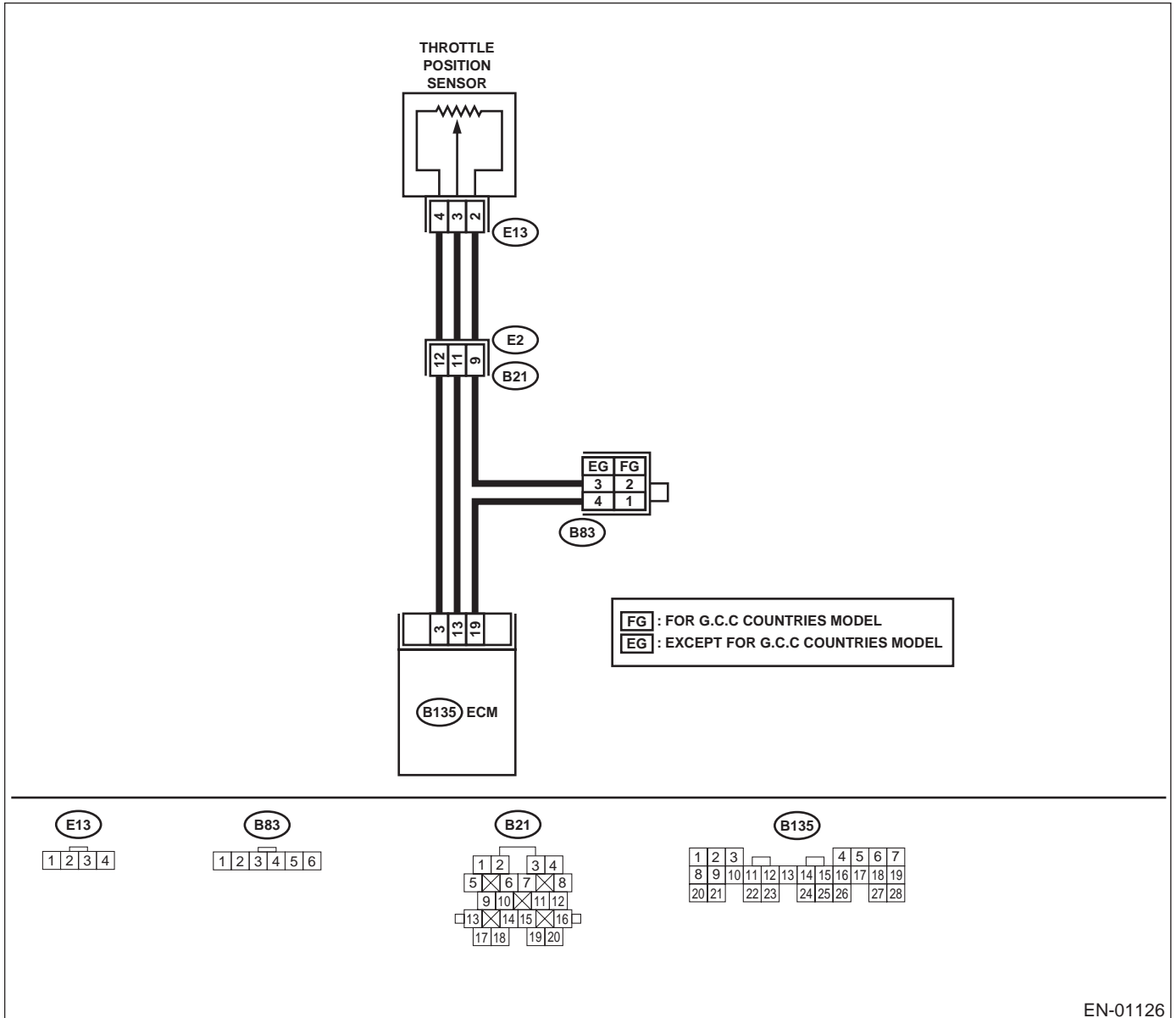
• **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01126

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace throttle position sensor. <Ref. to FU(H4SO)-30, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

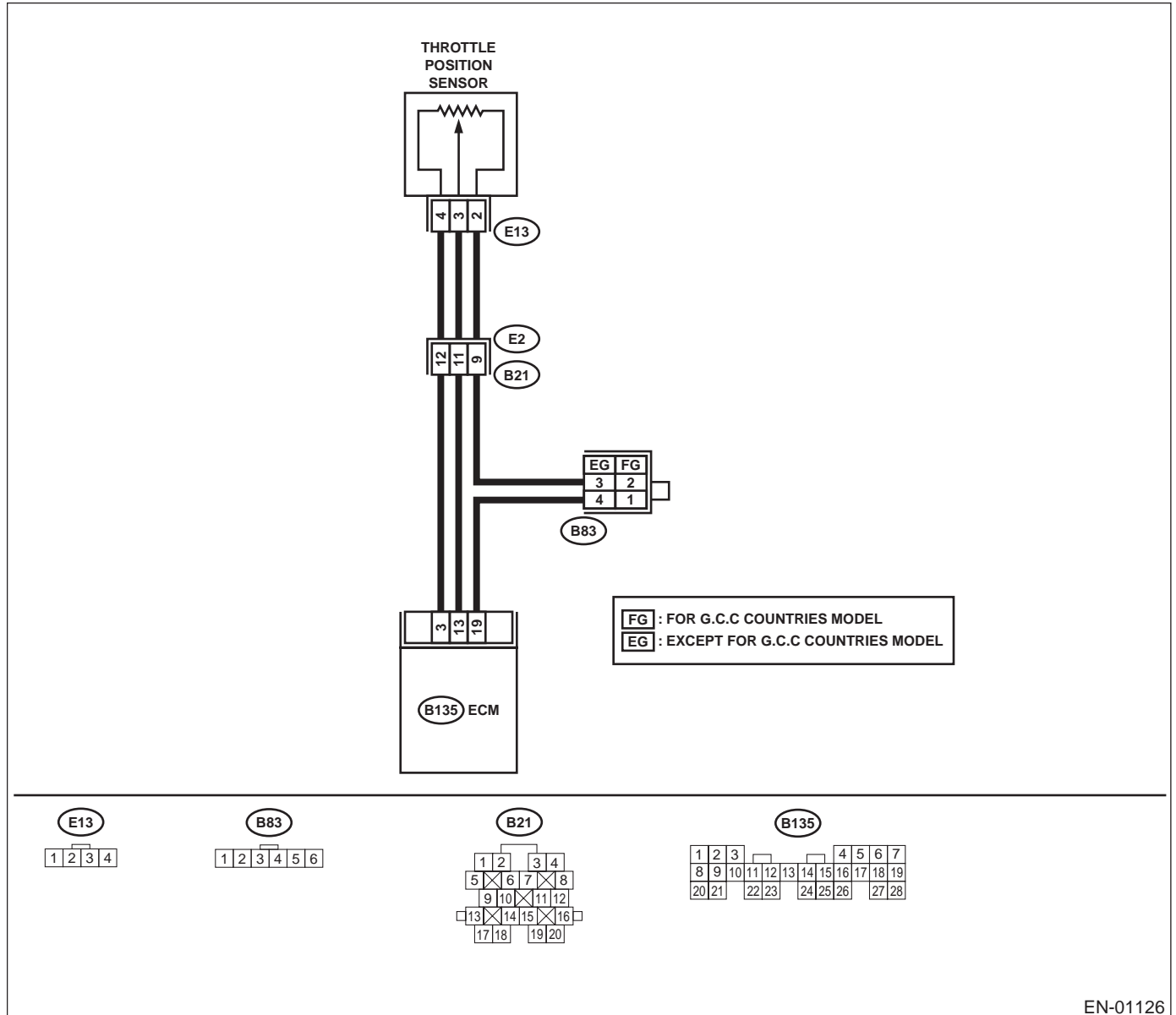
O: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01126

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA. 1) Start engine. 2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	0.1 V	Go to step 2.	Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground while throttle valve is fully closed. Connector & terminal (B135) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 4.	Go to step 3.
<p>3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	4.5 V	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
<p>4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 13 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.1 V	Go to step 6.	Go to step 5.
<p>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Measure voltage between ECM connector and chassis ground. Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p>	0.1 V	Repair poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from throttle position sensor. 3) Turn ignition switch to ON. 4) Measure voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 4 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>7 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and throttle position sensor connector.</p> <p>Connector & terminal (B135) No. 13 — (E13) No. 3: Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
<p>8 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>Measure resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 3 — Engine ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9.	Repair ground short circuit in harness between throttle position sensor and ECM connector.
<p>9 CHECK POOR CONTACT.</p> <p>Check poor contact in throttle position sensor connector. Is there poor contact in throttle position sensor connector?</p>	There is poor contact.	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor. <Ref. to FU(H4SO)-30, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

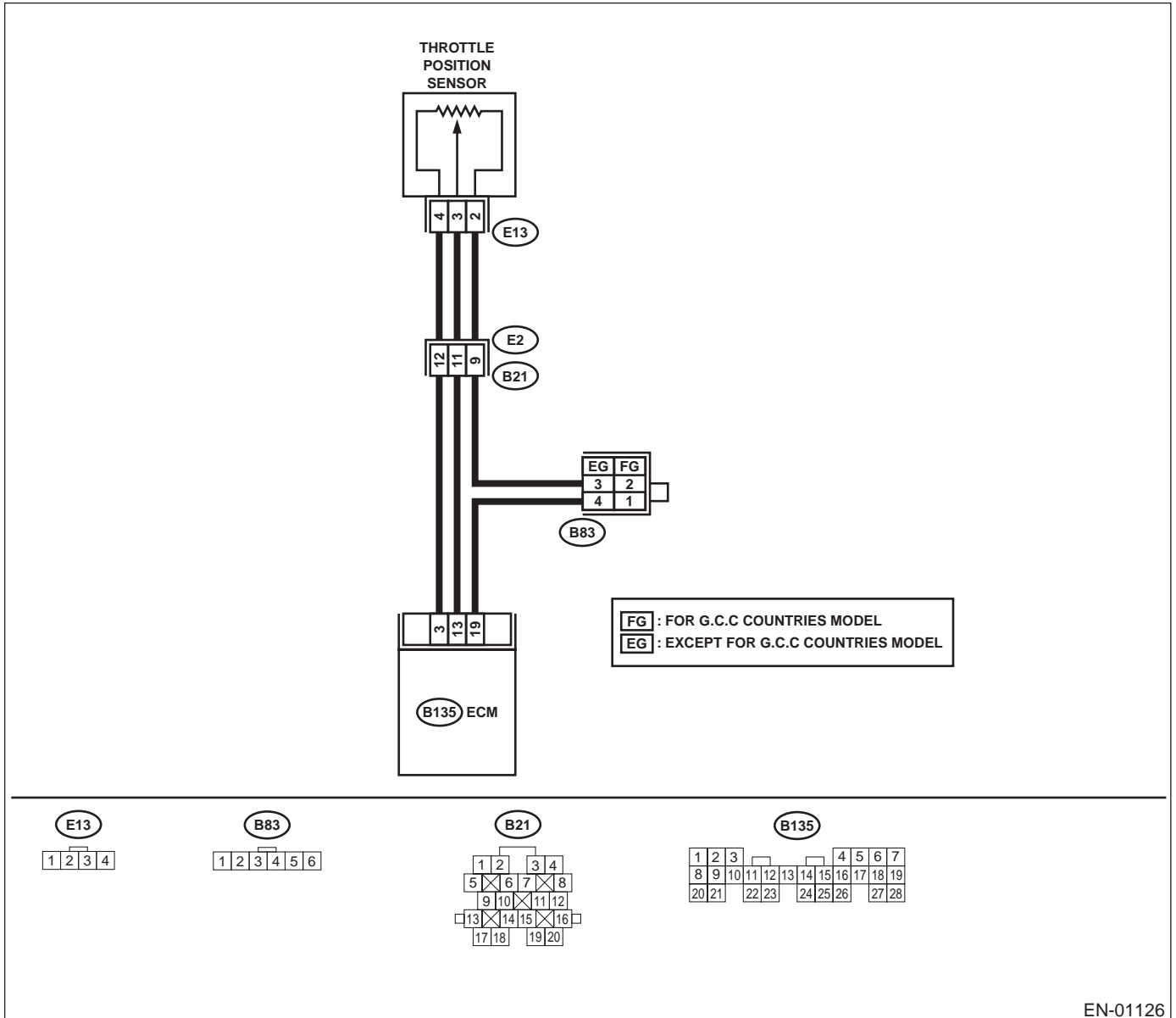
P: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01126

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA.</p> <p>1) Start engine.</p> <p>2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>Does the measured value exceed the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H4SO)-32, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	4.9 V	Go to step 2.	<p>Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>2 CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from throttle position sensor.</p> <p>3) Measure resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	<p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>3 CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to ON.</p> <p>2) Measure voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 3 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	4.9 V	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	<p>Replace throttle position sensor.</p> <p><Ref. to FU(H4SO)-30, Throttle Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

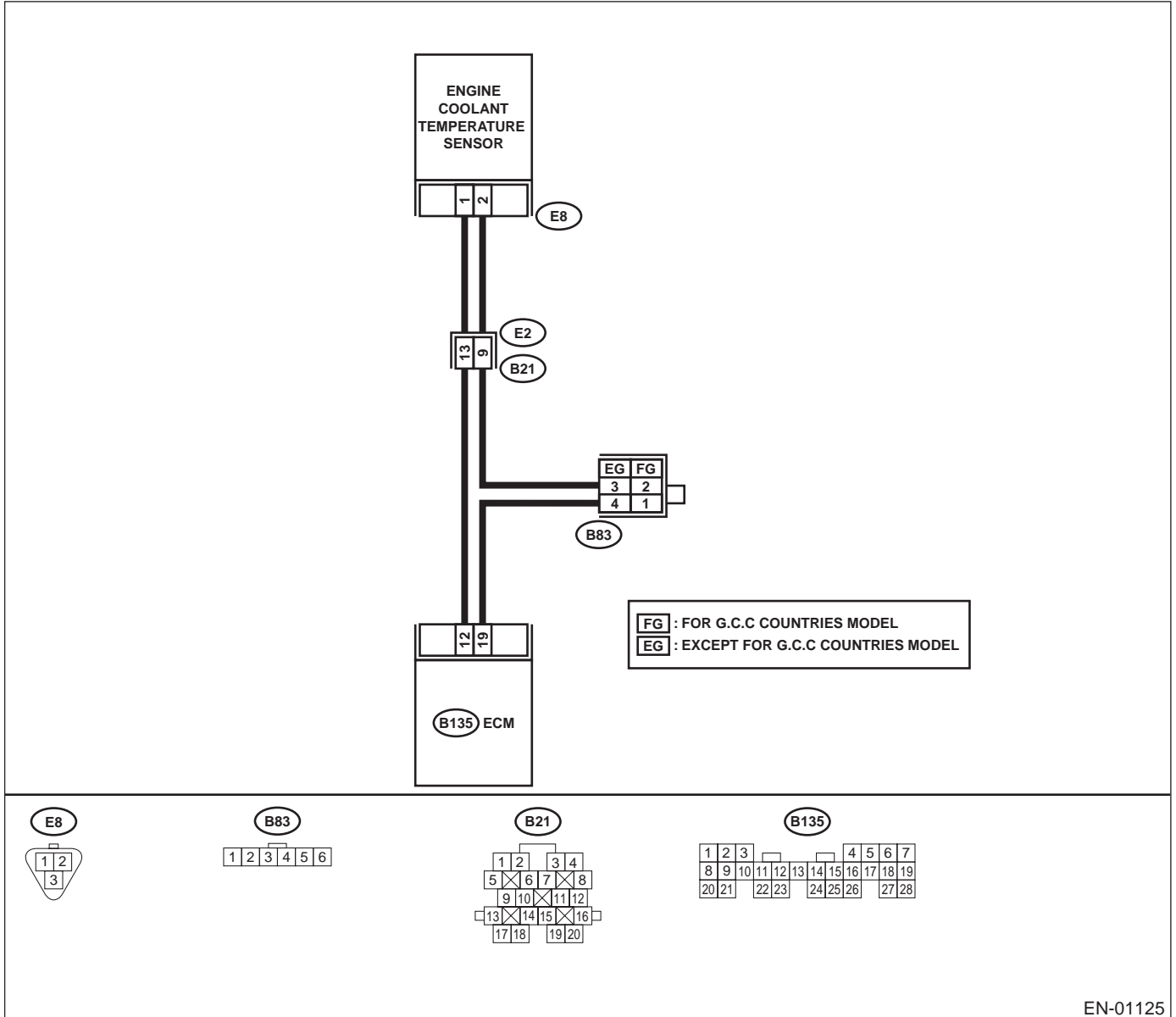
Q: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Engine would not return to idling.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01125

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step 2.
2 CHECK THERMOSTAT. Does thermostat remain opened?	Thermostat remains opened.	Replace thermostat. <Ref. to CO(H4SO)-21, Thermostat.>	Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-26, Engine Coolant Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

R: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

	Step	Value	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0129?	DTC P0129 indicated.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P0129.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

S: DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

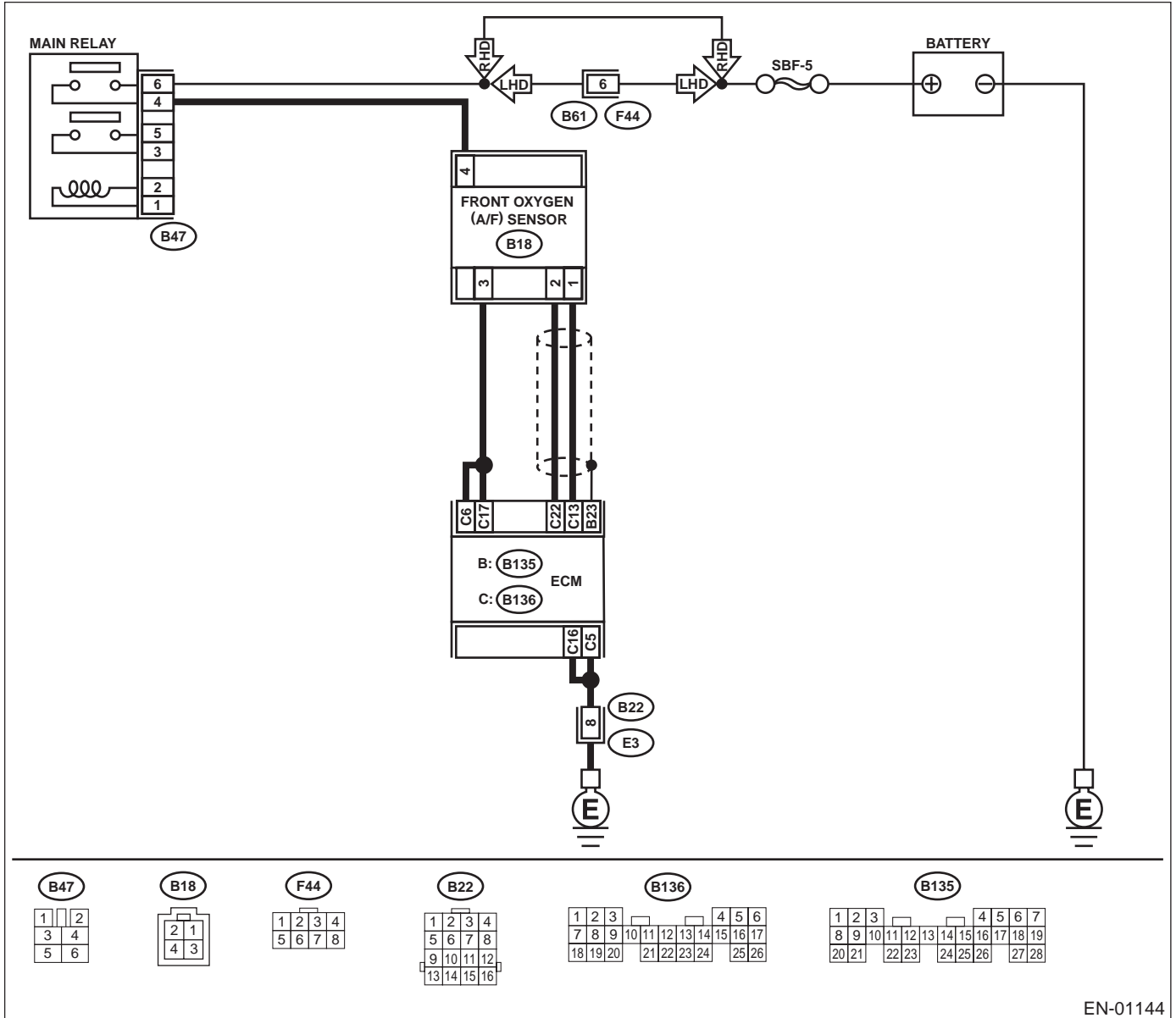
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR DATA. 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.85 - 1.15 in idling.	Go to step 3.	Go to step 4.
3 CHECK FRONT OXYGEN (A/F) SENSOR DATA. 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. 2) Read data of front oxygen (A/F) sensor signal during racing using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Normally, A/F mixture ratio is rich with racing engine. •To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	1.1 V	Go to step 6.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance between ECM and front oxygen (A/F) sensor. Connector & terminals (B136) No. 13 — (B18) No. 1: (B136) No. 22 — (B18) No. 2: Is the measured value less than the specified value?	5 Ω	Go to step 5.	Repair open circuit between ECM and front oxygen (A/F) sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. Measure resistance between ECM and chassis ground. Connector & terminals (B136) No. 13 — Chassis ground: (B136) No. 22 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair ground short circuit between ECM and front oxygen (A/F) sensor.
<p>6 CHECK EXHAUST SYSTEM. Check exhaust system parts. Is there a fault in exhaust system? NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</p>	There is a fault.	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-41, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

T: DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

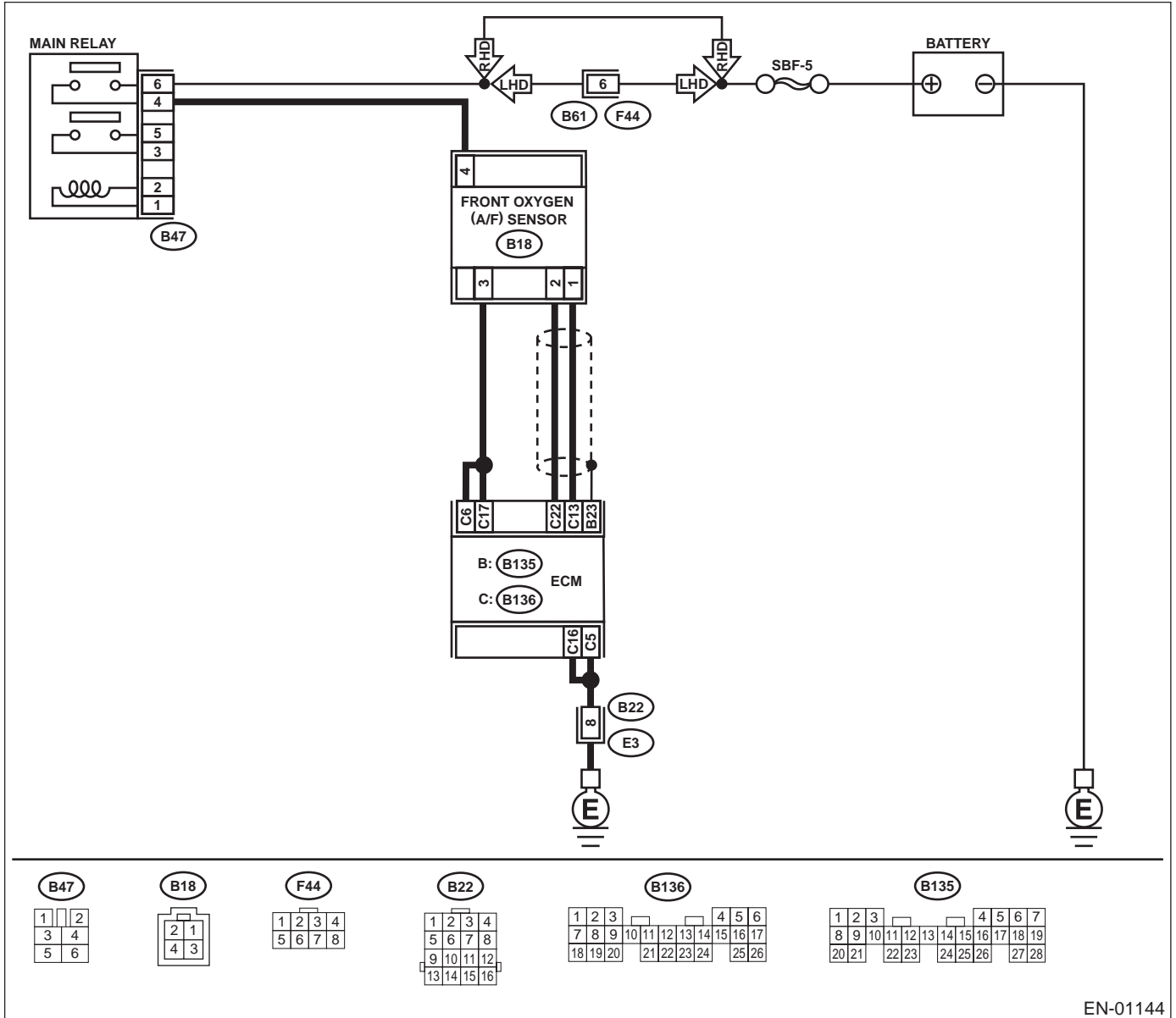
• DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B136) No. 13 — Chassis ground: (B136) No. 22 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-41, Front Oxygen (A/F) Sensor.>	Repair short circuit between ECM and front oxygen (A/F) sensor connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

U: DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

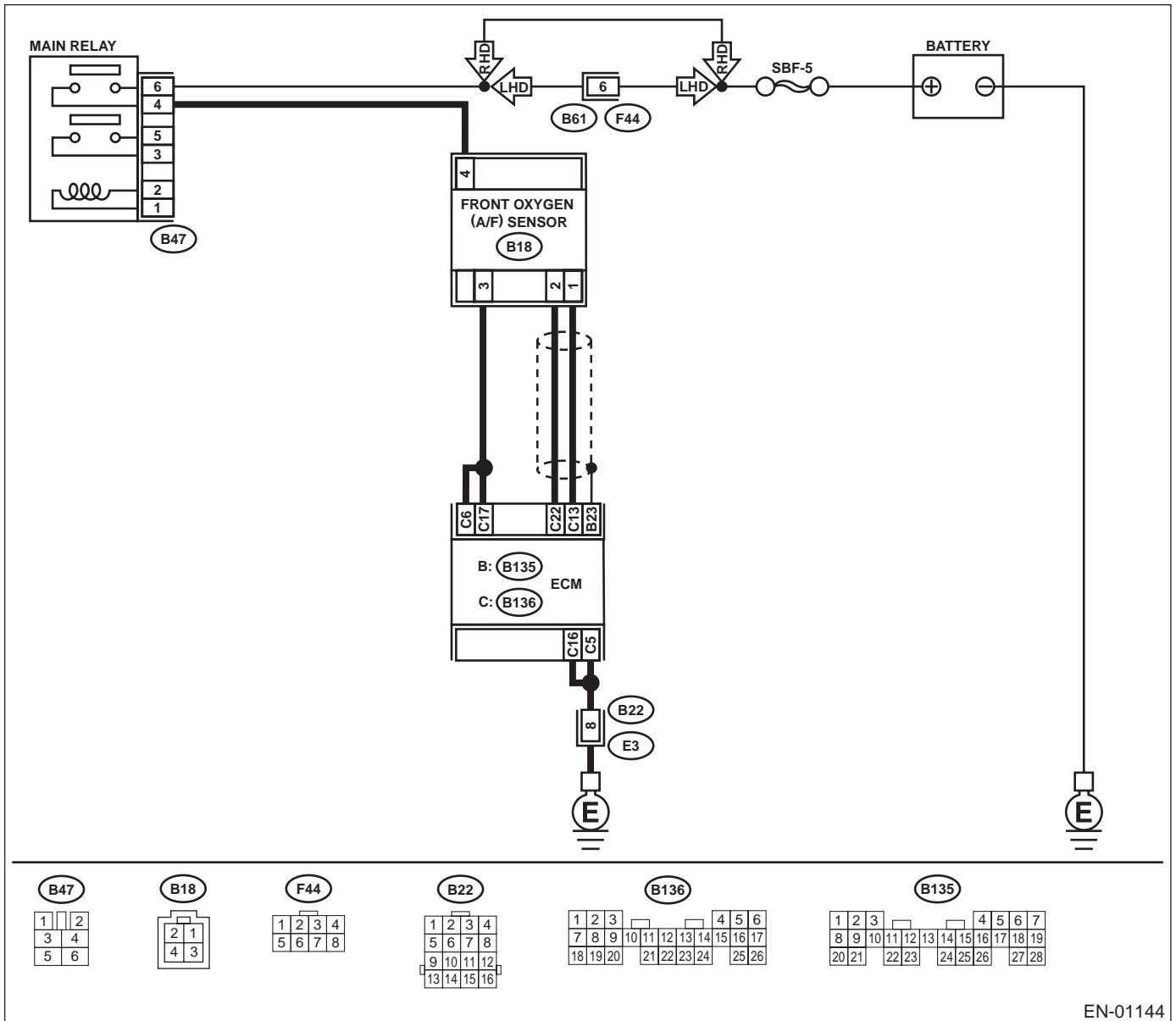
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure voltage of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-): (B136) No. 22 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	8 V	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Rear Oxygen Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

V: DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

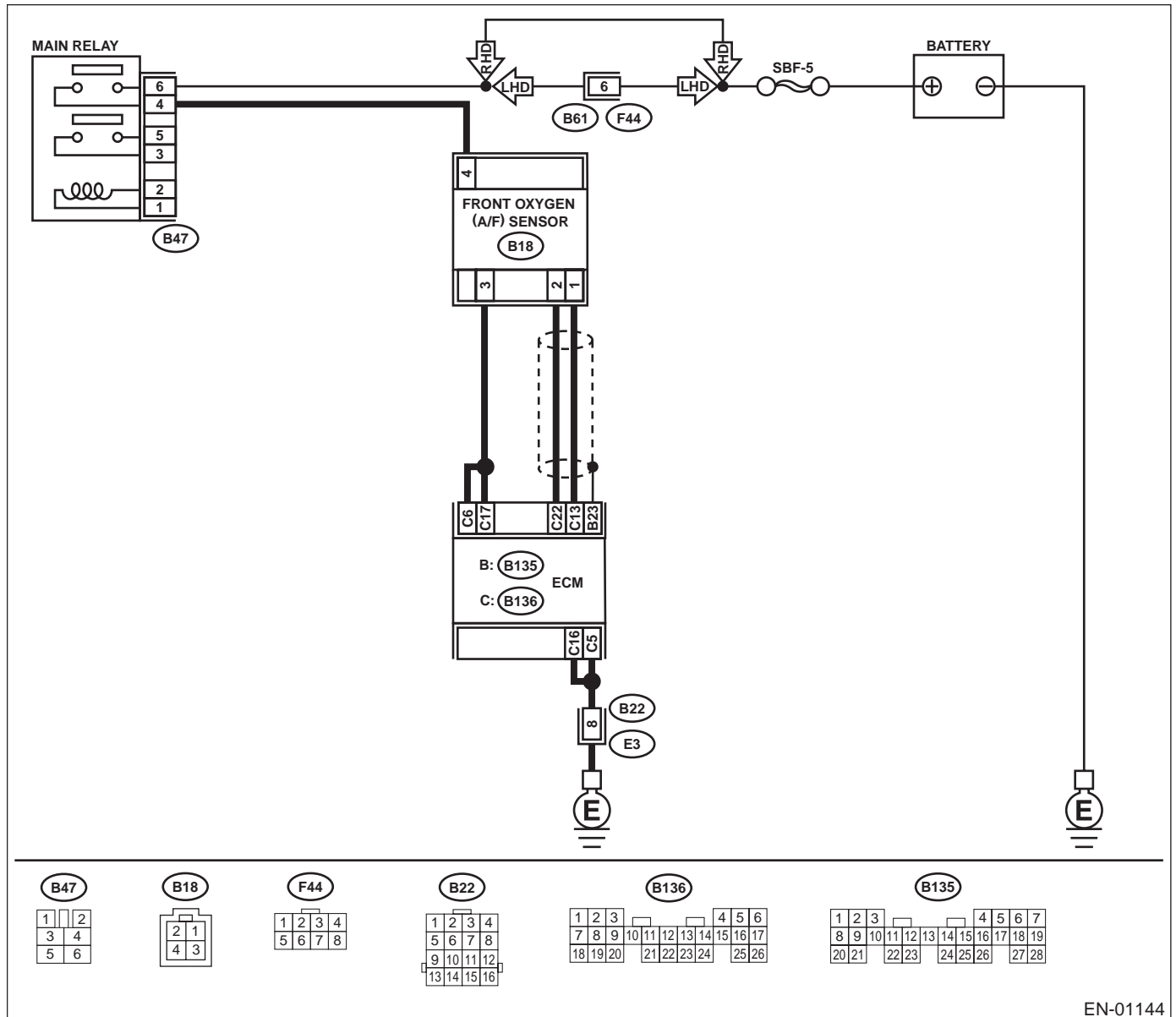
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step 2.
2 CHECK EXHAUST SYSTEM. Is there a problem in exhaust system? NOTE: Check the following items. <ul style="list-style-type: none"> •Loose installation of front portion of exhaust pipe onto cylinder heads •Loose connection between front exhaust pipe and front catalytic converter •Damage of exhaust pipe resulting in a hole 	There is a problem.	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-41, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

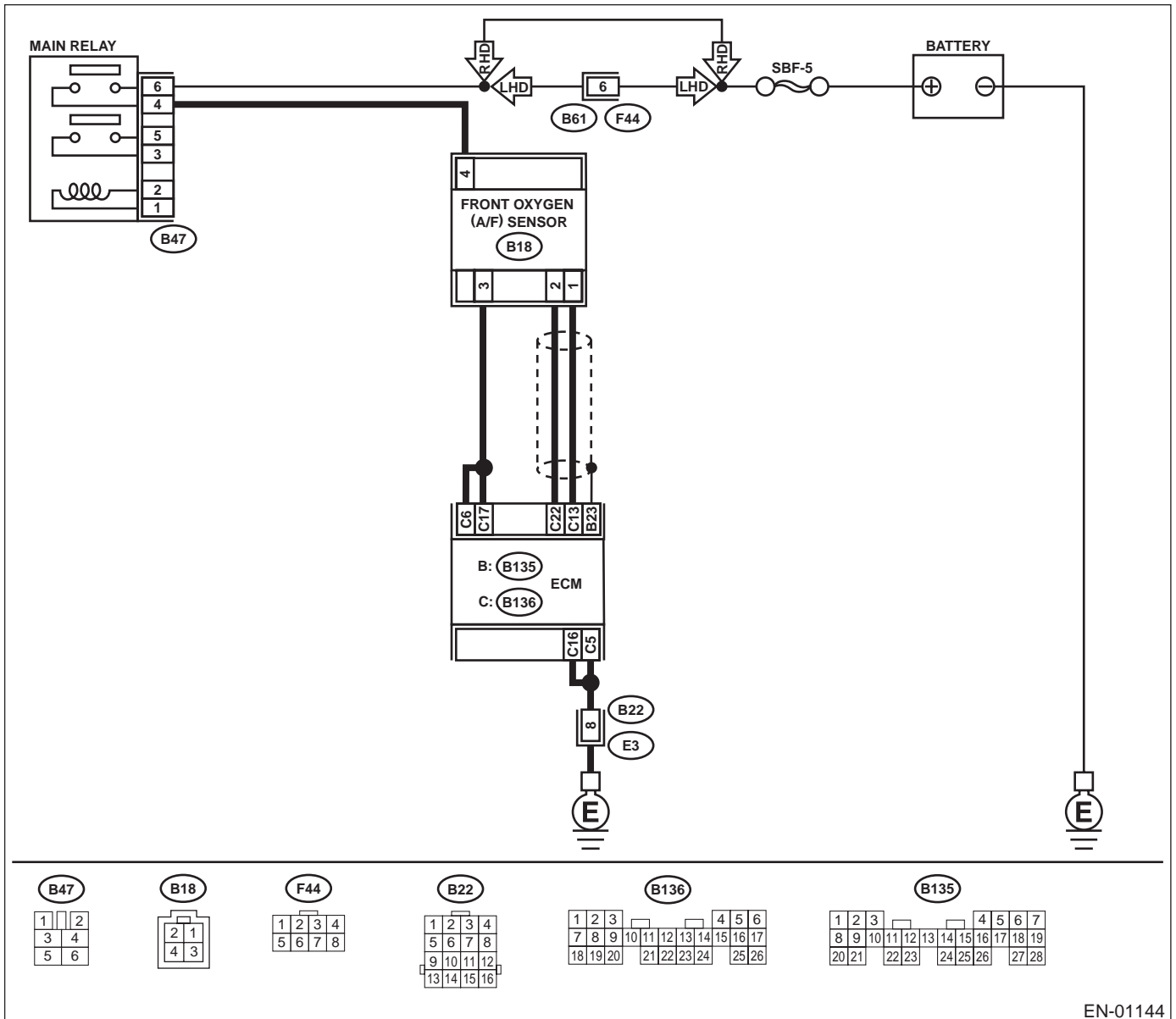
W: DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B136) No. 13 — (E18) No. 1: (B136) No. 22 — (B18) No. 2:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
<p>2 CHECK POOR CONTACT.</p> <p>Check poor contact in front oxygen (A/F) sensor connector. Is there poor contact in front oxygen (A/F) sensor connector?</p>	There is poor contact.	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-41, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

X: DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

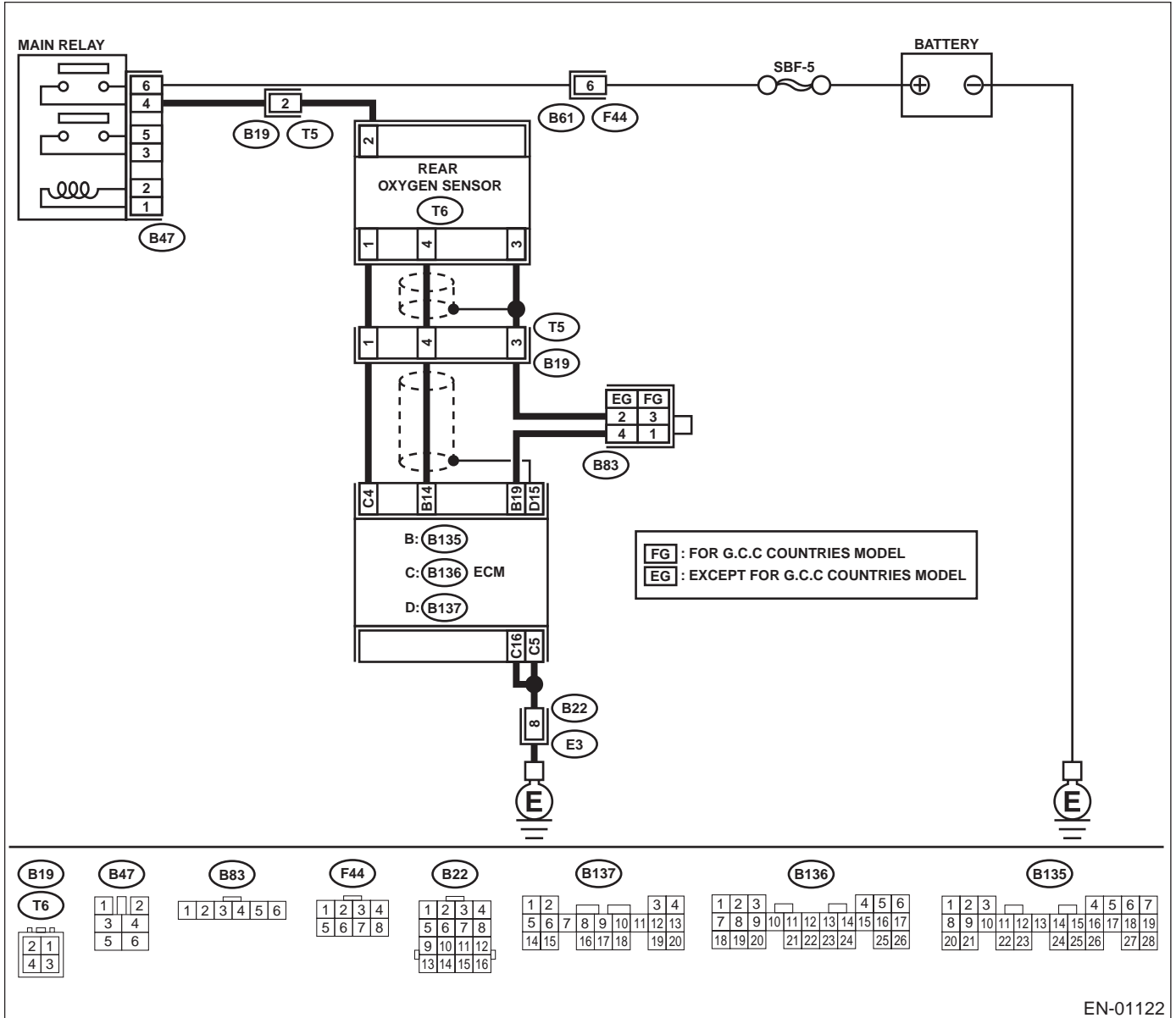
• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01122

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131, P0132 or P0134?	Indicated.	Repair referring procedure for P0131, P0132 and P0134. NOTE: In this case, checking procedure for P0137 is not necessary.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm for two minutes. 2) Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the value fluctuate? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	490 mV	Go to step 5.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and rear oxygen sensor. 3) Measure resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 14 — (T6) No. 4: (B135) No. 19 — (T6) No. 3: Does the measured value exceed the specified value?	3 Ω	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 4.
4 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 4 (+) — Engine ground (-): Is the measured value within the specified range?	0.2 V - 0.5 V	Replace rear oxygen sensor. <Ref. to FU(H4SO)-43, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
5 CHECK EXHAUST SYSTEM. Check exhaust system parts. Is there a fault in exhaust system? NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	There is a fault.	Repair or replace faulty parts.	Replace rear oxygen sensor. <Ref. to FU(H4SO)-43, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Y: DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

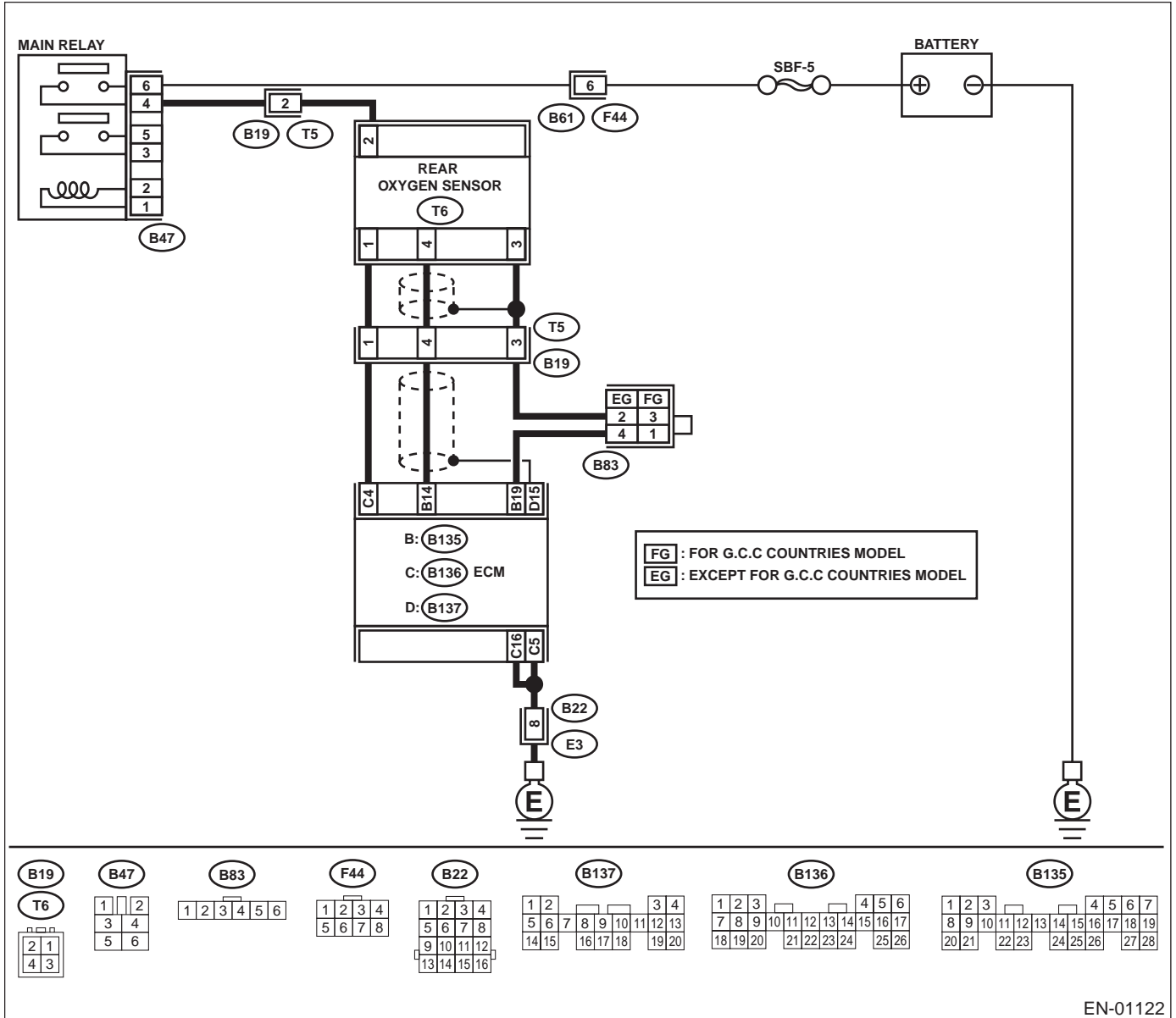
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0130, P0131, P0132 or P0134?</p>	DTC indicated.	Check DTC referring "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, CHECKING procedure for P0138 is not necessary.	Go to step 3.
<p>2</p> <p>CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and race engine until the engine speed reaches to 5,000 rpm and release accelerator pedal rapidly. 2) Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the value fluctuate?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	250 mV	Go to step 5.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and rear oxygen sensor. 3) Measure resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 14 — (T6) No. 4: (B135) No. 19 — (T6) No. 3: Does the measured value exceed the specified value?</p>	3 Ω	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 4.
<p>4</p> <p>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 4 (+) — Engine ground (-): Is the measured value within the specified range?</p>	0.2 V - 0.5 V	Replace rear oxygen sensor. <Ref. to FU(H4SO)-43, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
5 CHECK EXHAUST SYSTEM. Check exhaust system parts. Is there a fault in exhaust system? NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	There is a fault.	Repair or replace faulty parts.	Replace rear oxygen sensor. <Ref. to FU(H4SO)-43, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Z: DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

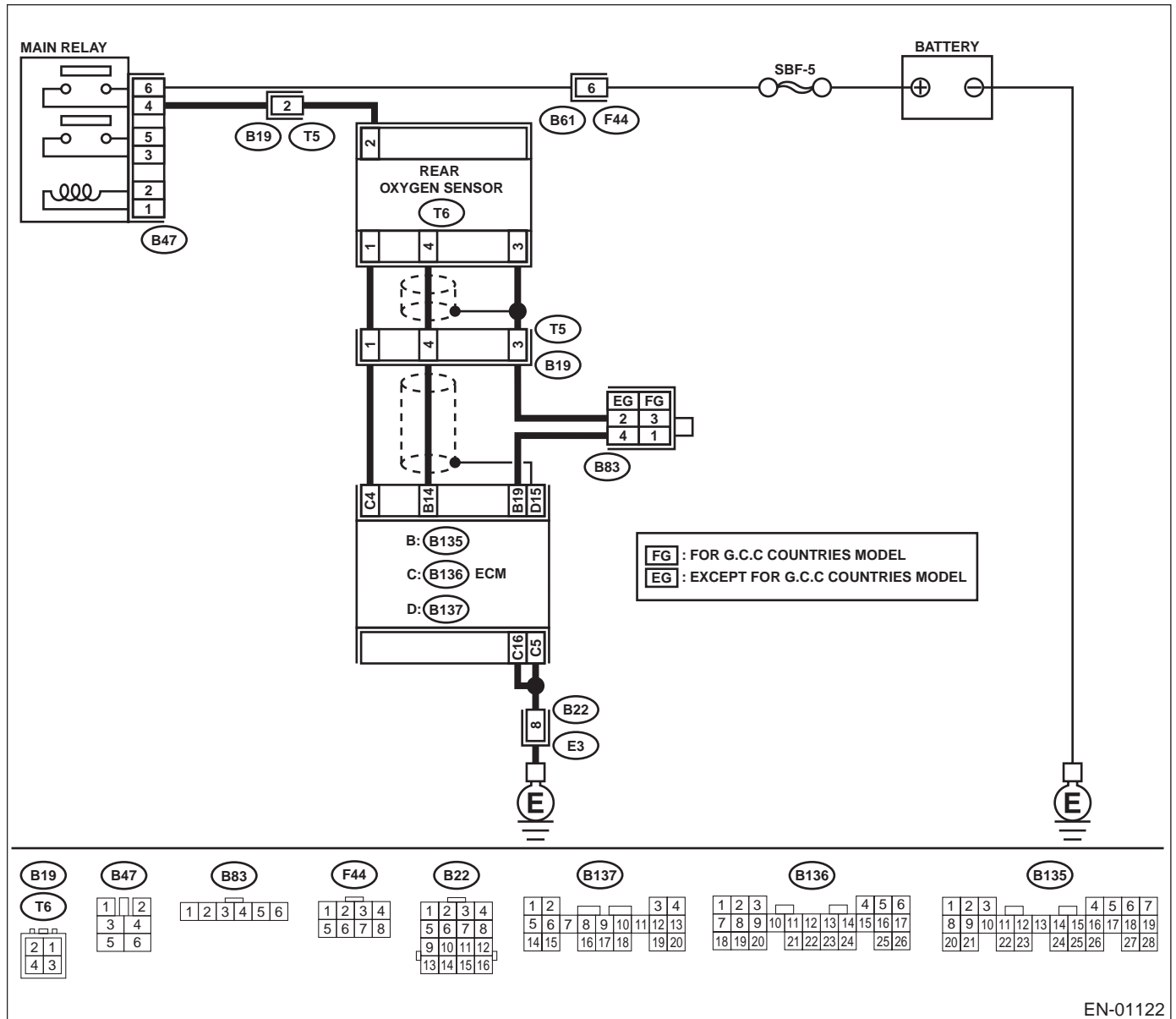
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN-01122

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace rear oxygen sensor. <Ref. to FU(H4SO)-43, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AA:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4SO)-164, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AB:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK EXHAUST SYSTEM. Are there holes or loose bolts on exhaust system?	There are holes or loose bolts on exhaust system.	Repair exhaust system.	Go to step 3.
3 CHECK EGR VALVE. Is EGR valve clogged?	EGR valve is clogged.	Replace EGR valve.	Go to step 4.
4 CHECK AIR INTAKE SYSTEM. Are there holes, loose bolts or disconnection of hose on air intake system?	There are holes, loose bolts or disconnection of hose on air intake system.	Repair air intake system.	Go to step 5.
5 CHECK PURGE CONTROL SOLENOID VALVE. Is purge control solenoid valve clogged?	Purge control solenoid valve is clogged.	Replace purge control solenoid valve.	Go to step 6.
6 CHECK PCV VALVE. Is PCV valve clogged?	PCV valve is clogged.	Replace PCV valve.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK FUEL PRESSURE.</p> <p>Warning: •Place “NO FIRE” signs near the working area. •Be careful not to spill fuel on the floor.</p> <ol style="list-style-type: none"> 1) Release fuel pressure. <ol style="list-style-type: none"> (1) Disconnect connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Is the measured value within the specified range? <p>Warning: Before removing fuel pressure gauge, release fuel pressure.</p> <p>NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</p>	<p>284 — 314 kPa (2.9 — 3.2 kg/cm², 41 — 46 psi)</p>	<p>Go to step 8.</p>	<p>Repair the following items.</p> <p>Fuel pressure too high</p> <ul style="list-style-type: none"> • Clogged fuel return line or bent hose <p>Fuel pressure too low</p> <ul style="list-style-type: none"> • Improper fuel pump discharge • Clogged fuel supply line
<p>8 CHECK FUEL PRESSURE.</p> <p>After connecting pressure regulator vacuum hose, measure fuel pressure. Is the measured value within the specified range?</p> <p>Warning: Before removing fuel pressure gauge, release fuel pressure.</p> <p>NOTE: •If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.</p>	<p>206 — 235 kPa (2.1 — 2.4 kg/cm², 30 — 34 psi)</p>	<p>Go to step 9.</p>	<p>Repair the following items.</p> <p>Fuel pressure too high</p> <ul style="list-style-type: none"> • Faulty pressure regulator • Clogged fuel return line or bent hose <p>Fuel pressure too low</p> <ul style="list-style-type: none"> • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>9 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up completely.</p> <p>2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	70 - 100°C (158 - 212°F)	Go to step 10.	Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-26, Engine Coolant Temperature Sensor.>
<p>10 CHECK INTAKE MANIFOLD PRESSURE SENSOR SIGNAL.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the selector lever in "N" or "P" position.</p> <p>3) Turn A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range?</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Idling 24.0 - 41.3 kPa (180 - 310 mmHg, 7.09 - 12.20 inHg), Ignition ON 73.3 - 106.6 kPa (550 - 800 mmHg, 21.65 - 31.50 inHg)	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace intake air temperature and pressure sensor. <Ref. to FU(H4SO)-32, Pressure Sensor.>

AC:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)-168, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AD:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)-168, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AE:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)-168, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AF:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)

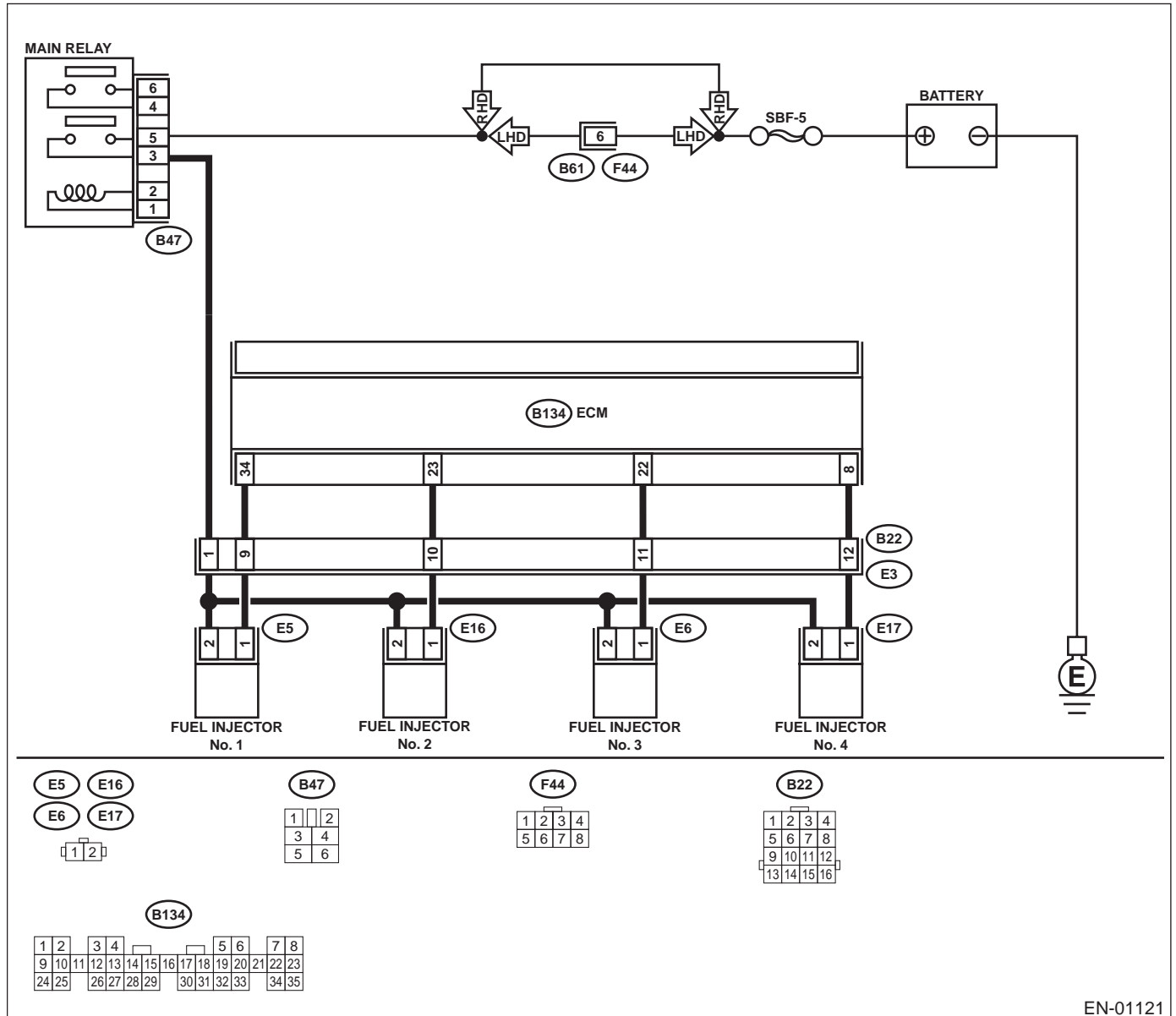
• TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01121

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.	Go to step 2.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground on faulty cylinders. Connector & terminal #1 (B134) No. 34 (+) — Chassis ground (-): #2 (B134) No. 23 (+) — Chassis ground (-): #3 (B134) No. 22 (+) — Chassis ground (-): #4 (B134) No. 8 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 7.	Go to step 3.
3 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on faulty cylinders. 3) Measure voltage between ECM connector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 1 — Engine ground: #2 (E16) No. 1 — Engine ground: #3 (E6) No. 1 — Engine ground: #4 (E17) No. 1 — Engine ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between fuel injector and ECM connector.	Go to step 4.
4 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. Measure resistance of harness connector between ECM connector and fuel injector on faulty cylinders. Connector & terminal #1 (B134) No. 34 — (E5) No. 1: #2 (B134) No. 23 — (E16) No. 1: #3 (B134) No. 22 — (E6) No. 1: #4 (B134) No. 18 — (E17) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
5 CHECK FUEL INJECTOR. Measure resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2: Is the measured value within the specified range?	5 - 20 Ω	Go to step 6.	Replace faulty fuel injector. <Ref. to FU(H4SO)-36, Fuel Injector.>
6 CHECK POWER SUPPLY LINE. 1) Turn ignition switch to ON. 2) Measure voltage between fuel injector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?	10 V	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on faulty cylinder. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground on faulty cylinders. Connector & terminal #1 (B134) No. 34 (+) — Chassis ground (-): #2 (B134) No. 23 (+) — Chassis ground (-): #3 (B134) No. 22 (+) — Chassis ground (-): #4 (B134) No. 8 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step 8.
8 CHECK FUEL INJECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2: Is the measured value less than the specified value?	1 Ω	Replace faulty fuel injector <Ref. to FU(H4SO)-36, Fuel Injector.> and replace ECM <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step 9.
9 CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR. Is camshaft position sensor or crankshaft position sensor loosely installed?	Loosely installed.	Tighten camshaft position sensor or crankshaft position sensor.	Go to step 10.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
10 CHECK CRANKSHAFT SPROCKET. Remove timing belt cover. Is crankshaft sprocket rusted or does it have broken teeth?	Rusted sprocket or broken teeth.	Replace crankshaft sprocket. <Ref. to ME(H4SO)-53, Crankshaft Sprocket.>	Go to step 11.
11 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. Is timing belt dislocated from its proper position?	Dislocated from its proper position.	Repair installation condition of timing belt. <Ref. to ME(H4SO)-46, Timing Belt Assembly.>	Go to step 12.
12 CHECK FUEL LEVEL. Is the fuel meter indication higher than the "Lower" level?	Indicated higher than the "Lower" level.	Go to step 13.	Replenish fuel so fuel meter indication is higher than the "Lower" level. After replenishing fuel, Go to step 13.
13 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI). 1) Clear memory using Subaru Select Monitor. <Ref. to EN(H4SO)-47, Clear Memory Mode.> 2) Start engine, and drive the vehicle more than 10 minutes. Is the MI coming on or blinking?	The MI is coming on or blinking.	Go to step 15.	Go to step 14.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>14 CHECK CAUSE OF MISFIRE DIAGNOSED. Was the cause of misfire diagnosed when the engine is running? NOTE: Disconnected spark plug code, etc.</p>	<p>The cause of misfire found.</p>	<p>Finish diagnostics operation, if the engine has no abnormality.</p>	<p>(1) Repair poor contact. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in ignitor connector • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector <p>(2) If there is no poor contact, contact SUBARU distributor. Before contacting, the following items must be checked:</p> <ul style="list-style-type: none"> • Fuel for condition • Fuel additives • Spark plug for condition • Plug code for condition • Engine oil for condition
<p>15 CHECK AIR INTAKE SYSTEM. Is there any fault in air intake system?</p>	<p>There is a fault.</p>	<p>Repair air intake system. NOTE: Check the following items:</p> <ul style="list-style-type: none"> • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses? 	<p>Go to step 16.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
16 CHECK MISFIRE SYMPTOM. 1) Turn ignition switch to ON. 2) Read diagnostic trouble code (DTC). Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC? •Subaru Select Monitor <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. NOTE: Perform diagnosis according to the items listed below.	Only one DTC indicated.	Go to step 21 .	Go to step 17 .
17 CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0302?	DTC P0301 and P0302 indicated.	Go to step 22 .	Go to step 18 .
18 CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0303 and P0304?	DTC P0303 and P0304 indicated.	Go to step 23 .	Go to step 19 .
19 CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0303?	DTC P0301 and P0303 indicated.	Go to step 24 .	Go to step 20 .
20 CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302 and P0304?	DTC P0302 and P0304 indicated.	Go to step 25 .	Go to step 26 .
21 ONLY ONE CYLINDER Is there any fault in that cylinder?	There is a fault.	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plug • Spark plug cord • Fuel injector • Compression ratio 	Go to DTC P0171. <Ref. to EN(H4SO)-162, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
22 GROUP OF #1 AND #2 CYLINDERS Are there faults in #1 and #2 cylinders?	There are faults.	Repair or replace faulty parts. NOTE: • Check the following items. <ul style="list-style-type: none"> • Spark plugs • Fuel injectors • Ignition coil • Compression ratio • If no abnormal is discovered, check for "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(H4SO)-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4SO)-162, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23 GROUP OF #3 AND #4 CYLINDERS Are there faults in #3 and #4 cylinders?	There are faults.	Repair or replace faulty parts. NOTE: • Check the following items. <ul style="list-style-type: none"> • Spark plugs • Fuel injectors • Ignition coil • If no abnormal is discovered, check for "16. D: IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(H4SO)-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4SO)-162, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24 GROUP OF #1 AND #3 CYLINDERS Are there faults in #1 and #3 cylinders?	There are faults.	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plugs • Fuel injectors • Skipping timing belt teeth 	Go to DTC P0171. <Ref. to EN(H4SO)-162, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
25 GROUP OF #2 AND #4 CYLINDERS Are there faults in #2 and #4 cylinders?	There are faults.	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth 	Go to DTC P0171. <Ref. to EN(H4SO)-162, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26 CYLINDER AT RANDOM Is the engine idle unstable?	Engine idle is unstable.	Go to DTC P0171. <Ref. to EN(H4SO)-162, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plugs • Fuel injectors • Compression ratio

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

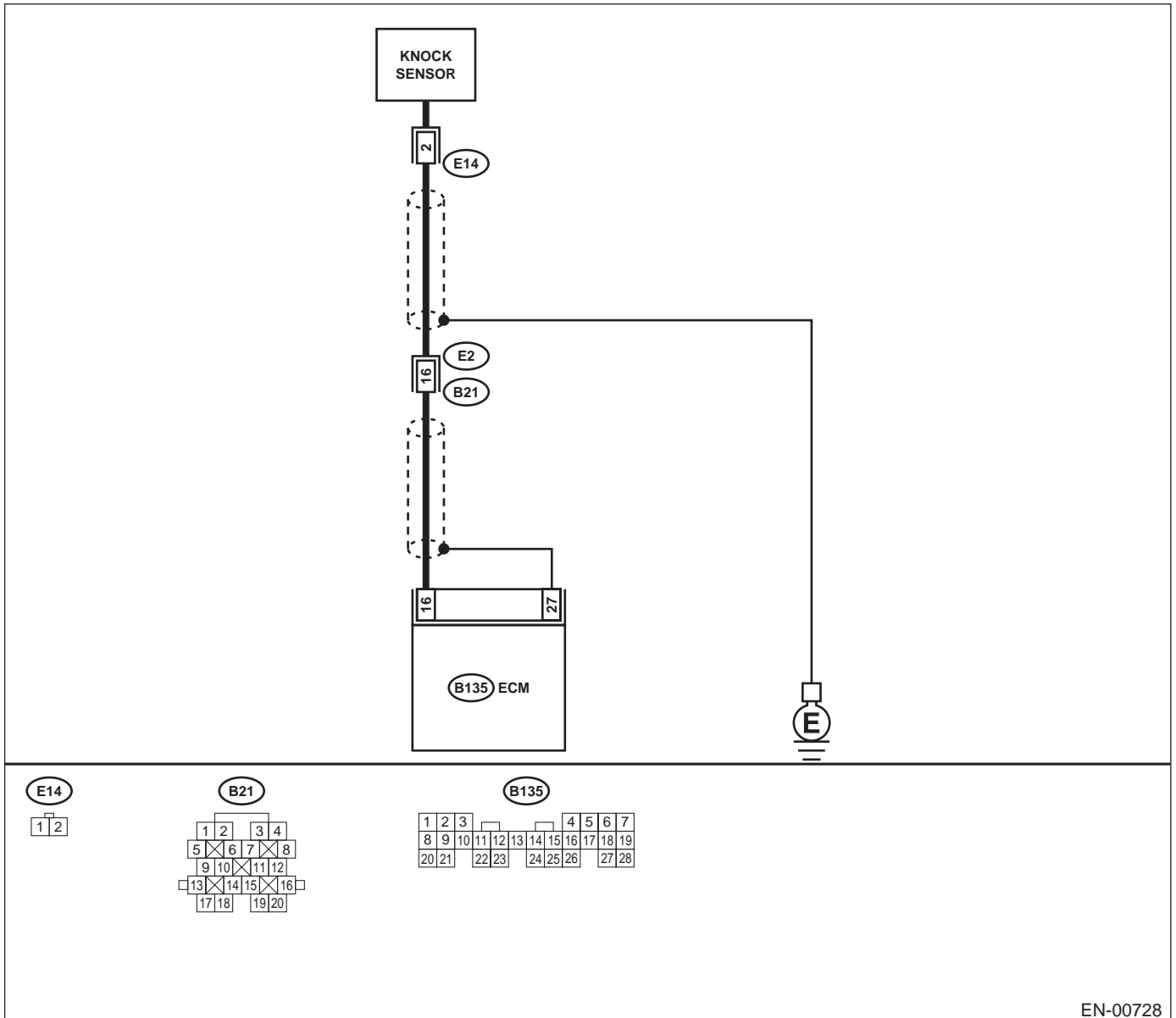
AG:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Poor driving performance
 - Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-00728

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground.</p> <p>Connector & terminal (B135) No. 16 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	700 kΩ	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
<p>2 CHECK KNOCK SENSOR.</p> <p>1) Disconnect connector from knock sensor. 2) Measure resistance between knock sensor connector terminal and engine ground.</p> <p>Terminal No. 2 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	700 kΩ	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
<p>3 CHECK CONDITION OF KNOCK SENSOR INSTALLATION.</p> <p>Is the knock sensor installation bolt tightened securely?</p>	Tightened securely.	Replace knock sensor. <Ref. to FU(H4SO)-29, Knock Sensor.>	Tighten knock sensor installation bolt securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

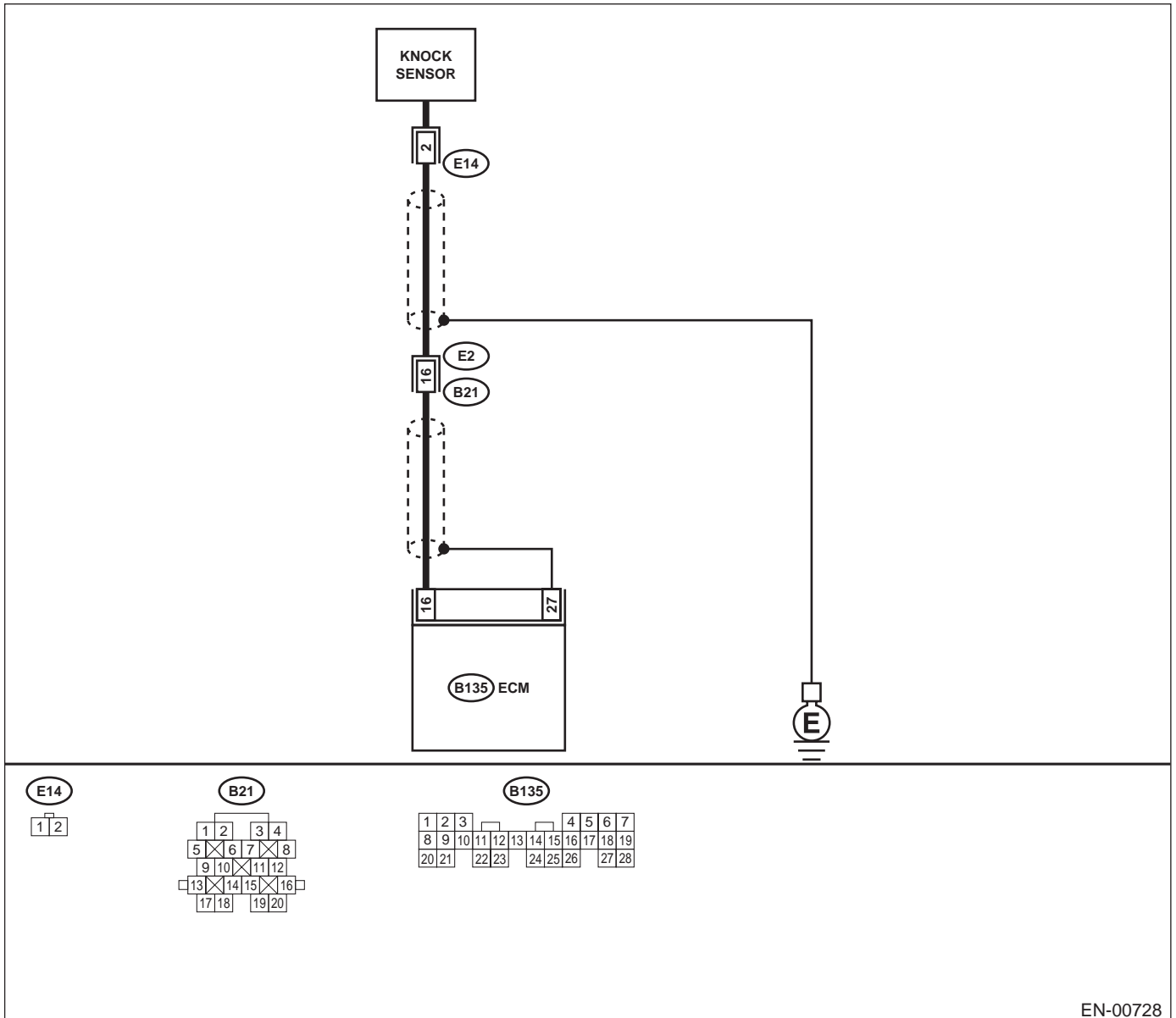
AH:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Poor driving performance
 - Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-00728

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 16 — Chassis ground: Is the measured value less than the specified value?</p>	400 kΩ	Go to step 2.	Go to step 3.
<p>2 CHECK KNOCK SENSOR. 1) Disconnect connector from knock sensor. 2) Measure resistance between knock sensor connector terminal and engine ground. Terminal No. 2 — Engine ground: Is the measured value less than the specified value?</p>	400 kΩ	Replace knock sensor. <Ref. to FU(H4SO)-29, Knock Sensor.>	Repair ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
<p>3 CHECK INPUT SIGNAL FOR ECM. 1) Connect connectors to ECM and knock sensor. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 16 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	2 V	Even if MI lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair poor contact in ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

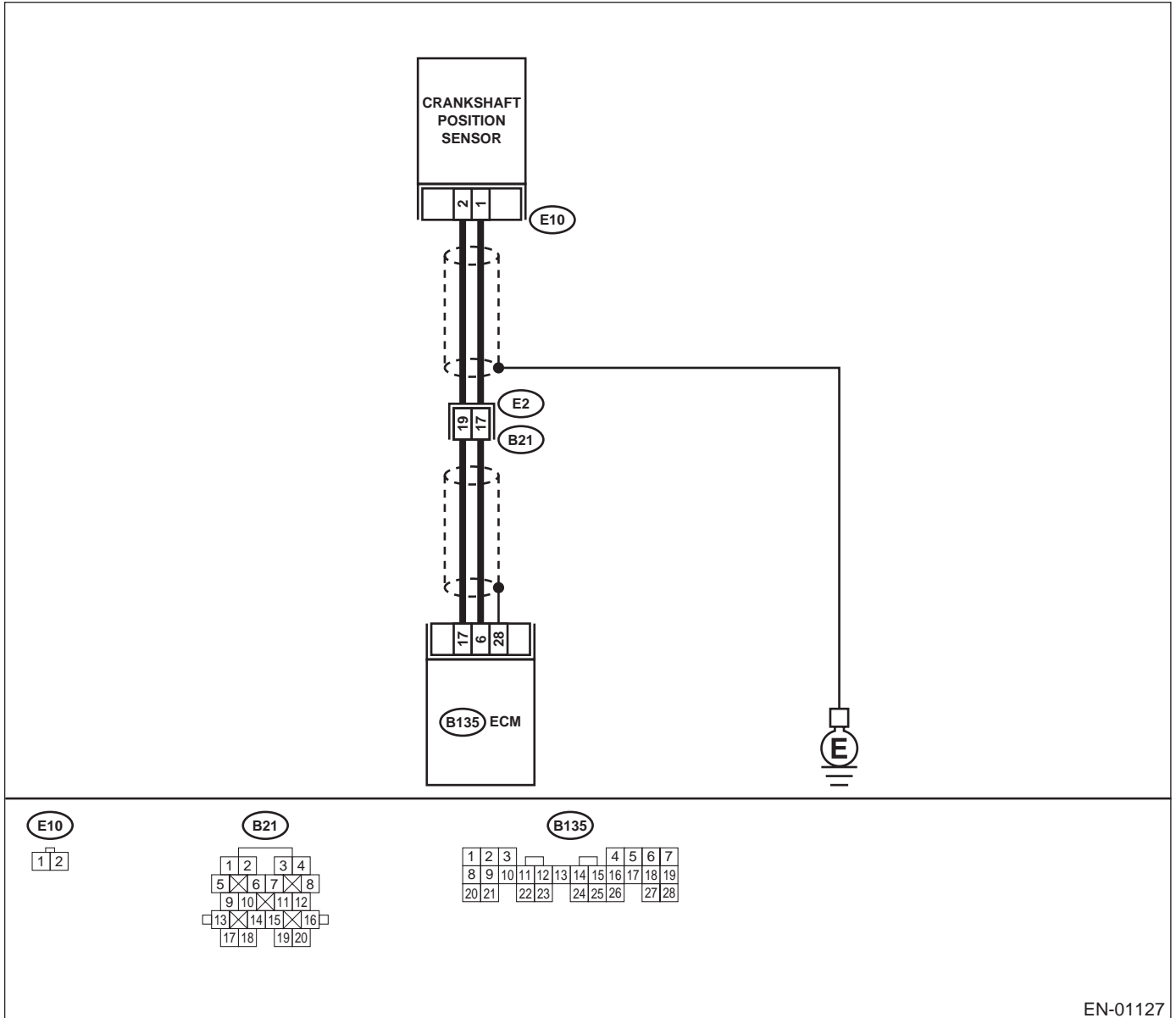
AI: DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine stalls.
 - Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from crankshaft position sensor. 3) Measure resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	100 k Ω	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	Go to step 2.
<p>2 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Repair ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step 3.
<p>3 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>4 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</p> <p>Is the crankshaft position sensor installation bolt tightened securely?</p>	Tightened securely.	Go to step 5.	Tighten crankshaft position sensor installation bolt securely.
<p>5 CHECK CRANKSHAFT POSITION SENSOR.</p> <p>1) Remove crankshaft position sensor. 2) Measure resistance between connector terminals of crankshaft position sensor.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified range?</p>	1 - 4 k Ω	Repair poor contact in crankshaft position sensor connector.	Replace crankshaft position sensor. <Ref. to FU(H4SO)-28, Camshaft Position Sensor.>

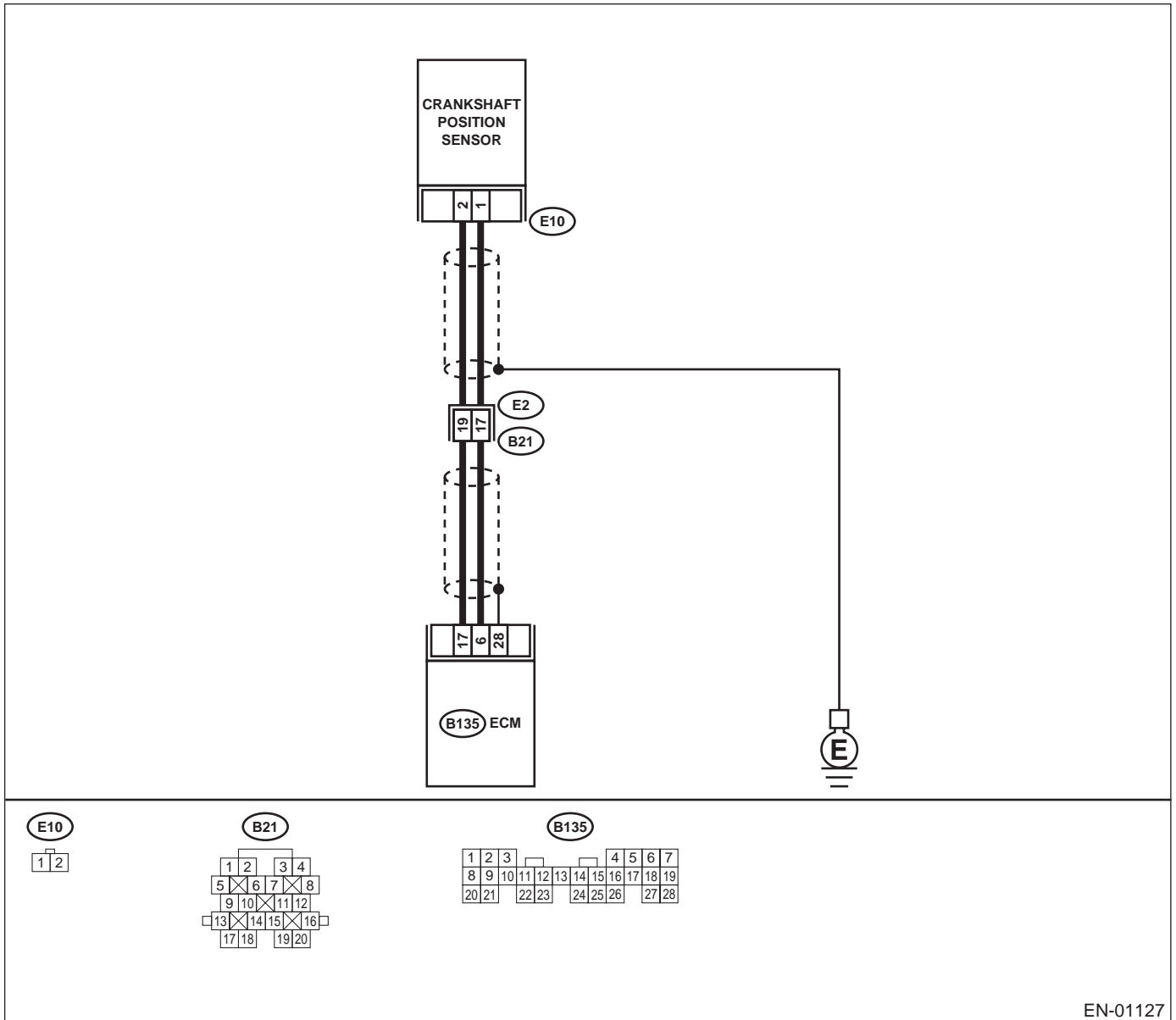
AJ:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine stalls.
 - Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0335?	DTC P0335 indicated.	Inspect DTC P0335 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR. Turn ignition switch to OFF. Is the crankshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step 3.	Tighten crankshaft position sensor installation bolt securely.
3 CHECK CRANKSHAFT SPROCKET. Remove front belt cover. Are crankshaft sprocket teeth cracked or damaged?	Cracked or damaged.	Replace crankshaft sprocket. <Ref. to ME(H4SO)-53, Crankshaft Sprocket.>	Go to step 4.
4 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. Is timing belt dislocated from its proper position?	Dislocated from proper position.	Repair installation condition of timing belt. <Ref. to ME(H4SO)-46, Timing Belt Assembly.>	Replace crankshaft position sensor. <Ref. to FU(H4SO)-27, Crankshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

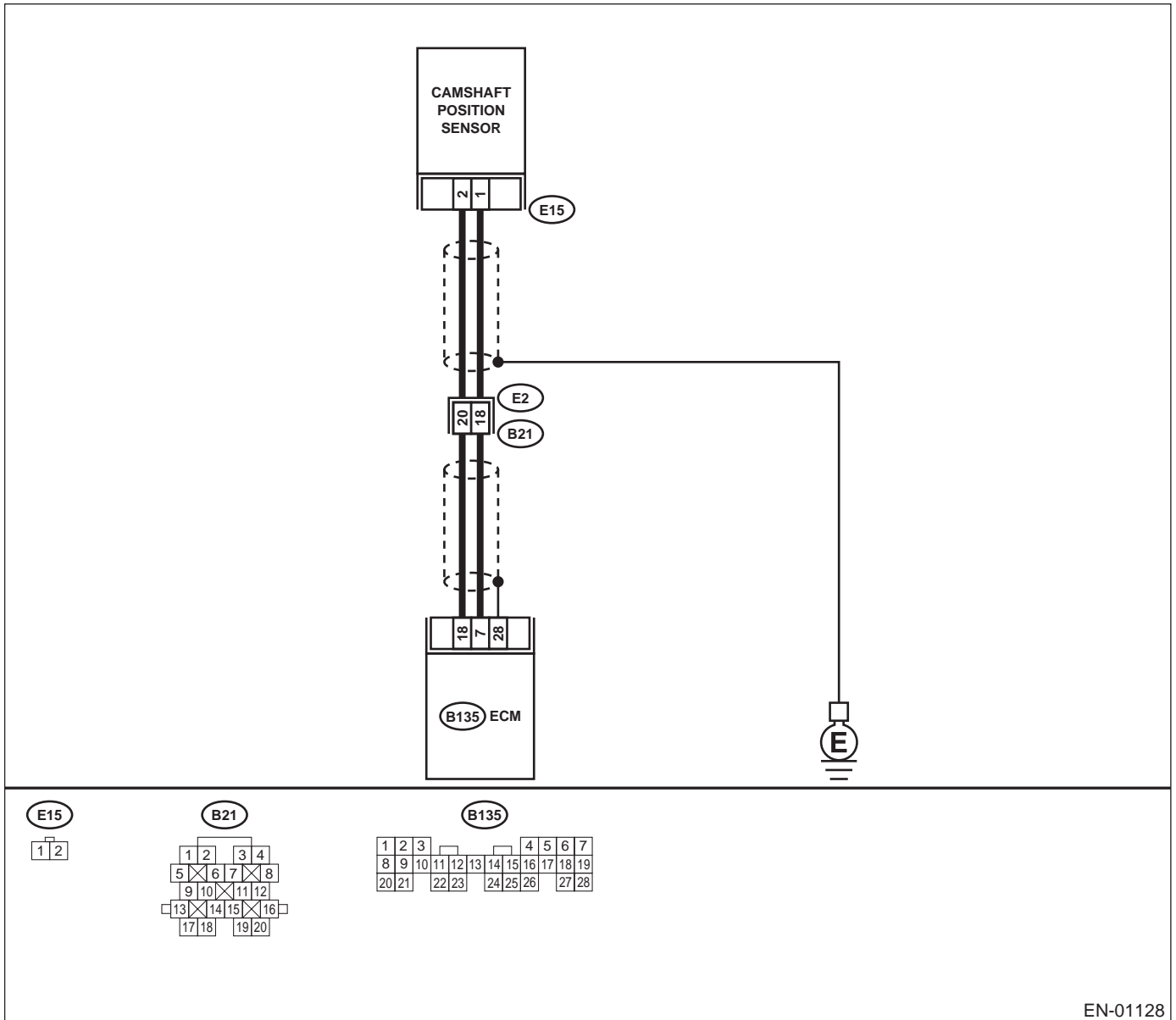
AK:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine stalls.
 - Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-01128

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from camshaft position sensor. 3) Measure resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 1 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	100 kΩ	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	Go to step 2.
<p>2 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 1 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	<p>Repair ground short circuit in harness between camshaft position sensor and ECM connector.</p> <p>NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.</p>	Go to step 3.
<p>3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 4.	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>4 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</p> <p>Is the camshaft position sensor installation bolt tightened securely?</p>	Tightened securely.	Go to step 5.	Tighten camshaft position sensor installation bolt securely.
<p>5 CHECK CAMSHAFT POSITION SENSOR.</p> <p>1) Remove camshaft position sensor. 2) Measure resistance between connector terminals of camshaft position sensor.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified range?</p>	1 - 4 kΩ	Repair poor contact in camshaft position sensor connector.	Replace camshaft position sensor. <Ref. to FU(H4SO)-28, Camshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

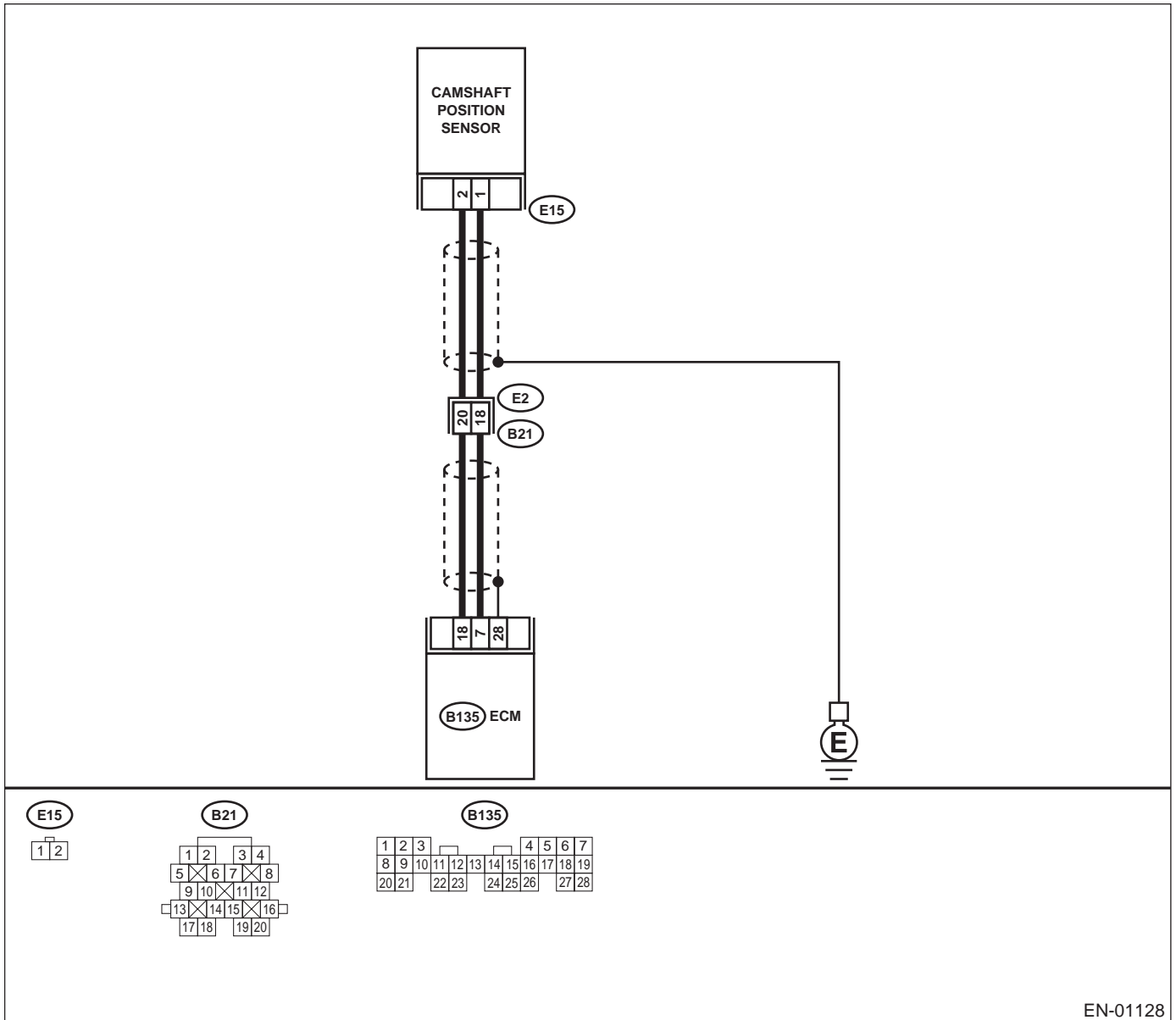
AL:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine stalls.
 - Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-01128

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0340?	DTC P0340 indicated.	Inspect DTC P0340 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from camshaft position sensor. 3) Measure resistance of harness between camshaft position sensor connector and engine ground. Connector & terminal (E15) No. 1 — Engine ground: Does the measured value exceed the specified value?	100 kΩ	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	Go to step 3.
3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure resistance of harness between camshaft position sensor connector and engine ground. Connector & terminal (E15) No. 1 — Engine ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step 4.
4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure resistance of harness between camshaft position sensor connector and engine ground. Connector & terminal (E15) No. 2 — Engine ground: Is the measured value less than the specified value?	5 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR. Is the camshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step 6.	Tighten camshaft position sensor installation bolt securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK CAMSHAFT POSITION SENSOR. 1) Remove camshaft position sensor. 2) Measure resistance between connector terminals of camshaft position sensor. Terminals No. 1 — No. 2: Is the measured value within the specified range?</p>	1 - 4 kΩ	Go to step 7.	Replace camshaft position sensor. <Ref. to FU(H4SO)-28, Camshaft Position Sensor.>
<p>7 CHECK CONDITION OF CAMSHAFT POSITION SENSOR. Turn ignition switch to OFF. Is the camshaft position sensor installation bolt tightened securely?</p>	Tightened securely.	Go to step 8.	Tighten camshaft position sensor installation bolt securely.
<p>8 CHECK CAMSHAFT SPROCKET. Remove front belt cover. Are camshaft sprocket teeth cracked or damaged?</p>	Cracked or damaged.	Replace camshaft sprocket. <Ref. to ME (H4SO)-, Camshaft Sprocket.>	Go to step 9.
<p>9 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH. Is timing belt dislocated from its proper position?</p>	Dislocated from proper position.	Repair installation condition of timing belt. <Ref. to ME(H4SO)-46, Timing Belt Assembly.>	Replace camshaft position sensor. <Ref. to FU(H4SO)-27, Crankshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AM:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

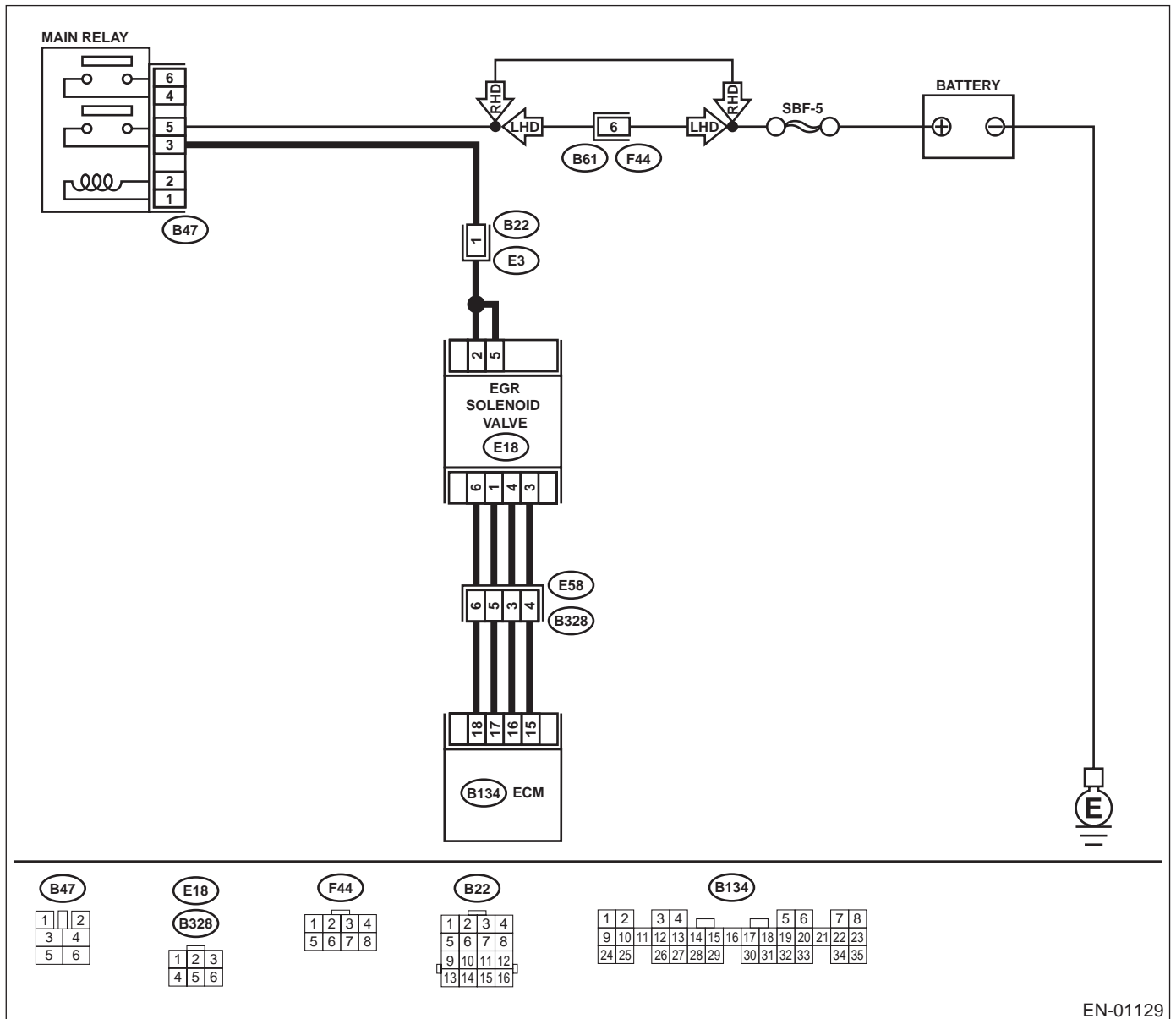
• TROUBLE SYMPTOM:

- Poor driving performance on low engine speed
- Erroneous idling
- Poor driving performance.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01129

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Other DTC indicated on display.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start engine. 2) Rear the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	53.3 kPa (400 mmHg, 15.75 inHg)	Check if EGR valve, intake manifold pressure sensor and throttle body are securely installed.	Go to step 3.
3 CHECK POWER SUPPLY TO EGR SOLENOID VALVE. 1) Disconnect connector from EGR solenoid valve. 2) Turn ignition switch to ON. 3) Measure voltage between EGR solenoid valve and engine ground. Connector & terminal (E18) No. 2 — Engine ground: (E18) No. 5 — Engine ground: Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair open circuit in harness between main relay and EGR solenoid valve connector.
4 CHECK EGR SOLENOID VALVE. Measure resistance between EGR solenoid valve terminals. NOTE: Make sure there are no foreign objects caught between EGR solenoid valve and valve seat. Terminals No. 1 — No. 2: No. 3 — No. 2: No. 4 — No. 5: No. 6 — No. 5: Is the measured value within the specified range?	20 — 30 Ω	Go to step 5.	Replace EGR solenoid valve. <Ref. to FU(H4SO)-35, EGR Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect connectors to ECM and EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 15 — Chassis ground: (B134) No. 16 — Chassis ground: (B134) No. 17 — Chassis ground: (B134) No. 18 — Chassis ground:</p> <p>Does the measured value change within specified range?</p>	0 — 10 V	Repair poor contact in ECM connector.	Go to step 6.
<p>6 CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from EGR solenoid valve and ECM. 3) Measure resistance of harness between EGR solenoid valve and ECM connector.</p> <p>Connector & terminal (B134) No. 18 — (E18) No. 6: (B134) No. 17 — (E18) No. 1: (B134) No. 16 — (E18) No. 4: (B134) No. 15 — (E18) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 7.	Repair open circuit in harness between ECM and EGR solenoid valve connector.
<p>7 CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.</p> <p>Measure resistance of harness between EGR solenoid valve and chassis ground.</p> <p>Connector & terminal (B134) No. 18 — Chassis ground: (B134) No. 17 — Chassis ground: (B134) No. 16 — Chassis ground: (B134) No. 15 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 8.	Repair short circuit in harness between main relay and EGR solenoid valve connector.
<p>8 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM and EGR solenoid valve connector. Is there poor contact in ECM and EGR solenoid valve connector?</p>	There is poor contact.	Repair poor contact in ECM and EGR solenoid valve connector.	Even if MI lights up, the circuit has returned to a normal condition at this time.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

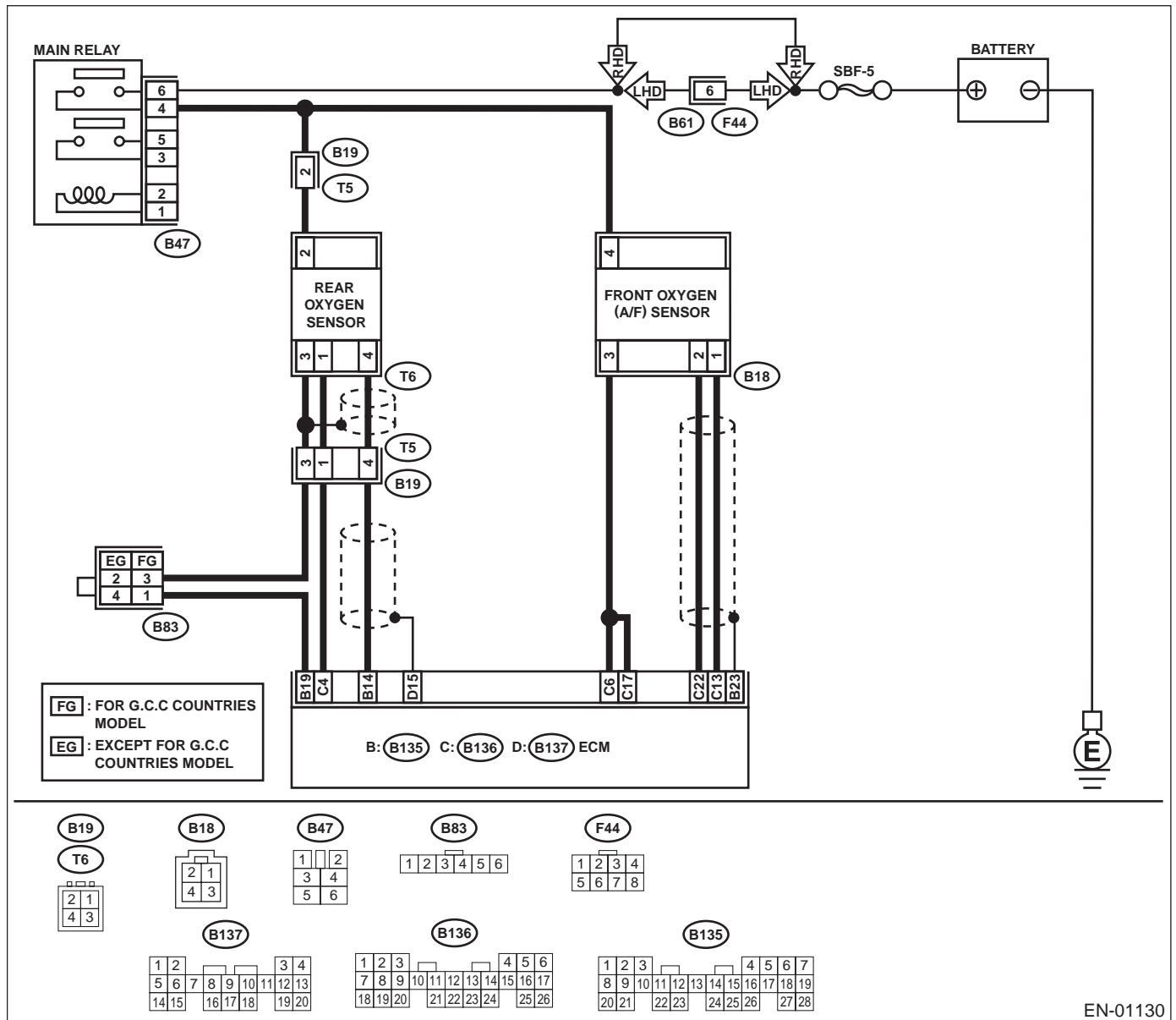
AN:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Engine stalls.
 - Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step 2.
2 CHECK EXHAUST SYSTEM. Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. Is there any fault in exhaust system? NOTE: Check the following positions. <ul style="list-style-type: none"> •Between cylinder head and front exhaust pipe •Between front exhaust pipe and front catalytic converter •Between front catalytic converter and rear catalytic converter 	There is a fault.	Repair or replace exhaust system. <Ref. to EX(H4SO)-2, General Description.>	Go to step 3.
3 CHECK CATALYTIC CONVERTER. Is there any damage at catalyst?	There is a damage.	Replace front catalytic converter. <Ref. to EC(H4SO)-3, Front Catalytic Converter.>	Go to step 4.
4 CHECK REAR OXYGEN SENSOR CIRCUIT. 1) Disconnect rear oxygen sensor connector. 2) Measure the resistance between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 19 - (T6) No. 3 Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair open harness between ECM and rear oxygen sensor.
5 CHECK SEALED WIRE. Is the sealed wire connected?	Connected.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Repair sealed wire.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

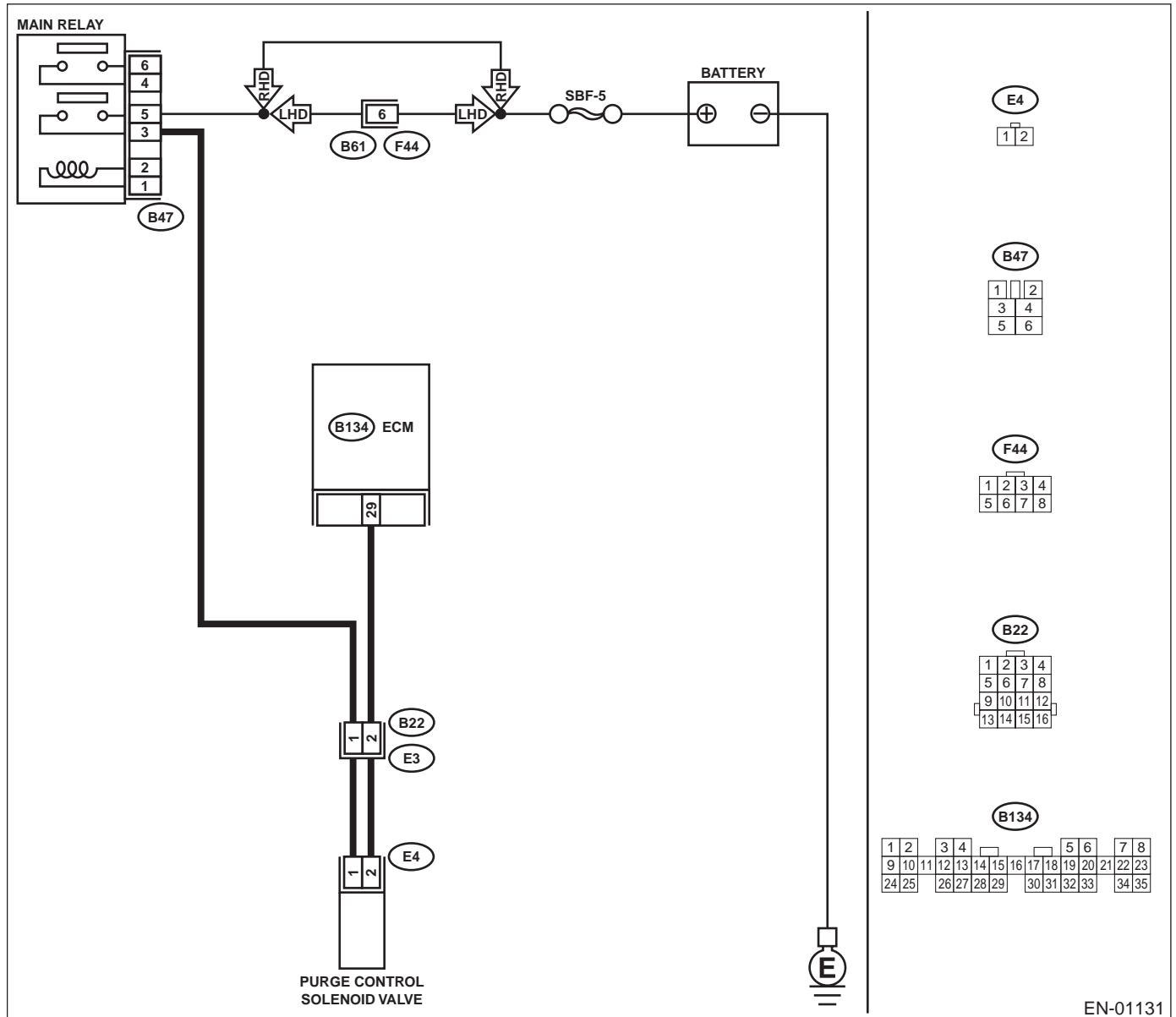
AO:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 29 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from purge control solenoid valve and ECM. 3) Measure resistance of harness between purge control solenoid valve connector and engine ground.</p> <p>Connector & terminal (E4) No. 2 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 3.	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.
<p>3</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>Measure resistance of harness between ECM and purge control solenoid valve of harness connector.</p> <p>Connector & terminal (B134) No. 29 — (E4) No. 2:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
<p>4</p> <p>CHECK PURGE CONTROL SOLENOID VALVE.</p> <p>1) Remove purge control solenoid valve. 2) Measure resistance between purge control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified range?</p>	10 - 100 Ω	Go to step 5.	Replace purge control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair open circuit in harness between main relay and purge control solenoid valve connector.
<p>6 CHECK POOR CONTACT. Check poor contact in purge control solenoid valve connector. Is there poor contact in purge control solenoid valve connector?</p>	There is poor contact.	Repair poor contact in purge control solenoid valve connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AP:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

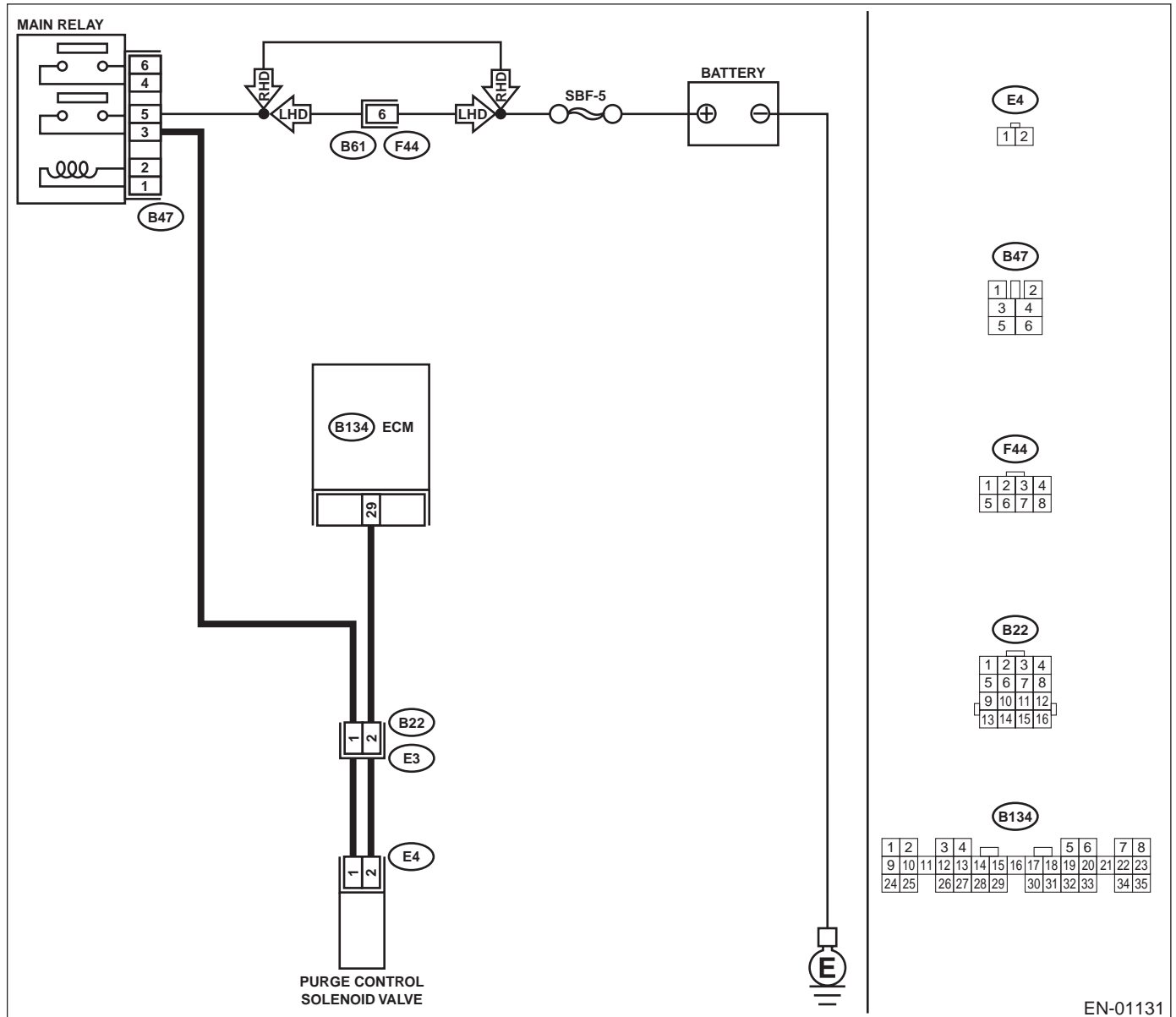
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01131

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) While operating purge control solenoid valve, measure voltage between ECM and chassis ground.</p> <p>NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-48, Compulsory Valve Operation Check Mode.></p> <p>Connector & terminal (B134) No. 29 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Even if MI light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
<p>2 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 29 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Go to step 3.
<p>3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>
<p>4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from purge control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 29 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step 5.
<p>5 CHECK PURGE CONTROL SOLENOID VALVE.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between purge control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2: Is the measured value less than the specified value?</p>	1 Ω	Replace purge control solenoid valve <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AQ:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

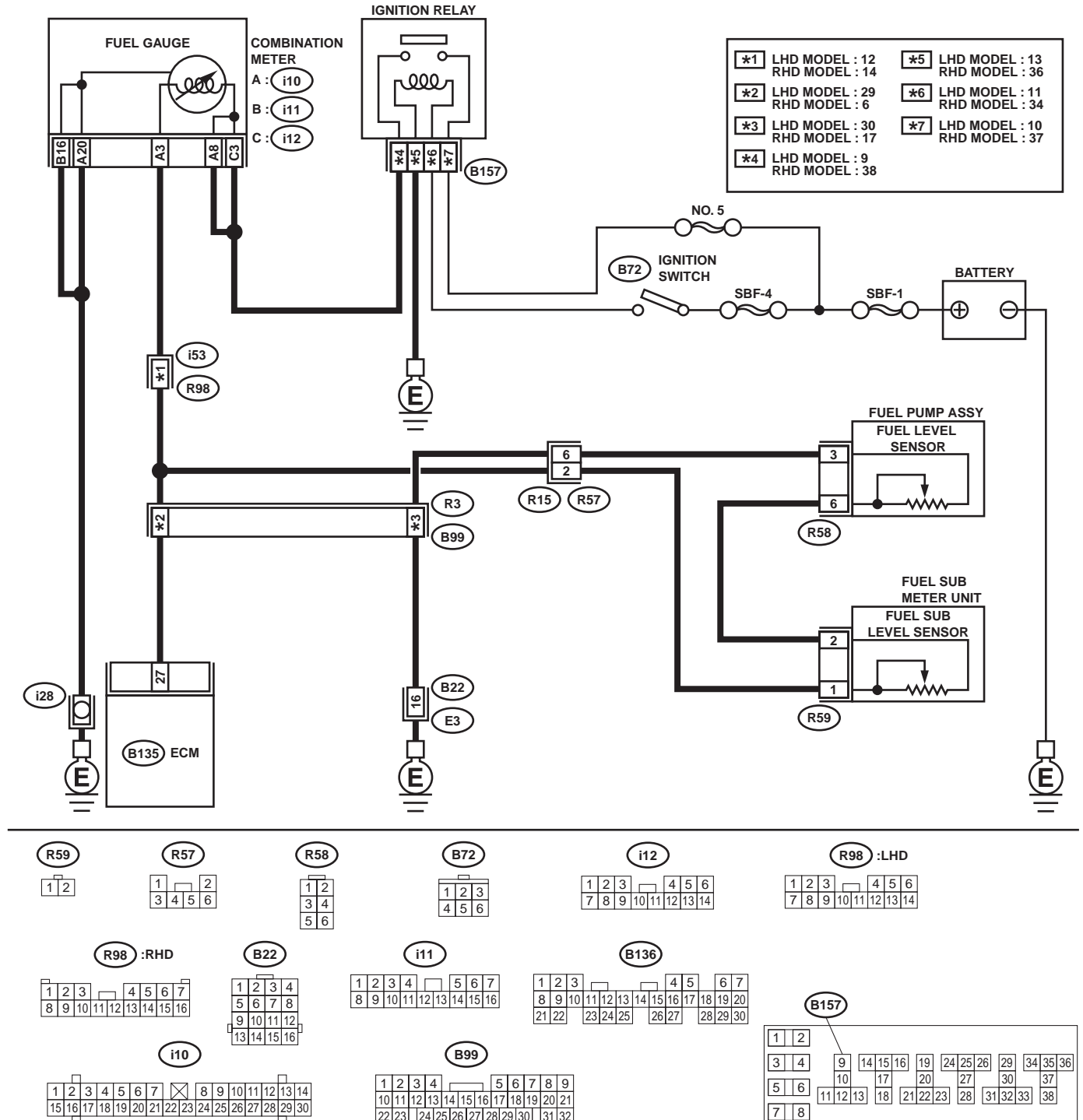
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01132

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace fuel level sensor <Ref. to FU(H4SO)-64, Fuel Level Sensor.> and fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Filler Pipe.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AR:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

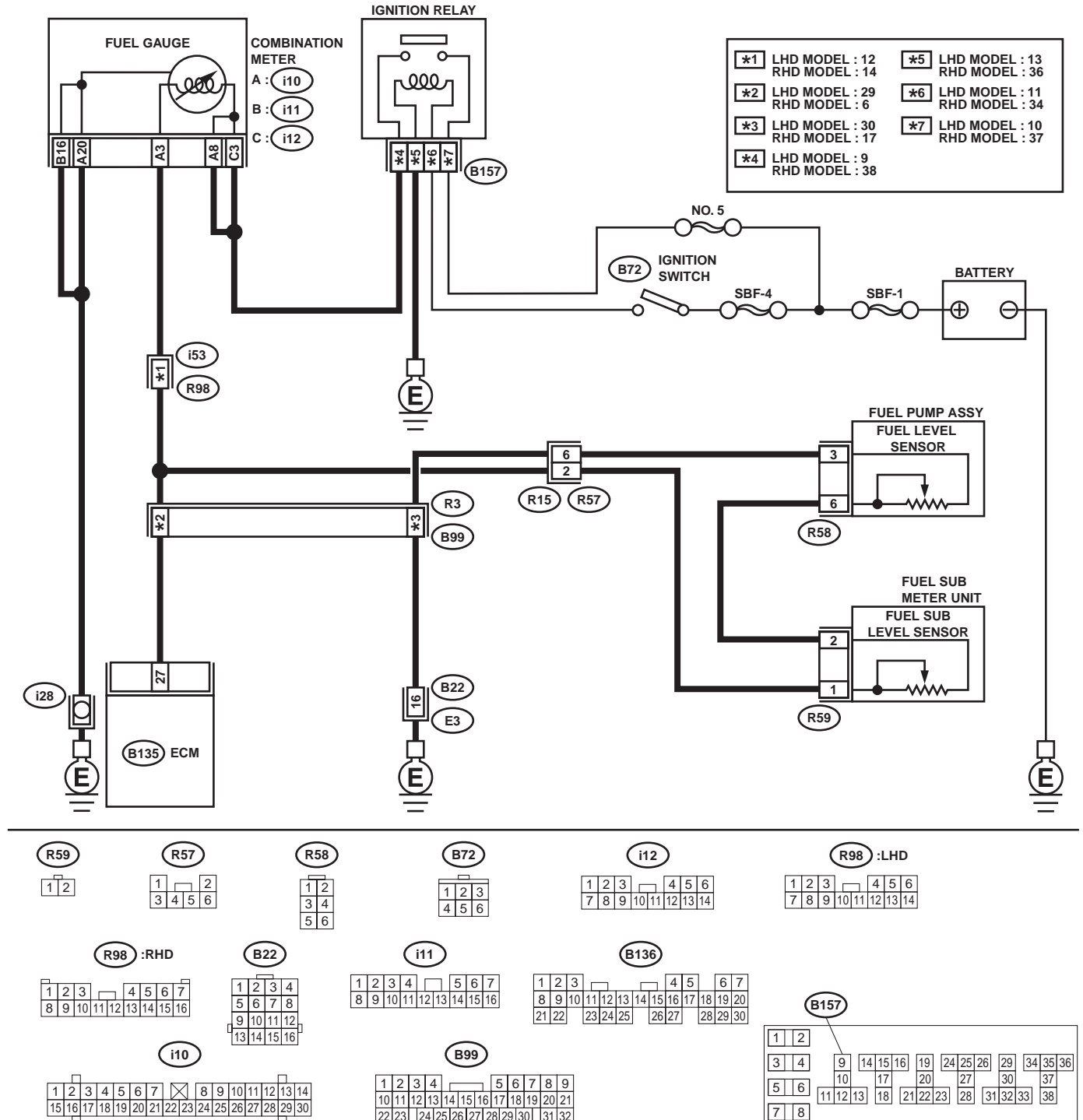
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN-01132

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER. Does speedometer and tachometer operate normally?	Operates normally.	Go to step 2.	Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 27 (+) — Chassis ground (-): Is the measured value less than the specified value?	0.12 V	Go to step 6.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read data of fuel level sensor signal using Subaru Select Monitor. Is the measured value less than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.>	0.12 V	Repair poor contact in ECM connector.	Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4 CHECK INPUT VOLTAGE OF ECM. 1) Turn ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 27 (+) — Chassis ground (-): Does the measured value exceed the specified value?	0.12 V	Go to step 4.	Go to step 7.
5 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. 1) Turn ignition switch to OFF. 2) Disconnect connector from connector (i10) and ECM connector. 3) Measure resistance between ECM and chassis ground. Connector & terminal (B136) No. 27 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 6.	Repair ground short circuit in harness between ECM and combination meter connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. Measure resistance between ECM and combination meter connector. Connector & terminal (B136) No. 27 — (i10) No. 3: Is the measured value less than the specified value?</p>	10 Ω	Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
<p>7 CHECK FUEL TANK CORD. 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel sub level sensor. 3) Measure resistance between fuel sub level sensor and chassis ground. Connector & terminal (R59) No. 1 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 8 .	Repair ground short circuit in fuel tank cord.
<p>8 CHECK FUEL TANK CORD. 1) Disconnect connector from fuel pump assembly. 2) Measure resistance between fuel pump assembly and chassis ground. Connector & terminal (R59) No. 2 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9 .	Repair ground short circuit in fuel tank cord.
<p>9 CHECK FUEL LEVEL SENSOR. Warning: During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill. 1) Remove fuel pump assembly. <Ref. to FU(H4SO)-62, Fuel Pump.> 2) Measure resistance between fuel level sensor and terminals with its float set to the full position. Terminals No. 3 — No. 6: Is the measured value within the specified range?</p>	0.5 - 2.5 Ω	Go to step 10 .	Replace fuel level sensor.
<p>10 CHECK FUEL SUB LEVEL SENSOR. Warning: During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill. 1) Remove fuel sub level sensor. <Ref. to FU(H4SO)-65, Fuel Sub Level Sensor.> 2) Measure resistance between fuel sub level sensor and terminals with its float set to the full position. Terminals No. 1 — No. 2: Is the measured value within the specified range?</p>	0.5 - 2.5 Ω	Repair poor contact in harness between ECM and combination meter connector.	Replace fuel sub level sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AS:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

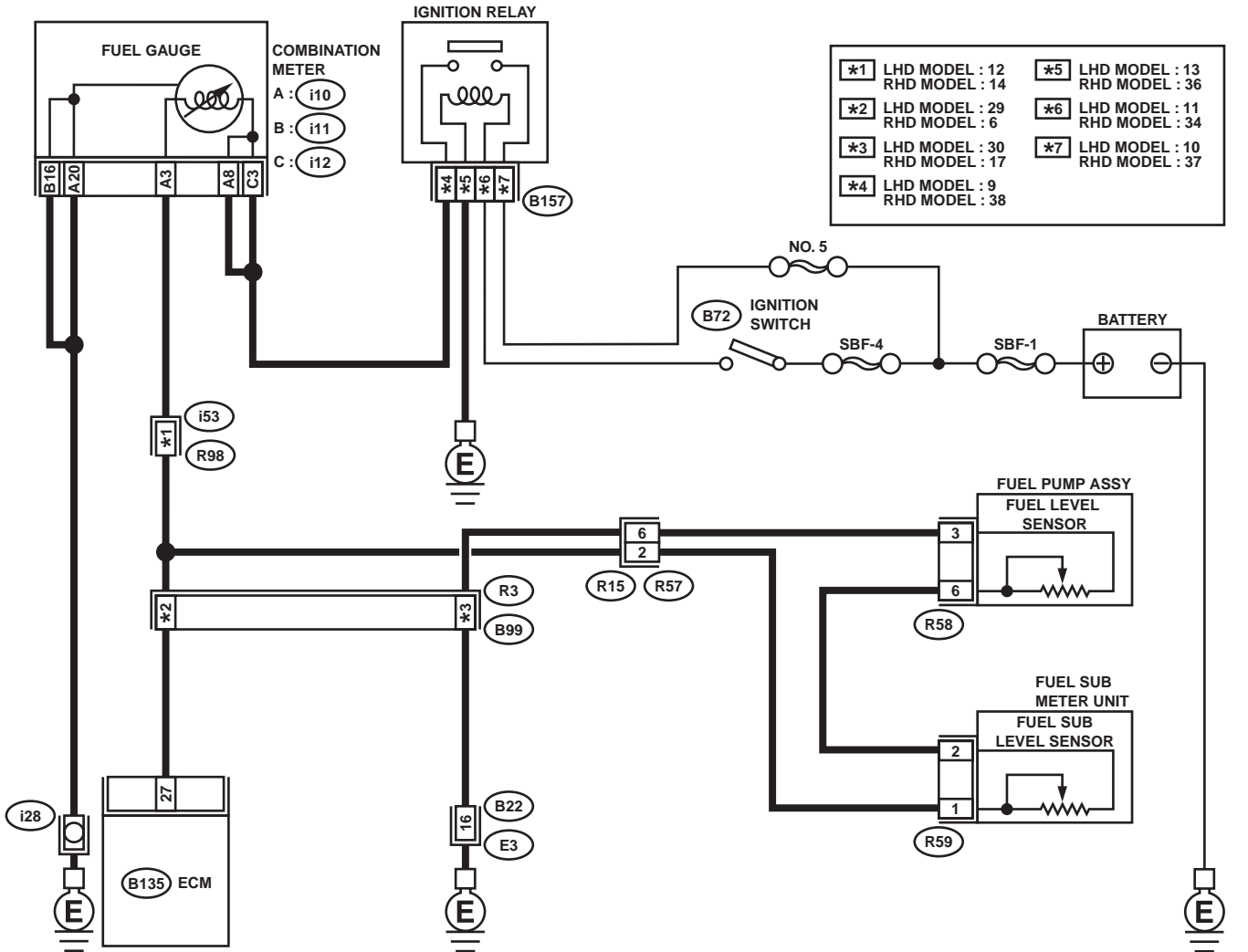
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

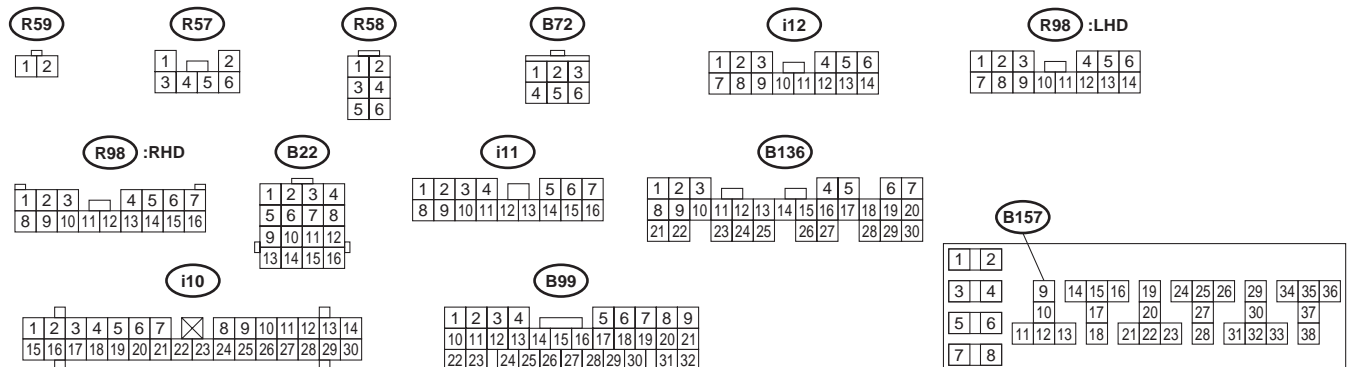
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



*1	LHD MODEL : 12 RHD MODEL : 14	*5	LHD MODEL : 13 RHD MODEL : 36
*2	LHD MODEL : 29 RHD MODEL : 6	*6	LHD MODEL : 11 RHD MODEL : 34
*3	LHD MODEL : 30 RHD MODEL : 17	*7	LHD MODEL : 10 RHD MODEL : 37
*4	LHD MODEL : 9 RHD MODEL : 38		



EN-01132

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER. Does speedometer and tachometer operate normally?	Operates normally.	Go to step 2.	Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 27 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.75 V	Go to step 3.	Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in fuel pump connector • Poor contact in coupling connector
3 CHECK INPUT VOLTAGE OF ECM. 1) Turn ignition switch to OFF. 2) Disconnect combination meter connector (i10) and ECM connector. 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM and chassis ground. Connector & terminal (B136) No. 27 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.75 V	Repair battery short circuit between ECM and combination meter connector.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD. 1) Turn ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure resistance between ECM and fuel tank cord. Connector & terminal (B136) No. 27 — (R15) No. 2: Is the measured value less than the specified value?	5 Ω	Go to step 5.	Repair open circuit between ECM and fuel tank cord.
5 CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND. Measure resistance between fuel tank cord and chassis ground. Connector & terminal (R15) No. 6 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 6.	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK FUEL TANK CORD. 1) Disconnect connector from fuel level sensor. 2) Measure resistance between fuel level sensor and coupling connector. Connector & terminal (R57) No. 6 — (R58) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 7.	Repair open circuit between coupling connector and fuel level sensor.
7 CHECK FUEL TANK CORD. 1) Disconnect connector from fuel sub level sensor. 2) Measure resistance between fuel level sensor and fuel sub level sensor. Connector & terminal (R58) No. 2 — (R59) No. 2: Is the measured value less than the specified value?	1 Ω	Go to step 8.	Repair open circuit between fuel level sensor and fuel sub level sensor.
8 CHECK FUEL TANK CORD. Measure resistance between fuel sub level sensor and coupling connector. Connector & terminal (R57) No. 2 — (R59) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 9.	Repair open circuit between coupling connector and fuel sub level sensor.
9 CHECK FUEL LEVEL SENSOR. Warning: During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill. 1) Remove fuel pump assembly. <Ref. to FU(H4SO)-62, Fuel Pump.> 2) While moving fuel level sensor float up and down, measure resistance between fuel level sensor terminals. Terminals No. 3 — No. 6: Does the measured value exceed the specified value?	54.5 Ω	Replace fuel level sensor. <Ref. to FU(H4SO)-64, Fuel Level Sensor.>	Go to step 10.
10 CHECK FUEL SUB LEVEL SENSOR. Warning: During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill. 1) Remove fuel sub level sensor. <Ref. to FU(H4SO)-65, Fuel Sub Level Sensor.> 2) While moving fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. Terminals No. 1 — No. 2: Does the measured value exceed the specified value?	41.5 Ω	Replace fuel sub level sensor. <Ref. to FU(H4SO)-65, Fuel Sub Level Sensor.>	Replace combination meter. <Ref. to IDI-14, Combination Meter Assembly.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AT:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT—

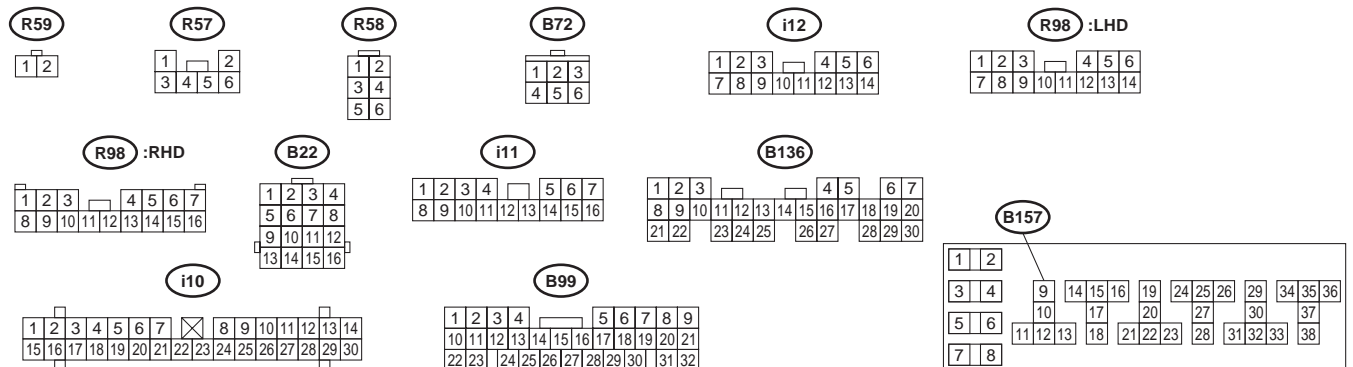
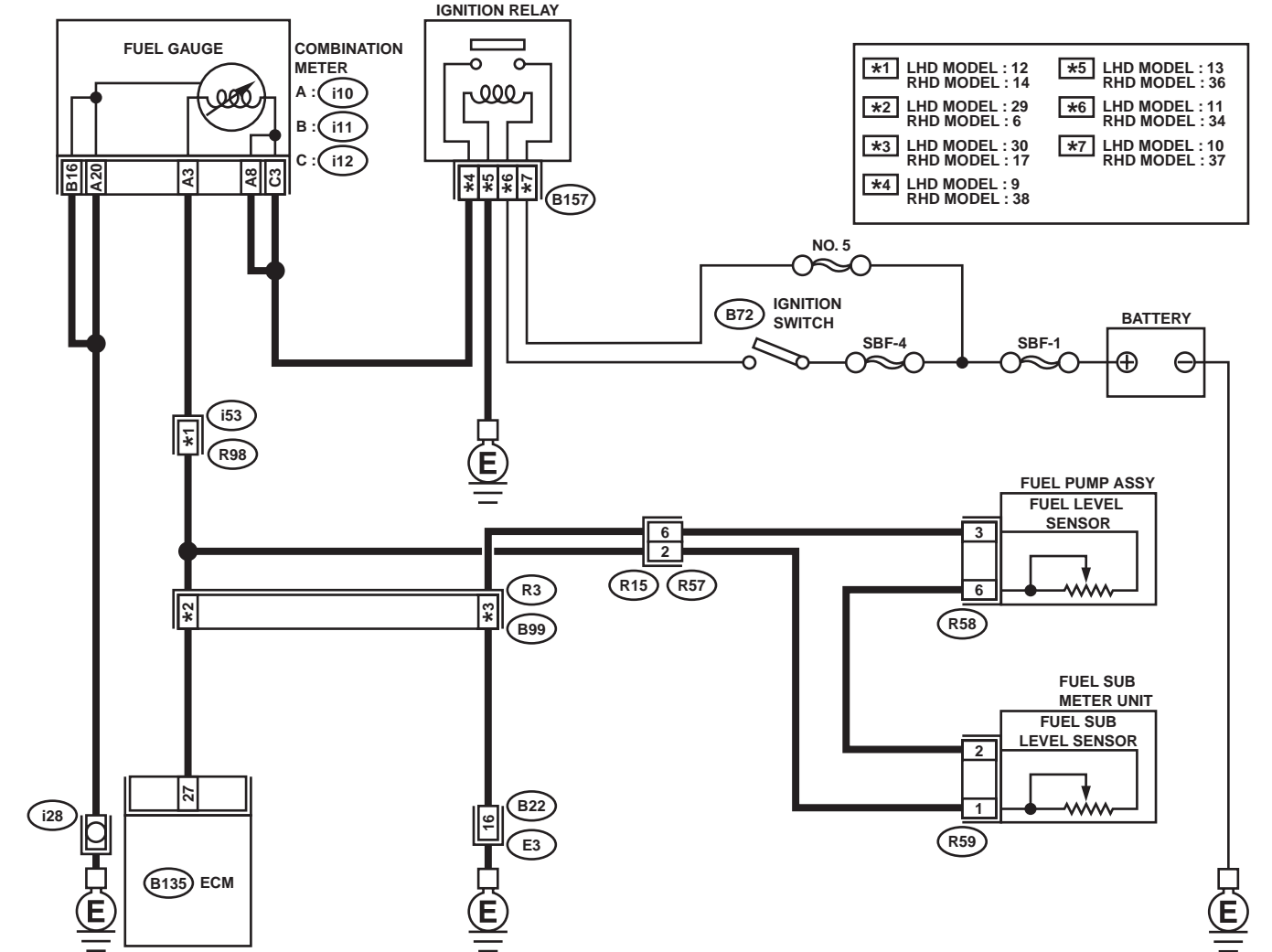
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01132

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL LEVEL SENSOR. Warning: During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill. 1) Remove fuel pump assembly. <Ref. to FU(H4SO)-62, Fuel Pump.> 2) While moving fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. Terminals No. 3 — No. 6: Does the resistance change smoothly?	Change smoothly.	Go to step 3.	Replace fuel level sensor. <Ref. to FU(H4SO)-64, Fuel Level Sensor.>
3 CHECK FUEL SUB LEVEL SENSOR. Warning: During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill. 1) Remove fuel sub level sensor. <Ref. to FU(H4SO)-65, Fuel Sub Level Sensor.> 2) While moving fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. Terminals No. 1 — No. 2: Does the resistance change smoothly?	Change smoothly.	Repair poor contact in ECM, combination meter and coupling connectors.	Replace fuel sub level sensor. <Ref. to FU(H4SO)-65, Fuel Sub Level Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AU:DTC P0483 — COOLING FAN RATIONALITY CHECK —

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

- **TROUBLE SYMPTOM:**

- Occurrence of noise
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

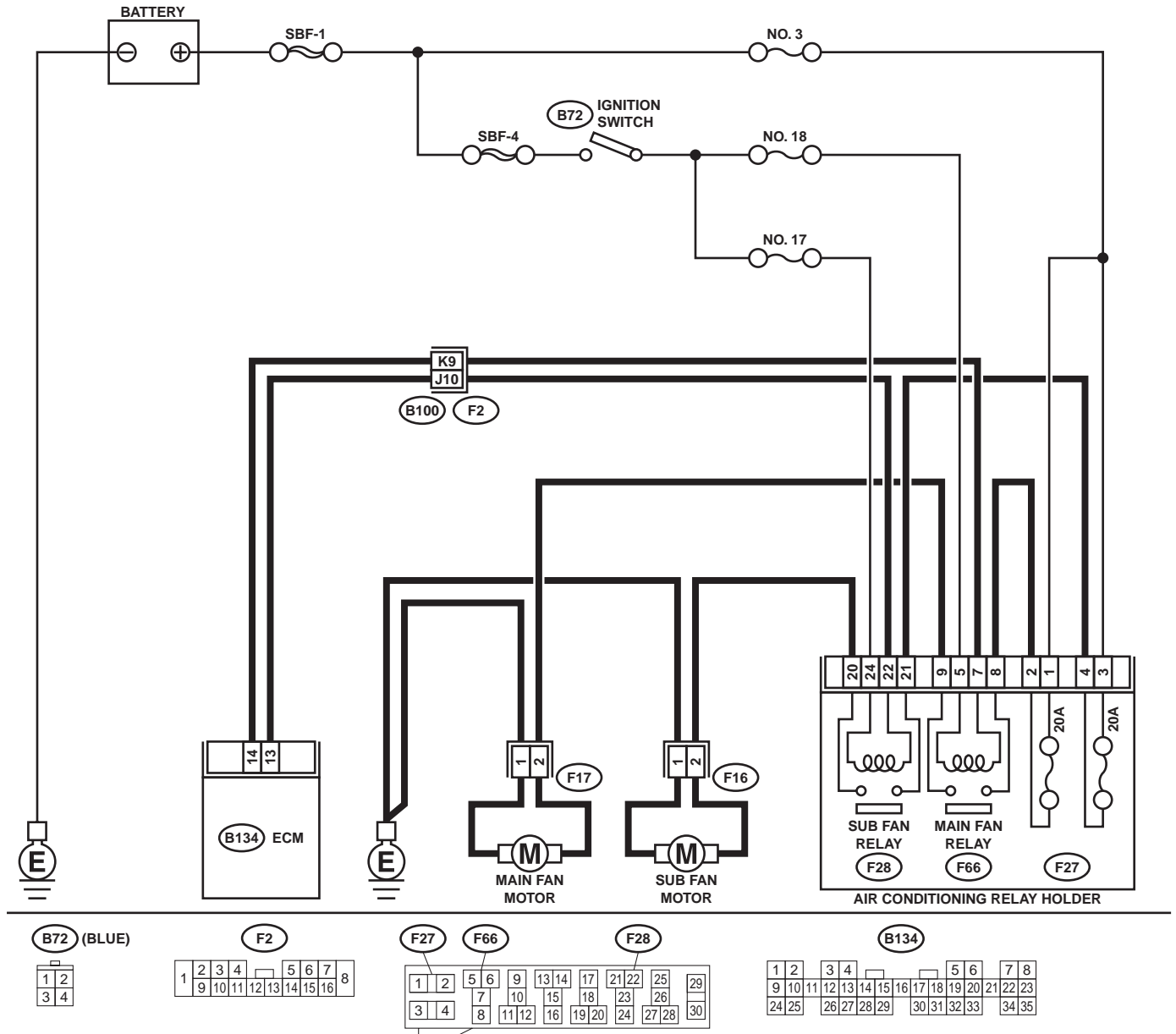
NOTE:

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-00736

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO(H4SO)-28, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-30, Radiator Sub Fan and Fan Motor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AV:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

NOTE:

For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H4SO)-222, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AW:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

—

• DTC DETECTING CONDITION:

- Immediately at fault recognition

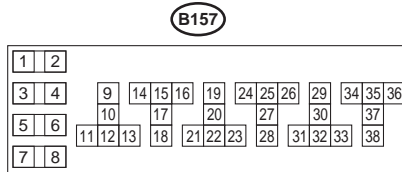
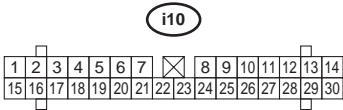
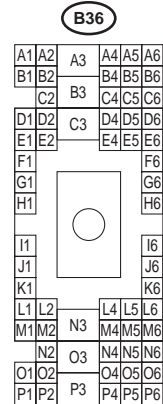
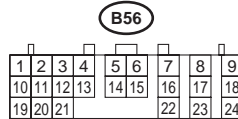
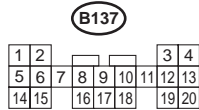
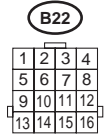
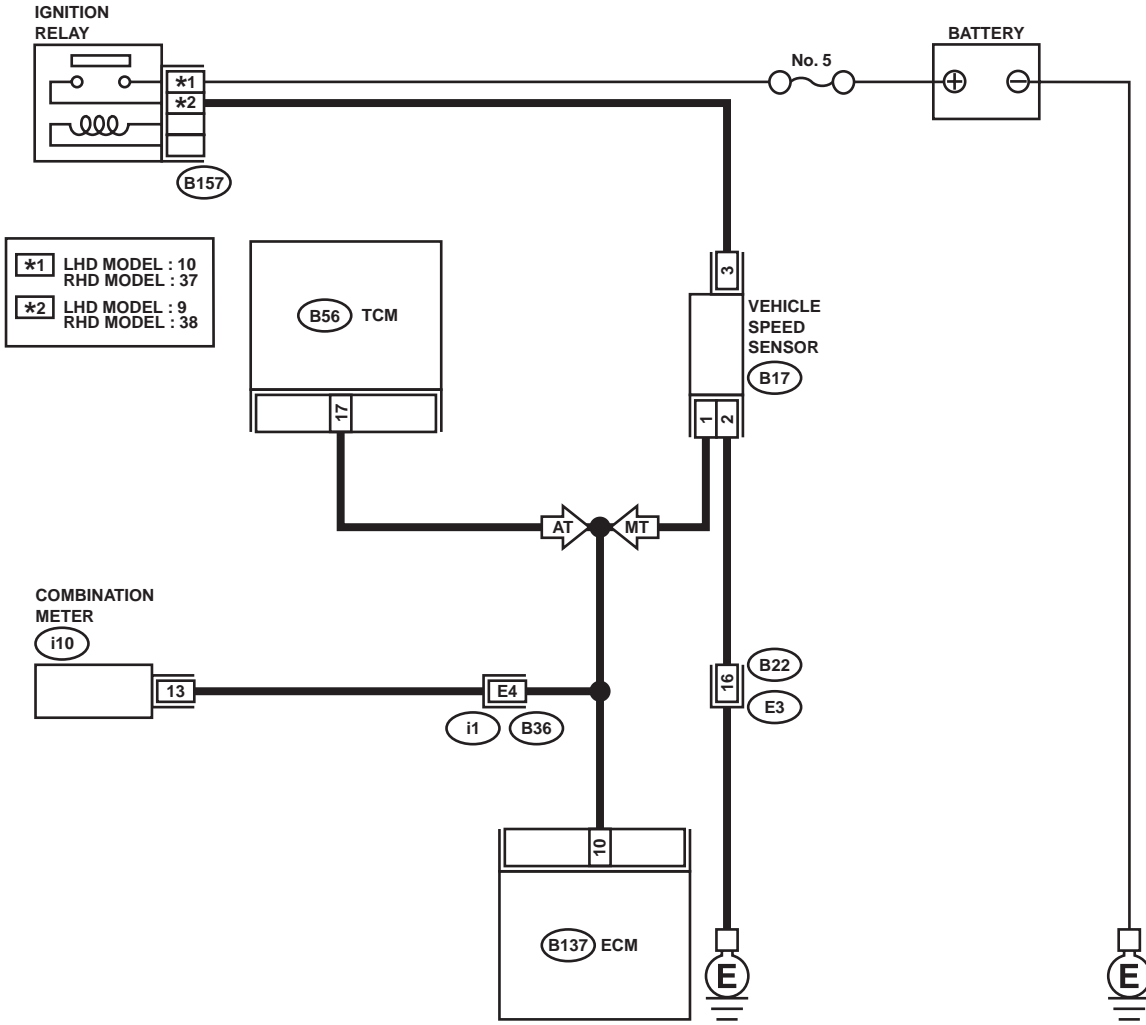
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• **WIRING DIAGRAM:**



EN-01133

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK TRANSMISSION TYPE. Is the transmission type AT?	Transmission type is AT.	Go to step 2.	Go to step 3.
2 CHECK DTC P0720 ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	DTC P0720 indicated.	Check front vehicle speed sensor signal circuit. <Ref. to AT-58, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK SPEEDOMETER OPERATION IN COMBINATION METER. Does speedometer operate normally?	Operates normally.	Go to step 4.	Check speedometer and vehicle speed sensor. <Ref. to IDI-18, Speedometer.> and <Ref. to AT-54, Front Vehicle Speed Sensor.> and <Ref. to AT-58, Rear Vehicle Speed Sensor.> and <Ref. to AT-59, Torque Converter Turbine Speed Sensor.>
4 CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from combination meter. 3) Measure resistance between ECM and combination meter. Connector & terminal (B137) No. 10 — (i10) No. 13: Is the measured value less than the specified value?	10 Ω	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AX:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

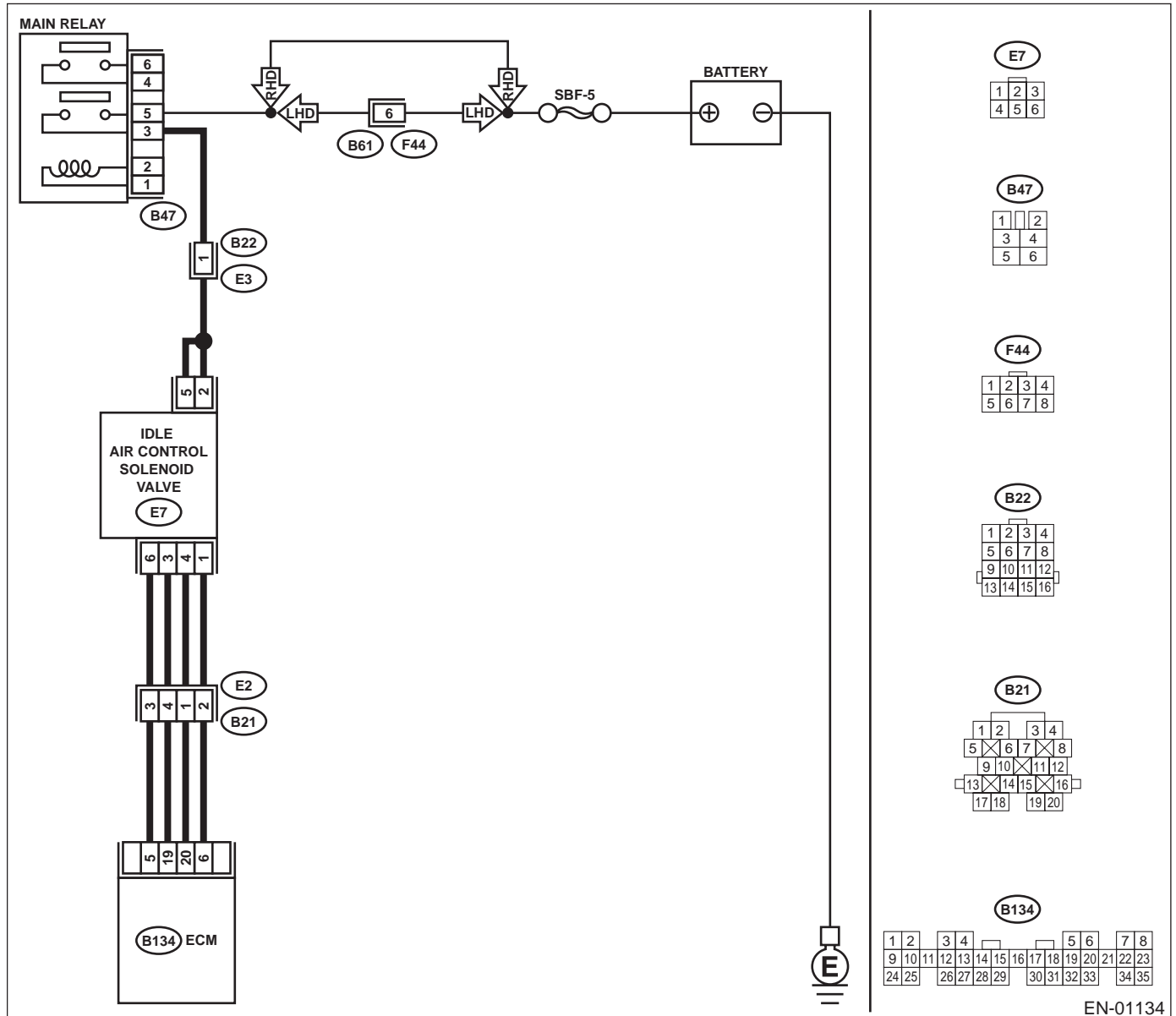
TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN-01134

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step 2.
2 CHECK AIR BY-PASS LINE. 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H4SO)-34, REMOVAL, Idle Air Control Solenoid Valve.> 3) Remove throttle body from intake manifold. <Ref. to FU(H4SO)-14, REMOVAL, Throttle Body.> 4) Using an air gun, force air into idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body interior. Does air flow out?	Flows out.	Replace idle air control solenoid valve. <Ref. to FU(H4SO)-34, INSTALLATION, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(H4SO)-14, INSTALLATION, Throttle Body.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AY:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

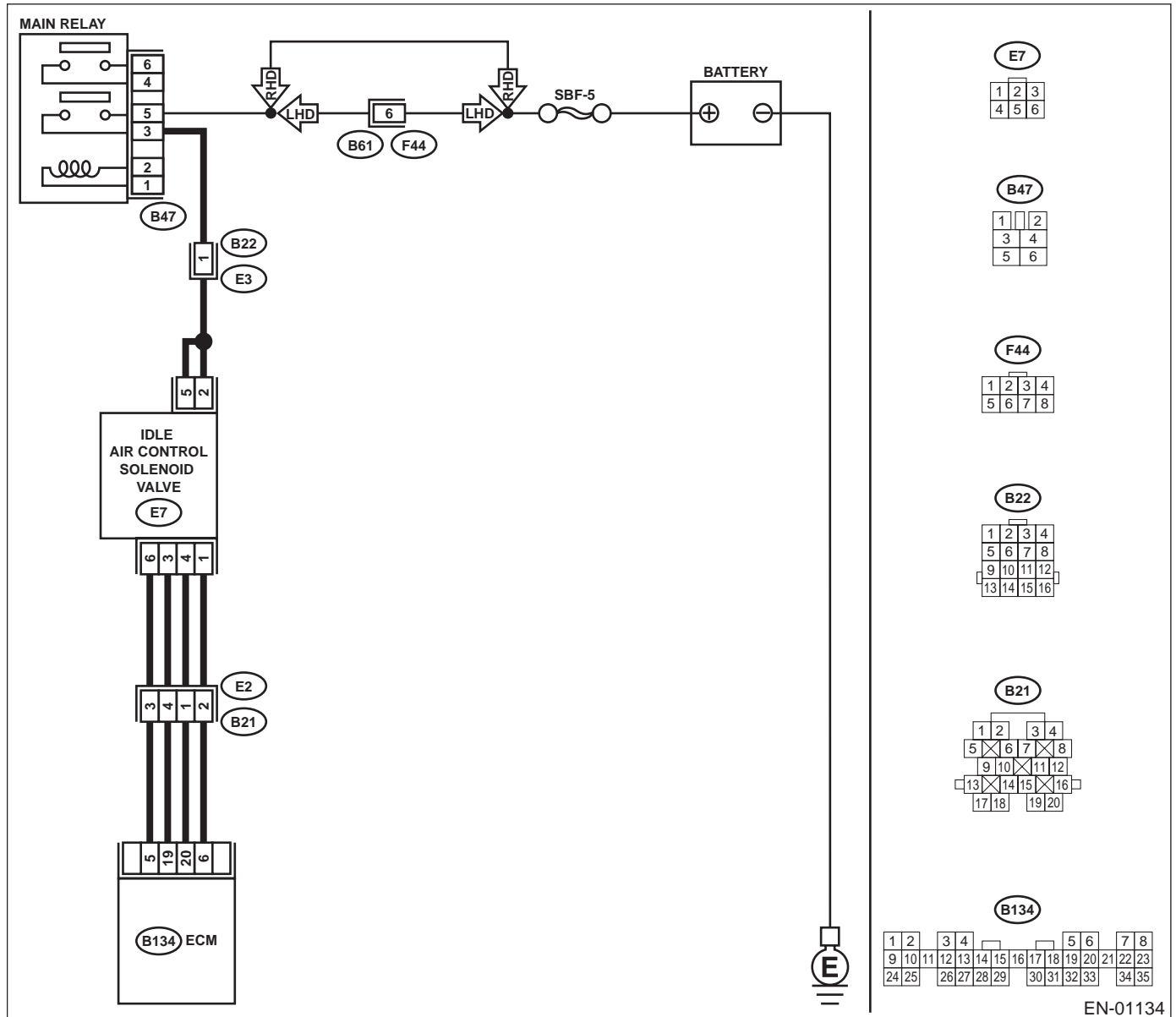
• **TROUBLE SYMPTOM:**

- Engine keeps running at higher revolution than specified idling revolution.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses Is there any fault in air intake system?	There is a fault.	Repair air suction and leaks.	Go to step 3.
3 CHECK THROTTLE CABLE. Does throttle cable have play for adjustment?	Cable has play.	Go to step 4.	Adjust throttle cable. <Ref. to SP(H4SO)-10, Accelerator Control Cable.>
4 CHECK AIR BY-PASS LINE. 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H4SO)-34, REMOVAL, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in by-pass air line. Are foreign particles in by-pass air line?	There are foreign particles.	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(H4SO)-34, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AZ:DTC P0512 — STARTER REQUEST CIRCUIT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Failure of engine to start

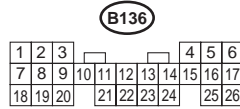
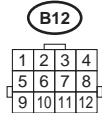
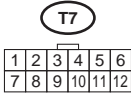
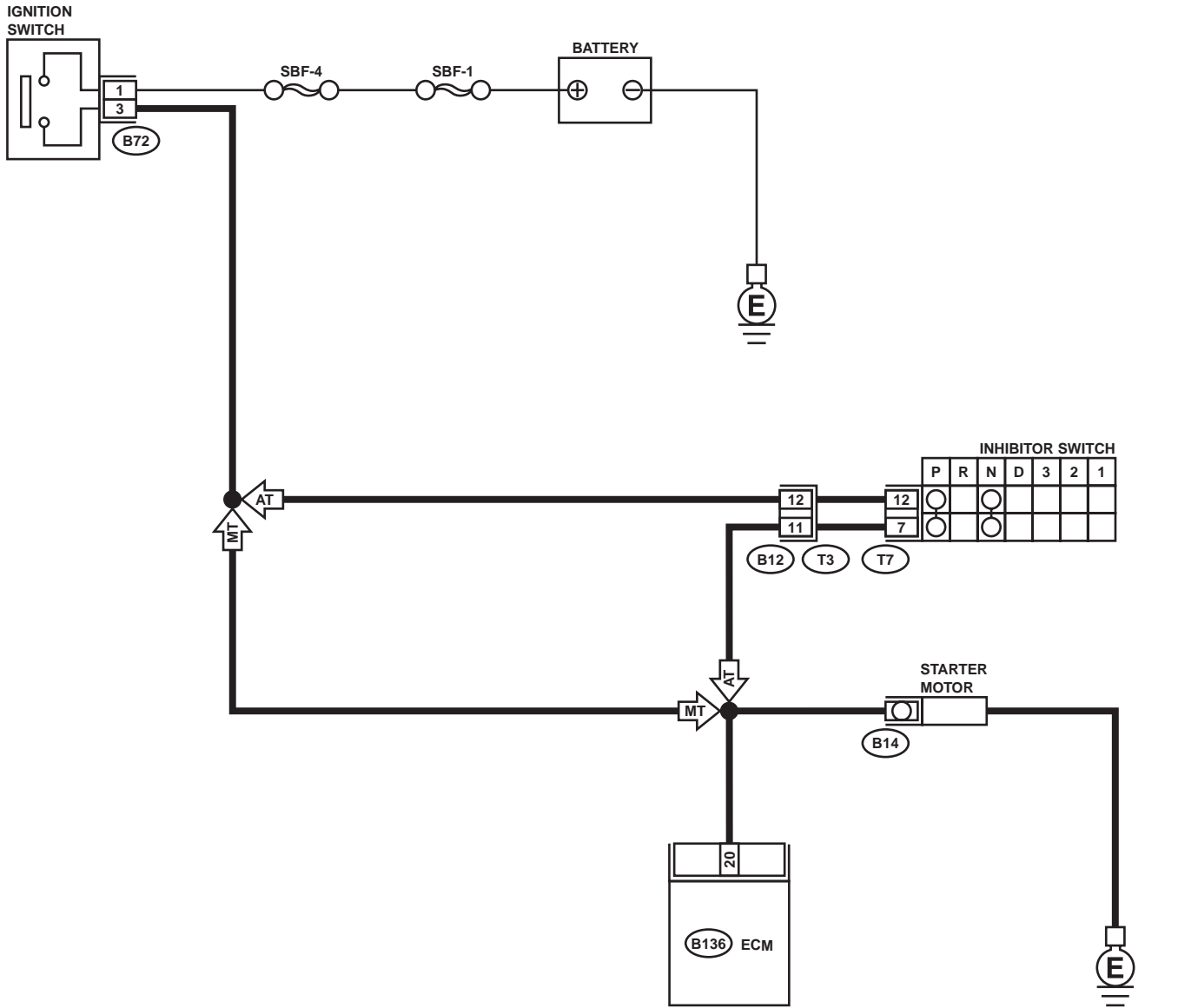
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• **WIRING DIAGRAM:**



EN-01118

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. NOTE: Place the inhibitor switch in each position. Does starter motor operate when ignition switch to "ON"?	Operates.	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EN(H4SO)-62, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BA:DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMANCE —

DTC DETECTING CONDITION:

- Immediately at fault recognition

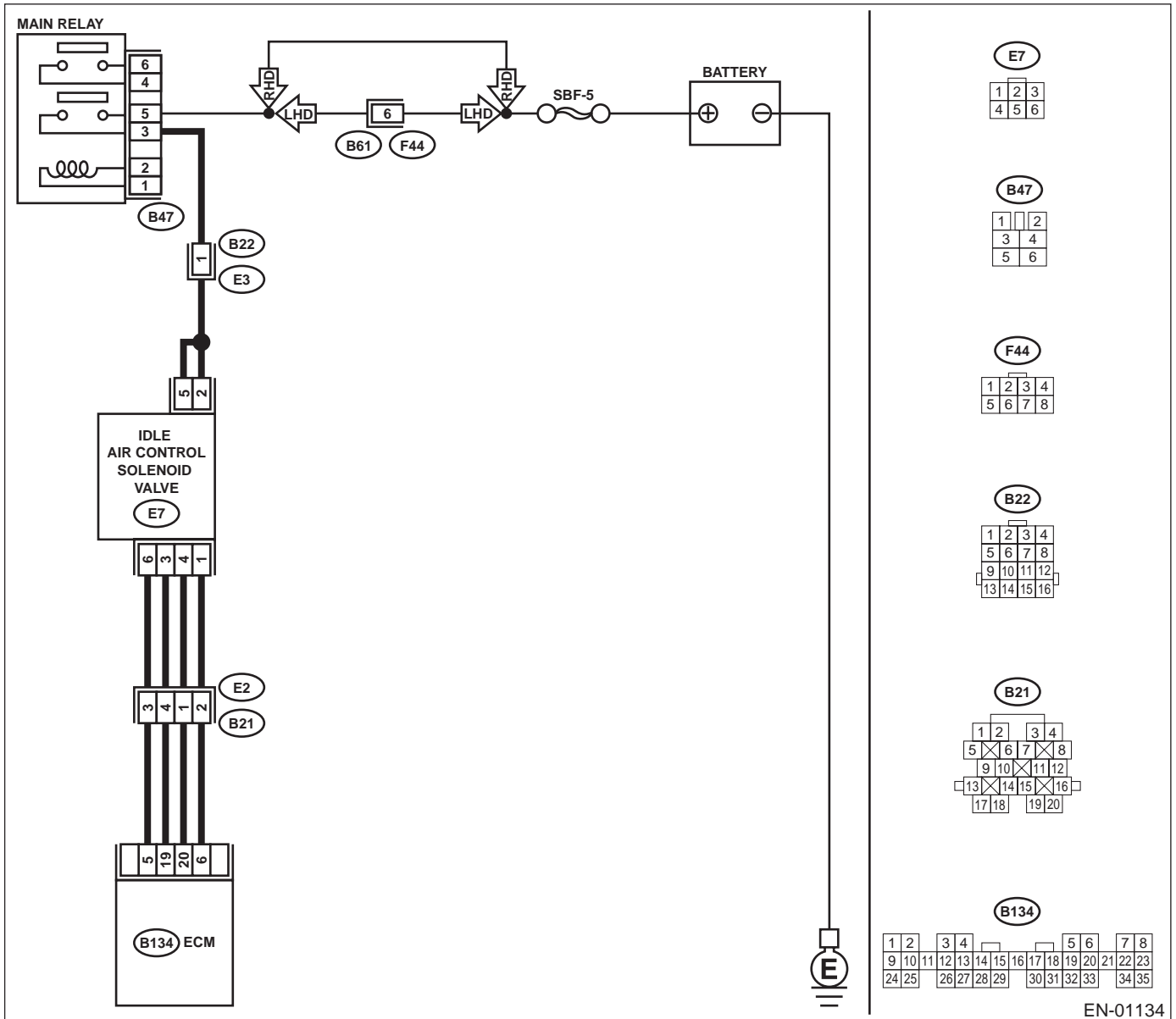
TROUBLE SYMPTOM:

- Engine keeps running at higher revolution than specified idling revolution.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN-01134

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses Is there a fault in air intake system?	There is a fault.	Repair air suction and leaks.	Go to step 3.
3 CHECK THROTTLE CABLE. Does throttle cable have play for adjustment?	Throttle cable has play for adjustment.	Go to step 4.	Adjust throttle cable. <Ref. to SP(H4SO)-10, Accelerator Control Cable.>
4 CHECK AIR BY-PASS LINE. 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H4SO)-34, REMOVAL, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in by-pass air line. Are foreign particles in by-pass air line?	Foreign particles are in by-pass air line.	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(H4SO)-34, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BB:DTC P0565 — CRUISE CONTROL ON SIGNAL —

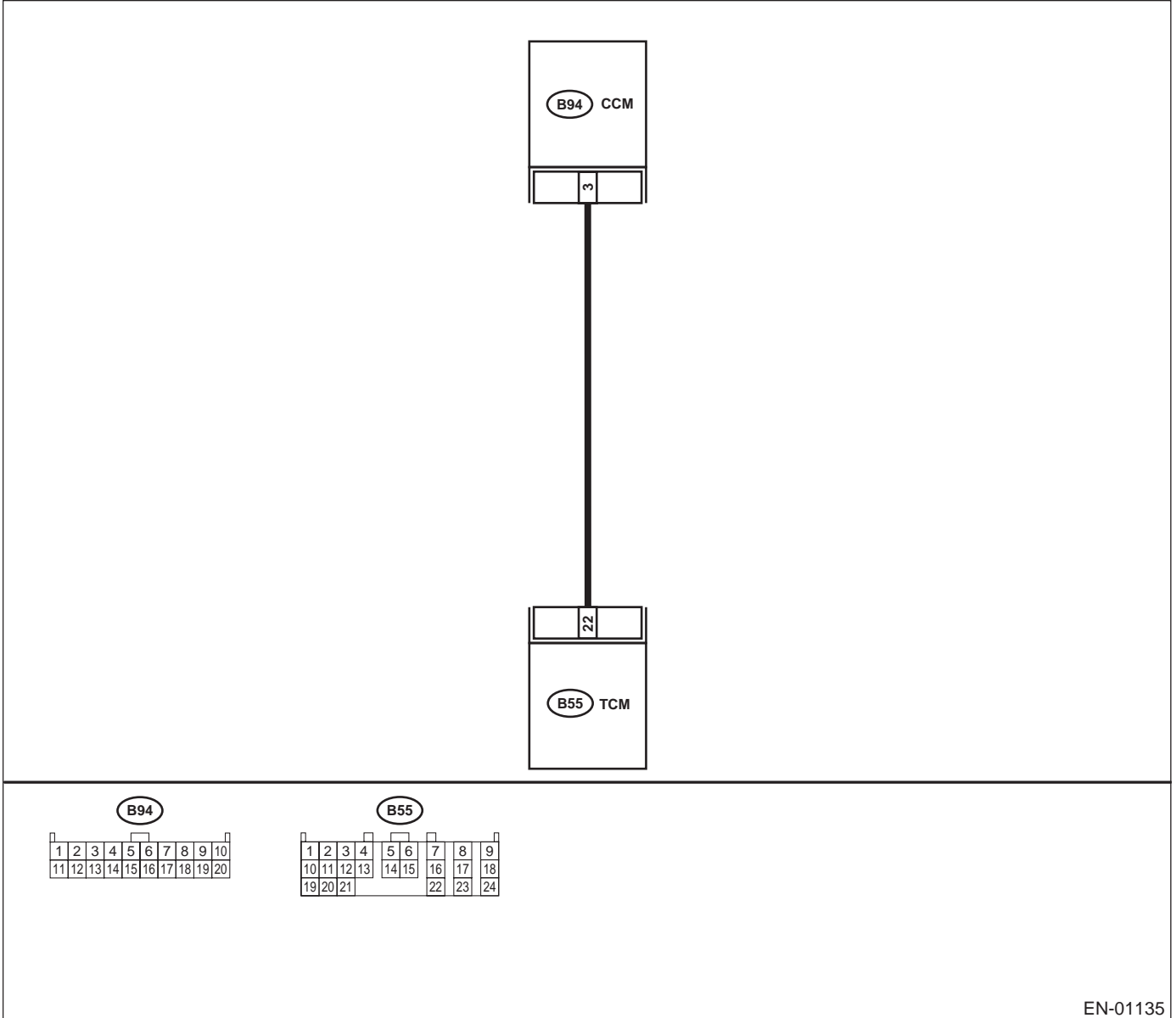
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01135

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and CCM. 3) Measure resistance of harness between TCM and CCM connector. Connector & terminal (B55) No. 22 - (B94) No. 3: Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and CCM connector.
<p>2 CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 22 - Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and CCM connector.
<p>3 CHECK INPUT SIGNAL FOR TCM. 1) Connect connector to TCM and CCM. 2) Lift-up the vehicle or set the vehicle on free rollers. CAUTION: On AWD models, raise all wheels off ground. 3) Start the engine. 4) Cruise control main switch to ON. 5) Move selector lever to "D" and slowly increase vehicle speed to 50 km/h (31 MPH). 6) Cruise control command switch to ON. 7) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 22 - Chassis ground: Is the measured value less than the specified value?</p>	1 V	Go to step 4.	Check cruise control command switch circuit. <Ref. to CC-8, INSPECTION, Cruise Control Command Switch.>
<p>4 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?</p>	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

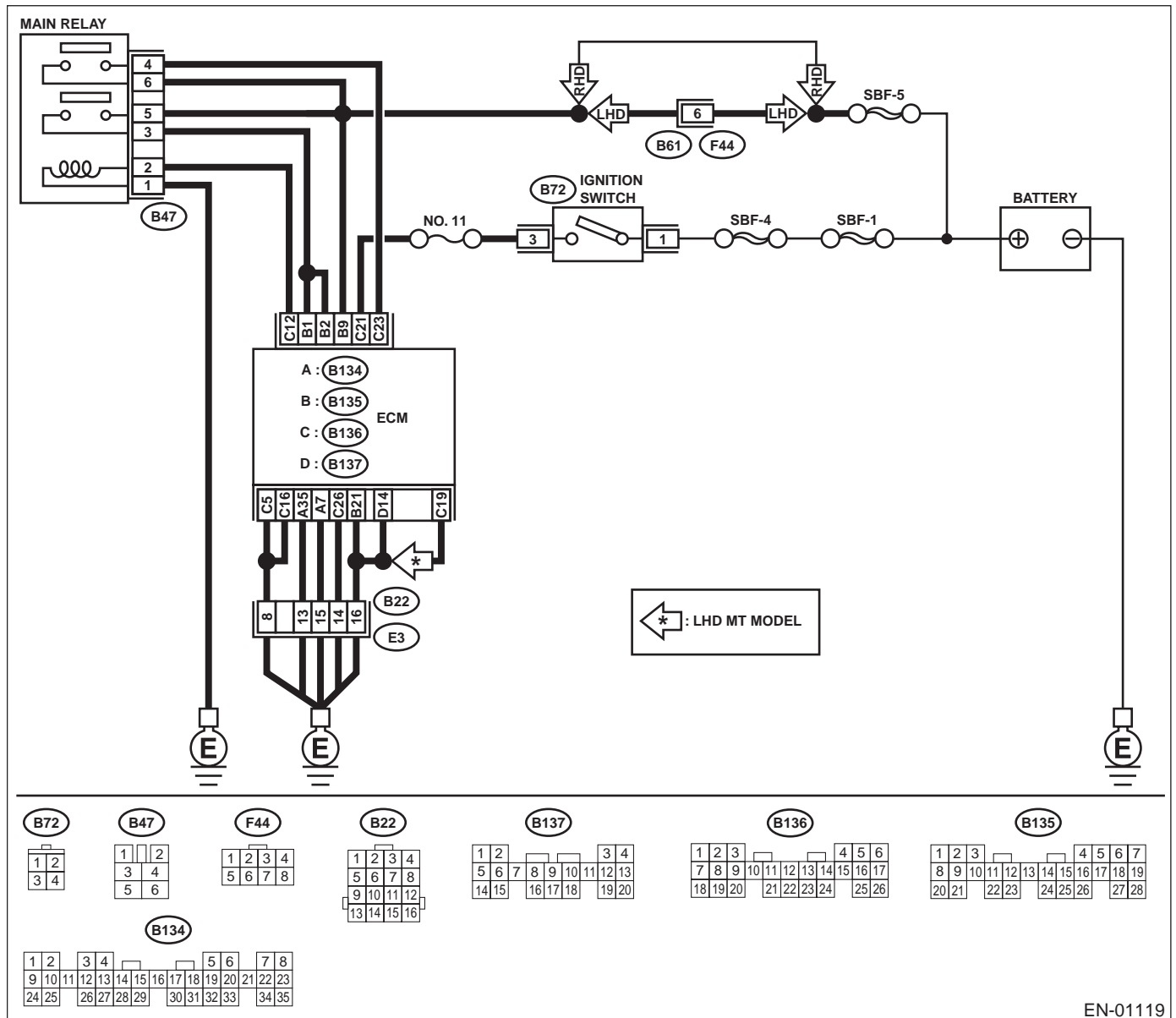
BC:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine does not start.
 - Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01119

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	DTC P0604 indicated.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	It is not necessary to inspect DTC P0604.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BD:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

- **TROUBLE SYMPTOM:**

- Radiator fan does not operate properly.
- Overheating

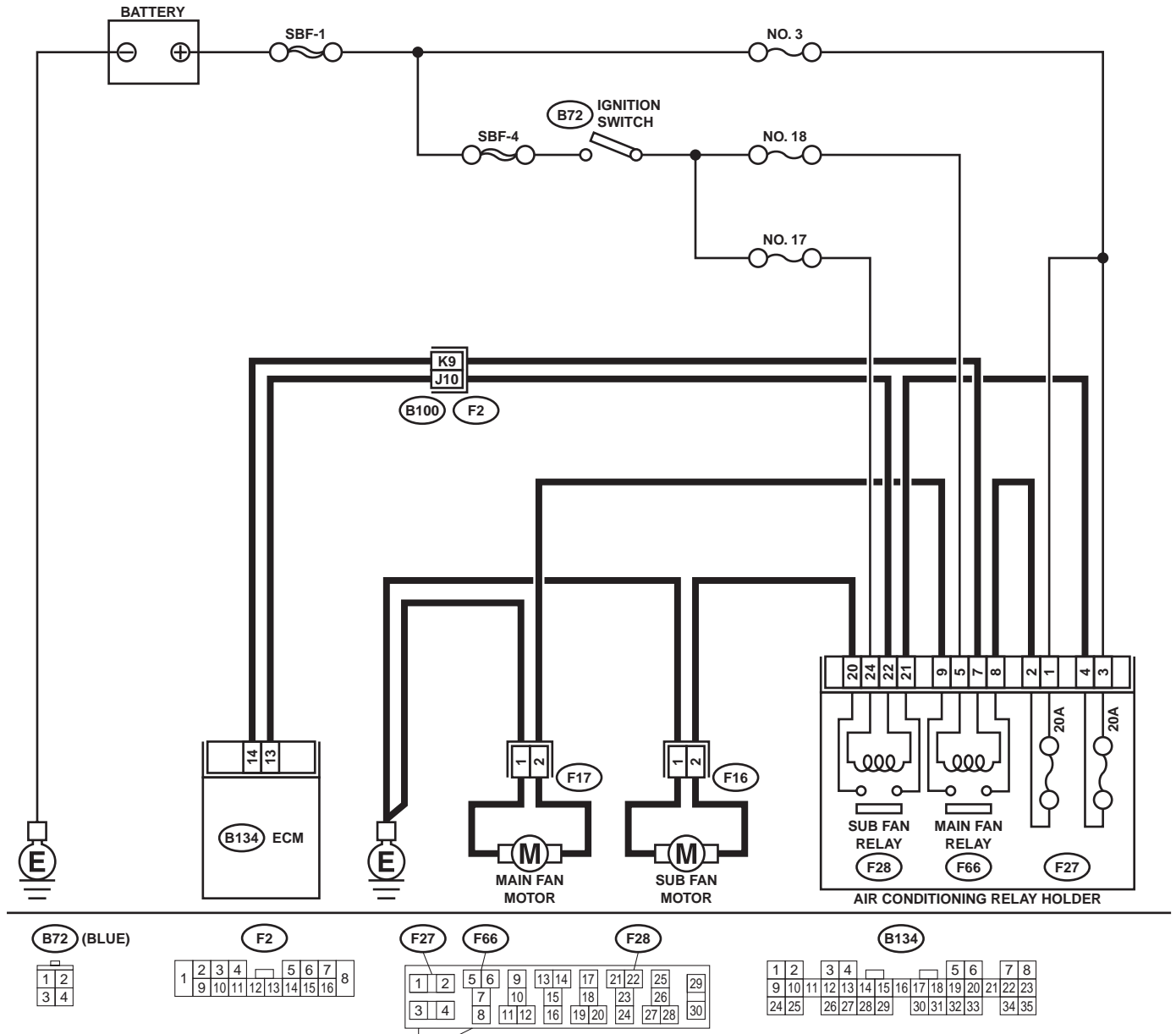
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-00736

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating radiator fan relay, measure voltage between ECM terminal and ground. Does the measured value change within specified range?</p> <p>NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H4SO)-32, Subaru Select Monitor.></p> <p>Connector & terminal (B134) No. 14 (+) — Chassis ground (-):</p>	0 - 10 V	Repair poor contact in ECM connector.	Go to step 2.
<p>2 CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY 1 CONTROL CIRCUIT.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and remove main fan relay from A/C relay holder. 3) Measure resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 14 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair ground short circuit in radiator fan relay 1 control circuit.
<p>3 CHECK POWER SUPPLY FOR RELAY.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between fuse and relay box (F/B) connector and chassis ground.</p> <p>Connector & terminal (F66) No. 5 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
<p>4 CHECK MAIN FAN RELAY.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between main fan relay terminals.</p> <p>Terminal No. 5 — No. 7:</p> <p>Is the measured value within the specified range?</p>	87 - 107 Ω	Go to step 5.	Replace main fan relay.
<p>5 CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.</p> <p>Measure resistance of harness between ECM and main fan relay connector.</p> <p>Connector & terminal (B134) No. 14 — (F66) No. 7:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and main fan relay connector • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in ECM or main fan relay connector. Is there poor contact in ECM or main fan relay connector?	There is poor contact.	Repair poor contact in ECM or main fan relay connector.	Contact SUBARU distributor service.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BE:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

- **TROUBLE SYMPTOM:**

- Radiator fan does not operate properly.
- Overheating

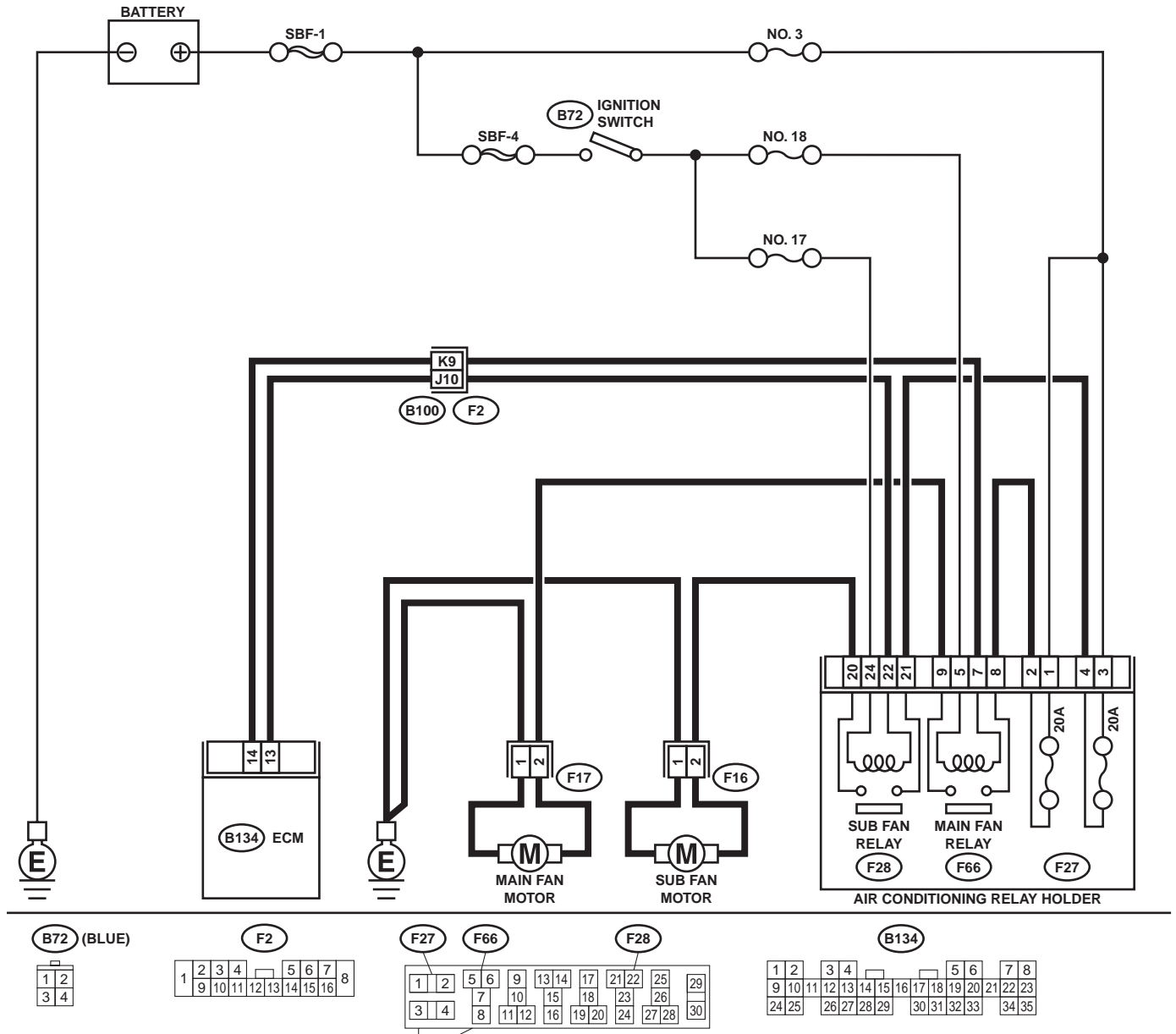
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-00736

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) While operating radiator fan relay, measure voltage between ECM and chassis ground. <p>NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H4SO)-48, Compulsory Valve Operation Check Mode.></p> <p>Connector & terminal (B134) No. 14 (+) — Chassis ground (-): (B134) No. 13 (+) — Chassis ground (-):</p> <p>Does the measured value change within specified range?</p>	0 - 10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step 2.
<p>2 CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Remove main fan relay and sub fan relay. (with A/C models) 3) Disconnect test mode connector. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground. <p>Connector & terminal (B134) No. 14 (+) — Chassis ground (-): (B134) No. 13 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in radiator fan relay control circuit.	Go to step 3.
<p>3 CHECK MAIN FAN RELAY.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Remove main fan relay. 3) Measure resistance between main fan relay terminals. <p>Terminal No. 5 — No. 7:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Replace main fan relay.	Go to step 4.
<p>4 CHECK SUB FAN RELAY.</p> <ol style="list-style-type: none"> 1) Remove sub fan relay. 2) Measure resistance between sub fan relay terminals. <p>Terminal No. 22 — No. 24</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Replace sub fan relay.	Go to step 5.
<p>5 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BF:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —

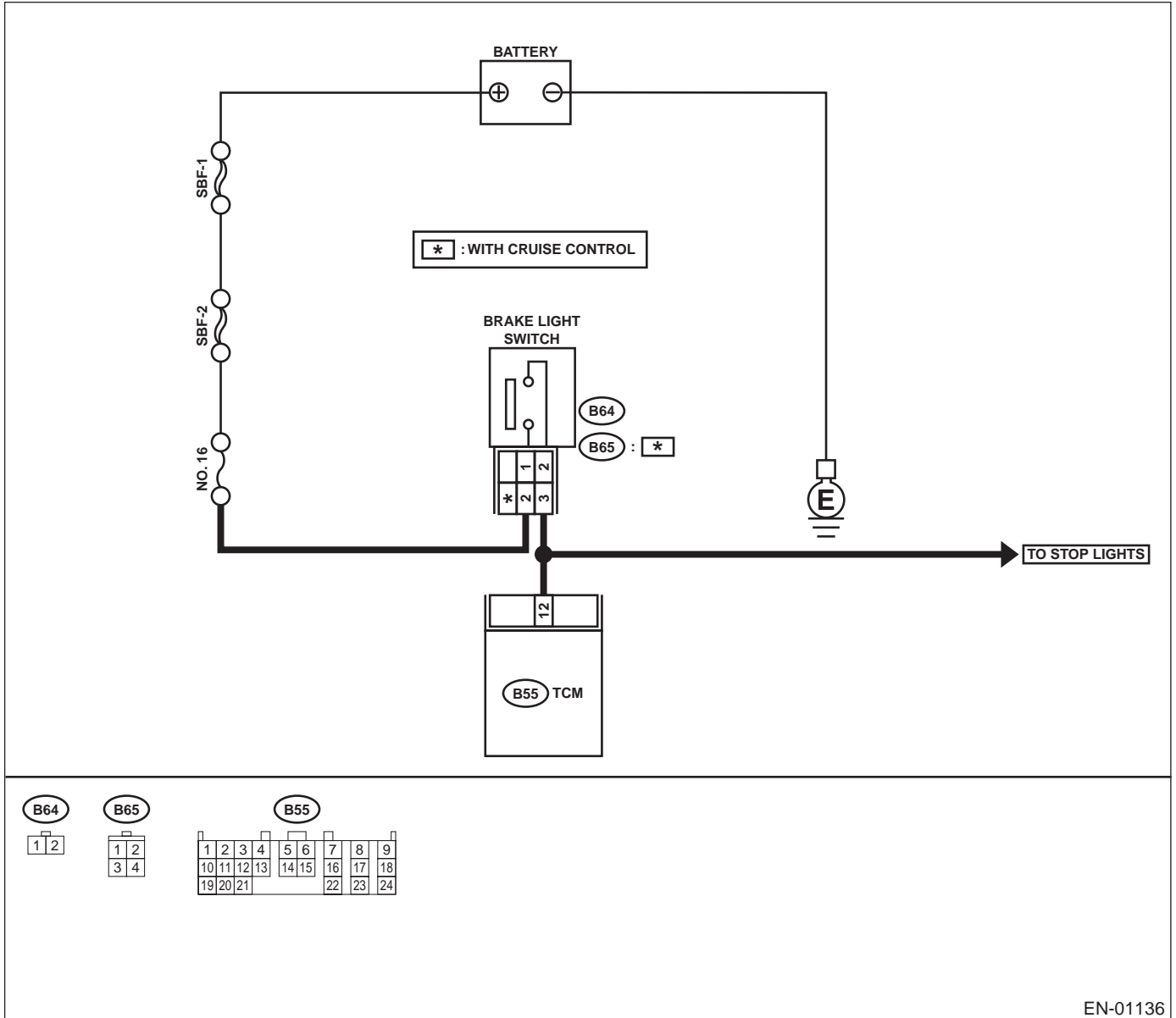
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01136

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF BRAKE LIGHT. Does brake light come on when depressing the brake pedal?	Brake light comes on.	Go to step 2.	Repair or replace brake light circuit.
2 CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR. 1) Disconnect connectors from TCM and brake light switch. 2) Measure resistance of harness between TCM and brake light switch connector. Connector & terminal (B55) No. 12 — (B64) No. 2: (B55) No. 12 — (B65) No. 3 (With cruise control): Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair or replace harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3 CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 12 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair ground short circuit in harness between TCM and brake light switch connector.
4 CHECK INPUT SIGNAL FOR TCM. 1) Connect connectors to TCM and brake light switch. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 12 (+) — Chassis ground (-): Is the measured value less than the specified value when releasing the brake pedal?	1 V	Go to step 5.	Adjust or replace brake light switch. <Ref. to LI-8, Stop Light System.>
5 CHECK INPUT SIGNAL FOR TCM. Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 12 (+) — Chassis ground (-): Is the measured value less than the specified value when depressing the brake pedal?	10 V	Go to step 6.	Adjust or replace brake light switch. <Ref. to LI-8, Stop Light System.>
6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BG:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)-250, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BH:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)-250, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BI: DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)-250, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BJ:DTC P0734 — GEAR 4 INCORRECT RATIO —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

• TROUBLE SYMPTOM:

- Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK THROTTLE POSITION SENSOR CIRCUIT. Check throttle position sensor circuit. Is there any trouble in throttle position sensor circuit? <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace throttle position sensor circuit.	Go to step 3.
3 CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT. Check front vehicle speed sensor circuit. Is there any trouble in vehicle speed sensor 2 circuit? <Ref. to AT-58, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace vehicle speed sensor 2 circuit.	Go to step 4.
4 CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT. Check torque converter turbine speed sensor circuit. Is there any trouble in torque converter turbine speed sensor circuit? <Ref. to AT-64, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace torque converter turbine speed sensor circuit.	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Go to step 6.
6 CHECK MECHANICAL TROUBLE. Check mechanical trouble in automatic transmission. Is there any mechanical trouble in automatic transmission?	There is mechanical trouble.	Repair or replace automatic transmission. <Ref. to AT-32, INSPECTION, Road Test.>	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BK:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

• TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- No shift or excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK LOCK-UP DUTY SOLENOID CIRCUIT. Check lock-up duty solenoid circuit. Is there any trouble in lock-up duty solenoid circuit? <Ref. to AT-96, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace lock-up duty solenoid circuit.	Go to step 3.
3 CHECK THROTTLE POSITION SENSOR CIRCUIT. Check throttle position sensor circuit. Is there any trouble in throttle position sensor circuit? <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace throttle position sensor circuit.	Go to step 4.
4 CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT. Check torque converter turbine speed sensor circuit. Is there any trouble in torque converter turbine speed sensor circuit? <Ref. to AT-64, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace torque converter turbine speed sensor circuit.	Go to step 5.
5 CHECK ENGINE SPEED INPUT CIRCUIT. Check engine speed input circuit. Is there any trouble in engine speed input circuit? <Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace engine speed input circuit.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK INHIBITOR SWITCH CIRCUIT. Check inhibitor switch circuit. Is there any trouble in inhibitor switch circuit? <Ref. to AT-132, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace inhibitor switch circuit.	Go to step 7.
7 CHECK BRAKE LIGHT SWITCH CIRCUIT. Check brake light switch circuit. Is there any trouble in brake light switch circuit? <Ref. to AT-125, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace brake light switch circuit.	Go to step 8.
8 CHECK ATF TEMPERATURE SENSOR CIRCUIT. Check ATF temperature sensor circuit. Is there any trouble in ATF temperature sensor circuit? <Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	There is a fault.	Repair or replace ATF temperature sensor circuit.	Go to step 9.
9 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Go to step 10.
10 CHECK MECHANICAL TROUBLE. Check mechanical trouble in automatic transmission. Is there any mechanical trouble in automatic transmission?	There is mechanical trouble.	Repair or replace automatic transmission. <Ref. to AT-32, INSPECTION, Road Test.>	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BL:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

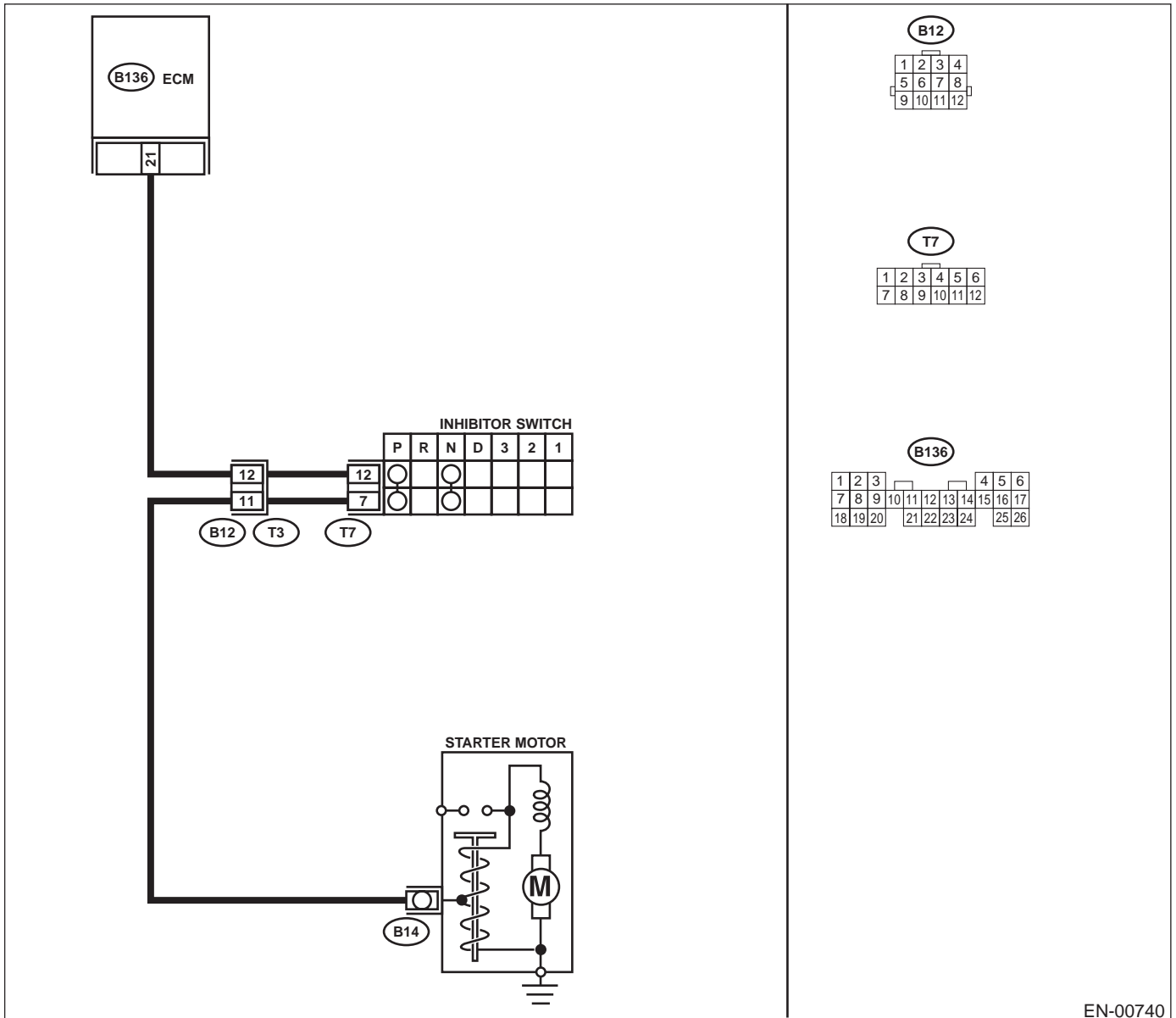
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00740

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostics Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 21 (+) — Chassis ground (-): Is the measured value within the specified value at except "N" and "P" position?	4.5 V - 5.5 V	Even if MI lights up, the circuit has returned to a normal condition at this time.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and transmission harness connector (T3). 3) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 21 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair ground short circuit in harness between ECM and transmission harness connector.
4 CHECK TRANSMISSION HARNESS CONNECTOR. 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness connector and engine ground. Connector & terminal (T3) No. 12 — Engine ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 5.	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5 CHECK INHIBITOR SWITCH. Measure resistance between inhibitor switch connector receptacle's terminals in select lever except for "N" position. Terminals No. 7 — No. 12: Does the measured value exceed the specified value at except "N" and "P" positions?	1 MΩ	Go to step 6.	Replace inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>
6 CHECK SELECTOR CABLE CONNECTION. Is there any fault in selector cable connection to inhibitor switch?	There is a fault.	Repair selector cable connection. <Ref. to CS-12, Select Cable.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

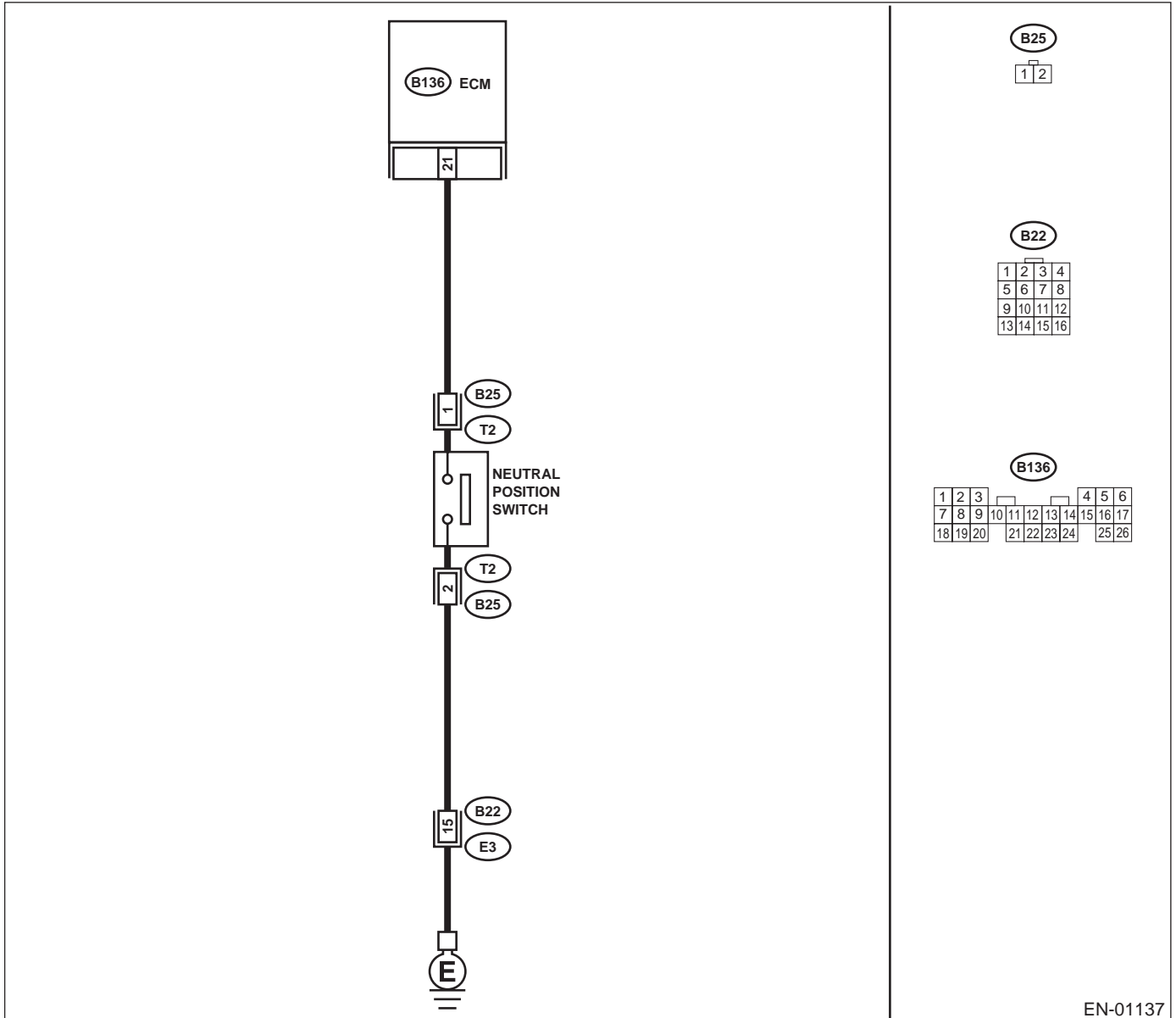
BM:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-01137

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 21 (+) — Chassis ground (-): Does the measured value exceed the specified value in neutral position?	5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 21 (+) — Chassis ground (-): Is the measured value less than the specified value at except neutral position?	1 V	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK NEUTRAL POSITION SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connector from transmission harness. 3) Measure resistance between transmission harness and connector terminals. Connector & terminal (T2) No. 1 — No. 2: Does the measured value exceed the specified value in neutral position?	1 MΩ	Go to step 5.	Repair short circuit in transmission harness or replace neutral position switch.
5 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance between ECM and chassis ground. Connector & terminal (B136) No. 21 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact in transmission harness connector. Is there poor contact in transmission harness connector?	There is poor contact.	Repair poor contact in transmission harness connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

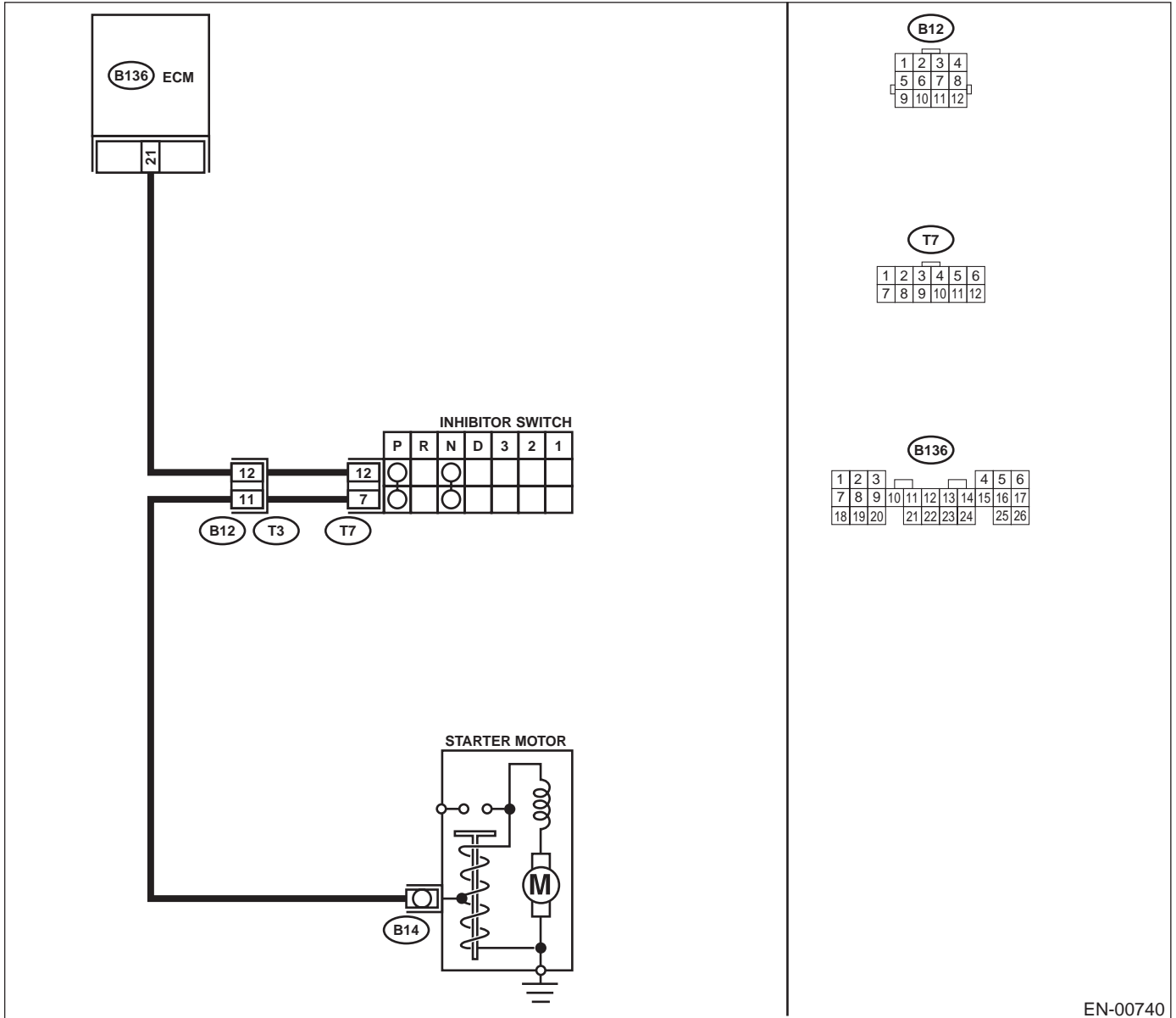
BN:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-00740

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostics Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground in select level "N" and "P" positions. Connector & terminal (B136) No. 21 (+) — Chassis ground Is the measured value less than the specified value?	1 V	Go to step 3.	Go to step 5.
3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground in select level "N" and "P" positions. Connector & terminal (B136) No. 21 (+) — Chassis ground Is the measured value within the specified range?	4.5 - 5.5 V	Go to step 4.	Go to step 5.
4 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector.	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5 CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and inhibitor switch. 3) Measure resistance of harness between ECM and inhibitor switch connector. Connector & terminal (B136) No. 21 — (T7) No. 12: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK INHIBITOR SWITCH GROUND LINE. Measure resistance of harness between inhibitor switch connector and engine ground. Connector & terminal (T7) No. 12 — Engine ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 7.	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
<p>7 CHECK INHIBITOR SWITCH. Measure resistance between inhibitor switch connector receptacle's terminals in select level "N" and "P" positions. Terminal No. 7 — No. 12: Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Replace inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>
<p>8 CHECK SELECTOR CABLE CONNECTION. Is there any fault in selector cable connection to inhibitor switch?</p>	There is a fault.	Repair selector cable connection. <Ref. to CS-12, Select Cable.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

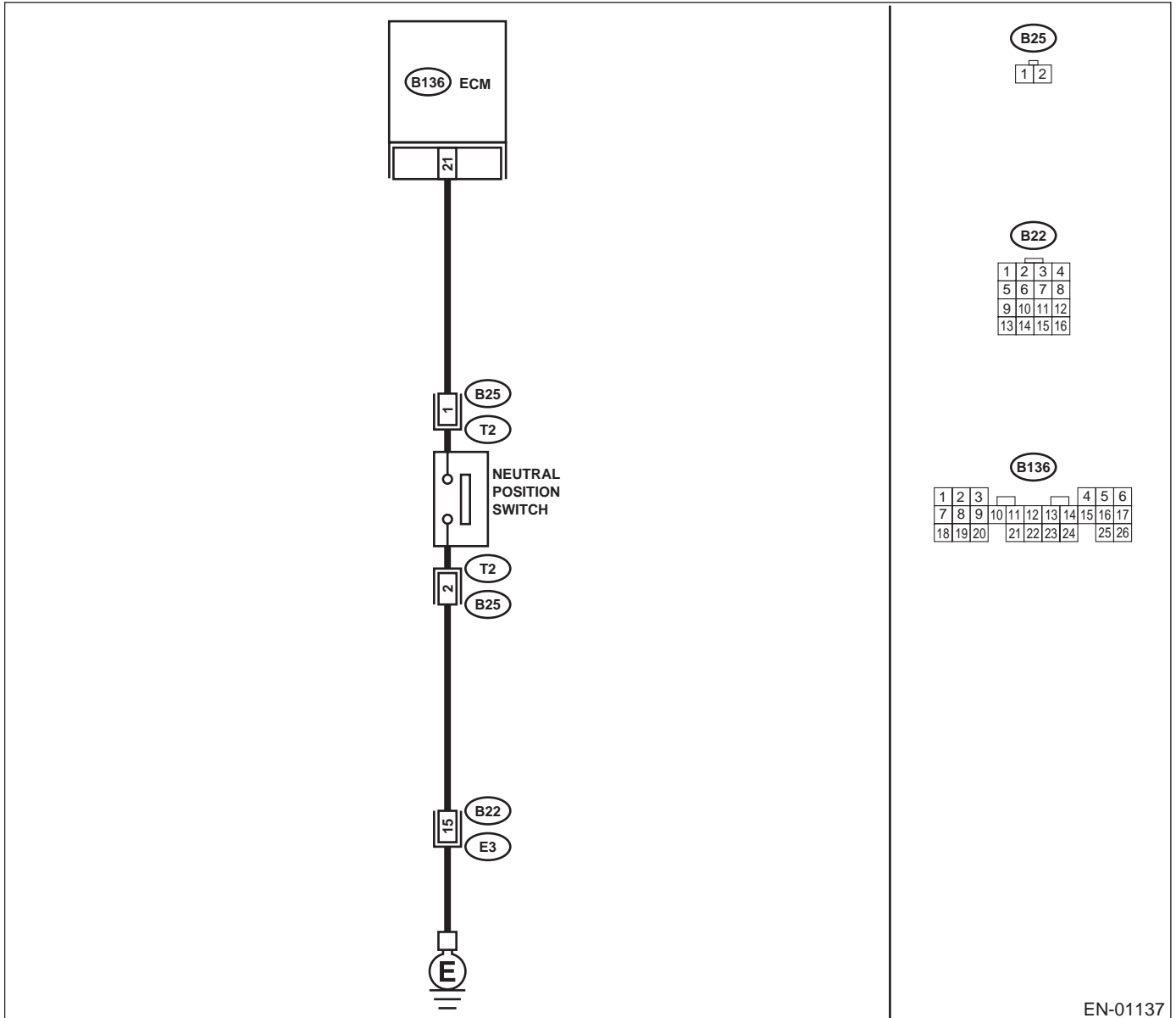
BO:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-01137

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 21 (+) — Chassis ground (-): Does the measured value exceed the specified value in neutral position?	5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 21 (+) — Chassis ground (-): Is the measured value less than the specified value at except neutral position?	1 V	Go to step 3.	Go to step 5.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK NEUTRAL POSITION SWITCH. Measure resistance between transmission harness connector terminals. Connector & terminal (T2) No. 1 — No. 2: Is the measured value less than the specified value at except neutral position?	1 Ω	Go to step 5.	Repair open circuit in transmission harness or replace neutral position switch.
5 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and transmission harness connector. Connector & terminal (B136) No. 21 — (B25) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair open circuit in harness between ECM and transmission harness connector.
6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure resistance of harness between transmission harness connector and engine ground. Connector & terminal (B25) No. 2 — Engine ground: Is the measured value less than the specified value?	5 Ω	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between transmission harness connector and engine grounding terminal • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK POOR CONTACT. Check poor contact in transmission harness connector. Is there poor contact in transmission harness connector?	There is poor contact.	Repair poor contact in transmission harness connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BP:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

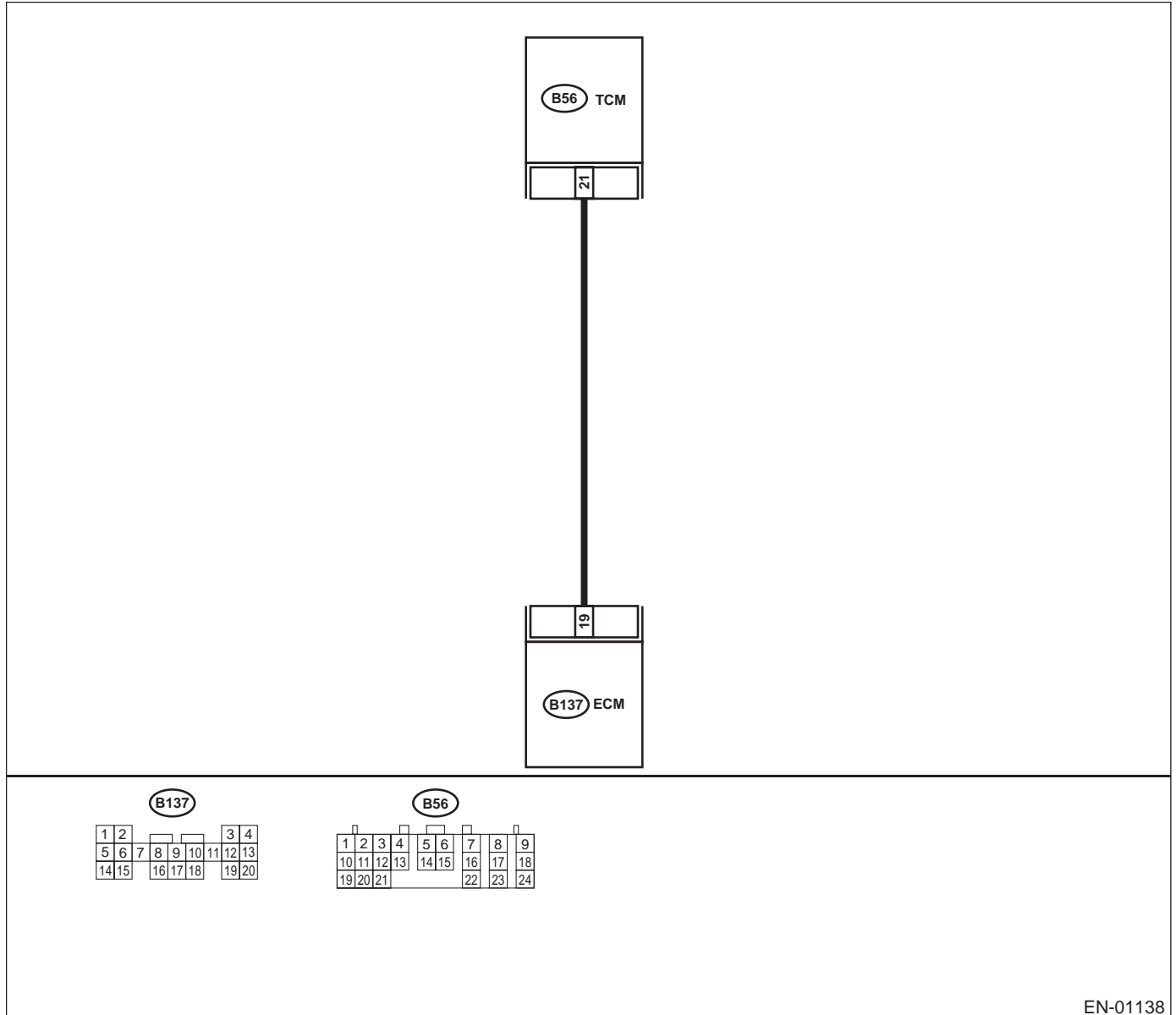
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01138

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DRIVING CONDITION. 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle. Is AT shift control functioning properly?	Operates properly.	Go to step 2.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
2 CHECK ACCESSORY. Are car phone and/or CB installed on vehicle?	Installed.	Repair grounding line of car phone or CB system.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BQ:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

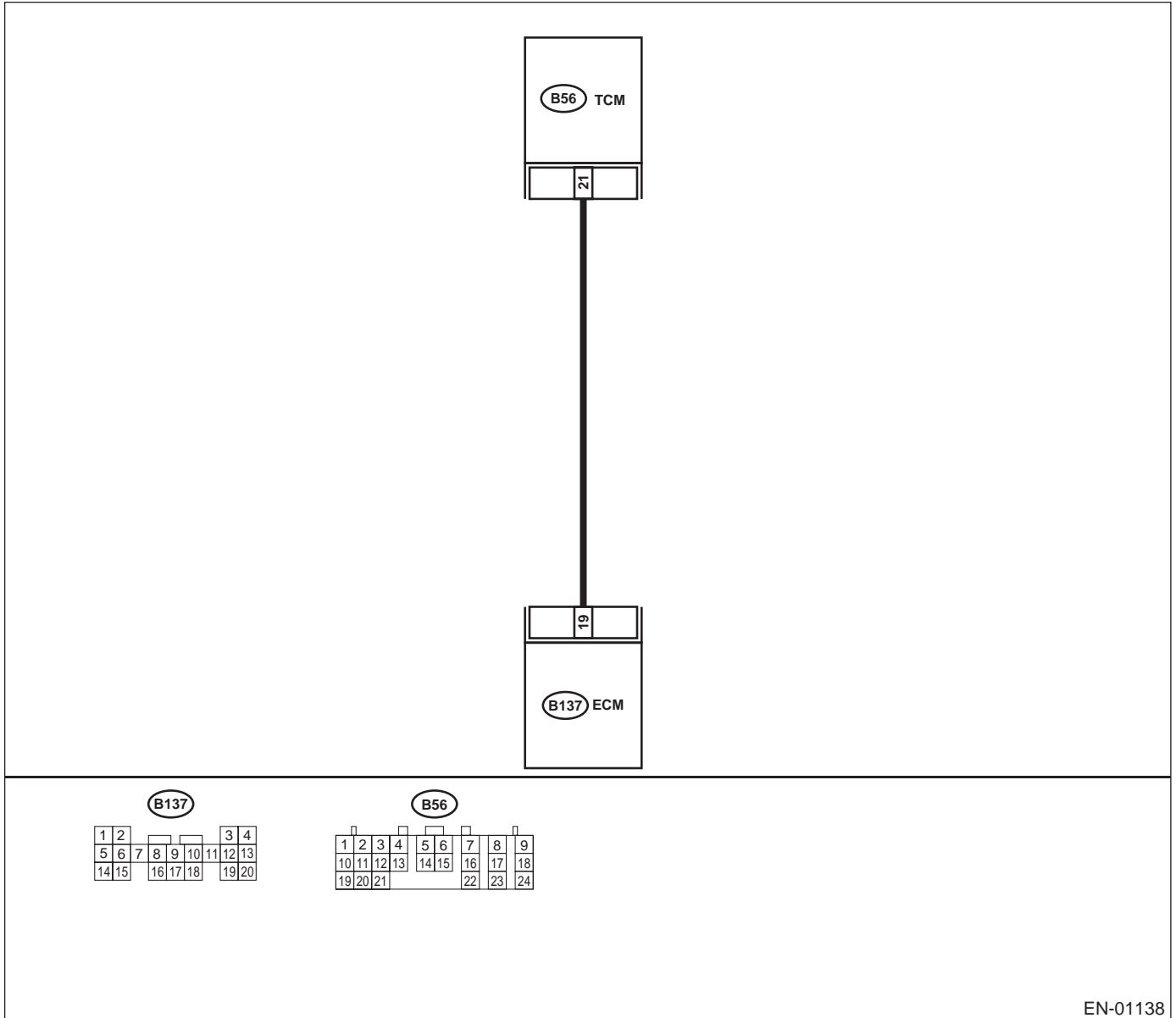
• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01138

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 19 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 2.	<p>Even if MI lights up, the circuit has returned to a normal condition at this time.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in ECM connector • Poor contact in TCM connector
<p>2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 19 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	<p>Repair ground short circuit in harness between ECM and TCM connector.</p>
<p>3 CHECK OUTPUT SIGNAL FOR ECM.</p> <p>1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	5 V	Go to step 4.	<p>Repair poor contact in ECM connector.</p>
<p>4 CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION.</p> <p>Read trouble code for automatic transmission. <Ref. to AT-24, Read Diagnostic Trouble Code (DTC).> Does trouble code appear for automatic transmission?</p>	Trouble code indicated.	Inspect trouble code for automatic transmission. <Ref. to AT-42, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	<p>Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BR:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

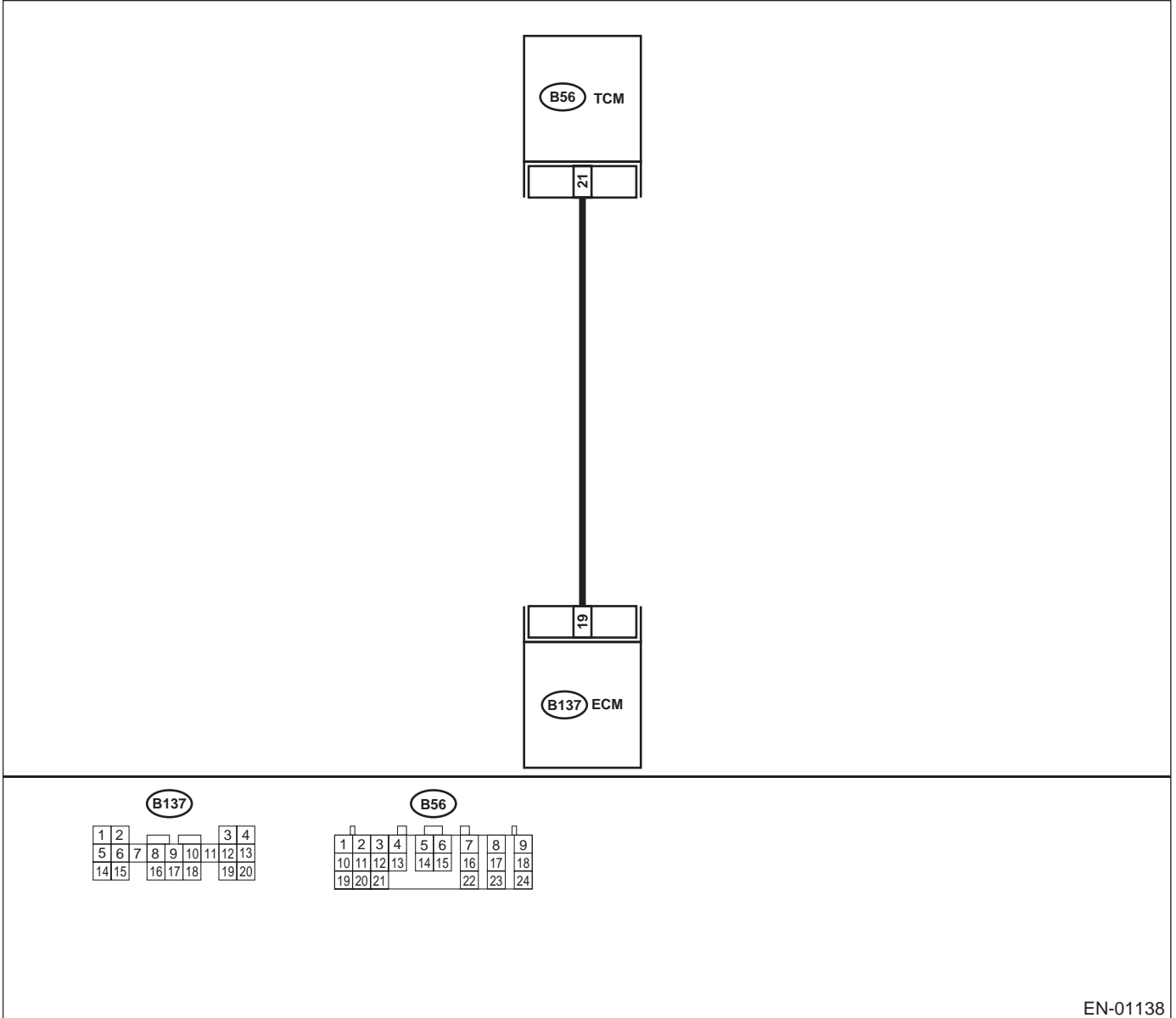
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01138

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B137) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4 V	Go to step 5.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 19 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Repair poor contact in ECM connector.	Go to step 4.
4 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B137) No. 19 (+) — Chassis ground (-): Does the measured value change within the specified range?	1 V - 4 V	Even if MI lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure voltage between TCM and chassis ground. Connector & terminal (B56) No. 21 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4 V	Go to step 6.	Repair open circuit in harness between ECM and TCM connector.
6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BS:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	DTC P1110 indicated.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1110.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

BT:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	DTC P1111 indicated.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1111.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BU:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

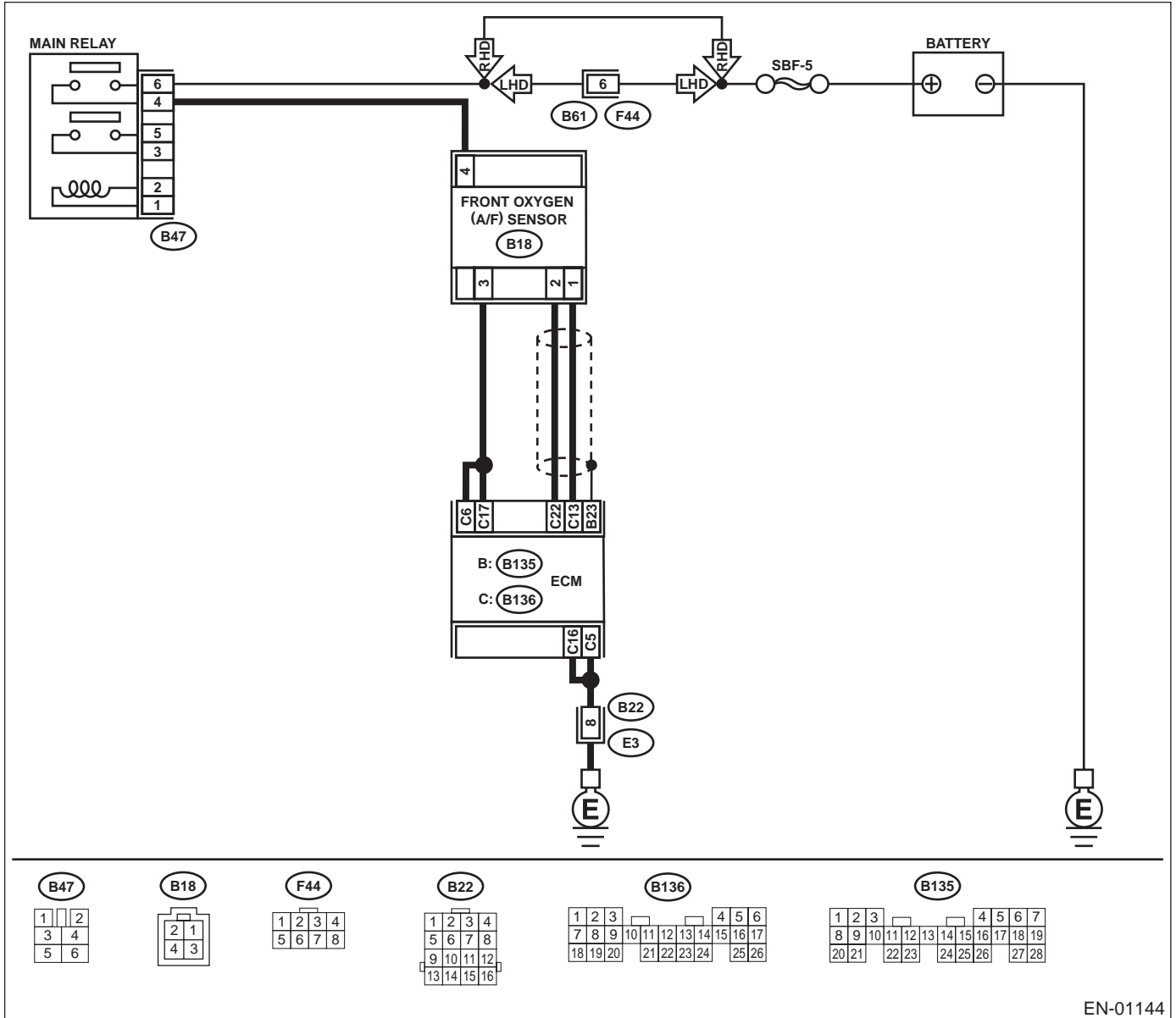
• **DTC DETECTING CONDITION:**

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	DTC P1134 indicated.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	It is not necessary to inspect DTC P1134.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BV: DTC P1137 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

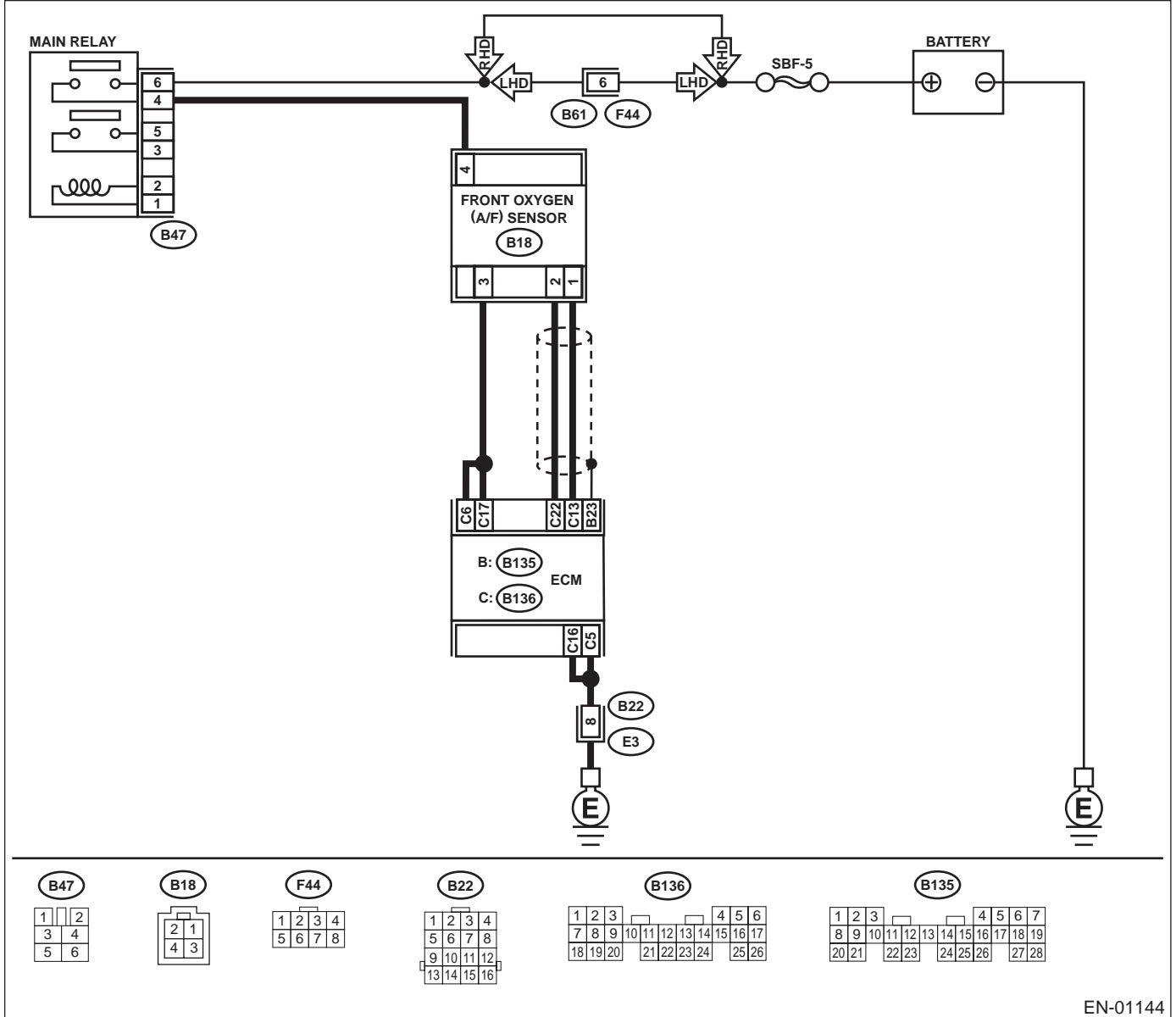
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01144

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR DATA. 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.85 - 1.15	Go to step 3.	Go to step 4.
3 CHECK FRONT OXYGEN (A/F) SENSOR DATA. Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. Does the measured value exceed the specified value? NOTE: •Normally, A/F mixture ratio is rich with racing engine. •To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	1.1	Go to step 6.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance between ECM and front oxygen (A/F) sensor. Connector & terminals (B136) No. 13 — (B18) No. 1: (B136) No. 22 — (B18) No. 2: Is the measured value less than the specified value?	5 Ω	Go to step 5.	Repair open circuit between ECM and front oxygen (A/F) sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. Measure resistance between ECM and chassis ground. Connector & terminals (B136) No. 13 — Chassis ground: (B136) No. 22 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair ground short circuit between ECM and front oxygen (A/F) sensor.
<p>6 CHECK EXHAUST SYSTEM. Check exhaust system parts. Is there any fault in exhaust system? NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</p>	There is a fault.	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-41, Front Oxygen (A/F) Sensor.>

**BW:DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION
(LOW INPUT) —**

NOTE:

For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)-280, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**BX:DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION
(HIGH INPUT) —**

NOTE:

For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)-282, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**BY:DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION
(LOW INPUT) —**

NOTE:

For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)-280, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**BZ:DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION
(HIGH INPUT) —**

NOTE:

For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)-282, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**CA:DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION
(LOW INPUT)—**

NOTE:

For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)-280, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**CB:DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION
(HIGH INPUT) —**

NOTE:

For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)-282, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

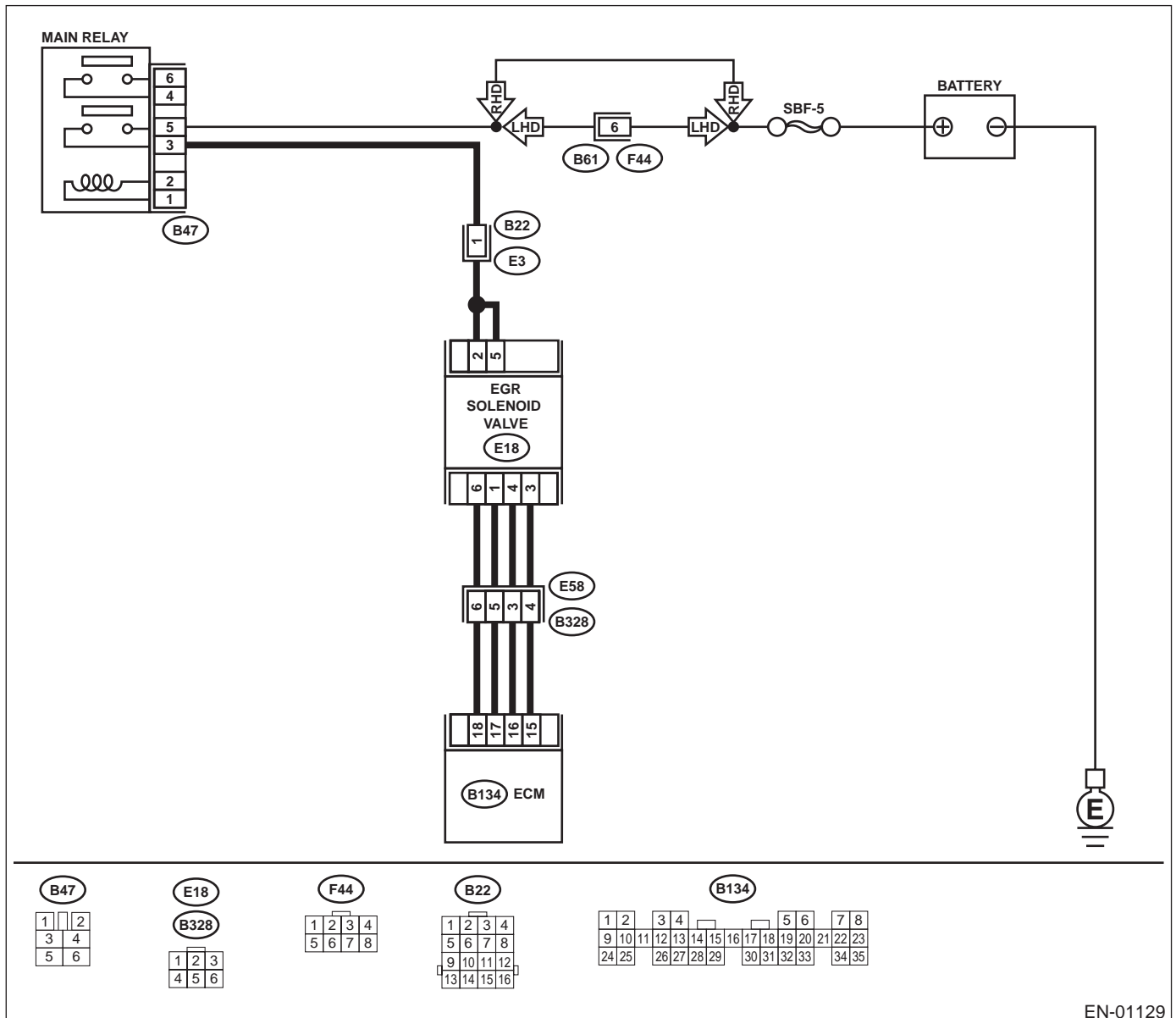
CC:DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-01129

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY TO EGR SOLENOID VALVE.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between EGR solenoid valve connector and engine ground.</p> <p>Connector & terminal (E18) No. 2 (+) - Engine ground (-): (E18) No. 5 (+) - Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between EGR solenoid valve and main relay connector • Poor contact in coupling connector
<p>2 CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between ECM and EGR solenoid valve connector.</p> <p>Connector & terminal DTC P1492; (B134) No. 18 - (E18) No. 6: DTC P1494; (B134) No. 17 - (E18) No. 1: DTC P1496; (B134) No. 16 - (E18) No. 4: DTC P1498; (B134) No. 15 - (E18) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and EGR solenoid valve connector • Poor contact in coupling connector
<p>3 CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.</p> <p>1) Disconnect connector from ECM. 2) Measure resistance between ECM connector and chassis ground.</p> <p>Connector & terminal DTC P1492; (B134) No. 18 - Chassis ground: DTC P1494; (B134) No. 17 - Chassis ground: DTC P1496; (B134) No. 16 - Chassis ground: DTC P1498; (B134) No. 15 - Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	<p>Repair ground short circuit between ECM and EGR solenoid valve connector.</p>
<p>4 CHECK POOR CONTACT.</p> <p>Check poor contact between ECM connector and EGR solenoid valve connector. Is there poor contact of ECM connector or EGR solenoid valve connector?</p>	There is poor contact.	Repair poor contact of ECM connector or EGR solenoid valve connector.	<p>Replace EGR solenoid valve. <Ref. to FU(H4SO)-35, EGR Valve.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

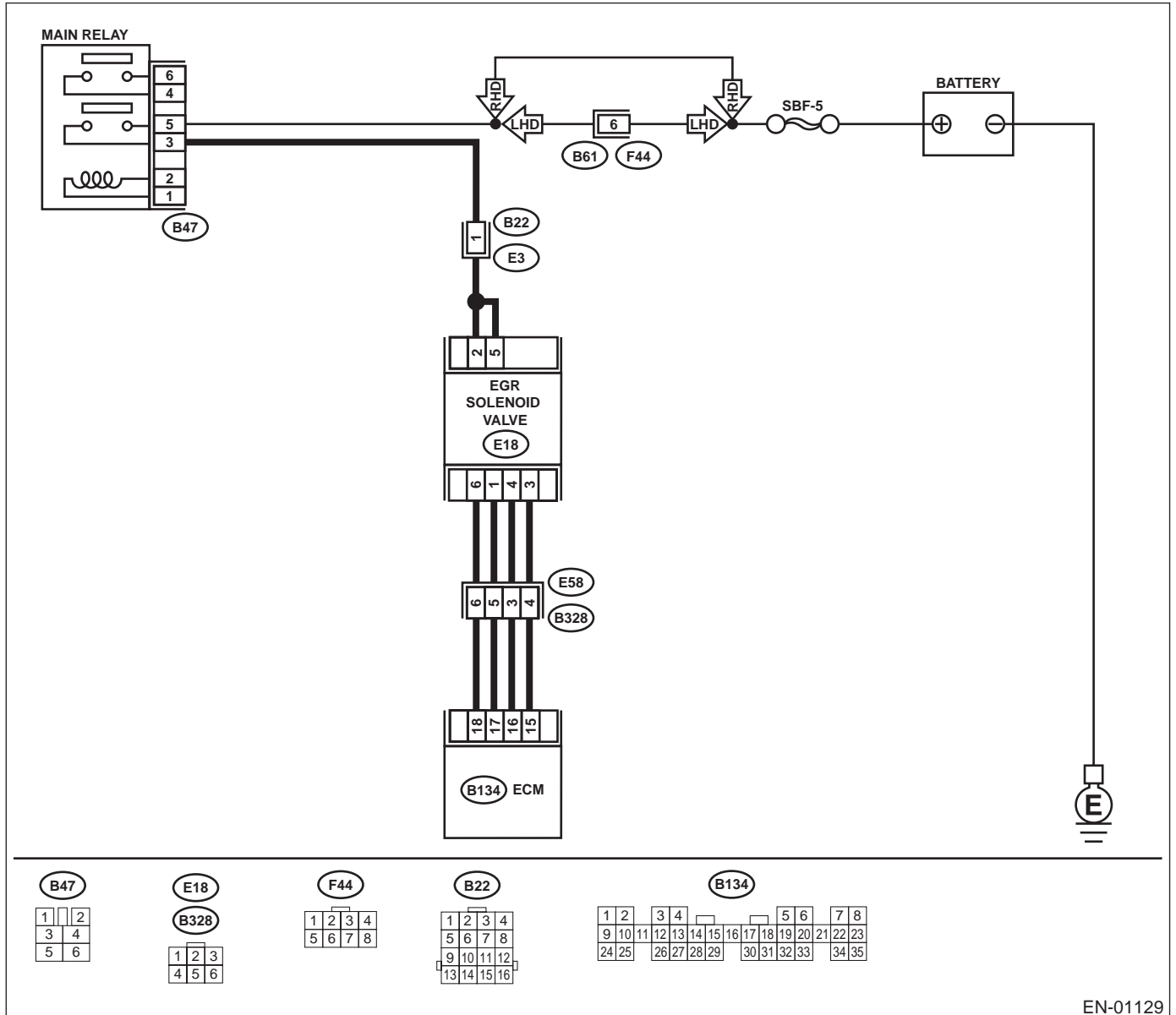
CD:DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01129

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is there any DTC on display?	Other DTC indicated on display.	Go to step 2.	Go to step 3.
2 CHECK ECM GROUND CIRCUIT. 1) Turn ignition switch to OFF. 2) Measure resistance between ECM connector and chassis ground. Connector & terminal <i>(B134) No. 7 - Chassis ground:</i> <i>(B137) No. 14 - Chassis ground:</i> <i>(B135) No. 21 - Chassis ground:</i> Is the measured value less than the specified value?	5 Ω	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM connector and engine ground • Poor contact in ECM connector • Poor contact in coupling connector
3 CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground. Connector & terminal <i>DTC P1493; (B134) No. 18 - Chassis ground:</i> <i>DTC P1495; (B134) No. 17 - Chassis ground:</i> <i>DTC P1497; (B134) No. 16 - Chassis ground:</i> <i>DTC P1499; (B134) No. 15 - Chassis ground:</i> Does the measured value exceed the specified value?	10 V	Repair ground short circuit between ECM and EGR solenoid valve connector. After completion of repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CE:DTC P1510 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:

For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)-286, DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CF:DTC P1511 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:

For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)-288, DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CG:DTC P1512 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:

For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)-286, DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CH:DTC P1513 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:

For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)-288, DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P1514 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:

For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)-286, DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P1515 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:

For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)-288, DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

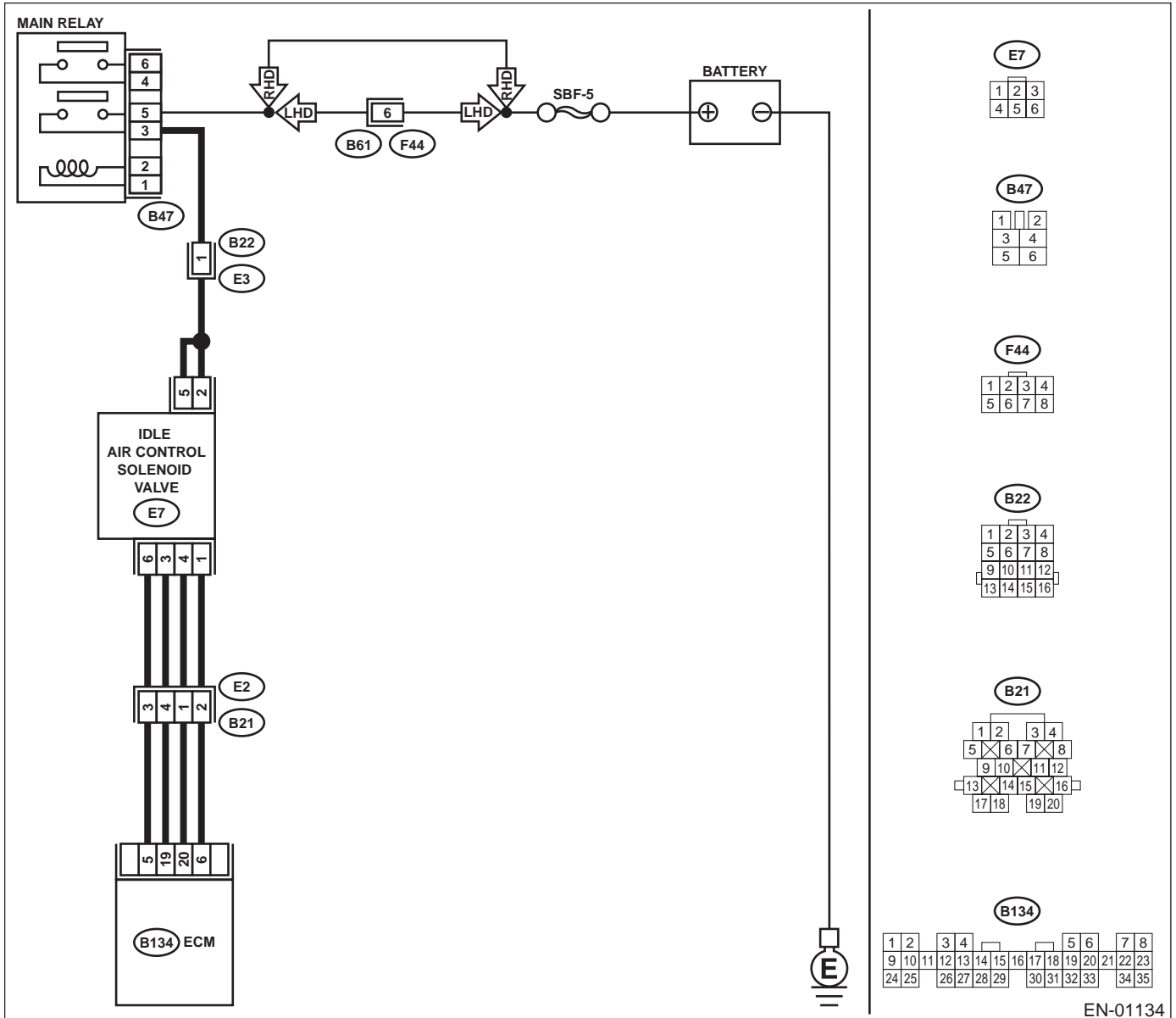
CK:DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01134

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between idle air control solenoid valve connector and engine ground.</p> <p>Connector & terminal (E7) No. 2 (+) — Engine ground (-): (E7) No. 5 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
<p>2 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between ECM and idle air control solenoid valve connector.</p> <p>Connector & terminal DTC P1510; (B134) No. 20 — (E7) No. 4: DTC P1512; (B134) No. 6 — (E7) No. 1: DTC P1514; (B134) No. 5 — (E7) No. 6: DTC P1516; (B134) No. 19 — (E7) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
<p>3 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.</p> <p>1) Disconnect connector from ECM. 2) Measure resistance between ECM connector and chassis ground.</p> <p>Connector & terminal DTC P1510; (B134) No. 20 — Chassis ground: DTC P1512; (B134) No. 6 — Chassis ground: DTC P1514; (B134) No. 5 — Chassis ground: DTC P1516; (B134) No. 19 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step 4.
<p>4 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM connector and idle air control solenoid valve connector. Is there poor contact in ECM connector or idle air control solenoid valve connector?</p>	There is poor contact.	Repair poor contact in ECM connector or idle air control solenoid valve connector.	Replace idle air control solenoid valve. <Ref. to FU(H4SO)-34, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

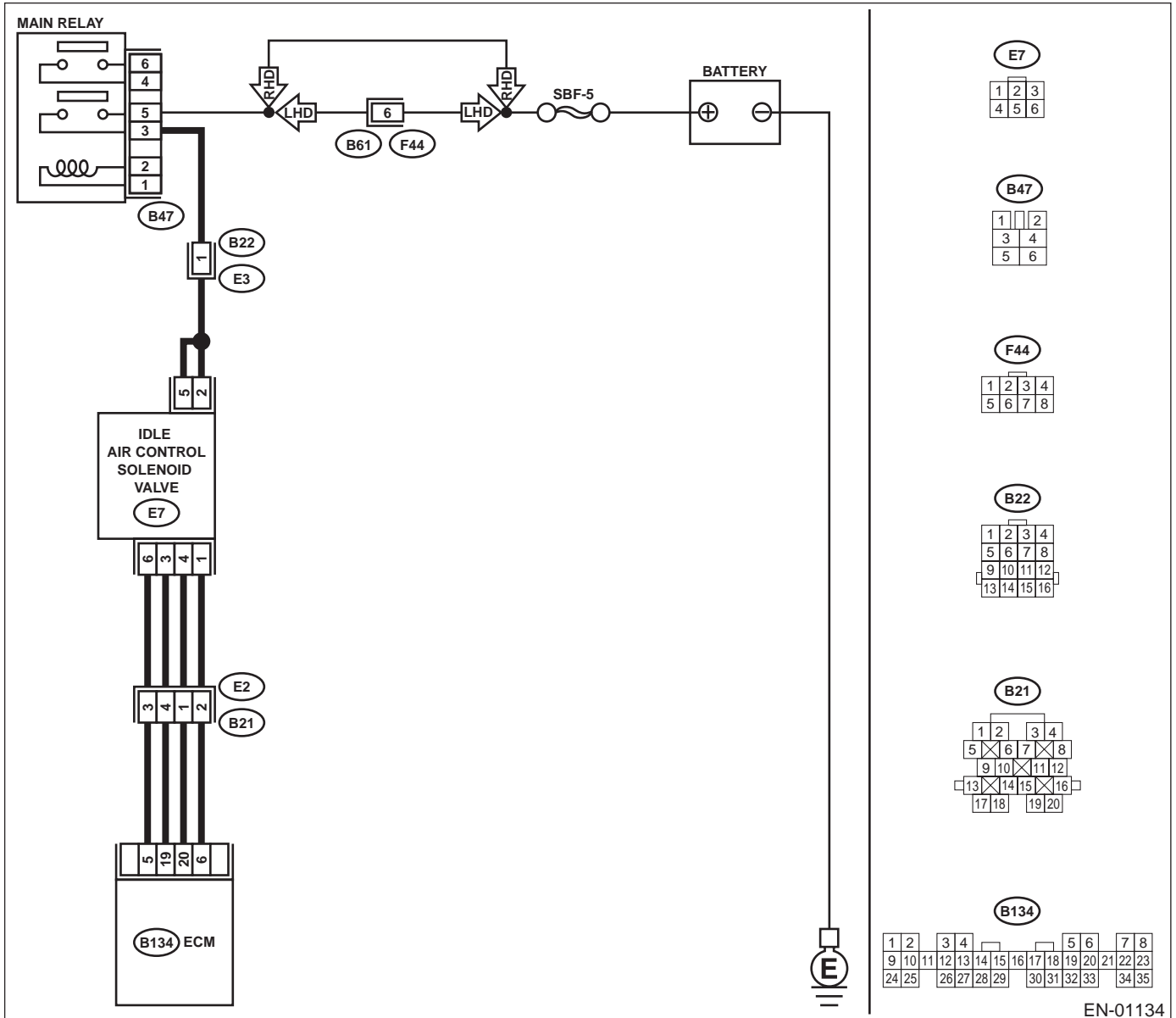
CL:DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01134

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1511, P1513, P1515 and P1517 at same time?	Indicated at same time.	Go to step 2.	Go to step 3.
2 CHECK GROUND CIRCUIT FOR ECM. 1) Turn ignition switch to OFF. 2) Measure resistance between ECM connector and chassis ground. Connector & terminal (B134) No. 7 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM connector and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
3 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground. Connector & terminal DTC P1511; (B134) No. 20 (+) — Chassis ground (-): DTC P1513; (B134) No. 6 (+) — Chassis ground (-): DTC P1515; (B134) No. 5 (+) — Chassis ground (-): DTC P1517; (B134) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CM:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

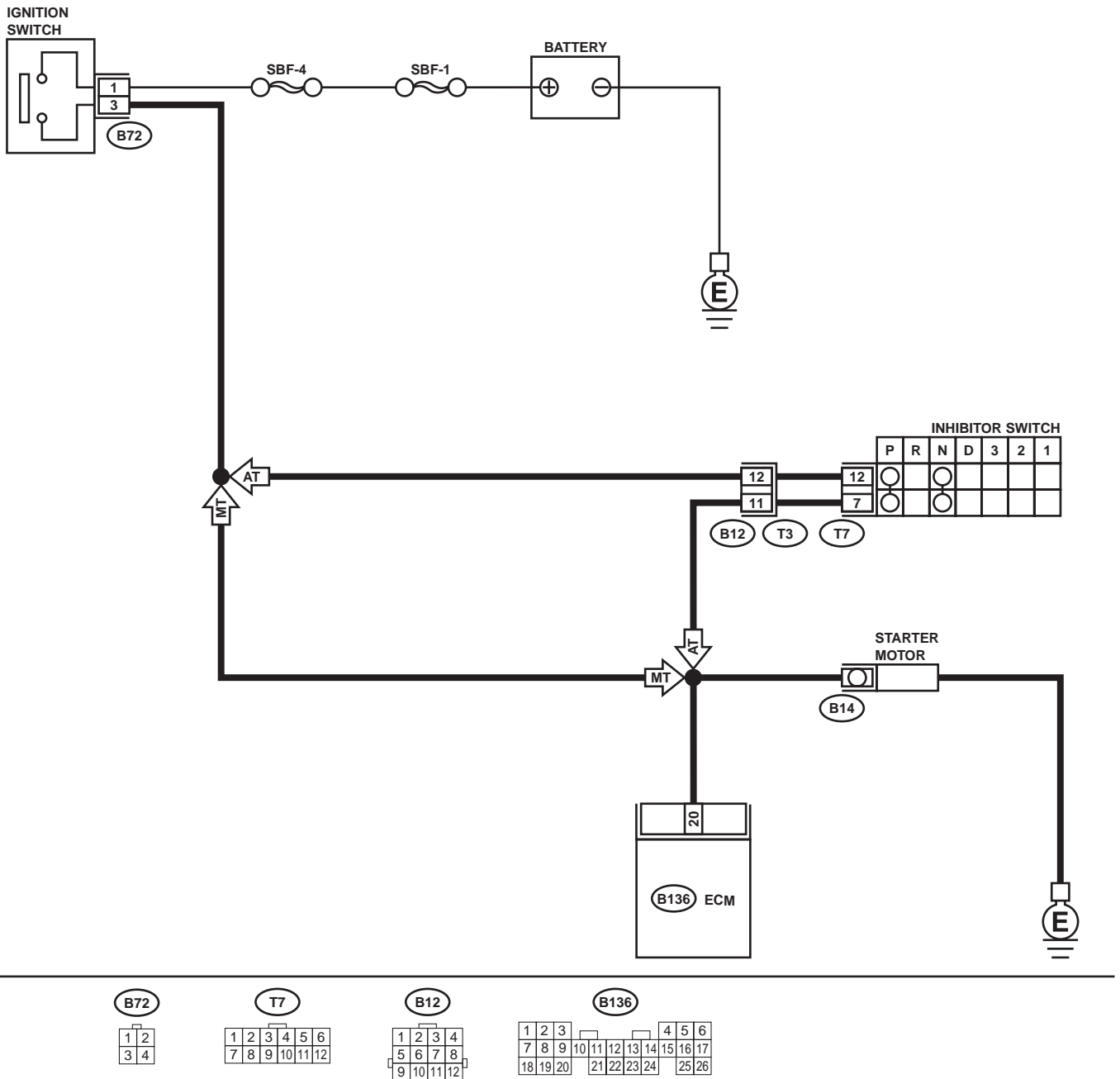
- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01118

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. Does starter motor operate when turning ignition switch to "ST"? NOTE: Place the inhibitor switch in the "P" or "N" position.	Operates.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none">• Open or ground short circuit in harness between ECM and starter motor connector.• Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(H4SO)-64, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

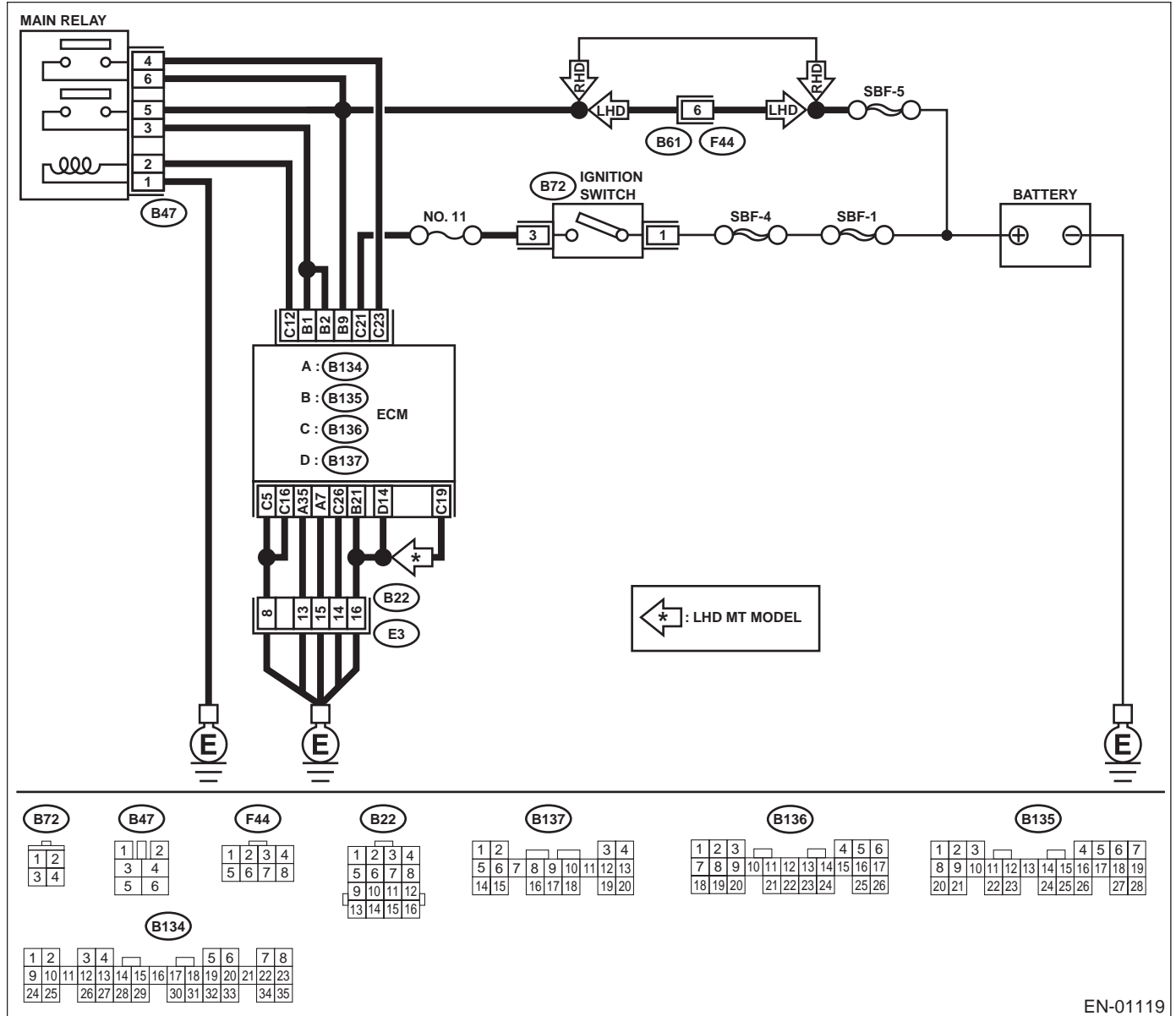
CN:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 9 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair ground short circuit in harness between ECM connector and battery terminal.
3 CHECK FUSE SBF-5. Is fuse blown?	Fuse is brown.	Replace fuse.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CO:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —

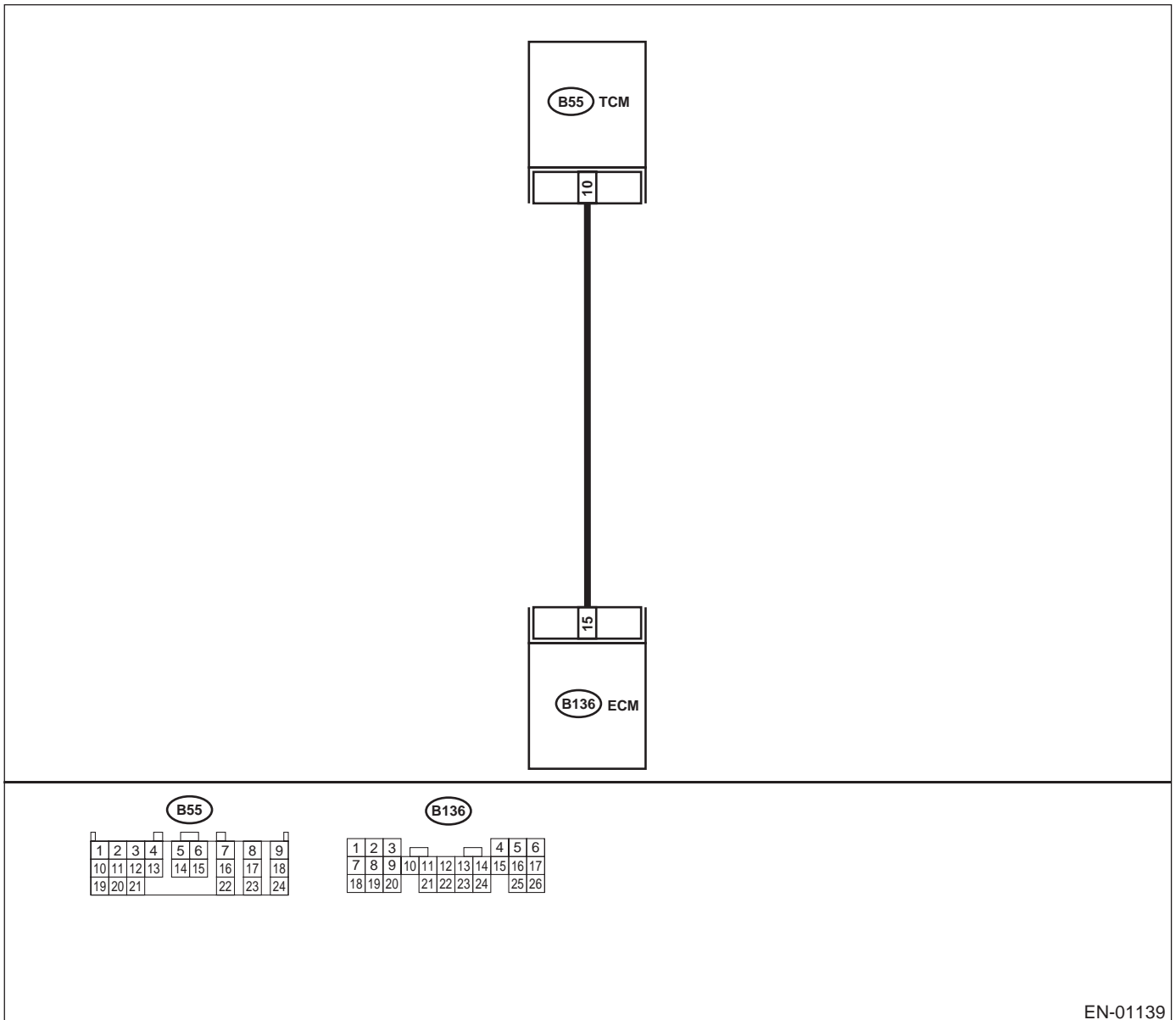
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01139

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 15 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	3 V	Repair poor contact in ECM connector.	Go to step 2.
<p>2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 15 — Chassis ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 3.	Repair ground short circuit in harness between ECM and TCM connector.
<p>3 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and TCM connector.</p> <p>Connector & terminal (B136) No. 15 — (B55) No. 10: Is the measured value less than the specified value?</p>	1 Ω	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CP:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —

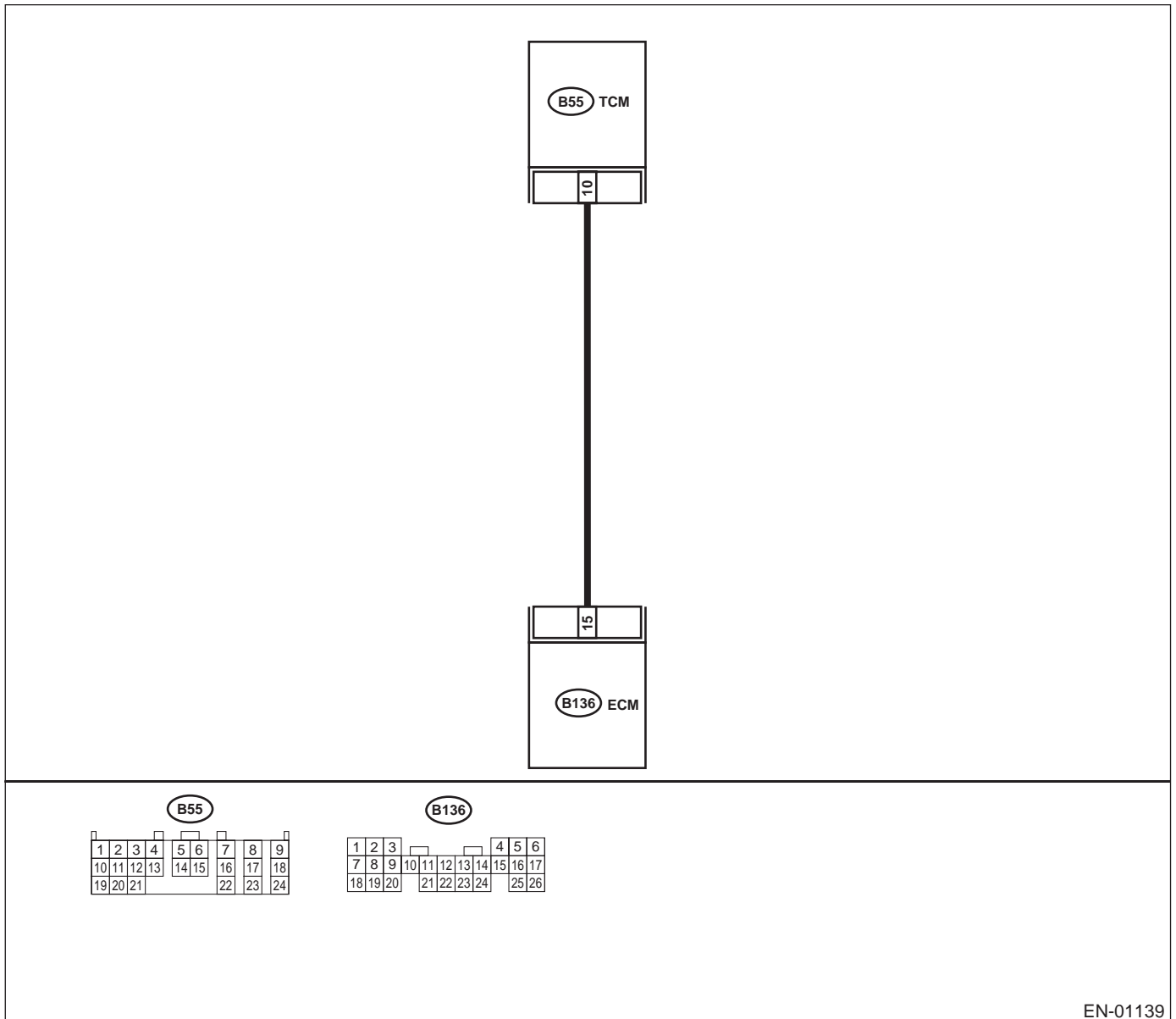
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01139

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connector from TCM. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 15 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	3 V	Go to step 2.	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>
<p>2</p> <p>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 15 (+) — Chassis ground (-): Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	10 V	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CQ:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

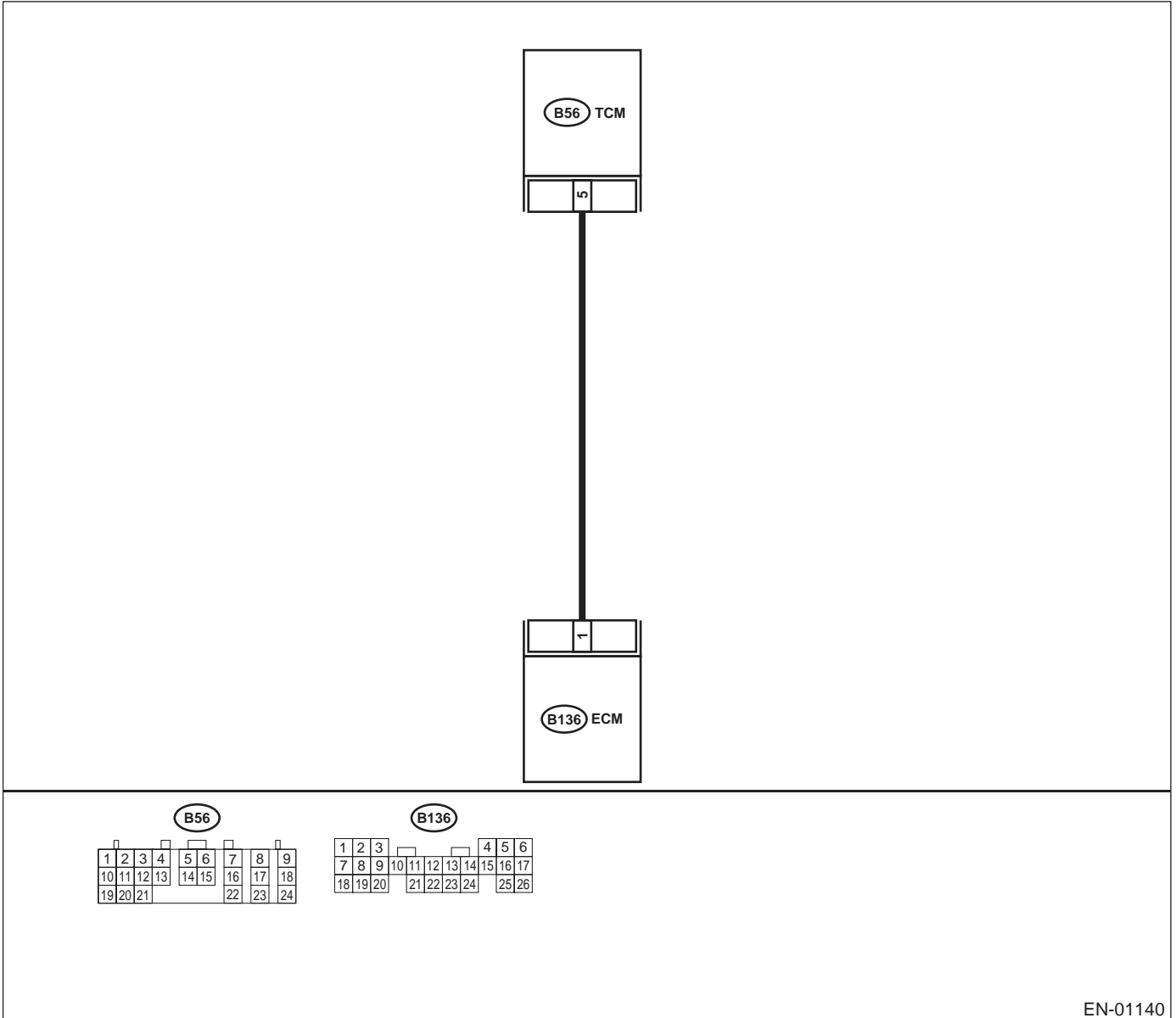
- **TROUBLE SYMPTOM:**

- Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-01140

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. Connector & terminal (B136) No. 1 — (B56) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair open circuit in harness between ECM and TCM connector.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 1 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 6.	Repair ground short circuit in harness between ECM and TCM connector.
6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CR:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

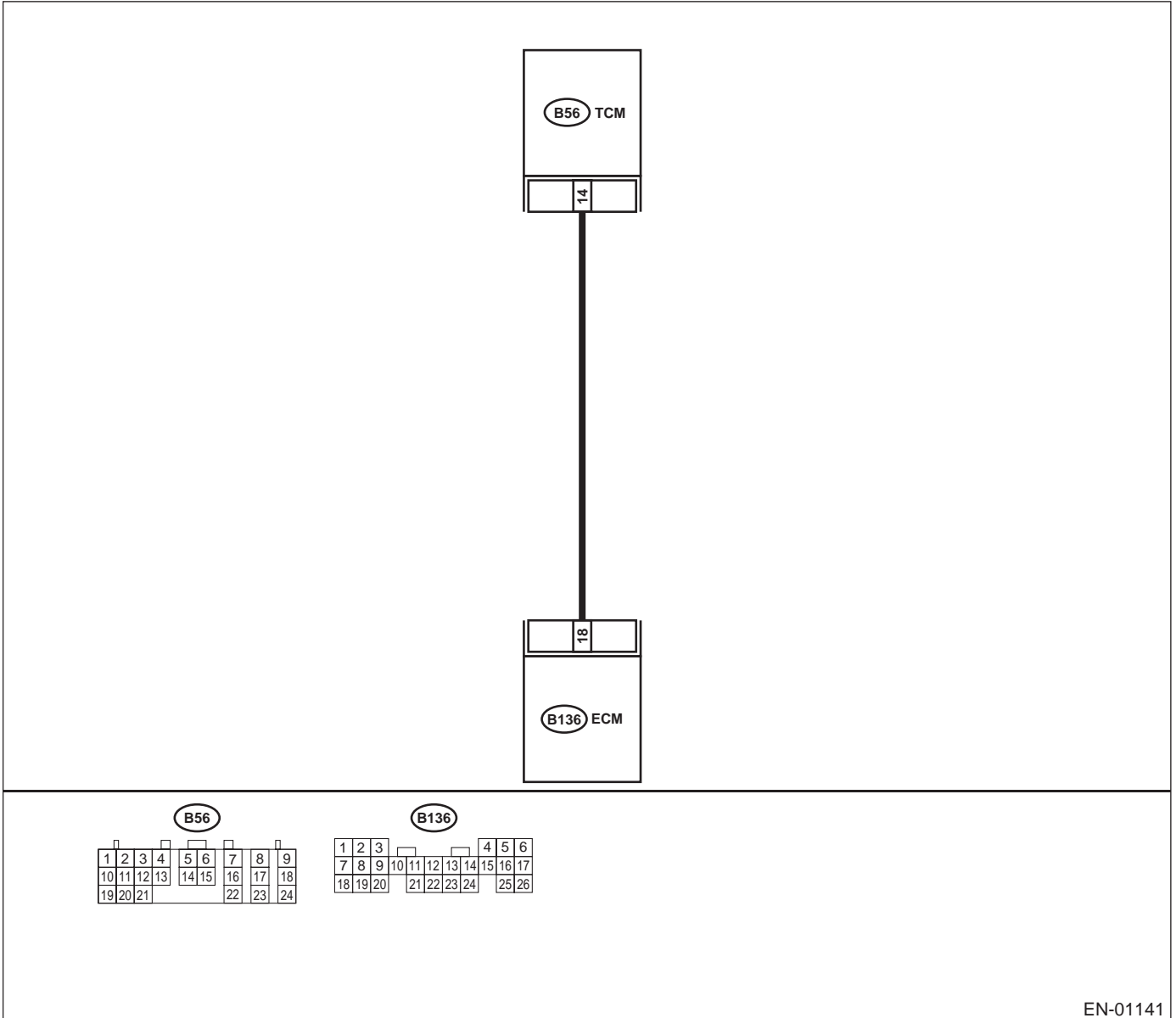
- **TROUBLE SYMPTOM:**

- Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4SO)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-40, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-01141

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 18 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 18 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. Connector & terminal (B136) No. 18 — (B56) No. 14:	1 Ω	Go to step 5.	Repair open circuit in harness between ECM and TCM connector.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 18 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Go to step 6.	Repair ground short circuit in harness between ECM and TCM connector.
6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

20. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H4SO)-89, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Ignition parts (*1) 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Engine coolant temperature sensor (*2) 6) Ignition parts (*1) 7) Air intake system (*5) 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Crankshaft position sensor (*3) 11) Camshaft position sensor (*3) 12) Oxygen sensor 13) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Intake manifold pressure sensor 6) Intake air temperature sensor 7) Intake air temperature and pressure sensor
4. Poor acceleration	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Throttle position sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay 7) Engine coolant temperature sensor (*2) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) A/C switch and A/C cut relay 11) Engine torque control signal circuit 12) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Purge control solenoid valve 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Fuel pump and fuel pump relay

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
6. Surge	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay
7. Spark knock	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor 5) Knock sensor 6) Fuel injection parts (*4) 7) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor assembly and spark plug.

*2: Indicate the symptom occurring only in cold temperatures.

*3: Ensure the secure installation.

*4: Check fuel injector, fuel pressure regulator and fuel filter.

*5: Inspect air leak in air intake system.

*6: Adjust accelerator cable.

2. AUTOMATIC TRANSMISSION

NOTE:

Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to AT-2, Basic Diagnostic Procedure.>

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

MEMO:

FUEL INJECTION (FUEL SYSTEMS)

FU(H4SOw/oOBD)

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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

Model		
Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm ² , 53.6 — 98 psi)
	Discharge flow	More than 65 ℓ (17.2 US gal, 14.3 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm ² , 43.5 psi)]
Fuel filter		Cartridge type

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

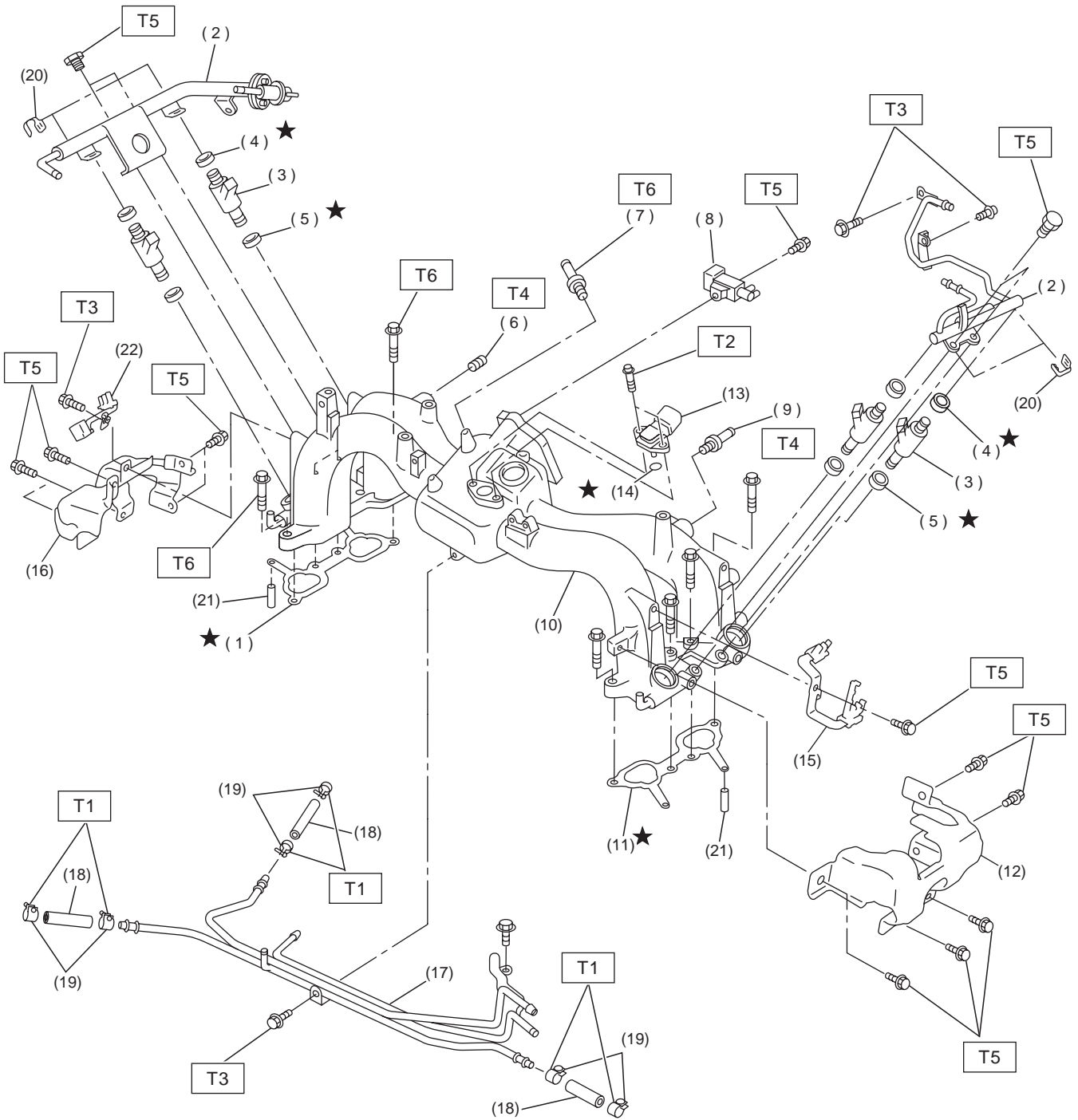
MEMO:

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

B: COMPONENT

1. INTAKE MANIFOLD



FU-00711

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

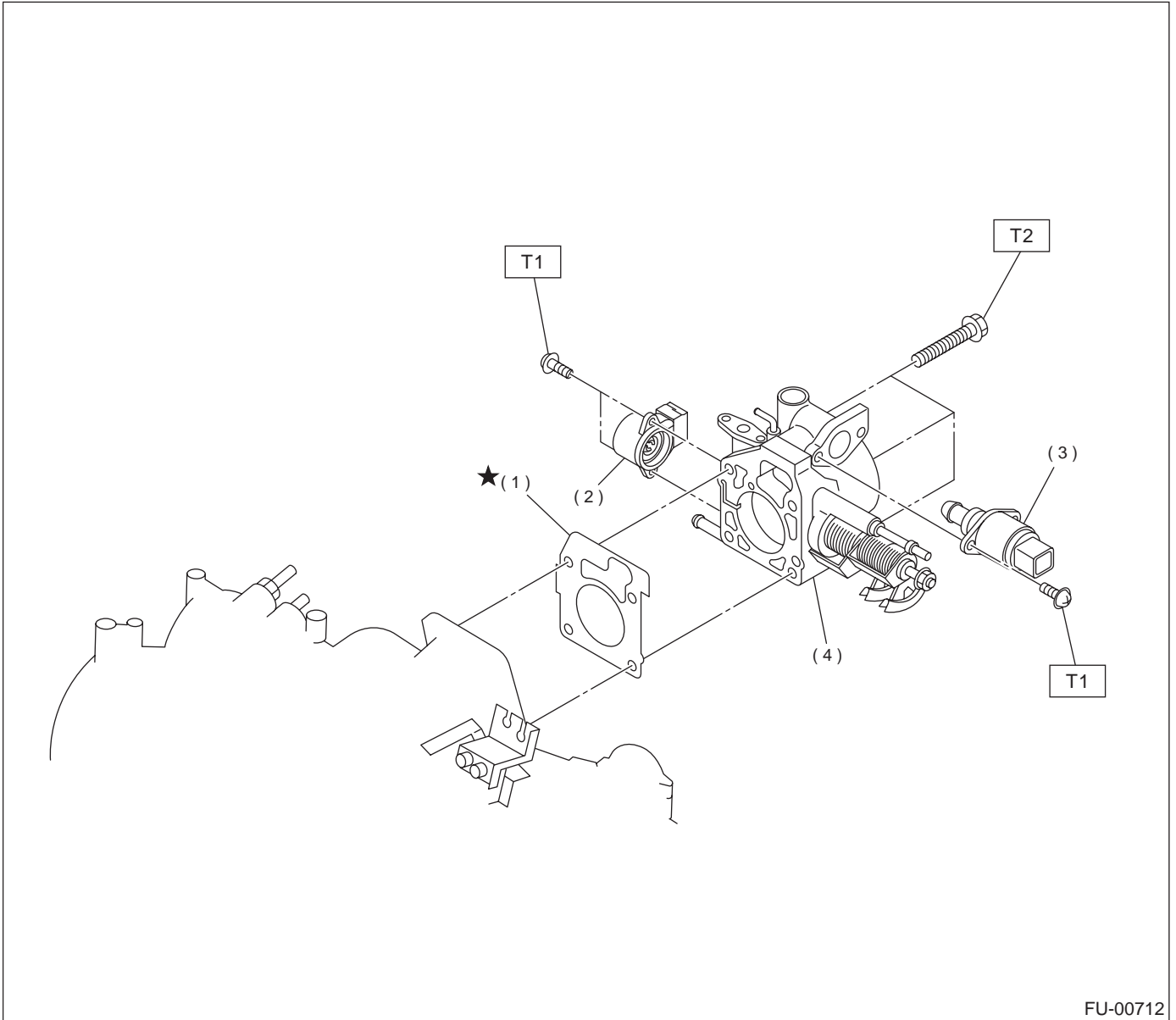
(1) Intake manifold gasket RH	(12) Fuel pipe protector LH	(22) Plug cord holder RH
(2) Fuel injector pipe	(13) Intake air temperature and pressure sensor	
(3) Fuel injector		
(4) O-ring	(14) O-ring	
(5) O-ring	(15) Plug cord holder LH	
(6) Plug	(16) Fuel pipe protector RH	
(7) PCV valve	(17) Fuel pipe ASSY	
(8) Purge control solenoid valve	(18) Fuel hose	
(9) Nipple	(19) Clip	
(10) Intake manifold	(20) Clip	
(11) Intake manifold gasket LH	(21) Guide pin	

Tightening torque: N.m (kgf-m, ft-lb)**T1: 1.5 (0.15, 1.1)****T2: 3.4 (0.35, 2.5)****T3: 5.0 (0.51, 3.7)****T4: 17 (1.7, 12)****T5: 19 (0.19, 1.4)****T6: 25 (2.6, 18.8)**

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

2. AIR INTAKE SYSTEM



- (1) Gasket
- (2) Throttle position sensor
- (3) Idle air control solenoid valve

- (4) Throttle body

Tightening torque: N·m (kgf·m, ft·lb)

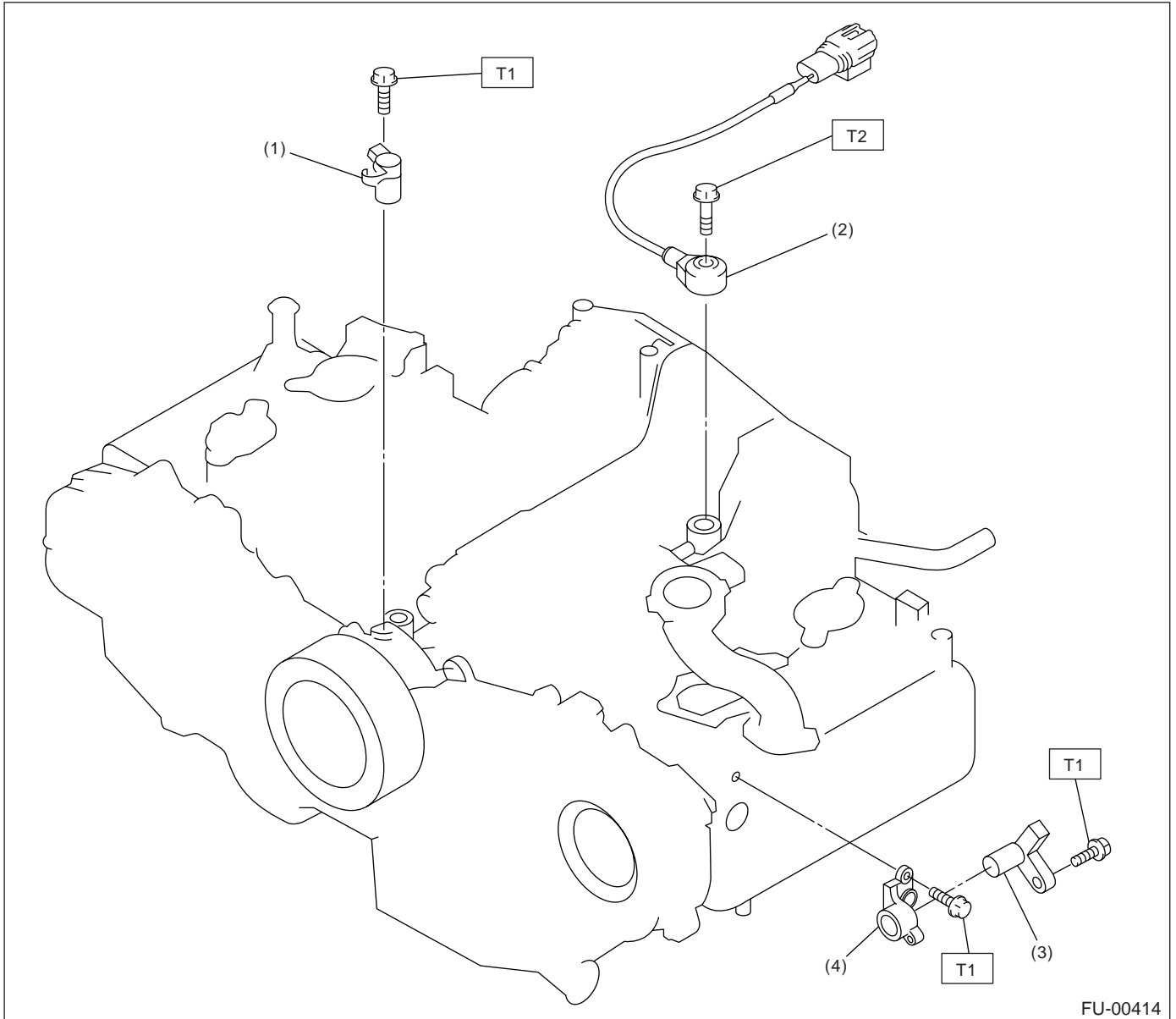
T1: 1.6 (0.16, 1.2)

T2: 22 (2.2, 15.9)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crank angle position sensor

(2) Knock sensor

(3) Camshaft position sensor

(4) Camshaft position sensor support

Tightening torque: N·m (kgf·m, ft·lb)

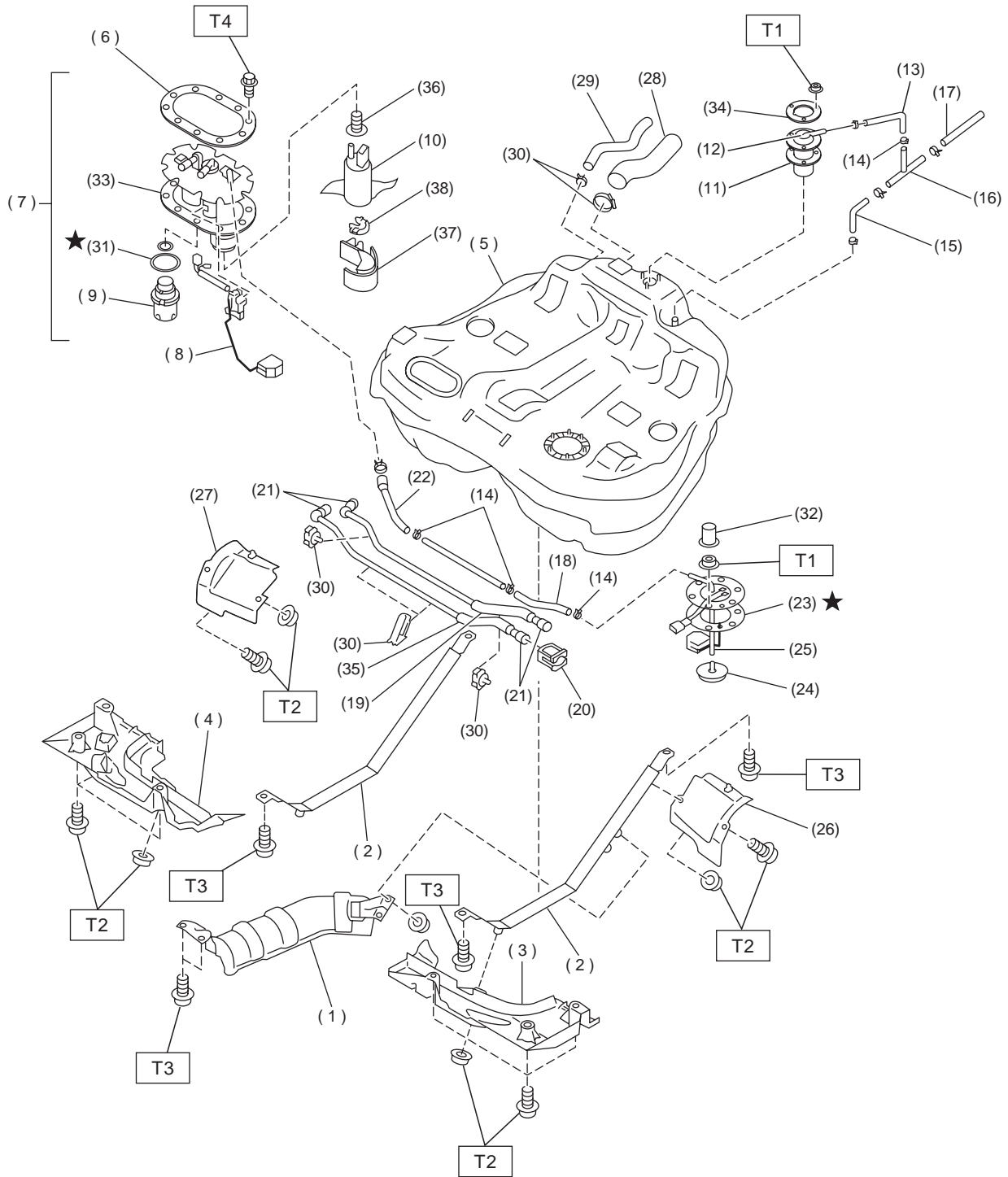
T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK



FU-00626

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

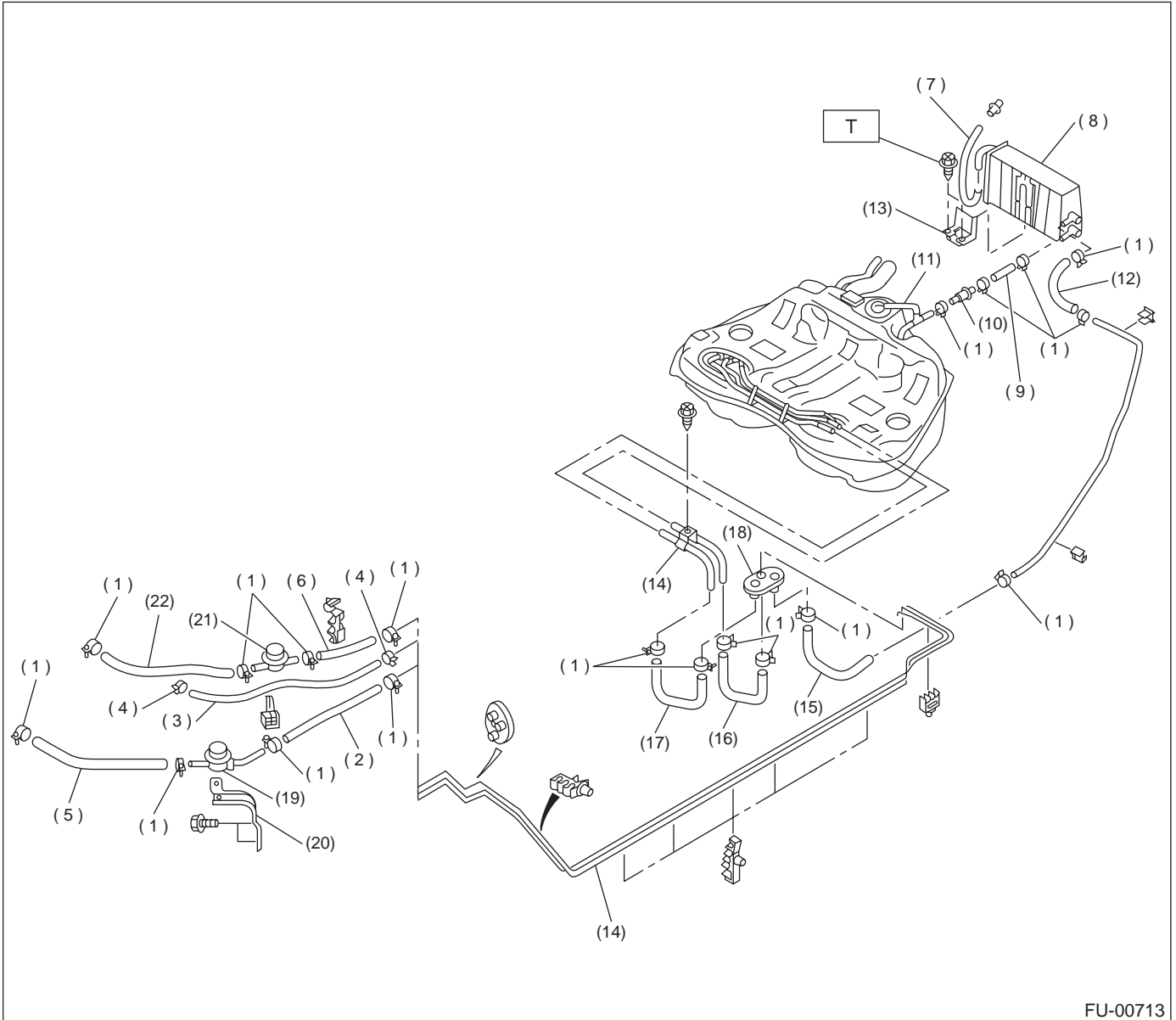
(1) Heat sealed cover	(16) Joint pipe	(31) Gasket
(2) Fuel tank band	(17) Evaporation hose B	(32) Cap
(3) Protector LH (Front)	(18) Jet pump hose A	(33) Gasket
(4) Protector RH (Front)	(19) Fuel return tube	(34) Fuel cut valve plate
(5) Fuel tank	(20) Retainer	(35) Fuel delivery tube
(6) Fuel pump plate	(21) Quick connector	(36) Seal
(7) Fuel pump ASSY	(22) Jet pump hose B	(37) Fuel pump holder
(8) Fuel level sensor	(23) Fuel sub level sensor gasket	(38) Grommet
(9) Fuel filter	(24) Jet pump filter	
(10) Fuel pump with filter	(25) Fuel sub level sensor	
(11) Fuel cut valve gasket	(26) Protector LH (Rear)	
(12) Fuel cut valve	(27) Protector RH (Rear)	
(13) Evaporation hose A	(28) Fuel filler hose	
(14) Clip	(29) Air vent hose	
(15) Evaporation hose C	(30) Clamp	

Tightening torque: N·m (kgf-m, ft-lb)**T1: 4.4 (0.45, 3.3)****T2: 18 (1.8, 13.0)****T3: 33 (3.4, 25)****T4: 5.9 (0.6, 4.3)**

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

5. FUEL LINE



- | | | |
|--------------------------|---------------------------|------------------------------|
| (1) Clamp | (10) Two-way valve | (19) Dumper valve (Delivery) |
| (2) Fuel delivery hose A | (11) Canister hose B | (20) Bracket |
| (3) Evaporation hose A | (12) Canister hose C | (21) Dumber valve (Return) |
| (4) Clip | (13) Canister bracket | (22) Fuel return hose B |
| (5) Fuel delivery hose B | (14) Fuel pipe ASSY | |
| (6) Fuel return hose A | (15) Evaporation hose B | |
| (7) Drain hose | (16) Fuel return hose C | |
| (8) Canister | (17) Fuel delivery hose C | |
| (9) Canister hose A | (18) Grommet | |

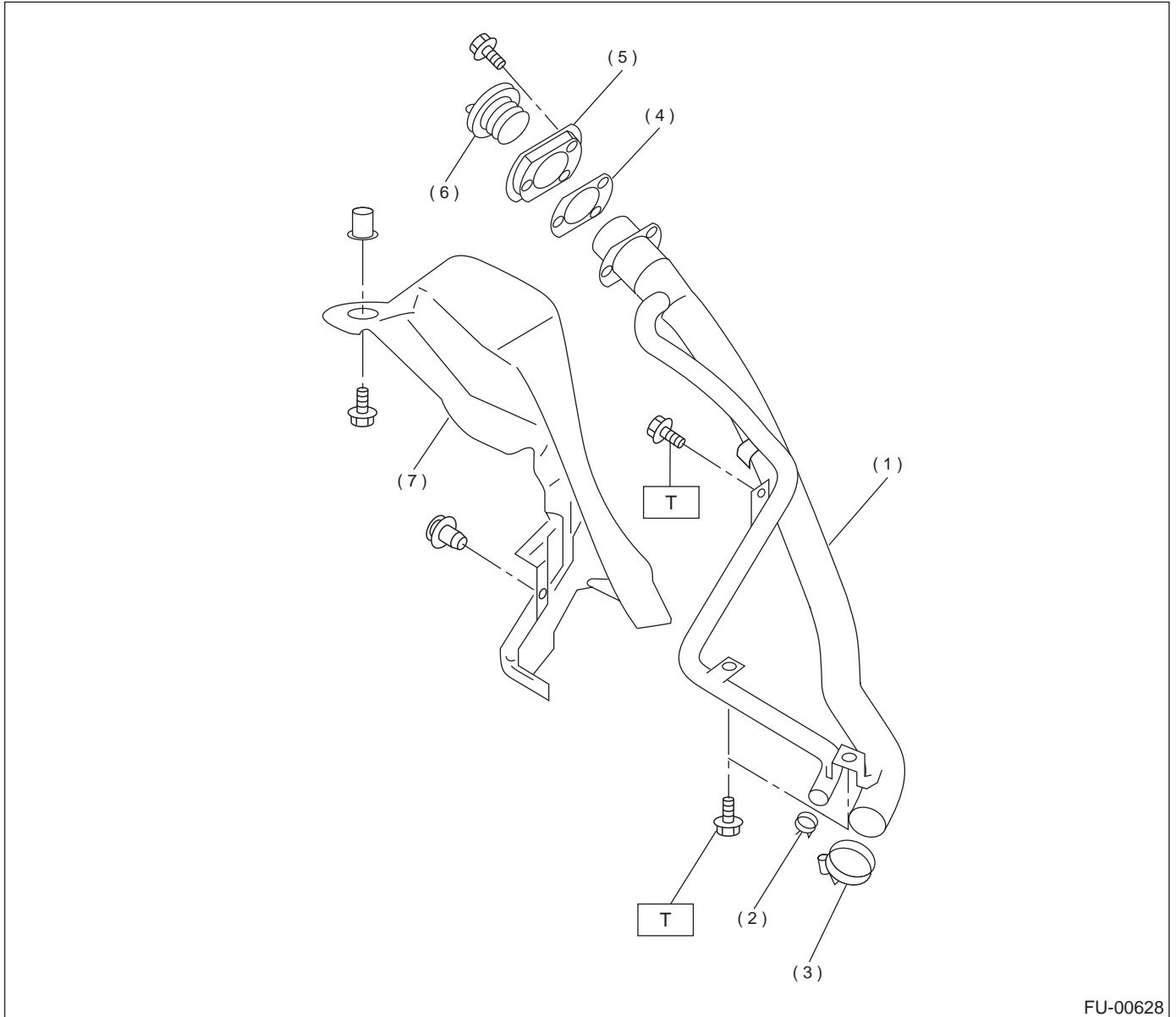
Tightening torque: N·m (kgf·m, ft·lb)

T: 7.4±2.0 (0.75±0.2, 5.4±1.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



FU-00628

- (1) Fuel filler pipe ASSY
- (2) Clip
- (3) Clamp
- (4) Filler pipe packing
- (5) Filler ring
- (6) Filler cap
- (7) Filler pipe protector

Tightening torque: N·m (kgf-m, ft-lb)

T: 7.4 (0.75, 5.4)

GENERAL DESCRIPTION

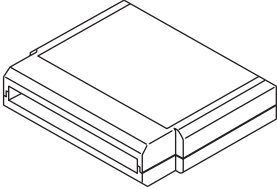

FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

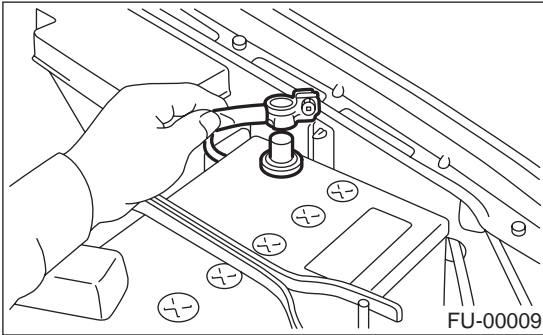
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

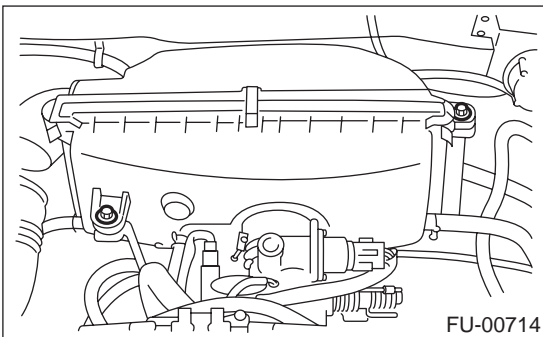
2. Throttle Body

A: REMOVAL

1) Disconnect battery ground cable.

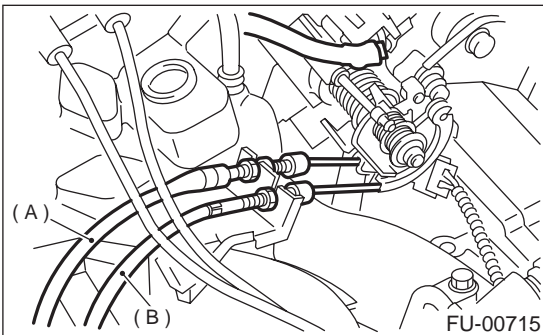


2) Remove air cleaner case.



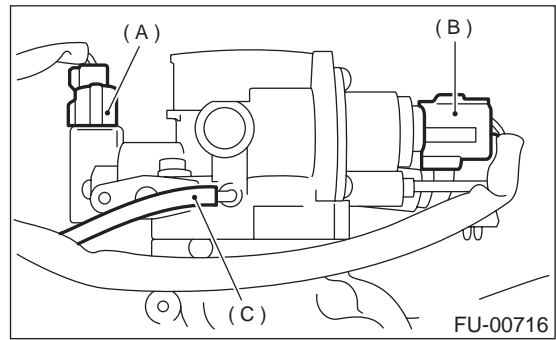
3) Disconnect accelerator cable (A).

4) Disconnect cruise control cable (B). (With cruise control model)



5) Disconnect connectors from idle air control solenoid valve, throttle position sensor.

6) Disconnect air by-pass hose from purge control solenoid valve.

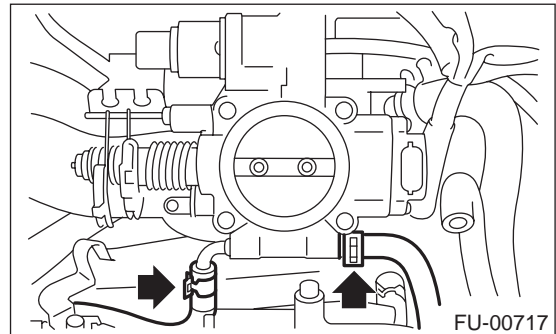


(A) Throttle position sensor

(B) Idle air control solenoid valve

(C) Air by-pass hose

7) Disconnect engine coolant hoses from throttle body.



8) Remove bolts which install throttle body to intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

Throttle body;

22 N·m (2.2 kgf-m, 15.9 ft-lb)

Air cleaner case;

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

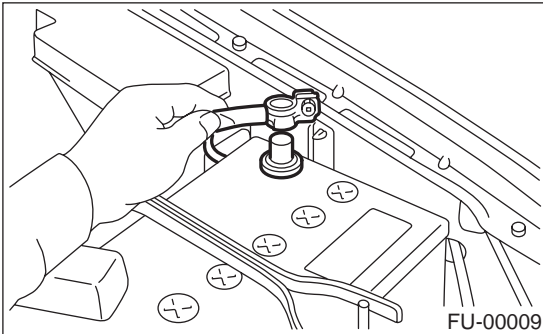
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

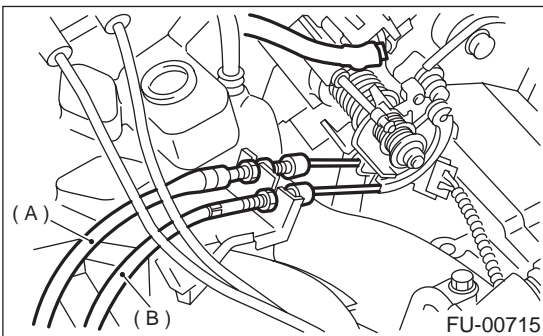
3. Intake Manifold

A: REMOVAL

- 1) Release fuel pressure. <Ref. to FU(H4SOw/oOBD)-45, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.
- 3) Disconnect battery ground cable.



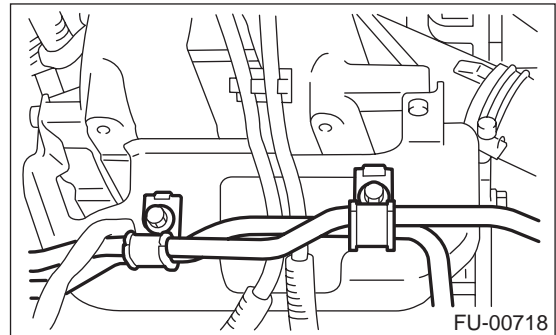
- 4) Remove air intake duct and air cleaner assembly. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 5) Disconnect accelerator cable (A).
- 6) Disconnect cruise control cable (B). (With cruise control model)



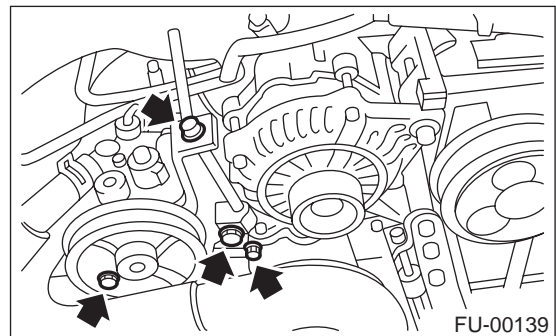
- 7) Remove power steering pump and tank from brackets.
 - (1) Remove resonator chamber. <Ref. to IN(H4SO)-8, REMOVAL, Resonator Chamber.>
 - (2) Remove front V-belt. <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>
 - (3) Remove bolts which hold power steering pipes onto intake manifold protector.

NOTE:

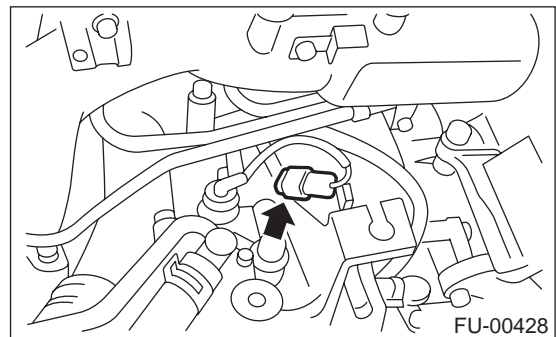
Do not disconnect power steering hose.



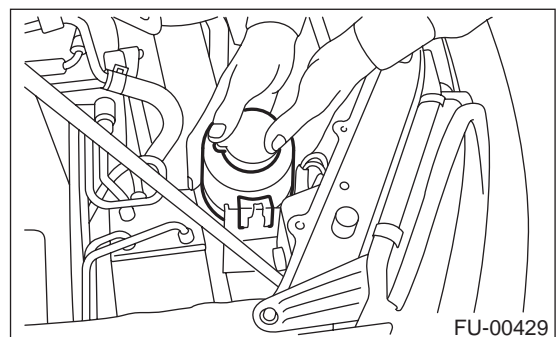
- (4) Remove bolts which install power steering pump bracket.



- (5) Disconnect connector from power steering pump switch.



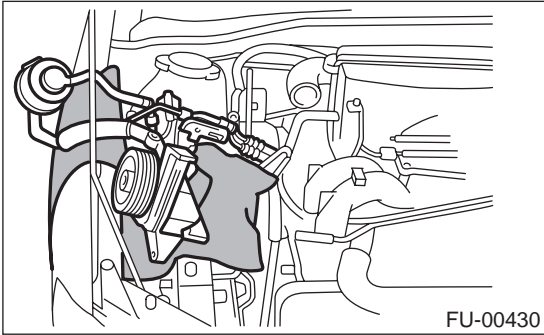
- (6) Remove power steering tank from the bracket by pulling it upwards.



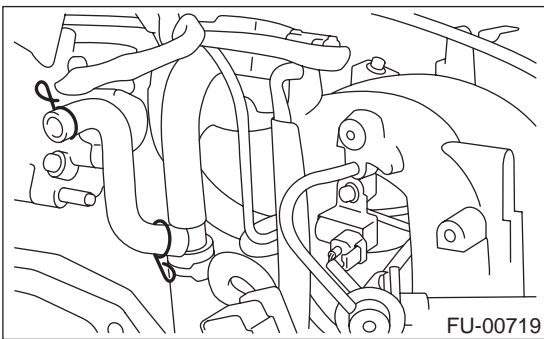
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

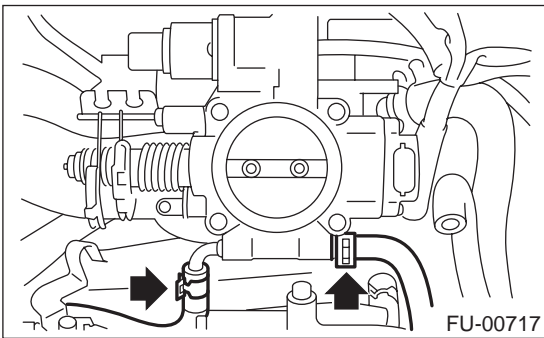
(7) Place power steering pump and tank on the right side wheel apron.



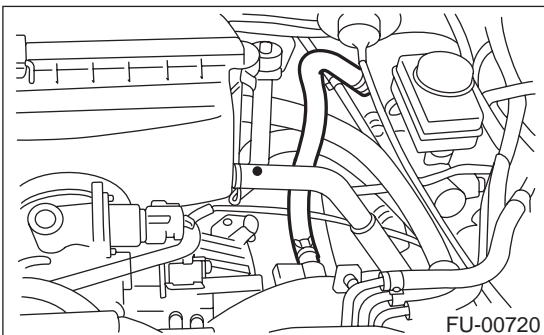
8) Disconnect spark plug cords from spark plugs.
9) Disconnect PCV hose from intake manifold.



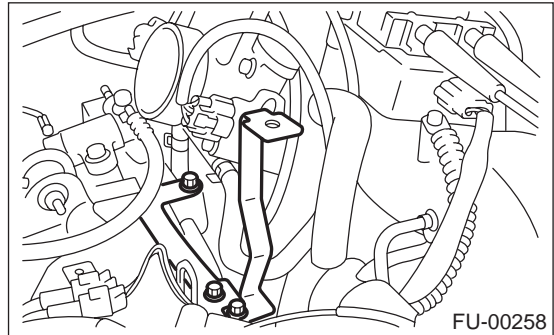
10) Disconnect engine coolant hose from throttle body.



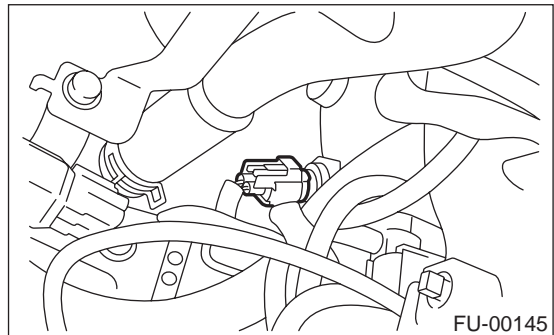
11) Disconnect brake booster hose.



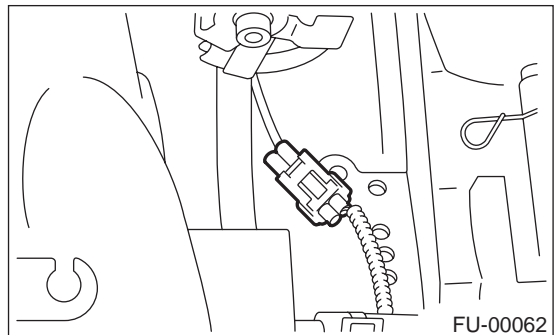
12) Remove air cleaner case stay RH and engine harness bracket, and disconnect engine harness connectors from bulkhead harness connectors.



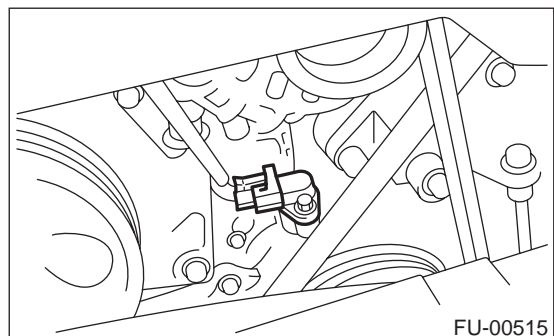
13) Disconnect connectors from engine coolant temperature sensor.



14) Disconnect knock sensor connector.



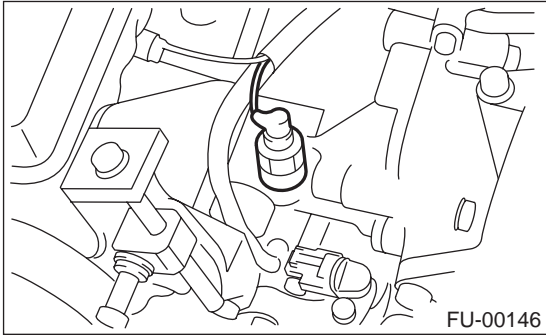
15) Disconnect connector from crankshaft position sensor.



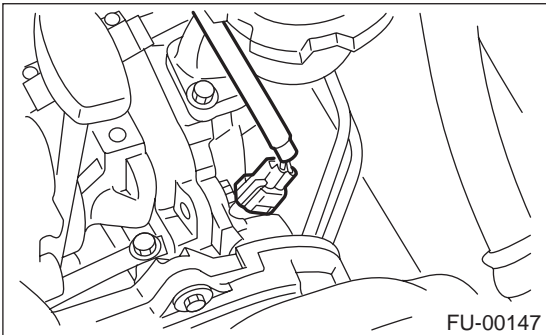
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

16) Disconnect connector from oil pressure switch.



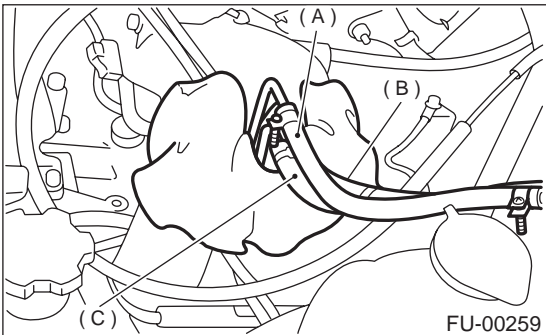
17) Disconnect connector from camshaft position sensor.



18) Disconnect fuel hoses from fuel pipes.

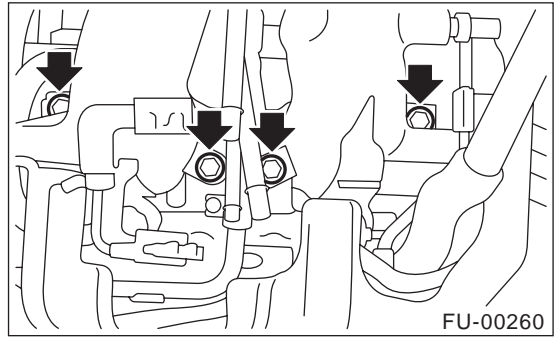
WARNING:

- Do not spill fuel.
- Catch fuel from hoses in a container or cloth.



- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

19) Remove bolts which hold intake manifold onto cylinder heads and then remove intake manifold.



B: INSTALLATION

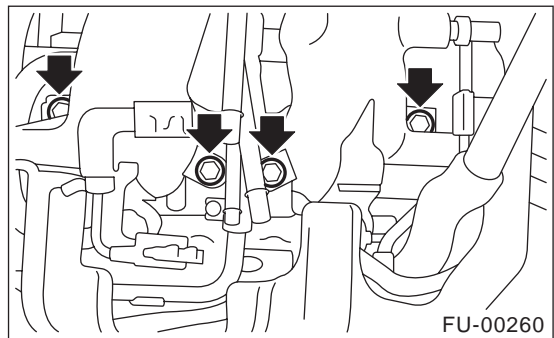
1) Install intake manifold onto cylinder heads.

NOTE:

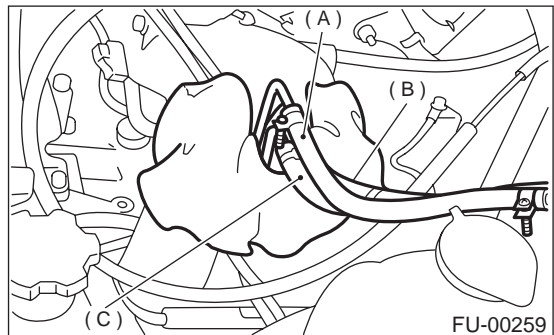
Always use new gaskets.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



2) Connect fuel hoses.

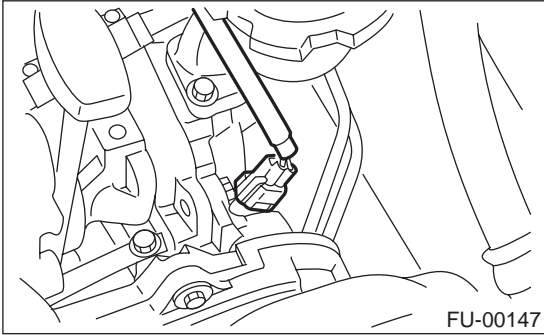


- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

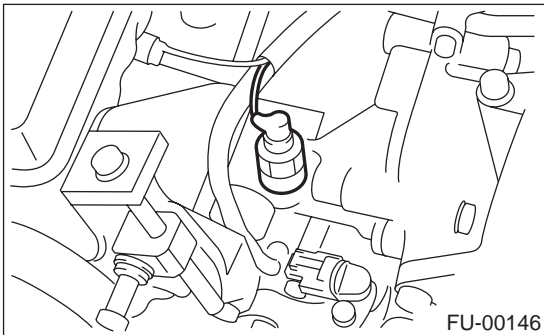
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

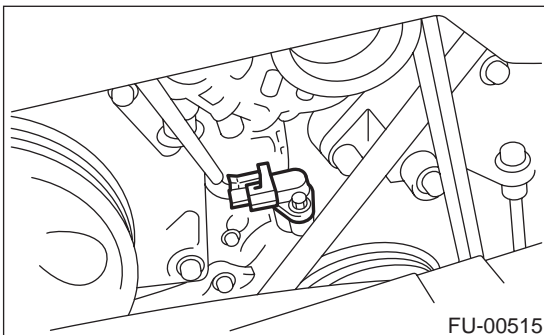
3) Connect connector to camshaft position sensor.



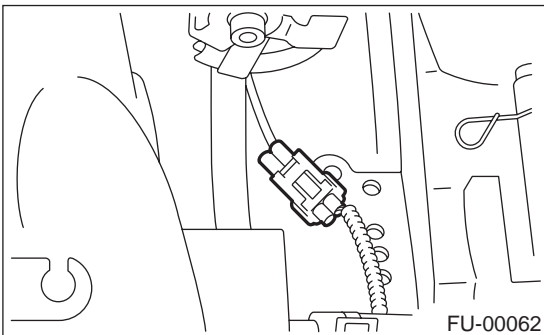
4) Connect connector to oil pressure switch.



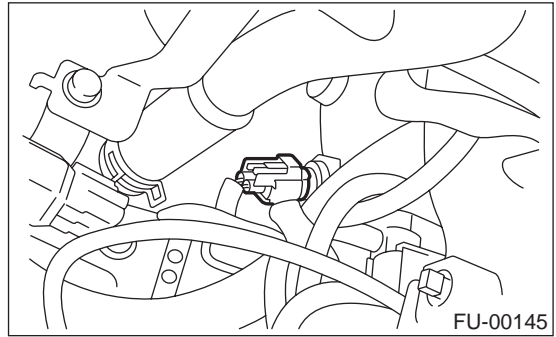
5) Connect connector to crankshaft position sensor.



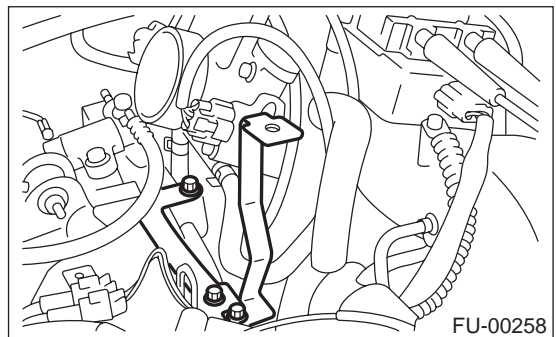
6) Connect knock sensor connector.



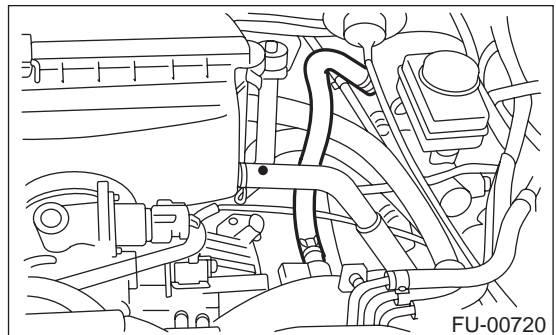
7) Connect connectors to engine coolant temperature sensor.



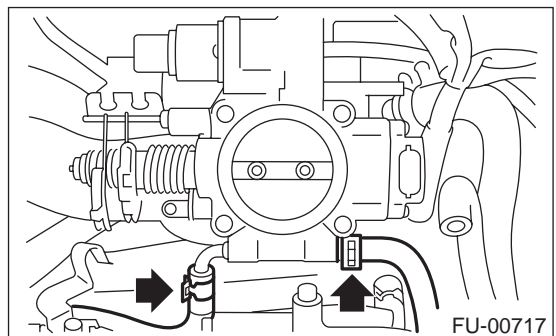
8) Install air cleaner case stay RH and engine harness bracket, and connect engine harness connectors to bulkhead connectors.



9) Connect brake booster hose.



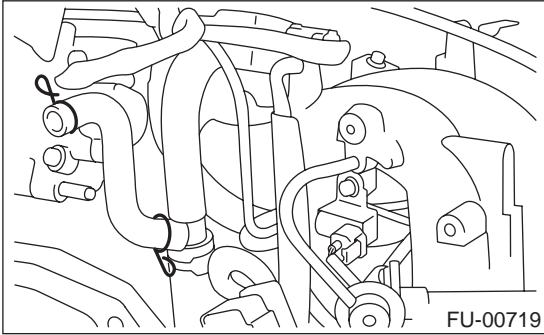
10) Connect engine coolant hose to throttle body.



INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

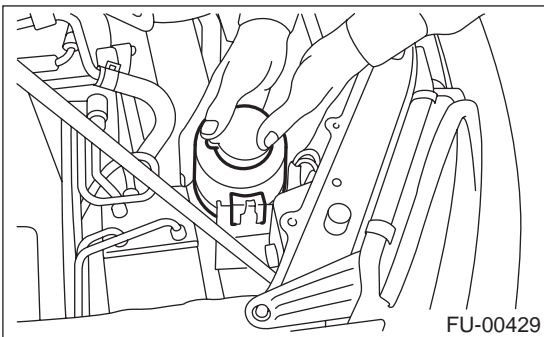
11) Connect PCV hose to intake manifold.



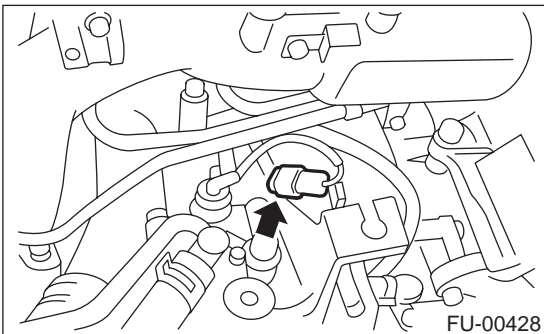
12) Connect spark plug cords to spark plugs.

13) Install power steering pump and tank on brackets.

(1) Install power steering tank on bracket.



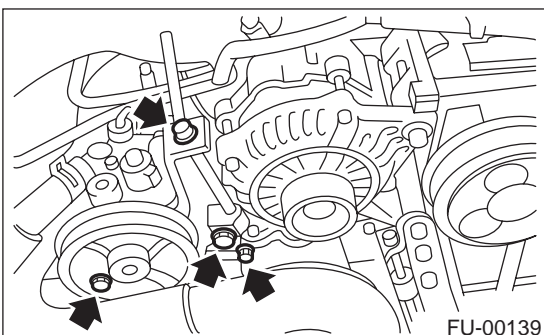
(2) Connect connector to power steering pump switch.



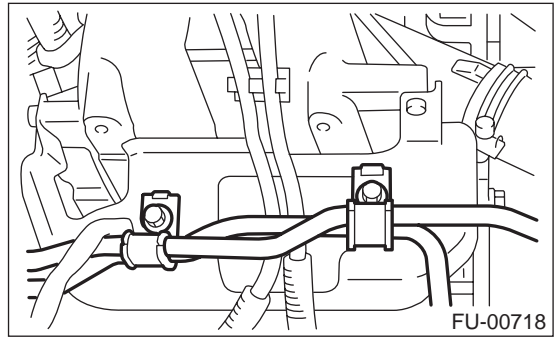
(3) Tighten bolts which install power steering pump on bracket.

Tightening torque:

22 N·m (2.2 kgf·m, 16 ft·lb)



(4) Install power steering pipes onto right side intake manifold protector.



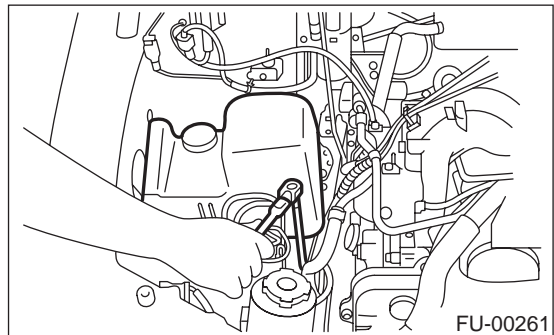
(5) Install front V-belt.

<Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

(6) Install resonator chamber.

Tightening torque:

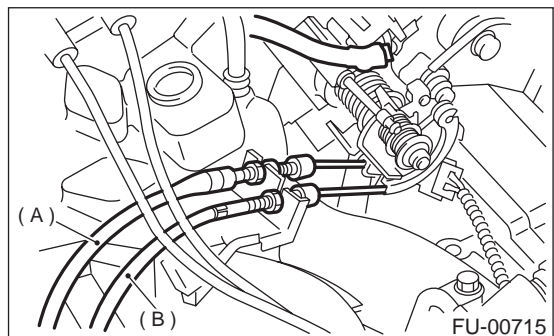
33 N·m (3.4 kgf·m, 24.6 ft·lb)



14) Connect accelerator cable (A).

<Ref. to SP(H4SO)-10, INSTALLATION, Accelerator Control Cable.>

15) Connect cruise control cable (B). (With cruise control models)



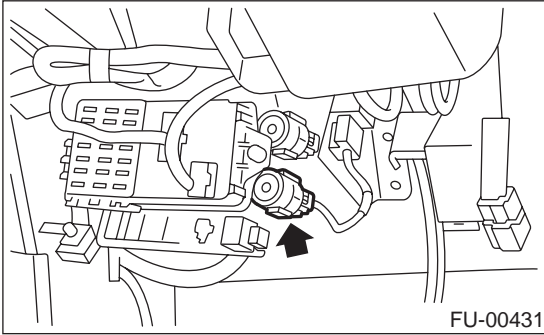
16) Install air intake duct and air cleaner assembly.

<Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

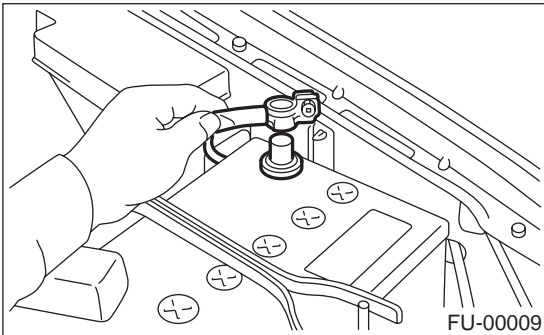
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

17) Connect connector to fuel pump relay.

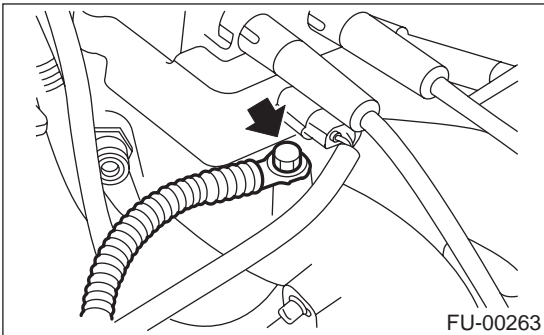


18) Connect battery ground cable.

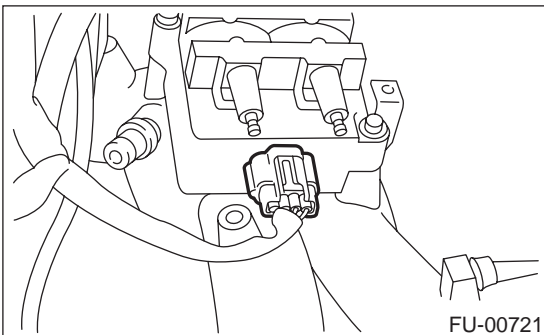


C: DISASSEMBLY

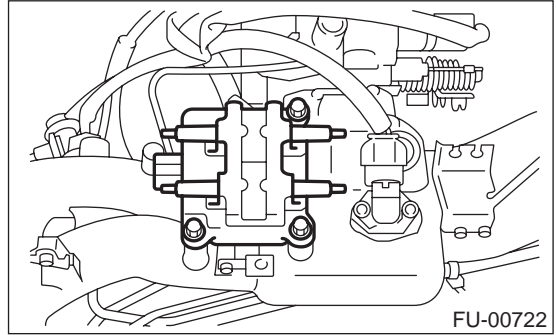
1) Disconnect engine ground terminal from intake manifold.



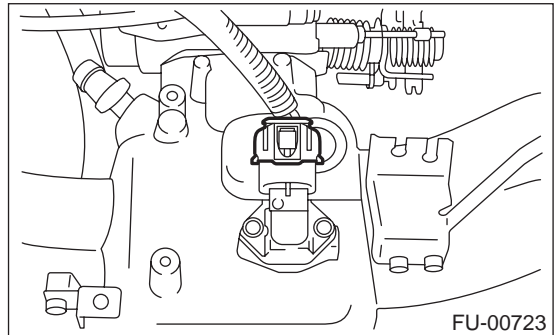
2) Disconnect connector from ignition coil and ignitor assembly.



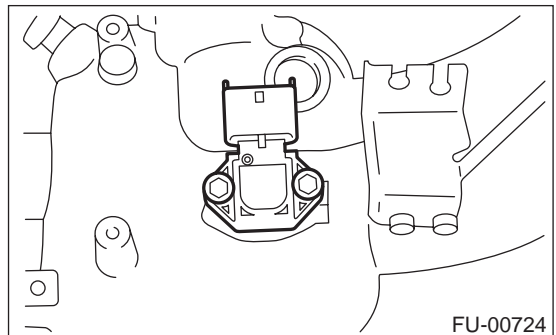
3) Remove ignition coil and ignitor assembly.



4) Disconnect connector from intake air temperature and pressure sensor.

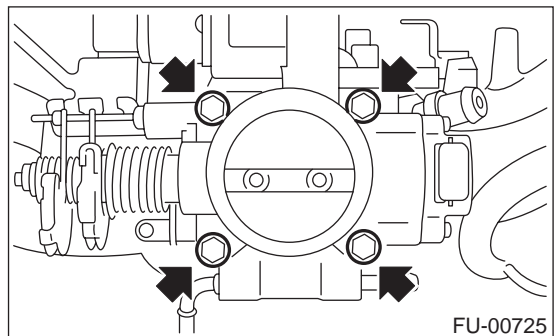


5) Remove intake air temperature and pressure sensor from intake manifold.



6) Disconnect connectors from throttle position sensor and idle air control solenoid valve.

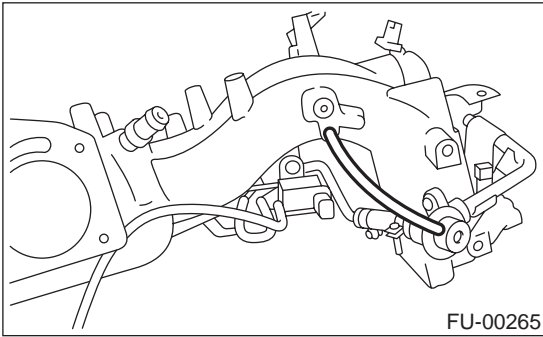
7) Remove throttle body.



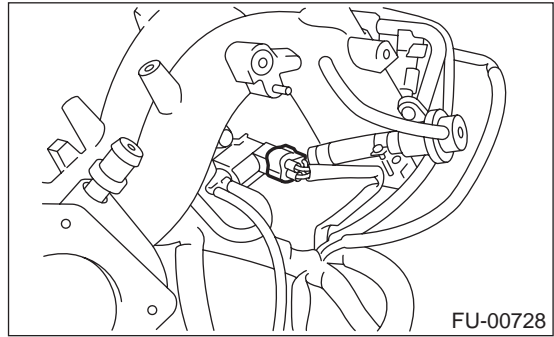
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

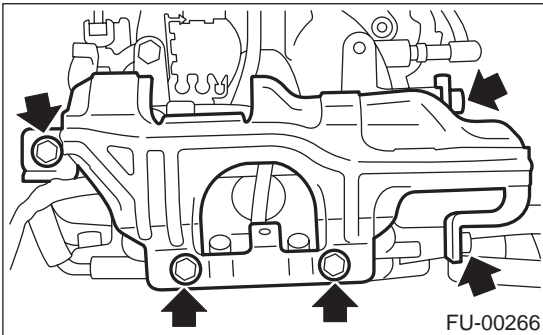
8) Disconnect pressure regulator vacuum hose from intake manifold.



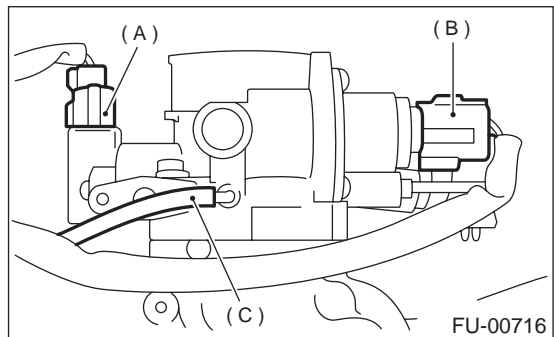
12) Disconnect connector from purge control solenoid valve.



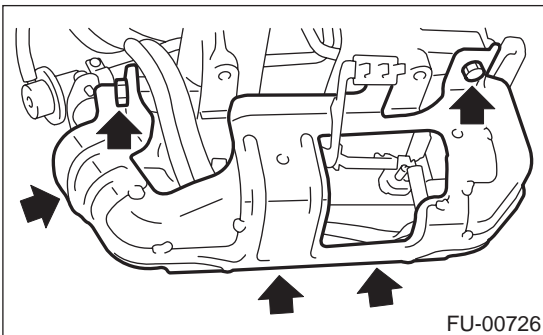
9) Remove fuel pipe protector LH.



13) Disconnect air by-pass hose from purge control solenoid valve.

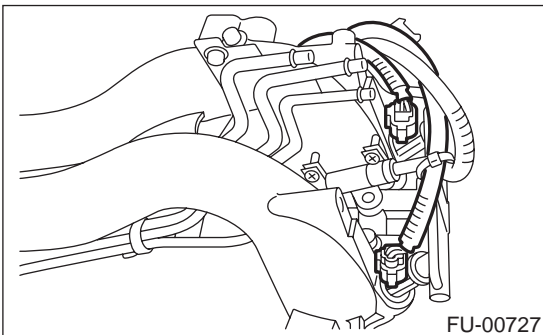


10) Remove fuel pipe protector RH.

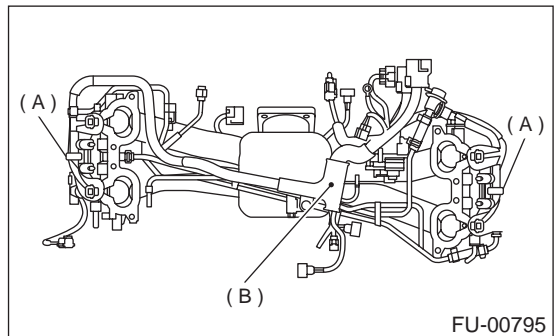


- (A) Throttle position sensor
- (B) Idle air control solenoid valve
- (C) Air by-pass hose

11) Disconnect connectors from fuel injectors.



14) Remove harness bands (A) and harness bracket (B) which hold engine harness onto intake manifold.

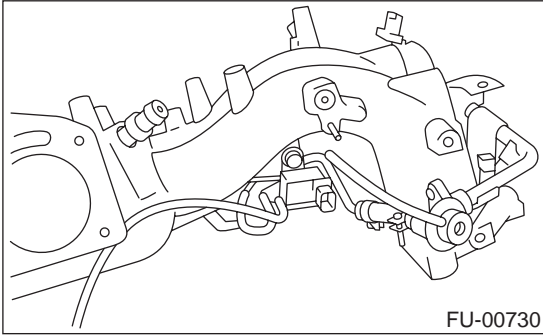


15) Remove engine harness from intake manifold.

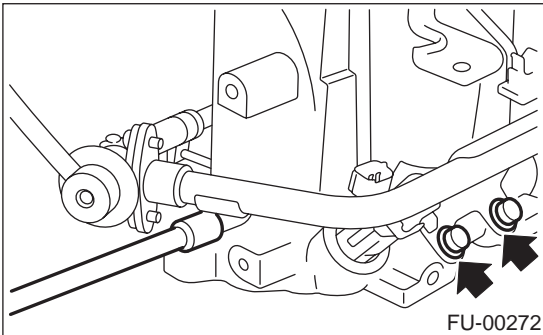
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

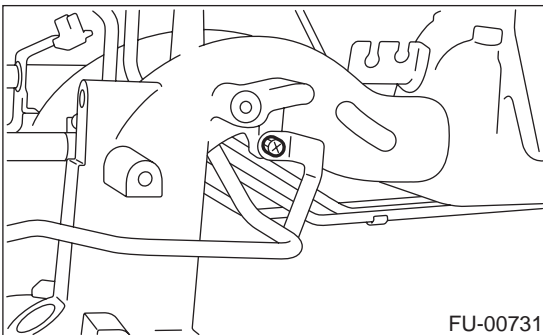
16) Remove purge control solenoid valve.



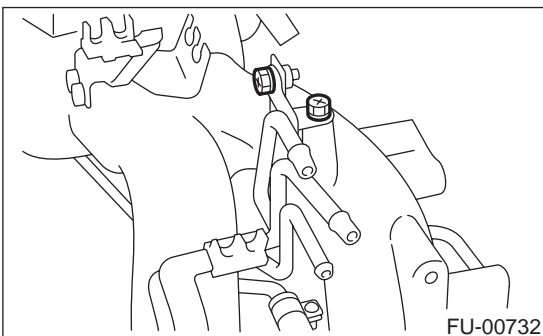
17) Remove bolt which installs injector pipe on intake manifold as shown in figure.



18) Remove bolt which installs injector pipe on intake manifold.

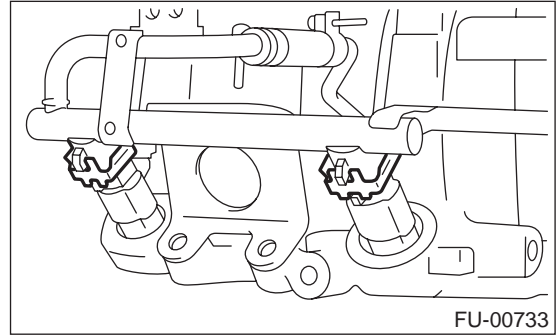


19) Remove two bolts which hold fuel pipes on the left side of intake manifold.

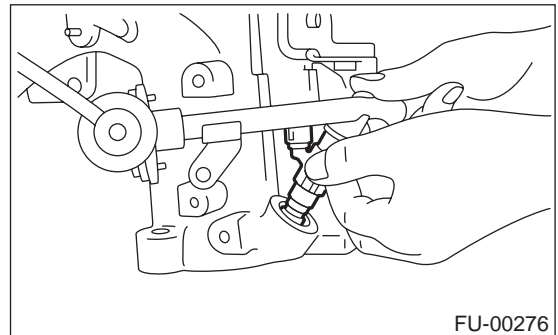


20) Remove fuel injectors.

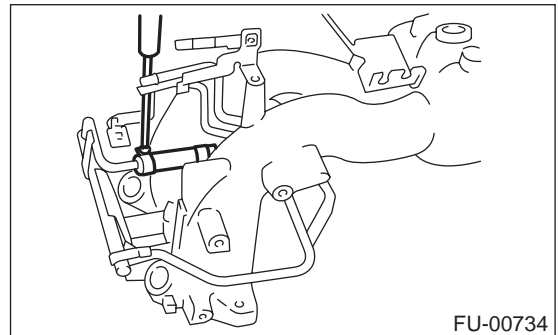
(1) Remove fuel injector securing clip.



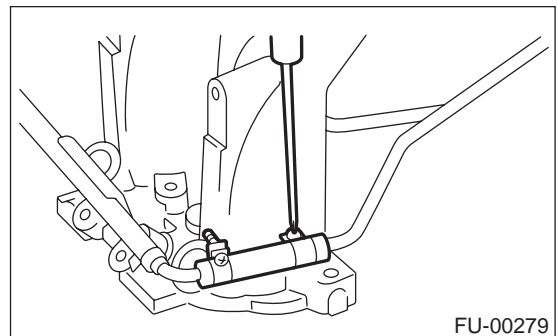
(2) Remove fuel injector while lifting up fuel injector pipe.



21) Loosen clamp which holds front left side fuel hose to injector pipe and remove the pipe from clamp.



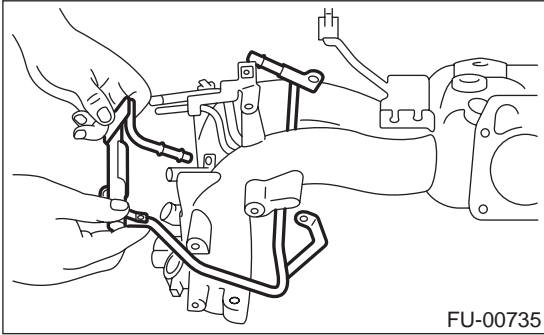
22) Loosen clamp which holds front right side fuel hose to injector pipe and remove the pipe from clamp.



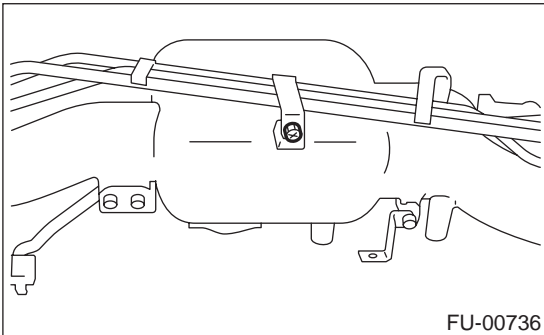
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

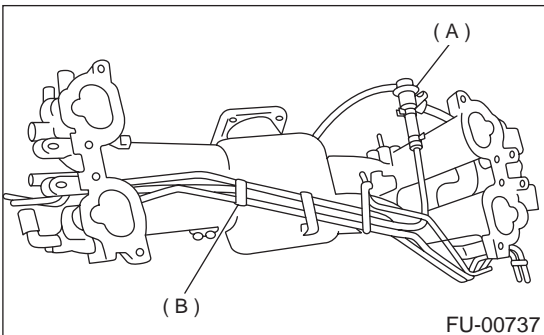
23) Remove fuel injector pipe.



24) Remove bolt which installs fuel pipes on intake manifold.



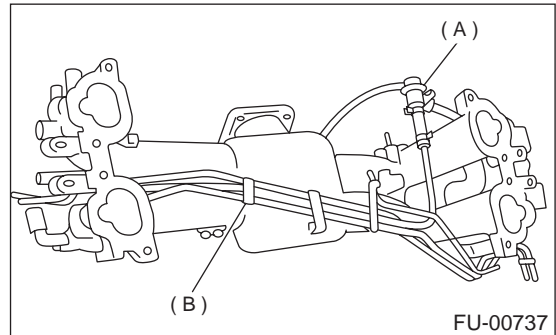
25) Remove fuel pipe assembly and pressure regulator, from intake manifold.



- (A) Pressure regulator
- (B) Fuel pipe ASSY

D: ASSEMBLY

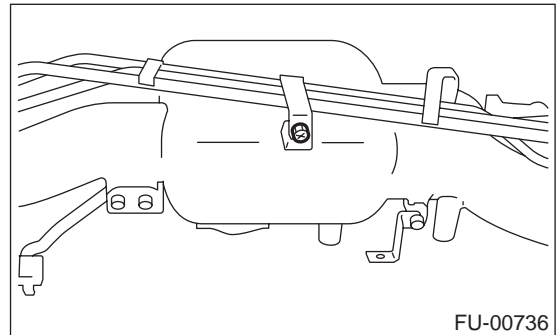
1) Install fuel pipe assembly and pressure regulator, etc. to intake manifold.



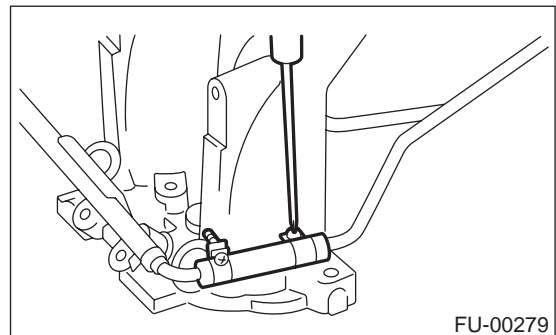
- (A) Pressure regulator
- (B) Fuel pipe ASSY

2) Tighten bolt which installs fuel pipes on intake manifold.

Tightening torque:
5.0 N·m (0.51 kgf·m, 3.7 ft·lb)



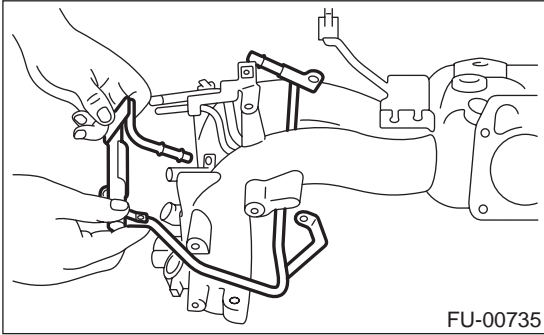
3) Connect right side fuel hose to injector pipe, and tighten clamp screw.



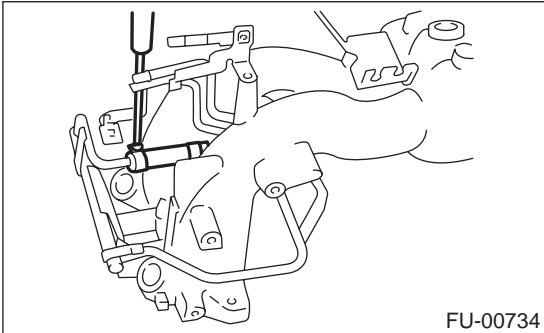
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

4) Install fuel injector pipe.



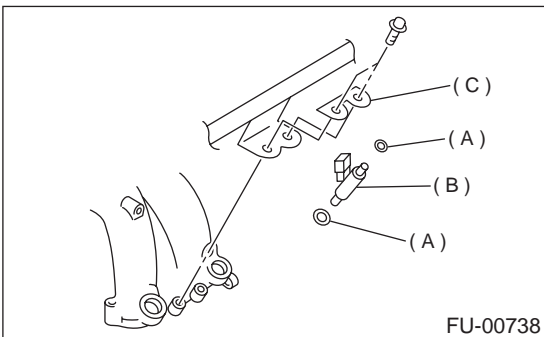
5) Connect left side fuel hose to injector pipe, and tighten clamp screw.



6) Install fuel injectors.

NOTE:

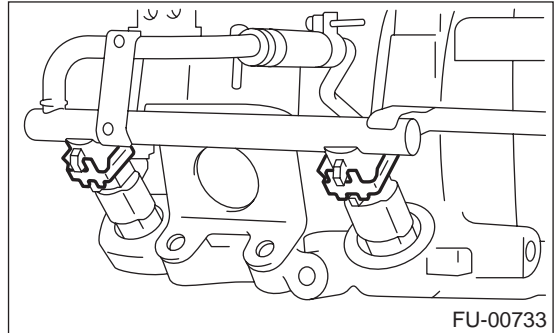
Always use new O-rings and insulators.



- (A) O-ring
- (B) Fuel injector
- (C) Intake manifold protector

NOTE:

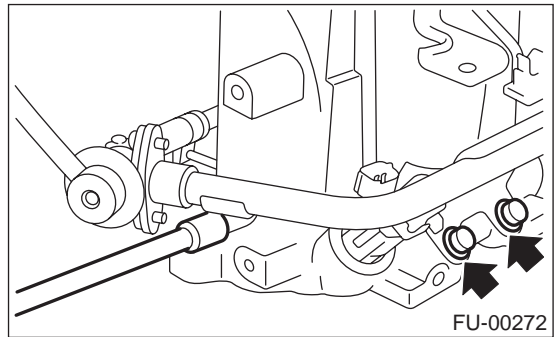
Do not forget to install the fuel injector securing clip.



7) Tighten bolt which installs injector pipe on intake manifold.

Tightening torque:

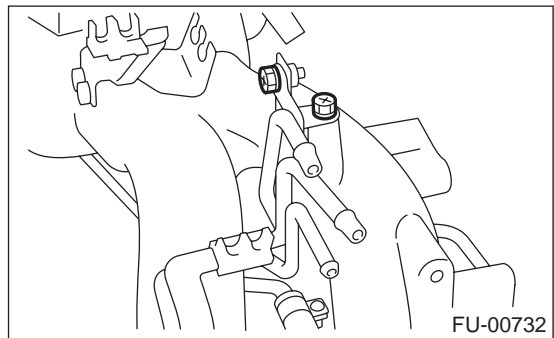
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



8) Tighten two bolts which install fuel pipes on the left side of intake manifold.

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



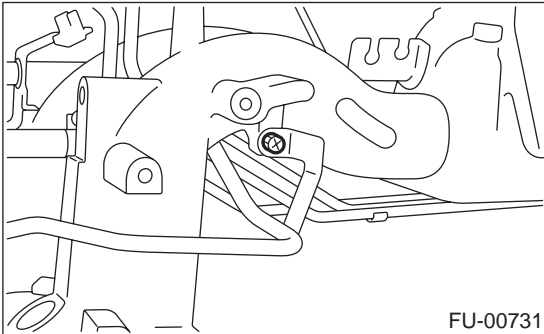
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

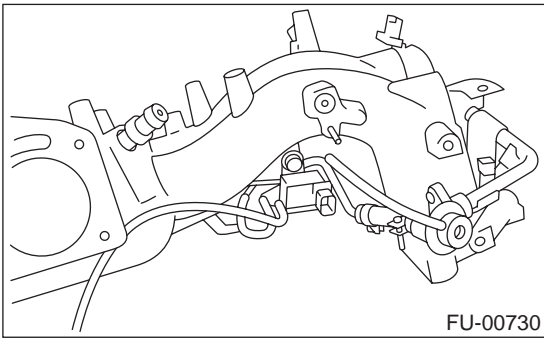
9) Tighten bolt which install injector pipe on intake manifold.

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



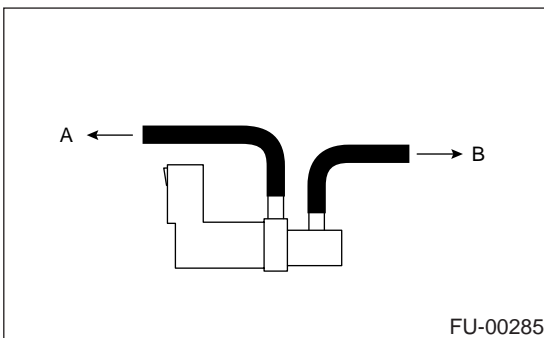
10) Install purge control solenoid valve.



11) Connect hoses to purge control solenoid valve.

NOTE:

Connect evaporation hoses as shown in the figure.



- (A) To fuel pipe
- (B) To intake manifold

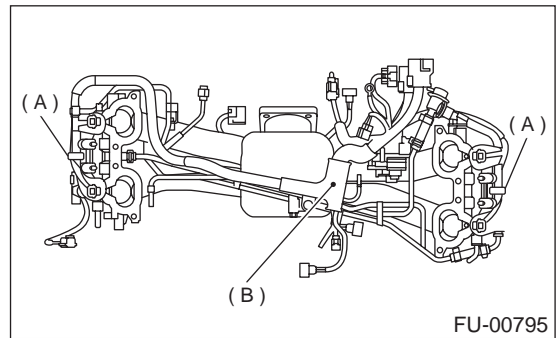
12) Install engine harness onto intake manifold.

Tightening torque:

16 N·m (1.6 kgf-m, 12 ft-lb)

13) Connect connectors to fuel injectors and purge control solenoid valve.

14) Hold engine harness by harness band (A) and harness bracket (B).



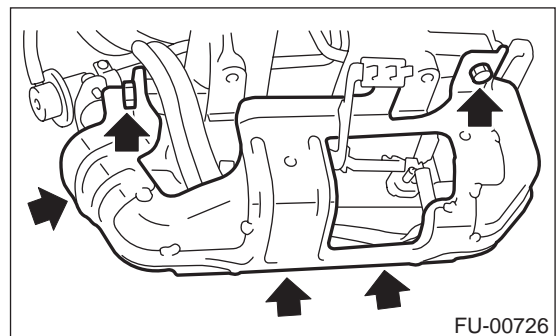
NOTE:

Do not use harness band on harnesses where they are supposed to be protected by the fuel pipe protector.

15) Install intake manifold protector RH.

Tightening torque:

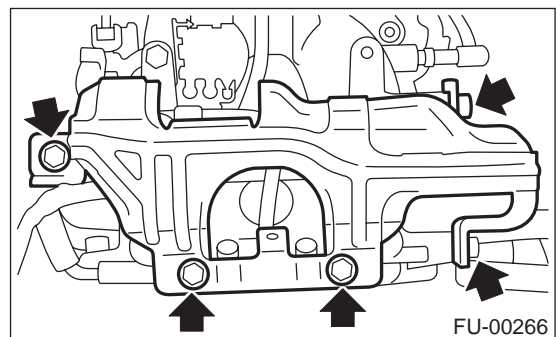
19 N·m (1.9 kgf-m, 13.7 ft-lb)



16) Install intake manifold protector LH.

Tightening torque:

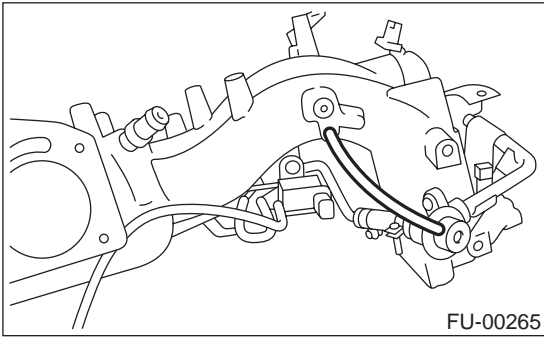
19 N·m (1.9 kgf-m, 13.7 ft-lb)



INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

17) Connect pressure regulator vacuum hose to intake manifold.



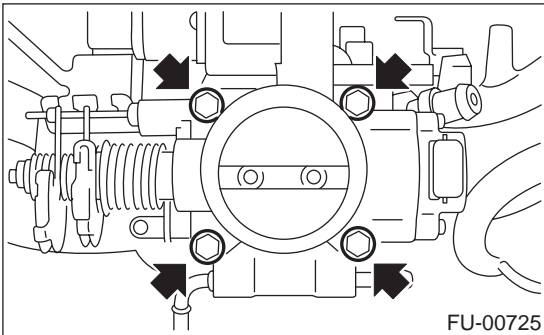
18) Install throttle body to intake manifold.

NOTE:

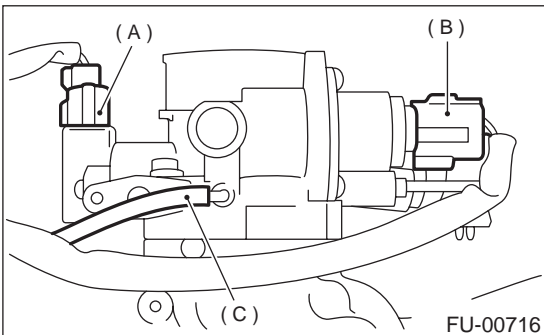
Replace gasket with a new one.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



19) Connect air by-pass hose from purge control solenoid valve to intake manifold.

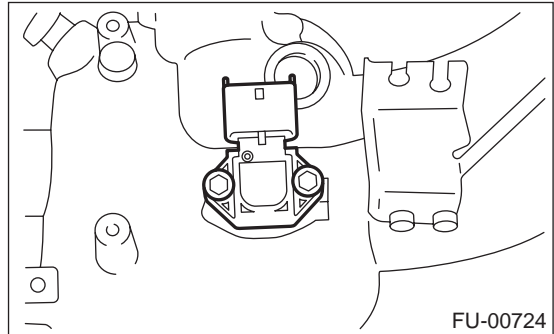


- (A) Throttle position sensor
- (B) Idle air control solenoid valve
- (C) Air by-pass hose

20) Install intake air temperature and pressure sensor.

Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



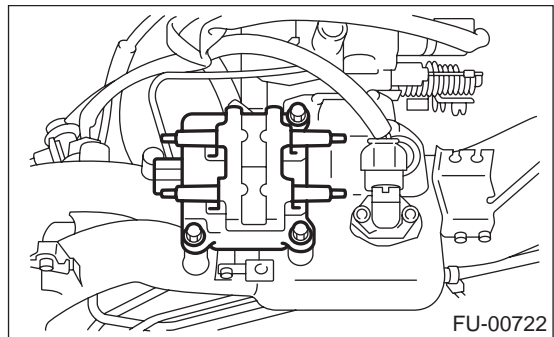
NOTE:

Replace O-ring with new one.

21) Connect connector to intake air temperature and pressure sensor.

22) Connect connectors to throttle position sensor and idle air control solenoid valve.

23) Install ignition coil and ignitor assembly.

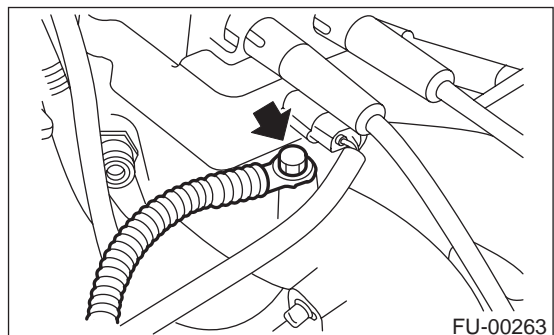


24) Connect connector to ignition coil and ignitor assembly.

25) Install engine ground terminal to intake manifold.

Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and that connections are tight.

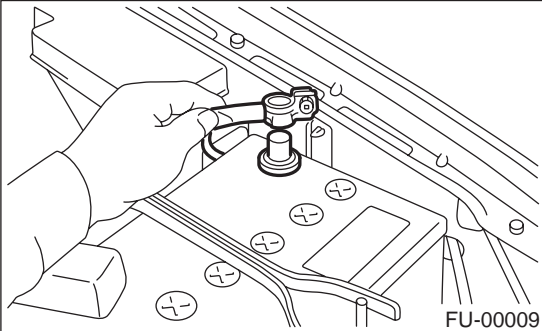
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

4. Engine Coolant Temperature Sensor

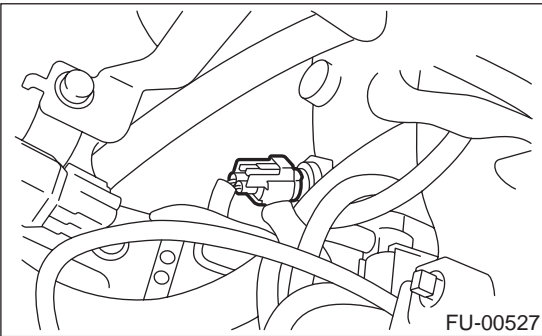
A: REMOVAL

1) Disconnect battery ground cable.



2) Remove air intake duct and air cleaner assembly. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>

3) Disconnect connector from engine coolant temperature sensor.



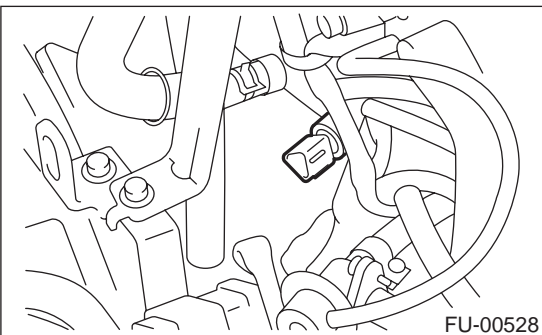
4) Remove engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



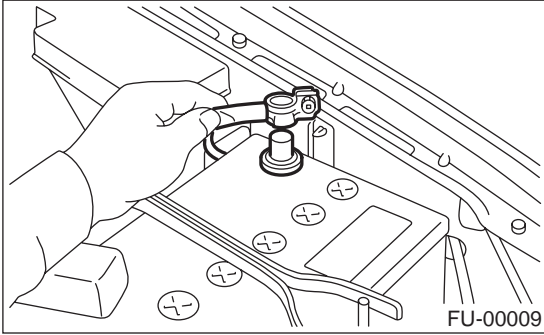
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

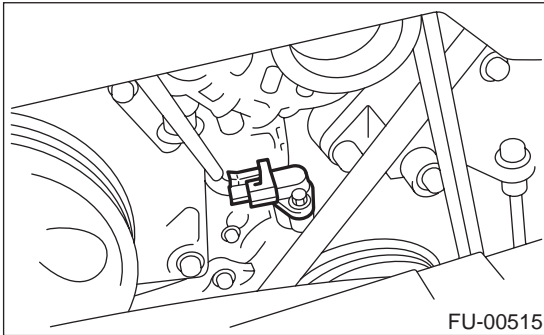
5. Crankshaft Position Sensor

A: REMOVAL

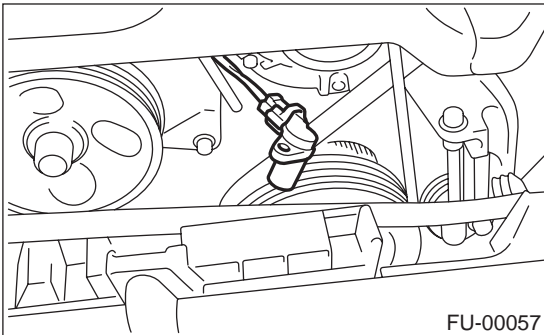
1) Disconnect battery ground cable.



2) Remove bolt which install crankshaft position sensor to cylinder block.



3) Remove crankshaft position sensor, and disconnect connector from it.

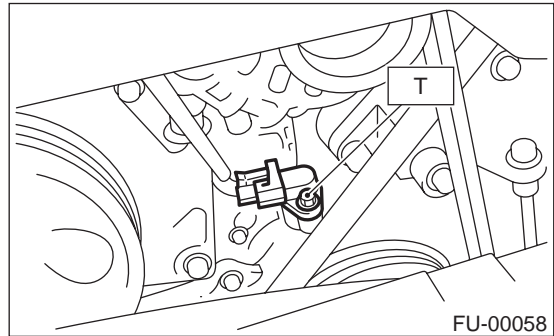


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



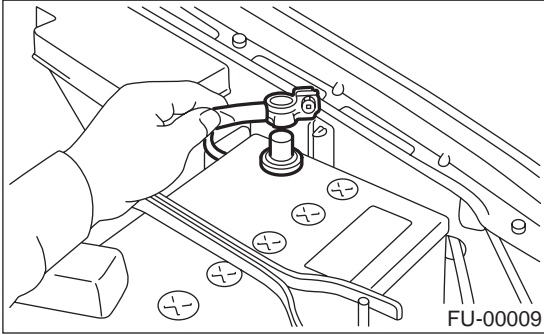
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

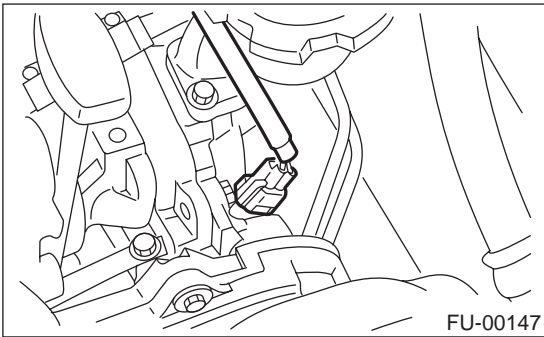
6. Camshaft Position Sensor

A: REMOVAL

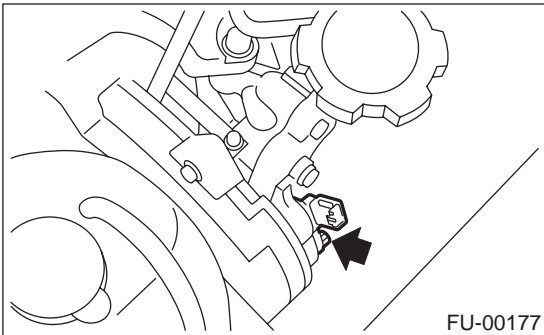
1) Disconnect battery ground cable.



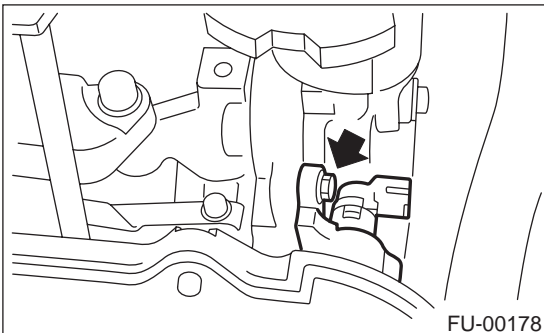
2) Disconnect connector from camshaft position sensor.



3) Remove bolt which installs camshaft position sensor to camshaft position sensor support.

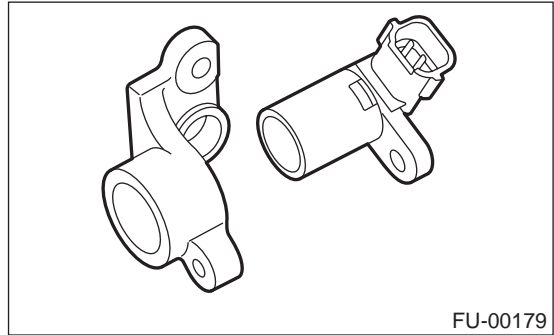


4) Remove bolt which installs camshaft position sensor support to camshaft cap LH.



5) Remove camshaft position sensor and camshaft position sensor support as a unit.

6) Remove camshaft position sensor itself.



B: INSTALLATION

Install in the reverse order of removal.

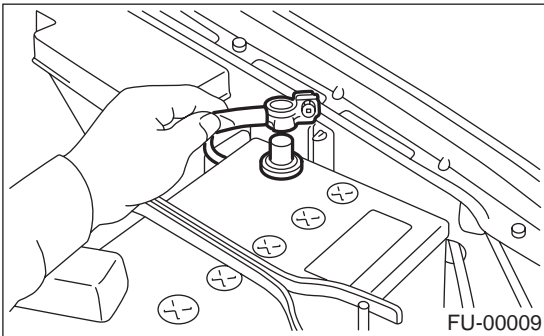
Tightening torque:

- **Camshaft position sensor support;**
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
- **Camshaft position sensor;**
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

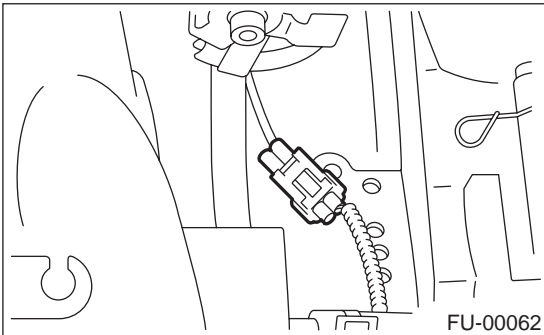
7. Knock Sensor

A: REMOVAL

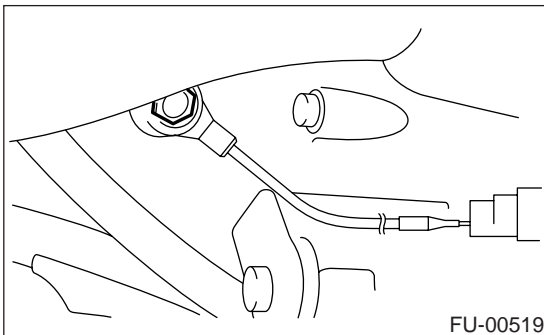
- 1) Disconnect battery ground cable from battery ground terminal.



- 2) Remove air cleaner case.
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 3) Disconnect knock sensor connector.



- 4) Remove knock sensor from cylinder block.



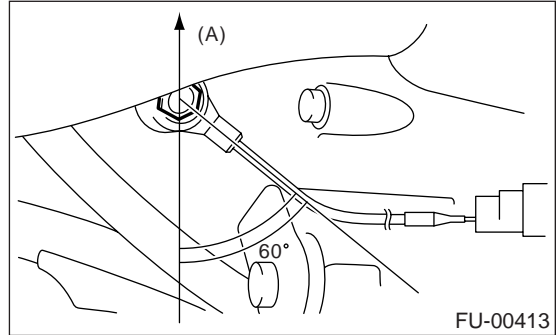
B: INSTALLATION

- 1) Install knock sensor to cylinder block.

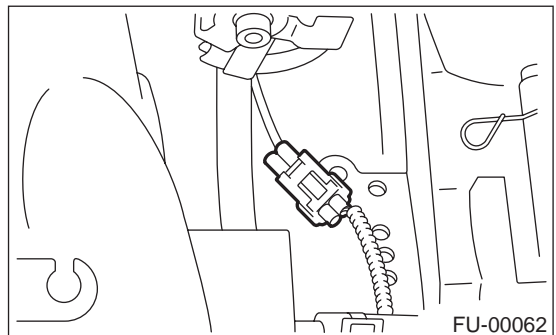
Tightening torque:
24 N·m (2.4 kgf·m, 17.4 ft·lb)

NOTE:

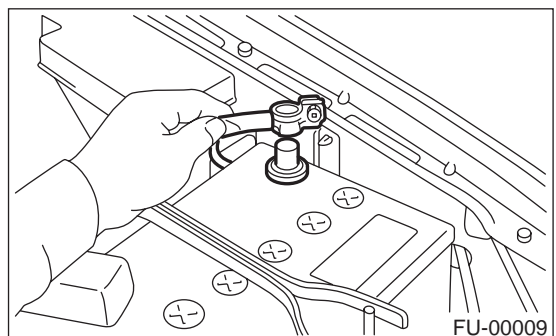
The extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.



- 2) Connect knock sensor connector.



- 3) Install air cleaner case.
<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>
- 4) Connect battery ground cable.



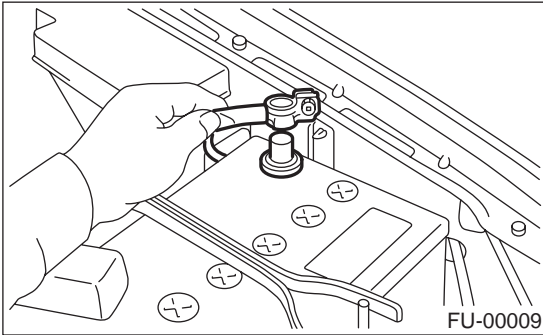
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

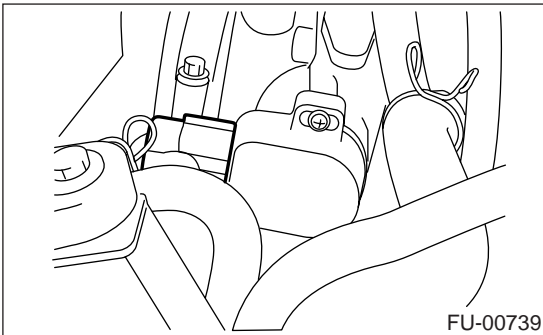
8. Throttle Position Sensor

A: REMOVAL

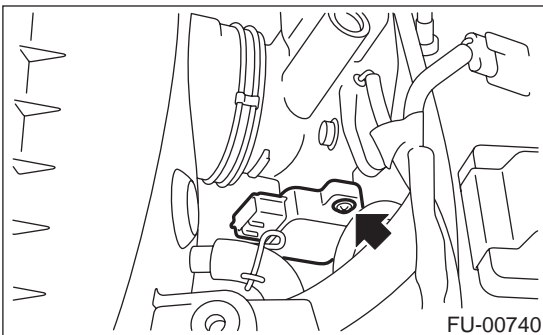
- 1) Disconnect battery ground cable.



- 2) Disconnect connector from throttle position sensor.



- 3) Remove throttle position sensor holding screws, and remove it.



B: INSTALLATION

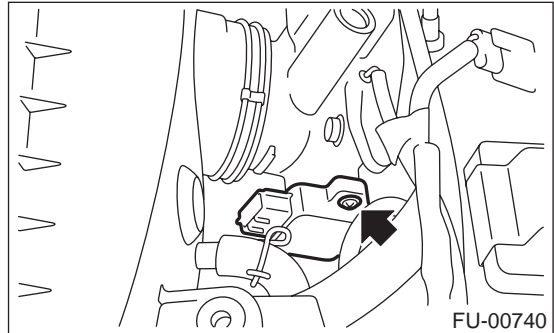
Install in the reverse order of removal.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)

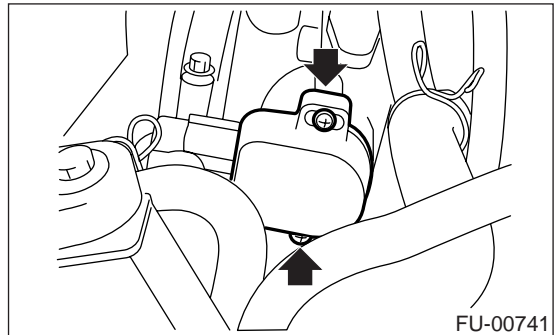
CAUTION:

When installing throttle position sensor, adjust to the specified data.



C: ADJUSTMENT

- 1) Turn ignition switch to OFF.
- 2) Loosen throttle position sensor holding screws.

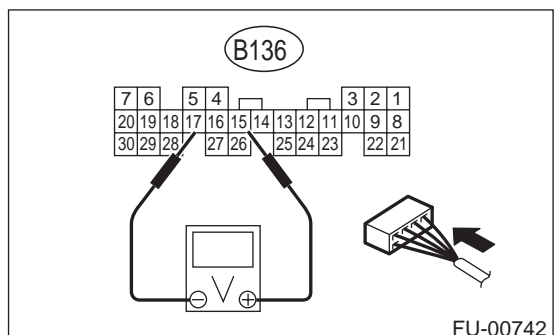


- 3) When using voltage meter;
 - (1) Take out ECM.
 - (2) Turn ignition switch to ON.
 - (3) Adjust throttle position sensor to the proper position to allow the voltage signal to ECM to be in specification.

Connector & terminal / Specified voltage

(B136) No. 15 — (B136) No. 17 / 0.45 — 0.55 V

[Fully closed.]



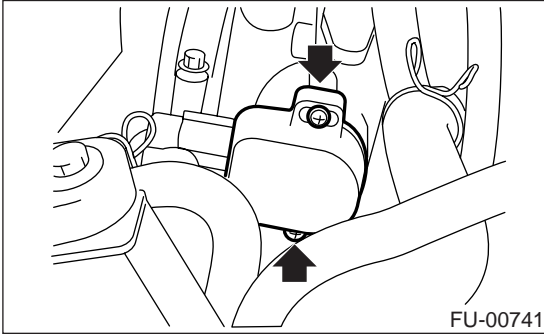
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

(4) Tighten throttle position sensor holding screws.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)



7) Select {Engine Control System} in Selection Menu.

8) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.

9) Select {1.12 Data Display} in Data Display Menu.

10) Adjust throttle position sensor to the proper position to match with the following specifications.

Condition: Throttle fully closed

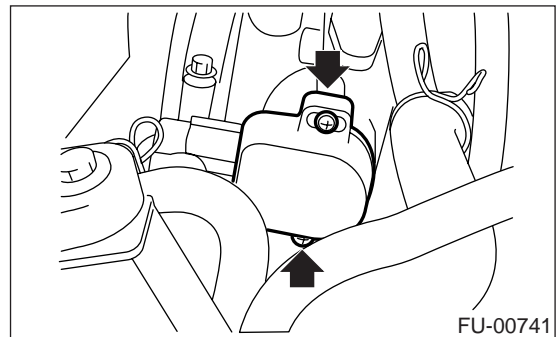
Throttle opening angle 0.00%

Throttle sensor voltage 0.50 V

11) Tighten throttle position sensor holding screws.

Tightening torque:

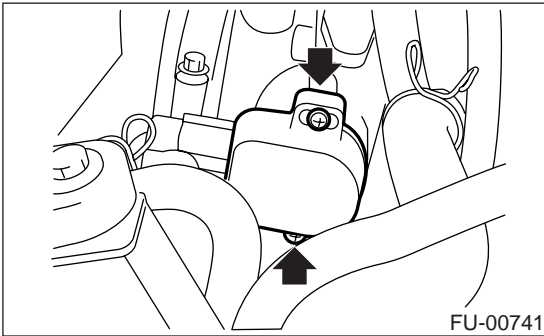
1.6 N·m (0.16 kgf·m, 1.2 ft·lb)



4) When using Subaru Select Monitor;

(1) Turn ignition switch to OFF.

(2) Loosen throttle position sensor holding screws.



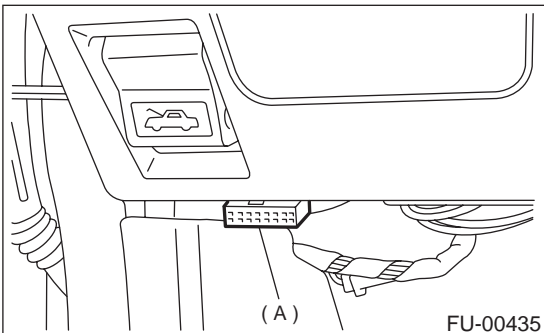
NOTE:

For detailed operation procedures, refer to the Subaru Select Monitor Operation Manual.

(3) Insert the cartridge to Subaru Select Monitor.

<Ref. to FU(H4S0w/oOBD)-12, PREPARATION TOOL, General Description.>

(4) Connect Subaru Select Monitor to the data link connector (A).



5) Turn ignition switch to ON, and Subaru Select Monitor switch to ON.

6) Select {2. Each System Check} in Main Menu.

INTAKE AIR TEMPERATURE AND PRESSURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

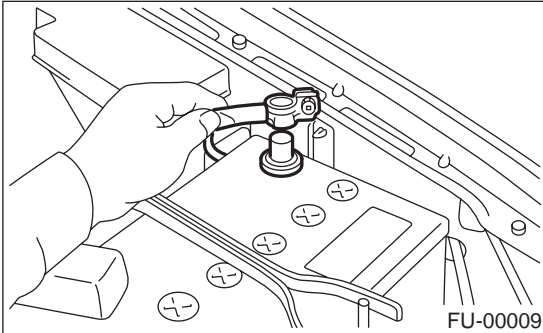
9. Intake Air Temperature and Pressure Sensor

A: REMOVAL

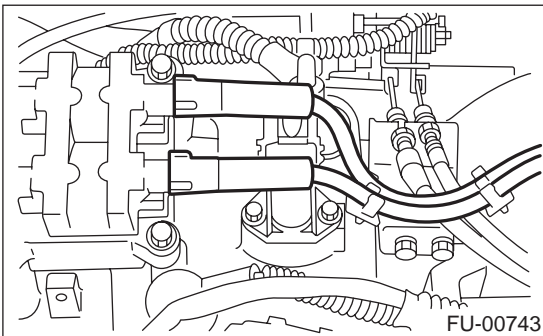
NOTE:

This sensor is installed on AT vehicles only.

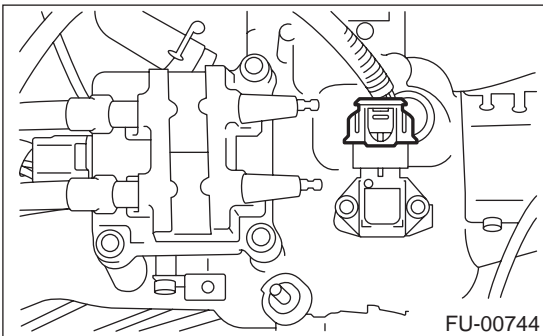
1) Disconnect battery ground cable.



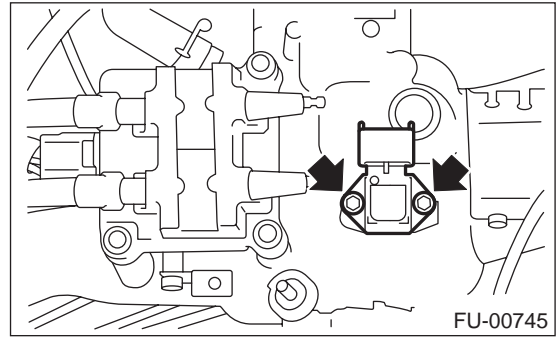
2) Disconnect spark plug cord from ignition coil and ignitor assembly.



3) Disconnect connector from intake air temperature and pressure sensor.



4) Remove intake air temperature and pressure sensor.

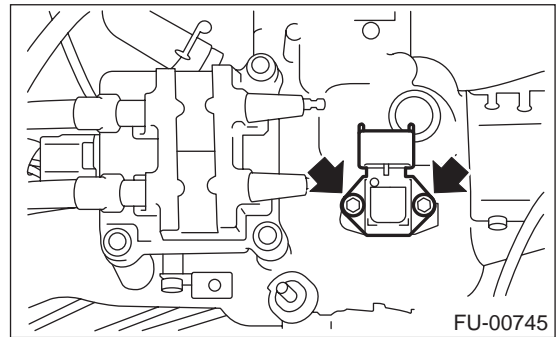


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



NOTE:

Replace O-ring with new one.

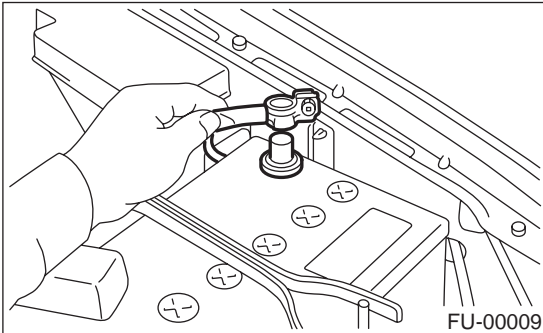
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

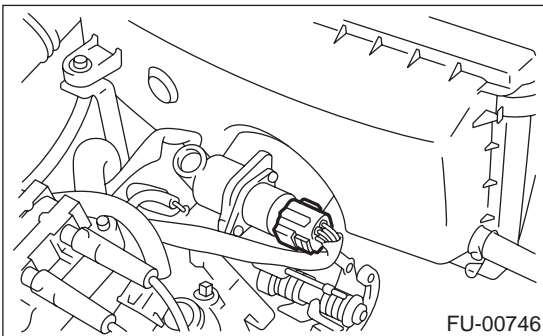
10. Idle Air Control Solenoid Valve

A: REMOVAL

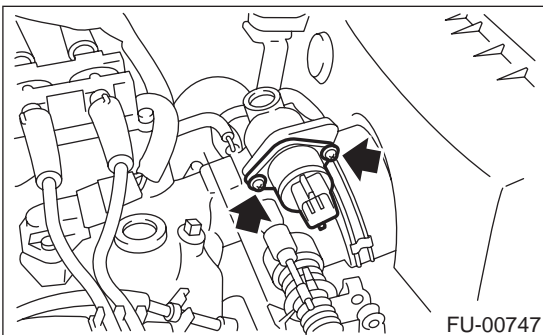
- 1) Disconnect battery ground cable.



- 2) Disconnect connector from idle air control solenoid valve.



- 3) Remove idle air control solenoid valve from throttle body.



B: INSTALLATION

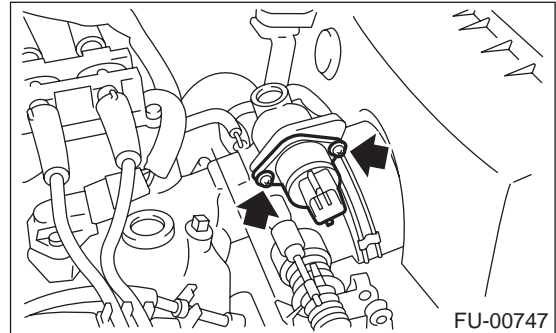
Install in the reverse order of removal.

NOTE:

Always use new gasket.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



FUEL INJECTOR

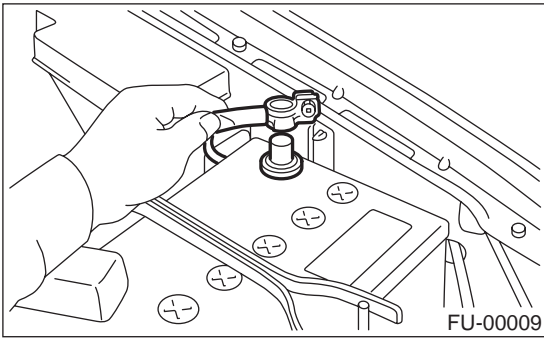
FUEL INJECTION (FUEL SYSTEMS)

11. Fuel Injector

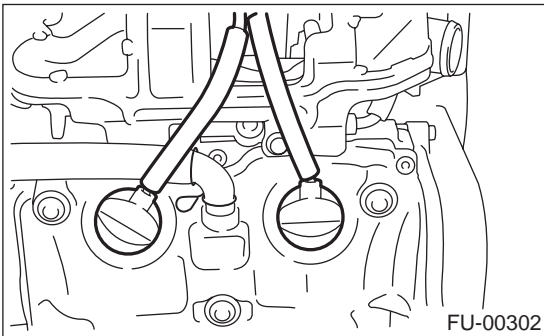
A: REMOVAL

1. RH SIDE

- 1) Release fuel pressure.
<Ref. to FU(H4SOw/oOBD)-45, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.
- 3) Disconnect battery ground cable.



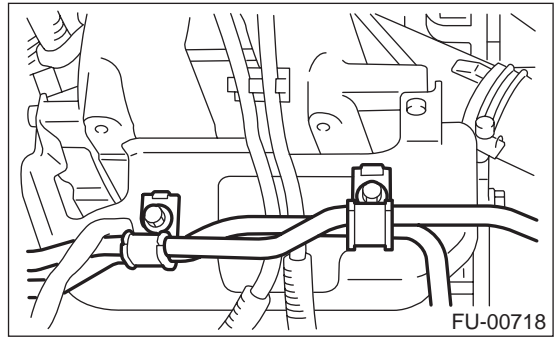
- 4) Remove air intake duct and air cleaner assembly. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 5) Remove resonator chamber. <Ref. to IN(H4SO)-8, REMOVAL, Resonator Chamber.>
- 6) Remove spark plug cords from spark plugs (#1 and #3 cylinders).



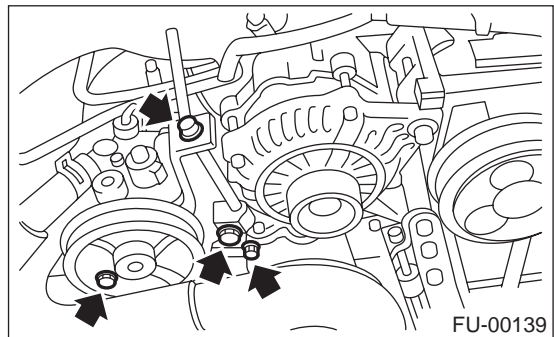
- 7) Remove power steering pump and tank from brackets.

- (1) Remove front V-belt covers.
<Ref. to ME(H4SO)-41, REMOVAL, V-belt.>

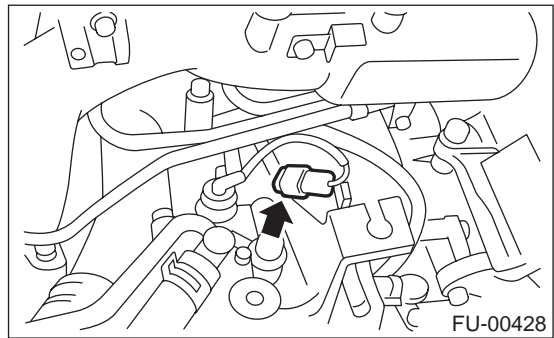
- (2) Remove bolts which hold power steering pipes onto intake manifold protector.



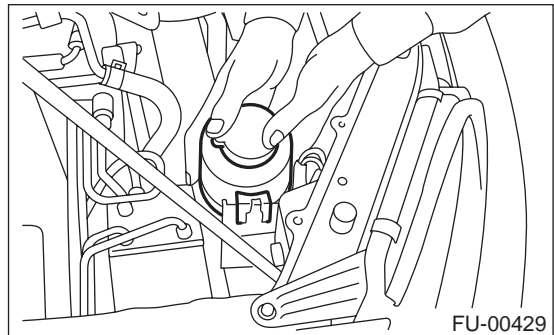
- (3) Remove bolts which install power steering pump to bracket.



- (4) Disconnect connector from power steering pump switch.



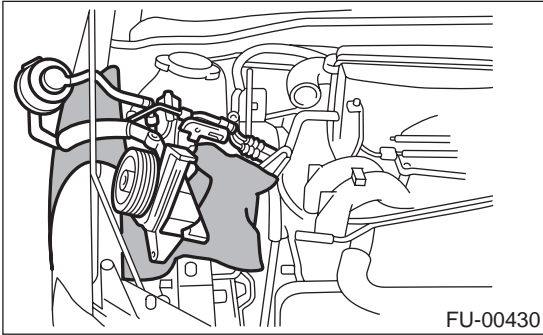
- (5) Remove power steering tank from the bracket by pulling it upwards.



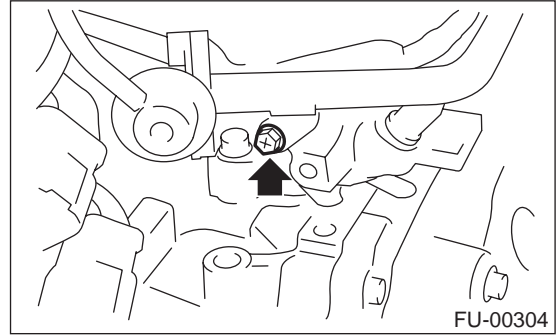
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

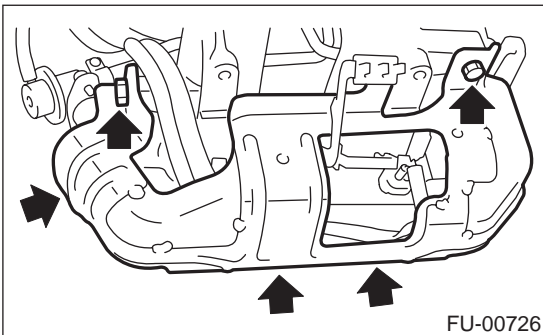
(6) Place power steering pump and tank on the right side wheel apron.



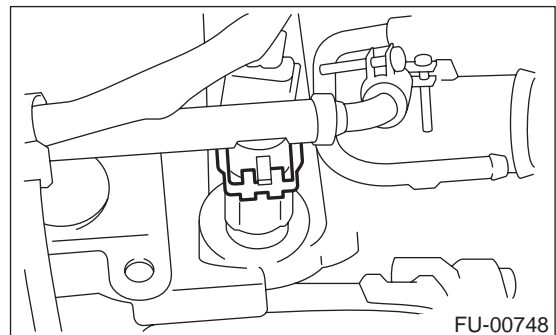
11) Remove bolt which install injector pipe to intake manifold.



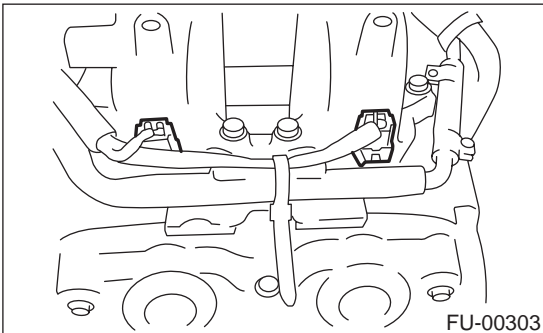
8) Remove fuel pipe protector RH. (RHD model only)



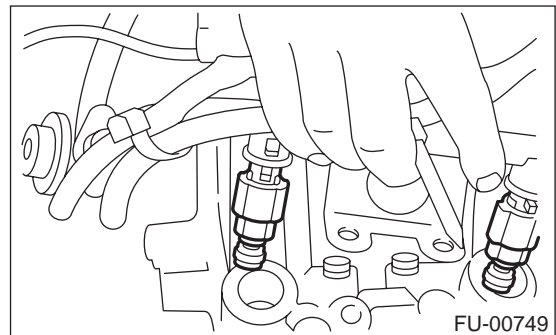
12) Remove fuel injector from intake manifold.
(1) Remove fuel injector securing clip.



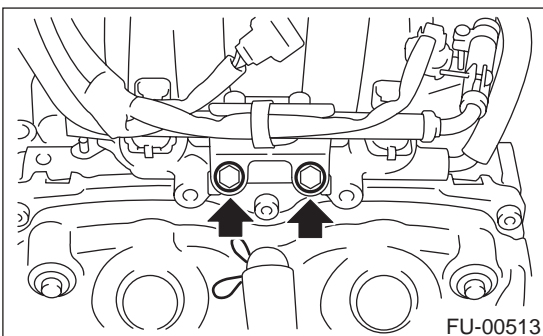
9) Disconnect connector from fuel injector.



(2) Remove fuel injector while lifting up fuel injector pipe.



10) Remove bolt which holds injector pipe to intake manifold.



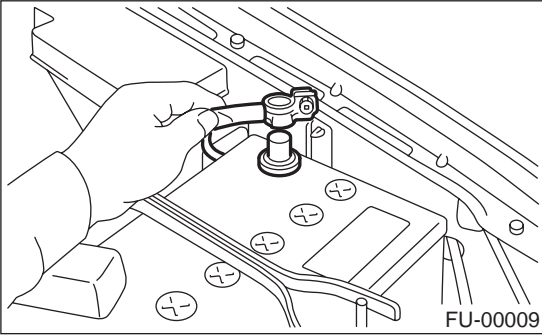
2. LH SIDE

- 1) Release fuel pressure. <Ref. to FU(H4SOw/oOBD)-45, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.

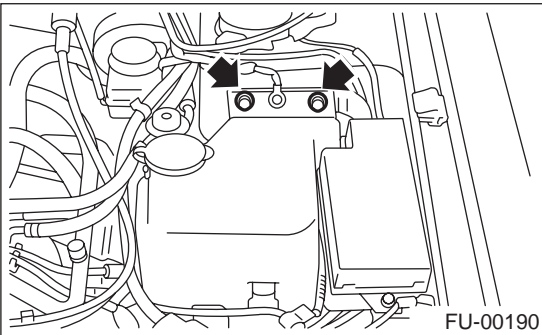
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

3) Disconnect battery ground cable.

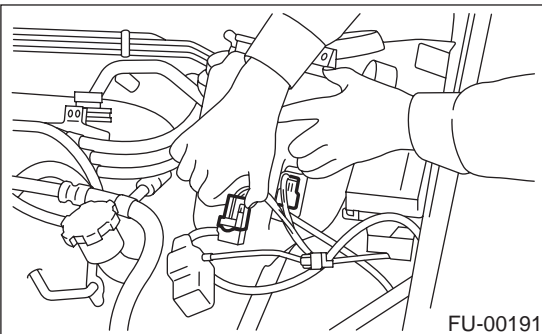


4) Remove two bolts which install washer tank on body.



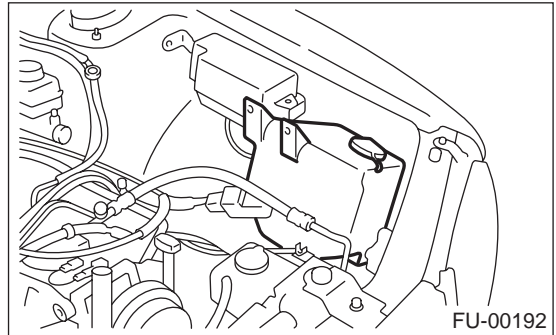
5) Disconnect connector from front window washer motor.

6) Disconnect connector from rear gate glass washer motor.

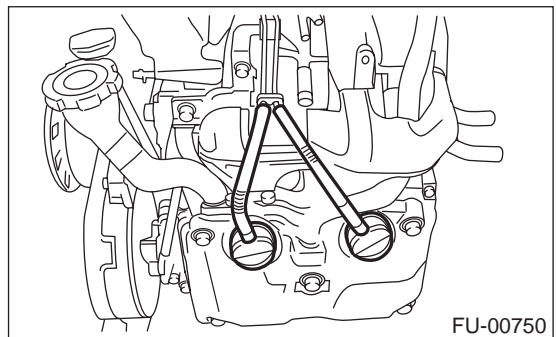


7) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

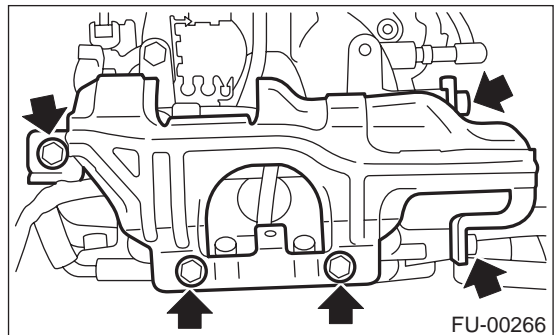
8) Move washer tank, and secure it away from working area.



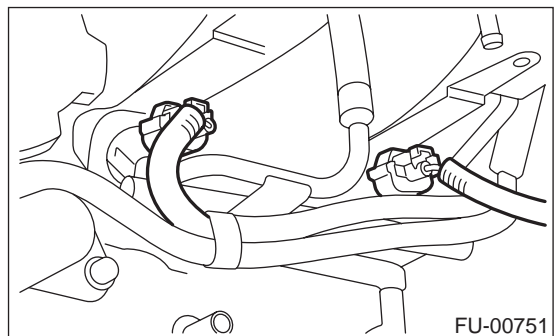
9) Remove spark plug cords from spark plugs (#2 and #4 cylinders).



10) Remove fuel pipe protector LH.



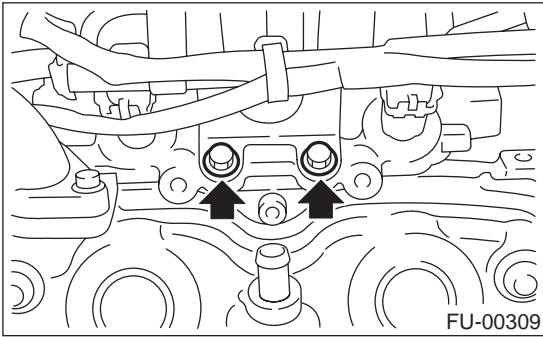
11) Disconnect connector from fuel injector.



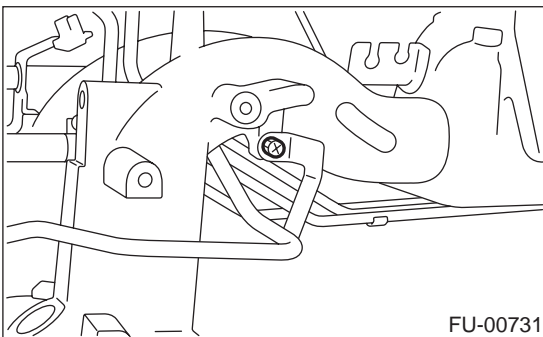
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

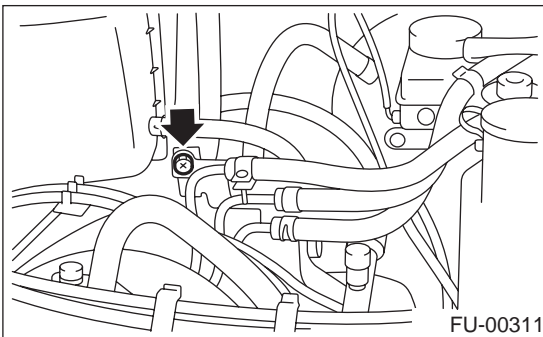
12) Remove bolt which holds injector pipe to intake manifold.



13) Remove bolt which installs injector pipe to intake manifold.

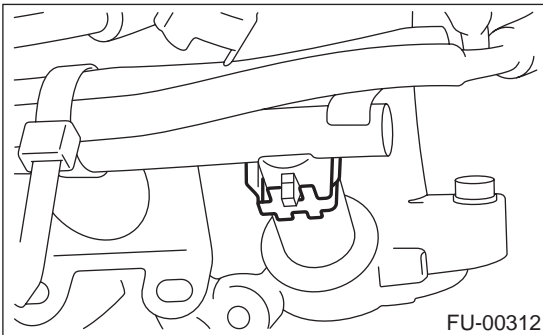


14) Remove bolt which holds fuel pipe on the left side intake manifold.

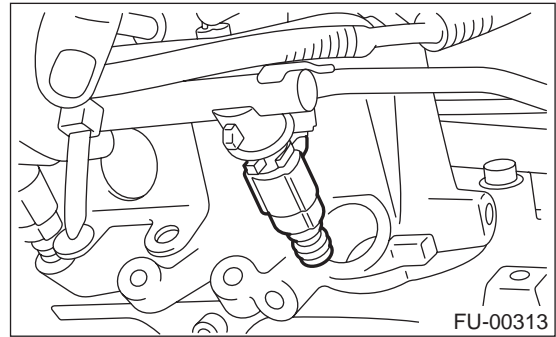


15) Remove fuel injector from intake manifold.

(1) Remove fuel injector securing clip.



(2) Remove fuel injector while lifting up fuel injector pipe.



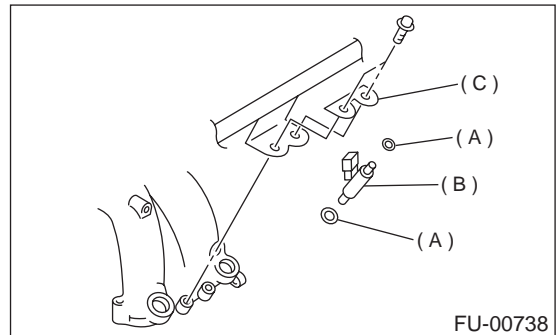
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

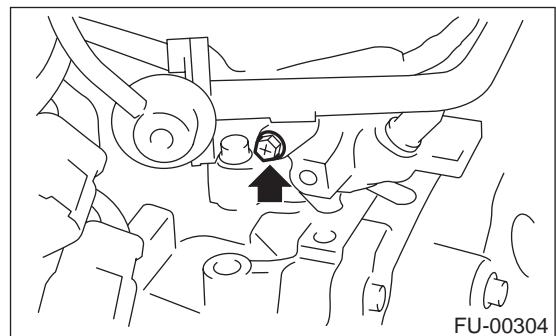
Replace O-rings with new ones.



- (A) O-ring
- (B) Fuel injector
- (C) Intake manifold protector

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

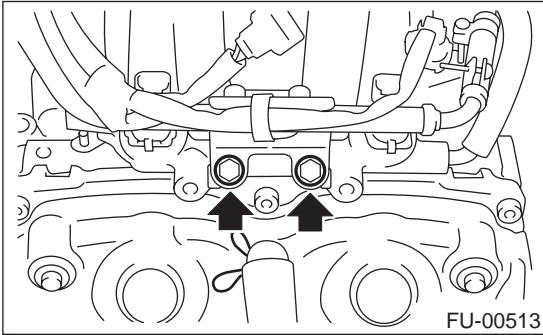


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

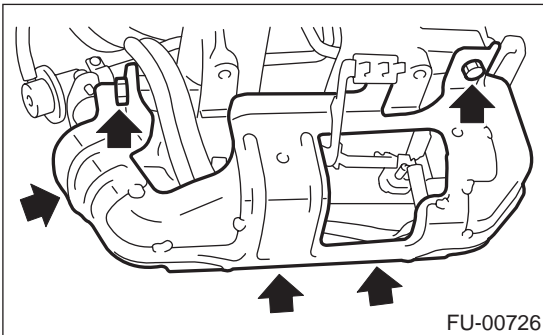
Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



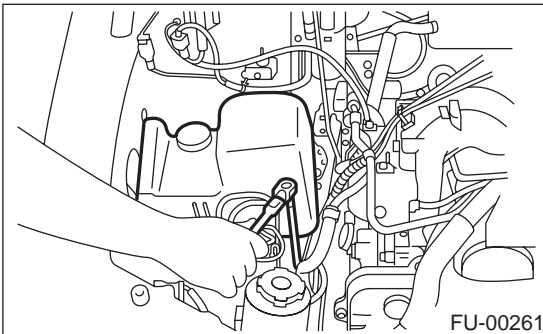
Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



Tightening torque:

32 N·m (3.3 kgf-m, 23.9 ft-lb)

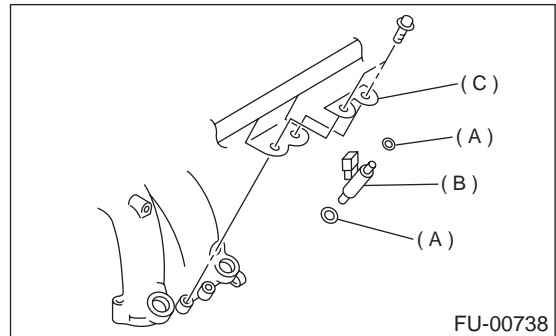


2. LH SIDE

Install in the reverse order of removal.

NOTE:

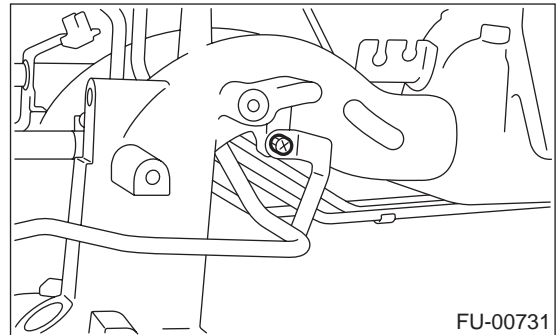
Replace O-rings with new ones.



- (A) O-ring
- (B) Fuel injector
- (C) Intake manifold protector

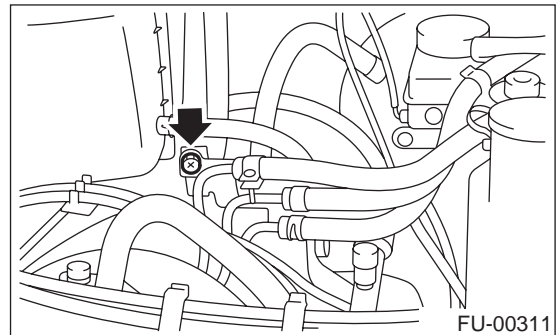
Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



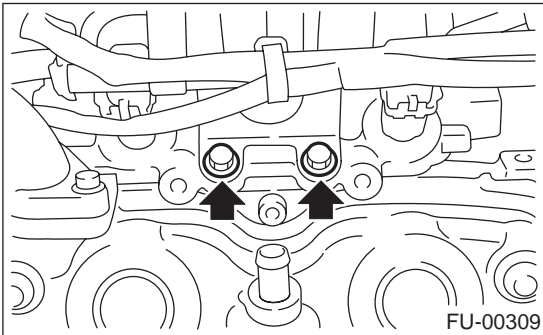
Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



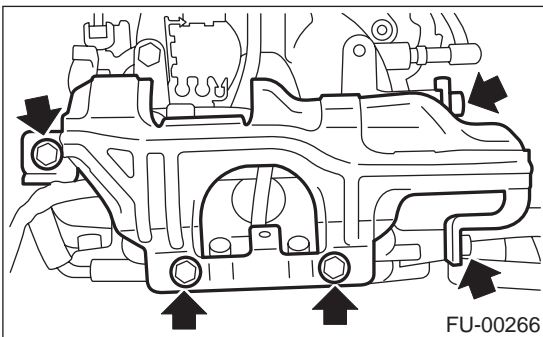
Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



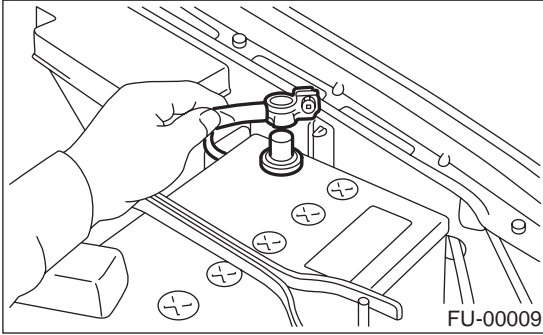
OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

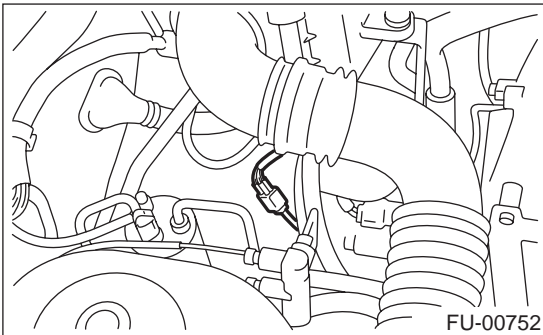
12. Oxygen Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from oxygen sensor.



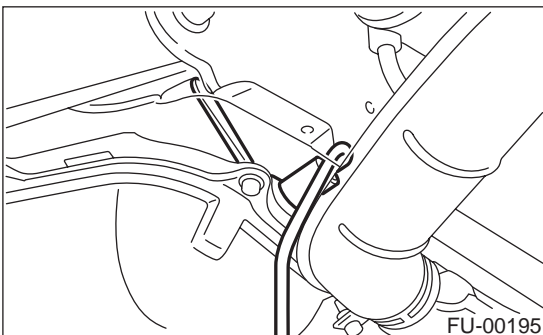
- 3) Lift-up the vehicle.
- 4) Apply SUBARU CRC or its equivalent to threaded portion of oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove oxygen sensor.

CAUTION:

When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



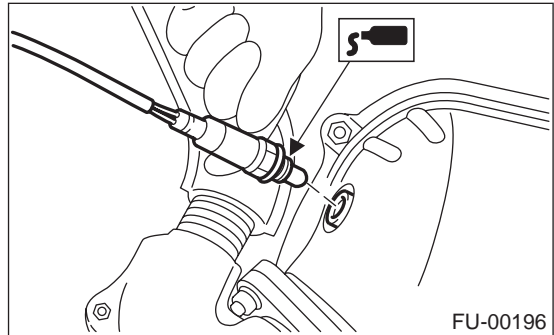
B: INSTALLATION

- 1) Before installing oxygen sensor, apply anti-seize compound only to threaded portion of oxygen sensor to make the next removal easier.

**Anti-seize compound:
SS-30 by JET LUBE**

CAUTION:

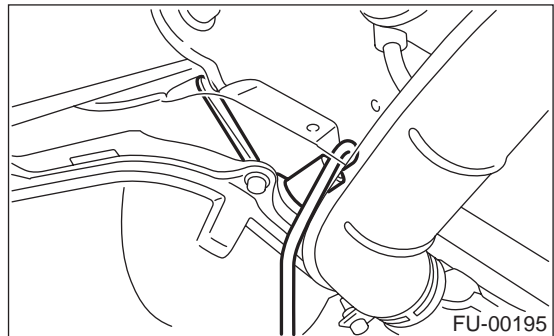
Never apply anti-seize compound to protector of oxygen sensor.



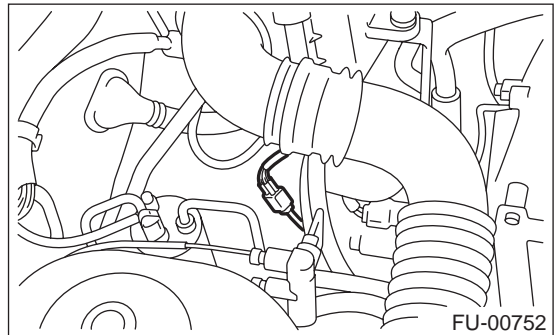
- 2) Install oxygen sensor.

Tightening torque:

21 N·m (2.1 kgf·m, 15.2 ft·lb)



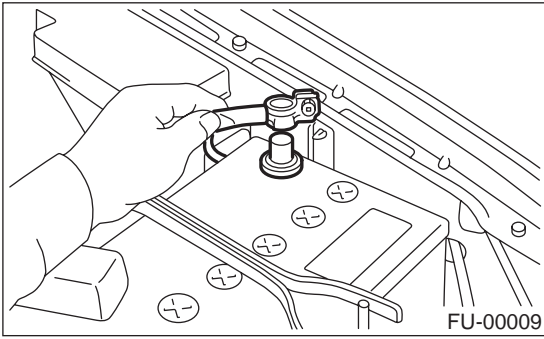
- 3) Lower the vehicle.
- 4) Connect connector of oxygen sensor.



OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

5) Connect battery ground cable.



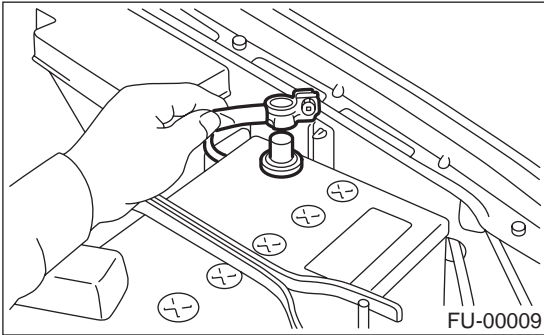
ENGINE CONTROL MODULE

FUEL INJECTION (FUEL SYSTEMS)

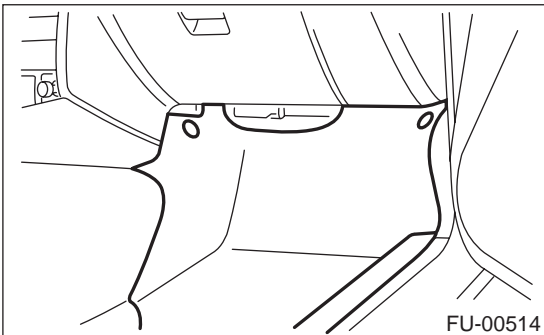
13.Engine Control Module

A: REMOVAL

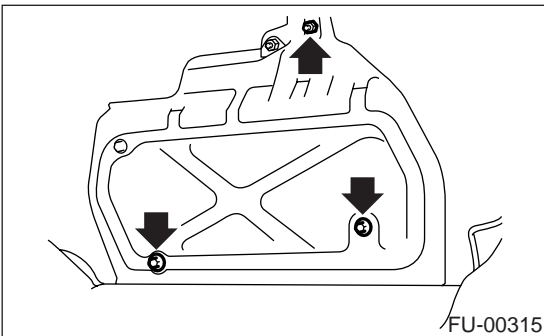
1) Disconnect battery ground cable.



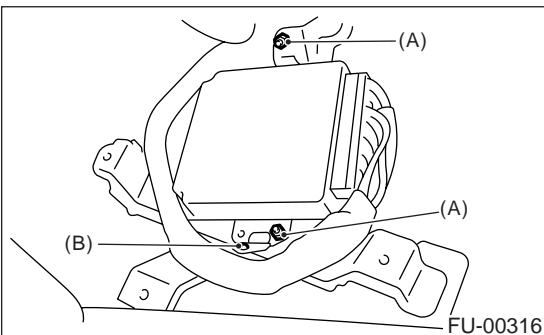
2) Remove lower inner trim of passenger side.
<Ref. to EI-39, REMOVAL, Lower Inner Trim.>
3) Detach floor mat of passenger seat.



4) Remove protect cover.



5) Remove nuts (A) which hold ECM to bracket.
6) Remove clip (B) from bracket.



7) Disconnect ECM connectors and take out ECM.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

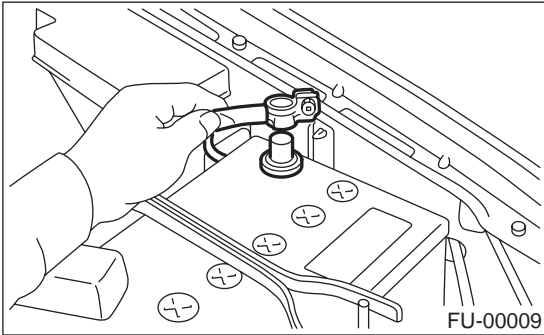
Tightening torque:

5 N·m (0.51 kgf-m, 3.7 ft-lb)

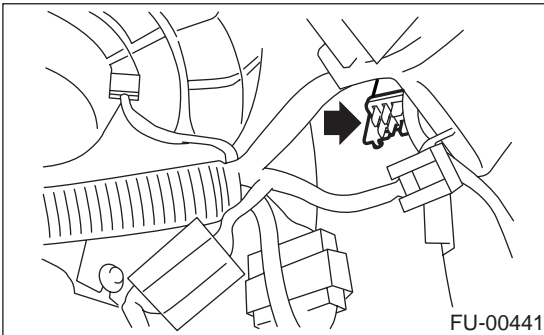
14.Main Relay

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Remove lower inner trim of passenger side.
<Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 3) Disconnect connectors from main relay.
- 4) Remove bolt which holds main relay bracket on body.



B: INSTALLATION

Install in the reverse order of removal.

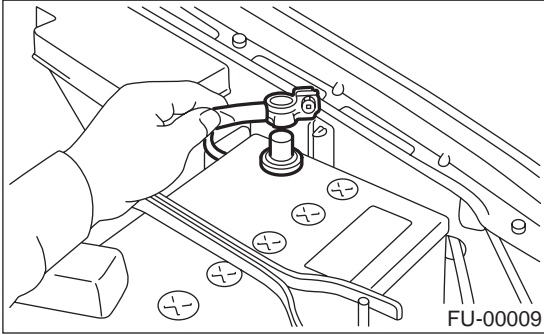
FUEL PUMP RELAY

FUEL INJECTION (FUEL SYSTEMS)

15. Fuel Pump Relay

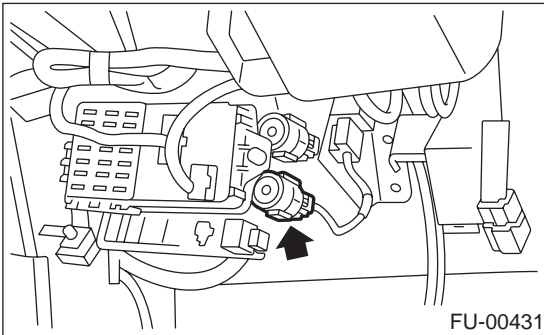
A: REMOVAL

1) Disconnect battery ground cable.



2) Remove lower cover. <Ref. to EI-35, REMOVAL, Instrument Panel Assembly.>

3) Disconnect connector from fuel pump relay.



4) Remove fuel pump relay from mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

16. Fuel

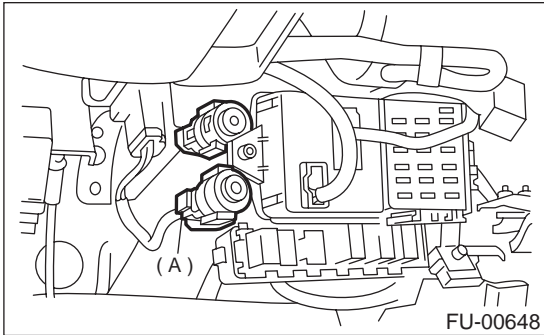
A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Disconnect the connector from fuel pump relay (A).



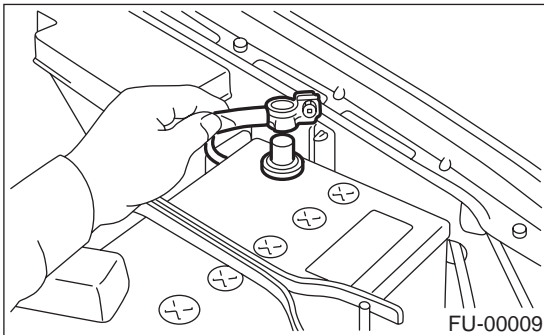
- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn the ignition switch to OFF.

2. DRAINING FUEL

WARNING:

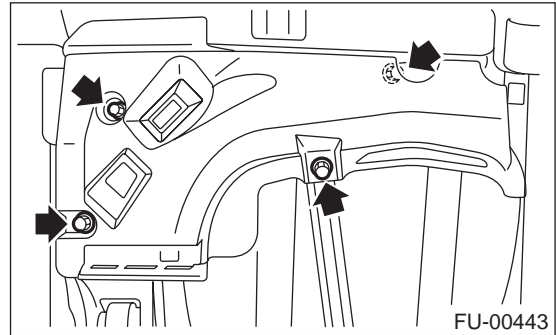
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.

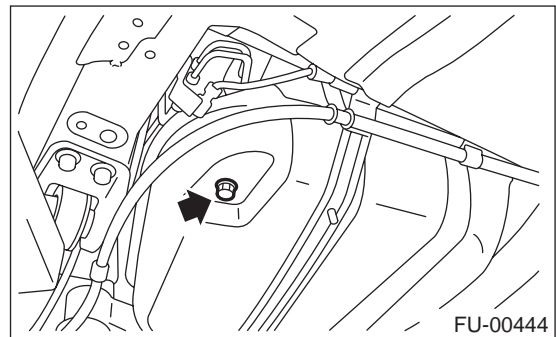


- 3) Lift-up the vehicle.

- 4) Remove the protector RH (Front).



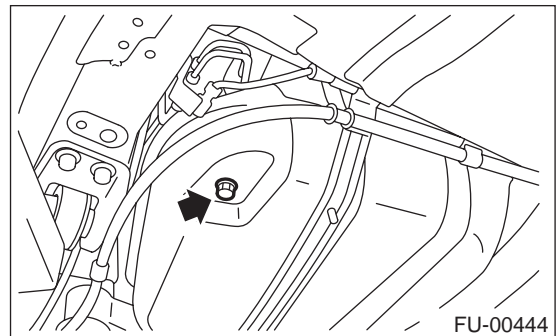
- 5) Drain the fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



- 6) Tighten the fuel drain plug, and then install the protector RH (Front).

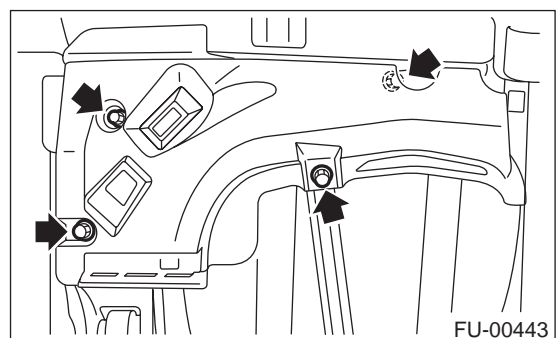
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



Tightening torque:

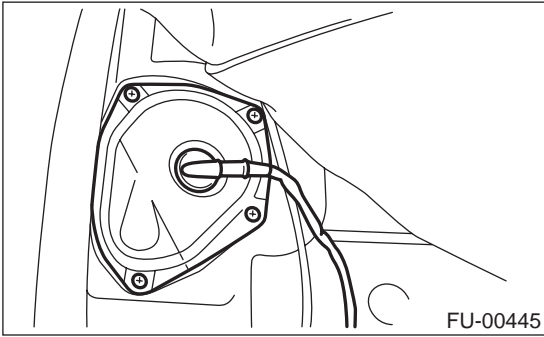
18 N·m (1.8 kgf-m, 13.0 ft-lb)



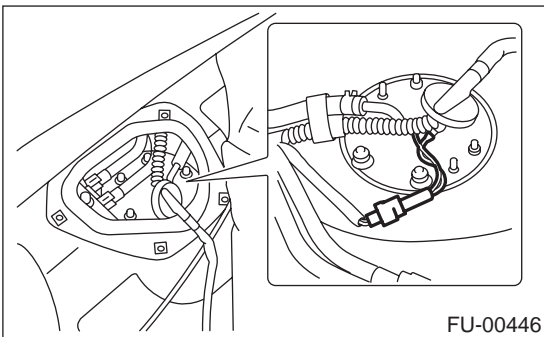
FUEL

FUEL INJECTION (FUEL SYSTEMS)

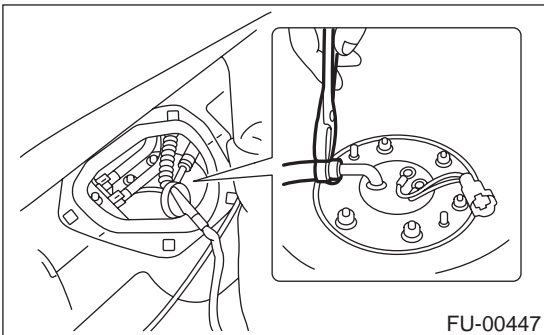
- 7) Lower the vehicle.
- 8) Remove the sub service hole cover.



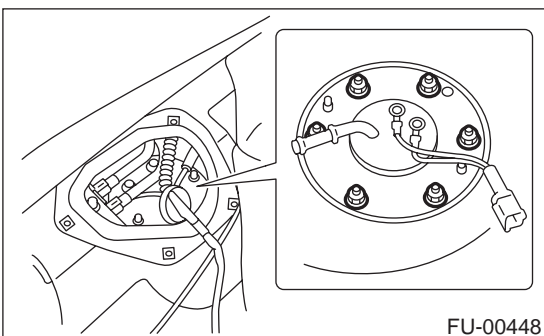
- 9) Disconnect the connector from fuel sub level sensor.



- 10) Disconnect the fuel jet pump hose.



- 11) Remove the fuel sub level sensor.



- 12) Drain the fuel from fuel tank by using a hand pump.

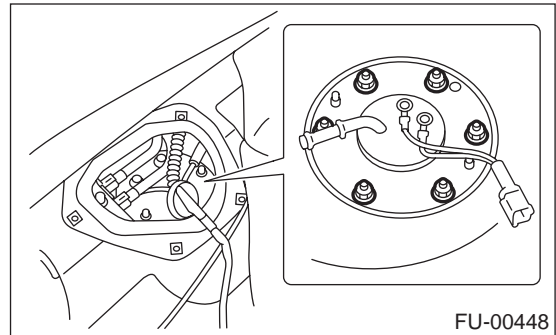
WARNING:

Do not use a motor pump when draining the fuel.

- 13) After draining the fuel, reinstall the fuel sub level sensor.

Tightening torque:

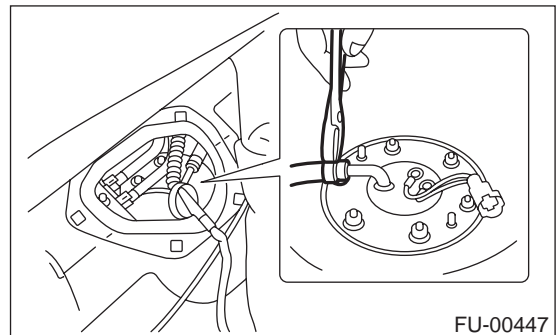
T: 4.4 N-m (0.45 kgf-m, 3.3 ft-lb)



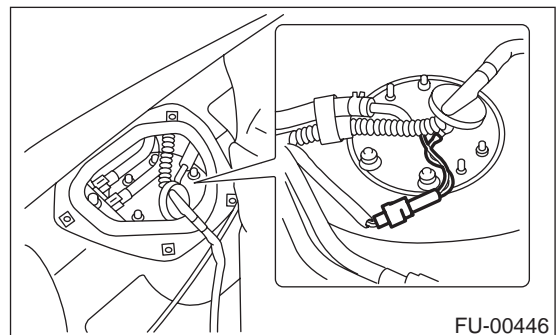
NOTE:

If you have not removed the fuel tank yet, proceed with the procedure below for installation.

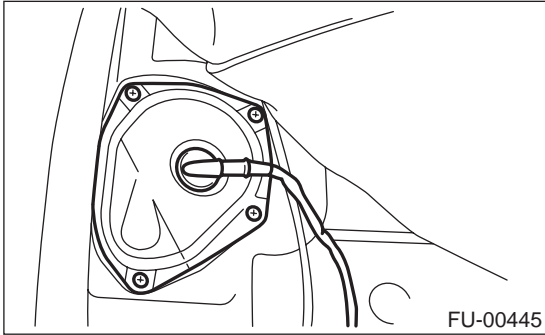
- (1) Connect the fuel jet pump hose.



- (2) Connect the connector from fuel sub level sensor.



(3) Install the sub service hole cover.



(4) Set the rear seat and floor mat.

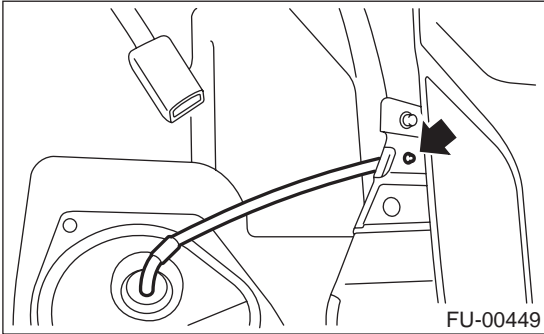
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

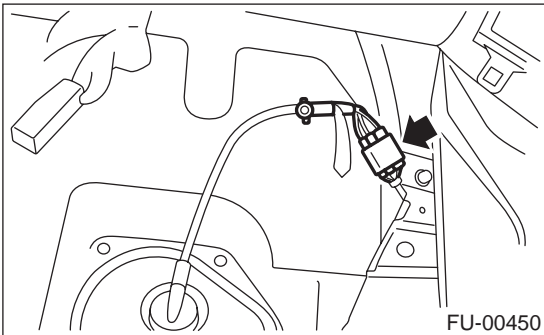
17. Fuel Tank

A: REMOVAL

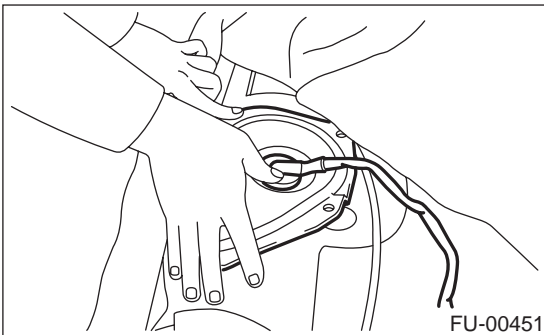
- 1) Set the vehicle on the lift.
- 2) Release the fuel pressure. <Ref. to FU(H4SOw/oOBD)-45, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain the fuel from fuel tank. <Ref. to FU(H4SOw/oOBD)-45, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove the holder clip which secures fuel tank cord on bracket.



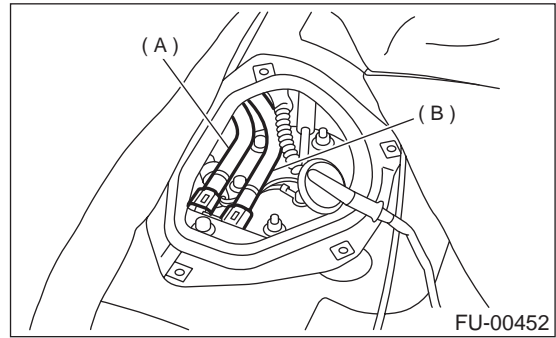
- 5) Disconnect the connector of fuel tank cord to rear harness.



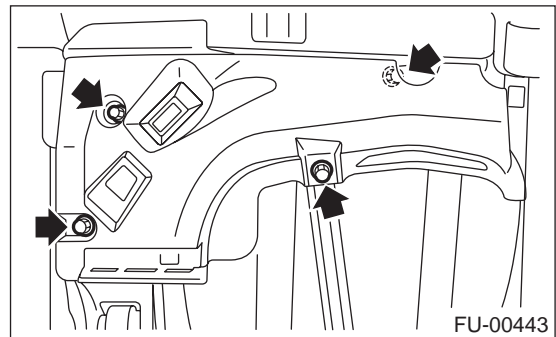
- 6) Push the grommet which holds fuel tank cord on service hole cover into body side.



- 7) Separate the quick connector of fuel delivery (A) and return hose (B). <Ref. to FU(H4SOw/oOBD)-67, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



- 8) Remove the parking brake cable.
 - (1) Remove the console box. <Ref. to EI-34, REMOVAL, Console Box.>
 - (2) Remove the parking brake bracket, and then disconnect the parking brake cable from equalizer. <Ref. to PB-7, REMOVAL, Parking Brake Cable.>
- 9) Remove the wheel nuts from rear wheels.
- 10) Lift-up the vehicle.
- 11) Remove the rear wheel.
- 12) Remove the front side protector.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

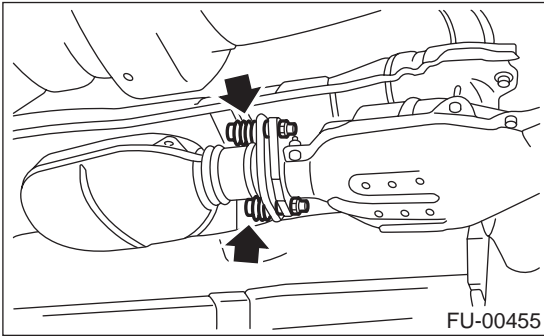
13) Remove the rear exhaust pipe and muffler.

NOTE:

To facilitate the removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

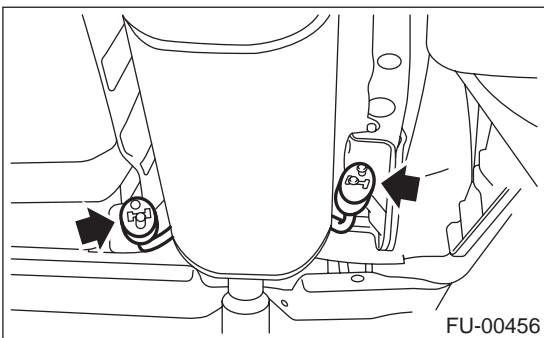
(1) Separate the rear exhaust pipe from center exhaust pipe.



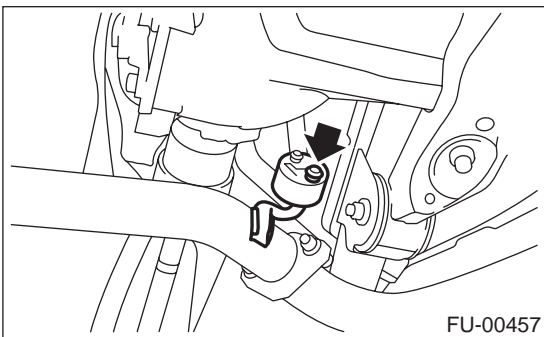
(2) Remove the right and left rubber cushions.

NOTE:

Be careful not to pull down the muffler.

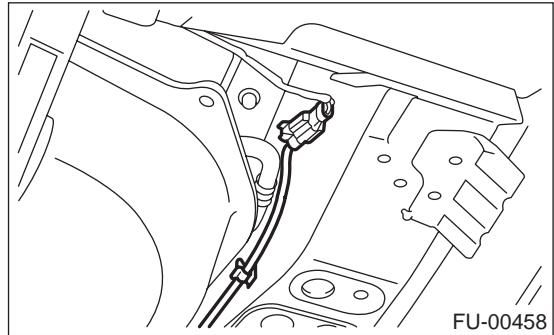


(3) Remove the front rubber cushion, and then detach the muffler assembly.



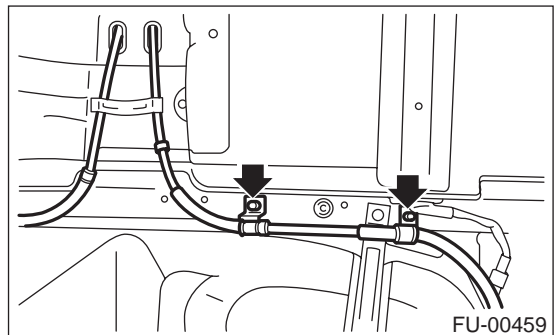
14) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

15) Disconnect the connector from ABS sensor.

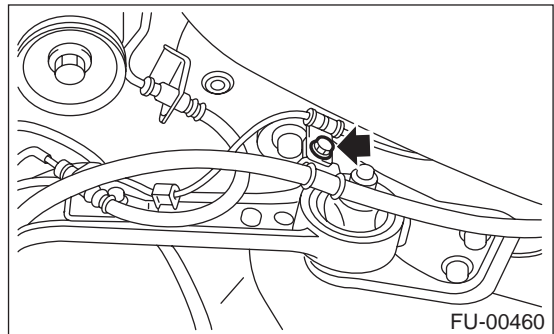


16) Remove the bolts which hold parking brake cable holding bracket.

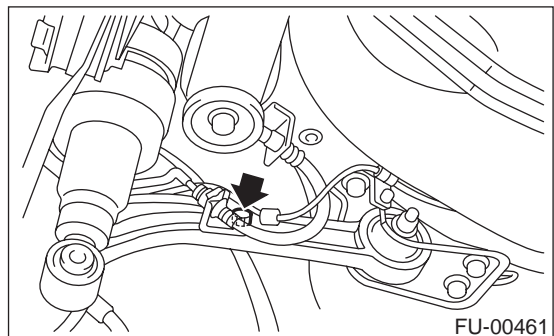
17) Remove the parking brake cable from cabin by forcibly pulling it backward.



18) Remove the bolt which holds parking brake cable holding bracket.



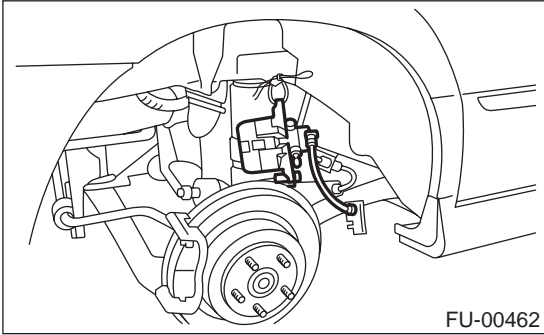
19) Remove the bolt which holds rear brake hoses holding bracket.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

20) Remove the rear brake caliper, and then tie it up to the body side of vehicle as shown in the figure.

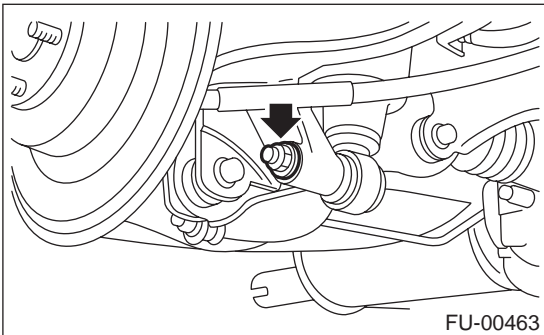


21) Remove the rear suspension assembly.

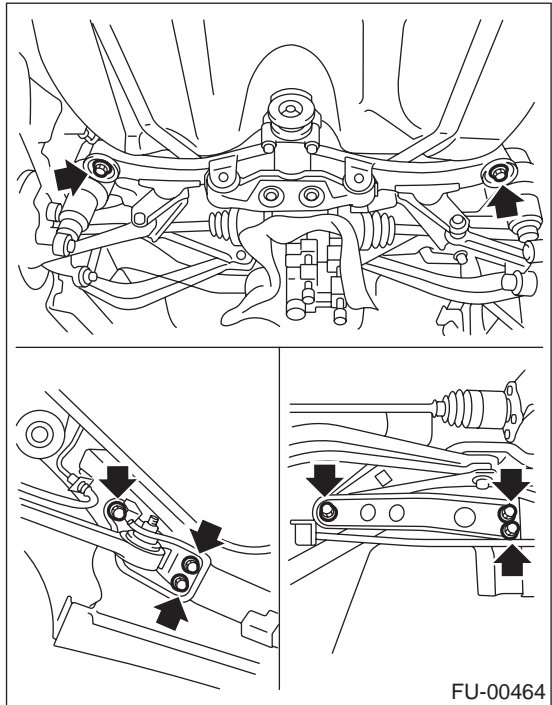
CAUTION:

A helper is required to perform this work.

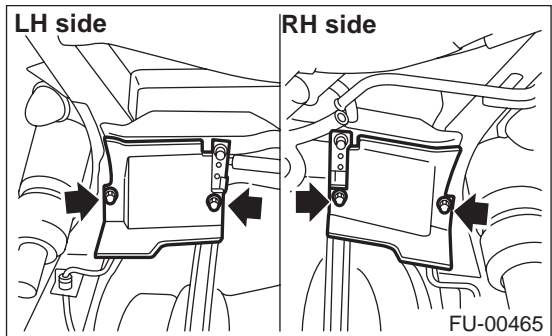
- (1) Support the rear differential with transmission jack.
- (2) Remove the bolt which holds rear shock absorber to rear suspension arm.



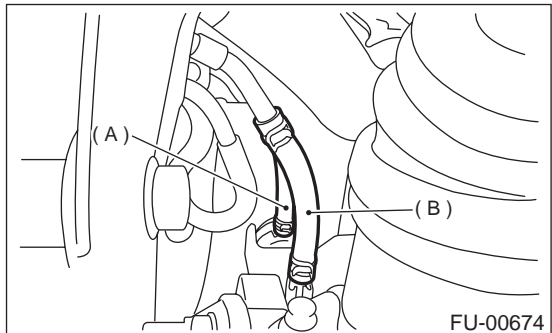
(3) Remove the bolts which secure rear suspension assembly to body.



(4) Remove the rear suspension assembly.
22) Remove the rear side protector.



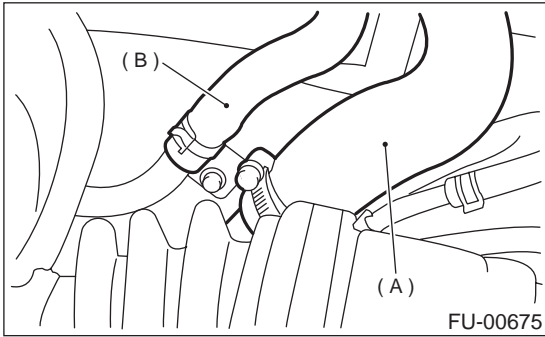
23) Disconnect the two-way valve hose (A) from two-way valve, and then disconnect the evaporation hose (B) from evaporation pipe.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

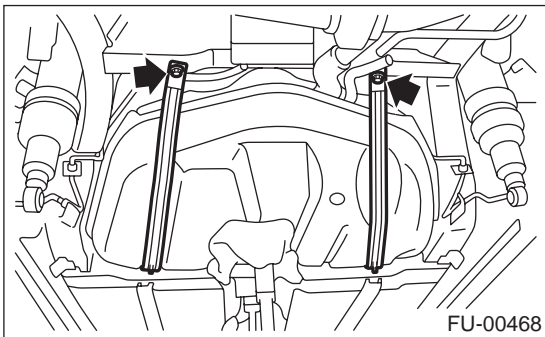
24) Loosen the clamp and disconnect the fuel filler hose (A) and air vent hose (B) from fuel filler pipe.



25) Support the fuel tank with transmission jack, then remove the bolts from bands and dismount fuel tank from the vehicle.

CAUTION:

A helper is required to perform this work.



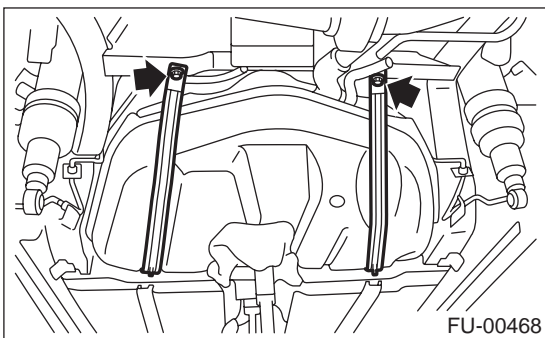
B: INSTALLATION

1) Support the fuel tank with transmission jack, and then push the fuel tank harness into access hole with grommet.

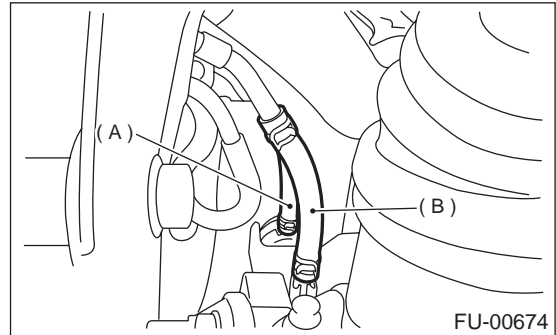
2) Set the fuel tank, and then temporarily tighten the bolts of fuel tank bands.

CAUTION:

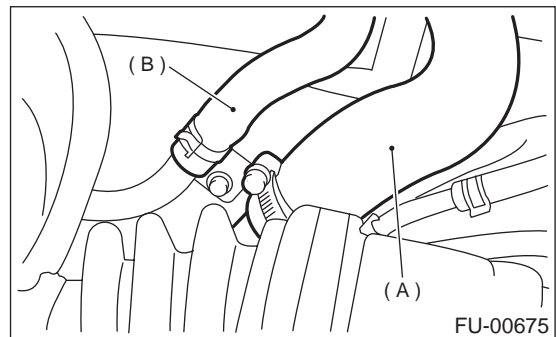
A helper is required to perform this work.



3) Connect the two-way valve hose (A) to two-way valve, and then connect the evaporation hose (B) to evaporation pipe.



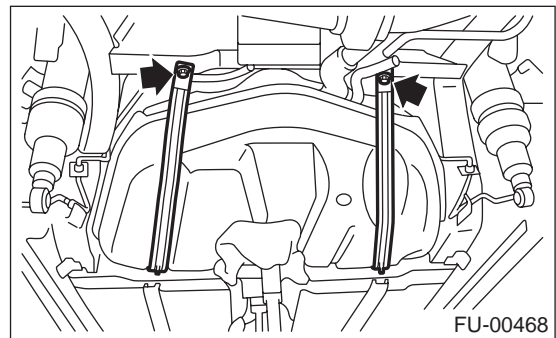
4) Connect the fuel filler hose (A) and air vent hose (B).



5) Tighten the band mounting bolts.

Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



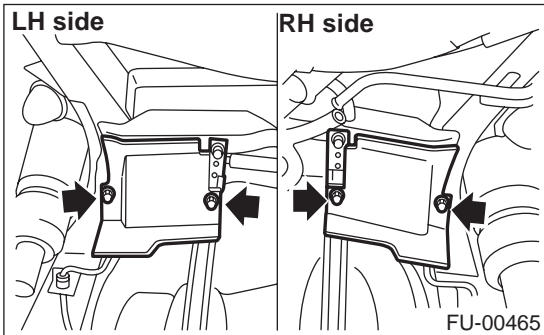
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

6) Install the rear side protector.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



7) Install the rear suspension assembly.

CAUTION:

A helper is required to perform this work.

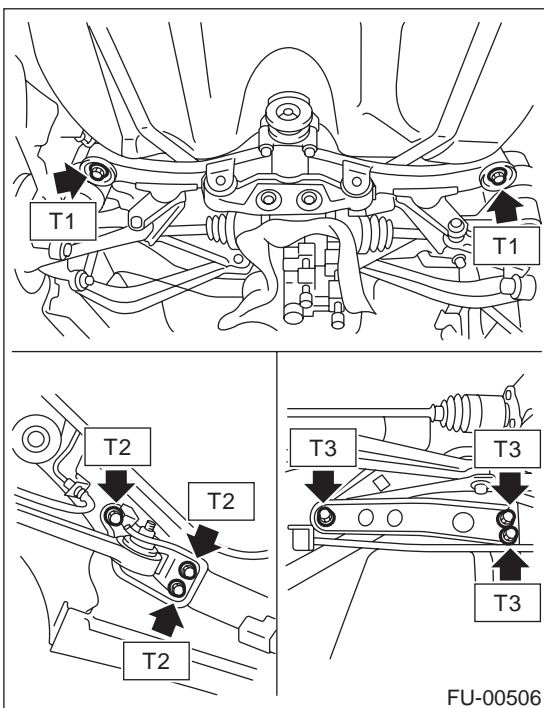
(1) Support the rear suspension assembly, and then tighten the bolts which secure rear suspension assembly.

Tightening torque:

T1: 172 N·m (17.5 kgf·m, 127 ft·lb)

T2: 108 N·m (11.0 kgf·m, 80 ft·lb)

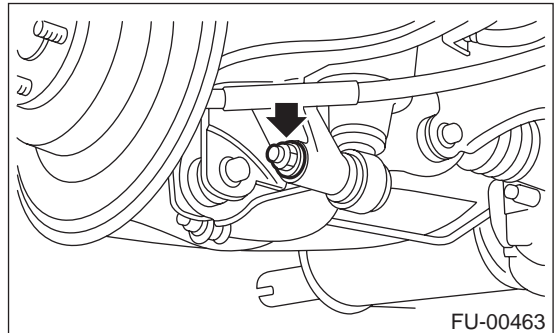
T3: 66 N·m (6.7 kgf·m, 48 ft·lb)



(2) Tighten the bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-11, INSTALLATION, Rear Arm.>

Tightening torque:

157 N·m (16 kgf·m, 116 ft·lb)

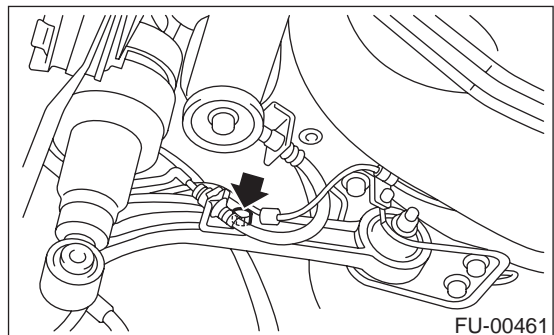


8) Install the rear brake caliper. <Ref. to BR-29, INSTALLATION, Rear Disc Brake Assembly.>

9) Tighten the bolt which holds rear brake hoses holding bracket.

Tightening torque:

33 N·m (3.4 kgf·m, 25 ft·lb)

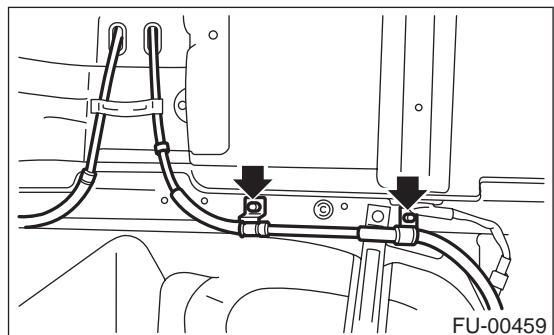


10) Install the parking brake cable to cabin by forcibly pushing it forward.

11) Tighten the bolts which hold parking brake cable holding bracket.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

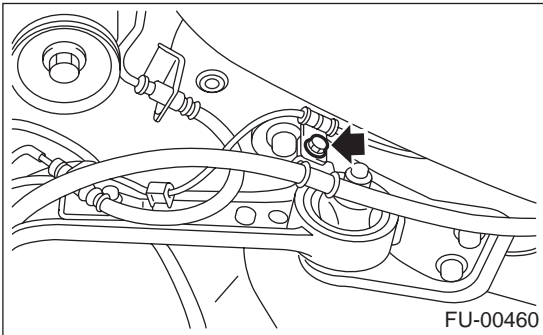


FUEL TANK

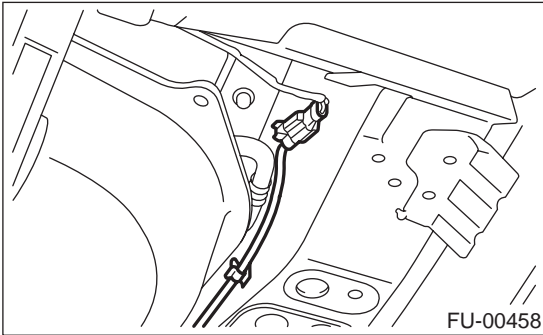
FUEL INJECTION (FUEL SYSTEMS)

Tightening torque:

32 N·m (3.3 kgf-m, 23.9 ft-lb)



12) Connect the connector to ABS sensor.



13) Install the propeller shaft. <Ref. to DS-14, INSTALLATION, Propeller Shaft.>

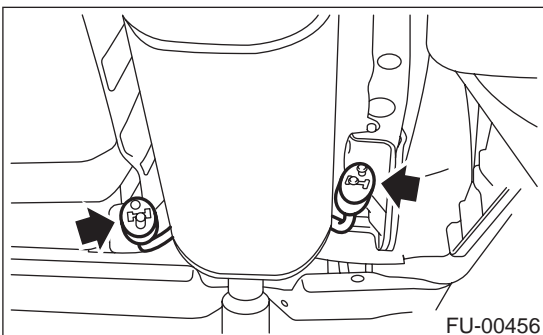
14) Install the rear exhaust pipe and muffler.

NOTE:

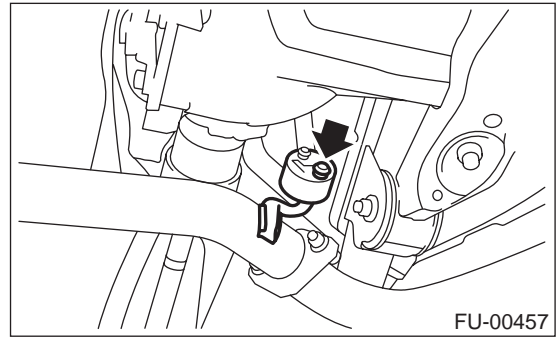
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of the rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install the right and left rubber cushions.



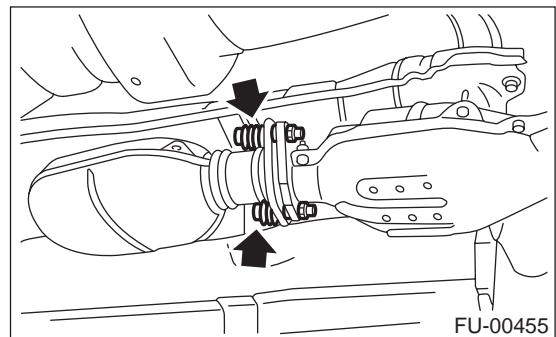
(2) Install the front rubber cushion and attach muffler assembly.



(3) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:

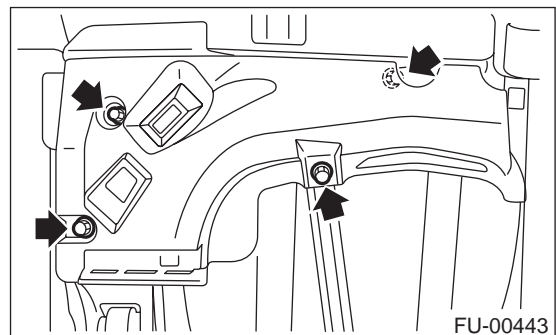
18 N·m (1.8 kgf-m, 13.0 ft-lb)



15) Install the front side protector.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



16) Install the rear wheel.

17) Lower the vehicle.

18) Tighten the wheel nuts to rear wheel.

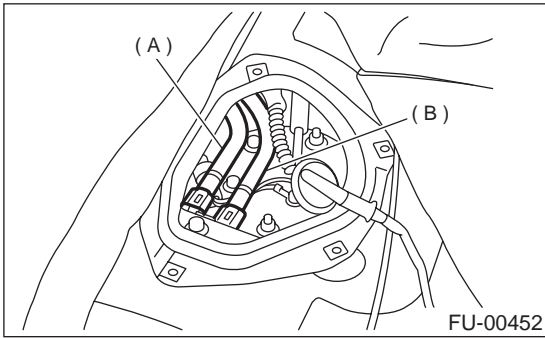
19) Install the parking brake cable. <Ref. to PB-7, INSTALLATION, Parking Brake Cable.>

20) Install the console box. <Ref. to EI-34, INSTALLATION, Console Box.>

FUEL TANK

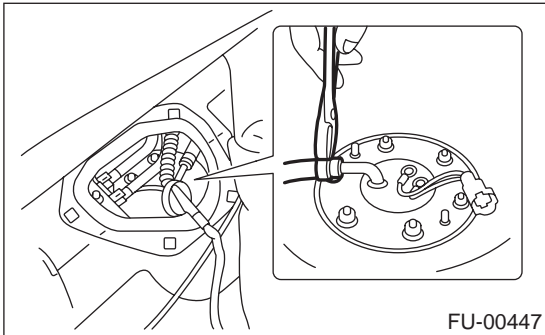
FUEL INJECTION (FUEL SYSTEMS)

21) Connect the fuel hoses, and then hold them with the quick connector. <Ref. to FU(H4SOw/oOBD)-68, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

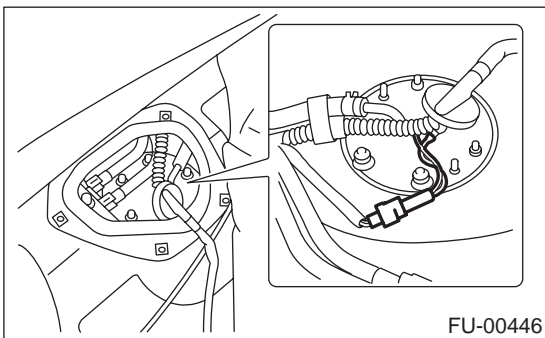


- (A) Delivery hose
- (B) Return hose

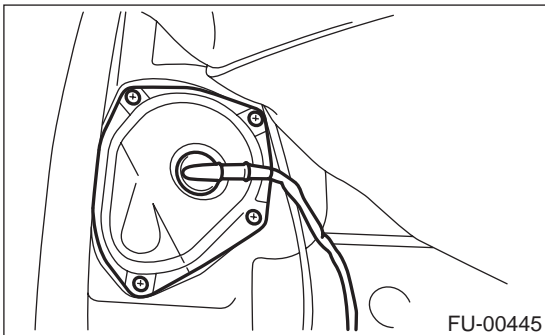
22) Connect the fuel jet pump hose.



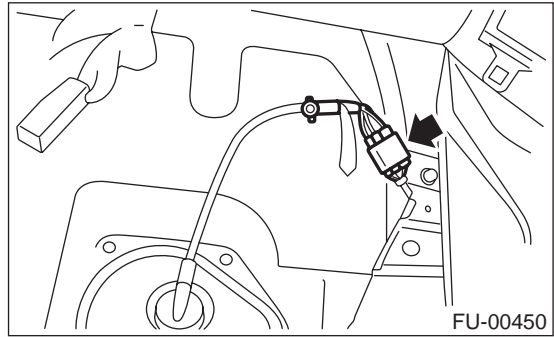
23) Connect the connector to fuel sub level sensor.



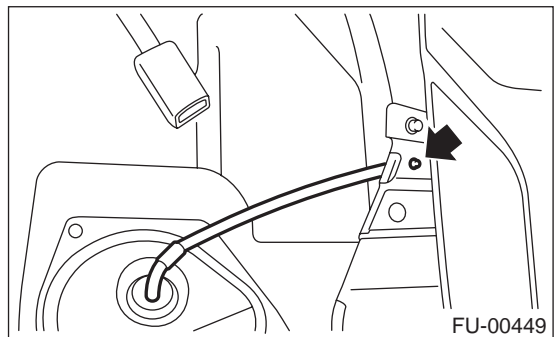
24) Install the sub service hole cover.



25) Connect the connectors to fuel tank cord, and then plug the service hole with grommet.

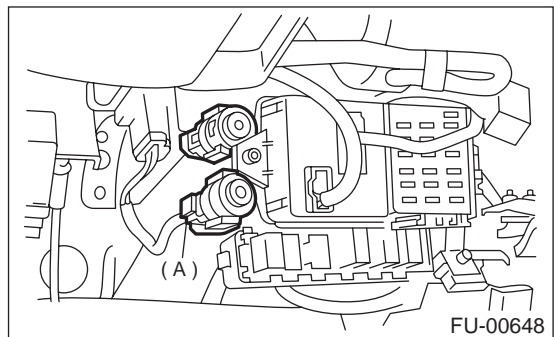


26) Install the holder clip which secures fuel tank cord on bracket.



27) Set the rear seat and floor mat.

28) Connect the connector to fuel pump relay (A).



29) Adjust the parking brake lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

30) Check the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

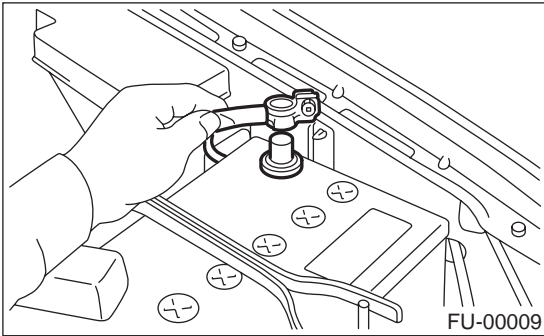
C: INSPECTION

- 1) Make sure there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

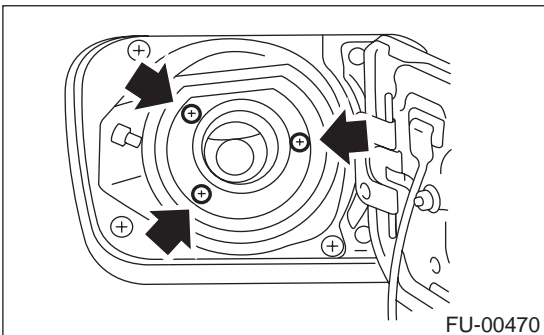
18. Fuel Filler Pipe

A: REMOVAL

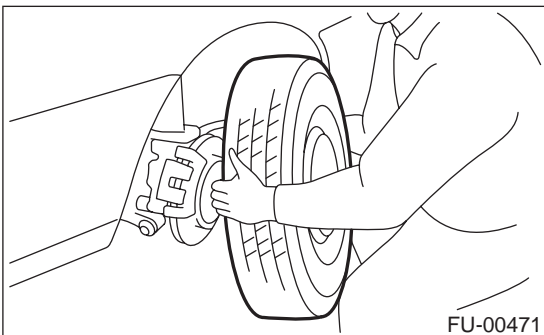
- 1) Release the fuel pressure. <Ref. to FU(H4S0w/oOBD)-45, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid, and then remove the filler cap.
- 3) Disconnect the ground cable from battery.



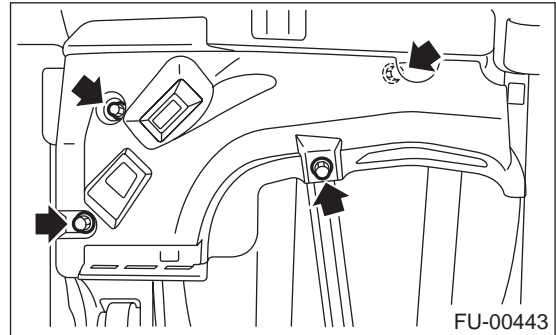
- 4) Remove the screws holding packing in place.



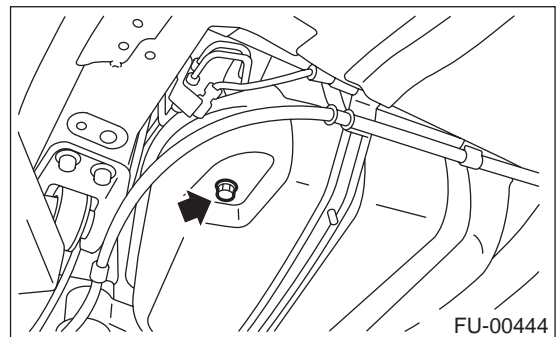
- 5) Lift-up the vehicle.
- 6) Remove the rear right side wheel nuts.
- 7) Remove the wheel RH (Rear).



- 8) Remove the protector RH (Front).

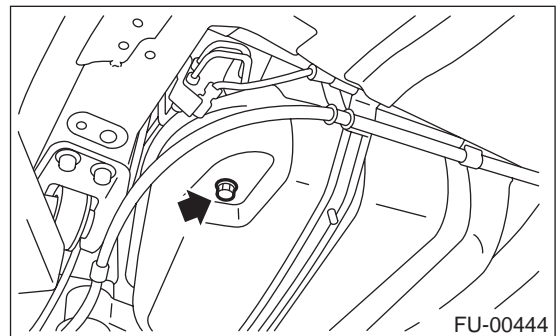


- 9) Drain fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.

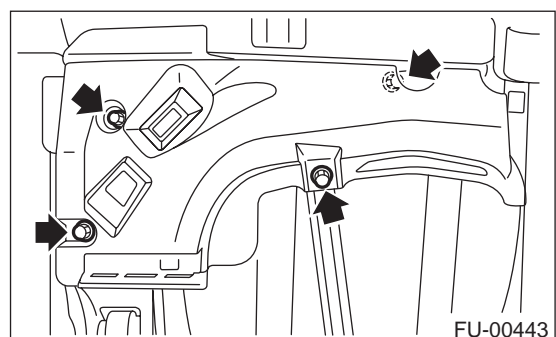


- 10) Tighten the fuel drain plug, and then install the protector RH (Front).

Tightening torque:
26 N·m (2.65 kg-m, 19.2 ft-lb)



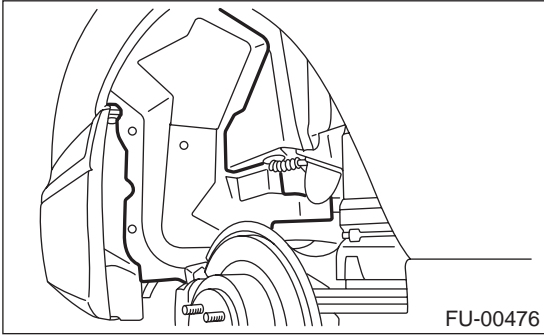
Tightening torque:
18 N·m (1.8 kg-m, 13.0 ft-lb)



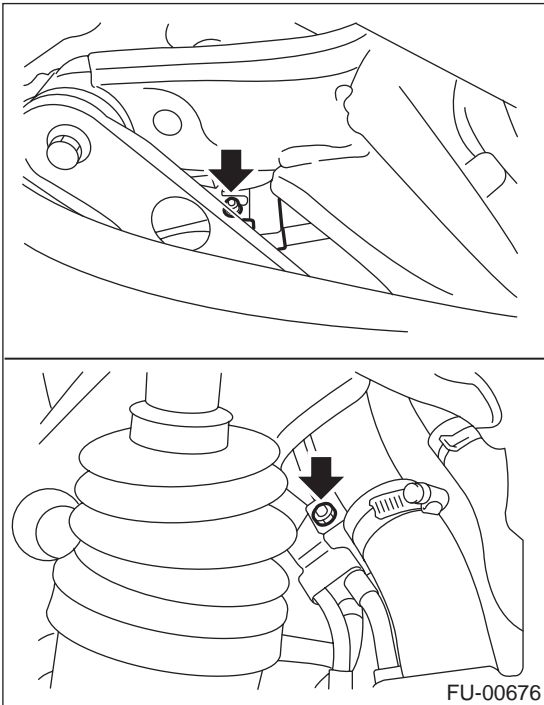
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

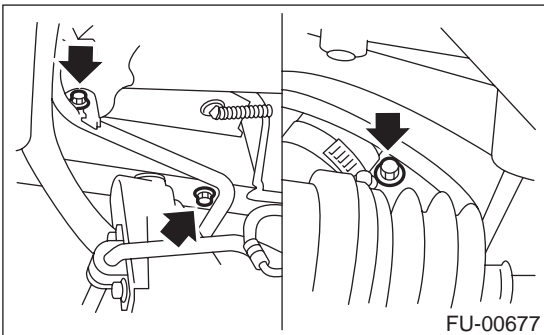
11) Remove the fuel filler pipe protector.



12) Remove the bolts which hold evaporation pipe bracket on fuel filler pipe.

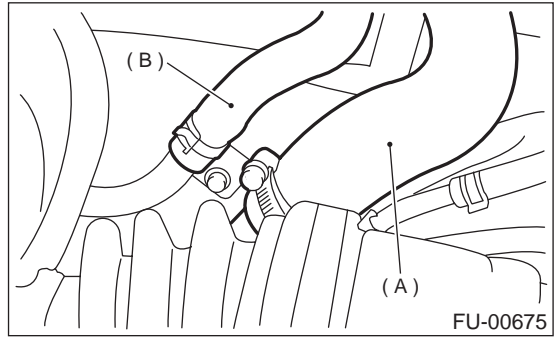


13) Remove the bolts which hold fuel filler pipe bracket on body.



14) Loosen the clamp, and then separate the fuel filler hose (A) from fuel filler pipe.

15) Move the clip, and then separate the air vent hose (B).

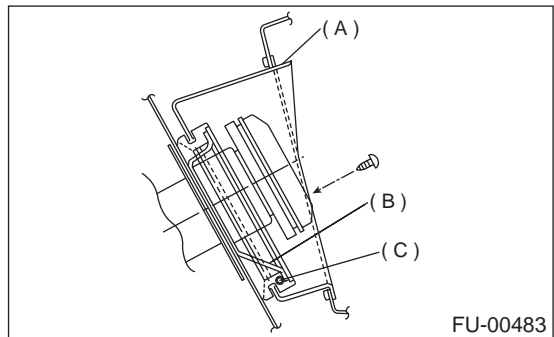


16) Remove the fuel filler pipe to under side of the vehicle.

B: INSTALLATION

1) Hold the fuel filler flap open.

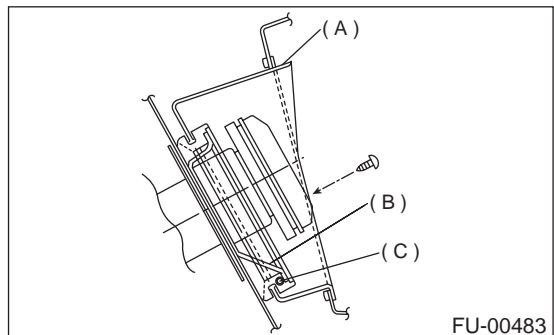
2) Set the fuel saucer (A) with rubber packing (C), and then insert the fuel filler pipe into hole from the inner side of apron.



3) Align holes in the fuel filler pipe neck, and then set the cup (B), and tighten screws.

NOTE:

If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



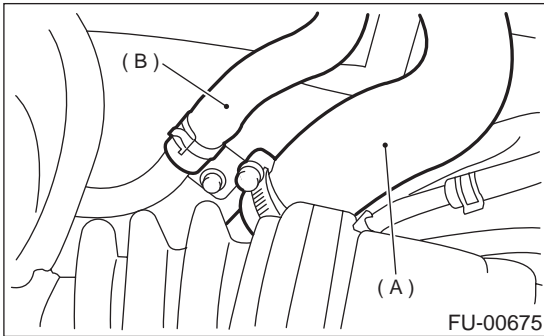
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

4) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe, and then tighten clamp.

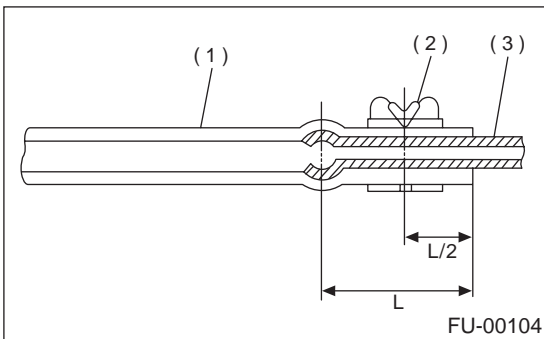
NOTE:

Do not allow clips to touch air vent hose (B) and rear suspension crossmember.



5) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe and hold clip.

$L = 27.5 \pm 2.5 \text{ mm (1.083 \pm 0.098 in)}$

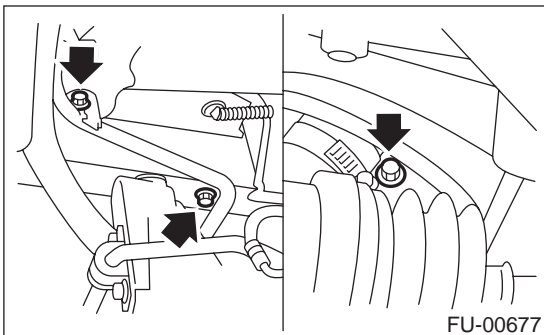


- (1) Hose
- (2) Clip
- (3) Pipe

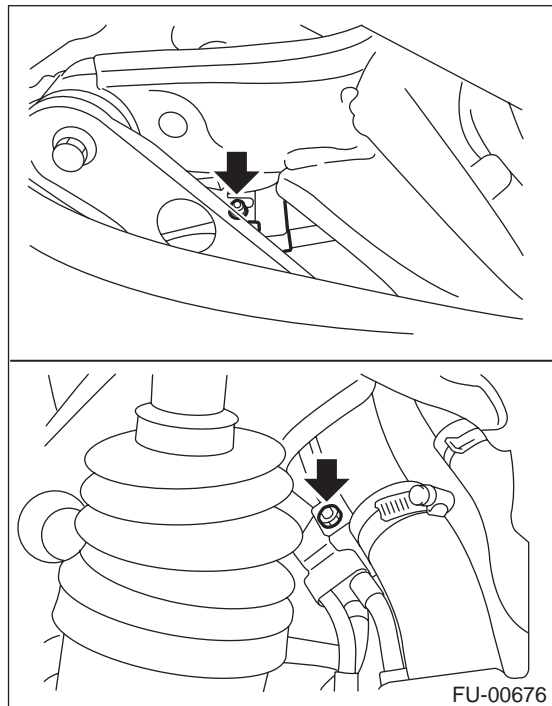
6) Tighten the bolt which holds fuel filler pipe bracket on body.

Tightening torque:

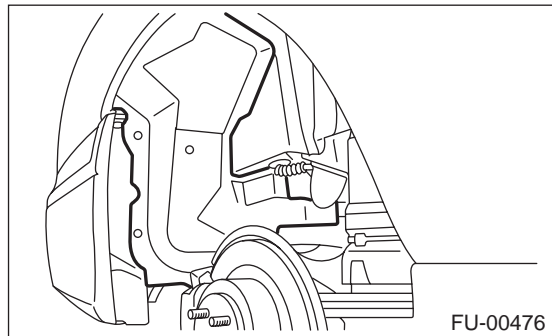
$7.4 \text{ N}\cdot\text{m (0.75 kg}\cdot\text{m, 5.4 ft}\cdot\text{lb)}$



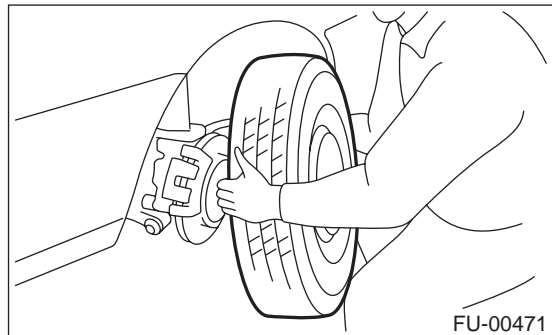
7) Tighten the bolts which hold evaporation pipe bracket on fuel pipe.



8) Install the fuel filler pipe protector.



9) Install the rear right wheel.



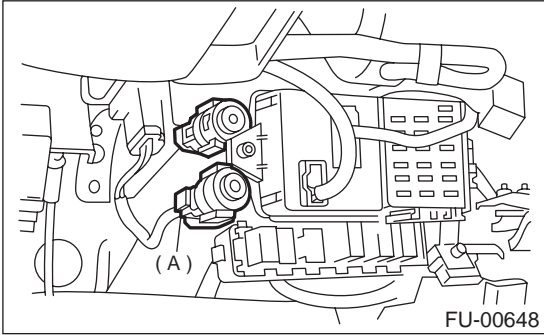
10) Lower the vehicle.

11) Tighten the wheel nuts.

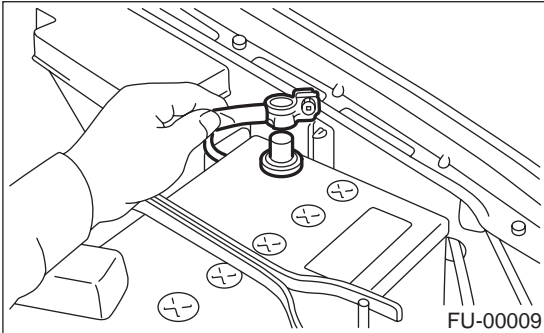
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

12) Connect the connector to fuel pump relay (A).



13) Connect the battery ground cable to battery.



19. Fuel Pump

A: REMOVAL

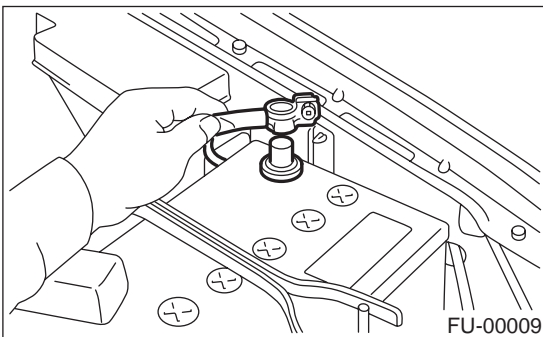
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

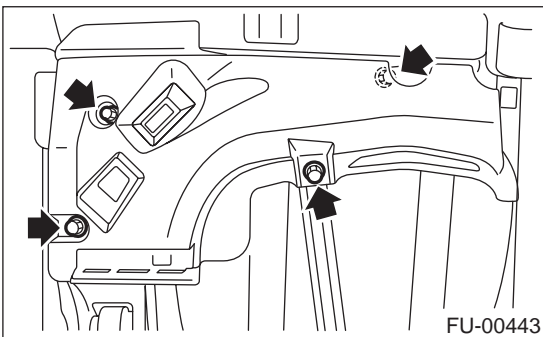
NOTE:

The fuel pump assembly consists of fuel pump and fuel level sensor.

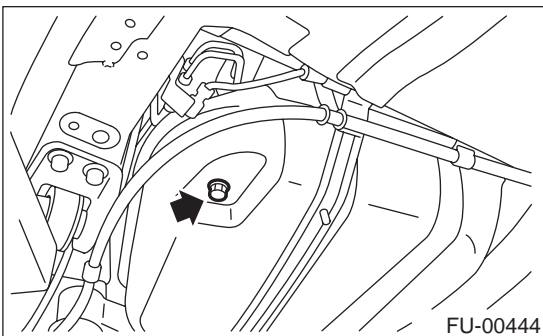
- 1) Release the fuel pressure. <Ref. to FU(H4S0w/oOBD)-45, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid, and then remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



- 4) Lift-up the vehicle.
- 5) Remove the protector RH (Front).



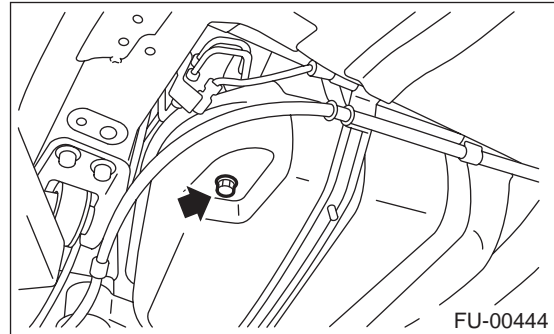
- 6) Drain the fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



- 7) Tighten the fuel drain plug, and then install the protector RH (Front).

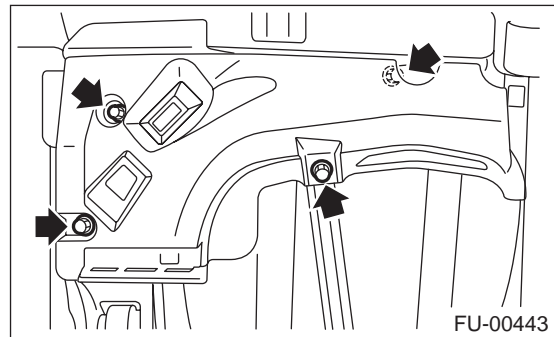
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)

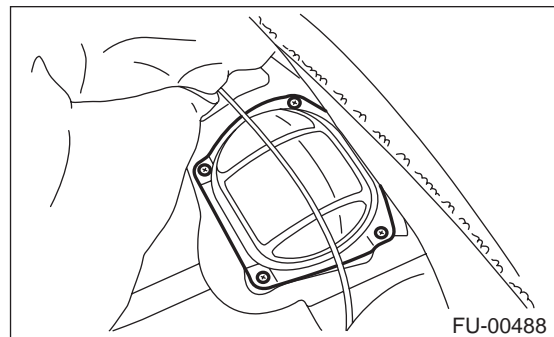


Tightening torque:

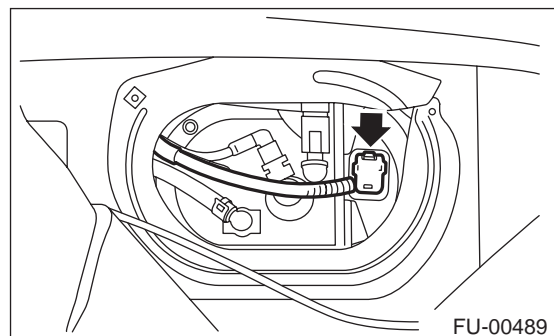
18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 8) Raise the rear seat, and then turn the floor mat up.
- 9) Remove the access hole lid.



- 10) Disconnect the connector from fuel pump.

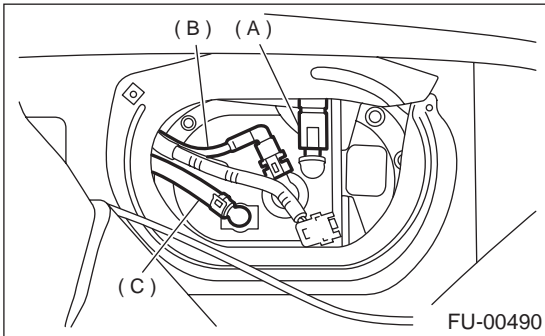


FUEL PUMP

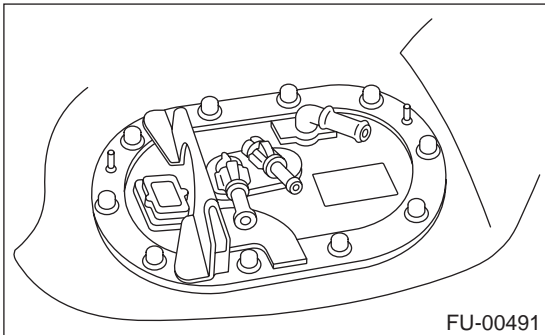
FUEL INJECTION (FUEL SYSTEMS)

11) Move the clips, and then disconnect the jet pump hose (C).

12) Disconnect the quick connector, and then disconnect the fuel delivery hose (A) and return hose (B). <Ref. to FU(H4SOw/oOBD)-67, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



13) Remove the nuts which install fuel pump assembly onto fuel tank.



14) Take off the fuel pump assembly from fuel tank.

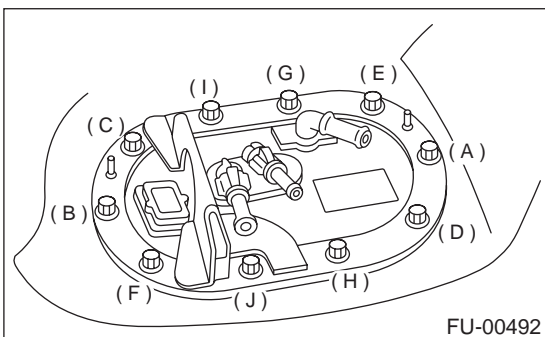
B: INSTALLATION

Install in the reverse order of removal. Do the following:

- (1) Always use new gaskets.
- (2) Ensure the sealing portion is free from fuel or foreign particles before installation.
- (3) Tighten the nuts in alphabetical sequence shown in the figure to specified torque.

Tightening torque:

5.9 N·m (0.6 kgf·m, 4.3 ft·lb)

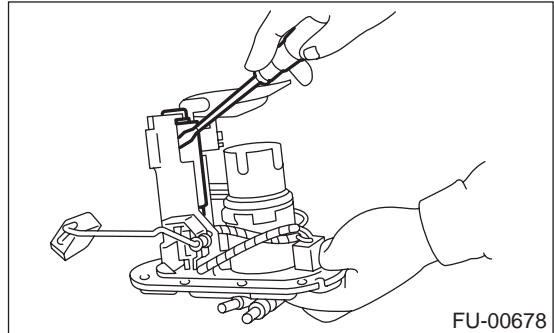


C: DISASSEMBLY

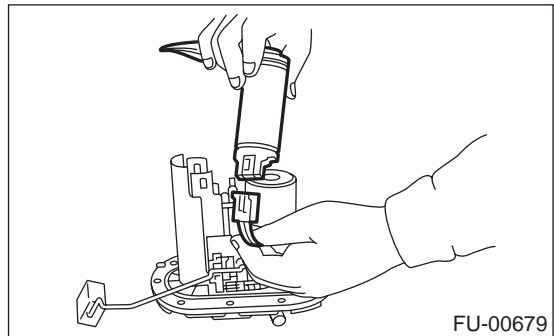
1) Remove the fuel pump and pump holder.

NOTE:

When disassembling the pump holder, be careful as it is installed with two pawls.



2) Disconnect the connector from fuel pump.



D: ASSEMBLY

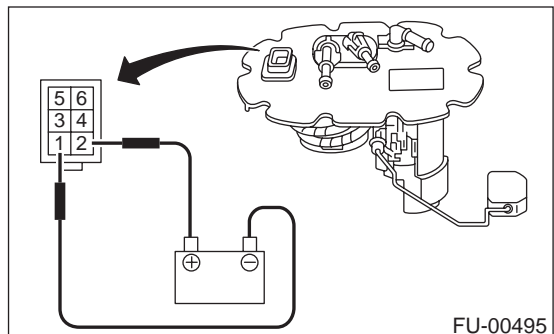
Assemble in the reverse order of disassembly.

E: INSPECTION

Connect the lead harness to connector terminal of fuel pump, and then apply battery power supply to check whether the pump operate.

WARNING:

- Wipe off the fuel completely.
- Keep the battery as far apart from fuel pump as possible.
- Be sure to turn the battery supply ON and OFF on the battery side.
- Do not run the fuel pump for a long time under non-load condition.



20. Fuel Level Sensor

A: REMOVAL

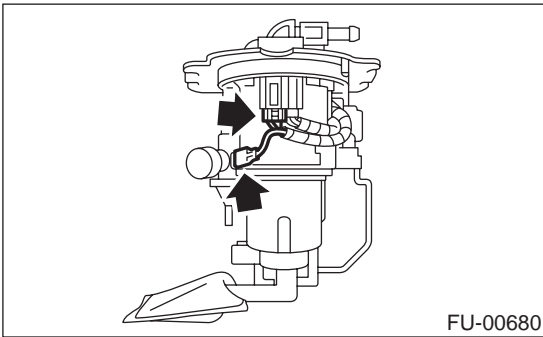
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

NOTE:

The fuel level sensor is built in fuel pump assembly.

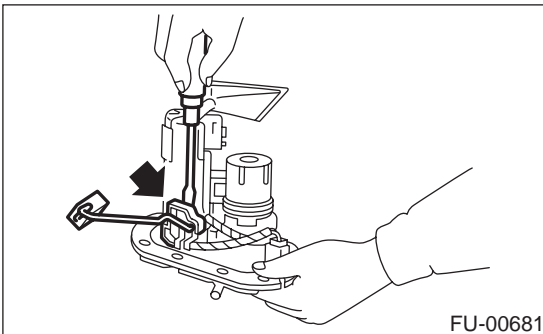
- 1) Remove the fuel pump assembly. <Ref. to FU(H4SOw/oOBD)-59, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from fuel pump bracket.



- 3) Pushing the pawls with a screwdriver, remove the fuel meter unit by pulling it downwards.

NOTE:

Replace the fuel filter pawls with new ones as they might brake when removed.

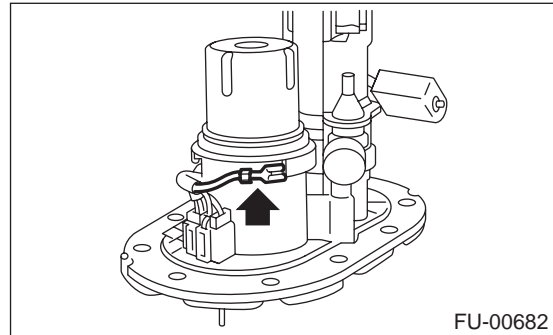


B: INSTALLATION

Install in the reverse order of removal.

WARNING:

- Ground cable must be connected.
- Spark may occur and ignite if fuel is nearby.



FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

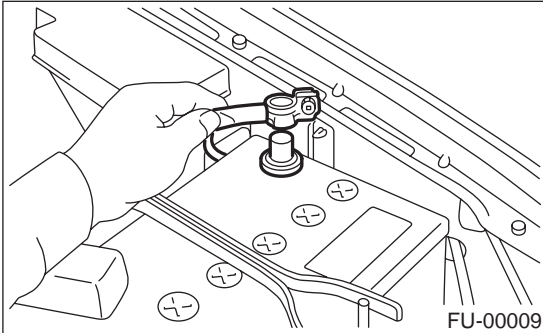
21. Fuel Sub Level Sensor

A: REMOVAL

WARNING:

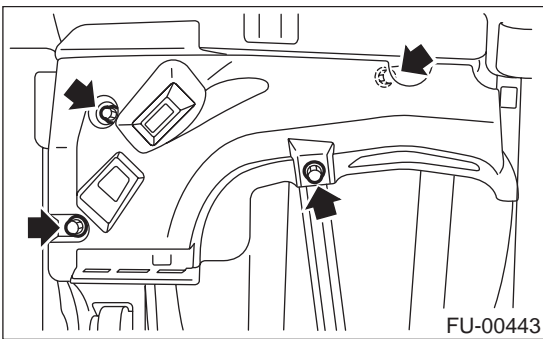
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect the ground cable from battery.

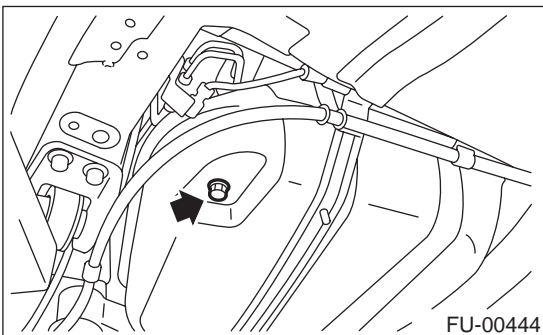


2) Lift-up the vehicle.

3) Remove the front side fuel tank cover.



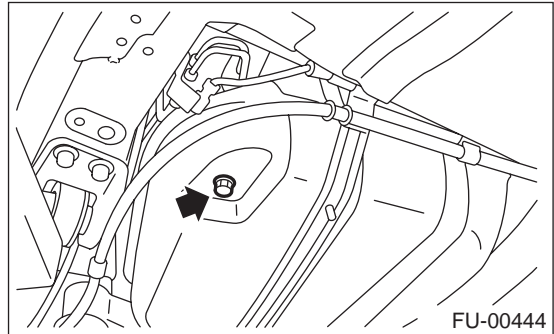
4) Drain fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



5) Tighten the fuel drain plug and install the protector RH (Front).

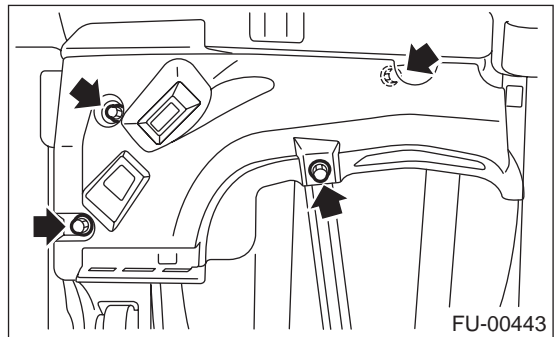
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



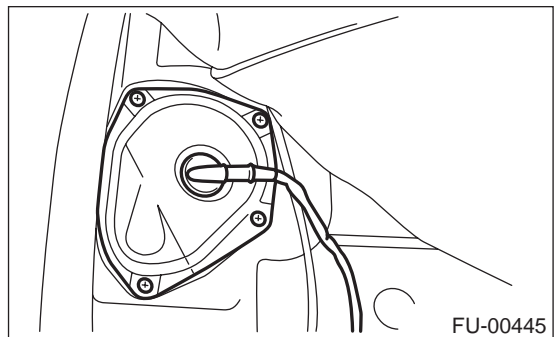
Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

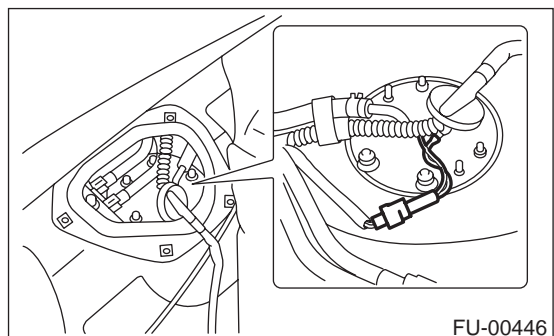


6) Remove the rear seat.

7) Remove the service hole cover.



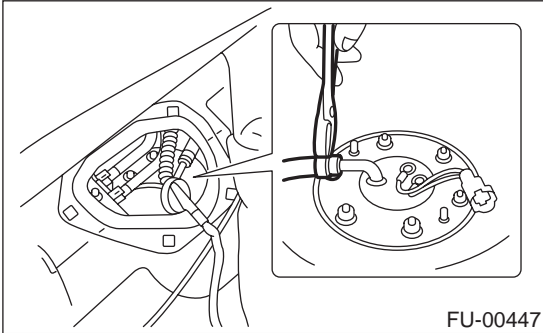
8) Disconnect the connector from fuel sub level sensor.



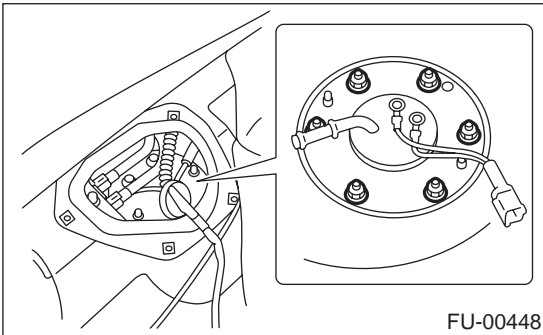
FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

9) Disconnect the fuel jet pump hose.



10) Remove the bolts which install fuel sub level sensor on fuel tank.



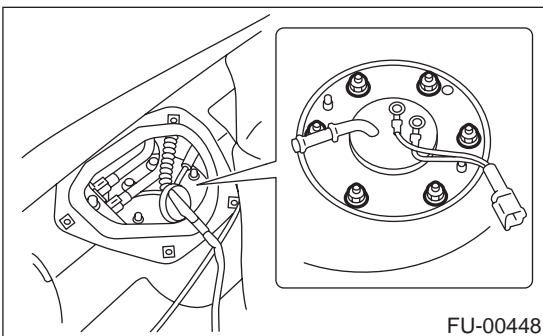
11) Remove the fuel sub level sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



FUEL FILTER

FUEL INJECTION (FUEL SYSTEMS)

22. Fuel Filter

A: REMOVAL

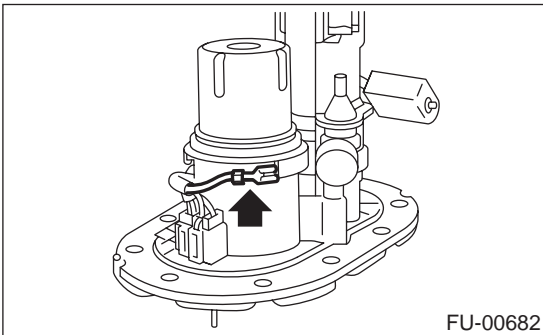
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

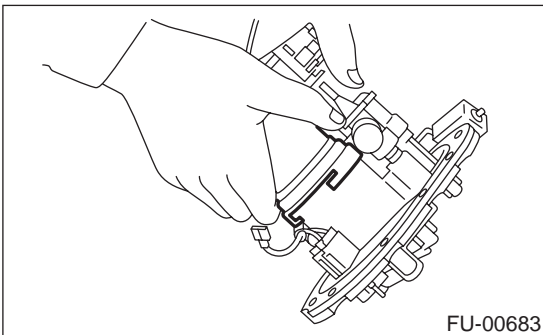
NOTE:

The fuel filter is built in fuel pump assembly.

- 1) Release the fuel pressure. <Ref. to FU(H4SOw/oOBD)-45, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Remove the fuel pump assembly. <Ref. to FU(H4SOw/oOBD)-59, REMOVAL, Fuel Pump.>
- 3) Disconnect the ground cable from filter holder.



- 4) Remove the filter holder by turning it to the left from the body pawls, and then take out the filter.

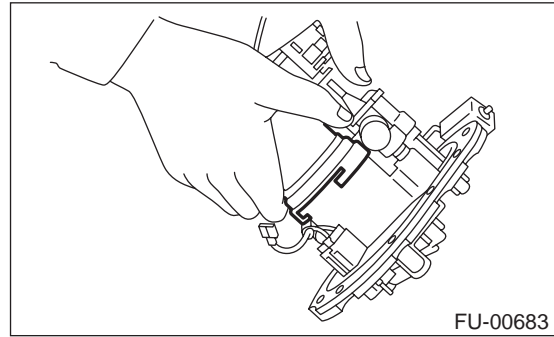


B: INSTALLATION

NOTE:

- If the fuel hoses are damaged at the connecting portion, replace it with a new one.
- If the clamps are badly damaged, replace with new ones.
- Replace the o-ring with new ones.

- 1) Set the O-ring on the filter holder, and then install by turning to the right.



- 2) Install the fuel pump assembly. <Ref. to FU(H4SOw/oOBD)-60, INSTALLATION, Fuel Pump.>

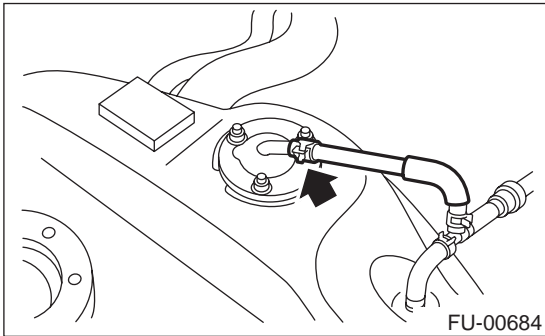
C: INSPECTION

- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if replacement interval has been reached, replace it.

23. Fuel Cut Valve

A: REMOVAL

- 1) Remove the fuel tank. <Ref. to FU(H4SOw/oOBD)-48, REMOVAL, Fuel Tank.>
- 2) Move the clip, and then disconnect the evaporation hose from fuel cut valve.



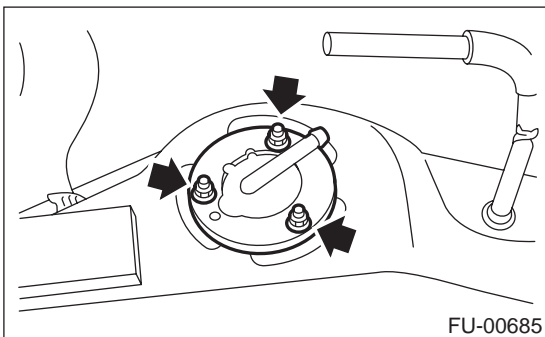
- 3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft-lb)



FUEL DAMPER VALVE

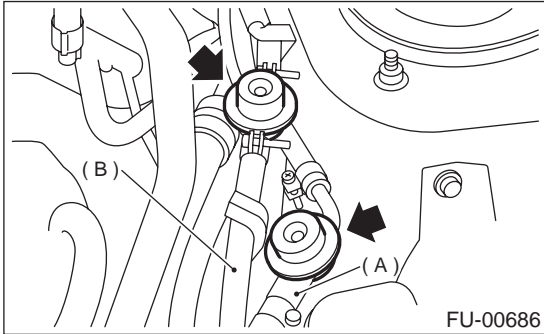
FUEL INJECTION (FUEL SYSTEMS)

24. Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4SOw/oOBD)-45, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Remove the fuel damper valve from fuel delivery line (A) and return line (B).



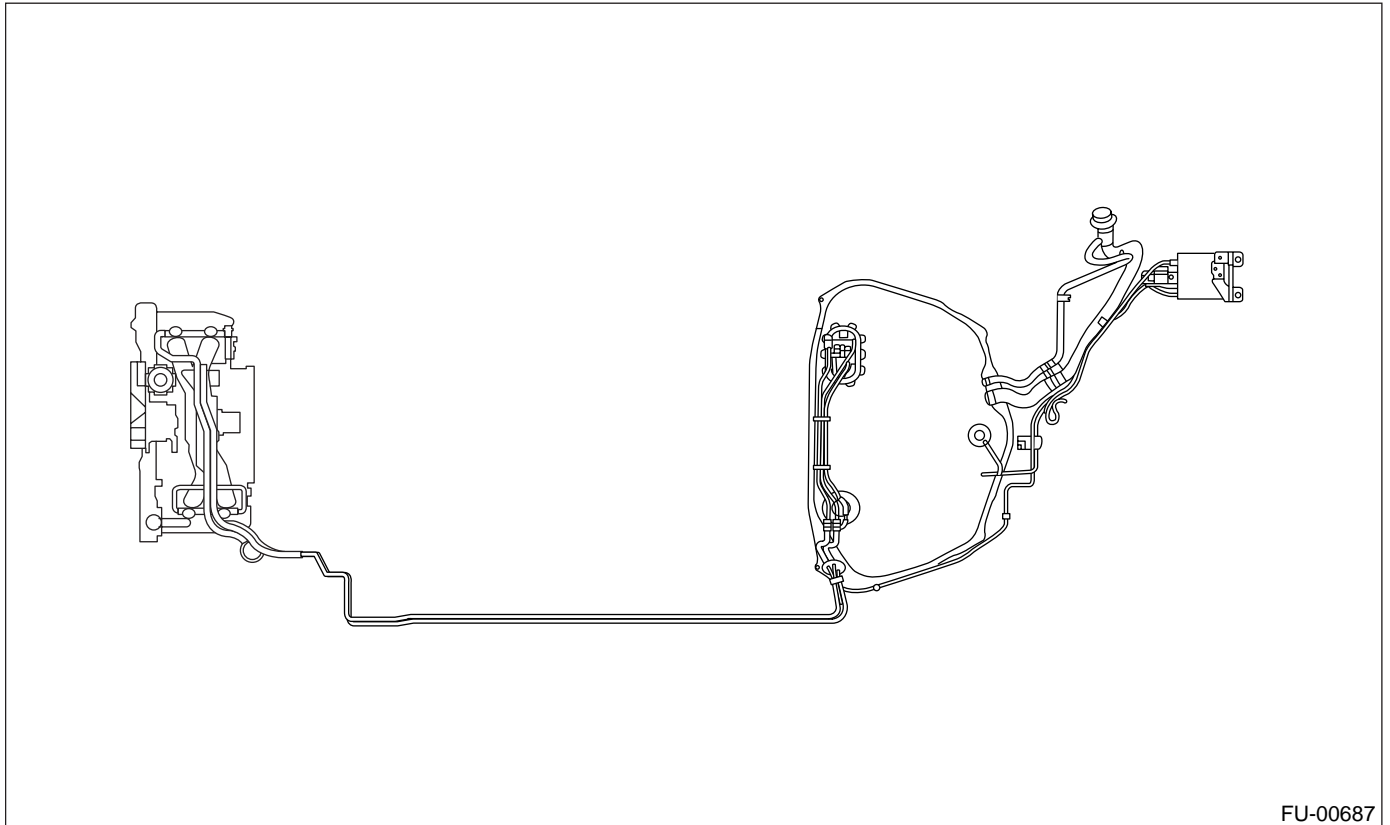
B: INSTALLATION

Install in the reverse order of removal.

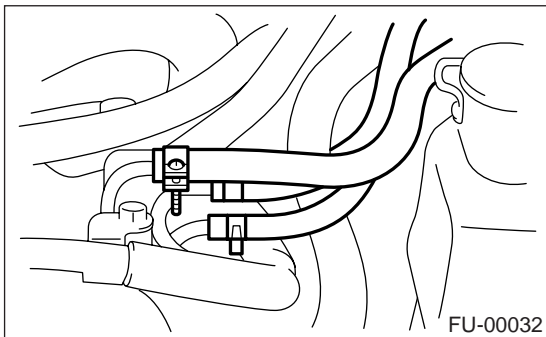
25. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Release the fuel pressure. <Ref. to FU(H4SOw/oOBD)-45, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Open the fuel filler flap lid, and then remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-48, REMOVAL, Floor Mat.>
- 5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

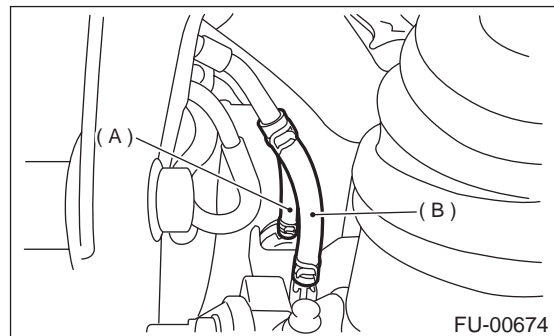


- 6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.



- 7) Lift-up the vehicle.

- 8) Disconnect the two-way valve hose (A) from the two-way valve and disconnect evaporation hose (B) from evaporation pipe.



FUEL DELIVERY, RETURN AND EVAPORATION LINES

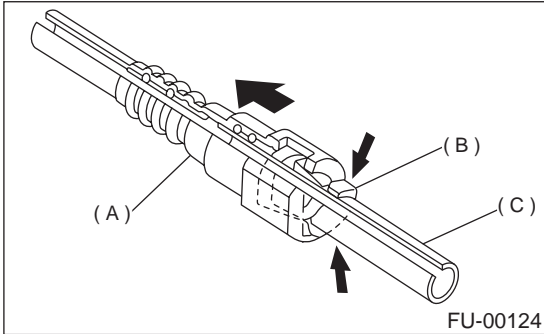
FUEL INJECTION (FUEL SYSTEMS)

9) Separate the quick connector on fuel delivery and return line.

- (1) Clean the pipe and connector, if they are covered with dust.
- (2) Hold the connector (A) and push retainer (B) down.
- (3) Pull out the connector (A) from retainer (B).

NOTE:

Replace the retainer with new ones.



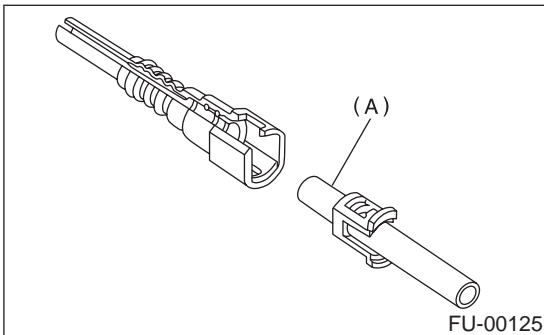
- (A) Connector
- (B) Retainer
- (C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery and return line.

NOTE:

- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.

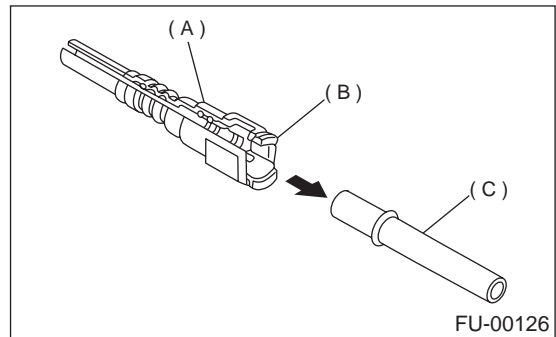


- (A) Seal surface

- (1) Set a new retainer (B) to connector (A).
- (2) Push the pipe into connector completely.

NOTE:

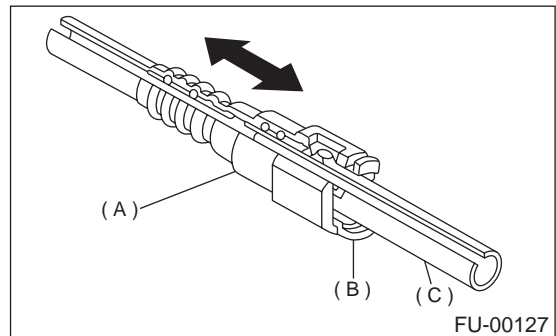
At this time, two clicking sounds are heard.



- (A) Connector
- (B) Retainer
- (C) Pipe

NOTE:

- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.
- Be sure to inspect the hoses and their connections for any leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

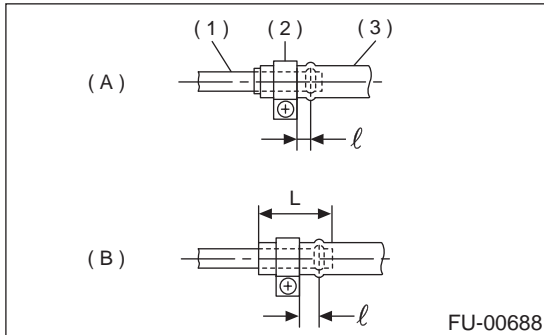
2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.

Type B: When fitting length is not specified.

\varnothing : 2.5 ± 1.5 mm (0.098 ± 0.059 in)

L : 22.5 ± 2.5 mm (0.886 ± 0.098 in)



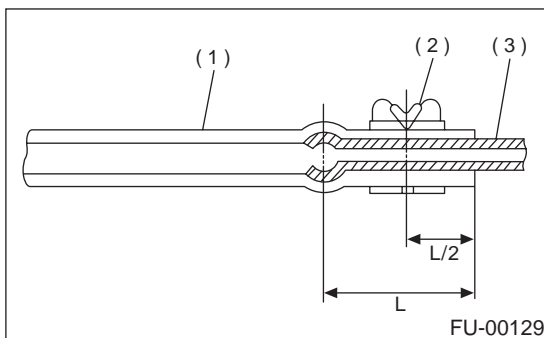
- (1) Fitting
- (2) Clamp
- (3) Hose
- (A) Type A
- (B) Type B

3) Connect the evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

$L = 17.5 \pm 2.5$ mm (0.689 ± 0.098 in)

NOTE:

Be sure to inspect the hoses and their connections for any leakage of fuel.



- (1) Hose
- (2) Clip
- (3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.

2) Make sure that the fuel pipe and fuel hose connections are tight.

FUEL SYSTEM TROUBLE IN GENERAL

FUEL INJECTION (FUEL SYSTEMS)

26. Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	○ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	○ Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace the fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace the separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel meter unit.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank.

To prevent water condensation.

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain water condensation from the fuel filter.

- Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

- Protecting the fuel system against freezing and water condensation.

(1) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter

season, drain water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

(2) Affected areas

When water condensation is notched in the fuel filter, drain water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

- Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC(H4SOw/oOBD)

	Page
1. General Description	2
2. Front Catalytic Converter	3
3. Rear Catalytic Converter	6
4. Canister.....	7
5. Purge Control Solenoid Valve	8
6. Two-way Valve	9



GENERAL DESCRIPTION

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

1. General Description

A: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

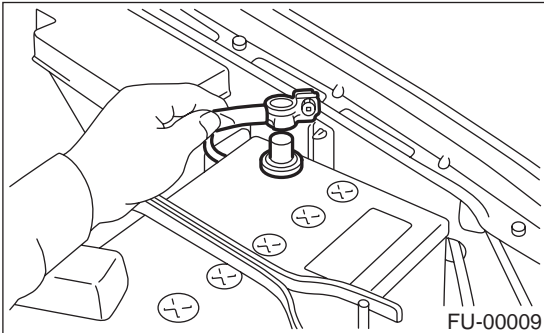
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

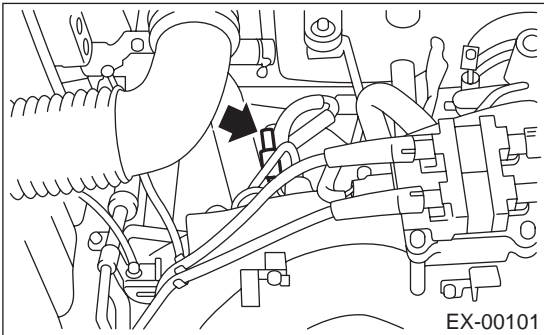
2. Front Catalytic Converter

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.

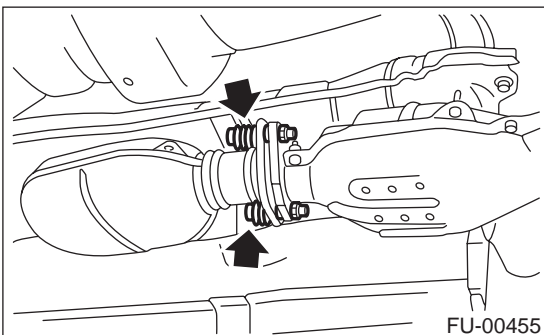


- 3) Disconnect front oxygen sensor connector. (With catalytic converter)

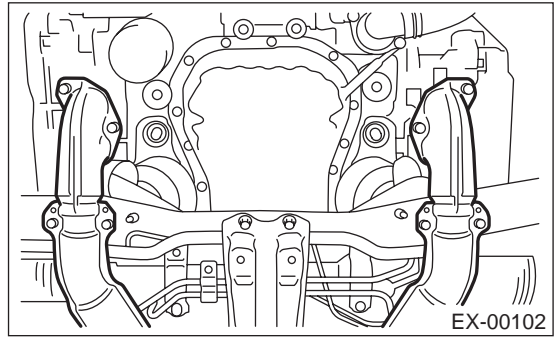


- 4) Lift-up the vehicle.
- 5) Remove under cover.
<Ref. to EI-13, REMOVAL, Front Under Cover.>
- 6) Separate front and center exhaust pipe assembly from rear exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.

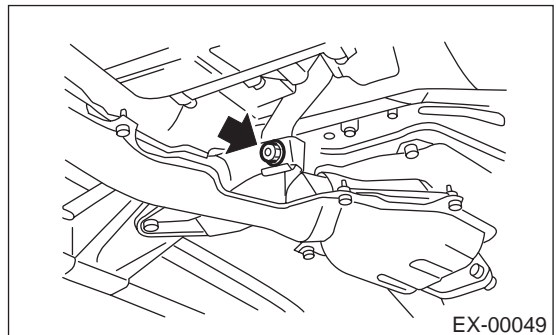


- 7) Remove nuts which hold front exhaust pipe onto cylinder heads.

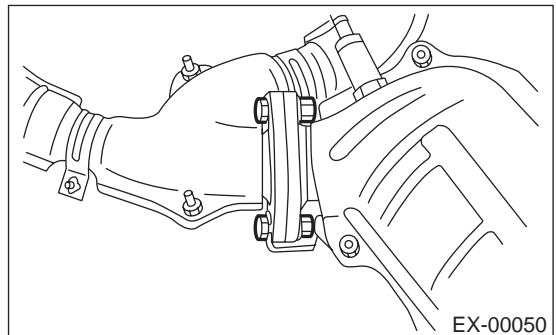


- 8) Remove front and center exhaust pipe assembly from hanger bracket.

CAUTION:
Be careful not to drop front and center exhaust pipe assembly.



- 9) Separate front catalytic converter from front exhaust pipe.



FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

B: INSTALLATION

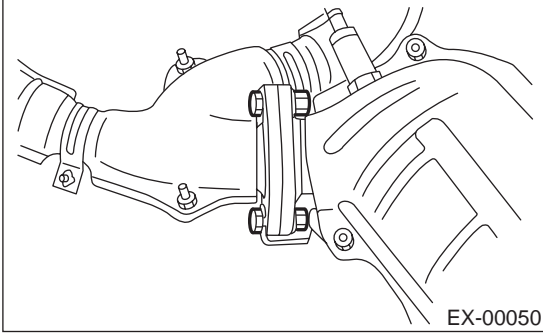
NOTE:

Replace gaskets with new ones.

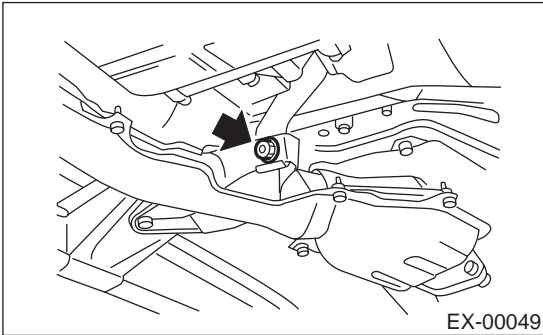
1) Install front catalytic converter to front exhaust pipe.

Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)



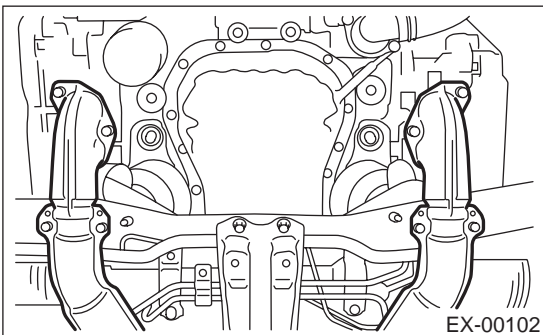
2) Install front and center exhaust pipe assembly to the vehicle. And temporarily tighten bolt which installs center exhaust pipe to hanger bracket.



3) Tighten nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

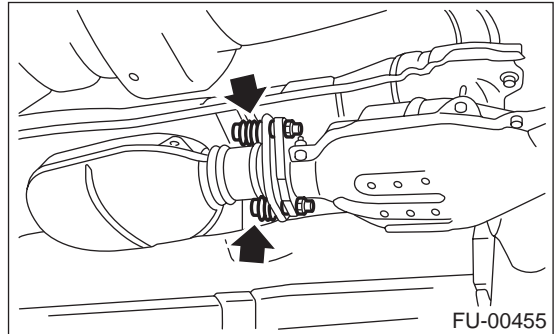
30 N·m (3.1 kgf-m, 22.4 ft-lb)



4) Tighten bolts which secure front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:

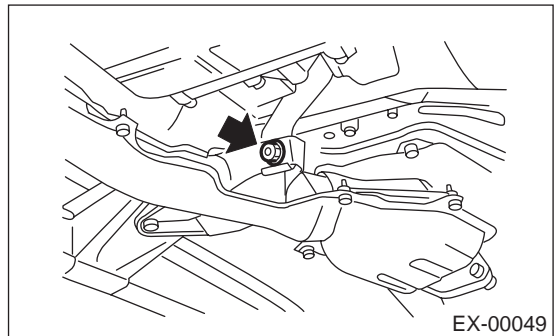
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Tighten bolt which holds front and center exhaust pipe assembly to hanger bracket.

Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)

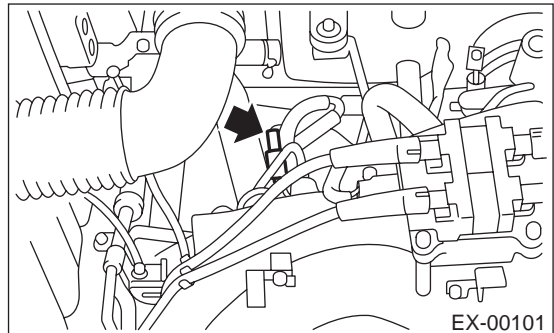


6) Install under cover.

<Ref. to EI-13, INSTALLATION, Front Under Cover.>

7) Lower the vehicle.

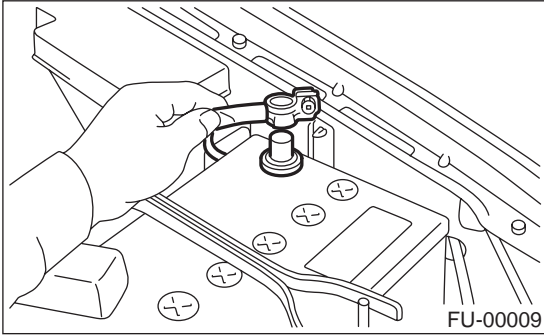
8) Connect front oxygen sensor connector. (With catalytic converter)



FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

9) Connect battery ground cable.



C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

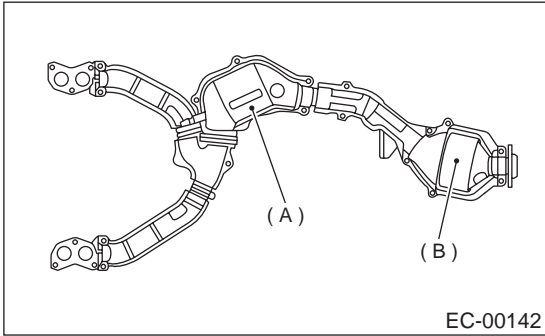
REAR CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

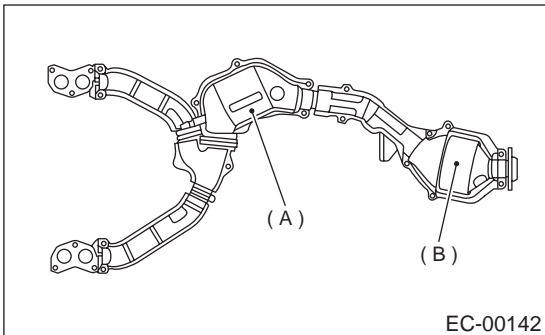
The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to EC(H4SOw/oOBD)-3, REMOVAL, Front Catalytic Converter.>



- (A) Front catalytic converter
- (B) Rear catalytic converter

B: INSTALLATION

The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the ones described under front catalytic converter. <Ref. to EC(H4SOw/oOBD)-4, INSTALLATION, Front Catalytic Converter.>



- (A) Front catalytic converter
- (B) Rear catalytic converter

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

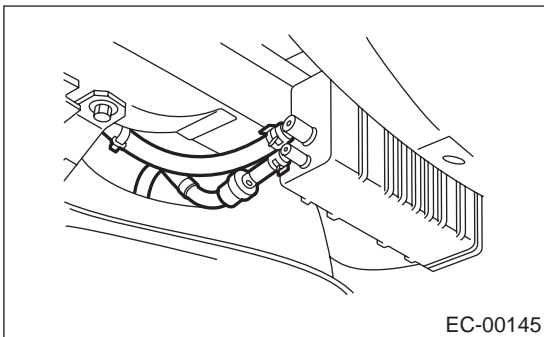
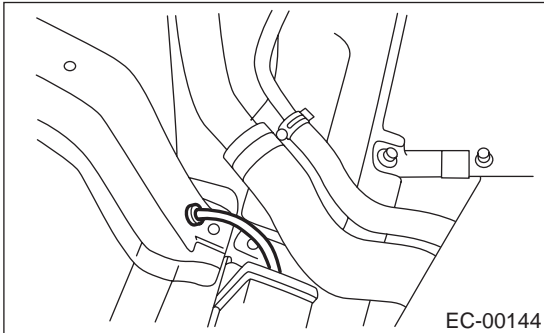
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

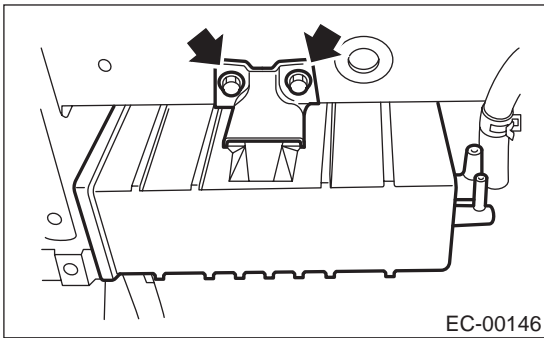
4. Canister

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Disconnect canister hoses from canister.



- 3) Remove canister from body.

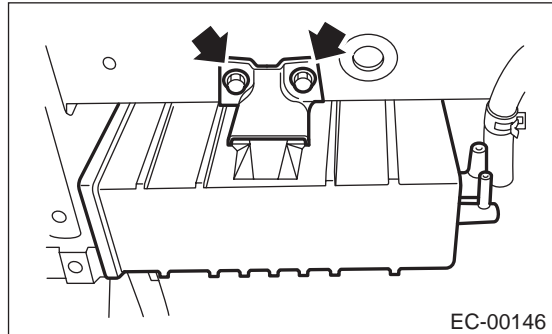


B: INSTALLATION

Install in the reverse order of removal.

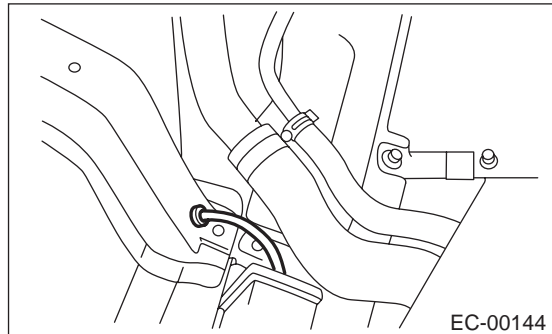
Tightening torque:

7.4 ± 2.0 N·m (0.75 ± 0.2 kgf-m, 5.4 ± 1.4 ft-lb)



CAUTION:

Insert drain hose of canister into the hole on body.



C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

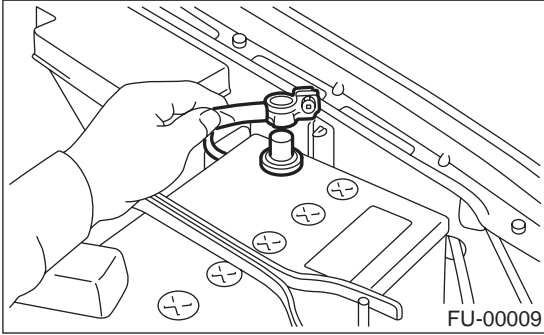
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

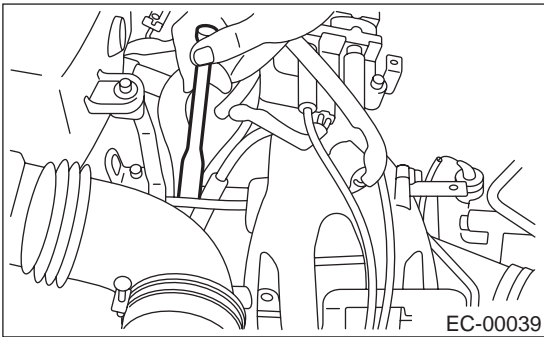
5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect battery ground cable.

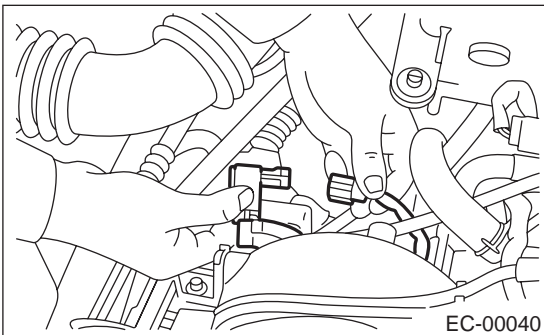


2) Remove bolt which installs purge control solenoid valve onto intake manifold.



3) Take out purge control solenoid valve through the bottom of the intake manifold.

4) Disconnect connector and hoses from purge control solenoid valve.



B: INSTALLATION

Install in the reverse order of removal.

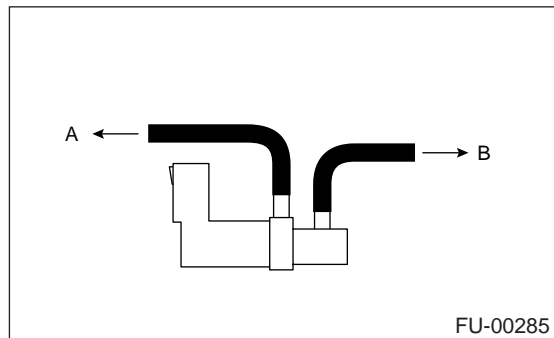
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



CAUTION:

Carefully connect the evaporation hoses.



(A) To fuel pipe

(B) To throttle body

C: INSPECTION

Make sure hoses are not cracked or loose.

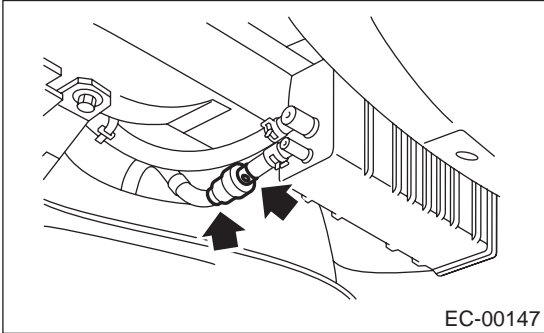
TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

6. Two-way Valve

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Disconnect hoses from two-way valve, and remove it.

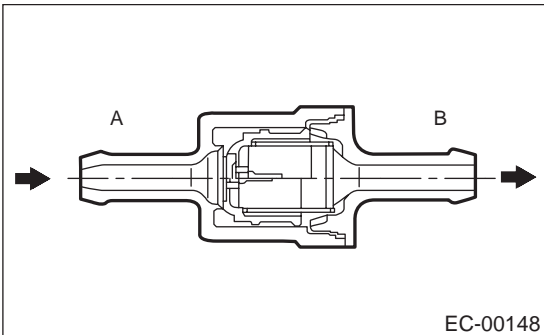


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

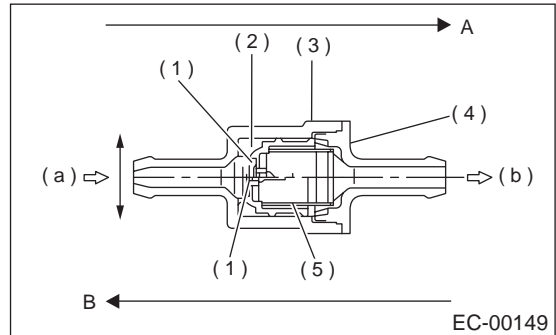
Be careful not to install two-way valve in the wrong direction.



- (A) From fuel tank
- (B) To canister

C: INSPECTION

- 1) Using a hand air pump, check if air goes through the valve from both A and B directions.



- (a) From fuel tank
- (b) To canister
- (1) Pressure valve
- (2) Valve
- (3) Body
- (4) Cap
- (5) Spring

- 2) Replace two-way valve, if necessary.

TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

MEMO:

INTAKE (INDUCTION)

IN(H4SOw/oOBD)

	Page
1. General Description	2



GENERAL DESCRIPTION

INTAKE (INDUCTION)

1. General Description

A: SPECIFICATIONS

Specification of model without OBD is the same as that of model with OBD. <Ref. to IN(H4SO)-2, General Description.>

MECHANICAL

ME(H4SOw/oOBD)

	Page
1. General Description	2



GENERAL DESCRIPTION

MECHANICAL

1. General Description

A: SPECIFICATIONS

Specification of model without OBD is the same as that of model with OBD. <Ref. to ME(H4SO)-2, General Description.>

EXHAUST

EX(H4SOw/oOBD)

	Page
1. General Description	2
2. Front Exhaust Pipe.....	9
3. Center Exhaust Pipe	12
4. Rear Exhaust Pipe	13
5. Muffler	14



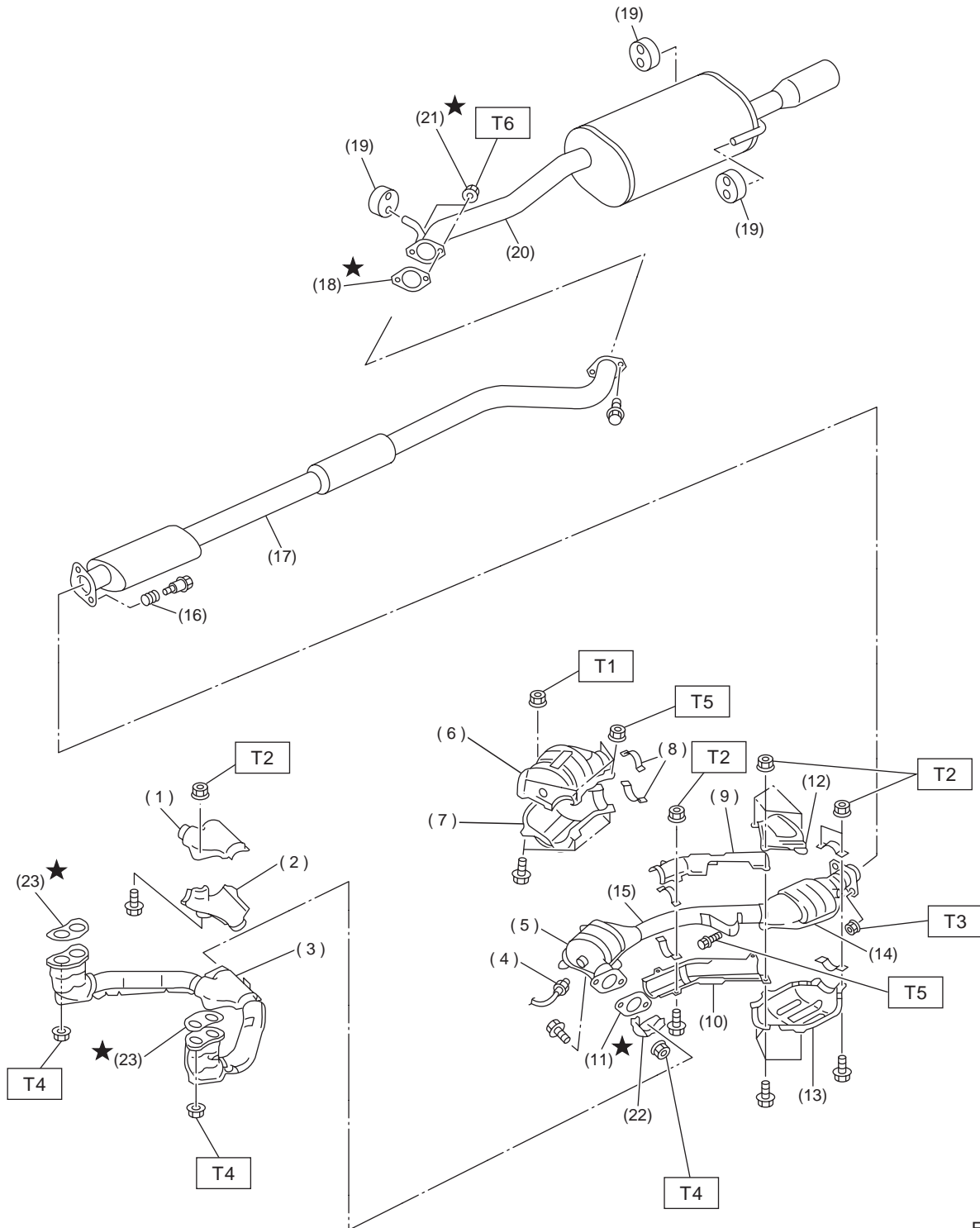
GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT

1. WITH CATALYTIC CONVERTER (EXCEPT AUSTRALIA OUTBACK MODEL)



EX-00098

GENERAL DESCRIPTION

EXHAUST

(1) Upper front exhaust pipe cover	(11) Gasket	(21) Self-locking nut
(2) Lower front exhaust pipe cover	(12) Upper rear catalytic converter cover	(22) Protector
(3) Front exhaust pipe	(13) Lower rear catalytic converter cover	(23) Gasket
(4) Oxygen sensor		
(5) Front catalytic converter		
(6) Upper front catalytic converter cover	(14) Rear catalytic converter	
(7) Lower front catalytic converter cover	(15) Center exhaust pipe	
(8) Clamp	(16) Spring	
(9) Upper center exhaust pipe cover	(17) Rear exhaust pipe	
(10) Lower center exhaust pipe cover	(18) Gasket	
	(19) Cushion rubber	
	(20) Muffler	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 13 (1.3, 9.4)

T3: 18 (1.8, 13.0)

T4: 30 (3.1, 22.4)

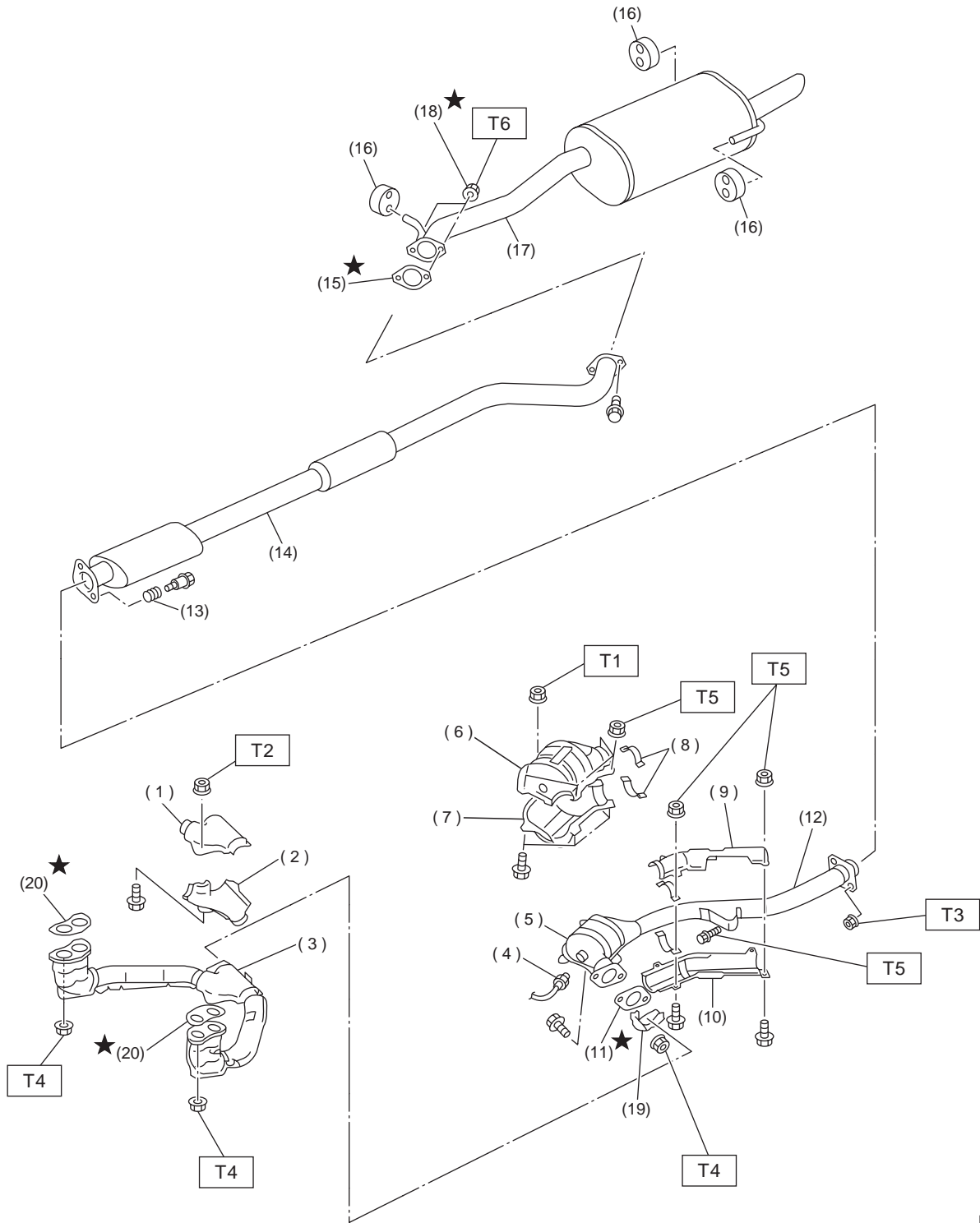
T5: 35 (3.6, 26.0)

T6: 48 (4.9, 35.4)

GENERAL DESCRIPTION

EXHAUST

2. AUSTRALIA OUTBACK MODEL



EX-00099

EX(H4S0w/oOBD)-4

GENERAL DESCRIPTION

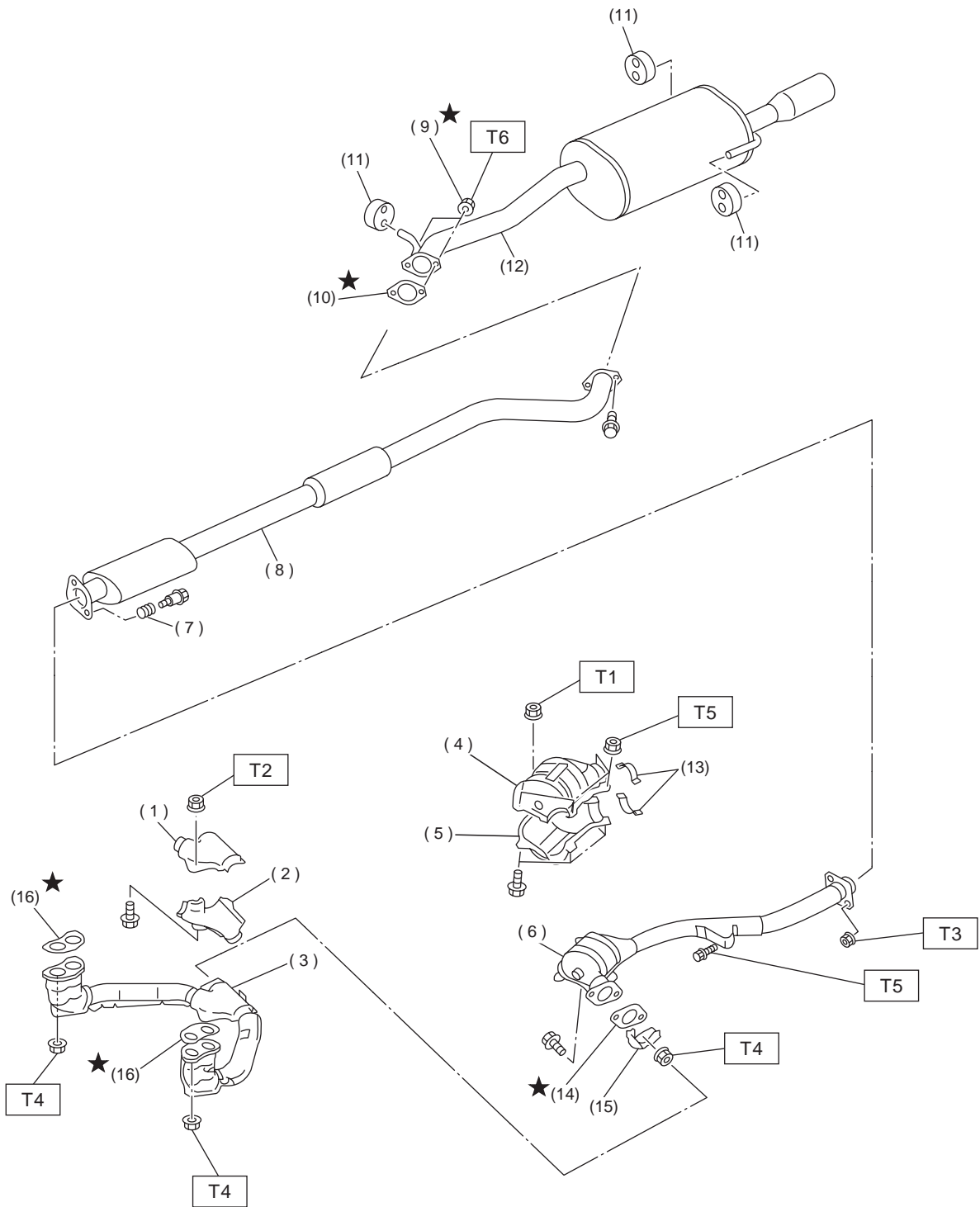
EXHAUST

(1) Upper front exhaust pipe cover	(9) Upper center exhaust pipe cover	(19) Protector
(2) Lower front exhaust pipe cover	(10) Lower center exhaust pipe cover	(20) Gasket
(3) Front exhaust pipe	(11) Gasket	
(4) Oxygen sensor	(12) Center exhaust pipe	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(5) Front catalytic converter	(13) Spring	<i>T1: 8 (0.8, 5.8)</i>
(6) Upper front catalytic converter cover	(14) Rear exhaust pipe	<i>T2: 13 (1.3, 9.4)</i>
(7) Lower front catalytic converter cover	(15) Gasket	<i>T3: 18 (1.8, 13.0)</i>
(8) Clamp	(16) Cushion rubber	<i>T4: 30 (3.1, 22.4)</i>
	(17) Muffler	<i>T5: 35 (3.6, 26.0)</i>
	(18) Self-locking nut	<i>T6: 48 (4.9, 35.4)</i>

GENERAL DESCRIPTION

EXHAUST

3. WITHOUT CATALYTIC CONVERTER



EX-00100

GENERAL DESCRIPTION

EXHAUST

- | | |
|-------------------------------------|----------------------|
| (1) Upper front exhaust pipe cover | (9) Self-locking nut |
| (2) Lower front exhaust pipe cover | (10) Gasket |
| (3) Front exhaust pipe | (11) Cushion rubber |
| (4) Upper center exhaust pipe cover | (12) Muffler |
| (5) Lower center exhaust pipe cover | (13) Clamp |
| (6) Center exhaust pipe | (14) Gasket |
| (7) Spring | (15) Protector |
| (8) Rear exhaust pipe | (16) Gasket |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 13 (1.3, 9.4)

T3: 18 (1.8, 13.0)

T4: 30 (3.1, 22.4)

T5: 35 (3.6, 26.0)

T6: 48 (4.9, 35.4)

GENERAL DESCRIPTION

EXHAUST

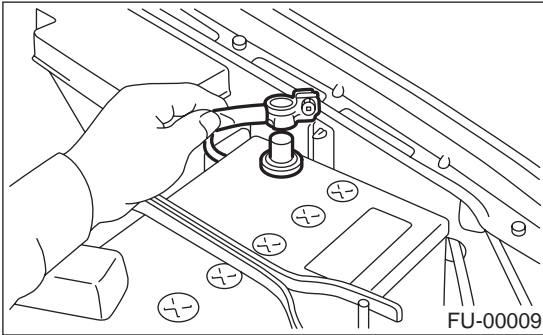
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

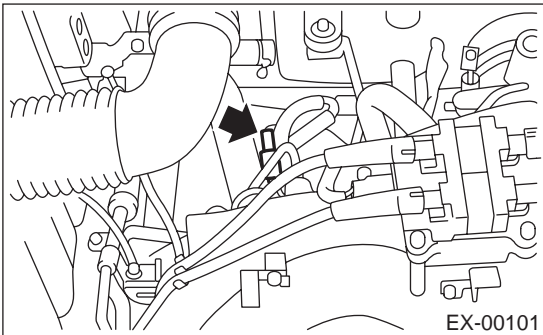
2. Front Exhaust Pipe

A: REMOVAL

1) Disconnect battery ground cable.



2) Disconnect front oxygen sensor connector.
(With catalytic converter)

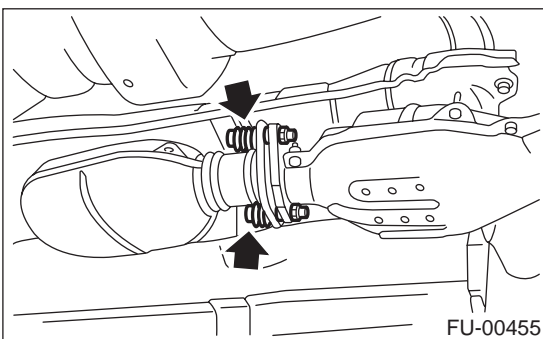


3) Lift-up the vehicle.

4) Separate front and center exhaust pipe assembly from rear exhaust pipe.

WARNING:

Be careful, exhaust pipe is hot.

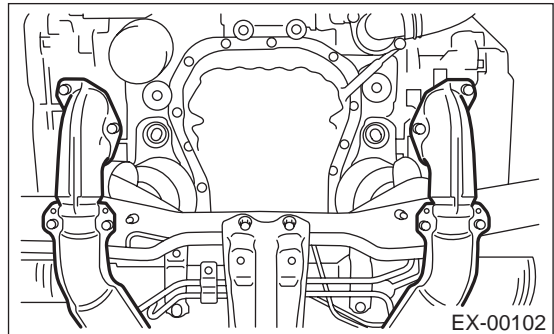


5) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>

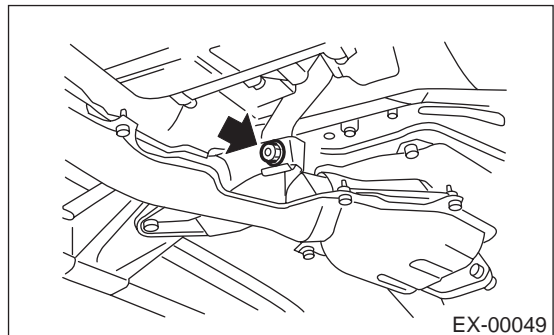
6) Remove nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:

Be careful not to pull down front and center exhaust pipe assembly.



7) Remove bolt which installs front and center exhaust pipe assembly to hanger bracket.



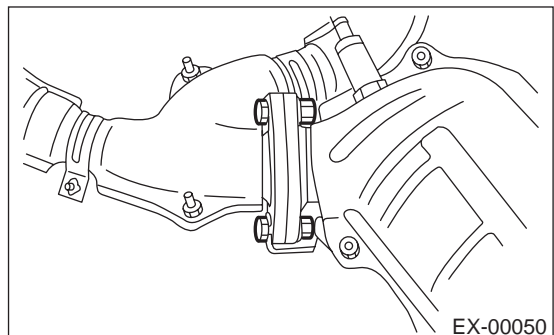
8) Remove front and center exhaust pipe assembly from the vehicle.

CAUTION:

- Be careful not to let front and center exhaust pipe assembly fall off when removing as it is quite heavy.

- After removing front and center exhaust assembly, do not apply excessive pulling force on rear exhaust pipe.

9) Separate front exhaust pipe from center exhaust pipe.



FRONT EXHAUST PIPE

EXHAUST

B: INSTALLATION

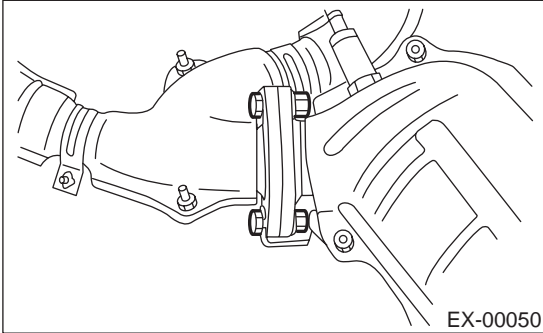
1) Install front exhaust pipe to center exhaust pipe.

NOTE:

Replace gaskets with new ones.

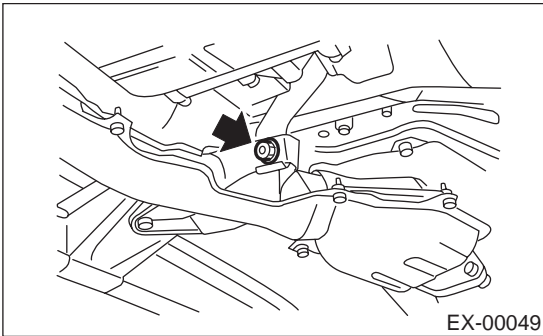
Tightening torque:

30 N·m (3.1 kgf·m, 22.4 ft·lb)



2) Install front and center exhaust pipe assembly to the vehicle.

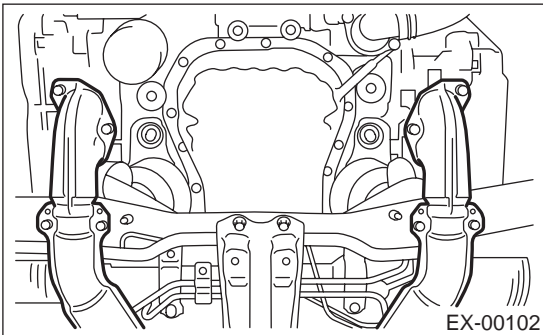
3) Temporarily tighten bolt which installs front and center exhaust pipe assembly to hanger bracket.



4) Tighten nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

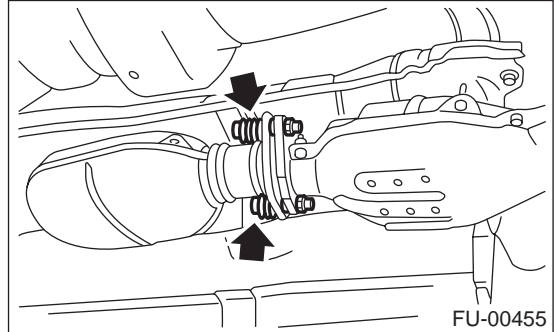
30 N·m (3.1 kgf·m, 22.4 ft·lb)



5) Tighten bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:

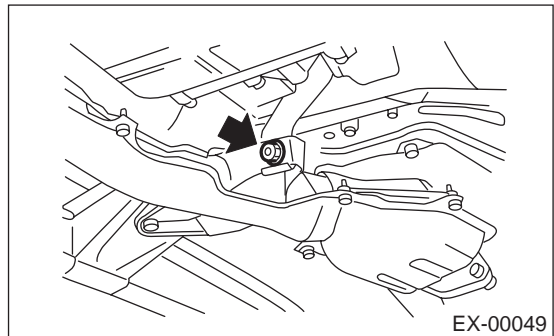
18 N·m (1.8 kgf·m, 13.0 ft·lb)



6) Tighten bolt which holds front and center exhaust pipe assembly to hanger bracket.

Tightening torque:

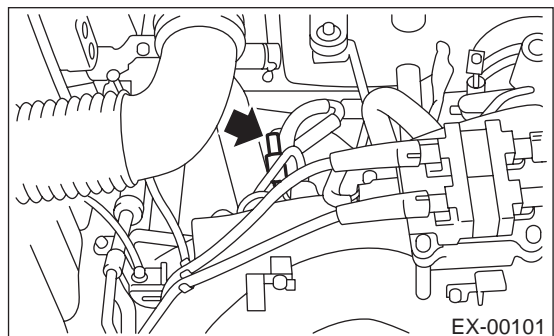
35 N·m (3.6 kgf·m, 26.0 ft·lb)



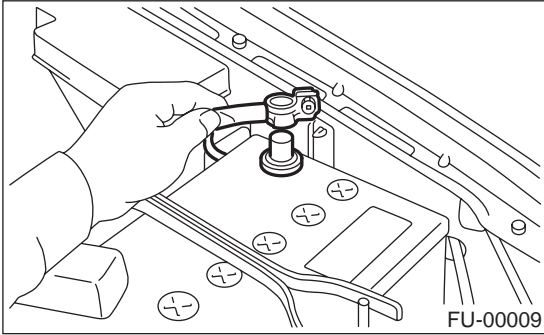
7) Install under cover. <Ref. to EI-13, INSTALLATION, Front Under Cover.>

8) Lower the vehicle.

9) Connect front oxygen sensor connector. (With catalytic converter)



10) Connect battery ground cable.



C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

3. Center Exhaust Pipe

A: REMOVAL

After removing the center and front exhaust pipes as one unit, separate them. Refer to the procedure for removing the front exhaust pipe. <Ref. to EX(H4SOw/oOBD)-9, Removal.>

B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to the procedure for installing the front exhaust pipe. <Ref. to EX(H4SOw/oOBD)-10, Installation.>

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

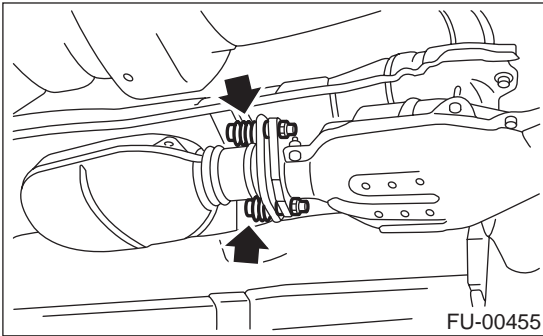
4. Rear Exhaust Pipe

A: REMOVAL

1) Separate rear exhaust pipe from center exhaust pipe.

CAUTION:

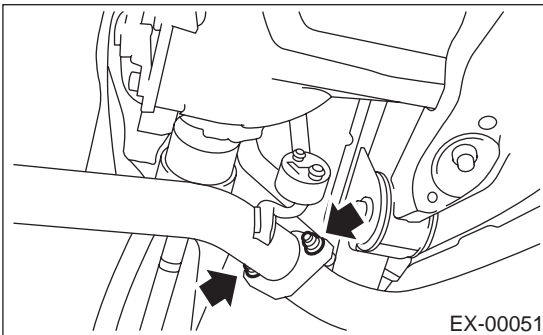
Be careful, exhaust pipe is hot.



2) Separate rear exhaust pipe from muffler.

CAUTION:

Be careful not to pull down rear exhaust pipe.



3) Remove rear exhaust pipe.

B: INSTALLATION

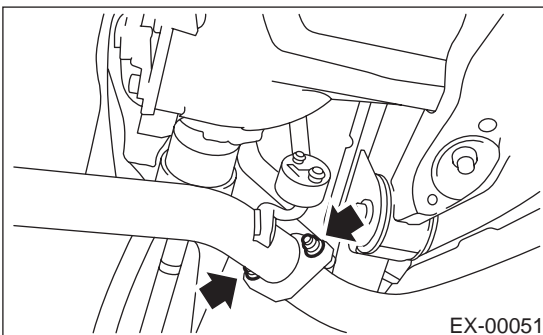
NOTE:

Replace gaskets with new ones.

1) Install rear exhaust pipe to muffler.

Tightening torque:

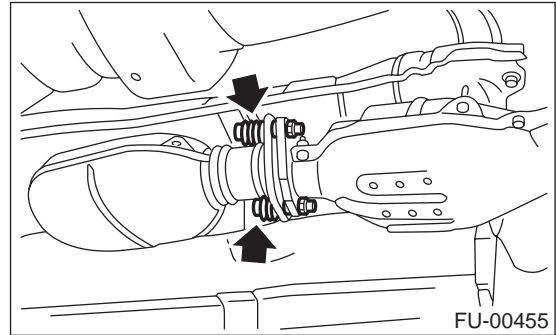
48 N·m (4.9 kgf-m, 35.4 ft-lb)



2) Install rear exhaust pipe to center exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

MUFFLER

EXHAUST

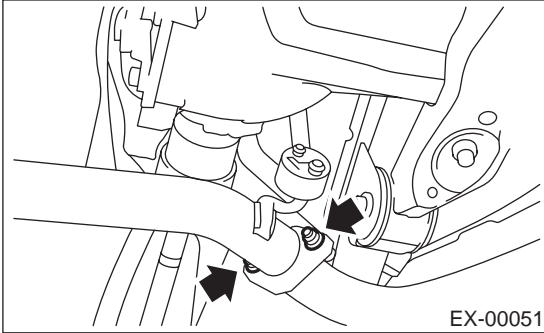
5. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

CAUTION:

Be careful, exhaust pipe is hot.



2) Remove left and right rubber cushions.

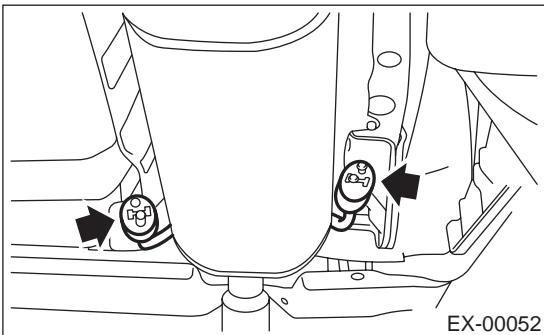
CAUTION:

Be careful not to drop the muffler during removal.

NOTE:

To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

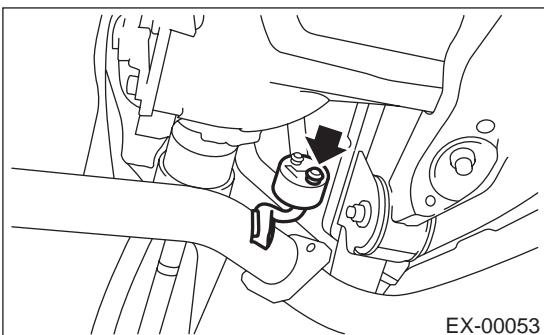


3) Remove front rubber cushion, and detach muffler assembly.

NOTE:

To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)



B: INSTALLATION

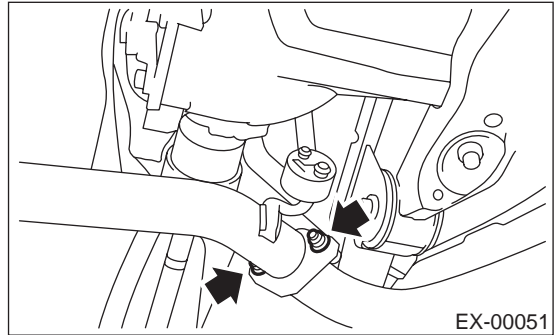
1) Install in the reverse order of removal.

NOTE:

Replace gasket with a new one.

Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

3) Make sure the cushion rubber is not worn or cracked.

COOLING

CO(H4SOw/oOBD)

	Page
1. General Description	2



1. General Description

A: SPECIFICATIONS

Specification of model without OBD is the same as that of model with OBD. <Ref. to CO(H4SO)-2, General Description.>

LUBRICATION

LU(H4SOw/oOBD)

	Page
1. General Description	2

1. General Description

A: SPECIFICATIONS

Specification of model without OBD is the same as that of model with OBD. <Ref. to LU(H4SO)-2, General Description.>

SPEED CONTROL SYSTEMS

SP(H4SOw/oOBD)

Page

1. General Description2

1. General Description

A: SPECIFICATION

Specification of model without OBD is the same as that of model with OBD. <Ref. to SP(H4SO)-2, General Description.>

IGNITION

IG(H4SOw/oOBD)

	Page
1. General Description	2
2. Spark Plug.....	5
3. Ignition Coil and Ignitor Assembly.....	8
4. Spark Plug Cord.....	10

GENERAL DESCRIPTION

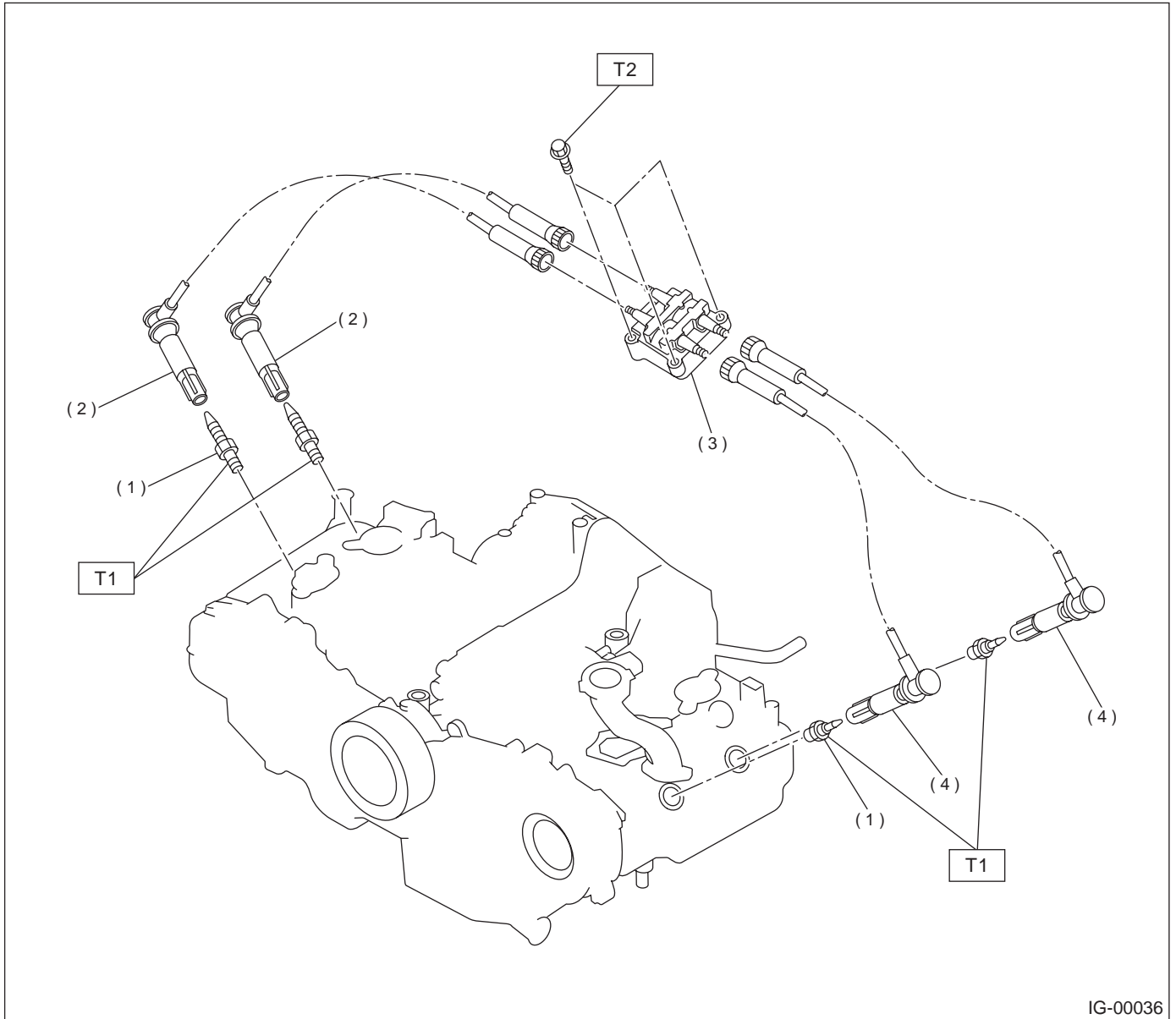
IGNITION

1. General Description

A: SPECIFICATIONS

Item		Designation	
Ignition coil and ignitor assembly	Model	FH0137	
	Manufacturer	DIAMOND	
	Primary coil resistance	0.73 Ω ±10%	
	Secondary coil resistance	12.8 k Ω ±15%	
	Insulation resistance between primary terminal and case	More than 100 M Ω	
Spark plug	Type and manufacturer	Without catalytic converter BKR6E NGK	
		With catalytic converter RC10YC4 CHAMPION BKR5E-11 NGK (Alternate)	
	Thread size	mm 14, P = 1.25	
	Spark gap	Without catalytic converter mm (in)	0.7 — 0.8 (0.028 — 0.031)
		With catalytic converter mm (in)	1.0 — 1.1 (0.039 — 0.043)

B: COMPONENT



- (1) Spark plug
- (2) Spark plug cord (#1, #3)
- (3) Ignition coil and ignitor ASSY

- (4) Spark plug cord (#2, #4)

Tightening torque: N·m (kgf·m, ft·lb)

T1: 21 (2.1, 15)

T2: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

IGNITION

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

2. Spark Plug

A: REMOVAL

CAUTION:

All spark plugs installed on an engine, must be of the same heat range.

Spark plug:

With catalytic converter

CHAMPION: RC10YC4

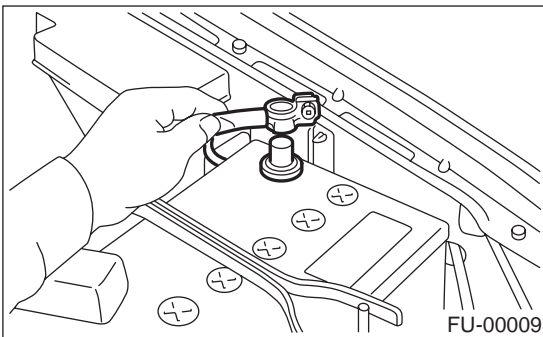
NGK: BKR5E-11 (Alternate)

Without catalytic converter

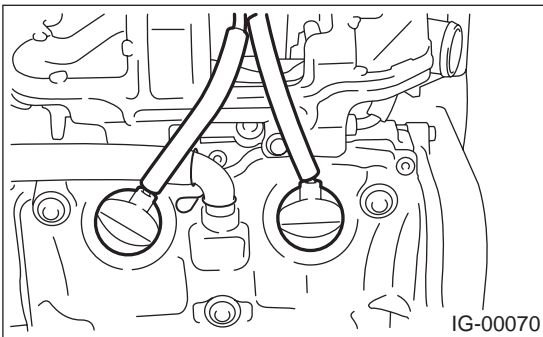
NGK: BKR6E

1. RH SIDE

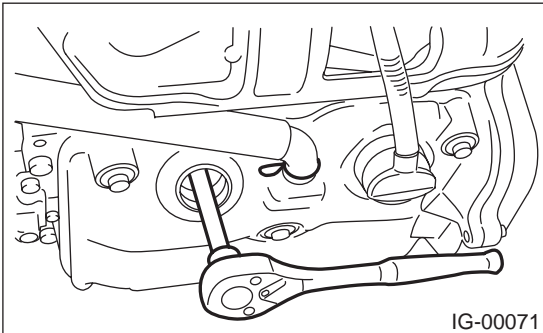
- 1) Disconnect battery ground cable.



- 2) Remove resonator chamber. <Ref. to IN(H4SO)-8, REMOVAL, Resonator Chamber.>
- 3) Remove spark plug cords by pulling boot, not cord itself.

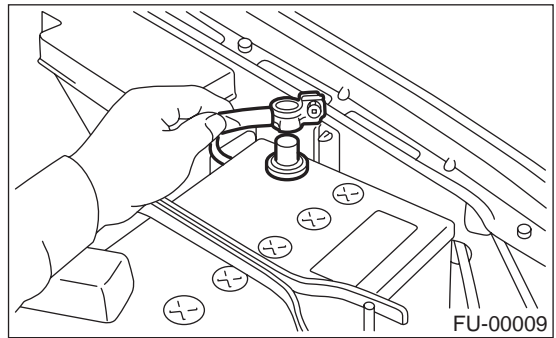


- 4) Remove spark plugs with the spark plug socket.

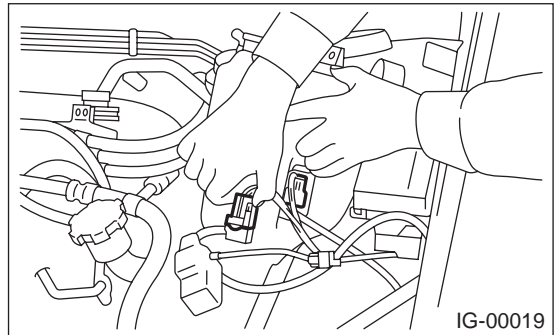


2. LH SIDE

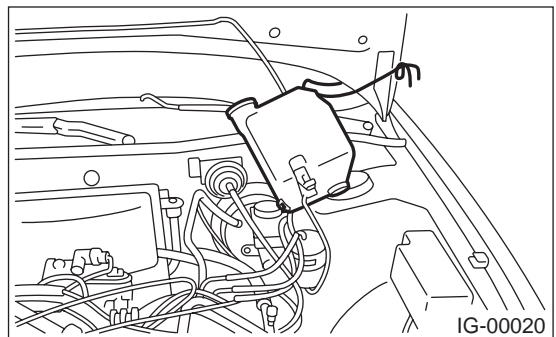
- 1) Disconnect battery ground cable.



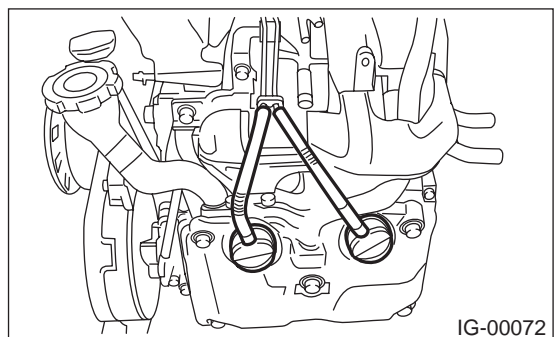
- 2) Disconnect washer motor connector.



- 3) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.
- 4) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



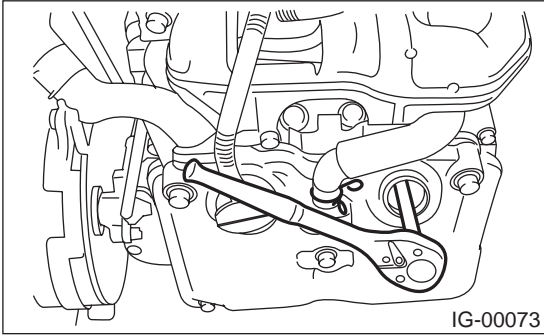
- 5) Remove spark plugs cord by pulling boot, not cord itself.



SPARK PLUG

IGNITION

6) Remove spark plug with the spark plugs socket.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

Tightening torque (Resonator chamber):
33 N·m (3.4 kgf-m, 24.6 ft-lb)

2. LH SIDE

1) Install in the reverse order of removal.

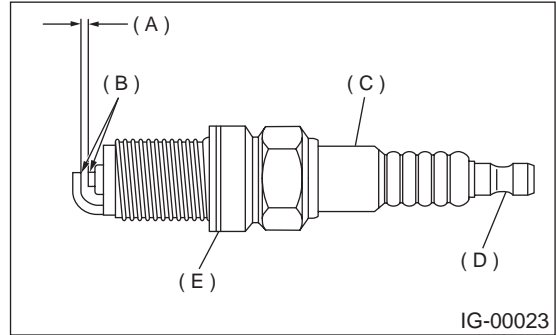
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

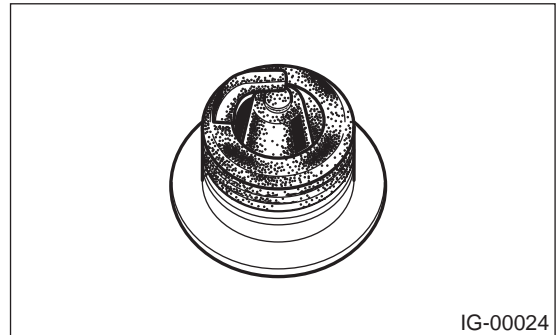
Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal

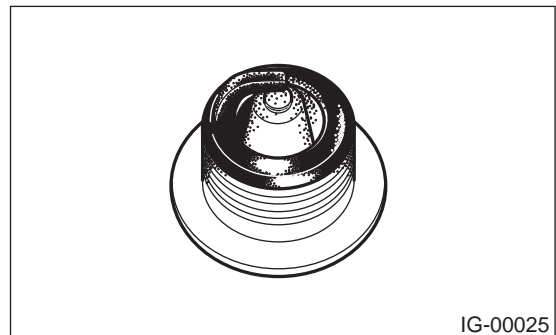
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



2) Carbon fouled

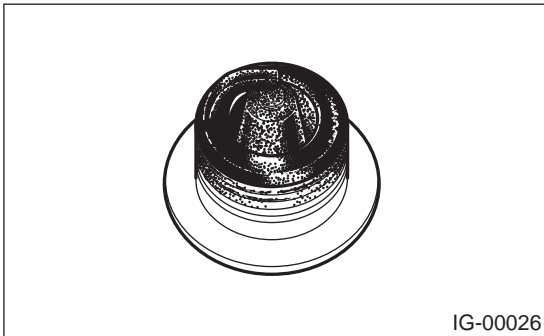
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



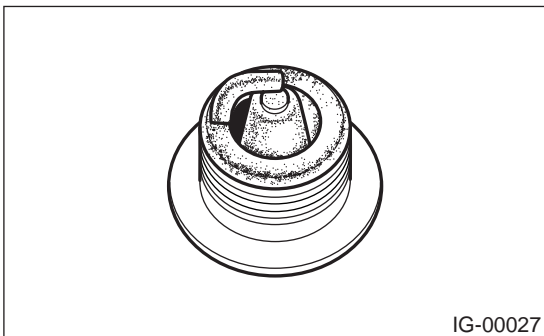
3) Oil fouled

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If same condition remains after repair, use a hotter plug.



4) Overheating

White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.



E: ADJUSTMENT

Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

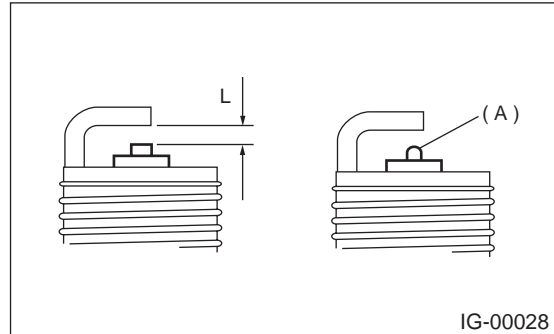
Spark plug gap: L

Without catalytic converter

0.7 — 0.8 mm (0.028 — 0.031 in)

With catalytic converter

1.0 — 1.1 mm (0.039 — 0.043 in)



NOTE:

Replace with new spark plug if this area (A) is worn to “ball” shape.

D: CLEANING

Clean spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.

If deposits are too stubborn, replace plugs.

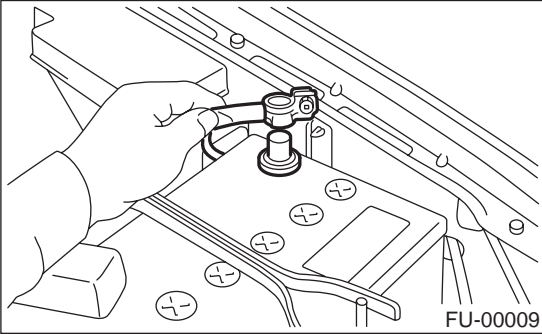
IGNITION COIL AND IGNITOR ASSEMBLY

IGNITION

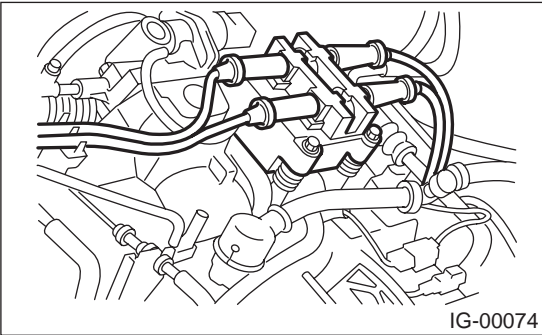
3. Ignition Coil and Ignitor Assembly

A: REMOVAL

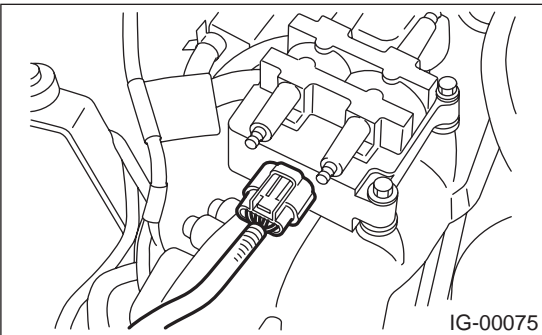
- 1) Disconnect battery ground cable.



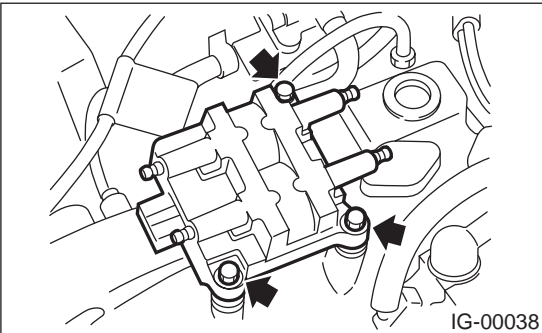
- 2) Disconnect spark plug cords from ignition coil and ignitor assembly.



- 3) Disconnect connector from ignition coil and ignitor assembly.



- 4) Remove ignition coil and ignitor assembly.



B: INSTALLATION

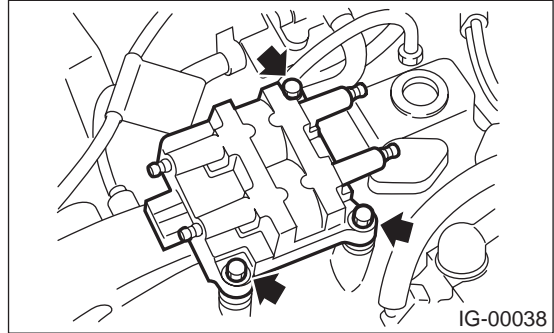
Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

CAUTION:

Be sure to connect wires to their proper positions. Failure to do so will damage unit.



C: INSPECTION

Using accurate tester, inspect the following items, and replace if defective.

- 1) Primary resistance
- 2) Secondary coil resistance

CAUTION:

If the resistance is extremely low, this indicates the presence of a short-circuit.

Specified resistance:

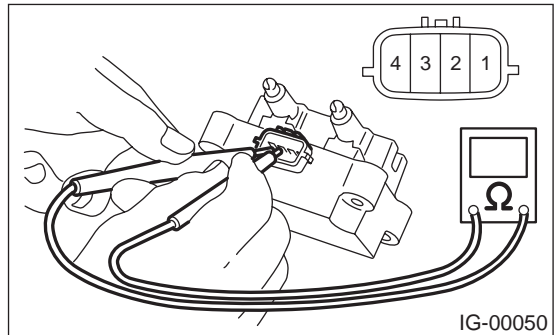
[Primary side]

Between terminal No. 1 and No. 2

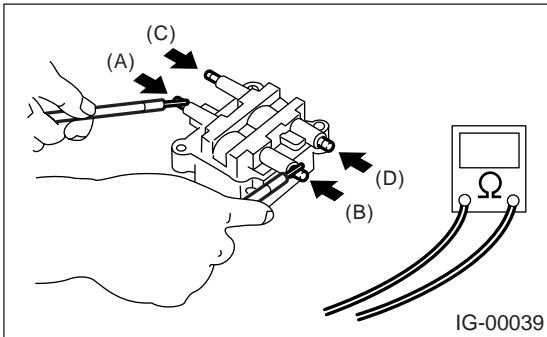
0.73 Ω±10%

Between terminal No. 2 and No. 4

0.73 Ω±10%



[Secondary side]
Between (A) and (B)
12.8 kΩ±15%
Between (C) and (D)
12.8 kΩ±15%



3) Insulation between primary terminal and case:
 100 MΩ or more.

4. Spark Plug Cord

A: INSPECTION

Check for:

- 1) Damage to cords, deformation, burning or rust formation of terminals
- 2) Resistance values of cords

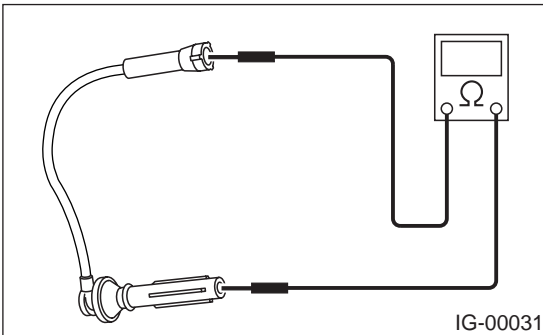
Resistance value:

#1 cord: 5.6 — 10.6

#2 cord: 7.3 — 13.7

#3 cord: 5.9 — 11.1

#4 cord: 7.3 — 13.7



STARTING/CHARGING SYSTEMS

SC(H4SOw/oOBD)

	Page
1. General Description	2



GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

1. General Description

A: SPECIFICATIONS

Specification of model without OBD is the same as that of model with OBD. <Ref. to SC(H4SO)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H4SOw/oOBD)

	Page
1. Basic Diagnostic Procedure	2
2. Check List for Interview	4
3. General Description	6
4. Electrical Components Location.....	9
5. Engine Control Module (ECM) I/O Signal	18
6. Subaru Select Monitor.....	21
7. Read Diagnostic Trouble Code (DTC)	24
8. Inspection Mode.....	26
9. Clear Memory Mode.....	28
10. Compulsory Valve Operation Check Mode	29
11. Engine Malfunction Indicator Lamp (MIL)	30
12. Diagnostics for Engine Starting Failure	39
13. List of Diagnostic Trouble Code (DTC)	57
14. Diagnostic Procedure with Diagnostic Trouble Code (DTC)	59
15. General Diagnostic Table.....	102

BASIC DIAGNOSTIC PROCEDURE

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITH SUBARU SELECT MONITOR

Step	Value	Yes	No
1 CHECK ENGINE START FAILURE. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4SOw/oOBD)-4, CHECK, Check List for Interview.> 2) Start the engine. Does the engine start?	Engine starts.	Go to step 2.	Inspection using "Diagnostics for Engine Starting Failure". <Ref. to EN(H4SOw/oOBD)-39, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). <Ref. to EN(H4SOw/oOBD)-30, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).> Does MIL illuminate?	MIL illuminates.	Go to step 3.	Inspection using "General Diagnostic Table". <Ref. to EN(H4SOw/oOBD)-102, INSPECTION, General Diagnostic Table.>
3 CHECK INDICATION OF DTC ON DISPLAY. 1) Turn ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn ignition switch to ON and the Subaru Select Monitor switch to ON. 4) Read DTC on the Subaru Select Monitor. <Ref. to EN(H4SOw/oOBD)-24, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Does the Subaru Select Monitor indicate DTC? <Ref. to EN(H4SOw/oOBD)-57, LIST, List of Diagnostic Trouble Code (DTC).>	DTC is displayed on Subaru select monitor.	Record diagnostic trouble code. Repair the trouble cause. <Ref. to EN(H4SOw/oOBD)-59, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Go to step 4.	Repair the related parts. NOTE: If DTC is not shown on display although the MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(H4SOw/oOBD)-30, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1) Perform the clear memory mode. <Ref. to EN(H4SOw/oOBD)-28, OPERATION, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H4SOw/oOBD)-26, OPERATION, Inspection Mode.> Does the Subaru Select Monitor indicate DTC? <Ref. to EN(H4SOw/oOBD)-57, LIST, List of Diagnostic Trouble Code (DTC).>	DTC is displayed on Subaru select monitor.	Record diagnostic trouble code. Repair the trouble cause. <Ref. to EN(H4SOw/oOBD)-59, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Go to step 4.	Complete the diagnosis.

BASIC DIAGNOSTIC PROCEDURE

ENGINE (DIAGNOSTICS)

2. WITHOUT SUBARU SELECT MONITOR

- Be sure to check again from the beginning in order to prevent secondary trouble caused by repair work.

CAUTION:

- Check the connector while it is connected unless specified otherwise.

Step	Value	Yes	No
1 CHECK ENGINE START FAILURE. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4SOw/oOBD)-4, CHECK, Check List for Interview.> 2) Start the engine. Does the engine start?	Engine starts.	Go to step 2.	Inspection using "Diagnostics for Engine Starting Failure". <Ref. to EN(H4SOw/oOBD)-39, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). <Ref. to EN(H4SOw/oOBD)-30, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).> Does MIL illuminate?	MIL illuminates.	Go to step 3.	Inspection using "9. General Diagnostic Table". <Ref. to EN(H4SOw/oOBD)-102, INSPECTION, General Diagnostic Table.>
3 CHECK INDICATION OF DTC ON MIL. 1) Perform the read diagnostic trouble code (read memory mode). <Ref. to EN(H4SOw/oOBD)-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> 2) Read DTC on MIL. Does the MIL indicate DTC? <Ref. to EN(H4SOw/oOBD)-57, LIST, List of Diagnostic Trouble Code (DTC).>	DTC is displayed on MIL.	Repair the trouble cause. Go to step 4.	Repair the related parts. NOTE: If DTC is not shown on MIL although the MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(H4SOw/oOBD)-30, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1) Perform the clear memory mode. <Ref. to EN(H4SOw/oOBD)-28, OPERATION, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H4SOw/oOBD)-26, OPERATION, Inspection Mode.> Does the MIL indicate DTC? <Ref. to EN(H4SOw/oOBD)-67, DTC 21 ENGINE COOLANT TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	DTC is displayed on MIL.	Repair the trouble cause. Go to step 4.	Complete the diagnosis.

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Outdoor temperature	°F (°C)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Cooling fan	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CB	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF		

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostics indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> VDC warning light <input type="checkbox"/> Engine oil pressure warning light
b) Fuel level
<ul style="list-style-type: none">• Lack of gasoline: <input type="checkbox"/> Yes/<input type="checkbox"/> No• Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:• Where:
f) Occurrence of noise: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> No shift <input type="checkbox"/> Excessive shift shock

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:

- All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery terminals while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing ECM from the located position, disconnect two cables on battery.

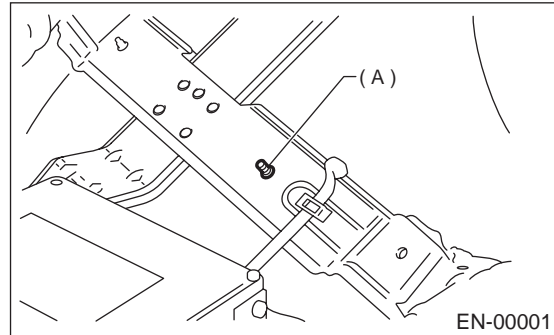
- Otherwise, the ECM may be damaged.

CAUTION:

When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

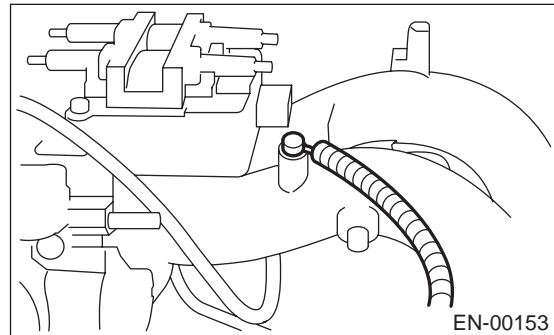
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.

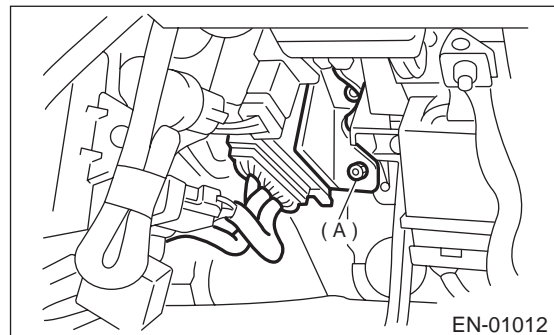


(A) Stud bolt

9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from the control unit. (The ECM is located inside of the instrument panel lower trim panel.)

- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.

14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.

15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.

16) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).

17) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

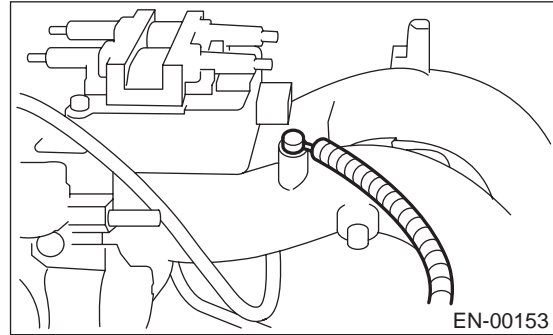
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.

With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

- Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

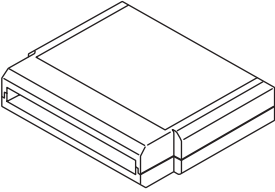

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

D: PREPARATION TOOL

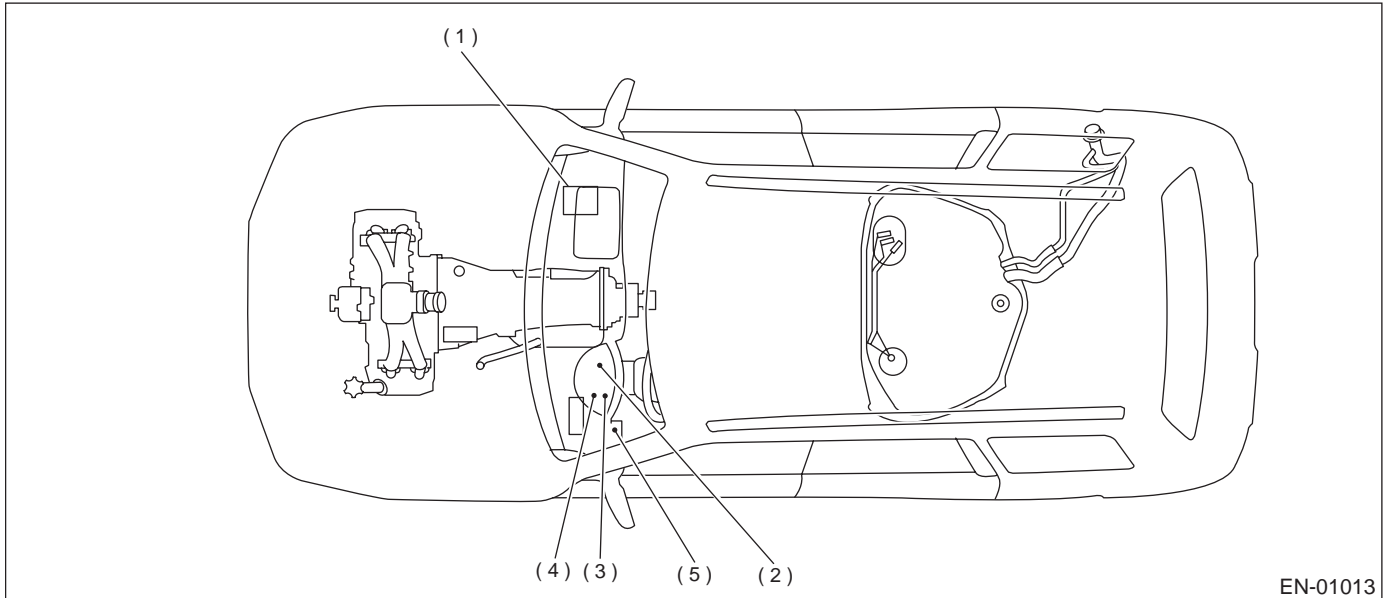
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
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 <p style="text-align: center;">ST22771AA030</p>	<p>22771AA030</p>	<p>SELECT MONITOR KIT</p>	<p>Troubleshooting for electrical systems.</p> <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

4. Electrical Components Location

A: LOCATION

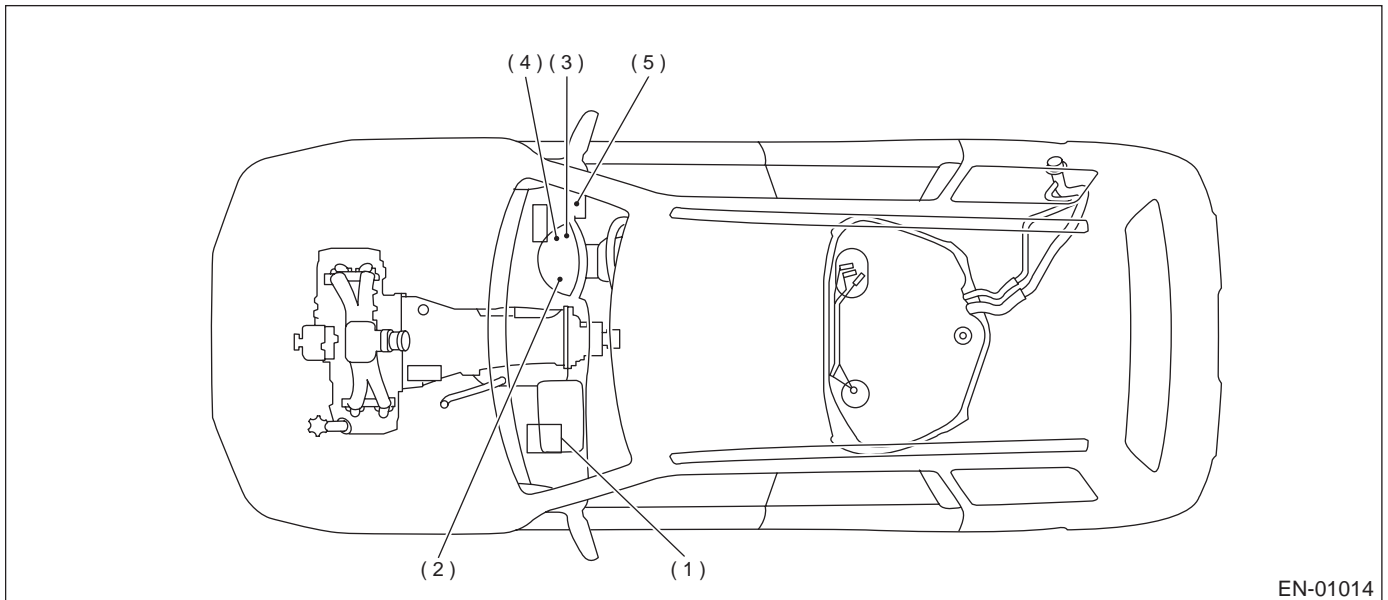
1. MODULE

- LHD model



EN-01013

- RHD model

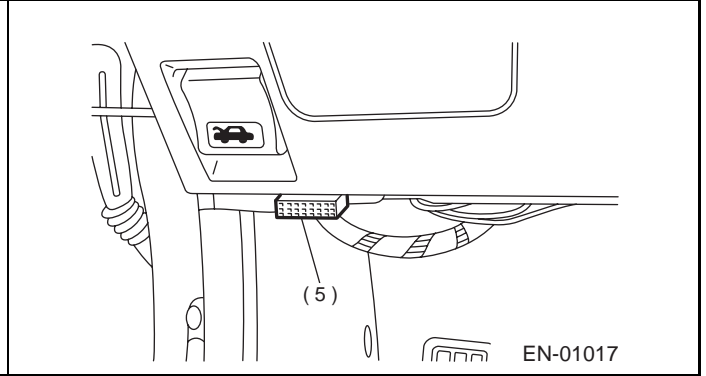
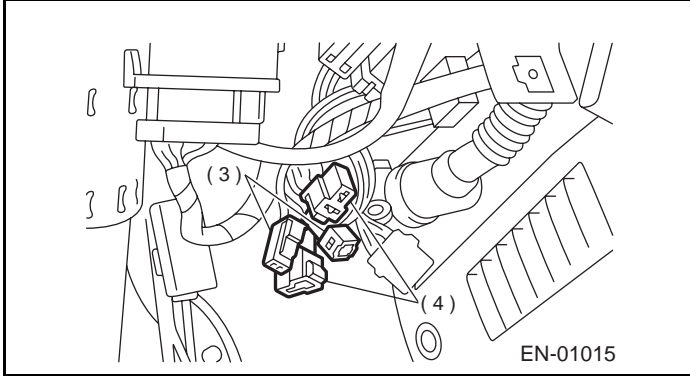
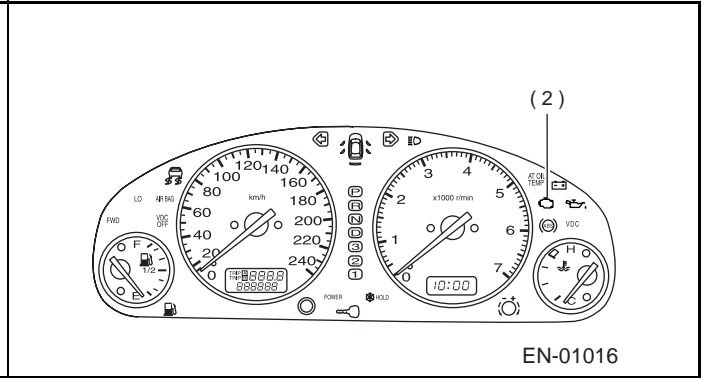
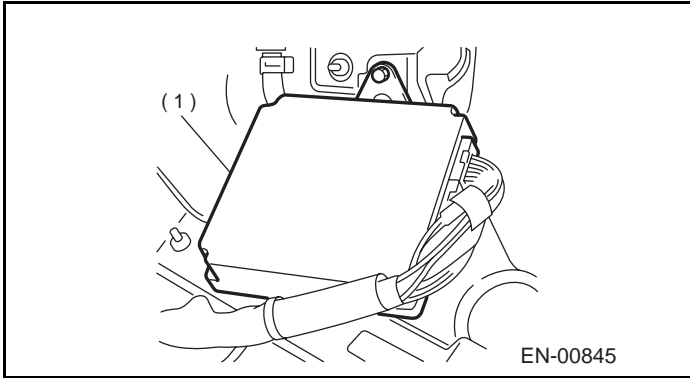


EN-01014

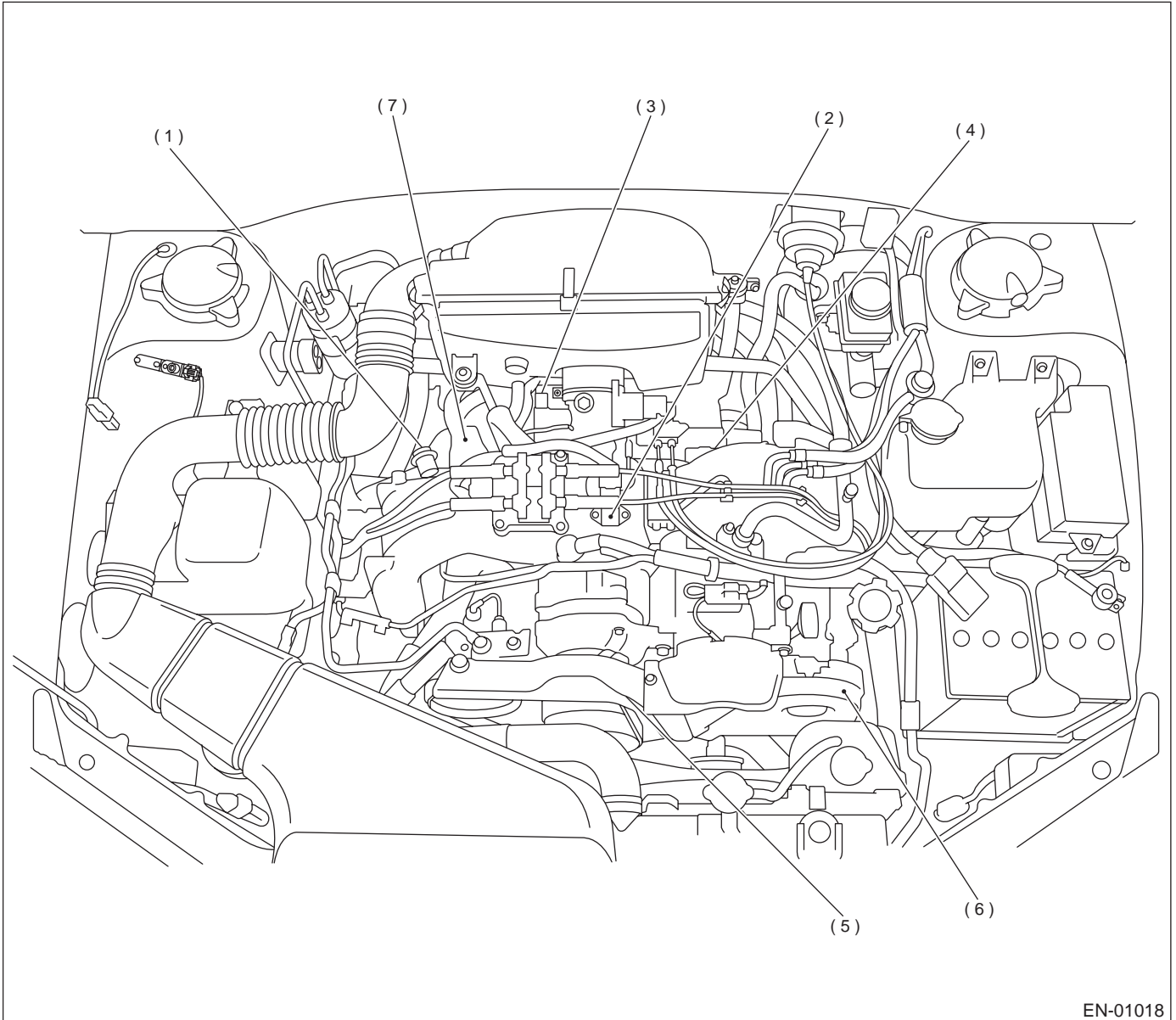
- | | | |
|---|---------------------------|-------------------------|
| (1) Engine control module (ECM) | (3) Read memory connector | (5) Data link connector |
| (2) CHECK ENGINE malfunction indicator lamp (MIL) | (4) Test mode connector | |

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



2. SENSOR



(1) Engine coolant temperature sensor

(2) Intake air temperature and pressure sensor

(3) Throttle position sensor

(4) Knock sensor

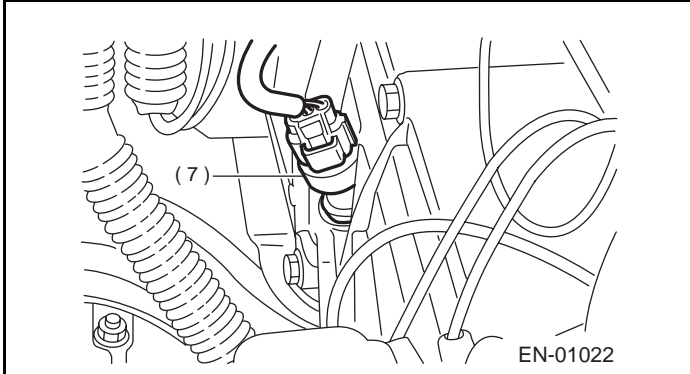
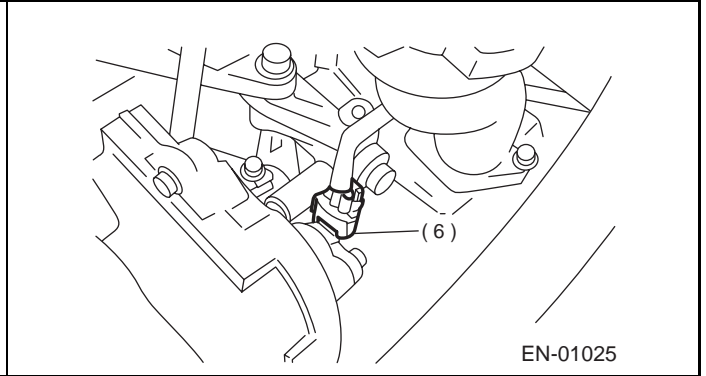
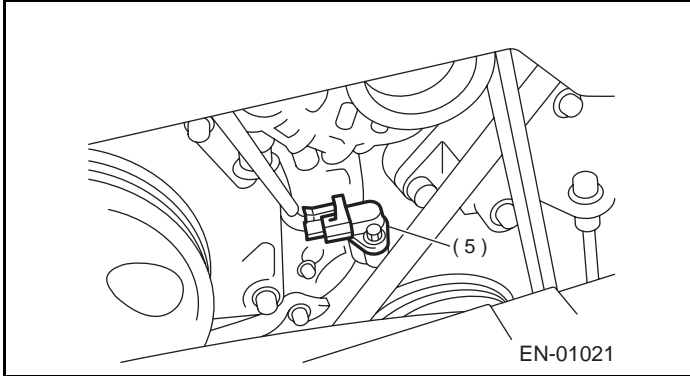
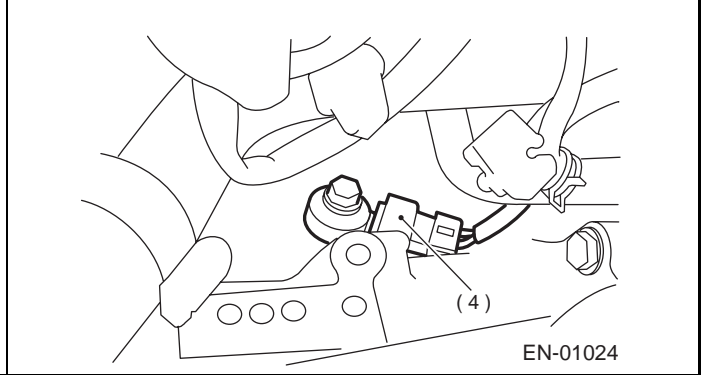
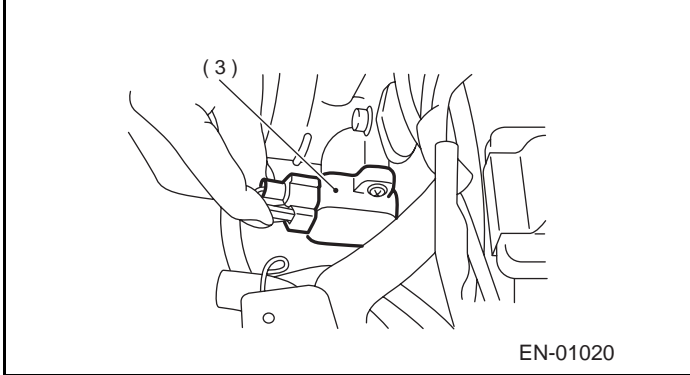
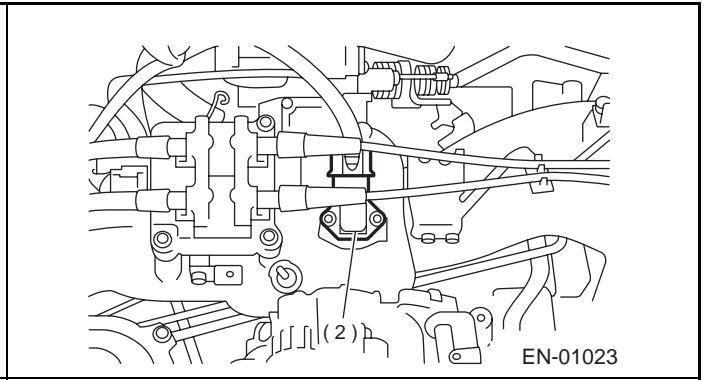
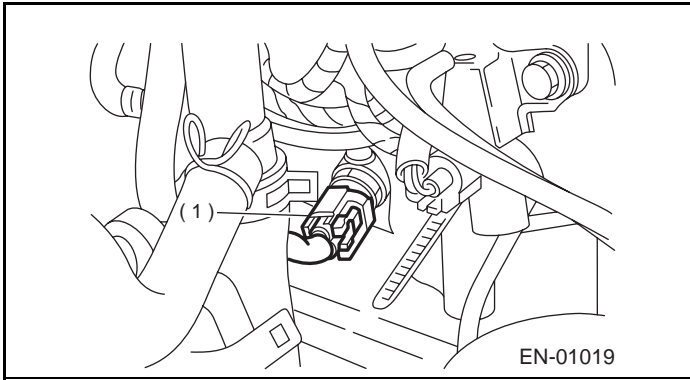
(5) Crankshaft position sensor

(6) Camshaft position sensor

(7) Vehicle speed sensor

ELECTRICAL COMPONENTS LOCATION

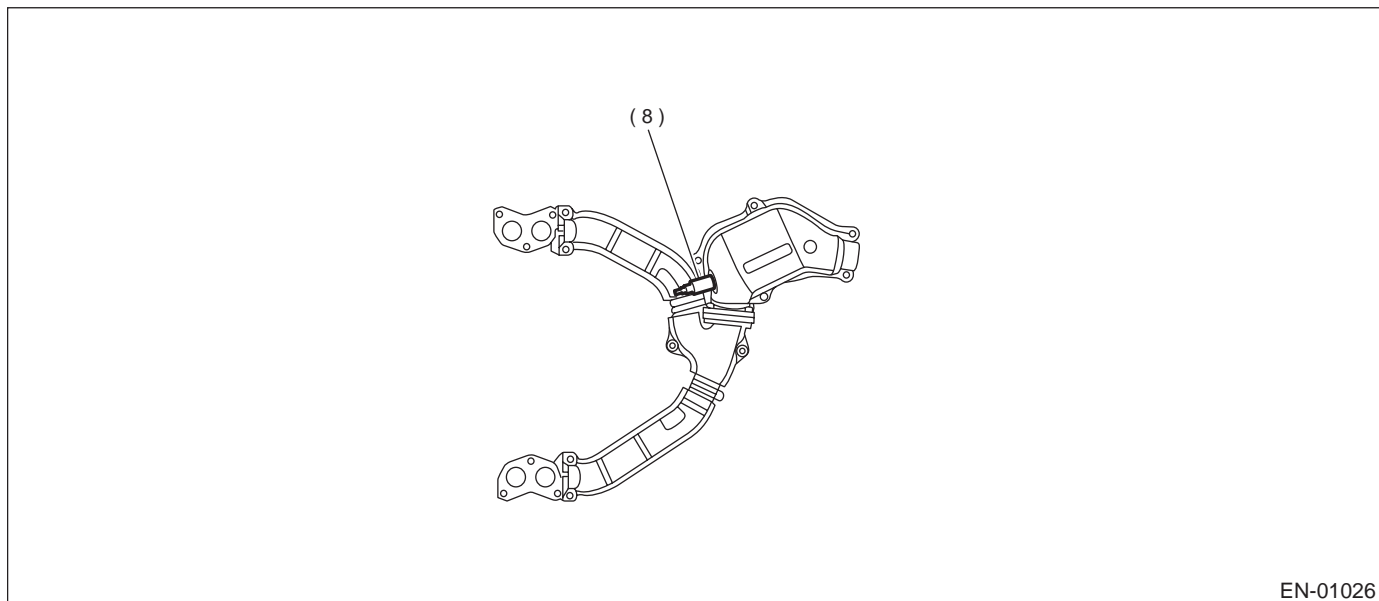
ENGINE (DIAGNOSTICS)



SUBARU

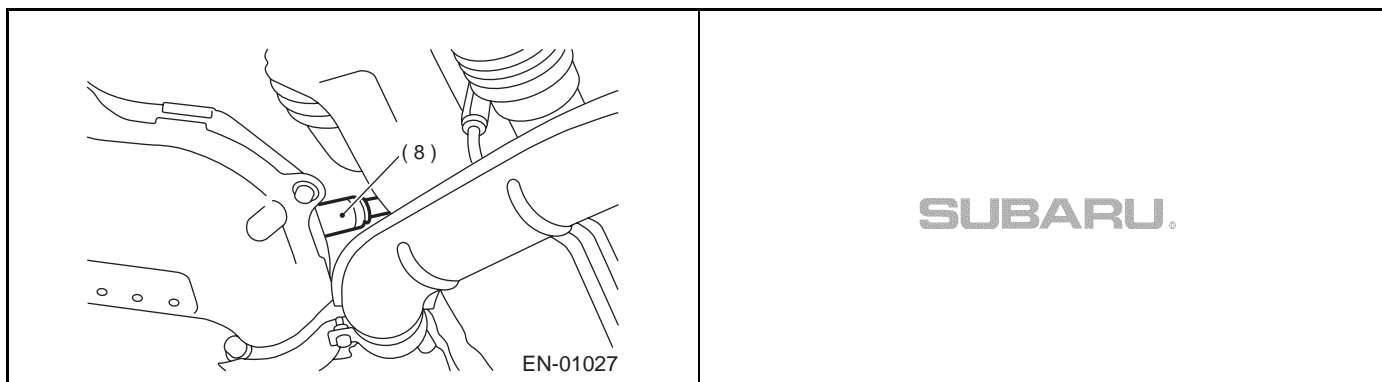
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



EN-01026

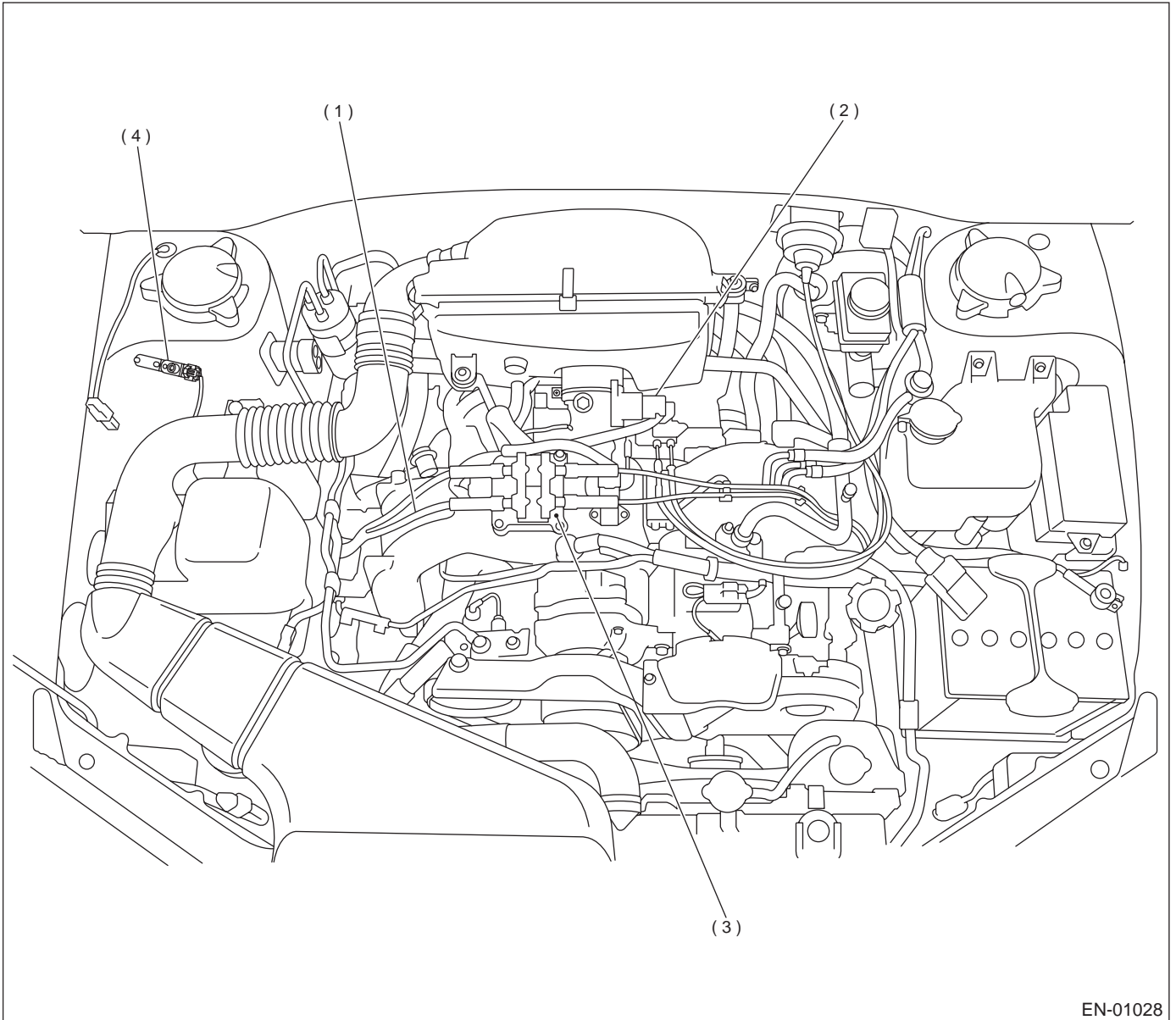
(8) Oxygen sensor (With catalyst model)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

3. SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



EN-01028

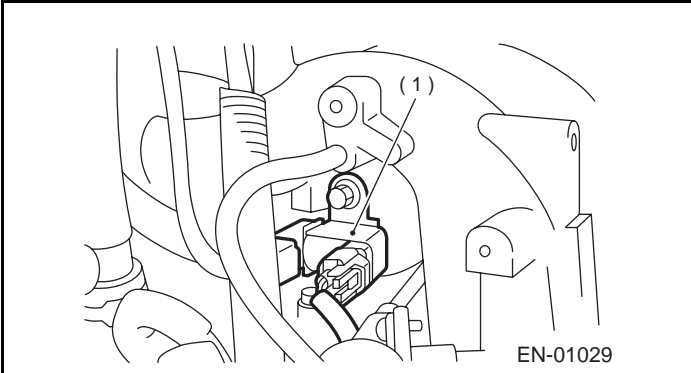
- (1) Purge control solenoid valve
- (2) Idle air control solenoid valve

- (3) Ignition coil and ignitor ASSY

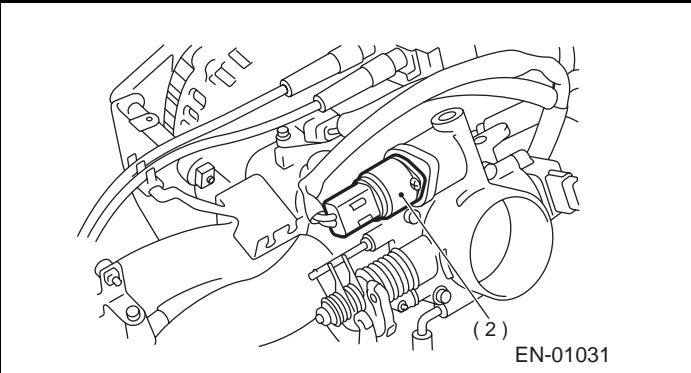
- (4) CO resistor (Without catalyst model)

ELECTRICAL COMPONENTS LOCATION

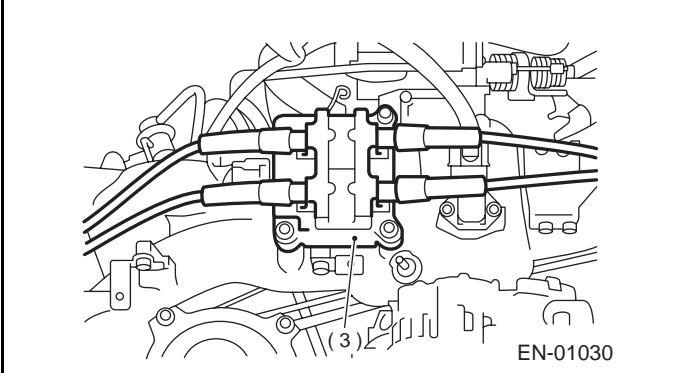
ENGINE (DIAGNOSTICS)



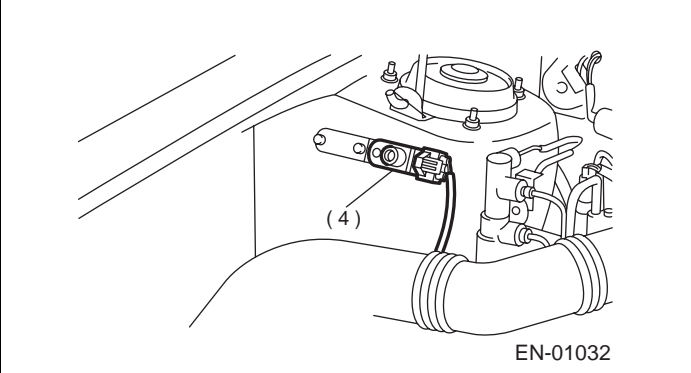
EN-01029



EN-01031



EN-01030

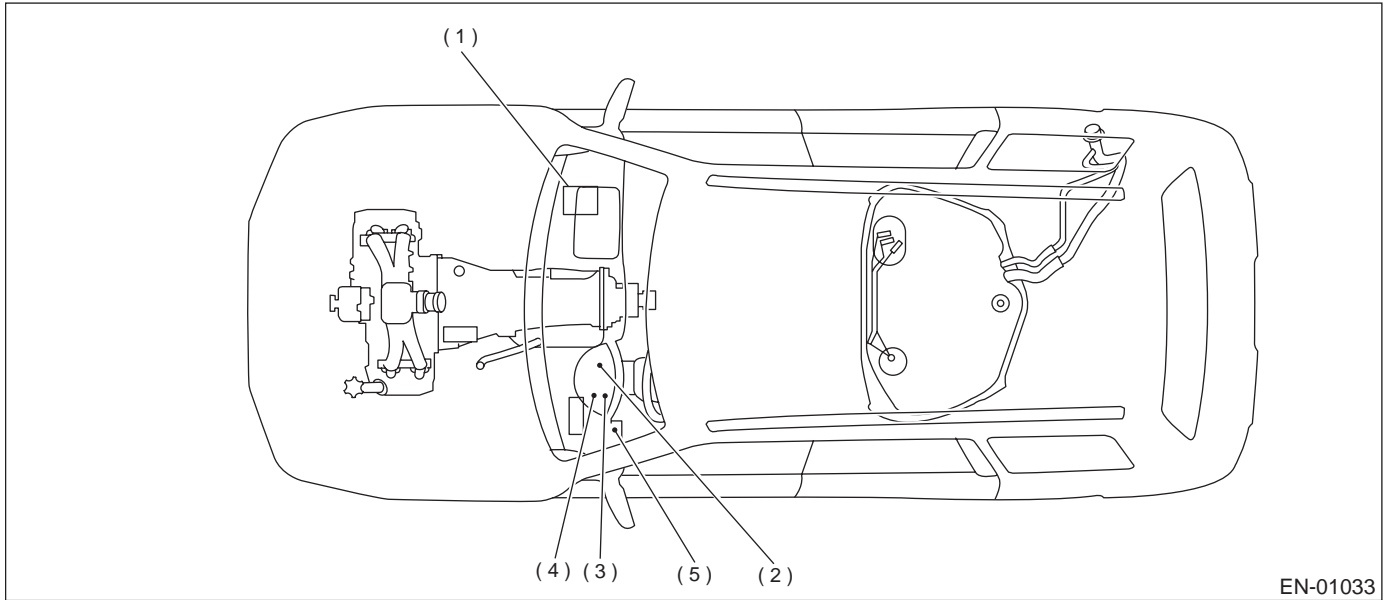


EN-01032

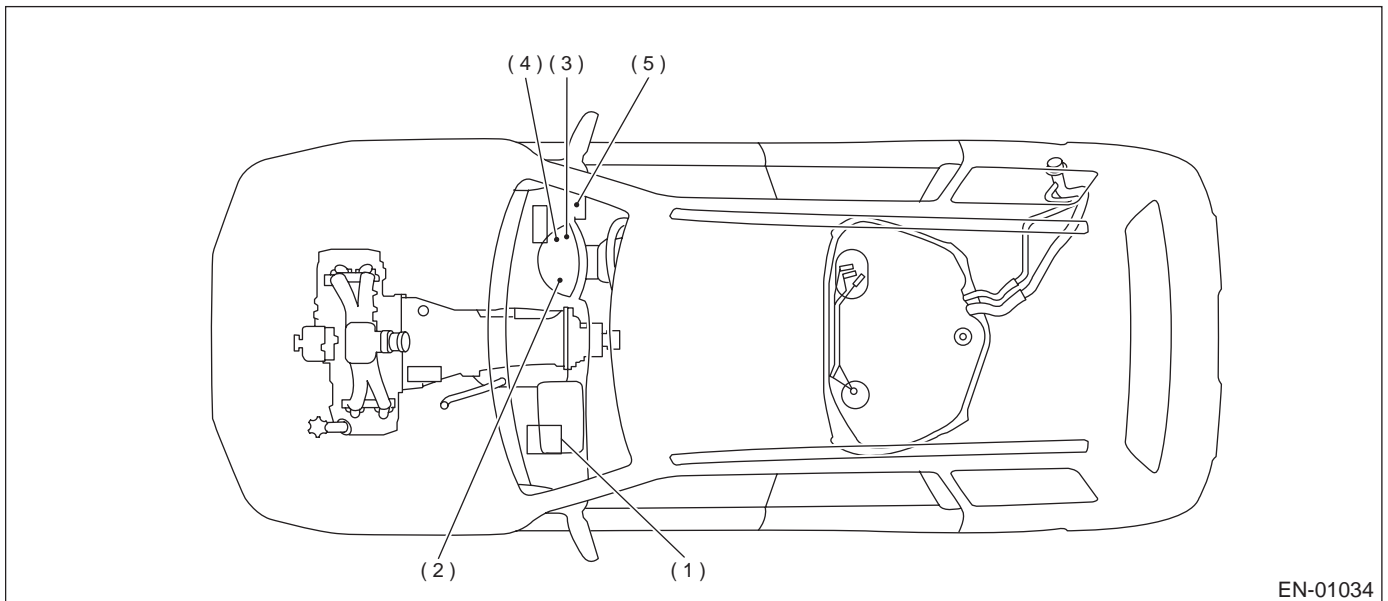
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• LHD model



• RHD model



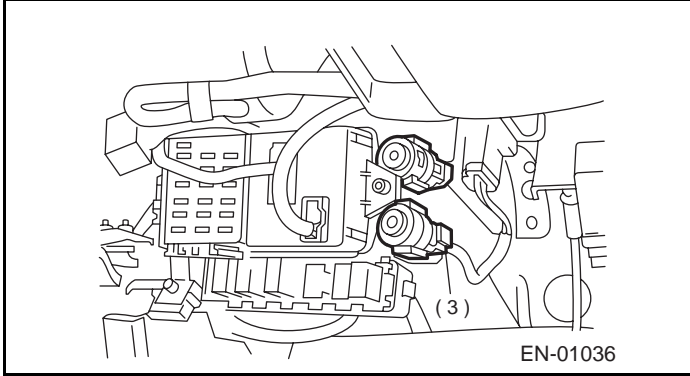
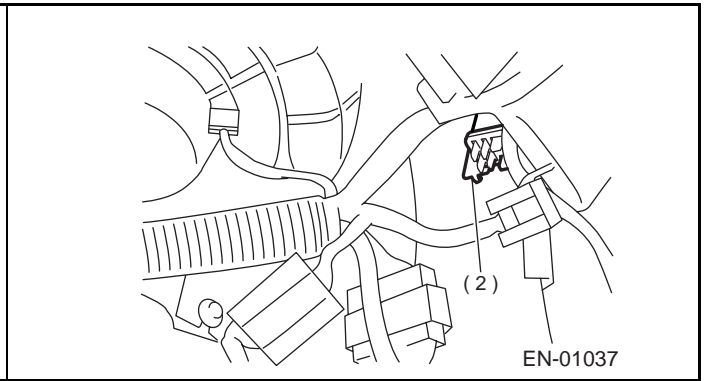
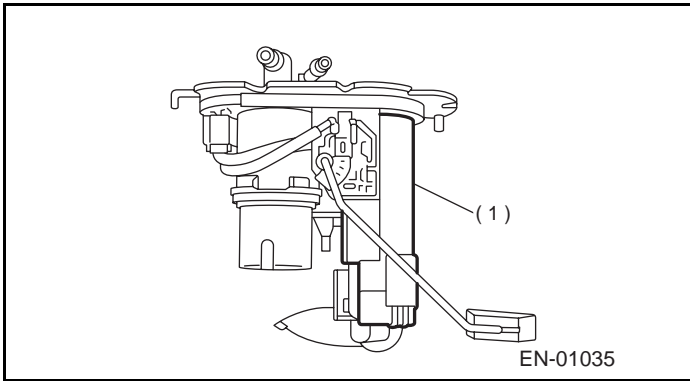
(1) Fuel pump

(2) Main relay

(3) Fuel pump relay

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

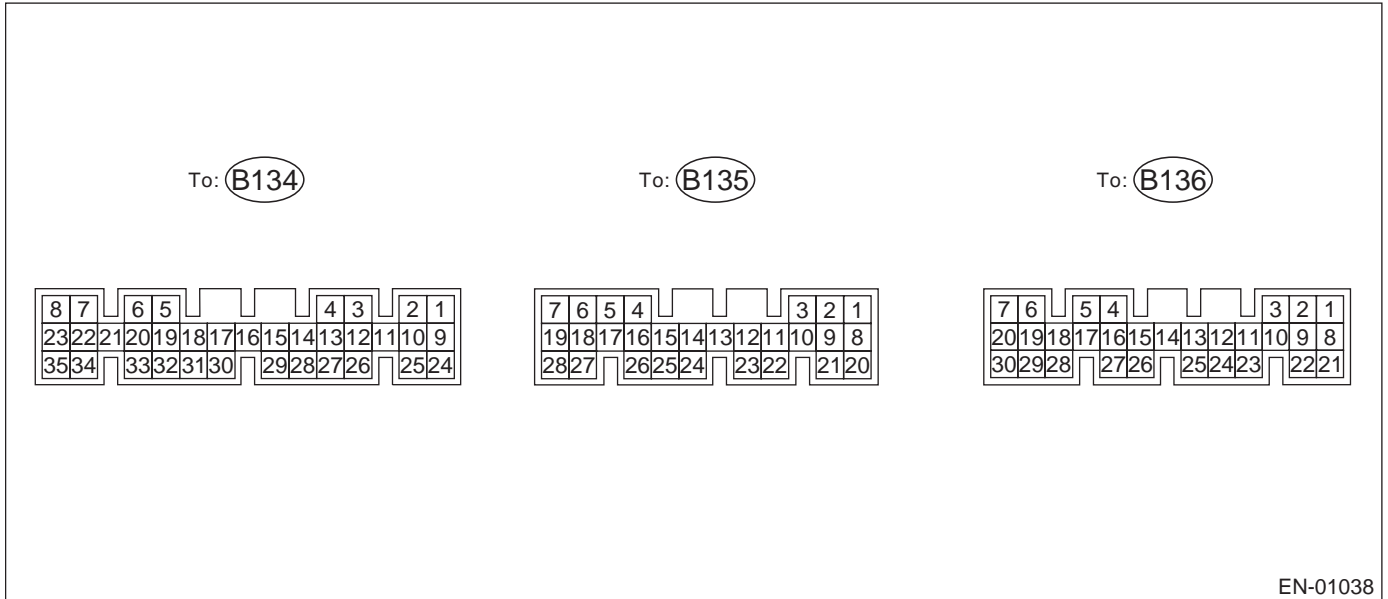


ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



EN-01038

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content		Connector No.	Terminal No.		Signal (V)		Note
					Ignition SW	Engine ON	
					ON (Engine OFF)	(Idling)	
Crankshaft position sensor	Signal (+)	B135	*2	1	0	±6	Sensor output waveform
	Signal (-)	B135	8		0	0	—
	Shield	B135	10		0	0	—
Camshaft position sensor	Signal (+)	B135	*1	2	0	±6	Sensor output waveform
	Signal (-)	B135	8		0	0	—
	Shield	B135	10		0	0	—
Intake air temperature sensor	Signal	B136	13		2.3 — 2.5	1.4 — 1.6	Ambient temperature: 25°C (77°F)
Throttle position sensor	Signal	B136	17		Fully closed: 0.5±0.3 Fully opened: 4.3±0.3		—
	Power supply	B136	15		5	5	—
	GND	B136	16		0	0	—
Oxygen sensor	Signal	B136	7		0		Rich mixture: 0.7 Lean mixture: 0
	Shield	B136	23		0	0	—
Engine coolant temperature sensor	Signal	B136	14		0.6 — 1.0	0.6 — 1.0	After warm-up
	GND	B136	16		0	0	—
Vehicle speed sensor		B135	24		0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.
Starter switch		B135	28		0	0	Cranking: 10 to 14
A/C switch		B135	27		ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B135	7		10 — 13	13 — 14	—
Neutral position switch (MT)		B135	26		ON: 5 OFF: 0		Switch is ON when gear is in neutral position.
Park/Neutral position switch (AT)		B135	26		ON: 0 OFF: 5		Switch is ON when shift lever is in "P" or "N" position.
Test mode connector		B135	14		5	5	When connected: 0
Read memory connector		B135	15		5	5	When connected: 0
Back-up power supply		B136	9		10 — 13	13 — 14	—
Control unit power supply		B136	1	2	10 — 13	13 — 14	—
Ignition control	# 1, # 2	B134	25		0	3.4, max.	—
	# 3, # 4	B134	26		0	3.4, max.	—
Fuel injector	# 1	B134	4		10 — 13	13 — 14	Waveform
	# 2	B134	13		10 — 13	13 — 14	Waveform
	# 3	B134	14		10 — 13	13 — 14	Waveform
	# 4	B134	15		10 — 13	13 — 14	Waveform

*: With immobilizer

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content		Connector No.	Terminal No.		Signal (V)		Note
					Ignition SW	Engine ON (Idling)	
					ON (Engine OFF)		
Idle air control solenoid valve	Signal 1	B134	5	—	1 — 13	Waveform	
	Signal 2	B134	6	—	1 — 13	Waveform	
	Signal 3	B134	19	—	1 — 13	Waveform	
	Signal 4	B134	20	—	1 — 13	Waveform	
Torque control signal 1		B135	16	5	5	—	
Torque control signal 2		B135	17	5	5	—	
Fuel pump relay control		B134	29*	16	ON: 0 OFF: 10 — 13	0	—
A/C relay control		B134	17		ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Radiator fan relay 1 control		B134	3		ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Radiator fan relay 2 control		B134	12		ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Self-shutoff control		B135	19		10 — 13	13 — 14	—
Malfunction indicator lamp		B134	11		—	—	Light "ON": 1, max. Light "OFF": 10 — 14
Engine speed output		B134	30		—	0 — 13, min.	Waveform
Knock sensor	Signal	B136	4		2.8	2.8	—
	Shield	B136	25		0	0	—
Pressure sensor	Signal	B136	5		3.4 — 3.6	1.2 — 1.8	—
	Power supply		15		5	5	—
	GND		16		0	0	—
Purge control solenoid valve		B134	2		ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
GND (sensors)		B136	16		0	0	—
GND (injectors)		B134	7		0	0	—
GND (ignition system)		B134	27		0	0	—
GND (power supply)		B134	8		0	0	—
GND (control systems)		B136	21		0	0	—
		B136	22		0	0	—
Select monitor signal		B135	11		—	—	—
			12		—	—	—
Power steering switch		B135	13		ON: 0 OFF: 10 — 13	ON: 0 OFF: 10 — 13	—
Torque control cut signal		B134	31		8	8	—
AT load signal		B136	11		0 — 0.3	0.8 — 1.2	—
MT/AT identification		B135	25		MT: 0 AT: 5	MT: 0 AT: 5	—

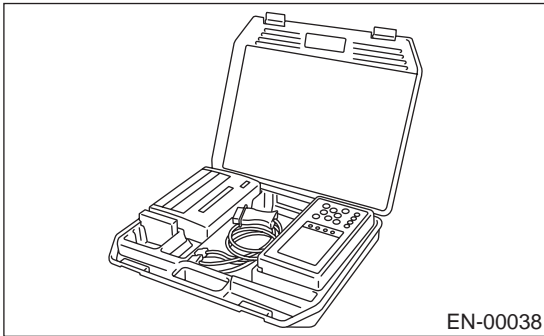
*: With immobilizer

6. Subaru Select Monitor

A: OPERATION

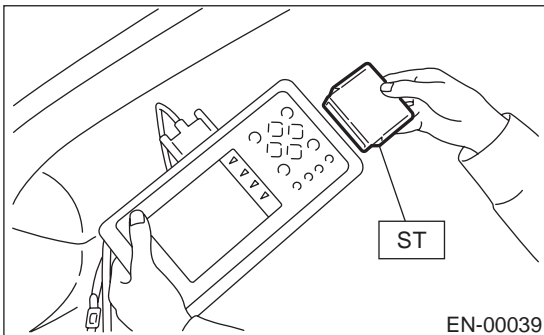
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru Select Monitor kit.



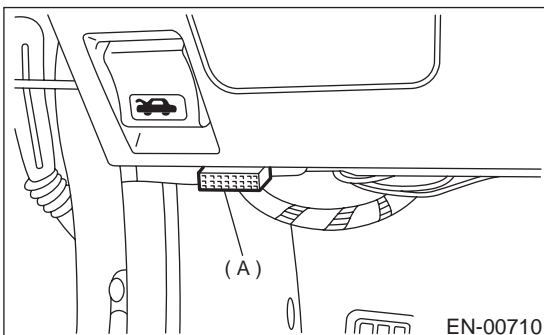
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor.



4) Connect Subaru Select Monitor to data link connector.

(1) Data link connector (A) located in the lower portion of the instrument panel (on the driver's side).

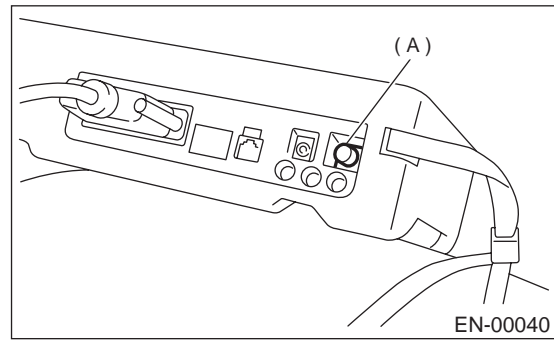


(2) Connect diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for Subaru Select Monitor.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using Subaru Select Monitor, call up diagnostic trouble code(s) and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE.

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H4SOw/oOBD)-24, Read Diagnostic Trouble Code (DTC).>

3. READ CURRENT DATA SHOWN ON DISPLAY.

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

3) Press the [YES] key after displayed the information of engine type.

4) On the «Engine Diagnosis» display screen, select the {1. Current Data Display & Save} and press the [YES] key.

5) On the «Data Display Menu» display screen, select the {1. 12 Data Display} and press the [YES] key.

6) Using the scroll key, move the display screen up or down until the desired data is shown.

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

- A list of the support data is shown in the following table.

Contents	Unit of measure
Battery voltage	V
Vehicle speed signal	km/h or MPH
Engine speed signal	rpm
Engine coolant temperature signal	°C or °F
Ignition timing signal	deg
Pressure sensor signal	mmHg or kPa or inHg or psi
Intake air temperature signal	°C or °F
Throttle position signal	V
Injection pulse width	ms
ISC valve step	STEP
Oxygen sensor output signal*1	V
Knock correction	deg
CO resistor*2	g/h
A/F correction #1	%
A/F learning #1	%
Ignition switch signal	ON or OFF
Automatic transmission vehicle identification signal	ON or OFF
Test mode connector signal	ON or OFF
Neutral position switch signal	ON or OFF
Air conditioning switch signal	ON or OFF
Air conditioning compressor signal	ON or OFF
Radiator fan relay signal #1	ON or OFF
Fuel pump relay signal	ON or OFF
Knocking signal	ON or OFF
Radiator fan relay signal #2	ON or OFF
Torque control signal #1	ON or OFF
Torque control signal #2	ON or OFF
Torque permission signal	ON or OFF
TCS AET signal	ON or OFF
Canister purge control solenoid valve	ON or OFF
Oxygen sensor rich signal	ON or OFF
Read memory connector signal	ON or OFF
P/S switch	ON or OFF
Starter switch	ON or OFF
Crankshaft position sensor signal	ON or OFF
Camshaft position sensor signal	ON or OFF
Rear defogger switch	ON or OFF
Blower fan switch	ON or OFF
Light switch	ON or OFF
Idle switch signal	ON or OFF

*1: With catalyst model only

*2: Without catalyst model only

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. LED OPERATION MODE FOR ENGINE

Contents	Message	LED "ON" requirements
Ignition switch signal	ON or OFF	When ignition switch is turned ON.
Automatic transmission vehicle identification signal	ON or OFF	When AT identification signal is entered.
Test mode connector signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal*1	ON or OFF	When neutral position switch signal is entered.
Air conditioning switch signal	ON or OFF	When air conditioning switch is turned ON.
Air conditioning compressor signal	ON or OFF	When air conditioning compressor is in function.
Radiator fan relay signal #1	ON or OFF	When radiator fan relay #1 is in function.
Fuel pump relay signal	ON or OFF	When fuel pump relay is in function.
Knocking signal	ON or OFF	When knocking signal is entered.
Radiator fan relay signal #2	ON or OFF	When radiator fan relay #2 is in function.
Engine torque control signal #1	ON or OFF	When torque control signal #1 is entered.
Torque control signal #2	ON or OFF	When torque control signal #2 is entered.
Torque permission signal	ON or OFF	When torque permission signal is entered.
TCS AET signal	ON or OFF	When TCS AET signal is entered.
Canister purge control solenoid valve	ON or OFF	When canister purge control solenoid valve is in function.
Oxygen sensor rich signal*2	ON or OFF	When oxygen sensor mixture ratio is rich.
Read memory connector signal	ON or OFF	When read memory connector is connected.
P/S switch	ON or OFF	When steering wheel is turned.
Starter switch	ON or OFF	When starter switch signal is entered.
Crankshaft position sensor signal	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	ON or OFF	When camshaft position sensor signal is entered.
Rear defogger switch	ON or OFF	When rear defogger switch signal is entered.
Blower fan switch	ON or OFF	When blower fan switch signal is entered.
Light switch	ON or OFF	When light switch signal is entered.
Idle switch signal	ON or OFF	When throttle sensor sends signal that throttle opening angle is in idle position.

*1: On MT model, switch is turned ON when gear position is in neutral position.

On AT model, switch is turned ON when shift position is in "P" or "N" position.

*2: With catalyst model only

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

READ DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITH SUBARU SELECT MONITOR

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SOW/oOBD)-57, LIST, List of Diagnostic Trouble Code (DTC).>

2. WITHOUT SUBARU SELECT MONITOR

Step	Value	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 1) Turn ignition switch to OFF. 2) Connect read memory connector. <Ref. to EN(H4SOW/oOBD)-9, LOCATION, Electrical Components Location.> 3) Turn ignition switch to ON. Does the MIL come on?	MIL illuminates.	Go to step 2.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none">• Open or short circuit in engine control module power supply or ground line• Open or short circuit in CHECK ENGINE malfunction indicator lamp
2 CHECK DIAGNOSTIC TROUBLE CODE (DTC). Does the MIL indicate diagnostic trouble code (DTC)?	DTC is displayed.	Record diagnostic trouble code (DTC). Then turn ignition switch to OFF, disconnect read memory connector.	Complete read diagnostic trouble code. Turn ignition switch to OFF and disconnect read memory connector.

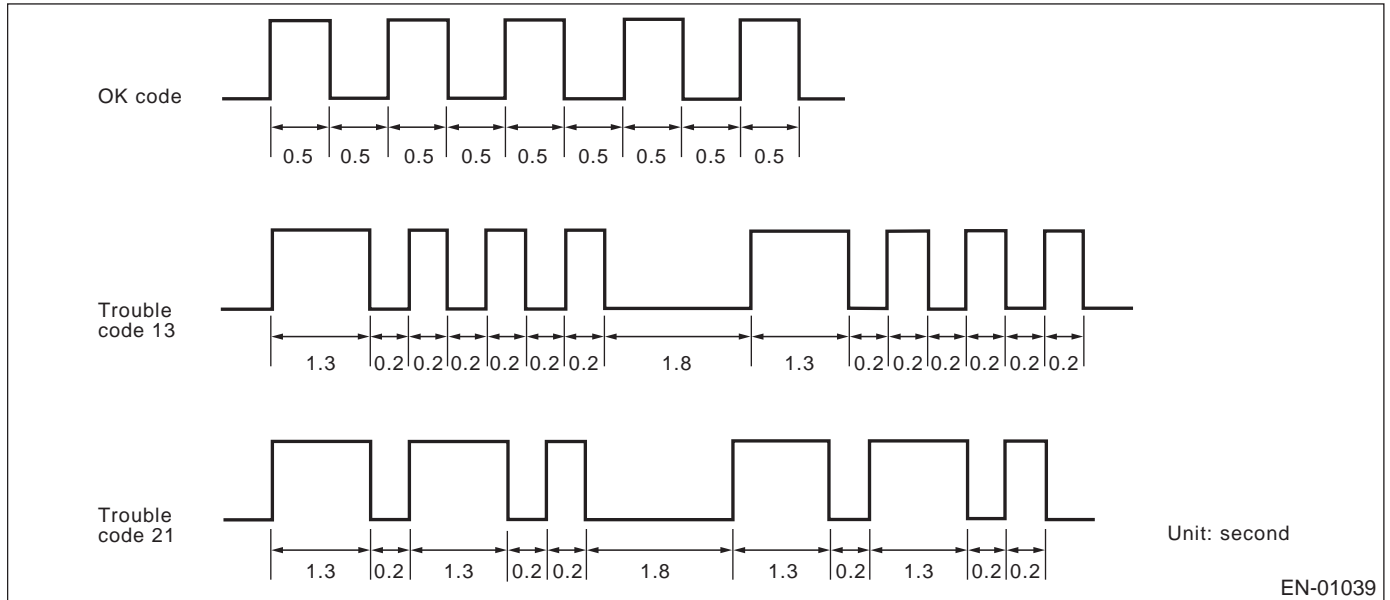
READ DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

The CHECK ENGINE malfunction indicator lamp (MIL) flashes the code corresponding to the faulty parts. The long segment (1.3 seconds ON) indicates a “ten”, and the short segment (0.2 seconds ON) signifies “one”. And middle segment (0.5 seconds ON) means OK code.

NOTE:

- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SOW/oOBD)-57, LIST, List of Diagnostic Trouble Code (DTC).>



8. Inspection Mode

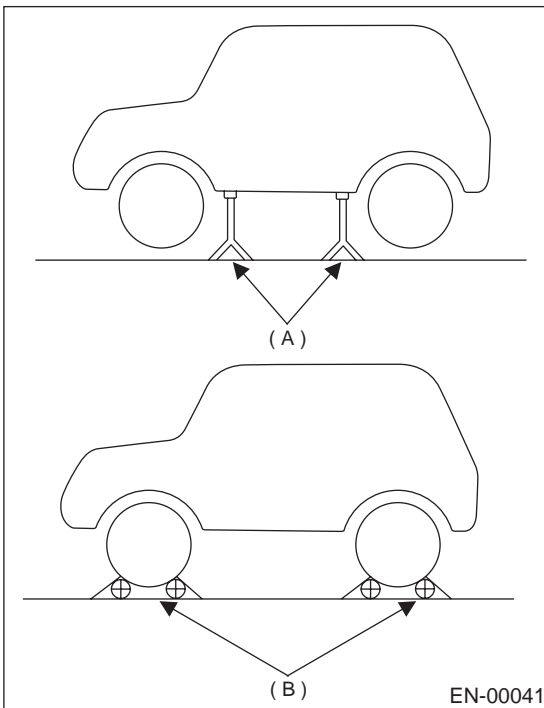
A: OPERATION

1. PREPARATIONS FOR THE INSPECTION MODE

Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

WARNING:

- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.

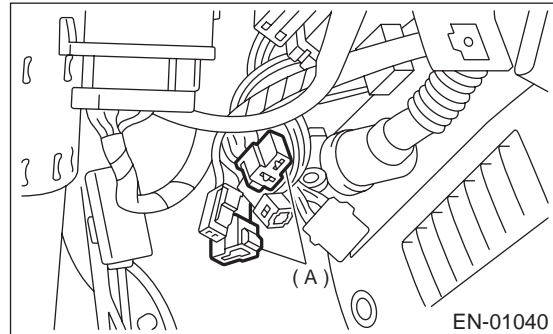


- (A) Safety stand
- (B) Free rollers

2. WITH SUBARU SELECT MONITOR

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.

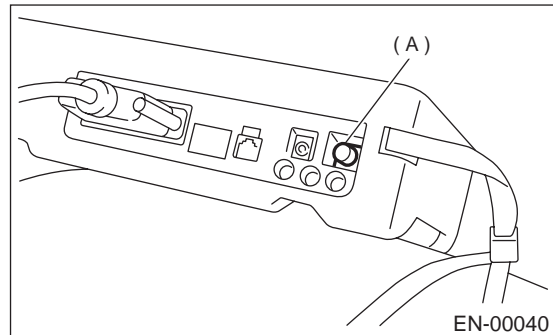
- 1) Connect test mode connector (green).



(A) Test mode connector

- 2) Connect Subaru select monitor to data link connector. <Ref. to EN(H4SOw/oOBD)-9, LOCATION, Electrical Components Location.>

- 3) Turn ignition switch to ON (engine OFF) and Subaru select monitor switch to ON.



(A) Power mode

- 4) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 5) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 6) Press the [YES] key after displayed the information of engine type.
- 7) On the «Engine Diagnosis» display screen, select the {6. Dealer Check Mode Procedure} and press the [YES] key.
- 8) When the “Perform Inspection (Dealer Check) Mode?” is shown on the display screen, press the [YES] key.
- 9) Perform subsequent procedures as instructed on the display screen.

INSPECTION MODE

ENGINE (DIAGNOSTICS)

- If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the DIAGNOSTIC TROUBLE CODE

(DTC) LIST. <Ref. to EN(H4SOw/oOBD)-57, LIST, List of Diagnostic Trouble Code (DTC).>

- Release the parking brake.
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

3. WITHOUT SUBARU SELECT MONITOR

Step	Value	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 1) Start and warm-up the engine. 2) Turn ignition switch to OFF. 3) Set shift lever to neutral position (MT vehicles), or set selector lever to "P" position (AT vehicles). 4) Connect test mode connector (green). 5) Turn ignition switch to ON. Does the MIL come on?	MIL illuminates.	Go to step 2.	Check the following and repair if necessary. NOTE: • Open or short circuit in engine control module power supply or ground line • Open or short circuit in CHECK ENGINE malfunction indicator lamp
2 CHECK DIAGNOSTIC TROUBLE CODE (DTC). 1) Set selector lever to "N" position, and then set selector lever to "P" position again (AT vehicles only). 2) Start the engine. Does the MIL indicate diagnostic trouble code (DTC)?	DTC is displayed.	Record diagnostic trouble code (DTC) and inspect using DTC. <Ref. to EN(H4SOw/oOBD)-59, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK DIAGNOSTIC TROUBLE CODE (DTC). 1) Drive vehicle at speed greater than 11 km/h (7 MPH) for at least one minute. 2) Warm-up engine above 2,000 rpm. Does the MIL indicate diagnostic trouble code (DTC)?	DTC is displayed.	Record diagnostic trouble code (DTC) and inspect using DTC. <Ref. to EN(H4SOw/oOBD)-59, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Turn ignition switch to OFF. Disconnect test mode connector. Complete inspection mode. NOTE: When on-board diagnosis system indicates no trouble, the trouble is in a different symptom.

CLEAR MEMORY MODE

ENGINE (DIAGNOSTICS)

9. Clear Memory Mode

A: OPERATION

1. WITH SUBARU SELECT MONITOR

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the `Done' and `Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- After the memory has been cleared, the ISC must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

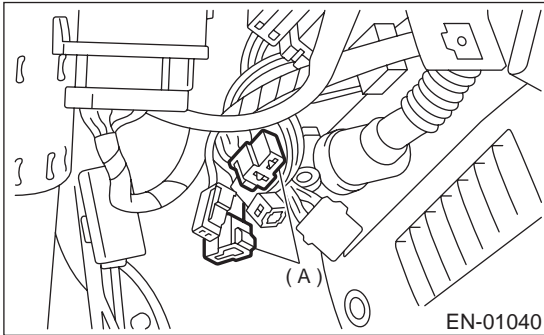
2. WITHOUT SUBARU SELECT MONITOR

Step	Value	Yes	No
<p>1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Set shift lever to neutral position (MT vehicles), or set selector lever to "P" position (AT vehicles). 3) Connect test mode connector and read memory connector. 4) Turn ignition switch to ON. Does the MIL come on? 	Mil illuminates.	Go to step 2.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none"> • Open or short circuit in engine control module power supply or ground line • Open or short circuit in CHECK ENGINE malfunction indicator lamp
<p>2 CHECK DIAGNOSTIC TROUBLE CODE (DTC).</p> <ol style="list-style-type: none"> 1) Set selector lever to "N" position, and then set selector lever to "P" position again (AT vehicles only). 2) Start the engine. 3) Drive vehicle at speed greater than 11 km/h (7 MPH) for at least one minute. 4) Warm-up engine above 2,000 rpm. Does the MIL indicate diagnostic trouble code (DTC)? <Ref. to EN(H4SOw/oOBD)-57, LIST, List of Diagnostic Trouble Code (DTC).> 	DTC is indicated.	Record diagnostic trouble code. Repair the trouble cause. <Ref. to EN(H4SOw/oOBD)-59, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Turn ignition switch to OFF. Disconnect read memory connector and test mode connector. Complete clear memory mode.

10. Compulsory Valve Operation Check Mode

A: OPERATION

1) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



(A) Test mode connector

2) Each valve functions when ignition switch is turned to ON (engine OFF).

• A list of the support portion is shown in the following table.

Contents
Compulsory fuel pump relay operation check
Compulsory purge control solenoid valve operation check
Compulsory radiator fan relay operation check
Compulsory air conditioning relay operation check

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

11.Engine Malfunction Indicator Lamp (MIL)

A: PROCEDURE

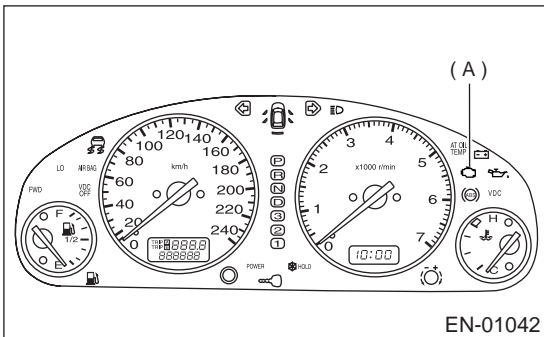
1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(H4SOw/oOBD)-30, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(H4SOw/oOBD)-31, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
↓
3. Check engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN(H4SOw/oOBD)-34, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
↓
4. Check engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN(H4SOw/oOBD)-35, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
↓
5. Check engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN(H4SOw/oOBD)-37, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

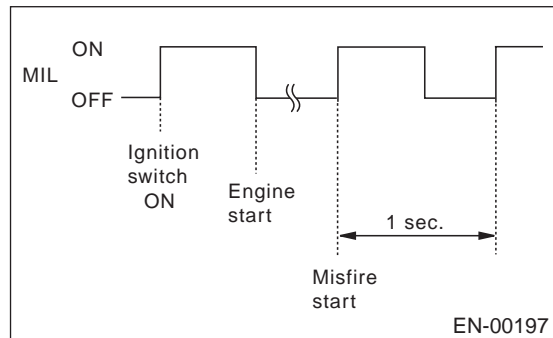
NOTE:

If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to IDI-14, Combination Meter Assembly.>

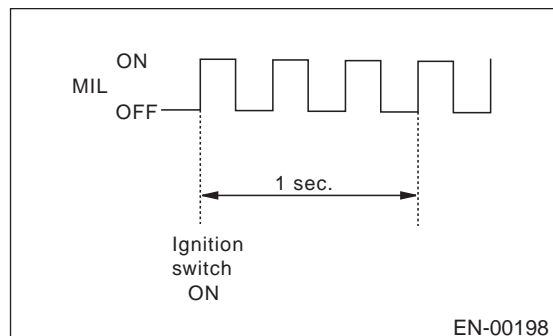


(A) Malfunction indicator lamp (MIL)

2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning. <Ref. to EN(H4SOw/oOBD)-2, PROCEDURE, Basic Diagnostic Procedure.>



3) When ignition switch is turned to ON (engine off) or to "START" with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.

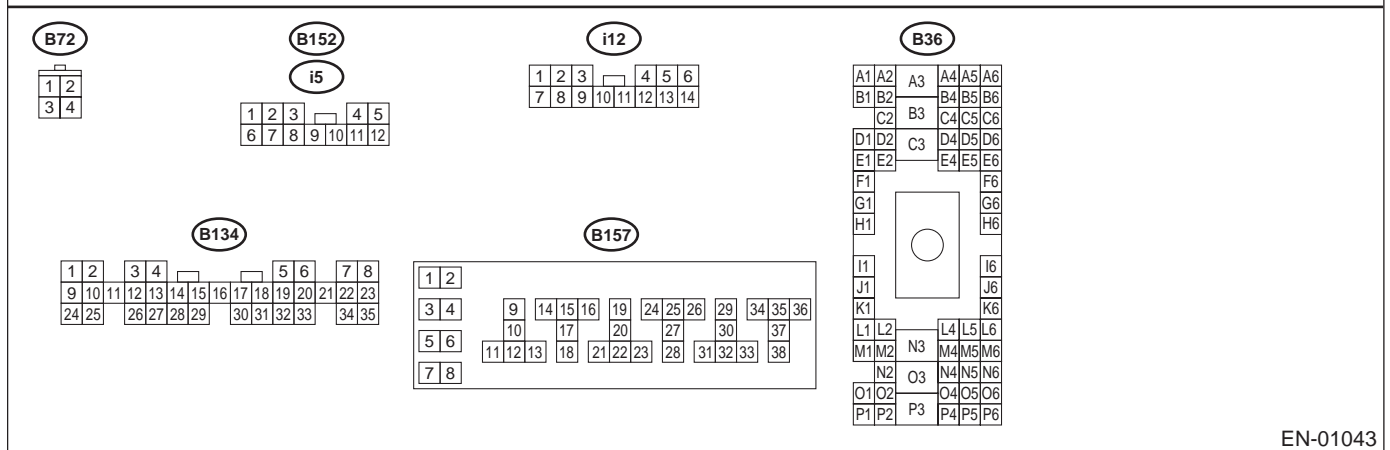
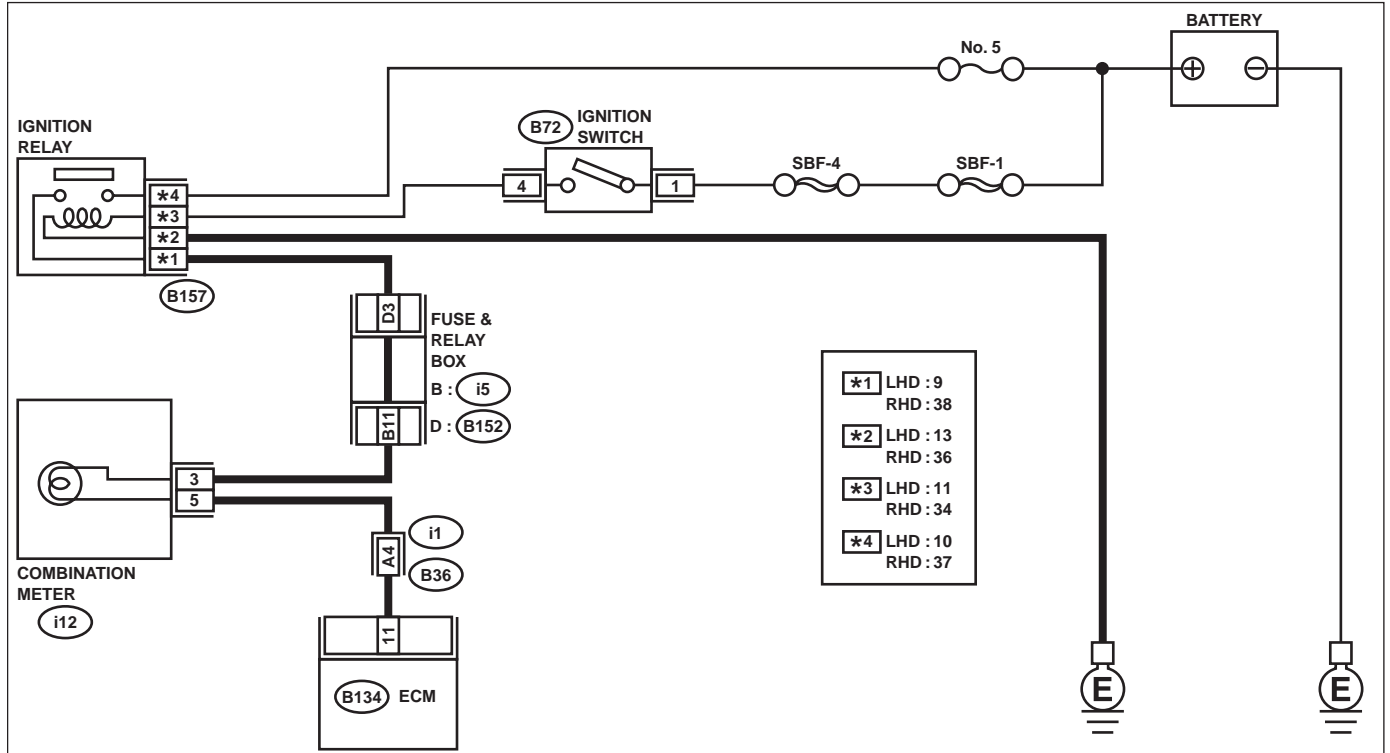


ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

- **DIAGNOSIS:**
 - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
 - When ignition switch is turned ON (engine OFF), MIL does not come on.
- **WIRING DIAGRAM:**



EN-01043

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 11 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 4.	Go to step 2.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
2 CHECK POOR CONTACT. Does the MIL come on when shaking or pulling ECM connector and harness?	MIL illuminates.	Repair poor contact in ECM connector.	Go to step 3.
3 CHECK ECM CONNECTOR. Is ECM connector correctly connected?	ECM connector is connected correctly.	Replace ECM.	Repair connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Remove combination meter. <Ref. to IDI-14, Combination Meter Assembly.> 3) Disconnect connector from ECM and combination meter. 4) Measure resistance of harness between ECM and combination meter connector. Connector & terminal (B134) No. 11 — (i12) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact in combination meter connector. <Ref. to IDI-14, Combination Meter Assembly.> Is there poor contact in combination meter connector?	There is poor contact.	Repair poor contact in combination meter connector.	Go to step 6.
6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR. 1) Turn ignition switch to ON. 2) Measure voltage between combination meter connector and chassis ground. Connector & terminal (i12) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 7.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none"> • Broken down ignition relay. • Blown out fuse (No. 5). • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

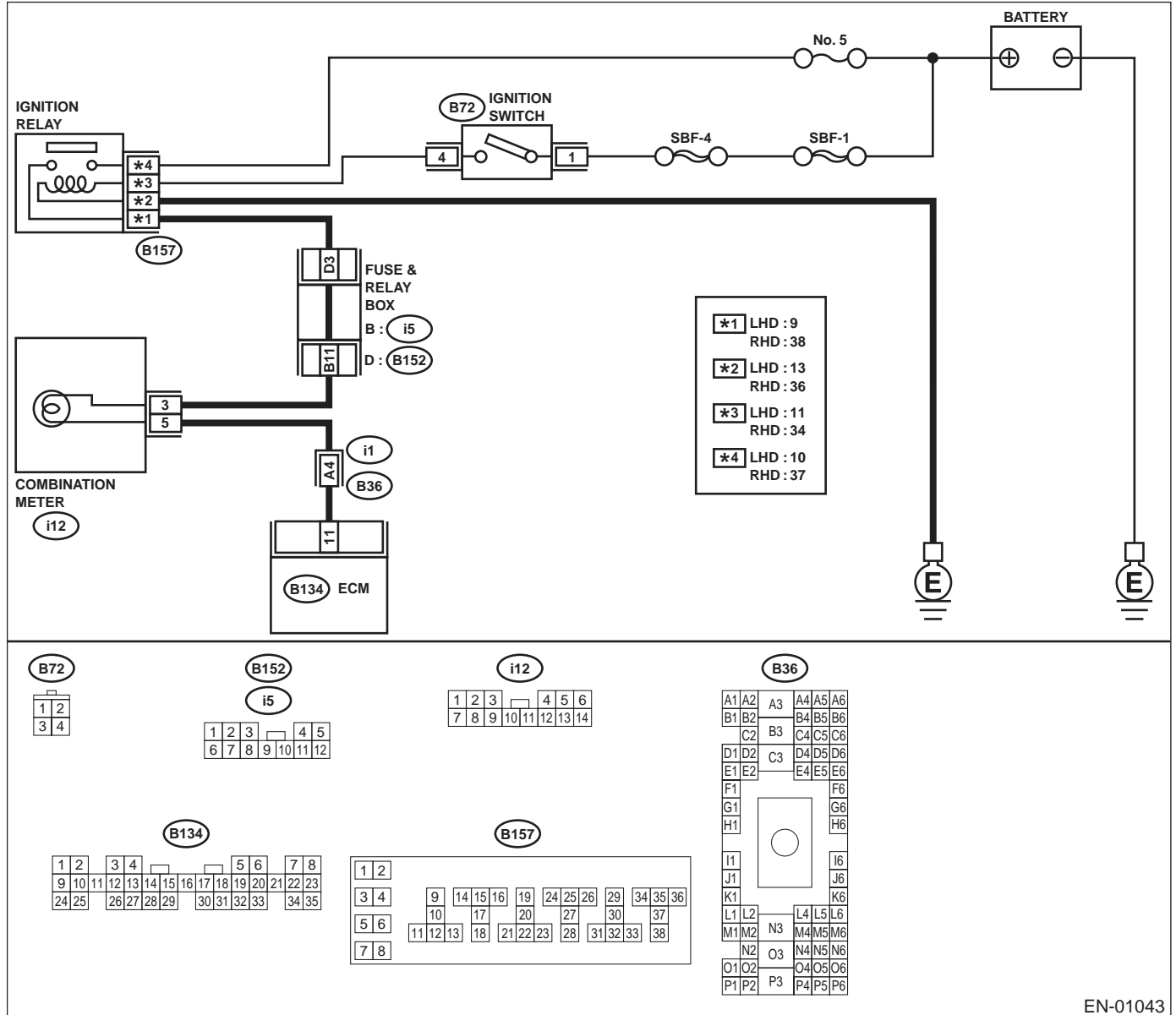
Step	Value	Yes	No
7 CHECK POOR CONTACT. Check poor contact in combination meter connector. <Ref. to IDI-14, Combination Meter Assembly.> Is there poor contact in combination meter connector?	There is poor contact.	Repair poor contact in combination meter connector.	Replace bulb or combination meter.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

- **DIAGNOSIS:**
 - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.
- **TROUBLE SYMPTOM:**
 - Although MIL comes on when engine runs, trouble code is not shown on Subaru select monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**



EN-01043

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON. Does the MIL come on?	MIL illuminates.	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 Hz.

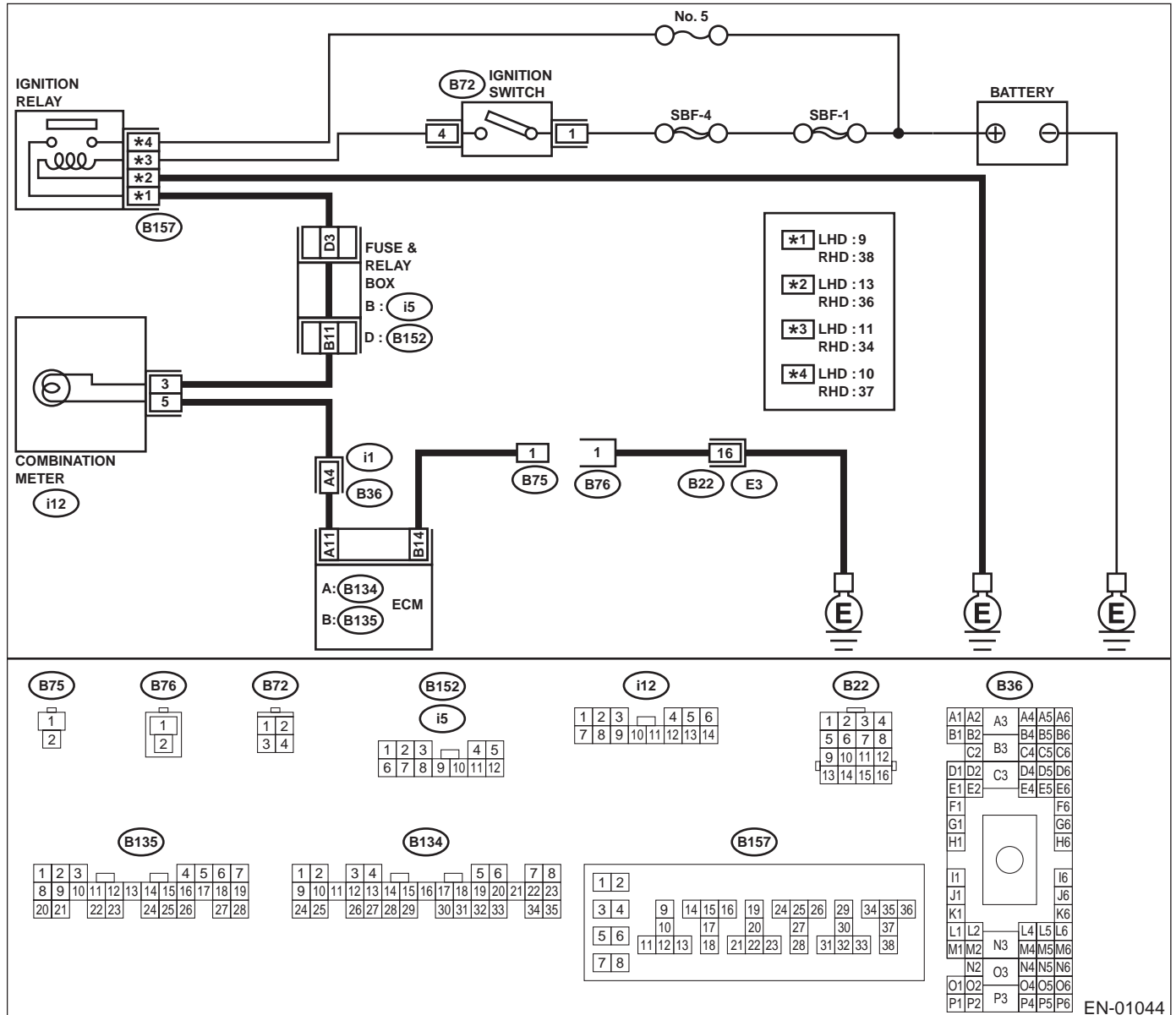
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- Test mode connector circuit is in open.

• TROUBLE SYMPTOM:

- When inspection mode, MIL does not blink at a cycle of 3 Hz.

• WIRING DIAGRAM:



EN-01044

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

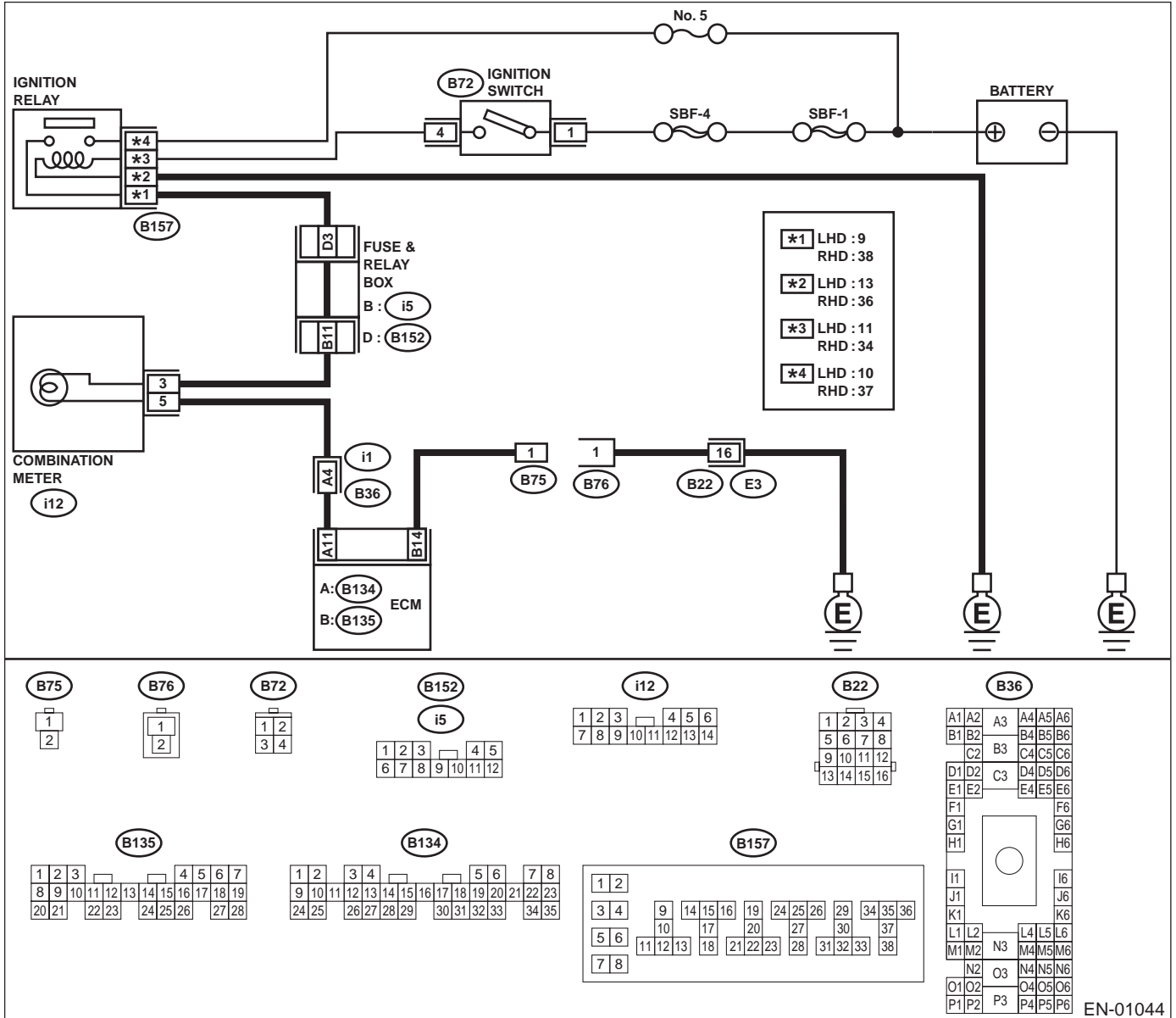
Step	Value	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Turn ignition switch to ON. Does the MIL come on?	MIL illuminates.	Go to step 2.	Repair the MIL circuit. <Ref. to EN(H4SOw/oOBD)-31, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between test mode connector and chassis ground. Connector & terminal (B75) No. 1 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 3.	Go to step 5.
3 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and test mode connector. Connector & terminal (B135) No. 14 — (B75) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and test mode connector
4 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>
5 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between test mode connector and chassis ground. Connector & terminal (B76) No. 1 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 Hz.

- **DIAGNOSIS:**
 - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
 - Even though test mode connector is disconnected, MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**



EN-01044

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and engine ground.</p> <p>Connector & terminal (B135) No. 14 — Engine ground: Is the measured value less than the specified value?</p>	5 Ω	Repair short circuit in harness between ECM and test mode connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>

12. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(H4SOW/oOBD)-40, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H4SOW/oOBD)-43, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H4SOW/oOBD)-46, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H4SOW/oOBD)-50, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H4SOW/oOBD)-53, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

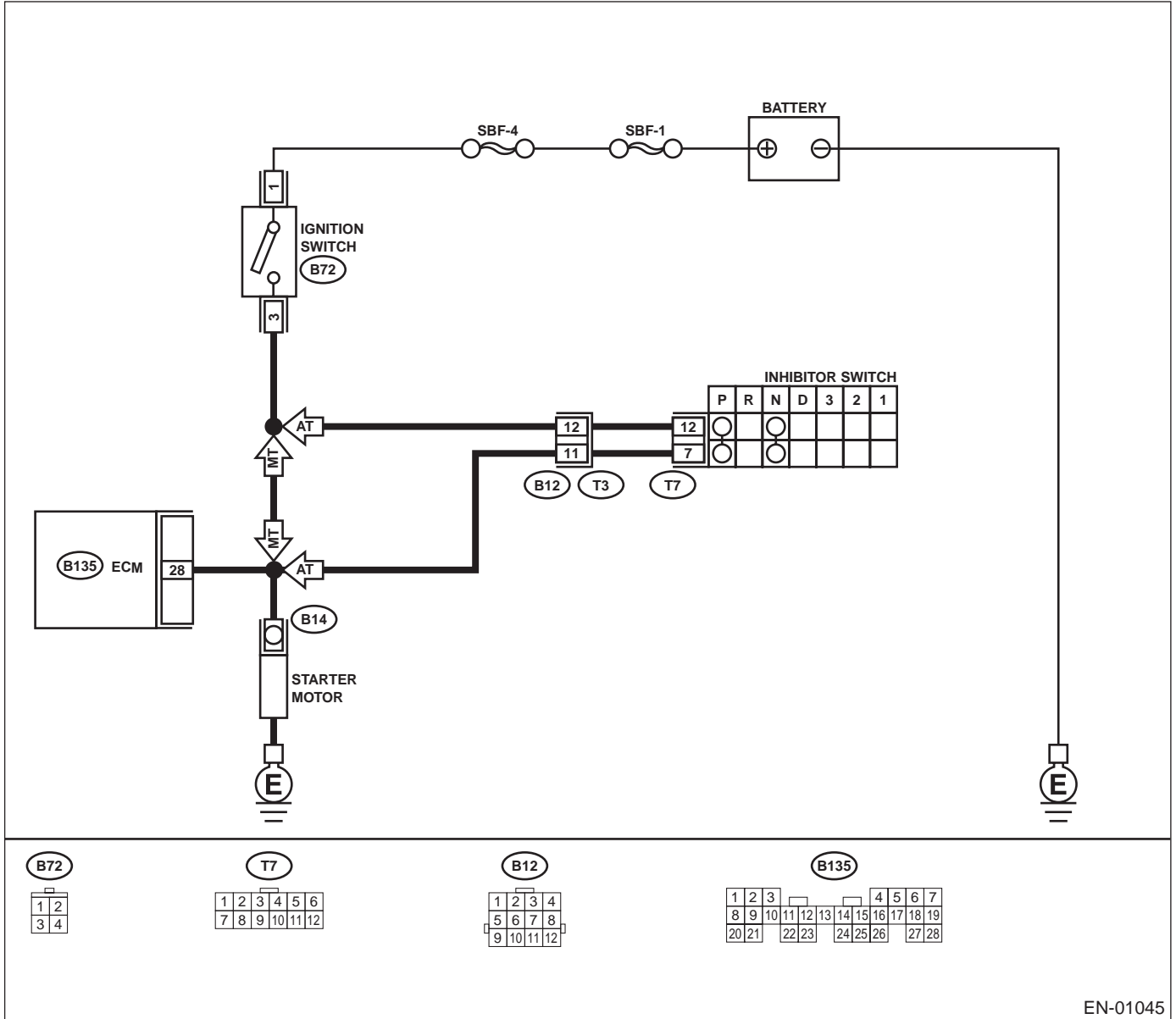
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(H4S0w/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4S0w/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN-01045

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. Does starter motor operate when the switch starts?	Starter motor operates.	Go to step 2.	Go to step 3.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>2 CHECK DTC. <Ref. to EN(H4SOw/oOBD)-24, OPERATION, Read Diagnostic Trouble Code (DTC).> Is the trouble code stored in memory? <Ref. to EN(H4SOw/oOBD)-57, LIST, List of Diagnostic Trouble Code (DTC).></p>	Trouble code is stored in memory.	Record DTC. Repair the trouble cause. <Ref. to EN(H4SOw/oOBD)-59, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.
<p>3 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from starter motor. 3) Turn ignition switch to ST. 4) Measure power supply voltage between starter motor connector terminal and engine ground. Connector & terminal (B14) No. 1 (+) — Engine ground (-): NOTE: On AT vehicles, place the selector lever in the "P" or "N" position. Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Go to step 5.
<p>4 CHECK GROUND CIRCUIT OF STARTER MOTOR. 1) Turn ignition switch to OFF. 2) Disconnect terminal from starter motor. 3) Measure resistance of ground cable between ground cable terminal and engine ground. Is the measured value less than the specified value?</p>	5 Ω	Check starter motor. <Ref. to SC(H4SO)-6, Starter.>	Repair open circuit of ground cable.
<p>5 CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT. 1) Turn ignition switch to OFF. 2) Measure resistance between starter motor and ECM. Connector & terminal (B14) No. 1 — Engine ground: Is the measured value less than the specified value?</p>	1 Ω	Repair ground short circuit.	Go to step 6.
<p>6 CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT. 1) Turn ignition switch to START. 2) Measure resistance of fuse. Connector & terminal (B14) No. 1 — Engine ground: Is the measured value less than the specified value?</p>	1 Ω	Go to step 7.	Repair ground short circuit.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Ignition switch to OFF. 2) Disconnect connector from ignition switch. 3) Measure power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 8 .	Repair open circuit in harness between ignition switch and battery.
8 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Connect connector to ignition switch. 2) Turn ignition switch to START. 3) Measure voltage between ignition switch and chassis ground. Connector & terminal (B72) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 9 .	Replace ignition switch.
9 CHECK TRANSMISSION TYPE. Is the vehicle AT?	Vehicle is AT.	Go to step 10 .	Repair open circuit between ignition switch and starter motor circuit.
10 CHECK INHIBITOR SWITCH CIRCUIT. 1) Turn ignition switch to OFF. 2) Place the selector lever in the "P" or "N" position. 3) Separate transmission harness connector. 4) Measure resistance between transmission harness connector receptacle's terminals. Connector & terminal (T3) No. 11 — No. 12: Is the measured value less than the specified value?	1 Ω	Repair open circuit in harness between starter motor and ignition switch connector.	Go to step 11 .
11 CHECK TRANSMISSION HARNESS. 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness and inhibitor switch connector. Connector & terminal (T3) No. 11 — (T7) No. 7: (T3) No. 12 — (T7) No. 12: Is the measured value less than the specified value?	1 Ω	Go to step 12 .	Repair open circuit in harness between transmission harness and inhibitor switch connector.
12 CHECK POOR CONTACT. Check poor contact in inhibitor switch connector. Is there poor contact in inhibitor switch connector?	There is poor contact.	Repair poor contact in inhibitor switch connector.	Replace inhibitor switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

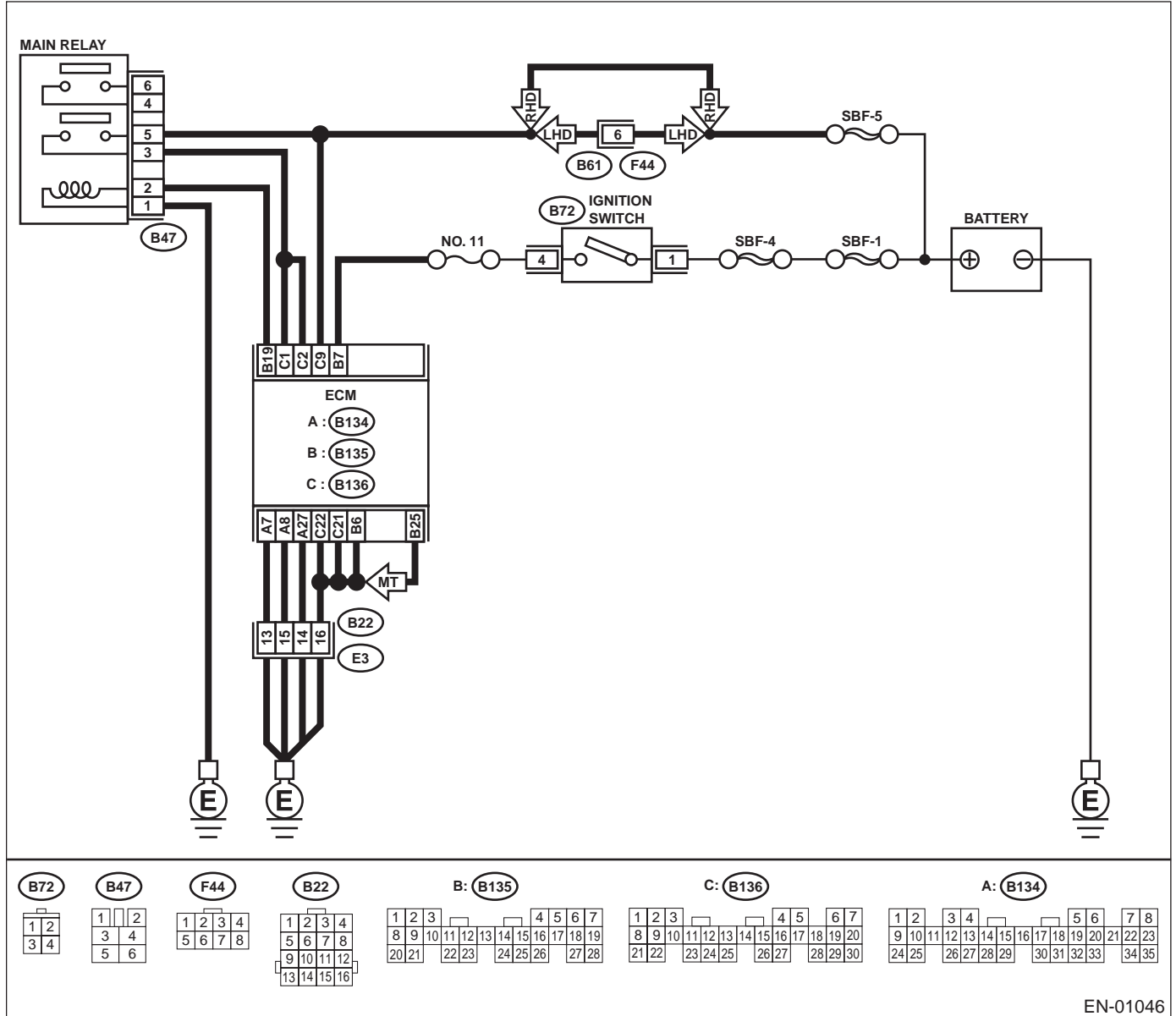
ENGINE (DIAGNOSTICS)

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01046

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK MAIN RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove main relay. 3) Connect battery to main relay terminals No. 1 and No. 2. 4) Measure resistance between main relay terminals.</p> <p>Terminals No. 3 — No. 5: No. 4 — No. 6:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 2.	Replace main relay.
<p>2 CHECK GROUND CIRCUIT OF ECM.</p> <p>1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 21 — Chassis ground: (B136) No. 22 — Chassis ground: (B135) No. 6 — Chassis ground (only LHD model): (B135) No. 25 — Chassis ground (only MT model): (B134) No. 27 — Chassis ground: (B134) No. 8 — Chassis ground: (B134) No. 7 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair open circuit in harness between ECM connector and engine grounding terminal.
<p>3 CHECK INPUT VOLTAGE OF ECM.</p> <p>Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 9 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Repair open or ground short circuit of power supply circuit.
<p>4 CHECK INPUT VOLTAGE OF ECM.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 7 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 5.	Repair open or ground short circuit of power supply circuit.
<p>5 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between ECM and chassis ground.</p> <p>Connector & terminal (B135) No. 19 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair ground short circuit in harness between ECM connector and main relay connector, then replace ECM.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK OUTPUT VOLTAGE FROM ECM. 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Replace ECM.
<p>7 CHECK INPUT VOLTAGE OF MAIN RELAY. Check voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 8.	Repair open circuit in harness between ECM connector and main relay connector.
<p>8 CHECK GROUND CIRCUIT OF MAIN RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between main relay connector and chassis ground. Connector & terminal (B47) No. 1 — Chassis ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 9.	Repair open circuit between main relay and chassis ground.
<p>9 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 5 (+) — Chassis ground (-): (B47) No. 6 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 10.	Repair open or ground short circuit in harness of power supply circuit.
<p>10 CHECK INPUT VOLTAGE OF ECM. 1) Connect main relay connector. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 1 (+) — Chassis ground (-): (B136) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Check ignition control system. <Ref. to EN(H4SOW/oOBD)-46, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

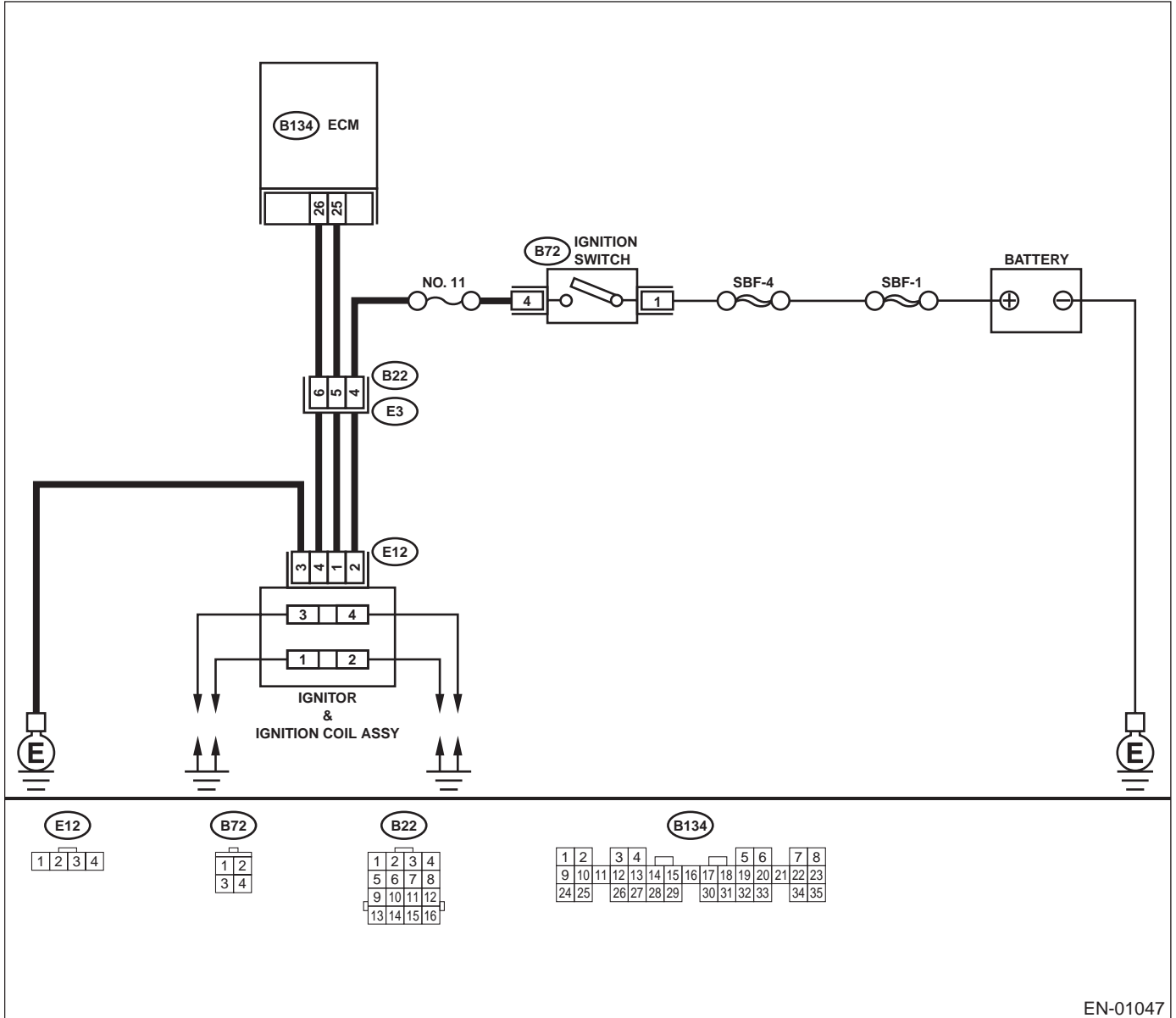
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01047

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK IGNITION SYSTEM FOR SPARKS. 1) Remove plug cord cap from each spark plug. 2) Install new spark plug on plug cord cap. CAUTION: Do not remove spark plug from engine. 3) Contact spark plug's thread portion on engine. 4) Crank engine to check that spark occurs at each cylinder. Does spark occur at each cylinder?</p>	Spark occurs.	Check fuel pump system. <Ref. to EN(H4SOW/oOBD)-50, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
<p>2 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY. 1) Turn ignition switch to OFF. 2) Disconnect connector from ignition coil & ignitor assembly. 3) Turn ignition switch to ON. 4) Measure power supply voltage between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E12) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit or ground short in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connector (B22)
<p>3 CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn ignition switch to OFF. 2) Measure resistance between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E12) No. 3 — Engine ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
<p>4 CHECK IGNITION COIL & IGNITOR ASSEMBLY. 1) Remove spark plug cords. 2) Measure resistance between spark plug cord contact portions to check secondary coil. Terminals No. 1 — No. 2: Is the measured value within the specified value?</p>	10 — 15 Ω	Go to step 5.	Replace ignition coil & ignitor assembly.
<p>5 CHECK IGNITION COIL & IGNITOR ASSEMBLY. Measure resistance between spark plug cord contact portions to check secondary coil. Terminals No. 3 — No. 4: Is the measured value within the specified value?</p>	10 — 15 Ω	Go to step 6.	Replace ignition coil & ignitor assembly.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY. Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E12) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Replace ignition coil & ignitor assembly.
<p>7 CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY. Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E12) No. 4 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 8.	Replace ignition coil & ignitor assembly.
<p>8 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and ignition coil & ignitor assembly connector. Connector & terminal (B134) No. 26 — (E12) No. 4: Is the measured value less than the specified value?</p>	1 Ω	Go to step 9.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in a coupling connector (B22)
<p>9 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure resistance of harness between ECM and ignition coil & ignitor assembly connector. Connector & terminal (B134) No. 25 — (E12) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 10.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in a coupling connector (B22)
<p>10 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal: (B134) No. 26 — Chassis ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 11.	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>11 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 25 — Chassis ground:</i> Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 12 .	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
<p>12 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Check spark plug and spark plug cord. <Ref. to IG(H4SOw/oOBD)-5, Spark Plug.> <Ref. to IG(H4SOw/oOBD)-10, Spark Plug Cord.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

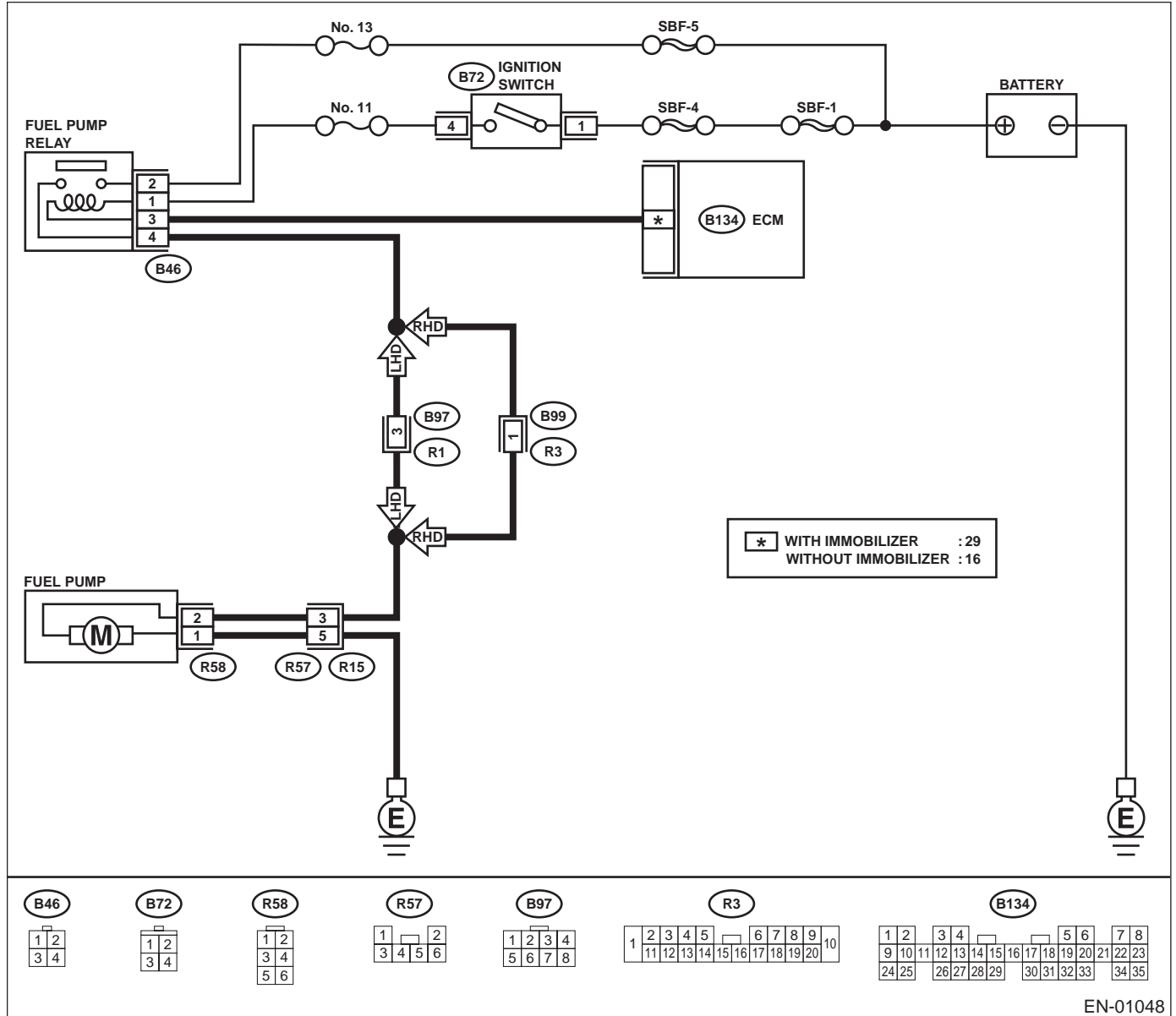
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01048

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OPERATING SOUND OF FUEL PUMP. Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON.</p> <p>NOTE: Fuel pump operation check can also be executed using Subaru Select Monitor. For the procedure, refer to the "COMPULSORY VALVE OPERATION CHECK MODE".<Ref. to EN(H4SOW/oOBD)-29, OPERATION, Compulsory Valve Operation Check Mode.></p> <p>Does fuel pump produce operating sound?</p>	Fuel pump produces operating sound.	Check fuel injector circuit. <Ref. to EN(H4SOW/oOBD)-53, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
<p>2 CHECK GROUND CIRCUIT OF FUEL PUMP.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Raise rear seat, and turn floor mat up. 3) Remove service hole cover. 4) Disconnect connector from fuel pump. 5) Measure resistance of harness connector between fuel pump and chassis ground. <p>Connector & terminal (R58) No. 1 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector (R57) and (R1)
<p>3 CHECK POWER SUPPLY TO FUEL PUMP.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to ON. 2) Measure voltage of power supply circuit between fuel pump connector and chassis ground. <p>Connector & terminal (R58) No. 2 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Replace fuel pump.	Go to step 4.
<p>4 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Measure resistance of harness between fuel pump and fuel pump relay connector. <p>Connector & terminal (R58) No. 2 — (B46) No. 4:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between fuel pump and fuel pump relay connector • Poor contact in coupling connectors (R57) and (R1)
<p>5 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.</p> <p>Measure resistance of harness between fuel pump and fuel pump relay connector.</p> <p>Connector & terminal (R58) No. 2 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair ground short circuit in harness between fuel pump and fuel pump relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK FUEL PUMP RELAY.</p> <p>1) Disconnect connector from fuel pump relay. 2) Remove fuel pump relay from bracket. 3) Connect battery to fuel pump relay connector terminals No. 1 and No. 3. 4) Measure resistance between connector terminals of fuel pump relay.</p> <p>Terminals No. 2 — No. 4: Is the measured value less than the specified value?</p>	10 Ω	Go to step 7.	Replace fuel pump relay.
<p>7 CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.</p> <p>1) Disconnect connectors from ECM. 2) Measure resistance of harness between ECM and fuel pump relay connector.</p> <p>Connector & terminal With cruise control: (B134) No. 29 — (B46) No. 3: Without cruise control: (B134) No. 16 — (B46) No. 3: Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair open circuit in harness between ECM and fuel pump relay connector.
<p>8 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(H4S0w/oOBD)-53, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

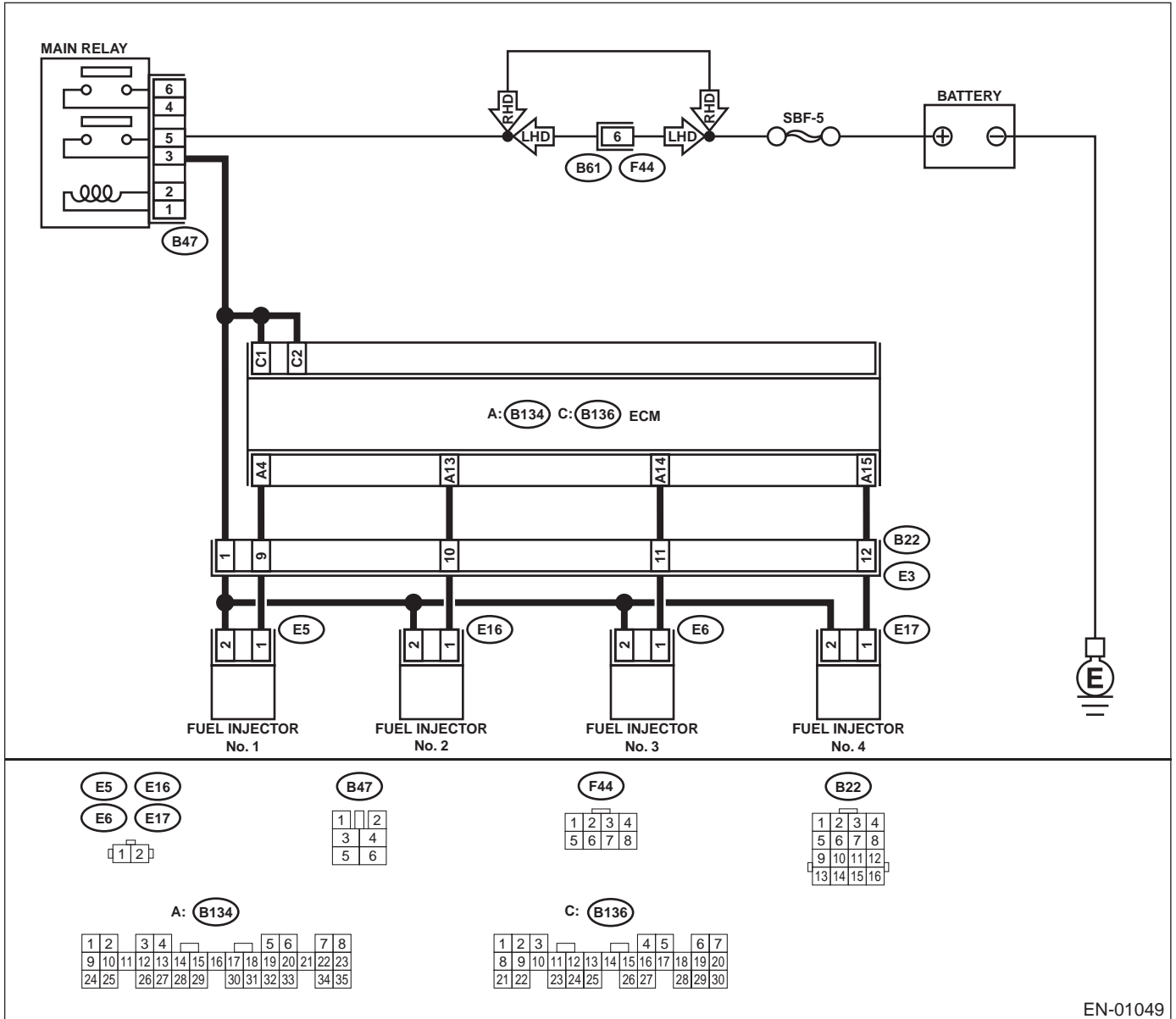
DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Check or repair only faulty parts.
- After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(H4Sow/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4Sow/oOBD)-26, OPERATION, Inspection Mode.>
- **WIRING DIAGRAM:**



EN-01049

Step	Value	Yes	No
1	CHECK OPERATION OF EACH FUEL INJECTOR. While cranking the engine, check that each fuel injector emits "operating" sound. Use a sound scope or attach a screwdriver to injector for this check. Is the fuel injector emits "operating" sound?	Fuel injector emits "operating" sound. Check fuel pressure. <Ref. to ME(H4SO)-28, INSPECTION, Fuel Pressure.>	Go to step 2.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from #1 cylinder fuel injector. 3) Turn ignition switch to ON. 4) Measure power supply voltage between the fuel injector terminal and engine ground.</p> <p>Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector (B22) • Poor contact in fuel injector connector
<p>3 CHECK POWER SUPPLY TO EACH FUEL INJECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from #2 cylinder fuel injector. 3) Turn ignition switch to ON. 4) Measure power supply voltage between the fuel injector terminal and engine ground.</p> <p>Connector & terminal #2 (E16) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector (B22) • Poor contact in fuel injector connector
<p>4 CHECK POWER SUPPLY TO EACH FUEL INJECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from #3 cylinder fuel injector. 3) Turn ignition switch to ON. 4) Measure power supply voltage between the fuel injector terminal and engine ground.</p> <p>Connector & terminal #3 (E6) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connectors (B22) • Poor contact in fuel injector connector

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK POWER SUPPLY TO EACH FUEL INJECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from #4 cylinder fuel injector. 3) Turn ignition switch to ON. 4) Measure power supply voltage between the fuel injector terminal and engine ground.</p> <p>Connector & terminal #4 (E17) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connectors (B22) • Poor contact in fuel injector connector
<p>6 CHECK EACH FUEL INJECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between each fuel injector terminals.</p> <p>Terminals No. 1 — No. 2: Is the measured value within the specified value?</p>	11 — 12 Ω	Go to step 7.	Replace faulty fuel injector.
<p>7 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</p> <p>1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 4 — (B136) No. 2: Is the measured value within the specified value?</p>	11 — 12 Ω	Go to step 8.	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
<p>8 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</p> <p>Measure resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 4 — Chassis ground: Is the measured value less than the specified value?</p>	1 Ω	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 9.
<p>9 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</p> <p>Measure resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 13 — (B136) No. 2: Is the measured value within the specified value?</p>	11 — 12 Ω	Go to step 10.	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
10 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 13 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 11.
11 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 14 — (B136) No. 2: Is the measured value within the specified value?	11 — 12 Ω	Go to step 12.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
12 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 14 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 13.
13 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 15 — (B136) No. 2: Is the measured value within the specified value?	11 — 12 Ω	Go to step 14.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
14 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 15 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 15.
15 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(H4S0w/oOBD)-102, INSPECTION, General Diagnostic Table.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

13. List of Diagnostic Trouble Code (DTC)

A: LIST

Trouble code	Item	Contents of diagnosis	Index
11	Crankshaft position sensor	<ul style="list-style-type: none"> No signal entered from crankshaft position sensor when starter switch is ON. The harness connector between ECM and crankshaft position sensor is in short or open. 	<Ref. to EN(H4SOW/oOBD)-59, DTC 11 CRANKSHAFT POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Starter switch	<ul style="list-style-type: none"> The starter switch signal is abnormal. The harness connector between ECM and starter switch is in short or open. 	<Ref. to EN(H4SOW/oOBD)-62, DTC 12 STARTER SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
13	Camshaft position sensor	<ul style="list-style-type: none"> No signal entered from camshaft position sensor, but signal entered from crankshaft position sensor. The harness connector between ECM and camshaft position sensor is in short or open. 	<Ref. to EN(H4SOW/oOBD)-64, DTC 13 CAMSHAFT POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	Engine coolant temperature sensor	<ul style="list-style-type: none"> The engine coolant temperature sensor signal is abnormal. The harness connector between ECM and engine coolant temperature sensor is in short or open. 	<Ref. to EN(H4SOW/oOBD)-67, DTC 21 ENGINE COOLANT TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Knock sensor	<ul style="list-style-type: none"> The knock sensor signal is abnormal. The harness connector between ECM and knock sensor is in short or open. 	<Ref. to EN(H4SOW/oOBD)-71, DTC 22 KNOCK SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Idle air control solenoid valve	<ul style="list-style-type: none"> The idle air control solenoid valve is not in function. The harness connector between ECM and idle air control solenoid valve is in short or open. 	<Ref. to EN(H4SOW/oOBD)-73, DTC 24 IDLE AIR CONTROL SOLENOID VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	Intake temperature sensor	<ul style="list-style-type: none"> The intake air temperature sensor signal is abnormal. The harness connector between ECM and intake air temperature sensor is in short or open. 	<Ref. to EN(H4SOW/oOBD)-76, DTC 26 INTAKE AIR TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Throttle position sensor	<ul style="list-style-type: none"> The throttle position sensor signal is abnormal. The throttle position sensor is installed abnormally. The harness connector between ECM and throttle position sensor is in short or open. 	<Ref. to EN(H4SOW/oOBD)-79, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Oxygen sensor	<ul style="list-style-type: none"> The oxygen sensor is not in function. The harness connector between ECM and oxygen sensor is in short or open. 	<Ref. to EN(H4SOW/oOBD)-81, DTC 32 OXYGEN SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Vehicle speed signal	<ul style="list-style-type: none"> The vehicle speed signal is abnormal. The harness connector between ECM and vehicle speed sensor is in short or open. 	<Ref. to EN(H4SOW/oOBD)-84, DTC 33 VEHICLE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Trouble code	Item	Contents of diagnosis	Index
35	Purge control solenoid valve	<ul style="list-style-type: none"> The purge control solenoid valve is not in function. The harness connector between ECM and purge control solenoid valve is in short or open. 	<Ref. to EN(H4SOw/oOBD)-86, DTC 35 PURGE CONTROL SOLENOID VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Torque control signal (AT)	<ul style="list-style-type: none"> Abnormal signal is entered from TCM. The harness connector between ECM and TCM is in short or open. 	<Ref. to EN(H4SOw/oOBD)-89, DTC 38 TORQUE CONTROL SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Pressure sensor	<ul style="list-style-type: none"> The pressure sensor signal is abnormal. The harness connector between ECM and pressure sensor is in short or open. 	<Ref. to EN(H4SOw/oOBD)-91, DTC 45 PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
46	CO resistor (General spec. vehicles)	<ul style="list-style-type: none"> The CO resistor signal is abnormal. The harness connector between ECM and CO resistor is in short or open. The CO valve is not adjusted to specification. 	<Ref. to EN(H4SOw/oOBD)-93, DTC 46 CO RESISTOR (GENERAL SPEC. VEHICLES), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Neutral position switch (MT)	<ul style="list-style-type: none"> The neutral position switch signal is abnormal. The harness connector between ECM and neutral position switch is in short or open. 	<Ref. to EN(H4SOw/oOBD)-95, DTC 51 NEUTRAL POSITION SWITCH (MT VEHICLE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	Park/Neutral position switch (AT)	<ul style="list-style-type: none"> The park/neutral position switch signal is abnormal. The shift cable is connected abnormally. The harness connector between ECM and inhibitor switch is in short or open. 	<Ref. to EN(H4SOw/oOBD)-98, DTC 51 PARK/NEUTRAL POSITION SWITCH (AT VEHICLE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
53*	Immobilizer system	Faulty immobilizer system.	<Ref. to IM-2, Basic Diagnostic Procedure.>
85	Charge system	Charge system is abnormal.	<Ref. to EN(H4SOw/oOBD)-100, DTC 85 CHARGE SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

*: Immobilizer system equipped model only

14. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 CRANKSHAFT POSITION SENSOR

• **DIAGNOSIS:**

- No signal entered from crankshaft position sensor when ignition switch is ON.
- The harness connector between ECM and crankshaft position sensor is in short or open.

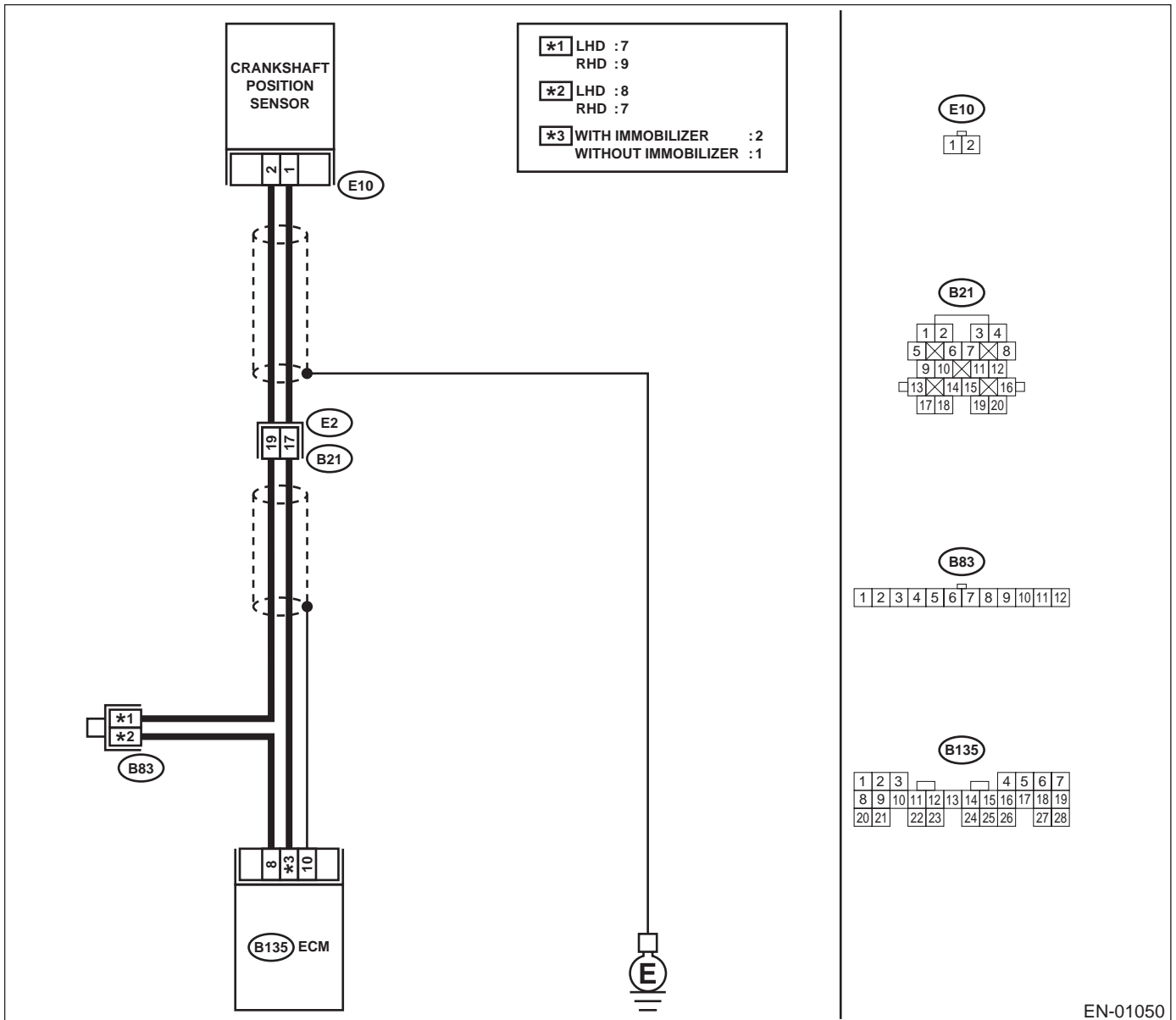
• **TROUBLE SYMPTOM:**

- Engine stalls.
- Restarting impossible

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN-01050

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR INSTALLATION. Are the crankshaft position sensor installing bolts tightened securely?	Installing bolts are securely tightened.	Go to step 2.	Tighten crankshaft position sensor installing bolts securely.
2 CHECK CRANKSHAFT POSITION SENSOR. 1) Remove crankshaft position sensor. 2) Measure resistance between connector terminals of crankshaft position sensor. Terminals No. 1 — No. 2: Is the measured value within the specified value?	1 — 4 k Ω	Go to step 3.	Replace crankshaft position sensor.
3 CHECK HARNESS BETWEEN ECM AND CRANKSHAFT POSITION SENSOR CONNECTOR. 1) Connect connector to crankshaft position sensor. 2) Disconnect connector from ECM. 3) Measure resistance of harness between crankshaft position sensor connector and ECM. Connector & terminal (B135) No. 8 — (B135) No. 2 (With immobilizer) (B135) No. 8 — (B135) No. 1 (Without immobilizer) Is the measured value within the specified value?	1 — 5 k Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in coupling connector (B21)
4 CHECK HARNESS BETWEEN ECM AND CRANKSHAFT POSITION SENSOR CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between crankshaft position sensor and ECM connector.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Set the positive (+) probe and ground lead of oscilloscope at ECM connector terminals. 3) Measure voltage indicated on oscilloscope while cranking the engine. Connector & terminal (B135) No. 2 (+) — (B135) No. 8 (-): (With immobilizer) (B135) No. 1 (+) — (B135) No. 8 (-): (Without immobilizer) Does the measured value exceed the specified value?	400 mV	Go to step 6.	Replace crankshaft position sensor.
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK ECM. 1) Connect all connectors. 2) Erase the memory. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> 3) Perform inspection mode. <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.> 4) Read out the trouble code. <Ref. to EN(H4SOW/oOBD)-24, OPERATION, Read Diagnostic Trouble Code (DTC).> Is the same trouble code (DTC) as in the current diagnosis still being output?	DTC is displayed.	Replace generator.	Go to step 8 .
8 CHECK ANY OTHER TROUBLE CODES APPEARANCE. Are other trouble codes (DTC) being output?	DTC is displayed.	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

B: DTC 12 STARTER SWITCH

DIAGNOSIS:

- The starter switch signal is abnormal.
- The harness connector between ECM and starter switch is in short or open.

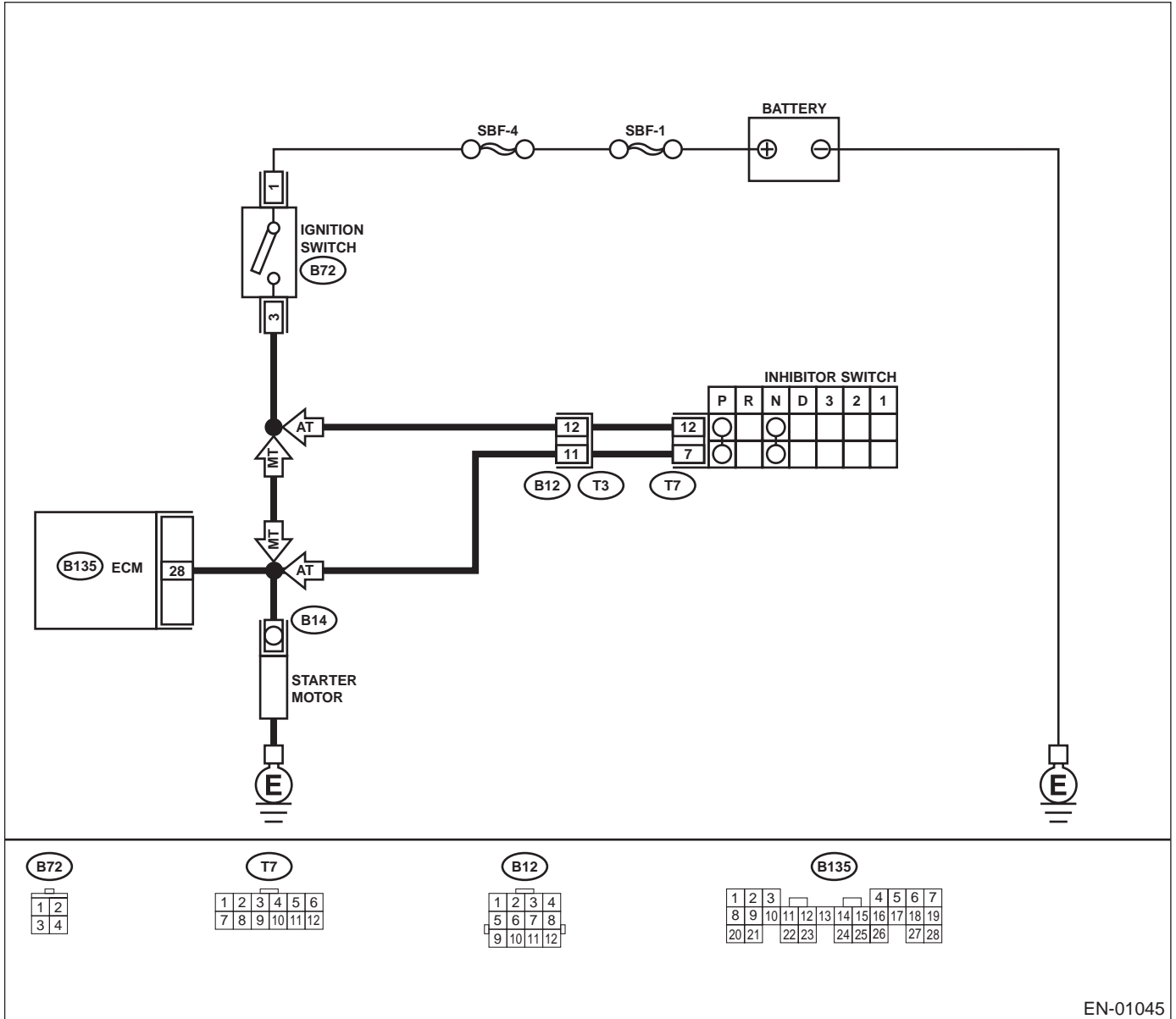
TROUBLE SYMPTOM:

- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4S0w/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4S0w/oOBD)-26, OPERATION, Inspection Mode.>

WIRING DIAGRAM:



EN-01045

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. Does starter motor operate when ignition switch starts?	Starter motor operates.	Go to step 2.	Check starter motor circuit.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>2 CHECK HARNESS BETWEEN ECM AND IGNITION SWITCH CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ST. 4) Measure power supply voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 28 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair poor contact in ECM connector.	Repair open or ground short circuit in harness between ECM and ignition switch connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

C: DTC 13 CAMSHAFT POSITION SENSOR

• **DIAGNOSIS:**

- No signal entered from camshaft position sensor, but signal entered from crankshaft position sensor.
- The harness connector between ECM and camshaft position sensor is in short or open.

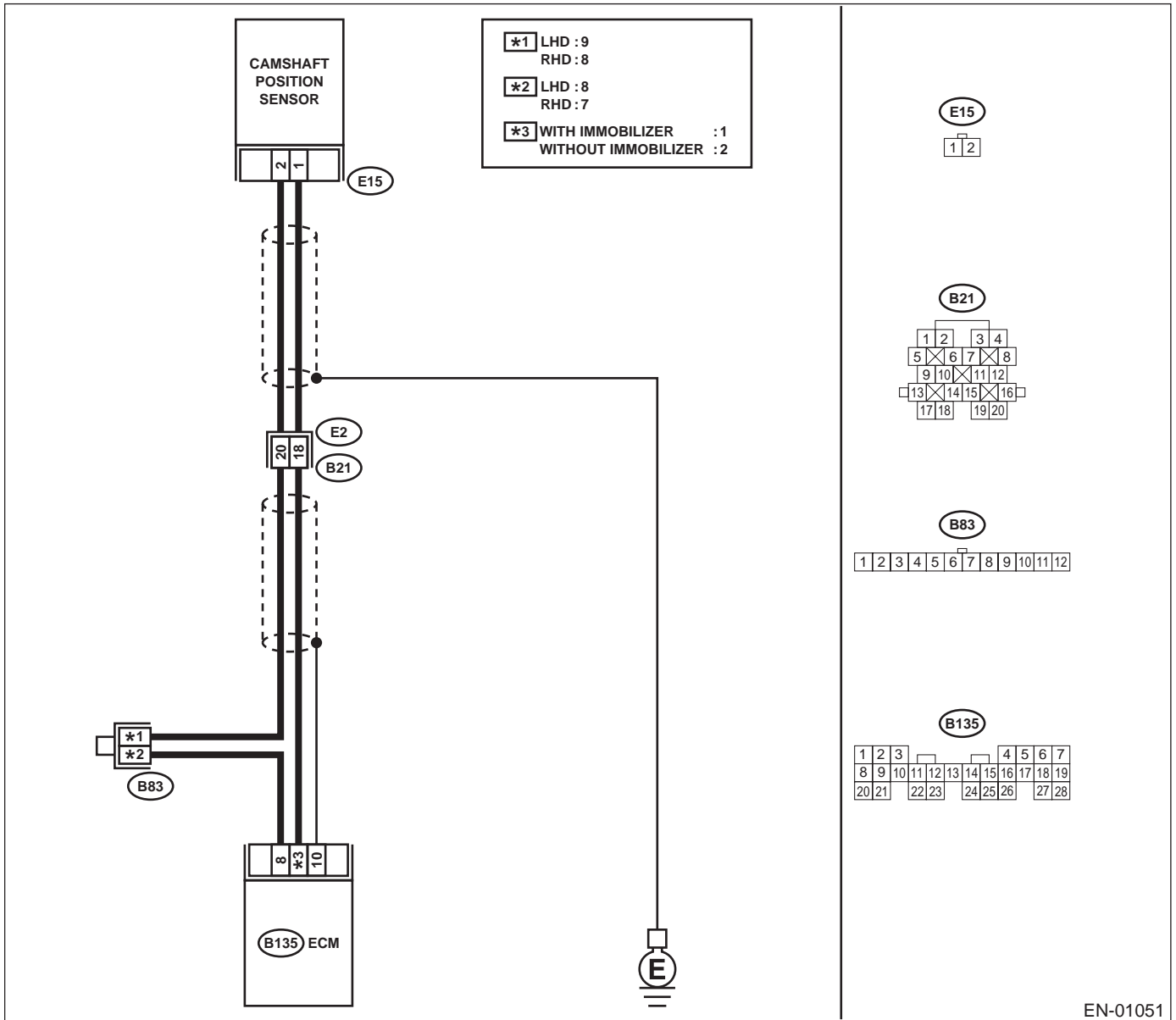
• **TROUBLE SYMPTOM:**

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN-01051

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK CONDITION OF CAMSHAFT POSITION SENSOR INSTALLATION. Are the camshaft position sensor installing bolts tightened securely?	Bolts are securely tightened.	Go to step 2.	Tighten camshaft position sensor installing bolts securely.
2 CHECK CAMSHAFT POSITION SENSOR. 1) Remove camshaft position sensor. 2) Measure resistance between connector terminals of camshaft position sensor. Terminals No. 1 — No. 2: Is the measured value within the specified value?	1 — 4 k Ω	Go to step 3.	Replace camshaft position sensor.
3 CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR. 1) Connect connector to camshaft position sensor. 2) Disconnect connector from ECM. 3) Measure resistance of harness between camshaft position sensor connector and ECM. Connector & terminal (B135) No. 8 — (B135) No. 1 (With immobilizer) (B135) No. 8 — (B135) No. 2 (Without immobilizer) Is the measured value within the specified value?	1 — 5 k Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in coupling connector (B21)
4 CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Repair ground short circuit in harness between camshaft position sensor and ECM connector.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Set the positive (+) probe and ground lead of oscilloscope at ECM connector terminals. 4) Measure voltage indicated on oscilloscope while cranking the engine. Connector & terminal (B135) No. 1 (+) — (B135) No. 8 (-): (With immobilizer) (B135) No. 2 (+) — (B135) No. 8 (-): (Without immobilizer) Does the measured value exceed the specified value?	400 mV	Go to step 6.	Replace camshaft position sensor.
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK ECM. 1) Connect all connectors. 2) Erase the memory. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> 3) Perform inspection mode. <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.> 4) Read out the trouble code. <Ref. to EN(H4SOW/oOBD)-24, OPERATION, Read Diagnostic Trouble Code (DTC).> Is the same trouble code (DTC) as in the current diagnosis still being output?	DTC is indicated.	Replace ECM.	Go to step 8 .
8 CHECK ANY OTHER TROUBLE CODES APPEARANCE. Are other trouble codes (DTC) being output?	DTC is indicated.	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

D: DTC 21 ENGINE COOLANT TEMPERATURE SENSOR

• **DIAGNOSIS:**

- The engine coolant temperature sensor signal is abnormal.
- The harness connector between ECM and engine coolant temperature sensor is in short or open.

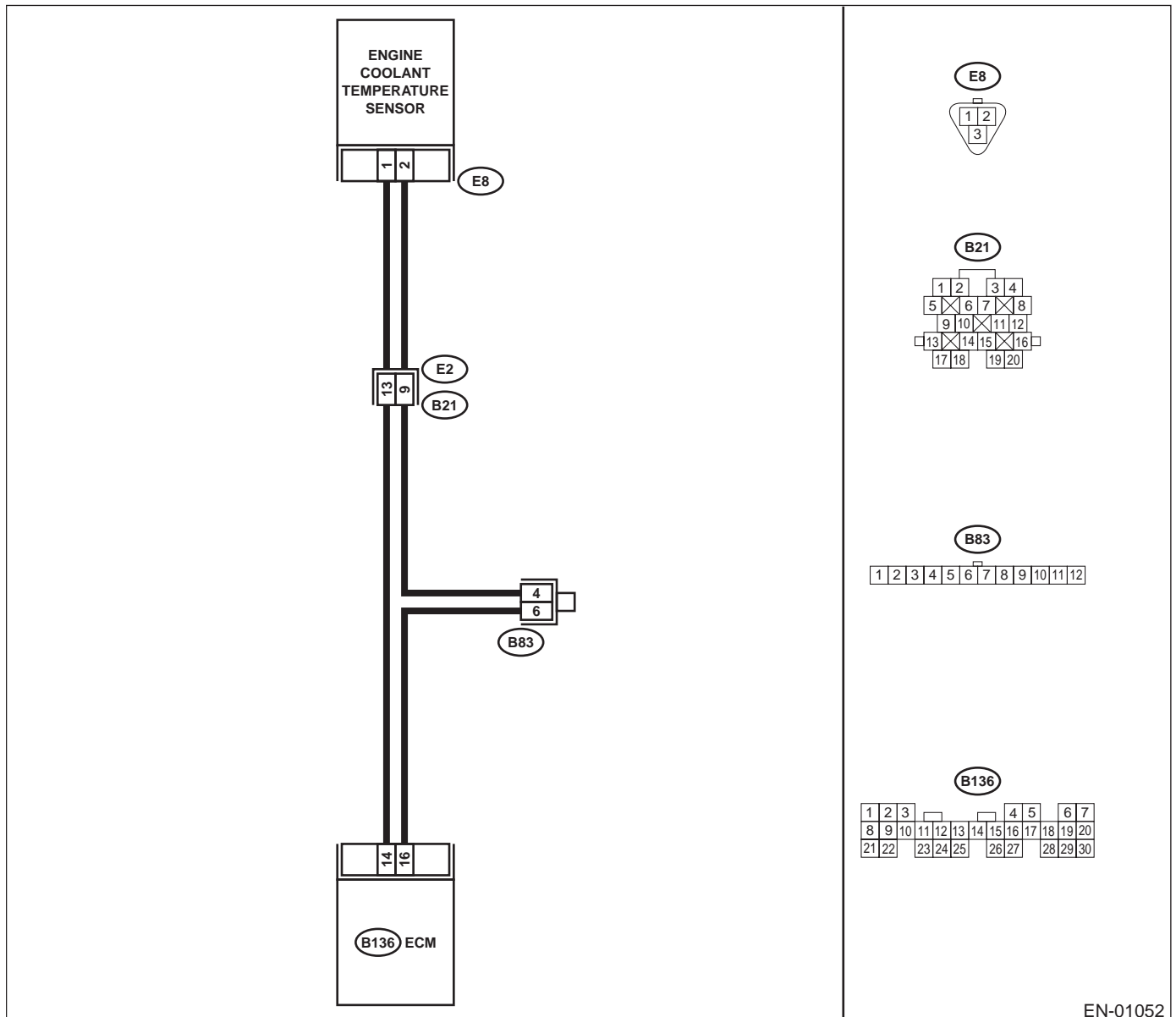
• **TROUBLE SYMPTOM:**

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN-01052

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Remove generator. 3) Disconnect connector from engine coolant temperature sensor. 4) Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 2.
<p>2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 3.
<p>3 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4 V	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>4</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 5.	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21) • Poor contact in sensor ground joint connector (B83)
<p>5</p> <p>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</p> <p>1) Remove engine coolant temperature sensor.</p> <p>2) Immerse sensor in approx. 20°C (68°F) water.</p> <p>NOTE: Prevent water from entering into terminal part of the sensor.</p> <p>3) Measure resistance between engine coolant temperature sensor terminals.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified value?</p>	2 — 3 kΩ	Go to step 6.	Replace engine coolant temperature sensor.
<p>6</p> <p>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</p> <p>1) Raise temperature up to approx. 80°C (176°F).</p> <p>CAUTION: Be careful not to burn yourself.</p> <p>2) Measure resistance between engine coolant temperature sensor terminals.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified value?</p>	0.35 — 0.4 kΩ	Go to step 7.	Replace engine coolant temperature sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7	CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Raise temperature up to approx. 90°C (194°F). CAUTION: Be careful not to burn yourself. 2) Measure resistance between engine coolant temperature sensor terminals. Terminals No. 1 — No. 2: Is the measured value within the specified value?	Replace ECM.	Replace engine coolant temperature sensor.

E: DTC 22 KNOCK SENSOR

• **DIAGNOSIS:**

- The knock sensor signal is abnormal.
- The harness connector between ECM and knock sensor is in short or open.

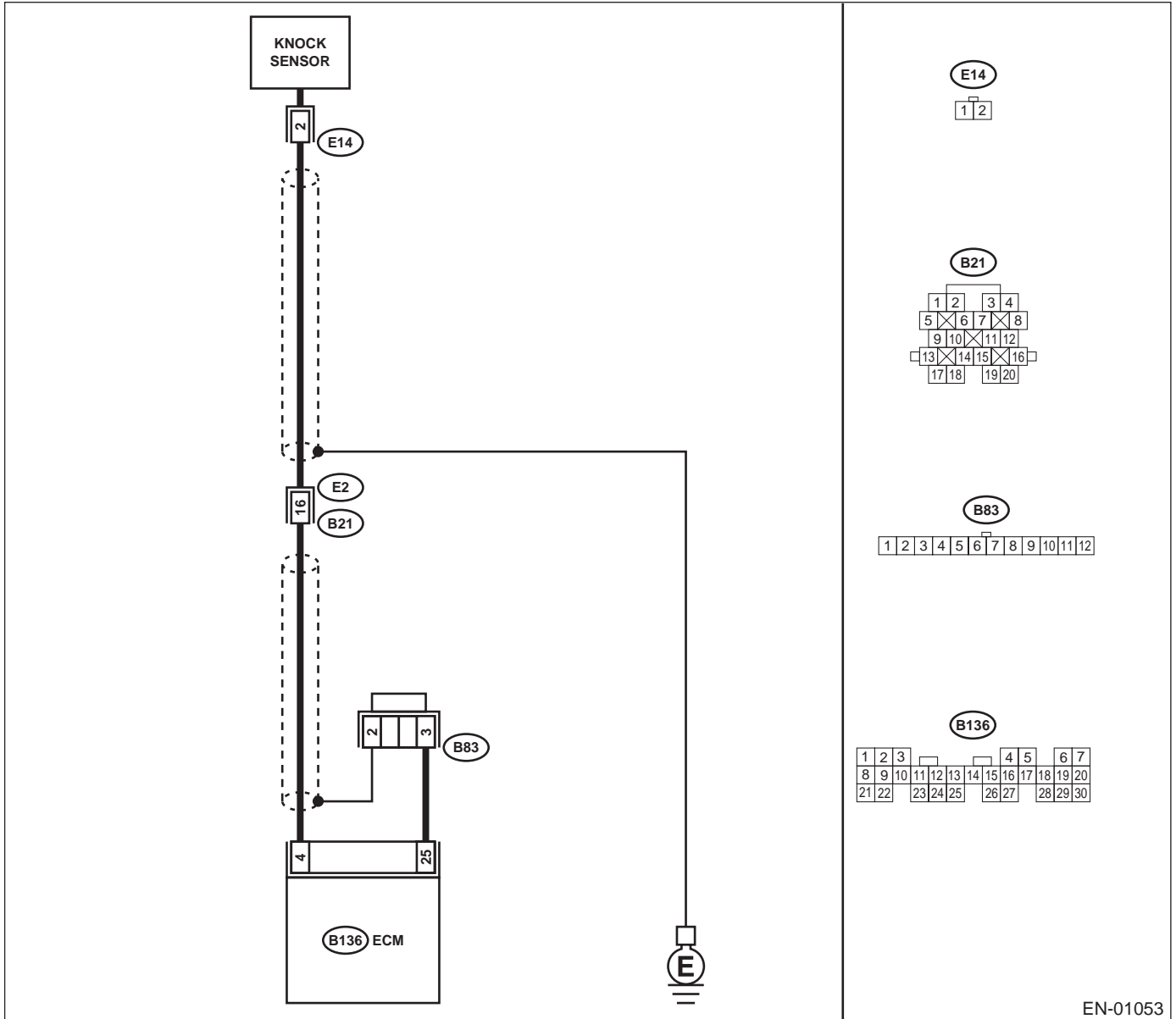
• **TROUBLE SYMPTOM:**

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN-01053

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 4 (+) — Chassis ground (-): Does the measured value exceed the specified value?	3 V	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>
3 CHECK KNOCK SENSOR. 1) Disconnect connector from knock sensor. 2) Measure resistance between knock sensor connector terminal and engine ground. Terminal No. 2 — Engine ground: Is the measured value within the specified value?	530 k Ω — 590 k Ω	Go to step 4.	Replace knock sensor. <Ref. to FU(w/oOBD)-, Knock Sensor.>
4 CHECK HARNESS CONNECTOR BETWEEN ECM AND KNOCK SENSOR. 1) Remove ECM connector. 2) Measure resistance of harness connector between ECM and knock sensor. Connector & terminal (E14) No. 2 — (B136) No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector (B21)
5 CHECK HARNESS CONNECTOR BETWEEN ECM AND KNOCK SENSOR. Measure resistance of harness of harness connector between ECM connector and knock sensor. Connector & terminal (B136) No. 4 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 6.	Repair ground short circuit between ECM and knock sensor.
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>

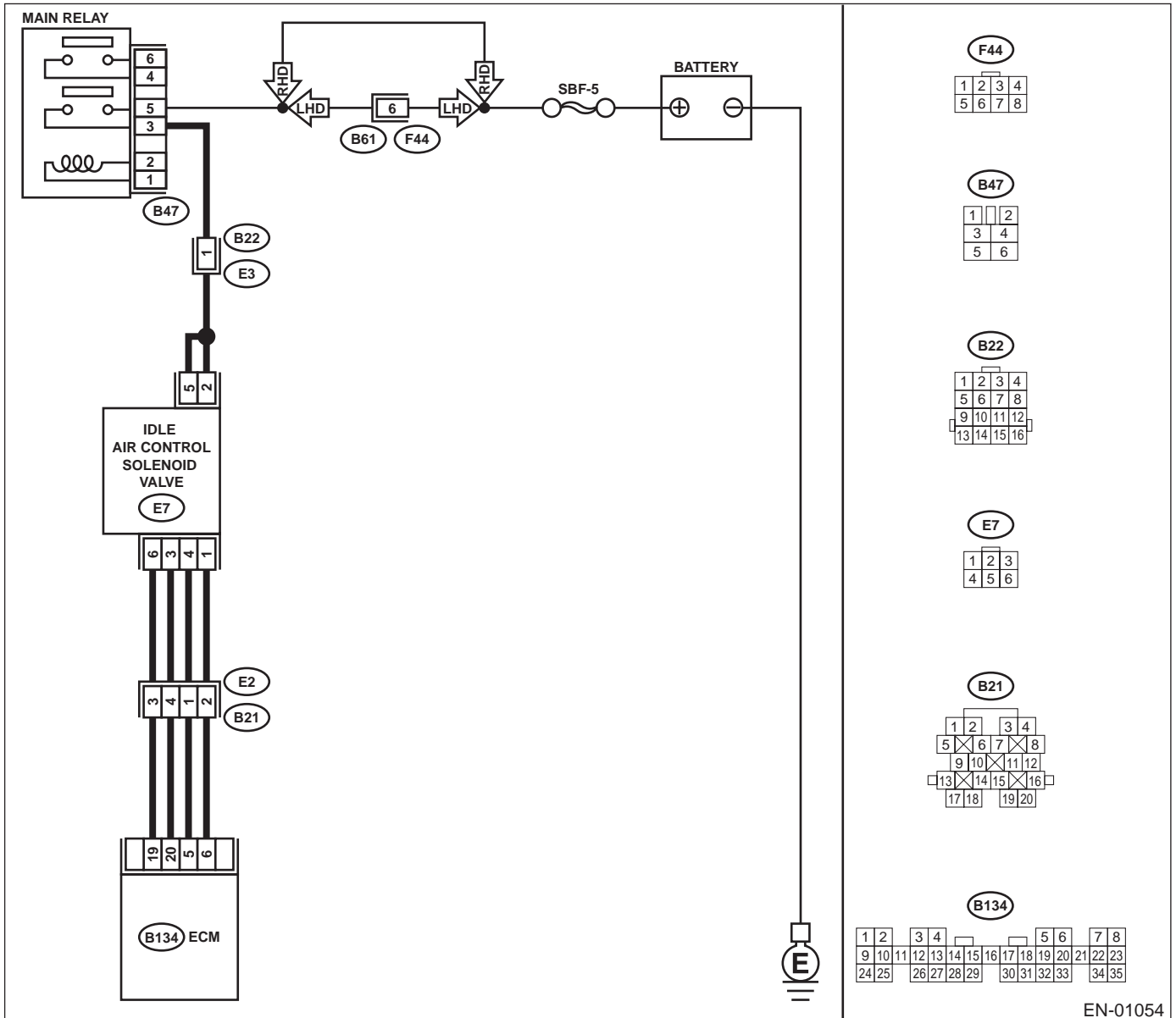
F: DTC 24 IDLE AIR CONTROL SOLENOID VALVE

- **DIAGNOSIS:**
 - The idle air control solenoid valve is not in function.
 - The harness connector between ECM and idle air control solenoid valve is in short or open.
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Hard to start
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN-01054

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between idle air control solenoid valve connector and engine ground. Connector & terminal (E7) No. 2 (+) — Engine ground (-): (E7) No. 5 (+) — Engine ground (-): Does the measured value exceed the specified value?	10 V	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector (B22)
2 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between ECM and idle air control solenoid valve connector. Connector & terminal #1; (B134) No. 20 — (E7) No. 3: #2; (B134) No. 6 — (E7) No. 1: #3; (B134) No. 19 — (E7) No. 6: #4; (B134) No. 5 — (E7) No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector (B21)
3 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance between ECM connector and chassis ground. Connector & terminal #1; (B134) No. 20 — Chassis ground: #2; (B134) No. 6 — Chassis ground: #3; (B134) No. 19 — Chassis ground: #4; (B134) No. 5 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.
4 CHECK POOR CONTACT. Check poor contact in ECM connector and idle air control solenoid valve connector. Is there poor contact in ECM connector or idle air control solenoid valve connector?	There is poor contact.	Repair poor contact in ECM connector or idle air control solenoid valve connector.	Go to step 5.
5 CHECK SPECIFICATIONS. Is the vehicle equipped with rear catalytic converter?	Equipped with rear catalytic converter.	Go to step 7.	Go to step 6.
6 CHECK IDLE SPEED. Is idling speed within the specified value?	550 — 750 rpm	Go to step 8.	Go to step 10.
7 CHECK IDLE SPEED. Is idling speed within the specified value?	600 — 800 rpm	Go to step 8.	Go to step 10.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK AIR INTAKE SYSTEM. 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. <ul style="list-style-type: none"> • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses Is there a fault in air intake system?	The system is faulty.	Repair air suction and leaks.	Go to step 9.
9 CHECK AIR BY-PASS LINE. 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H4SOw/oOBD)-33, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in by-pass air line. Are foreign particles in by-pass air line?	Foreign particles in by-pass air line.	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(H4SOw/oOBD)-33, Idle Air Control Solenoid Valve.>
10 CHECK AIR BY-PASS LINE. 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H4SOw/oOBD)-33, Idle Air Control Solenoid Valve.> 3) Remove throttle body from intake manifold. <Ref. to FU(H4SOw/oOBD)-13, Throttle Body.> 4) Confirm that there are no foreign particles in the throttle body. 5) Using an air gun, force air into idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body interior. Does air flow out?	Air flows out.	Replace idle air control solenoid valve. <Ref. to FU(H4SOw/oOBD)-33, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(H4SOw/oOBD)-13, Throttle Body.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

G: DTC 26 INTAKE AIR TEMPERATURE SENSOR

• DIAGNOSIS:

- The intake air temperature sensor signal is abnormal.
- The harness connector between ECM and intake air temperature sensor is in short or open.

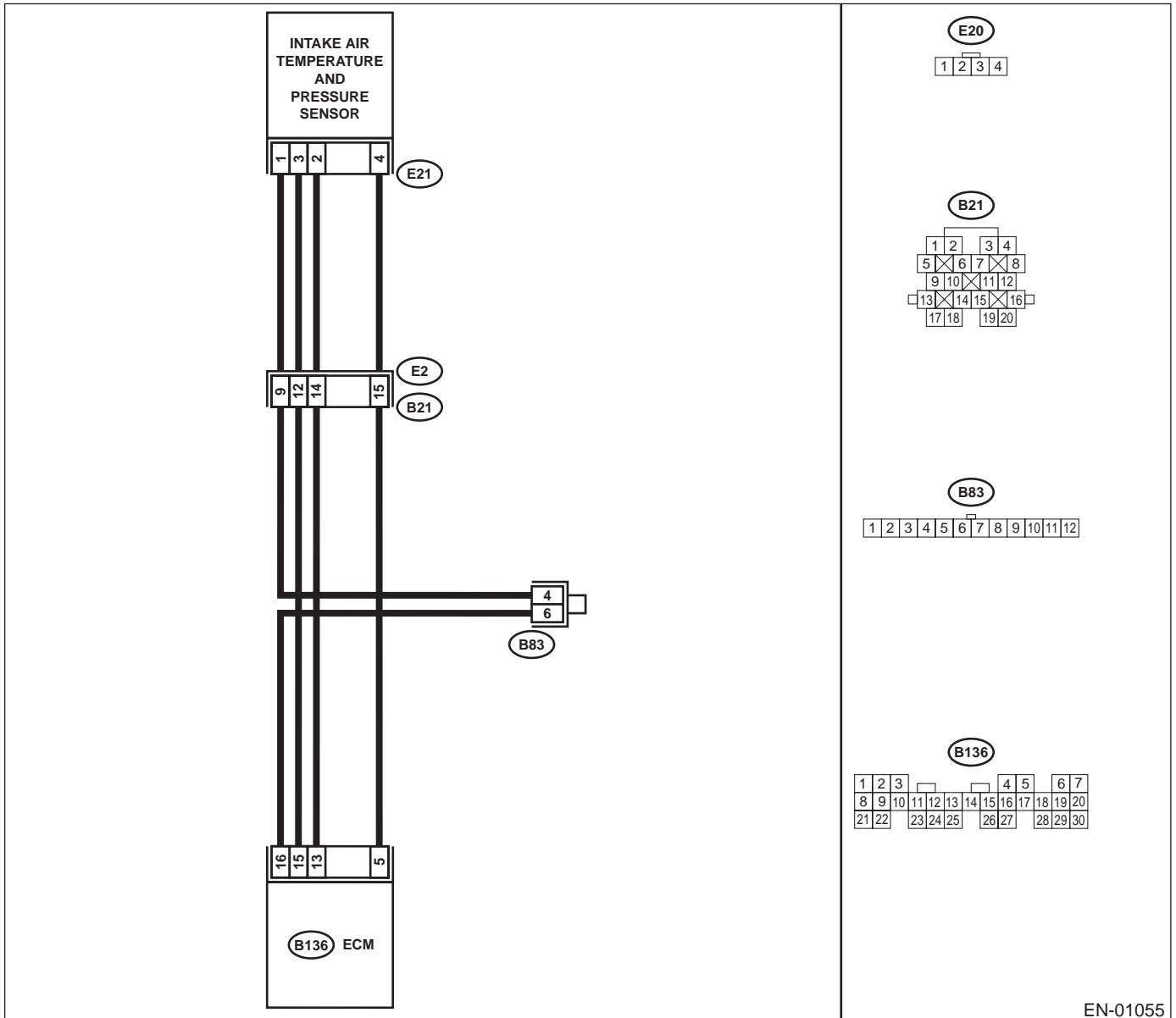
• TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01055

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Measure resistance between intake air temperature sensor terminals.</p> <p>Terminals No. 2 — No. 3: Is resistance within the specified value at 20°C (68°F)?</p>	2 — 3 kΩ	Go to step 2.	Replace intake air temperature sensor. <Ref. to FU(H4SOw/oOBD)-32, Intake Air Temperature and Pressure Sensor.>
<p>2 CHECK INTAKE AIR TEMPERATURE SENSOR.</p> <p>Measure resistance between intake air temperature sensor terminals.</p> <p>Terminals No. 2 — No. 3: Is resistance within the specified value at 50°C (122°F)?</p>	0.66 — 1 kΩ	Go to step 3.	Replace intake air temperature sensor. <Ref. to FU(H4SOw/oOBD)-32, Intake Air Temperature and Pressure Sensor.>
<p>3 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.</p> <p>1) Disconnect connector from ECM. 2) Measure resistance of harness connector between ECM and intake air temperature sensor connector.</p> <p>Connector & terminal (B136) No. 15 — (E20) No. 3: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and intake air temperature and pressure sensor connector • Poor contact in coupling connector (B21)
<p>4 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.</p> <p>Measure resistance of harness connector between ECM and intake air temperature sensor connector.</p> <p>Connector & terminal (B136) No. 13 — (E21) No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 5.	Repair harness and connector.
<p>5 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.</p> <p>Measure resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 15 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 13 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.
<p>7 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Contact with your Subaru distributor. NOTE: Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

H: DTC 31 THROTTLE POSITION SENSOR

• **DIAGNOSIS:**

- The throttle position sensor signal is abnormal.
- The throttle position sensor is installed abnormally.
- The harness connector between ECM and throttle position sensor is in short or open.

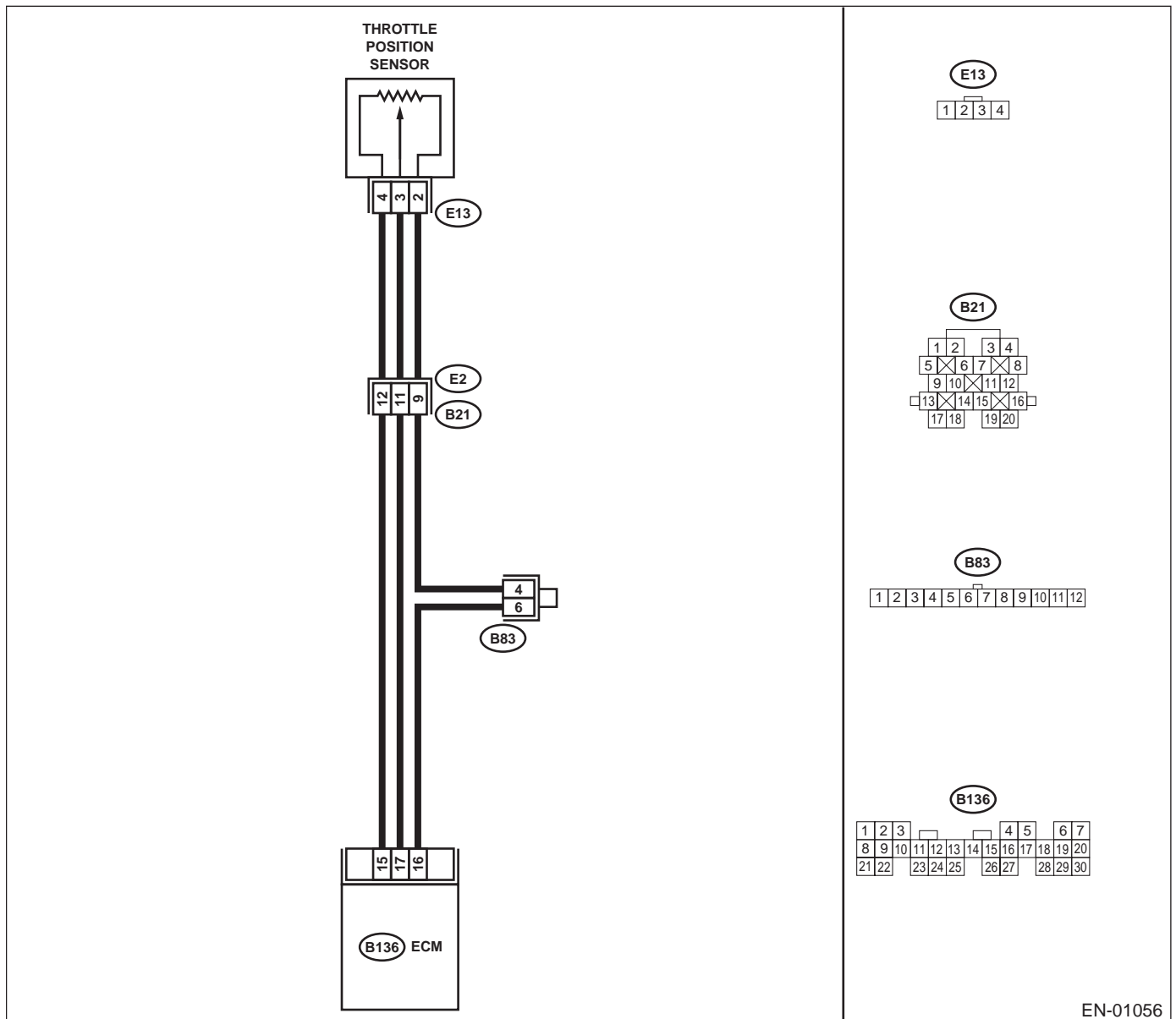
• **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN-01056

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK CONDITION OF THROTTLE POSITION SENSOR INSTALLATION. Are the throttle position sensor installing screw tightened securely?	Installing screw is securely tightened.	Go to step 2.	Adjust throttle position sensor and tighten throttle position sensor installing screws securely.
2 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR. 1) Disconnect connector from ECM and throttle position sensor. 2) Measure resistance between ECM and throttle position sensor. Connector & terminal (B136) No. 16 — (E13) No. 2: (B136) No. 17 — (E13) No. 3: (B136) No. 15 — (E13) No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit between ECM and throttle position sensor.
3 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. 1) Disconnect connector from TCM. (AT vehicle) 2) Measure resistance between ECM and chassis ground. Connector & terminal (B136) No. 16 — Chassis ground: (B136) No. 17 — Chassis ground: (B136) No. 15 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair ground short circuit between ECM and chassis ground.
4 CHECK INPUT SIGNAL FOR ECM. 1) Connect connector to ECM and throttle position sensor. 2) Ignition switch to ON. 3) Measure voltage between ECM terminals while throttle valve is fully closed. Connector & terminal (B136) No. 17 — No. 15: Is the measured value less than the specified value?	0.1 V	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FROM ECM. Measure voltage between ECM terminals while throttle valve is fully opened. Connector & terminal (B136) No. 17 — No. 15: Does the measured value exceed the specified value?	4.5 V	Go to step 6.	Replace ECM.
6 CHECK POOR CONTACT. Check poor contact in throttle position sensor connector. Is there poor contact in throttle position sensor connector?	There is poor contact.	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor.

I: DTC 32 OXYGEN SENSOR

• DIAGNOSIS:

- The oxygen sensor is not in function.
- The harness connector between ECM and oxygen sensor is in short or open.

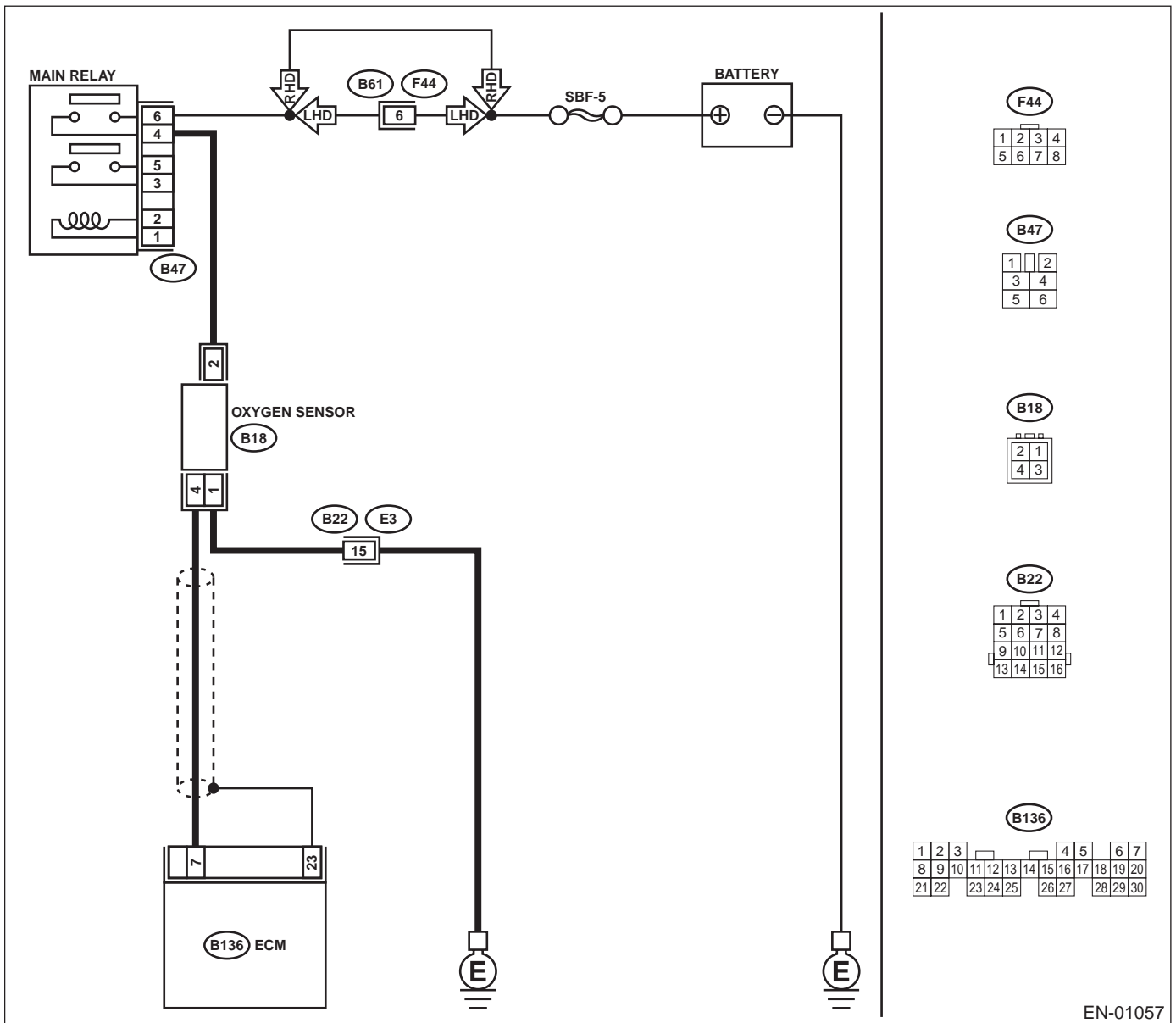
• TROUBLE SYMPTOM:

- Failure of engine to start
- Erroneous idling
- Poor driving performance
- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01057

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FOR OTHER CAUSES AFFECTING EXHAUST GAS. 1) Check for use of improper fuel. 2) Check if engine oil or coolant level is extremely low. Does CO% after warm-up exceed the specified value?	2%	Check fuel system.	Go to step 2.
2 CHECK EXHAUST SYSTEM. Is there a fault in exhaust system?	The system is faulty.	Repair exhaust system. NOTE: • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in hole	Go to step 3.
3 CHECK INPUT VOLTAGE FOR OXYGEN SENSOR. 1) Disconnect connector from oxygen sensor connector. 2) Measure voltage between main relay and oxygen sensor. Connector & terminal (B18) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair open circuit between main relay and oxygen sensor.
4 CHECK HARNESS CONNECTOR BETWEEN OXYGEN SENSOR AND ENGINE GROUND TERMINAL. Measure resistance between oxygen sensor and chassis ground. Connector & terminal (B18) No. 1 — Chassis ground: Is the measured value less than the specified value?	1Ω	Go to step 5.	Repair open circuit between oxygen sensor and chassis ground.
5 CHECK OXYGEN SENSOR. Measure resistance between oxygen sensor terminals. Connector & terminal No. 1 — No. 2: Is the measured value less than the specified value?	30 Ω	Repair poor contact.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND OXYGEN SENSOR. 1) Disconnect connector from ECM. 2) Measure resistance between ECM and chassis ground. Connector & terminal (B136) No. 7 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 7.	Repair ground short circuit between ECM and chassis ground.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK HARNESS BETWEEN ECM AND OXYGEN SENSOR. 1) Ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 7 (+) — Chassis ground (-): Does the measured value exceed the specified value?	0.2 V	Go to step 8 .	Repair battery short circuit between ECM and oxygen sensor.
8 CHECK INPUT VOLTAGE FOR ECM. 1) Turn ignition switch OFF. 2) Warm up engine until coolant temperature exceed 70°C (158°F) and idle. 3) Set plus (+) probe to ECM connector terminal, and set minus (-) probe to chassis ground. Connector & terminal (B136) No. 7 (+) — Chassis ground (-): 4) Measure voltage between ECM and chassis ground. Is the measured waveform standard?	0.1 \leftarrow \rightarrow 1 V	Go to step 9 .	Replace oxygen sensor.
9 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Replace oxygen sensor connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

J: DTC 33 VEHICLE SPEED SIGNAL

• DIAGNOSIS:

- The vehicle speed signal is abnormal.
- The harness connector between ECM and vehicle speed sensor is in short or open.

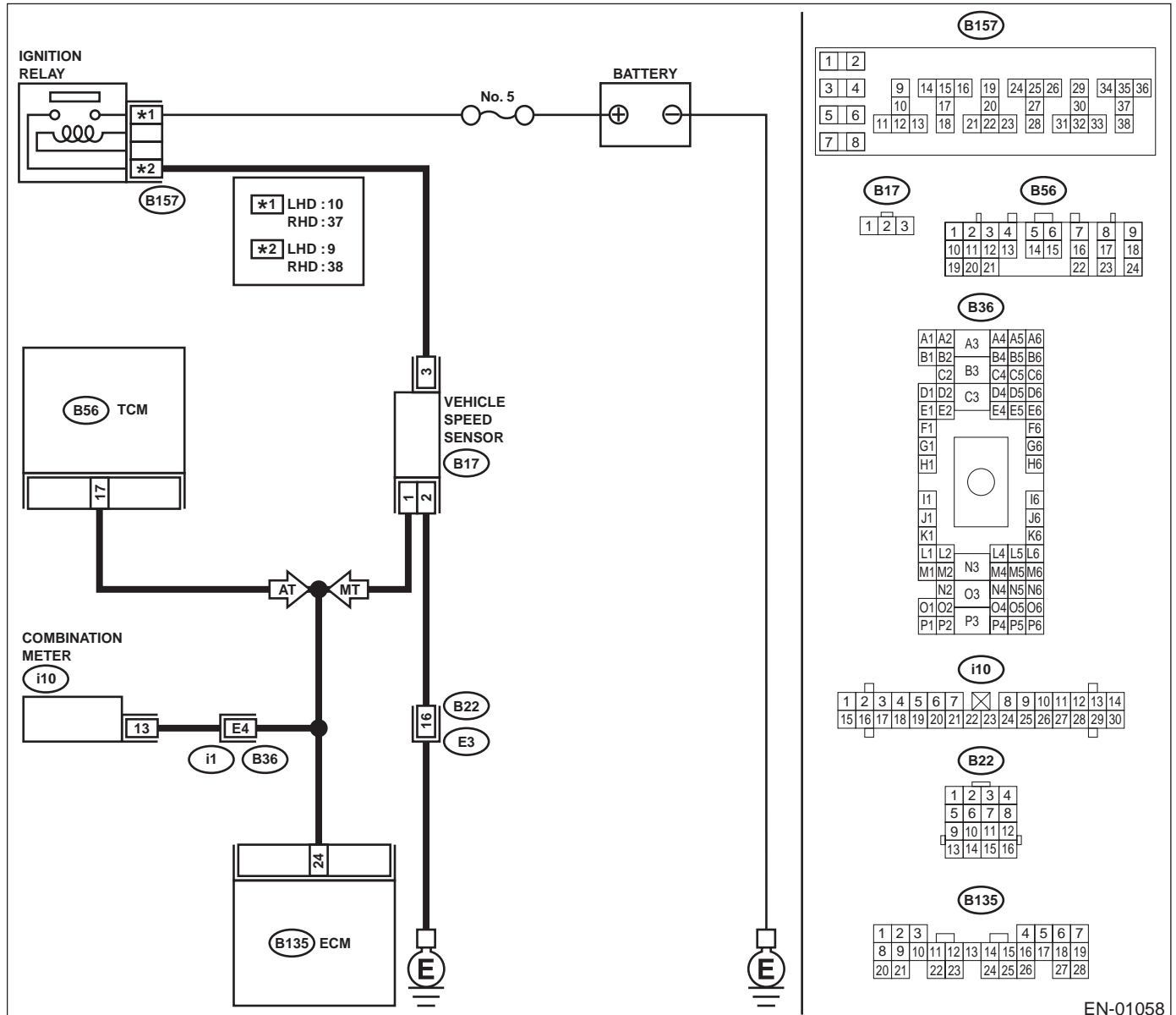
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01058

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPEEDOMETER OPERATION IN COMBINATION METER. Does speedometer operate normally?	Speedometer operates normally.	Go to step 2.	Check speedometer and vehicle speed sensor.
2 CHECK INPUT SIGNAL FOR ECM. 1) Lift-up the vehicle. 2) Set the positive (+) terminal and earth lead of oscilloscope at ECM connector terminals and chassis ground. Connector & terminal (B135) No. 24 (+) — Chassis ground (-): 3) Start the engine. 4) Shift on the gear position, and put the vehicle at constant speed. 5) Measure signal voltage indicated on oscilloscope. Does the measured value exceed the specified value?	3 V	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM.	Replace ECM. <Ref. to FU(H4S0w/oOBD)-42, Engine Control Module.>
4 CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 24 (+) — Chassis ground (-): Does the measured value exceed the specified value?	2 V	Repair harness and connector. NOTE: In this case, repair the following: Battery short circuit in harness between ECM and combination meter connector	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 24 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and combination meter connector.	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM.	Replace ECM. <Ref. to FU(H4S0w/oOBD)-42, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

K: DTC 35 PURGE CONTROL SOLENOID VALVE

• DIAGNOSIS:

- The purge control solenoid valve is not in function.
- The harness connector between ECM and purge control solenoid valve is in short or open.

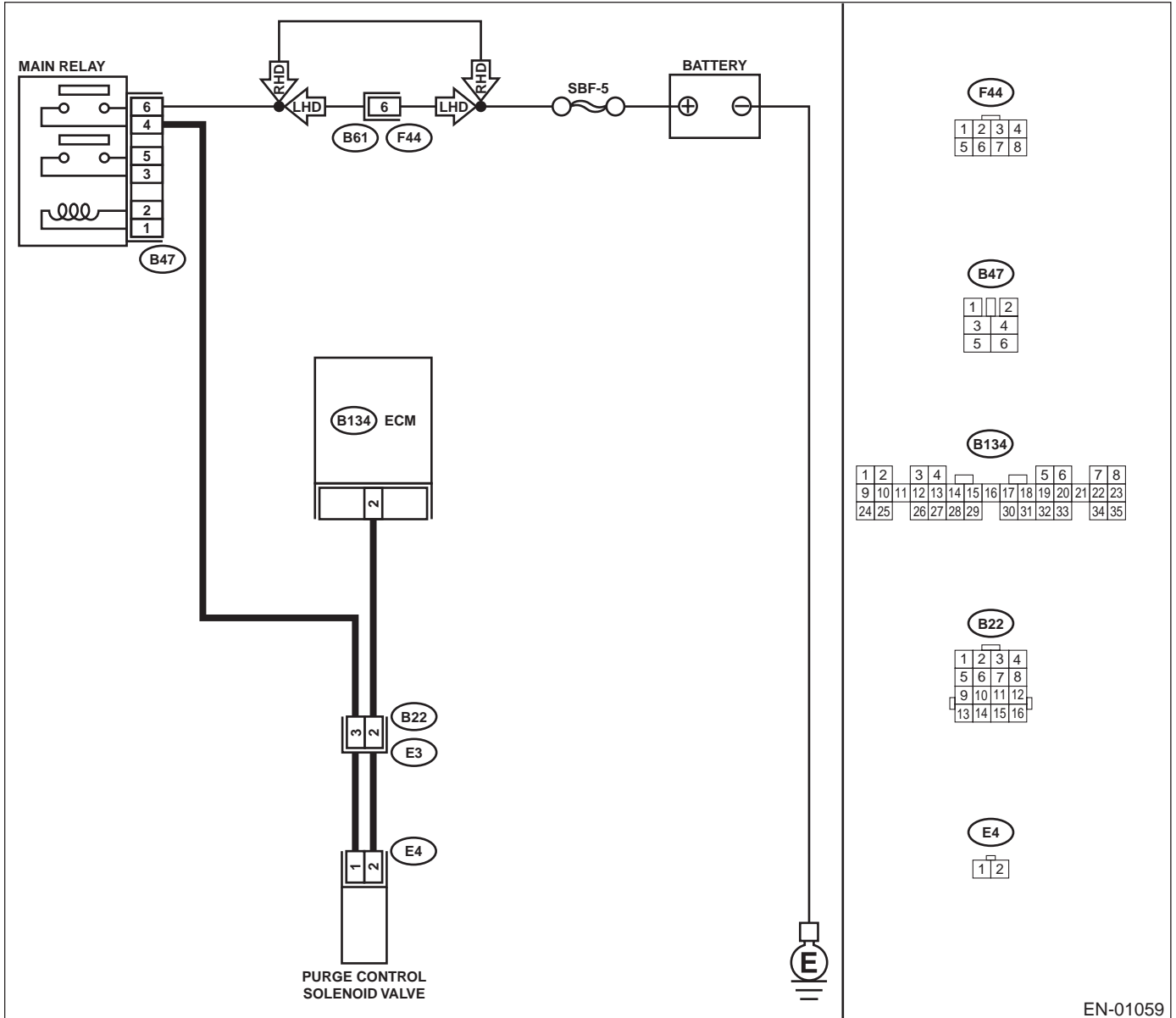
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01059

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION SOUND OF PURGE CONTROL SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) Make sure that the ON/OFF operating sound of purge control solenoid valve occurs at about 10 Hz. Does purge control solenoid valve produce operating sound?	The valve produces operating sound.	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM.	Replace ECM. <Ref. to FU(H4S0w/oOBD)-42, Engine Control Module.>
3 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Disconnect connector from purge control solenoid valve. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM.	Go to step 4.
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and purge control solenoid valve of harness connector. Connector & terminal (B134) No. 2 — (E4) No. 2: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair open circuit in harness between ECM and purge control solenoid valve connector.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove purge control solenoid valve. 2) Measure resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2: Is the measured value within the specified value?	23 — 27 Ω	Go to step 6.	Replace purge control solenoid valve. <Ref. to EC(H4S0w/oOBD)-8, Purge Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and purge control solenoid valve connector • Poor contact in main relay connector • Poor contact in coupling connector (B22)
<p>7 CHECK POOR CONTACT. Check poor contact in purge control solenoid valve connector. Is there poor contact in purge control solenoid valve connector?</p>	There is poor contact.	Repair poor contact in purge control solenoid valve connector.	Contact with your Subaru distributor. NOTE: Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

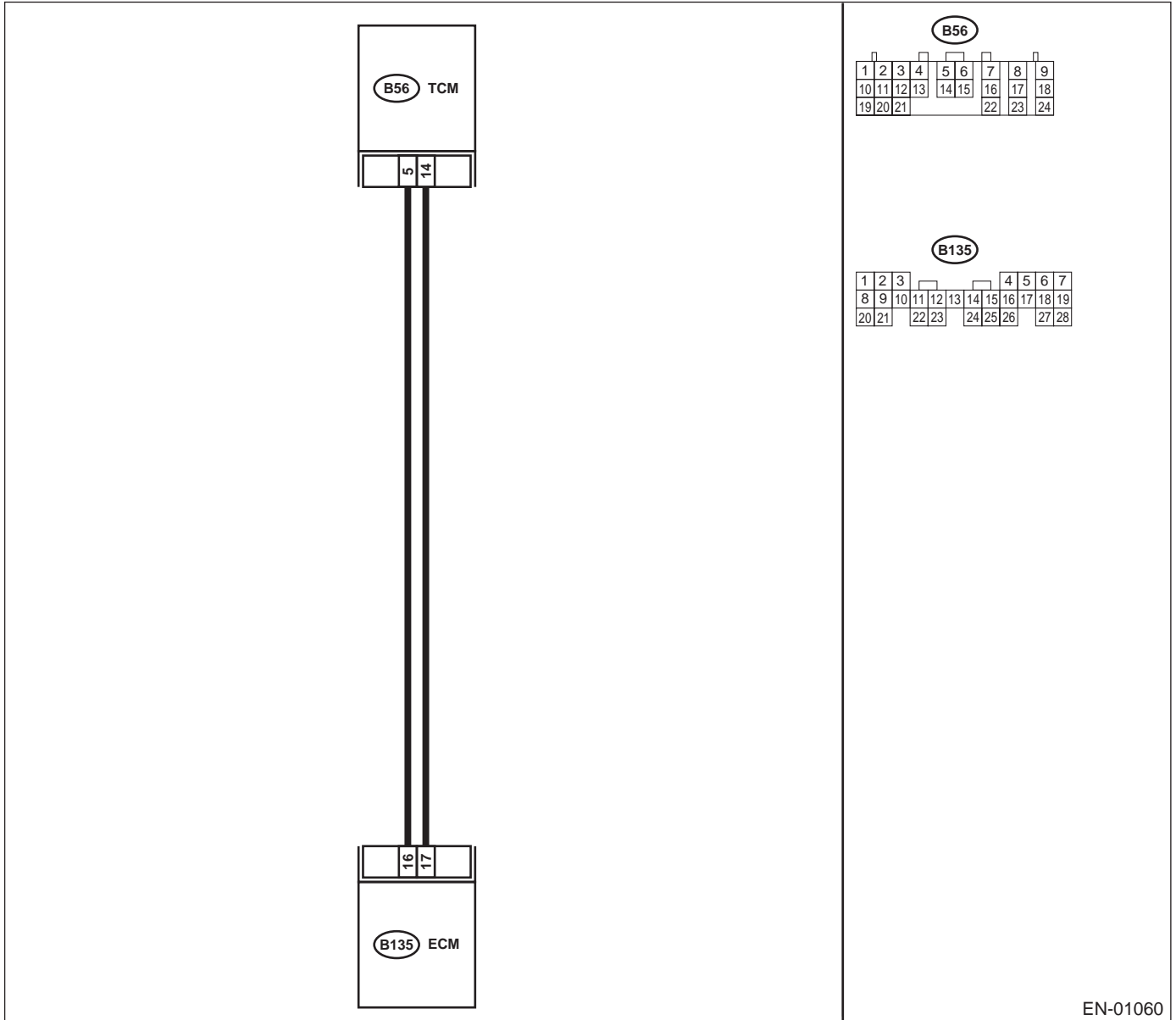
L: DTC 38 TORQUE CONTROL SIGNAL

- **DIAGNOSIS:**
 - Abnormal signal entered from TCM
 - The harness connector between ECM and TCM is in short.

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(H4S0w/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4S0w/oOBD)-26, OPERATION, Inspection Mode.>

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Disconnect connectors from ECM and TCM. 2) Measure resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 17 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 16 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

M: DTC 45 PRESSURE SENSOR

• **DIAGNOSIS:**

- The pressure sensor signal is abnormal.
- The harness connector between ECM and pressure sensor is in short or open.

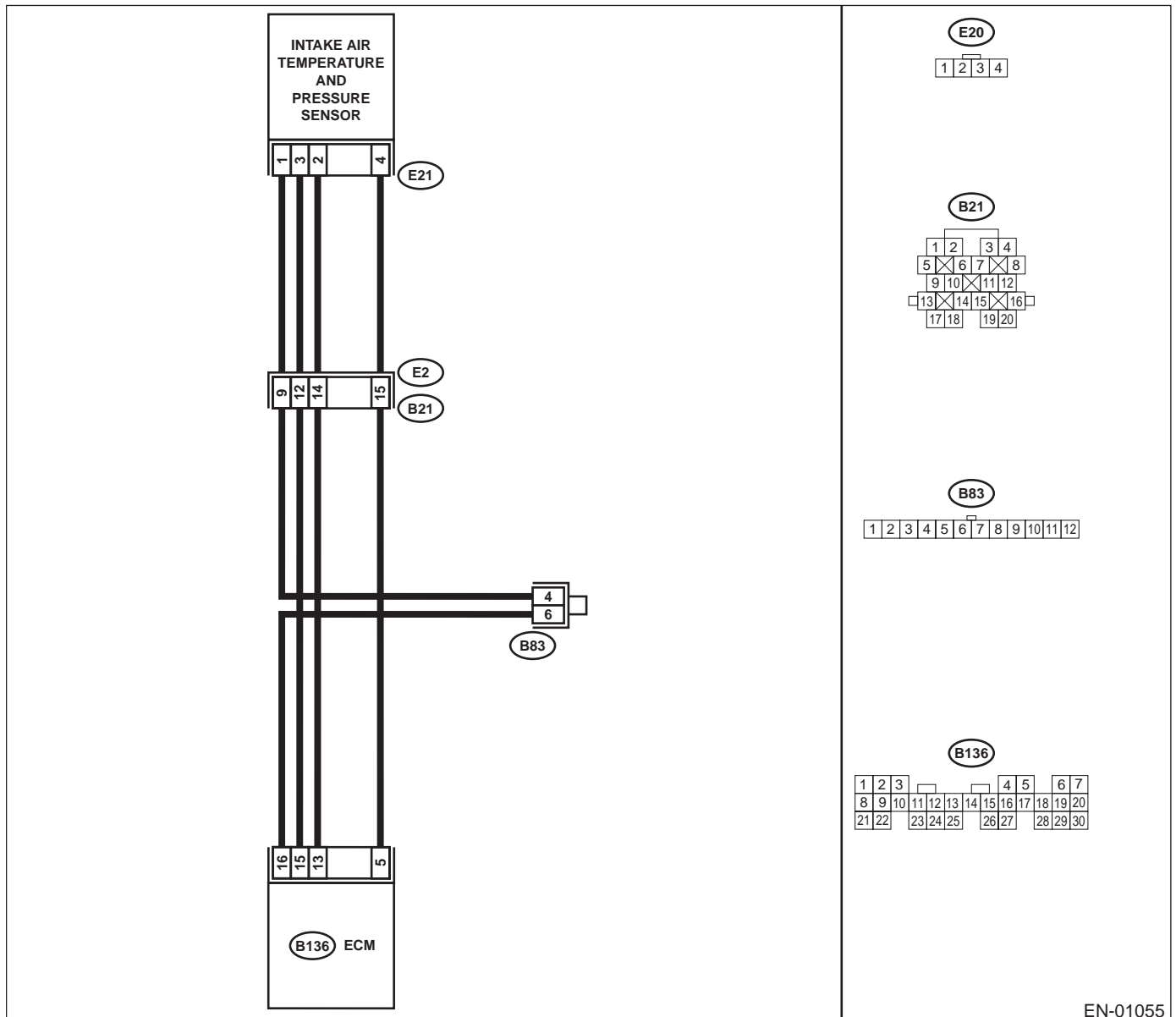
• **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN-01055

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Disconnect connector from pressure sensor. 2) Turn ignition switch to ON. 3) Measure voltage between pressure sensor connector and engine ground. Connector & terminal (E20) No. 3 (+) — Engine ground (-): Is the measured value within the specified value?	4.5 — 5.5 V	Go to step 2.	Repair open or ground short circuit in harness between ECM and pressure sensor.
2 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and pressure sensor connector. Connector & terminal (B136) No. 16 — (E20) No. 1: (B136) No. 5 — (E20) No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit in harness between ECM and pressure sensor connector.
3 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 5 — Chassis ground: (B136) No. 16 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 4.	Repair ground short circuit in harness between ECM and pressure sensor connector.
4 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Connect connector to ECM and pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 5 (+) — Chassis ground (-): Is the measured value within the specified value?	2.3 — 2.5 V	Go to step 5.	Replace pressure sensor. <Ref. to FU(H4SOw/oOBD)-32, Intake Air Temperature and Pressure Sensor.>
5 CHECK INPUT SIGNAL FOR ECM. 1) Start engine, and idle it. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 5 (+) — Chassis ground (-): Is the measured value within the specified value?	1.2 — 1.8 V	Go to step 6.	Replace pressure sensor. <Ref. to FU(H4SOw/oOBD)-32, Intake Air Temperature and Pressure Sensor.>
6 CHECK POOR CONTACT. Check poor contact in pressure sensor connector. Is there poor contact in pressure sensor connector?	There is poor contact.	Repair poor contact in pressure sensor connector.	Replace pressure sensor. <Ref. to FU(H4SOw/oOBD)-32, Intake Air Temperature and Pressure Sensor.>

N: DTC 46 CO RESISTOR (GENERAL SPEC. VEHICLES)

• **DIAGNOSIS:**

- The CO resistor signal is abnormal.
- The harness connector between ECM and CO resistor is in short or open.
- The CO value is not adjusted to specifications.

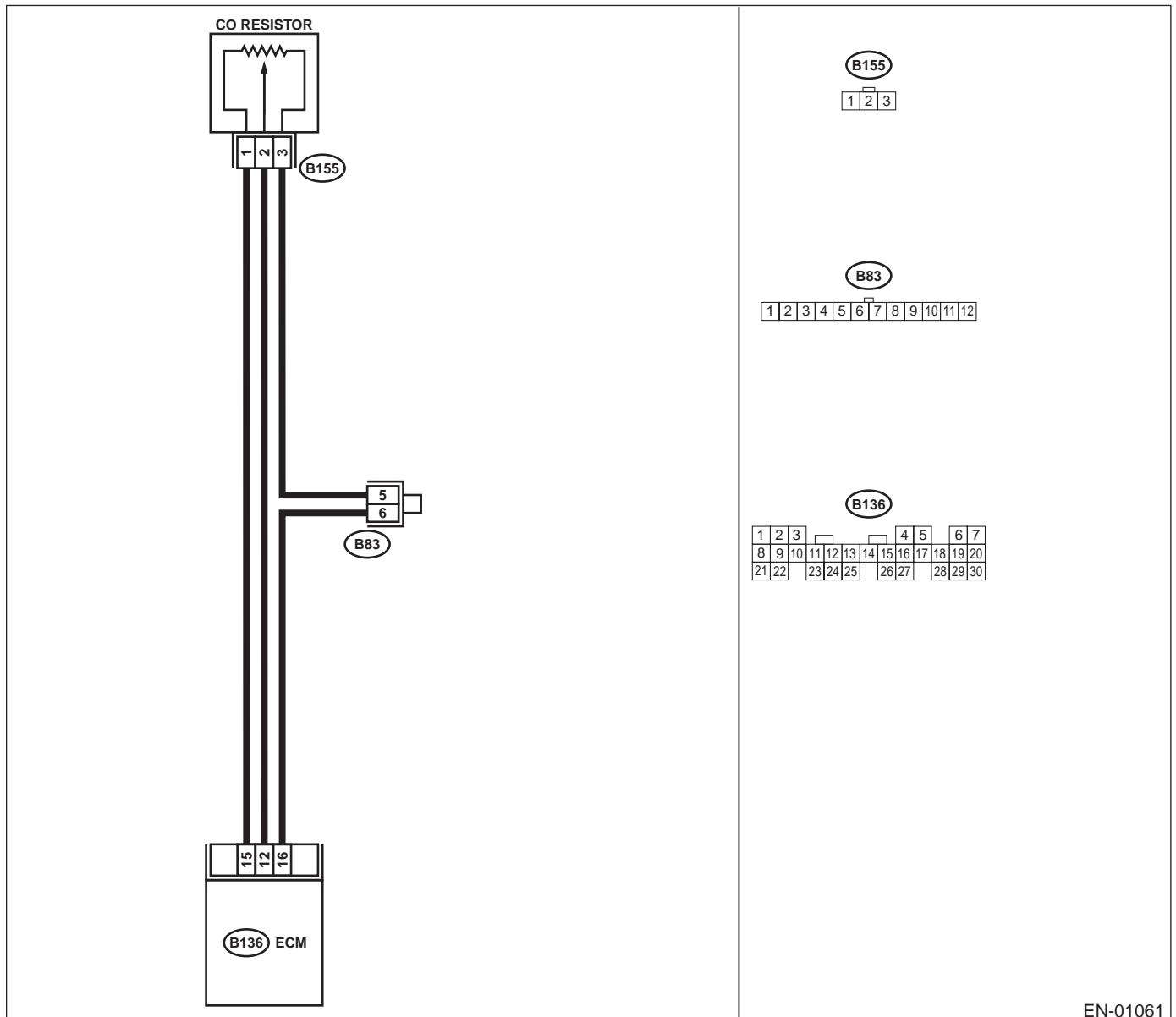
• **TROUBLE SYMPTOM:**

- Erroneous idling
- Mixture ratio is too rich or too lean.

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 12 (+) — Chassis ground (-): Is the measured value within the specified value?	0.5 — 4.5 V	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>
3 CHECK HARNESS BETWEEN CO RESISTOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and CO resistor. 3) Measure resistance of harness between ECM and CO resistor connector. Connector & terminal (B136) No. 15 — (B155) No. 1: (B136) No. 12 — (B155) No. 2: (B136) No. 16 — (B155) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair open circuit in harness between ECM and CO resistor connector.
4 CHECK HARNESS BETWEEN CO RESISTOR AND ECM CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 15 — Chassis ground: (B136) No. 12 — Chassis ground: (B136) No. 16 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 5.	Repair short circuit in harness between ECM and CO resistor connector.
5 CHECK CO RESISTOR. Measure resistance between CO resistor terminals. Terminals No. 1 — No. 3: Is the measured value within the specified value?	4 — 6 k Ω	Go to step 6.	Replace CO resistor.
6 CHECK CO RESISTOR. Measure variable resistance between CO resistor terminals while rotating the screw of CO resistor. Terminals No. 1 — No. 2: Is the measured value within the specified value?	0 — 6 k Ω	Replace ECM.	Replace CO resistor. NOTE: Ensure resistance varies in response to screw rotation.

O: DTC 51 NEUTRAL POSITION SWITCH (MT VEHICLE)

• DIAGNOSIS:

- The neutral position switch signal is abnormal.
- The harness connector between ECM and neutral position switch is in short or open.

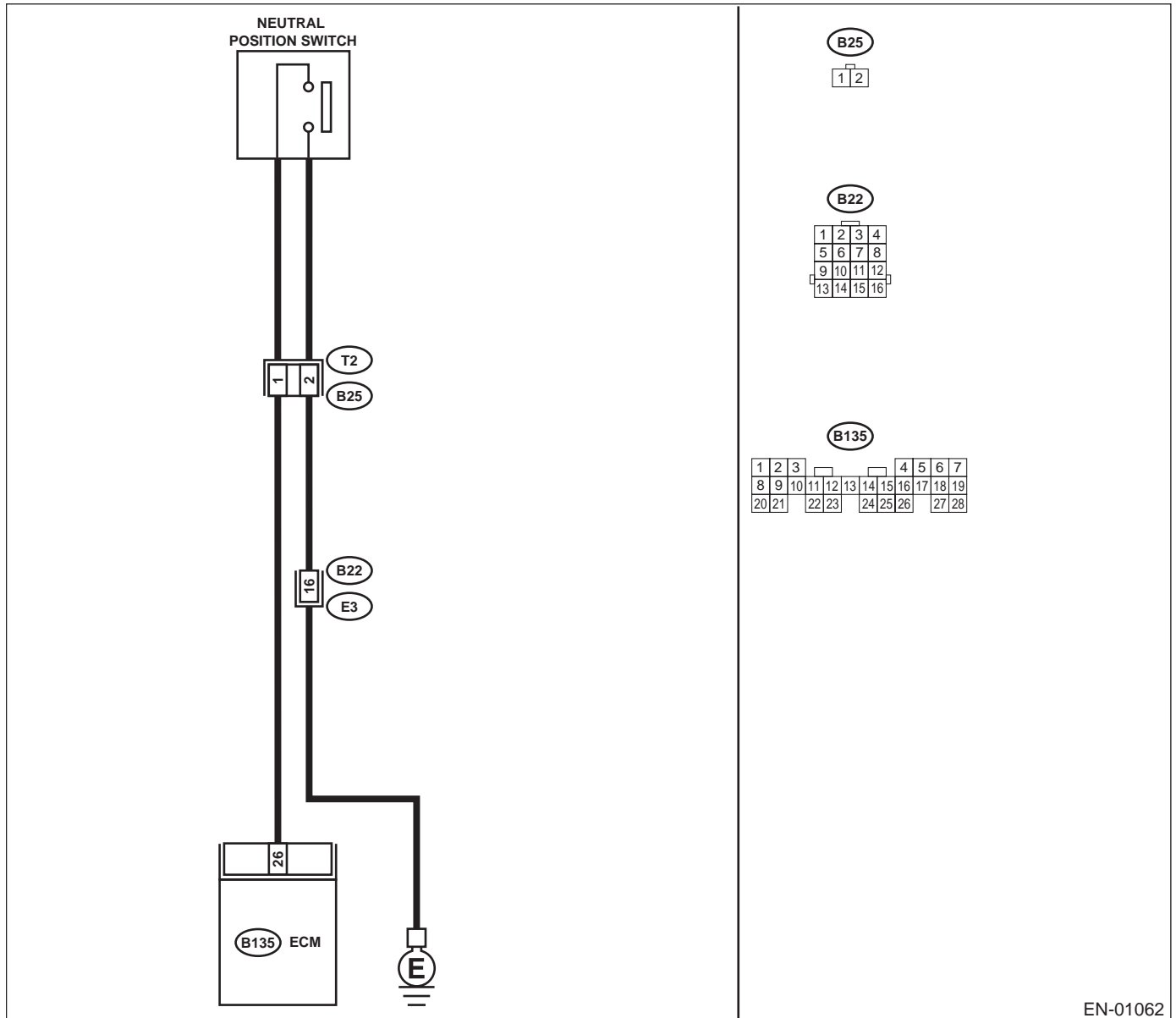
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01062

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Select MT shift lever to neutral position. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 26 (+) — Chassis ground (-): Is the measured value within the specified value?	4.5 — 5.5 V	Go to step 3.	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. 1) Select MT shift lever in any position other than neutral. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 26 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4S0w/oOBD)-42, Engine Control Module.>
4 CHECK NEUTRAL POSITION SWITCH. 1) Turn ignition switch to OFF. 2) Select MT shift lever to neutral position. 3) Disconnect connector from transmission harness. 4) Measure resistance between transmission harness and connector terminals. Connector & terminal (T2) No. 1 — No. 2: Does the measured value exceed the specified value?	1 M Ω	Go to step 5.	Repair short circuit in transmission harness or replace neutral position switch.
5 CHECK NEUTRAL POSITION SWITCH. 1) Move MT shift lever to any position other than neutral. 2) Measure resistance between transmission harness connector terminals. Connector & terminal (T2) No. 1 — No. 2: Is the measured value less than the specified value?	10 Ω	Go to step 6.	Repair open circuit in transmission harness or replace neutral position switch.
6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and transmission harness connector. Connector & terminal (B135) No. 26 — (B25) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 7.	Repair open circuit in harness between ECM and transmission harness connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure resistance between ECM and chassis ground. Connector & terminal (B135) No. 26 — Chassis ground: Is the measured value less than the specified value?</p>	10 Ω	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step 8 .
<p>8 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

P: DTC 51 PARK/NEUTRAL POSITION SWITCH (AT VEHICLE)

• DIAGNOSIS:

- The park/neutral position switch signal is abnormal.
- The shift cable is connected abnormally.
- The harness connector between ECM and inhibitor switch is in short or open.

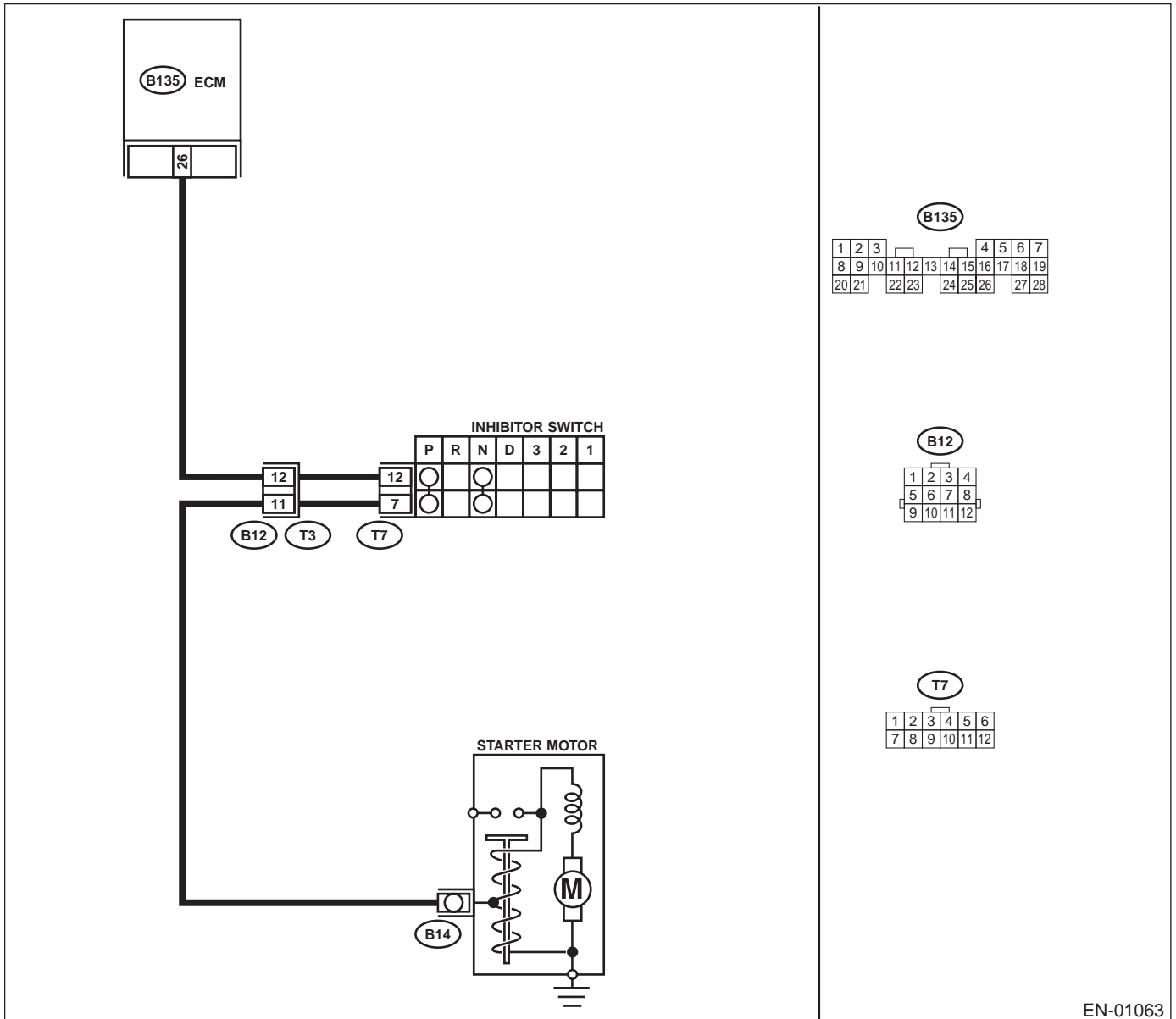
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01063

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground in selector lever "N" and "P" positions. Connector & terminal (B135) No. 26 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and inhibitor switch. 3) Measure resistance of harness between ECM and inhibitor switch connector. Connector & terminal (B135) No. 26 — (T7) No. 12: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector (B12) • Poor contact in inhibitor switch connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 26 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step 5.
5 CHECK INHIBITOR SWITCH GROUND LINE. Remove re-starter motor connector. Measure resistance of harness between inhibitor switch connector and engine ground. Connector & terminal (T7) No. 12 — (B14) No. 1: Is the measured value less than the specified value?	5 Ω	Go to step 6.	Repair open circuit in inhibitor switch ground line.
6 CHECK STARTER MOTOR. Check starter motor. <Ref. to SC(H4SO)-10, INSPECTION, Starter.>	Starter motor is normal.	Go to step 7.	Repair or replace starter motor.
7 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Q: DTC 85 CHARGE SYSTEM

• **DIAGNOSIS:**

- Power source voltage of the ECM is low or high.

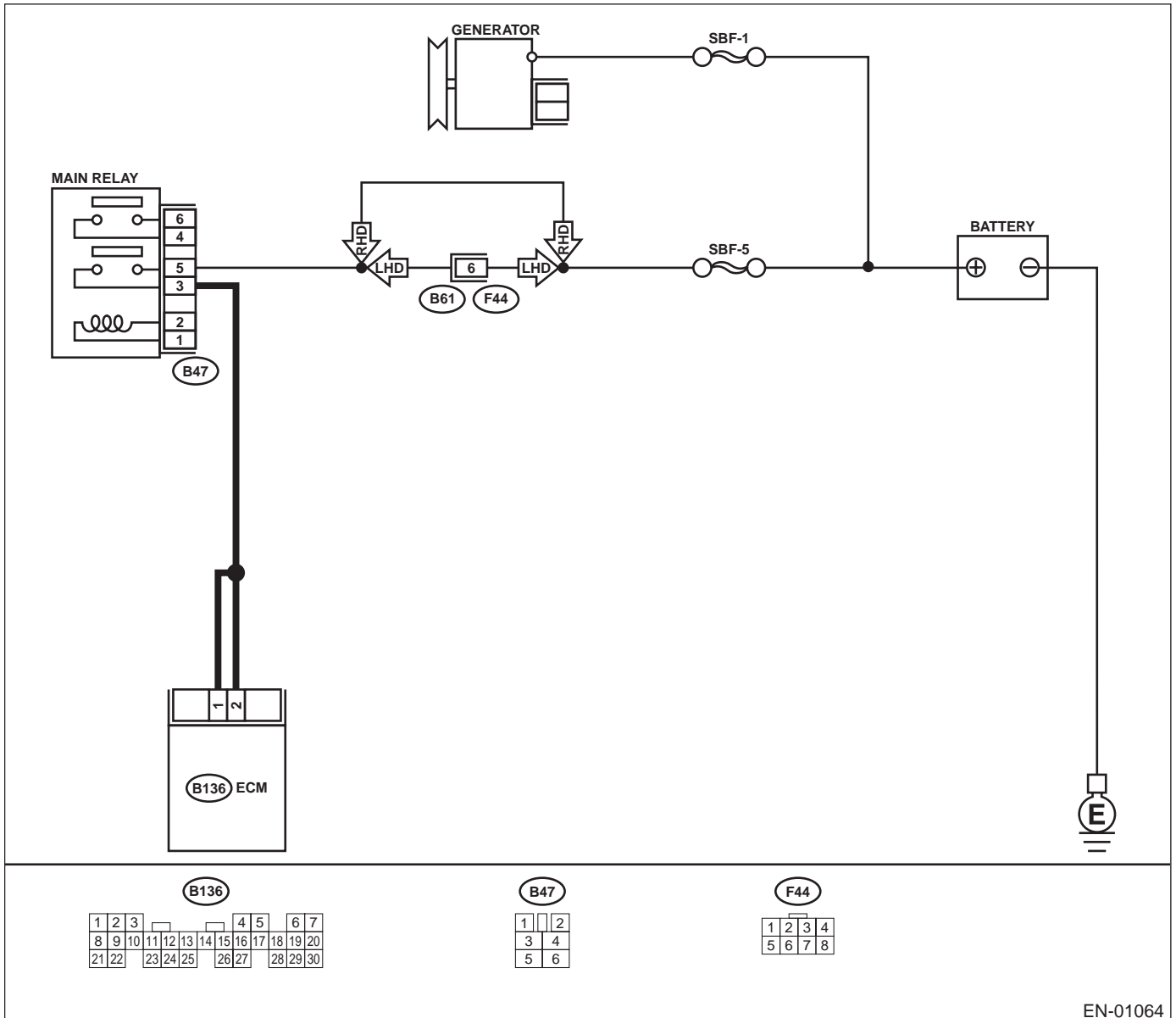
• **TROUBLE SYMPTOM:**

- Charge warning light comes on.

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> and <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN-01064

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK GENERATOR. 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-): Is the measured value within the specified value?	10.8 V — 16.2 V	Go to step 2.	Repair generator. <Ref. to SC(H4SO)-14, Generator.>
2 CHECK GENERATOR. 1) Run engine at 5,000 rpm. 2) Measure voltage between generator B terminal and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-): Is the measured value within the specified value?	10.8 V — 16.2 V	Go to step 3.	Repair generator. <Ref. to SC(H4SO)-14, Generator.>
3 CHECK BATTERY TERMINAL. Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Battery terminal is tightly clamped.	Go to step 4.	Tighten the clamp of terminal.
4 CHECK INPUT VOLTAGE OF ECM. 1) Run the engine at idle. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 1 (+) — Chassis ground (-): (B136) No. 2 (+) — Chassis ground (-): Is the measured value within the specified value?	10.8 V — 16.2 V	Go to step 5.	Repair harness connector between battery, main relay and ECM.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ECM?	There is poor contact.	Repair connector.	Go to step 6.
6 CHECK ECM. 1) Connect all connectors. 2) Erase the memory. <Ref. to EN(H4SOW/oOBD)-28, OPERATION, Clear Memory Mode.> 3) Perform inspection mode. <Ref. to EN(H4SOW/oOBD)-26, OPERATION, Inspection Mode.> 4) Read out the trouble code. <Ref. to EN(H4SOW/oOBD)-24, OPERATION, Read Diagnostic Trouble Code (DTC).> Is the same trouble code (DTC) as in the current diagnosis still being output?	DTC 85 is displayed.	Replace generator.	Go to step 7.
7 CHECK ANY OTHER TROUBLE CODES APPEARANCE. Are other trouble codes (DTC) being output?	DTC is displayed.	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

15. General Diagnostic Table

A: INSPECTION

NOTE:

- Malfunction of parts other than those listed is also possible.
- The right-hand priority column indicates the inspection priority of probable causes of the symptom. Carry out the check starting from A.

Symptom	Problem parts	Priority
1. Engine does not start. (internal combustion does not occur.)	1) ECM power supply	A
	2) Engine ground terminal	A
	3) Crankshaft position sensor	B
	4) Camshaft position sensor	B
	5) Fuel pump	B
	6) Pressure regulator	B
	7) Ignition coil & ignitor	C
	8) Spark plug	C
	9) Fuel injector	C
2. Engine does not start. (internal combustion occurs.)	1) ECM power supply	A
	2) Spark plug	A
	3) Engine coolant temperature sensor	B
	4) Pressure regulator	B
	5) Pressure sensor	C
	6) Fuel pump	C
	7) Fuel injector	C
	8) Camshaft position sensor	C
	9) Crankshaft position sensor	C
	10) Idle air control solenoid valve	C
3. Engine does not start. (engine stalls after internal combustion.)	1) ECM power supply	A
	2) Pressure sensor	A
	3) Engine coolant temperature sensor	B
	4) Spark plug	B
	5) Ignition coil	C
	6) Fuel pump	C
	7) Pressure regulator	C
	8) Fuel injector	C
	9) Idle air control solenoid valve	C
4. Engine stalls.	1) Idle air control solenoid valve	A
	2) Pressure sensor	B
	3) Spark plug	B
	4) Accelerator cable is out of adjustment	B
	5) ECM power supply	C
	6) Throttle position sensor	C
	7) Crankshaft position sensor	C
	8) Vehicle speed sensor	C
	9) Ignition coil	C
	10) Fuel pump	C

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts	Priority
5. Rough idling	1) Spark plug	A
	2) Pressure sensor	B
	3) Engine coolant temperature sensor	B
	4) Pressure regulator	B
	5) Idle air control solenoid valve	B
	6) Air leak in air intake system	B
	7) ECM power supply	C
	8) Throttle position sensor	C
	9) Camshaft position sensor	C
	10) Crankshaft position sensor	C
	11) Oxygen sensor	C
	12) Fuel pump	C
	13) Fuel injector	C
	14) Test mode or read memory connectors are connected.	C
	15) Intake air temperature sensor	C
6. Hard to drive at constant speed	1) Pressure regulator	A
	2) Fuel injector	B
	3) Pressure sensor	C
	4) Engine coolant temperature sensor	C
	5) Throttle position sensor	C
	6) Fuel pump	C
7. Poor acceleration/deceleration	1) Spark plug	A
	2) Throttle position sensor	B
	3) Ignition coil	B
	4) Fuel pump	B
	5) Pressure regulator	B
	6) Fuel injector	B
	7) Pressure sensor	C
	8) Engine coolant temperature sensor	C
	9) Idle air control solenoid valve	C
	10) Knock sensor	C
8. Poor return to idling	1) Accelerator cable is out of adjustment	A
	2) Throttle position sensor	B
	3) Idle air control solenoid valve	B
	4) Pressure sensor	C
	5) Engine coolant temperature sensor	C
9. Back fire	1) Spark plug	A
	2) Fuel injector	B
	3) Ignition coil and ignitor	C
	4) Fuel pump	C
	5) Pressure regulator	C
10. Knocking	1) Pressure sensor	A
	2) Fuel pump	B
	3) Knock sensor	B
	4) Pressure regulator	B
	5) Engine coolant temperature sensor	C
11. Excessive fuel consumption	1) Pressure sensor	A
	2) Pressure regulator	B
12. Shocks while driving	1) Pressure regulator	A
	2) ECM power supply	B
	3) Throttle position sensor	B
13. Poor engine revving	1) Pressure regulator	A
	2) Pressure sensor	B
	3) Engine coolant temperature sensor	B
	4) Throttle sensor	B
	5) Fuel pump	B

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts	Priority
14. Remarks	1) ECM power supply 2) Pressure sensor 3) Pressure regulator 4) Idle air control solenoid valve 5) Air leak in air intake system	A* B* B* B* B*

A*: Including ECM ground circuit

B*: Check hoses.

ENGINE SECTION 2

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUEL INJECTION (FUEL SYSTEMS) FU(H6DO)

**EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(H6DO)**

INTAKE (INDUCTION) IN(H6DO)

MECHANICAL ME(H6DO)

EXHAUST EX(H6DO)

COOLING CO(H6DO)

LUBRICATION LU(H6DO)

SPEED CONTROL SYSTEMS SP(H6DO)

IGNITION IG(H6DO)

STARTING/CHARGING SYSTEMS SC(H6DO)

ENGINE (DIAGNOSTICS) EN(H6DO)

FUEL INJECTION (FUEL SYSTEMS)

FU(H6DO)

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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

Model		
Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm ² , 53.6 — 98 psi)
	Discharge flow	More than 85 ℓ (22.5 US gal, 18.7 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm ² , 43.5 psi)]
Fuel filter		Cartridge type

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

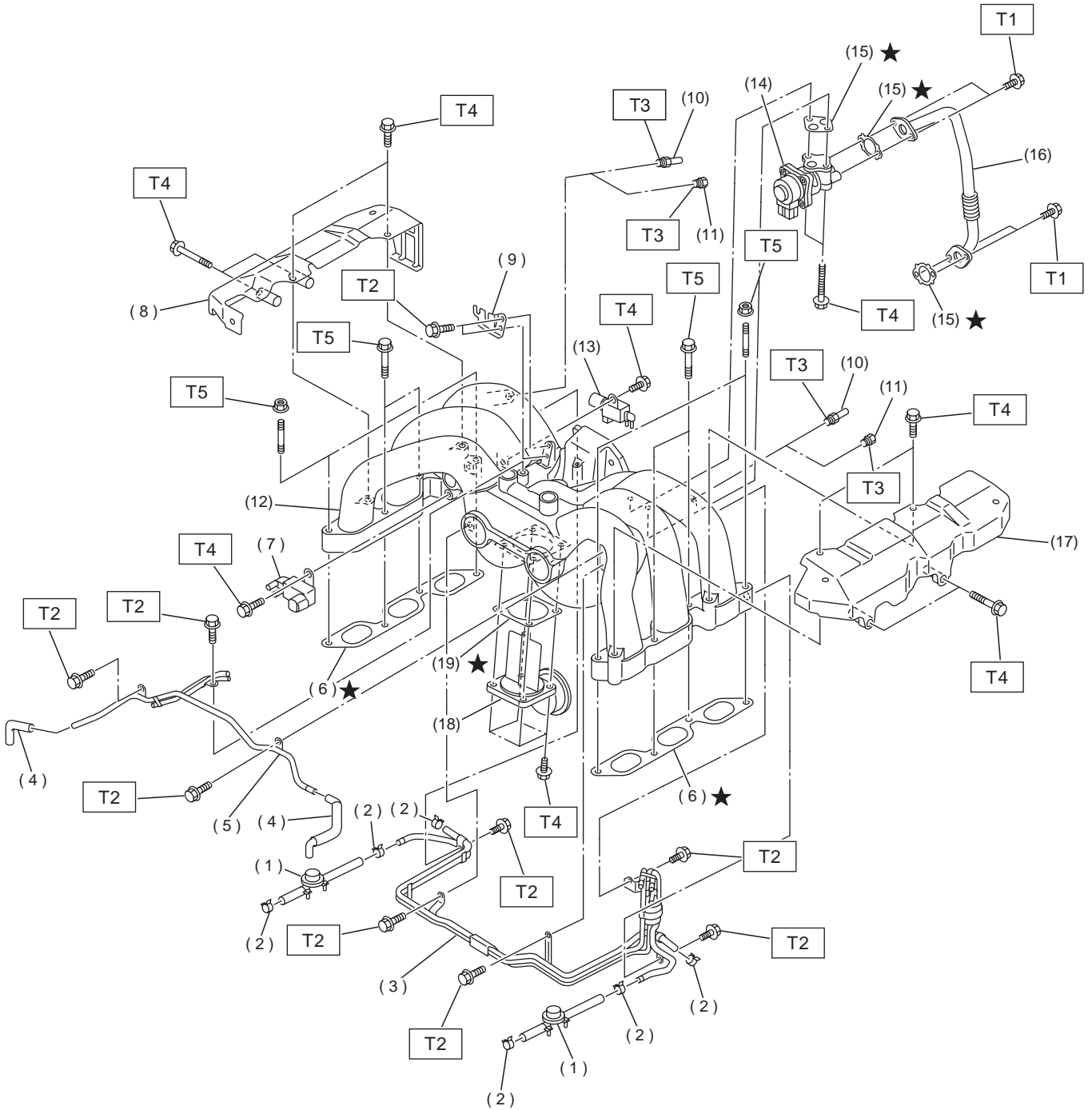
MEMO:

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

B: COMPONENT

1. INTAKE MANIFOLD



FU-00531

FU(H6DO)-4

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

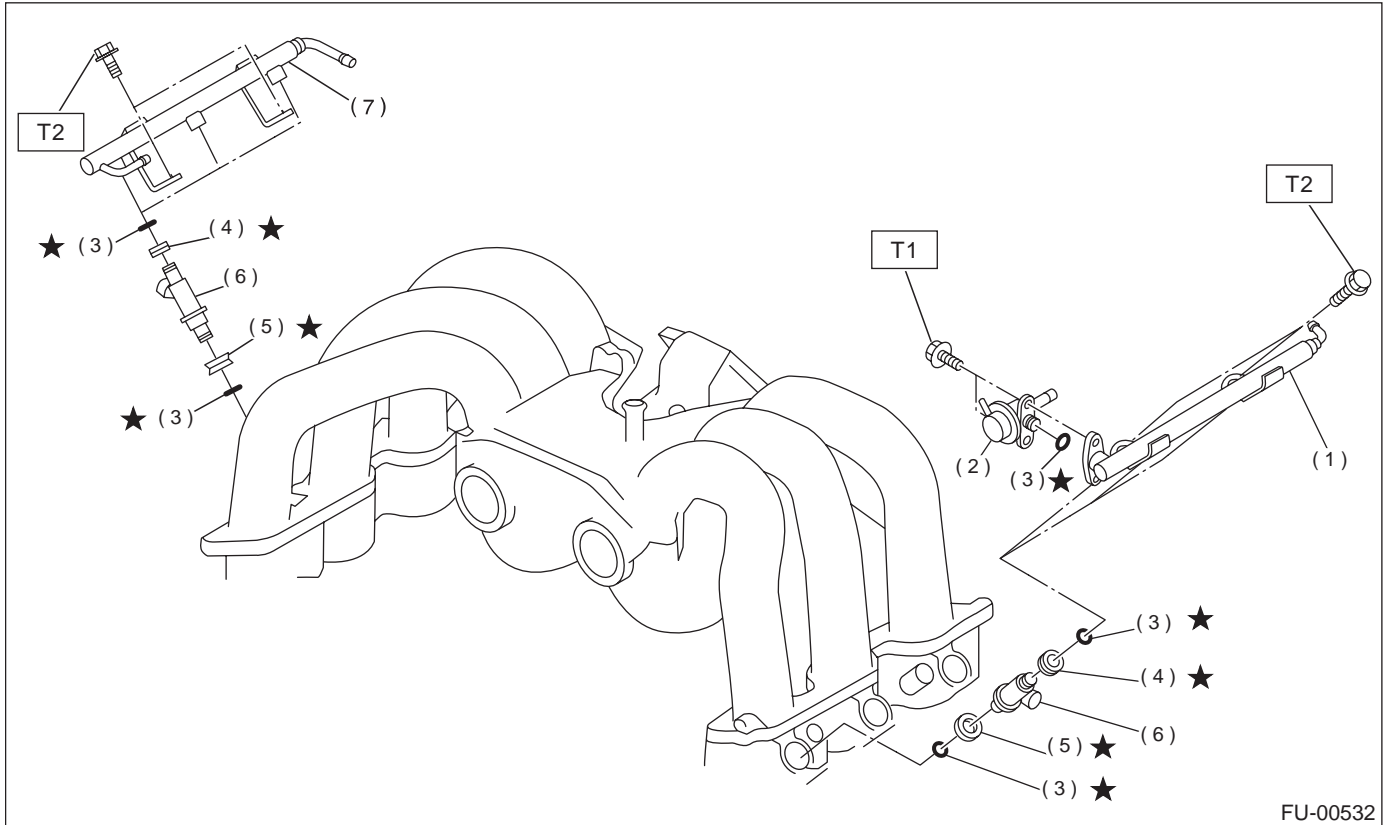
- | | | |
|------------------------------------|---------------------------------------|-------------|
| (1) Fuel damper valve | (10) Nipple | (19) Gasket |
| (2) Clamp | (11) Plug | |
| (3) Fuel pipe ASSY | (12) Intake manifold | |
| (4) Air assist hose | (13) Induction valve control solenoid | |
| (5) Air assist and purge pipe ASSY | (14) EGR valve | |
| (6) Gasket | (15) Gasket | |
| (7) Purge control solenoid valve | (16) EGR pipe | |
| (8) Fuel pipe protector RH | (17) Fuel pipe protector LH | |
| (9) Accelerator cable bracket | (18) Induction valve | |

Tightening torque: N·m (kgf-m, ft-lb)**T1: 6.4 (0.65, 4.7)****T2: 5.0 (0.51, 3.7)****T3: 17 (1.7, 12)****T4: 19 (1.9, 14)****T5: 25 (2.5, 18)**

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

2. FUEL INJECTOR



- (1) Fuel injector pipe LH
- (2) Pressure regulator
- (3) O-ring
- (4) Injection rubber
- (5) Insulator
- (6) Fuel injector
- (7) Fuel injector pipe RH

Tightening torque: N·m (kgf-m, ft-lb)

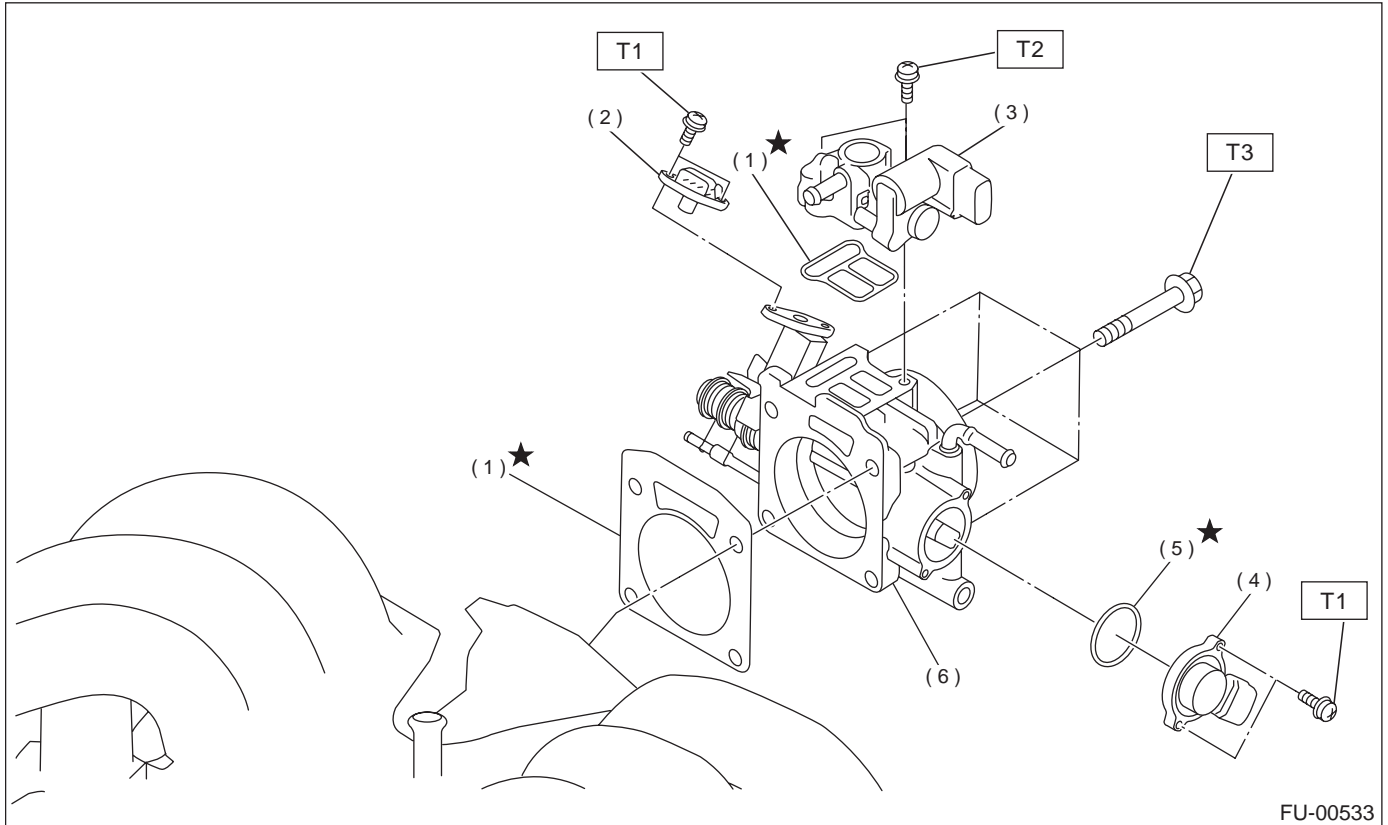
T1: 6.4 (0.65, 4.7)

T2: 19 (1.9, 14)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

3. AIR INTAKE SYSTEM



- (1) Gasket
- (2) Intake manifold pressure sensor
- (3) Idle air control solenoid valve
- (4) Throttle position sensor
- (5) O-ring
- (6) Throttle body

Tightening torque: N·m (*kgf-m, ft-lb*)

T1: 1.6 (0.16, 1.2)

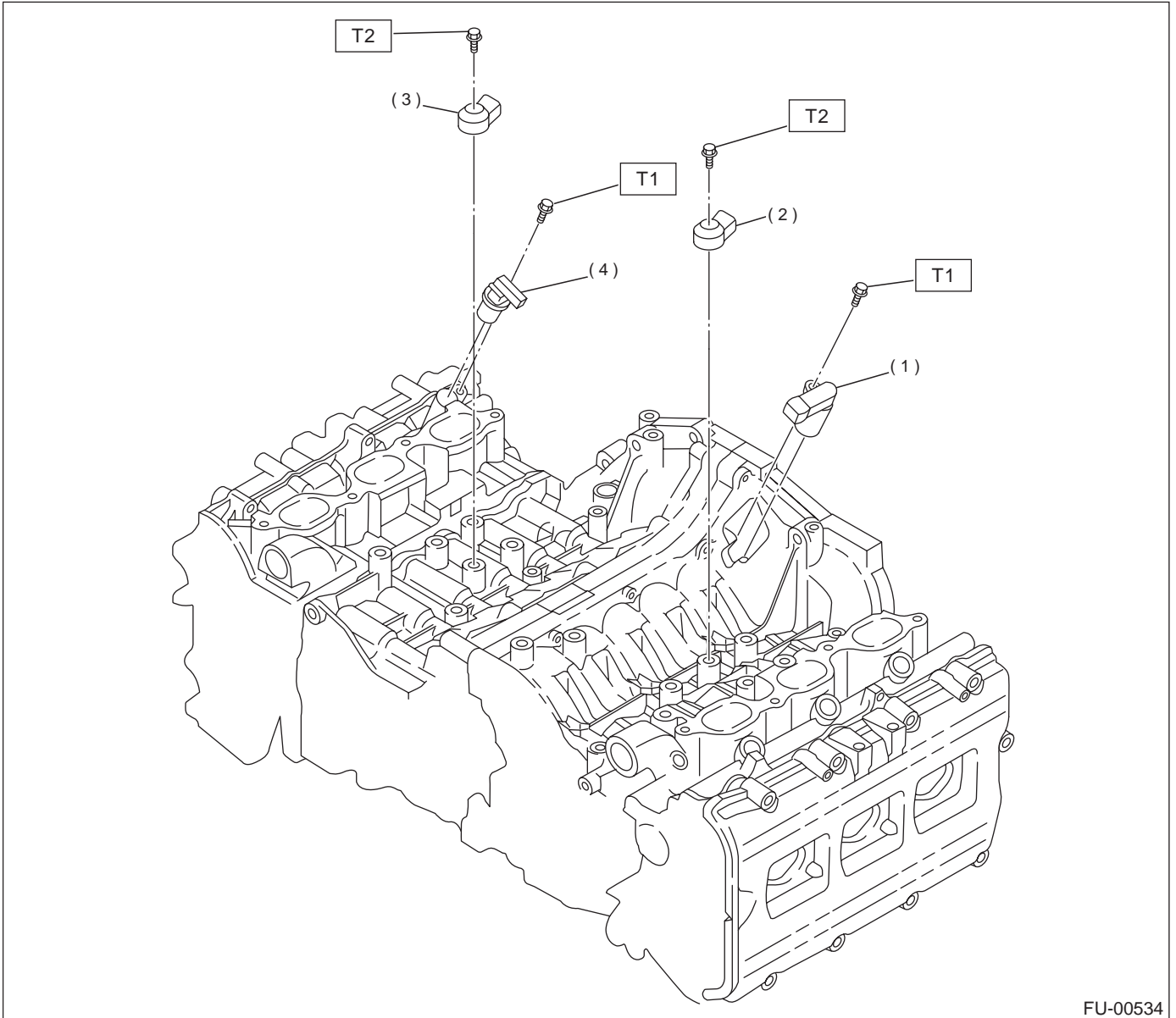
T2: 2.8 (0.29, 2.1)

T3: 22 (2.2, 15.9)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

4. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



- (1) Crankshaft position sensor
- (2) Knock sensor LH
- (3) Knock sensor RH
- (4) Camshaft position sensor

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.4 (0.65, 4.7)

T2: 25 (2.5, 18)

GENERAL DESCRIPTION

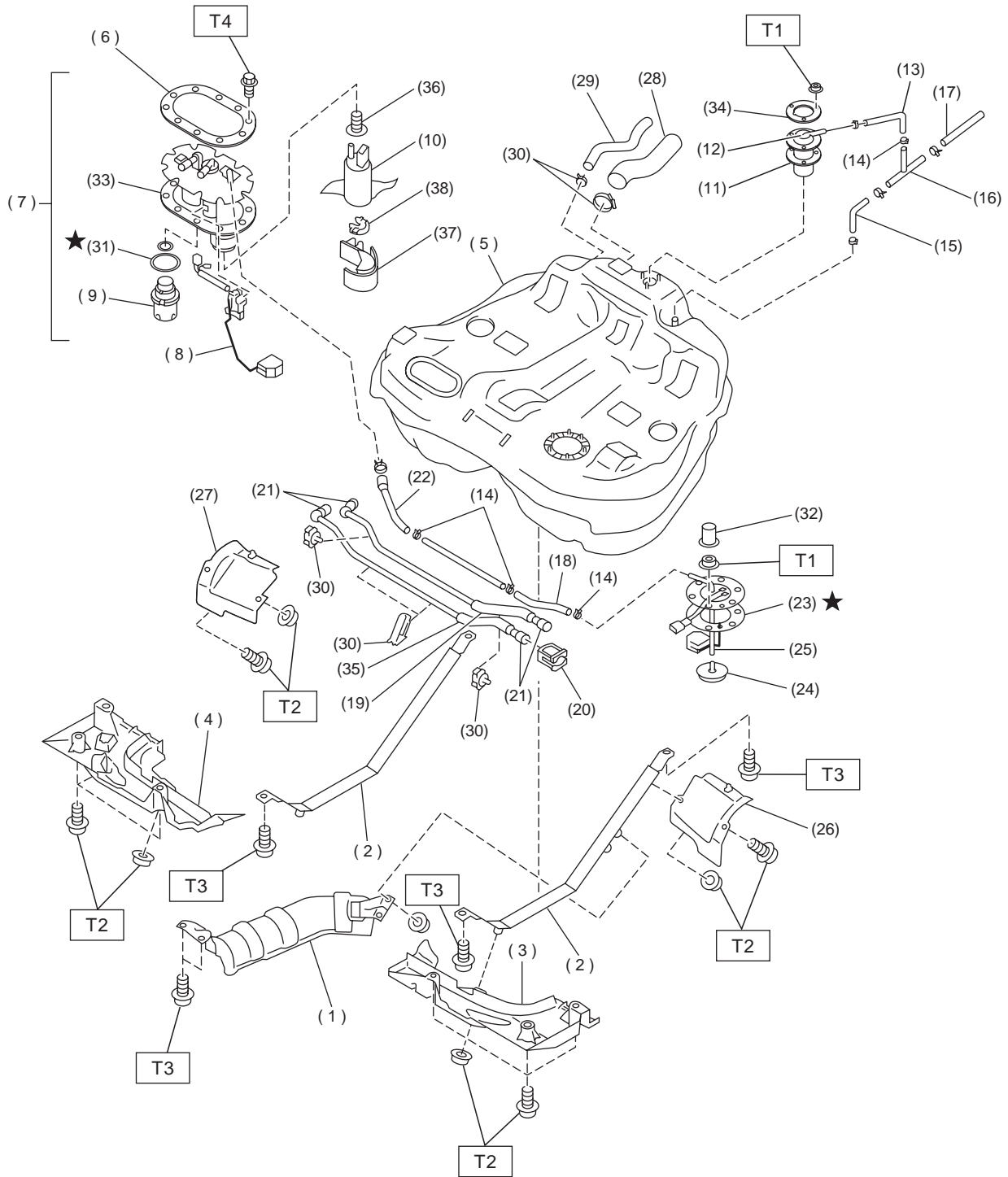
FUEL INJECTION (FUEL SYSTEMS)

MEMO:

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

5. FUEL TANK



FU-00626

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

- | | | |
|----------------------------|-----------------------------------|---------------------------|
| (1) Heat sealed cover | (16) Joint pipe | (31) Gasket |
| (2) Fuel tank band | (17) Evaporation hose B | (32) Cap |
| (3) Protector LH (Front) | (18) Jet pump hose A | (33) Gasket |
| (4) Protector RH (Front) | (19) Fuel return tube | (34) Fuel cut valve plate |
| (5) Fuel tank | (20) Retainer | (35) Fuel delivery tube |
| (6) Fuel pump plate | (21) Quick connector | (36) Seal |
| (7) Fuel pump ASSY | (22) Jet pump hose B | (37) Fuel pump holder |
| (8) Fuel level sensor | (23) Fuel sub level sensor gasket | (38) Grommet |
| (9) Fuel filter | (24) Jet pump filter | |
| (10) Fuel pump with filter | (25) Fuel sub level sensor | |
| (11) Fuel cut valve gasket | (26) Protector LH (Rear) | |
| (12) Fuel cut valve | (27) Protector RH (Rear) | |
| (13) Evaporation hose A | (28) Fuel filler hose | |
| (14) Clip | (29) Air vent hose | |
| (15) Evaporation hose C | (30) Clamp | |

Tightening torque: N·m (*kgf-m, ft-lb*)

T1: 4.4 (0.45, 3.3)

T2: 18 (1.8, 13.0)

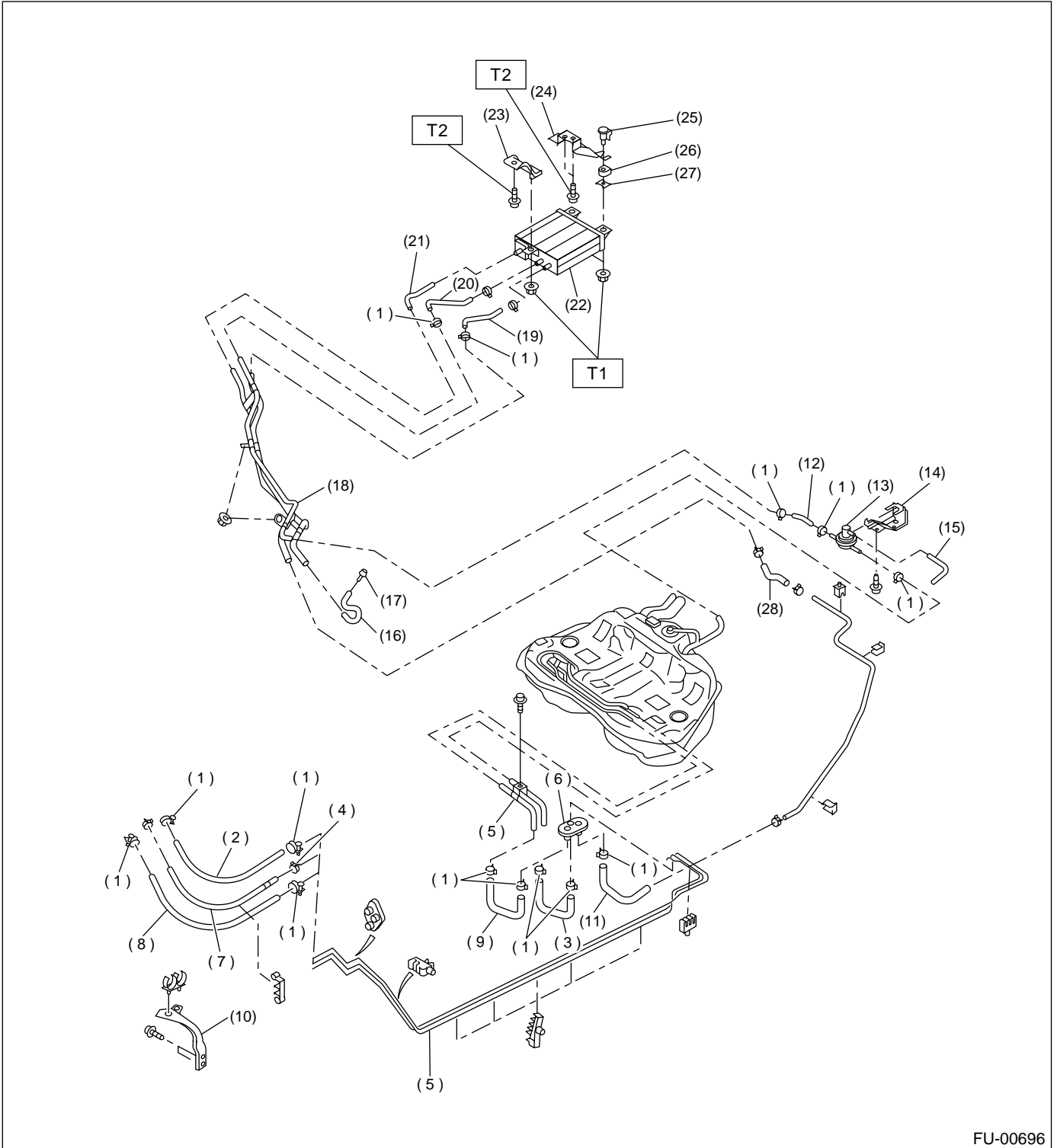
T3: 33 (3.4, 25)

T4: 5.9 (0.6, 4.3)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL LINE



FU-00696

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

- | | | |
|--------------------------|-------------------------------|------------------------------|
| (1) Clamp | (12) Two-way valve hose | (23) Front canister bracket |
| (2) Fuel return hose A | (13) Two-way valve | (24) Rear canister bracket |
| (3) Fuel return hose B | (14) Two-way valve bracket | (25) Canister bracket spacer |
| (4) Clip | (15) Two-way valve drain hose | (26) Cushion |
| (5) Fuel pipe ASSY | (16) Drain hose | (27) Canister bracket plate |
| (6) Grommet | (17) Fuel pipe connector | (28) Evaporation hose D |
| (7) Evaporation hose A | (18) Evaporation pipe ASSY | |
| (8) Fuel delivery hose A | (19) Purge hose | |
| (9) Fuel delivery hose B | (20) Evaporation hose C | |
| (10) Bracket | (21) Canister drain hose | |
| (11) Evaporation hose B | (22) Canister | |

Tightening torque: N·m (**kgf-m, ft-lb**)

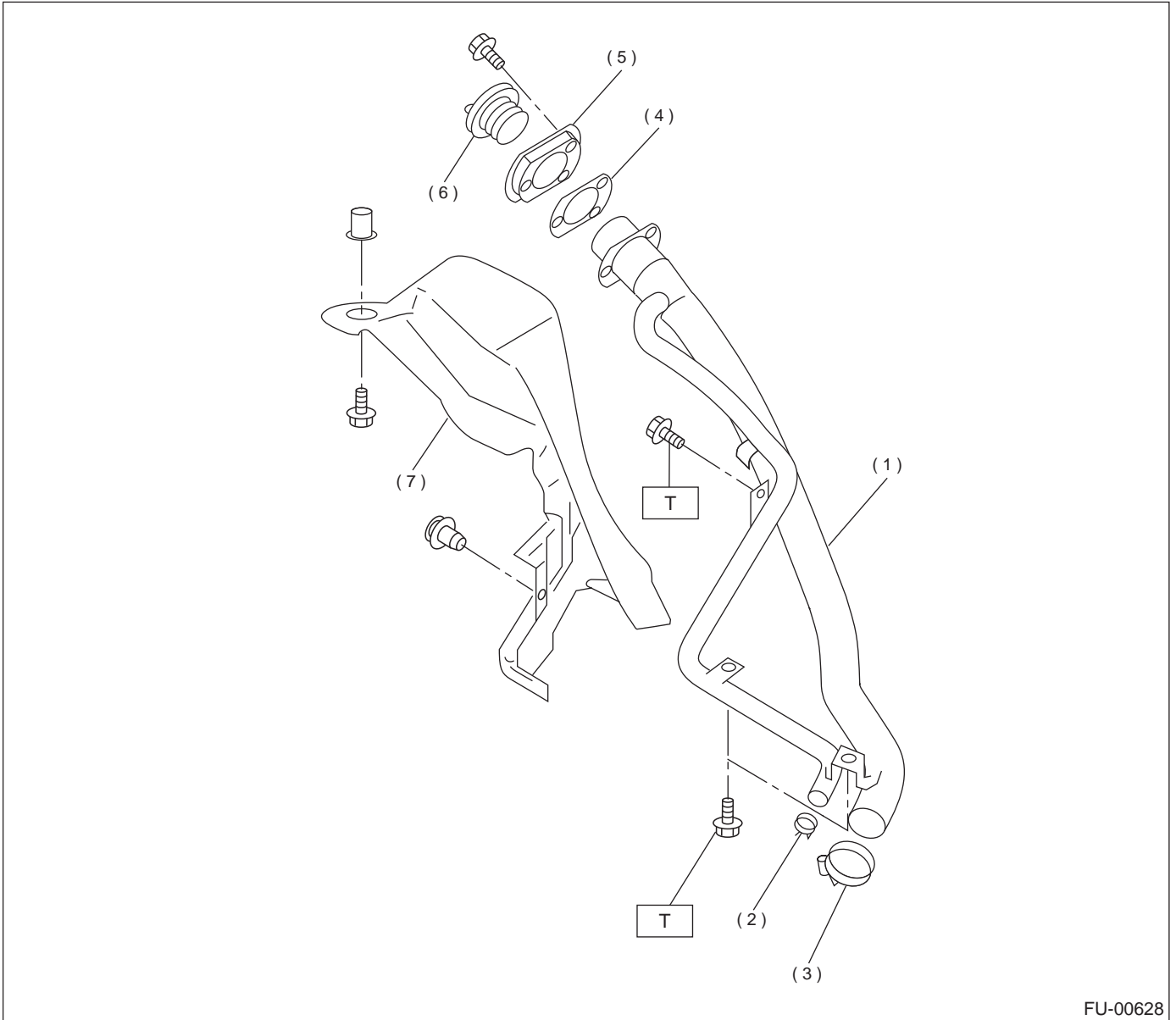
T1: 23 (2.3, 16.6)

T2: 33 (3.4, 25)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

7. FUEL FILLER PIPE



FU-00628

- (1) Fuel filler pipe ASSY
- (2) Clip
- (3) Clamp
- (4) Filler pipe packing
- (5) Filler ring
- (6) Filler cap
- (7) Filler pipe protector

Tightening torque: N·m (kgf·m, ft·lb)

T: 7.4 (0.75, 5.4)

GENERAL DESCRIPTION

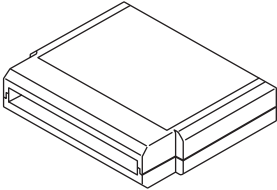

FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST24082AA210</p>	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 <p>ST22771AA030</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

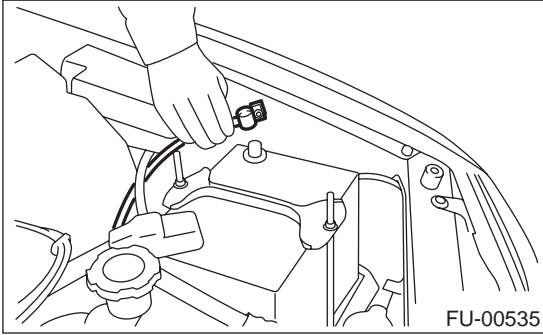
THROTTLE BODY

FUEL INJECTION (FUEL SYSTEMS)

2. Throttle Body

A: REMOVAL

1) Disconnect battery ground cable.

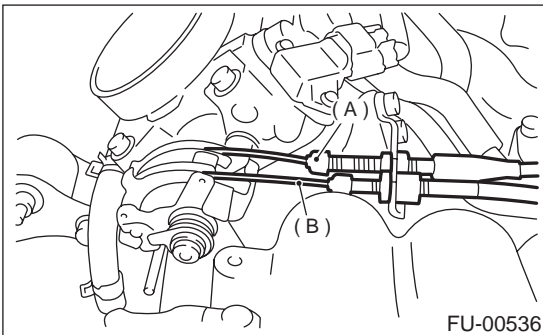


2) Remove air intake chamber.

<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

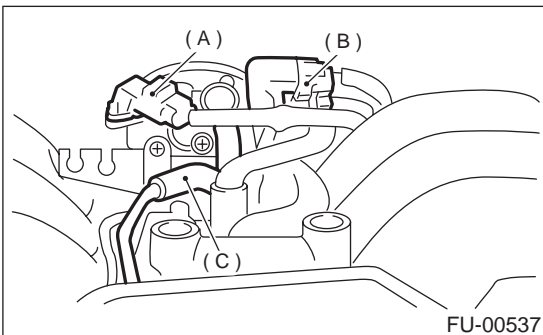
3) Disconnect accelerator cable (A).

4) Disconnect cruise control cable (B). (With cruise control model)

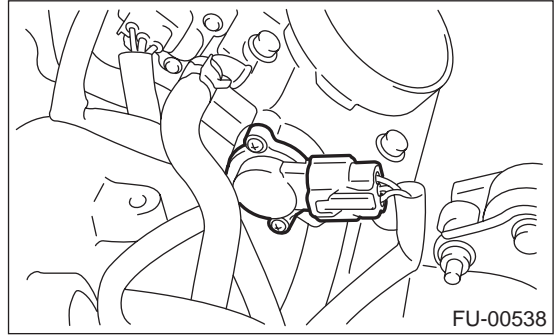


5) Disconnect connectors from intake manifold pressure sensor (A) and idle air control solenoid valve (B).

6) Disconnect air by-pass hose (C) from idle air control solenoid valve.

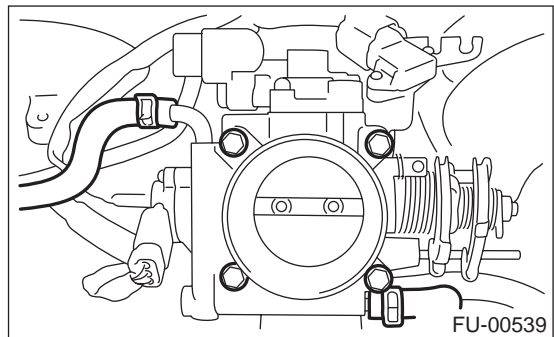


7) Disconnect throttle position sensor connector.



8) Disconnect engine coolant hoses from throttle body.

9) Remove bolts which secure throttle body to intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

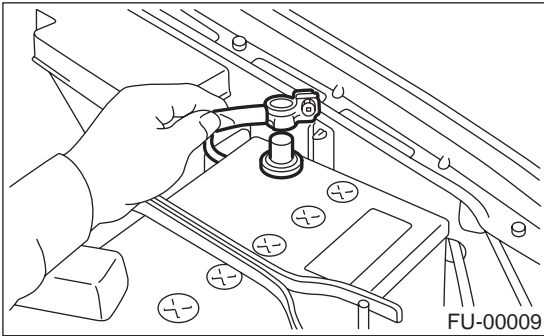
Throttle body;

22 N·m (2.2 kgf-m, 15.9 ft-lb)

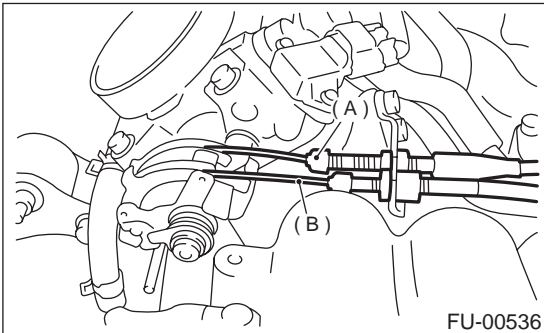
3. Intake Manifold

A: REMOVAL

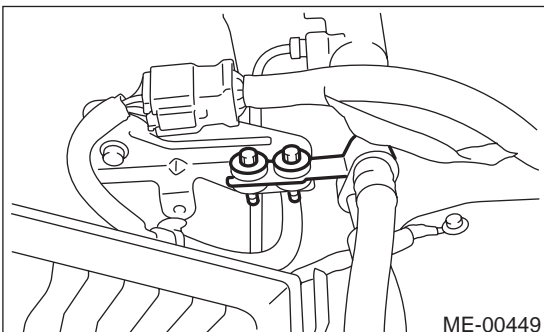
- 1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.
- 3) Disconnect battery ground cable.



- 4) Remove air intake duct, air cleaner assembly and air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> or <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
- 5) Disconnect accelerator cable (A).
- 6) Disconnect cruise control cable (B). (With cruise control model)



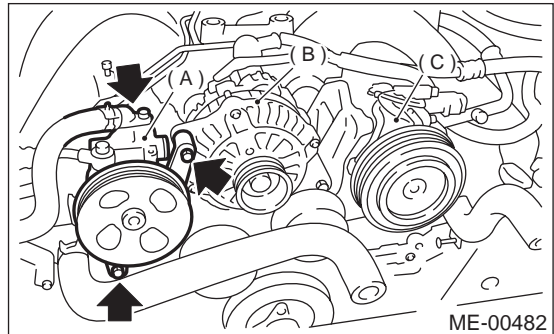
- 7) Remove power steering pump and tank from brackets.
 - (1) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
 - (2) Remove power steering oil pipe with bracket.



- (3) Remove bolts which install power steering pump bracket.

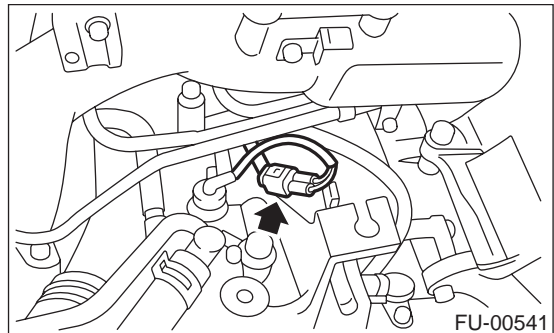
NOTE:

Do not separate hose and pipe from the main pump.

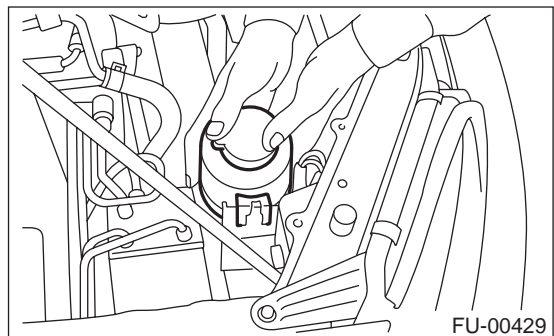


- (A) Power steering pump
- (B) Generator
- (C) A/C compressor

- (4) Disconnect power steering pump switch connector.



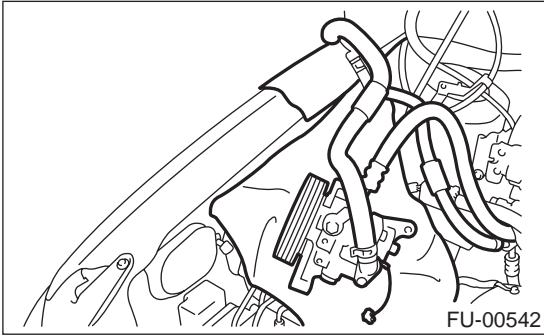
- (5) Remove power steering tank from the bracket by pulling it upward.



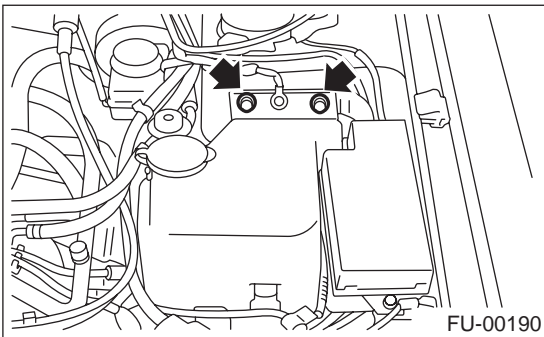
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

(6) Place power steering pump on the right side wheel apron.

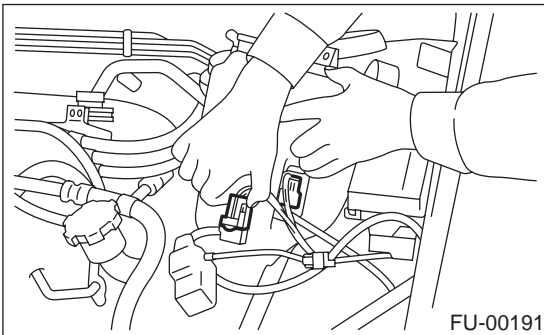


8) Remove two bolts which install washer tank on body.



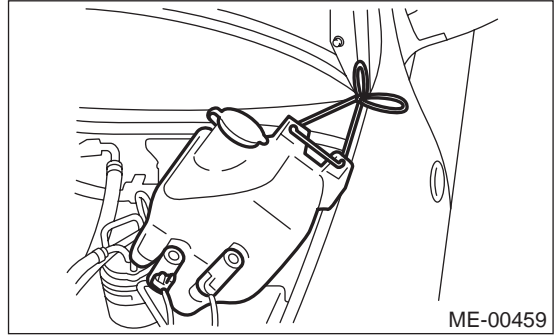
9) Disconnect connector from front window washer motor.

10) Disconnect connector from rear gate glass washer motor.

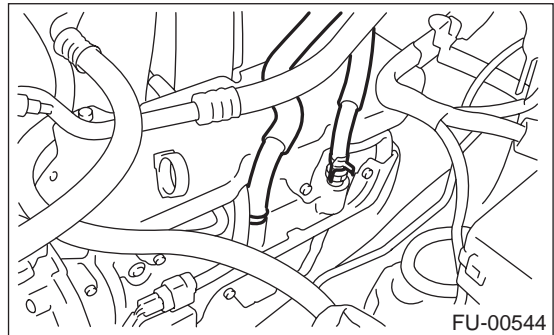


11) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

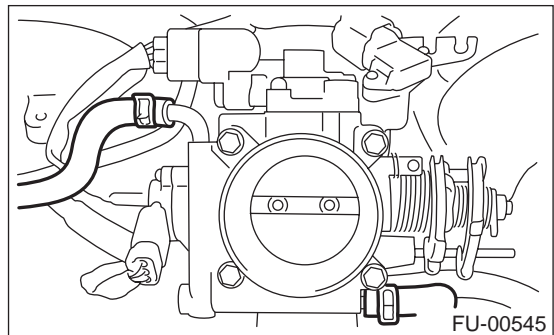
12) Move washer tank upward.



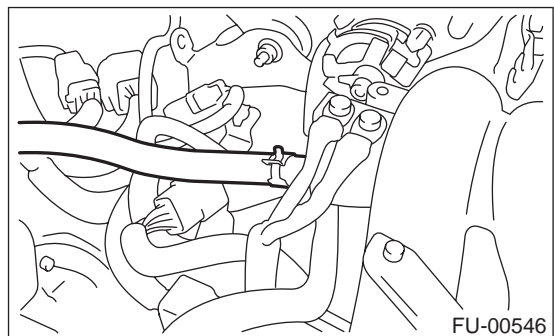
13) Disconnect PCV hoses from cylinder head cover.



14) Disconnect engine coolant hose from throttle body.



15) Disconnect brake booster hose.



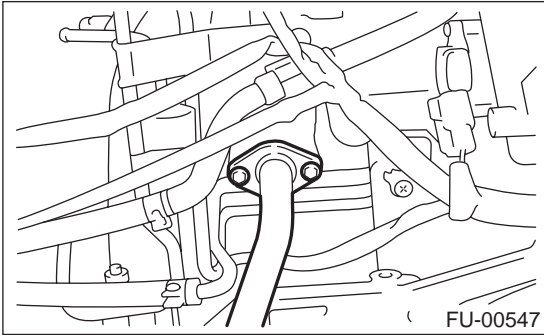
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

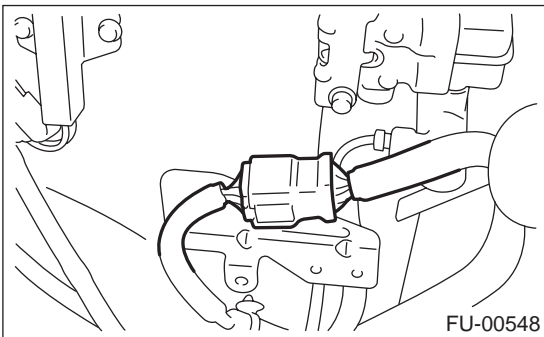
16) Remove EGR pipe from EGR valve.

NOTE:

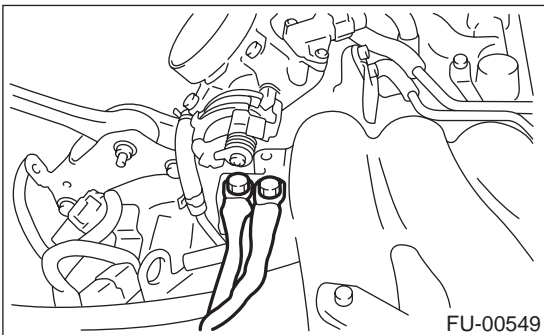
Be careful not to drop gaskets.



17) Disconnect engine harness connectors from bulkhead harness connectors.



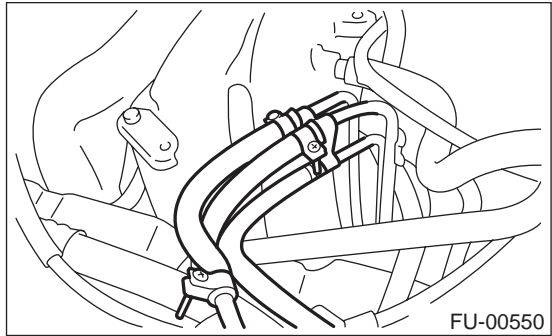
18) Disconnect engine ground terminal from intake manifold.



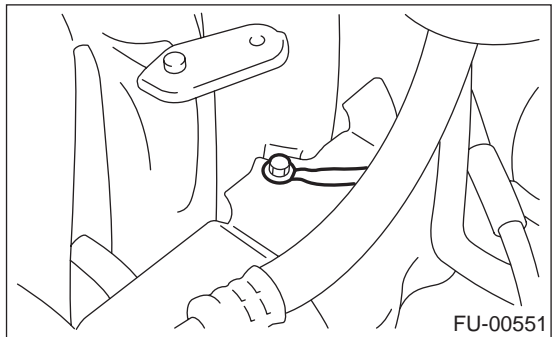
19) Disconnect fuel hoses from fuel pipes.

WARNING:

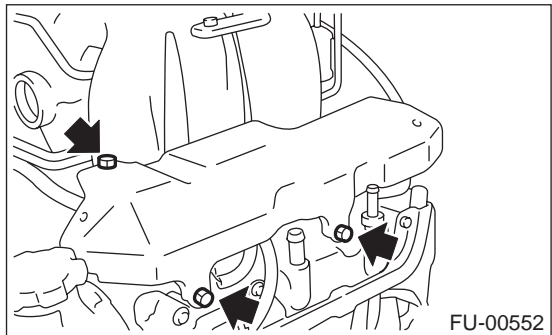
- Do not spill fuel.
- Catch fuel from hoses in a container or cloth.



20) Remove ground cable from fuel pipe protector LH.

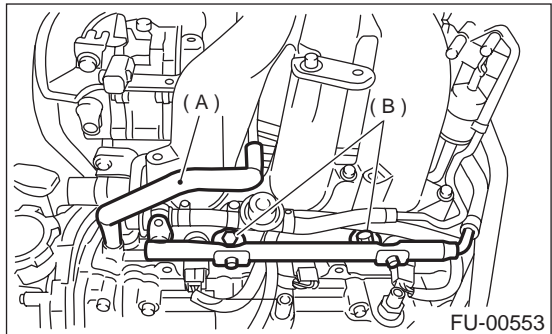


21) Remove fuel pipe protector LH.



22) Disconnect air assist hose (A).

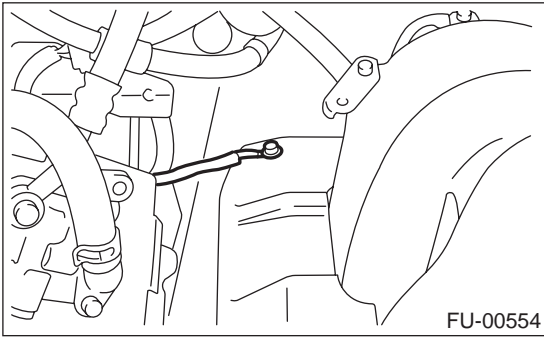
23) Remove the bolt (B), which holds fuel injector pipe LH onto cylinder head.



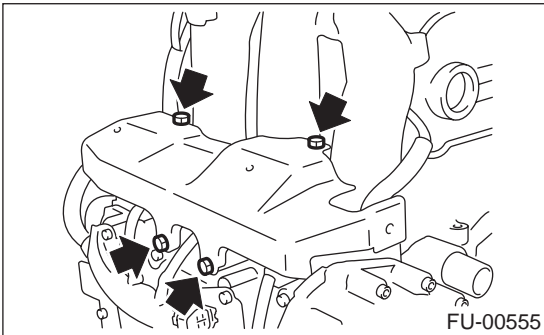
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

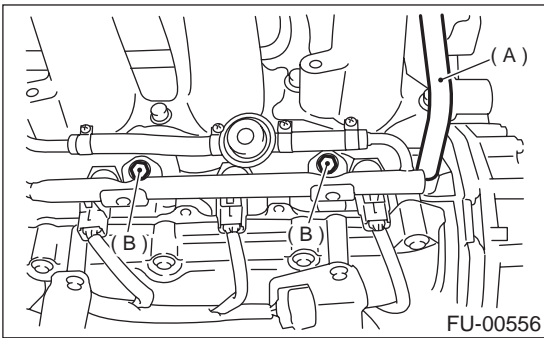
24) Remove ground cable from fuel pipe protector RH.



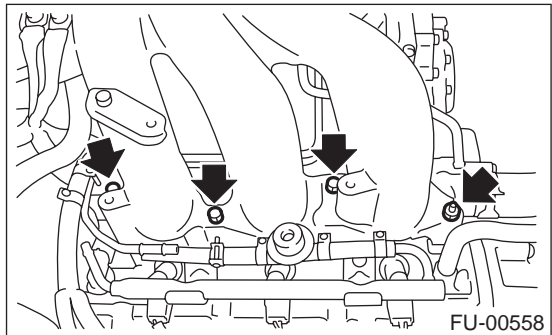
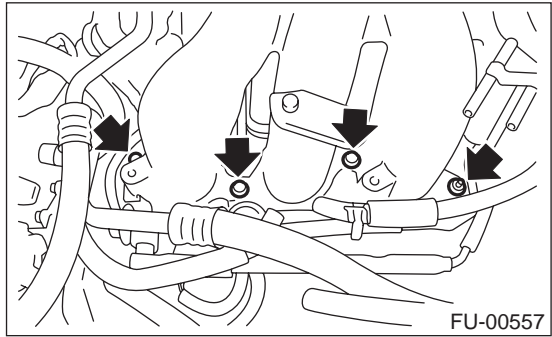
25) Remove fuel pipe protector RH.



26) Disconnect air assist hose (A).
Remove the bolt (B), which holds fuel injector pipe RH onto cylinder head.



27) Remove bolts which hold intake manifold onto cylinder heads.



28) Remove intake manifold.

B: INSTALLATION

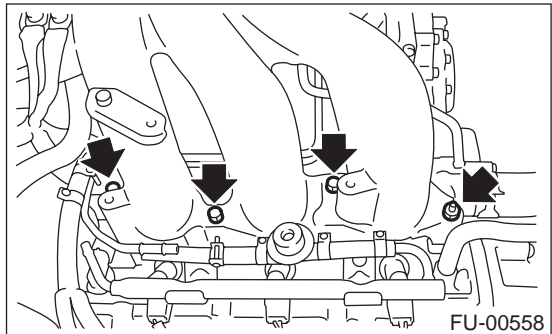
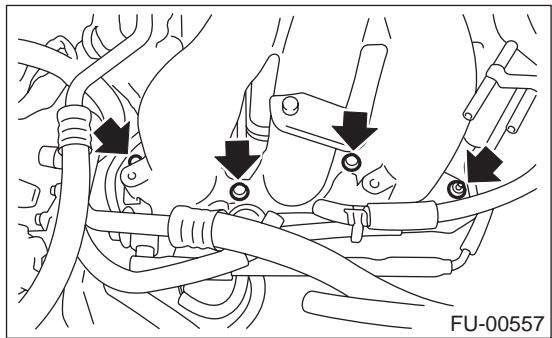
1) Install intake manifold onto cylinder heads.

NOTE:

Always use new gaskets.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



INTAKE MANIFOLD

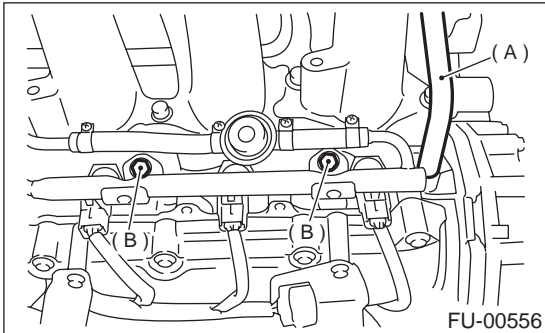
FUEL INJECTION (FUEL SYSTEMS)

2) Install the bolt (B), which holds fuel injector pipe RH onto cylinder head.

Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)

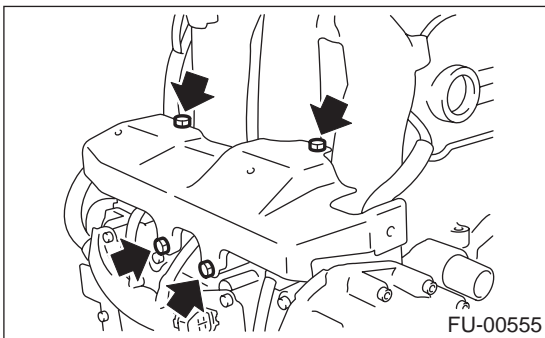
3) Connect air assist hose (A).



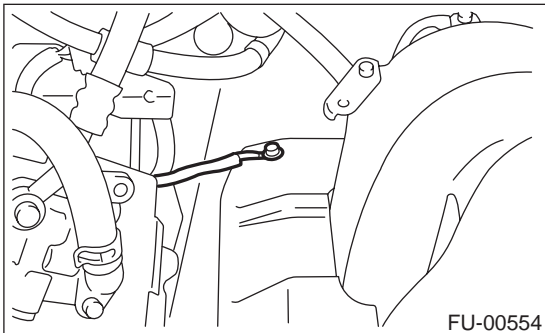
4) Install fuel pipe protector RH.

Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)



5) Install ground cable to fuel pipe protector RH.

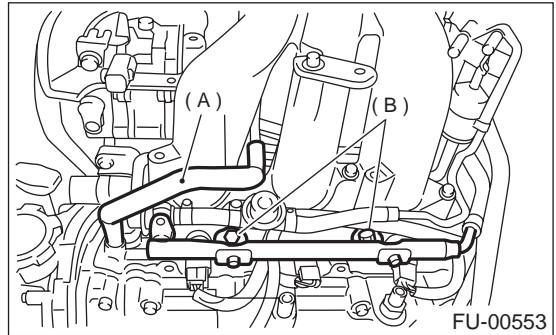


6) Install the bolt (B) which holds fuel injector pipe LH onto cylinder head.

Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)

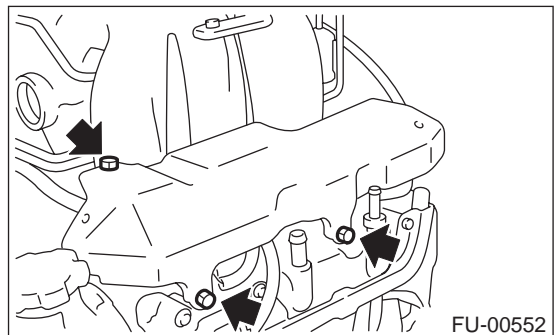
7) Connect air assist hose (A).



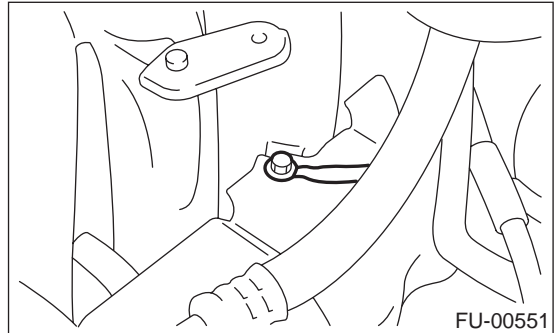
8) Install fuel pipe protector LH.

Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)



9) Install ground cable to fuel pipe protector LH.



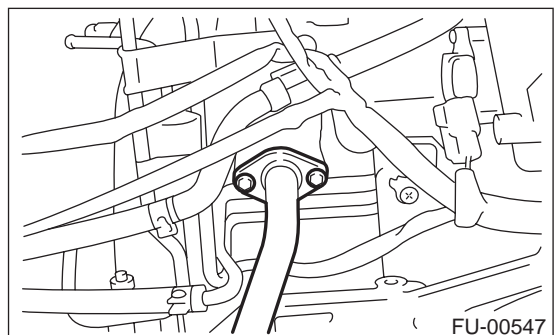
10) Install EGR pipe to EGR valve.

NOTE:

Always use new gasket.

Tightening torque:

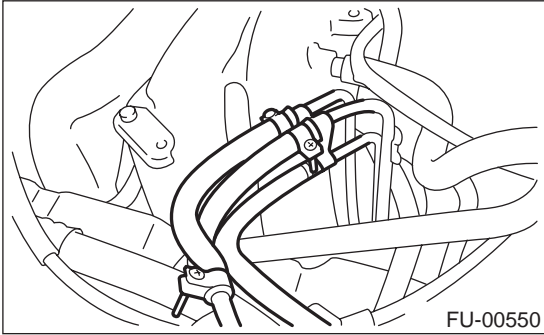
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



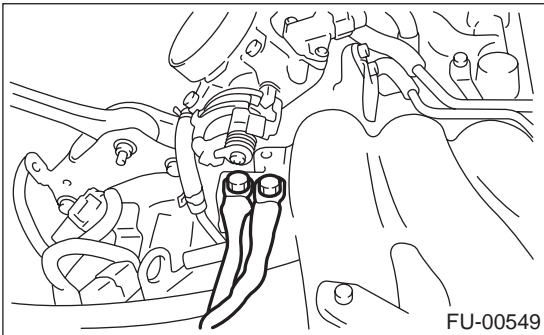
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

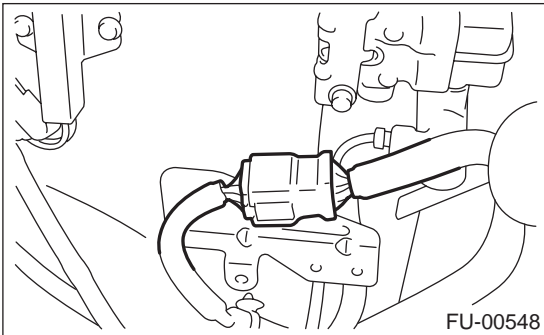
11) Connect fuel hoses.



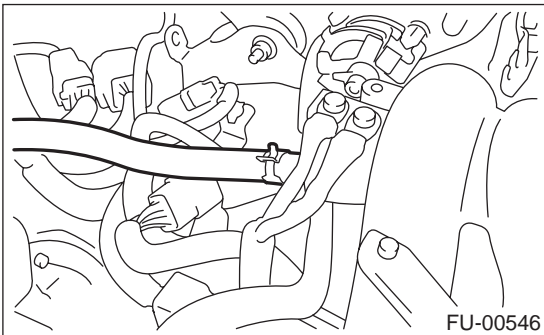
12) Connect engine ground terminal to intake manifold.



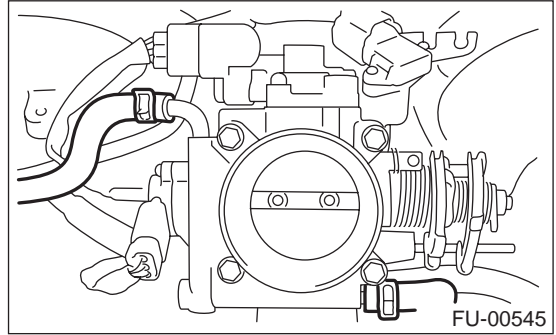
13) Connect engine harness connectors to bulkhead connectors.



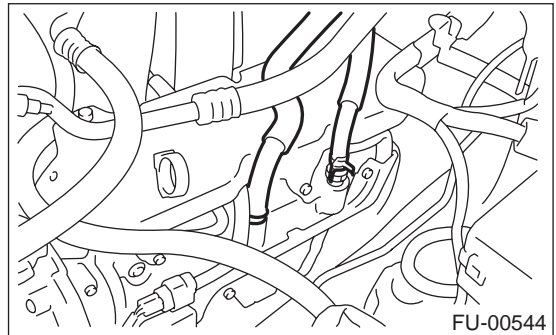
14) Connect brake booster hose.



15) Connect engine coolant hose to throttle body.

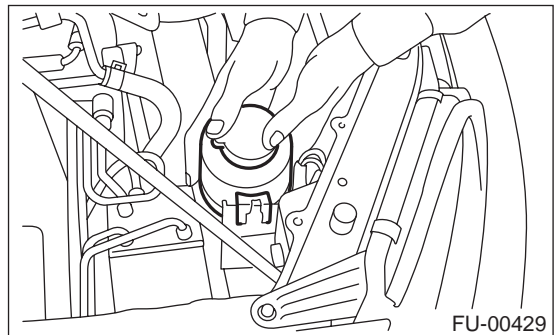


16) Connect PCV hose to cylinder head cover.

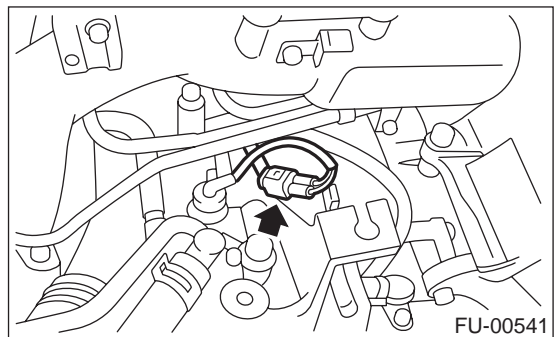


17) Install power steering pump and tank on brackets.

(1) Install power steering tank on bracket.



(2) Connect connector to power steering pump switch.



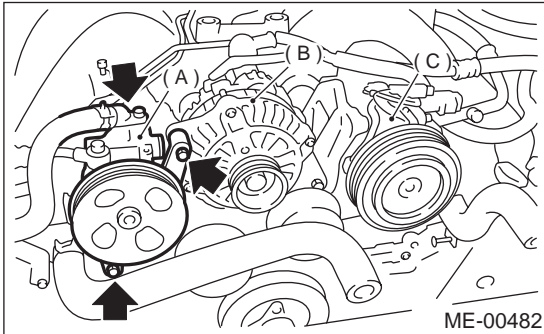
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

(3) Tighten bolts which install power steering pump on bracket.

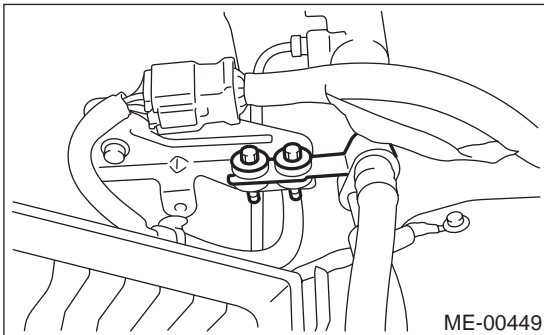
Tightening torque:

20.1 N·m (2.05 kgf·m, 14.8 ft·lb)



- (A) Power steering pump
- (B) Generator
- (C) A/C compressor

(4) Install power steering pipes with bracket.

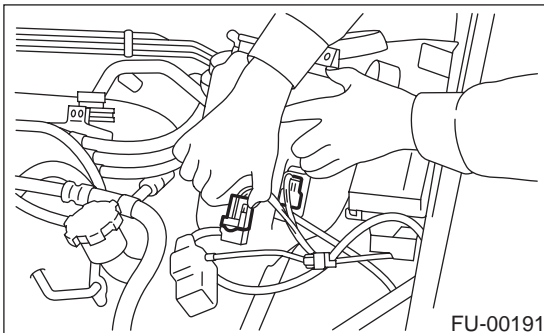


(5) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>

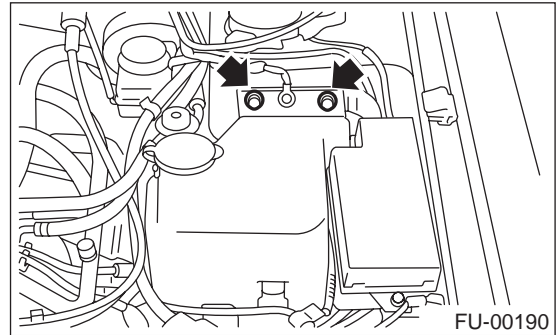
18) Connect rear window washer hose to washer motor.

19) Connect front window washer motor connector.

20) Connect rear window washer motor connector.

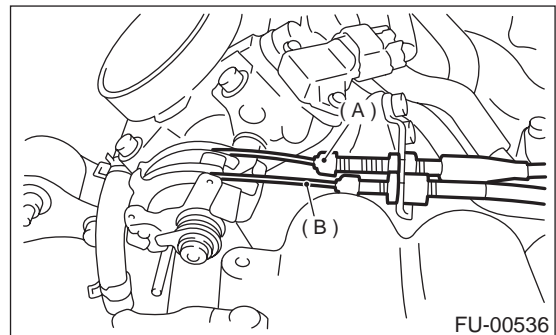


21) Install washer tank on body.



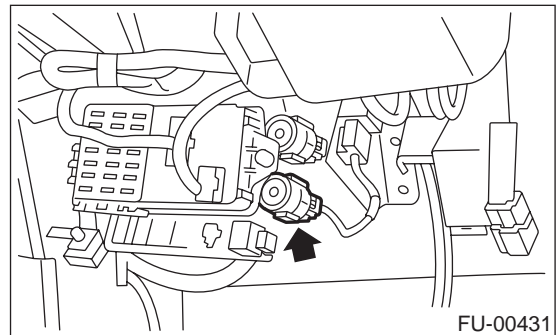
22) Connect accelerator cable (A).

23) Connect cruise control cable (B). (With cruise control models)



24) Install air intake duct, air cleaner and air intake chamber. <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>

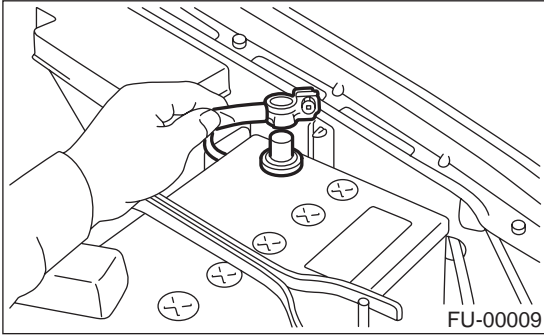
25) Connect connector to fuel pump relay.



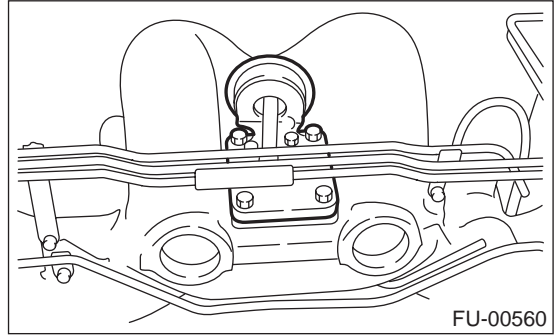
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

26) Connect battery ground cable.

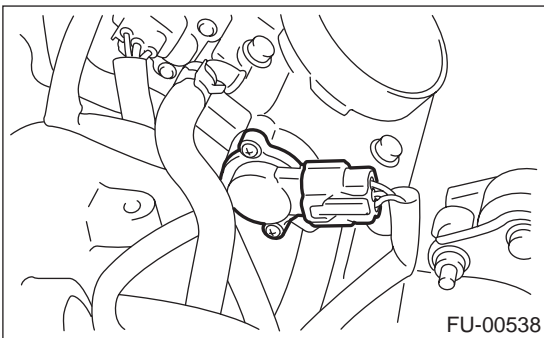


5) Remove induction valve.



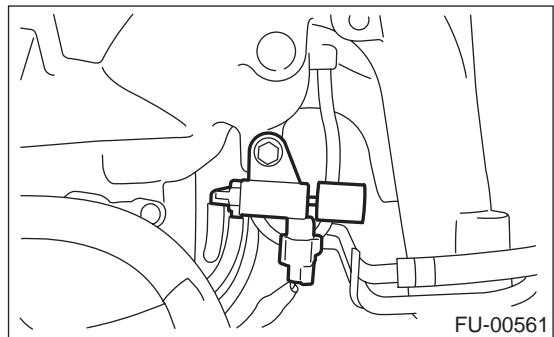
C: DISASSEMBLY

1) Disconnect connectors from throttle position sensor.



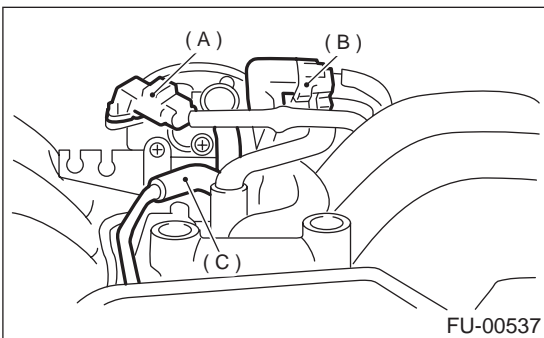
6) Disconnect connector from induction valve control solenoid.

7) Remove induction valve control solenoid.



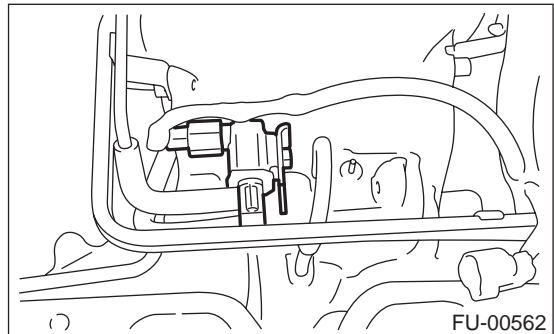
2) Disconnect connectors from intake manifold pressure sensor (B) and idle air control solenoid valve (A).

3) Disconnect air by-pass hose (C) from idle air control solenoid valve.

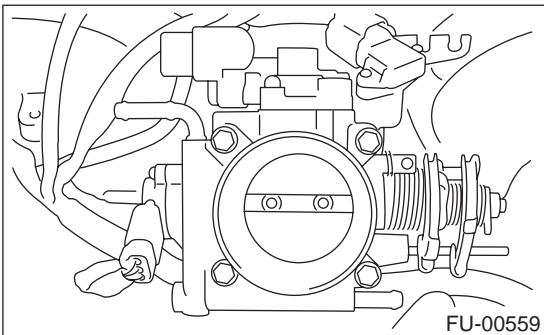


8) Disconnect connector from purge control solenoid valve.

9) Remove purge control solenoid valve.

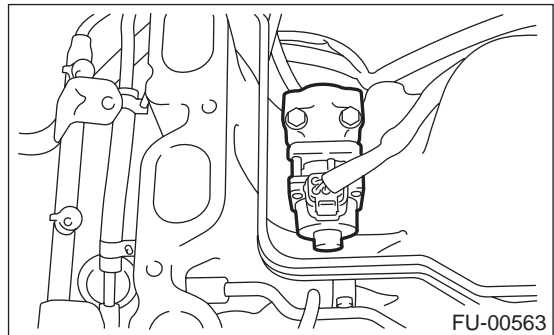


4) Remove throttle body.



10) Disconnect connector from EGR valve.

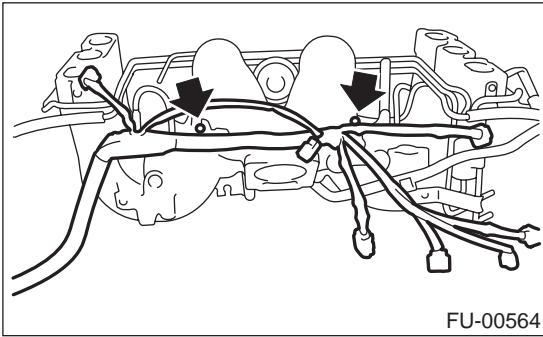
11) Remove EGR valve.



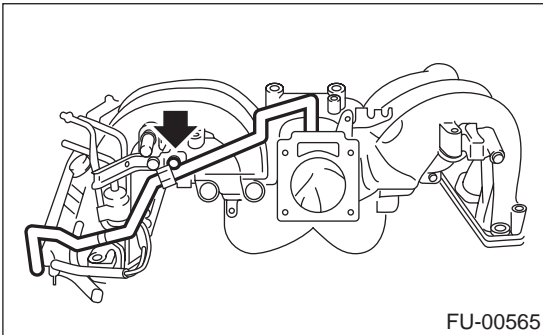
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

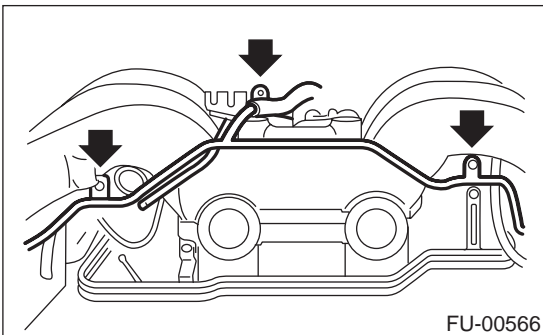
12) Remove engine harness assembly from intake manifold.



13) Remove PCV pipe from intake manifold.

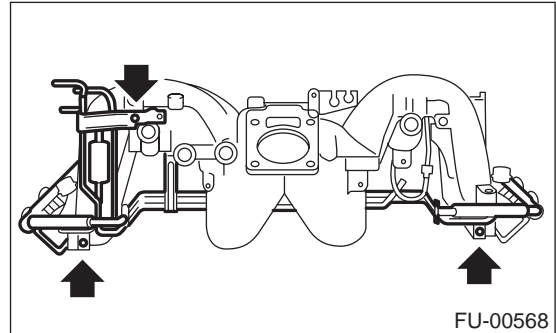
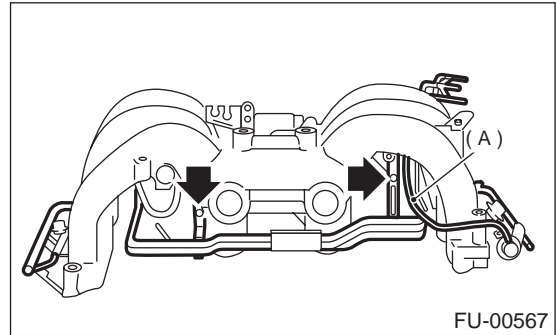


14) Remove air assist and purge pipe assembly.

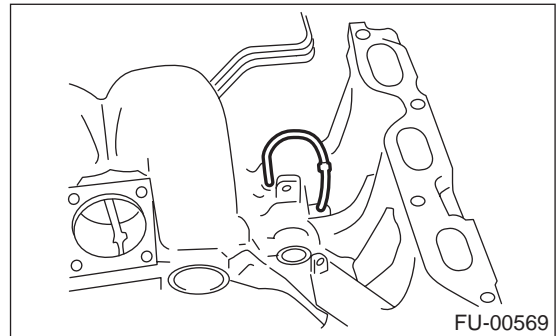


15) Disconnect pressure regulator vacuum hose (A) from intake manifold.

16) Remove fuel pipe and injector pipe assembly.

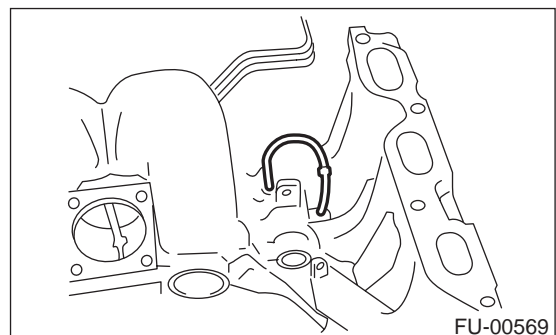


17) Remove induction valve vacuum hose from intake manifold.



D: ASSEMBLY

1) Intake induction valve vacuum hose to intake manifold.



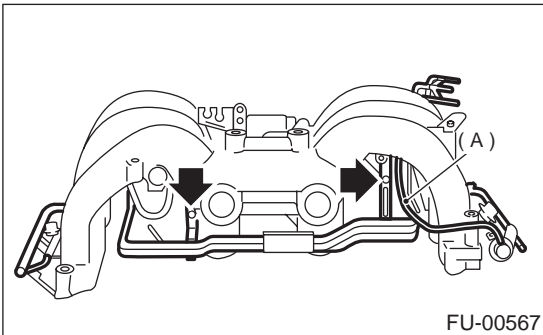
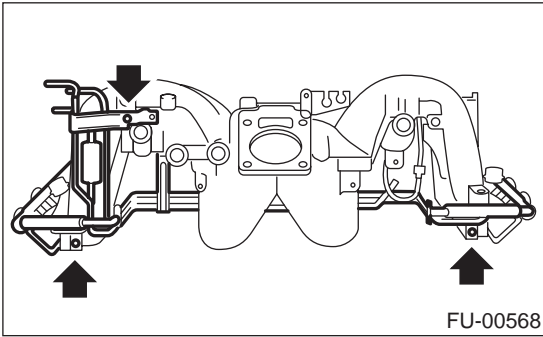
2) Install fuel pipe and injector pipe assembly.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

INTAKE MANIFOLD

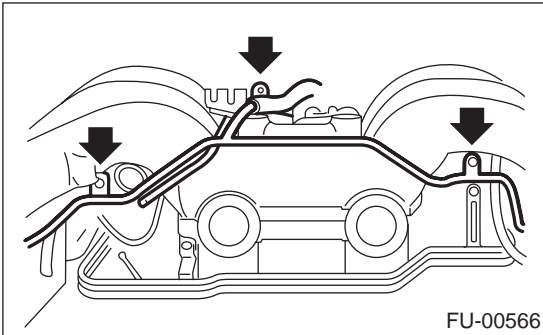
FUEL INJECTION (FUEL SYSTEMS)

3) Connect pressure regulator vacuum hose (A) to intake manifold.



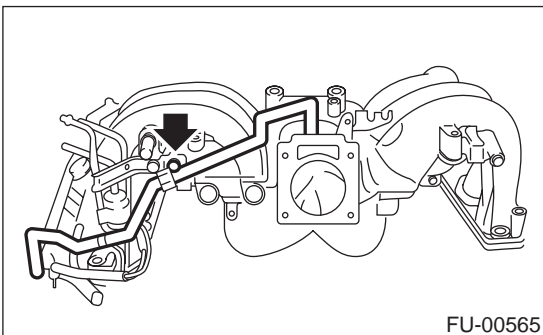
4) Install air assist and purge pipe assembly.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



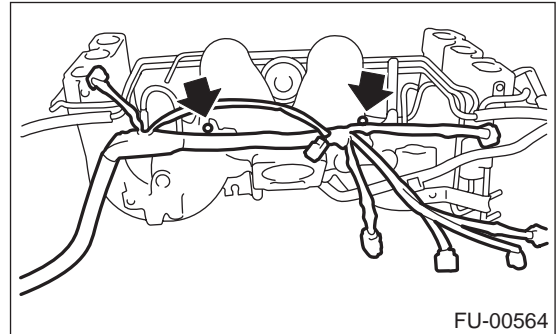
5) Install PCV pipe to intake manifold.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



6) Install engine harness assembly to intake manifold.

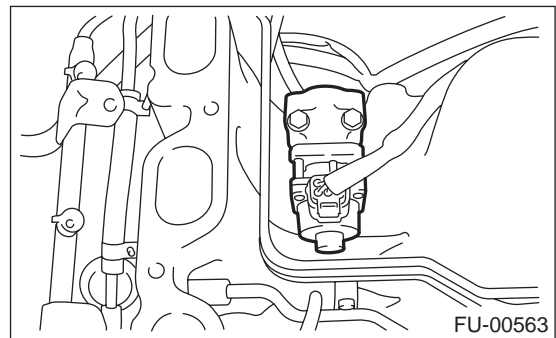
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



7) Install EGR valve.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

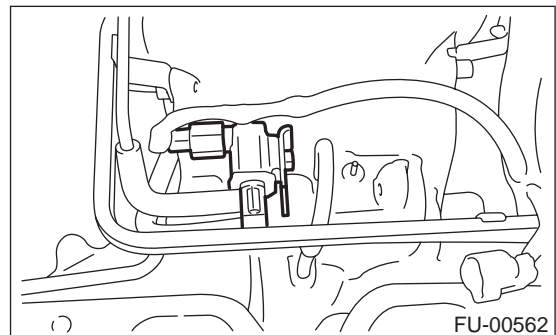
8) Connect connector to EGR valve.



9) Install purge control solenoid valve.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

10) Connect connector to purge control solenoid valve.



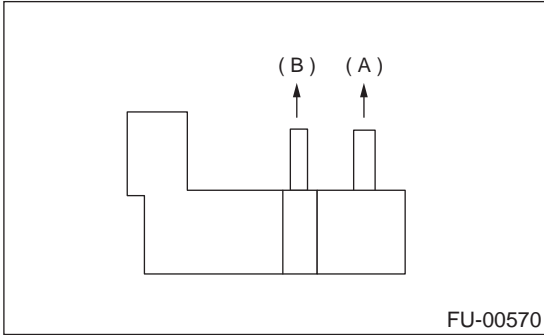
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

11) Connect hoses to purge control solenoid valve.

CAUTION:

Carefully connect the evaporation hoses.



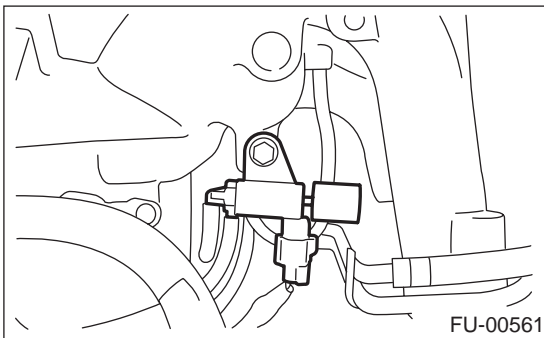
- (A) To purge pipe
- (B) To fuel pipe

12) Install induction valve control solenoid.

Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)

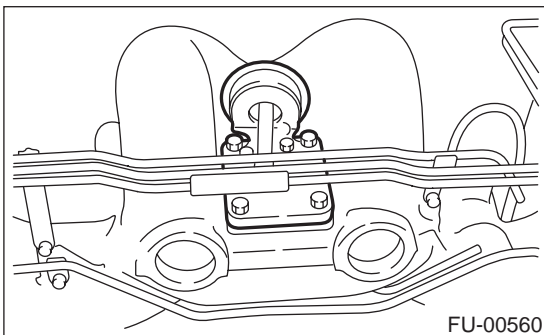
13) Connect connector to induction valve control solenoid.



14) Install induction valve.

Tightening torque:

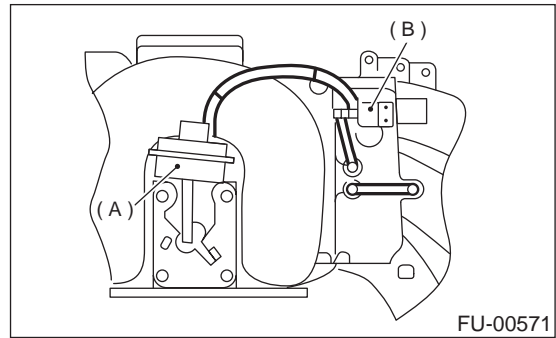
19 N·m (1.9 kgf-m, 14 ft-lb)



15) Connect hoses to induction valve control solenoid.

CAUTION:

Carefully connect the vacuum hoses.



- (A) Induction valve
- (B) Induction valve control solenoid

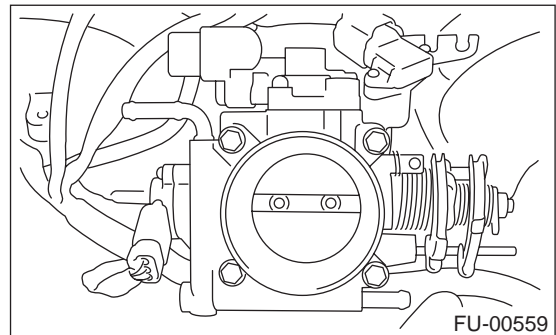
16) Install throttle body to intake manifold.

NOTE:

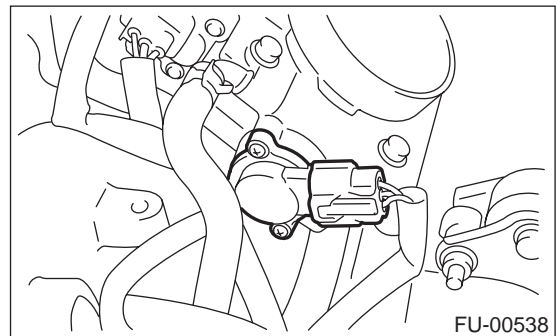
Replace gasket with a new one.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



17) Connect connectors to throttle position sensor.

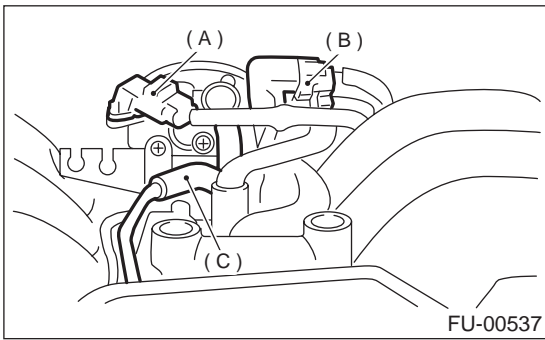


18) Connect connectors to intake manifold pressure sensor (A) and idle air control solenoid valve (B).

INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

19) Connect air by-pass hose (C) to idle air control solenoid valve.



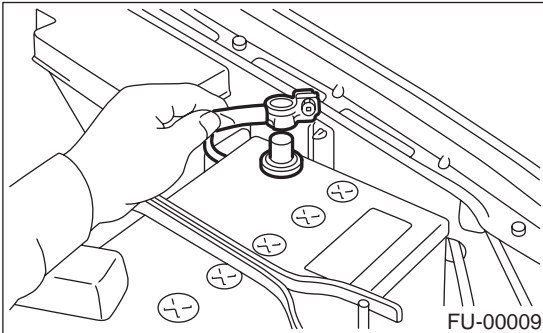
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

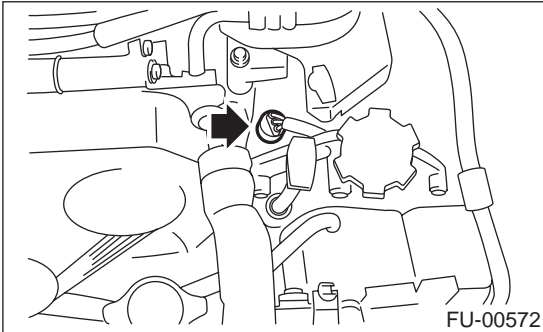
4. Engine Coolant Temperature Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from engine coolant temperature sensor.
- 3) Remove engine coolant temperature sensor.

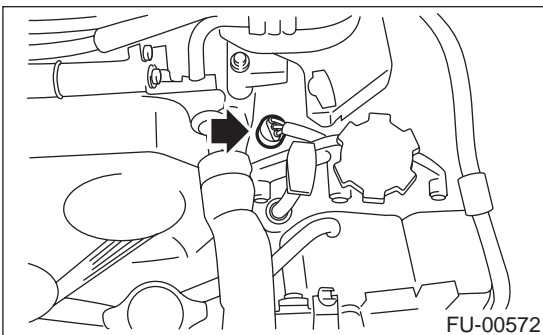


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 12 ft-lb)



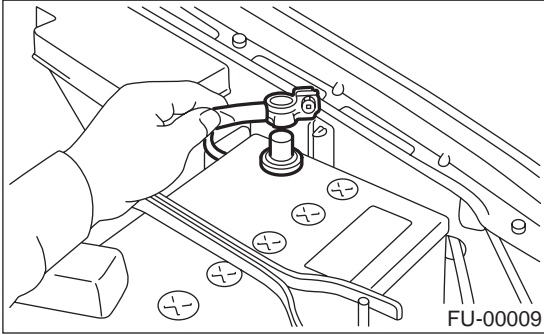
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

5. Crankshaft Position Sensor

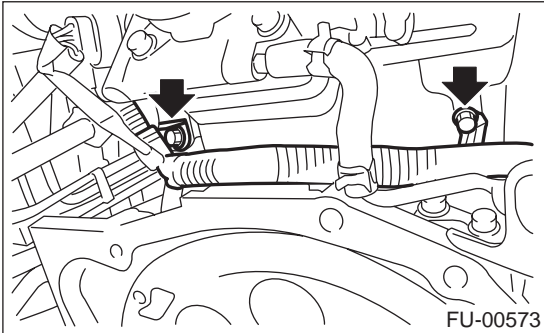
A: REMOVAL

1) Disconnect battery ground cable.

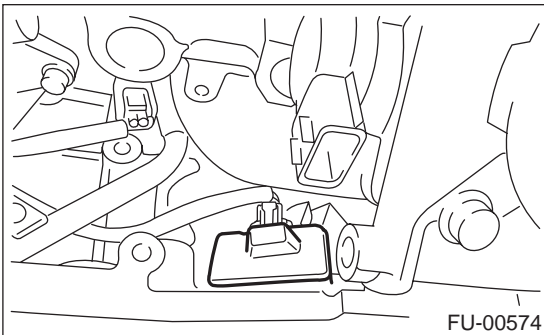


2) Remove air intake chamber.
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

3) Remove engine harness bracket from intake manifold.

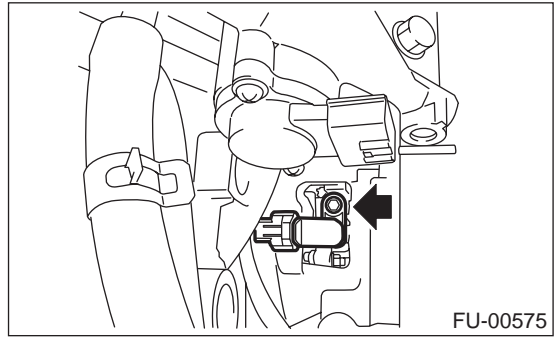


4) Remove service hole cover.



5) Remove bolt which install crankshaft position sensor to cylinder block.

6) Remove crankshaft position sensor, and disconnect connector from it.

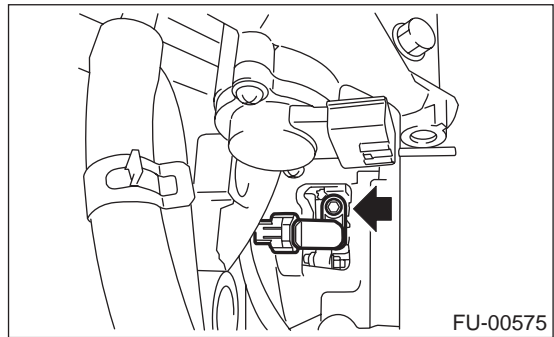


B: INSTALLATION

Install in the reverse order of removal.

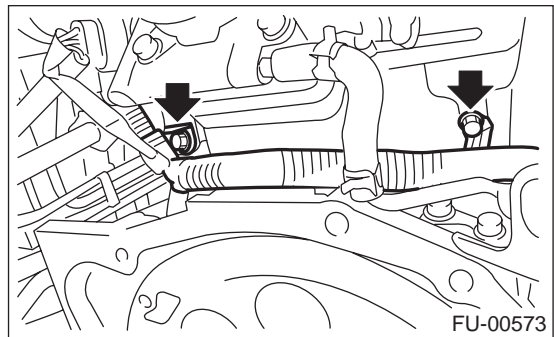
Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



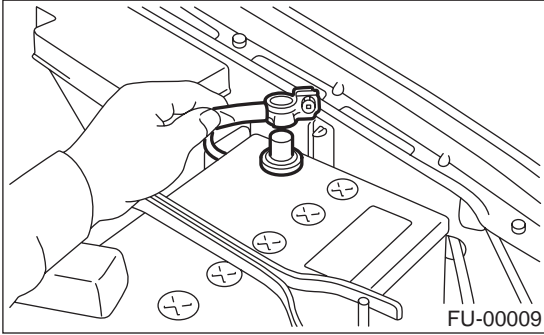
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

6. Camshaft Position Sensor

A: REMOVAL

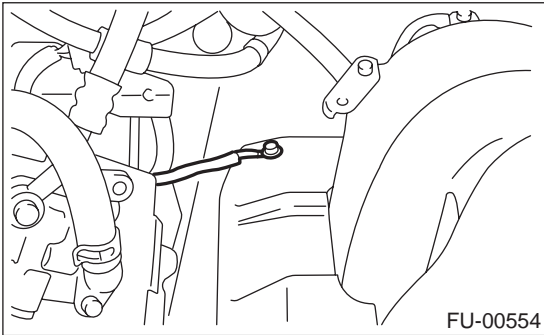
1) Disconnect battery ground cable.



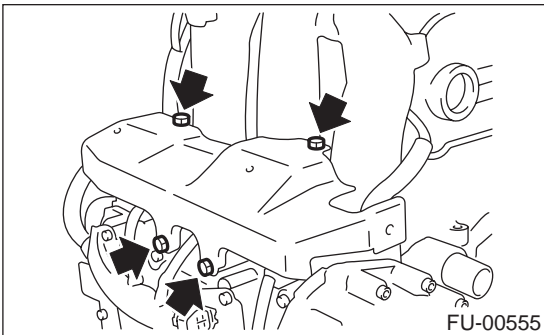
2) Remove air cleaner.

<Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>

3) Remove ground cable from fuel pipe protector RH.

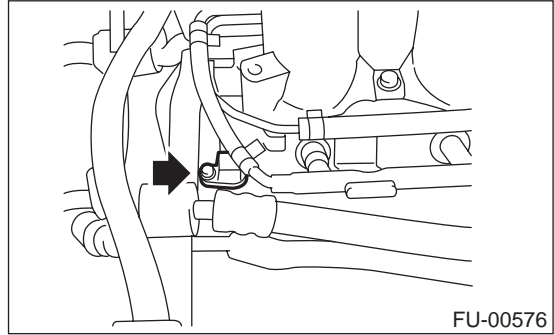


4) Remove fuel pipe protector RH.



5) Disconnect connector from camshaft position sensor.

6) Remove camshaft position sensor.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

- **Camshaft position sensor;**
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
- **Fuel pipe protector RH;**
19 N·m (1.9 kgf-m, 14 ft-lb)

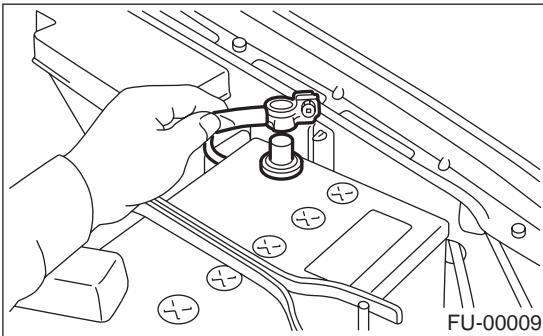
KNOCK SENSOR

FUEL INJECTION (FUEL SYSTEMS)

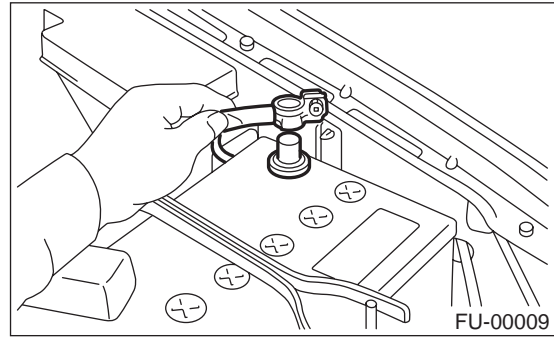
7. Knock Sensor

A: REMOVAL

1) Disconnect battery ground cable from battery ground terminal.



4) Connect battery ground cable.

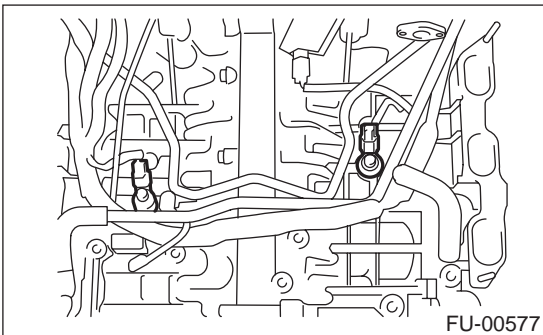


2) Remove intake manifold.

<Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>

3) Disconnect knock sensor connector.

4) Remove knock sensor from cylinder block.



B: INSTALLATION

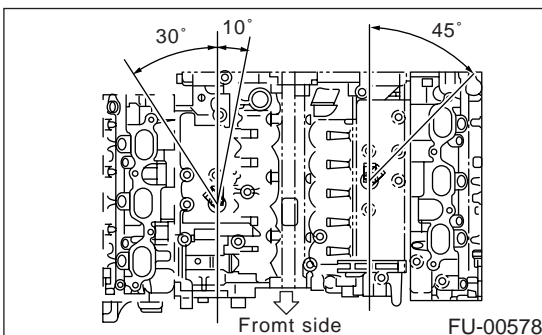
1) Install knock sensor to cylinder block.

Tightening torque:

25 N·m (2.5 kgf·m, 18 ft·lb)

NOTE:

For the knock sensor's installation angle, refer to the figure below.



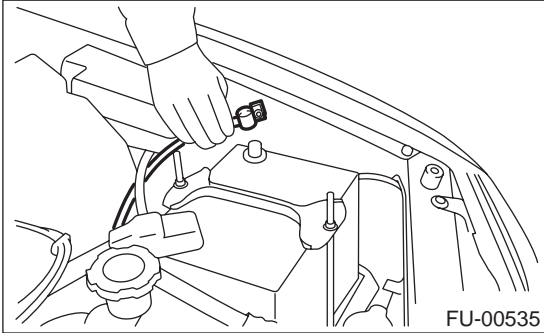
2) Connect knock sensor connector.

3) Install intake manifold. <Ref. to FU(H6DO)-20, INSTALLATION, Intake Manifold.>

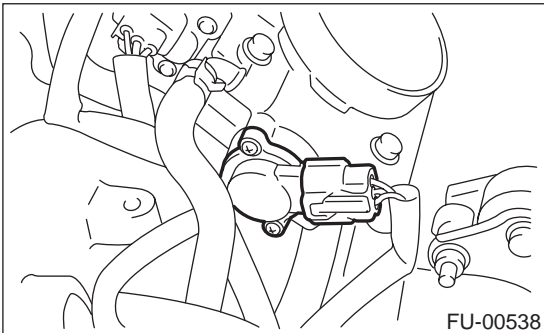
8. Throttle Position Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Remove air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
- 3) Disconnect connector from throttle position sensor.
- 4) Remove throttle position sensor holding screws, and remove throttle position sensor itself.

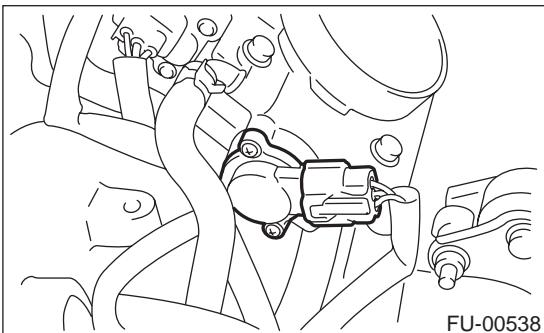


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)



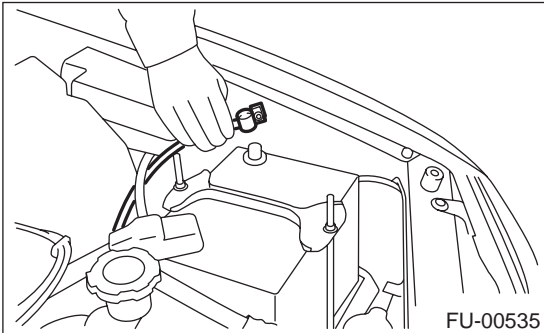
INTAKE MANIFOLD PRESSURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

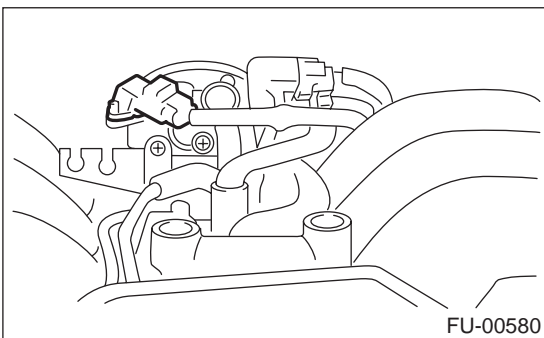
9. Intake Manifold Pressure Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from intake manifold pressure sensor.
- 3) Remove intake manifold pressure sensor from throttle body.



B: INSTALLATION

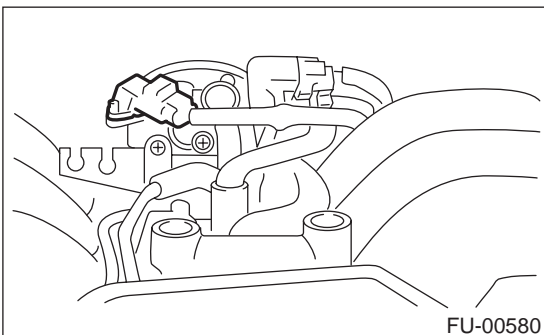
Install in the reverse order of removal.

NOTE:

Replace gasket with new one.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)



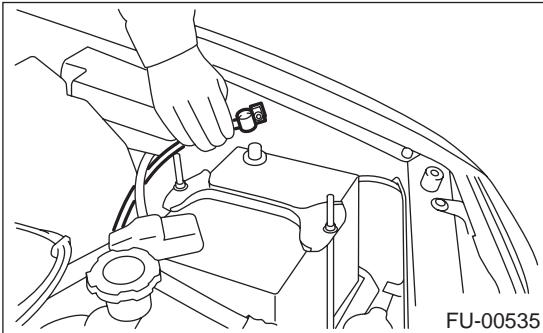
INTAKE AIR TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

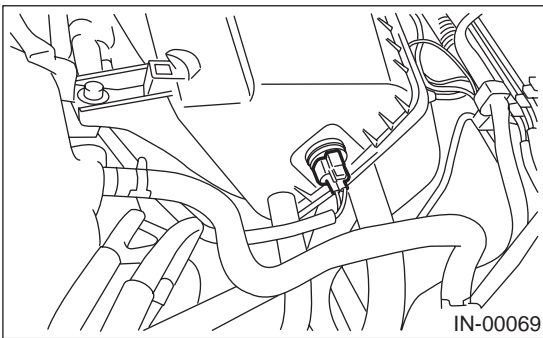
10. Intake Air Temperature Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from intake air temperature sensor.
- 3) Remove intake air temperature sensor from air intake chamber.



B: INSTALLATION

Install in the reverse order of removal.

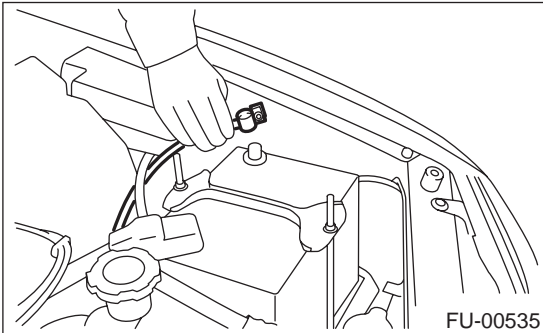
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

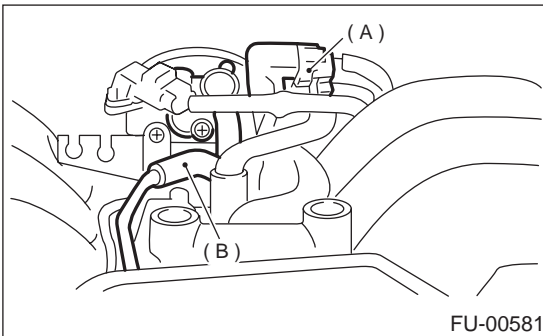
11. Idle Air Control Solenoid Valve

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector (A) from idle air control solenoid valve.
- 3) Disconnect air by-pass hose (B) from idle air control solenoid valve.
- 4) Remove idle air control solenoid valve from throttle body.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace gasket with a new one.

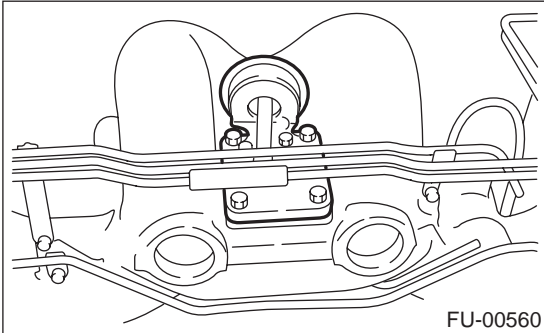
Tightening torque:

2.8 N·m (0.29 kgf-m, 2.1 ft-lb)

12. Induction Valve

A: REMOVAL

- 1) Disconnect battery ground cable.
- 2) Remove intake manifold.
<Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
- 3) Remove induction valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)

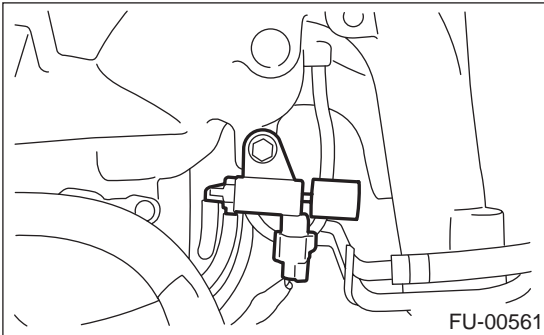
INDUCTION VALVE CONTROL SOLENOID

FUEL INJECTION (FUEL SYSTEMS)

13. Induction Valve Control Solenoid

A: REMOVAL

- 1) Disconnect battery ground cable.
- 2) Remove intake manifold.
<Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
- 3) Disconnect connector from induction valve control solenoid.
- 4) Remove induction valve control solenoid from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

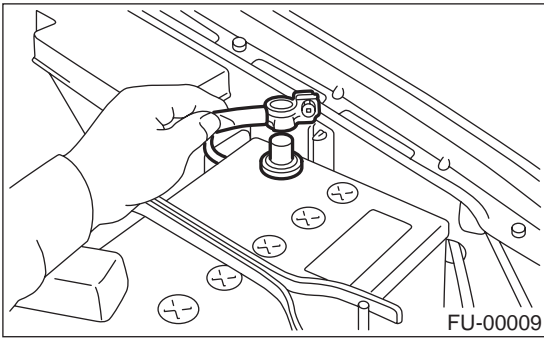
19 N·m (1.9 kgf-m, 14 ft-lb)

14. Fuel Injector

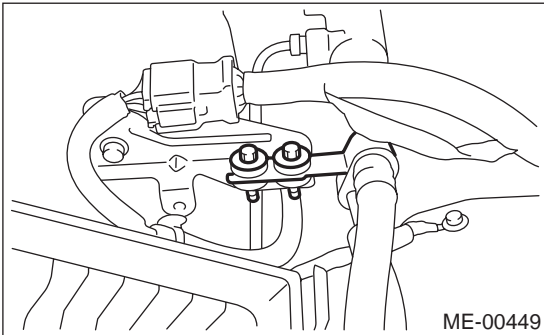
A: REMOVAL

1. RH SIDE

- 1) Release fuel pressure.
<Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.
- 3) Disconnect battery ground cable.



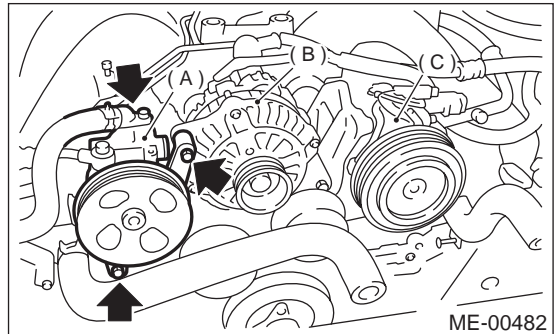
- 4) Remove air cleaner lower case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
- 5) Remove power steering pump and tank from brackets.
 - (1) Remove V-belt.
<Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
 - (2) Remove power steering oil pipe with bracket.



- (3) Remove bolts which install power steering pump bracket.

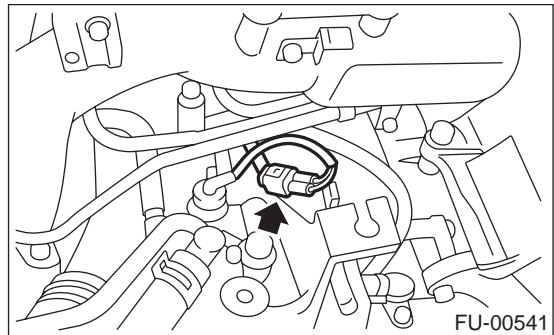
CAUTION:

Do not separate hose and pipe from the main pump.

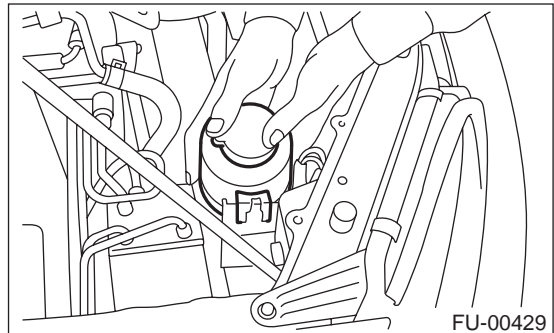


- (A) Power steering pump
- (B) Generator
- (C) A/C compressor

- (4) Disconnect power steering pump switch connector.



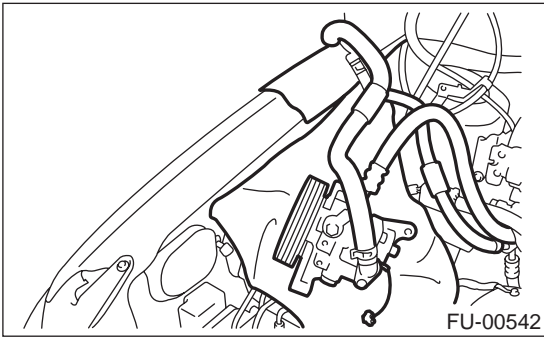
- (5) Remove power steering tank from the bracket by pulling it upward.



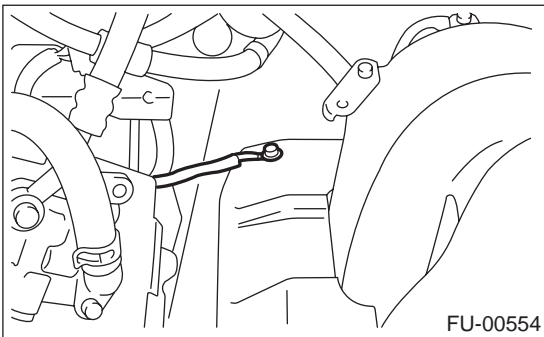
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

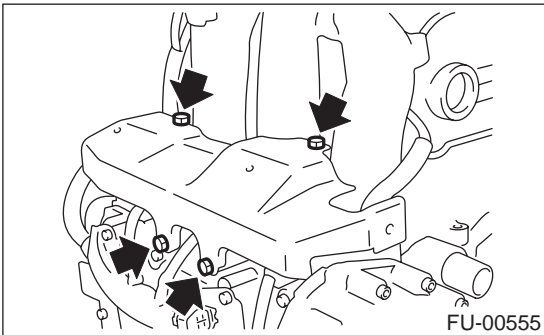
(6) Place power steering pump on the right side wheel apron.



6) Remove ground cable from fuel pipe protector RH.

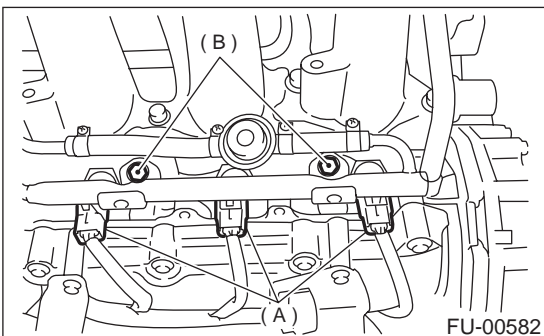


7) Remove fuel pipe protector RH.



8) Disconnect connector (A) from fuel injector.

9) Remove bolt (B) which holds injector pipe onto cylinder head.



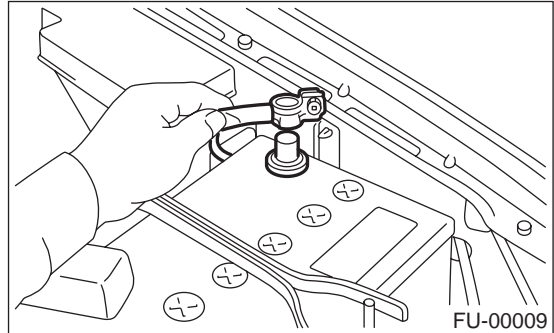
10) Remove fuel injector while lifting up fuel injector pipe.

2. LH SIDE

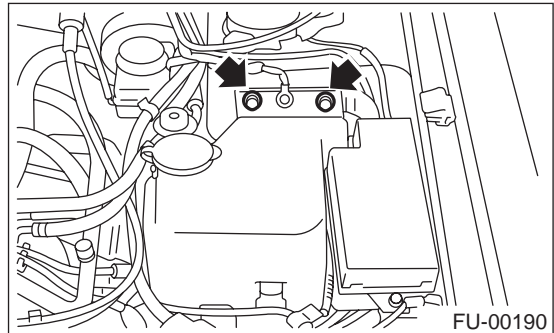
1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Open fuel flap lid, and remove fuel filler cap.

3) Disconnect battery ground cable.

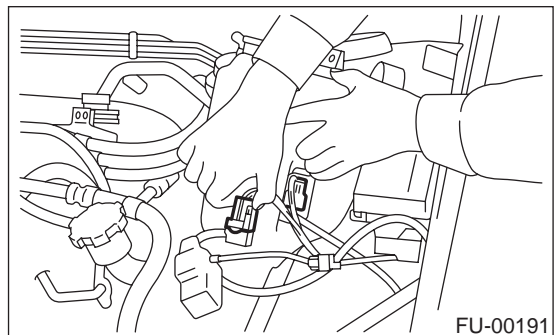


4) Remove two bolts which install washer tank on body.



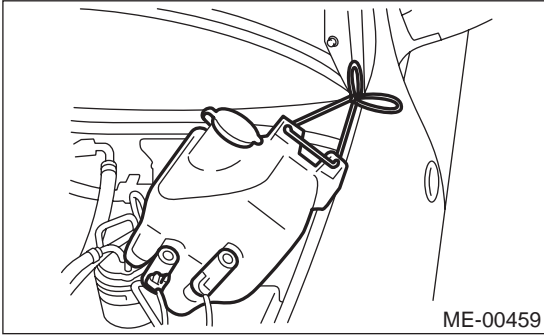
5) Disconnect connector from front window washer motor.

6) Disconnect connector from rear gate glass washer motor.

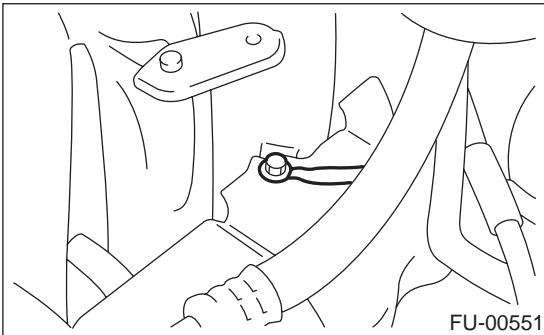


7) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

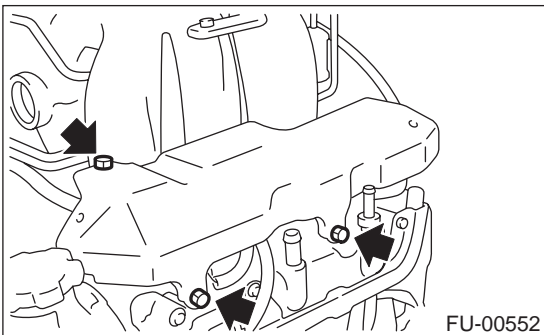
8) Move washer tank upward.



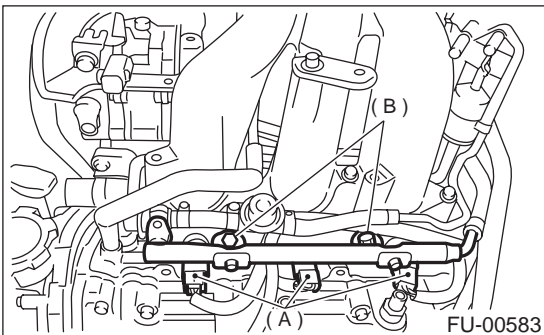
9) Remove ground cable from fuel pipe protector LH.



10) Remove fuel pipe protector LH.



11) Disconnect connector (A) from fuel injector.
12) Remove bolt (B) which holds injector pipe onto cylinder head.



13) Remove fuel injector while lifting up fuel injector pipe.

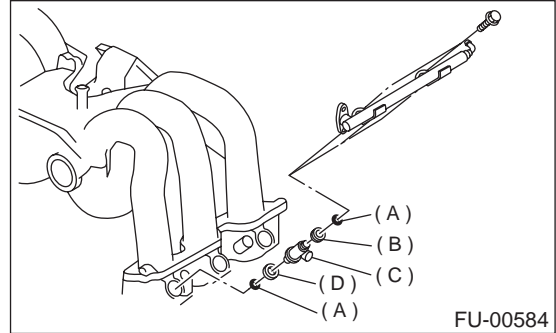
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

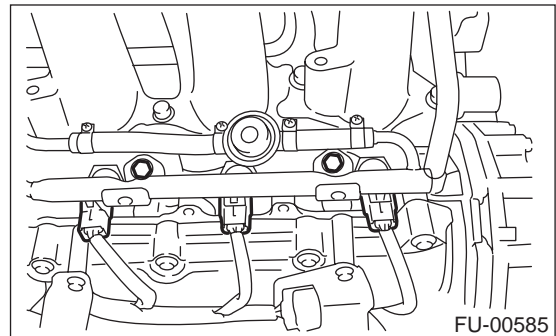
Replace O-rings and insulators with new ones.



- (A) O-ring
- (B) Injection rubber
- (C) Fuel injector
- (D) Insulator

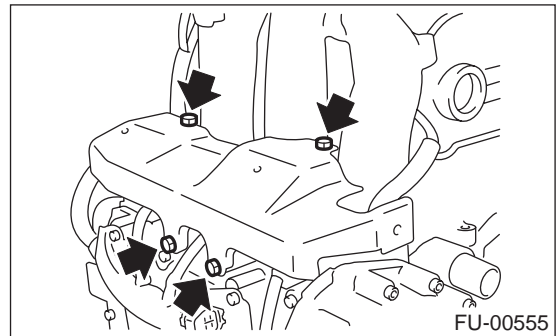
Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)



Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)



FUEL INJECTOR

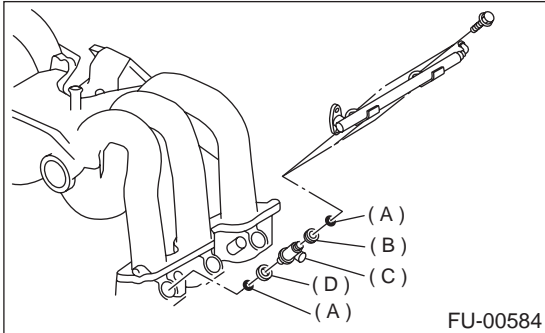
FUEL INJECTION (FUEL SYSTEMS)

2. LH SIDE

Install in the reverse order of removal.

NOTE:

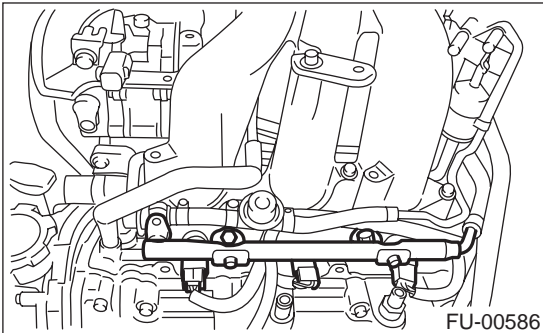
Replace O-rings and insulators with new ones.



- (A) O-ring
- (B) Injection rubber
- (C) Fuel injector
- (D) Insulator

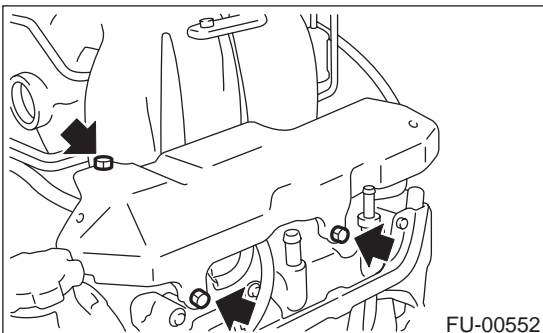
Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)



Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)



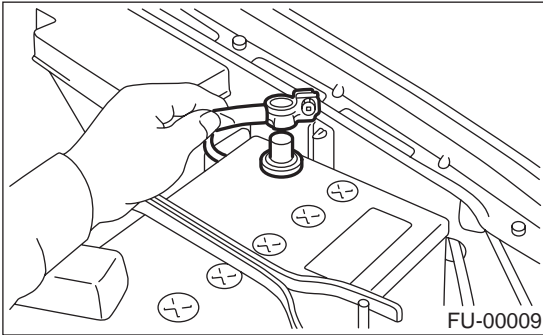
FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

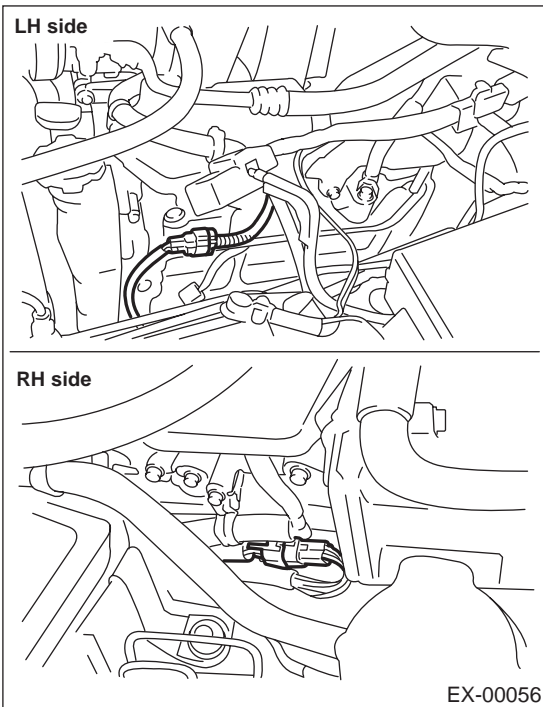
15. Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect battery ground cable.

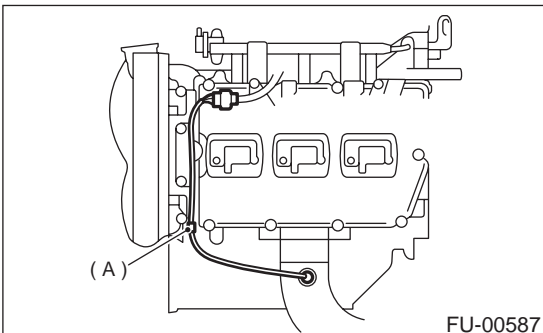


2) Disconnect connector from front oxygen (A/F) sensor.

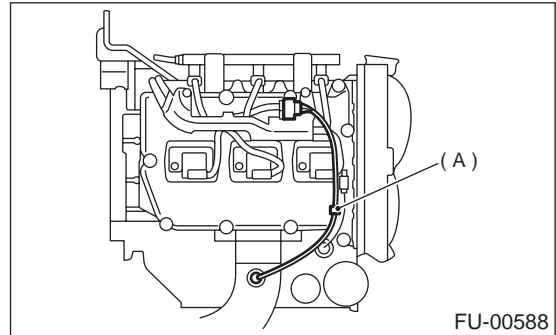


3) Lift-up the vehicle.
4) Remove under cover.
5) Separate harness from clip (A).

• LH side



• RH side



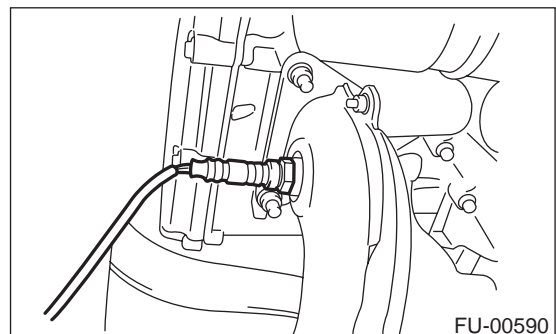
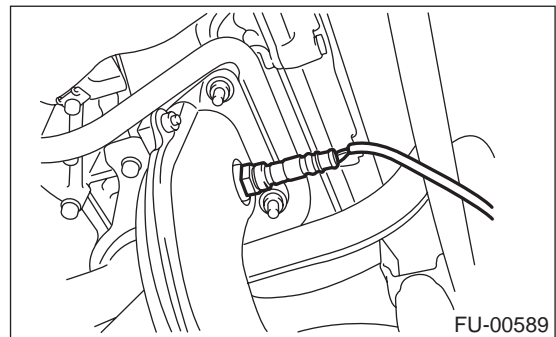
6) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

7) Remove front oxygen (A/F) sensor.

CAUTION:

When removing front oxygen (A/F) sensor, do not force front oxygen (A/F) sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.



FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

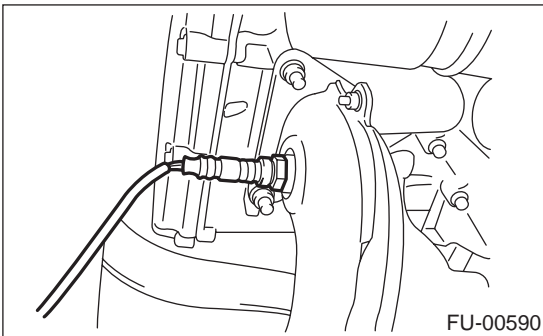
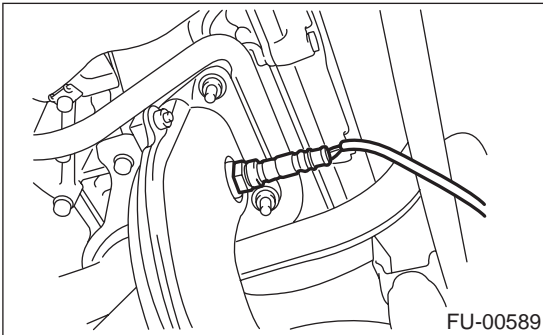
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

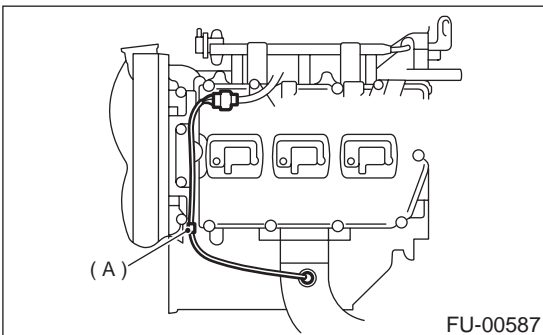
2) Install front oxygen (A/F) sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)

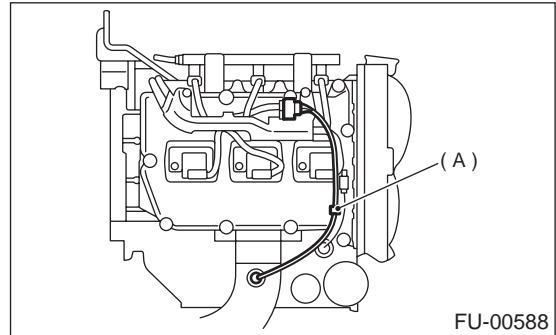


3) Secure harness to clip (A).

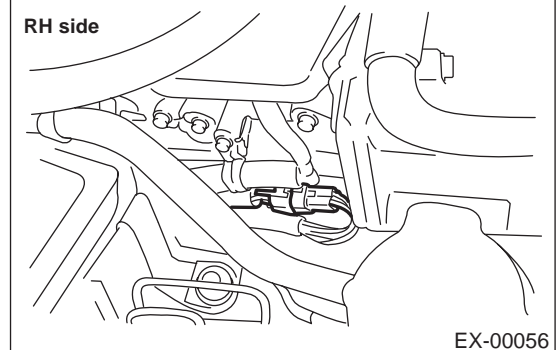
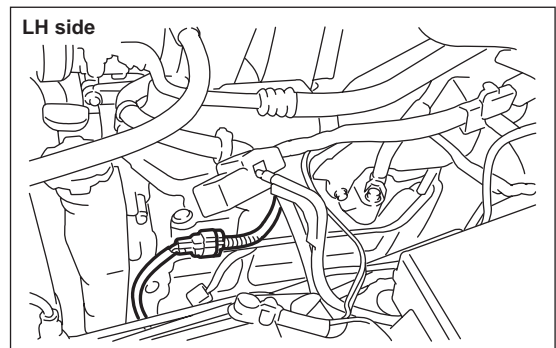
- LH side



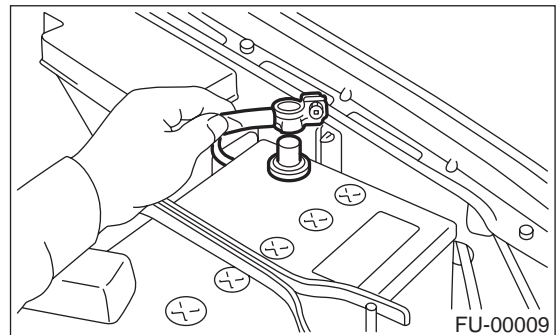
- RH side



- 4) Install under cover.
- 5) Lower the vehicle.
- 6) Connect connector of front oxygen (A/F) sensor.



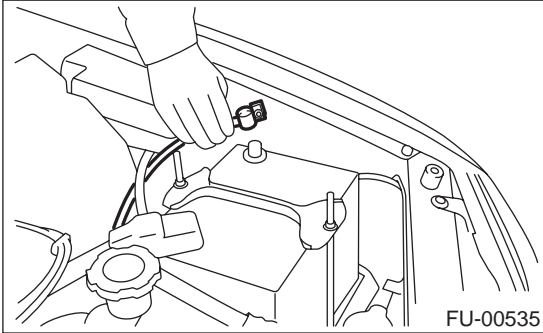
7) Connect battery ground cable.



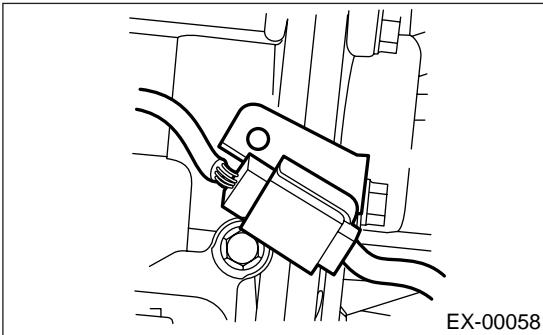
16.Rear Oxygen Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Lift-up the vehicle.
- 3) Disconnect connector from rear oxygen sensor.



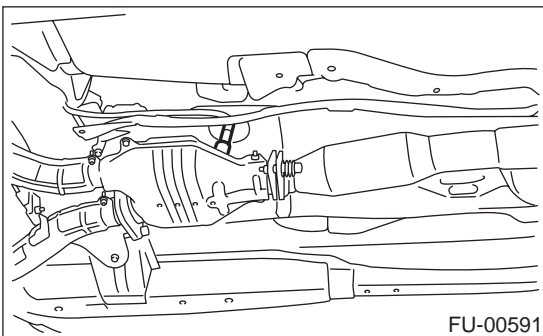
- 4) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove rear oxygen sensor.

CAUTION:

When removing, do not force rear oxygen sensor in an unnatural way especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.



B: INSTALLATION

- 1) Before installing rear oxygen sensor, apply anti-seize compound only to threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:

Never apply anti-seize compound to protector of rear oxygen sensor.

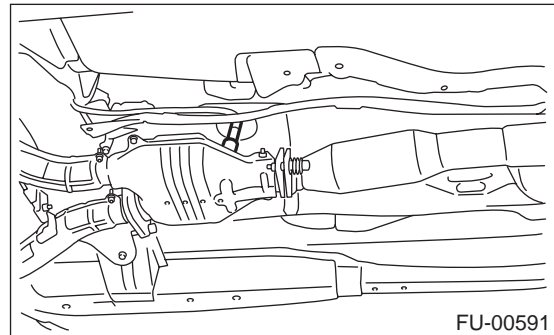
Anti-seize compound:

SS-30 by JET LUBE

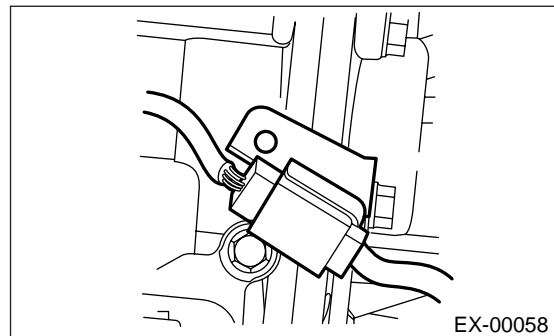
- 2) Install rear oxygen sensor.

Tightening torque:

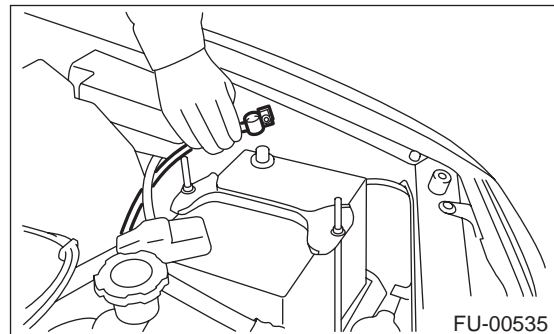
21 N·m (2.1 kgf-m, 15.2 ft-lb)



- 3) Connect connector to rear oxygen sensor.



- 4) Lower the vehicle.
- 5) Connect battery ground cable.



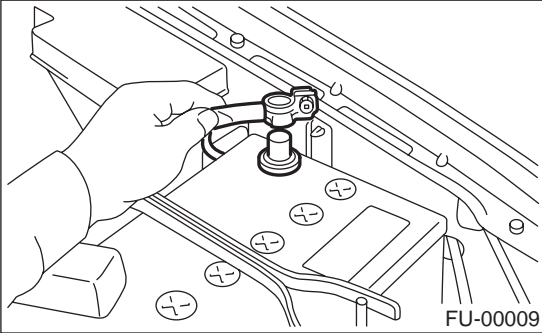
ENGINE CONTROL MODULE

FUEL INJECTION (FUEL SYSTEMS)

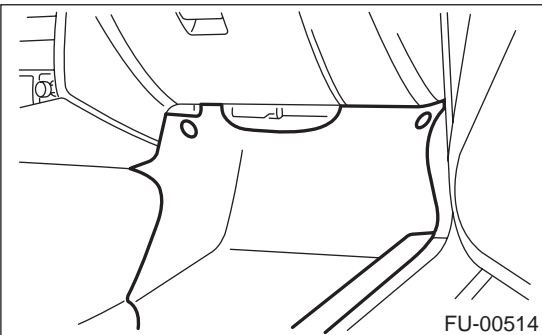
17.Engine Control Module

A: REMOVAL

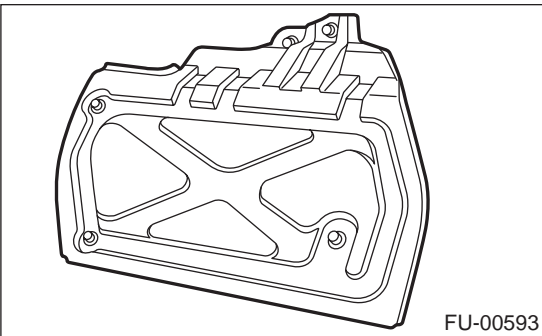
1) Disconnect battery ground cable.



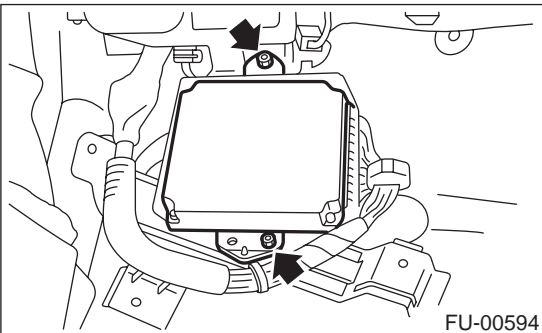
2) Remove lower inner trim of passenger side.
<Ref. to EI-39, REMOVAL, Lower Inner Trim.>
3) Detach floor mat of front passenger seat.



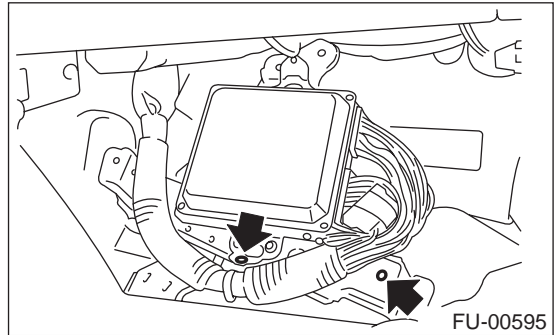
4) Remove protect cover.



5) Remove nuts which hold ECM to bracket.



6) Remove clip from bracket.



7) Disconnect ECM connectors and take out ECM.

B: INSTALLATION

Install in the reverse order of removal.

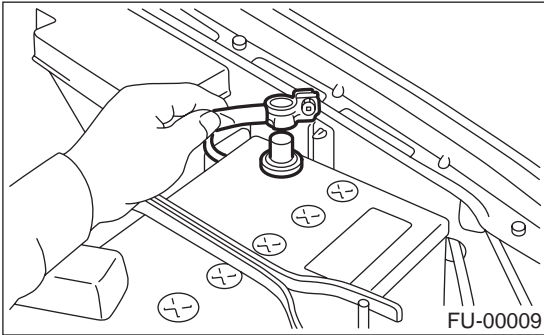
CAUTION:

When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

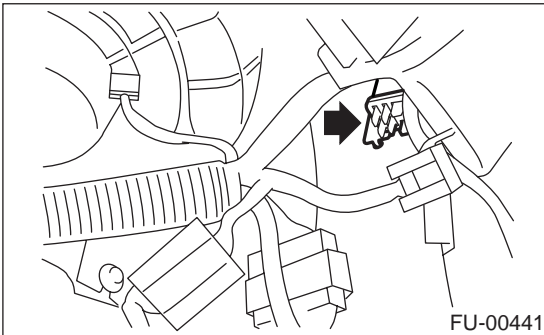
18.Main Relay

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Remove lower inner trim of passenger side.
<Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 3) Disconnect connectors from main relay.
- 4) Remove bolt which holds main relay bracket on body.



B: INSTALLATION

Install in the reverse order of removal.

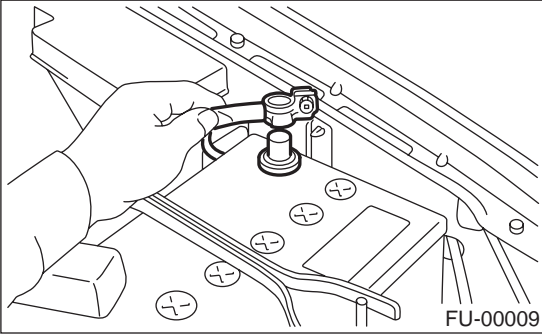
FUEL PUMP RELAY

FUEL INJECTION (FUEL SYSTEMS)

19. Fuel Pump Relay

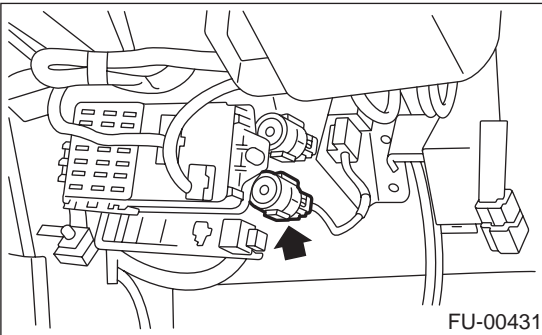
A: REMOVAL

1) Disconnect battery ground cable.



2) Remove lower cover. <Ref. to EI-35, REMOVAL, Instrument Panel Assembly.>

3) Disconnect connector from fuel pump relay.



4) Remove fuel pump relay from mounting bracket.

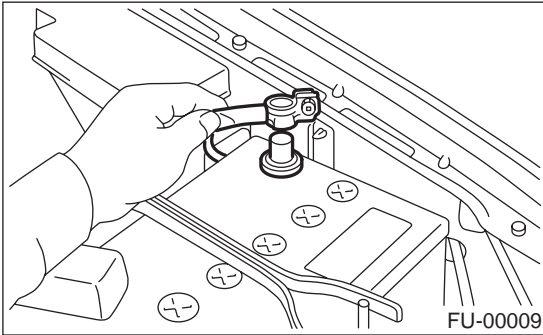
B: INSTALLATION

Install in the reverse order of removal.

20. Fuel Pump Controller

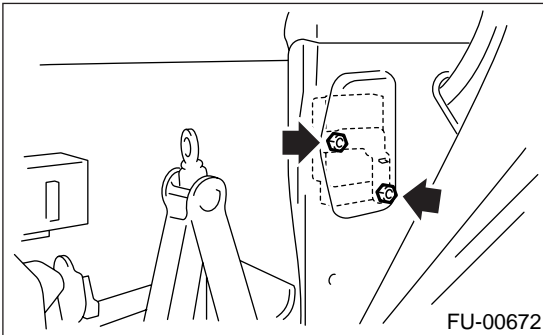
A: REMOVAL

1) Disconnect battery ground cable.



2) Remove rear quarter Trim. <Ref. to EI-40, REMOVAL, Rear Quarter Trim.>

3) Disconnect connector from fuel pump control unit.



4) Remove fuel pump control unit.

B: INSTALLATION

Install in the reverse order of removal.

FUEL

FUEL INJECTION (FUEL SYSTEMS)

21. Fuel

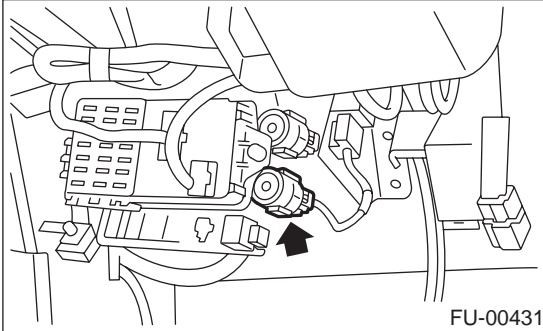
A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Disconnect connector from fuel pump relay.



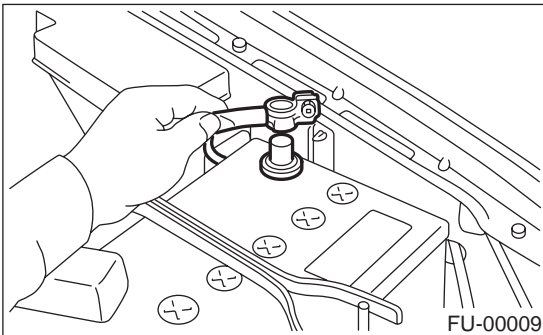
- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn ignition switch to OFF.

2. DRAINING FUEL

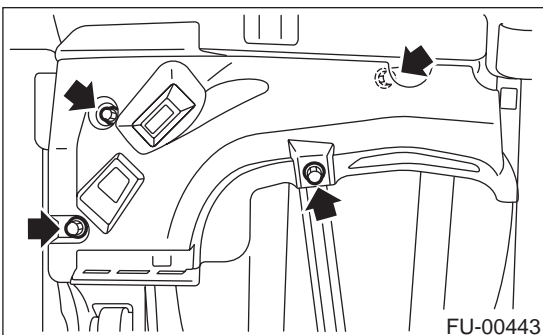
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Set vehicle on the lift.
- 2) Disconnect battery ground cable.

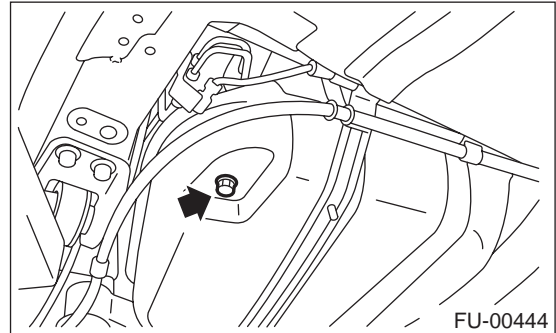


- 3) Lift-up the vehicle.
- 4) Remove front right side fuel tank cover.



- 5) Drain fuel from fuel tank.

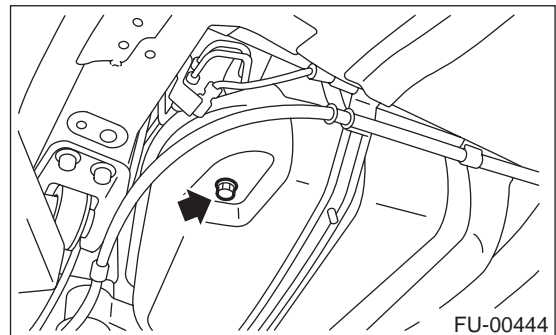
Set a container under the vehicle and remove drain plug from fuel tank.



- 6) Tighten fuel drain plug and install front right side tank cover.

Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



Tightening torque:

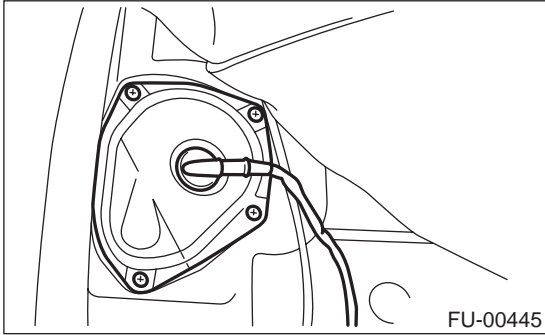
18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 7) Lower the vehicle.

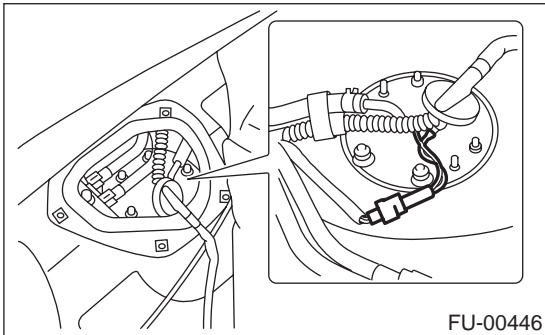
FUEL

FUEL INJECTION (FUEL SYSTEMS)

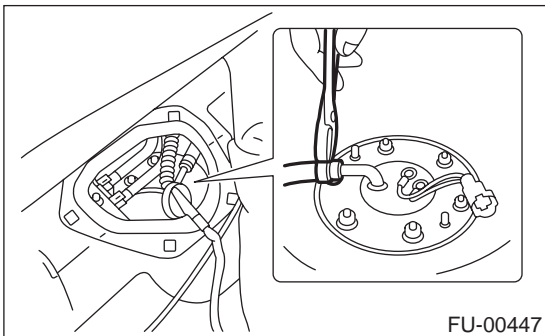
8) Remove sub service hole cover.



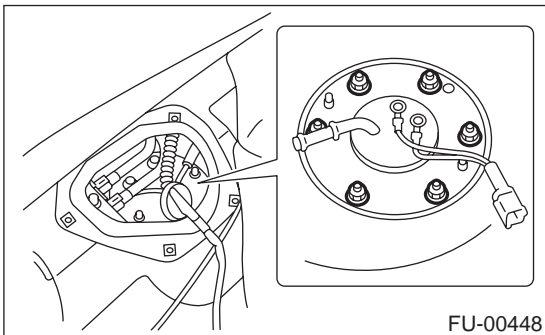
9) Disconnect connector from fuel sub level sensor.



10) Disconnect fuel jet pump hose.



11) Remove fuel sub level sensor.



12) Drain fuel from fuel tank by using hand pump.

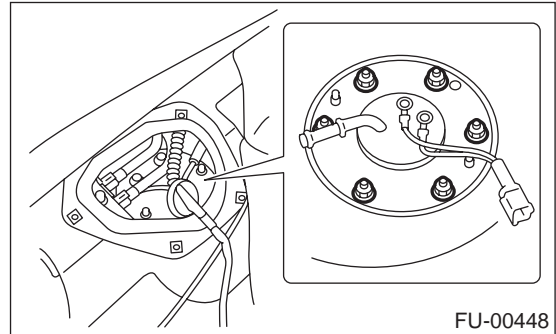
WARNING:

Do not use a motor pump when draining fuel.

13) After draining fuel, reinstall fuel sub level sensor.

Tightening torque:

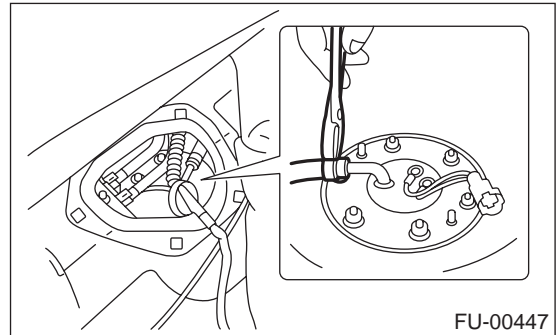
4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



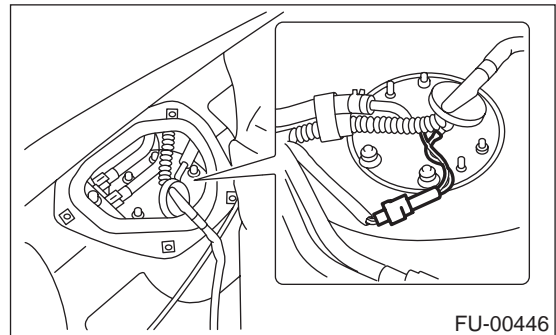
NOTE:

If you have not removed fuel tank yet, proceed with the procedure below for installation.

(1) Connect fuel jet pump hose.



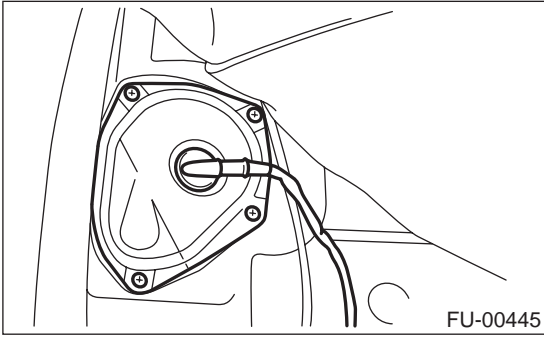
(2) Connect connector from fuel sub level sensor.



FUEL

FUEL INJECTION (FUEL SYSTEMS)

(3) Install sub service hole cover.

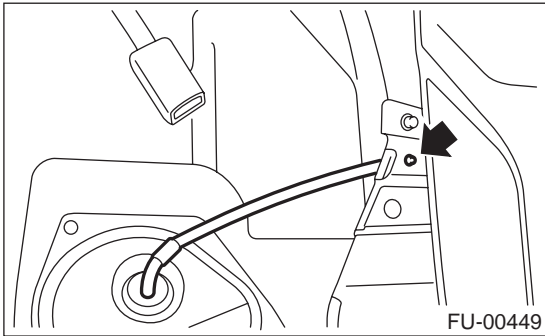


(4) Set rear seat and floor mat.

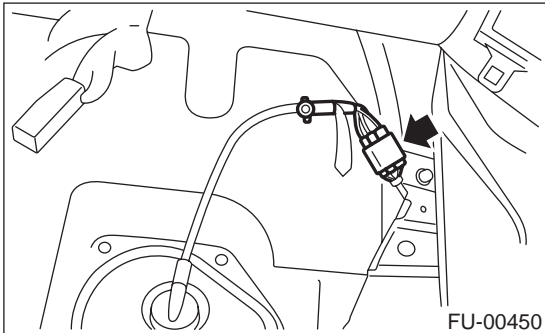
22. Fuel Tank

A: REMOVAL

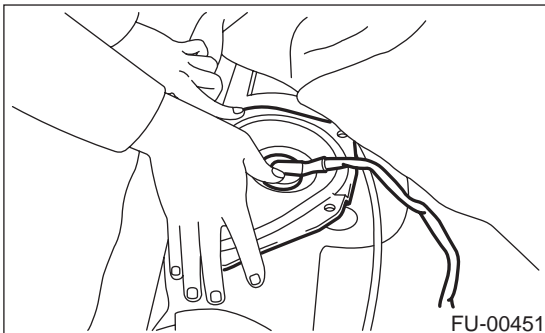
- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain fuel from fuel tank. <Ref. to FU(H6DO)-50, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove holder clip which secures fuel tank cord on bracket.



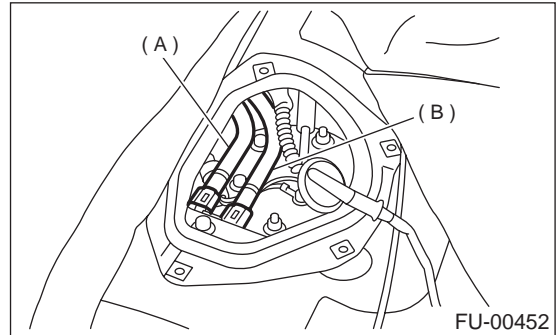
- 5) Disconnect connector of fuel tank cord to rear harness.



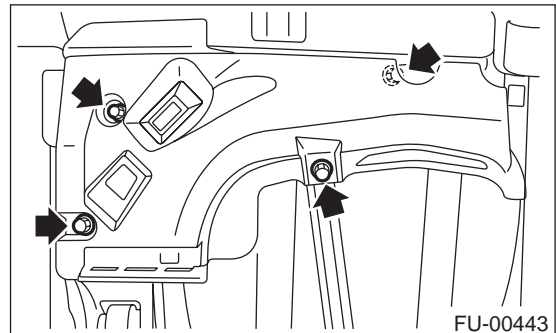
- 6) Push grommet which holds fuel tank cord on service hole cover into body side.



- 7) Separate quick connector of fuel delivery (A) and return hose (B). <Ref. to FU(H6DO)-73, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



- 8) Remove parking brake cable.
 - (1) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>
 - (2) Remove parking brake bracket and disconnect parking brake cable from equalizer. <Ref. to PB-7, REMOVAL, Parking Brake Cable.>
- 9) Remove wheel nuts from rear wheels.
- 10) Lift-up the vehicle.
- 11) Remove rear wheel.
- 12) Remove front side fuel tank cover.



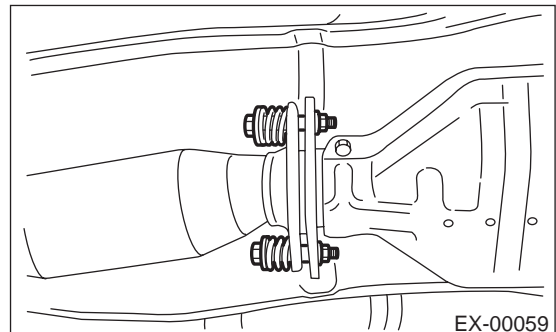
- 13) Remove rear exhaust pipe and muffler.

NOTE:

To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

- (1) Separate rear exhaust pipe from center exhaust pipe.



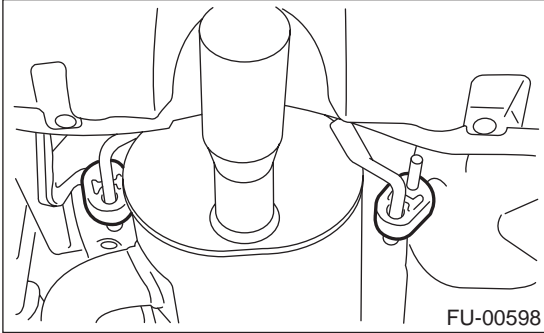
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

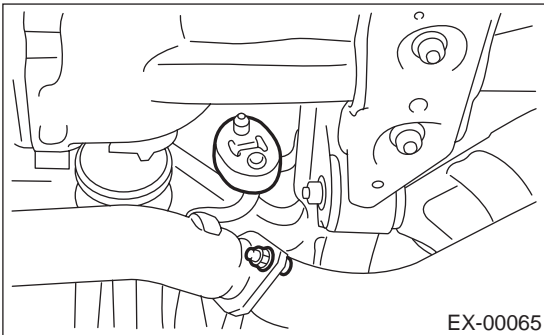
(2) Remove left and right rubber cushions.

CAUTION:

Be careful not to pull down muffler.

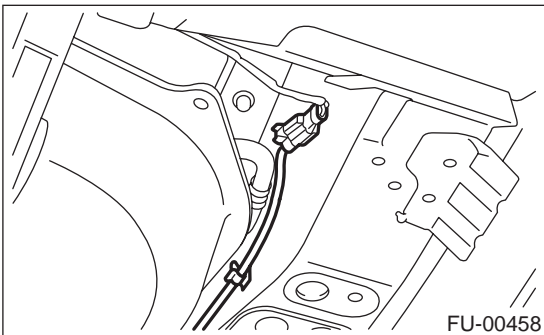


(3) Remove front rubber cushion and detach muffler assembly.



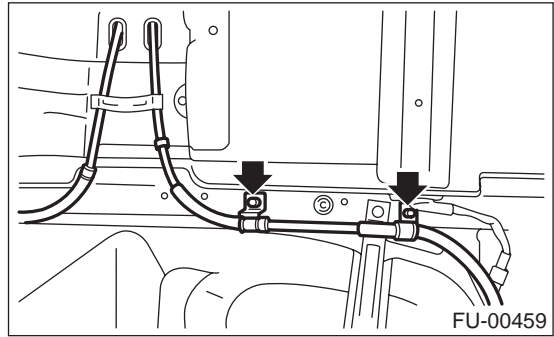
14) Remove propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

15) Disconnect connector from ABS sensor.

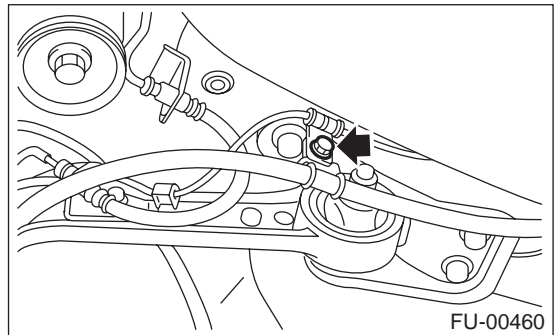


16) Remove bolts which hold parking brake cable holding bracket.

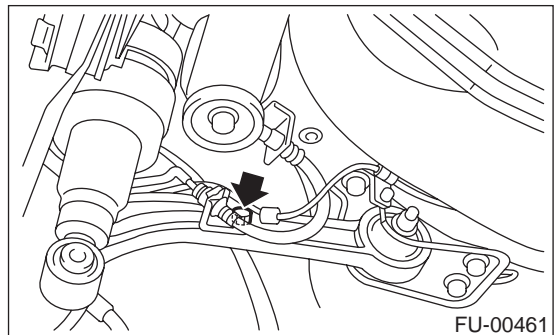
17) Remove parking brake cable from cabin by forcibly pulling it backward.



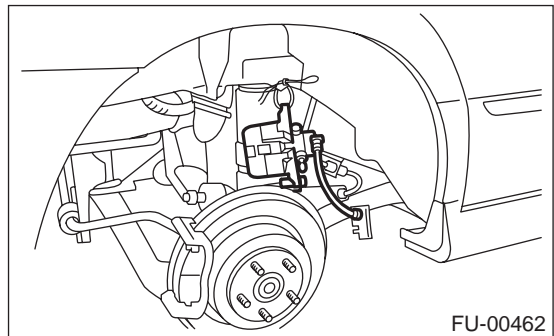
18) Remove bolts which hold parking brake cable holding bracket.



19) Remove bolts which hold rear brake hoses holding bracket.



20) Remove rear brake caliper, then tie it up to the body side of the vehicle as shown in figure.



FUEL TANK

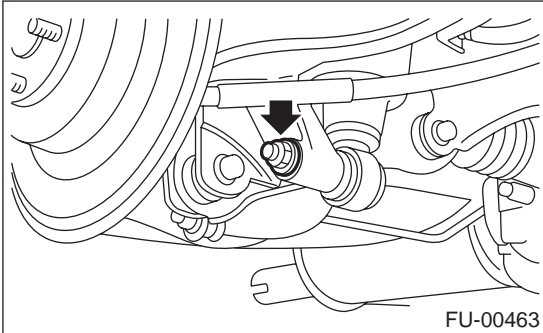
FUEL INJECTION (FUEL SYSTEMS)

21) Remove rear suspension assembly.

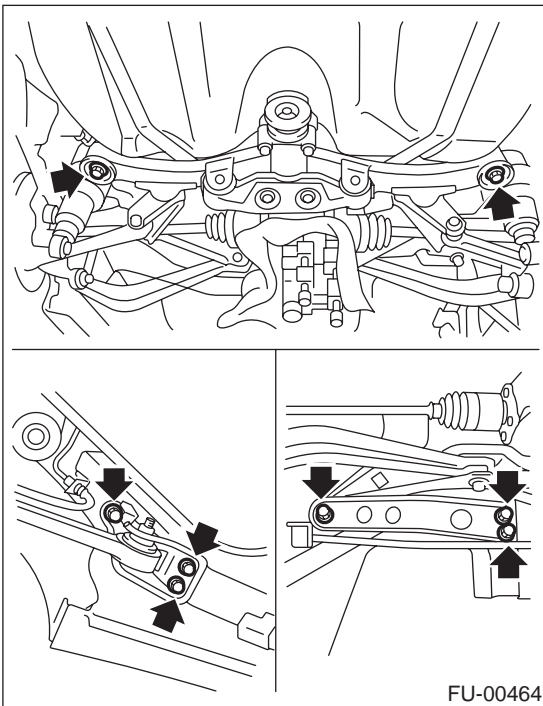
WARNING:

A helper is required to perform this work.

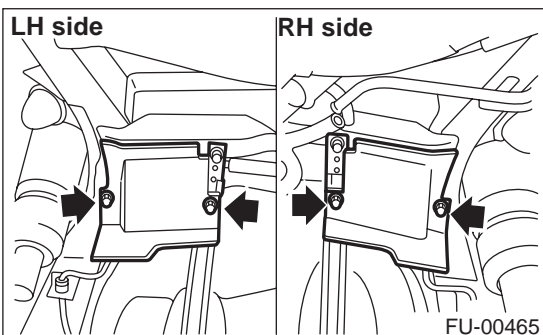
- (1) Support rear differential with transmission jack.
- (2) Remove bolt which holds rear shock absorber to rear suspension arm.



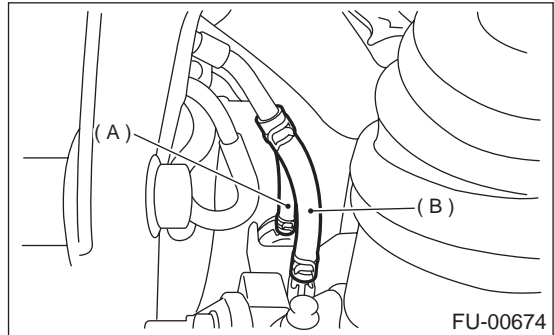
- (3) Remove bolts which secure rear suspension assembly to body.



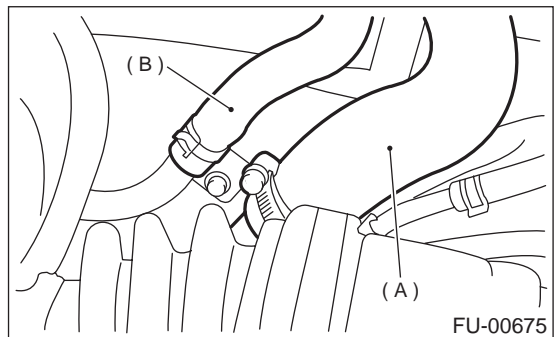
- (4) Remove rear suspension assembly.
- 22) Remove rear side fuel tank cover.



- 23) Disconnect two-way valve hose (A) from two-way valve and disconnect evaporation hose (B) from evaporation pipe.



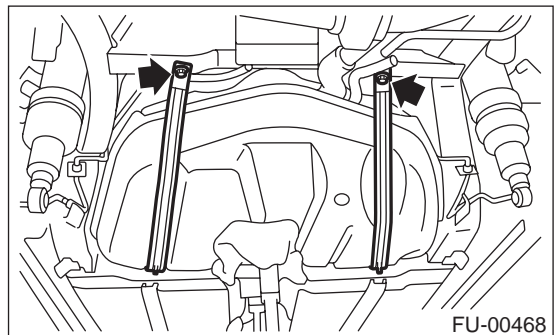
- 24) Loosen clamp and disconnect fuel filler hose (A) and air vent hose (B) from fuel filler pipe.



- 25) Support fuel tank with transmission jack, remove bolts from bands and dismount fuel tank from the vehicle.

WARNING:

A helper is required to perform this work.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

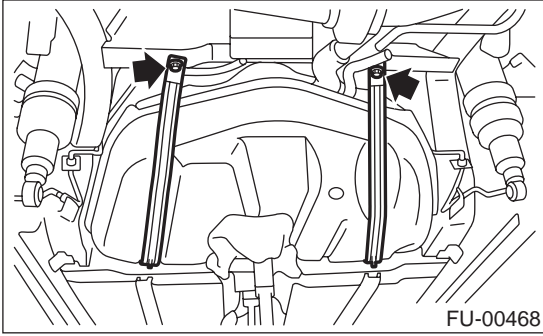
B: INSTALLATION

1) Support fuel tank with transmission jack and push fuel tank harness into access hole with grommet.

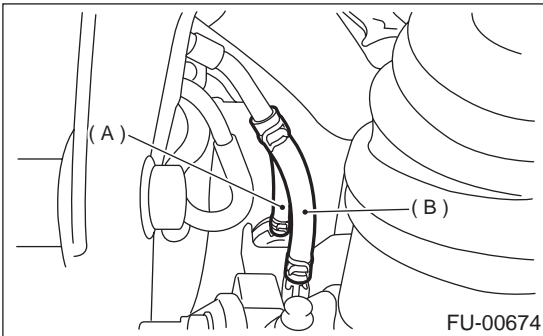
2) Set fuel tank and temporarily tighten bolts of fuel tank bands.

WARNING:

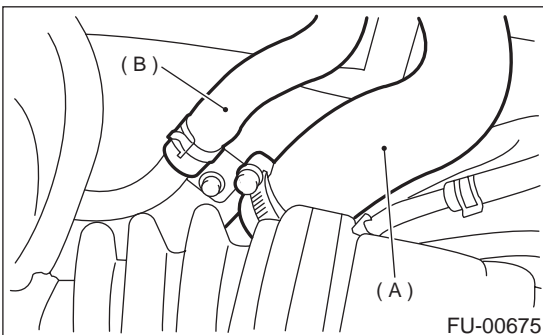
A helper is required to perform this work.



3) Connect two-way valve hose (A) to two-way valve and connect evaporation hose (B) to evaporation pipe.



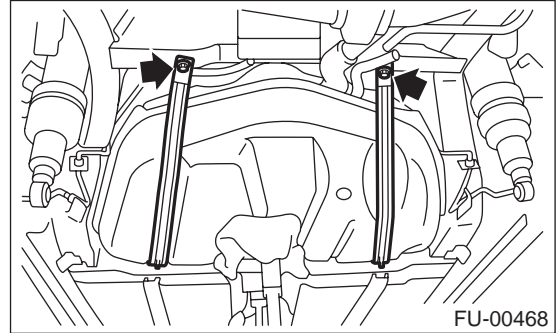
4) Connect fuel filler hose (A) and air vent hose (B).



5) Tighten band mounting bolts.

Tightening torque:

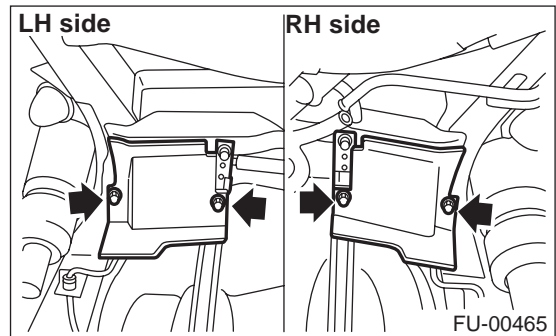
33 N·m (3.4 kgf·m, 25 ft·lb)



6) Install rear side fuel tank cover.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



7) Install rear suspension assembly.

WARNING:

A helper is required to perform this work.

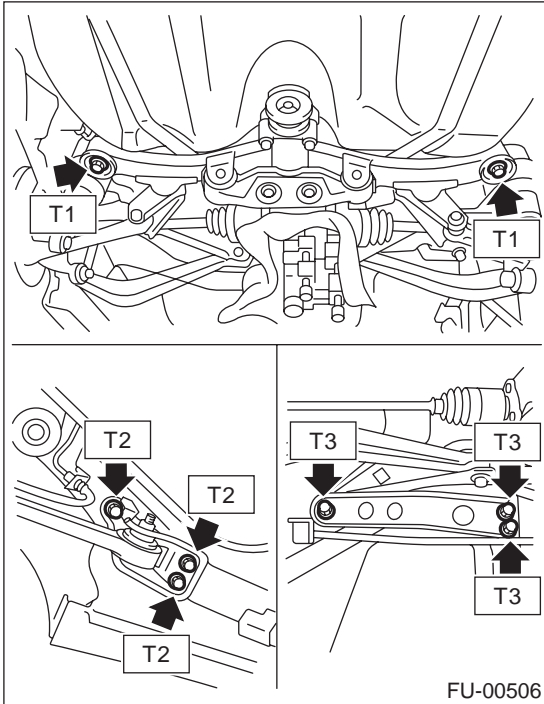
(1) Support rear suspension assembly and then tighten bolts which secure rear suspension assembly.

Tightening torque:

T1: 172 N·m (17.5 kgf-m, 127 ft-lb)

T2: 108 N·m (11.0 kgf-m, 80 ft-lb)

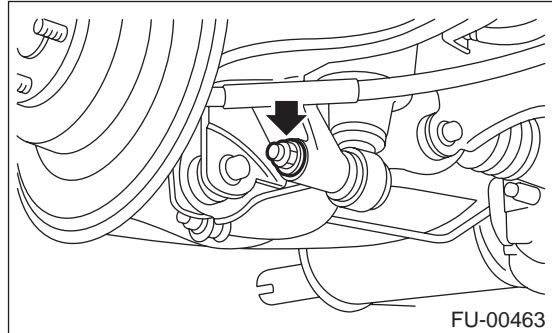
T3: 66 N·m (6.7 kgf-m, 48 ft-lb)



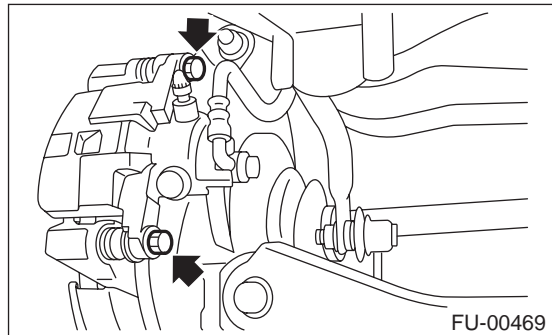
(2) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-14, INSTALLATION, Link Upper.>

Tightening torque:

157 N·m (16 kgf-m, 116 ft-lb)



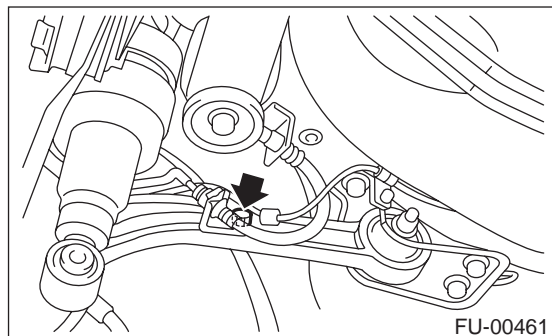
8) Install rear brake caliper. <Ref. to BR-29, INSTALLATION, Rear Disc Brake Assembly.>



9) Tighten bolt which holds rear brake hoses holding bracket.

Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



10) Install parking brake cable to cabin by forcibly pushing it forward.

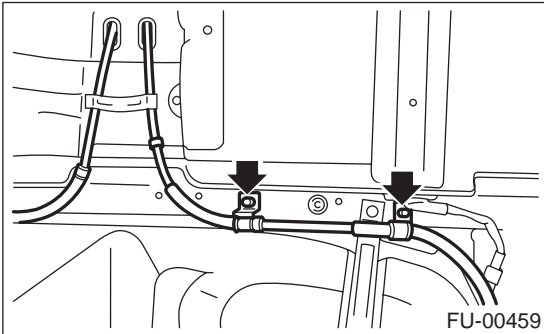
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

11) Tighten bolts which hold parking brake cable holding bracket.

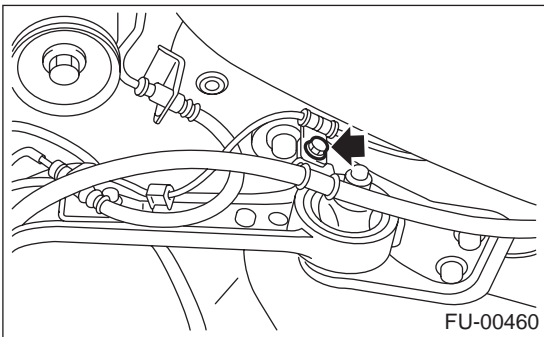
Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

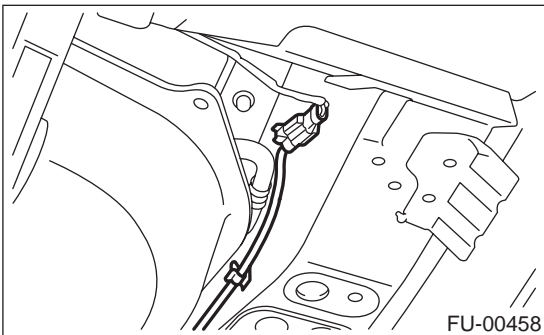


Tightening torque:

32 N·m (3.3 kgf-m, 23.9 ft-lb)



12) Connect connector to ABS sensor.



13) Install propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>

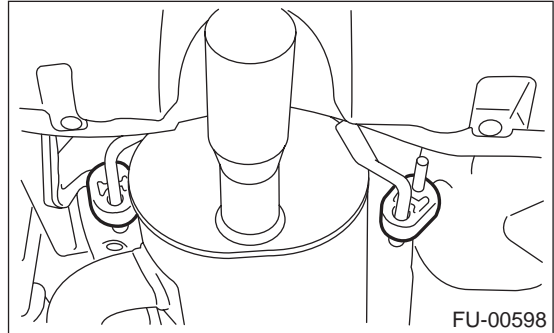
14) Install rear exhaust pipe and muffler.

NOTE:

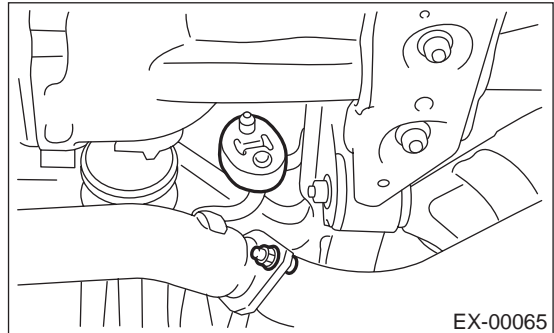
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.



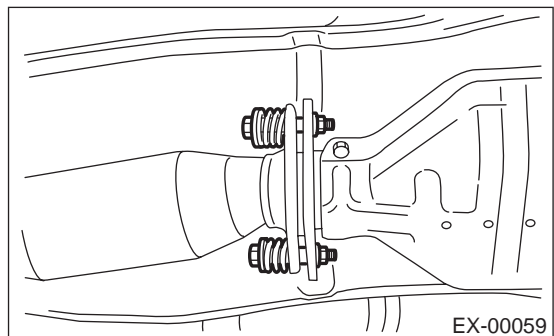
(2) Install front rubber cushion and attach muffler assembly.



(3) Install rear exhaust pipe to center exhaust pipe.

Tightening torque:

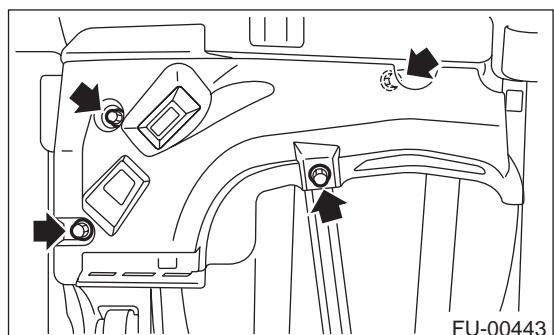
18 N·m (1.8 kgf-m, 13.0 ft-lb)



15) Install front side fuel tank cover.

Tightening torque:

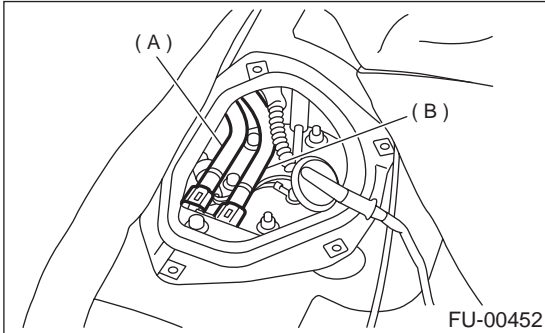
18 N·m (1.8 kgf-m, 13.0 ft-lb)



FUEL TANK

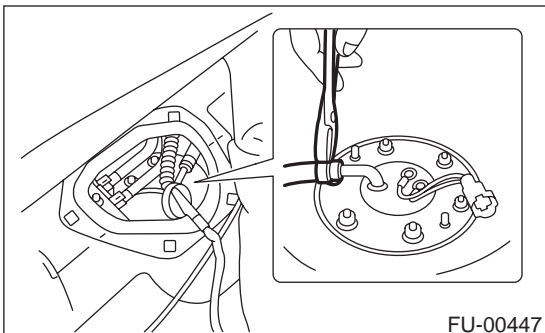
FUEL INJECTION (FUEL SYSTEMS)

- 16) Install rear wheel.
- 17) Lower the vehicle.
- 18) Tighten wheel nuts to rear wheel.
- 19) Install parking brake cable. <Ref. to PB-7, INSTALLATION, Parking Brake Cable.>
- 20) Install console box. <Ref. to EI-34, INSTALLATION, Console Box.>
- 21) Connect fuel hoses and hold them with quick connector. <Ref. to FU(H6DO)-74, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

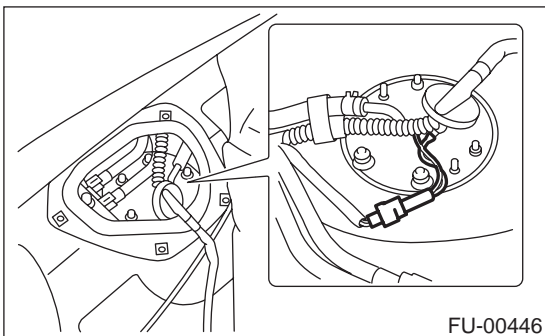


- (A) Delivery hose
(B) Return hose

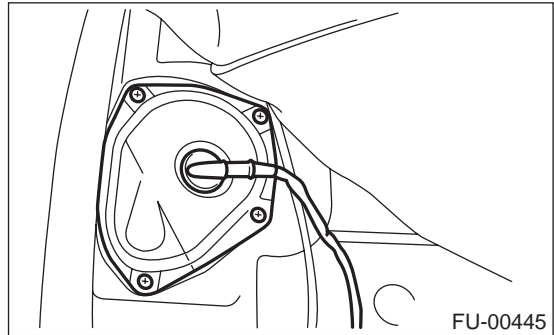
- 22) Connect fuel jet pump hose.



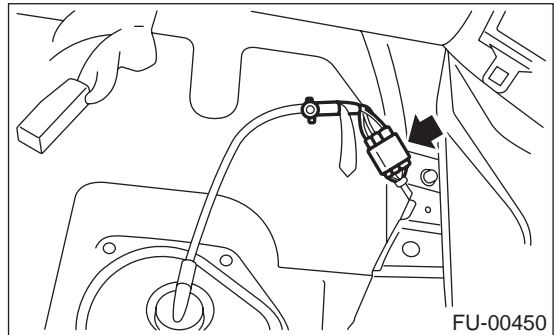
- 23) Connect connector to fuel sub level sensor.



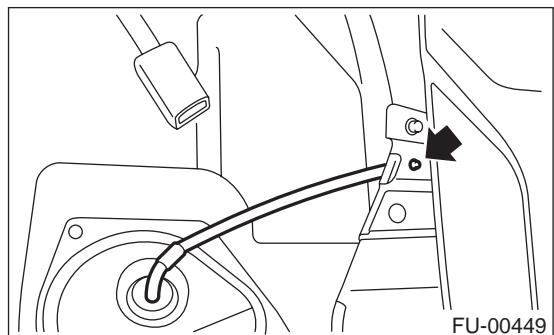
- 24) Install sub service hole cover.



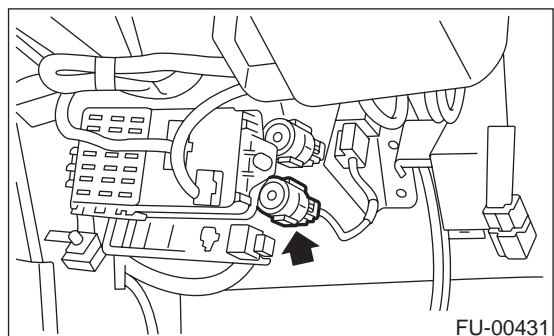
- 25) Connect connectors to fuel tank cord and plug service hole with grommet.



- 26) Install holder clip which secures fuel tank cord on bracket.



- 27) Set rear seat and floor mat.
- 28) Connect connector to fuel pump relay.



- 29) Adjust parking brake lever stroke. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly.>

FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

30) Check wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

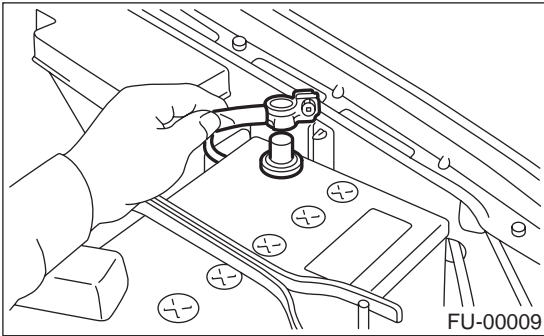
C: INSPECTION

- 1) Make sure there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

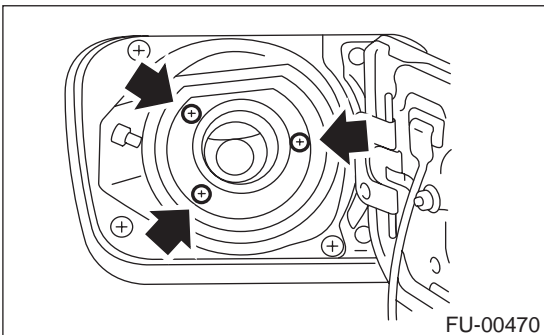
23. Fuel Filler Pipe

A: REMOVAL

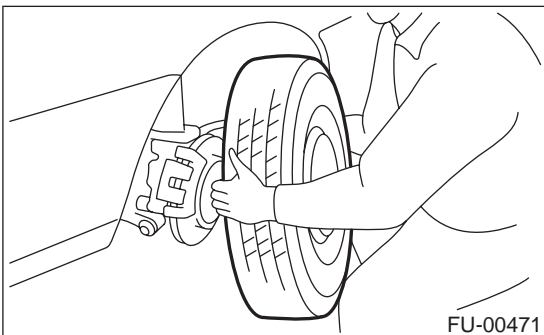
- 1) Release the fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid, and then remove the filler cap.
- 3) Disconnect the ground cable from battery.



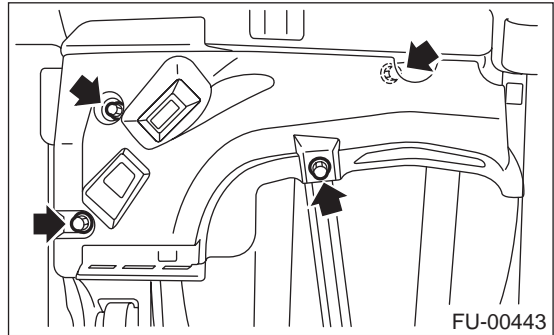
- 4) Remove the screws holding packing in place.



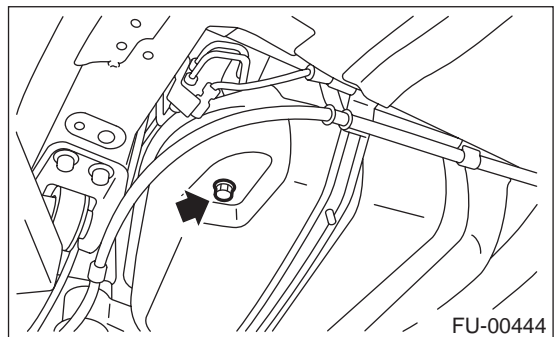
- 5) Lift-up the vehicle.
- 6) Remove the rear right side wheel nuts.
- 7) Remove the wheel RH (Rear).



- 8) Remove the protector RH (Front).



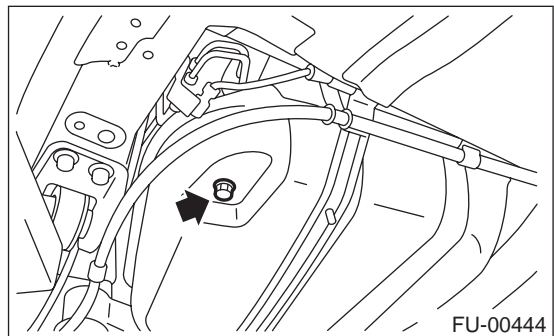
- 9) Drain fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



- 10) Tighten the fuel drain plug, and then install the protector RH (Front).

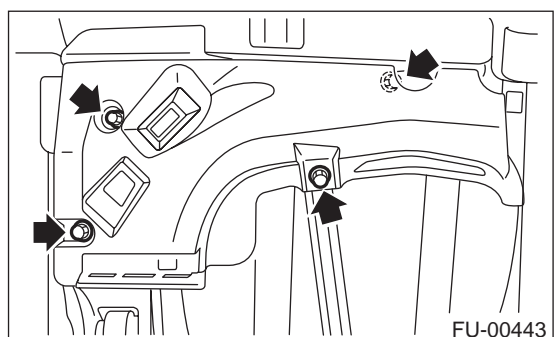
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



Tightening torque:

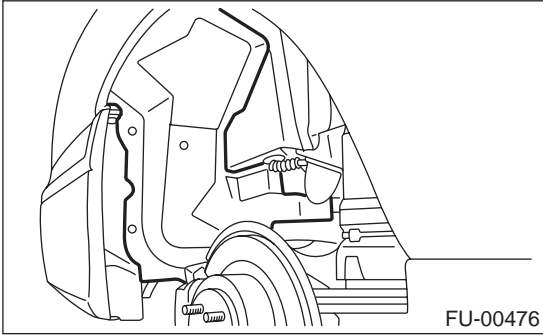
18 N·m (1.8 kgf-m, 13.0 ft-lb)



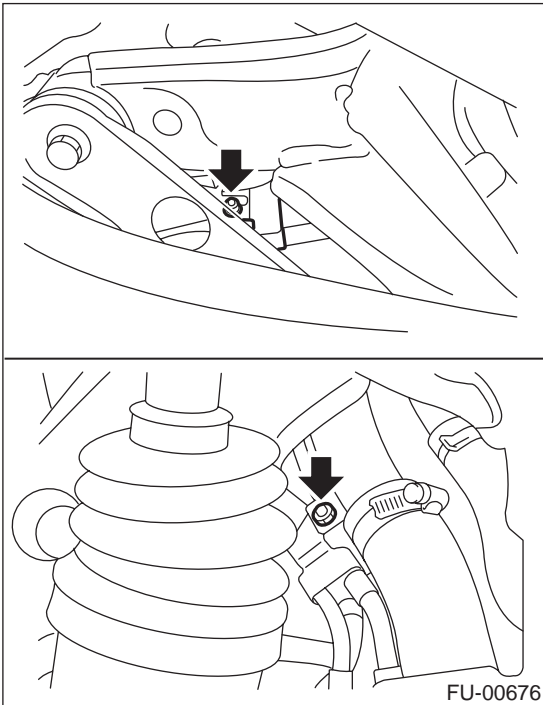
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

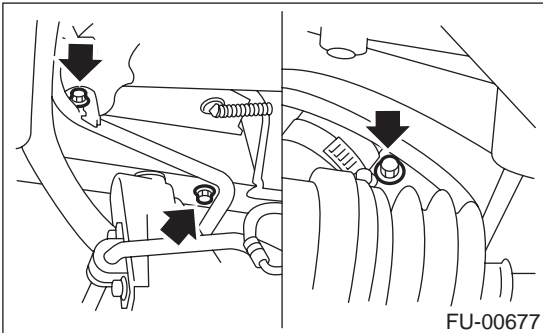
11) Remove the fuel filler pipe protector.



12) Remove the bolts which hold evaporation pipe bracket on fuel filler pipe.

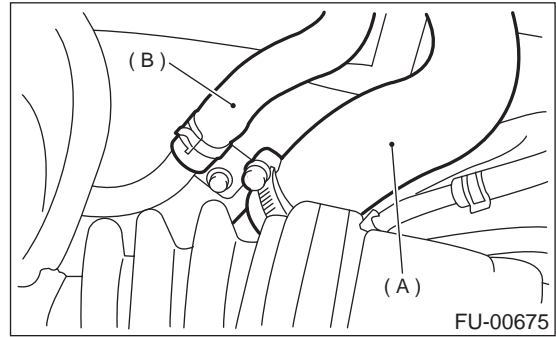


13) Remove the bolts which hold fuel filler pipe bracket on body.



14) Loosen the clamp, and then separate the fuel filler hose (A) from fuel filler pipe.

15) Move the clip, and then separate the air vent hose (B).

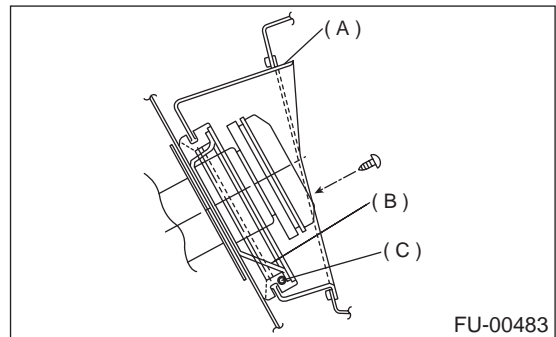


16) Remove the fuel filler pipe to under side of the vehicle.

B: INSTALLATION

1) Hold the fuel filler flap open.

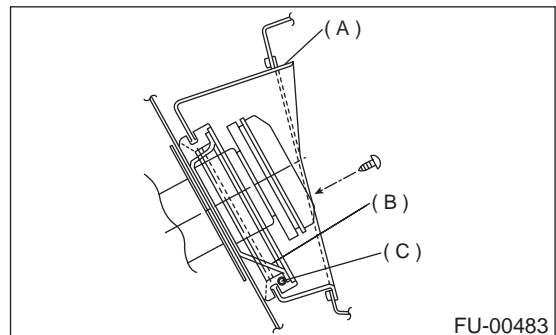
2) Set the fuel saucer (A) with rubber packing (C), and then insert the fuel filler pipe into hole from the inner side of apron.



3) Align holes in the fuel filler pipe neck, and then set the cup (B), and tighten screws.

NOTE:

If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



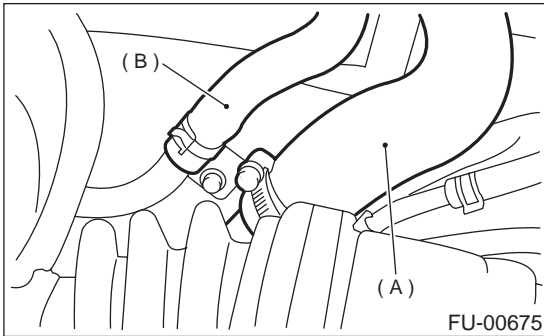
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

4) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe, and then tighten clamp.

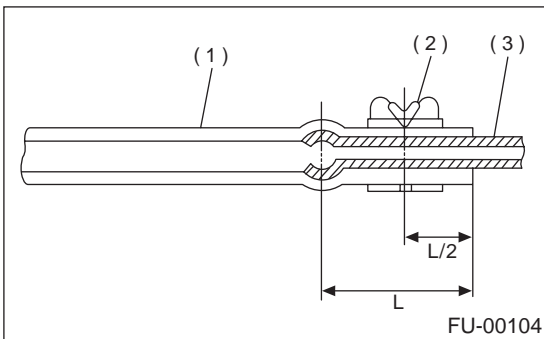
CAUTION:

Do not allow clips to touch air vent hose (B) and rear suspension crossmember.



5) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe and hold clip.

$L = 27.5 \pm 2.5 \text{ mm (1.083 \pm 0.098 in)}$

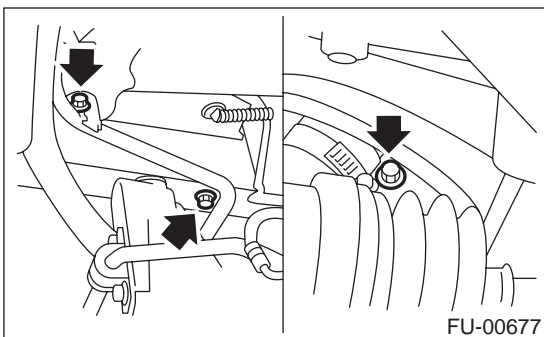


- (1) Hose
- (2) Clip
- (3) Pipe

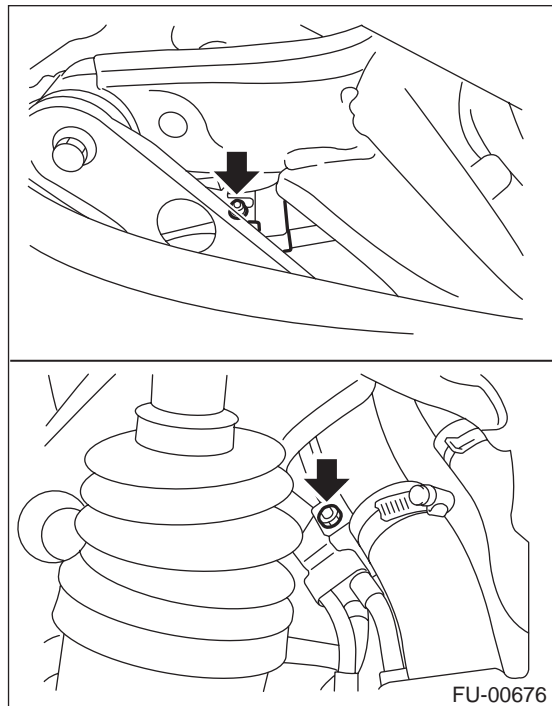
6) Tighten the bolt which holds fuel filler pipe bracket on body.

Tightening torque:

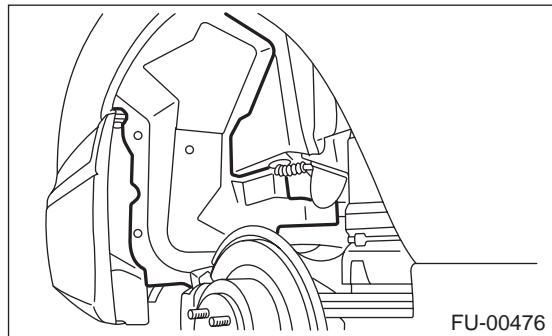
$7.4 \text{ N}\cdot\text{m (0.75 kgf}\cdot\text{m, 5.4 ft}\cdot\text{lb)}$



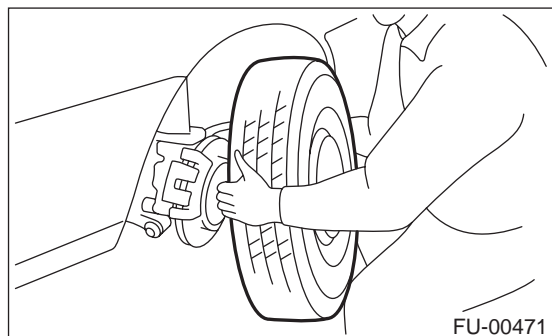
7) Tighten the bolts which hold evaporation pipe bracket on fuel pipe.



8) Install the fuel filler pipe protector.



9) Install the rear right wheel.



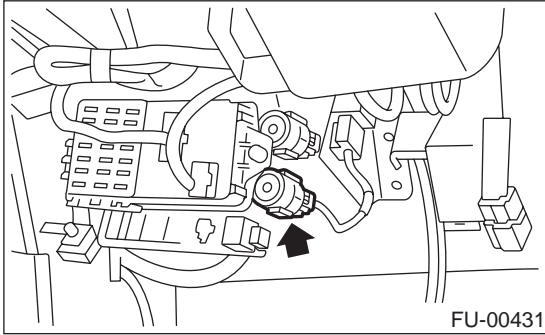
10) Lower the vehicle.

11) Tighten the wheel nuts.

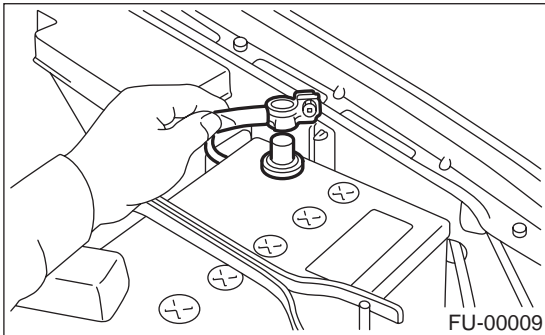
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

12) Connect the connector to fuel pump relay (A).



13) Connect the battery ground cable to battery.



24. Fuel Pump

A: REMOVAL

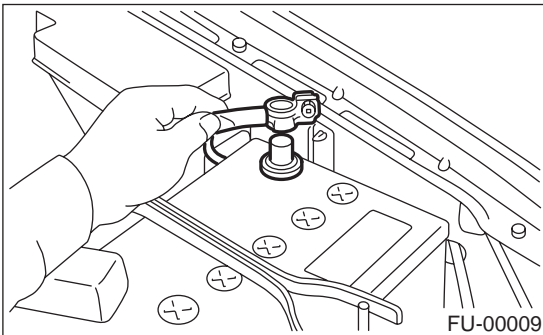
WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

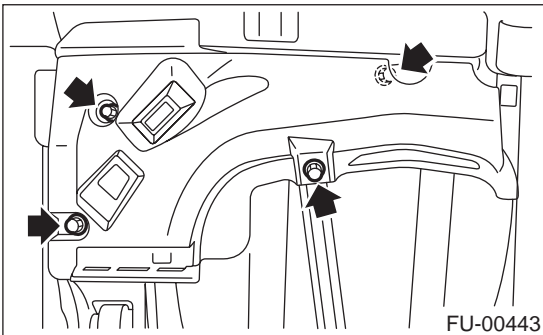
NOTE:

The fuel pump assembly consists of fuel pump and fuel level sensor.

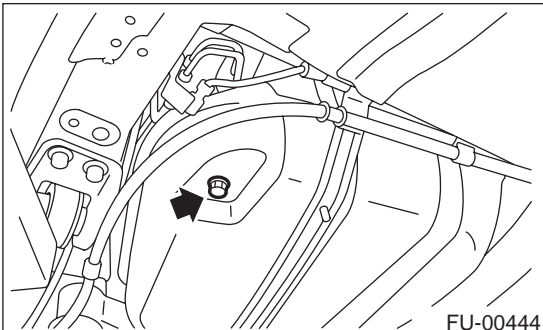
- 1) Release the fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid, and then remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



- 4) Lift-up the vehicle.
- 5) Remove the protector RH (Front).



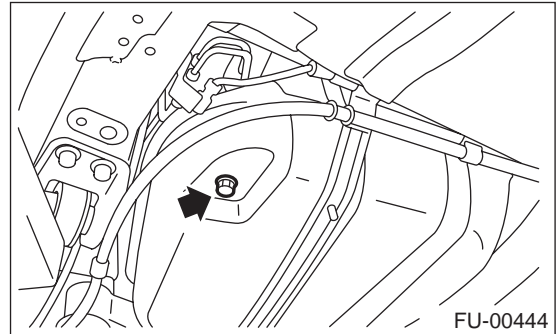
- 6) Drain the fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



- 7) Tighten the fuel drain plug, and then install the protector RH (Front).

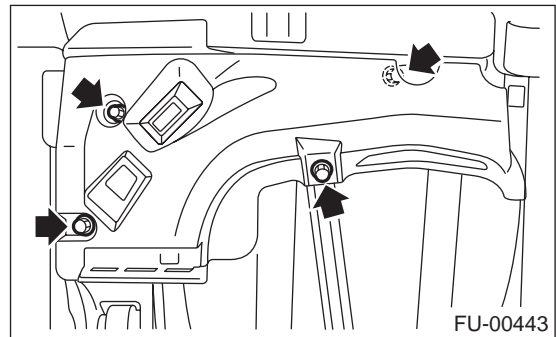
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)

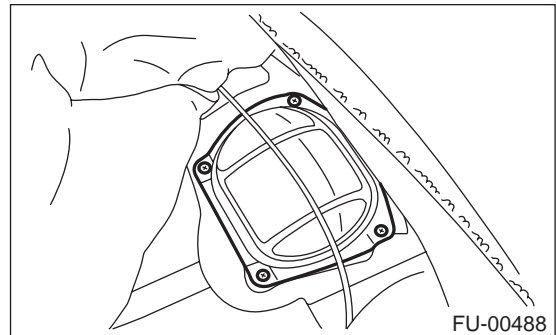


Tightening torque:

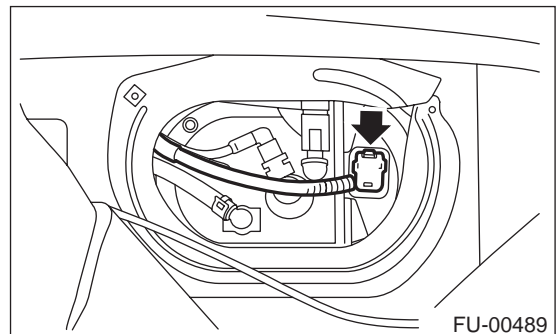
18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 8) Raise the rear seat, and then turn the floor mat up.
- 9) Remove the access hole lid.



- 10) Disconnect the connector from fuel pump.

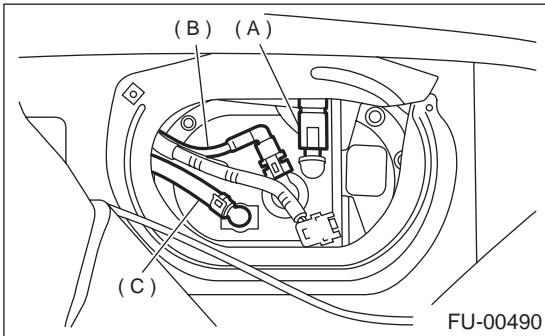


FUEL PUMP

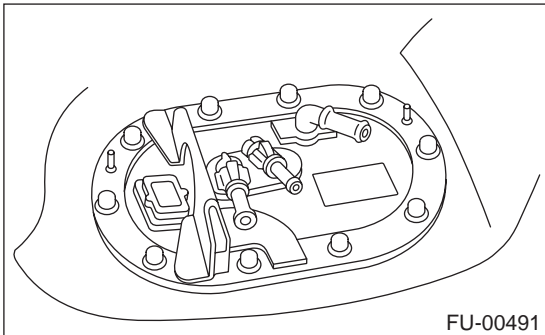
FUEL INJECTION (FUEL SYSTEMS)

11) Move the clips, and then disconnect the jet pump hose (C).

12) Disconnect the quick connector, and then disconnect the fuel delivery hose (A) and return hose (B). <Ref. to FU(H6DO)-73, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



13) Remove the nuts which install fuel pump assembly onto fuel tank.



14) Take off the fuel pump assembly from fuel tank.

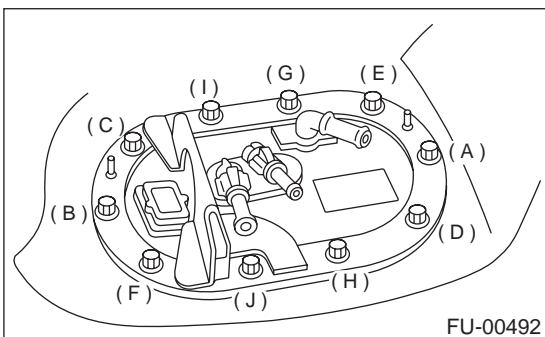
B: INSTALLATION

Install in the reverse order of removal. Do the following:

- (1) Always use new gaskets.
- (2) Ensure the sealing portion is free from fuel or foreign particles before installation.
- (3) Tighten the nuts in alphabetical sequence shown in the figure to specified torque.

Tightening torque:

5.9 N·m (0.6 kgf·m, 4.3 ft·lb)

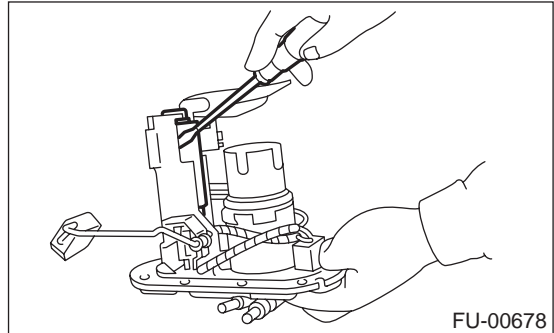


C: DISASSEMBLY

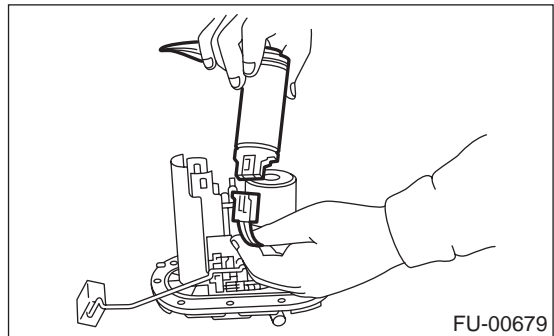
1) Remove the fuel pump and pump holder.

NOTE:

When disassembling the pump holder, be careful as it is installed with two pawls.



2) Disconnect the connector from fuel pump.



D: ASSEMBLY

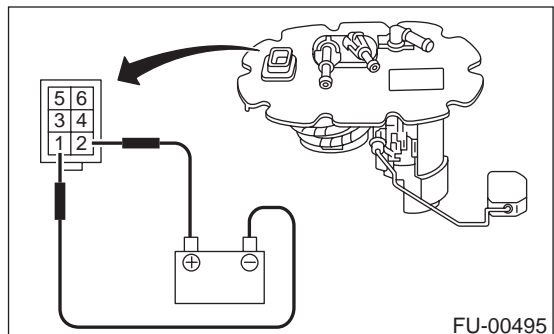
Assemble in the reverse order of disassembly.

E: INSPECTION

Connect the lead harness to connector terminal of fuel pump, and then apply battery power supply to check whether the pump operate.

WARNING:

- Wipe off the fuel completely.
- Keep the battery as far apart from fuel pump as possible.
- Be sure to turn the battery supply ON and OFF on the battery side.
- Do not run the fuel pump for a long time under non-load condition.



25. Fuel Level Sensor

A: REMOVAL

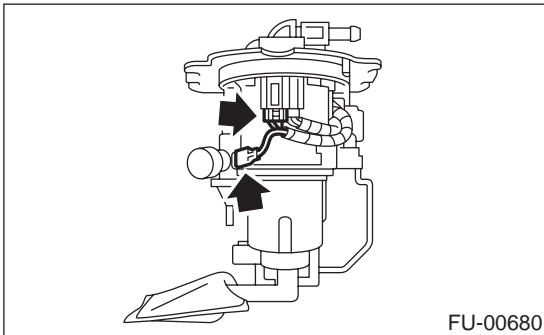
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

NOTE:

The fuel level sensor is built in fuel pump assembly.

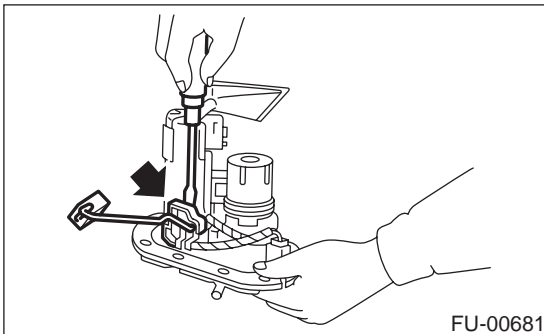
- 1) Remove the fuel pump assembly. <Ref. to FU(H6DO)-65, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from fuel pump bracket.



- 3) Pushing the pawls with a screwdriver, remove the fuel meter unit by pulling it downwards.

NOTE:

Replace the fuel filter pawls with new ones as they might brake when removed.

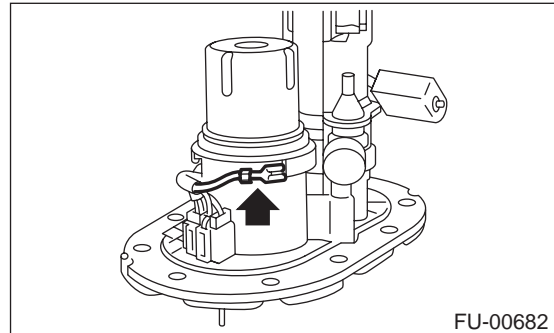


B: INSTALLATION

Install in the reverse order of removal.

WARNING:

- Ground cable must be connected.
- Spark may occur and ignite if fuel is nearby.



FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

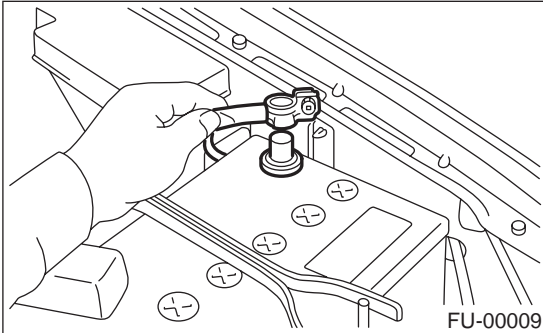
26. Fuel Sub Level Sensor

A: REMOVAL

WARNING:

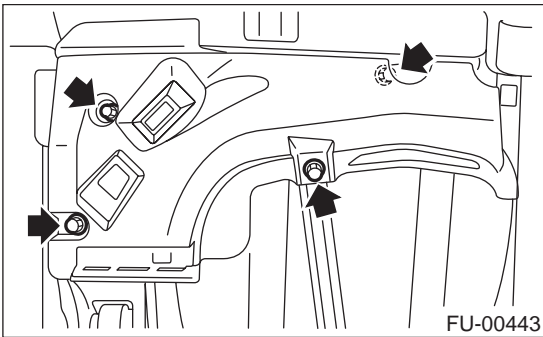
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect the ground cable from battery.

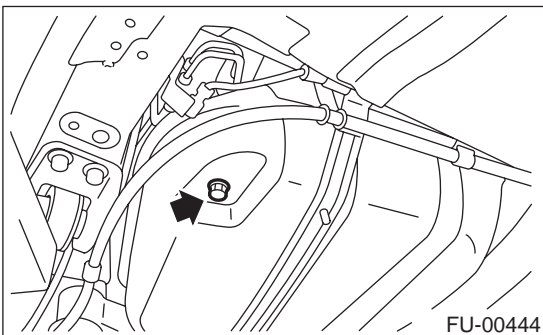


2) Lift-up the vehicle.

3) Remove the front side fuel tank cover.



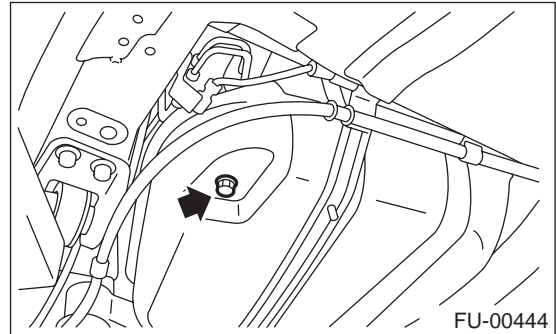
4) Drain fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



5) Tighten the fuel drain plug and install the protector RH (Front).

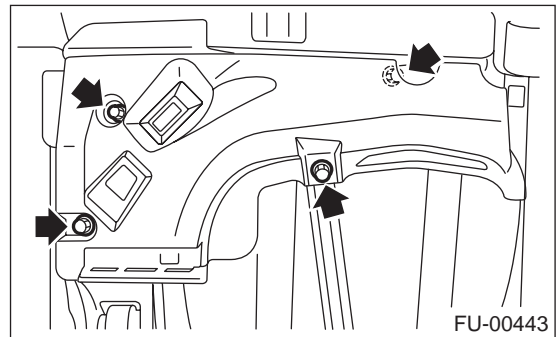
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



Tightening torque:

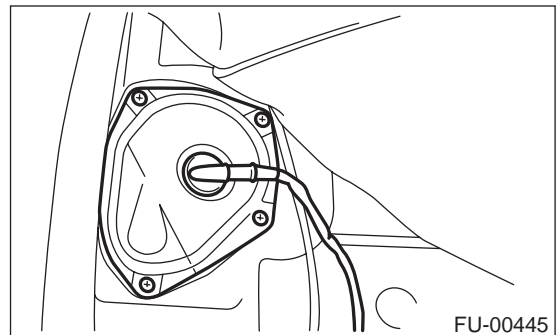
18 N·m (1.8 kgf-m, 13.0 ft-lb)



6) Remove the rear seat.

7) Remove the floor mat.

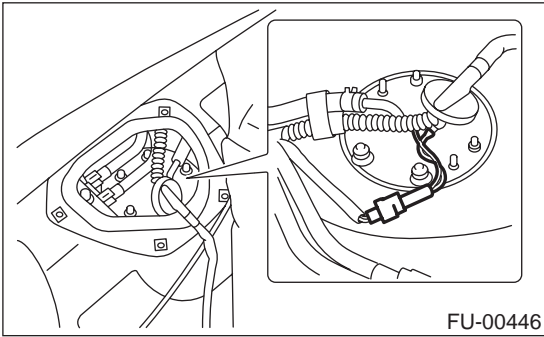
8) Remove the service hole cover.



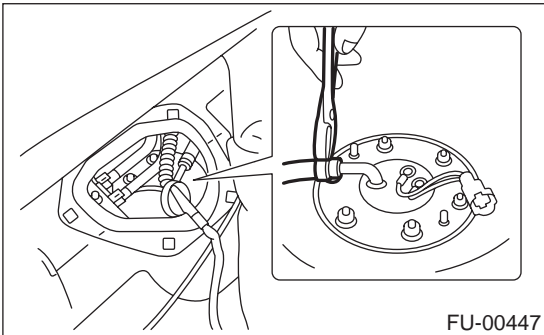
FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

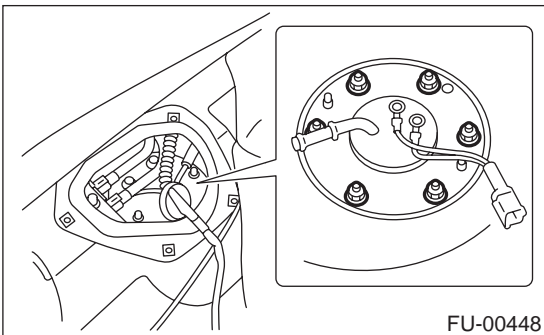
9) Disconnect the connector from fuel sub level sensor.



10) Disconnect the fuel jet pump hose.



11) Remove the bolts which install fuel sub level sensor on fuel tank.



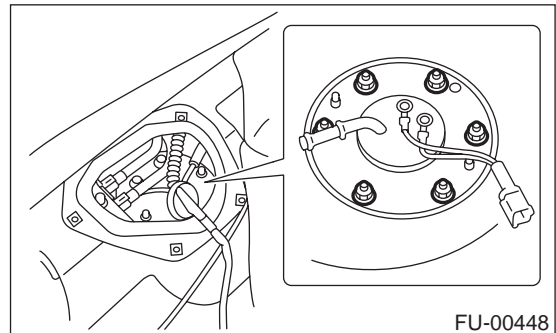
12) Remove the fuel sub level sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



FUEL FILTER

FUEL INJECTION (FUEL SYSTEMS)

27. Fuel Filter

A: REMOVAL

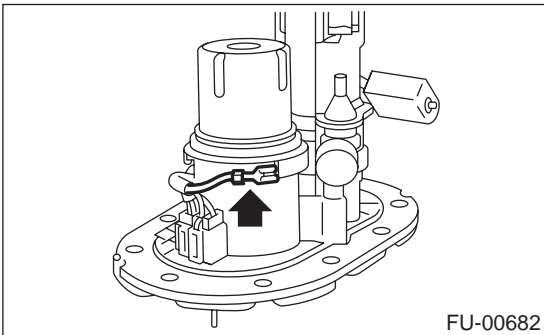
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

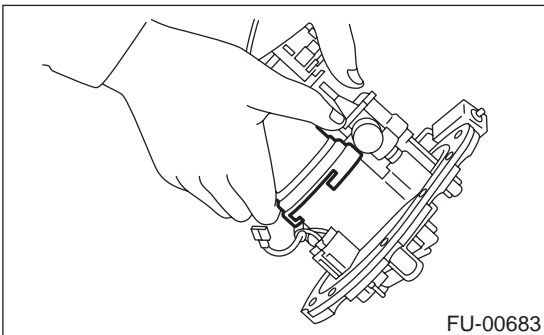
NOTE:

The fuel filter is built in fuel pump assembly.

- 1) Release the fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Remove the fuel pump assembly. <Ref. to FU(H6DO)-65, REMOVAL, Fuel Pump.>
- 3) Disconnect the ground cable from filter holder.



- 4) Remove the filter holder by turning it to the left from the body pawls, and then take out the filter.

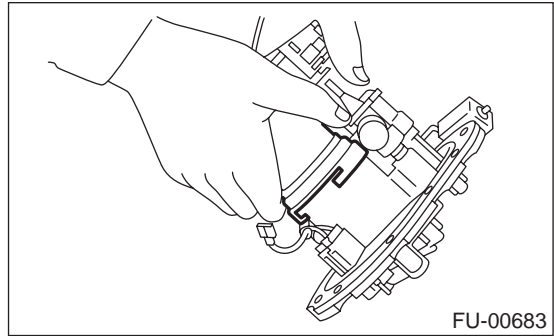


B: INSTALLATION

NOTE:

- If the fuel hoses are damaged at the connecting portion, replace it with a new one.
- If the clamps are badly damaged, replace with new ones.
- Replace the o-ring with new ones.

- 1) Set the O-ring on the filter holder, and then install by turning to the right.



- 2) Install the fuel pump assembly. <Ref. to FU(H6DO)-66, INSTALLATION, Fuel Pump.>

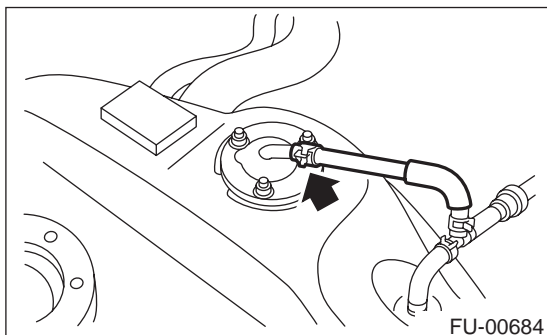
C: INSPECTION

- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if replacement interval has been reached, replace it.

28. Fuel Cut Valve

A: REMOVAL

- 1) Remove the fuel tank. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Tank.>
- 2) Move the clip, and then disconnect the evaporation hose from fuel cut valve.



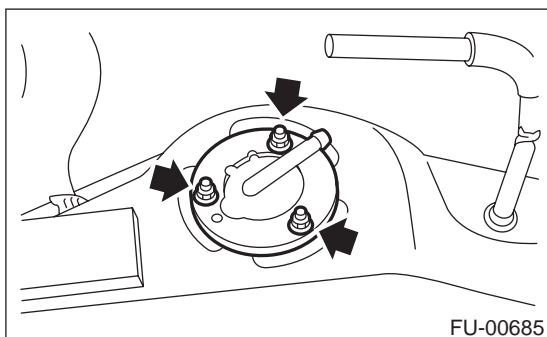
- 3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft-lb)



FUEL DAMPER VALVE

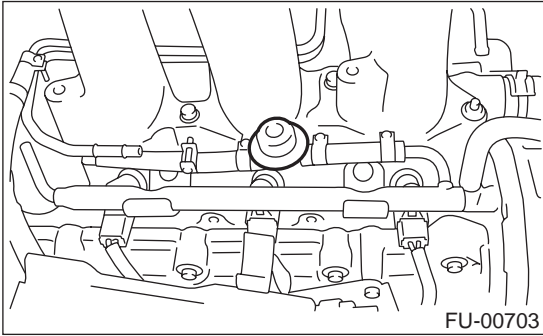
FUEL INJECTION (FUEL SYSTEMS)

29. Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Remove the fuel damper valve from fuel delivery line (A) and return line (B).



B: INSTALLATION

Install in the reverse order of removal.

30. Fuel Delivery, Return and Evaporation Lines

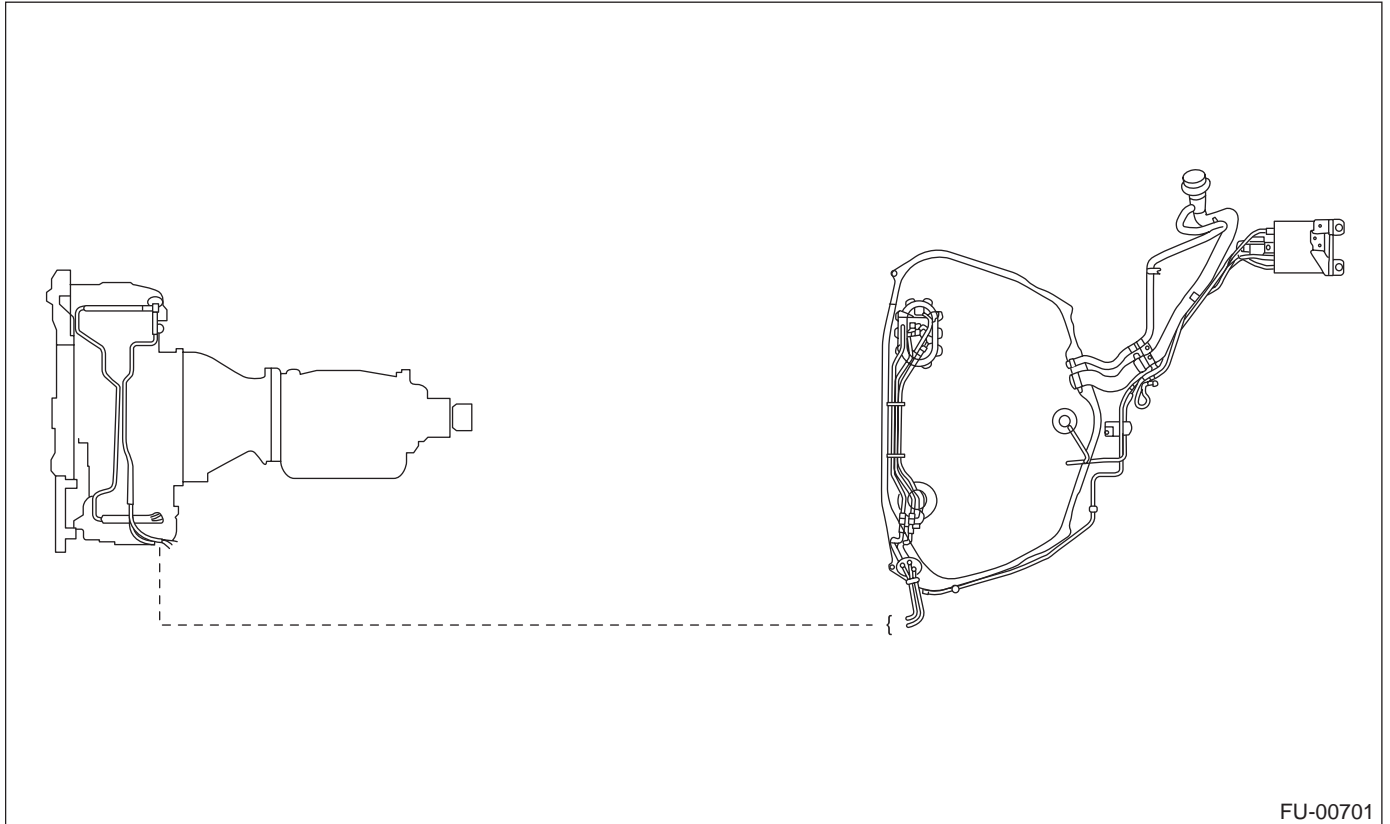
A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Release the fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

3) Open the fuel filler flap lid, and then remove the fuel filler cap.

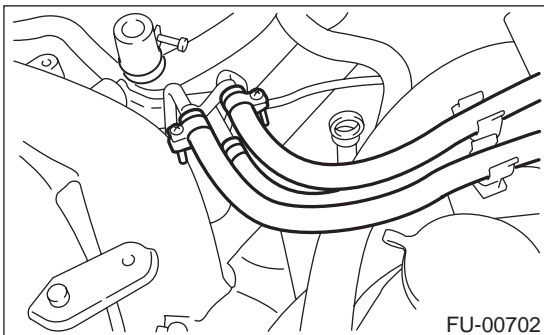
4) Remove the floor mat. <Ref. to EI-51 REMOVAL, Floor Mat.>

5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.

8) Disconnect the two-way valve hose (A) from the two-way valve and disconnect evaporation hose (B) from evaporation pipe.



7) Lift-up the vehicle.

FUEL DELIVERY, RETURN AND EVAPORATION LINES

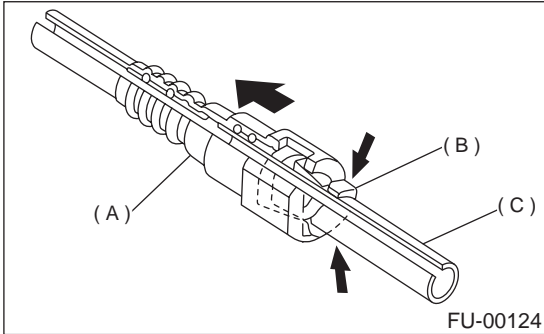
FUEL INJECTION (FUEL SYSTEMS)

9) Separate the quick connector on fuel delivery and return line.

- (1) Clean the pipe and connector, if they are covered with dust.
- (2) Hold the connector (A) and push retainer (B) down.
- (3) Pull out the connector (A) from retainer (B).

CAUTION:

Replace the retainer with new ones.



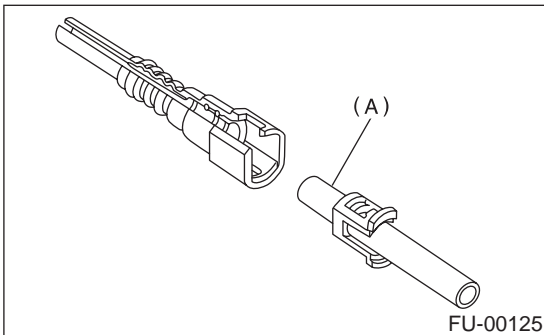
- (A) Connector
- (B) Retainer
- (C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery and return line.

NOTE:

- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.

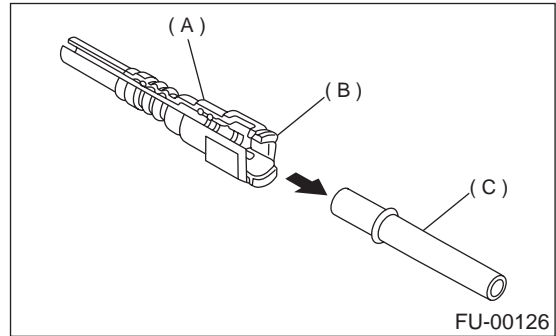


- (A) Seal surface

- (1) Set a new retainer (B) to connector (A).
- (2) Push the pipe into connector completely.

NOTE:

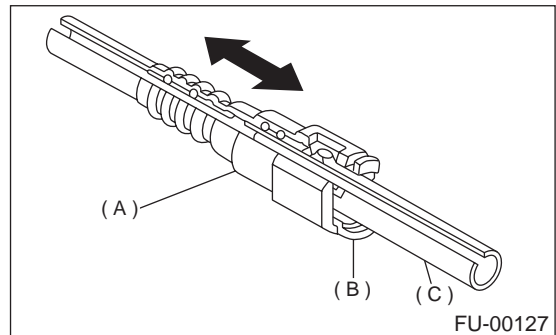
At this time, two clicking sounds are heard.



- (A) Connector
- (B) Retainer
- (C) Pipe

NOTE:

- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.
- Be sure to inspect the hoses and their connections for any leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

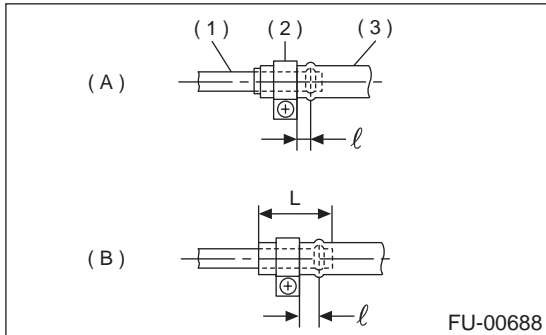
2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.

Type B: When fitting length is not specified.

\varnothing : 2.5 ± 1.5 mm (0.098 ± 0.059 in)

L : 22.5 ± 2.5 mm (0.886 ± 0.098 in)



(1) Fitting

(2) Clamp

(3) Hose

(A) Type A

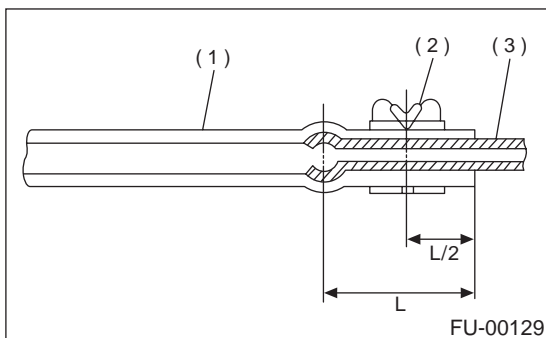
(B) Type B

3) Connect the evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

$L = 17.5 \pm 2.5$ mm (0.689 ± 0.098 in)

NOTE:

Be sure to inspect the hoses and their connections for any leakage of fuel.



(1) Hose

(2) Clip

(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.

2) Make sure that the fuel pipe and fuel hose connections are tight.

FUEL SYSTEM TROUBLE IN GENERAL

FUEL INJECTION (FUEL SYSTEMS)

31. Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	○ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	○ Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace the fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace the separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel meter unit.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank.

To prevent water condensation.

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain water condensation from the fuel filter.

- Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

- Protecting the fuel system against freezing and water condensation.

(1) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter

season, drain water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

(2) Affected areas

When water condensation is notched in the fuel filter, drain water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

- Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) *EC(H6DO)*

	Page
1. General Description	2
2. Front Catalytic Converter	3
3. Rear Catalytic Converter	6
4. Canister.....	7
5. Purge Control Solenoid Valve	8
6. EGR Valve	10
7. Two-way valve	12

GENERAL DESCRIPTION

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

1. General Description

A: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

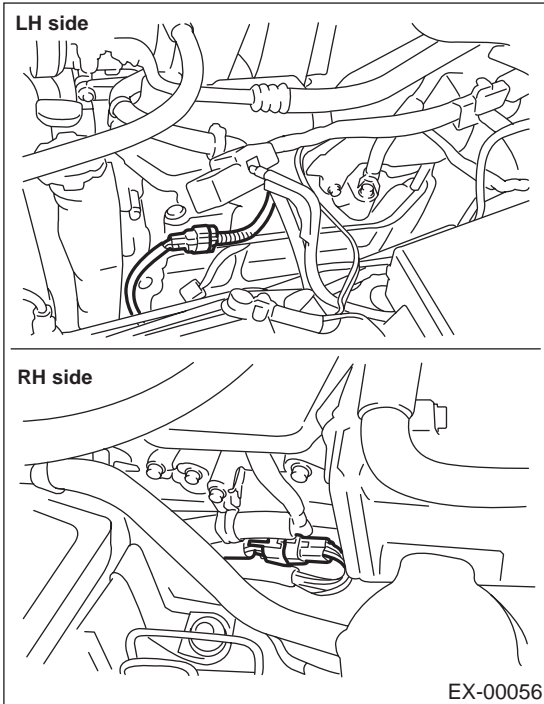
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

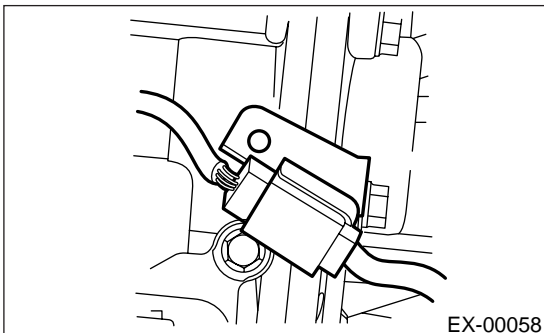
2. Front Catalytic Converter

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Remove battery.
- 3) Remove air cleaner case and air intake duct.
<Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
and <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
- 4) Disconnect front oxygen (A/F) sensor connectors.



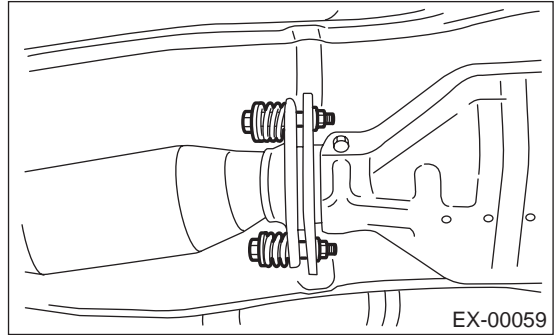
- 5) Lift-up the vehicle.
- 6) Remove under cover.
- 7) Remove front oxygen (A/F) sensor harness from the clips attached to both right and left cylinder head covers.
- 8) Disconnect connector from rear oxygen sensor connector.



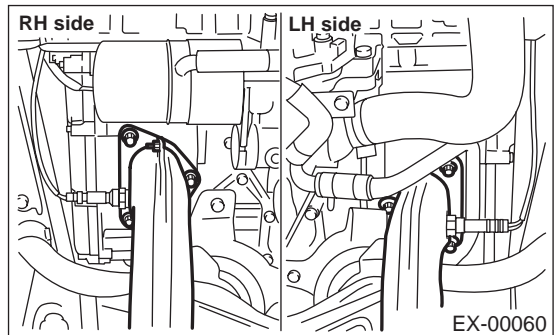
- 9) Separate front exhaust pipe from rear exhaust pipe.

CAUTION:

Be careful, exhaust pipe is hot.



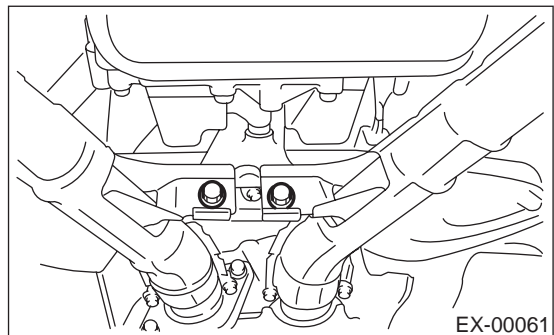
- 10) Remove nuts which hold front exhaust pipe onto cylinder heads.



- 11) Remove front exhaust pipe from hanger bracket.

CAUTION:

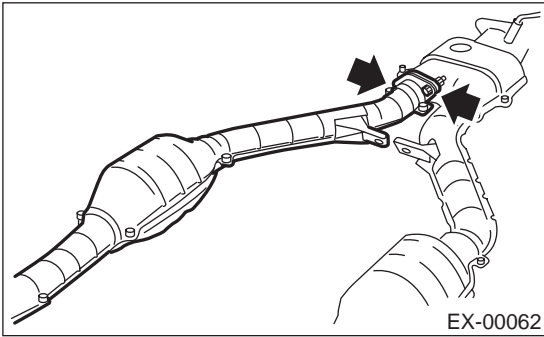
Be careful not to pull down front exhaust pipe.



FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

12) Separate front catalytic converter (RH) from front exhaust pipe.



B: INSTALLATION

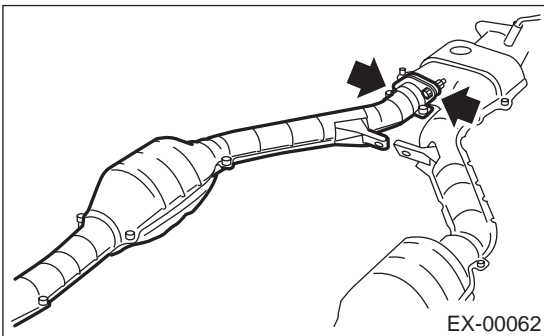
NOTE:

Replace gaskets with new ones.

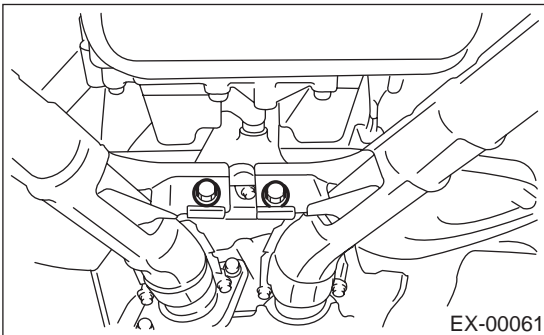
1) Install front catalytic converter (RH) to front exhaust pipe.

Tightening torque:

30 N·m (3.1 kgf·m, 22.4 ft·lb)



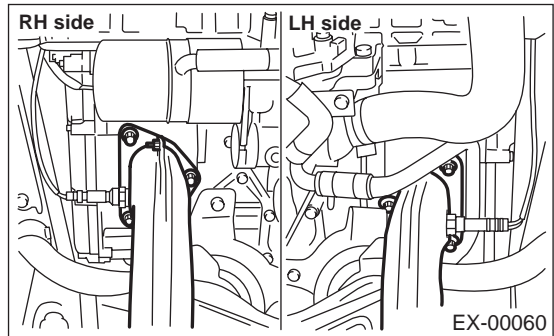
2) Install front exhaust pipe assembly to the vehicle. And temporarily tighten bolt which installs front exhaust pipe to hanger bracket.



3) Tighten nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

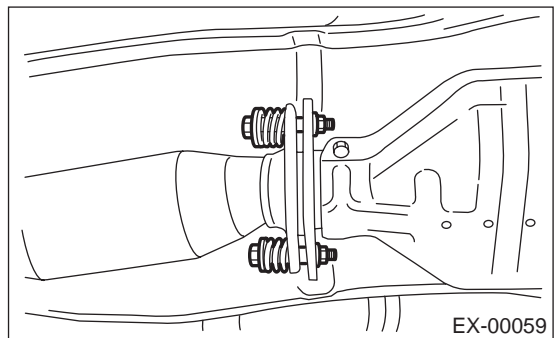
30 N·m (3.1 kgf·m, 22.4 ft·lb)



4) Tighten bolts which secure front exhaust pipe assembly to rear exhaust pipe.

Tightening torque:

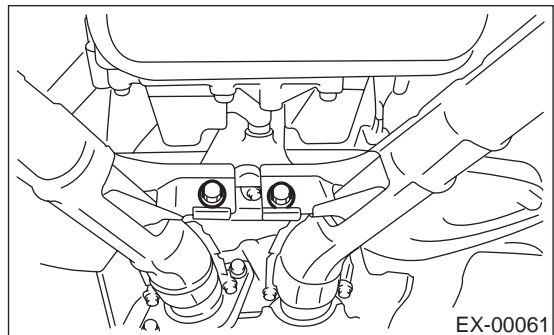
18 N·m (1.8 kgf·m, 13.0 ft·lb)



5) Tighten bolt which holds front exhaust pipes to hanger bracket.

Tightening torque:

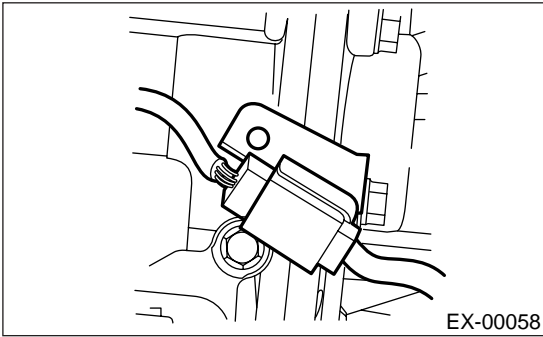
35 N·m (3.6 kgf·m, 26.0 ft·lb)



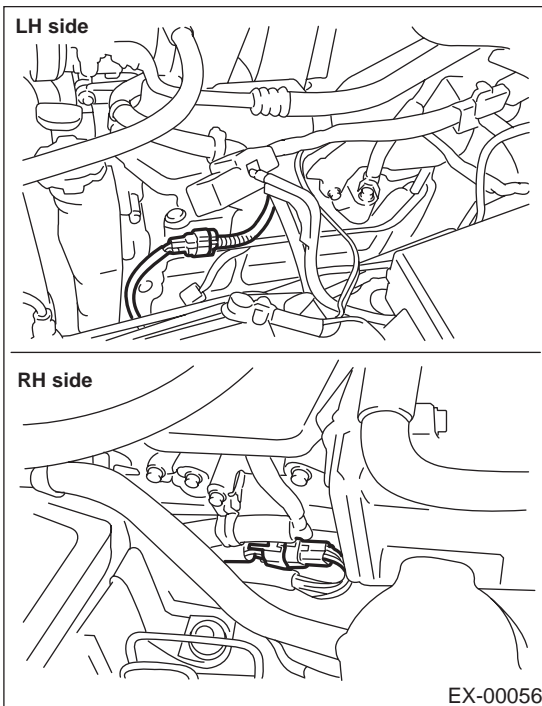
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

- 6) Connect connector to rear oxygen sensor connector.



- 7) Install front oxygen (A/F) sensor harness to the clips attached to the cylinder head covers.
- 8) Install under cover.
- 9) Lower the vehicle.
- 10) Connect front oxygen (A/F) sensor connector.



- 11) Install air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.>
- 12) Install battery.

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

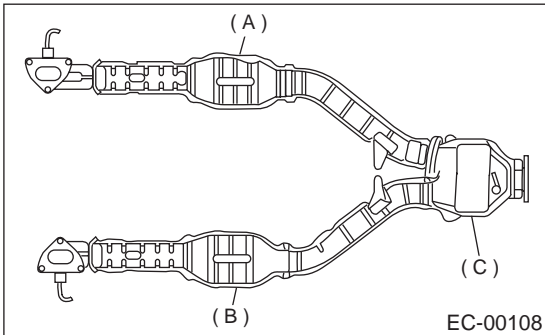
REAR CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

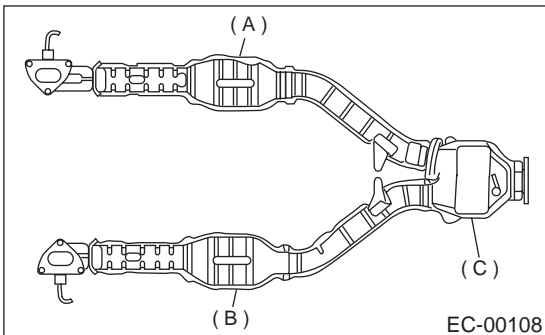
The front and rear catalytic converter are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to EC(H6DO)-3, REMOVAL, Front Catalytic Converter.>



- (A) Front catalytic converter RH
- (B) Front catalytic converter LH
- (C) Rear catalytic converter

B: INSTALLATION

The front and rear catalytic converter are integrated into one unit. Therefore, the removal and installation procedures are the same as the ones described under front catalytic converter. <Ref. to EC(H6DO)-4, INSTALLATION, Front Catalytic Converter.>



- (A) Front catalytic converter RH
- (B) Front catalytic converter LH
- (C) Rear catalytic converter

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

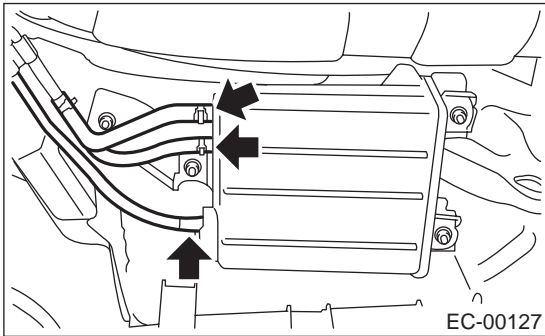
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

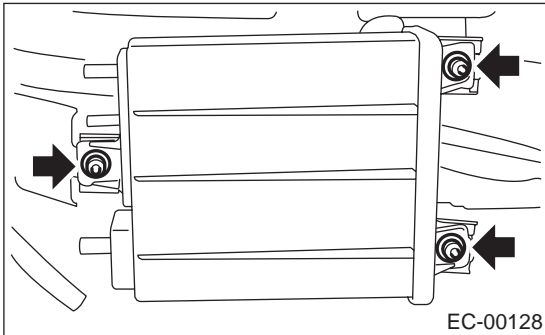
4. Canister

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen two clamps which hold two canister hoses, and disconnect evaporation hoses from canister.



- 3) Remove canister from body.

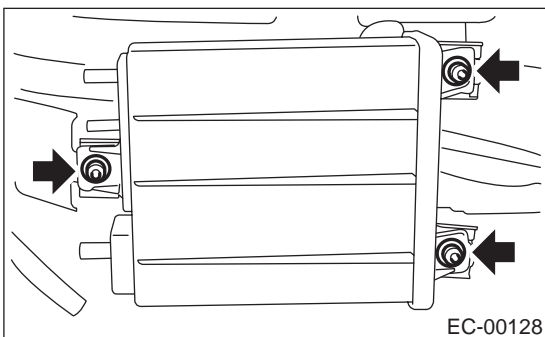


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

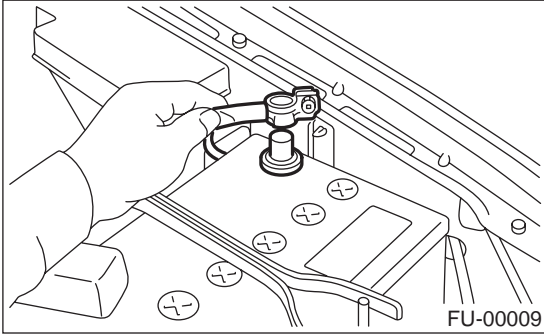
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect battery ground cable.

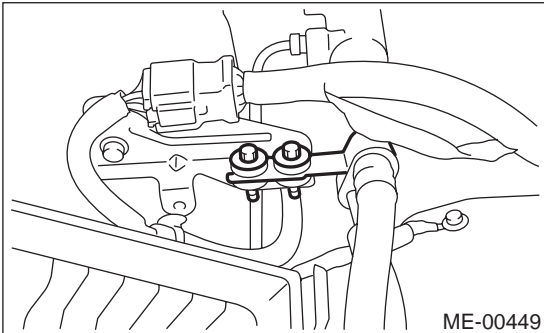


2) Remove power steering pump from bracket.

(1) Remove air intake duct and air cleaner case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> and <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>

(2) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>

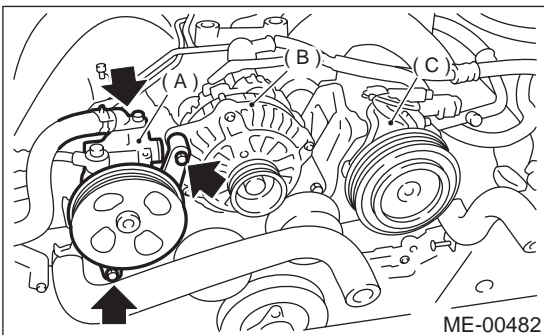
(3) Remove power steering oil pipe with bracket.



(4) Remove bolts which install power steering pump bracket.

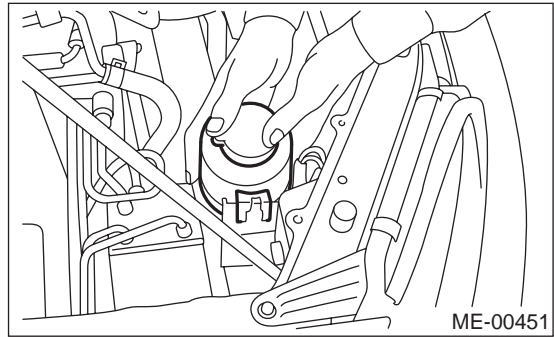
CAUTION:

Do not separate hose and pipe from the pump main unit.

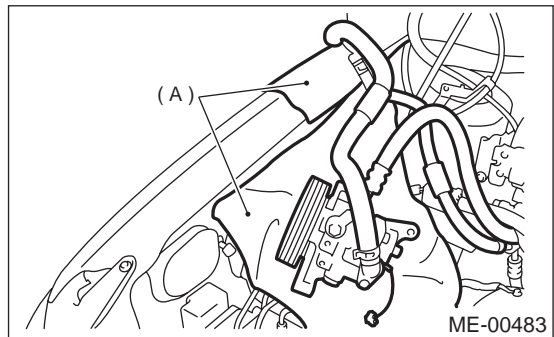


- (A) Power steering pump
- (B) Generator
- (C) A/C compressor

(5) Remove power steering tank from the bracket by pulling it upward.

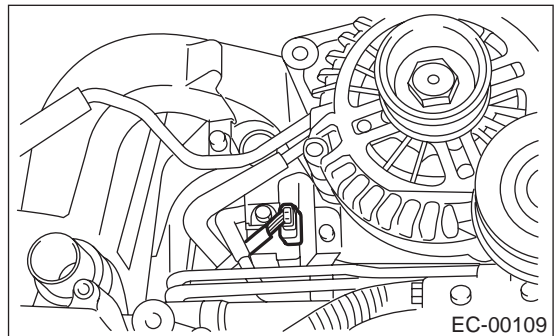


(6) Place power steering pump on the right side wheel apron.

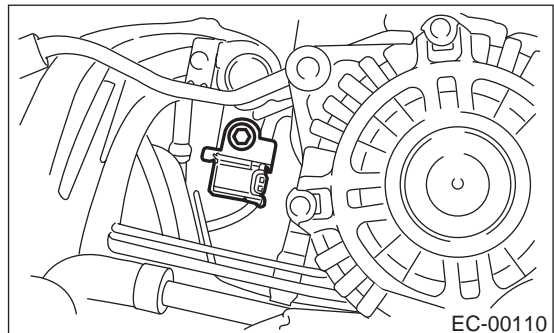


(A) Cloth

3) Disconnect connector and hoses from purge control solenoid valve.



4) Remove bolt which installs purge control solenoid valve onto intake manifold.



PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

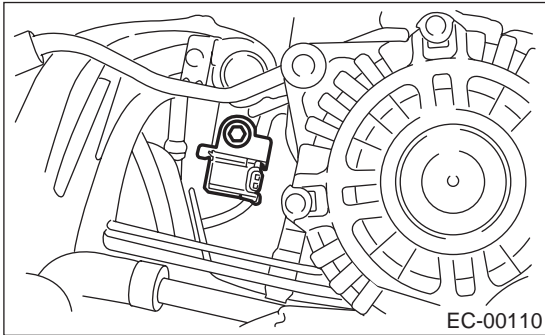
5) Take out purge control solenoid valve through the bottom of the intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

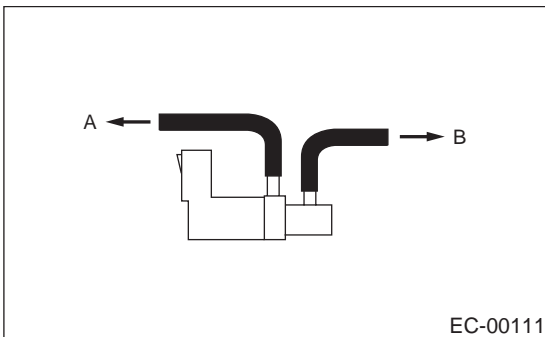
Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)



CAUTION:

Carefully connect the evaporation hoses.



A: To fuel pipe

B: To intake manifold

C: INSPECTION

Make sure hoses are not cracked or loose.

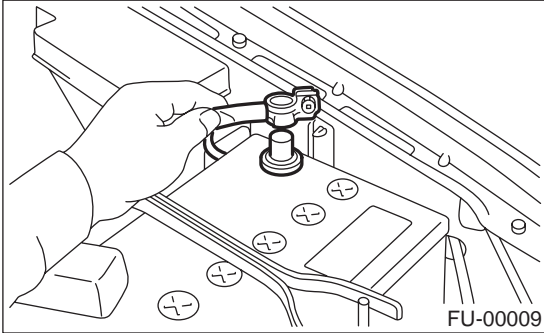
EGR VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

6. EGR Valve

A: REMOVAL

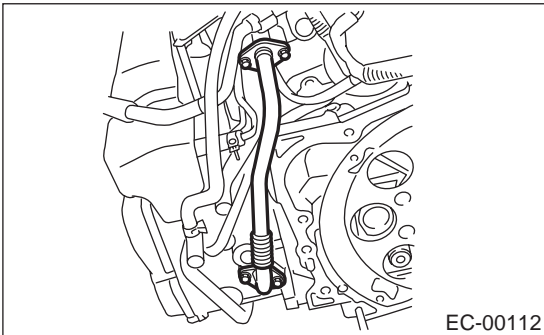
1) Disconnect battery ground cable.



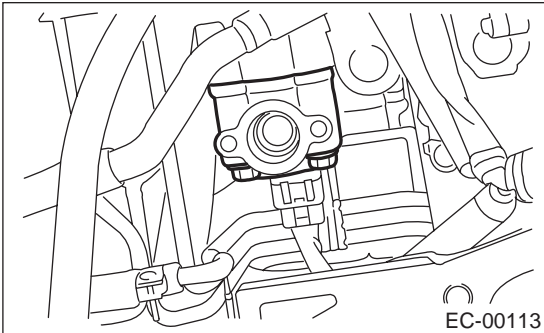
2) Remove air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

3) Remove starter. <Ref. to SC(H6DO)-6, REMOVAL, Starter.>

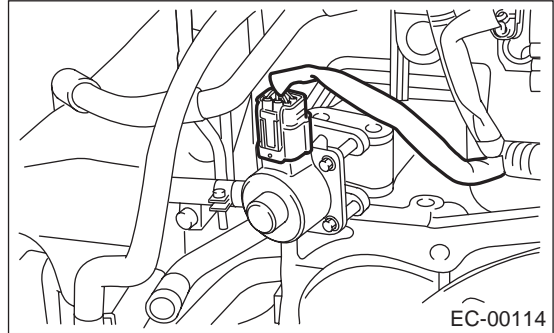
4) Remove EGR pipe from EGR valve and cylinder head.



5) Remove EGR valve from intake manifold.



6) Disconnect connector from EGR valve.

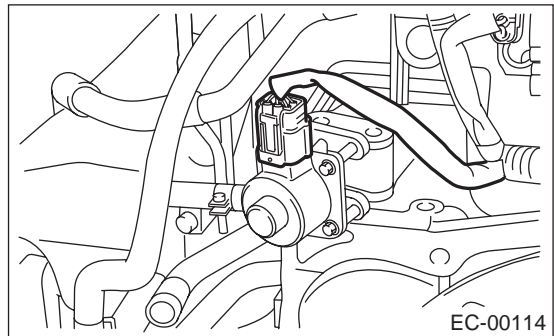


B: INSTALLATION

NOTE:

Replace old gaskets with new one.

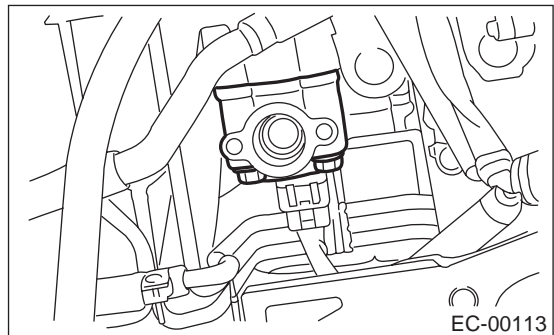
1) Connect connector EGR valve.



2) Install EGR valve to intake manifold.

Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)



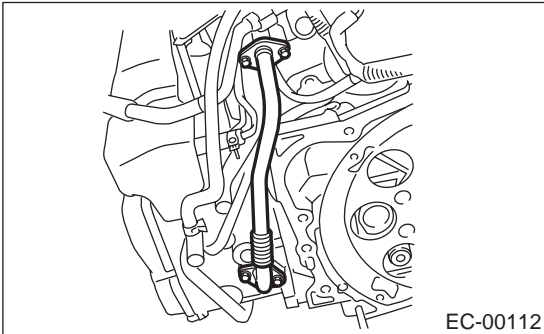
EGR VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3) Install EGR pipe to EGR valve and cylinder head.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



4) Install starter. <Ref. to SC(H6DO)-6, INSTALLATION, Starter.>

5) Install air intake chamber. <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>

6) Connect battery ground cable.

C: INSPECTION

1) Check the EGR valve for proper valve movement.

2) Check the EGR pipe, etc., for blockages or cracks.

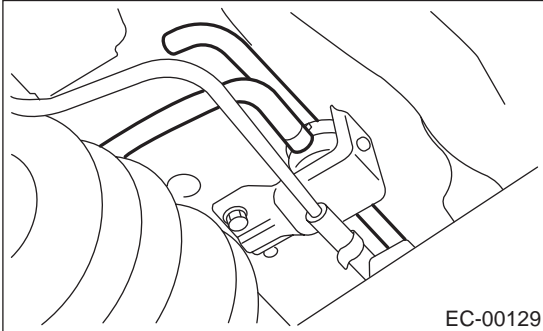
TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

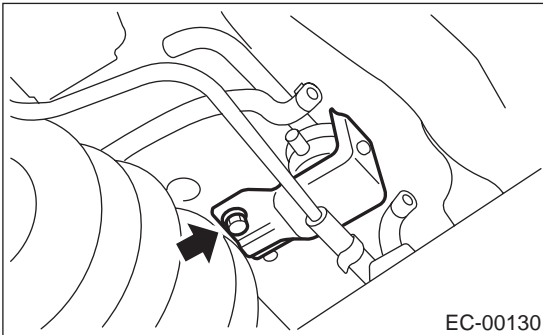
7. Two-way valve

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Disconnect hoses from two-way valve.



- 3) Remove two-way valve with bracket as a single unit from body.



- 4) Remove two-way valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure that hoses are not cracked or loose.

INTAKE (INDUCTION)

IN(H6DO)

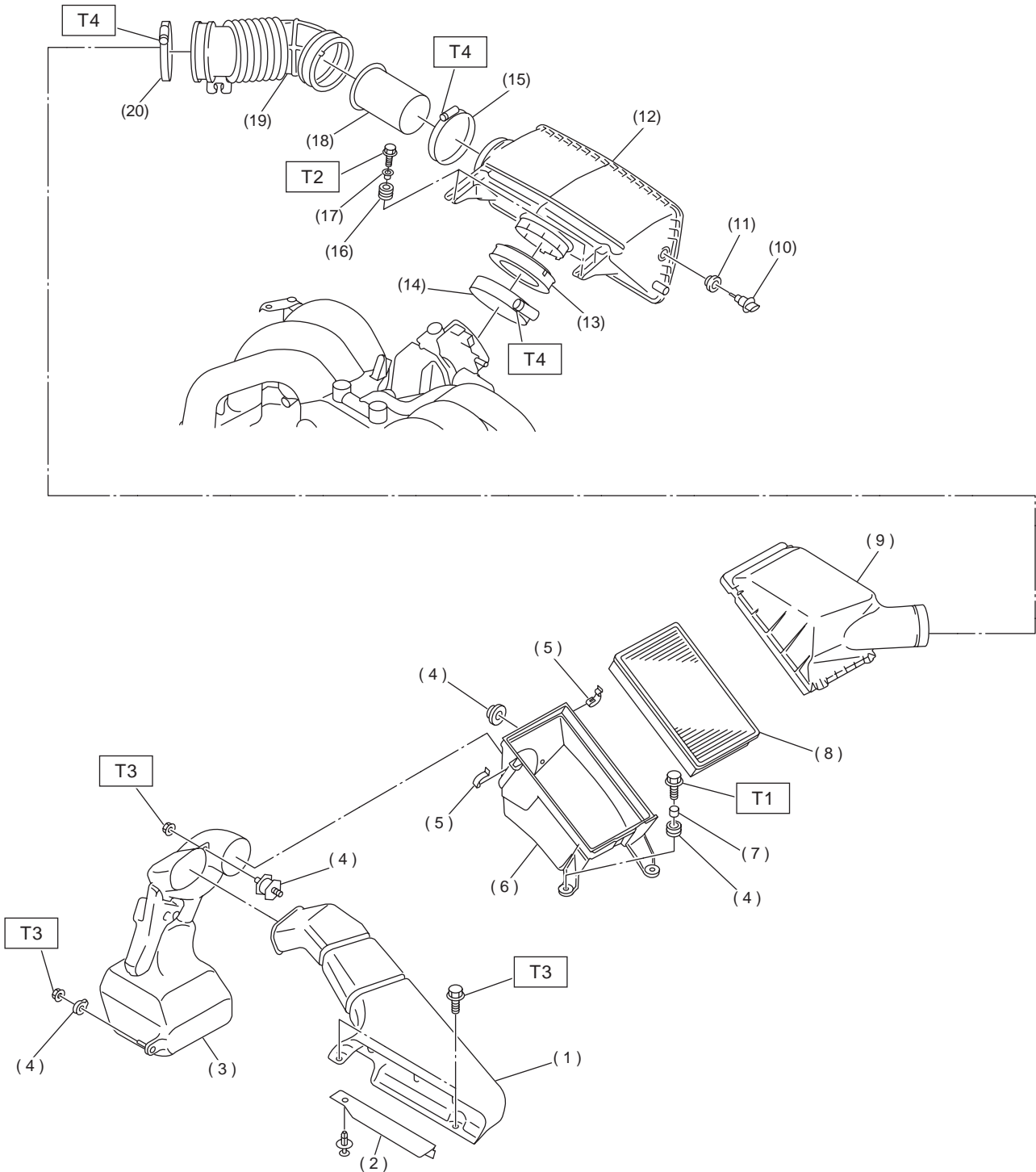
	Page
1. General Description	2
2. Air Cleaner	5
3. Air Intake Chamber	6
4. Air Intake Duct.....	7
5. Resonator Chamber	8

GENERAL DESCRIPTION

INTAKE (INDUCTION)

1. General Description

A: COMPONENT



IN-00064

GENERAL DESCRIPTION

INTAKE (INDUCTION)

- (1) Air intake duct
- (2) Plate
- (3) Resonator chamber
- (4) Cushion
- (5) Clip
- (6) Air cleaner lower case
- (7) Spacer
- (8) Air cleaner element
- (9) Air cleaner upper cover

- (10) Intake air temperature sensor
- (11) Grommet
- (12) Air intake chamber
- (13) Grommet
- (14) Clamp
- (15) Clamp
- (16) Cushion
- (17) Spacer
- (18) Intake duct

- (19) Air intake boot
- (20) Clamp

Tightening torque: N·m (kgf·m, ft·lb)

T1: 32.3 (3.3, 23.9)

T2: 6.4 (0.65, 4.7)

T3: 7.5 (0.76, 5.5)

T4: 3 (0.3, 2.2)

GENERAL DESCRIPTION

INTAKE (INDUCTION)

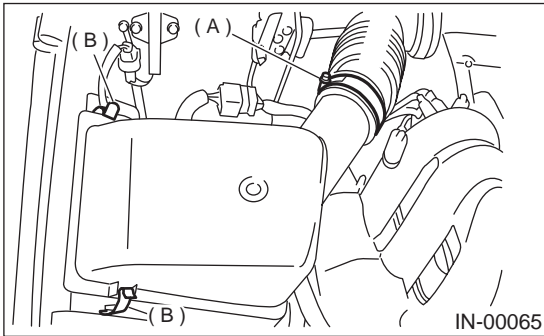
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect ground cable from battery.

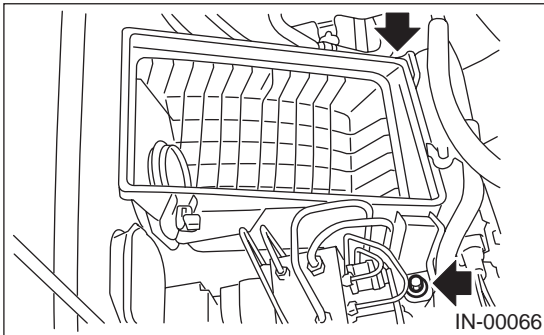
2. Air Cleaner

A: REMOVAL

- 1) Loosen clamp (A), and separate air cleaner upper cover from air intake boot.
- 2) Remove the clip (B) above the air cleaner upper cover.



- 3) Remove air cleaner element.
- 4) Remove air cleaner lower case.

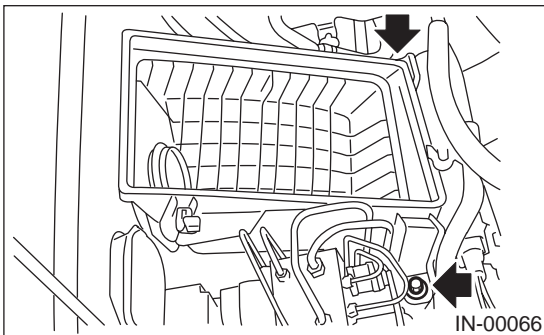


B: INSTALLATION

- 1) Install the air cleaner lower case.

Tightening torque:

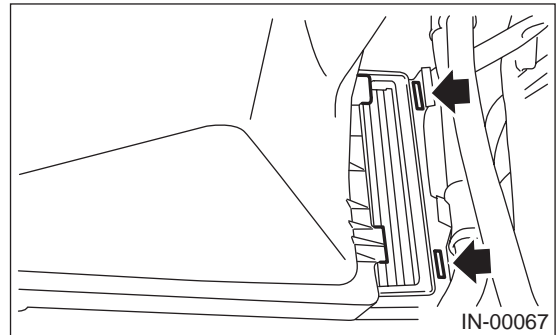
32.3 N·m (3.3 kgf·m, 23.9 ft·lb)



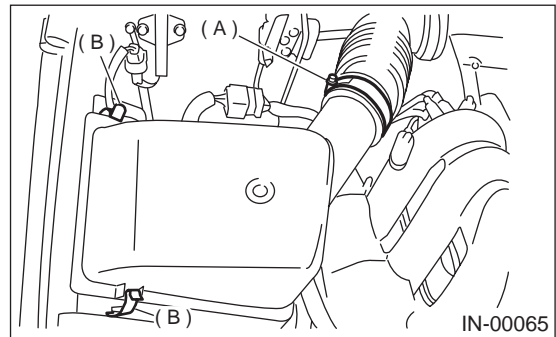
- 2) Set the air cleaner element.
- 3) Install the air cleaner upper cover.

NOTE:

Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.



- 4) Install the clip (B) above the air cleaner upper cover.
- 5) Tighten clamp (A), and connect air intake boot and air cleaner upper cover.



C: INSPECTION

Replace if excessively damaged or dirty.

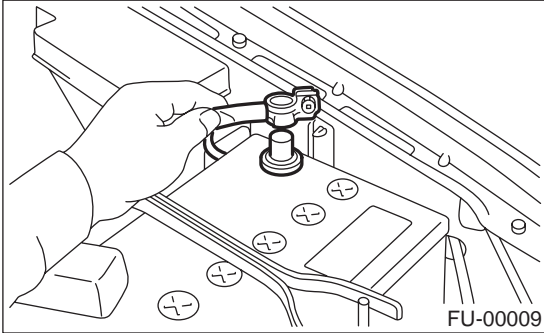
AIR INTAKE CHAMBER

INTAKE (INDUCTION)

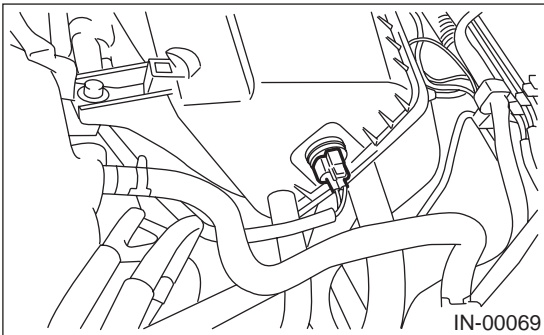
3. Air Intake Chamber

A: REMOVAL

1) Disconnect battery ground cable.



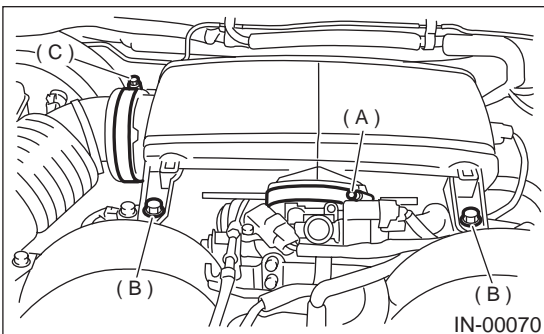
2) Disconnect connector from intake air temperature sensor.



3) Loosen clamp (A) which connects air intake chamber to throttle body.

4) Remove bolts (B) which install air intake chamber to intake manifold.

5) Loosen clamp (C) which connects air intake chamber to air intake boot.



6) Disconnect hoses from air intake chamber.

7) Remove air intake chamber.

B: INSTALLATION

Install in the reverse order of removal.

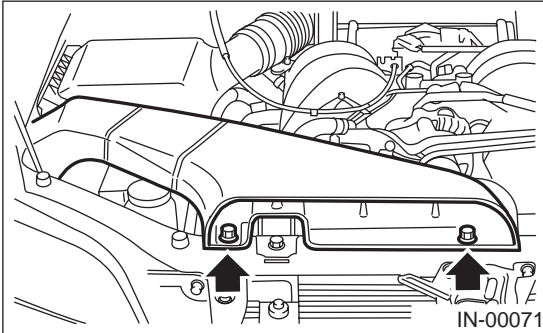
C: INSPECTION

Inspect for cracks and loose connections.

4. Air Intake Duct

A: REMOVAL

Remove bolts which install air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

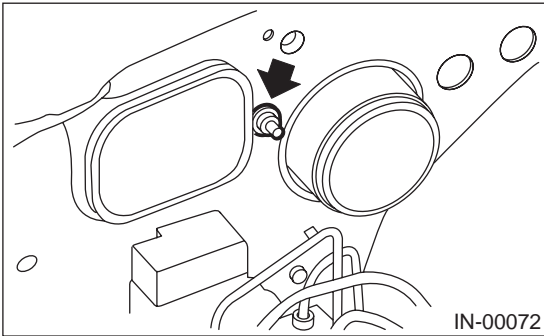
C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the air intake duct.

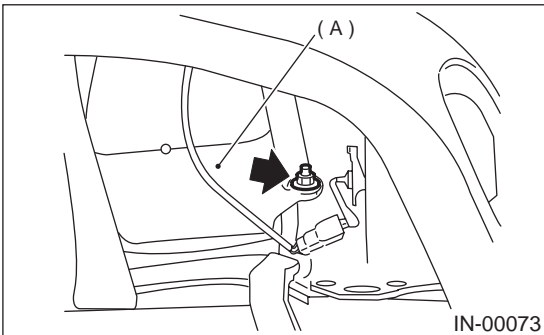
5. Resonator Chamber

A: REMOVAL

- 1) Set vehicle on a lift.
- 2) Remove air intake duct. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
- 3) Remove air cleaner lower case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
- 4) Remove the resonator chamber mounting bolt on the right of engine compartment.



- 5) Remove the front right tire, and lift the vehicle.
- 6) Remove front mudguard RH.
- 7) Remove the resonator chamber (A) from the inside front fender.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the resonator chamber.

MECHANICAL

ME(H6DO)

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GENERAL DESCRIPTION

MECHANICAL

1. General Description

A: SPECIFICATIONS

Engine	Type		Horizontally opposed, liquid cooled, 6-cylinder, 4-stroke gaso- line engine
	Valve arrangement		Chain driven, double over-head camshaft, 4-valve/cylinder
	Bore x Stroke	mm (in)	89.2 x 80 (3.512 x 3.150)
	Displacement	cm ³ (cu in)	3,000 (183)
	Compression ratio		10.7
	Compression pres- sure (350 rpm and fully open throttle)	kPa (kg/cm ² , psi)	1,275 — 1,471 (13.0 — 15.0, 185 — 213)
	Number of piston rings		Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening	5° BTDC
		Closing	55° ABDC
	Exhaust valve timing	Opening	52° BBDC
		Closing	0° ATDC
	Valve clearance	Intake mm (in)	0.20 ^{+0.04} / _{-0.06} (0.0079 ^{+0.0016} / _{-0.0024})
		Exhaust mm (in)	0.25±0.05 (0.0098±0.0020)
	Idle speed [At "P" or "N" posi- tion]	rpm	600±50 (No load) 700±50 (A/C switch ON)
Firing order		1 → 6 → 3 → 2 → 5 → 4	
Ignition timing		BTDC/rpm 10°±8°/600	

NOTE:

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter US: Undersize OS: Oversize

Camshaft	Bend limit		0.020 mm (0.0008 in)	
	Thrust clearance	Intake	STD	0.075 — 0.135 mm (0.0030 — 0.0053 in)
			Limit	0.155 mm (0.0061 in)
		Exhaust	STD	0.048 — 0.108 mm (0.0019 — 0.0043 in)
			Limit	0.130 mm (0.0051 in)
	Cam lobe height	Intake	STD	45.75 — 45.85 mm (1.8012 — 1.8051 in)
			Limit	45.65 mm (1.7972 in)
		Exhaust	STD	45.25 — 45.35 mm (1.7815 — 1.7854 in)
			Limit	45.15 mm (1.7776 in)
	Camshaft journal O.D.		Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center & Rear	27.946 — 27.963 mm (1.1002 — 1.1009 in)
	Camshaft journal hole I.D.		Front	38.000 — 38.018 mm (1.4961 — 1.4968 in)
			Center & Rear	28.000 — 28.018 mm (1.1024 — 1.1031 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
Limit			0.10 mm (0.0039 in)	
Cylinder head	Surface warpage limit		0.05 mm (0.0020 in)	
	Surface grinding limit		0.1 mm (0.004 in)	
	Standard height		124 mm (4.88 in)	
Valve seat	Refacing angle		90°	
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
Limit			2.2 mm (0.087 in)	
Valve guide	Inner diameter		5.500 — 5.512 mm (0.2165 — 0.2170 in)	
	Protrusion above head		Intake	12.3 — 12.7 mm (0.484 — 0.500 in)

GENERAL DESCRIPTION

MECHANICAL

Valve	Head edge thickness	Intake	STD	1.0 mm (0.039 in)
			Limit	0.8 mm (0.315 in)
		Exhaust	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.315 in)
	Stem diameter	Intake		5.455 — 5.470 mm (0.2148 — 0.2154 in)
		Exhaust		5.455 — 5.460 mm (0.2148 — 0.2150 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
Overall length	Limit		—	
	Intake		0.15 mm (0.0059 in)	
Valve spring	Intake		103.5 mm (4.07 in)	
	Exhaust		103.2 mm (4.06 in)	
Valve spring	Free length			46.79 mm (1.8421 in)
	Squareness			2.5°, 2.0 mm (0.079 in)
Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Cylinder bore	STD	A	89.205 — 89.215 mm (3.5120 — 3.5124 in)
			B	89.195 — 89.205 mm (3.5116 — 3.5120 in)
	Taper		Limit	0.050 mm (0.0020 in)
	Out-of-roundness		Limit	0.050 mm (0.0020 in)
	Piston clearance	STD		0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit		0.050 mm (0.0020 in)		
Enlarging (boring) limit			0.5 mm (0.020 in)	
Piston	Outer diameter	STD	A	89.185 — 89.195 mm (3.5112 — 3.5116 in)
			B	89.175 — 89.185 mm (3.5108 — 3.5112 in)
		0.25 mm (0.0098 in) OS		89.425 — 89.435 mm (3.5207 — 3.5211 in)
		0.50 mm (0.0197 in) OS		89.675 — 89.685 mm (3.5305 — 3.5309 in)
Standard inner diameter of piston pin hole			22.000 — 22.006 mm (0.8661 — 0.8664 in)	
Piston pin	Outer diameter			21.994 — 22.000 mm (0.8659 — 0.8661 in)
	Standard clearance between piston pin and hole in piston			0.004 — 0.008 mm (0.0002 — 0.0003 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.35 mm (0.0079 — 0.0138 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.35 — 0.50 mm (0.0138 — 0.0197 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.60 mm (0.0079 — 0.0236 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
Second ring		STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)	
		Limit	0.15 mm (0.0059 in)	
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance	STD		0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit		0.4 mm (0.016 in)		
Connecting rod bearing	Oil clearance		STD	0.022 — 0.052 mm (0.0009 — 0.0020 in)
			Limit	0.065 mm (0.0026 in)
	Thickness at center portion		STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.510 — 1.513 mm (0.0594 — 0.0596 in)
			0.05 mm (0.0020 in) US	1.520 — 1.523 mm (0.0598 — 0.0600 in)
		0.25 mm (0.0098 in) US	1.620 — 1.623 mm (0.0638 — 0.0639 in)	

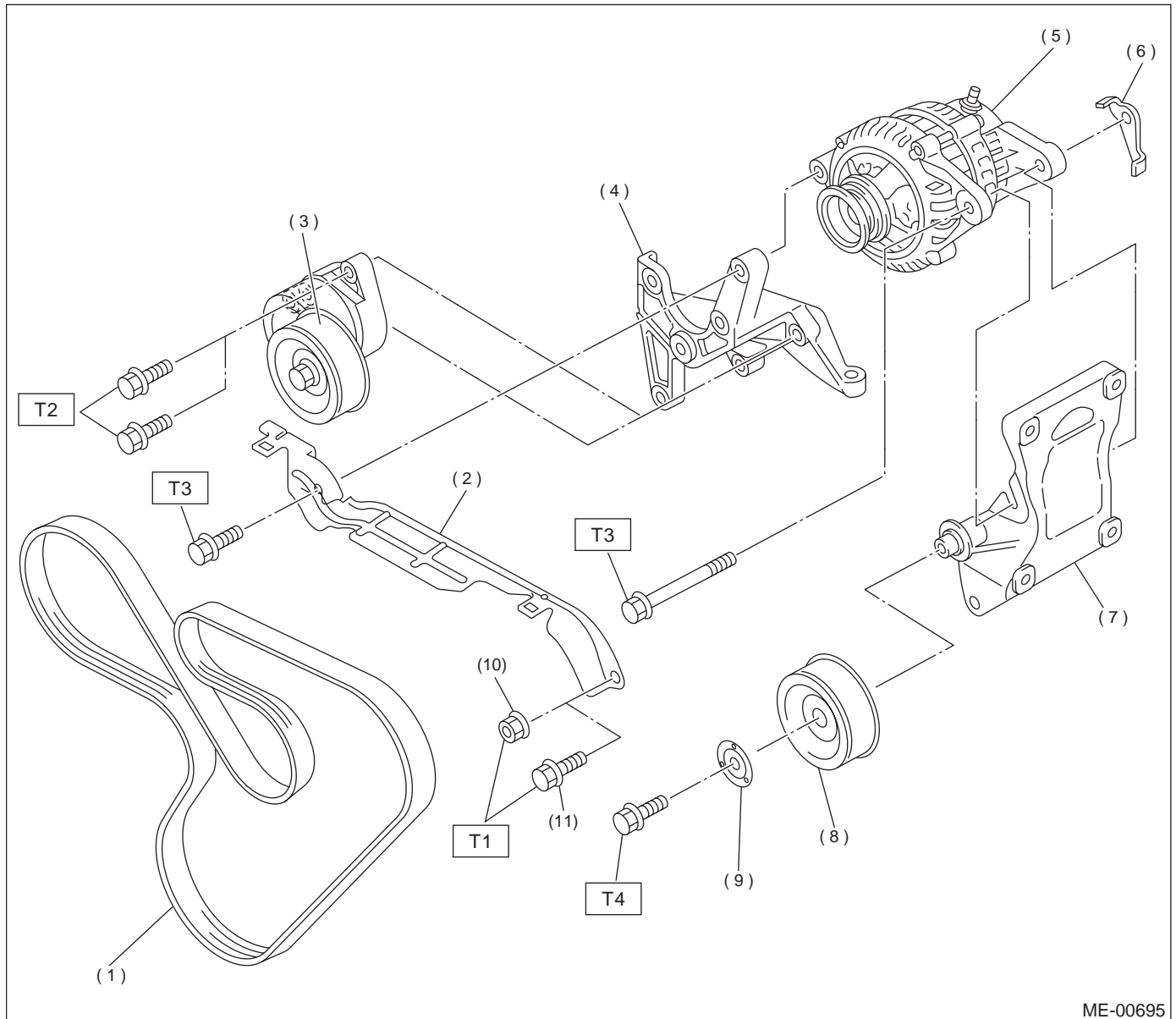
GENERAL DESCRIPTION

MECHANICAL

Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)
Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.250 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3, #5, #7	STD	63.992 — 64.008 mm (2.5194 — 2.5200 in)
			0.03 mm (0.0012 in) US	63.962 — 63.978 mm (2.5182 — 2.5188 in)
			0.05 mm (0.0020 in) US	63.942 — 63.958 mm (2.5174 — 2.5180 in)
			0.25 mm (0.0098 in) US	63.742 — 63.758 mm (2.5095 — 2.5102 in)
		#2, #4, #6	STD	63.992 — 64.008 mm (2.5194 — 2.5200 in)
			0.03 mm (0.0012 in) US	63.962 — 63.978 mm (2.5182 — 2.5188 in)
			0.05 mm (0.0020 in) US	63.942 — 63.958 mm (2.5174 — 2.5180 in)
			0.25 mm (0.0098 in) US	63.742 — 63.758 mm (2.5095 — 2.5102 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit			0.25 mm (0.0098 in)	
Oil clearance		STD	0.015 — 0.030 mm (0.0006 — 0.0012 in)	
		Limit	0.050 mm (0.0020 in)	
Crankshaft bearing	Crankshaft bearing thickness	#1, #3, #5, #7	STD	1.992 — 2.005 mm (0.0784 — 0.0789 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	1.996 — 2.000 mm (0.0786 — 0.0787 in)
			0.03 mm (0.0012 in) US	2.019 — 2.020 mm (0.0795 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

1. V-BELT



ME-00695

- | | |
|---------------------------------|-------------------------|
| (1) V-belt | (7) A/C compressor stay |
| (2) Belt cover | (8) Idler pulley |
| (3) Belt tensioner | (9) Idler pulley cover |
| (4) Power steering pump bracket | (10) Nut (LHD) |
| (5) Generator | (11) Bolt (RHD) |
| (6) Generator plate | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 20 (2.0, 14)

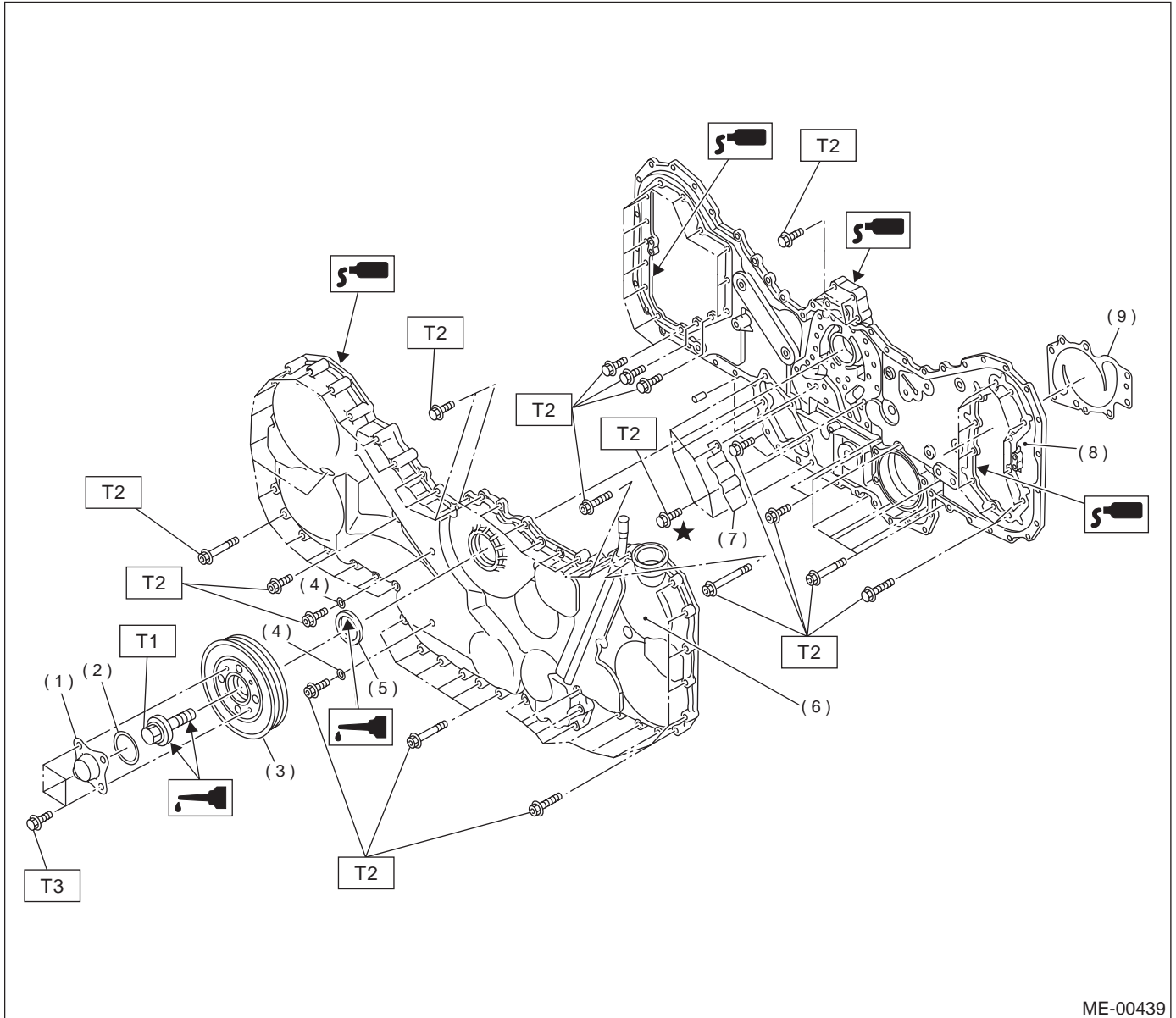
T3: 25 (2.5, 18)

T4: 33 (3.4, 25)

GENERAL DESCRIPTION

MECHANICAL

2. TIMING CHAIN COVER



ME-00439

- | | |
|------------------------|-----------------------|
| (1) Crank pulley cover | (7) Baffle |
| (2) O-ring | (8) Rear chain cover |
| (3) Crank pulley | (9) Water pump gasket |
| (4) Sealing washer | |
| (5) Oil seal | |
| (6) Front chain cover | |

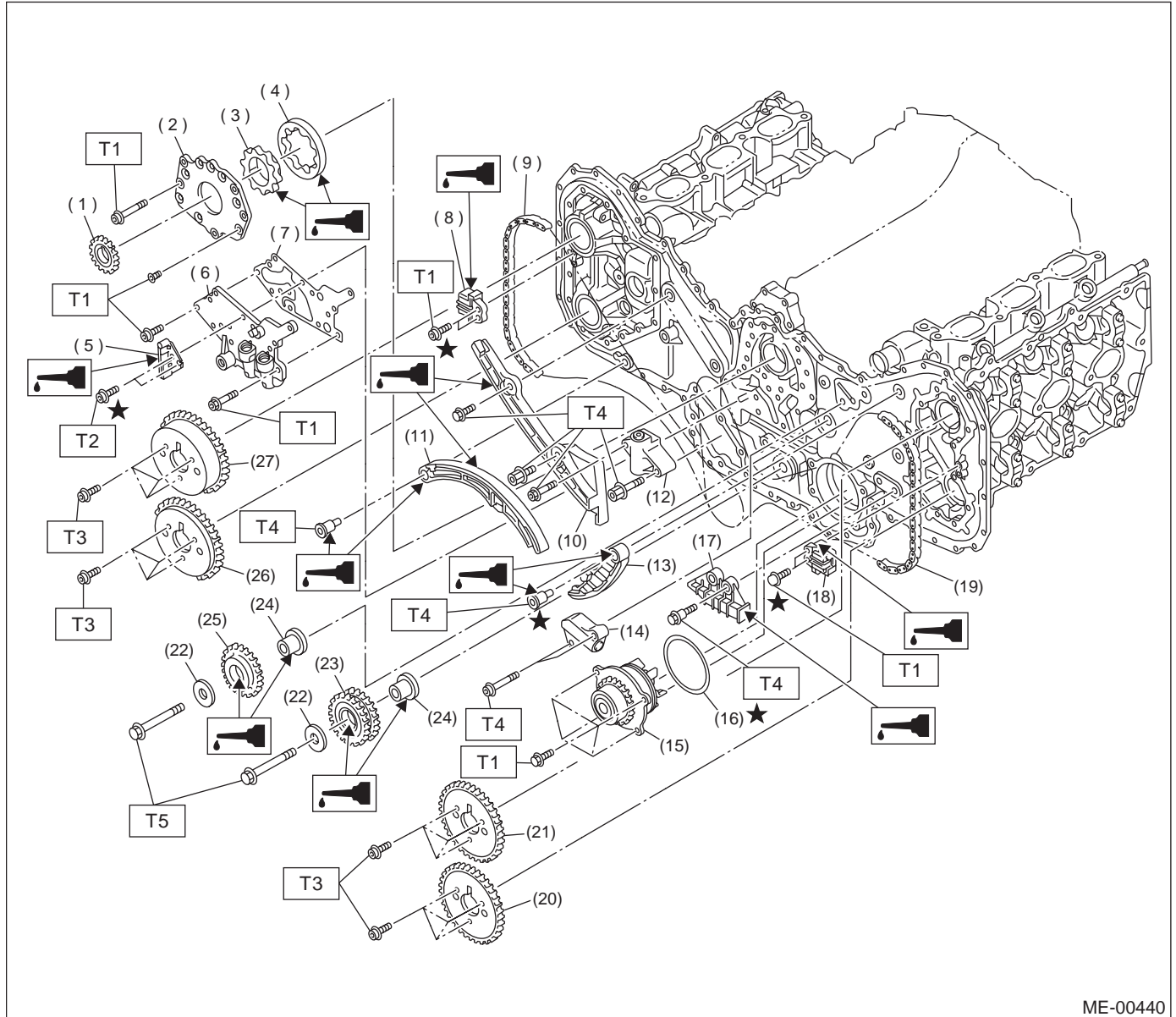
Tightening torque: N·m (kgf·m, ft·lb)

T1: <Ref. to ME(H6DO)-38,
Crankshaft Pulley.>

T2: <Ref. to ME(H6DO)-39, Front
Chain Cover.>

T3: 6.4 (0.65, 4.7)

3. TIMING CHAIN



ME-00440

- | | | |
|--|--|--------------------------------|
| (1) Crank sprocket | (13) Chain tensioner lever (LH) | (25) Idler sprocket (Upper) |
| (2) Oil pump cover | (14) Chain tensioner (LH) | (26) Exhaust cam sprocket (LH) |
| (3) Inner rotor | (15) Water pump | (27) Intake cam sprocket (LH) |
| (4) Outer rotor | (16) O-ring | |
| (5) Chain guide (Center) | (17) Chain guide (LH) | |
| (6) Relief valve case | (18) Chain guide (Left-hand between
cams) | |
| (7) Relief valve case gasket | (19) Timing chain (LH) | |
| (8) Chain guide (Right-hand between
cams) | (20) Exhaust cam sprocket (RH) | |
| (9) Timing chain (RH) | (21) Intake cam sprocket (RH) | |
| (10) Chain guide (RH) | (22) Idler sprocket plate | |
| (11) Chain tensioner lever (RH) | (23) Idler sprocket (Lower) | |
| (12) Chain tensioner (RH) | (24) Idler sprocket color | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 6.4 (0.64, 4.7)

T2: 7.8 (0.80, 5.8)

T3: 13 (1.3, 9.4)

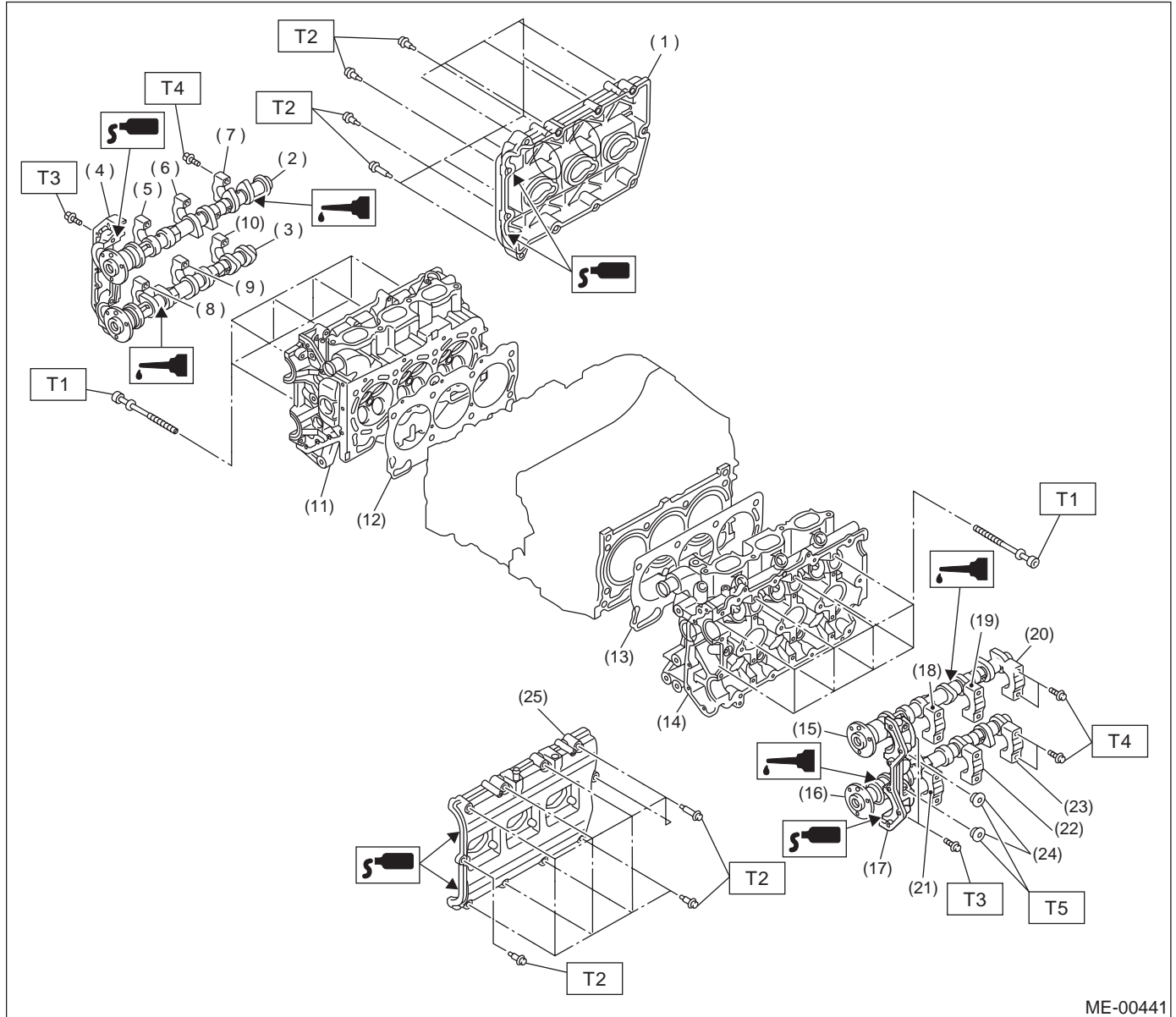
T4: 16 (1.6, 11.6)

T5: 69 (7.0, 50.6)

GENERAL DESCRIPTION

MECHANICAL

4. CYLINDER HEAD AND CAMSHAFT



ME-00441

- | | | |
|--------------------------------------|---------------------------------------|------------------------|
| (1) Rocker cover (RH) | (13) Cylinder head gasket (LH) | (25) Rocker cover (LH) |
| (2) Intake camshaft (RH) | (14) Cylinder head (LH) | |
| (3) Exhaust camshaft (RH) | (15) Intake camshaft (LH) | |
| (4) Front camshaft cap (RH) | (16) Exhaust camshaft (LH) | |
| (5) Intake camshaft cap (Front RH) | (17) Front camshaft cap (LH) | |
| (6) Intake camshaft cap (Center RH) | (18) Intake camshaft cap (Front LH) | |
| (7) Intake camshaft cap (Rear RH) | (19) Intake camshaft cap (Center LH) | |
| (8) Exhaust camshaft cap (Front RH) | (20) Intake camshaft cap (Rear LH) | |
| (9) Exhaust camshaft cap (Center RH) | (21) Exhaust camshaft cap (Front LH) | |
| (10) Exhaust camshaft cap (Rear RH) | (22) Exhaust camshaft cap (Center LH) | |
| (11) Cylinder head (RH) | (23) Exhaust camshaft cap (Rear LH) | |
| (12) Cylinder head gasket (RH) | (24) Plug | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: <Ref. to ME(H6DO)-54, Cylinder Head Assembly.>

T2: <Ref. to ME(H6DO)-50, Camshaft.>

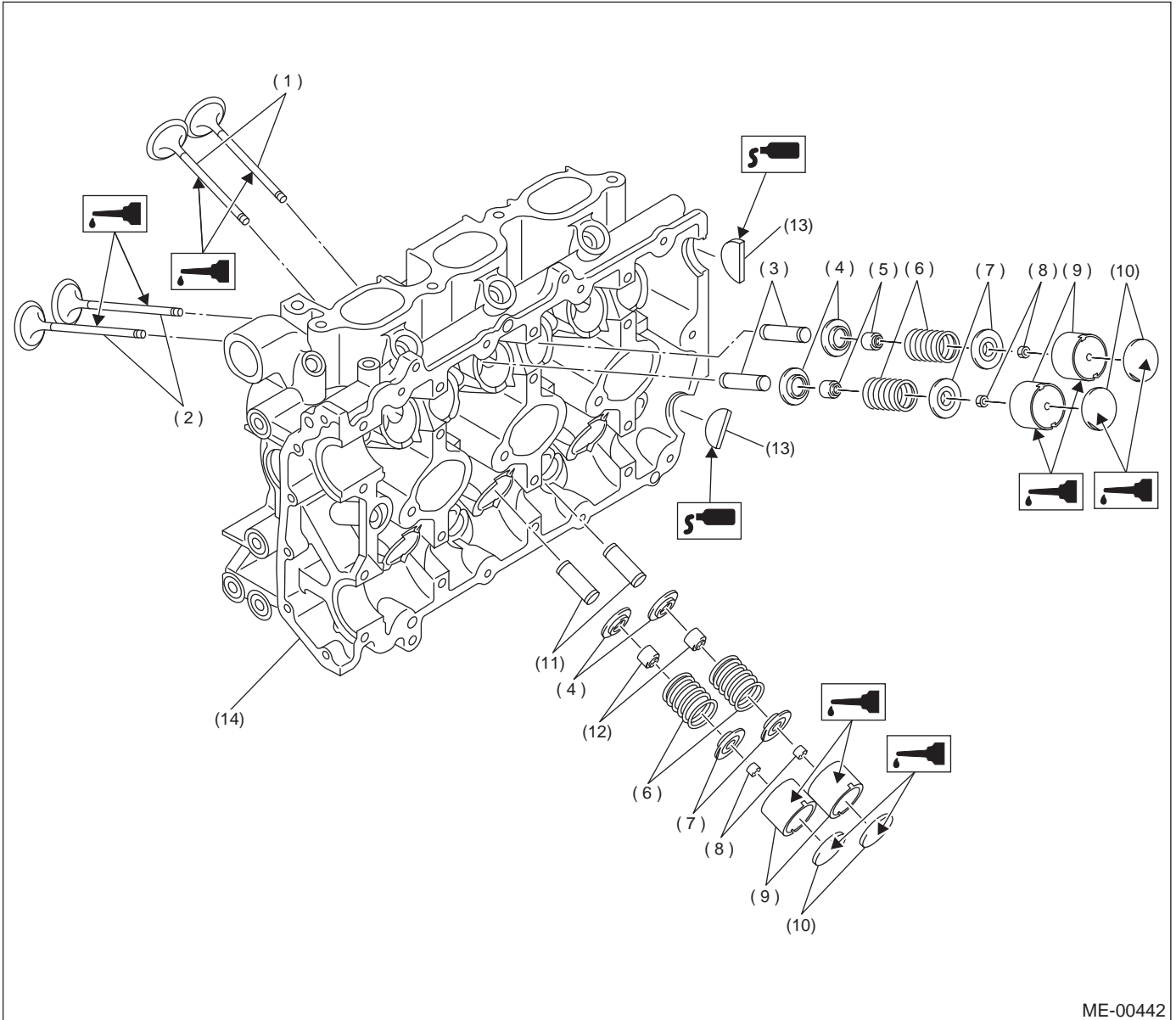
T3: 9.8 (1.0, 7.2)

T4: 16 (1.6, 12)

T5: 59 (6.0, 43)

ME(H6DO)-8

5. CYLINDER HEAD AND VALVE ASSEMBLY



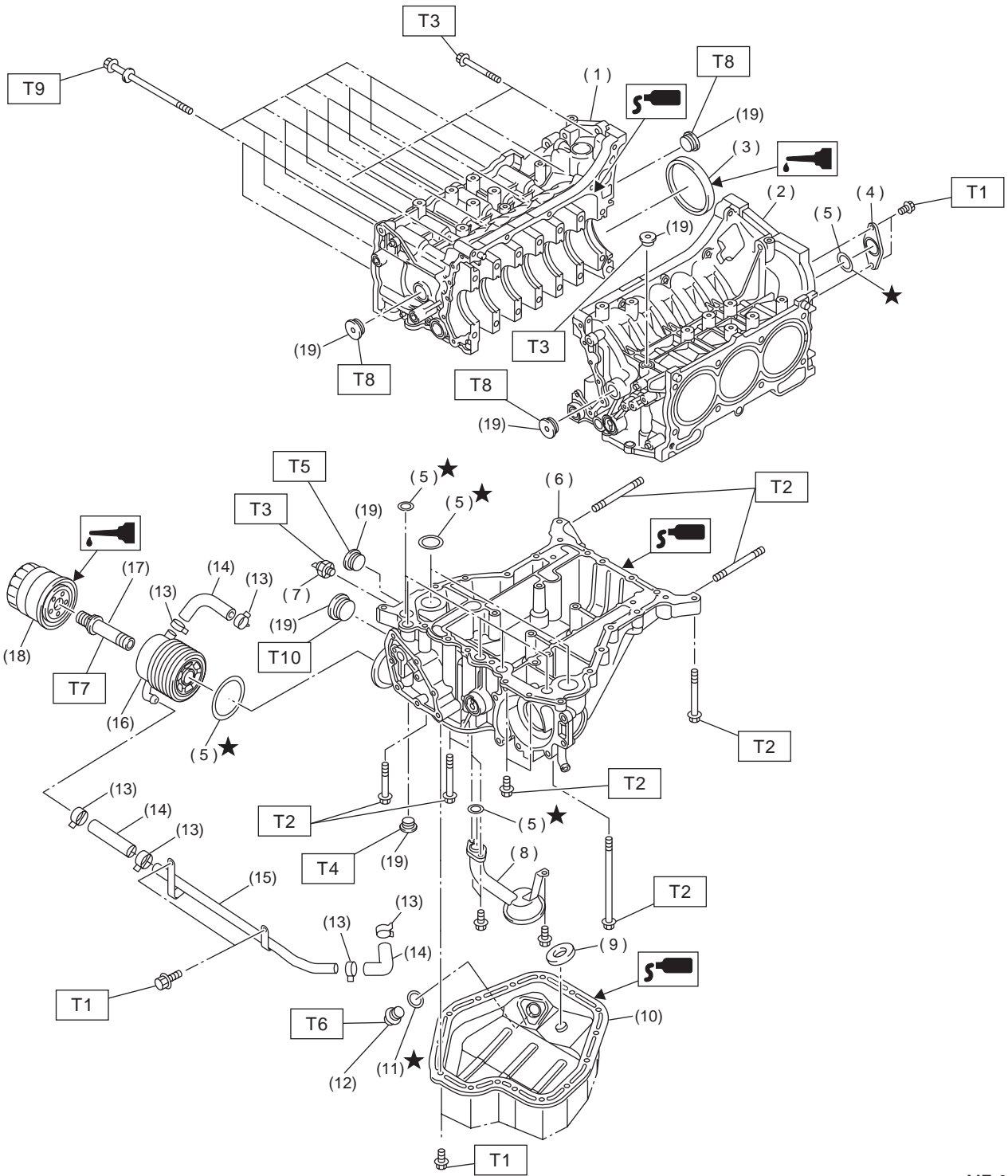
ME-00442

- | | | |
|----------------------------|------------------|------------------------------|
| (1) Exhaust valve | (6) Valve spring | (11) Exhaust valve guide |
| (2) Intake valve | (7) Retainer | (12) Exhaust valve stem seal |
| (3) Intake valve guide | (8) Retainer key | (13) Cylinder head plug |
| (4) Valve spring seat | (9) Valve lifter | (14) Cylinder head |
| (5) Intake valve stem seal | (10) Shim | |

GENERAL DESCRIPTION

MECHANICAL

6. CYLINDER BLOCK



ME-00693

ME(H6DO)-10

GENERAL DESCRIPTION

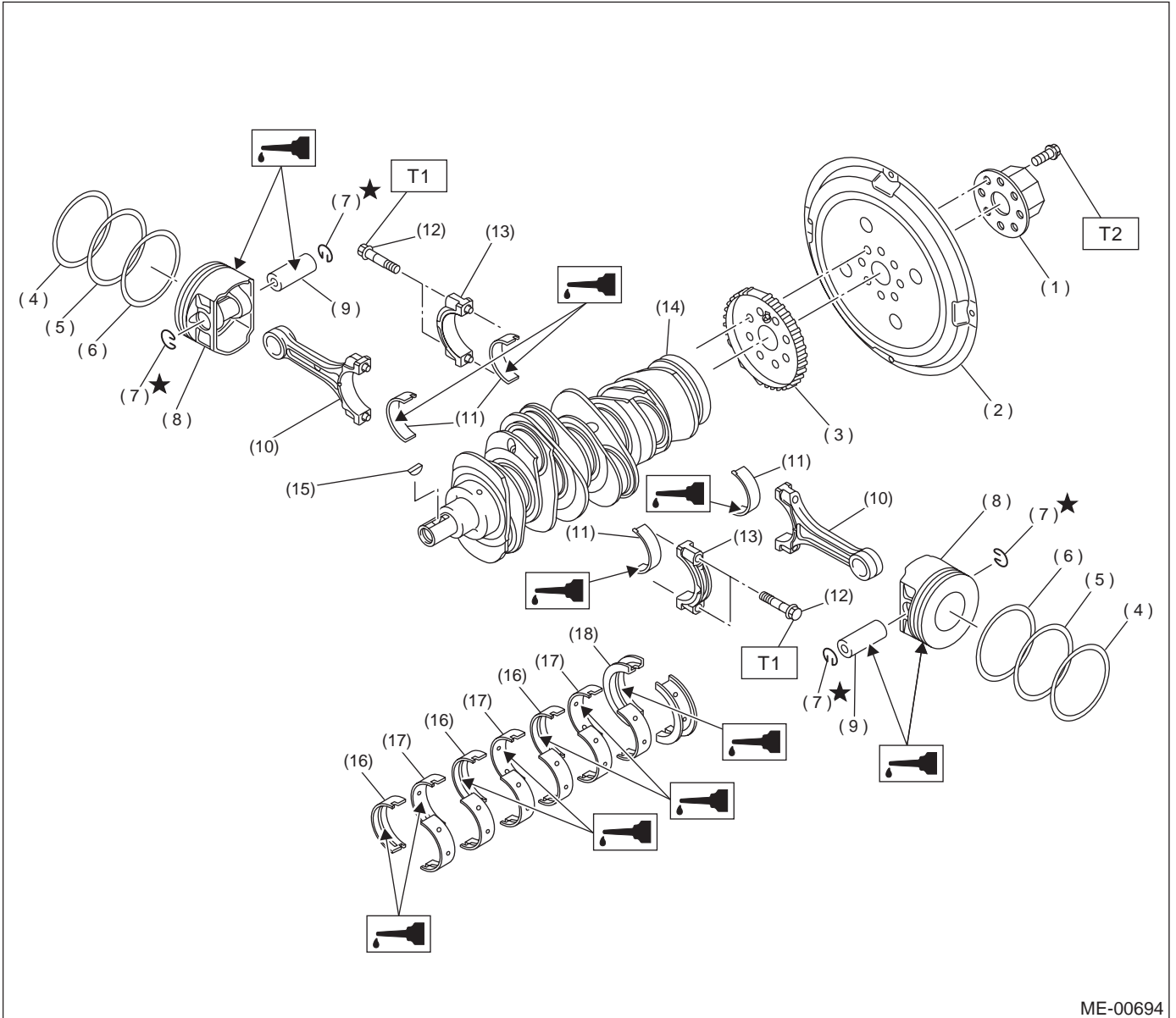
MECHANICAL

(1) Cylinder block (RH)	(11) Metal gasket	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(2) Cylinder block (LH)	(12) Drain plug	<i>T1: 6.4 (0.65, 4.7)</i>
(3) Rear oil seal	(13) Clamp	<i>T2: 18 (1.8, 13.0)</i>
(4) Service hole cover	(14) Hose	<i>T3: 25 (2.5, 18)</i>
(5) O-ring	(15) Oil cooler pipe	<i>T4: 34 (3.5, 25)</i>
(6) Oil pan upper	(16) Oil cooler	<i>T5: 37 (3.8, 27)</i>
(7) Oil pressure switch	(17) Connector	<i>T6: 44 (4.5, 33)</i>
(8) Oil strainer	(18) Oil filter	<i>T7: 54 (5.5, 40)</i>
(9) Magnet	(19) Plug	<i>T8: 69 (7.0, 51)</i>
(10) Oil pan		<i>T9: <Ref. to ME(H6DO)-60, Cylinder Block.></i>
		<i>T10: 90 (9.2, 67)</i>

GENERAL DESCRIPTION

MECHANICAL

7. CRANKSHAFT AND PISTON



ME-00694

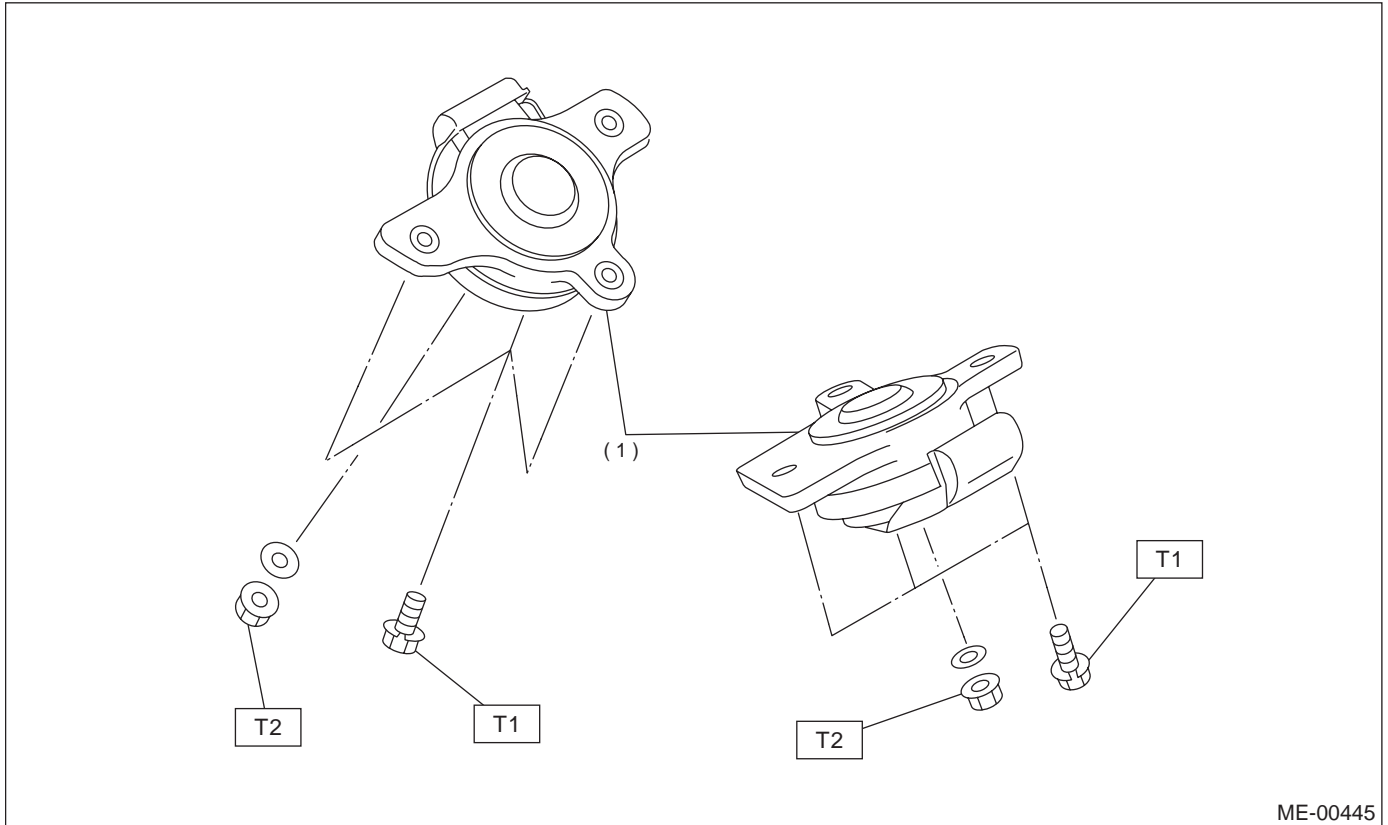
- | | | |
|-----------------------------|------------------------------------|------------------------------------|
| (1) Reinforcement | (9) Piston pin | (17) Crankshaft bearing #2, #4, #6 |
| (2) Drive plate | (10) Connecting rod | (18) Crankshaft bearing #7 |
| (3) Crankshaft sensor plate | (11) Connecting rod bearing | |
| (4) Top ring | (12) Connecting rod bolt | |
| (5) Second ring | (13) Connecting rod cap | |
| (6) Oil ring | (14) Crankshaft | |
| (7) Circlip | (15) Woodruff key | |
| (8) Piston | (16) Crankshaft bearing #1, #3, #5 | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 53 (5.4, 39)

T2: 81 (8.3, 60)

8. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque: N·m (kgf·m, ft·lb)

T1: 34 (3.5, 25.3)

T2: 74 (7.5, 54)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston,

bearing and gear should be coated with oil prior to assembly.

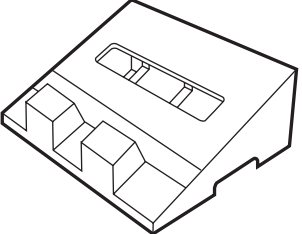
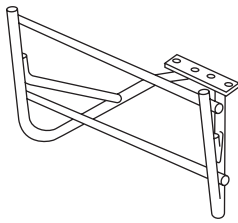
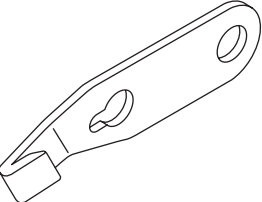
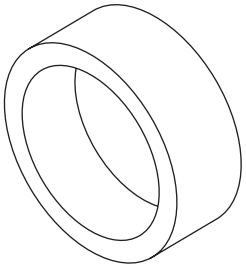
- Be careful not to let oil, grease or coolant contact the clutch disc and flywheel.
- All removed parts, if to be reused, should be re-installed in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following: Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

GENERAL DESCRIPTION

MECHANICAL

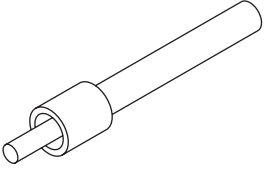
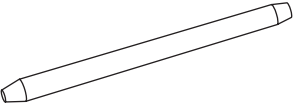
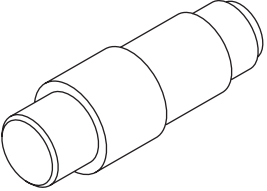
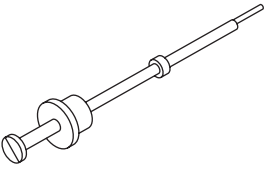
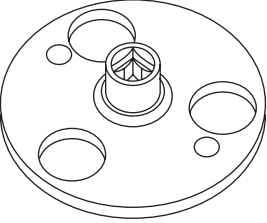
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18250AA000	18250AA000	CYLINDER HEAD TABLE	<ul style="list-style-type: none">• Used for replacing valve guides.• Used for removing and installing valve springs.
 ST18232AA000	18232AA000	ENGINE STAND	Used for engine disassembly and assembly.
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 ST18254AA000	18254AA000	PISTON GUIDE	Used for installing piston in cylinder.

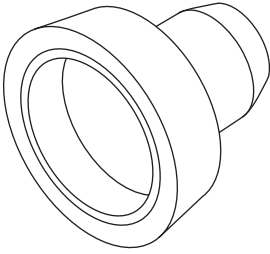
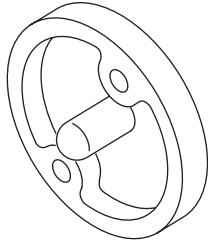
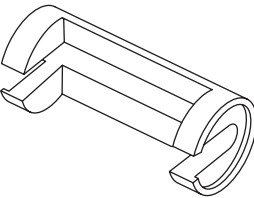
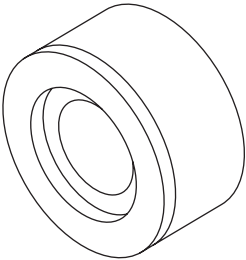
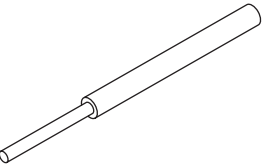
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498857100</p>	<p style="text-align: center;">498857100</p>	<p>VALVE STEM SEAL GUIDE</p>	<p>Used for press-fitting of intake and exhaust valve guide stem seals.</p>
 <p style="text-align: center;">ST18253AA000</p>	<p style="text-align: center;">18253AA000</p>	<p>PISTON PIN GUIDE</p>	<p>Used for installing piston pin, piston and connecting rod.</p>
 <p style="text-align: center;">ST18350AA000</p>	<p style="text-align: center;">18350AA000</p>	<p>CONNECTING ROD BUSHING REMOVER & INSTALLER</p>	<p>Used for removing and installing connecting rod bushing.</p>
 <p style="text-align: center;">ST-499097500</p>	<p style="text-align: center;">499097500</p>	<p>PISTON PIN REMOVER ASSY</p>	<p>Used for removing piston pin.</p>
 <p style="text-align: center;">ST18231AA000</p>	<p style="text-align: center;">18231AA000</p>	<p>CAMSHAFT SPROCKET WRENCH</p>	<p>Used for removing and installing camshaft sprocket.</p>

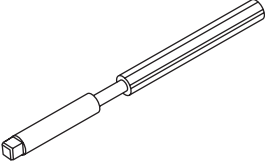
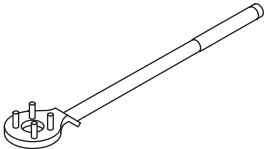
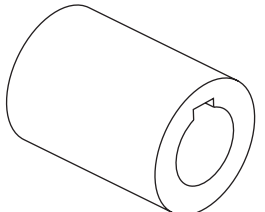
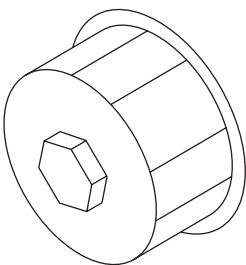
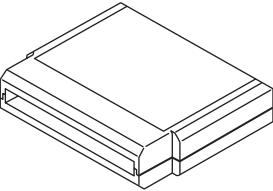
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499587200</p>	499587200	CRANKSHAFT OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 <p style="text-align: center;">ST-499597100</p>	499597100	CRANKSHAFT OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 <p style="text-align: center;">ST-499718000</p>	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 <p style="text-align: center;">ST18251AA000</p>	18251AA000	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 <p style="text-align: center;">ST-499765700</p>	499765700	VALVE GUIDE REMOVER	Used for removing valve guides.


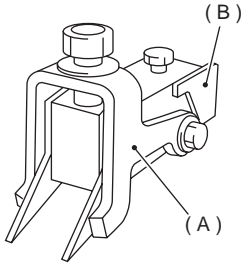
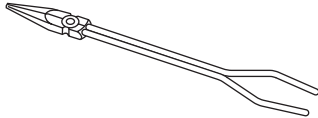
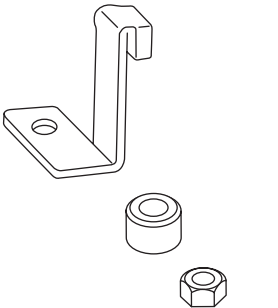
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499765900</p>	<p style="text-align: center;">499765900</p>	<p>VALVE GUIDE REAMER</p>	<p>Used for reaming valve guides.</p>
 <p style="text-align: center;">ST-499977100</p>	<p style="text-align: center;">499977100</p>	<p>CRANK PULLEY WRENCH</p>	<p>Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.</p>
 <p style="text-align: center;">ST18252AA000</p>	<p style="text-align: center;">18252AA000</p>	<p>CRANKSHAFT SOCKET</p>	<p>Used for rotating crankshaft.</p>
 <p style="text-align: center;">ST-498547000</p>	<p style="text-align: center;">498547000</p>	<p>OIL FILTER WRENCH</p>	<p>Used for removing and installing oil filter.</p>
 <p style="text-align: center;">ST24082AA210</p>	<p style="text-align: center;">24082AA210 (Newly adopted tool)</p>	<p>CARTRIDGE</p>	<p>Troubleshooting for electrical systems.</p>

GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST22771AA020</p>	22771AA020	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> English: 22771AA020 (With printer) 22771AA030 (Without printer)
 <p style="text-align: center;">ST18329AA000</p>	18329AA000	SHIM REPLACER ASSY	Used for correct valve clearance.
	A: 18330AA010	LIFTER	If 498187200 SHIM REPLACER ASSY (H4) tool is available, it is commonly used for H6 by partially replacing the following parts: <ul style="list-style-type: none"> LIFTER (H4) → LIFTER (H6) A: 18330AA010 SLIDER (H4) → SLIDER (H6) B: 18351AA000
	B: 18351AA000	SLIDER	
 <p style="text-align: center;">ST18233AA000</p>	18233AA000	PISTON PIN CIRCLIP PLIERS	Used for removing piston pin circlip.
 <p style="text-align: center;">ST-498277200</p>	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- Camshaft
- Cylinder Head

2. Compression

A: INSPECTION

CAUTION:

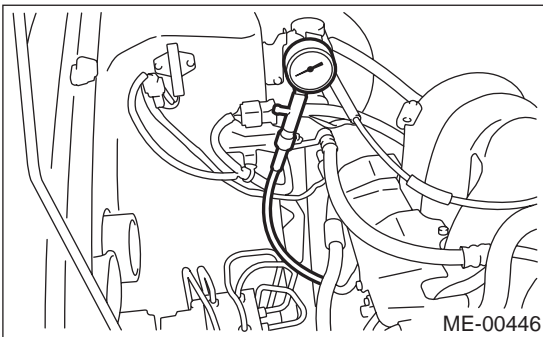
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) After warming-up the engine, turn ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
- 5) Check the starter motor for satisfactory performance and operation.
- 6) Hold the compression gauge tight against the spark plug hole.

CAUTION:

When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

- 7) Fully open throttle valve.
- 8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):

Standard;

1,275 — 1,471 kPa (13.0 — 15.0 kg/cm², 185 — 213 psi)

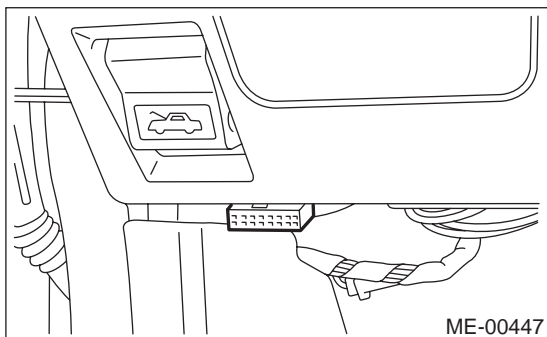
Limit;

1,128 kPa (11.5 kg/cm², 164 psi)

3. Idle Speed

A: INSPECTION

- 1) Before checking idle speed, check the following:
 - (1) Ensure that air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that hoses are connected properly.
 - (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
- 2) Warm-up the engine.
- 3) Stop the engine, and turn ignition switch to OFF.
- 4) When using SUBARU SELECT MONITOR <Ref. to ME(H6DO)-14, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
 - (1) Insert the cartridge to SUBARU SELECT MONITOR.
 - (2) Connect SUBARU SELECT MONITOR to the data link connector.



- (3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
- (4) Select {2. Each System Check} in Main Menu.
- (5) Select {Engine Control System} in Selection Menu.
- (6) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
- (7) Select {1.12 Data Display} in Data Display Menu.
- (8) Start the engine, and read engine idle speed.

NOTE:

- When using the OBD-II general scan tool, carefully read its operation manual.
- This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

5) Check idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed (No load and gears in N or P position):

600±50 rpm

6) Check idle speed when loaded. (Turn air conditioning switch to “ON” and operate compressor for at least one minute before measurement.)

Idle speed [A/C “ON”, no load and gears in N or P position]:

700±50 rpm

NOTE:

Idle speed cannot be adjusted manually because it is controlled automatically. If idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

1) Before checking ignition timing, check the following:

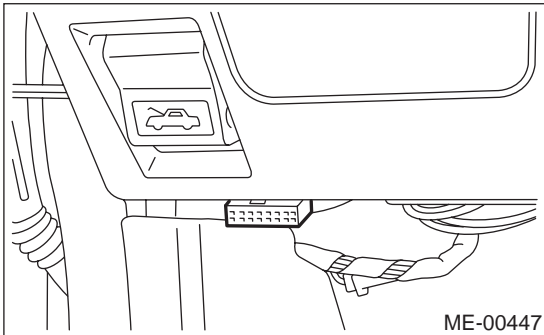
- (1) Ensure that air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
- (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and turn ignition switch to OFF.

4) When using SUBARU SELECT MONITOR <Ref. to ME(H6DO)-14, SPECIAL TOOLS, PREPARATION TOOL, General Description.>

- (1) Insert the cartridge to SUBARU SELECT MONITOR.
- (2) Connect SUBARU SELECT MONITOR to the data link connector.



(3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.

(4) Select {2. Each System Check} in Main Menu.

(5) Select {Engine Control System} in Selection Menu.

(6) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.

(7) Select {1.12 Data Display} in Data Display Menu.

(8) Start engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:

$10^{\circ} \pm 8^{\circ} / 600$

If the timing is not correct, check the ignition control system.

Refer to EN(H6DO) Engine Control System. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>

VALVE CLEARANCE

MECHANICAL

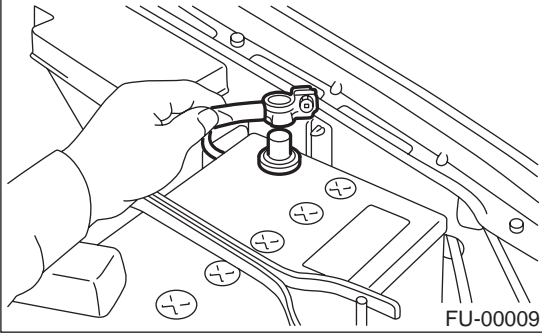
5. Valve Clearance

A: INSPECTION

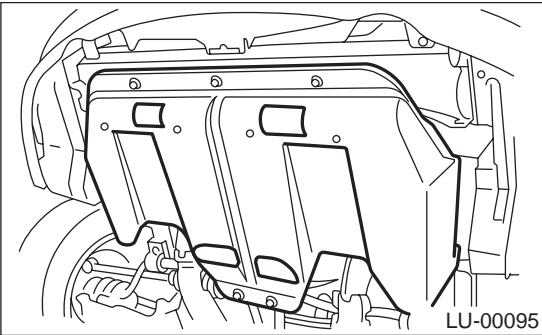
NOTE:

Inspection and adjustment of valve clearance should be performed while engine is cold.

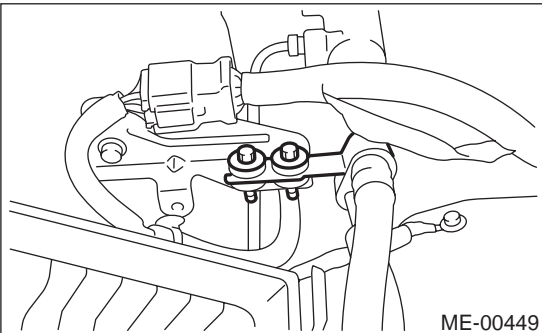
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.



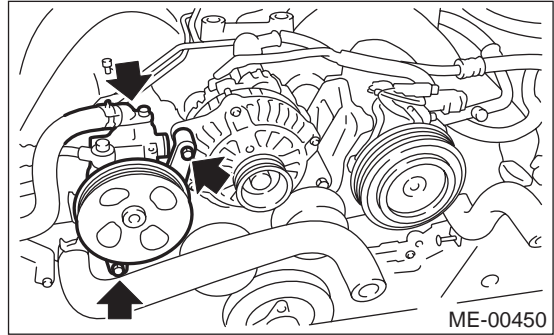
- 3) Lift up the vehicle.
- 4) Remove under cover.



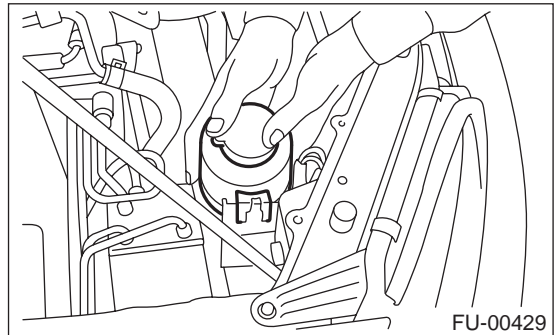
- 5) Lower the vehicle.
- 6) Place suitable container under the vehicle.
- 7) When inspecting RH side cylinder.
 - (1) Remove air intake duct and air cleaner case. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
 - (2) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
 - (3) Remove power steering hose from bracket.



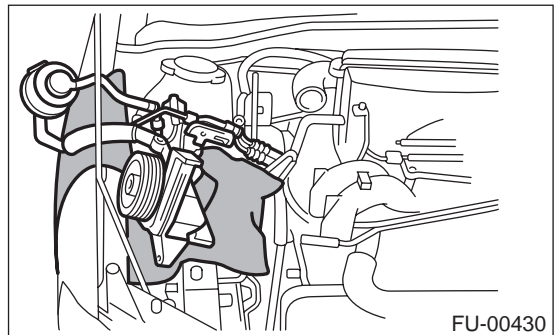
- (4) Remove bolts which install power steering pump bracket.



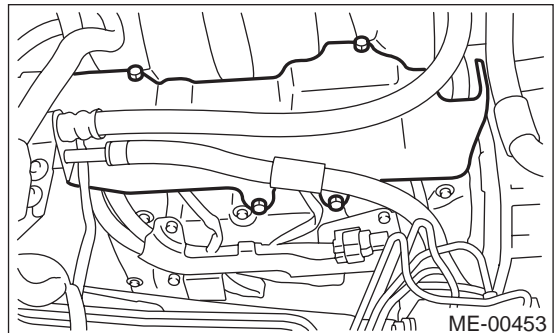
- (5) Remove power steering tank from the bracket by pulling it upward.



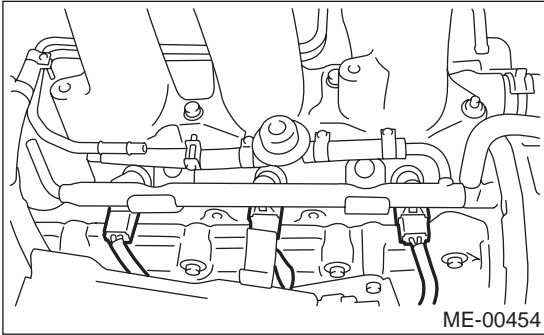
- (6) Place power steering pump on the right side wheel apron.



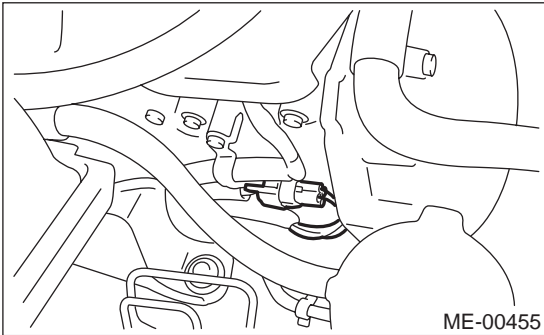
- (7) Remove fuel pipe protector RH.



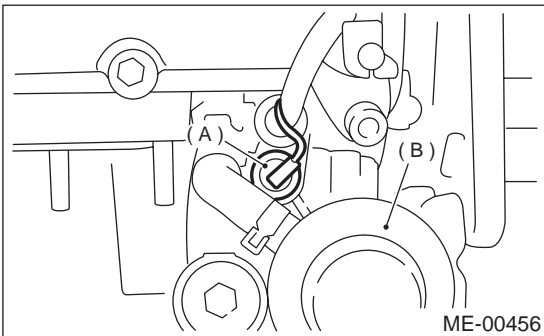
(8) Disconnect fuel injector connectors.



(9) Disconnect front oxygen (A/F) sensor connector.



(10) Disconnect oil pressure switch connector.



(A) Oil pressure switch

(B) Oil filter

(11) Remove ignition coils. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>

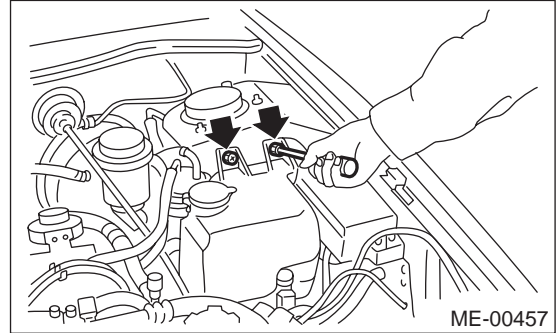
(12) Remove rocker cover RH. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>

8) When inspecting LH side cylinder.

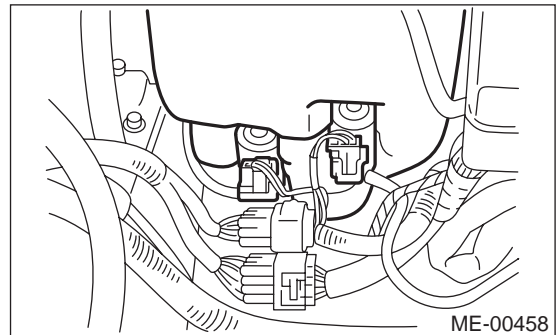
(1) Set the vehicle on the lift.

(2) Remove battery.

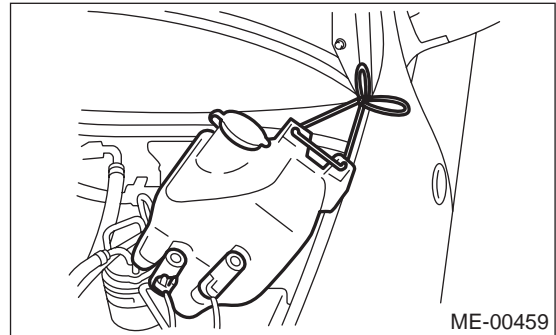
(3) Remove washer tank mounting bolts.



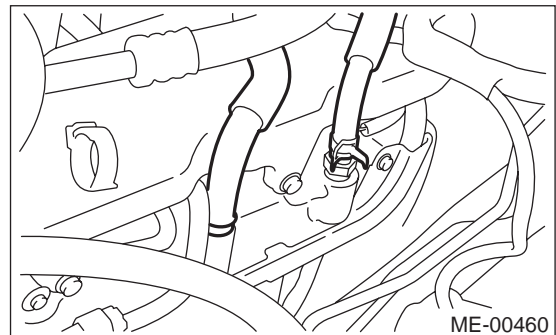
(4) Disconnect washer motor connectors.



(5) Move washer tank upward.



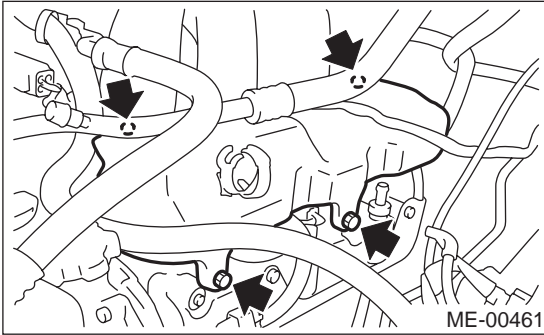
(6) Disconnect PCV and blow-by hose from rocker cover LH.



VALVE CLEARANCE

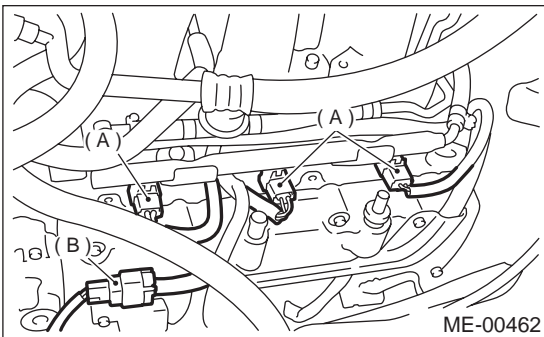
MECHANICAL

(7) Remove fuel pipe protector LH.



(8) Disconnect fuel injector connectors. (A)

(9) Disconnect front oxygen (A/F) sensor connector. (B)

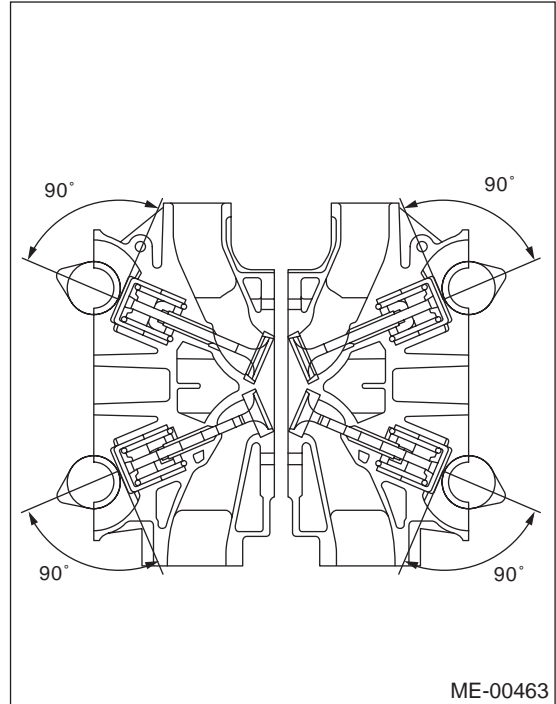


(10) Remove ignition coils. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>

(11) Remove rocker cover LH. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>

9) Using the ST, turn the crankshaft clockwise. Adjust the camshaft position so that the cam lobe is perpendicular to the shim as shown in the figure.

ST 18252AA000 CRANKSHAFT SOCKET



10) Measure intake valve and exhaust valve clearances by using thickness gauge (A).

NOTE:

Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.

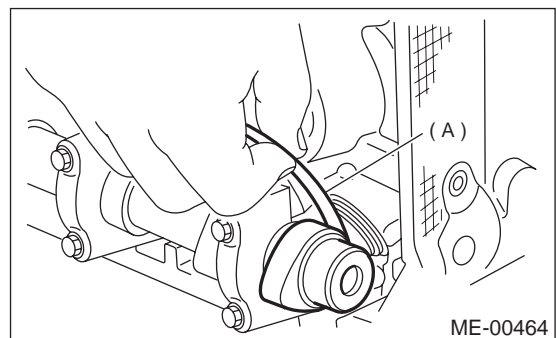
Valve clearance:

Intake: $0.20^{+0.04}/_{-0.06}$ mm ($0.0079^{+0.0016}/_{-0.0024}$ in)

Exhaust: 0.25 ± 0.05 mm (0.0098 ± 0.0020 in)

NOTE:

If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



11) If necessary, adjust the valve clearance. <Ref. to ME(H6DO)-25, ADJUSTMENT, Valve Clearance.>

12) Further turn crankshaft pulley clockwise. Using the same procedure described previously, then measure valve clearances again.

13) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

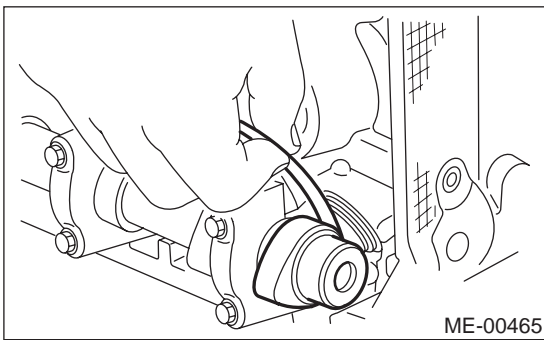
NOTE:

Adjustment of valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to ME(H6DO)-22, INSPECTION, Valve Clearance.>

NOTE:

Record each valve clearance after it has been measured.

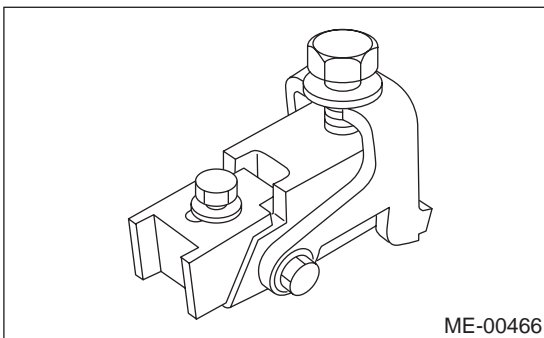


2) Remove shim from valve lifter.

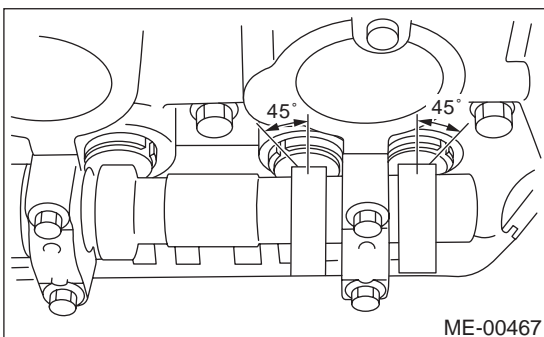
(1) Prepare the ST.

ST 18329AA000 SHIM REPLACER

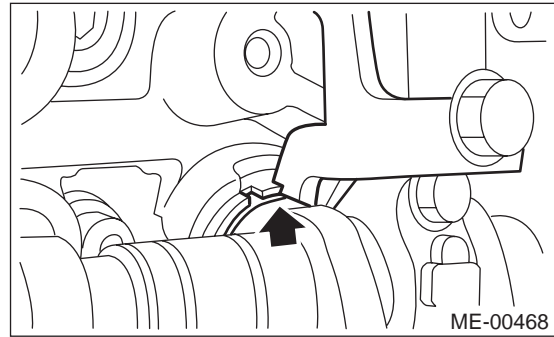
<Ref. to ME(H6DO)-14, PREPARATION TOOL, General Description.>



(2) Rotate the notch of the valve lifter outward by 45°.



(3) Adjust SHIM REPLACER notch to valve lifter and set it.

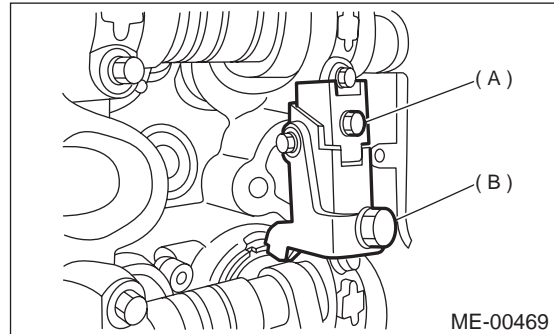


NOTE:

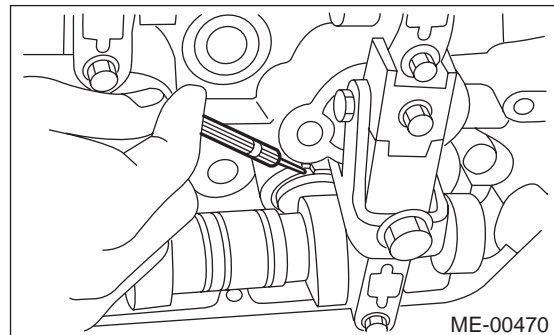
When setting, be careful SHIM REPLACER edge does not touch shim.

(4) Tighten bolt (A) and install it to the cylinder head.

(5) Tighten bolt (B) and insert the valve lifter.



(6) Insert tweezers into the notch of the valve lifter, and take the shim out.

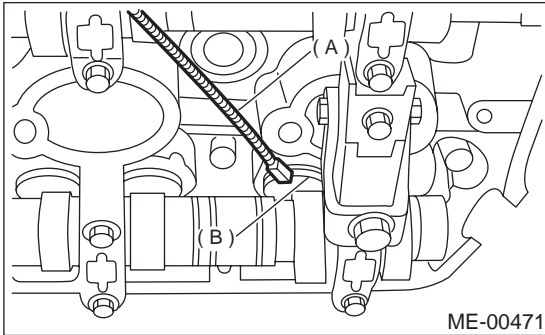


VALVE CLEARANCE

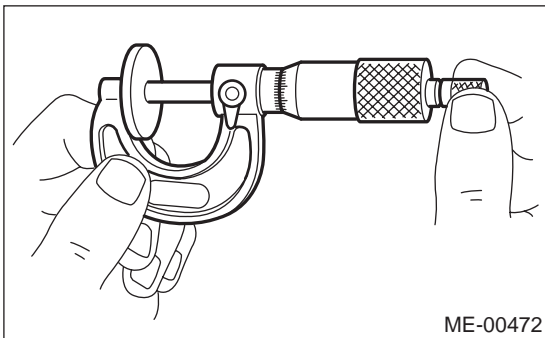
MECHANICAL

NOTE:

By using a magnet (A), the shim (B) can be taken out without dropping it.



3) Measure thickness of shim with micrometer.



4) Select a shim of suitable thickness using measured valve clearance and shim thickness, by referring to the following table.

5) Set suitable shim selected in step 4) to valve lifter.

Unit: mm
Intake valve: $S = (V + T) - 0.20$
Exhaust valve: $S = (V + T) - 0.25$
S: Shim thickness to be used
V: Measured valve clearance
T: Shim thickness required

Part No.	Thickness mm (in)
13218 AK010	2.00 (0.0787)
13218 AK020	2.02 (0.0795)
13218 AK030	2.04 (0.0803)
13218 AK040	2.06 (0.0811)
13218 AK050	2.08 (0.0819)
13218 AK060	2.10 (0.0827)
13218 AK070	2.12 (0.0835)
13218 AK080	2.14 (0.0843)
13218 AK090	2.16 (0.0850)
13218 AK100	2.18 (0.0858)
13218 AK110	2.20 (0.0866)
13218 AE710	2.22 (0.0874)
13218 AE720	2.23 (0.0878)
13218 AE730	2.24 (0.0882)
13218 AE740	2.25 (0.0886)

Part No.	Thickness mm (in)
13218 AE750	2.26 (0.0890)
13218 AE760	2.27 (0.0894)
13218 AE770	2.28 (0.0898)
13218 AE780	2.29 (0.0902)
13218 AE790	2.30 (0.0906)
13218 AE800	2.31 (0.0909)
13218 AE810	2.32 (0.0913)
13218 AE820	2.33 (0.0917)
13218 AE830	2.34 (0.0921)
13218 AE840	2.35 (0.0925)
13218 AE850	2.36 (0.0929)
13218 AE860	2.37 (0.0933)
13218 AE870	2.38 (0.0937)
13218 AE880	2.39 (0.0941)
13218 AE890	2.40 (0.0945)
13218 AE900	2.41 (0.0949)
13218 AE910	2.42 (0.0953)
13218 AE920	2.43 (0.0957)
13218 AE930	2.44 (0.0961)
13218 AE940	2.45 (0.0965)
13218 AE950	2.46 (0.0969)
13218 AE960	2.47 (0.0972)
13218 AE970	2.48 (0.0976)
13218 AE980	2.49 (0.0980)
13218 AE990	2.50 (0.0984)
13218 AF000	2.51 (0.0988)
13218 AF010	2.52 (0.0992)
13218 AF020	2.53 (0.0996)
13218 AF030	2.54 (0.1000)
13218 AF040	2.55 (0.1004)
13218 AF050	2.56 (0.1008)
13218 AF060	2.57 (0.1012)
13218 AF070	2.58 (0.1016)
13218 AF090	2.60 (0.1024)
13218 AF100	2.61 (0.1028)
13218 AF110	2.62 (0.1031)
13218 AF120	2.63 (0.1035)
13218 AF130	2.64 (0.1039)
13218 AF140	2.65 (0.1043)
13218 AF150	2.66 (0.1047)
13218 AF160	2.67 (0.1051)
13218 AF170	2.68 (0.1055)
13218 AF180	2.69 (0.1059)
13218 AF190	2.70 (0.1063)
13218 AF200	2.71 (0.1067)
13218 AF210	2.72 (0.1071)
13218 AF220	2.73 (0.1075)
13218 AF230	2.74 (0.1079)
13218 AF240	2.75 (0.1083)
13218 AF250	2.76 (0.1087)
13218 AF260	2.77 (0.1091)

VALVE CLEARANCE

MECHANICAL

Part No.	Thickness mm (in)
13218 AF270	2.78 (0.1094)
13218 AF280	2.79 (0.1098)
13218 AF290	2.80 (0.1102)
13218 AF300	2.81 (0.1106)

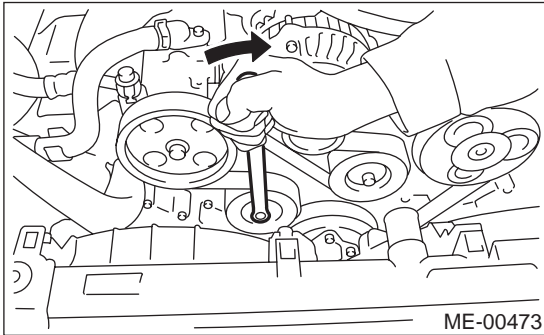
6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.

7) After inspection, install the related parts in the reverse order of removal.

6. V-belt

A: REMOVAL

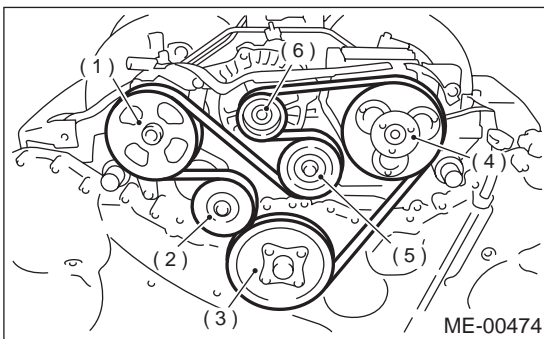
- 1) Fit the tool to the belt tensioner mounting bolt.
- 2) Turn the tool clockwise, and loosen the V-belt to remove.



- 3) Remove the V-belt cover.

B: INSTALLATION

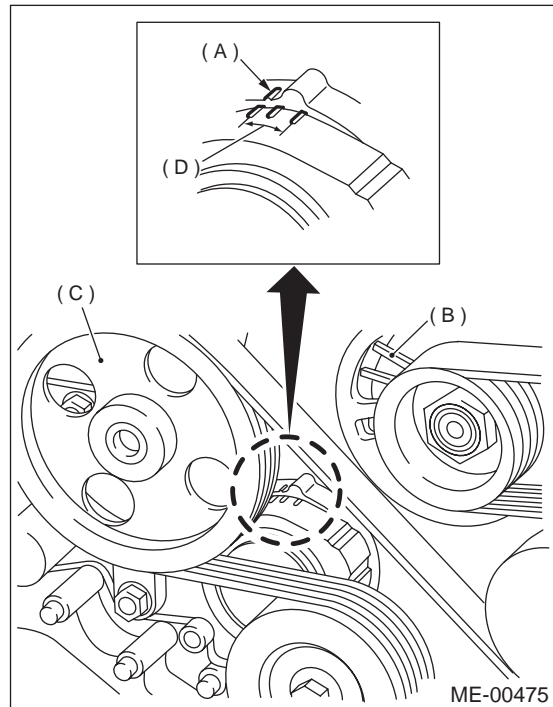
- 1) Install in the reverse order of removal.



- (1) Power steering oil pump
- (2) Belt tension adjuster
- (3) Crankshaft pulley
- (4) A/C compressor
- (5) Belt idler
- (6) Generator

C: INSPECTION

- 1) Replace belts, if cracks, fraying or wear is found.
- 2) Check that the V-belt automatic tensioner indicator (A) is within the range (D).

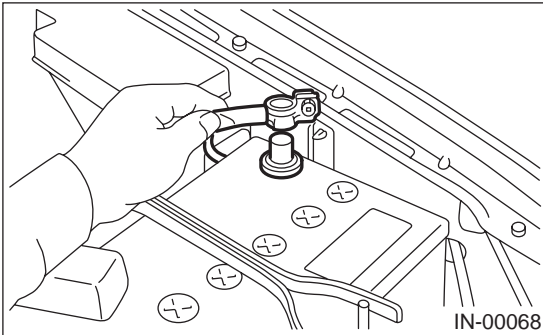


- (A) Indicator
- (B) Generator
- (C) Power steering oil pump
- (D) Service limit

7. Engine Assembly

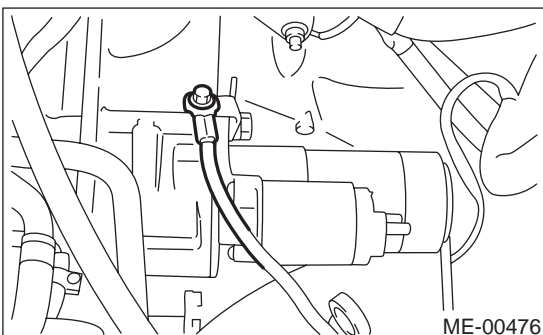
A: REMOVAL

- 1) Set the vehicle on lift arms.
- 2) Open front hood fully and support with stay.
- 3) Raise rear seat, and turn floor mat up.
- 4) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 5) Remove filler cap.
- 6) Disconnect battery ground cable.

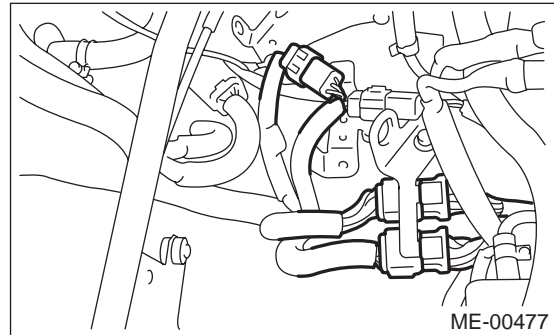


- 7) Remove air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>, <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.> and <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
- 8) Lift up the vehicle.
- 9) Remove under cover.
- 10) Remove radiator from vehicle. <Ref. to CO(H6DO)-27, REMOVAL, Radiator.>
- 11) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
- 12) Disconnect A/C pressure hoses from A/C compressor. <Ref. to AC-42, REMOVAL, Flexible Hose.>
- 13) Disconnect the following connectors and cables.

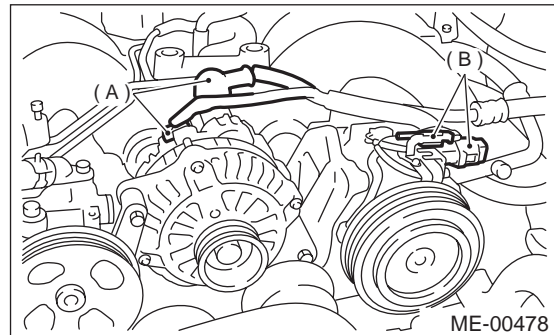
- (1) Engine ground terminal



- (2) Engine harness connectors

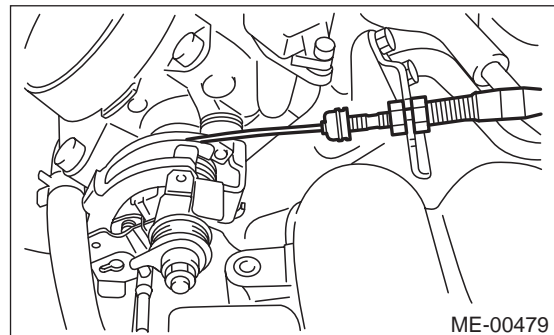


- (3) Generator connector, terminal and A/C compressor connector



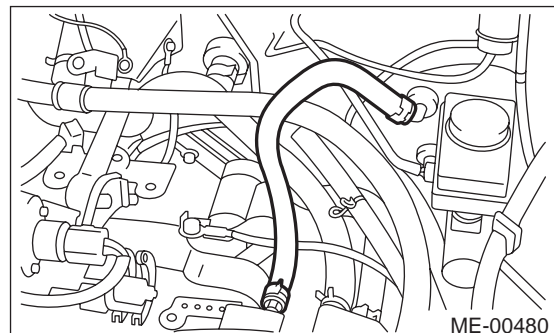
- (A) Generator connector and terminal
- (B) A/C compressor connector

- (4) Accelerator cable



- 14) Disconnect the following hoses.

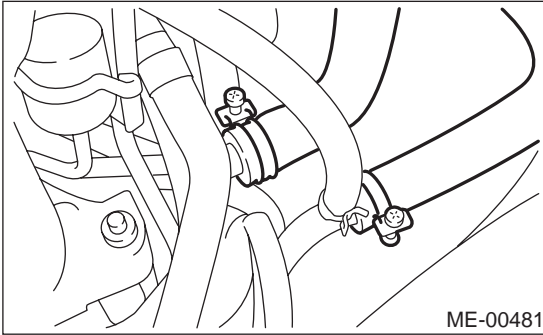
- (1) Brake booster vacuum hose



ENGINE ASSEMBLY

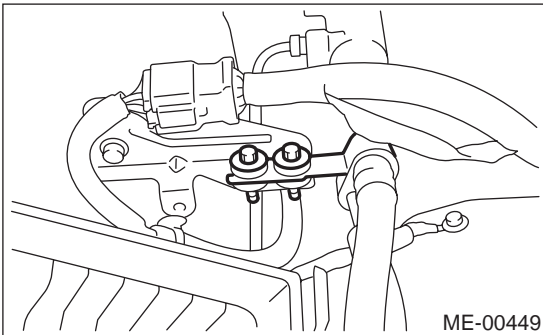
MECHANICAL

(2) Heater inlet outlet hose



15) Remove power steering pump from bracket.

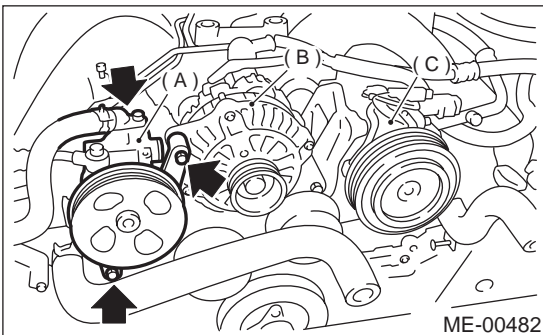
(1) Remove pipe with bracket.



(2) Remove bolts which install power steering pump bracket.

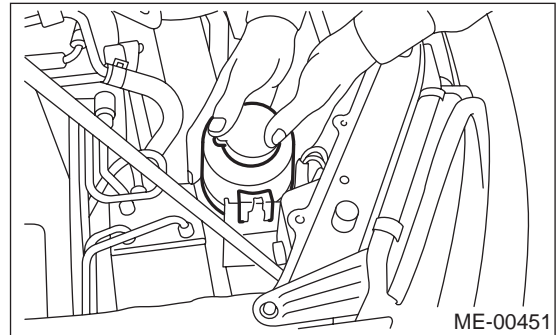
NOTE:

Do not separate the hose and the pipe from the pump body.

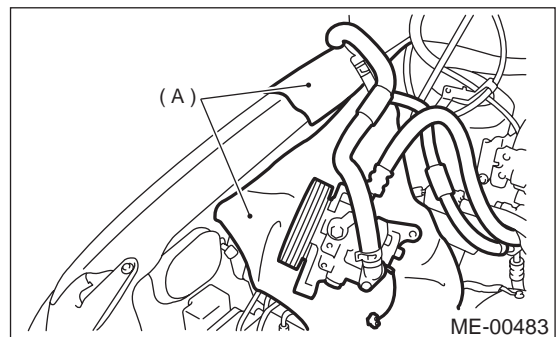


- (A) Power steering pump
- (B) Generator
- (C) A/C compressor

(3) Remove power steering tank from the bracket by pulling it upward.



(4) Place power steering pump on the right side wheel apron.

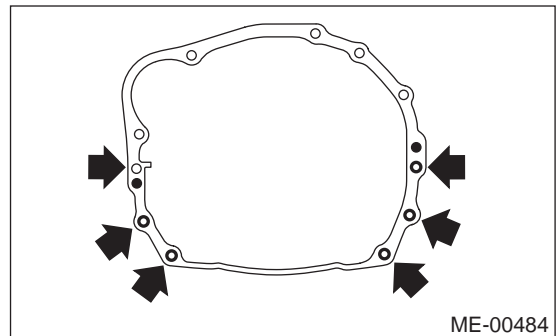


(A) Cloth

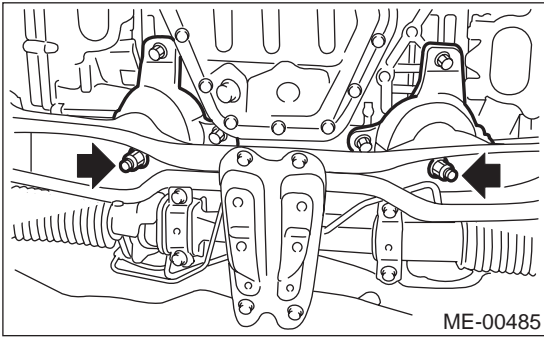
16) Remove front exhaust pipe.

<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>

17) Remove nuts which hold lower side of transmission to engine.



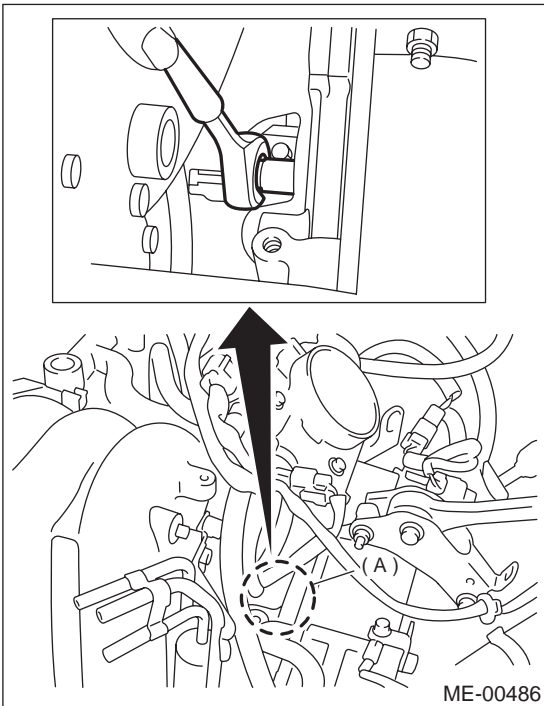
18) Remove nuts which install front cushion rubber onto front crossmember.



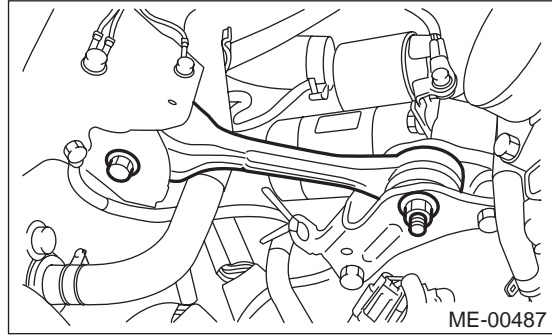
19) Separate torque converter clutch from drive plate.

- (1) Lower the vehicle.
- (2) Remove service hole plug (A).
- (3) Remove bolts which hold torque converter clutch to drive plate.
- (4) Remove other bolts while rotating the engine using ST.

ST 499977100 CRANK PULLEY WRENCH



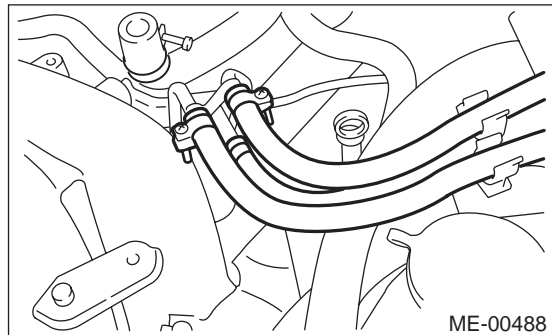
20) Remove pitching stopper.



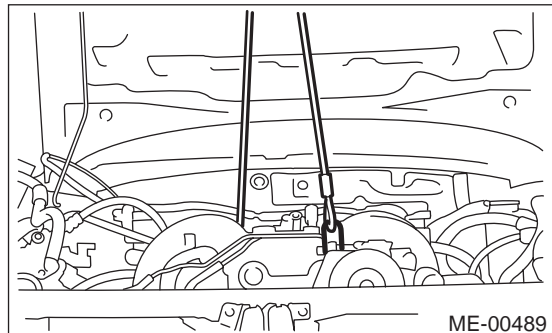
21) Disconnect fuel delivery hose, return hose and evaporation hose.

CAUTION:

- Disconnect hose with its end wrapped with cloth to prevent fuel from splashing.
- Catch fuel from hose into container.



22) Support engine with a lifting device and wire ropes.



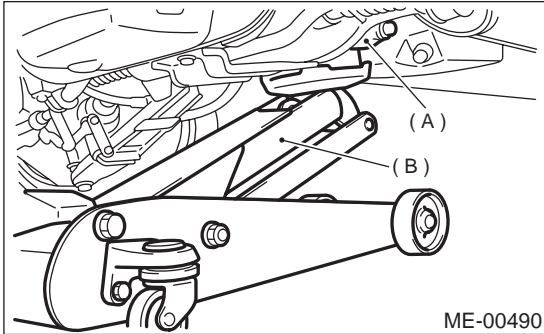
ENGINE ASSEMBLY

MECHANICAL

23) Support transmission with a garage jack.

CAUTION:

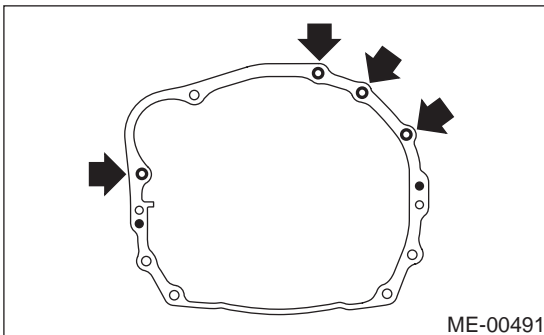
Before moving engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.



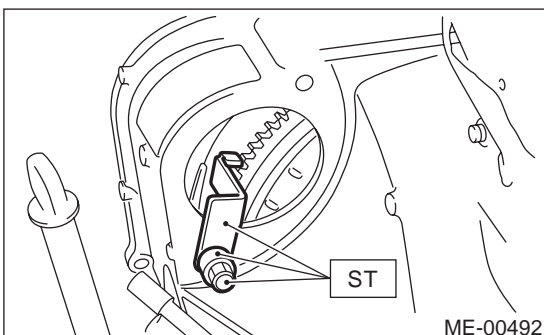
- (A) Transmission
- (B) Garage jack

24) Separation of engine and transmission.

- (1) Remove starter. <Ref. to SC(H6DO)-6, REMOVAL, Starter.>
- (2) Remove bolts which hold upper side of transmission to engine.



25) Install ST to torque converter clutch case.
ST 498277200 STOPPER SET

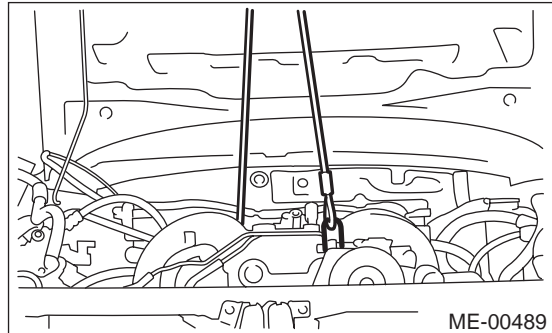


26) Remove engine from vehicle.

- (1) Slightly raise engine.
- (2) Raise transmission with garage jack.
- (3) Move engine horizontally until main shaft is withdrawn from clutch cover.
- (4) Slowly move engine away from engine compartment.

NOTE:

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



27) Remove front cushion rubbers.

B: INSTALLATION

- 1) Install front cushion rubbers.

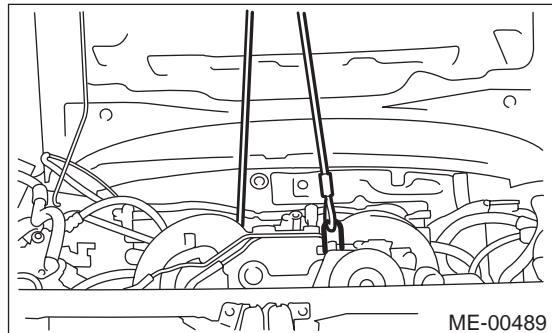
Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

- 2) Position engine in engine compartment and align it with transmission.

NOTE:

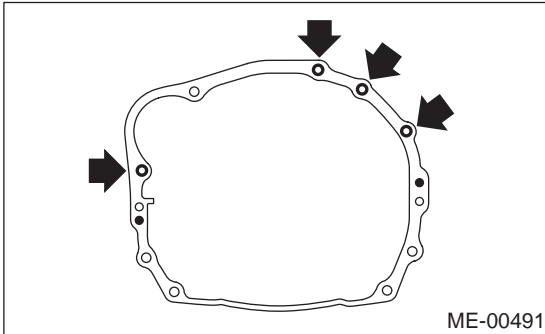
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



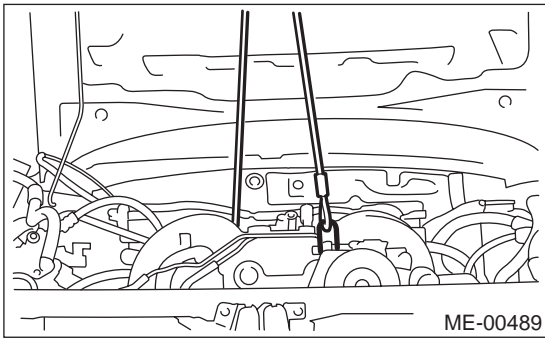
3) Tighten bolts which hold upper side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)



4) Remove lifting device and wire ropes.

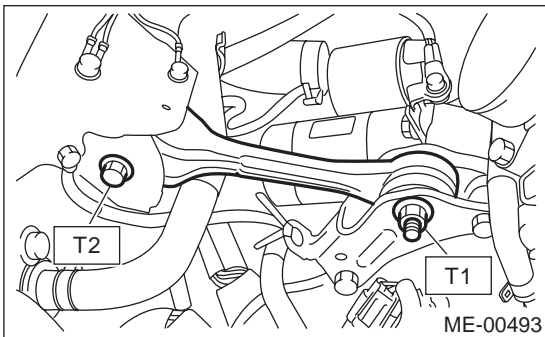


5) Remove garage jack.
6) Install pitching stopper.

Tightening torque:

T1: 49 N·m (5.0 kgf·m, 36.2 ft·lb)

T2: 57 N·m (5.8 kgf·m, 42 ft·lb)



7) Remove ST from torque converter clutch case.

NOTE:

Be careful not to drop the ST into the torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

8) Install starter. <Ref. to SC(H6DO)-6, INSTALLATION, Starter.>

9) Install torque converter clutch onto drive plate.
(1) Tighten bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

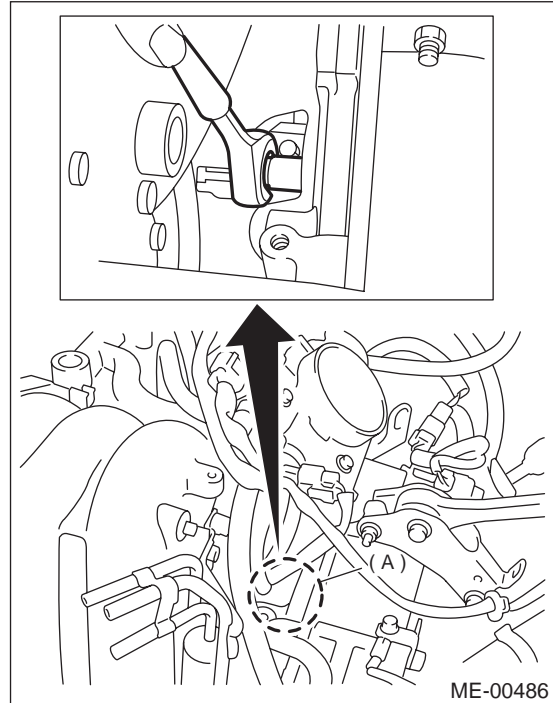
NOTE:

Be careful not to drop bolts into torque converter clutch housing.

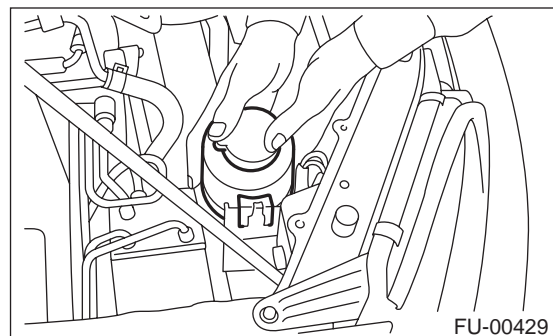
ST 499977100 CRANK PULLEY WRENCH

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



(3) Clog plug (A) onto service hole.
10) Install power steering pump on bracket.
(1) Install power steering tank on bracket.



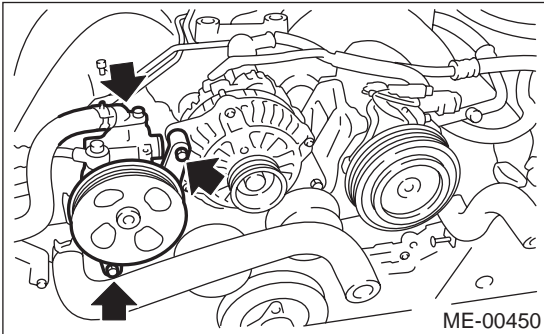
ENGINE ASSEMBLY

MECHANICAL

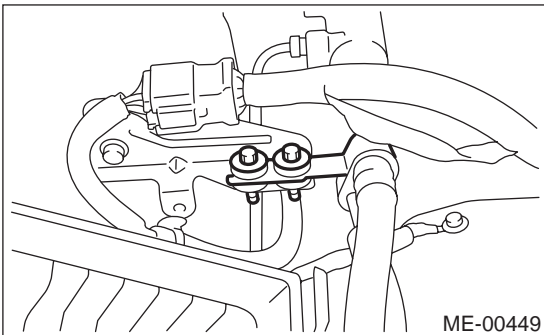
(2) Install power steering pump on bracket, and tighten bolts.

Tightening torque:

20.1 N·m (2.05 kgf·m, 14.8 ft·lb)



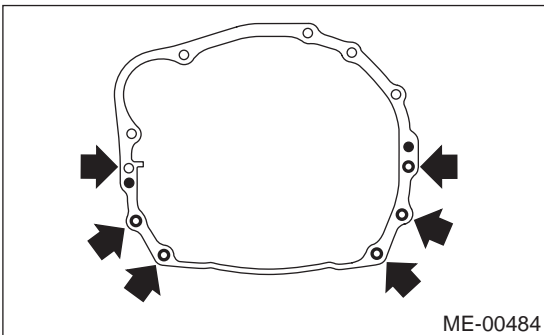
(3) Tighten bolt which installs power steering pipe bracket.



11) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)



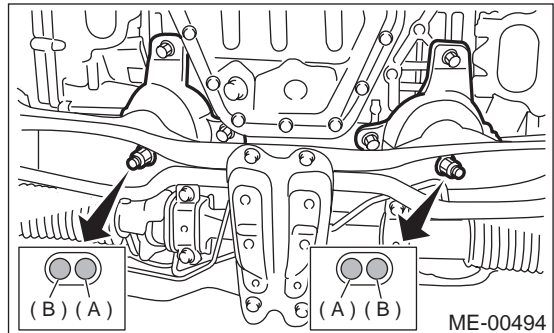
12) Tighten nuts which install front cushion rubber onto crossmember.

Tightening torque:

74 N·m (7.5 kgf·m, 54 ft·lb)

NOTE:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.

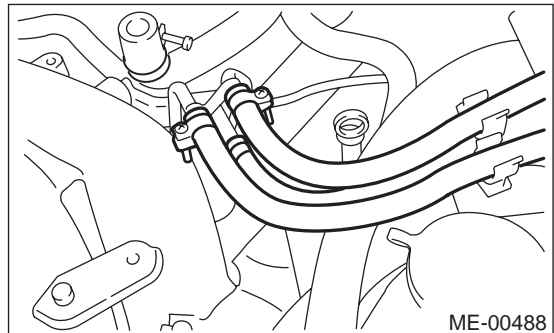


13) Install front exhaust pipe.

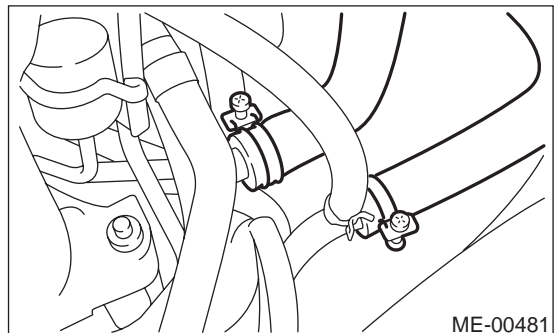
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>

14) Connect the following hoses.

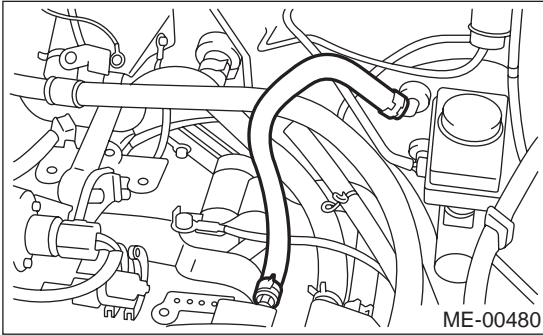
(1) Fuel delivery hose, return hose and evaporation hose



(2) Heater inlet and outlet hoses



(3) Brake booster vacuum hose

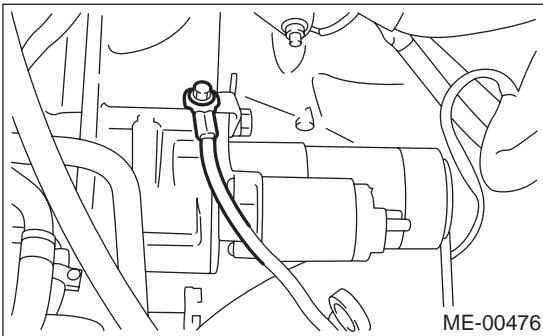


15) Connect the following connectors.

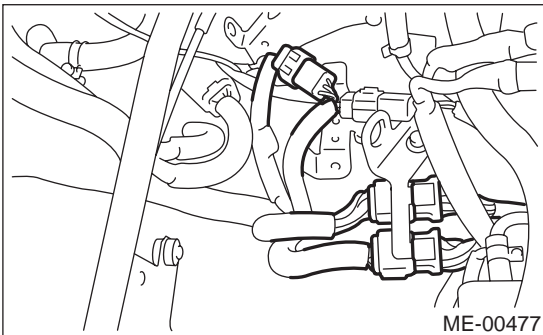
(1) Engine ground terminals

Tightening torque:

14 N·m (1.4 kgf-m, 10.1 ft-lb)

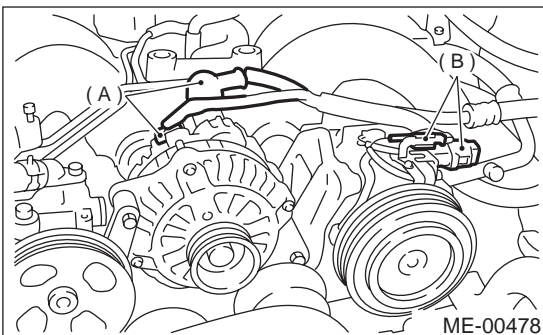


(2) Engine harness connectors



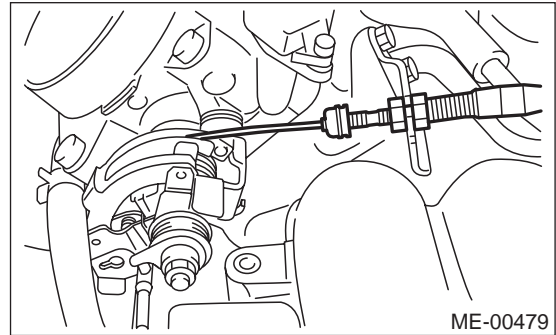
(3) Alternator connector and terminal (A)

(4) A/C compressor connectors (B)



16) Connect the following cables.

(1) Accelerator cable



NOTE:

After connecting each cable, adjust them.

17) Install A/C pressure hoses.

<Ref. to AC-42, INSTALLATION, Flexible Hose.>

18) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>

19) Install radiator to vehicle. <Ref. to CO(H6DO)-28, INSTALLATION, Radiator.>

20) Install air intake duct, cleaner case and air intake chamber.

<Ref. to IN(H6DO)-2, General Description.>

21) Install under cover.

22) Install battery in the vehicle, and connect cables.

23) Fill coolant.

<Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

24) Check ATF level and correct if necessary.

<Ref. to AT-30, Automatic Transmission Fluid.>

25) Charge A/C system with refrigerant.

<Ref. to AC-24, Refrigerant Charging Procedure.>

26) Remove front hood stay, and close front hood.

27) Take off the vehicle from lift arms.

C: INSPECTION

1) Make sure pipes and hoses are installed correctly.

2) Make sure the engine coolant and ATF are at specified levels.

8. Engine Mounting

A: REMOVAL

- 1) Remove engine assembly. <Ref. to ME(H6DO)-29, REMOVAL, Engine Assembly.>
- 2) Remove engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Engine mounting;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

C: INSPECTION

Make sure there are no cracks or other damage.

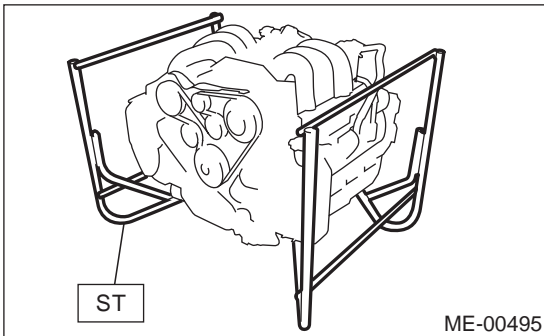
9. Preparation for Overhaul

A: REMOVAL

1) Remove engine from body. <Ref. to ME(H6DO)-29, REMOVAL, Engine Assembly.>

2) After removing engine from body, install ST onto engine.

ST 18232AA000 ENGINE STAND



3) Remove sensors, pipes, and hoses installed on engine before starting overhaul.

(1) Remove intake manifold. <Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>

(2) Remove generator. <Ref. to SC(H6DO)-14, REMOVAL, Generator.>

(3) Remove A/C compressor. <Ref. to AC-35, REMOVAL, Compressor.>

(4) Remove EGR pipe. <Ref. to EC(H6DO)-10, REMOVAL, EGR Valve.>

(5) Remove water pipe and hoses.

(6) Remove engine harness.

(7) Remove spark plugs. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>

(8) Remove camshaft position sensor. <Ref. to FU(H6DO)-31, REMOVAL, Camshaft Position Sensor.>

(9) Remove crankshaft position sensor. <Ref. to FU(H6DO)-30, REMOVAL, Crankshaft Position Sensor.>

(10) Remove knock sensor. <Ref. to FU(H6DO)-32, REMOVAL, Knock Sensor.>

(11) Remove engine coolant temperature sensor. <Ref. to FU(H6DO)-29, REMOVAL, Engine Coolant Temperature Sensor.>

(12) Remove oil pressure switch. <Ref. to LU(H6DO)-16, REMOVAL, Oil Pressure Switch.>

(13) Remove oil filter. <Ref. to LU(H6DO)-17, REMOVAL, Engine Oil Filter.>

(14) Remove oil cooler. <Ref. to LU(H6DO)-18, REMOVAL, Oil Cooler.>

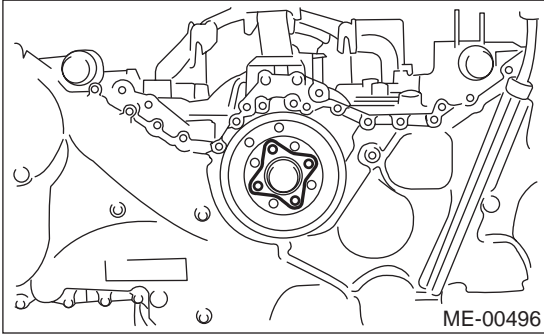
CRANKSHAFT PULLEY

MECHANICAL

10.Crankshaft Pulley

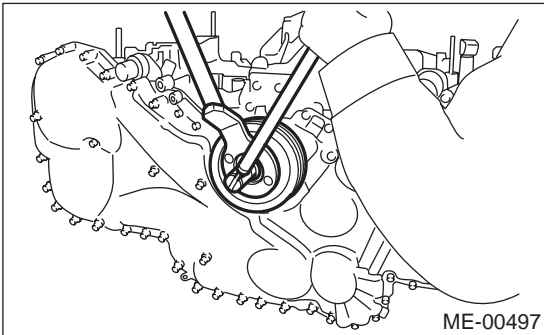
A: REMOVAL

1) Remove crankshaft pulley cover.



2) Remove crankshaft pulley bolt. To lock crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH



3) Remove crankshaft pulley.

B: INSTALLATION

1) Install crankshaft pulley.

2) Install crankshaft pulley bolt. To lock crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH

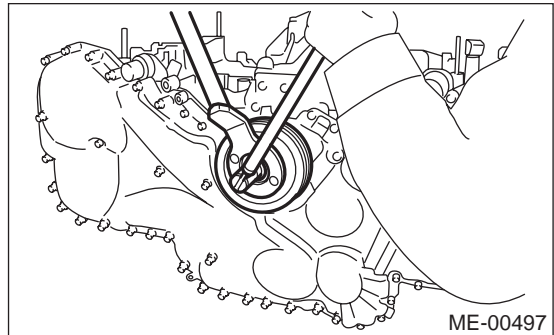
(1) Clean the crankshaft pulley thread using an air gun.

(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

(3) Tighten the crankshaft pulley bolts.

Tightening torque:

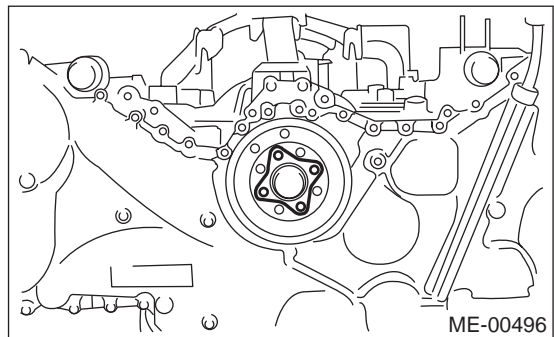
178 N·m (18.1 kgf·m, 131 ft·lb)



3) Install the crankshaft pulley cover.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



C: INSPECTION

1) Check crankshaft pulley cover for oil leaks and bleeding.

2) Check crankshaft pulley for looseness.

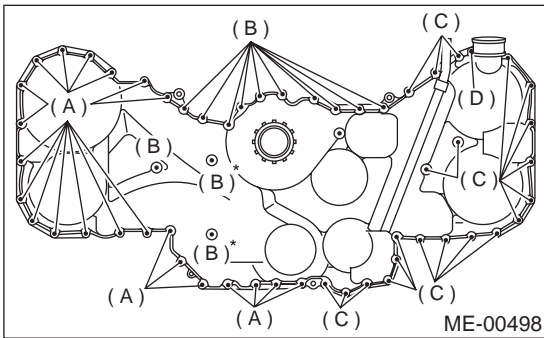
11. Front Chain Cover

A: REMOVAL

- 1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover.

NOTE:

There are four different types of chain cover mounting bolts. Sort them into separate containers to avoid confusion at installation.



Bolt dimension:

- (A) 6 × 45
- (B) 6 × 16
- (C) 6 × 30
- (D) 6 × 50

*: Sealing washer

B: INSTALLATION

- 1) Remove old fluid gasket on the matching surface, and degrease it.
- 2) Apply fluid gasket to the mating surface of front chain cover.

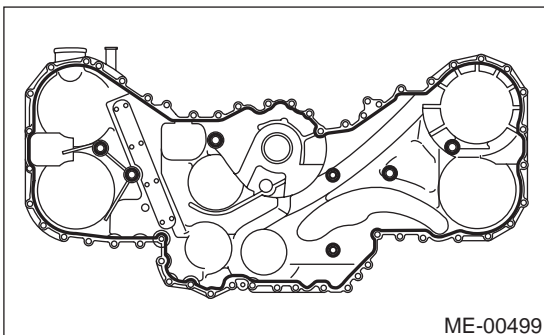
Fluid gasket:

THREE BOND 1280B

Part No.: K0877YA018

Fluid gasket application diameter:

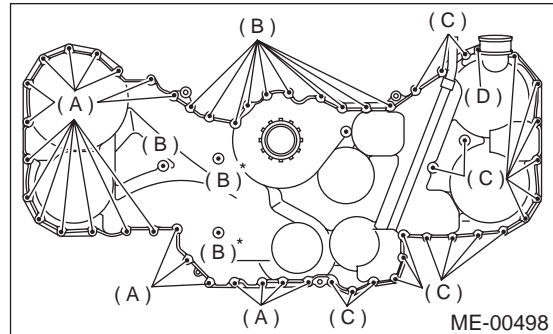
2.5±0.5 mm (0.098±0.020 in)



- 3) Install front chain cover. Temporarily tighten the bolts.

CAUTION:

Do not confuse the mounting positions of the bolts.



Bolt dimension:

- (A) 6 × 45
- (B) 6 × 16
- (C) 6 × 30
- (D) 6 × 50

*: Sealing washer

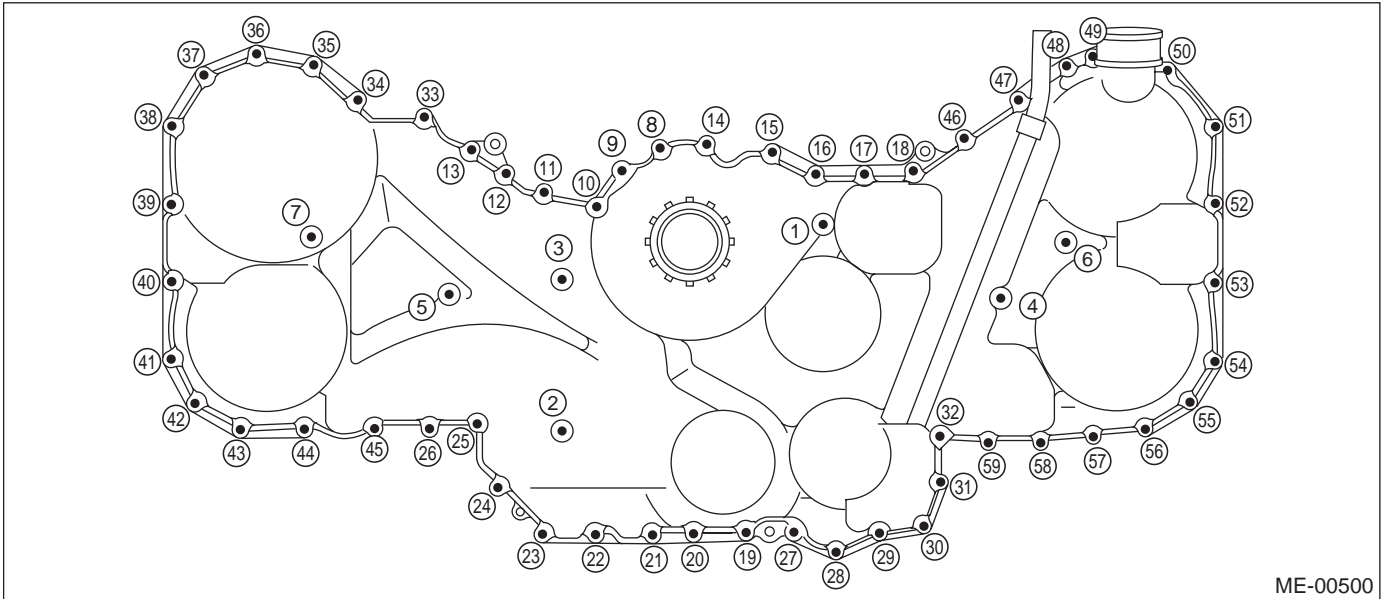
FRONT CHAIN COVER

MECHANICAL

4) Tighten the bolts in the numerical sequence shown in figure.

Tightening torque:

6.6 N·m (0.67 kgf-m, 4.8 ft-lb)



ME-00500

5) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: INSPECTION

Check the cover surface for flaws and dents.
Check the cover mating surface and the mounting point of crankshaft pulley for oil leaks.

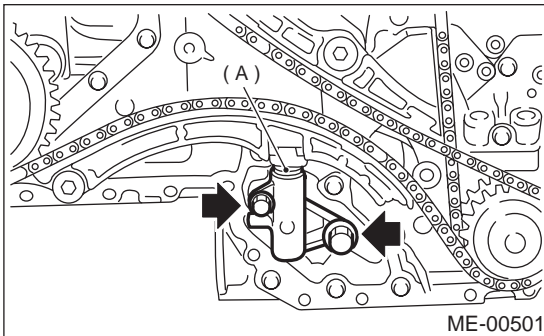
12. Timing Chain Assembly

A: REMOVAL

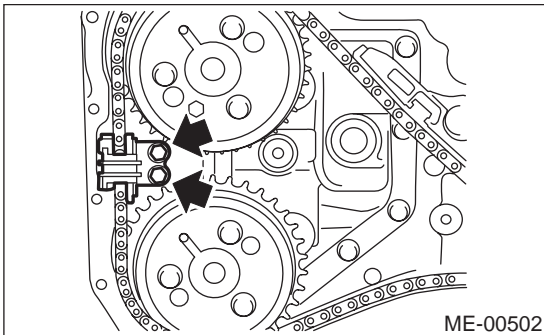
- 1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 3) Remove chain tensioner (RH).

NOTE:

Make sure plunger (A) does not come out.

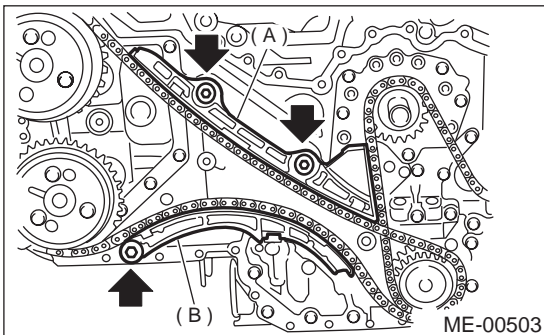


- 4) Remove chain guide. (Right-hand between cams)



- 5) Remove chain guide (RH).

- 6) Remove chain tensioner lever (RH).



(A) Chain guide (RH)

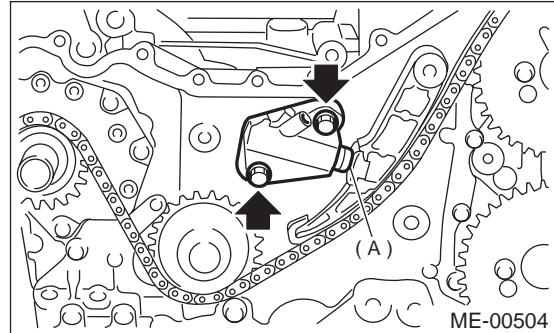
(B) Chain tensioner lever (RH)

- 7) Remove timing chain (RH).

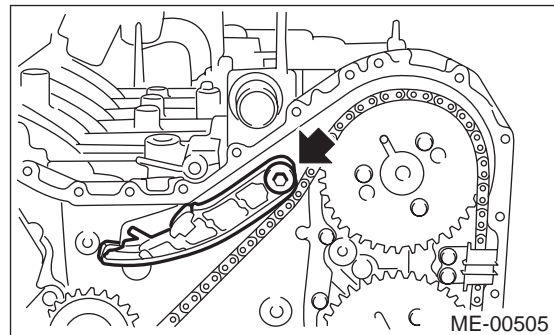
- 8) Remove chain tensioner (LH).

NOTE:

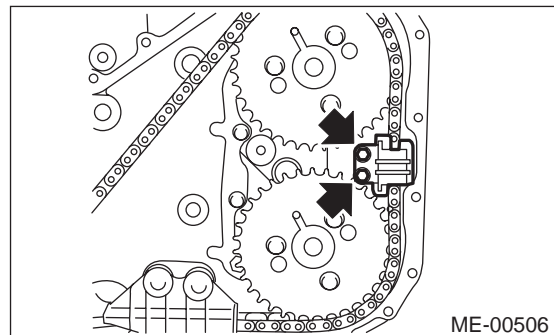
Make sure plunger (A) does not come out.



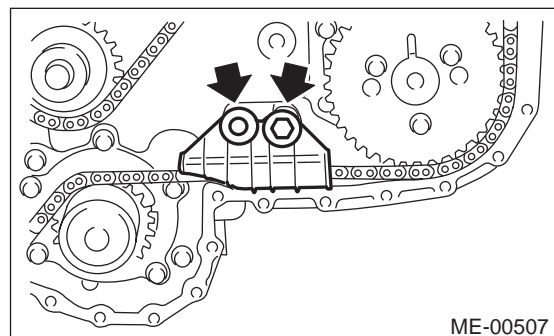
- 9) Remove chain tensioner lever (LH).



- Remove chain guide. (Left-hand between cams)



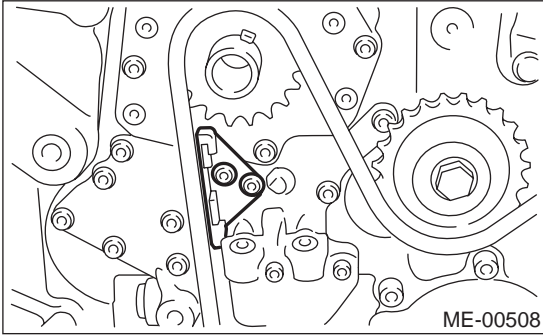
- 10) Remove chain guide (LH).



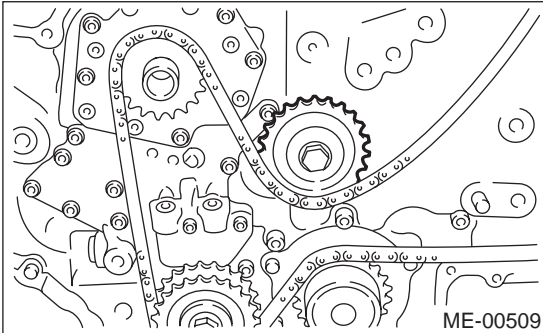
TIMING CHAIN ASSEMBLY

MECHANICAL

11) Remove chain guide. (Center)

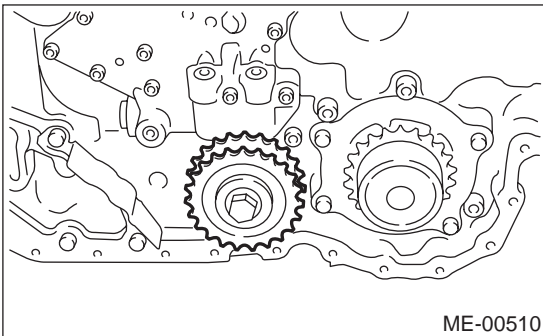


12) Remove idler sprocket. (Upper)



13) Remove timing chain (LH).

14) Remove idler sprocket. (Lower)



B: INSTALLATION

NOTE:

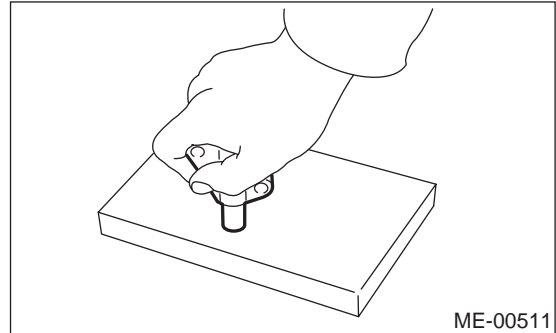
- During installation, be careful to prevent foreign objects from attaching to or mixing with assembled components.
- Apply engine oil to chain guide, chain tensioner lever, and idler sprocket during installation.

1) Preparation for installation of chain tensioner.

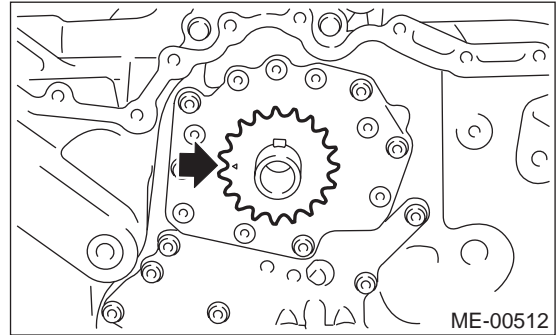
- (1) Put the screw, spring, pin and tension rod into the tensioner body.
- (2) While pressing tensioner onto rubber mat, twist it left and right to shorten tension rod. Then set a thin pin into the holes between tension rod and tensioner body to hold it.

NOTE:

Carry out the work on rubber mat or other nonslip material.

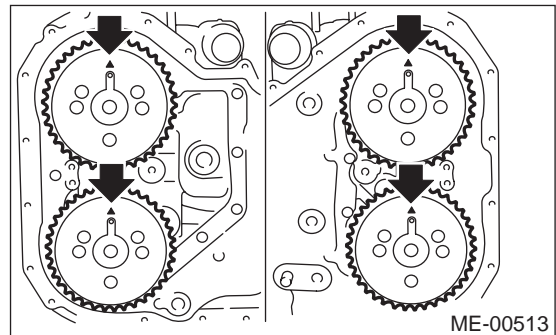


- 2) Using ST, align "top mark" on crankshaft sprocket at 9 o'clock position as shown in the figure.
ST 18252AA000 CRANKSHAFT SOCKET



- 3) Using ST, align four key grooves on camshaft sprocket at 12 o'clock position as shown in the figure.

ST 18231AA000 CAMSHAFT SPROCKET WRENCH



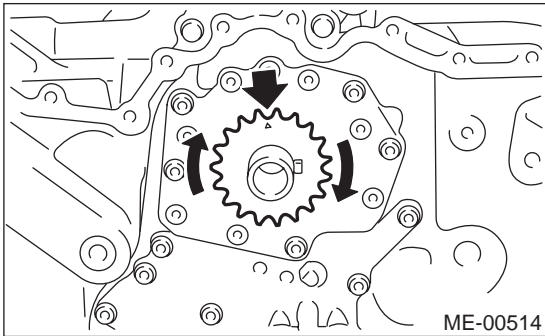
TIMING CHAIN ASSEMBLY

MECHANICAL

4) Rotate crankshaft sprocket clockwise to align "top mark" at 12 o'clock position as shown in the figure. (Piston # 1 is at TDC.)

NOTE:

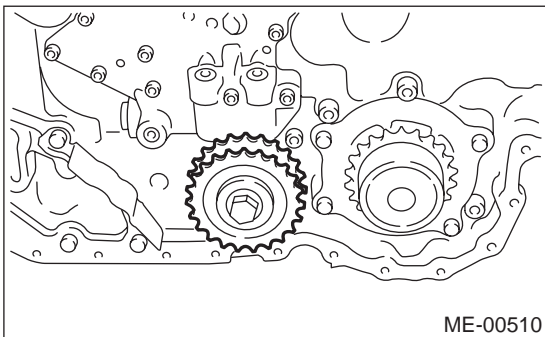
Do not rotate crankshaft and camshaft sprockets until timing chain is completely routed.



5) Install the idler sprocket. (Lower)

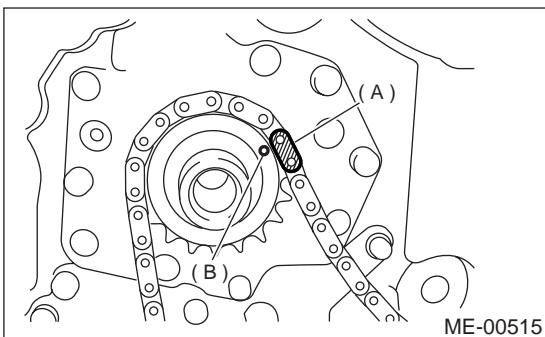
Tightening torque:

69 N·m (7.0 kgf·m, 50.6 ft·lb)



6) Install timing chain LH.

(1) Align the timing mark (B) on crankshaft sprocket with the matching mark (A) on timing chain LH.

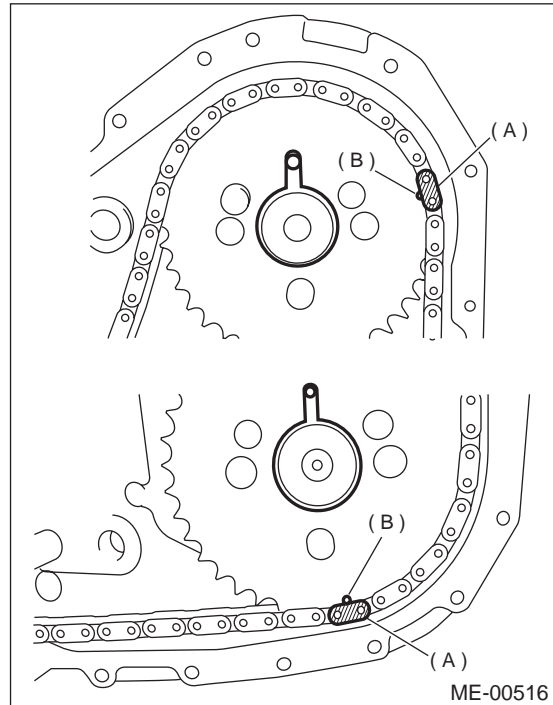


- (A) Gold
- (B) Mark

(2) Route timing chain LH on idler sprocket (Lower), water pump, exhaust cam sprocket, and intake cam sprocket in order.

NOTE:

Make sure that matching marks on the timing chain (A) and camshaft sprocket (B) are aligned the same way as the one on crankshaft sprocket.

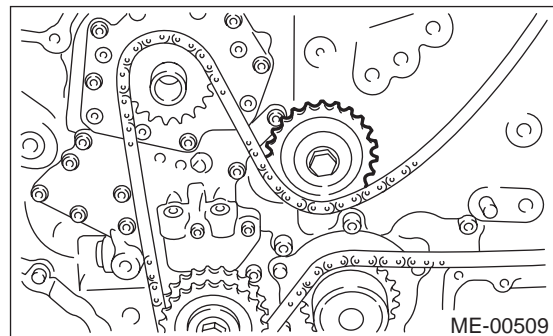


- (A) Dark blue
- (B) Mark

(3) Install chain idler. (Upper)

Tightening torque:

69 N·m (7.0 kgf·m, 50.6 ft·lb)



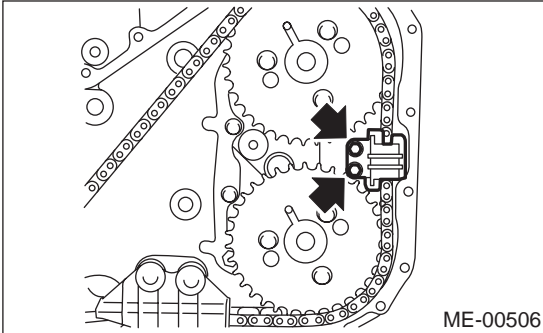
TIMING CHAIN ASSEMBLY

MECHANICAL

(4) Install chain guide. (Left-hand between cams)

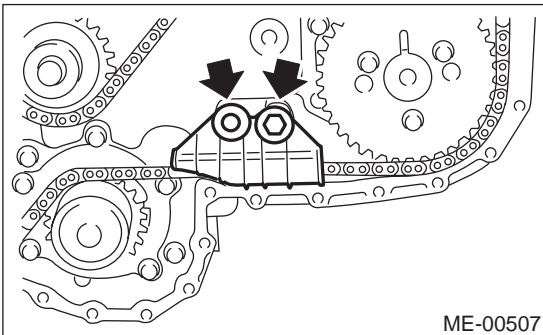
Tightening torque:
6.3N·m (0.64 kgf-m, 4.6 ft-lb)

NOTE:
Replace mounting bolt with a new one.



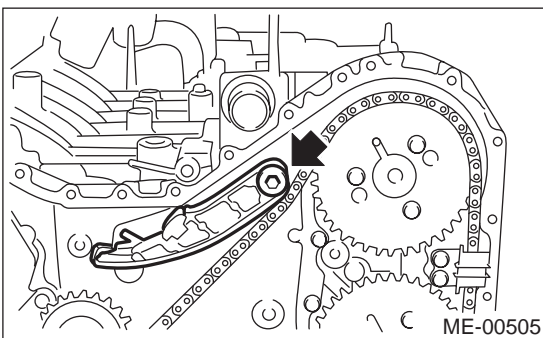
(5) Install chain guide (LH).

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



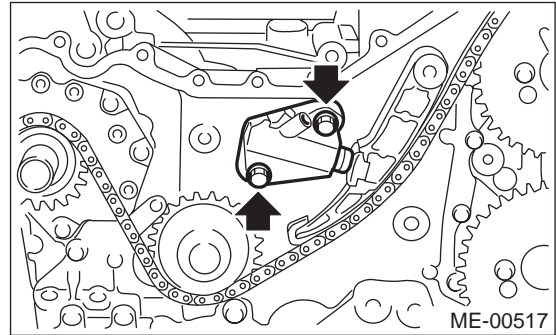
(6) Install chain tensioner lever LH.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



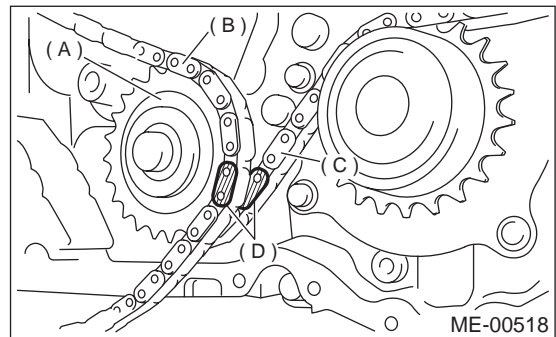
(7) Install chain tensioner LH.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



7) Install timing chain RH.

(1) On idler sprocket (Lower) , align matching marks on timing chains LH and RH.

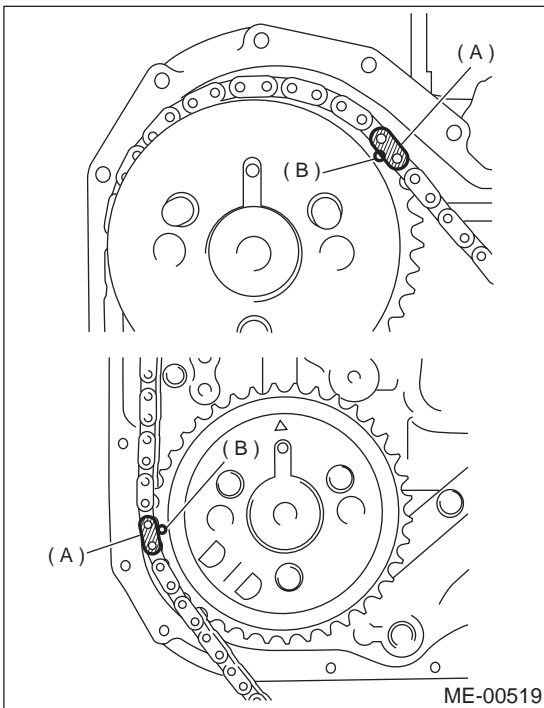


- (A) Lower idler sprocket
- (B) Timing chain RH
- (C) Timing chain LH
- (D) Dark gray

(2) Route timing chain RH on intake cam sprocket and then exhaust cam sprocket.

NOTE:

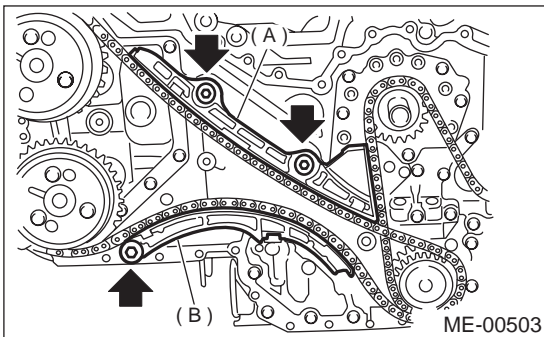
Make sure that matching marks on the timing chain (A) and camshaft sprocket (B) are aligned the same way as the one on crankshaft sprocket.



- (A) Gold
- (B) Mark

- (3) Install chain guide (RH).
- (4) Install chain tensioner lever (RH).

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

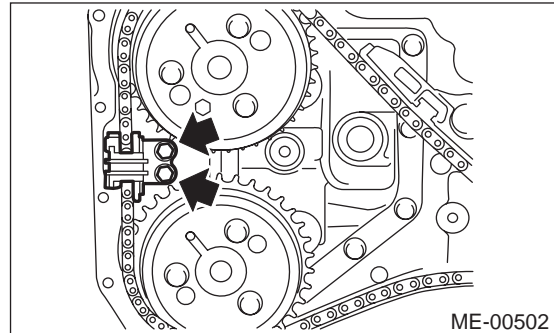


- (A) Chain guide (RH)
- (B) Chain tensioner lever (RH)

- (5) Install timing chain guide RH No. 1.

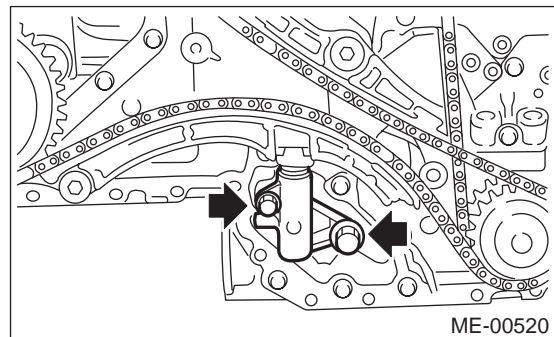
Tightening torque:
6.3 N·m (0.64 kgf-m, 4.6 ft-lb)

NOTE:
 Replace mounting bolt with a new one.



- (6) Install the chain tensioner (RH).

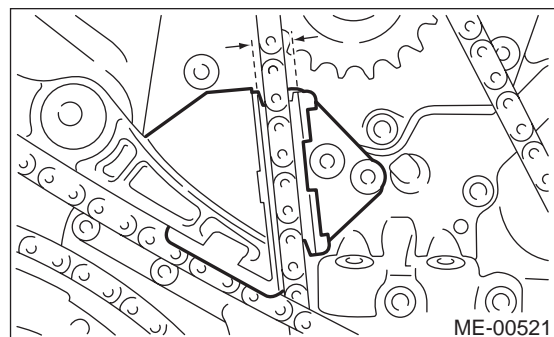
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



- (7) Adjust the clearance between chain guide (RH) and chain guide (Center) to the range between 8.4 mm (0.331 in) to 8.6 mm (0.339 in). And install chain guide (Center).

Tightening torque:
7.8 N·m (0.8 kgf-m, 5.8 ft-lb)

NOTE:
 Replace mounting bolt with a new one.



- (8) After checking the matching marks on each sprocket and corresponding timing chain are aligned, pull stopper pin out of chain tensioner.

CAMSHAFT SPROCKET

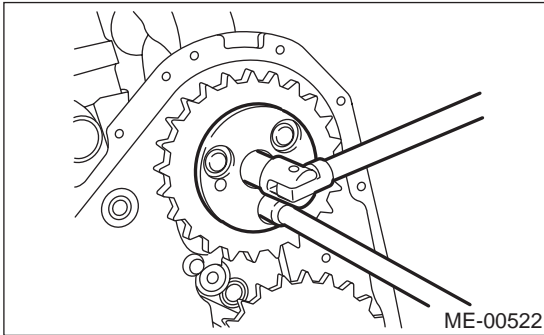
MECHANICAL

13. Camshaft Sprocket

A: REMOVAL

- 1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprocket. To lock camshaft, use ST.

ST 18231AA000 CAMSHAFT SPROCKET WRENCH



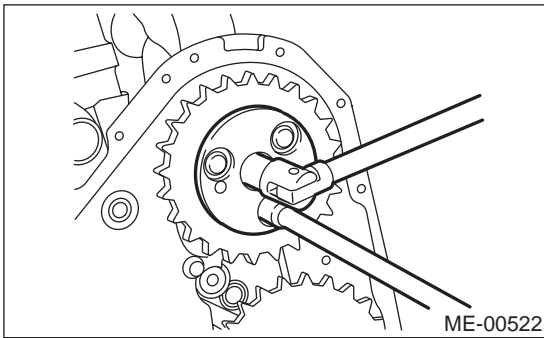
B: INSTALLATION

- 1) Install camshaft sprocket. To lock camshaft, use ST.

ST 18231AA000 CAMSHAFT SPROCKET WRENCH

Tightening torque:

13 N·m (1.0 kgf-m, 7.2 ft-lb)



- 2) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
- 3) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
- 4) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

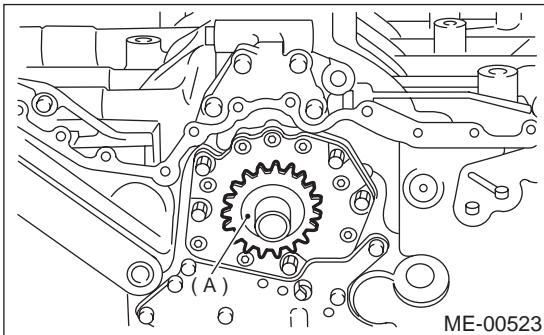
C: INSPECTION

- 1) Check sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.

14.Crankshaft Sprocket

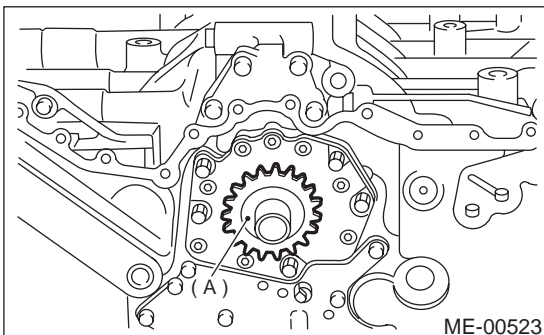
A: REMOVAL

- 1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprocket. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
- 5) Remove crankshaft sprocket (A).



B: INSTALLATION

- 1) Install crankshaft sprocket (A).



- 2) Install camshaft sprocket. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
- 3) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
- 4) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
- 5) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: INSPECTION

- 1) Check sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.

REAR CHAIN COVER

MECHANICAL

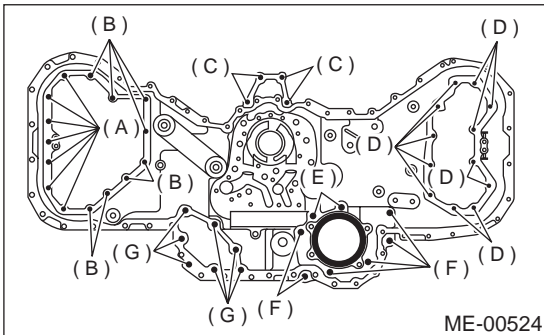
15.Rear Chain Cover

A: REMOVAL

- 1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprocket. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
- 5) Remove crankshaft sprocket.
- 6) Remove oil pump. <Ref. to LU(H6DO)-11, REMOVAL, Oil Pump.>
- 7) Remove oil pump relief valve. <Ref. to LU(H6DO)-13, REMOVAL, Oil Pump Relief Valve.>
- 8) Remove water pump. <Ref. to CO(H6DO)-24, REMOVAL, Water Pump.>
- 9) Remove rear chain cover.

NOTE:

There are seven different types of mounting bolts. Sort them into separate containers to avoid confusion at installation.



Bolt dimension:

- (A) 6 × 14
- (B) 6 × 18 (Silver)
- (C) 6 × 30
- (D) 6 × 18
- (E) 6 × 40
- (F) 6 × 30
- (G) 6 × 22

B: INSTALLATION

- 1) Remove old fluid gasket on the matching surface, and degrease it.
- 2) Apply fluid gasket to the mating surface of rear chain cover.

Fluid gasket:

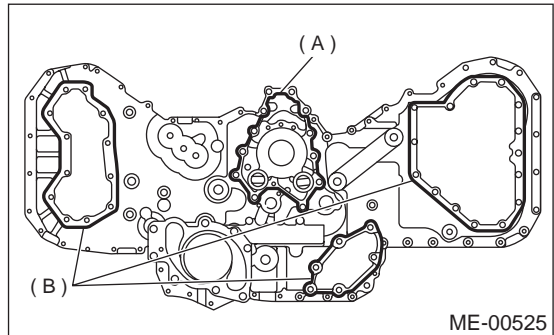
THREE BOND 1280B

Part No.: K0877YA018

Fluid gasket application diameter:

(A) 1.0±0.5 mm (0.039±0.020 in)

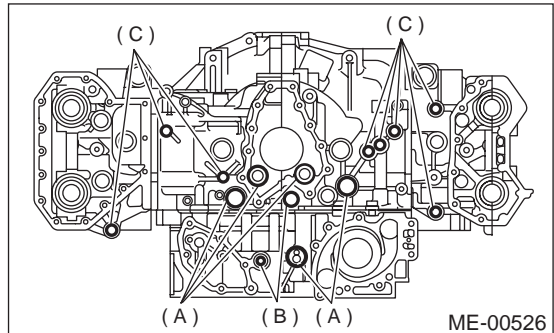
(B) 3.0±1.0 mm (0.118±0.039 in)



- 3) Install O-ring.

NOTE:

Do not reuse the O-ring.

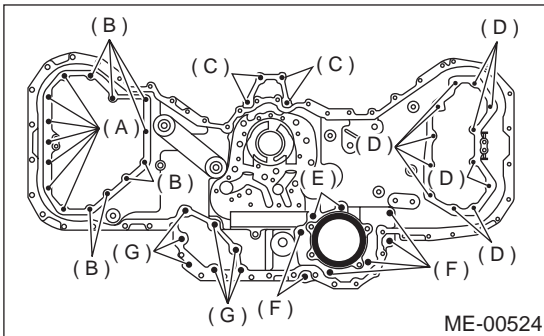


- (A) O-ring (Large)
- (B) O-ring (Medium)
- (C) O-ring (Small)

4) Temporarily tighten rear chain cover.

NOTE:

- Do not confuse the mounting positions of the bolts.
- Replace mounting bolts (G) with new ones.



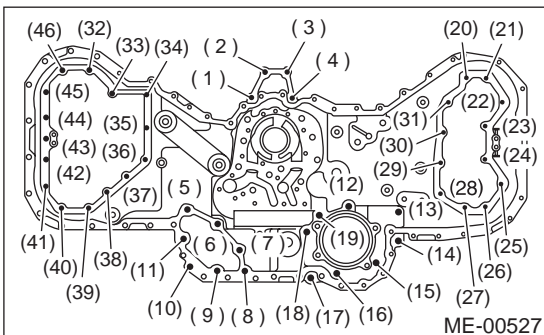
Bolt dimension:

- (A) 6 × 14
- (B) 6 × 18 (Silver)
- (C) 6 × 30
- (D) 6 × 18
- (E) 8 × 40
- (F) 8 × 30
- (G) 6 × 22

5) Tighten the bolts in the numerical sequence shown in figure.

Tightening torque:

(1) to (11)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(12) to (19)	20 N·m (2.0 kgf-m, 14 ft-lb)
(20) to (31)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(32) to (39)	12 N·m (1.2 kgf-m, 8.7 ft-lb)
(40) to (46)	9 N·m (0.9 kgf-m, 6.5 ft-lb)

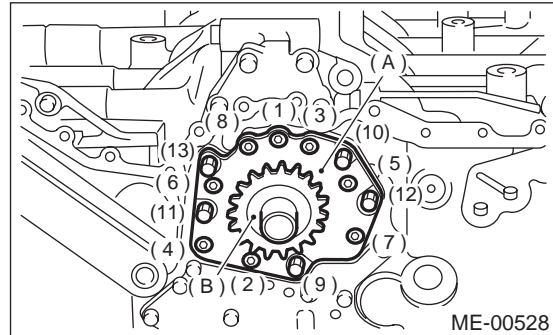


6) Install water pump. <Ref. to CO(H6DO)-24, REMOVAL, Water Pump.>

7) Install oil pump relief valve. <Ref. to LU(H6DO)-13, INSTALLATION, Oil Pump Relief Valve.>

8) Install oil pump. <Ref. to LU(H6DO)-11, INSTALLATION, Oil Pump.>

9) Install crankshaft sprocket.



10) Install camshaft sprocket. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>

11) Install timing chain. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>

12) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>

13) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

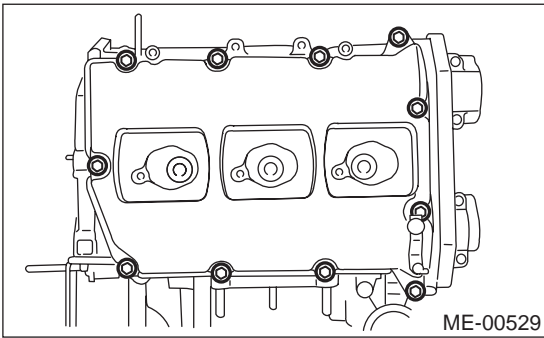
CAMSHAFT

MECHANICAL

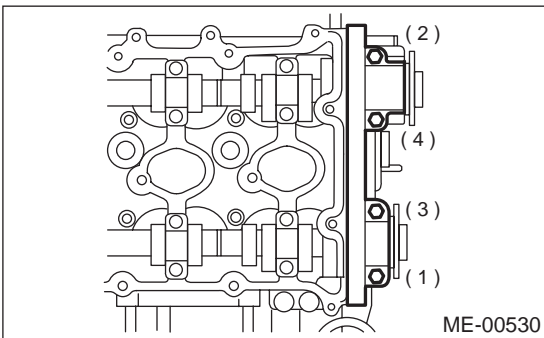
16. Camshaft

A: REMOVAL

- 1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprockets. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
- 5) Remove crankshaft sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Crankshaft Sprocket.>
- 6) Remove rear chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Rear Chain Cover.>
- 7) Remove rocker cover (RH).

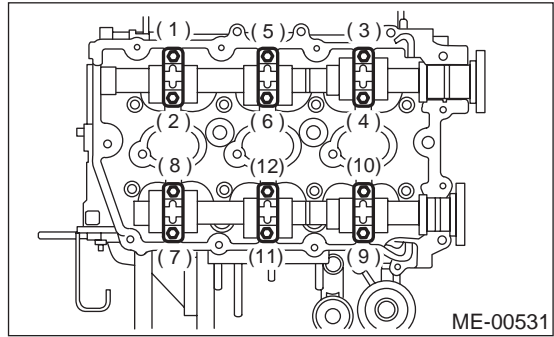


- 8) Loosen front camshaft cap bolts equally, a little at a time in numerical sequence shown in the figure (RH).



- 9) Remove camshaft cap and intake camshaft (RH).

- 10) Loosen camshaft cap bolts equally, a little at a time in the numerical sequence shown in the figure.

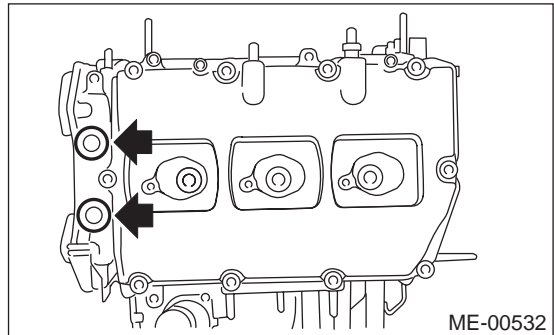


- 11) Remove camshaft cap and exhaust camshaft (RH).

CAUTION:

Arrange camshaft caps in order so that they can be installed in their original position.

- 12) Remove plug (LH).



- 13) Similarly, remove left-hand camshafts and related parts.

B: INSTALLATION

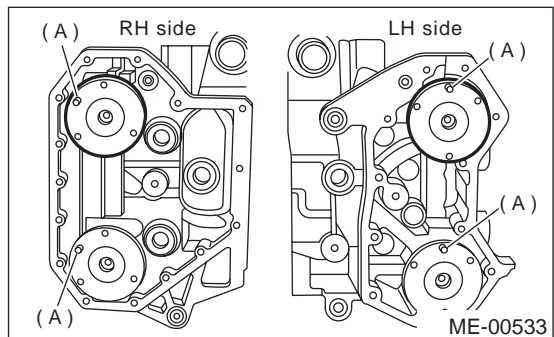
- 1) Apply a coat of engine oil to camshaft journals and install camshaft.

NOTE:

When installing camshaft, adjust camshaft front flange knock pin (A) position as follows:

LH side: 12 o'clock

RH side: 10 o'clock



- 2) Install camshaft cap.
 - (1) Apply fluid packing sparingly to back of front camshaft cap shown in the figure.

CAUTION:

Do not apply fluid gasket excessively. Failure to do so may cause excess fluid gasket to come out and flow toward camshaft journal, resulting burning stuck of engine.

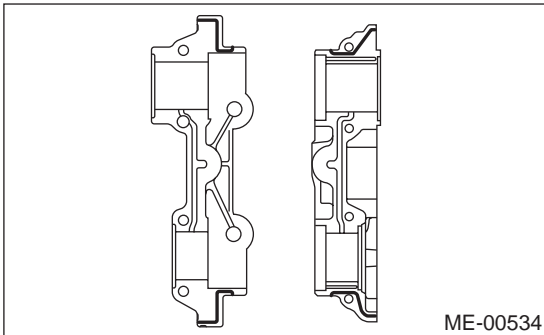
Fluid gasket:

THREE BOND 1280B

Part No.: K0877YA018

Fluid gasket application diameter:

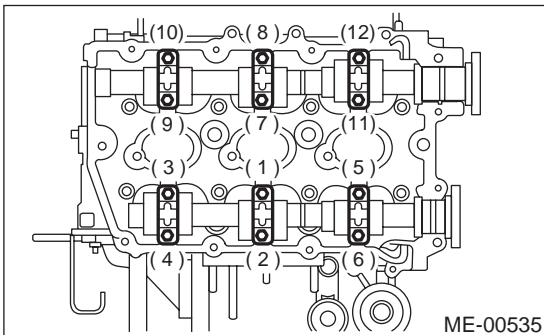
2.0±0.5 mm (0.079±0.020 in)



- (2) Apply engine oil to cap bearing surface and install cap on camshaft.
- (3) Tighten the camshaft cap bolts in the numerical sequence shown in the figure.

Tightening torque:

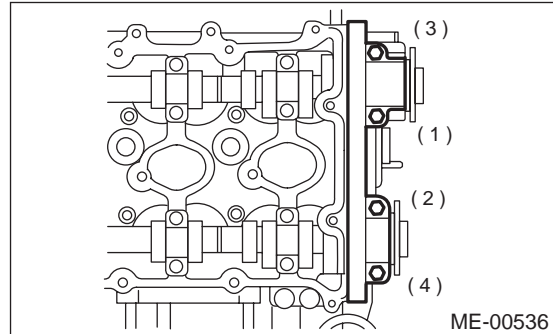
16 N·m (1.6 kgf·m, 11.6 ft·lb)



- (4) Tighten the front camshaft cap bolts in the numerical sequence shown in the figure.

Tightening torque:

9.8 N·m (1.0 kgf·m, 7.2 ft·lb)



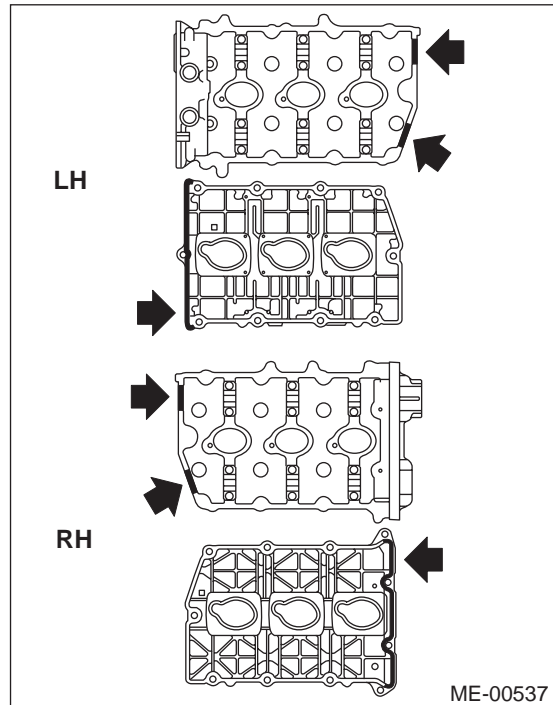
- 3) Install rocker cover.
 - (1) Apply fluid gasket sparingly to matching surface of cylinder heads and rocker covers shown in the figure.

CAUTION:

Do not apply fluid gasket excessively. Doing so may cause excess fluid gasket to come out and flow toward camshaft journal, resulting burning stuck of engine.

Fluid gasket:

THREE BOND 1280B



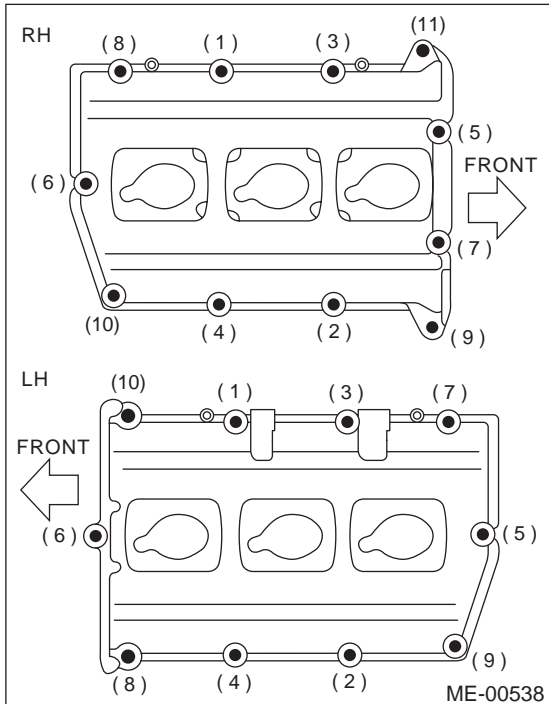
CAMSHAFT

MECHANICAL

(2) Tighten the rocker cover bolts in the numerical order shown in the figure.

Tightening torque:

6.4 N·m (0.64 kgf-m, 4.6 ft-lb)



4) Install rear chain cover. <Ref. to ME(H6DO)-48, INSTALLATION, Rear Chain Cover.>

5) Install crankshaft sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Crankshaft Sprocket.>

6) Install camshaft sprockets. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>

7) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>

8) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>

9) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

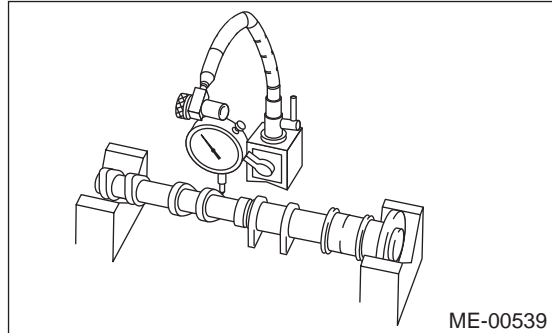
C: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

Limit:

0.020 mm (0.0008 in)



2) Check journal for damage and wear. Replace if faulty.

3) Measure outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	27.946 — 27.963 mm (1.1002 — 1.1009 in)

4) Measurement of the camshaft journal oil clearance

(1) Clean the bearing caps and camshaft journals.

(2) Place the camshafts on the cylinder head.

(3) Place plastigauge across each of the camshaft journals.

(4) Install the bearing caps.

NOTE:

Do not turn the camshaft.

(5) Remove the bearing caps.

(6) Measure the widest point of the plastigauge on each journal.

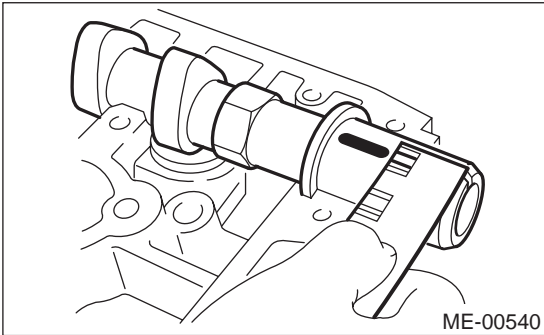
If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard oil clearance:

0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:

0.10 mm (0.0039 in)



(7) Completely remove the plastigauge.

5) Check cam face condition; remove minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H

Standard:

Intake:

45.75 — 45.85 mm (1.8012 — 1.8051 in)

Exhaust:

45.25 — 45.35 mm (1.7815 — 1.7854 in)

Limit:

Intake:

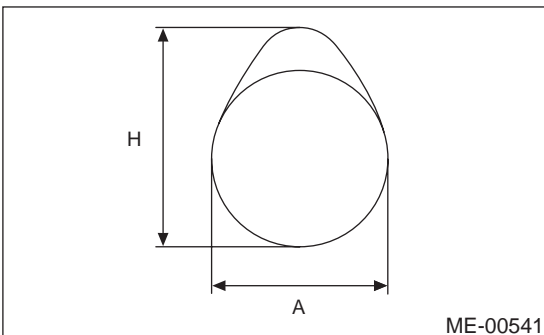
45.65 mm (1.7972 in)

Exhaust:

45.15 mm (1.7776 in)

Cam base circle diameter A:

36.0 mm (1.4173 in)



6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace caps and cylinder head as a set. If necessary replace camshaft.

Standard:

Intake:

0.075 — 0.135 mm (0.0030 — 0.0053 in)

Exhaust:

0.048 — 0.108 mm (0.0019 — 0.0043 in)

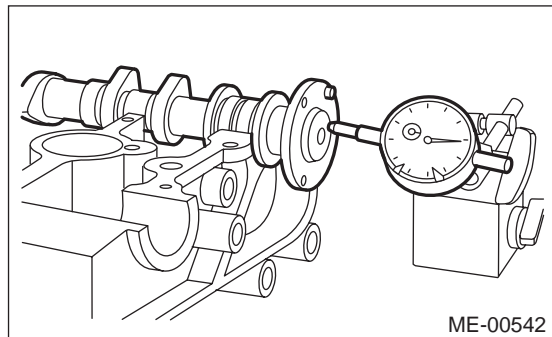
Limit:

Intake:

0.155 mm (0.0061 in)

Exhaust:

0.130 mm (0.0051 in)



CYLINDER HEAD ASSEMBLY

MECHANICAL

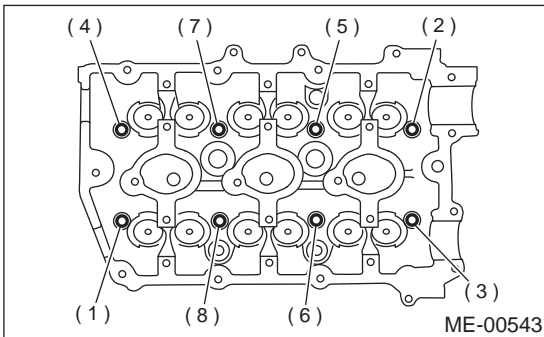
17. Cylinder Head Assembly

A: REMOVAL

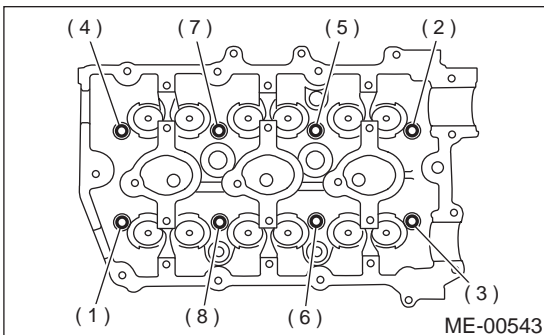
- 1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprockets. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
- 5) Remove crankshaft sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Crankshaft Sprocket.>
- 6) Remove rear chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Rear Chain Cover.>
- 7) Remove camshafts. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>
- 8) Remove cylinder head bolts in numerical sequence shown in figure.

NOTE:

Leave bolts (2) and (4) engaged by three or four threads to prevent cylinder head from falling.



- 9) Tap cylinder head with a plastic hammer to separate it from cylinder block.
- 10) Remove bolts (2) and (4) to remove cylinder head.



- 11) Remove cylinder head gasket.

NOTE:

Do not scratch the mating surface of cylinder head and cylinder block.

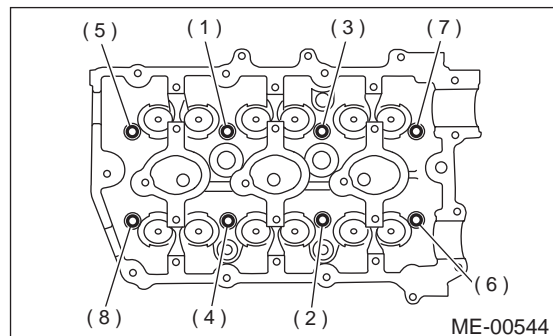
- 12) Similarly, remove right side cylinder head.

B: INSTALLATION

- 1) Install cylinder head and gaskets on cylinder block.

NOTE:

- Use new cylinder head gaskets.
 - Be careful not to scratch the mating surface of cylinder block and oil pump.
- 2) Tighten cylinder head bolts.
 - (1) Coat the washers and threaded parts of the cylinder head bolts with engine oil.
 - (2) Install the cylinder head on the cylinder block and tighten the bolts in the numerical order shown in the figure to a tightening torque of 20 N·m (2.0 kgf·m, 14 ft·lb).
 - (3) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 50 N·m (5.1 kgf·m, 37 ft·lb).
 - (4) Loosen all the bolts in 2 stages, 180° at a time, in the reverse order of tightening.
 - (5) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 25 N·m (2.5 kgf·m, 18 ft·lb).
 - (6) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 25 N·m (2.5 kgf·m, 18 ft·lb).
 - (7) Tighten all the bolts 90° in the numerical order shown in the figure.
 - (8) Tighten the (1) to (4) bolts 90° again in the numerical order shown in the figure.
 - (9) Tighten the (5) to (8) bolts 45° again in the numerical order shown in the figure.



- 3) Install camshafts. <Ref. to ME(H6DO)-50, INSTALLATION, Camshaft.>
- 4) Install rear chain cover. <Ref. to ME(H6DO)-48, INSTALLATION, Rear Chain Cover.>
- 5) Install crankshaft sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Crankshaft Sprocket.>
- 6) Install camshaft sprockets. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
- 7) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
- 8) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>

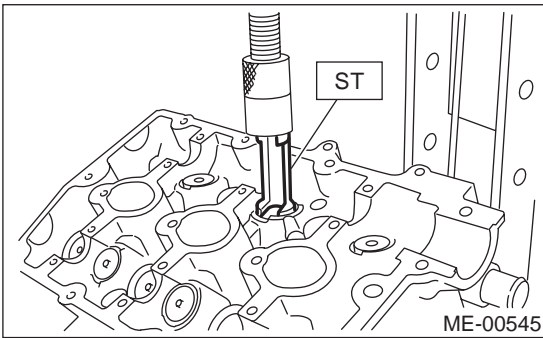
9) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: DISASSEMBLY

- 1) Place cylinder head on ST.
ST 18250AA000 CYLINDER HEAD TABLE
- 2) Remove valve shims and valve lifters.
- 3) Set ST on valve spring retainer. Compress valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

NOTE:

- For correct re-installation, keep removed parts in order in their original positions.
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve stem seals.



D: ASSEMBLY

- 1) Installation of valve spring and valve
 - (1) Place cylinder head on ST.
ST 18250AA000 CYLINDER HEAD TABLE
 - (2) Coat stem of each valve with engine oil and insert valve into valve guide.

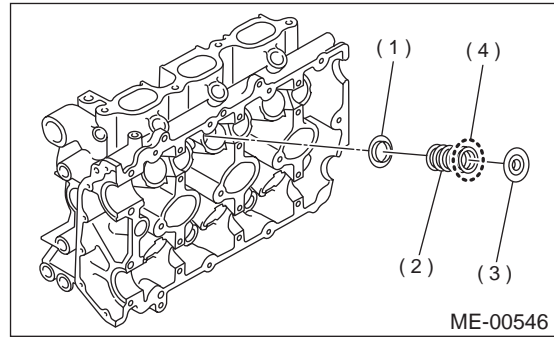
NOTE:

When inserting valve into valve guide, use special care not to damage the stem seal lip.

- (3) Install valve spring and retainer.

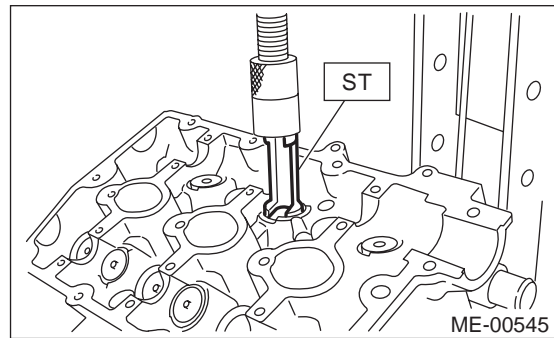
NOTE:

- Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.
- Install valve spring with the painted surface facing the retainer side.



- (1) Seat
- (2) Valve spring
- (3) Retainer
- (4) Painted face

- (4) Set ST on valve spring.
ST 499718000 VALVE SPRING REMOVER



- (5) Compress valve spring and fit valve spring retainer key.
- (6) After installing, tap valve spring retainers lightly with wooden hammer for better seating.
- 2) Apply oil to the surface of the valve lifter and valve shim.
- 3) Install valve lifter and valve shim.

CYLINDER HEAD ASSEMBLY

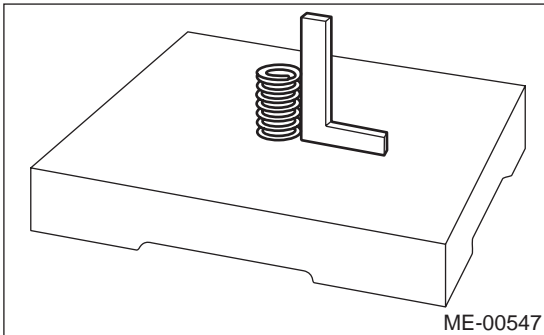
MECHANICAL

E: INSPECTION

1. VALVE SPRING

- 1) Check valve springs for damage, free length, and tension. Replace valve spring if it is not to the specifications presented below.
- 2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length	46.79 mm (1.8421 in)
Squareness	2.5°, 2.0 mm (0.079 in)



2. INTAKE AND EXHAUST VALVE STEM SEAL

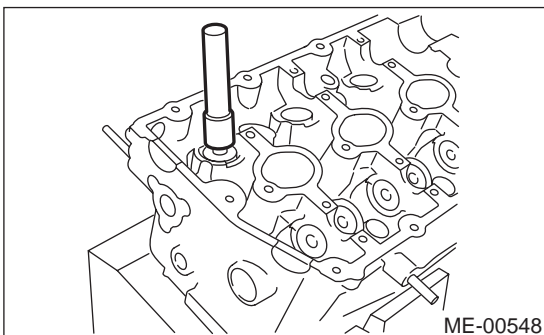
Replace oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced. Use pliers to pinch and remove oil seal from valve.

- 1) Place cylinder head on ST1.
- 2) Press-fit oil seal to the specified dimension indicated in the figure using ST2.

NOTE:

- Apply engine oil to stem seal before press-fitting.
- When press-fitting stem seal, do not use hammer or strike in.

ST1 18250AA000 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

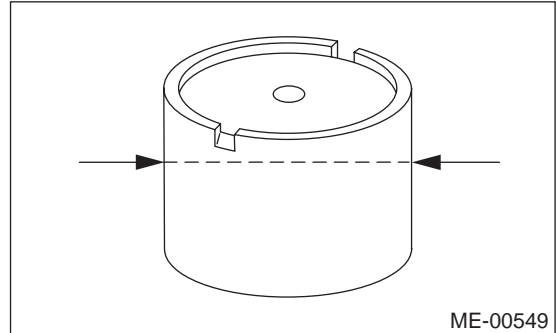


3. VALVE LIFTER

- 1) Check valve lifter visually.
- 2) Measure outer diameter of valve lifter.

Outer diameter:

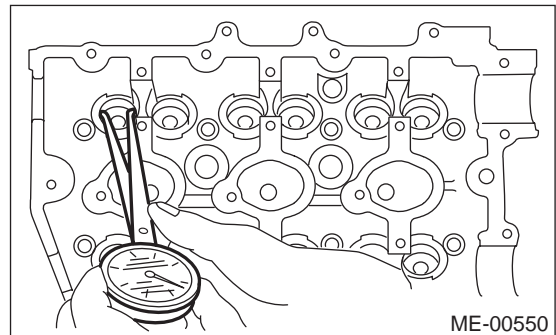
33.959 — 33.975 mm (1.3370 — 1.3376 in)



- 3) Measure inner diameter of valve lifter mating part on cylinder head.

Inner diameter:

34.006 — 34.016 mm (1.3388 — 1.3392 in)



NOTE:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace cylinder head.

Standard:

0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:

0.100 mm (0.0039 in)

F: ADJUSTMENT

1. CYLINDER HEAD

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.

Also make sure that gasket installing surface shows no trace of gas and water leaks.

2) Place cylinder head on ST.

ST 18250AA000 CYLINDER HEAD TABLE

3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.

If the warping exceeds 0.05 mm (0.0020 in), re-grind the surface with a surface grinder.

Warping limit:

0.05 mm (0.0020 in)

Grinding limit:

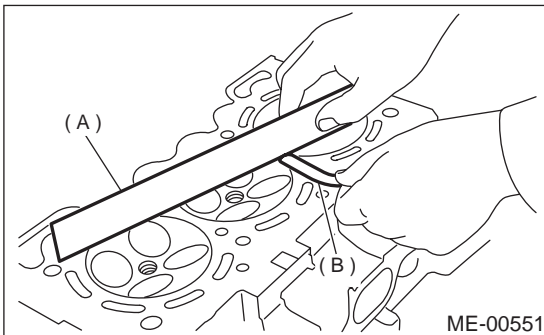
0.1 mm (0.004 in)

Standard height of cylinder head:

124 mm (4.88 in)

NOTE:

Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



- (A) Straight edge
- (B) Thickness gauge

2. VALVE SEAT

Inspect intake and exhaust valve seats, and correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: *W*

Intake

Standard

1.0 mm (0.039 in)

Limit

1.7 mm (0.067 in)

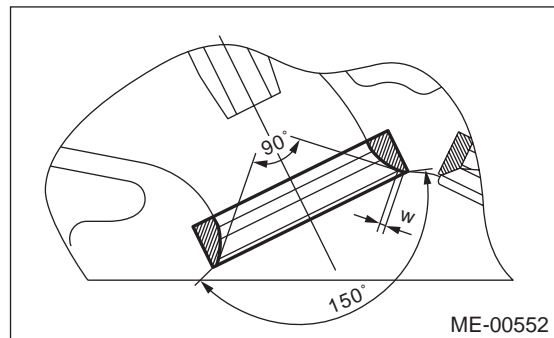
Exhaust

Standard

1.5 mm (0.059 in)

Limit

2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard

Intake

0.030 — 0.057 mm (0.0012 — 0.0022 in)

Exhaust

0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit

0.15 mm (0.0059 in)

CYLINDER HEAD ASSEMBLY

MECHANICAL

2) If the clearance between valve guide and stem exceeds the limit, replace valve guide or valve itself whichever shows greater amount of wear. See following procedure for valve guide replacement.

Valve guide inner diameter:

5.500 — 5.512 mm (0.2165 — 0.2170 in)

Valve stem outer diameter:

Intake

5.455 — 5.470 mm (0.2148 — 0.2154 in)

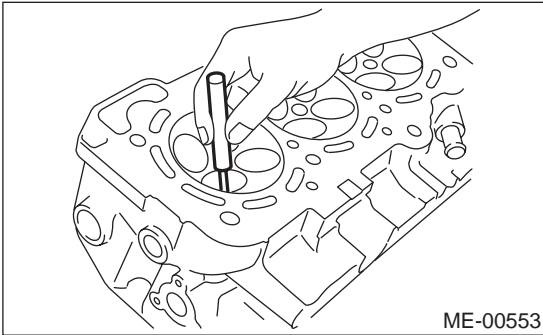
Exhaust

5.455 — 5.460 mm (0.2148 — 0.2150 in)

(1) Place cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

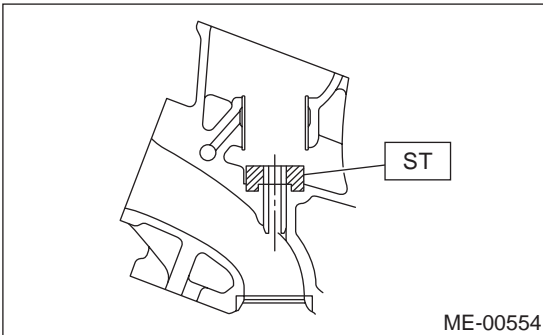
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1 18250AA000 CYLINDER HEAD TABLE
ST2 499765700 VALVE GUIDE REMOVER



(3) Turn cylinder head upside down and place ST as shown in the figure.

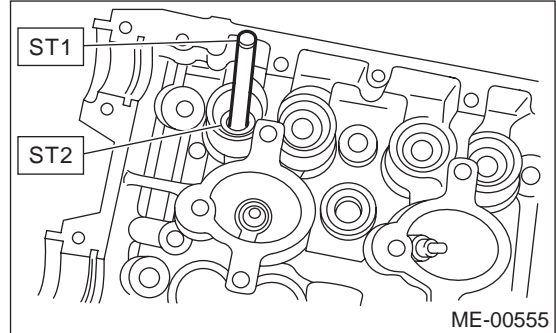
ST 18251AA000 VALVE GUIDE ADJUSTER



(4) Before installing new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

(5) Put new valve guide in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499765700 VALVE GUIDE REMOVER
ST2 18251AA000 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L

12.3 — 12.7 mm (0.484 — 0.500 in)

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean valve guide to remove chips.

ST 499765900 VALVE GUIDE REAMER

NOTE:

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

H:

Intake

Standard

1.0 mm (0.039 in)

Limit

0.8 mm (0.031 in)

Exhaust

Standard

1.2 mm (0.047 in)

Limit

0.8 mm (0.031 in)

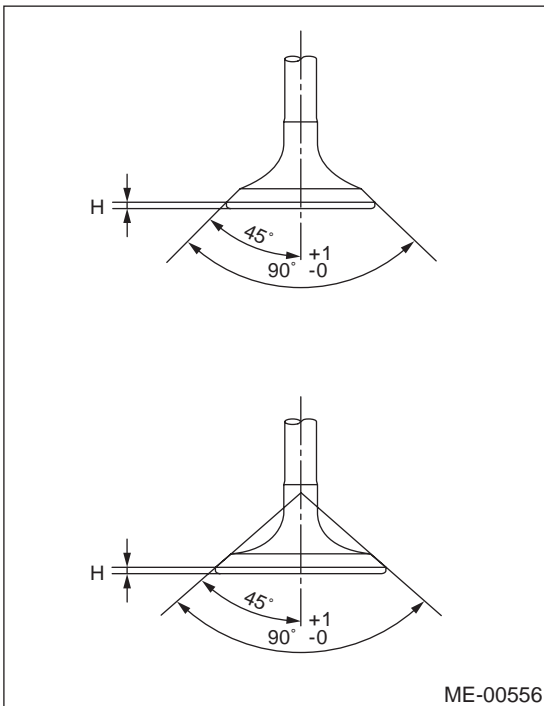
Valve overall length:

Intake

103.5 mm (4.075 in)

Exhaust

103.2 mm (4.063 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

CYLINDER BLOCK

MECHANICAL

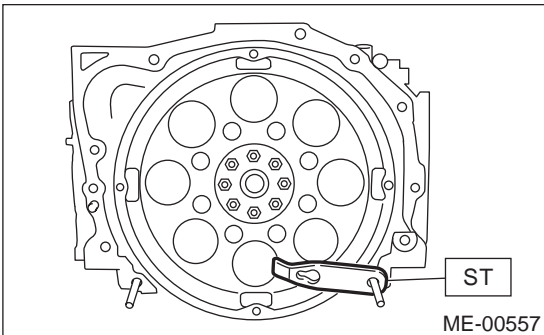
18. Cylinder Block

A: REMOVAL

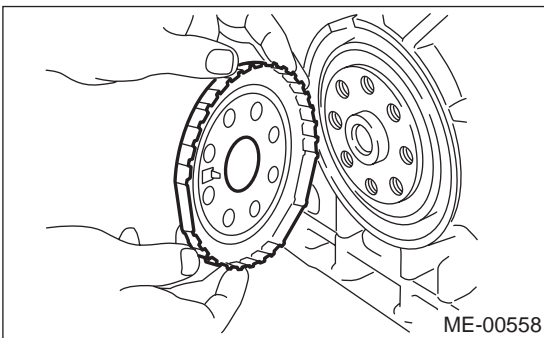
- 1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprockets. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
- 5) Remove crankshaft sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Crankshaft Sprocket.>
- 6) Remove rear chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Rear Chain Cover.>
- 7) Remove camshafts. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>
- 8) Remove cylinder head assembly. <Ref. to ME(H6DO)-54, REMOVAL, Cylinder Head Assembly.>
- 9) Remove drive plate.

Using ST, lock crankshaft.

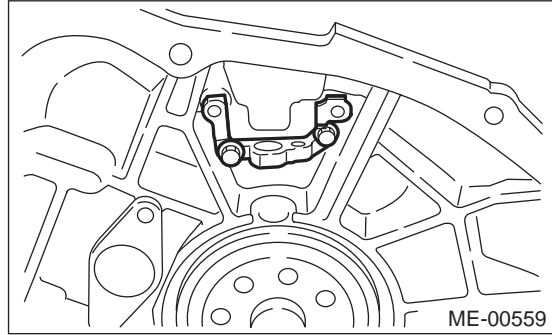
ST 498497100 CRANKSHAFT STOPPER



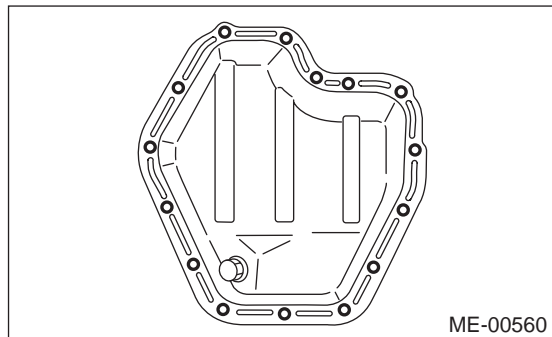
- 10) Remove crankshaft position sensor plate.



- 11) Remove crankshaft position sensor bracket.



- 12) Rotate engine until oil pan comes to the top.
- 13) Remove bolts which secure lower oil pan to upper oil pan.

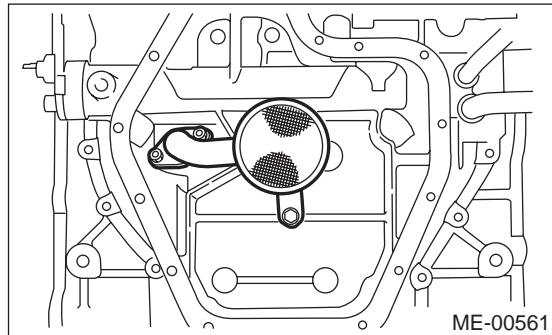


- 14) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove oil pan.

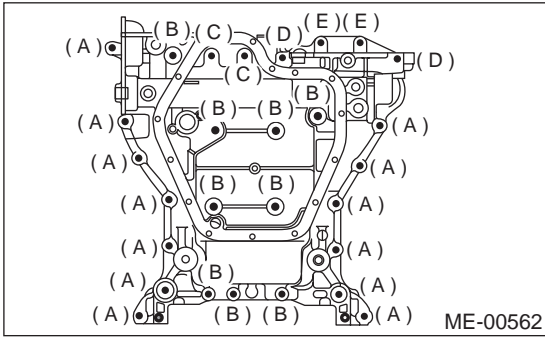
CAUTION:

Do not use a screwdriver or similar tool in place of oil pan cutter.

- 15) Remove oil strainer.



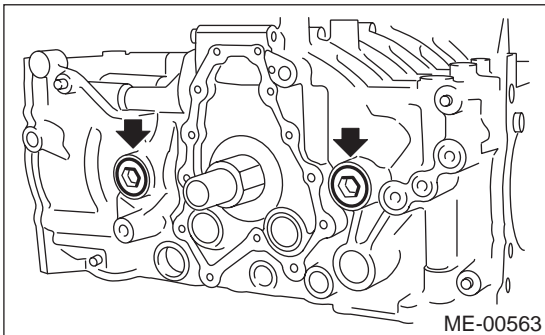
16) Remove bolts which secure upper oil pan to cylinder block.



Bolt dimension:

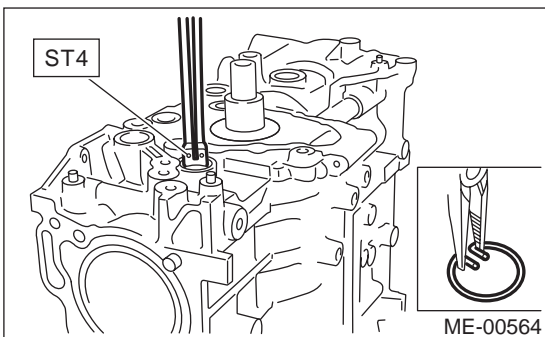
- (A) 8 × 40
- (B) 8 × 65
- (C) 8 × 85
- (D) 8 × 130
- (E) 8 × 24

17) Remove service hole cover and service hole plugs using hexagon wrench.



18) Rotate crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove piston circlip through service hole of #1 and #2 cylinders by using ST.

ST 18233AA000 PISTON PIN CIRCLIP PLIER

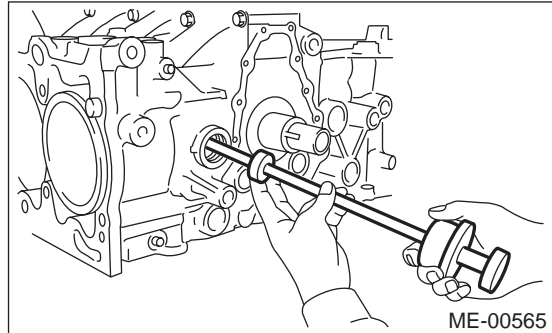


19) Draw out piston pin from #1 and #2 pistons by using ST.

ST 499097500 PISTON PIN REMOVER

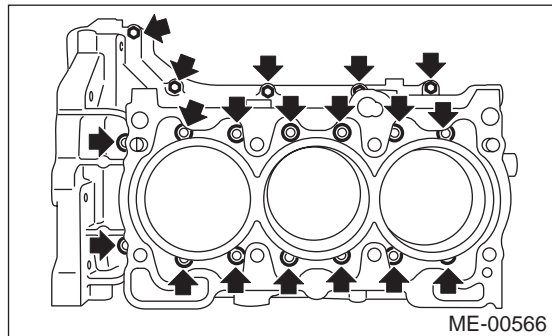
NOTE:

Be careful not to confuse original combination of piston, piston pin and cylinder.



20) Similarly remove piston pins from #3, #4, #5 and #6 pistons.

21) Remove bolts which connect cylinder block.



22) Separate left-hand and right-hand cylinder blocks.

NOTE:

When separating cylinder block, do not allow the connecting rod to fall and damage the cylinder block.

23) Remove rear oil seal.

24) Remove crankshaft together with connecting rod.

25) Remove crankshaft bearings from cylinder block using hammer handle.

NOTE:

Do not confuse combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

26) Draw out each piston from cylinder block using wooden bar or hammer handle.

NOTE:

Do not confuse combination of piston, piston pin and cylinder.

CYLINDER BLOCK

MECHANICAL

B: INSTALLATION

1) Install ST to cylinder block, then install crankshaft bearing.

ST 18232AA000 ENGINE STAND

NOTE:

Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

2) Position crankshaft and connecting rod on the #2, #4 and #6 cylinder.

3) Apply fluid gasket to the mating surface of #1, #3 and #5 cylinder block.

Fluid gasket:

THREE BOND 1215B or equivalent

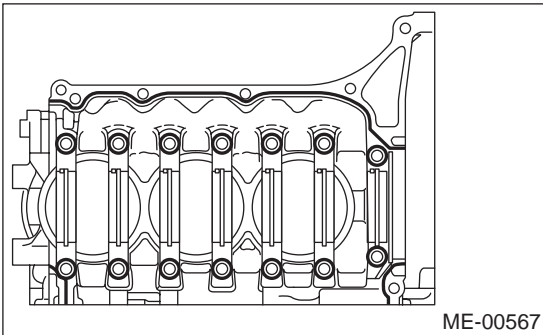
Part No.: 004403007

NOTE:

Do not allow fluid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.

Fluid gasket application diameter:

1.0±0.2 mm (0.039±0.008 in)

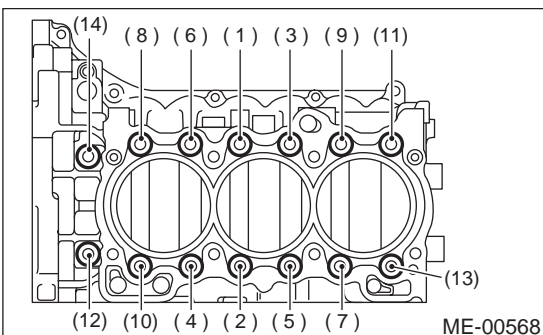


4) Apply engine oil to washers and threads of cylinder block connecting bolts. Tighten the bolts following the steps below.

(1) Tighten all the bolts in the numerical order shown in the figure.

Tightening torque:

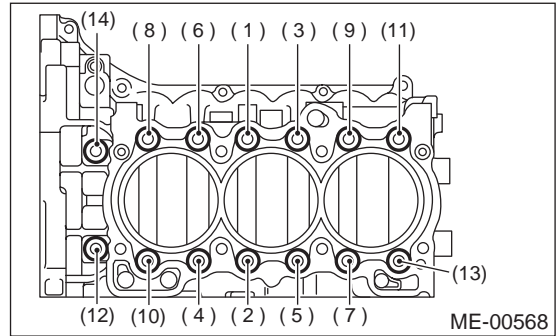
(1) to (11)	25 N·m (2.5 kgf-m, 18 ft-lb)
(12)	20 N·m (2.0 kgf-m, 14 ft-lb)
(13)	25 N·m (2.5 kgf-m, 18 ft-lb)
(14)	20 N·m (2.0 kgf-m, 14 ft-lb)



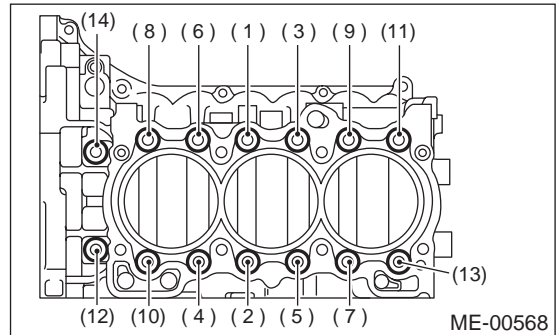
(2) Tighten all the bolts again in the order shown in the figure.

Tightening torque:

(1) to (11)	25 N·m (2.5 kgf-m, 18 ft-lb)
(12)	20 N·m (2.0 kgf-m, 14 ft-lb)
(13)	25 N·m (2.5 kgf-m, 18 ft-lb)
(14)	20 N·m (2.0 kgf-m, 14 ft-lb)



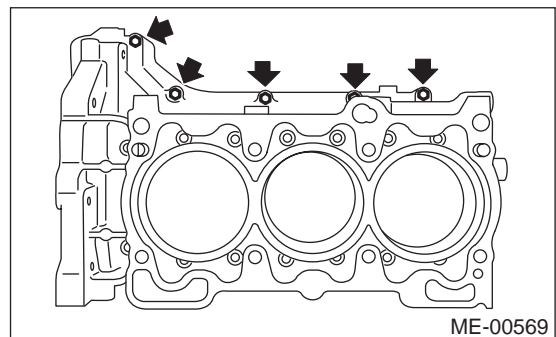
5) Tighten all the bolts by 90° in the order shown in the figure.



6) Install upper bolts on cylinder block.

Tightening torque:

25 N·m (2.5 kgf-m, 18 ft-lb)



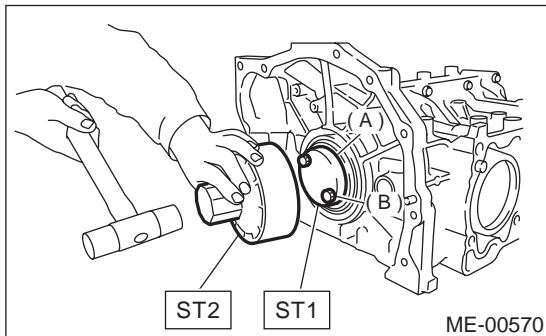
CYLINDER BLOCK

MECHANICAL

7) Install rear oil seal using ST1 and ST2.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

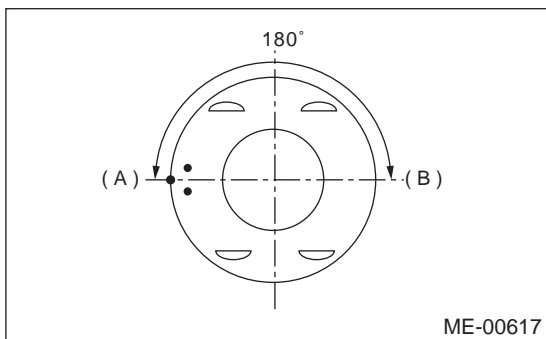
ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER



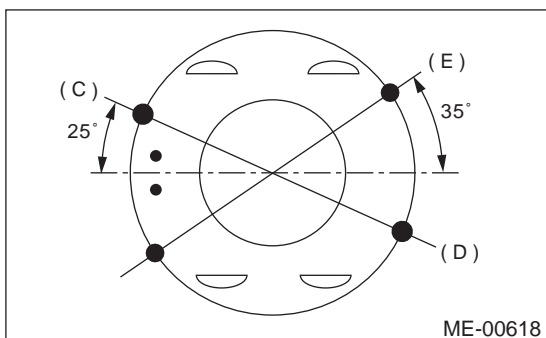
- (A) Rear oil seal
- (B) Drive plate attaching bolt

8) Positioning of piston ring.

- (1) Position the top ring gap at (A) in the figure.
- (2) Position the second ring gap at (B) in the figure.



- (3) Position the upper rail gap at (C) in the figure.
- (4) Position the expander gap at (D) in the figure.
- (5) Position the lower rail gap at (E) in the figure.



NOTE:

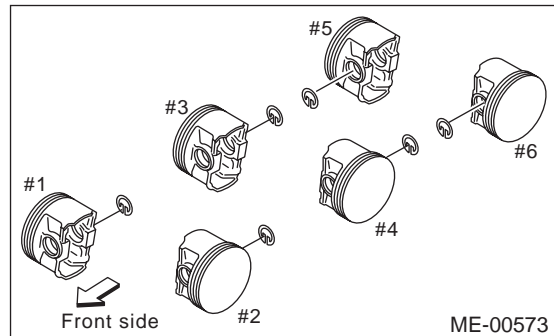
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

(6) Install circlip.

Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:

Use new circlips.



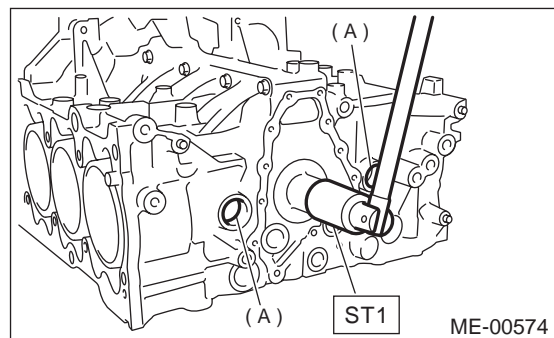
9) Installing piston.

NOTE:

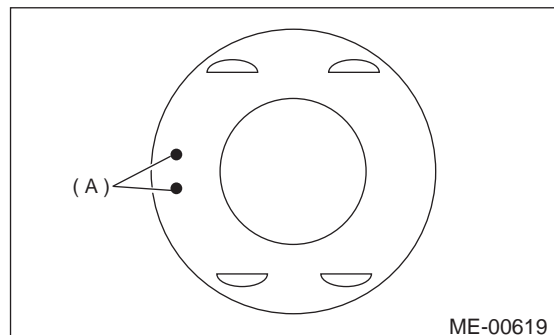
Install piston and piston pin to the same cylinder they were installed before overhaul.

- (1) Using ST1, rotate crankshaft until each small end of connecting rods #3 and #4 is aligned over service hole (A).

ST1 18252AA000 CRANKSHAFT SOCKET



- (2) Apply a coat of engine oil to piston and cylinders.
- (3) Install pistons with their front marks (A) facing the front of engine.

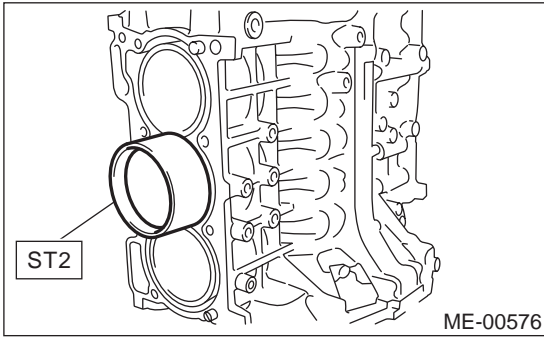


(4) Insert pistons in their cylinders using ST2.

CYLINDER BLOCK

MECHANICAL

ST2 18254AA000 PISTON GUIDE

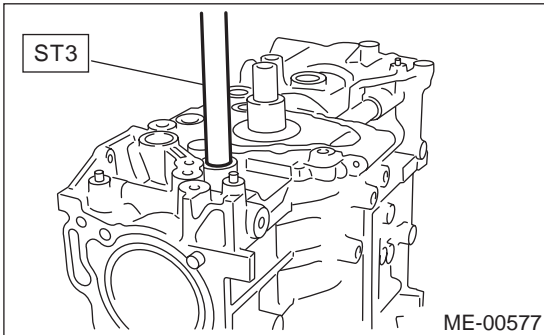


10) Installing piston pin.

- (1) Apply a coat of engine oil to ST3.

ST3 18253AA000 PISTON PIN GUIDE

- (2) Insert ST3 into service hole to align piston pin hole with connecting rod small end.



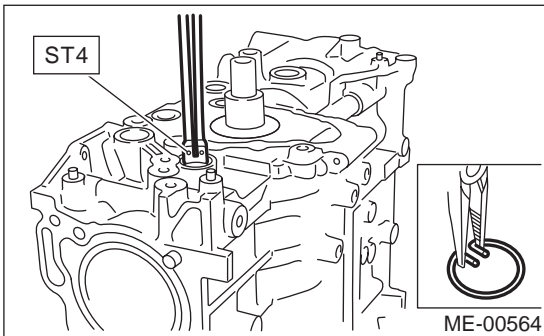
- (3) Apply a coat of engine oil to piston pin and insert piston pin into piston and connecting rod small end through service hole.

- (4) Using ST4, install circlip.

ST4 18233AA000 PISTON PIN CIRCLIP PLIER

NOTE:

Use a new circlip.



- 11) Repeat the same steps for pistons #1 and #2, #5 and #6.

- 12) Install service hole plug and cover.

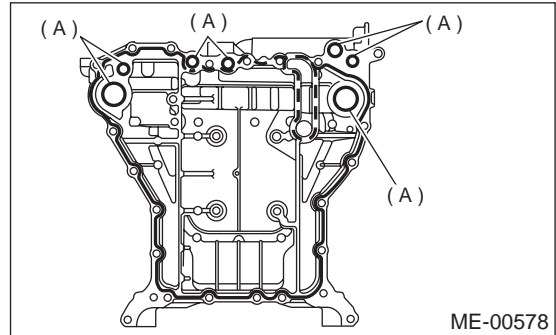
- 13) Apply fluid gasket to mating surface of upper oil pan.

- 14) Install O-ring.

Fluid gasket:

THREE BOND 1280B

Part No.: K0877YA018

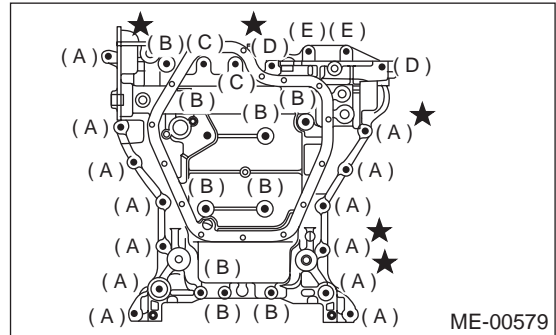


- (A) O-ring

- 15) Temporarily tighten the upper oil pan.

NOTE:

Do not confuse the mounting positions of the bolts.



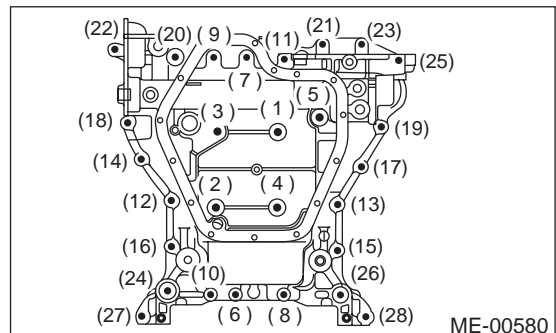
Bolt dimension:

- (A) 8 × 40
- (B) 8 × 65
- (C) 8 × 85
- (D) 8 × 130
- (E) 8 × 20

- 16) Tighten the upper oil pan mounting bolts in the numerical sequence shown in the figure.

Tightening torque:

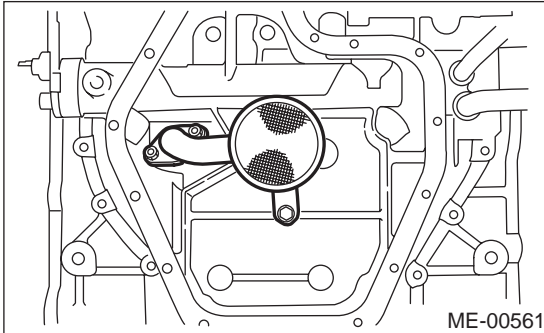
18 N·m (1.8 kgf·m, 13.0 ft·lb)



17) Install oil strainer.

NOTE:

Use a new O-ring.



18) Apply fluid gasket to mating surface of lower oil pan.

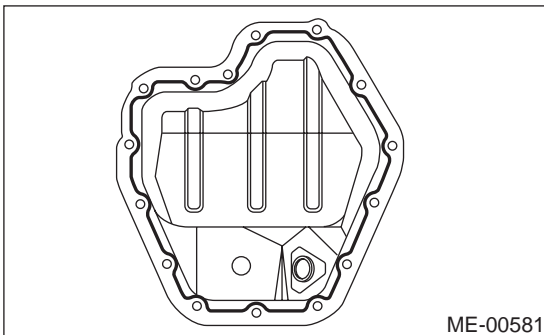
Fluid gasket:

THREE BOND 1280B

Part No.: K0877YA018

Fluid gasket application diameter:

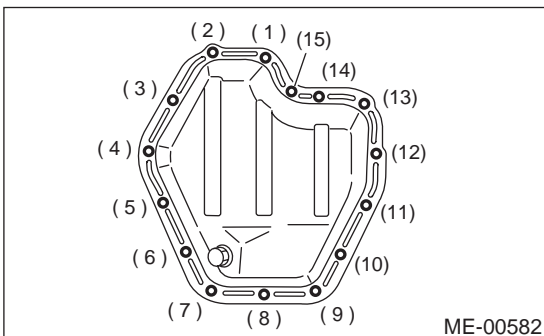
5.0±1.0 mm (0.097±0.039 in)



19) Tighten the lower oil pan mounting bolts in the numerical sequence shown in the figure.

Tightening torque:

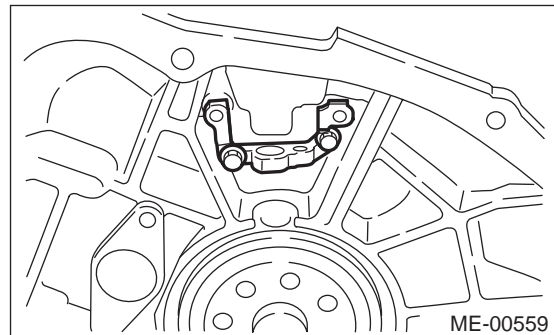
6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



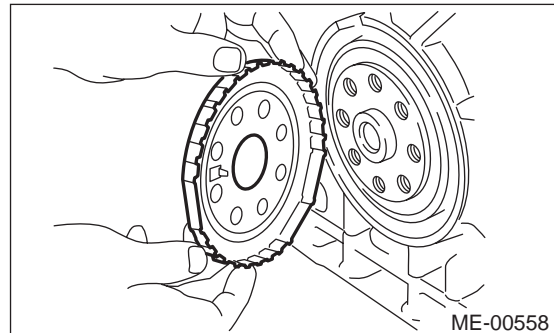
20) Install crankshaft position sensor bracket.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



21) Install crankshaft position sensor plate.



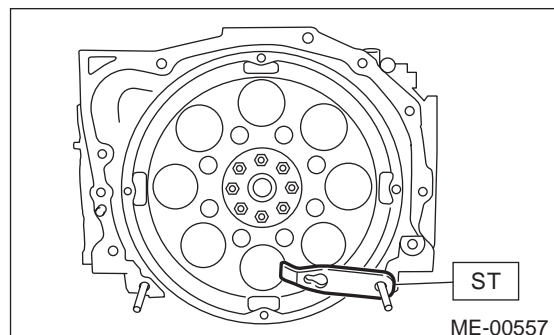
22) Install drive plate.

Using ST, lock crankshaft.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:

81 N·m (8.3 kgf·m, 60 ft·lb)



23) Install cylinder head assembly. <Ref. to ME(H6DO)-54, INSTALLATION, Cylinder Head Assembly.>

24) Install camshafts. <Ref. to ME(H6DO)-50, INSTALLATION, Camshaft.>

25) Install rear chain cover. <Ref. to ME(H6DO)-48, INSTALLATION, Rear Chain Cover.>

26) Install crankshaft sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Crankshaft Sprocket.>

27) Install camshaft sprockets. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>

CYLINDER BLOCK

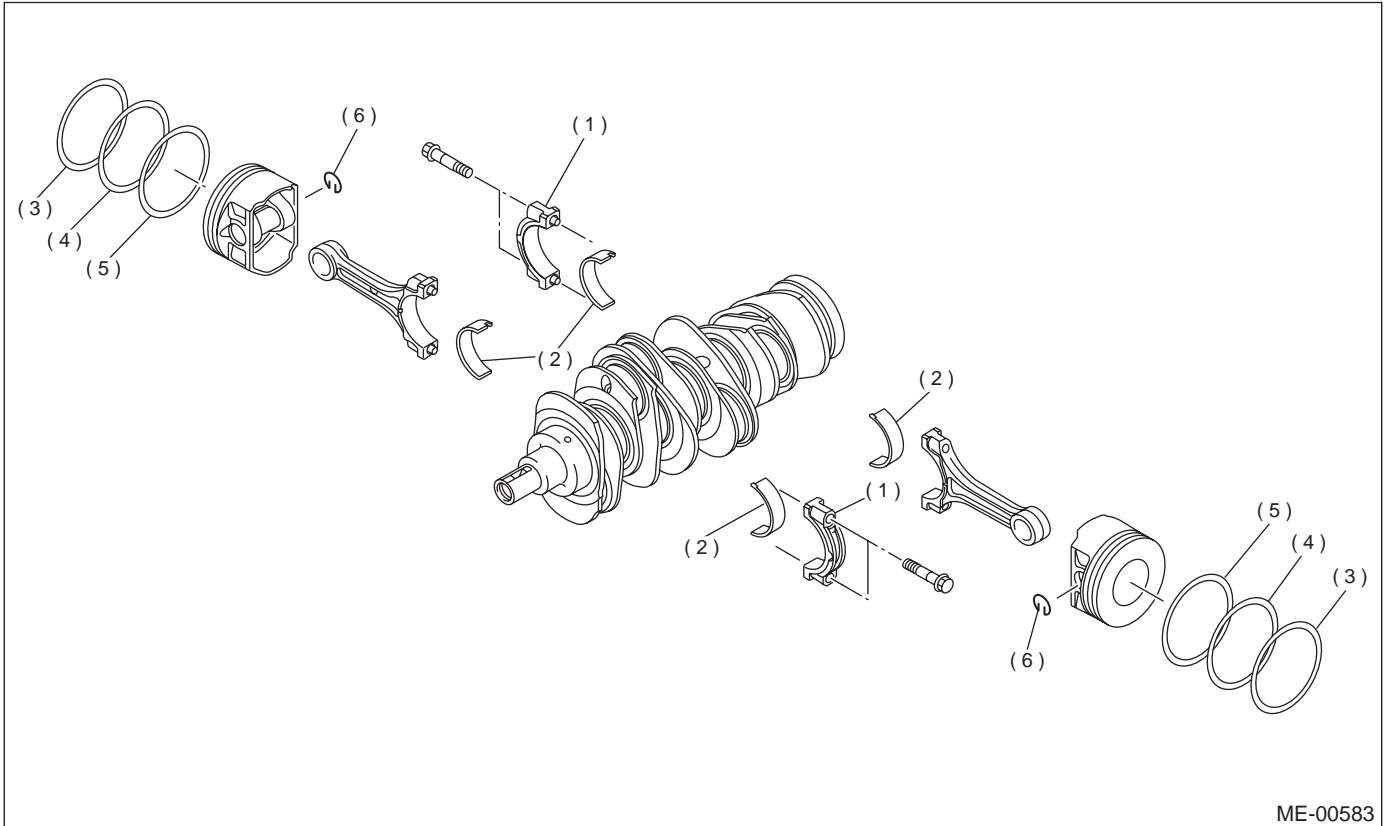
MECHANICAL

28) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>

29) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>

30) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: DISASSEMBLY



ME-00583

(1) Connecting rod cap

(3) Top ring

(5) Oil ring

(2) Connecting rod bearing

(4) Second ring

(6) Circlip

1) Remove connecting rod cap.

2) Remove connecting rod bearing.

NOTE:

Arrange removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove piston rings using the piston ring expander.

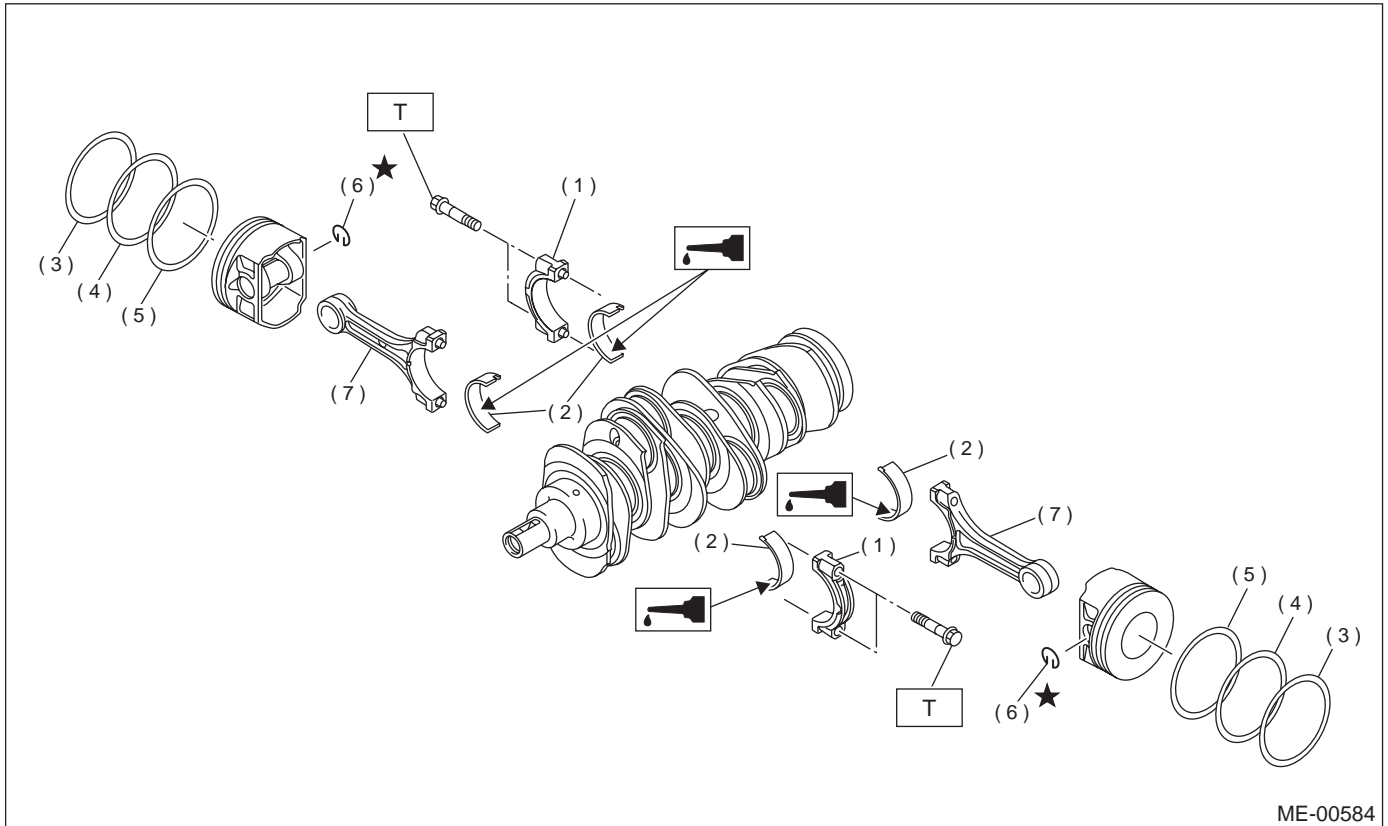
4) Remove the oil ring by hand.

NOTE:

Arrange the removed piston rings in good order to prevent confusion.

5) Remove circlip.

D: ASSEMBLY



ME-00584

- | | |
|----------------------------|--------------------|
| (1) Connecting rod cap | (5) Oil ring |
| (2) Connecting rod bearing | (6) Circlip |
| (3) Top ring | (7) Connecting rod |
| (4) Second ring | |

Tightening torque: N·m (kgf·m, ft·lb)
T: 53 (5.4, 39)

1) Install connecting rod bearings on connecting rods and connecting rod caps.

CAUTION:

Apply oil to the surfaces of the connecting rod bearings.

2) Install connecting rod on crankshaft.

CAUTION:

Position each connecting rod with the side marked facing forward.

3) Install connecting rod cap with connecting rod nut.

Ensure the arrow on connecting rod cap faces the front during installation.

CAUTION:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
- When tightening the connecting rod nuts, apply oil on the threads.

4) Installation of piston rings and oil ring

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect important parts by means of red lead check.

2) Check the oil passages for clogging.

3) Inspect crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:

0.05 mm (0.0020 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

202 mm (7.95 in)

CYLINDER BLOCK

MECHANICAL

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block's front upper surface.

NOTE:

Measurement should be performed at a temperature 20°C (68°F).

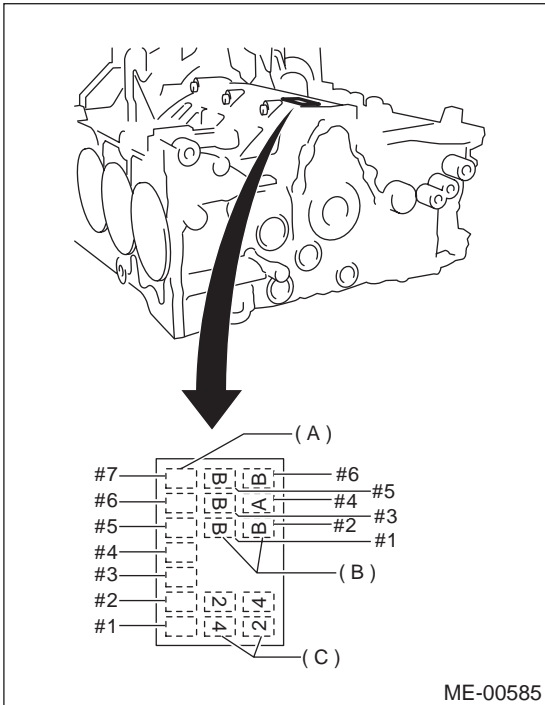
NOTE:

Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

Standard diameter:

A: 89.205 — 89.215 mm (3.5120 — 3.5124 in)

B: 89.195 — 89.205 mm (3.5116 — 3.5120 in)



- (A) Main journal size mark
- (B) Cylinder bore size mark
- (C) Cylinder block RH-LH combination mark

2) How to measure the inner diameter of each cylinder

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

CAUTION:

Measurement should be performed at a temperature 20°C (68°F).

Taper:

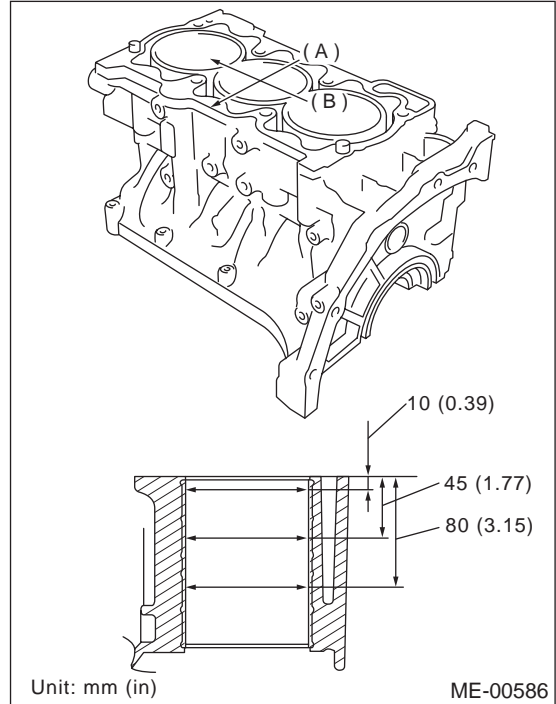
Limit

0.050 mm (0.0020 in)

Out-of-roundness:

Limit

0.050 mm (0.0020 in)



- (A) Thrust direction
- (B) Piston pin direction

3) When piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston

Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

CAUTION:

Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
39.0 mm (1.535 in)

Piston outer diameter:
Standard

A: 89.185 — 89.195 mm
(3.5112 — 3.5116 in)

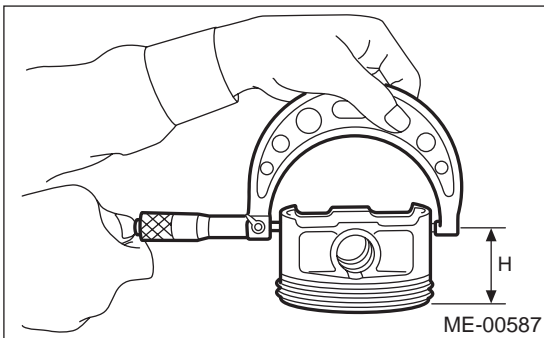
B: 89.175 — 89.185 mm
(3.5108 — 3.5112 in)

0.25 mm (0.0098 in) oversize

89.425 — 89.435 mm
(3.5207 — 3.5211 in)

0.50 mm (0.0197 in) oversize

89.675 — 89.685 mm
(3.5305 — 3.5309 in)



5) Calculate the clearance between cylinder and piston.

CAUTION:

Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard

0.010 — 0.030 mm (0.0004 — 0.0012 in)

Limit

0.050 mm (0.0020 in)

6) Boring and honing

(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

NOTE:

When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cyl-

inder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H6DO)-68, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.

3) Make sure that piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

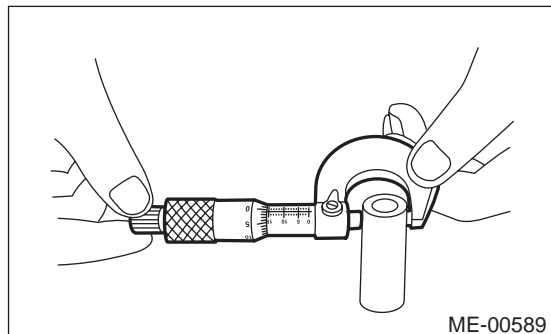
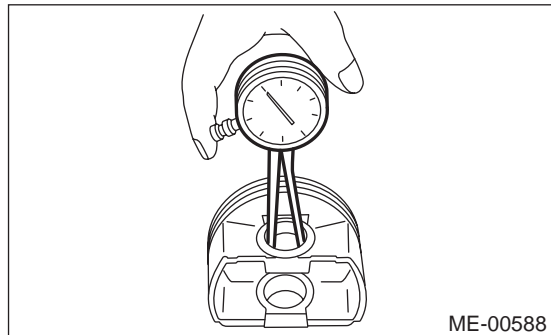
Standard clearance between piston pin and hole in piston:

Standard

0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

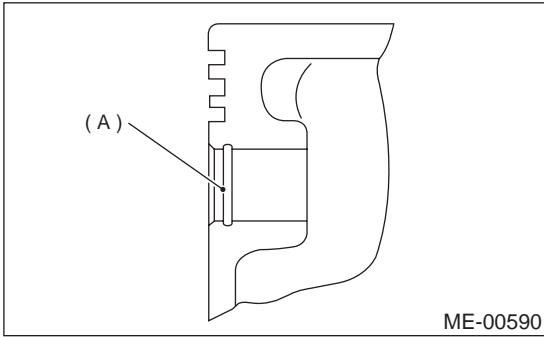
0.020 mm (0.0008 in)



CYLINDER BLOCK

MECHANICAL

4) Check circlip installation groove on the piston for burr. If necessary, remove burr (A) from the groove so that piston pin can lightly move.



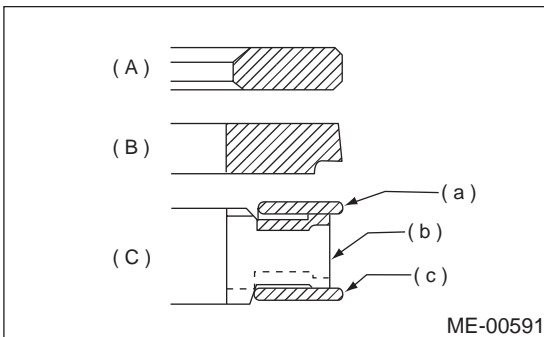
5) Check piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace piston ring with a new one of the same size as the piston.

CAUTION:

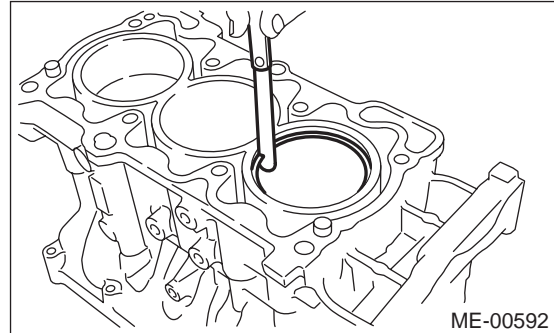
- Marks are shown on the end of the top and second rings. When installing the rings to the piston, face this mark upward.
- The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.



- (A) Top ring
- (B) Second ring
- (C) Oil ring
- (a) Upper rail
- (b) Expander
- (c) Lower rail

2) Squarely place piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.60 (0.0079 — 0.0236)	1.5 (0.059)

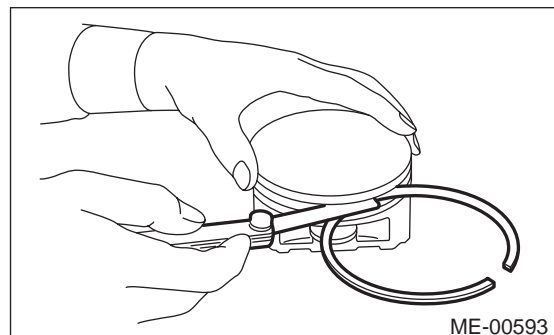


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

CAUTION:

Before measuring the clearance, clean the piston ring groove and piston ring.

		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)
Clearance between oil ring and oil ring groove		0.065 — 0.155 (0.0026 — 0.0061)	—

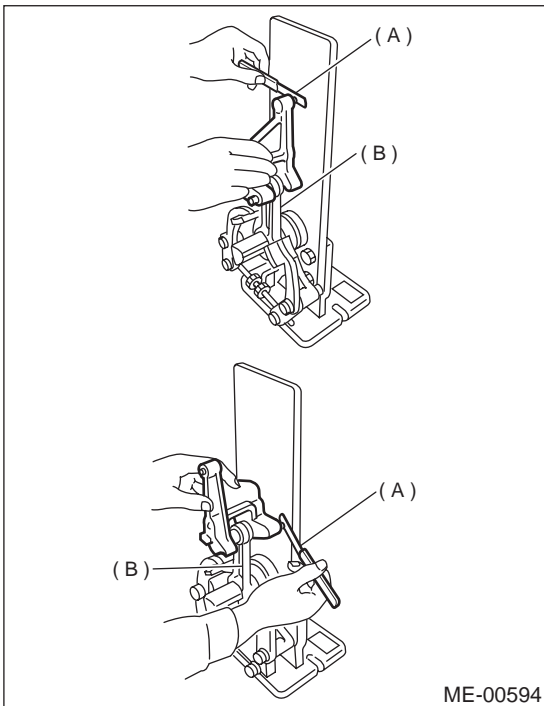


5. CONNECTING ROD

- 1) Replace connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:

0.10 mm (0.0039 in)



- (A) Thickness gauge
- (B) Connecting rod

- 3) Install connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). Replace connecting rod if the side clearance exceeds the specified limit.

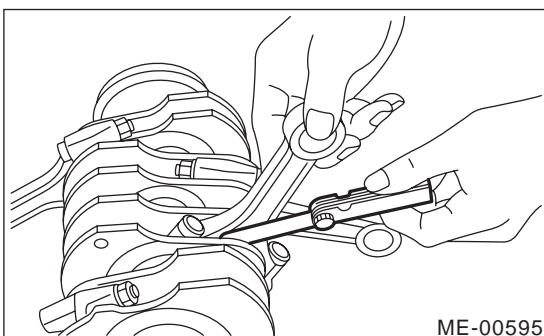
Connecting rod side clearance:

Standard

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Limit

0.4 mm (0.016 in)



- 4) Inspect connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

- 5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:

Standard

0.020 — 0.046 mm (0.0008 — 0.0018 in)

Limit

0.050 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

CYLINDER BLOCK

MECHANICAL

6) Inspect bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

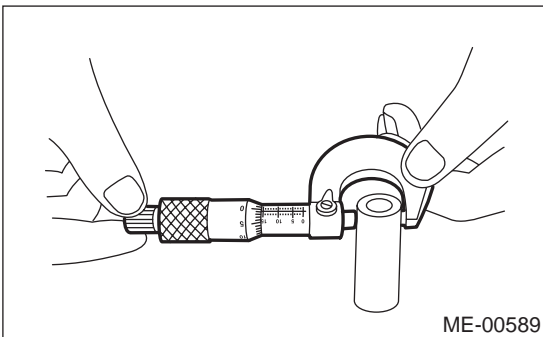
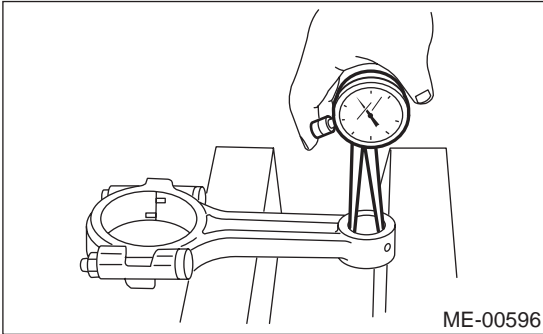
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

0.030 mm (0.0012 in)

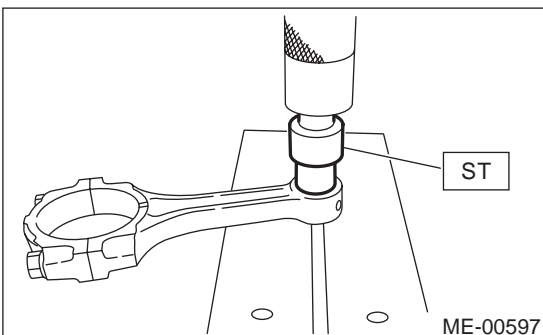


7) Replacement procedure is as follows.

(1) Remove bushing from connecting rod with ST and press.

(2) Press bushing with ST after applying oil on the periphery of bushing.

ST 18350AA000 CONNECTING ROD BUSHING REMOVER AND INSTALLER



(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.

(4) After completion of reaming, clean bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.

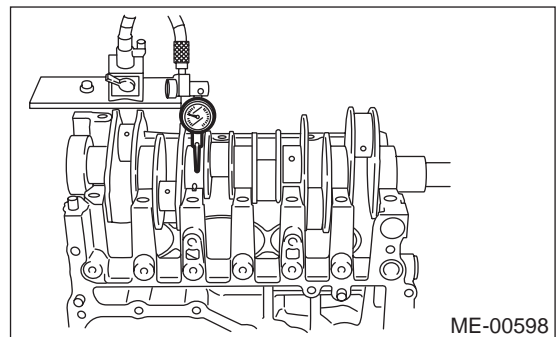
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

NOTE:

If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure crankshaft bend using a dial gauge.

Crankshaft bend limit:

0.035 mm (0.0014 in)



3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace bearing with a suitable (undersize) one, and replace or recondition crankshaft as necessary. When grinding crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

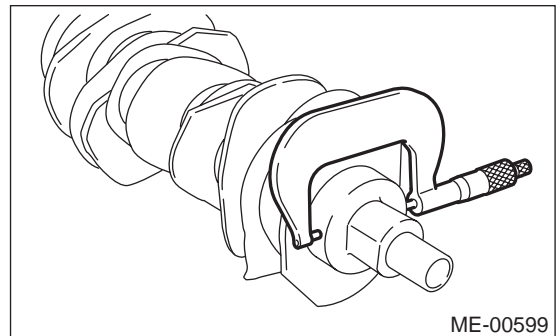
Crank pin and crank journal:

Out-of-roundness

0.020 mm (0.0008 in) or less

Grinding limit

0.250 mm (0.0098 in)



CYLINDER BLOCK

MECHANICAL

		Crank journal diameter		Crank pin diameter
		#1, #3, #5, #7	#2, #4, #6	
Standard	Journal O.D.	63.992 — 64.008 (2.5194 — 2.5200)		51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.992 — 2.005 (0.0784 — 0.0789)	1.996 — 2.000 (0.0786 — 0.0787)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	63.962 — 63.978 (2.5182 — 2.5188)		51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.020 (0.0795 — 0.0795)	1.510 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	63.942 — 63.958 (2.5174 — 2.5180)		51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.520 — 1.523 (0.0598 — 0.0600)
0.25 (0.0098) undersize	Journal O.D.	63.742 — 63.758 (2.5095 — 2.5102)		51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)

O.D. ... Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

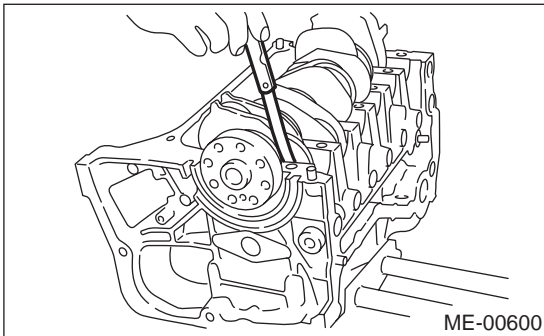
Crankshaft thrust clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition crankshaft as necessary.

		Unit: mm (in)
Crankshaft oil clearance		
Standard	0.010 — 0.030 (0.0004 — 0.0012)	
Limit	0.050 (0.0020)	

ENGINE TROUBLE IN GENERAL

MECHANICAL

19.Engine Trouble in General

A: INSPECTION

NOTE:

“RANK” shown in the chart refer to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
• Seized or stuck piston and cylinder		C	
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Fuel line	• Defective fuel pump and relay	A
		• Lack of or insufficient fuel	B
	• Chain	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
	• Improper engine oil (low viscosity)	B	
3) Initial combustion occur.	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Chain	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
• Incorrect valve timing		B	
• Improper engine oil (low viscosity)	B		

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	B
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	C
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Dirty air cleaner element	C
	• Fuel line	• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Chain	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
• Worn or stuck piston rings, cylinder and piston		C	
• Incorrect valve timing		B	
• Improper engine oil (low viscosity)		B	
2. Rough idle and engine stall	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	C
		• Loosened oil filter cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Chain	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
		• Defective rocker cover gasket	C
	• Cooling system	• Overheating	C
	• Others	• Malfunction of evaporative emission control system	A
		• Stuck or damaged throttle valve	B
		• Accelerator cable out of adjustment	C

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	B
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
• Improper engine oil (low viscosity)	B		
• Lubrication system	• Incorrect oil pressure	B	
• Cooling system	• Overheating	C	
	• Over cooling	C	
• Others	• Malfunction of evaporative emission control system	A	
4. Surging	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
• Improper engine oil (low viscosity)	B		
• Cooling system	• Overheating	B	
• Others	• Malfunction of evaporative emission control system	C	

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked vacuum hose	A
	• Others	• Stuck or damaged throttle valve	A
		• Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	B
7. After burning in exhaust system	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	C
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	B
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
• Lubrication system	• Incorrect oil pressure	C	
• Cooling system	• Over cooling	C	
• Others	• Malfunction of evaporative emission control system	C	
8. Knocking	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filter cap	B
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filter seal	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
	• Loosened oil pan fitting bolts or defective oil pan	B	

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK	
10. Excessive fuel consumption	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A	
	• Intake system	• Dirty air cleaner element	A	
	• Chain	• Defective timing	B	
	• Compression	• Incorrect valve clearance		B
		• Loosened spark plugs or defective gasket		C
		• Loosened cylinder head bolts or defective gasket		C
		• Improper valve seating		B
		• Defective valve stem		C
		• Worn or broken valve spring		C
		• Worn or stuck piston rings, cylinder and piston		B
		• Incorrect valve timing		B
	• Lubrication system	• Incorrect oil pressure	C	
	• Cooling system	• Over cooling	C	
• Others	• Accelerator cable out of adjustment	B		

20.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	<ul style="list-style-type: none"> Valve mechanism is defective. Incorrect valve clearance Worn camshaft Broken valve spring
Heavy and dull clank	Oil pressure is low.	<ul style="list-style-type: none"> Worn crankshaft main bearing Worn connecting rod bearing (big end)
	Oil pressure is normal.	<ul style="list-style-type: none"> Loose flywheel mounting bolts Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	<ul style="list-style-type: none"> Ignition timing advanced Accumulation of carbon inside combustion chamber Wrong spark plug Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> Worn crankshaft main bearing Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> Worn cylinder liner and piston ring Broken or stuck piston ring Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	<ul style="list-style-type: none"> Unusually worn valve lifter Worn cam gear Worn camshaft journal bore in crankcase
Squeaky sound	—	<ul style="list-style-type: none"> Insufficient generator lubrication
Rubbing sound	—	<ul style="list-style-type: none"> Defective generator brush and rotor contact
Gear scream when starting engine	—	<ul style="list-style-type: none"> Defective ignition starter switch Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	<ul style="list-style-type: none"> Loose drive belt Defective water pump shaft
Hissing sound	—	<ul style="list-style-type: none"> Loss of compression Air leakage in air intake system, hoses, connections or manifolds
Timing chain noise	—	<ul style="list-style-type: none"> Loose timing chain Chain contacting case/adjacent part
Valve tappet noise	—	<ul style="list-style-type: none"> Incorrect valve clearance

NOTE*:

When disconnecting fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.

Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H6DO)-54, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-47, Inspection Mode.> after connecting fuel injector connector.

ENGINE NOISE

MECHANICAL

MEMO:

EXHAUST

EX(H6DO)

	Page
1. General Description	2
2. Front Exhaust Pipe.....	5
3. Rear Exhaust Pipe	8
4. Muffler	9

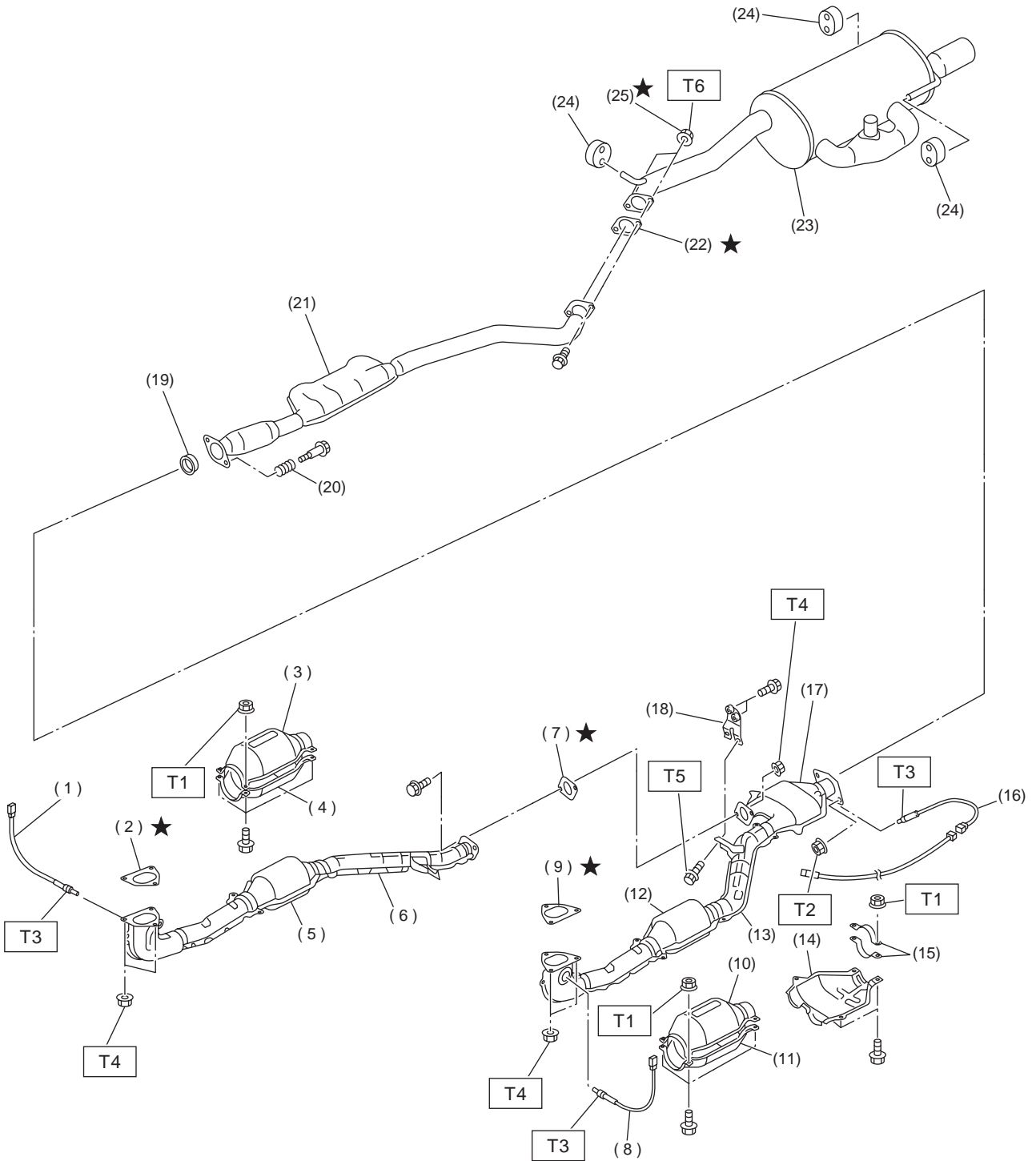


GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT



EX-00110

GENERAL DESCRIPTION

EXHAUST

(1) Front oxygen (A/F) sensor (RH)	(11) Lower front catalytic converter cover (LH)	(22) Gasket
(2) Gasket (RH)	(12) Front catalytic converter (LH)	(23) Muffler
(3) Upper front catalytic converter cover (RH)	(13) Front exhaust pipe (LH)	(24) Cushion rubber
(4) Lower front catalytic converter cover (RH)	(14) Lower rear catalytic converter cover	(25) Self-locking nut
(5) Front catalytic converter (RH)	(15) Clamp	
(6) Front exhaust pipe (RH)	(16) Rear oxygen sensor	
(7) Gasket (RH)	(17) Rear catalytic converter	
(8) Front oxygen (A/F) sensor (LH)	(18) Bracket	
(9) Gasket (LH)	(19) Gasket	
(10) Upper front catalytic converter cover (LH)	(20) Spring	
	(21) Rear exhaust pipe	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.4)

T2: 18 (1.8, 13.0)

T3: 21 (2.1, 15)

T4: 30 (3.1, 22.4)

T5: 35 (3.6, 26.0)

T6: 48 (4.9, 35.4)

GENERAL DESCRIPTION

EXHAUST

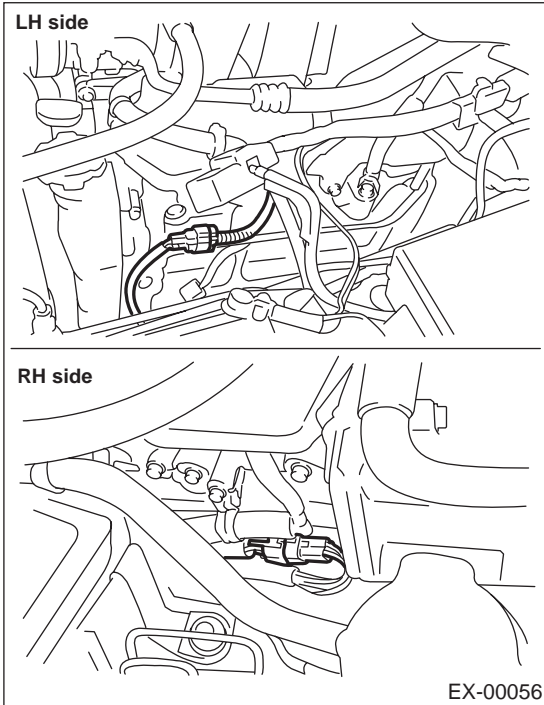
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

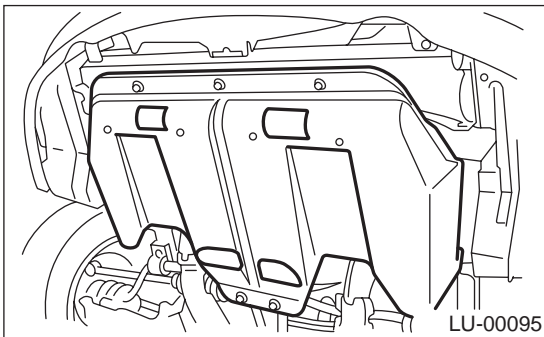
2. Front Exhaust Pipe

A: REMOVAL

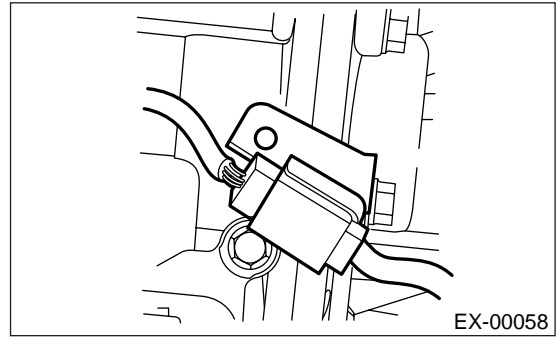
- 1) Remove battery.
- 2) Remove air cleaner case and air intake duct.
<Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
and <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
- 3) Disconnect front oxygen (A/F) sensor connector.



- 4) Lift-up the vehicle.
- 5) Remove under cover.

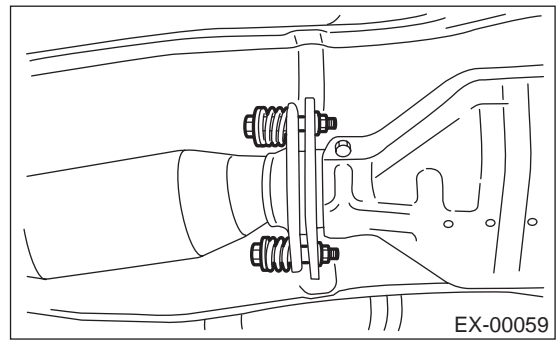


- 6) Disconnect rear oxygen sensor connector.



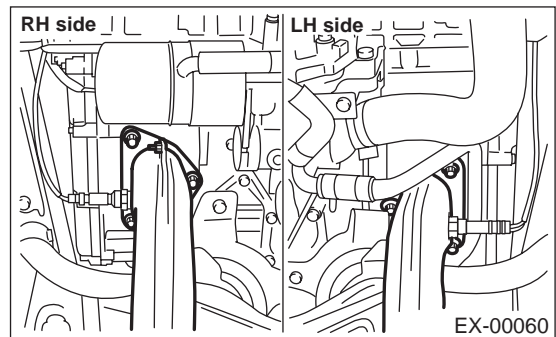
- 7) Separate front exhaust pipe assembly from rear exhaust pipe.

WARNING:
Be careful, exhaust pipe is hot.



- 8) Remove nuts which hold front exhaust pipe onto cylinder heads.

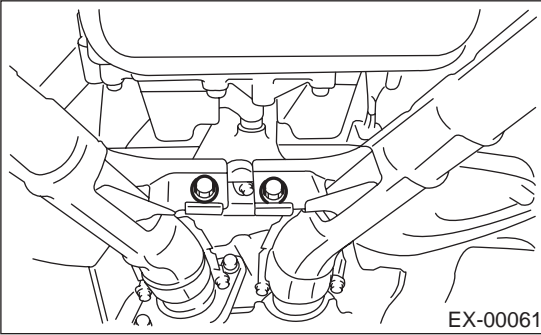
CAUTION:
Be careful not to pull down front exhaust pipe assembly.



FRONT EXHAUST PIPE

EXHAUST

9) Remove bolt which secures front exhaust pipe assembly to hanger bracket.

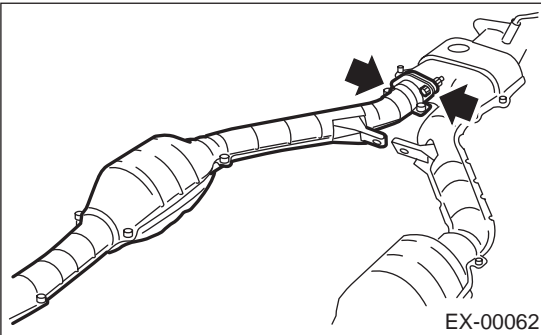


10) Remove front exhaust pipe from the vehicle.

CAUTION:

- Be careful not to let front exhaust pipe assembly fall off when removing as it is quite heavy.
- After removing front exhaust assembly, do not apply excessive pulling force on rear exhaust pipe.

11) Separate front exhaust pipe (RH) from front exhaust pipe assembly.



B: INSTALLATION

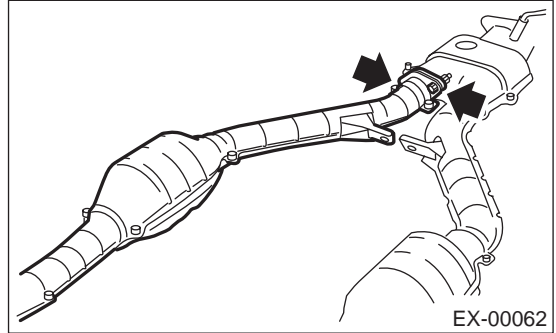
1) Install front exhaust pipe (RH) to front exhaust pipe assembly.

NOTE:

Replace gaskets with new ones.

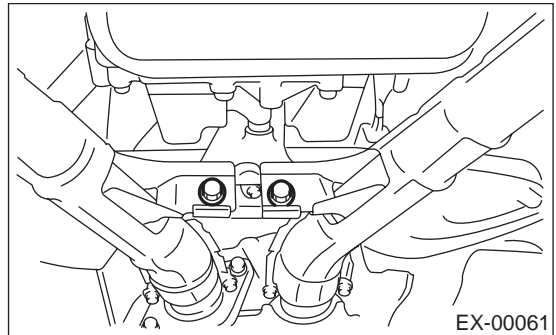
Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)



2) Install front exhaust pipe assembly to the vehicle.

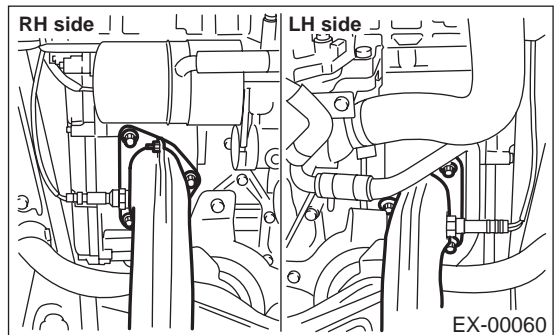
3) Temporarily tighten bolt which installs front exhaust pipe assembly to hanger bracket.



4) Tighten nuts which hold front exhaust pipe onto cylinder heads.

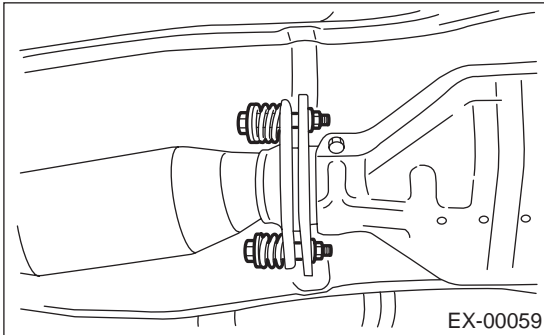
Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)



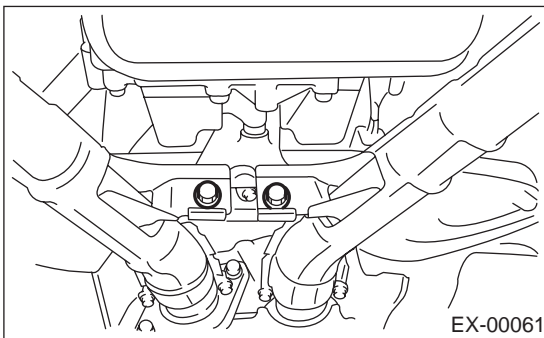
- 5) Install under cover.
- 6) Tighten bolts which install front exhaust pipe to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf·m, 13.0 ft·lb)

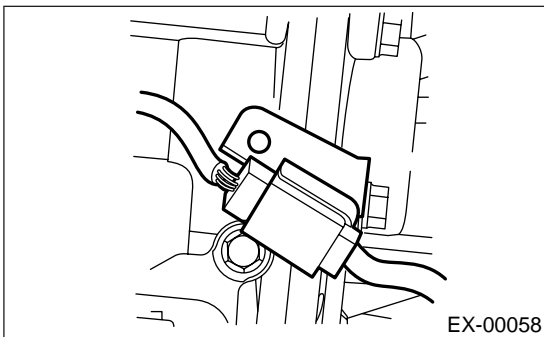


- 7) Tighten bolt which holds front exhaust pipe assembly to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf·m, 26.0 ft·lb)

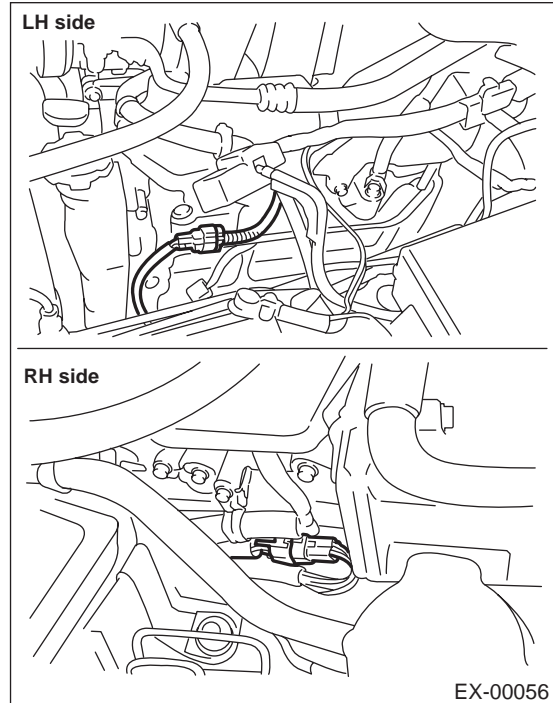


- 8) Connect rear oxygen sensor connector.



- 9) Install under cover.
- 10) Lower the vehicle.

- 11) Connect front oxygen (A/F) sensor connectors.



- 12) Install air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.>
- 13) Install battery.

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

REAR EXHAUST PIPE

EXHAUST

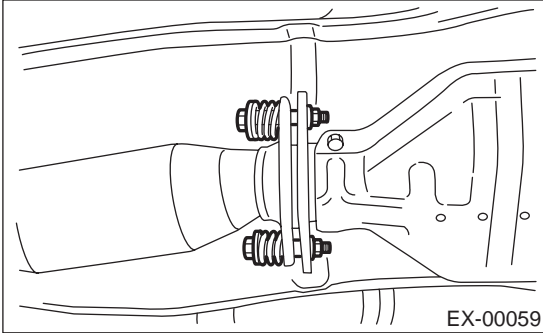
3. Rear Exhaust Pipe

A: REMOVAL

1) Separate rear exhaust pipe from front exhaust pipe.

CAUTION:

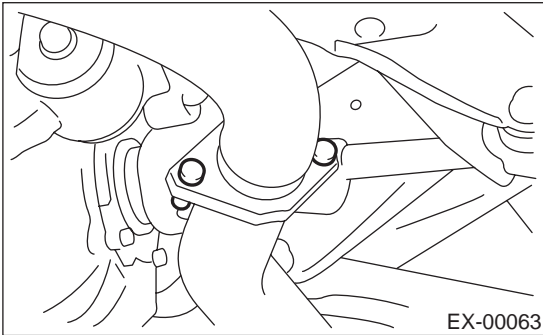
Be careful, exhaust pipe is hot.



2) Separate rear exhaust pipe from muffler.

CAUTION:

Be careful not to pull down rear exhaust pipe.



3) Remove rear exhaust pipe.

B: INSTALLATION

NOTE:

Replace gaskets and self-lock nut with new ones.

1) Install rear exhaust pipe to muffler.

Tightening torque:

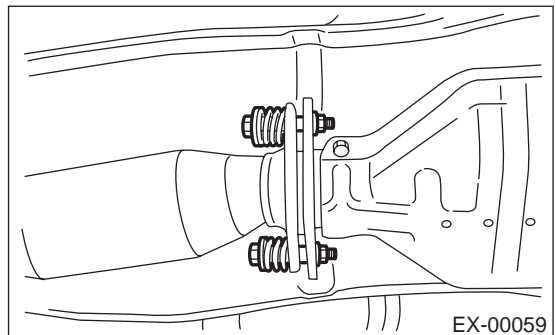
48 N·m (4.9 kgf-m, 35.4 ft-lb)



2) Install rear exhaust pipe to front exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

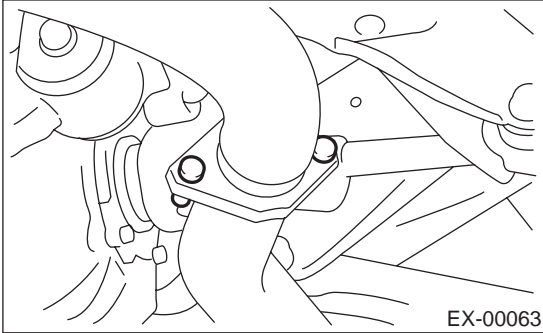
4. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

CAUTION:

Be careful, exhaust pipe is hot.



2) Remove left and right rubber cushions.

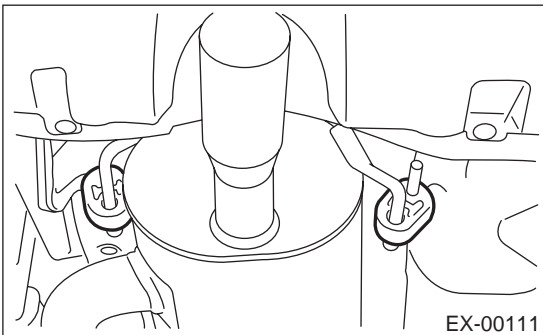
CAUTION:

Be careful not to drop the muffler during removal.

NOTE:

To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

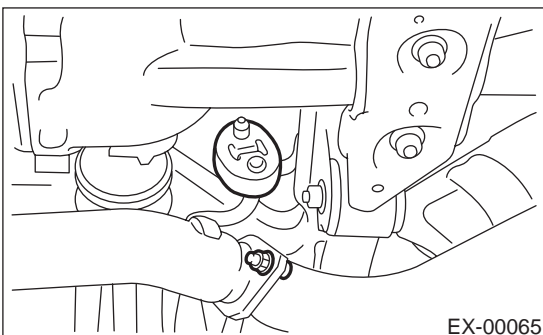


3) Remove front rubber cushion, and detach muffler assembly.

NOTE:

To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)



B: INSTALLATION

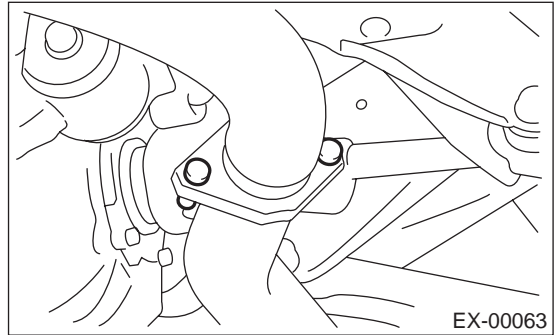
Install in the reverse order of removal.

NOTE:

Replace gasket and self-lock nut with a new one.

Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

MUFFLER

EXHAUST

MEMO:

COOLING

CO(*H6DO*)

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GENERAL DESCRIPTION

COOLING

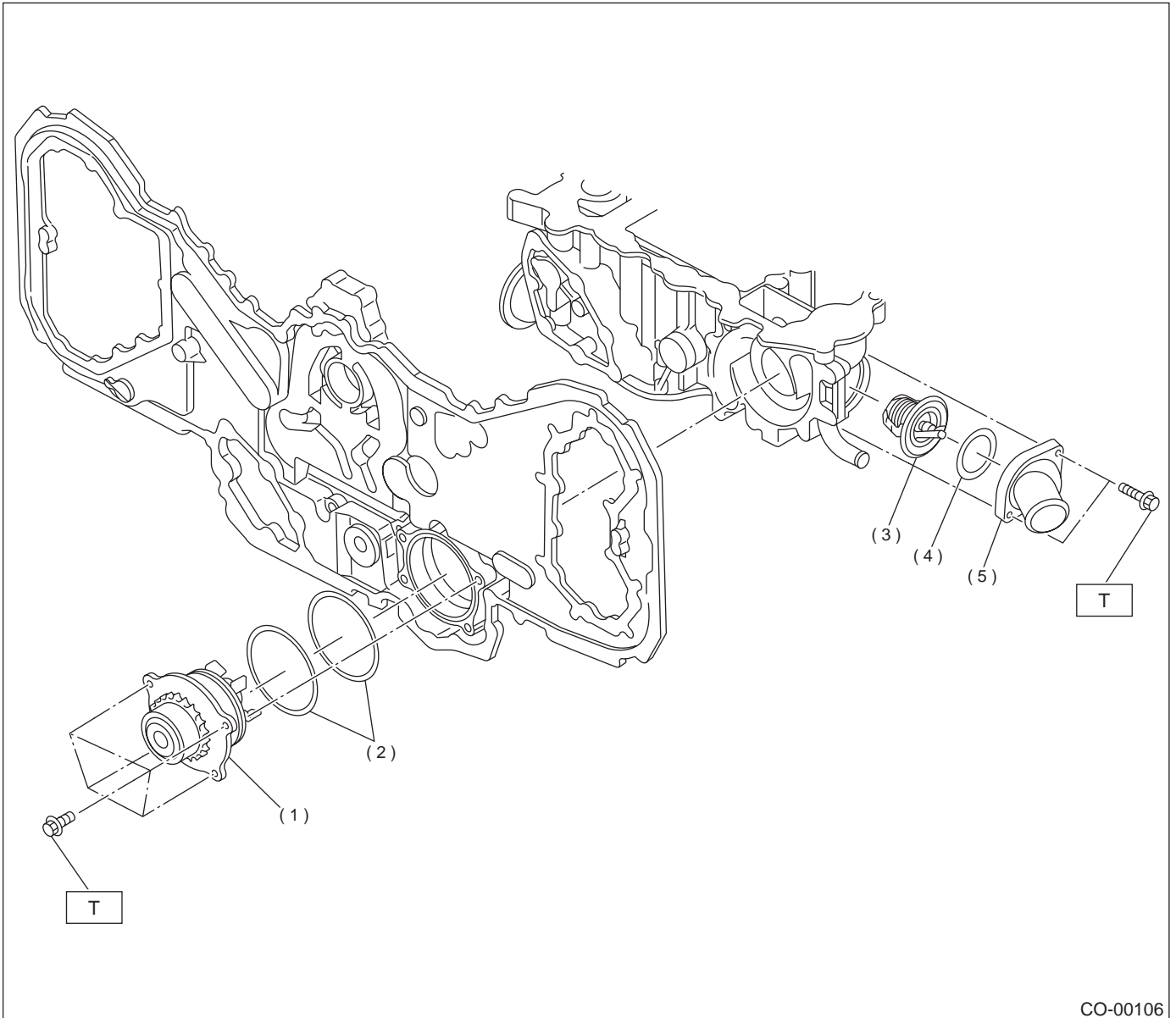
1. General Description

A: SPECIFICATIONS

Cooling system		Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity		ℓ (US qt, Imp qt)	
		Approx. 7.9 (8.4, 7.0)	
Water pump	Type	Centrifugal impeller type	
	Discharge performance	Discharge	320 L (84.5 US gal, 70.4 Imp gal)/min.
		Pump speed—total engine coolant head	5,500 rpm — 18 mAq (59 ft Aq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter	73.2 mm (2.882 in)	
	Number of impeller vanes	6	
	Tooth number of pump sprocket	22 t	
Thermostat	Type	Wax pellet type	
	Start to open	80 — 84 °C (176 — 183 °F)	
	Fully open	95°C (203°F)	
	Valve lift	9.0 mm (0.354 in) or more	
	Valve bore	35 mm (1.38 in)	
Radiator fan	Motor	120 W (main fan) 120 W (sub fan)	
	Fan diameter × Blade	320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)	
Radiator	Type	Down flow, pressure type	
	Core dimensions	699 × 349 × 27 mm (27.52 × 13.74 × 1.06 in)	
	Pressure range in which cap valve is open	Above: 108±15 kPa (1.1±0.15 kg/cm ² , 16±2 psi) Below: -1.0 to -4.9 kPa (-0.01 to -0.05 kg/cm ² , -0.1 to -0.7 psi)	
	Fins	Corrugated fin type	
Reservoir tank	Capacity	0.5 L (0.5 US qt, 0.4 Imp qt)	

B: COMPONENT

1. WATER PUMP



CO-00106

- (1) Water pump ASSY
- (2) O-ring
- (3) Thermostat

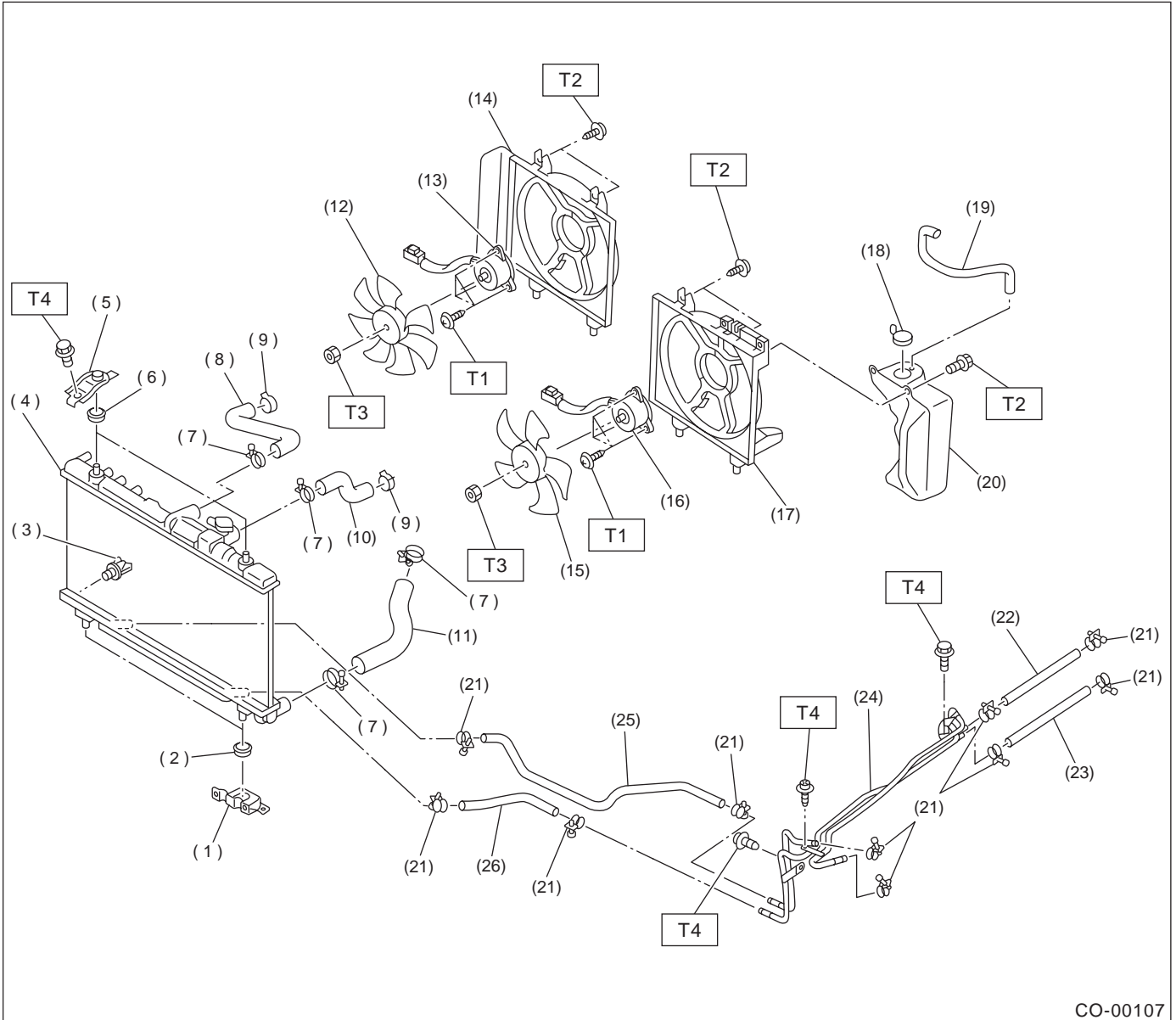
- (4) Gasket
- (5) Thermostat cover

Tightening torque: N-m (kgf-m, ft-lb)
T: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

COOLING

2. RADIATOR AND RADIATOR FAN



CO-00107

- | | | |
|----------------------------|--|------------------------|
| (1) Radiator lower bracket | (12) Radiator sub fan | (23) ATF outlet hose A |
| (2) Radiator lower cushion | (13) Radiator sub fan motor | (24) ATF pipe |
| (3) Drain cock | (14) Sub fan shroud | (25) ATF inlet hose B |
| (4) Radiator | (15) Radiator main fan | (26) ATF outlet hose B |
| (5) Radiator upper bracket | (16) Radiator main fan motor | |
| (6) Radiator upper cushion | (17) Main fan shroud | |
| (7) Clamp | (18) Engine coolant reservoir tank cap | |
| (8) Radiator inlet hose A | (19) Over flow hose | |
| (9) Clamp | (20) Engine coolant reservoir tank | |
| (10) Radiator inlet hose B | (21) ATF hose clamp | |
| (11) Radiator outlet hose | (22) ATF inlet hose A | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 4.4 (0.45, 3.3)

T2: 4.9 (0.50, 3.6)

T3: 7.5 (0.76, 5.5)

T4: 12 (1.2, 8.7)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
<p>ST-499977100</p>	499977100	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
<p>ST18231AA000</p>	18231AA000	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

2. GENERAL PURPOSE TOOLS

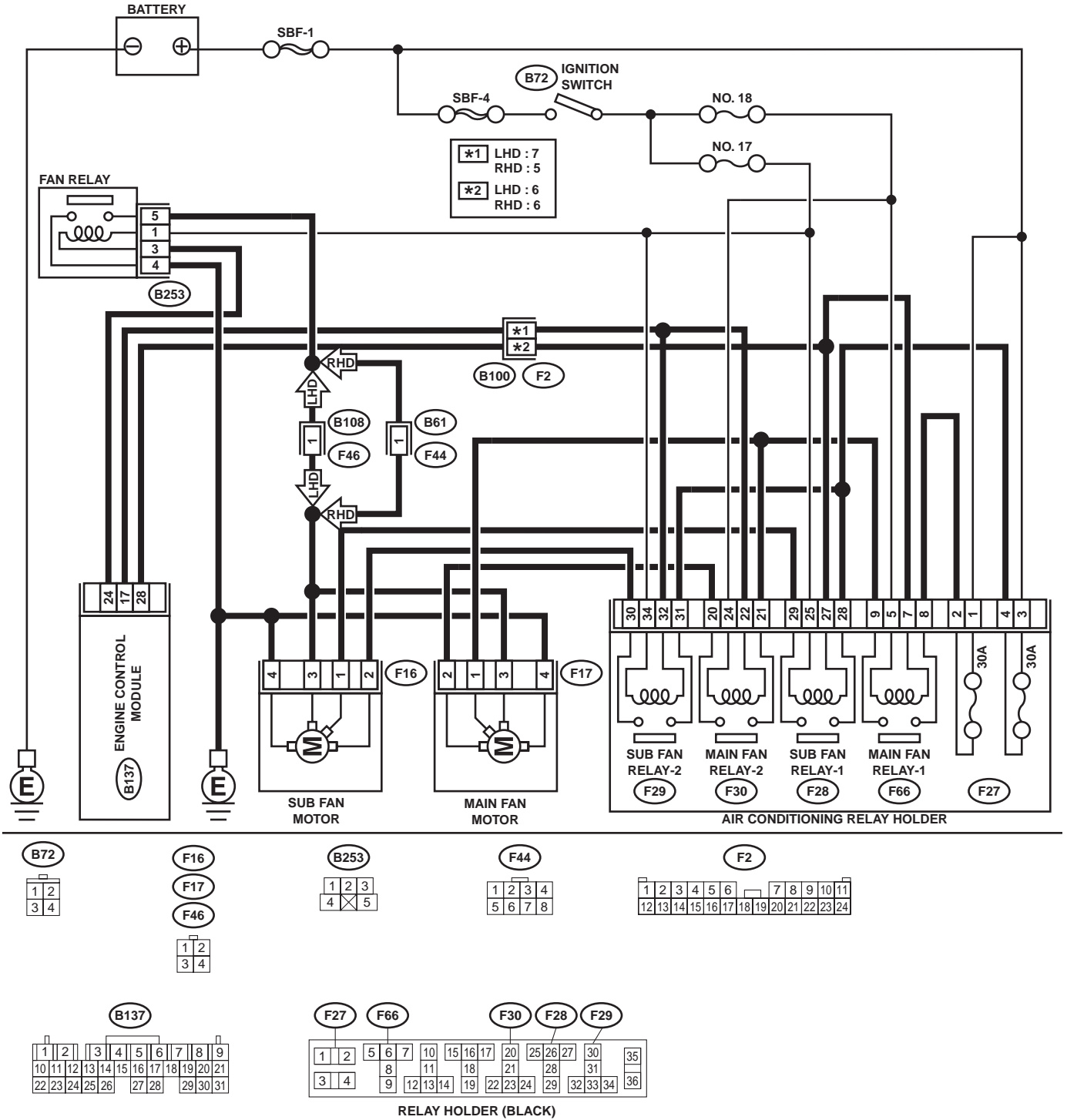
TOOL NAME	REMARKS
Radiator cap tester	Used for measuring pressure.

RADIATOR MAIN FAN SYSTEM

COOLING

2. Radiator Main Fan System

A: SCHEMATIC



CO-00167

B: INSPECTION

TROUBLE SYMPTOM:

- Radiator main fan does not rotate in low speed under the following conditions:
 - (1) Coolant temperature 98 — 101°C (208 — 214°F).
 - (2) A/C switch set to OFF.
- Radiator main fan does not rotate in middle speed under the following conditions:
 - (1) Coolant temperature 97°C (207°F) or less.
 - (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator main fan does not rotate in high speed under the following conditions:
 - (1) Coolant temperature 98 — 101°C (208 — 214°F).
 - (2) A/C switch set to ON and A/C temperature at the lowest position.

Step	Value	Yes	No
1 CHECK OPERATION OF RADIATOR FAN. 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 97°C (207°F) or less. When A/C compressor is operating, does the radiator main fan rotate in middle speed?	Rotates in middle speed.	Go to step 2.	Go to step 4.
2 CHECK OPERATION OF RADIATOR FAN. 1) Turn the A/C switch to OFF. 2) Perform checking procedure during coolant temperature is 98 — 101°C (208 — 214°F). Does the radiator main fan rotate in low speed?	Rotates in low speed.	Go to step 3.	Go to step 18.
3 CHECK OPERATION OF RADIATOR FAN. 1) Turn the A/C switch to ON, set temperature at the lowest position. 2) Perform checking procedure during coolant temperature is 98 — 101°C (208 — 214°F). When A/C compressor is operating, does the radiator main fan rotate in high speed?	Rotates in high speed.	Radiator main fan system is okay.	Go to step 31.
4 CHECK POWER SUPPLY TO MAIN FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, keep coolant temperature below 97°C (207°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between main fan motor connector and chassis ground. Connector & terminal (F17) No. 1 (+) — Chassis ground (–): (F17) No. 2 (+) — Chassis ground (–): Does the measured value exceed the specified value?	10 V	Go to step 5.	Go to step 8.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Value	Yes	No
5 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground. Connector & terminal (F17) No. 4 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 6.	Repair open circuit in harness between main fan motor connector and chassis ground.
6 CHECK POOR CONTACT. Check poor contact in main fan motor connector. Is there poor contact in main fan motor connector?	There is poor contact.	Repair poor contact in main fan motor connector.	Go to step 7.
7 CHECK MAIN FAN MOTOR. Connect battery positive (+) terminal to terminals No. 1 and No. 2 and negative (-) terminal to terminal No. 4 of main fan motor connector. Does the main fan rotate?	Rotates.	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
8 CHECK POWER SUPPLY TO MAIN FAN RELAYS 1 AND 2. 1) Remove main fan relays 1 and 2 from A/C relay holder. 2) Turn ignition switch to ON. 3) Measure voltage between main fan relays 1 and 2 terminal and chassis ground. Connector & terminal (F66) No. 8 (+) — Chassis ground (-): (F30) No. 21 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 9.	Go to step 10.
9 CHECK POWER SUPPLY TO MAIN FAN RELAYS 1 AND 2. Measure voltage between main fan relays 1 and 2 terminal and chassis ground. Connector & terminal (F66) No. 5 (+) — Chassis ground (-): (F30) No. 24 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 13.	Go to step 12.
10 CHECK 30 A FUSE. 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is blown out.	Replace fuse.	Go to step 11.
11 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. Connector & terminal (F27) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair open circuit in harness between 30 A fuse and main fan relays 1 and 2 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
12 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown out.	Replace fuse.	Repair open circuit in harness between main fan relays 1 and 2 and ignition switch.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Value	Yes	No
<p>13 CHECK MAIN FAN RELAYS 1 AND 2. 1) Turn ignition switch to OFF. 2) Remove main fan relays 1 and 2. 3) Measure resistance of main fan relays 1 and 2.</p> <p>Terminal No. 8 — No. 9: No. 20 — No. 21:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 14.	Replace main fan relays 1 and 2.
<p>14 CHECK MAIN FAN RELAYS 1 AND 2. 1) Connect battery to terminals No. 5 and No. 7 of main fan relay 1 or to terminals No. 22 and No. 24 of main fan relay 2. 2) Measure resistance of main fan relays 1 and 2.</p> <p>Terminal No. 8 — No. 9: No. 20 — No. 21:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 15.	Replace main fan relays 1 and 2.
<p>15 CHECK HARNESS BETWEEN MAIN FAN RELAYS 1 AND 2 TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure resistance of harness between main fan motor connector and main fan relays 1 and 2 terminal.</p> <p>Connector & terminal (F17) No. 1 — (F66) No. 9: (F17) No. 2 — (F30) No. 20:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 16.	Repair open circuit in harness between main fan motor connector and main fan relays 1 and 2 terminal.
<p>16 CHECK HARNESS BETWEEN MAIN FAN RELAYS 1 AND 2 AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relays 1 and 2 connector and ECM connector.</p> <p>Connector & terminal (F66) No. 7 — (B137) No. 28: (F30) No. 22 — (B137) No. 17:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 17.	Repair open circuit in harness between main fan relays 1 and 2 and ECM.
<p>17 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM. Is there poor contact in connector between main fan motor and ECM?</p>	There is poor contact.	Repair poor contact connector.	Contact SUBARU distributor service.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Value	Yes	No
<p>18 CHECK POWER SUPPLY TO MAIN FAN MOTOR.</p> <p>CAUTION: Be careful not to overheat engine during repair.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect main fan motor connector. 3) Start the engine, and perform checking procedure during coolant temperature is 98 — 101°C (208 — 214°F). 4) Measure voltage between main fan motor connector and chassis ground. <p>Connector & terminal (F17) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 19.	Go to step 21.
<p>19 CHECK POOR CONTACT.</p> <p>Check poor contact in main fan motor connector. Is there poor contact in main fan motor connector?</p>	There is poor contact.	Repair poor contact in main fan motor connector.	Go to step 20.
<p>20 CHECK MAIN FAN MOTOR.</p> <p>Connect battery positive (+) terminal to terminal No. 1, and negative (-) terminal to terminal No. 4 of main fan motor connector. Does the main fan rotate?</p>	Rotates.	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
<p>21 CHECK POWER SUPPLY TO MAIN FAN RELAY 1.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Remove main fan relay 1 from A/C relay holder. 3) Measure voltage between main fan relay 1 terminal and chassis ground. <p>Connector & terminal (F66) No. 8 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 22.	Go to step 23.
<p>22 CHECK POWER SUPPLY TO MAIN FAN RELAY 1.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay 1 terminal and chassis ground. <p>Connector & terminal (F66) No. 5 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 26.	Go to step 25.
<p>23 CHECK 30 A FUSE.</p> <ol style="list-style-type: none"> 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out? 	Fuse is blown out.	Replace fuse.	Go to step 24.
<p>24 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.</p> <p>Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. Connector & terminal (F27) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair open circuit in harness between 30 A fuse and main fan relay terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Value	Yes	No
25 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown out.	Replace fuse.	Repair open circuit in harness between main fan relay 1 and ignition switch.
26 CHECK MAIN FAN RELAY 1. 1) Turn ignition switch to OFF. 2) Remove main fan relay 1. 3) Measure resistance of main fan relay 1. Terminal No. 8 — No. 9: Does the measured value exceed the specified value?	1 MΩ	Go to step 27.	Replace main fan relay 1.
27 CHECK MAIN FAN RELAY. 1) Connect battery to terminals No. 5 and No. 7 of main fan relay 1. 2) Measure resistance of main fan relay 1. Terminal No. 8 — No. 9: Is the measured value less than the specified value?	1 Ω	Go to step 28.	Replace main fan relay 1.
28 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure resistance of harness between main fan motor connector and main fan relay 1 terminal. Connector & terminal (F17) No. 1 — (F66) No. 9: Is the measured value less than the specified value?	1 Ω	Go to step 29.	Replace open circuit in harness between main fan motor connector and main fan relay 1 terminal.
29 CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay 1 connector and ECM connector. Connector & terminal (F66) No. 7 — (B137) No. 28: Is the measured value less than the specified value?	1 Ω	Go to step 30.	Repair open circuit in harness between main fan relay 1 and ECM.
30 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM. Is there poor contact in connector between main fan motor and ECM?	There is poor contact.	Repair poor contact connector.	Contact SUBARU distributor service.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Value	Yes	No
31 CHECK HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect main fan motor connector. 3) Turn A/C switch ON and set the temperature at the lowest position. 4) Perform checking procedure during coolant temperature is 98 — 101°C (208 — 214°F). 5) Measure resistance of harness between main fan motor connector and chassis ground. Connector & terminal (F17) No. 3 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 32.	Go to step 33.
32 CHECK POOR CONTACT. Check poor contact in main fan motor connector. Is there poor contact in main fan motor connector?	There is poor contact.	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
33 CHECK HARNESS BETWEEN MAIN FAN AND FAN RELAY. 1) Disconnect fan relay connector. 2) Measure resistance of between main fan motor connector and fan relay connector. Connector & terminal (F17) No. 3 — (B253) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 34.	Repair open circuit between main fan motor connector and fan relay connector.
34 CHECK POWER SUPPLY TO FAN RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. Connector & terminal (B253) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 36.	Go to step 35.
35 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 17 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown out.	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.
36 CHECK FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. Terminal No. 4 — No. 5: Does the measured value exceed the specified value?	1 MΩ	Go to step 37.	Replace fan relay.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Value	Yes	No
37 CHECK FAN RELAY. 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. Terminal No. 4 — No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 38 .	Replace fan relay.
38 CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND. Measure resistance of harness between fan relay connector and chassis ground. Connector & terminal (B253) No. 4 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 39 .	Repair open circuit in harness between fan relay connector and chassis ground.
39 CHECK HARNESS BETWEEN FAN RELAY AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay and ECM connector. Connector & terminal (B253) No. 3 — (B137) No. 24: Is the measured value less than the specified value?	1 Ω	Go to step 40 .	Repair open circuit in harness between fan relay connector and ECM.
40 CHECK POOR CONTACT. Check poor contact in connector between fan relay and ECM. Is there poor contact in connector between fan relay and ECM?	There is poor contact.	Repair poor contact connector.	Contact SUBARU distributor service.

NOTE:

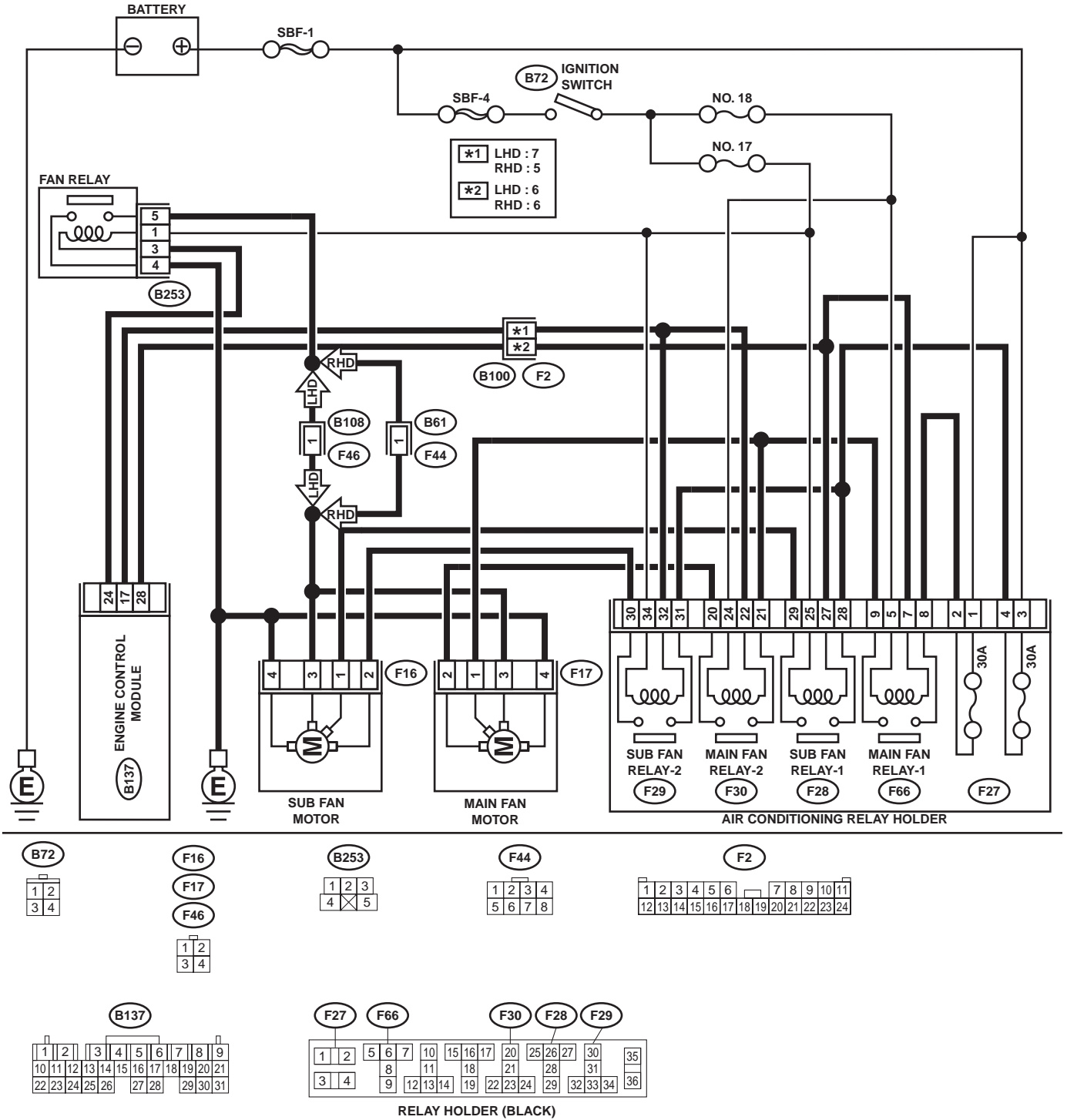
Inspection by SUBARU distributor service is required, because probable cause is deterioration of multiple parts.

RADIATOR SUB FAN SYSTEM

COOLING

3. Radiator Sub Fan System

A: SCHEMATIC



CO-00167

B: INSPECTION

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate in low speed under the following conditions:
 - (1) Coolant temperature 98 — 101°C (208 — 214°F).
 - (2) A/C switch set to OFF.
- Radiator sub fan does not rotate in middle speed under the following conditions:
 - (1) Coolant temperature 97°C (207°F) or less.
 - (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator sub fan does not rotate in high speed under the following conditions:
 - (1) Coolant temperature 98 — 101°C (208 — 214°F).
 - (2) A/C switch set to ON and A/C temperature at the lowest position.

Step	Value	Yes	No
1 CHECK OPERATION OF RADIATOR FAN. 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 97°C (207°F) or less. When A/C compressor is operating, does the radiator sub fan rotate in middle speed?	Rotates in middle speed.	Go to step 2.	Go to step 4.
2 CHECK OPERATION OF RADIATOR FAN. 1) Turn the A/C switch to OFF. 2) Perform checking procedure during coolant temperature is 98 — 101°C (208 — 214°F). When A/C compressor is operating, does the radiator sub fan rotate in low speed?	Rotates in low speed.	Go to step 3.	Go to step 18.
3 CHECK OPERATION OF RADIATOR FAN. 1) Turn the A/C switch to ON, set temperature at the lowest position. 2) Perform checking procedure during coolant temperature is 98 — 101°C (208 — 214°F). When A/C compressor is operating, does the radiator sub fan rotate in high speed?	Rotates in high speed.	Radiator sub fan system is okay.	Go to step 31.
4 CHECK POWER SUPPLY TO SUB FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor. 3) Start the engine, keep coolant temperature below 97°C (207°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 1 (+) — Chassis ground (-): (F16) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 5.	Go to step 8.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
5 CHECK GROUND CIRCUIT OF SUB FAN MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 4 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 6.	Repair open circuit in harness between sub fan motor connector and chassis ground.
6 CHECK POOR CONTACT. Check poor contact in sub fan motor connector. Is there poor contact in sub fan motor connector?	There is poor contact.	Repair poor contact in sub fan motor connector.	Go to step 7.
7 CHECK SUB FAN MOTOR. Connect battery positive (+) terminal to terminals No. 1 and No. 2 and negative (-) terminal to terminal No. 4 of sub fan motor connector. Does the sub fan rotate?	Rotates.	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
8 CHECK POWER SUPPLY TO SUB FAN RELAYS 1 AND 2. 1) Remove sub fan relays 1 and 2 from A/C relay holder. 2) Turn ignition switch to ON. 3) Measure voltage between sub fan relays 1 and 2 terminal and chassis ground. Connector & terminal (F28) No. 28 (+) — Chassis ground (-): (F29) No. 31 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 9.	Go to step 10.
9 CHECK POWER SUPPLY TO SUB FAN RELAYS 1 AND 2. Measure voltage between sub fan relays 1 and 2 terminal and chassis ground. Connector & terminal (F28) No. 25 (+) — Chassis ground (-): (F29) No. 34 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 13.	Go to step 12.
10 CHECK 30 A FUSE. 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Go to step 11.
11 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. Connector & terminal (F27) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair open circuit in harness between 30 A fuse and sub fan relays 1 and 2 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
12 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 17 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between sub fan relays 1 and 2 and ignition switch.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
<p>13 CHECK SUB FAN RELAYS 1 AND 2. 1) Turn ignition switch to OFF. 2) Remove sub fan relays 1 and 2. 3) Measure resistance of sub fan relays 1 and 2.</p> <p>Terminal No. 28 — No. 29: No. 30 — No. 31:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 14.	Replace sub fan relays 1 and 2.
<p>14 CHECK SUB FAN RELAYS 1 AND 2. 1) Connect battery to terminals No. 25 and No. 27 of sub fan relay 1 or to terminals No. 32 and No. 34 of sub fan relay 2. 2) Measure resistance of sub fan relays 1 and 2.</p> <p>Terminal No. 28 — No. 29: No. 30 — No. 31:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 15.	Replace sub fan relays 1 and 2.
<p>15 CHECK HARNESS BETWEEN SUB FAN RELAYS 1 AND 2 TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure resistance of harness between sub fan motor connector and sub fan relays 1 and 2 terminal.</p> <p>Connector & terminal (F16) No. 1 — (F28) No. 29: (F16) No. 2 — (F29) No. 30:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 16.	Repair open circuit in harness between sub fan motor connector and sub fan relays 1 and 2 terminal.
<p>16 CHECK HARNESS BETWEEN SUB FAN RELAYS 1 AND 2 AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relays 1 and 2 connector and ECM connector.</p> <p>Connector & terminal (F28) No. 27 — (B137) No. 28: (F29) No. 32 — (B137) No. 17:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 17.	Repair open circuit in harness between sub fan relays 1 and 2 and ECM.
<p>17 CHECK POOR CONTACT. Check poor contact in connector between sub fan and ECM. Is there poor contact in connector between sub fan motor and ECM.</p>	There is poor contact.	Repair poor contact connector.	Contact SUBARU distributor service.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
<p>18 CHECK POWER SUPPLY TO SUB FAN MOTOR.</p> <p>CAUTION: Be careful not to overheat engine during repair.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect sub fan motor connector. 3) Start the engine, and perform checking procedure during coolant temperature is 98 — 101°C (208 — 214°F). 4) Measure voltage between sub fan motor connector and chassis ground.</p> <p>Connector & terminal (F16) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 19.	Go to step 21.
<p>19 CHECK POOR CONTACT.</p> <p>Check poor contact in sub fan motor connector. Is there poor contact in sub fan motor connector?</p>	There is poor contact.	Repair poor contact in sub fan motor connector.	Go to step 20.
<p>20 CHECK SUB FAN MOTOR.</p> <p>Connect battery positive (+) terminal to terminal No. 1, and negative (-) terminal to terminal No. 4 of sub fan motor connector. Does the sub fan rotate?</p>	Rotates.	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
<p>21 CHECK POWER SUPPLY TO SUB FAN RELAY 1.</p> <p>1) Turn ignition switch to OFF. 2) Remove sub fan relay 1 from A/C relay holder. 3) Measure voltage between sub fan relay 1 terminal and chassis ground.</p> <p>Connector & terminal (F28) No. 28 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 22.	Go to step 23.
<p>22 CHECK POWER SUPPLY TO SUB FAN RELAY 1.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay 1 terminal and chassis ground.</p> <p>Connector & terminal (F28) No. 25 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 26.	Go to step 25.
<p>23 CHECK 30 A FUSE.</p> <p>1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?</p>	Fuse is blown-out.	Replace fuse.	Go to step 24.
<p>24 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.</p> <p>Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground.</p> <p>Connector & terminal (F27) No. 3(+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair open circuit in harness between 30 A fuse and sub fan relay 1 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
25 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 17 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between sub fan relay 1 and ignition switch.
26 CHECK SUB FAN RELAY 1. 1) Turn ignition switch to OFF. 2) Remove sub fan relay 1. 3) Measure resistance of sub fan relay 1. Terminal No. 28 — No. 29: Does the measured value exceed the specified value?	1 M Ω	Go to step 27.	Replace sub fan relay 1.
27 CHECK SUB FAN RELAY. 1) Connect battery to terminals No. 25 and No. 27 of sub fan relay 1. 2) Measure resistance of sub fan relay 1. Terminal No. 28 — No. 29: Is the measured value less than the specified value?	1 Ω	Go to step 28.	Replace sub fan relay 1.
28 CHECK HARNESS BETWEEN SUB FAN RELAY 1 AND SUB FAN MOTOR CONNECTOR. Measure resistance of harness between sub fan motor connector and sub fan relay 1 terminal. Connector & terminal (F16) No. 1 — (F28) No. 29: Is the measured value less than the specified value?	1 Ω	Go to step 29.	Replace open circuit in harness between sub fan motor connector and sub fan relay 1 terminal.
29 CHECK HARNESS BETWEEN SUB FAN RELAY 1 AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay 1 connector and ECM connector. Connector & terminal (F28) No. 27 — (B137) No. 28: Is the measured value less than the specified value?	1 Ω	Go to step 30.	Repair open circuit in harness between sub fan relay and ECM.
30 CHECK POOR CONTACT. Check poor contact in connector between sub fan and ECM. Is there poor contact in connector between sub fan motor and ECM?	There is poor contact.	Repair poor contact connector.	Contact SUBARU distributor service.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
31 CHECK HARNESS BETWEEN SUB FAN MOTOR CONNECTOR AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect sub fan motor connector. 3) Turn A/C switch ON and set the temperature at the lowest position. 4) Perform checking procedure during coolant temperature is 98 — 101°C (208 — 214°F). 5) Measure resistance of harness between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 3 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 32.	Go to step 33.
32 CHECK POOR CONTACT. Check poor contact in sub fan motor connector. Is there poor contact in sub fan motor connector?	There is poor contact.	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
33 CHECK HARNESS BETWEEN SUB FAN AND FAN RELAY. 1) Disconnect fan relay connector. 2) Measure resistance between sub fan motor connector and fan relay connector. Connector & terminal (F16) No. 3 — (B253) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 34.	Repair open circuit between sub fan motor connector and fan relay connector.
34 CHECK POWER SUPPLY TO FAN RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. Connector & terminal (B253) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 36.	Go to step 35.
35 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 17 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between fan relay and ignition switch.
36 CHECK FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. Terminal No. 4 — No. 5: Does the measured value exceed the specified value?	1 MΩ	Go to step 37.	Replace fan relay.
37 CHECK FAN RELAY. 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. Terminal No. 4 — No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 38.	Replace fan relay.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
38 CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND. Measure resistance of harness between fan relay connector and chassis ground. Connector & terminal (B253) No. 4 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 39 .	Repair open circuit in harness between fan relay connector and chassis ground.
39 CHECK HARNESS BETWEEN FAN RELAY AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay connector and ECM connector. Connector & terminal (B253) No. 3 — (B137) No. 24: Is the measured value less than the specified value?	1 Ω	Go to step 40 .	Repair open circuit in harness between fan relay connector and ECM.
40 CHECK POOR CONTACT. Check poor contact in connector between fan relay and ECM. Is there poor contact in connector between fan relay and ECM?	There is poor contact.	Repair poor contact connector.	Contact SUBARU distributor service.

NOTE:

Inspection by SUBARU distributor service is required, because probable cause is deterioration of multiple parts.

ENGINE COOLANT

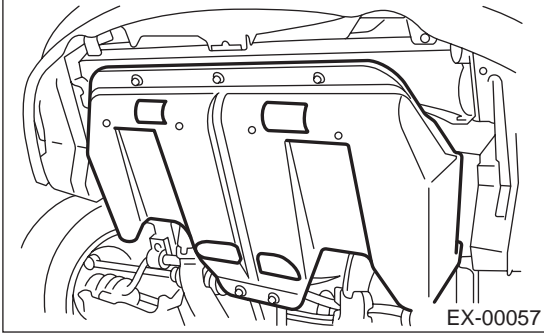
COOLING

4. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

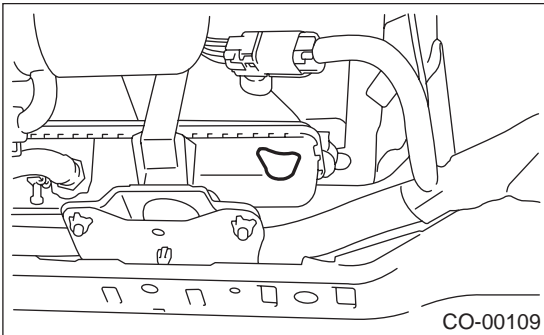
- 1) Lift-up the vehicle.
- 2) Remove under cover.



- 3) Remove drain cock to drain engine coolant into container.

NOTE:

Remove radiator cap so that engine coolant will drain faster.



2. FILLING OF ENGINE COOLANT

- 1) Fill engine coolant into radiator up to filler neck position.

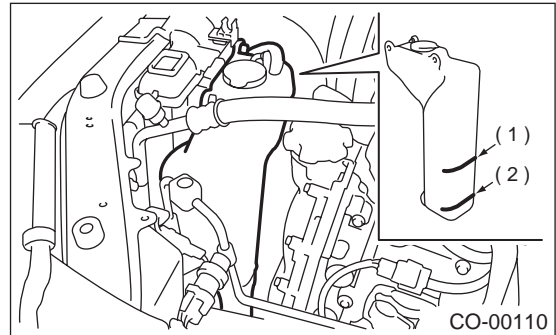
Coolant amount for refill:

Approx. 7.9 ℓ (8.4 US qt, 7.0 Imp qt)

CAUTION:

The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

- 2) Fill engine coolant into reservoir tank up to upper level.



- (1) Full level
- (2) Low level

- 3) Attach radiator cap and reservoir tank cap properly.
- 4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
- 5) If engine coolant level drops in radiator, add engine coolant to filler neck position.
- 6) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
- 7) Attach radiator cap and reservoir tank cap properly.

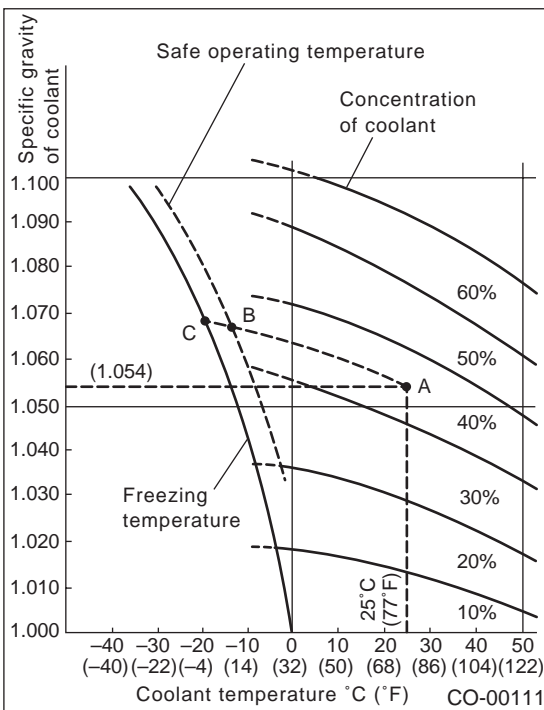
B: INSPECTION

1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

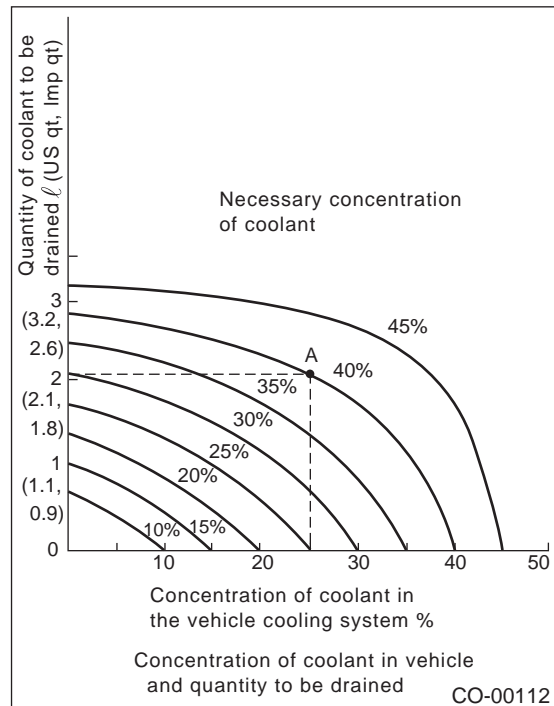
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).

The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



WATER PUMP

COOLING

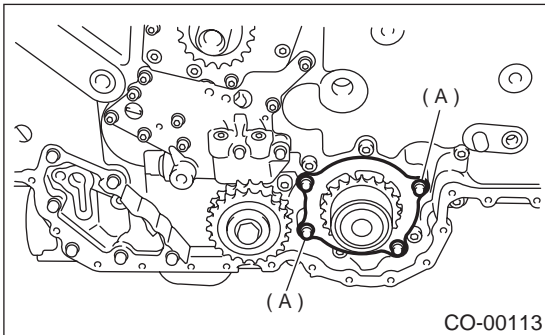
5. Water Pump

A: REMOVAL

- 1) Remove radiator. <Ref. to CO(H6DO)-27, REMOVAL, Radiator.>
- 2) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
- 3) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 4) Remove timing chain. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 5) Remove water pump.

NOTE:

When water pump cannot be easily removed, install M8 bolt in opposing bolt holes ("A" in figure). Alternately tightening each bolt should be enough to gradually free water pump from rear chain cover.



B: INSTALLATION

- 1) Install water pump onto rear chain cover.

NOTE:

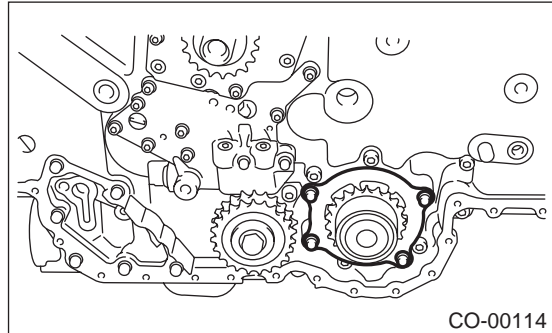
Apply engine coolant to O-ring.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:

- Replace O-rings with a new one.
- Applying engine coolant to O-ring makes water pump installation easier.



- 2) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
- 3) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
- 4) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
- 5) Install radiator. <Ref. to CO(H6DO)-28, INSTALLATION, Radiator.>
- 6) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

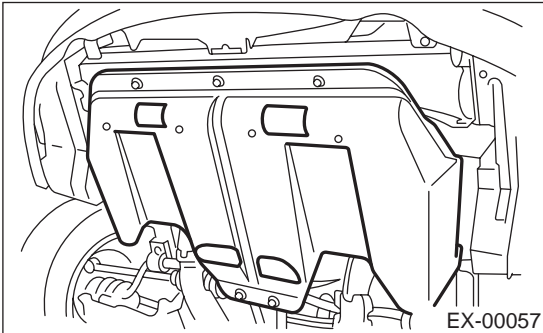
C: INSPECTION

- 1) Check water pump bearing for smooth rotation.
- 2) Check water pump sprocket for abnormalities.

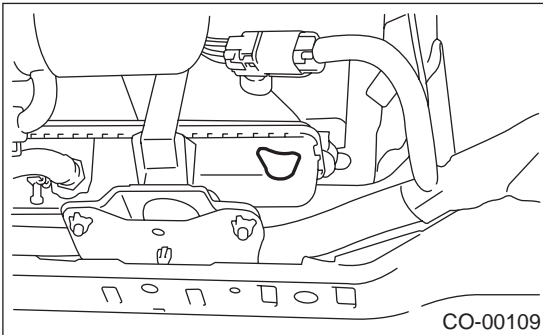
6. Thermostat

A: REMOVAL

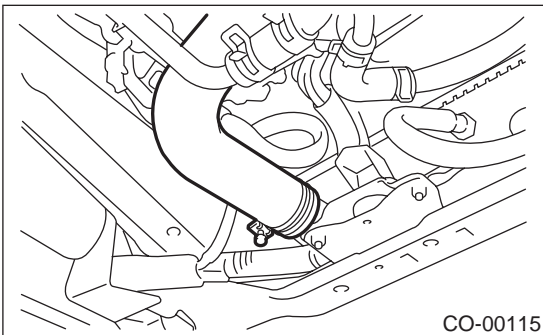
- 1) Lift-up the vehicle.
- 2) Remove under cover.



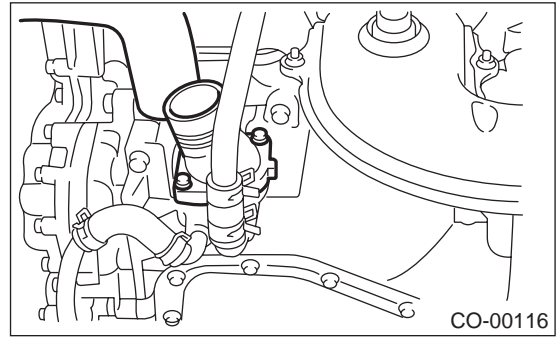
- 3) Drain engine coolant completely. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



- 4) Disconnect radiator outlet hose from thermostat cover.



- 5) Remove thermostat cover and gasket, and pull out the thermostat.



B: INSTALLATION

- 1) Install the thermostat to oil pan upper, and install the thermostat cover together with a gasket.

NOTE:

When reinstalling the thermostat, use a new gasket.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

- 2) Connect radiator outlet hose to thermostat cover.
- 3) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

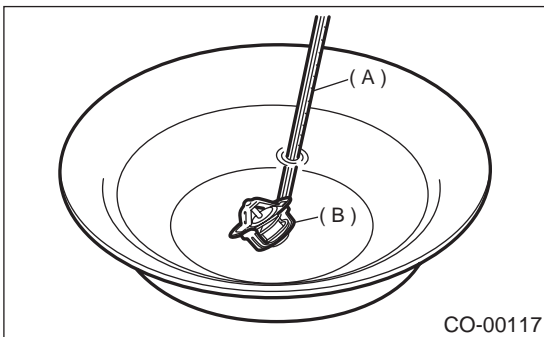
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:

80 — 84°C (176 — 183°F)

Fully opens:

95°C (203°F)

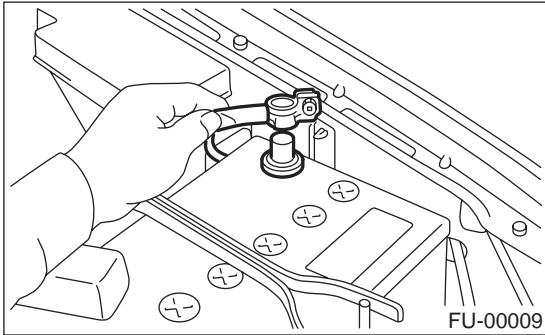


- (A) Thermometer
- (B) Thermostat

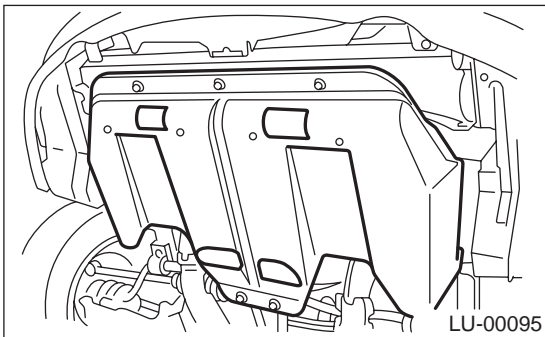
7. Radiator

A: REMOVAL

1) Disconnect battery ground cable.

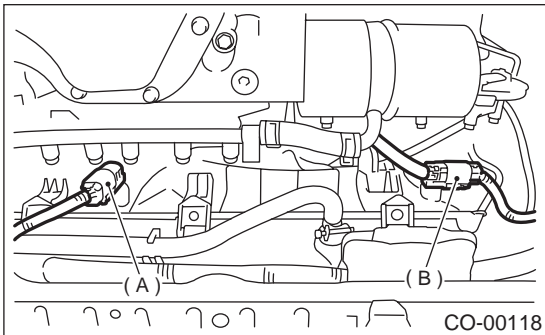


2) Lift-up the vehicle.
3) Remove under cover.

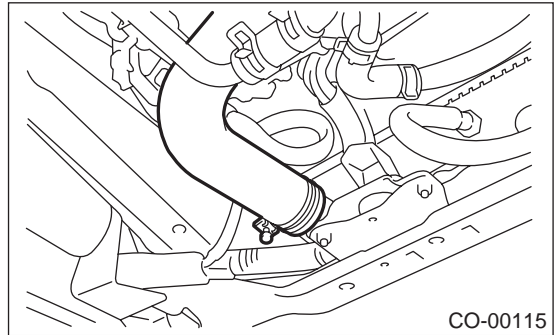


4) Drain engine coolant completely. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

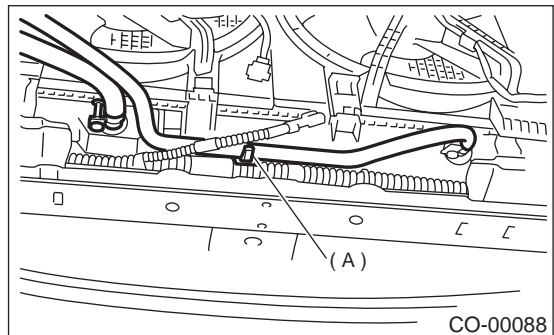
5) Disconnect connectors of radiator main fan motor (A) and sub fan motor (B).



6) Disconnect radiator outlet hose from radiator.

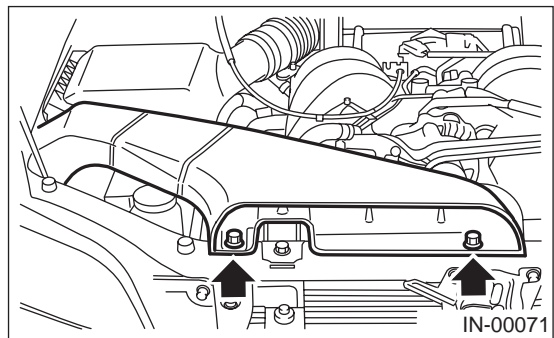


7) Disconnect ATF cooler hoses from radiator.

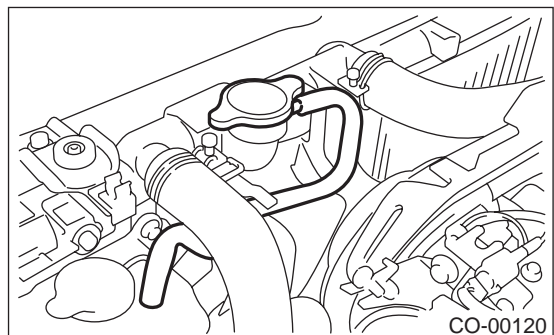


(A) Clip

8) Lower the vehicle.
9) Remove air intake duct.



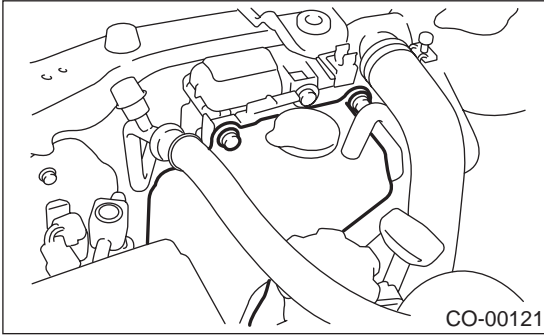
10) Disconnect over flow hose.



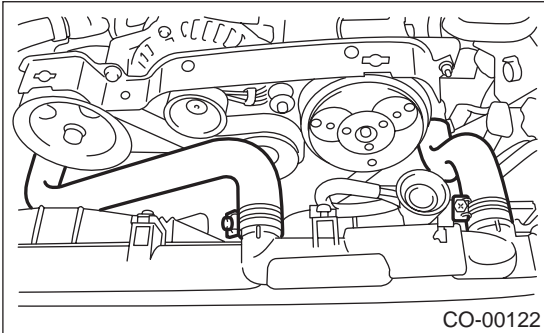
RADIATOR

COOLING

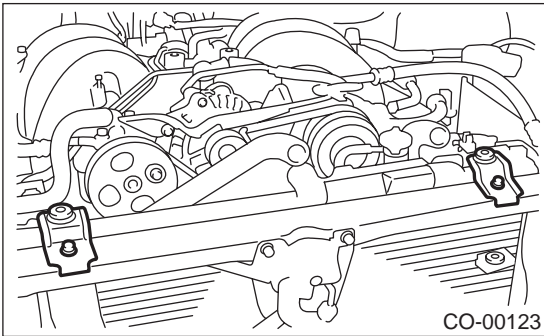
11) Remove reservoir tank.



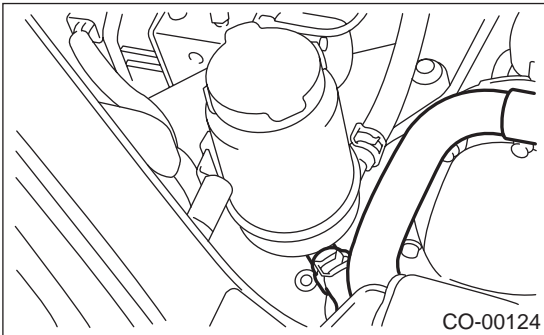
12) Disconnect radiator inlet hoses from radiator.



13) Remove radiator upper brackets.

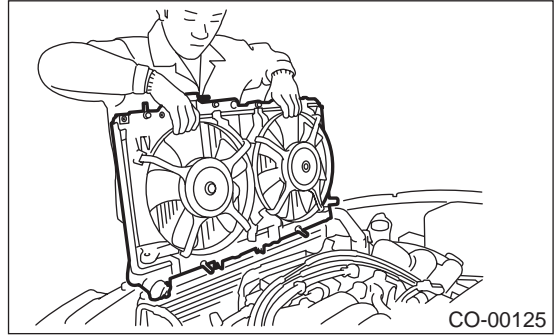


14) Detach power steering hose from the clip on the radiator.



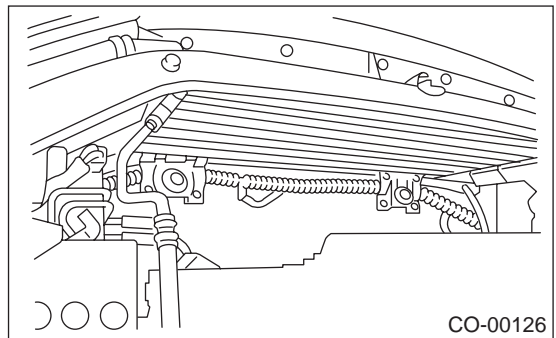
15) While slightly lifting radiator, slide it to left.

16) Lift radiator up and away from vehicle.



B: INSTALLATION

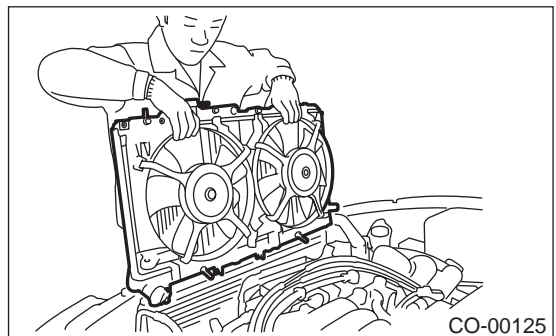
1) Attach radiator mounting cushions to holes on the vehicle.



2) Install radiator while fitting radiator pins to cushions.

NOTE:

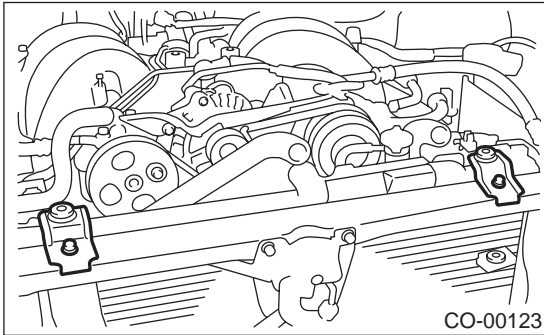
Fit pins on lower side of radiator into cushions on body side.



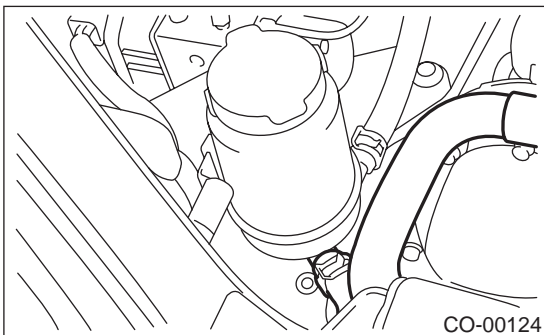
3) Install radiator brackets and tighten bolts.

Tightening torque:

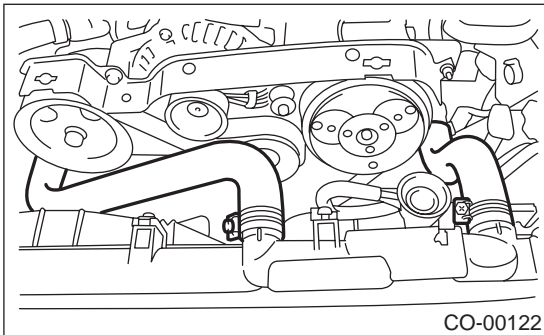
12 N·m (1.2 kgf-m, 8.7 ft-lb)



4) Attach power steering hose to the radiator.



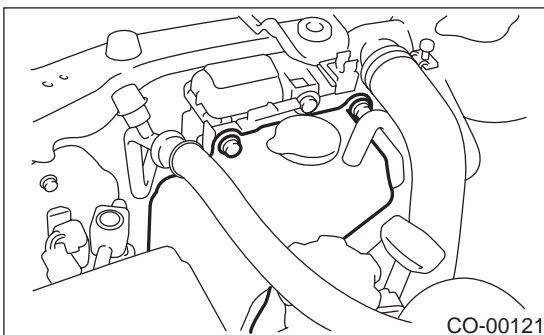
5) Connect radiator inlet hoses.



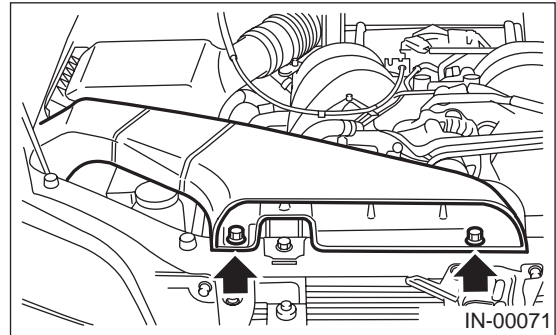
6) Install reservoir tank.

Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

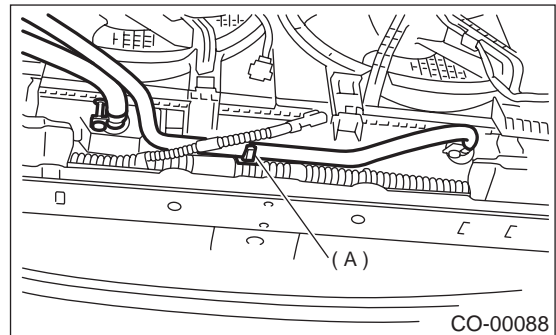


7) Install air intake duct.



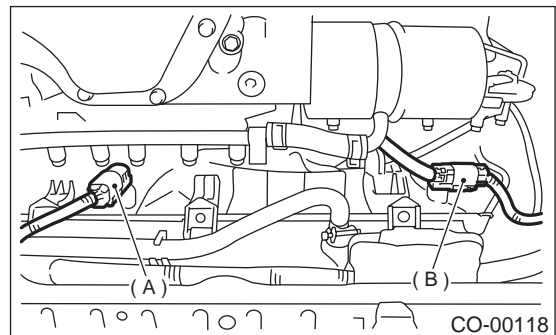
8) Lift-up the vehicle.

9) Connect ATF cooler hoses.

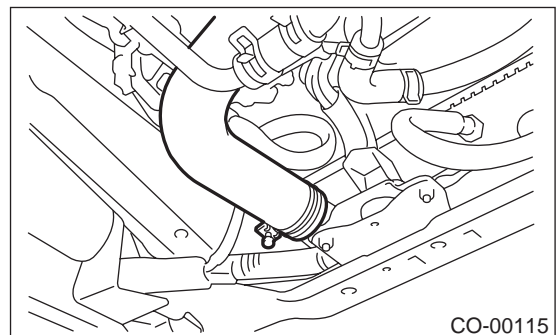


(A) Clip

10) Connect connectors to radiator main fan motor (A) and sub fan motor (B).



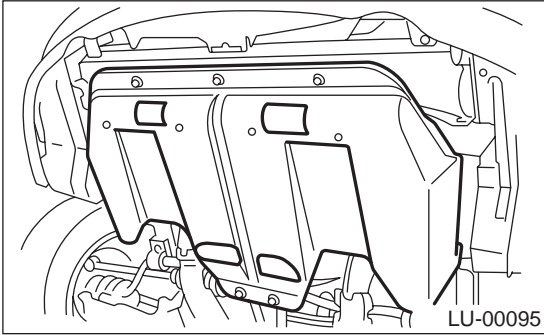
11) Connect radiator outlet hose.



RADIATOR

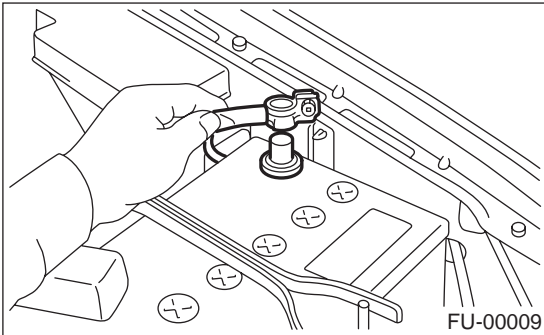
COOLING

12) Install under cover.



13) Lower the vehicle.

14) Connect battery ground cable.

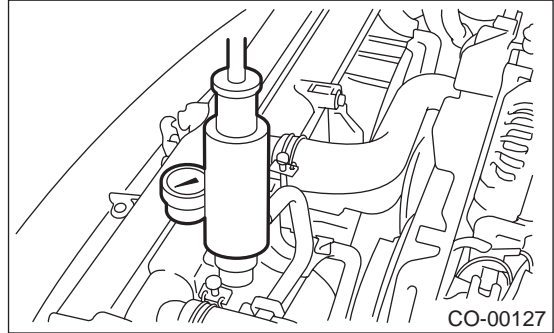


15) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

16) Check ATF level. <Ref. to AT-30, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.



2) Apply a pressure of 157 kPa (1.6 kg/cm², 23 psi) to radiator to check if:

- (1) Engine coolant leaks at/around radiator.
- (2) Engine coolant leaks at/around hoses or connections.

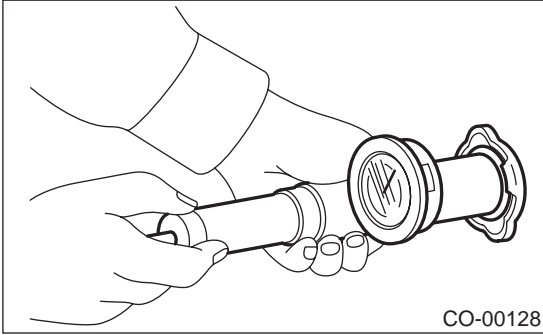
CAUTION:

- Engine should be off.
- Wipe engine coolant from check points in advance.
- Be careful to prevent engine coolant from spurting out when removing tester.
- Be careful also not to deform filler neck of radiator when installing or removing tester.

8. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.



2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:

93 — 123 kPa (0.95 — 1.25 kg/cm², 14 — 18 psi)

Service limit pressure:

83 kPa (0.85 kg/cm², 12 psi)

CAUTION:

Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

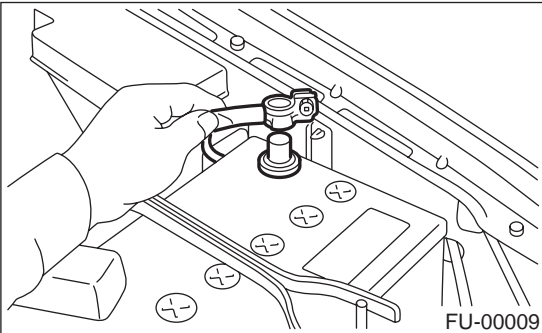
RADIATOR MAIN FAN AND FAN MOTOR

COOLING

9. Radiator Main Fan and Fan Motor

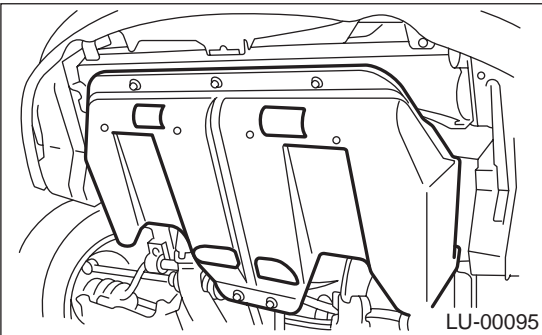
A: REMOVAL

1) Disconnect battery ground cable.



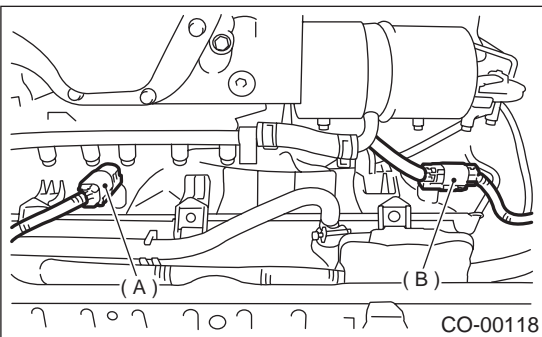
2) Lift-up the vehicle.

3) Remove under cover.



4) Drain engine coolant completely.
<Ref. to CO(H6DO)-22, Engine Coolant.>

5) Disconnect connectors of main and sub fan motor.

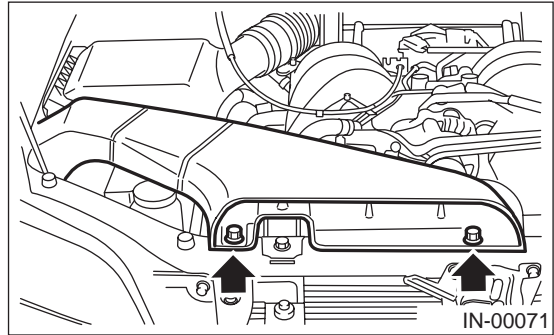


(A) Main fan motor connector

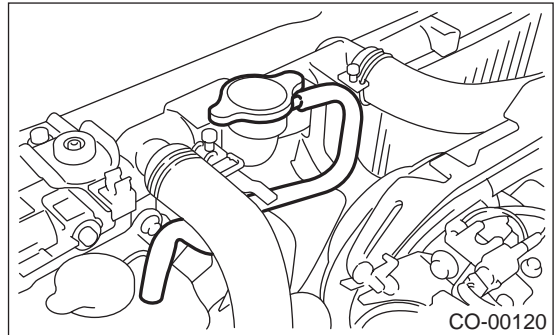
(B) Sub fan motor connector

6) Lower the vehicle.

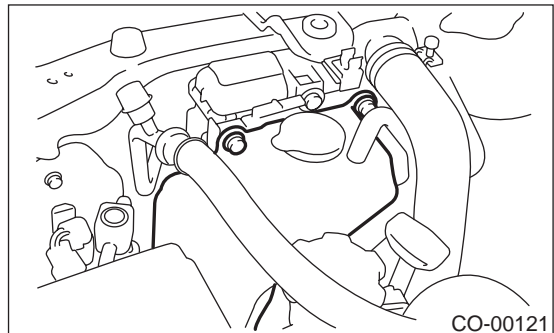
7) Remove air intake duct.



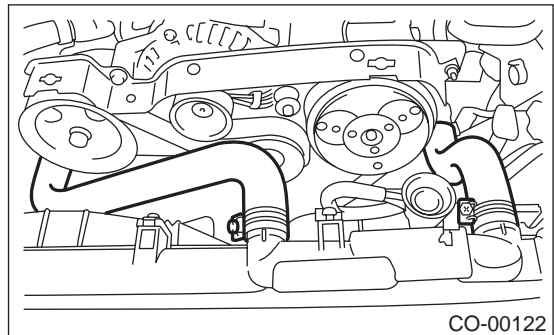
8) Disconnect over flow hose.



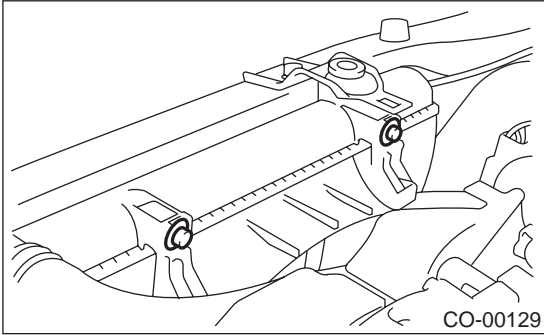
9) Remove reservoir tank.



10) Disconnect radiator inlet hoses from radiator.



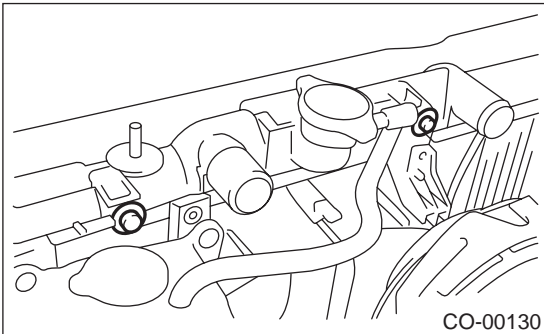
11) Remove radiator sub fan motor assembly.



12) Remove radiator main fan motor assembly.

NOTE:

When removing main fan assembly by lifting it upward, main fan shroud will cause interference with coolant suction area. In order to avoid this, shift the main fan assembly over to sub fan side before removing it.



B: INSTALLATION

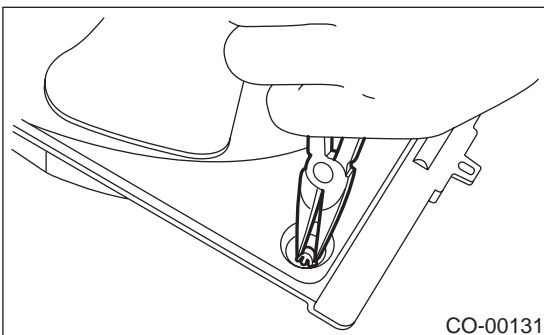
Install in the reverse order of removal.

NOTE:

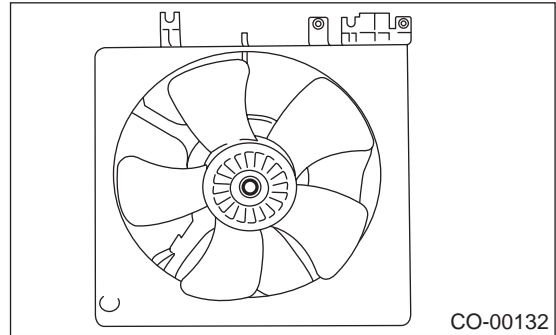
Refer to "COMPONENT" for tightening torque. <Ref. to CO(H6DO)-3, COMPONENT, General Description.>

C: DISASSEMBLY

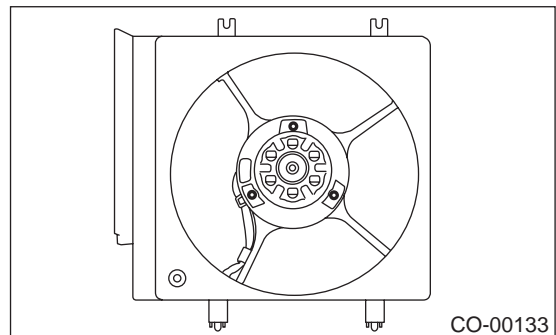
1) Remove clip which holds motor connector onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



3) Remove screws which install fan motor onto shroud.



D: ASSEMBLY

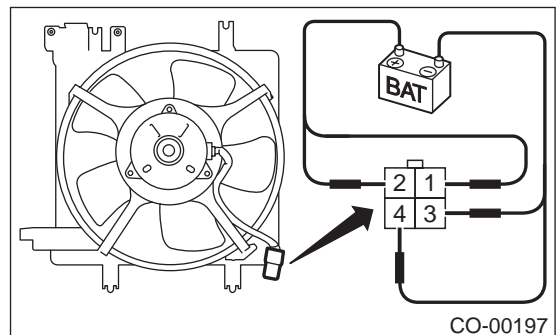
Assemble in the reverse order of disassembly.

NOTE:

Refer to "COMPONENT" for tightening torque. <Ref. to CO(H6DO)-3, COMPONENT, General Description.>

E: INSPECTION

1) Connect battery as shown in the figure.



Terminal

No. 1 (+) — No. 4 (-): Low speed

No. 1 (+), No. 2 (+) — No. 4 (-): Middle speed

No. 1 (+), No. 2 (+) — No. 3 (-), No. 4 (-): High speed

2) Make sure the main fan motor operates properly. Replace it if it doesn't.

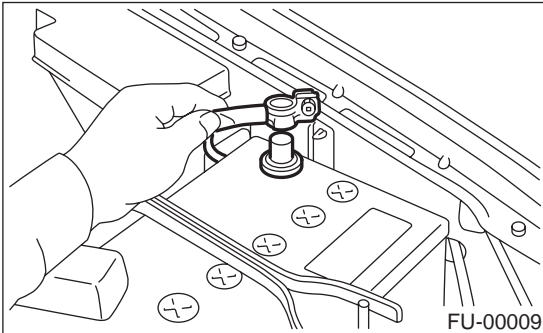
RADIATOR SUB FAN AND FAN MOTOR

COOLING

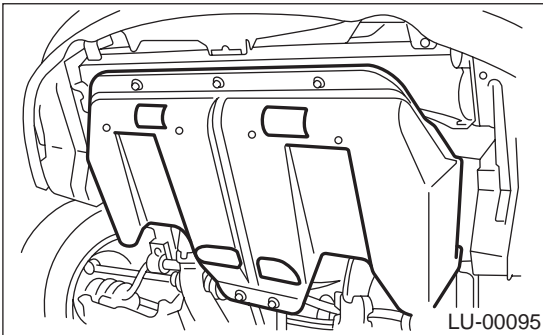
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

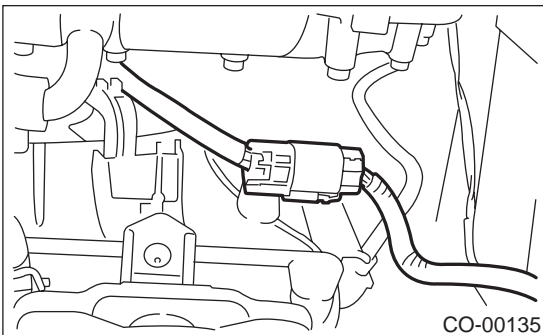
- 1) Disconnect battery ground cable.



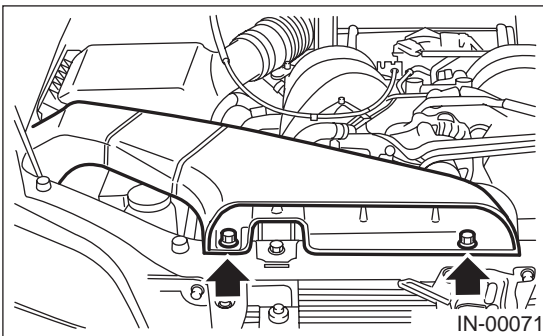
- 2) Lift-up the vehicle.
- 3) Remove under cover.



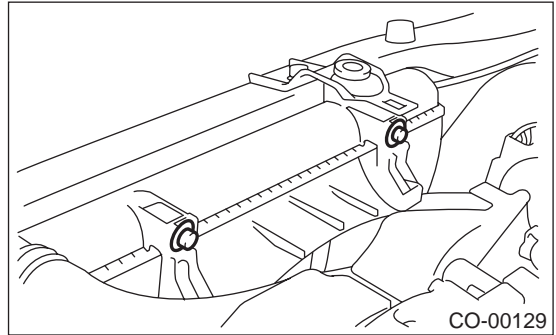
- 4) Disconnect connector of sub fan motor.



- 5) Lower the vehicle.
- 6) Remove air intake duct.



- 7) Remove bolts which hold sub fan shroud to radiator.
- 8) Remove radiator sub fan shroud through the under side of vehicle.



B: INSTALLATION

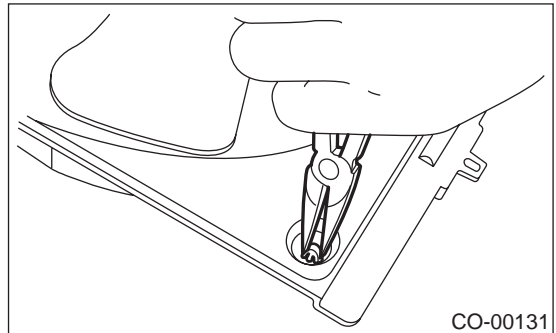
Install in the reverse order of removal.

NOTE:

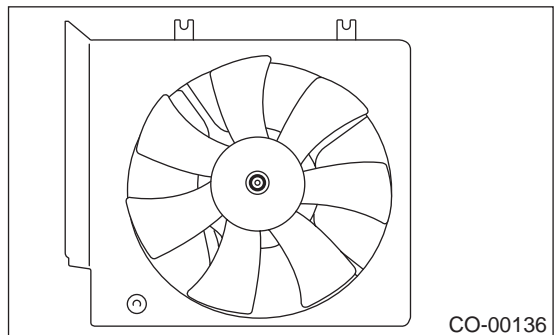
Refer to "COMPONENT" for tightening torque.
<Ref. to CO(H6DO)-3, COMPONENT, General Description.>

C: DISASSEMBLY

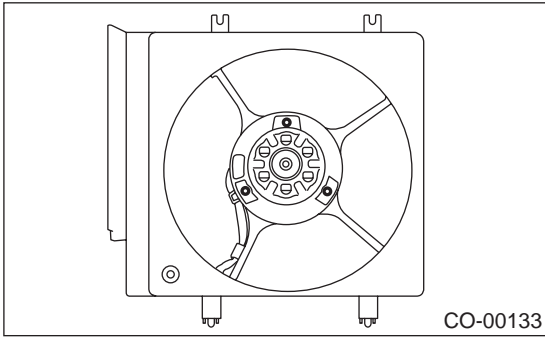
- 1) Remove clip which holds motor harness onto shroud.



- 2) Remove nut which holds fan itself onto fan motor and shroud assembly.



3) Remove screws which install fan motor onto shroud.



D: ASSEMBLY

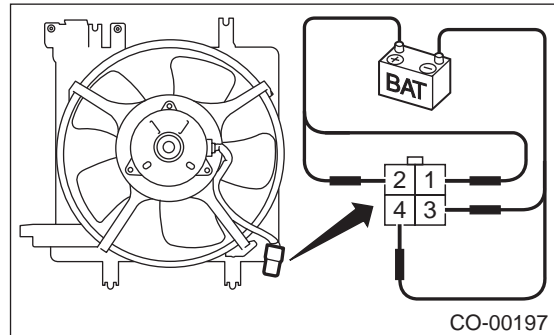
Assemble in the reverse order of disassembly.

NOTE:

Refer to "COMPONENT" for tightening torque.
 <Ref. to CO(H6DO)-3, COMPONENT, General Description.>

E: INSPECTION

1) Connect battery as shown in the figure.



Terminal

No. 1 (+) — No. 4 (-): Low speed

No. 1 (+), No. 2 (+) — No. 4 (-): Middle speed

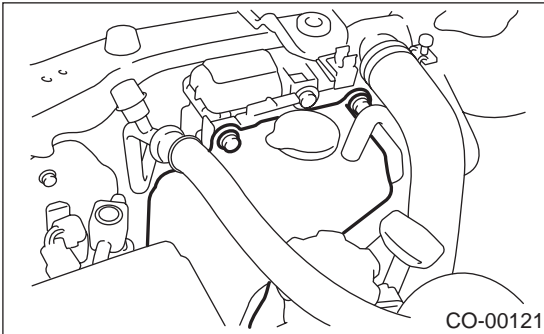
No. 1 (+), No. 2 (+) — No. 3 (-), No. 4 (-): High speed

2) Make sure the sub-fan motor operates properly. Replace it if it doesn't.

11. Reservoir Tank

A: REMOVAL

- 1) Disconnect over flow hose from radiator filler neck position.
- 2) Remove bolts which install reservoir tank onto radiator main fan shroud.
- 3) Remove reservoir tank.

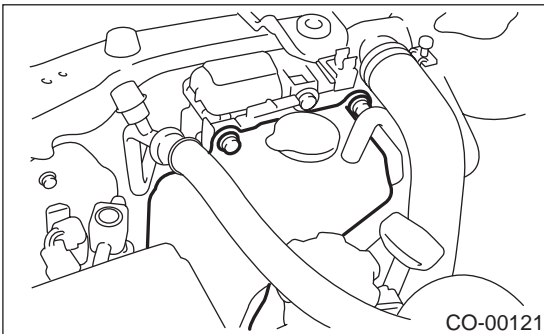


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.9N·m (0.50 kgf-m, 3.6 ft-lb)



C: INSPECTION

Make sure the engine coolant level is between full and low.

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Corrective action	
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Malfunction of thermostat	Replace.
	c. Malfunction of water pump	Replace.
	d. Clogged engine coolant passage	Clean.
	e. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>
	f. Clogged or leaking radiator	Clean or repair, or replace.
	g. Improper engine oil in engine coolant	Replace engine coolant.
	h. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>
	i. Excessive back pressure in exhaust system	Clean or replace.
	j. Insufficient clearance between piston and cylinder	Adjust or replace.
	k. Slipping clutch	Repair or replace.
	l. Dragging brake	Adjust.
	m. Improper transmission oil	Replace.
	n. Defective thermostat	Replace.
	o. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective timing chain	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

ENGINE COOLING SYSTEM TROUBLE IN GENERAL

COOLING

MEMO:

LUBRICATION

LU(H6DO)

	Page
1. General Description	2
2. Oil Pressure System	7
3. Engine Oil.....	9
4. Oil Pump	11
5. Oil Pump Relief Valve	13
6. Oil Pan and Strainer.....	14
7. Oil Pressure Switch.....	16
8. Engine Oil Filter.....	17
9. Oil Cooler	18
10. Engine Lubrication System Trouble in General.....	20



GENERAL DESCRIPTION

LUBRICATION

1. General Description

A: SPECIFICATIONS

Lubrication method			Forced lubrication
Oil pump	Pump type		Trochoid type
	Number of teeth	Inner rotor	9
		Outer rotor	10
	Outer rotor diameter × thickness		78 × 11 mm (3.07 × 0.43 in)
	Tip clearance between inner and outer rotor	Standard	0.04 — 0.14 mm (0.0016 — 0.0055 in)
		Limit	0.20 mm (0.0079 in)
	Side clearance between inner rotor and pump case	Standard	0.02 — 0.08 mm (0.0008 — 0.0031 in)
		Limit	0.15 mm (0.0059 in)
Case clearance between outer rotor and pump case	Standard	0.11 — 0.18 mm (0.0043 — 0.0071 in)	
	Limit	0.25 mm (0.0098 in)	
Oil filter	Type		Full-flow filter type
	Filtration area		1,300 cm ² (201.5 sq in)
	By-pass valve opening pressure		160 kPa (1.63 kg/cm ² , 23 psi)
	Outer diameter × width		80 × 75 mm (3.15 × 2.95 in)
	Oil filter to engine thread size		M 20 × 1.5
Relief valve operation pressure			588 kPa (6 kg/cm ² , 85 psi)
Oil pressure switch	Type		Immersed contact point type
	Working voltage — wattage		12 V — 3.4 W or less
	Warning light activation pressure		15 kPa (0.153 kg/cm ² , 2.18 psi)
	Proof pressure		More than 980 kPa (9.993 kg/cm ² , 142 psi)
Oil capacity (When replacing oil)			5.6 L (5.9 US qt, 4.9 Imp qt)

GENERAL DESCRIPTION

LUBRICATION

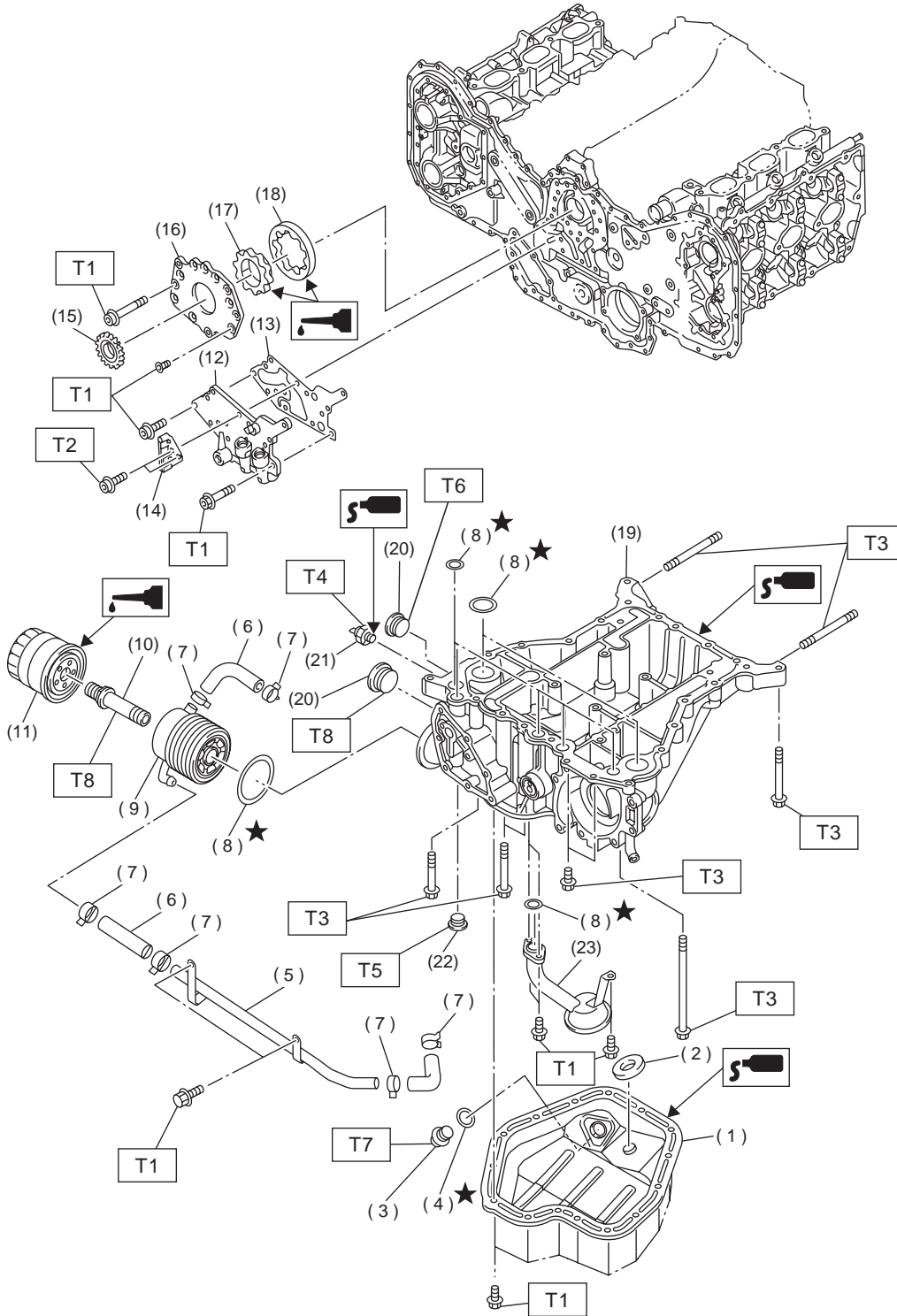
MEMO:

LU(H6DO)-3

GENERAL DESCRIPTION

LUBRICATION

B: COMPONENT



LU-00109

LU(H6DO)-4

GENERAL DESCRIPTION

LUBRICATION

(1) Oil pan lower	(13) Relief valve case gasket	<i>Tightening torque: N-m (kgf-m, ft-lb)</i>
(2) Magnet	(14) Chain guide (center)	<i>T1: 6.4 (0.65, 4.7)</i>
(3) Drain plug	(15) Crank sprocket	<i>T2: 7.8 (0.80, 5.8)</i>
(4) Gasket	(16) Oil pump cover	<i>T3: 18 (1.8, 13)</i>
(5) Oil cooler pipe	(17) Inner rotor	<i>T4: 25 (2.5, 18)</i>
(6) Hose	(18) Outer rotor	<i>T5: 34 (3.5, 25)</i>
(7) Clamp	(19) Oil pan upper	<i>T6: 37 (3.8, 27)</i>
(8) O-ring	(20) Plug	<i>T7: 44 (4.5, 33)</i>
(9) Oil cooler	(21) Oil pressure switch	<i>T8: 54 (5.5, 40)</i>
(10) Connector	(22) Plug	
(11) Oil filter	(23) Oil strainer	
(12) Relief valve case		

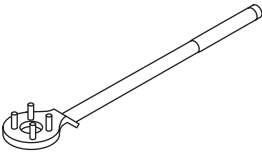
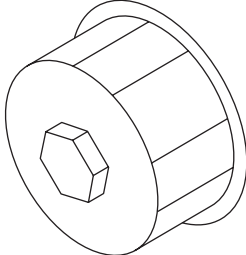
GENERAL DESCRIPTION

LUBRICATION

C: CAUTION

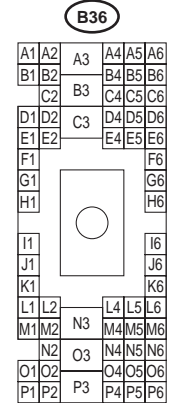
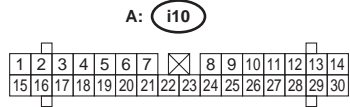
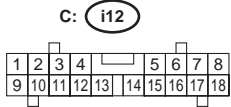
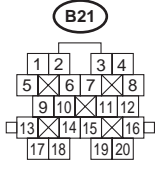
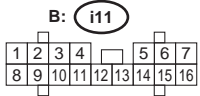
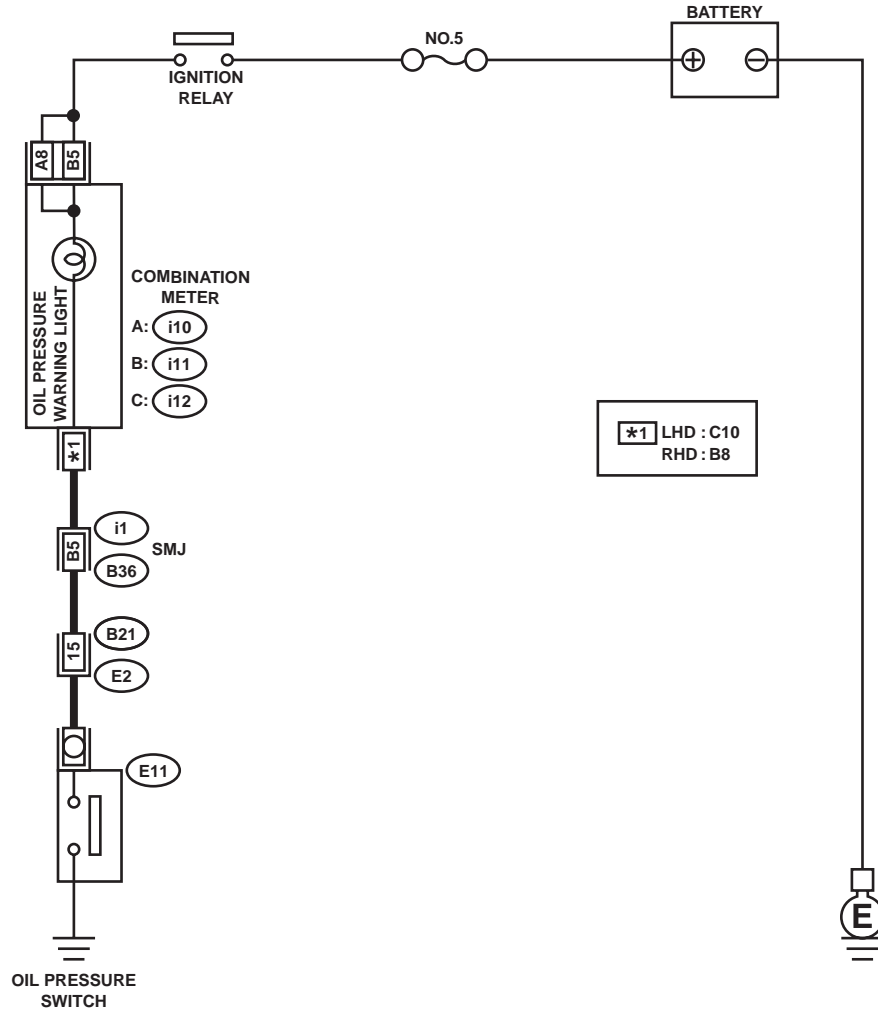
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.

2. Oil Pressure System

A: SCHEMATIC



LU-00145

OIL PRESSURE SYSTEM

LUBRICATION

B: INSPECTION

Step	Value	Yes	No
1 CHECK COMBINATION METER. 1) Turn ignition switch to ON. (engine OFF) 2) Check other warning lights. Do the warning lights go on?	Lights up.	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connector from the oil pressure switch. 3) Turn ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. Connector & terminal (E11) No. 1 — Chassis ground: Is the measured value exceed the specified value?	10 V	Replace oil pressure switch.	Go to step 3.
3 CHECK COMBINATION METER. 1) Turn ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of the combination meter. Terminals LHD (i12) No. 10 — (i11) No. 5: (i12) No. 10 — (i10) No. 8: RHD (i11) No. 8 — (i11) No. 5: (i11) No. 8 — (i10) No. 8: Is the measured value less than the specified value?	10 Ω	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter and the oil pressure switch warning light bulb.

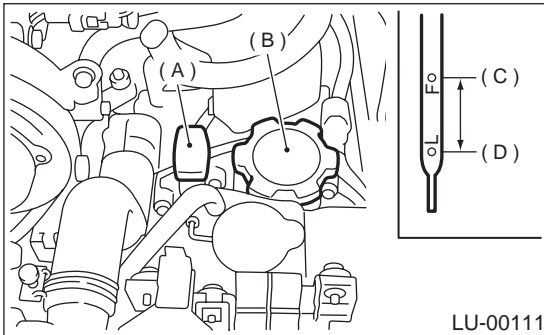
3. Engine Oil

A: INSPECTION

- 1) Park vehicle on a level surface.
- 2) Remove oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.
- 5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
- 6) To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.

NOTE:

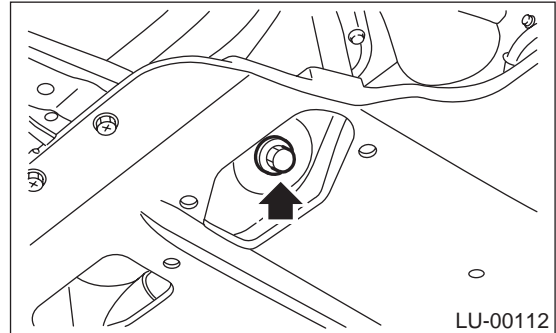
Just after driving or during warm-up, engine oil level may rise above the "F" mark.



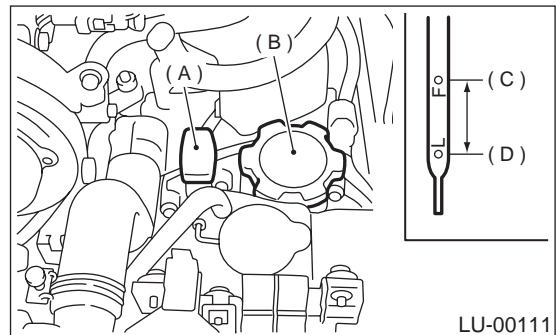
- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level

B: REPLACEMENT

- 1) Drain engine oil by loosening engine oil drain plug.



- 2) Open engine oil filler cap for quick draining of the engine oil.

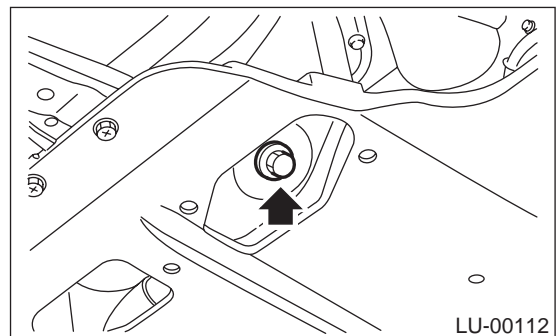


- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level

- 3) Replace drain plug gasket.
- 4) Tighten engine oil drain plug after draining engine oil.

Tightening torque:

44 N·m (4.5 kgf·m, 33 ft·lb)



ENGINE OIL

LUBRICATION

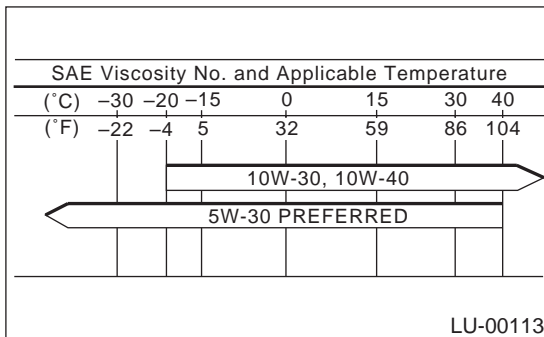
5) Fill engine oil through filler pipe up to upper point on level gauge. Make sure that vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil

- **API certification SL or SJ with the words "ENERGY CONSERVING" (if you cannot obtain the oil with SL or SJ grade, you may use SH grade)**
- **ACEA specification A1, A2 or A3**
- **CCMC specification G4 or G5**
- **New API certification mark (Star burst mark) label is on the container.**

Engine oil amount for preparation (with replacing engine oil):

Approx. 5.6 L (5.9 US qt, 4.9 Imp qt)



The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:

When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification and SAE viscosity No. designated by SUBARU.

NOTE:

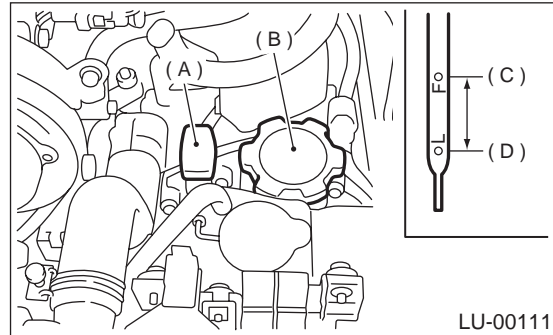
If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SL or SJ

SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

6) Close engine oil filler cap.

7) Start engine and warm it up for a time.

8) After engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.



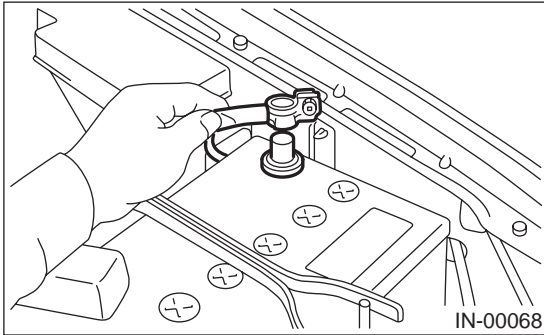
(A) Oil level gauge

(B) Engine oil filler cap

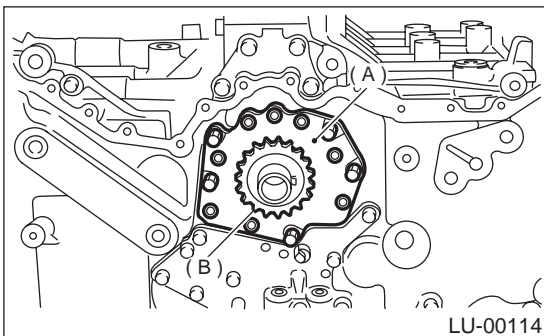
4. Oil Pump

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Lift-up the vehicle.
- 3) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>
- 4) Drain coolant. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 5) Lower the vehicle.
- 6) Remove radiator. <Ref. to CO(H6DO)-27, REMOVAL, Radiator.>
- 7) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
- 8) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 9) Remove timing chain. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 10) Remove oil pump cover and crankshaft sprocket.

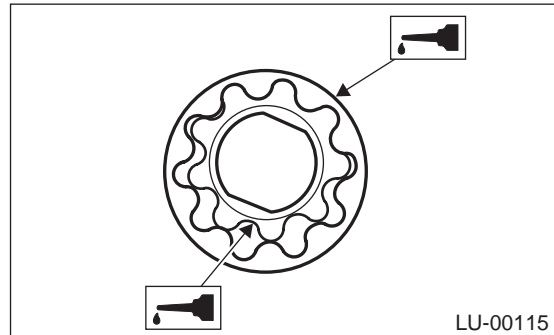


- (A) Oil pump cover
(B) Crankshaft sprocket

- 11) Remove inner rotor and outer rotor.

B: INSTALLATION

- 1) Apply engine oil to the entire surface area of both inner and outer rotor.



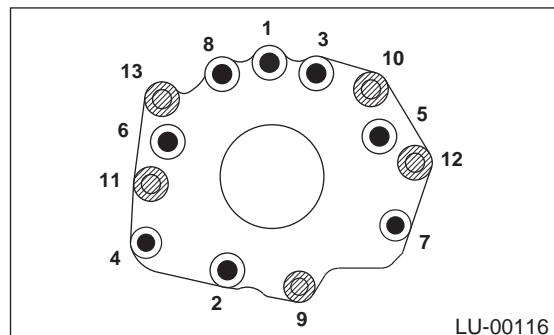
- 2) Install the inner rotor by fitting it into the groove on the crankshaft, and then assemble the outer rotor.
- 3) Install oil pump cover.
- 4) Tighten the bolts in the numerical sequence shown in the figure.

CAUTION:

Make sure that bolt mounting position is correct.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



- 5) Install crank sprocket.
- 6) Install timing chain. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
- 7) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
- 8) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
- 9) Install radiator. <Ref. to CO(H6DO)-28, INSTALLATION, Radiator.>
- 10) Install under cover. <Ref. to EI-13, INSTALLATION, Front Under Cover.>
- 11) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

OIL PUMP

LUBRICATION

C: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a set.

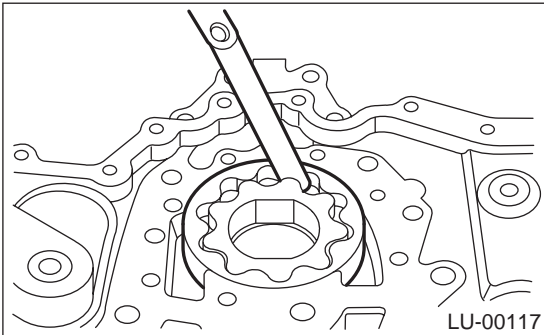
Tip clearance:

Standard

0.04 — 0.14 mm (0.0016 — 0.0055 in)

Limit

0.20 mm (0.0079 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and the rear chain cover rotor housing. If the clearance exceeds the limit, replace the rotor.

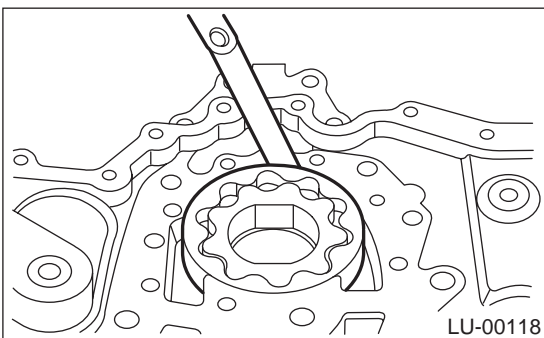
Case clearance:

Standard

0.11 — 0.18 mm (0.0043 — 0.0071 in)

Limit

0.25 mm (0.0098 in)



3. SIDE CLEARANCE

Measure clearance between oil pump inner rotor and rear chain cover. If the clearance exceeds the limit, replace rotors as a set.

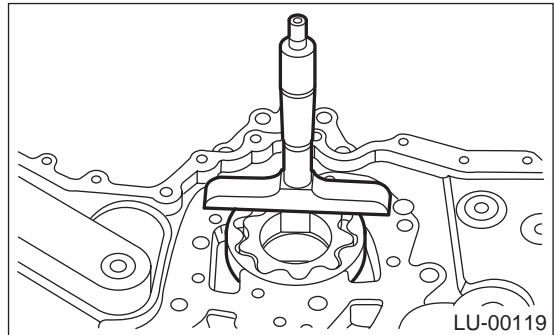
Side clearance:

Standard

0.02 — 0.08 mm (0.0008 — 0.0031 in)

Limit

0.15 mm (0.0059 in)



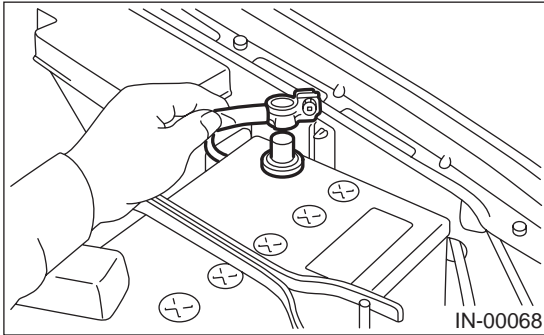
4. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, cracks and other faults.

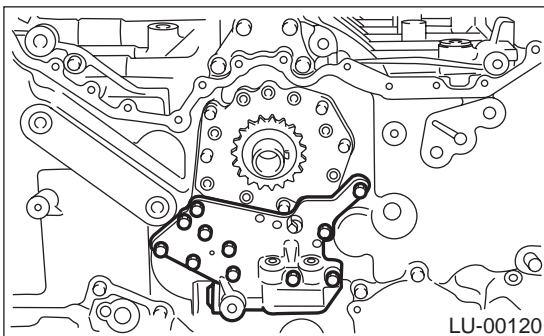
5. Oil Pump Relief Valve

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Lift-up the vehicle.
- 3) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>
- 4) Drain coolant. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 5) Lower the vehicle.
- 6) Remove radiator. <Ref. to CO(H6DO)-27, REMOVAL, Radiator.>
- 7) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
- 8) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 9) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 10) Remove oil pump relief valve.

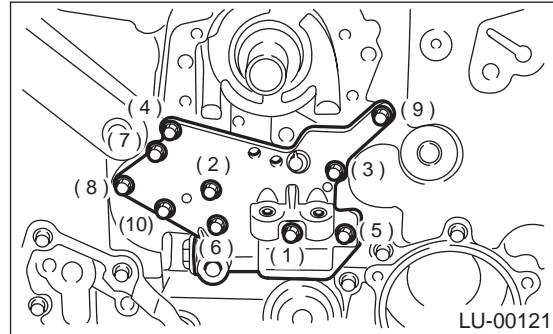


B: INSTALLATION

- 1) Install oil pump relief valve case and gasket
- 2) Tighten the bolts in the numerical sequence shown in the figure.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



Bolt installation position	Bolt dimension
(1) and (5)	6 x 26
(2), (3), (4) and (9)	6 x 35
(6), (7), (8) and (10)	6 x 16

- 3) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
- 4) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
- 5) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
- 6) Install radiator. <Ref. to CO(H6DO)-28, INSTALLATION, Radiator.>
- 7) Install under cover. <Ref. to EI-13, INSTALLATION, Front Under Cover.>
- 8) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

- Check the oil pump relief valve case for worn shaft hole, clogged oil passage, cracks and other faults.
- Make sure that there are no foreign materials on the gasket filter.

OIL PAN AND STRAINER

LUBRICATION

6. Oil Pan and Strainer

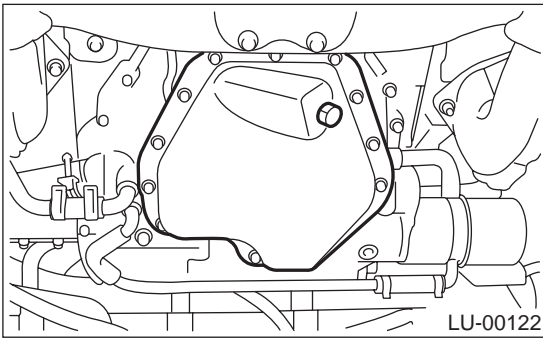
A: REMOVAL

NOTE:

Oil pan upper cannot be removed from the normal vehicle position. The engine must be separated from the vehicle prior to removal. <Ref. to ME(H6DO)-29, REMOVAL, Engine Assembly.>

- 1) Set the vehicle on lift arms.
- 2) Lift-up the vehicle.
- 3) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>
- 4) Drain engine oil.

Set container under the vehicle, and remove drain plug from oil pan.

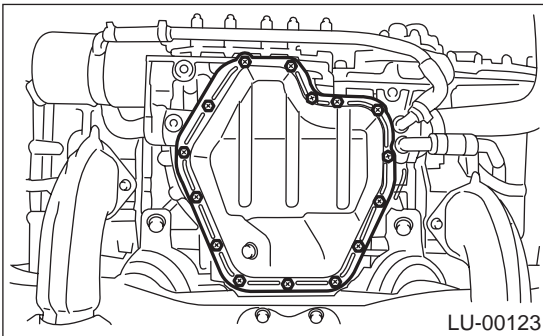


- 5) Insert oil pan cutter blade between upper and lower oil pans.

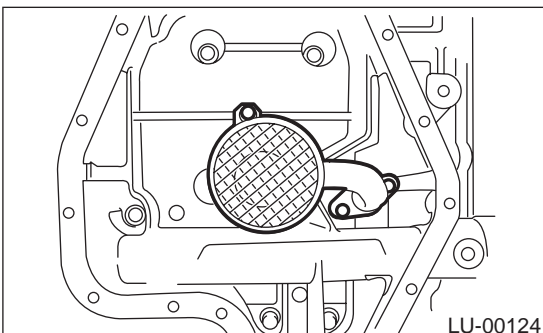
CAUTION:

Do not use a screwdriver or similar tool in place of oil pan cutter.

- 6) Remove lower oil pan.



- 7) Remove oil strainer.



B: INSTALLATION

CAUTION:

Before installing oil pan, clean liquid gasket from lower oil pan and upper oil pan.

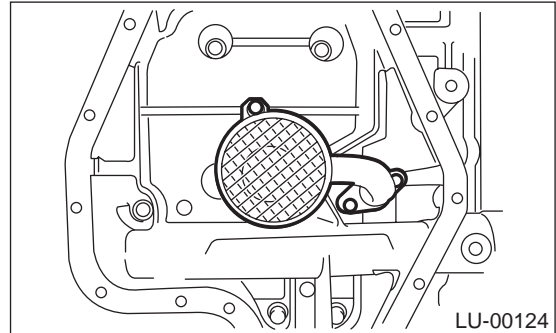
- 1) Install oil strainer onto upper oil pan.

CAUTION:

Replace O-ring with a new one.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



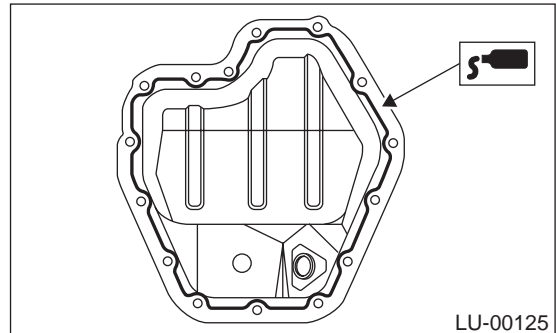
- 2) Apply liquid gasket to mating surfaces and install oil pan.

Liquid gasket:

THREE BOND 1280B

Liquid gasket application diameter:

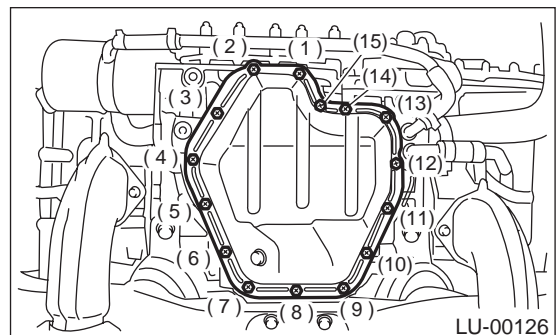
5.0±1.0 mm (0.197±0.039 in)



- 3) Tighten the lower oil pan mounting bolts in the numerical sequence shown in the figure.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



- 4) Install under cover. <Ref. to EI-13, INSTALLATION, Front Under Cover.>
- 5) Fill engine oil. <Ref. to LU(H6DO)-9, INSPECTION, Engine Oil.>

C: INSPECTION

By visual check make sure oil pan, oil strainer and oil strainer stay are not damaged.

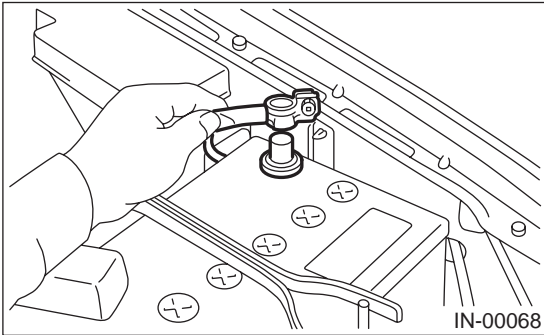
OIL PRESSURE SWITCH

LUBRICATION

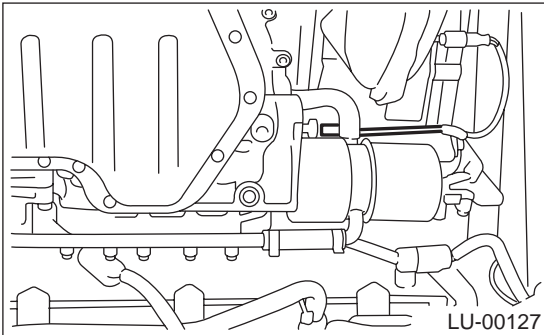
7. Oil Pressure Switch

A: REMOVAL

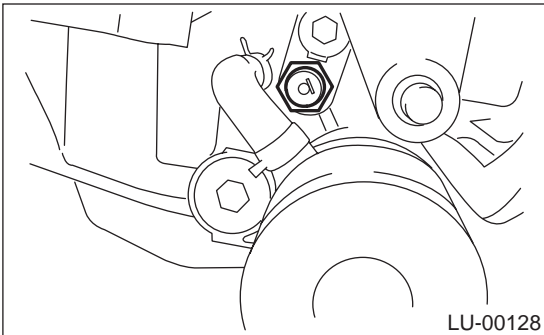
- 1) Set vehicle on the lift.
- 2) Disconnect battery ground cable.



- 3) Lift-up the vehicle.
- 4) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>
- 5) Disconnect terminal from oil pressure switch.



- 6) Remove oil pressure switch.

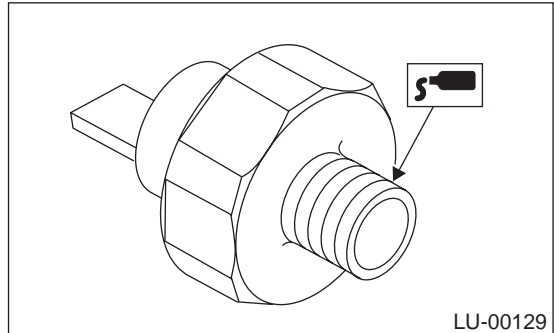


B: INSTALLATION

- 1) Apply liquid gasket to oil pressure switch threads.

Liquid gasket:

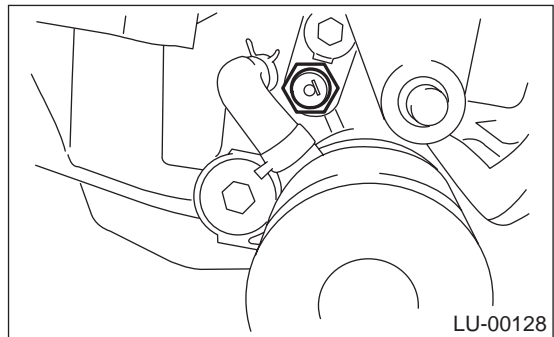
THREE BOND 1324 or equivalent



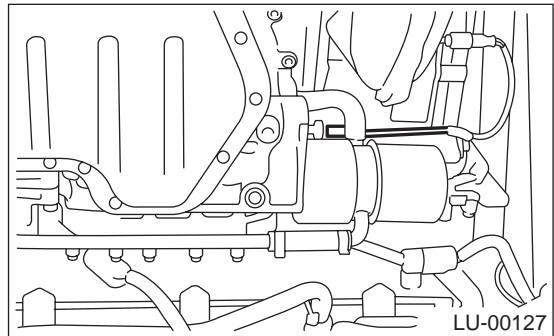
- 2) Install oil pressure switch.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- 3) Connect terminal of oil pressure switch.



- 4) Install under cover. <Ref. to EI-13, INSTALLATION, Front Under Cover.>

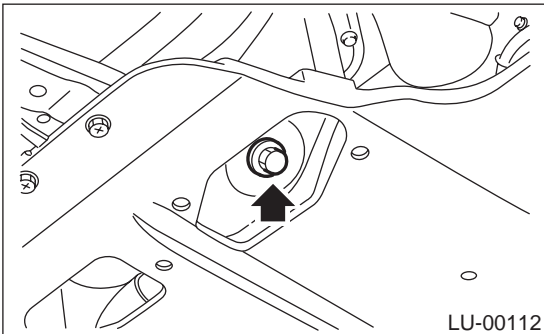
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

8. Engine Oil Filter

A: REMOVAL

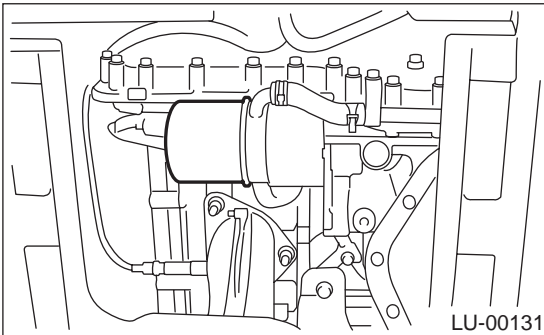
- 1) Drain engine oil by loosening engine oil drain plug.



- 2) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>

- 3) Remove oil filter with ST.

ST 498547000 OIL FILTER WRENCH



B: INSTALLATION

- 1) Get a new oil filter and thinly apply engine oil to the rubber seal.
- 2) Install oil filter by turning it by hand, being careful not to damage rubber seal.
- 3) Tighten more (approximately 3/4 turn) after the rubber seal contacts the oil cooler. Do not tighten excessively, or oil may leak.
- 4) Refill engine oil. <Ref. to LU(H6DO)-9, INSPECTION, Engine Oil.>

C: INSPECTION

- 1) After installing oil filter, run engine and make sure that no oil is leaking around rubber seal.

NOTE:

The filter element and filter case are unified; therefore, interior cleaning is not necessary.

- 2) Check the engine oil level. <Ref. to LU(H6DO)-9, INSPECTION, Engine Oil.>

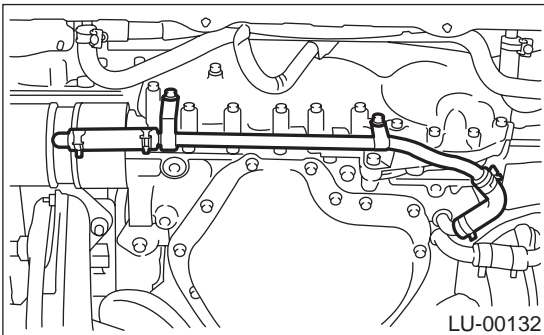
OIL COOLER

LUBRICATION

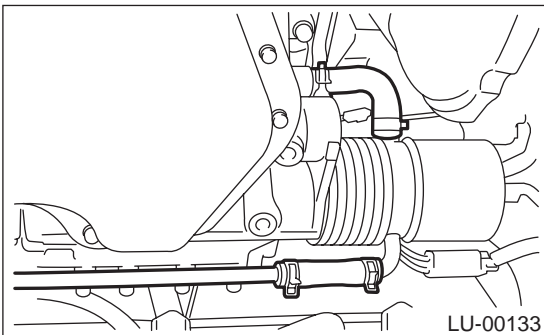
9. Oil Cooler

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove under cover. <Ref. to EI-13, REMOVAL, Front Under Cover.>
- 3) Drain engine coolant completely. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 4) Drain engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
- 5) Remove bolts which installs water pipe to engine.



- 6) Disconnect water hoses from oil cooler.

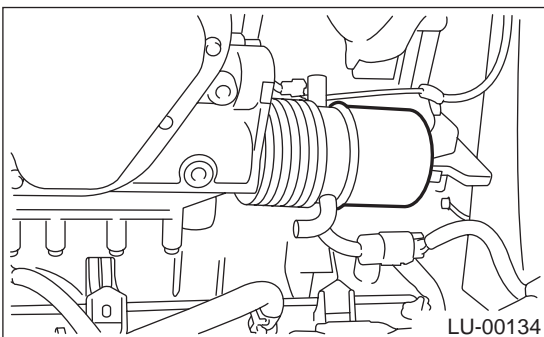


- 7) Remove oil filter using ST. <Ref. to LU(H6DO)-17, REMOVAL, Engine Oil Filter.>

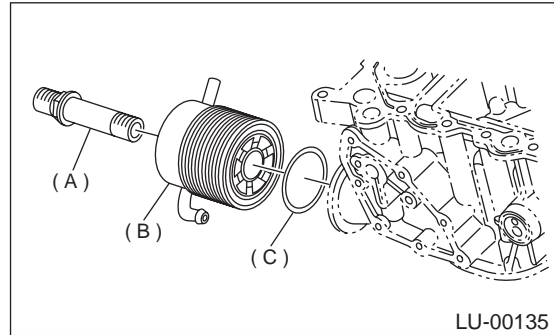
ST 498547000 OIL FILTER WRENCH

NOTE:

Set container under the vehicle.



- 8) Remove connector and remove oil cooler.



- (A) Connector
- (B) Oil cooler
- (C) O-ring

B: INSPECTION

- 1) Check that coolant passages are not clogged using air blow method.
- 2) Check upper oil pan and the installation surface of oil filter O-ring for damage.

C: INSTALLATION

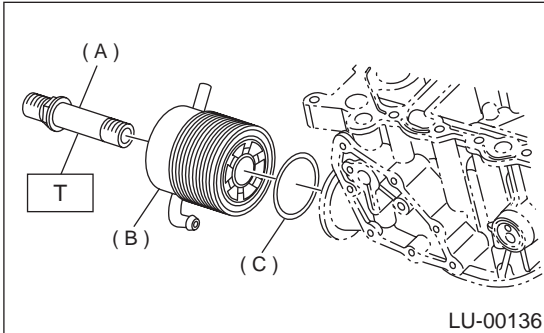
1) Install oil cooler on upper oil pan with connector pipe.

Tightening torque:

T: 54 N·m (5.5 kgf-m, 39.8 ft-lb)

NOTE:

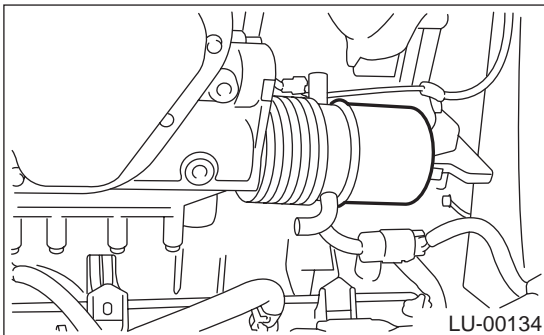
Always use a new O-ring.



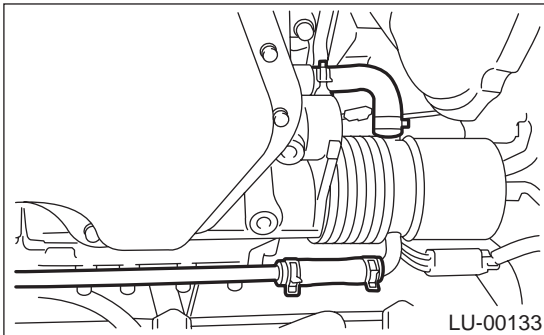
- (A) Connector
- (B) Oil cooler
- (C) O-ring

2) Install oil filter using ST. <Ref. to LU(H6DO)-17, INSTALLATION, Engine Oil Filter.>

ST 498547000 OIL FILTER WRENCH



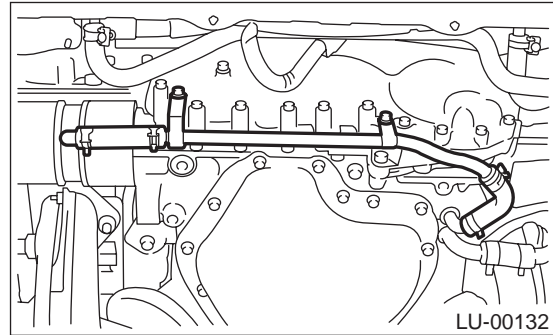
3) Install water hose.



4) Install water pipe to engine.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



5) Fill engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>

6) Fill engine coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

7) Check the engine oil level. <Ref. to LU(H6DO)-9, INSPECTION, Engine Oil.>

ENGINE LUBRICATION SYSTEM TROUBLE IN GENERAL

LUBRICATION

10.Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains ON.	1) Oil pressure switch failure	Cracked diaphragm or pressure leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
Oil pump rotor does not rotate.		Replace.	
2. Warning light does not go on.	1) Broken line related to bulb	Replace.	
	2) Poor contact of switch contact points	Replace.	
	3) Disconnection of wiring	Repair.	
3. Warning light flickers momentarily.	1) Poor contact at terminals	Repair.	
	2) Defective wiring harness	Repair.	
	3) Low oil pressure	Check for the same possible causes as listed in 1.—2).	

SPEED CONTROL SYSTEMS

SP(H6DO)

	Page
1. General Description	2
2. Accelerator Pedal	4
3. Accelerator Control Cable	8



GENERAL DESCRIPTION

SPEED CONTROL SYSTEMS

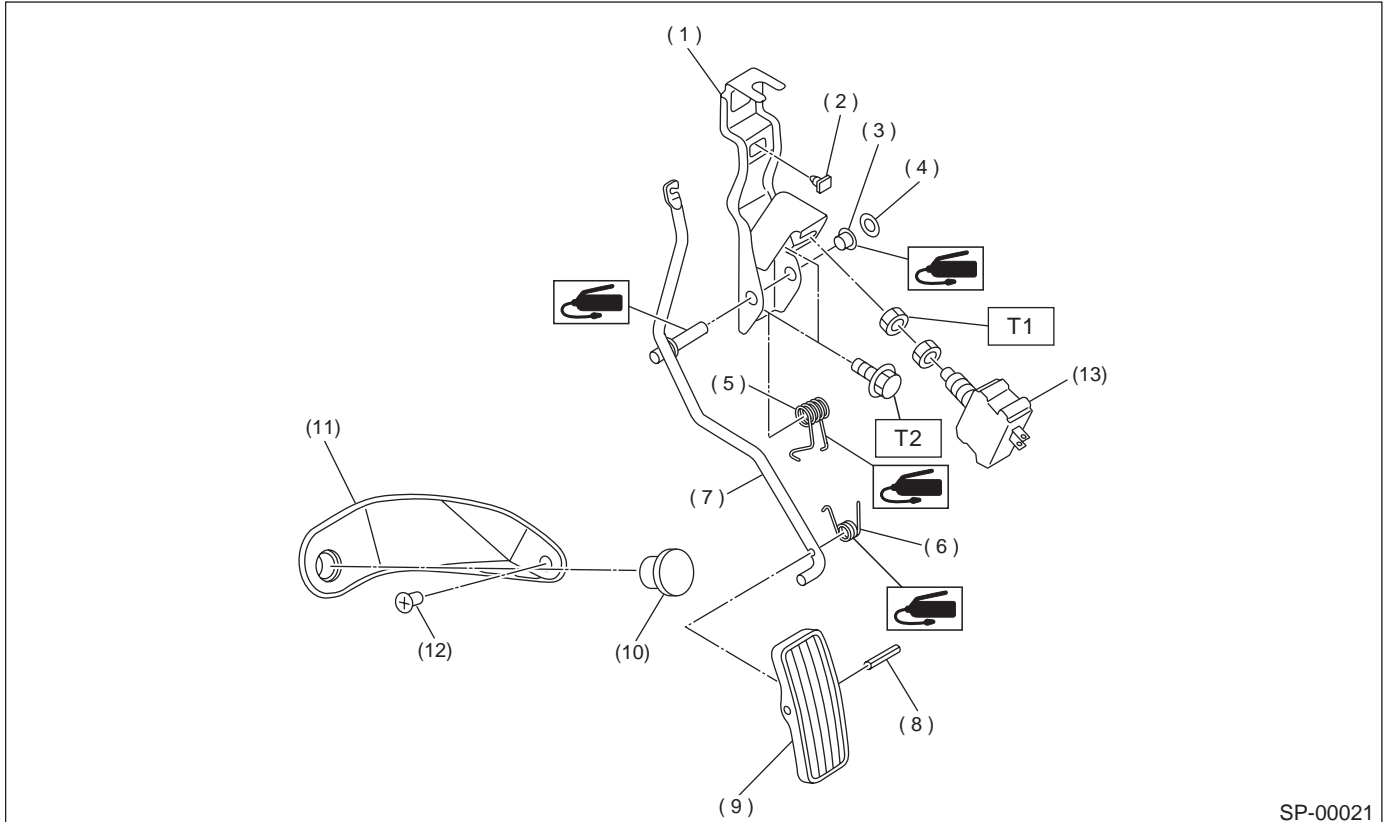
1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	0 — 4 mm (0 — 0.16 in)
	Stroke	At pedal pad	50 — 55 mm (1.97 — 2.17 in)

B: COMPONENT

1. LHD MODEL



- (1) Accelerator bracket
- (2) Stopper
- (3) Bushing
- (4) Clip
- (5) Accelerator spring
- (6) Accelerator pedal spring

- (7) Accelerator pedal lever
- (8) Spring pin
- (9) Accelerator pedal
- (10) Accelerator stopper
- (11) Accelerator plate
- (12) Clip

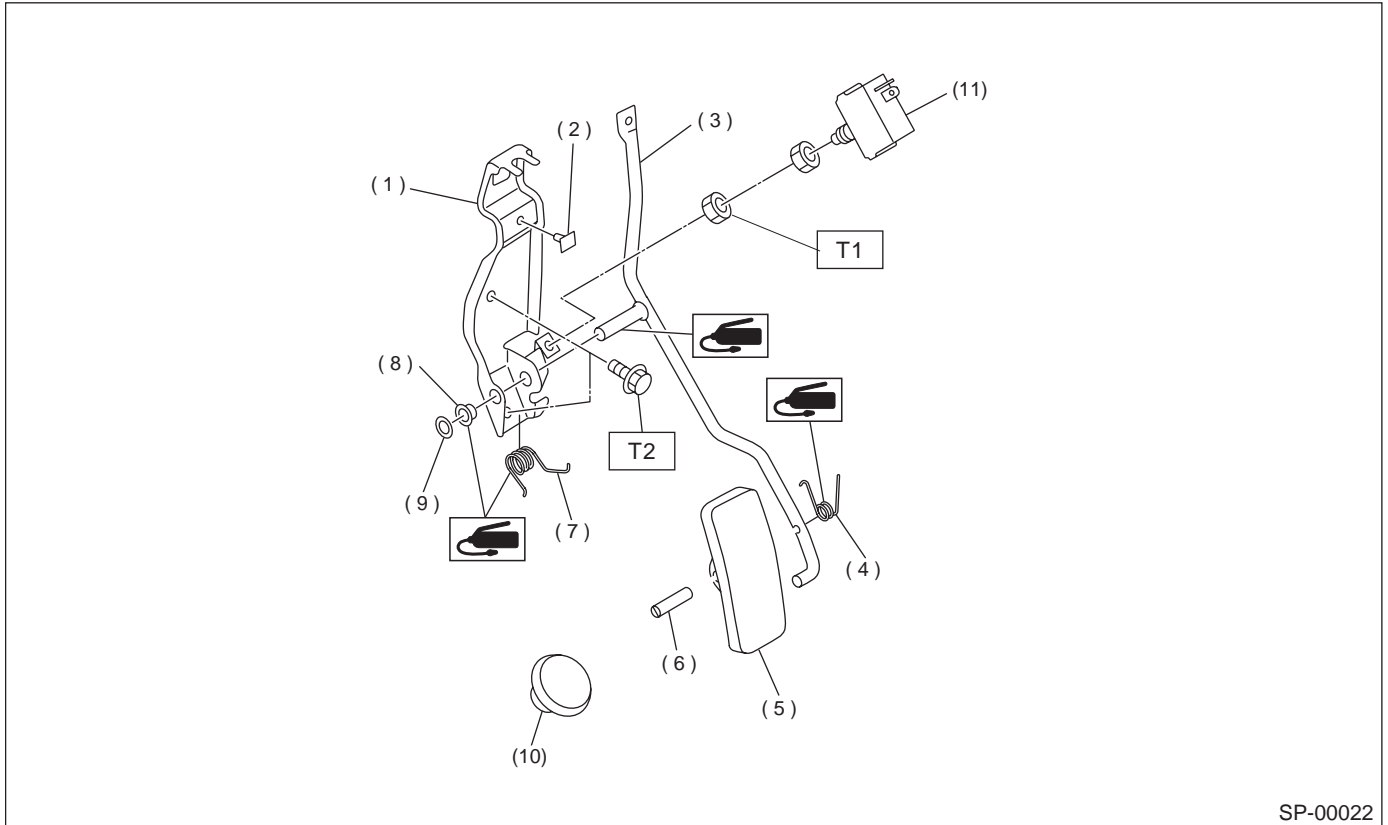
- (13) Kick-down switch

Tightening torque: N·m (kgf·m, ft·lb)

T1: 12 (1.2, 8.7)

T2: 18 (1.8, 13.0)

2. RHD MODEL



SP-00022

- | | |
|------------------------------|--------------------------|
| (1) Accelerator bracket | (7) Accelerator spring |
| (2) Stopper | (8) Bushing |
| (3) Accelerator pedal lever | (9) Clip |
| (4) Accelerator pedal spring | (10) Accelerator stopper |
| (5) Accelerator pedal | (11) Kick-down switch |
| (6) Spring pin | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 12 (1.2, 8.7)

T2: 18 (1.8, 13.0)

C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

ACCELERATOR PEDAL

SPEED CONTROL SYSTEMS

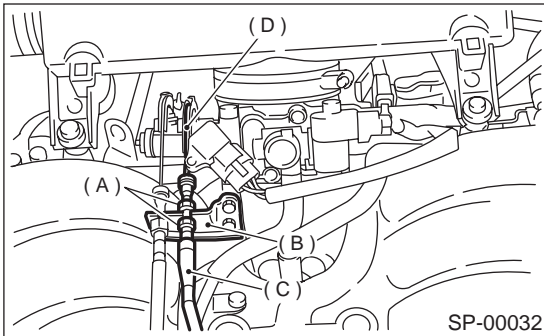
2. Accelerator Pedal

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove lock nut from accelerator cable bracket.
- 3) Separate accelerator cable from bracket.
- 4) Remove accelerator cable end from throttle cam.

NOTE:

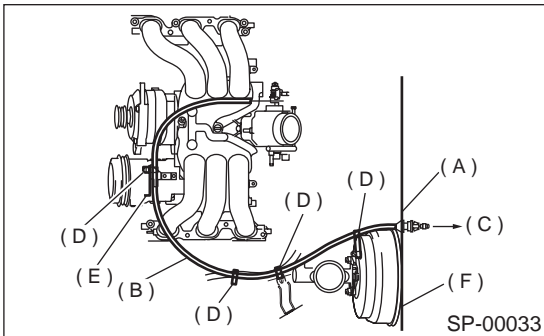
Be careful not to kink accelerator cable.



- (A) Lock nut
- (B) Accelerator cable bracket
- (C) Accelerator cable
- (D) Throttle cam

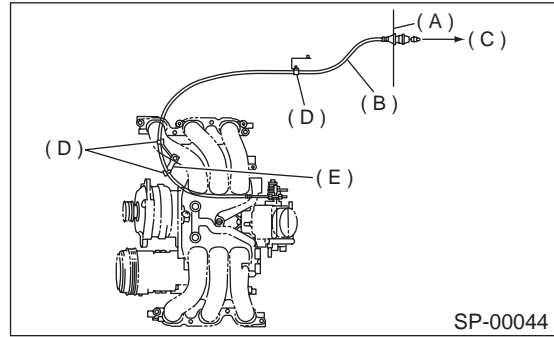
- 5) Remove clip inside engine compartment.

• LHD MODEL



- (A) Toe board
- (B) Accelerator cable
- (C) To accelerator pedal
- (D) Clip
- (E) Bracket
- (F) Brake booster

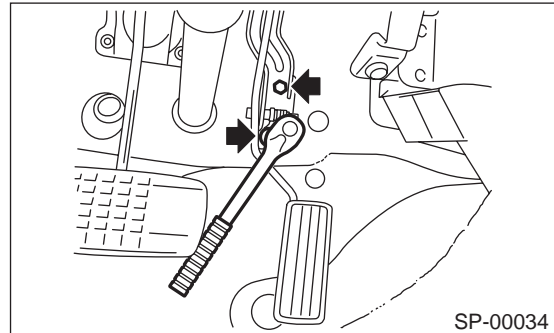
• RHD MODEL



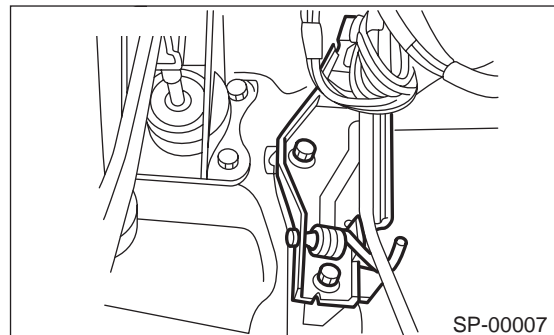
- (A) Toe board
- (B) Accelerator cable
- (C) To accelerator pedal
- (D) Clip
- (E) Bracket

- 6) Remove instrument panel lower cover from instrument panel, and connector.
- 7) Disconnect connector from kick-down switch.
- 8) Remove accelerator pedal connecting bolt from accelerator pedal bracket.

• LHD MODEL



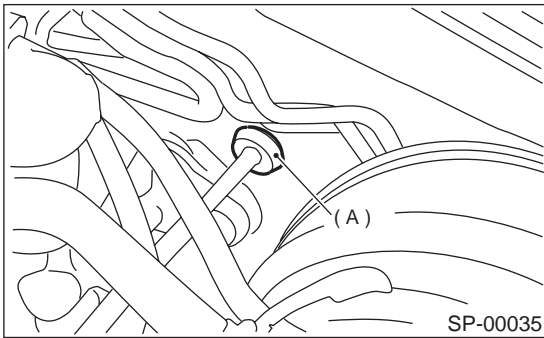
• RHD MODEL



9) Disconnect grommet from toe board.

NOTE:

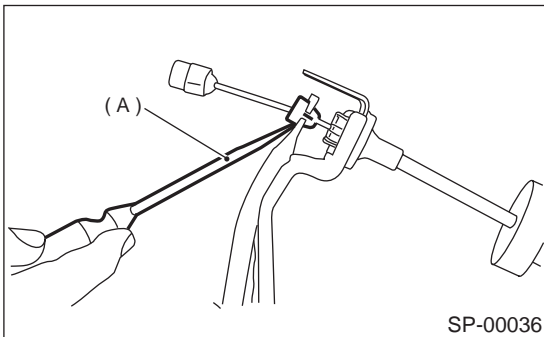
From engine compartment, push grommet into hole.



(A) Grommet

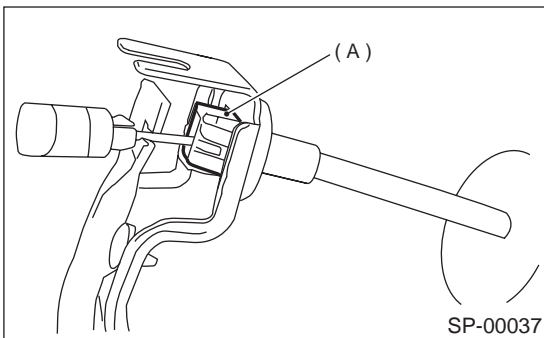
10) Pull out the cable from the toe board hole.

11) Disconnect accelerator cable bushing from accelerator pedal lever.



(A) Slot-type screwdriver

12) Disconnect accelerator cable stopper from bracket.



(A) Accelerator cable stopper

13) Separate accelerator cable and bracket.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:

- If cable clamp is damaged, replace it with a new one.
- Never fail to cover outer cable end with boot.
- Be careful not to kink accelerator cable.
- Refer to COMPONENT for the tightening torque. <Ref. to SP(H6DO)-2, COMPONENT, General Description.>

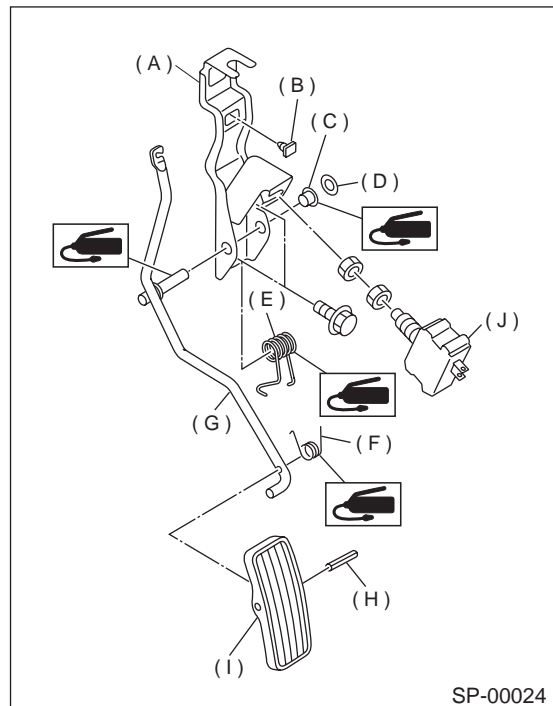
2) Adjust the pedal after installation. <Ref. to SP(H6DO)-7, ADJUSTMENT, Accelerator Pedal.>

C: DISASSEMBLY

1) Remove the clip, and then remove the accelerator pedal from the bracket.

2) Pull out the spring pin, and then remove the accelerator pedal from the accelerator pedal lever.

- LHD MODEL

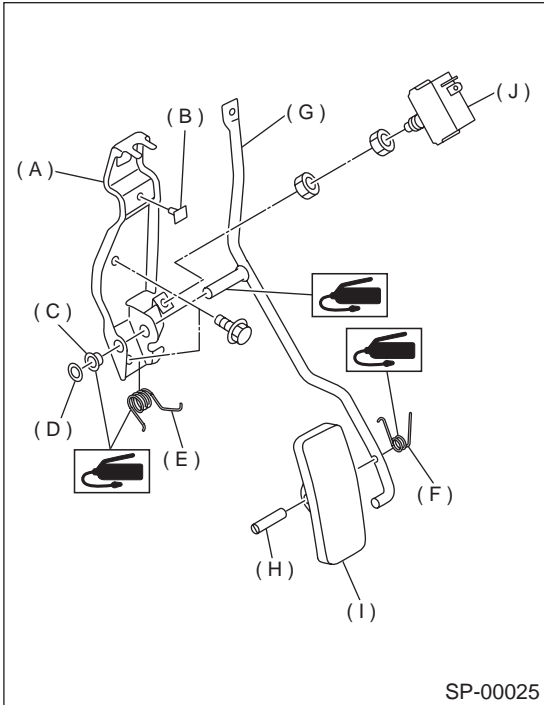


- (A) Accelerator bracket
- (B) Stopper
- (C) Bushing
- (D) Clip
- (E) Accelerator spring
- (F) Accelerator pedal spring
- (G) Accelerator pedal lever
- (H) Spring pin
- (I) Accelerator pedal
- (J) Kick-down switch

ACCELERATOR PEDAL

SPEED CONTROL SYSTEMS

• RHD MODEL



- (A) Accelerator bracket
- (B) Stopper
- (C) Bushing
- (D) Clip
- (E) Accelerator spring
- (F) Accelerator pedal spring
- (G) Accelerator pedal lever
- (H) Spring pin
- (I) Accelerator pedal
- (J) Kick-down switch

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:

Clean and apply grease to the position as shown in the figure.

Grease:

Part No. 003602010
SUNLIGHT No. 2

E: INSPECTION

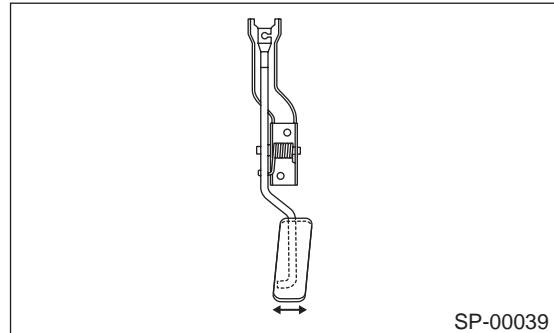
1. ACCELERATOR PEDAL

- 1) Lightly move pedal pad in the lateral direction to ensure pedal deflection is in specified range.
- 2) If excessive deflection is noted, replace bushing and clip with new ones.

Deflection of accelerator pedal:

Service limit

$\pm 2.0 \text{ mm } (\pm 0.079 \text{ in})$ or less

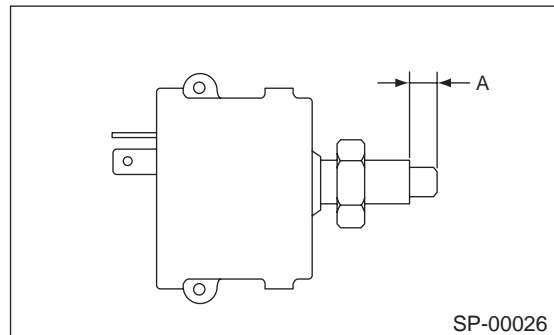


2. KICK-DOWN SWITCH

If kick-down switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position: A

$2.0 - 3.5 \text{ mm } (0.079 - 0.138 \text{ in})$



F: ADJUSTMENT

1) Check pedal stroke and free play by operating accelerator pedal by hand.

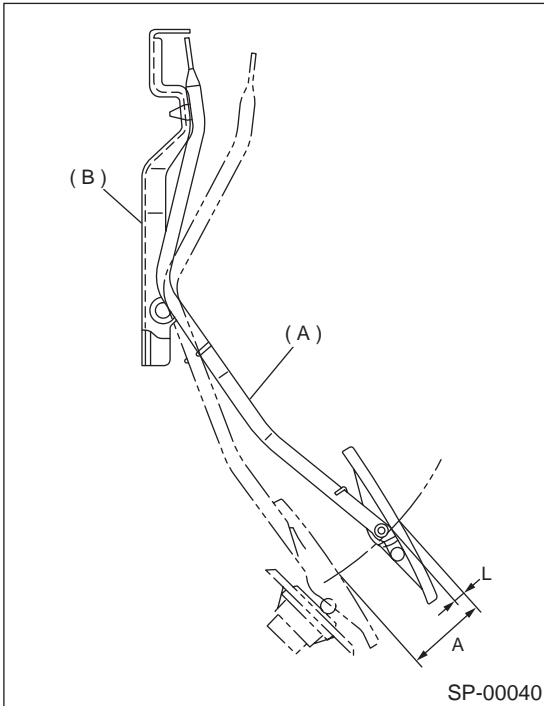
2) If it is not within specified value, adjust it by turning nut connecting accelerator cable to throttle body.

Free play at pedal pad: L

0 — 4 mm (0 — 0.16 in)

Stroke at pedal pad: A

50 — 55 mm (1.97 — 2.17 in)



(A) Accelerator pedal

(B) Accelerator pedal bracket

Tightening torque of accelerator cable lock nut:

12 N·m (1.2 kgf·m, 9 ft·lb)

3) Check to ensure the kick-down switch operates at the specified value in relation to the stroke of the accelerator pedal.

If it is not in specified value, adjust it by adjusting position of kick-down switch.

NOTE:

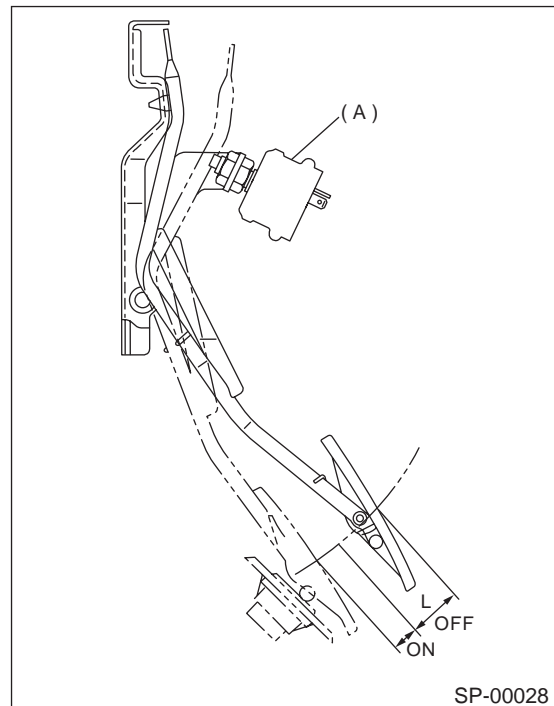
Be careful not to rotate kick-down switch.

Kick-down switch stroke: A

47 — 49 mm (1.85 — 1.93 in)

Kick-down switch tightening torque:

12 N·m (1.2 kgf·m, 8.7 ft·lb)



(A) Kick-down switch

ACCELERATOR CONTROL CABLE

SPEED CONTROL SYSTEMS

3. Accelerator Control Cable

A: REMOVAL

- 1) Remove accelerator pedal. <Ref. to SP(H6DO)-4, REMOVAL, Accelerator Pedal.>
- 2) Separate accelerator cable and accelerator pedal.

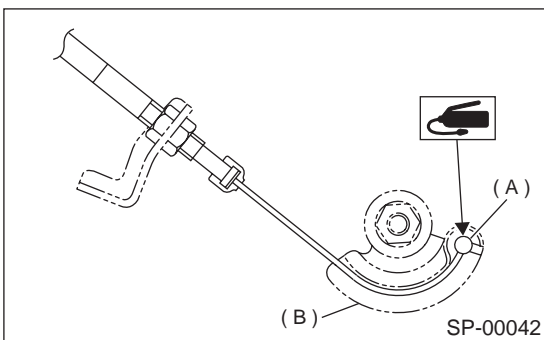
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Apply grease to engine side accelerator cable end.

Grease:

Part No. 004404002

Slicolube G-30M



(A) Grease application area

(B) Throttle cam

NOTE:

- If cable clamp is damaged, replace it with a new one.
- Never fail to cover outer cable end with boot.
- Be careful not to kink accelerator cable.
- Do not apply grease to the throttle cable on the engine side.

3) Adjustment after pedal installation <Ref. to SP(H6DO)-7, ADJUSTMENT, Accelerator Pedal.>

C: INSPECTION

- 1) Make sure the inner cable is not twisted or frayed.
- 2) Make sure the outer cable is not cracked.

IGNITION

IG(H6DO)

	Page
1. General Description	2
2. Spark Plug.....	4
3. Ignition Coil and Ignitor Assembly.....	7



GENERAL DESCRIPTION

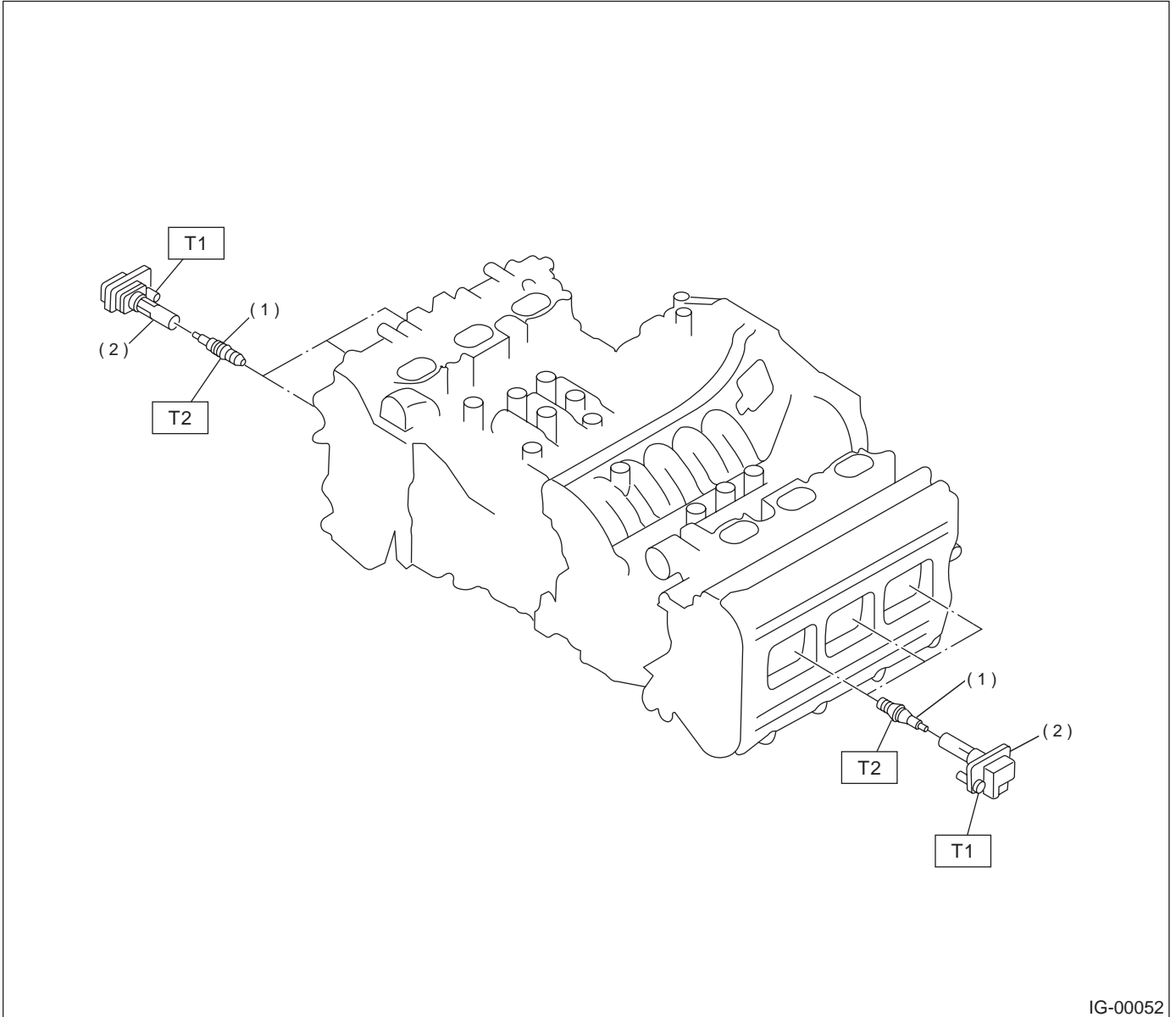
IGNITION

1. General Description

A: SPECIFICATIONS

Item		Designation
Ignition coil and ignitor assembly	Model	FK0140
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	NGK : PLFR6A-11
	Thread size	mm 14, P = 1.25
	Spark gap	mm (in) 1.0 — 1.1 (0.039 — 0.043)

B: COMPONENT



IG-00052

- (1) Spark plug
- (2) Ignition coil and ignitor ASSY

Tightening torque: N-m (kgf-m, ft-lb)

T1: 16 (1.6, 12)

T2: 21 (2.1, 15)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

SPARK PLUG

IGNITION

2. Spark Plug

A: REMOVAL

CAUTION:

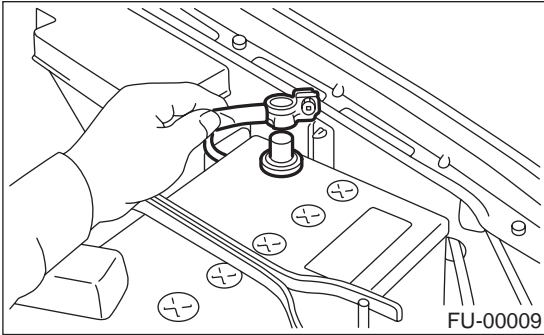
All spark plugs installed on an engine, must be of the same heat range.

Spark plug:

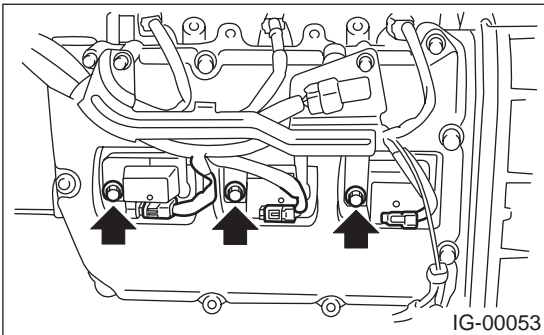
NGK: PLFR6A-11

1. RH SIDE

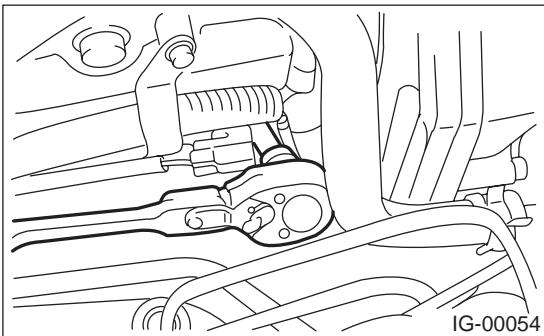
- 1) Disconnect battery ground cable.



- 2) Remove air cleaner lower case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
- 3) Disconnect connector from ignition coil.
- 4) Remove ignition coil.

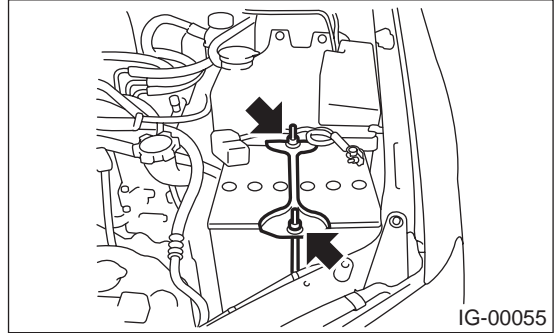


- 5) Remove spark plugs with the spark plug socket.

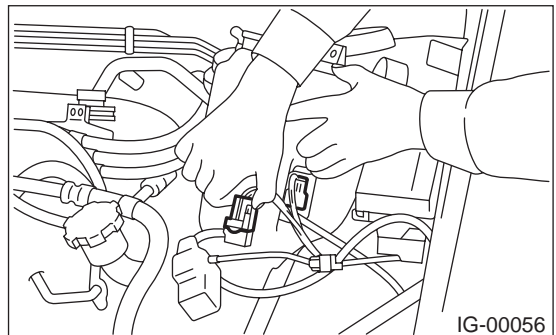


2. LH SIDE

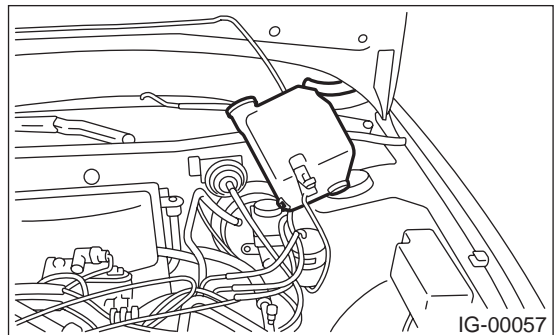
- 1) Disconnect battery cables and then remove battery and battery carrier.



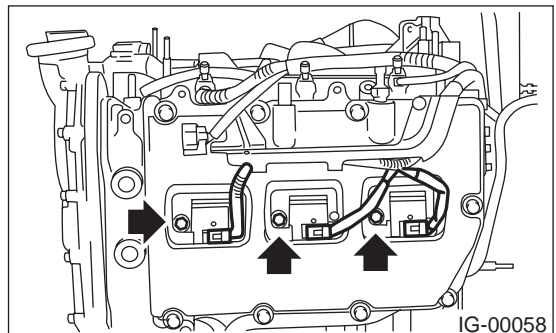
- 2) Disconnect washer motor connector.



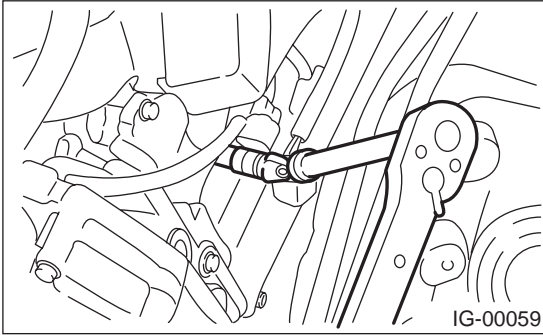
- 3) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



- 4) Disconnect connector from ignition coil.
- 5) Remove ignition coil.



6) Remove spark plug with the spark plugs socket.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 12 ft-lb)

2. LH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

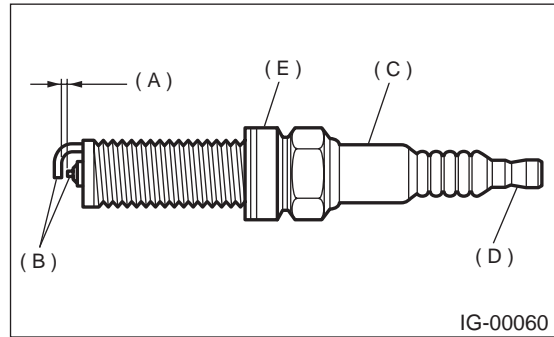
CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 12 ft-lb)

C: INSPECTION

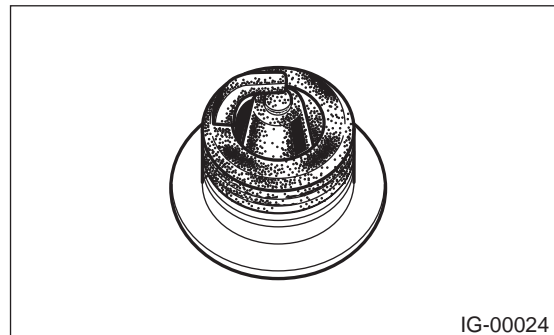
Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal:

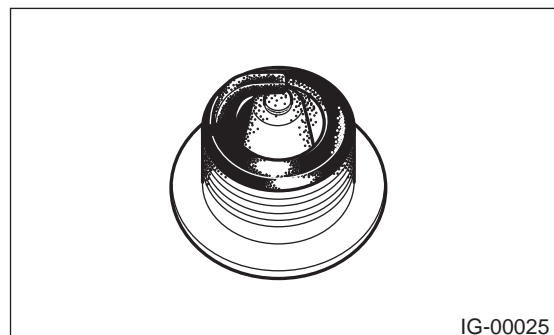
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



2) Carbon fouled:

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



SPARK PLUG

IGNITION

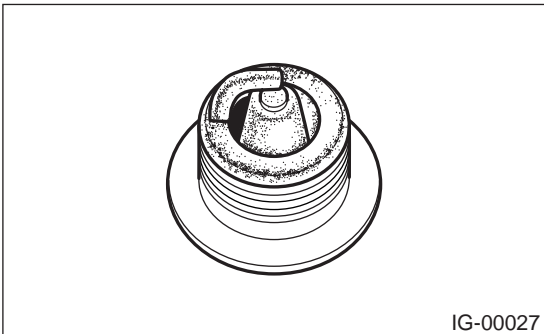
3) Oil fouled:

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.



4) Overheating:

White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.



D: CLEANING

Clean spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.

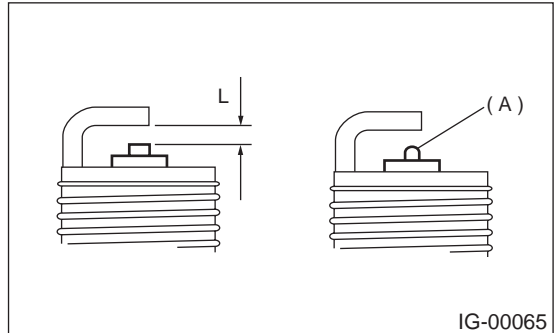
If deposits are too stubborn, replace plugs.

E: ADJUSTMENT

Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

Spark plug gap: L

1.0 — 1.1 mm (0.039 — 0.043 in)



NOTE:

Replace with new spark plug if this area (A) is worn to "ball" shape.

3. Ignition Coil and Ignitor Assembly

A: REMOVAL

Direct ignition type is adopted.

For the order of removal, refer to the removal of spark plugs.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 12 ft-lb)

C: INSPECTION

Because ignition coil is a direct ignition type, the resistance cannot be measured in a single unit. For inspection procedure of ignition system, refer to the following. <Ref. to EN(H6DO)-80, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

IGNITION COIL AND IGNITOR ASSEMBLY

IGNITION

MEMO:

STARTING/CHARGING SYSTEMS

SC(*H6DO*)

	Page
1. General Description	2
2. Starter	6
3. Generator	14
4. Battery	20



GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

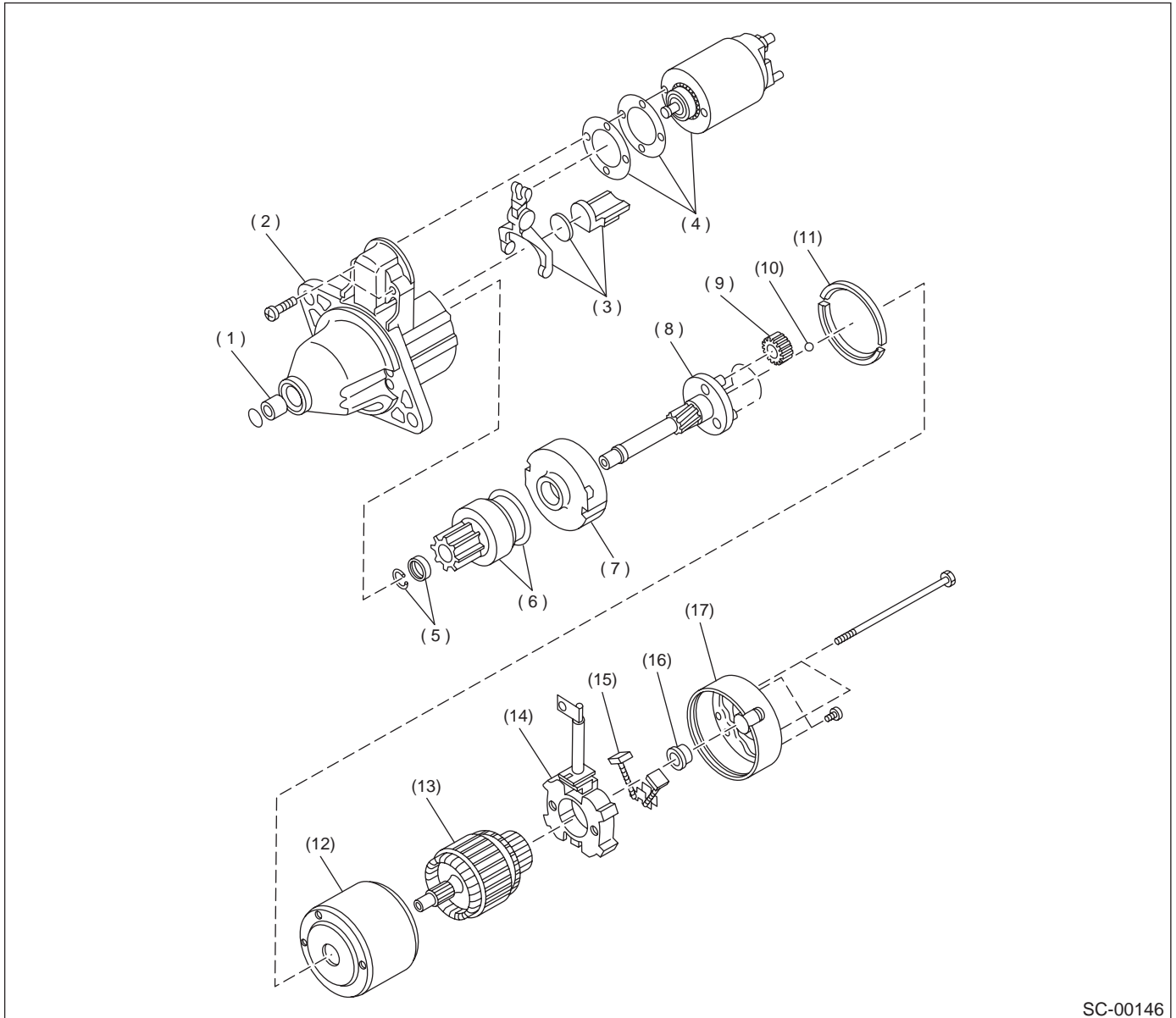
1. General Description

A: SPECIFICATIONS

Item		Designation	
Starter	Type	Reduction type	
	Model	M001T86481	
	Manufacturer	Mitsubishi Electric	
	Voltage and output	12 V — 1.4 kW	
	Direction of rotation	Counterclockwise (when observed from pinion)	
	Number of pinion teeth	9	
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	2,400 rpm or more
	Load characteristics	Voltage	7.7 V
		Current	400 A or less
		Torque	16.0 N·m (1.63 kgf·m, 11.8 ft·lb)
		Rotating speed	740 rpm or more
	Lock characteristics	Voltage	3.5 V
Current		940 A or less	
Torque		28.9 N·m (2.95 kgf·m, 21.3 ft·lb) or more	
Generator	Type	Rotating-field three-phase type	
	Model	A3TB1891	
	Manufacturer	Mitubishi Electric	
	Voltage and output	12 V — 100 A	
	Polarity on ground side	Negative	
	Rotating direction	Clockwise (when observed from pulley side.)	
	Armature connection	3-phase Y-type	
	Output current	1,500 rpm — 43 A or more	
		2,500 rpm — 76 A or more 5,000 rpm — 100 A or more	
Regulated voltage	14.1 — 14.8 V [20°C (68°F)]		
Battery	Type and capacity	For Europe/Latin America	12 V — 52 AH (75D23L)
		Others	12 V — 48 AH (55D23L)

B: COMPONENT

1. STARTER



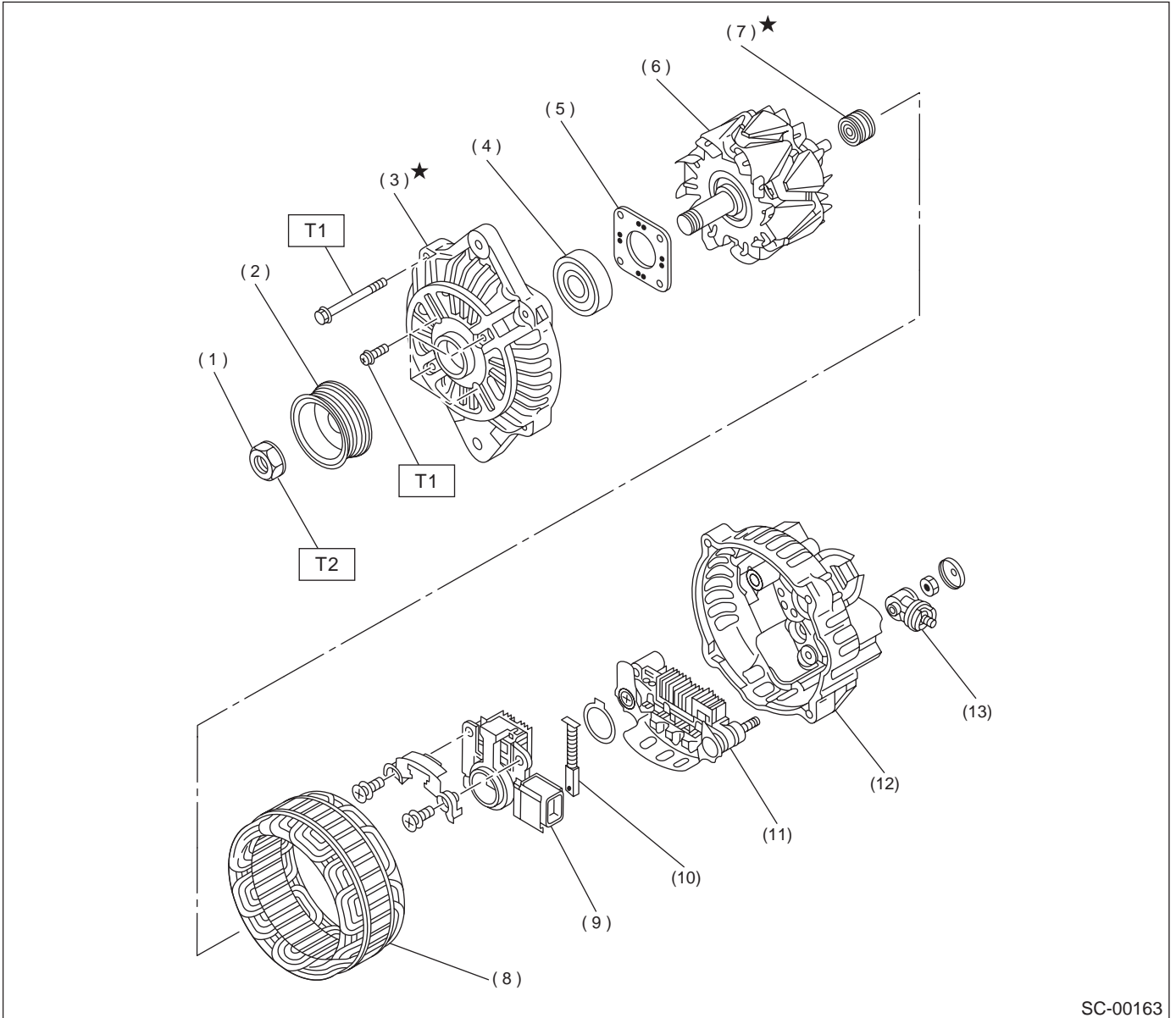
SC-00146

- | | | |
|-------------------------|------------------------|---------------------|
| (1) Sleeve bearing | (7) Internal gear ASSY | (13) Armature |
| (2) Front bracket | (8) Shaft ASSY | (14) Brush holder |
| (3) Lever set | (9) Gear ASSY | (15) Brush |
| (4) Magnet switch ASSY | (10) Ball | (16) Sleeve bearing |
| (5) Stopper set | (11) Packing | (17) Rear bracket |
| (6) Over running clutch | (12) Yoke | |

GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

2. GENERATOR



SC-00163

- | | |
|----------------------|-----------------------------|
| (1) Pulley nut | (7) Bearing |
| (2) Pulley | (8) Stator coil |
| (3) Front cover | (9) IC regulator with brush |
| (4) Ball bearing | (10) Brush |
| (5) Bearing retainer | (11) Rectifier |
| (6) Rotor | (12) Rear cover |

- (13) Terminal

Tightening torque: N·m (kgf·m, ft·lb)

T1: 4.7 (0.48, 3.5)

T2: 108 (11.0, 80)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable terminal.

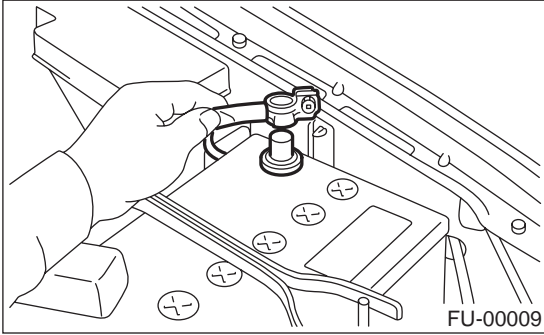
STARTER

STARTING/CHARGING SYSTEMS

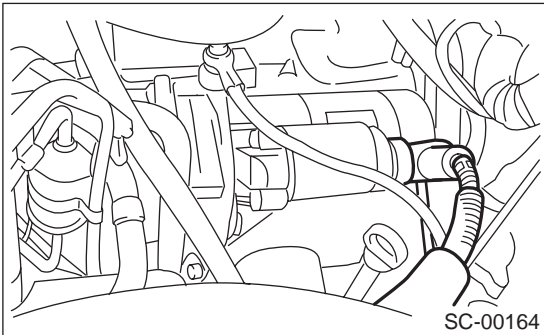
2. Starter

A: REMOVAL

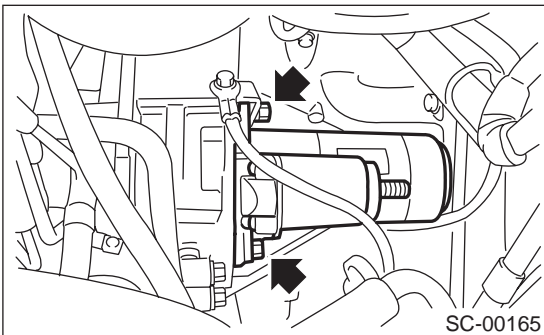
- 1) Disconnect battery ground cable.



- 2) Remove air intake chamber.<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
- 3) Disconnect connector and terminal from starter.



- 4) Remove starter from transmission.

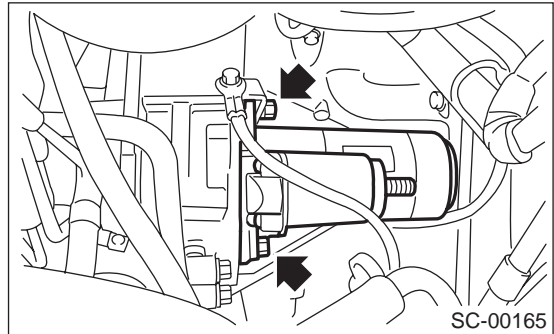


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

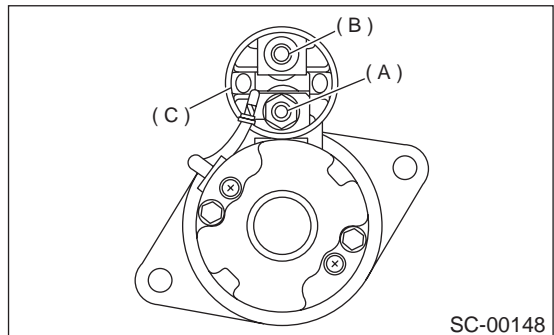
50 N·m (5.1 kgf·m, 37 ft·lb)



C: DISASSEMBLY

1. STARTER ASSEMBLY

- 1) Loosen nut which holds terminal M of switch assembly, and disconnect connector.



- (A) Terminal M
- (B) Terminal B
- (C) Terminal S

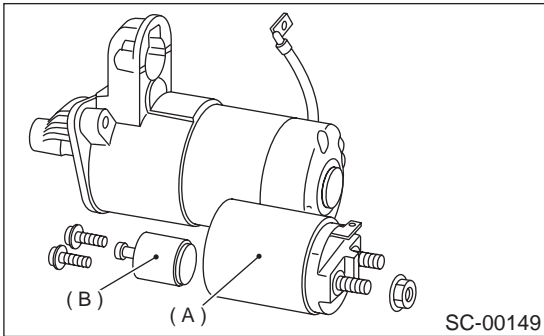
STARTER

STARTING/CHARGING SYSTEMS

2) Remove bolts which hold switch assembly, and remove switch assembly, plunger and plunger spring from starter as a unit.

NOTE:

Be careful because pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.

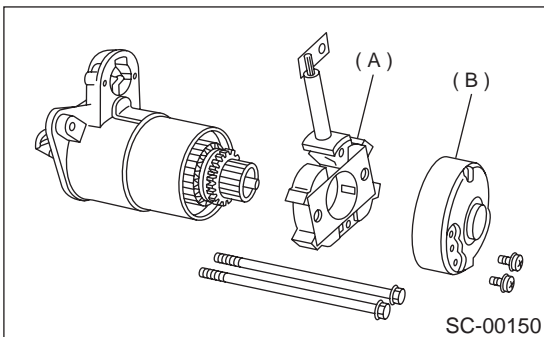


- (A) Switch ASSY
- (B) Plunger

3) Remove both through-bolts and brush holder screws, and detach rear bracket and brush holder.

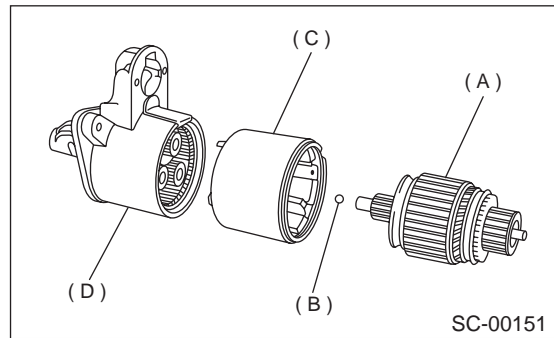
NOTE:

Before removal, confirm the attachment locations of brush holder and rear bracket.



- (A) Brush holder
- (B) Rear bracket

4) Remove armature and yoke from the front bracket.

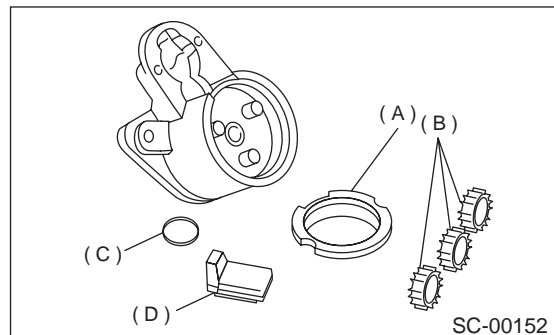


- (A) Armature
- (B) Ball
- (C) Yoke
- (D) Front bracket

5) Remove packing A, three planetary gears, packing B and plate.

NOTE:

Before removal, confirm the inserting location of packing A.



- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

STARTER

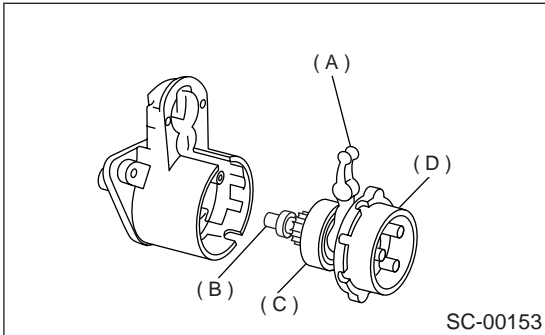
STARTING/CHARGING SYSTEMS

6) Remove shaft assembly and overrunning clutch as a unit.

NOTE:

Before removal, confirm the following:

- Lever direction
- Internal gear assembly position

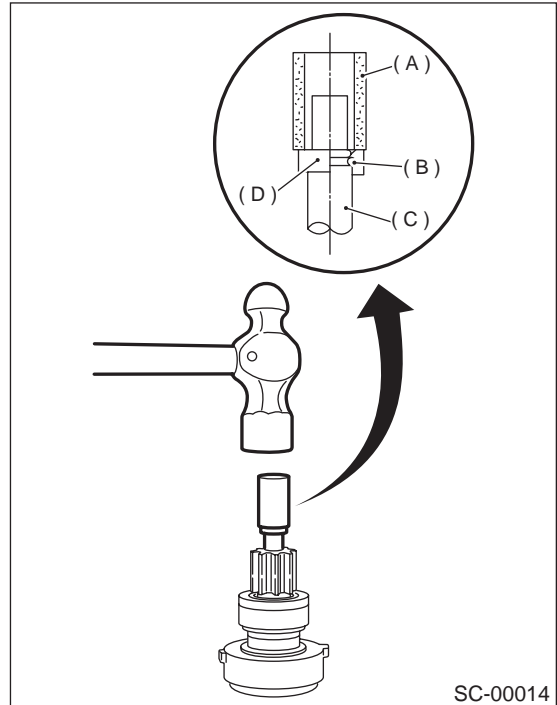


- (A) Lever
- (B) Shaft ASSY
- (C) Overrunning clutch
- (D) Internal gear ASSY

7) Remove overrunning clutch from shaft assembly as follows:

(1) Remove stopper from ring by lightly tapping the stopper with an appropriate tool (such as a socket).

(2) Remove ring, stopper and clutch from shaft.



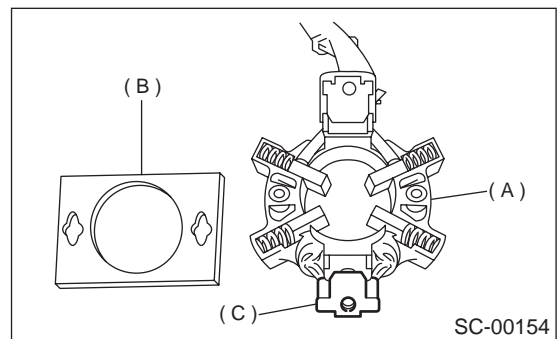
- (A) Socket wrench
- (B) Ring
- (C) Shaft
- (D) Stopper

2. BRUSH HOLDER

Slightly open the metal fitting holding the insulating plate to the brush holder. Remove the insulating plate.

NOTE:

The brush and spring can be easily removed from the brush holder at this time.



- (A) Brush holder
- (B) Insulating plate
- (C) Metal fitting

D: ASSEMBLY

Assemble in the reverse order of disassembly. Do the following:

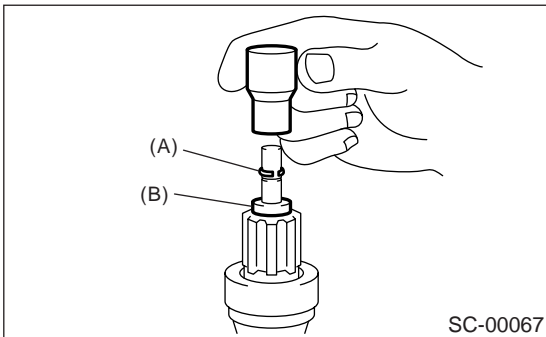
NOTE:

When assembling, apply grease to the following parts.

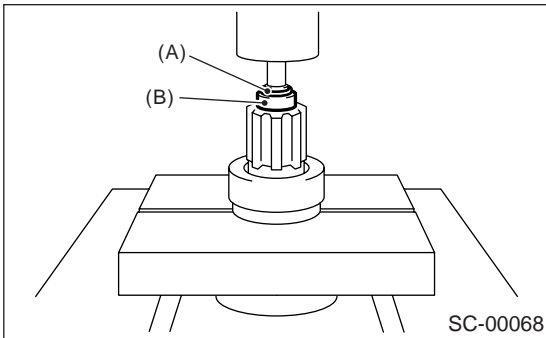
- Front and rear bracket sleeve bearing
- Armature shaft gear
- Outer periphery of plunger
- Mating surface of plunger and lever
- Gear shaft splines
- Mating surface of lever and clutch
- Ball at the armature shaft end
- Internal and planetary gears

- 1) Install overrunning clutch to shaft assembly.
- 2) Install stopper to shaft assembly in the following order.

(1) Insert the ring into the shaft groove by lightly tapping it with an appropriate tool (such as a fit socket wrench).



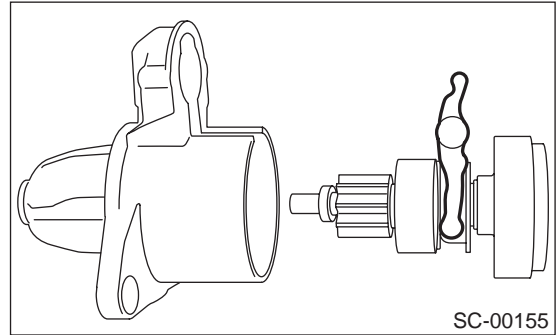
(2) Install the stopper to ring using a press.



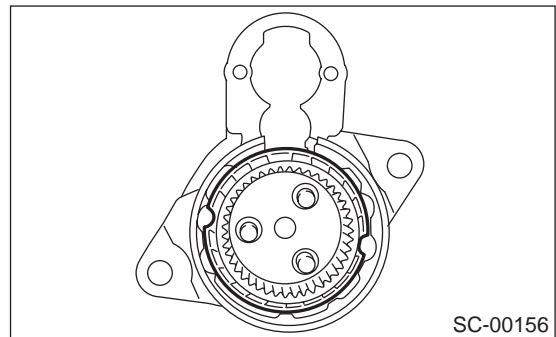
- (A) Ring
- (B) Stopper

3) When installing shaft assembly to front bracket, be careful of the following.

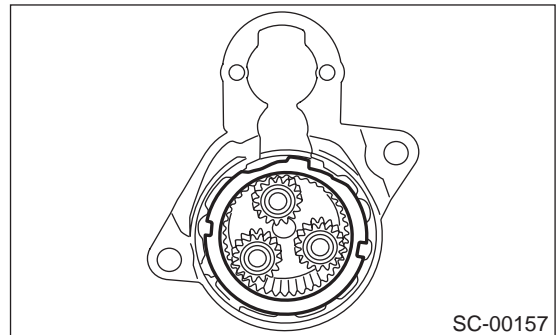
- Lever direction



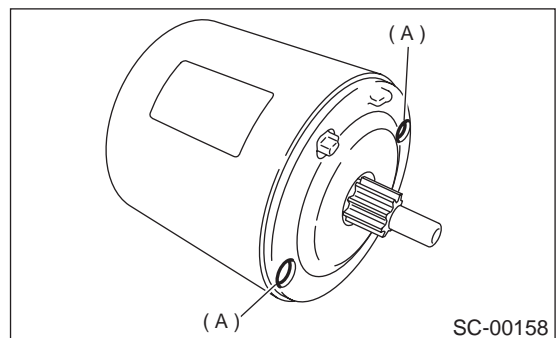
- Internal gear position



- Packing position



4) When installing yoke to the front bracket, match bolt hole.

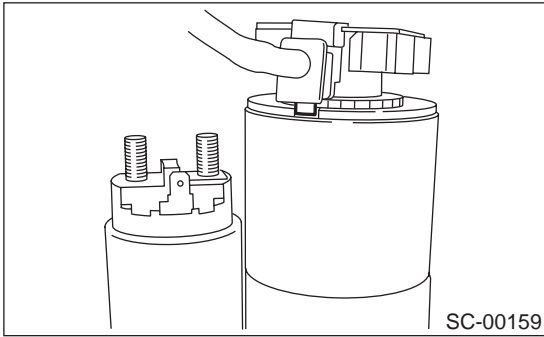


- (A) Bolt hole

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5) Install brush holder in alignment with Yoke's groove.



6) Install rear bracket.

7) When installing switch assembly, catch plunger protrusion to lever edge.

8) Install connector to switch assembly terminal M.

9) After assembling parts correctly, make sure starter operates properly.

E: INSPECTION

1. ARMATURE

1) Check commutator for any sign of burns or rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.

2) Run-out test

Check the commutator run-out and replace if it exceeds the limit.

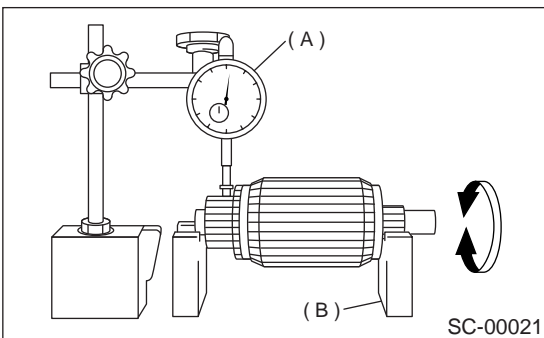
Commutator run-out:

Standard

0.05 mm (0.0020 in)

Service limit

Less than 0.10 mm (0.0039 in)



(A) Dial gauge

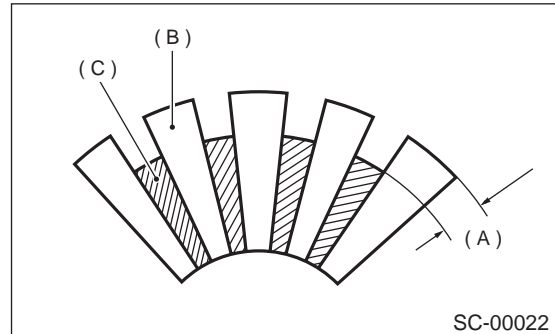
(B) V-block

3) Depth of segment mold

Check the depth of segment mold.

Depth of segment mold:

0.5 mm (0.020 in)



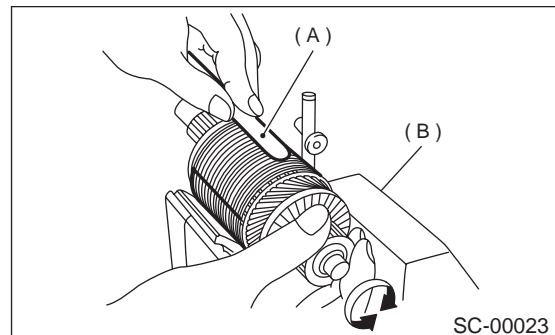
(A) Depth of mold

(B) Segment

(C) Mold

4) Armature short-circuit test

Check the armature for short-circuit by placing it on growler tester. Hold a iron sheet against the armature core while slowly rotating armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



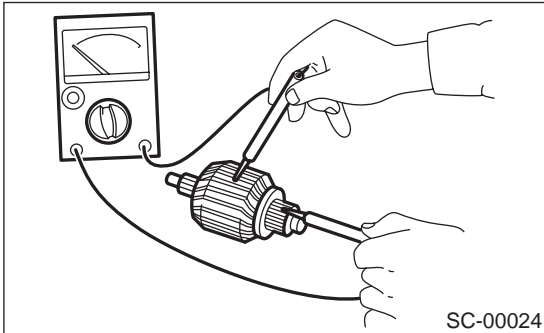
(A) Iron sheet

(B) Growler tester

5) Armature ground test

Using a circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, the armature is grounded.

Replace the armature if it is grounded.



2. YOKE

Make sure pole is set in position.

3. OVERRUNNING CLUTCH

Inspect the teeth of pinion for wear and damage. Replace if it is damaged. Rotate the pinion in direction of rotation (counterclockwise). It should rotate smoothly. But in opposite direction, it should be locked.

CAUTION:

Do not clean overrunning clutch with oil to prevent grease from flowing out.

4. BRUSH AND BRUSH HOLDER

1) Brush length

Measure the brush length and replace if it exceeds the service limit.

Replace if abnormal wear or cracks are noticed.

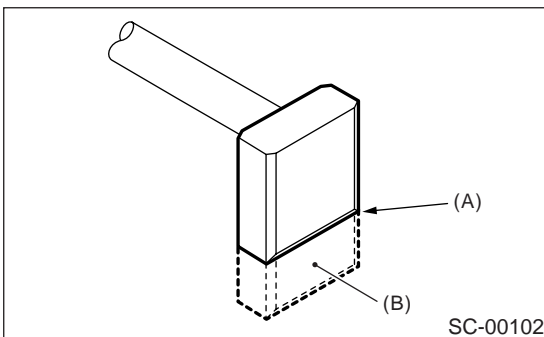
Brush length:

Standard

12.3 mm (0.484 in)

Service limit

7.0 mm (0.276 in)



(A) Service limit line

(B) Brush

2) Brush movement

Be sure brush moves smoothly inside brush holder.

3) Brush spring force

Measure brush spring force with a spring scale. If it is less than the service limit, replace brush holder.

Brush spring force:

Standard

21.6 N (2.2 kgf, 4.9 lb) (when new)

Service limit

5.9 N (0.6 kgf, 1.3 lb)

5. SWITCH ASSEMBLY

Be sure there is continuity between terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm").

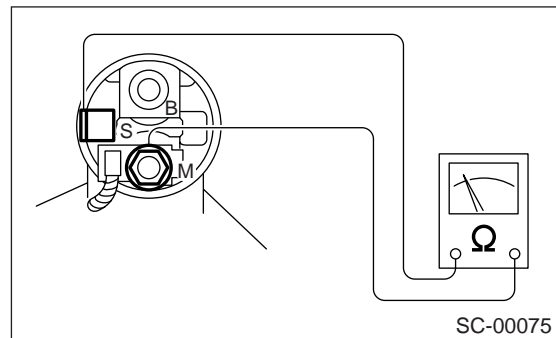
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:

S — M / Less than 1 Ω

S — Ground / Less than 1 Ω

M — B / More than 1 MΩ



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6. SWITCH ASSEMBLY OPERATION

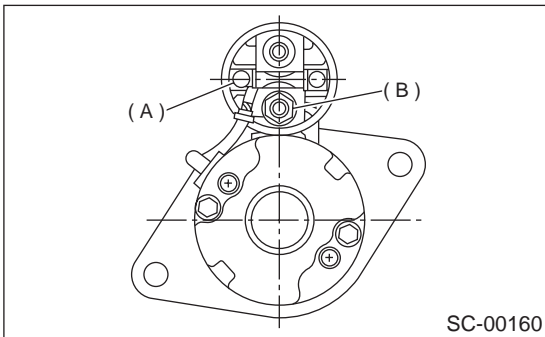
1) Connect the terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. The pinion should be forced endwise on shaft.

CAUTION:

With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

2) Disconnect the connector from terminal M, and then connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.

In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.



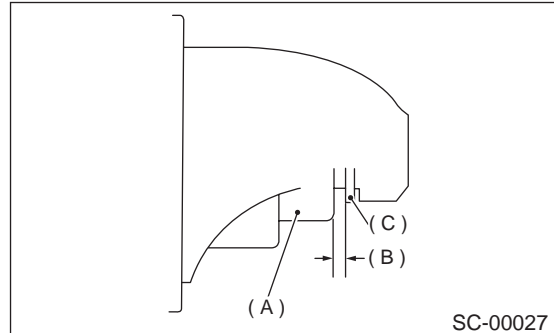
- (A) Terminal S
- (B) Terminal M

7. PINION GAP

1) Measure pinion gap while the pinion is pulled out as shown in the figure.

Pinion gap:

0.5 — 2.0 mm (0.020 — 0.079 in)



- (A) Pinion
- (B) Gap
- (C) Stopper

If the motor is running with the pinion forced endwise on shaft, disconnect the connector from terminal M of switch assembly, and then connect terminal M to ground terminal (-) of battery with a lead wire. Next, gently push the pinion back with your fingertips, and then measure the pinion gap.

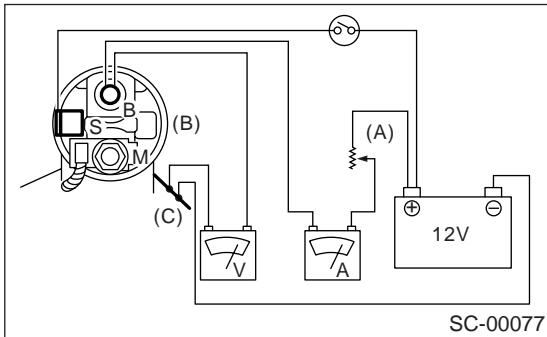
2) If the pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.

8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.

Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.

For these performance tests, use the circuit shown in figure.



- (A) Variable resistance
- (B) Magnetic switch
- (C) Starter body

1) No-load test

With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading and measure the starter speed. Compare these values with the specifications.

No-load test (Standard):

Voltage / Current
11 V / 90 A max.

Rotating speed
2,400 rpm or more

2) Load test

Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within specifications.

Load test (Standard):

Voltage / Load
7.7 V / 16.0 N·m (1.63 kgf·m, 11.8 ft·lb)

Current / Speed
400 A / 740 rpm or more

3) Lock test

With starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (Standard):

Voltage / Current
3.5 V / 940 A or less

Torque
28.9 N·m (2.95 kgf·m, 21.3 ft·lb) or more

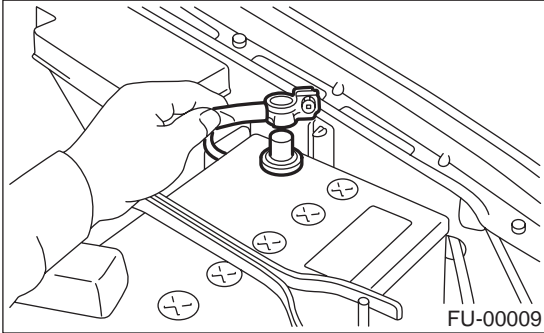
GENERATOR

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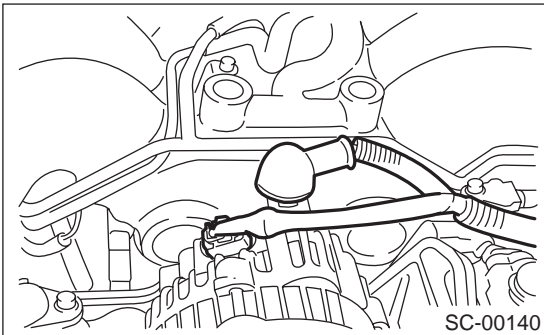
3. Generator

A: REMOVAL

- 1) Disconnect battery ground cable.

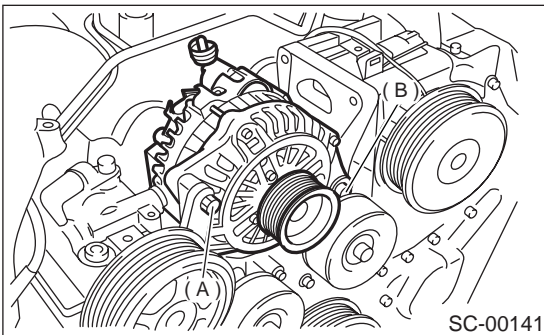


- 2) Disconnect connector and terminal from generator.



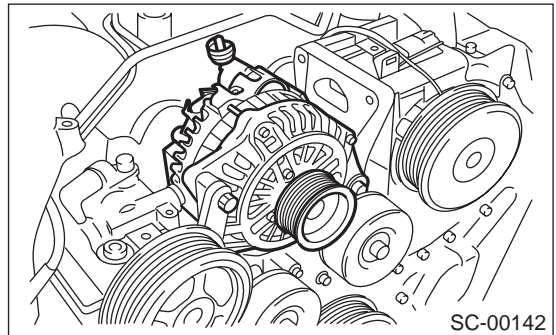
- 3) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>

- 4) Remove bolt (A), and loosen bolt (B). Then, remove generator from bracket.



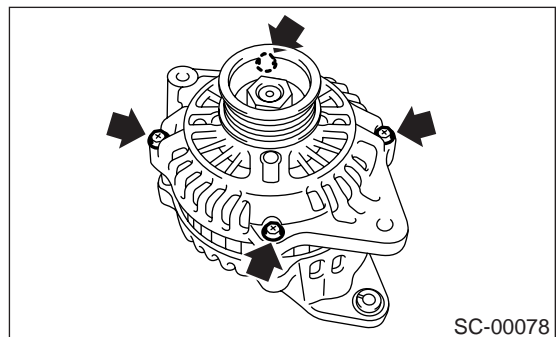
B: INSTALLATION

Install in the reverse order of removal.

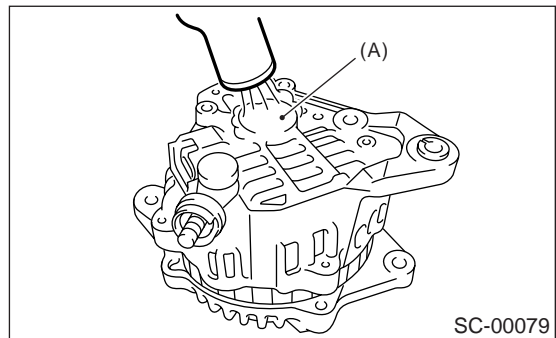


C: DISASSEMBLY

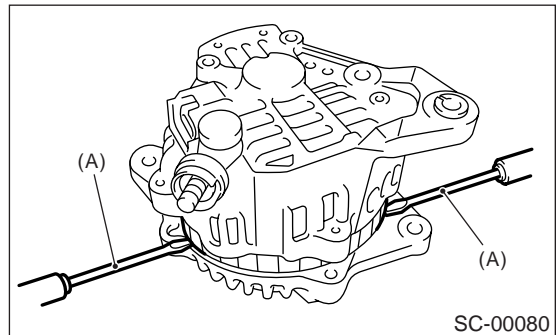
- 1) Remove the four through-bolts.



- 2) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.

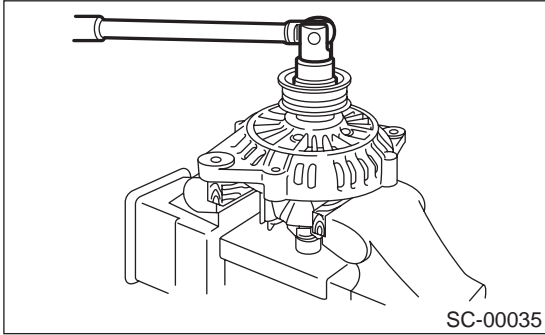


- 3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.



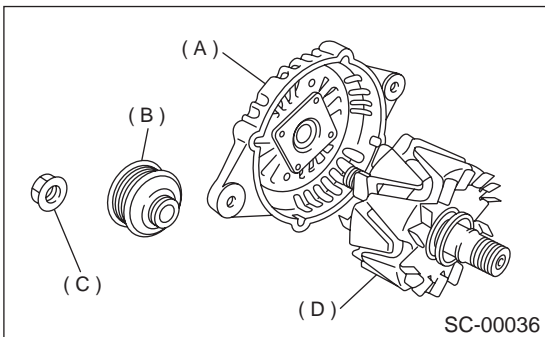
(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.



CAUTION:

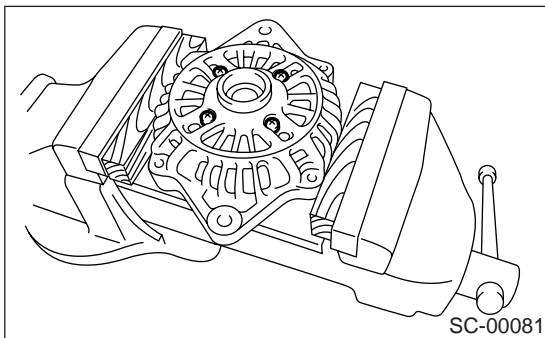
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of vise to prevent rotor from damage.



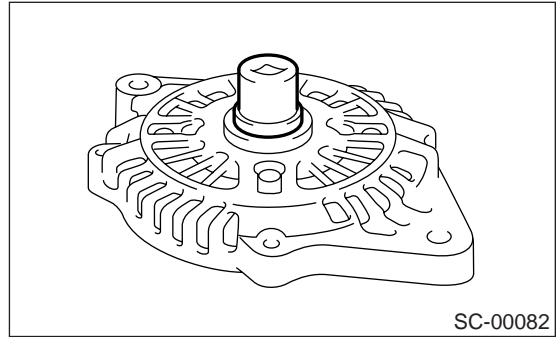
- (A) Front cover
- (B) Pulley
- (C) Nut
- (D) Rotor

5) Remove the ball bearing as follows.

(1) Remove the bolt, and then remove the bearing retainer.

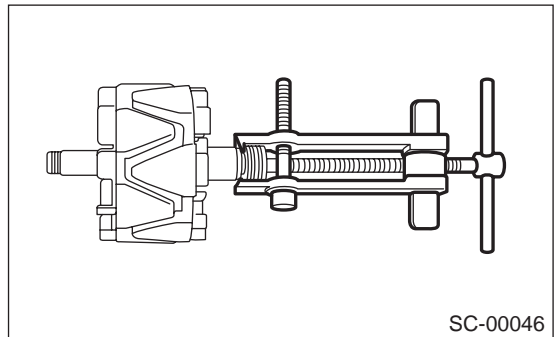


(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.



(3) Push the ball bearing off the front cover using a press.

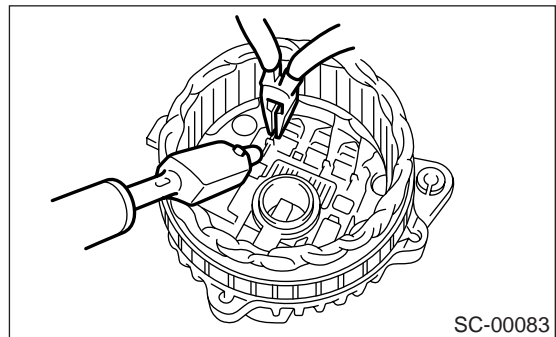
6) Remove the bearing from rotor using a bearing puller.



7) Unsolder connection between rectifier and stator coil to remove the stator coil.

CAUTION:

Do not allow the 180 — 270 W soldering bit to contact the terminals for more than 5 seconds at a time because the rectifier cannot withstand heat very well.

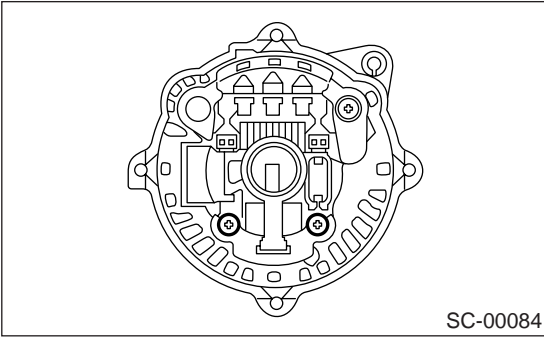


GENERATOR

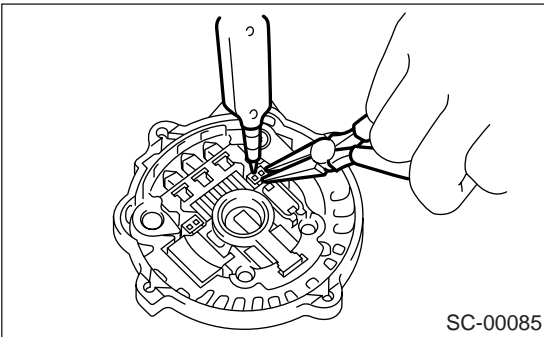
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8) Remove the IC regulator as follows.

(1) Remove the screws which secure IC regulator to rear cover.

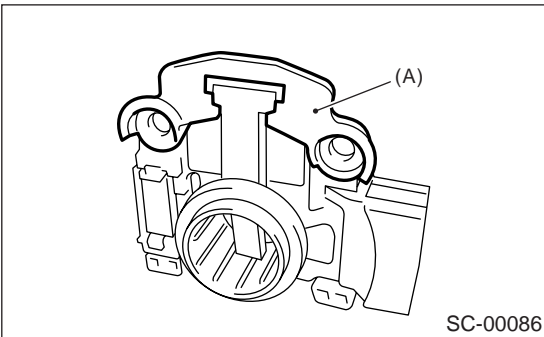


(2) Unsolder the connection between IC regulator and rectifier to remove the IC regulator.



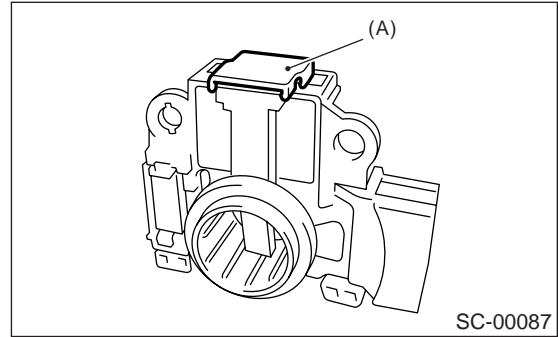
9) Remove the brush as follows.

(1) Remove cover A.



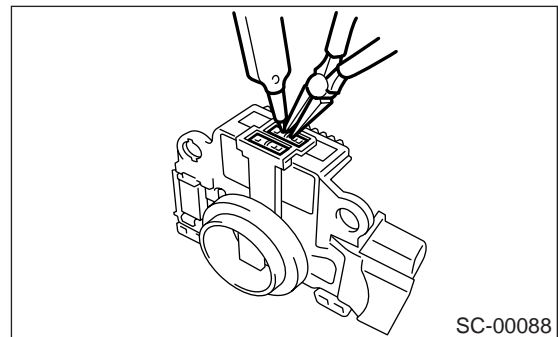
(A) Cover A

(2) Remove the cover B.



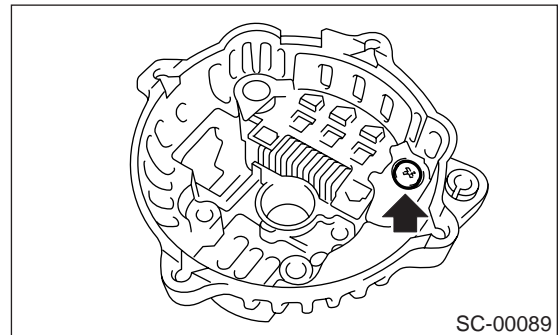
(A) Cover B

(3) Separate the brush from connection to remove.

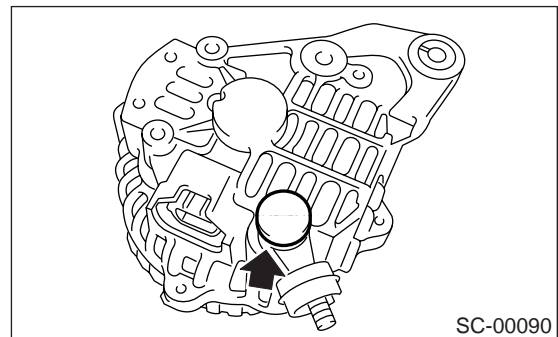


10) Remove the rectifier as follows.

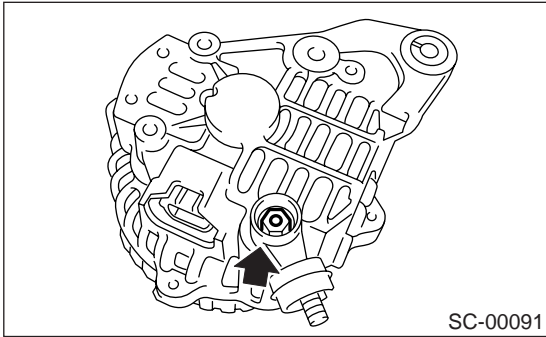
(1) Remove the bolts which secure the rectifier.



(2) Remove the cover of terminal B.



(3) Remove the nut of terminal B, and then remove the rectifier.



D: ASSEMBLY

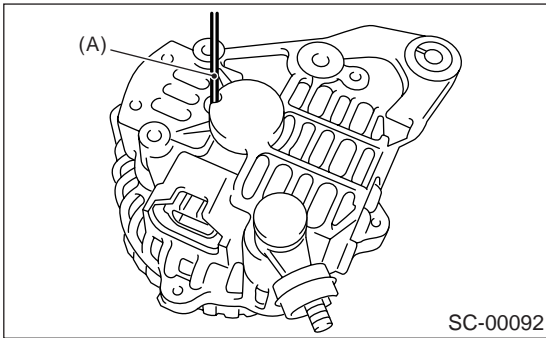
To assemble, reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:

Be sure to remove the wire after reassembly.



(A) Wire

2) Install the ball bearing.

(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.

(2) Press the ball bearing into the specified position using a press.

(3) Install the bearing retainer.

3) Press the bearing (rear side) into the rotor shaft using a press to install.

4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

CAUTION:

Grease should not be applied to rear bearing. Remove the oil completely if it is found on bearing box.

5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

E: INSPECTION

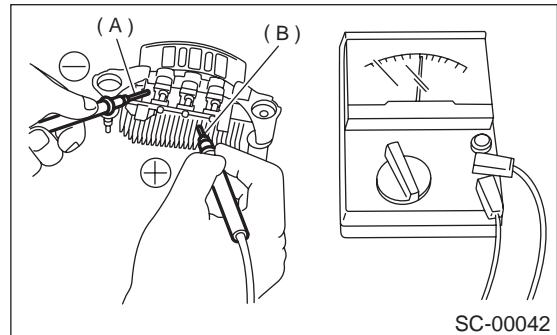
1. DIODE

CAUTION:

Never use a mega tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.

1) Checking positive diode

Check for continuity between the diode lead and positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to heat sink.

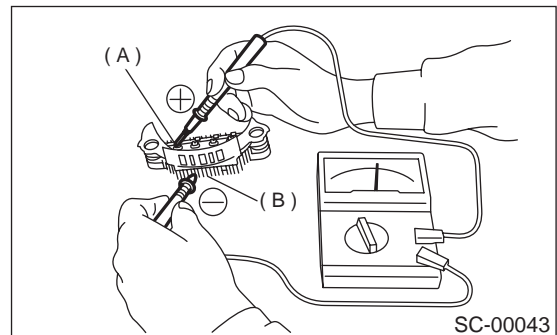


(A) Diode lead

(B) Heat sink (Positive side)

2) Checking negative diode

Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is 1 Ω or less only in the direction from the heat sink to diode lead.



(A) Diode lead

(B) Heat sink (Negative side)

GENERATOR

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2. ROTOR

1) Slip ring surface

Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter

Measure the slip ring outer diameter. If the slip ring is worn replace rotor assembly.

Slip ring outer diameter:

Standard

22.7 mm (0.894 in)

Limit

22.1 mm (0.870 in)

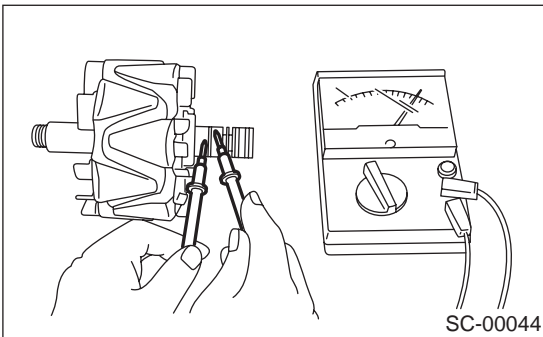
3) Continuity test

Check the resistance between slip rings using circuit tester.

If the resistance is not within specification, replace the rotor assembly.

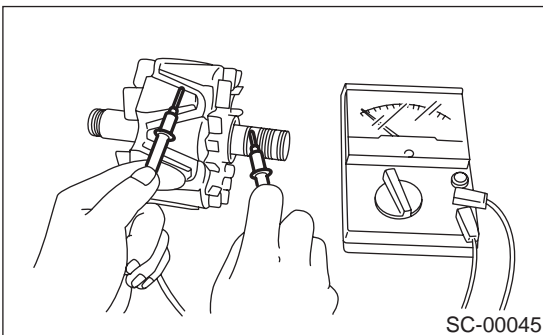
Specified resistance:

Approx. 2.0 — 2.4 Ω



4) Insulation test

Check the continuity between slip ring and rotor core or shaft. If resistance is 1 Ω or less, the rotor coil is grounded, and so replace the rotor assembly.



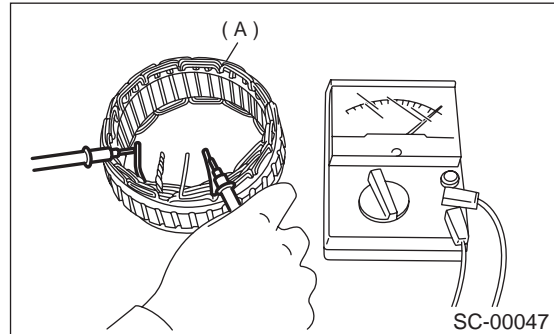
5) Ball bearing (rear side)

Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

3. STATOR

1) Continuity test

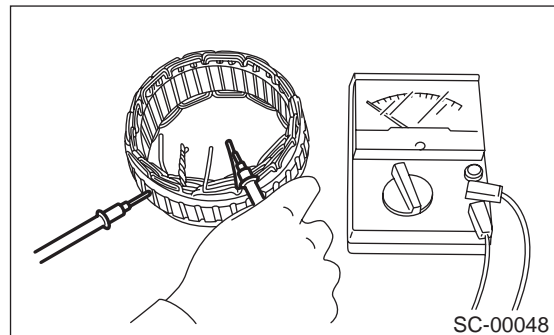
Inspect the stator coil for continuity between each end of the lead wires. If resistance is 1 M Ω or more, the lead wire is broken, and so replace the stator assembly.



(A) Stator

2) Insulation test

Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is 1 Ω or less, the stator coil is grounded, and so replace the stator assembly.



4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

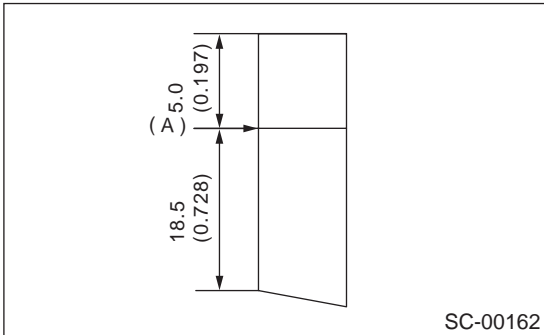
Brush length:

Standard

18.5 mm (0.728 in)

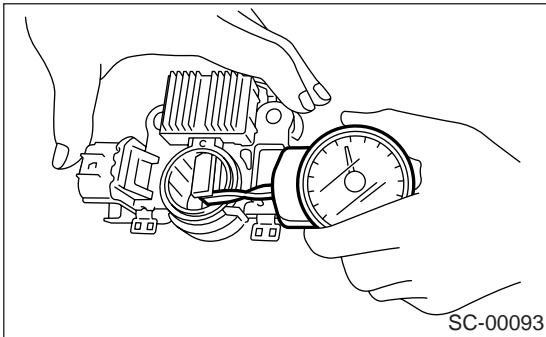
Service limit

5.0 mm (0.197 in)



2) Checking brush spring for proper pressure

Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is less than 2.2 N (224 g, 7.91 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.8 to 6.0 N (489 to 612 g, 17.26 to 21.60 oz).



5. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

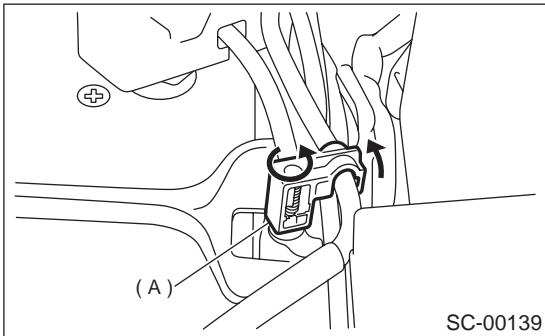
BATTERY

STARTING/CHARGING SYSTEMS

4. Battery

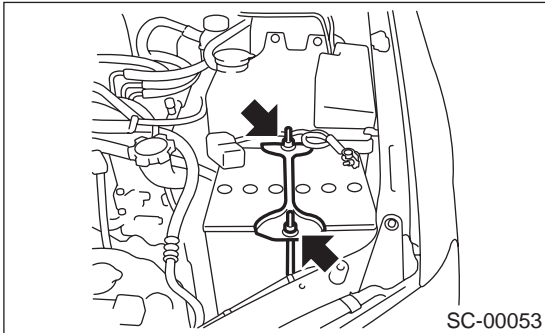
A: REMOVAL

1) Remove battery cable holder (A) from battery rod.



2) Disconnect the positive (+) cable after disconnecting the negative (-) cable of battery.

3) Remove flange nuts from battery rods and take off battery holder.



4) Remove battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:

- Clean battery cable terminals and apply grease to prevent corrosion.
- Connect the positive (+) cable of battery and then the negative (-) cable of the battery.

C: INSPECTION

WARNING:

- Electrolyte has toxicity; be careful handling the fluid.
- Avoid contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.
- Batteries produce explosive gases. Keep sparks, flame, cigarettes away.
- Ventilate when charging or using in enclosed space.
- For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
- Do not let battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
- To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on the battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.

Apply a thin coat of grease on the terminal posts to prevent corrosion.

2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.

Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

$$S_{20} = St + 0.0007 \times (t - 20)$$

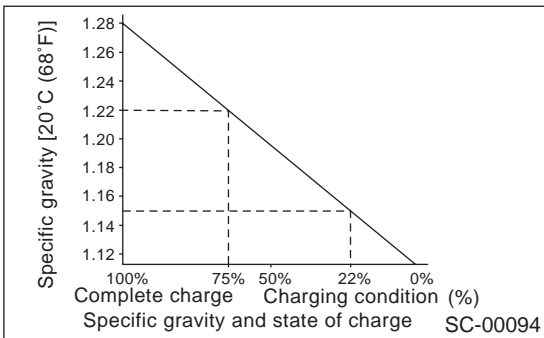
S₂₀: Specific gravity corrected at electrolyte temperature of 20°C

St : Measured specific gravity

t : Measured temperature (°C)

Determine whether or not battery must be charged, according to corrected specific gravity.

Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in figure.

D: MEASUREMENT

WARNING:

- Do not bring an open flame close to the battery at this time.

CAUTION:

- Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
- Be careful since battery electrolyte overflows while charging the battery.
- Observe instructions when handling battery charger.
- Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.

2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)

*: Check electrical system before replacement.

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.

Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).

It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:

- Observe the items in 3. NORMAL CHARGING.
- Never use more than 10 amperes when charging the battery because that will shorten battery life.

BATTERY

STARTING/CHARGING SYSTEMS

MEMO:

ENGINE (DIAGNOSTICS)

EN(H6DO)

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BASIC DIAGNOSTIC PROCEDURE

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

Step	Value	Yes	No
1 CHECK ENGINE START FAILURE. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H6DO)-4, CHECK, Check List for Interview.> 2) Start the engine. Does the engine start?	Engine starts.	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H6DO)-71, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI). Does CHECK ENGINE malfunction indicator lamp illuminate?	Indicator lamp illuminates.	Go to step 3.	Inspection using "General Diagnostics Table". <Ref. to EN(H6DO)-332, INSPECTION, General Diagnostic Table.>
3 CHECK INDICATION OF DTC ON DISPLAY. 1) Turn ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read DTC on the Subaru Select Monitor or OBD-II general scan tool. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	DTC indicated.	Go to step 4.	Repair the related parts. NOTE: If DTC is not shown on display although the MI illuminates, perform diagnostics of MI (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(H6DO)-58, Engine Malfunction Indicator Lamp (MI).>
4 PERFORM THE DIAGNOSIS. 1) Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H6DO)-96, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: Carry out the basic check, only when DTC about automatic transmission is shown on display. <Ref. to EN(H6DO)-46, Read Diagnostic Trouble Code.> 2) Repair the trouble cause. 3) Perform the clear memory mode. <Ref. to EN(H6DO)-54, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to EN(H6DO)-47, Inspection Mode.> Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	DTC indicated.	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H6DO)-96, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

- 1) ATF level check <Ref. to AT-30, Automatic Transmission Fluid.>
- 2) Differential gear oil level check <Ref. to AT-31, Differential Gear Oil.>
- 3) ATF leak check <Ref. to AT-30, Automatic Transmission Fluid.>
- 4) Differential gear oil leak check <Ref. to AT-31, Differential Gear Oil.>
- 5) Stall test <Ref. to AT-33, Stall Test.>
- 6) Line pressure test <Ref. to AT-36, Line Pressure Test.>
- 7) Transfer clutch pressure test <Ref. to AT-38, Transfer Clutch Pressure Test.>
- 8) Time lag test <Ref. to AT-35, Time Lag Test.>
- 9) Road test <Ref. to AT-32, Road Test.>
- 10) Shift characteristics <Ref. to AT-38, Transfer Clutch Pressure Test.>

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Outdoor temperature	°F (°C)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Cooling fan	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CB	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF		

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MI turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostics indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> VDC warning light <input type="checkbox"/> Engine oil pressure warning light
b) Fuel level
<ul style="list-style-type: none">• Lack of gasoline: <input type="checkbox"/> Yes/<input type="checkbox"/> No• Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:• Where:
f) Occurrence of noise: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> No shift <input type="checkbox"/> Excessive shift shock

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:

- All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery terminals while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing ECM from the located position, disconnect two cables on battery.

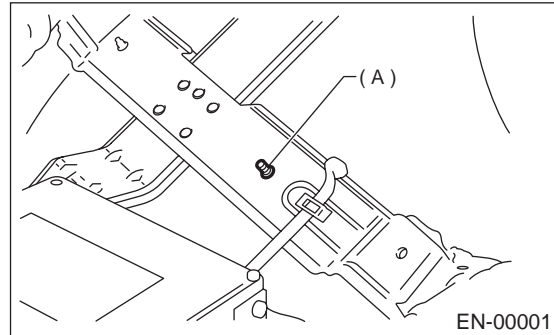
- Otherwise, the ECM may be damaged.

CAUTION:

When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

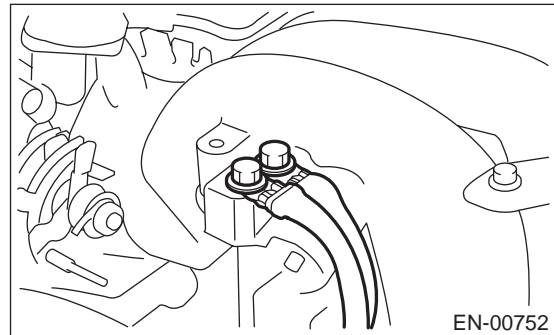
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.

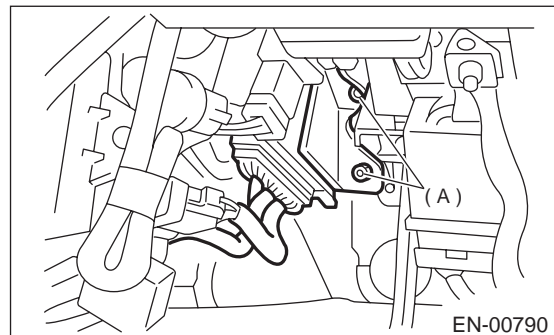


(A) Stud bolt

9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.

14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.

15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.

16) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).

17) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

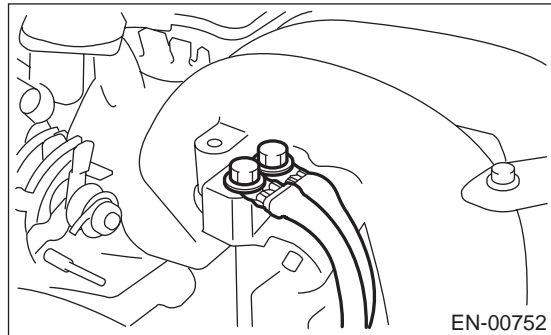
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. DESCRIPTION

- The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MI) in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
- The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation) and EC instruction No. 98/69/EC. The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
- When the system decides that a malfunction occurs, MI illuminates. At the same time of the MI illumination or blinking, a diagnostic trouble code (DTC) and a freeze frame engine conditions are stored into on-board computer.
- The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
- If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
- When the malfunction does not occur again for three consecutive driving cycles, MI is turned off, but DTC remains at on-board computer.
- The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
- The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting OBD-II vehicles, connect Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.

With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, de-

pending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

- Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

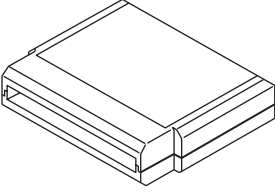

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST24082AA210</p>	<p>24082AA210 (Newly adopted tool)</p>	<p>CARTRIDGE</p>	<p>Troubleshooting for electrical systems.</p>
 <p style="text-align: center;">ST22771AA030</p>	<p>22771AA030</p>	<p>SELECT MONI-TOR KIT</p>	<p>Troubleshooting for electrical systems.</p> <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

ELECTRICAL COMPONENTS LOCATION

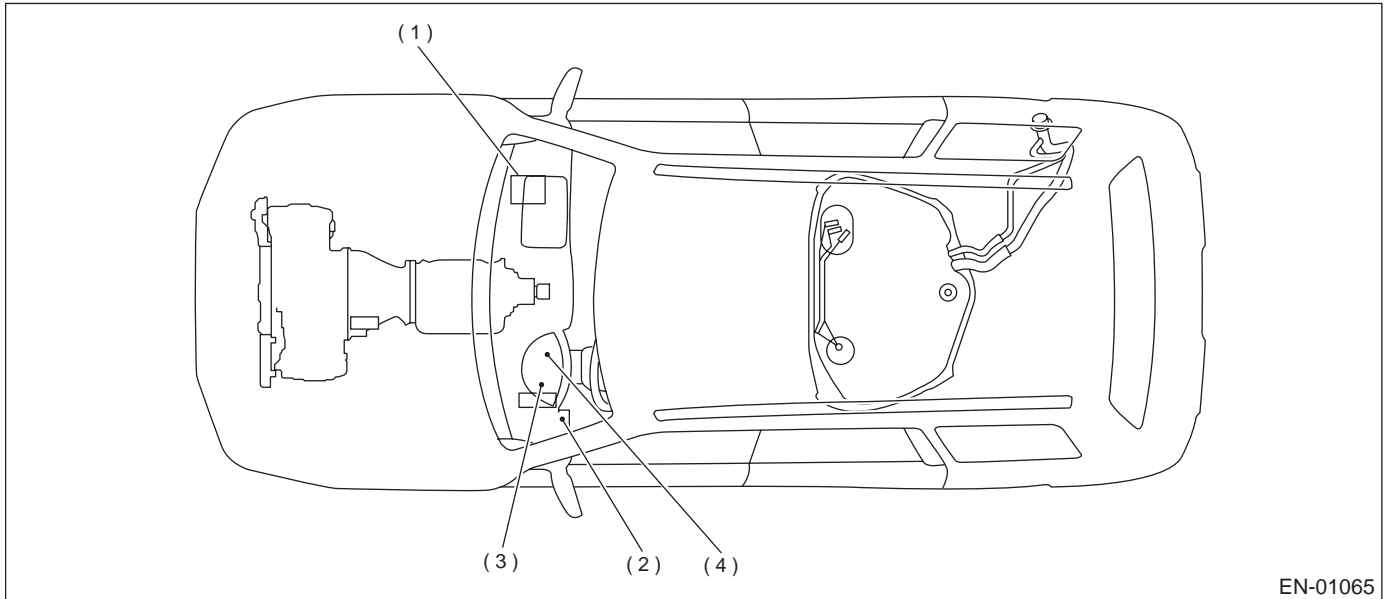
ENGINE (DIAGNOSTICS)

4. Electrical Components Location

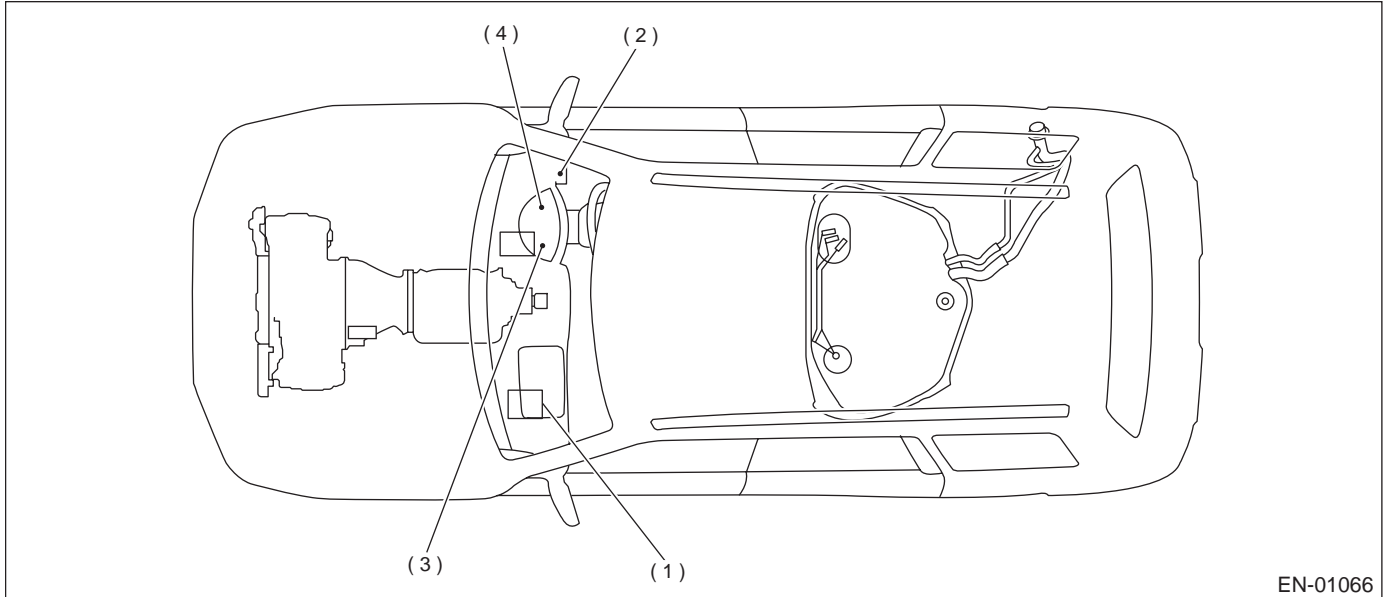
A: LOCATION

1. ENGINE

- **MODULE**
- LHD model



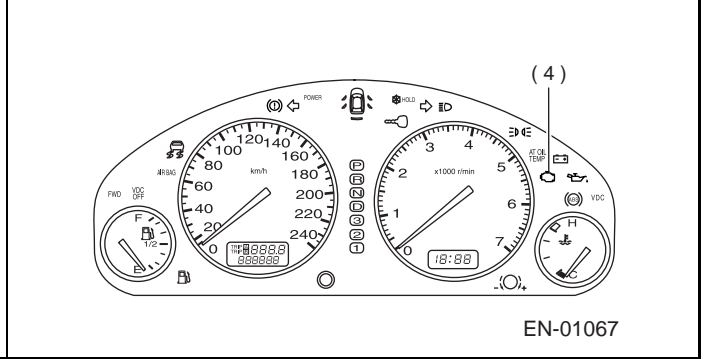
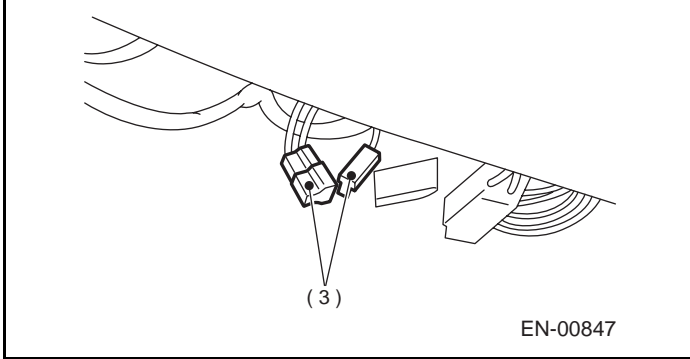
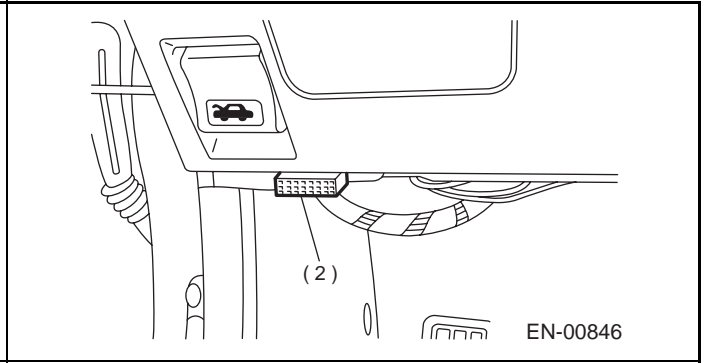
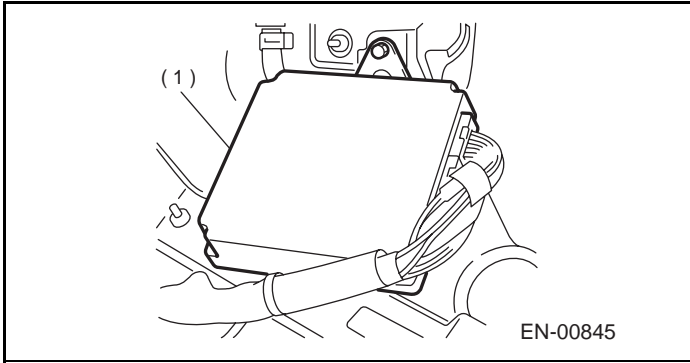
- RHD model



- | | |
|--|--|
| (1) Engine control module (ECM) | (3) Test mode connector |
| (2) Data link connector (for Subaru Select Monitor and OBD-II general scan tool) | (4) CHECK ENGINE malfunction indicator lamp (MI) |

ELECTRICAL COMPONENTS LOCATION

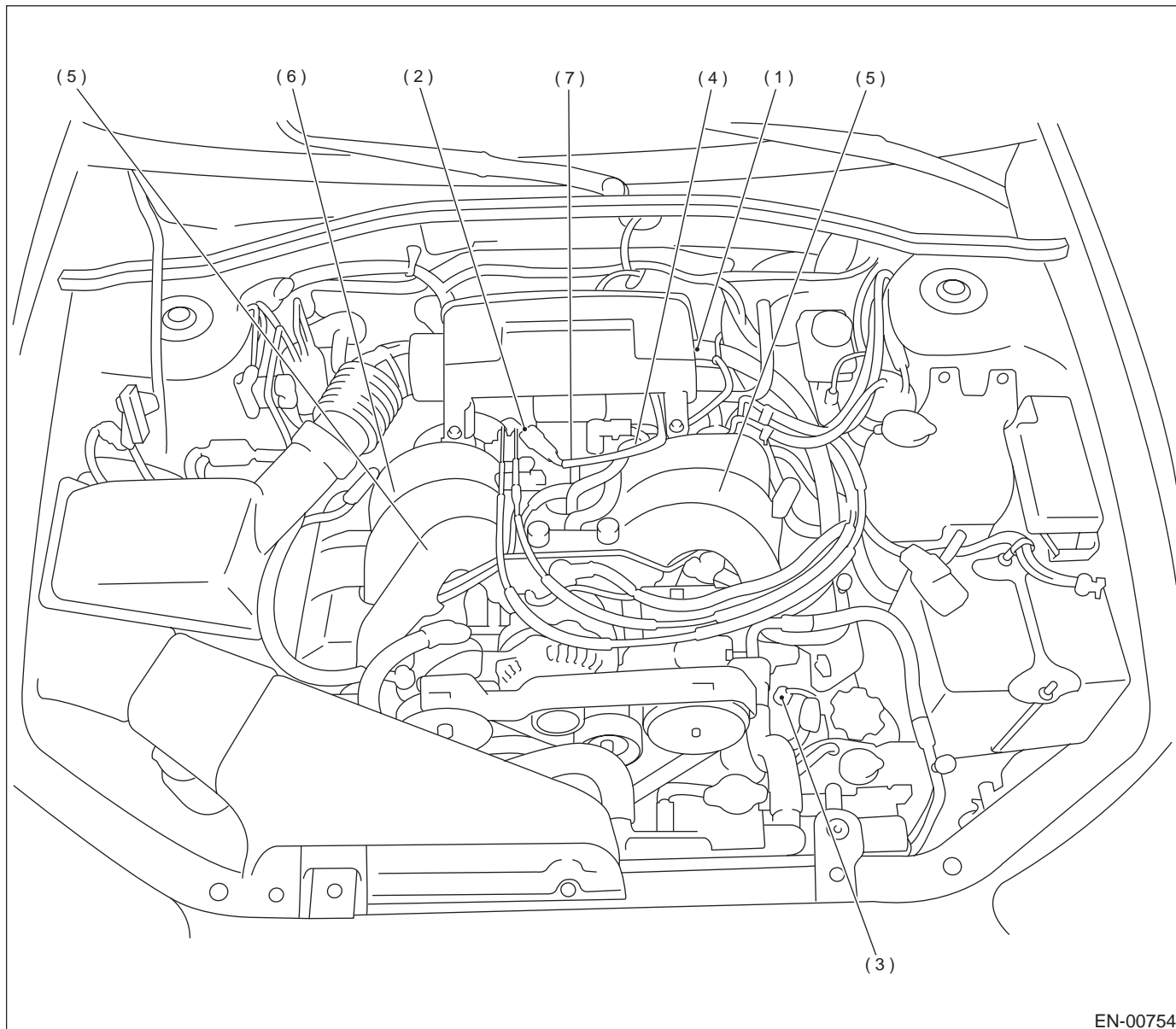
ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SENSOR

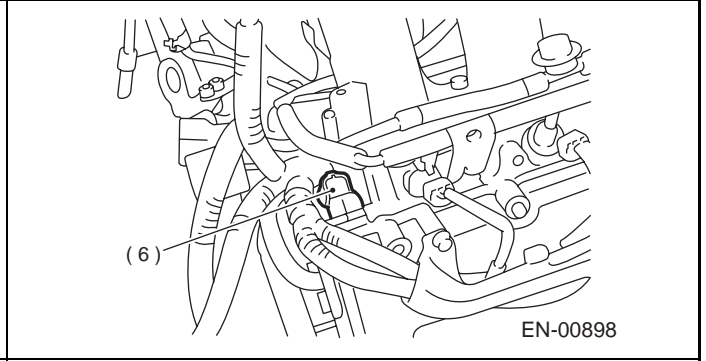
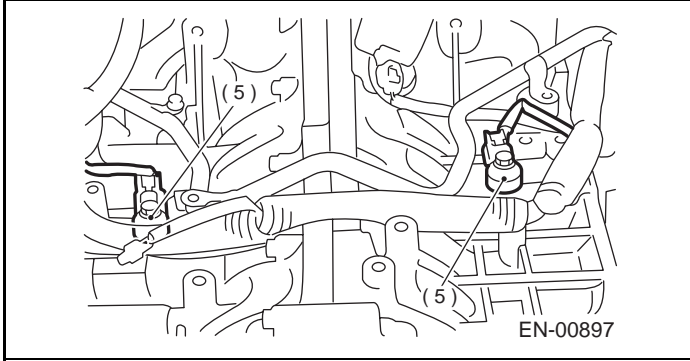
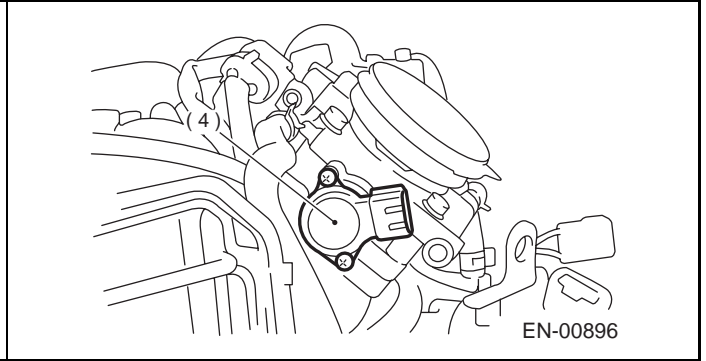
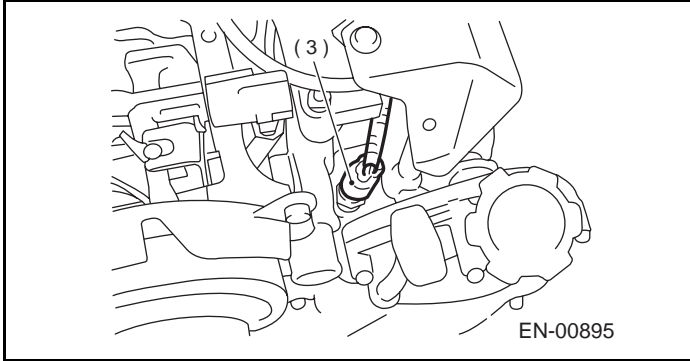
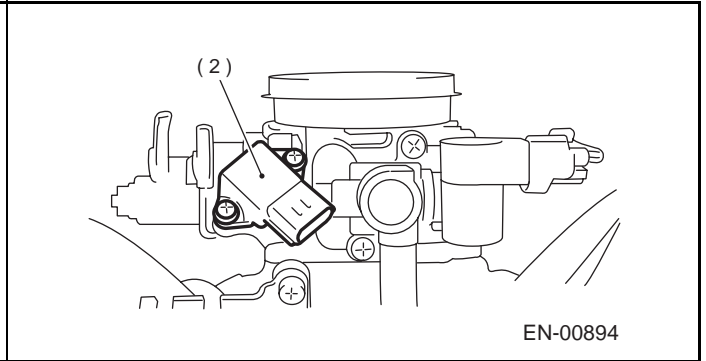
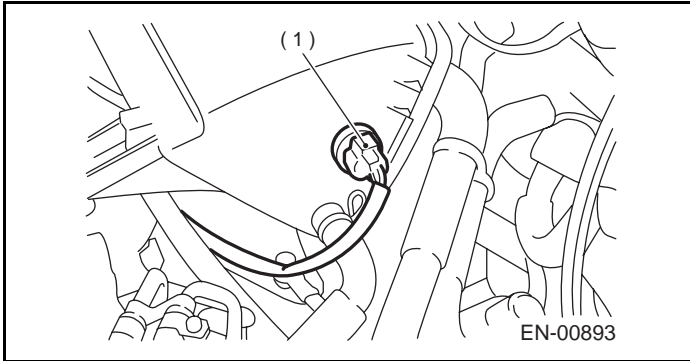


- (1) Intake air temperature sensor
- (2) Intake manifold pressure sensor
- (3) Engine coolant temperature sensor

- (4) Throttle position sensor
- (5) Knock sensor
- (6) Camshaft position sensor
- (7) Crankshaft position sensor

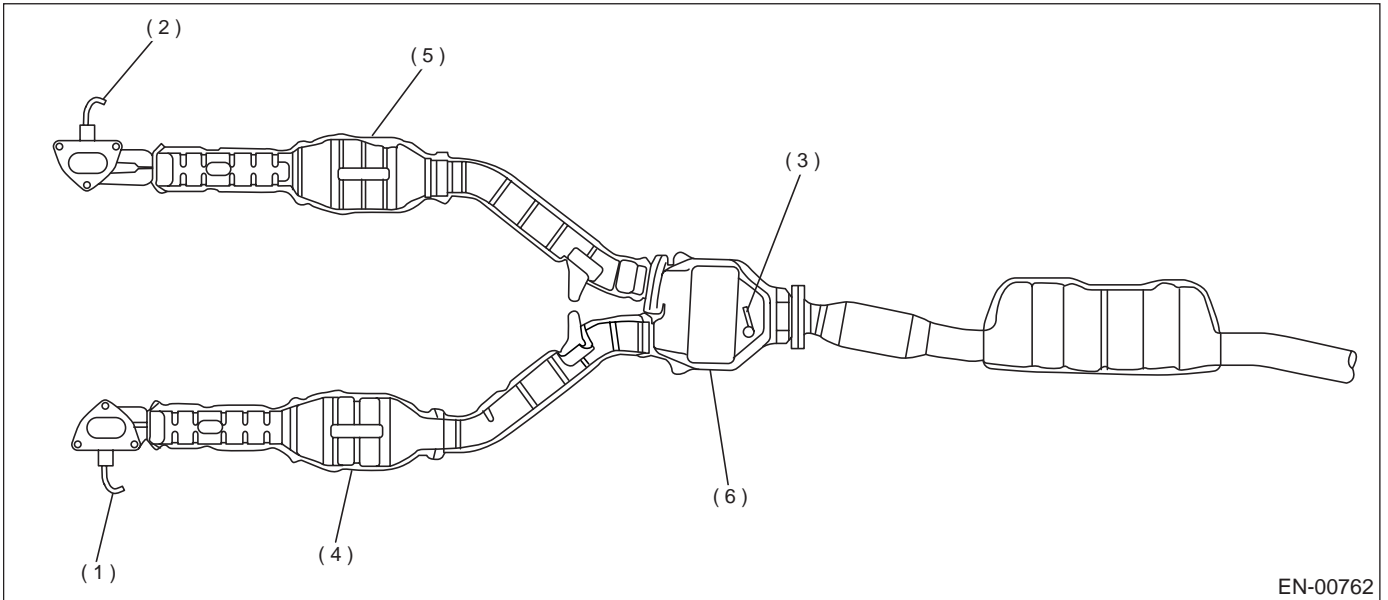
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

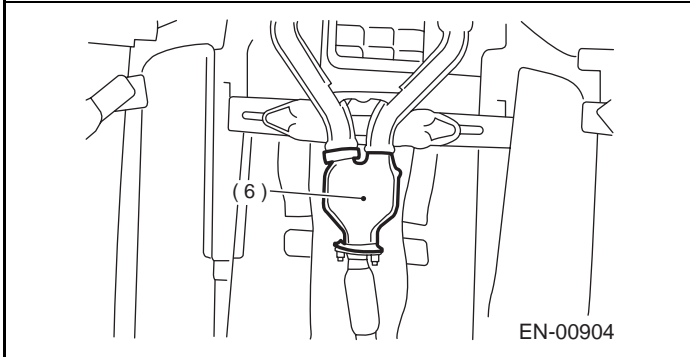
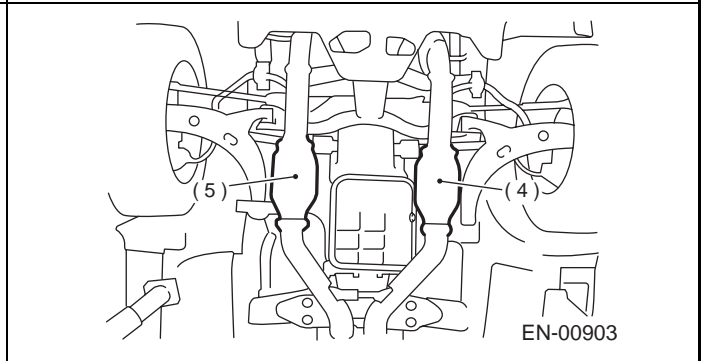
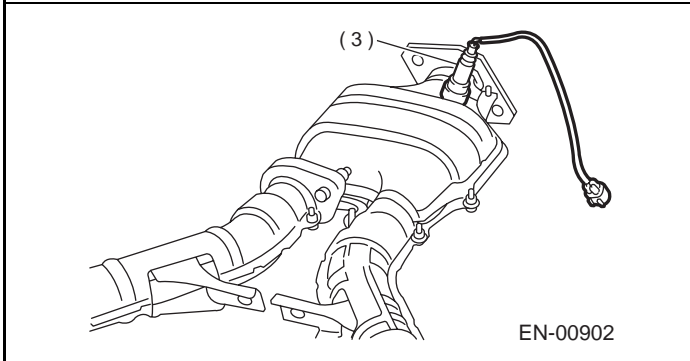
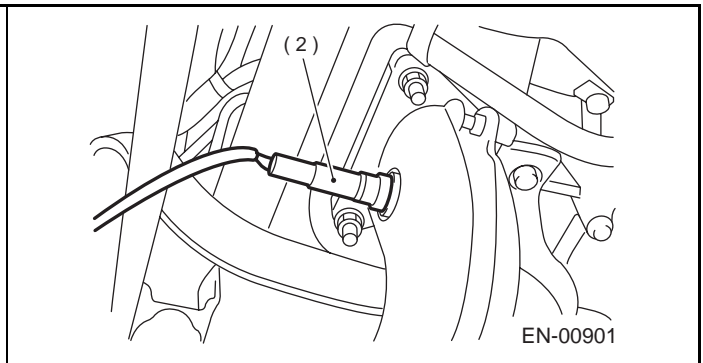
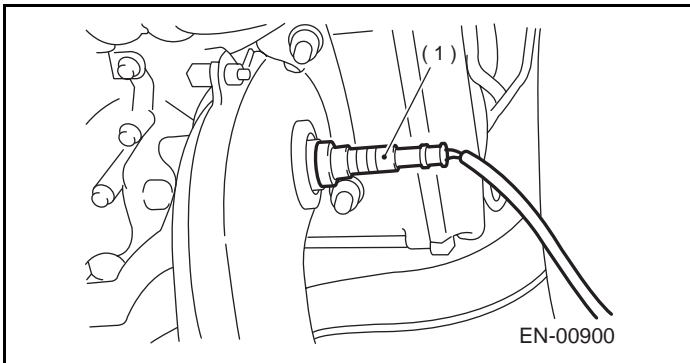


ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



- | | | |
|------------------------------------|------------------------------------|------------------------------------|
| (1) Front oxygen (A/F) sensor (LH) | (3) Rear oxygen sensor | (5) Front catalytic converter (RH) |
| (2) Front oxygen (A/F) sensor (RH) | (4) Front catalytic converter (LH) | (6) Rear catalytic converter |

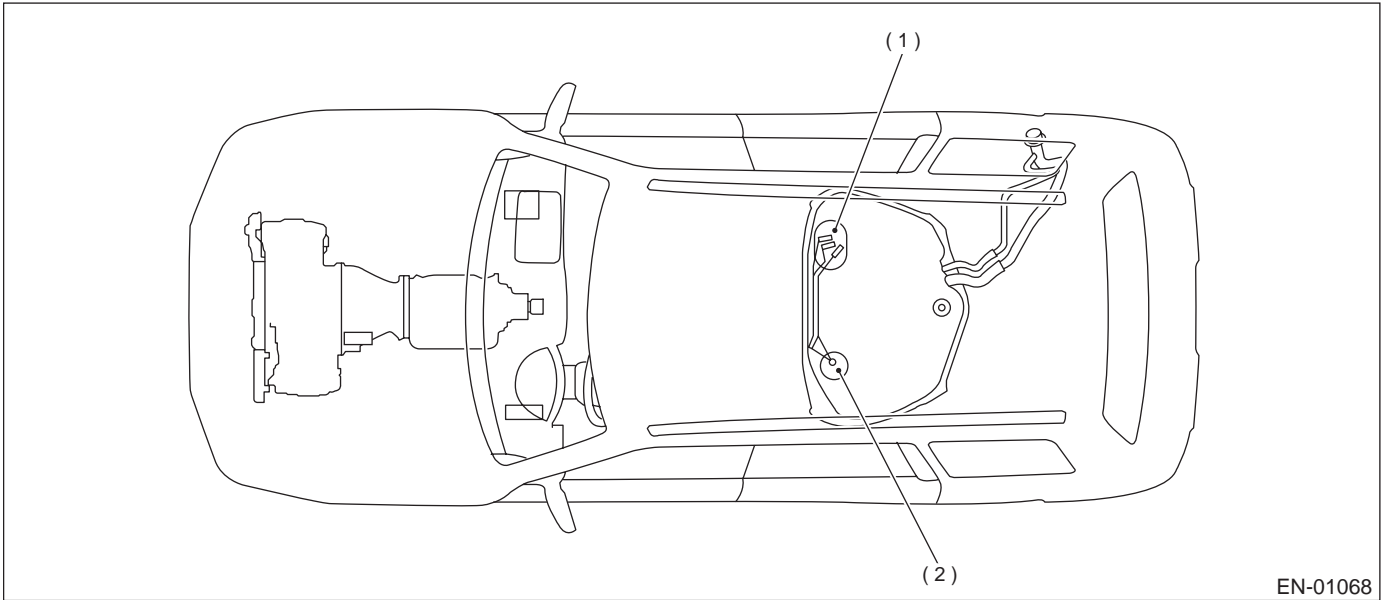


SUBARU

ELECTRICAL COMPONENTS LOCATION

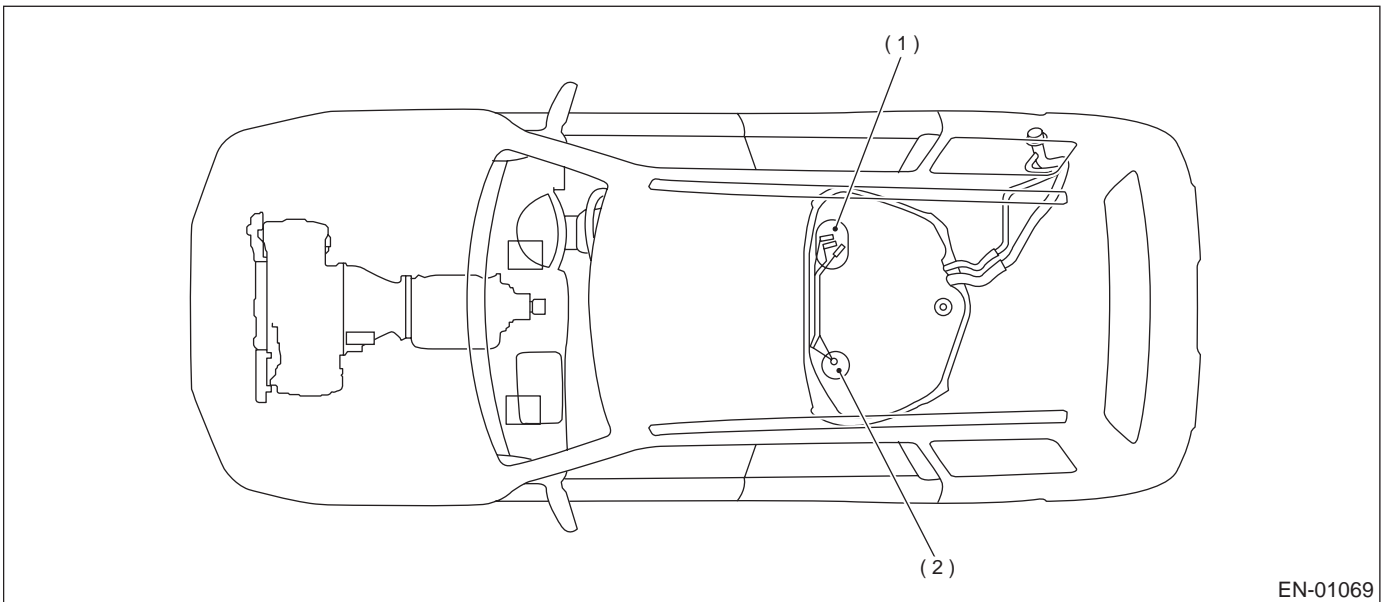
ENGINE (DIAGNOSTICS)

- LHD model



EN-01068

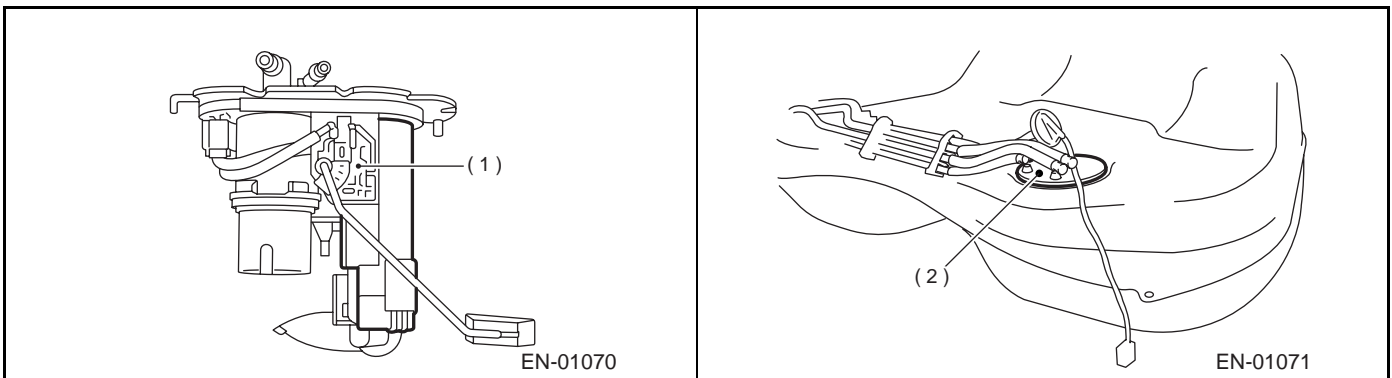
- RHD model



EN-01069

(1) Fuel level sensor

(2) Fuel sub level sensor



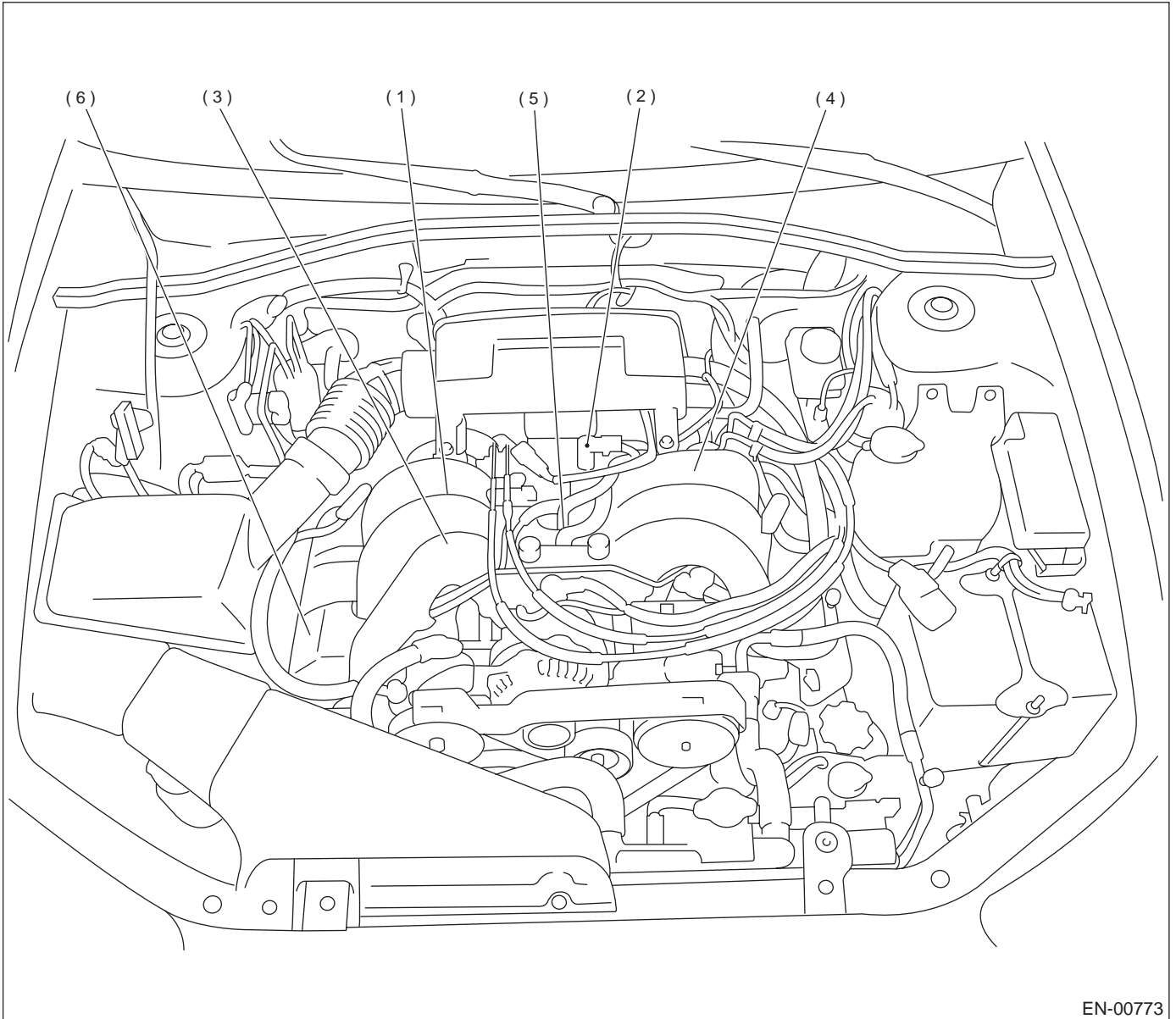
EN-01070

EN-01071

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



(1) Induction control solenoid valve

(3) Purge control solenoid valve

(5) Induction control valve

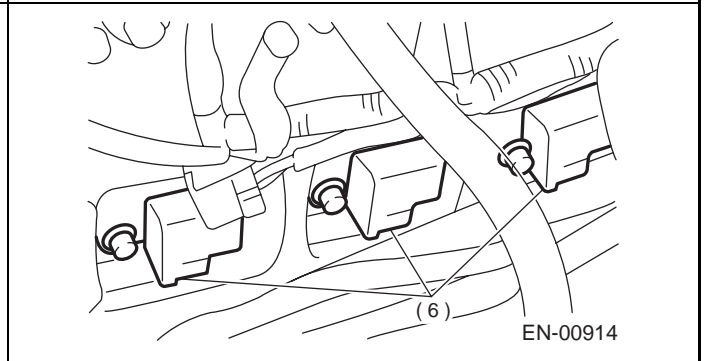
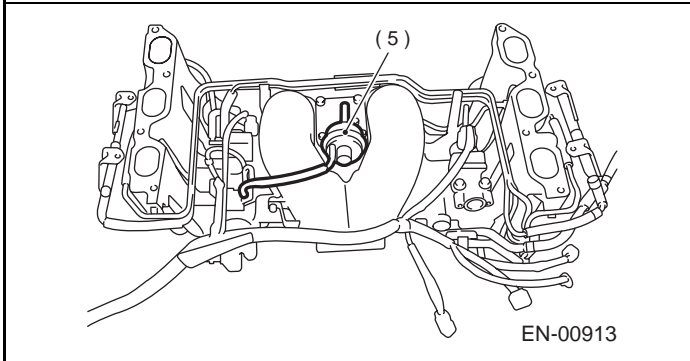
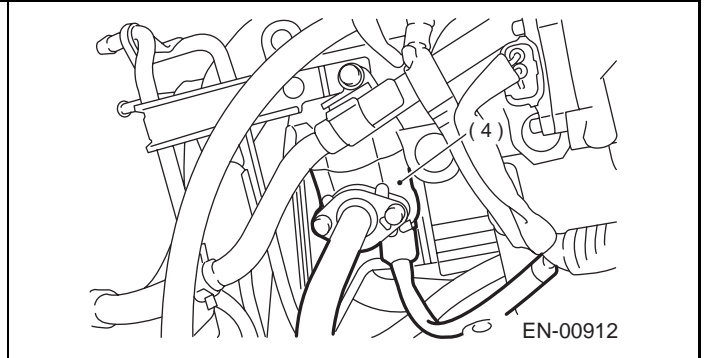
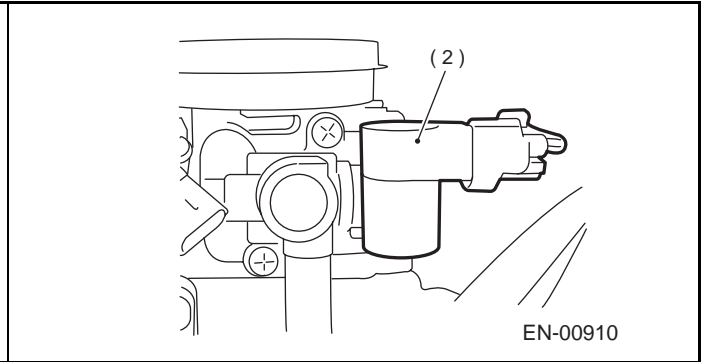
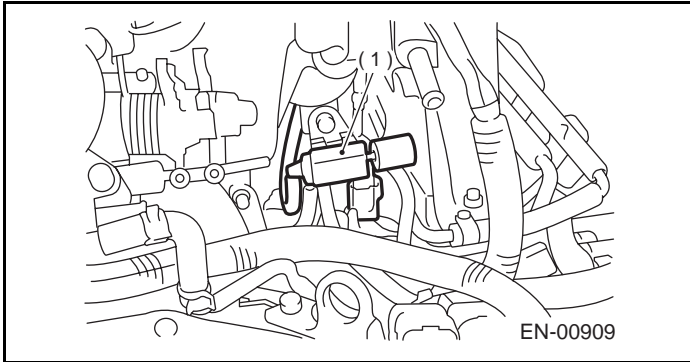
(2) Idle air control solenoid valve

(4) EGR solenoid valve

(6) Ignition coil & ignitor ASSY

ELECTRICAL COMPONENTS LOCATION

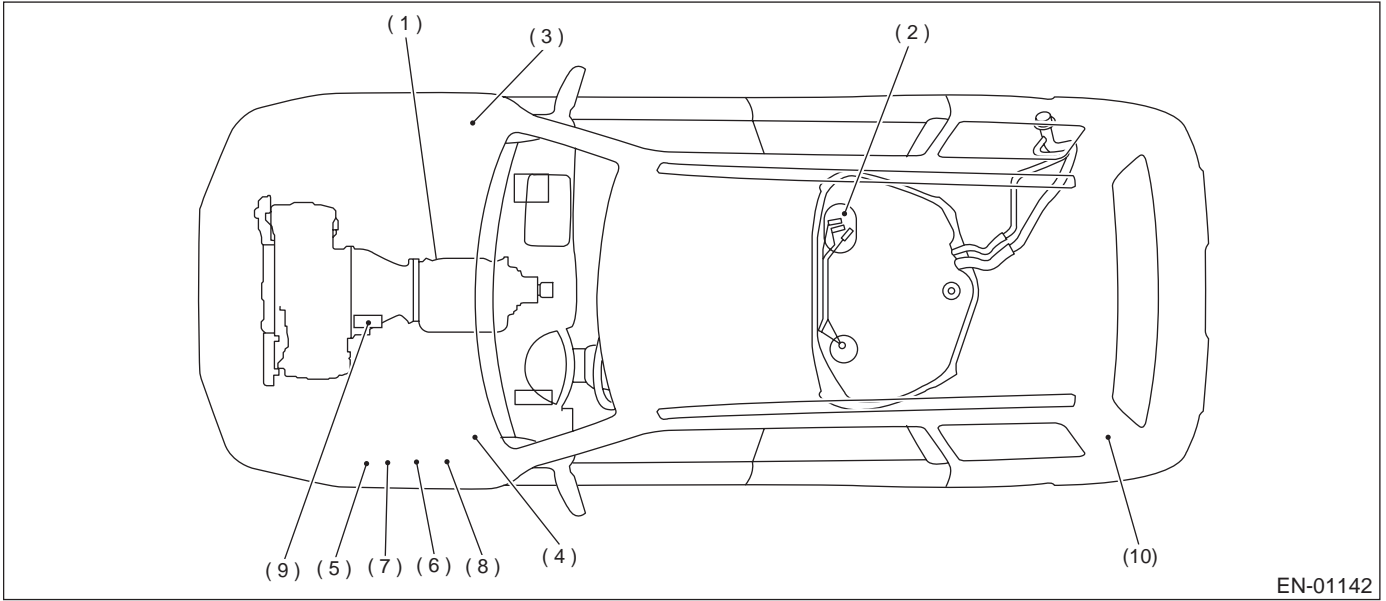
ENGINE (DIAGNOSTICS)



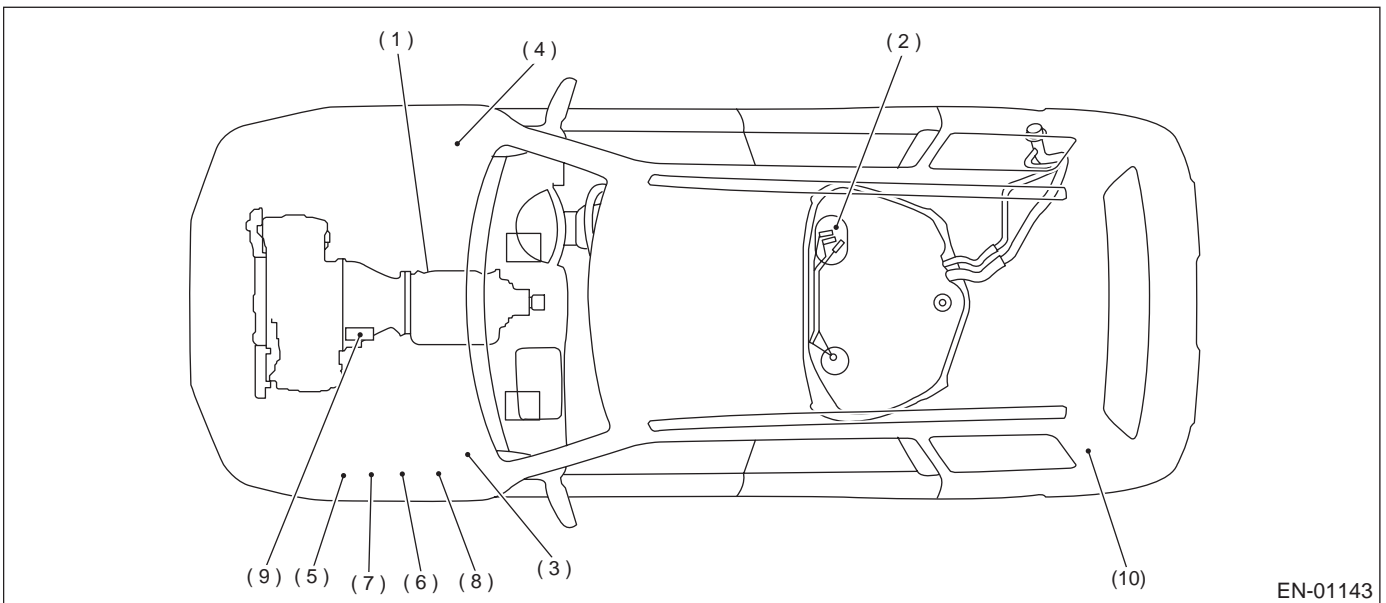
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• LHD model



• RHD model



(1) Inhibitor switch

(2) Fuel pump

(3) Main relay

(4) Fuel pump relay

(5) Radiator main fan relay-1

(6) Radiator sub fan relay-1

(7) Radiator main fan relay-2

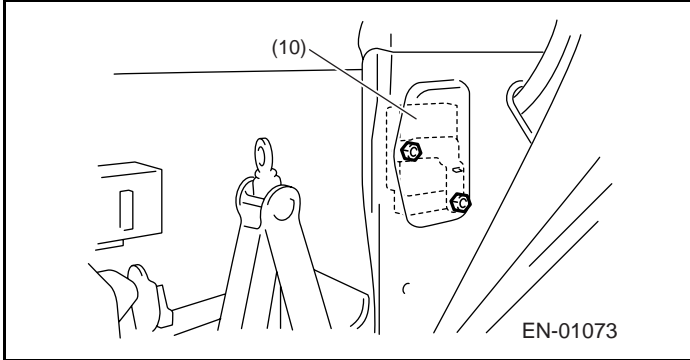
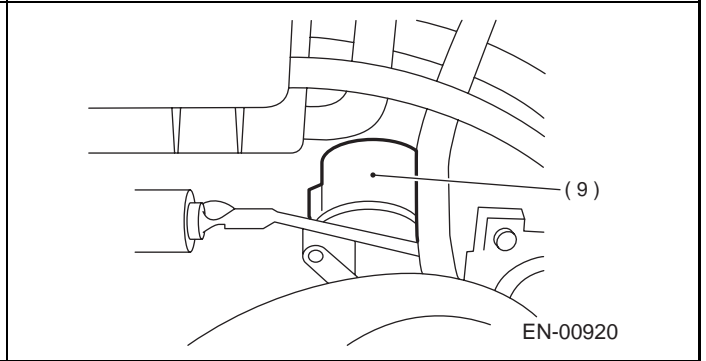
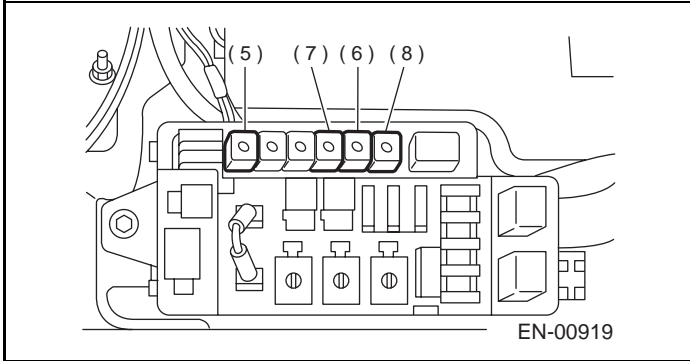
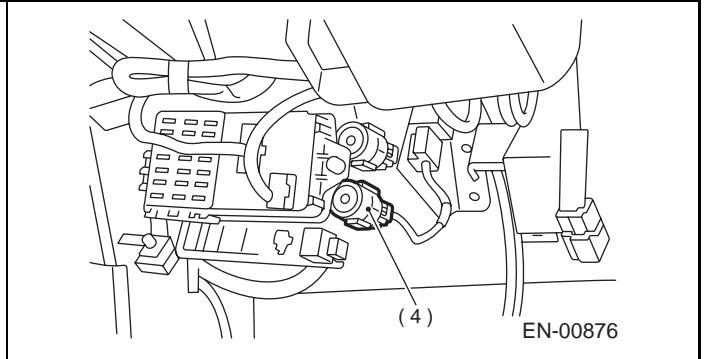
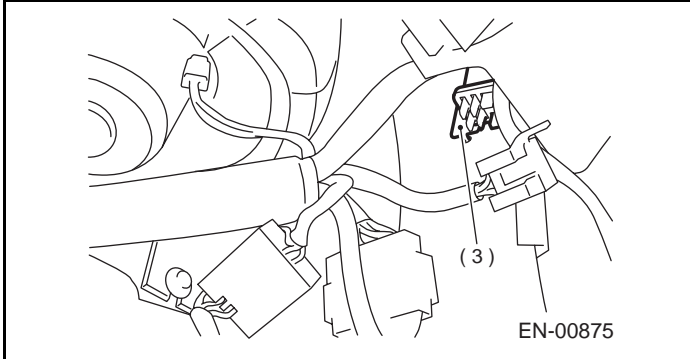
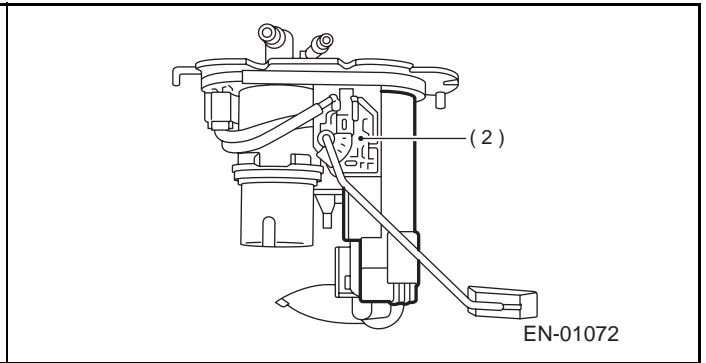
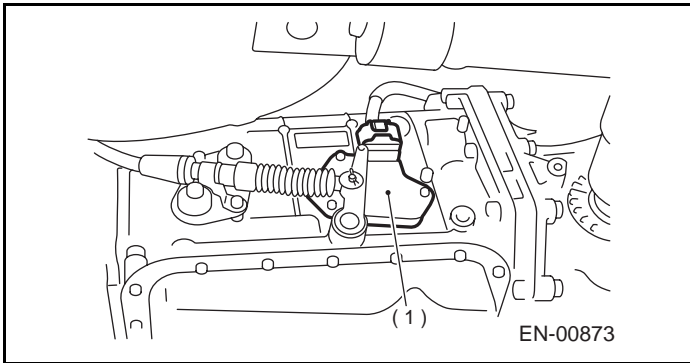
(8) Radiator sub fan relay-2

(9) Starter

(10) Fuel pump controller

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

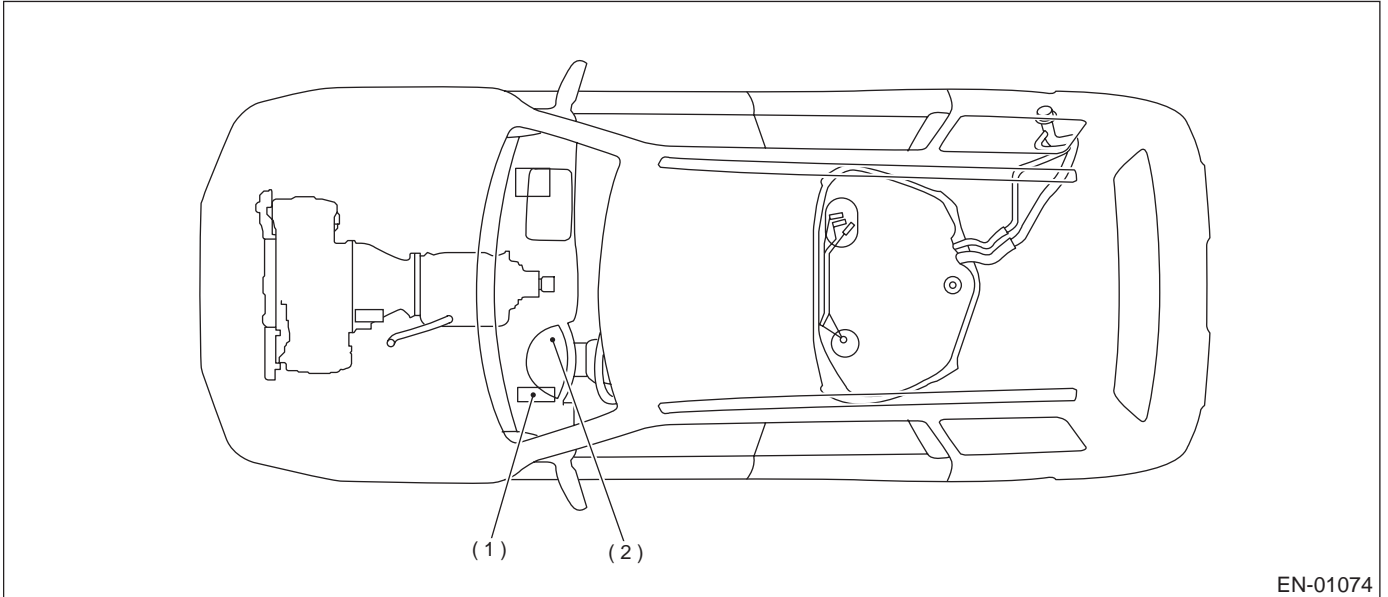


ELECTRICAL COMPONENTS LOCATION

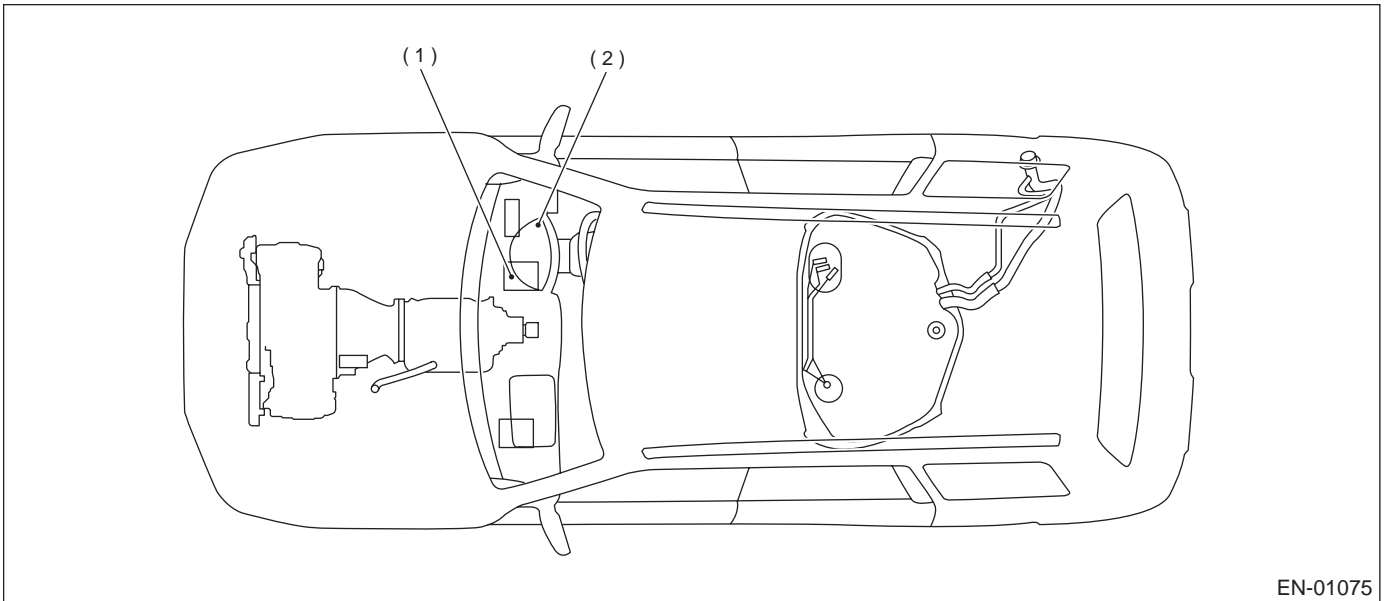
ENGINE (DIAGNOSTICS)

2. TRANSMISSION

- **MODULE**
- LHD model



- RHD model

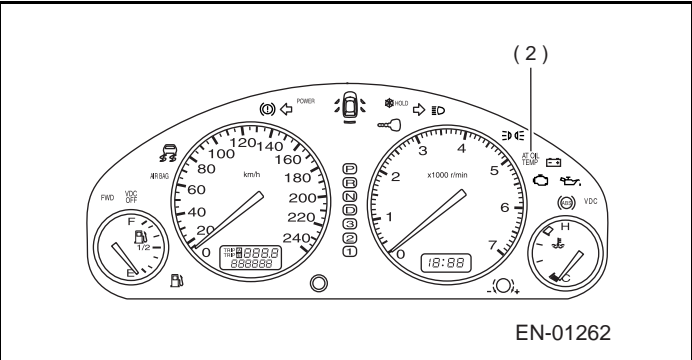
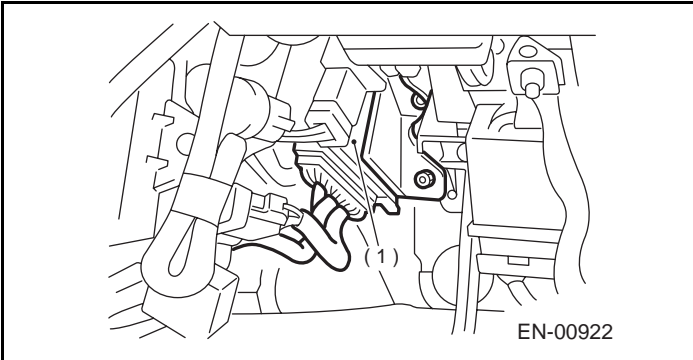


(1) Transmission Control Module (TCM)

(2) AT diagnostic indicator light

ELECTRICAL COMPONENTS LOCATION

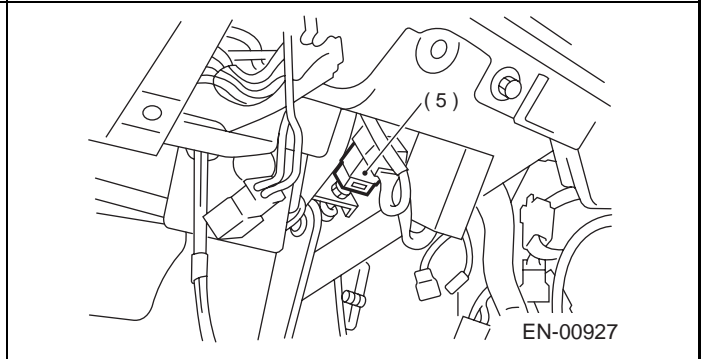
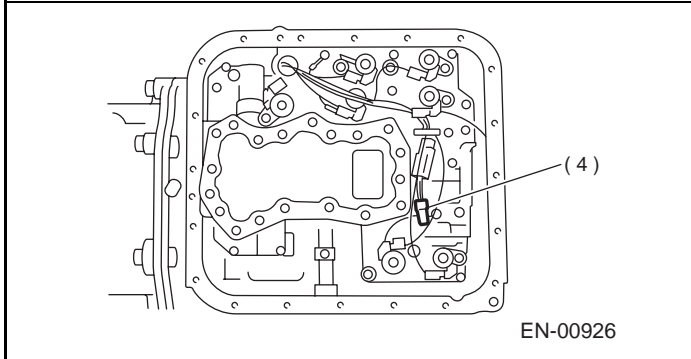
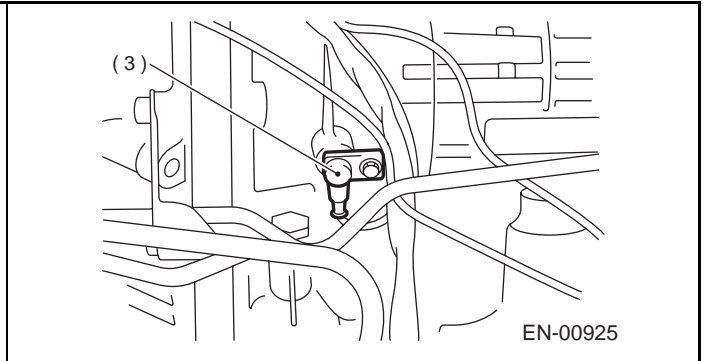
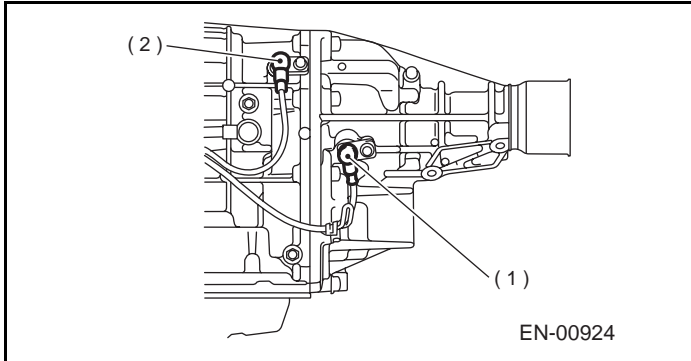
ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

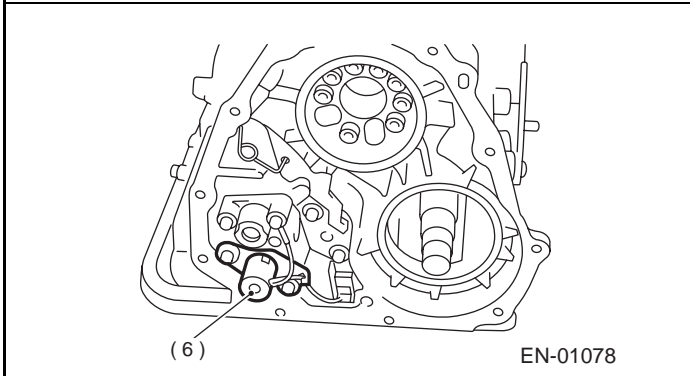
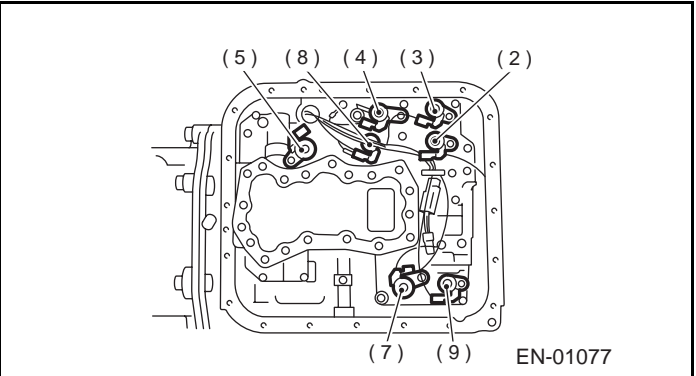
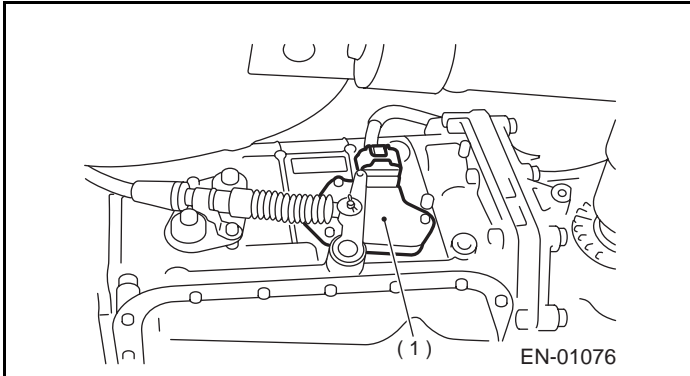
ENGINE (DIAGNOSTICS)

• SENSOR



- (1) Rear vehicle speed sensor
- (2) Front vehicle speed sensor
- (3) Torque converter turbine speed sensor
- (4) ATF temperature sensor
- (5) Brake light switch

• SOLENOID VALVE AND SWITCH



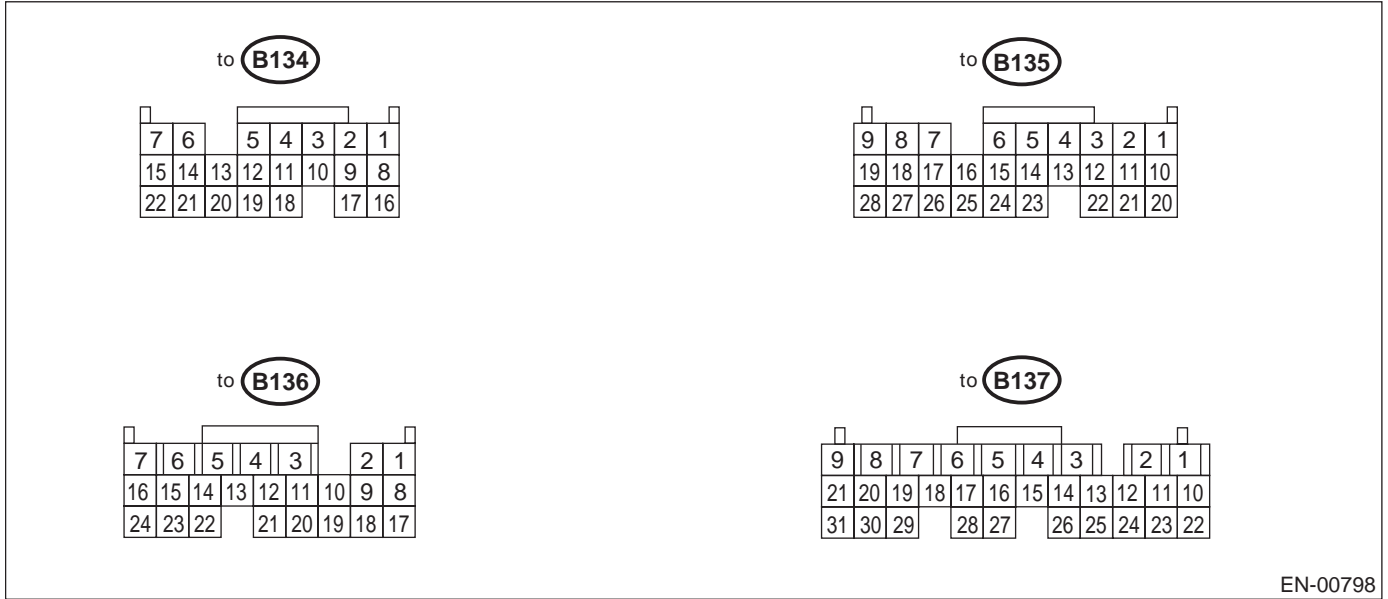
- (1) Inhibitor switch
- (2) Shift solenoid valve 1
- (3) Shift solenoid valve 2
- (4) Line pressure duty solenoid
- (5) Lock-up duty solenoid
- (6) Transfer duty solenoid
- (7) 2-4 brake duty solenoid
- (8) Low clutch timing solenoid valve
- (9) 2-4 brake timing solenoid valve

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



EN-00798

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note	
				Ignition SW ON (Engine OFF)	Engine ON (Idling)		
Crankshaft position sen- sor	Signal (+)	B135	2	0	—	Sensor output wave- form <Ref. to EN(H6DO)-28, WAVE- FORM, MEASURE- MENT, Engine Control Module (ECM) I/O Sig- nal.>	
	Signal (-)	B135	11	0	0		
	Shield	B135	21	0	0		
Camshaft position sen- sor	Signal (+)	B135	1	0	—	Sensor output wave- form <Ref. to EN(H6DO)-28, WAVE- FORM, MEASURE- MENT, Engine Control Module (ECM) I/O Sig- nal.>	
	Signal (-)	B135	10	0	0		
Throttle posi- tion sensor	Signal	B135	7	Fully closed: 0.3 — 0.8 Fully open: 4.2 — 4.7	0.3 — 0.8	—	
	Power supply	B135	9	5	5	—	
	GND (sensor)	B135	19	0	0	—	
Rear oxy- gen sensor	Signal	B135	17	0 — 0.5	0 — 0.9	—	
	Shield	B135	26	0	0	—	
Front oxygen (A/F) sensor heater	Signal	LH1	B137	7	—	—	—
		LH2	B137	6	—	—	—
		RH1	B137	5	—	—	—
		RH2	B137	4	—	—	—
Rear oxygen sensor heater signal		B136	13	—	—	—	
Vehicle speed signal		B134	1	0 or 5	0 or 5	"5" and "0" are repeat- edly displayed when vehicle is driven.	

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Engine coolant temperature sensor	Signal	B135	18	—	—	After warm-up the engine.
	GND (sensor)	B134	7	0	0	After warm-up the engine.
	15					
Generator signal		B137	12	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 10 — 13	Waveform
Starter switch		B134	16	0	0	Cranking: 9 — 12
A/C switch		B134	6	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B134	14	10 — 13	13 — 14	—
Neutral position switch		B134	8	ON: 0 OFF: 5		Switch is ON when shift is in "N" or "P" position.
Test mode connector		B134	5	5	5	When connected: 0
Knock sensor	Signal	B135	1	2.5	2.5	—
			2	2.5	2.5	—
	Shield	B135	22	0	0	—
Back-up power supply		B137	10	10 — 13	13 — 14	Ignition switch "OFF": 10 — 13
Immobilizer communication 1		B135	5	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
Immobilizer communication 2		B135	14	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
Control unit power supply		B137	2	10 — 13	13 — 14	—
			3	10 — 13	13 — 14	—
Sensor power supply		B135	9	5	5	—
Line end check 1		B134	10	0	0	—
Ignition control	#1	B136	24	0	—	Waveform
	#2	B136	23	0	—	Waveform
	#3	B136	22	0	—	Waveform
	#4	B136	21	0	—	Waveform
	#5	B136	20	0	—	Waveform
	#6	B136	19	0	—	Waveform
Fuel injector	#1	B137	1	10 — 13	1 — 14	Waveform
	#2	B136	6	10 — 13	1 — 14	Waveform
	#3	B136	5	10 — 13	1 — 14	Waveform
	#4	B136	4	10 — 13	1 — 14	Waveform
	#5	B136	3	10 — 13	1 — 14	Waveform
	#6	B136	1	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal	B136	10	10 — 13	—	Waveform
Fuel pump controller	Signal	B136	16	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less	—
A/C relay control		B137	27	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B137	17	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B137	28	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Radiator fan relay 3 control		B137	24	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content	Con- nector No.	Termi- nal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Self-shutoff control	B134	2	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less	—
Malfunction indicator lamp	B137	15	—	—	Light "ON": 1, or less Light "OFF": 10 — 14
Engine speed output	B136	9	—	0 — 13	Waveform
Torque control 1 signal	B134	19	5	5	—
Torque control 2 signal	B134	18	5	5	—
Torque control cut signal	B136	14	8	8	—
EGR solenoid valve (A-)	B137	26	10 — 13	13 — 14	—
EGR solenoid valve (B-)	B137	25	10 — 13	13 — 14	—
EGR solenoid valve (A+)	B137	14	10 — 13	13 — 14	—
EGR solenoid valve (B+)	B137	13	10 — 13	13 — 14	—
Induction control solenoid valve	B137	23	0	ON: 0 OFF: 13 — 14	—
Purge control solenoid valve	B137	16	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel level sensor	B135	25	0.12 — 4.75	0.12 — 4.75	—
A/C pressure switch	B135	23	OFF: 5	ON: 1, or less OFF: 5	—
AT diagnosis input signal	B135	20	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	Waveform
AT load signal	B135	28	4.3 — 4.4	0.9 — 1.4	—
Small light switch	B134	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch	B134	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch	B134	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Wiper switch	B135	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal RH (+)	B137	29	3.7 — 3.9	3.7 — 3.9	—
Front oxygen (A/F) sensor signal RH (-)	B137	19	2.6 — 4.4	3.4 — 3.6	—
Front oxygen (A/F) sensor signal LH (+)	B137	30	3.7 — 3.9	3.7 — 3.9	—
Front oxygen (A/F) sensor signal LH (-)	B137	20	2.6 — 4.4	3.4 — 3.6	—
Front oxygen (A/F) sensor shield	B137	18	0	0	—
Pressure sensor	B135	8	3.0 — 4.2	1.0 — 2.6	—
Intake air temperature sensor	B135	27	—	—	—
Power steering switch	B135	24	ON: 0 OFF: 5	ON: 0 OFF: 5	—
SSM/GST communication line	B134	21	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
GND (sensors)	B134	15	0	0	—
GND (injectors)	B136	8	0	0	—
GND (ignition system)	B136	18	0	0	—
GND (power supply)	B134	22	0	0	—
	B136	17	0	0	—
GND (control systems)	B134	7	0	0	—
		15	0	0	—

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
GND (oxygen sensor heater LH)	1	B137	21	0	0	—
	2	B137	31			
GND (oxygen sensor heater RH)	1	B137	9	0	0	—
	2	B137	8			

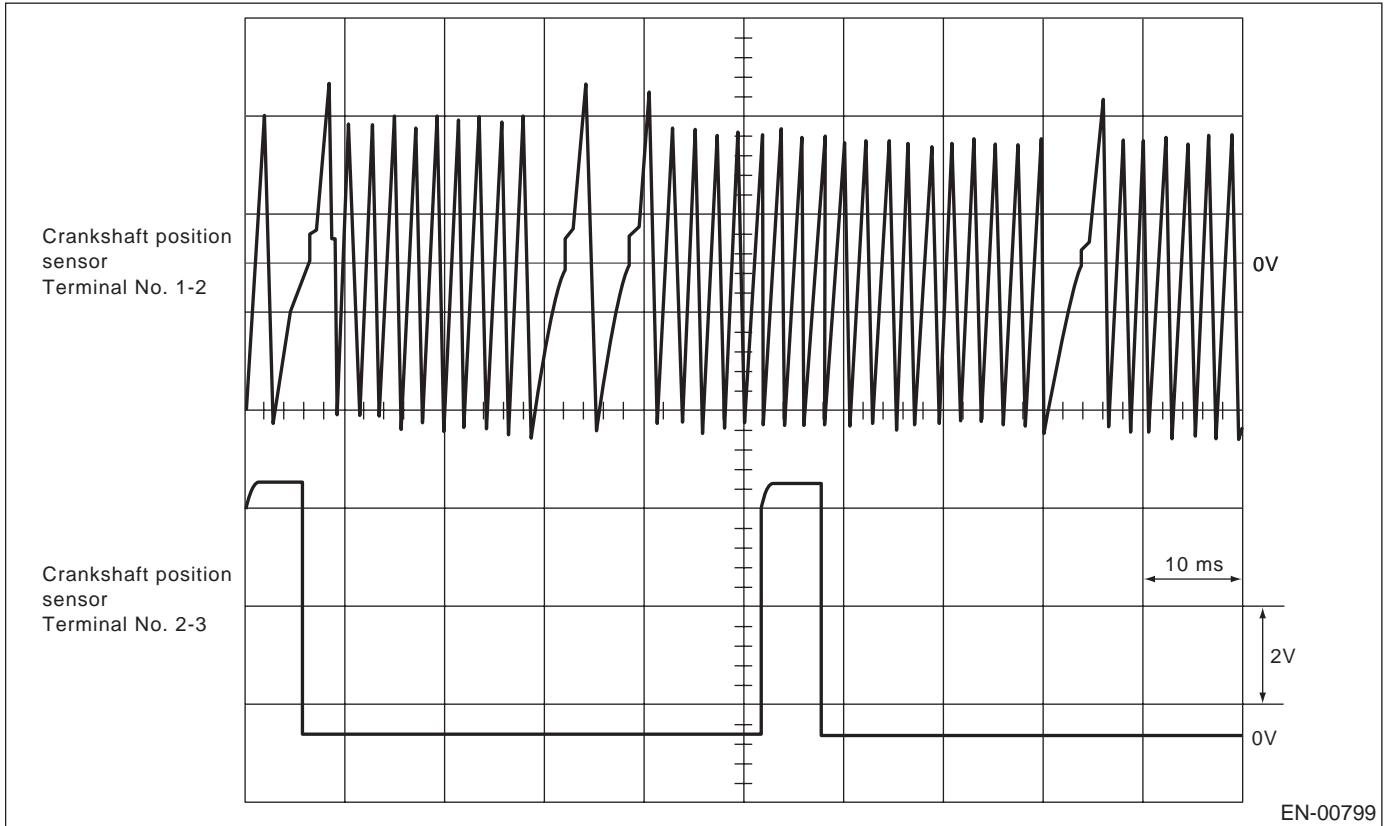
ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

B: MEASUREMENT

Measure input/output signal voltage.

1. WAVEFORM



6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 4.0 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:

- After warm-up the engine.
- Gear position is in “N” or “P” position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

For electrical specification of transmission control module (TCM) input/output signal, refer to AT section.
<Ref. to AT-14, ELECTRICAL SPECIFICATION, Transmission Control Module (TCM) I/O Signal.>

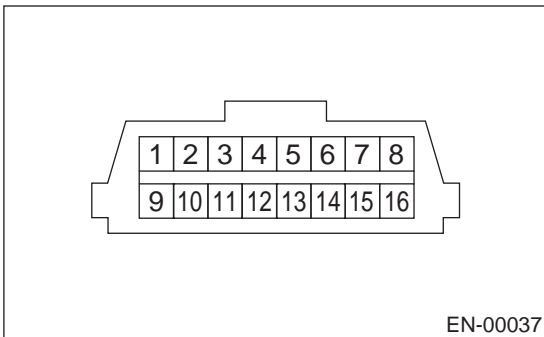
8. Data Link Connector

A: NOTE

This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.

CAUTION:

Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



(A) Data link connector

Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	—	14	Blank
7	Blank	15	Blank
8	—	16	Blank

OBD-II GENERAL SCAN TOOL

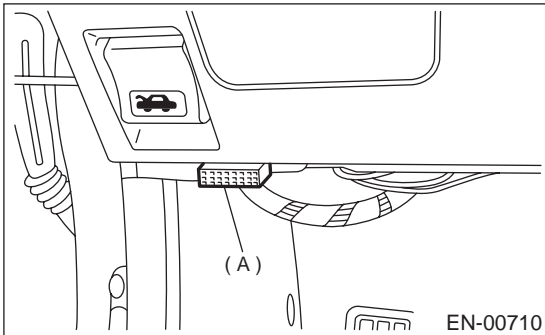
ENGINE (DIAGNOSTICS)

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

- 1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
- 2) Open the cover and connect the OBD-II general scan tool to the data link connector (A) located in the lower portion of the instrument panel (on the driver's side).



(A) Data link connector

2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.

A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and MI status	ON/OFF and number
03	Fuel system control status	%
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
24	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
28	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
1C	On-board diagnosis system	—

- 3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) and freeze frame data.

OBD-II general scan tool functions consist of:

- (1) MODE \$01: Current powertrain diagnostic data
- (2) MODE \$02: Powertrain freeze frame data
- (3) MODE \$03: Emission-related powertrain diagnostic trouble codes
- (4) MODE \$04: Clear/Reset emission-related diagnostic information

Read out data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:

For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE \$01).

3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

4. MODE \$03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE)

Refer to Read Diagnostic Trouble Code for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(H6DO)-46, Read Diagnostic Trouble Code.>

5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

SUBARU SELECT MONITOR

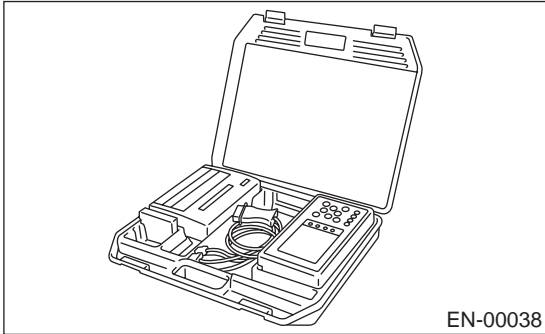
ENGINE (DIAGNOSTICS)

10. Subaru Select Monitor

A: OPERATION

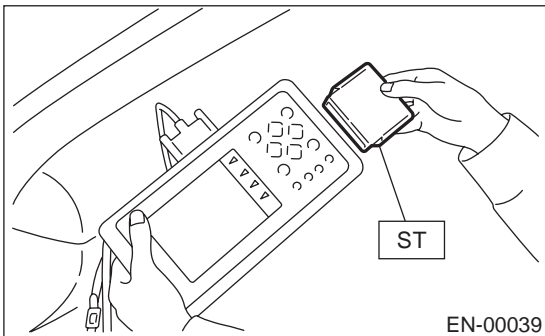
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru Select Monitor kit. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



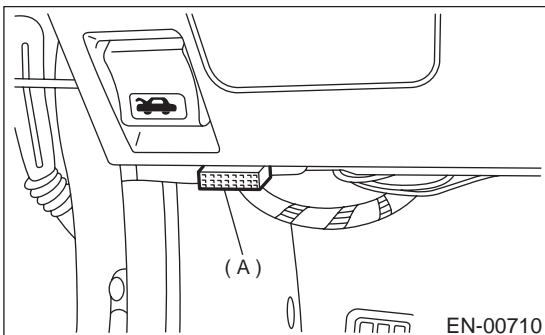
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



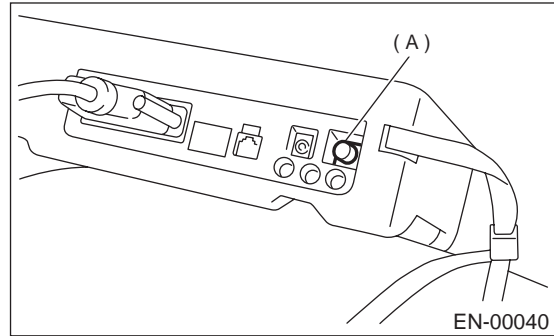
(A) Data link connector

(2) Connect diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using Subaru Select Monitor, call up diagnostic trouble code(s) and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H6DO)-46, Read Diagnostic Trouble Code.>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H6DO)-46, Read Diagnostic Trouble Code.>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width 1	Fuel Injection #1 Pulse	ms
Injection pulse width 2	Fuel Injection #2 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Engine load data	Engine Load	%
Front oxygen (A/F) sensor output signal 1	A/F Sensor #1	—
Front oxygen (A/F) sensor output signal 2	A/F Sensor #2	—
Front oxygen (A/F) sensor resistance 1	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor resistance 2	A/F Sensor #2 Resistance	Ω
Rear oxygen sensor output signal	Rear O2 Sensor	V
Short term fuel trim 1	A/F Correction #1	%
Short term fuel trim 2	A/F Correction #2	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psig
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psig
EGR control signal	No. of EGR Steps	STEP
Front oxygen (A/F) sensor 1 current	A/F Sensor #1 Current	mA
Front oxygen (A/F) sensor 2 current	A/F Sensor #2 Current	mA
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim 1	A/F Learning #1	%
Long term whole fuel trim 2	A/F Learning #2	%
Long term whole fuel trim 3	A/F Learning #3	%
Front oxygen (A/F) sensor heater current 1	A/F Heater Current 1	A
Front oxygen (A/F) sensor heater current 2	A/F Heater Current 2	A
Rear oxygen sensor heater voltage	Rear O2 Heater Voltage	V
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Ignition switch signal	Ignition Switch	ON or OFF
Alternator output signal	Alternator Control Output	%
Fuel pump controller control duty ratio	FPC Duty Ratio	%
Test mode connector signal	Test Mode Signal	ON or OFF

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioner switch signal	A/C Switch	ON or OFF
Radiator fan relay signal 1	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator fan relay signal 2	Radiator Fan Relay #2	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Control Permission Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Air conditioner lock switch signal	A/C Lock Signal	ON or OFF
Air conditioner mid pressure switch signal	A/C Mid Pressure Switch	ON or OFF
Air conditioner compressor signal	A/C Compressor Signal	ON or OFF
Radiator fan relay signal 3	Radiator Fan Relay #3	ON or OFF
Induction control solenoid signal	Variable Intake Air Sol.	ON or OFF
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF
Electric load signal (Wiper switch signal)	Electric load signal	ON or OFF

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For select monitor display details, refer to the following.

Engine Load

Display: 0 — 100%

The engine load is displayed. The ECM calculates the engine load via the engine speed and signals from the pressure sensor. The engine load increases when the engine speed and absolute pressure of the intake manifold increase.

Coolant Temp.

Display: -40 to 215°C (-40 to 419°F)

The coolant temperature transmitted from the engine coolant temperature sensor is displayed.

ATF Correction #1, #2 and #3

Display: -100 to 99%

Using the signal from the front oxygen (A/F) sensor, the correction value of the fuel supply amount regulated by the ECM is indicated. When the A/F is lean and when displayed value becomes 0 % or more, ECM increases the fuel. When the A/F is rich and when displayed value becomes 0 % or less, ECM decreases the fuel.

A/F Learning #1, #2 and #3

Display: -100 to 99.2%

The ECM calculates the long-term fuel trim value from the short-term fuel trim value. The long-term fuel trim value means the correction value of long-term fuel supply amount. If the displayed value is less than 0 %, the fuel system is in rich status and the ECM restricts the fuel supply (by shortening the injector pulse). If the displayed value is more than 0 %, the fuel system is in lean status and the ECM increases the fuel supply (by extending the injector pulse).

Mani Absolute Pressure

Display: 0 — 254.9 kPa (0 — 1,912.5 mmHg, 0 — 75.3 inHg)

The pressure in the intake manifold is displayed. The ECM detects the pressure in the intake tube via the signal from the pressure sensor. The ECM calculates the air mass required for the engine.

Engine Speed

Display: 0 — 16,383 rpm

The engine speed transmitted from the crankshaft position sensor is detected.

Vehicle Speed**Display: 0 — 255 km/h (0 — 158 MPH)**

The vehicle speed transmitted from the vehicle speed sensor is displayed.

Ignition Timing**Display: -64 to 63.5 deg.**

The advanced ignition timing value is displayed. The ECM calculates the advanced ignition timing value using engine coolant temperature, engine speed, and engine load.

Intake Air Temp.**Display: 40 — 215°C (104 — 419°F)**

The intake air temperature is displayed. The ECM detects the intake air temperature via the signal from the intake air temperature sensor, and corrects the ignition timing and fuel supply amount.

Rear O2 Sensor**Display: 0 — 327.7 Volt**

The ECM corrects air-fuel ratio by the signal sent from O2 sensor. Also, the signal is used for catalyst degradation diagnosis.

Battery Voltage**Display: 0 — 20.4 V**

The battery voltage is displayed.

Throttle Sensor Voltage**Display: 0 — 5 V**

The throttle angle is displayed in voltage. When the throttle is fully-closed, the displayed voltage value is approx. 0.5 V. When it is fully-open, the voltage is approx. 4 V or more.

Fuel Injection #1 and #2 Pulse**Display: 0 — 65.3 msec (0 — 214.2 ft/sec)**

The injector valve opening time is displayed. The longer the injector valve opening time, the more the fuel is supplied. The higher the engine load, the longer the injector valve opening time becomes.

Knocking Correction**Display: -64 to 63.5 deg.**

The ECM controls the ignition timing via the signal from the knock sensor.

Atmosphere Pressure**Display: 0 — 254.9 kPa (0 — 1,912.5 mmHg, 0 — 75.3 inHg)**

The atmospheric pressure is displayed. The ECM detects the atmospheric pressure via the signal from the atmosphere sensor.

Mani. Relative Pressure**Display: -128 — 128 kPa (-952 — 952 mm-Hg, -37.5 — 37.5 inHg)**

A value calculated by subtracting the absolute pressure in the intake tube from the atmospheric pressure is displayed. A larger load leads to a larger value.

Front O2 Heater #1, #2 Current**Display: 0 — 25.5 A**

The heater current of the A/F sensor is displayed. A larger current value leads to increased heat generation.

Fuel Level**Display: 0 — 5 V**

The float inside the fuel tank is a variable resistor which varies the resistance based on fuel level. The ECM then averages this voltage and the signal voltage from the fuel tank in order to determine fuel level. The scan tool displays close to 0.7 volts for an empty tank, and close to 5 volts for a full tank.

CPC Valve Duty Ratio**Display: 0 — 100%**

The purge control solenoid valve is regulated by the ECM. The displayed value of 0 % indicates that the purge amount is 0, and 100 % indicates that the purge amount becomes the maximum.

A/F sensor #1, #2**Display: 0 — 2**

The air surplus ratio output from the front oxygen (A/F) sensor is displayed. Air overflow ratio = 1.0 is regarded as a stoichiometric A/F ratio. A value above 1.0 indicates A/F lean range, and below 1.0 indicates A/F rich range.

A/F Correction #3**Display:**

The correction value of fuel supply amount regulated by the ECM via the signal from the rear oxygen sensor is displayed.

A/F Sensor #1, #2 Current**Display: -16 — 15.9 mA**

A value of 0 mA is regarded as a stoichiometric A/F ratio. A negative value indicates A/F rich range, and positive value indicates A/F lean range.

A/F Sensor #1, #2 Resistance**Display: 0 — 255 Ω**

The resistance value of the front oxygen (A/F) sensor is displayed. At idle after warm-up, the resistance value shows 27 to 32 ohm.

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

ISC Valve Duty Ratio

Display: 0 — 127.5%

The duty value of the idle air control solenoid valve is displayed. This value is regulated by the ECM. The displayed value of 0 % indicates that the air bypass circuit is closed, and 100 % indicates that it is fully-open.

No of EGR Steps

Display: 0 — 255 step

The number of the EGR valve steps is displayed. The EGR valve is driven by the stepping motor, and the number of steps is regulated by the ECM. A value of 0 steps indicates that the EGR ratio is 0 %.

Rear O2 Heater Voltage

Display: 0 — 5.1 V

The heater voltage value of the rear oxygen sensor is displayed. The heater current duty-controlled by driving range regulates heater temperature.

A/F Heater Current 1, 2

Display: 0 — 25.5 A

The heater voltage value of the front oxygen (A/F) sensor is displayed. To stabilize the output, the heater current is regulated to keep heater temperature to the specified value.

AT Vehicle ID Signal

Display: ON or OFF

AT and MT vehicles are identified. For AT vehicles, ON is displayed, and for MT ones, OFF is displayed.

Neutral Position Switch

Display: ON or OFF

When the shift lever stays in the neutral position, ON is displayed. When in other positions, OFF is displayed.

Idle Switch Signal

Display: ON or OFF

When the accelerator pedal is released fully, ON is displayed. When depressed fully, OFF is displayed.

P/S Switch

Display: ON or OFF

When the steering wheel is turned fully, ON is displayed. When returned, OFF is displayed. This signal is used for idle control or other controls.

A/C Switch

Display: ON or OFF

When the A/C switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

Starter Switch

Display: ON or OFF

When the vehicle is cranking, ON is displayed. When not cranking, OFF is displayed.

Rear O2 Rich Signal

Display: ON or OFF

When the A/F ratio is rich, ON is displayed. When lean, OFF is displayed.

Knocking Signal

Display: ON or OFF

When knocking occurs and the ignition timing is retarded, ON is displayed. At any other time, OFF is displayed.

Crankshaft Position Sig.

Display: ON or OFF

When a crankshaft signal exists, ON is displayed. At any other time (at engine stall), OFF is displayed.

Camshaft Position Sig.

Display: ON or OFF

When a camshaft signal exists, ON is displayed. At any other time (at engine stall), OFF is displayed.

Rear Defogger SW

Display: ON or OFF

When the rear defogger switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

Blower Fan SW

Display: ON or OFF

When the blower fan switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

Light Switch

Display: ON or OFF

When the light switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

A/C Lock Signal

Display: ON or OFF

Whether or not the A/C compressor is active is detected. When it is active, ON is displayed. When inactive, OFF is displayed.

A/C Mid Pressure Switch

Display: ON or OFF

The status of the A/C compressor is detected. When the A/C compressor voltage is high, ON is displayed. When low, OFF is displayed.

A/C Compressor Signal**Display: ON or OFF**

When the A/C clutch is engaged, ON is displayed.
When disengaged, OFF is displayed.

Radiator Fan Relay #1, #2, #3**Display: ON or OFF**

When the radiator fan relay is ON (radiator operates), ON is displayed. When OFF (radiator stops), OFF is displayed.

Fuel Pump Relay**Display: ON or OFF**

When the radiator fan relay is ON (fuel pump operates), ON is displayed. When OFF (fuel pump stops), OFF is displayed.

Torque Control Signal #1, #2**Display: ON or OFF**

When a torque down signal exists, ON is displayed.
When it doesn't, OFF is displayed.

Torque Permission Signal**Display: ON or OFF**

The signal which notifies whether or not torque down is possible is displayed. This signal is transmitted from the ECU in response to a torque down signal from the TCU. When torque down is prohibited, ON is displayed. When permitted, OFF is displayed.

Variable Intake Air Sol.**Display: ON or OFF**

The status of the induction control valve is displayed. When the valve is closed for the control to improve low- and mid-speed range, ON is displayed. When open, OFF is displayed.

Alternator output signal**Display: 0% or 100%**

Alternator control status is displayed. When in control 100% is shown. When not in control, 0% is shown.

Fuel pump controller control duty ratio**Display: 33% or 66% or 100%**

Duty ratio controlling fuel pump is displayed. This value is controlled by ECM.

Electric load signal**Display: ON or OFF**

When power switch is ON, ON is displayed. When power switch is OFF, OFF is displayed. This signal is used for alternator control, etc.

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 7) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diag Code:	—
Malfunction indicator lamp status	MI (MI)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	No support
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor (Bank 1, Bank 2, Rear)	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater (Bank 1, Bank 2, Rear)	O2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR Diagnosis	Complete or incomplete
Air fuel ratio control system for bank 1	Fuel System for Bank 1	C1 normal
Air fuel ratio control system for bank 2	Fuel System for Bank 2	C1 normal
Engine load data	Calculated load valve	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor bank 1	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor bank 1	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor bank 2	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor bank 2	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing for #1 cylinder	Ignition timing #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
Oxygen sensor equipment	Oxygen Sensor #11	Supported
Oxygen sensor equipment	Oxygen Sensor #12	Supported
Oxygen sensor equipment	Oxygen Sensor #21	Supported
A/F sensor equipment	A/F Sensor #11	—
A/F sensor output signal	A/F Sensor #11	V
A/F sensor equipment	A/F Sensor #21	—
A/F sensor output signal	A/F Sensor #21	V

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Air fuel ratio control system for bank 2	Fuel System for Bank 2	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor bank 1	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor bank 1	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor bank 2	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor bank 2	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

7. LED OPERATION MODE FOR ENGINE

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is functioning.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is functioning.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is functioning.
Knocking signal	Knocking Signal (#1 or #2)	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is functioning.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.
Radiator sub fan relay 2 signal	Radiator Fan Relay 3	ON or OFF	When radiator sub fan relay is functioning.
Air conditioner mid pressure switch signal	A/C Mid Pressure Switch	ON or OFF	When air conditioner mid pressure switch is entered.
Air conditioner lock switch signal	A/C Lock Signal	ON or OFF	When air conditioner lock switch is entered.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. READ CURRENT DATA FOR AT.

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of transmission type.
 - 4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Stop lamp switch signal	Stop Lamp Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	AT Diagnosis Lamp	ON or OFF

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For select monitor display details, refer to the following.

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

Front Wheel Speed

Display: 0 — 255 km/h (0 — 158 MPH)

The front wheel speed is displayed. This signal is used for the shift control, lock-up control, line pressure control, and transfer control.

ATF Temp.

Display: -40 to 215°C (-40 to 419°F)

The ATF temperature via the signal from the ATF temperature sensor is displayed.

Gear Position

Display:

The present gear position is displayed. The gear position is calculated from the engine speed and torque converter turbine speed.

Line Pressure Duty Ratio

Display: 0 — 123%

The duty value of the line pressure duty solenoid is displayed. The line pressure duty solenoid is regulated by the TCM, adjusting the line pressure to the optimum value depending on driving conditions.

Lock Up Duty Ratio

Display: 0 — 123%

The duty value of the lock-up duty solenoid is displayed. The lock-up duty solenoid is regulated by the TCM. Because the lock-up duty solenoid controls the lock-up control valve, the lock-up clutch engages and disengages smoothly.

Transfer Duty Ratio

Display: 0 — 123%

The duty value of the transfer duty solenoid is displayed. The transfer duty solenoid is regulated by the TCM, adjusting the transfer clutch oil pressure and controlling the driving force of the rear wheels.

Turbine Revolution Speed

Display: 0 — 8,160 rpm

The input shaft speed detected by the torque converter speed sensor is displayed. This signal is used to control the line pressure and 2 - 4 brake pressure control timing during shifting.

Throttle Sensor Power

Display: 0 — 256 V

The supply voltage to the throttle sensor is displayed. This signal is used for the throttle sensor output correction.

Brake Clutch Duty Ratio

Display: 0 — 123%

The duty value of the 2 - 4 brake duty solenoid. The 2 - 4 brake duty solenoid is regulated by the TCM, adjusting the 2 - 4 brake pressure during shifting and relieving from harsh shifting.

Rear Wheel Speed

Display: 0 — 255 km/h (0 — 158 MPH)

The rear wheel speed is displayed. This signal is used to control the transfer. If the front vehicle speed sensor is malfunctioning, this signal is used as a substitute.

Cruise Control Signal

Display: ON or OFF

When the cruise control switch is ON, ON is displayed. When OFF, OFF is displayed.

ABS Signal

Display: ON or OFF

When the ABS function is active, ON is displayed. When inactive, OFF is displayed.

Stop Light Signal

Display: ON or OFF

When the brake pedal is depressed, ON is displayed. When released, OFF is displayed.

1st, 2nd, 3rd, D, R, Range Signal

Display: ON or OFF

When the switch for each range is ON, ON is displayed.

2-4 Brake Timing Sol.

Display: ON or OFF

When the 2-4 brake timing solenoid is ON, ON is displayed. When OFF, OFF is displayed. The 2-4 brake timing solenoid is regulated by the TCM, controlling the release timing of the 2-4 brake.

Low Clutch Timing Sol.

Display: ON or OFF

When the low clutch timing solenoid is ON, ON is displayed. When OFF, OFF is displayed. The low clutch timing solenoid is regulated by the TCM, controlling the release timing of the low clutch.

Shift Solenoid #1, #2

Display: ON or OFF

When the solenoid valve is ON, ON is displayed. When OFF, OFF is displayed. By combining No. 1 and No. 2 solenoids, the shifting mechanism is controlled.

P Range

Display: ON or OFF

When the shift lever stays in P range, ON is displayed. When not in P range, OFF is displayed.

N Range

Display: ON or OFF

When the shift lever stays in N range, ON is displayed. When not in N range, OFF is displayed.

Torque Control Signal #1, #2

Display: ON or OFF

When the torque down signal exists, ON is displayed. When it does not exist, OFF is displayed.

Torque Permission Signal

Display: ON or OFF

The signal which notifies whether or not torque down is possible is displayed. This signal is transmitted from the ECU in response to a torque down signal from the TCU. When torque down is prohibited, ON is displayed. When permitted, OFF is displayed.

READ DIAGNOSTIC TROUBLE CODE

ENGINE (DIAGNOSTICS)

11. Read Diagnostic Trouble Code

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
 - For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
- <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
- 6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes.

For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (MODE \$03).

12. Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.

When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.
<Ref. to EN(H6DO)-52, Drive Cycle.>

DTC No.	Item
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)
P0050	HO2S Heater control circuit (Bank 2 Sensor 1)
P0051	HO2S Heater control circuit low (Bank 2 Sensor 1)
P0052	HO2S Heater control circuit high (Bank 2 Sensor 1)
P0068	Manifold absolute pressure/barometric pressure circuit range/performance
P0107	Manifold absolute pressure/barometric pressure circuit low input
P0108	Manifold absolute pressure/barometric pressure circuit high input
P0112	Intake air temperature circuit low input
P0113	Intake air temperature circuit high input
P0117	Engine coolant temperature circuit low input
P0118	Engine coolant temperature circuit high input
P0122	Throttle/pedal position sensor/switch "A" circuit low input
P0123	Throttle/pedal position sensor/switch "A" circuit high input
P0129	Barometric pressure too low
P0130	O2 sensor circuit (Bank 1 Sensor 1)
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)
P0150	O2 sensor circuit (Bank 2 Sensor 1)
P0154	O2 sensor circuit no activity detected (Bank 2 Sensor 1)
P0230	Fuel pump primary circuit
P0327	Knock sensor 1 circuit low input (Bank 1 or Single sensor)
P0328	Knock sensor 1 circuit high input (Bank 1 or Single sensor)
P0332	Knock sensor 2 circuit low input (Bank 2)
P0333	Knock sensor 2 circuit high input (Bank 2)
P0335	Crankshaft position sensor "A" circuit
P0336	Crankshaft position sensor "A" circuit range/performance
P0340	Camshaft position sensor "A" circuit (Bank 1 or Single Sensor)
P0341	Camshaft position sensor "A" circuit range/performance (Bank 1 or Single Sensor)
P0458	Evaporative emission control system purge control valve circuit low
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0502	Vehicle speed sensor circuit low input
P0503	Vehicle speed sensor intermittent/erratic/high
P0508	Idle control system circuit low
P0509	Idle control system circuit high
P0512	Starter request circuit
P0519	Idle air control circuit system performance
P0558	Alternator circuit low input
P0559	Alternator circuit high input
P0565	Cruise control on signal

INSPECTION MODE

ENGINE (DIAGNOSTICS)

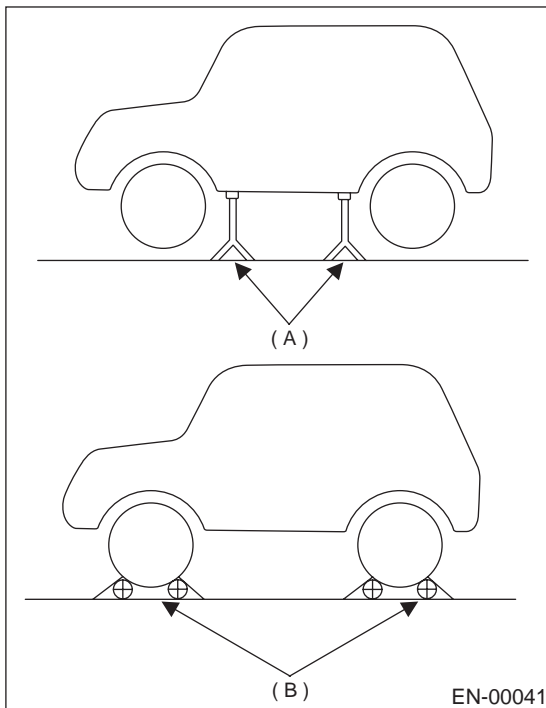
DTC No.	Item
P0604	Internal control module random access memory (RAM) error
P0661	Intake manifold tuning valve control circuit low - bank 1
P0662	Intake manifold tuning valve control circuit high - bank 2
P0691	Cooling fan 1 control circuit low
P0692	Cooling fan 1 control circuit high
P0703	Torque converter/brake switch "B" circuit
P0705	Transmission range sensor circuit (PRNDL input)
P0710	Transmission fluid temperature sensor circuit
P0716	Input/turbine speed sensor circuit range/performance
P0720	Output speed sensor circuit
P0726	Engine speed input circuit range/performance
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0741	Torque converter clutch circuit performance or stuck off
P0743	Torque converter clutch circuit electrical
P0748	Pressure control solenoid "A" electrical
P0753	Shift solenoid "A" electrical
P0758	Shift solenoid "B" electrical
P0771	Shift solenoid "E" performance or stuck off
P0778	Pressure control solenoid "B" electrical
P0785	Shift/timing solenoid
P0851	Neutral switch input circuit low
P0852	Neutral switch input circuit high
P0864	TCM communication circuit range/performance
P0865	TCM communication circuit low
P0866	TCM communication circuit high
P1110	Atmospheric pressure sensor circuit malfunction (low input)
P1111	Atmospheric pressure sensor circuit malfunction (high input)
P1134	A/F sensor micro-computer problem
P1152	O2 sensor circuit range/performance (low) (Bank 1 Sensor 1)
P1153	O2 sensor circuit range/performance (high) (Bank 1 Sensor 2)
P1154	O2 sensor circuit range/performance (low) (Bank 2 Sensor 1)
P1155	O2 sensor circuit range/performance (high) (Bank 2 Sensor 1)
P1518	Starter switch circuit low input
P1560	Back-up voltage circuit malfunction
P1698	Engine torque control cut signal circuit malfunction (low input)
P1699	Engine torque control cut signal circuit malfunction (high input)
P1700	Throttle position sensor circuit malfunction for AT
P1711	Engine torque control signal #1 circuit malfunction
P1712	Engine torque control signal #2 circuit malfunction

1. PREPARATION FOR THE INSPECTION MODE

- 1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
- 2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

WARNING:

- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



- (A) Safety stand
- (B) Free rollers

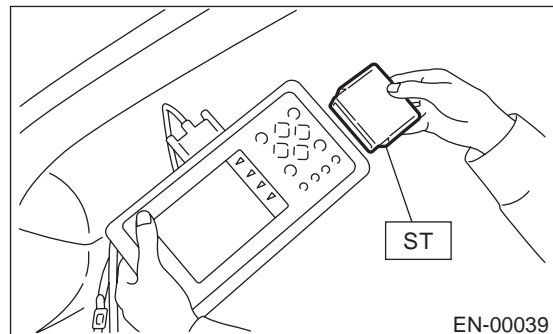
- 3) Warm up engine.

2. SUBARU SELECT MONITOR

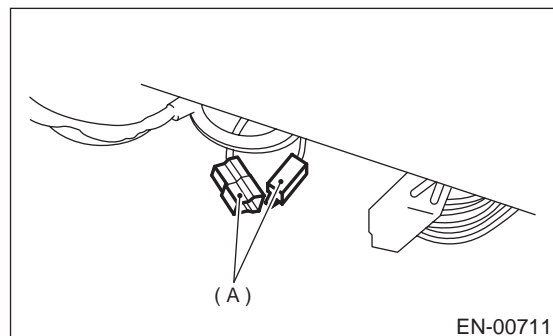
- 1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)-54, Clear Memory Mode.>
- 2) Prepare Subaru Select Monitor kit. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



- 3) Connect diagnosis cable to Subaru Select Monitor.
- 4) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



- 5) Connect test mode connector at the lower portion of instrument panel (on the driver's side).



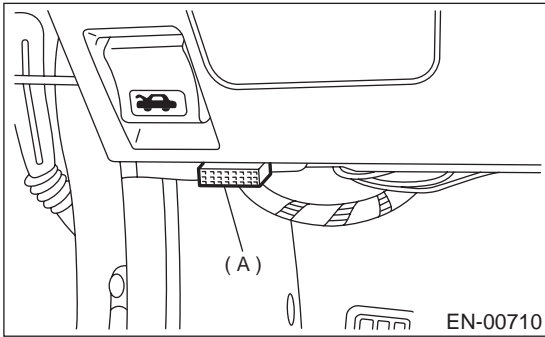
- (A) Test mode connector

- 6) Connect Subaru Select Monitor to data link connector.

INSPECTION MODE

ENGINE (DIAGNOSTICS)

- (1) Connect Subaru Select Monitor to data link connector (A) located in the lower portion of the instrument panel (on the driver's side).



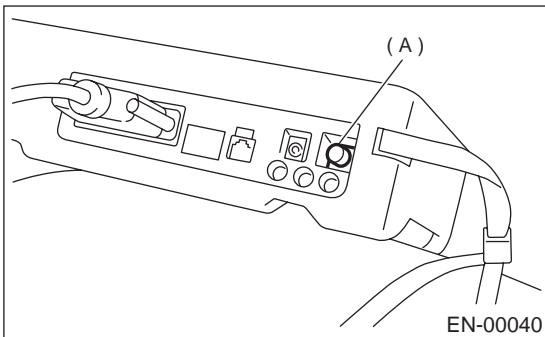
(A) Data link connector

- (2) Connect diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

- 7) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

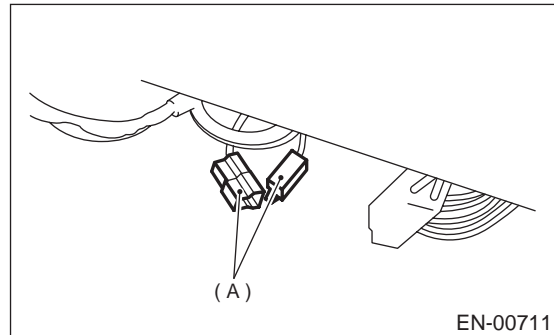
- 8) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
 - 9) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 10) Press the [YES] key after displayed the information of engine type.
 - 11) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
 - 12) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [YES] key.
 - 13) Perform subsequent procedures as instructed on the display screen.
- If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>
- Release the parking brake.
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

3. OBD-II GENERAL SCAN TOOL

- 1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data: <Ref. to EN(H6DO)-54, Clear Memory Mode.>
- 2) Connect test mode connector at the lower side of the instrument panel (on the driver's side).

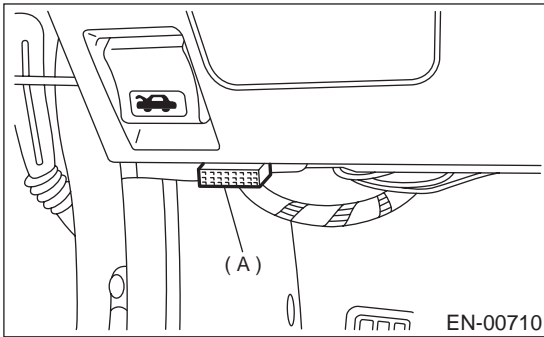


(A) Test mode connector

- 3) Connect the OBD-II general scan tool to its data link connector in the lower portion of the instrument panel (on the driver's side).

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



(A) Data link connector

4) Start the engine.

NOTE:

Ensure the select lever is placed in the “P” position before starting.

5) Using the select lever, turn the “P” position switch and the “N” position switch to ON.

6) Depress the brake pedal to turn the brake switch ON.

7) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

8) Place the select lever in the “D” position and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:

- On AWD vehicles, release the parking brake.
- The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

9) Using the OBD-II general scan tool, check for diagnostic trouble code(s) and record the result(s).

NOTE:

- For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>

DRIVE CYCLE

ENGINE (DIAGNOSTICS)

13. Drive Cycle

A: OPERATION

There are 3 drive patterns for trouble diagnosis. Driving in the specified pattern allows to diagnose the malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE.

- 1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
- 2) After performing diagnostics and cleaning the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)-54, Clear Memory Mode.>
- 3) Separate test mode connector.

NOTE:

- Except for water temperature specified items at starting, diagnosis is carried out after engine warm up.
- Carry out diagnosis which is marked * on DTC twice, Then, after finishing 1st diagnosis, stop engine and do the second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

DTC No.	Item	Condition
*P0111	Intake air temperature circuit range/performance	Coolant temperature at start is less than 30°C (86°F).
*P0125	Insufficient coolant temperature for closed loop fuel control	Coolant temperature at start is less than 20°C (68°F).
*P0133	O2 sensor circuit slow response (Bank 1 Sensor 1)	—
*P0153	O2 sensor circuit slow response (Bank 2 Sensor 1)	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
P0459	Evaporative emission control system purge control valve circuit high	—
P0461	Fuel level sensor circuit range/performance	—

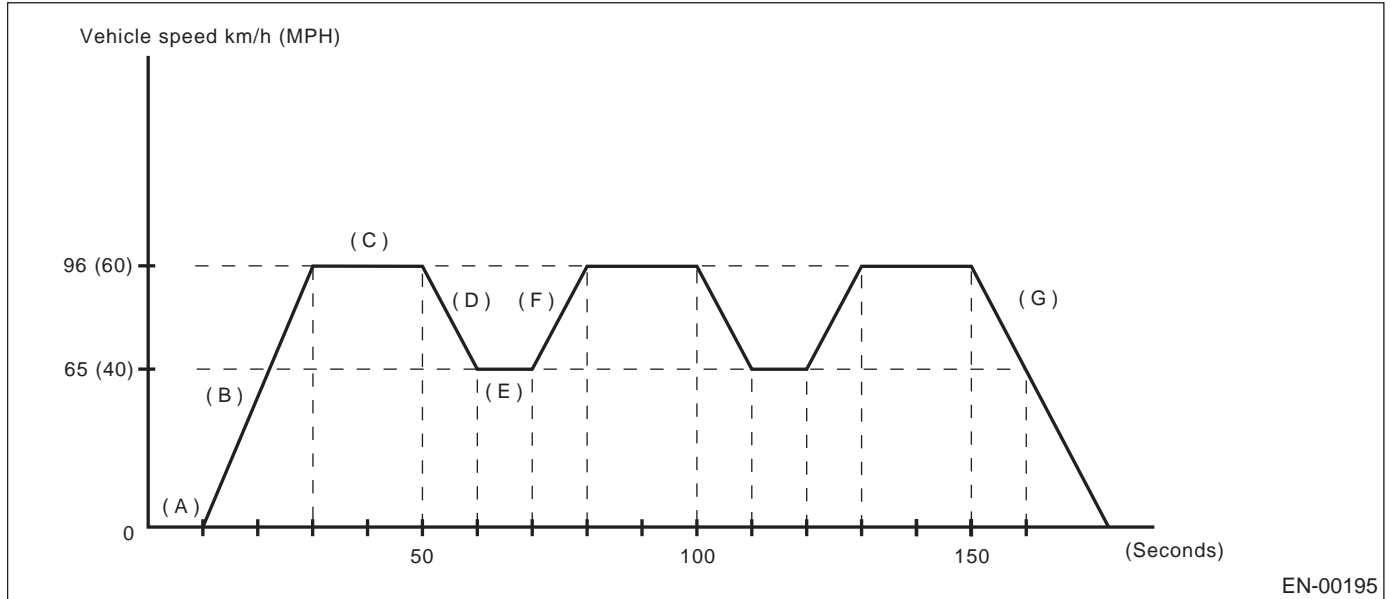
3. IDLE FOR 10 MINUTES

NOTE:

Before diagnosis, drive vehicle at 4 km/h (6 MPH) or more.

DTC No.	Item	Condition
*P0483	Cooling fan rationality check	—
*P0506	Idle control system RPM lower than expected	—
*P0507	Idle control system RPM higher than expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



- | | | |
|---|--|---|
| (A) Idle engine for 1 minute. | (D) Decelerate with fully closed throttle to 64 km/h (40 MPH). | (F) Accelerate to 97 km/h (60 MPH) within 10 seconds. |
| (B) Accelerate to 97 km/h (60 MPH) within 20 seconds. | (E) Drive vehicle at 64 km/h (40 MPH) for 10 seconds. | (G) Stop vehicle with throttle fully closed. |
| (C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds. | | |

DTC No.	Item	Condition
*P0121	Throttle/pedal position sensor/switch "A" circuit range/performance	Coolant temperature at start is more than 80°C (176°F).
*P0139	O2 sensor circuit slow response (Bank 1 Sensor 2)	—
*P0171	System too lean (Bank 1)	—
*P0172	System too rich (Bank 1)	—
*P0174	System too lean (Bank 2)	—
*P0175	System too rich (Bank 2)	—
*P0301	Cylinder 1 misfire detected	—
*P0302	Cylinder 2 misfire detected	—
*P0303	Cylinder 3 misfire detected	—
*P0304	Cylinder 4 misfire detected	—
*P0305	Cylinder 5 misfire detected	—
*P0306	Cylinder 6 misfire detected	—
*P0400	Exhaust gas recirculation flow	—

14. Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the `Done' and `Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
- 6) When the `Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
- 7) Turn Subaru Select Monitor and ignition switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

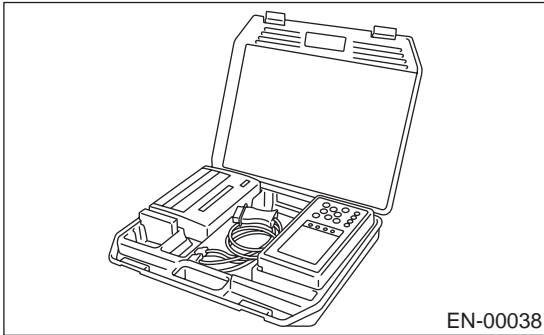
COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

15. Compulsory Valve Operation Check Mode

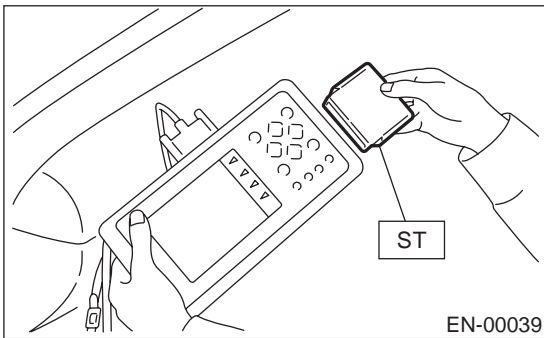
A: OPERATION

1) Prepare Subaru Select Monitor kit. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>

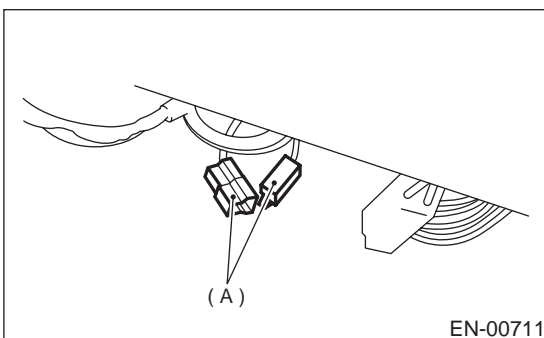


2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



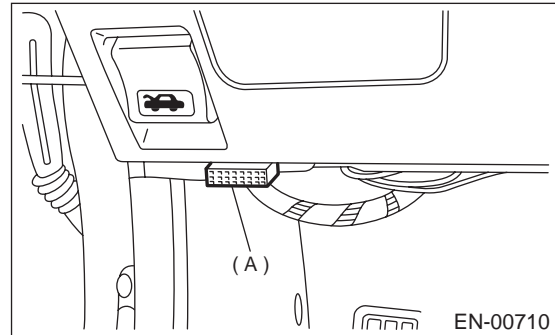
4) Connect test mode connector at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

5) Connect Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



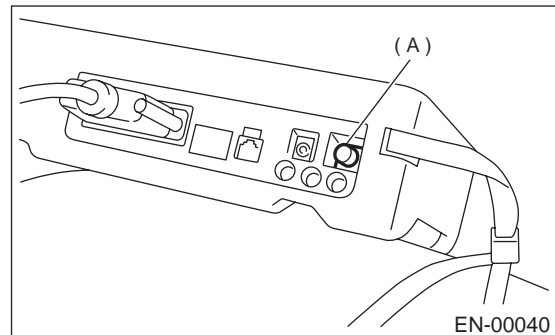
(A) Data link connector

(2) Connect diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

9) Press the [YES] key after displayed the information of engine type.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory air assist injector solenoid valve operation check	AAI Solenoid Valve

NOTE:

- The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Fuel Tank Sensor Control Valve
AAI Solenoid Valve

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

MEMO:

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

16.Engine Malfunction Indicator Lamp (MI)

A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MI). <Ref. to EN(H6DO)-59, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI), Engine Malfunction Indicator Lamp (MI).>
↓
2. Check engine malfunction indicator lamp (MI) does not come on. <Ref. to EN(H6DO)-60, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MI).>
↓
3. Check engine malfunction indicator lamp (MI) does not go off. <Ref. to EN(H6DO)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MI).>
↓
4. Check engine malfunction indicator lamp (MI) does not blink at a cycle of 3 Hz. <Ref. to EN(H6DO)-66, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MI).>
↓
5. Check engine malfunction indicator lamp (MI) remains blinking at a cycle of 3 Hz. <Ref. to EN(H6DO)-68, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MI).>

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

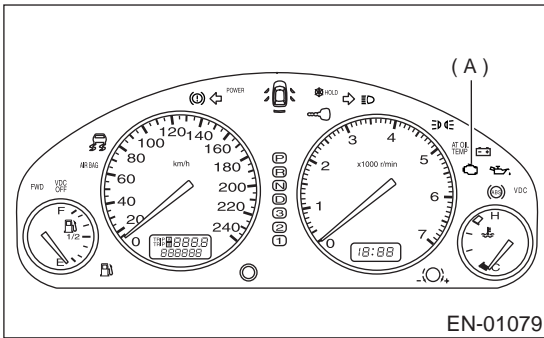
B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI)

1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MI) in the combination meter illuminates.

NOTE:

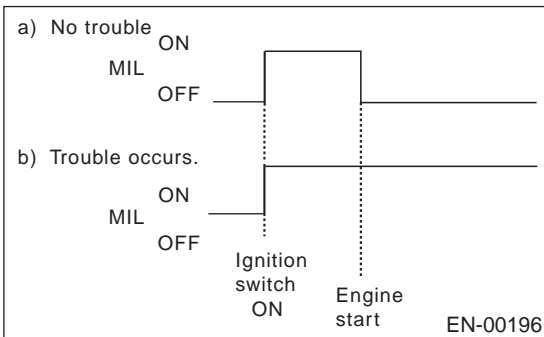
If the MI does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(H6DO)-60, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MI).>

4) When ignition switch is turned to ON (engine off) or to "START" with the test mode connector connected, the MI blinks at a cycle of 3 Hz.

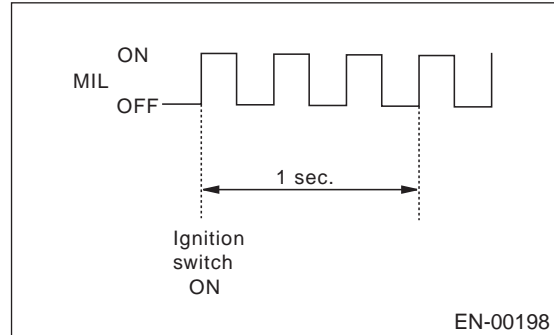
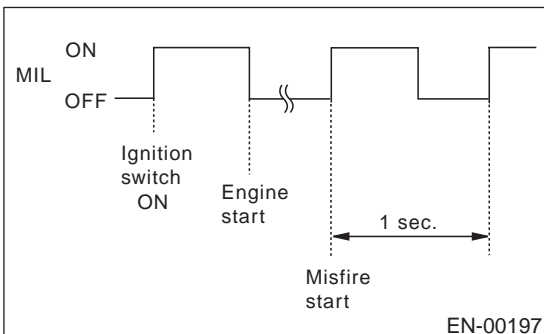


(A) Malfunction indicator lamp

2) After starting the engine, the MI goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MI will blink at a cycle of 1 Hz.

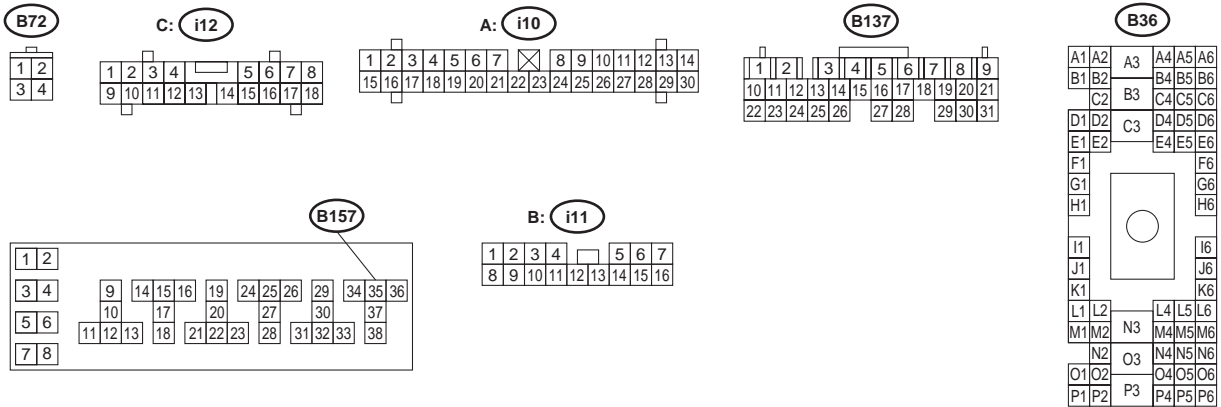
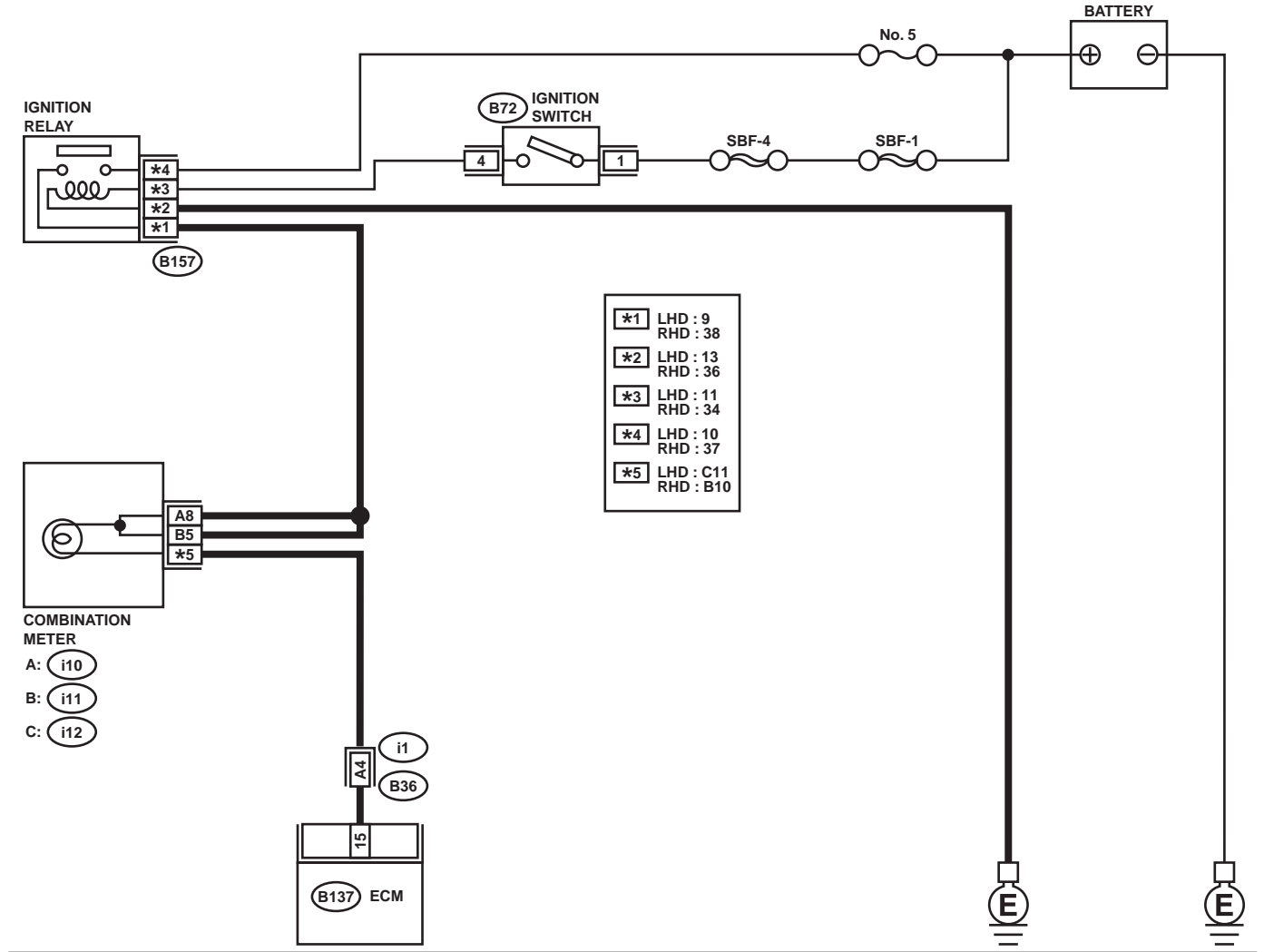


ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON.

- **DIAGNOSIS:**
 - The CHECK ENGINE malfunction indicator lamp (MI) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
 - When ignition switch is turned ON (engine OFF), MI does not come on.
- **WIRING DIAGRAM:**



EN-01080

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 15 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 4.	Go to step 2.
2 CHECK POOR CONTACT. Does the MI come on when shaking or pulling ECM connector and harness?	MI comes on.	Repair poor contact in ECM connector.	Go to step 3.
3 CHECK ECM CONNECTOR. Is ECM connector correctly connected?	Connected correctly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Remove combination meter. <Ref. to IDI-14, Combination Meter Assembly.> 3) Disconnect connector from ECM and combination meter. 4) Measure resistance of harness between ECM and combination meter connector. Connector & terminal LHD (B137) No. 15 — (i12) No. 11: RHD (B137) No. 15 — (i11) No. 10: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact in combination meter connector. Is there poor contact in combination meter connector?	There is poor contact.	Repair poor contact in combination meter connector.	Go to step 6.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR. Measure voltage between combination meter connector and chassis ground. Connector & terminal <i>(i10) No. 8 (+) — Chassis ground (-):</i> <i>(i11) No. 5 (+) — Chassis ground (-):</i> Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none"> • Broken down ignition relay. • Blown out fuse (No. 5). • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
<p>7 CHECK LAMP BULB. Remove engine malfunction indicator lamp bulb. Is lamp bulb condition OK?</p>	Bulb is OK.	Repair combination meter connector.	Replace lamp bulb.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

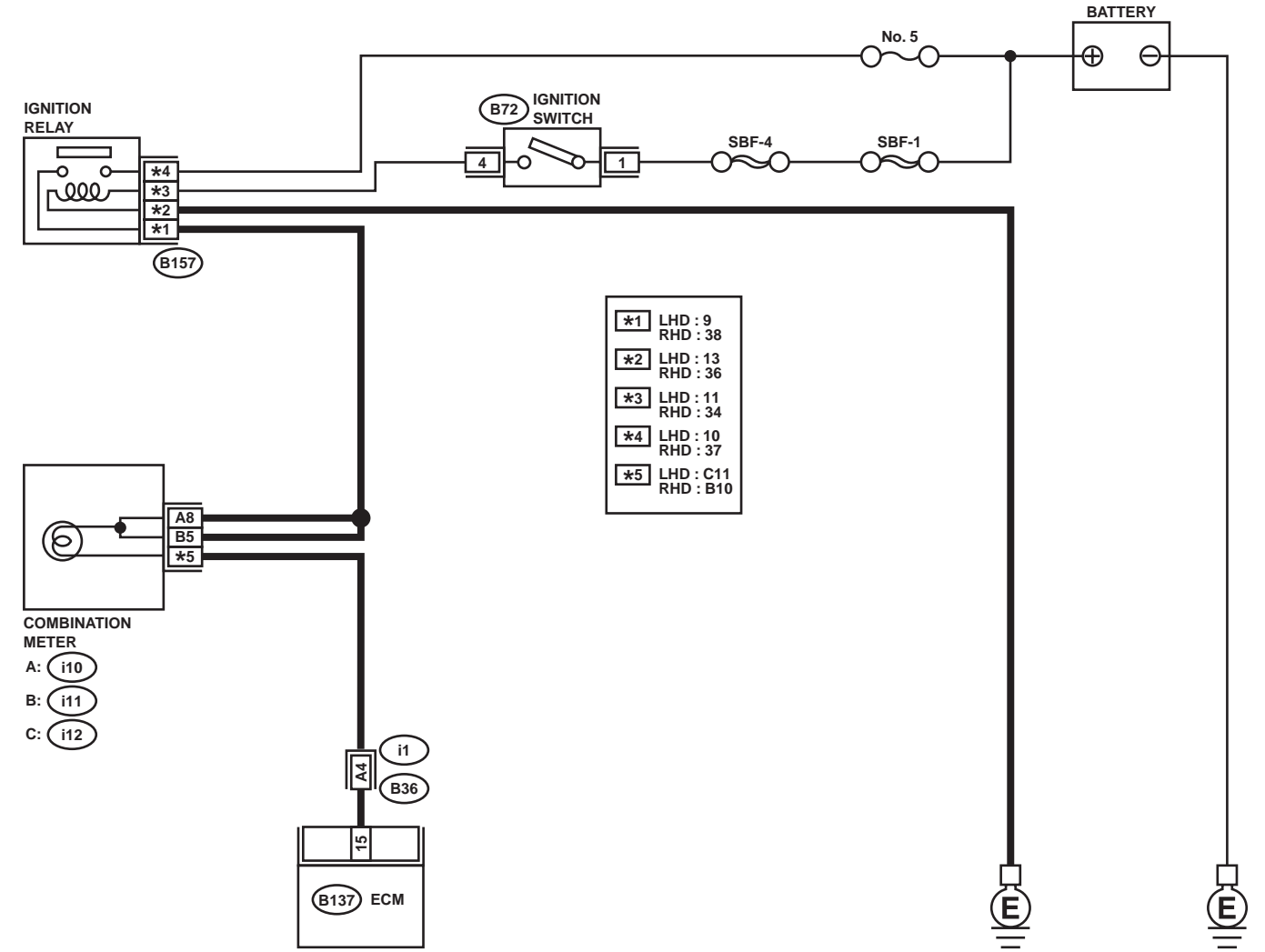
MEMO:

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT GO OFF.

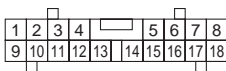
- **DIAGNOSIS:**
 - The CHECK ENGINE malfunction indicator lamp (MI) circuit is shorted.
- **TROUBLE SYMPTOM:**
 - Although MI comes on when engine runs, trouble code is not shown on Subaru select monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**



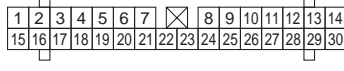
B72



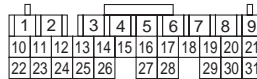
C: i12



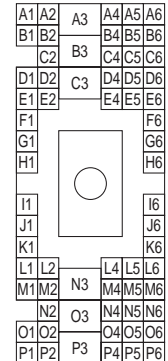
A: i10



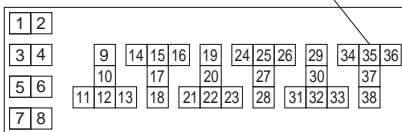
B137



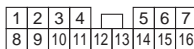
B36



B157



B: i11



EN-01080

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON. Does the MI come on?	MI comes on.	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT BLINK AT A CYCLE OF 3 HZ.

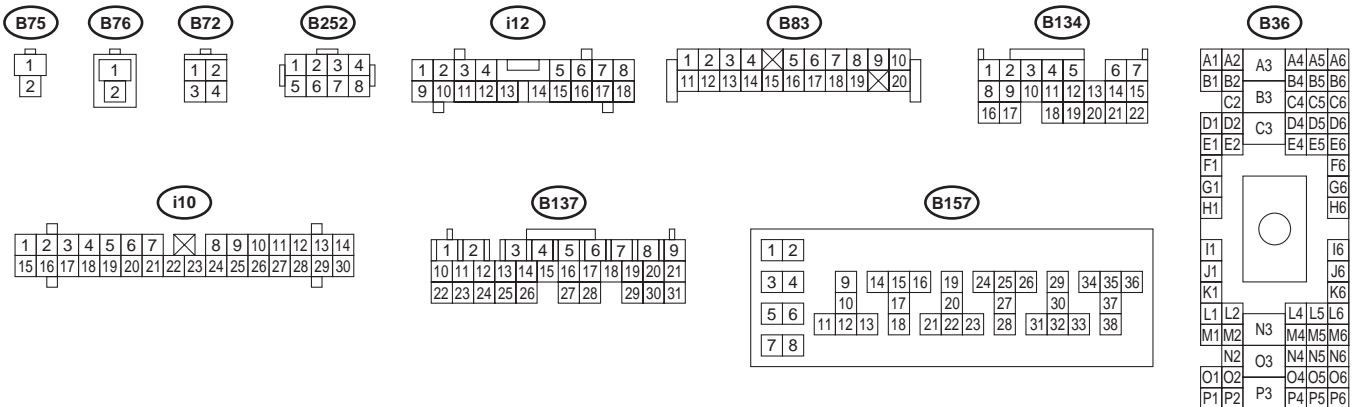
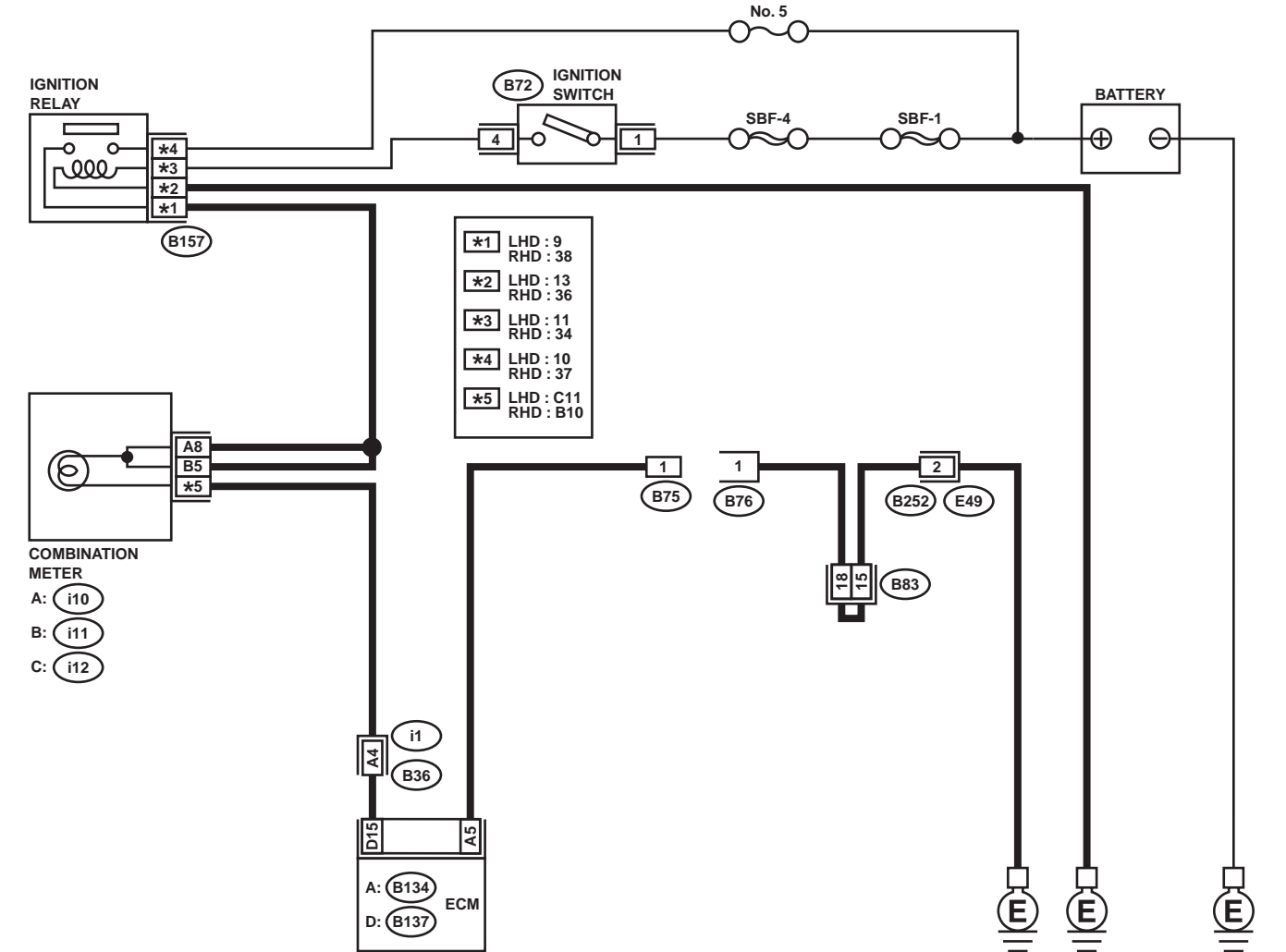
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MI) circuit is open or shorted.
- Test mode connector circuit is open.

• TROUBLE SYMPTOM:

- When inspection mode, MI does not blink at a cycle of 3 Hz.

• WIRING DIAGRAM:



EN-01081

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

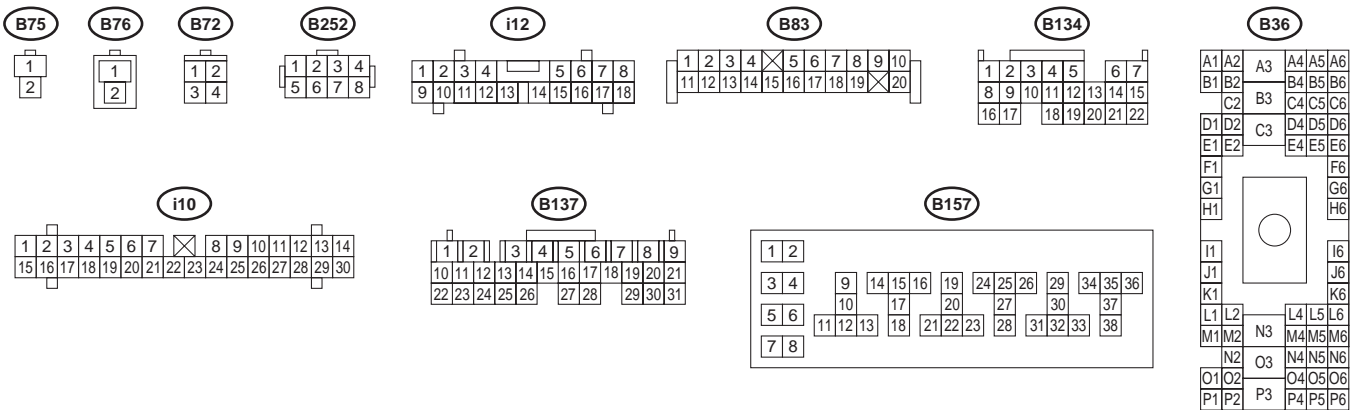
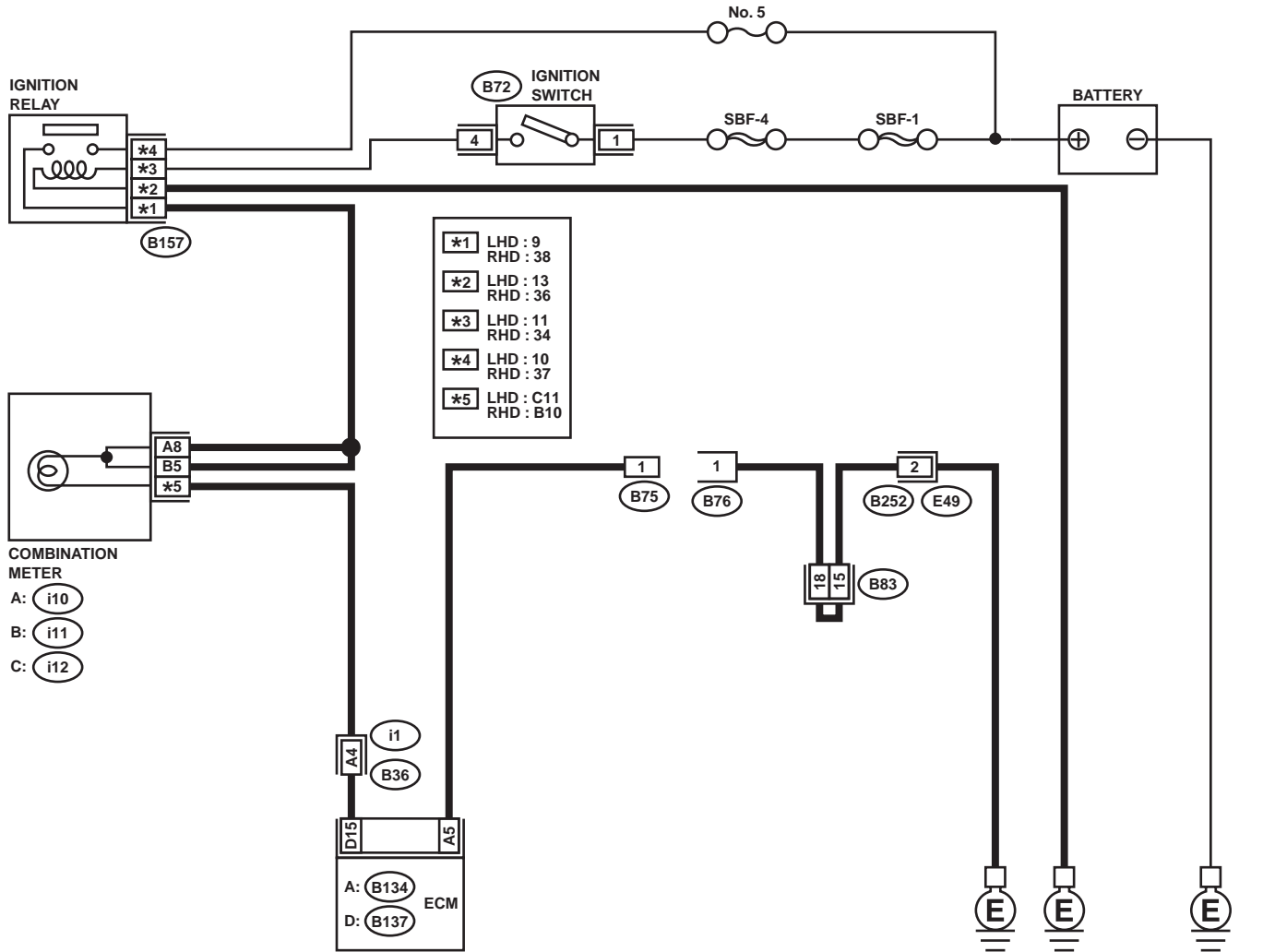
Step	Value	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI). 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Turn ignition switch to ON. (engine OFF) Does the MI come on?	MI comes on.	Go to step 2.	Repair the MI circuit. <Ref. to EN(H6DO)-60, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MI).>
2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON. Does the MI come on?	MI comes on.	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between test mode connector and chassis ground. Connector & terminal (B76) No. 1 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR. 1) Connect test mode connector. 2) Measure resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair open circuit in harness between ECM and test mode connector.
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
 - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
 - MI blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**



EN-01081

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK TEST MODE CONNECTOR. 1) Disconnect test mode connector. 2) Turn ignition switch to ON. Does MI flash on and off?	MI comes on.	Go to step 2.	System is in good order. NOTE: MI blinks at a cycle of 3 Hz when test mode connector is connected.
2 CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair short circuit in harness between ECM and test mode connector.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

MEMO:

17. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(H6DO)-72, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H6DO)-76, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H6DO)-80, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H6DO)-84, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H6DO)-86, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection using Subaru Select Monitor or OBD-II general scan tool <Ref. to EN(H6DO)-96, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or inspection using "General Diagnostics Table". <Ref. to EN(H6DO)-332, General Diagnostic Table.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

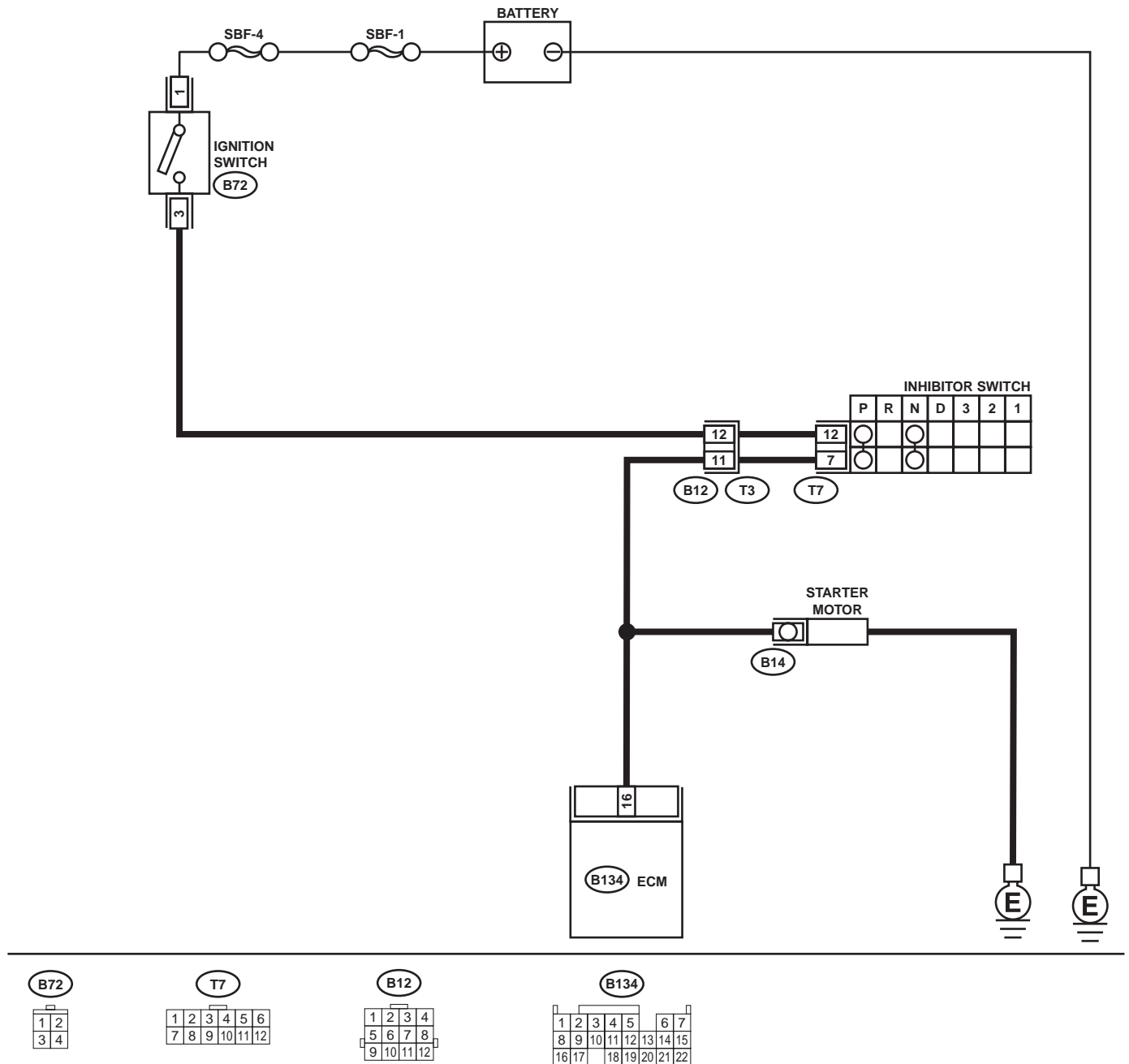
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01082

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. Does starter motor operate when the switch starts?	Starter motor operates.	Go to step 2.	Go to step 3.
2 CHECK DTC. Is diagnostic trouble code (DTC) displayed? <Ref. to EN(H6DO)-46, OPERATION, Read Diagnostic Trouble Code.>	Diagnostic trouble code (DTC) is displayed.	Check the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Repair poor contact of ECM connector.
3 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from starter motor. 3) Turn ignition switch to ST. 4) Measure power supply voltage between starter motor connector terminal and engine ground. Connector & terminal (B14) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value? NOTE: Place the selector lever in the "P" or "N" position.	10 V	Go to step 4.	Go to step 5.
4 CHECK GROUND CIRCUIT OF STARTER MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between ground cable terminal and engine ground. Is the measured value less than the specified value?	5 Ω	Check starter motor. <Ref. to SC(H6DO)-6, Starter.>	Repair open circuit of ground cable.
5 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Ignition switch to OFF. 2) Disconnect connector from ignition switch. 3) Measure power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 6.	Check the following items and repair, if necessary. • Blown out fuse • Open circuit in harness between ignition switch and battery
6 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Connect connector to ignition switch. 2) Turn ignition switch to START. 3) Measure voltage between ignition switch and chassis ground. Connector & terminal (B72) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 7.	Replace ignition switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK INPUT VOLTAGE OF INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connector from inhibitor switch. 3) Connect connector to ignition switch. 4) Measure input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to ST. Connector & terminal (B12) No. 12 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 8.	Repair open or ground short circuit in harness between inhibitor switch and ignition switch.
8 CHECK INHIBITOR SWITCH CIRCUIT. 1) Turn ignition switch to OFF. 2) Place the selector lever in the "P" or "N" position. 3) Separate transmission harness connector. 4) Measure resistance between transmission harness connector terminals. Connector & terminal (T3) No. 11 — No. 12: Is the measured value less than the specified value?	1 Ω	Repair open or short circuit in harness between starter motor and inhibitor switch.	Go to step 9.
9 CHECK TRANSMISSION HARNESS. 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness and inhibitor switch connector. Connector & terminal (T3) No. 12 — (T7) No. 12: (T3) No. 11 — (T7) No. 7: Is the measured value less than the specified value?	1 Ω	Go to step 10.	Repair open or short circuit in harness between transmission harness and inhibitor switch connector.
10 CHECK POOR CONTACT. Check poor contact in inhibitor switch connector. Is there poor contact in inhibitor switch connector?	There is poor contact.	Repair poor contact in inhibitor switch connector.	Replace inhibitor switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR ENGINE STARTING FAILURE

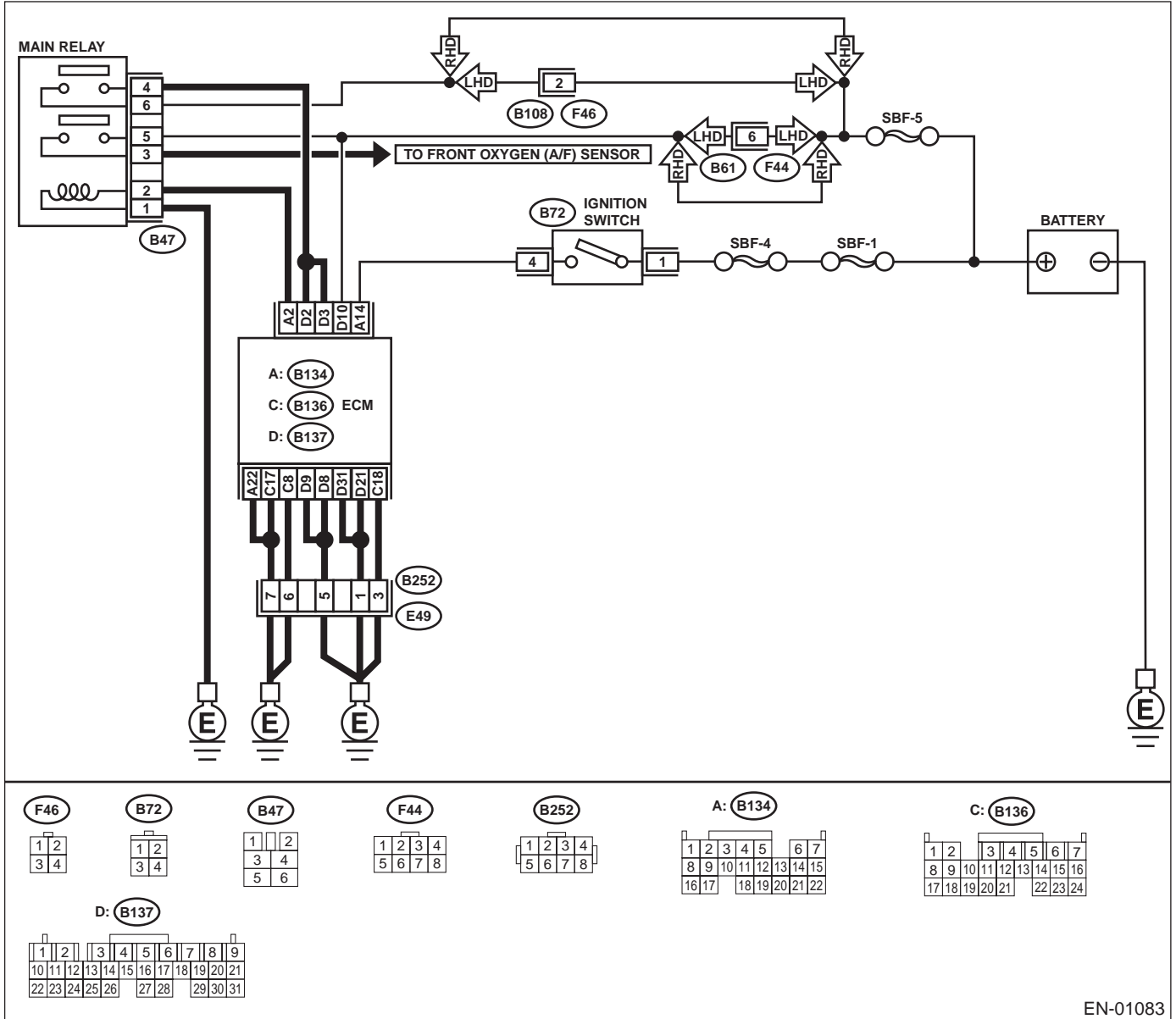
ENGINE (DIAGNOSTICS)

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN-01083

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK MAIN RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove main relay. 3) Connect battery to main relay terminals No. 1 and No. 2. 4) Measure resistance between main relay terminals.</p> <p>Terminals No. 3 — No. 5: No. 4 — No. 6:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 2.	Replace main relay.
<p>2 CHECK GROUND CIRCUIT OF ECM.</p> <p>1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 22 — Chassis ground: (B136) No. 8 — Chassis ground: (B136) No. 17 — Chassis ground: (B136) No. 18 — Chassis ground: (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground: (B137) No. 21 — Chassis ground: (B137) No. 31 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair open circuit in harness between ECM connector and engine grounding terminal.
<p>3 CHECK INPUT VOLTAGE OF ECM.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 10 (+) — Chassis ground (-): (B134) No. 14 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Repair open or ground short circuit of power supply circuit.
<p>4 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 2 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Repair ground short circuit in harness between ECM connector and main relay connector, then replace ECM.
<p>5 CHECK OUTPUT VOLTAGE FROM ECM.</p> <p>1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 2 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Replace ECM.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK INPUT VOLTAGE OF MAIN RELAY. Check voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 7.	Repair open circuit in harness between ECM connector and main relay connector.
7 CHECK GROUND CIRCUIT OF MAIN RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between main relay connector and chassis ground. Connector & terminal (B47) No. 1 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 8.	Repair open circuit between main relay and chassis ground.
8 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 5 (+) — Chassis ground (-): (B47) No. 6 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 9.	Repair open or ground short circuit in harness of power supply circuit.
9 CHECK INPUT VOLTAGE OF ECM. 1) Connect main relay connector. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 2 (+) — Chassis ground (-): (B137) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Check ignition control system. <Ref. to EN(H6DO)-80, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR ENGINE STARTING FAILURE

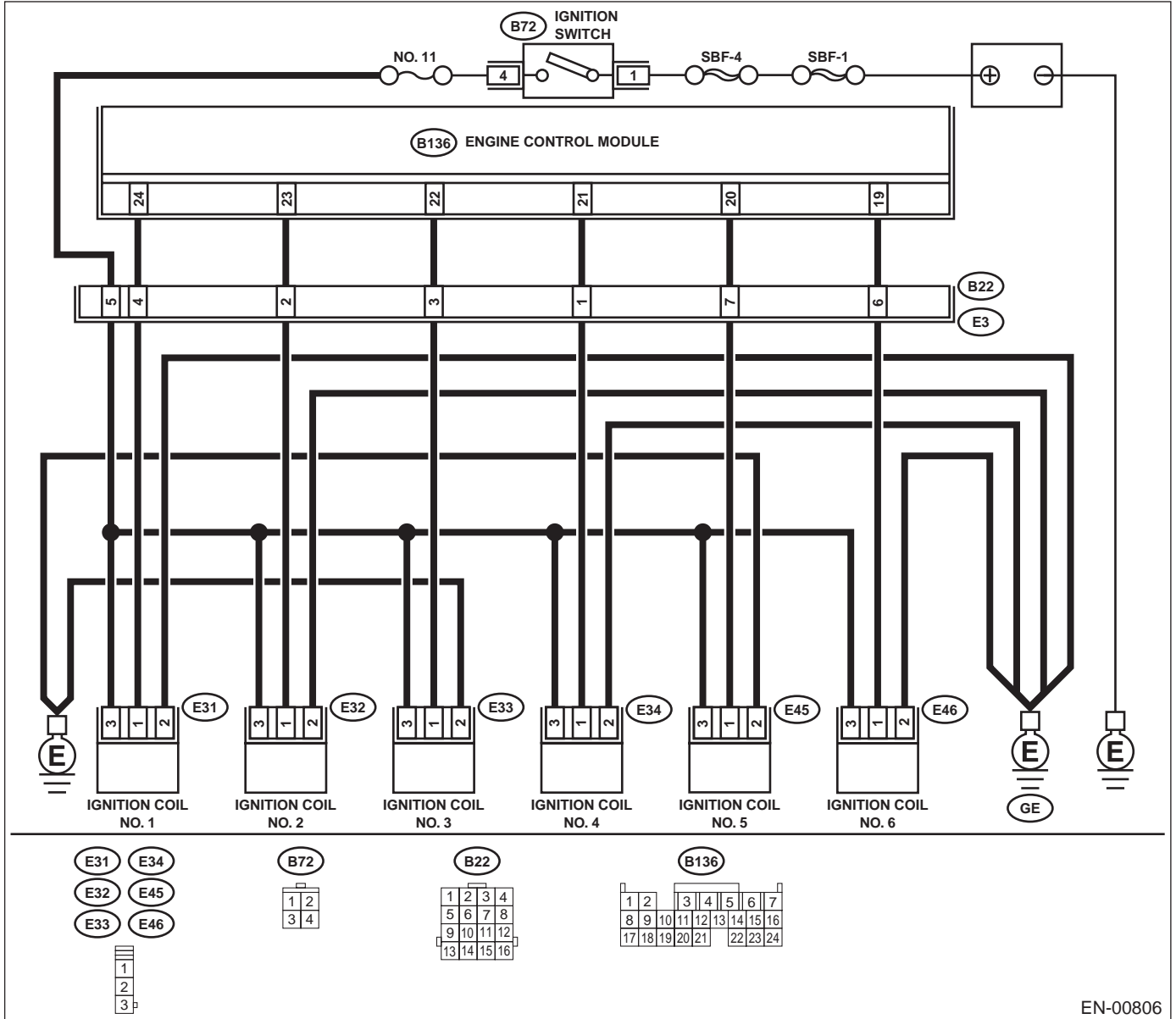
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-00806

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPARK PLUG CONDITION. 1) Remove the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H6DO)-5, INSPECTION, Spark Plug.> Is the spark plug OK?	Spark plug is OK.	Go to step 2.	Replace the spark plug.
2 CHECK IGNITION SYSTEM FOR SPARKS. 1) Connect spark plug to ignition coil. 2) Lower fuel pressure. 3) Contact spark plug thread portion with engine block. 4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder. Does spark occur at each cylinder?	Spark occurs.	Check fuel pump system. <Ref. to EN(H6DO)-84, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 3.
3 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY. 1) Turn ignition switch to OFF. 2) Disconnect connector from ignition coil & ignitor assembly. 3) Turn ignition switch to ON. 4) Measure power supply voltage between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E31) No. 3 (+) — Engine ground (-): (E32) No. 3 (+) — Engine ground (-): (E33) No. 3 (+) — Engine ground (-): (E34) No. 3 (+) — Engine ground (-): (E45) No. 3 (+) — Engine ground (-): (E46) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4 CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn ignition switch to OFF. 2) Measure resistance between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E31) No. 2 — Engine ground: (E32) No. 2 — Engine ground: (E33) No. 2 — Engine ground: (E34) No. 2 — Engine ground: (E45) No. 2 — Engine ground: (E46) No. 2 — Engine ground: Is the measured value less than the specified value?	5 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Disconnect connector from ignition coil & ignitor assembly. 4) Measure resistance of harness between ECM and ignition coil & ignitor assembly connector.</p> <p>Connector & terminal (B136) No. 24 — (E31) No. 1: (B136) No. 23 — (E32) No. 1: (B136) No. 22 — (E33) No. 1: (B136) No. 21 — (E34) No. 1: (B136) No. 20 — (E45) No. 1: (B136) No. 19 — (E46) No. 1:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector
<p>6 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <p>Measure resistance of harness between ECM and engine ground.</p> <p>Connector & terminal: (B136) No. 24 — Engine ground: (B136) No. 23 — Engine ground: (B136) No. 22 — Engine ground: (B136) No. 21 — Engine ground: (B136) No. 20 — Engine ground: (B136) No. 19 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
<p>7 CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY.</p> <p>1) Connect connector to ignition coil & ignitor assembly. 2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal (E31) No. 1 (+) — Engine ground (-): (E32) No. 1 (+) — Engine ground (-): (E33) No. 1 (+) — Engine ground (-): (E34) No. 1 (+) — Engine ground (-): (E45) No. 1 (+) — Engine ground (-): (E46) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 8.	Replace ignition coil & ignitor assembly. <Ref. to IG(H6DO)-7, Ignition Coil and Ignitor Assembly.>
<p>8 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H6DO)-84, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR ENGINE STARTING FAILURE

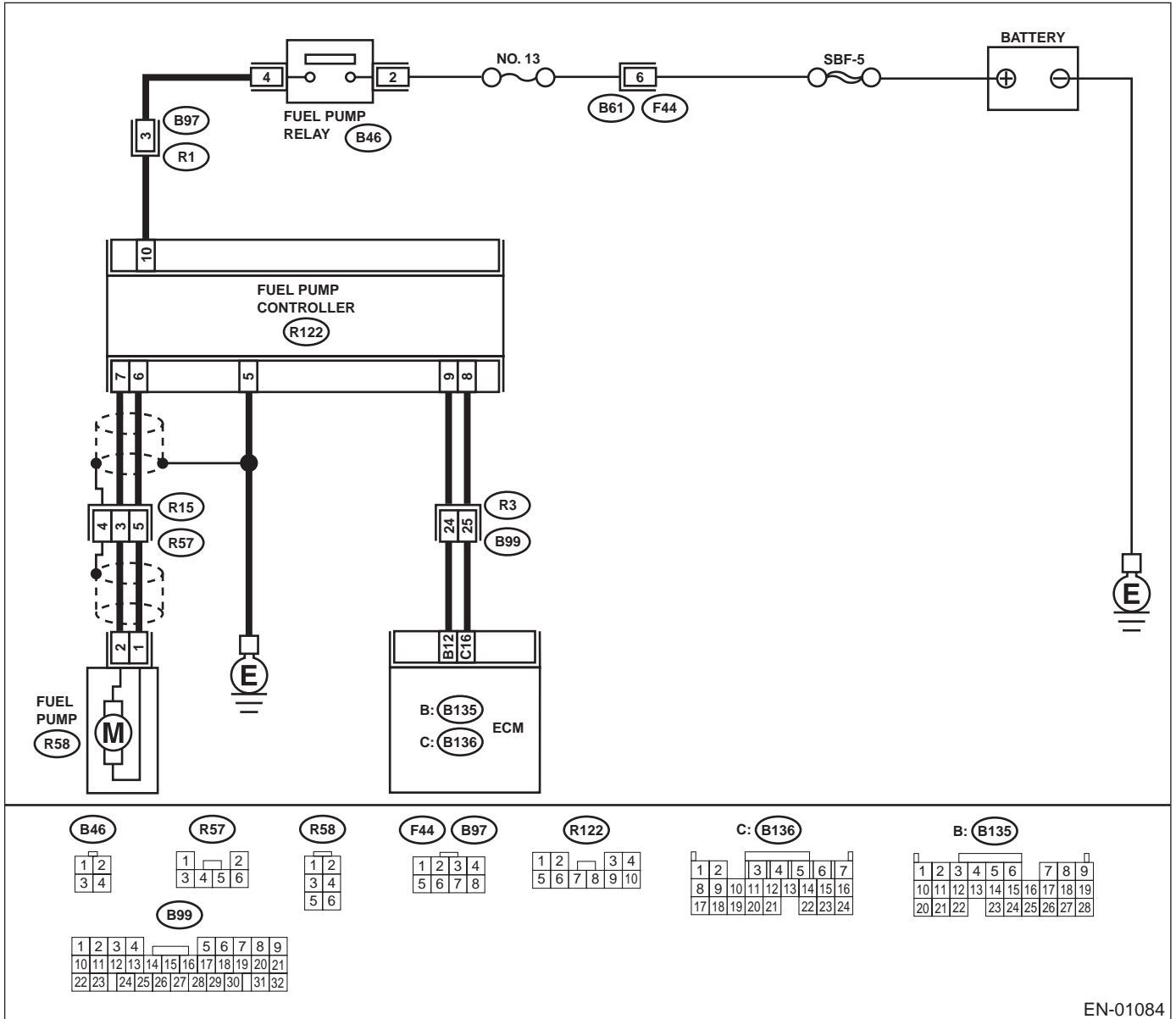
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- WIRING DIAGRAM:
- LHD model

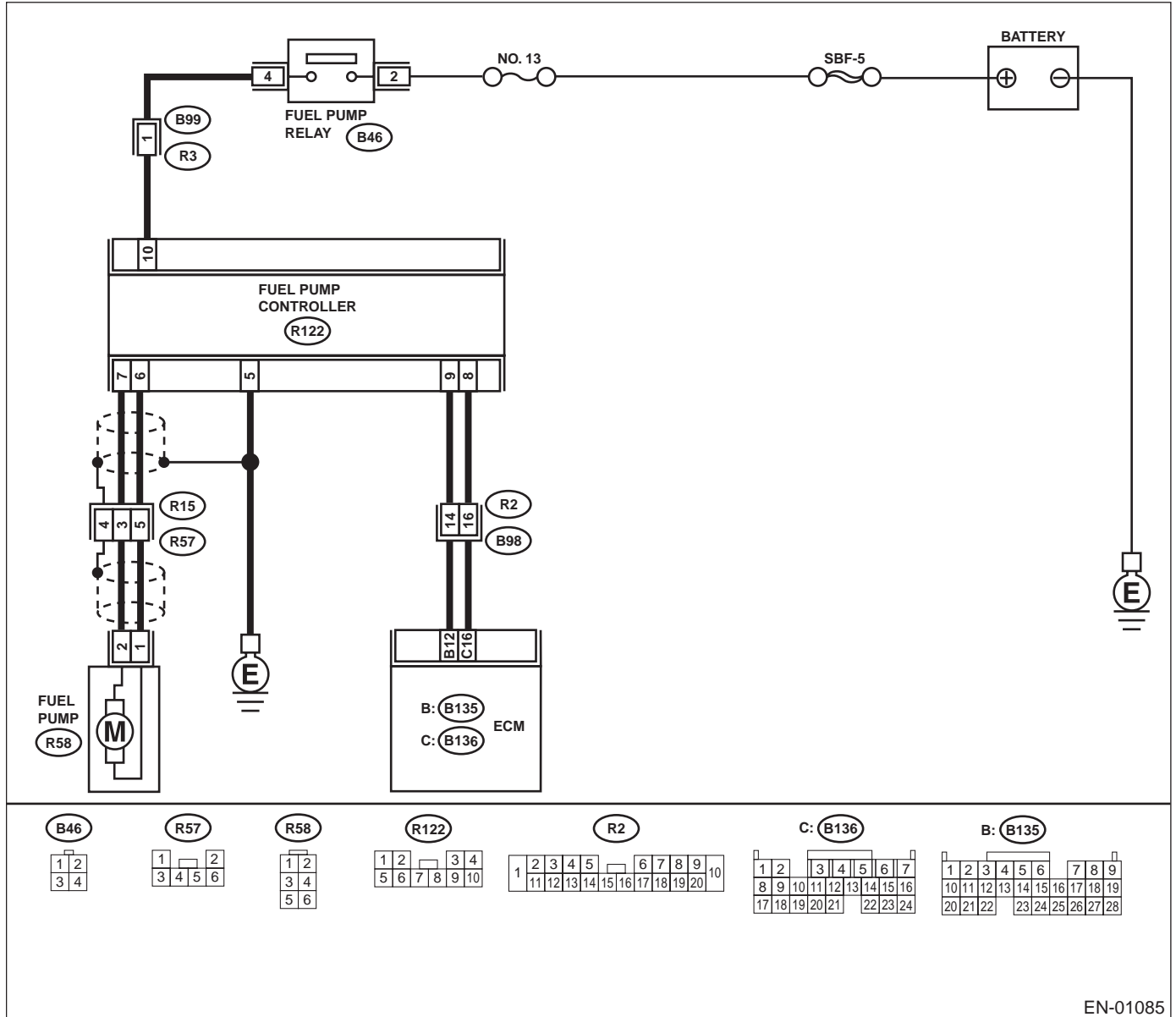


EN-01084

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

- RHD model



Step	Value	Yes	No
<p>1</p> <p>CHECK OPERATING SOUND OF FUEL PUMP.</p> <p>Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON.</p> <p>NOTE: Fuel pump operation check can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-55, Compulsory Valve Operation Check Mode.></p> <p>Does the fuel pump produce operating sound?</p>	<p>Operating sound produced.</p>	<p>Check fuel injector circuit. <Ref. to EN(H6DO)-86, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.></p>	<p>Read the diagnostic Trouble Code (DTC) and check related DTC. <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).></p>

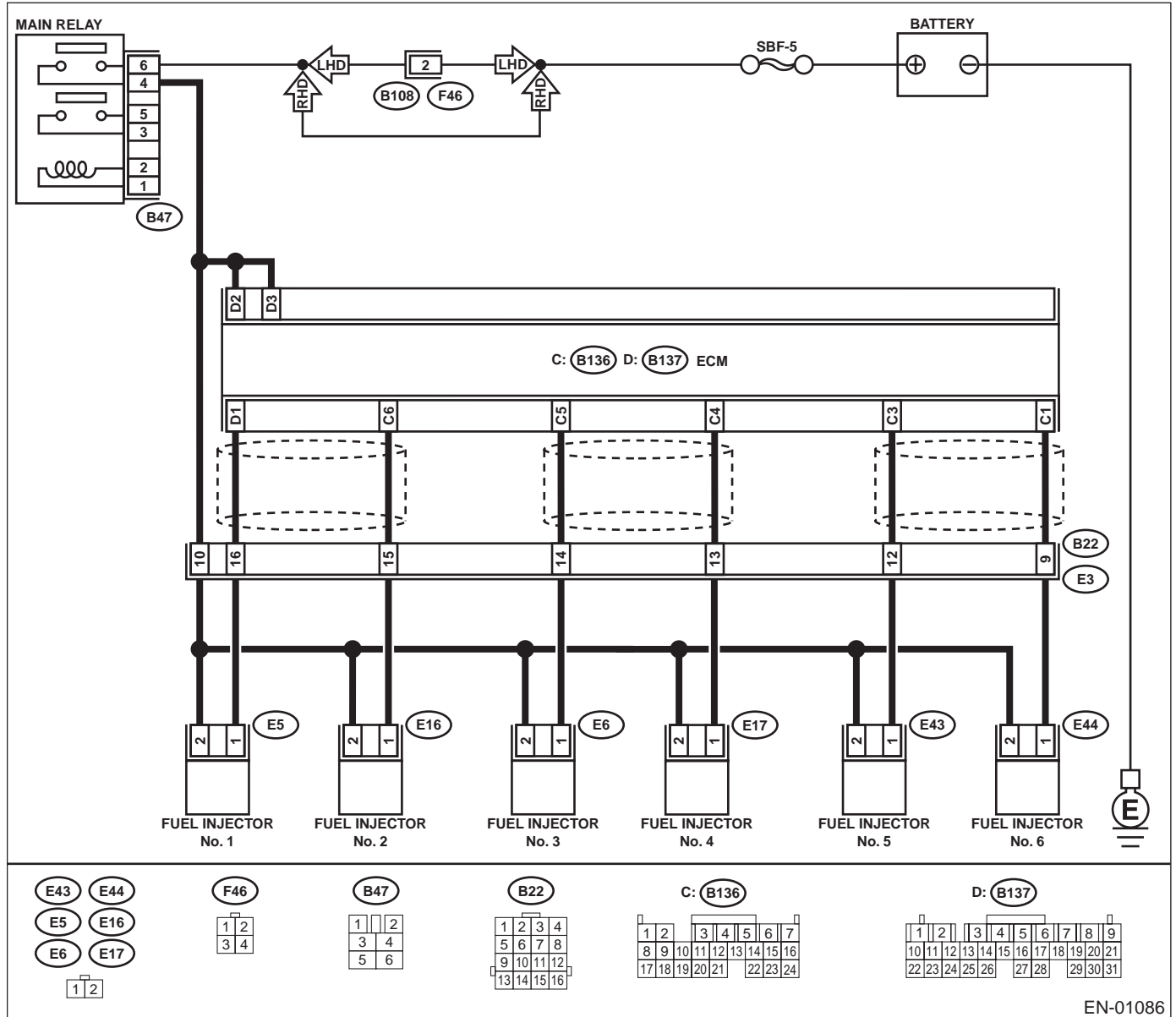
DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Check or repair only faulty parts.
- After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>
- WIRING DIAGRAM:



EN-01086

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OPERATION OF EACH FUEL INJECTOR. While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check. Does the fuel injector emit “operating” sound?</p>	Operating sound produced.	Check fuel pressure. <Ref. to FU(H6DO)-50, Fuel.>	Go to step 2.
<p>2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector. 3) Turn ignition switch to ON. 4) Measure power supply voltage between the fuel injector terminal and engine ground. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-): #5 (E43) No. 2 (+) — Engine ground (-): #6 (E44) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
<p>3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect connector from ECM and fuel injector. 2) Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B137) No. 1 — (E5) No. 1: (B136) No. 6 — (E16) No. 1: (B136) No. 5 — (E6) No. 1: (B136) No. 4 — (E17) No. 1: (B136) No. 3 — (E43) No. 1: (B136) No. 1 — (E44) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
<p>4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B137) No. 1 — Chassis ground: (B136) No. 6 — Chassis ground: (B136) No. 5 — Chassis ground: (B136) No. 4 — Chassis ground: (B136) No. 3 — Chassis ground: (B136) No. 1 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Repair ground short circuit in harness between ECM and fuel injector connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
5 CHECK EACH FUEL INJECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between each fuel injector terminals. Terminals No. 1 — No. 2: Is the measured value within the specified range?	5 — 20 Ω	Go to step 6.	Replace faulty fuel injector.
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(H6DO)-332, INSPECTION, General Diagnostic Table.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

18. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-96, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-100, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-104, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-108, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-112, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0050	HO2S Heater control circuit (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-114, DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0051	HO2S Heater control circuit low (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-116, DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0052	HO2S Heater control circuit high (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-120, DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold absolute pressure/barometric pressure circuit range/performance	<Ref. to EN(H6DO)-124, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold absolute pressure/barometric pressure circuit low input	<Ref. to EN(H6DO)-126, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold absolute pressure/barometric pressure circuit high input	<Ref. to EN(H6DO)-130, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature circuit range/performance	<Ref. to EN(H6DO)-134, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature circuit low input	<Ref. to EN(H6DO)-136, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature circuit high input	<Ref. to EN(H6DO)-138, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature circuit low input	<Ref. to EN(H6DO)-142, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature circuit high input	<Ref. to EN(H6DO)-144, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle/pedal position sensor/switch "A" circuit range/performance	<Ref. to EN(H6DO)-148, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0122	Throttle/pedal position sensor/switch "A" circuit low input	<Ref. to EN(H6DO)-150, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/pedal position sensor/switch "A" circuit high input	<Ref. to EN(H6DO)-154, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient coolant temperature for closed loop fuel control	<Ref. to EN(H6DO)-156, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Barometric pressure too low	<Ref. to EN(H6DO)-158, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O2 sensor circuit (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-160, DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 sensor circuit slow response (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-162, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-166, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-170, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-169, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O2 sensor circuit slow response (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-174, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0150	O2 sensor circuit (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-176, DTC P0150 — O2 SENSOR CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0153	O2 sensor circuit slow response (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-180, DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0154	O2 sensor circuit no activity detected (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-184, DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too lean (Bank 1)	<Ref. to EN(H6DO)-187, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too rich (Bank 1)	<Ref. to EN(H6DO)-188, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0174	System too lean (Bank 2)	<Ref. to EN(H6DO)-191, DTC P0174 — SYSTEM TOO LEAN (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0175	System too rich (Bank 2)	<Ref. to EN(H6DO)-192, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel pump primary circuit	<Ref. to EN(H6DO)-196, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(H6DO)-200, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(H6DO)-200, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(H6DO)-200, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(H6DO)-200, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0305	Cylinder 5 misfire detected	<Ref. to EN(H6DO)-200, DTC P0305 — CYLINDER 5 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0306	Cylinder 6 misfire detected	<Ref. to EN(H6DO)-202, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor 1 circuit low input (Bank 1 or Single sensor)	<Ref. to EN(H6DO)-210, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor 1 circuit high input (Bank 1 or Single sensor)	<Ref. to EN(H6DO)-212, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0332	Knock sensor 2 circuit low input (Bank 2)	<Ref. to EN(H6DO)-214, DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0333	Knock sensor 2 circuit high input (Bank 2)	<Ref. to EN(H6DO)-216, DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor “A” circuit	<Ref. to EN(H6DO)-218, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft position sensor “A” circuit range/performance	<Ref. to EN(H6DO)-220, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft position sensor “A” circuit (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)-222, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft position sensor “A” circuit range/performance (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)-224, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust gas recirculation flow	<Ref. to EN(H6DO)-226, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H6DO)-230, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative emission control system purge control valve circuit low	<Ref. to EN(H6DO)-232, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative emission control system purge control valve circuit high	<Ref. to EN(H6DO)-236, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance	<Ref. to EN(H6DO)-238, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(H6DO)-240, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel level sensor circuit high input	<Ref. to EN(H6DO)-244, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan rationality check	<Ref. to EN(H6DO)-248, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle speed sensor circuit low input	<Ref. to EN(H6DO)-251, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle speed sensor intermittent/erratic/high	<Ref. to EN(H6DO)-252, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(H6DO)-254, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0507	Idle control system RPM higher than expected	<Ref. to EN(H6DO)-256, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle control system circuit low	<Ref. to EN(H6DO)-258, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle control system circuit high	<Ref. to EN(H6DO)-260, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter request circuit	<Ref. to EN(H6DO)-262, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle air control circuit system performance	<Ref. to EN(H6DO)-266, DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0558	Alternator circuit low input	<Ref. to EN(H6DO)-268, DTC P0558 — ALTERNATOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0559	Alternator circuit high input	<Ref. to EN(H6DO)-268, DTC P0559 — ALTERNATOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0565	Cruise control on signal	<Ref. to EN(H6DO)-270, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal control module random access memory (RAM) error	<Ref. to EN(H6DO)-272, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0661	Intake manifold tuning valve control circuit low -bank 1	<Ref. to EN(H6DO)-274, DTC P0661 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT LOW - BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0662	Intake manifold tuning valve control circuit high -bank 2	<Ref. to EN(H6DO)-278, DTC P0662 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT HIGH - BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling fan 1 control circuit low	<Ref. to EN(H6DO)-280, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling fan 1 control circuit high	<Ref. to EN(H6DO)-284, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque converter/brake switch "B" circuit	<Ref. to EN(H6DO)-288, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit (PRNDL input)	<Ref. to AT-132, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit	<Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Input/turbine speed sensor circuit range/performance	<Ref. to AT-64, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor circuit	<Ref. to AT-58, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine speed input circuit range/performance	<Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(H6DO)-290, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(H6DO)-290, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(H6DO)-290, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN(H6DO)-291, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch circuit performance or stuck off	<Ref. to EN(H6DO)-292, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0743	Torque converter clutch circuit electrical	<Ref. to AT-96, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure control solenoid "A" electrical	<Ref. to AT-88, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift solenoid "A" electrical	<Ref. to AT-72, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid "B" electrical	<Ref. to AT-76, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Shift solenoid "E" performance or stuck off	<Ref. to AT-80, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure control solenoid "B" electrical	<Ref. to AT-92, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/timing solenoid	<Ref. to AT-84, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral switch input circuit low	<Ref. to EN(H6DO)-294, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral switch input circuit high	<Ref. to EN(H6DO)-296, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM communication circuit range/performance	<Ref. to EN(H6DO)-300, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM communication circuit low	<Ref. to EN(H6DO)-302, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM communication circuit high	<Ref. to EN(H6DO)-304, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor circuit malfunction (low input)	<Ref. to EN(H6DO)-306, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor circuit malfunction (high input)	<Ref. to EN(H6DO)-307, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F sensor micro-computer problem	<Ref. to EN(H6DO)-308, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 sensor circuit range/performance (low) (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-310, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 sensor circuit range/performance (high) (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-310, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1154	O2 sensor circuit range/performance (low) (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-314, DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1155	O2 sensor circuit range/performance (high) (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-314, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(H6DO)-318, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(H6DO)-322, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine torque control cut signal circuit malfunction (low input)	<Ref. to EN(H6DO)-324, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine torque control cut signal circuit malfunction (high input)	<Ref. to EN(H6DO)-326, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1700	Throttle position sensor circuit malfunction for AT	<Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine torque control signal #1 circuit malfunction	<Ref. to EN(H6DO)-328, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine torque control signal #2 circuit malfunction	<Ref. to EN(H6DO)-330, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

19. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

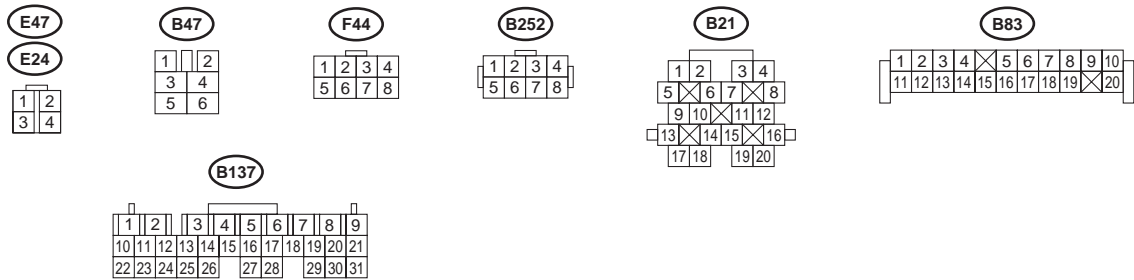
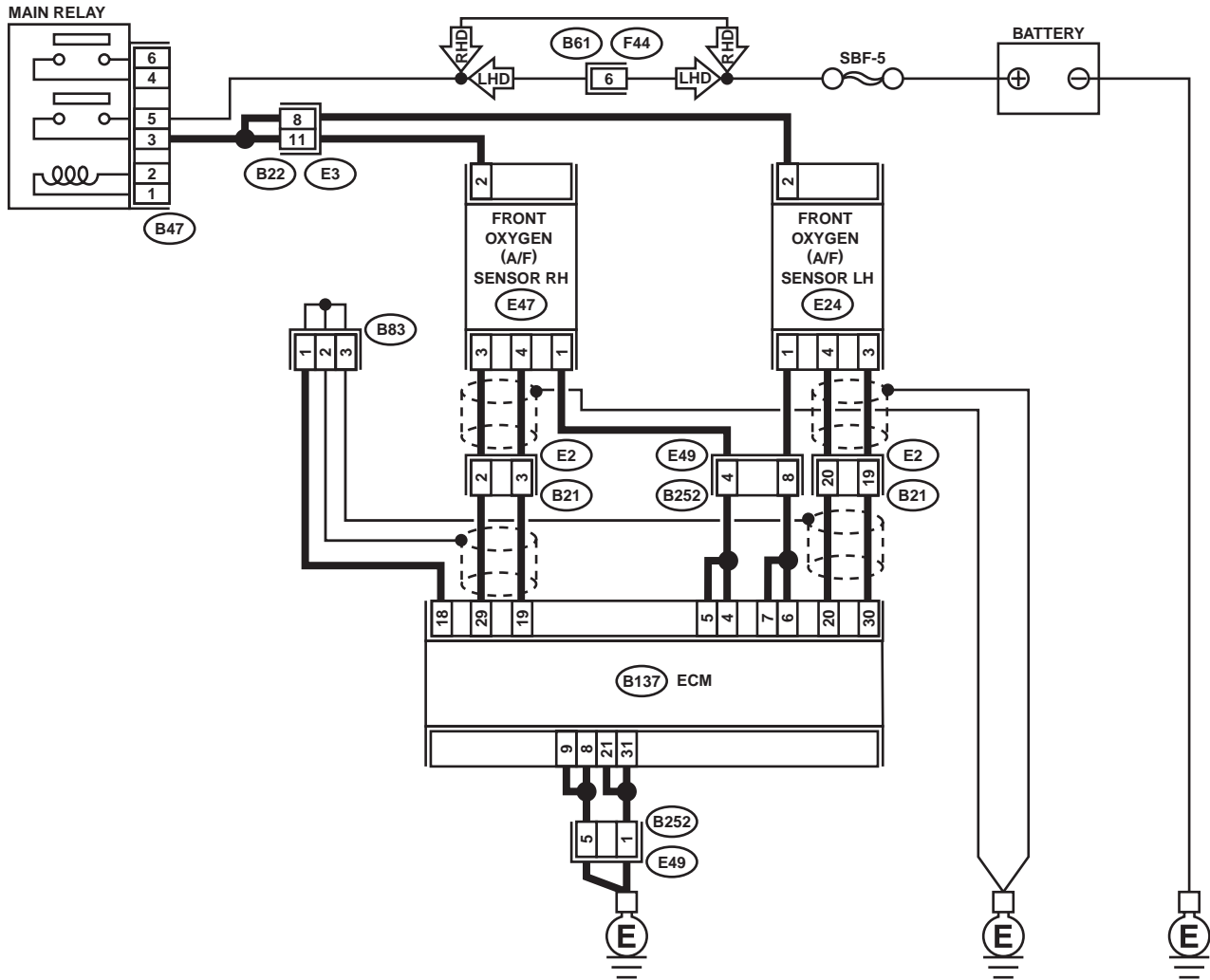
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connectors from ECM and front oxygen (A/F) sensor. 4) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B137) No. 4 — (E47) No. 1: (B137) No. 5 — (E47) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B137) No. 19 — (E47) No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B137) No. 29 — (E47) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4 CHECK FRONT OXYGEN (A/F) SENSOR. Measure resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 2 — No. 1: Is the measured value less than the specified value?	5 Ω	Go to step 5.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>
5 CHECK POOR CONTACT. Check poor contact in ECM and front oxygen (A/F) sensor connector. Is there poor contact in ECM or front oxygen (A/F) sensor connector?	There is poor contact.	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

—

- **DTC DETECTING CONDITION:**

- Immediately at fault recognition

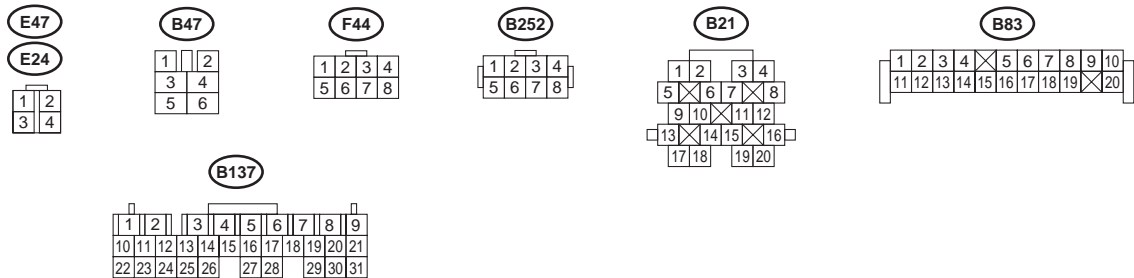
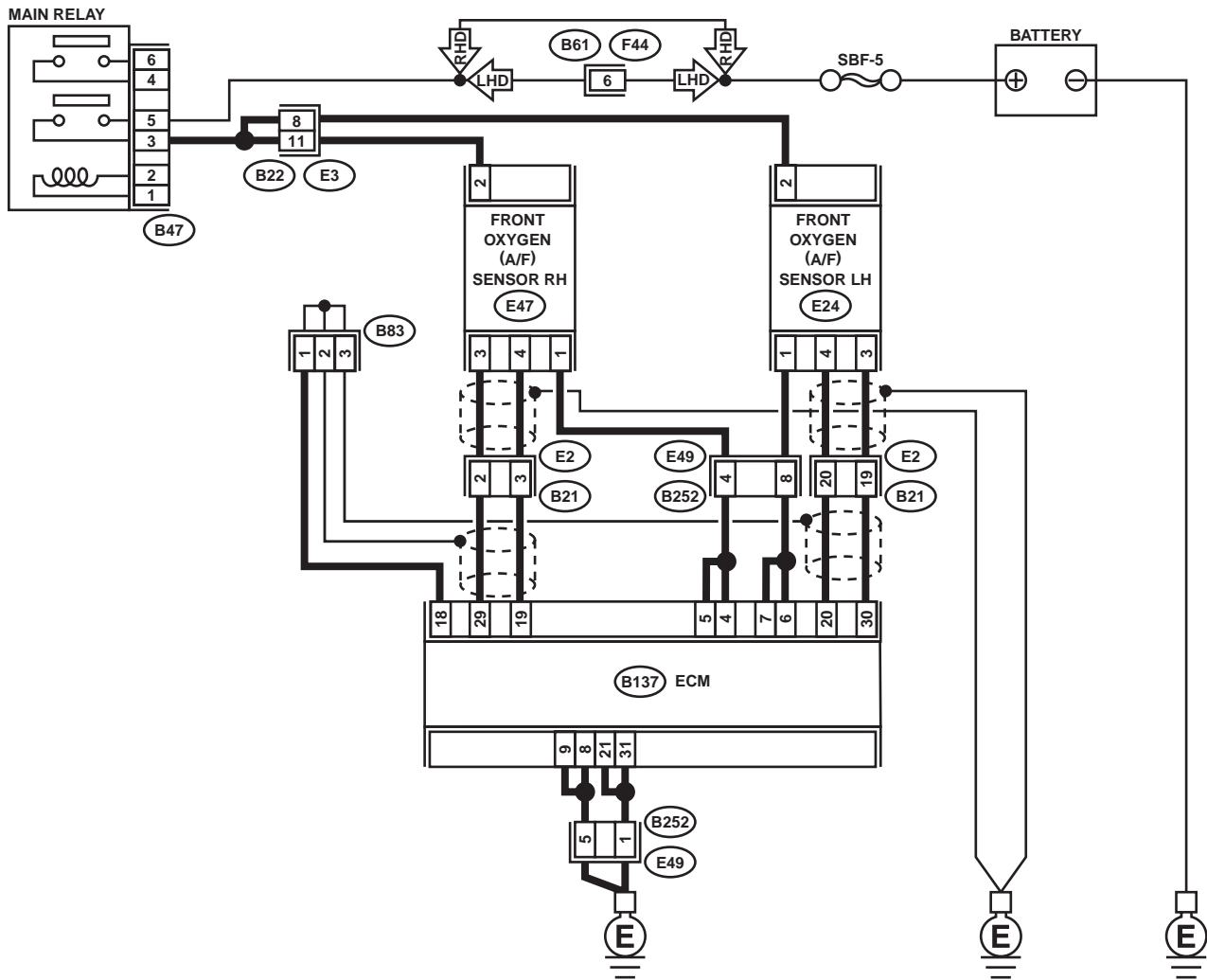
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND CIRCUIT OF ECM. Measure resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 31 — Chassis ground: (B137) No. 21 — Chassis ground: (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
<p>2 CHECK CURRENT DATA.</p> <p>1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	0.2 A	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step 3.
<p>3 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 4 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Go to step 5.	Go to step 4.
<p>4 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 4 (+) — Chassis ground (-):</p> <p>Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	1.0 V	Repair poor contact in ECM connector.	Go to step 5.
<p>5 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 5 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Go to step 7.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 5 (+) — Chassis ground (-): Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	1.0 V	Repair poor contact in ECM connector.	Go to step 7.
<p>7 CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from front oxygen (A/F) sensor. 3) Turn ignition switch to ON. 4) Measure voltage between front oxygen (A/F) sensor connector and engine ground. Connector & terminal (E47) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 8.	Repair power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
<p>8 CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn ignition switch to OFF. 2) Measure resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 2 — No. 1: Is the measured value less than the specified value?</p>	10 Ω	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector 	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

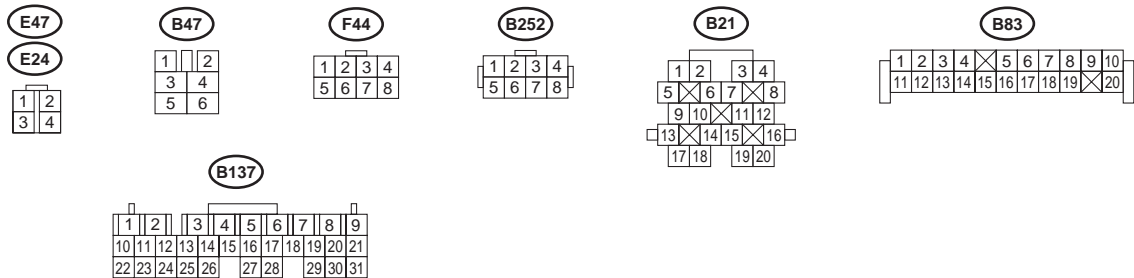
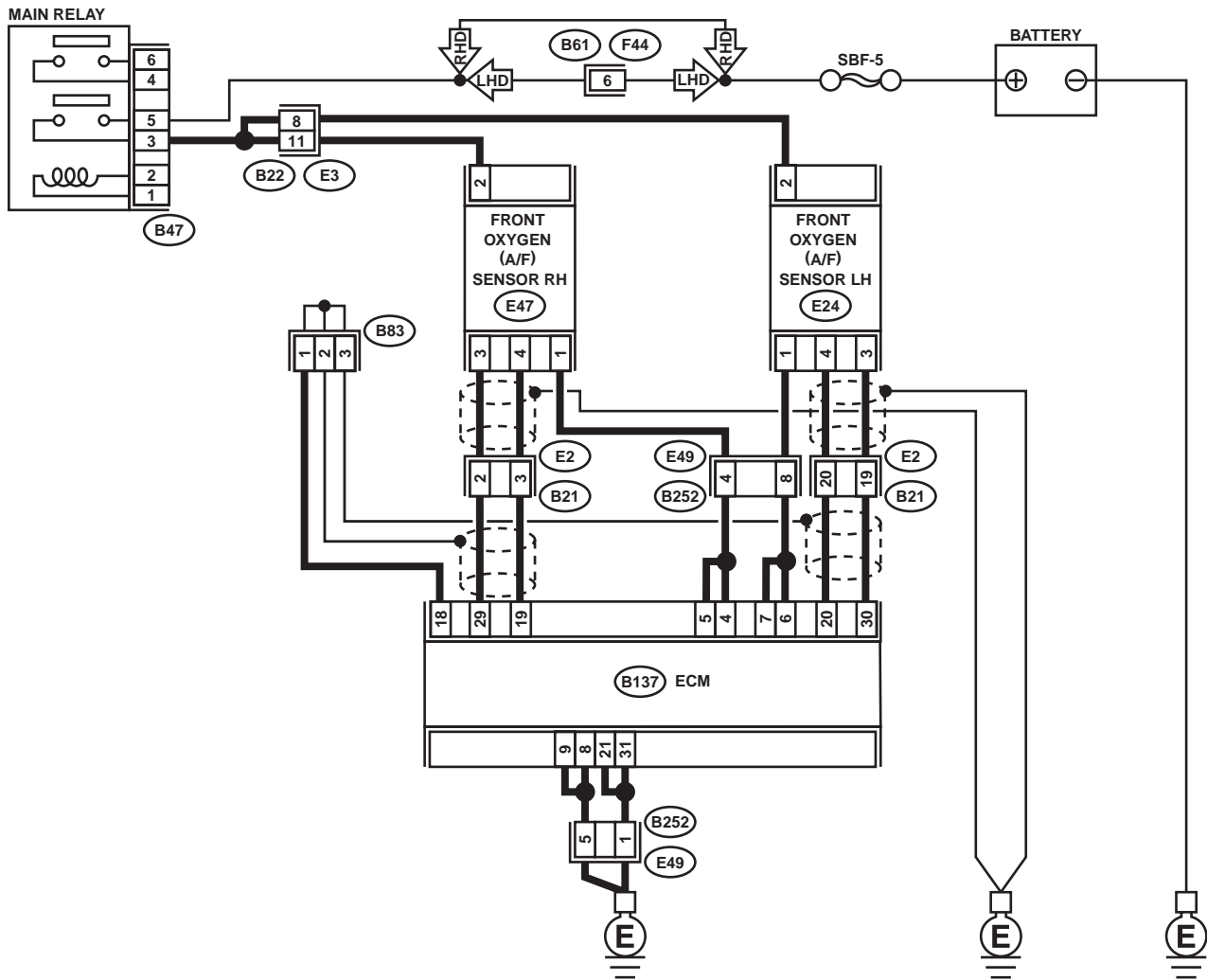
- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 3.	Go to step 2.
2 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 5 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 3.	Go to step 4.
3 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT. 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	2.3 A	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	END
4 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-): Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	8 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step 5.
5 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 5 (+) — Chassis ground (-): Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	8 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

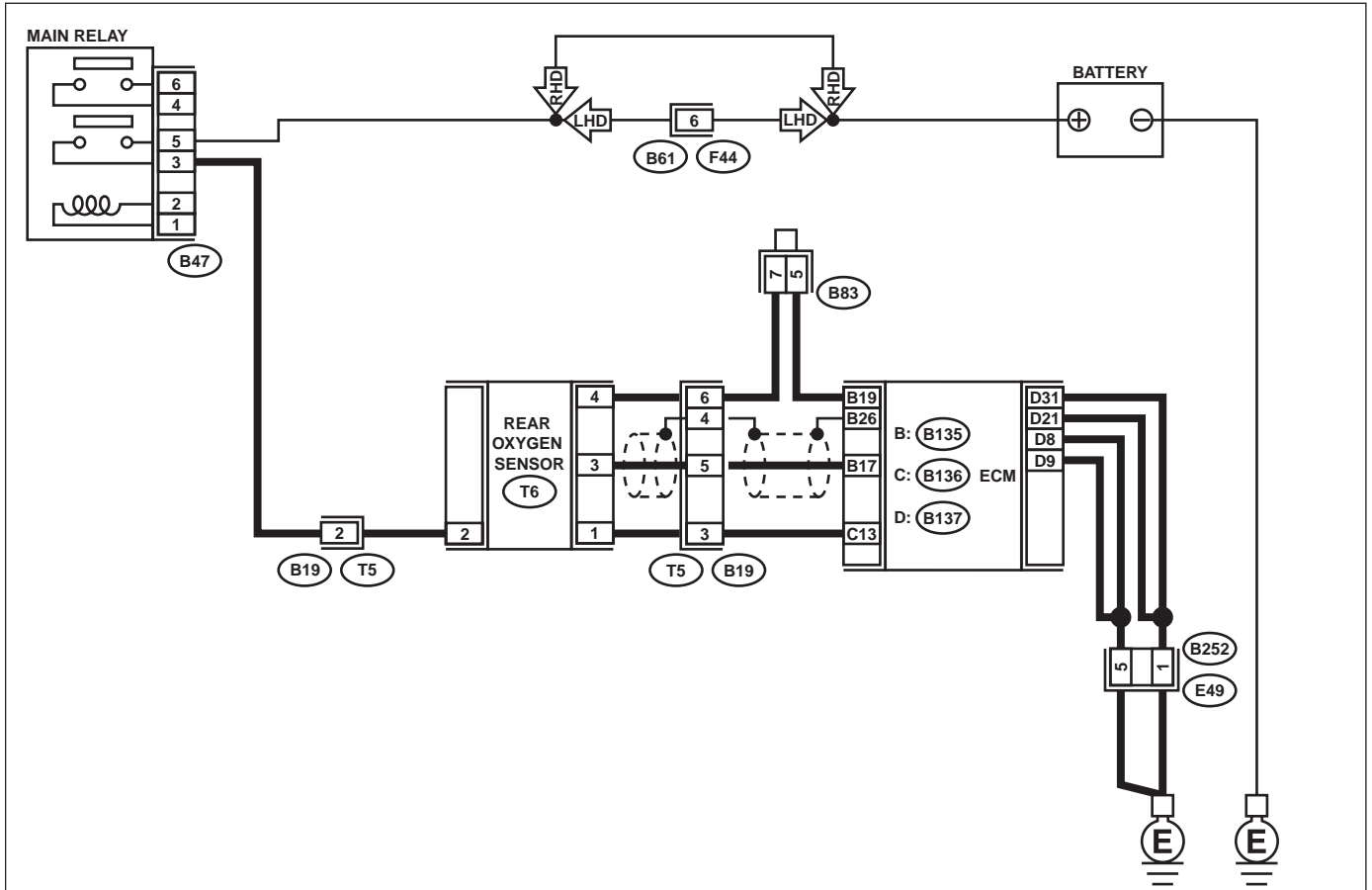
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



T6



B19



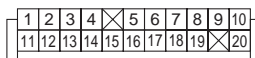
B47



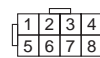
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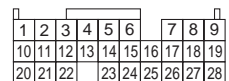
B83



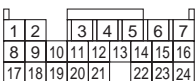
B252



B: B135



C: B136



D: B137



EN-01088

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND CIRCUIT OF ECM. 1) Turn ignition switch to OFF. 2) Disconnect ECM connector. 3) Measure resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 31 — Chassis ground: (B137) No. 21 — Chassis ground: (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
<p>2 CHECK CURRENT DATA. 1) Start engine. 2) Read data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	0.2 A	Repair connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step 3.
<p>3 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Go to step 6.	Go to step 4.
<p>4 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-):</p> <p>Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	1.0 V	Repair poor contact in ECM connector.	Go to step 5.
<p>5 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Contact SUARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor connector and engine ground or chassis ground. <p>Connector & terminal (T6) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Repair power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
<p>7 CHECK REAR OXYGEN SENSOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Measure resistance between rear oxygen sensor connector terminals. <p>Terminals No. 1 — No. 2: Is the measured value less than the specified value?</p>	30 Ω	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector 	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

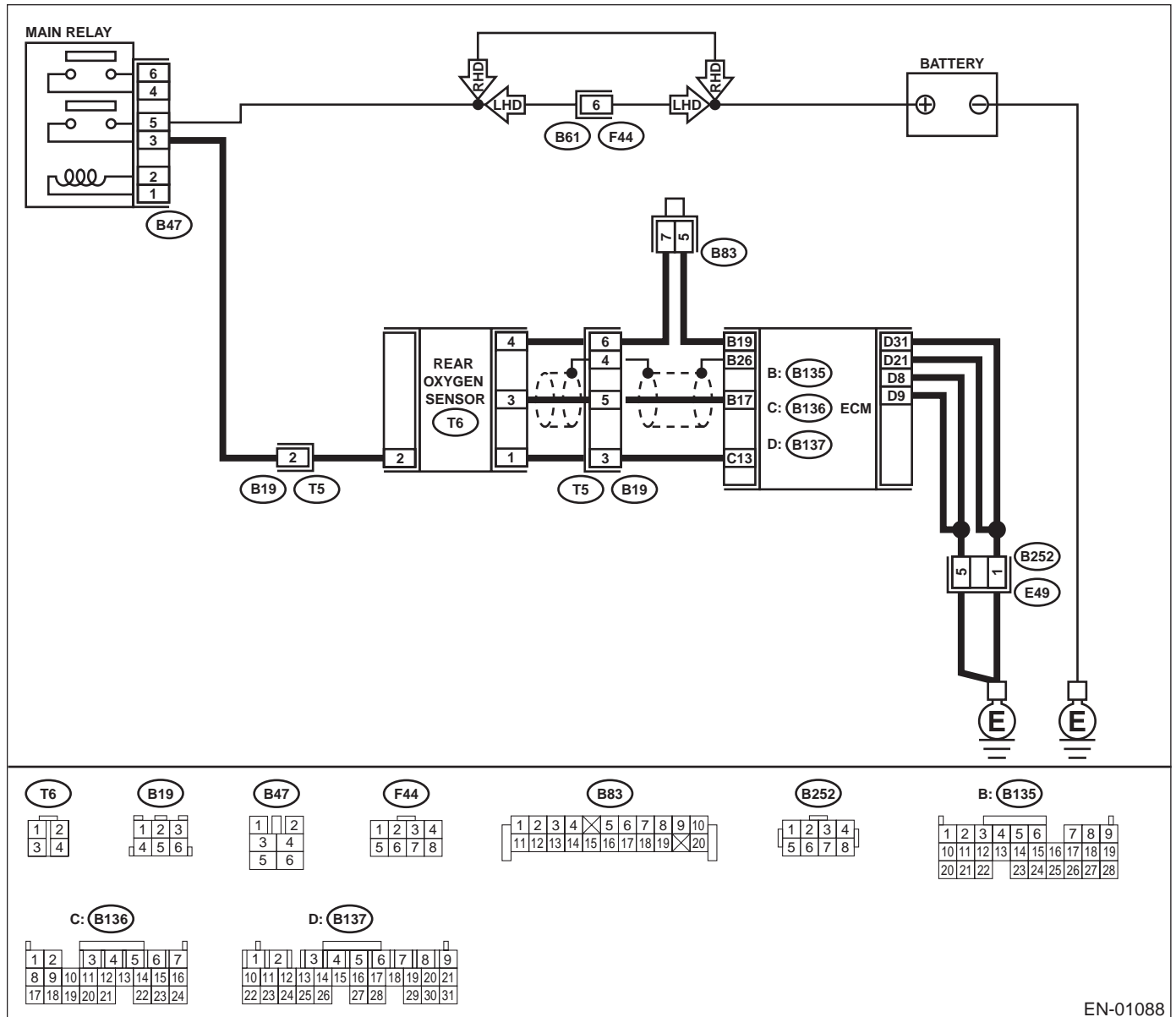
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01088

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 13 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 2.	Go to step 3.
2 CHECK CURRENT DATA. 1) Repair battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn ignition switch to ON. 3) Read data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	7 A	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	END
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	END

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

F: DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —

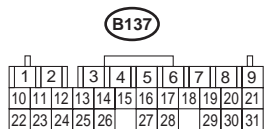
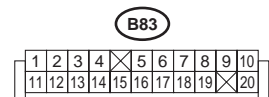
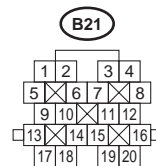
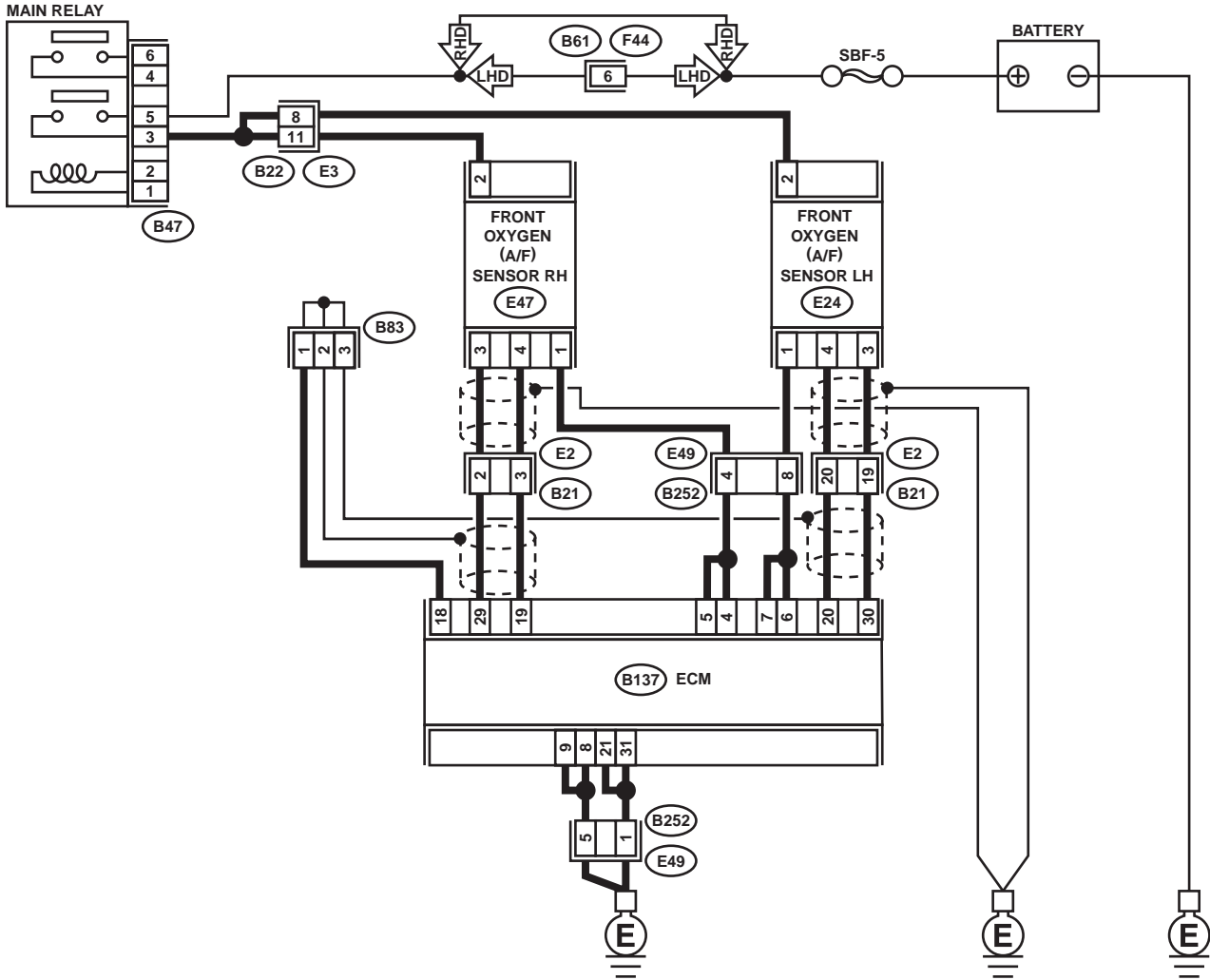
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connectors from ECM and front oxygen (A/F) sensor. 4) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 6 — (E24) No. 1: (B137) No. 7 — (E24) No. 1:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
<p>2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 20 — (E24) No. 4:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
<p>3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 30 — (E24) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
<p>4 CHECK FRONT OXYGEN (A/F) SENSOR.</p> <p>Measure resistance between front oxygen (A/F) sensor connector terminals.</p> <p>Terminals No. 2 — No. 1:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 5.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>
<p>5 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM and front oxygen (A/F) sensor connector. Is there poor contact in ECM or front oxygen (A/F) sensor connector?</p>	There is poor contact.	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

G: DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

—

- **DTC DETECTING CONDITION:**

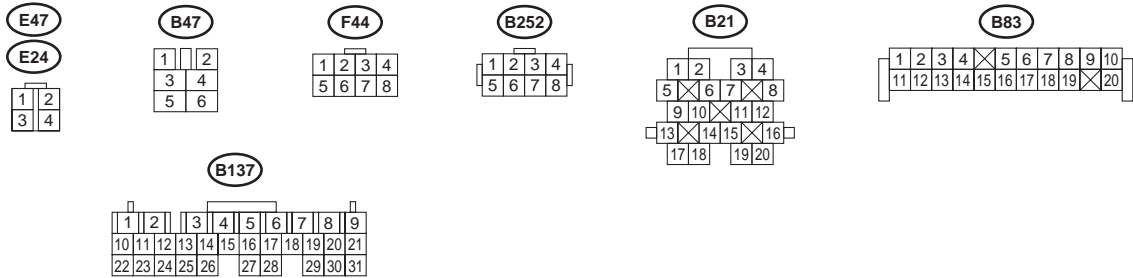
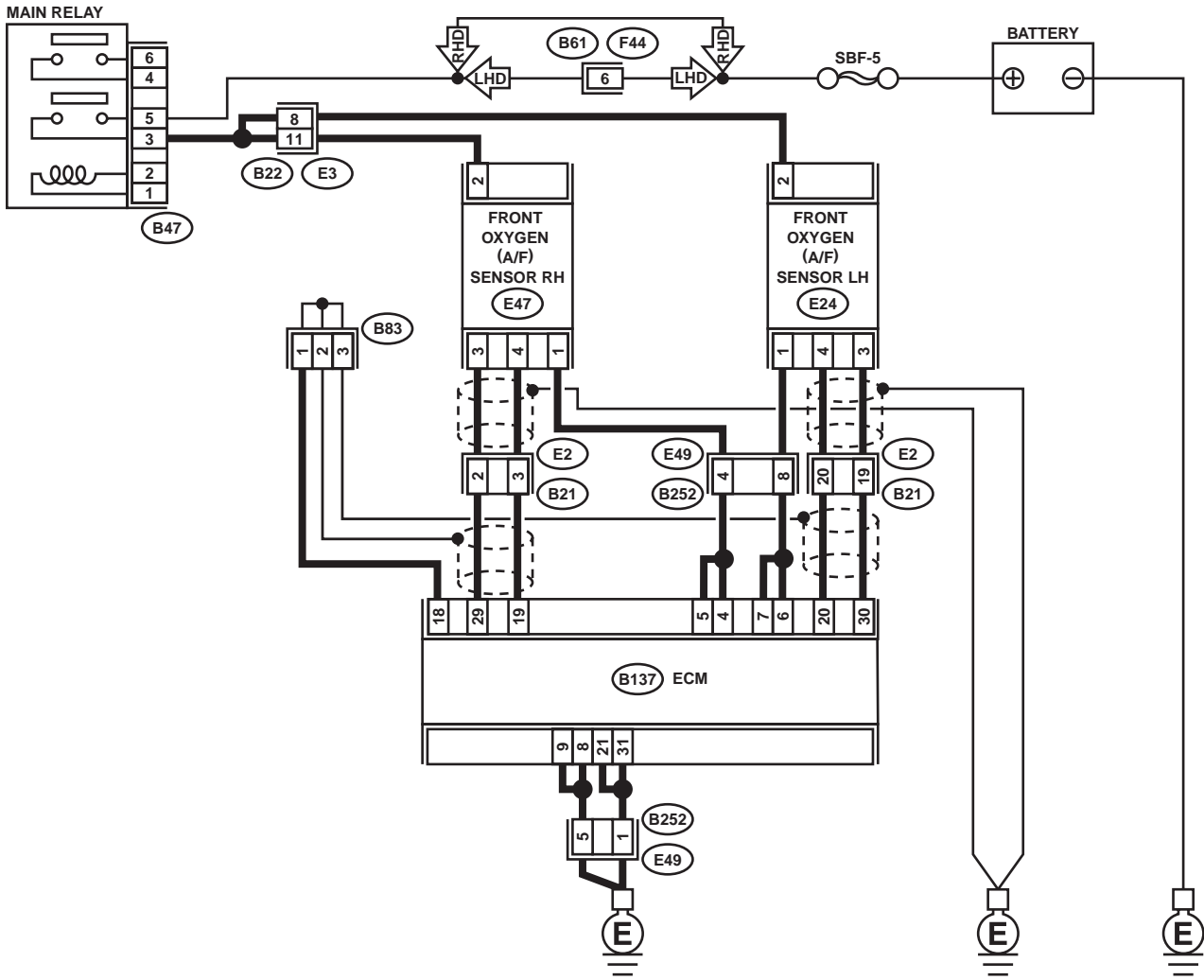
- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND CIRCUIT OF ECM. Measure resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 31 — Chassis ground: (B137) No. 21 — Chassis ground: (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
<p>2 CHECK CURRENT DATA.</p> <p>1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	0.2 A	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step 3.
<p>3 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 7 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Go to step 5.	Go to step 4.
<p>4 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 7 (+) — Chassis ground (-):</p> <p>Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	1.0 V	Repair poor contact in ECM connector.	Go to step 5.
<p>5 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 6 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Go to step 7.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 6 (+) — Chassis ground (-): Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	1.0 V	Repair poor contact in ECM connector.	Go to step 7.
<p>7 CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from front oxygen (A/F) sensor. 3) Turn ignition switch to ON. 4) Measure voltage between front oxygen (A/F) sensor connector and engine ground. Connector & terminal (E24) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 8.	Repair power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
<p>8 CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn ignition switch to OFF. 2) Measure resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 2 — No. 1: Is the measured value less than the specified value?</p>	10 Ω	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector 	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

H: DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

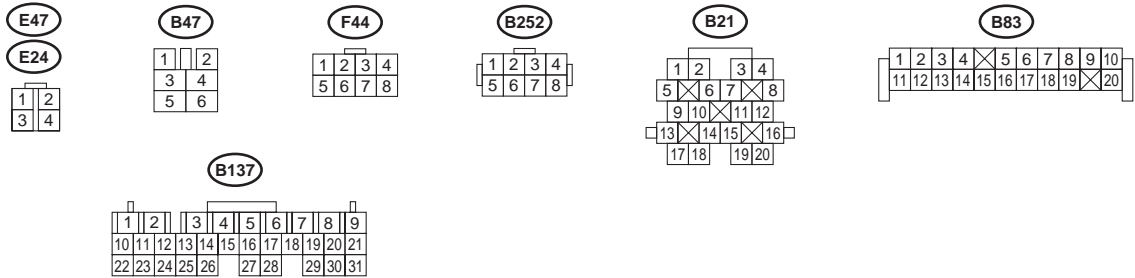
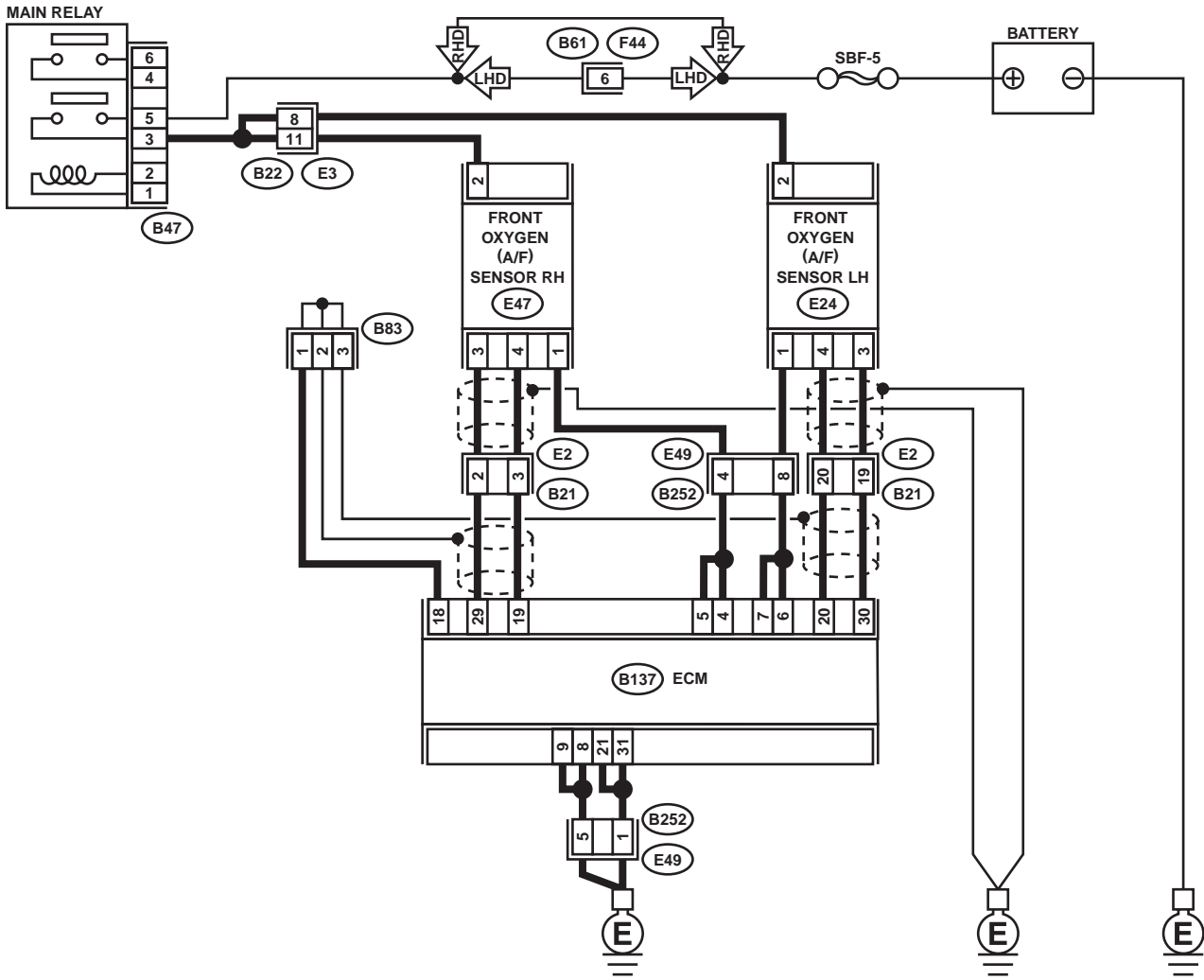
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 6 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 3.	Go to step 2.
2 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 7 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 3.	Go to step 4.
3 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT. 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	2.3 A	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	END
4 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 6 (+) — Chassis ground (-): Does the voltage change more than the specified value shaking harness and connector of ECM while monitoring the value with voltage meter?	8 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step 5.
5 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 7 (+) — Chassis ground (-): Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	8 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

I: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

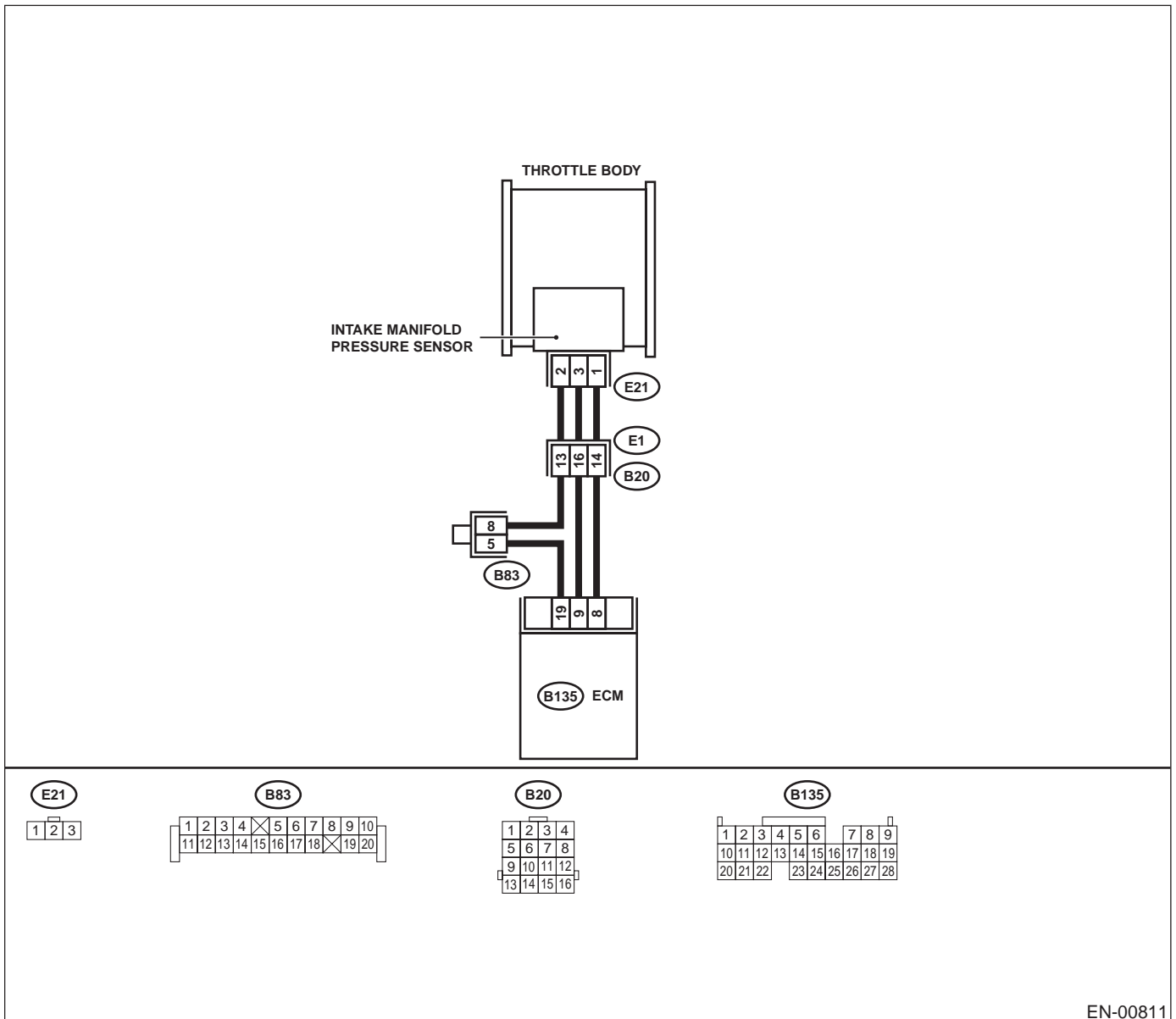
• TROUBLE SYMPTOM

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-00811

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK IDLE SWITCH SIGNAL. 1) Turn ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. Does the LED of {Idle Switch Signal} come on? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.>	LED comes on.	Go to step 2.	Check throttle position sensor circuit. <Ref. to EN(H6DO)-148, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step 3.
3 CHECK CONDITION OF INTAKE MANIFOLD PRESSURE SENSOR. Is the intake manifold pressure sensor installation bolt tightened securely?	Tightened securely.	Go to step 4.	Tighten intake manifold pressure sensor installation bolt securely.
4 CHECK CONDITION OF THROTTLE BODY. Is the throttle body installation bolt tightened securely?	Tightened securely.	Go to step 5.	Tighten throttle body installation bolt securely.
5 CHECK CONDITION OF EGR VALVE. Is there any foreign object caught between EGR solenoid valve and intake manifold?	There is a foreign object.	Completely remove foreign object, and install EGR solenoid valve securely to the intake manifold.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

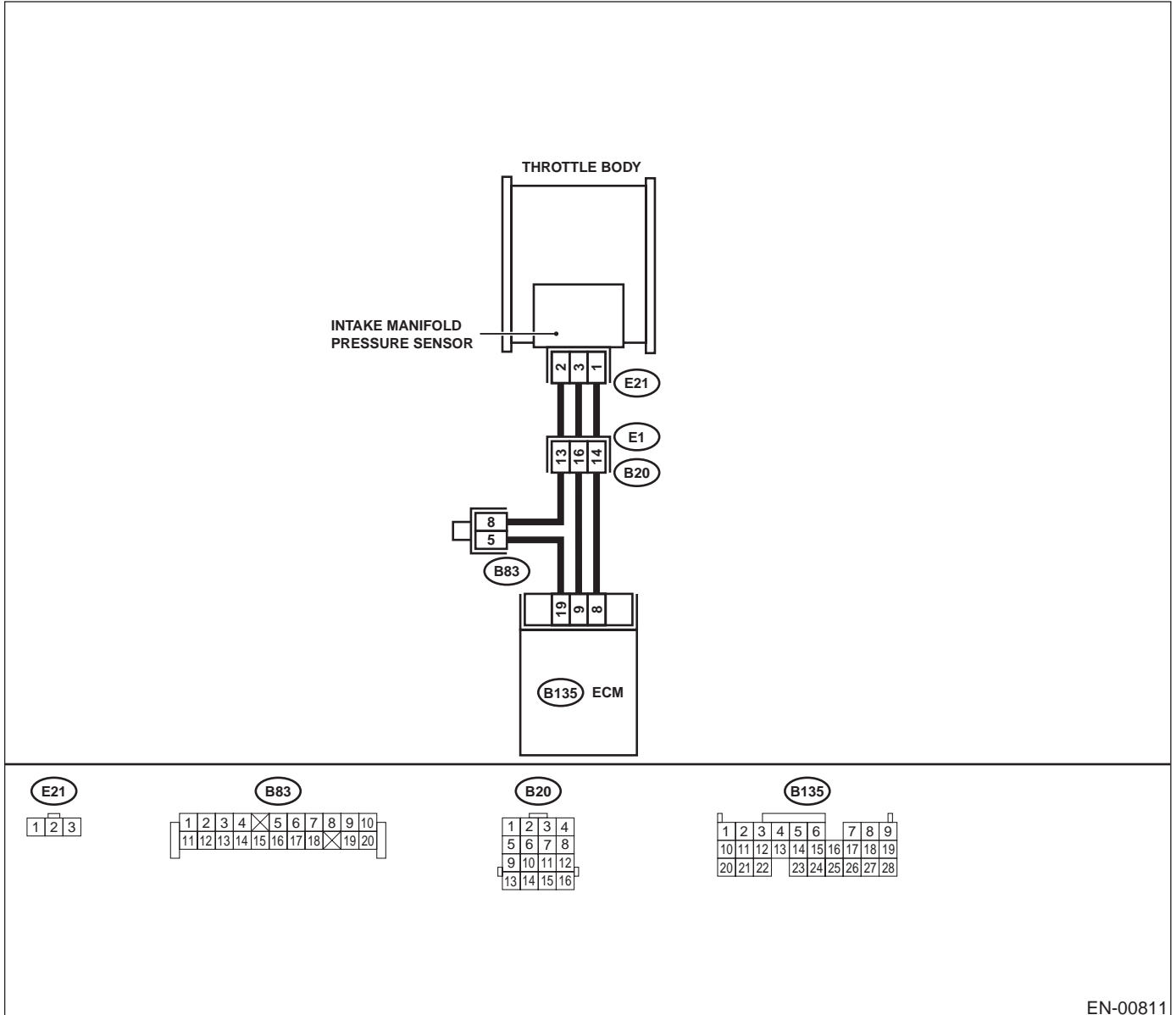
J: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- WIRING DIAGRAM:



EN-00811

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA. 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	1.7 kPa (13 mmHg, 0.51 inHg)	Go to step 3.	Go to step 2.
<p>2 CHECK POOR CONTACT. Check poor contact in ECM and pressure sensor connector. Is there poor contact in ECM or pressure sensor connector?</p>	There is poor contact.	Repair poor contact in ECM or pressure sensor connector.	Even if MI lights up, the circuit has returned to a normal condition at this time.
<p>3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 5.	Go to step 4.
<p>4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	4.5 V	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
<p>5 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.7 V	Go to step 7.	Go to step 6.
<p>6 CHECK INPUT SIGNAL FOR ECM. Read data of intake manifold atmospheric absolute pressure signal using Subaru Select Monitor. Does the value change more than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.></p>	1.7 kPa (13 mmHg, 0.51 inHg)	Repair poor contact in ECM connector.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from intake manifold pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between intake manifold pressure sensor connector and engine ground.</p> <p>Connector & terminal (E21) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 8 .	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
<p>8 CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake manifold pressure sensor connector.</p> <p>Connector & terminal (B135) No. 19 — (E21) No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 9 .	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
<p>9 CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</p> <p>Measure resistance of harness between intake manifold pressure sensor connector and engine ground.</p> <p>Connector & terminal (E21) No. 1 — Engine ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 10 .	Repair ground short circuit in harness between ECM and intake manifold pressure sensor connector.
<p>10 CHECK POOR CONTACT.</p> <p>Check poor contact in intake manifold pressure sensor connector. Is there poor contact in intake manifold pressure sensor connector?</p>	There is poor contact.	Repair poor contact in intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
 ENGINE (DIAGNOSTICS)

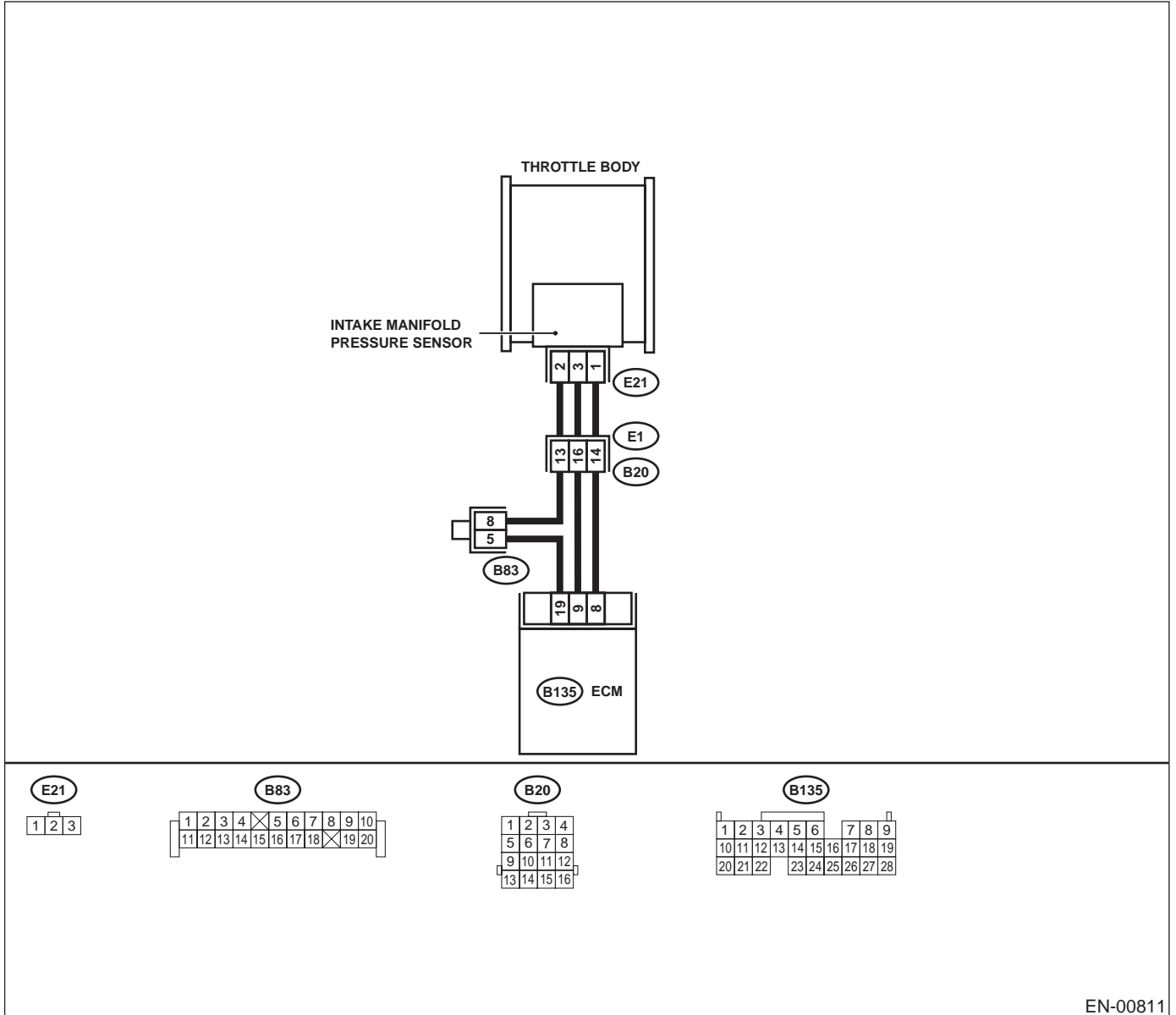
K: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00811

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA. 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	130 kPa (975 mmHg, 38.39 inHg)	Go to step 10.	Go to step 2.
<p>2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 4.	Go to step 3.
<p>3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	4.5 V	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
<p>4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.7 V	Go to step 6.	Go to step 5.
<p>5 CHECK INPUT SIGNAL FOR ECM. Read data of intake manifold atmospheric absolute pressure signal using Subaru Select Monitor. Does the value change more than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.></p>	1.7 kPa (13 mmHg, 0.51 inHg)	Repair poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from intake manifold pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between intake manifold pressure sensor connector and engine ground.</p> <p>Connector & terminal (E21) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 7.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
<p>7 CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake manifold pressure sensor connector.</p> <p>Connector & terminal (B135) No. 8 — (E21) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
<p>8 CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</p> <p>Measure resistance of harness between ECM and intake manifold pressure sensor connector.</p> <p>Connector & terminal (B135) No. 19 — (E21) No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 9.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
<p>9 CHECK POOR CONTACT.</p> <p>Check poor contact in intake manifold pressure sensor connector. Is there poor contact in intake manifold pressure sensor connector?</p>	There is poor contact.	Repair poor contact in intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>10 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF.</p> <p>2) Disconnect connector from pressure sensor.</p> <p>3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.</p> <p>4) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>130 kPa (975 mmHg, 38.39 inHg)</p>	<p>Repair battery short circuit in harness between ECM and intake manifold pressure sensor connector.</p>	<p>Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

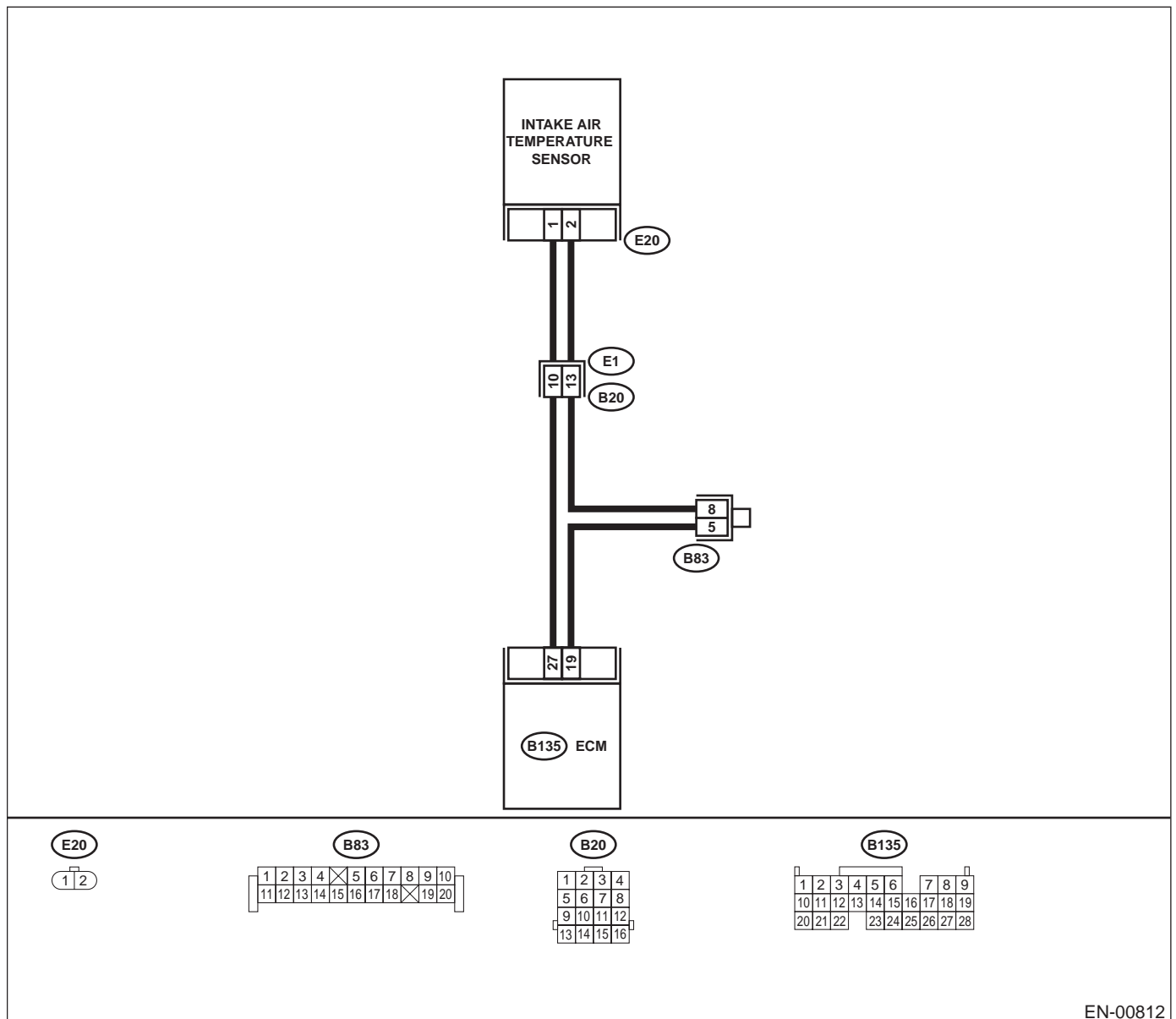
L: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• **WIRING DIAGRAM:**



EN-00812

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Replace intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

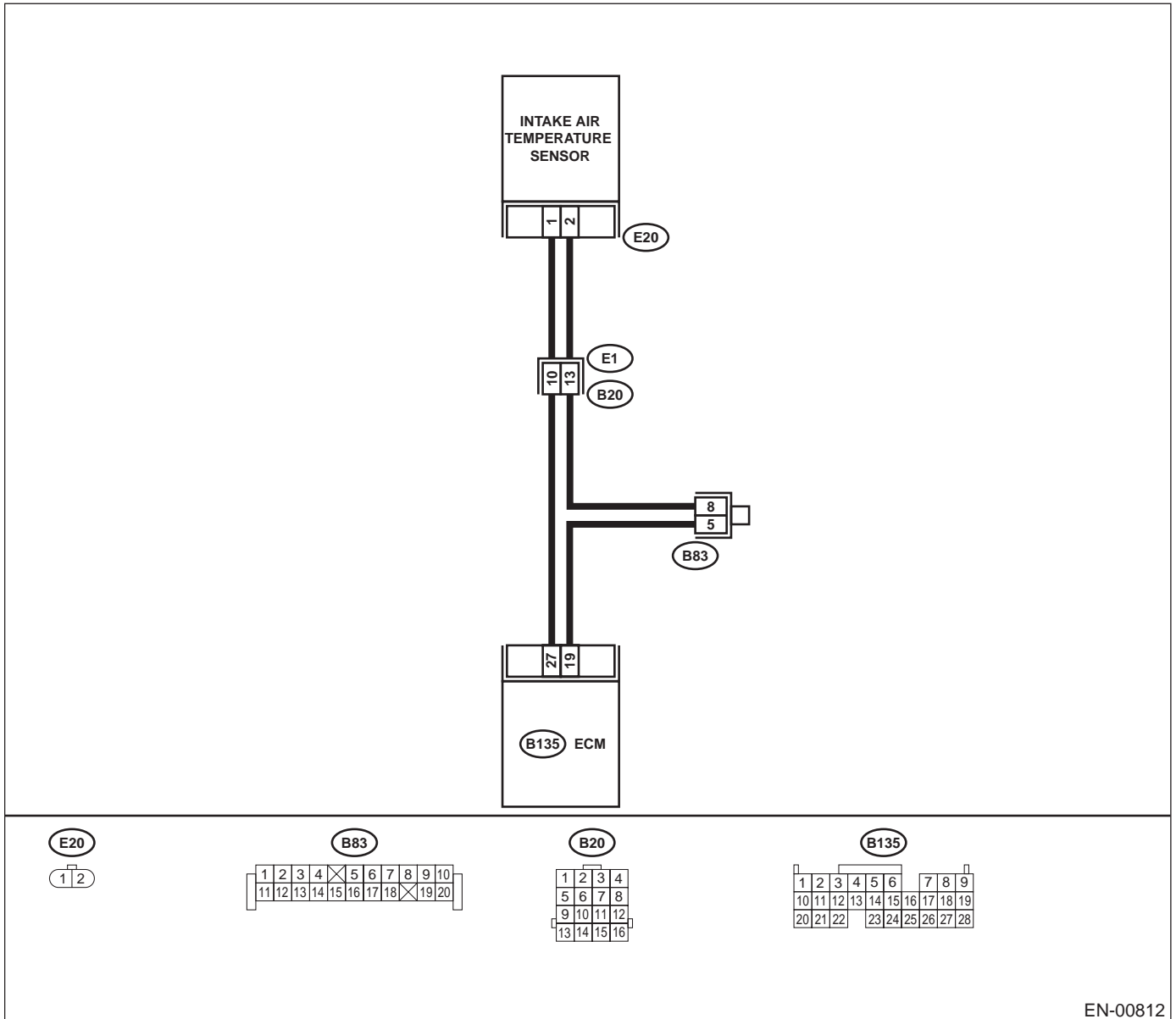
M: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00812

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start engine.</p> <p>2) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>Does the measured value exceed the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>120°C (248°F)</p>	<p>Go to step 2.</p>	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from intake air temperature sensor.</p> <p>3) Turn ignition switch to ON.</p> <p>4) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>Is the measured value less than the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>-40°C (-40°F)</p>	<p>Replace intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.></p>	<p>Repair ground short circuit in harness between intake air temperature sensor and ECM connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

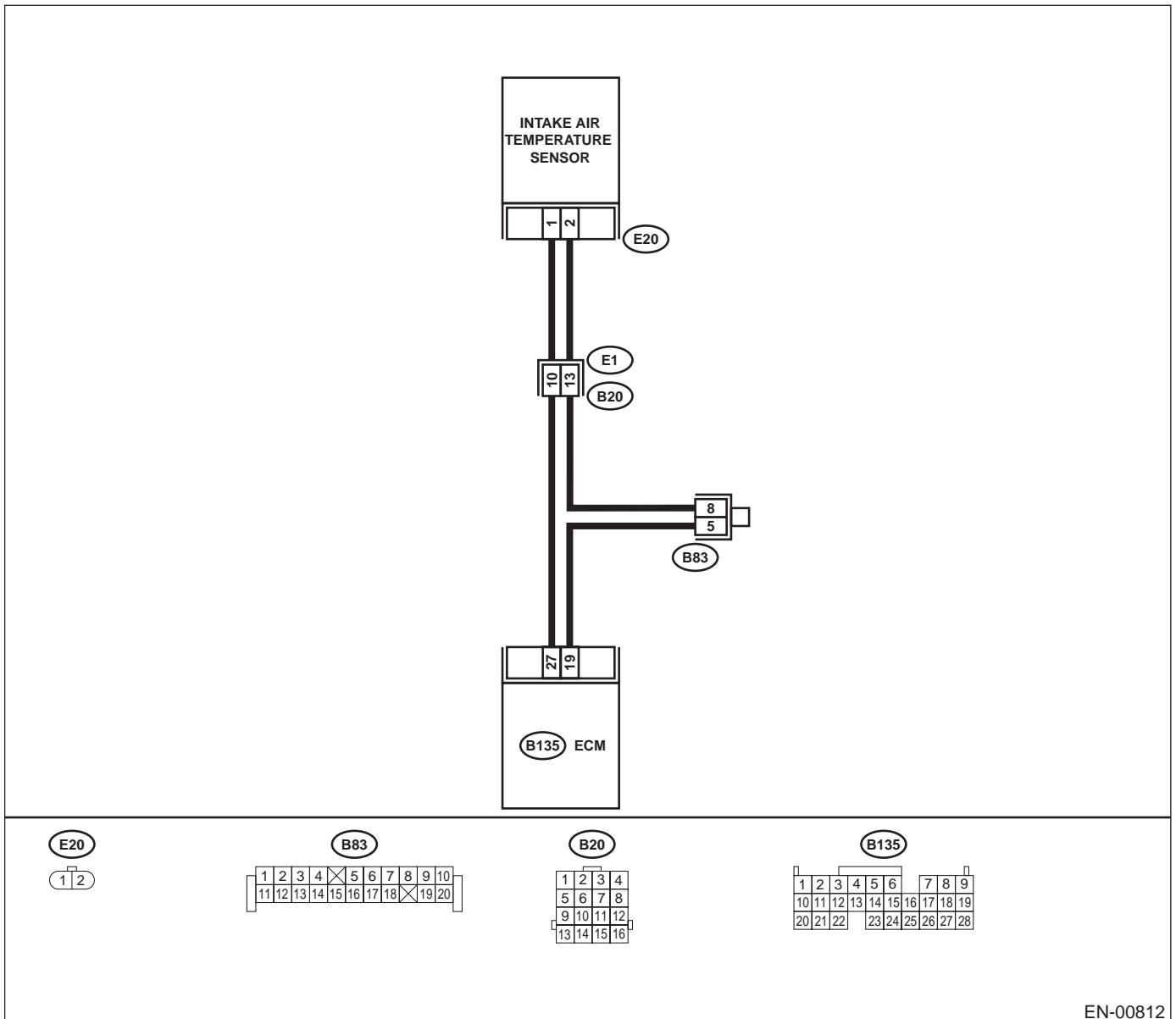
N: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00812

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA. 1) Turn ignition switch to ON. 2) Start engine. 3) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value less than the specified value?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	-40°C (-40°F)	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Measure voltage between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (E20) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step 3.
<p>3 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to ON. 2) Measure voltage between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (E20) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step 4.
<p>4 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. Measure voltage between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (E20) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	3 V	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance of harness between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (E20) No. 2 — Engine ground: Is the measured value less than the specified value?</p>	5 Ω	Replace intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

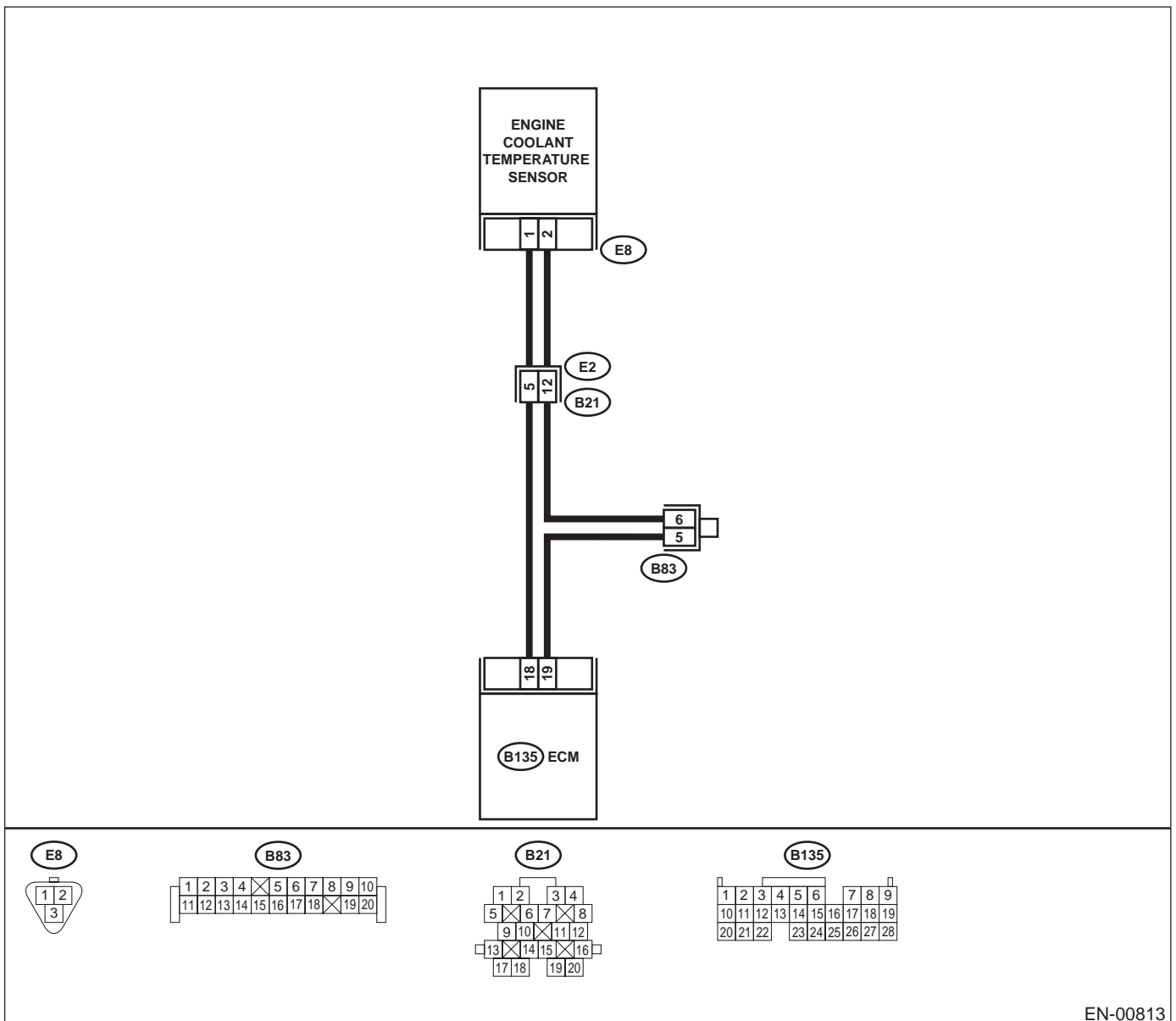
O: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Hard to start
 - Erroneous idling
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00813

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start engine.</p> <p>2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>Does the measured value exceed the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>120°C (248°F)</p>	<p>Go to step 2.</p>	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from engine coolant temperature sensor.</p> <p>3) Turn ignition switch to ON.</p> <p>4) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>Is the measured value less than the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>-40°C (-40°F)</p>	<p>Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.></p>	<p>Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

P: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

• **DTC DETECTING CONDITION:**

- Immediately at fault recognition

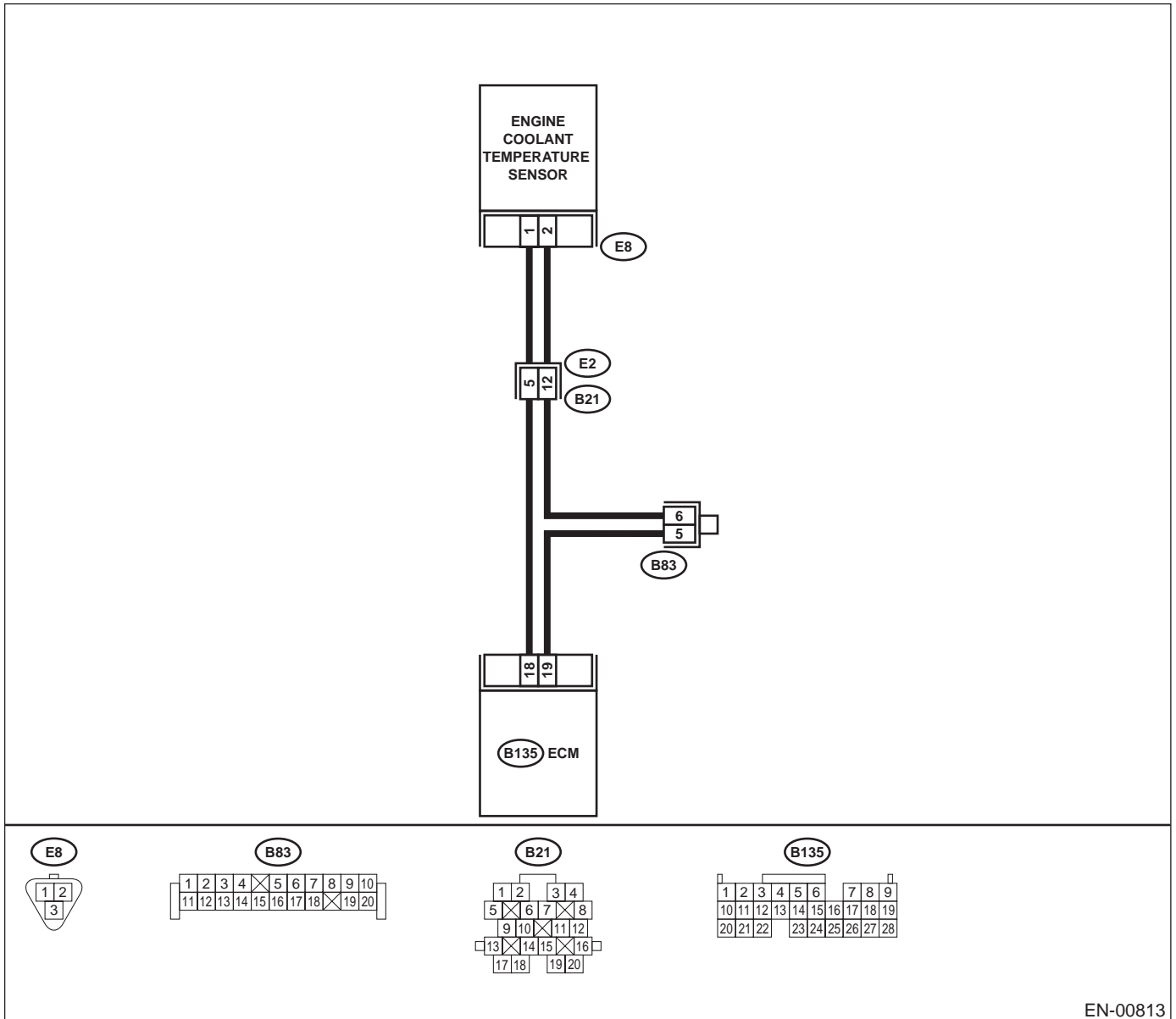
• **TROUBLE SYMPTOM:**

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• **WIRING DIAGRAM:**



EN-00813

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start engine.</p> <p>2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>Is the measured value less than the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>-40°C (-40°F)</p>	<p>Go to step 2.</p>	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from engine coolant temperature sensor.</p> <p>3) Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal</p> <p>(E8) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	<p>10 V</p>	<p>Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to ON.</p> <p>2) Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal</p> <p>(E8) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	<p>10 V</p>	<p>Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 4.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>4</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	<p>4 V</p>	<p>Go to step 5.</p>	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>5</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	<p>5 Ω</p>	<p>Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.></p>	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Q: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

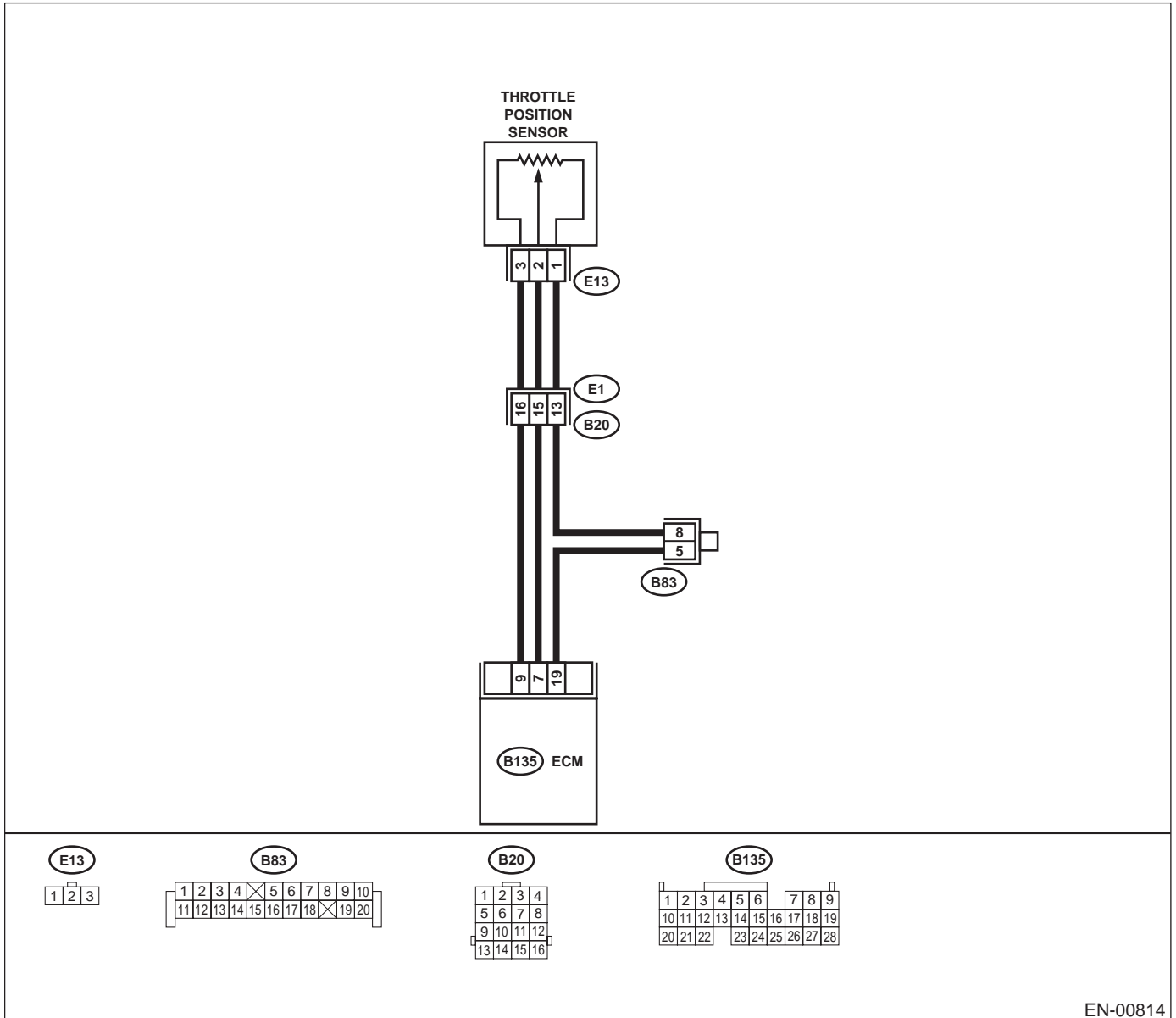
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-00814

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace throttle position sensor. <Ref. to FU(H6DO)-33, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

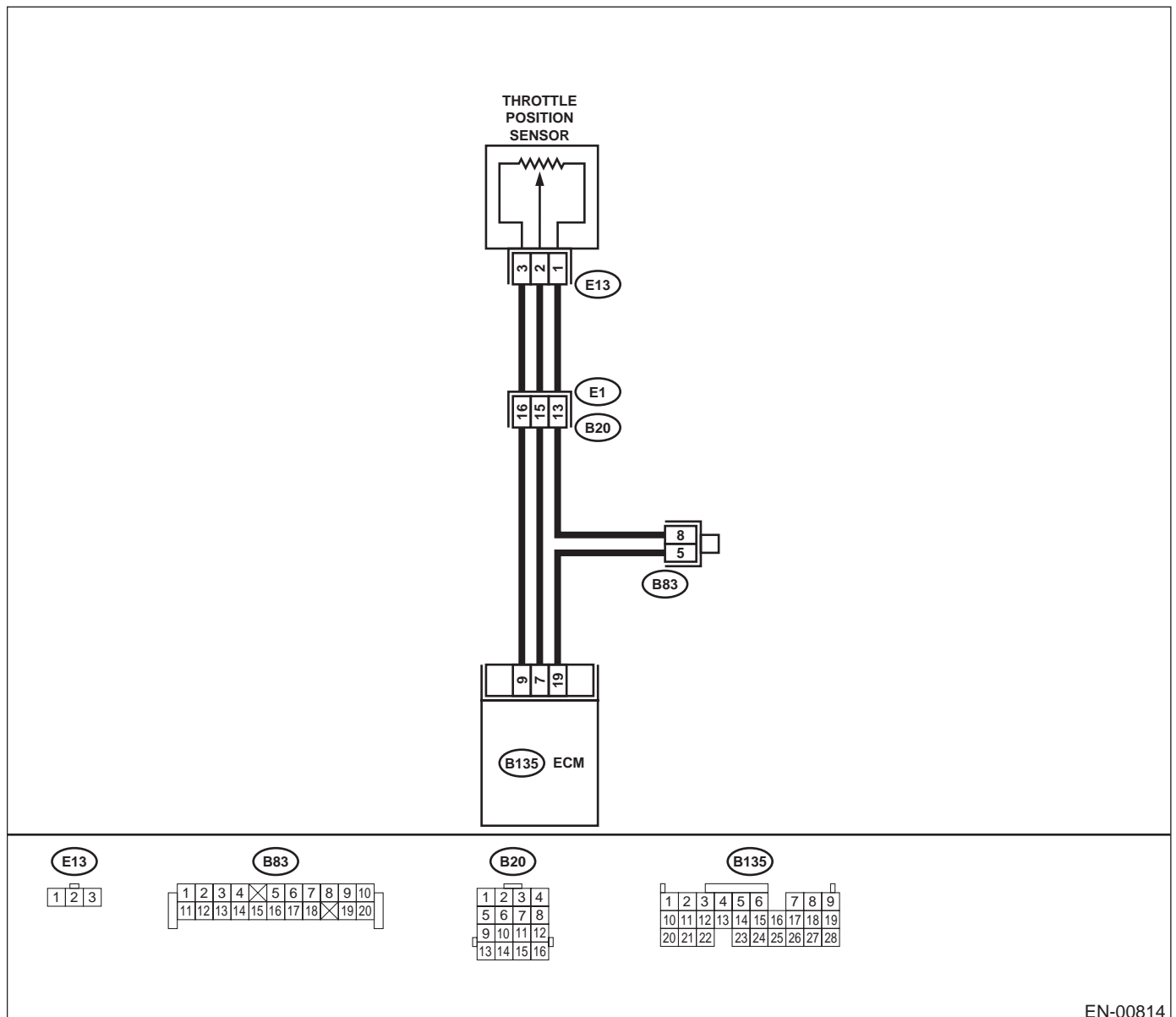
R: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-00814

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA. 1) Start engine. 2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value?</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	0.1 V	Go to step 2.	Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground while throttle valve is fully closed. Connector & terminal (B135) No. 7 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 4.	Go to step 3.
<p>3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 7 (+) — Chassis ground (-): Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	4.5 V	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
<p>4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.1 V	Go to step 6.	Go to step 5.
<p>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Measure voltage between ECM connector and chassis ground. Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p>	0.1 V	Repair poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from throttle position sensor. 3) Turn ignition switch to ON. 4) Measure voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>7 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and throttle position sensor connector.</p> <p>Connector & terminal (B135) No. 9 — (E13) No. 3: Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
<p>8 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>Measure resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 3 — Engine ground: Is the measured value less than the specified value?</p>	10 Ω	Repair ground short circuit in harness between throttle position sensor and ECM connector.	Go to step 9.
<p>9 CHECK POOR CONTACT.</p> <p>Check poor contact in throttle position sensor connector. Is there poor contact in throttle position sensor connector?</p>	There is poor contact.	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor. <Ref. to FU(H6DO)-33, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

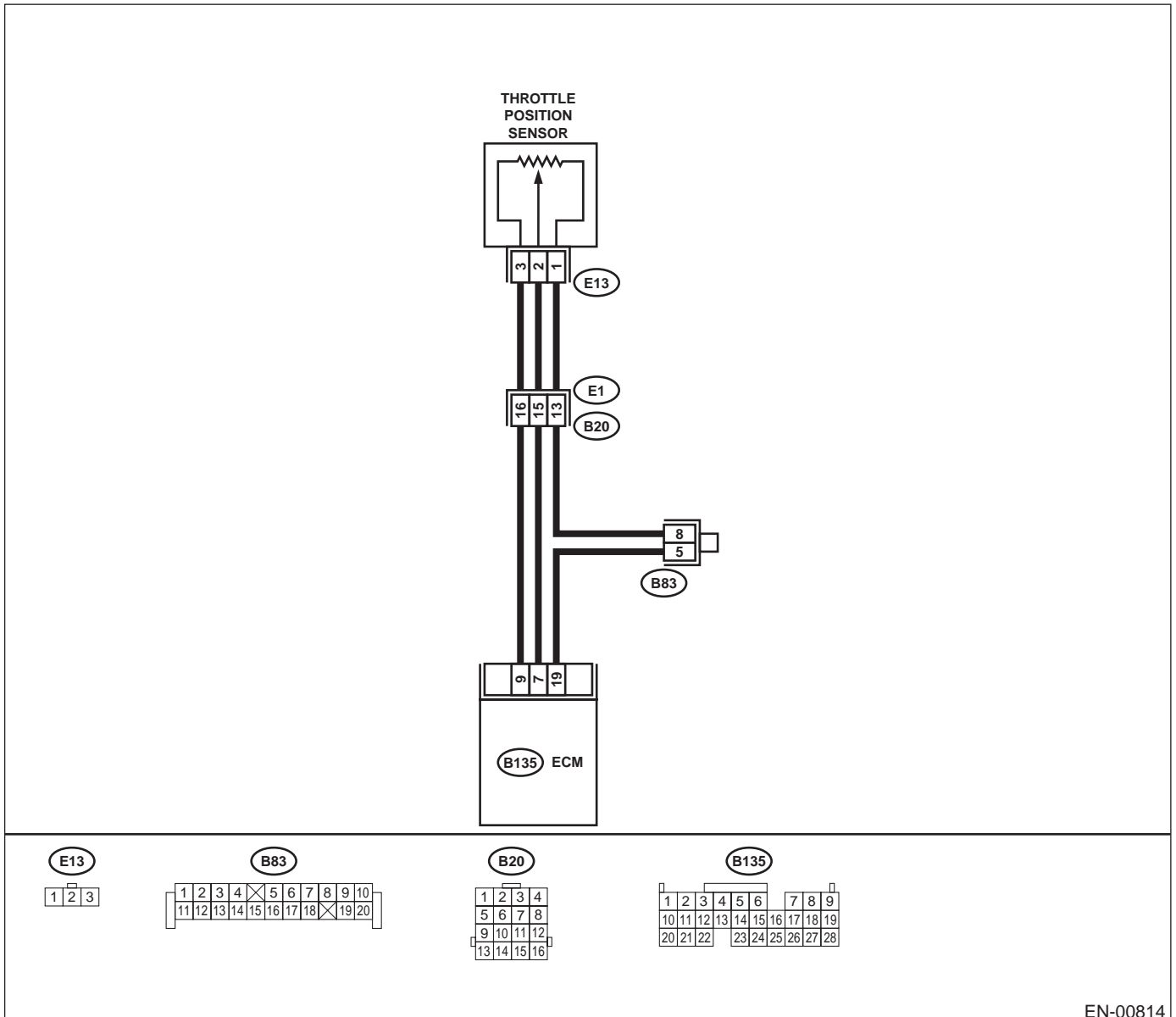
S: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-00814

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA.</p> <p>1) Start engine.</p> <p>2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>Does the measured value exceed the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	4.75 V	Go to step 2.	<p>Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>2 CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from throttle position sensor.</p> <p>3) Measure resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	<p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>3 CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to ON.</p> <p>2) Measure voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 3 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	4.9 V	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	<p>Replace throttle position sensor.</p> <p><Ref. to FU(H6DO)-33, Throttle Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

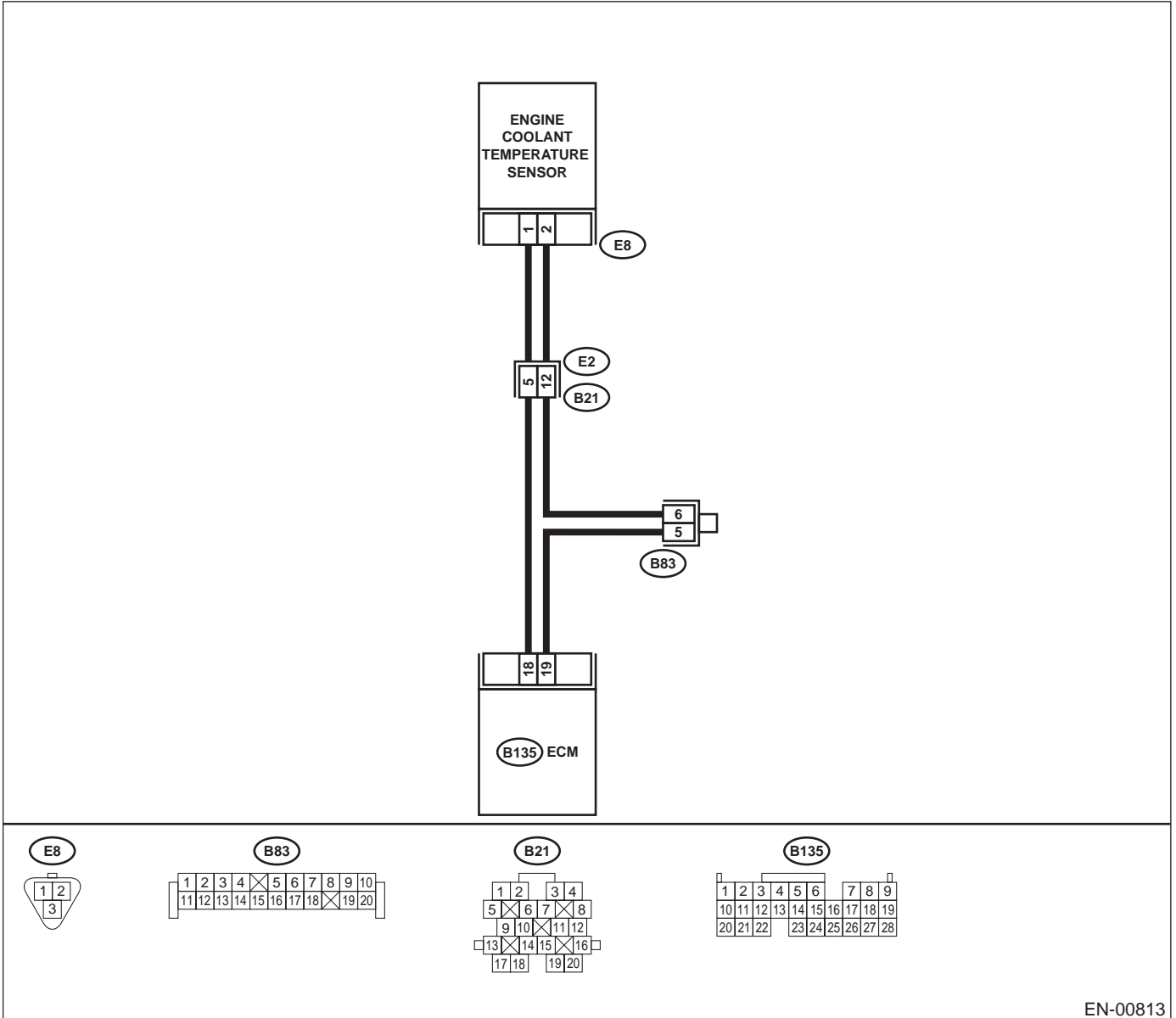
T: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Engine does not return to idle.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step 2.
2 CHECK TIRE SIZE. Is the tire size the same as designated tire and four-wheel tire?	Same.	Go to step 3.	Replace tire.
3 CHECK ENGINE COOLANT. Check the following items. <ul style="list-style-type: none"> • Engine coolant volume • Engine coolant freezing • Contamination in engine coolant Is the engine coolant normal?	Normal.	Go to step 4.	Refill or replace coolant. <Ref. to CO(H6DO)-23, INSPECTION, Engine Coolant.>
4 CHECK THERMOSTAT. Does thermostat remain open?	Remains open.	Replace thermostat. <Ref. to CO(H6DO)-25, Thermostat.>	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

U: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

V: DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

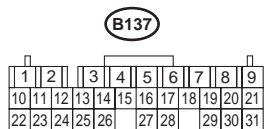
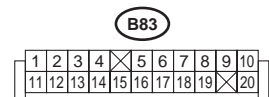
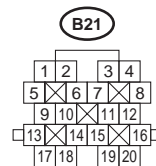
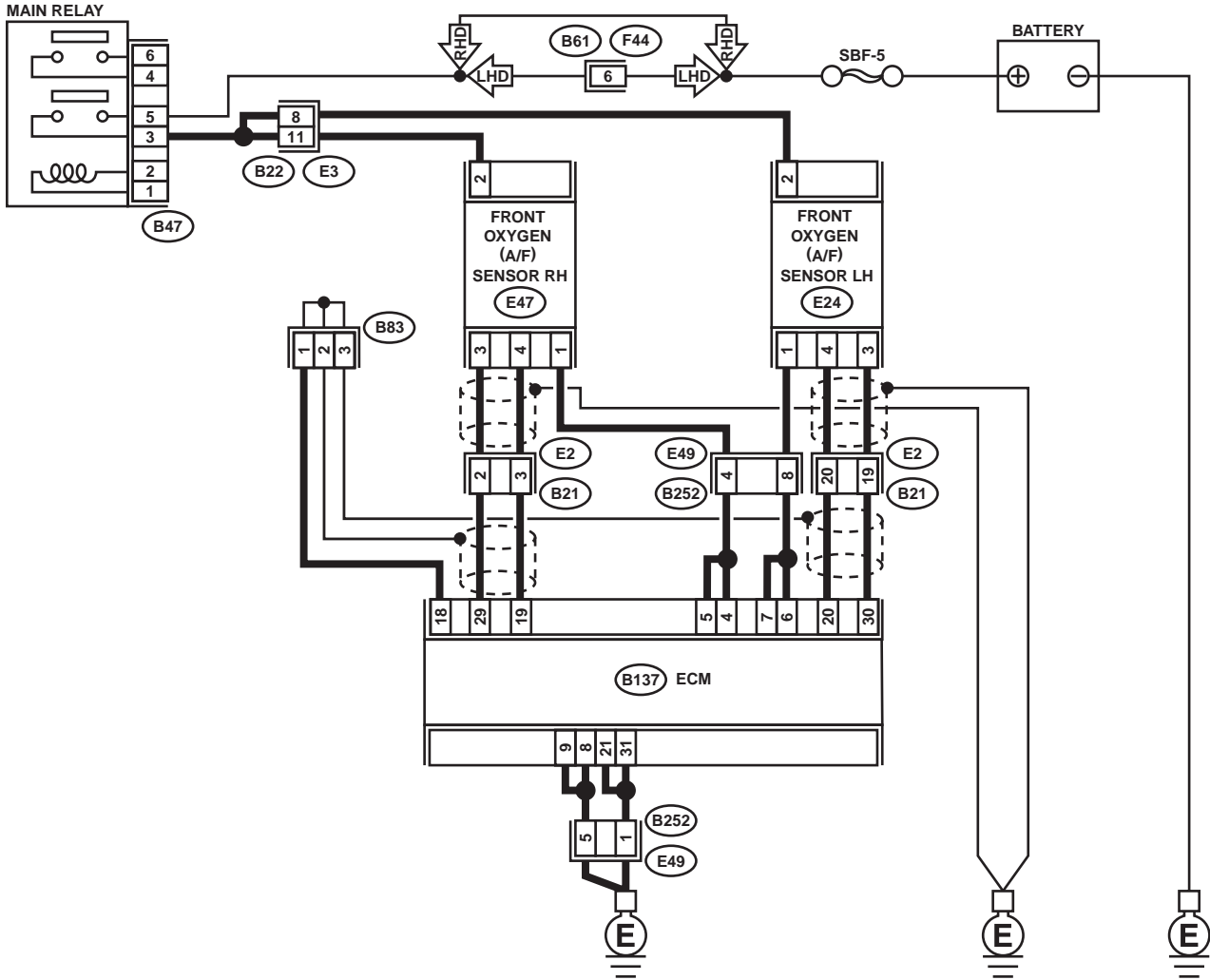
• DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DTC ON DISPLAY. Are P0130 and P0134 displayed at the same time?	Δισπλάμεδ	Go to step 3.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FRONT O2 (A/F) SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and front O2 (A/F) sensor. 3) Measure resistance of harness between ECM connectors. Connector & terminal (B137) No. 29 — (B137) No. 19: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair ground short circuit in harness between ECM and front oxygen O2 (A/F) sensor connector.
3 CHECK INPUT SIGNAL FOR ECM. 1) Connect ECM and front O2 (A/F) sensor connector. 2) Turn ignition switch to ON. 3) After warming up engine, idle engine. 4) Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-): Is the measured value within the specified range?	3.5 — 4.5 V	Go to step 4.	Repair power short circuit in harness, when 4.5 V or more. Repair ground short circuit in harness, when 3.5 V or less.
4 CHECK ECM INPUT VOLTAGE. Measure voltage between ECM connector and body ground. Connector & terminal (B137) No. 19 (+) — Chassis ground (-): Is the measured value within the specified range?	2.5 — 4.95 V	Replace front O2 (A/F) sensor.	Repair power short circuit in harness, when 4.95 V or more. Repair ground short circuit in harness, when 2.5 V or less.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

W: DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

—

- **DTC DETECTING CONDITION:**

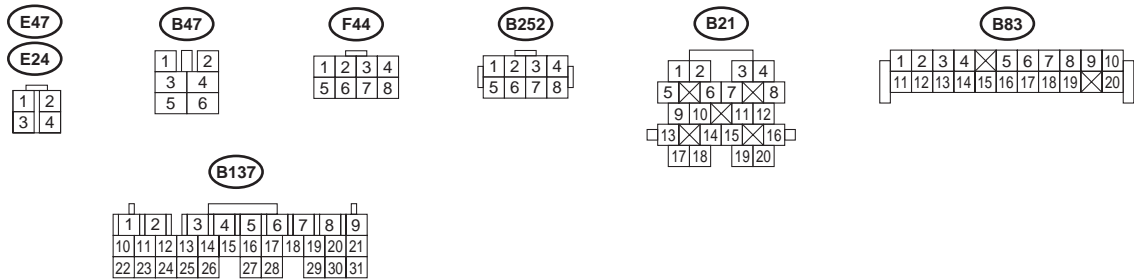
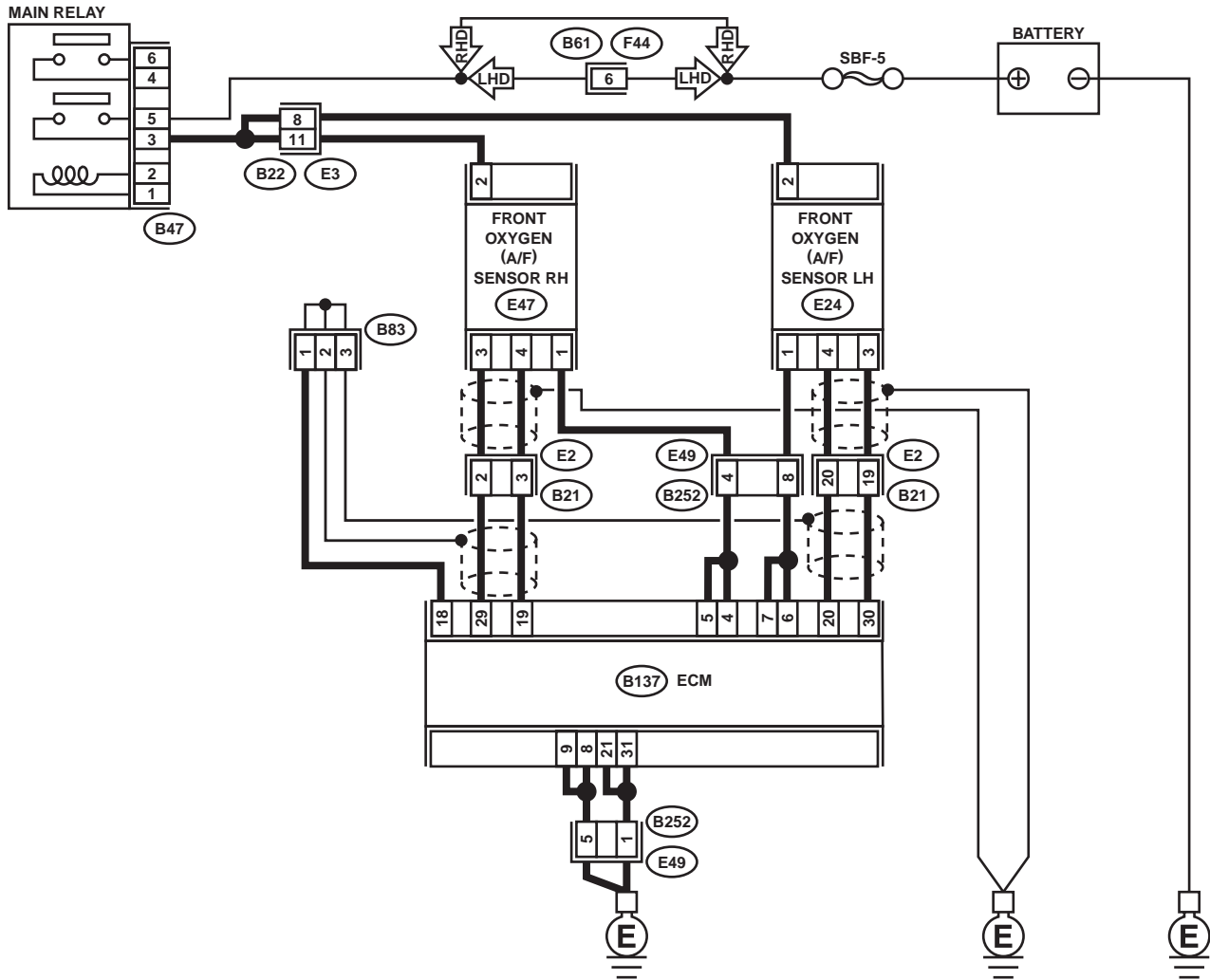
- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step 2.
2 CHECK EXHAUST SYSTEM. NOTE: Check the following items. <ul style="list-style-type: none">• Loose installation of front portion of exhaust pipe onto cylinder heads• Loose connection between front exhaust pipe and front catalytic converter (RH side)• Damage of exhaust pipe resulting in a hole Is there a fault in exhaust system?	There is a malfunction.	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

X: DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

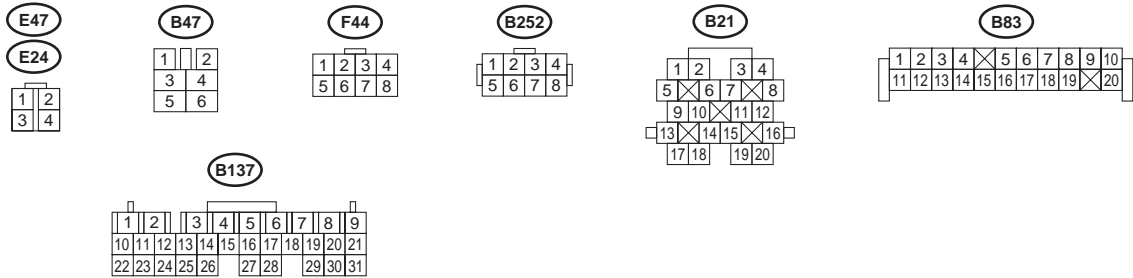
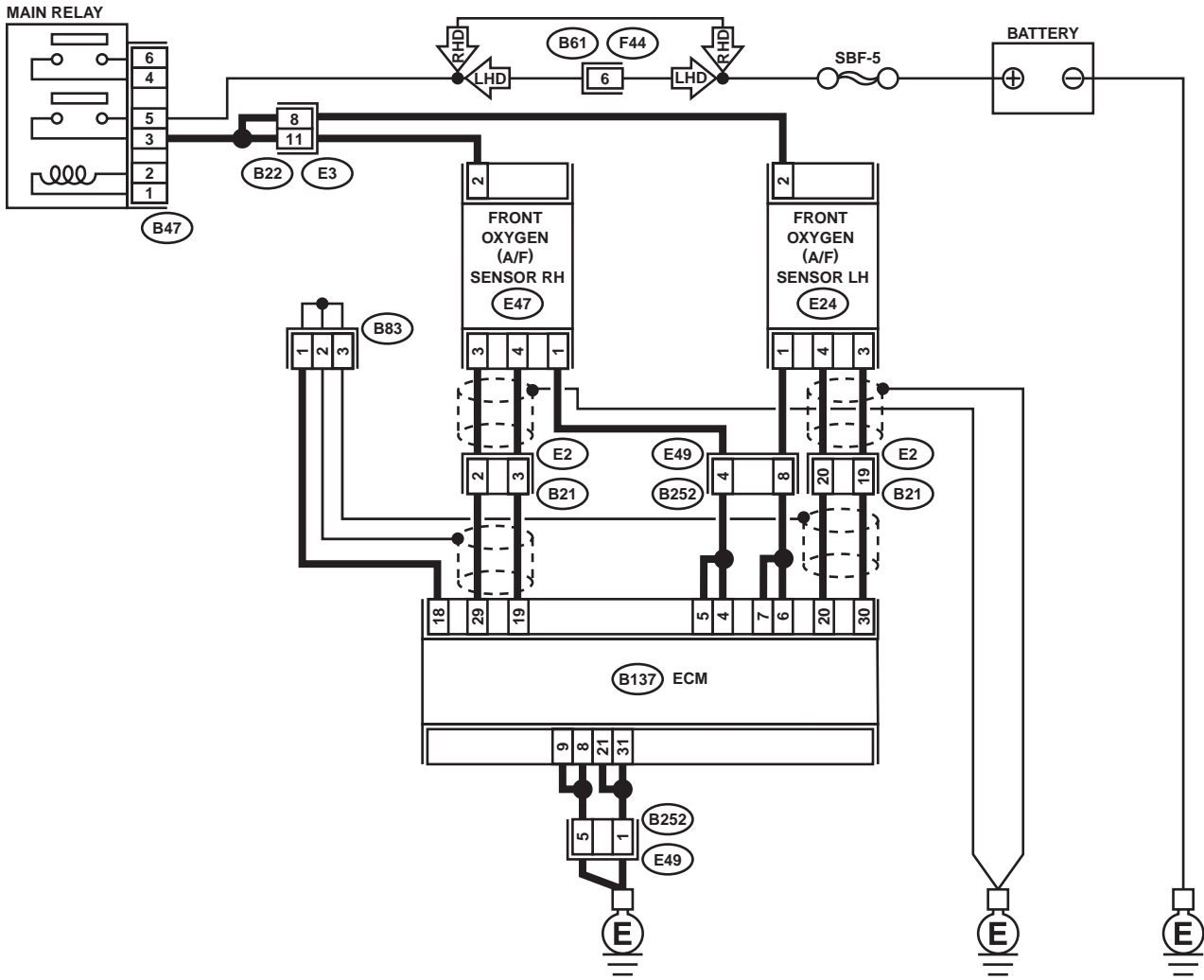
- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 19 — (E47) No. 4:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
<p>2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 29 — (E47) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
<p>3 CHECK POOR CONTACT.</p> <p>Check poor contact in front oxygen (A/F) sensor connector. Is there poor contact in front oxygen (A/F) sensor connector?</p>	There is poor contact.	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

Y: DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

NOTE:

For diagnostic procedure, refer to DTC P0138.

<Ref. to EN(H6DO)-170, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Z: DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

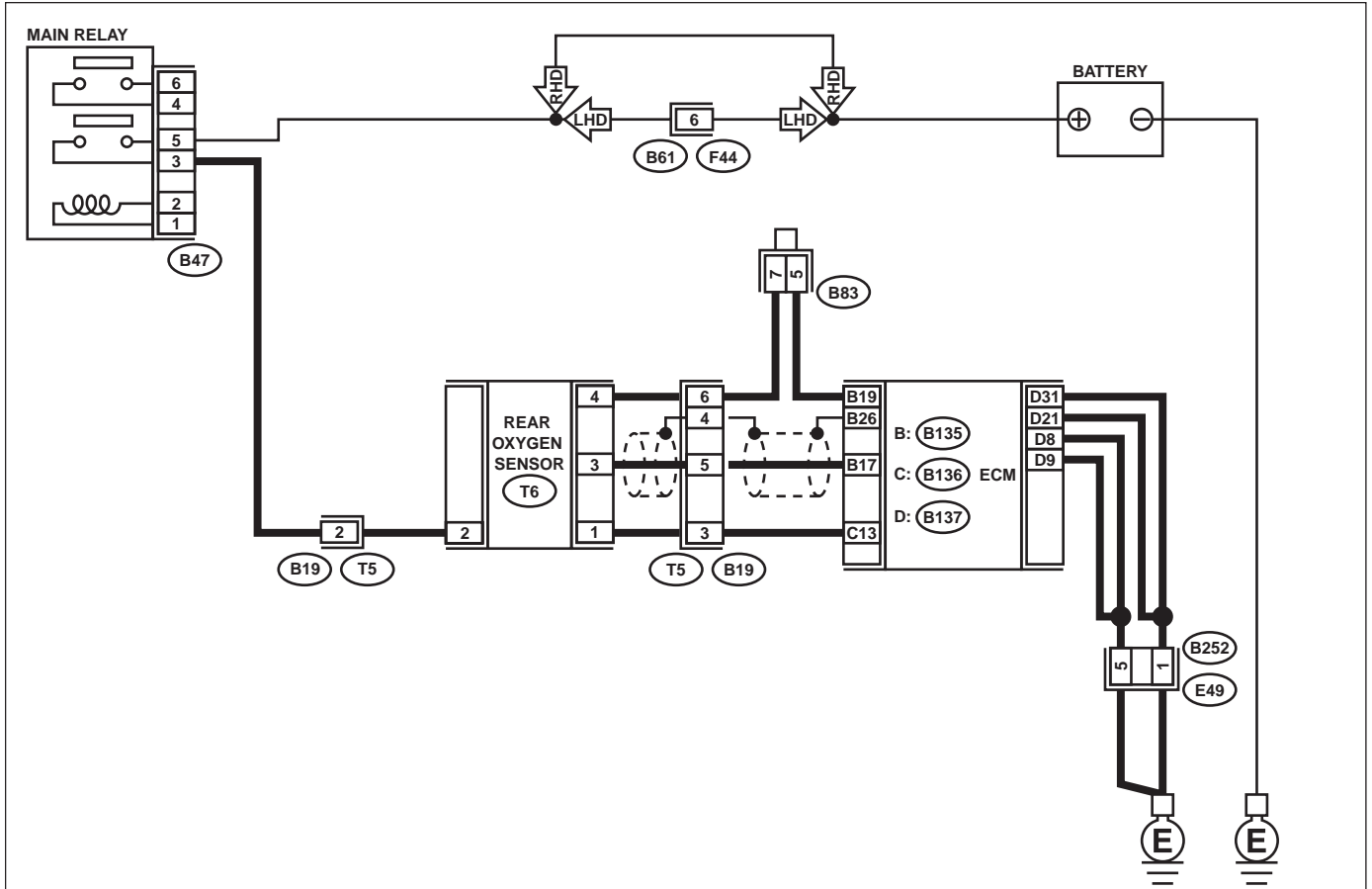
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



T6



B19



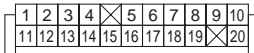
B47



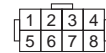
F44



B83



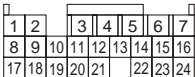
B252



B: B135



C: B136



D: B137



EN-01088

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC is displayed?	Another DTC is displayed.	Check the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2) Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the value fluctuate? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Value fluctuates.	Go to step 6.	Go to step 3.
3 CHECK REAR OXYGEN SENSOR DATA. Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool. Is the measured value within the specified range?	Output maximum value 0.49 V or more and output minimum value 0.25 V or less.	Go to step 4.	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and rear oxygen sensor. 3) Measure resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 19 — (T6) No. 4: Does the measured value exceed the specified value?	3 Ω	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 5.
5 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?	0.2 V	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none">• Loose installation of portions• Damage (crack, hole etc.) of parts• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor Is there a fault in exhaust system?	There is a trouble.	Repair or replace faulty parts.	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AA:DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

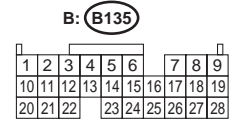
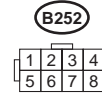
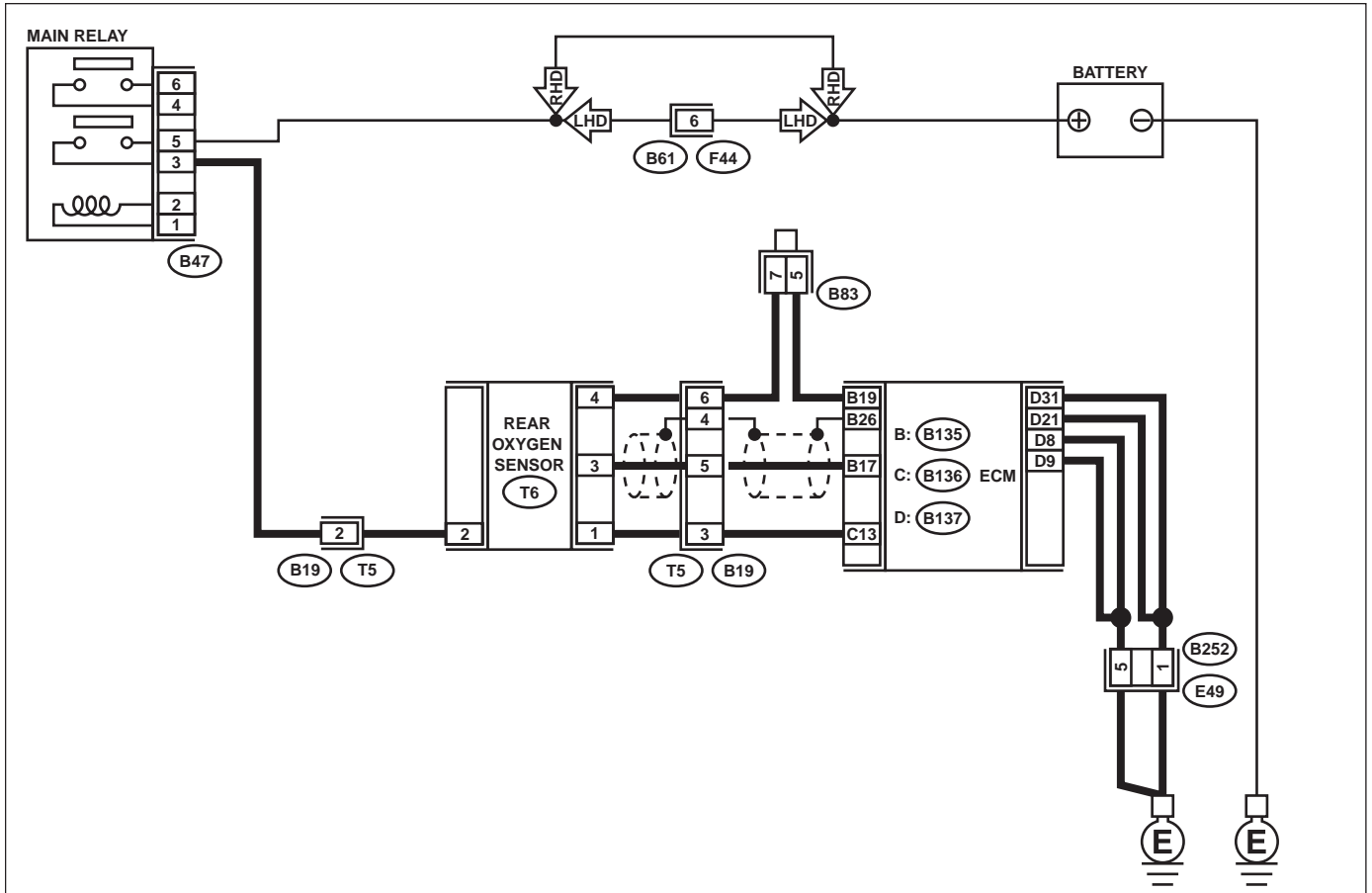
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

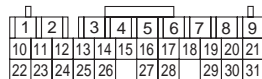
WIRING DIAGRAM:



C: B136



D: B137



EN-01088

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AB:DTC P0150 — O2 SENSOR CIRCUIT (BANK 2 SENSOR 1) —

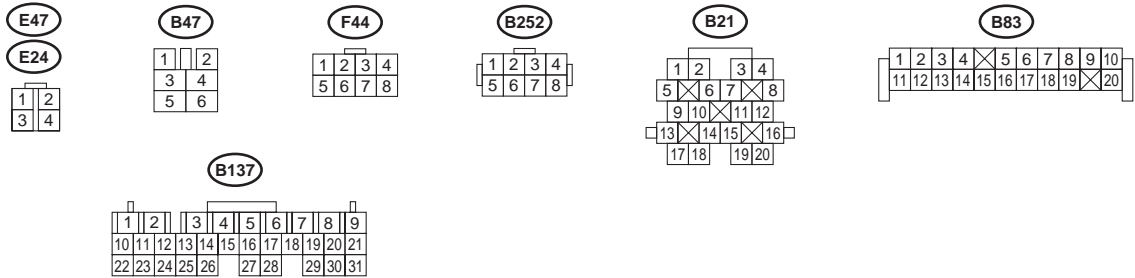
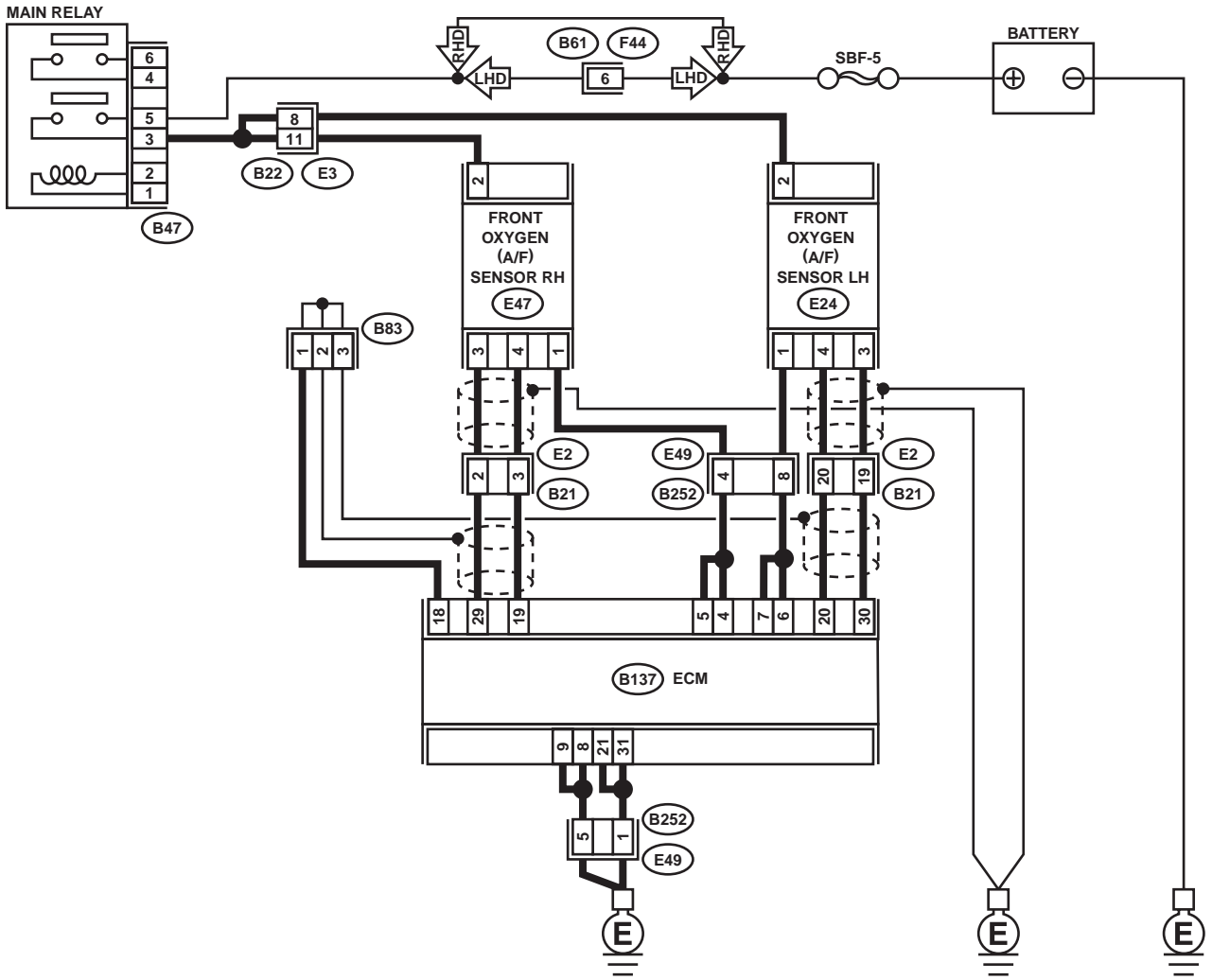
- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DTC ON DISPLAY. Are P0150 and P0154 displayed at the same time?	Displayed	Go to step 3.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FRONT O2 (A/F) SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and front O2 (A/F) sensor. 3) Measure resistance of harness between ECM connectors. Connector & terminal (B137) No. 30 — (B137) No. 20: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair ground short circuit in harness between ECM and front oxygen O2 (A/F) sensor connector.
3 CHECK INPUT SIGNAL FOR ECM. 1) Connect ECM and front O2 (A/F) sensor connector. 2) Turn ignition switch to ON. 3) After warming up engine, idle engine. 4) Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 30 (+) — Chassis ground (-): Is the measured value within the specified value?	3.5 — 4.5 V	Go to step 4.	Repair power short circuit in harness, when 4.5 V or more. Repair ground short circuit in harness, when 3.5 V or less.
4 CHECK ECM INPUT VOLTAGE. Measure voltage between ECM connector and body ground. Connector & terminal (B137) No. 20 (+) — Chassis ground (-): Is the measured value within the specified value?	2.5 — 4.95 V	Replace front O2 (A/F) sensor.	Repair power short circuit in harness, when 4.95 V or more. Repair ground short circuit in harness, when 2.5 V or less.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AC:DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

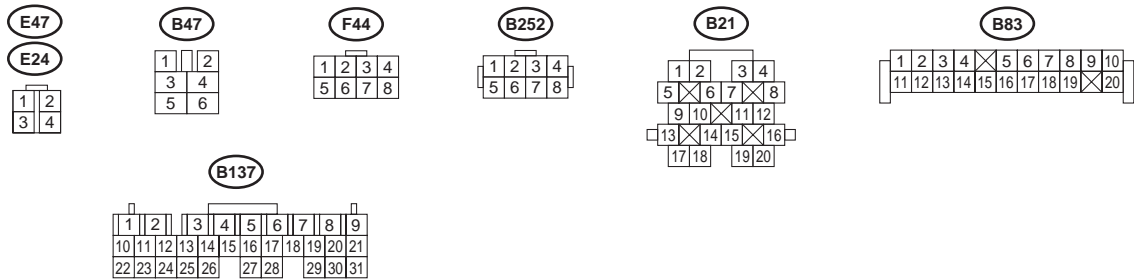
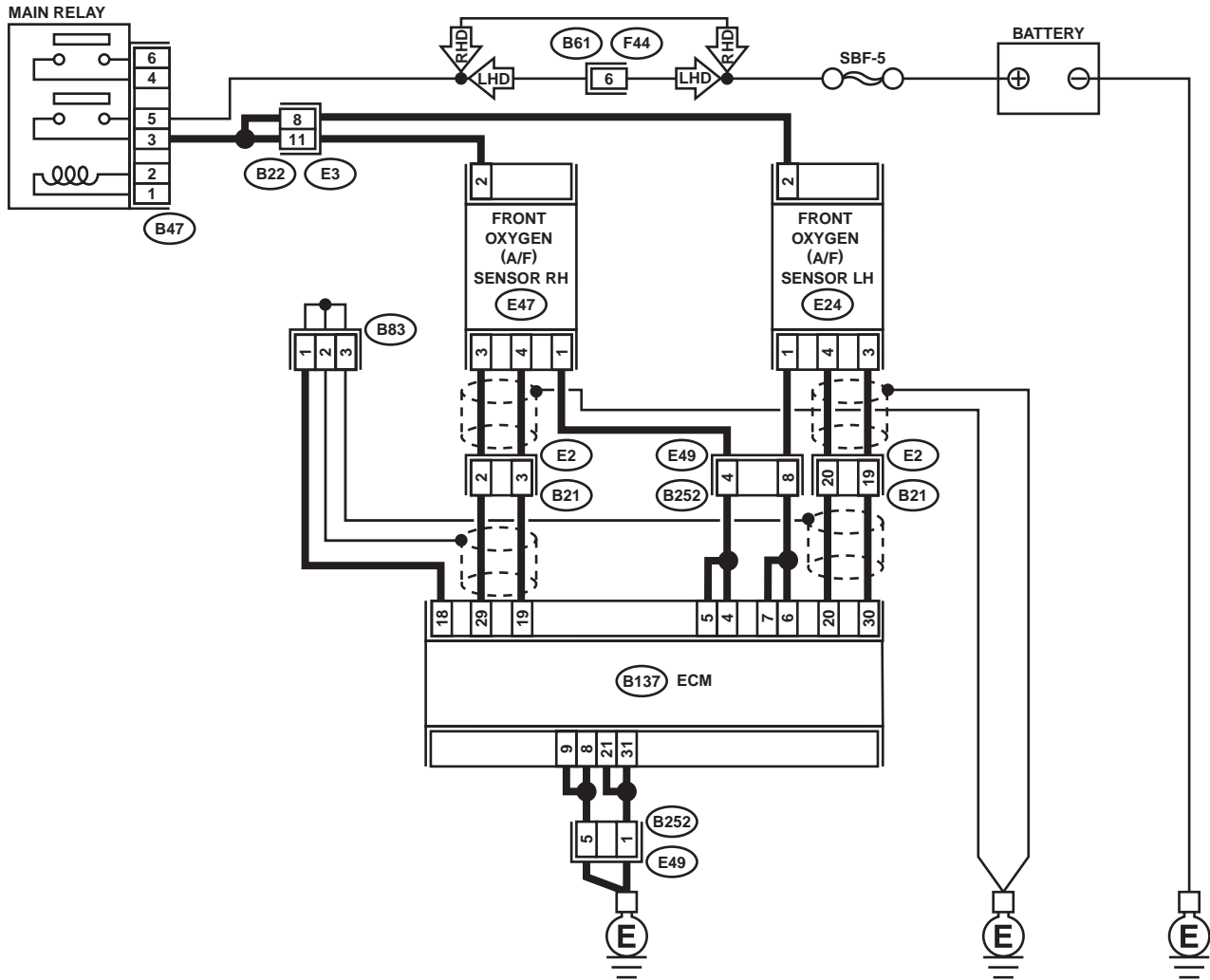
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0153.	Go to step 2.
2 CHECK EXHAUST SYSTEM. NOTE: Check the following items. <ul style="list-style-type: none">• Loose installation of front portion of exhaust pipe onto cylinder heads• Loose connection between front exhaust pipe and front catalytic converter (RH side)• Damage of exhaust pipe resulting in a hole Is there a fault in exhaust system?	There is a trouble.	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AD:DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —

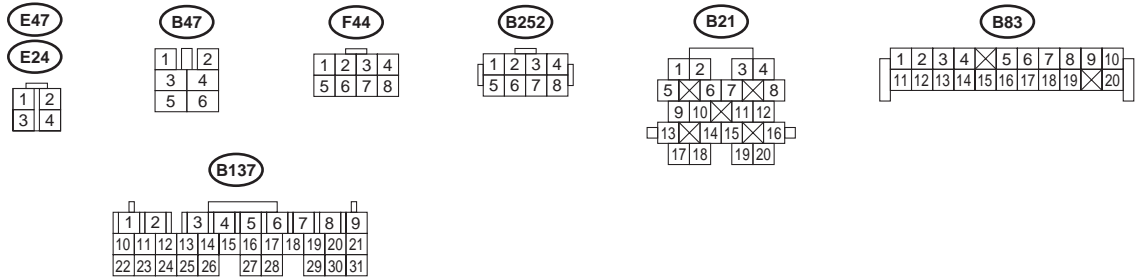
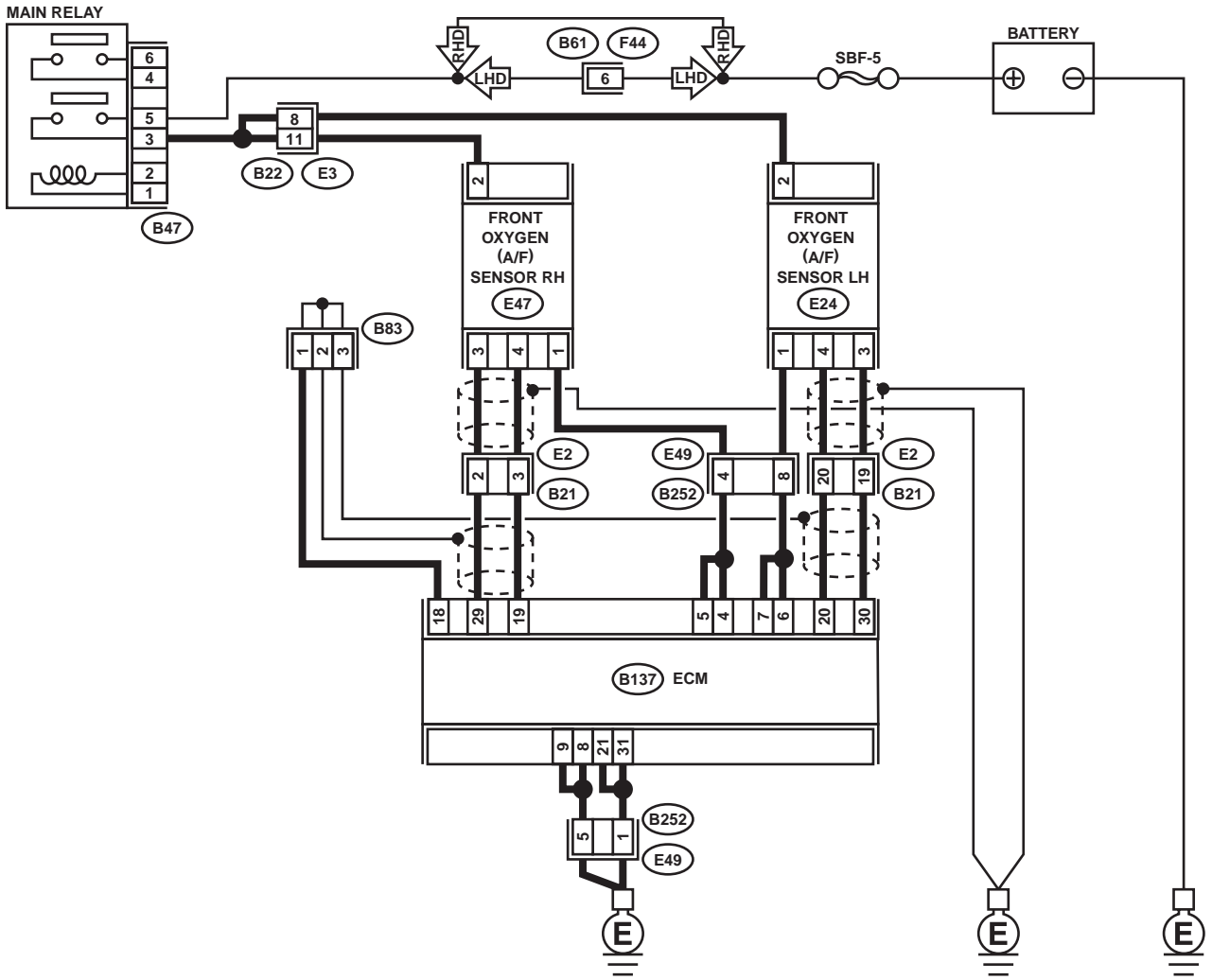
- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 20 — (E24) No. 4:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
<p>2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 30 — (E24) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
<p>3 CHECK POOR CONTACT.</p> <p>Check poor contact in front oxygen (A/F) sensor connector. Is there poor contact in front oxygen (A/F) sensor connector?</p>	There is poor contact.	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

AE:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H6DO)-188, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AF:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK EXHAUST SYSTEM. Are there holes or loose bolts on exhaust system?	Holes or loose bolts are found.	Repair exhaust system.	Go to step 3.
3 CHECK AIR INTAKE SYSTEM. Are there holes, loose bolts or disconnection of hose on air intake system?	Holes, loose bolts or disconnection of hose is found.	Repair air intake system.	Go to step 4.
4 CHECK FUEL PRESSURE. Warning: • Place "NO FIRE" signs near the working area. • Be careful not to spill fuel on the floor. 1) Lower fuel pressure. (1) Disconnect connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Is the measured value within the specified range? Warning: Before removing fuel pressure gauge, lower fuel pressure. NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	284 — 314 kPa (2.9 — 3.2 kg/cm ² , 41 — 46 psi)	Go to step 5.	Repair the following items. Fuel pressure too high • Clogged fuel return line or bent hose Fuel pressure too low • Improper fuel pump discharge • Clogged fuel supply line

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK FUEL PRESSURE. After connecting pressure regulator vacuum hose, measure fuel pressure. Is the measured value within the specified range?</p> <p>Warning: Before removing fuel pressure gauge, lower fuel pressure.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose. 	206 — 235 kPa (2.1 — 2.4 kg/cm ² , 30 — 34 psi)	Go to step 6.	Repair the following items. Fuel pressure too high • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
<p>6 CHECK FUEL INJECTOR. 1) Turn ignition switch to OFF. 2) Remove right bank fuel injector. <Ref. to FU(H6DO)-39, REMOVAL, Fuel Injector.> 3) Check fuel injector Is fuel injector clogged?</p>	Fuel injector is clogged.	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>	Go to step 7.
<p>7 CHECK FUEL INJECTOR. Measure resistance between terminals of fuel injector. Terminals No. 1 — No. 2 Is the measured value within the specified range?</p>	5 — 20 Ω	Go to step 8.	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>
<p>8 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. 	75°C (167°F)	Go to step 9.	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>9 CHECK INTAKE MANIFOLD PRESSURE SENSOR.</p> <ol style="list-style-type: none"> 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. <p>Is the measured value within the specified range?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Ignition ON 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg), Idling 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)</p>	<p>Go to step 10.</p>	<p>Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.></p>
<p>10 CHECK INTAKE AIR TEMPERATURE SENSOR.</p> <ol style="list-style-type: none"> 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open front hood. 6) Measure ambient temperature. 7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. <p>Is value within the specified range when ambient temperature is subtracted from intake air temperature greater than -10°C (14°F) and less than 50°C (122°F)?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>-10 — 50°C (14 — 122°F)</p>	<p>Contact SUBARU distributor service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>	<p>Check intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.></p>

AG:DTC P0174 — SYSTEM TOO LEAN (BANK 2) —

NOTE:

For the diagnostic procedure, refer to DTC P0175. <Ref. to EN(H6DO)-192, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AH:DTC P0175 — SYSTEM TOO RICH (BANK 2) —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

• **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK EXHAUST SYSTEM. Are there holes or loose bolts on exhaust system?	Holes or loose bolts are found.	Repair exhaust system.	Go to step 3.
3 CHECK AIR INTAKE SYSTEM. Are there holes, loose bolts or disconnection of hose on air intake system?	Holes, loose bolts or disconnection of hose is found.	Repair air intake system.	Go to step 4.
4 CHECK FUEL PRESSURE. Warning: • Place "NO FIRE" signs near the working area. • Be careful not to spill fuel on the floor. 1) Lower fuel pressure. (1) Disconnect connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Is the measured value within the specified range? Warning: Before removing fuel pressure gauge, lower fuel pressure. NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	284 — 314 kPa (2.9 — 3.2 kg/cm ² , 41 — 46 psi)	Go to step 5.	Repair the following items. Fuel pressure too high • Clogged fuel return line or bent hose Fuel pressure too low • Improper fuel pump discharge • Clogged fuel supply line

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK FUEL PRESSURE. After connecting pressure regulator vacuum hose, measure fuel pressure. Is the measured value within the specified range?</p> <p>Warning: Before removing fuel pressure gauge, lower fuel pressure.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose. 	206 — 235 kPa (2.1 — 2.4 kg/cm ² , 30 — 34 psi)	Go to step 6.	Repair the following items. Fuel pressure too high <ul style="list-style-type: none"> • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low <ul style="list-style-type: none"> • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
<p>6 CHECK FUEL INJECTOR. 1) Turn ignition switch to OFF. 2) Remove left bank fuel injector. <Ref. to FU(H6DO)-39, REMOVAL, Fuel Injector.> 3) Check fuel injector. Is fuel injector clogged?</p>	Fuel injector is clogged.	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>	Go to step 7.
<p>7 CHECK FUEL INJECTOR. Measure resistance between terminals of fuel injector. Terminals No. 1 — No. 2 Is the measured value within the specified range?</p>	5 — 20 Ω	Go to step 8.	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>
<p>8 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. 	75°C (167°F)	Go to step 9.	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>9 CHECK INTAKE MANIFOLD PRESSURE SENSOR.</p> <ol style="list-style-type: none"> 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. <p>Is the measured value within the specified range?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Ignition ON 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg), Idling 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)</p>	<p>Go to step 10.</p>	<p>Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.></p>
<p>10 CHECK INTAKE AIR TEMPERATURE SENSOR.</p> <ol style="list-style-type: none"> 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open front hood. 6) Measure ambient temperature. 7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. <p>Is value the specified range when ambient temperature is subtracted from intake air temperature?</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>-10 — 50°C (14 — 122°F)</p>	<p>Contact SUBARU distributor service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>	<p>Check intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

AI: DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

• DTC DETECTING CONDITION:

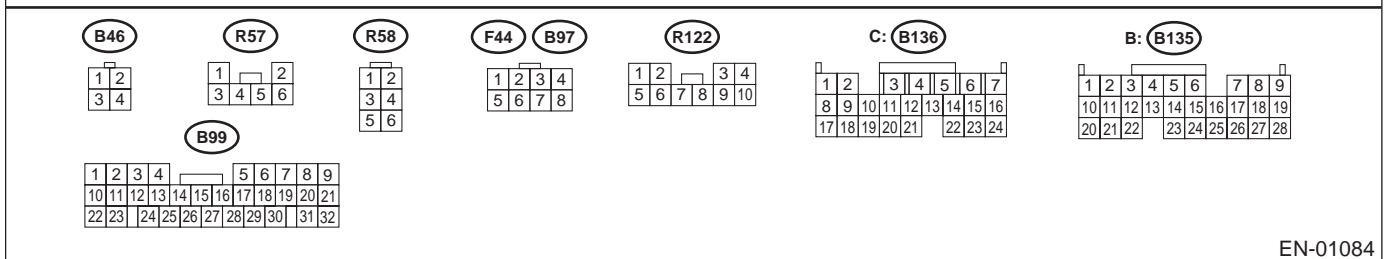
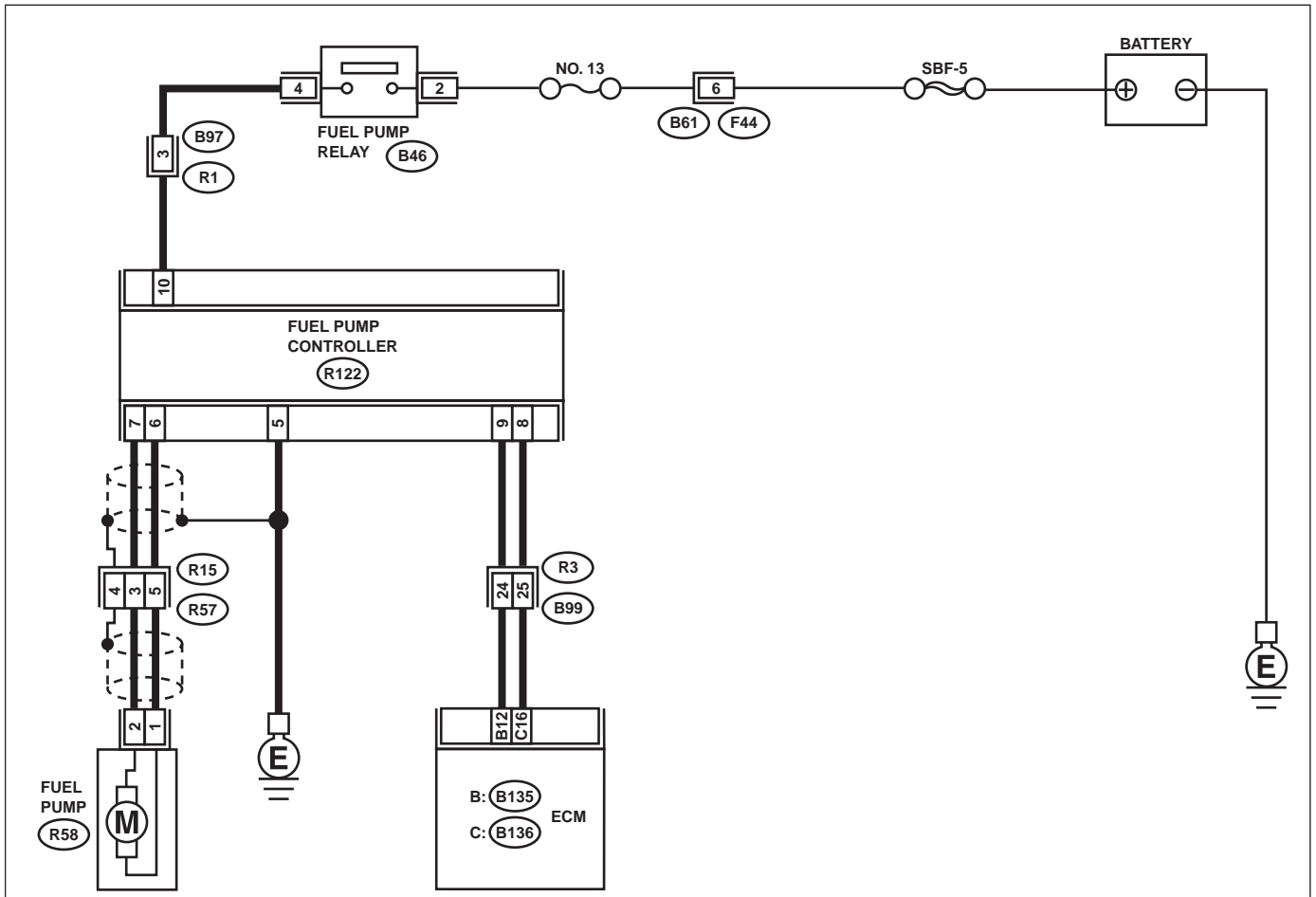
- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, Inspection Mode.>.

• WIRING DIAGRAM:

- LHD model

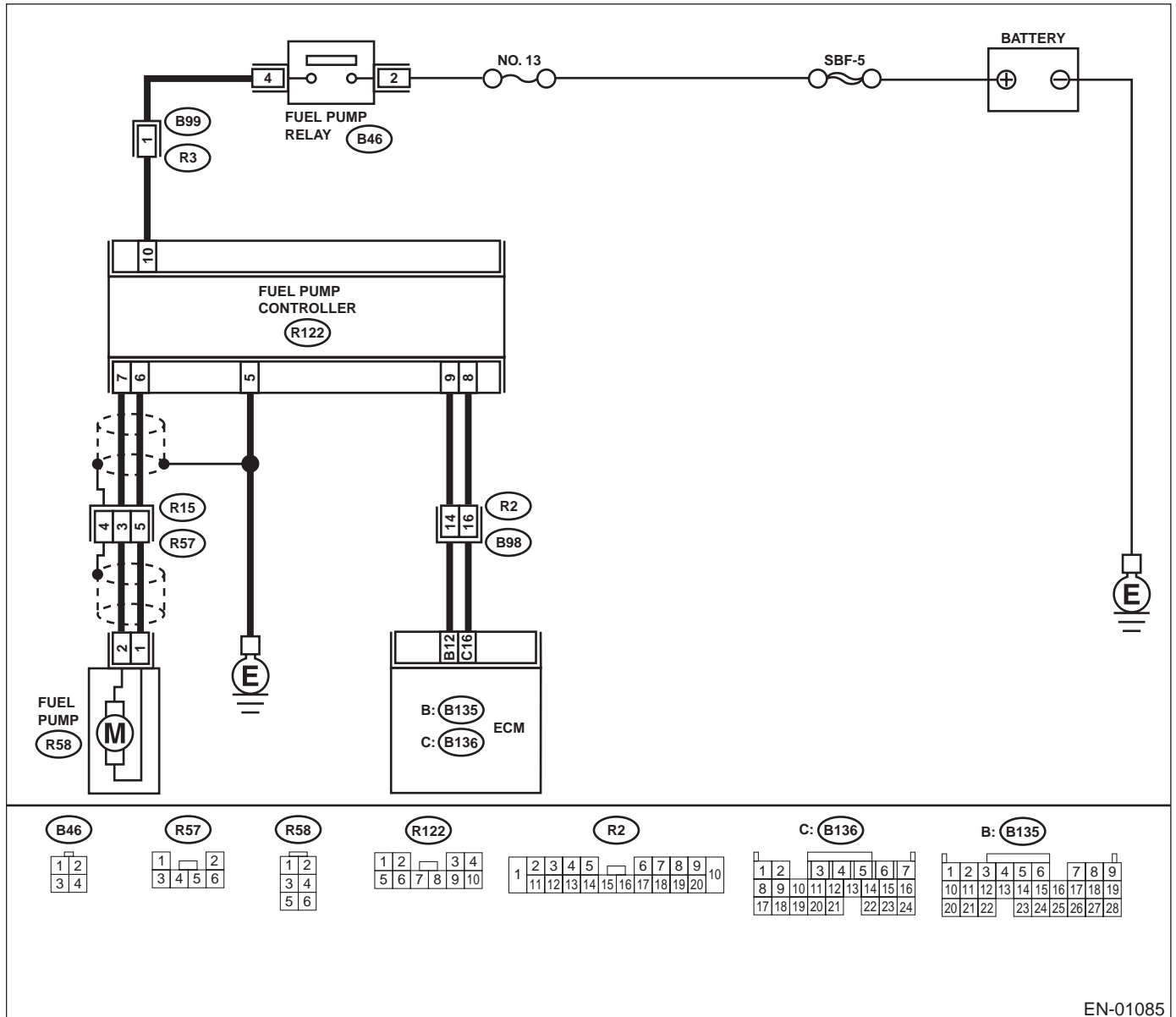


EN-01084

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

- RHD model



EN-01085

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROLLER.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel pump controller. 3) Turn ignition switch to ON. 4) Measure voltage between fuel pump controller and chassis ground. <p>Connector & terminal (R122) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Repair power supply circuit. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open or ground short circuit in harness between fuel pump relay and fuel pump controller. • Poor contact in fuel pump controller connector. • Poor contact in fuel pump relay connector.
<p>2 CHECK GROUND CIRCUIT OF FUEL PUMP CONTROLLER.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Measure resistance of harness between fuel pump controller and chassis ground. <p>Connector & terminal (R122) No. 5 — Chassis ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit between fuel pump controller and chassis ground. • Poor contact in fuel pump controller connector.
<p>3 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.</p> <ol style="list-style-type: none"> 1) Disconnect connector from fuel pump. 2) Measure resistance of harness between fuel pump controller and fuel pump connector. <p>Connector & terminal (R122) No. 7 — (R58) No. 2: (R122) No. 6 — (R58) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair open circuit between fuel pump controller and fuel pump.
<p>4 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.</p> <p>Measure resistance of harness between fuel pump controller and chassis ground.</p> <p>Connector & terminal (R122) No. 7 — Chassis ground: (R122) No. 6 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Repair ground short circuit between fuel pump controller and fuel pump.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fuel pump controller and ECM connector. Connector & terminal (R122) No. 9 — (B135) No. 12: (R122) No. 8 — (B136) No. 16: Is the measured value less than the specified value?</p>	1 Ω	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump controller and ECM. • Poor contact in fuel pump controller and ECM connector.
<p>6 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR. Measure resistance of harness between fuel pump controller and chassis ground. Connector & terminal (R122) No. 9 — Chassis ground: (R122) No. 8 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Repair ground short circuit between fuel pump controller and ECM.
<p>7 CHECK POOR CONTACT. Check poor contact in ECM and fuel pump controller connector. Is there poor contact in ECM and fuel pump controller connector.</p>	There is poor contact.	Repair poor contact in ECM and fuel pump controller.	Replace fuel pump controller. <Ref. to FU(H6DO)-49, Fuel Pump Controller.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AJ:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-202, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AK:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-202, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AL:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-202, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AM:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-202, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AN:DTC P0305 — CYLINDER 5 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-202, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AO:DTC P0306 — CYLINDER 6 MISFIRE DETECTED —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)

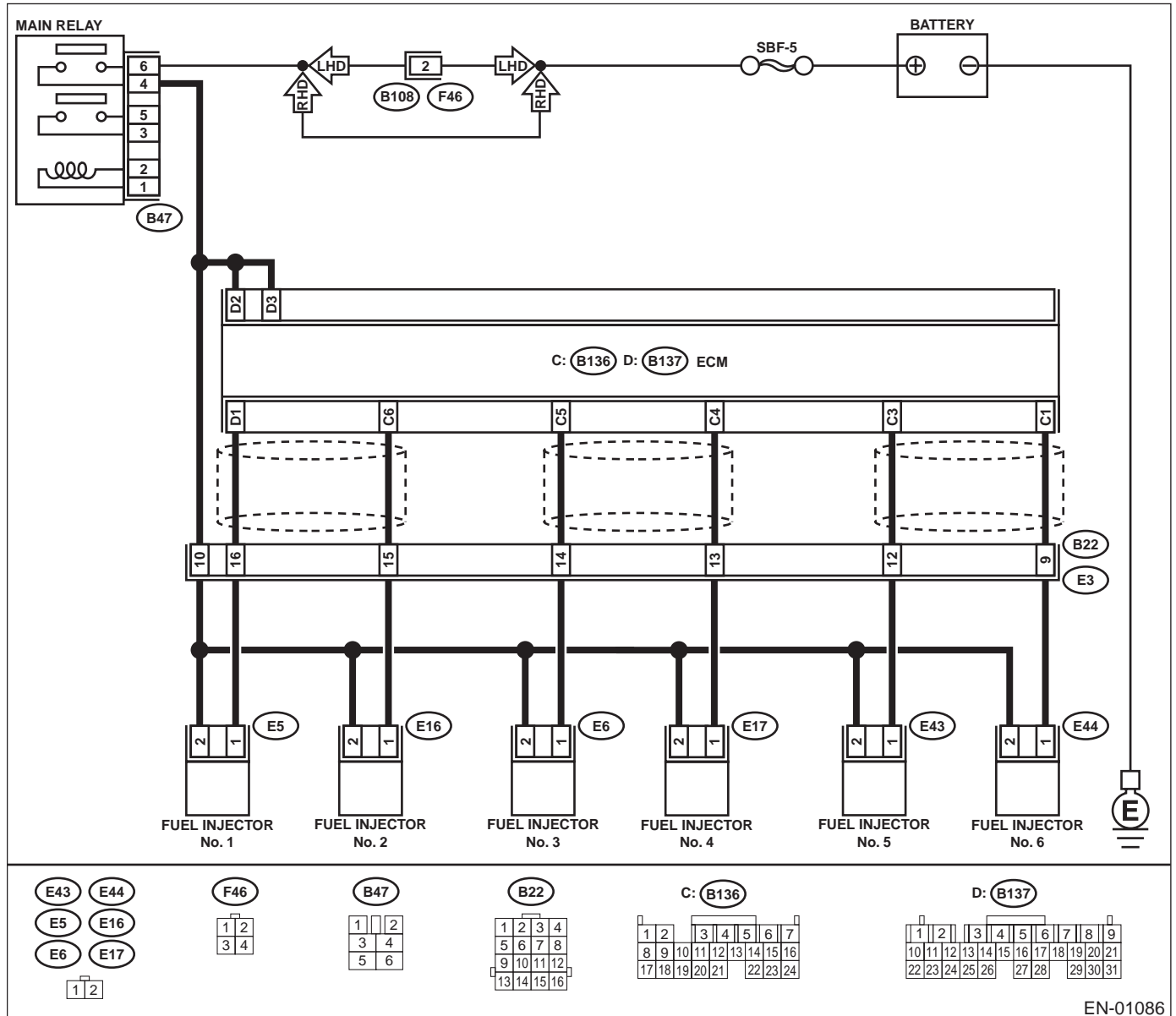
• TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01086

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303, P0304, P0305 and P0306.	Go to step 2.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground on faulty cylinders. Connector & terminal #1 (B137) No. 1 (+) — Chassis ground (-): #2 (B136) No. 6 (+) — Chassis ground (-): #3 (B136) No. 5 (+) — Chassis ground (-): #4 (B136) No. 4 (+) — Chassis ground (-): #5 (B136) No. 3 (+) — Chassis ground (-): #6 (B136) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 7.	Go to step 3.
3 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on faulty cylinders. 3) Measure resistance between ECM connector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 1 — Engine ground: #2 (E16) No. 1 — Engine ground: #3 (E6) No. 1 — Engine ground: #4 (E17) No. 1 — Engine ground: #5 (E43) No. 1 — Engine ground: #6 (E44) No. 1 — Engine ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between fuel injector and ECM connector.	Go to step 4.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>4 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. Measure resistance of harness connector between ECM connector and fuel injector on faulty cylinders.</p> <p>Connector & terminal #1 (B137) No. 1 — (E5) No. 1: #2 (B136) No. 6 — (E16) No. 1: #3 (B136) No. 5 — (E6) No. 1: #4 (B136) No. 4 — (E17) No. 1: #5 (B136) No. 3 — (E43) No. 1: #6 (B136) No. 1 — (E44) No. 1:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
<p>5 CHECK FUEL INJECTOR. Measure resistance between fuel injector terminals on faulty cylinder.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified range?</p>	5 — 20 Ω	Go to step 6.	Replace faulty fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>
<p>6 CHECK POWER SUPPLY LINE. 1) Turn ignition switch to ON. 2) Measure voltage between fuel injector and engine ground on faulty cylinders.</p> <p>Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-): #5 (E43) No. 2 (+) — Engine ground (-): #6 (E44) No. 2 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on faulty cylinder. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground on faulty cylinders.</p> <p>Connector & terminal #1 (B137) No. 1 (+) — Chassis ground (-): #2 (B136) No. 6 (+) — Chassis ground (-): #3 (B136) No. 5 (+) — Chassis ground (-): #4 (B136) No. 4 (+) — Chassis ground (-): #5 (B136) No. 3 (+) — Chassis ground (-): #6 (B136) No. 1 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step 8 .
<p>8 CHECK FUEL INJECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between fuel injector terminals on faulty cylinder.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Replace faulty fuel injector <Ref. to FU(H6DO)-39, Fuel Injector.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>.	Go to step 9 .
<p>9 CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</p> <p>Is camshaft position sensor or crankshaft position sensor loosely installed?</p>	Loosely installed.	Tighten camshaft position sensor or crankshaft position sensor.	Go to step 10 .
<p>10 CHECK CRANKSHAFT PLATE.</p> <p>Is crankshaft plate rusted or does it have broken teeth?</p>	Rusted or teeth is broken.	Replace crankshaft plate.	Go to step 11 .
<p>11 CHECK INSTALLATION CONDITION OF TIMING CHAIN.</p> <p>Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark. ST 18252AA000 CRANKSHAFT SOCKET</p> <p>Is timing chain dislocated from its proper position?</p>	Dislocated from proper position.	Repair installation condition of timing chain. <Ref. to ME(H6DO)-41, Timing Chain Assembly.>	Go to step 12 .
<p>12 CHECK FUEL LEVEL.</p> <p>Is the fuel meter indication lower than the "Lower" level?</p>	The indication is lower.	Replenish fuel so fuel meter indication is higher than the "Lower" level. After replenishing fuel, Go to step 13 .	Go to step 13 .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
13 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI). 1) Clear memory using Subaru Select Monitor. <Ref. to EN(H6DO)-54, Clear Memory Mode.> 2) Start engine, and drive the vehicle more than 10 minutes. Is the MI coming on or blinking?	Comes on or blinking.	Go to step 15.	Go to step 14.
14 CHECK CAUSE OF MISFIRE DIAGNOSED. Was the cause of misfire diagnosed when the engine is running?	Diagnosed.	Finish diagnostics operation, if the engine has no abnormality.	Repair poor contact. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15 CHECK AIR INTAKE SYSTEM. Is there a fault in air intake system?	There is a malfunction.	Repair air intake system. NOTE: Check the following items: <ul style="list-style-type: none"> • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses? 	Go to step 16.
16 CHECK MISFIRE SYMPTOM. 1) Turn ignition switch to ON. 2) Read diagnostic trouble code (DTC) using the Subaru Select Monitor or OBD-II general scan tool. <ul style="list-style-type: none"> • Subaru Select Monitor <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC?	Only one DTC is indicated.	Go to step 22.	Go to step 17.
17 CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0302?	Indicated.	Go to step 23.	Go to step 18.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
18 CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0303 and P0304?	Indicated.	Go to step 24 .	Go to step 19 .
19 CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0305 and P0306?	Indicated.	Go to step 25 .	Go to step 20 .
20 CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301, P0303 and P0305?	Indicated.	Go to step 26 .	Go to step 21 .
21 CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302, P0304 and P0306?	Indicated.	Go to step 27 .	Go to step 28 .
22 ONLY ONE CYLINDER Is there a fault in that cylinder?	There is a malfunction.	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plug • Fuel injector • Compression ratio 	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>
23 GROUP OF #1 AND #2 CYLINDERS Are there faults in #1 and #2 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: • Check the following items. Spark plugs Fuel injectors Ignition coil Compression ratio • If no abnormality is discovered, check for "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(H6DO)-80, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
24 GROUP OF #3 AND #4 CYLINDERS Are there faults in #3 and #4 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: • Check the following items. Spark plugs Fuel injectors Ignition coil • If no abnormality is discovered, check for "17. D: IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(H6DO)-80, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>
25 GROUP OF #5 AND #6 CYLINDERS Are there faults in #5 and #6 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: • Check the following items: Spark plugs, fuel injector, ignition coil and compression ratio • If no abnormality is discovered, check for "17. IGNITION CONTROL SYSTEM" of #5 and #6 cylinders side. <Ref. to EN(H6DO)-80, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>
26 GROUP OF #1, #3 AND #5 CYLINDERS Are there faults in #1, #3 and #5 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing chain	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
27 GROUP OF #2, #4 AND #6 CYLINDERS Are there faults in #2, #4 and #6 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plugs • Fuel injectors • Compression ratio • Skipping timing chain 	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>
28 CYLINDER AT RANDOM Is the engine idle unstable?	Engine idle is unstable.	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plugs • Fuel injectors • Compression ratio

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

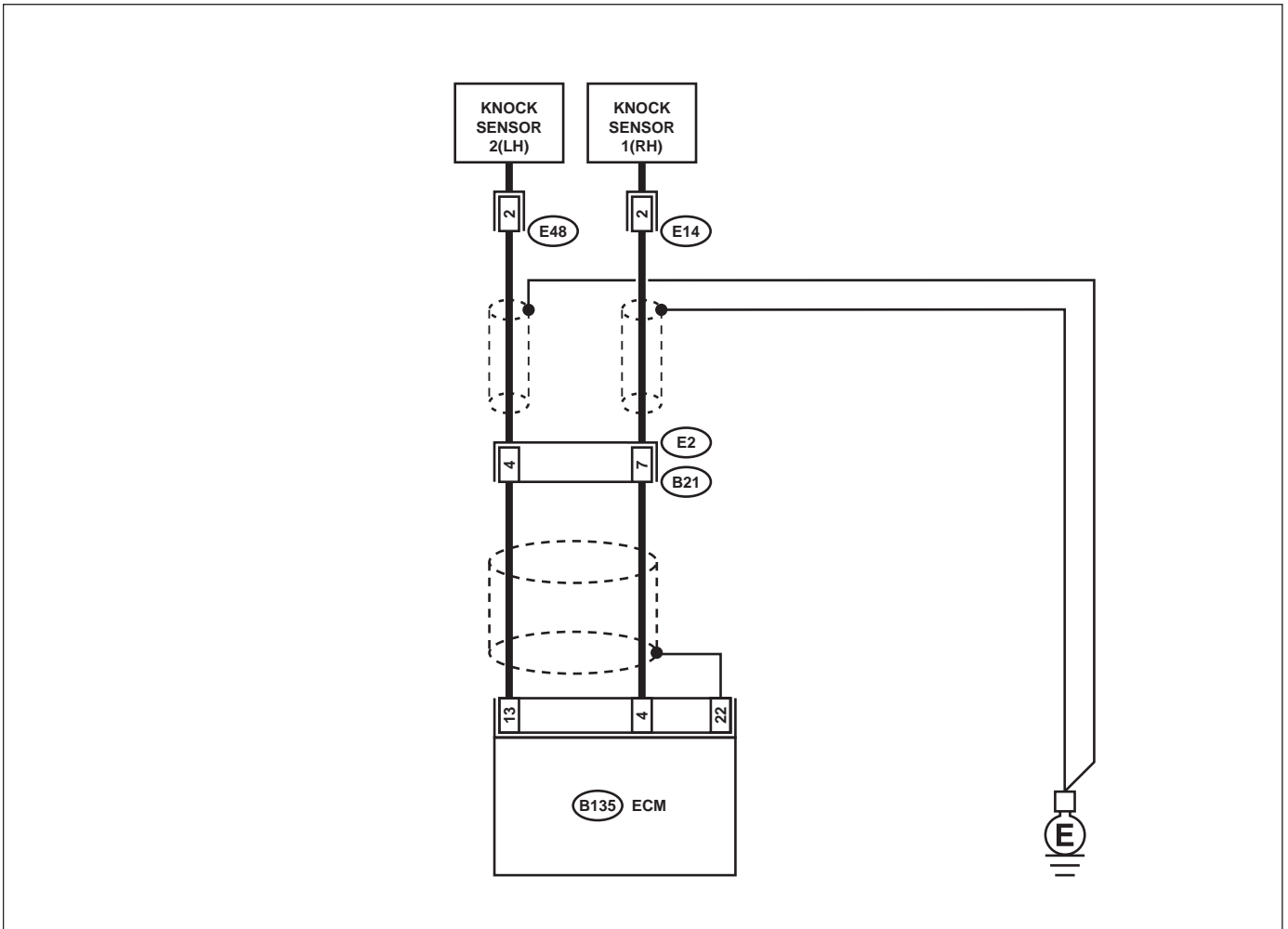
AP:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Poor driving performance
 - Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

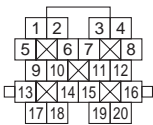


E48

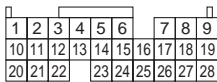
E14

1 2

B21



B135



EN-00816

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR 1 AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground. Connector & terminal (B135) No. 4 — Chassis ground: Does the measured value exceed the specified value?	700 kΩ	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between knock sensor 1 (RH) and ECM connector • Poor contact in knock sensor 1 (RH) connector • Poor contact in coupling connector
2 CHECK KNOCK SENSOR 1 (RH). 1) Disconnect connector from knock sensor 1 (RH). 2) Measure resistance between knock sensor connector terminal and engine ground. Terminal No. 2 — Engine ground: Does the measured value exceed the specified value?	700 kΩ	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between knock sensor 1 (RH) and ECM connector • Poor contact in knock sensor 1 (RH) connector • Poor contact in coupling connector
3 CHECK CONDITION OF KNOCK SENSOR 1 (RH) INSTALLATION. Is the knock sensor 1 (RH) installation bolt tightened securely?	Tightened securely.	Replace knock sensor 1 (RH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Tighten knock sensor 1 (RH) installation bolt securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

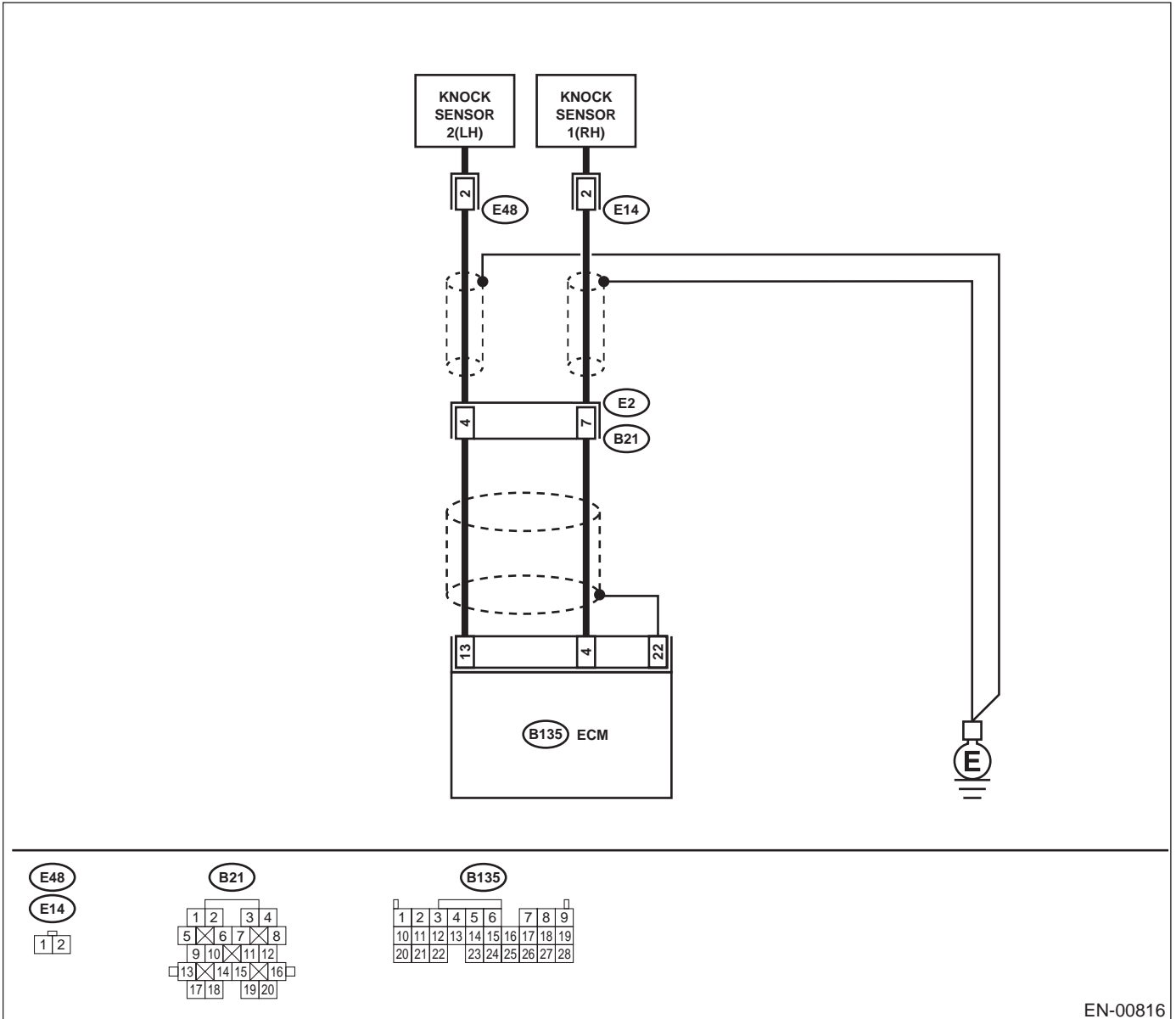
AQ:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Poor driving performance
 - Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00816

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR 1 (RH) AND ECM CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 4 — Chassis ground: Is the measured value less than the specified value?	400 k Ω	Go to step 2.	Go to step 3.
2 CHECK KNOCK SENSOR 1 (RH). 1) Disconnect connector from knock sensor 1 (RH). 2) Measure resistance between knock sensor connector terminal and engine ground. Terminal No. 2 — Engine ground: Is the measured value less than the specified value?	400 k Ω	Replace knock sensor 1 (RH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Repair ground short circuit in harness between knock sensor 1 (RH) connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3 CHECK INPUT SIGNAL FOR ECM. 1) Connect connectors to ECM and knock sensor 1 (RH). 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 4 (+) — Chassis ground (-): Does the measured value exceed the specified value?	2 V	Even if MI lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in knock sensor 1 (RH) connector • Poor contact in ECM connector • Poor contact in coupling connector 	Repair poor contact in ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

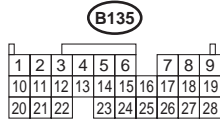
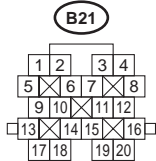
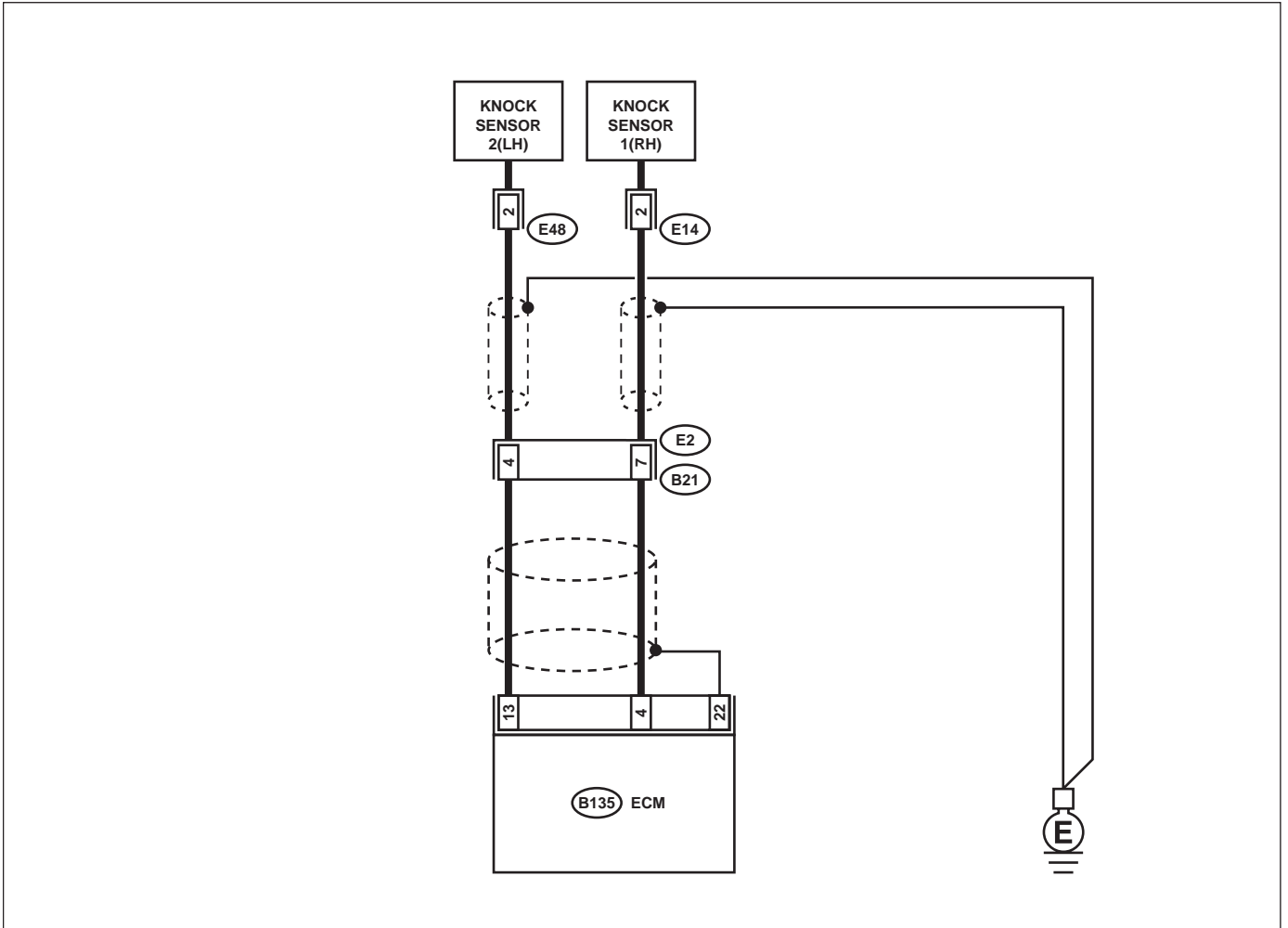
AR:DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Poor driving performance
 - Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• **WIRING DIAGRAM:**



EN-00816

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN KNOCK SENSOR 2 (LH) AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground.</p> <p>Connector & terminal (B135) No. 13 — Chassis ground: Does the measured value exceed the specified value?</p>	700 kΩ	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between knock sensor 2 (LH) and ECM connector • Poor contact in knock sensor 2 (LH) connector • Poor contact in coupling connector
<p>2 CHECK KNOCK SENSOR 2 (LH).</p> <p>1) Disconnect connector from knock sensor 2 (LH). 2) Measure resistance between knock sensor 2 (LH) connector terminal and engine ground.</p> <p>Terminal No. 2 — Engine ground: Does the measured value exceed the specified value?</p>	700 kΩ	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between knock sensor 2 (LH) and ECM connector • Poor contact in knock sensor 2 (LH) connector • Poor contact in coupling connector
<p>3 CHECK CONDITION OF KNOCK SENSOR 2 (LH) INSTALLATION.</p> <p>Is the knock sensor 2 (LH) installation bolt tightened securely?</p>	Tightened securely.	Replace knock sensor 2 (LH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Tighten knock sensor 2 (LH) installation bolt securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AS:DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2) —

• DTC DETECTING CONDITION:

- Immediately at fault recognition

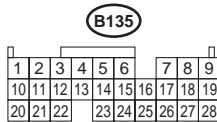
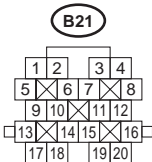
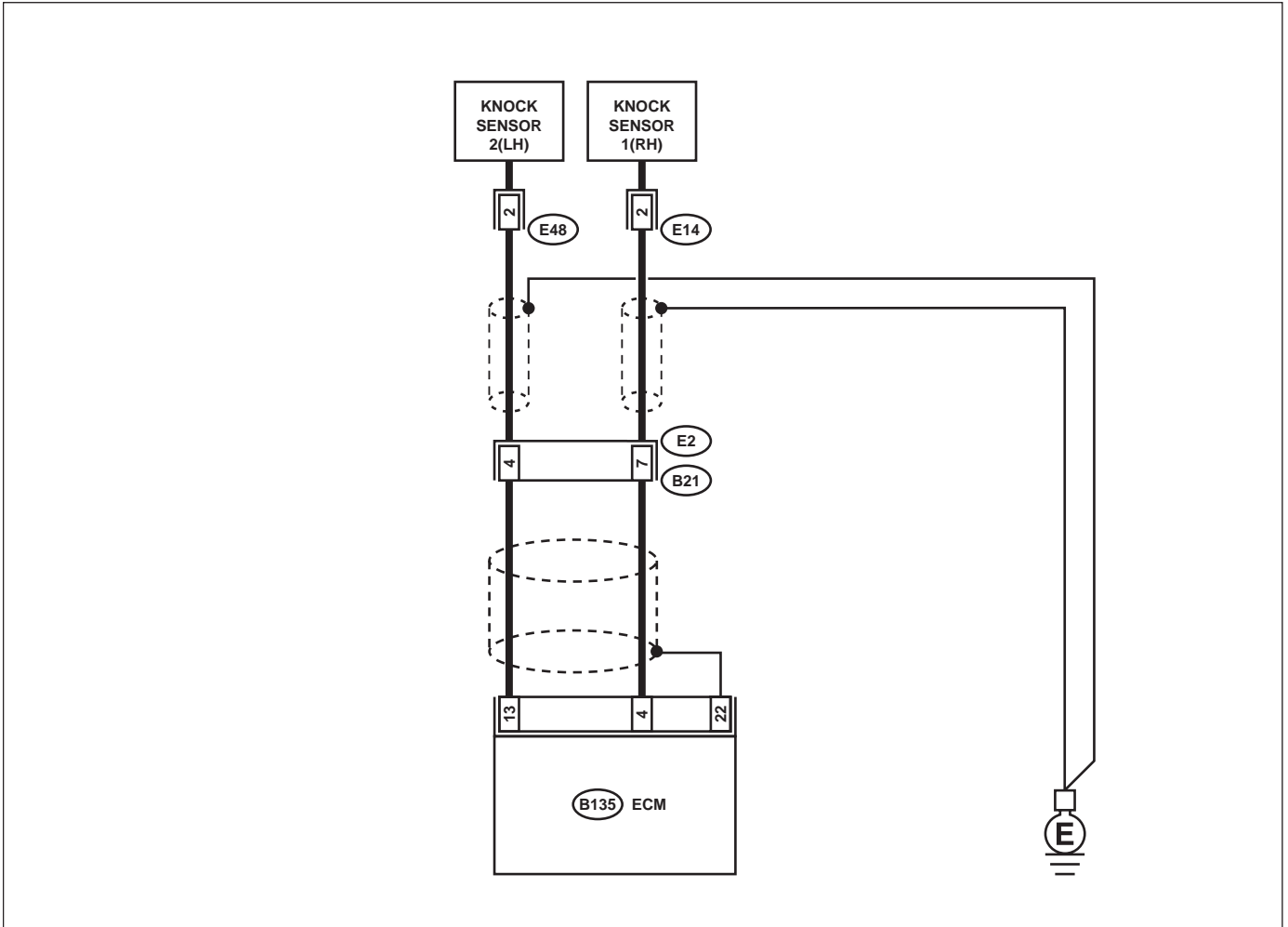
• TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-00816

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN KNOCK SENSOR 2 (LH) AND ECM CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 13 — Chassis ground: Is the measured value less than the specified value?</p>	400 kΩ	Go to step 2.	Go to step 3.
<p>2 CHECK KNOCK SENSOR 2 (LH). 1) Disconnect connector from knock sensor 2 (LH). 2) Measure resistance between knock sensor 2 (LH) connector terminal and engine ground. Terminal No. 2 — Engine ground: Is the measured value less than the specified value?</p>	400 kΩ	Replace knock sensor 2 (LH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Repair ground short circuit in harness between knock sensor 2 (LH) connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
<p>3 CHECK INPUT SIGNAL FOR ECM. 1) Connect connectors to ECM and knock sensor 2 (LH). 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 13 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	2 V	Even if MI lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in knock sensor connector 2 (LH) • Poor contact in ECM connector • Poor contact in coupling connector 	Repair poor contact in ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

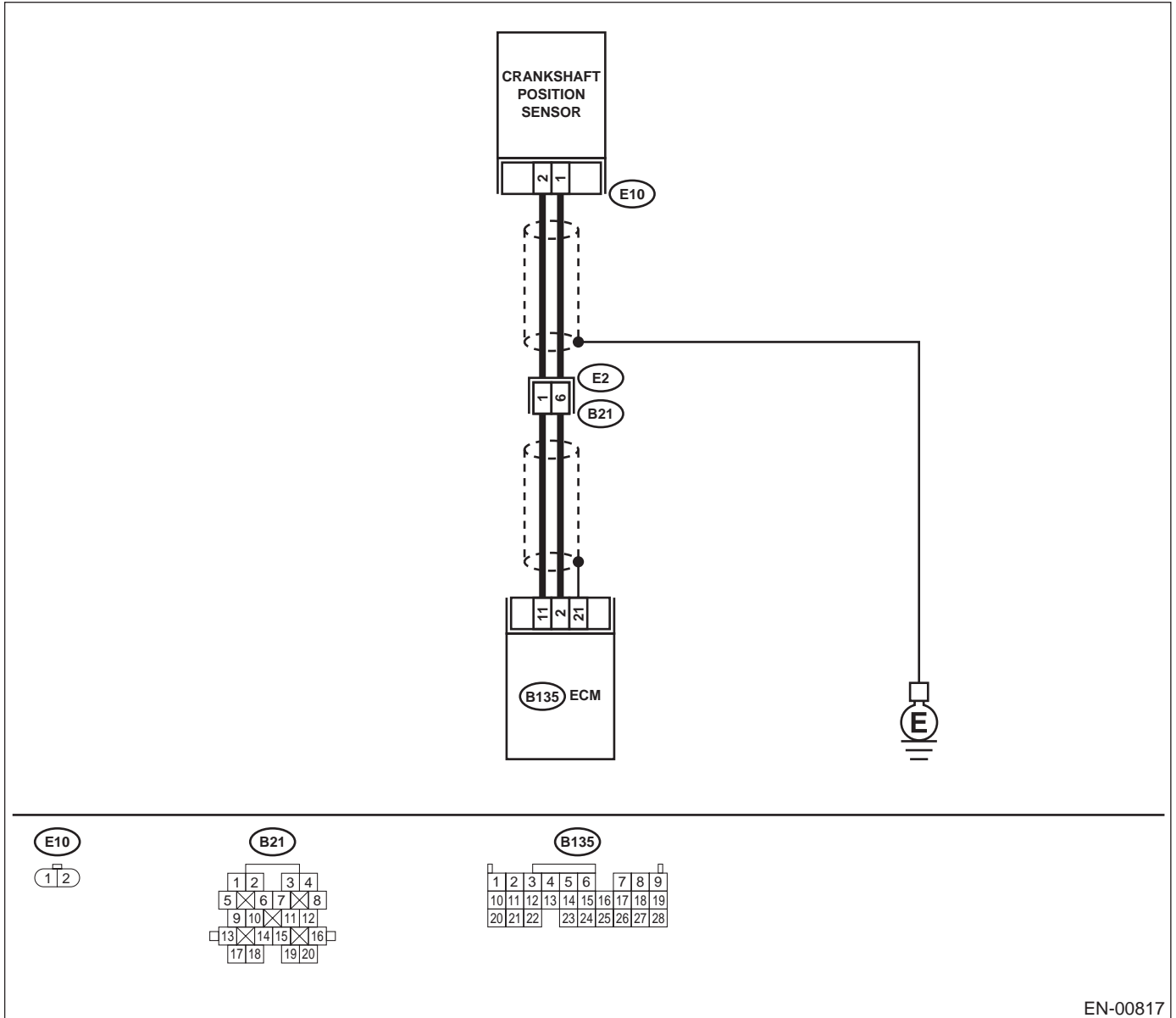
AT:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine stalls.
 - Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00817

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between crankshaft position sensor and ECM. Connector & terminal (E10) No. 1 — (B135) No. 2: (E10) No. 2 — (B135) No. 11: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit between crankshaft position sensor and ECM.
2 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM. Measure resistance between crankshaft position sensor and engine ground. Connector & terminal (E10) No. 1 — Engine ground: (E10) No. 2 — Engine ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair ground short circuit between crankshaft position sensor and ECM.
3 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR. Is the crankshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step 4.	Tighten crankshaft position sensor installation bolt securely.
4 CHECK CRANKSHAFT POSITION SENSOR. 1) Turn ignition switch to OFF. 2) Remove crankshaft position sensor. 3) Measure resistance between connector terminals of crankshaft position sensor. Terminals No. 1 — No. 2: Is the measured value within the specified range?	800 — 1300 kΩ	Go to step 5.	Replace crankshaft position sensor. <Ref. to FU(H6DO)-30, REMOVAL, Crankshaft Position Sensor.>
5 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AU:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

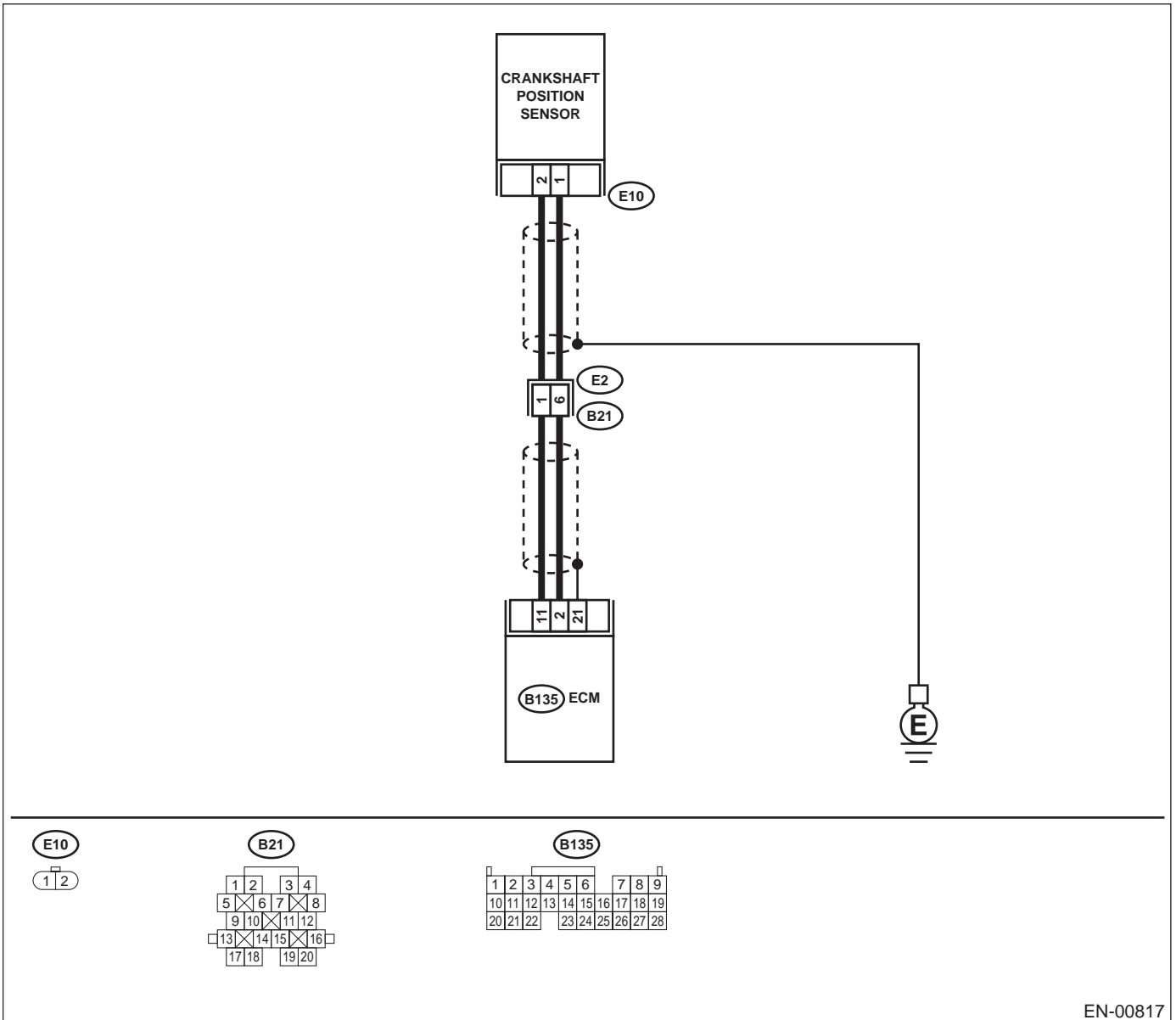
• TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-00817

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect DTC P0335 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2 .
2 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR. Turn ignition switch to OFF. Is the crankshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step 3 .	Tighten crankshaft position sensor installation bolt securely.
3 CHECK CRANKSHAFT PLATE. Are crankshaft plate teeth cracked or damaged?	Cracked or damaged.	Replace crankshaft plate.	Go to step 4 .
4 CHECK INSTALLATION CONDITION OF TIMING CHAIN. Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET Is timing chain dislocated from its proper position?	Dislocated from proper position.	Repair installation condition of timing chain. <Ref. to ME(H6DO)-41, Timing Chain Assembly.>	Replace crankshaft position sensor. <Ref. to FU(H6DO)-30, Crankshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

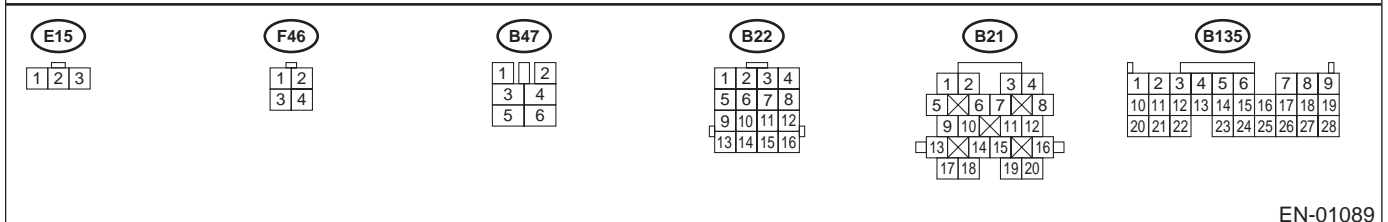
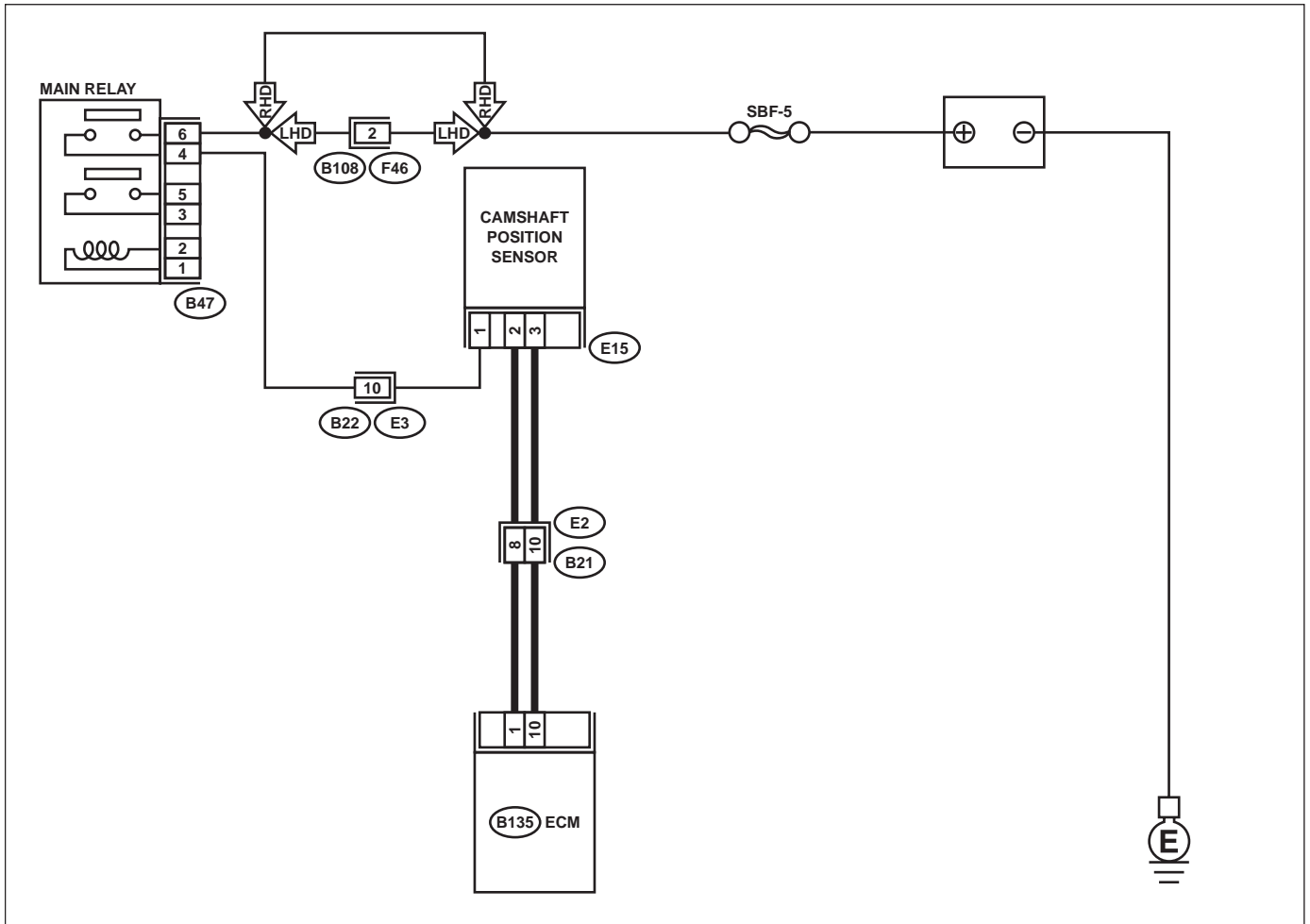
AV:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine stalls.
 - Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• **WIRING DIAGRAM:**



EN-01089

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from camshaft position sensor. 3) Measure voltage between camshaft position sensor and engine ground. Connector & terminal (E15) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?	10V	Repair ground short circuit between main relay connector and camshaft position sensor connector.	Go to step 2.
2 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR. 1) Turn ignition switch to ON. 2) Measure voltage between camshaft position sensor and engine ground. Connector & terminal (E15) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?	10V	Go to step 3.	Repair open or ground short circuit between main relay connector and camshaft position sensor connector.
3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between camshaft position sensor and ECM. Connector & terminal (E15) No. 2 — (B135) No. 1: (E15) No. 3 — (B135) No. 10: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair open circuit between camshaft position sensor and ECM.
4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. Measure resistance between camshaft position sensor and engine ground. Connector & terminal (E15) No. 2 — Engine ground: (E15) No. 3 — Engine ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 5.	Repair ground short circuit between camshaft position sensor and ECM.
5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR. Is the camshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step 6.	Tighten camshaft position sensor installation bolt securely.
6 CHECK CAMSHAFT POSITION SENSOR. Check camshaft position sensor wave form. <Ref. to EN(H6DO)-28, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.> Is any abnormality found in waveform?	Normal waveform.	Go to step 7.	Replace camshaft position sensor. <Ref. to FU(H6DO)-31, Camshaft Position Sensor.>
7 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AW:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

DTC DETECTING CONDITION:

- Tow consecutive driving cycles with fault

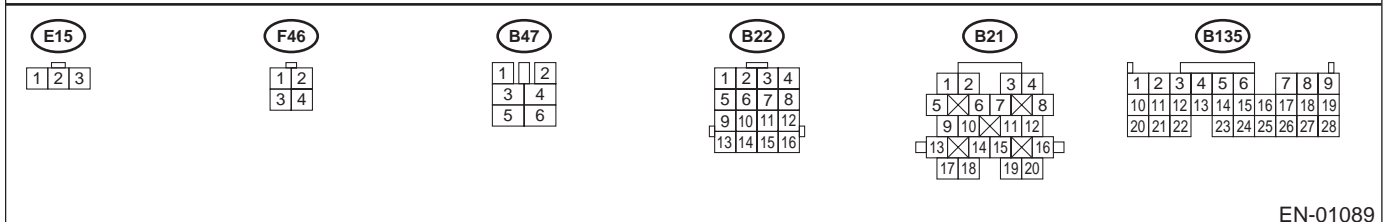
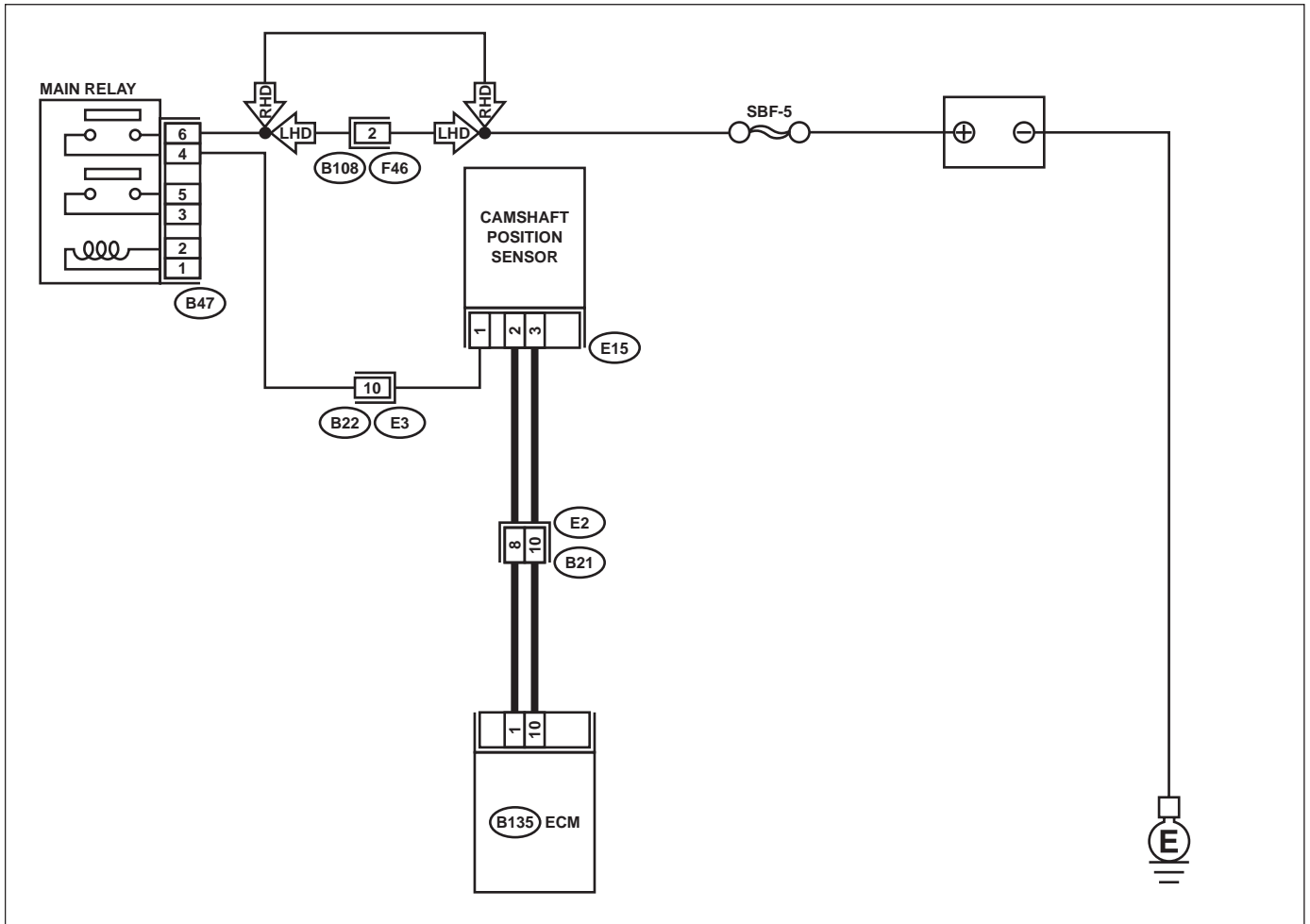
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



EN-01089

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect DTC P0340 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2 .
2 CHECK CONDITION OF CAMSHAFT POSITION SENSOR. Is the camshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step 3 .	Tighten camshaft position sensor installation bolt securely.
3 CHECK CAMSHAFT SPROCKET. Remove front chain cover. <Ref. to ME(H6DO)-39, Front Chain Cover.> Are camshaft sprocket teeth cracked or damaged?	Cracked or damaged.	Replace camshaft sprocket. <Ref. to ME(H6DO)-46, Camshaft Sprocket.>	Go to step 4 .
4 CHECK INSTALLATION CONDITION OF TIMING CHAIN. Turn crankshaft using ST, and align alignment mark on camshaft sprocket with alignment mark. ST 18252AA000 CRANKSHAFT SOCKET Is timing chain dislocated from its proper position?	Dislocated from proper position.	Repair installation condition of timing chain. <Ref. to ME(H6DO)-41, Timing Chain Assembly.>	Replace camshaft position sensor. <Ref. to FU(H6DO)-31, Camshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AX:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

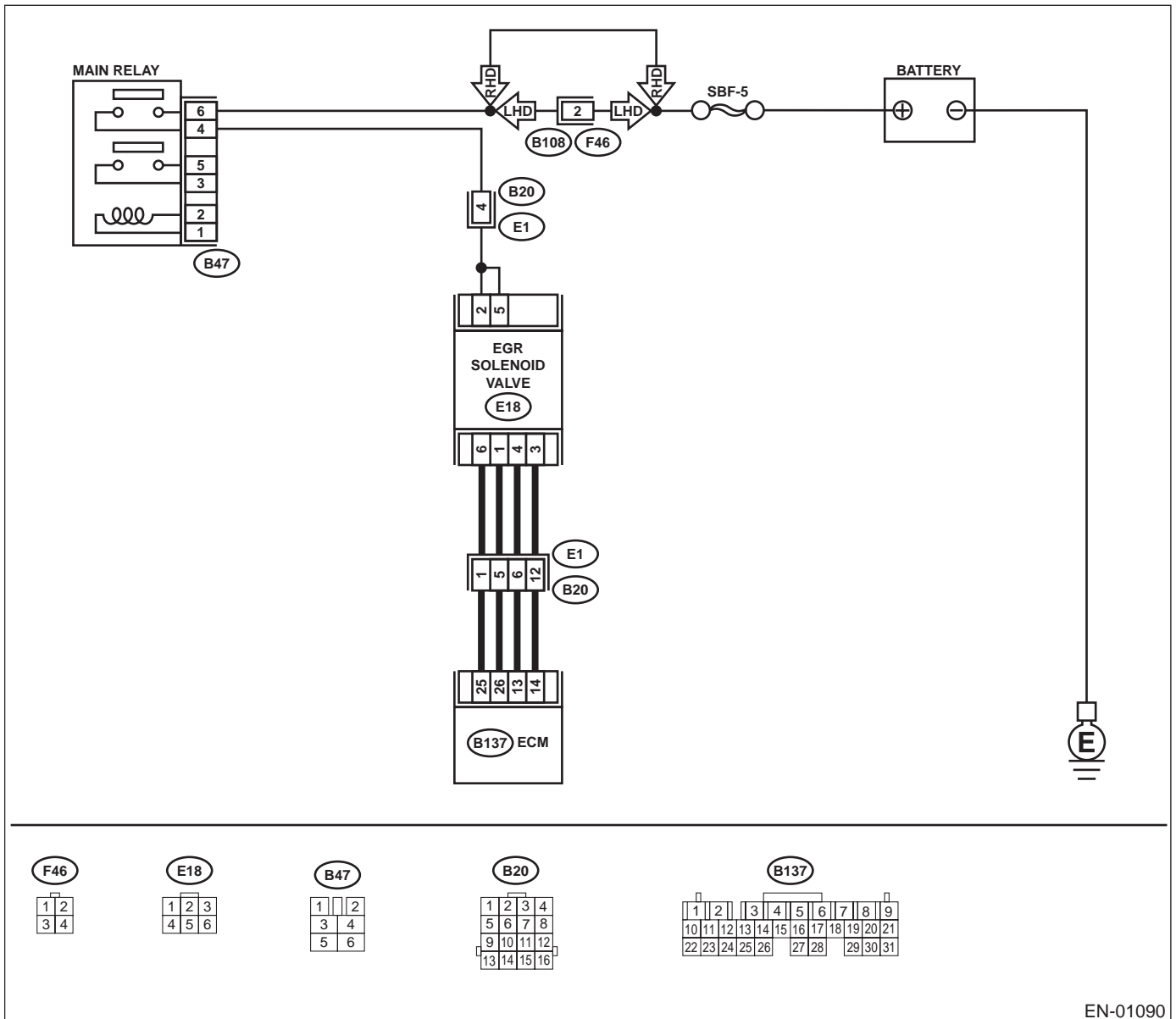
• TROUBLE SYMPTOM:

- Poor driving performance on low engine speed
- Erroneous idling
- Poor driving performance.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01090

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start engine. 2) Rear the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	53.3 kPa (400 mmHg, 15.75 inHg)	Check if EGR valve, intake manifold pressure sensor and throttle body are securely installed.	Go to step 3.
3 CHECK POWER SUPPLY TO EGR SOLENOID VALVE. 1) Disconnect connector from EGR solenoid valve. 2) Turn ignition switch to ON. 3) Measure voltage between EGR solenoid valve and engine ground. Connector & terminal (E18) No. 2 — Engine ground: (E18) No. 5 — Engine ground: Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair open circuit in harness between main relay and EGR solenoid valve connector.
4 CHECK EGR SOLENOID VALVE. Measure resistance between EGR solenoid valve terminals. NOTE: Make sure there are no foreign objects caught between EGR solenoid valve and valve seat. Terminals No. 1 — No. 2: No. 3 — No. 2: No. 4 — No. 5: No. 6 — No. 5: Is the measured value within the specified range?	20 — 30 Ω	Go to step 5.	Replace EGR solenoid valve. <Ref. to EC(H6DO)-10, EGR Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect connectors to ECM and EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 25 — Chassis ground: (B137) No. 26 — Chassis ground: (B137) No. 13 — Chassis ground: (B137) No. 14 — Chassis ground:</p> <p>Does the measured value fluctuate within the specified range?</p>	0 — 10 V	Repair poor contact in ECM connector.	Go to step 6.
<p>6 CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from EGR solenoid valve and ECM. 3) Measure resistance of harness between EGR solenoid valve and ECM connector.</p> <p>Connector & terminal (B137) No. 25 — (E18) No. 6: (B137) No. 26 — (E18) No. 1: (B137) No. 13 — (E18) No. 4: (B137) No. 14 — (E18) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 7.	Repair open circuit in harness between ECM and EGR solenoid valve connector.
<p>7 CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.</p> <p>Measure resistance of harness between EGR solenoid valve and chassis ground.</p> <p>Connector & terminal (B137) No. 25 — Chassis ground: (B137) No. 26 — Chassis ground: (B137) No. 13 — Chassis ground: (B137) No. 14 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 8.	Repair short circuit in harness between main relay and EGR solenoid valve connector.
<p>8 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM and EGR solenoid valve connector. Is there poor contact in ECM and EGR solenoid valve connector?</p>	There is poor contact.	Repair poor contact in ECM and EGR solenoid valve connector.	Even if MI lights up, the circuit has returned to a normal condition at this time.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

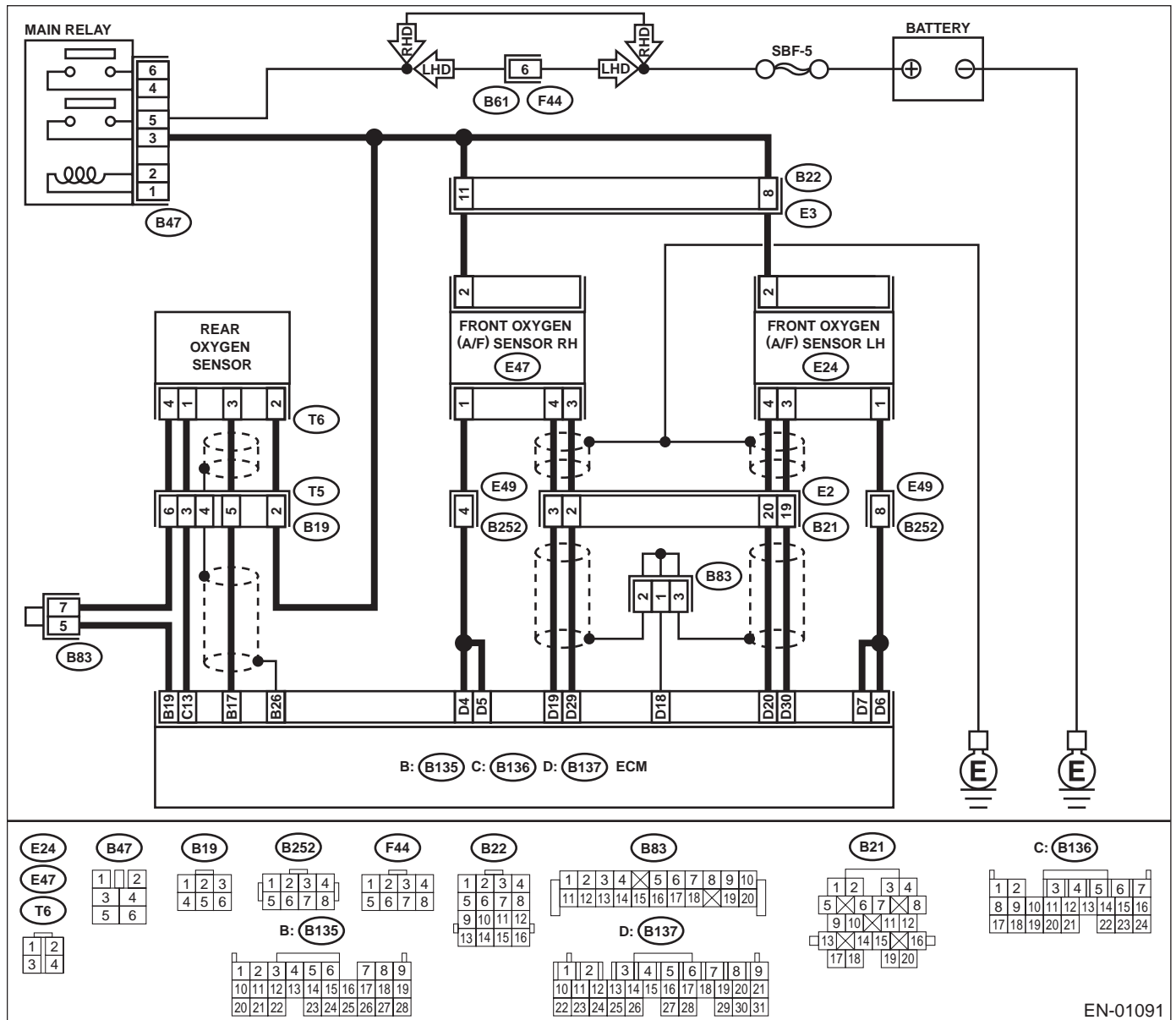
AY:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Engine stalls.
 - Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• **WIRING DIAGRAM:**



EN-01091

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step 2.
2 CHECK EXHAUST SYSTEM. Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. <ul style="list-style-type: none"> • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter Is there a fault in exhaust system?	There is a malfunction.	Repair or replace exhaust system.	Go to step 3.
3 CHECK REAR CATALYTIC CONVERTER. Separate rear catalytic converter from rear exhaust pipe. Is there damage at rear face of rear catalyst?	There is damage.	Replace front catalytic converter <Ref. to EC(H6DO)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(H6DO)-6, Rear Catalytic Converter.>.	Go to step 4.
4 CHECK FRONT CATALYTIC CONVERTER. Remove front catalytic converter. Is there damage at rear face or front face of front catalyst?	There is damage.	Replace front catalytic converter. <Ref. to EC(H6DO)-3, Front Catalytic Converter.>	Contact SUBRU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

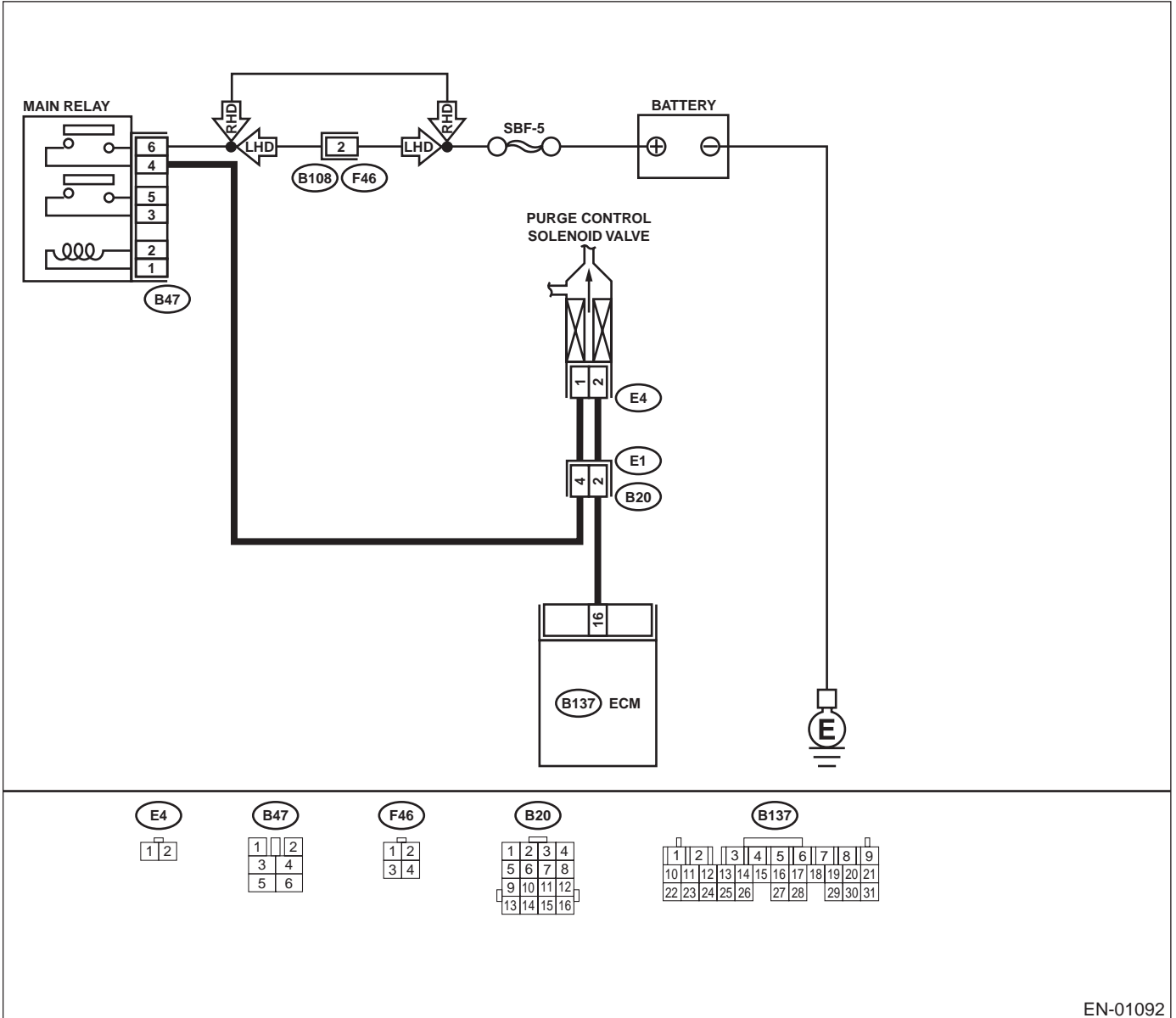
AZ:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-01092

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B137) No. 16 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from purge control solenoid valve and ECM. 3) Measure resistance of harness between purge control solenoid valve connector and engine ground. Connector & terminal (E4) No. 2 — Engine ground: Is the measured value less than the specified value?</p>	10 Ω	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step 3.
<p>3 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure resistance of harness between ECM and purge control solenoid valve of harness connector. Connector & terminal (B137) No. 16 — (E4) No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
<p>4 CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove purge control solenoid valve. 2) Measure resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2: Is the measured value within the specified range?</p>	10 — 100 Ω	Go to step 5.	Replace purge control solenoid valve. <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair open circuit in harness between main relay and purge control solenoid valve connector.
<p>6 CHECK POOR CONTACT. Check poor contact in purge control solenoid valve connector. Is there poor contact in purge control solenoid valve connector?</p>	There is poor contact.	Repair poor contact in purge control solenoid valve connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

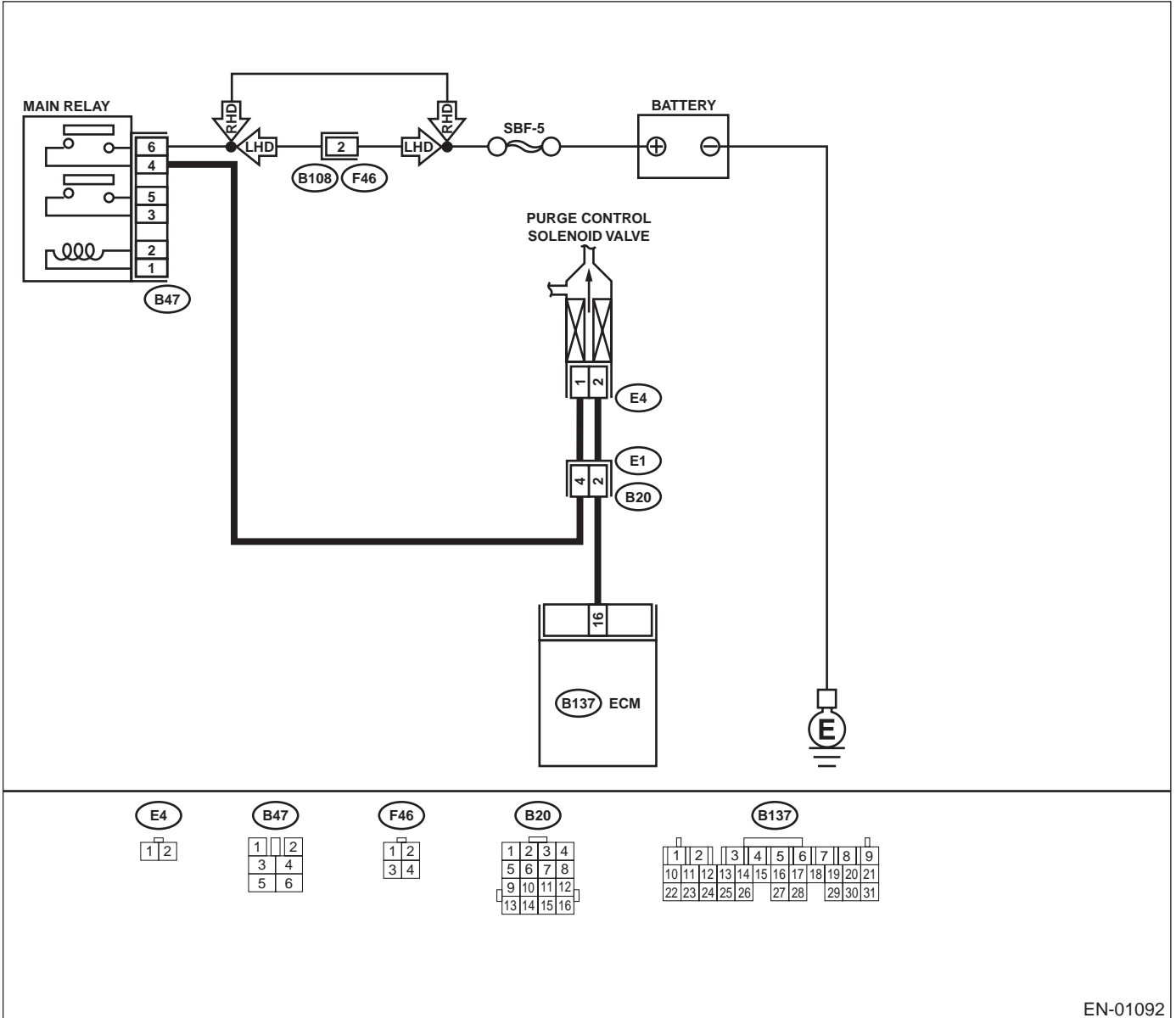
BA:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• **WIRING DIAGRAM:**



EN-01092

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating purge control solenoid valve, measure voltage between ECM and chassis ground.</p> <p>NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-55, Compulsory Valve Operation Check Mode.></p> <p>Connector & terminal (B137) No. 16 (+) — Chassis ground (-): Does the measured value change within the specified range?</p>	0 — 10 V	Go to step 2.	Even if MI lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
<p>2 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 16 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 V	Go to step 4.	Go to step 3.
<p>3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
<p>4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from purge control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 16 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step 5.
<p>5 CHECK PURGE CONTROL SOLENOID VALVE.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between purge control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2: Is the measured value less than the specified value?</p>	1 Ω	Replace purge control solenoid valve <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step 6.
<p>6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BB:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

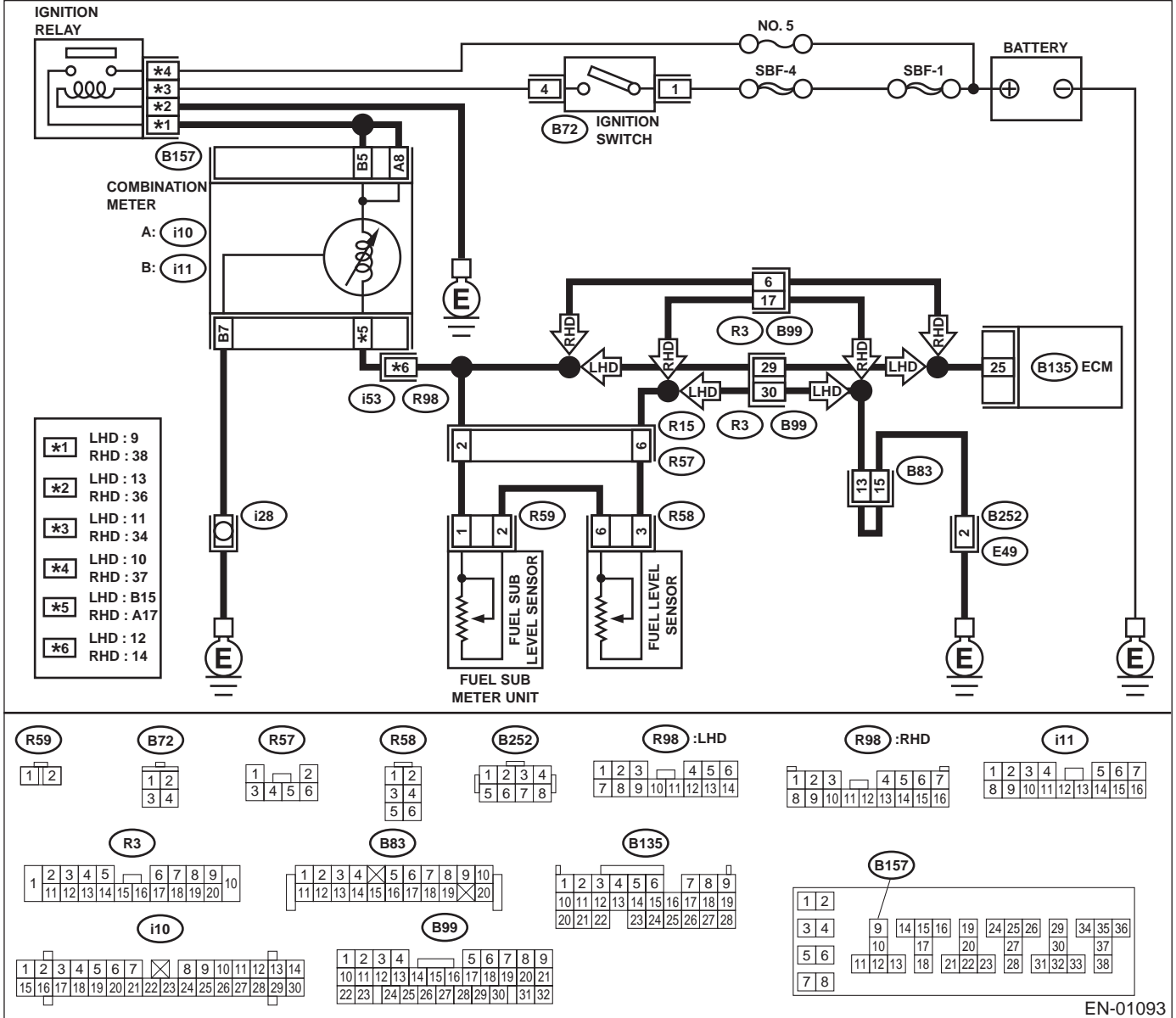
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01093

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace fuel level sensor <Ref. to FU(H6DO)-67, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(H6DO)-68, Fuel Sub Level Sensor.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BC:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

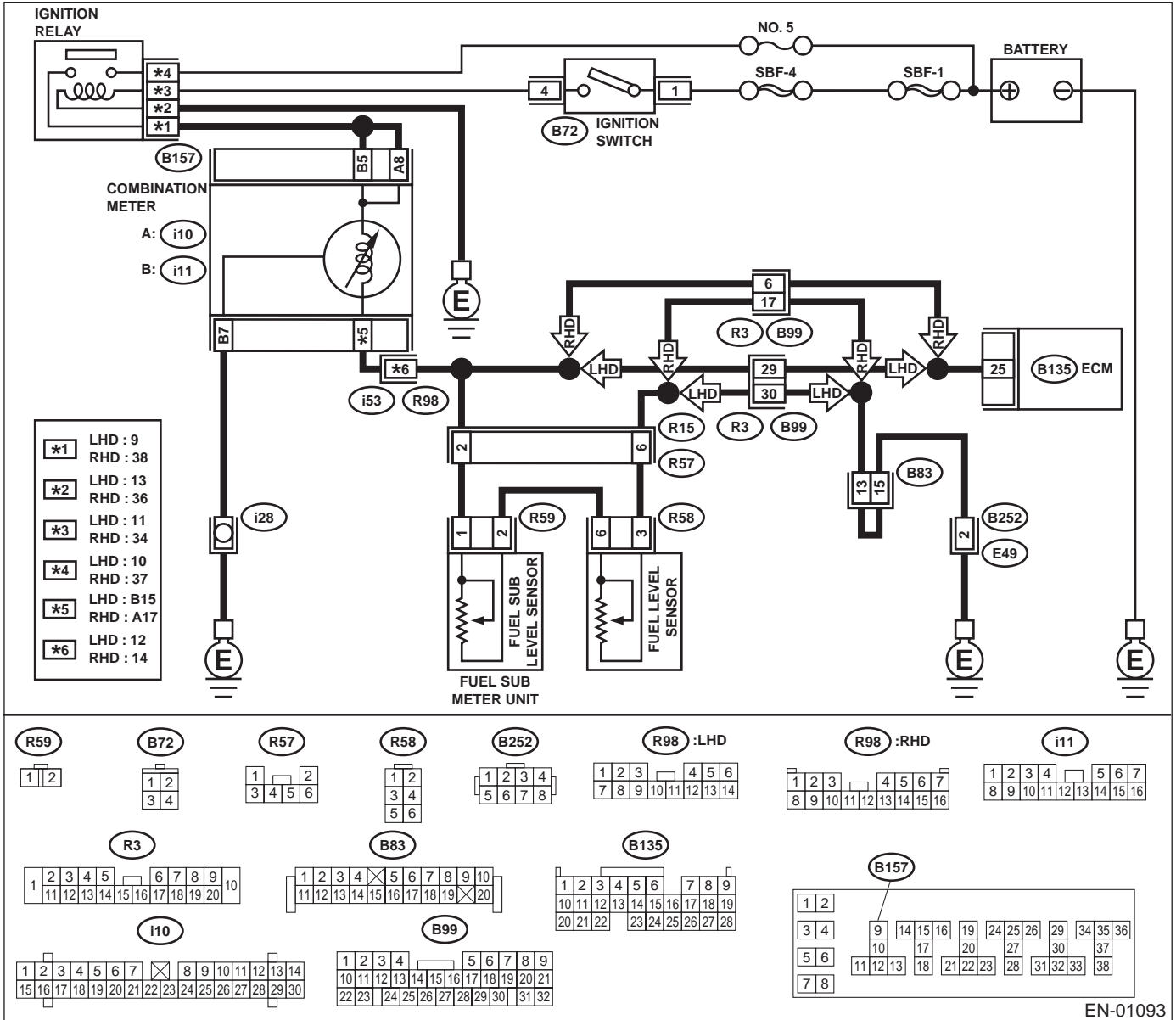
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01093

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER. Does speedometer and tachometer operate normally?	Operates properly.	Go to step 2.	Repair or replace combination meter. <Ref. to IDI-14, Combination Meter Assembly.>
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 25 (+) — Chassis ground (-): Is the measured value less than the specified value?	0.12 V	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read data of fuel level sensor signal using Subaru Select Monitor. Does the value change less than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.>	0.12 V	Repair poor contact in ECM connector.	Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4 CHECK INPUT VOLTAGE OF ECM. 1) Turn ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 25 (+) — Chassis ground (-): Does the measured value exceed the specified value?	0.12 V	Go to step 5.	Go to step 7.
5 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. 1) Turn ignition switch to OFF. 2) Disconnect connector from connector (i10) and ECM connector. 3) Measure resistance between ECM and chassis ground. Connector & terminal (B135) No. 25 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 6.	Repair ground short circuit in harness between ECM and combination meter connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. Measure resistance between ECM and combination meter connector. Connector & terminal LHD (B135) No. 25 — (i10) No. 15: RHD (B135) No. 25 — (i10) No. 17: Is the measured value less than the specified value?</p>	10 Ω	Repair or replace combination meter. <Ref. to IDI-14, Combination Meter Assembly.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
<p>7 CHECK FUEL TANK CORD. 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel sub level sensor. 3) Measure resistance between fuel sub level sensor and chassis ground. Connector & terminal (R59) No. 1 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 8.	Repair ground short circuit in fuel tank cord.
<p>8 CHECK FUEL TANK CORD. 1) Disconnect connector from fuel pump assembly. 2) Measure resistance between fuel pump assembly and chassis ground. Connector & terminal (R59) No. 2 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9.	Repair ground short circuit in fuel tank cord.
<p>9 CHECK FUEL LEVEL SENSOR. 1) Remove fuel pump assembly. <Ref. to FU(H6DO)-65, Fuel Pump.> 2) Measure resistance between fuel level sensor and terminals with its float set to the full position. Terminals No. 3 — No. 6: Is the measured value within the specified range?</p>	0.5 — 2.5 Ω	Go to step 10.	Replace fuel level sensor.
<p>10 CHECK FUEL SUB LEVEL SENSOR. Warning: During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill. 1) Remove fuel sub level sensor. <Ref. to FU(H6DO)-68, Fuel Sub Level Sensor.> 2) Measure resistance between fuel sub level sensor and terminals with its float set to the full position. Terminals No. 1 — No. 2: Is the measured value within the specified range?</p>	0.5 — 2.5 Ω	Repair poor contact in harness between ECM and combination meter connector.	Replace fuel sub level sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BD:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

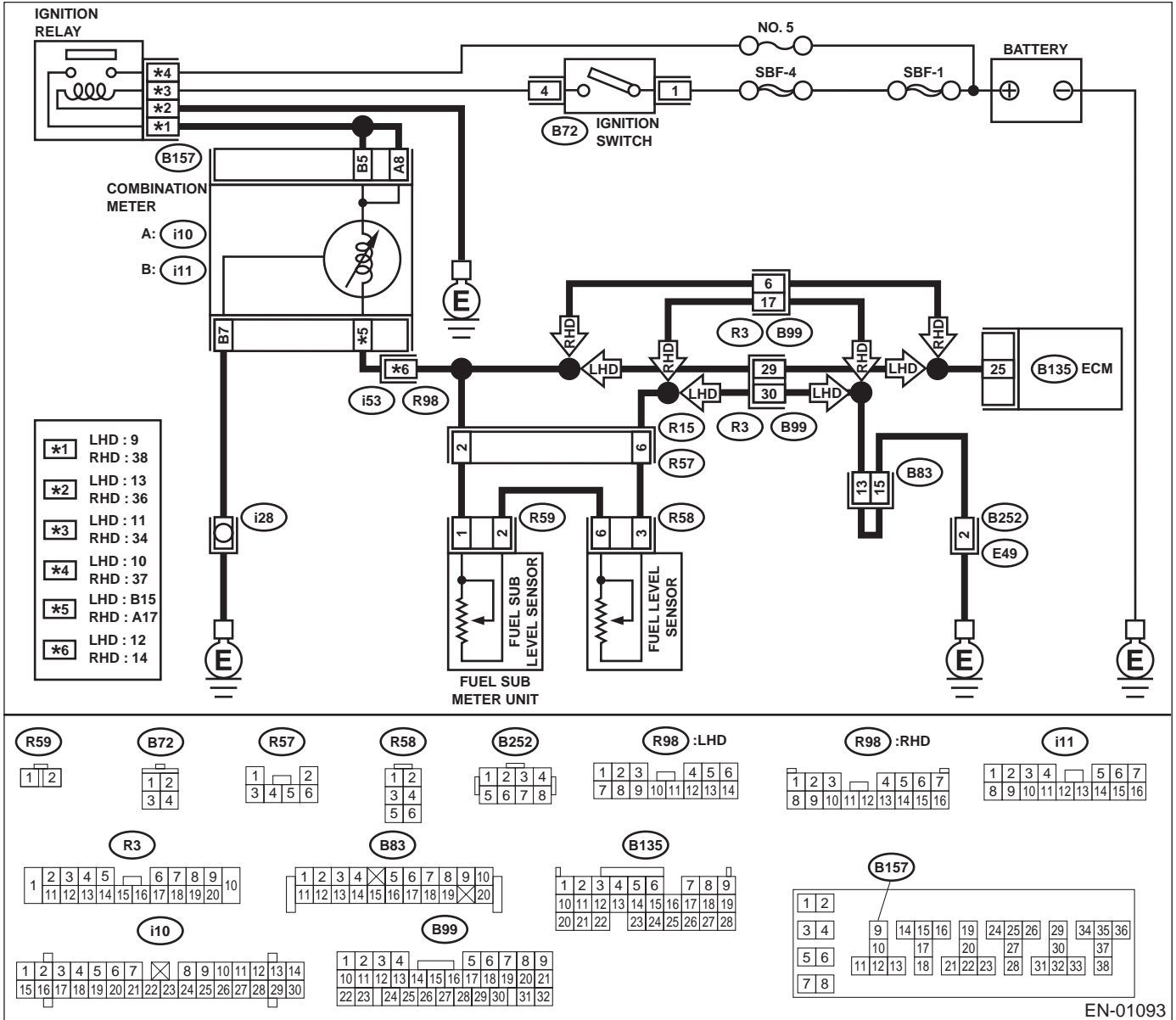
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01093

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER. Does speedometer and tachometer operate normally?	Operates properly.	Go to step 2.	Repair or replace combination meter. <Ref. to IDI-14, Combination Meter Assembly.>
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 25 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.75 V	Go to step 3.	Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in fuel pump connector • Poor contact in coupling connector
3 CHECK INPUT VOLTAGE OF ECM. 1) Turn ignition switch to OFF. 2) Disconnect combination meter connector (i10) and ECM connector. 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM and chassis ground. Connector & terminal (B135) No. 25 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.75 V	Go to step 4.	Repair battery short circuit between ECM and combination meter connector.
4 CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD. 1) Turn ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure resistance between ECM and fuel tank cord. Connector & terminal (B135) No. 25 — (R15) No. 2: Is the measured value less than the specified value?	5 Ω	Go to step 5.	Repair open circuit between ECM and fuel tank cord.
5 CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND. Measure resistance between fuel tank cord and chassis ground. Connector & terminal (R15) No. 6 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 6.	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK FUEL TANK CORD. 1) Disconnect connector from fuel level sensor. 2) Measure resistance between fuel level sensor and coupling connector. Connector & terminal (R57) No. 6 — (R58) No. 3: Is the measured value less than the specified value?	10 Ω	Go to step 7.	Repair open circuit between coupling connector and fuel level sensor.
7 CHECK FUEL TANK CORD. 1) Disconnect connector from fuel sub level sensor. 2) Measure resistance between fuel level sensor and fuel sub level sensor. Connector & terminal (R58) No. 6 — (R59) No. 2: Is the measured value less than the specified value?	10 Ω	Go to step 8.	Repair open circuit between fuel level sensor and fuel sub level sensor.
8 CHECK FUEL TANK CORD. Measure resistance between fuel sub level sensor and coupling connector. Connector & terminal (R57) No. 2 — (R59) No. 1: Is the measured value less than the specified value?	10 Ω	Go to step 9.	Repair open circuit between coupling connector and fuel sub level sensor.
9 CHECK FUEL LEVEL SENSOR. Warning: During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill. 1) Remove fuel pump assembly. <Ref. to FU(H6DO)-65, Fuel Pump.> 2) While moving fuel level sensor float up and down, measure resistance between fuel level sensor terminals. Terminals No. 3 — No. 6: Does the measured value exceed the specified value?	54.5 Ω	Replace fuel level sensor. <Ref. to FU(H6DO)-67, Fuel Level Sensor.>	Go to step 10.
10 CHECK FUEL SUB LEVEL SENSOR. Warning: During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill. 1) Remove fuel sub level sensor. <Ref. to FU(H6DO)-68, Fuel Sub Level Sensor.> 2) While moving fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. Terminals No. 1 — No. 2: Does the measured value exceed the specified value?	41.5 Ω	Replace fuel sub level sensor. <Ref. to FU(H6DO)-68, Fuel Sub Level Sensor.>	Replace combination meter. <Ref. to IDI-14, Combination Meter Assembly.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BE:DTC P0483 — COOLING FAN RATIONALITY CHECK —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

• TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

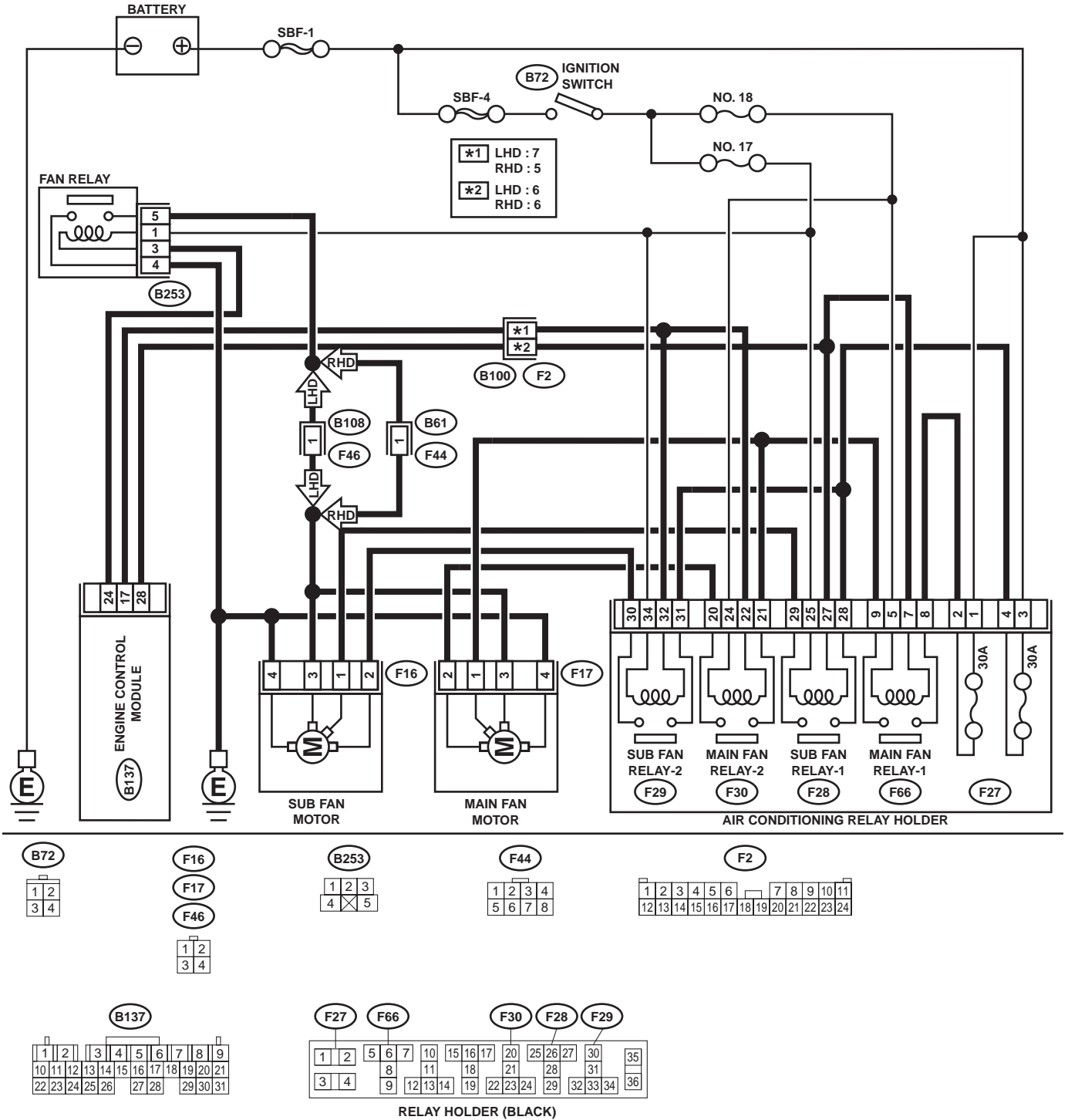
NOTE:

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



CO-00167

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO(H6DO)-7, INSPECTION, Radiator Main Fan System.> and <Ref. to CO(H6DO)-15, INSPECTION, Radiator Sub Fan System.>

BF:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

NOTE:

For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H6DO)-252, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BG:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

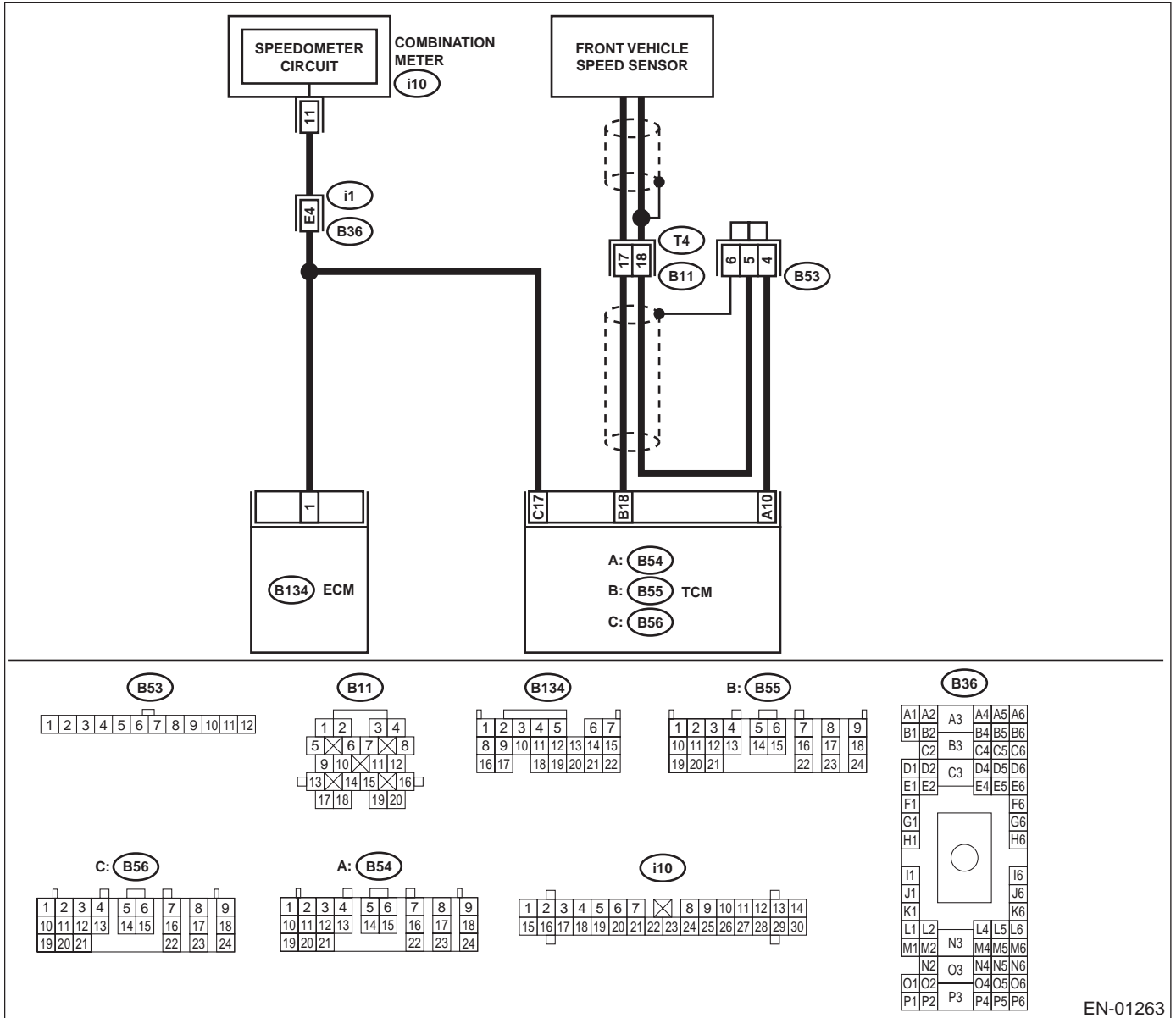
• DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01263

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DTC P0720 ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	DTC P0720 is indicated.	Check front vehicle speed sensor signal circuit. <Ref. to AT-58, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK SPEEDOMETER OPERATION IN COMBINATION METER. Does speedometer operate normally?	Operates properly.	Go to step 3.	Check speedometer and vehicle speed sensor. <Ref. to IDI-18, Speedometer.>, <Ref. to AT-54, Front Vehicle Speed Sensor.>, <Ref. to AT-58, Rear Vehicle Speed Sensor.> and <Ref. to AT-59, Torque Converter Turbine Speed Sensor.>
3 CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from combination meter. 3) Measure resistance between ECM and combination meter. Connector & terminal (B134) No. 1 — (i10) No. 11: Is the measured value less than the specified value?	10 Ω	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BH:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

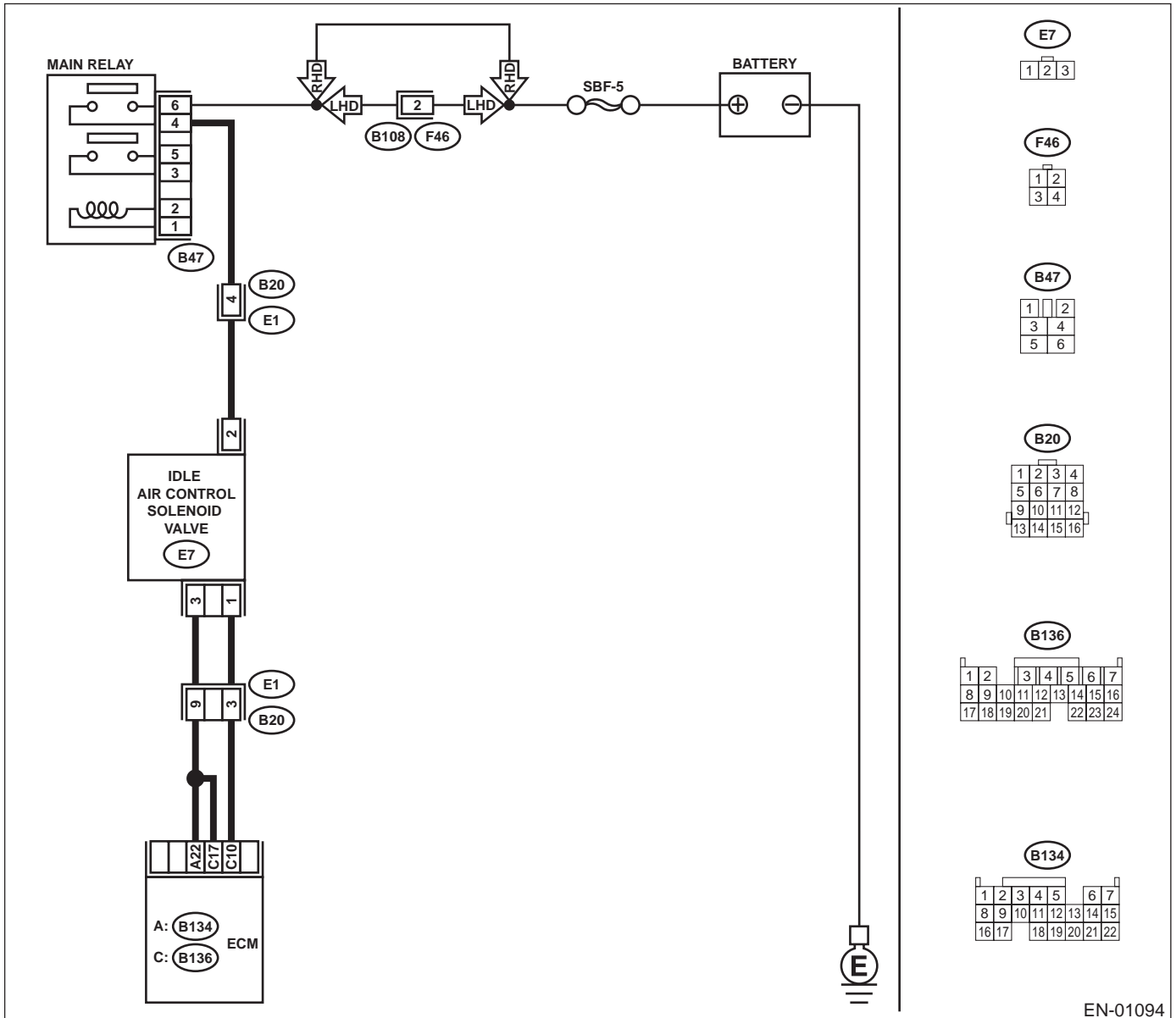
• TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01094

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step 2.
2 CHECK AIR BY-PASS LINE. 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.> 3) Remove throttle body from intake manifold. <Ref. to FU(H6DO)-16, Throttle Body.> 4) Using an air gun, force air into idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body interior. Does air flow out?	Air flows out.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(H6DO)-16, Throttle Body.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BI: DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

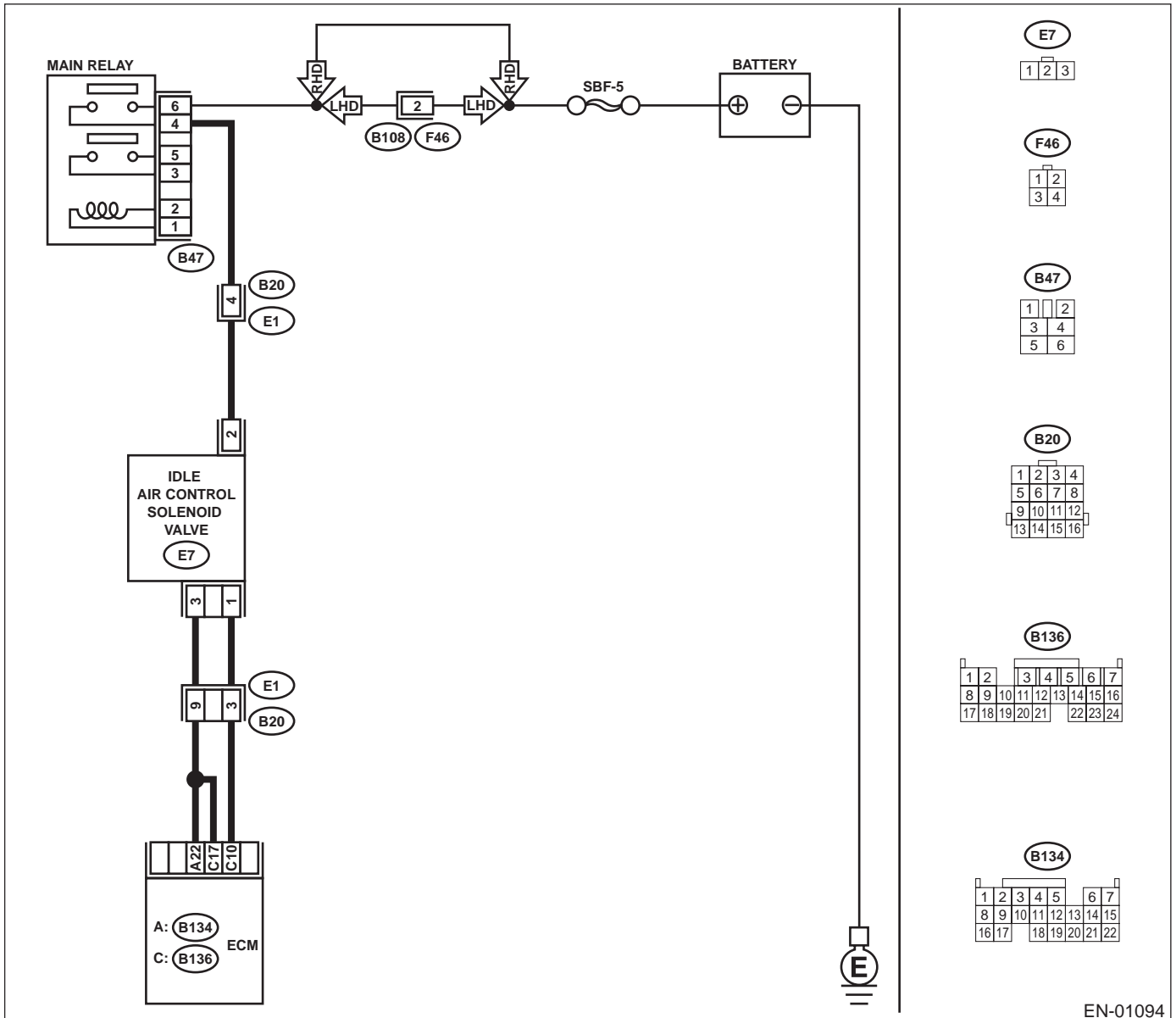
• TROUBLE SYMPTOM:

- Engine does not return to normal idle speed.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01094

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses Is there a fault in air intake system?	There is a fault.	Repair air suction and leaks.	Go to step 3.
3 CHECK THROTTLE CABLE. Does throttle cable have play for adjustment?	Throttle cable has a play.	Go to step 4.	Adjust throttle cable. <Ref. to SP(H6DO)-8, Accelerator Control Cable.>
4 CHECK AIR BY-PASS LINE. 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in by-pass air line. Are foreign particles in by-pass air line?	Foreign particles are in by-pass air line.	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

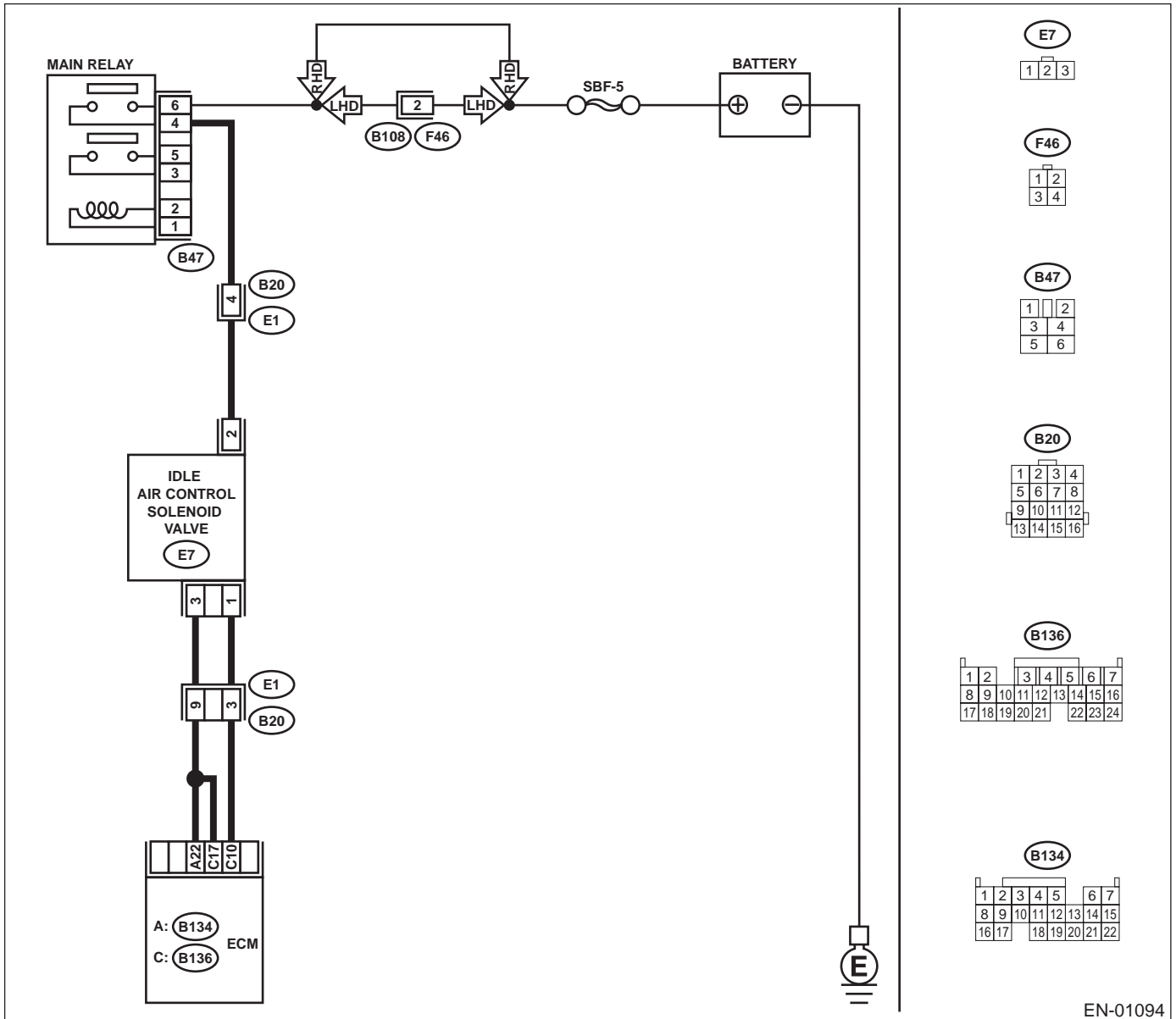
BJ:DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01094

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	3 V	Repair poor contact in ECM connector.	Go to step 2.
<p>2 CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between idle air control solenoid valve and engine ground. Connector & terminal (E7) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
<p>3 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and idle air control solenoid valve connector. Connector & terminal (B136) No. 10 — (E7) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
<p>4 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 10 — Chassis ground: Is the measured value less than the specified value?</p>	10 Ω	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step 5.
<p>5 CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE. Measure resistance of harness between idle air control solenoid valve connector and engine ground. Connector & terminal (E7) No. 3 — Engine ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 6.	Repair open circuit in harness between idle air control solenoid valve connector and engine ground terminal.
<p>6 CHECK POOR CONTACT. Check poor contact in ECM and idle air control solenoid valve connectors. Is there poor contact in ECM and idle air control solenoid valve connectors?</p>	There is poor contact.	Repair poor contact in ECM and idle air control solenoid valve connectors.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

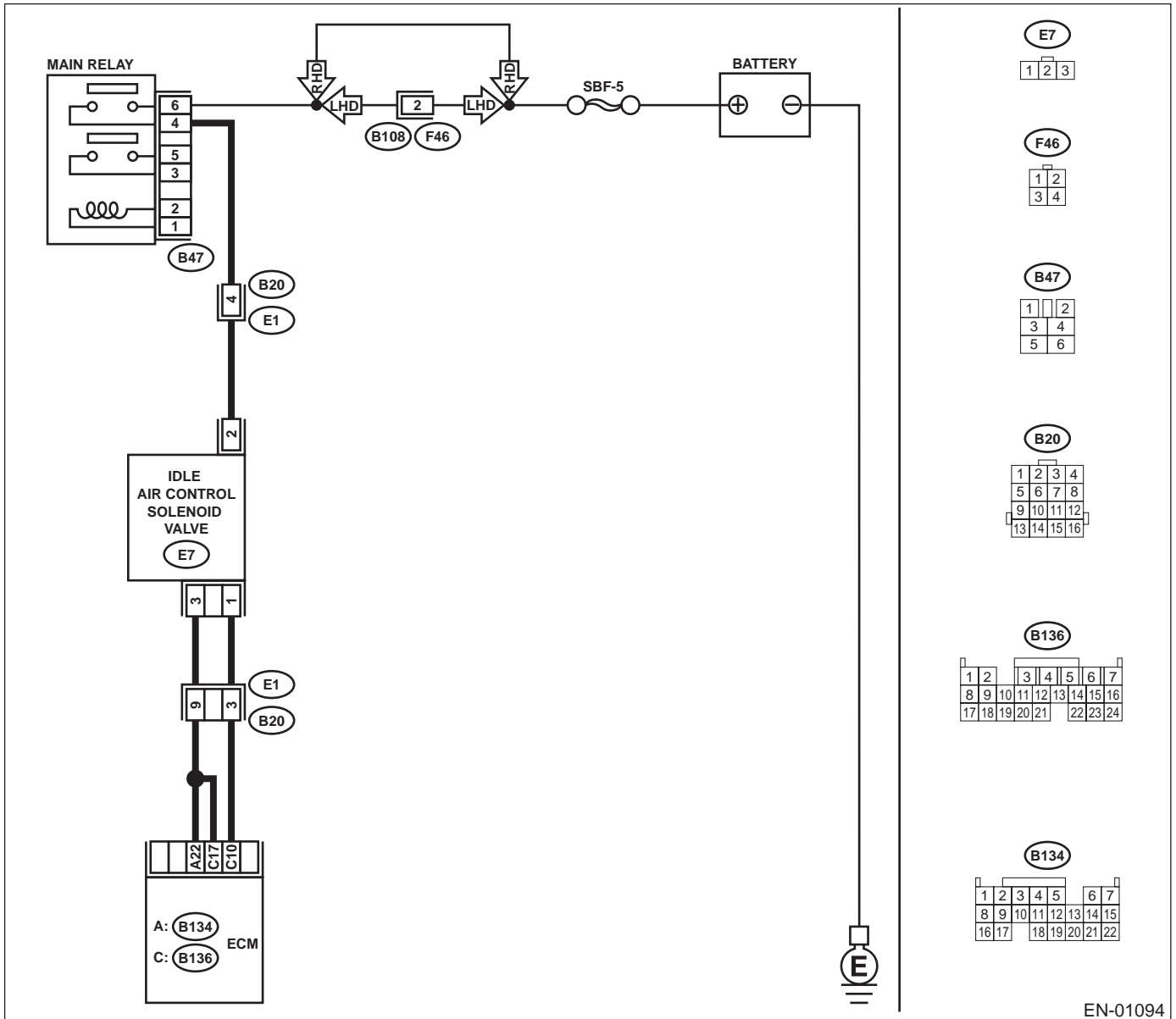
BK:DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01094

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK THROTTLE CABLE. Does throttle cable have play for adjustment?	Throttle cable has play for adjustment.	Go to step 2.	Adjust throttle cable. <Ref. to SP(H6DO)-8, Accelerator Control Cable.>
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 4.
3 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Replace idle air control solenoid valve <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>
4 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-): Does the voltage change exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	10 V	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BL:DTC P0512 — STARTER REQUEST CIRCUIT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Failure of engine to start

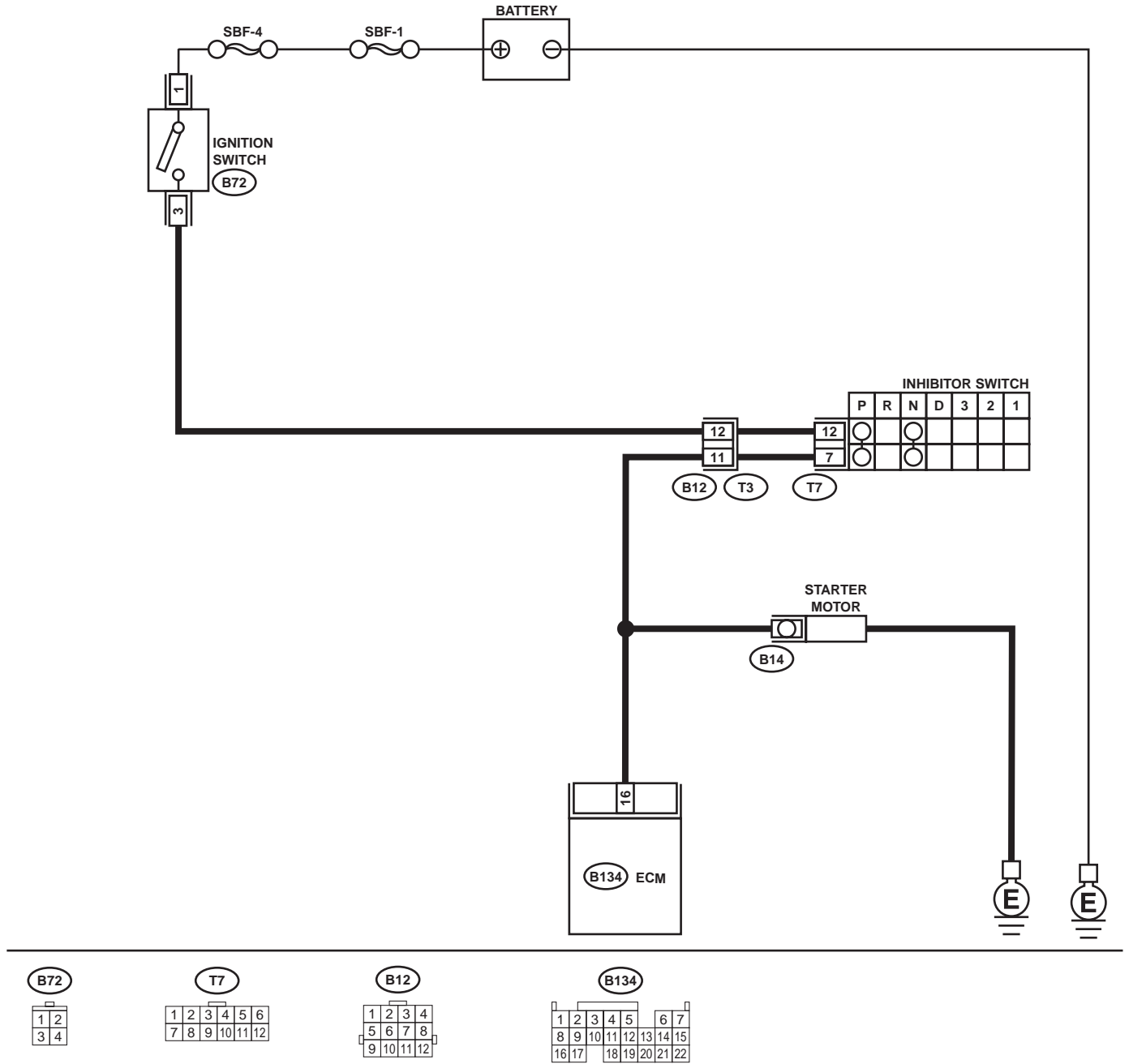
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01082

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. NOTE: Place the inhibitor switch in each position. Does starter motor operate when ignition switch to "ON"?	Starter motor operates.	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EN(H6DO)-71, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BM:DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMANCE —

• **DTC DETECTING CONDITION:**

- Immediately at fault recognition

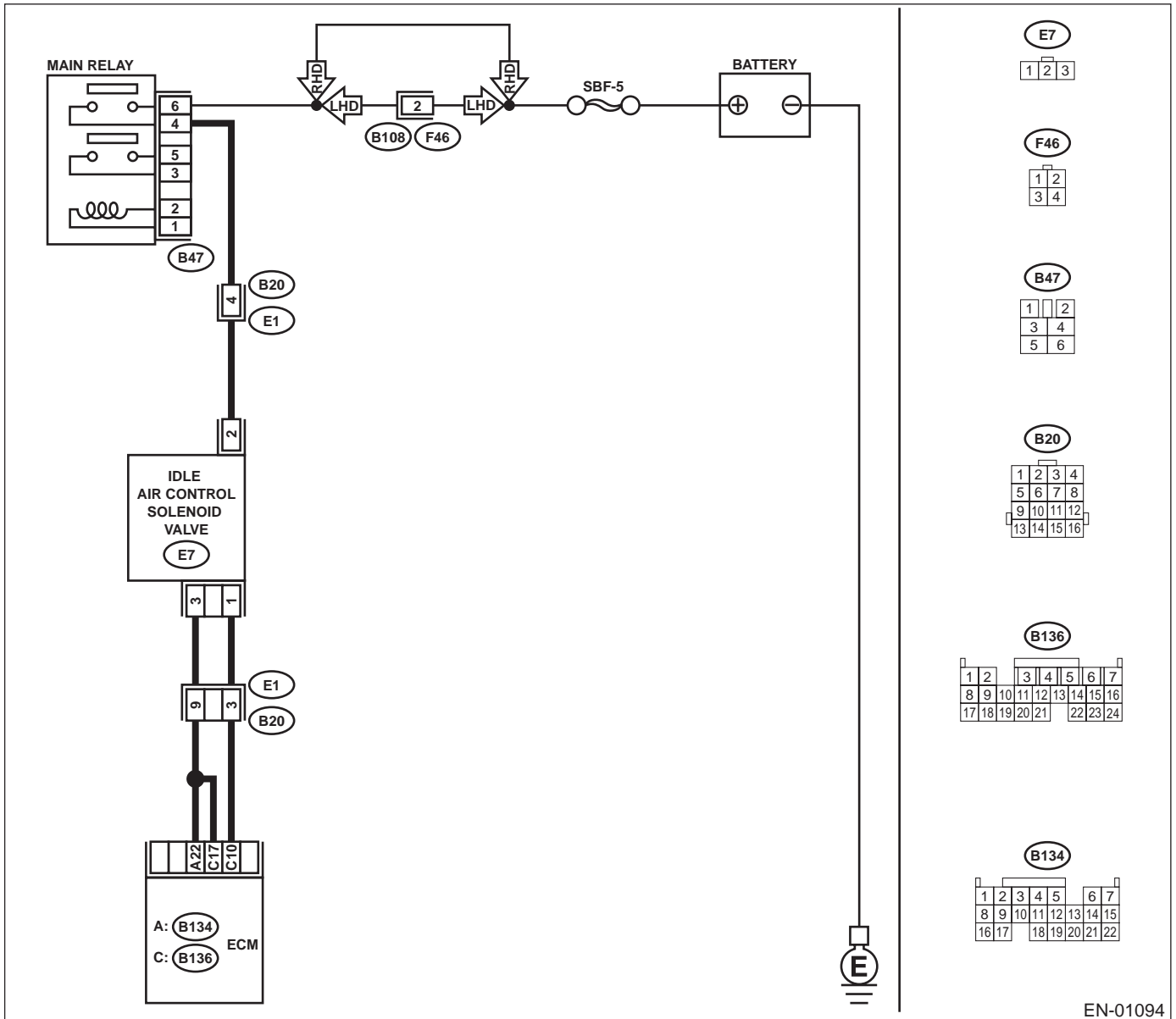
• **TROUBLE SYMPTOM:**

- Engine does not return to normal idle speed.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• **WIRING DIAGRAM:**



EN-01094

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1507.	Go to step 2.
2 CHECK THROTTLE CABLE. Does throttle cable have play for adjustment?	Throttle cable has a play.	Go to step 3.	Adjust throttle cable. <Ref. to SP(H6DO)-8, Accelerator Control Cable.>
3 CHECK AIR INTAKE SYSTEM. 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. <ul style="list-style-type: none"> • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses Is there a fault in air intake system?	There is a fault.	Repair air suction and leaks.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BN:DTC P0558 — ALTERNATOR CIRCUIT LOW INPUT —

NOTE:

For the diagnostic procedure, refer to DTC P0559. <Ref. to EN(H6DO)-268, DTC P0559 — ALTERNATOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BO:DTC P0559 — ALTERNATOR CIRCUIT HIGH INPUT —

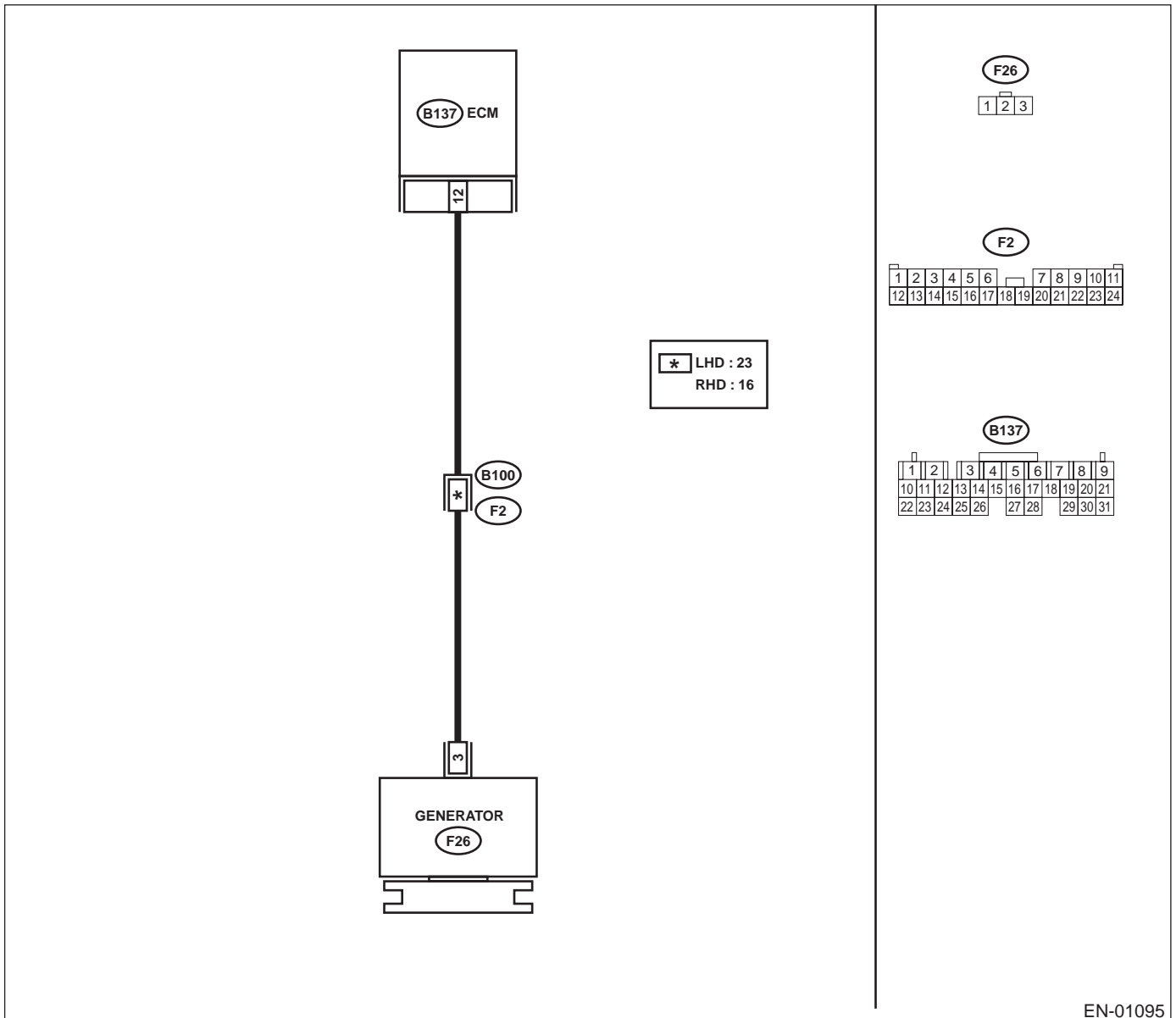
• DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect the connectors from generator and ECM. 3) Measure the resistance of harness between generator connector and engine ground.</p> <p>Connector & terminal (F26) No. 3 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 2.	Repair the short circuit in harness between ECM and generator connector.
<p>2</p> <p>CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between ECM and generator of harness connector.</p> <p>Connector & terminal (B137) No. 12 — (F26) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Repair poor contact in connector.	Repair the open circuit in harness between ECM and generator connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and generator connector • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BP:DTC P0565 — CRUISE CONTROL ON SIGNAL —

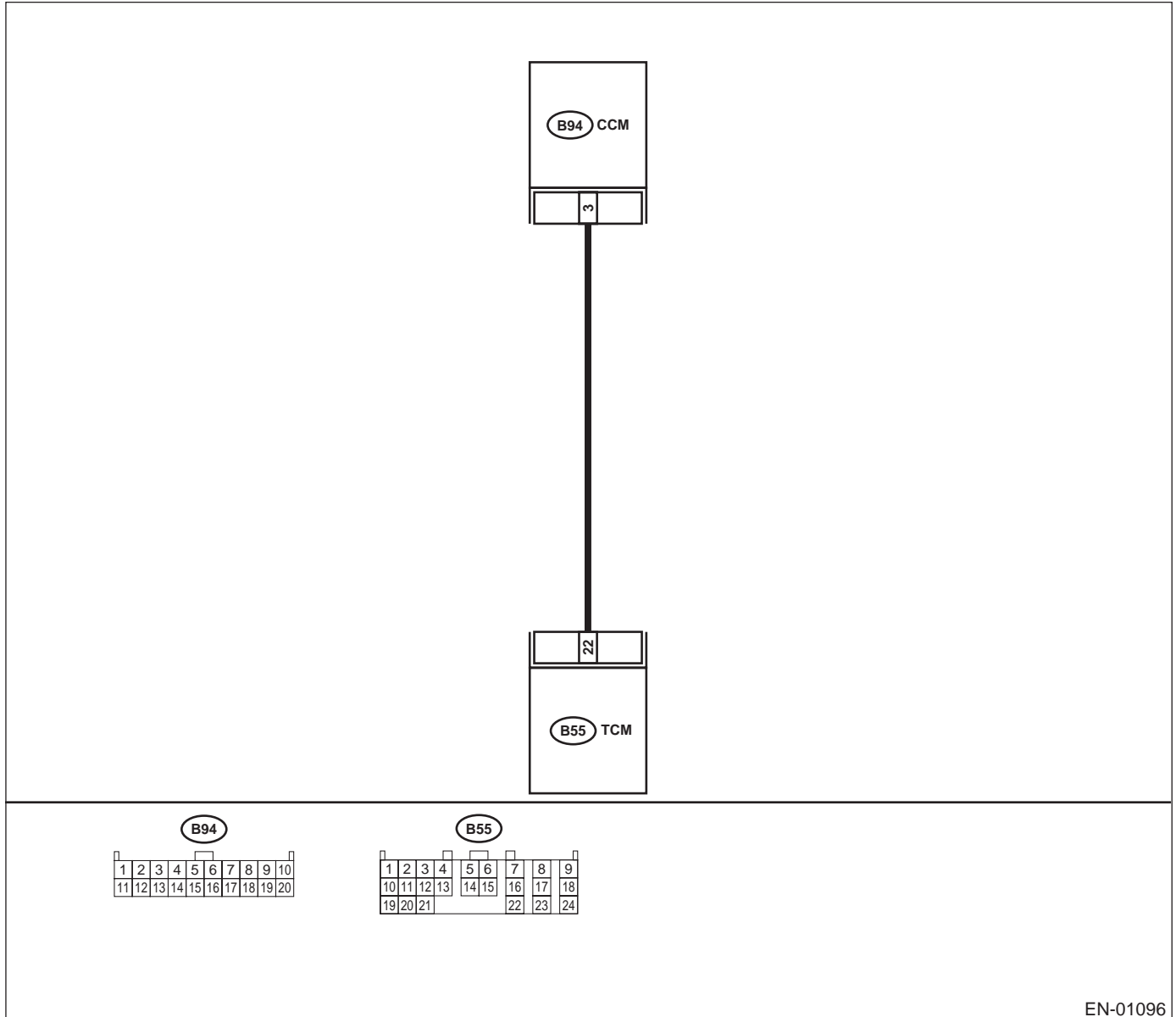
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01096

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and CCM. 3) Measure resistance of harness between TCM and CCM connector. Connector & terminal (B55) No. 22 — (B94) No. 3: Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and CCM connector.
<p>2 CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 22 — Chassis ground: Is the measured value less than the specified value?</p>	10 Ω	Repair short circuit in harness between TCM and CCM connector.	Go to step 3.
<p>3 CHECK INPUT SIGNAL FOR TCM. 1) Connect connector to TCM and CCM. 2) Lift-up the vehicle or set the vehicle on free rollers. CAUTION: On AWD models, raise all wheels off ground. 3) Start the engine. 4) Cruise control main switch to ON. 5) Move selector lever to “D” and slowly increase vehicle speed to 50 km/h (31 MPH). 6) Cruise control command switch to ON. 7) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 22 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 4.	Check cruise control command switch circuit. <Ref. to CC-8, Cruise Control Command Switch.>
<p>4 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?</p>	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

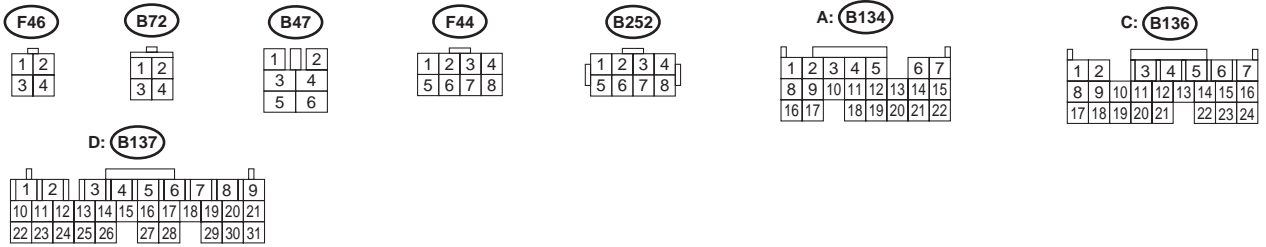
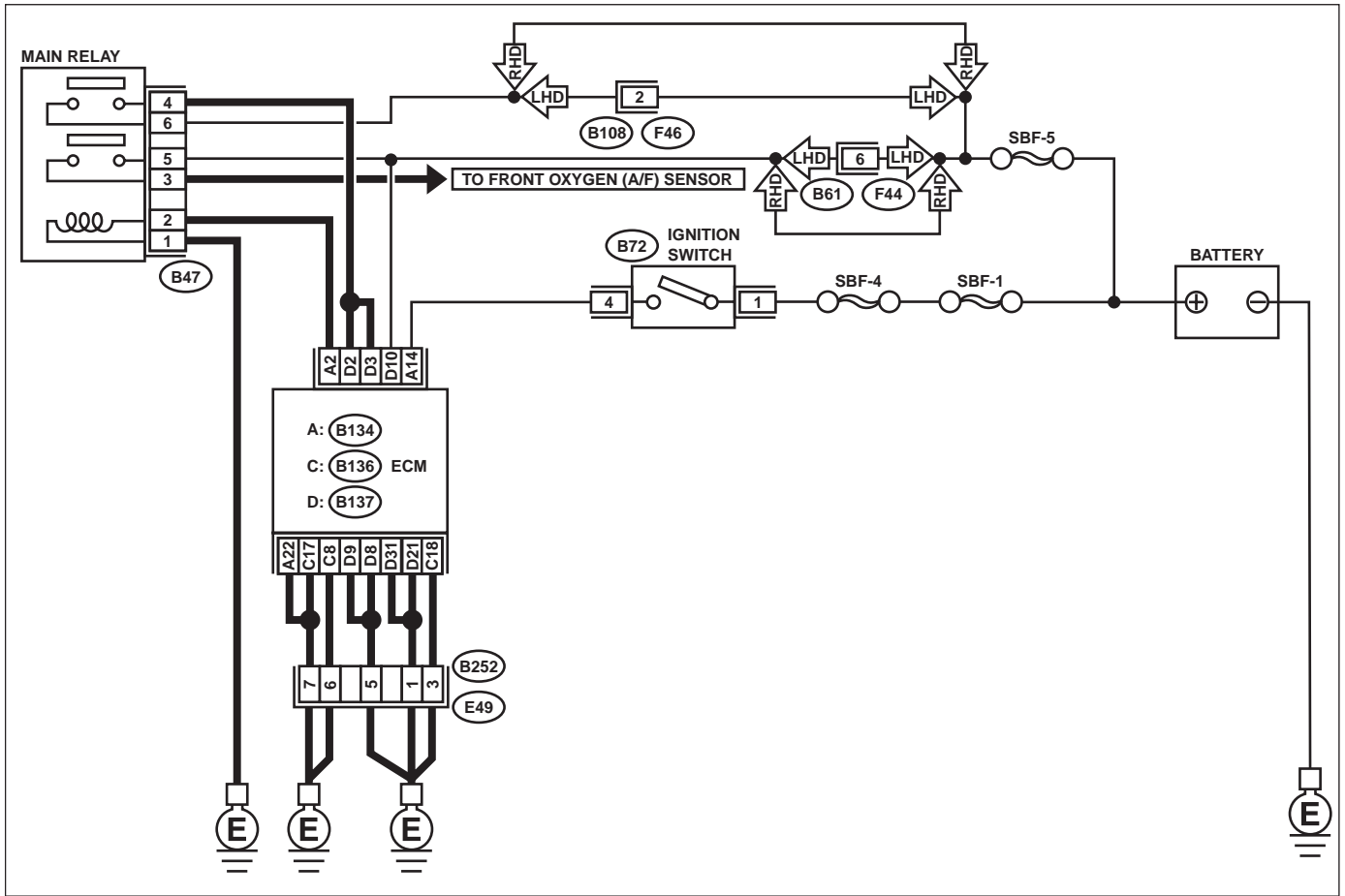
BQ:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine does not start.
 - Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• **WIRING DIAGRAM:**



EN-01083

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	DTC P0604 is indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	It is not necessary to inspect DTC P0604.

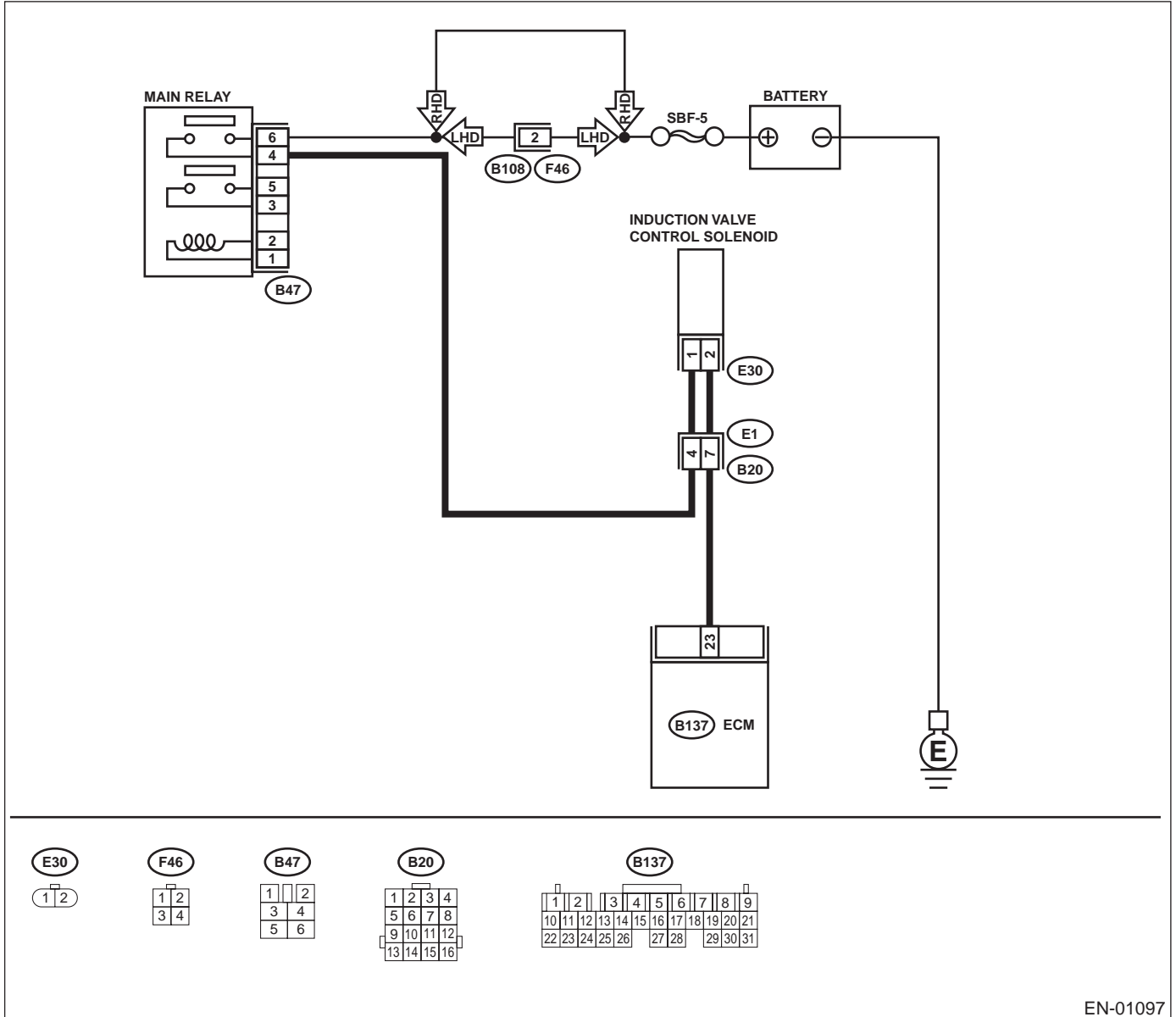
**BR:DTC P0661 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT
 LOW - BANK 1 —**

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK INPUT SIGNAL OF ECM.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 23 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	<p>Even if MI lights up, the circuit has returned to a normal condition at this time. Contact SUBARU distributor service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from induction control solenoid valve and ECM. 3) Measure resistance of harness between induction control solenoid valve connector and engine ground.</p> <p>Connector & terminal (E30) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	<p>Repair ground short circuit in harness between ECM and induction control solenoid valve connector.</p>	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>Measure resistance of harness between ECM and induction control solenoid valve of harness connector.</p> <p>Connector & terminal (B137) No. 23 — (E30) No. 2:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	<p>Repair open circuit in harness between ECM and induction control solenoid valve connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and induction control solenoid valve connector • Poor contact in coupling connector
<p>4</p> <p>CHECK INDUCTION CONTROL SOLENOID VALVE.</p> <p>1) Remove induction control solenoid valve. 2) Measure resistance between induction control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified range?</p>	37 — 44 Ω	Go to step 5.	<p>Replace induction control solenoid valve. <Ref. to FU(H6DO)-38, Induction Valve Control Solenoid.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK POWER SUPPLY TO INDUCTION CONTROL SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between induction control solenoid valve and engine ground. Connector & terminal (E30) No. 1 (+) — Engine ground (-): Is the measured value within the specified range?</p>	10 V	Go to step 6.	Repair open circuit in harness between main relay and induction control solenoid valve connector.
<p>6 CHECK POOR CONTACT. Check poor contact in induction control solenoid valve connector. Is there poor contact in induction control solenoid valve connector?</p>	There is poor contact.	Repair poor contact in induction control solenoid valve connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

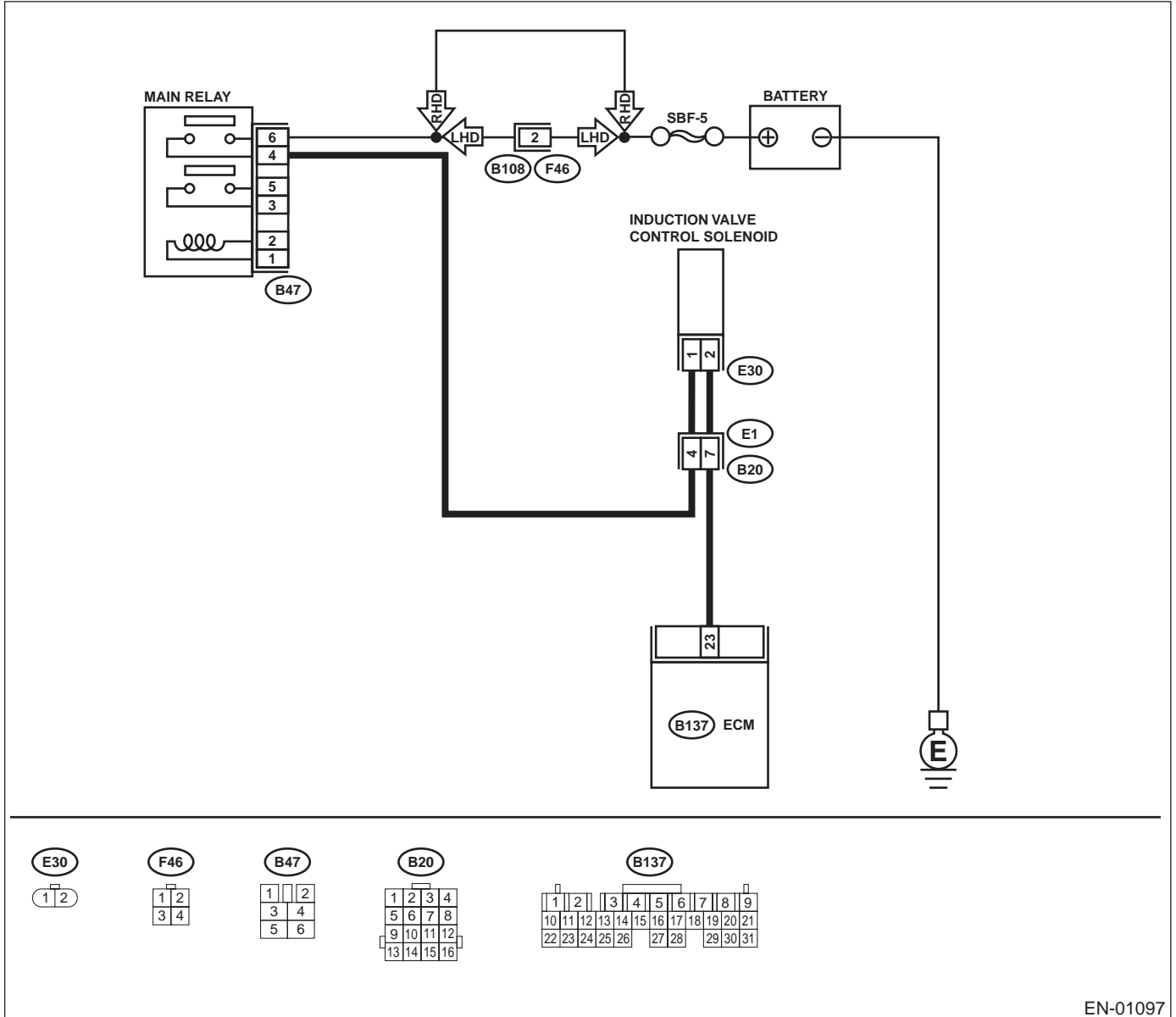
**BS:DTC P0662 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT
 HIGH - BANK 1 —**

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL OF ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B137) No. 23 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
3 CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from induction control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. Connector & terminal (B137) No. 23 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and induction control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step 4.
4 CHECK INDUCTION CONTROL SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Measure resistance between induction control solenoid valve terminals. Terminals No. 1 — No. 2: Is the measured value less than the specified value?	1 Ω	Replace induction control solenoid valve <Ref. to FU(H6DO)-38, Induction Valve Control Solenoid.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BT:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

- **TROUBLE SYMPTOM:**

- Radiator fan does not operate properly.
- Overheating

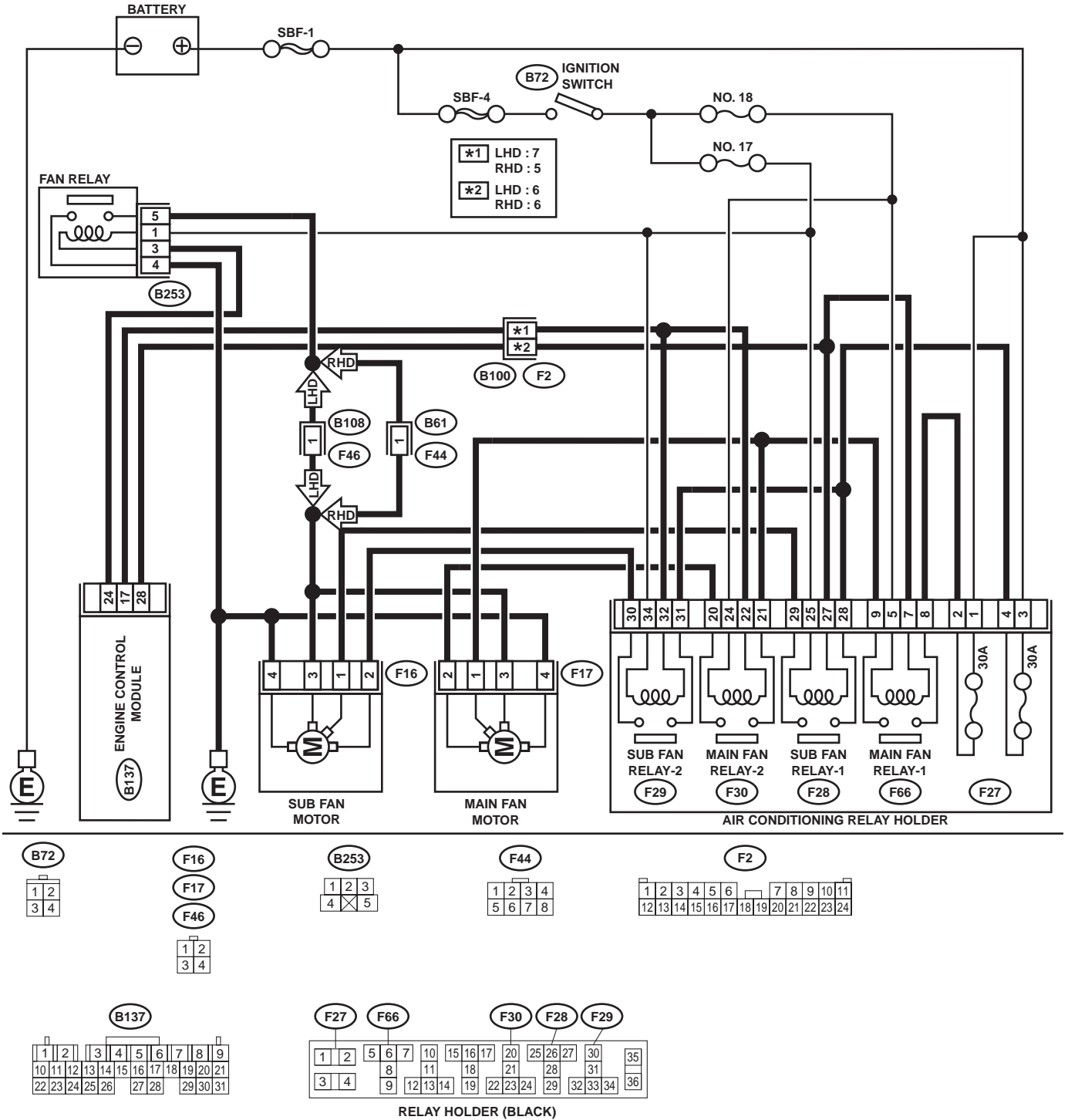
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



CO-00167

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating radiator fan relay, measure voltage between ECM terminal and ground.</p> <p>NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-34, Subaru Select Monitor.></p> <p>Connector & terminal (B137) No. 28 (+) — Chassis ground (-): (B137) No. 17 (+) — Chassis ground (-):</p> <p>Does the measured value change within the specified range?</p>	0 — 10 V	Repair poor contact in ECM connector.	Go to step 2.
<p>2 CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY 1 CONTROL CIRCUIT.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and remove main fan relays from A/C relay holder. 3) Measure resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 28 — Chassis ground: (B137) No. 17 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair ground short circuit in radiator fan relay 1 control circuit.
<p>3 CHECK POWER SUPPLY FOR RELAY.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between fuse and relay box (F/B) connector and chassis ground.</p> <p>Connector & terminal (F66) No. 5 (+) — Chassis ground (-): (F30) No. 24 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
<p>4 CHECK MAIN FAN RELAYS.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between main fan relay terminals.</p> <p>Terminal (F66) No. 5 — No. 7: (F30) No. 22 — No. 24:</p> <p>Is the measured value within the specified range?</p>	87 — 107 Ω	Go to step 5.	Replace main fan relay.
<p>5 CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.</p> <p>Measure resistance of harness between ECM and main fan relay connector.</p> <p>Connector & terminal (B137) No. 28 — (F66) No. 7: (B137) No. 17 — (F30) No. 22:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and main fan relay connector • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in ECM or main fan relay connector. Is there poor contact in ECM or main fan relay connector?	There is poor contact.	Repair poor contact in ECM or main fan relay connector.	Contact SUBARU distributor service.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BU:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

- **TROUBLE SYMPTOM:**

- Radiator fan does not operate properly.
- Overheating

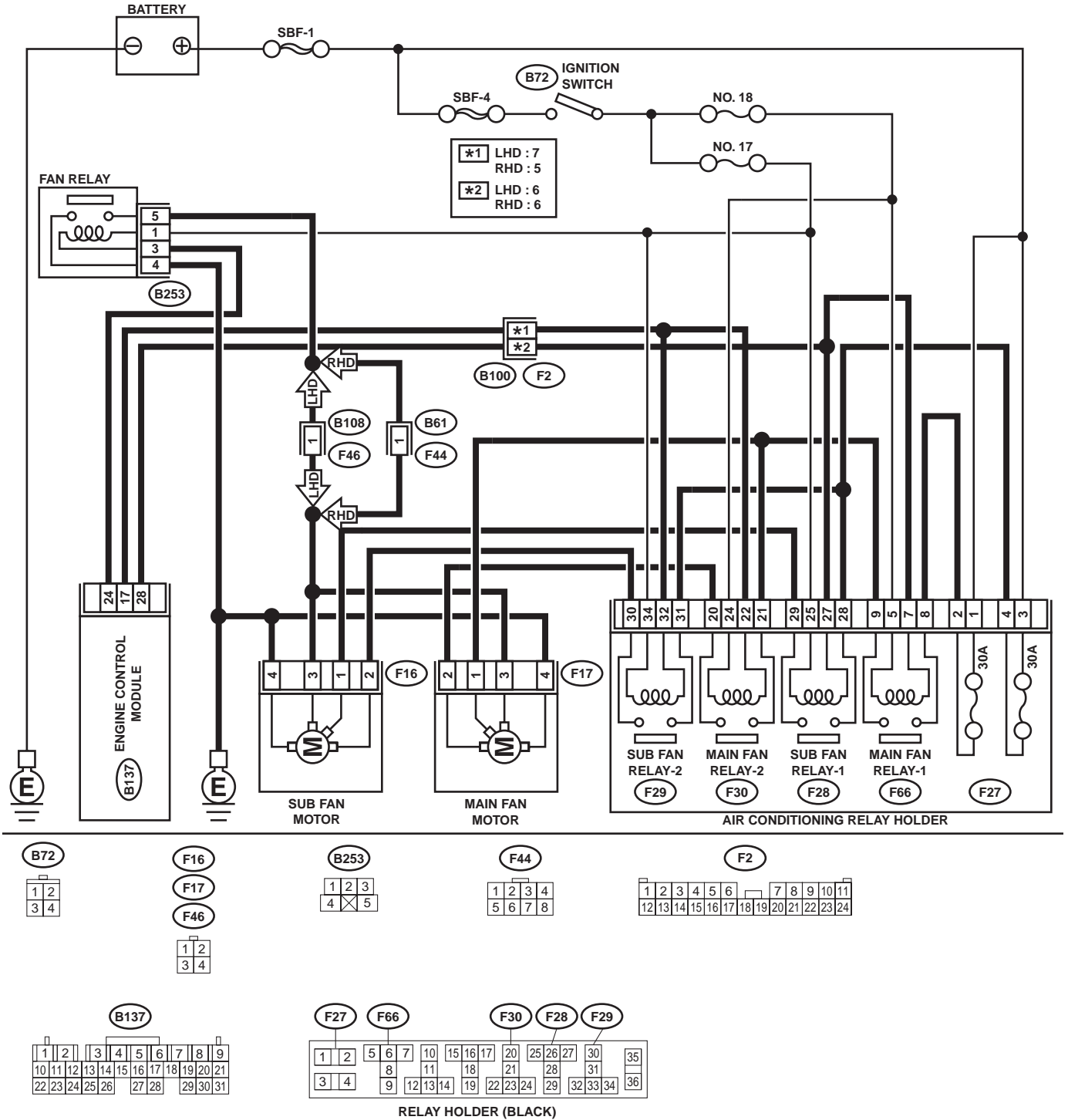
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



CO-00167

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating radiator fan relay, measure voltage between ECM and chassis ground.</p> <p>NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-55, Compulsory Valve Operation Check Mode.></p> <p>Connector & terminal (B137) No. 28 (+) — Chassis ground (-): (B137) No. 17 (+) — Chassis ground (-):</p> <p>Does the measured value change within the specified range?</p>	0 — 10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step 2.
<p>2 CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.</p> <p>1) Turn ignition switch to OFF. 2) Remove main fan relay and sub fan relay. (with A/C models) 3) Disconnect test mode connector. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 28 (+) — Chassis ground (-): (B137) No. 17 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in radiator fan relay control circuit.	Go to step 3.
<p>3 CHECK MAIN FAN RELAY.</p> <p>1) Turn ignition switch to OFF. 2) Remove main fan relay. 3) Measure resistance between main fan relay terminals.</p> <p>Terminal (F66) No. 5 — No. 7: (F30) No. 22 — No. 24:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Replace main fan relay.	Go to step 4.
<p>4 CHECK SUB FAN RELAY.</p> <p>1) Remove sub fan relay. 2) Measure resistance between sub fan relay terminals.</p> <p>Terminal (F28) No. 25 — No. 27: (F29) No. 32 — No. 34:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Replace sub fan relay.	Go to step 5.
<p>5 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BV:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —

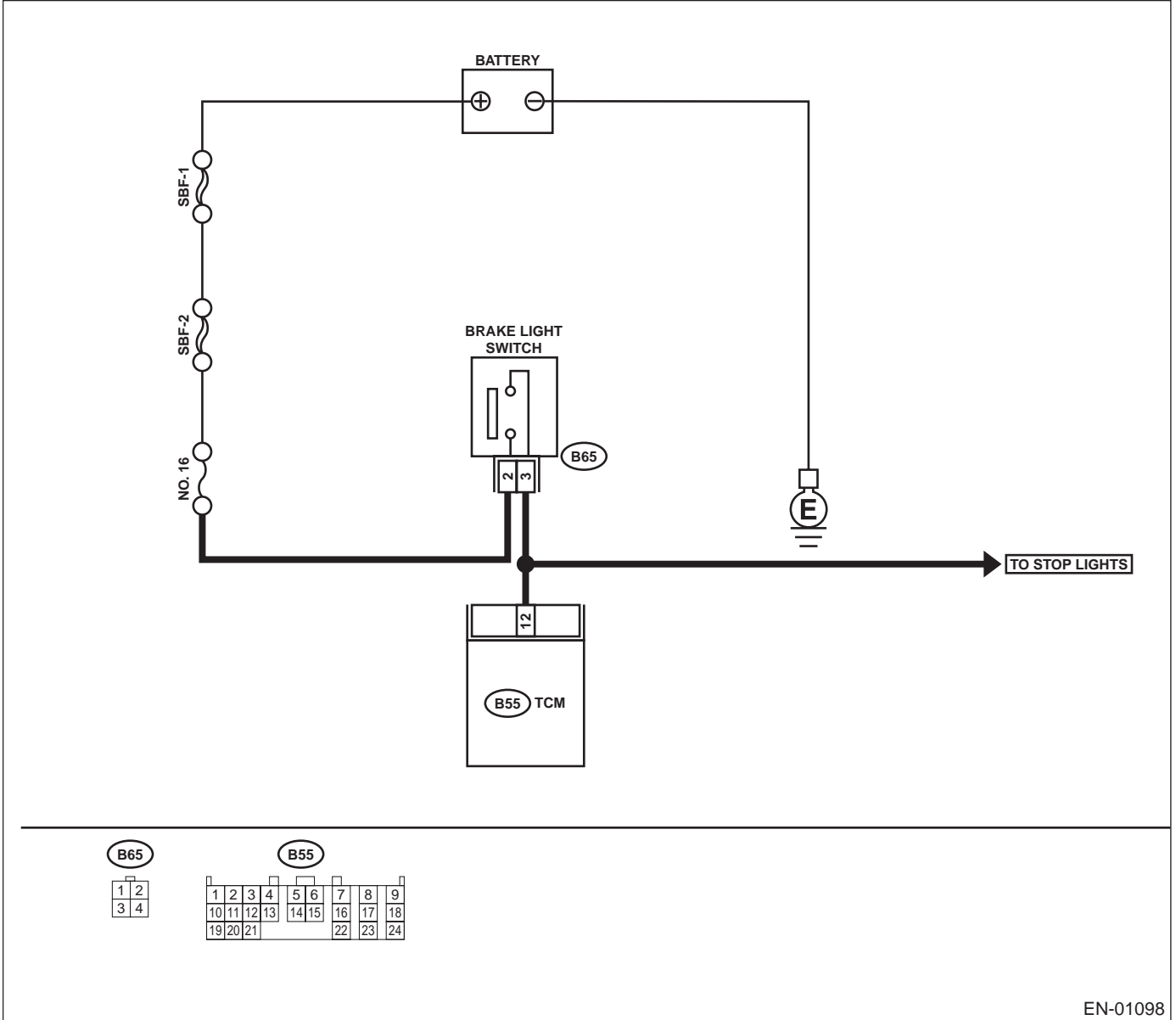
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



EN-01098

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF BRAKE LIGHT. Does brake light come on when depressing the brake pedal?	Comes on.	Go to step 2.	Repair or replace brake light circuit.
2 CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR. 1) Disconnect connectors from TCM and brake light switch. 2) Measure resistance of harness between TCM and brake light switch connector. Connector & terminal (B55) No. 12 — (B65) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair or replace harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3 CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair ground short circuit in harness between TCM and brake light switch connector.
4 CHECK INPUT SIGNAL FOR TCM. 1) Connect connectors to TCM and brake light switch. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 12 (+) — Chassis ground (-): Is the measured value less than the specified value when releasing the brake pedal?	1 V	Go to step 5.	Adjust or replace brake light switch. <Ref. to LI-8, INSPECTION, Stop Light System.>
5 CHECK INPUT SIGNAL FOR TCM. Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value when depressing the brake pedal?	10 V	Go to step 6.	Adjust or replace brake light switch. <Ref. to LI-8, INSPECTION, Stop Light System.>
6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BW:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6DO)-291, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BX:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6DO)-291, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BY:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6DO)-291, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BZ:DTC P0734 — GEAR 4 INCORRECT RATIO —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

• **TROUBLE SYMPTOM:**

- Shift point too high or too low; engine brake not effective in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK THROTTLE POSITION SENSOR CIRCUIT. Check throttle position sensor circuit. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in throttle position sensor circuit?	There is a malfunction.	Repair or replace throttle position sensor circuit.	Go to step 3.
3 CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT. Check front vehicle speed sensor circuit. <Ref. to AT-58, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in front throttle position sensor circuit?	There is a malfunction.	Repair or replace front vehicle speed sensor circuit.	Go to step 4.
4 CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT. Check torque converter turbine speed sensor circuit. <Ref. to AT-64, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in torque converter turbine speed sensor circuit?	There is a malfunction.	Repair or replace torque converter turbine speed sensor circuit.	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Go to step 6.
6 CHECK MECHANICAL TROUBLE. Check mechanical trouble in automatic transmission. Is there any mechanical trouble in automatic transmission?	There is a malfunction.	Repair or replace automatic transmission.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CA:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

• TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- No shift or excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK LOCK-UP DUTY SOLENOID CIRCUIT. Check lock-up duty solenoid circuit. <Ref. to AT-96, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in lock-up duty solenoid circuit?	There is a malfunction.	Repair or replace lock-up duty solenoid circuit.	Go to step 3.
3 CHECK THROTTLE POSITION SENSOR CIRCUIT. Check throttle position sensor circuit. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in throttle position sensor circuit?	There is a malfunction.	Repair or replace throttle position sensor circuit.	Go to step 4.
4 CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT. Check torque converter turbine speed sensor circuit. <Ref. to AT-64, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in torque converter turbine speed sensor circuit?	There is a malfunction.	Repair or replace torque converter turbine speed sensor circuit.	Go to step 5.
5 CHECK ENGINE SPEED INPUT CIRCUIT. Check engine speed input circuit. <Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in engine speed input circuit?	There is a malfunction.	Repair or replace engine speed input circuit.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK INHIBITOR SWITCH CIRCUIT. Check inhibitor switch circuit. <Ref. to AT-132, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> Is there any trouble in inhibitor switch circuit?	There is a malfunction.	Repair or replace inhibitor switch circuit.	Go to step 7.
7 CHECK BRAKE LIGHT SWITCH CIRCUIT. Check brake light switch circuit. <Ref. to AT-125, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> Is there any trouble in brake light switch circuit?	There is a malfunction.	Repair or replace brake light switch circuit.	Go to step 8.
8 CHECK ATF TEMPERATURE SENSOR CIRCUIT. Check ATF temperature sensor circuit. <Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in ATF temperature sensor circuit?	There is a malfunction.	Repair or replace ATF temperature sensor circuit.	Go to step 9.
9 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Go to step 10.
10 CHECK MECHANICAL TROUBLE. Check mechanical trouble in automatic transmission. Is there any mechanical trouble in automatic transmission?	There is a malfunction.	Repair or replace automatic transmission.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CB:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

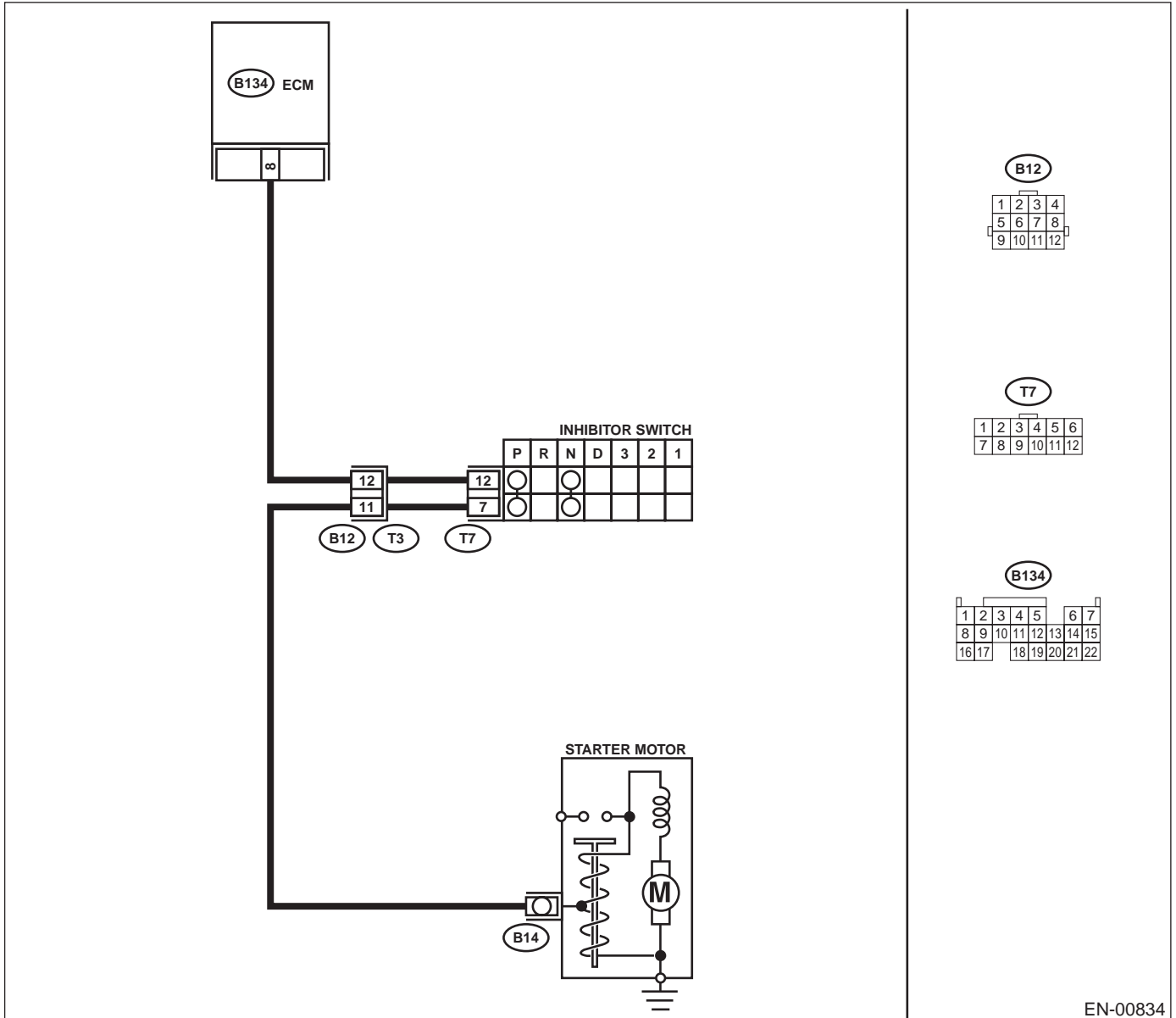
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-00834

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Move select lever to any position except for "N" and "P". 3) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-): Is the measured value within the specified range?	4.5 — 5.5 V	Even if MI lights up, the circuit has returned to a normal condition at this time.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and transmission harness connector (T3). 3) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 8 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step 4.
4 CHECK TRANSMISSION HARNESS CONNECTOR. 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness connector and engine ground. Connector & terminal (T3) No. 12 — Engine ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.	Go to step 5.
5 CHECK INHIBITOR SWITCH. By moving select lever any position except for "N" and "P", measure resistance between inhibitor switch connector socket terminals. Terminals No. 7 — No. 12: Does the measured value exceed the specified value?	1 MΩ	Go to step 6.	Replace inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>
6 CHECK SELECTOR CABLE CONNECTION. Is there any fault in selector cable connection to inhibitor switch?	There is a malfunction.	Repair selector cable connection. <Ref. to CS-12, Select Cable.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CC:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

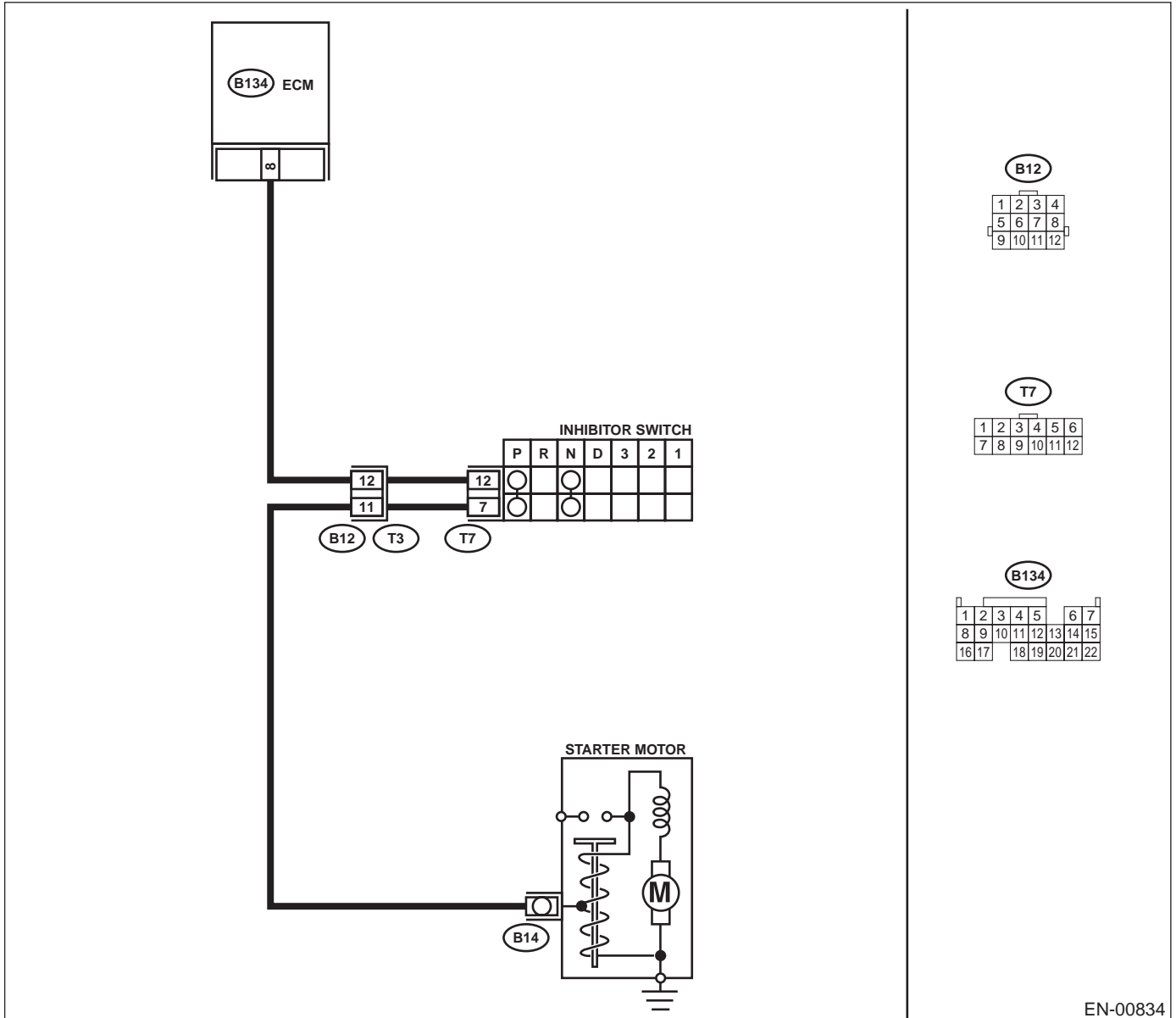
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Move select lever to "N" and "P" positions. 3) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 3.	Go to step 5.
3 CHECK INPUT SIGNAL FOR ECM. By moving select lever to any position except for "N" and "P", measure ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-): Is the measured value within the specified range?	4.5 — 5.5 V	Go to step 4.	Go to step 5.
4 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and inhibitor switch. 3) Measure resistance of harness between ECM and inhibitor switch connector. Connector & terminal (B134) No. 8 — (T7) No. 12: Is the measured value less than the specified value?	1 Ω	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK INHIBITOR SWITCH GROUND LINE. Measure resistance of harness between inhibitor switch connector and engine ground. Connector & terminal (T7) No. 12 — Engine ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 8.	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
<p>8 CHECK INHIBITOR SWITCH. By moving select lever to "N" and "P" positions, measure resistance between inhibitor switch connector socket terminal. Terminals No. 7 — No. 12: Is the measured value less than the specified value?</p>	1 Ω	Go to step 9.	Replace inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>
<p>9 CHECK SELECTOR CABLE CONNECTION. Is there any fault in selector cable connection to inhibitor switch?</p>	There is a malfunction.	Repair selector cable connection. <Ref. to CS-12, Select Cable.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CD:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

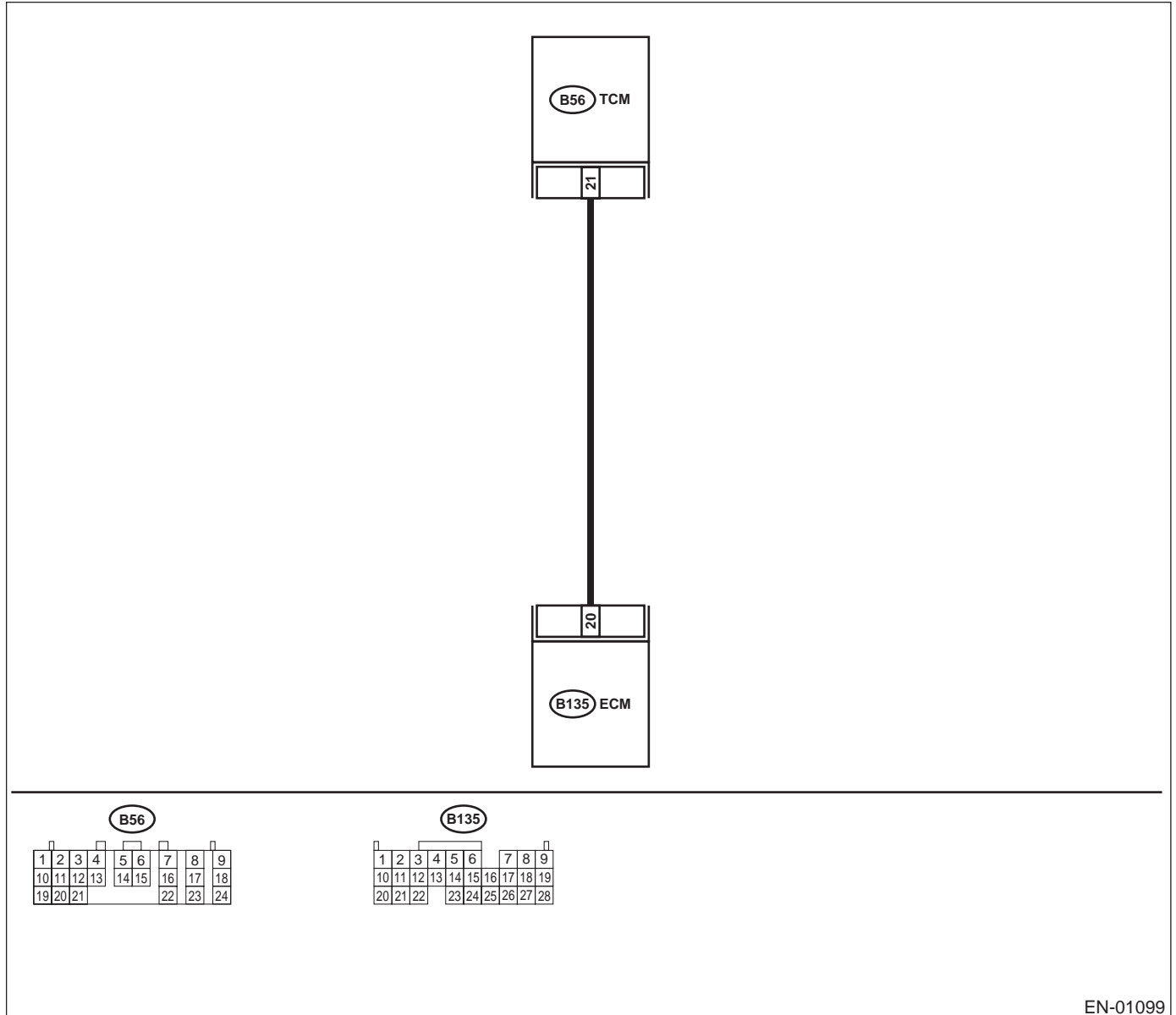
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01099

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DRIVING CONDITION. 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle. Is AT shift control functioning properly?	Operates properly.	Go to step 2.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
2 CHECK ACCESSORY. Are car phone and/or CB installed on vehicle?	Equipped.	Repair grounding line of car phone or CB system.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CE:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

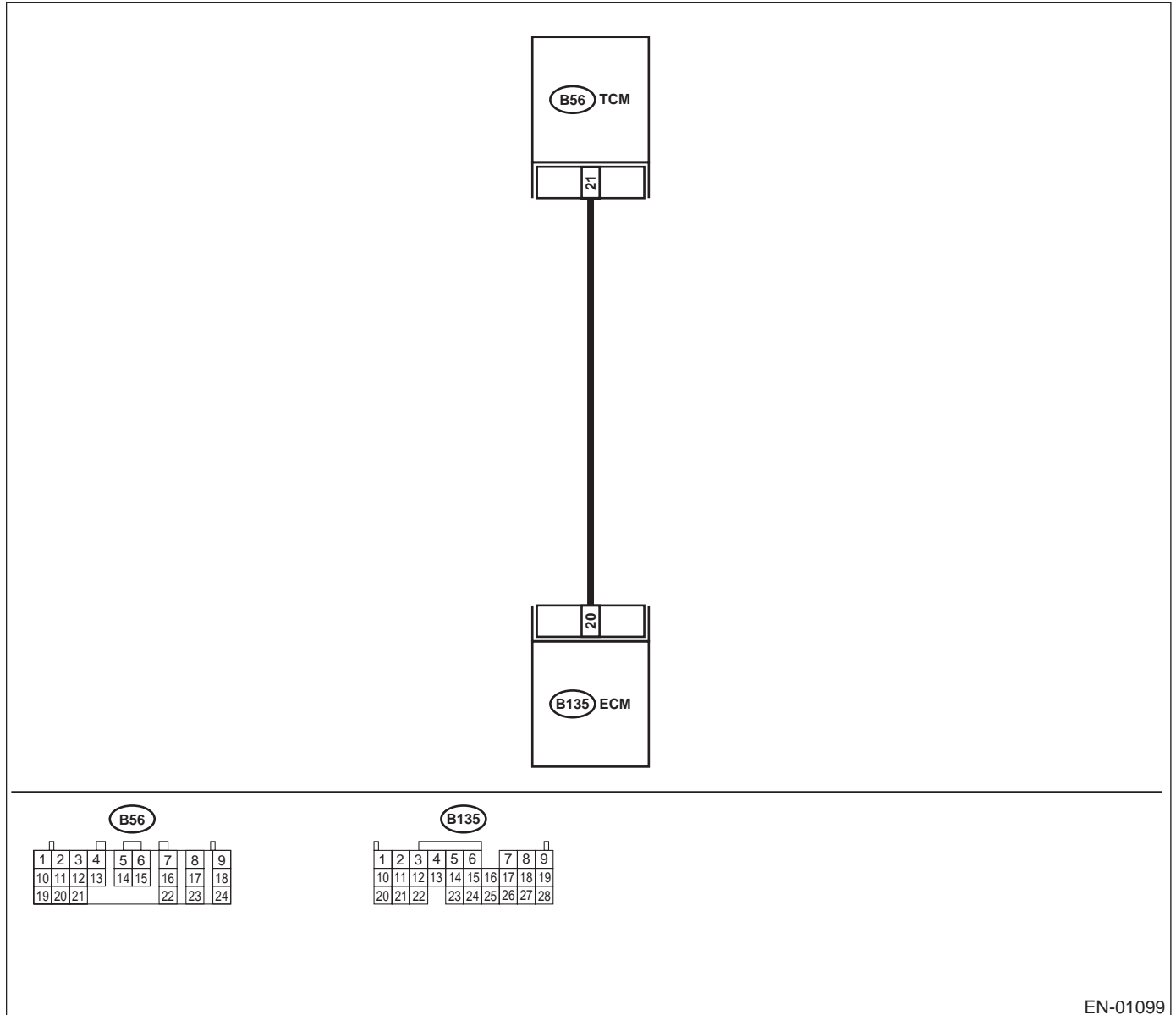
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01099

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B135) No. 20 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 2.	<p>Even if MI lights up, the circuit has returned to a normal condition at this time.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in ECM connector • Poor contact in TCM connector
<p>2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground.</p> <p>Connector & terminal (B135) No. 20 — Chassis ground: Is the measured value less than the specified value?</p>	10 Ω	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 3.
<p>3 CHECK OUTPUT SIGNAL FOR ECM.</p> <p>1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B135) No. 20 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	5 V	Go to step 4.	Repair poor contact in ECM connector.
<p>4 CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION.</p> <p>Read trouble code for automatic transmission. <Ref. to AT-24, Read Diagnostic Trouble Code (DTC).> Does trouble code appear for automatic transmission?</p>	Trouble code for automatic transmission is indicated.	Inspect trouble code for automatic transmission.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CF:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

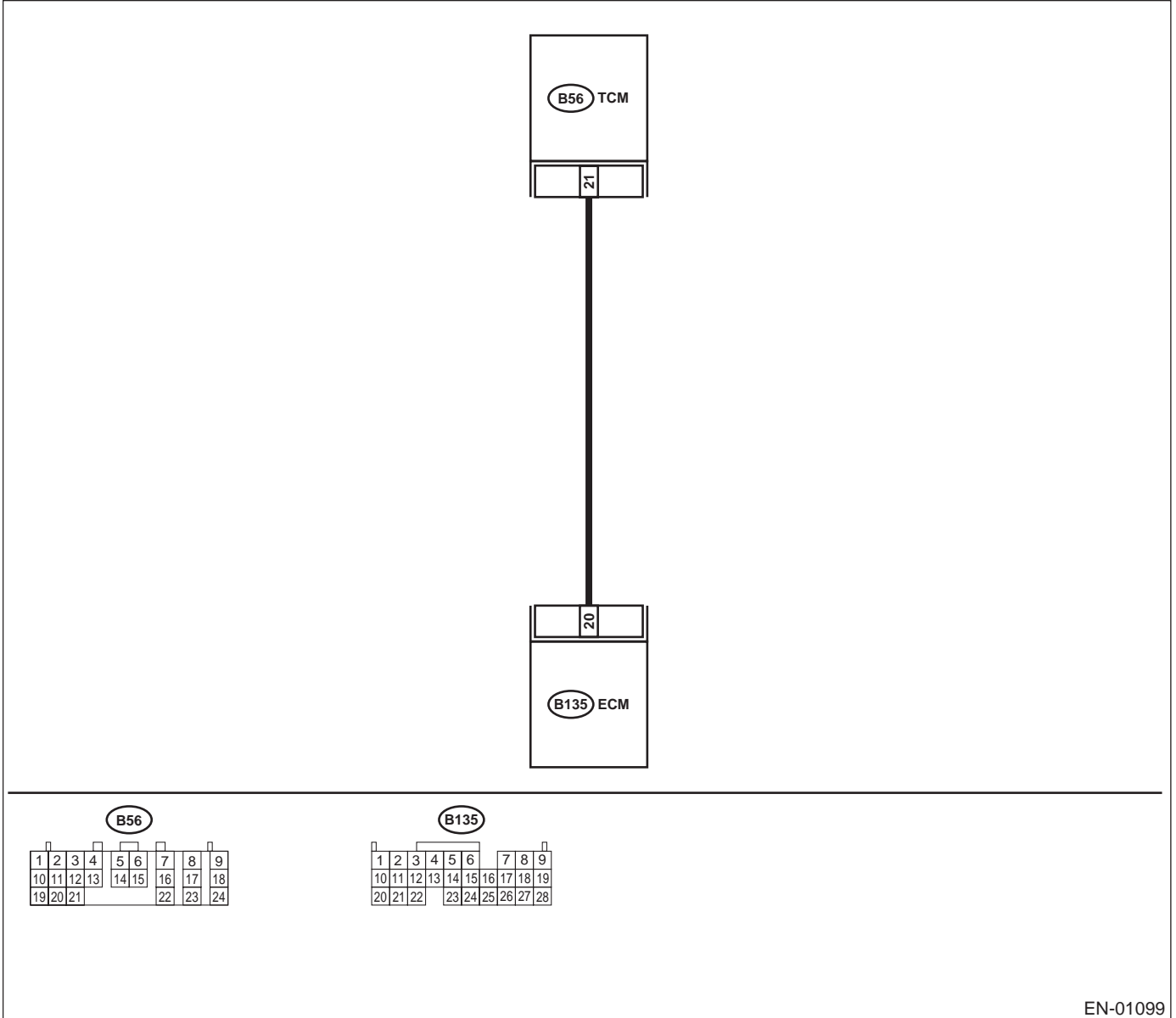
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01099

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 20 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 2.
<p>2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 20 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4 V	Go to step 5.	Go to step 3.
<p>3 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 20 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Repair poor contact in ECM connector.	Go to step 4.
<p>4 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 20 (+) — Chassis ground (-): Does the measured value change within the specified range?</p>	1 V — 4 V	Even if MI lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
<p>5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure voltage between TCM and chassis ground. Connector & terminal (B56) No. 21 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4 V	Go to step 6.	Repair open circuit in harness between ECM and TCM connector.
<p>6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?</p>	There is poor contact.	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CG:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	DTC P1110 is indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1110.

CH:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	DTC P1111 is indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1111.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CI: DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

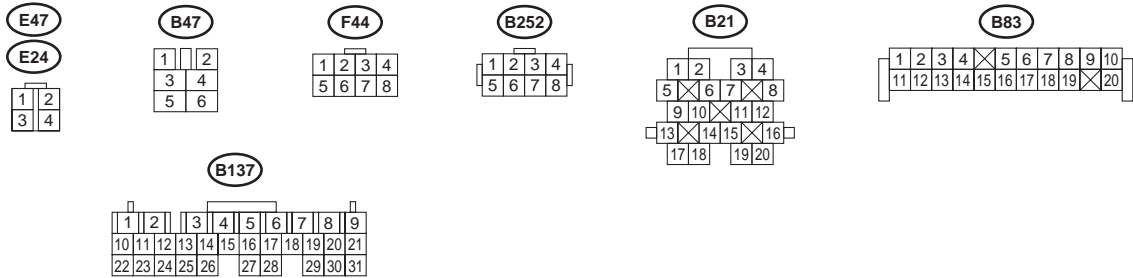
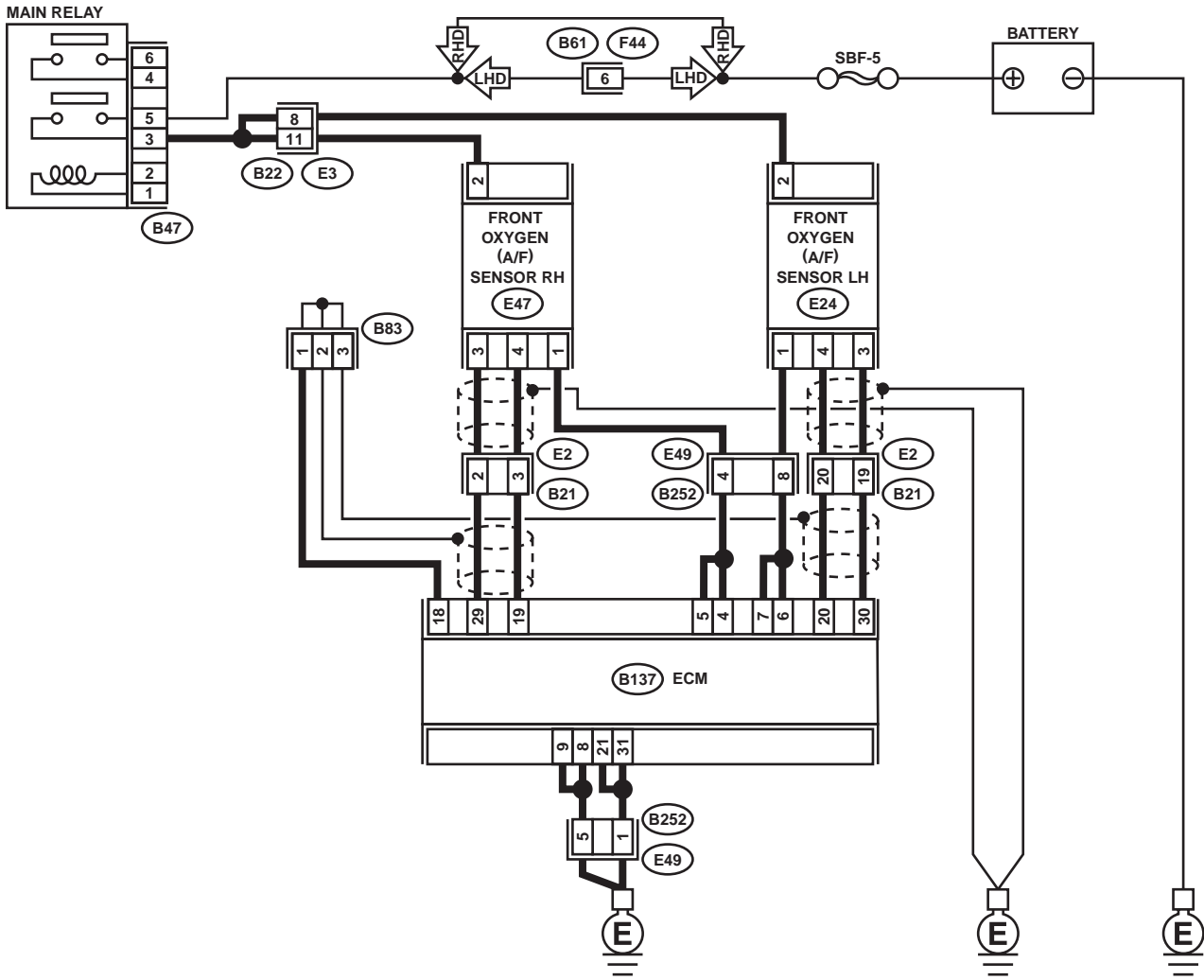
- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• **WIRING DIAGRAM:**



EN-01087

Step	Value	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	DTC P1134 is indicated. Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	It is not necessary to inspect DTC P1134.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CJ:DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —

NOTE:

For the diagnostic procedure, refer to DTC P1153. <Ref. to EN(H6DO)-310, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CK:DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

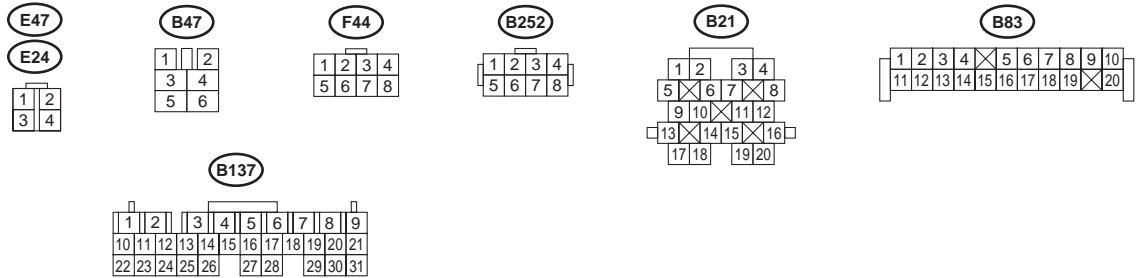
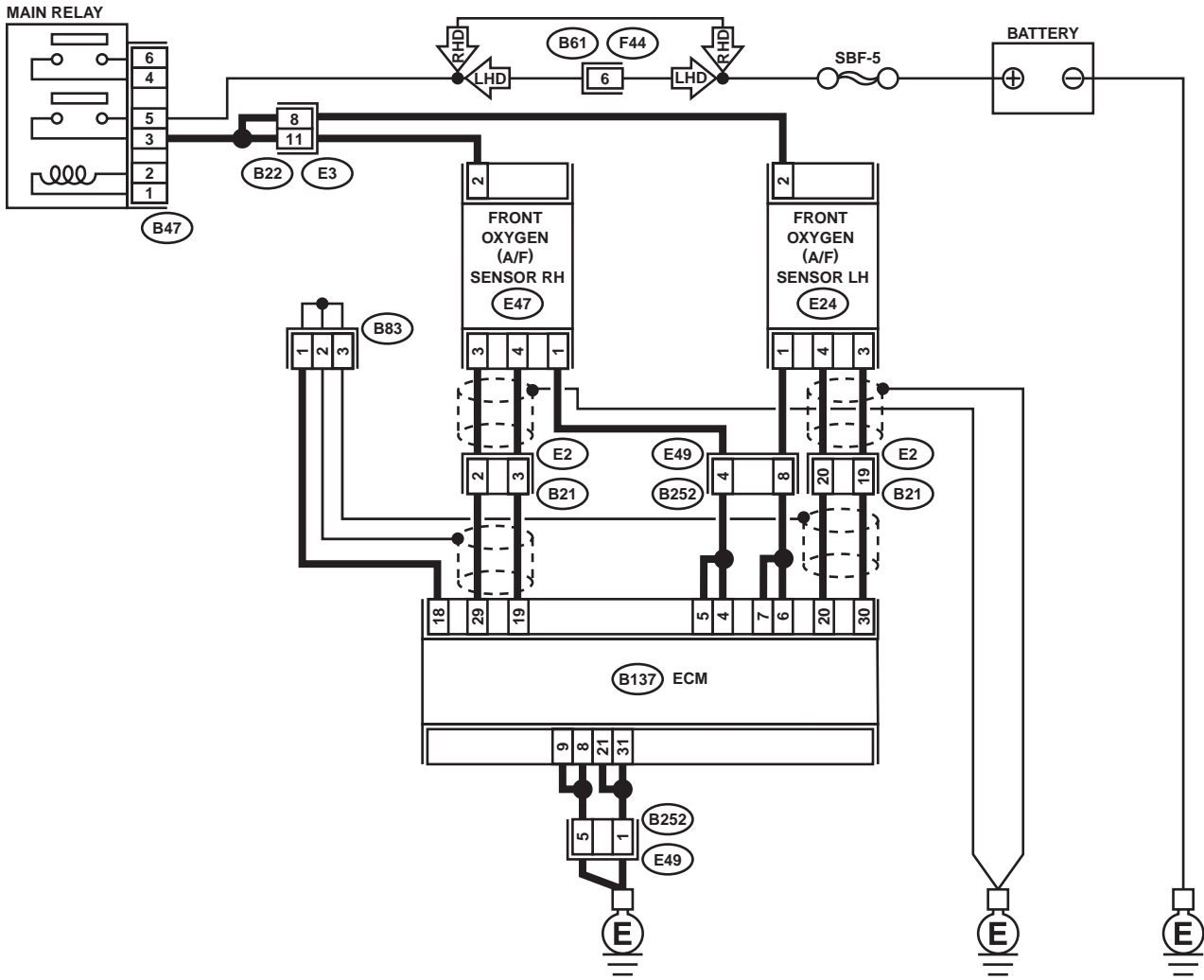
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FRONT (A/F) OXYGEN SENSOR DATA. 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range at idle? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.85 — 1.15	Go to step 3.	Go to step 4.
3 CHECK REAR OXYGEN SENSOR SIGNAL. 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. Does the LED of {Rear O2 Rich Signal} blink? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.>	LED blinks.	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>4 CHECK EXHAUST SYSTEM. Check exhaust system parts.</p> <p>NOTE: Check the following items.</p> <ul style="list-style-type: none"> • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor <p>Is there a fault in exhaust system?</p>	<p>There is a malfunction.</p>	<p>Repair or replace faulty parts.</p>	<p>Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CL: DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —

NOTE:

For the diagnostic procedure, refer to DTC P1155. <Ref. to EN(H6DO)-314, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CM: DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

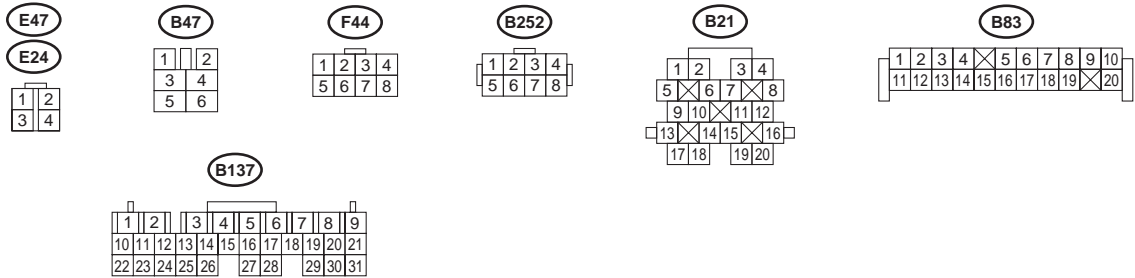
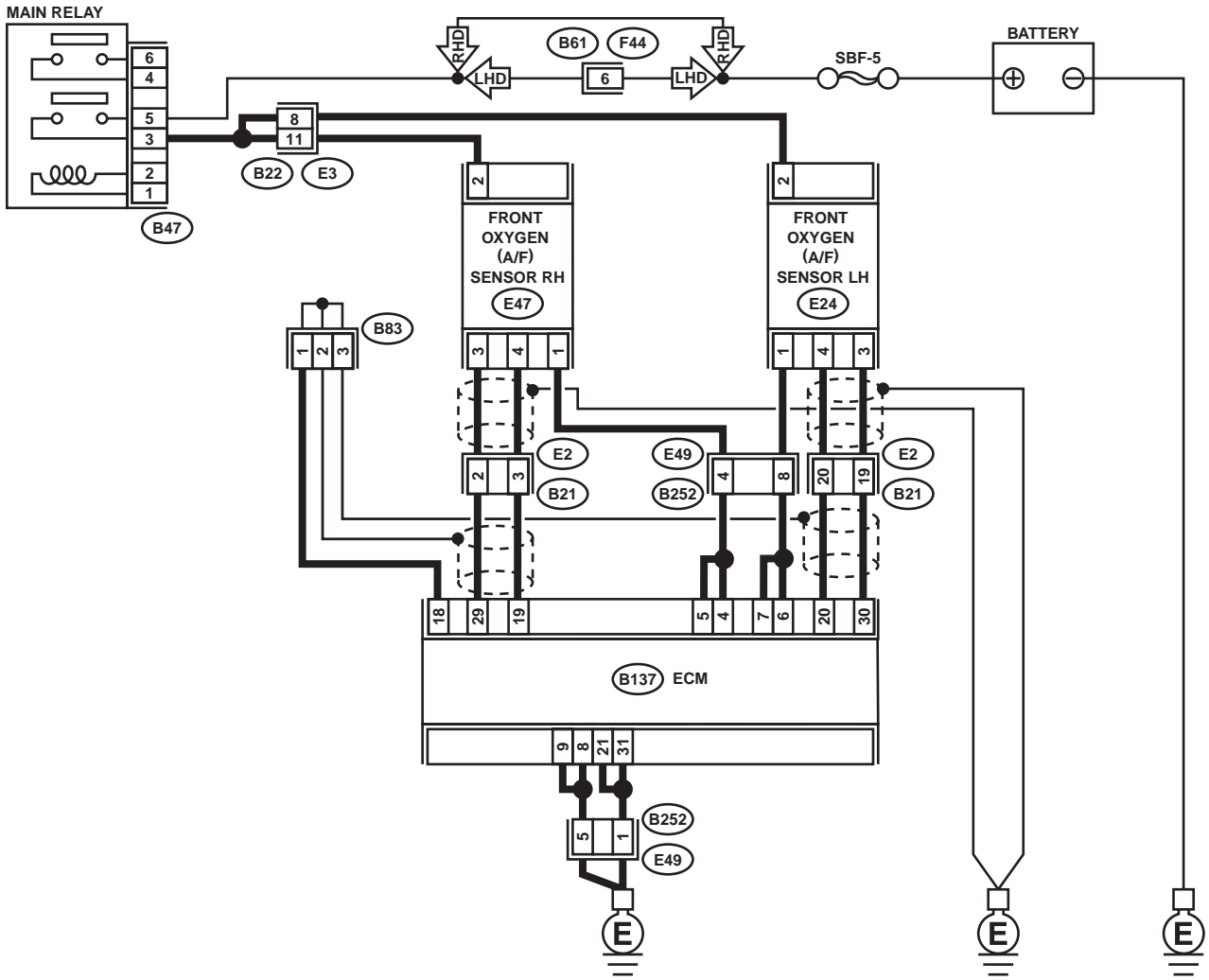
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01087

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FRONT (A/F) OXYGEN SENSOR DATA. 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range at idle? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.85 — 1.15	Go to step 3.	Go to step 4.
3 CHECK REAR OXYGEN SENSOR SIGNAL. 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. Does the LED of {Rear O2 Rich Signal} blink? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-34, Subaru Select Monitor.>	LED blinks.	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>4 CHECK EXHAUST SYSTEM. Check exhaust system parts.</p> <p>NOTE: Check the following items.</p> <ul style="list-style-type: none"> • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor <p>Is there a fault in exhaust system?</p>	<p>There is a malfunction.</p>	<p>Repair or replace faulty parts.</p>	<p>Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CN:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

- **TROUBLE SYMPTOM:**

- Failure of engine to start

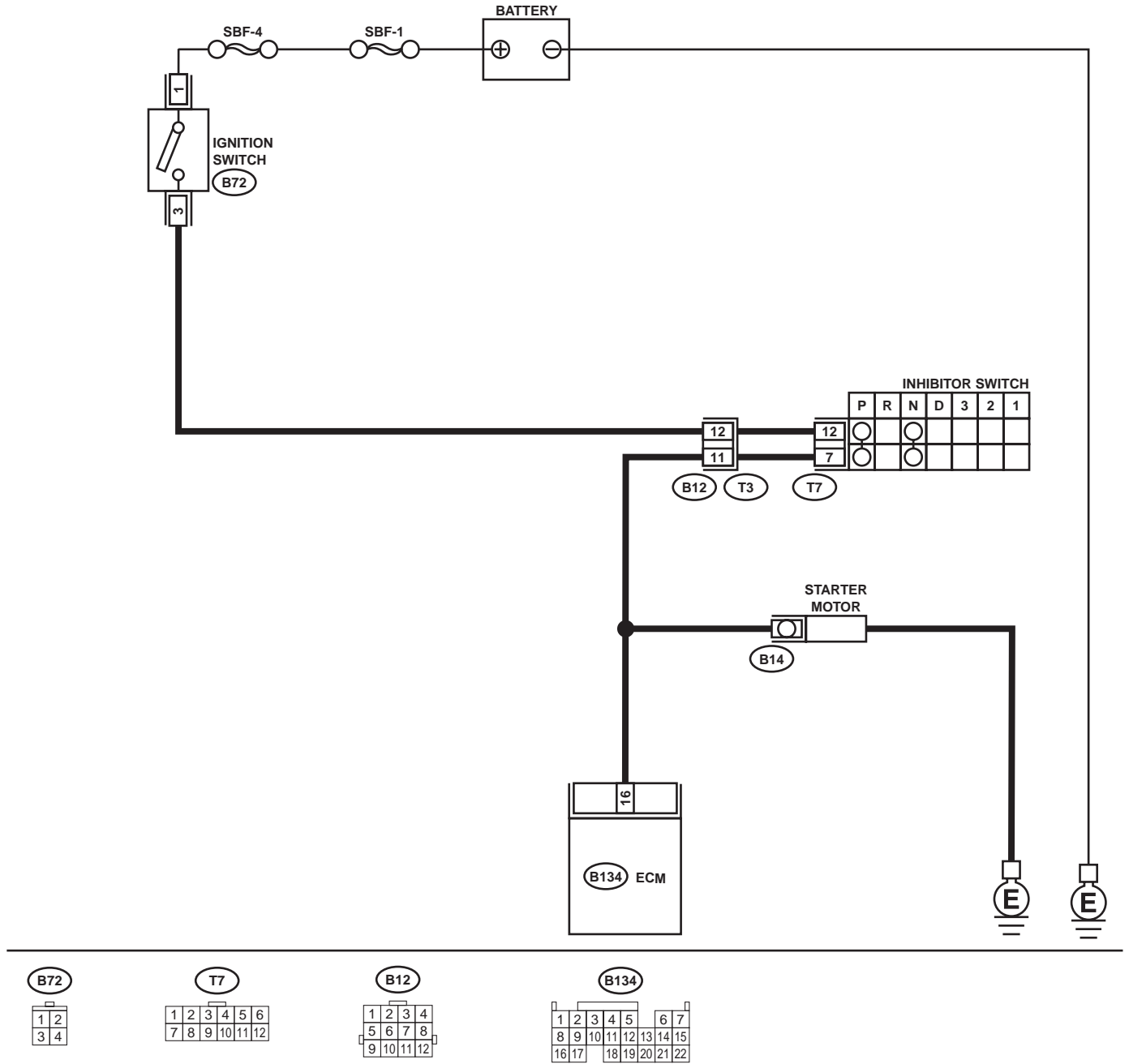
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN-01082

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. Place the select lever in the "P" or "N" range. Does starter motor operate when turning ignition switch to "ST"?	Starter motor operates.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none">• Open or ground short circuit in harness between ECM and starter motor connector.• Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(H6DO)-72, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CO:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

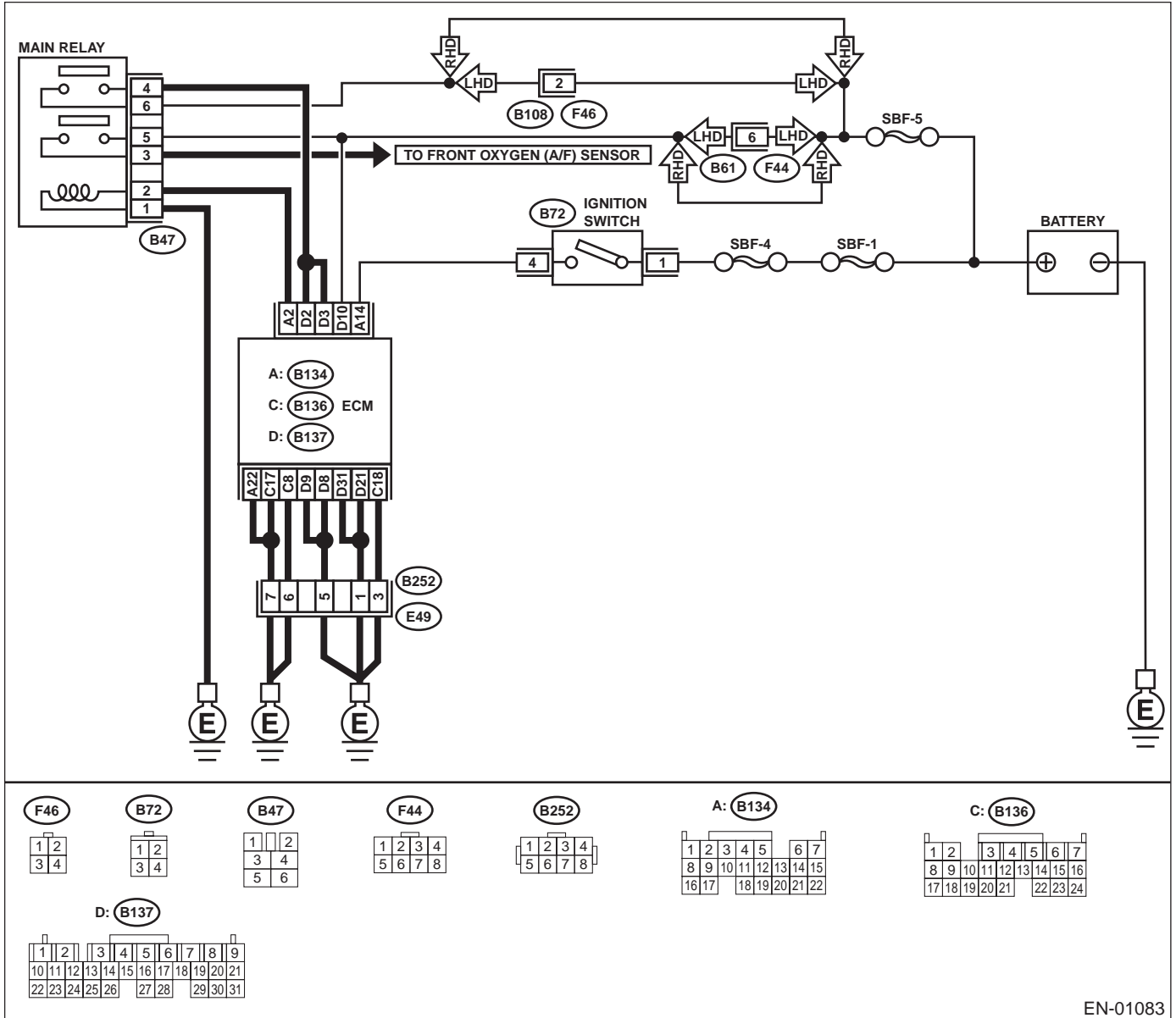
DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



EN-01083

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B137) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. Connector & terminal (B137) No. 10 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step 3.
3 CHECK FUSE SBF-5. Is fuse blown?	Fuse blown out.	Replace fuse.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CP:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —

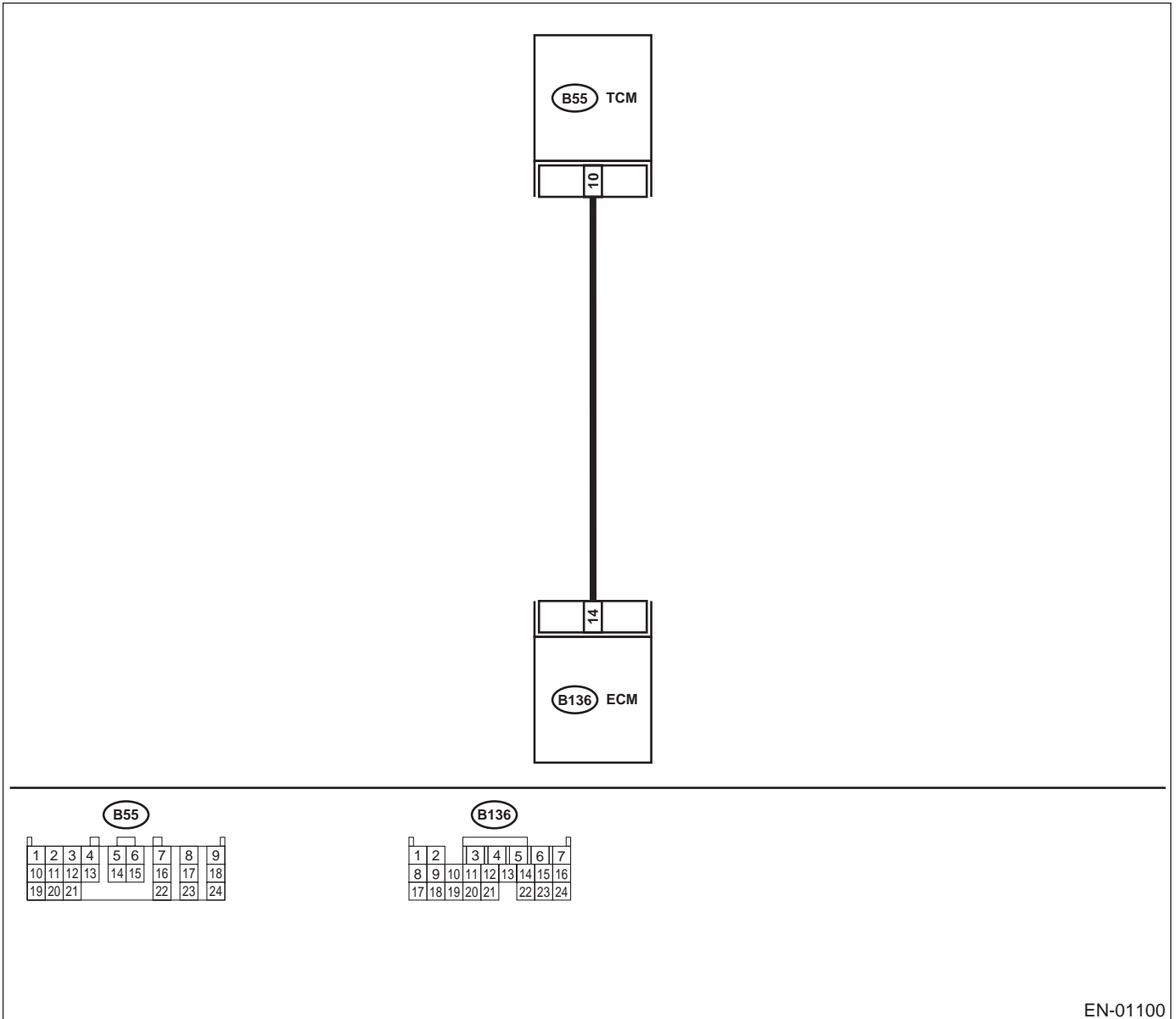
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01100

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 14 (+) — Chassis ground (-): Does the measured value exceed the specified value?	3 V	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 14 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and TCM connector. Connector & terminal (B136) No. 14 — (B55) No. 10: Is the measured value less than the specified value?	1 Ω	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CQ:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —

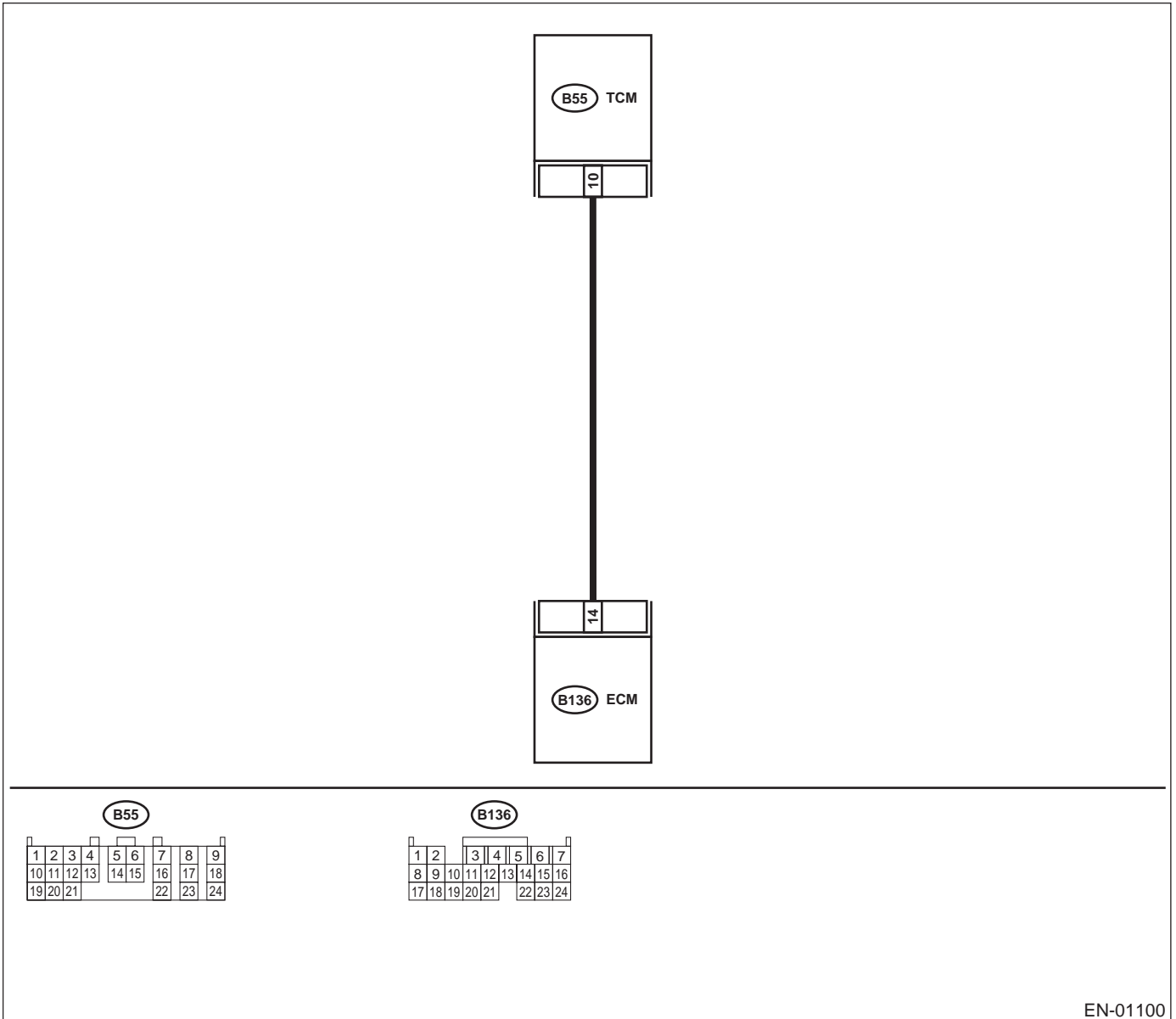
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-01100

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connector from TCM. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 14 (+) — Chassis ground (-): Is the measured value less than the specified value?	3 V	Go to step 2.	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 14 (+) — Chassis ground (-): Does the voltage change exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	10 V	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

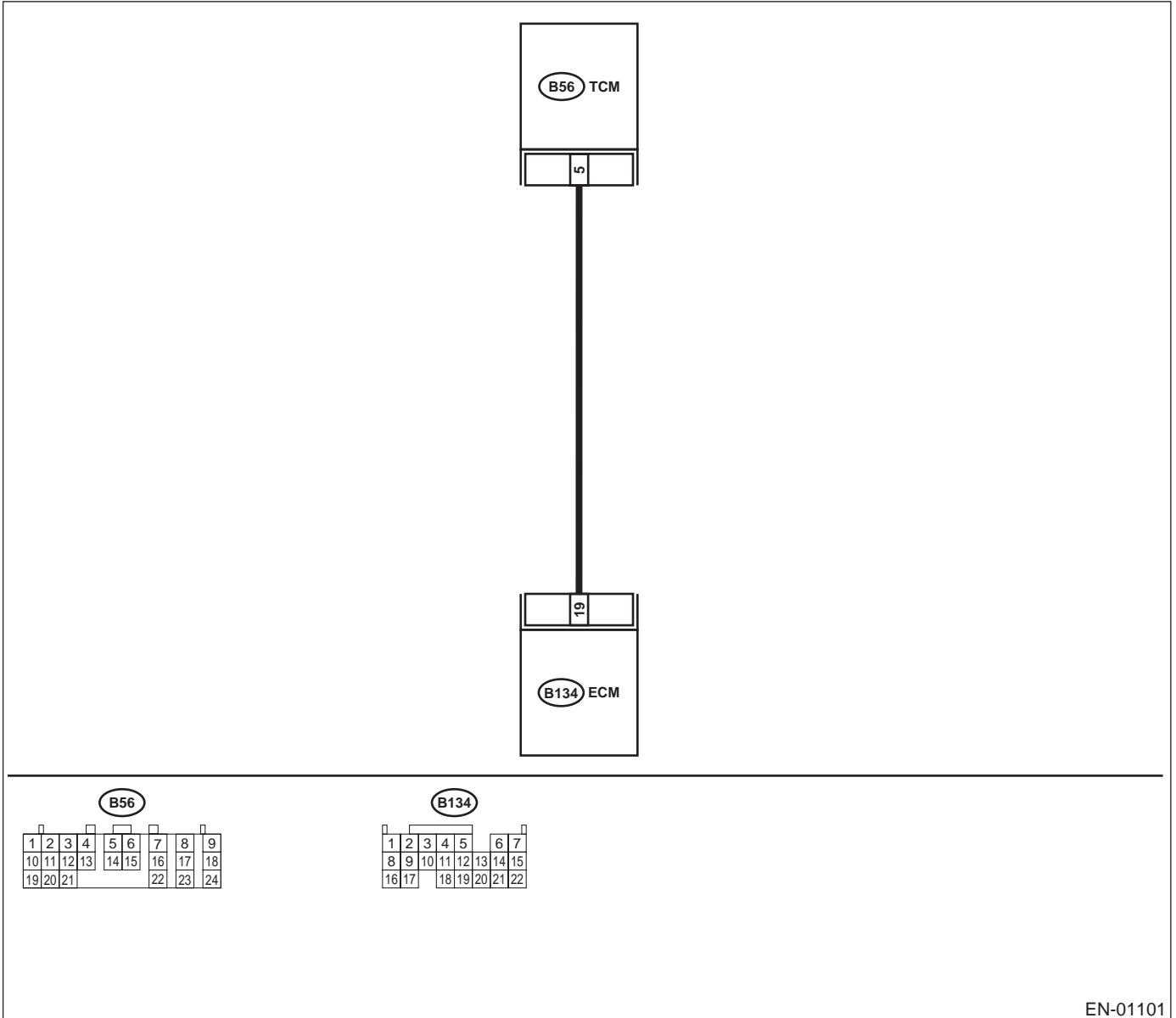
CR:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-01101

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. Connector & terminal (B134) No. 19 — (B56) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair open circuit in harness between ECM and TCM connector.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 19 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

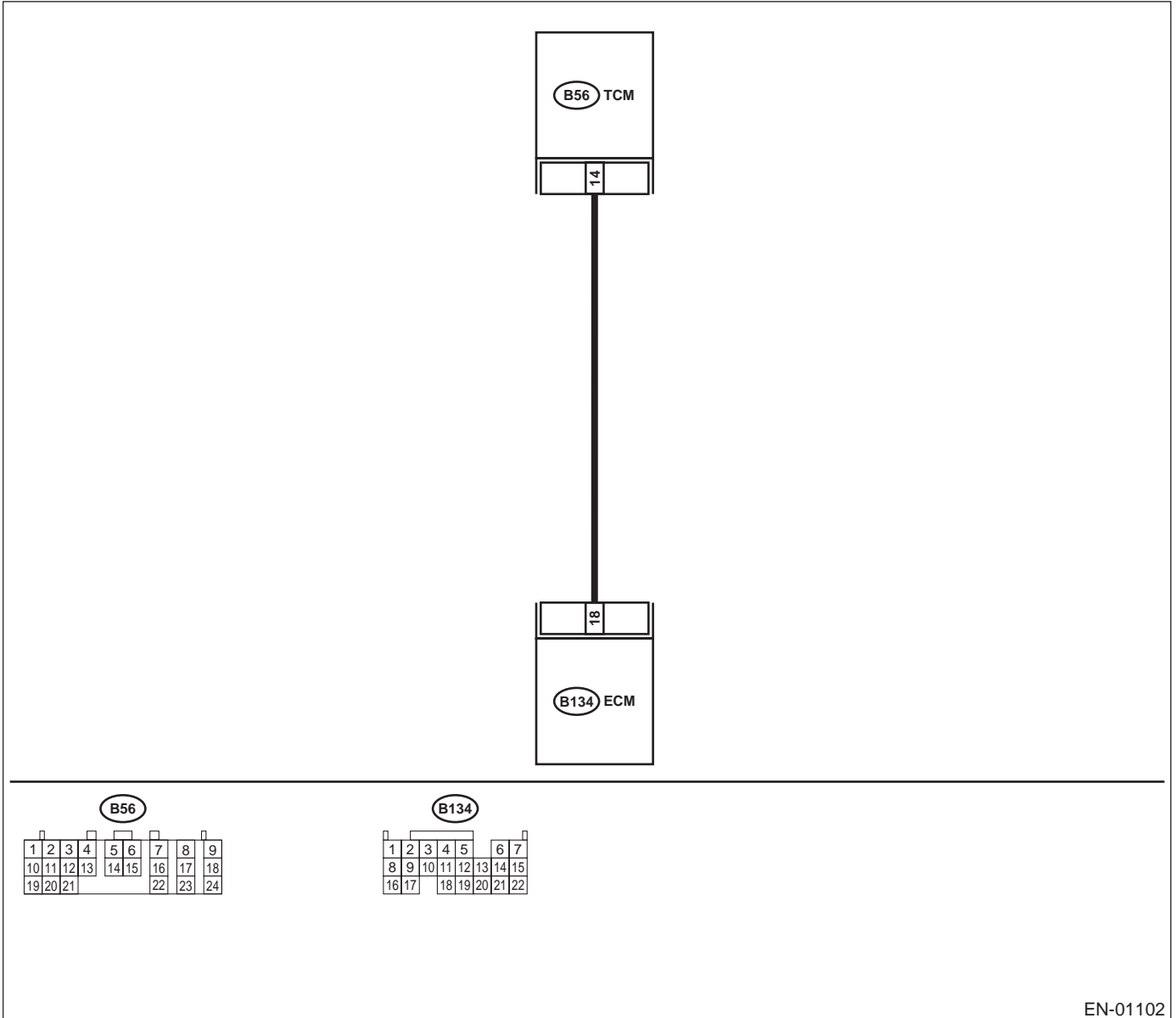
CS:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-47, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-01102

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 18 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 18 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. Connector & terminal (B134) No. 18 — (B56) No. 14: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair open circuit in harness between ECM and TCM connector.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 18 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

20. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H6DO)-74, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4) 9) EGR valve
2. Rough idling	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Crankshaft position sensor (*3) 10) Camshaft position sensor (*3) 11) Oxygen sensor 12) Fuel pump and fuel pump relay 13) EGR valve
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Intake manifold pressure sensor 6) Intake air temperature sensor 7) EGR valve
4. Poor acceleration	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Throttle position sensor 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1) 12) EGR valve
5. Engine stalls or engine sags or hesitates at acceleration.	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay 10) EGR valve

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
6. Surge	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay 9) EGR valve
7. Spark knock	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor assembly and spark plug.

*2: Indicate the symptom occurring only in cold temperatures.

*3: Ensure the secure installation.

*4: Check fuel injector, fuel pressure regulator and fuel filter.

*5: Inspect air leak in air intake system.

*6: Adjust accelerator cable.

2. AUTOMATIC TRANSMISSION

NOTE:

Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to AT-2, Basic Diagnostic Procedure.>

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

MEMO:

ENGINE SECTION 3

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUEL INJECTION (FUEL SYSTEMS) FU(H4DOSTC)

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) EC(H4DOSTC)

INTAKE (INDUCTION) IN(H4DOSTC)

MECHANICAL ME(H4DOSTC)

EXHAUST EX(H4DOSTC)

COOLING CO(H4DOSTC)

LUBRICATION LU(H4DOSTC)

SPEED CONTROL SYSTEMS SP(H4DOSTC)

IGNITION IG(H4DOSTC)

STARTING/CHARGING SYSTEMS SC(H4DOSTC)

ENGINE (DIAGNOSTICS) EN(H4DOSTC)

FUEL INJECTION (FUEL SYSTEMS)

FU(H4DOSTC)

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5. Crankshaft Position Sensor	29
6. Camshaft Position Sensor	30
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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kg/cm ² , 65.27 — 98.2 psi)
	Discharge flow	More than 130 ℓ (34.3 US gal, 28.6 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm ² , 43.5 psi)]
Fuel filter		Cartridge type

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

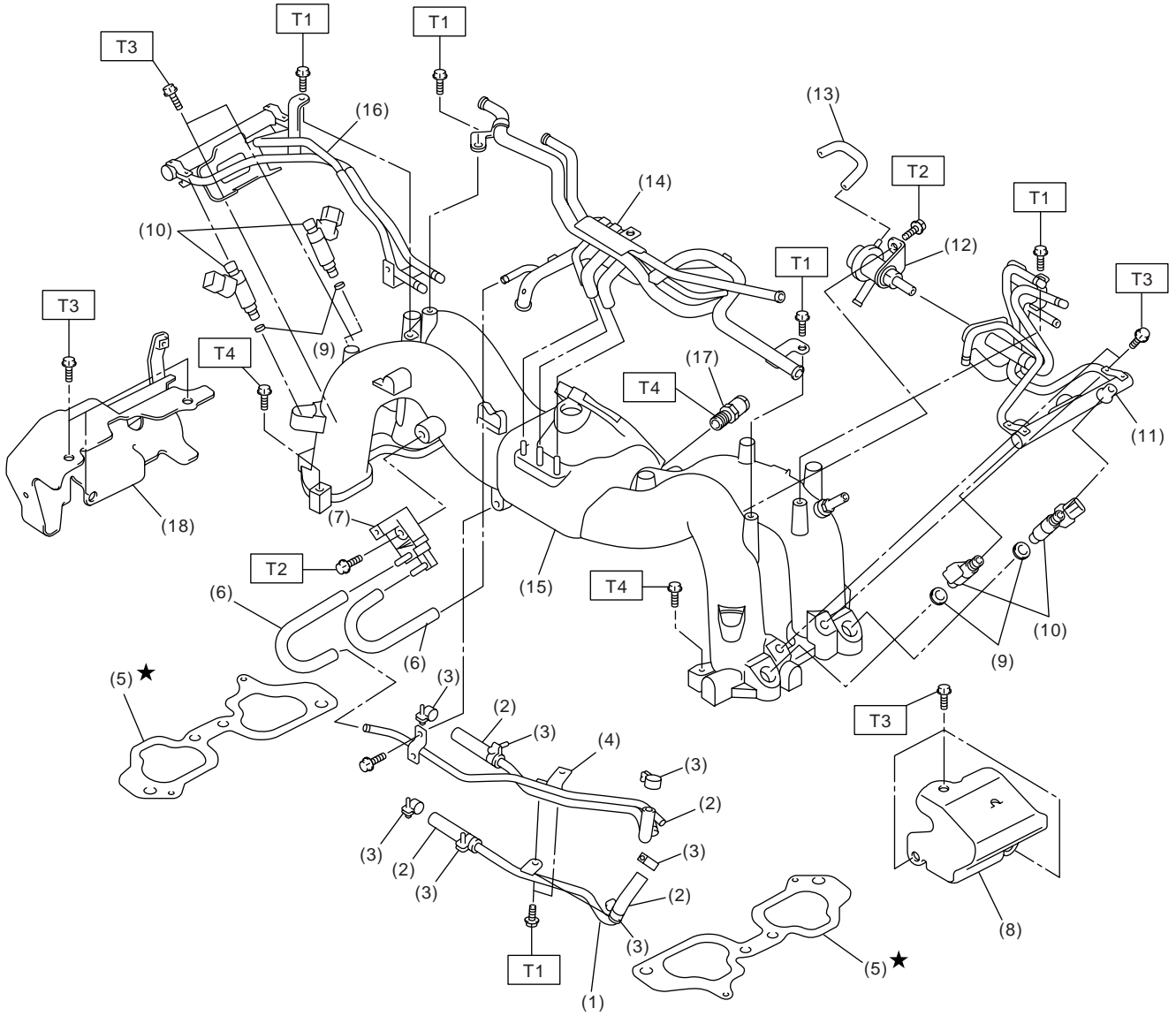
MEMO:

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

B: COMPONENT

1. INTAKE MANIFOLD



FU-00625

FU(H4DOSTC)-4

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

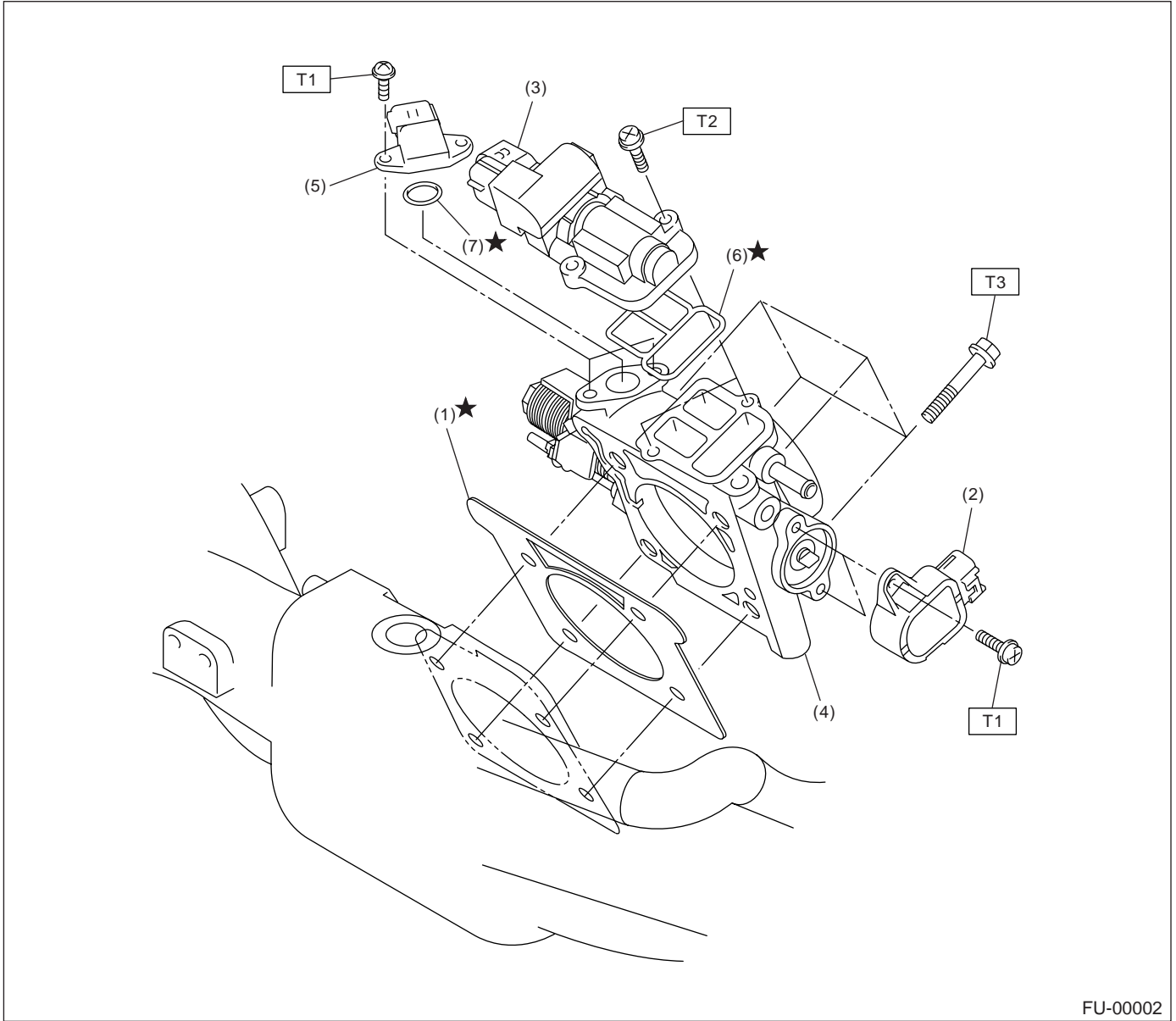
- | | | |
|------------------------------------|--|-----------------------------|
| (1) Fuel pipe ASSY | (10) Fuel injector | (18) Fuel pipe protector RH |
| (2) Hose | (11) Fuel injector pipe LH | |
| (3) Clamp | (12) Pressure regulator | |
| (4) Evaporation and fuel pipe ASSY | (13) Hose | |
| (5) Gasket | (14) Evaporation and coolant pipe ASSY | |
| (6) Purge hose | (15) Intake manifold | |
| (7) Purge control solenoid valve | (16) Fuel injector pipe RH | |
| (8) Fuel pipe protector LH | (17) PCV valve | |
| (9) Insulator | | |

Tightening torque: N·m (kgf-m, ft-lb)**T1: 5.0 (0.51, 3.7)****T2: 19 (1.94, 13.7)****T3: 19 (1.94, 13.7)****T4: 25 (2.5, 18.1)**

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

2. AIR INTAKE SYSTEM



FU-00002

- | | |
|-------------------------------------|---------------------|
| (1) Gasket | (5) Pressure sensor |
| (2) Throttle position sensor | (6) Gasket |
| (3) Idle air control solenoid valve | (7) O-ring |
| (4) Throttle body | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 1.6 (0.16, 1.2)

T2: 2.8 (0.29, 2.1)

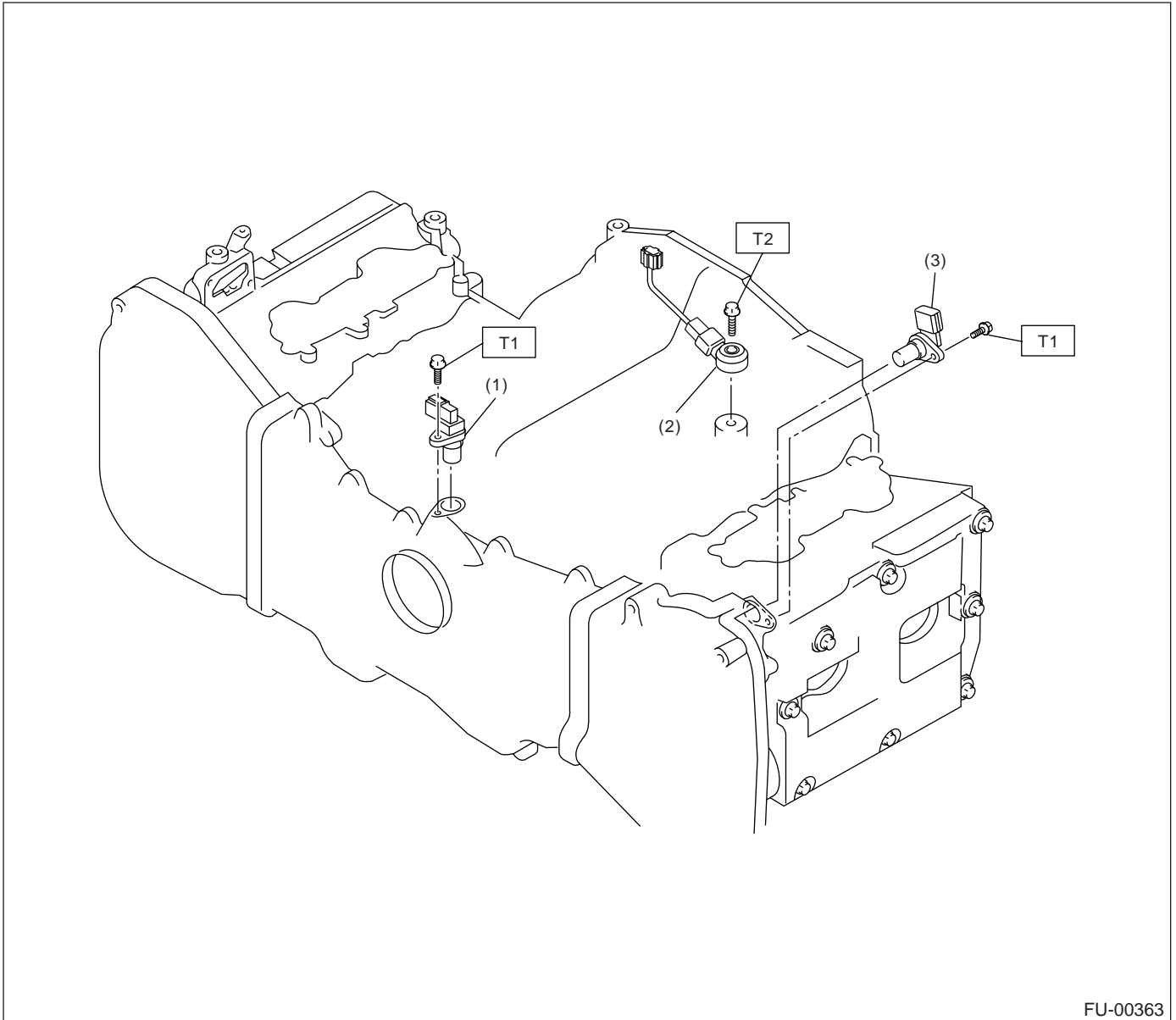
T3: 22 (2.2, 15.9)

FU(H4DOSTC)-6

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



FU-00363

- (1) Crankshaft position sensor
- (2) Knock sensor

- (3) Camshaft position sensor

Tightening torque: N·m (kgf·m, ft·lb)

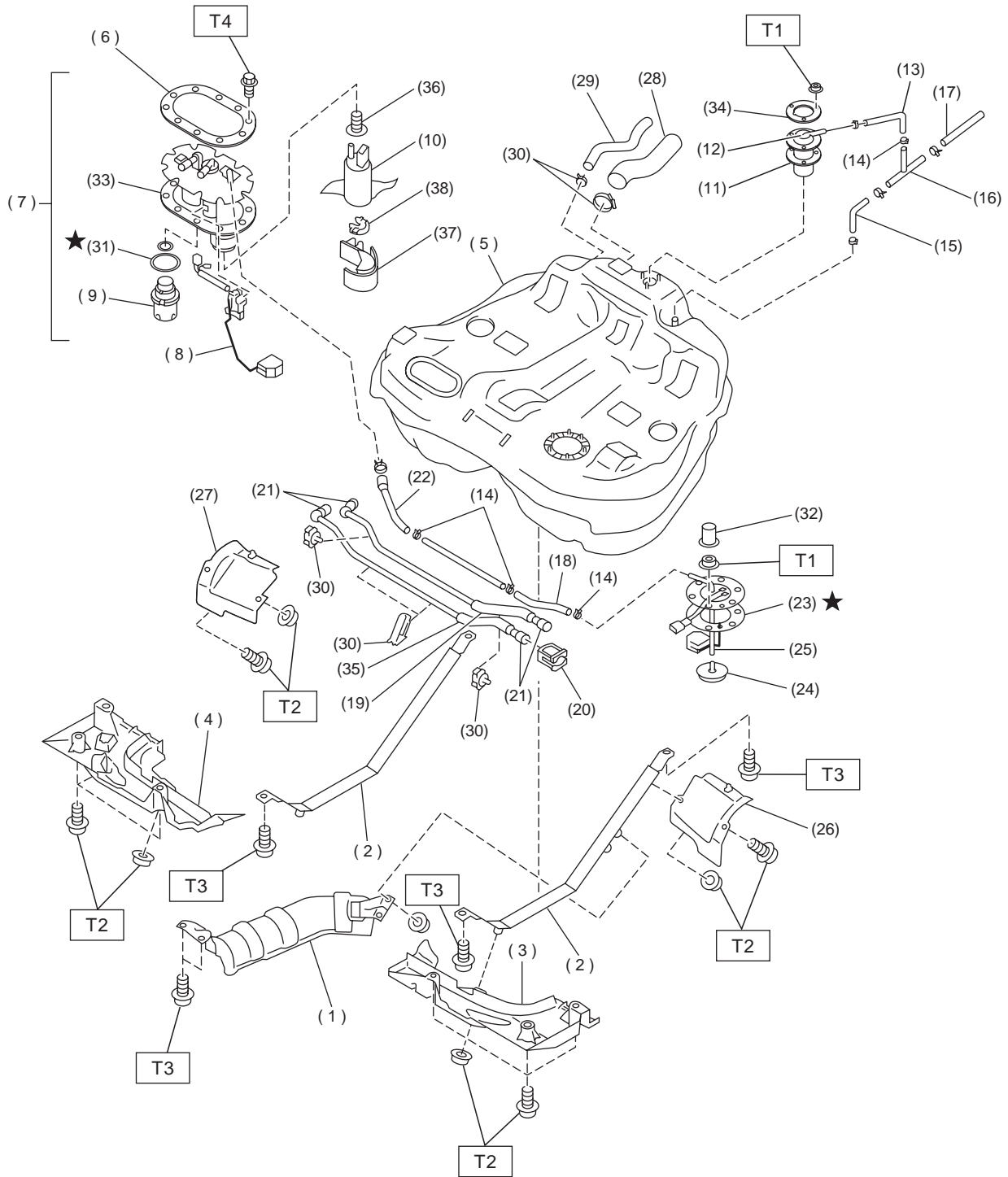
T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK



FU-00626

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

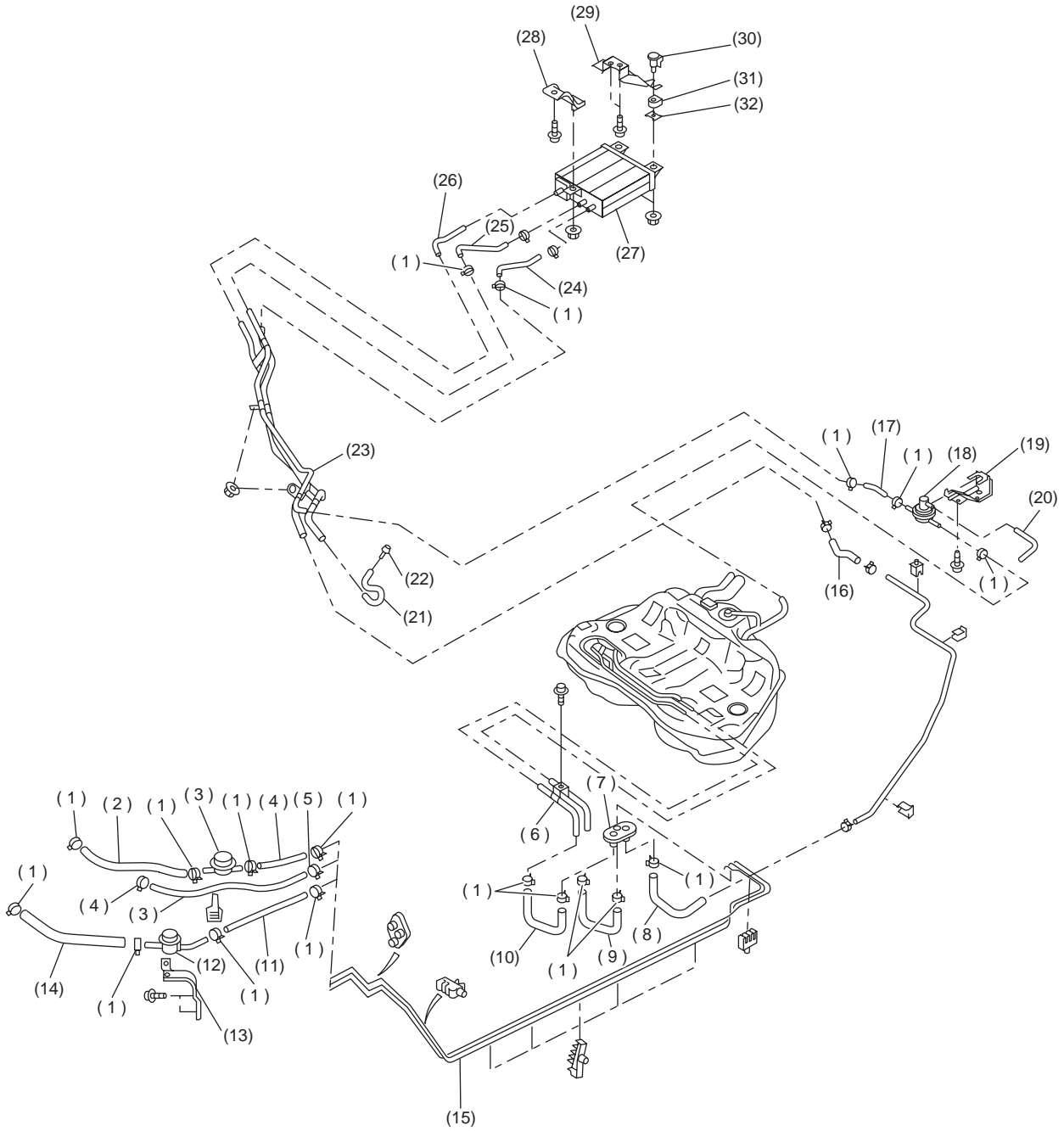
(1) Heat shield cover	(16) Joint pipe	(31) Gasket
(2) Fuel tank band	(17) Evaporation hose B	(32) Cap
(3) Protector LH (Front)	(18) Jet pump hose A	(33) Gasket
(4) Protector RH (Front)	(19) Fuel return tube	(34) Fuel cut valve plate
(5) Fuel tank	(20) Retainer	(35) Fuel delivery tube
(6) Fuel pump plate	(21) Quick connector	(36) Seal
(7) Fuel pump ASSY	(22) Jet pump hose B	(37) Fuel pump holder
(8) Fuel level sensor	(23) Fuel sub level sensor gasket	(38) Grommet
(9) Fuel filter	(24) Jet pump filter	
(10) Fuel pump	(25) Fuel sub level sensor	
(11) Fuel cut valve gasket	(26) Protector LH (Rear)	
(12) Fuel cut valve	(27) Protector RH (Rear)	
(13) Evaporation hose A	(28) Fuel filler hose	
(14) Clip	(29) Vent hose	
(15) Evaporation hose C	(30) Clamp	

Tightening torque: N·m (kgf-m, ft-lb)**T1: 4.4 (0.45, 3.3)****T2: 18 (1.8, 13.0)****T3: 33 (3.4, 25)****T4: 5.9 (0.6, 4.3)**

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

5. FUEL LINE



FU-00627

GENERAL DESCRIPTION

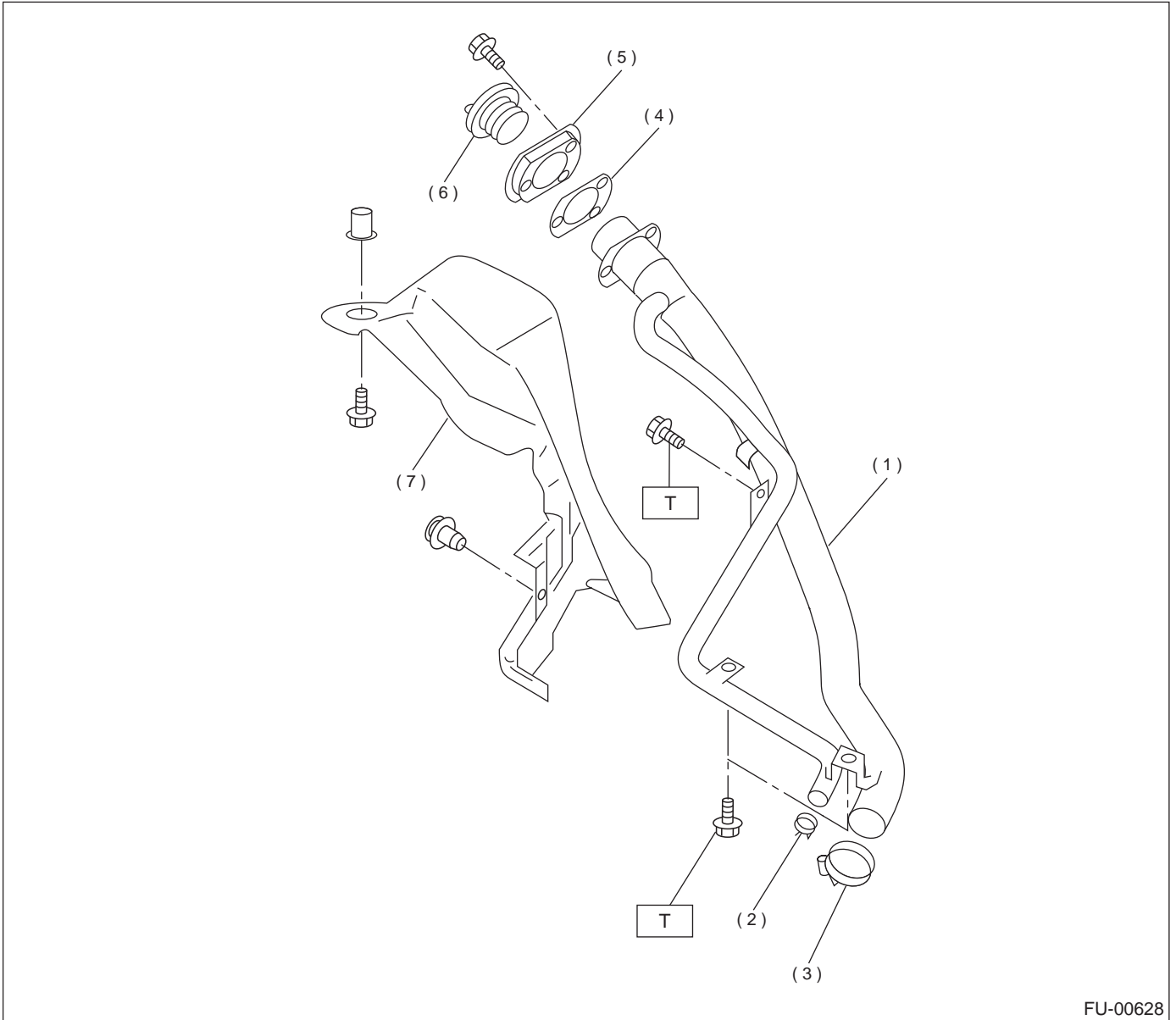
FUEL INJECTION (FUEL SYSTEMS)

- | | | |
|---------------------------|-------------------------------|------------------------------|
| (1) Clamp | (12) Damper valve (Delivery) | (23) Evaporation pipe ASSY |
| (2) Fuel return hose A | (13) Bracket | (24) Purge hose |
| (3) Damper valve (Return) | (14) Fuel delivery hose C | (25) Evaporation hose C |
| (4) Fuel return hose B | (15) Fuel pipe ASSY | (26) Canister drain hose |
| (5) Clip | (16) Evaporation hose B | (27) Canister |
| (6) Fuel pipe ASSY | (17) Two-way valve hose | (28) Front canister bracket |
| (7) Grommet | (18) Two-way valve | (29) Rear canister bracket |
| (8) Evaporation hose A | (19) Two-way valve bracket | (30) Canister bracket spacer |
| (9) Fuel return hose C | (20) Two-way valve drain hose | (31) Cushion |
| (10) Fuel delivery hose A | (21) Drain hose | (32) Canister bracket plate |
| (11) Fuel delivery hose B | (22) Fuel pipe connector | |

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



FU-00628

- | | |
|---------------------------|--------------------------------|
| (1) Fuel filler pipe ASSY | (5) Filler ring |
| (2) Clip | (6) Filler cap |
| (3) Clamp | (7) Fuel filler pipe protector |
| (4) Filler pipe packing | |

Tightening torque: N·m (kgf·m, ft·lb)

T: 7.4 (0.75, 5.4)

GENERAL DESCRIPTION

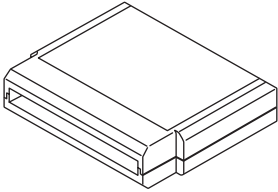

FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST24082AA210</p>	24082AA210	CARTRIDGE	Troubleshooting for electrical system.
 <p>ST22771AA030</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

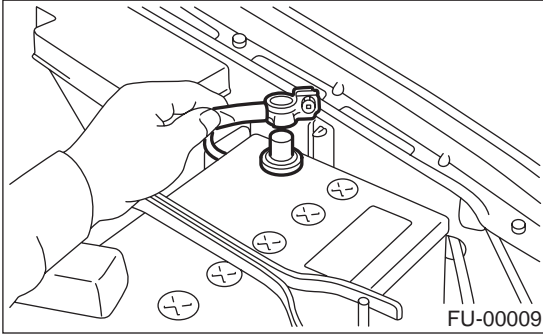
THROTTLE BODY

FUEL INJECTION (FUEL SYSTEMS)

2. Throttle Body

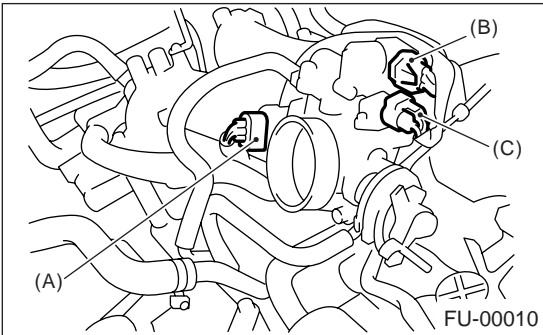
A: REMOVAL

1) Disconnect the ground cable from battery.

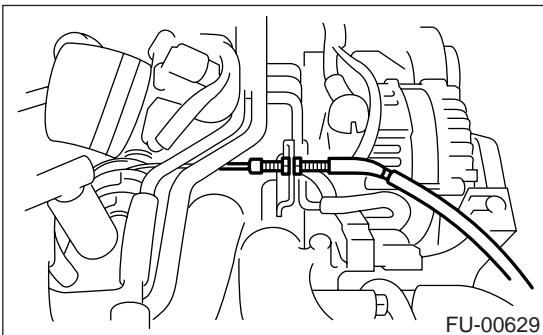


2) Remove the intercooler. <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>

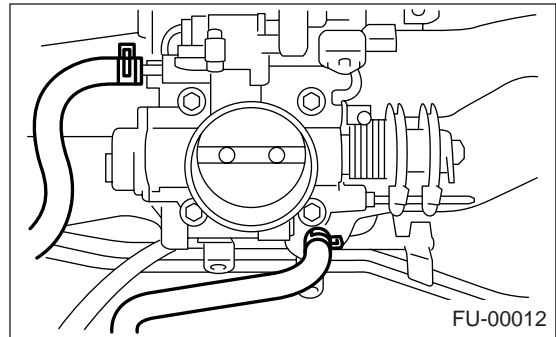
3) Disconnect the connector from the throttle position sensor (A) and idle air control solenoid valve (B) and pressure sensor (C).



4) Disconnect the accelerator cable.



5) Disconnect the engine coolant hoses from throttle body.



6) Remove the bolts which secure throttle body to intake manifold.

B: INSTALLATION

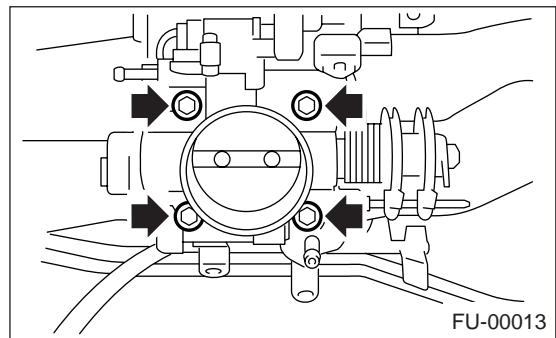
1) Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)

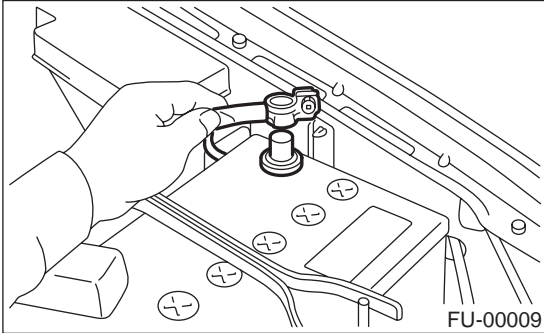


2) Install the accelerator cable. <Ref. to SP(H4SO)-10, INSTALLATION, Accelerator Control Cable.>

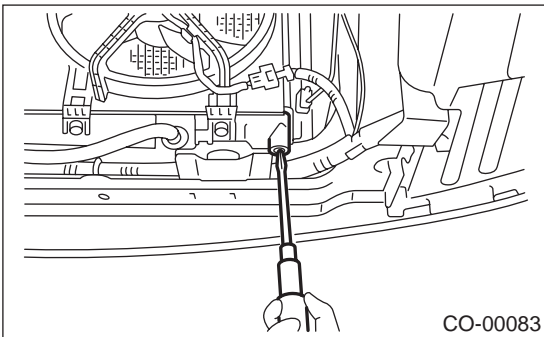
3. Intake Manifold

A: REMOVAL

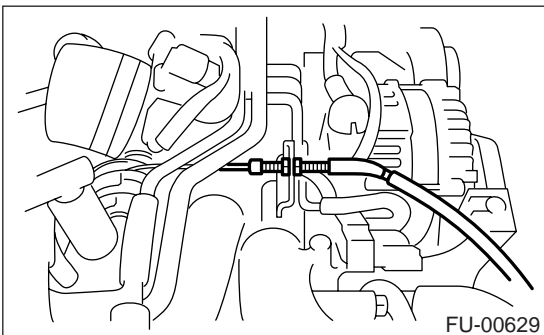
- 1) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Disconnect the ground cable from battery.



- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).

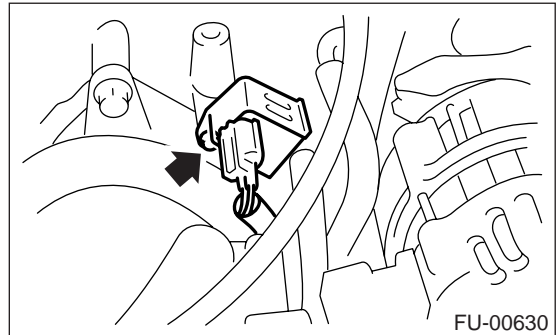


- 6) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOSTC)-10, REMOVAL, Air Cleaner.>
- 7) Remove the air cleaner element.
- 8) Remove the intercooler. <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 9) Disconnect the accelerator cable.

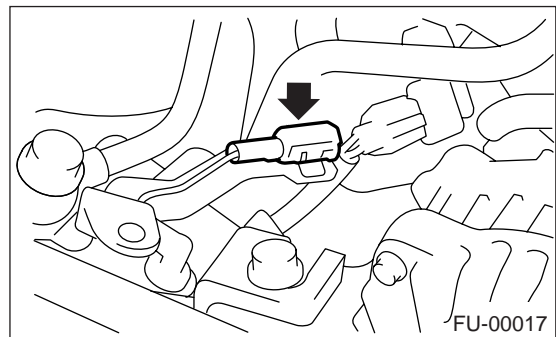


- 10) Remove the coolant filler tank. <Ref. to CO(H4DOSTC)-33, REMOVAL, Coolant Filler Tank.>

- 11) Remove the power steering pump.
 - (1) Remove the purge control solenoid valve.

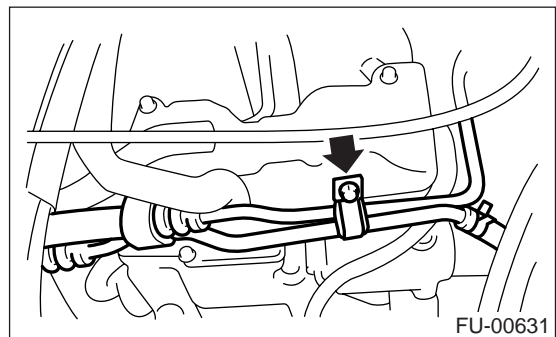


- (2) Remove the front side V-belt. <Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- (3) Disconnect the power steering switch connector.



- (4) Remove the bolt which secures power steering pipe brackets to intake manifold.

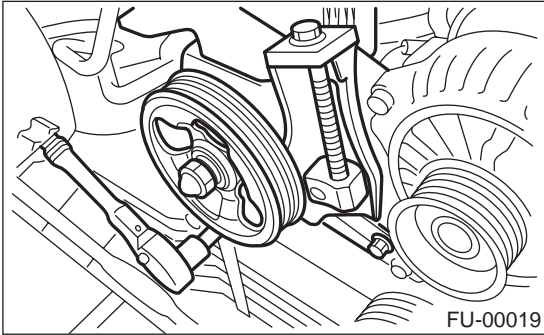
NOTE:
Do not disconnect the power steering hose.



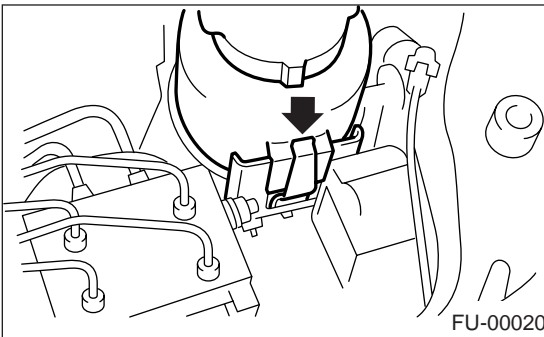
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

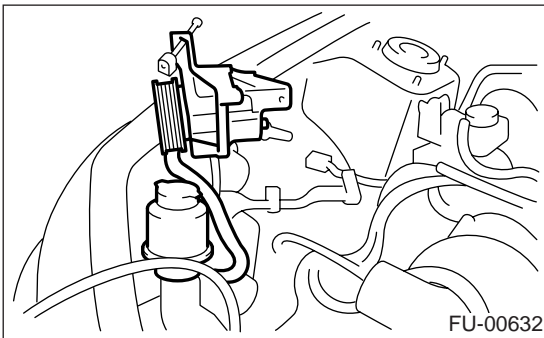
(5) Remove the bolts which secure power steering pump bracket.



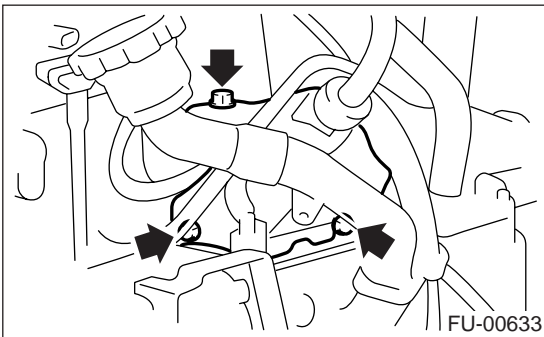
(6) Remove the power steering tank from the bracket by pulling it upward.



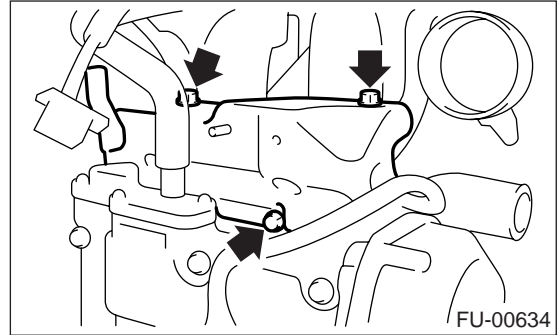
(7) Place the power steering pump on the right side wheel apron.



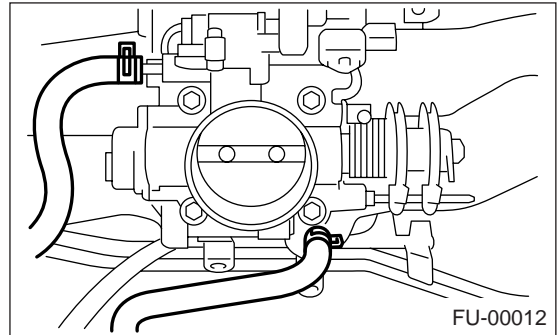
12) Remove the fuel pipe protector LH.



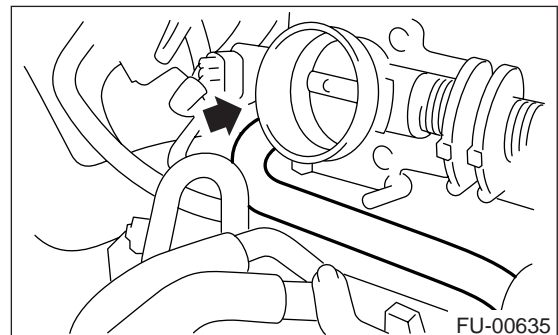
13) Remove the fuel pipe protector RH.



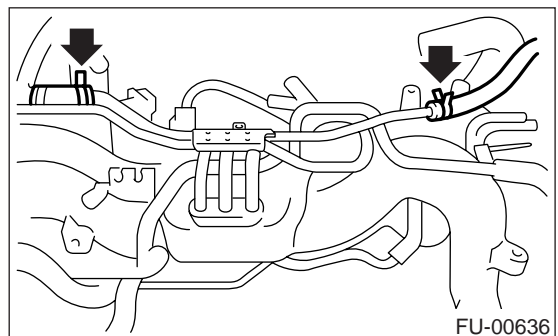
14) Disconnect the engine coolant hoses from throttle body.



15) Disconnect the emission hose from PCV valve.



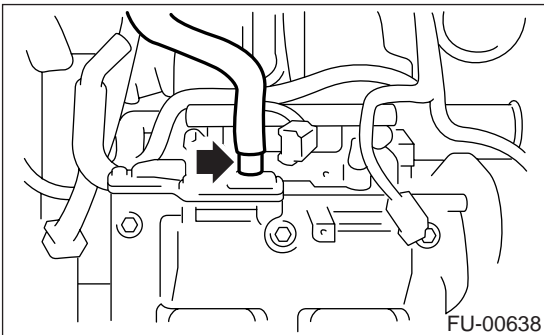
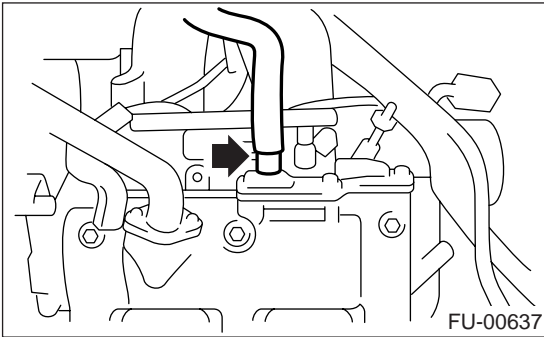
16) Disconnect the engine coolant hoses from the evaporation and coolant pipe assembly.



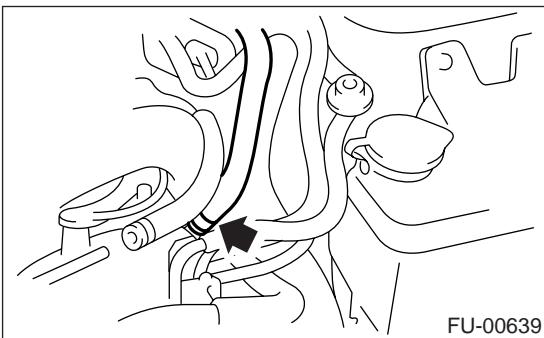
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

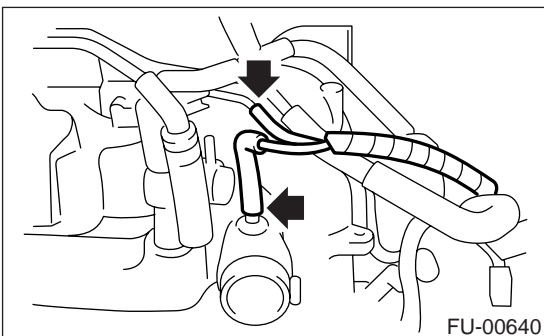
17) Disconnect the blow-by hoses from cylinder head.



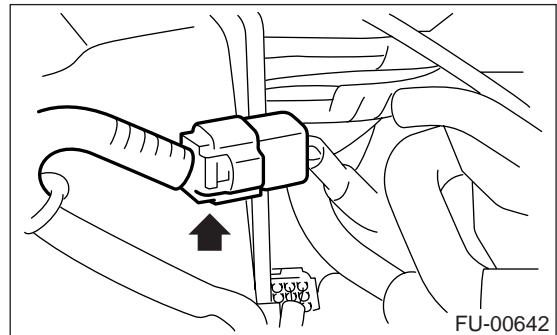
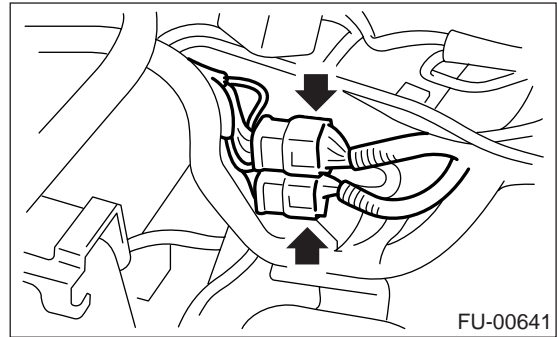
18) Disconnect the brake booster hose.



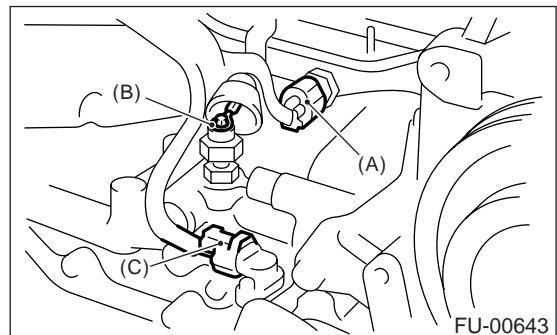
19) Disconnect the pressure hose from intake duct.



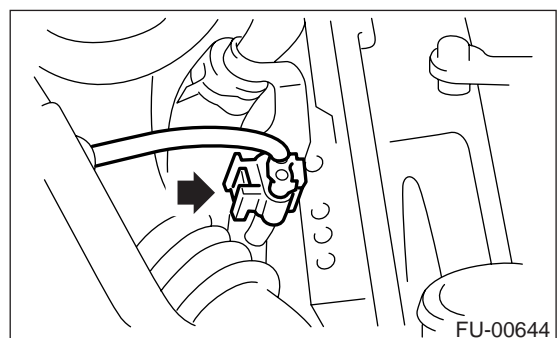
20) Disconnect the engine harness connectors from bulkhead harness connectors.



21) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



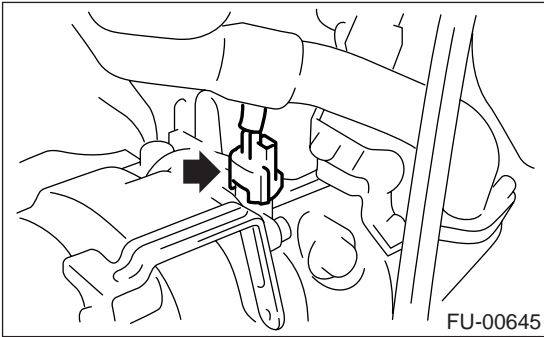
22) Disconnect the knock sensor connector.



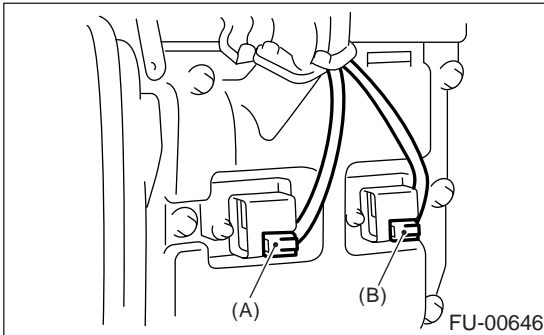
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

23) Disconnect the connector from camshaft position sensor.

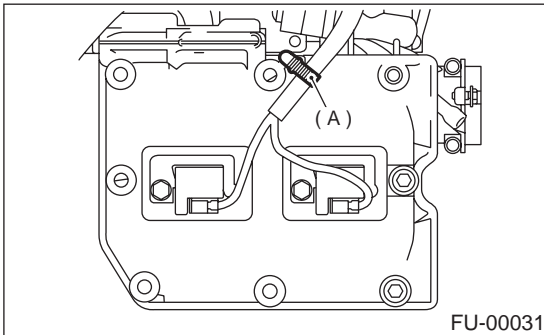


24) Disconnect the connector from ignition coil.



- (A) White
- (B) Black

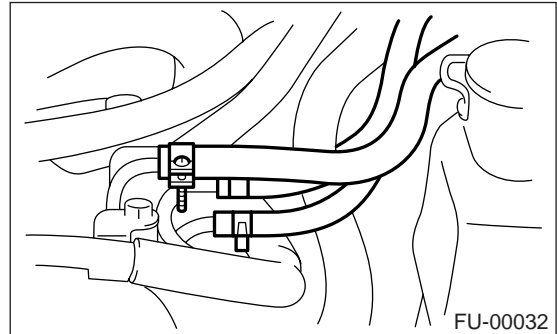
25) Disconnect the engine harness fixed by clip (A) from cylinder head cover.



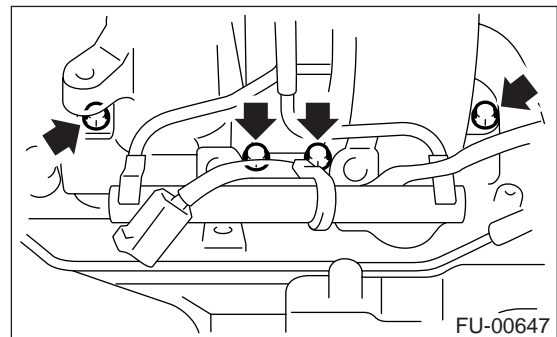
26) Disconnect the fuel delivery hose, return hose and evaporation hose.

WARNING:

Catch the fuel from hoses in a container.



27) Remove the bolts which secure intake manifold to cylinder heads.



28) Remove the intake manifold.

B: INSTALLATION

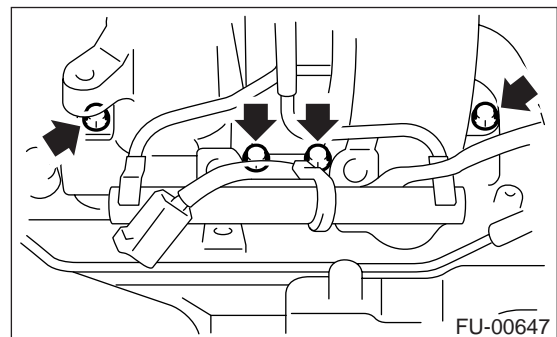
1) Install the intake manifold onto cylinder heads.

NOTE:

Always use new gaskets.

Tightening torque:

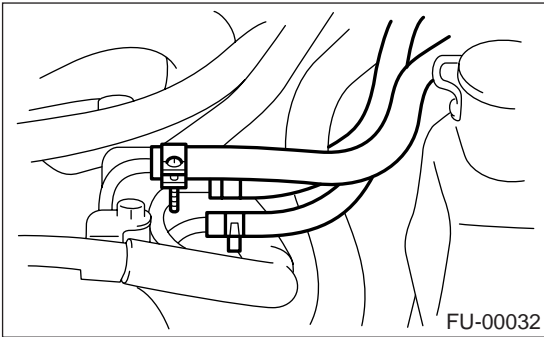
25 N·m (2.5 kgf·m, 18.1 ft·lb)



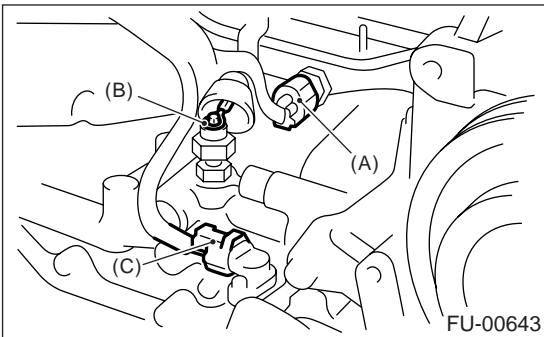
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

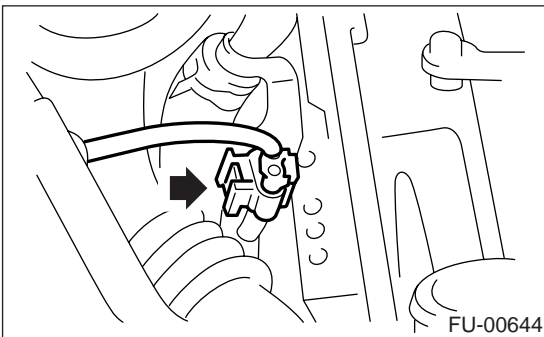
2) Connect the fuel delivery hose, return hose, and evaporation hose.



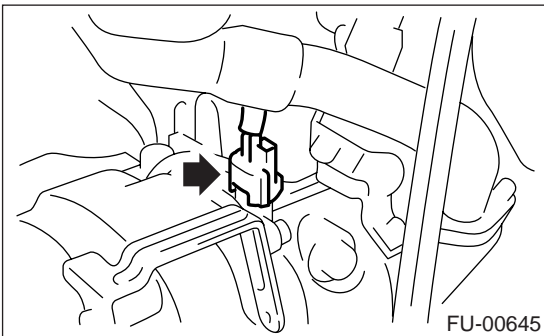
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



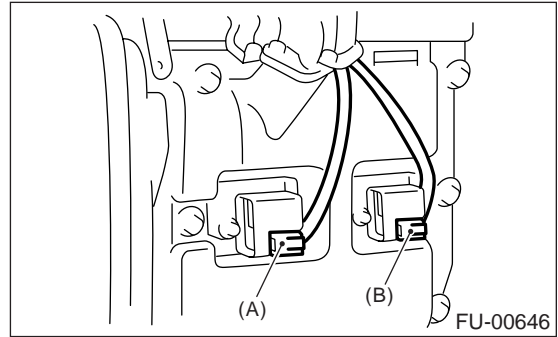
4) Connect the connector to knock sensor.



5) Connect the connector to camshaft position sensor.



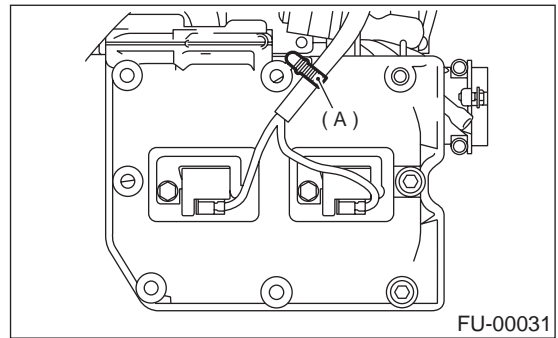
6) Connect the connector to ignition coil.



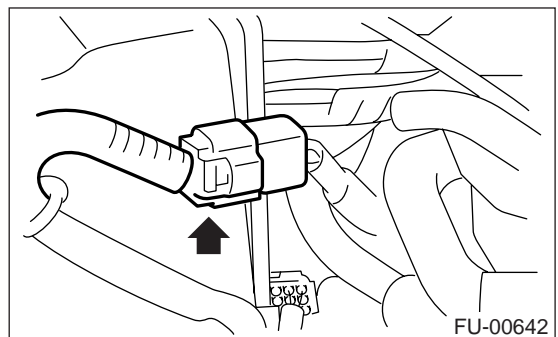
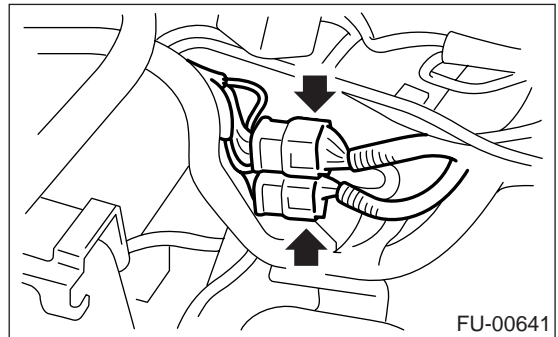
(A) White

(B) Black

7) Connect the engine harness with clip (A) to bracket.



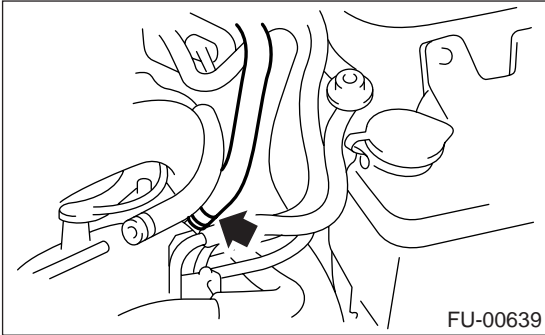
8) Connect the engine harness connector to bulk-head harness connectors.



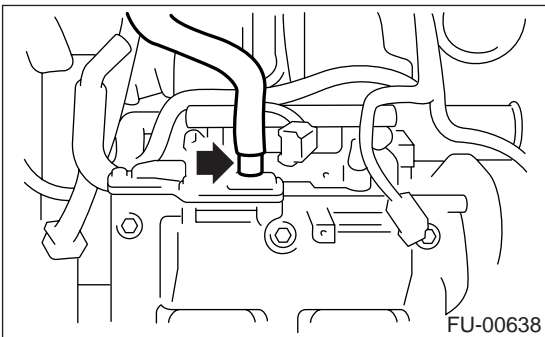
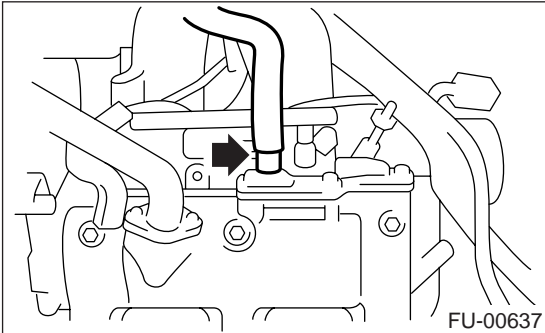
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

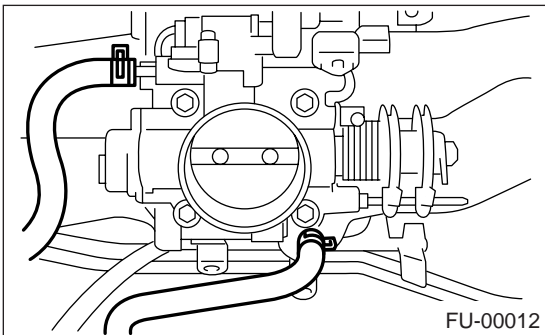
9) Connect the brake booster vacuum hose.



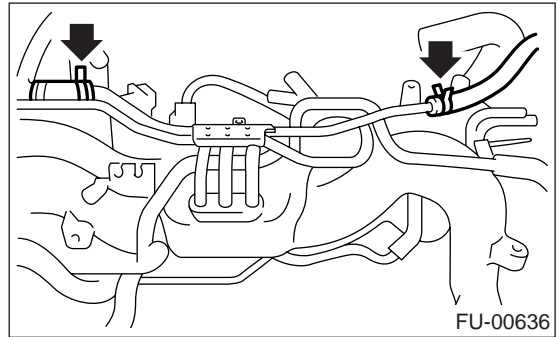
10) Connect the blow-by hoses to cylinder head.



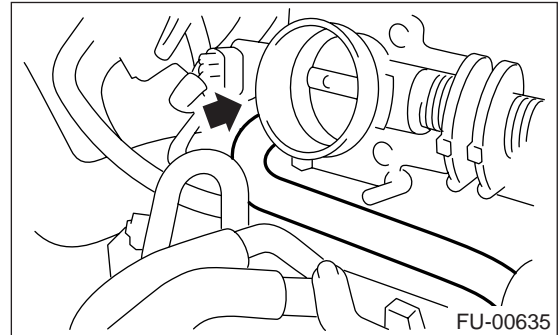
11) Connect the engine coolant hoses to throttle body.



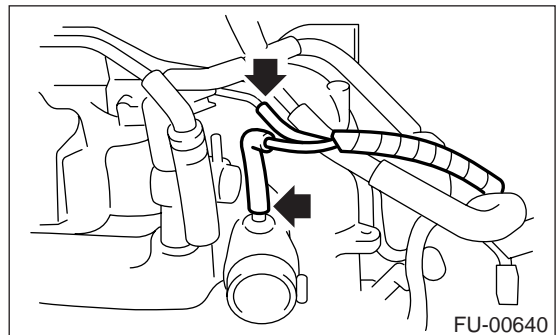
12) Connect the engine coolant hoses to engine coolant pipe.



13) Connect the emission hose to PCV valve.



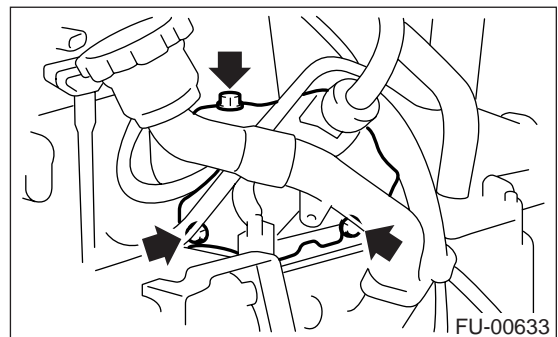
14) Connect the pressure hose to intake duct.



15) Install the fuel pipe protector LH.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



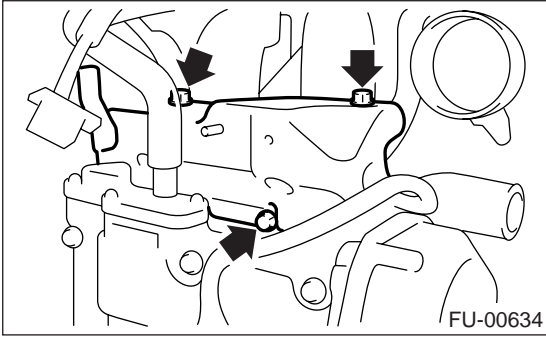
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

16) Install the fuel pipe protector RH.

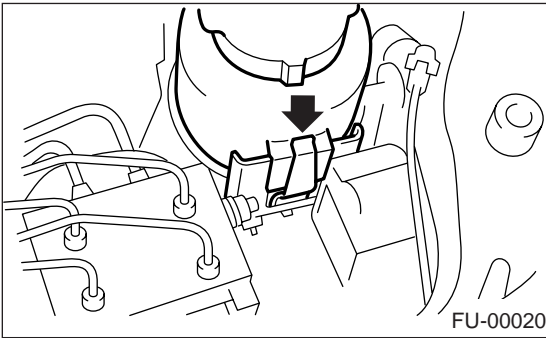
Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)

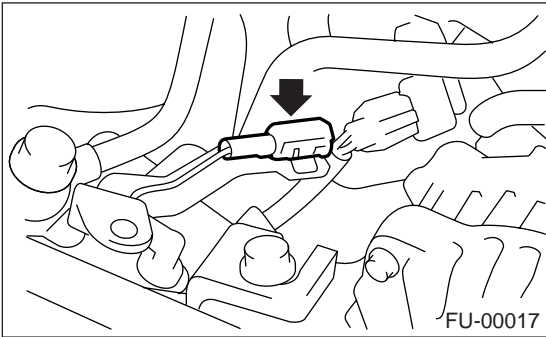


17) Install the power steering pump.

(1) Install the power steering tank on bracket.



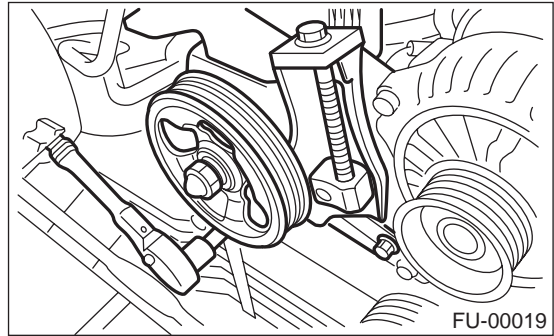
(2) Connect the connector to power steering pump switch.



(3) Install the power steering pump, and tighten the bolts.

Tightening torque:

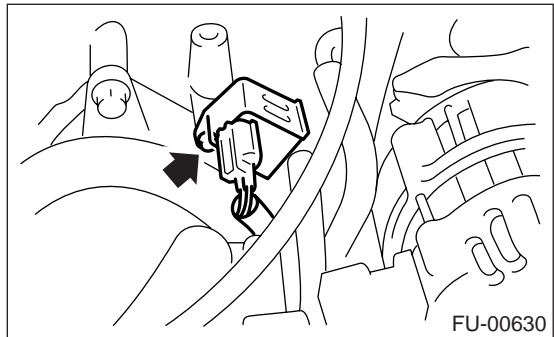
22 N·m (2.2 kgf-m, 15.9 ft-lb)



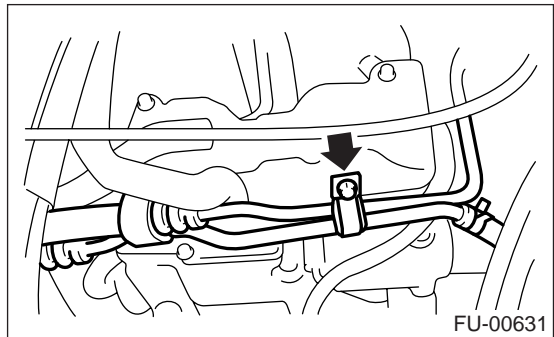
(4) Install the purge control solenoid valve.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



(5) Install the power steering pipe brackets on right side intake manifold.



(6) Install the front side V-belt.

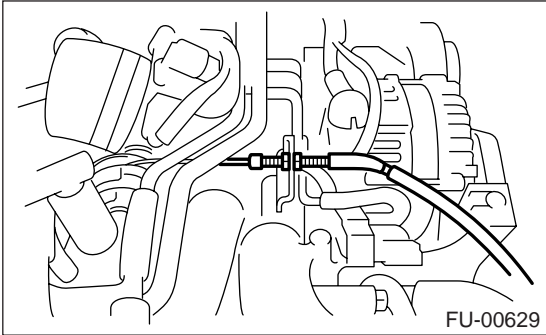
<Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

18) Install the coolant filler tank. <Ref. to CO(H4DOSTC)-33, INSTALLATION, Coolant Filler Tank.>

INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

19) Connect the accelerator cable. <Ref. to SP(H4SO)-10, INSTALLATION, Accelerator Control Cable.>

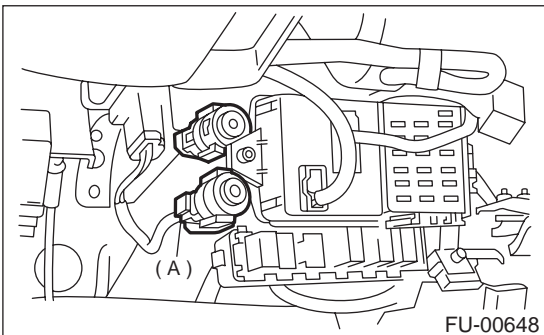


20) Install the intercooler. <Ref. to IN(H4DOSTC)-15, INSTALLATION, Turbocharger.>

21) Install the air cleaner element.

22) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(H4DOSTC)-10, INSTALLATION, Air Cleaner.>

23) Connect the connector to fuel pump relay (A).



24) Connect the battery ground cable to battery.

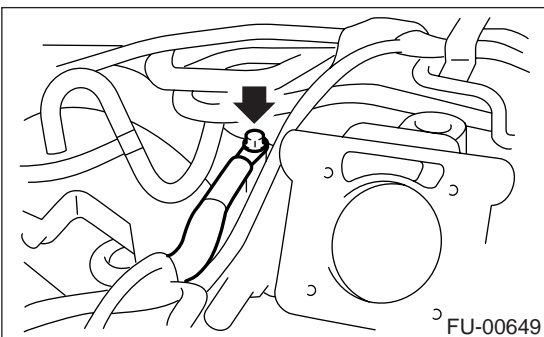
25) Lift-up the vehicle.

26) Install the under cover.

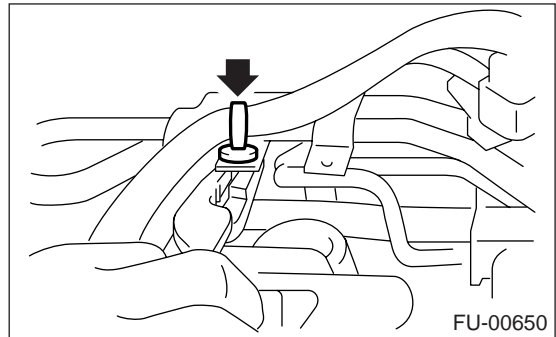
27) Fill the coolant. <Ref. to CO(H4DOSTC)-15, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: DISASSEMBLY

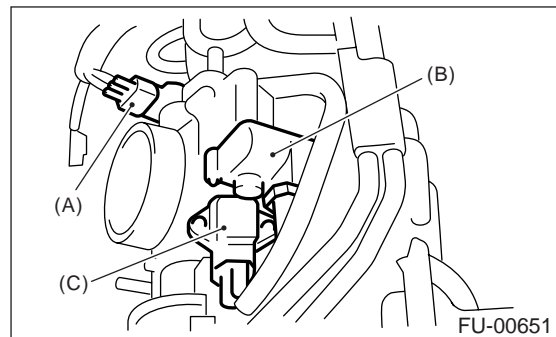
1) Remove the engine ground cable from intake manifold.



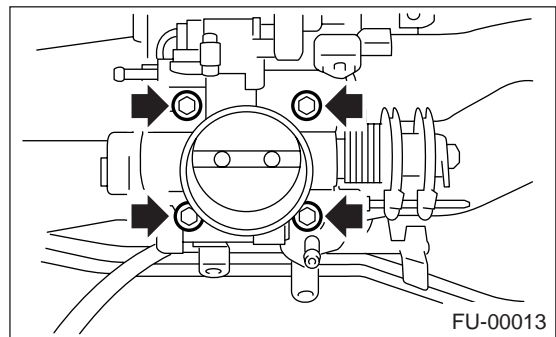
2) Disconnect the engine harness fixed by clip from engine coolant pipe.



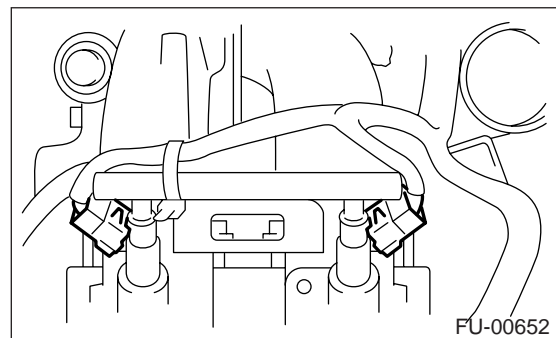
3) Disconnect the connector from the throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).



4) Remove the throttle body from intake manifold.



5) Disconnect the connector from fuel injector.

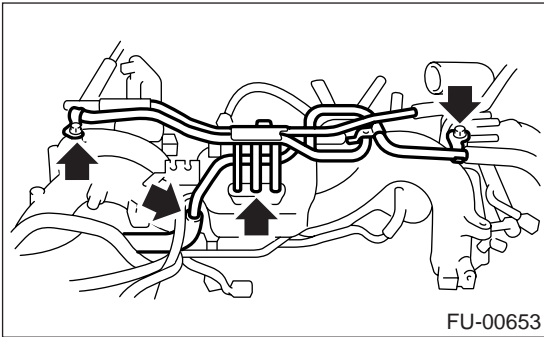


6) Disconnect the evaporation hoses from the evaporation and coolant pipe assembly.

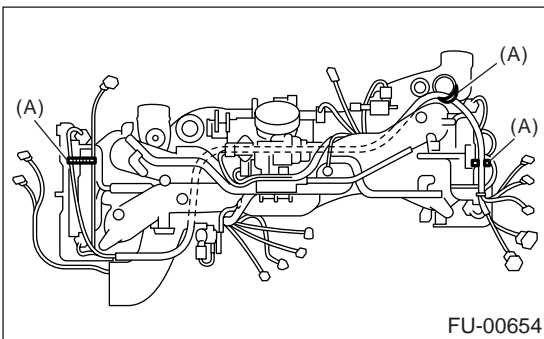
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

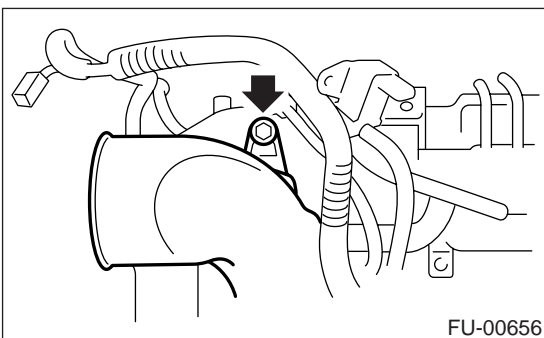
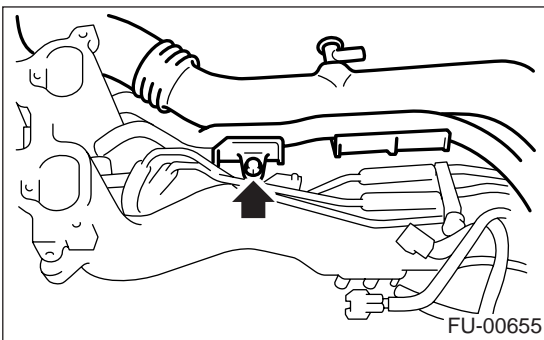
7) Remove the evaporation and coolant pipe assembly.



8) Remove the harness bands (A) which hold engine harness onto intake manifold.

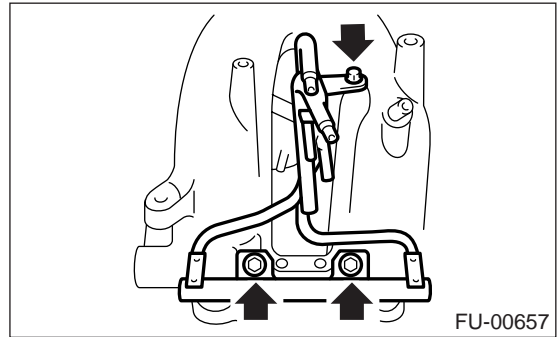


9) Remove the intake duct and engine harness from intake manifold as a unit.

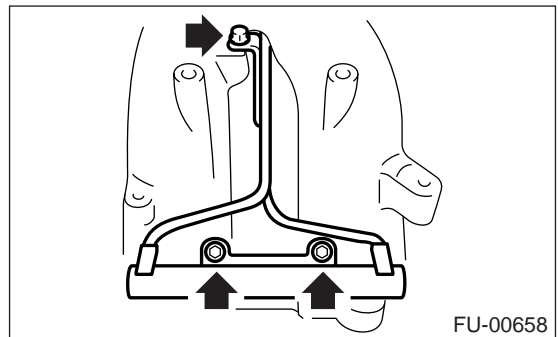


10) Remove the bolts which hold fuel injector pipe onto intake manifold.

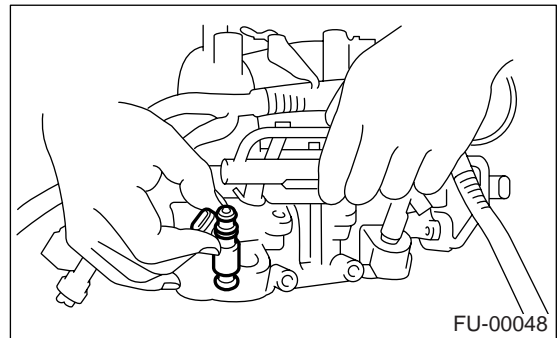
• LH SIDE



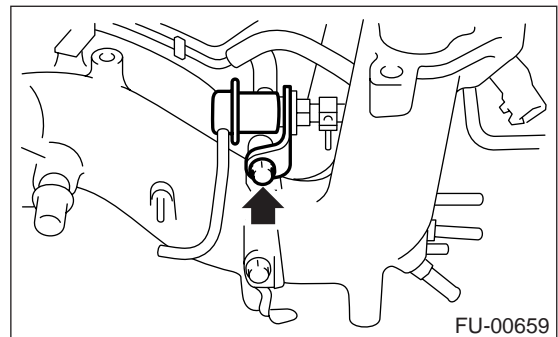
• RH SIDE



11) Remove the fuel injector.



12) Remove the pressure regulator.

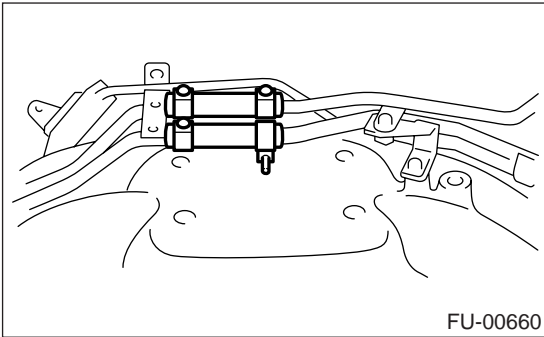


13) Remove the engine harness from intake manifold.

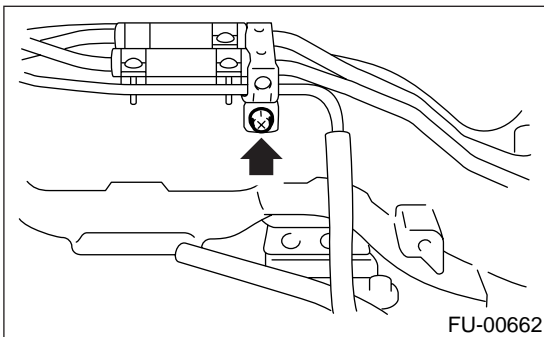
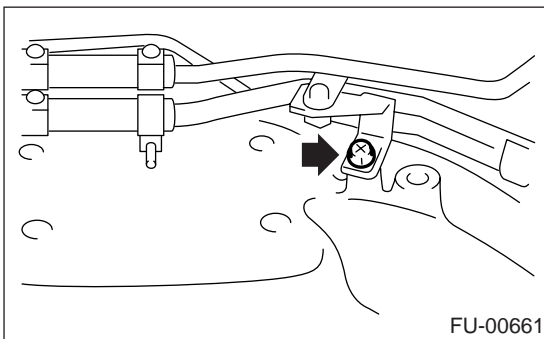
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

14) Loosen the clamps which hold fuel hose to fuel pipe assembly.



15) Remove the bolts which install fuel pipe on intake manifold.



D: ASSEMBLY

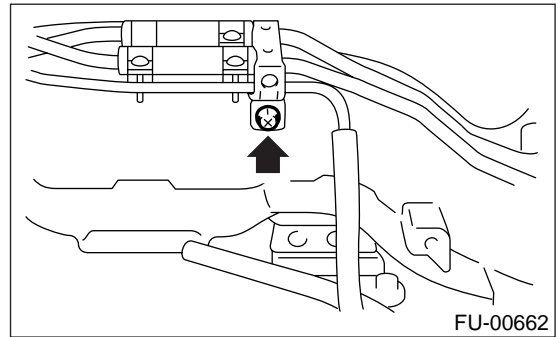
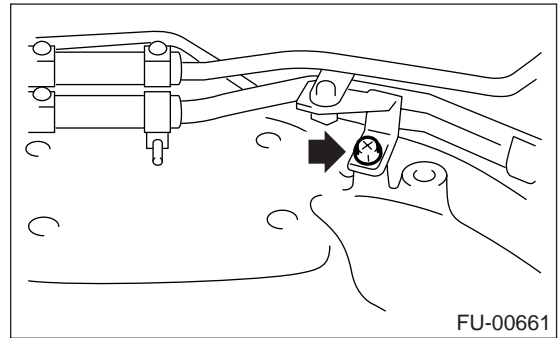
NOTE:

Replace the gasket with a new one.

1) Install the fuel pipe assembly to intake manifold.

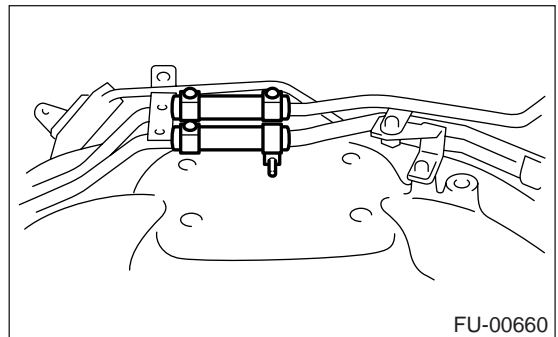
Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



2) Install the fuel injector pipe LH.

3) Connect the fuel hose to fuel pipe, and tighten the clamp screw.



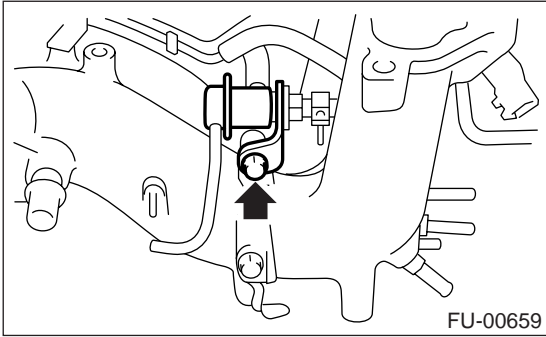
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

4) Install the pressure regulator.

Tightening torque:

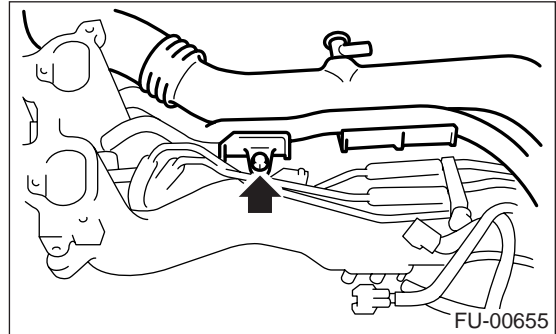
19 N·m (1.94 kgf-m, 13.7 ft-lb)



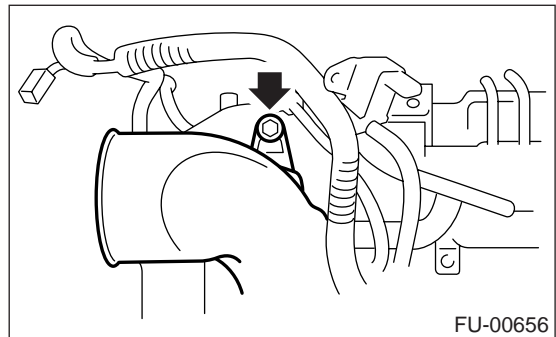
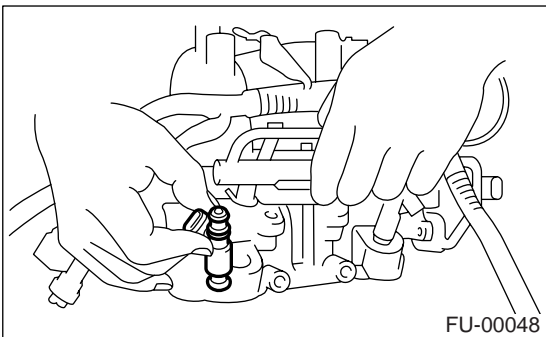
7) Install the intake duct and engine harness to intake manifold as a unit.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



5) Install the fuel injector.

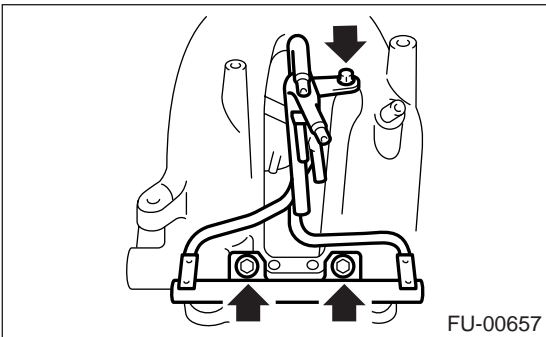


6) Tighten the bolts which install fuel injector pipe onto intake manifold.

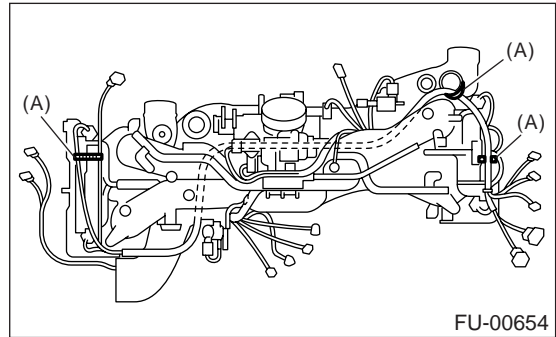
Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)

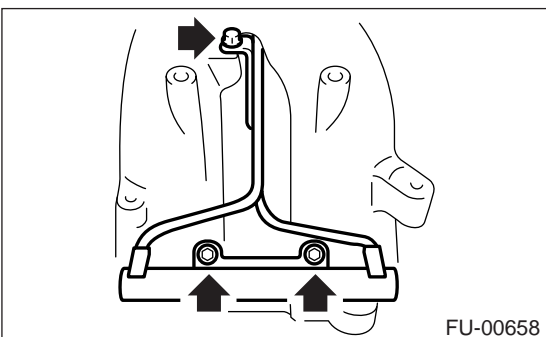
• LH SIDE



8) Hold the engine harness by harness bands (A).



• RH SIDE



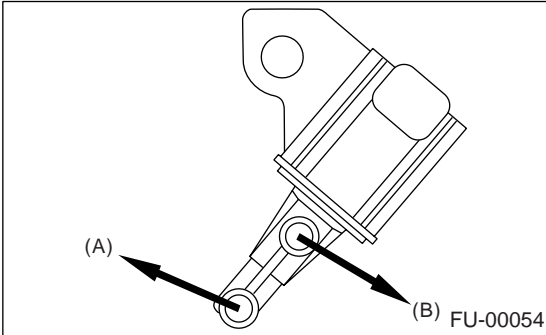
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

9) Connect the hoses to purge control solenoid valve.

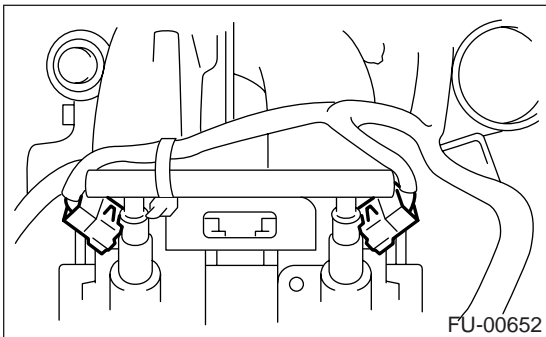
NOTE:

Connect the evaporation hoses as shown in the figure.



- (A) To intake manifold
- (B) To fuel pipe assembly

10) Connect the connector to fuel injector.

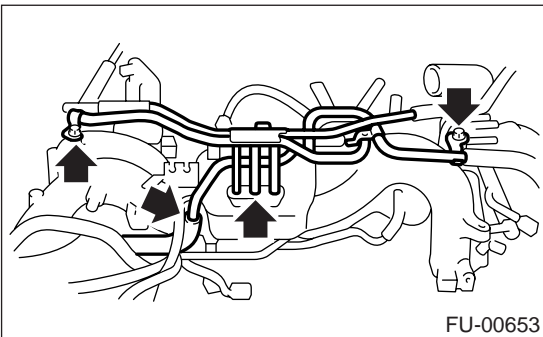


11) Install the evaporation and coolant pipe assembly.

12) Connect the evaporation hoses to evaporation and coolant pipe assembly.

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



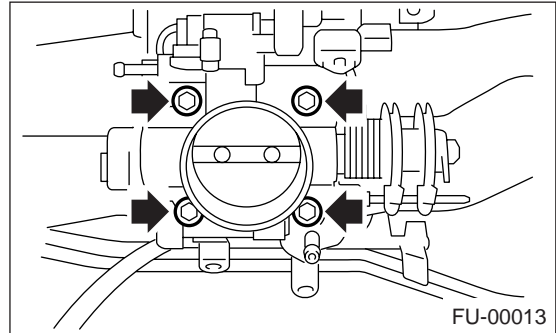
13) Install the throttle body to intake manifold.

NOTE:

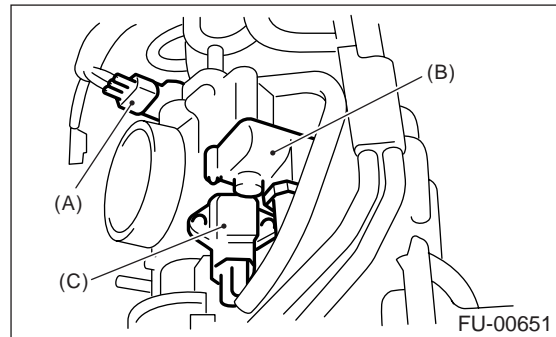
Replace the gasket with a new one.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



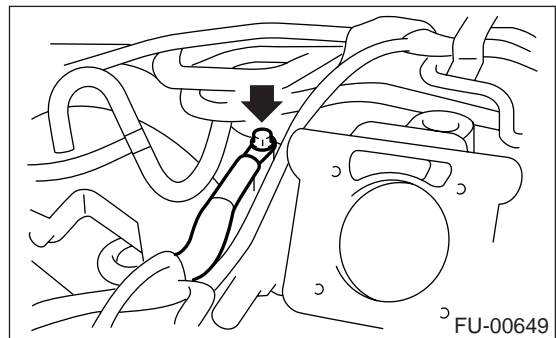
14) Connect the connector to the throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).



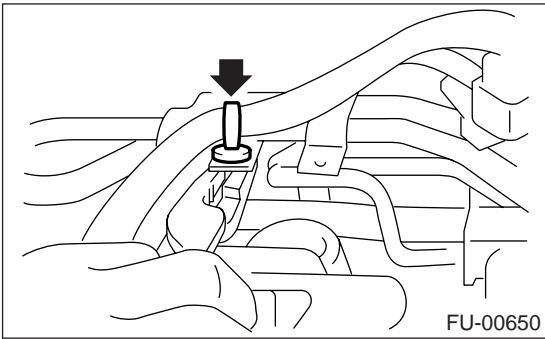
15) Install the engine ground cable to intake manifold.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



16) Connect the engine harness with clip to engine coolant pipe.



E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and that connections are tight.

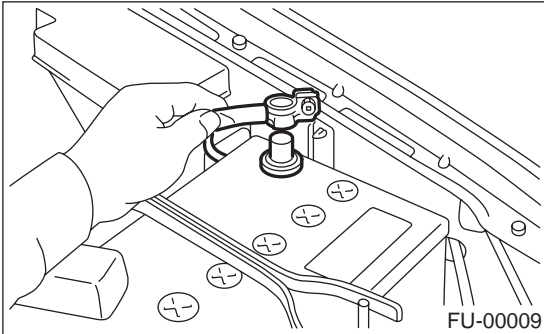
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

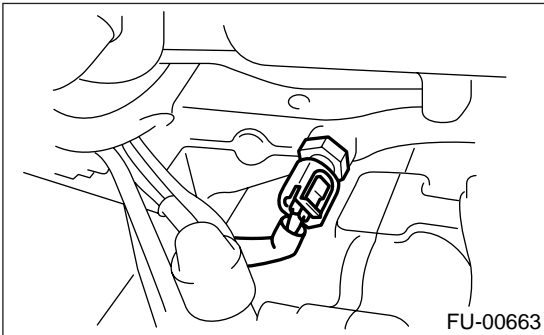
4. Engine Coolant Temperature Sensor

A: REMOVAL

- 1) Drain engine coolant.
- 2) Disconnect the ground cable from battery.



- 3) Remove the generator. <Ref. to SC(H4DOSTC)-14, REMOVAL, Generator.>
- 4) Disconnect the connector from engine coolant temperature sensor.
- 5) Remove the engine coolant temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18 N·m (1.8 kgf·m, 13.3 ft·lb)

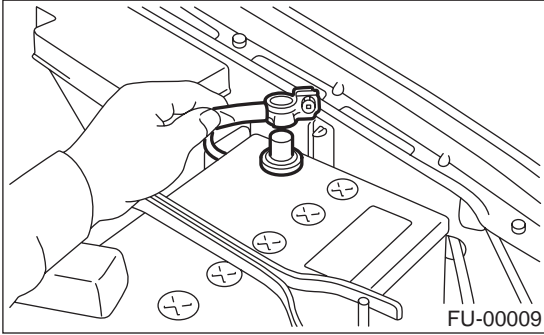
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

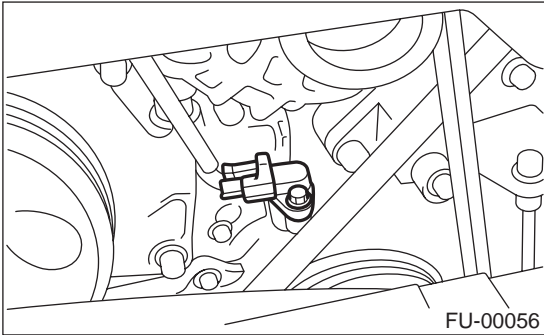
5. Crankshaft Position Sensor

A: REMOVAL

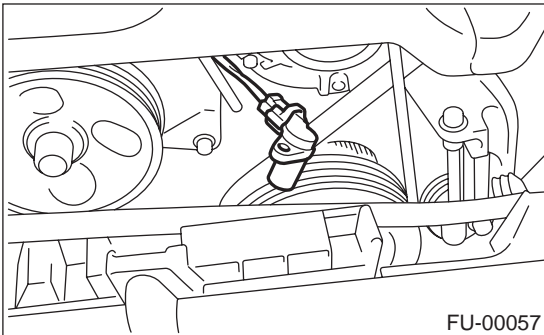
1) Disconnect the ground cable from battery.



2) Remove the bolt which installs crankshaft position sensor to cylinder block.



3) Remove the crankshaft position sensor, and then disconnect the connector from it.

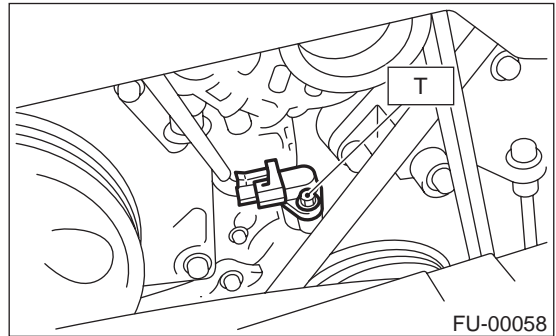


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



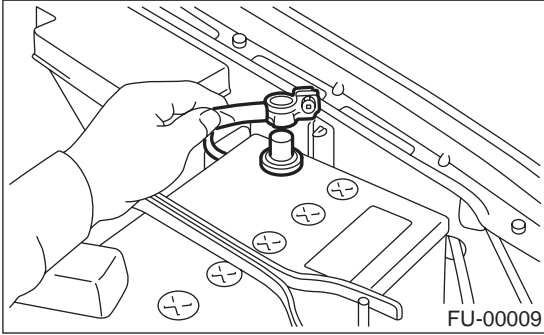
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

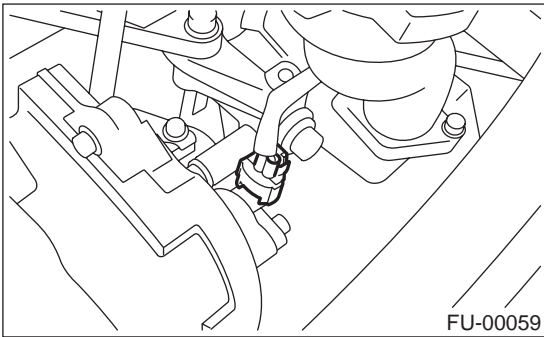
6. Camshaft Position Sensor

A: REMOVAL

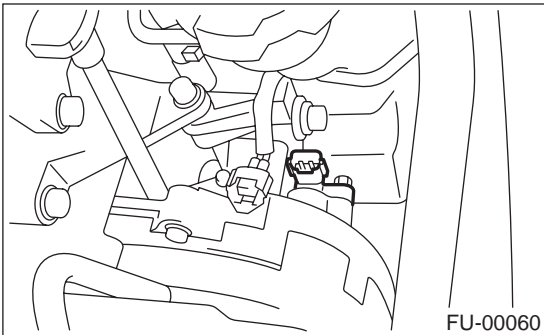
1) Disconnect the ground cable from battery.



2) Disconnect the connector from camshaft position sensor.



3) Remove the camshaft position sensor from camshaft support LH.

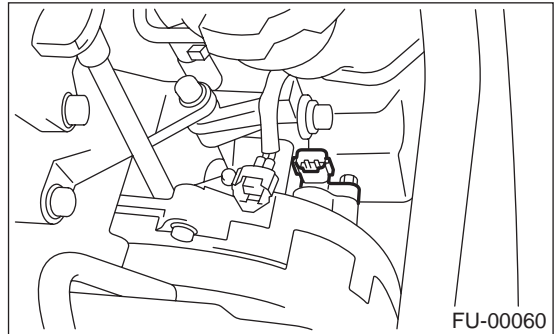


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

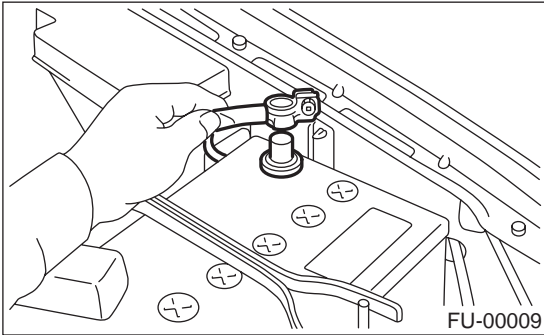
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



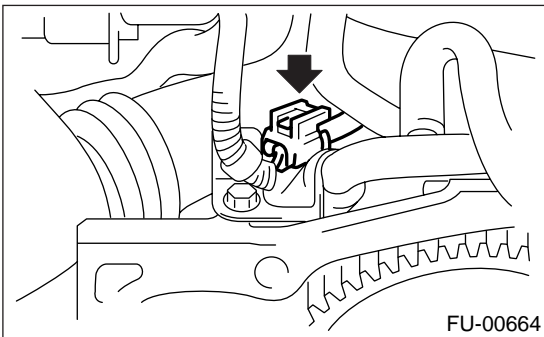
7. Knock Sensor

A: REMOVAL

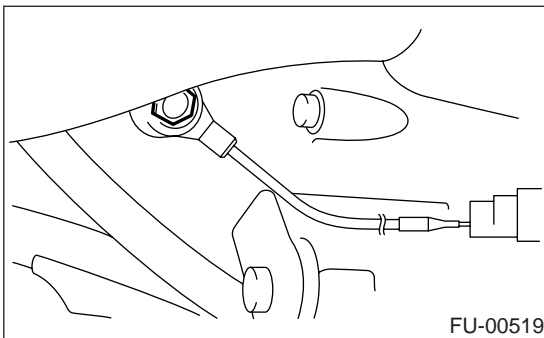
- 1) Disconnect the ground cable from battery.



- 2) Remove the intercooler. <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from cylinder block.



B: INSTALLATION

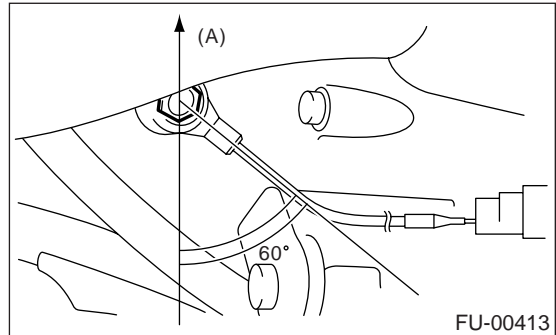
- 1) Install the knock sensor to cylinder block.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

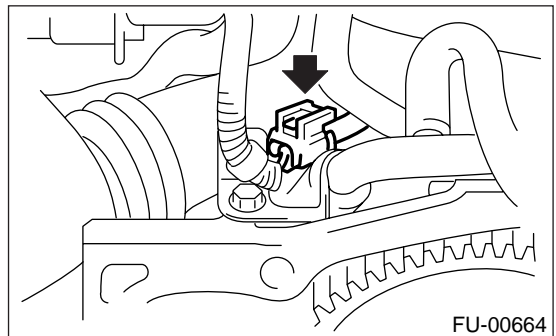
NOTE:

The extraction area of knock sensor cord must be positioned at a 60° angle relative to the engine rear.

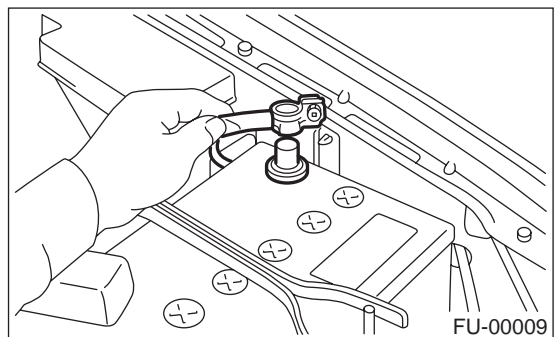


(A) Front side

- 2) Connect the knock sensor connector.



- 3) Install the intercooler. <Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>
- 4) Connect the battery ground cable to battery.



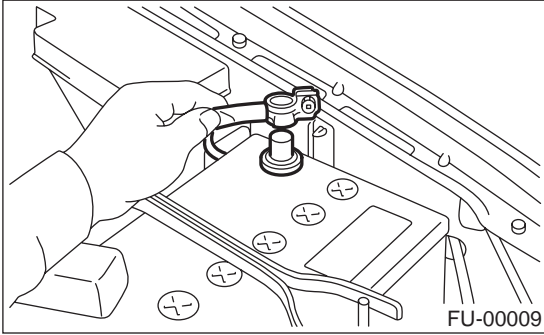
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

8. Throttle Position Sensor

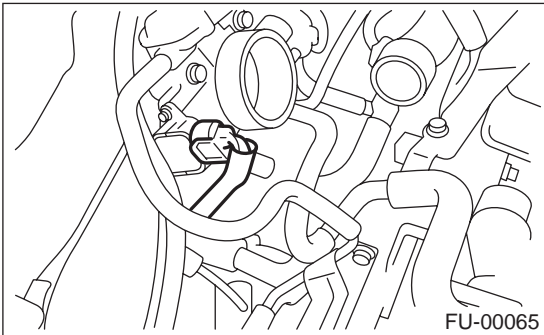
A: REMOVAL

1) Disconnect the ground cable from battery.

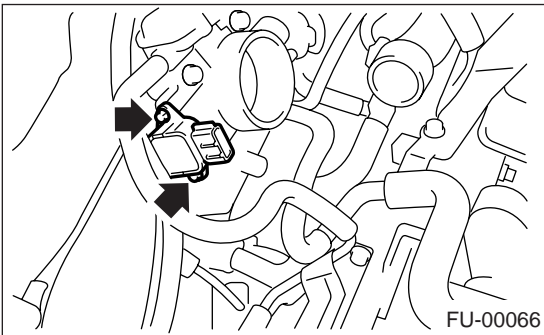


2) Remove the intercooler. <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>

3) Disconnect the connector from throttle position sensor.



4) Remove the throttle position sensor holding screws, and then remove it.

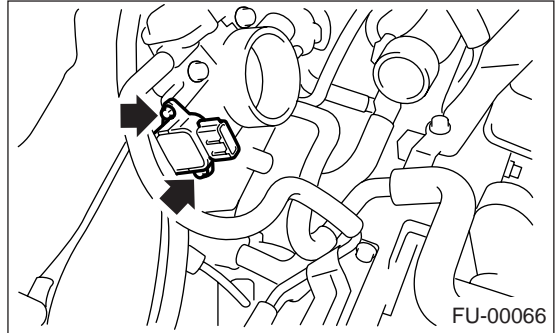


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

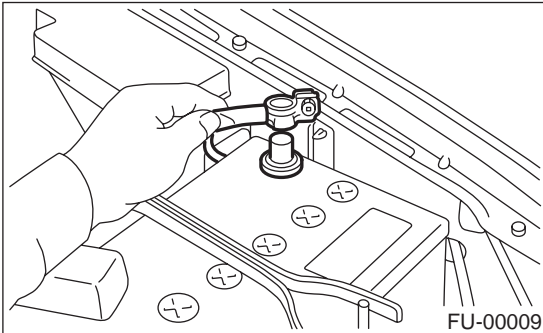
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



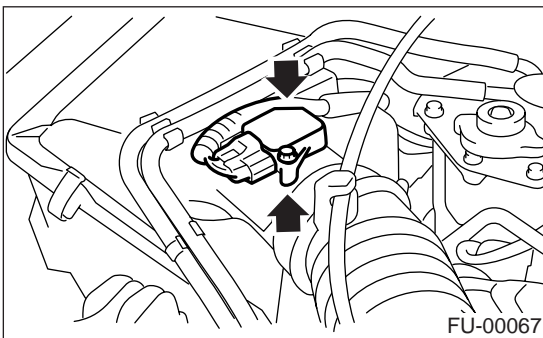
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector mass air flow and intake air temperature sensor.
- 3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

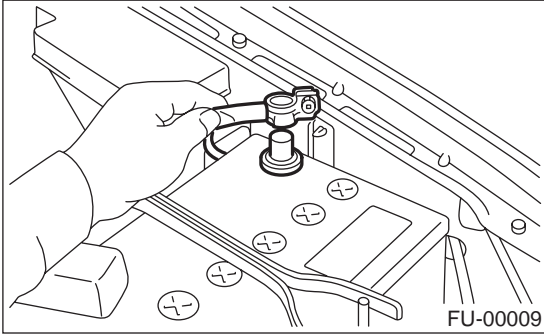
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

10. Pressure Sensor

A: REMOVAL

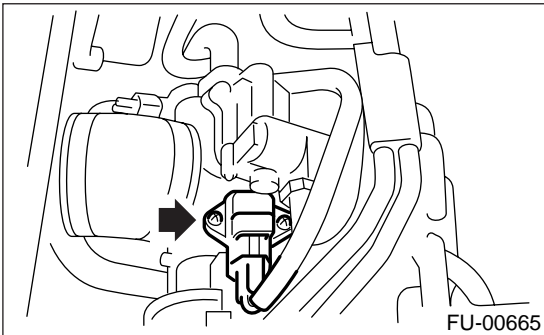
1) Disconnect the ground cable from battery.



2) Remove the idle air control solenoid valve. <Ref. to FU(H4DOSTC)-35, REMOVAL, Idle Air Control Solenoid Valve.>

3) Disconnect the connectors from pressure sensor.

4) Remove the pressure sensor from throttle body.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the O-ring for the pressure sensor with new ones.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

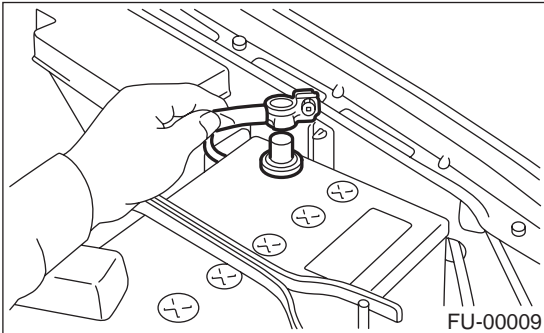
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

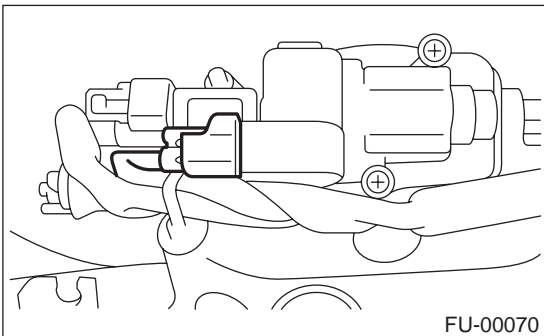
11. Idle Air Control Solenoid Valve

A: REMOVAL

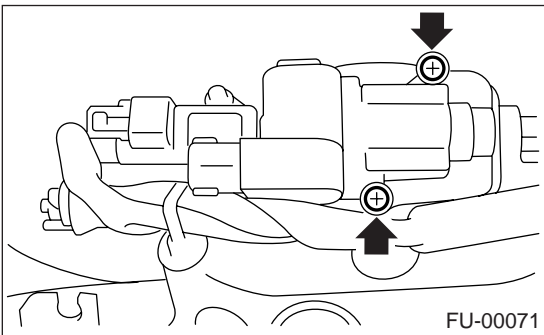
- 1) Disconnect the ground cable from battery.



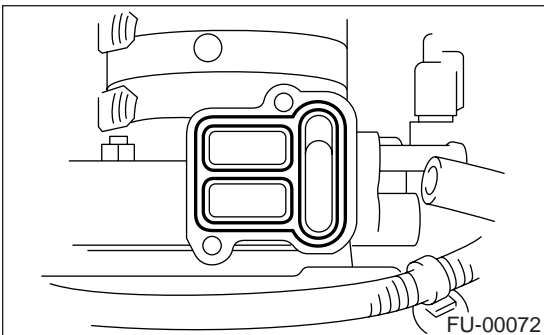
- 2) Disconnect the connector from idle air control solenoid valve.



- 3) Remove the idle air control solenoid valve from throttle body.



- 4) Remove the gasket from throttle body.



B: INSTALLATION

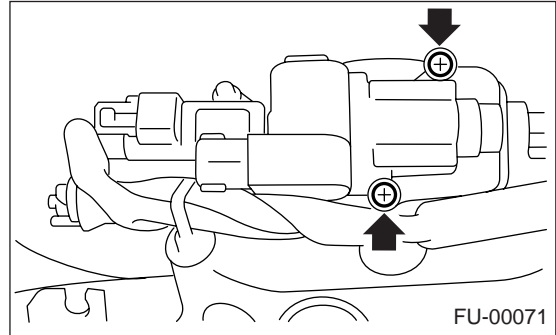
Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

2.8 N·m (0.29 kgf-m, 2.1 ft-lb)



FUEL INJECTOR

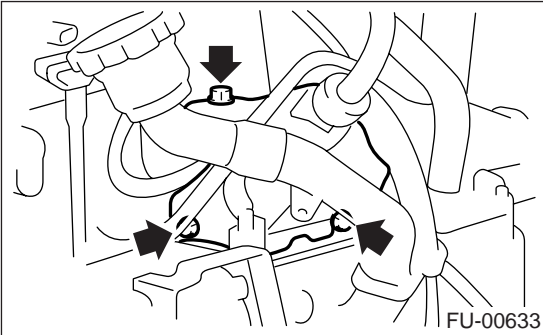
FUEL INJECTION (FUEL SYSTEMS)

12. Fuel Injector

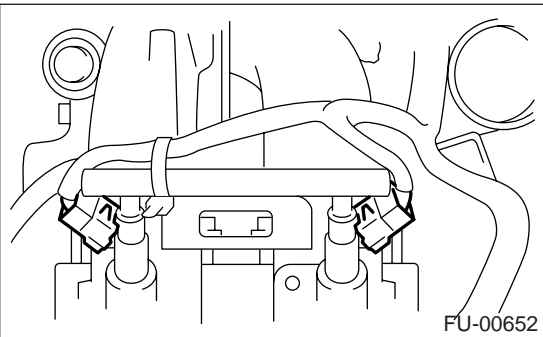
A: REMOVAL

1. RH SIDE

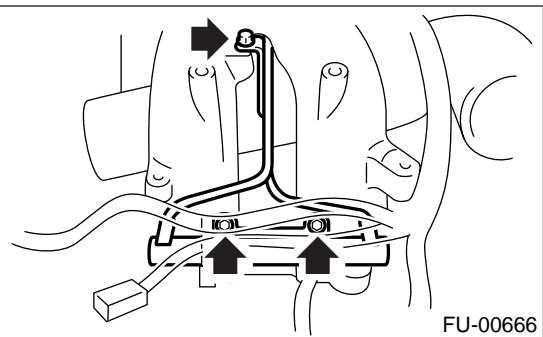
1) Remove the fuel pipe protector RH.



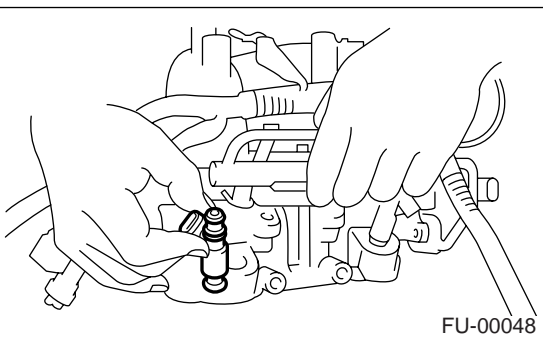
2) Disconnect the connector from fuel injector.



3) Remove the bolts which hold injector pipe to intake manifold.

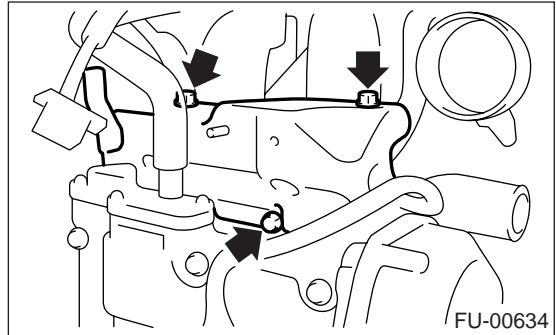


4) Remove the fuel injector while lifting up the fuel injector pipe.

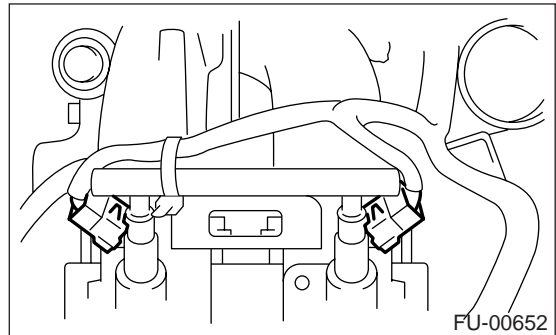


2. LH SIDE

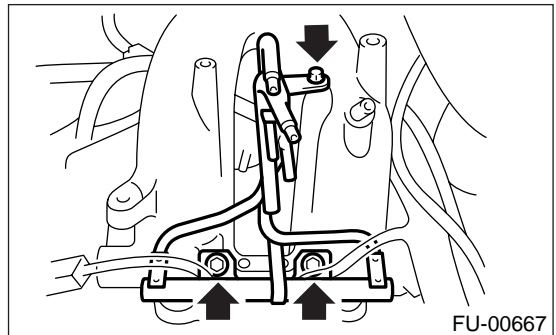
1) Remove the fuel pipe protector LH.



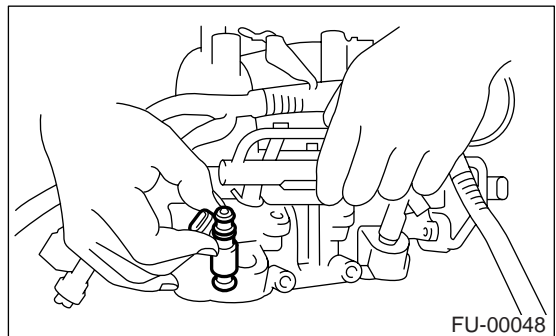
2) Disconnect the connector from fuel injector.



3) Remove the bolts which hold injector pipe to intake manifold.



4) Remove the fuel injector while lifting up the fuel injector pipe.



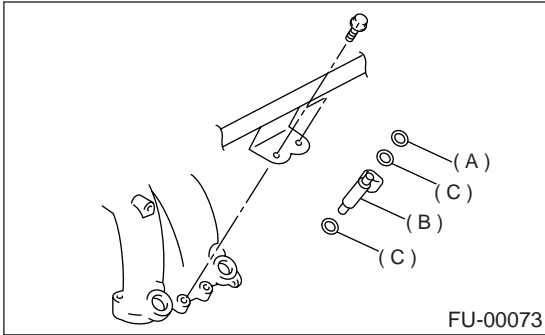
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

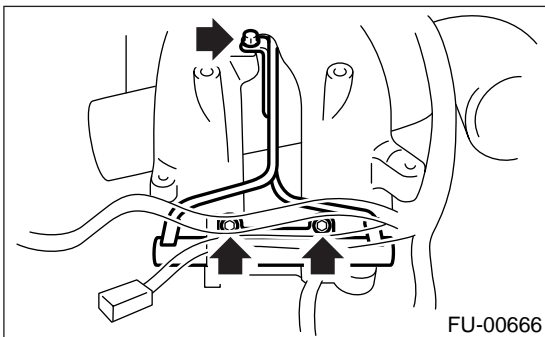
Replace the O-ring and insulators with new ones.



- (A) O-ring
- (B) Fuel injector
- (C) Insulator

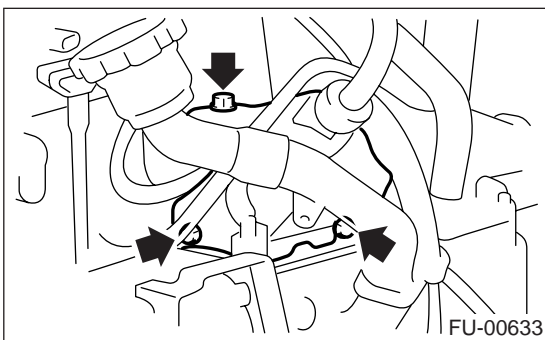
Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)

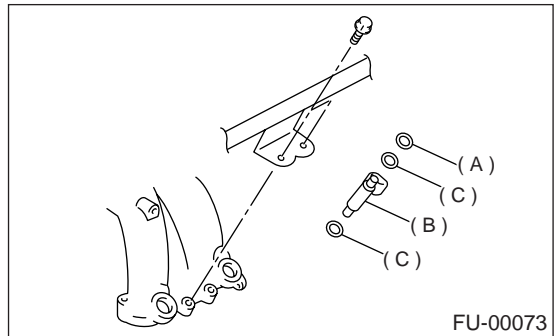


2. LH SIDE

Install in the reverse order of removal.

NOTE:

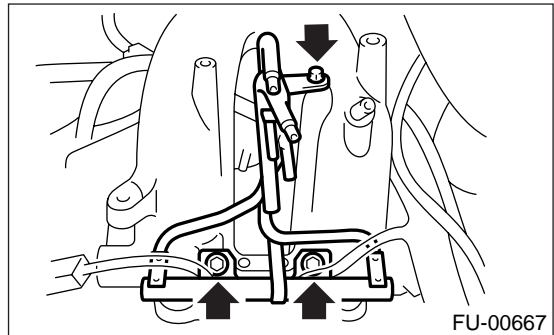
Replace the O-ring and insulators with new ones.



- (A) O-ring
- (B) Fuel injector
- (C) Insulator

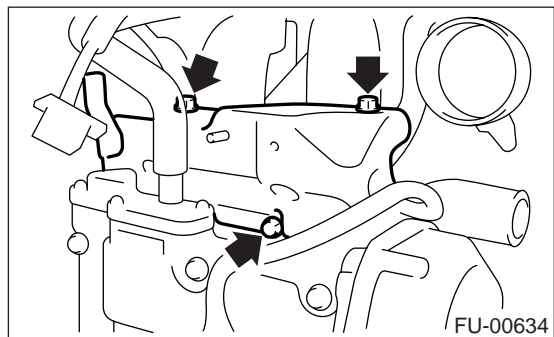
Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



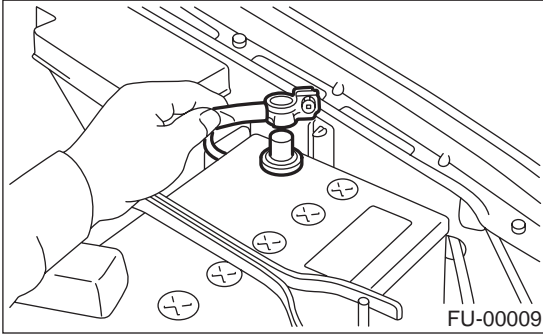
FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

13. Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from front oxygen (A/F) sensor.

3) Lift-up the vehicle.

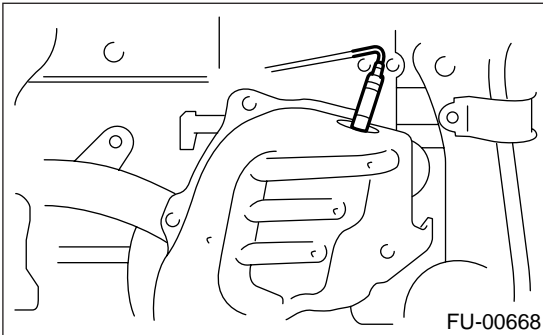
4) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and then leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove the front oxygen (A/F) sensor.

NOTE:

When removing the oxygen (A/F) sensor, wait until the exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

1) Before installing the front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:

SS-30 by JET LUBE

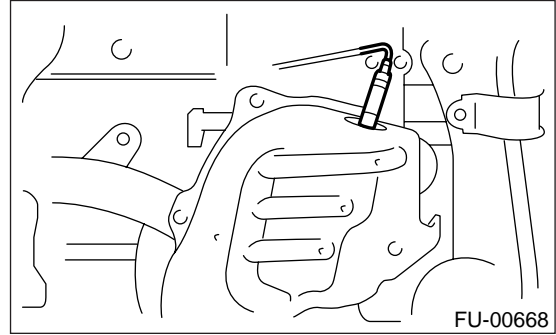
NOTE:

Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.

2) Install the front oxygen (A/F) sensor.

Tightening torque:

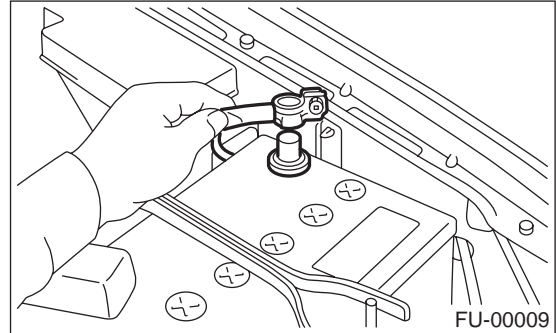
21 N·m (2.1 kgf·m, 15.2 ft·lb)



3) Lower the vehicle.

4) Connect the connector of front oxygen (A/F) sensor.

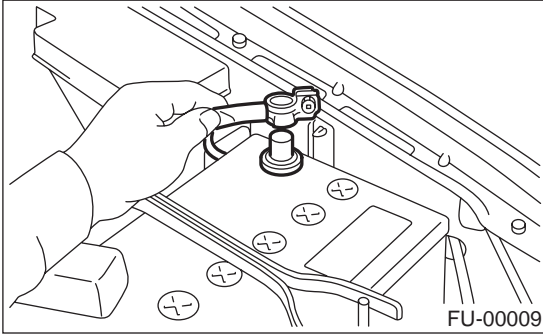
5) Connect the battery ground cable to battery.



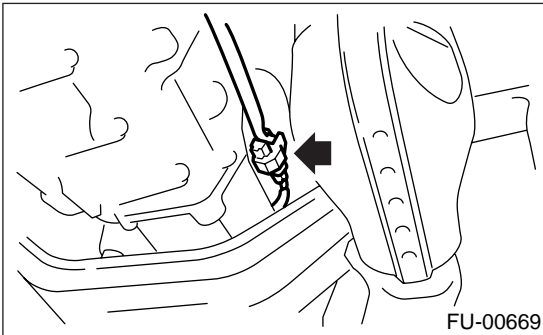
14. Rear Oxygen Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Lift-up the vehicle.
- 3) Disconnect the connector from rear oxygen sensor.



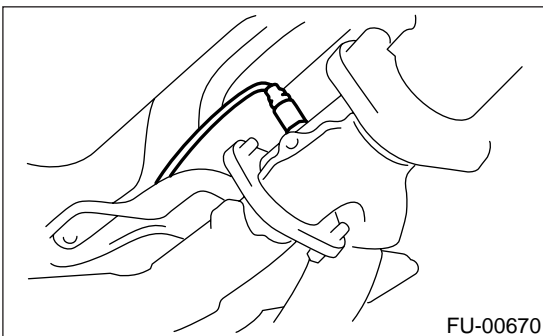
- 4) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and then leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove the rear oxygen sensor.

NOTE:

When removing the oxygen sensor, wait until the exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

- 1) Before installing the rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

NOTE:

Never apply anti-seize compound to the protector of rear oxygen sensor.

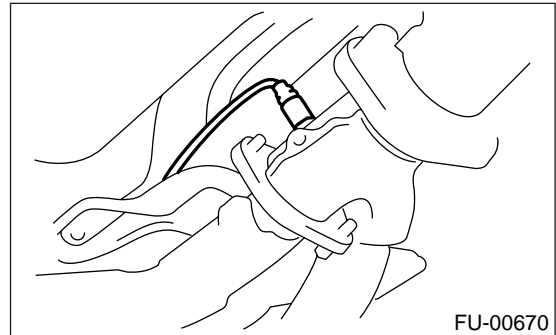
Anti-seize compound:

SS-30 by JET LUBE

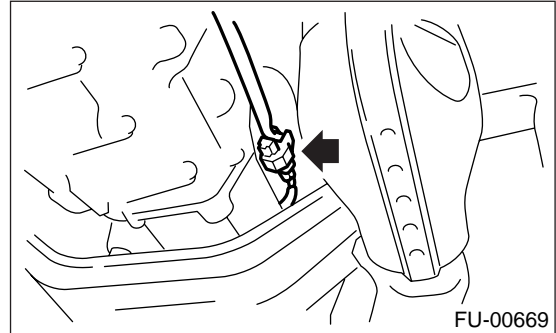
- 2) Install the rear oxygen sensor.

Tightening torque:

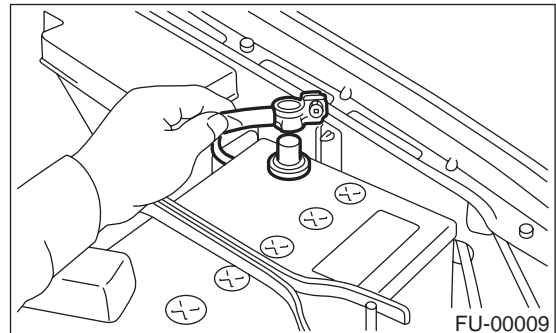
21 N·m (2.1 kgf-m, 15.2 ft-lb)



- 3) Connect the connector to rear oxygen sensor.



- 4) Lower the vehicle.
- 5) Connect the battery ground cable to battery.



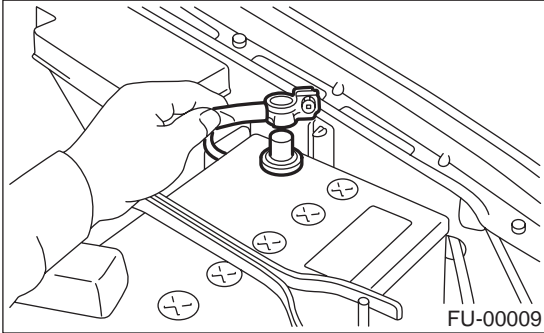
ENGINE CONTROL MODULE

FUEL INJECTION (FUEL SYSTEMS)

15.Engine Control Module

A: REMOVAL

1) Disconnect the ground cable from battery.

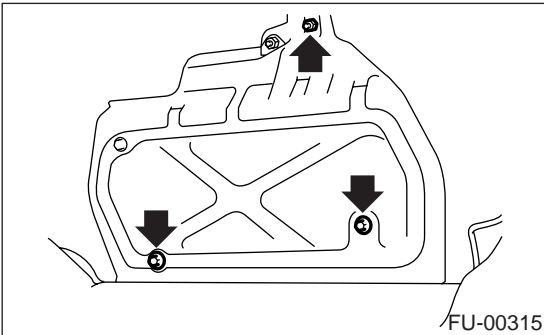


2) Remove the lower inner trim of passenger side.

<Ref. to EI-39, REMOVAL, Lower Inner Trim.>

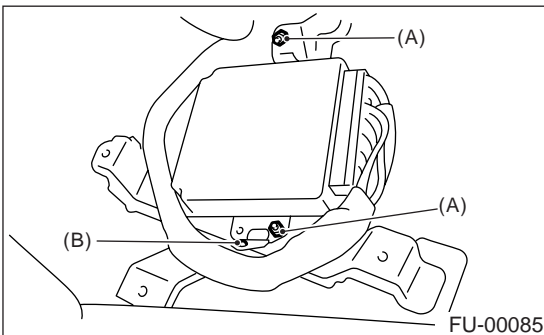
3) Detach the floor mat of front passenger seat.

4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to bracket.

6) Remove the clip (B) from bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

Install in the reverse order of removal.

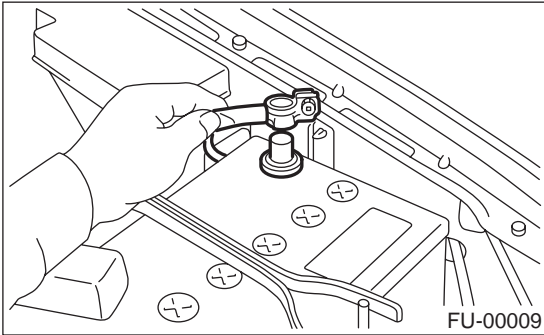
NOTE:

When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

16.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.

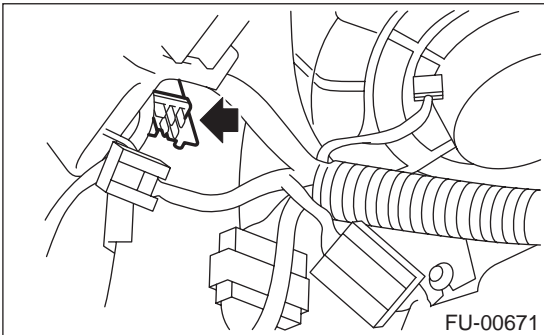


2) Remove the lower inner trim of passenger side.

<Ref. to EI-39, REMOVAL, Lower Inner Trim.>

3) Disconnect the connectors from main relay.

4) Remove the bolt which holds main relay bracket on body.



B: INSTALLATION

Install in the reverse order of removal.

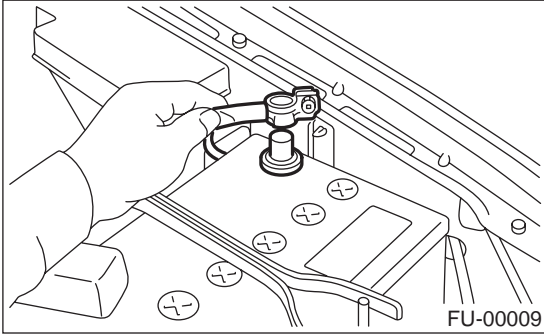
FUEL PUMP RELAY

FUEL INJECTION (FUEL SYSTEMS)

17. Fuel Pump Relay

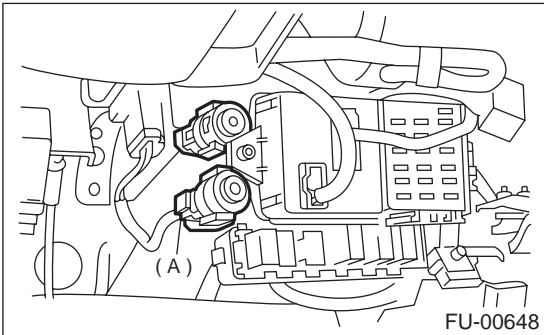
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the lower cover.

3) Disconnect the connector from fuel pump relay (A).



4) Remove the fuel pump relay from mounting bracket.

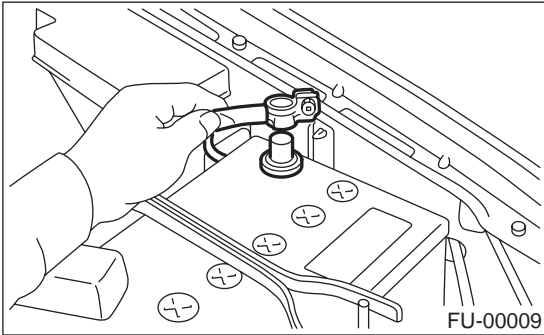
B: INSTALLATION

Install in the reverse order of removal.

18. Fuel Pump Controller

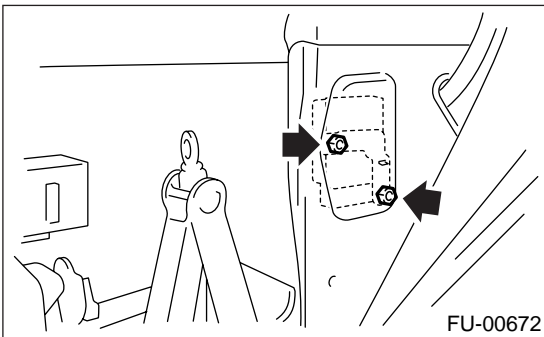
A: REMOVAL

1) Disconnect the ground cable from battery.

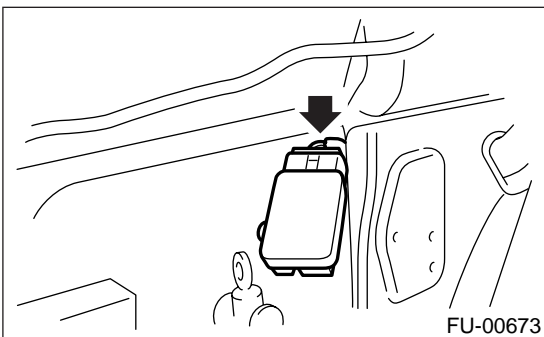


2) Remove the rear quarter trim. <Ref. to EI-40, REMOVAL, Rear Quarter Trim.>

3) Remove the fuel pump controller.



4) Disconnect the connector from the fuel pump controller.



B: INSTALLATION

Install in the reverse order of removal.

FUEL

FUEL INJECTION (FUEL SYSTEMS)

19. Fuel

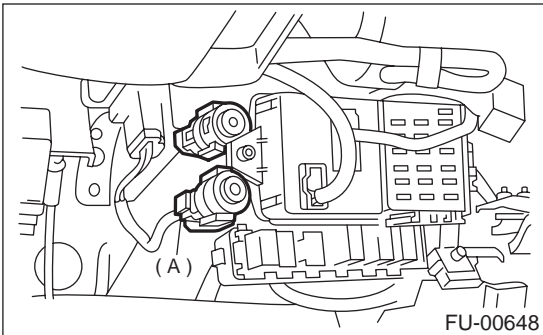
A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Disconnect the connector from fuel pump relay (A).



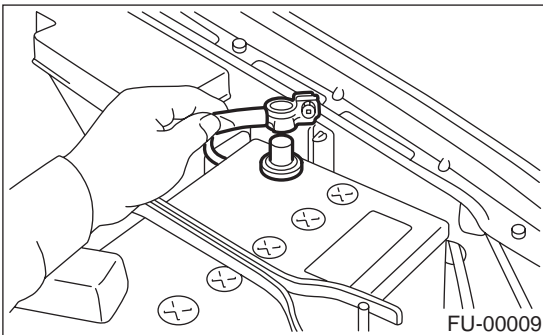
- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn the ignition switch to OFF.

2. DRAINING FUEL

WARNING:

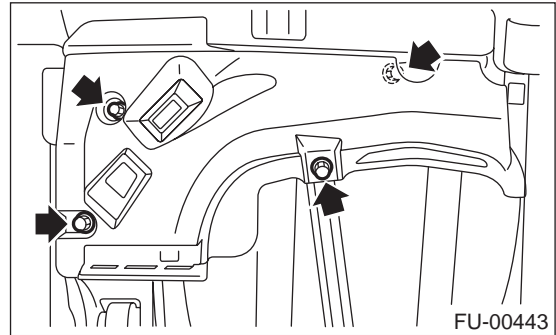
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.

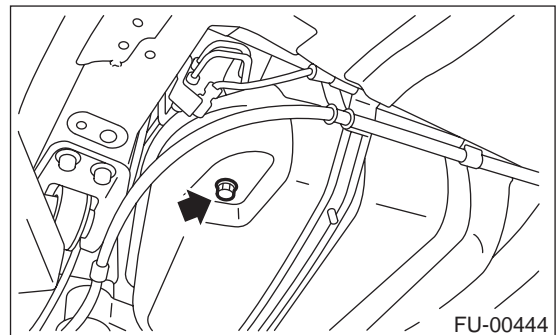


- 3) Lift-up the vehicle.

- 4) Remove the protector RH (Front).



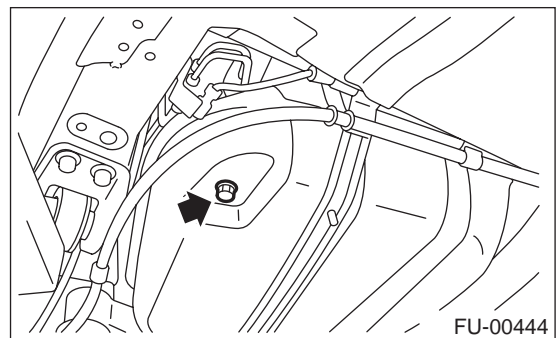
- 5) Drain the fuel from fuel tank.
Set a container under the vehicle, and then remove the drain plug from fuel tank.



- 6) Tighten the fuel drain plug, and then install the protector RH (Front).

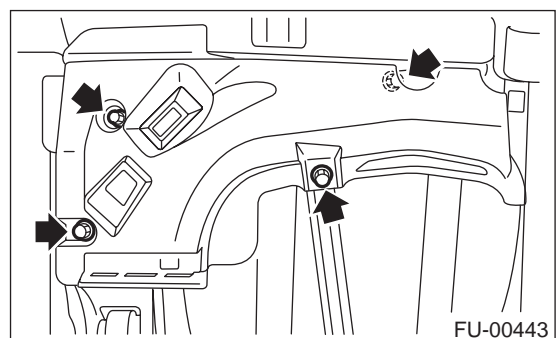
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

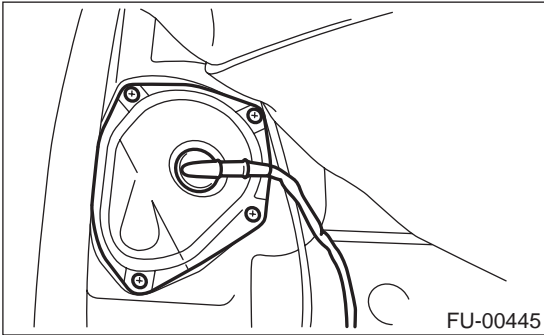


FUEL

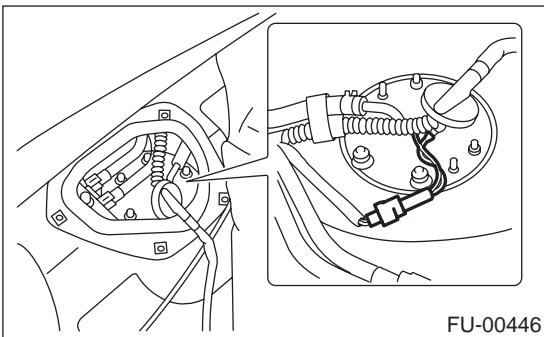
FUEL INJECTION (FUEL SYSTEMS)

7) Lower the vehicle.

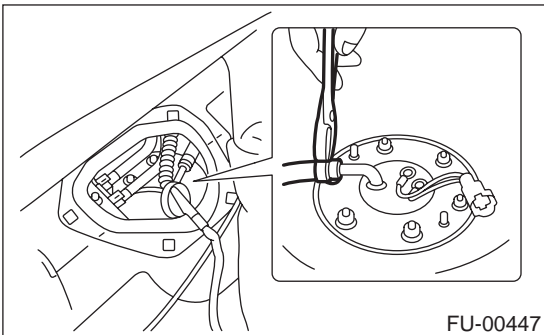
8) Remove the sub service hole cover.



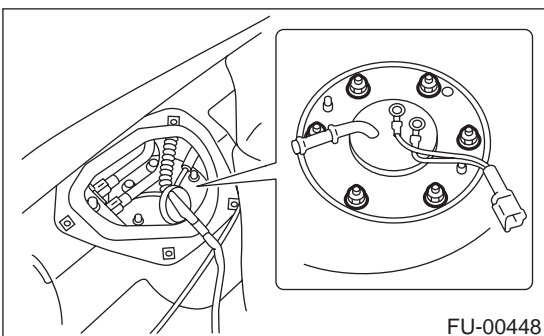
9) Disconnect the connector from fuel sub level sensor.



10) Disconnect the fuel jet pump hose.



11) Remove the fuel sub level sensor.



12) Drain the fuel from fuel tank by using a hand pump.

WARNING:

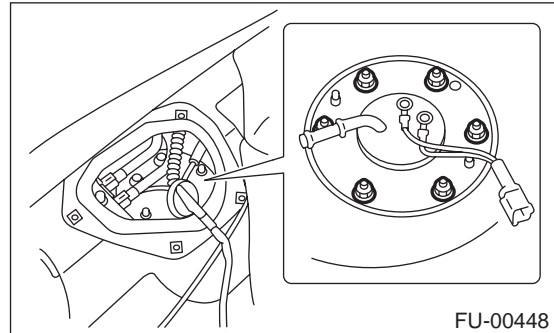
Do not use a motor pump when draining the fu-

el.

13) After draining the fuel, reinstall the fuel sub level sensor.

Tightening torque:

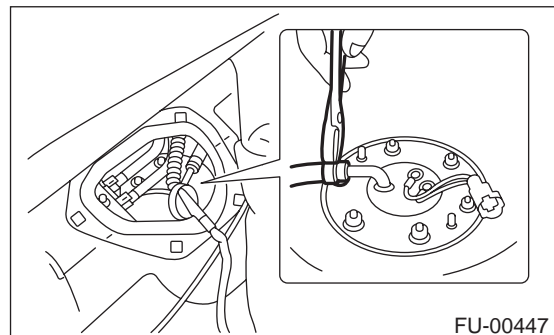
T: 4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



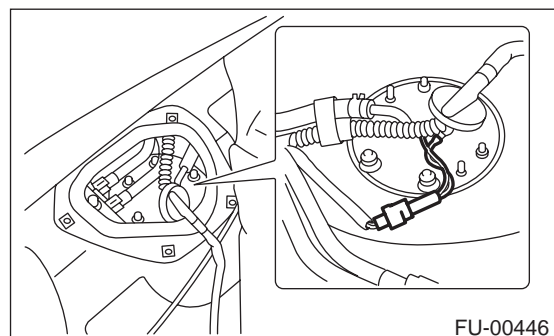
NOTE:

If you have not removed the fuel tank yet, proceed with the procedure below for installation.

(1) Connect the fuel jet pump hose.



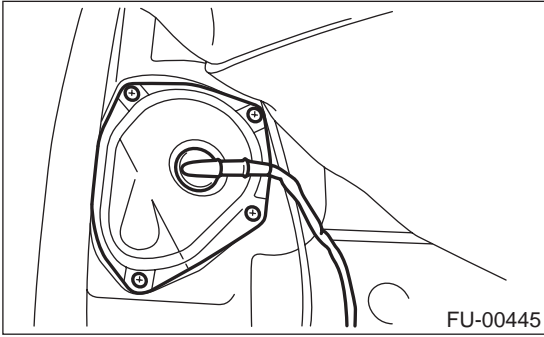
(2) Connect the connector from fuel sub level sensor.



FUEL

FUEL INJECTION (FUEL SYSTEMS)

- (3) Install the sub service hole cover.

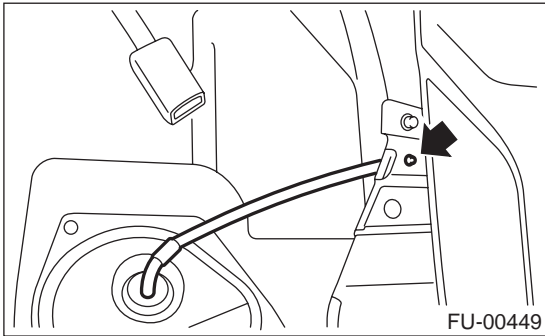


- (4) Set the rear seat and floor mat.

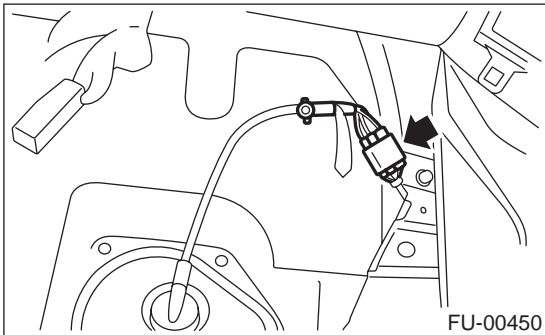
20. Fuel Tank

A: REMOVAL

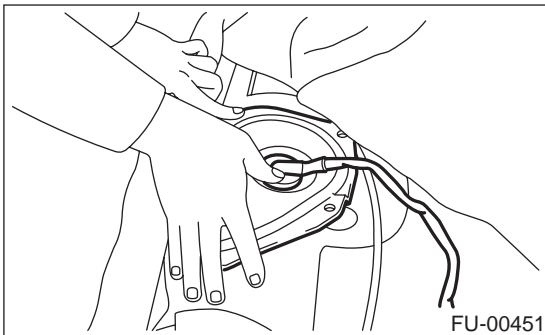
- 1) Set the vehicle on the lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain the fuel from fuel tank. <Ref. to FU(H4DOSTC)-44, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove the holder clip which secures fuel tank cord on bracket.



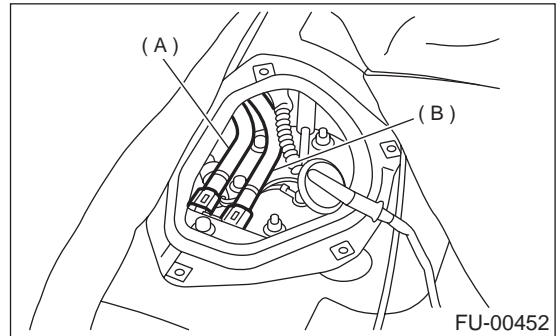
- 5) Disconnect the connector of fuel tank cord to rear harness.



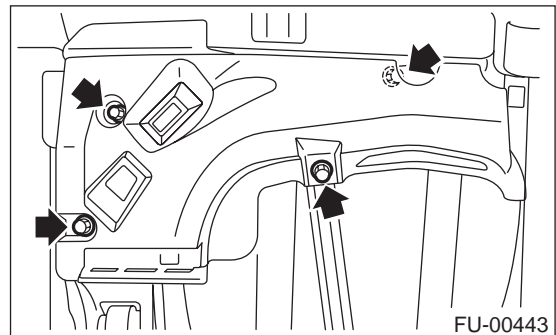
- 6) Push the grommet which holds fuel tank cord on service hole cover into body side.



- 7) Separate the quick connector of fuel delivery (A) and return hose (B). <Ref. to FU(H4DOSTC)-67, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



- 8) Remove the parking brake cable.
 - (1) Remove the console box. <Ref. to EI-34, REMOVAL, Console Box.>
 - (2) Remove the parking brake bracket, and then disconnect the parking brake cable from equalizer. <Ref. to PB-7, REMOVAL, Parking Brake Cable.>
- 9) Remove the wheel nuts from rear wheels.
- 10) Lift-up the vehicle.
- 11) Remove the rear wheel.
- 12) Remove the front side protector.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

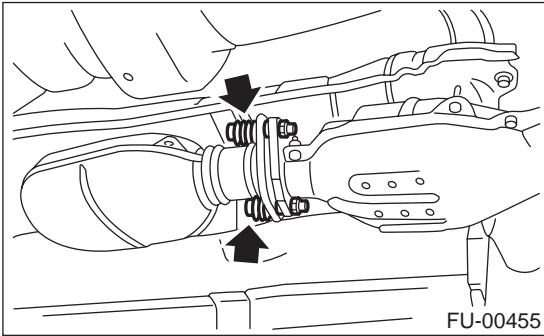
13) Remove the rear exhaust pipe and muffler.

NOTE:

To facilitate the removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

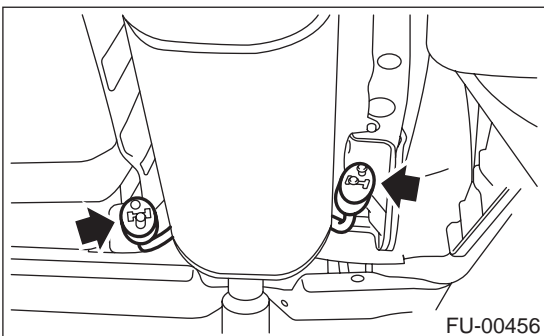
(1) Separate the rear exhaust pipe from center exhaust pipe.



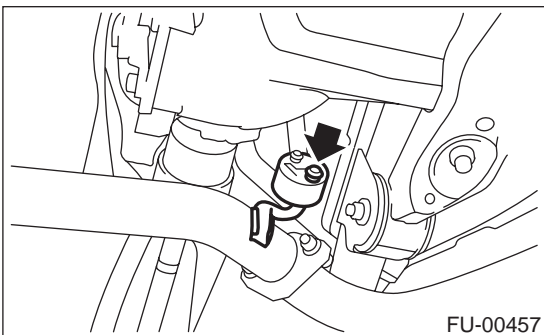
(2) Remove the right and left rubber cushions.

NOTE:

Be careful not to pull down the muffler.

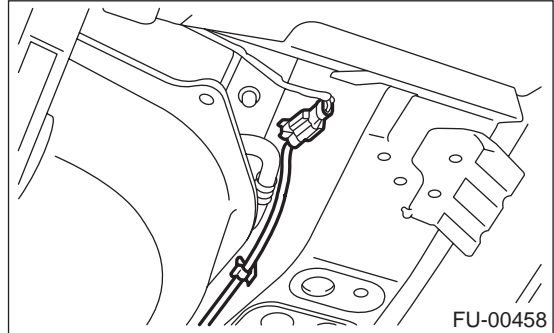


(3) Remove the front rubber cushion, and then detach the muffler assembly.



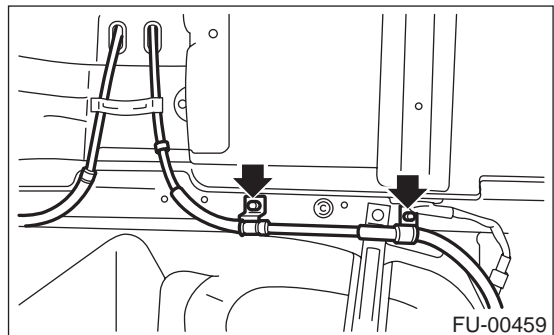
14) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

15) Disconnect the connector from ABS sensor.

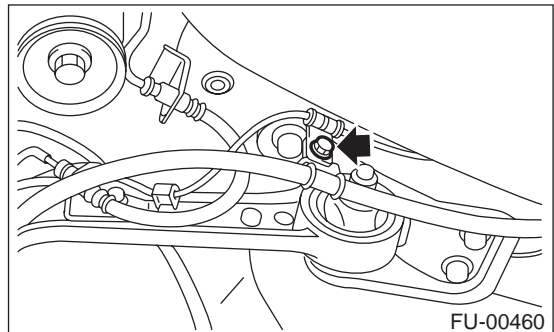


16) Remove the bolts which hold parking brake cable holding bracket.

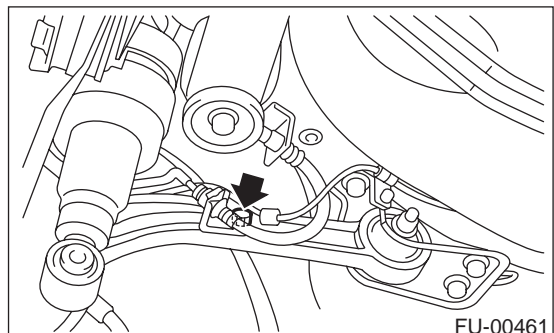
17) Remove the parking brake cable from cabin by forcibly pulling it backward.



18) Remove the bolt which holds parking brake cable holding bracket.



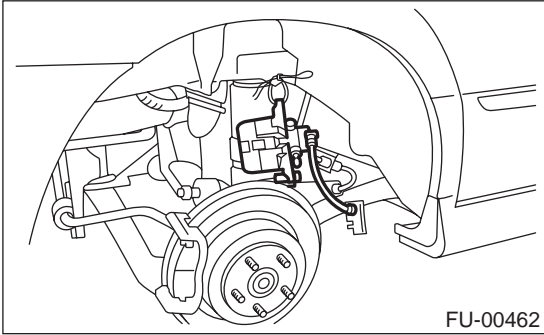
19) Remove the bolt which holds rear brake hoses holding bracket.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

20) Remove the rear brake caliper, and then tie it up to the body side of vehicle as shown in the figure.

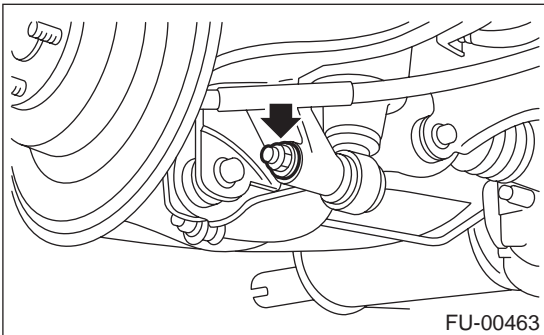


21) Remove the rear suspension assembly.

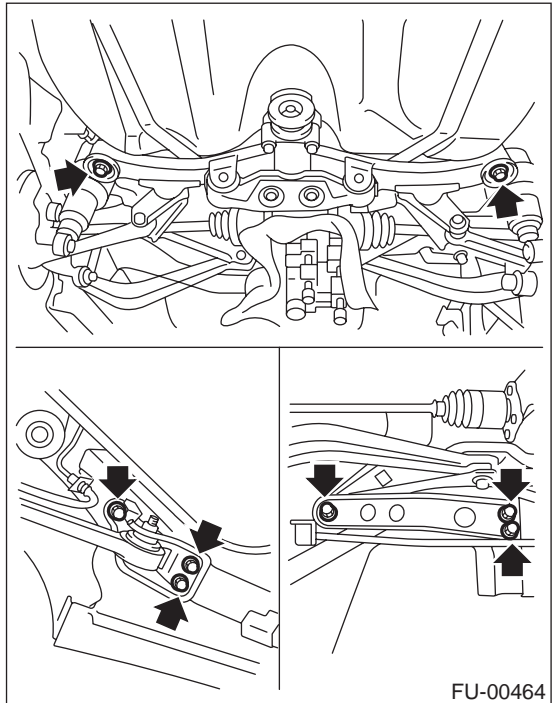
CAUTION:

A helper is required to perform this work.

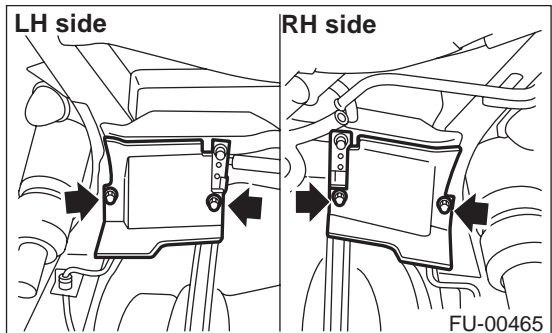
- (1) Support the rear differential with transmission jack.
- (2) Remove the bolt which holds rear shock absorber to rear suspension arm.



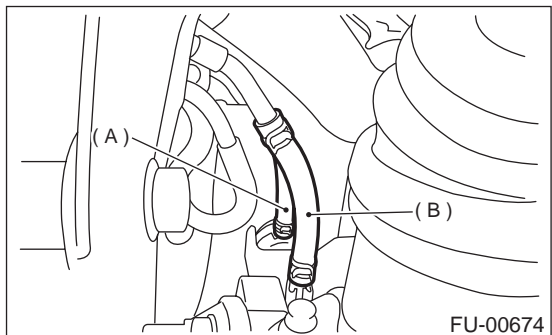
(3) Remove the bolts which secure rear suspension assembly to body.



(4) Remove the rear suspension assembly.
22) Remove the rear side protector.



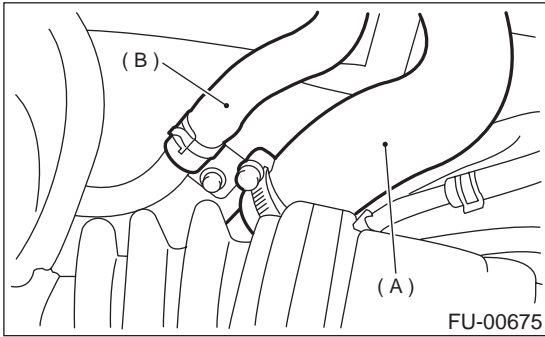
23) Disconnect the two-way valve hose (A) from two-way valve, and then disconnect the evaporation hose (B) from evaporation pipe.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

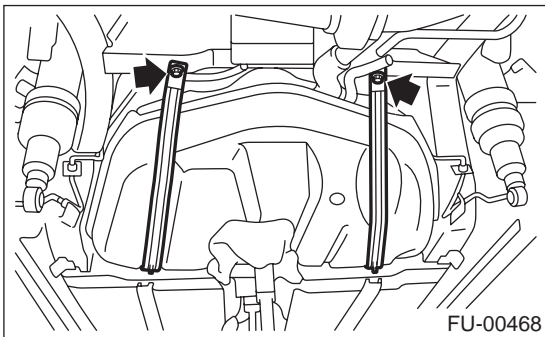
24) Loosen the clamp and disconnect the fuel filler hose (A) and air vent hose (B) from fuel filler pipe.



25) Support the fuel tank with transmission jack, then remove the bolts from bands and dismount fuel tank from the vehicle.

CAUTION:

A helper is required to perform this work.



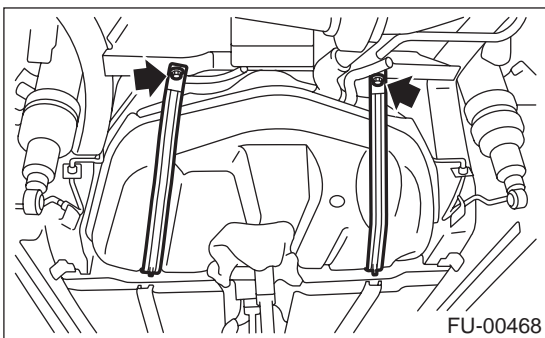
B: INSTALLATION

1) Support the fuel tank with transmission jack, and then push the fuel tank harness into access hole with grommet.

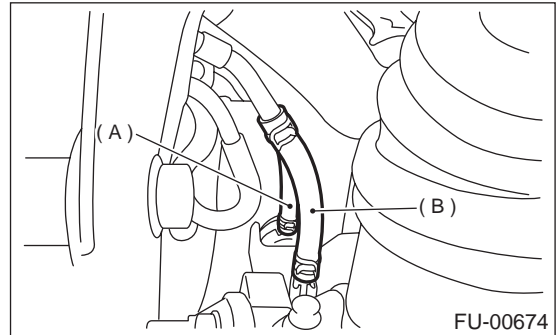
2) Set the fuel tank, and then temporarily tighten the bolts of fuel tank bands.

CAUTION:

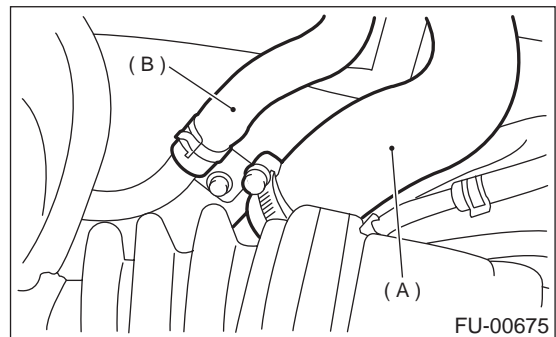
A helper is required to perform this work.



3) Connect the two-way valve hose (A) to two-way valve, and then connect the evaporation hose (B) to evaporation pipe.



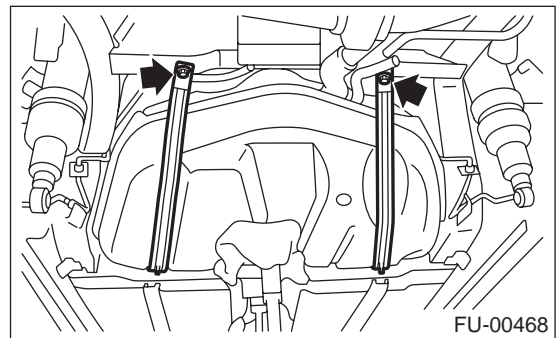
4) Connect the fuel filler hose (A) and air vent hose (B).



5) Tighten the band mounting bolts.

Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



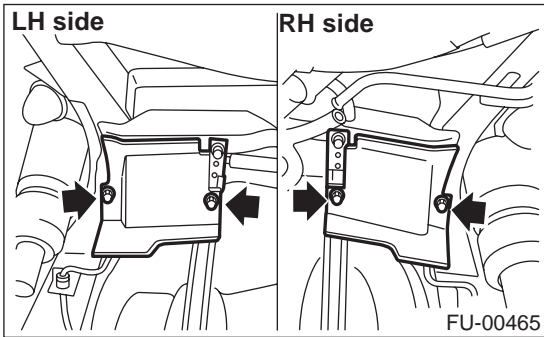
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

6) Install the rear side protector.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



7) Install the rear suspension assembly.

CAUTION:

A helper is required to perform this work.

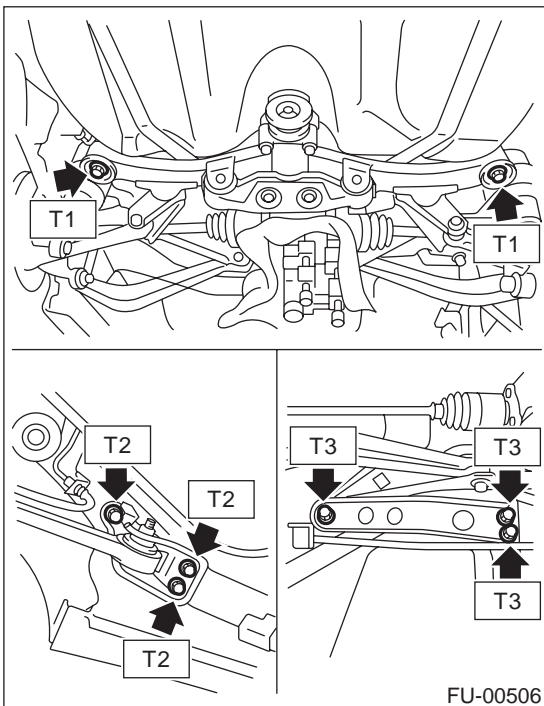
(1) Support the rear suspension assembly, and then tighten the bolts which secure rear suspension assembly.

Tightening torque:

T1: 172 N·m (17.5 kgf·m, 127 ft·lb)

T2: 108 N·m (11.0 kgf·m, 80 ft·lb)

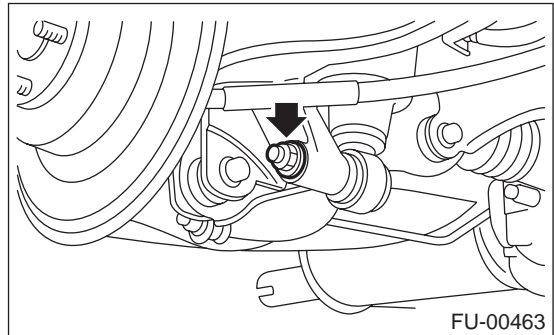
T3: 66 N·m (6.7 kgf·m, 48 ft·lb)



(2) Tighten the bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-11, INSTALLATION, Rear Arm.>

Tightening torque:

157 N·m (16 kgf·m, 116 ft·lb)

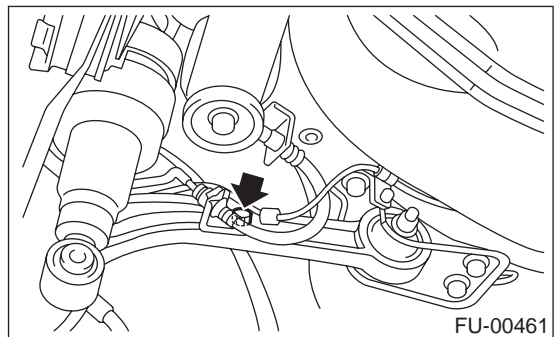


8) Install the rear brake caliper. <Ref. to BR-29, INSTALLATION, Rear Disc Brake Assembly.>

9) Tighten the bolt which holds rear brake hoses holding bracket.

Tightening torque:

33 N·m (3.4 kgf·m, 25 ft·lb)



10) Install the parking brake cable to cabin by forcibly pushing it forward.

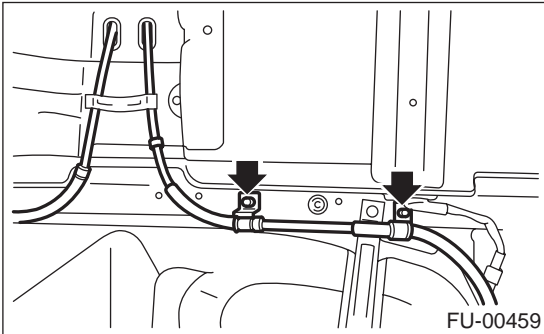
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

11) Tighten the bolts which hold parking brake cable holding bracket.

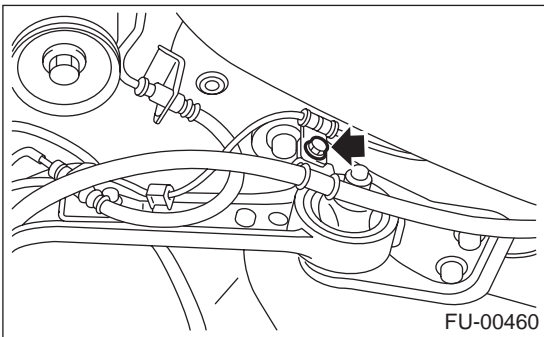
Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

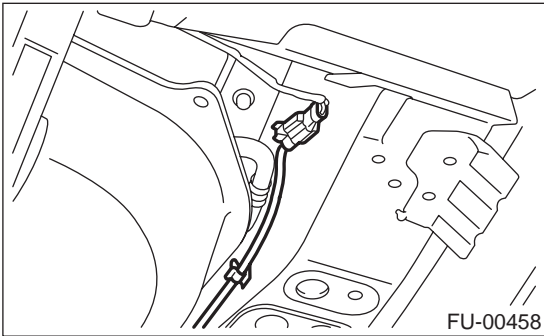


Tightening torque:

32 N·m (3.3 kgf-m, 23.9 ft-lb)



12) Connect the connector to ABS sensor.



13) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>

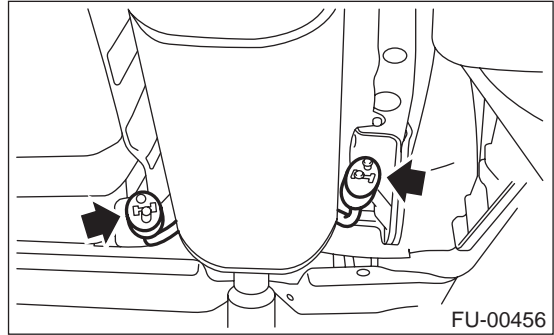
14) Install the rear exhaust pipe and muffler.

NOTE:

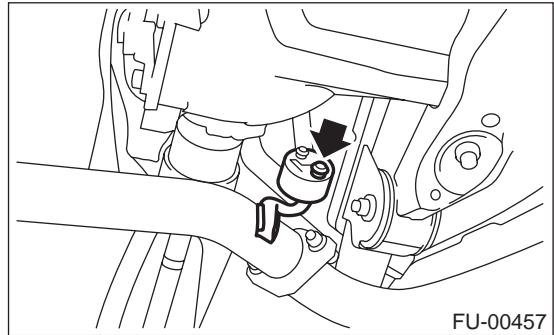
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of the rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install the right and left rubber cushions.



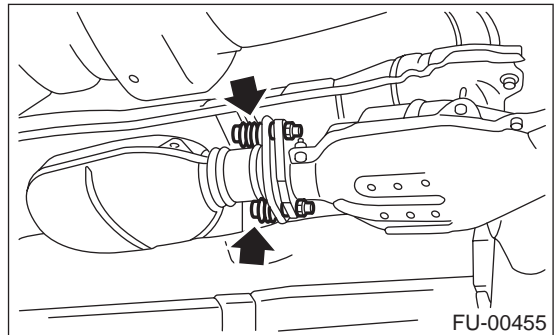
(2) Install the front rubber cushion and attach muffer assembly.



(3) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:

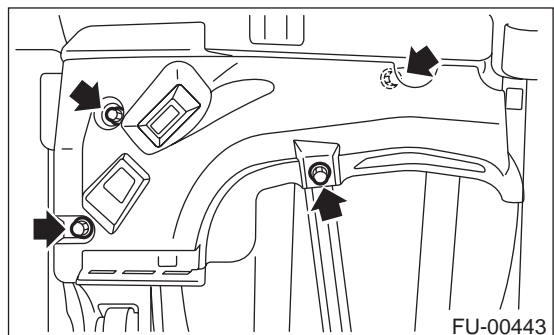
18 N·m (1.8 kgf-m, 13.0 ft-lb)



15) Install the front side protector.

Tightening torque:

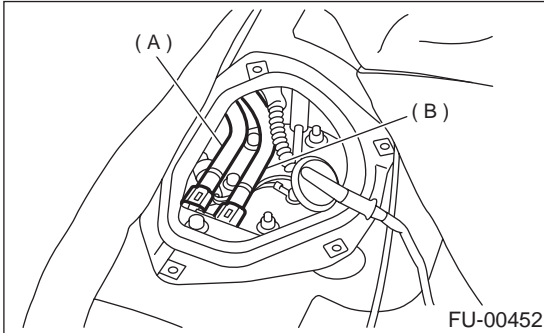
18 N·m (1.8 kgf-m, 13.0 ft-lb)



FUEL TANK

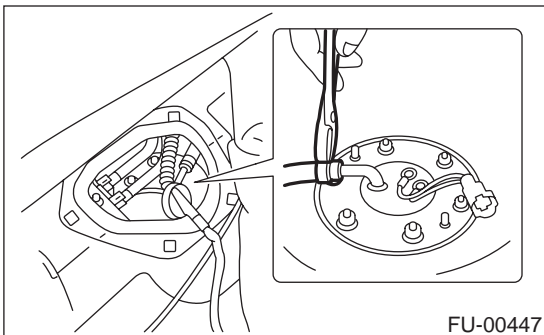
FUEL INJECTION (FUEL SYSTEMS)

- 16) Install the rear wheel.
- 17) Lower the vehicle.
- 18) Tighten the wheel nuts to rear wheel.
- 19) Install the parking brake cable. <Ref. to PB-7, INSTALLATION, Parking Brake Cable.>
- 20) Install the console box. <Ref. to EI-34, INSTALLATION, Console Box.>
- 21) Connect the fuel hoses, and then hold them with the quick connector. <Ref. to FU(H4DOSTC)-68, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

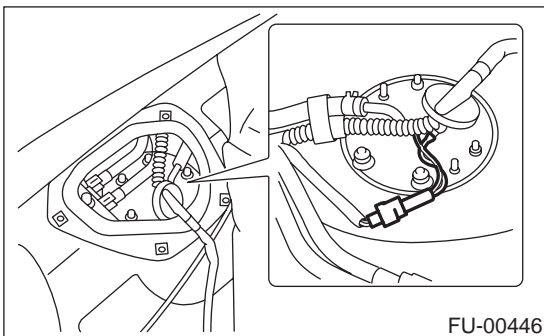


- (A) Delivery hose
(B) Return hose

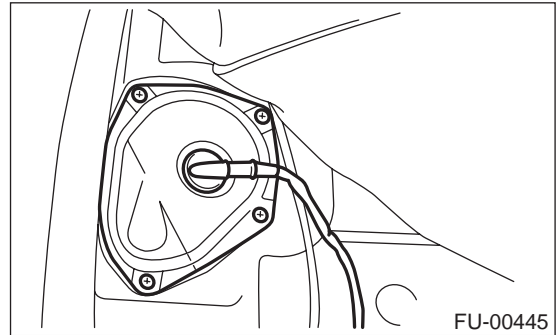
- 22) Connect the fuel jet pump hose.



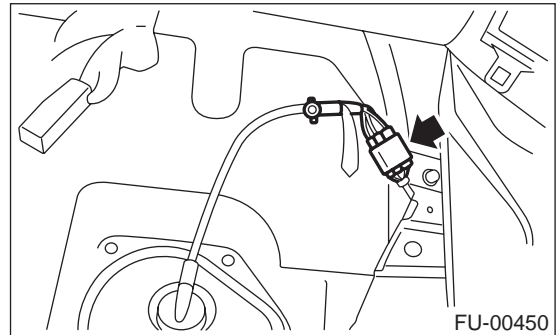
- 23) Connect the connector to fuel sub level sensor.



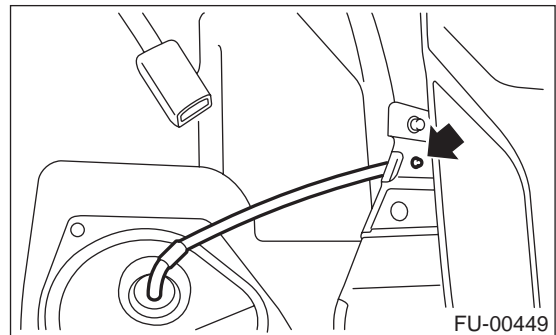
- 24) Install the sub service hole cover.



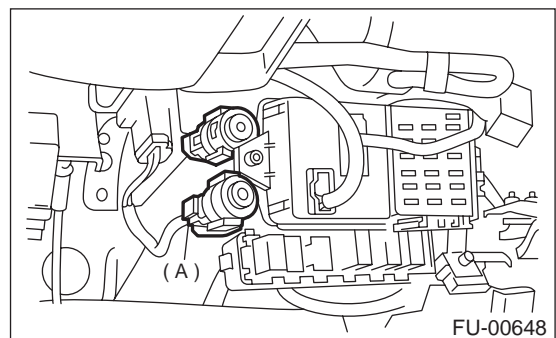
- 25) Connect the connectors to fuel tank cord, and then plug the service hole with grommet.



- 26) Install the holder clip which secures fuel tank cord on bracket.



- 27) Set the rear seat and floor mat.
- 28) Connect the connector to fuel pump relay (A).



- 29) Adjust the parking brake lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

30) Check the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

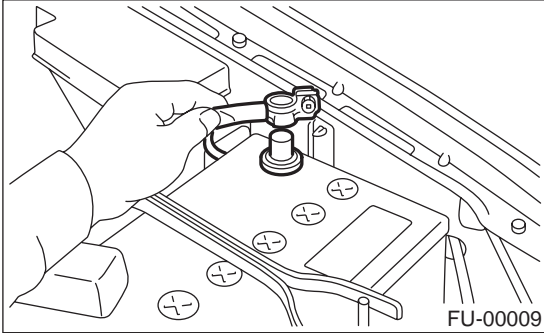
C: INSPECTION

- 1) Make sure there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

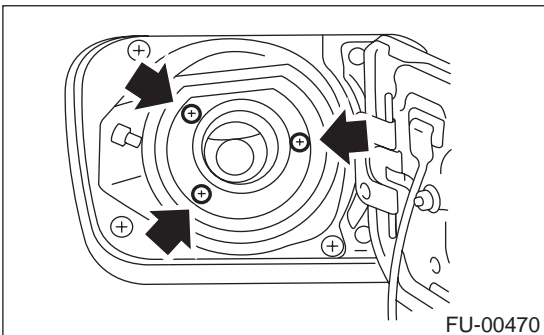
21. Fuel Filler Pipe

A: REMOVAL

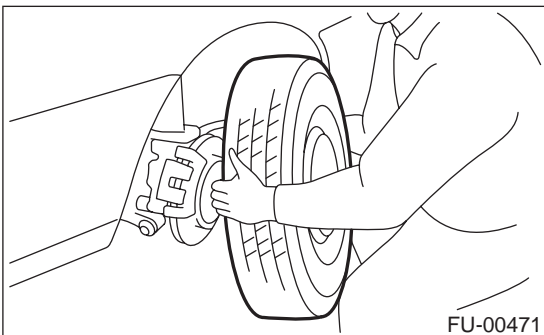
- 1) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid, and then remove the filler cap.
- 3) Disconnect the ground cable from battery.



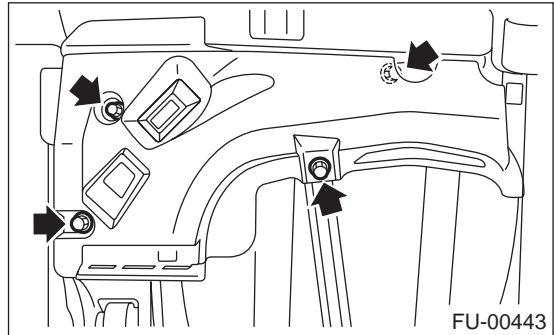
- 4) Remove the screws holding packing in place.



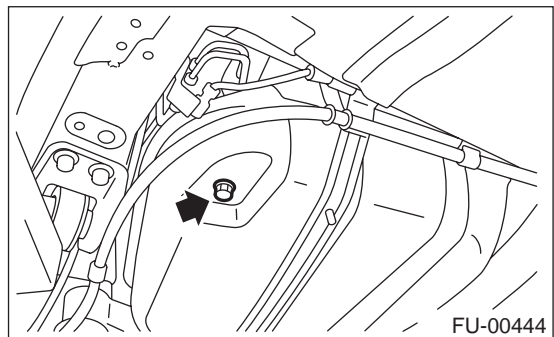
- 5) Lift-up the vehicle.
- 6) Remove the rear right side wheel nuts.
- 7) Remove the wheel RH (Rear).



- 8) Remove the protector RH (Front).

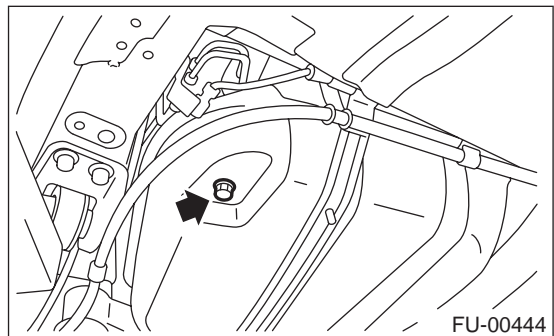


- 9) Drain fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.

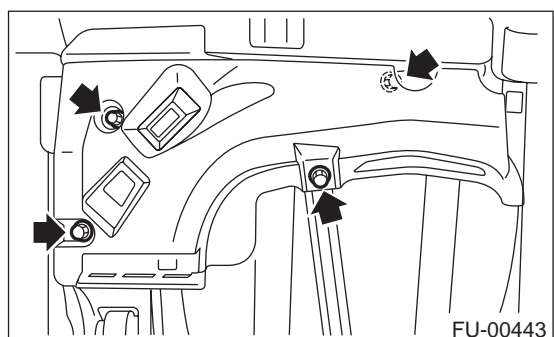


- 10) Tighten the fuel drain plug, and then install the protector RH (Front).

Tightening torque:
26 N·m (2.65 kg-m, 19.2 ft-lb)



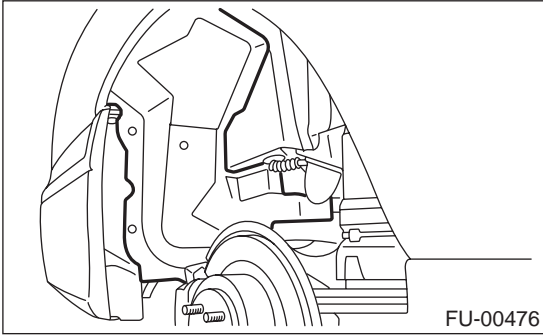
Tightening torque:
18 N·m (1.8 kg-m, 13.0 ft-lb)



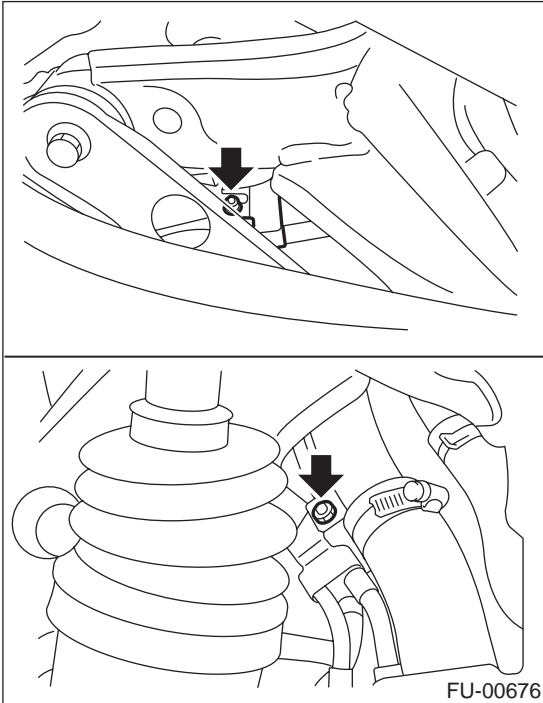
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

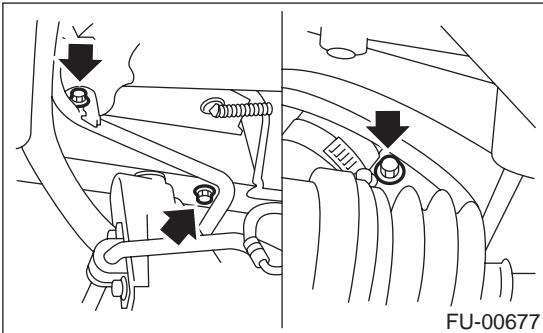
11) Remove the fuel filler pipe protector.



12) Remove the bolts which hold evaporation pipe bracket on fuel filler pipe.

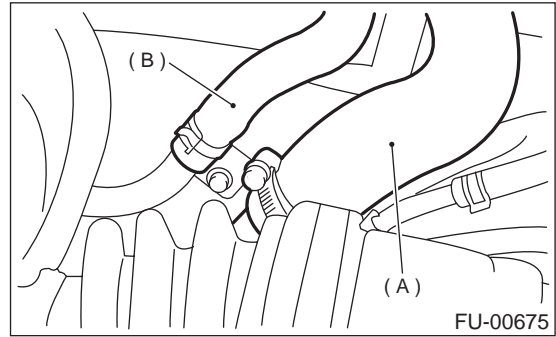


13) Remove the bolts which hold fuel filler pipe bracket on body.



14) Loosen the clamp, and then separate the fuel filler hose (A) from fuel filler pipe.

15) Move the clip, and then separate the air vent hose (B).

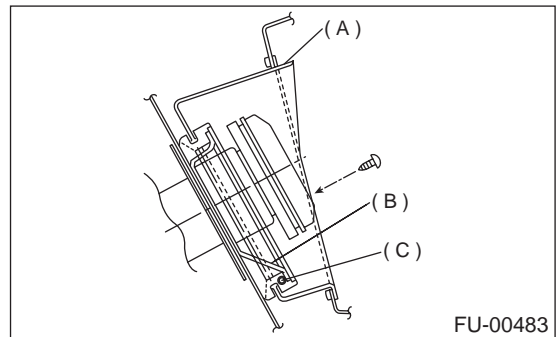


16) Remove the fuel filler pipe to under side of the vehicle.

B: INSTALLATION

1) Hold the fuel filler flap open.

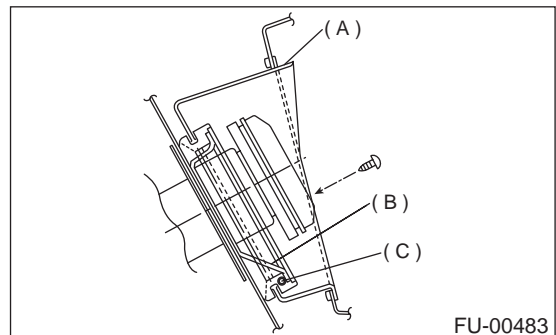
2) Set the fuel saucer (A) with rubber packing (C), and then insert the fuel filler pipe into hole from the inner side of apron.



3) Align holes in the fuel filler pipe neck, and then set the cup (B), and tighten screws.

NOTE:

If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



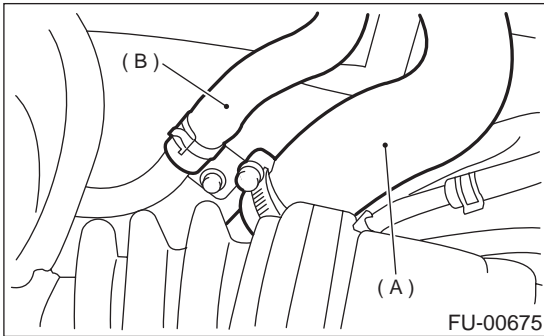
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

4) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe, and then tighten clamp.

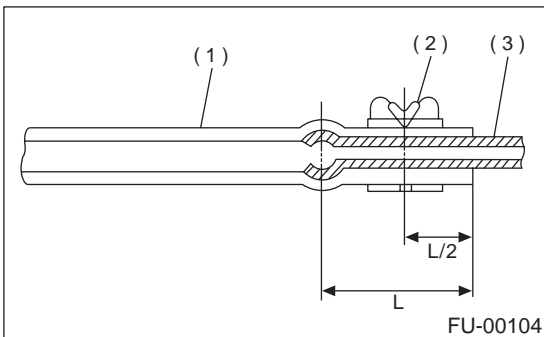
NOTE:

Do not allow clips to touch air vent hose (B) and rear suspension crossmember.



5) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe and hold clip.

$L = 27.5 \pm 2.5 \text{ mm (1.083 \pm 0.098 in)}$

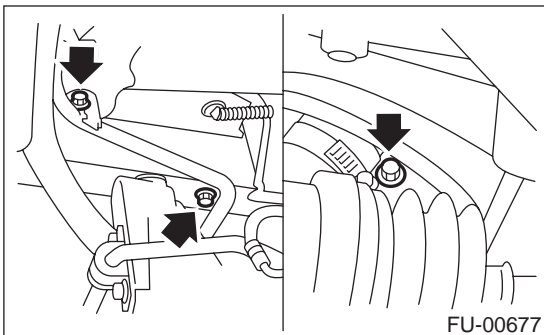


- (1) Hose
- (2) Clip
- (3) Pipe

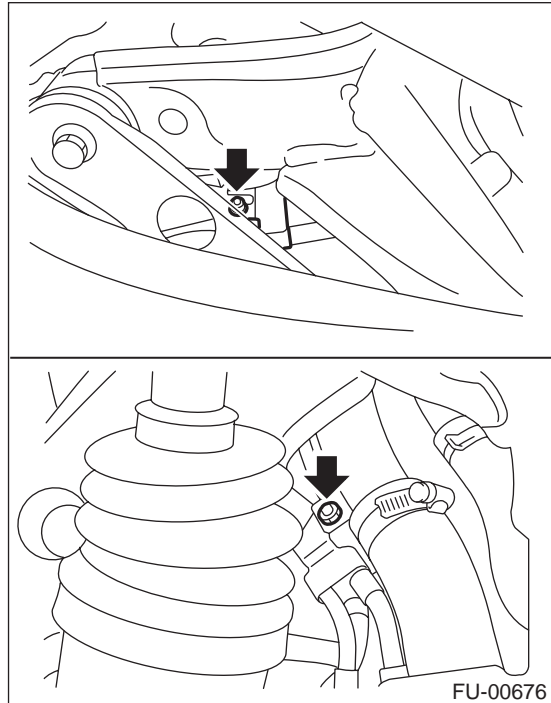
6) Tighten the bolt which holds fuel filler pipe bracket on body.

Tightening torque:

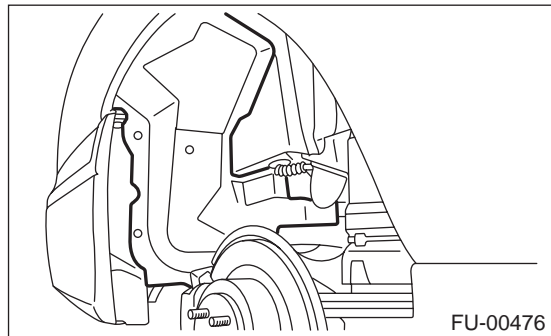
$7.4 \text{ N}\cdot\text{m (0.75 kg}\cdot\text{m, 5.4 ft}\cdot\text{lb)}$



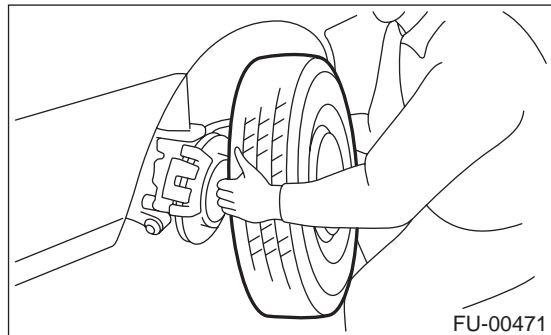
7) Tighten the bolts which hold evaporation pipe bracket on fuel pipe.



8) Install the fuel filler pipe protector.



9) Install the rear right wheel.



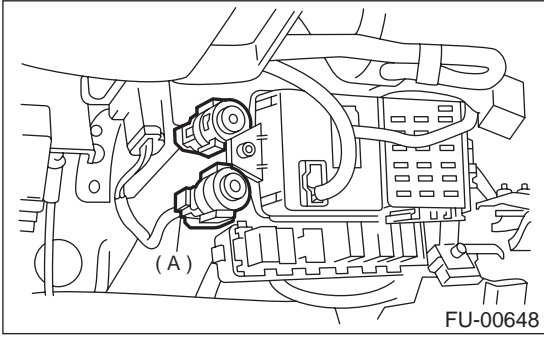
10) Lower the vehicle.

11) Tighten the wheel nuts.

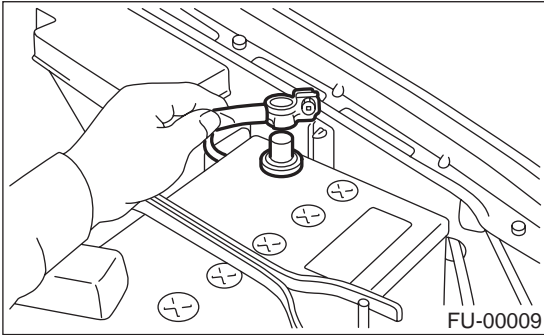
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

12) Connect the connector to fuel pump relay (A).



13) Connect the battery ground cable to battery.



22. Fuel Pump

A: REMOVAL

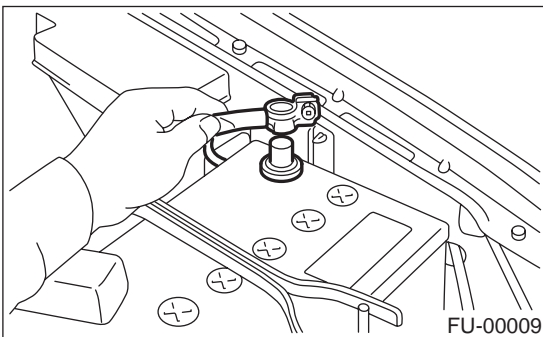
WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

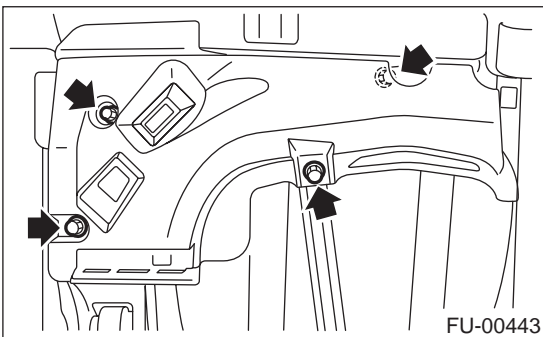
NOTE:

The fuel pump assembly consists of fuel pump and fuel level sensor.

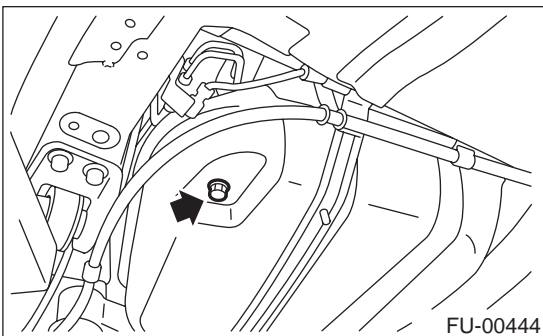
- 1) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid, and then remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



- 4) Lift-up the vehicle.
- 5) Remove the protector RH (Front).



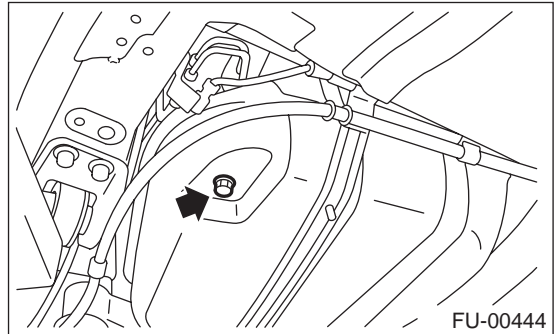
- 6) Drain the fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



- 7) Tighten the fuel drain plug, and then install the protector RH (Front).

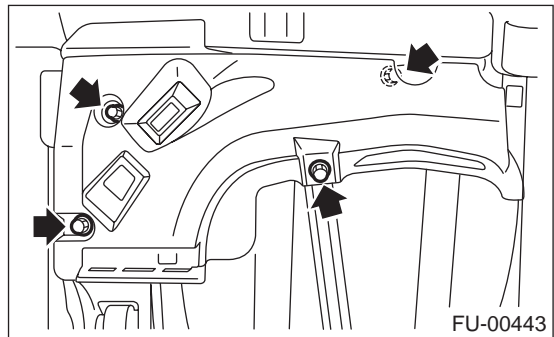
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)

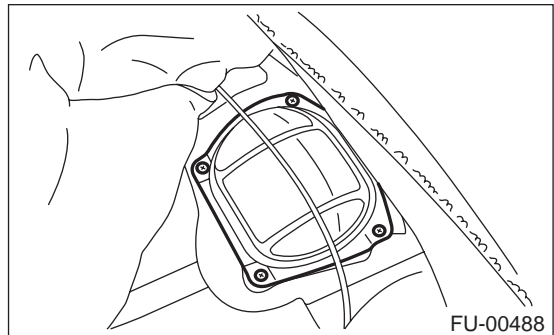


Tightening torque:

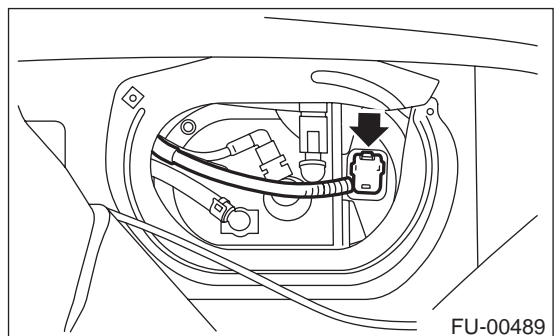
18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 8) Raise the rear seat, and then turn the floor mat up.
- 9) Remove the access hole lid.



- 10) Disconnect the connector from fuel pump.

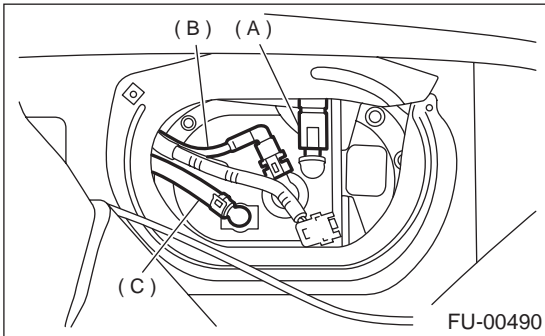


FUEL PUMP

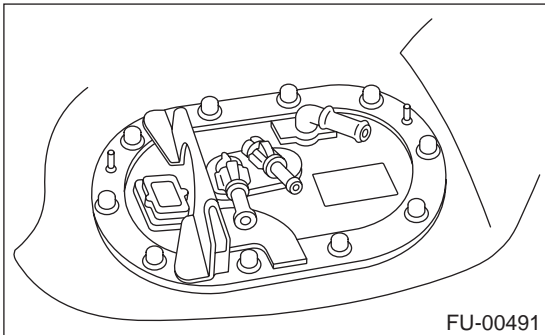
FUEL INJECTION (FUEL SYSTEMS)

11) Move the clips, and then disconnect the jet pump hose (C).

12) Disconnect the quick connector, and then disconnect the fuel delivery hose (A) and return hose (B). <Ref. to FU(H4DOSTC)-67, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



13) Remove the nuts which install fuel pump assembly onto fuel tank.



14) Take off the fuel pump assembly from fuel tank.

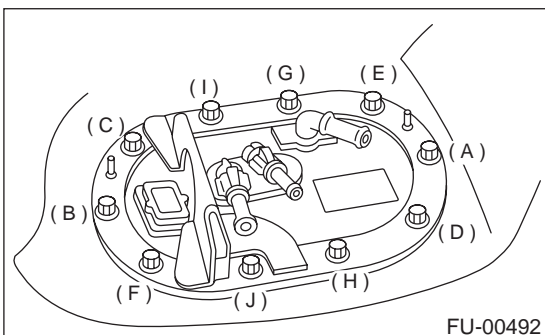
B: INSTALLATION

Install in the reverse order of removal. Do the following:

- (1) Always use new gaskets.
- (2) Ensure the sealing portion is free from fuel or foreign particles before installation.
- (3) Tighten the nuts in alphabetical sequence shown in the figure to specified torque.

Tightening torque:

5.9 N·m (0.6 kgf·m, 4.3 ft·lb)

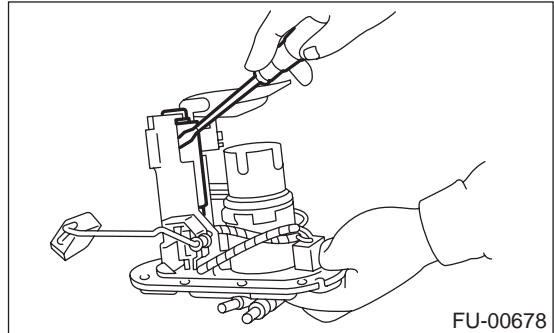


C: DISASSEMBLY

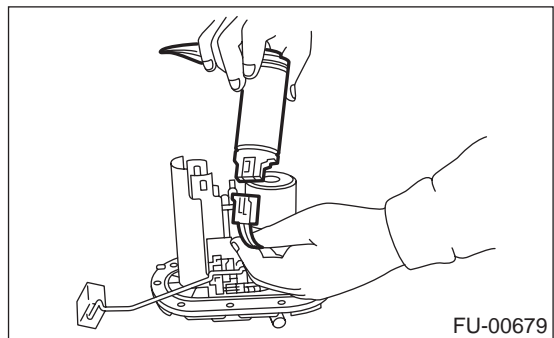
1) Remove the fuel pump and pump holder.

NOTE:

When disassembling the pump holder, be careful as it is installed with two pawls.



2) Disconnect the connector from fuel pump.



D: ASSEMBLY

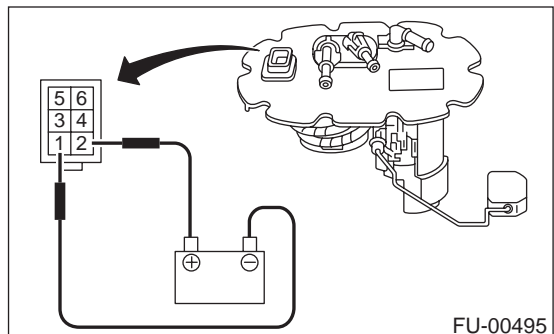
Assemble in the reverse order of disassembly.

E: INSPECTION

Connect the lead harness to connector terminal of fuel pump, and then apply battery power supply to check whether the pump operate.

WARNING:

- Wipe off the fuel completely.
- Keep the battery as far apart from fuel pump as possible.
- Be sure to turn the battery supply ON and OFF on the battery side.
- Do not run the fuel pump for a long time under non-load condition.



23. Fuel Level Sensor

A: REMOVAL

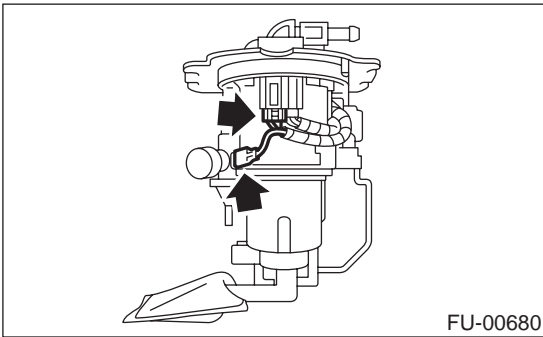
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

NOTE:

The fuel level sensor is built in fuel pump assembly.

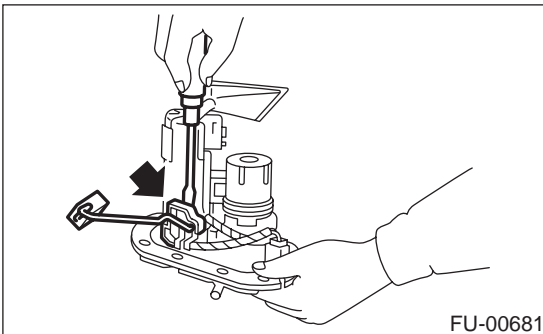
- 1) Remove the fuel pump assembly. <Ref. to FU(H4DOSTC)-59, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from fuel pump bracket.



- 3) Pushing the pawls with a screwdriver, remove the fuel meter unit by pulling it downwards.

NOTE:

Replace the fuel filter pawls with new ones as they might brake when removed.

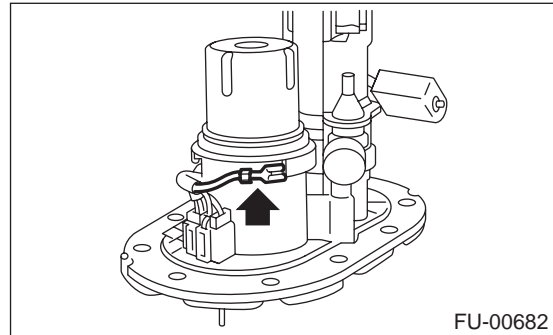


B: INSTALLATION

Install in the reverse order of removal.

WARNING:

- Ground cable must be connected.
- Spark may occur and ignite if fuel is nearby.



FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

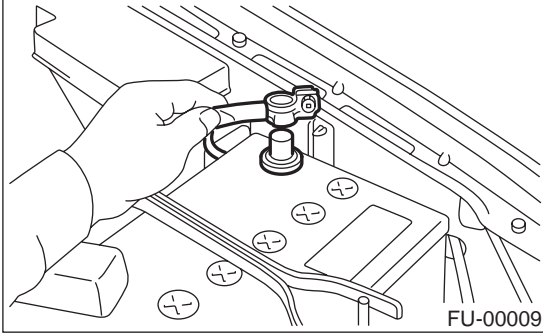
24. Fuel Sub Level Sensor

A: REMOVAL

WARNING:

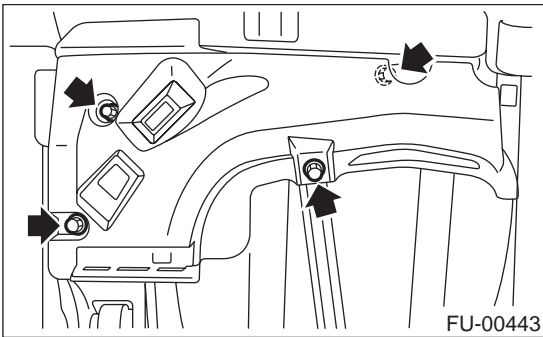
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect the ground cable from battery.

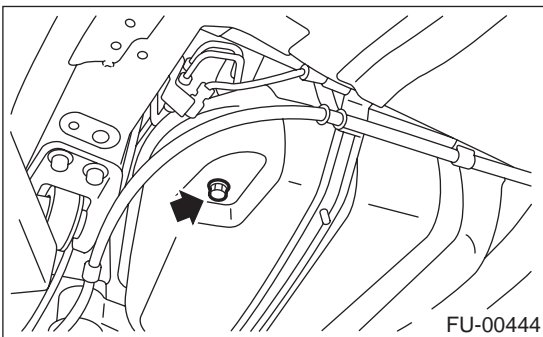


2) Lift-up the vehicle.

3) Remove the front side fuel tank cover.



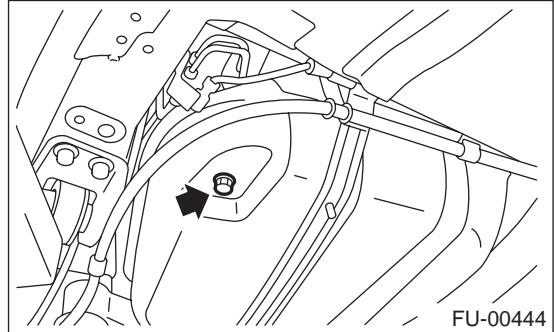
4) Drain fuel from fuel tank. Set a container under the vehicle, and then remove the drain plug from fuel tank.



5) Tighten the fuel drain plug and install the protector RH (Front).

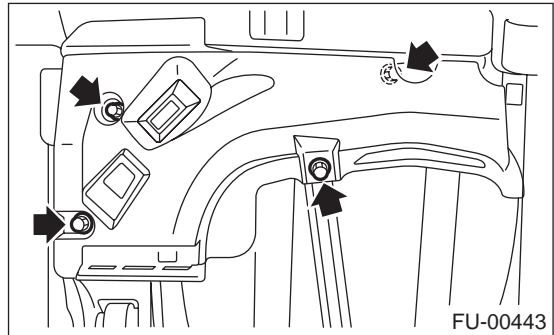
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



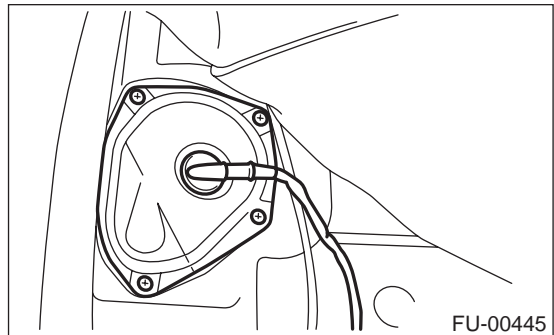
Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

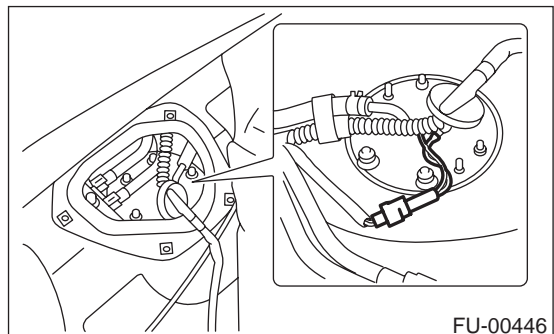


6) Remove the rear seat.

7) Remove the service hole cover.



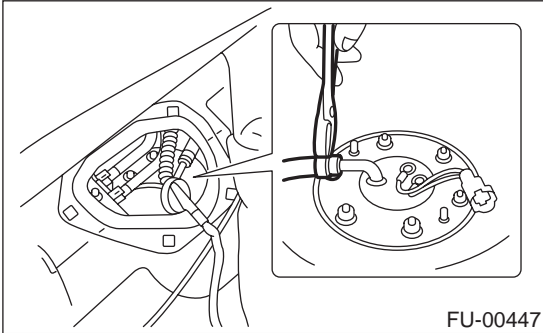
8) Disconnect the connector from fuel sub level sensor.



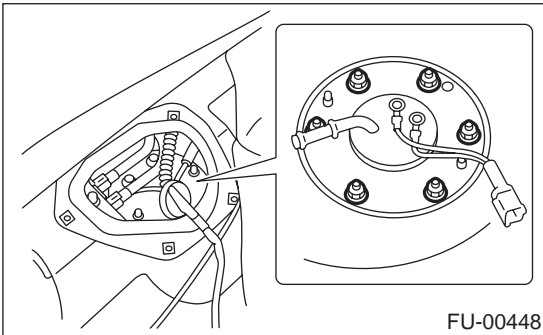
FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

9) Disconnect the fuel jet pump hose.



10) Remove the bolts which install fuel sub level sensor on fuel tank.



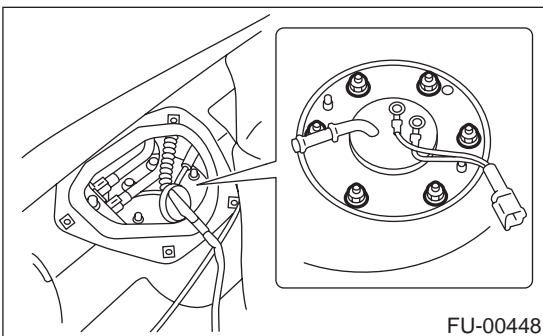
11) Remove the fuel sub level sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



FUEL FILTER

FUEL INJECTION (FUEL SYSTEMS)

25. Fuel Filter

A: REMOVAL

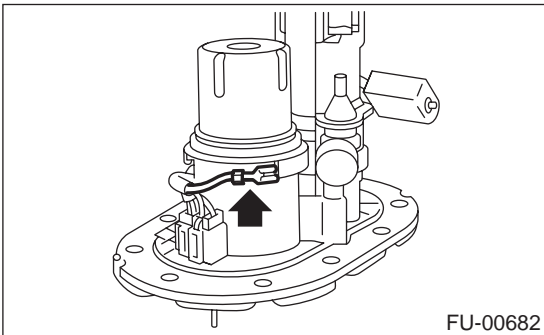
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

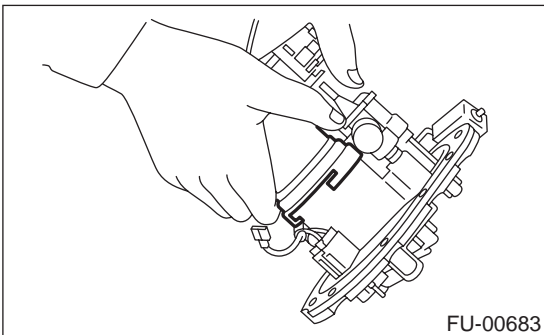
NOTE:

The fuel filter is built in fuel pump assembly.

- 1) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Remove the fuel pump assembly. <Ref. to FU(H4DOSTC)-59, REMOVAL, Fuel Pump.>
- 3) Disconnect the ground cable from filter holder.



- 4) Remove the filter holder by turning it to the left from the body pawls, and then take out the filter.

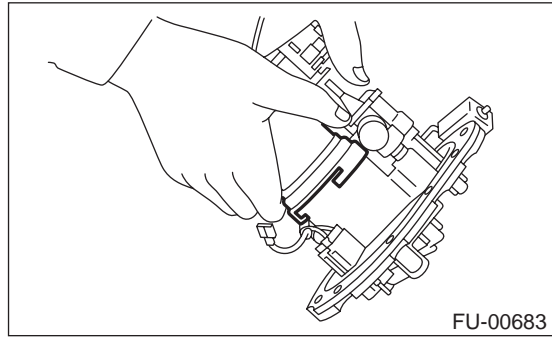


B: INSTALLATION

NOTE:

- If the fuel hoses are damaged at the connecting portion, replace it with a new one.
- If the clamps are badly damaged, replace with new ones.
- Replace the o-ring with new ones.

- 1) Set the O-ring on the filter holder, and then install by turning to the right.



- 2) Install the fuel pump assembly. <Ref. to FU(H4DOSTC)-60, INSTALLATION, Fuel Pump.>

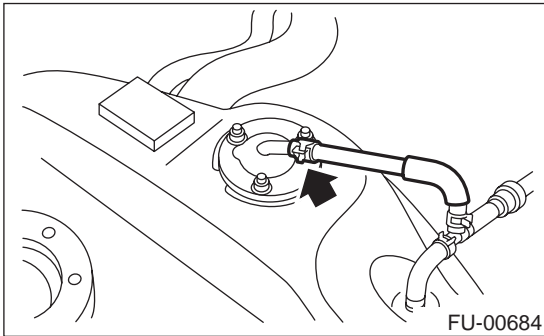
C: INSPECTION

- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if replacement interval has been reached, replace it.

26. Fuel Cut Valve

A: REMOVAL

- 1) Remove the fuel tank. <Ref. to FU(H4DOSTC)-47, REMOVAL, Fuel Tank.>
- 2) Move the clip, and then disconnect the evaporation hose from fuel cut valve.



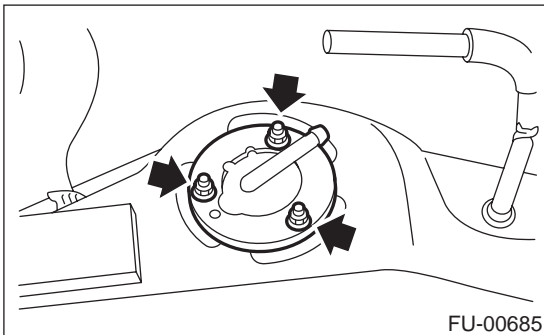
- 3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft-lb)



FUEL DAMPER VALVE

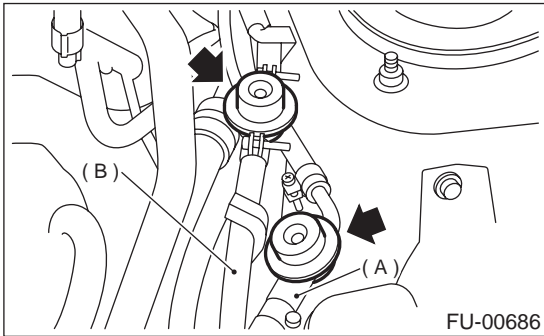
FUEL INJECTION (FUEL SYSTEMS)

27. Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Remove the fuel damper valve from fuel delivery line (A) and return line (B).



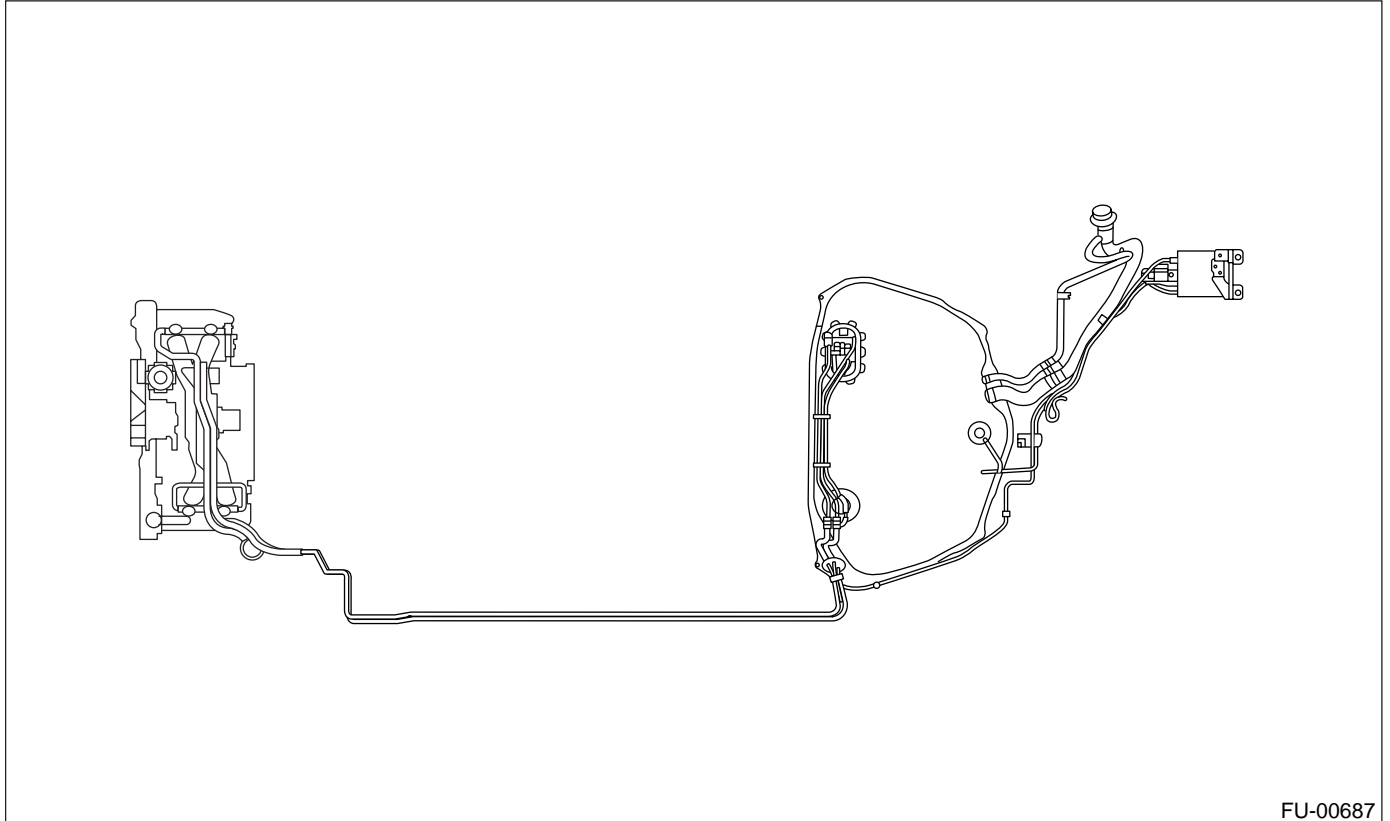
B: INSTALLATION

Install in the reverse order of removal.

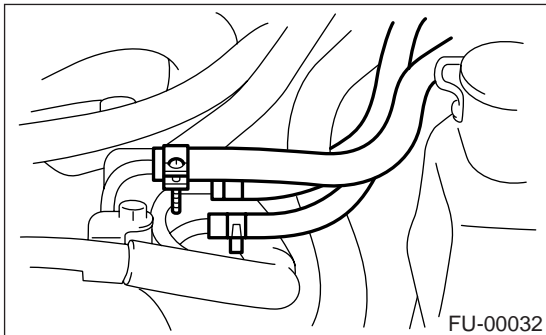
28. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Open the fuel filler flap lid, and then remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-48, REMOVAL, Floor Mat.>
- 5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

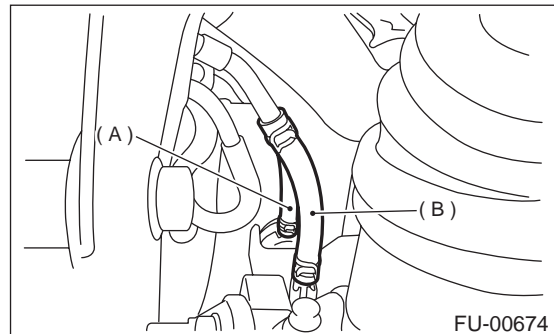


- 6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.



- 7) Lift-up the vehicle.

- 8) Disconnect the two-way valve hose (A) from the two-way valve and disconnect evaporation hose (B) from evaporation pipe.



FUEL DELIVERY, RETURN AND EVAPORATION LINES

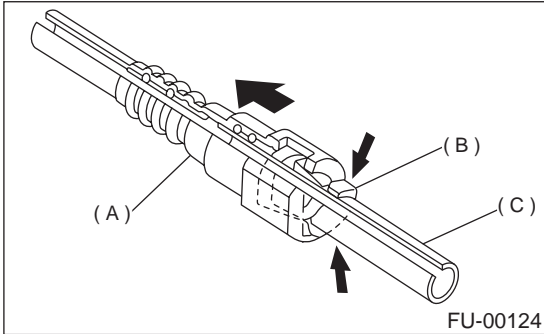
FUEL INJECTION (FUEL SYSTEMS)

9) Separate the quick connector on fuel delivery and return line.

- (1) Clean the pipe and connector, if they are covered with dust.
- (2) Hold the connector (A) and push retainer (B) down.
- (3) Pull out the connector (A) from retainer (B).

NOTE:

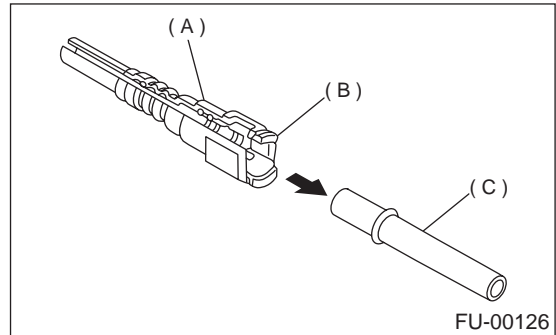
Replace the retainer with new ones.



- (A) Connector
- (B) Retainer
- (C) Pipe

NOTE:

At this time, two clicking sounds are heard.



- (A) Connector
- (B) Retainer
- (C) Pipe

NOTE:

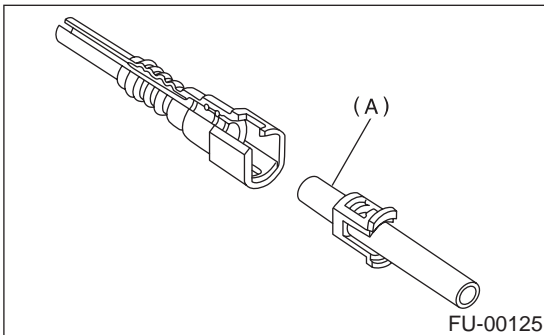
- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.
- Be sure to inspect the hoses and their connections for leakage of fuel.

B: INSTALLATION

1) Connect the quick connector on fuel delivery and return line.

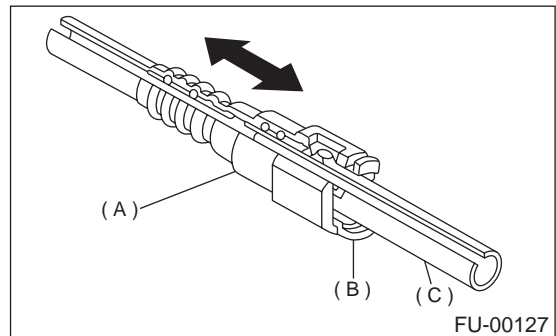
NOTE:

- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.



- (A) Seal surface

- (1) Set a new retainer (B) to connector (A).
- (2) Push the pipe into connector completely.



- (A) Connector
- (B) Retainer
- (C) Pipe

FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

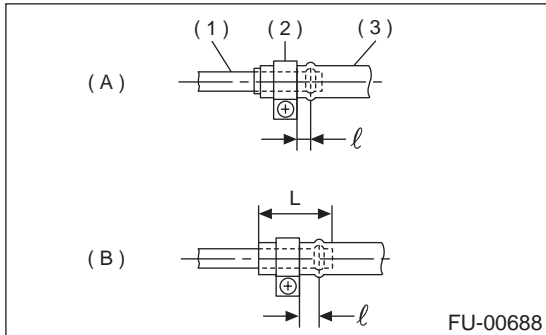
2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.

Type B: When fitting length is not specified.

\varnothing : 2.5 ± 1.5 mm (0.098 ± 0.059 in)

L : 22.5 ± 2.5 mm (0.886 ± 0.098 in)



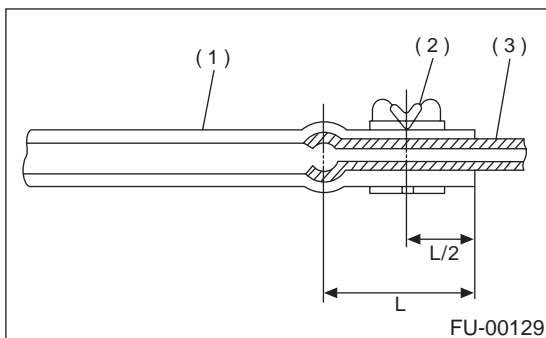
- (1) Fitting
- (2) Clamp
- (3) Hose
- (A) Type A
- (B) Type B

3) Connect the evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

$L = 17.5 \pm 2.5$ mm (0.689 ± 0.098 in)

NOTE:

Be sure to inspect the hoses and their connections for any leakage of fuel.



- (1) Hose
- (2) Clip
- (3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.

2) Make sure that the fuel pipe and fuel hose connections are tight.

FUEL SYSTEM TROUBLE IN GENERAL

FUEL INJECTION (FUEL SYSTEMS)

29. Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	○ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	○ Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace the fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace the separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel meter unit.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. To prevent water condensation.

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain water condensation from the fuel filter.

- Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

- Protecting the fuel system against freezing and water condensation.

(1) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

(2) Affected areas

When water condensation is notched in the fuel filter, drain water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

- Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) *EC(H4DOSTC)*

	Page
1. General Description	2
2. Front Catalytic Converter	3
3. Rear Catalytic Converter	4
4. Canister.....	5
5. Purge Control Solenoid Valve	6
6. Two-way Valve	7

GENERAL DESCRIPTION

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

1. General Description

A: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

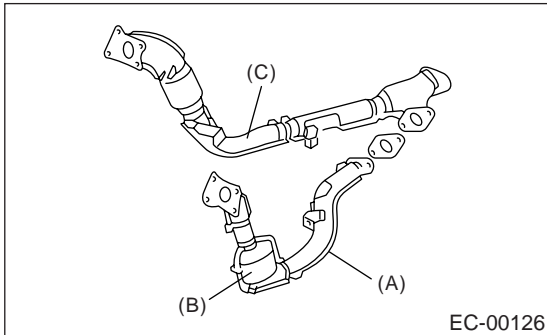
2. Front Catalytic Converter

A: REMOVAL

NOTE:

Front catalytic converter is installed at the center exhaust pipe (LH).

- 1) Remove the center exhaust pipe. <Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>
- 2) Separate the center exhaust pipe (LH) and center exhaust pipe (RH).



- (A) Center exhaust pipe (LH)
- (B) Front catalytic converter
- (C) Center exhaust pipe (RH)

B: INSTALLATION

NOTE:

Replace the gaskets with new ones.
Install in the reverse order of removal.

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

REAR CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

NOTE:

Rear catalytic converter is installed at the rear exhaust pipe.

1) Remove the rear exhaust pipe. <Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.>

B: INSTALLATION

NOTE:

Replace the gaskets with new ones.
Install in the reverse order of removal.

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

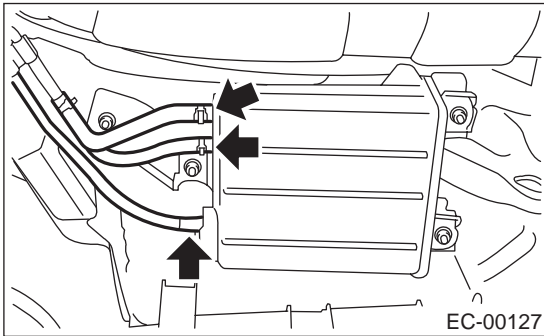
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

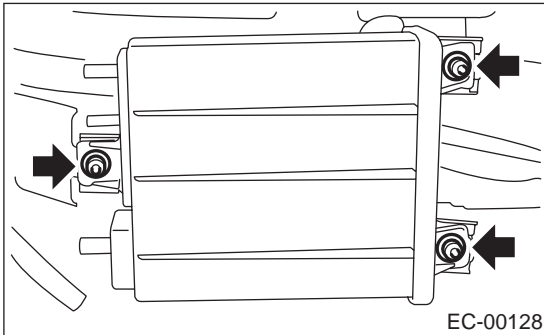
4. Canister

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen the two clamps which hold two canister hoses, and then disconnect the evaporation three hoses from canister.



- 3) Remove the canister from body.

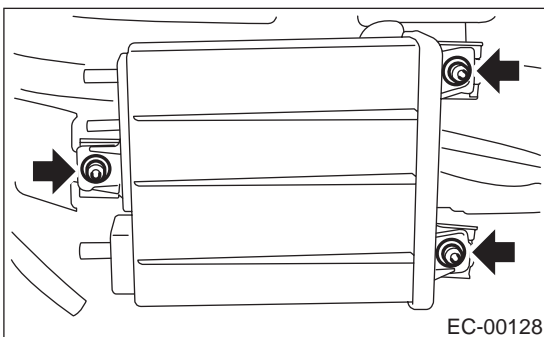


B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

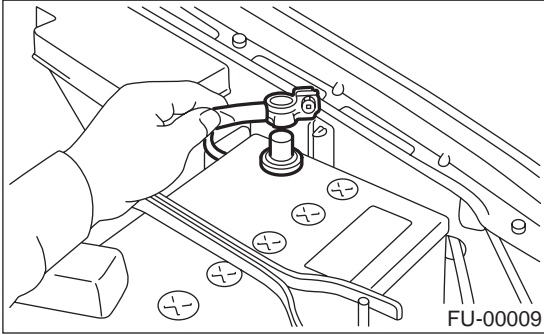
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

5. Purge Control Solenoid Valve

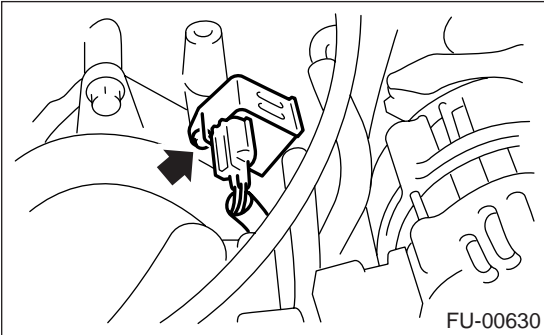
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the bolt which installs purge control solenoid valve onto intake manifold.

3) Disconnect the connector and hoses from purge control solenoid valve.

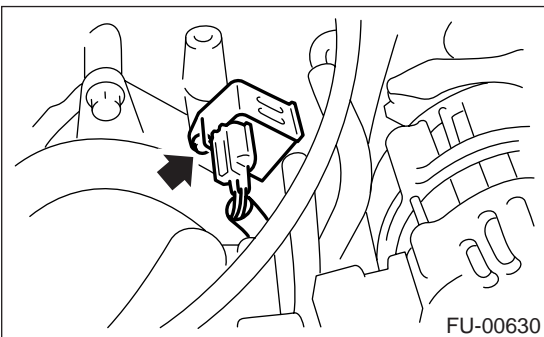


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

19 N·m (1.94 kgf·m, 13.74 ft·lb)

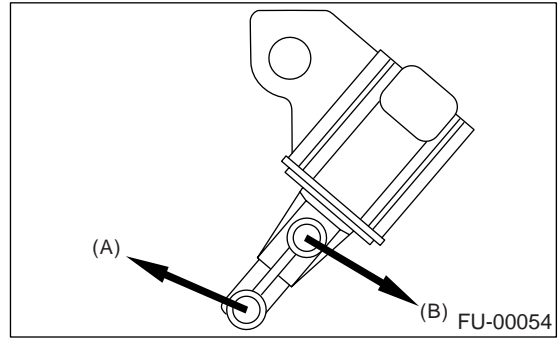


CAUTION:

Carefully connect the evaporation hoses.

NOTE:

Connect the evaporation hoses as shown in the figure.



(A) To intake manifold

(B) To fuel pipe

C: INSPECTION

Make sure hoses are not cracked or loose.

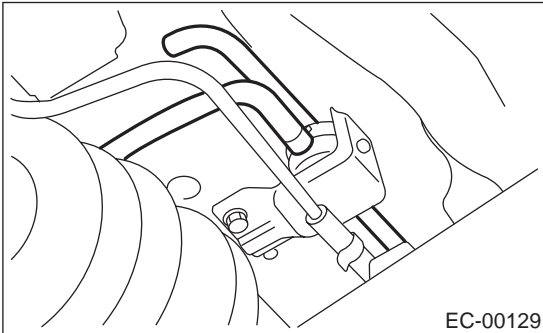
TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

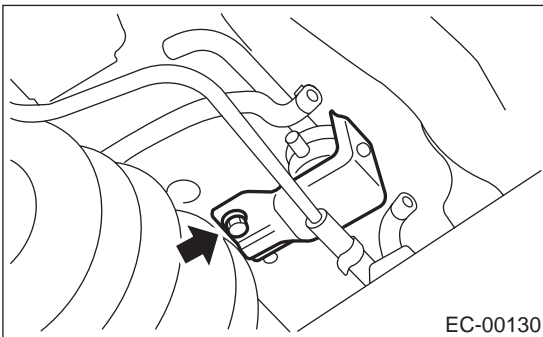
6. Two-way Valve

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Disconnect the hoses from two-way valve.



- 3) Remove the two-way valve with bracket as a single unit from body.



- 4) Remove the two-way valve from bracket.

B: INSTALLTION

Install in the reverse order of removal.

C: INSPECTION

Make sure that the hoses are not cracked or loose.

TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

MEMO:

INTAKE (INDUCTION)

IN(H4DOSTC)

	Page
1. General Description	2
2. Air Cleaner	10
3. Air Intake Duct.....	11
4. Intake Duct	12
5. Intercooler	13
6. Turbocharger.....	15
7. Air By-pass Valve	17
8. Turbocharging Pressure Relief Valve	18
9. Solenoid Box Assembly	19
10. Wastegate Control Solenoid Valve	21
11. Surge Tank.....	22
12. Differential Pressure Sensor	23

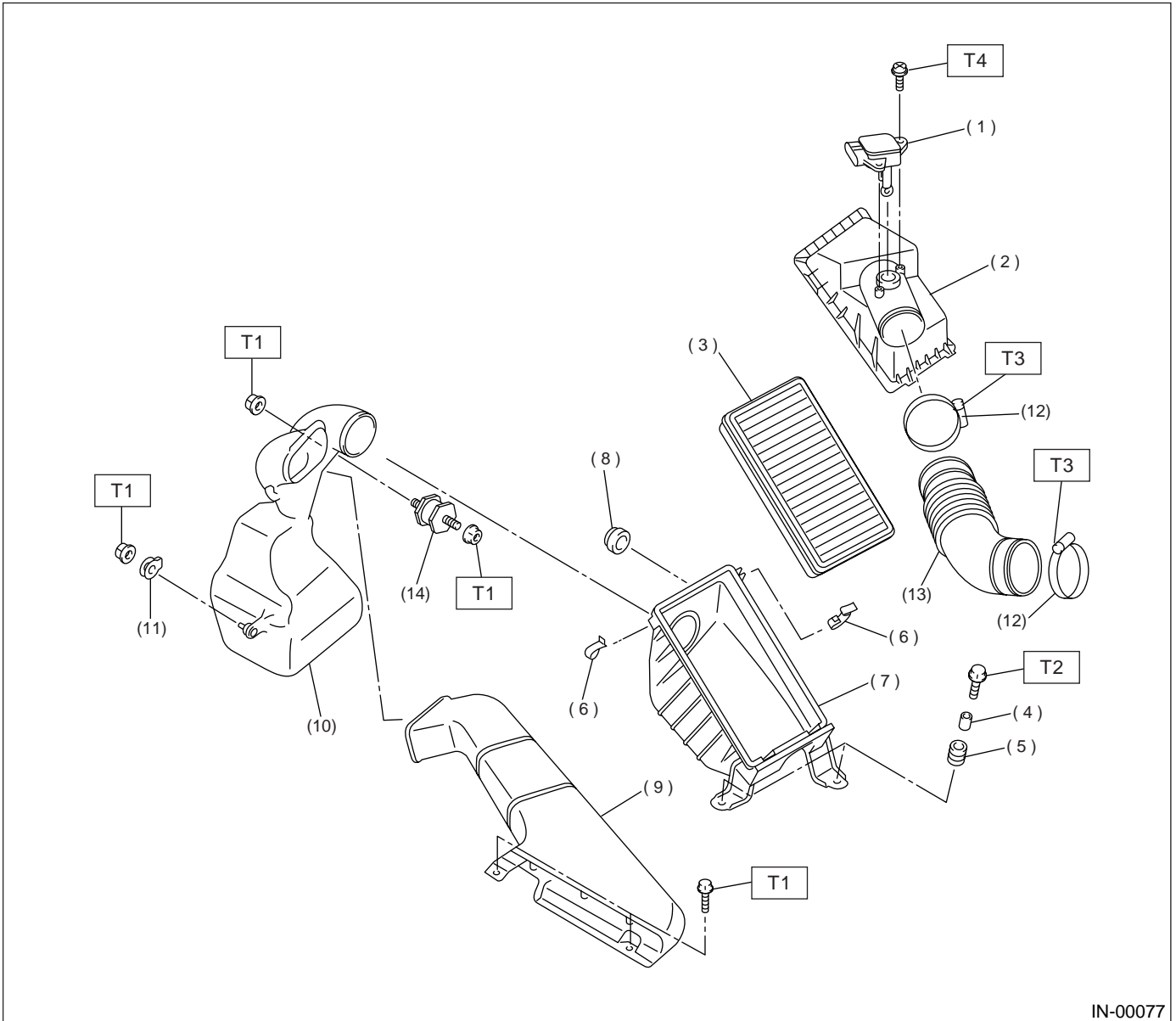
GENERAL DESCRIPTION

INTAKE (INDUCTION)

1. General Description

A: COMPONENT

1. AIR CLEANER



IN-00077

- | | |
|-----------------------------|-----------------------------|
| (1) Mass air flow sensor | (8) Cushion rubber |
| (2) Air cleaner upper cover | (9) Air intake duct |
| (3) Air cleaner element | (10) Resonator chamber ASSY |
| (4) Spacer | (11) Cushion rubber |
| (5) Bush | (12) Clamp |
| (6) Clip | (13) Air intake boot |
| (7) Air cleaner lower case | (14) Cushion |

Tightening torque: N·m (kgf·m, ft·lb)

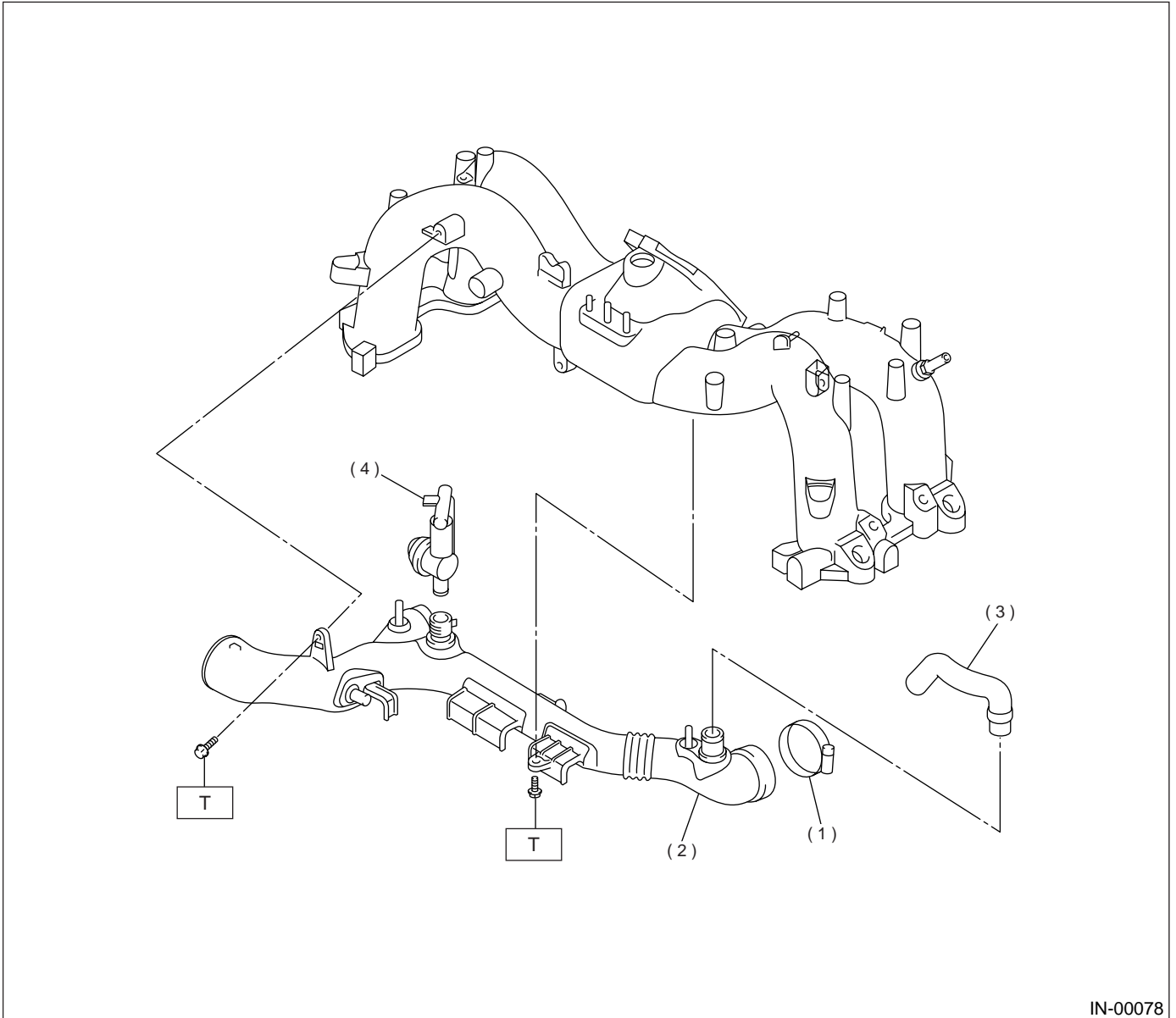
T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.3)

T3: 2.5 (0.25, 1.8)

T4: 1.7 (0.17, 1.2)

2. INTAKE DUCT



IN-00078

- (1) Clamp
- (2) Intake duct

- (3) Air by-pass hose
- (4) Turbocharging pressure relief valve

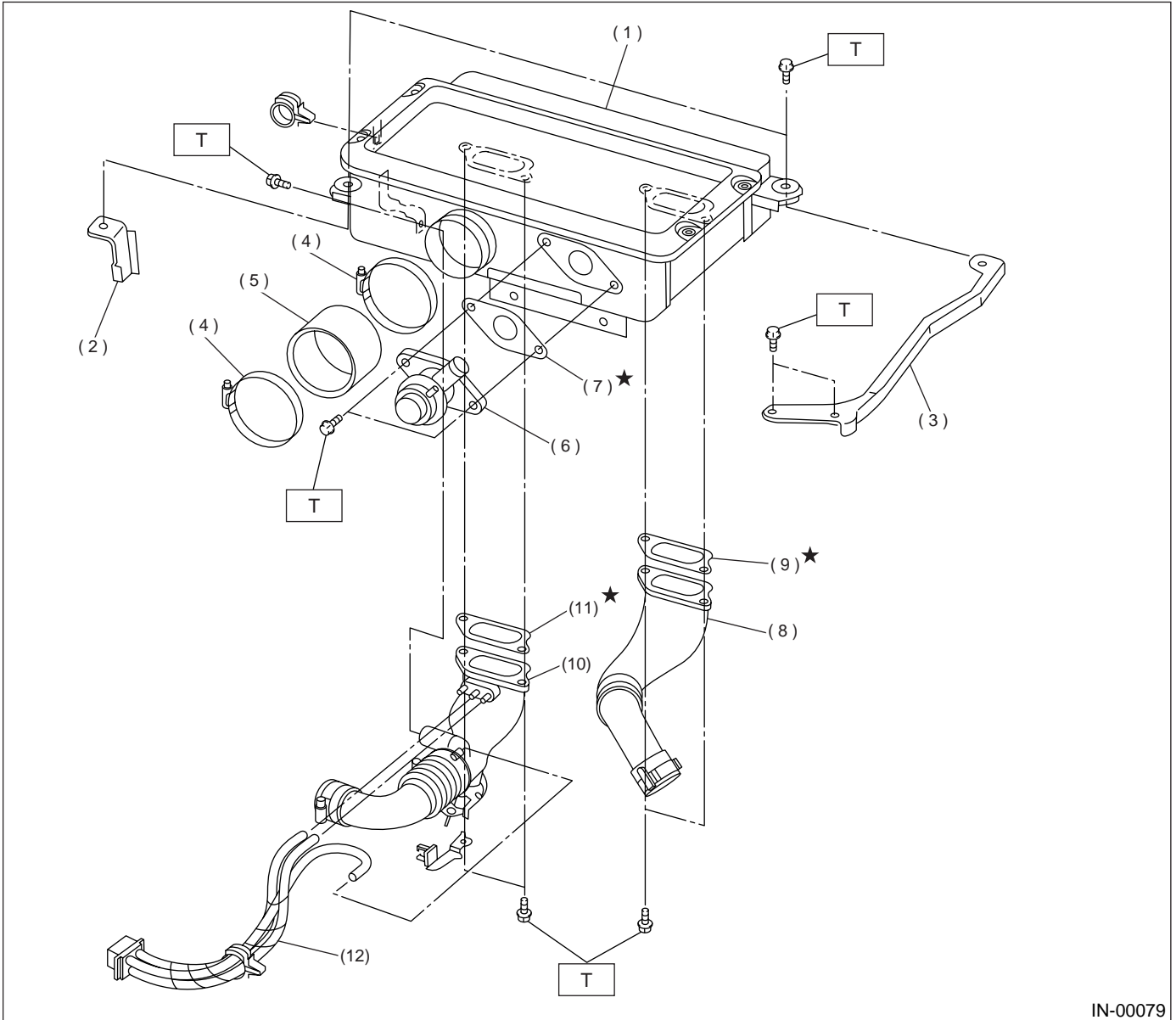
Tightening torque: N·m (kgf·m, ft·lb)

T: 19 (1.9, 14.0)

GENERAL DESCRIPTION

INTAKE (INDUCTION)

3. INTERCOOLER



IN-00079

- | | | |
|----------------------------|-----------------------------------|---------------------|
| (1) Intercooler | (6) Air by-pass valve | (11) Gasket |
| (2) Intercooler bracket RH | (7) Gasket | (12) Hose connector |
| (3) Intercooler bracket LH | (8) Intercooler duct (Primary) | |
| (4) Clamp | (9) Gasket | |
| (5) Air intake duct | (10) Intercooler duct (Secondary) | |

Tightening torque: N-m (kgf-m, ft-lb)

T: 16 (1.6, 11.7)

GENERAL DESCRIPTION

INTAKE (INDUCTION)

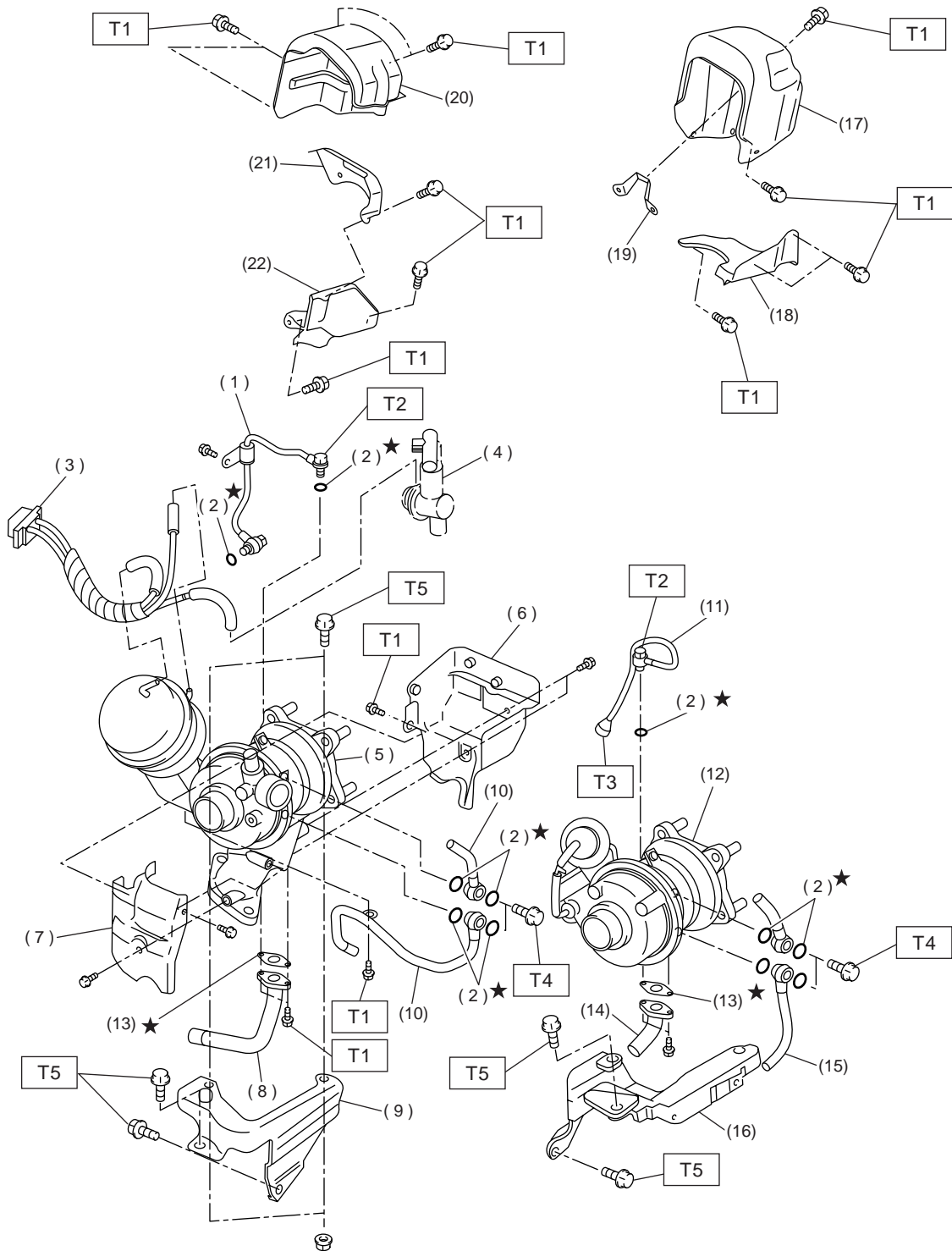
MEMO:

IN(H4DOSTC)-5

GENERAL DESCRIPTION

INTAKE (INDUCTION)

4. TURBOCHARGER



IN-00080

GENERAL DESCRIPTION

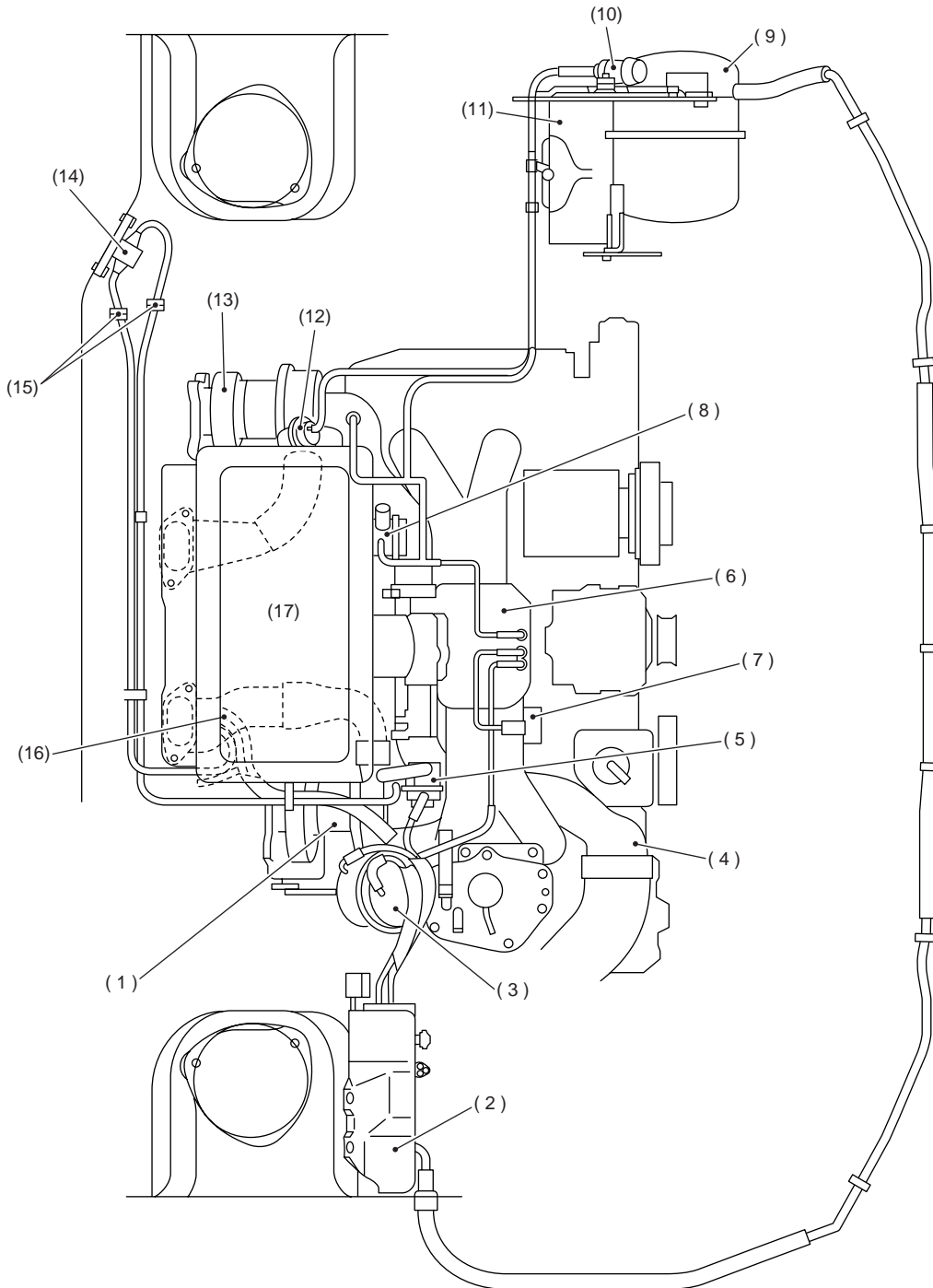
INTAKE (INDUCTION)

(1) Oil inlet pipe (Secondary)	(13) Gasket	(21) Turbocharger cover bracket (Secondary)
(2) Metal gasket	(14) Oil outlet pipe (Primary)	(22) Turbocharger lower cover (Secondary)
(3) Hose assembly	(15) Water pipe (Primary)	
(4) Relief valve	(16) Turbocharger bracket LH	
(5) Secondary turbocharger ASSY	(17) Turbocharger upper cover (Primary)	
(6) Turbocharger cover	(18) Turbocharger lower cover (Primary)	<hr/> Tightening torque: N·m (kgf-m, ft-lb)
(7) Turbocharger cover	(19) Turbocharger cover bracket (Primary)	T1: 6.5 (0.66, 4.8)
(8) Oil outlet pipe (Secondary)	(20) Turbocharger upper cover (Secondary)	T2: 16 (1.6, 11.8)
(9) Turbocharger bracket RH		T3: 19.5 (1.99, 14.4)
(10) Water pipe (Secondary)		T4: 29 (3.0, 21.4)
(11) Oil inlet pipe (Primary)		T5: 33 (3.4, 24.3)
(12) Primary turbocharger ASSY		<hr/>

GENERAL DESCRIPTION

INTAKE (INDUCTION)

5. TURBOCHARGER SYSTEM



IN-00081

- | | | |
|---|---------------------------------------|-----------------------------------|
| (1) Secondary turbocharger | (6) Intake manifold | (12) Wastegate valve |
| (2) Solenoid box ASSY | (7) Purge control solenoid valve | (13) Primary turbocharger |
| (3) Exhaust gas control valve | (8) Air by-pass valve | (14) Differential pressure sensor |
| (4) Intake duct | (9) Surge tank | (15) Filter |
| (5) Turbocharging pressure relief valve | (10) Wastegate control solenoid valve | (16) Intake air control valve |
| | (11) Battery | |

IN(H4DOSTC)-8

B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

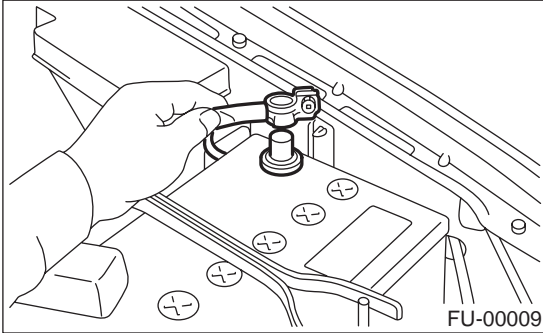
AIR CLEANER

INTAKE (INDUCTION)

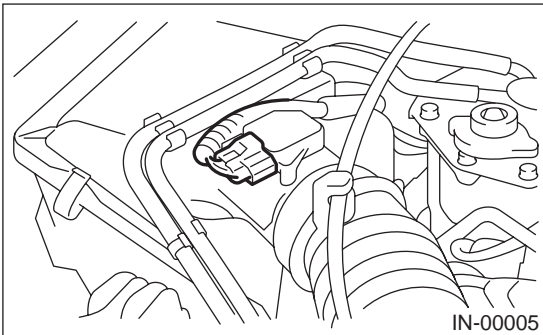
2. Air Cleaner

A: REMOVAL

1) Disconnect the ground cable from battery.

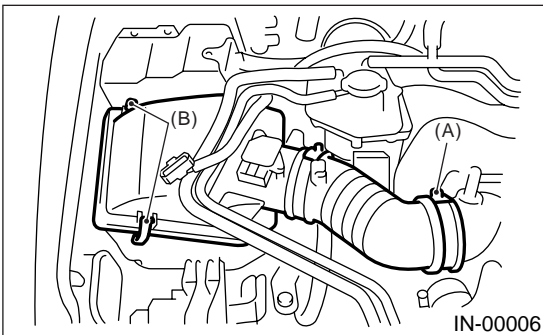


2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects air intake boot to intake duct.

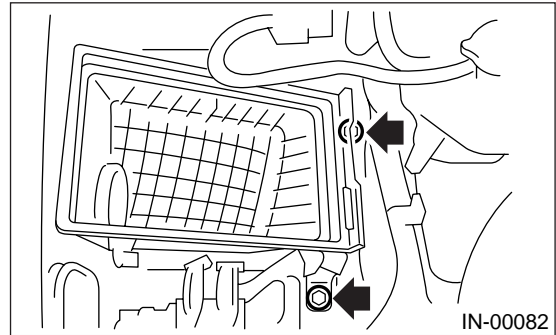
4) Remove the two clips (B) from air cleaner upper cover.



5) Remove the air cleaner upper cover.

6) Remove the air cleaner element.

7) Remove the air cleaner lower case.

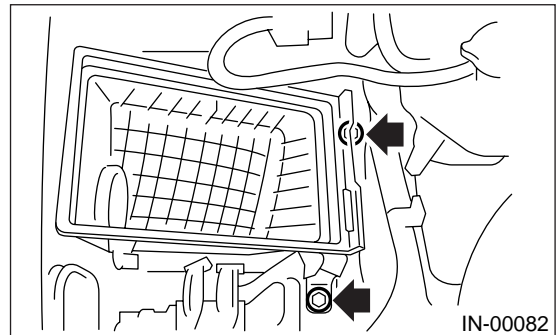


B: INSTALLATION

Install in the reverse order of removal.

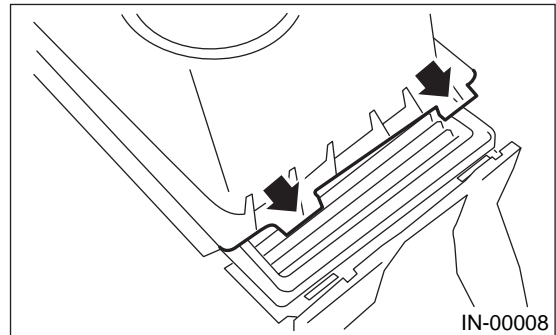
Tightening torque:

33 N·m (3.4 kgf·m, 24.3 ft·lb)



CAUTION:

Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to lower case.



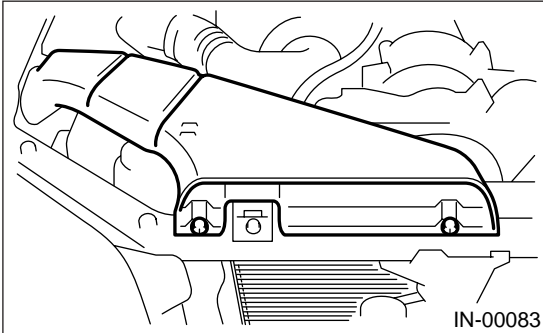
C: INSPECTION

Replace if excessively damaged or dirty.

3. Air Intake Duct

A: REMOVAL

1) Remove the bolts which install air intake duct on front side of body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 24.3 ft-lb)

C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in the air intake duct.

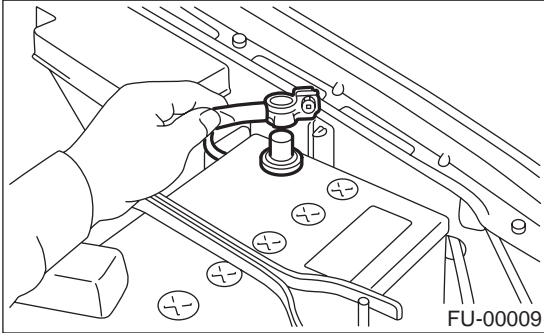
INTAKE DUCT

INTAKE (INDUCTION)

4. Intake Duct

A: REMOVAL

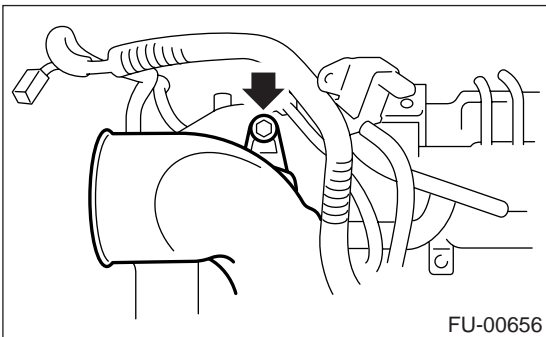
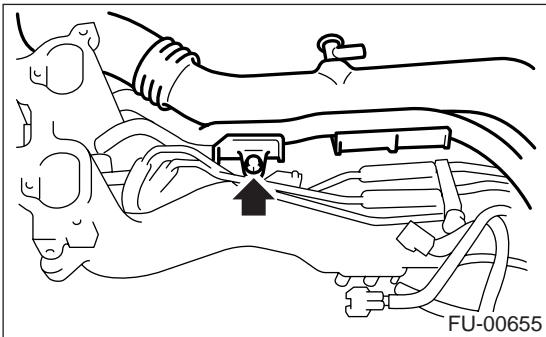
1) Disconnect the ground cable from battery.



2) Remove the intake manifold. <Ref. to FU(H4DOSTC)-15, REMOVAL, Intake Manifold.>

3) Remove the sensor, engine harness, and fuel pipe attached to intake manifold. <Ref. to FU(H4DOSTC)-22, DISASSEMBLY, Intake Manifold.>

4) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

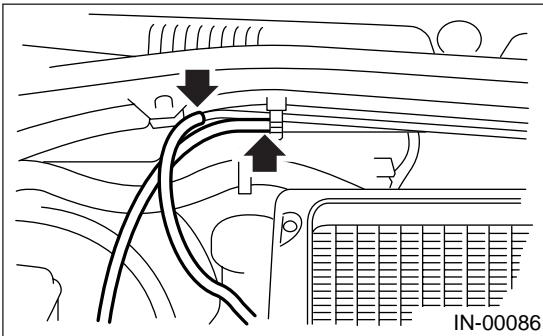
Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)

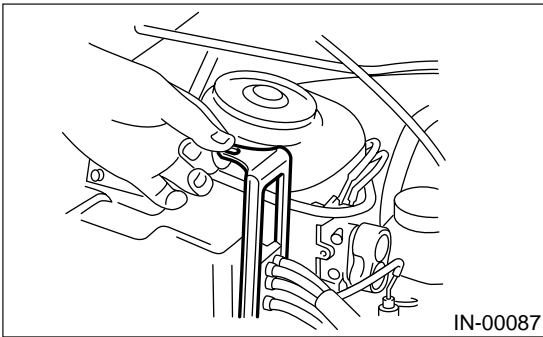
5. Intercooler

A: REMOVAL

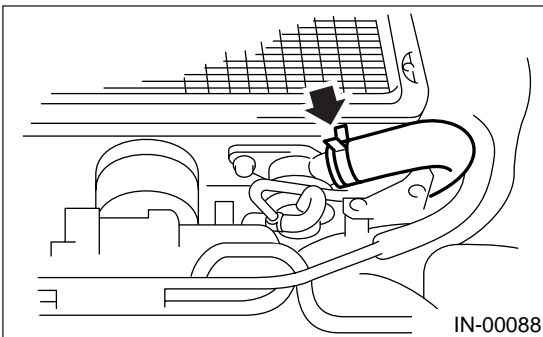
1) Disconnect the differential pressure hose from pipes.



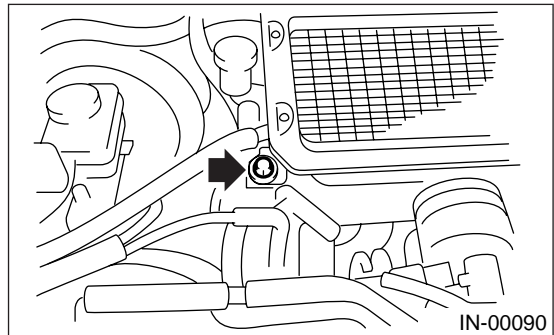
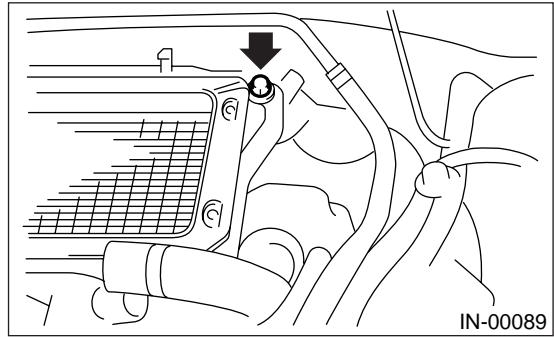
2) Disconnect the hose from hose connector of solenoid box assembly.



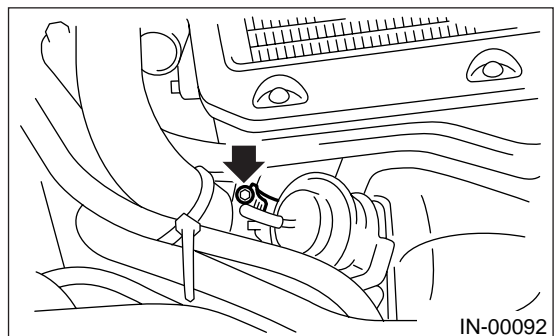
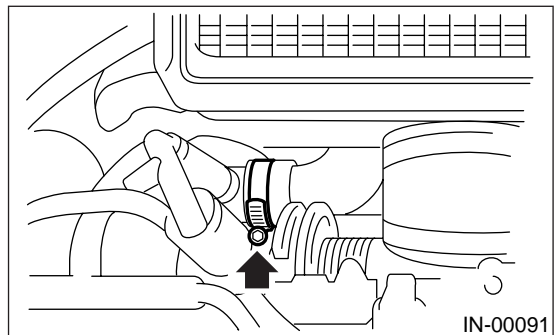
3) Disconnect the air by-pass hose from air by-pass valve.



4) Remove the bolts which secure intercooler to bracket.



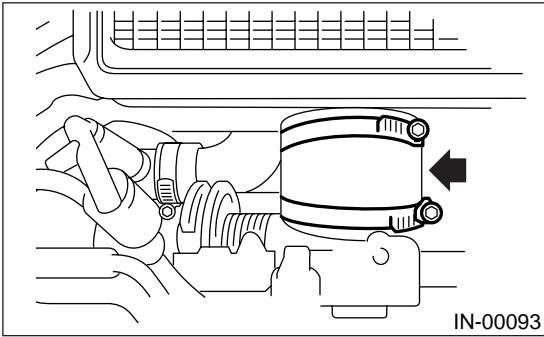
5) Separate the intercooler air duct from turbo-charger.



INTERCOOLER

INTAKE (INDUCTION)

6) Separate the intercooler from throttle body.

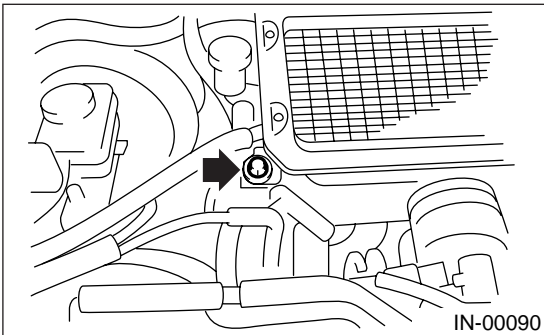
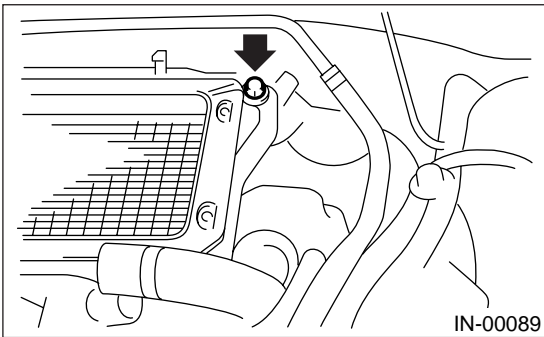


B: INSTALLATION

Install in the reverse order of removal.

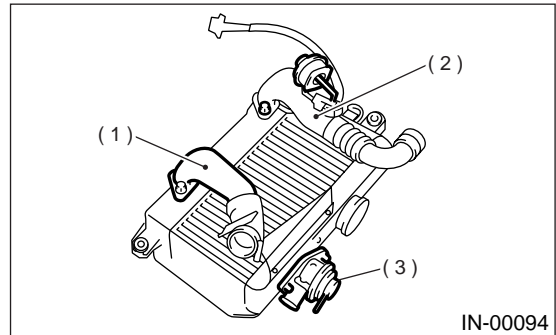
Tightening torque:

16 N·m (1.6 kgf·m, 11.7 ft·lb)



C: DISASSEMBLY

1) Loosen the clamps, then remove the intercooler duct.



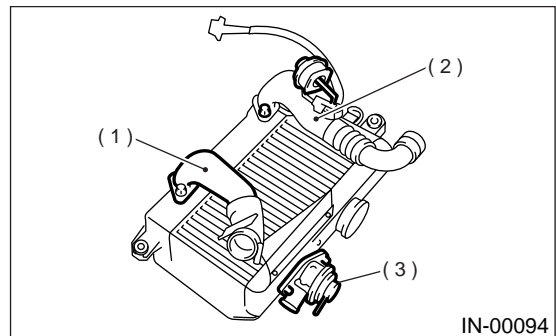
- (1) Intercooler duct (Primary)
- (2) Intercooler duct (Secondary)
- (3) Air by-pass valve

D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:

16 N·m (1.6 kgf·m, 11.7 ft·lb)



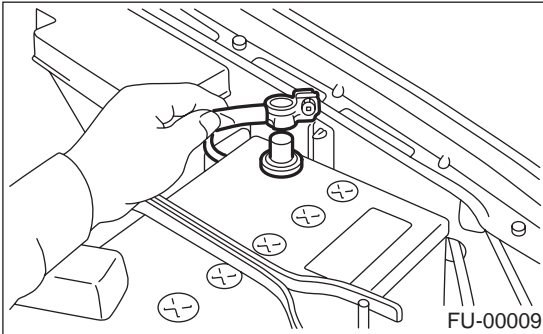
- (1) Intercooler duct (Primary)
- (2) Intercooler duct (Secondary)
- (3) Air by-pass valve

6. Turbocharger

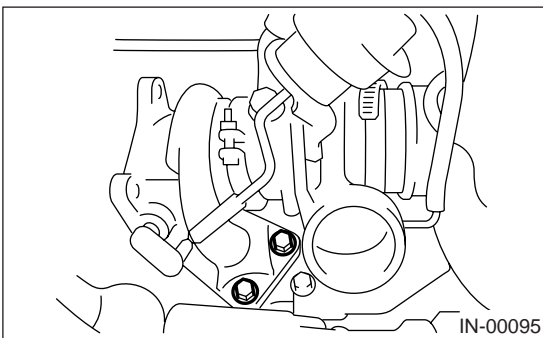
A: REMOVAL

1. PRIMARY TURBOCHARGER

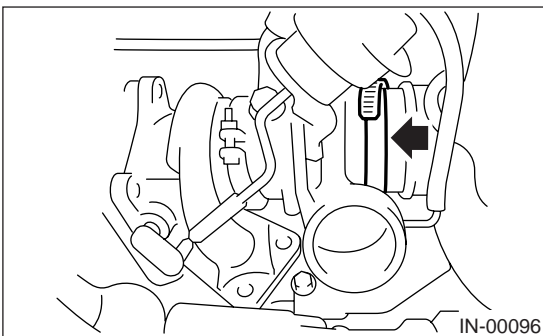
- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.



- 3) Remove the intercooler. <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 4) Remove the center exhaust pipe. <Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>
- 5) Lower the vehicle.
- 6) Separate the turbocharger joint pipe from turbocharger.

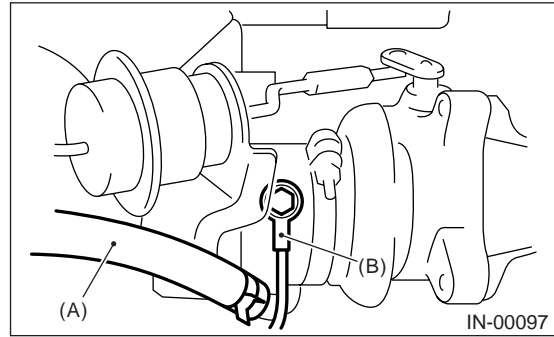


- 7) Loosen the clamp which secures turbocharger to air inlet duct.



- 8) Disconnect the engine coolant hose.
- 9) Remove the bolt which secures bracket of oil pipe to turbocharger.

- 10) Remove the oil pipe from turbocharger.



- (A) Engine coolant hose
(B) Oil pipe

- 11) Remove the turbocharger bracket.
- 12) Disconnect the oil and coolant outlet hose from pipe.
- 13) Take out the turbocharger from engine compartment.

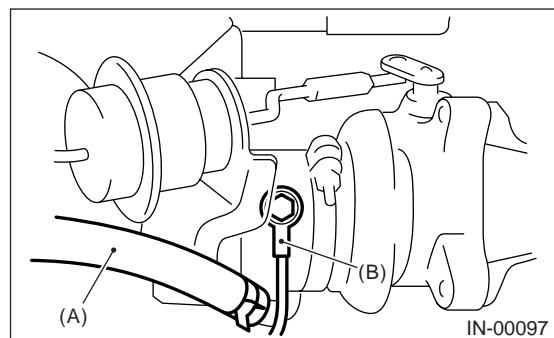
2. SECONDARY TURBOCHARGER

Refer to the removal of primary turbocharger for removal procedure. <Ref. to IN(H4DOSTC)-15, PRIMARY TURBOCHARGER, REMOVAL, Turbocharger.>

B: INSTALLATION

1. PRIMARY TURBOCHARGER

- 1) Connect the oil outlet hose to outlet pipe.
- 2) Install the oil pipe to turbocharger.

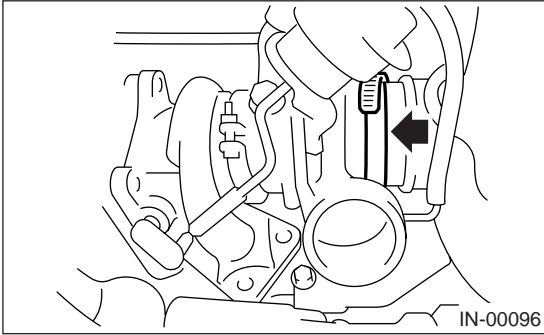


- (A) Engine coolant hose
(B) Oil pipe

TURBOCHARGER

INTAKE (INDUCTION)

- 3) Install the turbocharger to air intake duct.



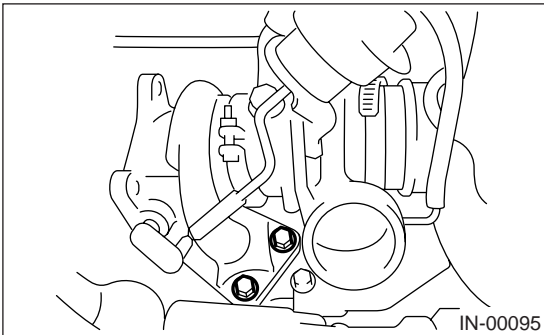
- 4) Install the joint pipe to turbocharger.

NOTE:

Replace the gasket with a new one.

Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)



- 5) Install the turbocharger bracket.
6) Connect the engine coolant hose which is connected to the coolant filler tank.
7) Lift-up the vehicle.
8) Install the center exhaust pipe. <Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>
9) Install the intercooler. <Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

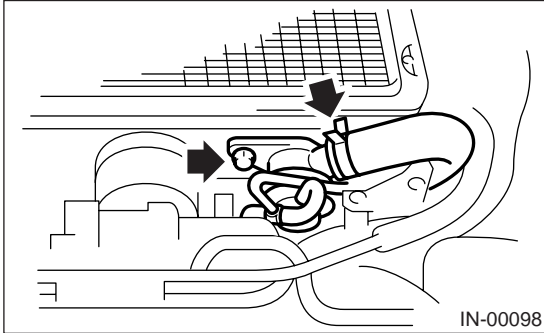
2. SECONDARY TURBOCHARGER

Refer to the installation of primary turbocharger for installation procedure. <Ref. to IN(H4DOSTC)-15, PRIMARY TURBOCHARGER, INSTALLATION, Turbocharger.>

7. Air By-pass Valve

A: REMOVAL

- 1) Remove the air by-pass valve from intercooler.
- 2) Disconnect the air by-pass hoses from air by-pass valve.

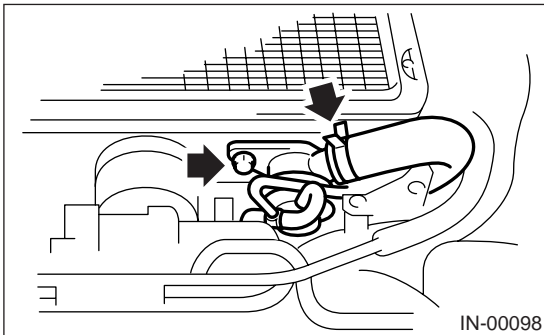


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.7 ft-lb)



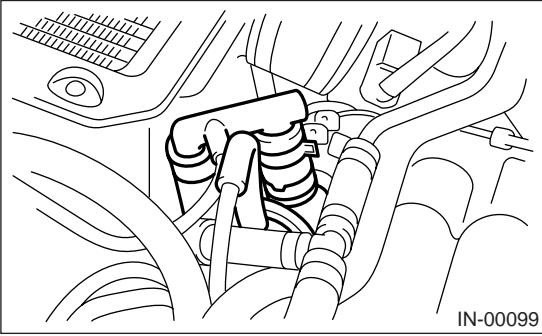
TURBOCHARGING PRESSURE RELIEF VALVE

INTAKE (INDUCTION)

8. Turbocharging Pressure Relief Valve

A: REMOVAL

Remove the turbocharging pressure relief valve from secondary turbocharger and joint part of air duct.



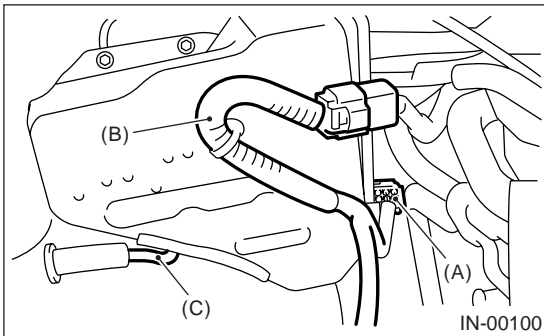
B: INSTALLATION

Install in the reverse order of removal.

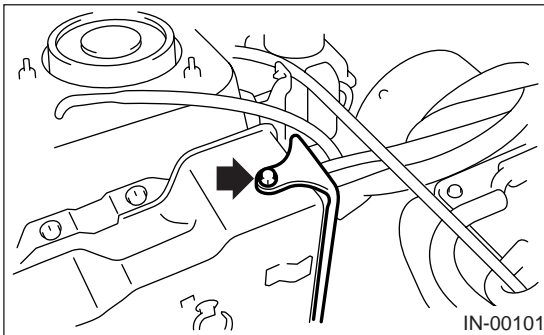
9. Solenoid Box Assembly

A: REMOVAL

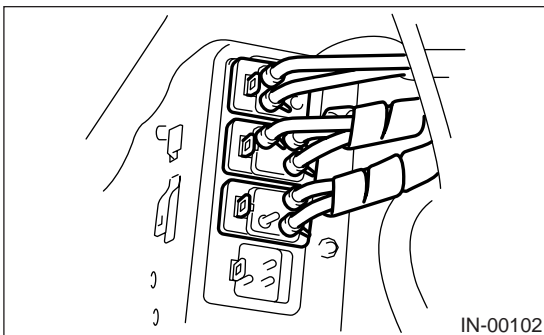
- 1) Disconnect the connector (A) for solenoid valve.
- 2) Disconnect the engine harness (B) from solenoid box.
- 3) Disconnect the hose (C) for surge tank.



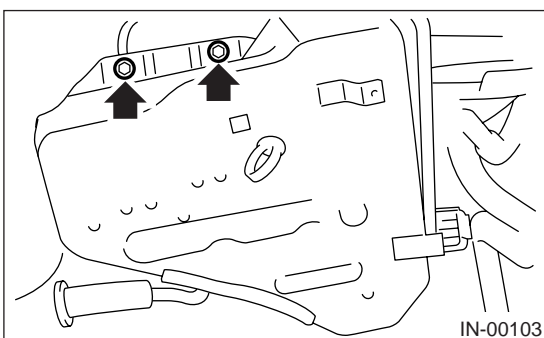
- 4) Remove the lock plate on solenoid box side.



- 5) Disconnect the hose connector.



- 6) Remove the installation bolts, and then remove the solenoid box assembly.

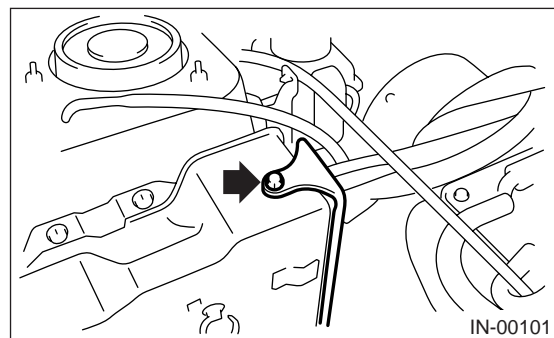
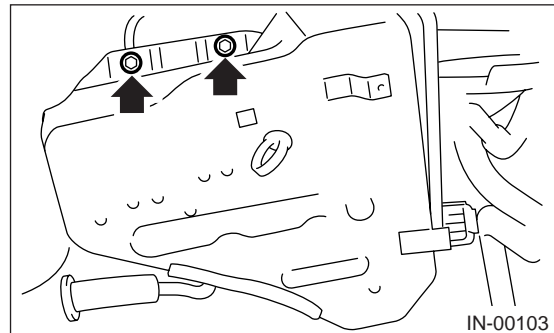


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

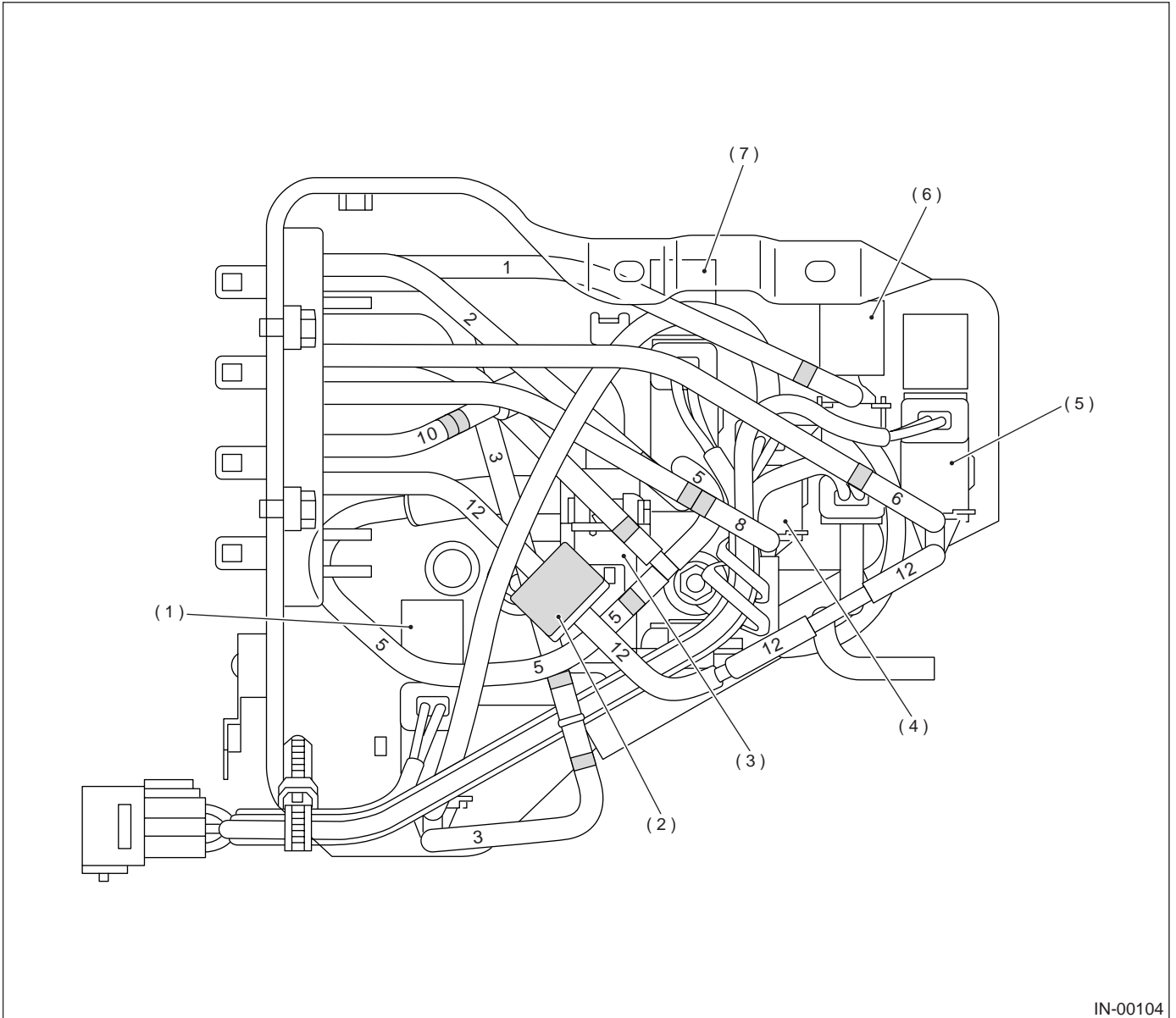


SOLENOID BOX ASSEMBLY

INTAKE (INDUCTION)

C: INSPECTION

- 1) Make sure the inner hoses are not cracked and that connections are tight.
- 2) Make sure the air filter is properly installed.
- 3) Make sure the solenoid valve is not damaged.



(1) Turbocharging pressure relief valve control solenoid valve #2

(2) Filter

(3) Exhaust valve control duty solenoid valve

(4) Turbocharging pressure relief valve control solenoid valve #1

(5) Exhaust valve control solenoid valve (For negative pressure)

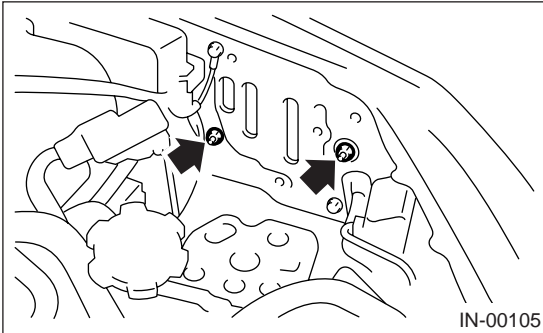
(6) Intake air valve control solenoid valve

(7) Exhaust valve control solenoid valve (For positive pressure)

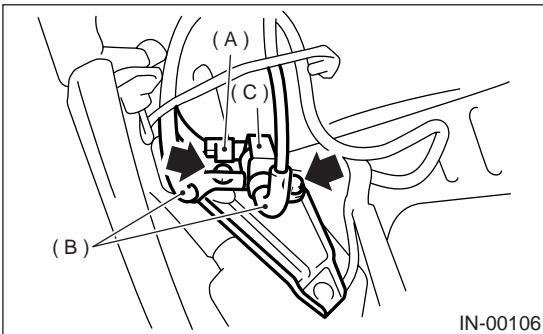
10. Wastegate Control Solenoid Valve

A: REMOVAL

- 1) Remove the battery.
- 2) Remove the wastegate control solenoid valve bracket installation nut from engine compartment.



- 3) Remove the front tire LH, and then lift-up the vehicle.
- 4) Remove the front mudguard LH.
- 5) Pull out the wastegate control solenoid valve and bracket from the vehicle as a unit.
- 6) Disassemble the connector (A), pressure hose (B) and solenoid valve (C).

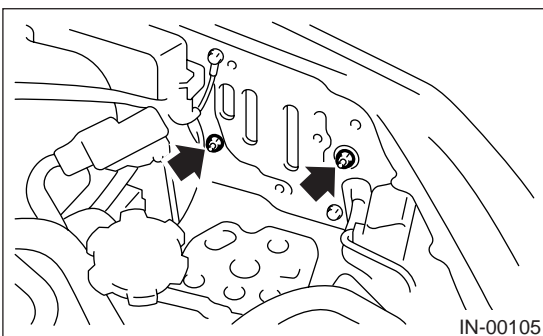


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.4 ft-lb)



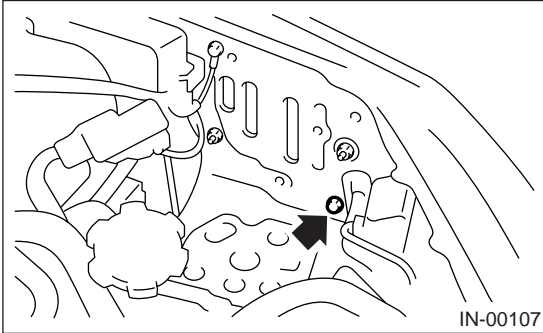
SURGE TANK

INTAKE (INDUCTION)

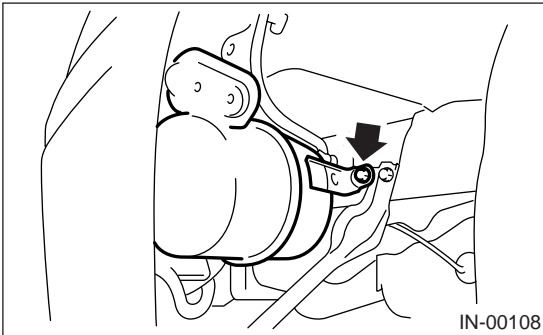
11. Surge Tank

A: REMOVAL

- 1) Remove the battery.
- 2) Remove the surge tank installation nut from engine compartment.



- 3) Remove the front tire LH, and lift the vehicle.
- 4) Remove the front mudguard LH.
- 5) Remove the surge tank.

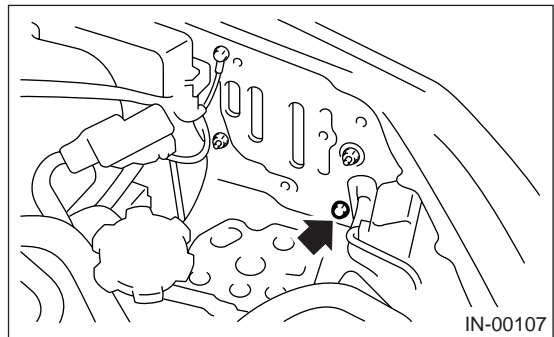
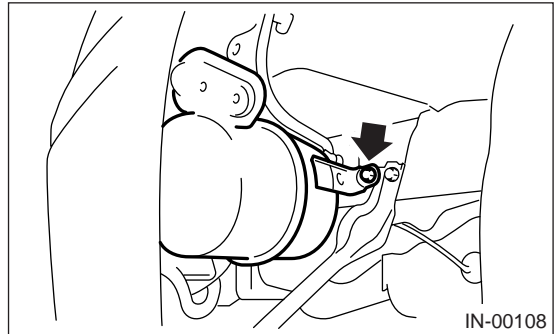


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

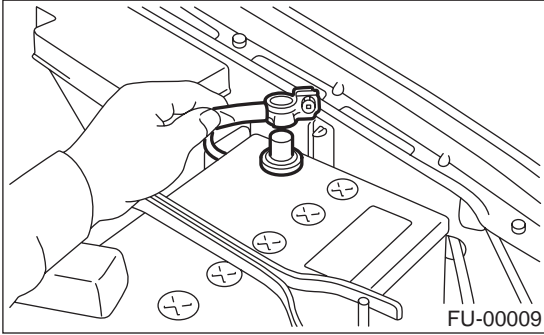
16 N·m (1.6 kgf·m, 11.8 ft·lb)



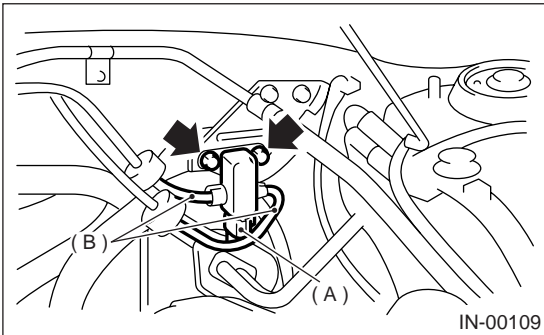
12. Differential Pressure Sensor

A: REMOVAL

- 1) Remove the ground cable from battery.



- 2) Disconnect the connector (A) of differential pressure sensor.
- 3) Disconnect the hose (B) of differential pressure sensor.
- 4) Remove the differential pressure sensor.

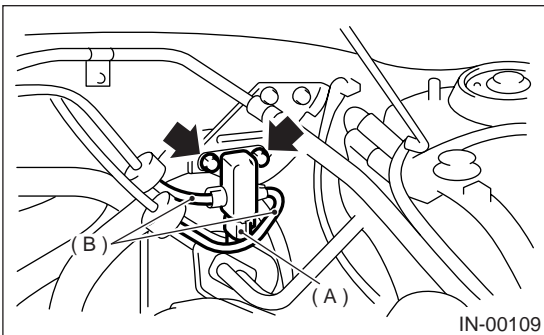


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



DIFFERENTIAL PRESSURE SENSOR

INTAKE (INDUCTION)

MEMO:

MECHANICAL

ME(H4DOSTC)

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GENERAL DESCRIPTION

MECHANICAL

1. General Description

A: SPECIFICATIONS

Engine	Type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
	Valve arrangement		Belt driven, single over-head camshaft, 4-valve/cylinder		
	Bore x Stroke	mm (in)	92 x 75 (3.62 x 2.95)		
	Piston displacement	cm ³ (cu in)	1,994 (121.67)		
	Compression ratio		9.0		
	Compression pressure (at 200 — 300 rpm)	kPa (kg/cm ² , psi)	1,079 — 1,275 (11 — 13, 155 — 183)		
	Number of piston rings		Pressure ring: 2, Oil ring: 1		
	Intake valve timing	Opening	9° BTDC		
		Closing	51° ABDC		
	Exhaust valve timing	Opening	53° BBDC		
		Closing	7° ATDC		
	Valve clearance	Intake	mm (in)	0.20±0.02 (0.0079±0.0008)	
		Exhaust	mm (in)	0.25±0.02 (0.0098±0.0008)	
	Idling speed [At neutral position]	rpm	MT	700±100 (No load) 800±150 (A/C switch ON)	
			AT	650±100 (No load) 850±150 (A/C switch ON)	
Firing order		1 → 3 → 2 → 4			
Ignition timing	BTDC/rpm	MT	14°±10°/700 rpm		
		AT	14°±10°/650 rpm		

NOTE:

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod		5.2 — 6.2 mm (0.205 — 0.244 in)		
Belt tensioner	Spacer O.D.		17.955 — 17.975 mm (0.7069 — 0.7077 in)		
	Tensioner bus I.D.		18.0 — 18.08 mm (0.7087 — 0.7118 in)		
	Clearance between spacer and bush	STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)		
		Limit	0.175 mm (0.0069 in)		
Side clearance of spacer	STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)			
	Limit	0.81 mm (0.0319 in)			
Camshaft	Bend limit		0.020 mm (0.0079 in)		
	Thrust clearance	STD	0.015 — 0.070 mm (0.0006 — 0.0028 in)		
		Limit	0.10 mm (0.0039 in)		
	Cam lobe height	Intake	STD	46.25 — 46.35 mm (1.821 — 1.825 in)	
			Limit	46.15 mm (1.817 in)	
		Exhaust	STD	46.15 — 46.25 mm (1.817 — 1.821 in)	
			Limit	46.65 mm (1.813 in)	
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)	
Center rear			29.946 — 29.963 mm (1.1790 — 1.1796 in)		
Oil clearance	STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)			
	Limit	0.10 mm (0.0039 in)			
Cylinder head	Surface warpage limit		0.05 mm (0.0020 in)		
	Surface grinding limit		0.3 mm (0.012 in)		
	Standard height		127.5 mm (5.02 in)		

GENERAL DESCRIPTION

MECHANICAL

Valve seat	Refacing angle			90°	
	Contacting width	Intake	STD	1.0 mm (0.039 in)	
			Limit	1.7 mm (0.067 in)	
		Exhaust	STD	1.5 mm (0.059 in)	
Limit			2.2 mm (0.087 in)		
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)	
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)	
Valve	Head edge thickness	Intake	STD	1.2 mm (0.047 in)	
			Limit	0.8 mm (0.031 in)	
		Exhaust	STD	1.5 mm (0.059 in)	
			Limit	0.8 mm (0.031 in)	
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)	
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)	
	Stem oil clearance		STD	Intake 0.030 — 0.057 mm (0.0012 — 0.0022 in) Exhaust 0.040 — 0.067 mm (0.0016 — 0.0026 in)	
			Limit	— 0.15 mm (0.0059 in)	
Overall length		Intake	104.4 mm (4.110 in)		
		Exhaust	104.7 mm (4.122 in)		
Valve spring	Free length			44.67 mm (1.7587 in)	
	Squareness			2.5°, 2.0 mm (0.079 in)	
	Tension/spring height			206 — 236 N (21.0 — 24.1 kgf, 46.2 — 53.0 lb)/ 36.0 mm (1.417 in) 485 — 537 N (49.5 — 54.8 kgf, 109.2 — 120.6 lb)/ 26.6 mm (1.047 in)	
Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)	
	Surface grinding limit			0.1 mm (0.004 in)	
	Cylinder bore	STD	A	92.005 — 92.015 mm (3.6222 — 3.6226 in)	
			B	91.995 — 92.005 mm (3.6218 — 3.6222 in)	
	Taper		STD	0.015 mm (0.0006 in)	
			Limit	0.050 mm (0.0020 in)	
	Out-of-roundness		STD	0.010 mm (0.0004 in)	
			Limit	0.050 mm (0.0020 in)	
Piston clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)		
		Limit	0.050 mm (0.0020 in)		
Enlarging (boring) limit			0.5 mm (0.020 in)		
Piston	Outer diameter	STD	A	91.985 — 91.995 mm (3.6214 — 3.6218 in)	
			B	91.975 — 91.985 mm (3.6211 — 3.6214 in)	
		0.25 mm (0.0098 in) OS			92.225 — 92.235 mm (3.6309 — 3.6313 in)
		0.50 mm (0.0197 in) OS			92.475 — 92.485 mm (3.6407 — 3.6411 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)	
			Limit	0.020 mm (0.0008 in)	
		Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)	
			Limit	1.0 mm (0.039 in)	
		Second ring	STD	0.35 — 0.50 mm (0.0138 — 0.0197 in)	
			Limit	1.0 mm (0.039 in)	
	Oil ring		STD	0.20 — 0.50 mm (0.0079 — 0.0197 in)	
			Limit	1.5 mm (0.059 in)	
	Clearance between piston ring and piston ring groove		Top ring	STD	0.055 — 0.090 mm (0.0022 — 0.0035 in)
				Limit	0.15 mm (0.0059 in)
Second ring			STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)	
			Limit	0.15 mm (0.0059 in)	

ME(H4DOSTC)-3

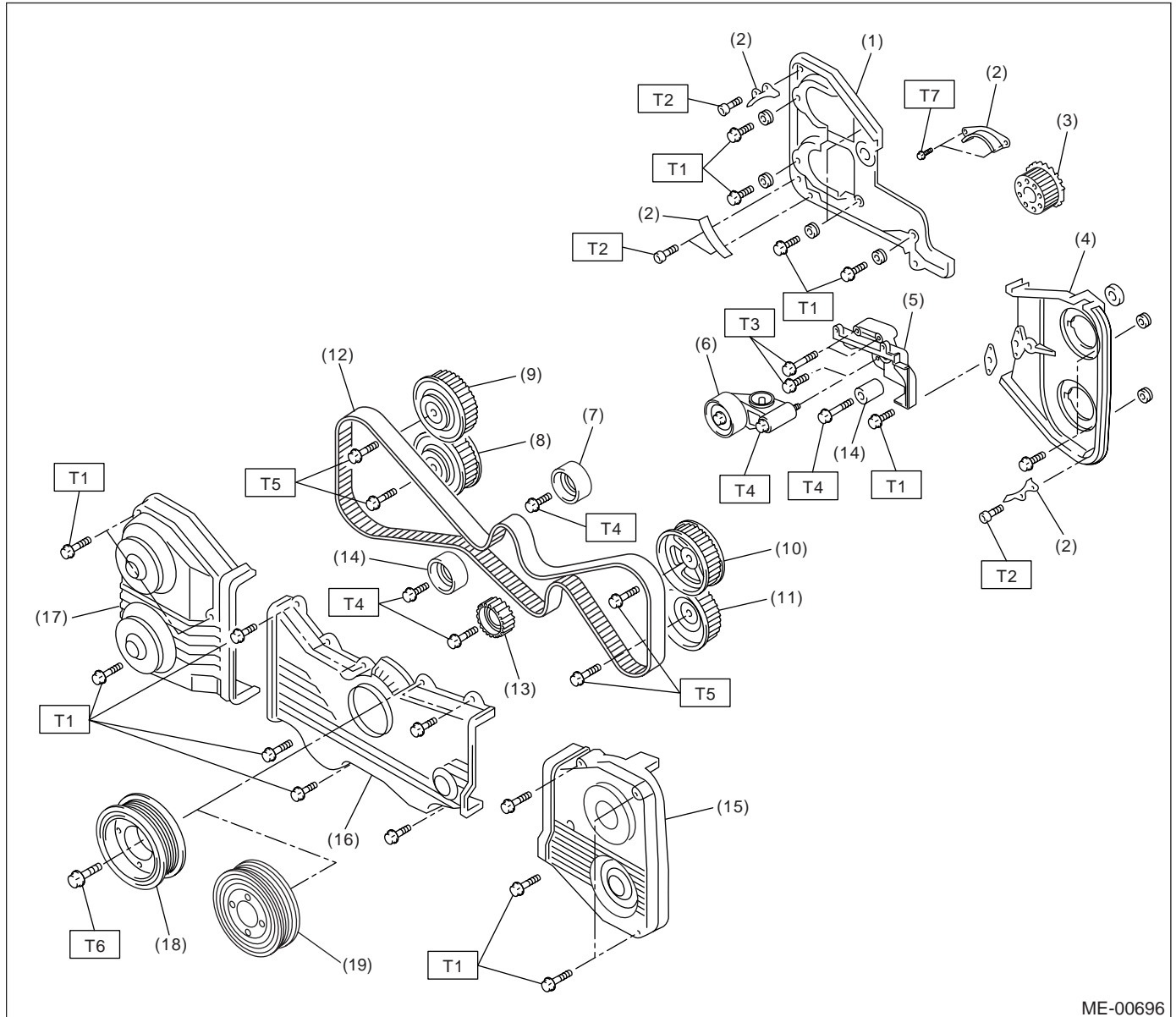
GENERAL DESCRIPTION

MECHANICAL

Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit			0.4 mm (0.016 in)	
Connecting rod bearing	Oil clearance		STD	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.486 — 1.498 mm (0.0585 — 0.0590 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
		0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)	
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)
Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
#4		STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)	
		Limit	0.045 mm (0.0018 in)	
#5		STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)	
		Limit	0.040 mm (0.0016 in)	
Crankshaft bearing	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)	
		0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)	
		0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)	
		0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)	
	#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)	
		0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)	
		0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)	
		0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)	

B: COMPONENT

1. TIMING BELT



ME-00696

- | | |
|--|--------------------------------------|
| (1) Belt cover No. 2 (RH) | (10) Intake camshaft sprocket (LH) |
| (2) Timing belt guide (MT vehicles only) | (11) Exhaust camshaft sprocket (LH) |
| (3) Crankshaft sprocket | (12) Timing belt |
| (4) Belt cover No. 2 (LH) | (13) Belt idler No. 2 |
| (5) Tensioner bracket | (14) Belt cover |
| (6) Automatic belt tension adjuster ASSY | (15) Belt cover (LH) |
| (7) Belt idler | (16) Front belt cover |
| (8) Exhaust camshaft sprocket (RH) | (17) Belt cover (RH) |
| (9) Intake camshaft sprocket (RH) | (18) Crankshaft pulley (AT vehicles) |
| | (19) Crankshaft pulley (MT vehicles) |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 5 (0.5, 3.6)

T2: 6.4 (0.65, 4.7)

T3: 25 (2.5, 18.1)

T4: 39 (4.0, 28.9)

T5: 98 (10, 72.4)

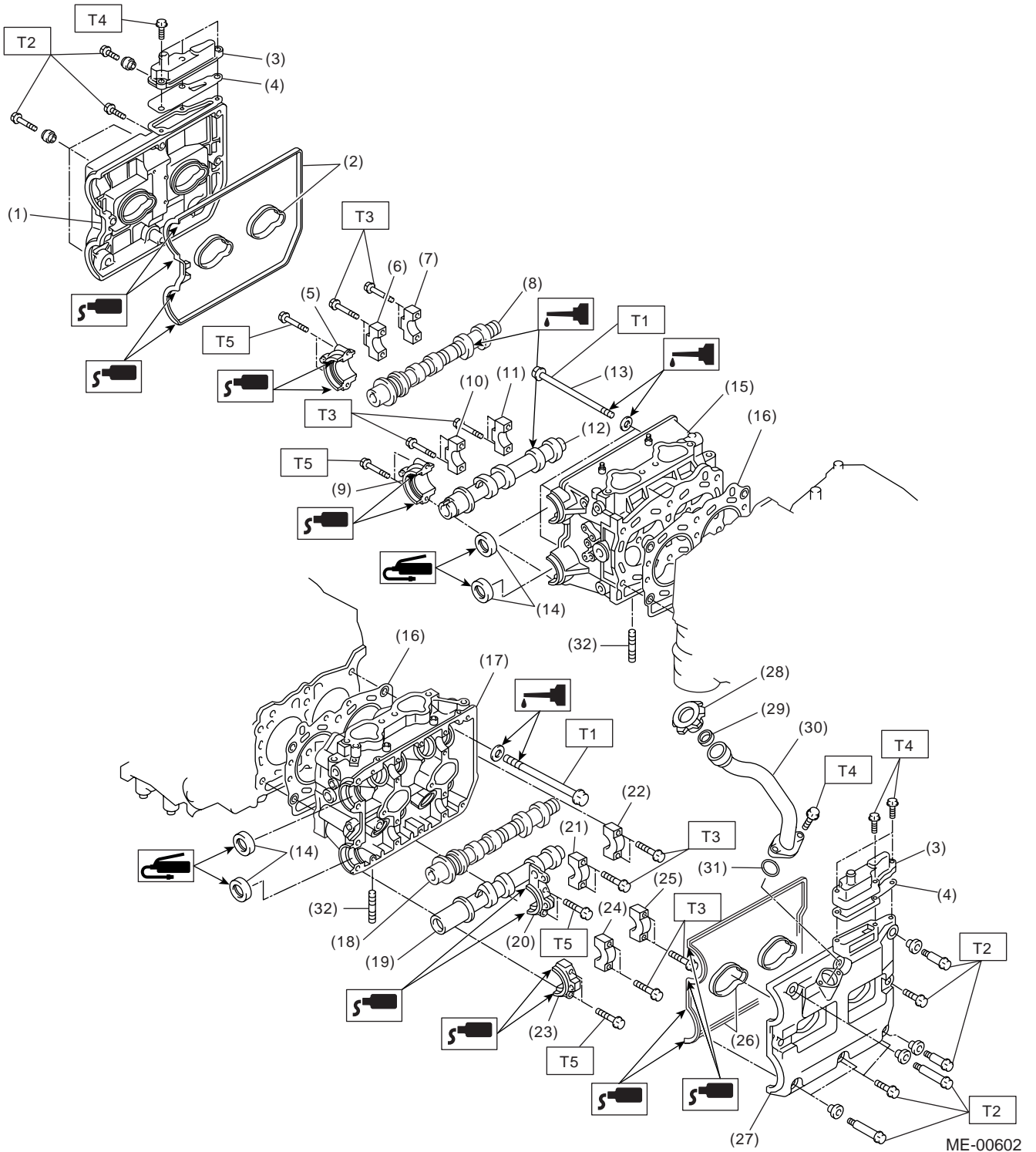
T6: <Ref. to ME(H4DOSTC)-44, INSTALLATION, CRANKSHAFT PULLEY.>

T7: 10 (1.0, 7.2)

GENERAL DESCRIPTION

MECHANICAL

2. CYLINDER HEAD AND CAMSHAFT



ME(H4DOSTC)-6

GENERAL DESCRIPTION

MECHANICAL

- | | | |
|---------------------------------------|---------------------------------------|------------------------|
| (1) Rocker cover (RH) | (14) Oil seal | (27) Rocker cover (LH) |
| (2) Rocker cover gasket (RH) | (15) Cylinder head (RH) | (28) Oil filler cap |
| (3) Oil separator cover | (16) Cylinder head gasket (RH) | (29) Gasket |
| (4) Gasket | (17) Cylinder head (LH) | (30) Oil filler duct |
| (5) Intake camshaft cap (Front RH) | (18) Intake camshaft (LH) | (31) O-ring |
| (6) Intake camshaft cap (Center RH) | (19) Exhaust camshaft (LH) | (32) Stud bolt |
| (7) Intake camshaft cap (Rear RH) | (20) Intake camshaft cap (Front LH) | |
| (8) Intake camshaft cap (RH) | (21) Intake camshaft cap (Center LH) | |
| (9) Exhaust camshaft cap (Front RH) | (22) Intake camshaft cap (Rear LH) | |
| (10) Exhaust camshaft cap (Center RH) | (23) Exhaust camshaft cap (Front LH) | |
| (11) Exhaust camshaft cap (Rear RH) | (24) Exhaust camshaft cap (Center LH) | |
| (12) Exhaust camshaft (RH) | (25) Exhaust camshaft cap (Rear LH) | |
| (13) Cylinder head bolt | (26) Rocker cover gasket (LH) | |

Tightening torque: N·m (kgf-m, ft-lb)

**T1: <Ref. to ME(H4DOSTC)-62,
INSTALLATION, CYLINDER
HEAD ASSEMBLY.>**

T2: 5 (0.5, 3.6)

T3: 20 (2.0, 14.5)

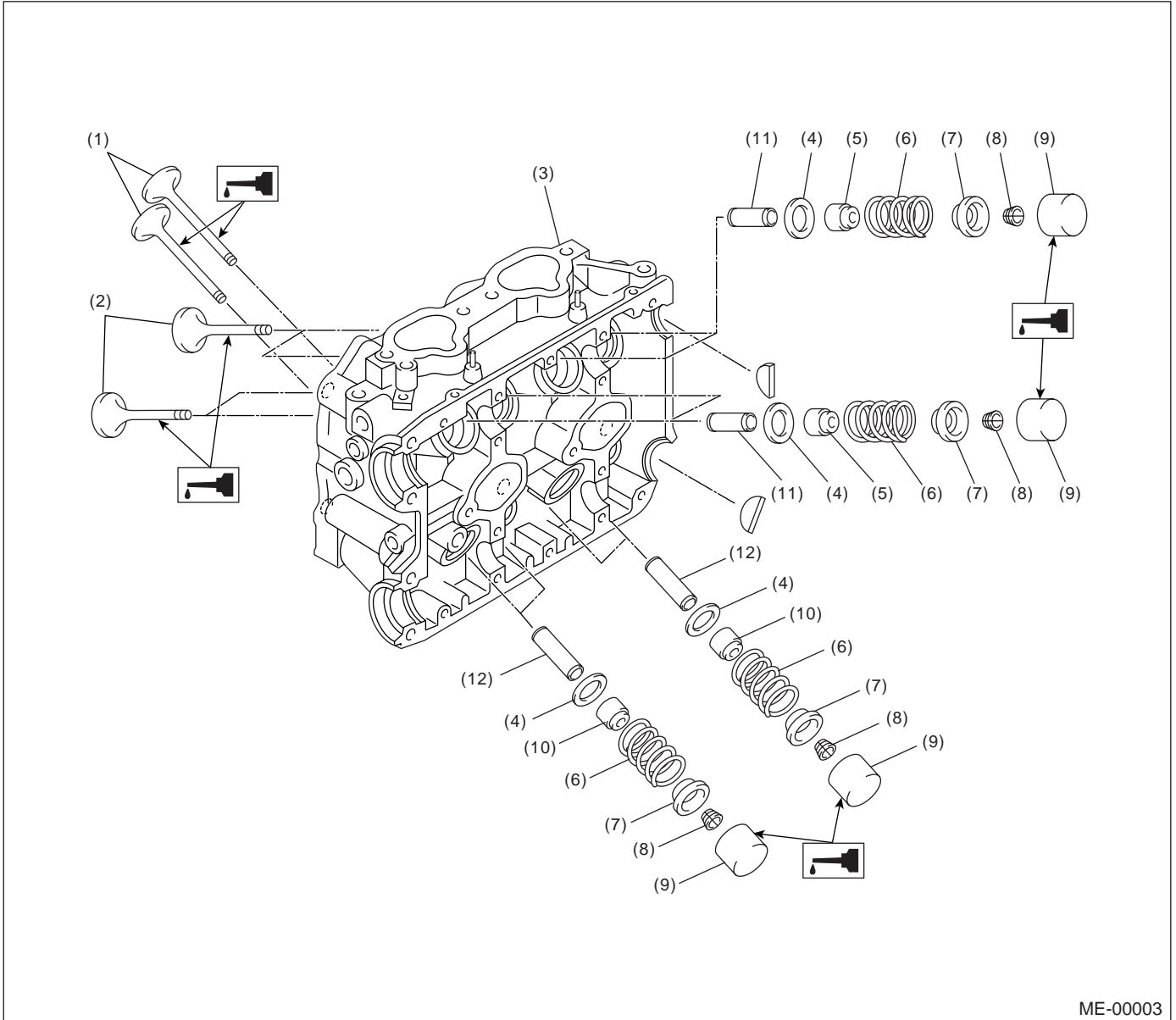
T4: 6.4 (0.65, 4.7)

T5: 10 (1.0, 7.2)

GENERAL DESCRIPTION

MECHANICAL

3. CYLINDER HEAD AND VALVE ASSEMBLY



- | | | |
|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve | (5) Intake valve oil seal | (9) Valve lifter |
| (2) Intake valve | (6) Valve spring | (10) Exhaust valve oil seal |
| (3) Cylinder head | (7) Retainer | (11) Intake valve guide |
| (4) Valve spring seat | (8) Retainer key | (12) Exhaust valve guide |

ME(H4DOSTC)-8

GENERAL DESCRIPTION

MECHANICAL

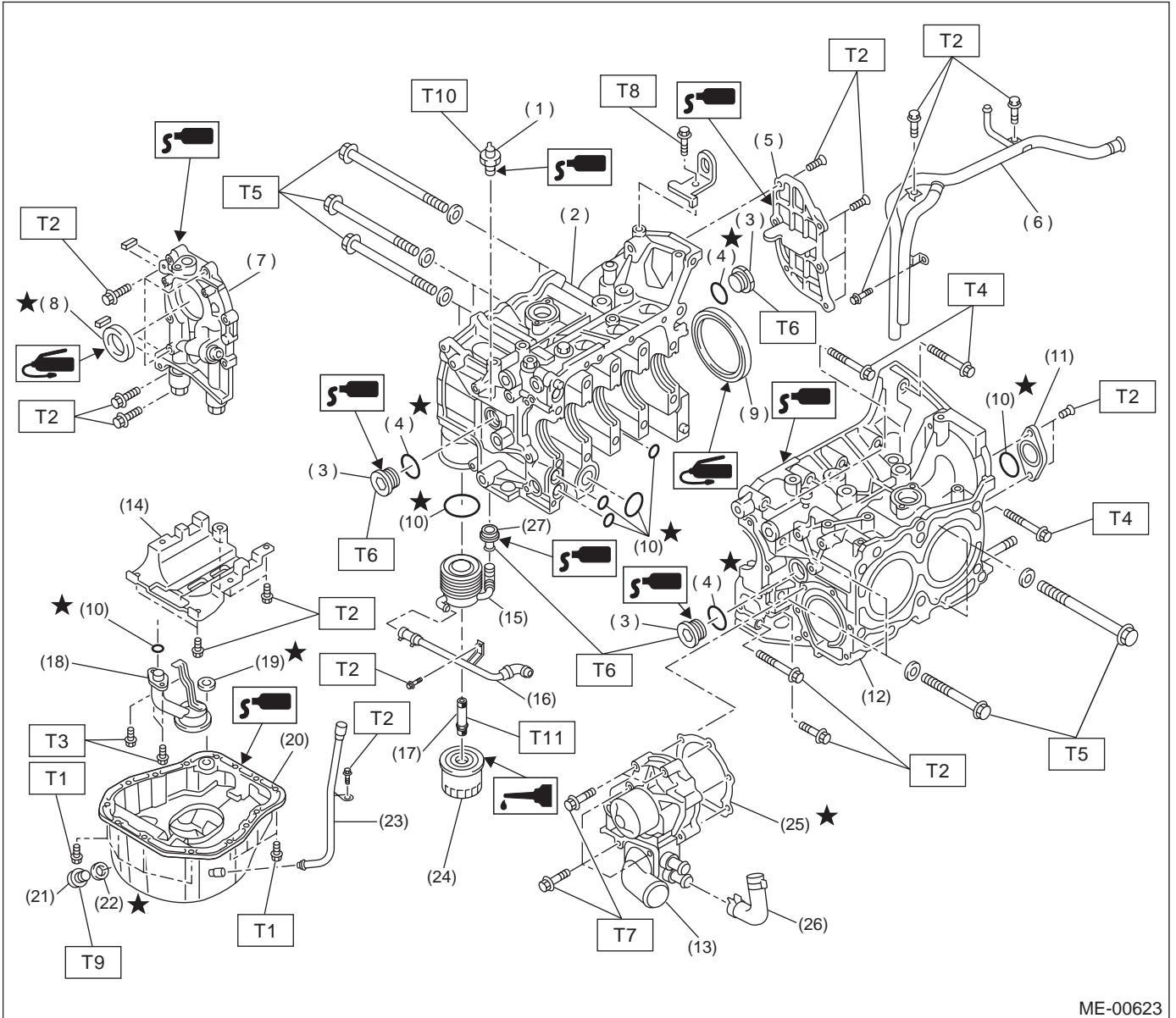
MEMO:

ME(H4DOSTC)-9

GENERAL DESCRIPTION

MECHANICAL

4. CYLINDER BLOCK



ME-00623

GENERAL DESCRIPTION

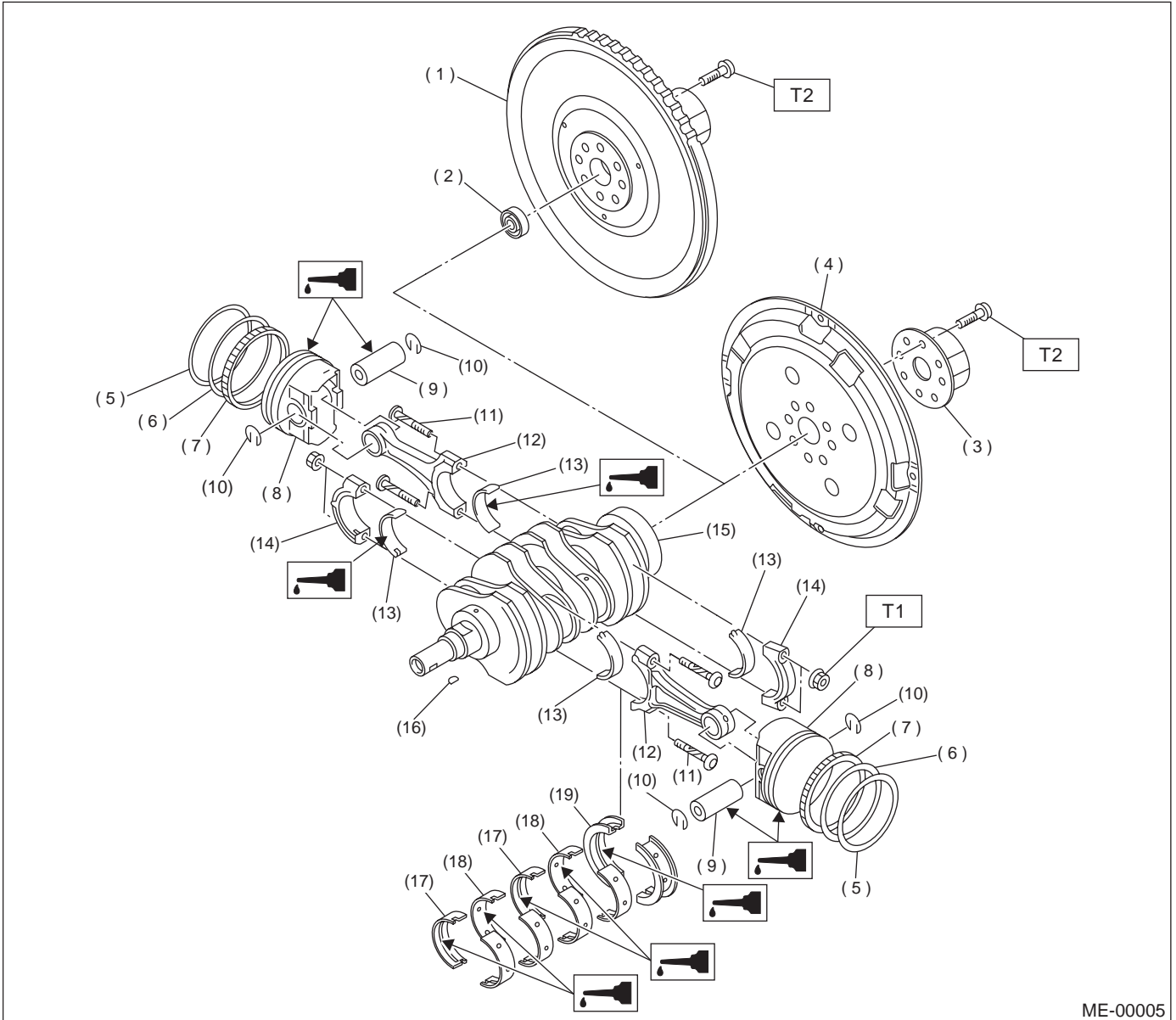
MECHANICAL

(1) Oil pressure switch	(15) Oil cooler (MT vehicles)	Tightening torque: N-m (kgf-m, ft-lb)
(2) Cylinder block (RH)	(16) Waster by-pass pipe (AT vehicles)	T1: 5 (0.5, 3.6)
(3) Service hole plug	(17) Connector	T2: 6.4 (0.65, 4.7)
(4) Gasket	(18) Oil strainer	T3: 10 (1.0, 7.2)
(5) Oil separator cover	(19) Gasket	T4: 25 (2.5, 18.1)
(6) Water by-pass pipe	(20) Oil pan	T5: <Ref. to ME(H4DOSTC)-74, INSTALLATION, CYLINDER BLOCK.>
(7) Oil pump	(21) Drain plug	T6: 70 (7.1, 50.6)
(8) Front oil seal	(22) Metal gasket	T7: First 12 (1.2, 8.7) Second 12 (1.2, 8.7)
(9) Rear oil seal	(23) Oil level gauge guide	T8: 16 (1.6, 11.6)
(10) O-ring	(24) Oil filter	T9: 44 (4.5, 33)
(11) Service hole cover	(25) Gasket	T10: 25 (2.5, 18.1)
(12) Cylinder block (LH)	(26) Water pump hose	T11: 54 (5.5, 40)
(13) Water pump	(27) Plug	
(14) Baffle plate		

GENERAL DESCRIPTION

MECHANICAL

5. CRANKSHAFT AND PISTON



ME-00005

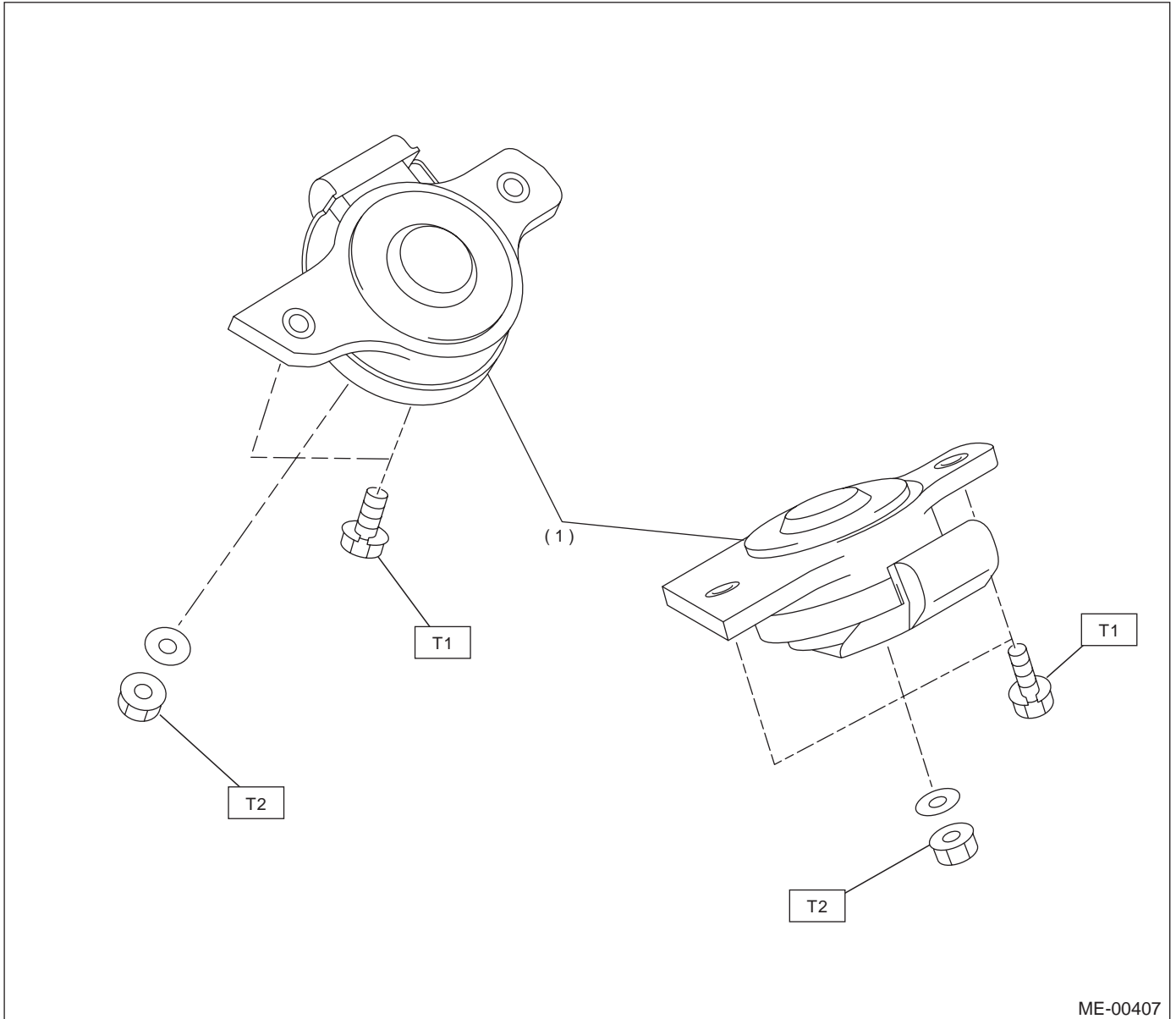
- | | | |
|--------------------------------------|-----------------------------|--------------------------------|
| (1) Flywheel (MT vehicles only) | (9) Piston pin | (17) Crankshaft bearing #1, #3 |
| (2) Ball bearing (MT vehicles only) | (10) Circlip | (18) Crankshaft bearing #2, #4 |
| (3) Reinforcement (AT vehicles only) | (11) Connecting rod bolt | (19) Crankshaft bearing #5 |
| (4) Drive plate (AT vehicles only) | (12) Connecting rod | |
| (5) Top ring | (13) Connecting rod bearing | |
| (6) Second ring | (14) Connecting rod cap | |
| (7) Oil ring | (15) Crankshaft | |
| (8) Piston | (16) Woodruff key | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 45 (4.6, 33.3)

T2: 72 (7.3, 52.8)

6. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)

T1: 35 (3.5, 25.3)

T2: 85 (8.7, 62.7)

GENERAL DESCRIPTION

MECHANICAL

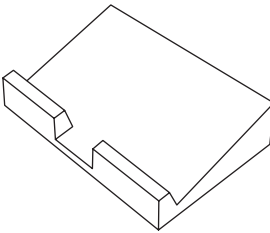
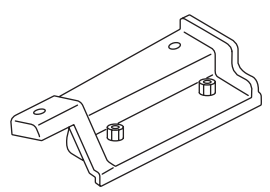
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.

- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be re-installed in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

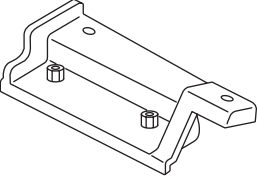
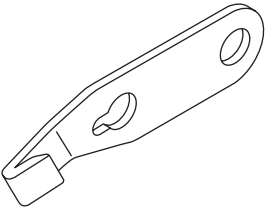
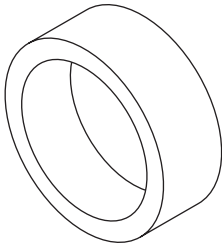
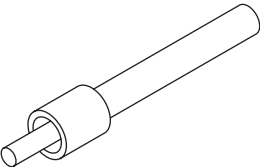
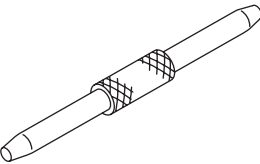
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-498267600</p>	498267600	CYLINDER HEAD TABLE	<ul style="list-style-type: none"> • Used for replacing valve guides. • Used for removing and installing valve springs.
 <p>ST-498457000</p>	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).

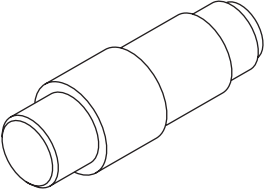
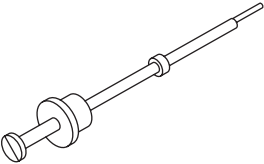
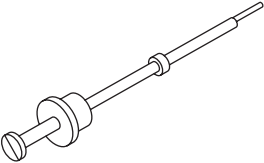
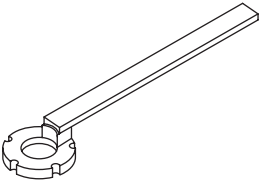
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498457100</p>	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 <p style="text-align: center;">ST-498497100</p>	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 <p style="text-align: center;">ST-398744300</p>	398744300	PISTON GUIDE	Used for installing piston in cylinder for 2000 cc engine.
 <p style="text-align: center;">ST-498857100</p>	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 <p style="text-align: center;">ST-499017100</p>	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.

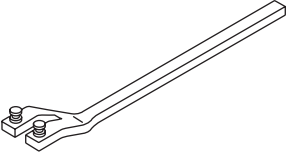
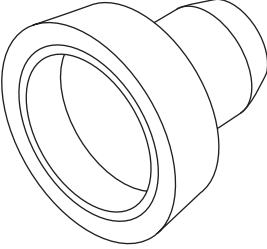
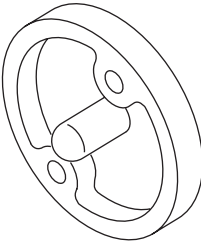
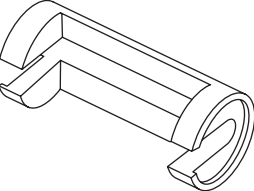
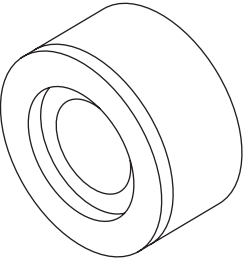
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499037100</p>	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 <p style="text-align: center;">ST-499097600</p>	499097600 (MT vehicles)	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 <p style="text-align: center;">ST-499097700</p>	499097700 (AT vehicles)	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 <p style="text-align: center;">ST-499207400</p>	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprocket.

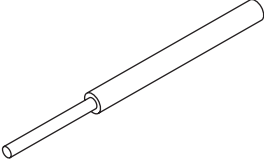
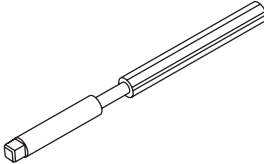
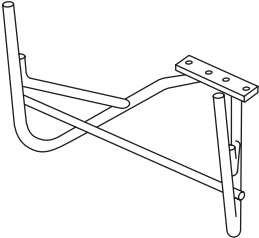
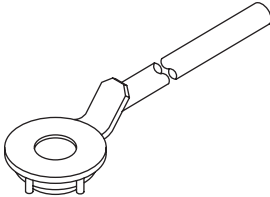
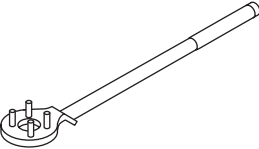
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST18231AA010</p>	<p style="text-align: center;">18231AA010 (Newly adopted tool)</p>	<p style="text-align: center;">CAMSHAFT SPROCKET WRENCH</p>	<p>Used for removing and installing intake camshaft sprocket. (Intake camshaft sprocket LH)</p>
 <p style="text-align: center;">ST-499587200</p>	<p style="text-align: center;">499587200</p>	<p style="text-align: center;">CRANKSHAFT OIL SEAL INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 <p style="text-align: center;">ST-499597100</p>	<p style="text-align: center;">499597100</p>	<p style="text-align: center;">CRANKSHAFT OIL SEAL GUIDE</p>	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 <p style="text-align: center;">ST-499718000</p>	<p style="text-align: center;">499718000</p>	<p style="text-align: center;">VALVE SPRING REMOVER</p>	<p>Used for removing and installing valve spring.</p>
 <p style="text-align: center;">ST18251AA020</p>	<p style="text-align: center;">18251AA020</p>	<p style="text-align: center;">VALVE GUIDE ADJUSTER</p>	<p>Used for installing intake and exhaust valve guides.</p>

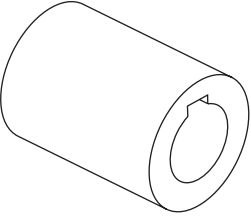
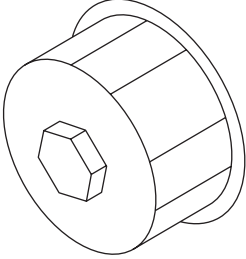
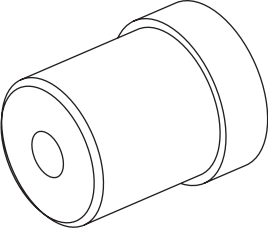
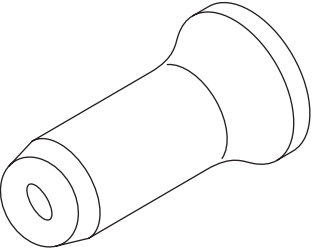
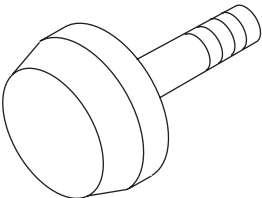
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499767200</p>	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 <p style="text-align: center;">ST-499767400</p>	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 <p style="text-align: center;">ST-499817100</p>	499817000	ENGINE STAND	<ul style="list-style-type: none"> • Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 <p style="text-align: center;">ST-499977400</p>	499977400	CRANK PULLEY WRENCH (AT vehicles)	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 <p style="text-align: center;">ST-499977100</p>	499977100	CRANK PULLEY WRENCH (MT vehicles)	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.

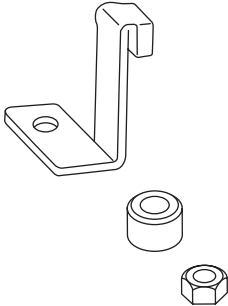
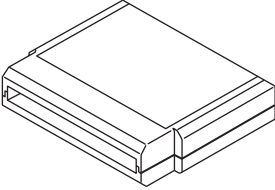

GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499987500</p>	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 <p style="text-align: center;">ST-498547000</p>	498547000	OIL FILTER WRENCH	Used for removing and installing the oil filter.
 <p style="text-align: center;">ST-499587100</p>	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 <p style="text-align: center;">ST-499587600</p>	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.
 <p style="text-align: center;">ST-499597200</p>	499597200	OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing camshaft oil seal for DOHC engine. • Used with OIL SEAL GUIDE (499587600).

GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498277200</p>	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 <p style="text-align: center;">ST24082AA210</p>	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 <p style="text-align: center;">ST22771AA030</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

2. Compression

A: INSPECTION

CAUTION:

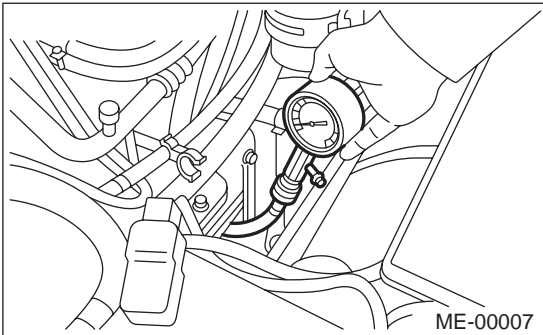
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(H4DOSTC)-5, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Hold the compression gauge tight against spark plug hole.

NOTE:

When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

- 8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):

Standard;7

1,079 — 1,275 kPa (11 — 13 kg/cm², 155 — 183 psi)

Limit;

951 kPa (10 kg/cm², 138 psi)

Difference between cylinders;

49 kPa (0.5 kg/cm², 7 psi)

3. Idle Speed

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the idle speed, check the following:

(1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.

(2) Ensure the malfunction indicator light (CHECK ENGINE light) does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and then turn the ignition switch to OFF.

4) Insert the cartridge to SUBARU SELECT MONITOR.

5) Connect the SUBARU SELECT MONITOR to data link connector.

6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.

7) Select the {2. Each System Check} in Main Menu.

8) Select the {Engine Control System} in Selection Menu.

9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select the {1.12 Data Display} in Data Display Menu.

11) Start the engine, and then read the engine idle speed.

12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral]:

700 ±100 rpm (MT vehicles)

650 ±100 rpm (AT vehicles)

13) Check the idle speed when loaded. (Turn the air conditioning switch to "ON" and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C "ON", no load and gears in neutral]:

800 ±150 rpm (MT vehicles)

850 ±150 rpm (AT vehicles)

NOTE:

As idle speed is controlled by the automatic adjustment type, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the ignition timing speed, check the following:

(1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.

(2) Ensure the malfunction indicator light (CHECK ENGINE light) does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and then turn the ignition switch to OFF.

4) Insert the cartridge to SUBARU SELECT MONITOR.

5) Connect the SUBARU SELECT MONITOR to data link connector.

6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.

7) Select the {2. Each System Check} in Main Menu.

8) Select the {Engine Control System} in Selection Menu.

9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select the {1.12 Data Display} in Data Display Menu.

11) Start the engine, at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:

14±10°/700

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>

INTAKE MANIFOLD VACUUM

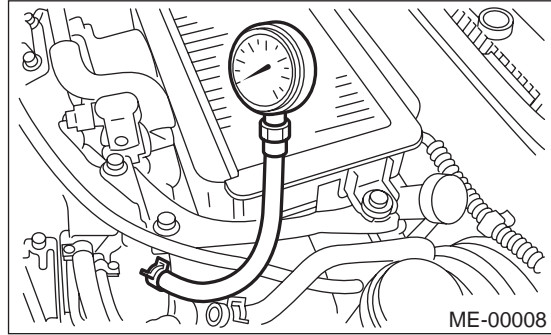
MECHANICAL

5. Intake Manifold Vacuum

A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
- 3) Keep the engine at the idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.



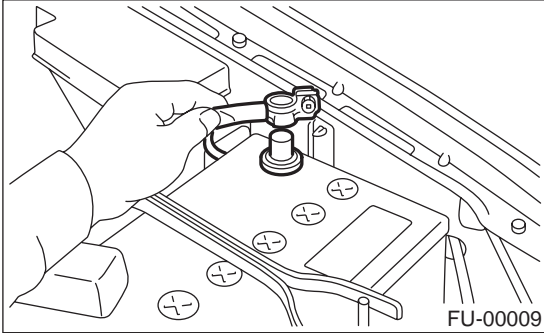
Vacuum pressure (at idling, A/C "OFF"):
Less than -64.0 kPa (-480 mmHg, -18.90 inHg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment.

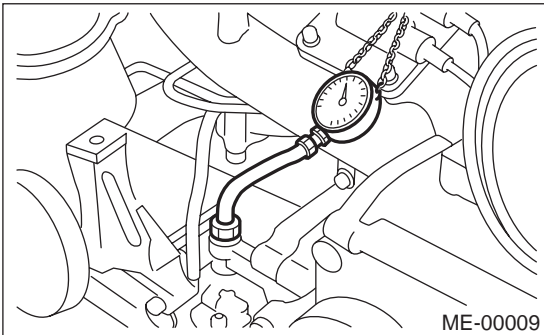
6. Engine Oil Pressure

A: INSPECTION

- 1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(H4DOSTC)-18, REMOVAL, Oil Pressure Switch.>
- 2) Connect the oil pressure gauge hose to cylinder block.
- 3) Connect the battery ground cable to battery.



- 4) Start the engine, and then measure the oil pressure.



Oil pressure:

98 kPa (1.0 kg/cm², 14 psi) or more at 800 rpm

294 kPa (3.0 kg/cm², 43 psi) or more at 5,000 rpm

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4DOSTC)-22, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(H4DOSTC)-22, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:

The specified data is based on an engine oil temperature of 80°C (176°F).

- 5) After measuring the oil pressure, install the oil pressure switch. <Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

FUEL PRESSURE

MECHANICAL

7. Fuel Pressure

A: INSPECTION

CAUTION:

Before removing the fuel pressure gauge, release the fuel pressure.

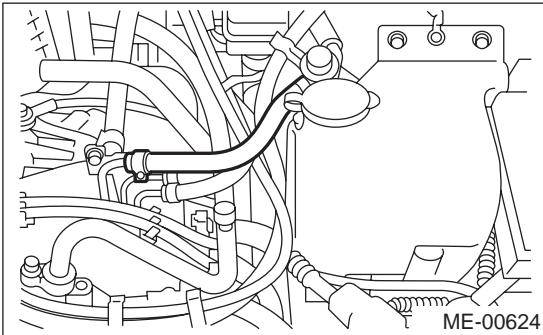
NOTE:

If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

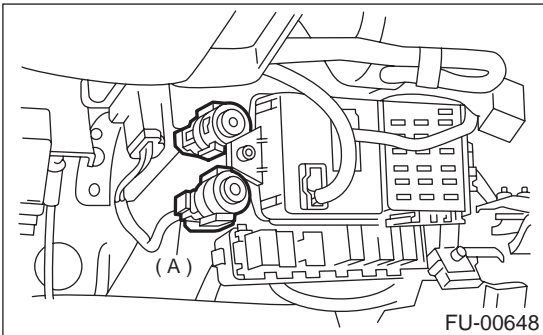
1) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Open the fuel flap lid, and then remove the fuel filler cap.

3) Disconnect the fuel delivery hoses from fuel filter, and then connect the fuel pressure gauge.



4) Connect the connector of fuel pump relay (A).

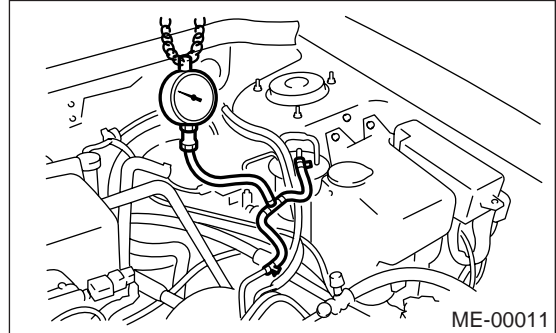


5) Start the engine.

6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:

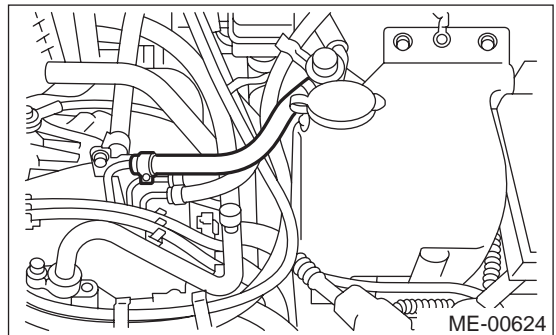
Standard; 284 — 314 kPa (2.9 — 3.2 kg/cm², 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:

Standard; 230 — 260 kPa (2.35 — 2.65 kg/cm², 33 — 38 psi)



NOTE:

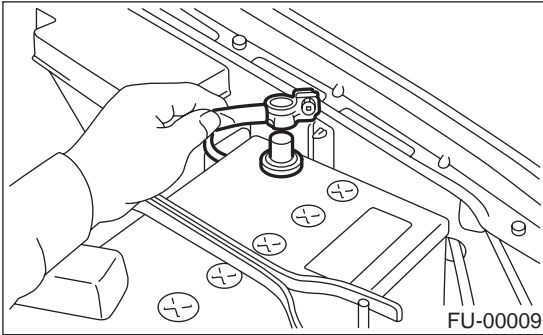
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm², 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

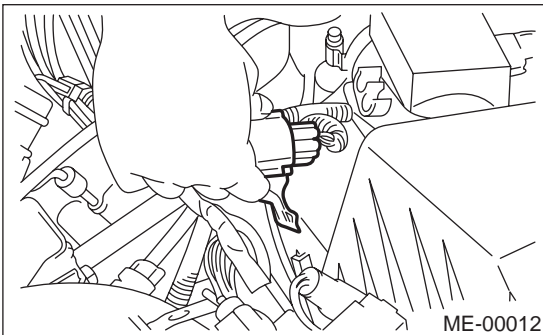
A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.

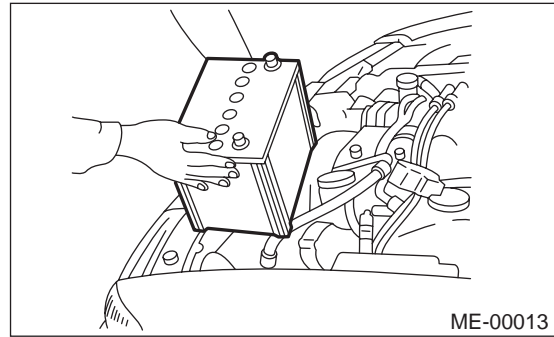


- 3) Remove the air intake duct. <Ref. to IN(H4DOSTC)-11, REMOVAL, Air Intake Duct.>
- 4) Remove the bolt which secures belt cover (RH).
- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Loosen the remaining bolts which secure belt cover (RH), and then remove the belt cover.
- 8) Lower the vehicle.
- 9) When inspecting the #1 and #3 cylinders:
 - (1) Pull out the engine harness connector with bracket from air cleaner upper cover.

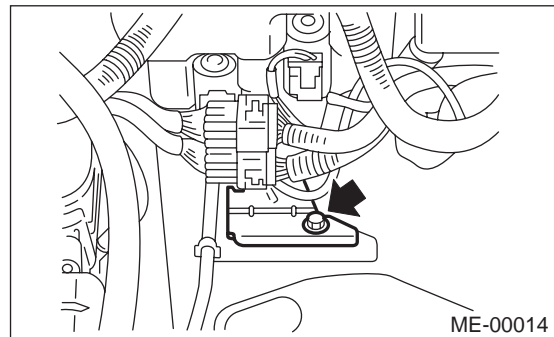


- (2) Remove the air cleaner case. <Ref. to IN(H4DOSTC)-10, REMOVAL, Air Cleaner.>
 - (3) Disconnect the ignition coil connector.
 - (4) Remove the ignition coil.
 - (5) Place a suitable container under the vehicle.
 - (6) Disconnect the PCV hose from rocker cover (RH).
 - (7) Remove the bolts, and then remove the rocker cover (RH).
- 10) When inspecting the #2 and #4 cylinders:

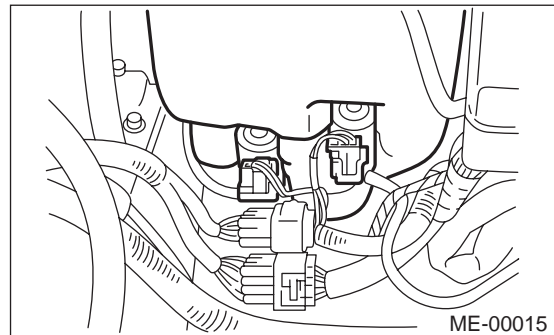
- (1) Disconnect the battery cable, and then remove the battery and battery carrier.



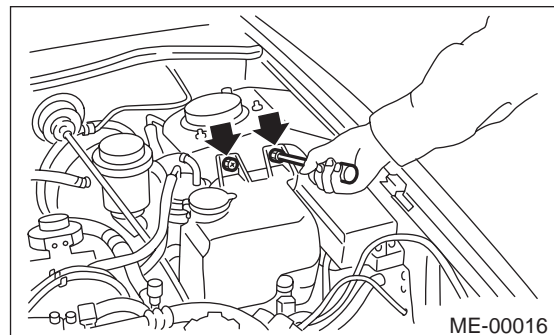
- (2) Remove the bolt which secures engine harness bracket onto body.



- (3) Disconnect the washer motor connectors.



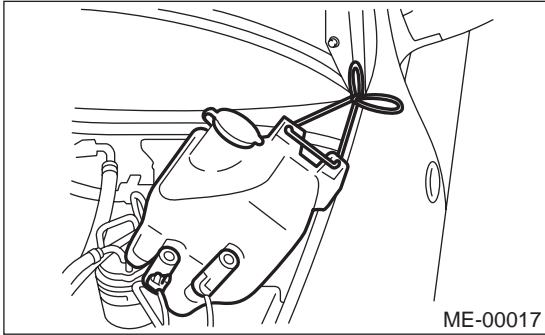
- (4) Remove the washer tank mounting bolts.



VALVE CLEARANCE

MECHANICAL

- (5) Move the washer tank upward.

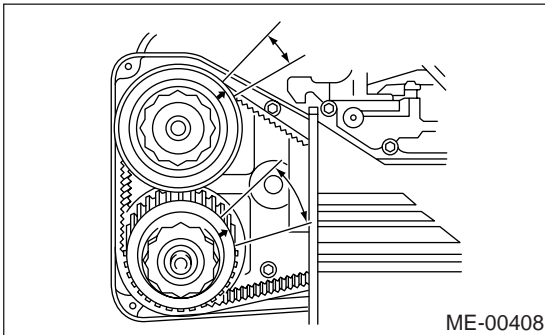


- (6) Disconnect the ignition coil connector.
(7) Remove the ignition coil.
(8) Place a suitable container under the vehicle.
(9) Disconnect the PCV hose from rocker cover (LH).
(10) Remove the bolts, and then remove the rocker cover (LH).

- 11) Turn the crankshaft pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:

Turn the crankshaft using socket wrench.



- 12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:

- Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
- Measure the exhaust valve clearances while lifting-up the vehicle.

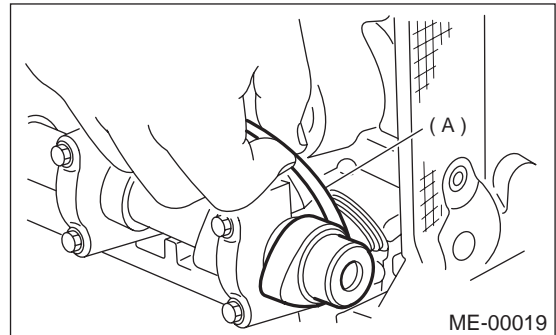
Valve clearance:

Intake: 0.20 ± 0.02 mm (0.0079 ± 0.0008 in)

Exhaust: 0.25 ± 0.02 mm (0.0098 ± 0.0008 in)

NOTE:

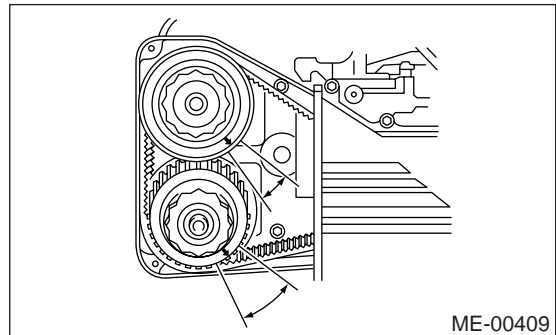
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



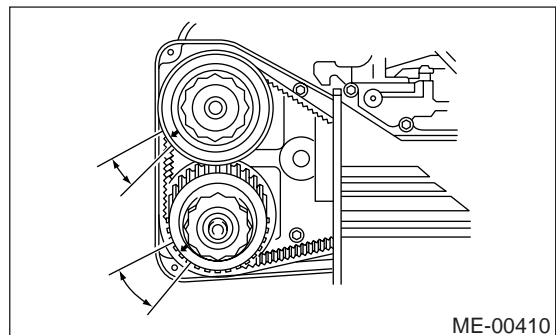
- 13) If necessary, adjust the valve clearance. <Ref. to ME(H4DOSTC)-29, ADJUSTMENT, Valve Clearance.>

- 14) Further turn the crankshaft pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.

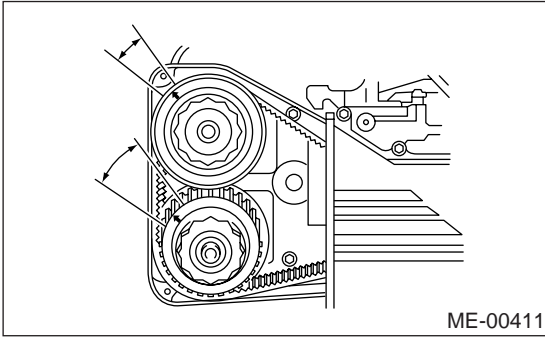
- (1) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



- (2) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



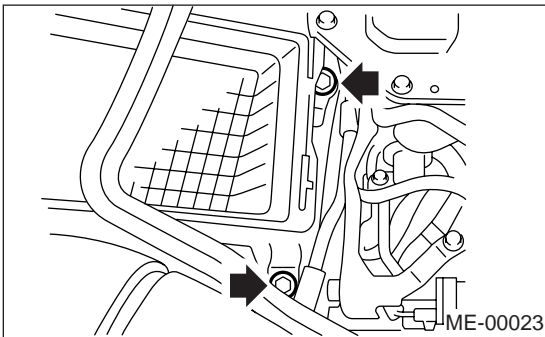
(3) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



15) After inspection, install the related parts in the reverse order of removal.

Tightening torque:

32 N·m (3.3 kgf·m, 24 ft·lb)



B: ADJUSTMENT

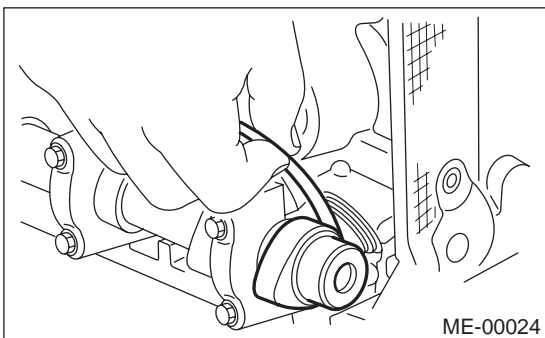
CAUTION:

Adjustment of the valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to ME(H4DOSTC)-27, INSPECTION, Valve Clearance.>

NOTE:

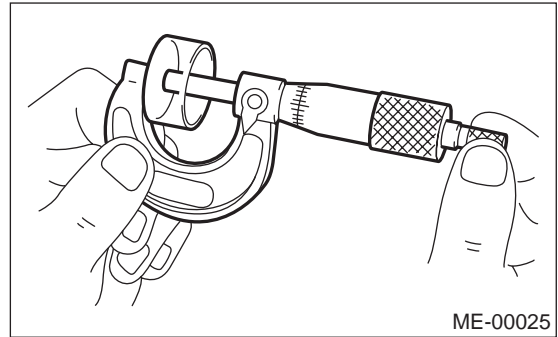
Record each valve clearance after it has been measured.



2) Remove the camshaft. <Ref. to ME(H4DOSTC)-57, REMOVAL, Camshaft.>

3) Remove the valve lifter.

4) Measure the thickness of valve lifter with a micrometer.



5) Select a shim of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

6) Set the suitable shim selected in step 4) to valve lifter.

Unit: mm	
Intake valve:	$S = (V + T) - 0.20$
Exhaust valve:	$S = (V + T) - 0.25$
S:	Valve lifter thickness to be used
V:	Measured valve clearance
T:	Shim thickness required

Part No.	Thickness mm (in)
13228 AB101	4.68 (0.1843)
13228 AB111	4.69 (0.1846)
13228 AB121	4.70 (0.1850)
13228 AB131	4.71 (0.1854)
13228 AB141	4.72 (0.1858)
13228 AB151	4.73 (0.1862)
13228 AB161	4.74 (0.1866)
13228 AB171	4.75 (0.1870)
13228 AB181	4.76 (0.1874)
13228 AB191	4.77 (0.1878)
13228 AB201	4.78 (0.1882)
13228 AB211	4.79 (0.1886)
13228 AB221	4.80 (0.1890)
13228 AB231	4.81 (0.1894)
13228 AB241	4.82 (0.1898)
13228 AB251	4.83 (0.1902)
13228 AB261	4.84 (0.1906)
13228 AB271	4.85 (0.1909)
13228 AB281	4.86 (0.1913)
13228 AB291	4.87 (0.1917)
13228 AB301	4.88 (0.1921)
13228 AB311	4.89 (0.1925)
13228 AB321	4.90 (0.1929)
13228 AB331	4.91 (0.1933)
13228 AB341	4.92 (0.1937)
13228 AB351	4.93 (0.1941)

VALVE CLEARANCE

MECHANICAL

Part No.	Thickness mm (in)
13228 AB361	4.94 (0.1945)
13228 AB371	4.95 (0.1949)
13228 AB381	4.96 (0.1953)
13228 AB391	4.97 (0.1957)
13228 AB401	4.98 (0.1961)
13228 AB411	4.99 (0.1965)
13228 AB421	5.00 (0.1969)
13228 AB431	5.01 (0.1972)
13228 AB441	5.02 (0.1976)
13228 AB451	5.03 (0.1980)
13228 AB461	5.04 (0.1984)
13228 AB471	5.05 (0.1988)
13228 AB481	5.06 (0.1992)
13228 AB491	5.07 (0.1996)
13228 AB501	5.08 (0.2000)
13228 AB511	5.09 (0.2004)
13228 AB521	5.10 (0.2008)
13228 AB531	5.11 (0.2012)
13228 AB541	5.12 (0.2016)
13228 AB551	5.13 (0.2020)
13228 AB561	5.14 (0.2024)
13228 AB571	5.15 (0.2028)
13228 AB581	5.16 (0.2031)
13228 AB591	5.17 (0.2035)
13228 AB601	5.18 (0.2039)
13228 AB611	5.19 (0.2043)
13228 AB621	5.20 (0.2047)
13228 AB631	5.21 (0.2051)
13228 AB641	5.22 (0.2055)
13228 AB651	5.23 (0.2059)
13228 AB661	5.24 (0.2063)
13228 AB671	5.25 (0.2067)
13228 AB681	5.26 (0.2071)
13228 AB691	5.27 (0.2075)
13228 AB701	4.38 (0.1724)
13228 AB711	4.40 (0.1732)
13228 AB721	4.42 (0.1740)
13228 AB731	4.44 (0.1748)
13228 AB741	4.46 (0.1756)
13228 AB751	4.48 (0.1764)
13228 AB761	4.50 (0.1771)
13228 AB771	4.52 (0.1780)
13228 AB781	4.54 (0.1787)
13228 AB791	4.56 (0.1795)
13228 AB801	4.58 (0.1803)
13228 AB811	4.60 (0.1811)
13228 AB821	4.62 (0.1819)
13228 AB831	4.64 (0.1827)
13228 AB841	4.66 (0.1835)
13228 AB851	5.29 (0.2083)
13228 AB861	5.31 (0.2091)

Part No.	Thickness mm (in)
13228 AB871	5.33 (0.2098)
13228 AB881	5.35 (0.2106)
13228 AB891	5.37 (0.2114)
13228 AB901	5.39 (0.2122)
13228 AB911	5.41 (0.2123)
13228 AB921	5.43 (0.2138)
13228 AB931	5.45 (0.2146)
13228 AB941	5.47 (0.2154)
13228 AB951	5.49 (0.2161)
13228 AB961	5.51 (0.2169)
13228 AB971	5.53 (0.2177)
13228 AB981	5.55 (0.2185)
13228 AB991	5.57 (0.2193)
13228 AC001	5.59 (0.2201)
13228 AC011	5.61 (0.2209)
13228 AC021	5.63 (0.2217)
13228 AC031	5.65 (0.2224)

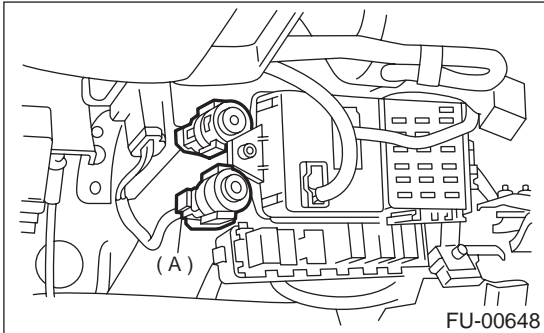
7) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.

8) After inspection, install the related parts in the reverse order of removal.

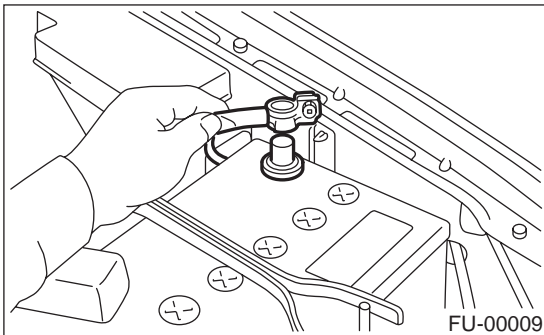
9. Engine Assembly

A: REMOVAL

- 1) Set the vehicle on lift arms.
- 2) Open the front hood fully, and then support with the hood stay.
- 3) Collect the refrigerant from A/C system. <Ref. to AC-23, Refrigerant Recovery Procedure.>
- 4) Release the fuel pressure.
 - (1) Disconnect the fuel pump relay (A) connector.

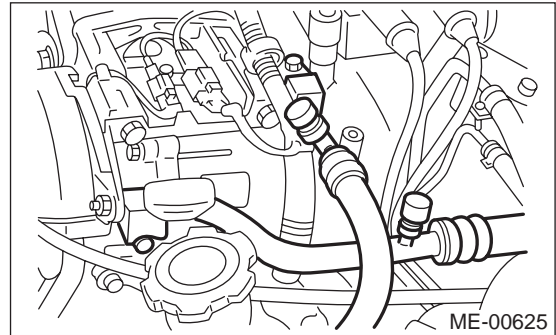


- (2) Start the engine, and run until stalls.
- (3) After the engine stalls, crank it for 5 seconds more.
- (4) Turn the ignition switch to OFF.
- 5) Remove the filler cap.
- 6) Disconnect the ground cable from battery.

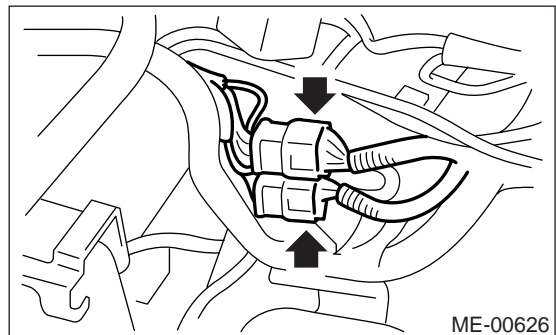


- 7) Remove the radiator from vehicle. <Ref. to CO(H4DOSTC)-23, REMOVAL, Radiator.>
- 8) Remove the coolant filler tank. <Ref. to CO(H4DOSTC)-33, REMOVAL, Coolant Filler Tank.>

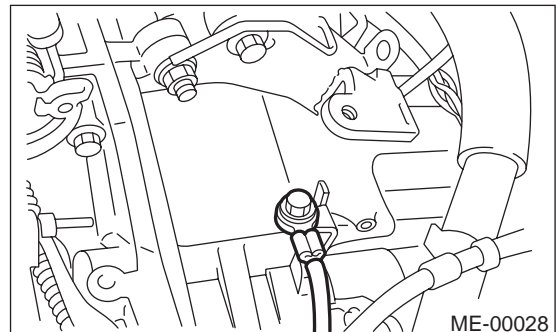
- 9) Disconnect the A/C pressure hoses from A/C compressor.



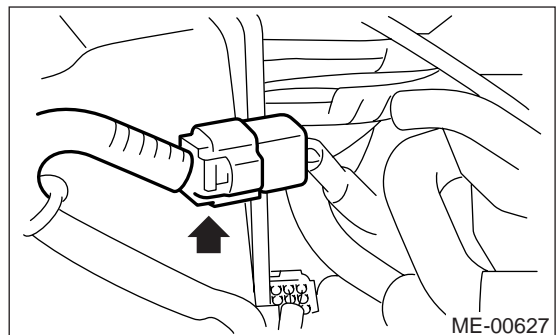
- 10) Remove the intercooler. <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 11) Disconnect the following connectors and cable.
 - (1) Engine harness connector



- (2) Engine ground terminal



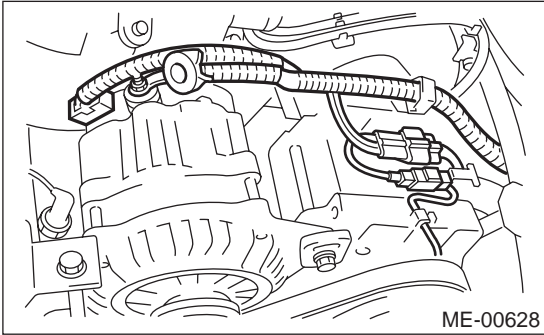
- (3) Engine harness connector



ENGINE ASSEMBLY

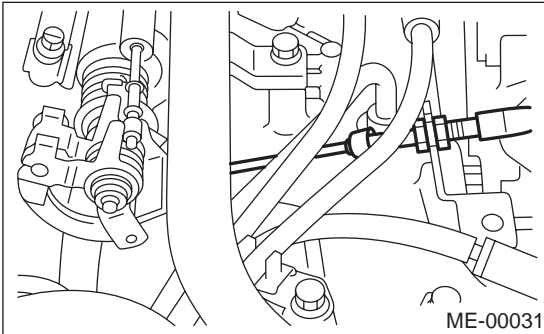
MECHANICAL

- (4) Generator connector, terminal and A/C compressor connectors

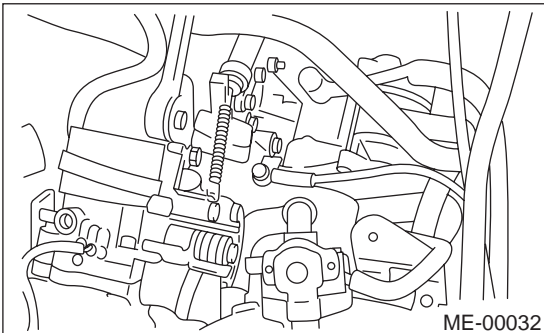


- (A) A/C compressor connector
(B) Generator connector and terminal

- (5) Accelerator cable (MT vehicles)

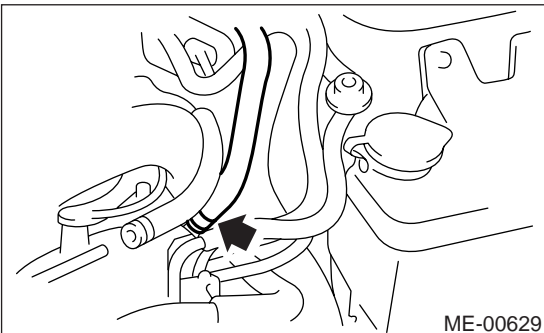


- (6) Clutch release spring (MT vehicles)

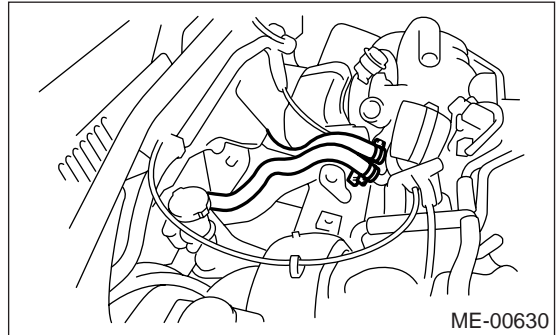


- 12) Disconnect the following hoses.

- (1) Brake booster vacuum hose



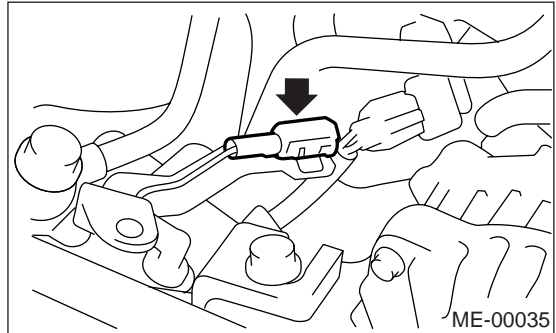
- (2) Heater inlet outlet hose



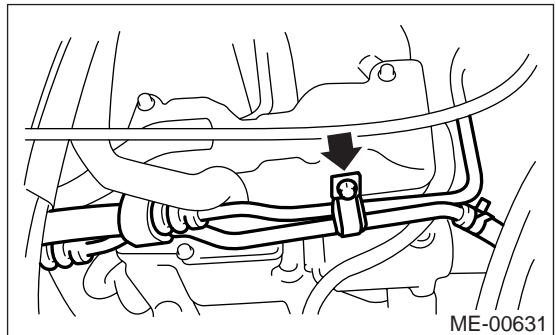
- 13) Remove the power steering pump from bracket.

- (1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>

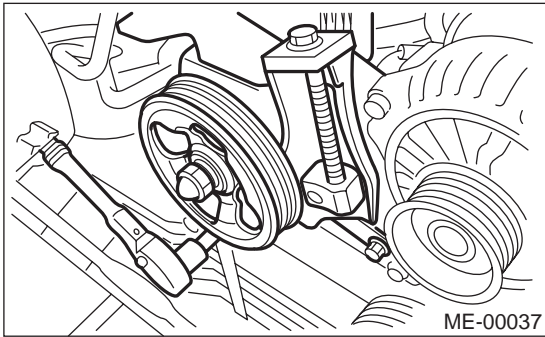
- (2) Disconnect the power steering switch connector.



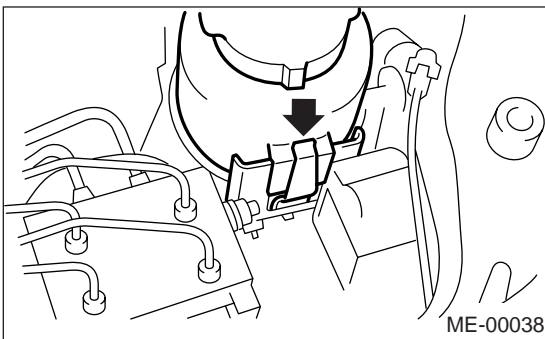
- (3) Remove the pipe with bracket from intake manifold.



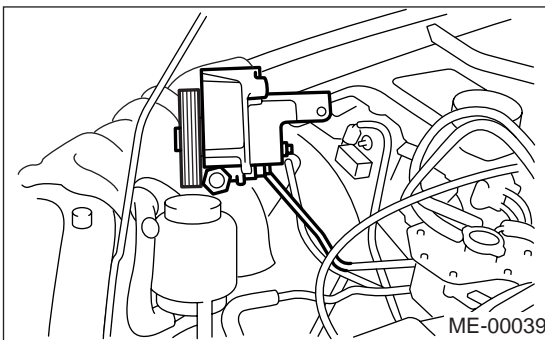
(4) Remove the power steering pump from engine.



(5) Remove the power steering tank from bracket by pulling it upward.



(6) Place the power steering pump on right side wheel apron.

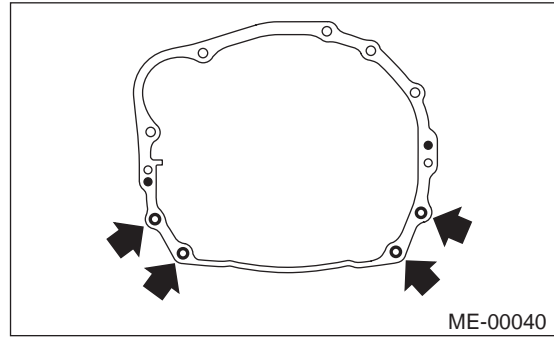


14) Lift-up the vehicle.

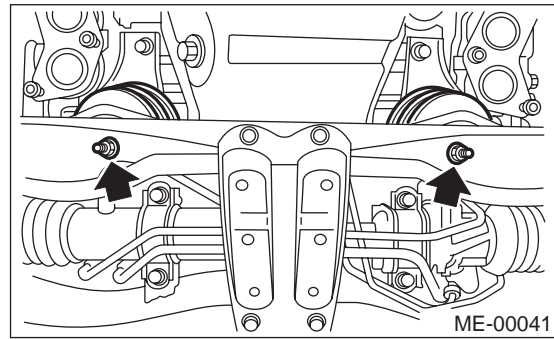
15) Remove the ATF cooler pipe from frame. (AT vehicles)

16) Remove the center exhaust pipe. <Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>

17) Remove the nuts which hold lower side of transmission to engine.



18) Remove the nuts which install front cushion rubber onto front crossmember.

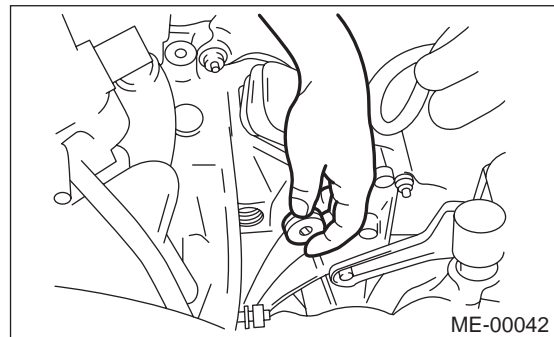


19) Lower the vehicle.

20) Separate the clutch release fork from release bearing. (MT vehicles)

(1) Remove the clutch operating cylinder from transmission.

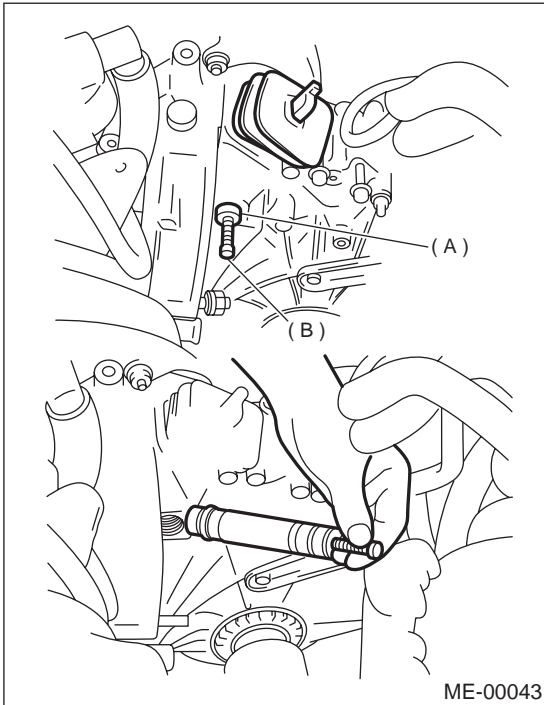
(2) Remove the plug using a 10 mm hexagon wrench.



ENGINE ASSEMBLY

MECHANICAL

(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.



- (A) Shaft
- (B) Bolt

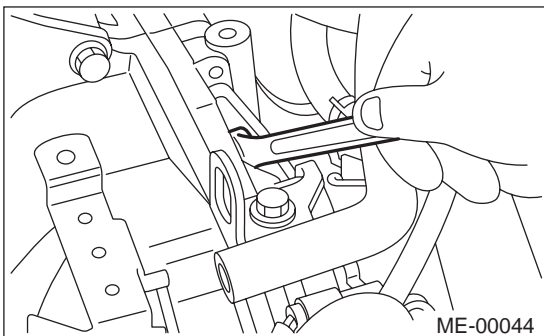
(4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

NOTE:

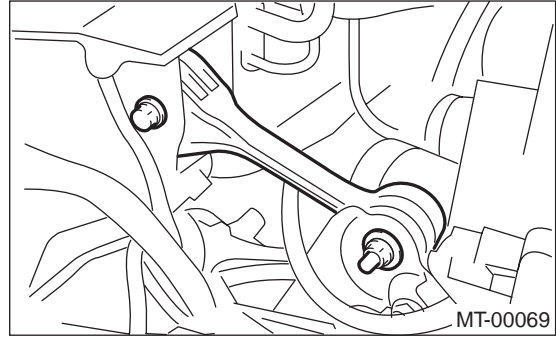
Step (4) is required to prevent interference with engine when removing the engine from transmission.

21) Separate the torque converter clutch from drive plate. (AT vehicles)

- (1) Lower the vehicle.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold torque converter clutch to drive plate.
- (4) Remove the other bolts while rotating the engine using socket wrench.



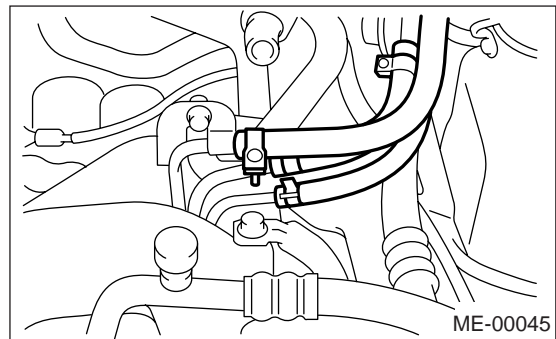
22) Remove the pitching stopper.



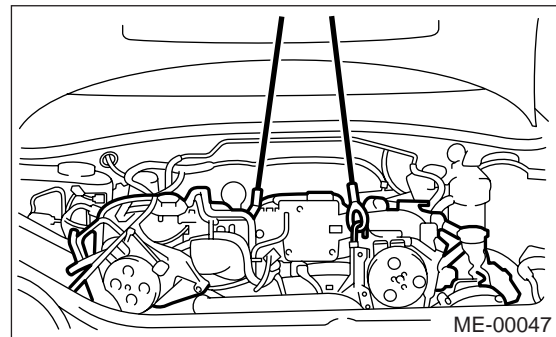
23) Disconnect the fuel delivery hose, return hose and evaporation hose.

NOTE:

- Catch fuel from the hose into container.
- Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



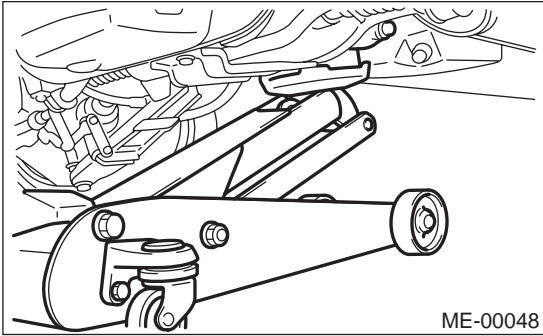
24) Support the engine with a lifting device and wire ropes.



25) Support the transmission with a garage jack.

NOTE:

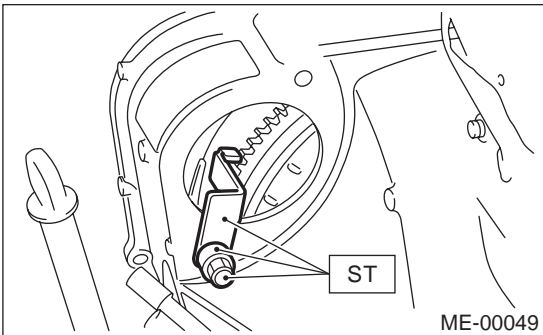
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate reinstallation and because transmission lowers under its own weight.



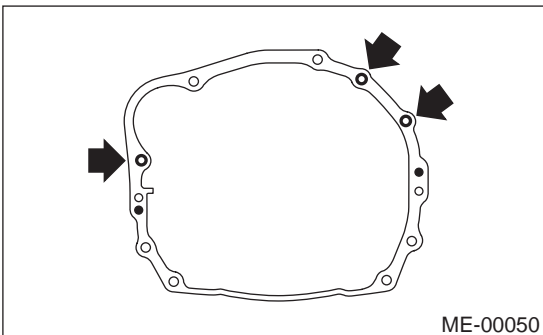
26) Separation of the engine and transmission.

- (1) Remove the starter. <Ref. to SC(H4DOSTC)-6, REMOVAL, Starter.>
- (2) Install the ST to torque converter clutch case. (AT vehicles)

ST 498277200 STOPPER SET



(3) Remove the bolts which hold right upper side of transmission to engine.



27) Remove the engine from vehicle.

- (1) Slightly raise the engine.
- (2) Raise the transmission with garage jack.
- (3) Move the engine horizontally until the main-shaft is withdrawn from clutch cover.
- (4) Slowly move the engine away from engine compartment.

NOTE:

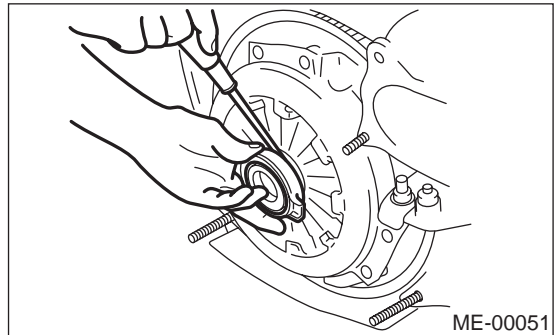
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

28) Remove the front cushion rubbers.

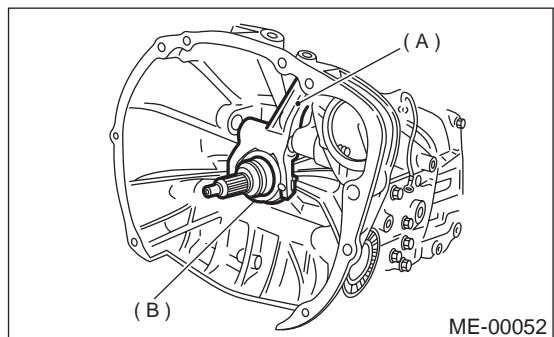
B: INSTALLATION

1) Install the clutch release fork and bearing onto transmission. (MT vehicles)

- (1) Remove the release bearing from clutch cover with flat type screw driver.



- (2) Install the release bearing on transmission.
- (3) Install the release fork into release bearing tab.

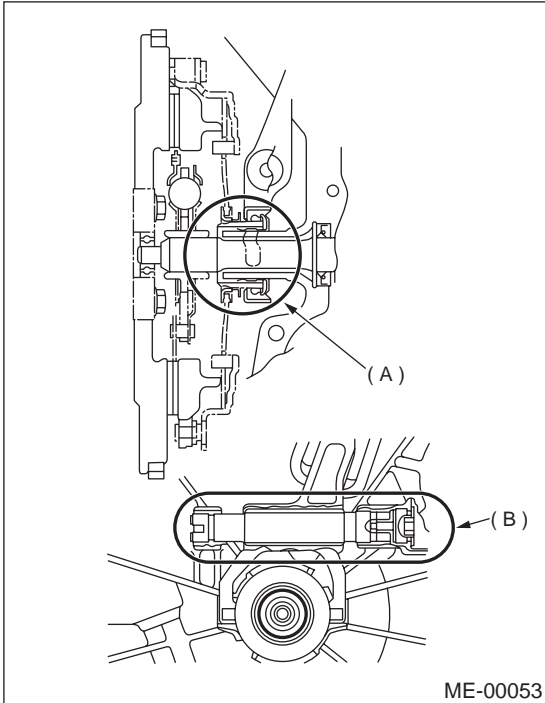


- (A) Release fork
- (B) Release bearing

ENGINE ASSEMBLY

MECHANICAL

- (4) Apply grease to the specified points.
- Spline FX2200
 - Shaft SUNLIGHT 2

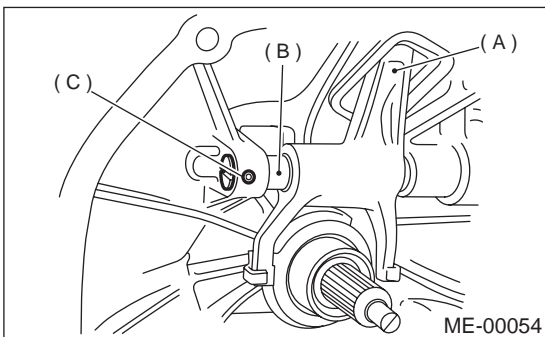


- (A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

- (5) Insert the release fork shaft into release fork.

NOTE:

Make sure the cutout portion of release fork shaft contacts spring pin.

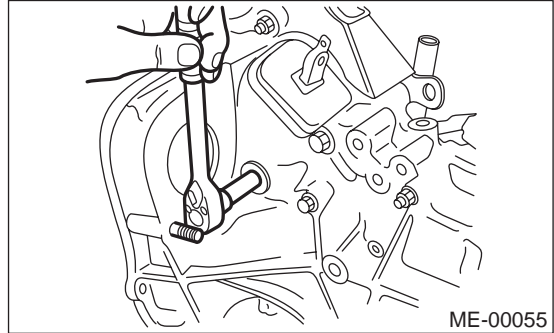


- (A) Release fork
(B) Release shaft
(C) Spring pin

- (6) Tighten the plug.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



- 2) Install the front cushion rubbers to engine.

Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

- 3) Install the engine onto transmission.

- (1) Position the engine in engine compartment, and then align it with the transmission.

NOTE:

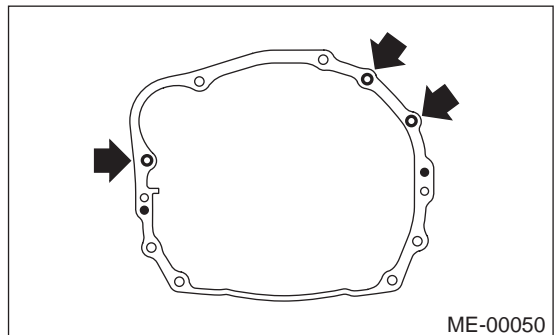
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

- (2) Apply a small amount of grease to the splines of mainshaft. (MT vehicles)

- 4) Tighten the bolts which hold right upper side of transmission to engine.

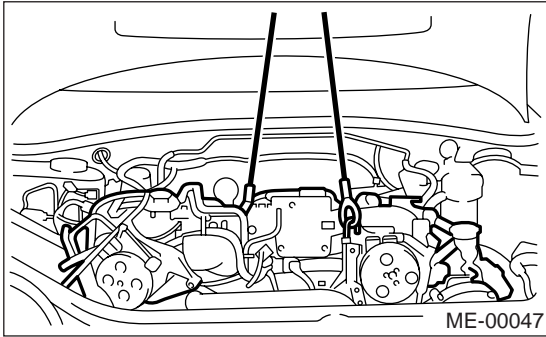
Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



- 5) Remove the lifting device and wire ropes.

6) Remove the garage jack.

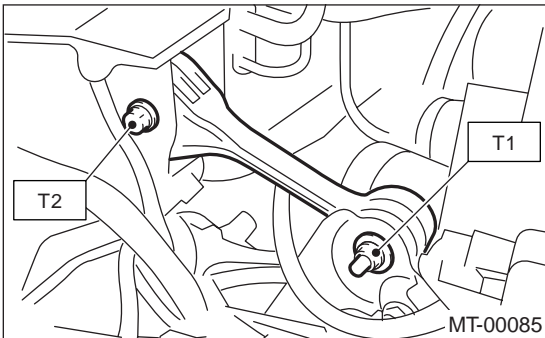


7) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



8) Remove the ST from torque converter clutch case. (AT vehicles)

NOTE:

Be careful not to drop the ST into torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC(H4DOSTC)-6, INSTALLATION, Starter.>

10) Install the torque converter clutch onto drive plate. (AT vehicles)

(1) Tighten the bolts which hold torque converter clutch to drive plate.

(2) Tighten other bolts while rotating the engine by using ST.

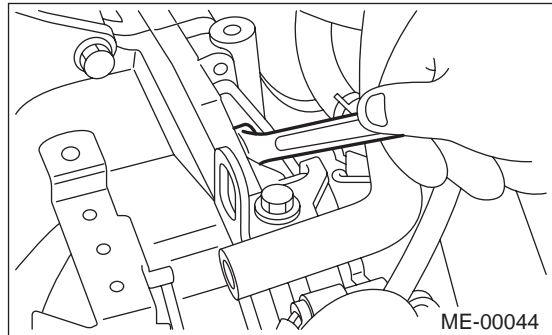
NOTE:

Be careful not to drop bolts into the torque converter clutch housing.

ST 499977300 CRANK PULLEY WRENCH

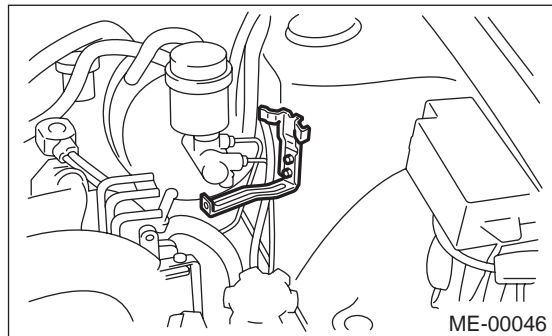
Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



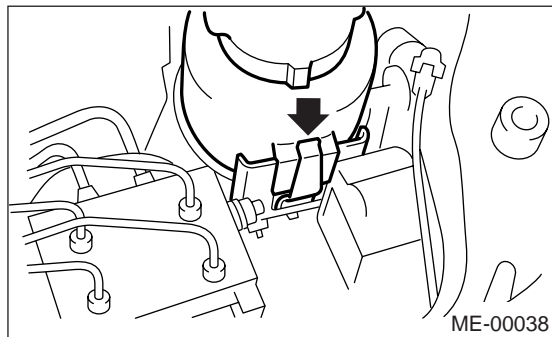
(3) Clog the service hole with plug.

11) Install the fuel filter and bracket.



12) Install the power steering pump on bracket.

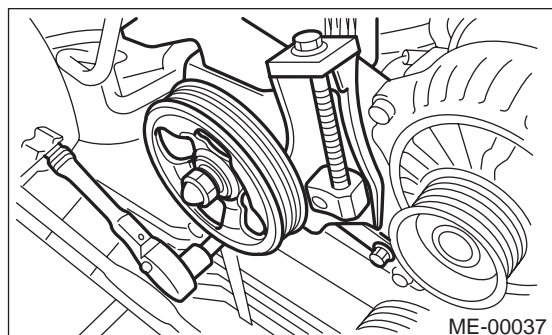
(1) Install the power steering tank on bracket.



(2) Install the power steering pump.

Tightening torque:

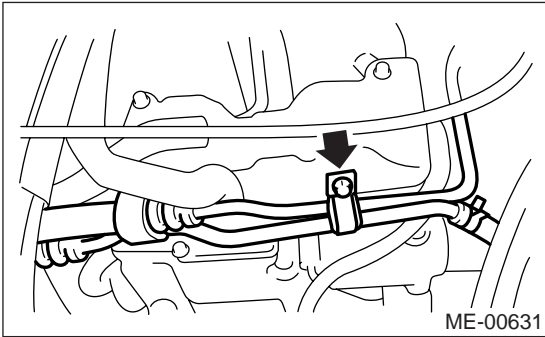
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



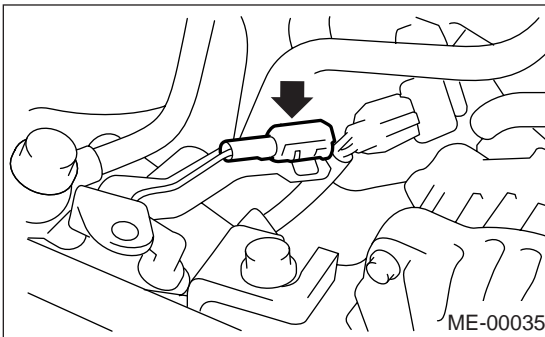
ENGINE ASSEMBLY

MECHANICAL

- (3) Install the power steering pipe bracket on right side intake manifold.



- (4) Connect the power steering switch connector.



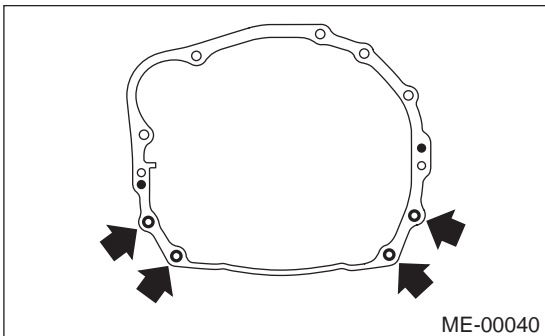
- (5) Install the front side V-belt, and adjust it.
<Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

- 13) Lift-up the vehicle.

- 14) Tighten the nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)



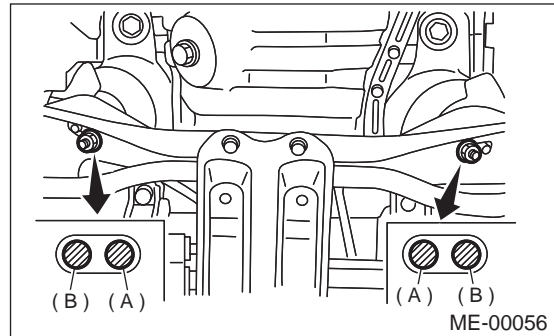
- 15) Tighten the nuts which install front cushion rubber onto crossmember.

Tightening torque:

83 N·m (8.5 kgf·m, 61 ft·lb)

NOTE:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



- 16) Install the ATF cooler pipe to frame. (AT vehicles)

- 17) Install the center exhaust pipe.

<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>

- 18) Lower the vehicle.

- 19) Connect the following hoses:

- (1) Fuel delivery hose, return hose and evaporation hose
- (2) Heater inlet and outlet hoses
- (3) Brake booster vacuum hose

- 20) Connect the following connectors and terminals:

- (1) Engine ground terminal
- (2) Engine harness connectors
- (3) Generator connector and terminal
- (4) A/C compressor connectors

- 21) Connect the following cables:

- (1) Accelerator cable
- (2) Clutch release spring

- 22) After connecting each cable, adjust them.

- 23) Install the air intake system.

- (1) Install the intercooler. <Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

- (2) Install the air cleaner element and air cleaner upper cover.

- (3) Install the engine harness connector bracket.

- (4) Install the filler hose to air cleaner case.

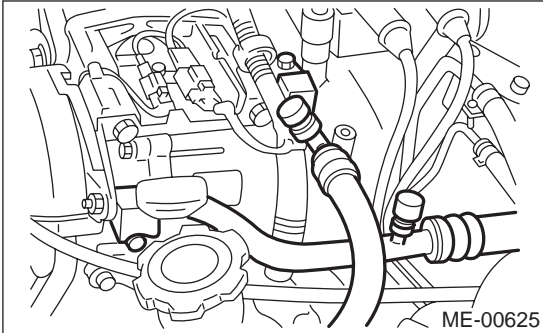
24) Install the A/C pressure hoses.

NOTE:

Use new O-rings.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



25) Install the radiator. <Ref. to CO(H4DOSTC)-24, INSTALLATION, Radiator.>

26) Install the coolant filler tank. <Ref. to CO(H4DOSTC)-33, INSTALLATION, Coolant Filler Tank.>

27) Install the window washer tank.

28) Install the battery in the vehicle, and connect cables.

29) Fill coolant. <Ref. to CO(H4DOSTC)-15, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

30) Charge the A/C system with refrigerant. <Ref. to AC-24, OPERATION, Refrigerant Charging Procedure.>

31) Remove the front hood stay, and close the front hood.

32) Take off the vehicle from lift arms.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(H4DOSTC)-31, REMOVAL, Engine Assembly.>

2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Engine mounting;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

C: INSPECTION

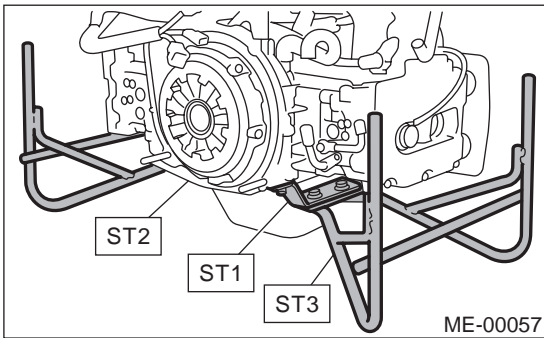
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

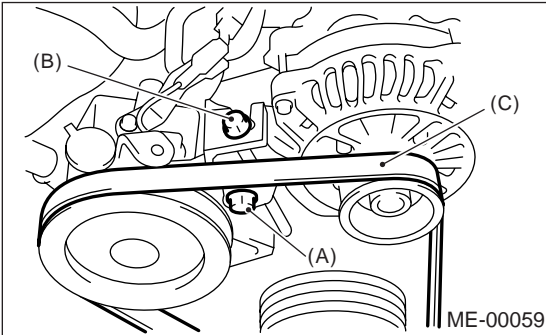
A: REMOVAL

1. FRONT SIDE BELT

NOTE:

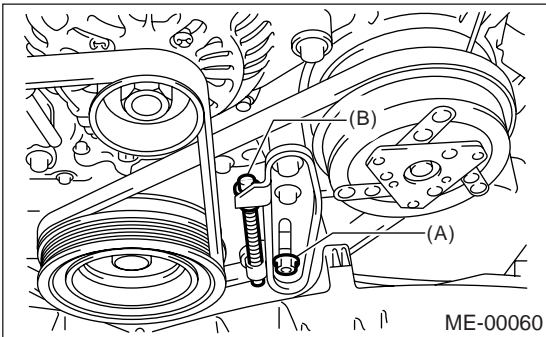
Perform the following procedures 1) to 4) with the engine installed to the body.

- 1) Remove the V-belt cover.
- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).

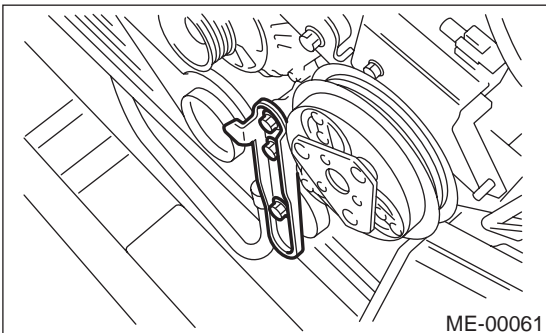


2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



- 3) Remove the A/C belt.
- 4) Remove the A/C belt tensioner.



B: INSTALLATION

1. FRONT SIDE BELT

CAUTION:

Wipe off any oil or water on the belt and pulley.

- 1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4DOSTC)-43, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

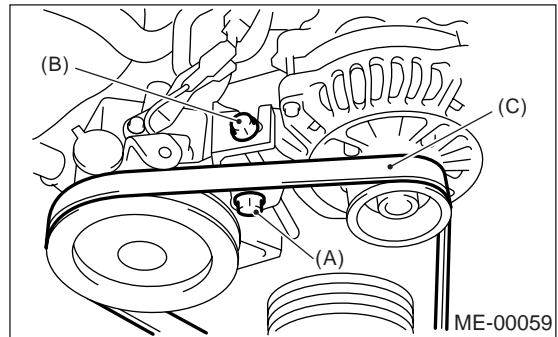
Tightening torque:

Lock bolt through bolt:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

Slider bolt:

8 N·m (0.8 kgf-m, 5.5 ft-lb)



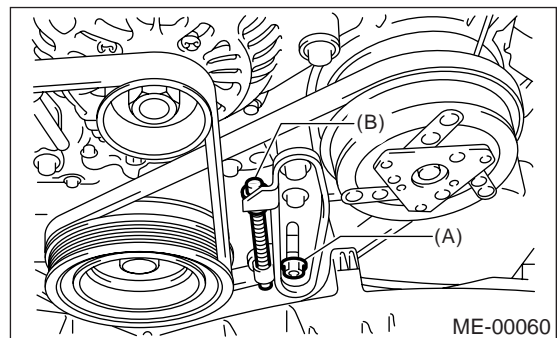
2. REAR SIDE BELT

- 1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOSTC)-43, INSPECTION, V-belt.>
- 2) Tighten the lock nut (A).

Tightening torque:

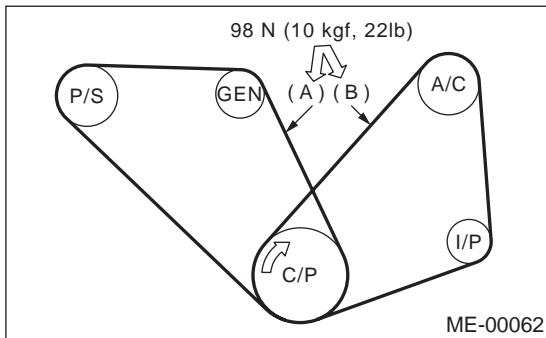
Lock nut (A);

22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



C: INSPECTION

- 1) Replace the belts, if cracks, fraying or wear is found.
- 2) Check the drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension**(A)****replaced: 7 — 9 mm (0.276 — 0.354 in)****reused: 9 — 11 mm (0.354 — 0.433 in)****(B)*****replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)****reused: 9.0 — 10.0 mm (0.354 — 0.394 in)*****: with air conditioner**

C/P Crankshaft pulley

GEN Generator

P/S Power steering oil pump pulley

A/C Air conditioning compressor pulley

I/P Idler pulley

CRANKSHAFT PULLEY

MECHANICAL

13. Crankshaft Pulley

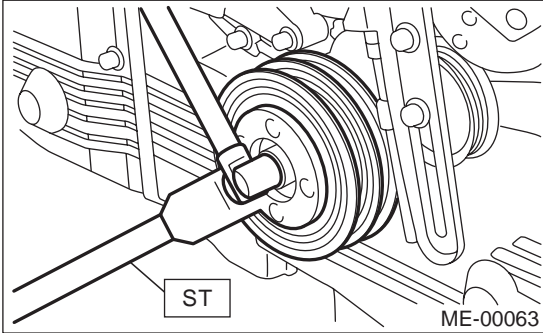
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>

2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH (MT vehicles)

ST 499977400 CRANKSHAFT PULLEY WRENCH (AT vehicles)



3) Remove the crankshaft pulley.

B: INSTALLATION

1. MT MODEL

1) Install the crankshaft pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.

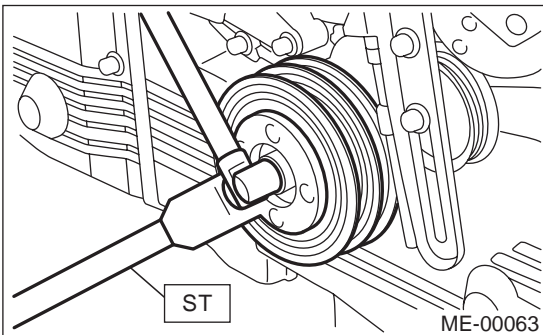
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(4) Tighten the crankshaft pulley bolts.

Tightening torque:

177 N·m (18.0 kgf·m, 130.2 ft·lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 65 degrees or more. If not, conduct the following procedures (1) through (4).

(1) Replace the crankshaft pulley bolts.

Crankshaft pulley bolt:

12369AA011

(2) Clean the crankshaft thread using an air gun.

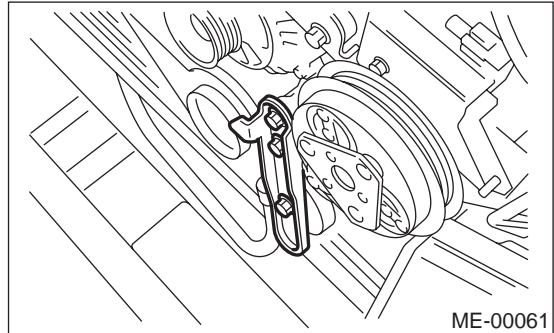
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(4) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

NOTE:

Conduct the tightening procedures by confirming the turning angle of the crankshaft pulley bolt referring to the gauge indicated on the belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

2. AT MODEL

1) Install the crankshaft pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977400 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.

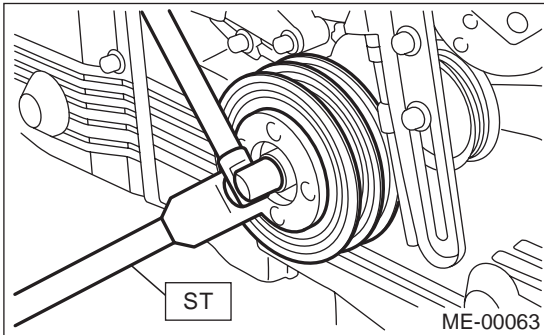
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(4) Tighten the crankshaft pulley bolts.

Tightening torque:

127 N·m (13 kgf-m, 94.0 ft-lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 45 degrees or more. If the confirmed value is less than 45 degrees, conduct the following procedures (1) through (4).

- (1) Replace the crankshaft pulley bolts.

Crankshaft pulley bolt:

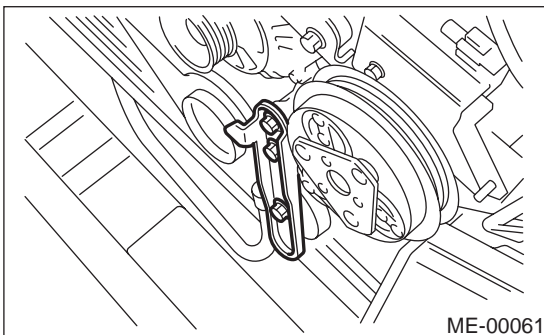
12369AA011

- (2) Clean the crankshaft thread using an air gun.
- (3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
- (4) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

NOTE:

Conduct the tightening procedures by confirming the turning angle of the crankshaft pulley bolt referring to the gauge indicated on the belt cover.

- 4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

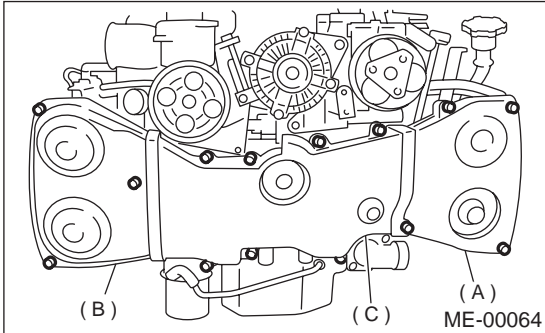
C: INSPECTION

- 1) Make sure the V-belt is not worn or otherwise damaged.
- 2) Check the tension of the belt. <Ref. to ME(H4DOSTC)-43, INSPECTION, V-belt.>

14. Belt Cover

A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4DOSTC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover (LH) (A).
- 4) Remove the belt cover (RH) (B).
- 5) Remove the front belt cover (C).



B: INSTALLATION

- 1) Install the front belt cover (C).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

- 2) Install the belt cover (RH) (B).

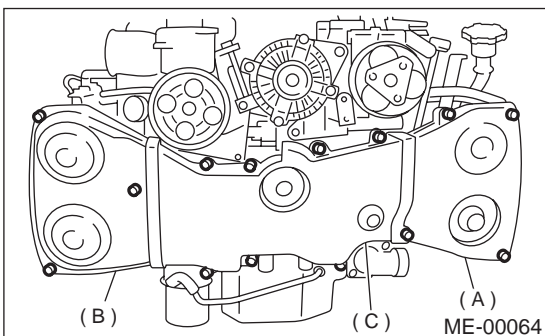
Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

- 3) Install the belt cover (LH) (A).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



- 4) Install the crankshaft pulley. <Ref. to ME(H4DOSTC)-44, INSTALLATION, Crankshaft Pulley.>
- 5) Install the V-belt. <Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

C: INSPECTION

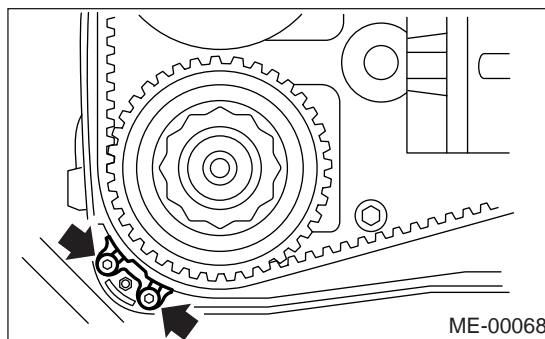
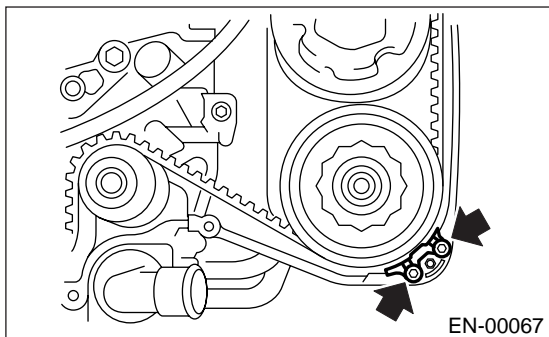
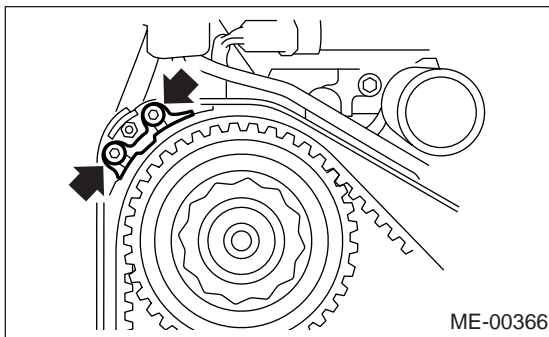
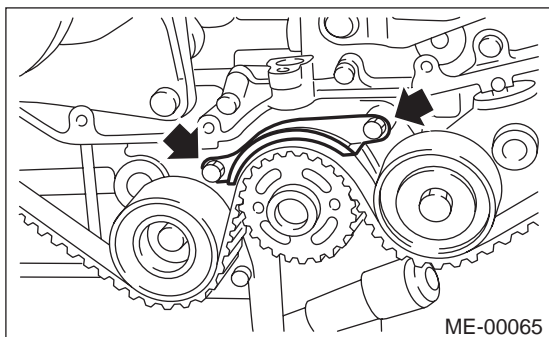
Make sure the cover is not damaged.

15. Timing Belt Assembly

A: REMOVAL

1. TIMING BELT

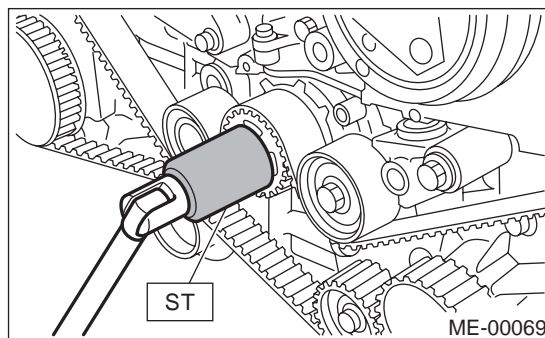
- 1) Remove the V-belt.
<Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley.
<Ref. to ME(H4DOSTC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover.
<Ref. to ME(H4DOSTC)-46, REMOVAL, Belt Cover.>
- 4) Remove the timing belt guide. (MT vehicles)



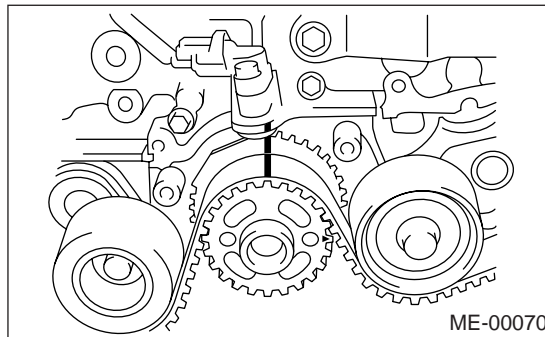
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:

- (1) Turn the crankshaft using ST, and align the alignment marks on crankshaft sprocket, intake camshaft sprocket (LH), exhaust camshaft sprocket (LH), intake camshaft sprocket (RH) and exhaust camshaft sprocket (RH) with notches of belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET

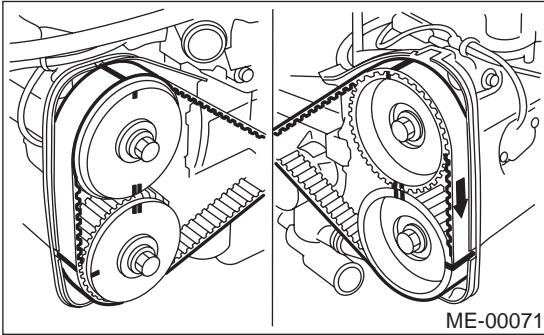


- (2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.

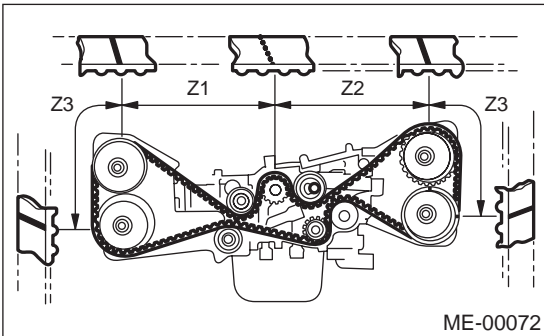


TIMING BELT ASSEMBLY

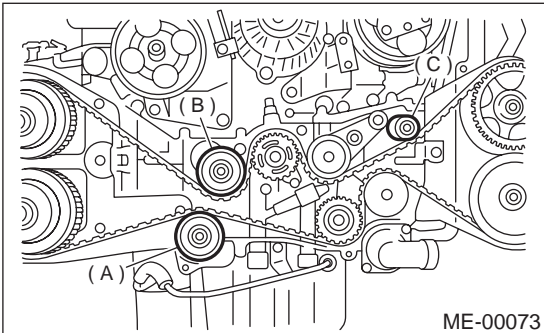
MECHANICAL



Z_1 : 54.5 tooth length
 Z_2 : 51 tooth length
 Z_3 : 28 tooth length



6) Remove the belt idler (A).



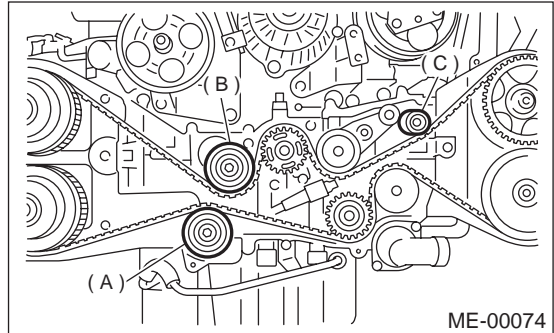
7) Remove the timing belt.

CAUTION:

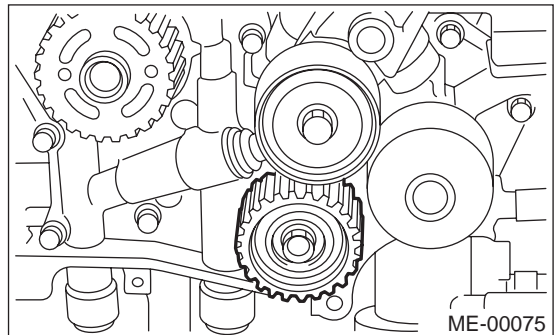
After the timing belt has been removed, never rotate the intake and exhaust, camshaft sprocket. If the camshaft sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

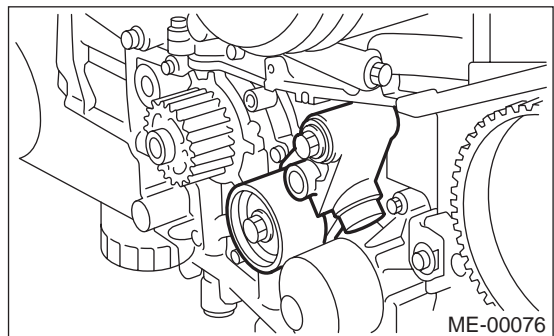
1) Remove the belt idler (B) and (C).



2) Remove the belt idler No. 2.



3) Remove the automatic belt tension adjuster assembly.



B: INSTALLATION

1. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

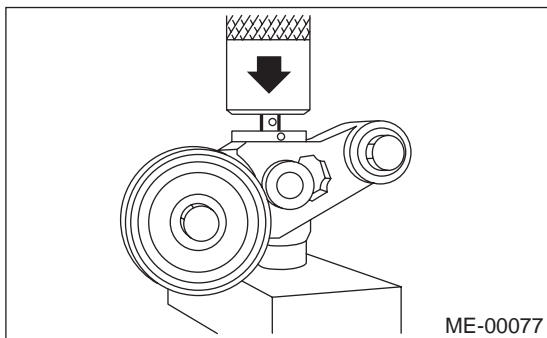
1) Preparation for installation of automatic belt tension adjuster assembly;

NOTE:

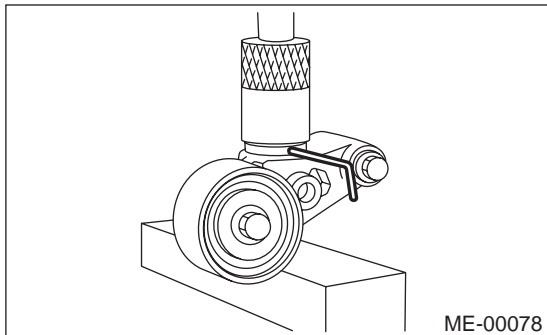
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kgf, 66 lb).
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
- Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- Do not release press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



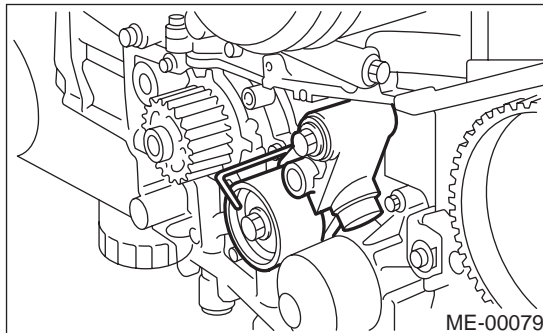
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



2) Install automatic belt tension adjuster assembly.

Tightening torque:

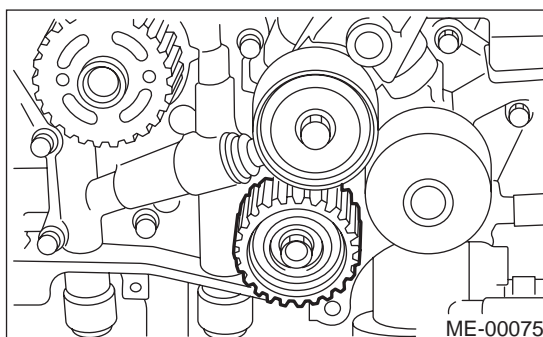
39 N·m (4.0 kgf·m, 28.9 ft·lb)



3) Install belt idler No. 2.

Tightening torque:

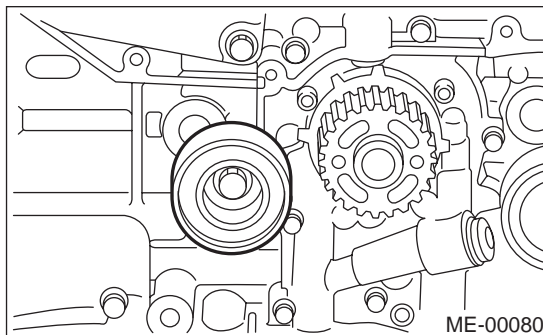
39 N·m (4.0 kgf·m, 28.9 ft·lb)



4) Install the belt idler.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)



2. TIMING BELT

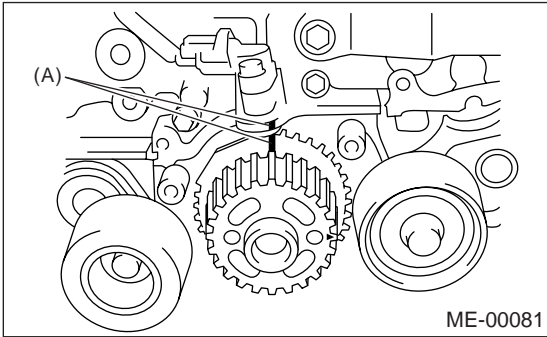
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOSTC)-49, TIMING BELT, INSTALLATION, Timing Belt Assembly.>

2) Crankshaft and camshaft sprocket alignment.

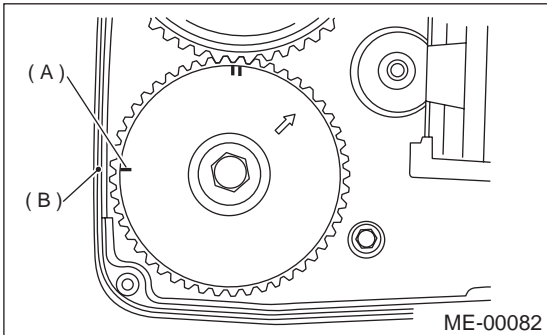
TIMING BELT ASSEMBLY

MECHANICAL

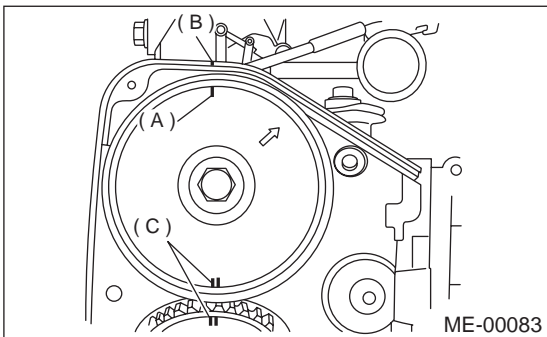
(1) Align mark (A) on the crankshaft sprocket with mark on the oil pump cover at cylinder block.



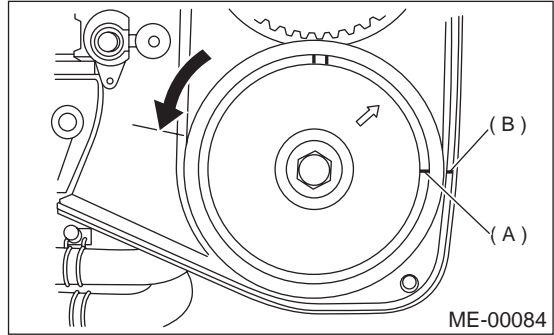
(2) Align single line mark (A) on the exhaust camshaft sprocket (RH) with notch (B) on belt cover.



(3) Align single line mark (A) on the intake camshaft sprocket (RH) with notch (B) on belt cover. (Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)

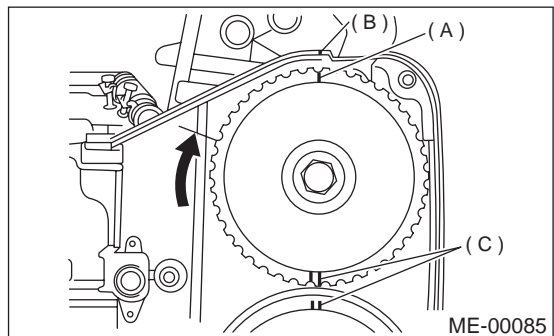


(4) Align single line mark (A) on exhaust camshaft sprocket (LH) with notch (B) on belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



(5) Align the single line mark (A) on intake camshaft sprocket (LH) with notch (B) on belt cover by turning the sprocket clockwise (as viewed from front of engine).

Ensure the double lines (C) on intake and exhaust camshaft sprockets are aligned.

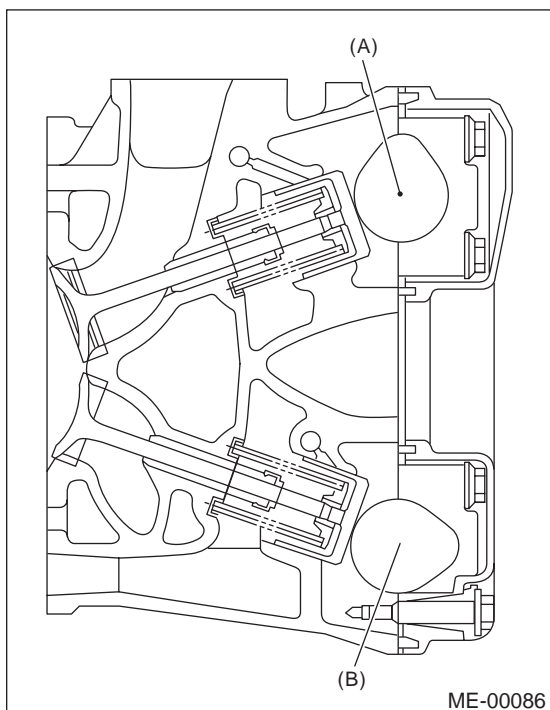


(6) Ensure the camshaft and crankshaft sprockets are positioned properly.

CAUTION:

- Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted

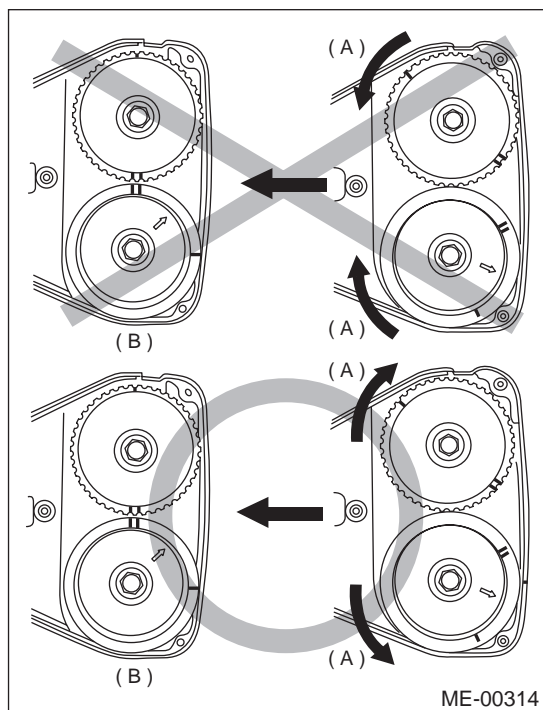
simultaneously, their heads will interfere with each other, resulting in bent valves.



(A) Intake camshaft
(B) Exhaust camshaft

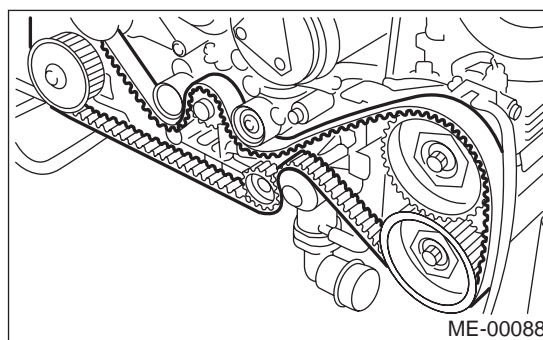
- When the timing belts are not installed, four camshafts are held at the “zero-lift” position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
- When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of left-hand camshafts are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Right-side camshafts are held so that their cams do not push valves down.
- Left-hand camshafts must be rotated from the “zero-lift” position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
- Do not allow the camshafts to rotate in the direction shown in the figure as this causes both

intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



(A) Rotating direction
(B) Timing belt installation position

3) Installation of timing belt:



Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure.

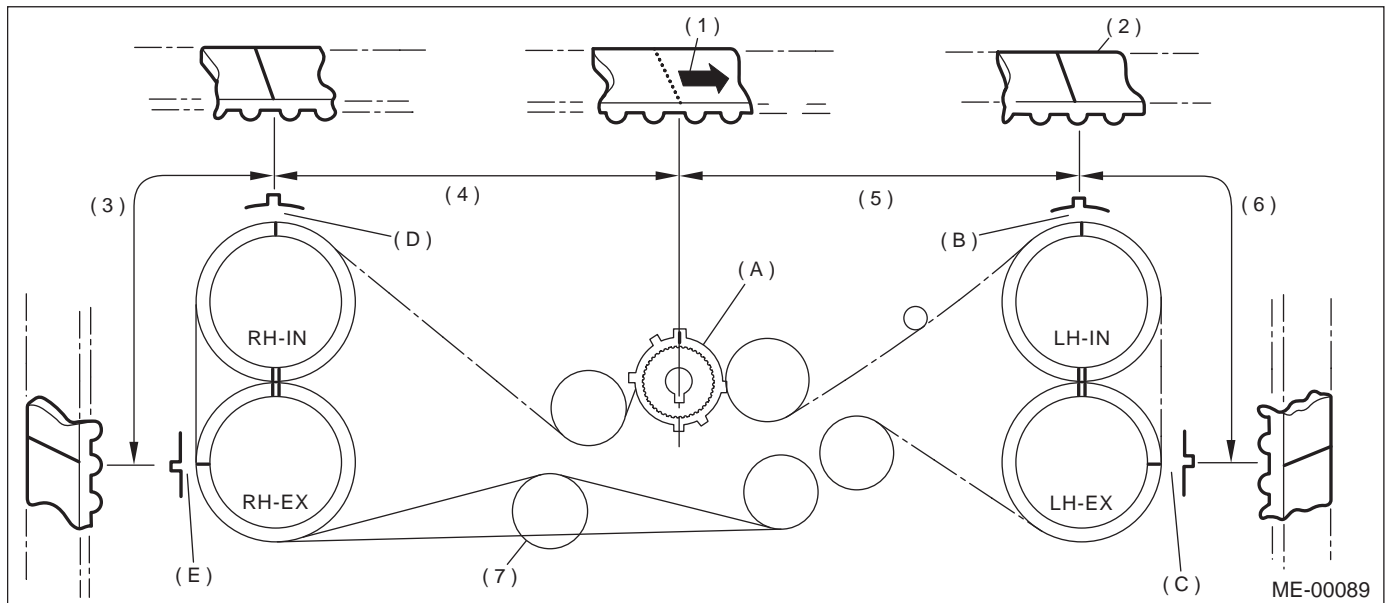
While aligning marks, position the timing belt properly.

CAUTION:

- Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
- Ensure the belt's rotating direction is correct.

TIMING BELT ASSEMBLY

MECHANICAL



- | | | |
|---------------------|-----------------------|---------------------------|
| (1) Arrow mark | (4) 54.5 tooth length | (7) Install it in the end |
| (2) Timing belt | (5) 51 tooth length | |
| (3) 28 tooth length | (6) 28 tooth length | |

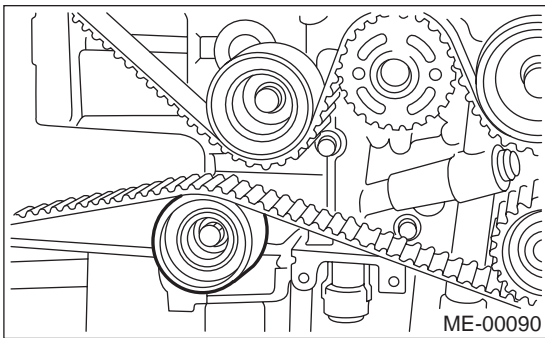
4) Install the belt idlers.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

Make sure that the marks on the timing belt and sprockets are aligned.



5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

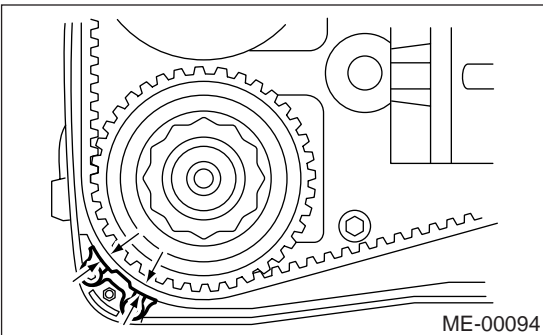
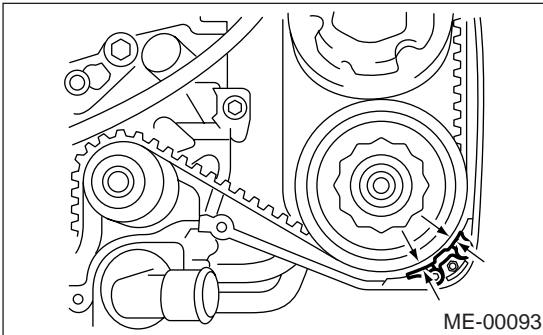
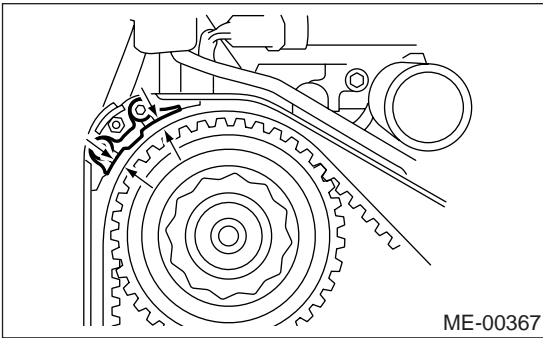
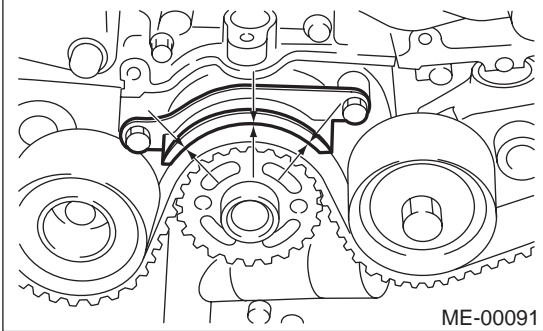
TIMING BELT ASSEMBLY

MECHANICAL

- 6) Install the timing belt guide. (MT vehicles)
(1) Temporarily tighten the bolts.
(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:

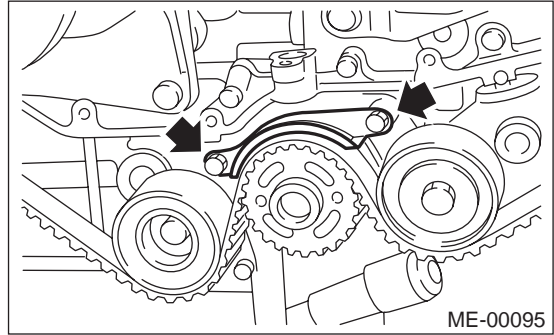
1.0 ± 0.5 mm (0.039 ± 0.020 in)



- (3) Tighten the bolts.

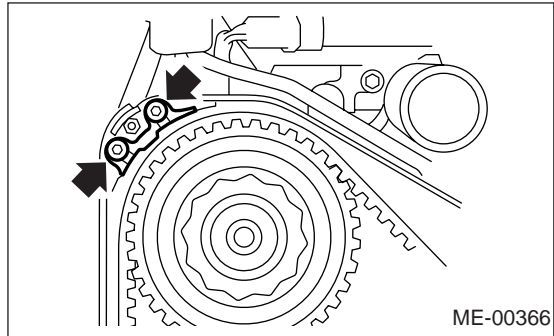
Tightening torque:

10 N·m (1.0 kgf·m, 7.2 ft·lb)



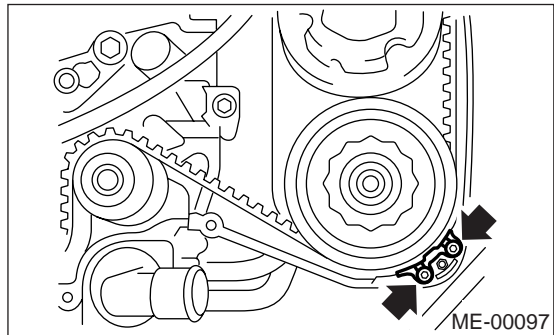
Tightening torque:

6.4 N·m (0.7 kgf·m, 5.1 ft·lb)



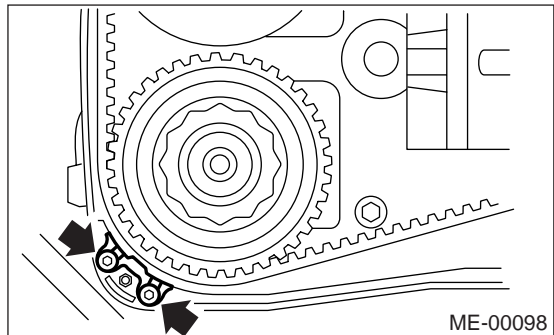
Tightening torque:

6.4 N·m (0.7 kgf·m, 5.1 ft·lb)



Tightening torque:

6.4 N·m (0.7 kgf·m, 5.1 ft·lb)



TIMING BELT ASSEMBLY

MECHANICAL

7) Install the belt cover.

<Ref. to ME(H4DOSTC)-46, INSTALLATION, Belt Cover.>

8) Install the crankshaft pulley.

<Ref. to ME(H4DOSTC)-44, INSTALLATION, Crankshaft Pulley.>

9) Install the V-belt.

<Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.

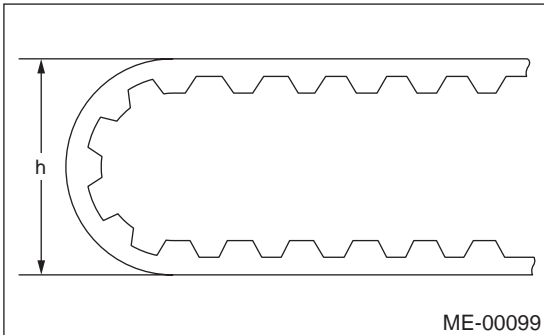
2) Check the condition of back side of belt; if any crack is found, replace the belt.

NOTE:

- Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
- Do not bend the belt sharply.

Bending radius: h

60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUST-ER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

NOTE:

Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check adjuster rod stiffness.

3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:

(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.

(2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check the adjuster rod stiffness.

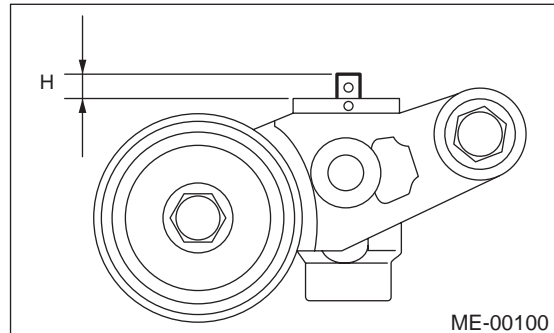
(3) If the the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

NOTE:

- Always use a vertical type pressing tool to move the adjuster rod down.
 - Do not use a lateral type vise.
 - Push the adjuster rod vertically.
 - Press-in the push adjuster rod gradually taking more than 3 minutes.
 - Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
 - Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- 4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H

5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.

2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.

3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

1) Check the idler for smooth rotation. Replace if noise or excessive play is noted.

2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.

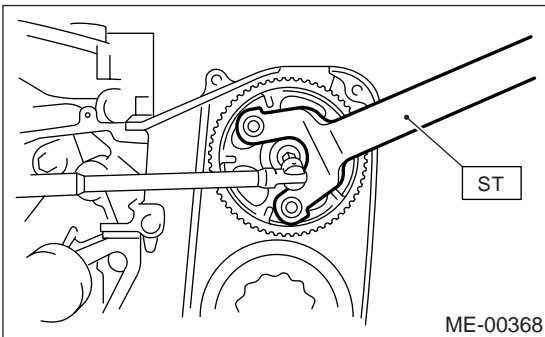
3) Check the idler for grease leakage.

16. Camshaft Sprocket

A: REMOVAL

- 1) Remove the V-belt.
<Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley.
<Ref. to ME(H4DOSTC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover.
<Ref. to ME(H4DOSTC)-46, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly.
<Ref. to ME(H4DOSTC)-47, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft position sensor.
<Ref. to FU(H4DOSTC)-30, REMOVAL, Camshaft Position Sensor.>
- 6) Remove the camshaft sprockets. To lock the camshaft, use ST.

- | | |
|---------------|---|
| ST 18231AA010 | CAMSHAFT SPROCKET WRENCH (INTAKE LH) |
| ST 499207400 | CAMSHAFT SPROCKET WRENCH (Except INTAKE LH) |



B: INSTALLATION

- 1) Install the camshaft sprocket. To lock the camshaft, use ST.

- | | |
|---------------|---|
| ST 18231AA010 | CAMSHAFT SPROCKET WRENCH (INTAKE LH) |
| ST 499207400 | CAMSHAFT SPROCKET WRENCH (Except INTAKE LH) |

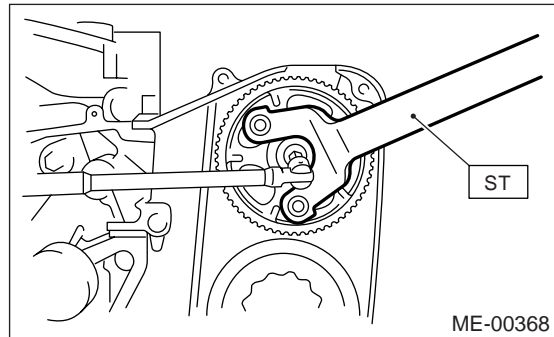
Tightening torque:

98 N·m (10 kgf·m, 72.4 ft·lb)

NOTE:

Do not confuse the right and left side camshaft sprockets intake side during installation. The cam-

shaft sprocket LH is identified by a projection used to monitor camshaft position sensor.



- 2) Install the camshaft position sensor.
<Ref. to FU(H4DOSTC)-30, INSTALLATION, Camshaft Position Sensor.>
- 3) Install the timing belt assembly.
<Ref. to ME(H4DOSTC)-49, INSTALLATION, Timing Belt Assembly.>
- 4) Install the belt cover.
<Ref. to ME(H4DOSTC)-46, INSTALLATION, Belt Cover.>
- 5) Install the crankshaft pulley.
<Ref. to ME(H4DOSTC)-44, INSTALLATION, Crankshaft Pulley.>
- 6) Install the V-belt.
<Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

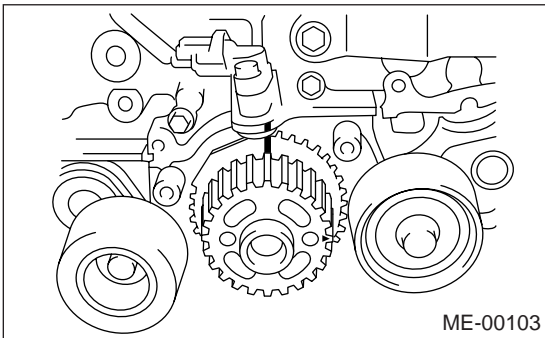
CRANKSHAFT SPROCKET

MECHANICAL

17.Crankshaft Sprocket

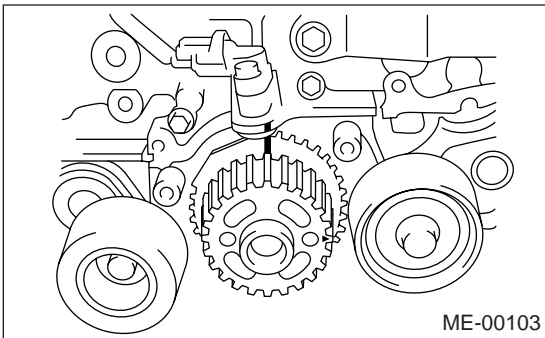
A: REMOVAL

- 1) Remove the V-belt.
<Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley.
<Ref. to ME(H4DOSTC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover.
<Ref. to ME(H4DOSTC)-46, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly.
<Ref. to ME(H4DOSTC)-47, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket.
<Ref. to ME(H4DOSTC)-55, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket.



B: INSTALLATION

- 1) Install the crankshaft sprocket.



- 2) Install the camshaft sprocket.
<Ref. to ME(H4DOSTC)-55, INSTALLATION, Camshaft Sprocket.>
- 3) Install the timing belt assembly.
<Ref. to ME(H4DOSTC)-49, INSTALLATION, Timing Belt Assembly.>
- 4) Install the belt cover.
<Ref. to ME(H4DOSTC)-46, INSTALLATION, Belt Cover.>
- 5) Install the crankshaft pulley.
<Ref. to ME(H4DOSTC)-44, INSTALLATION, Crankshaft Pulley.>

- 6) Install the V-belt.

<Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

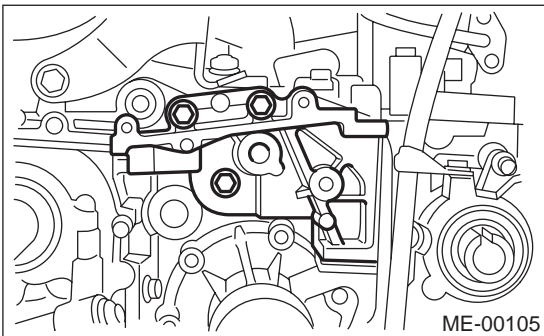
C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

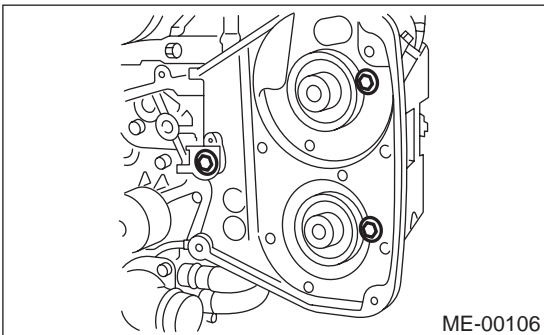
18. Camshaft

A: REMOVAL

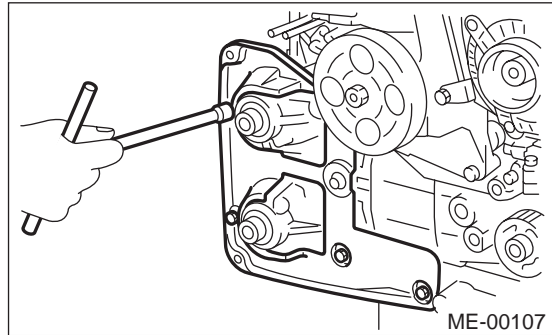
- 1) Remove the V-belt.
<Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley.
<Ref. to ME(H4DOSTC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover.
<Ref. to ME(H4DOSTC)-46, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly.
<Ref. to ME(H4DOSTC)-47, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket.
<Ref. to ME(H4DOSTC)-55, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket.
<Ref. to ME(H4DOSTC)-56, REMOVAL, Crankshaft Sprocket.>
- 7) Remove the tensioner bracket.



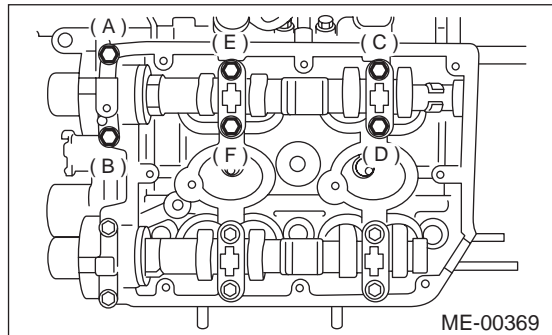
- 8) Remove the belt cover No. 2 (LH).



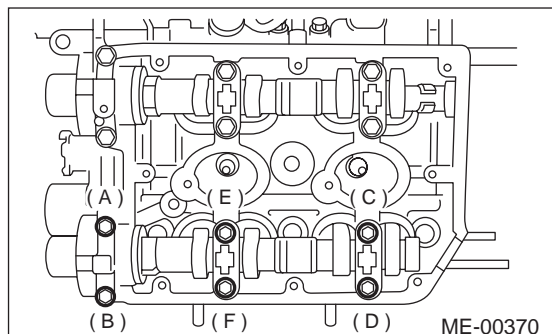
- 9) Remove the belt cover No. 2 (RH).



- 10) Disconnect the ignition coil connector.
- 11) Remove the ignition coil.
- 12) Remove the rocker cover and gasket.
- 13) Loosen the intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



- 14) Remove the camshaft cap and intake camshaft.
- 15) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



- 16) Remove the camshaft caps and exhaust camshaft.

NOTE:

Arrange the camshaft caps in order so that they can be installed in their original positions.

- 17) Similarly, remove the camshafts (RH) and related parts.

CAMSHAFT

MECHANICAL

B: INSTALLATION

1) Camshaft installation:

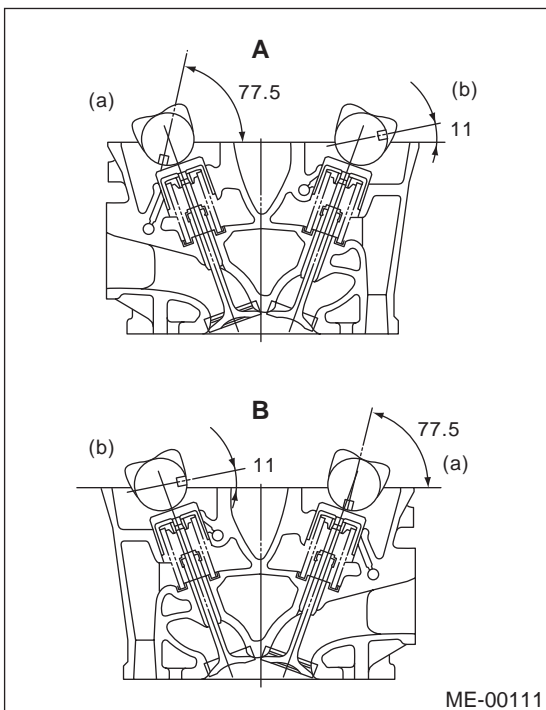
Apply engine oil to the cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valves is close to or in contact with "base circle" of cam lobe.

NOTE:

- When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.
- Camshaft (RH) need not be rotated when set at the position shown in the figure.

Intake camshaft (LH): Rotate 80° clockwise.

Exhaust camshaft (LH): Rotate 45° counterclockwise.



- A Left side cylinder head
- B Right side cylinder head
- (a) Intake camshaft
- (b) Exhaust camshaft

2) Camshaft cap installation:

(1) Apply fluid packing sparingly to the cap mating surface.

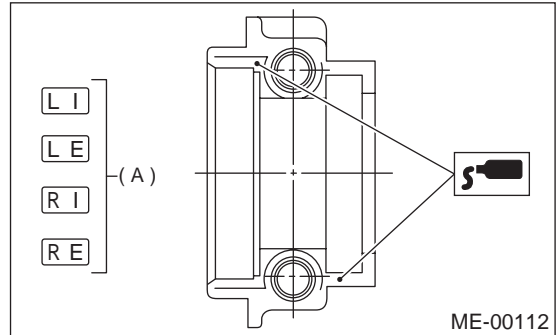
NOTE:

Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward oil seal, resulting in oil leaks.

Fluid packing:

Part No. 004403007

THREE BOND 1215 or equivalent



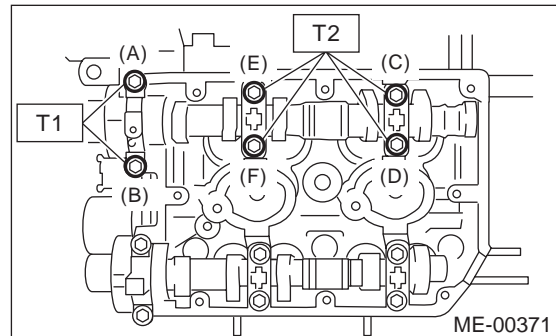
(2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).

(3) Gradually tighten the camshaft cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:

T1: 10 N·m (1.0 kgf·m, 7.2 ft·lb)

T2: 20 N·m (2.0 kgf·m, 14.5 ft·lb)

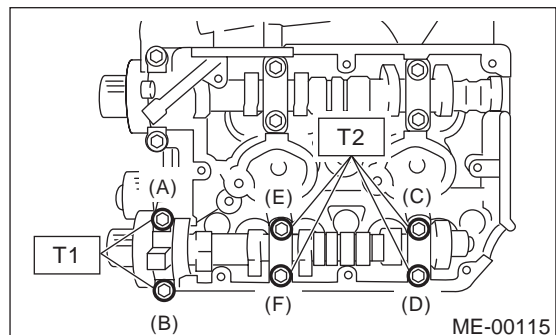


(4) Similarly, tighten the cap on exhaust side. After tightening the cap, ensure the camshaft rotates only slightly while holding it at "base" circle.

Tightening torque:

T1: 10 N·m (1.0 kgf·m, 7.2 ft·lb)

T2: 20 N·m (2.0 kgf·m, 14.5 ft·lb)

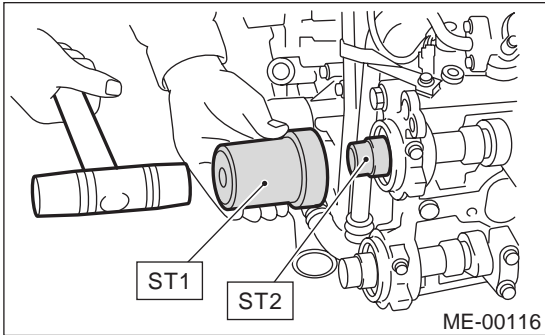


3) Camshaft oil seal installation:
Apply grease to the new oil seal lips and press onto the front end of camshaft by using ST1 and ST2.

NOTE:

Use a new oil seal.

ST1	499587600	OIL SEAL INSTALLER
ST2	499597200	OIL SEAL GUIDE

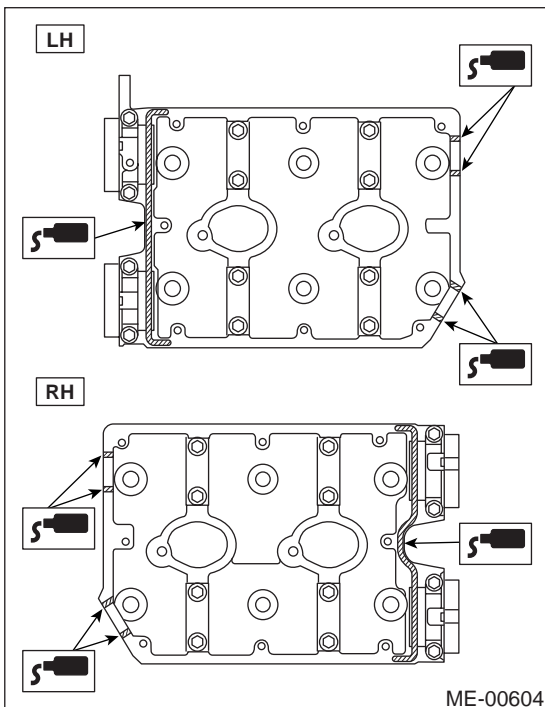


4) Rocker cover installation:
(1) Install the gasket on rocker cover.
Install the peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to the indicated portion on rocker cover.

Fluid packing:

Part No. 004403007

THREE BOND 1215 or equivalent

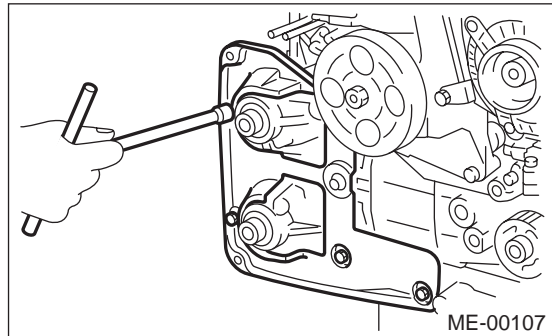


(3) Install the rocker cover on cylinder head.
Ensure the gasket is properly positioned during installation.
5) Install the ignition coil.
6) Connect the ignition coil connector.

7) Similarly, install the parts on right-hand side.
8) Install the belt cover No. 2 (RH).

Tightening torque:

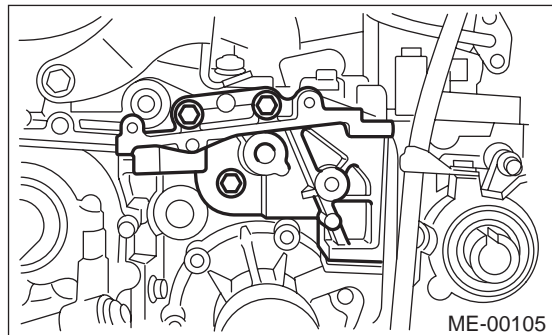
5 N·m (0.5 kgf·m, 3.6 ft·lb)



9) Install the tensioner bracket.

Tightening torque:

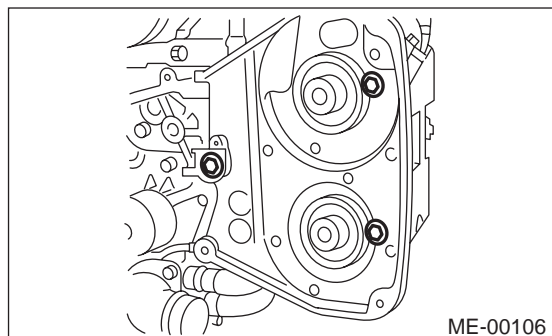
25 N·m (2.5 kgf·m, 18.1 ft·lb)



10) Install the belt cover No. 2 (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



11) Install the crankshaft sprockets.
<Ref. to ME(H4DOSTC)-56, INSTALLATION, Crankshaft Sprocket.>
12) Install the camshaft sprocket.
<Ref. to ME(H4DOSTC)-55, INSTALLATION, Camshaft Sprocket.>
13) Install the timing belt assembly.
<Ref. to ME(H4DOSTC)-49, INSTALLATION, Timing Belt Assembly.>
14) Install the belt cover.

CAMSHAFT

MECHANICAL

<Ref. to ME(H4DOSTC)-46, INSTALLATION, Belt Cover.>

15) Install the crankshaft pulley.

<Ref. to ME(H4DOSTC)-44, INSTALLATION, Crankshaft Pulley.>

16) Install the V-belt.

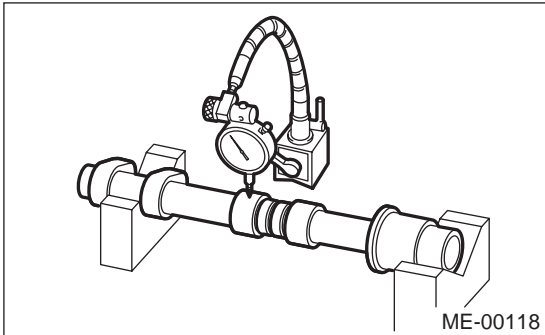
<Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Limit:

0.020 mm (0.0008 in)



2) Check the journal for damage and wear. Replace if faulty.

3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

4) Measurement of the camshaft journal oil clearance:

(1) Clean the bearing caps and camshaft journals.

(2) Place the camshafts on cylinder head. (Without installing the valve rocker.)

(3) Place a plastigauge across each of the camshaft journals.

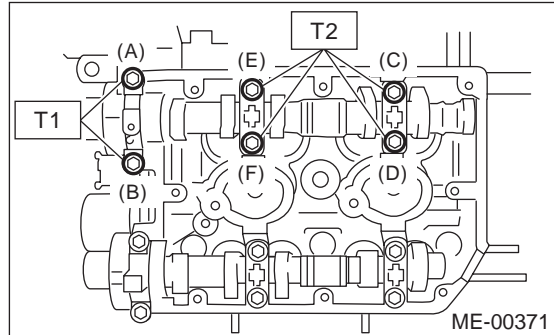
(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Do not turn the camshaft.

Tightening torque:

T1: 10 N·m (1.0 kgf·m, 7.2 ft·lb)

T2: 20 N·m (2.0 kgf·m, 14.5 ft·lb)



(5) Remove the bearing caps.

(6) Measure the widest point of plastigauge on each journal.

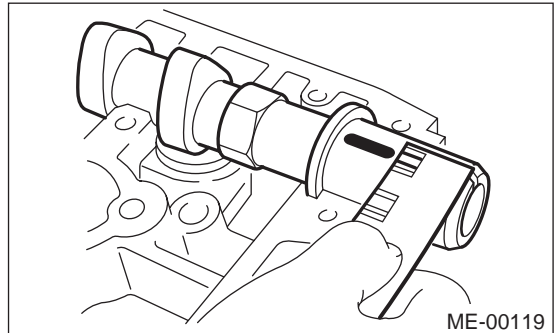
If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:

0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:

0.10 mm (0.0039 in)



(7) Completely remove the plastigauge.

5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H

Standard:

Intake:

46.25 — 46.35 mm (1.821 — 1.825 in)

Exhaust:

46.15 — 46.25 mm (1.817 — 1.821 in)

Limit:

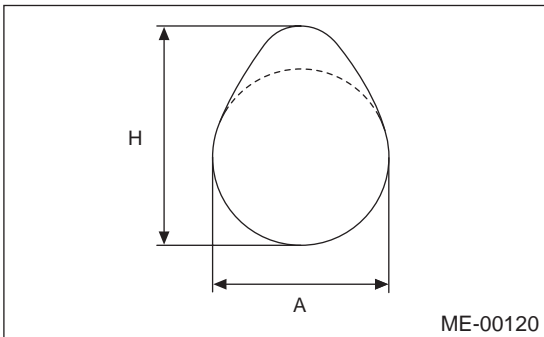
Intake:

46.15 mm (1.817 in)

Exhaust:

46.65 mm (1.813 in)

Cam base circle diameter A:
37.0 mm (1.457 in)



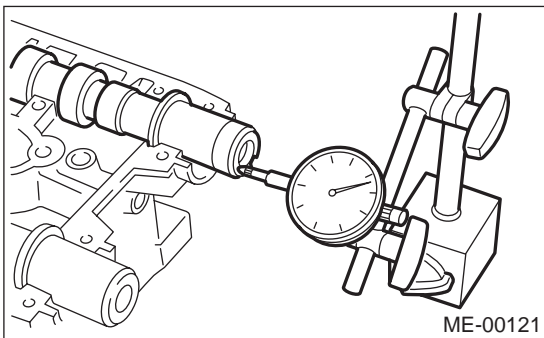
6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary replace the camshaft.

Standard:

0.015 — 0.070 mm (0.0006 — 0.0028 in)

Limit:

0.1 mm (0.004 in)



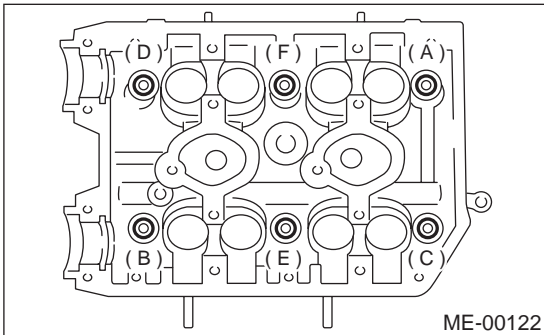
CYLINDER HEAD ASSEMBLY

MECHANICAL

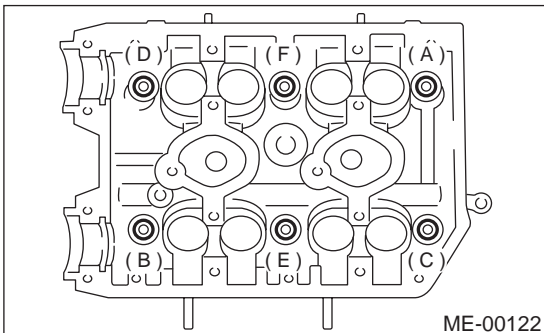
19. Cylinder Head Assembly

A: REMOVAL

- 1) Remove the V-belt.
<Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley.
<Ref. to ME(H4DOSTC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover.
<Ref. to ME(H4DOSTC)-46, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly.
<Ref. to ME(H4DOSTC)-47, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket.
<Ref. to ME(H4DOSTC)-55, REMOVAL, Camshaft Sprocket.>
- 6) Remove the intake manifold.
<Ref. to FU(H4DOSTC)-15, REMOVAL, Intake Manifold.>
- 7) Remove the bolt which installs A/C compressor bracket on cylinder head.
- 8) Remove the camshaft. <Ref. to ME(H4DOSTC)-57, REMOVAL, Camshaft.>
- 9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



- 10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
Remove the bolts (A) and (D) to remove cylinder head.



- 11) Remove the cylinder head gasket.

NOTE:

Do not scratch the mating surface of cylinder head and cylinder block.

- 12) Similarly, remove the right side cylinder head.

B: INSTALLATION

- 1) Install the cylinder head and gaskets on cylinder block.

NOTE:

- Use new cylinder head gaskets.
 - Be careful not to scratch the mating surface of cylinder head and cylinder block.
- 2) Tighten the cylinder head bolts.
 - (1) Apply a coat of engine oil to the washers and bolt threads.
 - (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
 - (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence again.
 - (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
 - (5) Tighten all bolts to 39 N·m (4.0 kgf-m, 29 ft-lb) in alphabetical sequence.
 - (6) Tighten all bolts 80 to 90° in alphabetical sequence.
 - (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

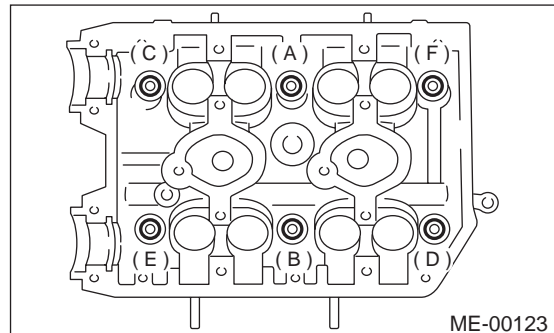
NOTE:

Do not tighten the bolts by more than 45°.

- (8) Further tighten all bolts (A) and (B) by 40 to 45°.

NOTE:

Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



- 3) Install the camshaft.
<Ref. to ME(H4DOSTC)-58, INSTALLATION, Camshaft.>
- 4) Install the A/C compressor bracket on cylinder head.
- 5) Install the intake manifold.
<Ref. to FU(H4DOSTC)-18, INSTALLATION, Intake Manifold.>

- 6) Install the camshaft sprocket.
<Ref. to ME(H4DOSTC)-55, INSTALLATION, Camshaft Sprocket.>
- 7) Install the timing belt assembly.
<Ref. to ME(H4DOSTC)-49, INSTALLATION, Timing Belt Assembly.>
- 8) Install the belt cover.
<Ref. to ME(H4DOSTC)-46, INSTALLATION, Belt Cover.>
- 9) Install the crankshaft pulley.
<Ref. to ME(H4DOSTC)-44, INSTALLATION, Crankshaft Pulley.>
- 10) Install the V-belt.
<Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

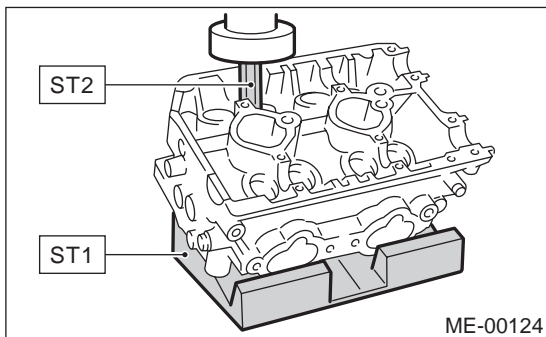
C: DISASSEMBLY

- 1) Remove the valve shims and valve lifters.
- 2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:

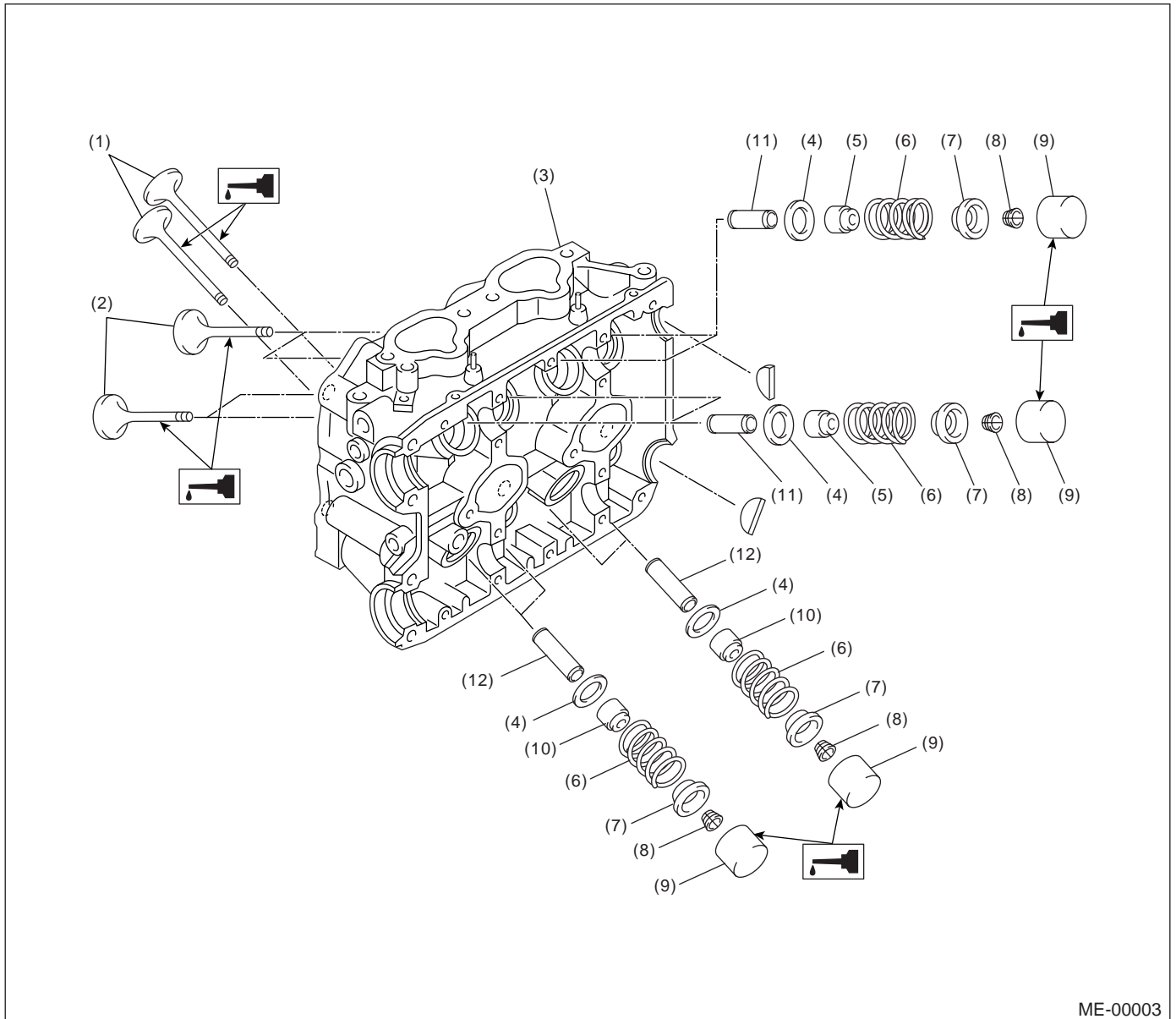
- Keep the removed parts in order for re-installing in their original positions.
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



CYLINDER HEAD ASSEMBLY

MECHANICAL

D: ASSEMBLY



ME-00003

- | | | |
|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve | (5) Intake valve oil seal | (9) Valve lifter |
| (2) Intake valve | (6) Valve spring | (10) Exhaust valve oil seal |
| (3) Cylinder head | (7) Retainer | (11) Intake valve guide |
| (4) Valve spring seat | (8) Retainer key | (12) Exhaust valve guide |

- 1) Installation of valve spring and valve:
 - (1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:

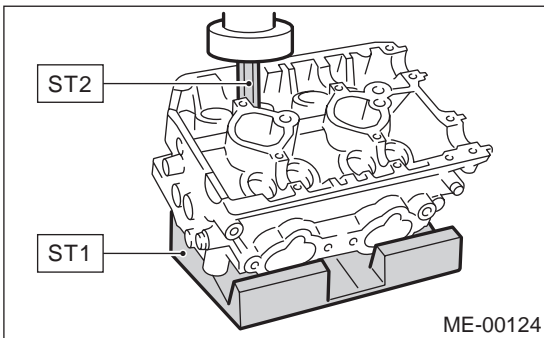
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

- (2) Set the cylinder head on ST1.
- (3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
 ST2 499718000 VALVE SPRING REMOVER

NOTE:

Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.



- (4) Compress the valve spring, and then fit the valve spring retainer key.
 - (5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.
- 2) Apply oil to the surface of the valve lifter.
 - 3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

- 1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
- 2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B). If the warping exceeds 0.05 mm (0.0020 in), re-grind the surface with a surface grinder.

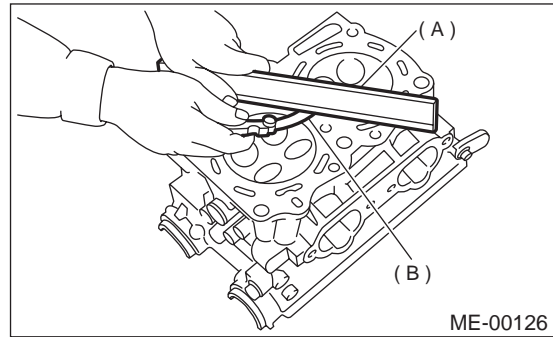
Warping limit:
 0.05 mm (0.0020 in)

Grinding limit:
 0.3 mm (0.012 in)

Standard height of cylinder head:
 127.5 mm (5.02 in)

NOTE:

Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W

Intake

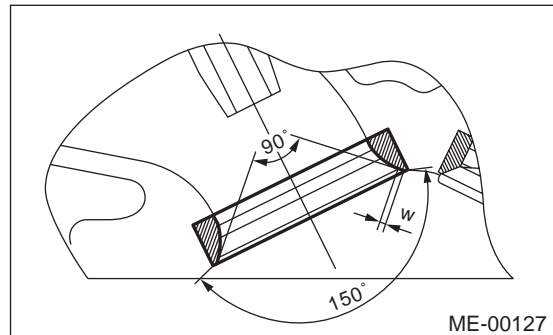
Standard
 1.0 mm (0.039 in)

Limit
 1.7 mm (0.067 in)

Exhaust

Standard
 1.5 mm (0.059 in)

Limit
 2.2 mm (0.087 in)



CYLINDER HEAD ASSEMBLY

MECHANICAL

3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard

Intake

0.030 — 0.057 mm (0.0012 — 0.0022 in)

Exhaust

0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit

0.15 mm (0.0059 in)

2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:

Intake

5.955 — 5.970 mm (0.2344 — 0.2350 in)

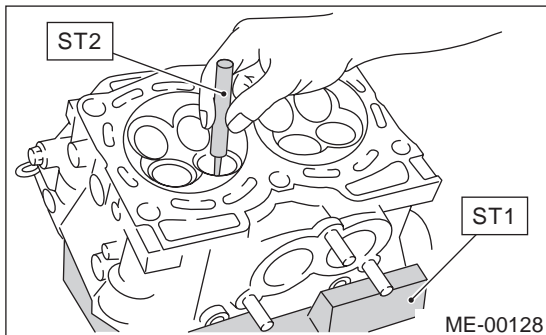
Exhaust

5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

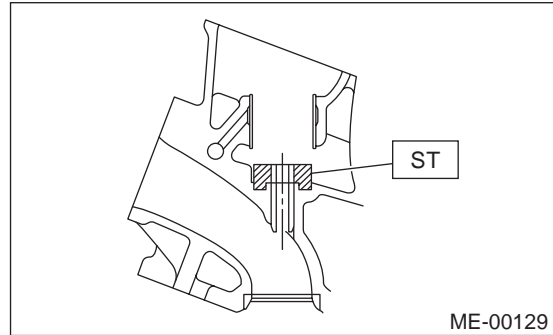
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place ST as shown in the figure.

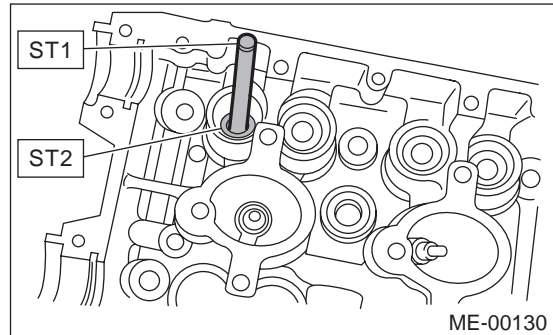
ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

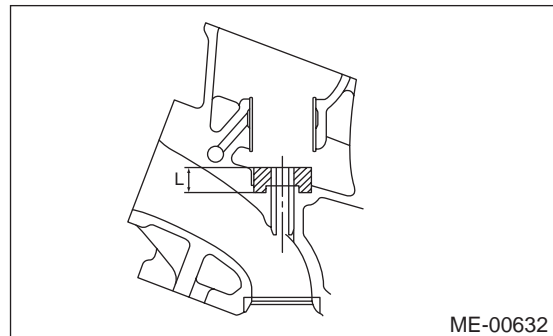
ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L

15.8 — 16.2 mm (0.622 — 0.638 in)



(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

NOTE:

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

H:

Intake

Standard

1.2 mm (0.047 in)

Limit

0.8 mm (0.031 in)

Exhaust

Standard

1.5 mm (0.059 in)

Limit

0.8 mm (0.031 in)

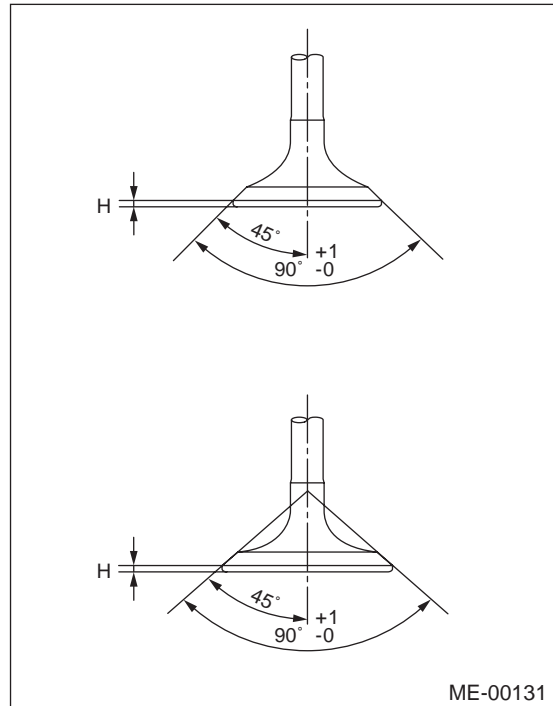
Valve overall length:

Intake

104.4 mm (4.110 in)

Exhaust

104.7 mm (4.122 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

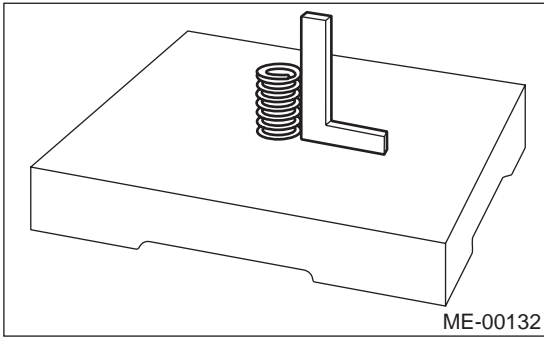
CYLINDER HEAD ASSEMBLY

MECHANICAL

5. VALVE SPRINGS

- 1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.
- 2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Valve spring	
Free length	44.67 mm (1.7587 in)
Tension/spring height	206 — 236 N (21.0 — 24.1 kgf, 46.2 — 53.1 lb) /36.0 mm (1.417 in)
	485 — 537 N (49.5 — 54.8 kgf, 109.2 — 120.6 lb) /26.6 mm (1.047 in)
Squareness	2.5°, 2.0 mm (0.079 in)



6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.

- 1) Place the cylinder head on ST1.
- 2) Press in the oil seal as shown in the figure by using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

NOTE:

- Apply engine oil to oil seal before force-fitting.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:

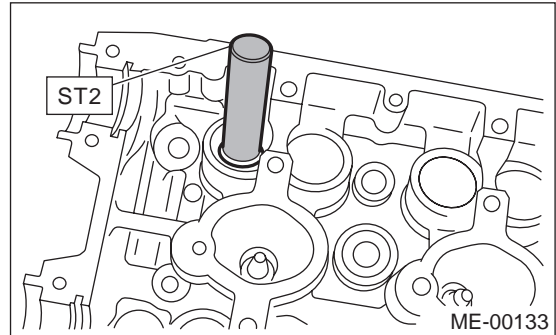
Intake [Black]

Exhaust [Brown]

Color of spring part:

Intake [Silver]

Exhaust [Silver]

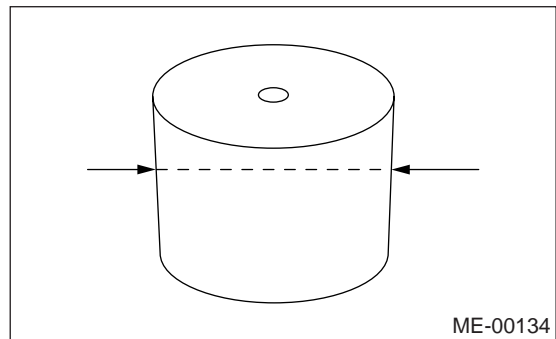


7. VALVE LIFTER

- 1) Check the valve lifter visually.
- 2) Measure the outer diameter of valve lifter.

Outer diameter:

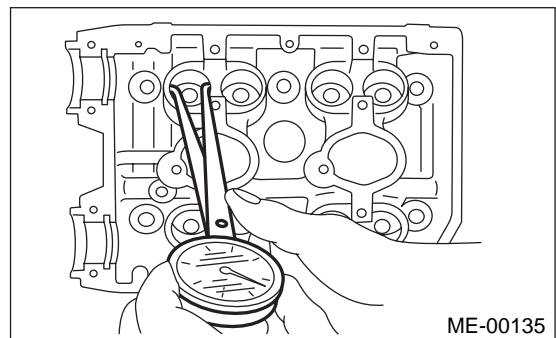
34.959 — 34.975 mm (1.3763 — 1.3770 in)



- 3) Measure the inner diameter of valve lifter mating part on cylinder head.

Inner diameter:

34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:

0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:

0.100 mm (0.0039 in)

F: DISPOSAL**CAUTION:**

- **Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.**

- **Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart and remove the metallic sodium.**

1) If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.

- (1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
- (2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 liters).
- (3) Immerse the damaged valve in the receptacle.

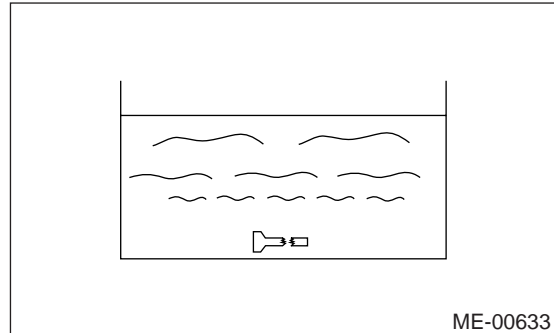
CAUTION:

A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

- (4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.
- (5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

CAUTION:

Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.



CYLINDER BLOCK

MECHANICAL

20. Cylinder Block

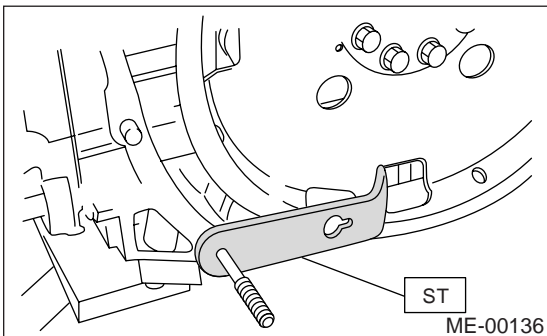
A: REMOVAL

NOTE:

Before conducting this procedure, drain the engine oil completely if applicable.

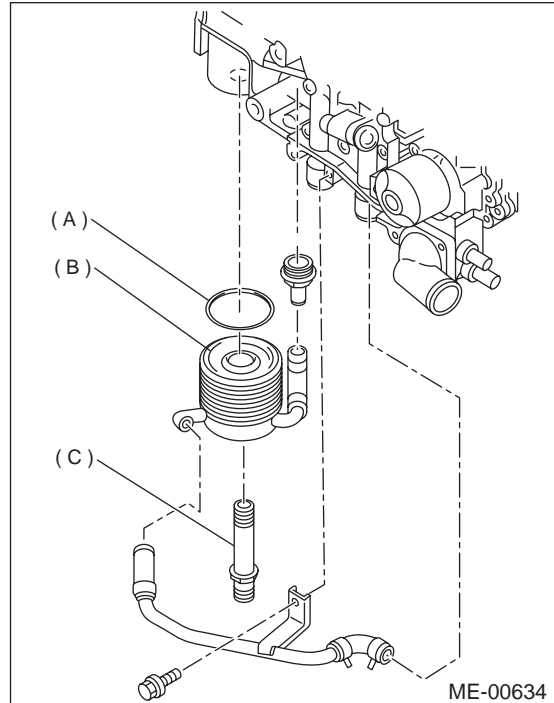
- 1) Remove the intake manifold.
<Ref. to FU(H4DOSTC)-15, REMOVAL, Intake Manifold.>
- 2) Remove the V-belt. <Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- 3) Remove the crankshaft pulley.
<Ref. to ME(H4DOSTC)-44, REMOVAL, Crankshaft Pulley.>
- 4) Remove the belt cover.
<Ref. to ME(H4DOSTC)-46, REMOVAL, Belt Cover.>
- 5) Remove the timing belt assembly.
<Ref. to ME(H4DOSTC)-47, REMOVAL, Timing Belt Assembly.>
- 6) Remove the camshaft sprocket.
<Ref. to ME(H4DOSTC)-55, REMOVAL, Camshaft Sprocket.>
- 7) Remove the crankshaft sprocket.
<Ref. to ME(H4DOSTC)-56, REMOVAL, Crankshaft Sprocket.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the cylinder head assembly.
<Ref. to ME(H4DOSTC)-62, REMOVAL, Cylinder Head Assembly.>
- 10) Remove the clutch disc and cover. (MT vehicles) <Ref. to CL-15, REMOVAL, Clutch Disc and Cover.>
- 11) Remove the flywheel. (MT vehicles)
<Ref. to CL-20, REMOVAL, Flywheel.>
- 12) Remove the drive plate. (AT vehicles)
Using the ST, lock crankshaft.

ST 498497100 CRANKSHAFT STOPPER



- 13) Remove the oil separator cover.
- 14) Remove the water by-pass pipe for heater.
- 15) Remove the oil filter.

- 16) Remove the oil cooler. (MT vehicles)

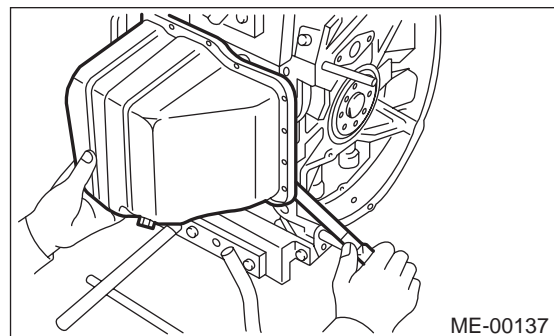


- (A) Gasket
- (B) Oil cooler
- (C) Oil cooler connector

- 17) Removal of oil pan:

- (1) Turn the cylinder block with #2 and #4 piston sides facing upward.
- (2) Remove the bolts which secure oil pan to cylinder block.
- (3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

Do not use a screwdriver or similar tool in place of oil pan cutter.



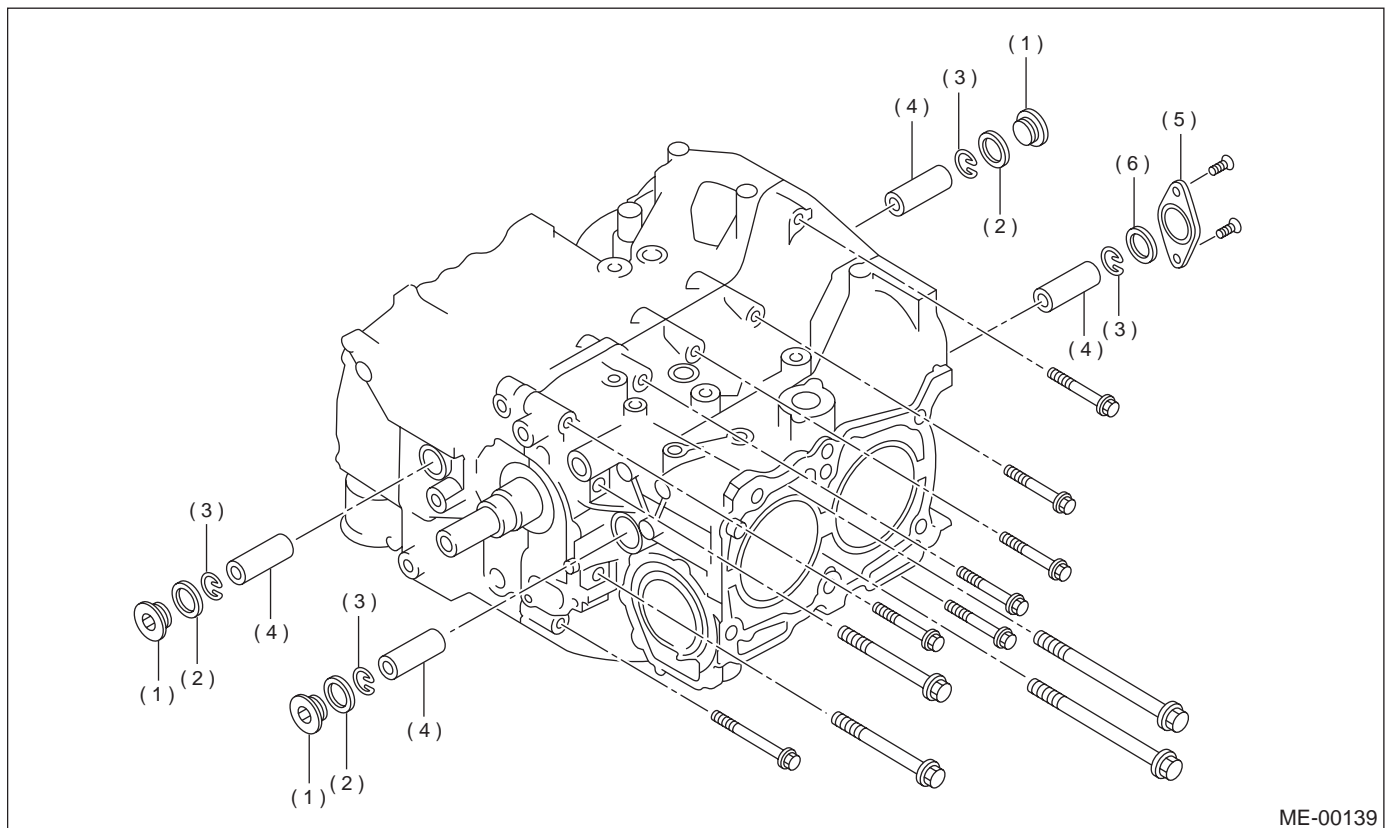
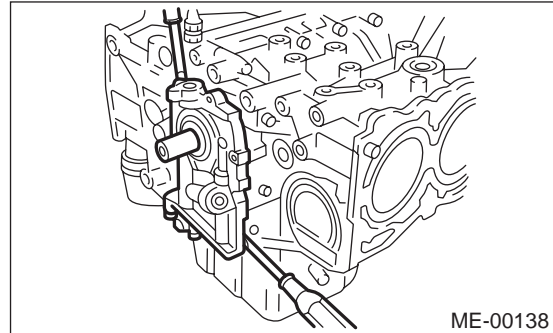
- 18) Remove the oil strainer stay.
- 19) Remove the oil strainer.
- 20) Remove the baffle plate.
- 21) Remove the water pipes.
- 22) Remove the water pump.

CYLINDER BLOCK

MECHANICAL

23) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

NOTE:
Be careful not to scratch the mating surface of cylinder block and oil pump.



(1) Service hole plug
(2) Gasket

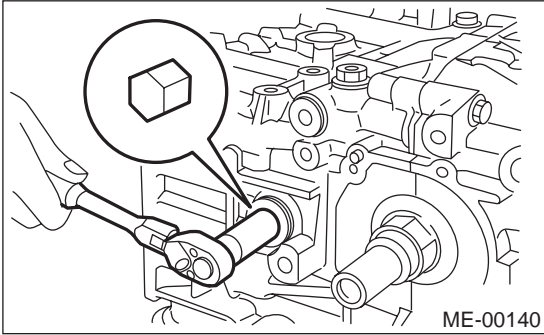
(3) Circlip
(4) Piston pin

(5) Service hole cover
(6) O-ring

CYLINDER BLOCK

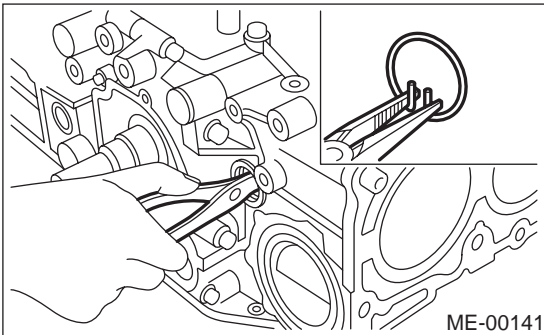
MECHANICAL

24) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].



25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.

ST 499897200 PISTON CIRCLIP PLIERS



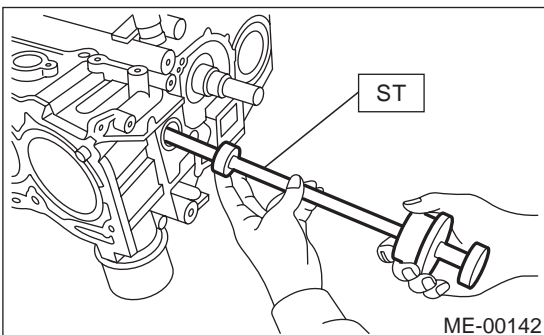
26) Draw out the piston pin from #1 and #2 pistons using ST.

ST 499097600 PISTON PIN REMOVER (MT vehicles)

ST 499097700 PISTON PIN REMOVER (AT vehicles)

NOTE:

Be careful not to confuse the original combination of piston, piston pin and cylinder.



27) Similarly remove the piston pins from #3 and #4 pistons.

28) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.

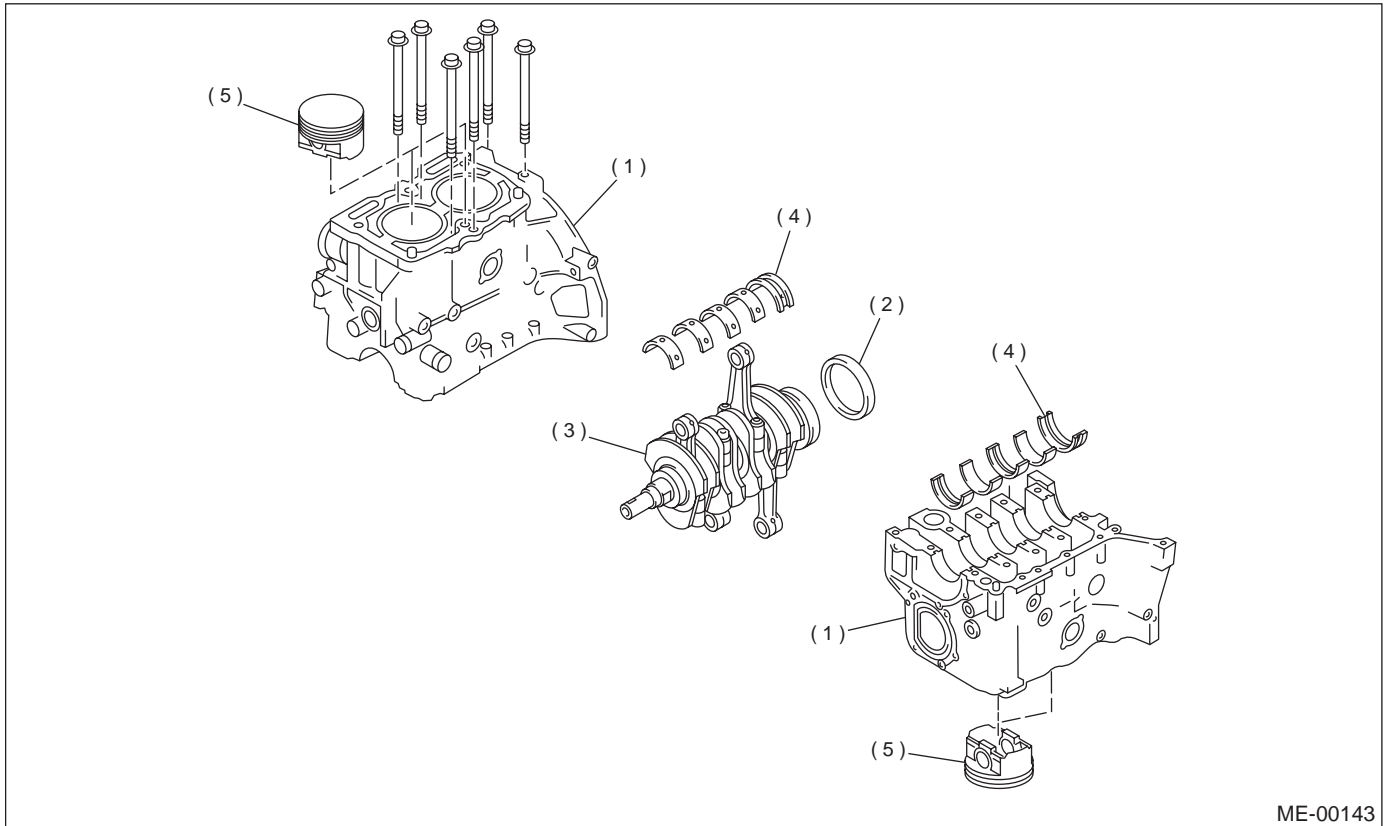
29) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.

30) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.

31) Separate the cylinder blocks (LH) and (RH).

NOTE:

When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



ME-00143

- | | | |
|--------------------|------------------------|------------|
| (1) Cylinder block | (3) Crankshaft | (5) Piston |
| (2) Rear oil seal | (4) Crankshaft bearing | |

- 32) Remove the rear oil seal.
 33) Remove the crankshaft together with connecting rod.
 34) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:

Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

- 35) Draw out each piston from cylinder block using a wooden bar or hammer handle.

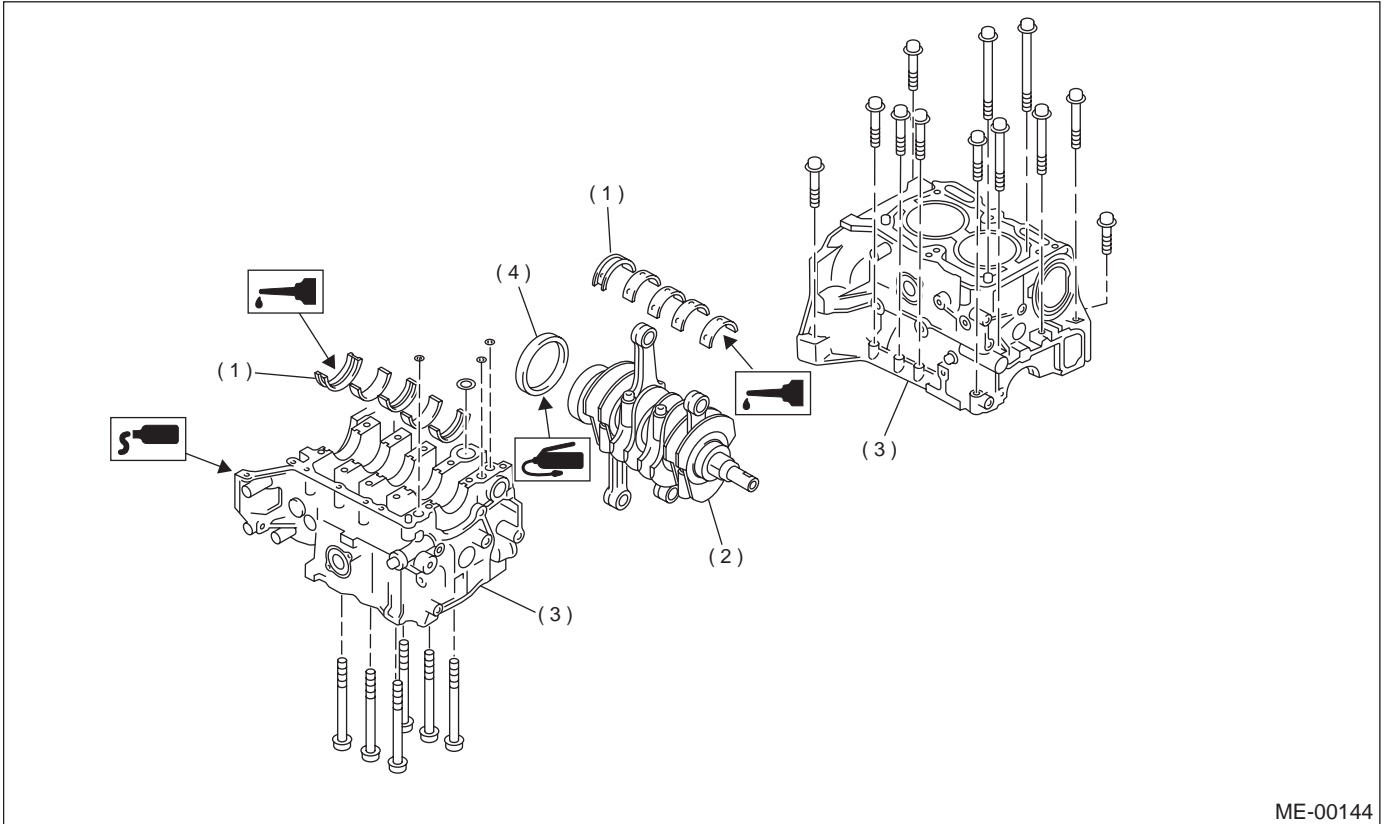
NOTE:

Do not confuse the combination of piston and cylinder.

CYLINDER BLOCK

MECHANICAL

B: INSTALLATION



ME-00144

(1) Crankshaft bearing
(2) Crankshaft

(3) Cylinder block

(4) Rear oil seal

- 1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.
- 2) Position the crankshaft on #2 and #4 cylinder block.
- 3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

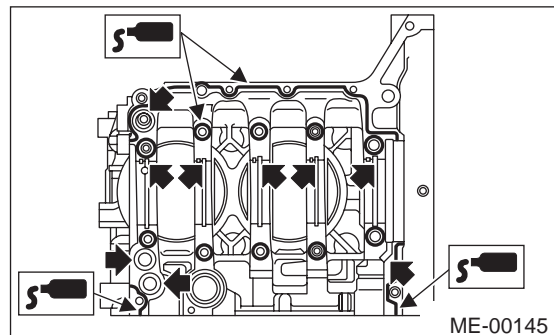
Fluid packing:

Part No. 004403007

THREE BOND 1215 or equivalent

NOTE:

Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



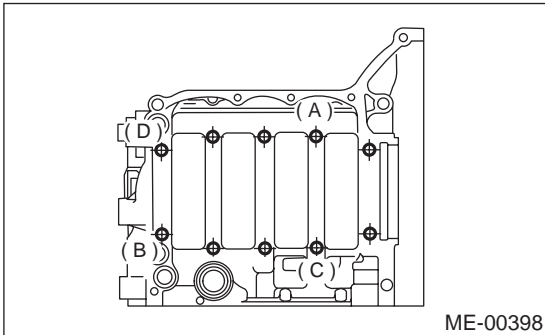
ME-00145

CYLINDER BLOCK

MECHANICAL

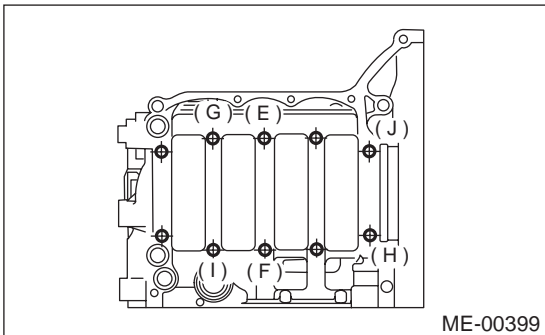
4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

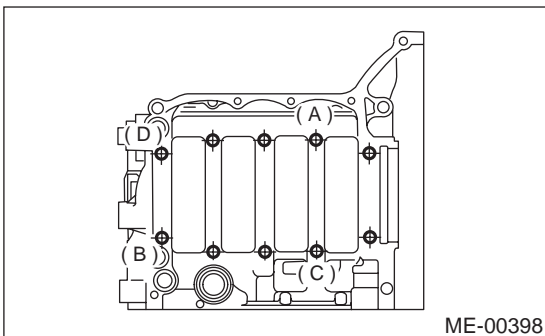


5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

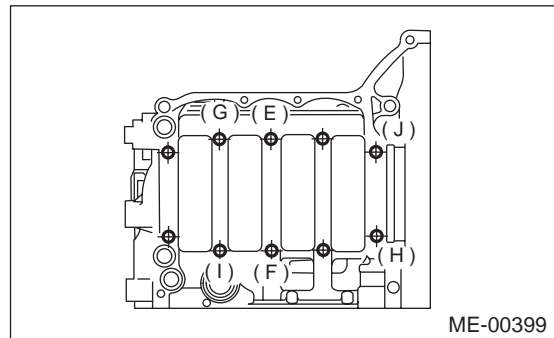
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



6) Further tighten the LH side bolts (A — D) to 90° in alphabetical sequence.

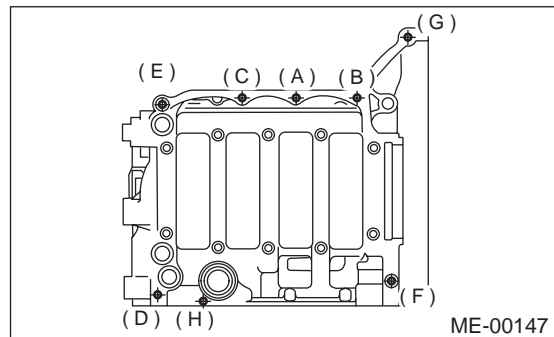


7) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.

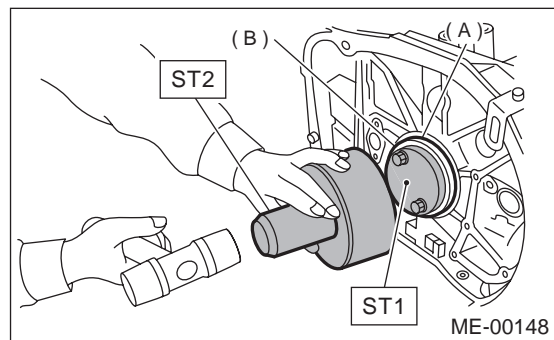


8) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



9) Install the rear oil seal using ST1 and ST2.
ST1 499597100 OIL SEAL GUIDE
ST2 499587200 OIL SEAL INSTALLER



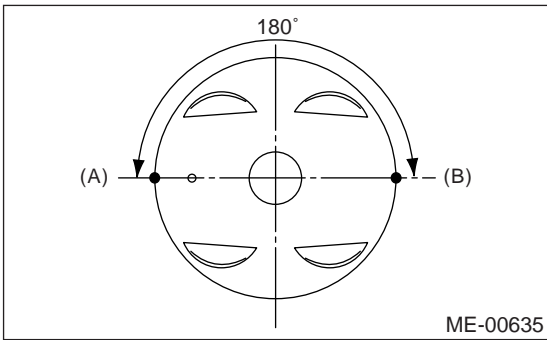
(A) Rear oil seal
(B) Flywheel attaching bolt

10) Position the top ring gap at (A) or (B) in the figure.

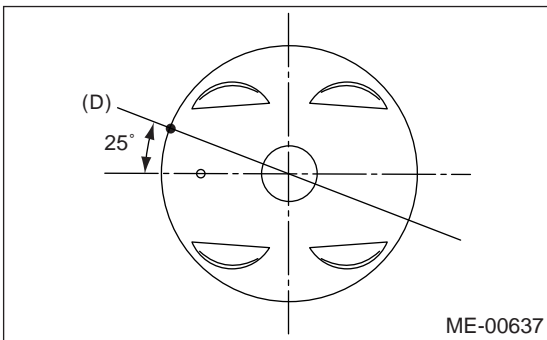
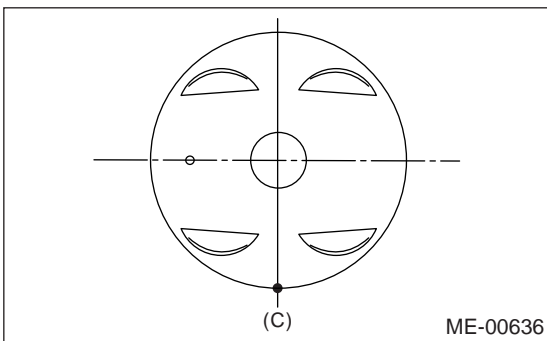
CYLINDER BLOCK

MECHANICAL

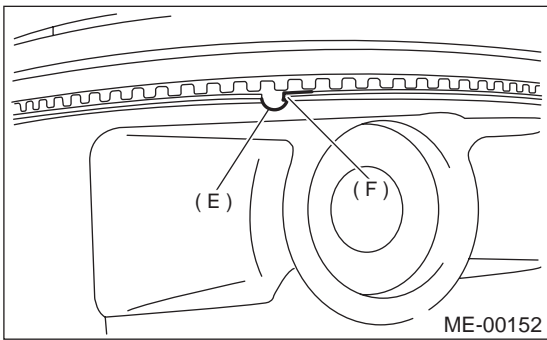
11) Position the second ring gap at 180° on the reverse side for the top ring gap.



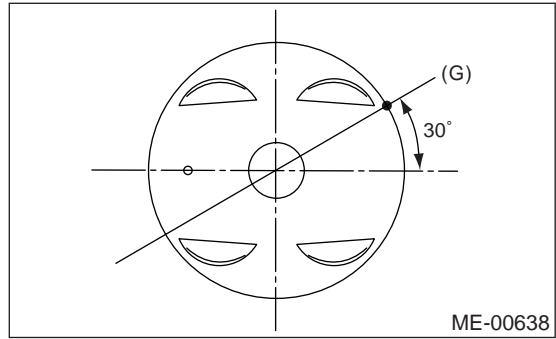
12) Position the expander rail gap at (C) in the figure.



NOTE:
Align the lower rail spin stopper (F) with piston side surface hole (E).



13) Position the upper rail gap at (G) in the figure.



NOTE:

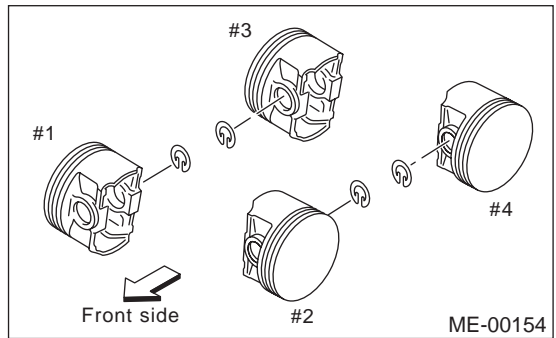
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

14) Installing the circlip:

Install the circlips in piston holes located opposite of the service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

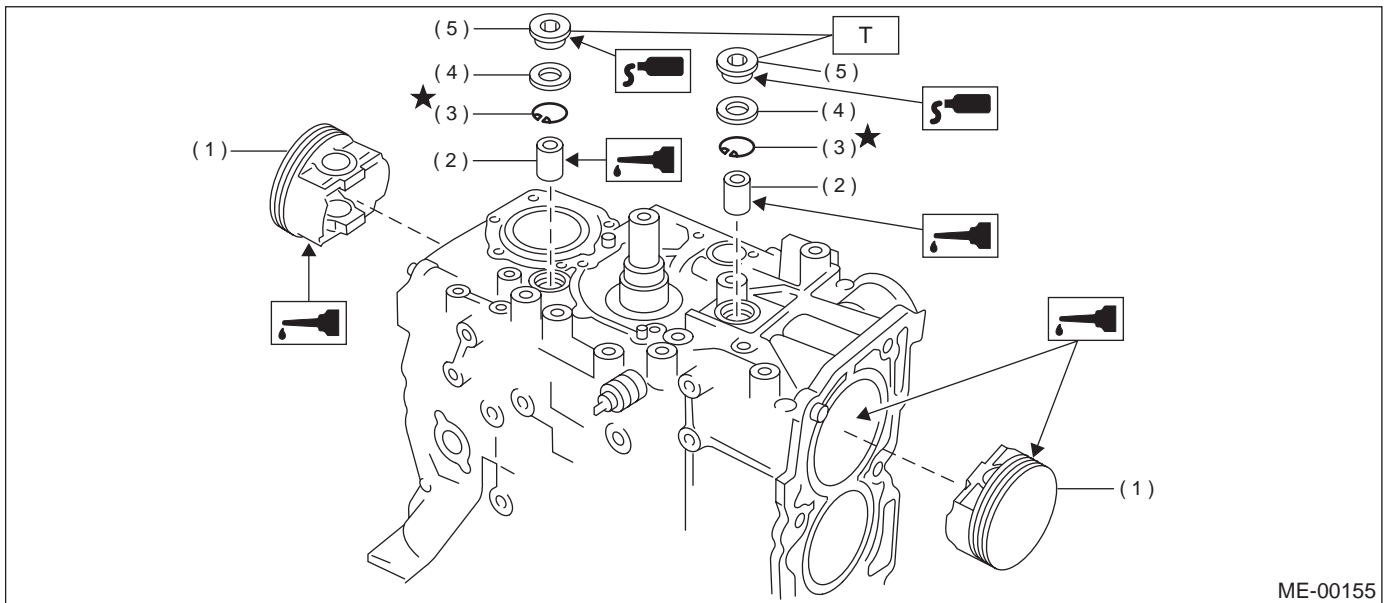
NOTE:

Use new circlips.



CYLINDER BLOCK

MECHANICAL



- (1) Piston
- (2) Piston pin
- (3) Circlip
- (4) Gasket
- (5) Service hole plug

Tightening torque : N·m (kgf·m, ft·lb)
T: 70 (7.1, 51.4)

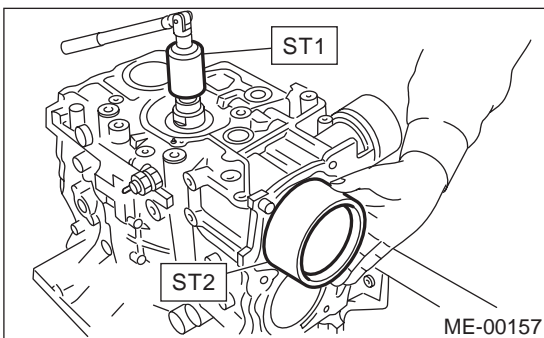
15) Installing the piston:

- (1) Turn the cylinder block so that #1 and #2 cylinders face upward.
- (2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

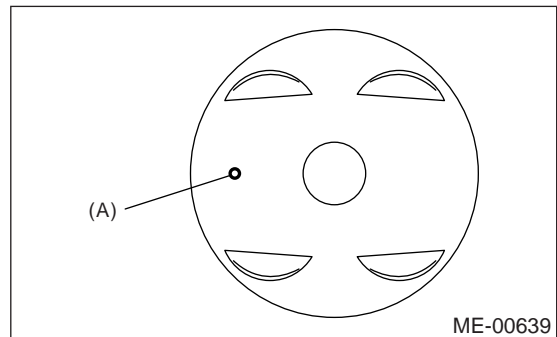
- (3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 398744300 PISTON GUIDE



NOTE:

Piston front mark faces towards the front of the engine.



(A) Front mark

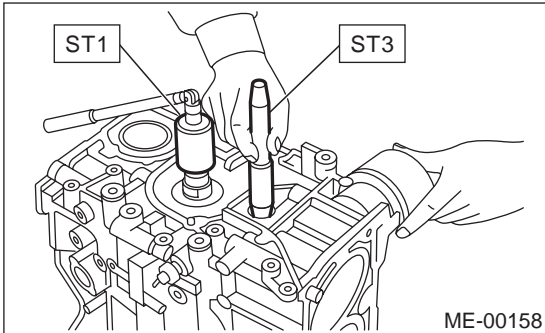
CYLINDER BLOCK

MECHANICAL

16) Installing piston pin:

- (1) Apply a coat of engine oil to ST3, and then insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE

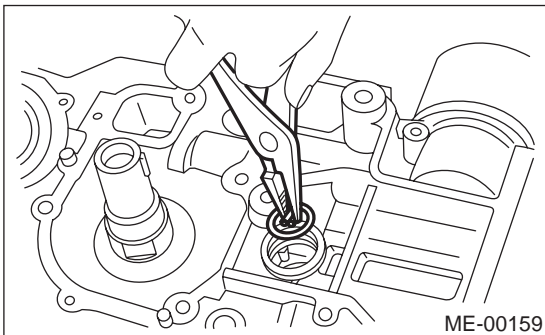


- (2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
- (3) Using the ST, install the circlip.

ST 499897200 PISTON CIRCLIP PLIERS

NOTE:

Use new circlips.

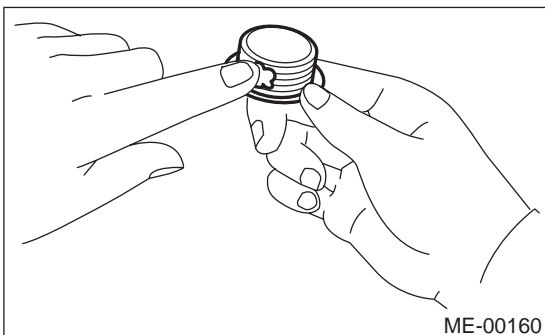


- (4) Apply fluid packing around the service hole plug.

Fluid packing:

Part No. 004403007

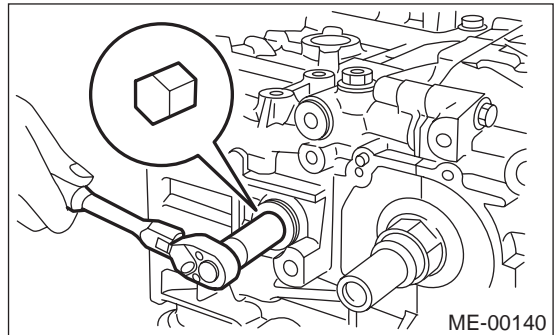
THREE BOND 1215 or equivalent



- (5) Install the service hole plug and gasket.

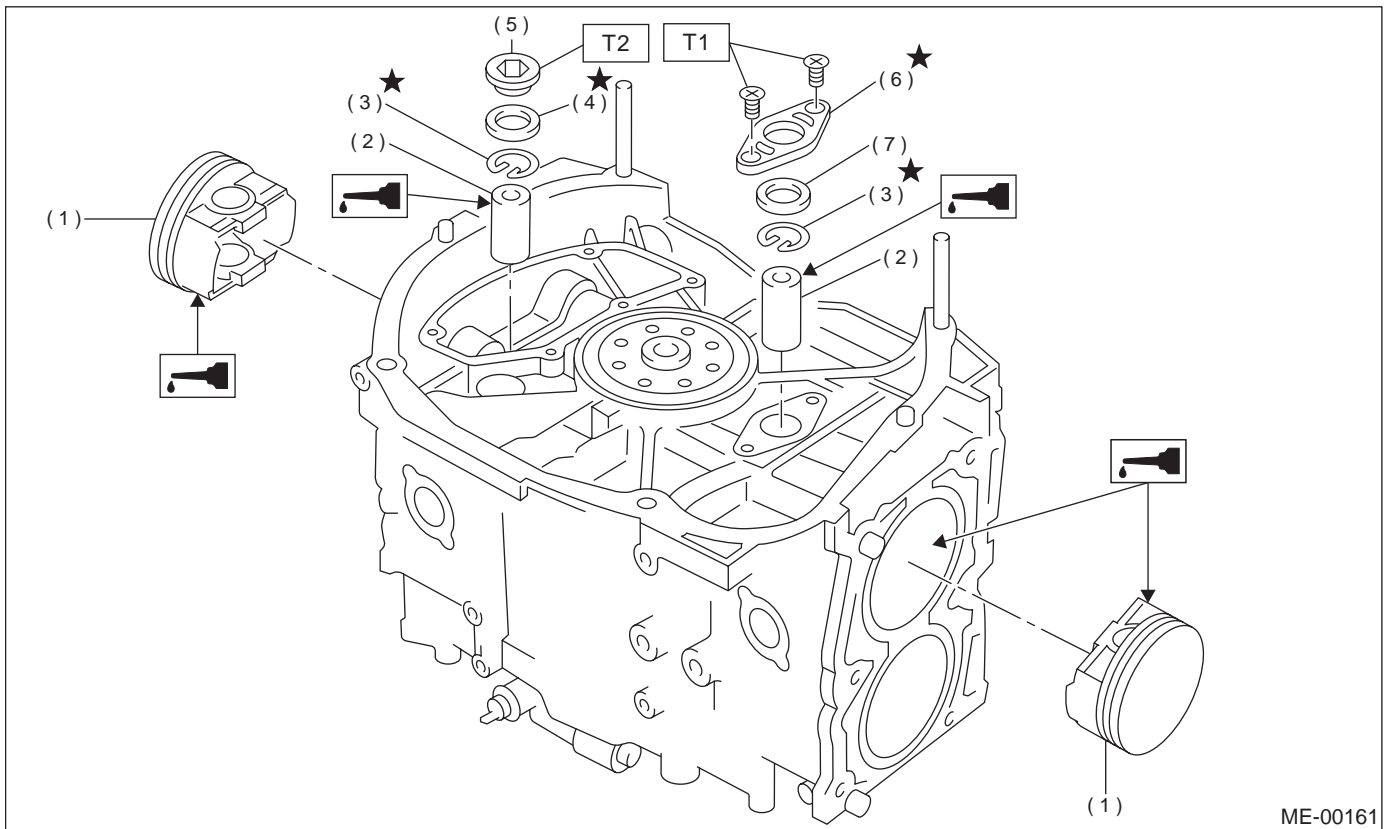
NOTE:

Use a new gasket.



CYLINDER BLOCK

MECHANICAL



- | | |
|----------------|------------------------|
| (1) Piston | (5) Service hole plug |
| (2) Piston pin | (6) Service hole cover |
| (3) Circlip | (7) O-ring |
| (4) Gasket | |

Tightening torque : N-m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 70 (7.1, 51.4)

(6) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

17) Install the water pipe.

18) Install the baffle plate.

Tightening torque:

6.4 N-m (0.65 kgf-m, 4.7 ft-lb)

19) Install the oil strainer and O-ring.

Tightening torque:

10 N-m (1.0 kgf-m, 7 ft-lb)

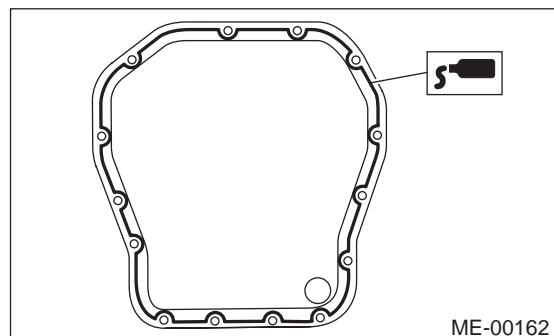
20) Install the oil strainer stay.

21) Apply fluid packing to the matching surfaces, and then install the oil pan.

Fluid packing:

Part No. 004403007

THREE BOND 1215 or equivalent



CYLINDER BLOCK

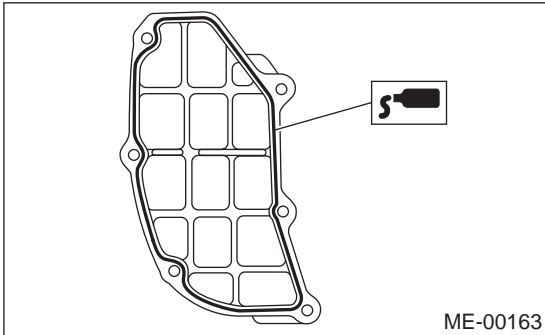
MECHANICAL

22) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

Fluid packing:

Part No. 004403007

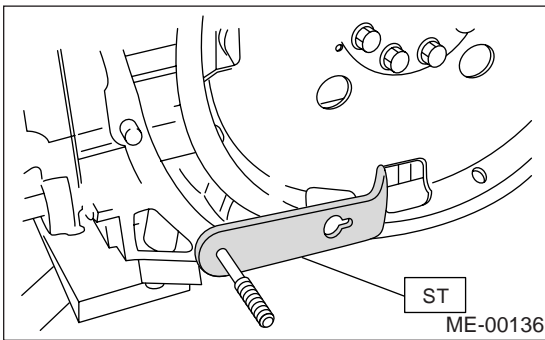
THREE BOND 1215 or equivalent



23) Install the drive plate. (AT vehicles)
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:

7.2 N·m (7.3 kgf-m, 52.8 ft-lb)



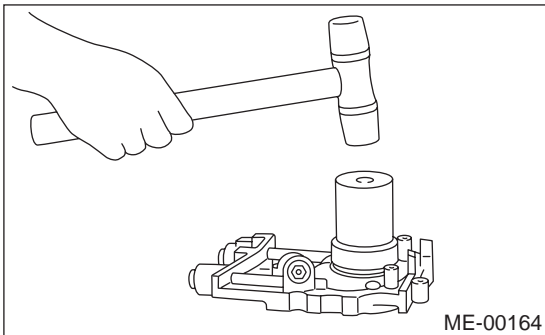
24) Install the flywheel. (MT vehicles) <Ref. to CL-20, INSTALLATION, Flywheel.>

25) Install the clutch disc and cover. (MT vehicles) <Ref. to CL-15, INSTALLATION, Clutch Disc and Cover.>

26) Installation of oil pump:

(1) Discard the front oil seal after removal. Replace with a new one using the ST.

ST 499587100 OIL SEAL INSTALLER

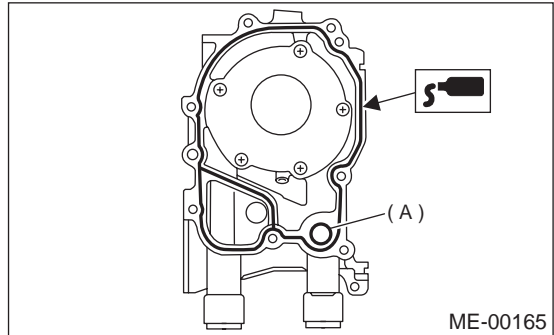


(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:

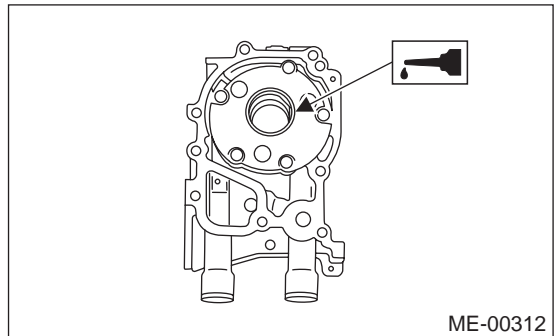
Part No. 004403007

THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:

- Do not forget to install the O-ring and seal when installing the oil pump.
- Align the flat surface of oil pump's inner rotor with crankshaft before installation.

27) Install the water pump and gasket.

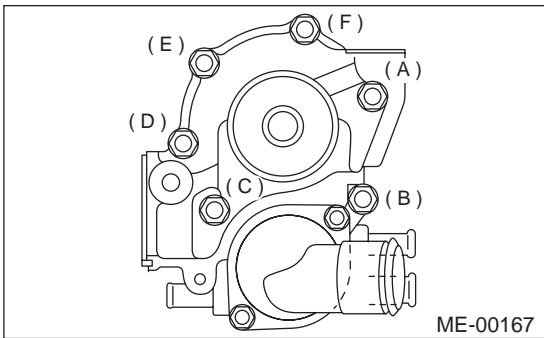
Tightening torque:

First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

NOTE:

- Be sure to use a new gasket.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.



28) Install the water by-pass pipe for heater.

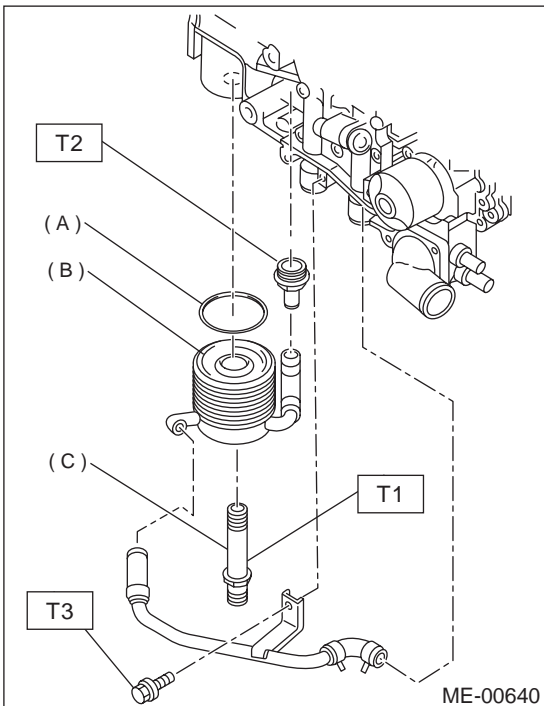
29) Install the oil cooler.

Tightening torque:

T1: 55 N·m (5.5 kgf-m, 40 ft-lb)

T2: 69 N·m (7.0 kgf-m, 50.6 ft-lb)

T3: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



- (A) O-ring
- (B) Oil cooler
- (C) Oil cooler connector

30) Install the oil filter using ST.

ST 18332AA000 OIL FILTER WRENCH

31) Install the water by-pass pipe between oil cooler and water pump.

32) Install the water pipe.

NOTE:

Always use a new O-ring.

33) Install the cylinder head assembly.

<Ref. to ME(H4DOSTC)-62, INSTALLATION, CYLINDER HEAD ASSEMBLY.>

34) Install the oil level gauge guide and tighten the attaching bolt (left side only).

35) Install the rocker cover.

36) Install the crankshaft sprocket.

<Ref. to ME(H4DOSTC)-56, INSTALLATION, Crankshaft Sprocket.>

37) Install the camshaft sprocket.

<Ref. to ME(H4DOSTC)-55, INSTALLATION, Camshaft Sprocket.>

38) Install the timing belt assembly.

<Ref. to ME(H4DOSTC)-49, INSTALLATION, Timing Belt Assembly.>

39) Install the belt cover.

<Ref. to ME(H4DOSTC)-46, INSTALLATION, Belt Cover.>

40) Install the crankshaft pulley.

<Ref. to ME(H4DOSTC)-44, INSTALLATION, Crankshaft Pulley.>

41) Install the generator and A/C compressor brackets on cylinder head.

42) Install the V-belt.

<Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

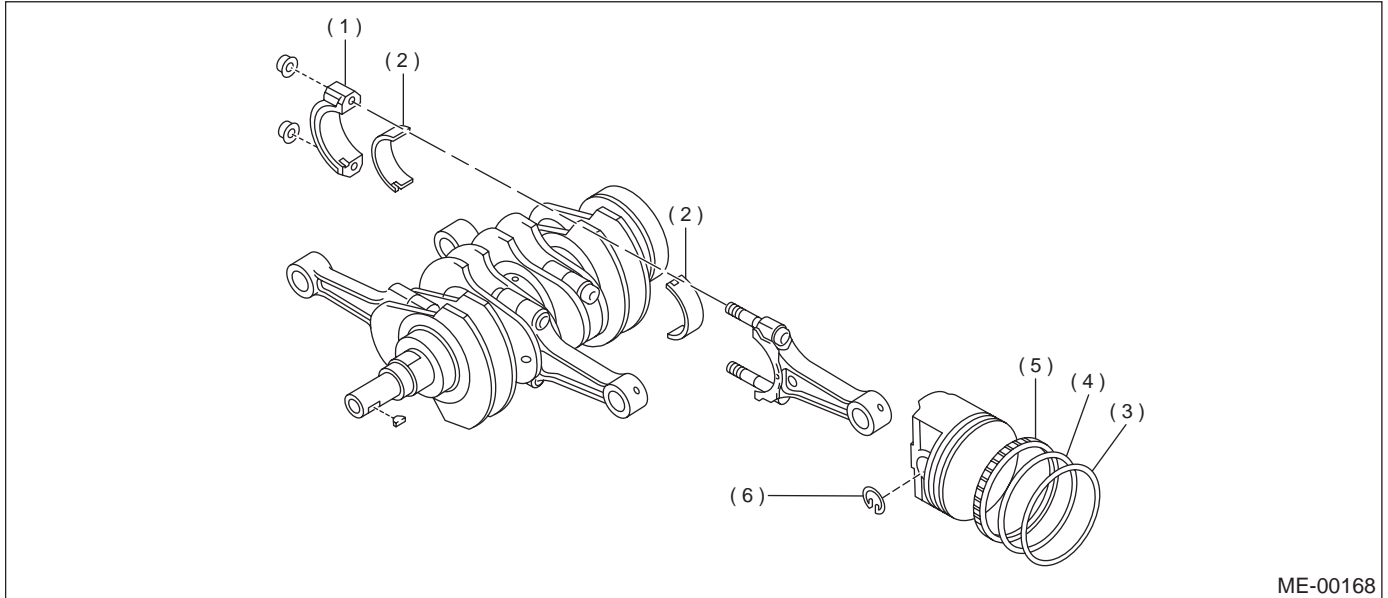
43) Install the intake manifold.

<Ref. to FU(H4DOSTC)-18, INSTALLATION, Intake Manifold.>

CYLINDER BLOCK

MECHANICAL

C: DISASSEMBLY



ME-00168

- (1) Connecting rod cap
- (2) Connecting rod bearing

- (3) Top ring
- (4) Second ring

- (5) Oil ring
- (6) Circlip

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

NOTE:

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

- 3) Remove the piston rings using the piston ring expander.

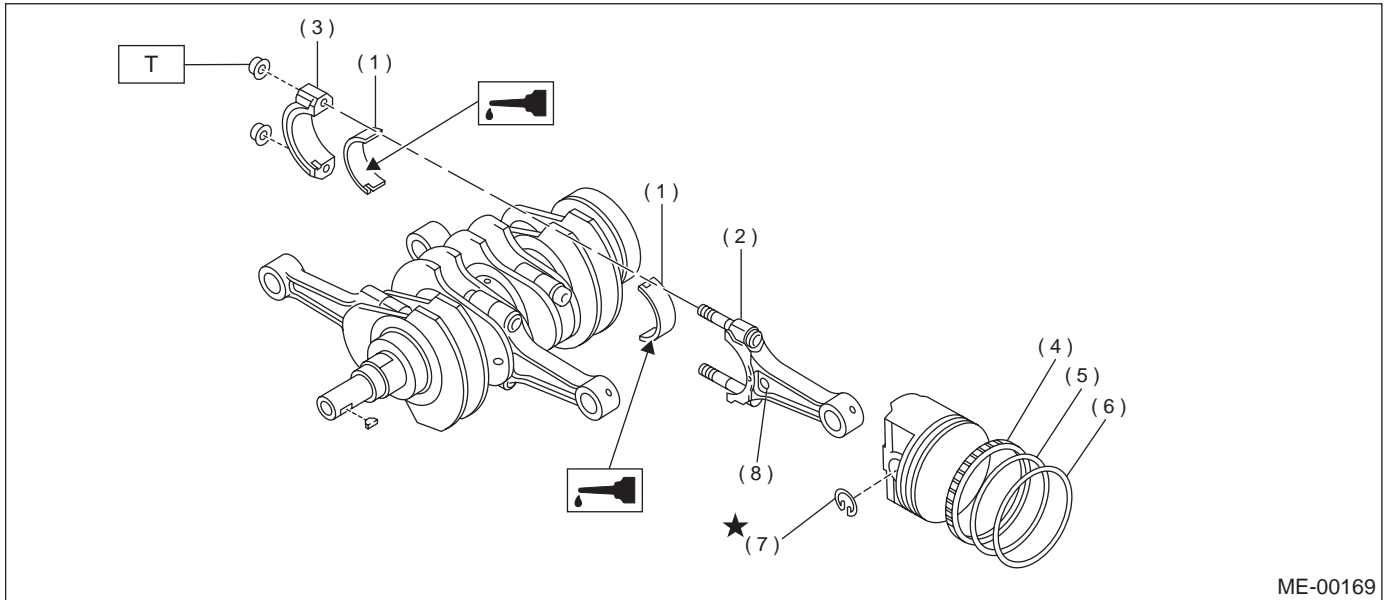
- 4) Remove the oil ring by hand.

NOTE:

Arrange the removed piston rings in proper order to prevent confusion.

- 5) Remove the circlip.

D: ASSEMBLY



- | | |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod | (6) Top ring |
| (3) Connecting rod cap | (7) Circlip |
| (4) Oil ring | (8) Side mark |

Tightening torque: N-m (kgf-m, ft-lb)

T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.

2) Install the connecting rod on crankshaft.

NOTE:

Position each connecting rod with the side marked facing forward.

3) Install the connecting rod cap with connecting rod nut.

Ensure the arrow on connecting rod cap faces the front during installation.

NOTE:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
- When tightening the connecting rod nuts, apply oil on the threads.

4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.

2) Check the oil passages for clogging.

3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:

0.05 mm (0.0020 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

NOTE:

Measurement should be performed at a temperature of 20°C (60°F).

NOTE:

Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

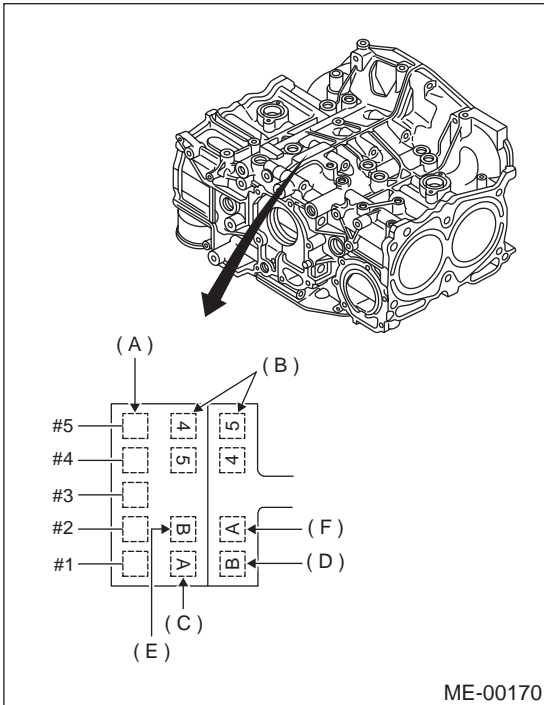
CYLINDER BLOCK

MECHANICAL

Standard diameter:

A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)

B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)



- (A) Main journal size mark
- (B) Cylinder block RH-LH combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Taper:

Standard

0.015 mm (0.0006 in)

Limit

0.050 mm (0.0020 in)

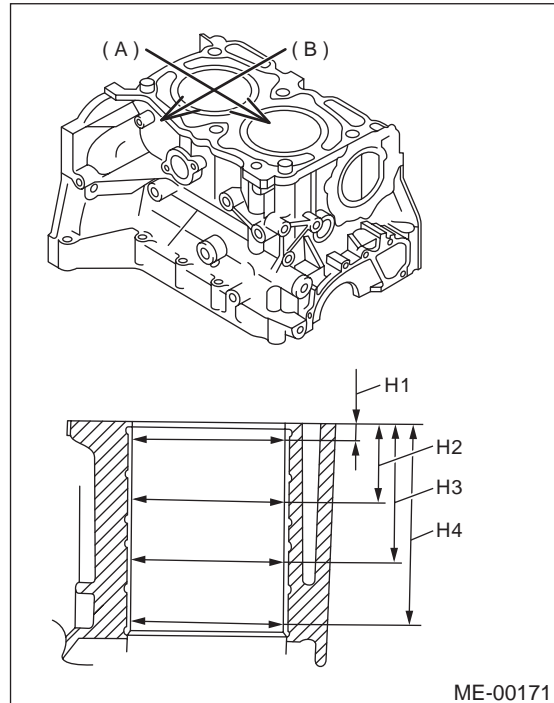
Out-of-roundness:

Standard

0.010 mm (0.0004 in)

Limit

0.050 mm (0.0020 in)



- (A) Piston pin direction
- (B) Thrust direction
- H1: 10 mm (0.39 in)
- H2: 45 mm (1.77 in)
- H3: 80 mm (3.15 in)
- H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
38.7 mm (1.524 in)

Piston outer diameter:
Standard

A: 91.985 — 91.995 mm (3.6214 — 3.6218 in)

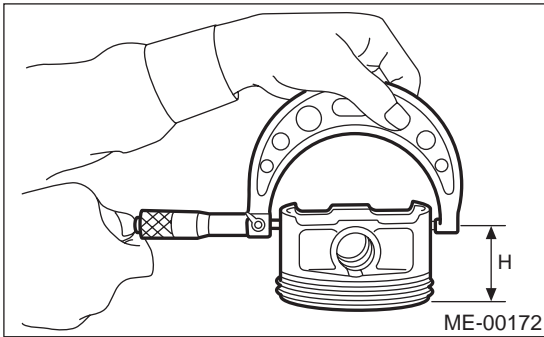
B: 91.975 — 91.985 mm (3.6211 — 3.6214 in)

0.25 mm (0.0098 in) oversize

92.225 — 92.235 mm (3.6309 — 3.6313 in)

0.50 mm (0.0197 in) oversize

92.475 — 92.485 mm (3.6407 — 3.6411 in)



5) Calculate the clearance between cylinder and piston.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):

Standard

0.010 — 0.030 mm (0.0004 — 0.0012 in)

Limit

0.050 mm (0.0020 in)

6) Boring and honing:

(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

NOTE:

When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOSTC)-83, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.

3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

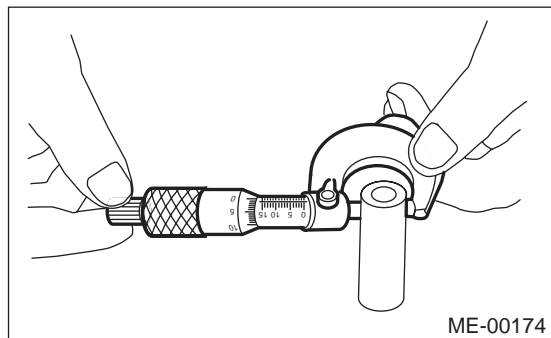
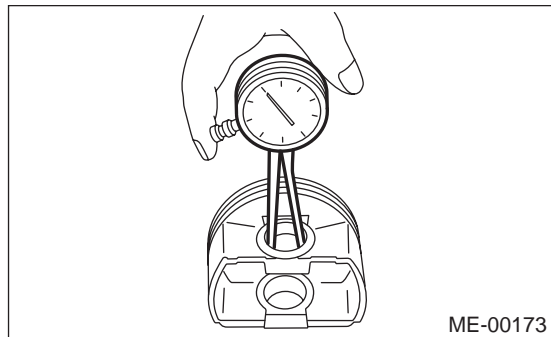
Standard clearance between piston pin and hole in piston:

Standard

0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

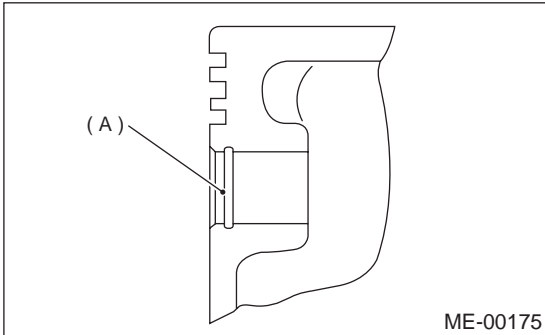
0.020 mm (0.0008 in)



CYLINDER BLOCK

MECHANICAL

4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that the piston pin can lightly move.



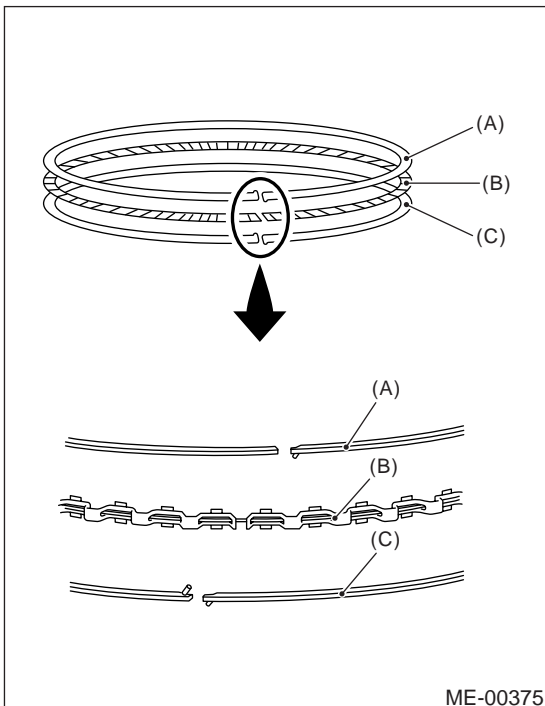
5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

NOTE:

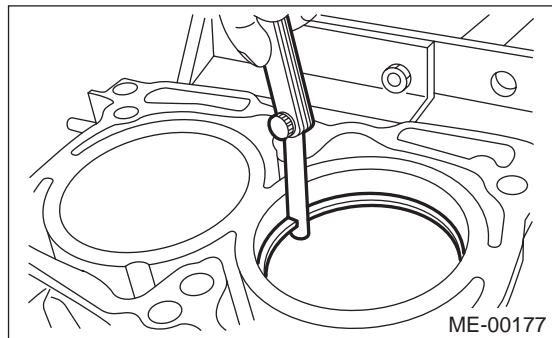
- Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
- Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



- (A) Upper rail
- (B) Expander
- (C) Lower rail

2) Clean up the piston ring groove and piston ring.
3) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

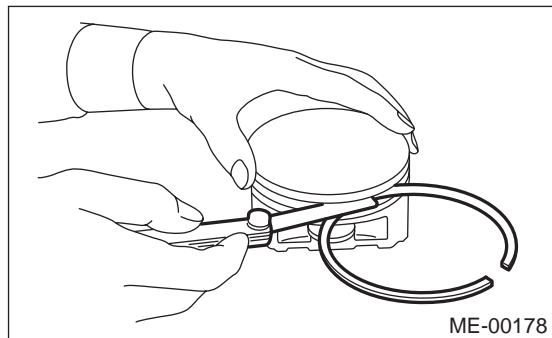


4) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.055 — 0.090 (0.0022 — 0.0035)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)

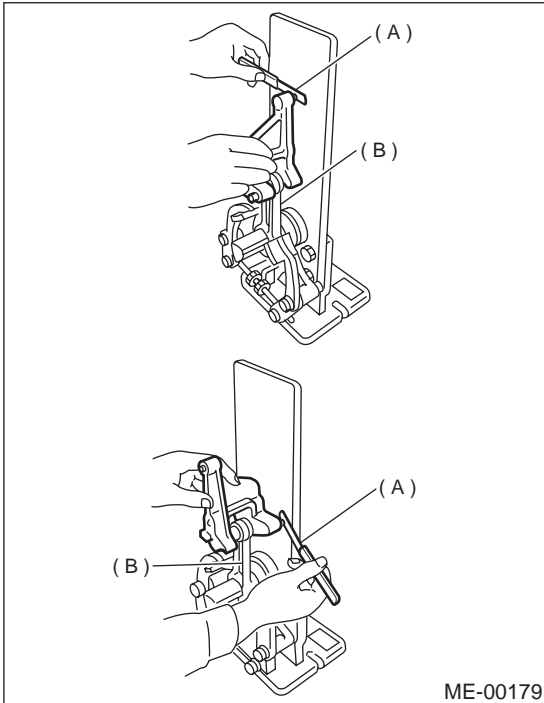


5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:

0.10 mm (0.0039 in)



- (A) Thickness gauge
(B) Connecting rod

- 3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

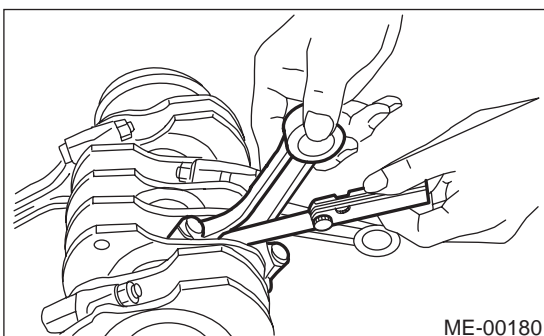
Connecting rod side clearance:

Standard

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Limit

0.4 mm (0.016 in)



- 4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

- 5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:

Standard

0.020 — 0.046 mm (0.0008 — 0.0018 in)

Limit

0.05 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.486 — 1.498 (0.0585 — 0.0590)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

CYLINDER BLOCK

MECHANICAL

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

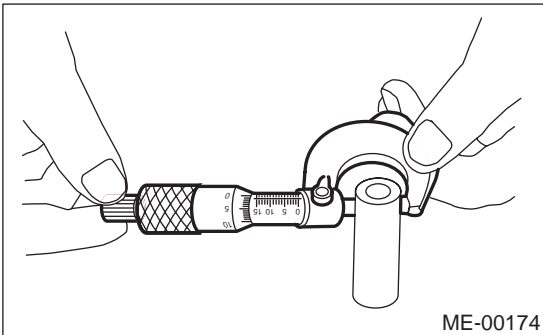
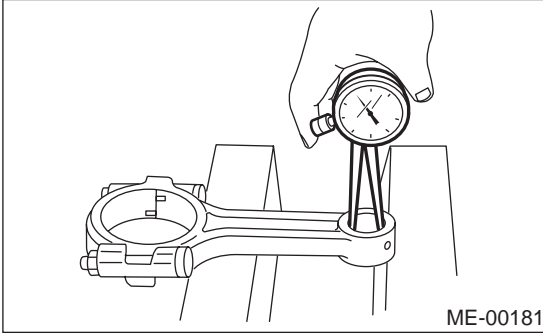
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

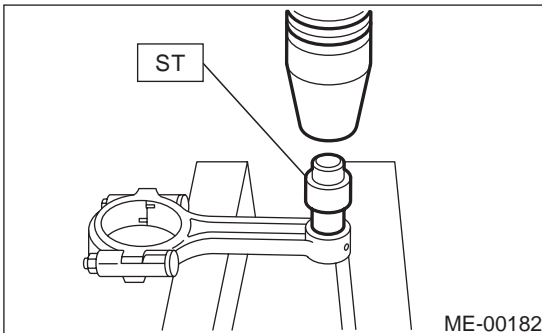
0.030 mm (0.0012 in)



7) Replacement procedure is as follows:

- (1) Remove the bushing from connecting rod with ST and press.
- (2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



- (3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
- (4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

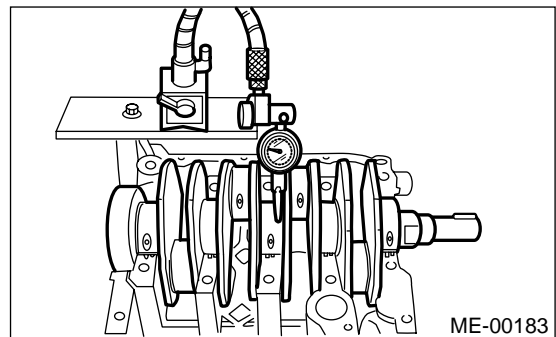
- 1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
- 2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

NOTE:

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:

0.035 mm (0.0014 in)



- 3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:

Out-of-roundness

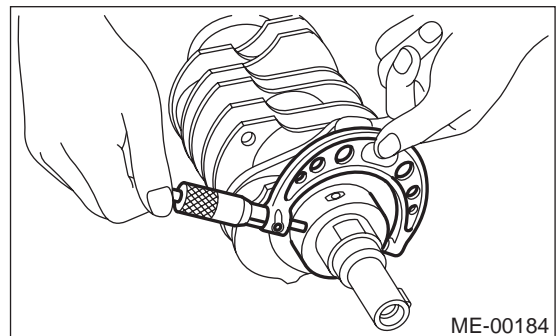
0.020 mm (0.0008 in) or less

Taper limit

0.07 mm (0.0028 in)

Grinding limit

0.250 mm (0.0098 in)



CYLINDER BLOCK

MECHANICAL

		Crank journal diameter		Unit: mm (in)
		#1, #3, #5	#2, #4	Crank pin diameter
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

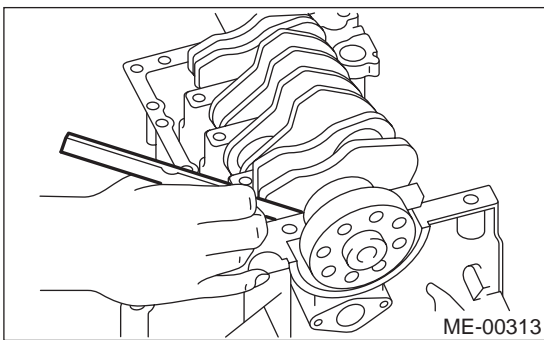
Crankshaft thrust clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)



			Unit: mm (in)
			Crankshaft oil clearance
#1	STD	0.003 — 0.030 (0.0001 — 0.0012)	
	Limit	0.040 (0.0016)	
#2	STD	0.012 — 0.033 (0.0005 — 0.0013)	
	Limit	0.045 (0.0018)	
#3	STD	0.003 — 0.030 (0.0001 — 0.0012)	
	Limit	0.040 (0.0016)	
#4	STD	0.012 — 0.033 (0.0005 — 0.0013)	
	Limit	0.045 (0.0018)	
#5	STD	0.010 — 0.031 (0.0004 — 0.0012)	
	Limit	0.040 (0.0016)	

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

ENGINE TROUBLE IN GENERAL

MECHANICAL

21.Engine Trouble in General

A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
• Seized or stuck piston and cylinder		C	
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Fuel line	• Defective fuel pump and relay	A
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
• Improper engine oil (low viscosity)	B		
3) Initial combustion occur.	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
• Worn or stuck piston rings, cylinder and piston		C	
• Incorrect valve timing		B	
• Improper engine oil (low viscosity)	B		

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	B
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	C
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Dirty air cleaner element	C
	• Fuel line	• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
• Worn or stuck piston rings, cylinder and piston		C	
• Incorrect valve timing		B	
• Improper engine oil (low viscosity)		B	
2. Rough idle and engine stall	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	C
		• Loosened oil filler cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
		• Defective rocker cover gasket	C
	• Cooling system	• Overheating	C
	• Others	• Malfunction of evaporative emission control system	A
		• Stuck or damaged throttle valve	B
		• Accelerator cable out of adjustment	C

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	B
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
• Improper engine oil (low viscosity)		B	
• Lubrication system	• Incorrect oil pressure	B	
• Cooling system	• Overheating	C	
	• Over cooling	C	
• Others	• Malfunction of evaporative emission control system	A	
4. Surging	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
• Improper engine oil (low viscosity)		B	
• Cooling system	• Overheating	B	
• Others	• Malfunction of evaporative emission control system	C	

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked vacuum hose	A
	• Others	• Stuck or damaged throttle valve	A
		• Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	B
7. After burning in exhaust system	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	C
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	B
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Lubrication system	• Incorrect oil pressure	C
• Cooling system	• Over cooling	C	
• Others	• Malfunction of evaporative emission control system	C	
8. Knocking	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filler o-ring	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
	• Loosened oil pan fitting bolts or defective oil pan	B	

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK	
10. Excessive fuel consumption	• Engine control system <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>		A	
	• Intake system	• Dirty air cleaner element	A	
	• Belt	• Defective timing	B	
	• Compression	• Incorrect valve clearance		B
		• Loosened spark plugs or defective gasket		C
		• Loosened cylinder head bolts or defective gasket		C
		• Improper valve seating		B
		• Defective valve stem		C
		• Worn or broken valve spring		C
		• Worn or stuck piston rings, cylinder and piston		B
		• Incorrect valve timing		B
	• Lubrication system	• Incorrect oil pressure	C	
	• Cooling system	• Over cooling	C	
• Others	• Accelerator cable out of adjustment	B		

22.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	<ul style="list-style-type: none"> • Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	<ul style="list-style-type: none"> • Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	<ul style="list-style-type: none"> • Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	<ul style="list-style-type: none"> • Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	<ul style="list-style-type: none"> • Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	<ul style="list-style-type: none"> • Insufficient generator lubrication
Rubbing sound	—	<ul style="list-style-type: none"> • Defective generator brush and rotor contact
Gear scream when starting engine	—	<ul style="list-style-type: none"> • Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	<ul style="list-style-type: none"> • Loose drive belt • Defective water pump shaft
Hissing sound	—	<ul style="list-style-type: none"> • Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	<ul style="list-style-type: none"> • Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	<ul style="list-style-type: none"> • Incorrect valve clearance

NOTE*:

When disconnecting the fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.

Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.> after connecting the fuel injector connector.

ENGINE NOISE

MECHANICAL

MEMO:

EXHAUST

EX(H4DOSTC)

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3. Center Exhaust Pipe	7
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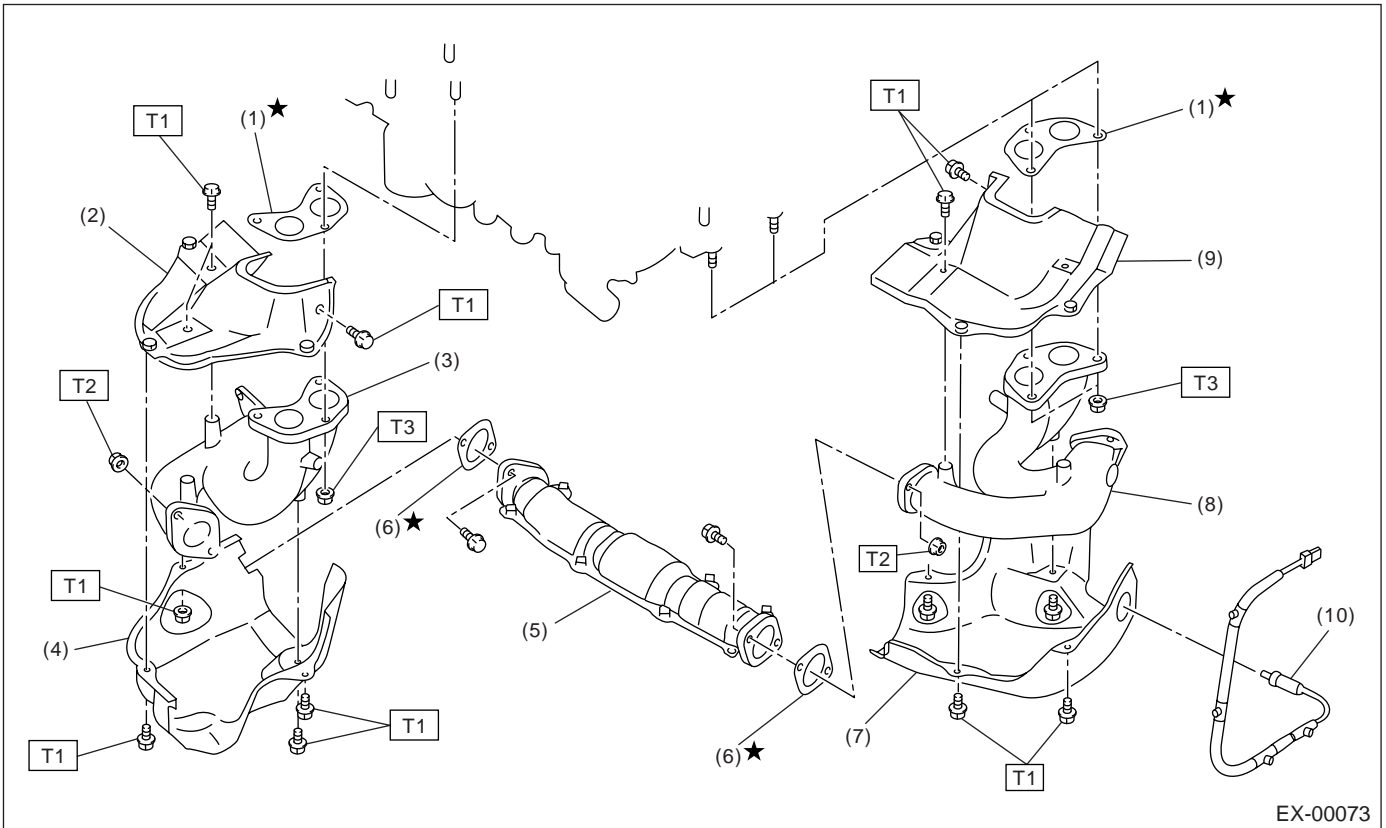
GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE



- | | |
|---------------------------------------|---------------------------------------|
| (1) Gasket | (6) Gasket |
| (2) Upper exhaust manifold cover (RH) | (7) Lower exhaust manifold cover (LH) |
| (3) Exhaust manifold (RH) | (8) Exhaust manifold (LH) |
| (4) Lower exhaust manifold cover (RH) | (9) Upper exhaust manifold cover (LH) |
| (5) Front exhaust pipe | (10) Front oxygen (A/F) sensor |

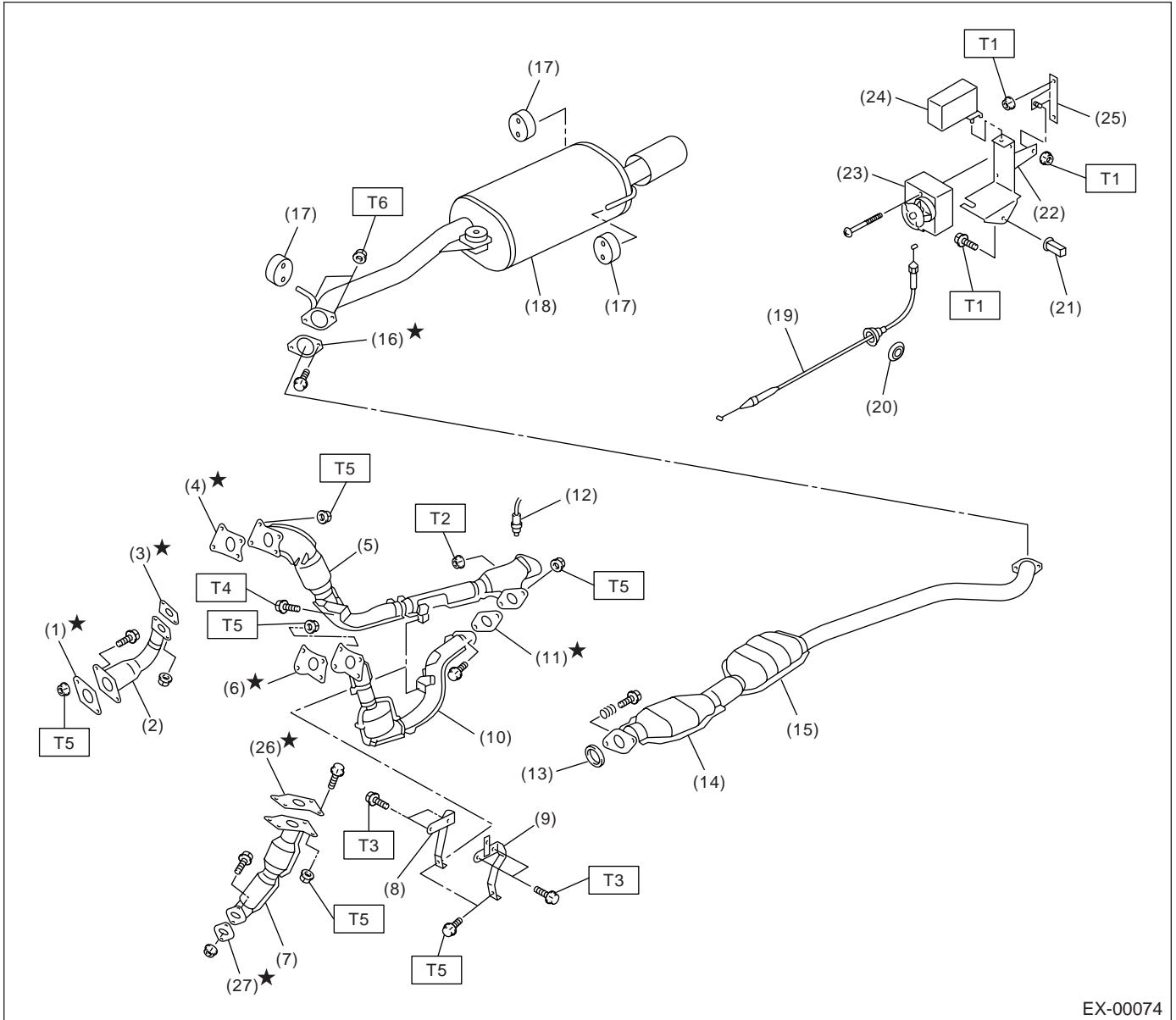
Tightening torque: N·m (kgf·m, ft·lb)

T1: 19 (1.9, 13.7)

T2: 35 (3.6, 26.0)

T3: 39 (4.0, 28.9)

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



- | | | |
|-------------------------------|-------------------------------------|----------------------------|
| (1) Gasket | (13) Gasket | (25) Bracket (MT vehicles) |
| (2) Joint pipe (RH) | (14) Rear catalytic converter | (26) Gasket |
| (3) Gasket | (15) Rear exhaust pipe | (27) Gasket |
| (4) Gasket | (16) Gasket | |
| (5) Center exhaust pipe (RH) | (17) Cushion | |
| (6) Gasket | (18) Muffler | |
| (7) Joint pipe (LH) | (19) Control cable (MT vehicles) | |
| (8) Hanger bracket (RH) | (20) Plug (AT vehicles) | |
| (9) Hanger bracket (LH) | (21) Grommet | |
| (10) Center exhaust pipe (LH) | (22) Actuator bracket (MT vehicles) | |
| (11) Gasket | (23) Actuator (MT vehicles) | |
| (12) Rear oxygen sensor | (24) Controller (MT vehicles) | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 4.5 (0.46, 3.3)

T2: 18 (1.8, 13.0)

T3: 23 (2.3, 16.6)

T4: 30 (3.0, 21.7)

T5: 35 (3.6, 26.0)

T6: 48 (4.9, 35.4)

GENERAL DESCRIPTION

EXHAUST

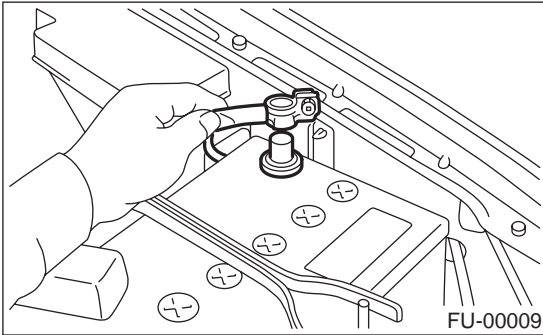
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Front Exhaust Pipe

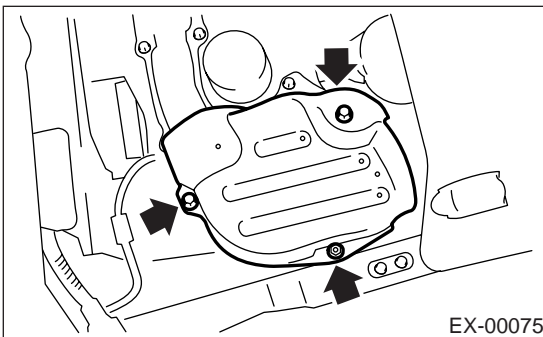
A: REMOVAL

1) Disconnect the ground cable from battery.

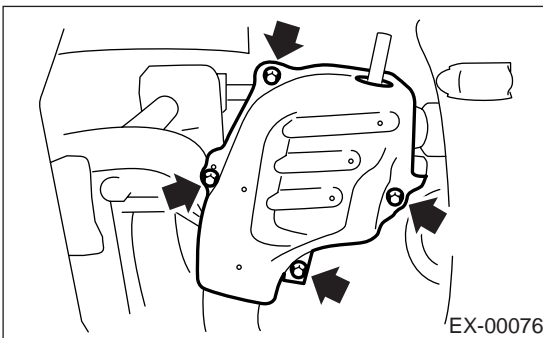


2) Disconnect the connector from front oxygen (A/F) sensor.

3) Remove the exhaust manifold cover (RH).

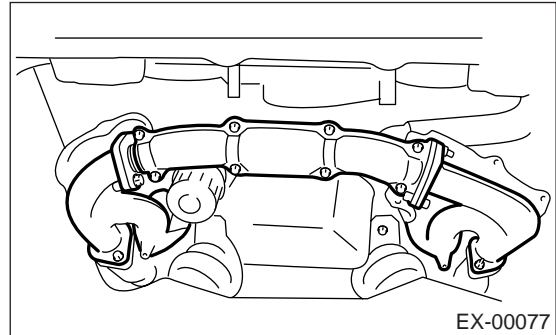


4) Remove the exhaust manifold covers (LH).



5) Remove the bolts and nuts which hold front exhaust pipe assembly to turbocharger joint pipe.

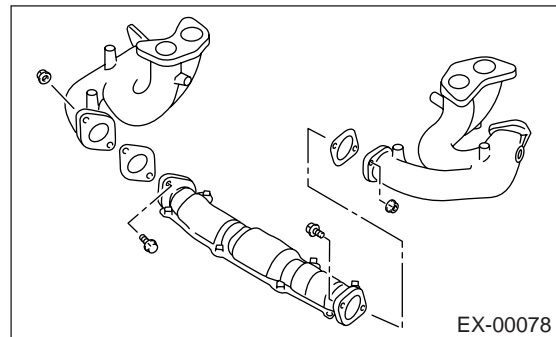
6) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold front exhaust pipe assembly to cylinder head exhaust port.



7) Remove the front exhaust pipe assembly.

8) Remove the covers from the exhaust manifold and front exhaust pipe.

9) Separate the front exhaust pipe from exhaust manifolds.



B: INSTALLATION

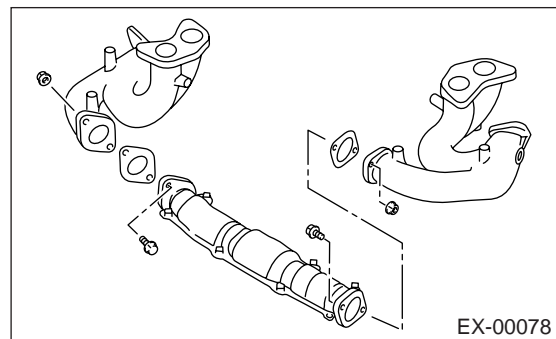
NOTE:

Replace the gaskets with new ones.

1) Assemble the front exhaust pipe and exhaust manifolds.

Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)



2) Install the front exhaust pipe assembly.

Tightening torque:

40 N·m (4.0 kgf-m, 28.9 ft-lb)

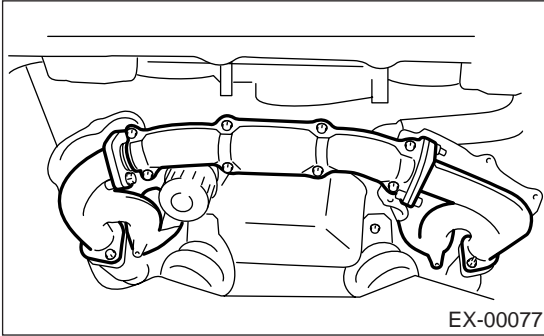
FRONT EXHAUST PIPE

EXHAUST

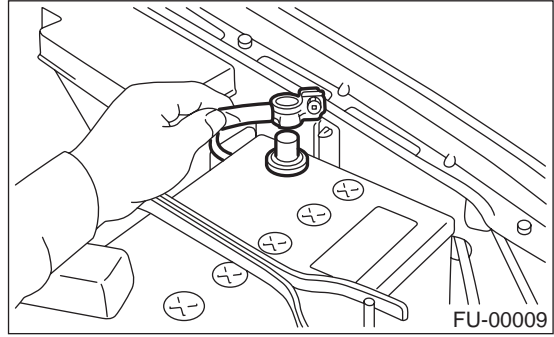
3) Connect the exhaust manifold to turbocharger joint pipe.

Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)



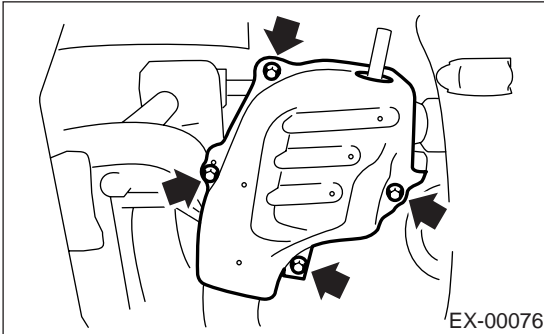
8) Connect the battery ground cable to battery.



4) Install the exhaust manifold covers (LH).

Tightening torque:

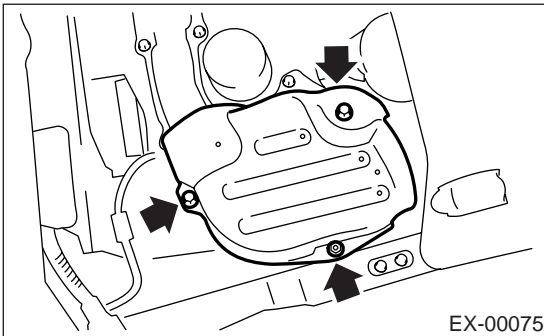
19 N·m (1.9 kgf-m, 13.7 ft-lb)



5) Install the lower exhaust manifold cover (RH).

Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



6) Connect the connector to front oxygen (A/F) sensor.

7) Install the under cover.

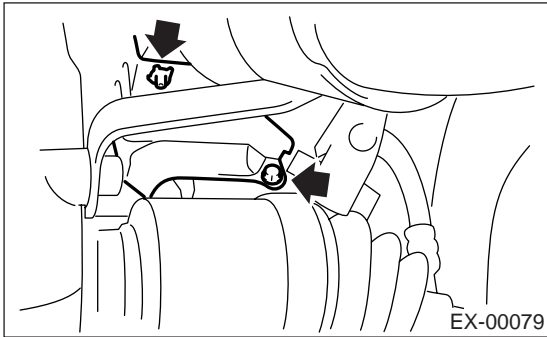
3. Center Exhaust Pipe

A: REMOVAL

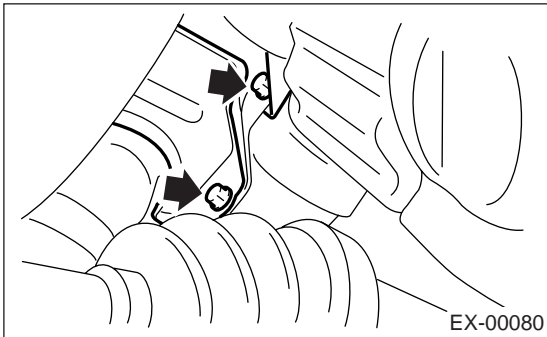
- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the intercooler. <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 4) Lift-up the vehicle.
- 5) Remove the under cover.
- 6) Remove the bolts which install lower side of turbocharger cover (RH).

CAUTION:

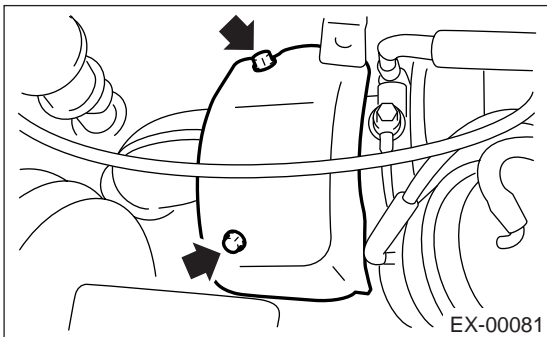
Be careful, the turbocharger cover and exhaust pipe are hot.



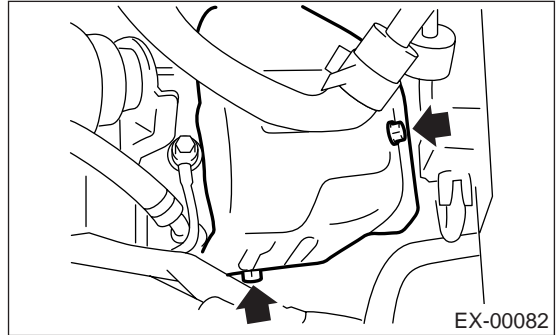
- 7) Remove the bolts which install lower side of turbocharger cover (LH).



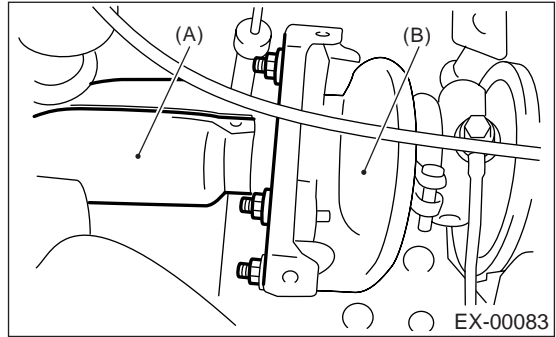
- 8) Lower the vehicle.
- 9) Remove the turbocharger cover (RH).



- 10) Remove the turbocharger cover (LH).

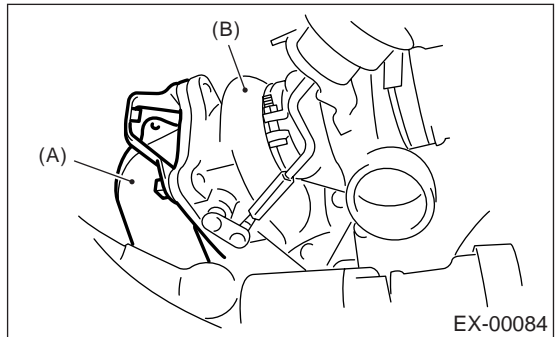


- 11) Separate the center exhaust pipe (RH) from secondary turbocharger.



- (A) Center exhaust pipe (RH)
- (B) Secondary turbocharger

- 12) Separate the center exhaust pipe (LH) from primary turbocharger.



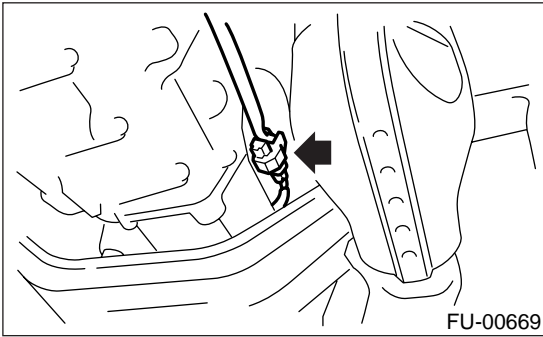
- (A) Center exhaust pipe (LH)
- (B) Primary turbocharger

- 13) Lift-up the vehicle.

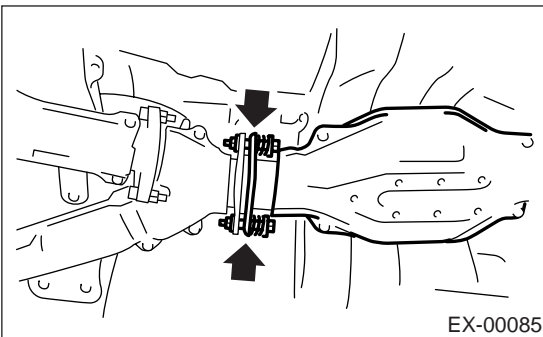
CENTER EXHAUST PIPE

EXHAUST

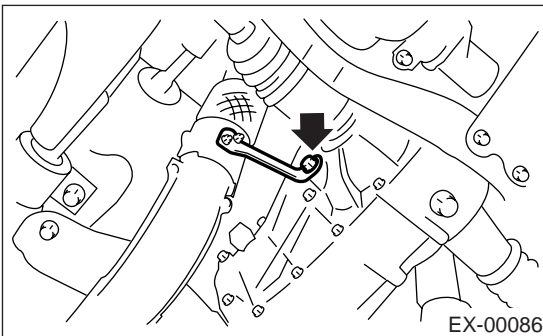
14) Disconnect the connector from rear oxygen sensor.



15) Vertically draw out the clip from crossmember.
16) Separate the center exhaust pipe from rear exhaust pipe.



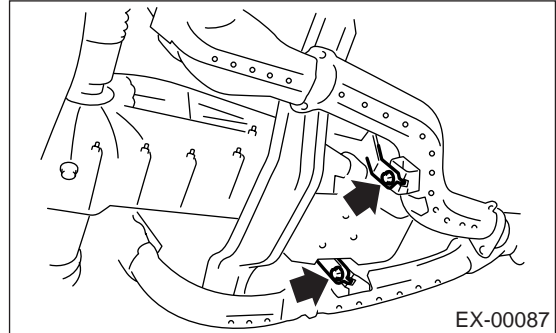
17) Remove the bolt which holds center exhaust pipe bracket to transmission.



18) Remove the bolts which hold center exhaust pipe to hanger bracket.

CAUTION:

Be careful not to pull down the center exhaust pipe.



19) Remove the center exhaust pipe.

B: INSTALLATION

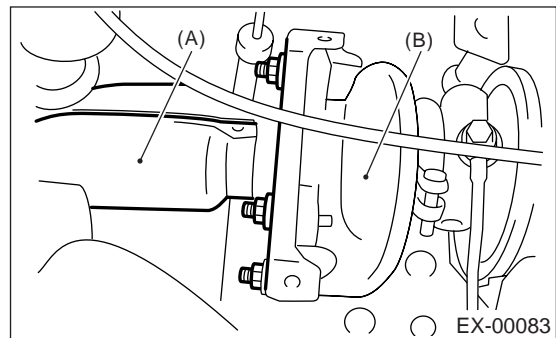
NOTE:

Replace the gaskets with new ones.

- 1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
- 2) Temporarily tighten the bolt which holds center exhaust pipe to transmission.
- 3) Connect the center exhaust pipe (RH) to secondary turbocharger.

Tightening torque:

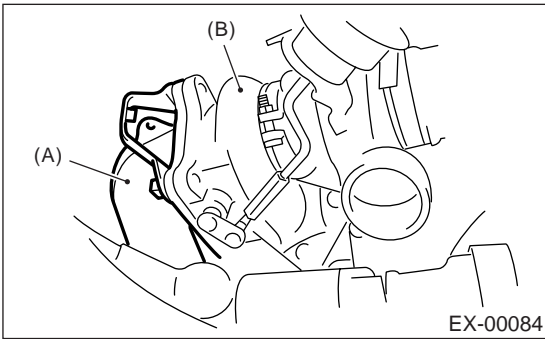
35 N·m (3.6 kgf-m, 26.0 ft-lb)



- (A) Center exhaust pipe (RH)
(B) Secondary turbocharger

4) Connect the center exhaust pipe (LH) to primary turbocharger.

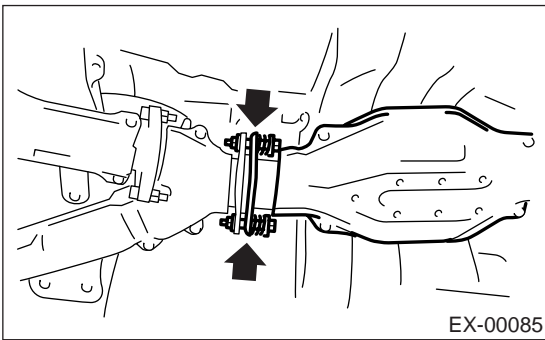
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



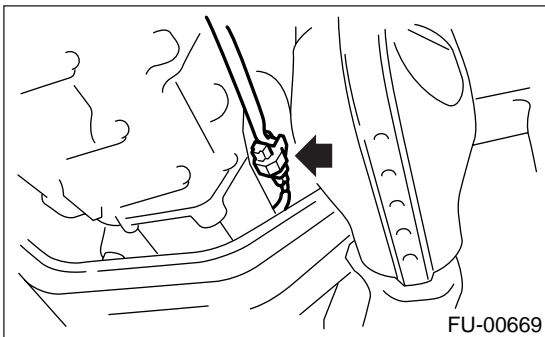
- (A) Center exhaust pipe (LH)
- (B) Primary turbocharger

5) Install the center exhaust pipe to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



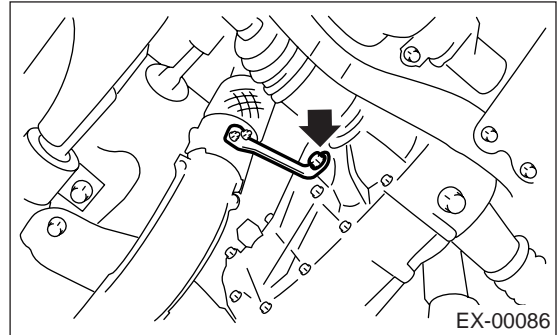
6) Connect the connector to rear oxygen sensor.



7) Secure clip on the crossmember.

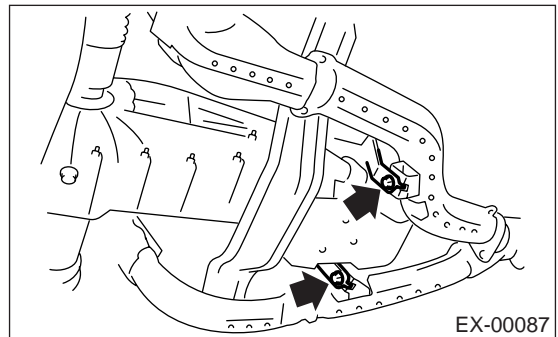
8) Tighten the bolt which holds center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



9) Tighten the bolts which hold center exhaust pipe to hanger bracket.

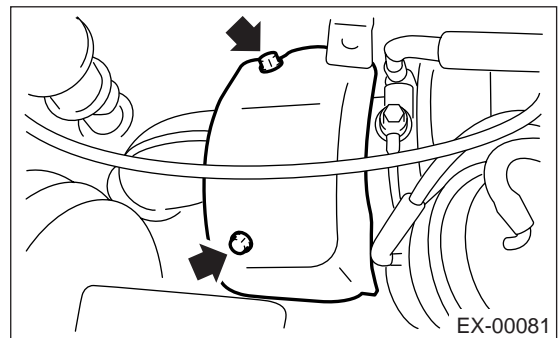
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



10) Lower the vehicle.

11) Place the turbocharger cover (RH), and then tighten the bolts which install turbocharger cover (RH).

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



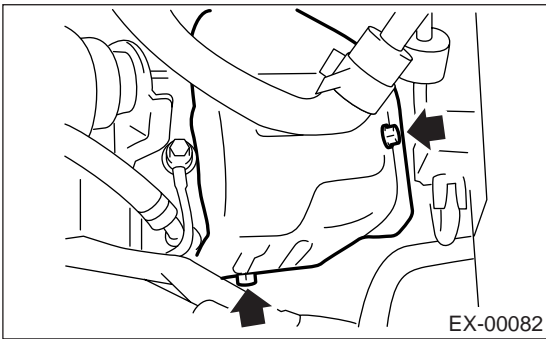
CENTER EXHAUST PIPE

EXHAUST

12) Place the turbocharger cover (LH), and tighten the bolts which install turbocharger cover (LH).

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

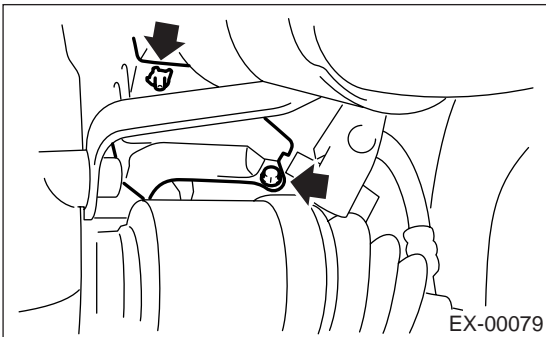


13) Lift-up the vehicle.

14) Tighten the bolts which install under side of turbocharger cover (RH).

Tightening torque:

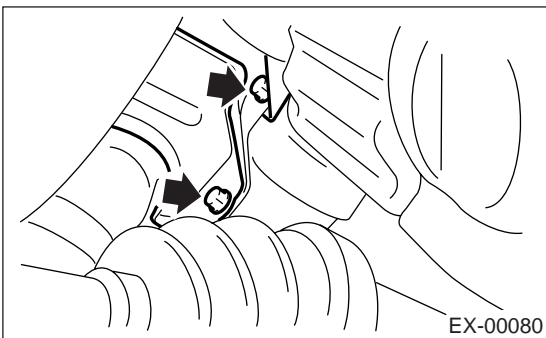
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



15) Tighten the bolts which install under side of turbocharger cover (LH).

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



16) Install the under cover.

17) Lower the vehicle.

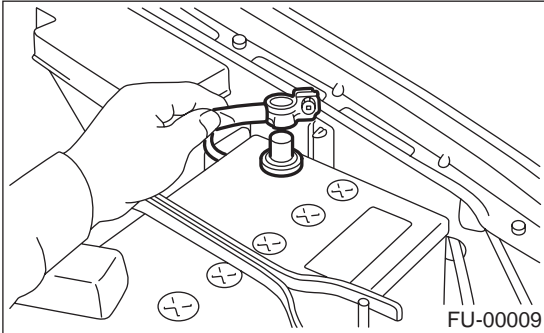
18) Install the intercooler. <Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

4. Joint Pipe

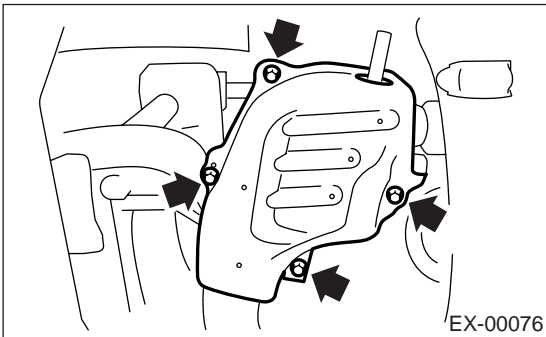
A: REMOVAL

1. PRIMARY SIDE

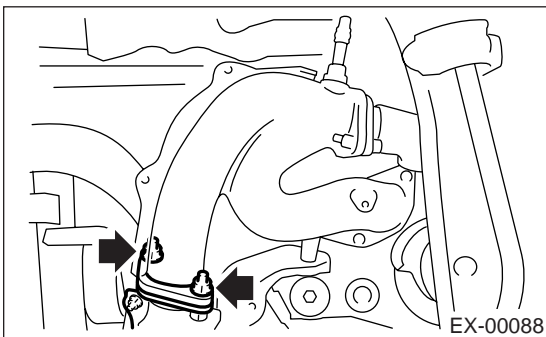
- 1) Disconnect the ground cable from battery.



- 2) Remove the under cover.
- 3) Remove the lower exhaust manifold cover (LH).



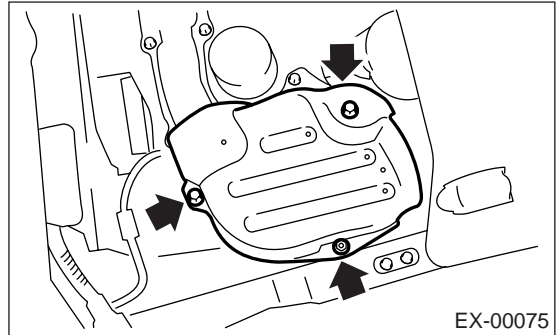
- 4) Remove the nuts which hold front exhaust manifold to joint pipe.



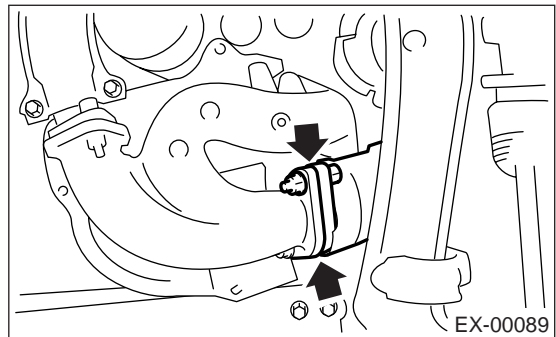
- 5) Remove the center exhaust pipe. <Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>
- 6) Remove the turbocharger. <Ref. to IN(H4DOSTC)-15, REMOVAL, Turbocharger.>
- 7) Take off the joint pipe in the upward direction.

2. SECONDARY SIDE

- 1) Remove the under cover.
- 2) Remove the lower exhaust manifold cover (RH).



- 3) Remove the nuts which hold front exhaust manifold to joint pipe.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the gaskets with new ones.

Tightening torque:

T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)

REAR EXHAUST PIPE

EXHAUST

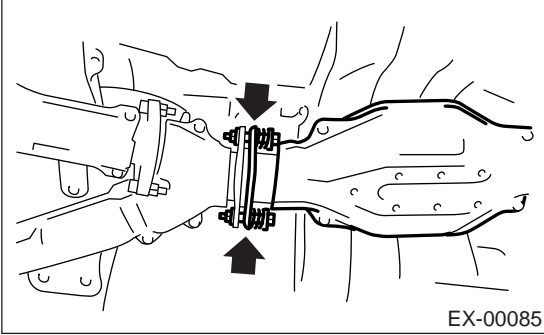
5. Rear Exhaust Pipe

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:

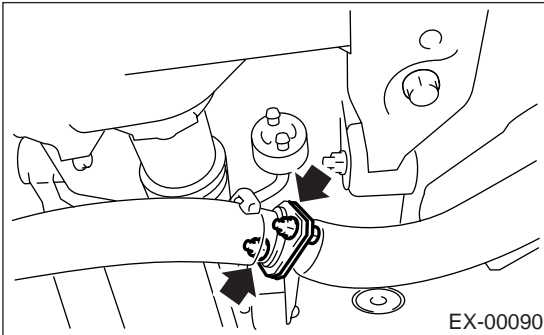
Be careful, the exhaust pipe is hot.



- 3) Separate the rear exhaust pipe from muffler.

CAUTION:

Be careful not to pull down the rear exhaust pipe.



- 4) Remove the rear exhaust pipe.

B: INSTALLATION

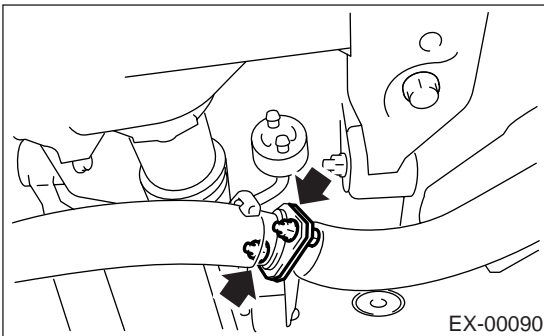
NOTE:

Replace the gaskets with new ones.

- 1) Install the rear exhaust pipe to muffler.

Tightening torque:

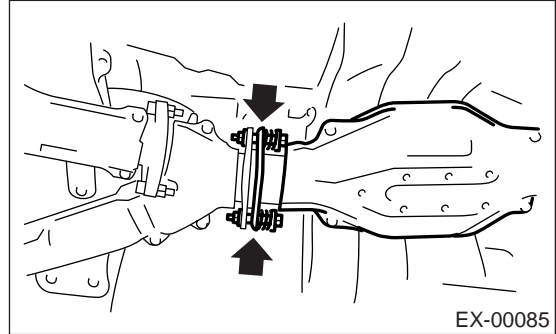
48 N·m (4.9 kgf·m, 35.4 ft·lb)



- 2) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



- 3) Lower the vehicle.

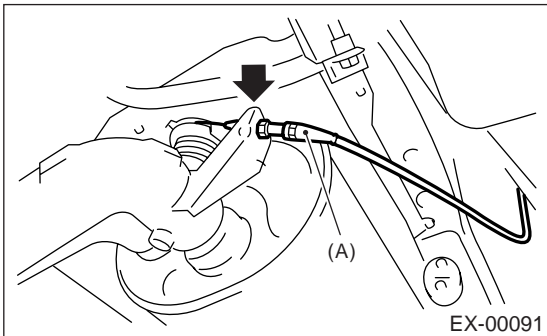
C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

6. Muffler

A: REMOVAL

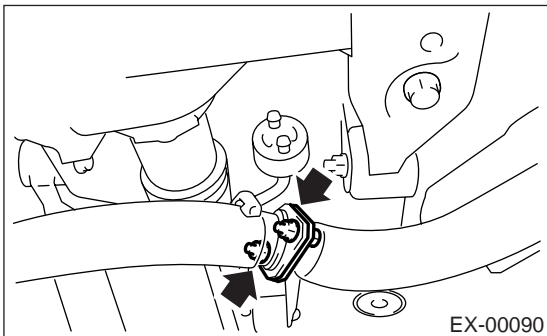
1) Disconnect the cable (A) for variable muffler from joint part of muffler. (MT vehicles)



2) Separate the muffler from rear exhaust pipe.

CAUTION:

Be careful, the exhaust pipe is hot.



3) Remove the rubber cushions, and then detach the muffler.

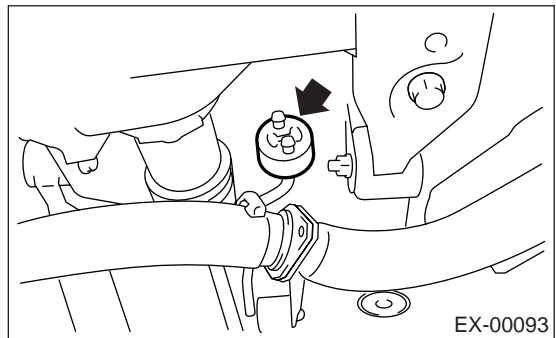
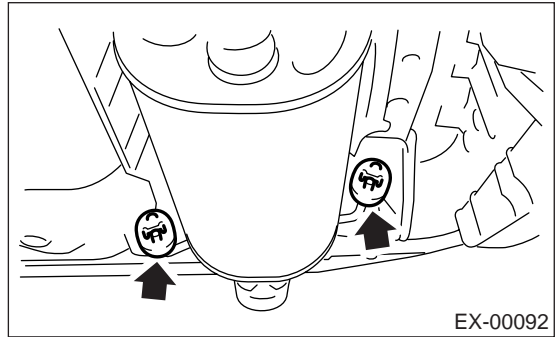
CAUTION:

Be careful not to drop the muffler during removal.

NOTE:

To facilitate removal, apply a coat of SUBARU CRC to the mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)



B: INSTALLATION

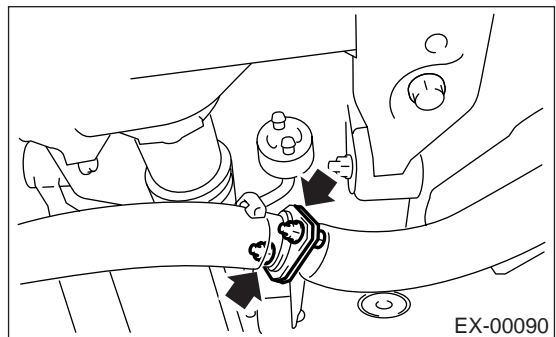
1) Install in the reverse order of removal.

CAUTION:

Replace the gasket with a new one.

Tightening torque:

48 N·m (4.9 kgf·m, 35.4 ft·lb)



C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

VARIABLE MUFFLER CONTROL UNIT

EXHAUST

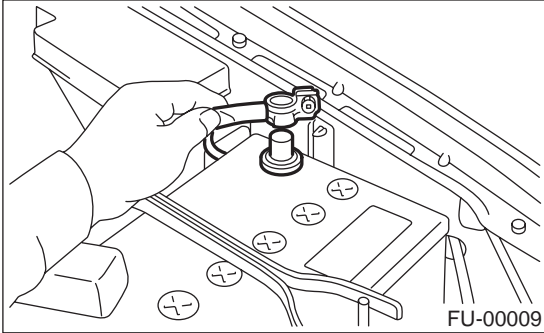
7. Variable Muffler Control Unit

A: REMOVAL

NOTE:

This unit is equipped only for MT vehicles.

1) Disconnect the ground cable from battery.

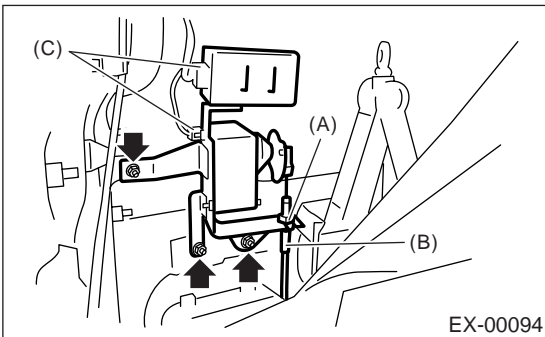


2) Remove the rear quarter trim. <Ref. EI-42 REMOVAL, Rear QUARTER Trim.>

3) Loosen the lock nut (A) which holds control cable, and then remove the cable (B).

4) Disconnect the variable muffler control unit and connector (C) of actuator.

5) Remove the variable muffler control unit, actuator and bracket as a unit.



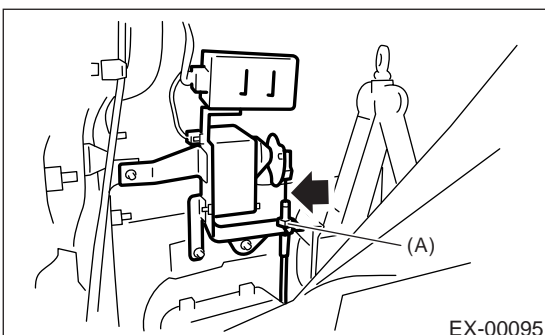
B: INSTALLATION

Install in the reverse order of removal.

C: ADJUSTMENT

Adjust the free play of control cable with lock nut (A).

**Inner cable free play when pressed with finger:
2.0 mm (0.08 in)**



D: INSPECTION

Turn the ignition switch ON (engine OFF), and then check that the actuator moves smoothly and does not make abnormal noise.

COOLING

CO(H4DOSTC)

	Page
1. General Description	2
2. Radiator Main Fan System.....	7
3. Radiator Sub Fan System	11
4. Engine Coolant.....	15
5. Water Pump	17
6. Thermostat	21
7. Radiator.....	23
8. Radiator Cap	27
9. Radiator Main Fan and Fan Motor	28
10. Radiator Sub Fan and Fan Motor.....	30
11. Reservoir Tank.....	32
12. Coolant Filler Tank	33
13. Engine Cooling System Trouble in General	34

GENERAL DESCRIPTION

COOLING

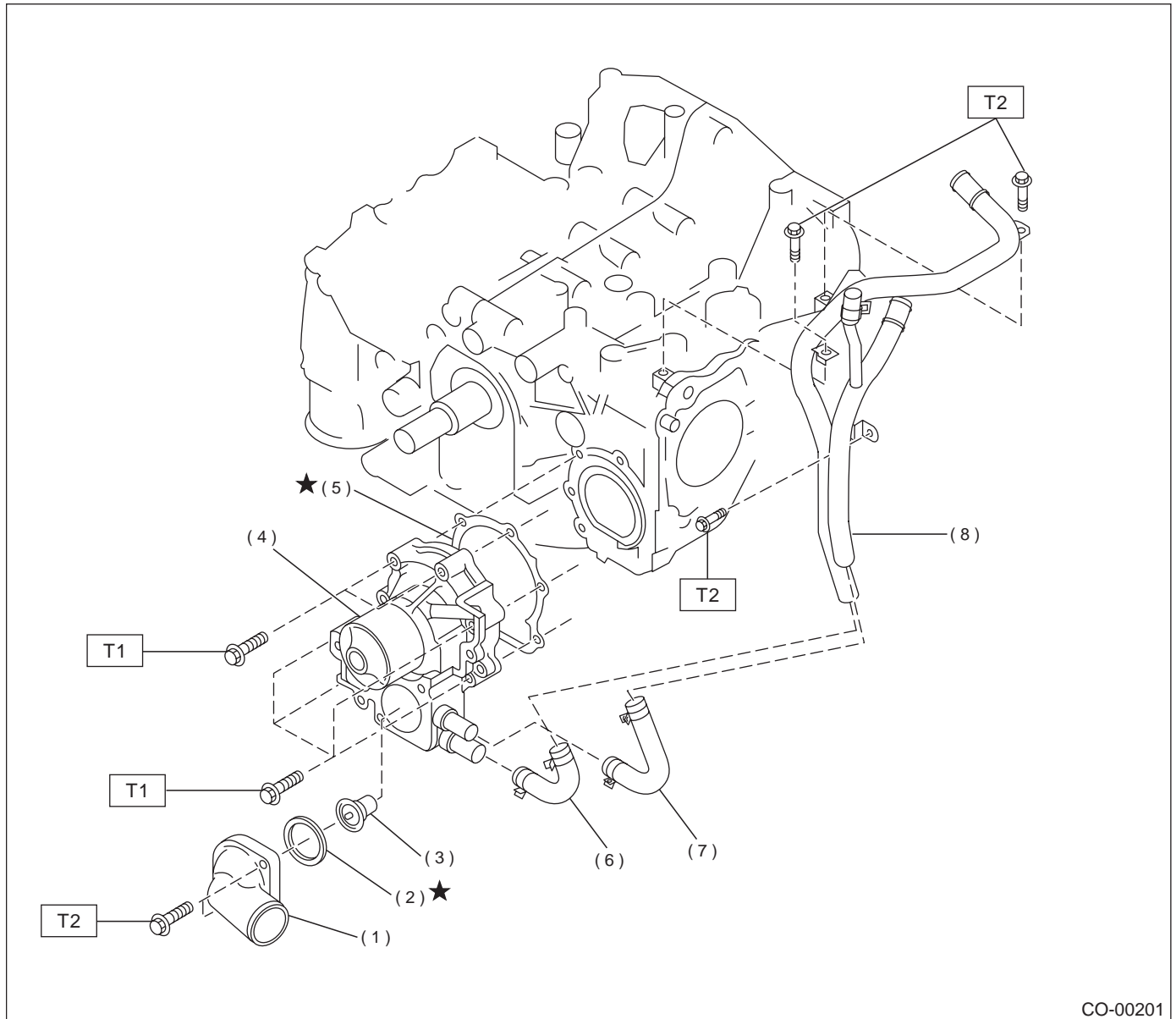
1. General Description

A: SPECIFICATIONS

Cooling system		Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity		ℓ (US qt, Imp qt) MT: Approx. 7.7 (8.1, 6.8) AT: Approx. 7.6 (8.0, 6.7)	
Water pump	Type	Centrifugal impeller type	
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed—Discharge pressure (pressure leak)	760 rpm — 2.9 kPa [0.3 mAq (1.0 ftAq)]
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed—Discharge pressure (pressure leak)	3,000 rpm — 49.0 kPa [5.0 mAq (16.4 ftAq)]
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed—Discharge pressure (pressure leak)	6,000 rpm — 225.4 kPa [23.0 mAq (75.5 ftAq)]
		Engine coolant temperature	85°C (185°F)
	Impeller diameter		76 mm (2.99 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
Clearance between impeller and case	Standard	0.5 — 0.7 mm (0.020 — 0.028 in)	
	Limit	1.0 mm (0.039 in)	
“Thrust” runout of impeller end		0.5 mm (0.020 in)	
Thermostat	Type	Wax pellet type	
	Starts to open	76 — 80°C (169 — 176°F)	
	Fully opened	91°C (196°F)	
	Valve lift	9.0 mm (0.354 in) or more	
	Valve bore	35 mm (1.38 in)	
Radiator fan	Motor	75 W (main fan) 75 W (sub fan)	
	Fan diameter × Blade	300 mm (11.81 in) × 5 (main fan) 300 mm (11.81 in) × 4 (sub fan)	
Radiator	Type	Down flow, pressure type	
	Core dimensions	691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in)	
	Pressure range in which cap valve is open or closed	Above: 108±15 kPa (1.1±0.15 kg/cm ² , 16±2 psi) Below: -1.0 to -4.9 kPa (-0.01 to -0.05 kg/cm ² , -0.1 to -0.7 psi)	
	Fins	Corrugated fin type	
Reservoir tank	Capacity	0.5 ℓ (0.5 US qt, 0.4 Imp qt)	

B: COMPONENT

1. WATER PUMP



CO-00201

- | | |
|---------------------|--------------------------------------|
| (1) Thermostat case | (5) Gasket |
| (2) Gasket | (6) Heater by-pass hose |
| (3) Thermostat | (7) Coolant filler tank by-pass hose |
| (4) Water pump ASSY | (8) Water by-pass hose |

Tightening torque: N·m (kgf·m, ft·lb)

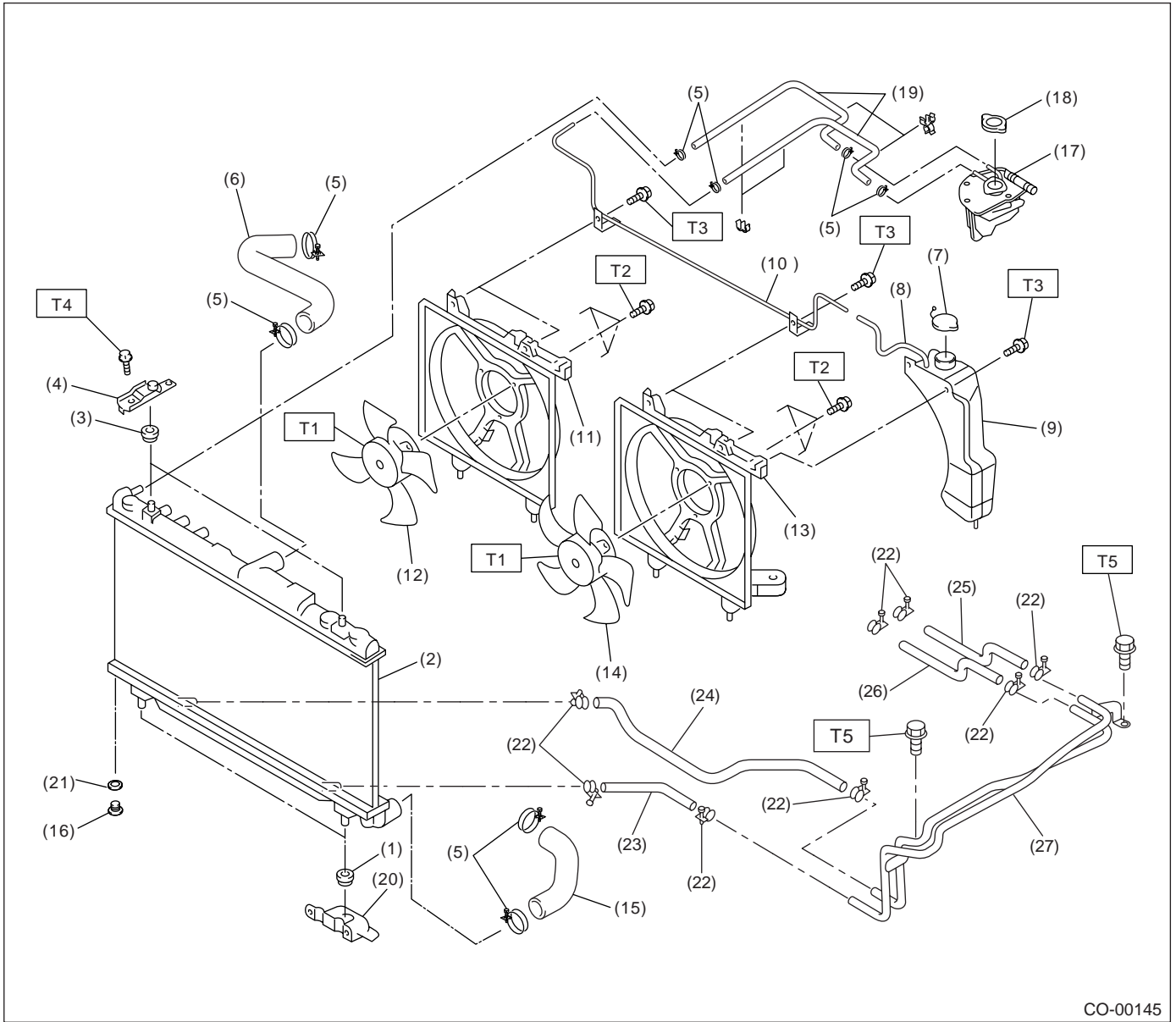
**T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)**

T2: 6.5 (0.66, 4.8)

GENERAL DESCRIPTION

COOLING

2. RADIATOR AND RADIATOR FAN



CO-00145

- | | | |
|--|--|---|
| (1) Radiator lower cushion | (14) Radiator main fan and main fan motor ASSY | (25) ATF outlet hose B (AT vehicles only) |
| (2) Radiator | (15) Radiator outlet hose | (26) ATF inlet hose B (AT vehicles only) |
| (3) Radiator upper cushion | (16) Radiator drain plug | (27) ATF pipe (AT vehicles only) |
| (4) Radiator upper bracket | (17) Engine coolant filler tank | |
| (5) Clamp | (18) Engine coolant filler tank cap | |
| (6) Radiator inlet hose | (19) Engine coolant hose | |
| (7) Engine coolant reservoir tank cap | (20) Radiator lower bracket | |
| (8) Overflow hose | (21) O-ring | |
| (9) Engine coolant reservoir tank | (22) ATF hose clamp (AT vehicles only) | |
| (10) Overflow pipe | (23) ATF outlet hose A (AT vehicles only) | |
| (11) Sub fan shroud | (24) ATF inlet hose A (AT vehicles only) | |
| (12) Radiator sub fan and sub fan motor ASSY | | |
| (13) Main fan shroud | | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 3.4 (0.35, 2.5)

T2: 4.4 (0.45, 3.3)

T3: 4.9 (0.50, 3.6)

T4: 18 (1.8, 13.0)

T5: 12 (1.2, 8.7)

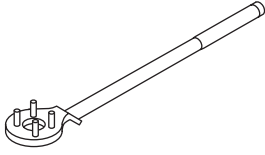
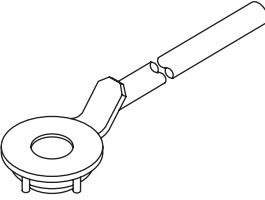
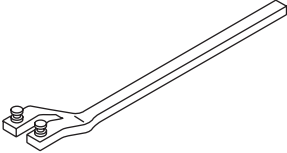
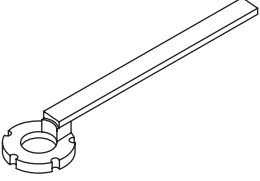
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

GENERAL DESCRIPTION

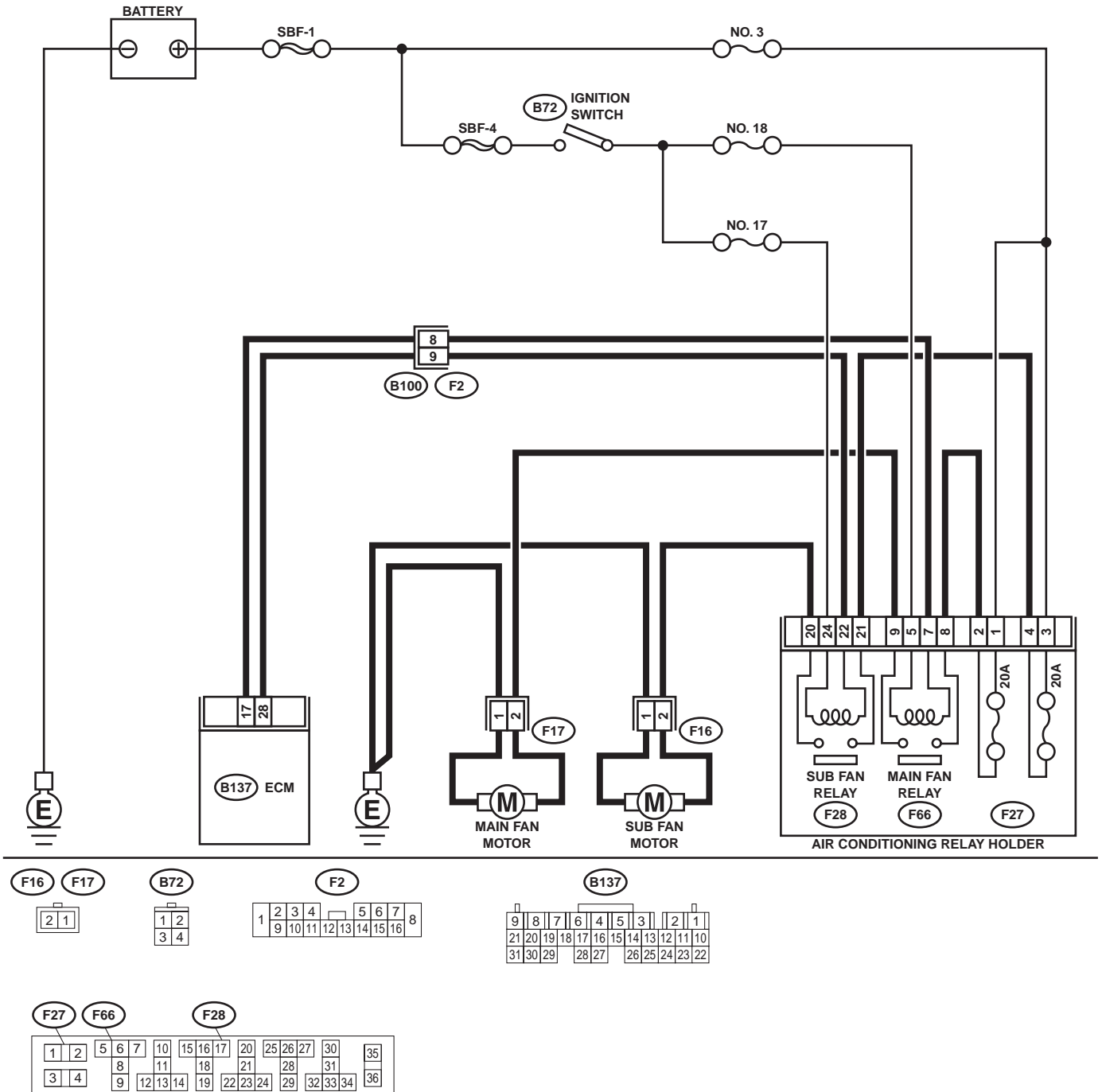
COOLING

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499977100</p>	499977100 (MT model)	CRANK PULLEY WRENCH	Used for fixing crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 <p style="text-align: center;">ST-499977400</p>	499977400 (AT model)	CRANK PULLEY WRENCH	Used for fixing crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 <p style="text-align: center;">ST18231AA010</p>	18231AA010	CAMSHAFT SPROCKET WRENCH	<ul style="list-style-type: none"> • Used for removing and installing camshaft sprocket. (Intake side) • Camshaft sprocket wrench (499207100) is also available.
 <p style="text-align: center;">ST-499207400</p>	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (Exhaust side)

2. Radiator Main Fan System

A: SCHEMATIC



RADIATOR MAIN FAN SYSTEM

COOLING

B: INSPECTION

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 95°C (203°F).
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY TO MAIN FAN MOTOR.</p> <p>CAUTION: Be careful not to overheat engine during repair.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between main fan motor connector and chassis ground. <p>Connector & terminal (F17) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Go to step 5.
<p>2 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground. <p>Connector & terminal (F17) No. 1 — Chassis ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair open circuit in harness between main fan motor connector and chassis ground.
<p>3 CHECK POOR CONTACT.</p> <p>Check poor contact in main fan motor connector.</p> <p>Is there poor contact in main fan motor connector?</p>	There is poor contact.	Repair poor contact in main fan motor connector.	Go to step 4.
<p>4 CHECK MAIN FAN MOTOR.</p> <p>Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of main fan motor connector.</p> <p>Does the main fan rotate?</p>	The main fan rotates.	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
<p>5 CHECK POWER SUPPLY TO MAIN FAN RELAY.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Remove main fan relay from A/C relay holder. 3) Measure voltage between main fan relay terminal and chassis ground. <p>Connector & terminal (F66) No. 8 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Go to step 7.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Value	Yes	No
<p>6 CHECK POWER SUPPLY TO MAIN FAN RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay terminal and chassis ground. Connector & terminal (F66) No. 5 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 10.	Go to step 9.
<p>7 CHECK 20 A FUSE. 1) Remove 20 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?</p>	Fuse is blown-out.	Replace fuse.	Go to step 8.
<p>8 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. Connector & terminal (F27) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair open circuit in harness between 20 A fuse and main fan relay terminal.	Repair open circuit in harness between main fuse box connector and 20 A fuse terminal.
<p>9 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check fuse. Is the fuse blown-out?</p>	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.
<p>10 CHECK MAIN FAN RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance of main fan relay. Terminal No. 8 — No. 9: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 11.	Replace main fan relay.
<p>11 CHECK MAIN FAN RELAY. 1) Connect battery to terminals No. 5 and No. 7 of main fan relay. 2) Measure resistance of main fan relay. Terminal No. 8 — No. 9: Is the measured value less than the specified value?</p>	1 Ω	Go to step 12.	Replace main fan relay.
<p>12 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure resistance of harness between main fan motor connector and main fan relay terminal. Connector & terminal (F17) No. 2 — (F66) No. 9: Is the measured value less than the specified value?</p>	1 Ω	Go to step 13.	Repair open circuit in harness between main fan motor connector and main fan relay terminal.

RADIATOR MAIN FAN SYSTEM

COOLING

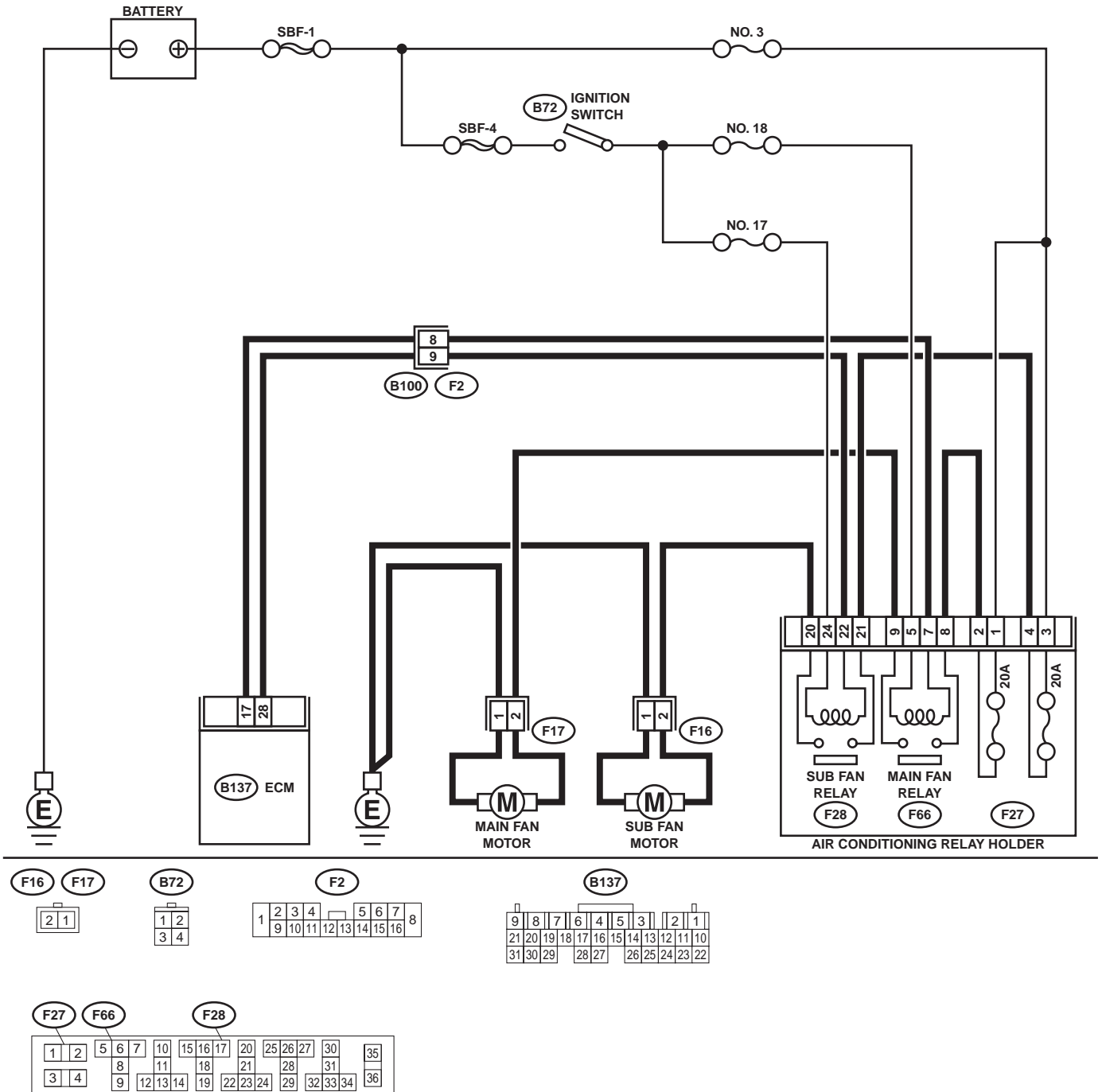
Step	Value	Yes	No
13 CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay connector and ECM connector. Connector & terminal (F66) No. 7 — (B134) No. 14: Is the measured value less than the specified value?	1 Ω	Go to step 14.	Repair open circuit in harness between main fan relay and ECM.
14 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM. Is there poor contact in connector between main fan motor and ECM?	There is poor contact.	Repair poor contact connector.	Contact with distributor service.

NOTE:

Inspection by distributor service is required, because probable cause is deterioration of multiple parts.

3. Radiator Sub Fan System

A: SCHEMATIC



RADIATOR SUB FAN SYSTEM

COOLING

B: INSPECTION

NOTE:

Radiator sub fan system is for model with A/C.

DETECTING CONDITION:

Condition (1):

- Engine coolant temperature is below 95°C (203°F).
- A/C switch is turned ON.
- Vehicle speed is below 19 km/h (12 MPH).

Condition (2):

- Engine coolant temperature is above 100°C (212°F).
- A/C switch is turned OFF.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under conditions (1) and (2) above.

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY TO SUB FAN MOTOR.</p> <p>CAUTION: Be careful not to overheat engine during repair.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor and main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between sub fan motor connector and chassis ground. <p>Connector & terminal (F16) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Go to step 5.
<p>2 CHECK GROUND CIRCUIT OF SUB FAN MOTOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground. <p>Connector & terminal (F16) No. 1 — Chassis ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair open circuit in harness between sub fan motor connector and chassis ground.
<p>3 CHECK POOR CONTACT. Check poor contact in sub fan motor connector. Is there poor contact in sub fan motor connector?</p>		Repair poor contact in sub fan motor connector.	Go to step 4.
<p>4 CHECK SUB FAN MOTOR. Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of sub fan motor connector. Does the sub fan rotate?</p>	Sub fan rotates.	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
5 CHECK POWER SUPPLY TO SUB FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove sub fan relay from A/C relay holder. 3) Measure voltage between sub fan relay terminal and chassis ground. Connector & terminal (F28) No. 21 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 6.	Go to step 7.
6 CHECK POWER SUPPLY TO SUB FAN RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay terminal and chassis ground. Connector & terminal (F28) No. 24 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 10.	Go to step 9.
7 CHECK 20 A FUSE. 1) Remove 20 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Go to step 8.
8 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. Connector & terminal (F27) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair open circuit in harness between main fuse box connector and 20 A fuse terminal.
9 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 17 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between sub fan relay and ignition switch.
10 CHECK SUB FAN RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance of sub fan relay. Terminal No. 20 — No. 21: Does the measured value exceed the specified value?	1 MΩ	Go to step 11.	Replace sub fan relay.
11 CHECK SUB FAN RELAY. 1) Connect battery to terminals No. 22 and No. 24 of sub fan relay. 2) Measure resistance of sub fan relay. Terminal No. 20 — No. 21: Is the measured value less than the specified value?	1 Ω	Go to step 12.	Replace sub fan relay.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Value	Yes	No
12 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure resistance of harness between sub fan motor connector and sub fan relay terminal. <i>Connector & terminal</i> <i>(F16) No. 2 — (F28) No. 20:</i> Is the measured value less than the specified valve?	1 Ω	Go to step 13.	Repair open circuit in harness between sub fan motor and sub fan relay connector.
13 CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay connector and ECM connector. <i>Connector & terminal</i> <i>(F28) No. 22 — (B134) No. 13:</i> Is the measured value less than the specified valve?	1 Ω	Go to step 14.	Repair open circuit in harness between sub fan relay and ECM.
14 CHECK POOR CONTACT. Check poor contact in connector between sub fan and ECM. Is there poor contact in connector between sub fan motor and ECM?	There is poor contact.	Repair poor contact connector.	Contact with distributor service.

NOTE:

Inspection by distributor service is required, because probable cause is deterioration of multiple parts.

4. Engine Coolant

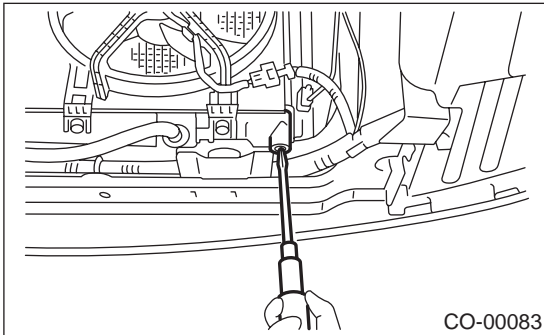
A: REPLACEMENT

1. DRAINING LOF ENGINE COOLANT

- 1) Lift-up the vehicle.
- 2) Remove under cover.
- 3) Remove drain cock to drain engine coolant into container.

NOTE:

Remove radiator cap so that engine coolant will drain faster.



2. FILLING OF ENGINE COOLANT

- 1) Fill engine coolant into radiator up to filler neck position.

Engine coolant amount for refill:

MT model;

Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)

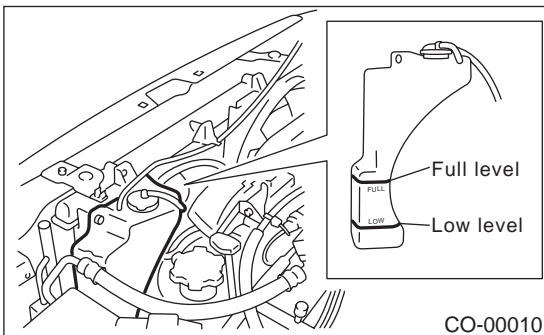
AT model;

Approx. 7.6 ℓ (8.0 US qt, 6.7 Imp qt)

CAUTION:

The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

- 2) Fill engine coolant into reservoir tank up to upper level.



- 3) Attach radiator cap and reservoir tank cap properly.
- 4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.

- 5) If engine coolant level drops in radiator, add engine coolant to filler neck position.
- 6) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
- 7) Attach radiator cap and reservoir tank cap properly.

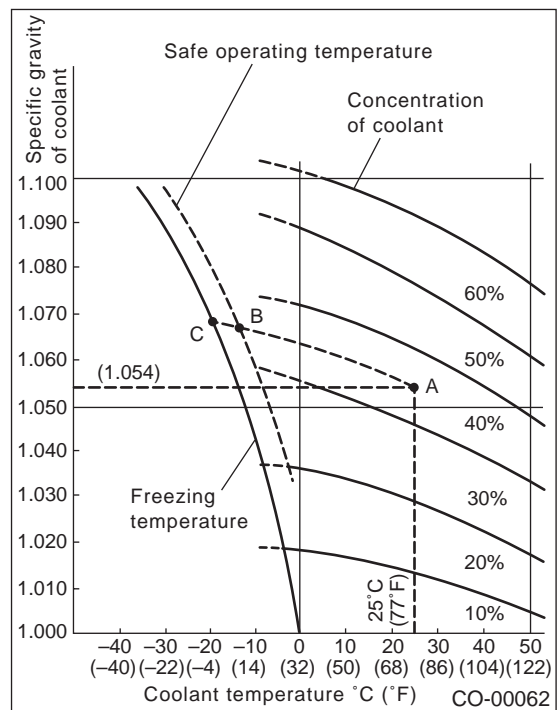
B: INSPECTION

1. RELATIONSHIP LOF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



ENGINE COOLANT

COOLING

2. PROCEDURE LTO ADJUST THE CONCENTRATION OF THE COOLANT

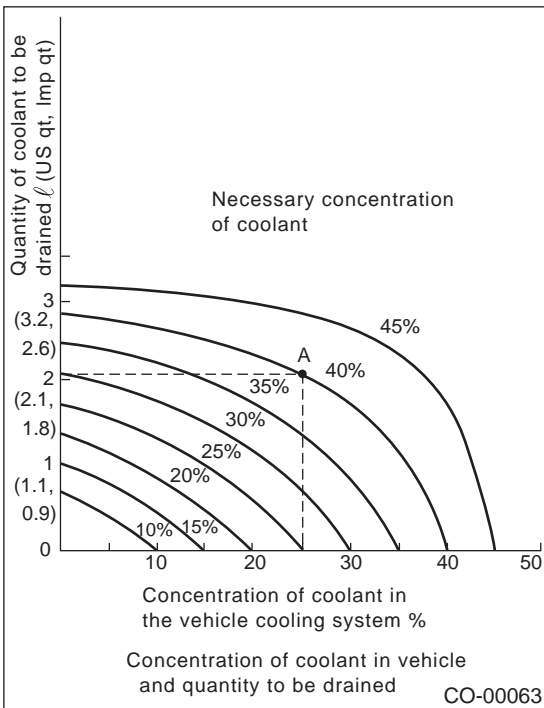
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).

The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

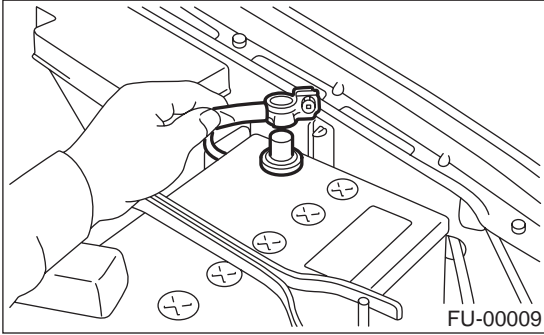
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



5. Water Pump

A: REMOVAL

1) Disconnect ground cable from battery.



2) Lift-up the vehicle.

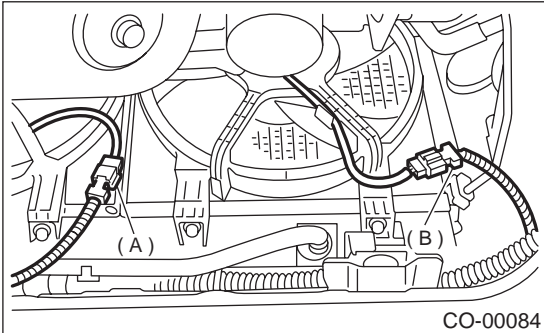
3) Remove under cover.

4) Drain engine coolant completely.

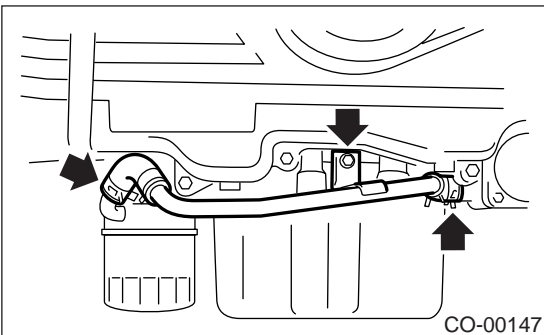
<Ref. to CO(H4DOSTC)-15, DRAINING LOF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

5) Remove radiator under cover.

6) Disconnect connectors from radiator main fan (A) and sub fan (B) motors.

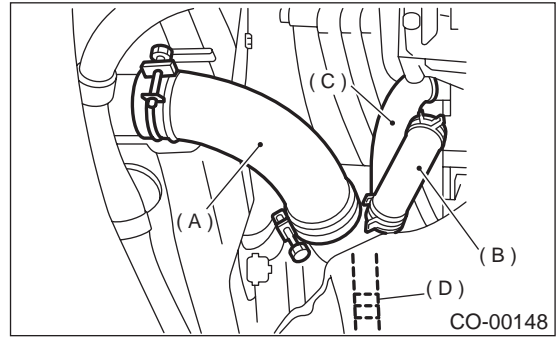


7) Remove bolt and clamps, and then remove water by-pass pipe. (MT model)



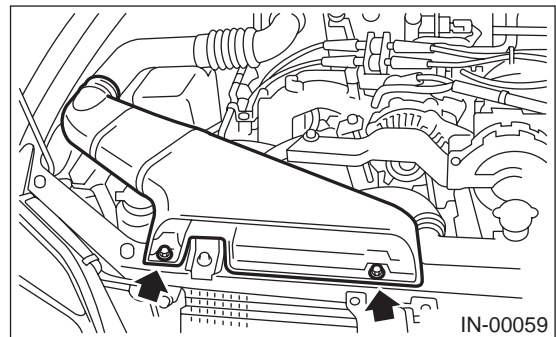
8) Disconnect radiator outlet hose (A) and heater hose (B) from water pump.

9) Disconnect water by-pass hose (C) and oil cooler hose (D).

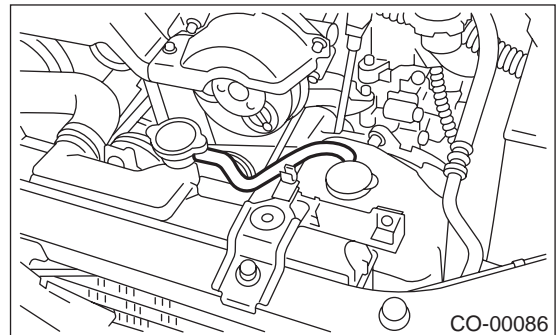


10) Lower the vehicle.

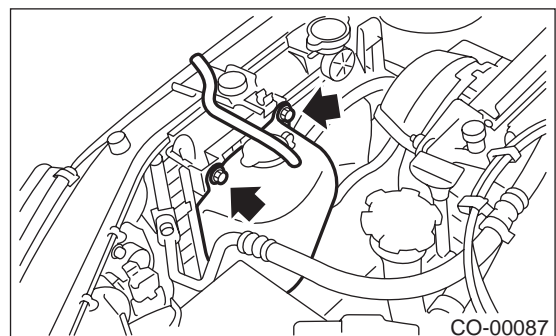
11) Remove air intake duct.



12) Disconnect overflow hose.



13) Remove reservoir tank.

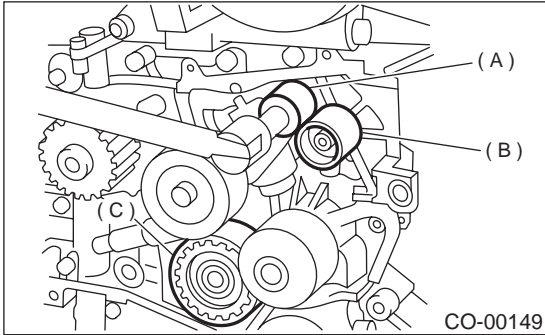


14) Remove radiator main fan and sub fan assemblies. <Ref. to CO(H4DOSTC)-28, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4DOSTC)-30, REMOVAL, Radiator Sub Fan and Fan Motor.>

WATER PUMP

COOLING

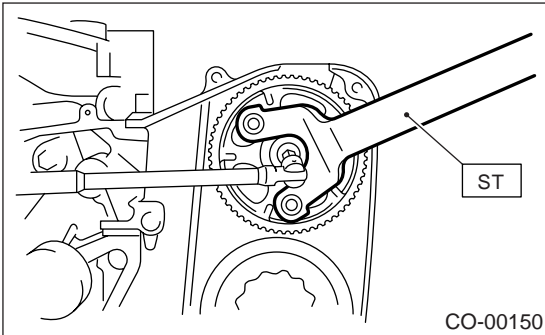
- 15) Remove V-belts.
<Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- 16) Remove timing belt.
<Ref. to ME(H4DOSTC)-47, REMOVAL, Timing Belt Assembly.>
- 17) Remove automatic belt tension adjuster.
- 18) Remove belt idler (B).
- 19) Remove belt idler No. 2 (C).



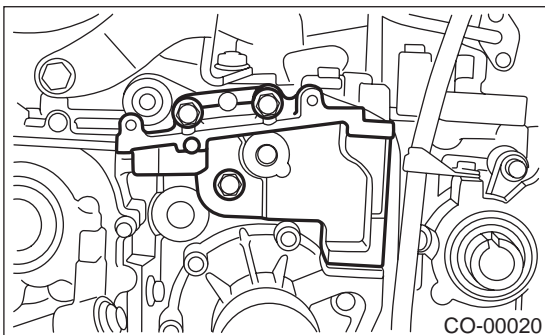
20) Remove camshaft position sensor. <Ref. to FU(H4DOSTC)-30, REMOVAL, Camshaft Position Sensor.>

21) Remove left-hand camshaft sprocket by using ST.

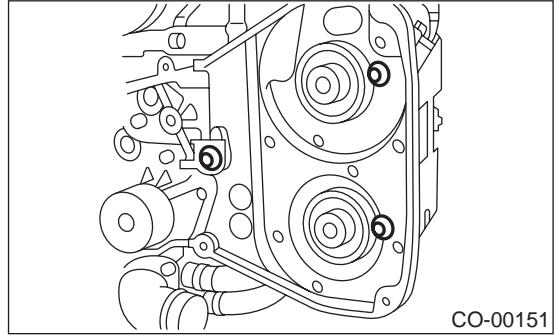
- | | |
|---------------|---|
| ST 18231AA010 | CAMSHAFT SPROCKET WRENCH (Intake side) |
| ST 499207400 | CAMSHAFT SPROCKET WRENCH (Exhaust side) |



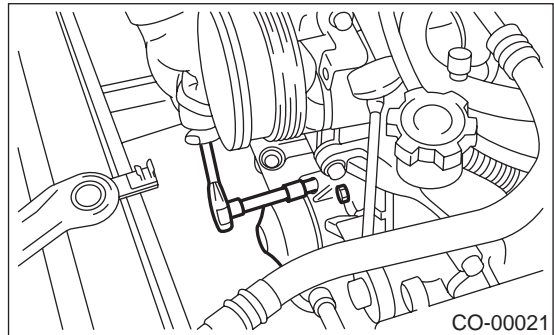
22) Remove tensioner bracket.



23) Remove left-hand belt cover No. 2.



24) Remove water pump.



B: INSTALLATION

1) Install water pump onto left-hand cylinder block.

NOTE:

- Replace gasket with a new one.
- When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.

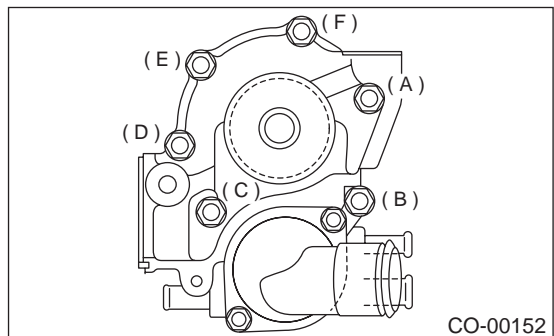
Tightening torque:

First:

12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second:

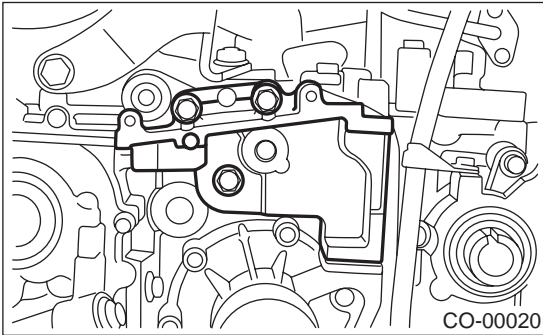
12 N·m (1.2 kgf-m, 8.7 ft-lb)



2) Install tensioner bracket.

Tightening torque:

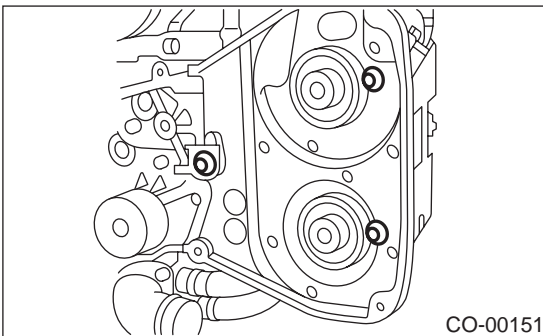
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Install left-hand belt cover No. 2.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install left-hand camshaft sprockets by using ST.

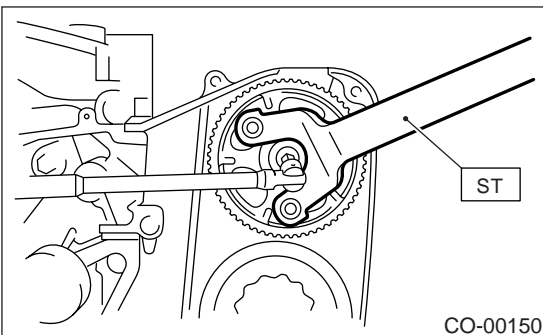
ST 18231AA010 CAMSHAFT SPROCKET WRENCH (Intake side)

ST 499207400 CAMSHAFT SPROCKET WRENCH (Exhaust side)

5) Install camshaft position sensor. <Ref. to FU(H4DOSTC)-30, INSTALLATION, Camshaft Position Sensor.>

Tightening torque:

98 N·m (10.0 kgf-m, 72.3 ft-lb)



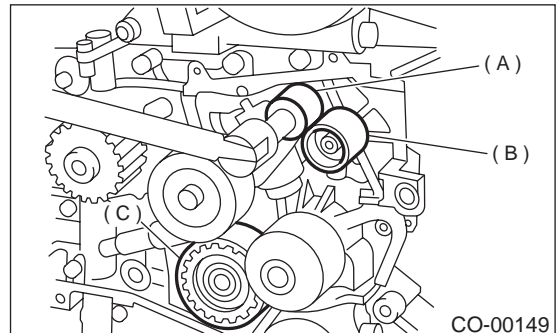
6) Install belt idler No. 2 (C).

7) Install belt idler (B).

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

8) Install automatic belt tension adjuster which tension rod is held with pin. <Ref. to ME(H4DOSTC)-49, BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY, INSTALLATION, Timing Belt Assembly.>

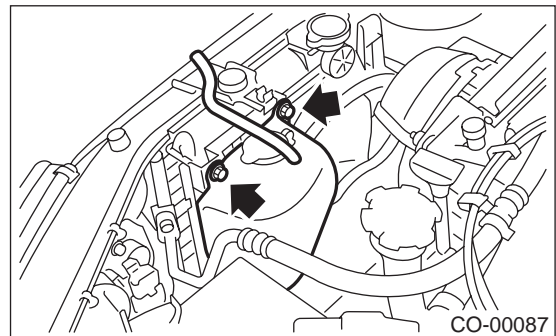


9) Install timing belt. <Ref. to ME(H4DOSTC)-49, INSTALLATION, Timing Belt Assembly.>

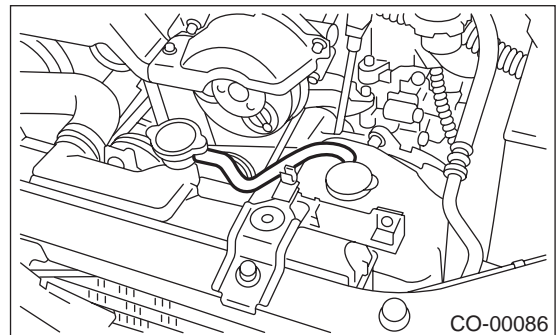
10) Install V-belts. <Ref. to ME(H4DOSTC)-42, INSTALLATION, V-belt.>

11) Install radiator main fan and sub fan motor assemblies. <Ref. to CO(H4DOSTC)-28, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4DOSTC)-30, INSTALLATION, Radiator Sub Fan and Fan Motor.>

12) Install reservoir tank.



13) Connect overflow hose.



14) Install air intake duct.

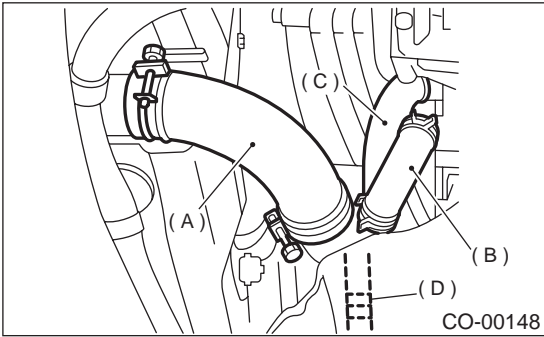
15) Lift-up the vehicle.

16) Connect radiator outlet hose (A) and heater bypass hose (B) to water pump.

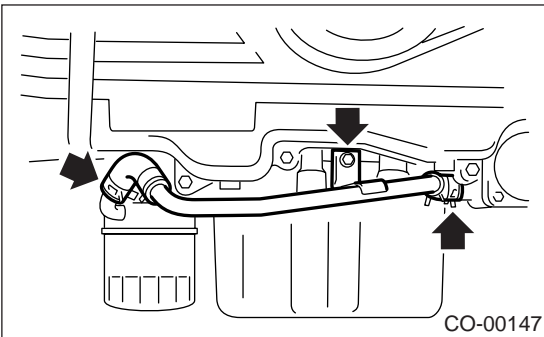
WATER PUMP

COOLING

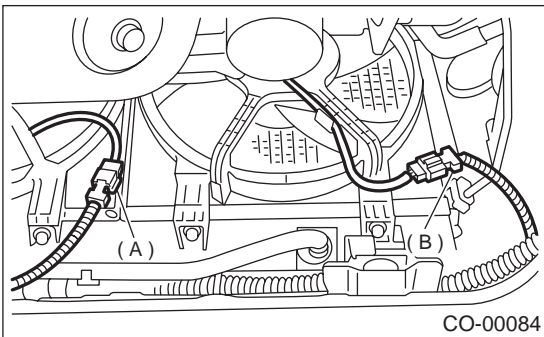
17) Connect water by-pass hose (C) and oil cooler hose (D).



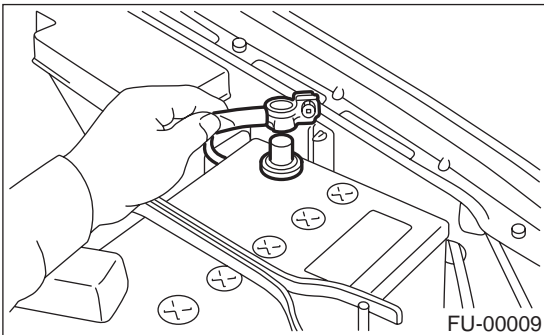
18) Install water by-pass pipe, and then install bolt and clamps. (MT model)



19) Connect connectors to radiator main fan (A) and sub fan (B) motors.



- 20) Install radiator under cover.
- 21) Install under cover.
- 22) Lower the vehicle.
- 23) Connect battery ground cable.

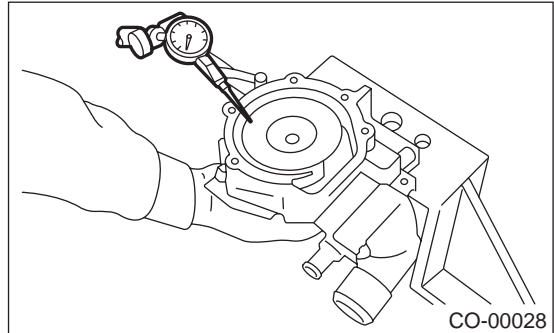


24) Fill coolant. <Ref. to CO(H4DOSTC)-15, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

- 1) Check water pump bearing for smooth rotation.
- 2) Check water pump pulley for abnormalities.
- 3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

“Thrust” runout limit:
0.5 mm (0.020 in)



- 4) Check clearance between impeller and pump case.

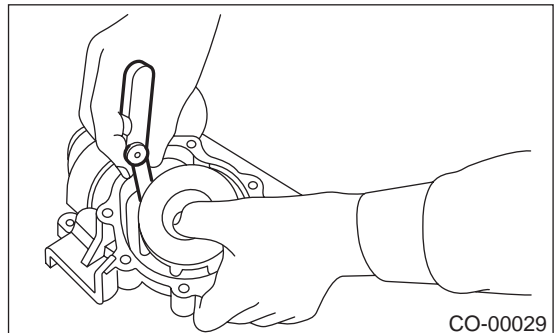
Clearance between impeller and pump case:

Standard

0.5 — 0.7 mm (0.020 — 0.028 in)

Limit

1.0 mm (0.039 in)

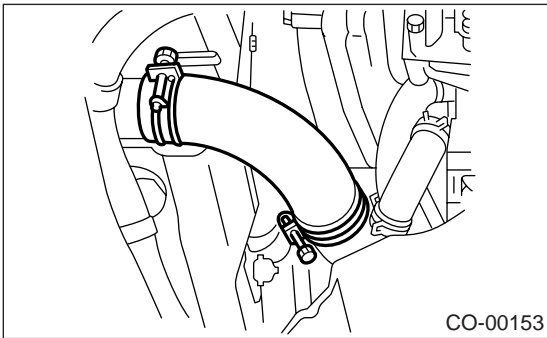


- 5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace water pump assembly.

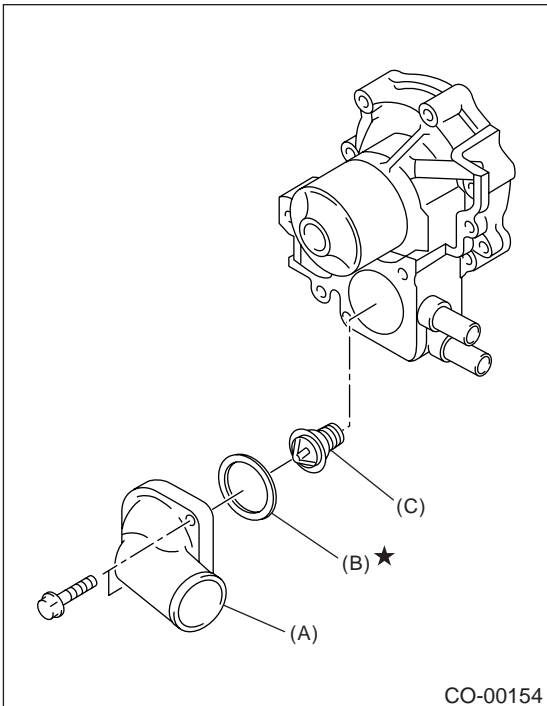
6. Thermostat

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove under cover.
- 3) Drain engine coolant completely. <Ref. to CO(H4DOSTC)-15, DRAINING LOF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 4) Disconnect radiator outlet hose from thermostat cover.



- 5) Remove thermostat cover and gasket, and pull out the thermostat.



- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat

B: INSTALLATION

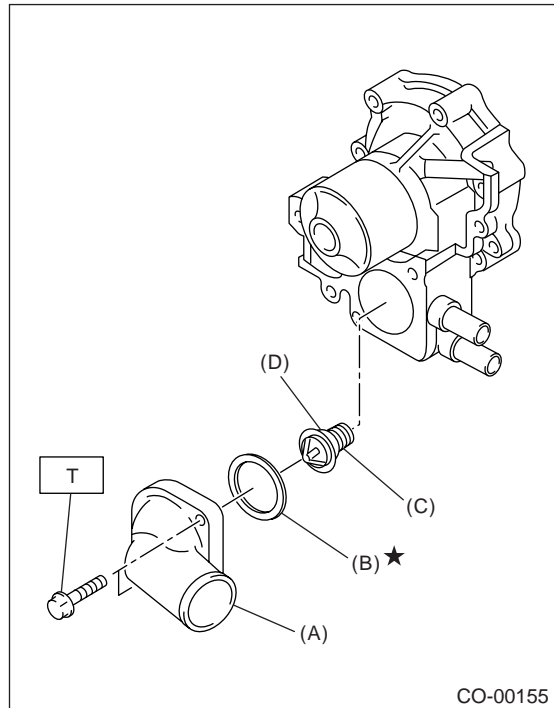
- 1) Install the thermostat in the water pump, and install the thermostat cover together with a gasket.

NOTE:

- Replace gasket with a new one.
- Thermostat must be installed with jiggle pin facing the front side.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat
- (D) Jiggle pin

- 2) Fill coolant. <Ref. to CO(H4DOSTC)-15, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

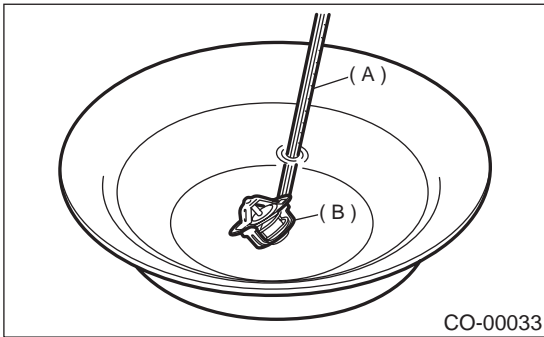
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. If the measured temperature is within the specified range, the condition of thermostat is normal.

Specified value:**Starts to open:**

76.0 — 80.0°C (169 — 176°F)

Fully opens:

91°C (196°F)

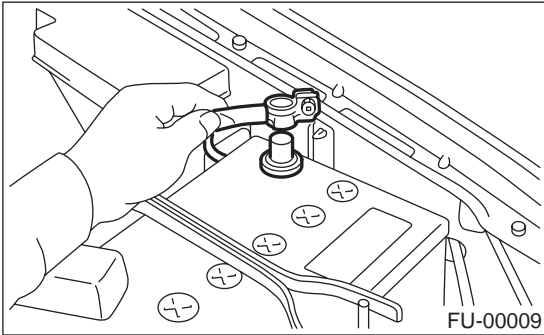


- (A) Thermometer
- (B) Thermostat

7. Radiator

A: REMOVAL

1) Disconnect battery ground cable.

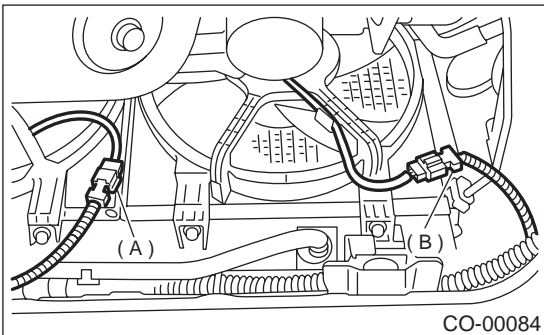


2) Lift-up the vehicle.

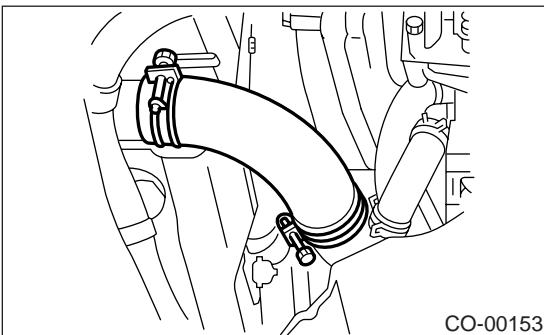
3) Remove under cover.

4) Drain engine coolant completely. <Ref. to CO(H4DOSTC)-15, DRAINING LOF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

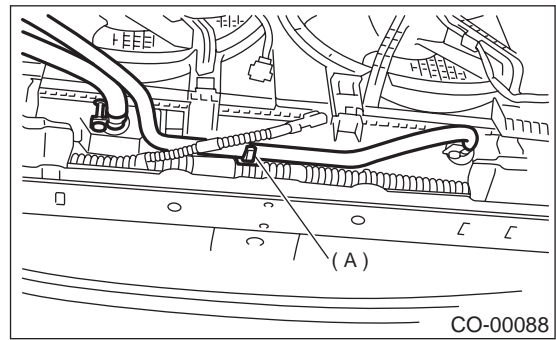
5) Disconnect connectors of radiator main fan (A) and sub fan (B) motor.



6) Disconnect radiator outlet hose from thermostat cover.



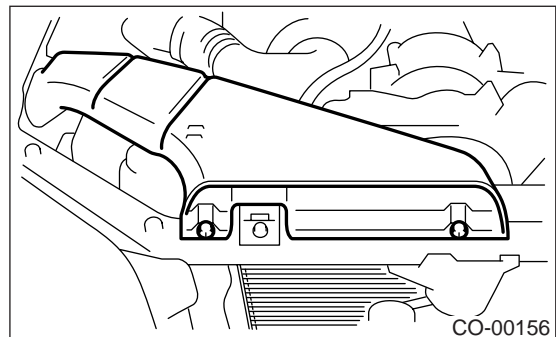
7) Disconnect ATF cooler hoses from radiator. (AT vehicles only)



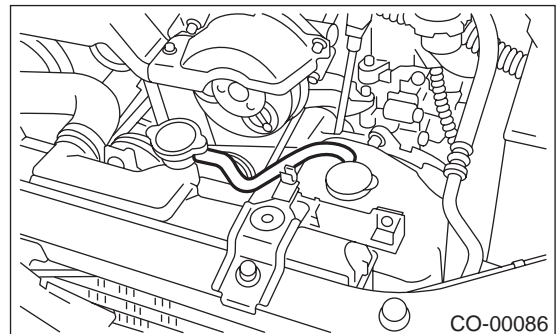
(A) Clip

8) Lower the vehicle.

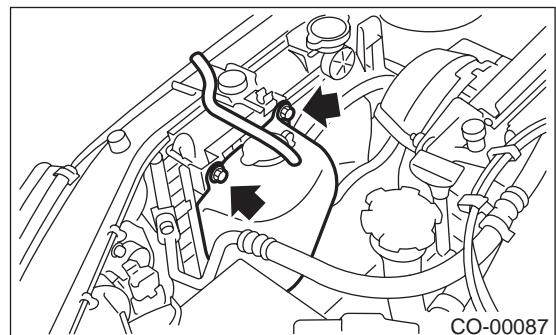
9) Remove air intake duct.



10) Disconnect overflow hose.



11) Remove reservoir tank.

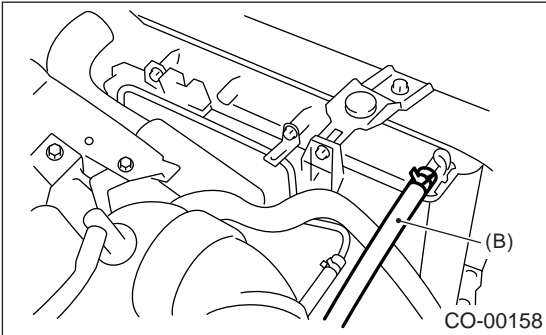
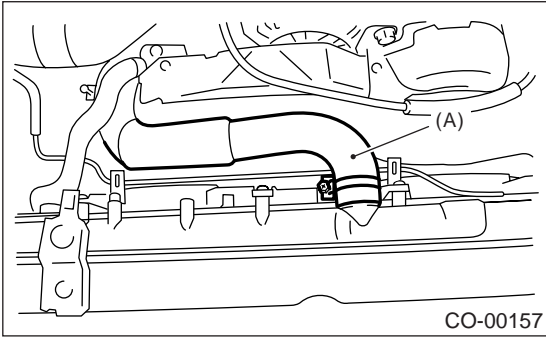


12) Remove V-belt cover.

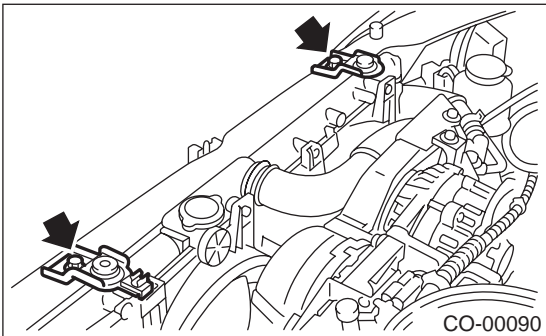
RADIATOR

COOLING

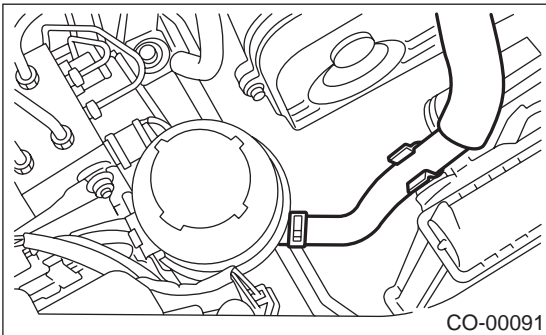
13) Disconnect radiator inlet hose (A) and engine coolant filler tank hose (B) from radiator.



14) Remove radiator upper brackets.

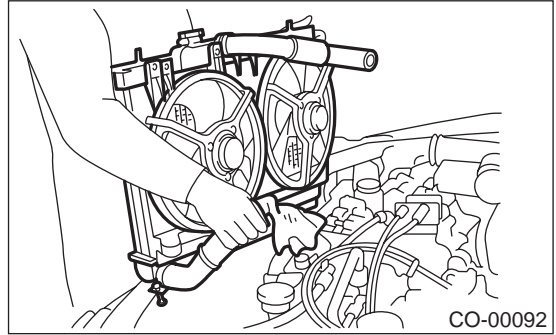


15) Detach power steering hose from the clip on the radiator.



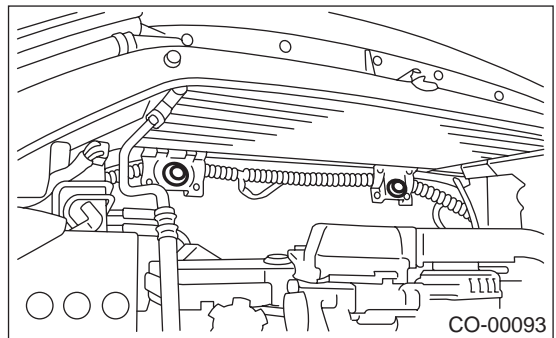
16) While slightly lifting radiator, slide it to left.

17) Lift radiator up and away from vehicle.



B: INSTALLATION

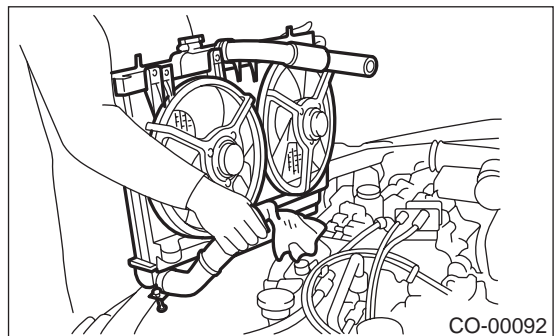
1) Attach radiator mounting cushions to holes on the vehicle.



2) Install radiator while fitting radiator pins to cushions.

NOTE:

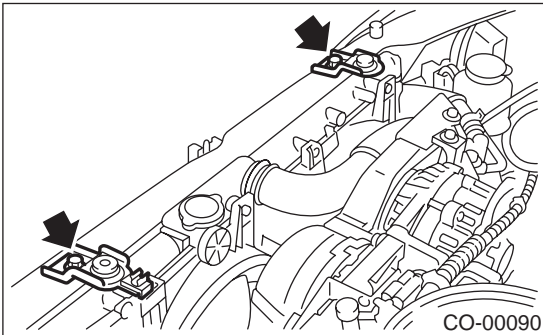
Fit pins on lower side of radiator into cushions on body side.



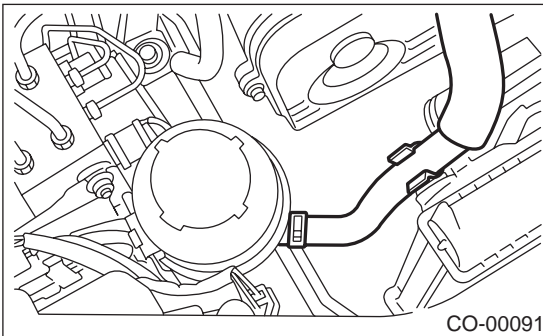
3) Install radiator brackets and tighten bolts.

Tightening torque:

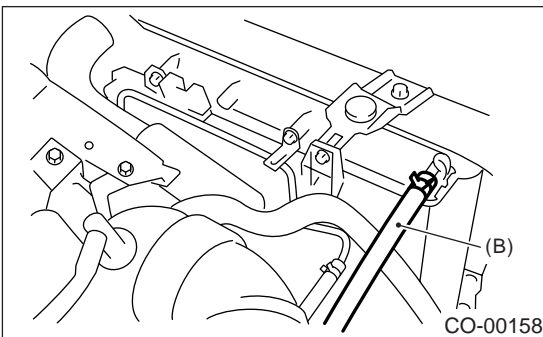
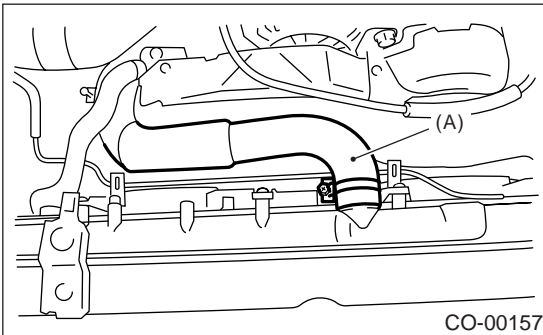
18 N·m (1.8 kgf·m, 13.0 ft·lb)



4) Attach power steering hose to the radiator.



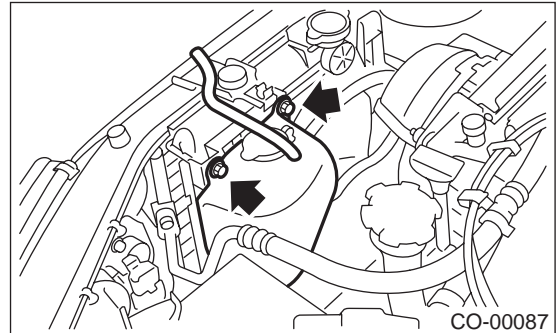
5) Connect radiator inlet hose (A) and engine coolant filler tank hose (B) to radiator.



6) Install reservoir tank.

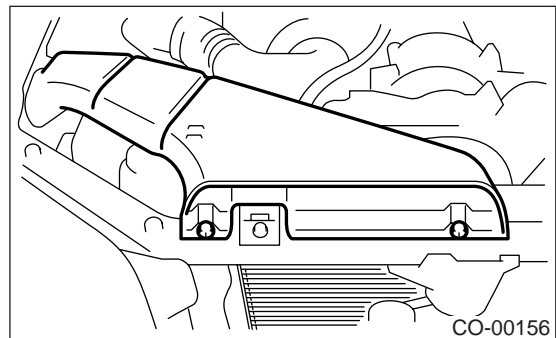
Tightening torque:

4.9 N·m (0.50 kgf·m, 3.6 ft·lb)



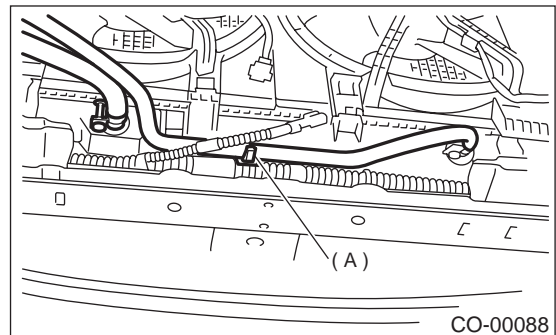
7) Connect overflow hose.

8) Install air intake duct.



9) Lift-up the vehicle.

10) Connect ATF cooler hoses. (AT vehicles only)

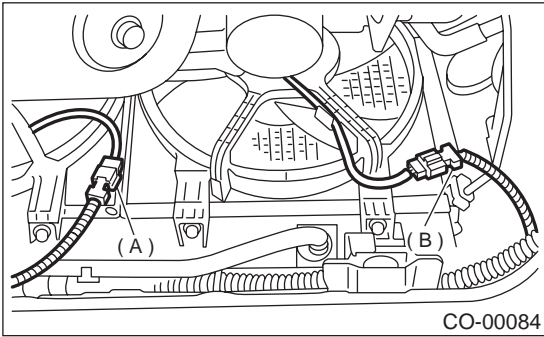


(A) Clip

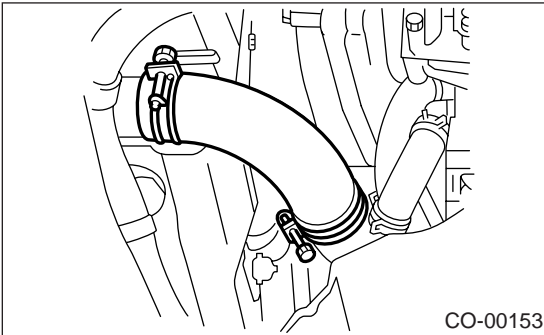
RADIATOR

COOLING

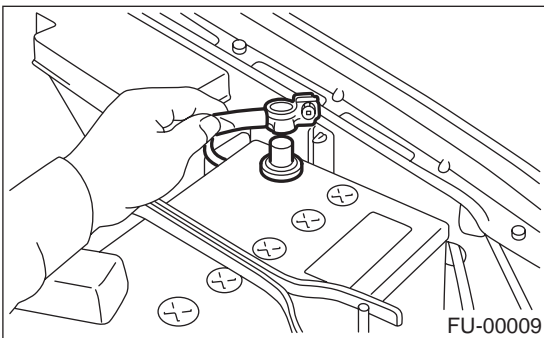
- 11) Connect connectors to radiator main fan motor (A) and sub fan motor (B).



- 12) Connect radiator outlet hose.



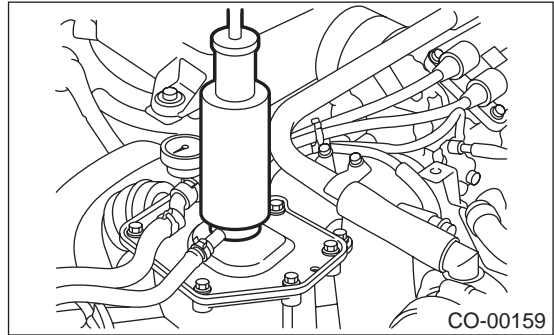
- 13) Install under cover.
- 14) Lower the vehicle.
- 15) Connect battery ground cable.



- 16) Fill coolant. <Ref. to CO(H4DOSTC)-15, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 17) Check ATF level. <Ref. to AT-30, REPLACEMENT, Automatic Transmission Fluid.>

C: INSPECTION

- 1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.



- 2) Apply a pressure of 157 kPa (1.6 kg/cm², 23 psi) to radiator to check if:

- (1) Engine coolant leaks at/around radiator.
- (2) Engine coolant leaks at/around hoses or connections.

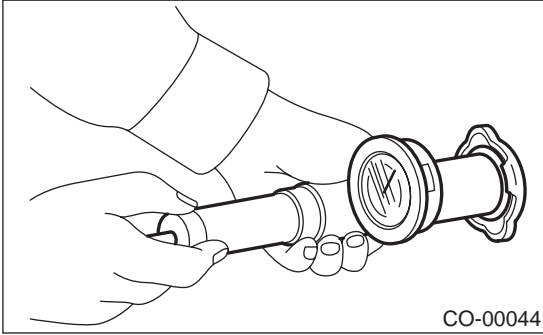
NOTE:

- Engine should be off.
- Wipe engine coolant from check points in advance.
- Be careful to prevent engine coolant from spurting out when removing tester.
- Be careful also not to deform filler neck of radiator when installing or removing tester.

8. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.



2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:

93 — 123 kPa (0.95 — 1.25 kg/cm², 14 — 18 psi)

Service limit pressure:

83 kPa (0.85 kg/cm², 12 psi)

CAUTION:

Be sure to remove foreign matter and rust from the cap in advance. Otherwise, results of pressure test will be incorrect.

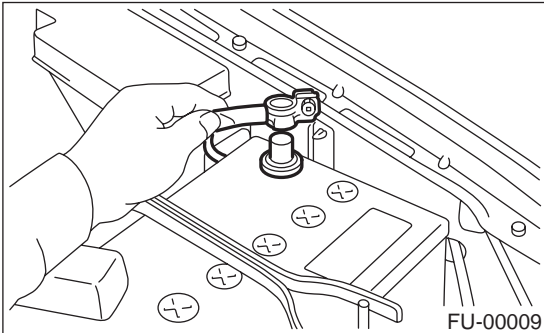
RADIATOR MAIN FAN AND FAN MOTOR

COOLING

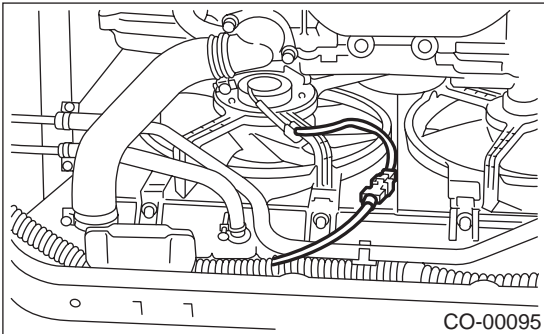
9. Radiator Main Fan and Fan Motor

A: REMOVAL

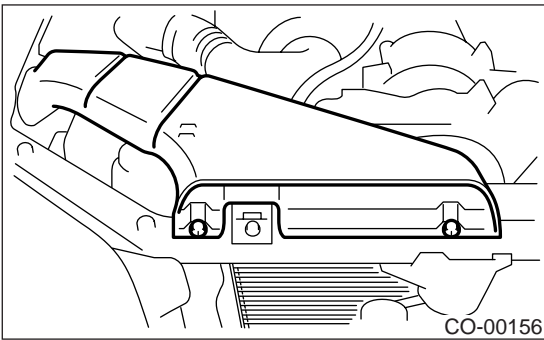
1) Disconnect battery ground cable.



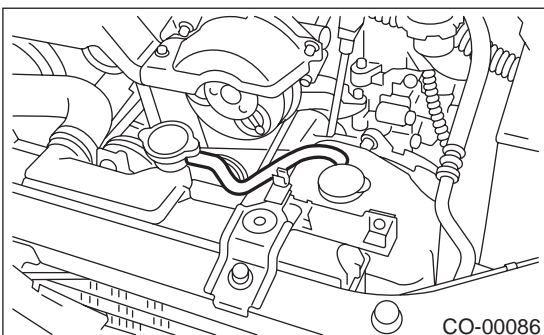
- 2) Lift-up the vehicle.
- 3) Remove under cover.
- 4) Disconnect connector of main fan motor.



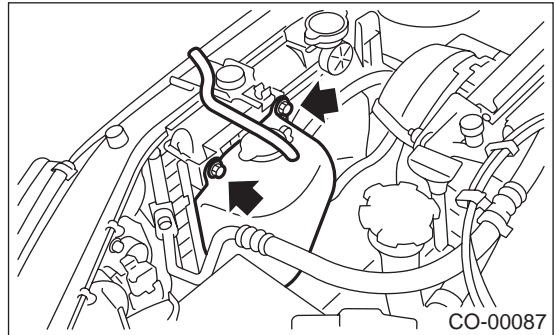
- 5) Lower the vehicle.
- 6) Remove air intake duct.



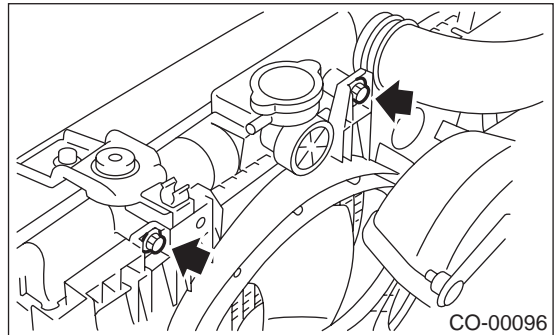
7) Disconnect overflow hose.



8) Remove reservoir tank.



9) Remove radiator main fan motor assembly.

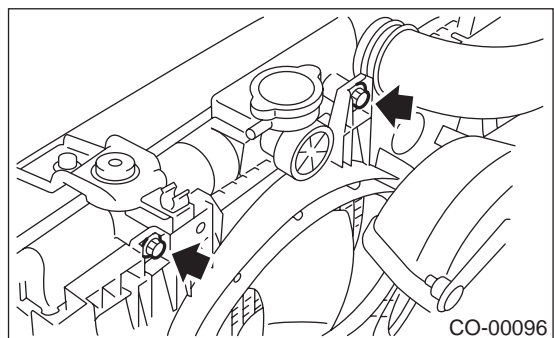


B: INSTALLATION

Install in the reverse order of removal.

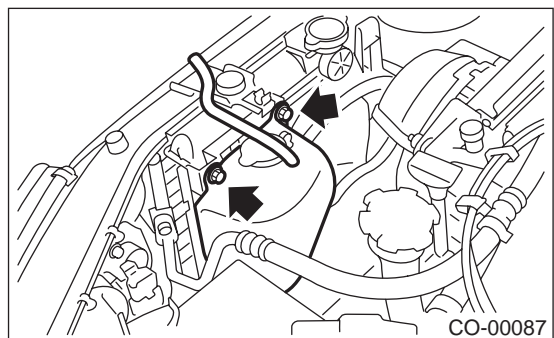
NOTE:

When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.



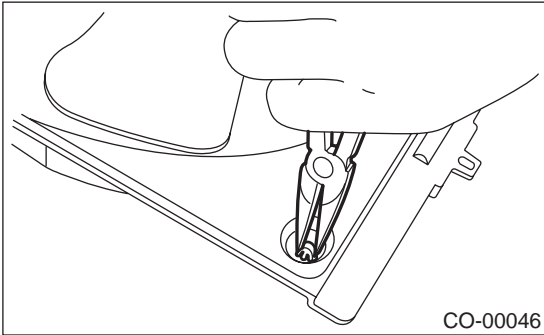
Tightening torque:

4.9 N·m (0.50 kgf·m, 3.6 ft·lb)

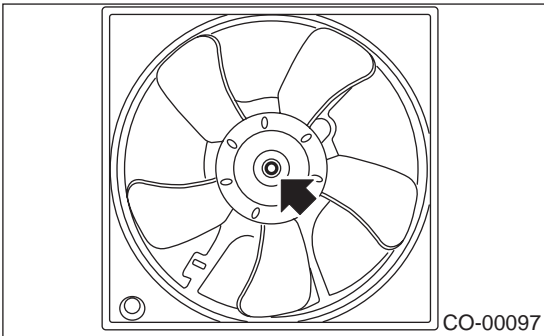


C: DISASSEMBLY

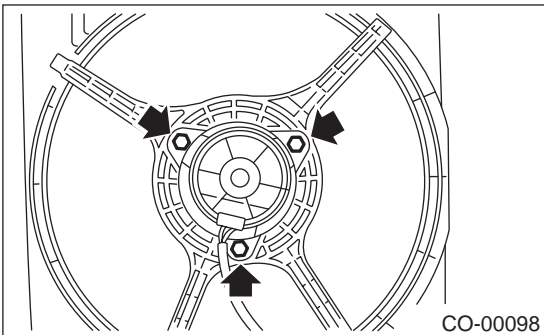
1) Remove clip which holds motor connector onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



3) Remove bolts which install fan motor onto shroud.

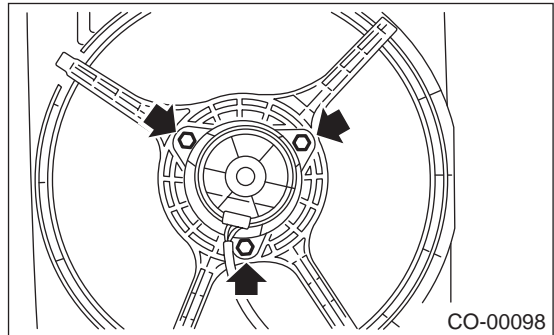


D: ASSEMBLY

Assemble in the reverse order of disassembly.

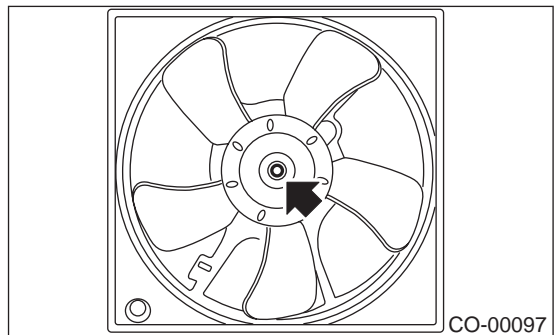
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Tightening torque:

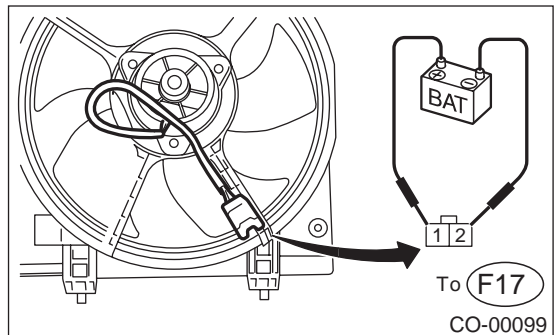
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



E: INSPECTION

1) Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of main fan motor connector.

2) Make sure the main fan motor operates properly. Replace it if it doesn't.



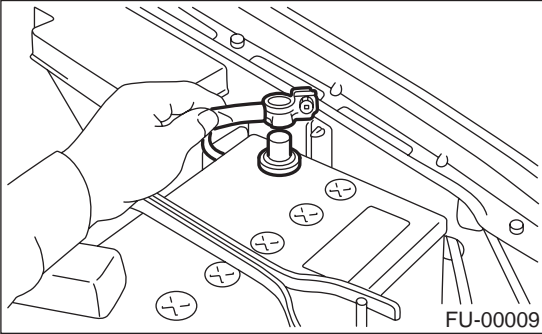
RADIATOR SUB FAN AND FAN MOTOR

COOLING

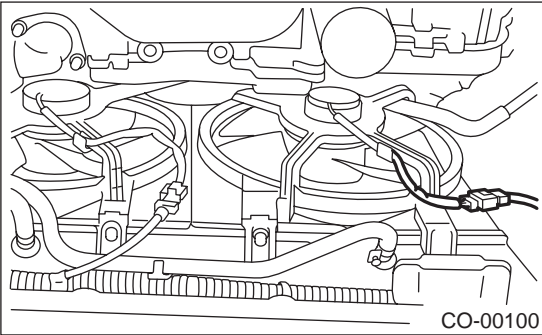
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

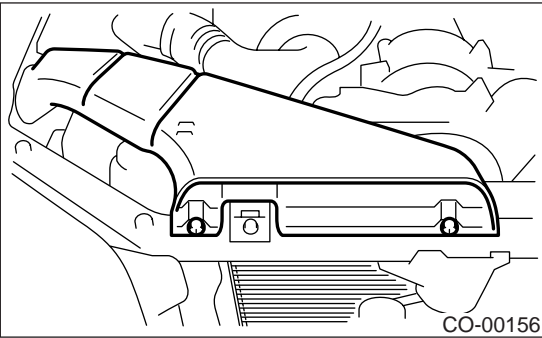
- 1) Disconnect battery ground cable.



- 2) Lift-up the vehicle.
- 3) Remove under cover.
- 4) Disconnect connector of sub fan motor.

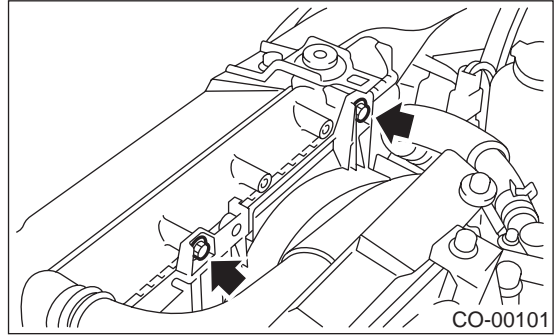


- 5) Lower the vehicle.
- 6) Remove air intake duct.



- 7) Remove bolts which hold sub fan shroud to radiator.

- 8) Remove radiator sub fan shroud through the under side of vehicle.

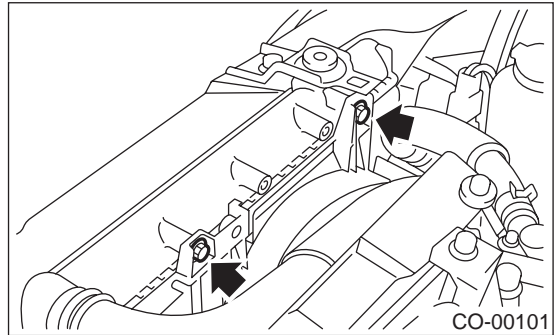


B: INSTALLATION

Install in the reverse order of removal.

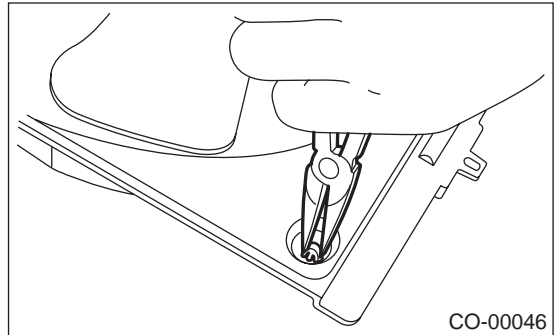
Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

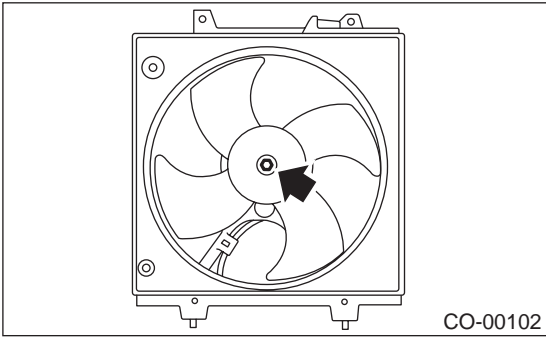


C: DISASSEMBLY

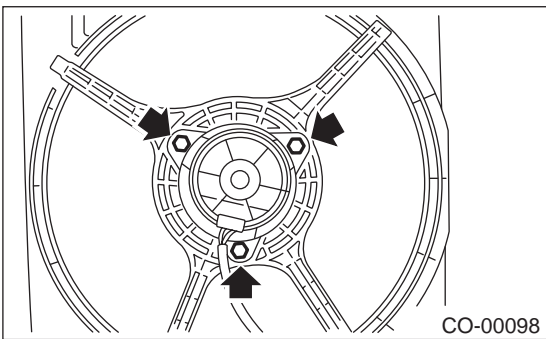
- 1) Remove clip which holds motor harness onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



3) Remove bolts which install fan motor onto shroud.

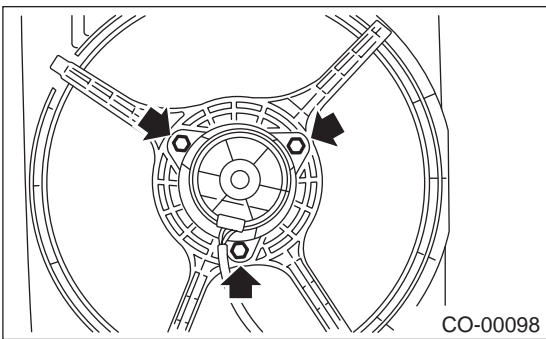


D: ASSEMBLY

Assemble in the reverse order of disassembly.

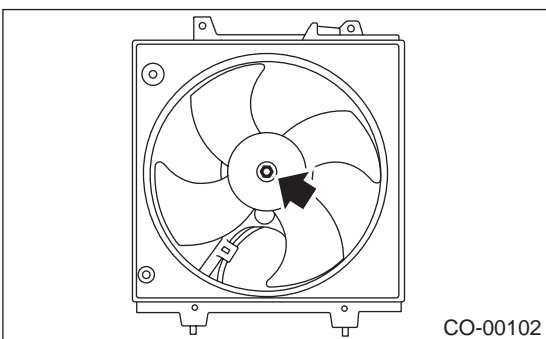
Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



Tightening torque:

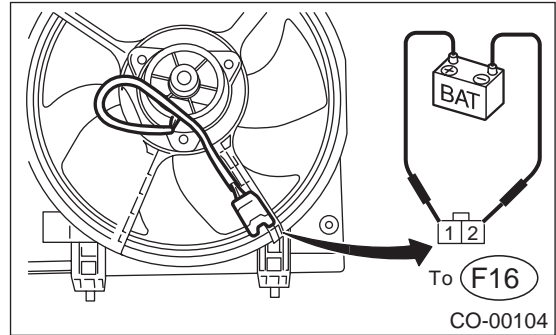
3.4 N·m (0.35 kgf·m, 2.5 ft·lb)



E: INSPECTION

1) Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of sub fan motor connector.

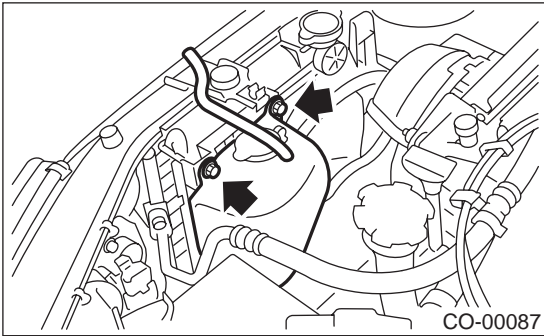
2) Make sure the sub-fan motor operates properly. Replace it if it doesn't.



11. Reservoir Tank

A: REMOVAL

- 1) Disconnect overflow hose from radiator filler neck position.
- 2) Remove bolts which install reservoir tank onto radiator main fan shroud.
- 3) Remove reservoir tank.

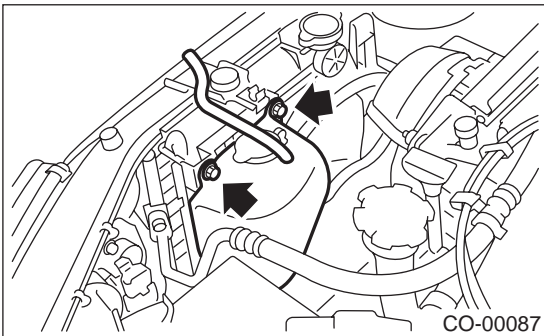


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.9N·m (0.50 kgf-m, 3.6 ft-lb)



C: INSPECTION

Make sure the engine coolant level is between full and low.

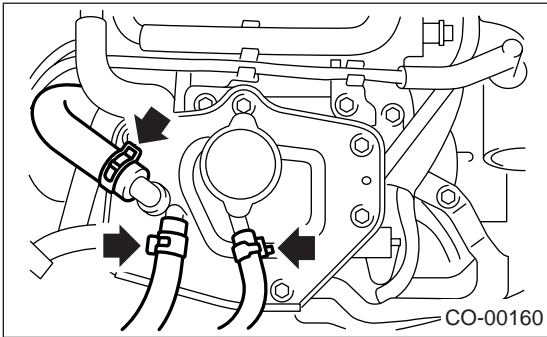
12. Coolant Filler Tank

A: REMOVAL

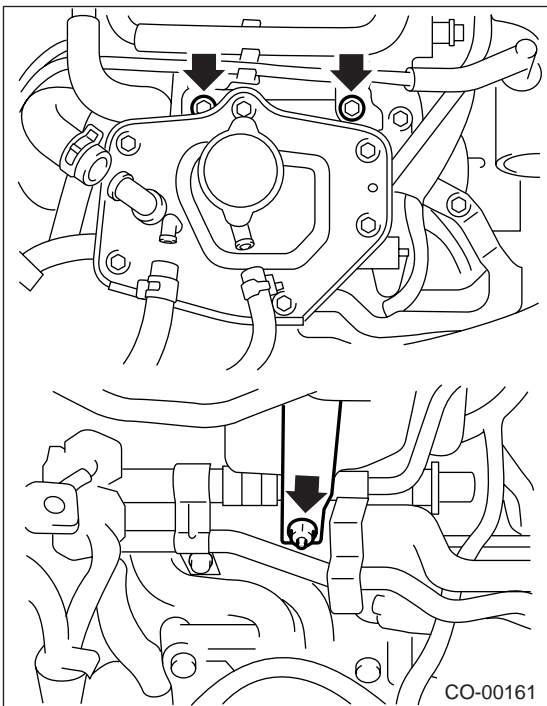
WARNING:

The radiator is pressurized. Wait until the engine cools down before working on the radiator.

- 1) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO(H4DOSTC)-15, DRAINING LOF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOSTC)-10, REMOVAL, Air Cleaner.>
- 3) Remove the air cleaner element.
- 4) Disconnect the engine coolant hoses from coolant filler tank.



- 5) Remove the bolts and nut which installs coolant filler tank.
- 6) Disconnect the engine coolant hose which connects under side of coolant filler tank.
- 7) Remove the coolant filler tank.



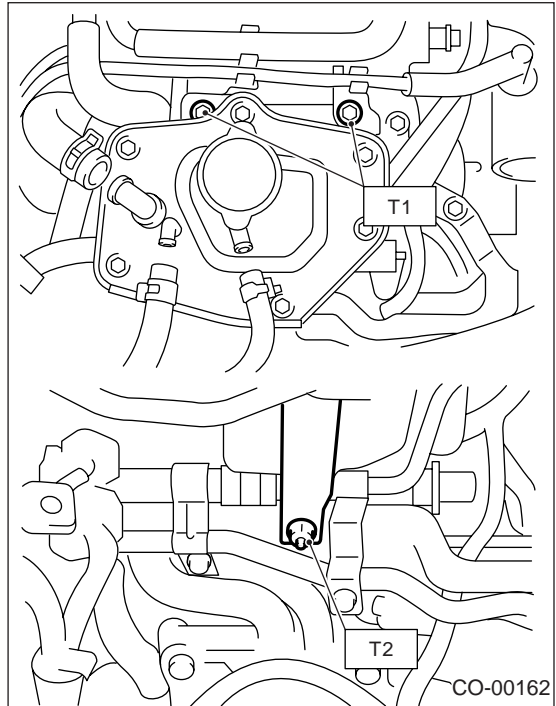
B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)

T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



- 2) Fill the engine coolant. <Ref. to CO(H4DOSTC)-15, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

ENGINE COOLING SYSTEM TROUBLE IN GENERAL

COOLING

13.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Corrective action	
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H4DOSTC)-2, ENGINE, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Engine oil mixed in engine coolant	Replace engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to EN(H4DOSTC)-2, ENGINE, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
o. Improper transmission oil	Replace.	
p. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.	
Over-cooling	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Malfunction of thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

LU(H4DOSTC)

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4. Oil Pump	10
5. Oil Pan and Strainer	14
6. Oil Pressure Switch.....	18
7. Engine Oil Cooler	19
8. Engine Oil Filter.....	21
9. Engine Lubrication System Trouble in General.....	22



GENERAL DESCRIPTION

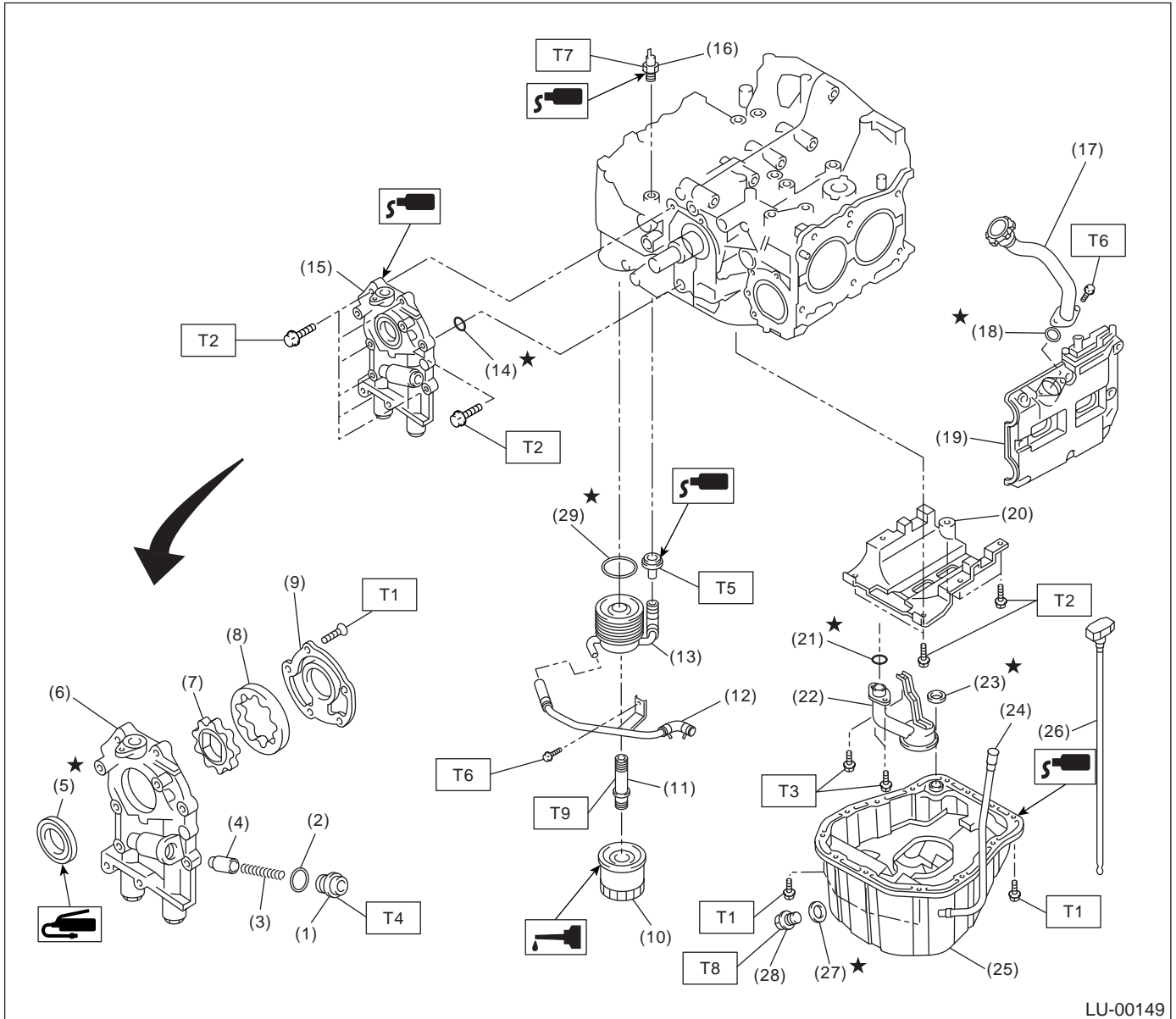
LUBRICATION

1. General Description

A: SPECIFICATIONS

Lubrication method			Forced lubrication
Oil pump	Pump type		Trochoid type
	Number of teeth	Inner rotor	9
		Outer rotor	10
	Outer rotor diameter × thickness		78 × 7 mm (3.07 × 0.28 in)
	Tip clearance between inner and outer rotor	STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
		LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case	STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
		LIMIT	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case	STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
		LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	- Discharge pressure
- Discharge quantity			4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.
5,000 rpm		- Discharge pressure	294 kPa (3.0 kg/cm ² , 43 psi)
		- Discharge quantity	47.0 ℓ (12.42 US gal, 10.34 Imp gal)/min.
Relief valve operation pressure			588 kPa (6.0 kg/cm ² , 85 psi)
Oil filter	Type		Full-flow filter type
	Filtration area		760 cm ² (118 sq in)
	By-pass valve opening pressure		157 kPa (1.6 kg/cm ² , 23 psi)
	Outer diameter × width		80 × 75 mm (3.15 × 2.95 in)
	Installation screw type		M 20 × 1.5
Oil pressure switch	Type		Immersed contact point type
	Working voltage — wattage		12 V — 3.4 W or less
	Warning light activation pressure		14.7 kPa (0.15 kg/cm ² , 2.1 psi)
	Proof pressure		More than 981 kPa (10 kg/cm ² , 142 psi)
Oil capacity (when replacing oil)			Approx. 4.5 ℓ (4.8 US qt, 4.0 Imp qt)

B: COMPONENT



LU-00149

- | | |
|-------------------------------|----------------------------|
| (1) Plug | (16) Oil pressure switch |
| (2) Gasket | (17) Oil filler duct |
| (3) Relief valve spring | (18) O-ring |
| (4) Relief valve | (19) Rocker cover |
| (5) Oil seal | (20) Baffle plate |
| (6) Oil pump case | (21) O-ring |
| (7) Inner rotor | (22) Oil strainer |
| (8) Outer rotor | (23) Gasket |
| (9) Oil pump cover | (24) Oil level gauge guide |
| (10) Oil filter | (25) Oil pan |
| (11) Connector (MT model) | (26) Oil level gauge |
| (12) Water by-pass (MT model) | (27) Metal gasket |
| (13) Oil cooler (MT model) | (28) Drain plug |
| (14) O-ring | (29) O-ring |
| (15) Oil pump ASSY | |

Tightening torque: N-m (kgf-m, ft-lb)

- T1: 5 (0.5, 3.6)**
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 44 (4.5, 33)
T5: 69 (7.0, 51)
T6: 6.4 (0.65, 4.7)
T7: 25 (2.5, 18.1)
T8: 44 (4.5, 33)
T9: 54 (5.5, 40)

GENERAL DESCRIPTION

LUBRICATION

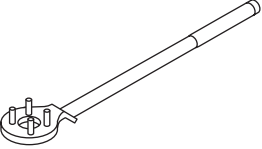
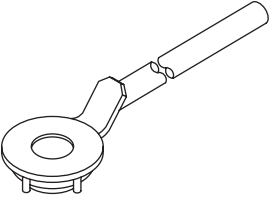
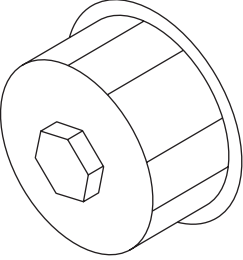
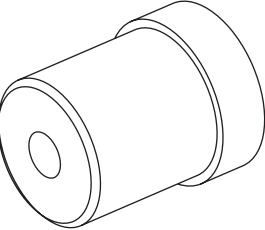
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

GENERAL DESCRIPTION

LUBRICATION

D: PREPARATION TOOL

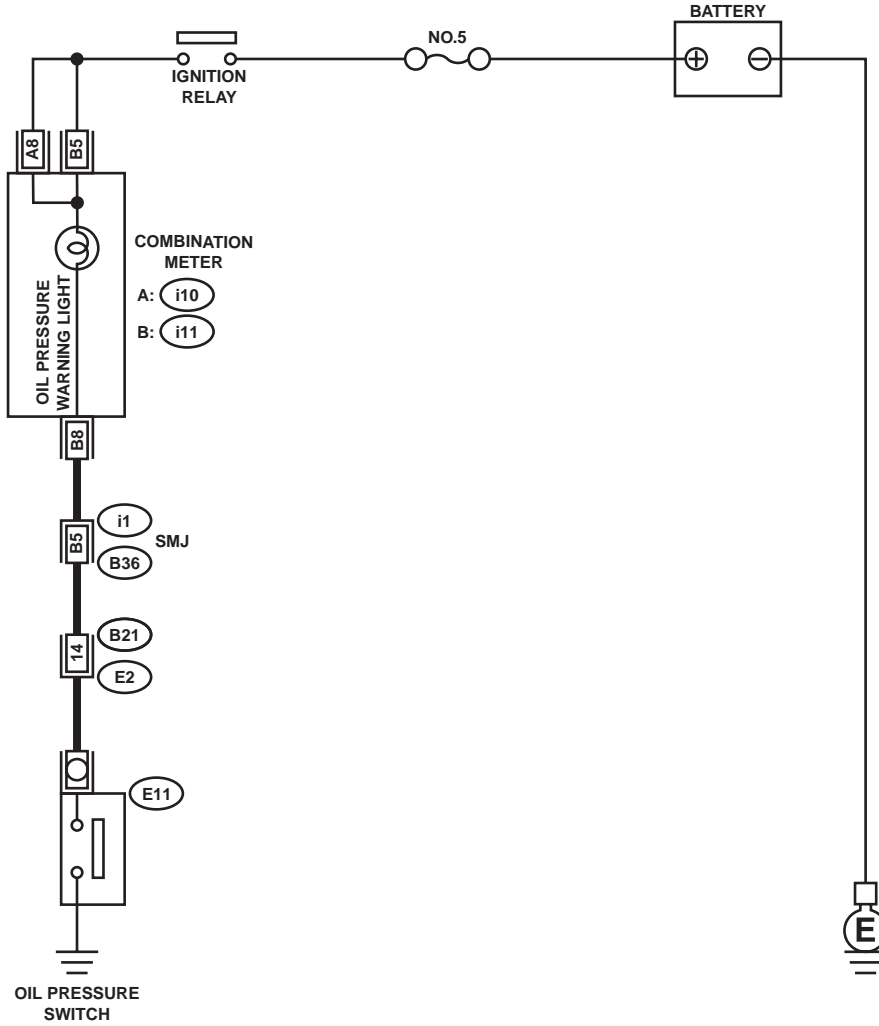
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499977100</p>	<p style="text-align: center;">499977100 (MT model)</p>	<p>CRANKSHAFT PULLEY WRENCH</p>	<p>Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.</p>
 <p style="text-align: center;">ST-499977400</p>	<p style="text-align: center;">499977400 (AT model)</p>	<p>CRANKSHAFT PULLEY WRENCH</p>	<p>Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.</p>
 <p style="text-align: center;">ST-498547000</p>	<p style="text-align: center;">498547000</p>	<p>OIL FILTER WRENCH</p>	<p>Used for removing and installing oil filter.</p>
 <p style="text-align: center;">ST-499587100</p>	<p style="text-align: center;">499587100</p>	<p>OIL SEAL INSTALLER</p>	<p>Used for installing oil pump oil seal.</p>

OIL PRESSURE SYSTEM

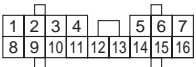
LUBRICATION

2. Oil Pressure System

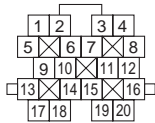
A: SCHEMATIC



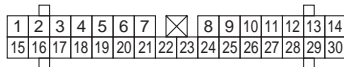
i11



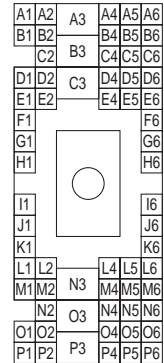
B21



i10



B36



LU-00150

B: INSPECTION

Step	Value	Yes	No
1 CHECK COMBINATION METER. 1) Turn ignition switch to ON. (engine OFF) 2) Check other warning lights. Does the warning lights go on?	Warning light goes on.	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connector from the oil pressure switch. 3) Turn ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. Connector & terminal (E11) No. 1 — Chassis ground: Does the measured value exceed the specified value?	10 V	Replace oil pressure switch.	Go to step 3.
3 CHECK COMBINATION METER. 1) Turn ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of the combination meter. Terminal No. A8 — No. B8: No. B5 — No. B8: Is the measured value less than the specified value?	10 Ω	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter and the oil pressure switch warning light bulb.

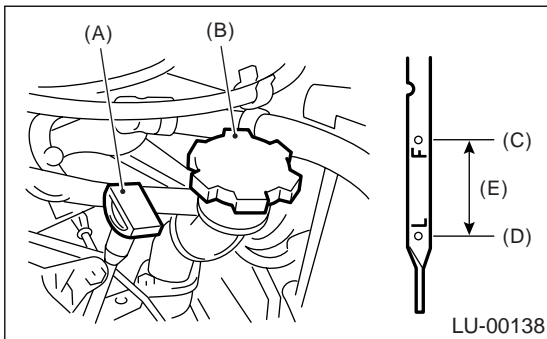
ENGINE OIL

LUBRICATION

3. Engine Oil

A: INSPECTION

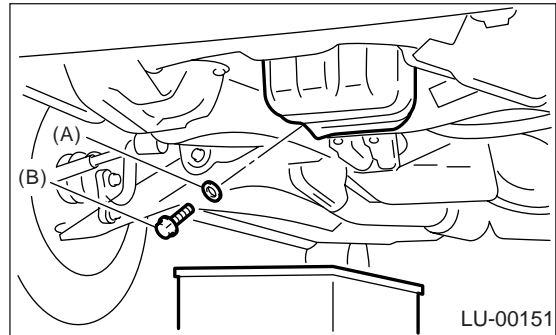
- 1) Park vehicle on a level surface.
- 2) Remove oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.
- 5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
- 6) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and the notch mark. This is caused by thermal expansion of the engine oil.
- 7) To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

- 1) Open engine oil filler cap for quick draining of the engine oil.
- 2) Drain engine oil by loosening engine oil drain plug.

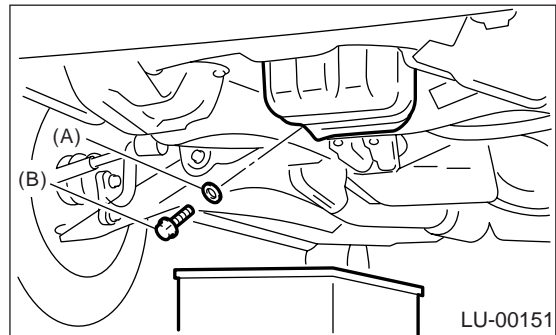


- (A) Gasket
- (B) Drain plug

- 3) Replace drain plug gasket.
- 4) Tighten engine oil drain plug after draining engine oil.

Tightening torque:

44 N·m (4.5 kgf-m, 33 ft-lb)



- (A) Gasket
- (B) Drain plug

5) Fill engine oil through filler pipe up to upper point on level gauge. Make sure that vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil

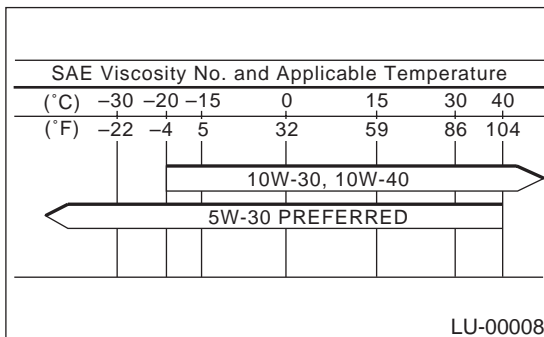
ILSAC GF-3, which can be identified with the new API certification mark (Star burst mark)

API classification SL with the words “ENERGY CONSERVING” (if you cannot obtain the oil with SL grade, you may use SJ grade “ENERGY CONSERVING” oil)

ACEA specification A1, A2 or A3

Oil amount for preparation (when replacing engine oil):

Approx. 4.5 ℓ (4.8 US qt, 4.0 Imp qt)



The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:

When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the ILSAC or API classification and SAE viscosity No. designated by SUBARU.

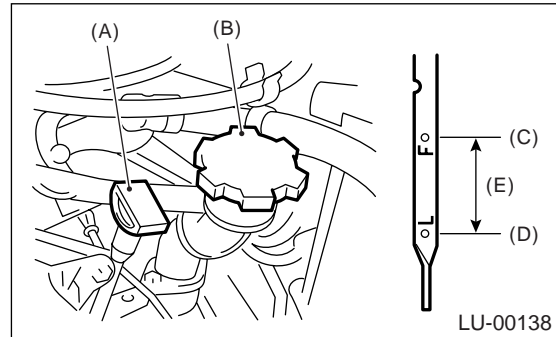
NOTE:

If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: ILSAC classification: GF-3 or API classification: SL
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

6) Close engine oil filler cap.

7) Start engine and warm it up for a time.

8) After engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. (1.1 US qt, 0.9 Imp qt)

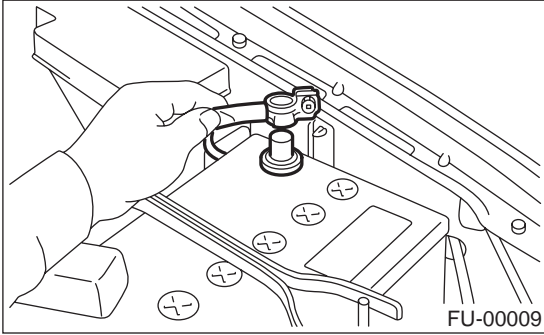
OIL PUMP

LUBRICATION

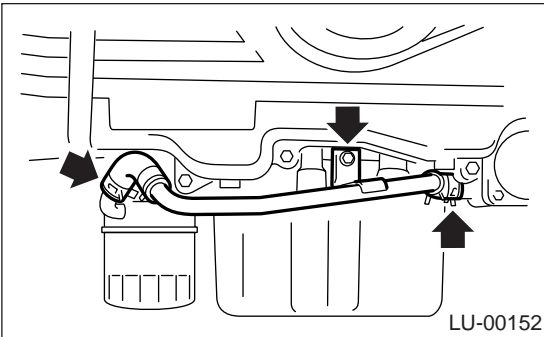
4. Oil Pump

A: REMOVAL

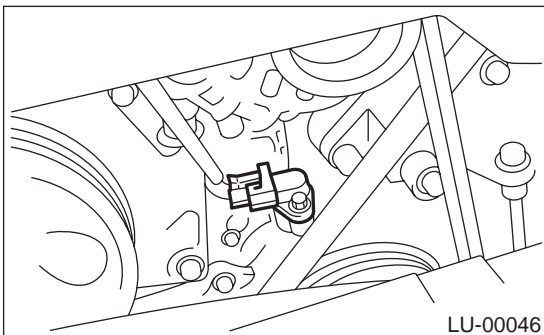
1) Disconnect battery ground cable.



2) Lift-up the vehicle.
3) Remove under cover.

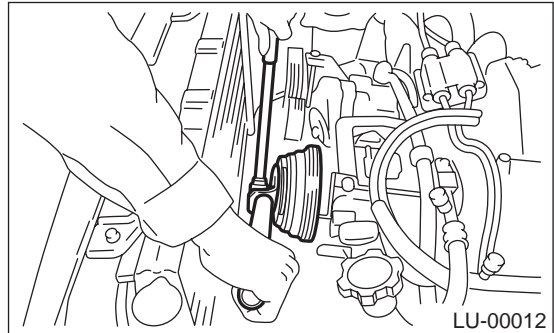


4) Remove bolts which install water pipe of oil cooler onto oil pump. (MT model)
5) Remove water pipe and hose between water pipe and oil cooler. (MT model)
6) Lower the vehicle.
7) Remove radiator. <Ref. to CO(H4DOSTC)-23, REMOVAL, Radiator.>
8) Remove crankshaft position sensor.

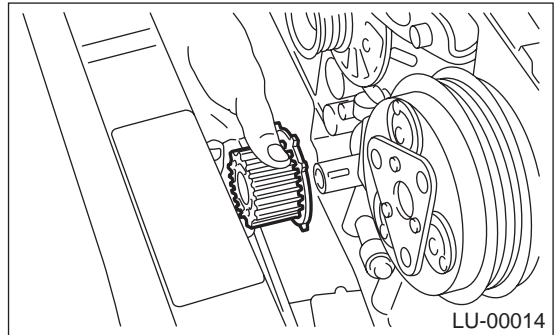


9) Remove V-belts. <Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
10) Remove rear side V-belt tensioner.

11) Remove crankshaft pulley by using ST.
ST 499977100 CRANKSHAFT PULLEY WRENCH (MT model)
ST 499977400 CRANKSHAFT PULLEY WRENCH (AT model)



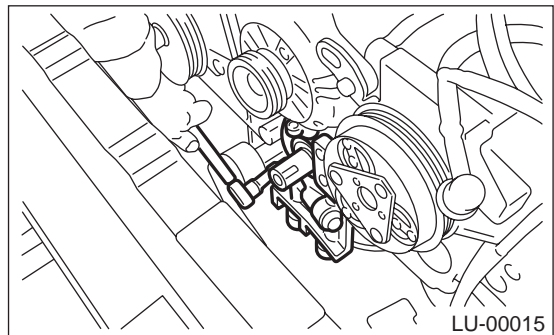
12) Remove water pump. <Ref. to CO(H4DOSTC)-17, REMOVAL, Water Pump.>
13) Remove timing belt guide. (MT model)
14) Remove crankshaft sprocket.



15) Remove bolts which install oil pump onto cylinder block.

NOTE:

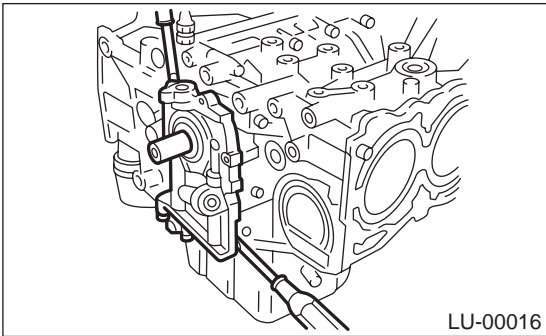
To disassemble and check oil pump, loosen relief valve plug before removing the pump.



16) Remove oil pump by using flat bladed screwdriver.

CAUTION:

Be careful not to scratch mating surfaces of cylinder block and oil pump.



5) Position the oil pump, aligning the notched area with the crankshaft, and push the oil pump straight.

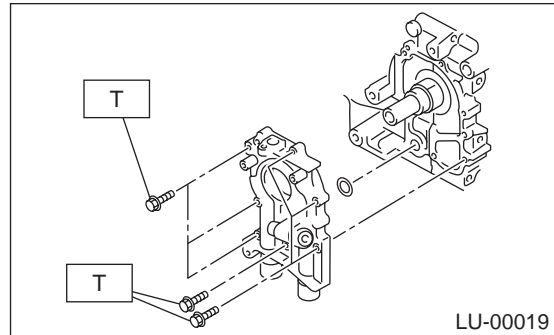
CAUTION:

Make sure the oil seal lip is not folded.

6) Install oil pump.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



B: INSTALLATION

Install in the reverse order of removal.

Do the following:

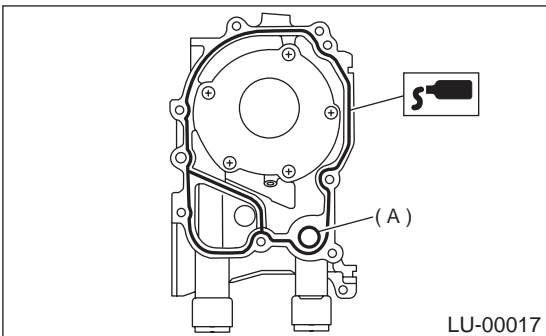
1) Apply fluid gasket to matching surfaces of oil pump.

Fluid gasket:

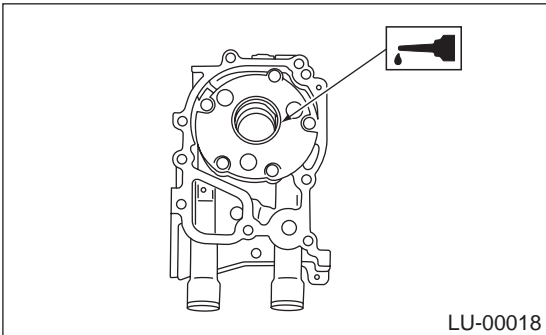
Part No. 004403007

THREE BOND 1215 or equivalent

2) Replace O-ring (A) with a new one.



3) Apply engine oil to the inside of the oil seal.



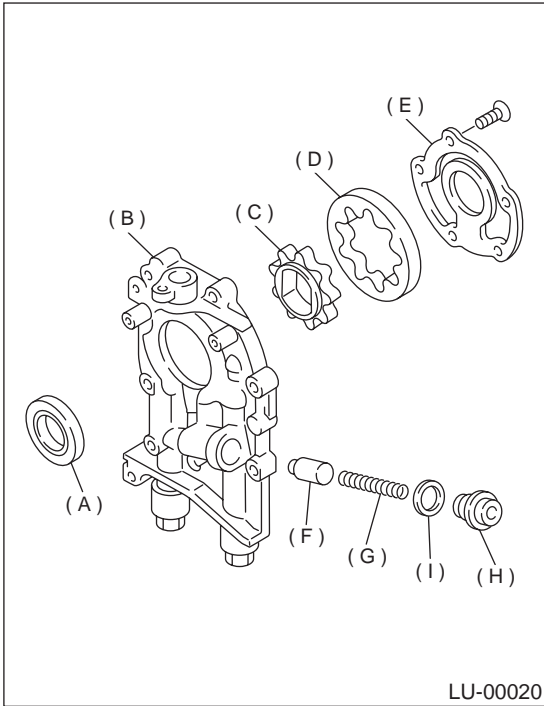
4) Be careful not to scratch oil seal when installing oil pump on cylinder block.

OIL PUMP

LUBRICATION

C: DISASSEMBLY

Remove screws which secure oil pump cover and disassemble oil pump. Inscribe alignment marks on inner and outer rotors so that they can be replaced in their original positions during reassembly.

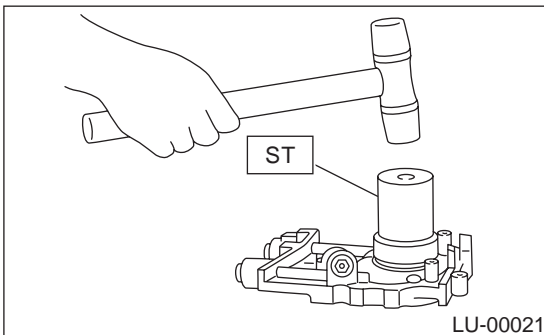


- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

D: ASSEMBLY

1) Install front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.

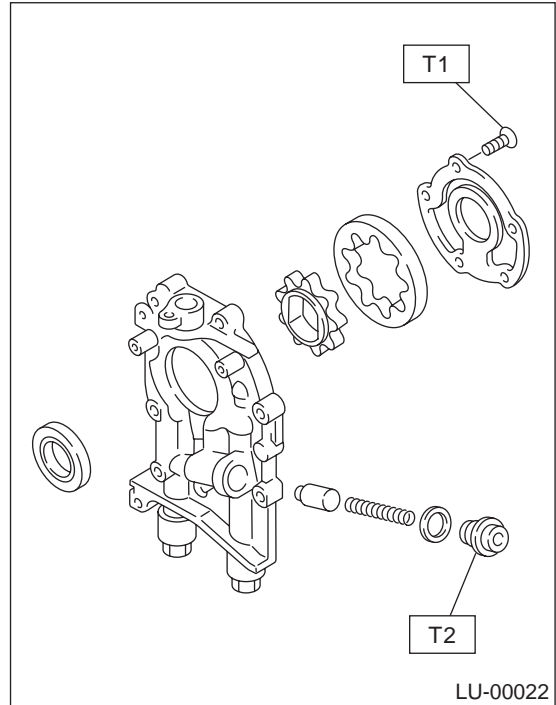


- 2) Apply engine oil to inner and outer rotors.
- 3) Install inner and outer rotors in their original positions.
- 4) Install oil relief valve and relief valve spring.
- 5) Install oil pump cover.

Tightening torque:

T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)

T2: 44 N·m (4.5 kgf-m, 33 ft-lb)



E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a set.

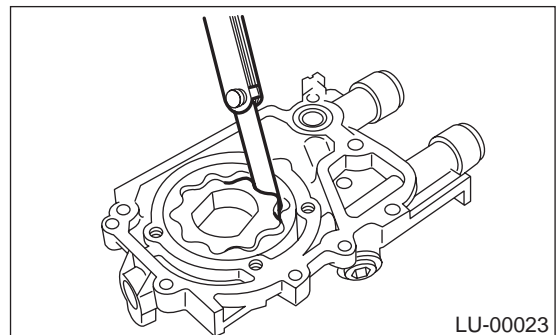
Tip clearance:

Standard

0.04 — 0.14 mm (0.0016 — 0.0055 in)

Limit

0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and the oil pump rotor housing. If the clearance exceeds the limit, replace the rotor.

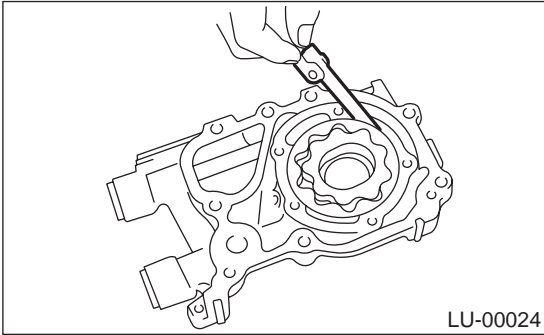
Case clearance:

Standard

0.10 — 0.175 mm (0.0039 — 0.0069 in)

Limit

0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure clearance between oil pump inner rotor and pump cover. If the clearance exceeds the limit, replace rotor or pump body.

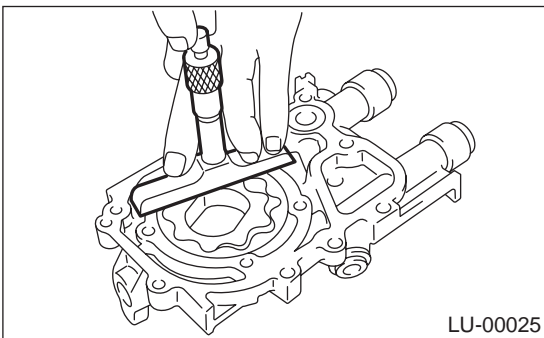
Side clearance:

Standard

0.02 — 0.07 mm (0.0008 — 0.0028 in)

Limit

0.12 mm (0.0047 in)



4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:

Free length

73.7 mm (2.902 in)

Installed length

54.7 mm (2.154 in)

Load when installed

93.1 N (9.49 kgf, 20.93 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

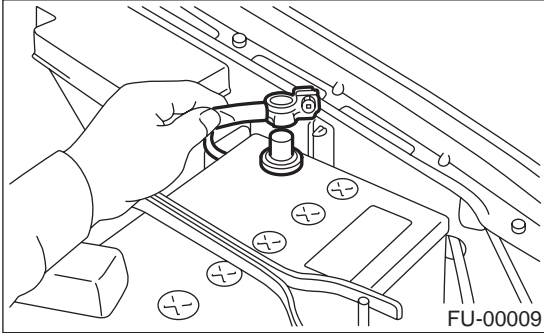
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

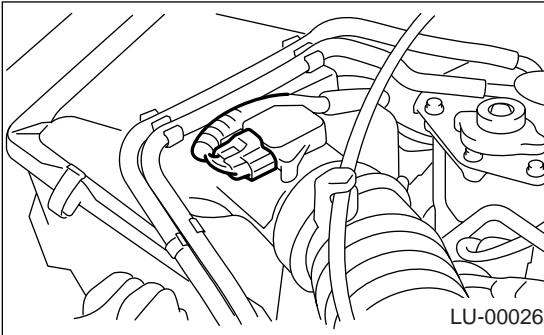
5. Oil Pan and Strainer

A: REMOVAL

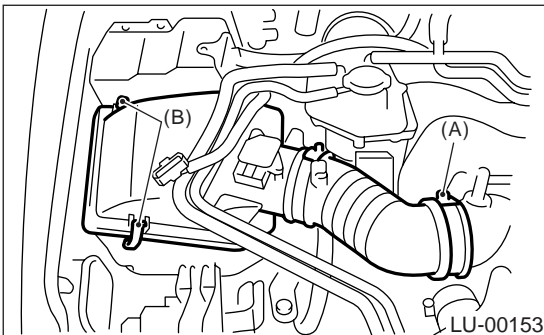
- 1) Set the vehicle on lift arms.
- 2) Remove front wheels.
- 3) Disconnect battery ground cable.



- 4) Disconnect the connector from mass air flow sensor.

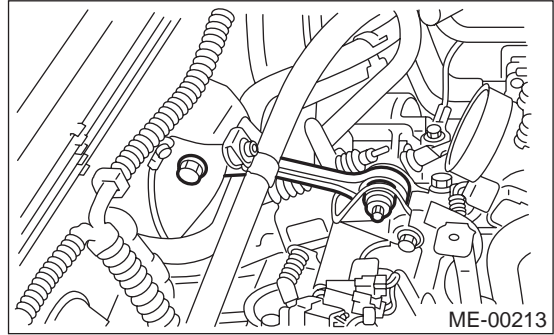


- 5) Loosen the clamp (A) which connects air intake boot to intake duct.
- 6) Remove the two clips (B) from air cleaner upper cover.
- 7) Remove the air intake boot and air cleaner upper cover.

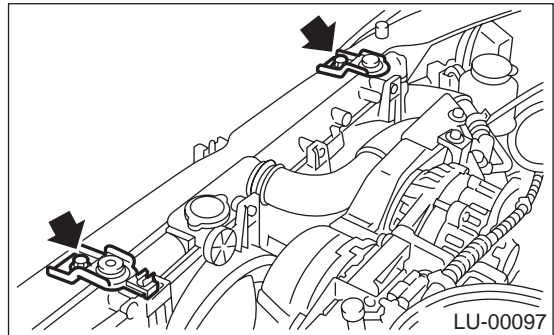


- 8) Remove the intercooler. <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>

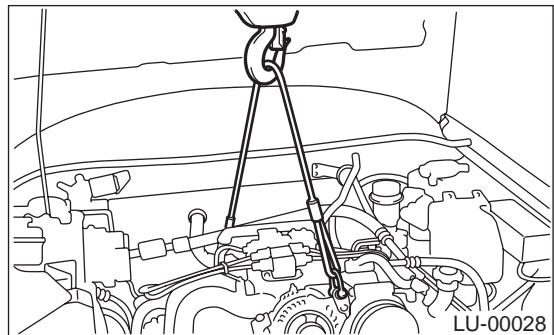
- 9) Remove pitching stopper.



- 10) Remove radiator upper brackets.



- 11) Support engine with a lifting device and wire ropes.

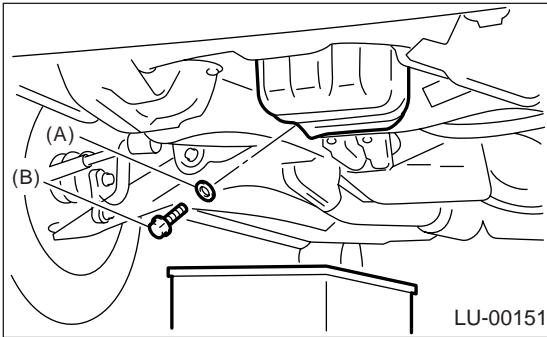


- 12) Lift-up the vehicle.

CAUTION:
When lifting up the vehicle, wire rope must be raised at the same time.

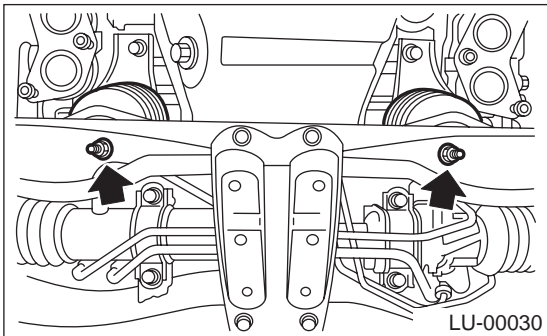
- 13) Remove under cover.

- 14) Drain engine oil.
Set container under the vehicle, and remove drain plug from oil pan.



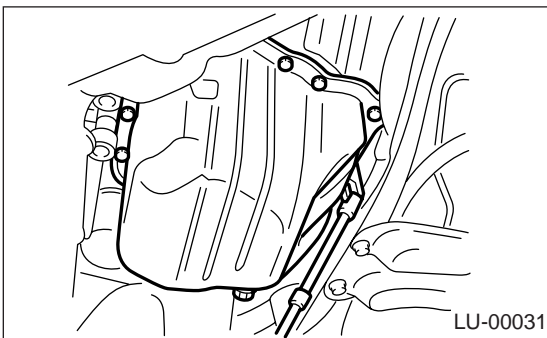
- (A) Gasket
- (B) Drain plug

- 15) Remove nuts which secure front cushion rubber onto front crossmember.

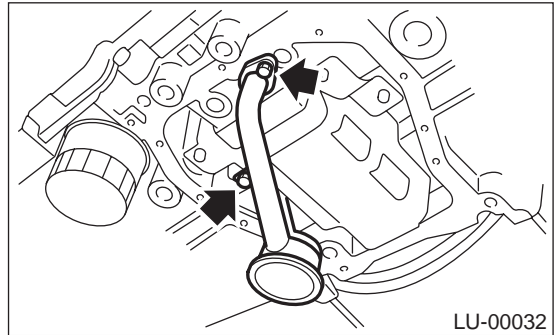


- 16) Remove bolts which secure oil pan on cylinder block while raising up engine.
17) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

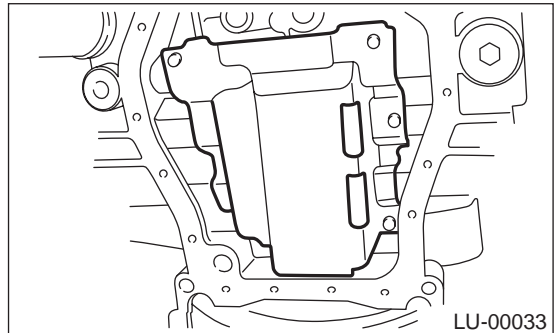
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.



- 18) Remove oil strainer.



- 19) Remove baffle plate.



B: INSTALLATION

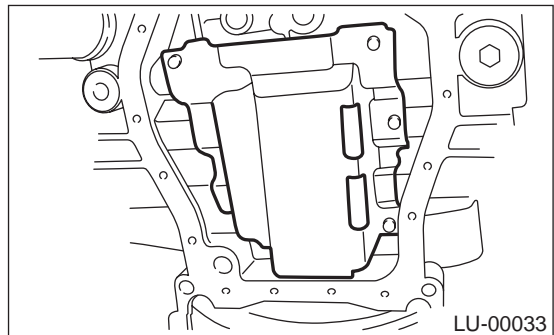
NOTE:

Before installing oil pan, clean sealant from oil pan and engine block.

- 1) Install baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



OIL PAN AND STRAINER

LUBRICATION

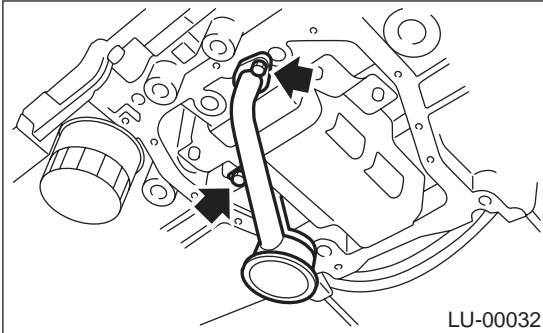
2) Install oil strainer onto baffle plate.

CAUTION:

Replace O-ring with a new one.

Tightening torque:

10 N·m (1.0 kgf·m, 7 ft·lb)

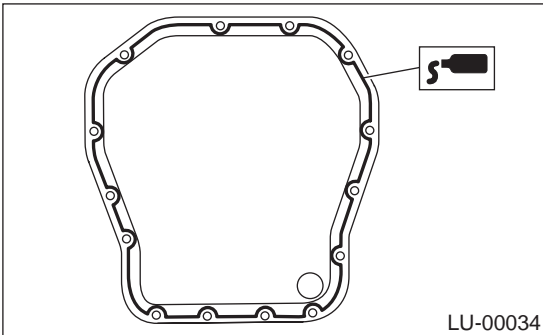


3) Apply fluid gasket to mating surfaces and install oil pan.

Fluid gasket:

Part No. 004403007

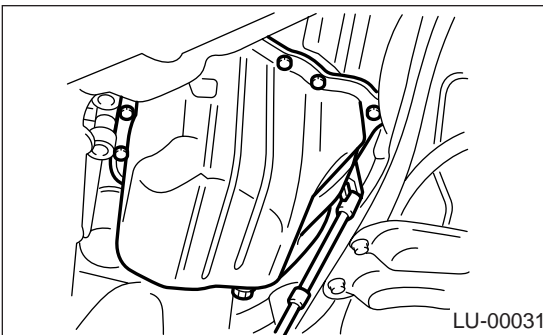
THREE BOND 1215 or equivalent



4) Mount oil pan on engine block.

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

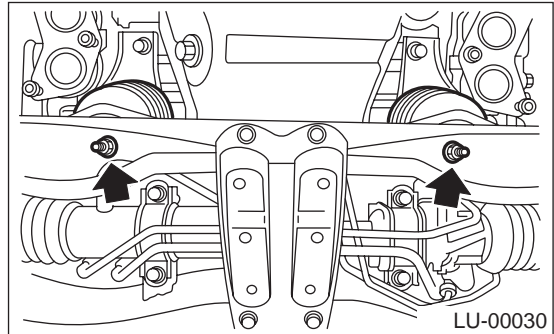


5) Lower engine onto front crossmember.

6) Tighten nuts which secure front cushion rubber onto front crossmember.

Tightening torque:

69 N·m (7.0 kgf·m, 51 ft·lb)



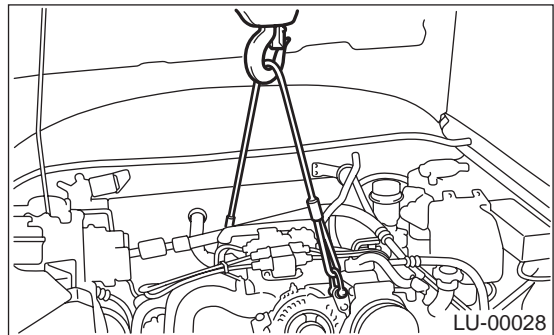
7) Install under cover.

8) Lower the vehicle.

CAUTION:

When lowering vehicle, wire rope must be released at the same time.

9) Remove lifting device and steel cables.

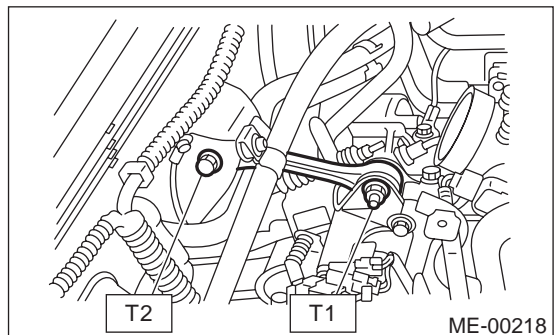


10) Install pitching stopper.

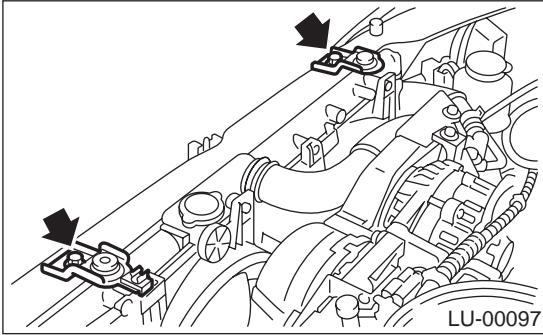
Tightening torque:

T1: 50 N·m (5.1 kgf·m, 37 ft·lb)

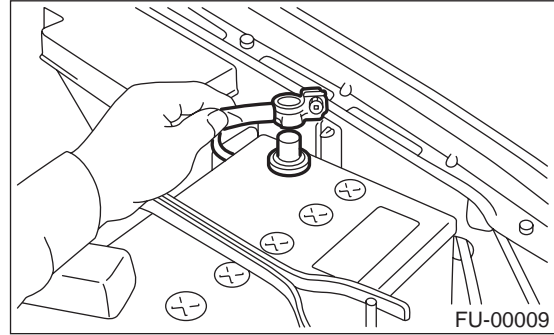
T2: 58 N·m (5.9 kgf·m, 43 ft·lb)



11) Install radiator upper brackets.



18) Connect battery ground cable.

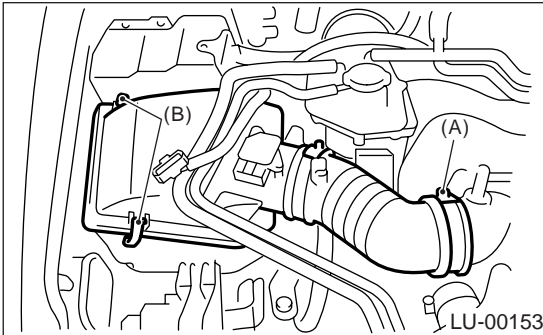


12) Install the intercooler. <Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

13) Install the air intake boot and air cleaner upper cover.

14) Tighten the clamp (A) which connects air intake boot to intake duct.

15) Lock the two clips (B) to air cleaner upper cover.

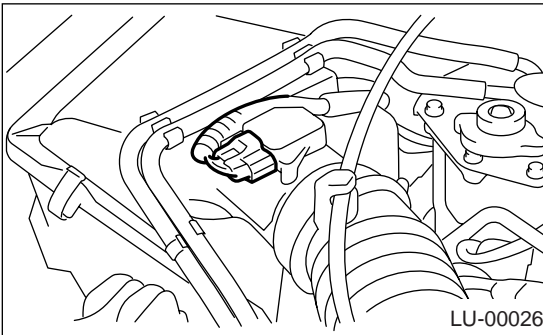


19) Fill engine oil. <Ref. to LU(H4DOSTC)-8, INSPECTION, Engine Oil.>

C: INSPECTION

By visual check make sure oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

16) Connect the connector to mass air flow sensor.



17) Install front wheels.

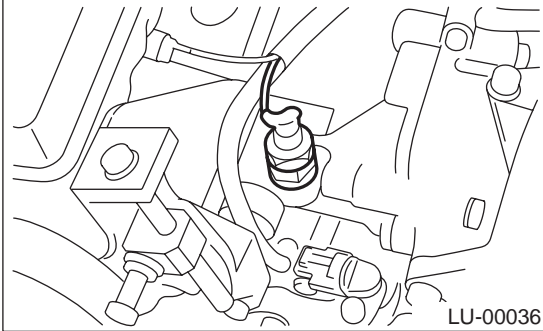
OIL PRESSURE SWITCH

LUBRICATION

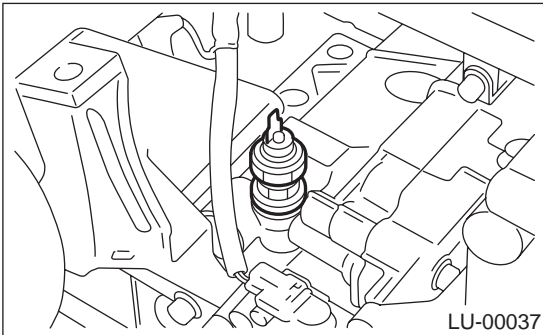
6. Oil Pressure Switch

A: REMOVAL

- 1) Remove generator from bracket. <Ref. to SC(H4DOSTC)-14, REMOVAL, Generator.>
- 2) Disconnect terminal from oil pressure switch.



- 3) Remove oil pressure switch.



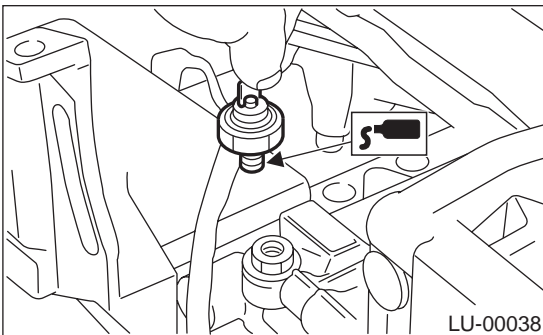
B: INSTALLATION

- 1) Apply fluid gasket to oil pressure switch threads.

Fluid gasket:

Part No. 004403042

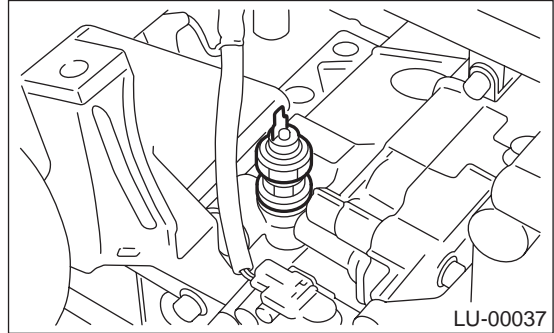
THREE BOND 1324 or equivalent



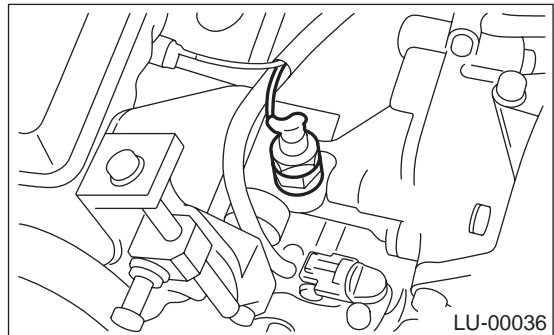
- 2) Install oil pressure switch onto engine block.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- 3) Connect terminal of oil pressure switch.



- 4) Install generator on bracket. <Ref. to SC(H4DOSTC)-14, INSTALLATION, Generator.>

C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

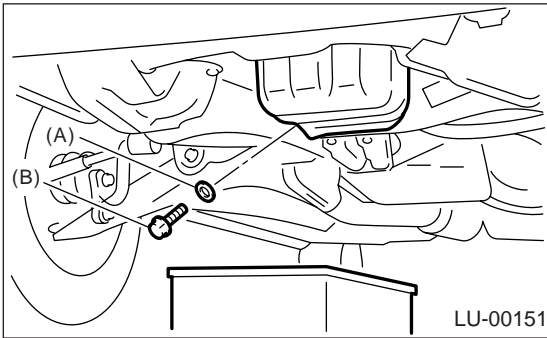
7. Engine Oil Cooler

A: REMOVAL

NOTE:

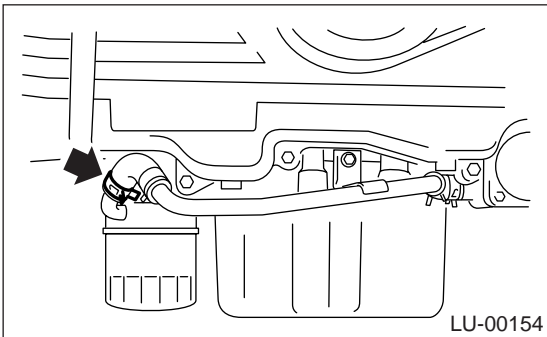
Equipped only for MT model.

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Drain the engine oil.
Set a container under the vehicle, and remove the drain plug from oil pan.



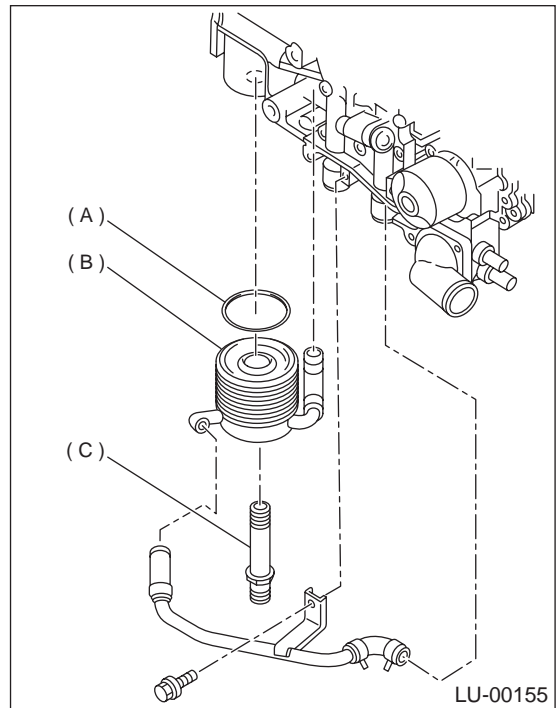
- (A) Metal gasket
- (B) Drain plug

- 4) Drain the coolant.
- 5) Remove the water by-pass pipe between oil cooler and water pump.



- 6) Remove the engine oil filter. <Ref. to LU(H4DOSTC)-21, REMOVAL, Engine Oil Filter.>

- 7) Remove the connector, and then remove the oil cooler.



- (A) O-ring
- (B) Oil cooler
- (C) Connector

ENGINE OIL COOLER

LUBRICATION

B: INSTALLATION

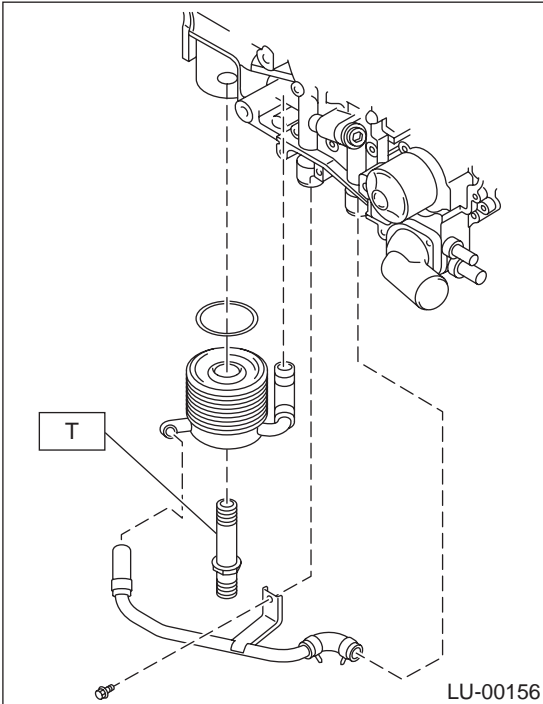
1) Install in the reverse order of removal.

Tightening torque:

T: 54 N·m (5.5 kgf-m, 40 ft-lb)

CAUTION:

Always use a new O-ring.



C: INSPECTION

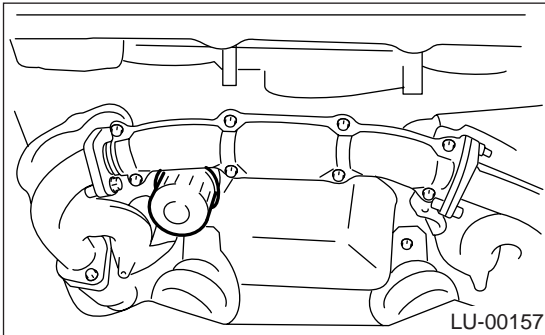
1) Check that the coolant passages are not clogged using an air blow method.

2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

8. Engine Oil Filter

A: REMOVAL

- 1) Remove under cover.
 - 2) Remove oil filter with ST.
- ST 498547000 OIL FILTER WRENCH



B: INSTALLATION

- 1) Get a new oil filter and thinly apply engine oil to the seal rubber.
- 2) Install oil filter by turning it by hand, being careful not to damage seal rubber.
- 3) Tighten more (approximately 2/3 to 3/4 turn) after the seal rubber contacts the oil pump case. Do not tighten excessively, or oil may leak.

C: INSPECTION

- 1) After installing oil filter, run engine and make sure that no oil is leaking around seal rubber.

NOTE:

The filter element and filter case are integrated therefore, interior cleaning is not necessary.

- 2) Check the engine oil level. <Ref. to LU(H4DOSTC)-8, INSPECTION, Engine Oil.>z

ENGINE LUBRICATION SYSTEM TROUBLE IN GENERAL

LUBRICATION

9. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
Stuck oil pump rotor		Replace.	
2. Warning light does not go on.	1) Burn-out bulb		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.—2).

SPEED CONTROL SYSTEMS

SP(H4DOSTC)



	Page
1. General Description	2



1. General Description

A: SPECIFICATION

Specification of TURBO model is also described on SP(H4SO). <Ref. to SP(H4SO)-2, General Description.>

IGNITION

IG(H4DOSTC)

	Page
1. General Description	2
2. Spark Plug.....	5
3. Ignition Coil and Ignitor Assembly.....	8



GENERAL DESCRIPTION

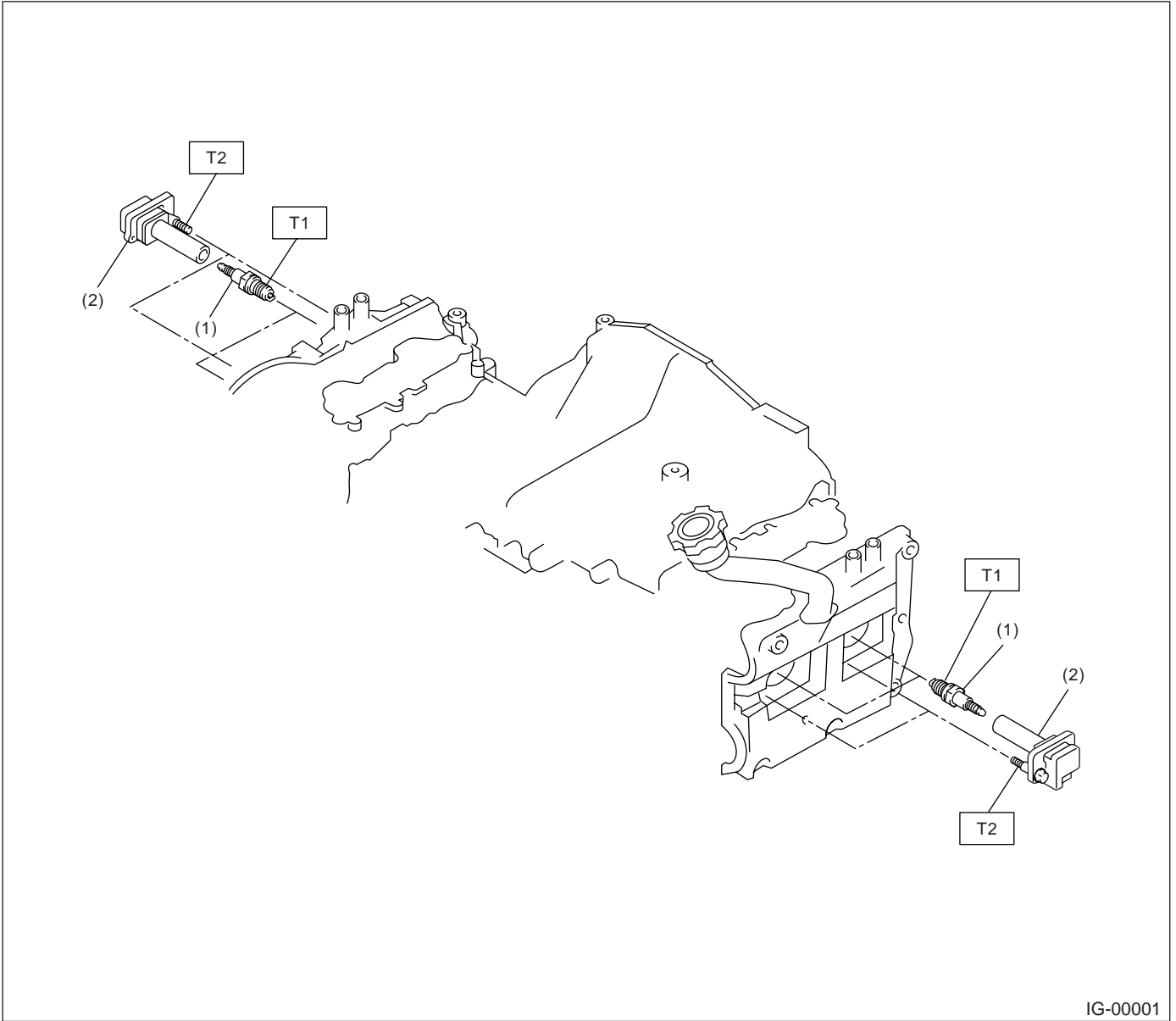
IGNITION

1. General Description

A: SPECIFICATIONS

Item		Designation
Ignition coil and ignitor assembly	Model	FK0186
	Ignition type	Direct ignition
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	NGK : PFR6G
	Thread size	mm 14, P = 1.25
	Spark gap	mm (in) 0.7 — 0.8 (0.028 — 0.031)
	Electrode	Platinum

B: COMPONENT



IG-00001

- (1) Spark plug
- (2) Ignition coil and ignitor ASSY

Tightening torque: N·m (kgf·m, ft·lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

GENERAL DESCRIPTION

IGNITION

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

A: REMOVAL

CAUTION:

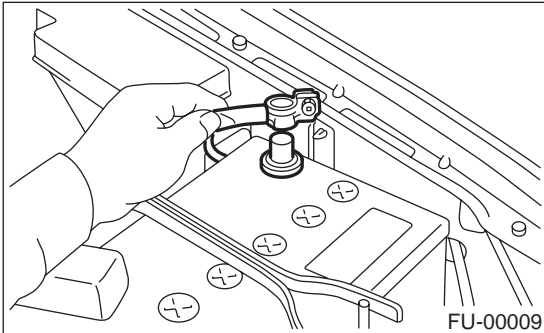
All spark plugs installed on an engine, must be of the same heat range.

Spark plug:

NGK: PFR6G

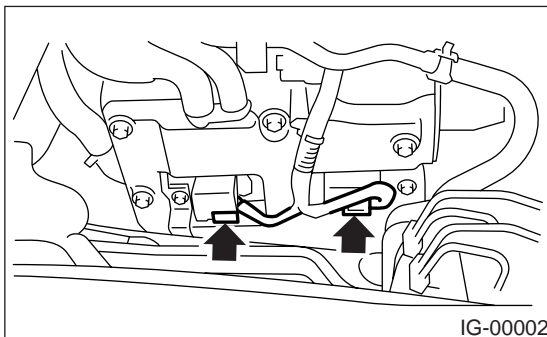
1. RH SIDE

1) Disconnect the ground cable from battery.

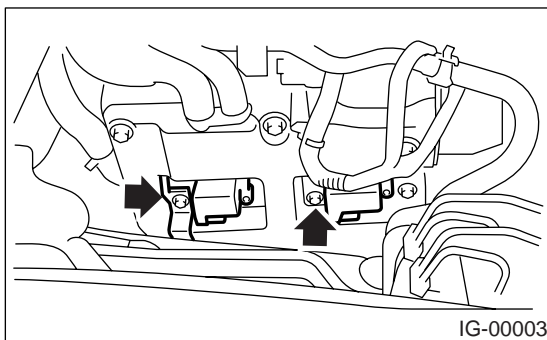


2) Remove the air cleaner lower case. <Ref. to IN(H4DOSTC)-10, REMOVAL, Air Cleaner.>

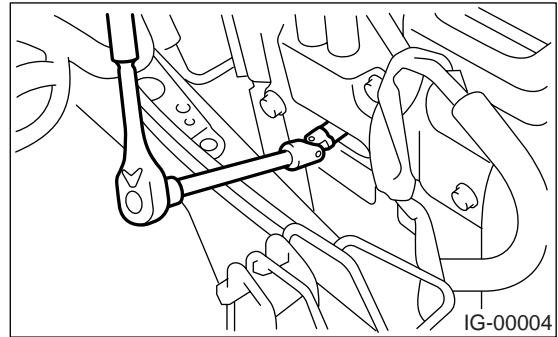
3) Disconnect the connector from ignition coil.



4) Remove the ignition coil.

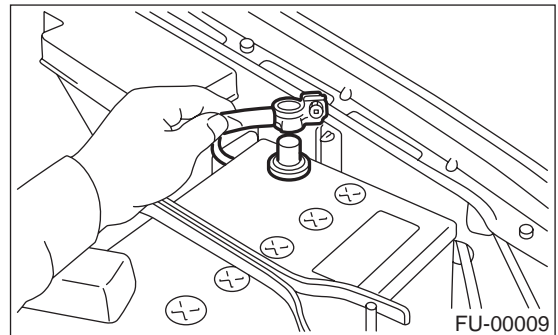


5) Remove the spark plugs with the spark plug sockets.

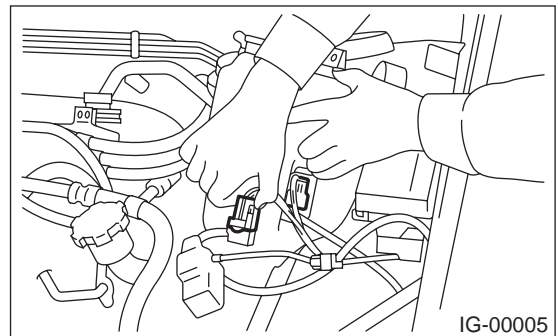


2. LH SIDE

1) Disconnect the battery cables, and then remove the battery and battery carrier.

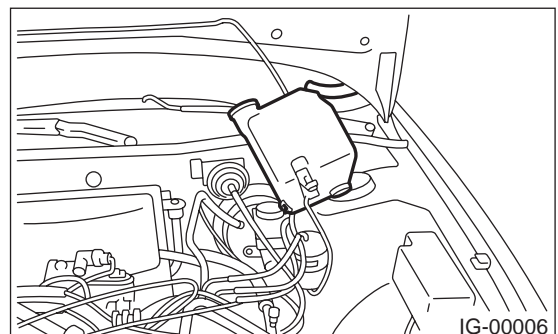


2) Disconnect the washer motor connector.



3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.

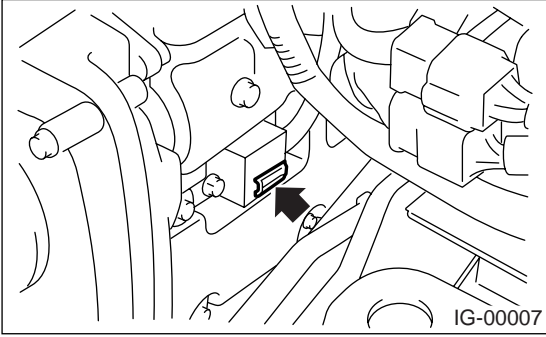
4) Remove the two bolts which hold washer tank, then take the tank away from working area.



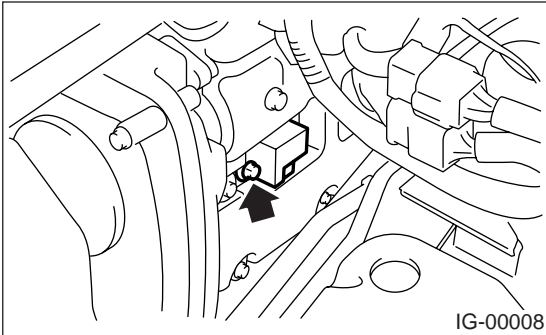
SPARK PLUG

IGNITION

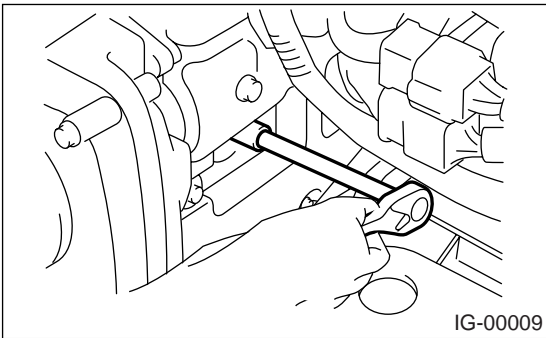
5) Disconnect the connector from ignition coil.



6) Remove the ignition coil.



7) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

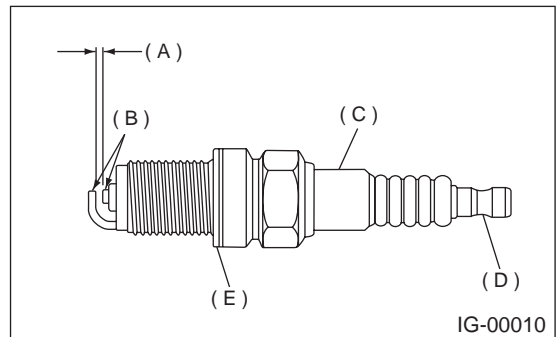
Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

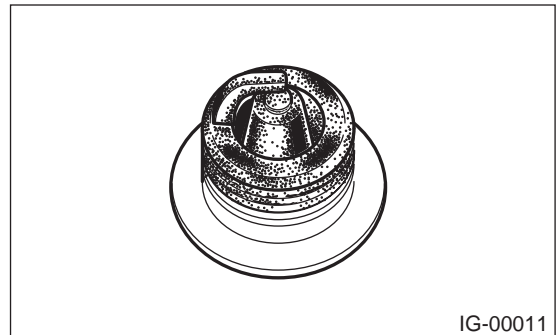
Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal:

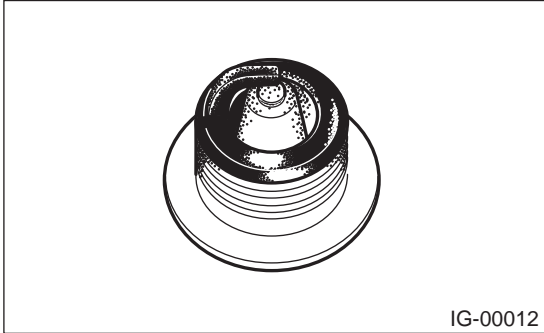
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



2) Carbon fouled:

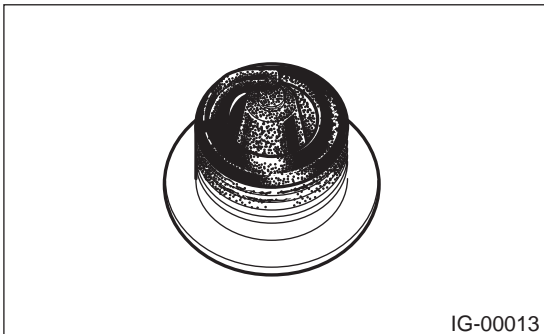
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



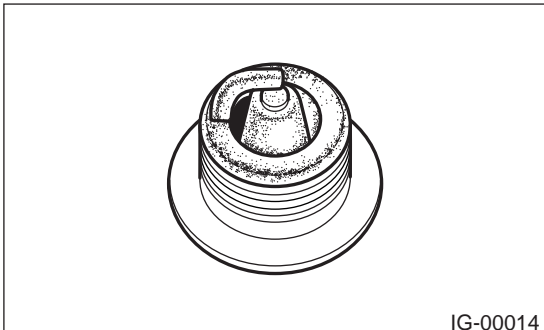
3) Oil fouled:

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.



4) Overheating:

White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.



D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.

If deposits are too stubborn, replace the plugs.

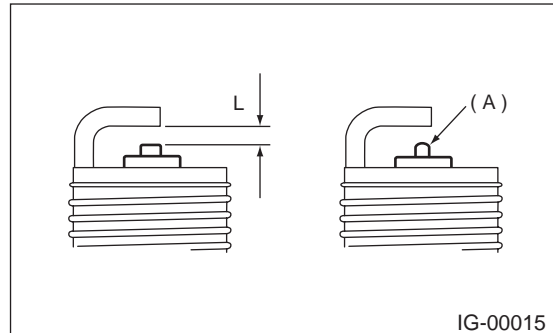
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:

Do not use spark plug cleaners, because the spark plugs are applied with platinum tips.

Spark plug gap: L

0.7 — 0.8 mm (0.028 — 0.031 in)



NOTE:

Replace with a new spark plug if this area (A) is worn to "ball" shape.

3. Ignition Coil and Ignitor Assembly

A: REMOVAL

Direct ignition type has been adopted.
Refer to the "Spark Plug Removal" for removal procedure. <Ref. to IG(H4DOSTC)-5, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

Ignitor is integrated with the coil. Therefore resistance cannot be measured.

For inspection procedure of ignition system, refer to the following.

<Ref. to EN(H4DOSTC)-144, DTC P0350 — IGNITION COIL PRIMARY/SECONDARY CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

STARTING/CHARGING SYSTEMS

SC(H4DOSTC)

	Page
1. General Description	2
2. Starter	6
3. Generator	14
4. Battery	17



GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

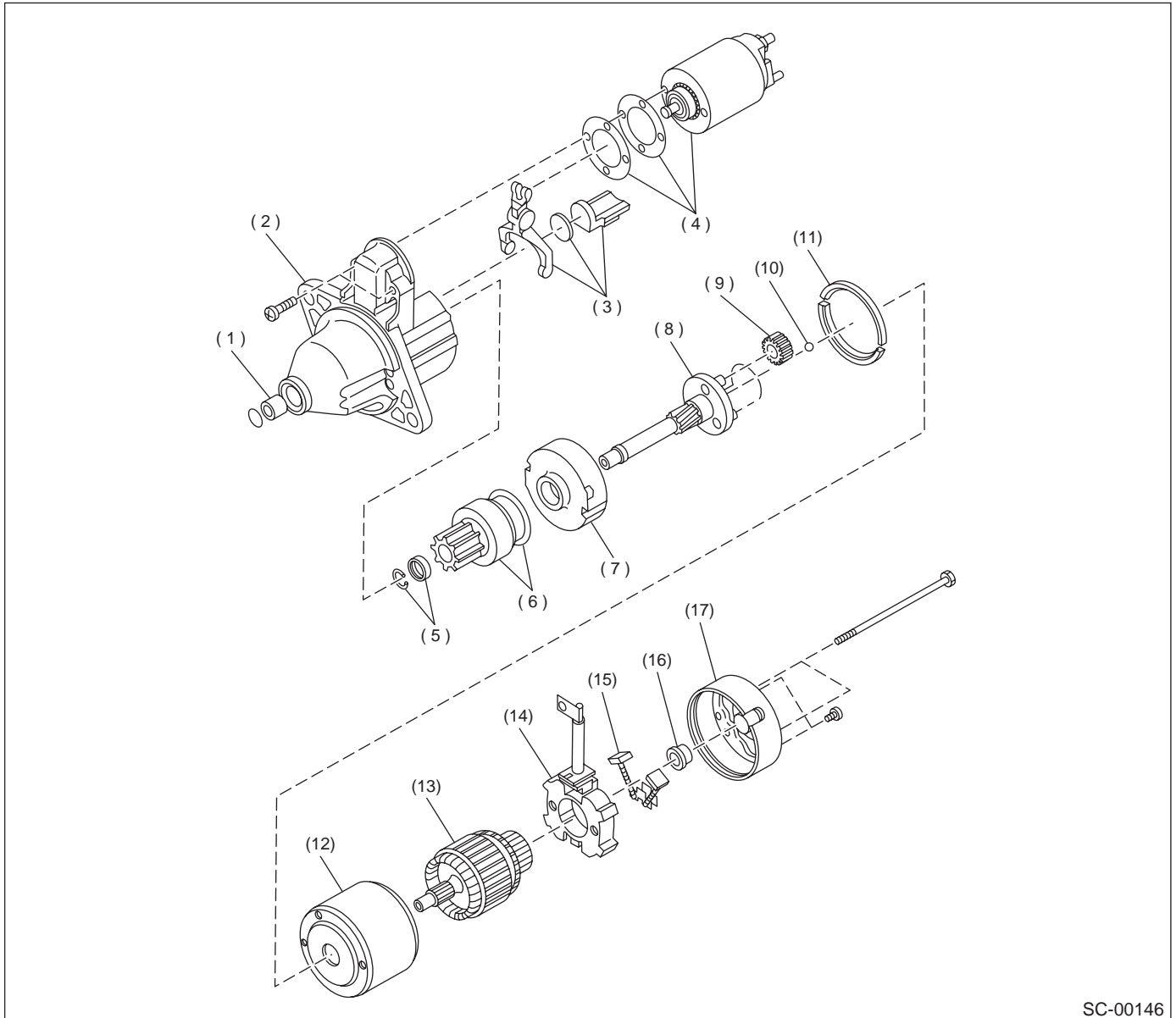
1. General Description

A: SPECIFICATIONS

Item		Designation		
Starter	Type	Reduction type		
	Vehicle type	MT vehicles	AT vehicles	
	Model	M000T83881	M000T86381	
	Manufacturer	Mitsubishi Electric		
	Voltage and output	12 V — 1.0 kW	12 V — 1.4 kW	
	Direction of rotation	Counterclockwise (viewed from pinion gear side)		
	Number of pinion teeth	8	9	
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	
		Rotating speed	2,800 rpm or more	2,400 rpm or more
	Load characteristics	Voltage	7.5 V	7.7 V
		Current	300 A	400 A
		Torque	8.6 N (0.88 kgf, 6.4 lb) or more	16.0 N (1.63 kgf, 11.8 lb) or more
		Rotating speed	920 rpm or more	740 rpm or more
	Lock characteristics	Voltage	4 V	3.5 V
		Current	650 A or less	940 A or less
Torque		14.7 N (1.50 kgf, 10.8 lb) or more	28.9 N (2.95 kgf, 21.3 lb) or more	
Generator	Type	Rotating-field three-phase type, Voltage regulator built-in type, with load response control system		
	Model	LR1100-733		
	Manufacturer	HITACHI		
	Voltage and output	12 V — 100 A		
	Polarity on ground side	Negative		
	Rotating direction	Clockwise (viewed from pulley side)		
	Armature connection	3-phase Y-type		
	Output current	1,500 rpm — 49 A or more 2,500 rpm — 79 A or more 5,000 rpm — 102 A or more		
	Regulated voltage	14.1 — 14.8 V [20°C (68°F)]		

B: COMPONENT

1. STARTER



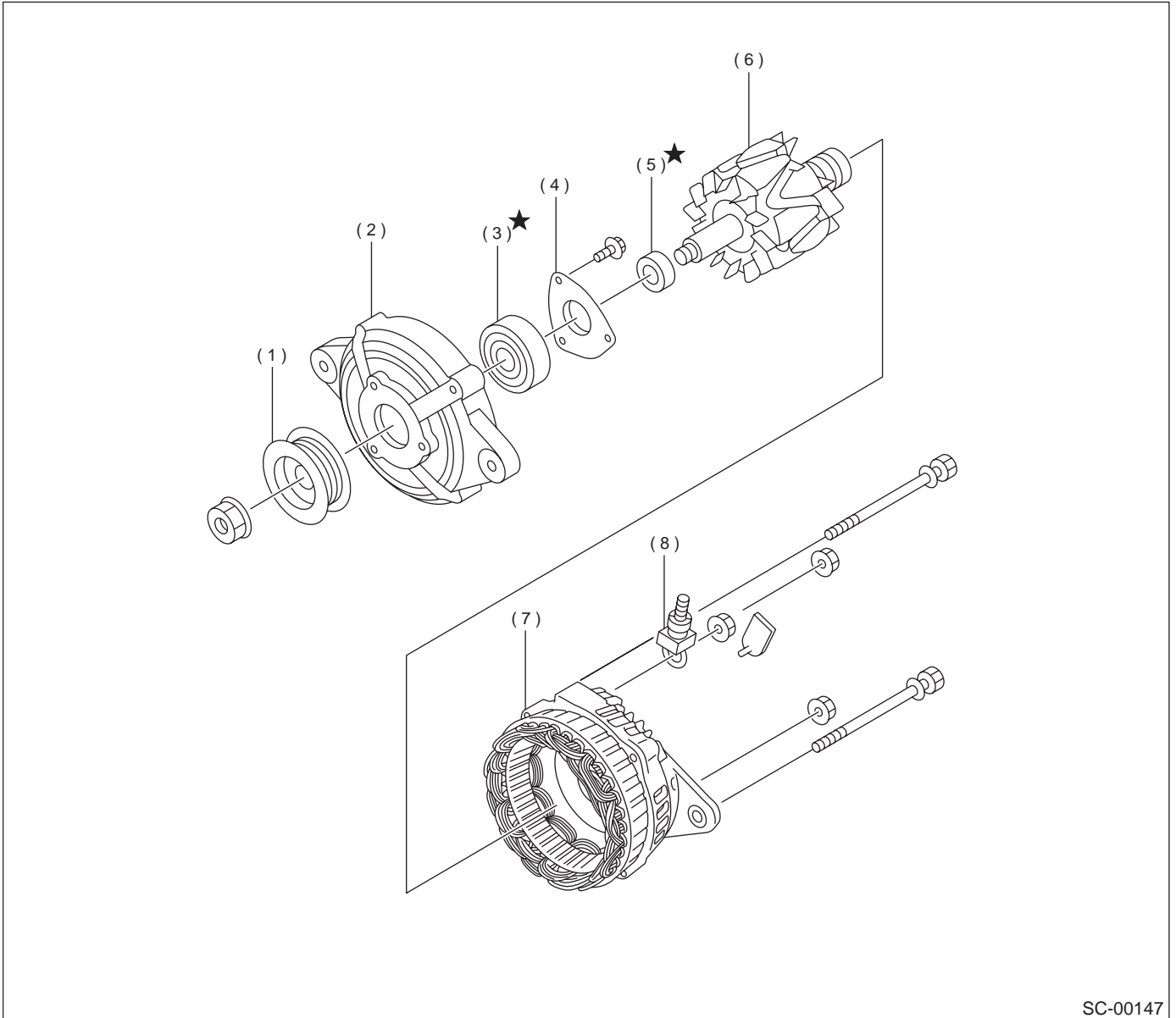
SC-00146

- | | | |
|-------------------------|------------------------|---------------------|
| (1) Sleeve bearing | (7) Internal gear ASSY | (13) Armature |
| (2) Front bracket | (8) Shaft ASSY | (14) Brush holder |
| (3) Lever set | (9) Shaft ASSY | (15) Brush |
| (4) Magnet switch ASSY | (10) Ball | (16) Sleeve bearing |
| (5) Stopper set | (11) Packing | (17) Rear bracket |
| (6) Over running clutch | (12) Yoke | |

GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

2. GENERATOR



SC-00147

- | | | |
|------------------|----------------------|---------------------|
| (1) Pulley | (4) Bearing retainer | (7) Rear cover ASSY |
| (2) Front cover | (5) Ball bearing | (8) Terminal |
| (3) Ball bearing | (6) Rotor | |

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

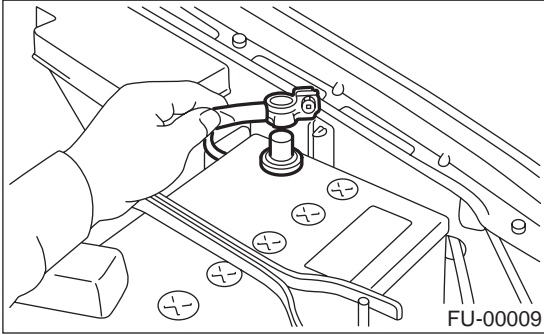
STARTER

STARTING/CHARGING SYSTEMS

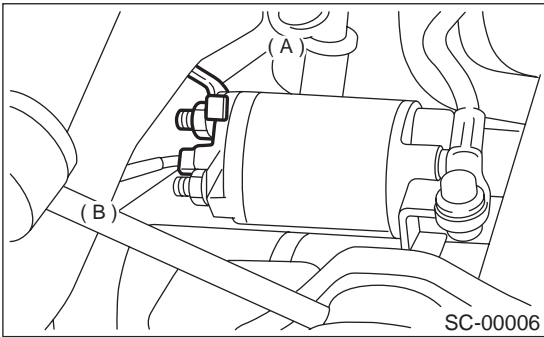
2. Starter

A: REMOVAL

1) Disconnect the ground cable from battery.

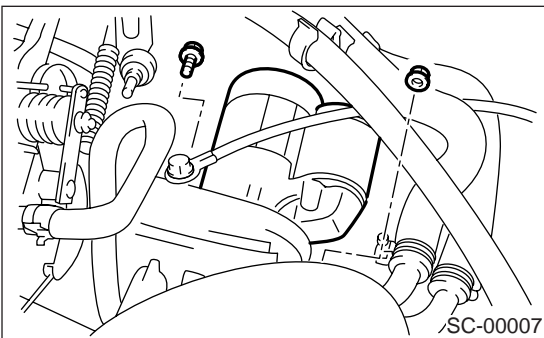


2) Remove the intercooler.
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
3) Disconnect the connector and terminal from starter.



- (A) Terminal
- (B) Connector

4) Remove the starter from transmission.

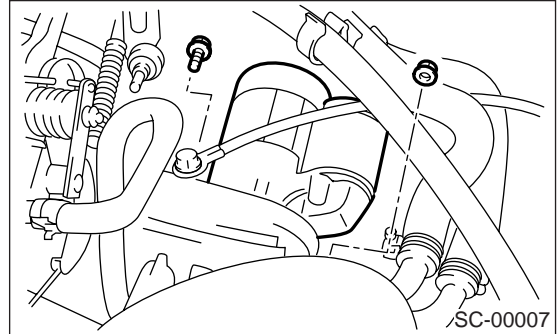


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

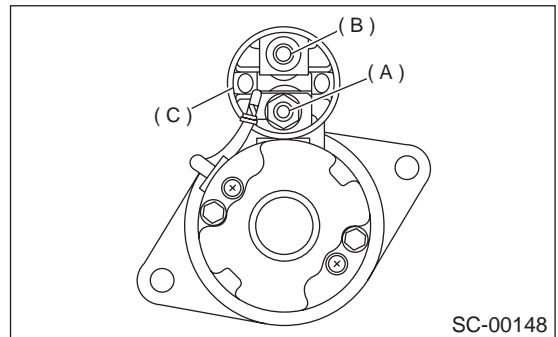
50 N·m (5.1 kgf·m, 37 ft·lb)



C: DISASSEMBLY

1. STARTER ASSEMBLY

1) Loosen the nut which holds terminal M of switch assembly, and then disconnect the connector.



- (A) Terminal M
- (B) Terminal B
- (C) Terminal S

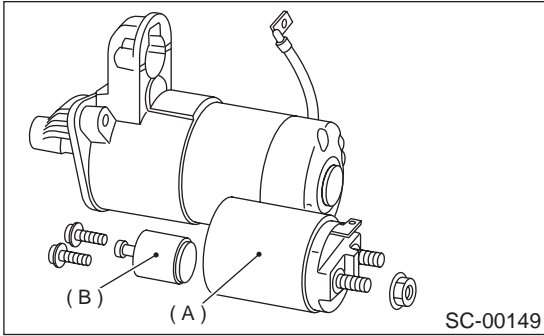
STARTER

STARTING/CHARGING SYSTEMS

2) Remove the bolts which hold switch assembly, and then remove the switch assembly, plunger and plunger spring from starter as a unit.

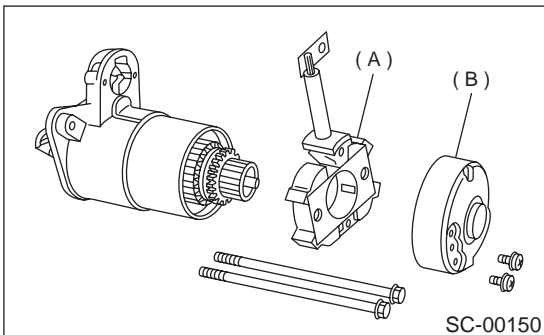
NOTE:

Be careful because the pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



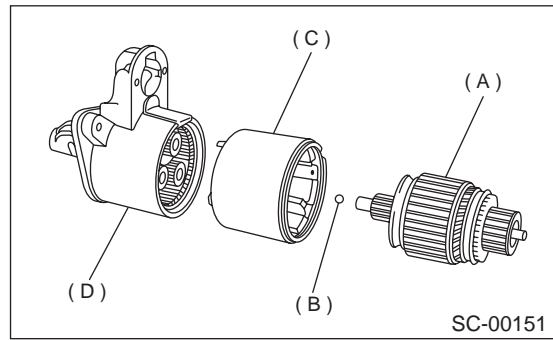
- (A) Switch ASSY
- (B) Plunger

3) Remove both through-bolts and brush holder screws, and then detach the rear cover and brush holder.



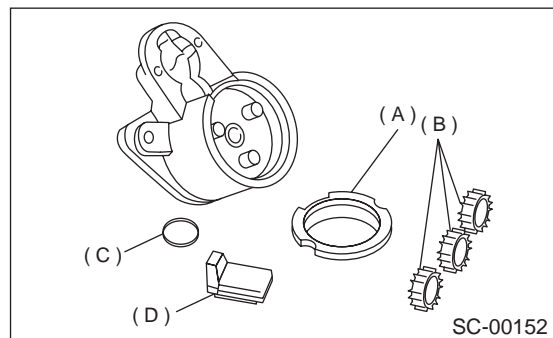
- (A) Brush holder
- (B) Rear bracket

4) Remove the armature and yoke from front bracket.



- (A) Armature
- (B) Ball
- (C) Yoke
- (D) Front bracket

5) Remove the packing A, planetary gear, packing B and plate.



- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

STARTER

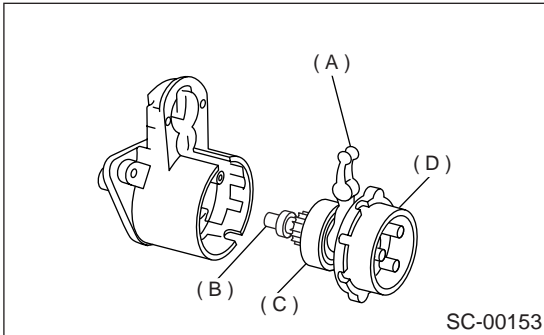
STARTING/CHARGING SYSTEMS

6) Remove the shaft assembly and overrunning clutch from front bracket as a unit.

NOTE:

Check the following points before removal.

- Lever direction
- Position of internal gear assembly

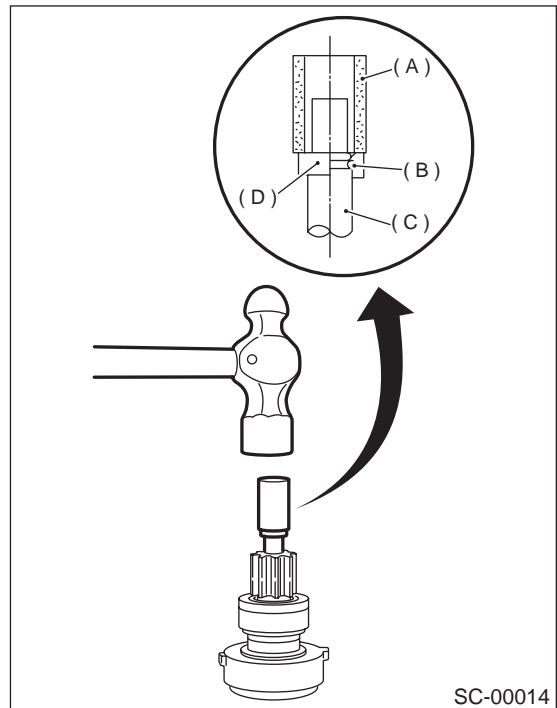


- (A) Lever
- (B) Shaft ASSY
- (C) Overrunning clutch
- (D) Internal gear ASSY

7) Remove the overrunning clutch from shaft assembly as follows:

(1) Remove the stopper from ring by lightly tapping the stopper with an appropriate tool (such as a fit socket wrench).

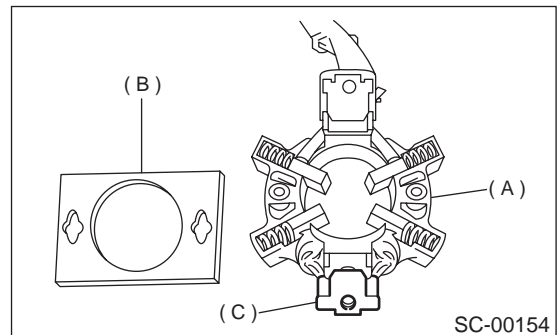
(2) Remove the ring, stopper and clutch from shaft.



- (A) Socket wrench
- (B) Ring
- (C) Shaft
- (D) Stopper

2. BRUSH HOLDER

Unlock metal clip fixing insulation plate to brush holder and remove insulation plate.



- (A) Brush holder
- (B) Insulation plate
- (C) Metal clip

D: ASSEMBLY

Assemble in the reverse order of disassembly. Do the following:

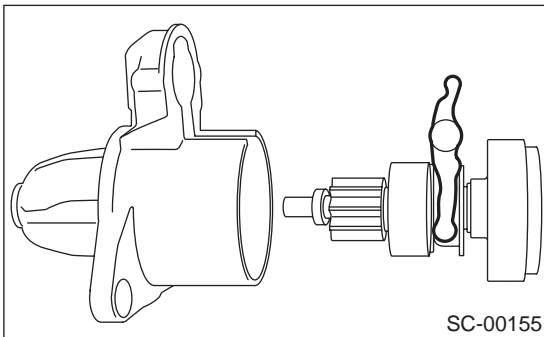
NOTE:

When assembling, apply grease to the following parts.

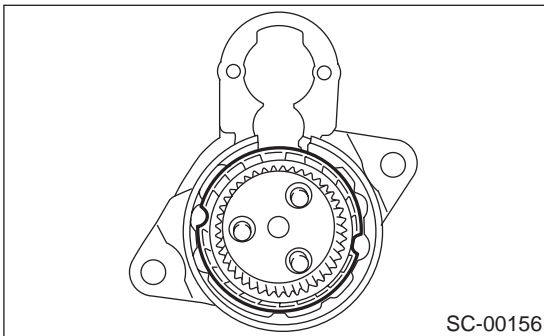
- Front and rear bracket sleeve bearing
- Armature shaft gear
- Outer periphery of plunger
- Mating surface of plunger and lever
- Gear shaft splines
- Mating surface of lever and clutch
- Ball at the armature shaft end
- Internal and planetary gears

1) When installing shaft assembly to front bracket, be careful of the following.

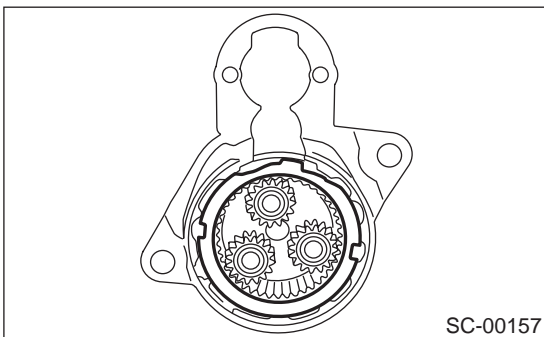
- Lever direction



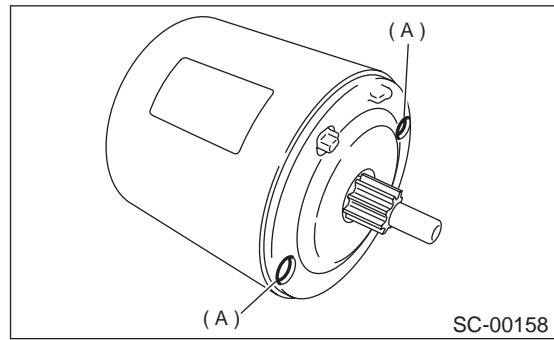
- Internal gear position



- Packing position

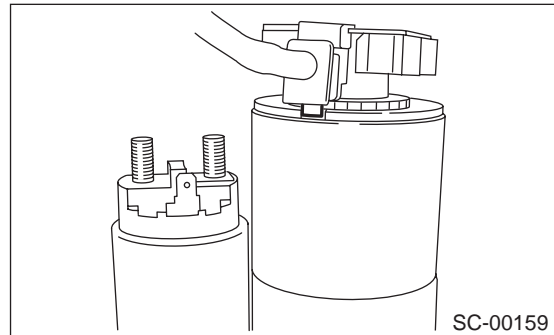


2) When installing yoke to the front bracket, match bolt hole.



(A) Bolt hole

3) When installing rear bracket, match brush holder and yoke's groove.



4) When installing switch assembly, catch plunger protrusion to lever edge.

5) After assembling parts correctly, make sure starter operates properly.

STARTER

STARTING/CHARGING SYSTEMS

E: INSPECTION

1. ARMATURE

1) Check the commutator for any sign of burns or rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.

2) Run-out test

Check the commutator run-out, and then replace if it exceeds the limit.

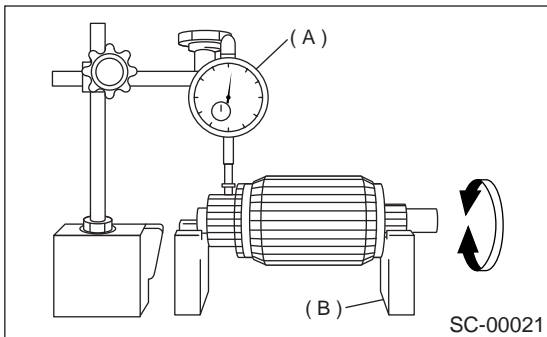
Commutator run-out:

Standard

0.05 mm (0.0020 in)

Service limit

Less than 0.10 mm (0.0039 in)



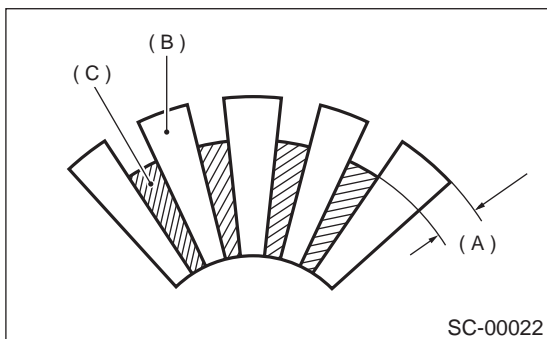
- (A) Dial gauge
- (B) V-block

3) Depth of segment mold

Check the depth of segment mold.

Depth of segment mold:

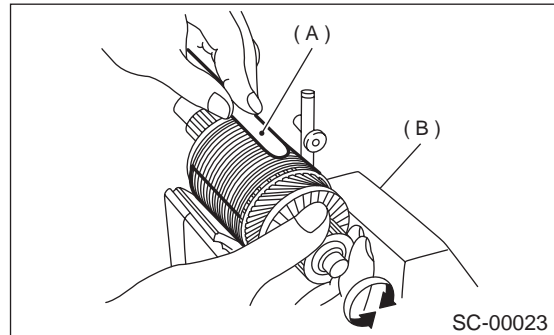
0.5 mm (0.020 in)



- (A) Depth of mold
- (B) Segment
- (C) Mold

4) Armature short-circuit test

Check the armature for short-circuit by placing it on growler tester. Hold an iron sheet against the armature core while slowly rotating the armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to the core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.

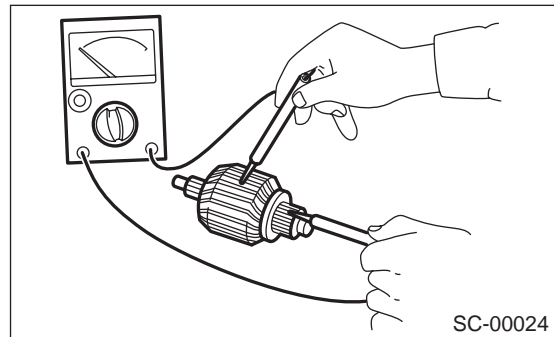


- (A) Iron sheet
- (B) Growler tester

5) Armature ground test

Using a circuit tester, touch one probe to the commutator segment and the other to the shaft. There should be no continuity. If there is continuity, the armature is grounded.

Replace the armature if it is grounded.



2. YOKE

Make sure the pole is set in position.

3. OVERRUNNING CLUTCH

Inspect the teeth of the pinion for wear and damage. Replace if it is damaged. Rotate the pinion in the direction of rotation (counterclockwise). It should rotate smoothly. But in the opposite direction, it should be locked.

CAUTION:

Do not clean the overrunning clutch with oil to prevent grease from flowing out.

4. BRUSH AND BRUSH HOLDER

1) Brush length

Measure the brush length, and then replace if it exceeds the service limit.

Replace if abnormal wear or cracks are noticed.

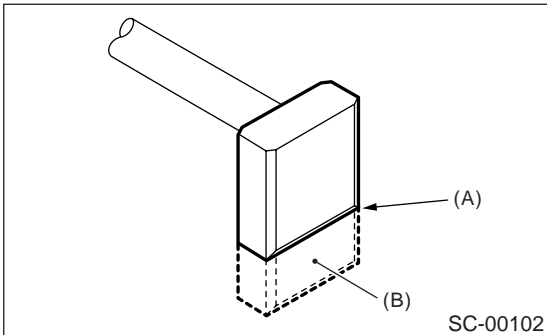
Brush length:

Standard

12.3 mm (0.484 in)

Service limit

7.0 mm (0.276 in)



(A) Service limit line

(B) Brush

2) Brush movement

Be sure the brush moves smoothly inside brush holder.

3) Brush spring force

Measure the brush spring force with a spring scale. If it is less than the service limit, replace the brush holder.

Brush spring force:

Standard

21.6 N (2.2 kgf, 4.9 lb) (when new)

Service limit

5.9 N (0.6 kgf, 1.3 lb)

5. SWITCH ASSEMBLY

Be sure there is continuity between the terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm").

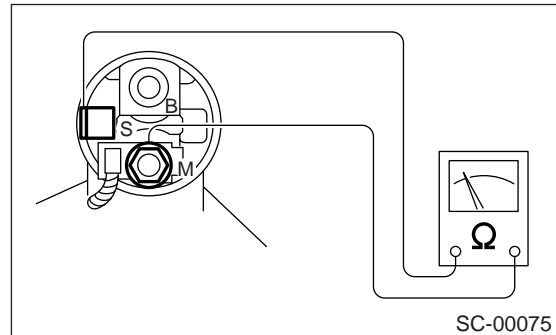
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:

S — M / Less than 1 Ω

S — Ground / Less than 1 Ω

M — B / More than 1 MΩ



6. SWITCH ASSEMBLY OPERATION

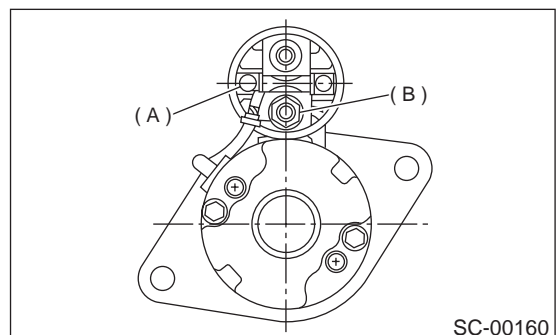
1) Connect the terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. The pinion should be forced endwise on shaft.

CAUTION:

With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

2) Disconnect the connector from terminal M, and then connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.

In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.



(A) Terminal S

(B) Terminal M

STARTER

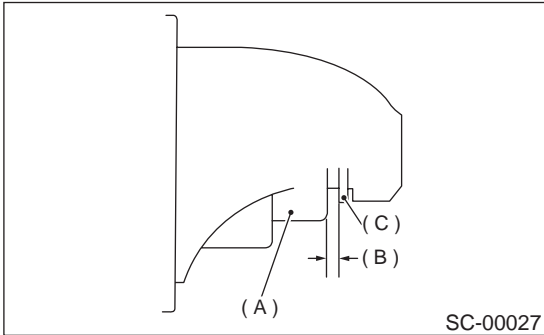
STARTING/CHARGING SYSTEMS

7. PINION GAP

1) Measure the pinion gap while the pinion is pulled out as shown in the figure.

Pinion gap:

0.5 — 2.0 mm (0.020 — 0.079 in)



- (A) Pinion
- (B) Gap
- (C) Stopper

If the motor is running with the pinion forced endwise on shaft, disconnect the connector from terminal M of switch assembly, and then connect terminal M to ground terminal (–) of battery with a lead wire. Next, gently push the pinion back with your fingertips, and then measure the pinion gap.

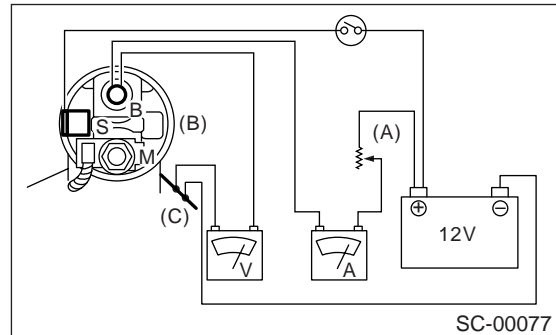
2) If the pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.

8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.

Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.

For these performance tests, use the circuit shown in figure.



- (A) Variable resistance
- (B) Magnetic switch
- (C) Starter body

1) No-load test

With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading, and then measure the starter speed. Compare these values with the specifications.

No-load test (Standard):

Voltage / Current

MAX. 11 V / 90 A

Rotating speed

MT vehicles

2,800 rpm or more

AT vehicles

2,400 rpm or more

2) Load test

Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within the specifications.

Load test (Standard):

Voltage / Road

MT vehicles

7.5 V / 8.6 N (0.88 kgf, 1.94 lb)

AT vehicles

7.7 V / 16.0 N (1.63 kgf, 3.59 lb)

Current / Speed

MT vehicles

300 A / 920 rpm or more

AT vehicles

400 A / 740 rpm or more

3) Lock test

With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (Standard):

Voltage / Current

MT vehicles

4 V / 650 A or less

AT vehicles

3.5 V / 940 A or less

Torque

MT vehicles

14.7 N·m (1.50 kgf-m, 10.8 ft-lb) or more

AT vehicles

28.9 N·m (2.95 kgf-m, 21.3 ft-lb) or more

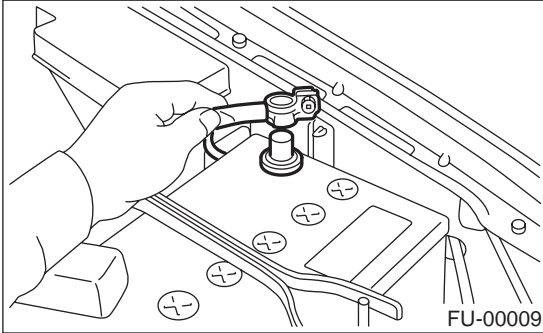
GENERATOR

STARTING/CHARGING SYSTEMS

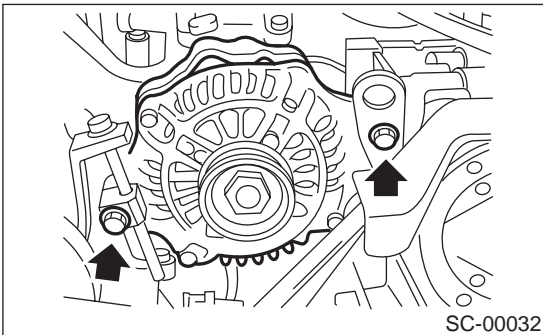
3. Generator

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector and terminal from generator.
 - 3) Remove the V-belt cover.
 - 4) Remove the front side V-belt.
- <Ref. to ME(H4DOSTC)-42, REMOVAL, V-belt.>
- 5) Remove the bolts which install generator onto bracket.

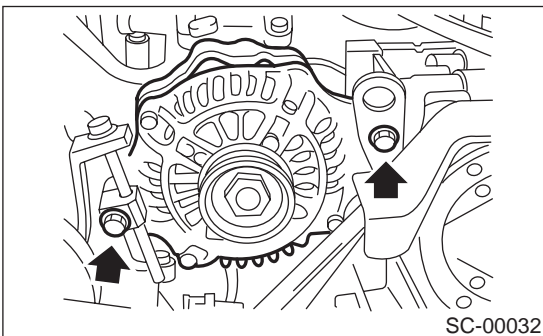


B: INSTALLATION

Install in the reverse order of removal.

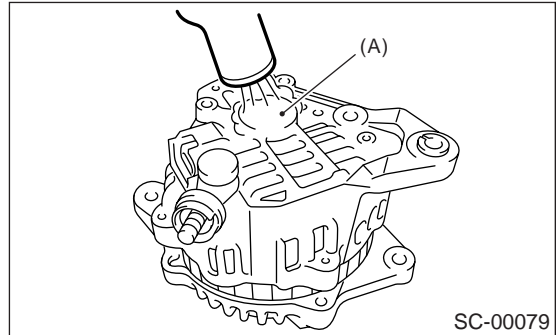
CAUTION:

Check and adjust the V-belt tension. <Ref. to ME(H4DOSTC)-43, INSPECTION, V-belt.>

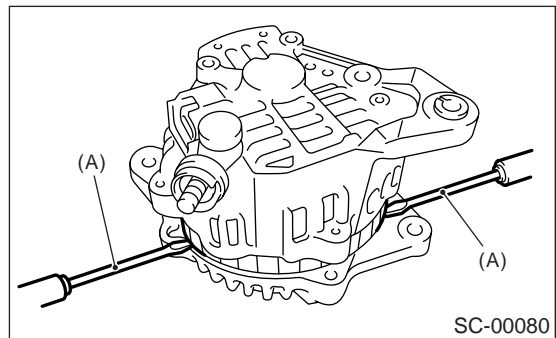


C: DISASSEMBLY

- 1) Remove the four through-bolts.
- 2) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.

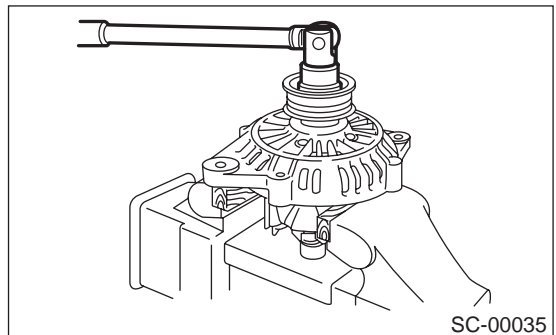


- 3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.



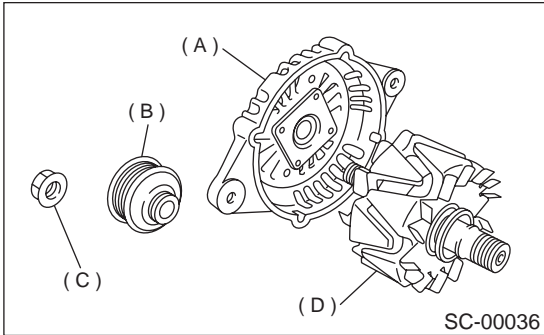
(A) Screwdriver

- 4) Hold the rotor with a vise and remove pulley nut.



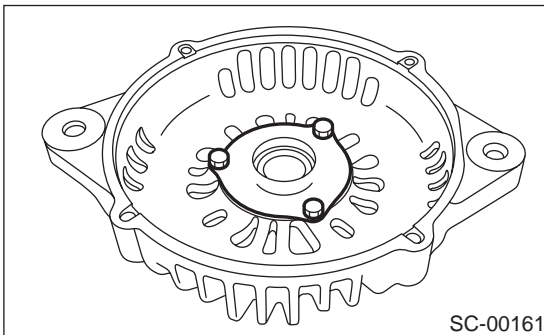
CAUTION:

When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of vise to prevent rotor from damage.

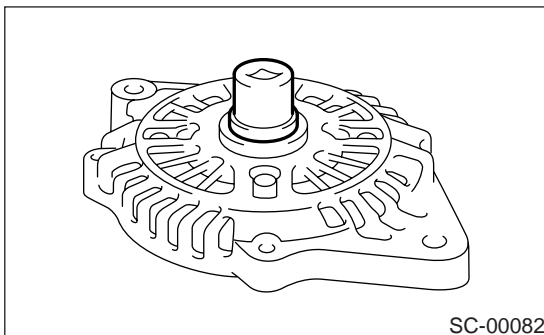


- (A) Front cover
- (B) Pulley
- (C) Nut
- (D) Rotor

- 5) Remove the ball bearing as follows.
 - (1) Remove the bolt, and then remove the bearing retainer.

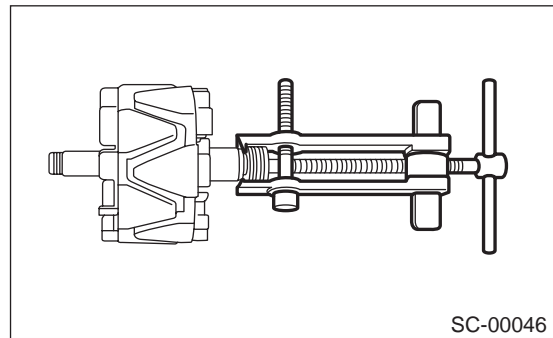


- (2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.



- (3) Push the ball bearing off the front cover using a press.

- 6) Remove the bearing from rotor using a bearing puller.



D: ASSEMBLY

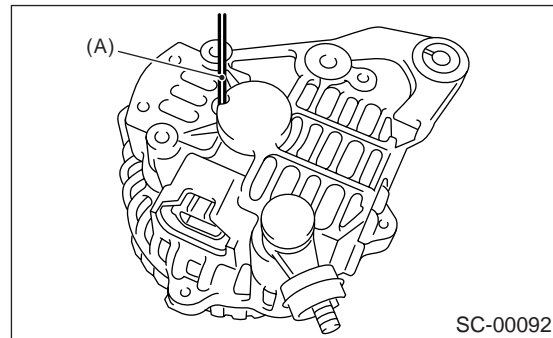
To assemble, reverse order of disassembly.

- 1) Pulling up brush

Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:

Be sure to remove the wire after reassembly.



- (A) Wire

- 2) Install the ball bearing.

- (1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.
- (2) Press the ball bearing into the specified position using a press.
- (3) Install the bearing retainer.

- 3) Press the bearing (rear side) into the rotor shaft using a press to install.

- 4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

CAUTION:

Grease should not be applied to rear bearing. Remove the oil completely if it is found on bearing box.

- 5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

GENERATOR

STARTING/CHARGING SYSTEMS

E: INSPECTION

1. ROTOR

1) Slip ring surface

Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter

Measure the slip ring outer diameter. If the slip ring is worn replace rotor assembly.

Slip ring outer diameter:

Standard

22.7 mm (0.894 in)

Limit

22.1 mm (0.870 in)

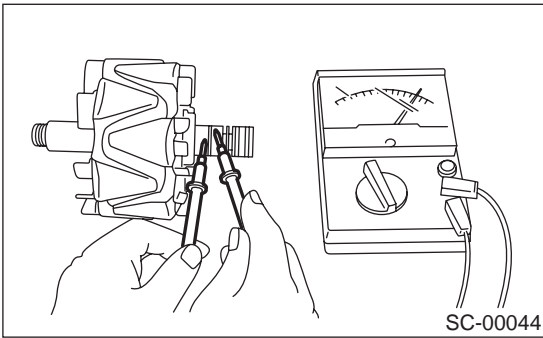
3) Continuity test

Check the resistance between slip rings using circuit tester.

If the resistance is not within specification, replace the rotor assembly.

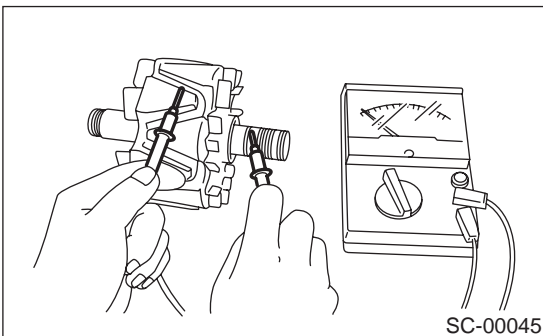
Specified resistance:

Approx. 1.8 — 2.2 Ω



4) Insulation test

Check the continuity between slip ring and rotor core or shaft. If resistance is 1 Ω or less, the rotor coil is grounded, and so replace the rotor assembly.



5) Ball bearing (rear side)

Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

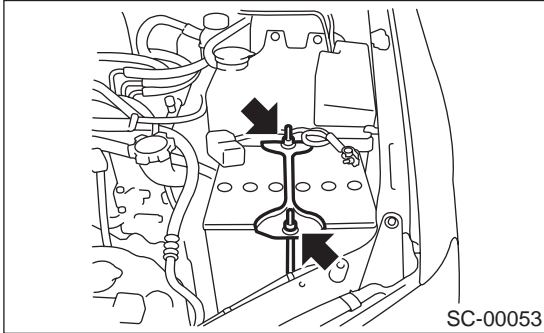
2. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

4. Battery

A: REMOVAL

- 1) Disconnect the positive (+) cable after disconnecting the ground (-) cable of battery.
- 2) Remove the flange nuts from battery rods, and then take off the battery holder.



- 3) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

3.4 N·m (0.35 kgf·m, 2.5 ft·lb)

NOTE:

- Clean the battery cable terminals, and then apply grease to retard formation of corrosion.
- Connect the positive (+) cable of battery and then the ground (-) cable of battery.

C: INSPECTION

WARNING:

- Electrolyte has toxicity; be careful handling the fluid.
- Avoid contact with skin, eyes or clothing. Especially at contact with eyes, bluish with water for 15 minutes and get prompt medical attention.
- Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.
- Ventilate when charging or using in enclosed space.
- For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
- Do not let the battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
- To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.

Apply a thin coat of grease on the terminal posts to prevent corrosion.

2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

- 1) Measure the specific gravity of electrolyte using a hydrometer and a thermometer.

Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

$$S_{20} = S_t + 0.0007 \times (t - 20)$$

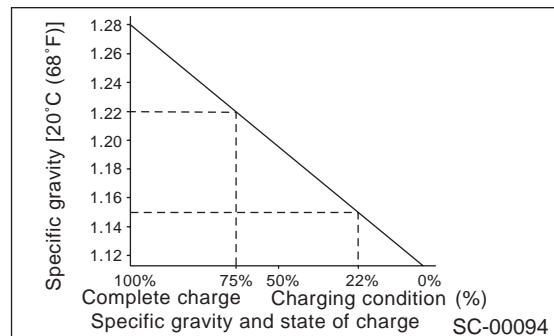
S_{20} : Specific gravity corrected at electrolyte temperature of 20°C

S_t : Measured specific gravity

t : Measured temperature (°C)

Determine whether or not battery must be charged, according to corrected specific gravity.

Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



- 2) Measuring the specific gravity of the electrolyte in battery will disclose the state of charge of battery. The relation between specific gravity and state of charge is as shown in the figure.

BATTERY

STARTING/CHARGING SYSTEMS

D: MEASUREMENT

WARNING:

- Do not bring an open flame close to the battery at this time.

CAUTION:

- Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
- Be careful since the battery electrolyte overflows while charging the battery.
- Observe the instructions when handling battery charger.
- Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

- 1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
- 2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)

*: Check electrical system before replacement.

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approx. 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.

Since a large current flow raises electrolyte temperature, the battery is subject to damage if large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).

It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:

- Observe the items in 3. NORMAL CHARGING.
- Never use more than 10 amperes when charging the battery because that will shorten battery life.

MEMO:

ENGINE (DIAGNOSTICS)

EN(H4DOSTC)

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BASIC DIAGNOSTIC PROCEDURE

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

Step	Value	Yes	No
1 CHECK ENGINE START FAILURE. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4DOSTC)-4, CHECK, Check List for Interview.> 2) Start the engine. Does the engine start?	Engine starts.	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOSTC)-66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI). Does the CHECK ENGINE malfunction indicator lamp illuminate?	Indicator lamp illuminates.	Go to step 3.	Inspection using "General Diagnostics Table". <Ref. to EN(H4DOSTC)-246, General Diagnostic Table.>
3 CHECK INDICATION OF DTC ON DISPLAY. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read the DTC on the Subaru Select Monitor. Does the Subaru Select Monitor indicate DTC?	DTC is indicated.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).> Go to step 4.	Repair the related parts. NOTE: If DTC is not shown on display although the MI illuminates, perform diagnostics of MI (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(H4DOSTC)-38, Engine Malfunction Indicator Lamp (MI).>
4 PERFORM THE DIAGNOSIS. 1) Perform the clear memory mode. <Ref. to EN(H4DOSTC)-35, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H4DOSTC)-33, Inspection Mode.> Does the Subaru Select Monitor indicate DTC?	DTC is indicated.	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOSTC)-66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

- 1) ATF level check <Ref. to AT-30, Automatic Transmission Fluid.>
- 2) Differential gear oil level check <Ref. to AT-31, Differential Gear Oil.>
- 3) ATF leak check <Ref. to AT-30, Automatic Transmission Fluid.>
- 4) Differential gear oil leak check <Ref. to AT-31, Differential Gear Oil.>
- 5) Stall test <Ref. to AT-33, Stall Test.>
- 6) Line pressure test <Ref. to AT-36, Line Pressure Test.>
- 7) Transfer clutch pressure test <Ref. to AT-38, Transfer Clutch Pressure Test.>
- 8) Time lag test <Ref. to AT-35, Time Lag Test.>
- 9) Road test <Ref. to AT-32, Road Test.>
- 10) Shift characteristics <Ref. to AT-38, Transfer Clutch Pressure Test.>

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Outdoor temperature	°C (°F)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Cooling fan	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CB	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF		

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MI turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostics indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> Engine oil pressure warning light
b) Fuel level
<ul style="list-style-type: none">• Lack of gasoline: <input type="checkbox"/> Yes/<input type="checkbox"/> No• Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:• Where:
f) Occurrence of noise: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> No shift <input type="checkbox"/> Excessive shift shock

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:

- All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage the Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery cables while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and ECM, be sure to turn OFF the ignition switch.

5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing ECM from the located position, disconnect two cables on the battery.

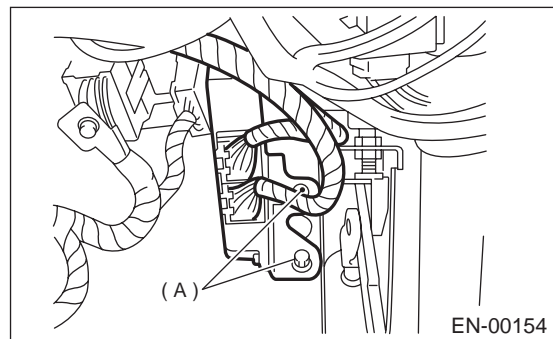
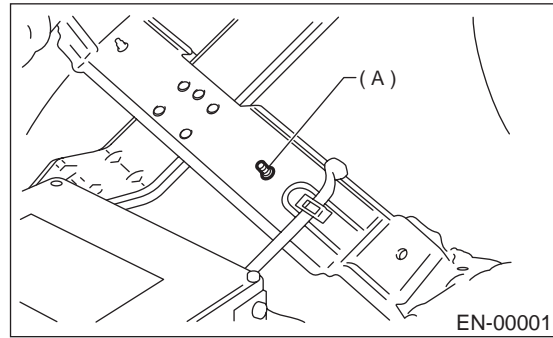
- Otherwise, the ECM may be damaged.

CAUTION:

When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

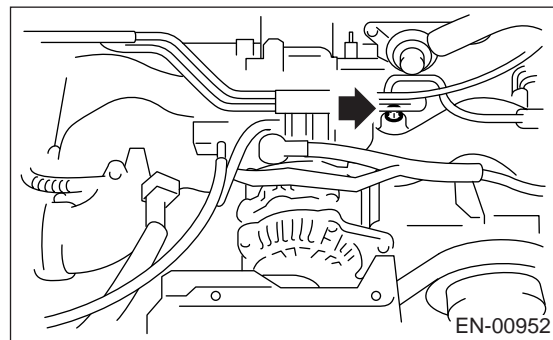
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM or TCM mounting stud bolts at the body head grounding point when measuring the voltage and resistance inside the passenger compartment.



(A) Stud bolt

9) Use engine grounding terminal or engine proper as grounding point to the body when measuring the voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of ECM.

12) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.

13) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.

14) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.

15) On ABS vehicle, when performing a driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

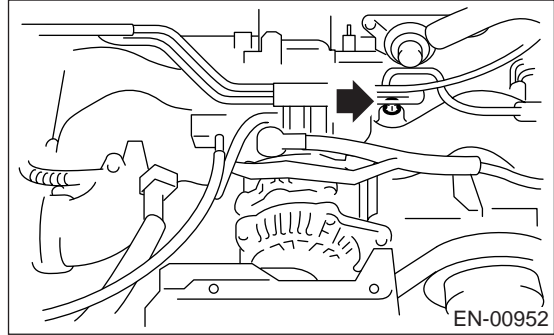
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. DESCRIPTION

- The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MI) in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.

2. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.

With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of fuel.

- Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

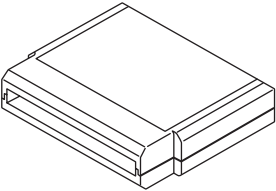

- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the

transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

D: PREPARATION TOOL

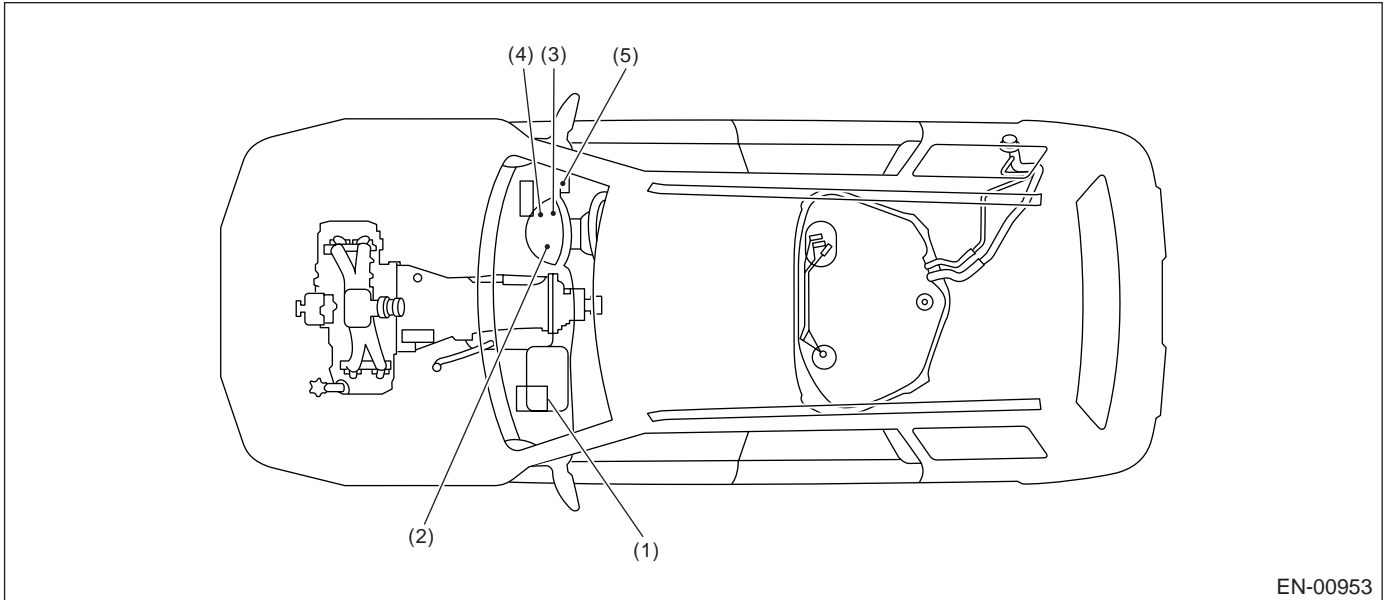
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST24082AA210</p>	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 <p style="text-align: center;">ST22771AA030</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

4. Electrical Components Location

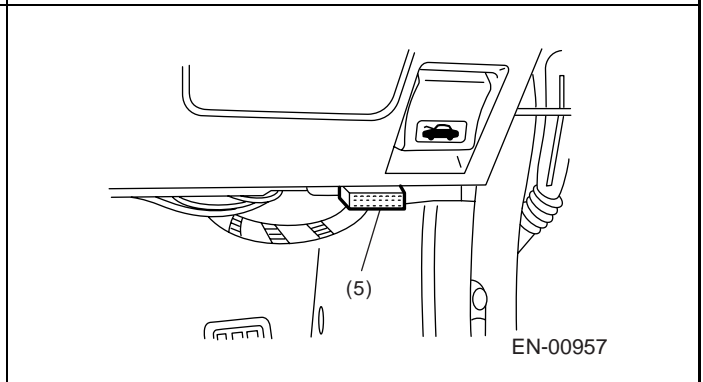
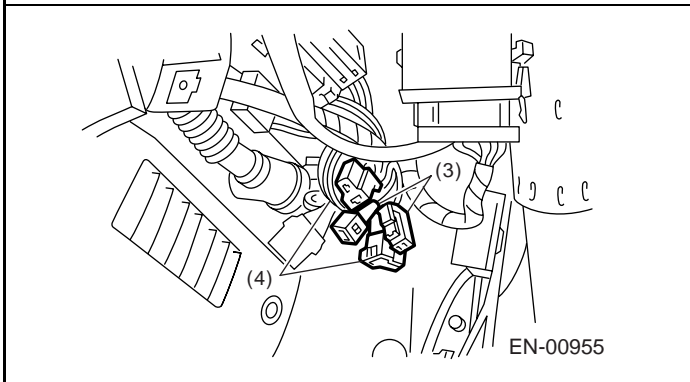
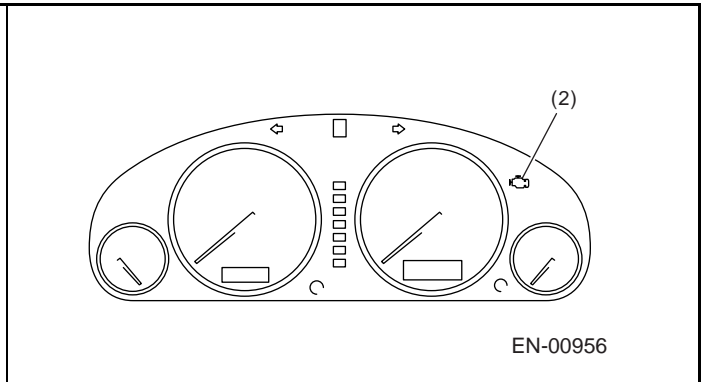
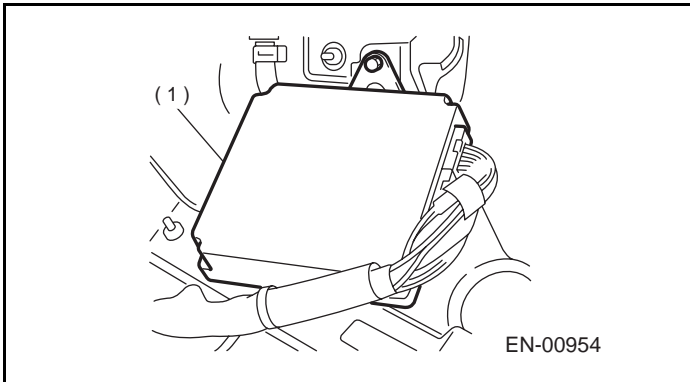
A: LOCATION

1. ENGINE

• MODULE



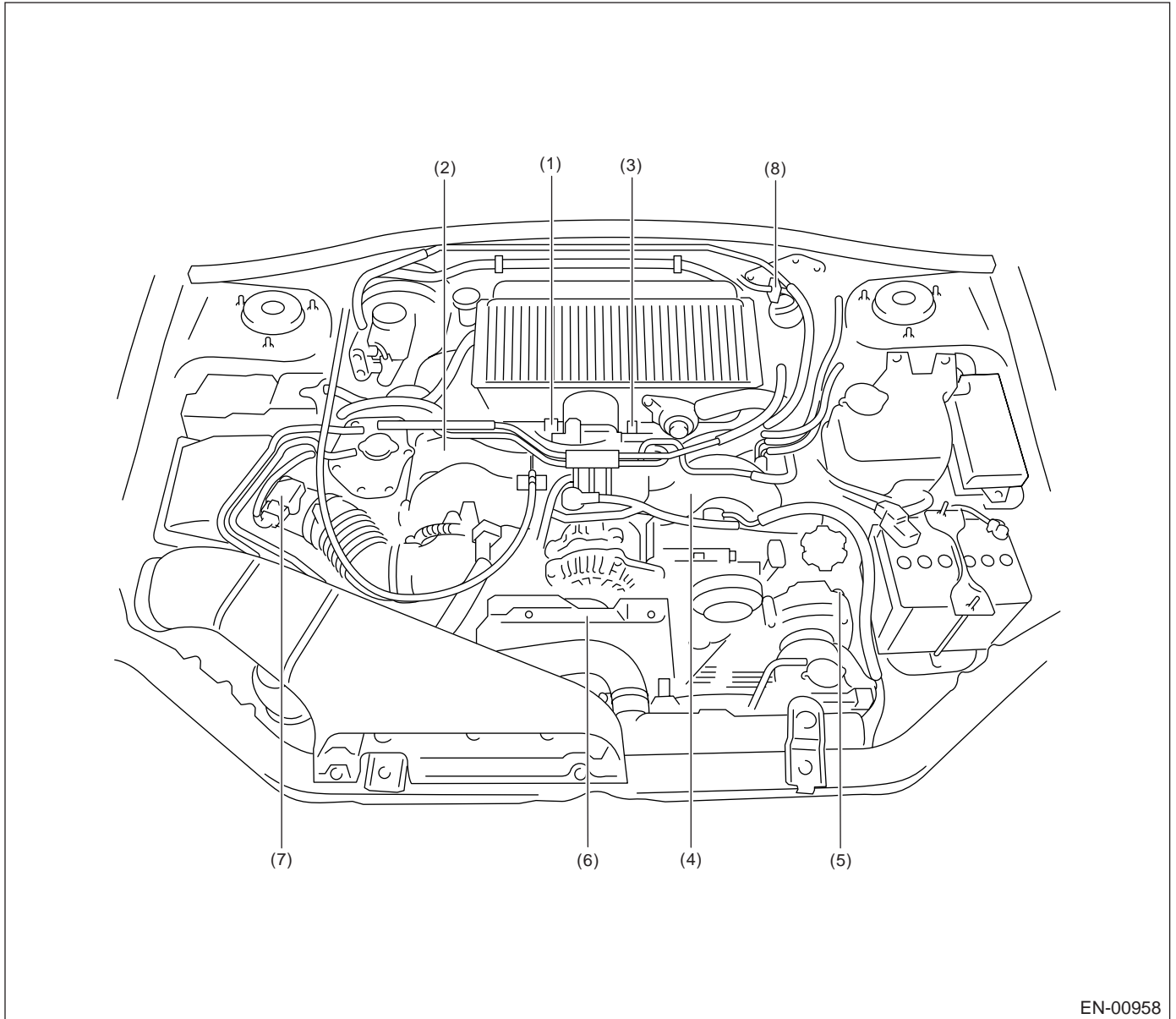
- (1) Engine control module (ECM)
- (2) CHECK ENGINE malfunction indicator lamp (MI)
- (3) Read memory connector
- (4) Test mode connector
- (5) Data link connector



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

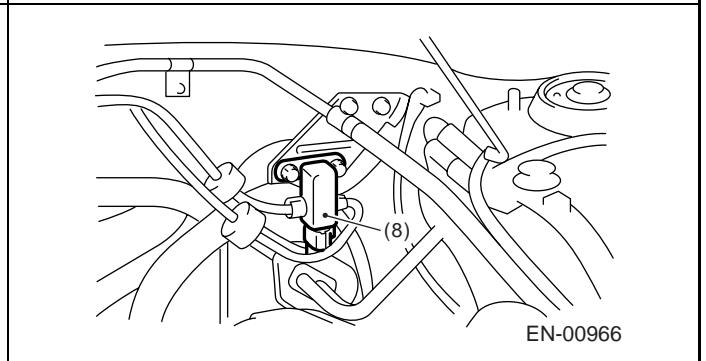
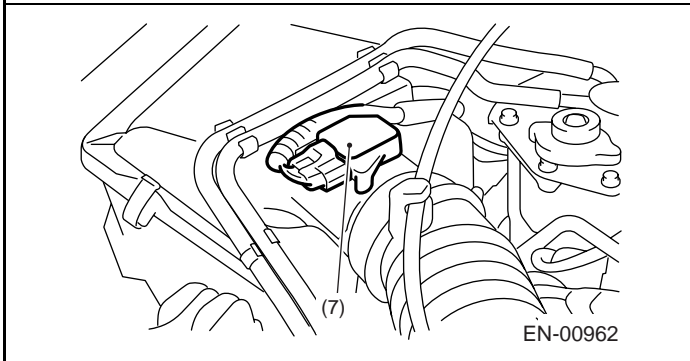
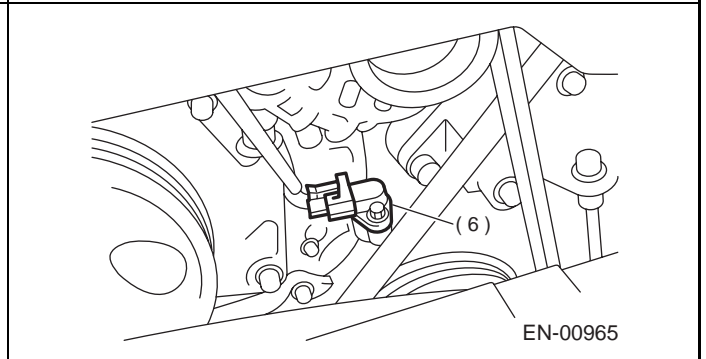
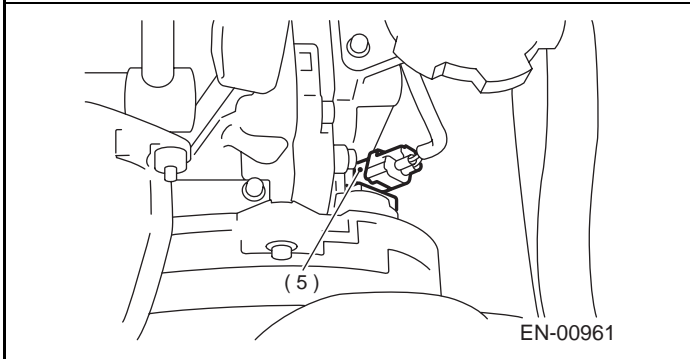
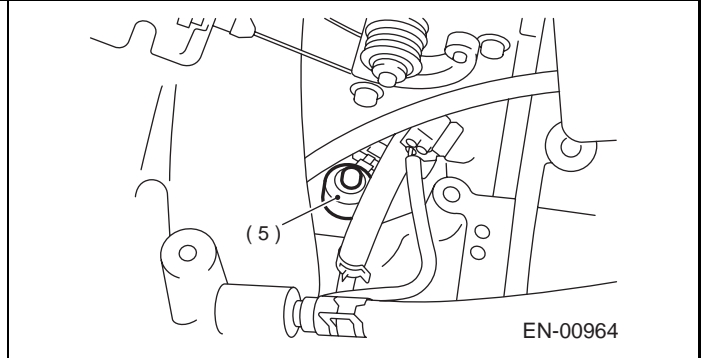
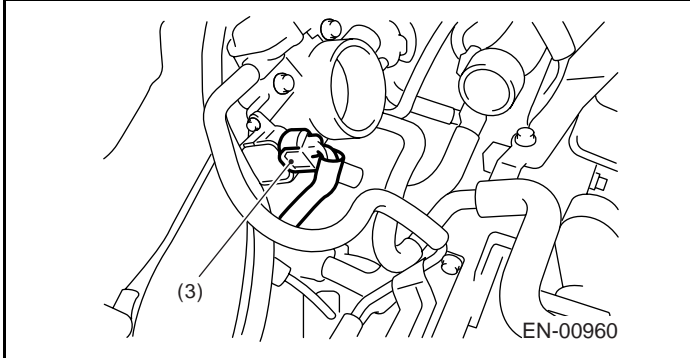
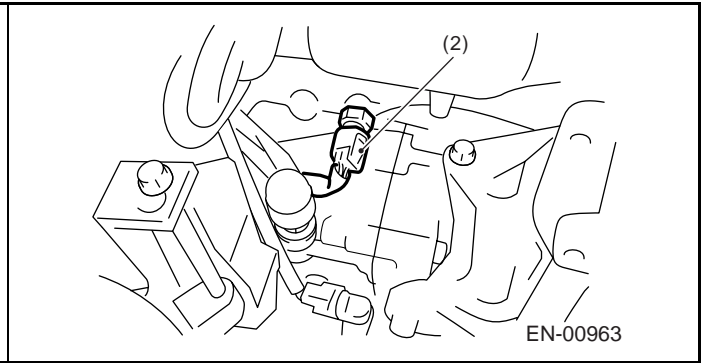
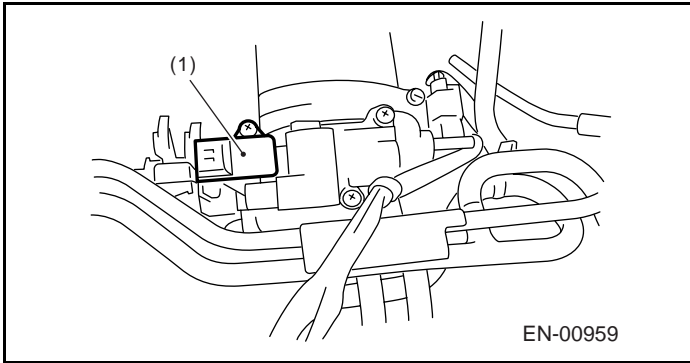
• SENSOR



- | | | |
|---------------------------------------|--------------------------------|---|
| (1) Pressure sensor | (4) Knock sensor | (7) Mass air flow and intake air temperature sensor |
| (2) Engine coolant temperature sensor | (5) Camshaft position sensor | (8) Differential pressure sensor |
| (3) Throttle position sensor | (6) Crankshaft position sensor | |

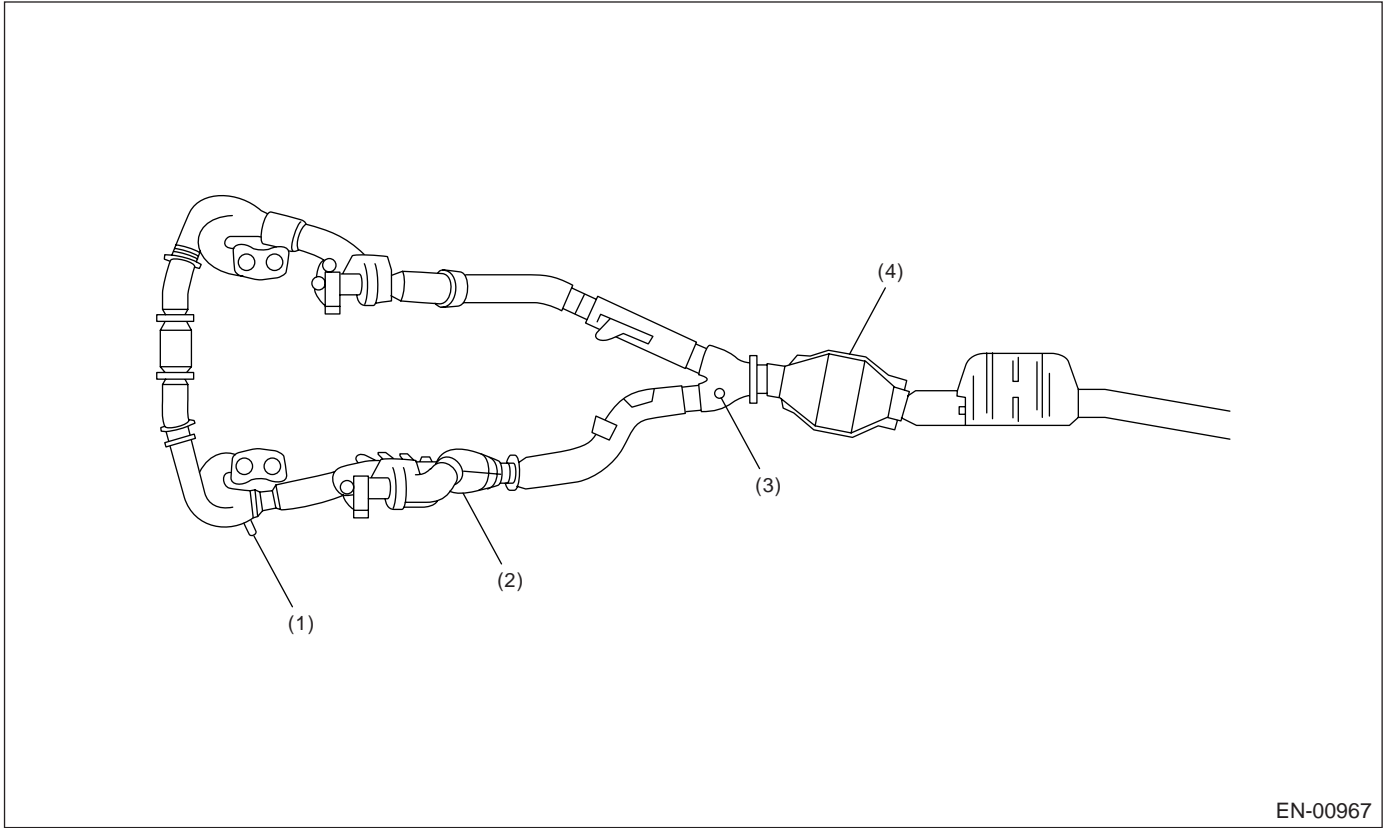
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



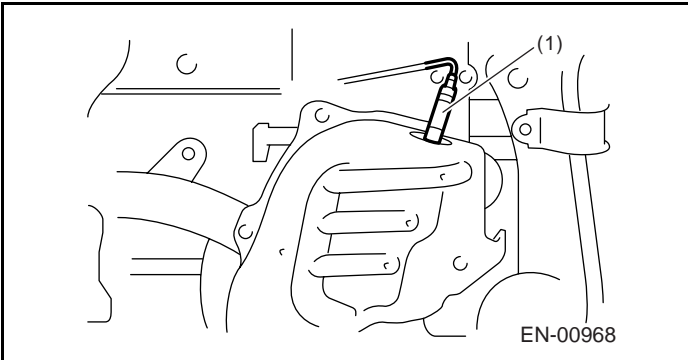
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

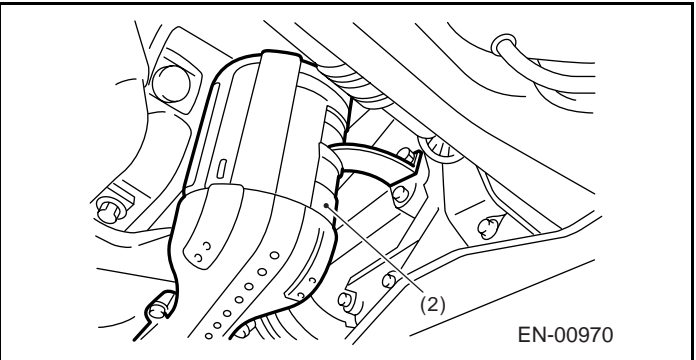


EN-00967

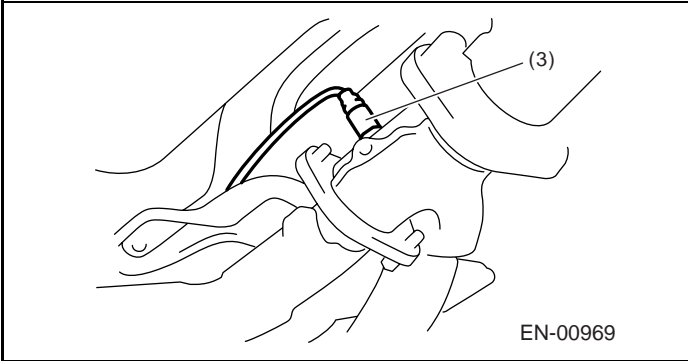
- (1) Front oxygen (A/F) sensor
- (2) Front catalytic converter
- (3) Rear oxygen sensor
- (4) Rear catalytic converter



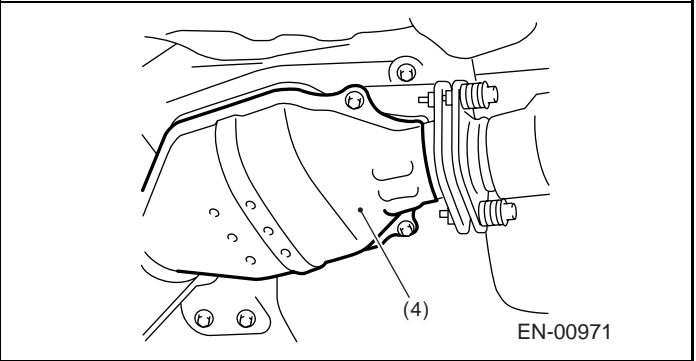
EN-00968



EN-00970



EN-00969

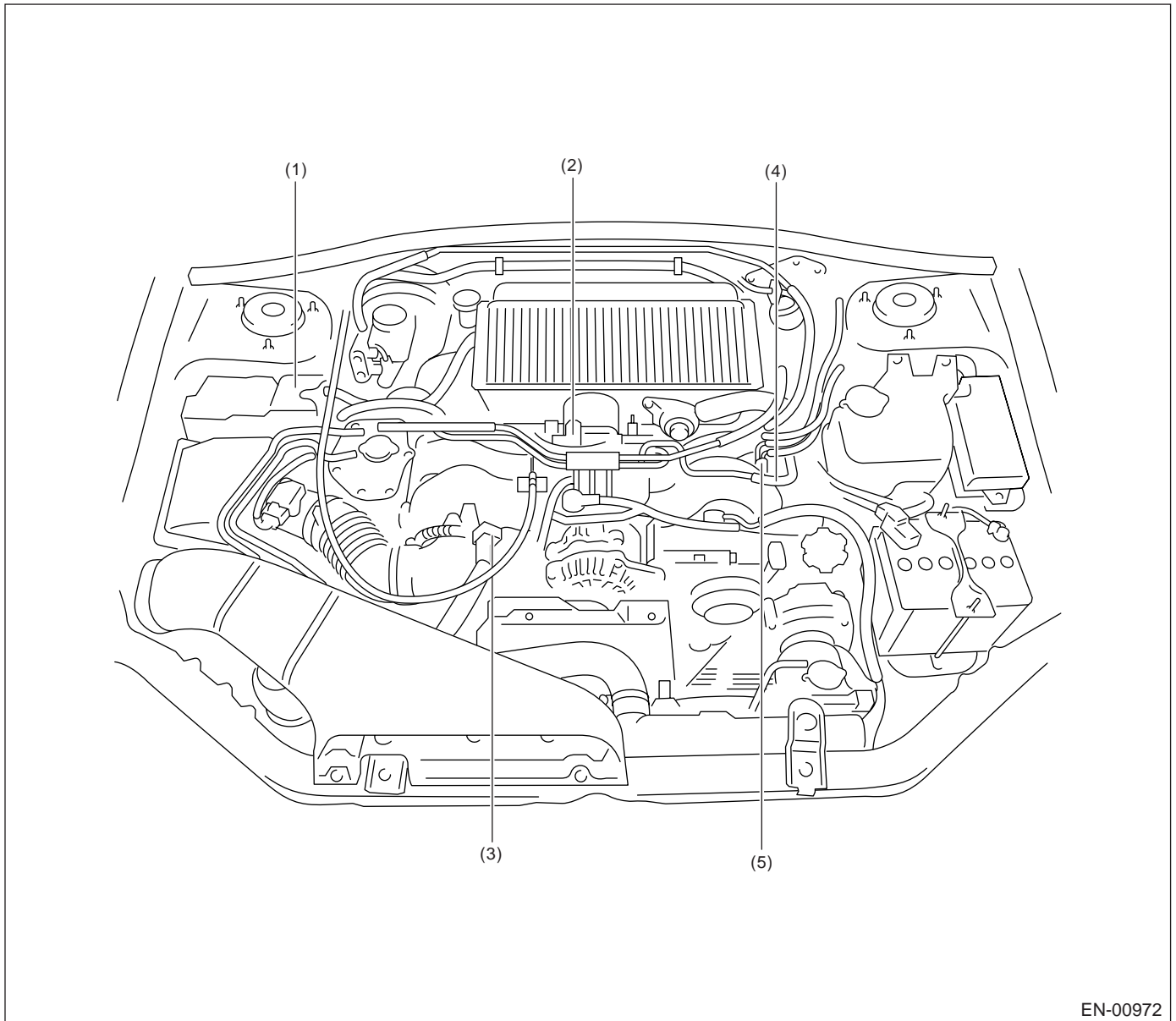


EN-00971

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



EN-00972

(1) Solenoid box ASSY

(3) Purge control solenoid valve

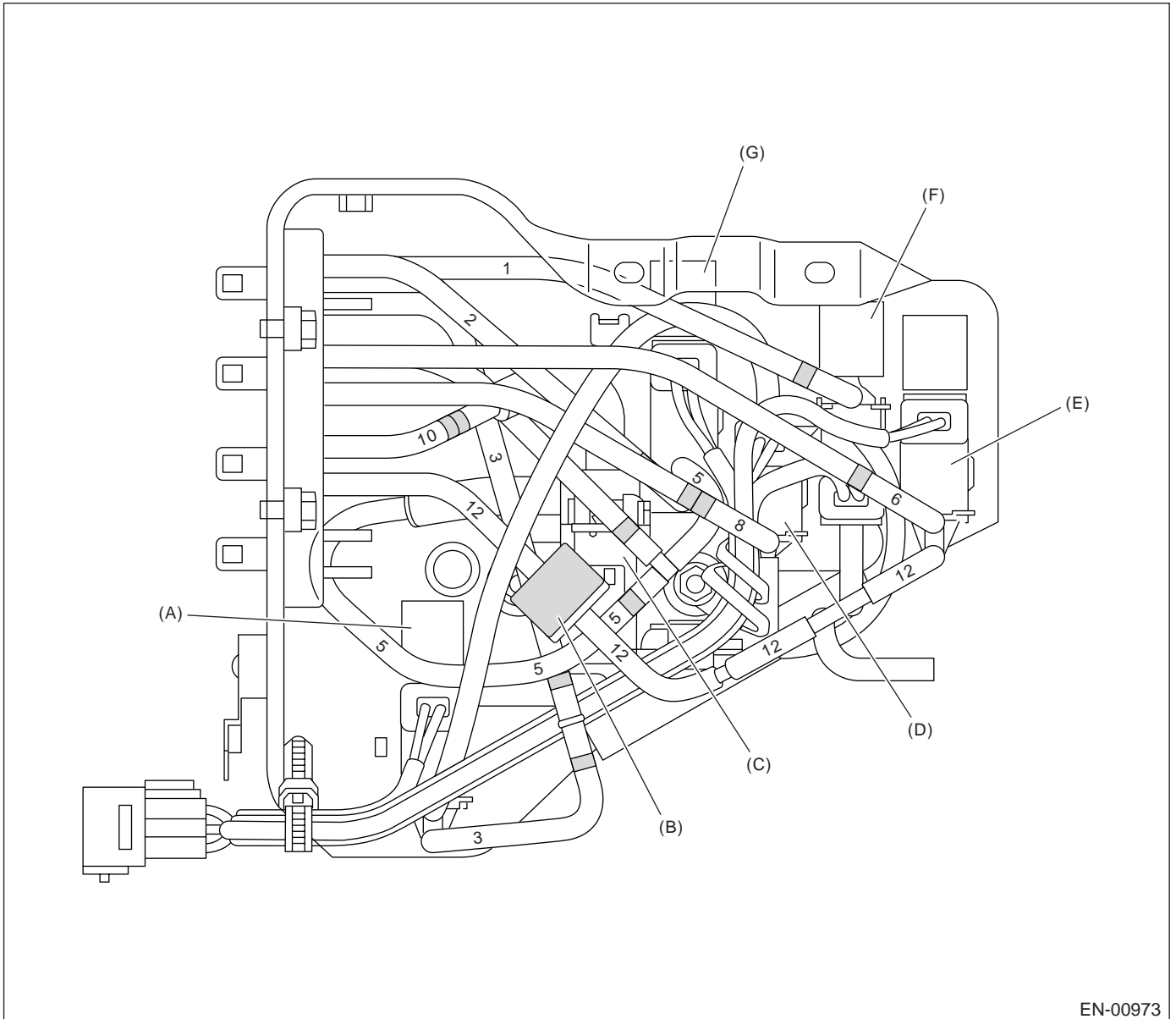
(5) Fuel injector

(2) Idle air control solenoid valve

(4) Ignition coil

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

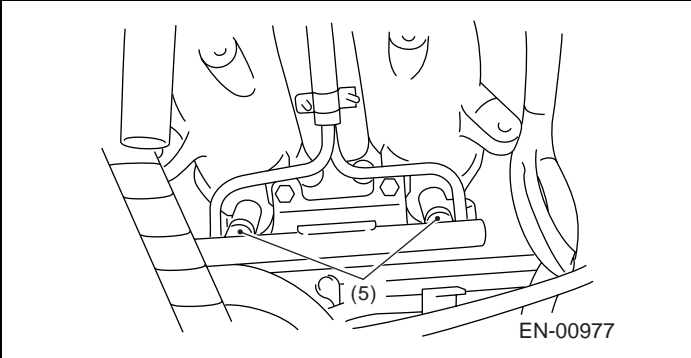
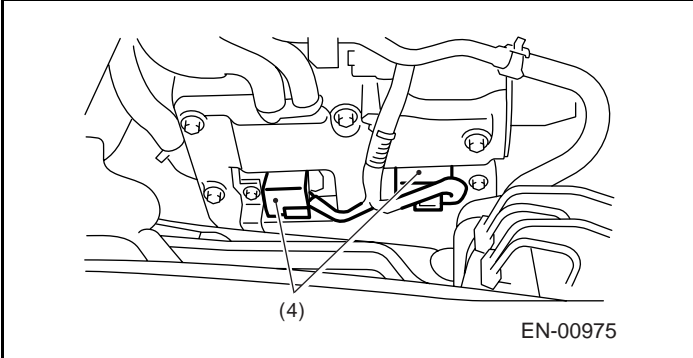
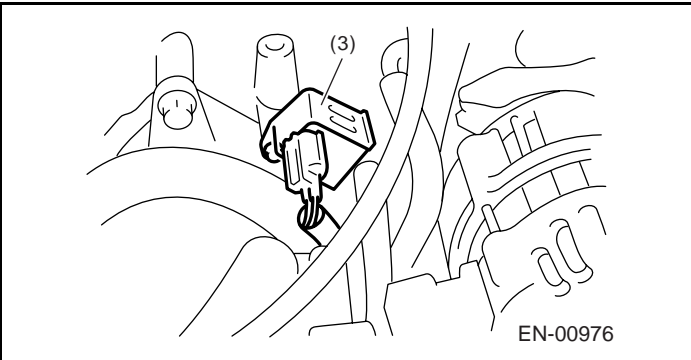
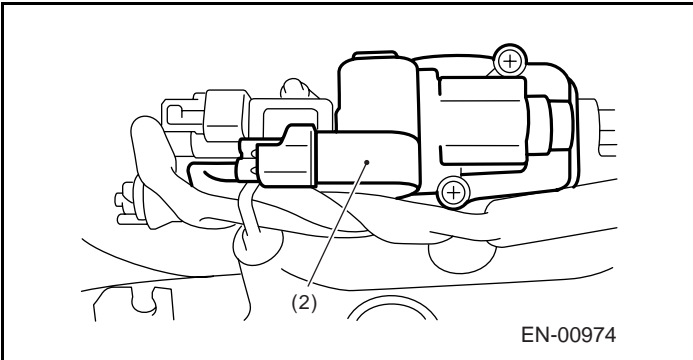


EN-00973

- | | | |
|---|--|--|
| (A) Relief valve control solenoid valve 2 | (D) Relief valve control solenoid valve 1 | (G) Exhaust valve control solenoid valve (For positive pressure) |
| (B) Filter | (E) Exhaust valve control solenoid valve (For negative pressure) | |
| (C) Exhaust valve control duty solenoid valve | (F) Intake air valve control solenoid valve | |

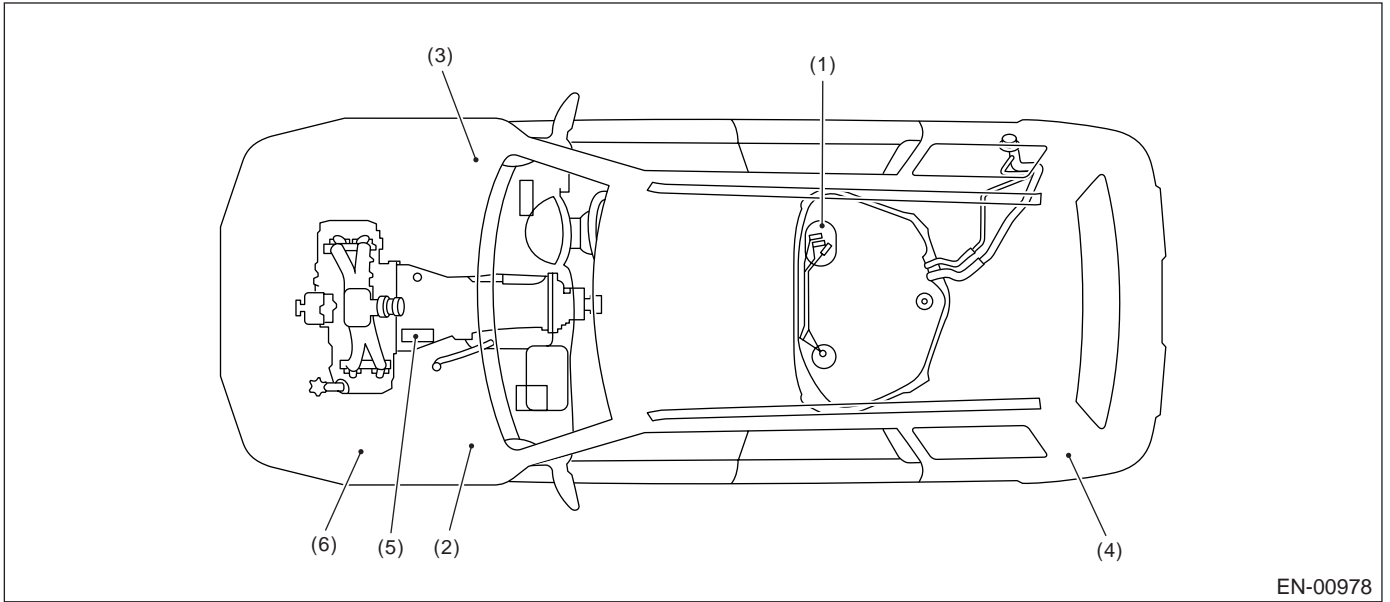
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

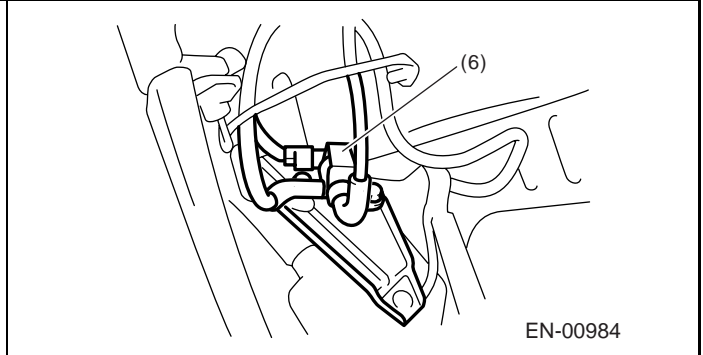
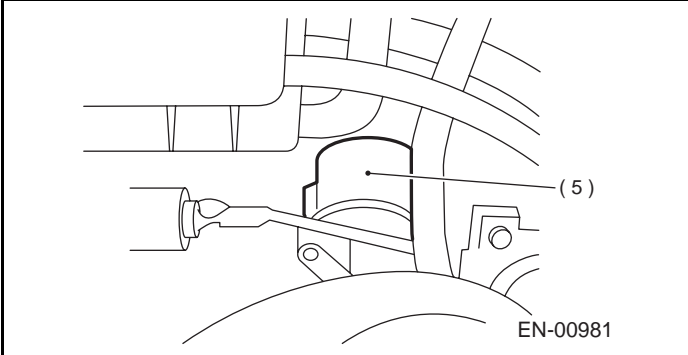
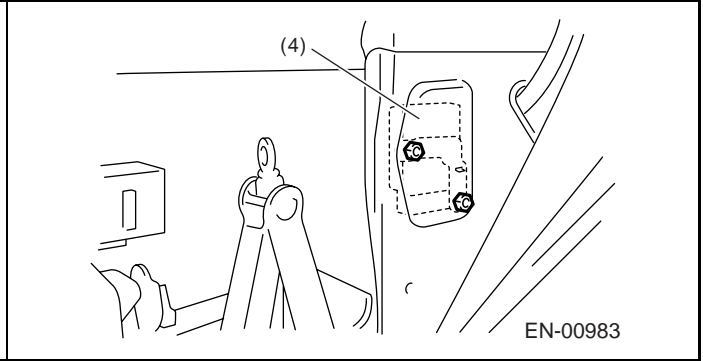
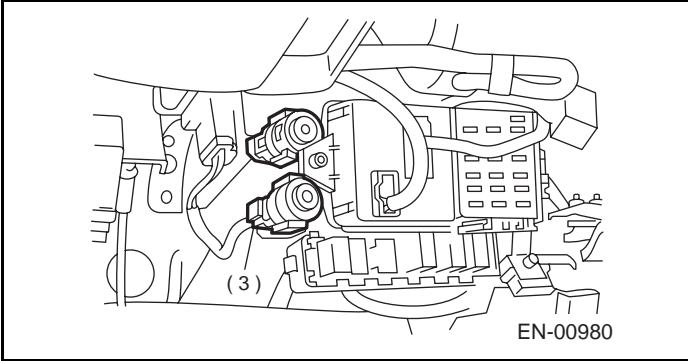
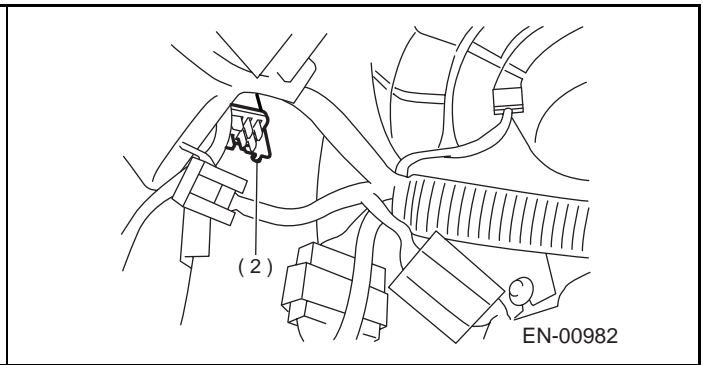
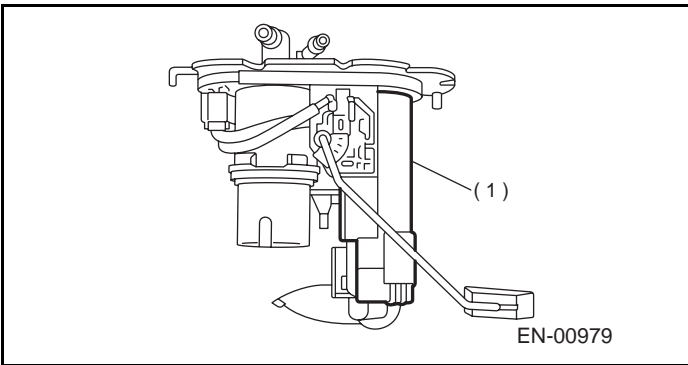


ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

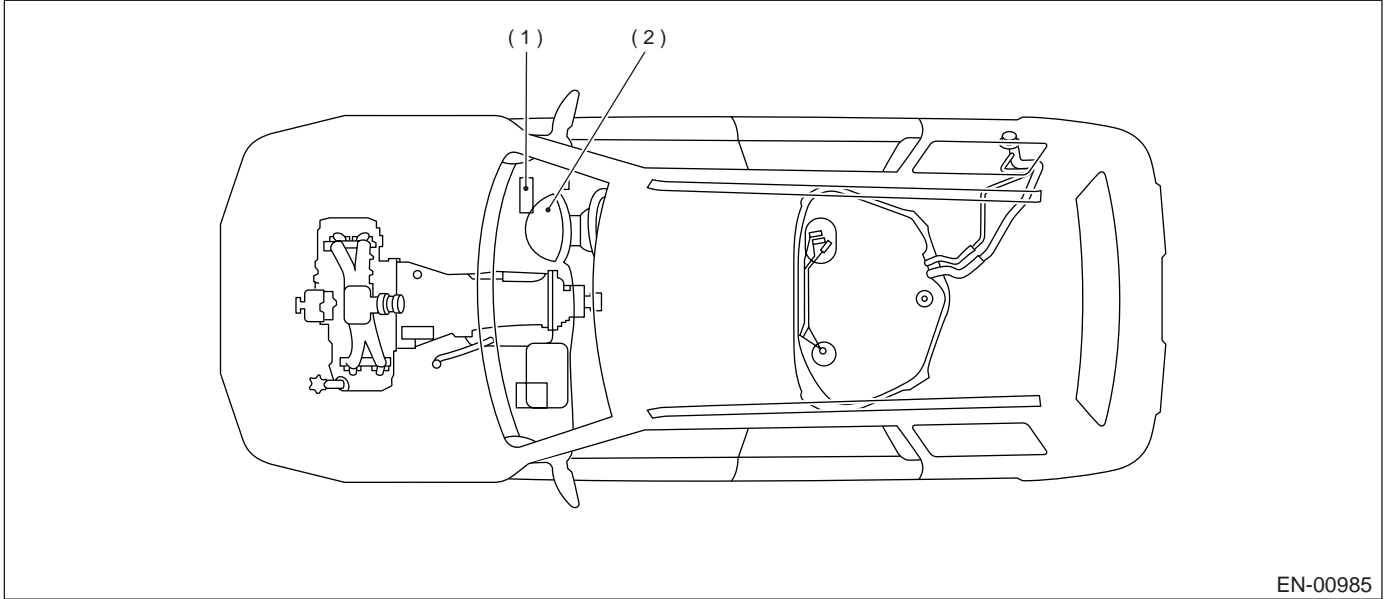


- | | | |
|----------------|--------------------------|--------------------------------------|
| (1) Fuel pump | (3) Fuel pump relay | (5) Starter |
| (2) Main relay | (4) Fuel pump controller | (6) Wastegate control solenoid valve |



2. TRANSMISSION

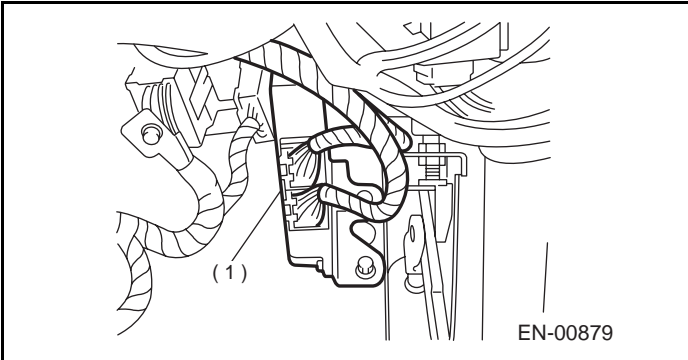
• MODULE



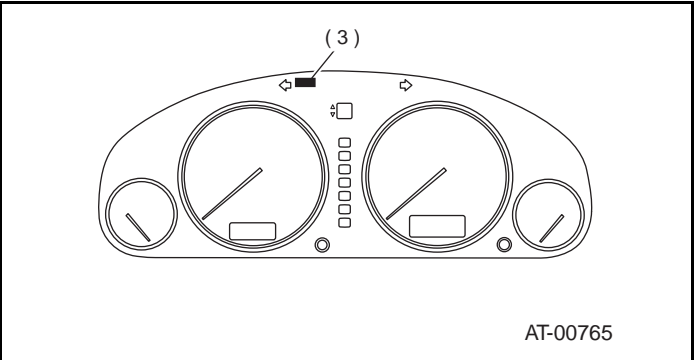
EN-00985

(1) Transmission Control Module (TCM) (for AT vehicles)

(2) AT diagnostic indicator light (for AT vehicles)



EN-00879

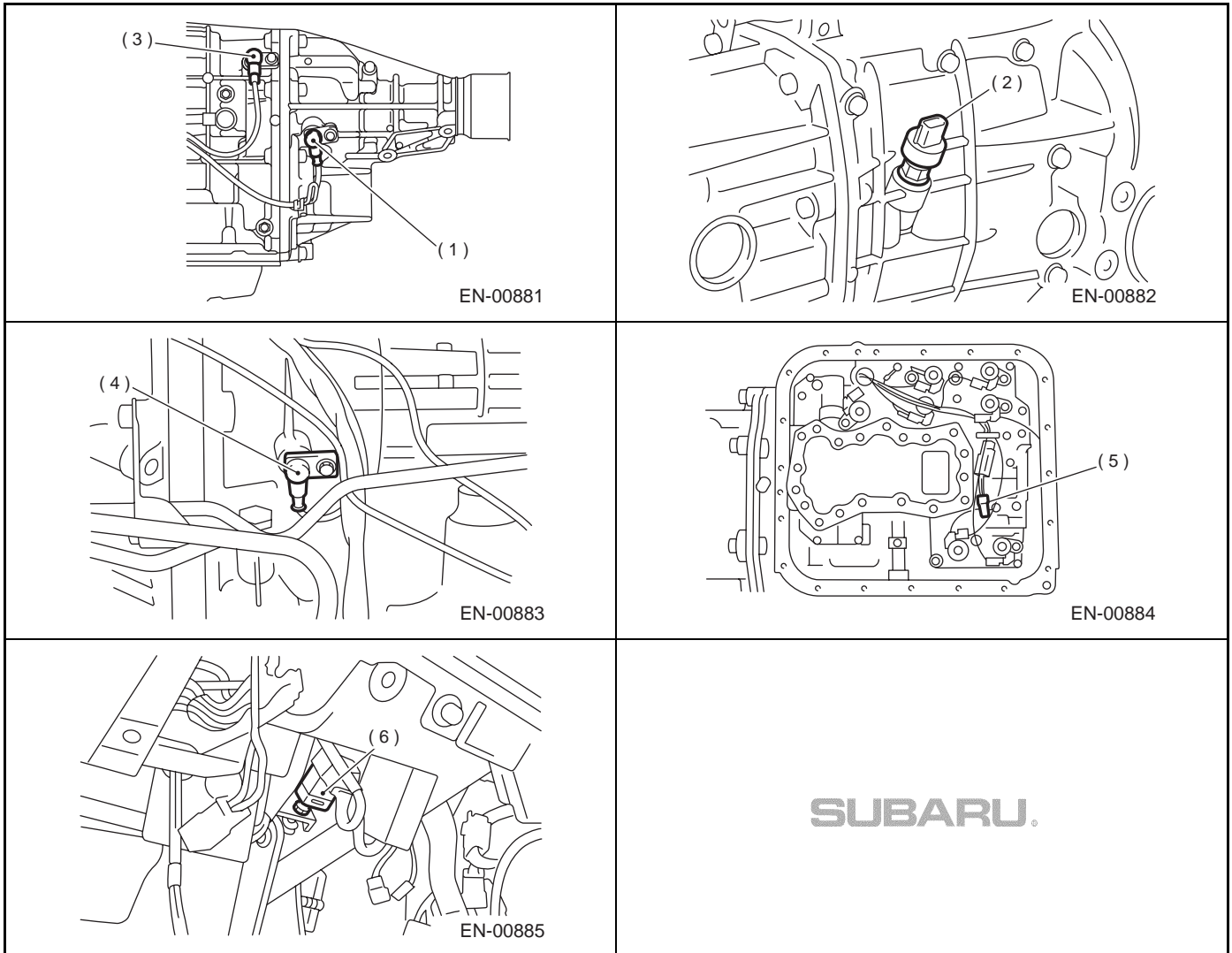


AT-00765

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SENSOR

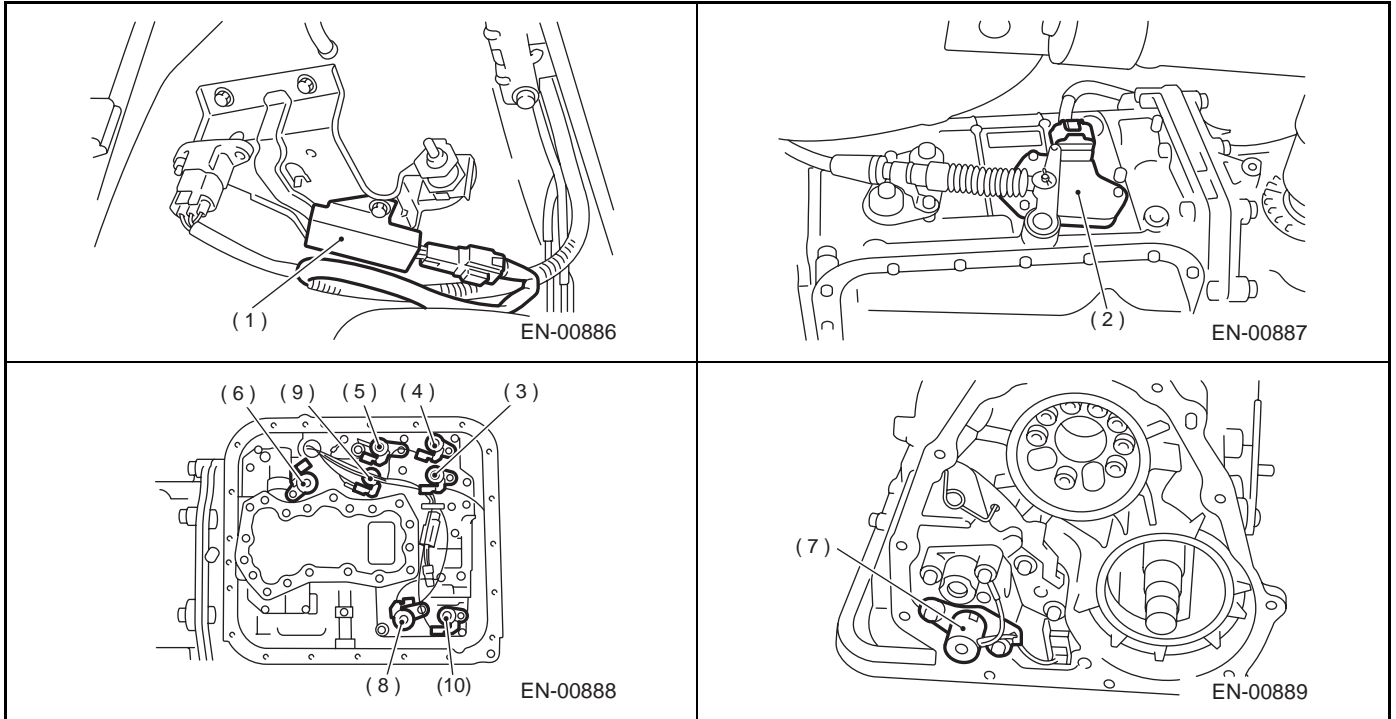


- (1) Rear vehicle speed sensor (for AT vehicles)
- (2) Front vehicle speed sensor (for MT vehicles)
- (3) Front vehicle speed sensor (for AT vehicles)
- (4) Torque converter turbine speed sensor
- (5) ATF temperature sensor (for AT vehicles)
- (6) Brake light switch

ELECTRICAL COMPONENTS LOCATION

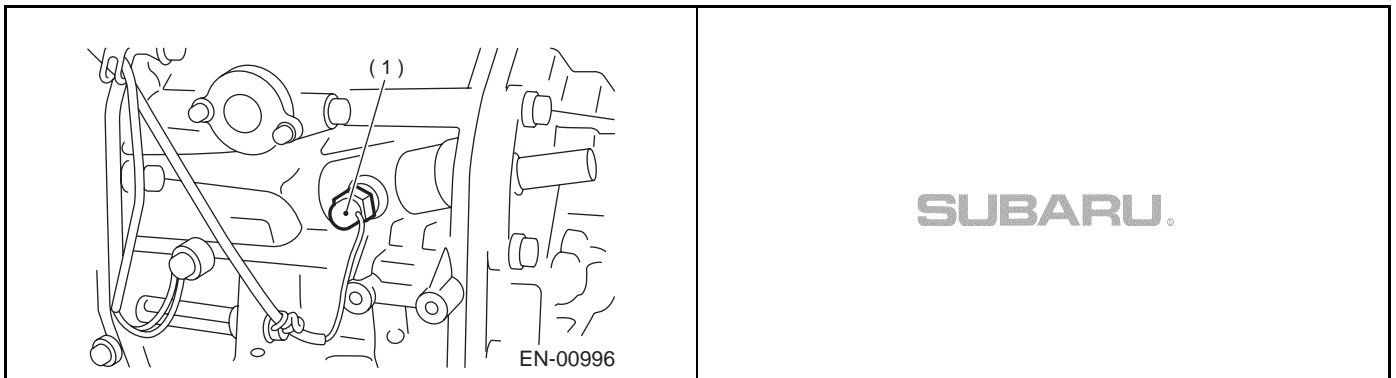
ENGINE (DIAGNOSTICS)

• SOLENOID VALVE AND SWITCH (AT VEHICLES)



- (1) Dropping resistor
- (2) Inhibitor switch
- (3) Shift solenoid valve 1
- (4) Shift solenoid valve 2
- (5) Line pressure duty solenoid
- (6) Lock-up duty solenoid
- (7) Transfer duty solenoid
- (8) 2-4 brake duty solenoid
- (9) Low clutch timing solenoid valve
- (10) 2-4 brake timing solenoid valve

• SOLENOID VALVE AND SWITCH (MT VEHICLES)



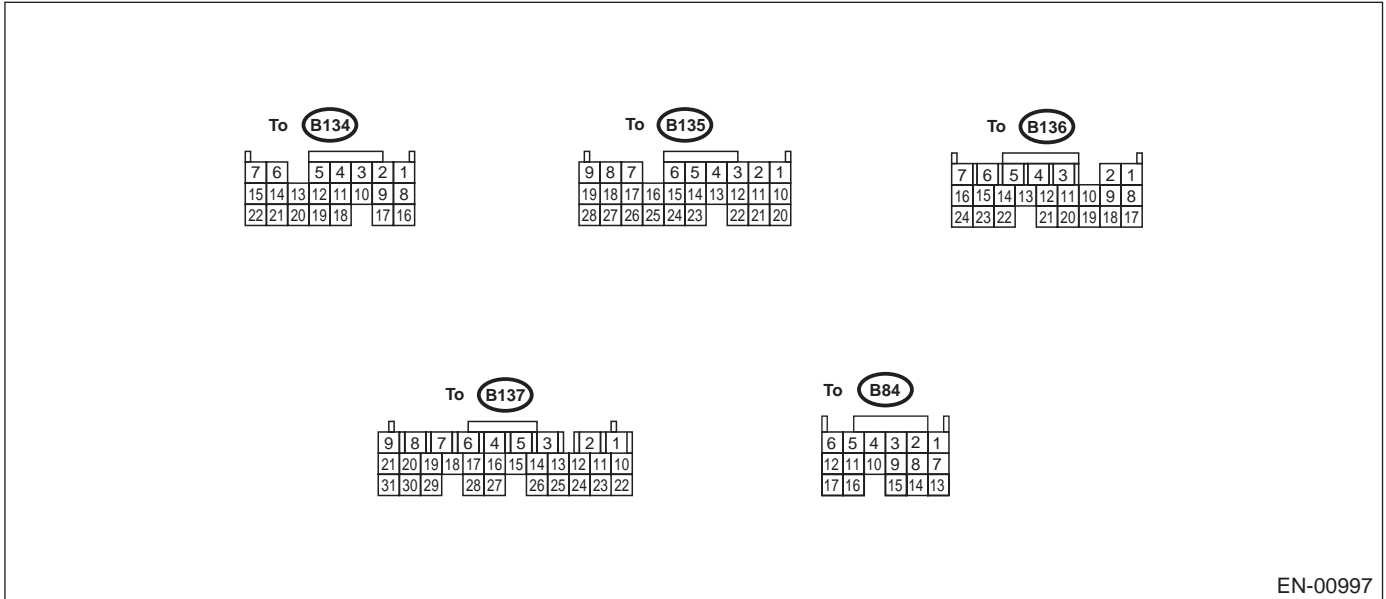
- (1) Neutral position switch

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



EN-00997

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crank- shaft position sensor	Signal (+)	B135	2	0	-7 — +7	Sensor output waveform
	Signal (-)	B135	11	0	0	—
	Shield	B135	21	0	0	—
Camshaft position sensor	Signal (+)	B135	1	0	-7 — +7	Sensor output waveform
	Signal (-)	B135	10	0	0	—
	Shield	B135	21	0	0	—
Throttle position sensor	Signal	B135	7	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sen- sor)	B135	19	0	0	—
Rear oxy- gen sen- sor	Signal	B135	17	0	0 — 0.9	—
	Shield	B135	26	0	0	—
	GND (sen- sor)	B135	19	0	0	—
Front oxy- gen (A/F) sensor heater	Signal 1	B137	4	0 — 1.0	0 — 1.0	—
	Signal 2	B137	5	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B136	13	0 — 1.0	0 — 1.0	—
Engine coolant tempera- ture sen- sor	Signal	B135	18	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sen- sor)	B135	19	0	0	After warm-up the engine.
Vehicle speed signal		B134	1	0 or 5	0 or 5	"5" and "0" are repeatedly displayed when the vehicle is driven.

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Mass air flow sensor	Signal	B84	13	—	0.3 — 4.5	—
	Shield	B84	8	0	0	—
	GND	B84	7	0	0	—
Intake air temperature sensor signal		B135	27	—	—	—
Wastegate control solenoid valve		B137	24	10 — 13	13 — 14	—
Starter switch		B134	16	0	0	Cranking: 8 — 14
A/C switch		B134	6	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B134	14	10 — 13	13 — 14	—
Neutral position switch (MT)		B134	8	ON: 12±0.5 OFF: 0		Switch is ON when gear is in neutral position.
Neutral position switch (AT)		B134	8	ON: 0 OFF: 12±0.5		Switch is ON when shift is in "N" or "P" position.
Test mode connector		B134	5	5	5	When connected: 0
Knock sensor	Signal	B135	4	2.8	2.8	—
	Shield	B135	22	0	0	—
Back-up power supply		B137	10	10 — 13	13 — 14	Ignition switch "OFF": 10 — 13
Control unit power supply	B137	2	10 — 13	13 — 14	—	
	B137	3	10 — 13	13 — 14	—	
Sensor power supply		B135	9	5	5	—
Line end check		B134	10	0	0	—
Ignition control	#1	B136	24	0	13 — 14	Waveform
	#2	B136	23	0	13 — 14	Waveform
	#3	B136	22	0	13 — 14	Waveform
	#4	B136	21	0	13 — 14	Waveform
Fuel injector	#1	B137	1	10 — 13	1 — 14	Waveform
	#2	B136	6	10 — 13	1 — 14	Waveform
	#3	B136	5	10 — 13	1 — 14	Waveform
	#4	B136	4	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal	B136	10	0 or 13 — 14	0 or 13 — 14	Waveform
Fuel pump controller	Signal 1	B134	13	—	—	—
	Signal 2	B136	16	—	—	—
A/C relay control		B137	27	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B137	17	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B137	28	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Malfunction indicator lamp		B137	15	—	—	Light "ON": 1, or less Light "OFF": 10 — 14
Engine speed output		B136	9	—	0 — 13, or more	Waveform
Torque control signal 1		B134	19	5	5	—
Torque control signal 2		B134	18	5	5	—
Torque control cut signal		B136	14	8	8	—
Purge control solenoid valve		B137	16	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Pressure sensor	Signal	B135	8	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B135	9	5	5	
	GND (sensor)	B135	19	0	0	
Small light switch		B134	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B134	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B134	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Power steering oil pressure switch		B135	24	10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal (+)		B137	19	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (-)		B137	29	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B137	18	0	0	—
SSM/GST communication line		B134	21	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
GND (sensors)		B135	19	0	0	—
GND (injectors)		B136	8	0	0	—
GND (ignition system)		B136	18	0	0	—
GND (power supply)		B136	17	0	0	—
		B134	22	0	0	—
GND (control systems)		B134	7	0	0	—
		B134	15	0	0	—
GND (oxygen sensor heater 1)		B137	9	0	0	—
GND (oxygen sensor heater 2)		B137	8	0	0	—
Differential pressure sensor signal		B135	15	2	2	—
Relief valve control solenoid valve 2 signal		B136	11	10 — 13	13 — 14	—
Relief valve control solenoid valve 1 signal		B136	12	10 — 13	13 — 14	—
Exhaust valve control solenoid valve (negative pressure) signal		B136	3	10 — 13	13 — 14	—
Exhaust valve control solenoid valve (positive pressure) signal		B136	1	10 — 13	13 — 14	—
Intake air valve control solenoid valve signal		B137	12	10 — 13	13 — 14	—
Exhaust valve control duty solenoid valve		B137	11	10 — 13	13 — 14	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:

- After engine is warmed-up.
- Gear position is in neutral position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

<Ref. to AT-14, Transmission Control Module (TCM) I/O Signal.>

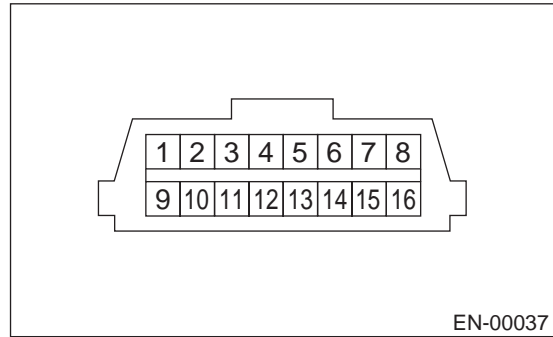
8. Data Link Connector

A: NOTE

- 1) This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.
- 2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:

Do not connect any scan tools other than the OBD-II general scan tools and Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Flash write	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

SUBARU SELECT MONITOR

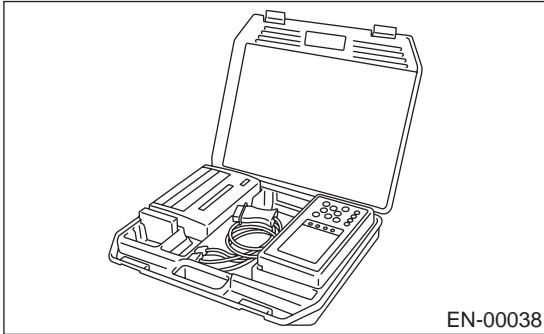
ENGINE (DIAGNOSTICS)

9. Subaru Select Monitor

A: OPERATION

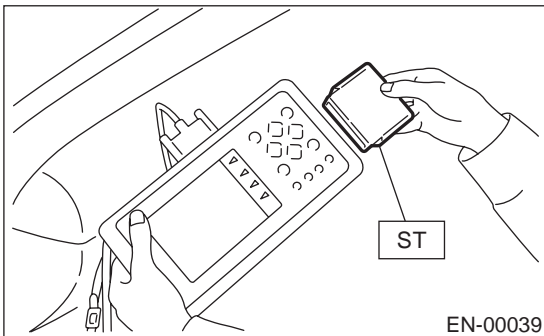
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOSTC)-8, PREPARATION TOOL, General Description.>



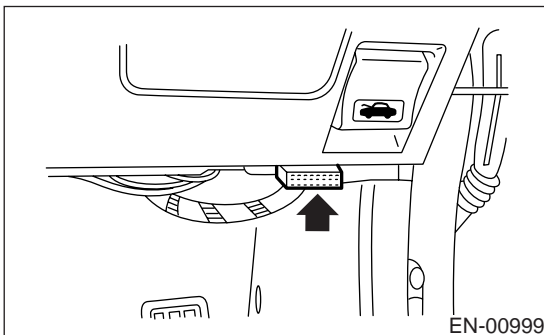
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOSTC)-8, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).

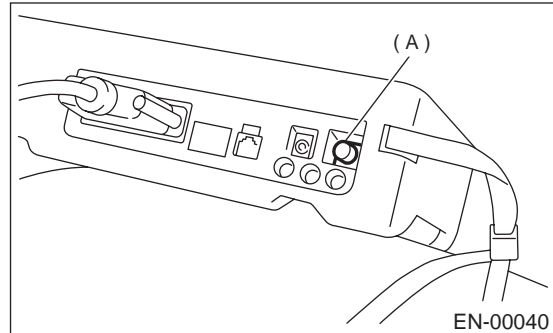


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up the diagnostic trouble code(s) and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H4DOSTC)-32, Read Diagnostic Trouble Code.>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H4DOSTC)-32, Read Diagnostic Trouble Code.>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
 - 6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Alternator duty control signal	ALT Duty	%
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor resistance	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor output signal	A/F Sensor Output Lamda 1	—
Rear oxygen sensor output signal	Rear O2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor signal	Knocking Signal	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psig
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psig
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Front oxygen (A/F) sensor heater current	A/F Heater Current 1	A
Rear oxygen sensor heater voltage	Rear O2 Heater Voltage	V
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Primary supercharged pressure control signal	Primary Control	%
Secondary supercharged pressure control signal	Secondary control	%
Differential pressure sensor signal	Diff. Press. Sen. Vol.	V
Differential pressure sensor signal	Pressure Diff. Sensor	mmHg or kPa or inHg or psig
Intake air temperature signal	Intake Air Temp.	°C or °F
Mass air flow sensor signal	Mass Air Flow	g/s
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure
Power steering switch signal	P/S Switch	ON or OFF
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Supercharged pressure relief valve solenoid 1 signal	Relief Valve Solenoid 1	ON or OFF
Supercharged pressure relief valve solenoid 2 signal	Relief Valve Solenoid 2	ON or OFF
Exhaust gas positive pressure signal	Ex. Gas Pos. Pressure	ON or OFF
Exhaust gas negative pressure signal	Ex. Gas Neg. Pressure	ON or OFF
Read memory connector signal	Read Memory Signal	ON or OFF
MT/AT identification signal	AT Vehicle ID Signal	ON or OFF
TCS relief valve solenoid signal	TCS Relief Valve Sol.	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press [YES] key.
 - 6) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
 - 7) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diagnosis Code	—
Malfunction indicator lamp status	MI (MI)	Complete or incomplete
Monitoring test of misfire	Misfire monitoring	No support
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	No support
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	No support
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press [YES] key.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

- 1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press [YES] key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral SW	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C SW	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

Contents	Display	Message	LED "ON" requirements
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S SW	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger SW	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan SW	ON or OFF	When blower fan switch is turned ON.
Light switch signal	Light SW	ON or OFF	When small light switch is turned ON.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. READ CURRENT DATA FOR AT.

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
 - 3) Press the [YES] key after displayed the information of transmission type.
 - 4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Stop lamp switch signal	Stop Lamp Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure
Automatic transmission diagnosis indicator lamp	AT Diagnosis Lamp	ON or OFF

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

For select monitor display details, refer to the following.

10. Read Diagnostic Trouble Code

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
- 5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press [YES] key.
- 6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).>

11. Inspection Mode

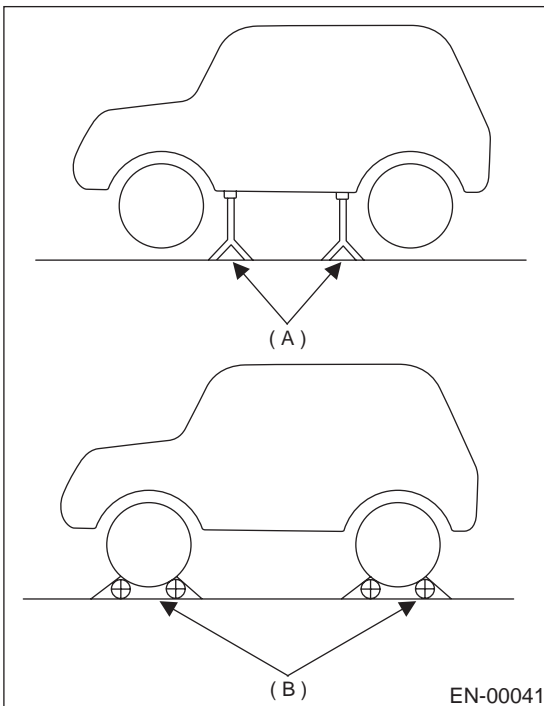
A: OPERATION

1. PREPARATION FOR THE INSPECTION MODE

Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

WARNING:

- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.

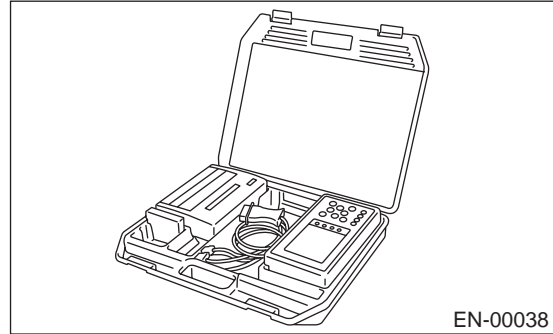


- (A) Safety stand
- (B) Free rollers

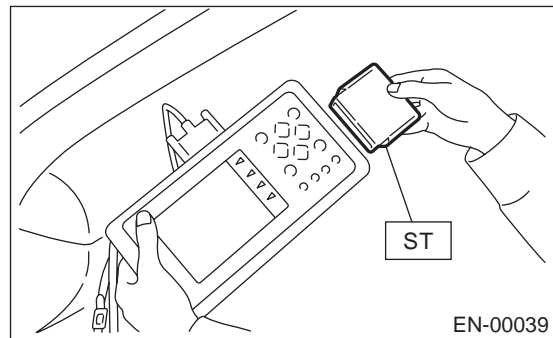
2. SUBARU SELECT MONITOR

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.

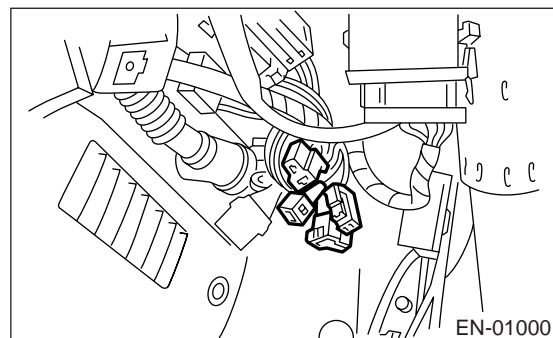
- 1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOSTC)-8, PREPARATION TOOL, General Description.>



- 2) Connect the diagnosis cable to Subaru Select Monitor.
- 3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOSTC)-8, PREPARATION TOOL, General Description.>



- 4) Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of center console box.

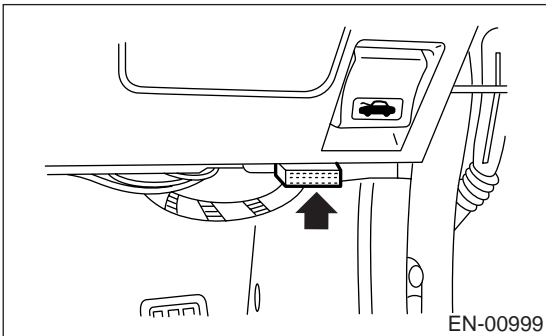


INSPECTION MODE

ENGINE (DIAGNOSTICS)

5) Connect the Subaru Select Monitor to data link connector.

(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).

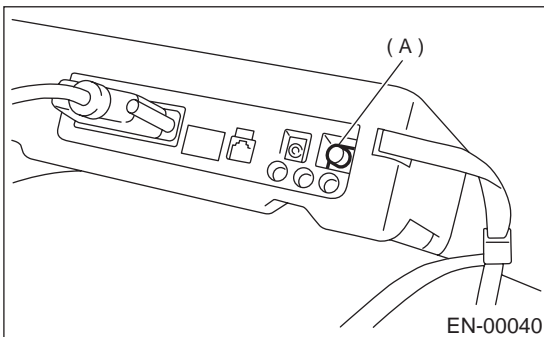


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.

9) Press the [YES] key after displayed the information of engine type.

10) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press [YES] key.

11) When the “Perform Inspection (Dealer Check) Mode?” is shown on the display screen, press [YES] key.

12) Perform subsequent procedures as instructed on the display screen.

• If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:

• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).>

• Release the parking brake.

• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

12. Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press [YES] key.
- 5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
- 5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press [YES] key.
- 6) When the 'Clear Diagnostic Code?' is shown on the display screen, press [YES] key.
- 7) Turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

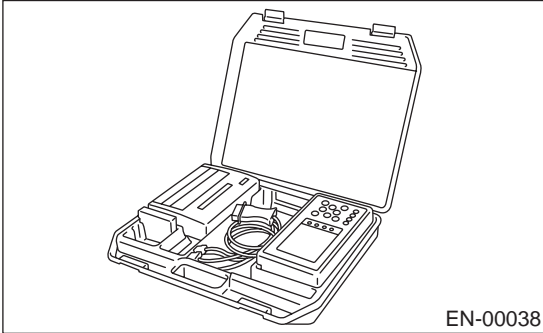
COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

13. Compulsory Valve Operation Check Mode

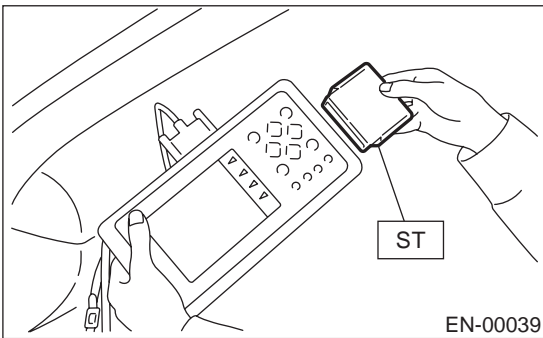
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOSTC)-8, PREPARATION TOOL, General Description.>

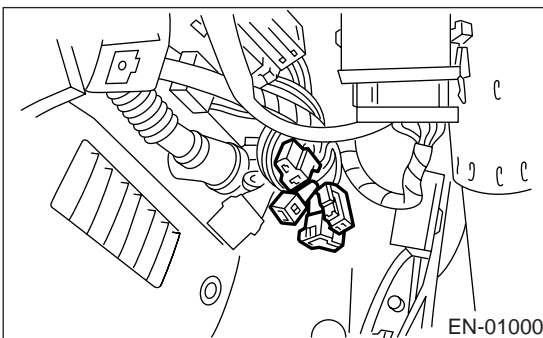


2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOSTC)-8, PREPARATION TOOL, General Description.>

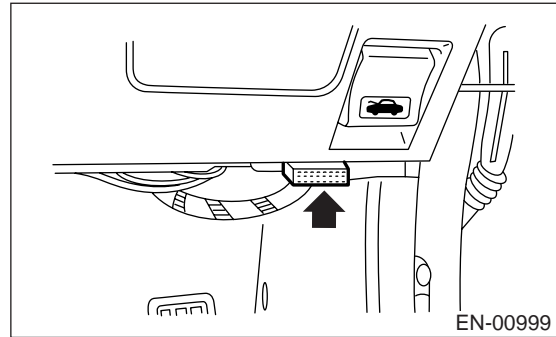


4) Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of center console box.



5) Connect the Subaru Select Monitor to data link connector.

(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).

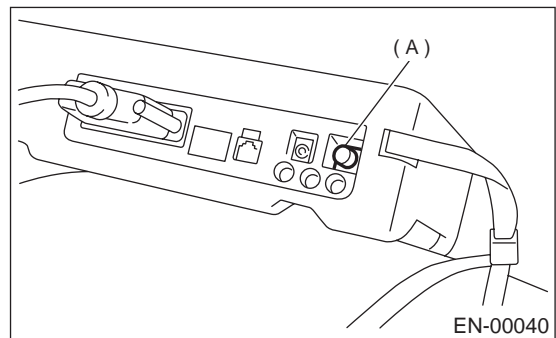


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.

9) Press the [YES] key after displayed the information of engine type.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press [YES] key.

COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory relief valve control solenoid valve operation check	—
Compulsory exhaust valve control solenoid valve operation check	—
Compulsory intake air control solenoid valve operation check	—

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

14.Engine Malfunction Indicator Lamp (MI)

A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MI). <Ref. to EN(H4DOSTC)-39, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI), Engine Malfunction Indicator Lamp (MI).>
↓
2. Check that engine malfunction indicator lamp (MI) does not come on. <Ref. to EN(H4DOSTC)-40, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MI).>
↓
3. Check that engine malfunction indicator lamp (MI) does not go off. <Ref. to EN(H4DOSTC)-44, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MI).>
↓
4. Check that engine malfunction indicator lamp (MI) does not blink at a cycle of 3 Hz. <Ref. to EN(H4DOSTC)-46, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MI).>
↓
5. Check that engine malfunction indicator lamp (MI) remains blinking at a cycle of 3 Hz. <Ref. to EN(H4DOSTC)-48, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MI).>

ENGINE MALFUNCTION INDICATOR LAMP (MI)

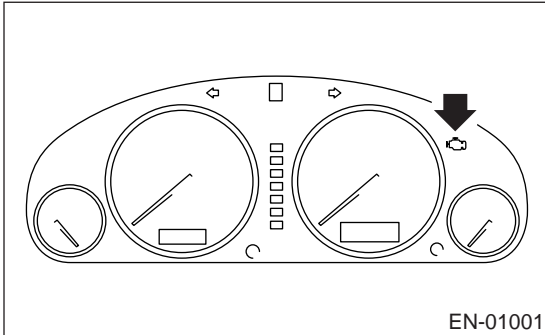
ENGINE (DIAGNOSTICS)

B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI)

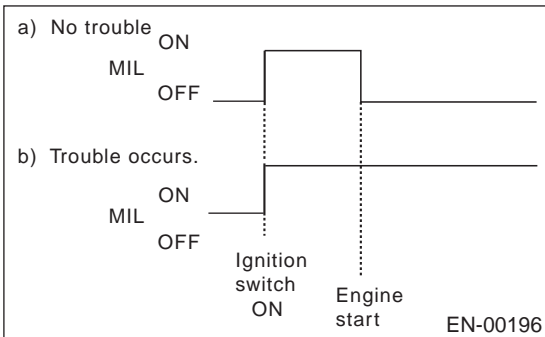
1) When the ignition switch is turned to ON (engine OFF), the CHECK ENGINE malfunction indicator lamp (MI) in the combination meter illuminates.

NOTE:

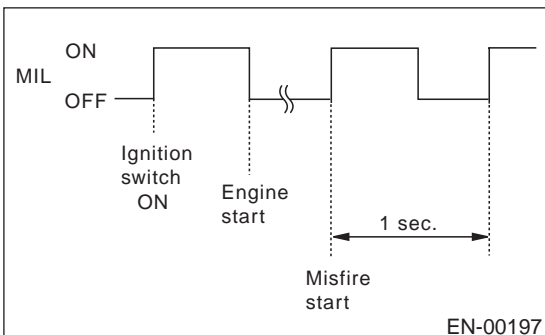
If the MI does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(H4DOSTC)-40, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MI).>



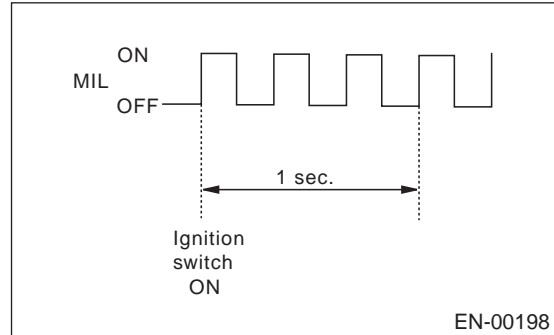
2) After starting the engine, the MI goes out. If it does not, either the engine or emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MI will blink at a cycle of 1 Hz.



4) When the ignition switch is turned to ON (engine OFF) or to "START" with the test mode connector connected, the MI blinks at a cycle of 3 Hz.

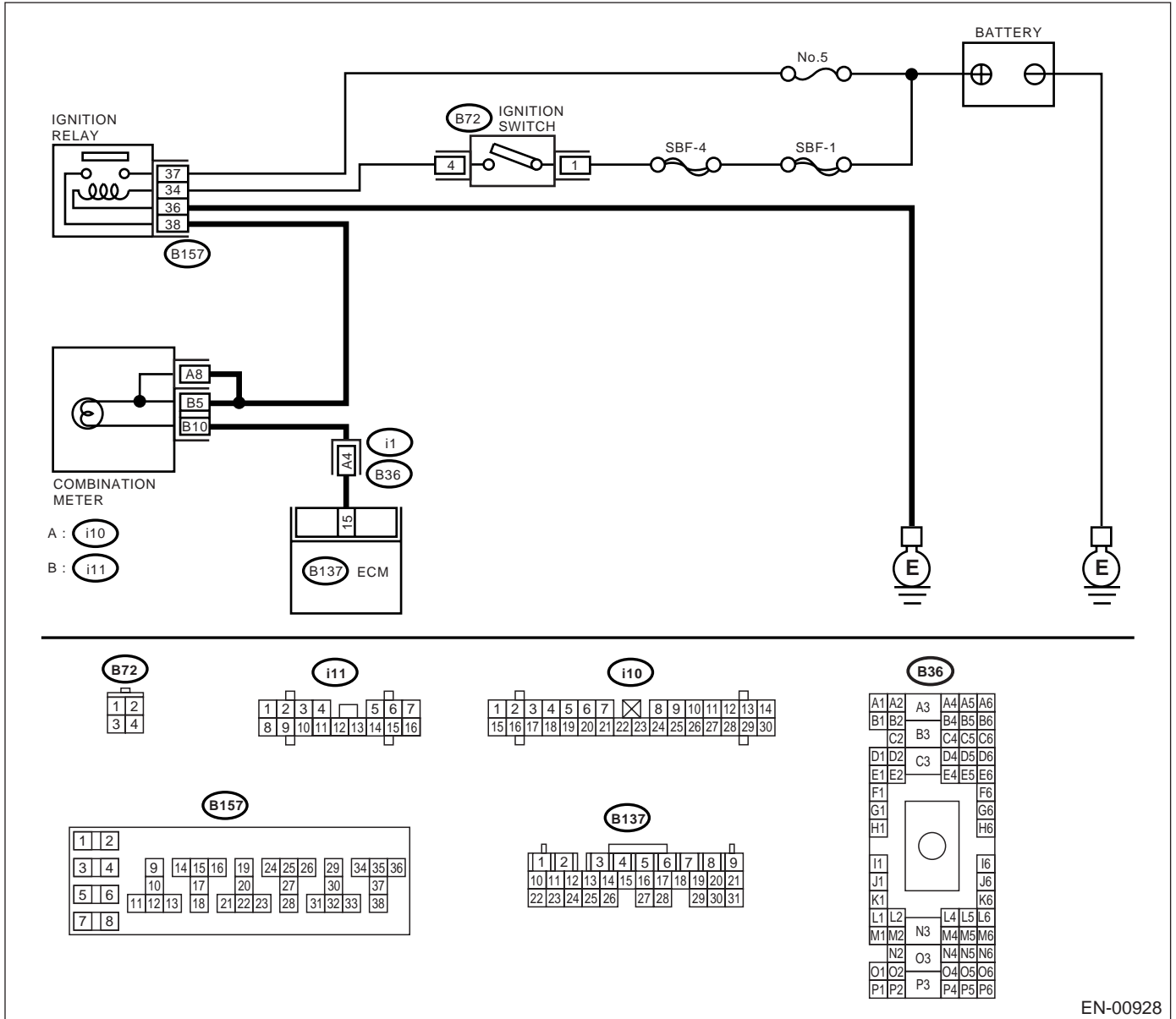


ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON.

- **DIAGNOSIS:**
 - The CHECK ENGINE malfunction indicator lamp (MI) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
 - When the ignition switch is turned ON (engine OFF), the MI does not come on.
- **WIRING DIAGRAM:**



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ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 15 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 4.	Go to step 2.
2 CHECK POOR CONTACT. Does the MI come on when shaking or pulling ECM connector and harness?	MI illuminates.	Repair the poor contact in ECM connector.	Go to step 3.
3 CHECK ECM CONNECTOR. Is the ECM connector correctly connected?	Connected.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Repair the connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-15, Combination Meter Assembly.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. Connector & terminal (B137) No. 15 — (i11) No. 10: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact in combination meter connector. Is there poor contact in combination meter connector?	There is poor contact.	Repair the poor contact in combination meter connector.	Go to step 6.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground.</p> <p>Connector & terminal <i>(i10) No. 8 (+) — Chassis ground (-):</i> <i>(i11) No. 5 (+) — Chassis ground (-):</i></p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	<p>Check the following and repair if necessary.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Broken down ignition relay. • Blown out fuse (No. 5). • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
<p>7 CHECK LAMP BULB.</p> <p>Remove the engine malfunction indicator lamp bulb. Is the lamp bulb condition OK?</p>	OK	Repair the combination meter connector.	Replace the lamp bulb.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

MEMO:

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT GO OFF.

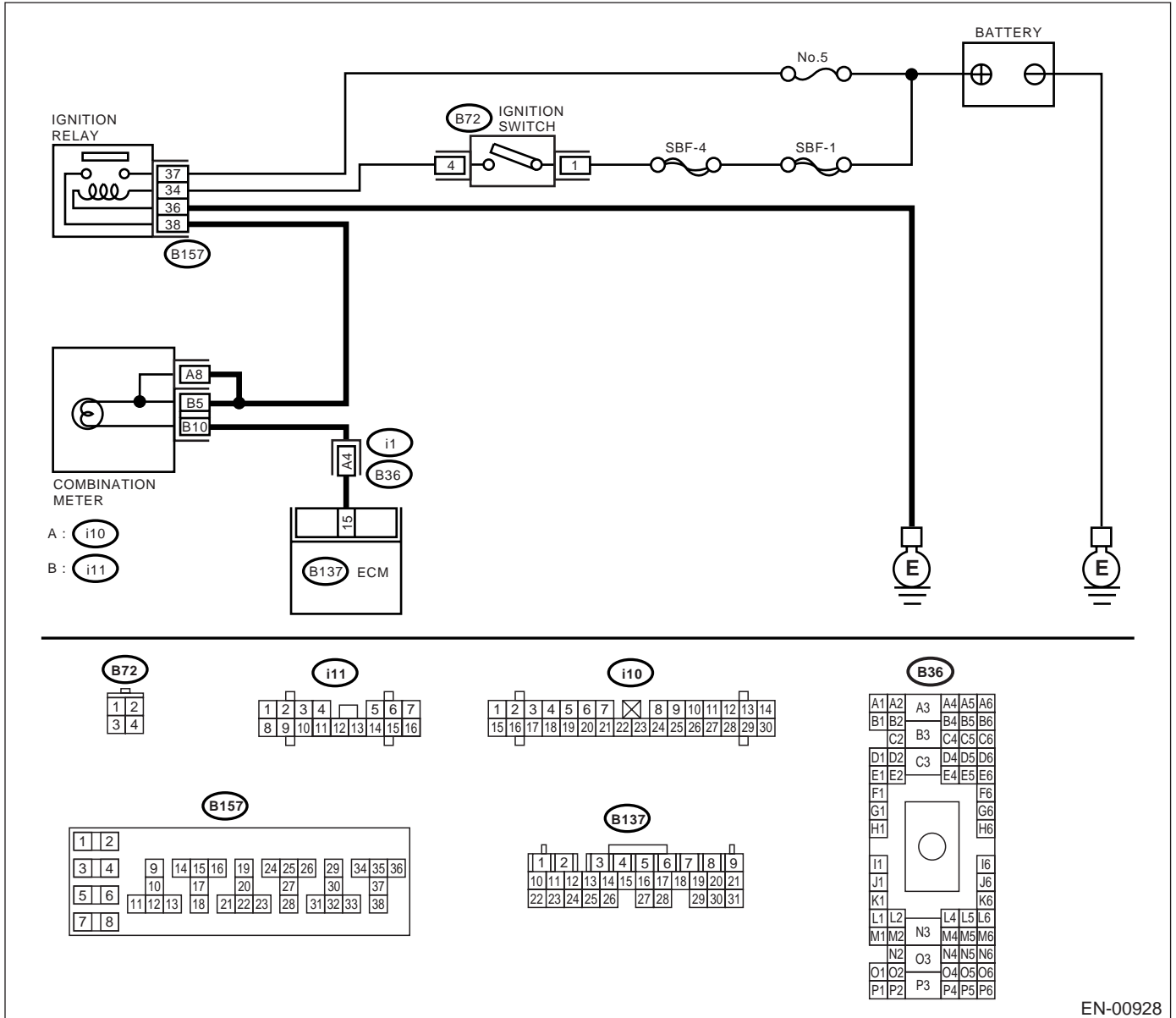
DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MI) circuit is shorted.

TROUBLE SYMPTOM:

- Although MI comes on when the engine runs, trouble code is not shown on the Subaru select monitor or OBD-II general scan tool display.

WIRING DIAGRAM:



EN-00928

Step	Value	Yes	No
1	<p>CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. Does the MI come on?</p>	MI illuminates.	<p>Repair the short circuit in harness between combination meter and ECM connector.</p> <p>Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.></p>

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

MEMO:

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT BLINK AT A CYCLE OF 3 HZ.

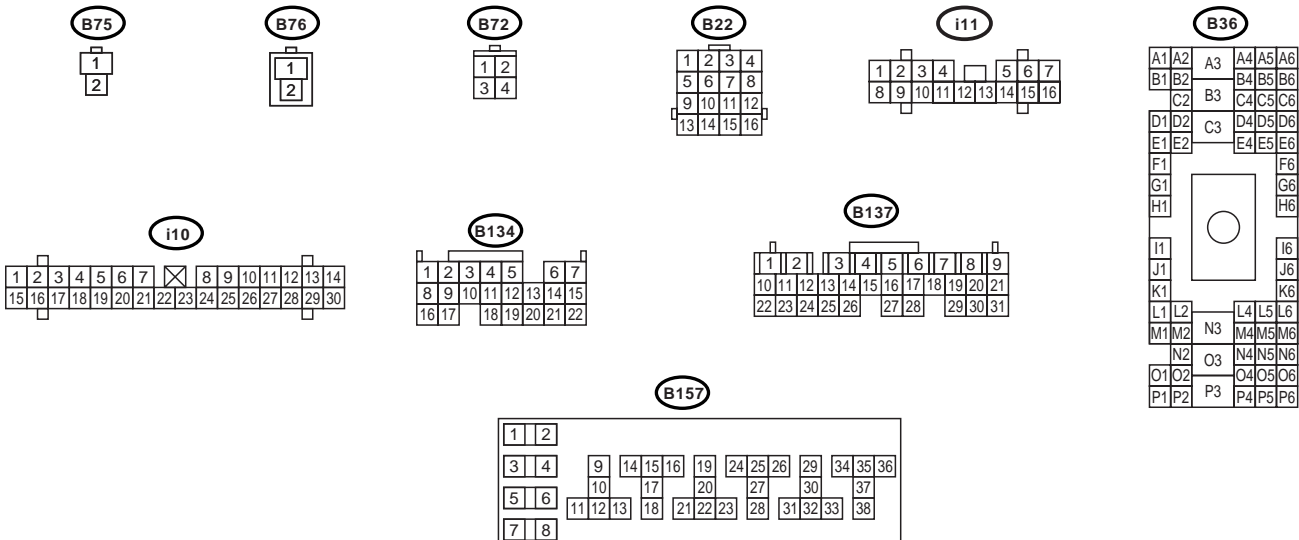
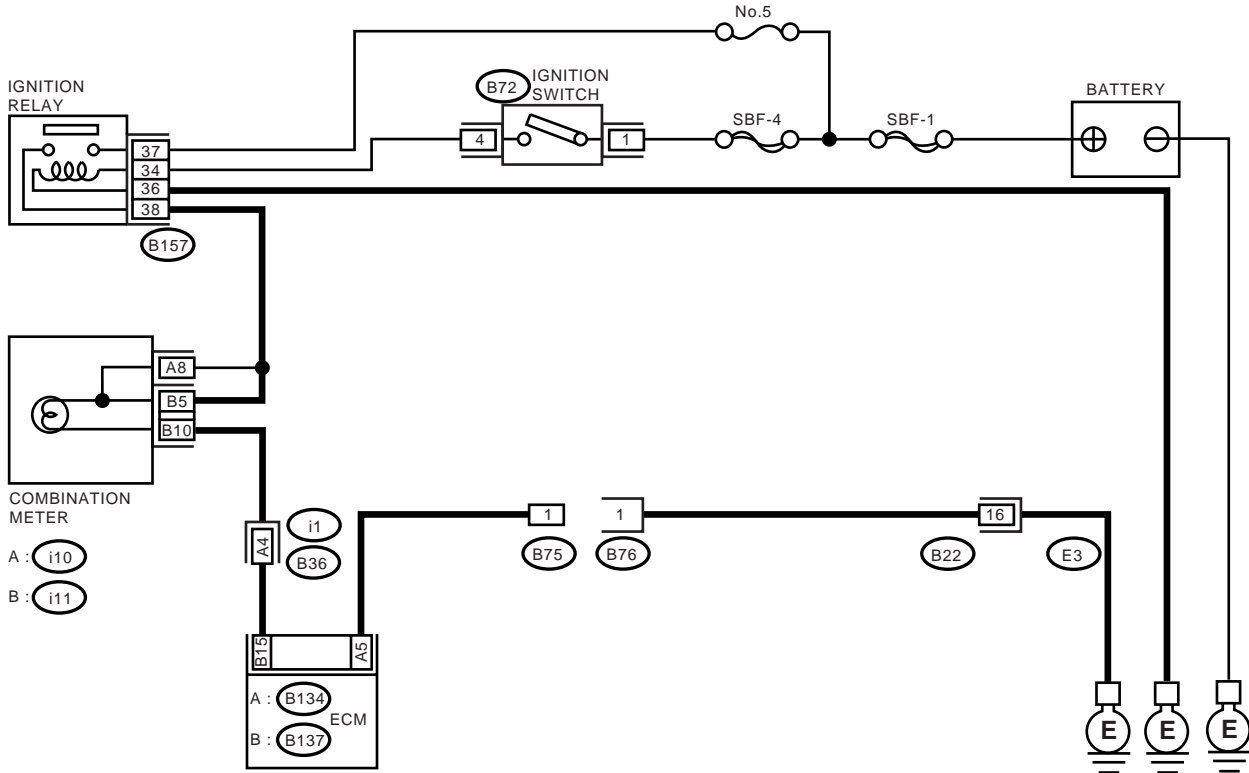
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MI) circuit is open or shorted.
- Test mode connector circuit is in open.

• TROUBLE SYMPTOM:

- When in inspection mode, the MI does not blink at a cycle of 3 Hz.

• WIRING DIAGRAM:



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ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

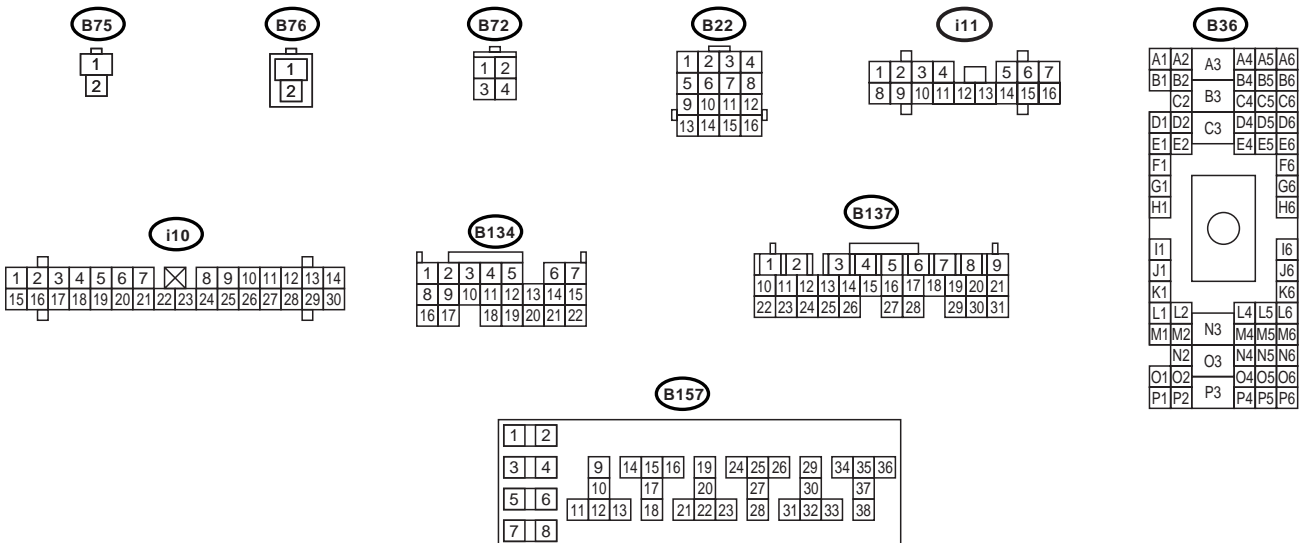
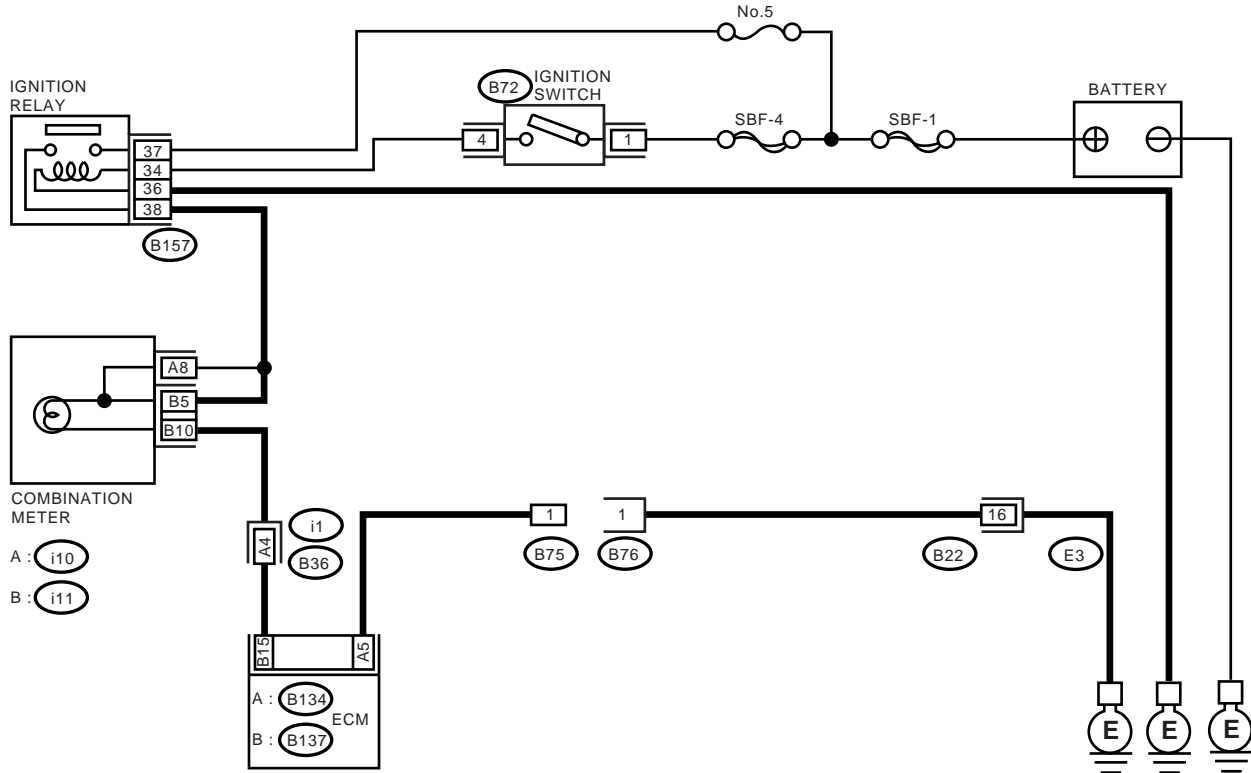
Step	Value	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI). 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF) Does the MI come on?	MI illuminates.	Go to step 2.	Repair the MI circuit. <Ref. to EN(H4DOSTC)-40, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MI).>
2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. Does the MI come on?	MI illuminates.	Repair the ground short circuit in harness between combination meter and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. Connector & terminal (B76) No. 1 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR. 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair the open circuit in harness between ECM and test mode connector.
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MI) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
 - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
 - MI blinks at a cycle of 3 Hz when the ignition switch is turned to ON.
- **WIRING DIAGRAM:**



EN-00929

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK TEST MODE CONNECTOR. 1) Disconnect the test mode connector. 2) Turn the ignition switch to ON. Does the MI flash on and off?	MI flashes.	Go to step 2.	System is in good order. NOTE: MI blinks at a cycle of 3 Hz when test mode connector is connected.
2 CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Repair the short circuit in harness between ECM and test mode connector.

ENGINE MALFUNCTION INDICATOR LAMP (MI)

ENGINE (DIAGNOSTICS)

MEMO:

15. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(H4DOSTC)-52, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOSTC)-56, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of fuel pump circuit. <Ref. to EN(H4DOSTC)-60, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

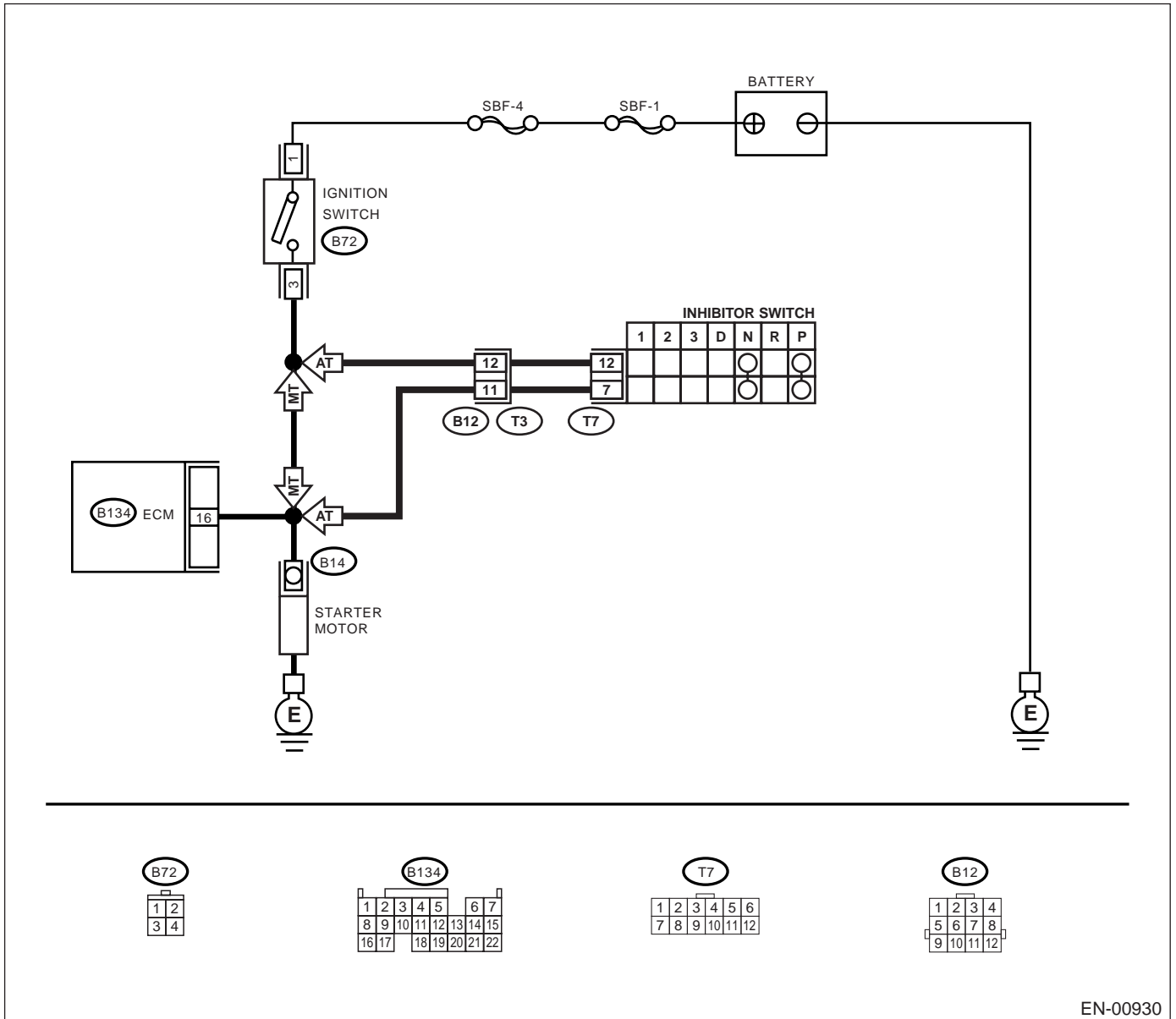
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4DOSTC)-35, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00930

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. Does the starter motor operate when the switch starts?	Operates.	Go to step 2.	Go to step 3.
2 CHECK DTC. Is DTC displayed?	DTC is indicated.	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).>	Repair poor contact in ECM connector.
3 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to ST. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. Connector & terminal (B14) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value? NOTE: On AT vehicles, place the selector lever in the "P" or "N" position.	10 V	Go to step 4.	Go to step 5.
4 CHECK GROUND CIRCUIT OF STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground. Is the measured value less than the specified value?	5 Ω	Check the starter motor. <Ref. to SC(H4DOSTC)-6, Starter.>	Repair the open circuit of ground cable.
5 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition switch. 3) Measure the power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 6.	Repair the open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
6 CHECK IGNITION SWITCH. 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to the "ST" position. Terminals No. 1 — No. 3: Is the measured value less than specified value?	5 Ω	Go to step 7.	Replace the ignition switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK TRANSMISSION TYPE. Is the target AT vehicle?	Target is AT vehicle.	Go to step 8 .	Repair open or ground short circuit in harness between starter motor and ignition switch.
8 CHECK INPUT VOLTAGE OF INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to ST. Connector & terminal (B12) No. 12 (+) — Engine ground (-): Does the measured value exceed the specified value?	10 V	Go to step 9 .	Repair open or ground short circuit in harness between inhibitor switch and ignition switch.
9 CHECK INHIBITOR SWITCH. 1) Place the selector lever in the “P” or “N” position. 2) Measure the resistance between inhibitor switch terminals. Connector & terminal (T3) No. 11 — No. 12: Is the measured value less than specified value?	1 Ω	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace the inhibitor switch. <Ref. to AT-50, REMOVAL, Inhibitor Switch.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR ENGINE STARTING FAILURE

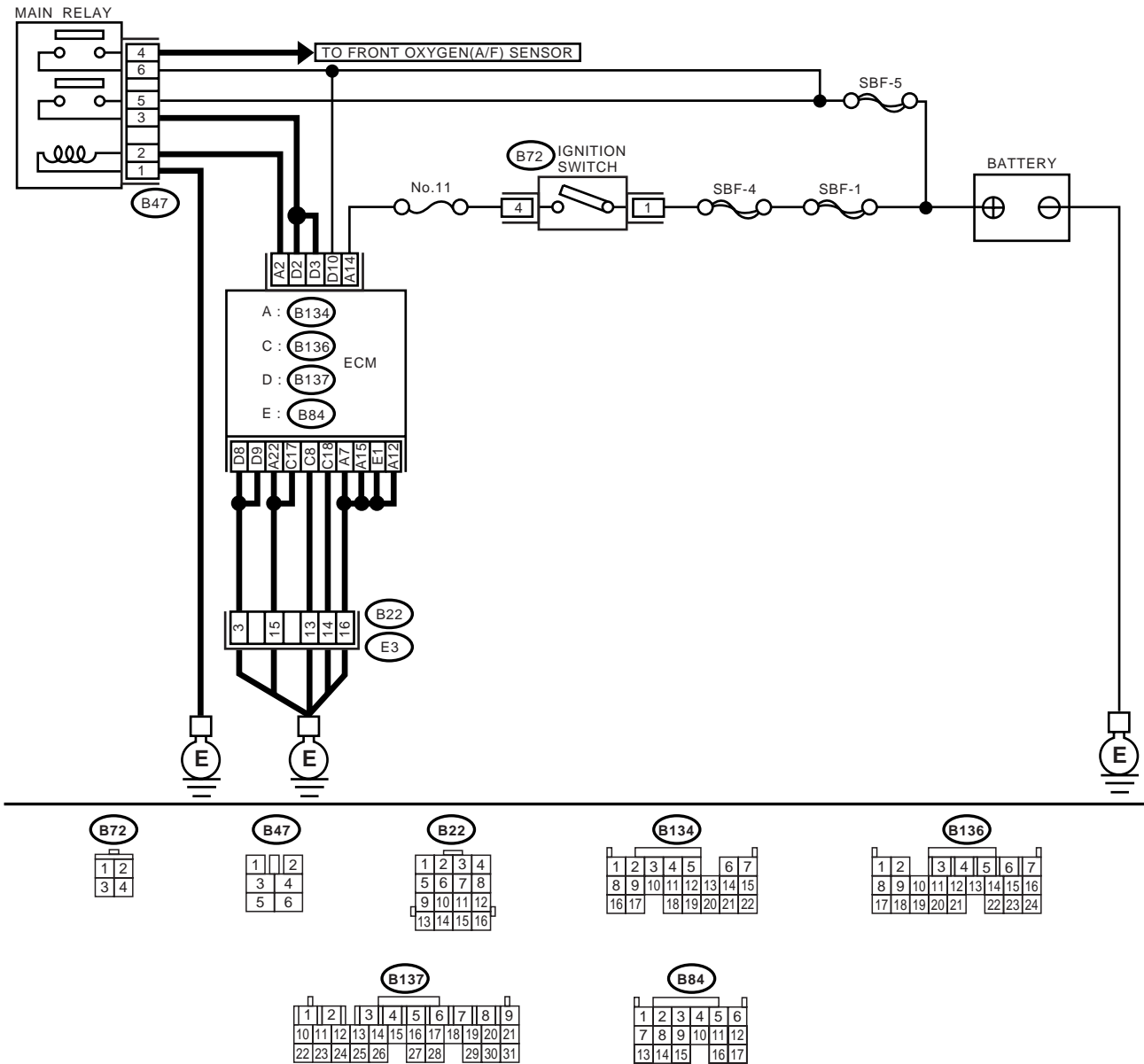
ENGINE (DIAGNOSTICS)

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4DOSTC)-35, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(H4DOSTC)-33, Inspection Mode.>

• WIRING DIAGRAM:



EN-00931

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK MAIN RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals.</p> <p>Terminals No. 3 — No. 5: No. 4 — No. 6:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 2.	Replace the main relay.
<p>2 CHECK GROUND CIRCUIT OF ECM.</p> <p>1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 7 — Chassis ground: (B134) No. 12 — Chassis ground: (B134) No. 15 — Chassis ground: (B134) No. 22 — Chassis ground: (B136) No. 8 — Chassis ground: (B136) No. 17 — Chassis ground: (B136) No. 18 — Chassis ground: (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground: (B84) No. 1 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair the open circuit in harness between ECM connector and engine grounding terminal.
<p>3 CHECK INPUT VOLTAGE OF ECM.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 10 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Repair the open or ground short circuit of power supply circuit.
<p>4 CHECK INPUT VOLTAGE OF ECM.</p> <p>1) Turn the ignition switch to ON. 2) Measure the resistance between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 14 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 5.	Repair the open or ground short circuit of power supply circuit.
<p>5 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 2 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair ground short circuit in harness between ECM connector and main relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK OUTPUT VOLTAGE FROM ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 7.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
7 CHECK INPUT VOLTAGE OF MAIN RELAY. Check the voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 8.	Repair the open circuit in harness between ECM connector and main relay connector.
8 CHECK GROUND CIRCUIT OF MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between main relay connector and chassis ground. Connector & terminal (B47) No. 1 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 9.	Repair the open circuit between main relay and chassis ground.
9 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure the voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 5 (+) — Chassis ground (-): (B47) No. 6 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 10.	Repair the open or ground short circuit in harness of power supply circuit.
10 CHECK INPUT VOLTAGE OF ECM. 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 2 (+) — Chassis ground (-): (B137) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Check the fuel pump circuit. <Ref. to EN(H4DOSTC)-60, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit in harness between ECM connector and main relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR ENGINE STARTING FAILURE

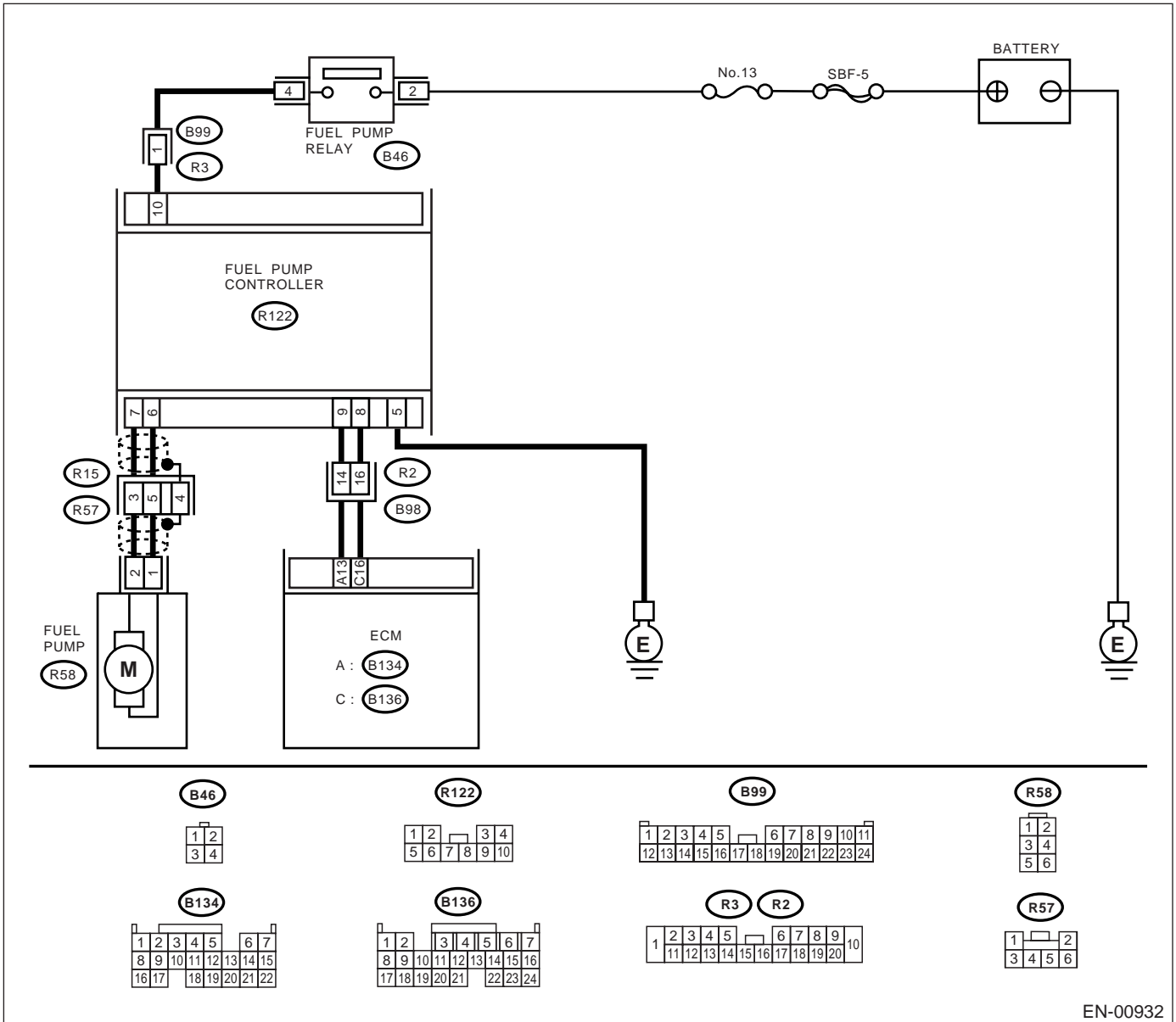
ENGINE (DIAGNOSTICS)

D: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4DOSTC)-35, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00932

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OPERATING SOUND OF FUEL PUMP. Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. Does the fuel pump produce operating sound? NOTE: Fuel pump operation can also be executed using the Subaru Select Monitor (Function mode: FD01). For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOSTC)-36, Compulsory Valve Operation Check Mode.></p>	Operating sound produced.	Go to step 2.	Record the DTC. Repair the trouble case. <Ref. to EN(H4DOSTC)-66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
<p>2 CHECK POOR CONTACT. Check poor contact in ECM connector. Are there poor contact in ECM connectors?</p>	There is poor contact.	Repair poor contact in ECM connectors.	Inspection using "General Diagnostic Table" <Ref. to EN(H4DOSTC)-246, INSPECTION, General Diagnostic Table.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

16. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4DOSTC)-66, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4DOSTC)-70, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4DOSTC)-72, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4DOSTC)-76, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4DOSTC)-78, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4DOSTC)-82, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOSTC)-84, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOSTC)-88, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(H4DOSTC)-92, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(H4DOSTC)-94, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4DOSTC)-98, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(H4DOSTC)-100, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	<Ref. to EN(H4DOSTC)-104, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	<Ref. to EN(H4DOSTC)-108, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0136	O2 Sensor Circuit (Bank 1 Sensor 2)	<Ref. to EN(H4DOSTC)-110, DTC P0136 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(H4DOSTC)-112, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(H4DOSTC)-114, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super ChargerWastegateSolenoid "A" Low	<Ref. to EN(H4DOSTC)-118, DTC P0245 — TURBO/SUPER CHARGER-WASTEGATESOLENOID "A" LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0246	Turbo/Super ChargerWastegateSolenoid "A" High	<Ref. to EN(H4DOSTC)-122, DTC P0246 — TURBO/SUPER CHARGER-WASTEGATESOLENOID "A" HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0249	Turbo/Super ChargerWastegateSolenoid "B" Low	<Ref. to EN(H4DOSTC)-124, DTC P0249 — TURBO/SUPER CHARGER-WASTEGATESOLENOID "B" LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0250	Turbo/Super ChargerWastegateSolenoid "B" High	<Ref. to EN(H4DOSTC)-128, DTC P0250 — TURBO/SUPER CHARGER-WASTEGATESOLENOID "B" HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0261	Cylinder 1 Injector Circuit Low	<Ref. to EN(H4DOSTC)-130, DTC P0261 — CYLINDER 1 INJECTOR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0264	Cylinder 2 Injector Circuit Low	<Ref. to EN(H4DOSTC)-130, DTC P0264 — CYLINDER 2 INJECTOR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0267	Cylinder 3 Injector Circuit Low	<Ref. to EN(H4DOSTC)-130, DTC P0267 — CYLINDER 3 INJECTOR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0270	Cylinder 4 Injector Circuit Low	<Ref. to EN(H4DOSTC)-132, DTC P0270 — CYLINDER 4 INJECTOR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOSTC)-136, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOSTC)-138, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to EN(H4DOSTC)-140, DTC P0335 — CRANKSHAFT POSITION SENSOR "A" CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4DOSTC)-142, DTC P0340 — CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)N —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0350	Ignition Coil Primary/Secondary Circuit	<Ref. to EN(H4DOSTC)-144, DTC P0350 — IGNITION COIL PRIMARY/SECONDARY CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0444	Evaporative Emission Control System Purge Control Valve Circuit Open	<Ref. to EN(H4DOSTC)-148, DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT OPEN —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0445	Evaporative Emission Control System Purge Control Valve Circuit Shorted	<Ref. to EN(H4DOSTC)-152, DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT SHORTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor	<Ref. to EN(H4DOSTC)-156, DTC P0500 — VEHICLE SPEED SENSOR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle Control System Circuit Low	<Ref. to EN(H4DOSTC)-158, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle Control System Circuit High	<Ref. to EN(H4DOSTC)-162, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOSTC)-164, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM-20, DTC P0153 — INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY) —, Diagnostics Chart with Trouble Code.>
P0562	System Voltage Low	<Ref. to EN(H4DOSTC)-166, DTC P0562 — SYSTEM VOLTAGE LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0563	System Voltage High	<Ref. to EN(H4DOSTC)-168, DTC P0563 — SYSTEM VOLTAGE HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0851	Neutral switch input circuit low	<Ref. to EN(H4DOSTC)-170, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and <Ref. to EN(H4DOSTC)-172, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral switch input circuit high	<Ref. to EN(H4DOSTC)-174, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and <Ref. to EN(H4DOSTC)-178, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(H4DOSTC)-181, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(H4DOSTC)-182, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1130	O2 Sensor Circuit (Open) (Bank1 Sensor1)	<Ref. to EN(H4DOSTC)-184, DTC P1130 — O2 SENSOR CIRCUIT (OPEN) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1131	O2 Sensor Circuit (Short) (Bank1 Sensor1)	<Ref. to EN(H4DOSTC)-186, DTC P1131 — O2 SENSOR CIRCUIT (SHORT) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F Sensor micro-computer Problem	<Ref. to EN(H4DOSTC)-190, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1199	Differential Pressure Sensor	<Ref. to EN(H4DOSTC)-192, DTC P1199 — DIFFERENTIAL PRESSURE SENSOR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1230	Fuel Pump Controller	<Ref. to EN(H4DOSTC)-194, DTC P1230 — FUEL PUMP CONTROLLER —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1235	Intake Control Solenoid Valve Circuit Low	<Ref. to EN(H4DOSTC)-198, DTC P1235 — INTAKE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1236	Intake Control Solenoid Valve Circuit High	<Ref. to EN(H4DOSTC)-202, DTC P1236 — INTAKE CONTROL SOLENOID VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1237	Exhaust Control Valve Solenoid Circuit Low (Positive Pressure)	<Ref. to EN(H4DOSTC)-204, DTC P1237 — EXHAUST CONTROL VALVE SOLENOID CIRCUIT LOW (POSITIVE PRESSURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1238	Exhaust Control Valve Solenoid Circuit High (Positive Pressure)	<Ref. to EN(H4DOSTC)-208, DTC P1238 — EXHAUST CONTROL VALVE SOLENOID CIRCUIT HIGH (POSITIVE PRESSURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1239	Exhaust Control Valve Solenoid Circuit Low (Negative Pressure)	<Ref. to EN(H4DOSTC)-210, DTC P1239 — EXHAUST CONTROL VALVE SOLENOID CIRCUIT LOW (NEGATIVE PRESSURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1240	Exhaust Control Valve Solenoid Circuit High (Negative Pressure)	<Ref. to EN(H4DOSTC)-214, DTC P1240 — EXHAUST CONTROL VALVE SOLENOID CIRCUIT HIGH (NEGATIVE PRESSURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1241	2Stage Twin TURBO System (Single)	<Ref. to EN(H4DOSTC)-216, DTC P1241 — 2STAGE TWIN TURBO SYSTEM (SINGLE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1242	2Stage Twin TURBO System (Twin)	<Ref. to EN(H4DOSTC)-218, DTC P1242 — 2STAGE TWIN TURBO SYSTEM (TWIN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1247	Relief Valve Control Solenoid Valve 1 Circuit Low	<Ref. to EN(H4DOSTC)-220, DTC P1247 — RELIEF VALVE CONTROL SOLENOID VALVE 1 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1248	Relief Valve Control Solenoid Valve 1 Circuit High	<Ref. to EN(H4DOSTC)-224, DTC P1248 — RELIEF VALVE CONTROL SOLENOID VALVE 1 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1249	Relief Valve Control Solenoid Valve 2 Circuit Low	<Ref. to EN(H4DOSTC)-226, DTC P1249 — RELIEF VALVE CONTROL SOLENOID VALVE 2 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1250	Relief Valve Control Solenoid Valve 2 Circuit High	<Ref. to EN(H4DOSTC)-230, DTC P1250 — RELIEF VALVE CONTROL SOLENOID VALVE 2 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1507	Idle Control System Malfunction (Fail-safe)	<Ref. to EN(H4DOSTC)-232, DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low input	<Ref. to EN(H4DOSTC)-234, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H4DOSTC)-236, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM-21, DTC P1570 — Antenna —, Diagnostics Chart with Trouble Code.>
P1571	Reference Code Incompatibility	<Ref. to IM-17, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM-18, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM-23, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM-25, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM-25, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Trouble Code (DTC).>
P1698	Engine Torque Control Cut Signal Circuit Malfunction (Low Input)	<Ref. to EN(H4DOSTC)-238, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine Torque Control Cut Signal Circuit Malfunction (High Input)	<Ref. to EN(H4DOSTC)-240, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine Torque Control Signal #1 Circuit Malfunction	<Ref. to EN(H4DOSTC)-242, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine Torque Control Signal #2 Circuit Malfunction	<Ref. to EN(H4DOSTC)-244, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

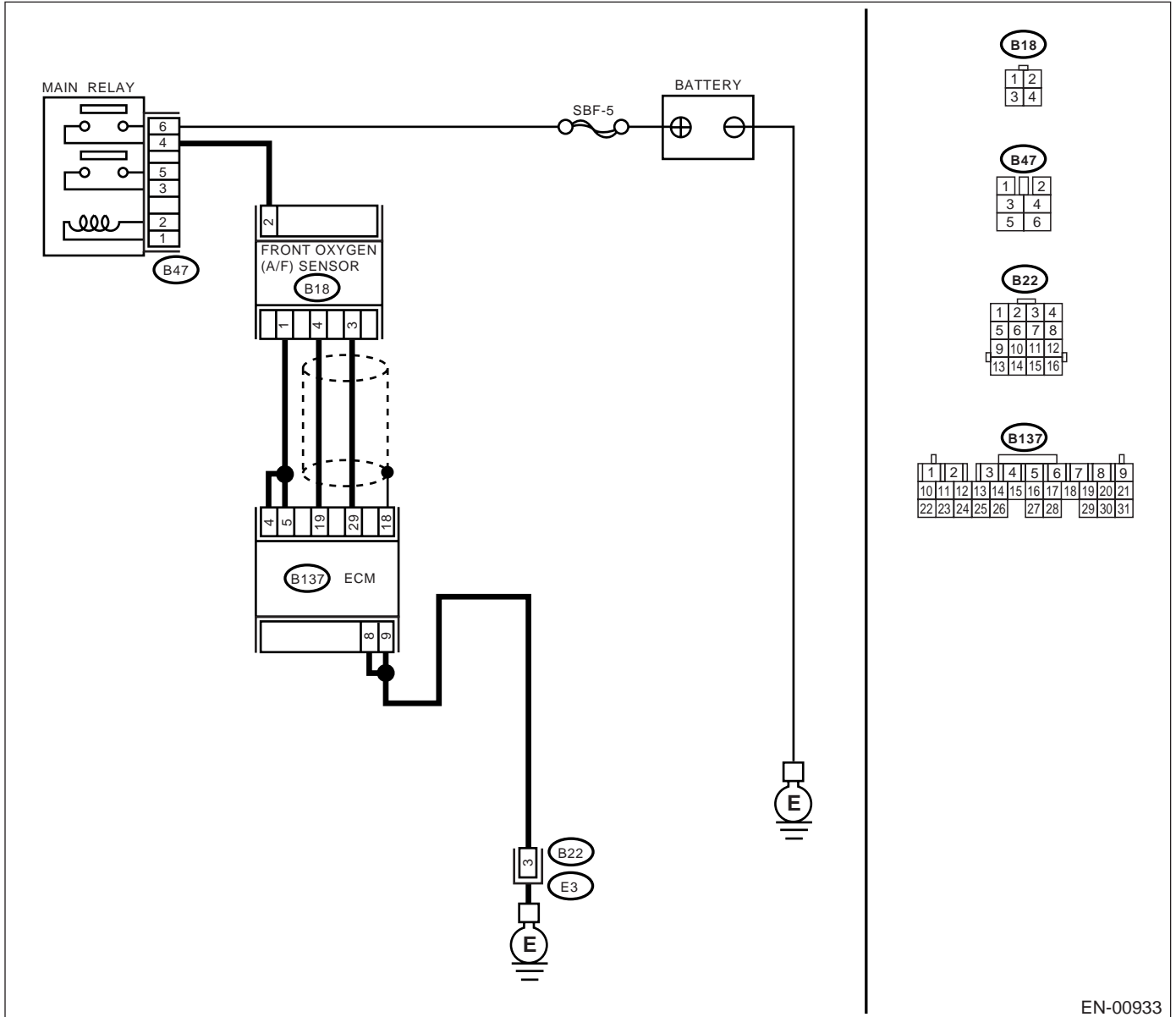
17. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-00933

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031 and P0037 at the same time?	Indicated.	Go to step 2.	Go to step 5.
2 CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. Connector & terminal (B18) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Repair the power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
3 CHECK GROUND CIRCUIT OF ECM. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground: Is the measured value less than the specified value?	5 Ω	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK CURRENT DATA. 1) Start the engine 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor. Is the measured value less than the specified value? NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.>	0.2 A	Repair the poor contact in connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector 	Go to step 5.
5 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-): (B137) No. 5 (+) — Chassis ground (-): Is the measured value less than the specified value?	1.0 V	Go to step 7.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-): (B137) No. 5 (+) — Chassis ground (-): Is the measured value less than the specified value shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	1.0 V	Repair the poor contact in ECM connector.	Go to step 7.
<p>7 CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 2 — No. 1: Is the measured value less than the specified value?</p>	10 Ω	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector 	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOSTC)-38, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

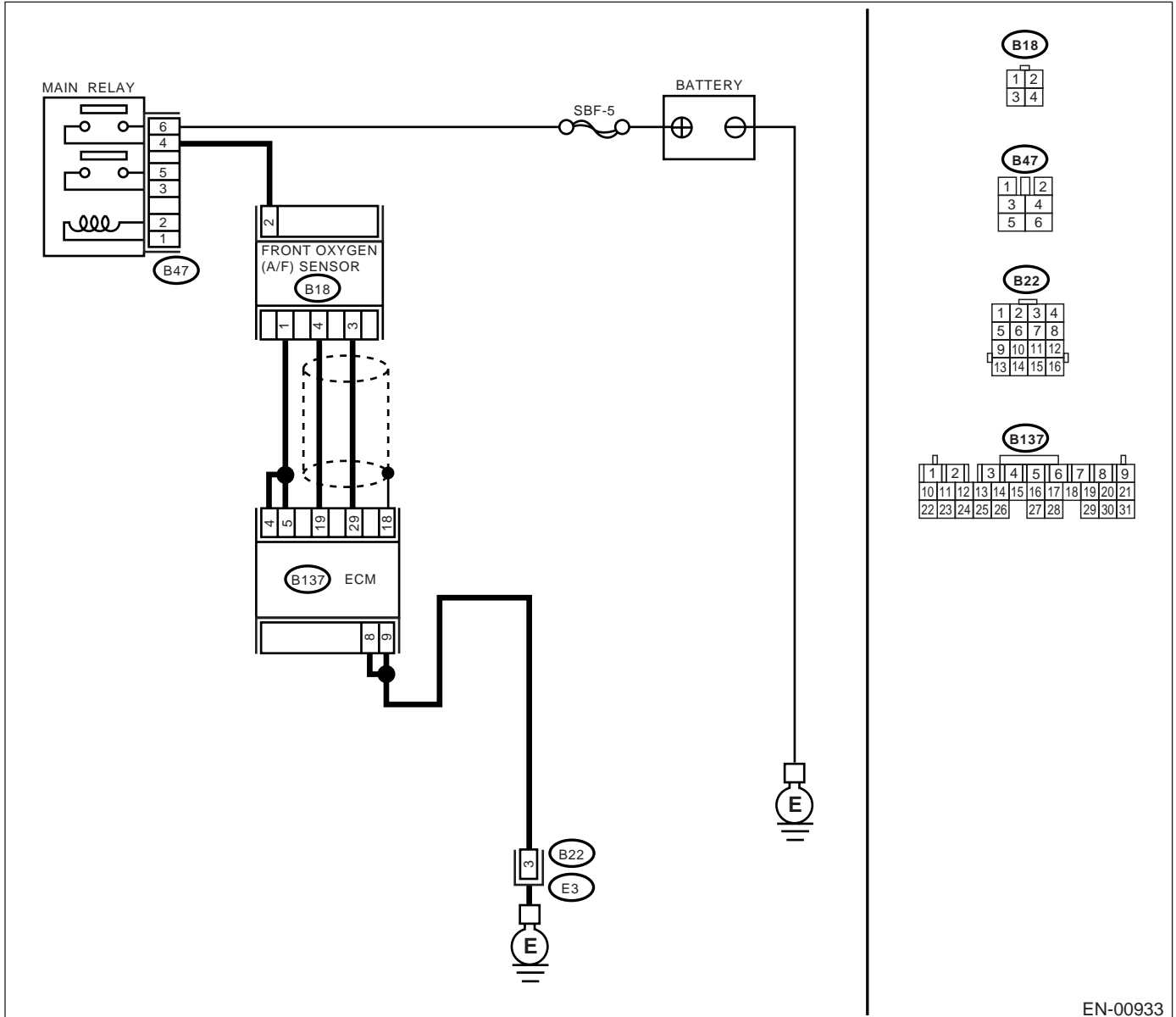
ENGINE (DIAGNOSTICS)

B: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00933

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-): (B137) No. 5 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	8 V	Go to step 3.	Go to step 2.
<p>2 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT. 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor. Does the measured value exceed the specified value? NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	2.3 A	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	END
<p>3 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-): (B137) No. 5 (+) — Chassis ground (-): Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	8.0 V	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

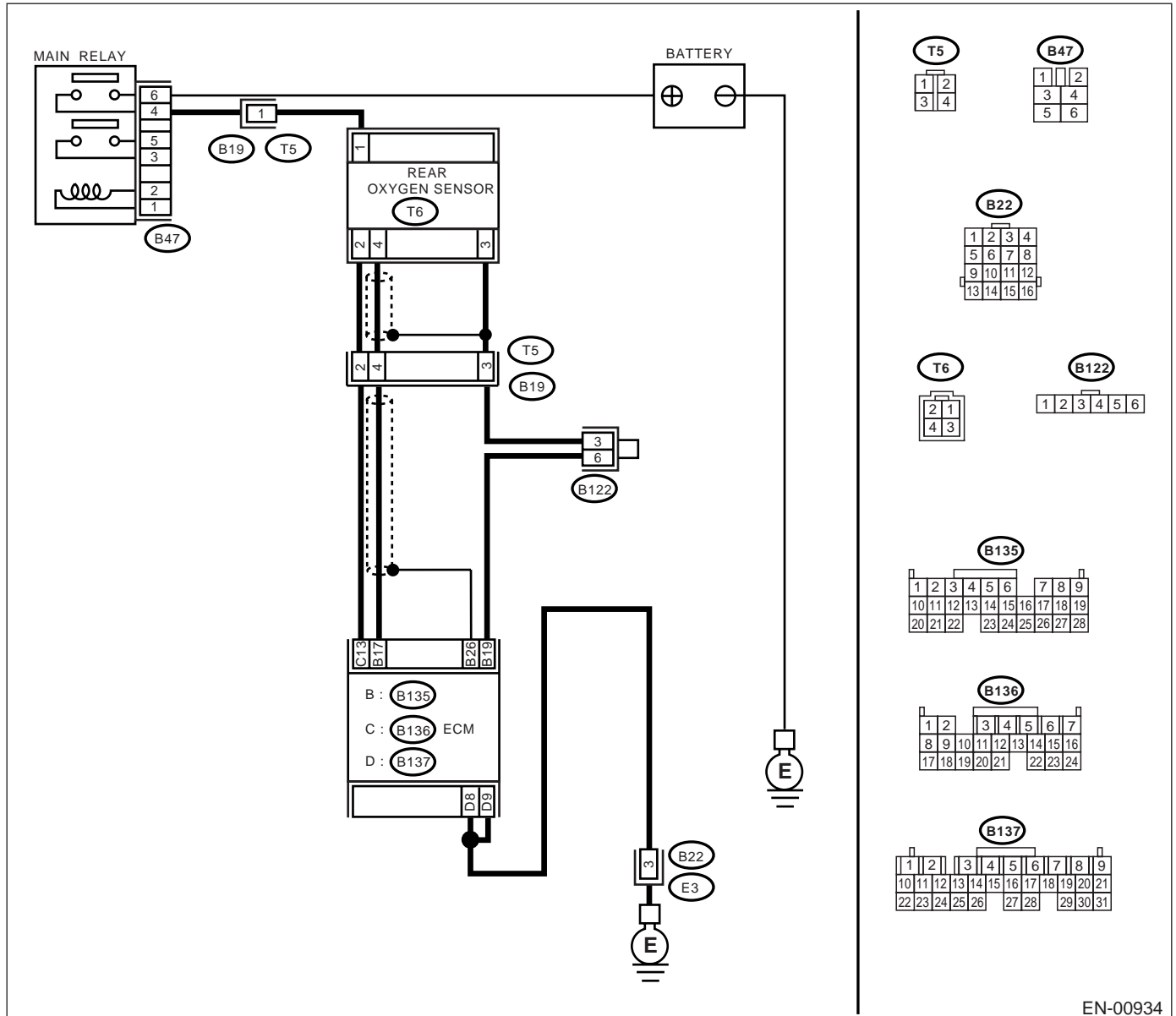
DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

C: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00934

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND CIRCUIT OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Go to step 2.
<p>2 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor. Does the measured value exceed the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	0.2 A	Repair the connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector 	Go to step 3.
<p>3 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Go to step 6.	Go to step 4.
<p>4 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	1.0 V	Repair the poor contact in ECM connector.	Go to step 5.
<p>5 CHECK OUTPUT SIGNAL FROM ECM. 1) Disconnect the connector from rear oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1.0 V	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. <p>Connector & terminal (T6) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Repair the power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
<p>7 CHECK REAR OXYGEN SENSOR.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. <p>Terminals No. 1 — No. 2: Is the measured value less than the specified value?</p>	30 Ω	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector 	Replace the rear oxygen sensor. <Ref. to FU(H4DOSTC)-39, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

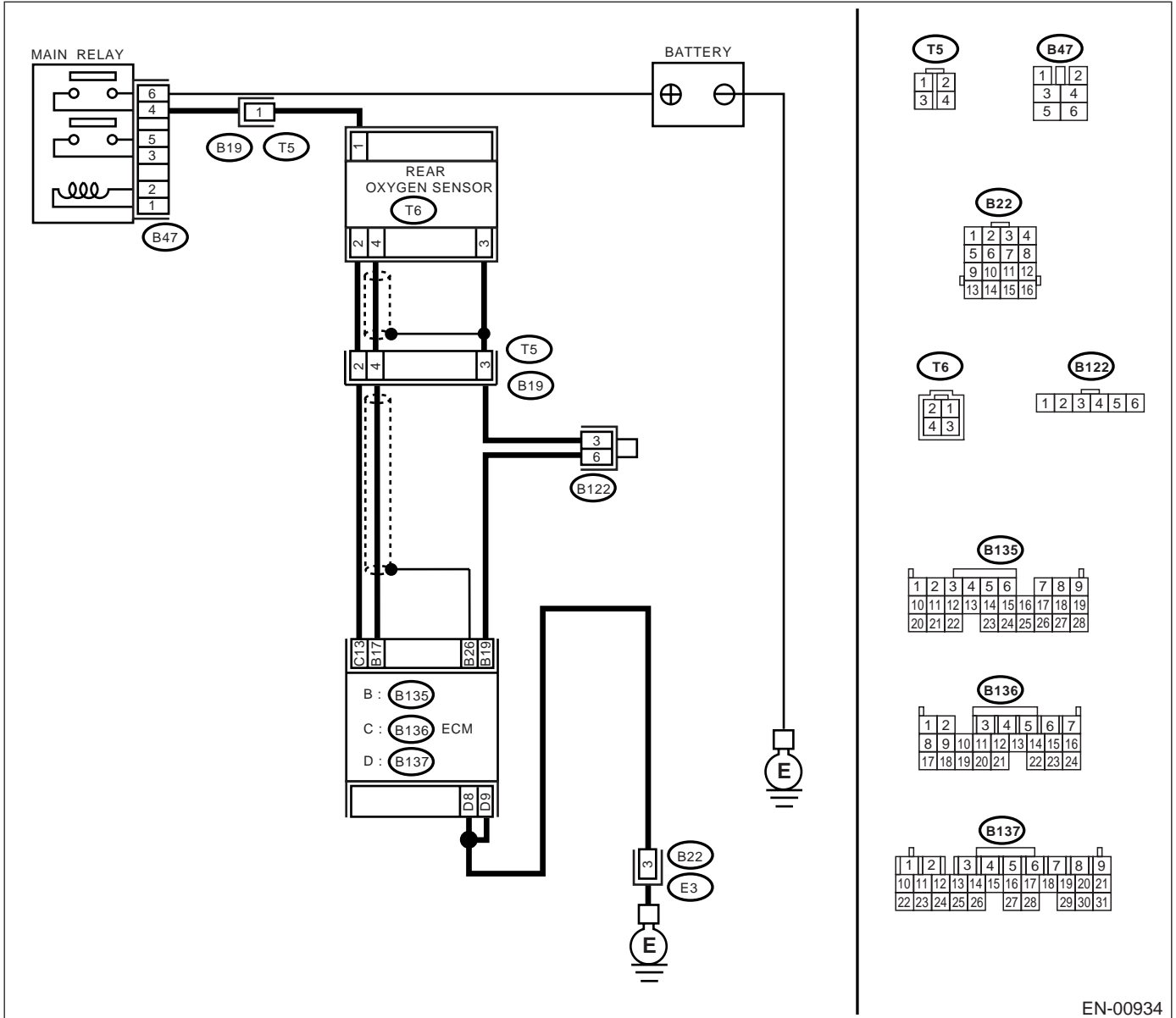
ENGINE (DIAGNOSTICS)

D: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00934

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 13 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 2.	Go to step 3.
2 CHECK CURRENT DATA. 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of rear oxygen sensor heater current using Subaru Select Monitor. Does the measured value exceed the specified value? NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.>	7 A	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	END
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	END

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

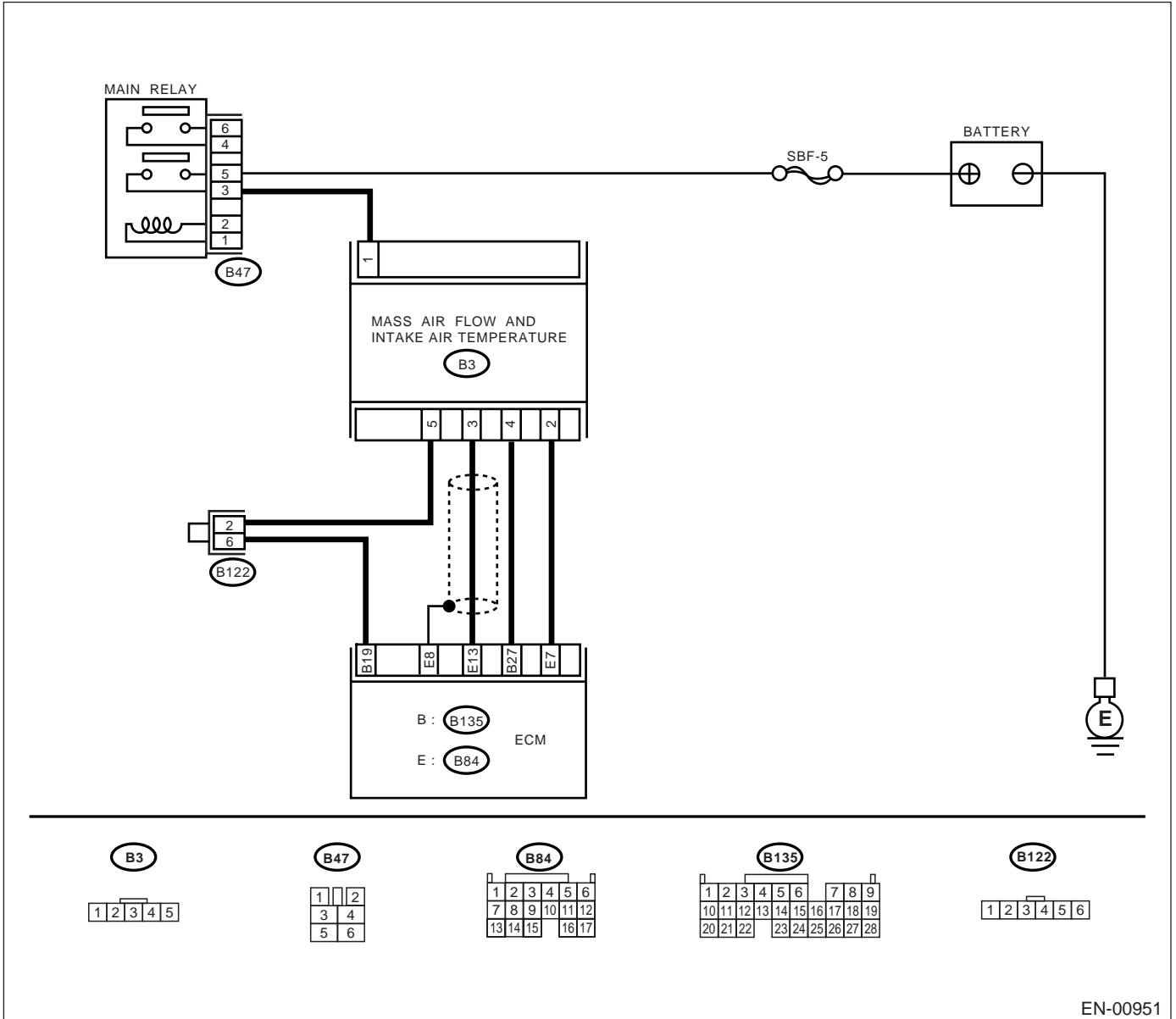
ENGINE (DIAGNOSTICS)

E: DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —

• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

• WIRING DIAGRAM:



EN-00951

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Start the engine and run it at idle. 5) Read the data of mass air flow sensor signal using Subaru Select Monitor. Is the measured value within the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	<p>1.3 g/sec (0.172 lb/min) — 240 g/sec (32 lb/min) or 0.3 — 4.58 V</p>	<p>Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the mass air flow sensor.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector 	<p>Go to step 2.</p>
<p>2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground while engine is idling. Connector & terminal (B84) No. 13 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	<p>0.2 V</p>	<p>Go to step 4.</p>	<p>Go to step 3.</p>
<p>3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Measure the voltage between ECM connector and chassis ground while engine is idling. Does the measured value change by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p>	<p>The value changes.</p>	<p>Repair the poor contact in ECM connector.</p>	<p>Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>
<p>4 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. Connector & terminal (B3) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	<p>10V</p>	<p>Go to step 5.</p>	<p>Repair the open circuit between mass air flow sensor and main relay</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector.</p> <p>Connector & terminal (B84) No. 13 — (B3) No. 3: (B135) No. 27 — (B3) No. 4: (B135) No. 19 — (B3) No. 5:</p> <p>Is the measured value less than the specified value?</p>	1Ω	Go to step 6.	Repair the open circuit between ECM and mass air flow sensor connector.
<p>6 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR</p> <p>Measure the resistance of harness between ECM and chassis ground.</p> <p>Connector & terminal (B84) No. 13 — Chassis ground: (B135) No. 27 — Chassis ground: (B135) No. 19 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1MΩ	Go to step 7.	Repair the ground short circuit between ECM and mass air flow sensor connector.
<p>7 CHECK POOR CONTACT</p> <p>Check poor contact in mass air flow sensor connector. Is there poor contact in mass air flow sensor connector?</p>	There is poor contact.	Repair the poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOSTC)-33, Mass Air Flow and Intake Air Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

F: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —

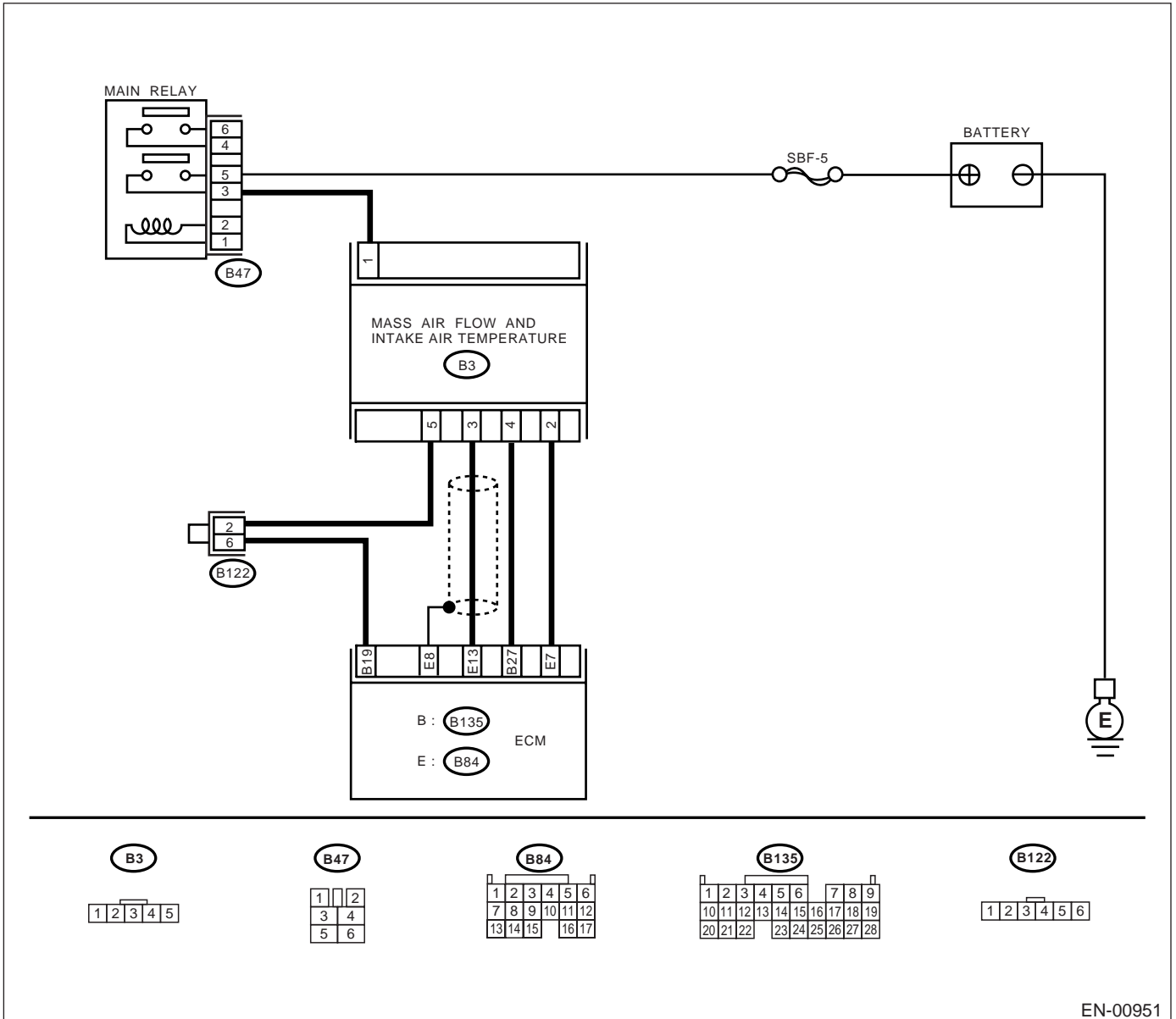
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00951

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CONNECT SUBARU SELECT MONITOR, AND READ DATA.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor switch to ON. 4) Start the engine. 5) Read the data of mass air flow sensor signal using Subaru Select Monitor. <p>Is the measured value within the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	<p>1.3 g/sec (0.172 lb/min) — 240 g/sec (32 lb/min) or 0.3 — 4.58 V</p>	<p>Even if MI lights up, the circuit has returned to a normal condition at this time.</p>	<p>Go to step 2.</p>
<p>2 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF and Subaru Select Monitor switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON and Subaru Select Monitor switch to ON. 4) Read the data of mass air flow sensor signal using Subaru Select Monitor. <p>Does the measured value exceed the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	<p>240 g/sec (32 lb/min) or 4.58 V</p>	<p>Repair the battery short circuit in harness between mass air flow sensor and ECM connector. After repair, replace the ECM.</p>	<p>Replace the mass air flow sensor.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

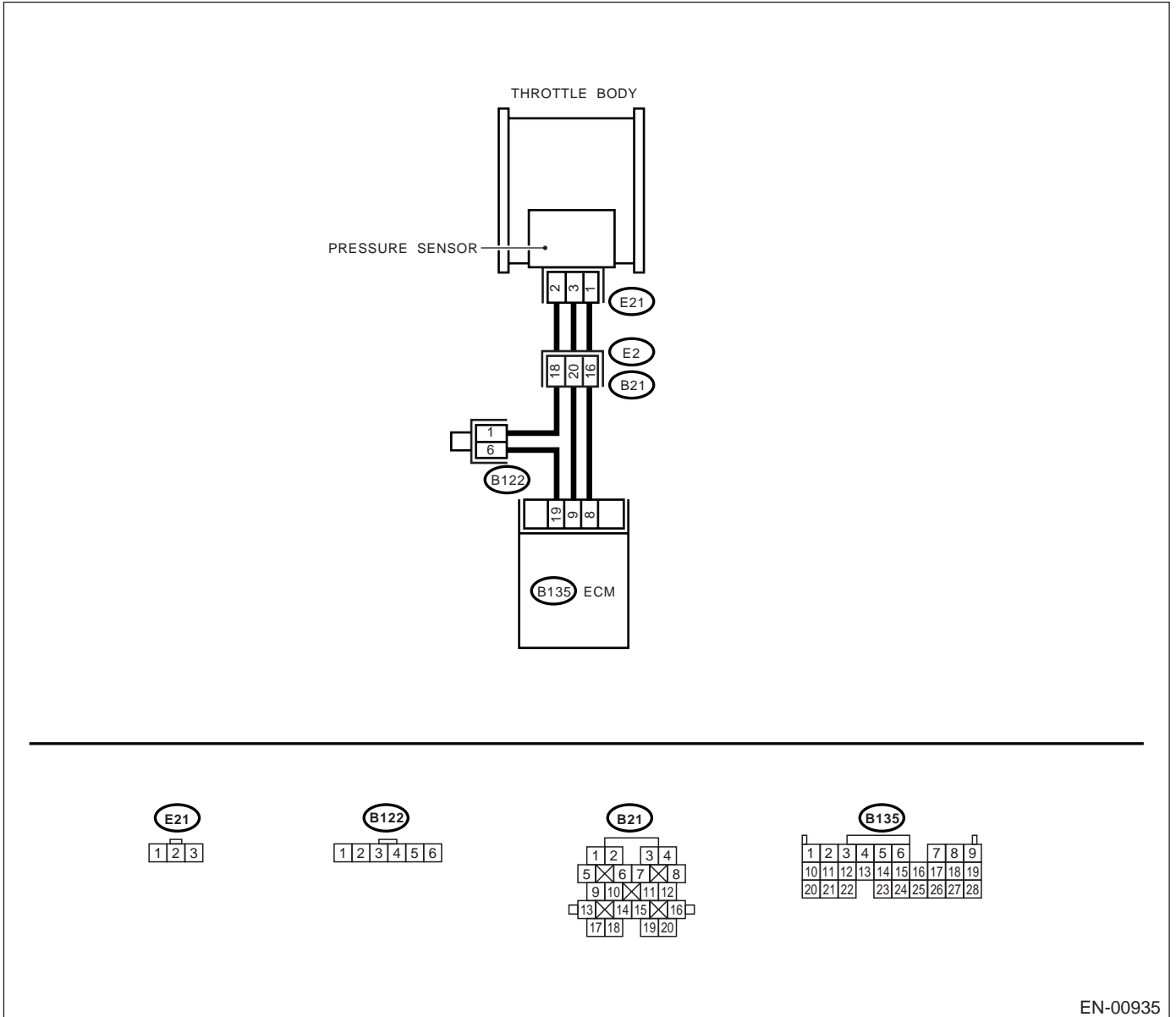
ENGINE (DIAGNOSTICS)

G: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00935

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor. Is the measured value less than the specified value? NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.>	-7.2 kPa (-54 mmHg, -2.1 inHg)	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check the poor contact in ECM and pressure sensor connector. Is there poor contact in ECM or pressure sensor connector?	There is poor contact.	Repair the poor contact in ECM or pressure sensor connector.	Even if MI lights up, the circuit has returned to a normal condition at this time.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 5.	Go to step 4.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the measured value change by shaking harness and connector of ECM while monitoring the value with voltage meter?	The value changes.	Repair the poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-): Is the measured value less than the specified value?	0.7 V	Go to step 6.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
6 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between pressure sensor connector and engine ground. Connector & terminal (E21) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 7.	Repair the open circuit in harness between ECM and intake manifold pressure sensor connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and intake manifold pressure sensor connector. Connector & terminal (B135) No. 19 — (E21) No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 8 .	Repair the open circuit in harness between ECM and intake manifold pressure sensor connector.
<p>8 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between intake manifold pressure sensor connector and engine ground. Connector & terminal (E21) No. 1 — Engine ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9 .	Repair the ground short circuit in harness between ECM and intake manifold pressure sensor connector.
<p>9 CHECK POOR CONTACT. Check poor contact in pressure sensor connector. Is there poor contact in pressure sensor connector?</p>	There is poor contact.	Repair the poor contact in pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(H4DOSTC)-34, Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

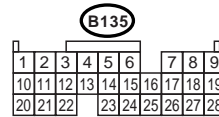
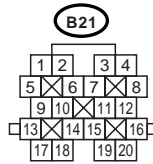
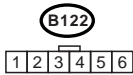
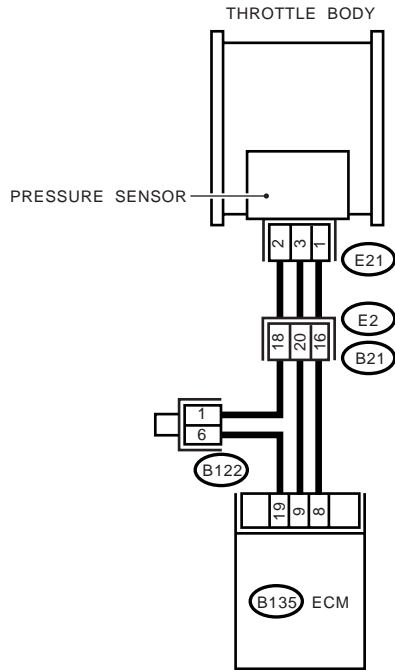
ENGINE (DIAGNOSTICS)

H: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00935

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor. Does the measured value exceed the specified value? NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.>	282 kPa (2121 mmHg, 83.50 inHg)	Go to step 7.	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the measured value change by shaking harness and connector of ECM while monitoring the value with voltage meter?	The value changes.	Repair the poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-): Is the measured value less than the specified value?	4.5 V	Go to step 5.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between pressure sensor connector and engine ground. Connector & terminal (E21) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 6.	Repair the open circuit in harness between ECM and pressure sensor connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and pressure sensor connector. Connector & terminal (B135) No. 8 — (E21) No. 1: (B135) No. 19 — (E21) No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 7.	Repair the open circuit in harness between ECM and pressure sensor connector.
<p>7 CHECK POOR CONTACT. Check poor contact in pressure sensor connector. Is there poor contact in pressure sensor connector?</p>	There is poor contact.	Repair the poor contact in pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(H4DOSTC)-34, Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

I: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

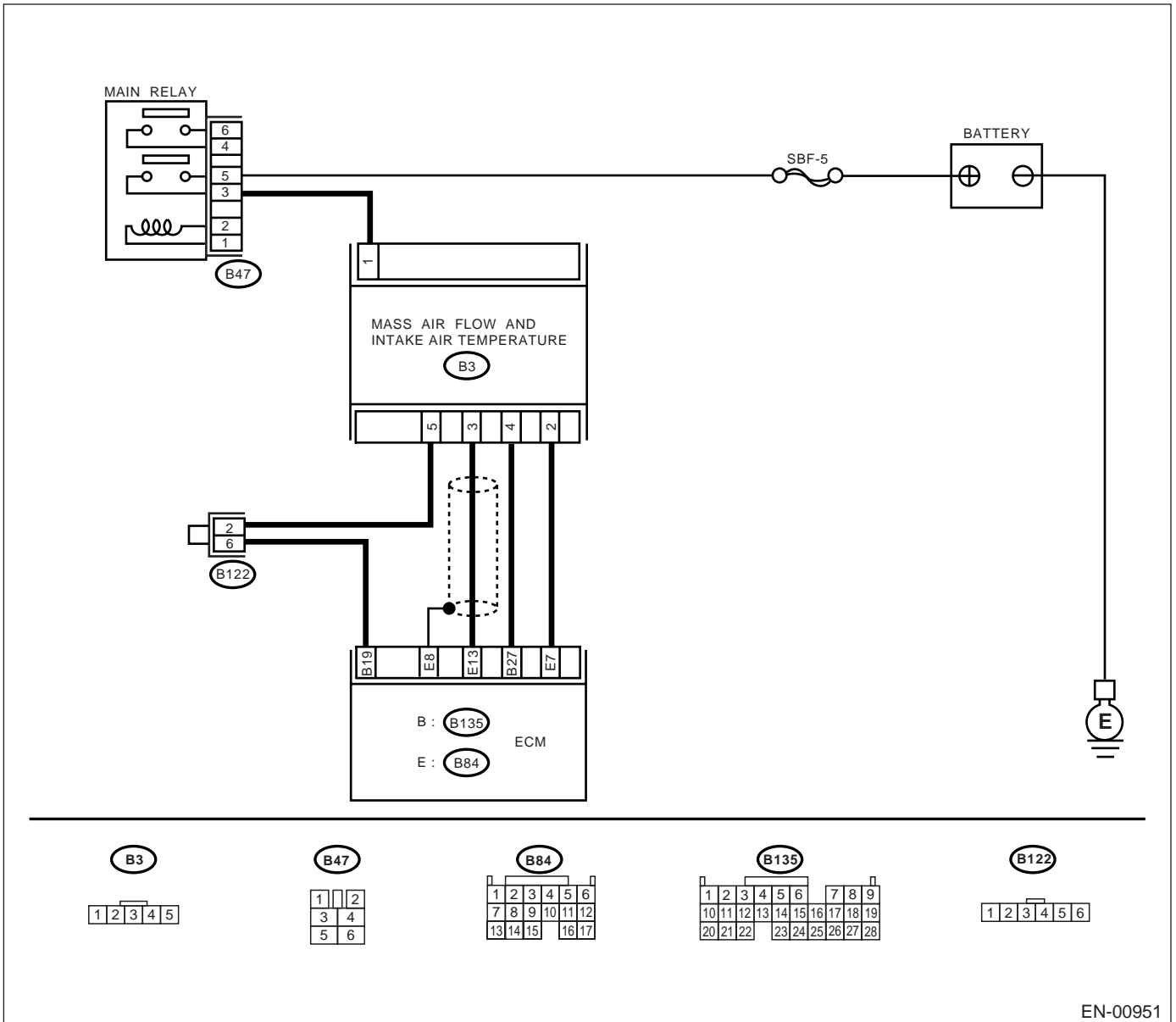
• TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00951

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor. Does the measured value exceed the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	55°C (131°F)	Go to step 2.	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from mass air flow and intake air temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of intake air temperature sensor signal using Subaru Select Monitor. Is the measured value less than the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	-36°C (-97°F)	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOSTC)-33, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

J: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

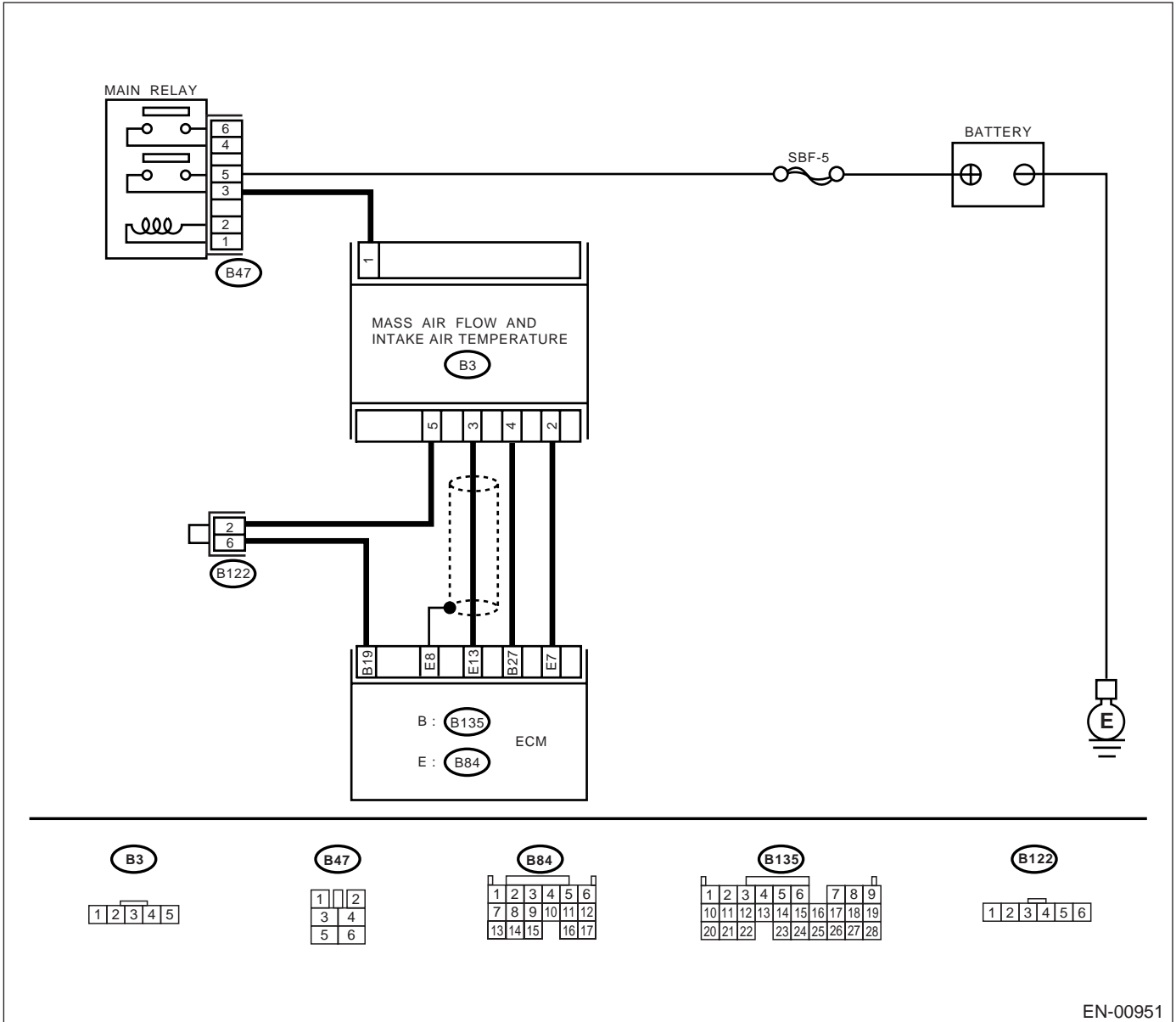
• TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00951

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor. Is the measured value less than the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	-36°C (-97°F)	Go to step 2.	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from mass air flow and intake air temperature sensor.</p> <p>3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (B3) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (B3) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step 4.
<p>4</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure the voltage between mass air flow and intake air temperature sensor and pressure sensor connector and engine ground.</p> <p>Connector & terminal (B3) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4 V	Go to step 5.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground.</p> <p>Connector & terminal (B3) No. 5 — Engine ground: Is the measured value less than the specified value?</p>	<p>5 Ω</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOSTC)-33, Mass Air Flow and Intake Air Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

K: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

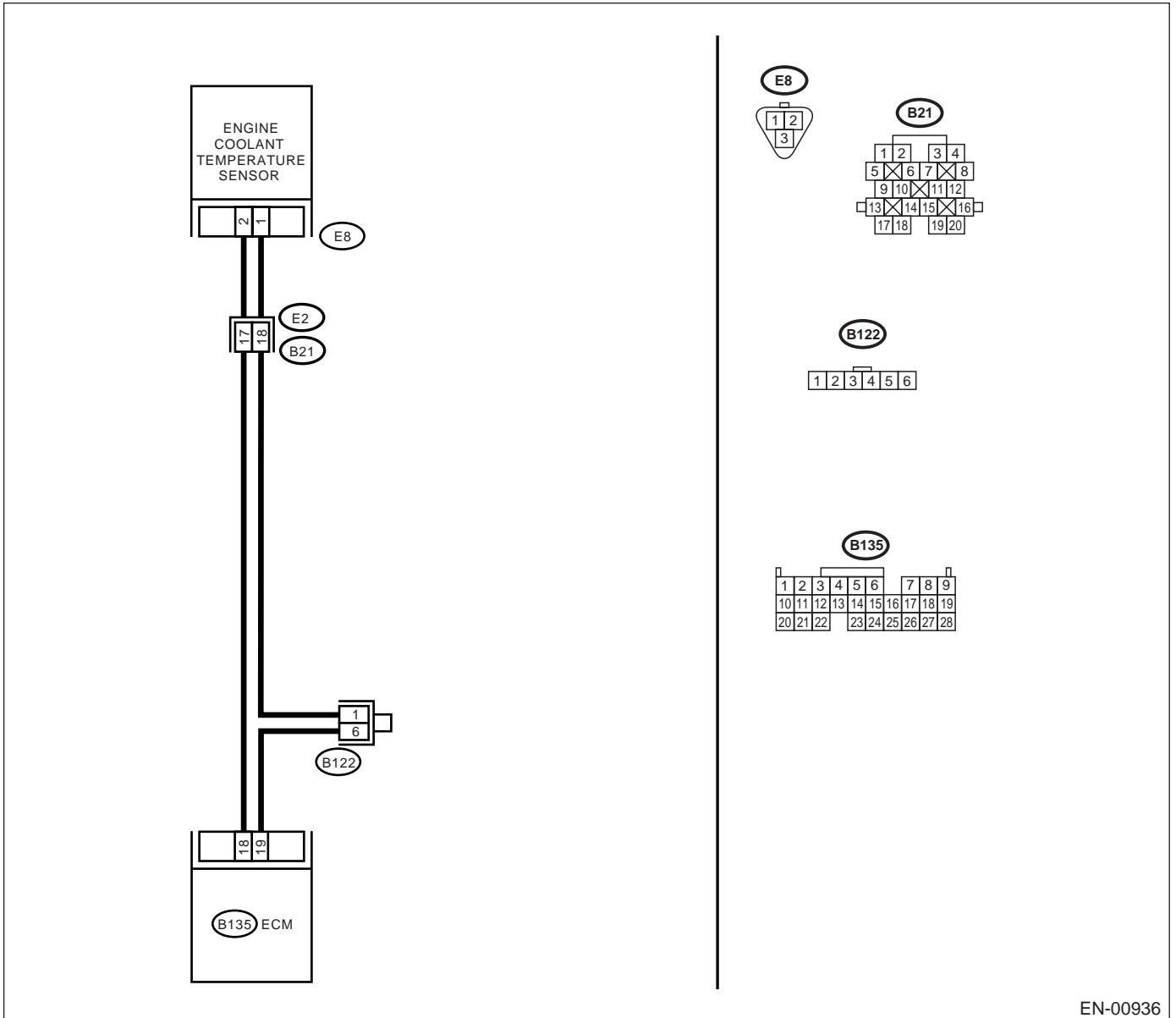
• TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00936

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor.</p> <p>Does the measured value exceed the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	120°C (248°F)	Go to step 2.	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine coolant temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor.</p> <p>Is the measured value less than the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	-40°C (-40°F)	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOSTC)-28, Engine Coolant Temperature Sensor.>	Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

L: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

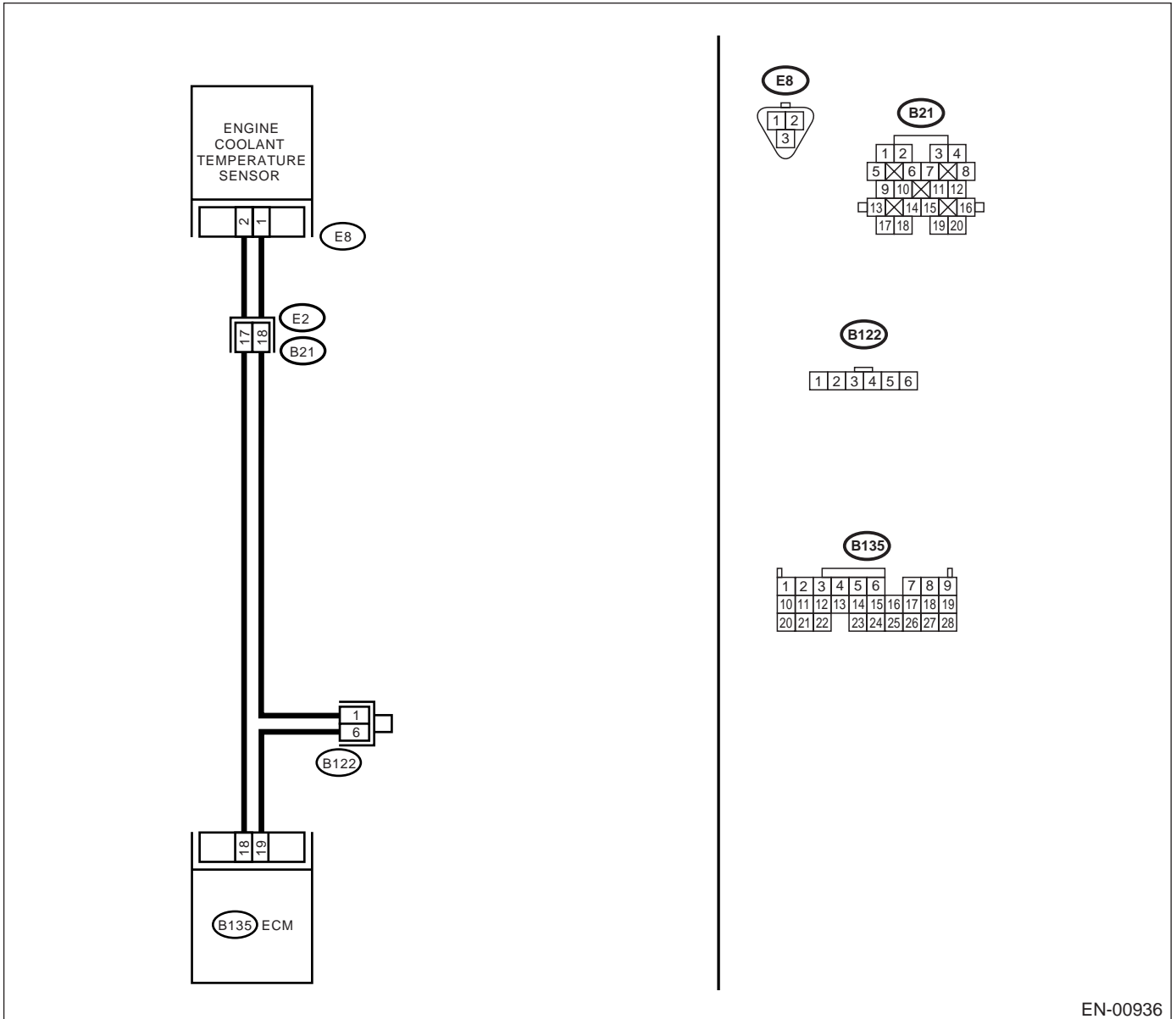
• TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00936

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor.</p> <p>Is the measured value less than the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	-40°C (-40°F)	Go to step 2.	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine coolant temperature sensor.</p> <p>3) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 4.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>4</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	4 V	Go to step 5.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>5</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOSTC)-28, Engine Coolant Temperature Sensor.>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

M: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

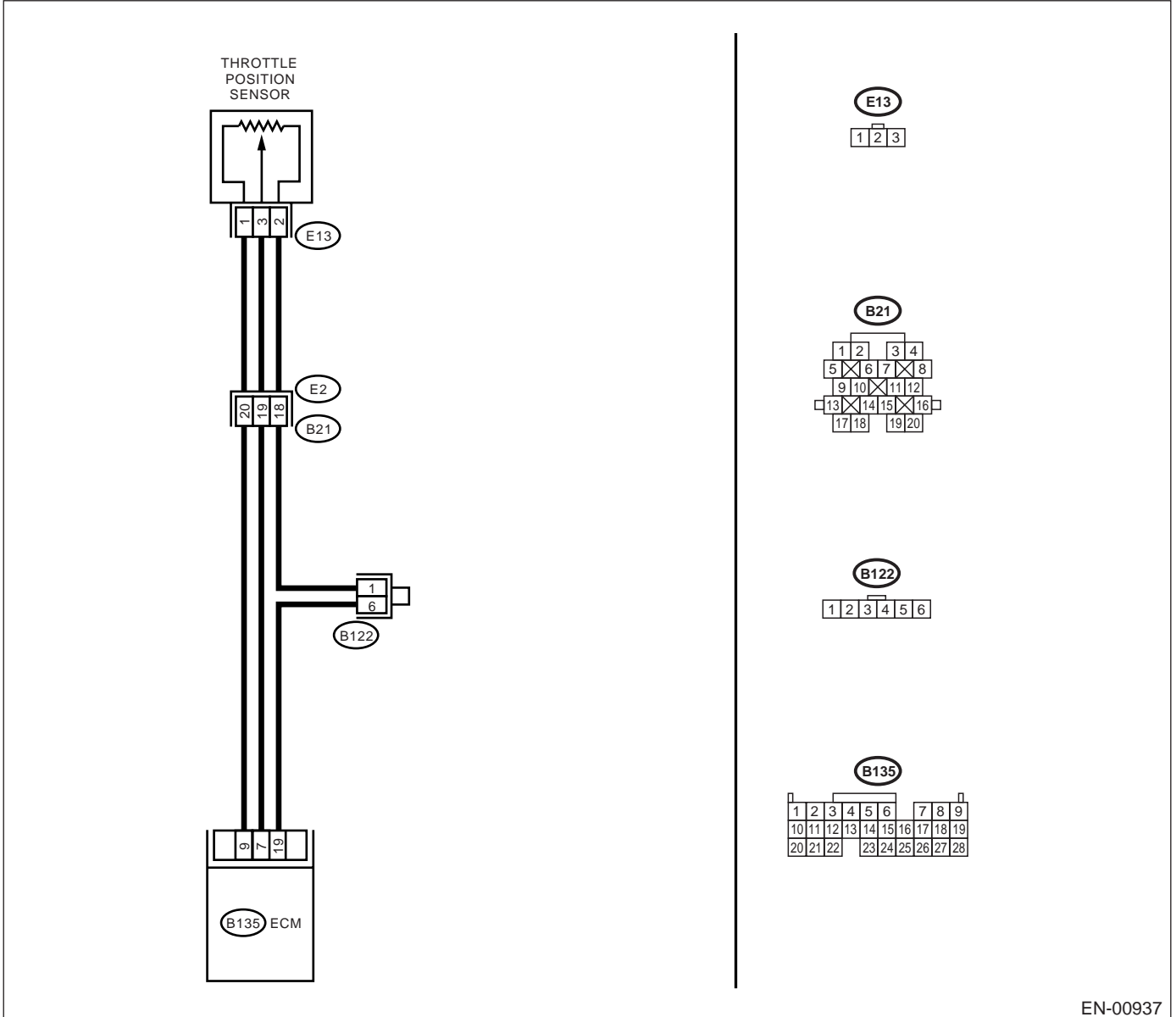
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00937

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor. Is the measured value less than the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	0.1 V	Go to step 2.	Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 4.	Go to step 3.
<p>3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): Does the measured value change by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	The voltage changes.	Repair the poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
<p>4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 7 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.1 V	Go to step 6.	Go to step 5.
<p>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Measure the voltage between ECM connector and chassis ground. Does the measured value change by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p>	The value changes.	Repair the poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 7.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>7 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector.</p> <p>Connector & terminal (B135) No. 7 — (E13) No. 3: Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
<p>8 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>Measure the resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 3 — Engine ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9.	Repair the ground short circuit in harness between throttle position sensor and ECM connector.
<p>9 CHECK POOR CONTACT.</p> <p>Check the poor contact in throttle position sensor connector. Is there poor contact in throttle position sensor connector?</p>	There is poor contact.	Repair the poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(H4DOSTC)-32, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

N: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —

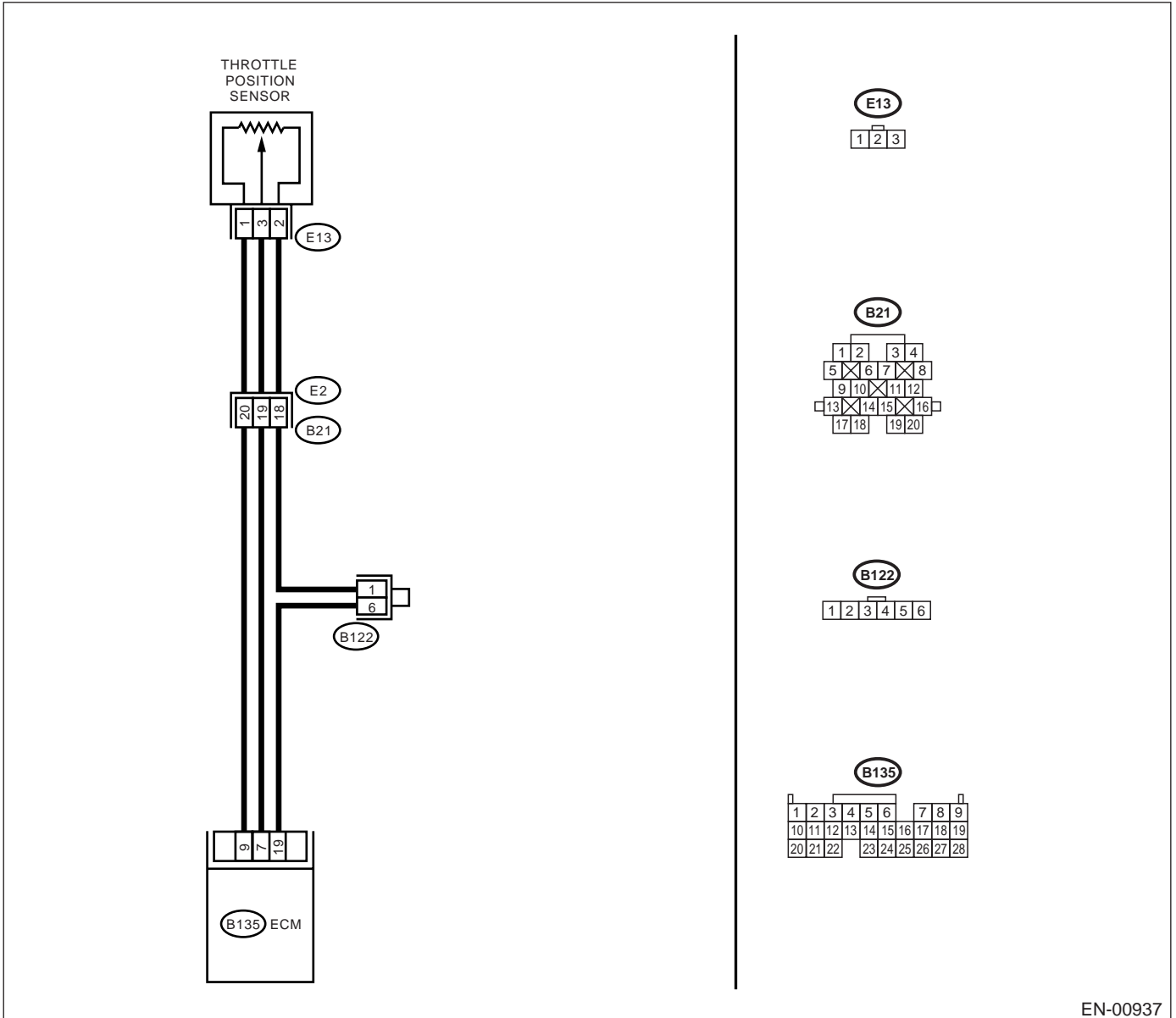
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00937

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of throttle position sensor signal using Subaru Select Monitor. Does the measured value exceed the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	4.7 V	Go to step 2.	<p>Even if MI lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>2</p> <p>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from throttle position sensor.</p> <p>3) Measure the resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>3</p> <p>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 3 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	4.7 V	Repair the battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Replace the throttle position sensor. <Ref. to FU(H4DOSTC)-32, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

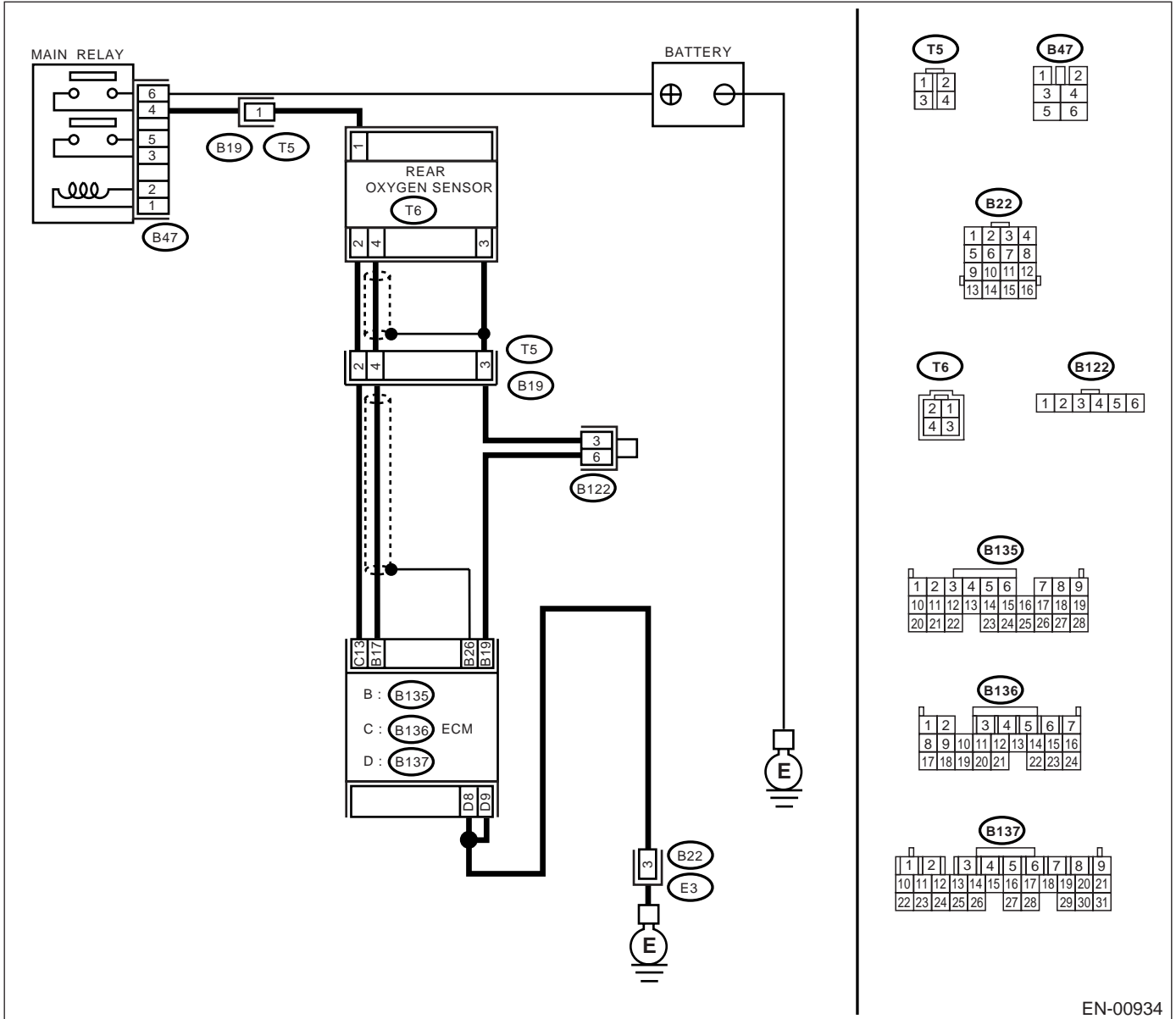
ENGINE (DIAGNOSTICS)

O: DTC P0136 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 2) —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-00934

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor. Does the value fluctuate? NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.>	The value fluctuates.	Go to step 5.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool. Is the measured value within the specified value?	0.2 — 0.4 V	Go to step 3.	Replace the rear oxygen sensor. <Ref. to FU(H4DOSTC)-39, Rear Oxygen Sensor.>
3 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 26 — (T6) No. 4: Does the measured value exceed the specified value?	3 Ω	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 4.
4 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 4 (+) — Engine ground (-): Does the measured value exceed the specified value?	0.2 V	Replace the rear oxygen sensor. <Ref. to FU(H4DOSTC)-39, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
5 CHECK EXHAUST SYSTEM. Check the exhaust system parts. Is there a fault in exhaust system? NOTE: Check the following items. <ul style="list-style-type: none"> • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor 	There is a fault.	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOSTC)-39, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

P: DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOSTC)-114, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Q: DTC P0172 — SYSTEM TOO RICH (BANK 1) —

• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

Step	Value	Yes	No
1 CHECK EXHAUST SYSTEM. Are there holes or loose bolts on exhaust system?	There is no problem.	Go to step 2.	Repair the exhaust system.
2 CHECK AIR INTAKE SYSTEM. Are there holes, loose bolts or disconnection of hose on air intake system?	There is no problem.	Go to step 3.	Repair the air intake system.
3 CHECK PCV VALVE. Is PCV valve clogged?	PCV valve is not clogged.	Go to step 4.	Replace PCV valve.
4 CHECK FUEL PRESSURE. Warning: •Place "NO FIRE" signs near the working area. •Be careful not to spill fuel on the floor. 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Is the measured value within the specified value? Warning: Before removing the fuel pressure gauge, release fuel pressure. NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	284 — 314 kPa (2.9 — 3.2 kg/cm ² , 41 — 46 psi)	Go to step 5.	Repair the following items. Fuel pressure too high • Clogged fuel return line or bent hose Fuel pressure too low • Improper fuel pump discharge • Clogged fuel supply line

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK FUEL PRESSURE. After connecting pressure regulator vacuum hose, measure fuel pressure. Is the measured value within the specified value?</p> <p>Warning: Before removing the fuel pressure gauge, release fuel pressure.</p> <p>NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</p>	206 — 235 kPa (2.1 — 2.4 kg/cm ² , 30 — 34 psi)	Go to step 6.	<p>Repair the following items.</p> <p>Fuel pressure too high</p> <ul style="list-style-type: none"> • Faulty pressure regulator • Clogged fuel return line or bent hose <p>Fuel pressure too low</p> <ul style="list-style-type: none"> • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
<p>6 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor. Does the measured value exceed the specified value?</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	60°C (140°F)	Go to step 7.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOSTC)-28, Engine Coolant Temperature Sensor.>
<p>7 CHECK INTAKE MANIFOLD PRESSURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of intake manifold pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.> Is the measured value within the specified value?</p>	Ignition ON 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step 8.	Replace the mass air flow and intake manifold pressure sensor. <Ref. to FU(H4DOSTC)-33, Mass Air Flow and Intake Air Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Value	Yes	No
8	<p>CHECK INTAKE AIR TEMPERATURE SENSOR.</p> <ol style="list-style-type: none">1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).2) Place the shift lever in neutral position.3) Turn the A/C switch to OFF.4) Turn all accessory switches to OFF.5) Open the front hood.6) Measure the ambient temperature.7) Read the data of intake manifold pressure sensor signal using Subaru Select Monitor. Is the value obtained when ambient temperature is subtracted from intake air temperature within the specified range? <p>NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOSTC)-26, Subaru Select Monitor.></p>	-10°C (14°F) — 50°C (122°F)	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOSTC)-33, Mass Air Flow and Intake Air Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

R: DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW

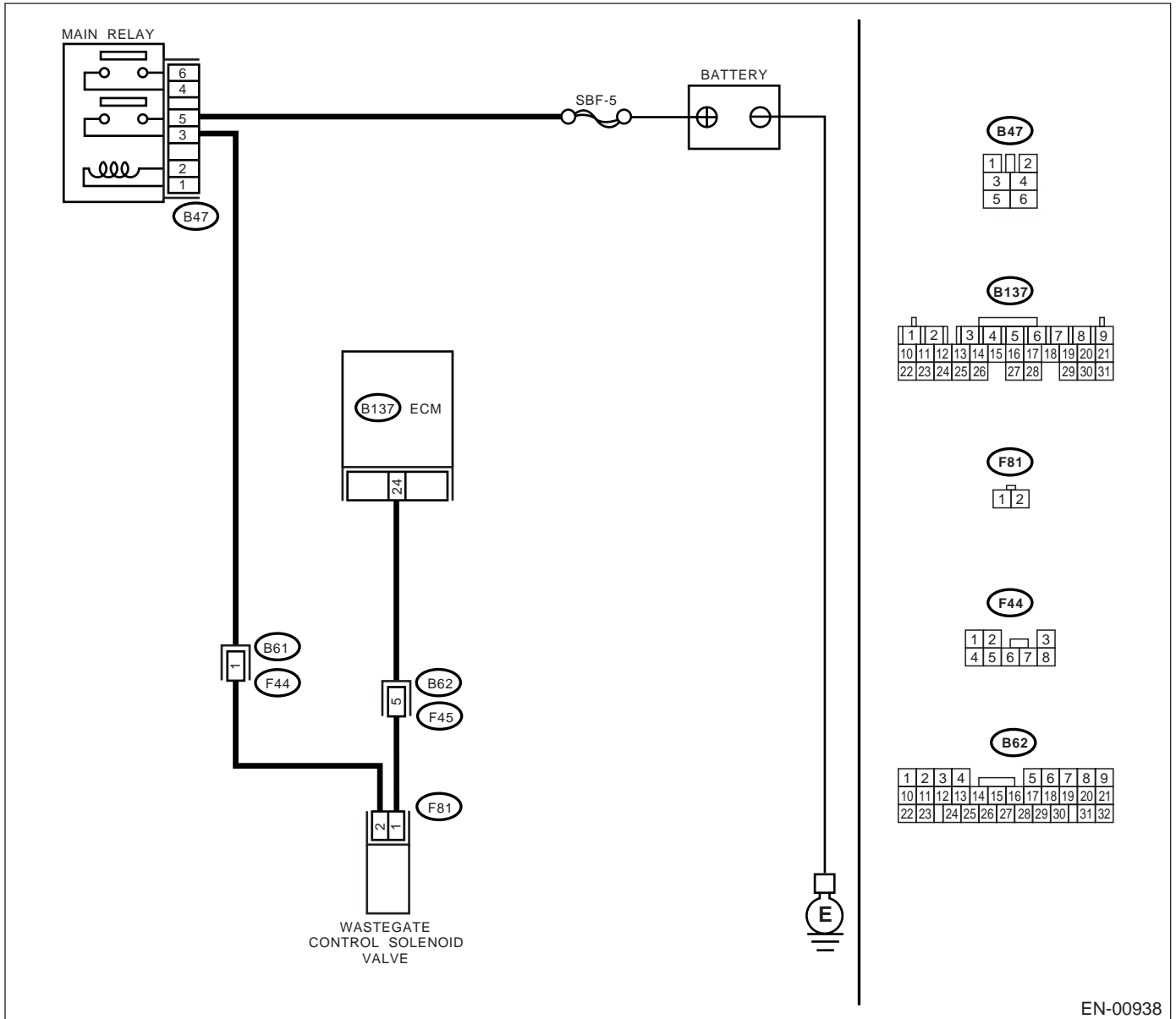
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00938

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 24 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. Contact with your Subaru distributor. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground.</p> <p>Connector & terminal (F81) No. 1 — Engine ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 3.	Repair the ground short circuit in harness between ECM and wastegate control solenoid valve connector.
<p>3</p> <p>CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and wastegate control solenoid valve of harness connector.</p> <p>Connector & terminal (B137) No. 24 — (F81) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair the open circuit in harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and wastegate control solenoid valve connector
<p>4</p> <p>CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2: Is the measured value within the specified value?</p>	30 — 34 Ω	Go to step 5.	Replace the wastegate control solenoid valve. <Ref. to IN(H4DOSTC)-21, Wastegate Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. Connector & terminal (F81) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair the open circuit in harness between main relay and wastegate control solenoid valve connector.
<p>6 CHECK POOR CONTACT. Check poor contact in wastegate control solenoid valve connector. Is there poor contact in wastegate control solenoid valve connector?</p>	There is poor contact.	Repair the poor contact in wastegate control solenoid valve connector.	Contact with your Subaru distributor. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

S: DTC P0246 — TURBO/SUPER CHARGERWASTEGATESOLENOID “A” HIGH

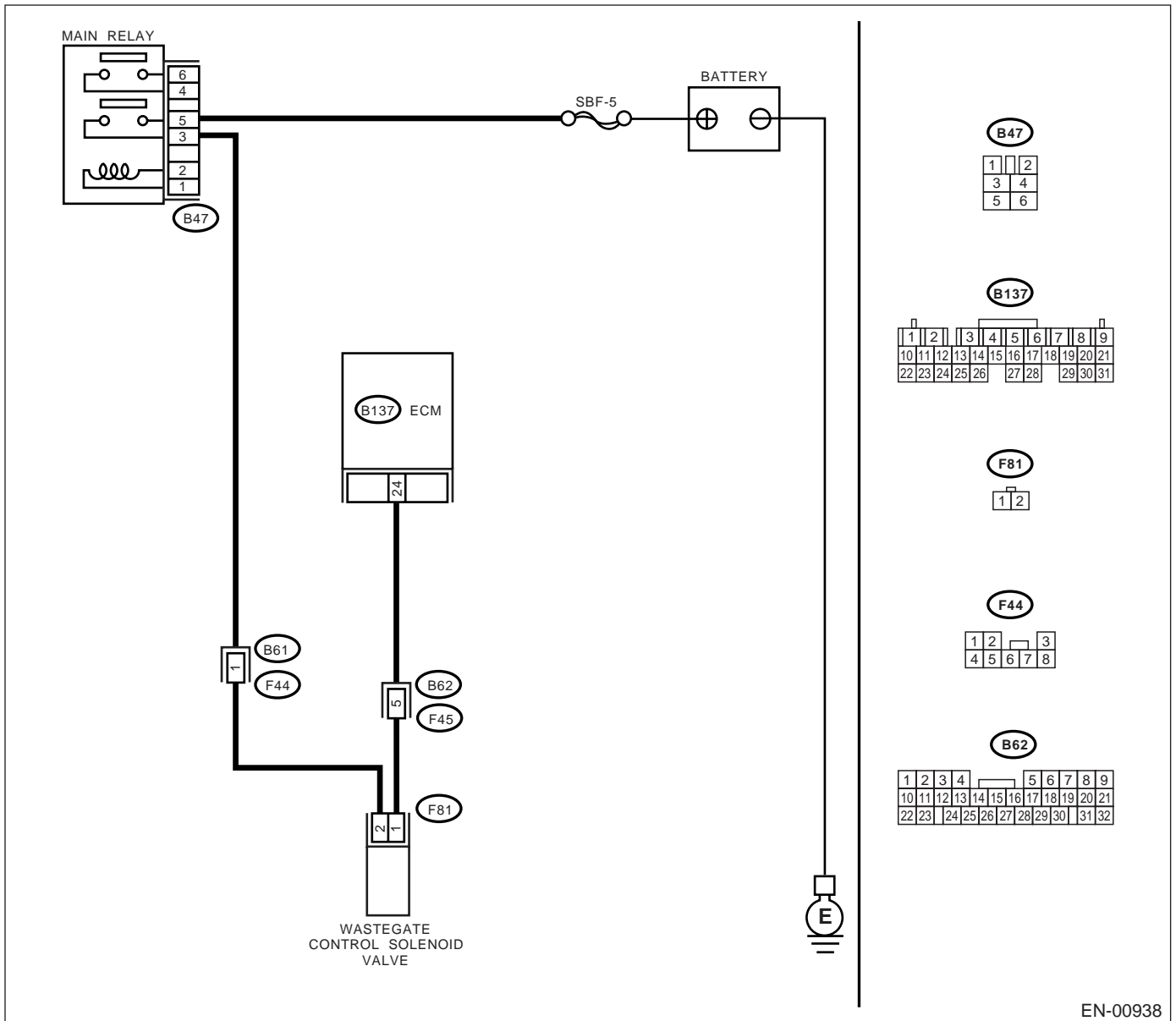
• **TROUBLE SYMPTOM:**

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 24 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
3 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 24 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 4.
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. Terminals No. 1 — No. 2: Is the measured value less than the specified value?	1 Ω	Replace the wastegate control solenoid valve <Ref. to IN(H4DOSTC)-21, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

T: DTC P0249 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “B” LOW

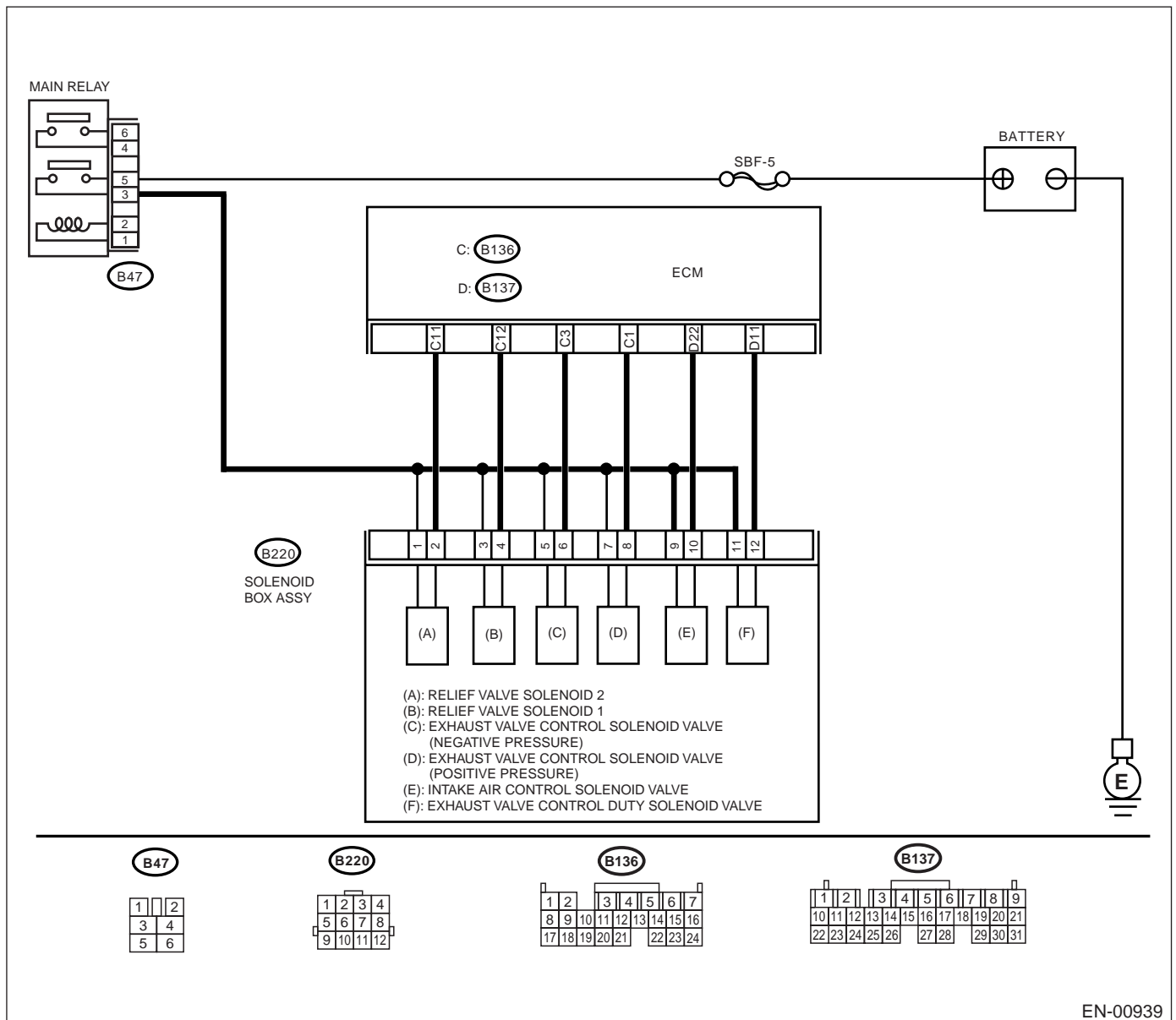
• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 11 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN EXHAUST VALVE CONTROL DUTY SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from exhaust valve control duty solenoid valve and ECM. 3) Measure the resistance of harness between exhaust valve control duty solenoid valve connector and engine ground.</p> <p>Connector & terminal (B220) No. 12 — Engine ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 3.	Repair the ground short circuit in harness between ECM and exhaust valve control duty solenoid valve connector.
<p>3</p> <p>CHECK HARNESS BETWEEN EXHAUST VALVE CONTROL DUTY SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and exhaust valve control duty solenoid valve of harness connector.</p> <p>Connector & terminal (B137) No. 11 — (B220) No. 12: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair the open circuit in harness between ECM and exhaust valve control duty solenoid valve connector.
<p>4</p> <p>CHECK EXHAUST VALVE CONTROL DUTY SOLENOID VALVE. Measure the resistance between purge control solenoid valve terminals.</p> <p>Terminals No. 11 — No. 12: Is the measured value within the specified value?</p>	17 — 21 Ω	Go to step 5.	Replace the exhaust valve control duty solenoid valve. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
<p>5</p> <p>CHECK POWER SUPPLY TO EXHAUST VALVE CONTROL DUTY SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between exhaust valve control duty solenoid valve and engine ground.</p> <p>Connector & terminal (B220) No. 11 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair the open circuit in harness between main relay and exhaust valve control duty solenoid valve connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in exhaust valve control duty solenoid valve and ECM connectors. Is there poor contact in exhaust valve control duty solenoid valve and ECM connectors?	There is poor contact.	Repair the poor contact in exhaust valve control duty solenoid valve and ECM connectors.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

U: DTC P0250 — TURBO/SUPER CHARGER WASTEGATESOLENOID “B” HIGH

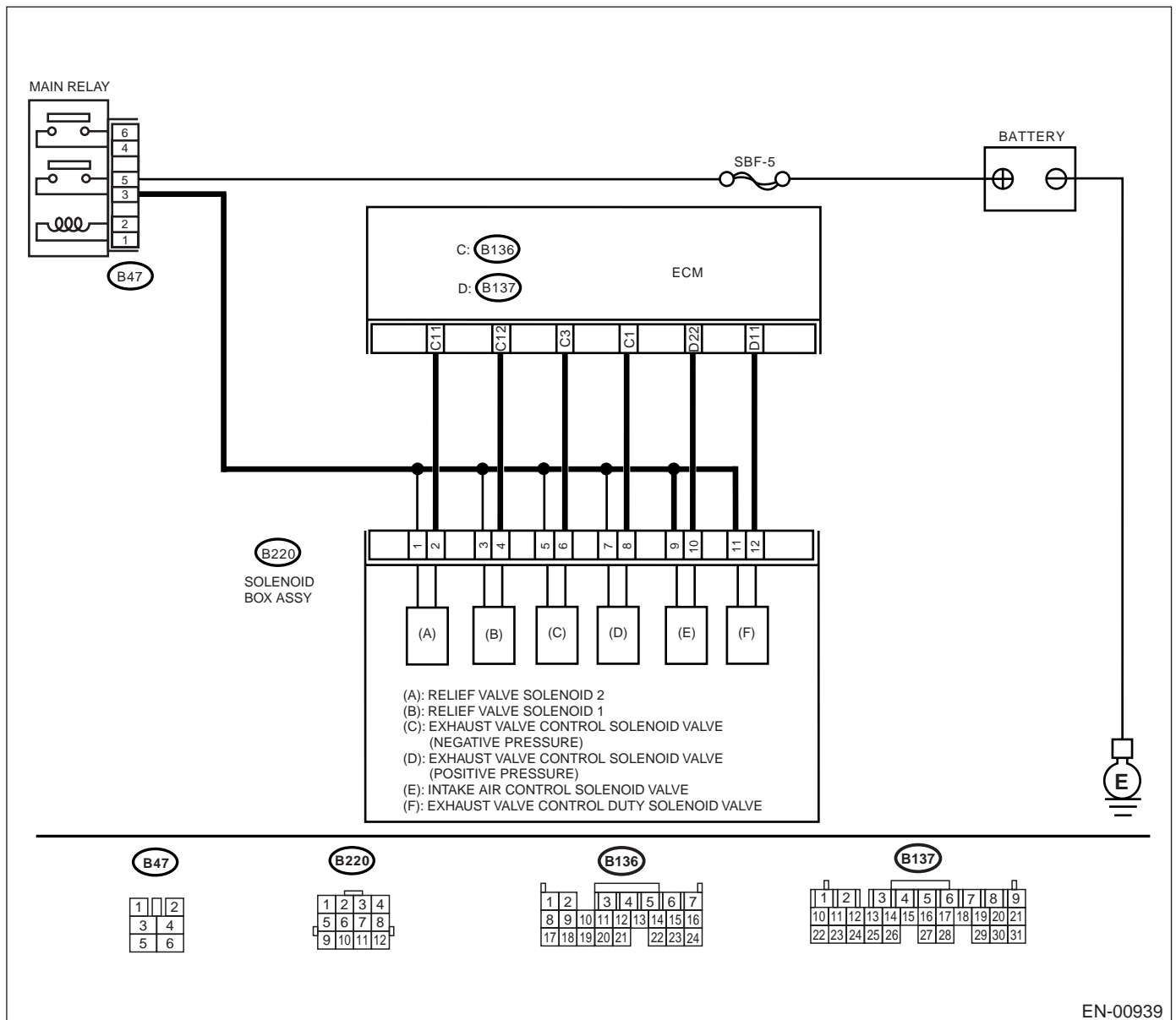
• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 11 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
3 CHECK HARNESS BETWEEN EXHAUST VALVE CONTROL DUTY SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust valve control duty solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 11 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair the battery short circuit in harness between ECM and exhaust valve control duty solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 4.
4 CHECK EXHAUST VALVE CONTROL DUTY SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between exhaust valve control duty solenoid valve terminals. Terminals No. 11 — No. 12: Is the measured value less than the specified value?	1 Ω	Replace the exhaust valve control duty solenoid valve <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.> and ECM <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM and exhaust valve control duty solenoid valve connectors. Is there poor contact in ECM exhaust valve control duty solenoid valve connectors?	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

V: DTC P0261 — CYLINDER 1 INJECTOR CIRCUIT LOW —

NOTE:

For the diagnostic procedure, refer to DTC P0270. <Ref. to EN(H4DOSTC)-132, DTC P0270 — CYLINDER 4 INJECTOR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

W: DTC P0264 — CYLINDER 2 INJECTOR CIRCUIT LOW —

NOTE:

For the diagnostic procedure, refer to DTC P0270. <Ref. to EN(H4DOSTC)-132, DTC P0270 — CYLINDER 4 INJECTOR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

X: DTC P0267 — CYLINDER 3 INJECTOR CIRCUIT LOW —

NOTE:

For the diagnostic procedure, refer to DTC P0270. <Ref. to EN(H4DOSTC)-132, DTC P0270 — CYLINDER 4 INJECTOR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Y: DTC P0270 — CYLINDER 4 INJECTOR CIRCUIT LOW —

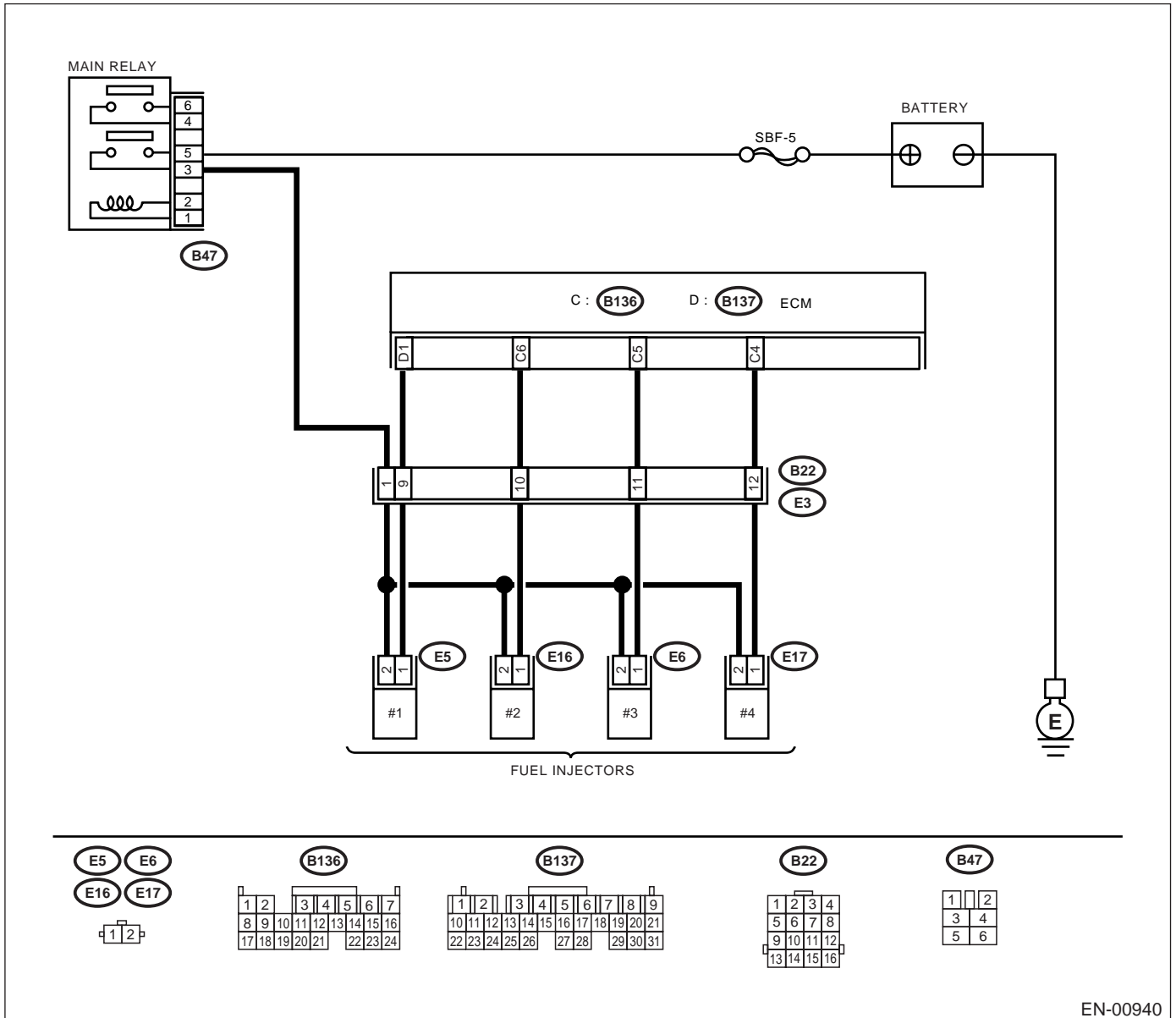
• TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00940

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OPERATION OF EACH FUEL INJECTOR.</p> <p>While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.</p> <p>Does the fuel injector operate?</p>	Operates.	Check the fuel pressure. <Ref. to ME(H4DOSTC)-26, FUEL PRESSURE, .>	Go to step 2.
<p>2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from #1 cylinder fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground.</p> <p>Connector & terminal</p> <p>#1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
<p>3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</p> <p>1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal</p> <p>(B137) No. 1 — (E5) No. 1: (B136) No. 6 — (E16) No. 1: (B136) No. 5 — (E6) No. 1: (B136) No. 4 — (E6) No. 1:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in the harness between ECM and fuel injector connector • Poor contact in the coupling connector
<p>4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</p> <p>Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal</p> <p>(B137) No. 1 — Chassis ground: (B136) No. 6 — Chassis ground: (B136) No. 5 — Chassis ground: (B136) No. 4 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Repair the ground short circuit in harness between ECM and fuel injector connector.
<p>5 CHECK EACH FUEL INJECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals.</p> <p>Terminals</p> <p>No. 1 — No. 2:</p> <p>Is the measured value within the specified value?</p>	5 — 20 Ω	Go to step 6.	Replace the faulty fuel injector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(H4DOSTC)-246, INSPECTION, General Diagnostic Table.>

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Z: DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

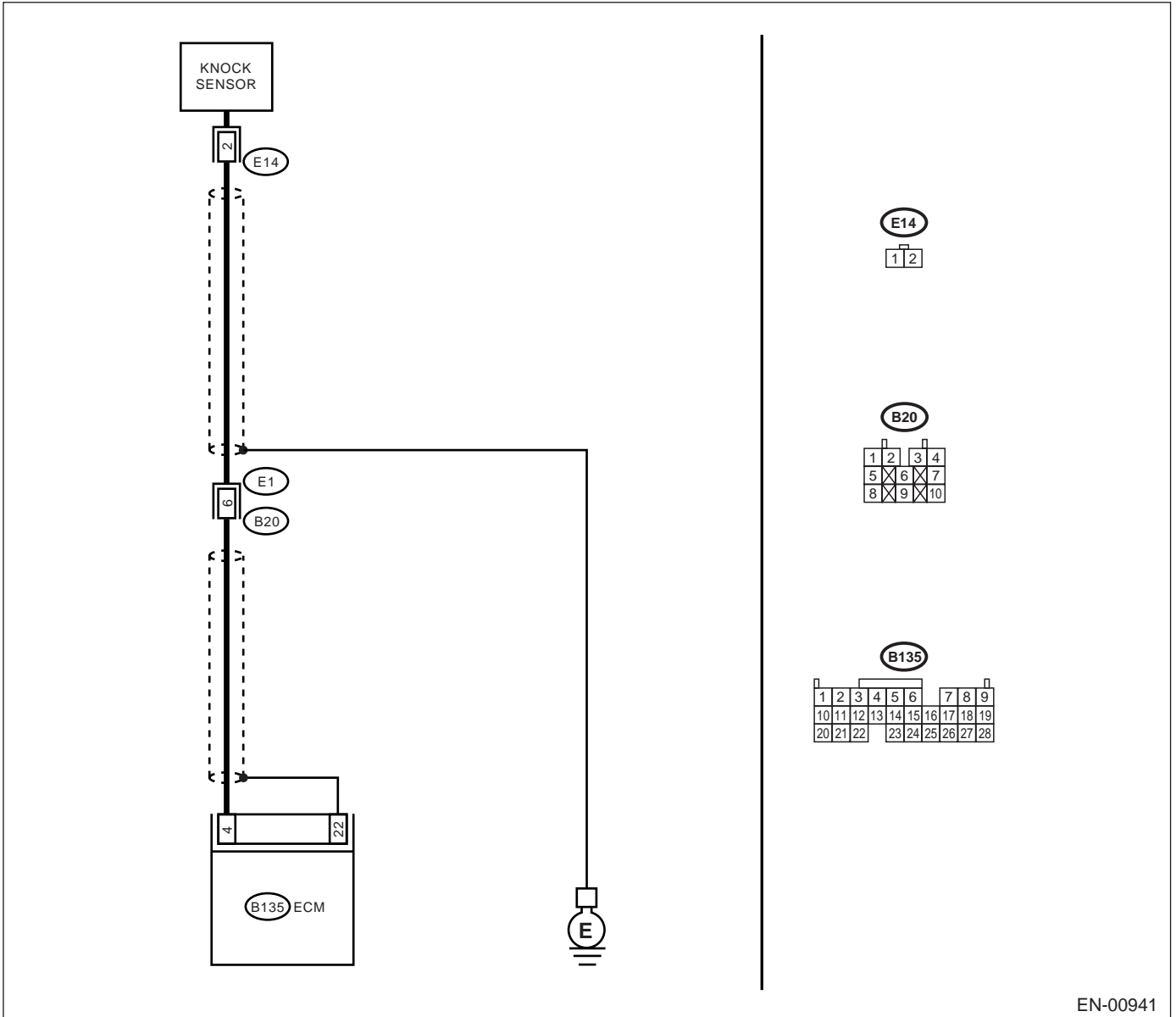
• TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00941

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground.</p> <p>Connector & terminal (B135) No. 4 — Chassis ground: Does the measured value exceed the specified value?</p>	700 kΩ	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
<p>2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground.</p> <p>Terminal No. 2 — Engine ground: Does the measured value exceed the specified value?</p>	700 kΩ	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
<p>3 CHECK CONDITION OF KNOCK SENSOR INSTALLATION. Is the knock sensor installation bolt tightened securely?</p>	Tightened securely.	Replace the knock sensor. <Ref. to FU(H4DOSTC)-31, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AA:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

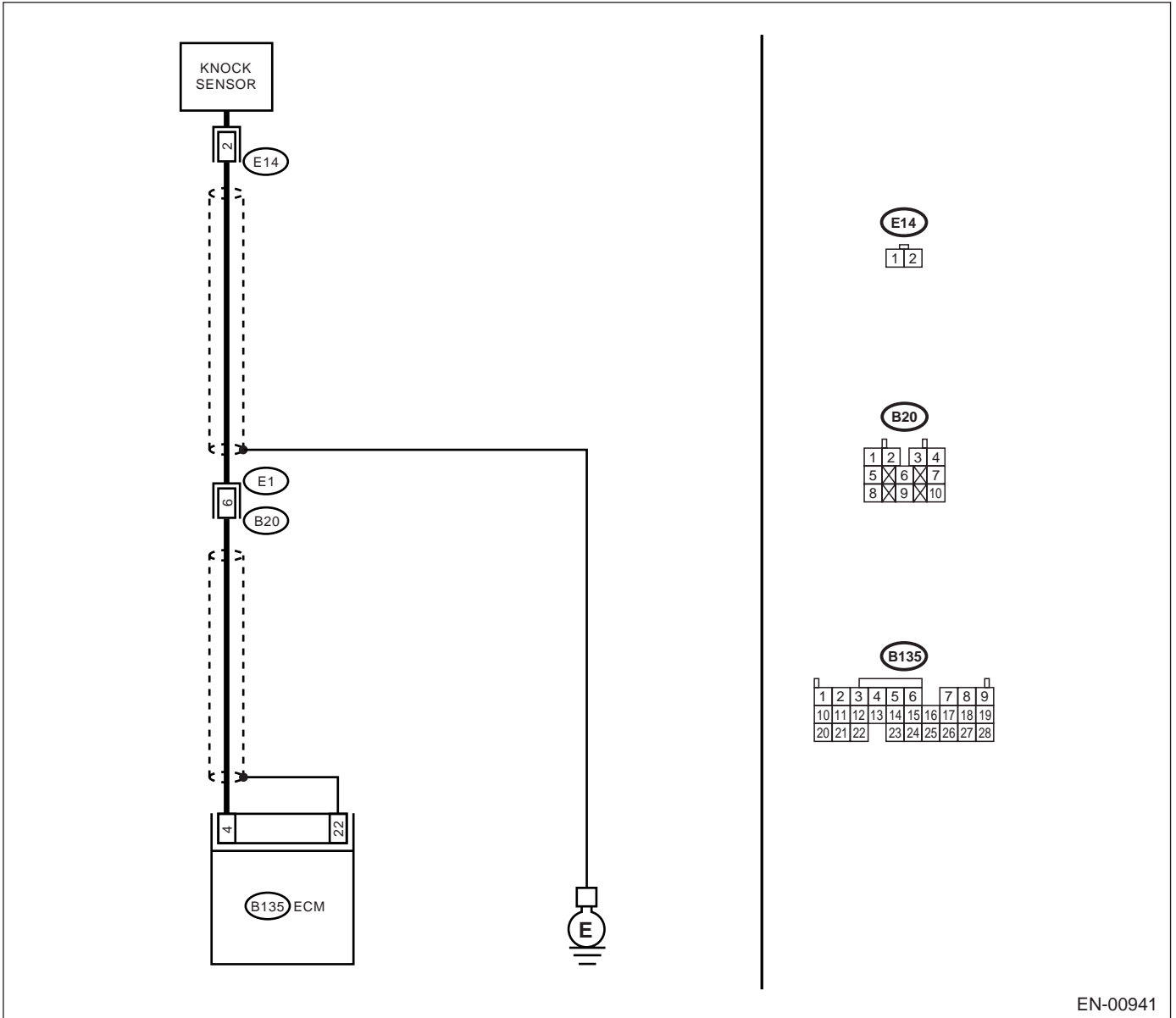
• TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00941

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 4 — Chassis ground: Is the measured value less than the specified value?</p>	400 kΩ	Go to step 2.	Go to step 3.
<p>2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. Terminal No. 2 — Engine ground: Is the measured value less than the specified value?</p>	400 kΩ	Replace the knock sensor. <Ref. to FU(H4DOSTC)-31, Knock Sensor.>	Repair the ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair the short circuit of harness together with shield.
<p>3 CHECK INPUT SIGNAL FOR ECM. 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 4 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	2 V	Even if MI lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair the poor contact in ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AB:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

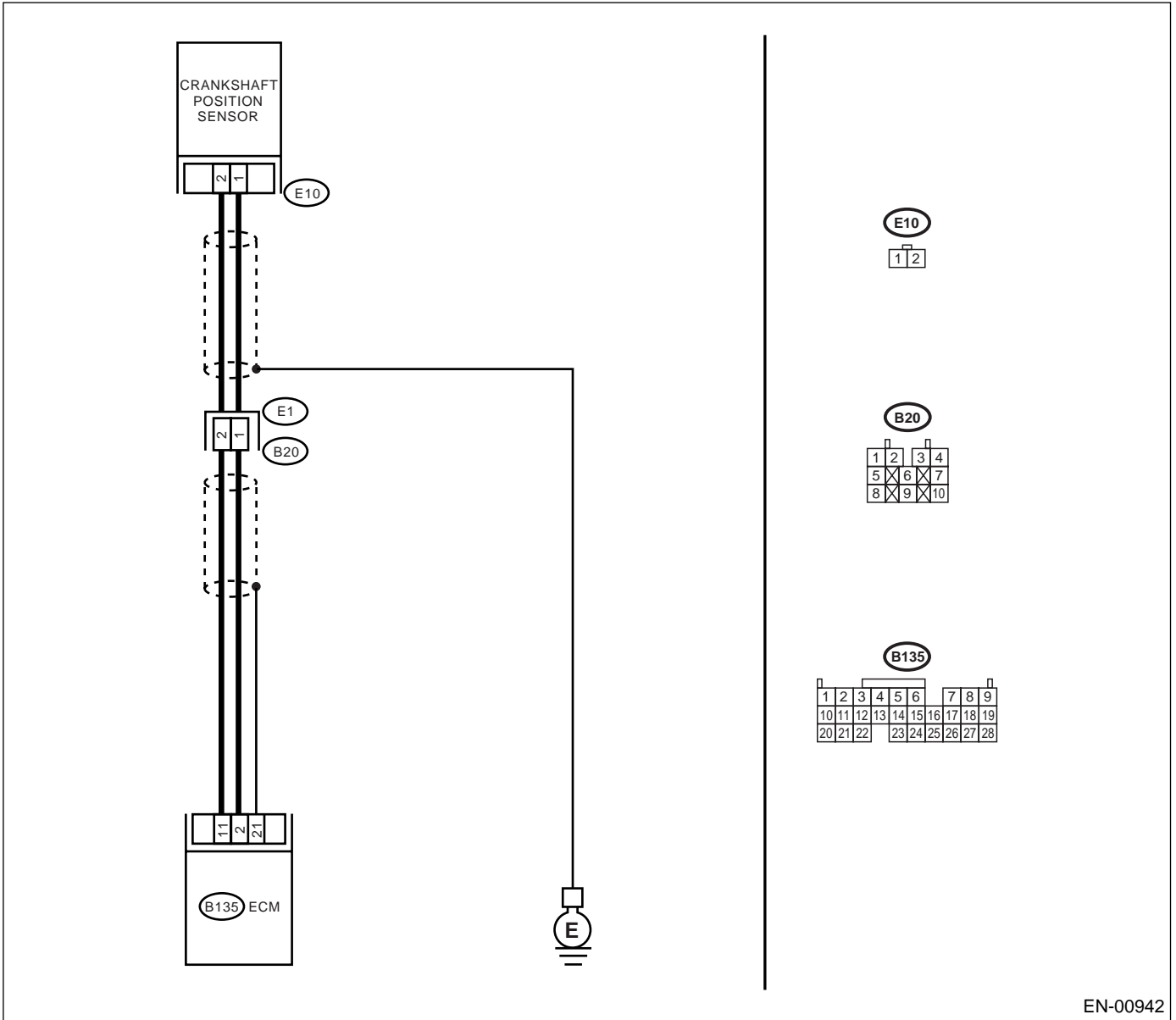
• **TROUBLE SYMPTOM:**

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-00942

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	100 k Ω	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	<p>Repair the ground short circuit in harness between crankshaft position sensor and ECM connector.</p> <p>NOTE: The harness between both connectors are shielded. Repair the ground short circuit in harness together with shield.</p>	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 4.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>4</p> <p>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</p> <p>Is the crankshaft position sensor installation bolt tightened securely?</p>	Tightened securely.	Go to step 5.	Tighten the crankshaft position sensor installation bolt securely.
<p>5</p> <p>CHECK CRANKSHAFT POSITION SENSOR.</p> <p>1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified value?</p>	1 — 4 k Ω	Repair the poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4DOSTC)-29, Crankshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
 ENGINE (DIAGNOSTICS)

AC:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)N —

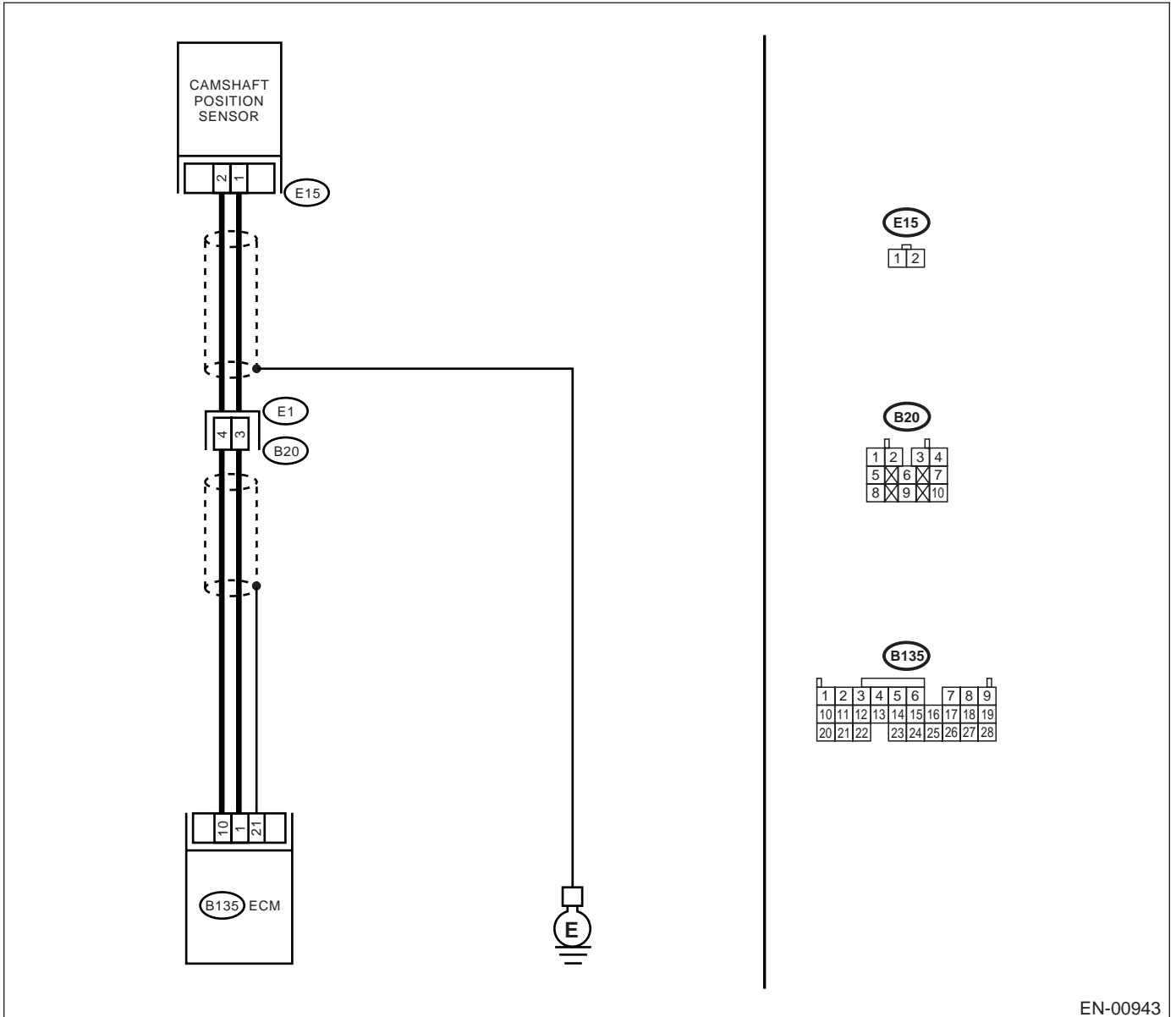
• TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00943

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 1 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	100 kΩ	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	Go to step 2.
<p>2 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 1 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	<p>Repair the ground short circuit in harness between camshaft position sensor and ECM connector.</p> <p>NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.</p>	Go to step 3.
<p>3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	5 Ω	Go to step 4.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>4 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</p> <p>Is the camshaft position sensor installation bolt tightened securely?</p>	Tightened securely.	Go to step 5.	Tighten the camshaft position sensor installation bolt securely.
<p>5 CHECK CAMSHAFT POSITION SENSOR.</p> <p>1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified value?</p>	1 — 4 kΩ	Repair the poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(H4DOSTC)-30, Camshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AD:DTC P0350 — IGNITION COIL PRIMARY/SECONDARY CIRCUIT —

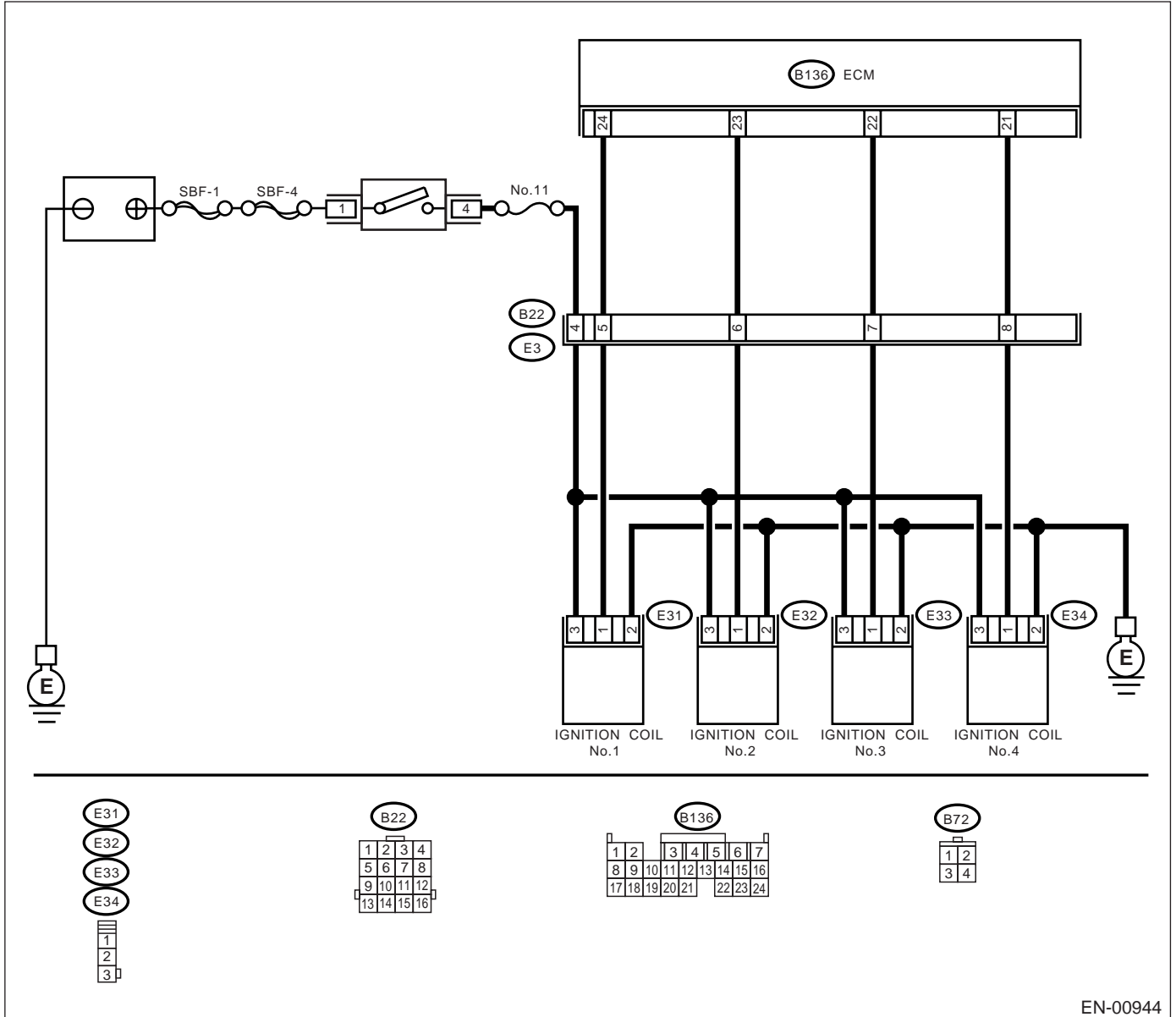
• **TROUBLE SYMPTOM:**

- Failure of engine to start
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4DOSTC)-35, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-00944

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPARK PLUG CONDITION. 1) Remove the spark plug. <Ref. to IG(H4DOSTC)-5, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOSTC)-6, INSPECTION, Spark Plug.> Is spark plug's status OK?	OK	Go to step 2.	Replace the spark plug.
2 CHECK IGNITION SYSTEM FOR SPARKS. 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOSTC)-44, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> 3) Contact the spark plug's thread portion on engine. 4) While opening throttle valve fully, crank the engine to check that spark occurs at each cylinder. Does the spark occur at each cylinder?	Spark occurs.	Check the fuel pump system. <Ref. to EN(H4DOSTC)-60, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 3.
3 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E31) No. 3 (+) — Engine ground (-): (E32) No. 3 (+) — Engine ground (-): (E33) No. 3 (+) — Engine ground (-): (E34) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4 CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E31) No. 2 — Engine ground: (E32) No. 2 — Engine ground: (E33) No. 2 — Engine ground: (E34) No. 2 — Engine ground: Is the measured value less than the specified value?	5 Ω	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector.</p> <p>Connector & terminal (B136) No. 21 — (E34) No. 1: (B136) No. 22 — (E33) No. 1: (B136) No. 23 — (E32) No. 1: (B136) No. 24 — (E31) No. 1:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector
<p>6 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <p>Measure the resistance of harness between ECM and engine ground.</p> <p>Connector & terminal: (B136) No. 21 — Engine ground: (B136) No. 22 — Engine ground: (B136) No. 23 — Engine ground: (B136) No. 24 — Engine ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Repair the ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
<p>7 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ignition coil and ignitor assembly.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AE:DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT OPEN —

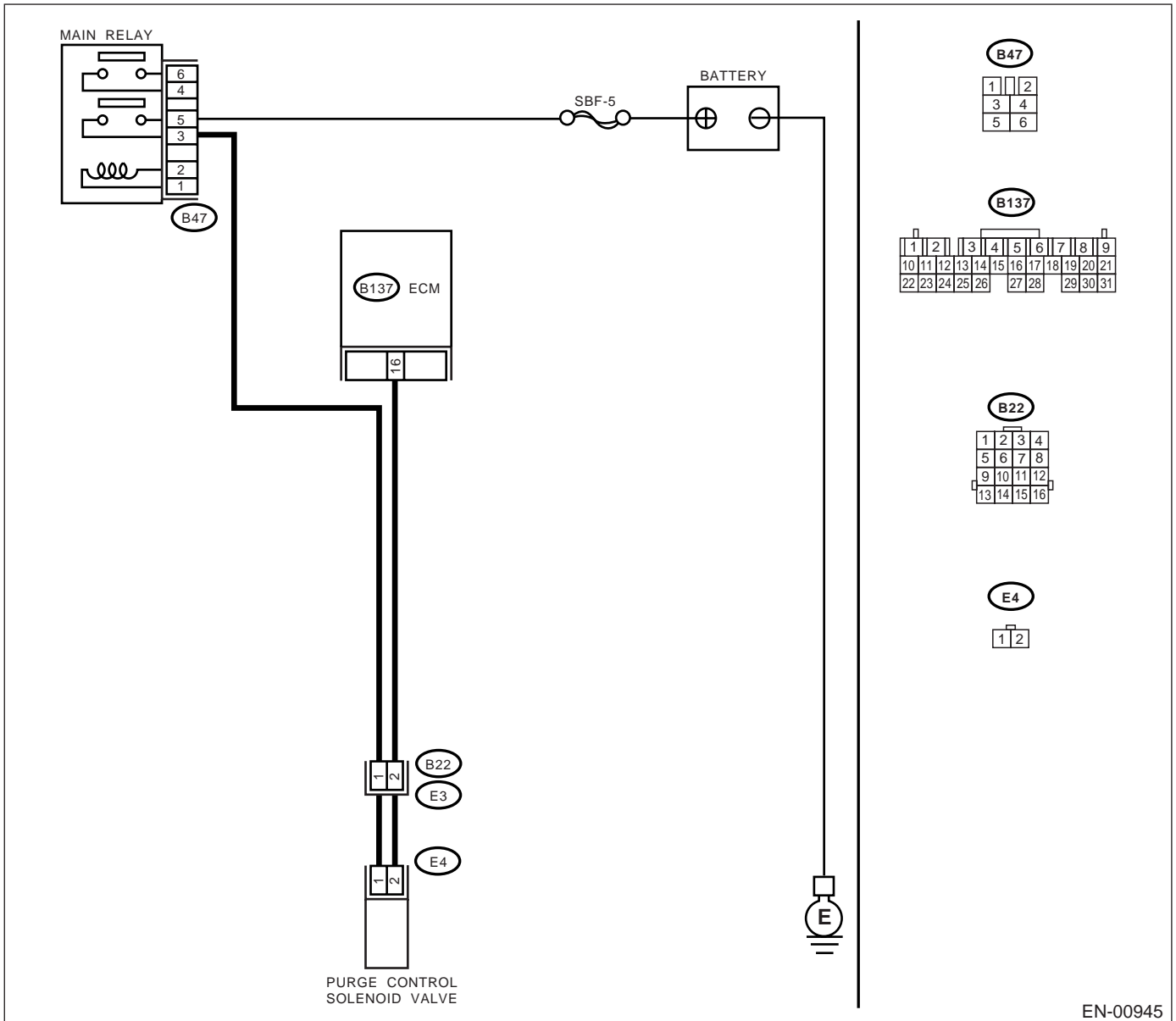
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00945

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 16 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	<p>Even if MI lights up, the circuit has returned to a normal condition at this time. Contact SUBARU distributor service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground.</p> <p>Connector & terminal (E4) No. 2 — Engine ground:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	<p>Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.</p>	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between ECM and purge control solenoid valve of harness connector.</p> <p>Connector & terminal (B137) No. 16 — (E4) No. 2:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	<p>Repair the open circuit in harness between ECM and purge control solenoid valve connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
<p>4</p> <p>CHECK PURGE CONTROL SOLENOID VALVE.</p> <p>1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p> <p>Is the measured value within the specified value?</p>	10 — 100 Ω	Go to step 5.	<p>Replace the purge control solenoid valve. <Ref. to EC(H4DOSTC)-6, Purge Control Solenoid Valve.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair the open circuit in harness between main relay and purge control solenoid valve connector.
<p>6 CHECK POOR CONTACT. Check poor contact in purge control solenoid valve connector. Is there poor contact in purge control solenoid valve connector?</p>	There is poor contact.	Repair the poor contact in purge control solenoid valve connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AF:DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT SHORTED —

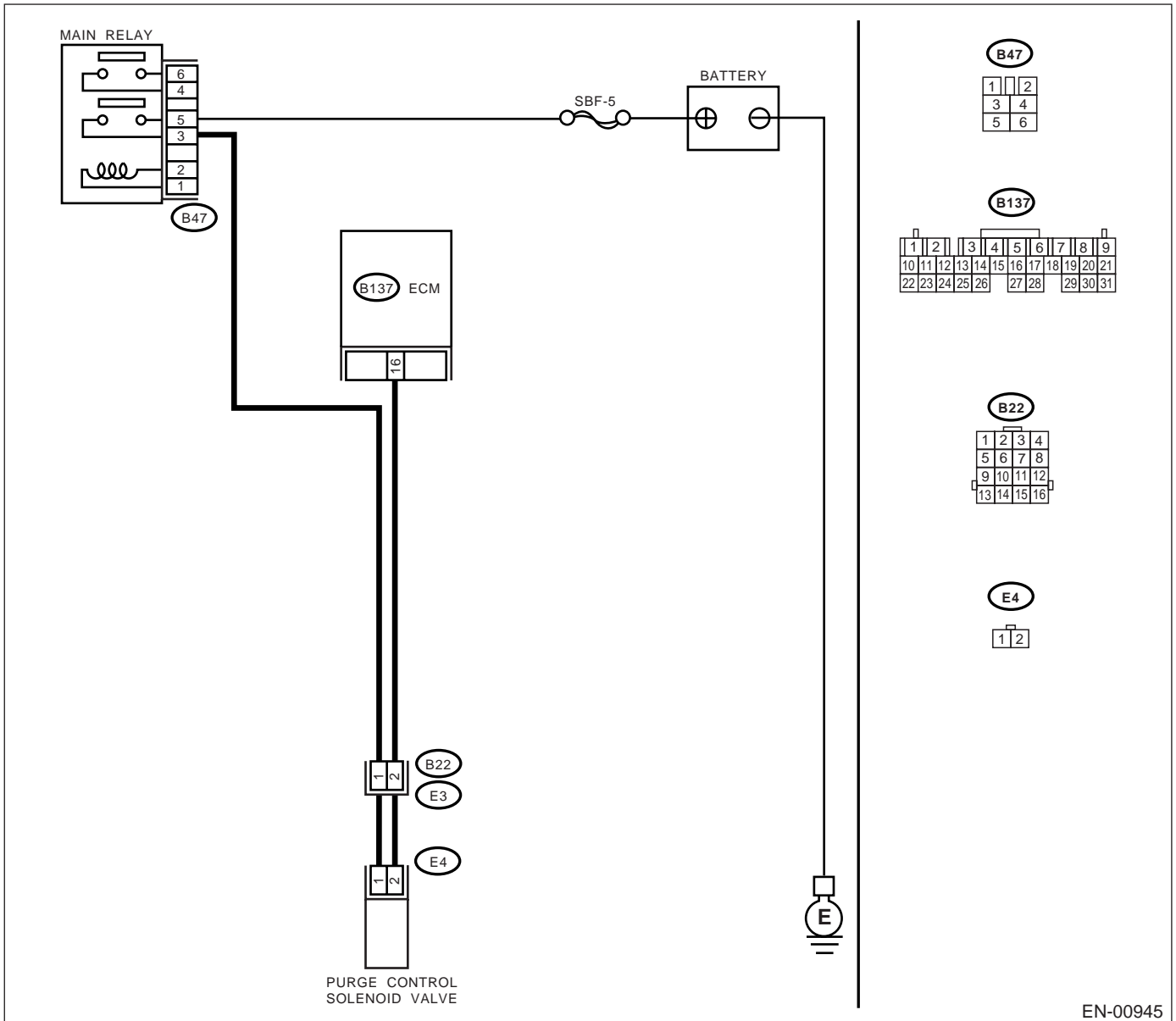
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00945

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of center console box. 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground.</p> <p>NOTE: Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOSTC)-36, Compulsory Valve Operation Check Mode.></p> <p>Connector & terminal (B137) No. 16 (+) — Chassis ground (-): Is the measured value within the specified value?</p>	0 — 13 V	Go to step 2.	Even if MI light up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
<p>2 CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 16 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 4.	Go to step 3.
<p>3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
<p>4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 16 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 5.
<p>5 CHECK PURGE CONTROL SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2: Is the measured value less than the specified value?</p>	1 Ω	Replace the purge control solenoid valve <Ref. to EC(H4DOSTC)-6, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

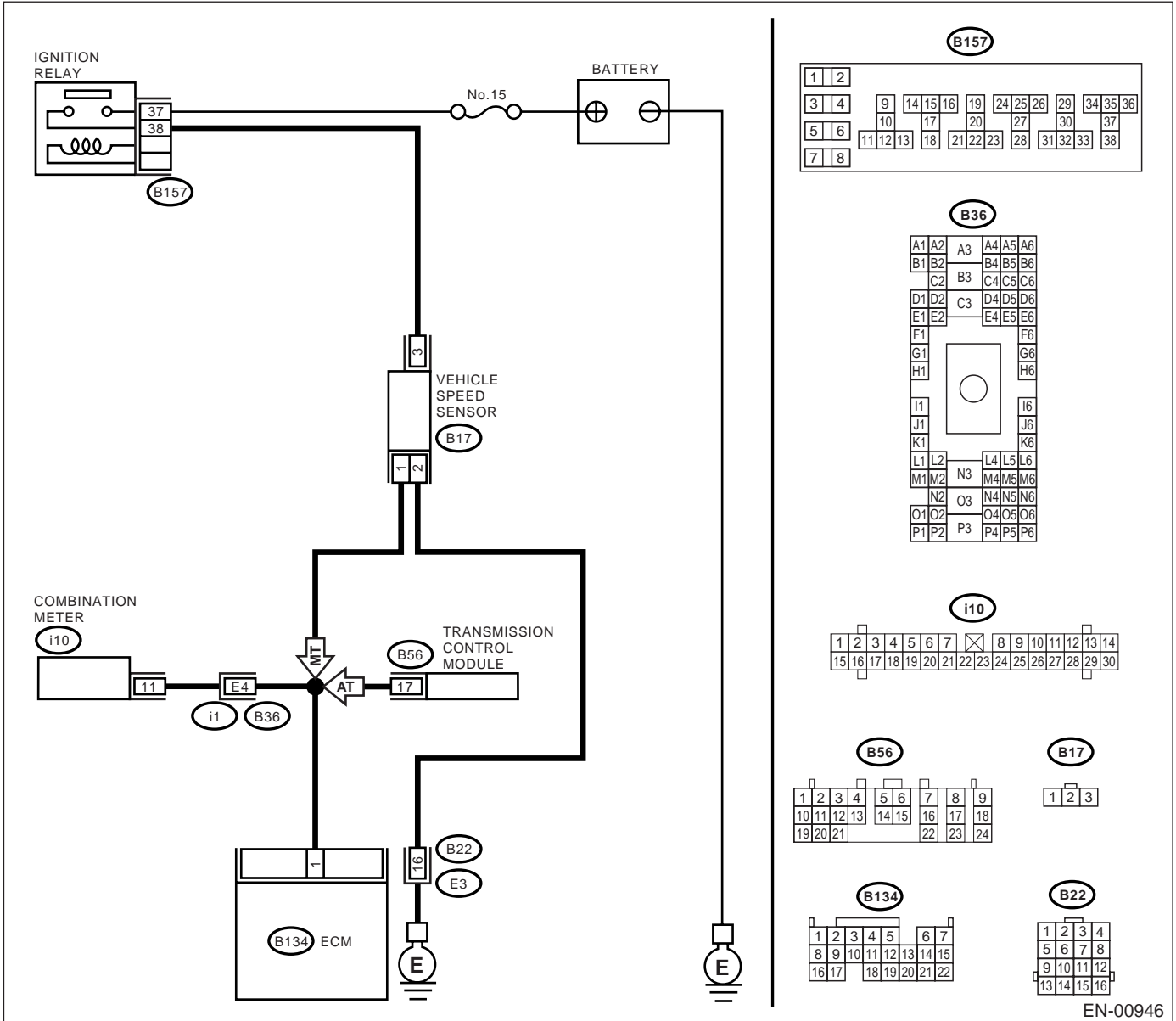
ENGINE (DIAGNOSTICS)

AG:DTC P0500 — VEHICLE SPEED SENSOR —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00946

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPEEDOMETER OPERATION IN COMBINATION METER. Does the speedometer operate normally?	Operates normally.	Go to step 2.	Check the speedometer and vehicle speed sensor. <Ref. to IDI-19, Speedometer.>
2 CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. Connector & terminal (B134) No. 1 — (i10) No. 11: Is the measured value less than the specified value?	10 Ω	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AH:DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —

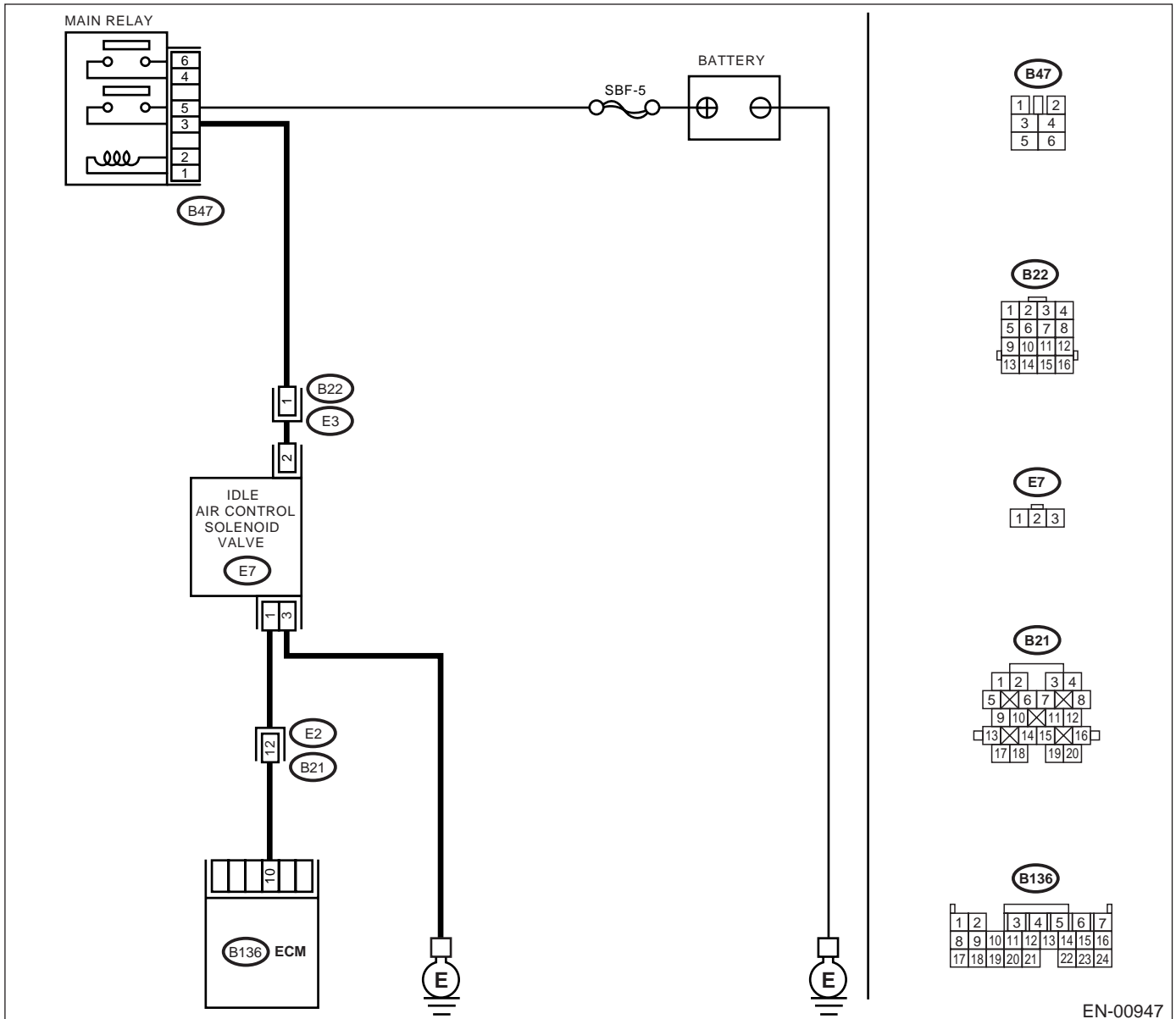
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00947

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	3 V	Repair the poor contact in ECM connector.	Go to step 2.
<p>2 CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between idle air control solenoid valve and engine ground. Connector & terminal (E7) No. 2 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
<p>3 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and idle air control solenoid valve connector. Connector & terminal (B136) No. 10 — (E7) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
<p>4 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 10 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Repair the ground short circuit in harness between ECM and idle air control solenoid valve connector.
<p>5 CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE. Measure the resistance of harness between idle air control solenoid valve connector and engine ground. Connector & terminal (E7) No. 3 — Engine ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 6.	Repair the open circuit in harness between idle air control solenoid valve connector and engine ground cable.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in ECM and idle air control solenoid valve connectors. Is there poor contact in ECM and idle air control solenoid valve connectors?	There is poor contact.	Repair the poor contact in ECM and idle air control solenoid valve connectors.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOSTC)-35, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AI: DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —

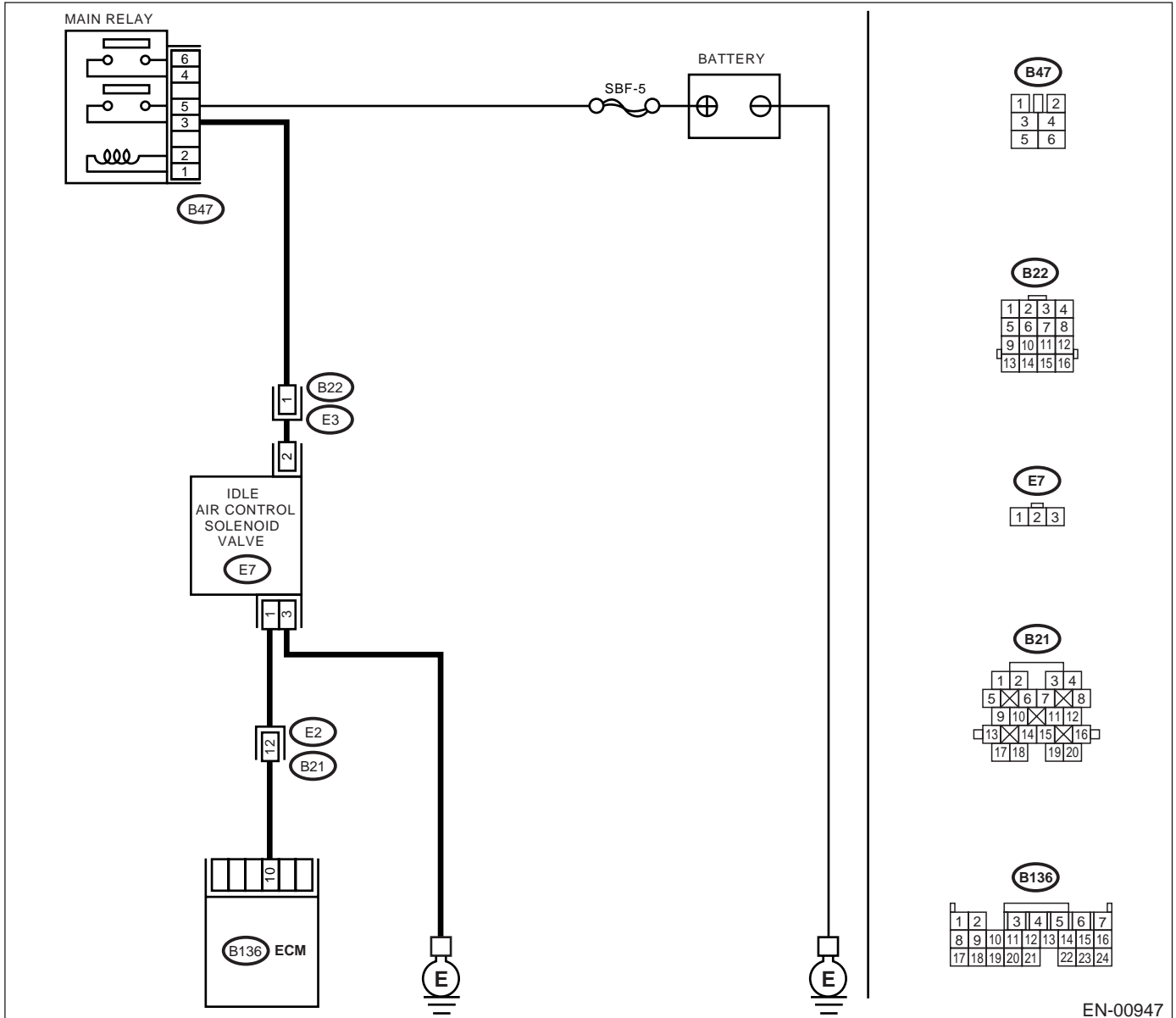
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00947

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK THROTTLE CABLE. Does the throttle cable have play for adjustment?	Cable has play correctly.	Go to step 2.	Adjust the throttle cable. <Ref. to SP(H4SO)-10, Accelerator Control Cable.>
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 4.
3 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Replace the idle air control solenoid valve <Ref. to FU(H4DOSTC)-35, Idle Air Control Solenoid Valve.> and replace ECM <Ref. to FU(H4DOSTC)-40, Engine Control Module.>.
4 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-): Does the measured value change by shaking harness and connector of ECM while monitoring the value with voltage meter?	The value changes.	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Contact SUBARU distributor service. NOTE: Insepection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AJ:DTC P0512 — STARTER REQUEST CIRCUIT —

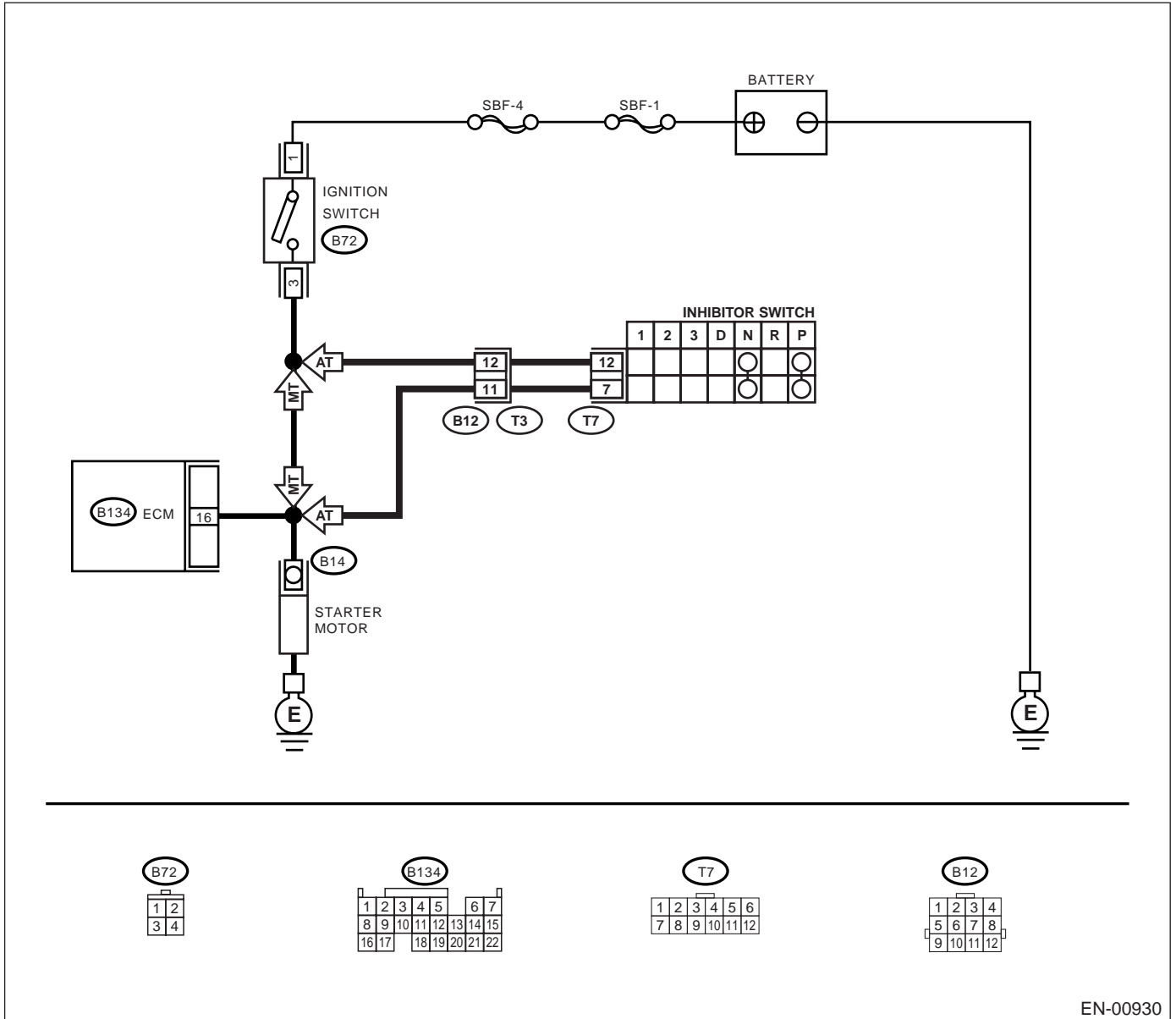
• TROUBLE SYMPTOM:

- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00930

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. NOTE: Place the inhibitor switch in each position. Does the starter motor operate when ignition switch to "ON"?	Operates.	Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Check the starter motor circuit. <Ref. to EN(H4DOSTC)-52, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AK:DTC P0562 — SYSTEM VOLTAGE LOW —

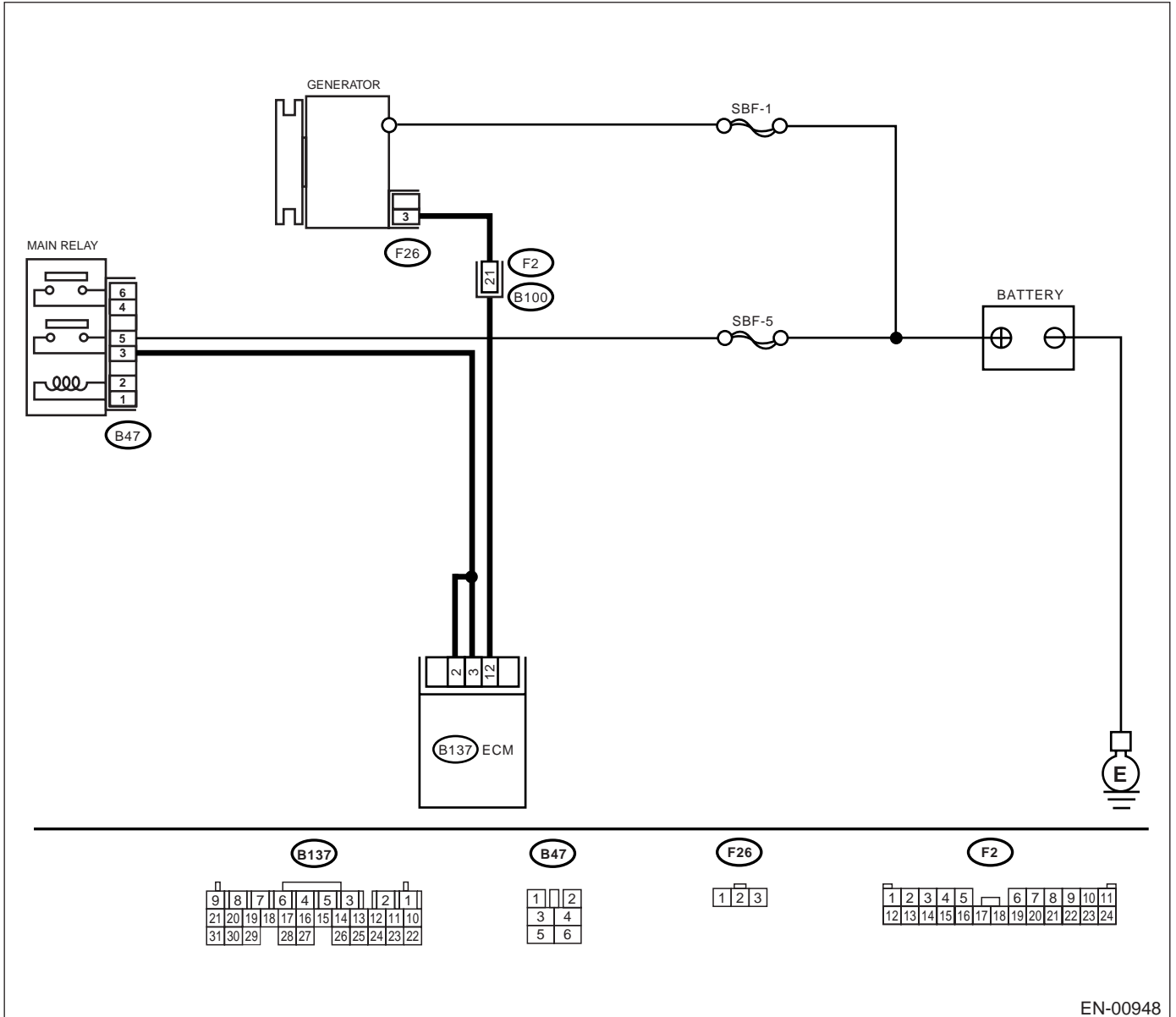
• TROUBLE SYMPTOM:

- Charge warning light comes on.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK GENERATOR. 1) Start the engine. 2) Idling after warm-up. 3) Measure the voltage between generator B terminal and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-): Is the measured value less than the specified value?	10.8 V	Go to step 2.	Repair the generator. <Ref. to SC(H4DOSTC)-14, Generator.>
2 CHECK GENERATOR. 1) Run the engine at 5,000 rpm. 2) Measure the voltage between generator B terminal and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-): Is the measured value less than the specified value?	10.8 V	Go to step 3.	Repair the generator. <Ref. to SC(H4DOSTC)-14, Generator.>
3 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Clamped tightly.	Go to step 4.	Tighten the clamp of terminal.
4 CHECK INPUT VOLTAGE OF ECM. 1) Run the engine at idle. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 1 (+) — Chassis ground (-): (B136) No. 2 (+) — Chassis ground (-): Is the measured value less than the specified value?	10.8 V	Go to step 5.	Repair the harness connector between battery, main relay and ECM.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ECM?	There is poor contact.	Repair the connector.	Go to step 6.
6 CHECK ECM. 1) Connect all connectors. 2) Erase the memory. <Ref. to EN(H4DOSTC)-35, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to EN(H4DOSTC)-33, Inspection Mode.> 4) Read out the DTC. <Ref. to EN(H4DOSTC)-32, Read Diagnostic Trouble Code.> Is the same DTC as in the current diagnosis still being output?	DTC indicated.	Replace the generator.	Go to step 7.
7 CHECK ANY OTHER DTCs APPEARANCE. Are other DTCs being output?	DTCs indicated.	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AL:DTC P0563 — SYSTEM VOLTAGE HIGH —

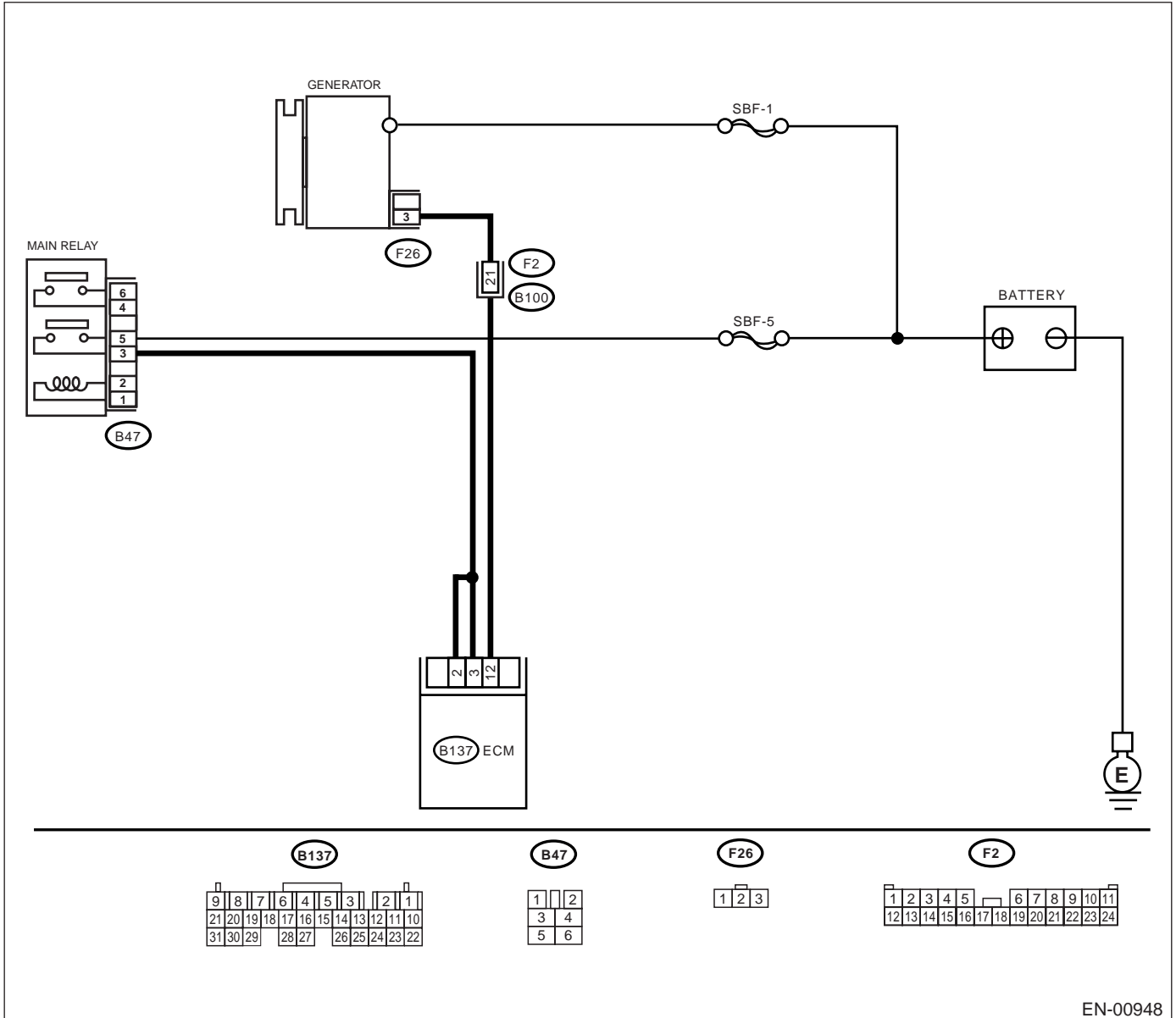
• TROUBLE SYMPTOM:

- Charge warning light comes on.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN-00948

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK GENERATOR. 1) Start the engine. 2) Idling after warm-up. 3) Measure the voltage between generator B terminal and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-): Does the measured value exceed the specified value?	16.2 V	Go to step 2.	Repair the generator. <Ref. to SC(H4DOSTC)-14, Generator.>
2 CHECK GENERATOR. 1) Run the engine at 5,000 rpm. 2) Measure the voltage between generator B terminal and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-): Does the measured value exceed the specified value?	16.2 V	Go to step 3.	Repair the generator. <Ref. to SC(H4DOSTC)-14, Generator.>
3 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Clamped tightly.	Go to step 4.	Tighten the clamp of terminal.
4 CHECK INPUT VOLTAGE OF ECM. 1) Run the engine at idle. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 1 (+) — Chassis ground (-): (B136) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	16.2 V	Go to step 5.	Repair the harness connector between battery, main relay and ECM.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ECM?	There is poor contact.	Repair the connector.	Go to step 6.
6 CHECK ECM. 1) Connect all connectors. 2) Erase the memory. <Ref. to EN(H4DOSTC)-35, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to EN(H4DOSTC)-33, Inspection Mode.> 4) Read out the DTC. <Ref. to EN(H4DOSTC)-32, Read Diagnostic Trouble Code.> Is the same DTC as in the current diagnosis still being output?	DTC indicated.	Replace the generator.	Go to step 7.
7 CHECK ANY OTHER DTCs APPEARANCE. Are other DTCs being output?	DTCs indicated.	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

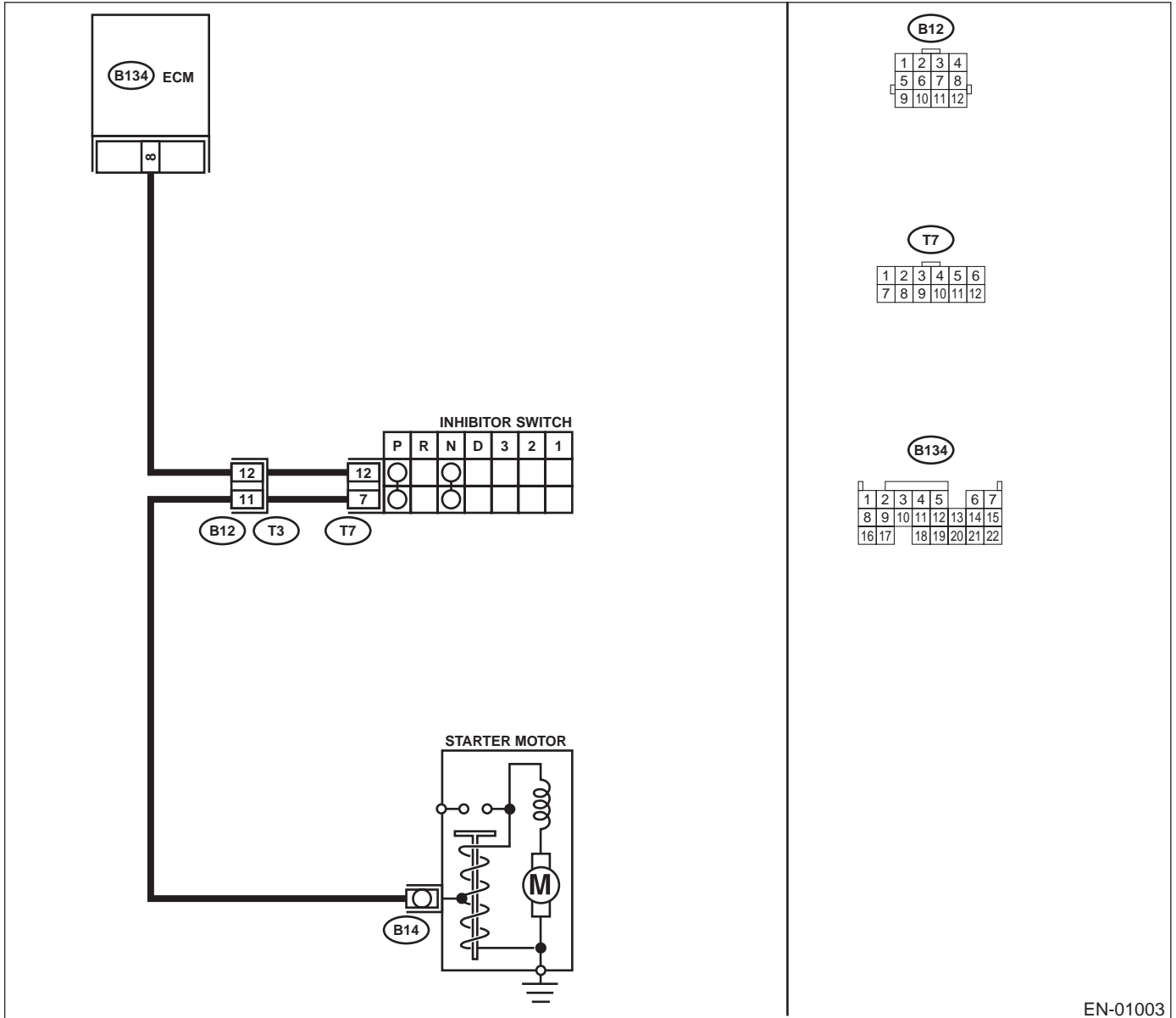
AM:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01003

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostics Trouble Code (DTC)". <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-): Is the measured value within the specified value at except "N" and "P" position?	4.5 V — 5.5 V	Even if MI lights up, the circuit has returned to a normal condition at this time.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and transmission harness connector (T3). 3) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 8 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair ground short circuit in harness between ECM and transmission harness connector.
4 CHECK TRANSMISSION HARNESS CONNECTOR. 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness connector and engine ground. Connector & terminal (T3) No. 12 — Engine ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 5.	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5 CHECK INHIBITOR SWITCH. Measure resistance between inhibitor switch connector receptacle's terminals in select lever except for "N" position. Terminals No. 7 — No. 12: Does the measured value exceed the specified value at except "N" and "P" positions?	1 MΩ	Go to step 6.	Replace inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>
6 CHECK SELECTOR CABLE CONNECTION. Is there any fault in selector cable connection to inhibitor switch?	There is a fault.	Repair selector cable connection. <Ref. to CS-12, Select Cable.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

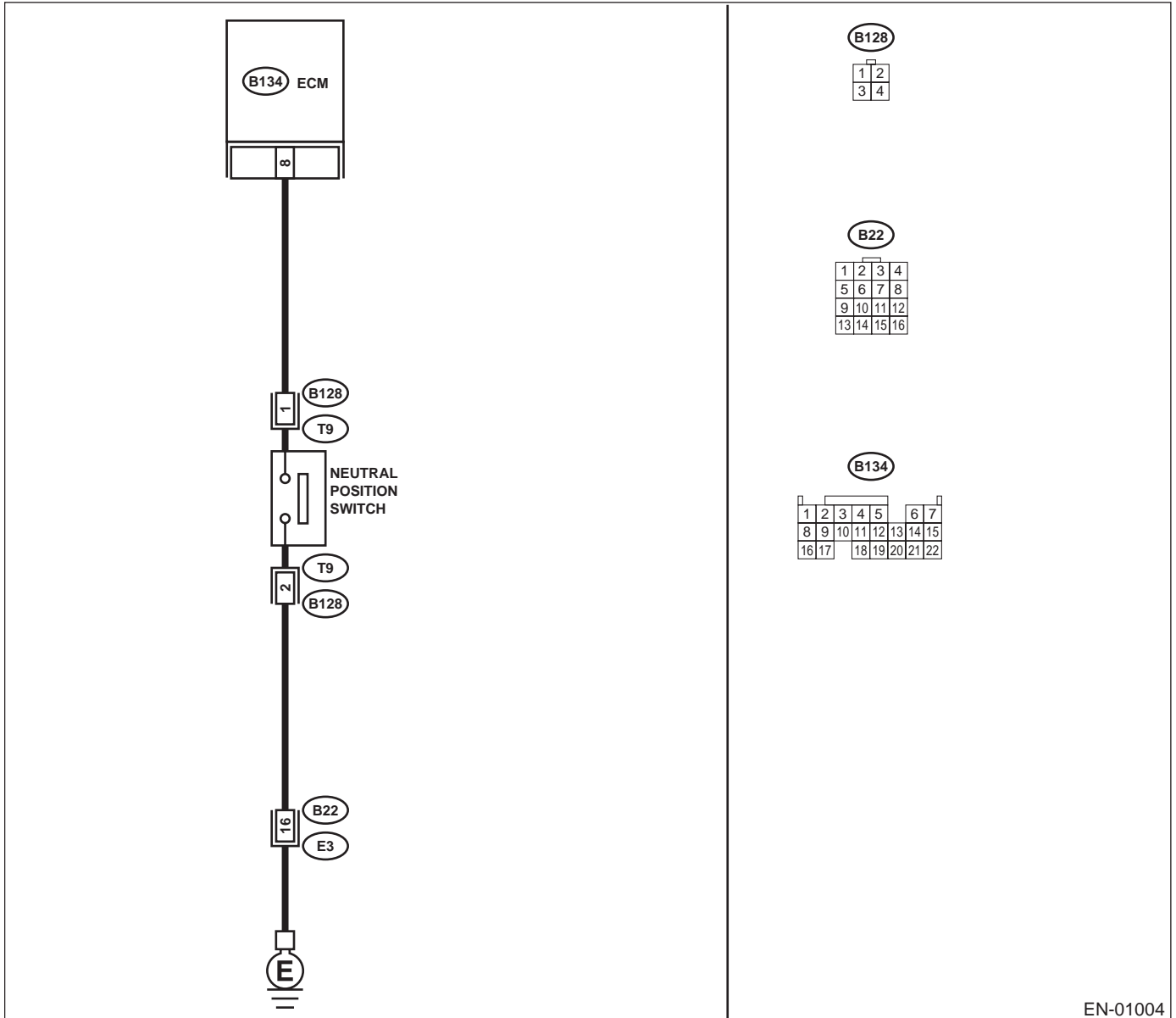
AN:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-01004

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-): Does the measured value exceed the specified value in neutral position?	5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-): Is the measured value less than the specified value at except neutral position?	1 V	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK NEUTRAL POSITION SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connector from transmission harness. 3) Measure resistance between transmission harness and connector terminals. Connector & terminal (T9) No. 1 — No. 2: Does the measured value exceed the specified value in neutral position?	1 MΩ	Go to step 5.	Repair short circuit in transmission harness or replace neutral position switch.
5 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance between ECM and chassis ground. Connector & terminal (B134) No. 8 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact in transmission harness connector. Is there poor contact in transmission harness connector?	There is poor contact.	Repair poor contact in transmission harness connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
 ENGINE (DIAGNOSTICS)

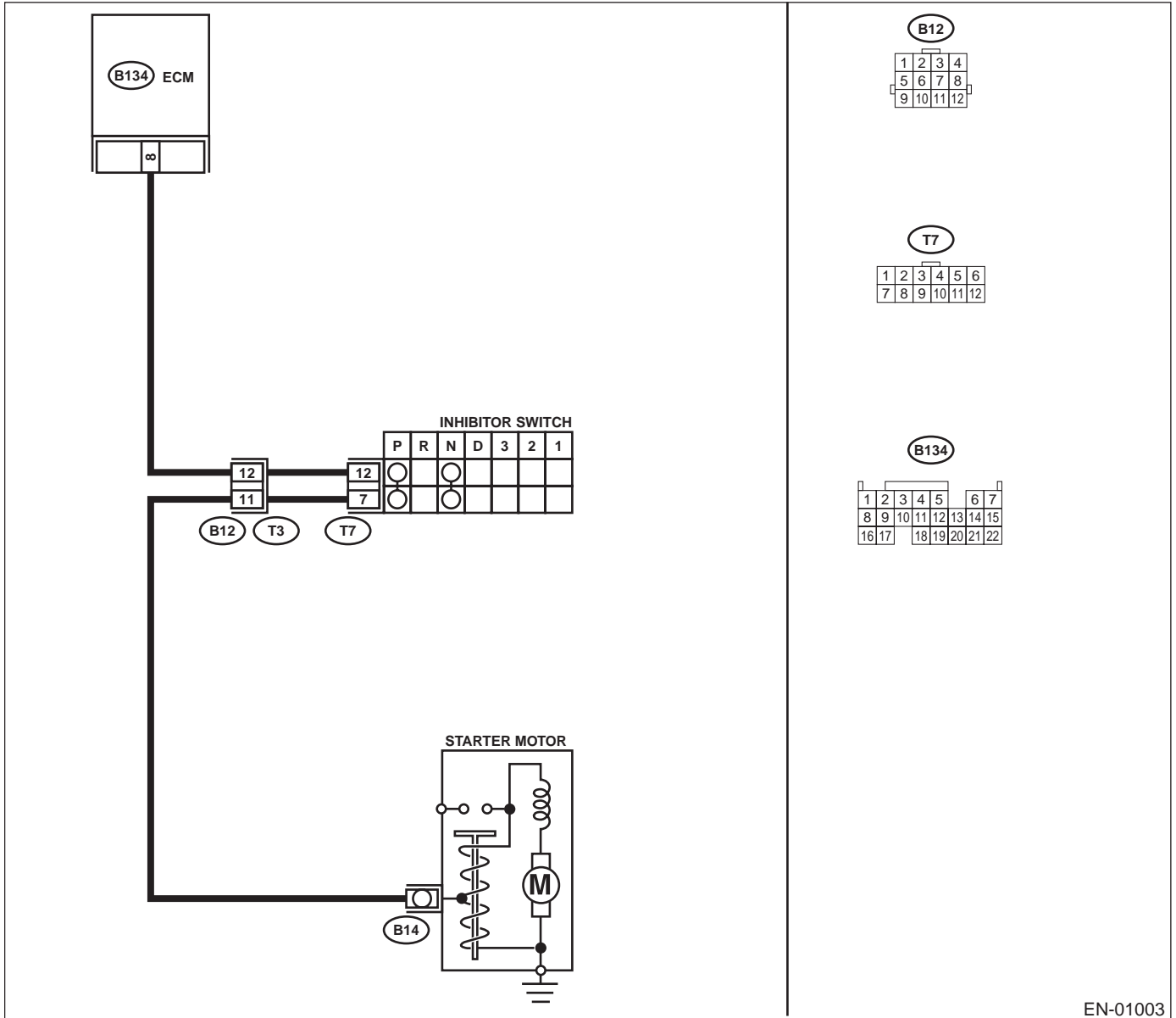
AO:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01003

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostics Trouble Code (DTC)". <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground in select level "N" and "P" positions. Connector & terminal (B134) No. 8 (+) — Chassis ground Is the measured value less than the specified value?	1 V	Go to step 3.	Go to step 5.
3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground in select level "N" and "P" positions. Connector & terminal (B134) No. 8 (+) — Chassis ground Is the measured value within the specified range?	4.5 - 5.5 V	Go to step 4.	Go to step 5.
4 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector.	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5 CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and inhibitor switch. 3) Measure resistance of harness between ECM and inhibitor switch connector. Connector & terminal (B134) No. 8 — (T7) No. 12: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK INHIBITOR SWITCH GROUND LINE. Measure resistance of harness between inhibitor switch connector and engine ground. Connector & terminal (T7) No. 7 — Engine ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 7.	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
<p>7 CHECK INHIBITOR SWITCH. Measure resistance between inhibitor switch connector receptacle's terminals in select level "N" and "P" positions. Terminal No. 7 — No. 12: Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Replace inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>
<p>8 CHECK SELECTOR CABLE CONNECTION. Is there any fault in selector cable connection to inhibitor switch?</p>	There is a fault.	Repair selector cable connection. <Ref. to CS-12, Select Cable.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AP:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

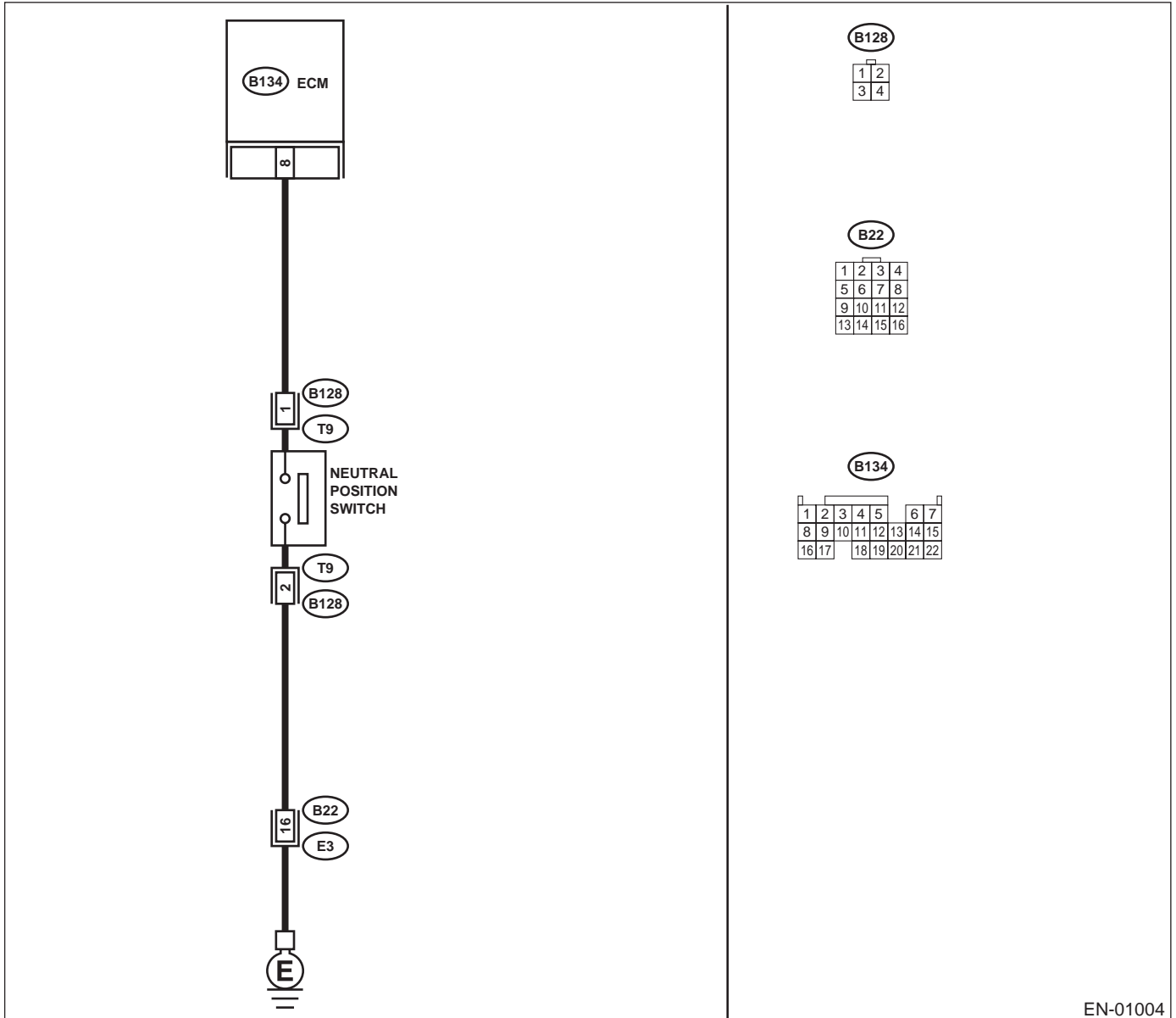
• **TROUBLE SYMPTOM:**

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01004

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-): Does the measured value exceed the specified value in neutral position?	5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-): Is the measured value less than the specified value at except neutral position?	1 V	Go to step 3.	Go to step 5.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK NEUTRAL POSITION SWITCH. Measure resistance between transmission harness connector terminals. Connector & terminal (T9) No. 1 — No. 2: Is the measured value less than the specified value at except neutral position?	1 Ω	Go to step 5.	Repair open circuit in transmission harness or replace neutral position switch.
5 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and transmission harness connector. Connector & terminal (B134) No. 8 — (B128) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair open circuit in harness between ECM and transmission harness connector.
6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure resistance of harness between transmission harness connector and engine ground. Connector & terminal (B128) No. 2 — Engine ground: Is the measured value less than the specified value?	5 Ω	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between transmission harness connector and engine grounding terminal • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK POOR CONTACT. Check poor contact in transmission harness connector. Is there poor contact in transmission harness connector?	There is poor contact.	Repair poor contact in transmission harness connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AQ:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

Step	Value	Yes	No
<p>1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor indicate DTC P1110?</p>	<p>DTC P1110 indicated.</p>	<p>Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.</p>	<p>It is not necessary to inspect DTC P1110.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AR:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

	Step	Value	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor indicate DTC P1111?	DTC P1111 indicated.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1111.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

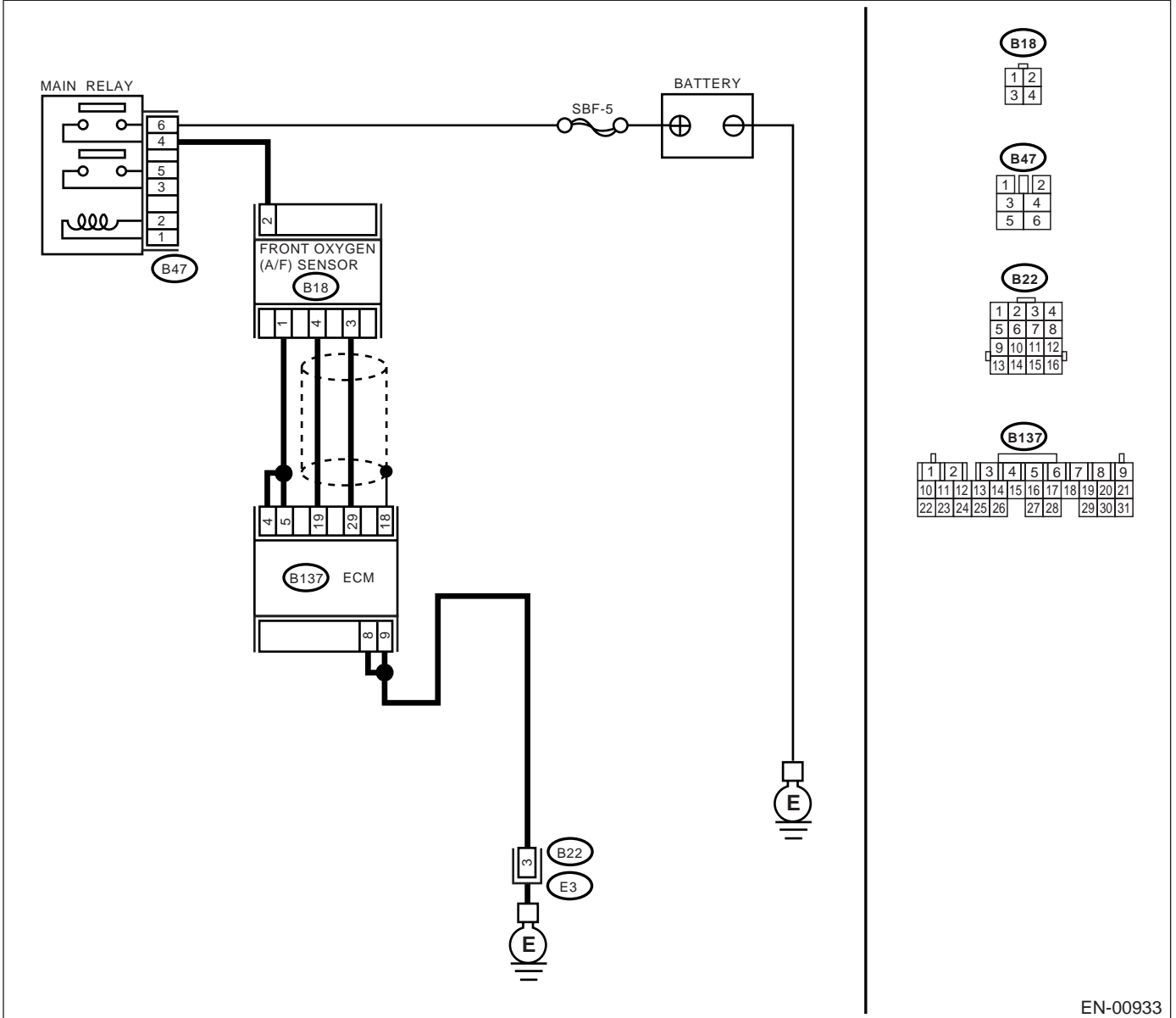
ENGINE (DIAGNOSTICS)

AS: DTC P1130 — O2 SENSOR CIRCUIT (OPEN) (BANK1 SENSOR1) —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00933

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 29 — (B18) No. 3: (B137) No. 19 — (B18) No. 4:</p> <p>Is the measured value less than the specified value?</p>	<p>1 Ω</p>	<p>Go to step 2.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
<p>2</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact in front oxygen (A/F) sensor connector. Is there poor contact in front oxygen (A/F) sensor connector?</p>	<p>There is poor contact.</p>	<p>Repair the poor contact in front oxygen (A/F) sensor connector.</p>	<p>Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOSTC)-38, Front Oxygen (A/F) Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

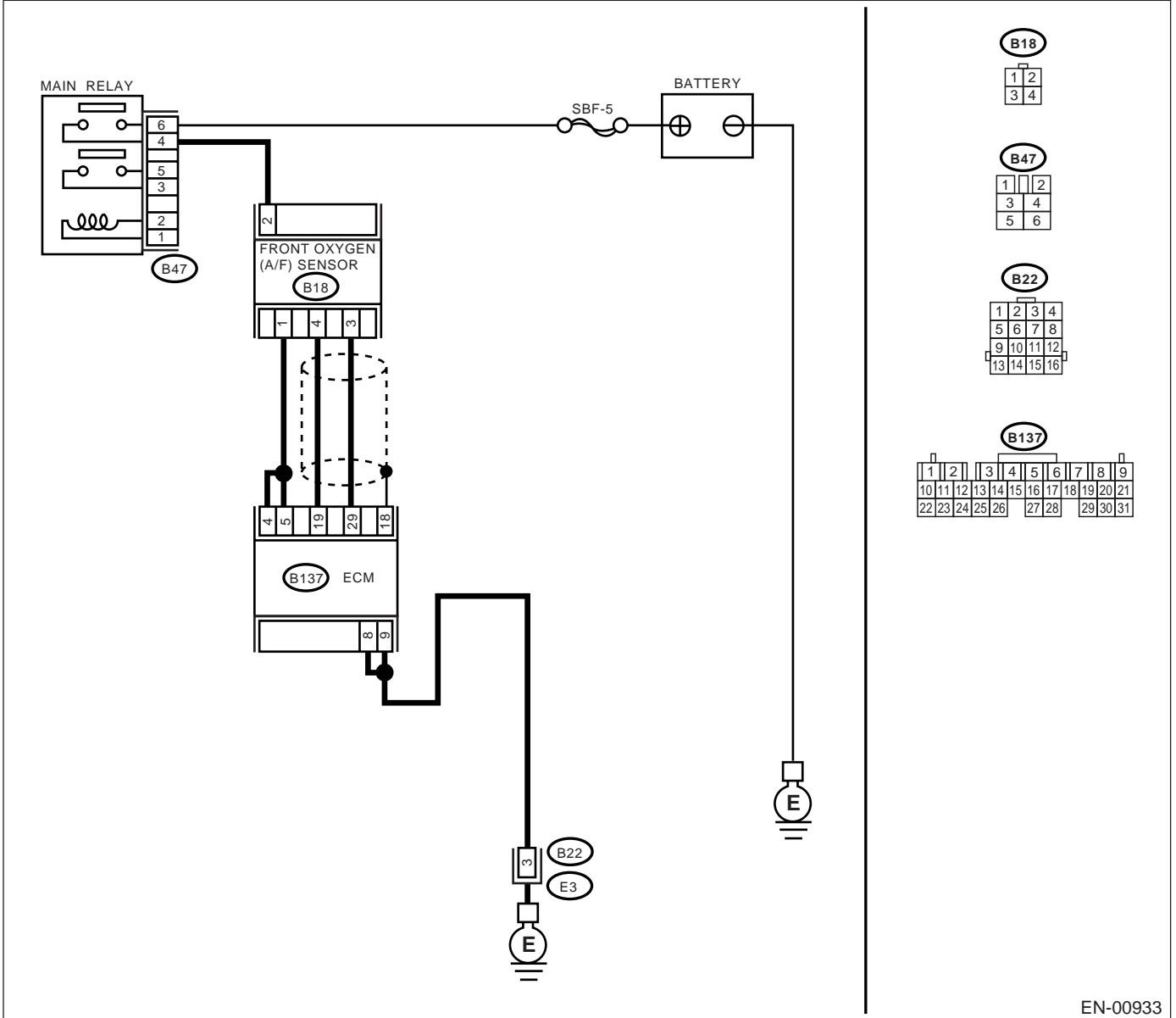
ENGINE (DIAGNOSTICS)

AT: DTC P1131 — O2 SENSOR CIRCUIT (SHORT) (BANK1 SENSOR1) —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00933

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 19 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 2.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
<p>2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 29 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
<p>3 CHECK OUTPUT SIGNAL FOR ECM.</p> <p>1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 4.	Go to step 5.
<p>4 CHECK OUTPUT SIGNAL FOR ECM.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Repair the poor contact in ECM connector.
<p>5 CHECK OUTPUT SIGNAL FOR ECM.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 29 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.95 V	Go to step 6.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOSTC)-38, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Repair the poor contact in ECM connector.

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

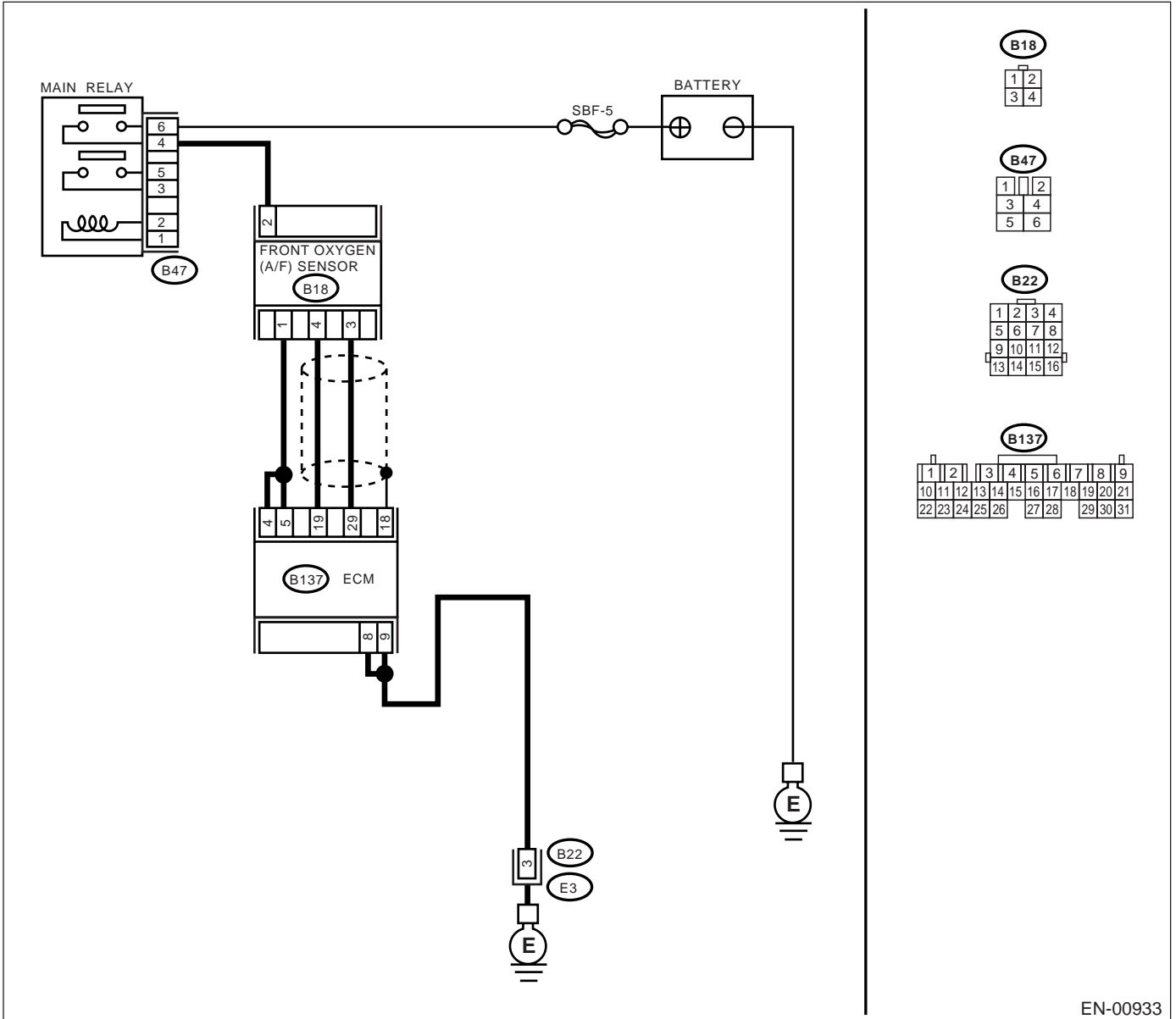
ENGINE (DIAGNOSTICS)

AU:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00933

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Does the Subaru Select Monitor indicate DTC P1134?	DTC P1134 indicated.	Replace the ECM. <Ref. to FU(H4DOSTC)- 40, Engine Con- trol Module.>	It is not necessary to inspect DTC P1134.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

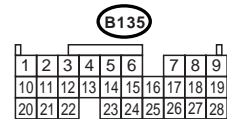
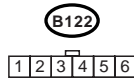
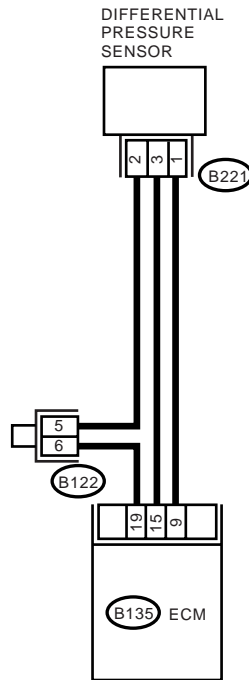
ENGINE (DIAGNOSTICS)

AV:DTC P1199 — DIFFERENTIAL PRESSURE SENSOR —

- TROUBLE SYMPTOM:
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .



EN-01006

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY TO DIFFERENTIAL PRESSURE SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from differential pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between differential pressure sensor and engine ground.</p> <p>Connector & terminal (B221) No. 1(+) — Engine ground (-): Does the measured value exceed the specified value?</p>	4.5 V	Go to step 2.	Repair or replace the harness connector between ECM and differential pressure connector.
<p>2 CHECK HARNESS BETWEEN ECM AND DIFFERENTIAL PRESSURE SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and differential pressure sensor.</p> <p>Connector & terminal (B221) No. 2 — (B135) No. 19: (B221) No. 3 — (B135) No. 15: Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	Repair the open circuit between ECM and differential pressure sensor.
<p>3 CHECK HARNESS BETWEEN ECM AND DIFFERENTIAL PRESSURE SENSOR.</p> <p>Measure the resistance between differential pressure sensor and engine ground.</p> <p>Connector & terminal (B221) No. 3 — engine ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Repair the ground short circuit between ECM and differential pressure sensor.
<p>4 CHECK DIFFERENTIAL PRESSURE SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Install the vacuum pump to secondary turbocharger side hose fitting. 3) Apply 5 V to the terminals No.1 and No.2, then connect terminal NO.3 to positive side and terminal No.2 to negative side. 4) Measure the voltage between differential pressure sensor terminals.</p> <p>Terminal No. 3 (+) — No. 2 (-): Does the voltage change as in the specified range?</p>	3.5 V at 66.7 kPa (500 mmHg, 19.69 inHg) 2.0 V at 0 kPa (0 mmHg, 0 inHg) 0.5 V at -66.7 kPa (-500 mmHg, -19.69 inHg)	Go to step 5.	Replace the differential pressure sensor.
<p>5 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM and differential pressure sensor connectors. Is there poor contact in ECM and differential pressure sensor connectors.</p>	There is poor contact.	Repair the poor contact in ECM and differential pressure sensor connectors.	Replace the ECM.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

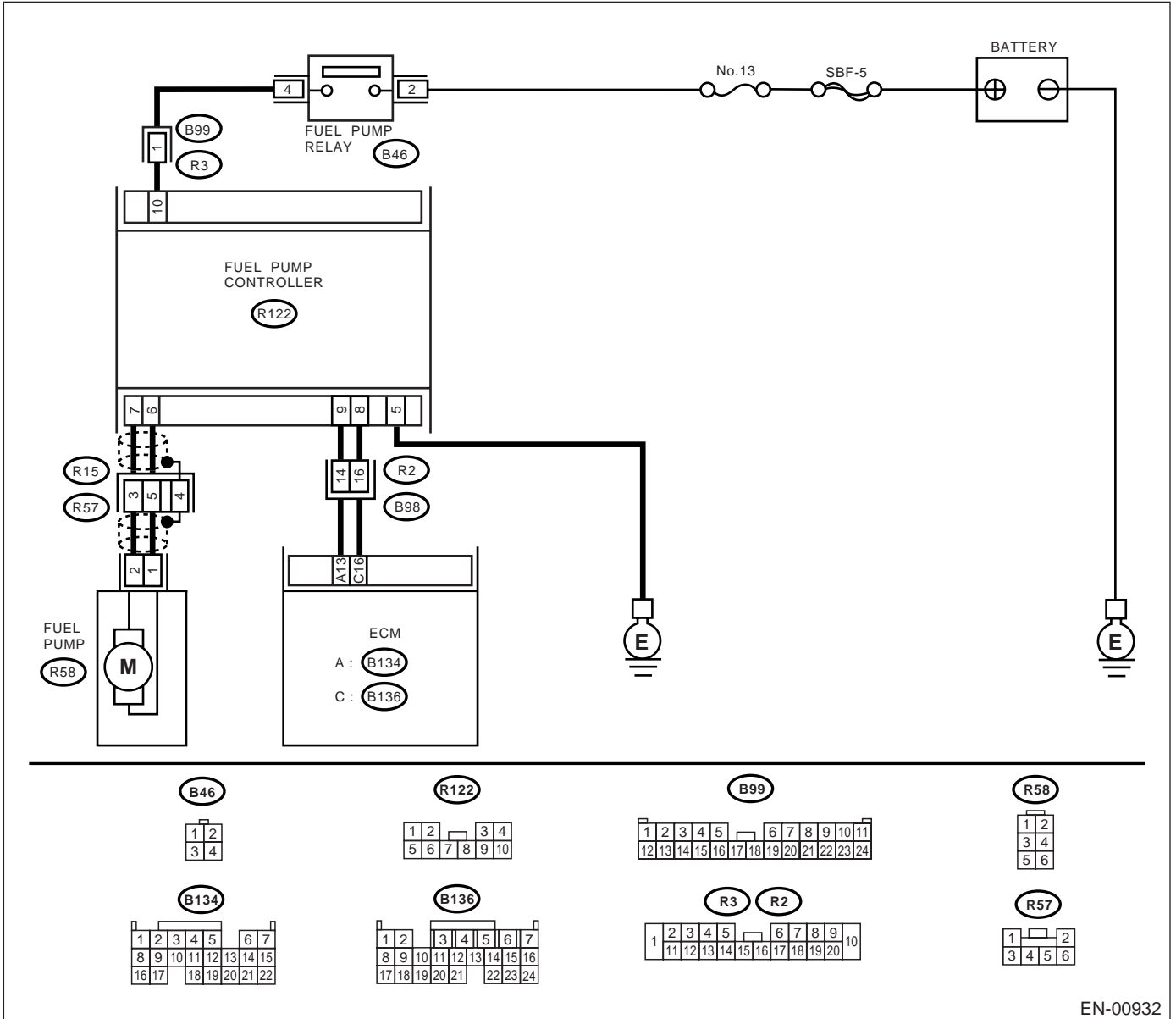
ENGINE (DIAGNOSTICS)

AW:DTC P1230 — FUEL PUMP CONTROLLER —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00932

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROLLER.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump controller. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump controller and chassis ground.</p> <p>Connector & terminal (R122) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Repair the power supply circuit. NOTE: In this case repair the following: <ul style="list-style-type: none"> • Open or ground short circuit in harness between fuel pump relay and fuel pump controller. • Poor contact in fuel pump controller connector. • Poor contact in fuel pump relay connector.
<p>2 CHECK GROUND CIRCUIT OF FUEL PUMP CONTROLLER.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump controller and chassis ground.</p> <p>Connector & terminal (R122) No. 5 — Chassis ground: Is the measured value less than the specified value?</p>	5 Ω	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit between fuel pump controller and chassis ground. • Poor contact in fuel pump controller connector.
<p>3 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.</p> <p>1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump controller and fuel pump connector.</p> <p>Connector & terminal (R122) No. 7 — (R58) No. 2: (R122) No. 6 — (R58) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair the open circuit between fuel pump controller and fuel pump.
<p>4 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.</p> <p>Measure the resistance of harness between fuel pump controller and chassis ground.</p> <p>Connector & terminal (R122) No. 7 — Chassis ground: (R122) No. 6 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Repair the ground short circuit between fuel pump controller and fuel pump.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump controller and ECM connector.</p> <p>Connector & terminal (R122) No. 9 — (B134) No. 13: (R122) No. 8 — (B136) No. 16:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump controller and ECM. • Poor contact in fuel pump controller and ECM connector.
<p>6 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between fuel pump controller and chassis ground.</p> <p>Connector & terminal (R122) No. 9 — Chassis ground: (R122) No. 8 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Repair the ground short circuit between fuel pump controller and ECM.
<p>7 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM and fuel pump controller connector. Is there poor contact in ECM and fuel pump controller connector.</p>	There is poor contact.	Repair the poor contact in ECM and fuel pump controller.	Replace the fuel pump controller. <Ref. to FU(H4DOSTC)-43, Fuel Pump Controller.>

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AX:DTC P1235 — INTAKE CONTROL SOLENOID VALVE CIRCUIT LOW —

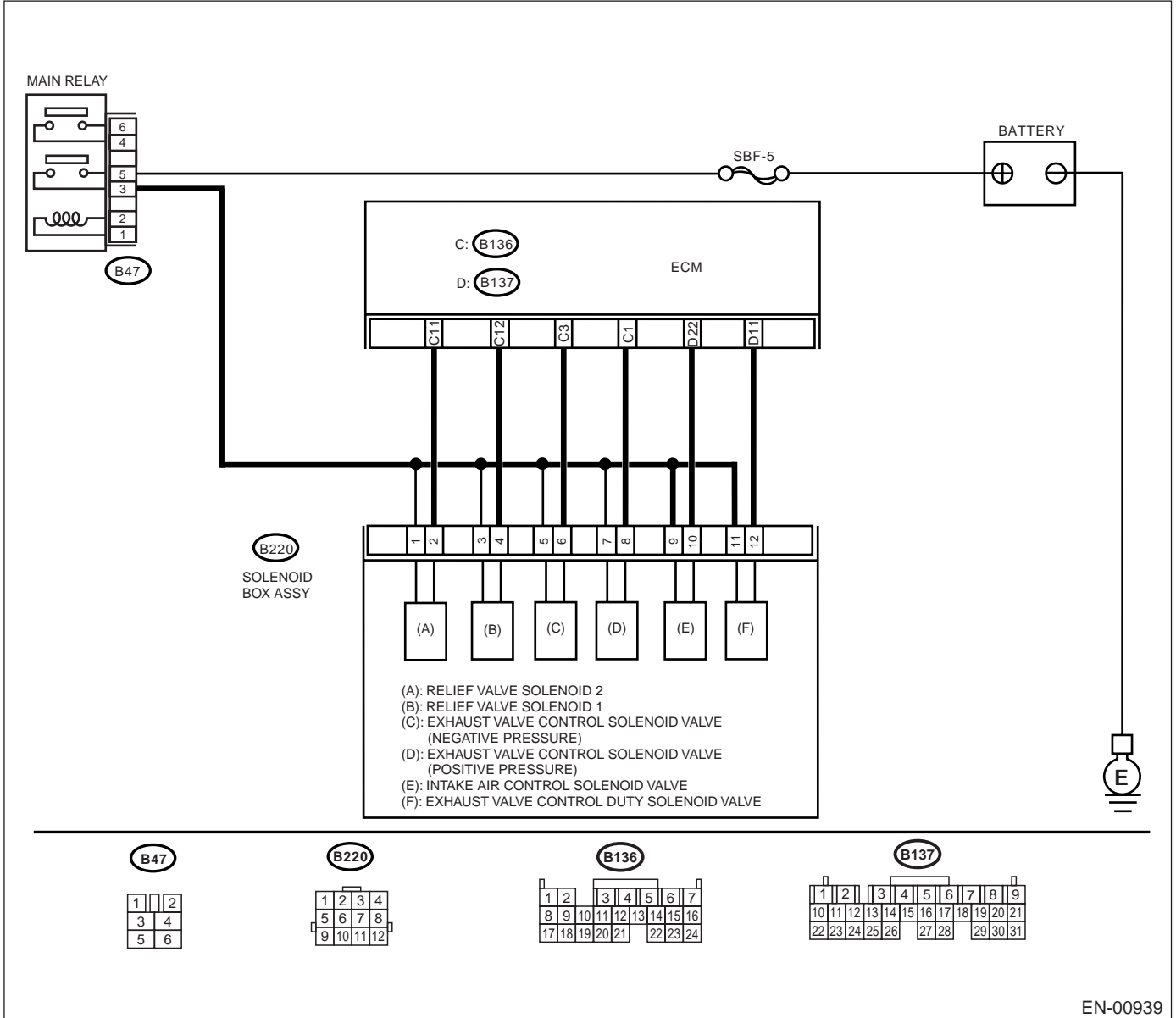
• **TROUBLE SYMPTOM:**

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 22 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN INTAKE AIR VALVE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from intake air valve control solenoid valve and ECM. 3) Measure the resistance of harness between intake air valve control solenoid valve connector and engine ground.</p> <p>Connector & terminal (B220) No. 10 — Engine ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 3.	Repair the ground short circuit in harness between ECM and intake air valve control solenoid valve connector.
<p>3</p> <p>CHECK HARNESS BETWEEN INTAKE AIR VALVE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and intake air valve control solenoid valve of harness connector.</p> <p>Connector & terminal (B137) No. 22 — (B220) No. 10: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair the open circuit in harness between ECM and intake air valve control solenoid valve connector.
<p>4</p> <p>CHECK INTAKE AIR VALVE CONTROL SOLENOID VALVE. Measure the resistance between intake air valve control solenoid valve terminals.</p> <p>Terminals No. 9 — No. 10: Is the measured value within the specified value?</p>	37 — 44 Ω	Go to step 5.	Replace the intake air valve control solenoid valve. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
<p>5</p> <p>CHECK POWER SUPPLY TO INTAKE AIR VALVE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between intake air valve control solenoid valve and engine ground.</p> <p>Connector & terminal (B220) No. 9 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair the open circuit in harness between main relay and intake air valve control solenoid valve connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in intake air valve control solenoid valve and ECM connectors. Is there poor contact in intake air valve control solenoid valve and ECM connectors?	There is poor contact.	Repair the poor contact in intake air valve control solenoid valve and ECM connectors.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AY:DTC P1236 — INTAKE CONTROL SOLENOID VALVE CIRCUIT HIGH —

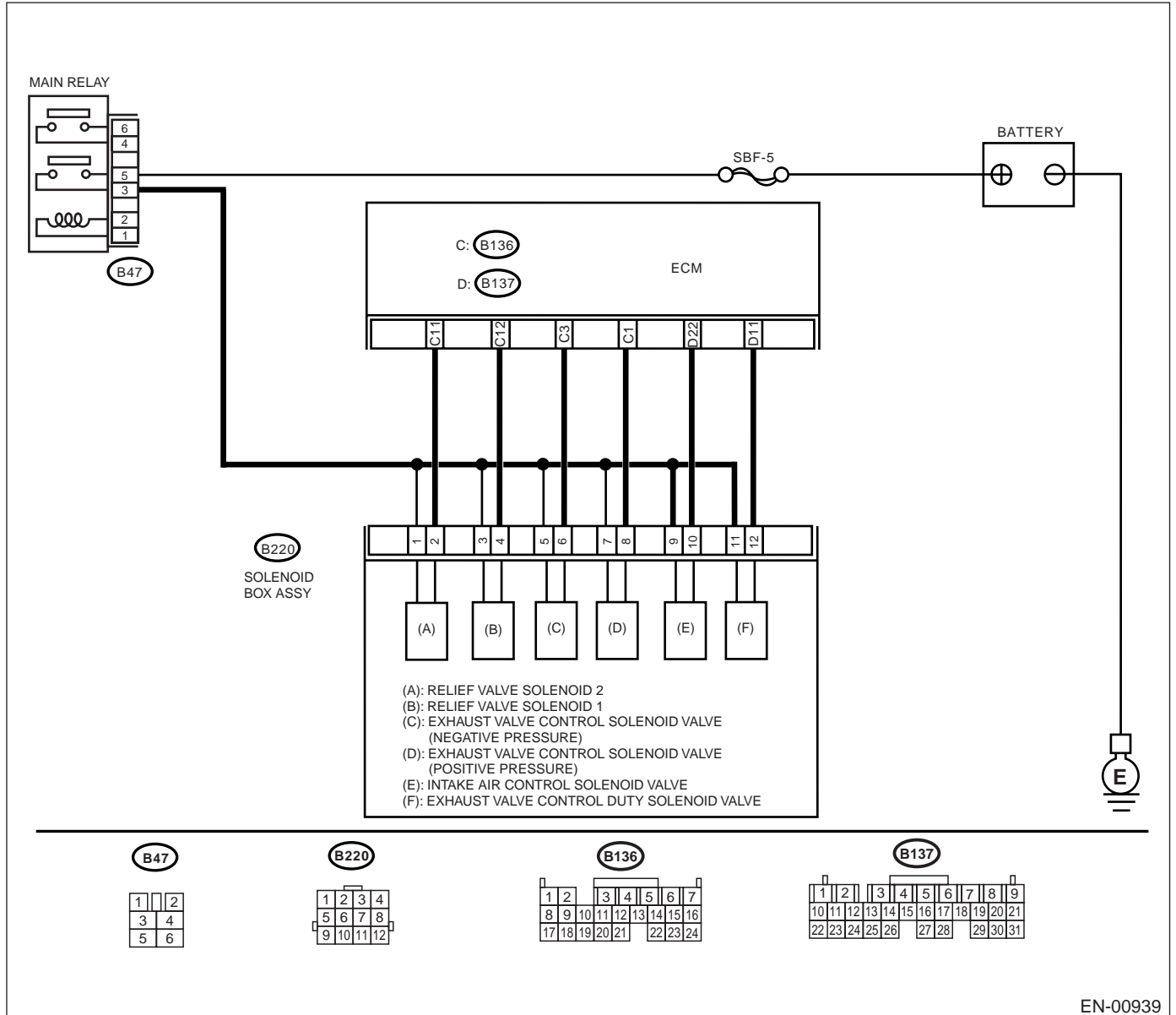
• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 22 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
3 CHECK HARNESS BETWEEN INTAKE AIR VALVE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from intake air valve control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair the battery short circuit in harness between ECM and intake air valve control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 4.
4 CHECK INTAKE AIR VALVE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between intake air valve control solenoid valve terminals. Terminals No. 9 — No. 10: Is the measured value less than the specified value?	1 Ω	Replace the intake air valve control solenoid valve <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.> and ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM and intake air valve control solenoid valve connectors. Is there poor contact in ECM and intake air valve control solenoid valve connectors?	There is poor contact.	Repair the poor contact in ECM and intake air valve control solenoid valve connectors.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AZ:DTC P1237 — EXHAUST CONTROL VALVE SOLENOID CIRCUIT LOW (POSITIVE PRESSURE) —

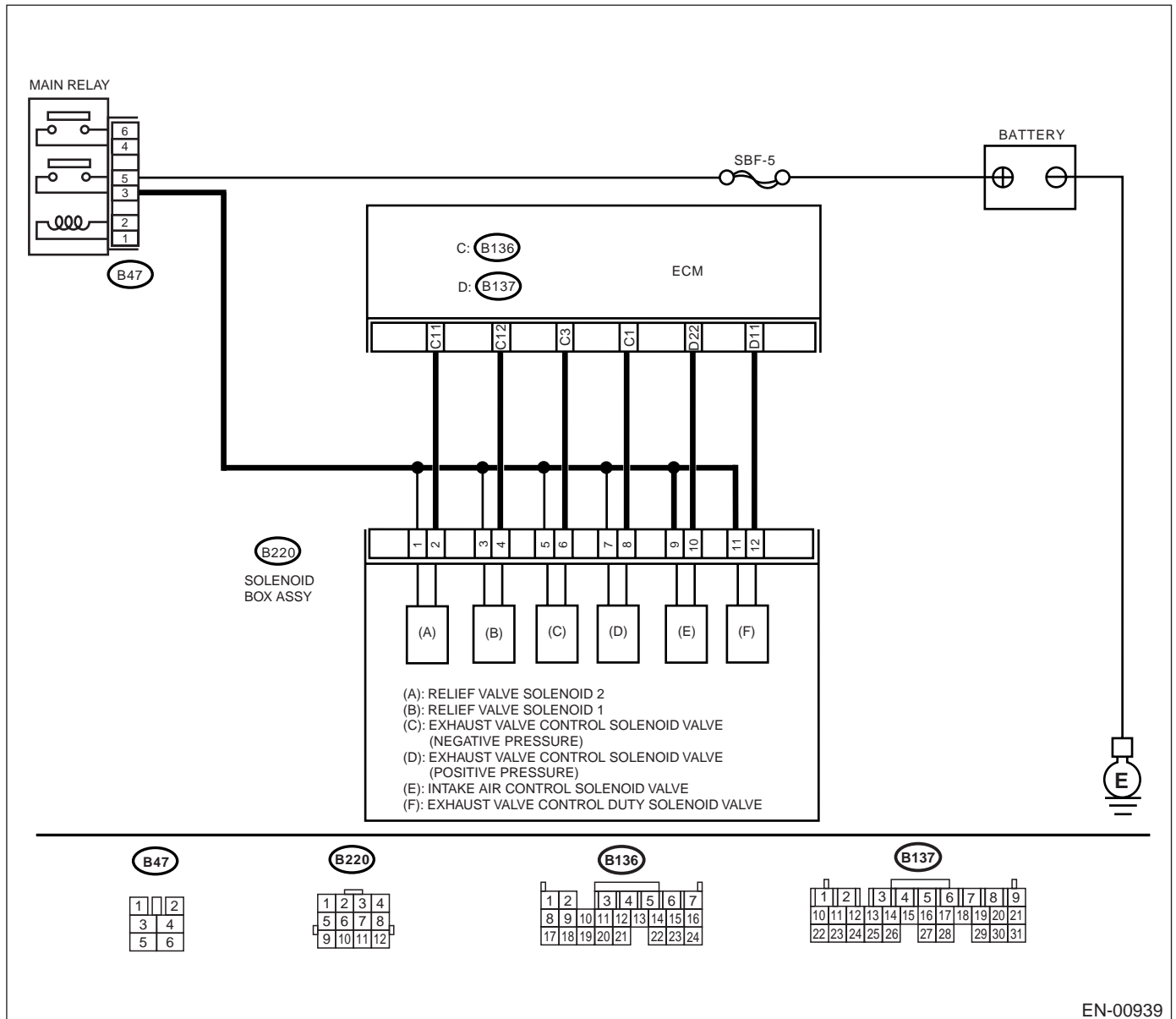
• **TROUBLE SYMPTOM:**

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. Contact with your Subaru distributor. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN EXHAUST VALVE CONTROL SOLENOID VALVE (POSITIVE PRESSURE) AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from exhaust valve control solenoid valve (positive pressure) and ECM. 3) Measure the resistance of harness between exhaust valve control solenoid valve (positive pressure) connector and engine ground.</p> <p>Connector & terminal (B220) No. 8 — Engine ground: Does the measured value exceed the specified value?</p>	1 M Ω	Repair the ground short circuit in harness between ECM and exhaust valve control solenoid valve (positive pressure) connector.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN EXHAUST VALVE CONTROL SOLENOID VALVE (POSITIVE PRESSURE) AND ECM CONNECTOR. Measure the resistance of harness between ECM and exhaust valve control solenoid valve (positive pressure) of harness connector.</p> <p>Connector & terminal (B136) No. 1 — (B220) No. 8: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 4.	Repair the open circuit in harness between ECM and exhaust valve control solenoid valve (positive pressure) connector.
<p>4</p> <p>CHECK EXHAUST VALVE CONTROL SOLENOID VALVE (POSITIVE PRESSURE). Measure the resistance between exhaust valve control solenoid valve (positive pressure) terminals.</p> <p>Terminals No. 7 — No. 8: Is the measured value within the specified value?</p>	37 — 44 Ω	Go to step 5.	Replace the exhaust valve control solenoid valve (positive pressure). <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
<p>5</p> <p>CHECK POWER SUPPLY TO EXHAUST VALVE CONTROL SOLENOID VALVE (POSITIVE PRESSURE). 1) Turn the ignition switch to ON. 2) Measure the voltage between exhaust valve control solenoid valve (positive pressure) and engine ground.</p> <p>Connector & terminal (B220) No. 7 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair open circuit in harness between main relay and exhaust valve control solenoid valve (positive pressure) connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in exhaust valve control solenoid valve (positive pressure) and ECM connectors. Is there poor contact in exhaust valve control solenoid valve (positive pressure) and ECM connectors?	There is poor contact.	Repair the poor contact in exhaust valve control solenoid valve (positive pressure) and ECM connectors.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BA:DTC P1238 — EXHAUST CONTROL VALVE SOLENOID CIRCUIT HIGH (POSITIVE PRESSURE) —

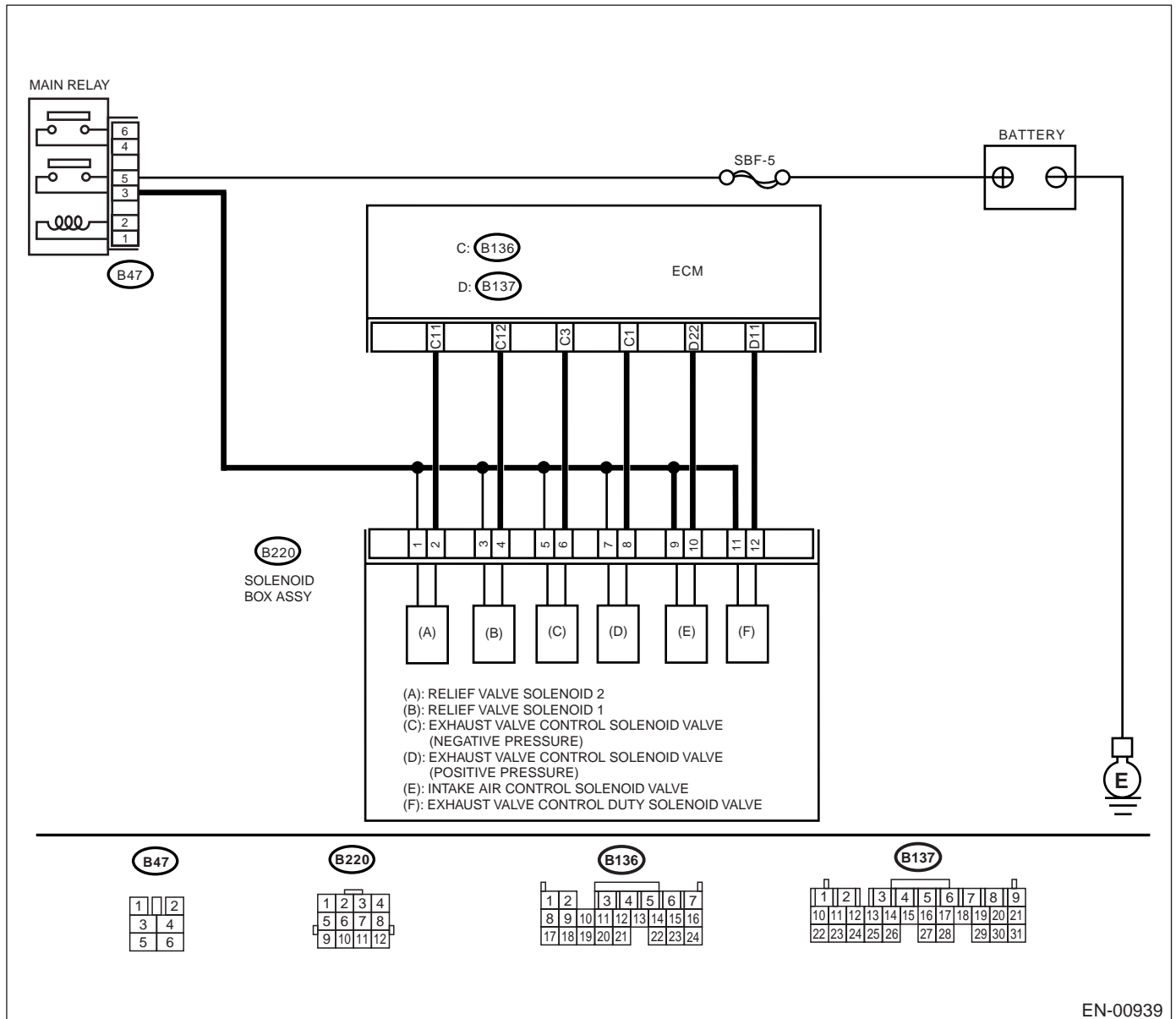
• **TROUBLE SYMPTOM:**

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check the poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
3 CHECK HARNESS BETWEEN EXHAUST VALVE CONTROL SOLENOID VALVE (POSITIVE PRESSURE) AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust valve control solenoid valve (positive pressure). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair the battery short circuit in harness between ECM and exhaust valve control solenoid valve (positive pressure) connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 4.
4 CHECK EXHAUST VALVE CONTROL SOLENOID VALVE (POSITIVE PRESSURE). 1) Turn the ignition switch to OFF. 2) Measure the resistance between exhaust valve control solenoid valve (positive pressure) terminals. Terminals No. 7 — No. 8: Is the measured value less than the specified value?	1 Ω	Replace the exhaust valve control solenoid valve (positive pressure). <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.> and ECM <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM and exhaust valve control solenoid valve (positive pressure). Is there poor contact in ECM and exhaust valve control solenoid valve (positive pressure)?	There is poor contact.	Repair the poor contact in ECM and exhaust valve control solenoid valve (positive pressure).	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BB:DTC P1239 — EXHAUST CONTROL VALVE SOLENOID CIRCUIT LOW (NEGATIVE PRESSURE) —

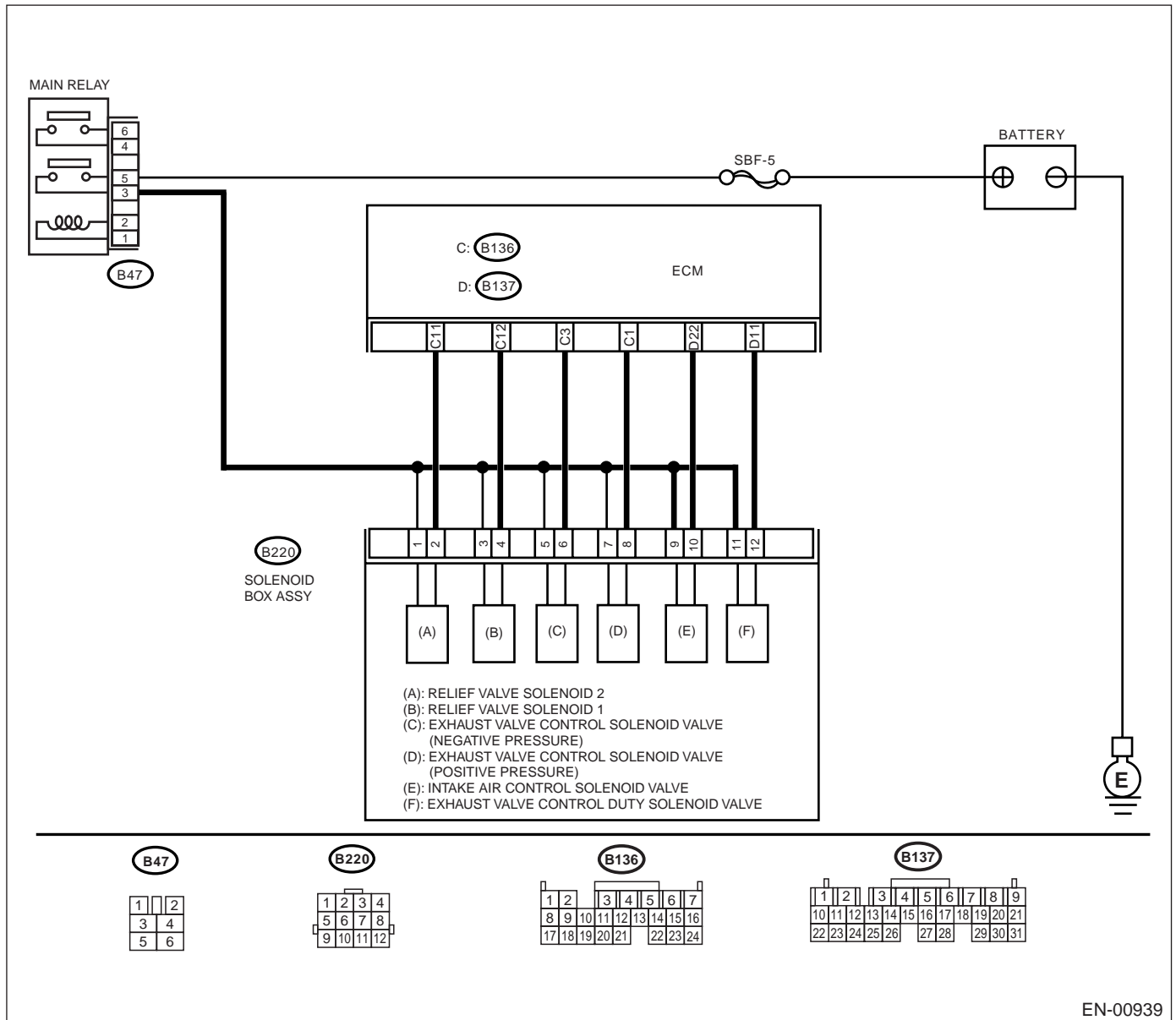
• **TROUBLE SYMPTOM:**

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN EXHAUST VALVE CONTROL SOLENOID VALVE (NEGATIVE PRESSURE) AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from exhaust valve control solenoid valve (negative pressure) and ECM. 3) Measure the resistance of harness between exhaust valve control solenoid valve (negative pressure) connector and engine ground.</p> <p>Connector & terminal (B136) No. 3 — Engine ground: Does the measured value exceed the specified value?</p>	1 M Ω	Repair the ground short circuit in harness between ECM and exhaust valve control solenoid valve (negative pressure) connector.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN EXHAUST VALVE CONTROL SOLENOID VALVE (NEGATIVE PRESSURE) AND ECM CONNECTOR. Measure the resistance of harness between ECM and exhaust valve control solenoid valve (negative pressure) of harness connector.</p> <p>Connector & terminal (B136) No. 3 — (B220) No. 6: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair the open circuit in harness between ECM and exhaust valve control solenoid valve (negative pressure) connector.
<p>4</p> <p>CHECK EXHAUST VALVE CONTROL SOLENOID VALVE. (NEGATIVE PRESSURE) Measure the resistance between exhaust valve control solenoid valve (negative pressure) terminals.</p> <p>Terminals No. 5 — No. 6: Is the measured value within the specified value?</p>	30 — 34 Ω	Go to step 5.	Replace the exhaust valve control solenoid valve (negative pressure). <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK POWER SUPPLY TO EXHAUST VALVE CONTROL SOLENOID VALVE (NEGATIVE PRESSURE). 1) Turn the ignition switch to ON. 2) Measure the voltage between exhaust valve control solenoid valve (negative pressure) and engine ground. Connector & terminal (B220) No. 5 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair the open circuit in harness between main relay and exhaust valve control solenoid valve (negative pressure) connector.
<p>6 CHECK POOR CONTACT. Check poor contact in exhaust valve control solenoid valve (negative pressure) and ECM connectors. Are there poor contact in exhaust valve control solenoid valve (negative pressure) and ECM connectors?</p>	There are poor contacts.	Repair the poor contact in exhaust valve control solenoid valve (negative pressure) and ECM connectors.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

BC:DTC P1240 — EXHAUST CONTROL VALVE SOLENOID CIRCUIT HIGH (NEGATIVE PRESSURE) —

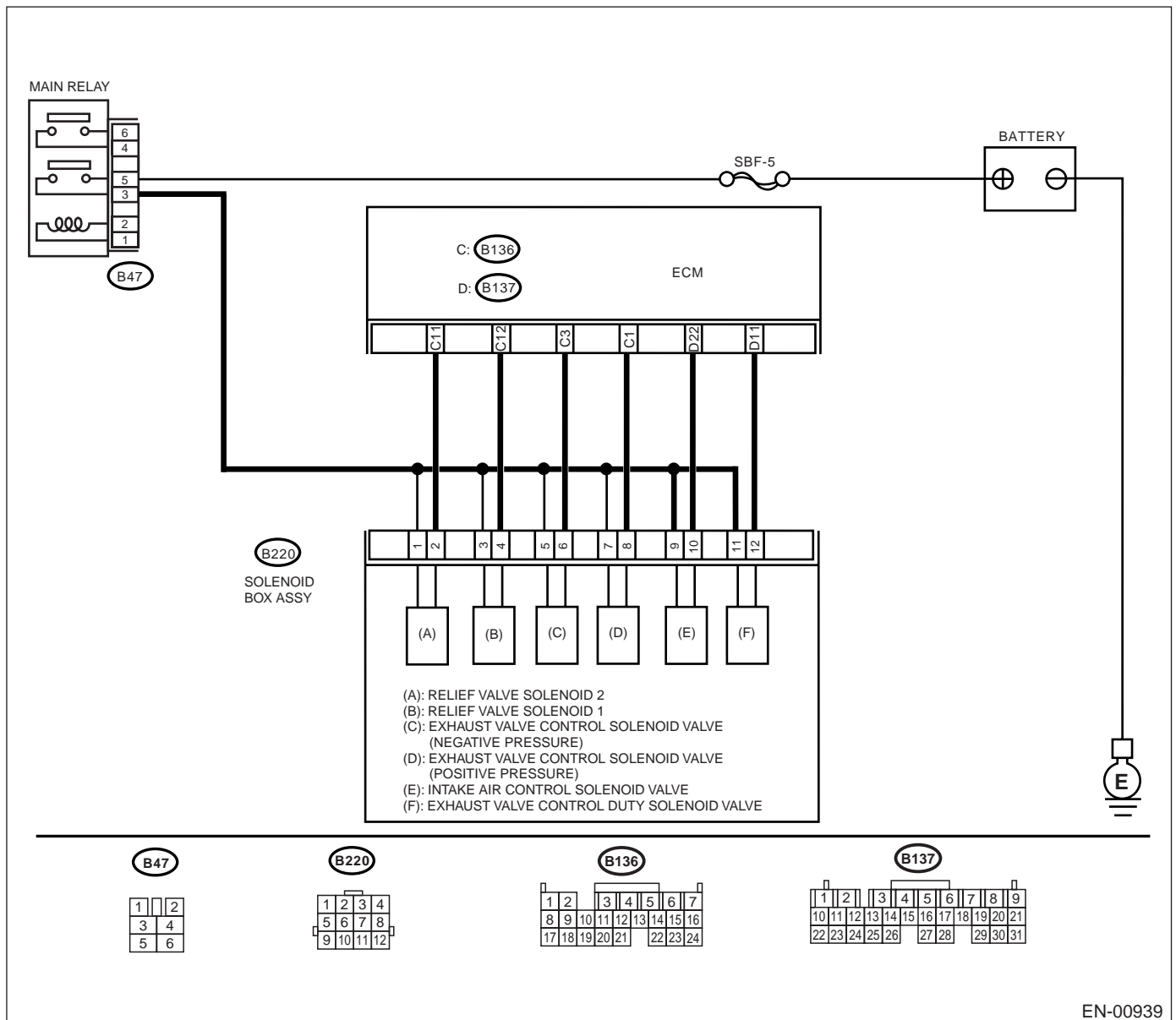
• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Go to step 2.
<p>2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
<p>3 CHECK HARNESS BETWEEN EXHAUST VALVE CONTROL SOLENOID VALVE (NEGATIVE PRESSURE) AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust valve control solenoid valve (negative pressure). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair the battery short circuit in harness between ECM and exhaust valve control solenoid valve (negative pressure) connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 4.
<p>4 CHECK EXHAUST VALVE CONTROL SOLENOID VALVE (NEGATIVE PRESSURE). 1) Turn the ignition switch to OFF. 2) Measure the resistance between exhaust valve control solenoid valve (negative pressure) terminals. Terminals No. 5 — No. 6: Is the measured value less than the specified value?</p>	1 Ω	Replace the exhaust valve control solenoid valve (negative pressure) <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.> and ECM <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 5.
<p>5 CHECK POOR CONTACT. Check poor contact in ECM and exhaust valve control solenoid valve (negative pressure) connectors. Are there poor contact in ECM and exhaust valve control solenoid valve (negative pressure) connectors?</p>	There are poor contacts.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BD:DTC P1241 — 2STAGE TWIN TURBO SYSTEM (SINGLE) —

• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK OPERATION OF RELIEF VALVE CONTROL SOLENOID VALVE 2. Operate the relief valve control solenoid valve 2. <Ref. to EN(H4DOSTC)-36, Compulsory Valve Operation Check Mode.> Does the relief valve control solenoid valve 2 produce operating sound?	Operating sound produced.	Go to step 3.	Replace the relief valve control solenoid valve 2. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
3 CHECK OPERATION OF EXHAUST CONTROL VALVE. 1) Operate the exhaust valve control solenoid valve. <Ref. to EN(H4DOSTC)-36, Compulsory Valve Operation Check Mode.> 2) Check the operation of exhaust control valve actuator. Does the actuator rod operate correctly? NOTE: Actuator rod operates in approx. 7 second cycle, and stroke is approx. 30 mm (1.18 in).	Operates correctly.	Go to step 4.	Check the exhaust valve control solenoid valve and vacuum hose. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
4 CHECK OPERATION OF INTAKE AIR CONTROL VALVE. 1) Operate the intake air valve control solenoid valve. <Ref. to EN(H4DOSTC)-36, Compulsory Valve Operation Check Mode.> 2) Check the operation of intake air control valve actuator. Does the actuator rod operate correctly? NOTE: Actuator rod operates in approx. 2 second cycle, and stroke is approx. 12 mm (0.47 in).	Operates correctly.	Go to step 5.	Check the intake air control solenoid valve and vacuum hose. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
5 CHECK RELIEF VALVE. 1) Remove the relief valve. 2) Check the relief valve. Is there a fault in the relief valve and hose routing?	There is no problem.	Go to step 6.	Replace or repair the relief valve and vacuum hose.
6 CHECK VACUUM HOSES OF EXHAUST VALVE CONTROL SOLENOID VALVE (POSITIVE PRESSURE). Are there cracks, stuck or improper routing on vacuum hose?	There is no problem.	Go to step 7.	Repair or replace the vacuum hoses.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK VACUUM HOSES OF DIFFERENTIAL PRESSURE SENSOR. Are there cracks, stuck or improper routing on vacuum hose?	There is no problem.	Go to step 8 .	Repair or replace the vacuum hoses.
8 CHECK VACUUM HOSES OF PRIMARY TURBOCHARGER WASTEGATE CONTROL VALVE. Are there cracks, stuck or improper routing on vacuum hose?	There is no problem.	Go to step 9 .	Repair or replace the vacuum hoses.
9 CHECK VACUUM HOSES BETWEEN SOLENOID BOX AND SURGE TANK. Are there cracks, stuck or improper routing on vacuum hose?	There is no problem.	Go to step 10 .	Repair or replace the vacuum hoses.
10 CHECK PRIMARY TURBOCHARGER WASTEGATE VALVE. Is there a fault on the primary turbocharger wastegate valve?	There is no problem.	Go to step 11 .	Replace the primary turbocharger. <Ref. to IN(H4DOSTC)-15, Turbocharger.>
11 CHECK LH AND RH INTAKE DUCT. Are there cracks or stuck on the LH and RH intake duct?	There is no problem.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Replace the air intake duct. <Ref. to IN(H4DOSTC)-12, Intake Duct.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BE:DTC P1242 — 2STAGE TWIN TURBO SYSTEM (TWIN) —

• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK OPERATION OF RELIEF VALVE CONTROL SOLENOID VALVE 2. Operate the relief valve control solenoid valve 2. <Ref. to EN(H4DOSTC)-36, Compulsory Valve Operation Check Mode.> Does the relief valve control solenoid valve 2 produce operating sound?	Operating sound produced.	Go to step 3.	Replace the relief valve control solenoid valve 2. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
3 CHECK OPERATION OF EXHAUST CONTROL VALVE. 1) Operate the exhaust valve control solenoid valve. <Ref. to EN(H4DOSTC)-36, Compulsory Valve Operation Check Mode.> 2) Check the operation of exhaust control valve actuator. Does the actuator rod operate correctly? NOTE: Actuator rod operates in approx. 7 second cycle, and stroke is approx. 30 mm (1.18 in).	Operate correctly.	Go to step 4.	Check the exhaust valve control solenoid valve and vacuum hose. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
4 CHECK OPERATION OF INTAKE AIR CONTROL VALVE. 1) Operate the intake air valve control solenoid valve. <Ref. to EN(H4DOSTC)-36, Compulsory Valve Operation Check Mode.> 2) Check the operation of intake air control valve actuator. Does the actuator rod operate correctly? NOTE: Actuator rod operates in approx. 2 second cycle, and stroke is approx. 12 mm (0.47 in).	Operate correctly.	Go to step 5.	Check the intake valve control solenoid valve and vacuum hose. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
5 CHECK RELIEF VALVE. 1) Remove the relief valve. 2) Check the relief valve. Is there a fault in the relief valve and hose routing?	There is no problem.	Go to step 6.	Replace or repair the relief valve and vacuum hose.
6 CHECK VACUUM HOSES OF EXHAUST VALVE CONTROL SOLENOID VALVE (POSITIVE PRESSURE). Are there cracks, stuck or improper routing on vacuum hose?	There is no problem.	Go to step 7.	Repair or replace the vacuum hoses.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK VACUUM HOSES OF DIFFERENTIAL PRESSURE SENSOR. Are there cracks, stuck or improper routing on vacuum hose?	There is no problem.	Go to step 8 .	Repair or replace the vacuum hoses.
8 CHECK VACUUM HOSES OF PRIMARY TURBOCHARGER WASTEGATE CONTROL VALVE. Are there cracks, stuck or improper routing on vacuum hose?	There is no problem.	Go to step 9 .	Repair or replace the vacuum hoses.
9 CHECK VACUUM HOSES BETWEEN SOLENOID BOX AND SURGE TANK. Are there cracks, stuck or improper routing on vacuum hose?	There is no problem.	Go to step 10 .	Repair or replace the vacuum hoses.
10 CHECK PRIMARY TURBOCHARGER WASTEGATE VALVE. Is there a fault on the primary turbocharger wastegate valve?	There is no problem.	Go to step 11 .	Replace the primary turbocharger. <Ref. to IN(H4DOSTC)-15, Turbocharger.>
11 CHECK LH AND RH INTAKE DUCT. Are there cracks or stuck on the LH and RH intake duct?	There is no problem.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Replace the air intake duct. <Ref. to IN(H4DOSTC)-12, Intake Duct.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BF:DTC P1247 — RELIEF VALVE CONTROL SOLENOID VALVE 1 CIRCUIT LOW

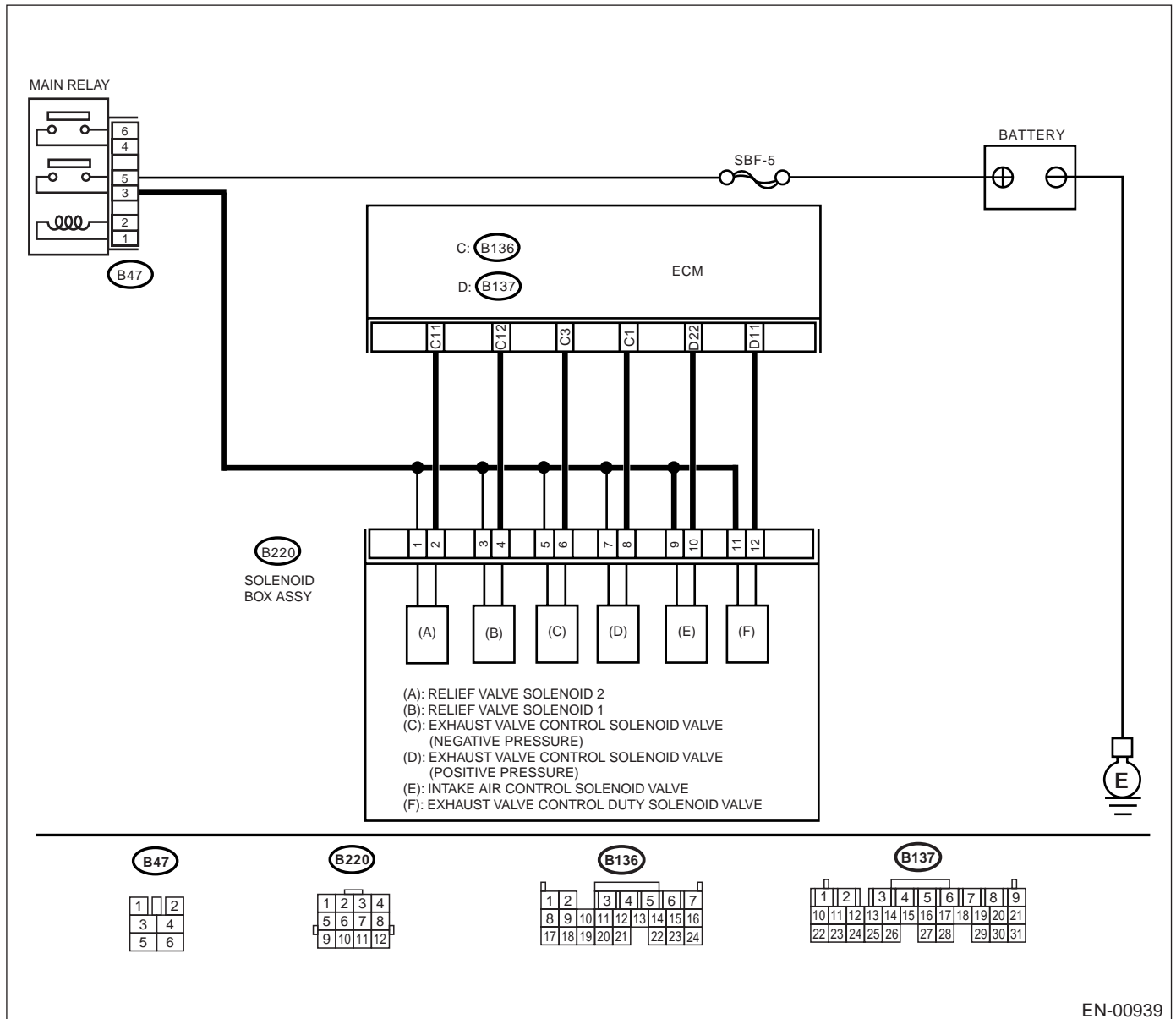
• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. Contact with your Subaru distributor. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN RELIEF VALVE CONTROL SOLENOID VALVE 1 AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from relief valve control solenoid valve 1 and ECM. 3) Measure the resistance of harness between relief valve control solenoid valve 1 connector and engine ground.</p> <p>Connector & terminal (B220) No. 4 — Engine ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 3.	Repair the ground short circuit in harness between ECM and relief valve control solenoid valve 1 connector.
<p>3</p> <p>CHECK HARNESS BETWEEN RELIEF VALVE CONTROL SOLENOID VALVE 1 AND ECM CONNECTOR. Measure the resistance of harness between ECM and relief valve control solenoid valve 1 of harness connector.</p> <p>Connector & terminal (B136) No. 12 — (B220) No. 4: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair the open circuit in harness between ECM and relief valve control solenoid valve 1 connector.
<p>4</p> <p>CHECK RELIEF VALVE CONTROL SOLENOID VALVE 1. Measure the resistance between relief valve control solenoid valve 1 terminals.</p> <p>Terminals No. 3 — No. 4: Is the measured value within the specified value?</p>	37 — 44 Ω	Go to step 5.	Replace the relief valve control solenoid valve 1. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
<p>5</p> <p>CHECK POWER SUPPLY TO RELIEF VALVE CONTROL SOLENOID VALVE 1. 1) Turn the ignition switch to ON. 2) Measure the voltage between relief valve control solenoid valve 1 and engine ground.</p> <p>Connector & terminal (B220) No. 3 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair the open circuit in harness between main relay and relief valve control solenoid valve 1 connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in relief valve control solenoid valve 1 and ECM connectors. Are there poor contact in relief valve control solenoid valve 1 and ECM connectors?	There are poor contacts.	Repair the poor contact in relief valve control solenoid valve 1 and ECM connectors.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BG:DTC P1248 — RELIEF VALVE CONTROL SOLENOID VALVE 1 CIRCUIT HIGH —

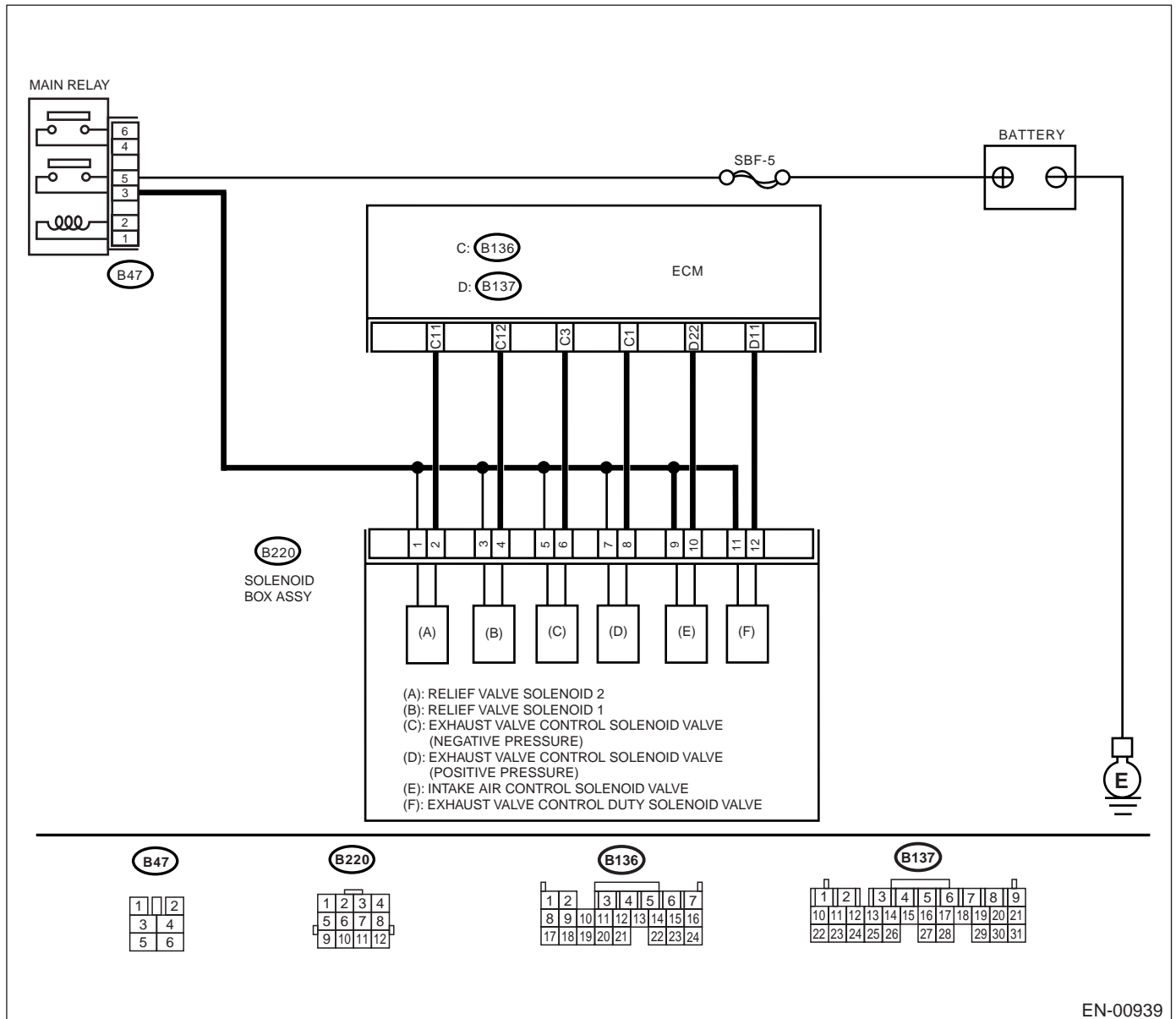
• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Go to step 2.
<p>2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?</p>	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
<p>3 CHECK HARNESS BETWEEN RELIEF VALVE CONTROL SOLENOID VALVE 1 AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from relief valve control solenoid valve 1. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Repair the battery short circuit in harness between ECM and relief valve control solenoid valve 1 connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 4.
<p>4 CHECK RELIEF VALVE CONTROL SOLENOID VALVE 1. 1) Turn the ignition switch to OFF. 2) Measure the resistance between relief valve control solenoid valve 1 terminals. Terminals No. 3 — No. 4: Is the measured value less than the specified value?</p>	1 Ω	Replace the relief valve control solenoid valve 1 <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.> and replace ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 5.
<p>5 CHECK POOR CONTACT. Check poor contact in ECM and relief valve control solenoid valve 1 connectors. Are there poor contact in ECM and relief valve control solenoid valve 1 connectors?</p>	There are poor contacts.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

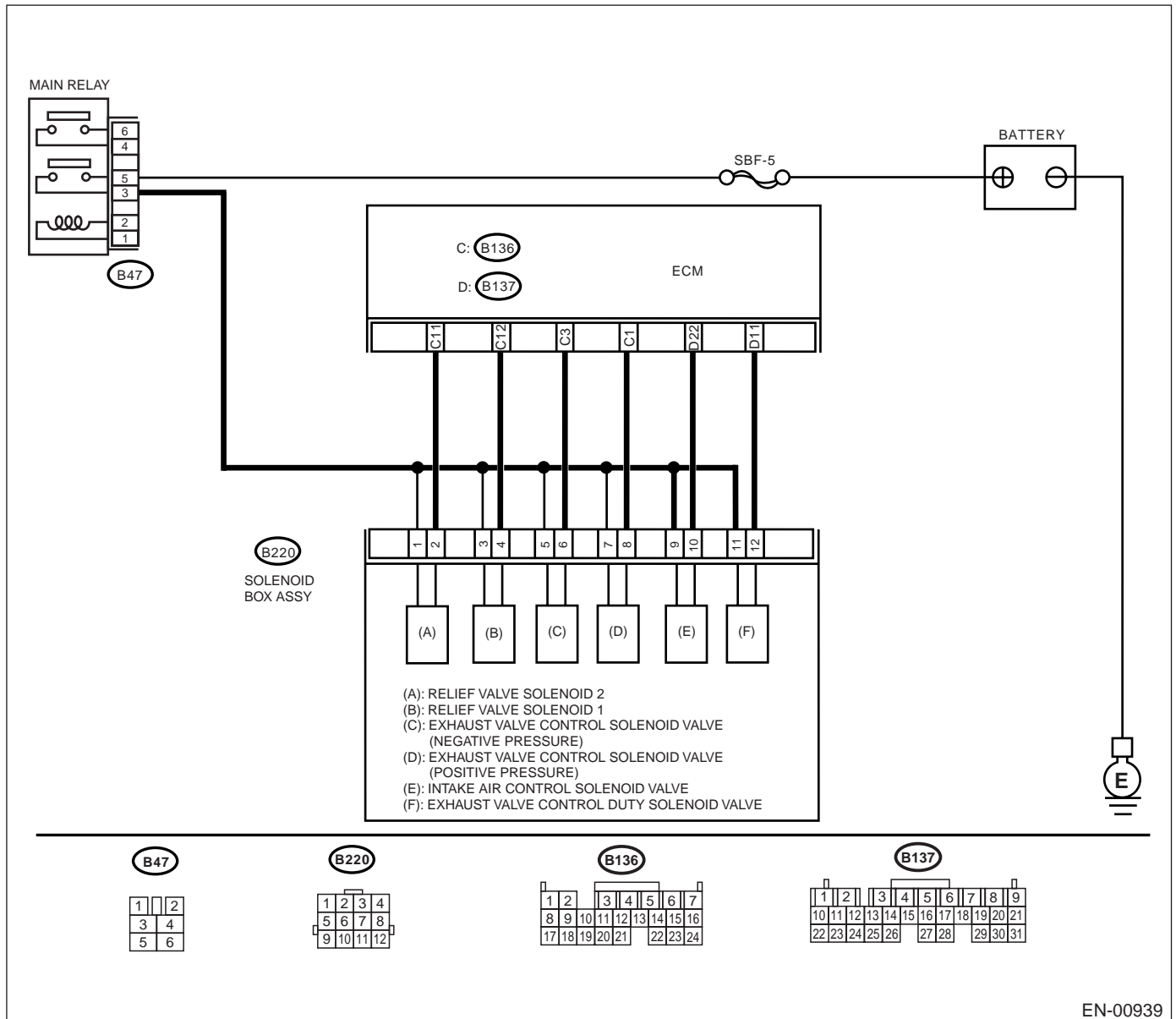
BH:DTC P1249 — RELIEF VALVE CONTROL SOLENOID VALVE 2 CIRCUIT LOW —

- **TROUBLE SYMPTOM:**
 - Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 11 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Even if MI lights up, the circuit has returned to a normal condition at this time. Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN RELIEF VALVE CONTROL SOLENOID VALVE 2 AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from relief valve control solenoid valve 2 and ECM. 3) Measure the resistance of harness between relief valve control solenoid valve 2 connector and engine ground.</p> <p>Connector & terminal (B220) No. 2 — Engine ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 3.	Repair the ground short circuit in harness between ECM and relief valve control solenoid valve 2 connector.
<p>3</p> <p>CHECK HARNESS BETWEEN RELIEF VALVE CONTROL SOLENOID VALVE 2 AND ECM CONNECTOR. Measure the resistance of harness between ECM and relief valve control solenoid valve 2 of harness connector.</p> <p>Connector & terminal (B136) No. 11 — (B220) No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 4.	Repair the open circuit in harness between ECM and relief valve control solenoid valve 2 connector.
<p>4</p> <p>CHECK RELIEF VALVE CONTROL SOLENOID VALVE 2. Measure the resistance between relief valve control solenoid valve 2 terminals.</p> <p>Terminals No. 1 — No. 2: Is the measured value within the specified value?</p>	37 — 44 Ω	Go to step 5.	Replace the relief valve control solenoid valve 2. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.>
<p>5</p> <p>CHECK POWER SUPPLY TO RELIEF VALVE CONTROL SOLENOID VALVE 2. 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground.</p> <p>Connector & terminal (B220) No. 1 (+) — Engine ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 6.	Repair the open circuit in harness between main relay and relief valve control solenoid valve 2 connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK POOR CONTACT. Check poor contact in ECM and relief valve control solenoid valve 2 and ECM connectors. Are there poor contact in ECM and relief valve control solenoid valve 2 and ECM connectors?	There are poor contacts.	Repair the poor contact in ECM and relief valve control solenoid valve 2 and ECM connectors.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BI: DTC P1250 — RELIEF VALVE CONTROL SOLENOID VALVE 2 CIRCUIT HIGH —

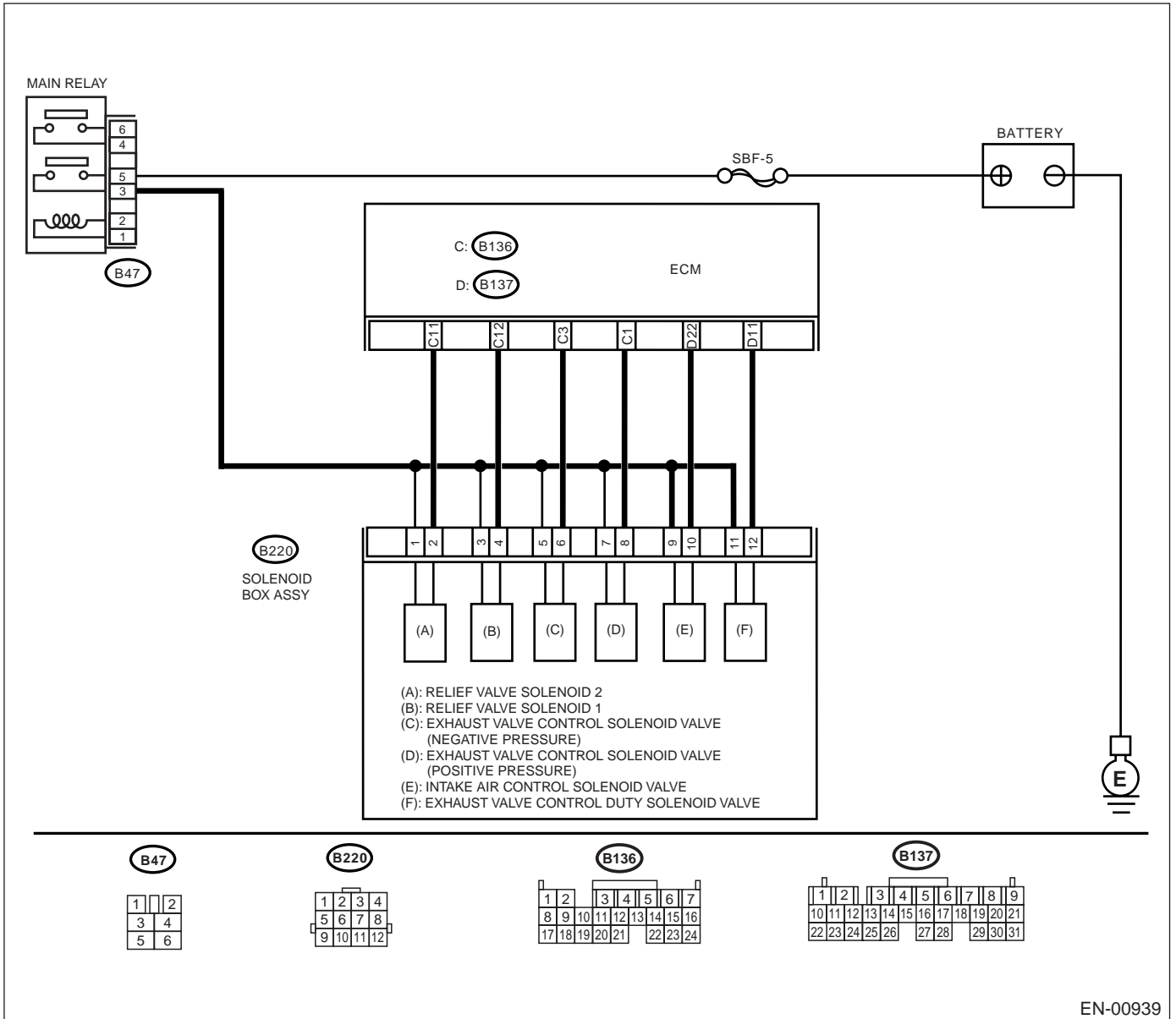
• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL TO ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 11 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
3 CHECK HARNESS BETWEEN RELIEF VALVE CONTROL SOLENOID VALVE 2 AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from relief valve control solenoid valve 2. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 11 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair the battery short circuit in harness between ECM and relief valve control solenoid valve 2 connector. After repair, replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 4.
4 CHECK RELIEF VALVE CONTROL SOLENOID VALVE 2. 1) Turn the ignition switch to OFF. 2) Measure the resistance between relief valve control solenoid valve 2 terminals. Terminals No. 1 — No. 2: Is the measured value less than the specified value?	1 Ω	Replace the relief valve control solenoid valve 2. <Ref. to IN(H4DOSTC)-19, Solenoid Box Assembly.> and replace ECM <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM and relief valve control solenoid valve 2 connectors. Are there poor contact in ECM and relief valve control solenoid valve 2 connectors?	There are poor contacts.	Repair the poor contact in ECM and relief valve control solenoid valve 2 connectors.	Replace the ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BJ:DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

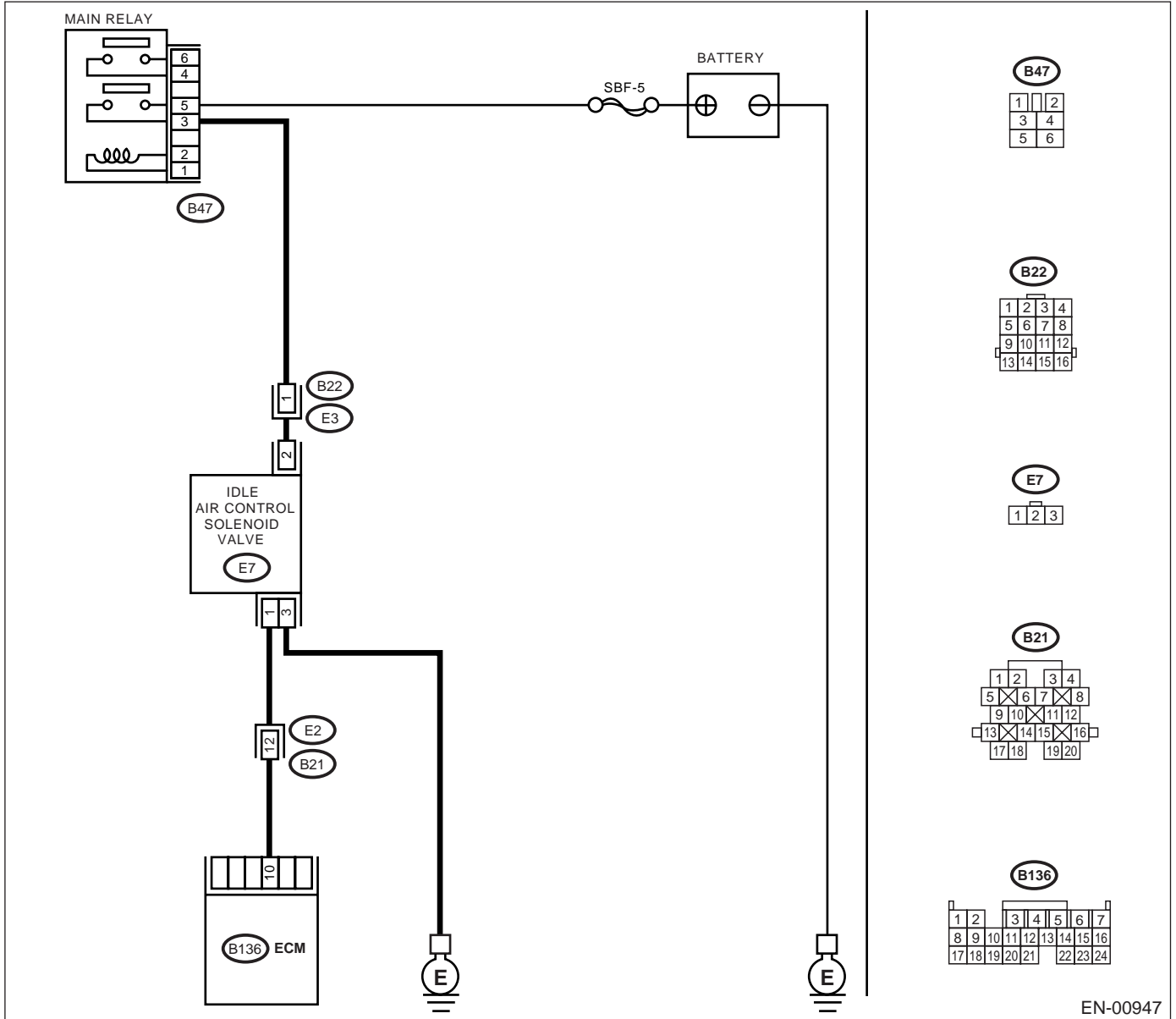
• **TROUBLE SYMPTOM:**

- Engine keeps running at higher revolution than specified idling revolution.
- Fuel is cut according to fail-safe function.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-00947

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. Is any other DTC displayed?	DTC indicated.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items: •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses Is there a fault in the air intake system?	There is no problem.	Go to step 3.	Repair the air suction and leaks.
3 CHECK THROTTLE CABLE. Does the throttle cable have play for adjustment?	Cable has play correctly.	Go to step 4.	Adjust the throttle cable. <Ref. to SP(H4SO)-10, Accelerator Control Cable.>
4 CHECK AIR BY-PASS LINE. 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4DOSTC)-35, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in the by-pass air line. Are foreign particles in the by-pass air line?	Foreign particles are in the by-pass air line.	Remove the foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOSTC)-35, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BK:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

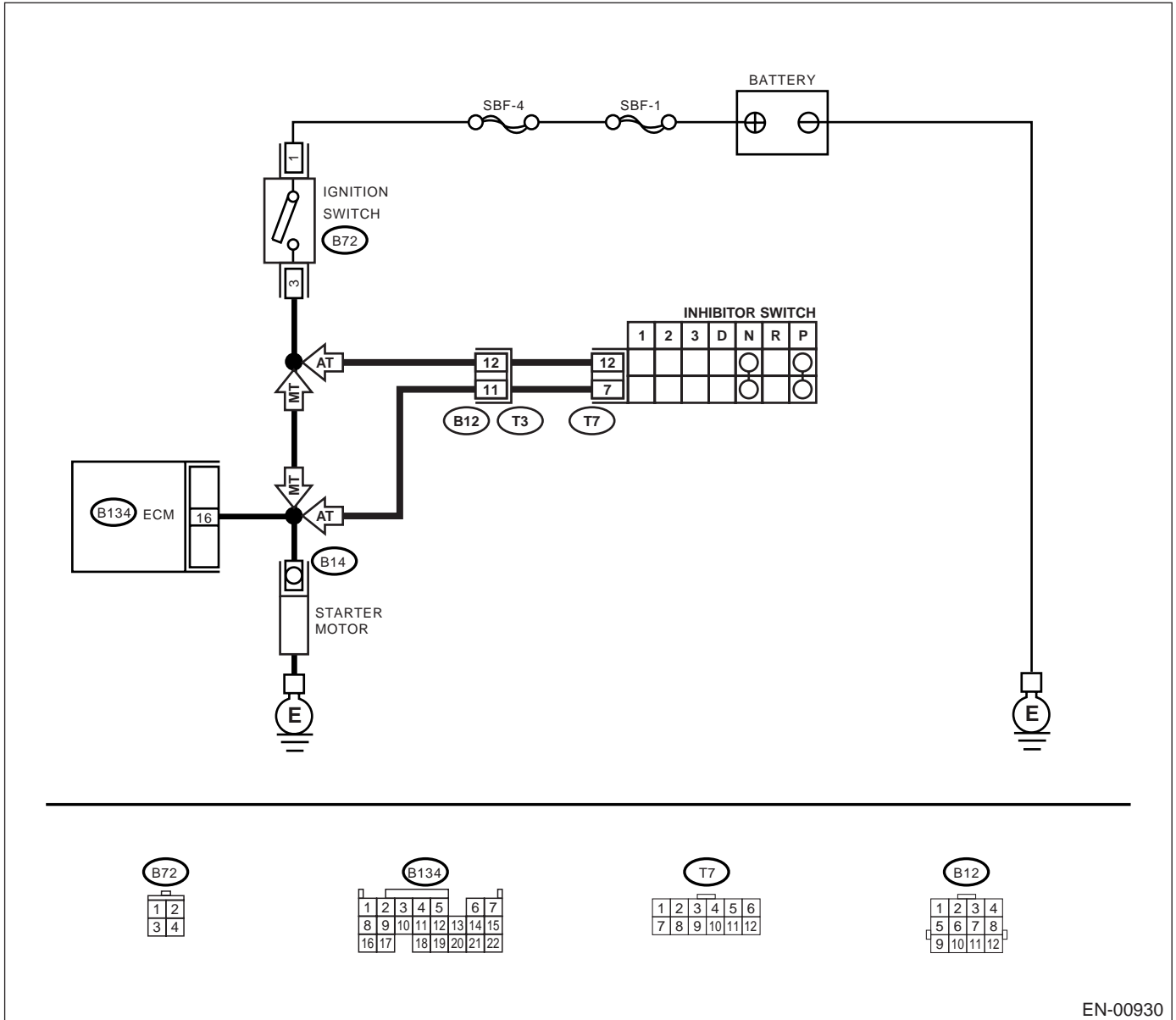
• TROUBLE SYMPTOM:

- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00930

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. Does the starter motor operate when ignition switch to "ST"?	Operates.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector. 	Check the starter motor circuit. <Ref. to EN(H4DOSTC)-52, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

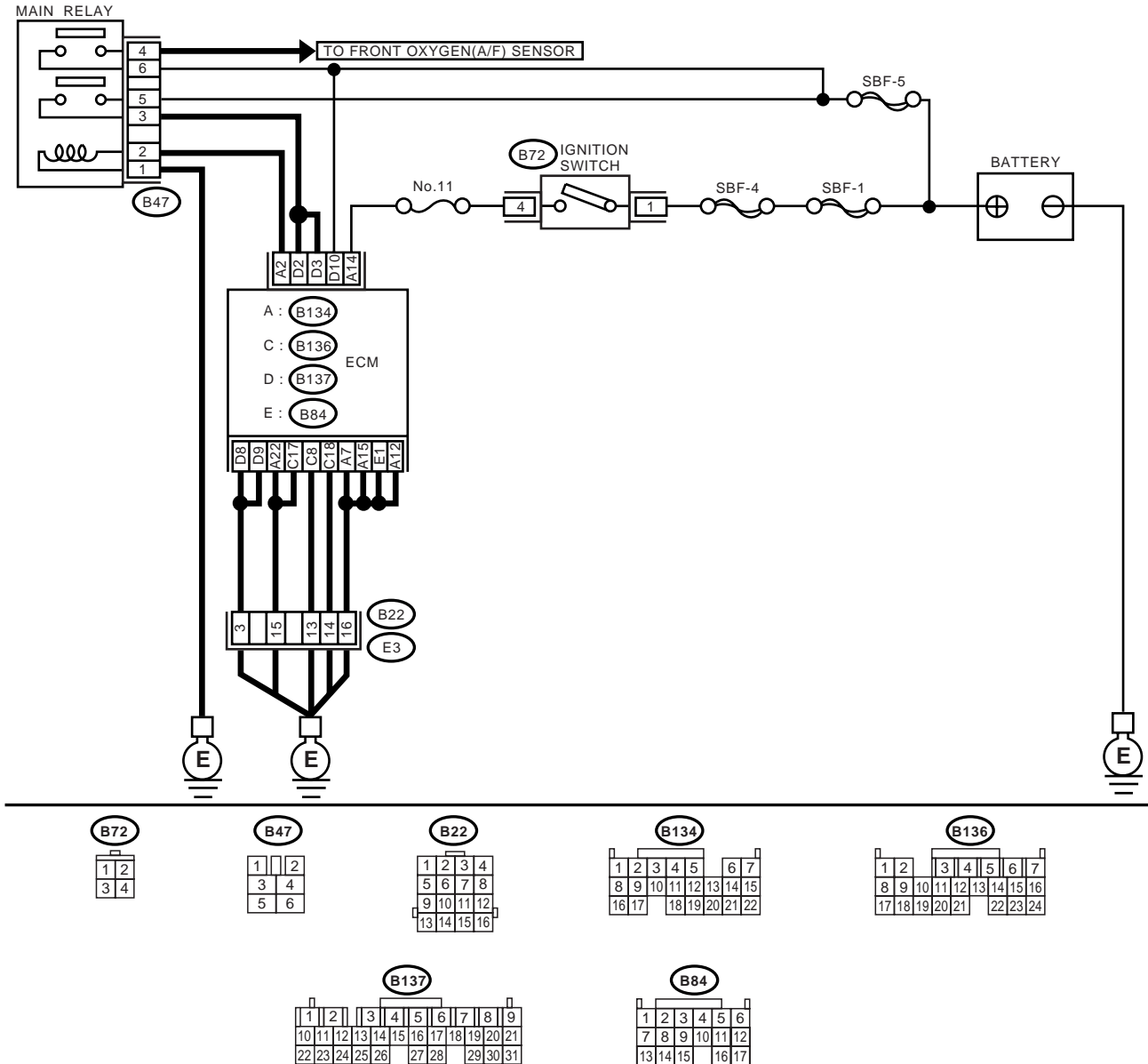
ENGINE (DIAGNOSTICS)

BL:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, Inspection Mode.> .

• WIRING DIAGRAM:



EN-00931

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair the poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B137) No. 10 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair the ground short circuit in harness between ECM connector and battery terminal.
3 CHECK FUSE SBF-5. Is the fuse blown?	Fuse is blown-out.	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BM:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —

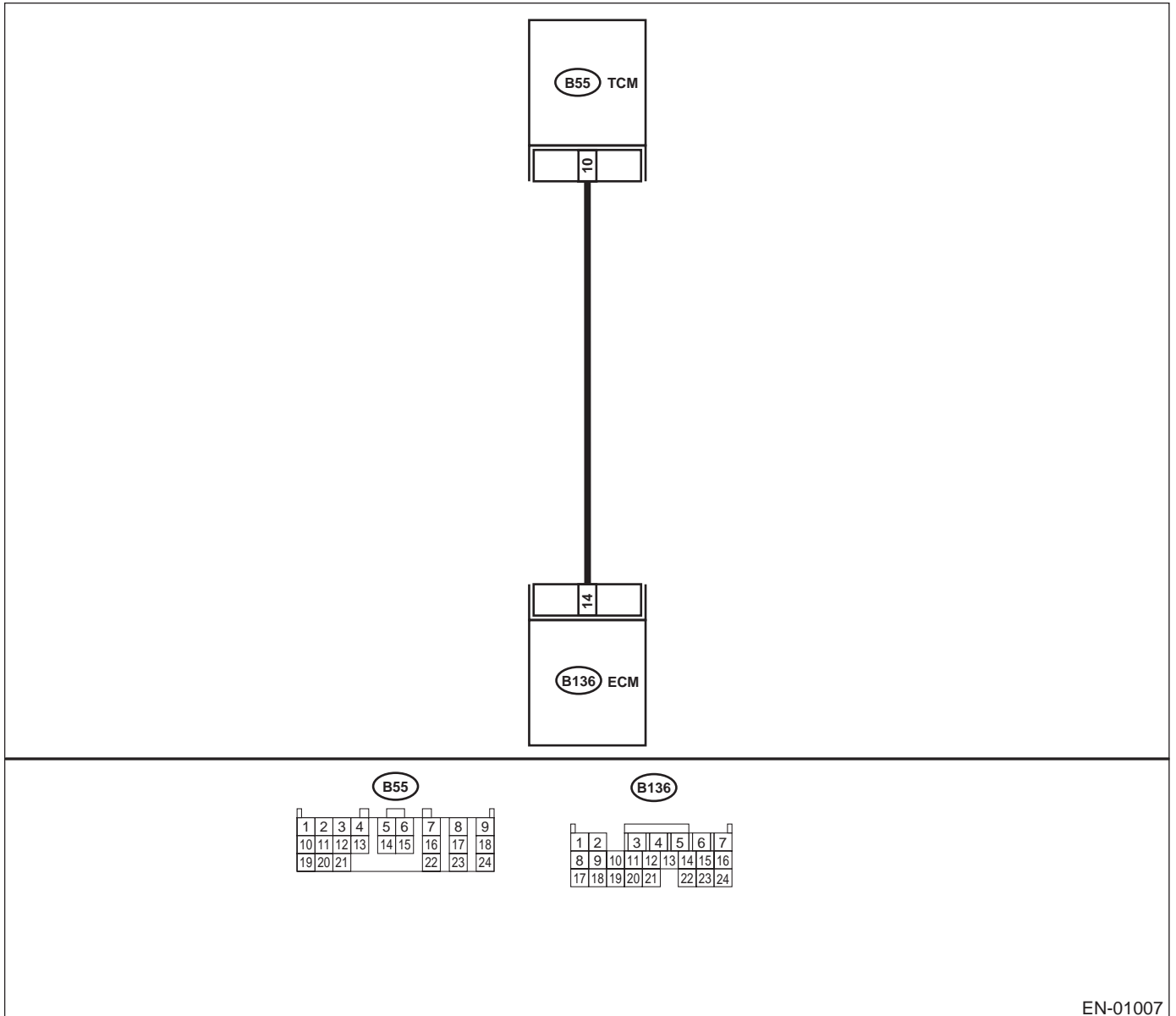
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01007

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 14 (+) — Chassis ground (-): Does the measured value exceed the specified value?	3 V	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 14 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 3.	Repair ground short circuit in harness between ECM and TCM connector.
3 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and TCM connector. Connector & terminal (B136) No. 14 — (B55) No. 10: Is the measured value less than the specified value?	1 Ω	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BN:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —

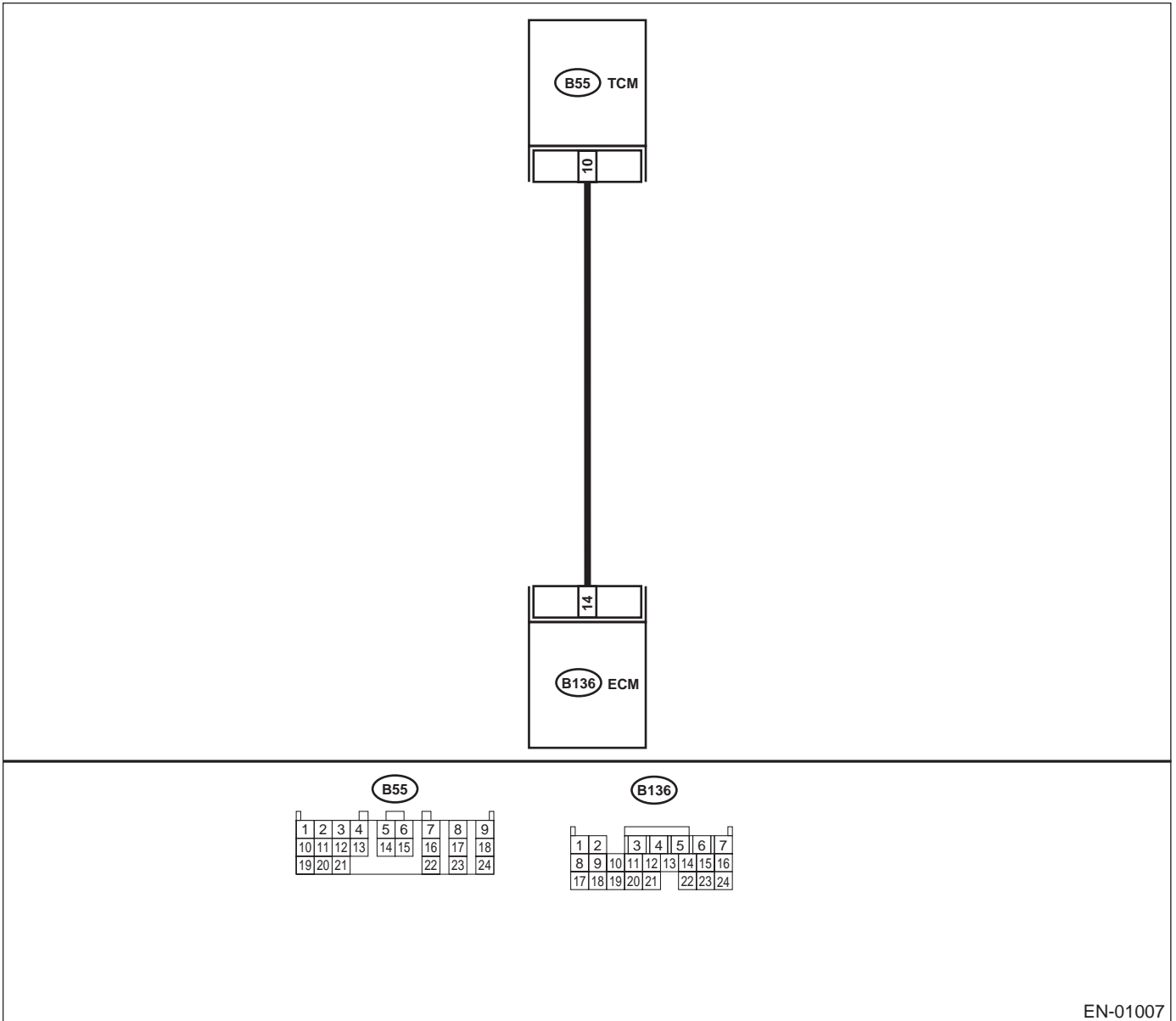
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01007

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connector from TCM. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 14 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	3 V	Go to step 2.	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>
<p>2</p> <p>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 14 (+) — Chassis ground (-): Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	10 V	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H4DOSTC)-40, Engine Control Module.>	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BO:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

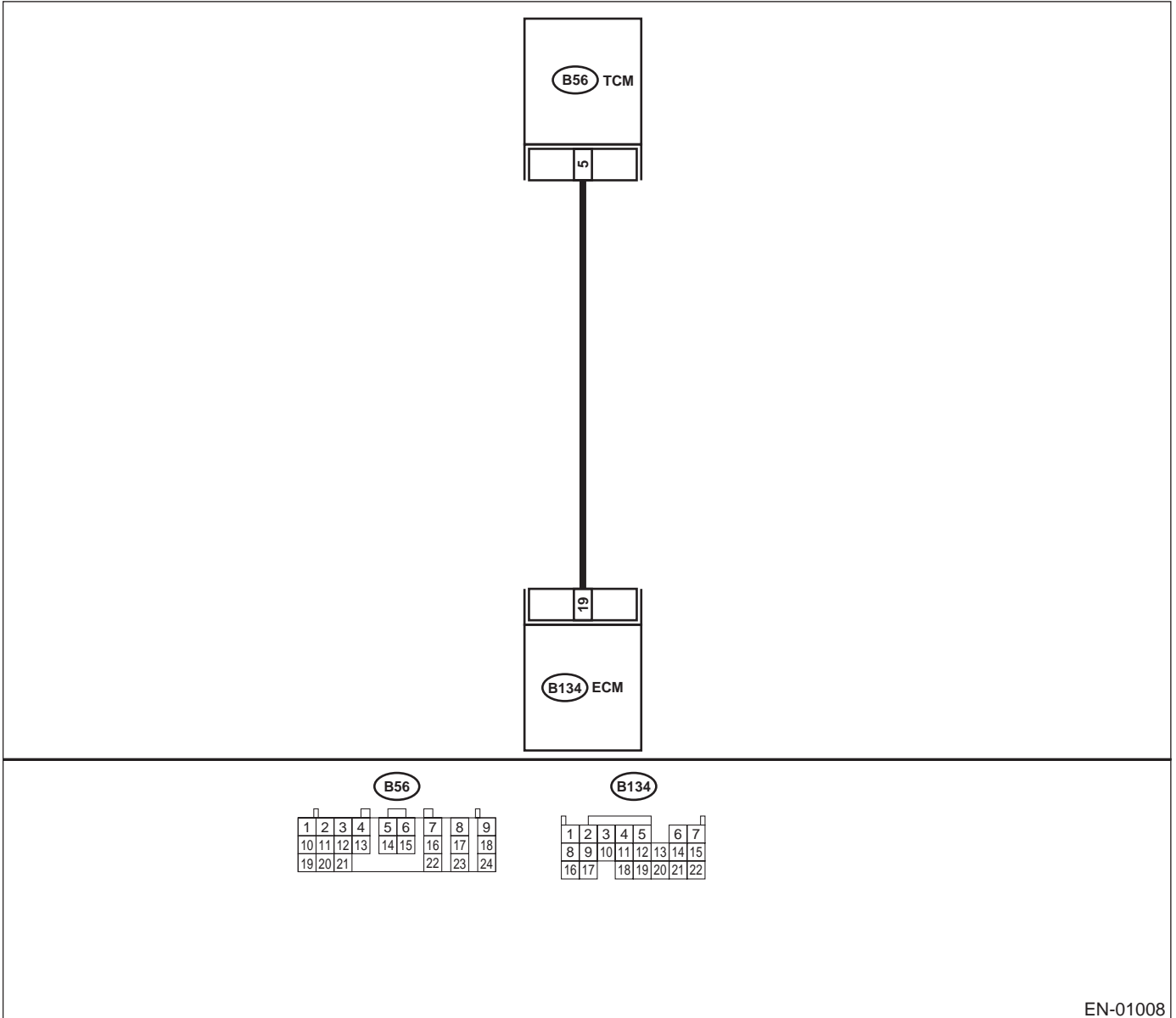
• TROUBLE SYMPTOM:

- Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN-01008

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 19 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. Connector & terminal (B134) No. 19 — (B56) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair open circuit in harness between ECM and TCM connector.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 19 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 6.	Repair ground short circuit in harness between ECM and TCM connector.
6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BP:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

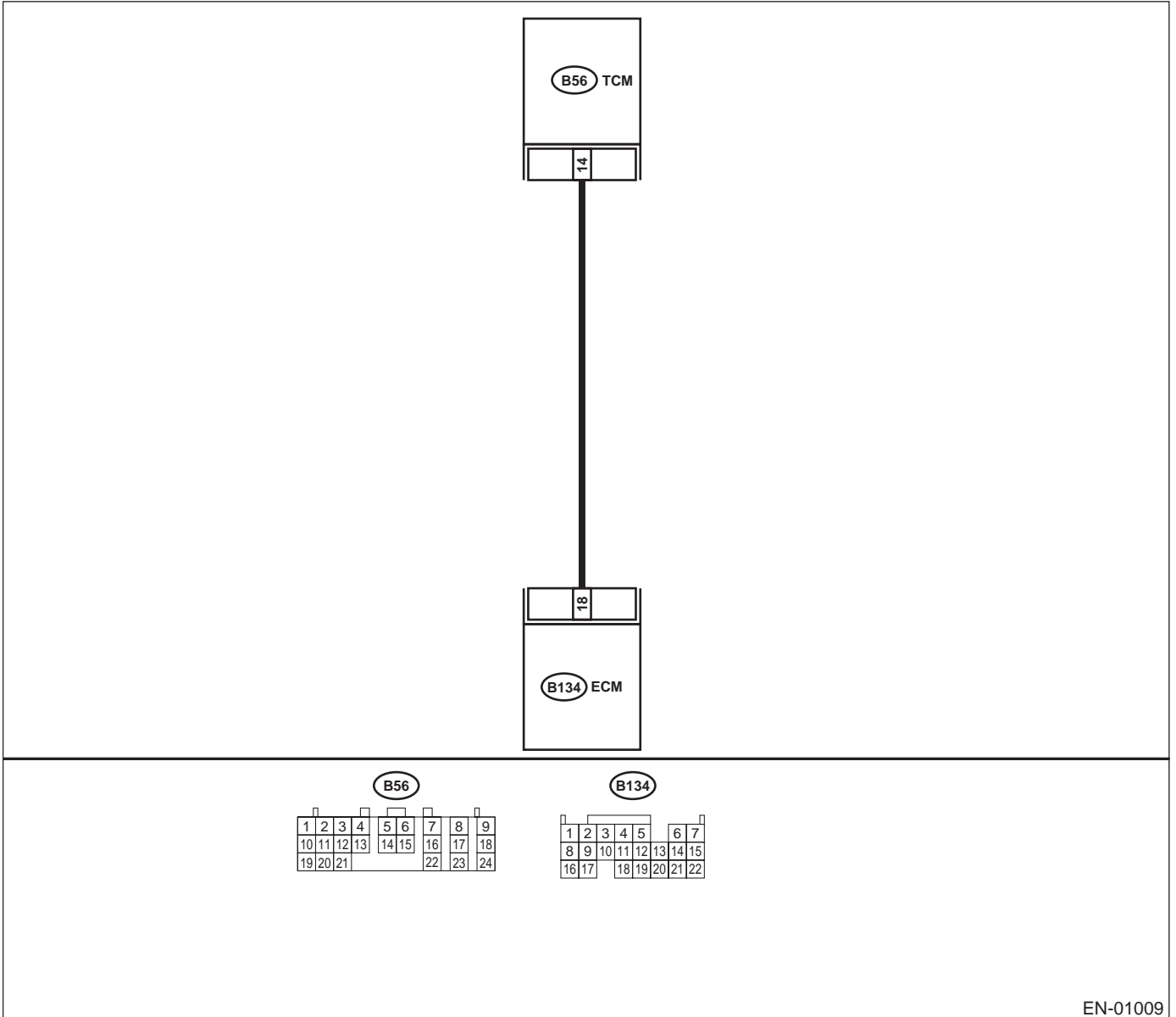
• **TROUBLE SYMPTOM:**

- Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H4DOSTC)-35, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOSTC)-33, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN-01009

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 18 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4.5 V	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 18 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Contact SUBARU distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. Connector & terminal (B134) No. 18 — (B56) No. 14:	1 Ω	Go to step 5.	Repair open circuit in harness between ECM and TCM connector.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 18 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Go to step 6.	Repair ground short circuit in harness between ECM and TCM connector.
6 CHECK POOR CONTACT. Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

18. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOSTC)-90, Engine Trouble in General.>

Symptom	Problem parts
1. Engine does not start. (internal combustion does not occur.)	1) ECM power supply 2) Engine ground terminal 3) Crankshaft position sensor 4) Camshaft position sensor 5) Fuel pump 6) Pressure regulator 7) Ignition coil & ignitor 8) Spark plug 9) Fuel injector
2. Engine does not start. (internal combustion occurs.)	1) ECM power supply 2) Spark plug 3) Engine coolant temperature sensor 4) Pressure regulator 5) Pressure sensor 6) Fuel pump 7) Fuel injector 8) Camshaft position sensor 9) Crankshaft position sensor 10) Idle air control solenoid valve
3. Engine does not start. (engine stalls after internal combustion.)	1) ECM power supply 2) Pressure sensor 3) Engine coolant temperature sensor 4) Spark plug 5) Ignition coil 6) Fuel pump 7) Pressure regulator 8) Fuel injector 9) Idle air control solenoid valve
4. Engine stalls during idling.	1) Idle air control solenoid valve 2) Pressure sensor 3) Mass air flow and intake temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
5. Rough idling	1) Idle air control solenoid valve 2) Pressure sensor 3) Mass air flow and intake temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Crankshaft position sensor (*3) 10) Camshaft position sensor (*3) 11) Oxygen sensor 12) Fuel pump and fuel pump relay

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
6. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Pressure sensor 6) Mass air flow sensor
7. Poor acceleration	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Throttle position sensor 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
8. Engine stalls or engine sags or hesitates at acceleration.	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay
9. Surge	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay
10. Spark knock	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
11. After burning in exhaust system	1) Pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

- *1: Check the ignition coil & ignitor assembly and spark plug.
- *2: Indicate the symptom occurring only in cold temperatures.
- *3: Ensure the secure installation.
- *4: Check the fuel injector, fuel pressure regulator and fuel filter.
- *5: Inspect air leak in the air intake system.
- *6: Adjust the accelerator cable.

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

MEMO:

TRANSMISSION SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

CONTROL SYSTEMS**CS****AUTOMATIC TRANSMISSION****AT****AUTOMATIC TRANSMISSION
(DIAGNOSTICS)****AT****MANUAL TRANSMISSION AND
DIFFERENTIAL****MT****CLUTCH SYSTEM****CL**

CONTROL SYSTEMS



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2. Select Lever	8
3. Select Cable	12
4. MT Gear Shift Lever	15
5. MT Drive Select Lever	21
6. Drive Select Cable	23
7. General Diagnostic Table	25

GENERAL DESCRIPTION

CONTROL SYSTEMS

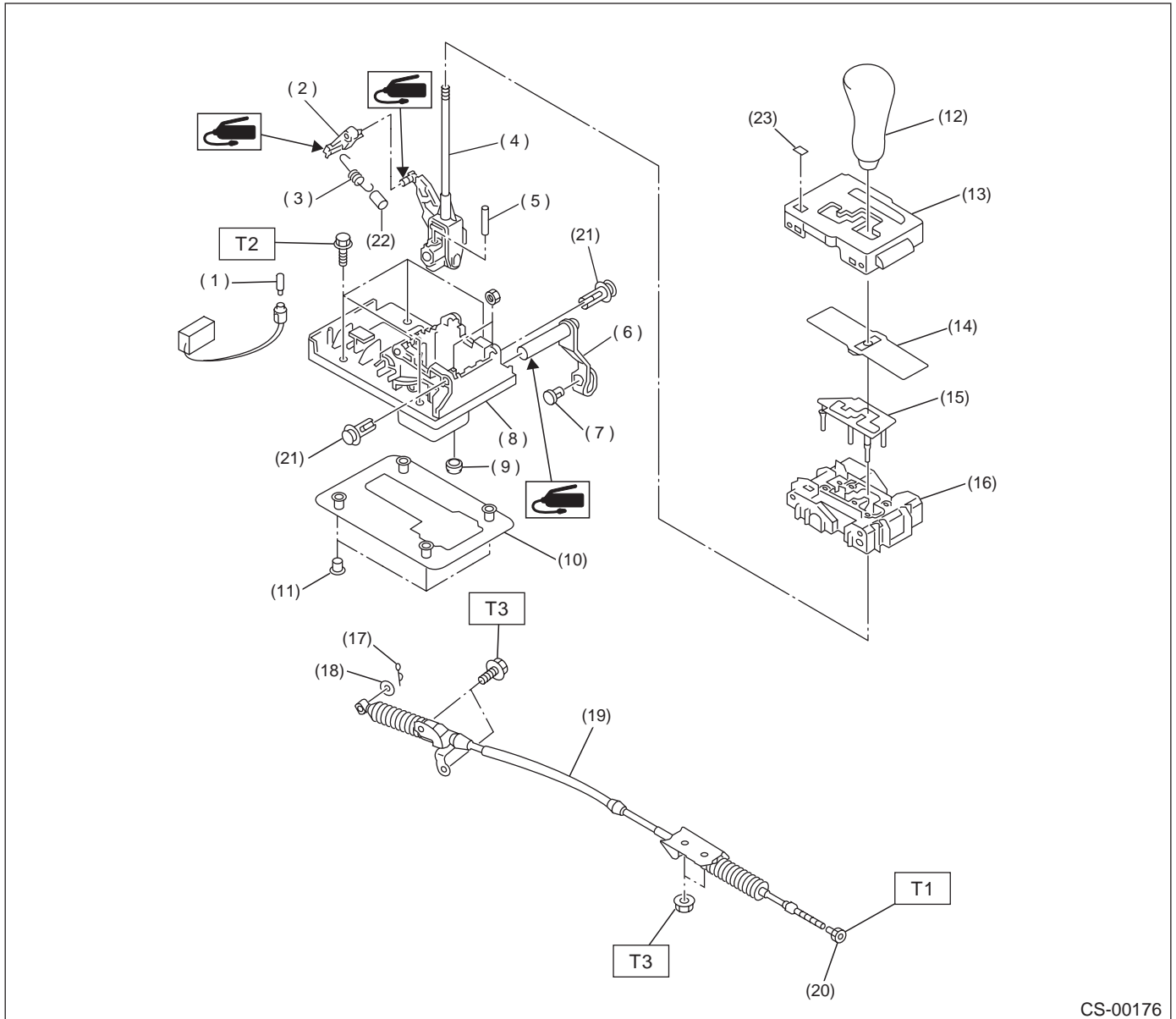
1. General Description

A: SPECIFICATIONS

Item	Specification
Swing torque of rod against lever N (kgf, lb)	3.7 (0.38, 0.84) or less

B: COMPONENT

1. AT SELECT LEVER (EXCEPT SPORT SHIFT MODEL)



CS-00176

- | | |
|--------------------------|---------------------|
| (1) Indicator light bulb | (11) Spacer |
| (2) Detent arm | (12) Grip |
| (3) Detent spring | (13) Indicator |
| (4) Select lever ASSY | (14) Blind |
| (5) Spring pin | (15) Cushion |
| (6) Arm ASSY | (16) Guide plate |
| (7) Bushing | (17) Snap pin |
| (8) Base plate | (18) Washer |
| (9) Grommet | (19) Selector cable |
| (10) Packing | (20) Nut A |

- | |
|------------|
| (21) Clip |
| (22) Tube |
| (23) Cover |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

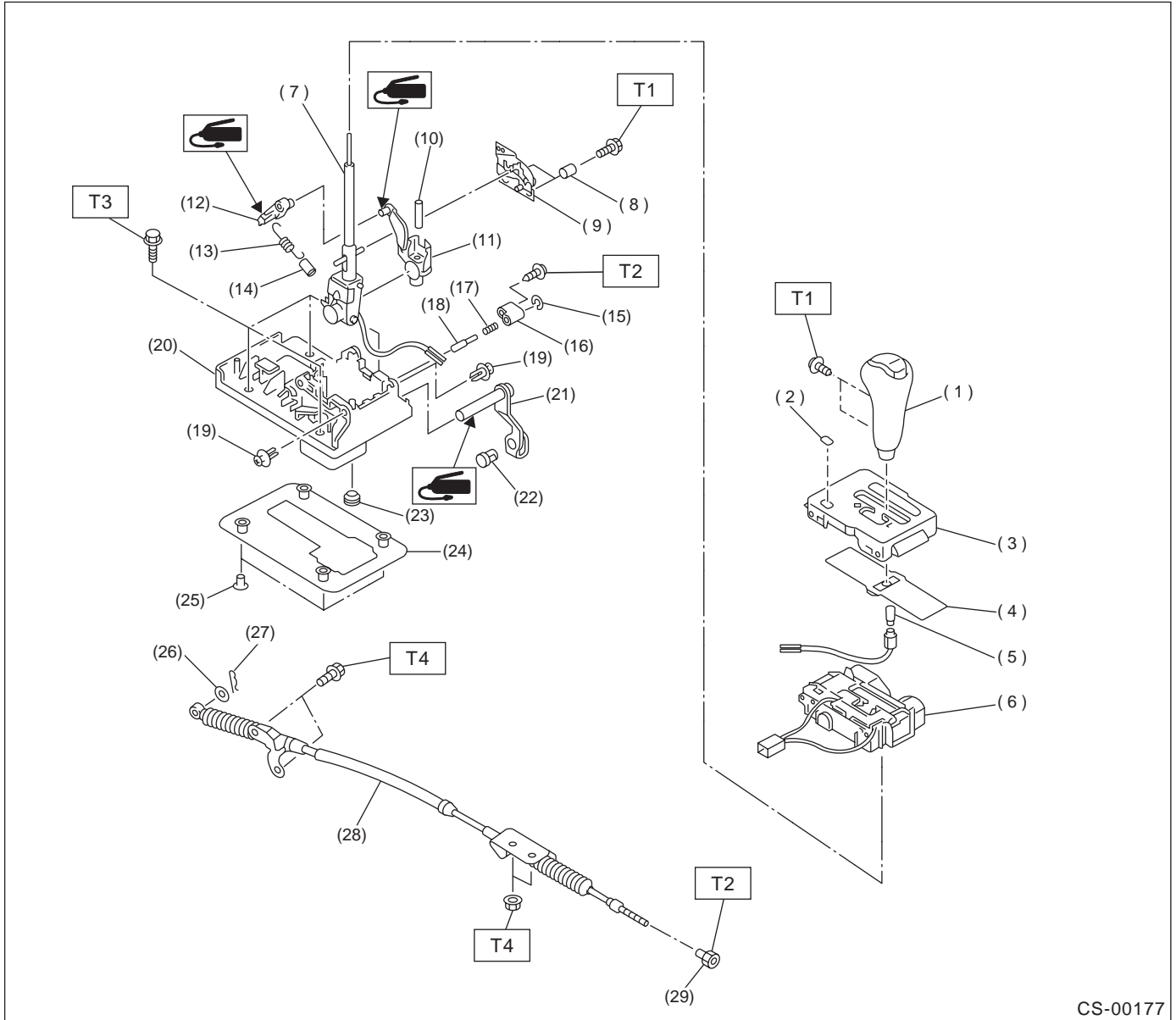
T2: 13 (1.3, 9.4)

T3: 18 (1.8, 13.0)

GENERAL DESCRIPTION

CONTROL SYSTEMS

2. AT SELECT LEVER (SPORT SHIFT MODEL)



CS-00177

- | | | |
|-------------------|--------------------|-------------------|
| (1) Grip | (13) Detent spring | (25) Spacer |
| (2) Cover | (14) Tube | (26) Washer |
| (3) Indicator | (15) Clip | (27) Snap pin |
| (4) Blind | (16) Bushing | (28) Select cable |
| (5) Bulb | (17) Spring | (29) Nut A |
| (6) Guide plate | (18) Rod | |
| (7) Lever | (19) Clip | |
| (8) Spacer | (20) Base plate | |
| (9) Bracket guide | (21) Arm | |
| (10) Spring pin | (22) Bushing | |
| (11) Arm bracket | (23) Grommet | |
| (12) Detent arm | (24) Packing | |

Tightening torque: N·m (kgf·m, ft·lb)

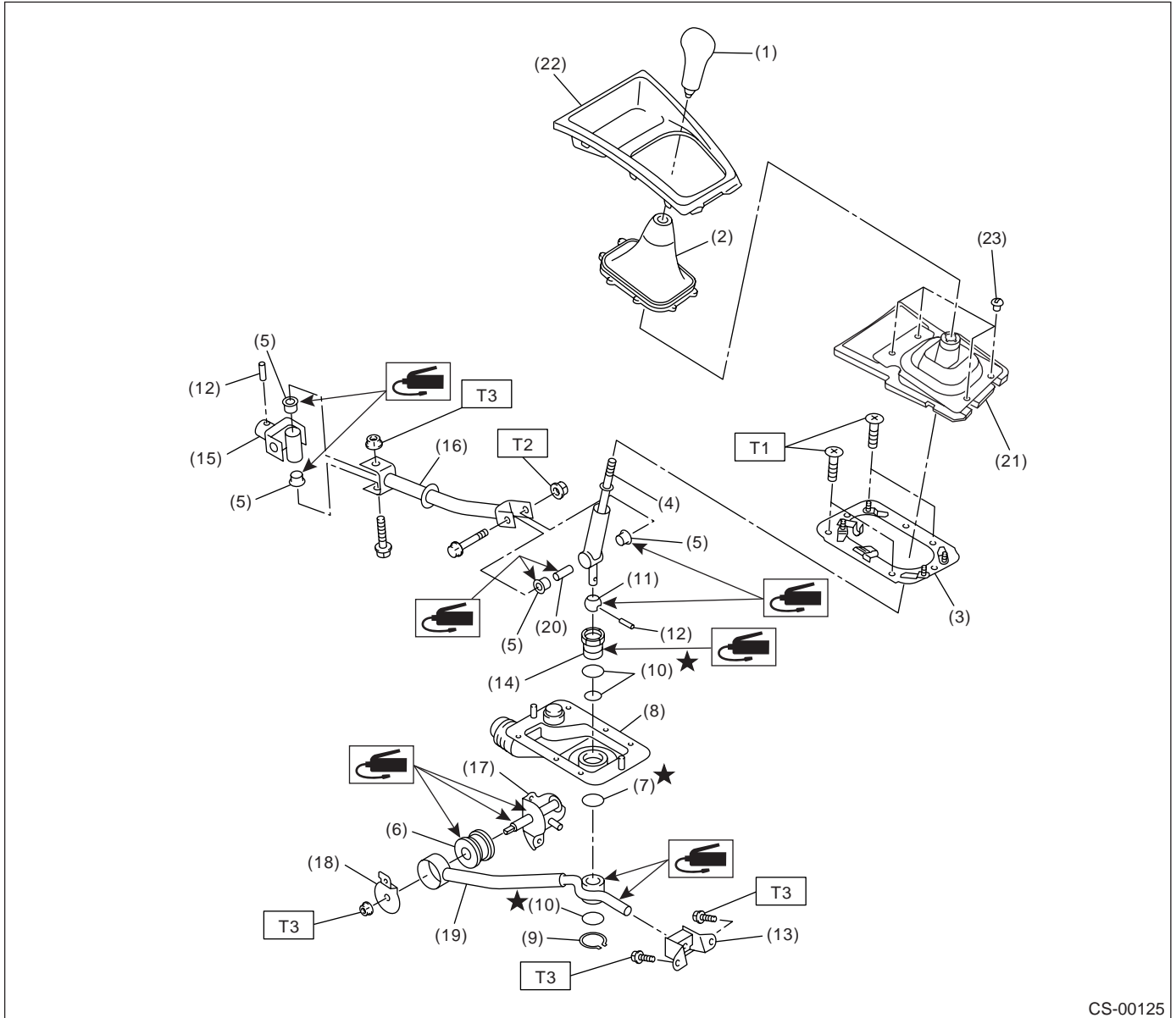
T1: 2.0 (0.2, 1.4)

T2: 7.5 (0.76, 5.5)

T3: 13 (1.3, 9.4)

T4: 18 (1.8, 13.0)

3. MT GEAR SHIFT LEVER



CS-00125

- | | | |
|---------------------|---------------------|------------------------------|
| (1) Gear shift knob | (11) Bushing A | (21) Boot and insulator ASSY |
| (2) Console boot | (12) Spring pin | (22) Front cover |
| (3) Plate ASSY | (13) Cushion rubber | (23) Clamp |
| (4) Lever | (14) Bushing B | |
| (5) Bushing | (15) Joint | |
| (6) Bushing | (16) Rod | |
| (7) Lock wire | (17) Bracket | |
| (8) Boot | (18) Washer | |
| (9) Snap ring | (19) Stay | |
| (10) O-ring | (20) Spacer | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

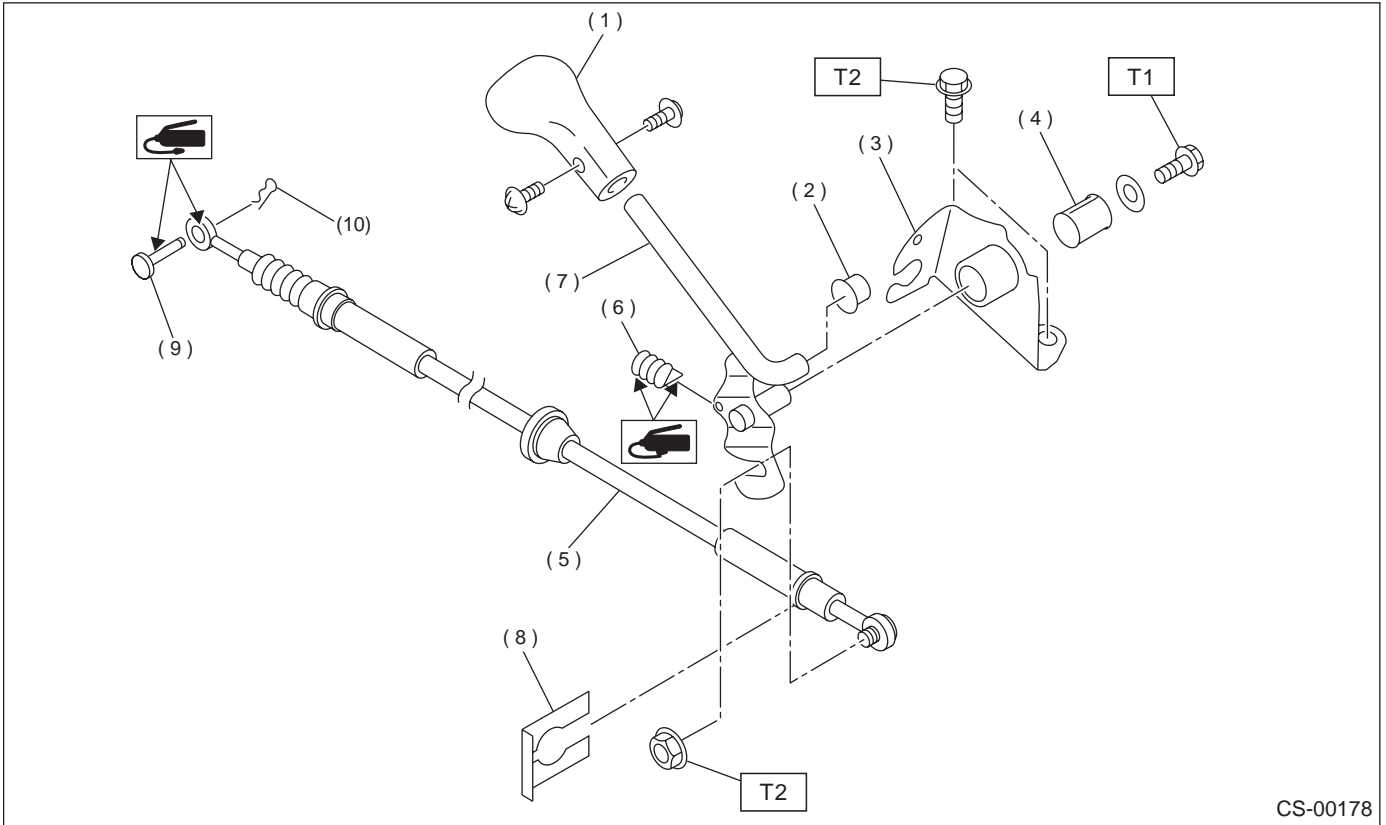
T2: 12 (1.2, 8.7)

T3: 18 (1.8, 13.0)

GENERAL DESCRIPTION

CONTROL SYSTEMS

4. DRIVE SELECT LEVER



- | | |
|----------------|----------------|
| (1) Knob | (6) Spring |
| (2) Cushion | (7) Lever ASSY |
| (3) Plate ASSY | (8) Clip |
| (4) Bushing | (9) Clevis pin |
| (5) Cable | (10) Snap pin |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 1.6 (0.16, 1.2)

T2: 18 (1.8, 13.0)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Before disconnecting electrical connectors, be sure to disconnect ground cable from battery.

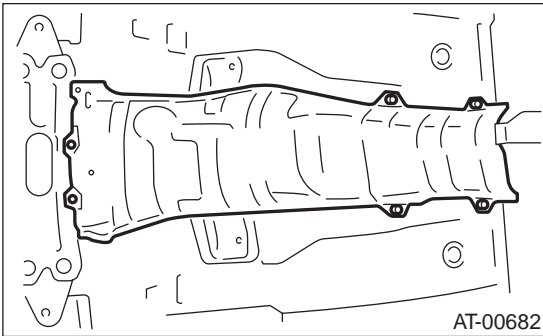
SELECT LEVER

CONTROL SYSTEMS

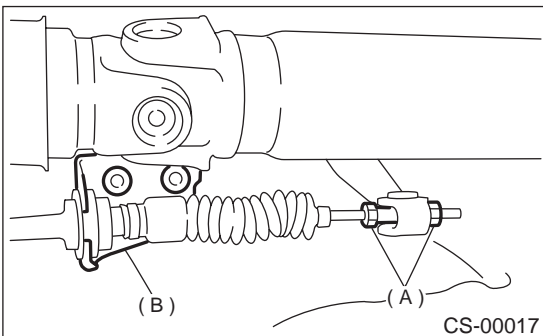
2. Select Lever

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect negative cable from battery.
- 3) Move the select lever to the "N" position.
- 4) Lift-up the vehicle.
- 5) Remove rear exhaust pipe and muffler.
2.0 L and 2.5 L with OBD models
<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.0 L and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>
- 6) Remove heat shield cover. (If equipped)



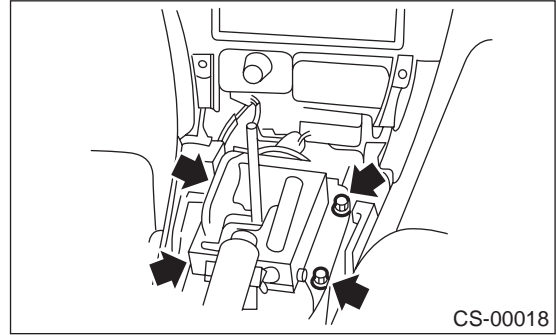
- 7) Disconnect cable from select lever and then remove cable bracket.



- (A) Adjusting nuts
(B) Cable bracket

- 8) Lower the vehicle.
- 9) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>

- 10) Disconnect the connectors, then remove the four bolts to take out the select lever assembly from the body.

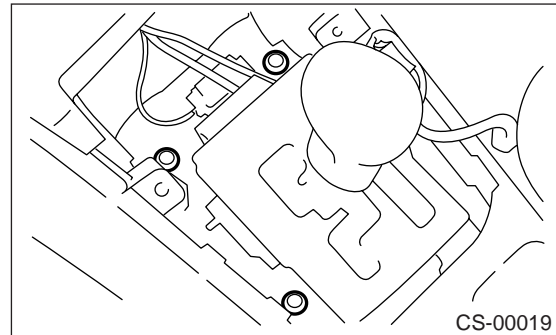


B: INSTALLATION

- 1) Mount the select lever onto the vehicle body.
- 2) Tighten the four bolts to install the select lever to the vehicle body, then connect connector.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



- 3) Install console box. <Ref. to EI-34, INSTALLATION, Console Box.>
- 4) Set location of select lever at "N" position.
- 5) Lift-up the vehicle.
- 6) Set location of range select lever to "N" position.
- 7) Insert the thread portion of the other inner cable and into the connector hole of the select lever, and fix the other outer cable end to the bracket.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 8) Adjust the select cable position. <Ref. to CS-14, ADJUSTMENT, Select Cable.>
- 9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
- 10) Install heat shield cover. (If equipped)

- 11) Install rear exhaust pipe and muffler.
 2.0 L and 2.5 L with OBD models
 <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
 2.0 L and 2.5 L without OBD models
 <Ref. to EX(H4SOw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, INSTALLATION, Muffler.>
 3.0 L model
 <Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
 Turbo model
 <Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>
- 12) Inspect the following items. If the following inspection reveals problems, adjust the select cable and inhibitor switch. <Ref. to CS-14, ADJUSTMENT, Select Cable.> and <Ref. to AT-50, ADJUSTMENT, Inhibitor Switch.>

- (1) The engine starts operating when select lever is in position "P" and "N", but not in other positions.
- (2) The back-up light is lit when the select lever is in position "R", but not in other positions.
- (3) Select lever and indicator positions are matched.

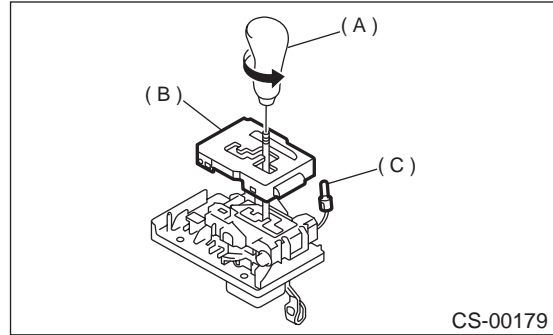
C: DISASSEMBLY

1. EXCEPT SPORT SHIFT MODEL

- 1) Remove grip.
- 2) Remove bulb and then remove indicator.

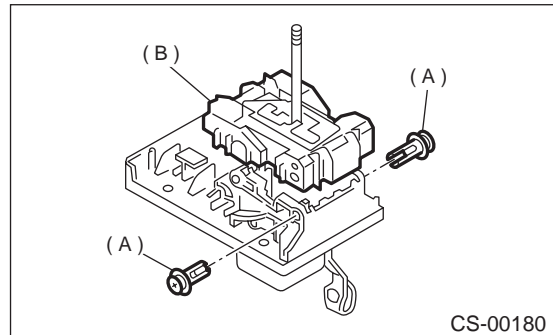
NOTE:

Be careful not to break the bulb during removal.



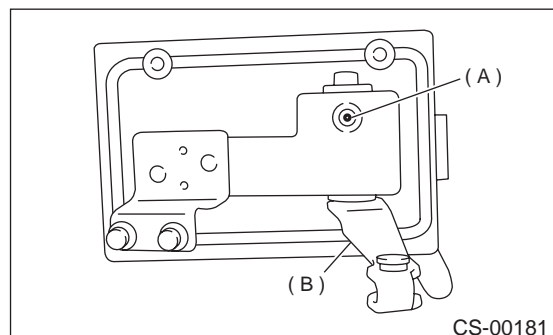
- (A) Grip
- (B) Indicator
- (C) Bulb

- 3) Remove blind.
- 4) Remove clips and then remove guide plate.



- (A) Clips
- (B) Guide plate

- 5) Remove cap and then extract spring pin.

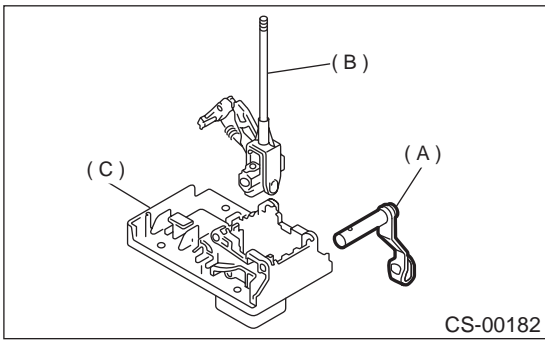


- (A) Spring pin
- (B) Arm ASSY

SELECT LEVER

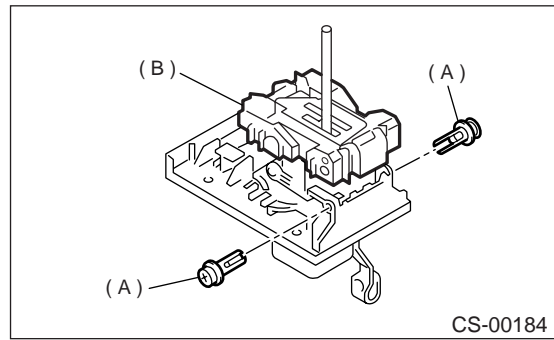
CONTROL SYSTEMS

6) Remove arm assembly then take away lever from base plate.



- (A) Arm ASSY
- (B) Lever
- (C) Base plate

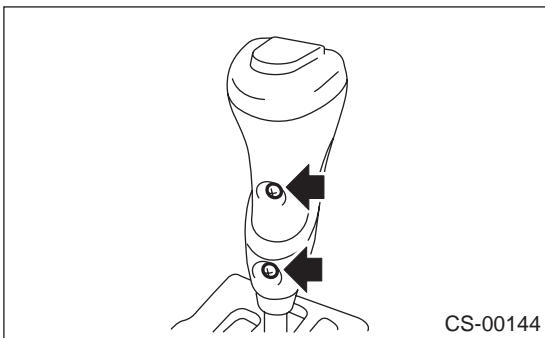
5) Remove the clips, and then remove the guide plate.



- (A) Clips
- (B) Guide plate

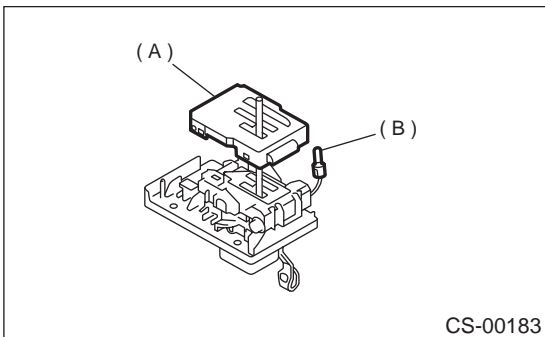
2. SPORT SHIFT MODEL

- 1) Remove the packing.
- 2) Remove the grip.



3) Remove the bulb, and then remove the indicator.

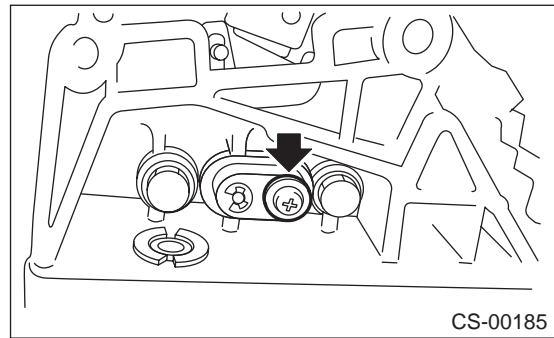
NOTE:
Be careful not to break the bulb during removal.



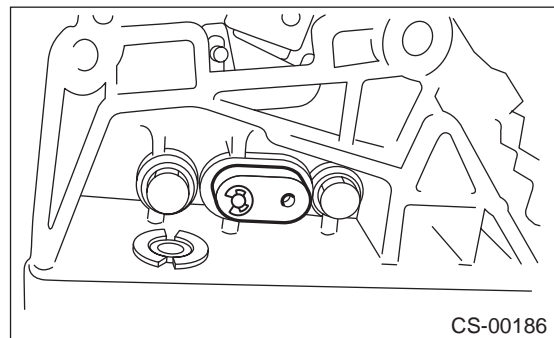
- (A) Indicator
- (B) Bulb

4) Remove the blind.

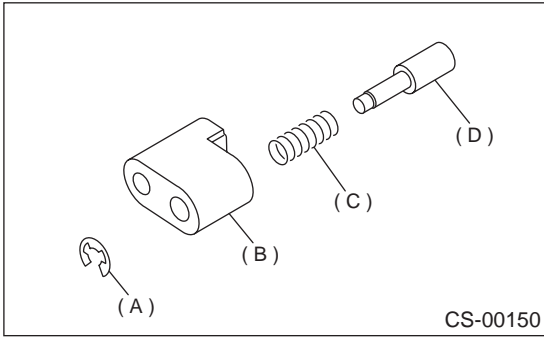
6) Remove the screw.



7) Remove the bushing.

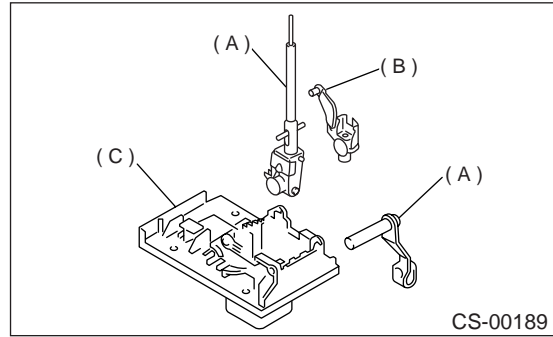


8) Remove the clip, and then remove the rod and the spring.



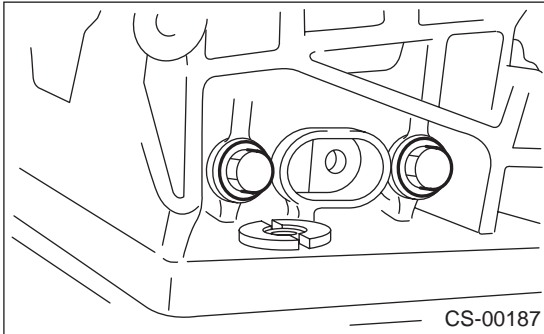
- (A) Clip
- (B) Bushing
- (C) Spring
- (D) Rod

12) Remove the arm assembly and then take away the lever and arm bracket from base plate.

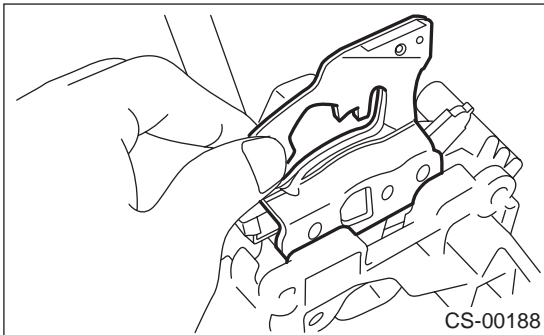


- (A) Arm ASSY
- (B) Lever
- (C) Base plate
- (D) Arm bracket

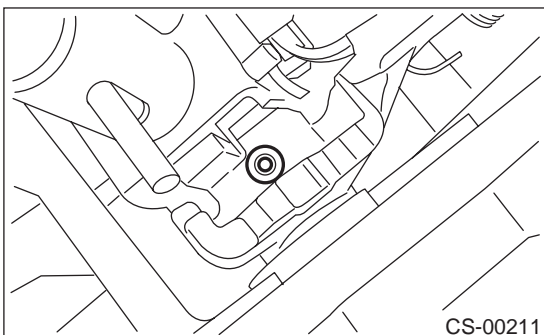
9) Remove the bolt.



10) Remove the bracket guide assembly.



11) Remove the grommet, and then extract spring pin from the top.



13) Remove the spring, and then remove the detent arm.

D: ASSEMBLY

- 1) Clean all parts before assembly.
- 2) Apply grease [SUNLIGHT 2 (Part No. 003602010) or equivalent] to each parts. <Ref. to CS-3, AT SELECT LEVER (EXCEPT SPORT SHIFT MODEL), COMPONENT, General Description.> and <Ref. to CS-4, AT SELECT LEVER (SPORT SHIFT MODEL), COMPONENT, General Description.>
- 3) Assembly is in the reverse order of disassembly.
- 4) After completion of fitting, transfer the select lever to range "P" — "1", then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.

E: INSPECTION

- 1) Inspect the removed parts by comparing with new ones for deformation, damage and wear. Correct or replace if defective.
- 2) Confirm the following parts for operating condition before assembly. Moving condition of the select lever assembly, it should move smoothly.

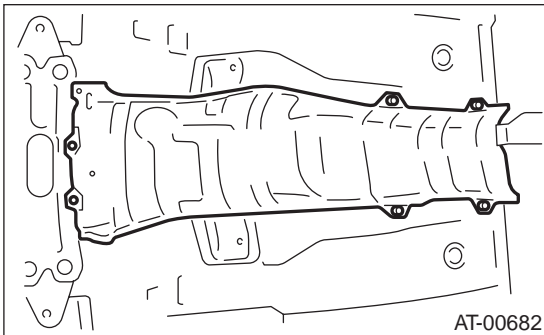
SELECT CABLE

CONTROL SYSTEMS

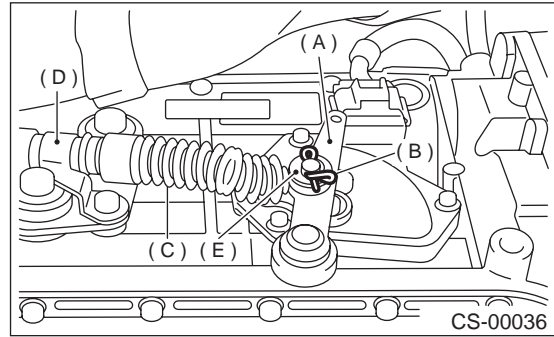
3. Select Cable

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect negative cable from battery.
- 3) Prior to removal, set lever to "N" position.
- 4) Lift-up the vehicle.
- 5) Remove front, center, rear exhaust pipe and muffler. (Non-turbo model)
2.0 L and 2.5 L with OBD models
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.0 L and 2.5 L without OBD models
<Ref. to EX(H4SOW/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SOW/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOW/oOBD)-14, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
- 6) Remove center and rear exhaust pipes and muffler. (Turbo model)
<Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>
- 7) Remove heat shield cover. (If equipped)

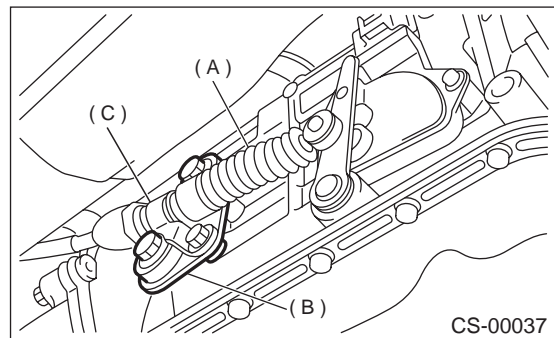


- 8) Remove snap pin and washer from range select lever.



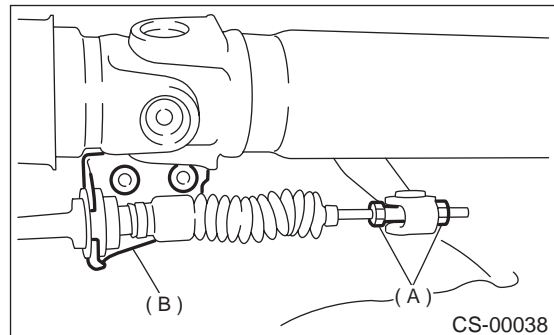
- (A) Range select lever
- (B) Snap pin
- (C) Select cable
- (D) Clamp
- (E) Washer

- 9) Remove plate assembly from transmission case.



- (A) Select cable
- (B) Plate ASSY
- (C) Clamp

- 10) Disconnect cable from select lever and then remove cable bracket.



- (A) Adjusting nuts
- (B) Cable bracket

- 11) Remove select cable from plate assembly.

B: INSTALLATION

1) Install select cable to plate assembly.

Tightening torque:

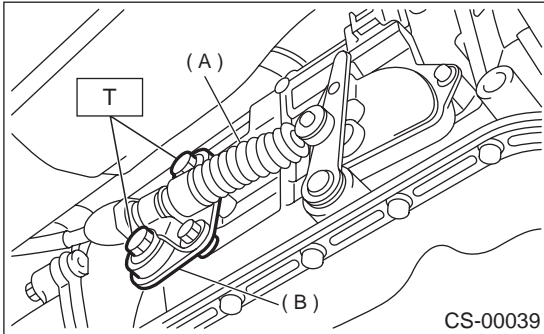
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Install select cable to range select lever.

3) Install plate assembly to transmission.

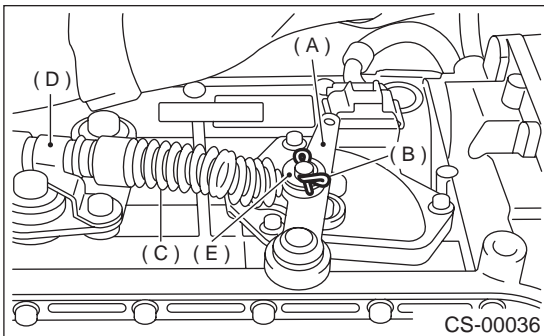
Tightening torque:

T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



- (A) Select cable
- (B) Plate ASSY

4) Install washer and snap pin to range select lever.



- (A) Range select lever
- (B) Snap pin
- (C) Select cable
- (D) Clamp
- (E) Washer

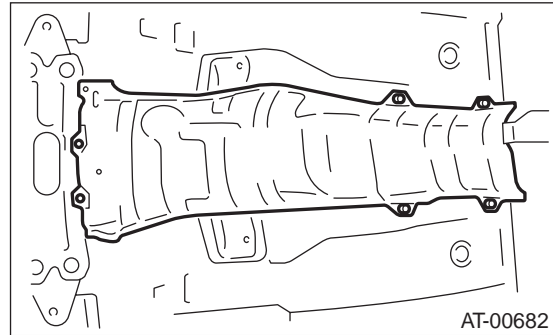
5) Insert the thread portion of the other inner cable and into the connector hole of the select lever, and fix the other outer cable end to the bracket.

Tightening torque:

18 N·m (1.8 kgf-m, 13 ft-lb)

6) Move the select lever to the “N” position, then adjust the select cable position. <Ref. to CS-14, ADJUSTMENT, Select Cable.>

7) Install heat shield cover.



8) Install front, center, rear exhaust pipe and muffler. (Non-turbo model)

2.0 L and 2.5 L with OBD models

<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>

2.0 L and 2.5 L without OBD models

<Ref. to EX(H4SOw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SOw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, INSTALLATION, Muffler.>

3.0 L model

<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>

9) Install center and rear exhaust pipes and muffler. (Turbo model)

<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>

C: INSPECTION

Check the removed cable and replace if damaged, rusty, or malfunctioning.

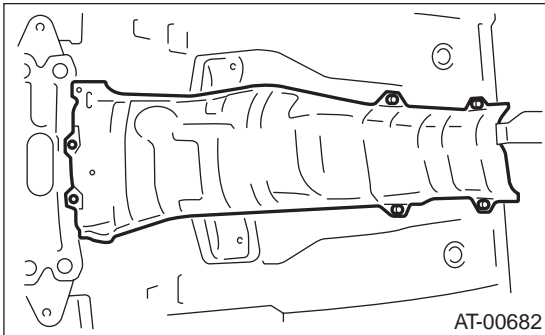
- 1) Check for smooth operation of the cable.
- 2) Check the inner cable for damage and rust.
- 3) Check the outer cable for damage, bends, and cracks.
- 4) Check the boot for damage, cracks, and deterioration.
- 5) Move select lever from “P” position to “1” position. You should be able to feel the detentes in each position. If the detentes cannot be felt or the position pointer is improperly aligned, adjust the cable.

SELECT CABLE

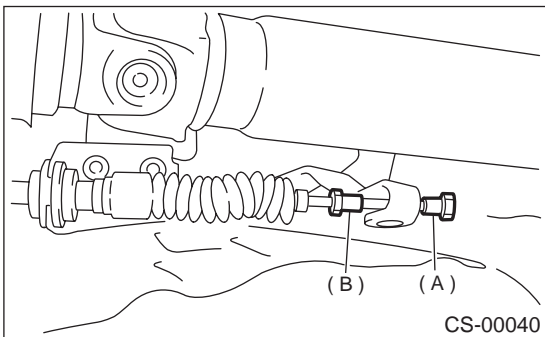
CONTROL SYSTEMS

D: ADJUSTMENT

- 1) Prior to removal, set lever to "N" position.
- 2) Remove rear exhaust pipe and muffler.
2.0 L (non-turbo) and 2.5 L with OBD models
<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.0 L (non-turbo) and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>
- 3) Remove heat shield cover. (If equipped)

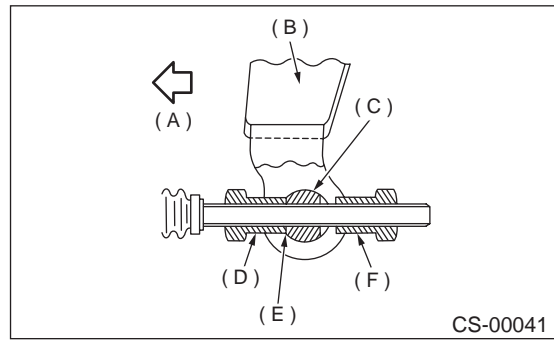


- 4) Loosen the adjusting nut on each side.



- (A) Adjusting nut A
- (B) Adjusting nut B

- 5) Turn adjusting nut B until it lightly touches the connector.

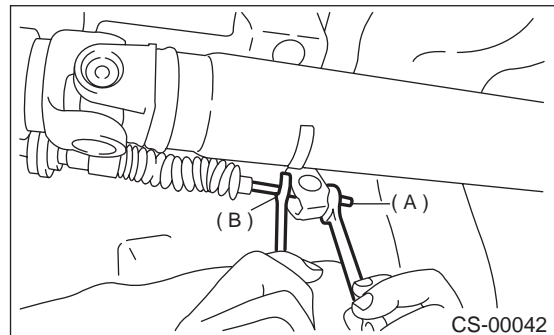


- (A) Front side
- (B) Select lever
- (C) Connector
- (D) Adjusting nut B
- (E) Contact point
- (F) Adjusting nut A

- 6) While preventing adjusting nut B from moving with a wrench, tighten adjusting nut A.

Tightening torque:

7.5 N·m (0.76 kgf·m, 5.5 ft·lb)



- (A) Adjusting nut A
- (B) Adjusting nut B

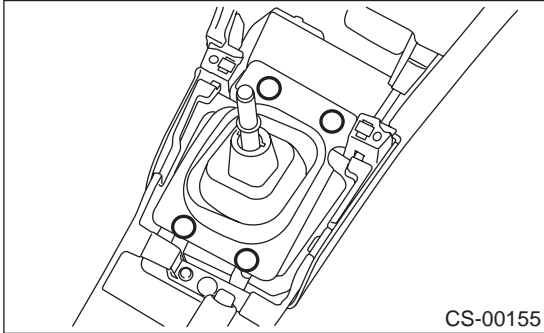
- 7) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.

- 8) Install in the reverse order of removal.

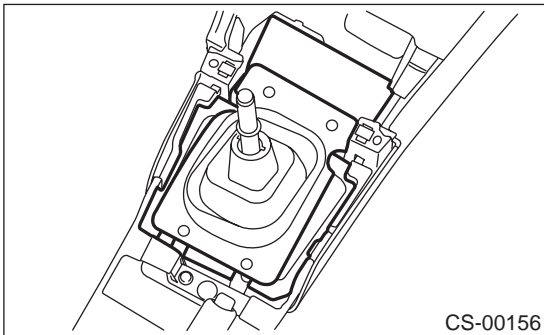
4. MT Gear Shift Lever

A: REMOVAL

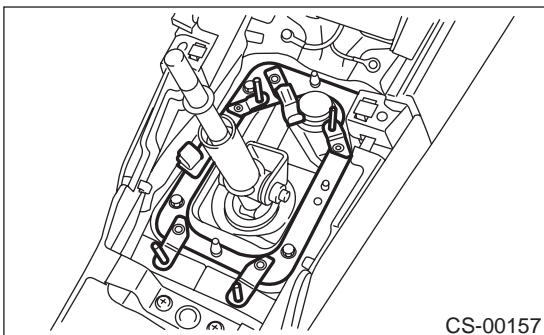
- 1) Set the vehicle on a lift.
- 2) Disconnect negative cable from battery.
- 3) Remove gear shift knob.
- 4) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>
- 5) Remove the clamp.



- 6) Remove the boot and insulator assembly.



- 7) Remove the drive select cable. (Dual-range model)
<Ref. to CS-23, REMOVAL, Drive Select Cable.>
- 8) Remove the plate assembly from body.



- 9) Lift-up the vehicle.
- 10) Remove rear exhaust pipe and muffler.
2.0 L (non-turbo) and 2.5 L with OBD models
<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.0 L (non-turbo) and 2.5 L without OBD models

<Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>

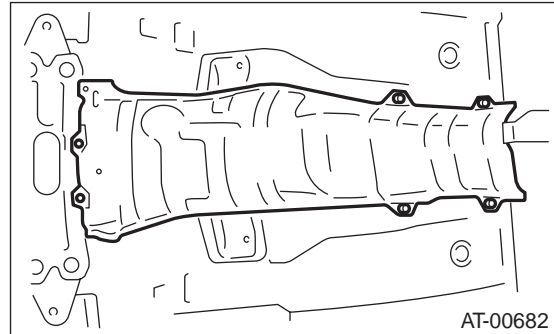
3.0 L model

<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>

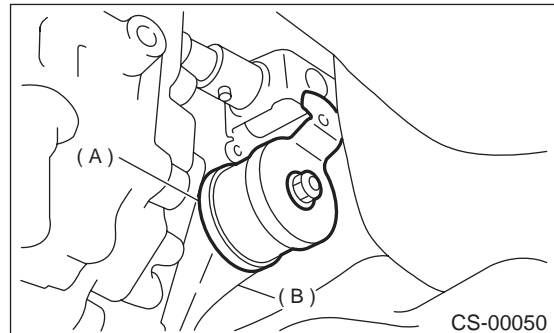
Turbo model

<Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>

- 11) Remove heat shield cover. (If equipped)

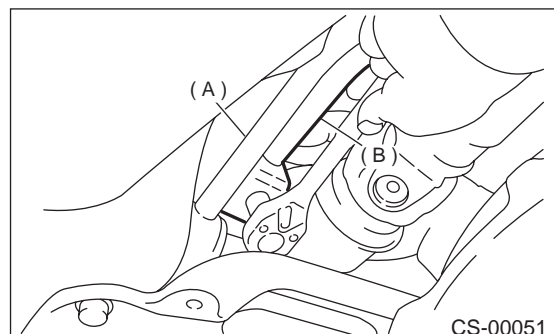


- 12) Remove stay from transmission bracket.



- (A) Stay
- (B) Transmission bracket

- 13) Remove rod from joint.

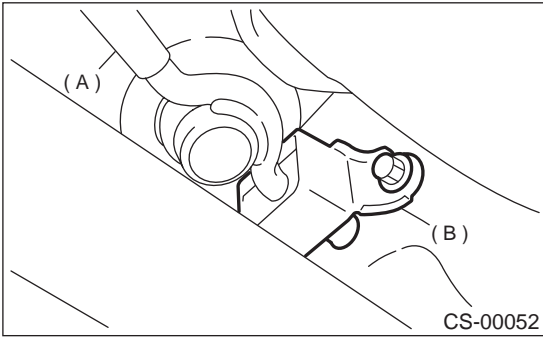


- (A) Stay
- (B) Rod

MT GEAR SHIFT LEVER

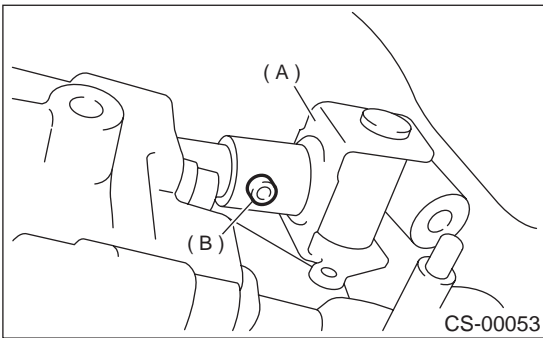
CONTROL SYSTEMS

14) Remove cushion rubber from body.



- (A) Stay
- (B) Cushion rubber

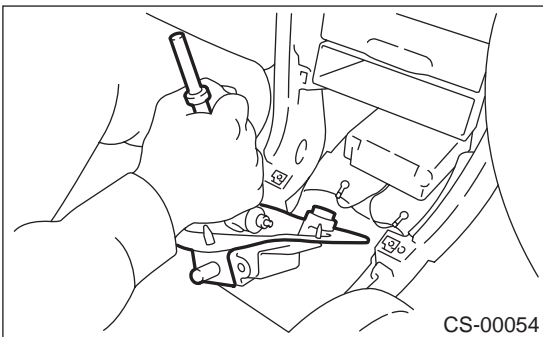
15) Remove joint and then extract spring pin.



- (A) Joint
- (B) Spring pin

16) Lower the vehicle.

17) Remove gear shift lever.



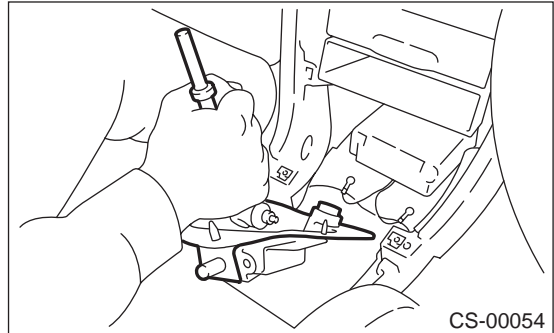
B: INSTALLATION

1) Install the joint to the transmission and secure with the spring pin.

2) Insert gear shift lever from room side.

NOTE:

After inserting rod and stay, temporarily put them onto transmission mount.

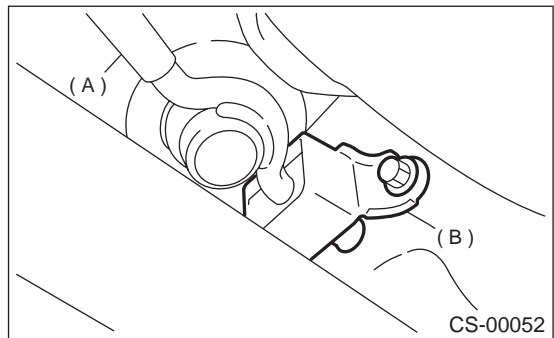


3) Lift-up the vehicle.

4) Mount cushion rubber on the body.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

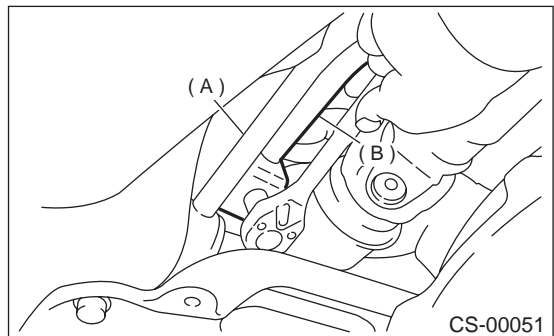


- (A) Stay
- (B) Cushion rubber

5) Connect rod to the joint.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

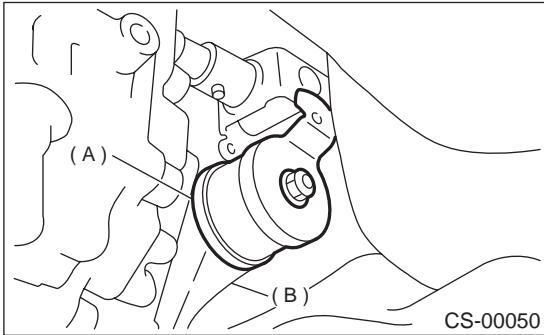


- (A) Stay
- (B) Rod

6) Connect stay to transmission bracket.

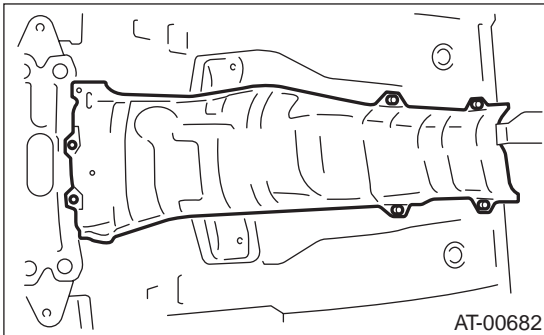
Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



- (A) Stay
- (B) Transmission bracket

7) Install heat shield cover. (If equipped)



8) Install rear exhaust pipe and muffler.

2.0 L (non-turbo) and 2.5 L with OBD models
 <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>

2.0 L (non-turbo) and 2.5 L without OBD models
 <Ref. to EX(H4SOW/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOW/oOBD)-14, INSTALLATION, Muffler.>

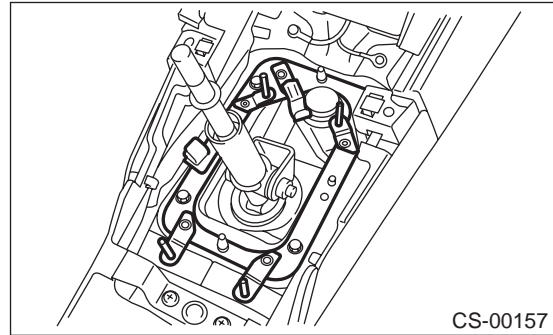
3.0 L model
 <Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>

Turbo model
 <Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>

9) Install the plate assembly to body.

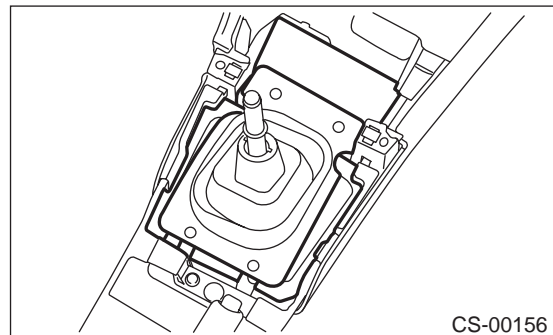
Tightening torque:

7.5 N·m (0.76 kgf·m, 5.5 ft·lb)



10) Install the drive select cable. (Dual-range model)
 <Ref. to CS-23, INSTALLATION, Drive Select Cable.>

11) Install the boot and insulator assembly to vehicle in proper direction.



12) Install the clamp.

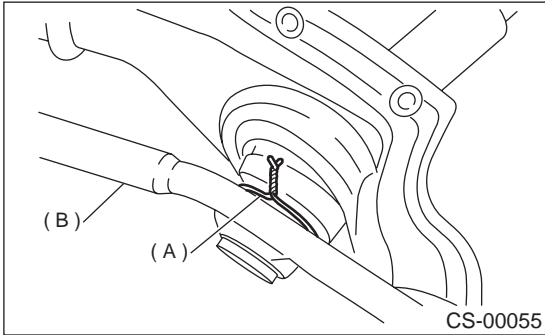
13) Install console box. <Ref. to EI-34, INSTALLATION, Console Box.>

MT GEAR SHIFT LEVER

CONTROL SYSTEMS

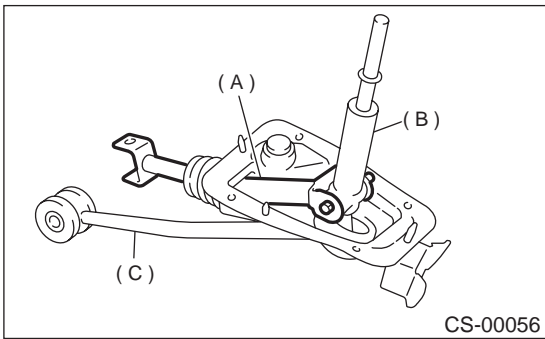
C: DISASSEMBLY

1) Disassemble lock wire.



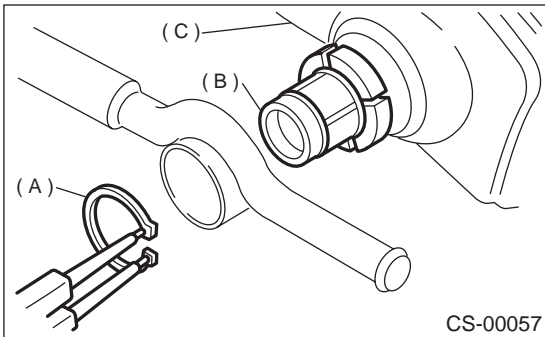
- (A) Lock wire
- (B) Stay

2) Remove rod from lever.



- (A) Rod
- (B) Lever
- (C) Stay

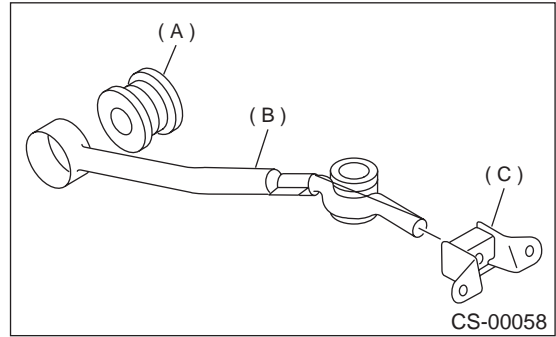
3) Remove snap ring from bushing B, then disconnect stay.



- (A) Snap ring
- (B) Bushing B
- (C) Boot

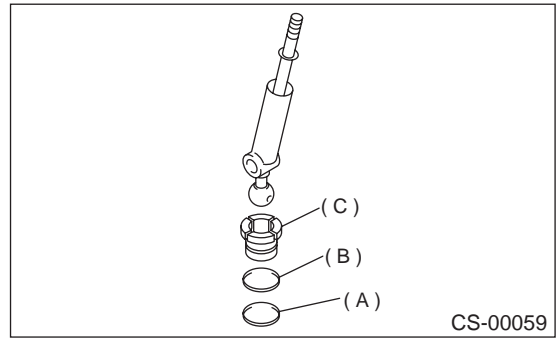
4) Remove boot from gear shift lever.

5) Remove bushing and cushion rubber from stay.



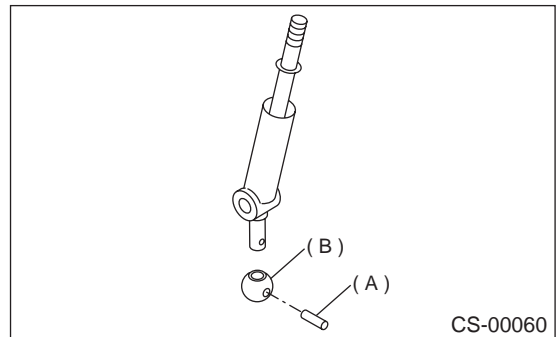
- (A) Bushing
- (B) Stay
- (C) Cushion rubber

6) Remove O-ring, then disconnect bushing B.



- (A) O-ring
- (B) O-ring
- (C) Bushing B

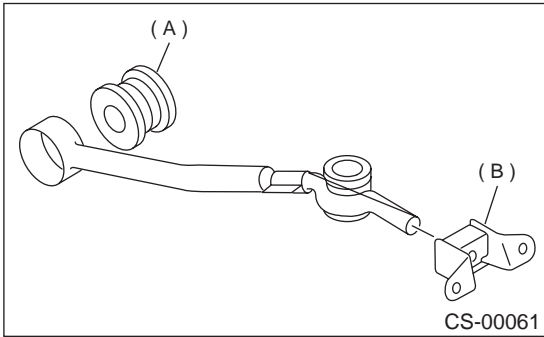
7) Draw out spring pin, then remove bushing A from gear shift lever.



- (A) Spring pin
- (B) Bushing A

D: ASSEMBLY

- 1) Clean all parts before assembly.
- 2) Mount the bushing and cushion rubber on the stay.

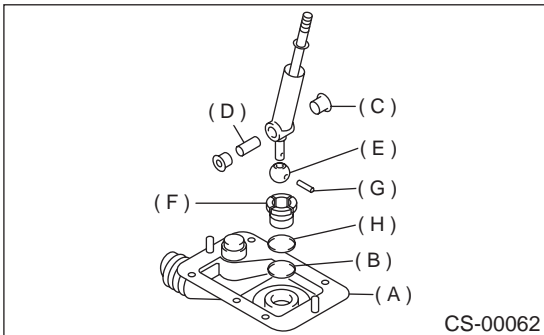


- (A) Bushing
- (B) Cushion rubber

- 3) Mount each part; boot, O-ring, bushing A, spacer, bushing B, bushing and spring pin on the gear shift lever.

NOTE:

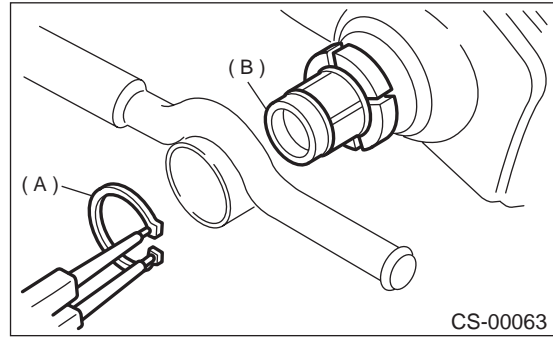
- Always use new O-rings.
- Apply grease [SUNLIGHT 2 (Part No. 003602010 or equivalent)] to the inner and side surfaces of the bushing when installing the spacer.



- (A) Boot
- (B) O-ring
- (C) Bushing
- (D) Spacer
- (E) Bushing A
- (F) Bushing B
- (G) Spring pin
- (H) O-ring

- 4) Insert the gear shift lever into the boot hole.

- 5) Install snap ring and stay to the bushing B.

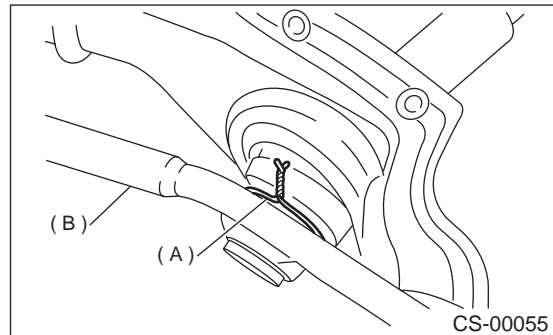


- (A) Snap ring
- (B) Bushing B

- 6) Tighten with lock wire to the extent that the boot will not come off.

NOTE:

Always use new lock wire.

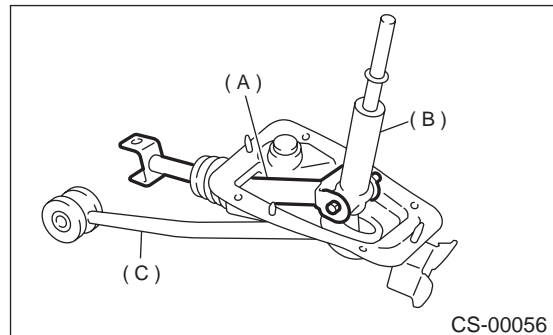


- (A) Lock wire
- (B) Stay

- 7) Insert the rod into the boot hole.
- 8) Connect rod to lever.

Tightening torque:

11.8 N·m (1.2 kgf-m, 8.7 ft-lb)



- (A) Rod
- (B) Lever
- (C) Stay

MT GEAR SHIFT LEVER

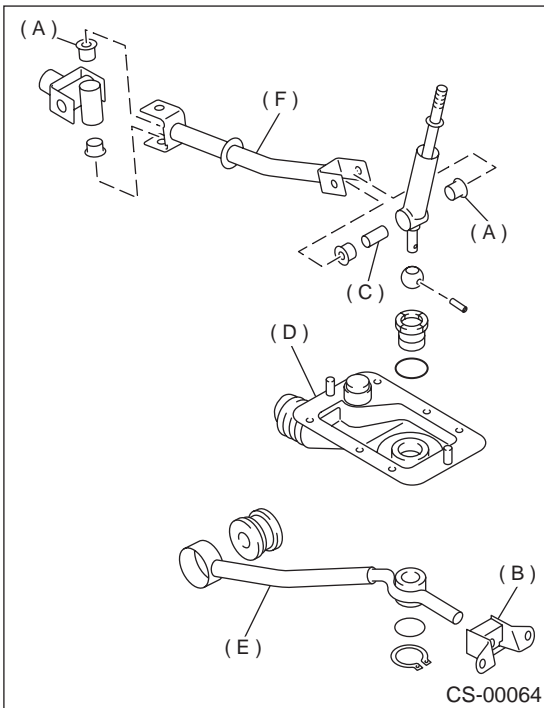
CONTROL SYSTEMS

9) Check the swing torque of the rod in relation to the gear shift lever.

10) Check that there is no excessive play and that parts move smoothly.

E: INSPECTION

1) Check each part (bushing, cushion rubber, spacer, boot, stay and rod, etc.) for deformation, damage and wear. Repair or replace any defective part. Determine defective parts by comparing with new parts.



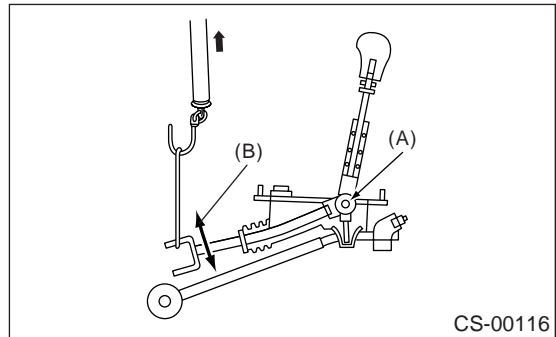
- (A) Bushing
- (B) Cushion rubber
- (C) Spacer
- (D) Boot
- (E) Stay
- (F) Rod

2) Check the swing torque of the rod in relation of the gear shift lever.

If the torque exceeds the specification, replace bushing or retighten nuts.

Swing torque:

3.7 N (0.38 kgf, 0.84 lb) or less

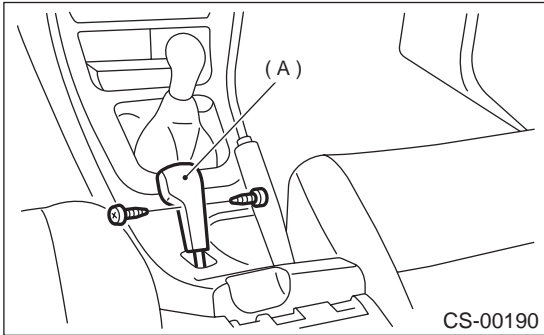


- (A) Center of rotation
- (B) Swing torque

5. MT Drive Select Lever

A: REMOVAL

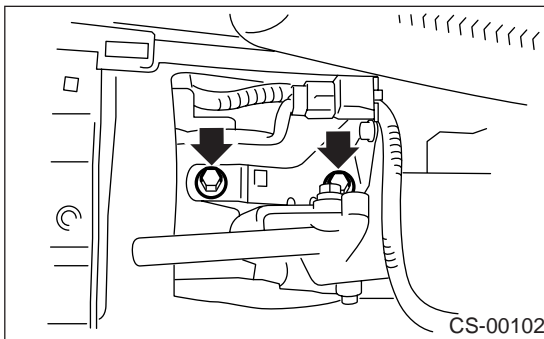
- 1) Set drive select lever to HI position.
- 2) Remove the knob.



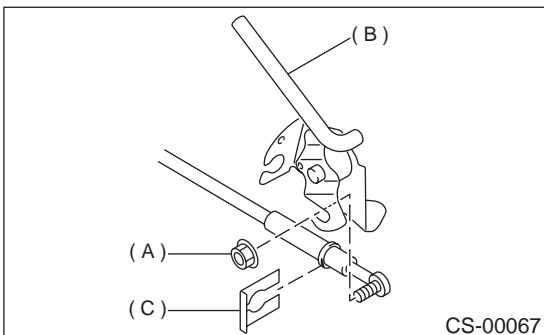
(A) Drive select lever knob

- 3) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>

- 4) Remove the bolt installing drive select lever assembly on body.



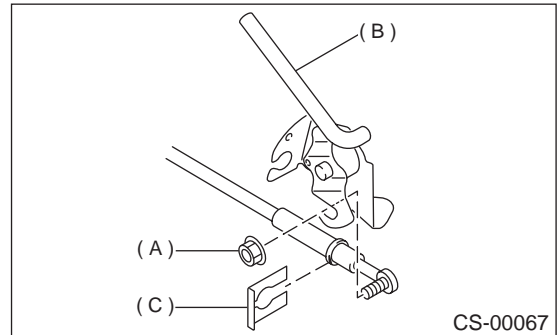
- 5) Remove flange nut, clip and then disconnect the cable from lever assembly.



(A) Flange nut
(B) Lever ASSY
(C) Clip

B: INSTALLATION

- 1) Attach the drive select cable to the lever assembly and secure with the clamp.



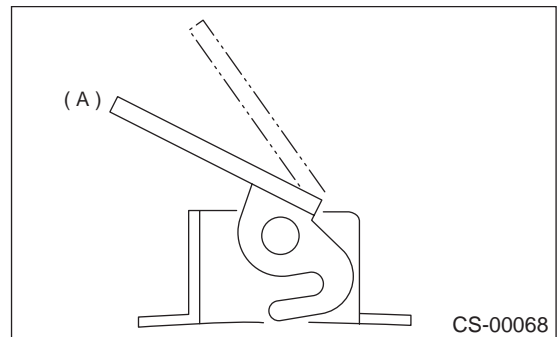
(A) Flange nut
(B) Lever ASSY
(C) Clip

- 2) Install drive select lever.

Tightening torque:

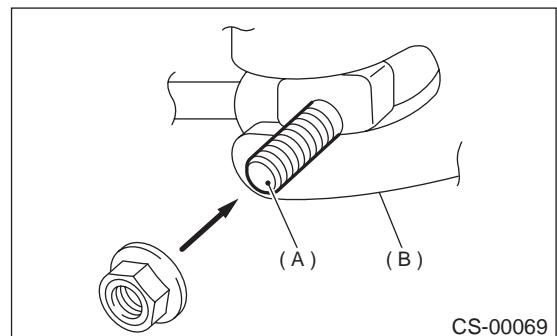
18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 3) Set drive select lever to HI position.



(A) HI position

- 4) Be sure to insert cable eye end bolt into lever arm slit.



(A) Cable eye end bolt
(B) Lever arm

MT DRIVE SELECT LEVER

CONTROL SYSTEMS

5) Tighten nut where cable end bolt comes to a stop.

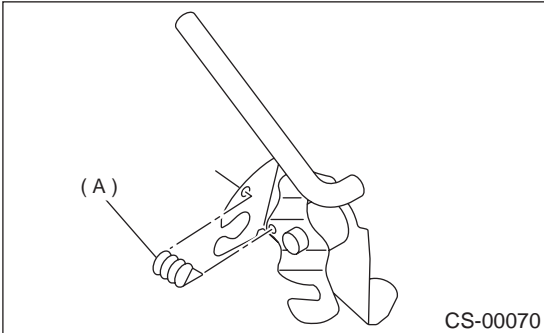
Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

6) Install in the reverse order of removal.

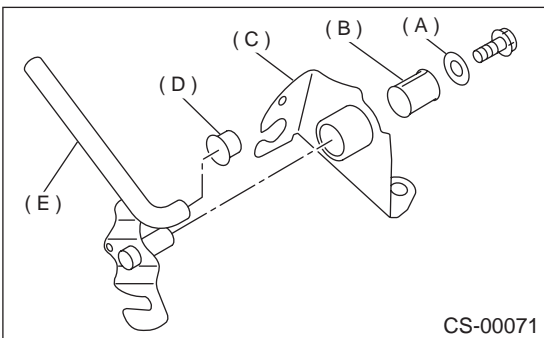
C: DISASSEMBLY

1) Remove spring.



(A) Spring

2) Remove lever, cap and bushing.



- (A) Washer
- (B) Bushing
- (A) Plate ASSY
- (D) Cushion
- (E) Lever ASSY

D: ASSEMBLY

1) Assemble in the reverse order of disassembly.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

2) Make sure the select lever moves smoothly.

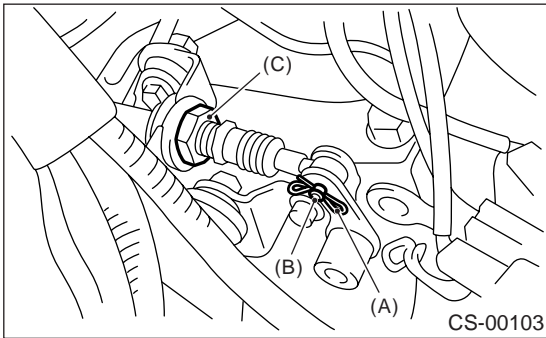
E: INSPECTION

- 1) Make sure the select lever moves smoothly. If it does not move smoothly, repair or replace it.
- 2) Make sure the drive select lever is not damaged. If it is damaged, repair or replace it.

6. Drive Select Cable

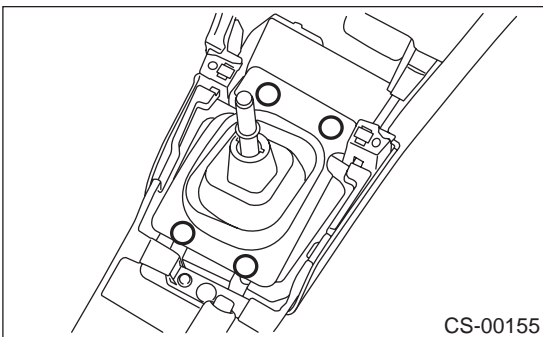
A: REMOVAL

- 1) Remove the drive select lever. <Ref. to CS-21, REMOVAL, MT Drive Select Lever.>
- 2) Remove air cleaner case or air intake duct. <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- 3) Remove snap pin and clevis pin.

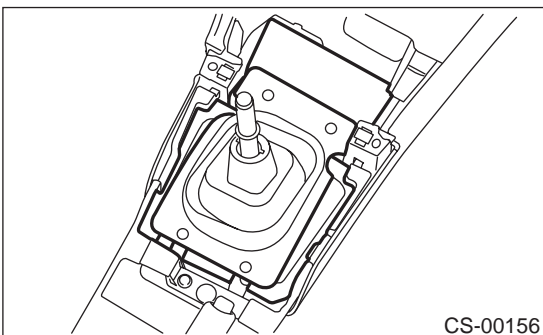


- (A) Snap pin
- (B) Clevis pin
- (C) Nut

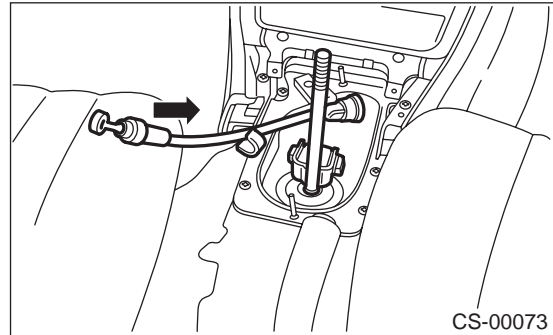
- 4) Loosen the nut and disconnect the cable from cable bracket.
- 5) Remove cable from transmission clamp.
- 6) Remove the console box. <Ref. to EI-34, REMOVAL, Console Box.>
- 7) Remove the clamp.



- 8) Remove the boot and insulator assembly.



- 9) Remove cable from the under side of vehicle.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Make sure the drive select lever operates properly.

C: INSPECTION

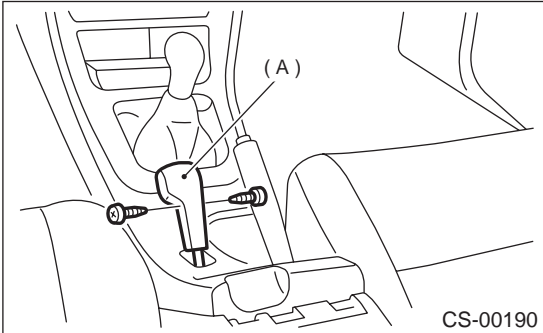
- 1) Make sure to move transmission to HI or LO position by moving the drive select lever. If it doesn't, adjust the cable. <Ref. to CS-24, ADJUSTMENT, Drive Select Cable.>
- 2) Make sure cable operates smoothly. If it catches or fails to work properly, repair or replace it.
- 3) Check cable for damage.

DRIVE SELECT CABLE

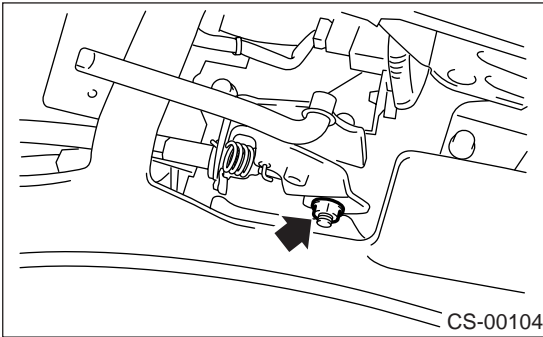
CONTROL SYSTEMS

D: ADJUSTMENT

- 1) Set the drive select lever to HI position.
- 2) Remove the knob.



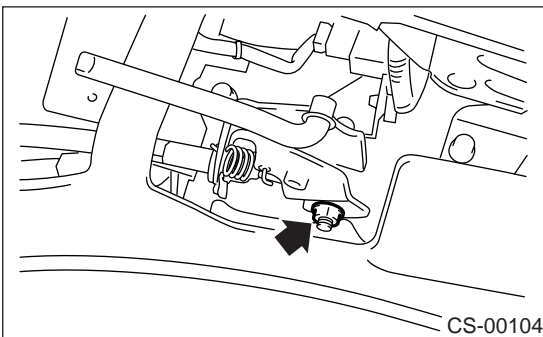
- 3) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>
- 4) Loosen the nut.



- 5) Make sure transmission is in HI position. If isn't, pull on cable to put transmission in HI position.
- 6) Tighten the nut in the location where the cable end bolt stops naturally.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 7) Make sure to move transmission to HI or LO position by moving the drive select lever. If it doesn't, readjust cable.

7. General Diagnostic Table

A: INSPECTION

Symptom	Remedy
Starter does not run.	Adjust select cable and inhibitor switch, or inspect circuit.
Back-up light does not light up.	Adjust select cable and inhibitor switch, or inspect circuit.

GENERAL DIAGNOSTIC TABLE

CONTROL SYSTEMS

MEMO:

AUTOMATIC TRANSMISSION

AT

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GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

1. General Description

A: SPECIFICATIONS

1. TORQUE CONVERTER CLUTCH

Model	2.0 L non-TURBO model	2.5 L model	3.0 L model	2.0 L TURBO model
Type	Symmetric, 3 element, single stage, 2 phase torque converter			
Stall torque ratio	2.2 — 2.4	1.9 — 2.1	2.1 — 2.3	
Nominal diameter	236 mm (9.29 in)	246 mm (9.69 in)		
Stall speed (at sea level)	2,000 — 2,500 rpm	2,100 — 2,600 rpm		2,600 — 3,500 rpm
One-way clutch	Sprague type one-way clutch			

2. OIL PUMP

Type	Pracoid constant-displacement pump		
Driving method	Driven by engine		
Number of teeth	Inner rotor	9	
	Outer rotor	10	

3. TRANSMISSION CONTROL ELEMENT

Type	4-forward, 1-reverse, double-row planetary gears
Multi-plate clutch	3 sets
Multi-plate brake	2 sets
One-way clutch (sprague type)	1 sets

4. TRANSMISSION GEAR RATIO

1st	2.785
2nd	1.545
3rd	1.000
4th	0.694
Rev	2.272

5. PLANETARY GEAR AND PLATE

	2.0 L non-TURBO model	2.5 L model	3.0 L and 2.0 L TURBO models
Tooth number of front sun gear	33		
Tooth number of front pinion	21		
Tooth number of front internal gear	75		
Tooth number of rear sun gear	42		
Tooth number of rear pinion	17		
Tooth number of rear internal gear	75		
Drive & driven plate number of high clutch	4	5	
Drive & driven plate number of low clutch	4	6	7
Drive & driven plate number of reverse clutch	2		
Drive & driven plate number of 2-4 brake	3		4
Drive & driven plate number of low & reverse brake	4	6	7

6. SELECTOR POSITION

P (Park)	Transmission in neutral, output member immovable, and engine start possible
R (Reverse)	Transmission in reverse for backing
N (Neutral)	Transmission in neutral and engine start possible
D (Drive)	Automatic gear change 1st ← → 2nd ← → 3rd ← → 4th
3 (3rd)	Automatic gear change 1st ← → 2nd ← → 3rd ← 4th
2 (2nd)	Automatic gear change (Deceleration possible 1st ← → 2nd ← 3rd ← 4th)
1 (1st)	1st gear locked (Deceleration possible 1st ← 2nd ← 3rd ← 4th)
Control method	Hydraulic remote control

7. HYDRAULIC CONTROL AND LUBRICATION

Type	Electronic/hydraulic control [Four forward speed changes by electrical signals of vehicle speed and accelerator (throttle) opening]	
Fluid	Dexron III type Automatic transmission fluid	
Fluid capacity	2.0 L non-TURBO model	8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)
	Except for 2.0 L non-TURBO model	9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)
Lubrication system	Forced feed lubrication with oil pump	
Oil	Automatic transmission fluid (above mentioned)	

8. COOLING AND HARNESS

Cooling system	Liquid-cooled cooler incorporated in radiator
Inhibitor switch	12 poles
Transmission harness	20 poles

9. TRANSFER

Model	2.0 L non-TURBO	2.5 L without VDC	2.5 L with VDC 3.0 L and 2.0 L TURBO
Transfer type	Multi-plate transfer (MPT)		Variable torque distribution (VTD)
Drive & driven plate number of transfer clutch	4	5	3
Control method	Electronic, hydraulic type		
Lubricant	The same Automatic transmission fluid used in automatic transmission		
1st reduction gear ratio	1.000 (53/53)		

10.FINAL REDUCTION

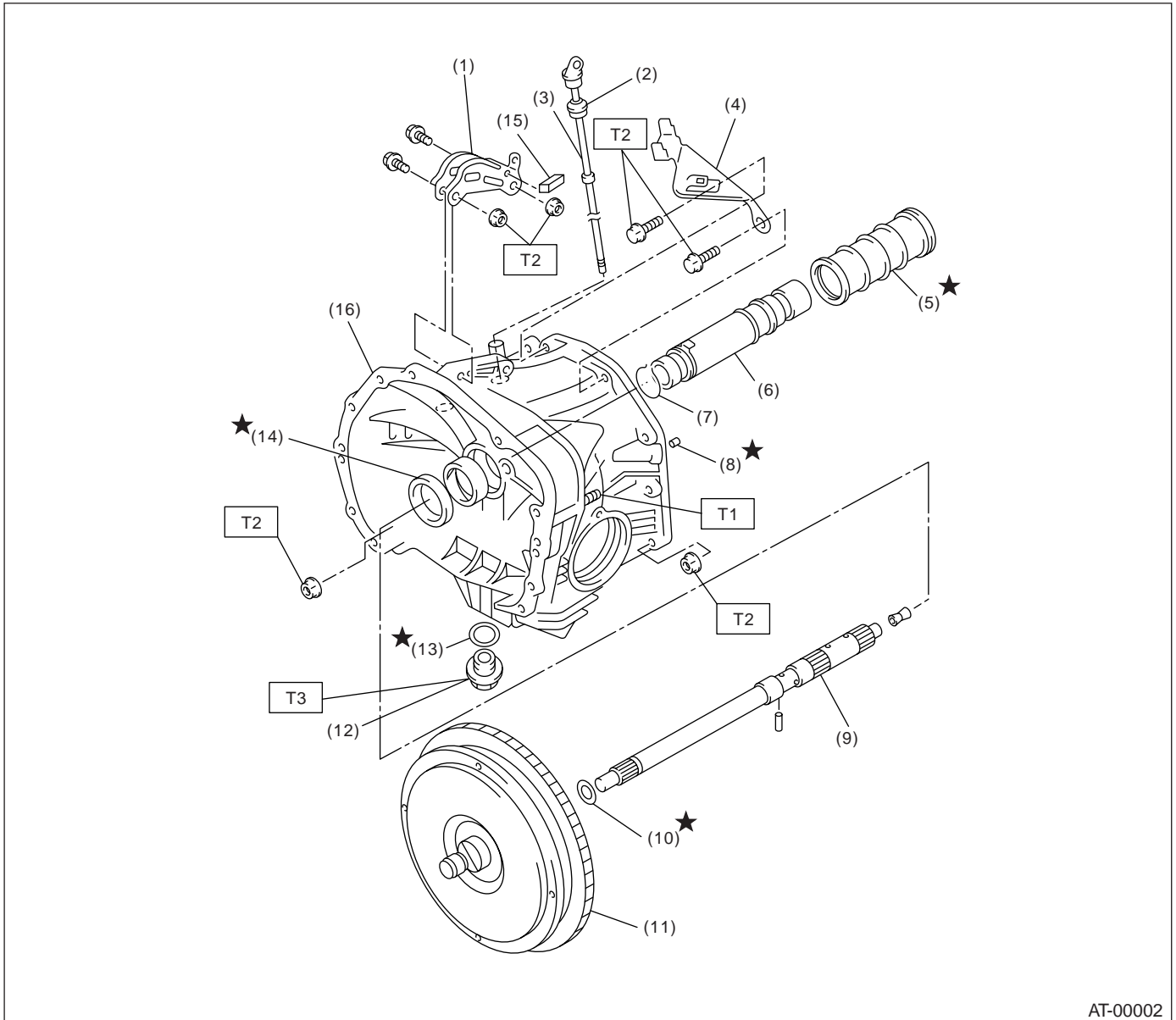
Model	3.0 L model and except for OUTBACK	OUTBACK																		
Front final gear ratio	4.111 (37/9)	4.444 (40/9)																		
Lubrication oil	<p style="text-align: center;">ITEM</p> <ul style="list-style-type: none"> • Front differential gear oil <p style="text-align: center;">API Classification</p> <p style="text-align: center;">GL-5</p> <p style="text-align: center;">SAE Viscosity No. and Applicable Temperature</p> <table style="margin: auto; border-collapse: collapse;"> <tr> <td style="text-align: center;">(°C)</td> <td style="text-align: center;">-30</td> <td style="text-align: center;">-26</td> <td style="text-align: center;">-15</td> <td style="text-align: center;">-5</td> <td style="text-align: center;">0</td> <td style="text-align: center;">15</td> <td style="text-align: center;">25</td> <td style="text-align: center;">30</td> </tr> <tr> <td style="text-align: center;">(°F)</td> <td style="text-align: center;">-22</td> <td style="text-align: center;">-15</td> <td style="text-align: center;">5</td> <td style="text-align: center;">23</td> <td style="text-align: center;">32</td> <td style="text-align: center;">59</td> <td style="text-align: center;">77</td> <td style="text-align: center;">86</td> </tr> </table> <p style="text-align: right;">AT-00001</p>		(°C)	-30	-26	-15	-5	0	15	25	30	(°F)	-22	-15	5	23	32	59	77	86
(°C)	-30	-26	-15	-5	0	15	25	30												
(°F)	-22	-15	5	23	32	59	77	86												
Front differential oil capacity	1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)																			

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

B: COMPONENT

1. TORQUE CONVERTER CLUTCH AND CASE



- (1) Pitching stopper bracket
- (2) O-ring
- (3) Differential oil level gauge
- (4) Stay
- (5) Seal pipe
- (6) Oil pump shaft
- (7) Clip

- (8) Oil drain pipe
- (9) Input shaft
- (10) O-ring
- (11) Torque converter clutch ASSY
- (12) Drain plug
- (13) Gasket
- (14) Oil seal

- (15) Clip
- (16) Torque converter clutch case

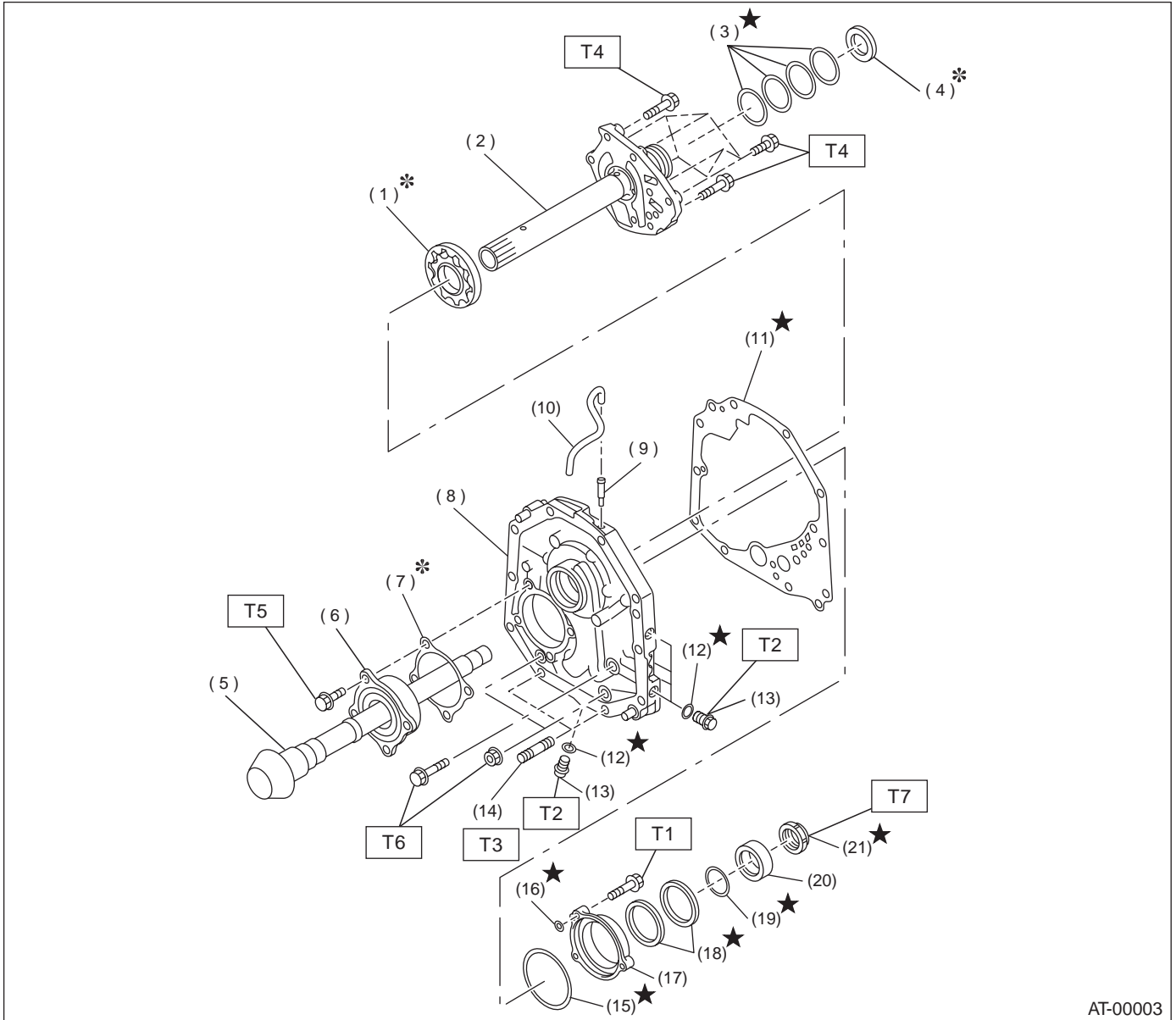
Tightening torque: N·m (kgf·m, ft·lb)

T1: 18 (1.8, 13.0)

T2: 41 (4.2, 30.4)

T3: 44 (4.5, 32.5)

2. OIL PUMP



- | | |
|---------------------------|--------------------------|
| (1) Oil pump rotor | (12) O-ring |
| (2) Oil pump cover | (13) Test plug |
| (3) Seal ring | (14) Stud bolt |
| (4) Thrust needle bearing | (15) O-ring |
| (5) Drive pinion shaft | (16) O-ring |
| (6) Roller bearing | (17) Oil seal retainer |
| (7) Shim | (18) Oil seal |
| (8) Oil pump housing | (19) O-ring |
| (9) Nipple | (20) Drive pinion collar |
| (10) Air breather hose | (21) Lock nut |
| (11) Gasket | |

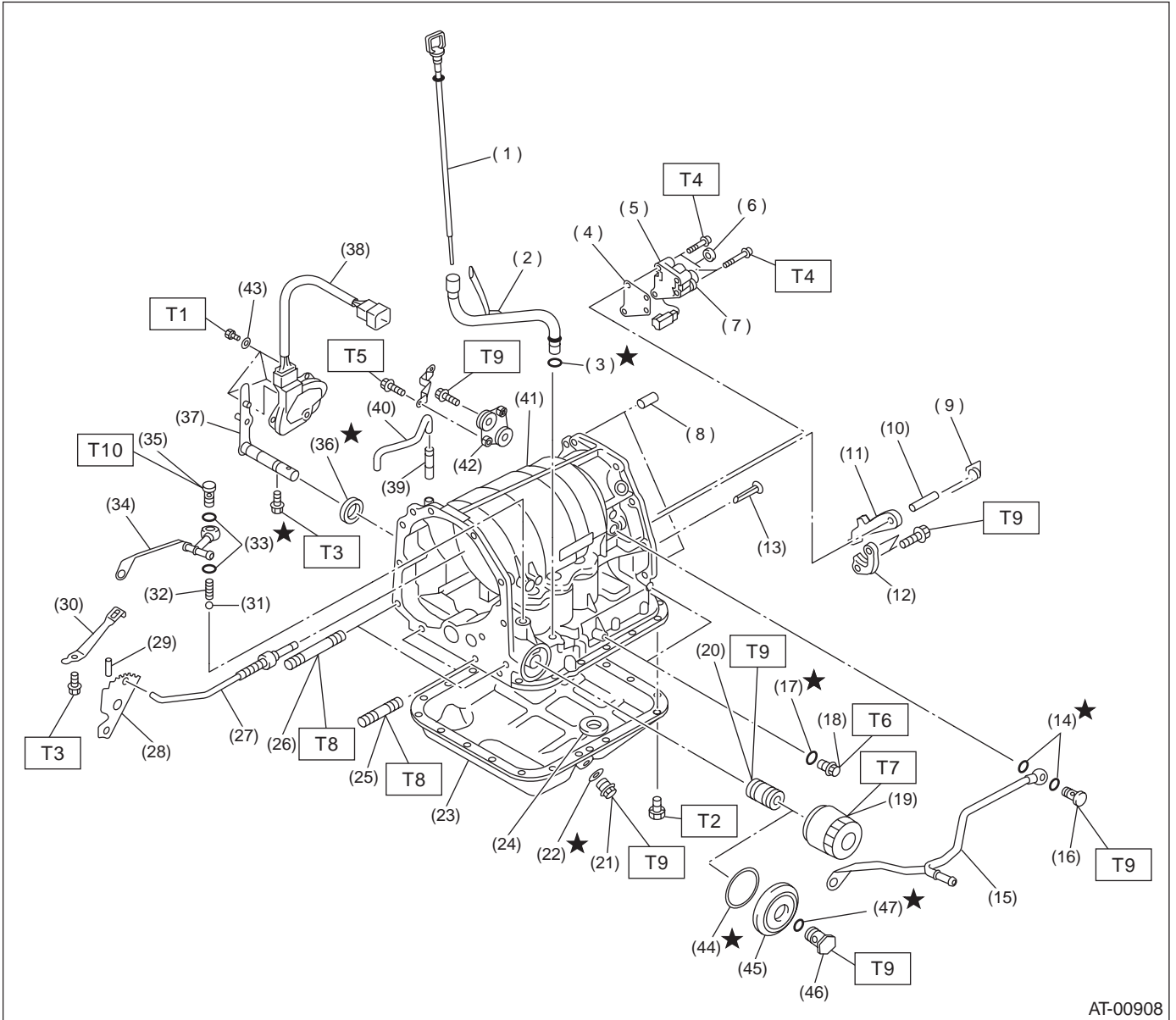
Tightening torque: N·m (kgf·m, ft·lb)

- T1: 7 (0.7, 5.1)**
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 25 (2.5, 18.1)
T5: 40 (4.1, 30)
T6: 42 (4.3, 31)
T7: 116 (11.8, 85)

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

3. TRANSMISSION CASE AND CONTROL DEVICE



GENERAL DESCRIPTION

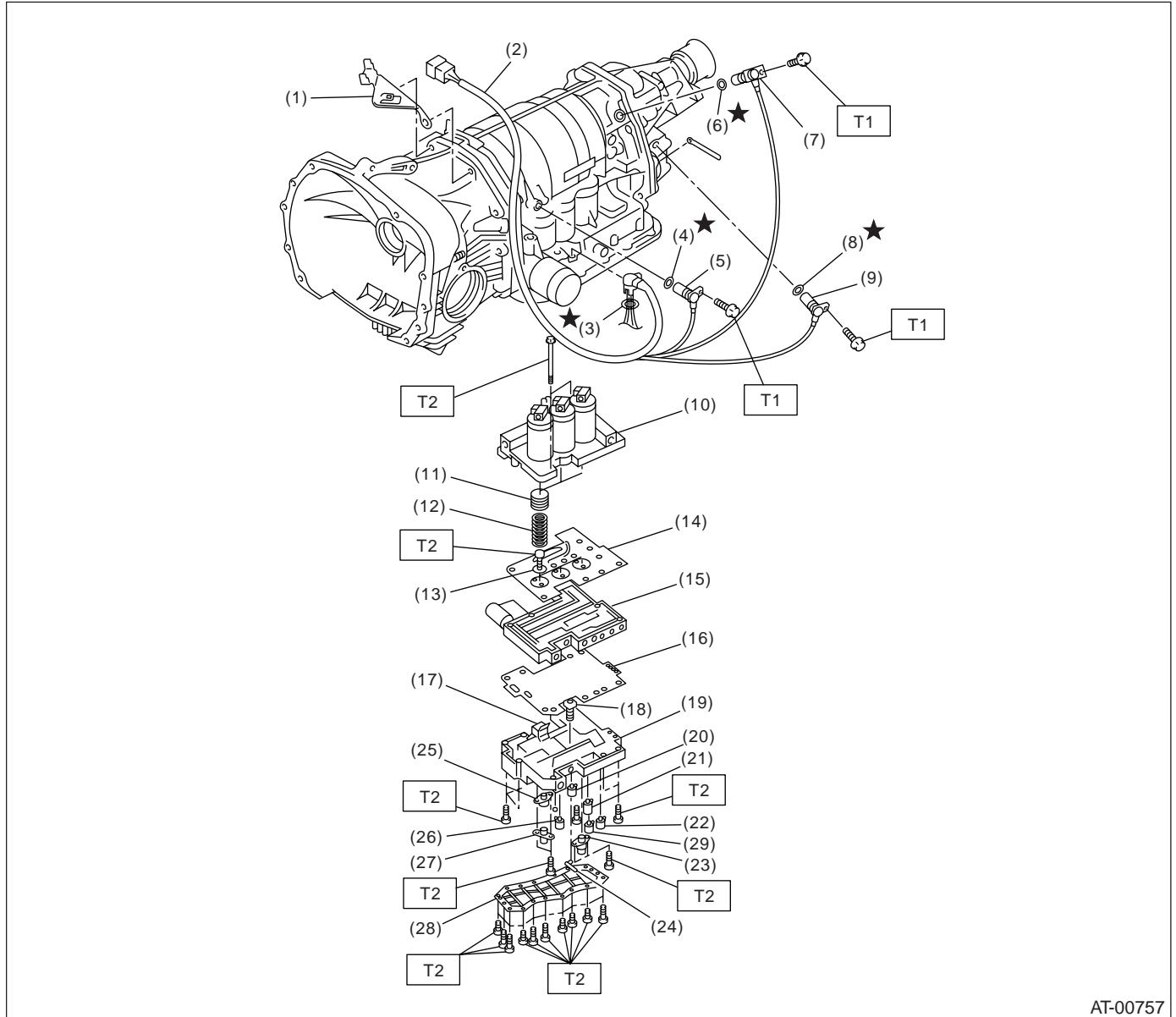
AUTOMATIC TRANSMISSION

(1) ATF level gauge	(21) Drain plug	(41) Transmission case
(2) ATF charger pipe	(22) Gasket	(42) Plate ASSY
(3) O-ring	(23) Oil pan	(43) Washer
(4) Transfer valve plate	(24) Magnet	(44) O-ring (3.0 L and TURBO models)
(5) Transfer valve ASSY	(25) Stud bolt (Short)	(45) Cover (3.0 L and TURBO models)
(6) Transfer clutch seal	(26) Stud bolt (Long)	(46) Union screw (3.0 L and TURBO models)
(7) Transfer duty solenoid	(27) Parking rod	(47) Gasket (3.0 L and TURBO models)
(8) Straight pin	(28) Manual plate	
(9) Return spring	(29) Spring pin	
(10) Shaft	(30) Detention spring	
(11) Parking pawl	(31) Ball	Tightening torque: N-m (kgf-m, ft-lb)
(12) Parking support	(32) Spring	T1: 3.4 (0.35, 2.5)
(13) Inlet filter	(33) Gasket	T2: 5 (0.5, 3.6)
(14) Gasket	(34) Outlet pipe	T3: 6 (0.6, 4)
(15) Inlet pipe	(35) Union screw	T4: 8 (0.8, 6)
(16) Union screw	(22) Gasket	T5: 12 (1.2, 8.7)
(17) O-ring	(36) Oil seal	T6: 13 (1.3, 10)
(18) Test plug	(37) Select lever	T7: 14 (1.4, 10)
(19) Oil filter (Except for 3.0 L and TURBO models)	(38) Inhibitor switch ASSY	T8: 18 (1.8, 13)
(20) Oil filter stud bolt	(39) Nipple	T9: 25 (2.6, 18)
	(40) Air breather hose	T10: 44 (4.5, 32)

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

4. CONTROL VALVE AND HARNESS ROUTING



AT-00757

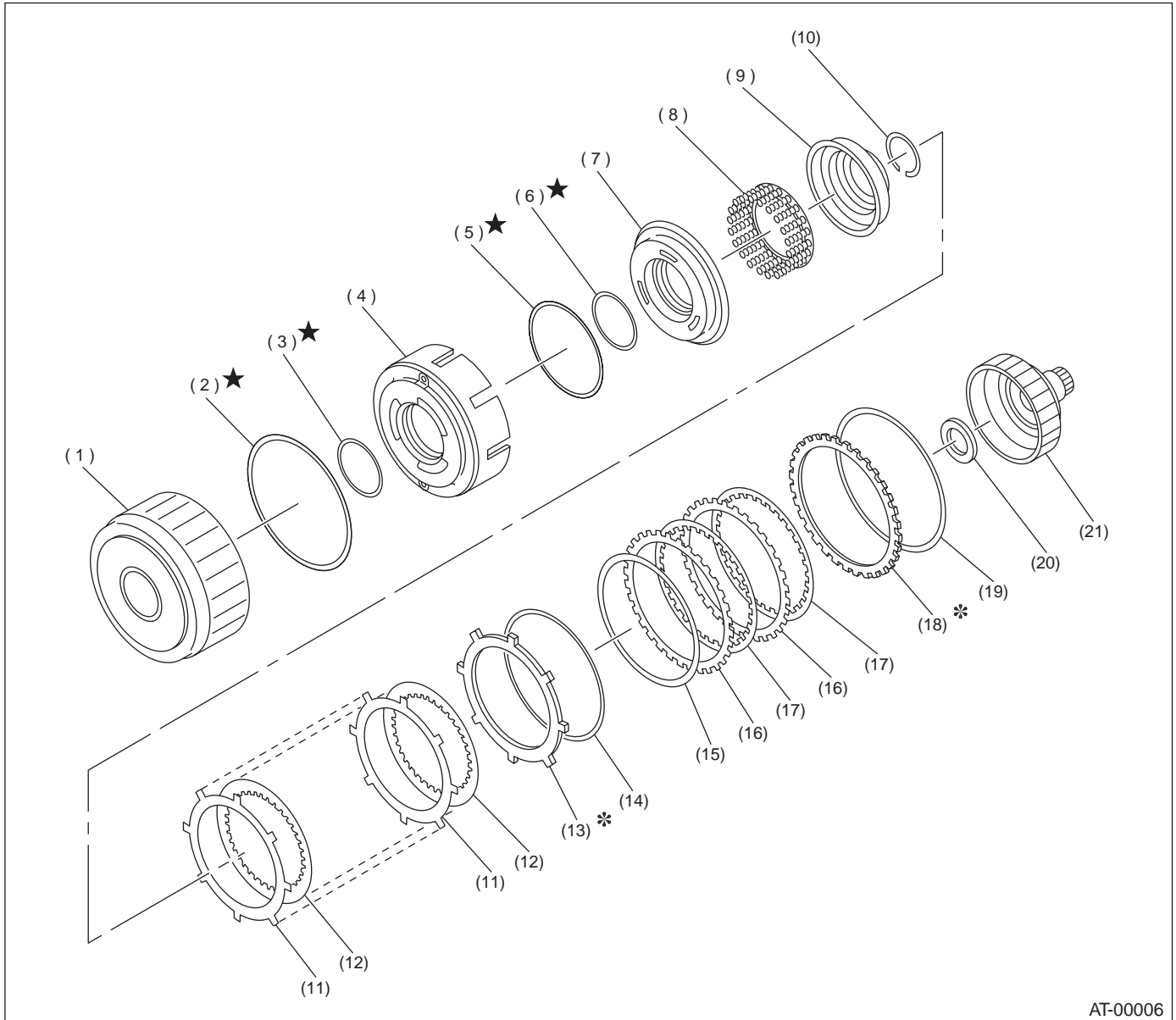
- | | | |
|---|-------------------------|---|
| (1) Stay | (11) Accumulator piston | (22) 2-4 brake timing solenoid |
| (2) Transmission harness | (12) Accumulator spring | (23) 2-4 brake duty solenoid |
| (3) O-ring | (13) Side plate | (24) ATF temperature sensor |
| (4) O-ring | (14) Separate plate | (25) Line pressure duty solenoid |
| (5) Torque converter turbine speed sensor | (15) Middle valve body | (26) Low clutch timing solenoid |
| (6) O-ring | (16) Separate plate | (27) Lock-up duty solenoid |
| (7) Front vehicle speed sensor | (17) Fluid filter | (28) Oil strainer |
| (8) O-ring | (18) Fluid filter | (29) SPORT shift solenoid (if equipped) |
| (9) Rear vehicle speed sensor | (19) Lower valve body | |
| (10) Upper valve body | (20) Shift solenoid 2 | |
| | (21) Shift solenoid 1 | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7 (0.7, 5.1)

T2: 8 (0.8, 5.8)

5. HIGH CLUTCH AND REVERSE CLUTCH



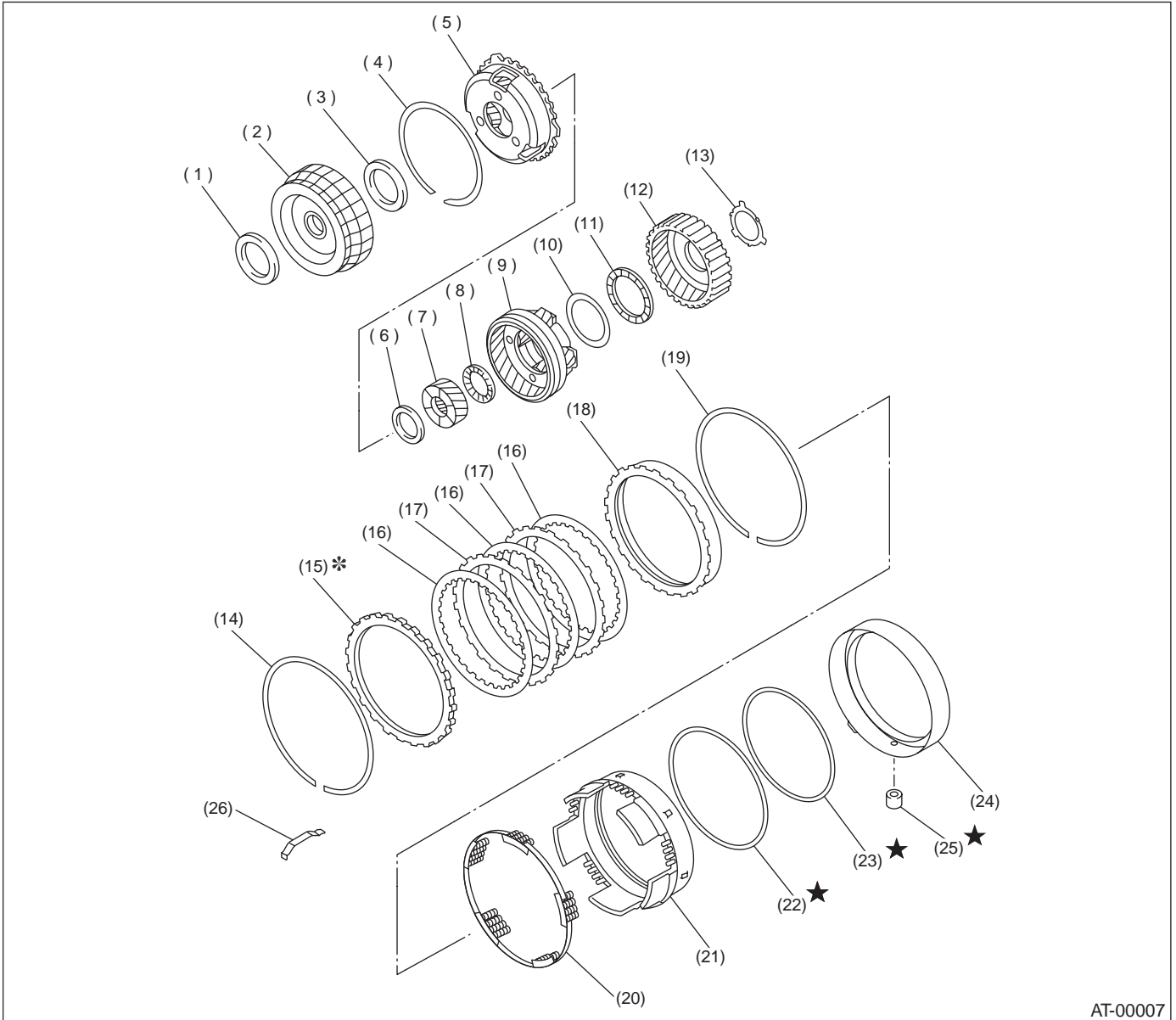
AT-00006

- | | | |
|---------------------------|----------------------|----------------------------|
| (1) High clutch drum | (8) Spring retainer | (15) Dish plate |
| (2) Lip seal | (9) Cover | (16) Driven plate |
| (3) D-ring | (10) Snap ring | (17) Drive plate |
| (4) Reverse clutch piston | (11) Driven plate | (18) Retaining plate |
| (5) D-ring | (12) Drive plate | (19) Snap ring |
| (6) D-ring | (13) Retaining plate | (20) Thrust needle bearing |
| (7) High clutch piston | (14) Snap ring | (21) High clutch hub |

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

6. PLANETARY GEAR AND 2-4 BRAKE



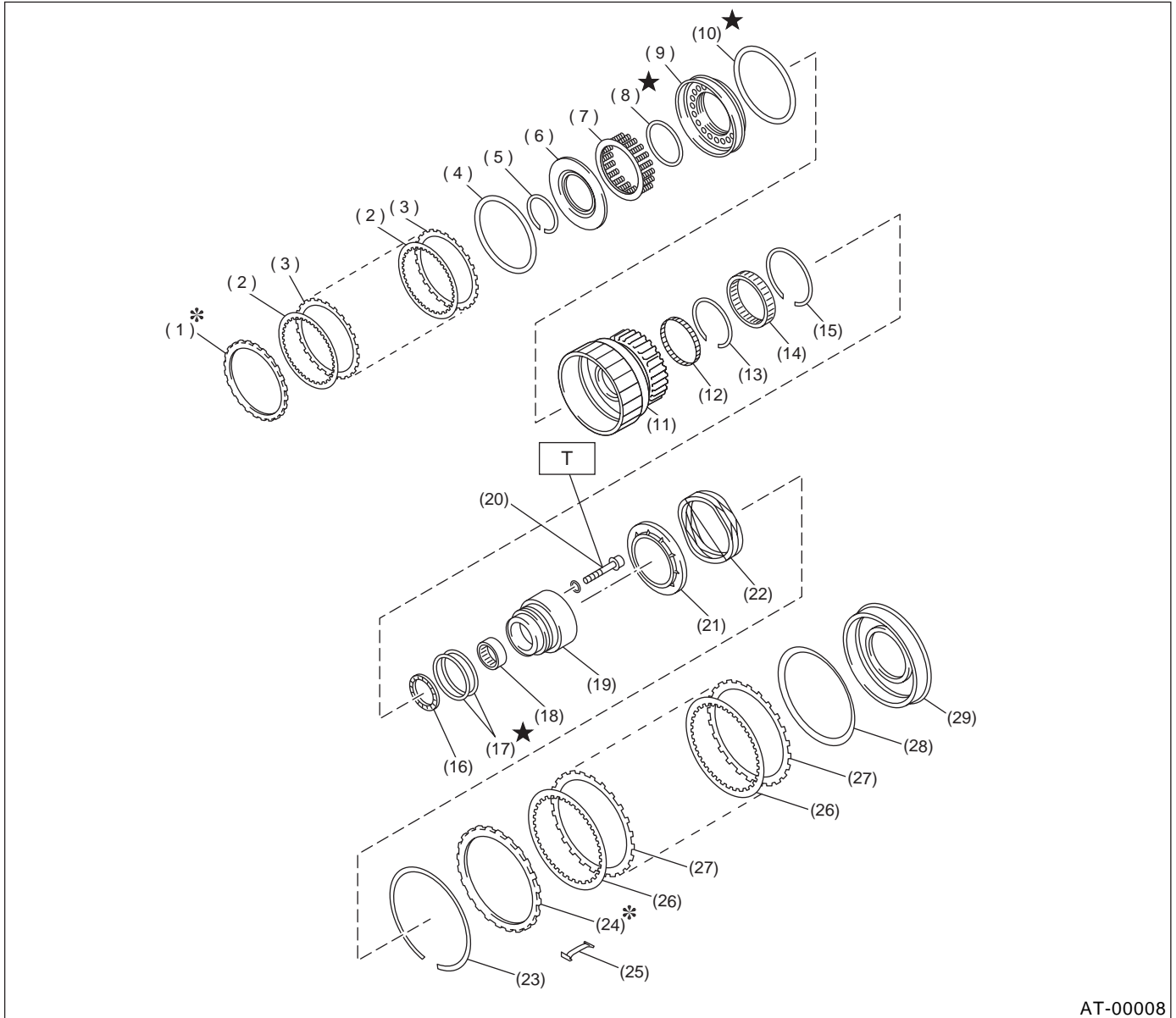
AT-00007

- (1) Thrust needle bearing
- (2) Front sun gear
- (3) Thrust needle bearing
- (4) Snap ring
- (5) Front planetary carrier
- (6) Thrust needle bearing
- (7) Rear sun gear
- (8) Thrust needle bearing
- (9) Rear planetary carrier

- (10) Washer
- (11) Thrust needle bearing
- (12) Rear internal gear
- (13) Washer
- (14) Snap ring
- (15) Retaining plate
- (16) Drive plate
- (17) Driven plate
- (18) Pressure rear plate

- (19) Snap ring
- (20) Spring retainer
- (21) 2-4 brake piston
- (22) D-ring
- (23) D-ring
- (24) 2-4 brake piston retainer
- (25) 2-4 brake seal
- (26) Leaf spring

7. LOW CLUTCH AND LOW & REVERSE BRAKE



AT-00008

- | | | |
|-----------------------|--------------------------------|-----------------------------------|
| (1) Retaining plate | (12) Needle bearing | (23) Snap ring |
| (2) Drive plate | (13) Inner snap ring | (24) Retaining plate |
| (3) Driven plate | (14) One-way clutch | (25) Leaf spring |
| (4) Dish plate | (15) Outer snap ring | (26) Drive plate |
| (5) Snap ring | (16) Thrust needle bearing | (27) Driven plate |
| (6) Cover | (17) Seal ring | (28) Dish plate |
| (7) Spring retainer | (18) Needle bearing | (29) Low and reverse brake piston |
| (8) D-ring | (19) One-way clutch inner race | |
| (9) Low clutch piston | (20) Socket bolt | |
| (10) D-ring | (21) Spring retainer | |
| (11) Low clutch drum | (22) Return spring | |

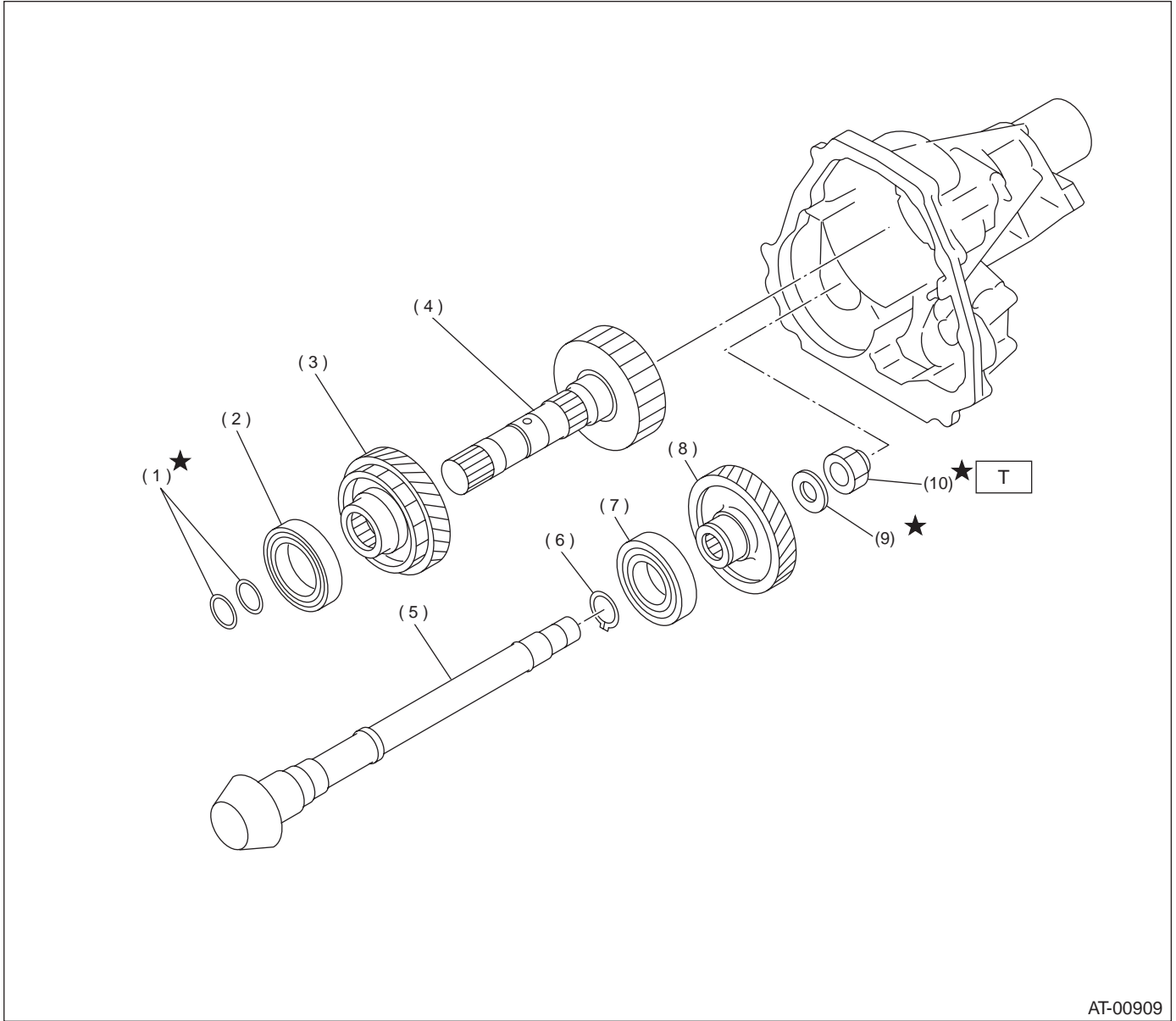
Tightening torque: N-m (kgf-m, ft-lb)

T: 25 (2.5, 18.1)

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

8. REDUCTION GEAR (MPT)



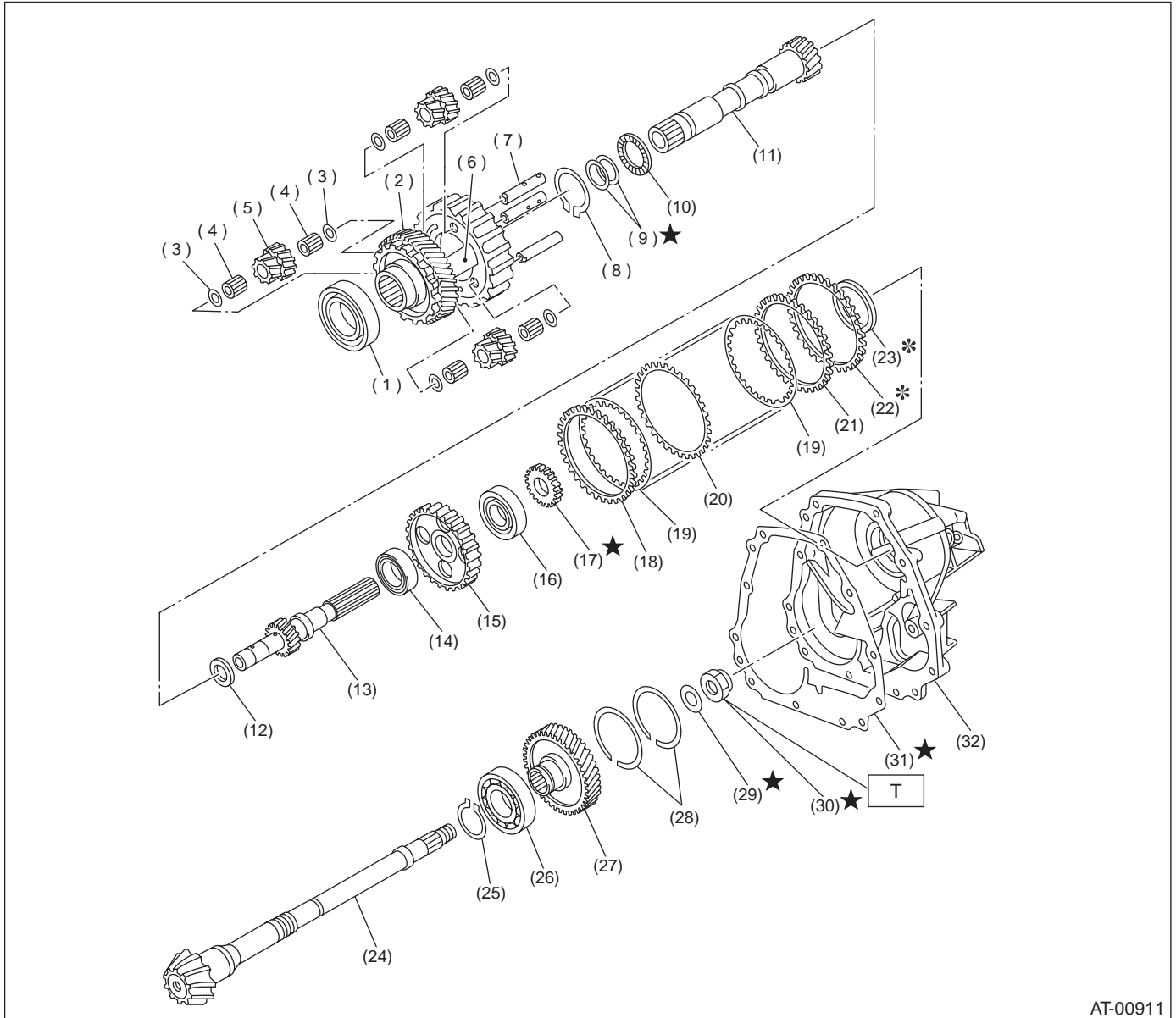
AT-00909

- | | |
|---------------------------|---------------------------|
| (1) Seal ring | (6) Snap ring |
| (2) Ball bearing | (7) Ball bearing |
| (3) Reduction drive gear | (8) Reduction driven gear |
| (4) Reduction drive shaft | (9) Washer |
| (5) Drive pinion shaft | (10) Lock nut |

Tightening torque: N·m (kgf·m, ft·lb)

T: 100 (10.2, 73.8)

9. REDUCTION GEAR (VTD)



AT-00911

- | | | |
|----------------------------|-----------------------------------|------------------------------|
| (1) Ball bearing | (13) Rear drive shaft | (25) Snap ring |
| (2) Reduction drive gear | (14) Ball bearing | (26) Ball bearing |
| (3) Washer | (15) Multi-plate clutch (LSD) hub | (27) Reduction driven gear |
| (4) Needle bearing | (16) Ball bearing | (28) Snap ring (3.0 L model) |
| (5) Pinion gear | (17) Revolution gear | (29) Lock washer |
| (6) Carrier | (18) Driven plate (Thick) | (30) Lock nut |
| (7) Planetary pinion shaft | (19) Driven plate | (31) Gasket |
| (8) Snap ring | (20) Driven plate (Thin) | (32) Extension case |
| (9) Seal ring | (21) Driven plate (Thick) | |
| (10) Thrast needle bearing | (22) Pressure plate | |
| (11) Intermediate shaft | (23) Rear drive shaft shim | |
| (12) Thrast washer | (24) Drive pinion shaft | |

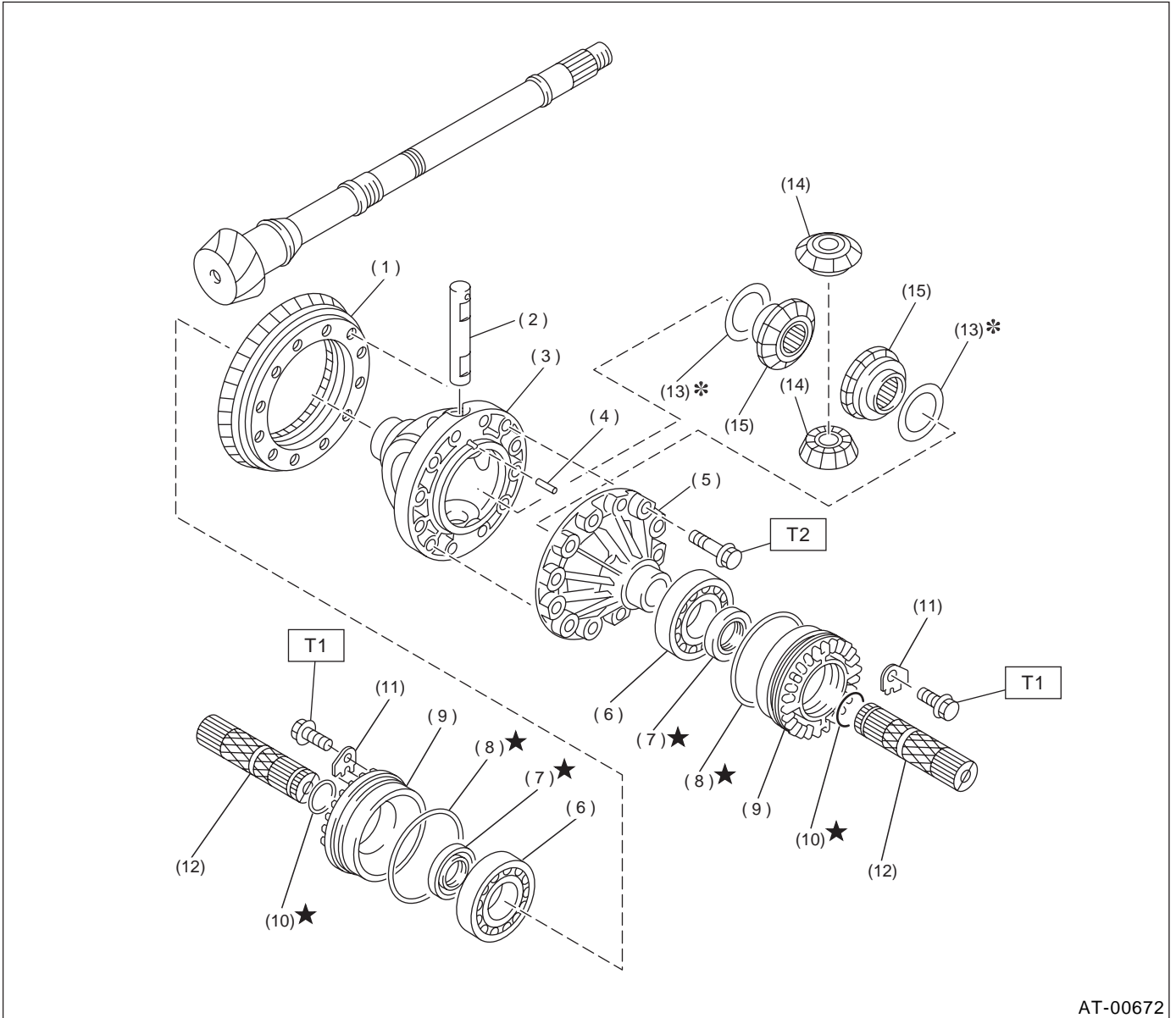
Tightening torque: N·m (kgf·m, ft·lb)

T: 100 (10.2, 73.8)

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

10.DIFFERENTIAL GEAR



AT-00672

- | | |
|----------------------------|--------------------------------|
| (1) Crown gear | (8) O-ring |
| (2) Pinion shaft | (9) Differential side retainer |
| (3) Differential case (RH) | (10) Circlip |
| (4) Straight pin | (11) Lock plate |
| (5) Differential case (LH) | (12) Axle shaft |
| (6) Taper roller bearing | (13) Washer |
| (7) Oil seal | (14) Differential bevel pinion |

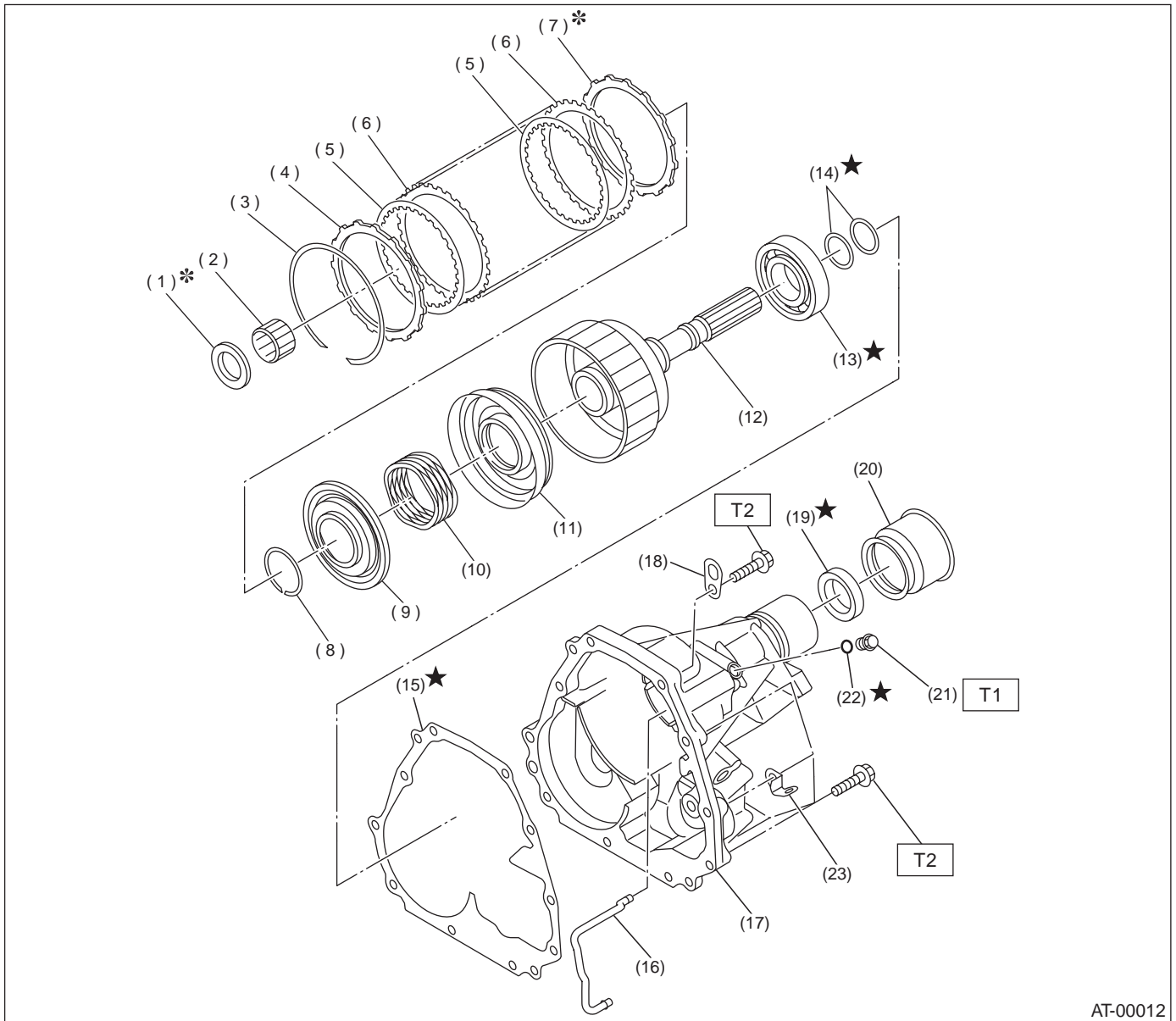
- (15) Differential bevel gear

Tightening torque: N-m (kgf-m, ft-lb)

T1: 25 (2.5, 18.1)

T2: 62 (6.3, 45.6)

11.TRANSFER AND EXTENSION CASE (MPT)



AT-00012

- (1) Thrust needle bearing
- (2) Needle bearing
- (3) Snap ring
- (4) Pressure plate
- (5) Drive plate
- (6) Driven plate
- (7) Pressure plate
- (8) Snap ring
- (9) Transfer piston seal

- (10) Return spring
- (11) Transfer clutch piston
- (12) Rear drive shaft
- (13) Ball bearing
- (14) Seal ring
- (15) Gasket
- (16) Transfer clutch pipe
- (17) Extension case
- (18) Transmission hanger

- (19) Oil seal
- (20) Dust cover
- (21) Test plug
- (22) O-ring
- (23) Clip

Tightening torque: N·m (kgf·m, ft·lb)

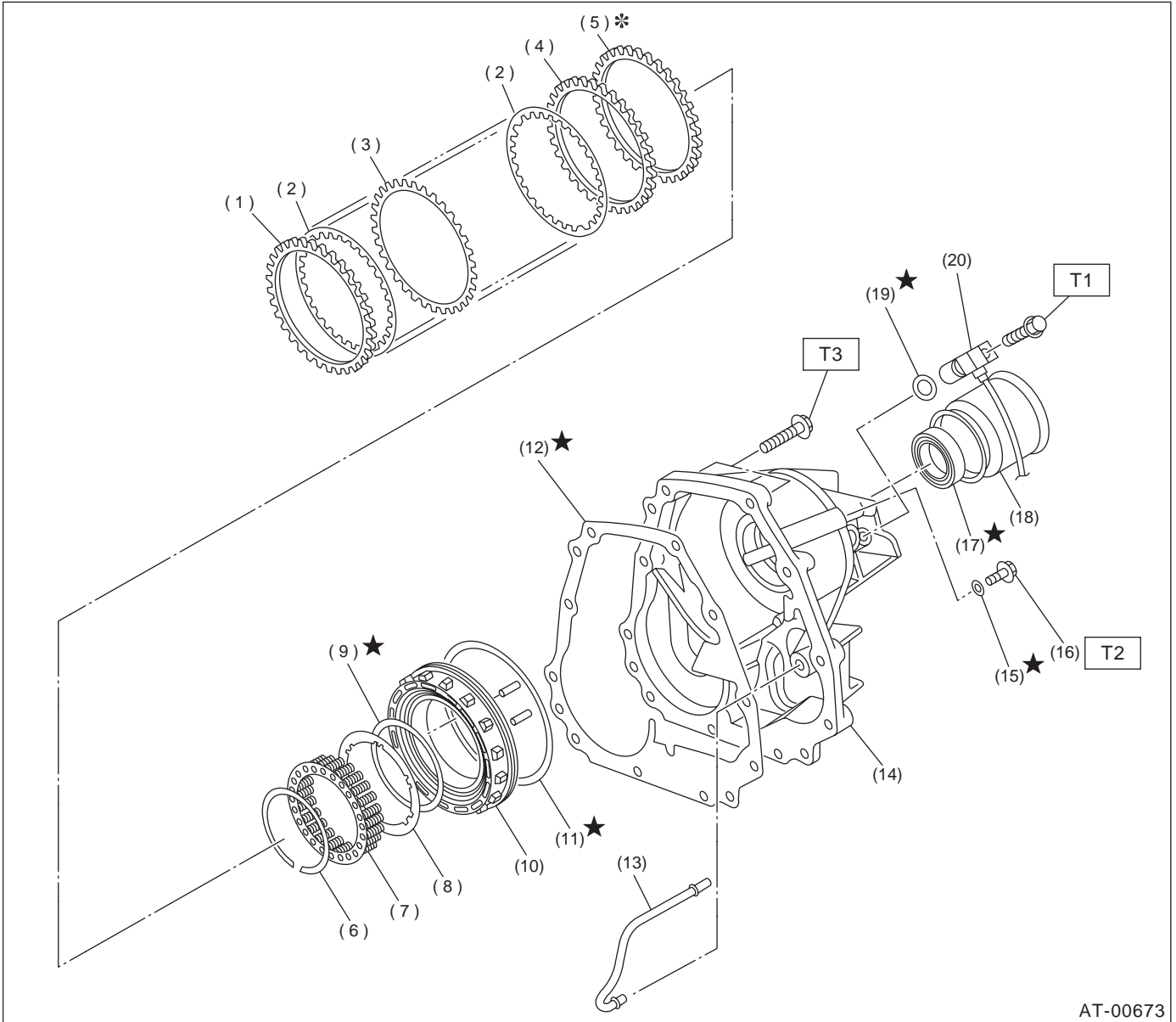
T1: 13 (1.3, 9.4)

T2: 25 (2.5, 18.1)

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

12. TRANSFER AND EXTENSION CASE (VTD)



- (1) Driven plate (Thick)
- (2) Driven plate
- (3) Driven plate (Thin)
- (4) Driven plate (Thick)
- (5) Adjust plate
- (6) Snap ring
- (7) Spring retainer
- (8) Plate
- (9) D-ring

- (10) Multi-plate clutch (LSD) piston
- (11) D-ring
- (12) Gasket
- (13) Multi-plate clutch (LSD) pipe
- (14) Extension case
- (15) O-ring
- (16) Test plug
- (17) Oil seal
- (18) Dust cover

- (19) O-ring
- (20) Rear wheel sensor

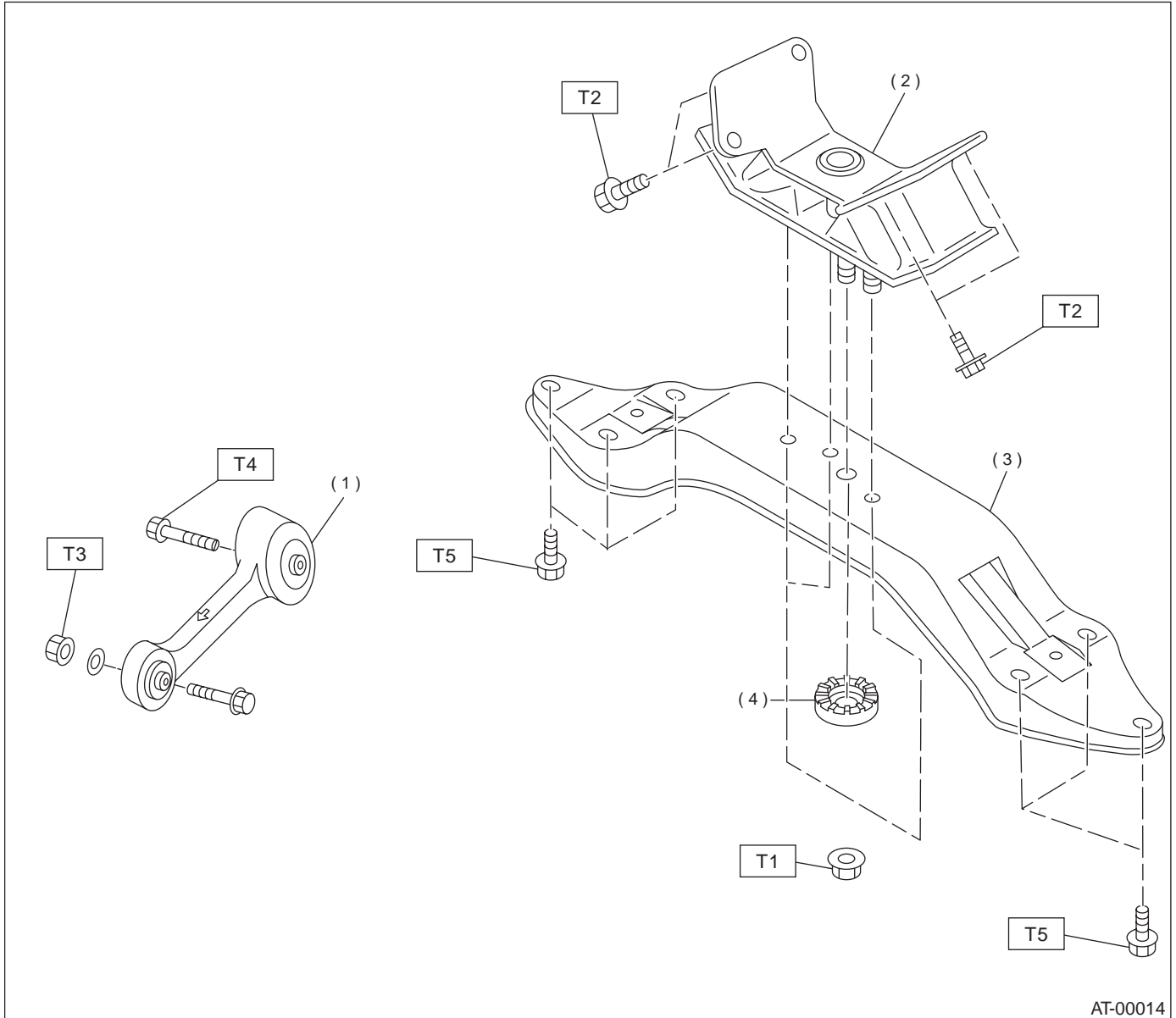
Tightening torque: N·m (kgf·m)

T1: 7 (0.7, 5.1)

T2: 13 (1.3, 9.4)

T3: 25 (2.5, 18,1)

13.TRANSMISSION MOUNTING



AT-00014

- (1) Pitching stopper
- (2) Rear cushion rubber
- (3) Transmission rear crossmember
- (4) Stopper

Tightening torque: N·m (kgf·m, ft·lb)

T1: 35 (3.6, 26)

T2: 39 (4.0, 29)

T3: 50 (5.1, 37)

T4: 58 (5.9, 43)

T5: 70 (7.1, 51)

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

C: CAUTION

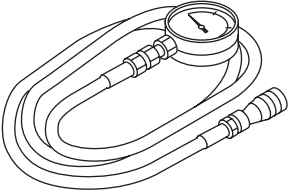
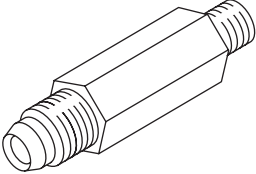
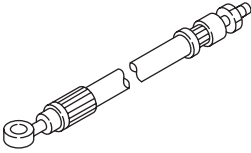
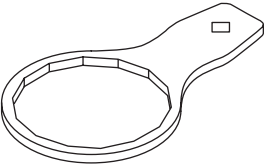
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation, and disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Until the oil pan is removed, do not place with the oil pan side facing up to prevent foreign matter from entering the valve body.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use Subaru genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Replace deformed or otherwise damaged snap rings with new ones.
- Before installing O-rings or oil seals, apply sufficient amount of ATF fluid to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old seal.

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

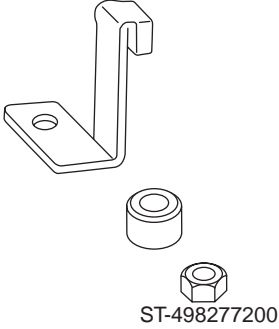
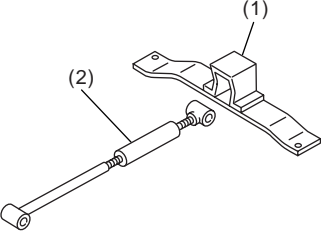
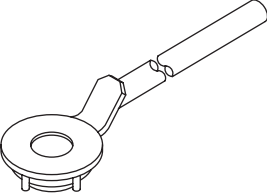
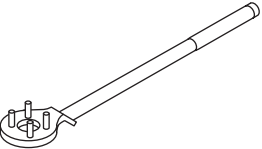
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498575400</p>	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 <p style="text-align: center;">ST-498897200</p>	498897200	ADAPTER	Used oil pump housing when measuring reverse clutch pressure and line pressure.
 <p style="text-align: center;">ST-498897700</p>	498897700	ADAPTER SET	Used for measuring transfer clutch pressure.
 <p style="text-align: center;">ST-498545400</p>	498545400	FILTER WRENCH	Used for removing and installing ATF filter.

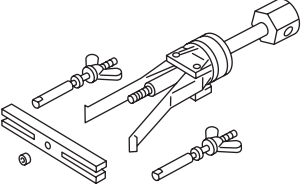
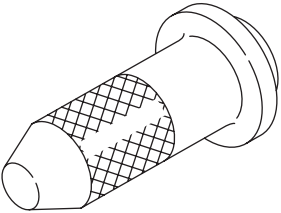
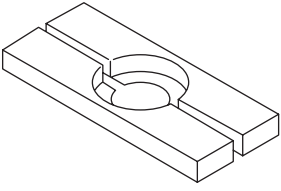
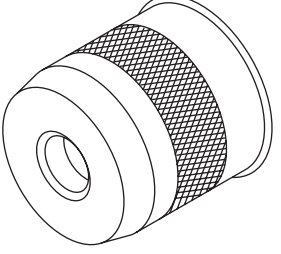
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498277200</p>	498277200	STOPPER SET	Used for removing and installing automatic transmission assembly to engine.
 <p style="text-align: center;">ST41099AA000</p>	41099AA000	ENGINE SUPPORT ASSY	Used for supporting engine. (1) ENGINE SUPPORT BRACKET (41099AA010) (2) ENGINE SUPPORT (41099AA020)
 <p style="text-align: center;">ST-499977400</p>	499977400	CRANKSHAFT PULLEY WRENCH	<ul style="list-style-type: none"> • Used for rotating crankshaft. • Used for 2.0 L model.
 <p style="text-align: center;">ST-499977100</p>	49977100	CRANKSHAFT PULLEY WRENCH	<ul style="list-style-type: none"> • Use for rotating crankshaft. • Used for 2.5 L and 3.0 L models.

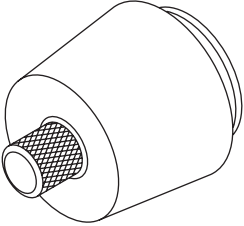
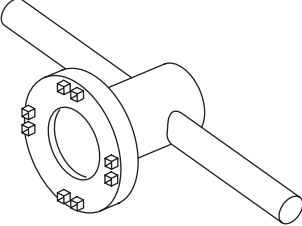
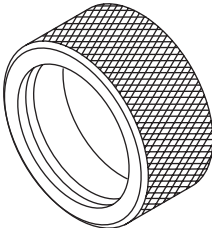
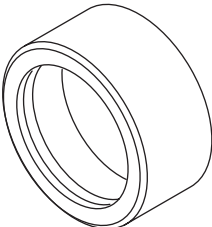
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398527700</p>	<p style="text-align: center;">398527700</p>	<p>PULLER ASSY</p>	<ul style="list-style-type: none"> • Used for removing extension case roller bearing. • Used for removing extension oil seal. • Used for removing front differential side retainer bearing outer race. • Used for removing front differential side retainer bearing outer ball race.
 <p style="text-align: center;">ST-498057300</p>	<p style="text-align: center;">498057300</p>	<p>INSTALLER</p>	<p>Used for installing extension oil seal.</p>
 <p style="text-align: center;">ST-498077000</p>	<p style="text-align: center;">498077000</p>	<p>REMOVER</p>	<p>Used for removing differential taper roller bearing.</p>
 <p style="text-align: center;">ST-499247400</p>	<p style="text-align: center;">499247400</p>	<p>INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing transfer outer snap ring. • Used with GUIDE (499257300).

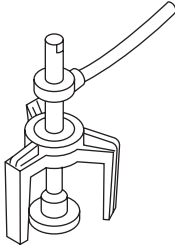
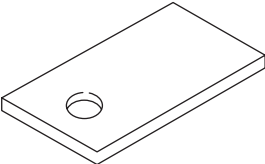
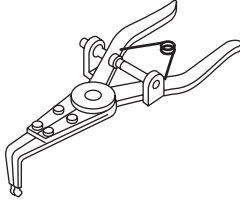
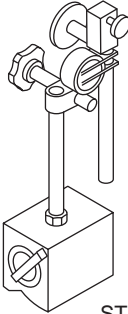
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499257300</p>	<p style="text-align: center;">499257300</p>	<p>SNAP RING OUTER GUIDE</p>	<ul style="list-style-type: none"> • Used for installing transfer outer snap ring. • Used with INSTALLER (499247400).
 <p style="text-align: center;">ST-499787000</p>	<p style="text-align: center;">499787000</p>	<p>WRENCH ASSY</p>	<p>Used for removing and installing differential side retainer.</p>
 <p style="text-align: center;">ST-398437700</p>	<p style="text-align: center;">398437700</p>	<p>DRIFT</p>	<p>Used for installing converter case oil seal.</p>
 <p style="text-align: center;">ST-398487700</p>	<p style="text-align: center;">398487700</p>	<p>INSTALLER</p>	<p>Used for installing taper roller bearing of front differential.</p>

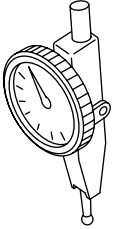
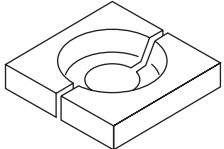
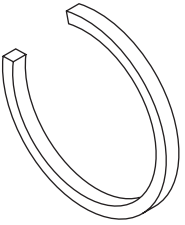
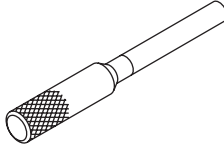
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398673600</p>	398673600	COMPRESSOR	Used for removing and installing clutch spring.
 <p style="text-align: center;">ST-498255400</p>	498255400	PLATE	Used for measuring backlash of hypoid gear.
 <p style="text-align: center;">ST-399893600</p>	399893600	PLIERS	Used for removing and installing clutch spring.
 <p style="text-align: center;">ST-498247001</p>	498247001	MAGNET BASE	<ul style="list-style-type: none"> • Used for measuring gear backlash. • Used with DIAL GAUGE (498247100).

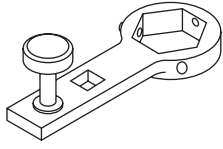
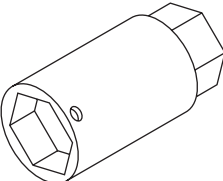
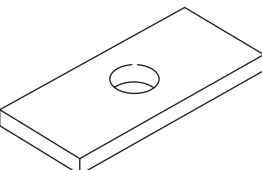
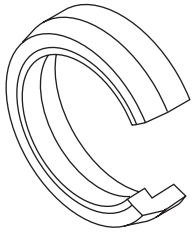
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498247100</p>	<p style="text-align: center;">498247100</p>	<p>DIAL GAUGE</p>	<ul style="list-style-type: none"> • Used for measuring gear backlash. • Used with MAGNET BASE (498247001).
 <p style="text-align: center;">ST-498517000</p>	<p style="text-align: center;">498517000</p>	<p>REPLACER</p>	<p>Used for removing front roller bearing.</p>
 <p style="text-align: center;">ST-398623600</p>	<p style="text-align: center;">398623600</p>	<p>SEAT</p>	<p>Used for removing spring of transfer clutch piston.</p>
 <p style="text-align: center;">ST-499267300</p>	<p style="text-align: center;">499267300</p>	<p>STOPPER PIN</p>	<p>Used for installing inhibitor switch.</p>

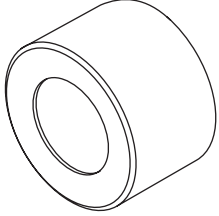
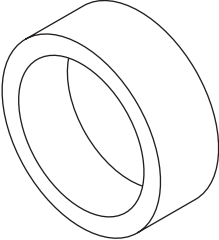
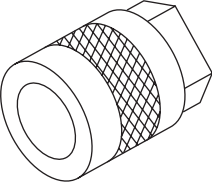
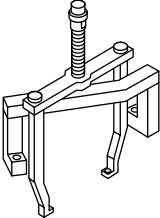
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787700	499787700	WRENCH	Used for removing and installing drive pinion lock nut.
 ST-499787500	499787500	ADAPTER	Used for removing and installing drive pinion lock nut.
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 ST-498627100	498627100	SEAT	Used for holding low clutch piston retainer spring when installing snap ring.

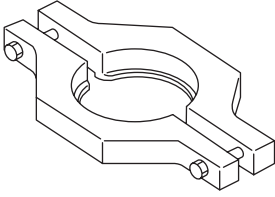
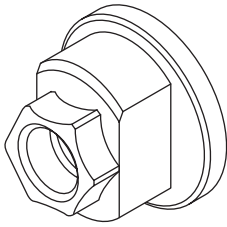
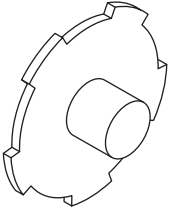
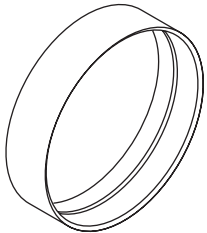
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499577000</p>	499577000	GAUGE	Used for measuring the transmission case mating surface to the reduction gear end surface.
 <p style="text-align: center;">ST-398744300</p>	398744300	GAUGE	<ul style="list-style-type: none"> • Use for measuring contact face between multi-plate clutch end and transmission. • VTD model
 <p style="text-align: center;">ST-499737000</p>	499737000	PULLER	Used for removing reduction driven gear assembly.
 <p style="text-align: center;">ST-499737100</p>	499737100	PULLER SET	Used for removing reduction drive gear assembly.

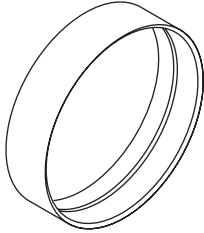
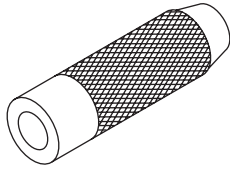
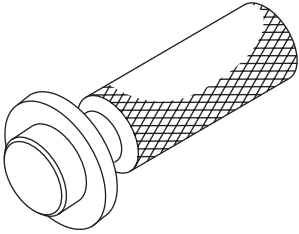
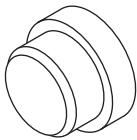
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498077600</p>	<p style="text-align: center;">498077600</p>	<p>REMOVER</p>	<p>Used for removing ball bearing.</p>
 <p style="text-align: center;">ST-498937110</p>	<p style="text-align: center;">498937110</p>	<p>HOLDER</p>	<p>Used for removing and installing drive pinion lock nut.</p>
 <p style="text-align: center;">ST-498677100</p>	<p style="text-align: center;">498677100</p>	<p>COMPRESSOR</p>	<p>Used for installing 2-4 brake snap ring.</p>
 <p style="text-align: center;">ST-498437000</p>	<p style="text-align: center;">498437000</p>	<p>HIGH CLUTCH PISTON GUIDE</p>	<p>Used for installing high clutch piston.</p>

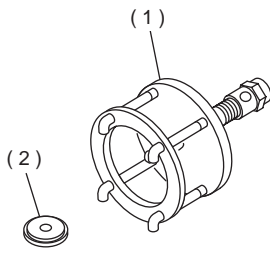
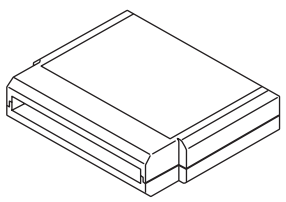

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498437100</p>	<p style="text-align: center;">498437100</p>	<p>LOW CLUTCH PISTON GUIDE</p>	<p>Used for installing low clutch piston.</p>
 <p style="text-align: center;">ST-899580100</p>	<p style="text-align: center;">899580100</p>	<p>INSTALLER</p>	<p>Used for press-fitting the ball bearing for transfer clutch.</p>
 <p style="text-align: center;">ST-499797000</p>	<p style="text-align: center;">499797000</p>	<p>DIFFERENTIAL OIL SEAL INSTALLER</p>	<p>Used for installing differential side retainer oil seal.</p>
 <p style="text-align: center;">ST-398497701</p>	<p style="text-align: center;">398497701</p>	<p>SEAT</p>	<p>Used for installing needle bearing.</p>

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-899524100</p>	899524100	PULLER SET	<ul style="list-style-type: none"> Using the bolt only. (1) Bolt Used with PULLER SET (499737100). Used with PULLER (499737000). (1) Puller (2) Cap
 <p>ST24082AA210</p>	24082AA210 <Newly adopted tool>	CARTRIDGE	Troubleshooting for electrical systems.
 <p>ST22771AA010</p>	22771AA010	SELECT MONI-TOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Depth gauge	Used for measuring transmission end play.
Thickness gauge	Used for measuring clearances of clutch, brake and oil pump.
Micro meter	Used for measuring thickness of drive pinion.
Spring balance	Used for measuring starting torque of drive pinion.
Circuit tester	Used for measuring resistance and voltage.

AUTOMATIC TRANSMISSION FLUID

AUTOMATIC TRANSMISSION

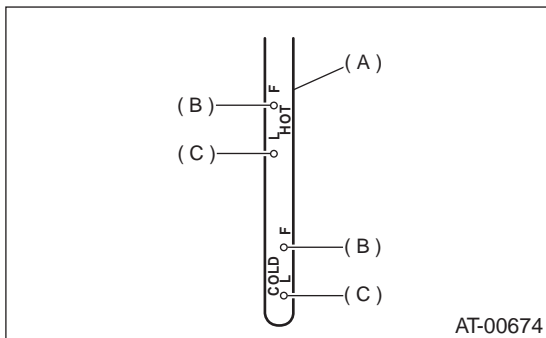
2. Automatic Transmission Fluid

A: INSPECTION

CAUTION:

The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking ATF level.

- 1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on Subaru Select Monitor. <Ref. to AT-21, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
- 2) Make sure the vehicle is level.
- 3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in "P" range. Measure the ATF level with the engine idling for one or two minutes.



- (A) ATF level gauge
- (B) Upper level
- (C) Lower level

- 4) Make sure that ATF level is above the center of upper and lower marks.

NOTE:

When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

- 5) If the ATF level is below the center between upper and lower marks, add the recommended ATF until the ATF level is found above the center between upper and lower marks.

CAUTION:

- Use care not to exceed the upper limit level.
- Remember that the addition of ATF to the upper limit mark when the transmission is cold will result in overfilling of ATF, causing a transmission failure.

- 6) Check ATF level after raising ATF temperature to 70 — 80°C (158 — 176°F) by running the vehicle or by idling the engine again.
- 7) Check the ATF for leaks.

Check for leaks in the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.

B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Drain the ATF completely.

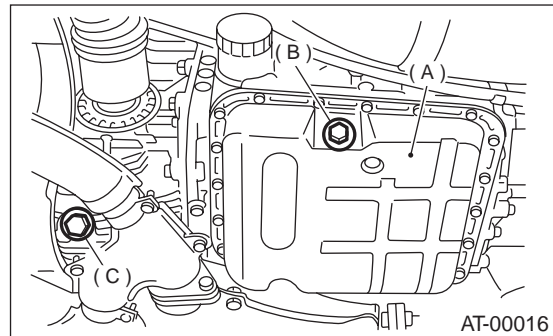
CAUTION:

Directly after the engine has been running, the ATF is hot. Be careful not to burn yourself.

- 3) Replace with a new gasket, and then tighten the ATF drain plug.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- (A) Oil pan
- (B) Drain plug (ATF)
- (C) Differential oil drain plug

- 4) Lower the vehicle.
- 5) Pour ATF into the oil charge pipe.

Recommended fluid:

Dexron III type automatic transmission fluid

Capacity:

Fill the same amount of ATF drained from drain plug hole.

Capacity when transmission is overhauled:

2.0 L non-TURBO model:

8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)

Except 2.0 L non-TURBO model:

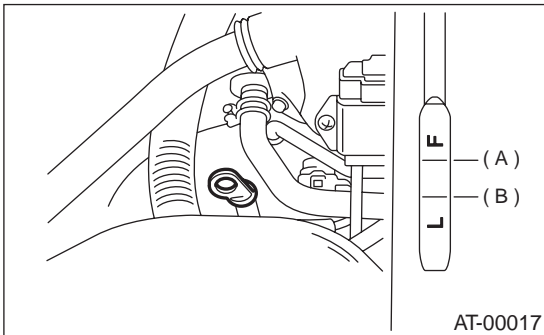
9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)

- 6) Check the level and leaks of ATF. <Ref. to AT-30, INSPECTION, Automatic Transmission Fluid.>

3. Differential Gear Oil

A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Remove the oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the differential gear oil level is below the "L" line, add oil to bring the level up to the "F" line.
- 5) To prevent overfilling the differential gear oil, do not add oil above the "F" line.



- (A) Upper level
(B) Lower level

B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Drain the differential gear oil completely.

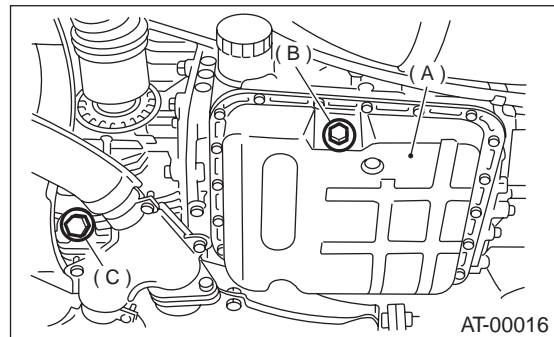
CAUTION:

- **Directly after the engine has been running, the differential gear oil is hot. Be careful not to burn yourself.**
- **Be careful not to spill the differential gear oil on exhaust pipe to prevent it from emitting smoke or fire. When the differential gear oil is spilled on exhaust pipe, wipe it away completely.**

- 3) Replace the gasket with a new one, and then tighten the differential gear oil drain plug.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



- (A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

- 4) Lower the vehicle.
- 5) Pour gear oil into the gauge hole.

Recommended fluid:

Use GL-5 (SAE: 80W — 90) or equivalent.

Gear oil capacity:

1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

- 6) Check the level of differential gear oil.
<Ref. to AT-31, INSPECTION, Differential Gear Oil.>

4. Road Test

A: INSPECTION

1. GENERAL PRECAUTION

Road tests should be conducted to properly diagnose the condition of the automatic transmission.

NOTE:

When performing the test, do not exceed posted speed limit.

2. D RANGE SHIFT FUNCTION

Check shifting between 1st ⇔ 2nd ⇔ 3rd ⇔ 4th while driving on normal city streets.

3. D RANGE SHIFT SHOCK

Check the shock level when shifting up during normal driving.

4. KICK-DOWN FUNCTION

Check kick-down for each gear. Also check the kick-down shock level.

5. ENGINE BRAKE OPERATION

- Check the 3rd gear engine brake when shifting between D ⇔ 3rd range while driving in 4th gear of D range [50 to 60 km/h (31 to 37 MPH)].
- Check the 2nd gear engine brake when shifting between 3 ⇔ 2 range while driving in the 3 range 3rd gear [40 to 50 km/h (25 to 31 MPH)].
- Check the 1st gear engine brake when shifting between 2 ⇔ 1 range while driving in the 2 range 2nd gear [20 to 30 km/h (12 to 19 MPH)].

6. LOCK-UP FUNCTION

Check that engine speed does not change sharply when the accelerator pedal is lightly depressed when driving on flat roads at normal speed in the lock-up range.

7. P RANGE OPERATION

Stop the vehicle on an uphill grade of 5% or more and shift to "P" range. Check that the vehicle does not move when the parking brake is released.

8. UNUSUAL SOUNDS AND VIBRATION

Check for unusual sounds and vibration while driving and during shifting.

9. CLIMBING CONTROL FUNCTION

- Check that the gear remains in 3rd when going up a grade.
- Check that the gear remains in 3rd when applying the brakes while going down a grade.

10. TRANSFER CLUTCH

Check if the tight corner braking occurs when the vehicle is started with steering wheel held at fully turned position.

11. OIL LEAKS

After the driving test, inspect for oil leaks.

5. Stall Test

A: INSPECTION

1. GENERAL INFORMATION

The stall test is of extreme importance in diagnosing the condition of the automatic transmission and the engine. It should be conducted to measure the engine stall speeds in “R” and “2” ranges.

Purposes of the stall test:

- 1) To check the operation of the automatic transmission clutch.
- 2) To check the operation of the torque converter clutch.
- 3) To check engine performance.

2. TEST METHODS

1) Preparations before test:

- (1) Check that throttle valve opens fully.
- (2) Check that engine oil level is correct.
- (3) Check that coolant level is correct.
- (4) Check that ATF level is correct.
- (5) Check that differential gear oil level is correct.
- (6) Increase ATF temperature to 70 to 80°C (158 to 176°F) by idling the engine for approx. 30 minutes (with select lever set to “N” or “P”).

2) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.

3) Move the manual linkage to ensure it operates properly, and shift the select lever to the “2” range. Turn hold switch ON.

4) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.

may occur. To identify it, conduct the same test as above in “R” range.

8) Perform the stall tests with the select lever in “D” range. Turn hold switch OFF.

NOTE:

- Do not continue the stall test for MORE THAN 5 SECONDS at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction causes the engine oil and ATF to deteriorate and the clutch and brake to be adversely affected.
- Be sure to cool down the engine for at least 1 minute after each stall test with the select lever set in the “P” or “N” range and with the idle speed lower than 1,200 rpm.
- If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.

Stall speed (at sea level):

2.0 L non-TURBO model:

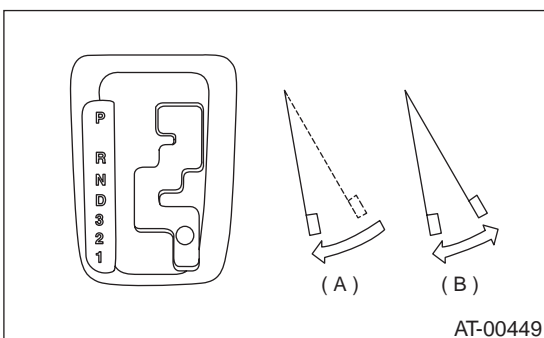
2,000 — 2,500 rpm

2.5 L and 3.0 L models:

2,100 — 2,600 rpm

2.0 L TURBO model:

2,600 — 3,500 rpm



- (A) Brake pedal
- (B) Accelerator pedal

5) When the engine speed is stabilized, record that speed quickly and release the accelerator pedal.

6) Shift the select lever to “N” range, and cool down the engine by idling it for more than one minute.

7) If the stall speed in “2” range is higher than specifications, low clutch slipping and 2-4 brake slipping

STALL TEST

AUTOMATIC TRANSMISSION

3. EVALUATION

Stall speed (at sea level)	Position	Cause
Less than specifications	2 (Hold switch ON) R	<ul style="list-style-type: none">• Throttle valve not fully open• Erroneous engine operation• Torque converter clutch's one-way clutch slipping
Greater than specifications	D	<ul style="list-style-type: none">• Line pressure too low• Low clutch slipping• One-way clutch malfunction
	R	<ul style="list-style-type: none">• Line pressure too low• Reverse clutch slipping• Low & reverse brake slipping
	2 (Hold switch ON)	<ul style="list-style-type: none">• Line pressure too low• Low clutch slipping• 2-4 brake slipping

6. Time Lag Test

A: INSPECTION

1. GENERAL INFORMATION

If the select lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the low clutch, reverse clutch, low & reverse brake and one-way clutch.

NOTE:

- Perform the test at normal operating fluid temperature 70 to 80°C (158 to 176°F).
- Be sure to allow a 1 minute interval between tests.
- Make three measurements and take the average value.

2. TEST METHODS

1) Fully apply the parking brake.

2) Start the engine.

Check the idling speed (A/C OFF).

3) Shift the select lever from "N" to "D" range.

Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

4) In the same manner, measure the time lag for "N" → "R".

Time lag: Less than 1.5 seconds

3. EVALUATION

1) If "N" → "D" time lag is longer than specified:

- Line pressure too low
- Low clutch worn
- One-way clutch not operating properly

2) If "N" → "R" time lag is longer than specified:

- Line pressure too low
- Reverse clutch worn
- Low & reverse brake worn

LINE PRESSURE TEST

AUTOMATIC TRANSMISSION

7. Line Pressure Test

A: MEASUREMENT

1. GENERAL INFORMATION

If the clutch or the brake shows a sign of slippage or shifting sensation is not correct, the line pressure should be checked.

- Excessive shocks during upshifting or shifting takes place at a higher point than under normal circumstances, may be due to the line pressure being too high.

- Slippage or inability to operate the vehicle may, in most cases, be due to loss of oil pressure for the operation of the clutch, brake or control valve.

1) Line pressure measurement (under no load)

NOTE:

- Before measuring the line pressure, jack-up all wheels.

- Maintain the temperature of ATF at approx. 70 — 80°C (158 — 176°F) during measurement.

(ATF will reach the above temperature after idling the engine for approx. 30 minutes with select lever in “N” or “P”.)

2) Line pressure measurement (under heavy load)

NOTE:

- Before measuring the line pressure, apply both foot and parking brakes with all wheels chocked (Same as for “stall” test conditions).

- Measure the line pressure when select lever is in “R”, “2” with engine under stall conditions.

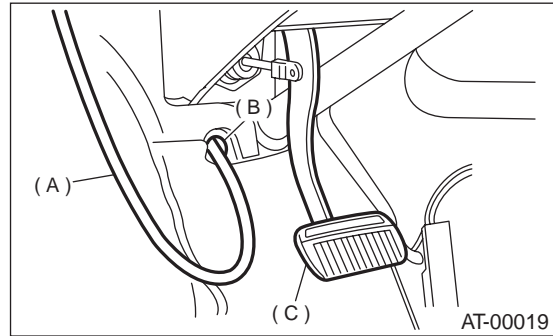
- Measure the line pressure within 5 seconds after shifting the select lever to each position. (If line pressure needs to be measured again, allow the engine to idle, and then stop it to cool down for at least one minute.)

- Maintain the temperature of ATF at approx. 70 — 80°C (158 — 176°F) during measurement (ATF will reach the above temperature after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)

2. TEST METHODS

1) Temporarily attach the ST to a suitable place in the driver's compartment, remove the blind plug located in front of the toe board and pass the hose of the ST to engine compartment.

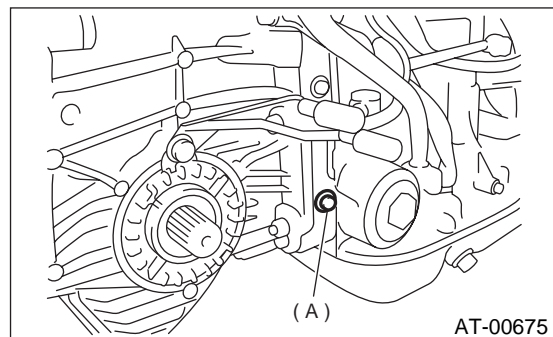
ST 498575400 OIL PRESSURE GAUGE ASSY



- (A) Pressure gauge hose
- (B) Hole in toe board (blank cap hole)
- (C) Brake pedal

2) Remove the test plug and install the ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



- (A) Test plug

3) Connect the ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER

ST2 498575400 OIL PRESSURE GAUGE ASSY

4) Check for duty ratio changes by opening and closing the throttle valve using Subaru Select Monitor.

(1) Insert the cartridge to Subaru Select Monitor. <Ref. to AT-19, PREPARATION TOOL, General Description.>



(2) Connect the Subaru Select Monitor to data link connector.

5) Check the line pressure in accordance with the following chart.

3. EVALUATION

Standard line pressure			
Range position	Line pressure duty ratio (%)	Throttle position	Line pressure kPa (kg/cm ² , psi)
2	5	Full open	1,128 — 1,304 (11.5 — 13.3, 164 — 189)
R	5	Full open	1,520 — 1,716 (15.5 — 17.5, 220 — 249)
D	95	Full closed	304 — 412 (3.1 — 4.2, 44 — 60)

TRANSFER CLUTCH PRESSURE TEST

AUTOMATIC TRANSMISSION

8. Transfer Clutch Pressure Test

A: INSPECTION

1. TEST METHODS

- MPT model

Check the transfer clutch pressure in accordance with the following chart in the same manner as with line pressure. <Ref. to AT-36, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET

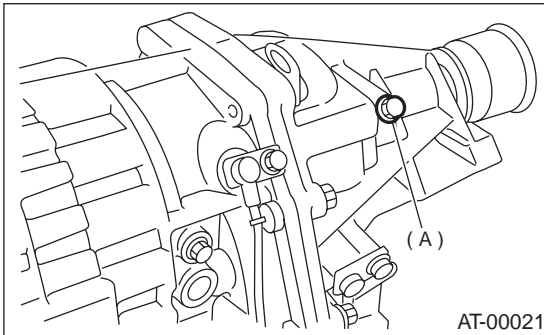
ST 498575400 OIL PRESSURE GAUGE ASSY

AWD mode: "D" range

FWD mode: "P" range, engine speed 2,000 rpm

NOTE:

Before setting in FWD mode, install the spare fuse on FWD mode switch.



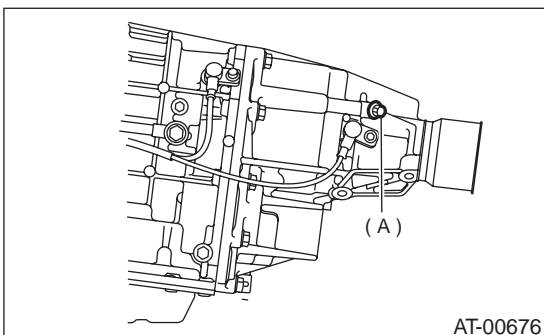
(A) Test plug

- VTD model

Check transfer clutch pressure using the following chart. <Ref. to AT-36, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET

ST 498575400 OIL PRESSURE GAUGE ASSY



(A) Test plug

2. EVALUATION

- MPT model

NOTE:

If oil pressure is not produced or if it does not change in the AWD mode, the transfer duty solenoid or transfer valve assembly may be malfunctioning. If oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

Standard transfer clutch pressure kPa (kg/cm ² , psi)			
ON Duty ratio (%)	Throttle position	AWD mode	FWD mode
5	Full open	951 — 1,089 (9.7 — 11.1, 138 — 158)	—
60	2/3 throttle	226 — 294 (2.3 — 3.0, 33 — 43)	—
95	Full closed	—	0 (0, 0)

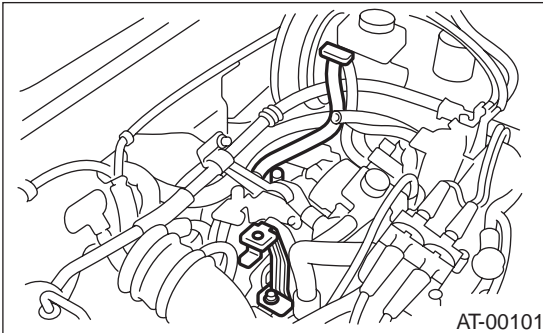
- VTD model

Duty ratio (%)	Throttle opening angle	Standard of transfer clutch pressure kPa (kg/cm ² , psi)
95	Fully open	951 — 1,089 (9.7 — 11.1, 138 — 158)
60	2/3 open	226 — 294 (2.3 — 3.0, 33 — 43)

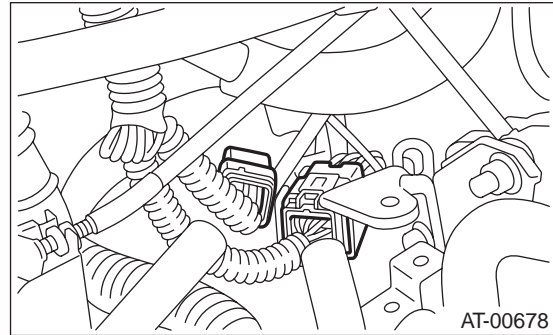
9. Automatic Transmission Assembly

A: REMOVAL

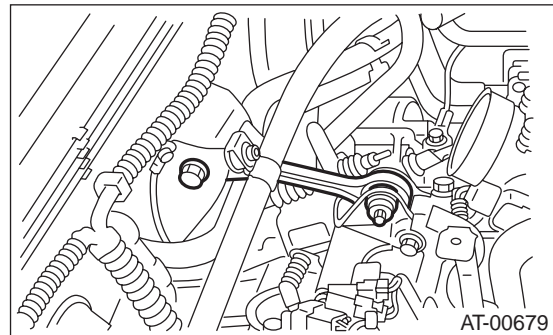
- 1) Set the vehicle on a lift.
- 2) Open front hood fully, and support with stay.
- 3) Disconnect battery ground cable.
- 4) Remove air intake duct. (Non-TURBO model)
2.0 L and 2.5 L models
<Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
3.0 L model
<Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
- 5) Remove air cleaner case or air intake chamber. (Non-TURBO model)
2.0 L and 2.5 L models
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
3.0 L model
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
- 6) Remove intercooler. (TURBO model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 7) Remove air cleaner case stay. (Non-TURBO model)



- 8) Disconnect the following connectors.
 - (1) Transmission harness connector



- (2) Transmission ground terminal
- 9) Remove starter.
2.0 L non-TURBO and 2.5 L models
<Ref. to SC(H4SO)-6, REMOVAL, Starter.>
3.0 L model
<Ref. to SC(H6DO)-6, REMOVAL, Starter.>
2.0 L TURBO model
<Ref. to SC(H4DOSTC)-6, REMOVAL, Starter.>
- 10) Remove pitching stopper.



- 11) Separate torque converter clutch from drive plate.
 - (1) Remove service hole plug.
 - (2) Remove bolts which hold torque converter clutch to drive plate.
 - (3) While rotating the engine, remove other bolts using ST.

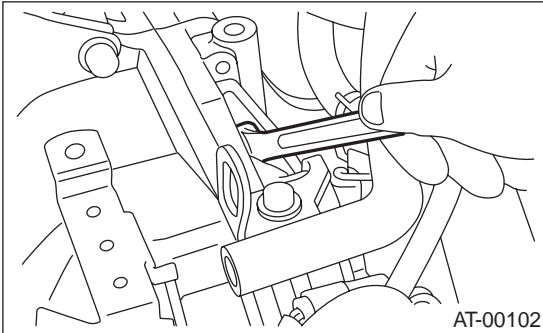
CAUTION:

Be careful not to drop bolts into torque converter clutch housing.

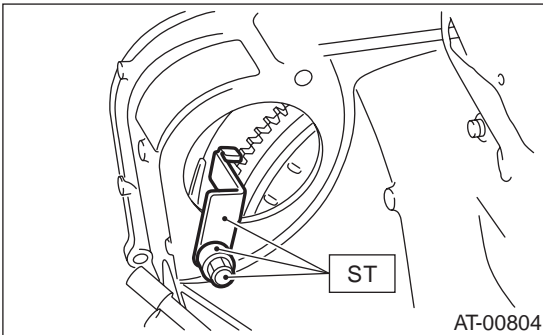
AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

- Except 2.0 L model
ST 499977100 CRANKSHAFT PULLEY
WRENCH
- 2.0 L model
ST 499977400 CRANKSHAFT PULLEY
WRENCH



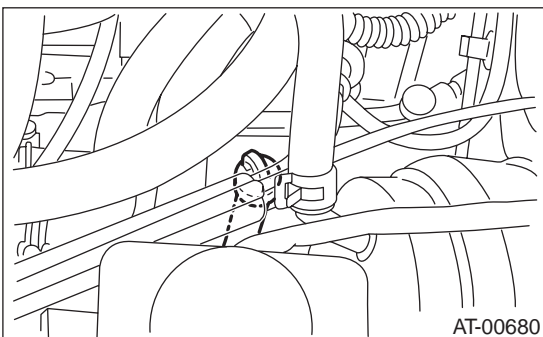
- 12) Install ST to torque converter clutch case.
ST 498277200 STOPPER SET



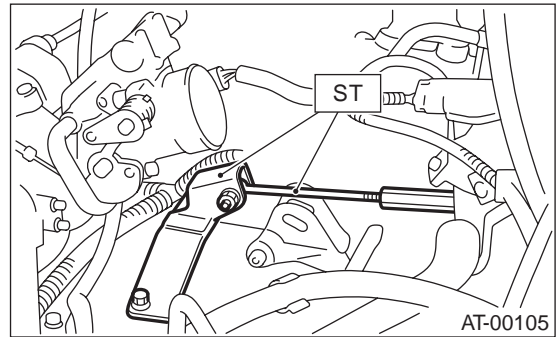
- 13) Remove ATF level gauge.

NOTE:

Plug opening to prevent entry of foreign particles into transmission fluid.

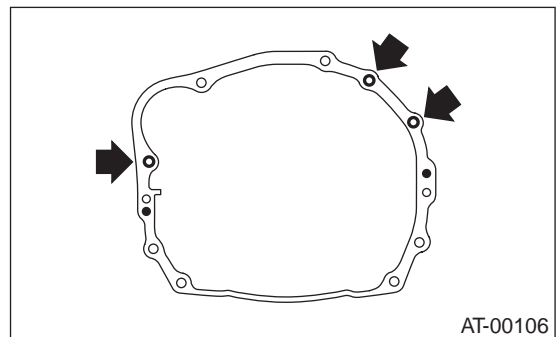


- 14) Set ST.
ST 41099AA000 ENGINE SUPPORT ASSY

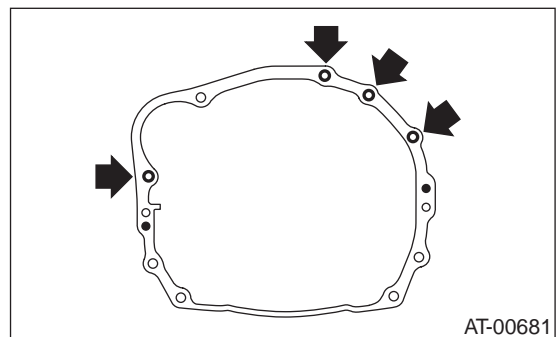


- 15) Remove bolt which holds right upper side of transmission to engine.

Except 3.0 L model



3.0 L model



- 16) Lift-up the vehicle.
17) Remove under cover.
18) Remove front, center, rear exhaust pipe and muffler. (Non-TURBO model)
2.0 L and 2.5 L with OBD models
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.0 L and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>

AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

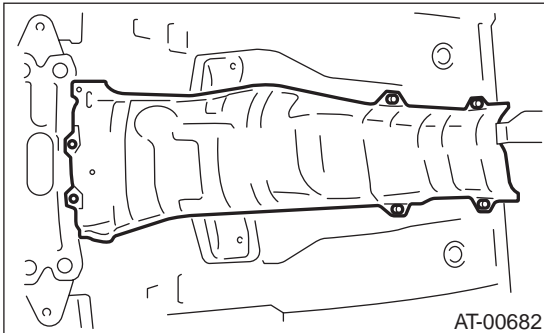
3.0 L model

<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>

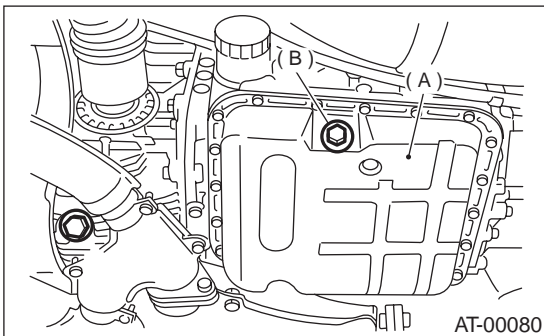
19) Remove center and rear exhaust pipes, and muffler. (TURBO model)

<Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>

20) Remove heat shield cover.



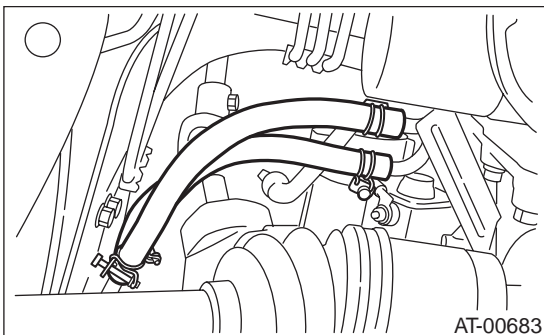
21) Drain ATF to remove ATF drain plug.



(A) Oil pan

(B) Drain plug

22) Disconnect ATF cooler hoses from pipes of transmission side, and remove ATF level gauge guide.



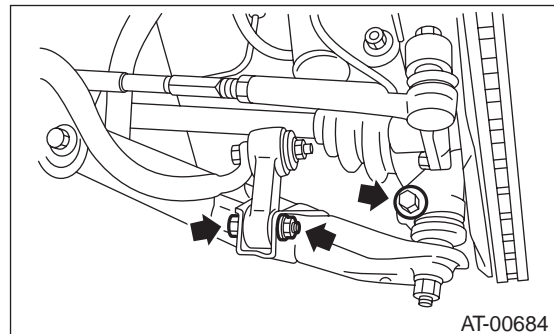
23) Remove propeller shaft.

<Ref. to DS-14, REMOVAL, Propeller Shaft.>

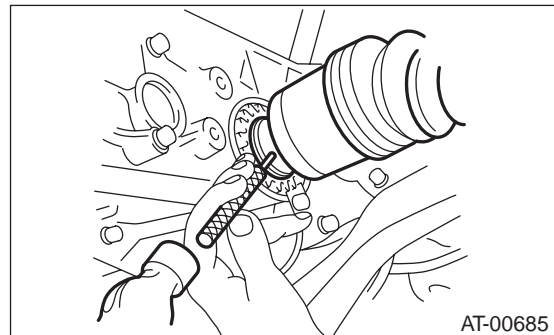
24) Remove shift select cable. <Ref. to CS-12, REMOVAL, Select Cable.>

25) Disconnect stabilizer link from transverse link.

26) Remove bolt securing ball joint of transverse link to housing.

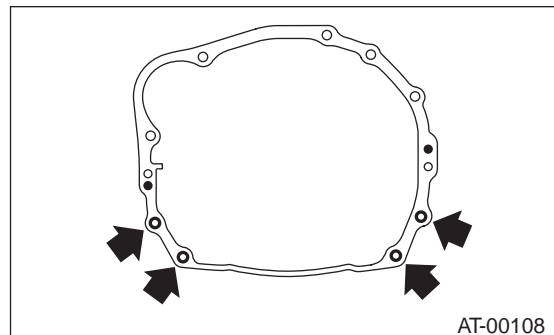


27) Remove spring pins and separate front drive shafts from each side of the transmission.

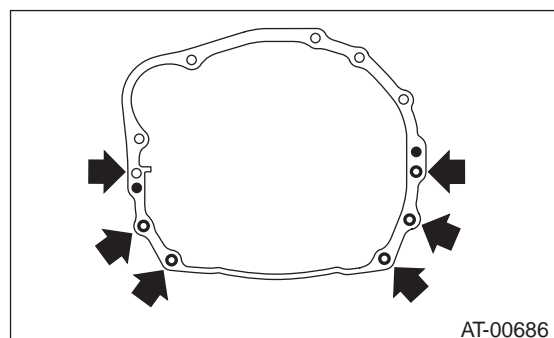


28) Remove nuts which hold lower side of transmission to engine.

Except 3.0 L model



3.0 L model



AUTOMATIC TRANSMISSION ASSEMBLY

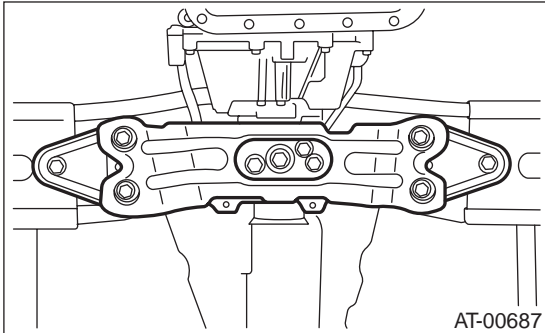
AUTOMATIC TRANSMISSION

29) Place transmission jack under transmission.

NOTE:

Make sure that the support plates of transmission jack don't touch the oil pan.

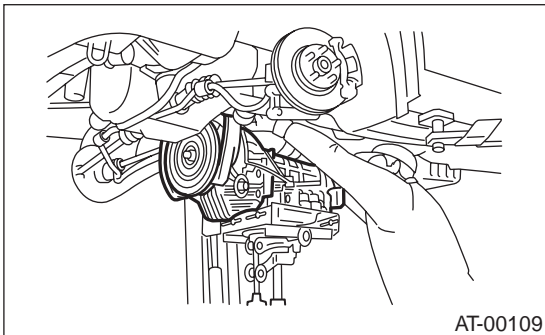
30) Remove transmission rear crossmember from vehicle.



31) Remove transmission.

CAUTION:

Move transmission and torque converter as a unit away from engine.



32) Separate transmission assembly and rear cushion rubber.

B: INSTALLATION

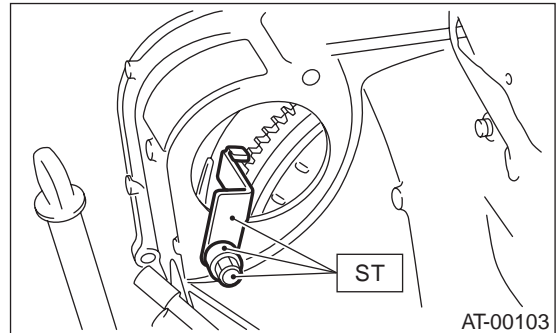
1) Install rear cushion rubber to transmission assembly.

Tightening torque:

39 N·m (4.0 kgf-m, 29 ft-lb)

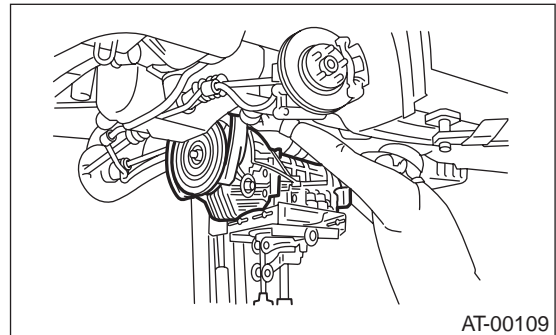
2) Install ST to torque converter clutch case.

ST 498277200 STOPPER SET



3) Install transmission onto engine.

(1) Gradually raise transmission with transmission jack.



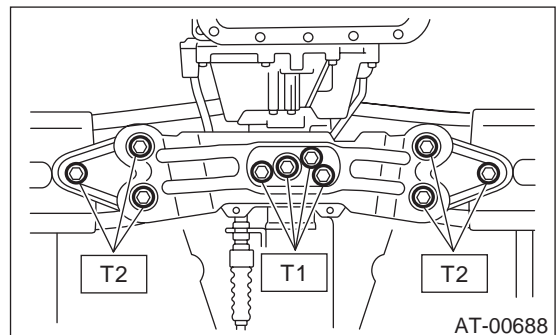
(2) Engage them at splines.

4) Install transmission rear crossmember.

Tightening torque:

T1: 35 N·m (3.6 kgf-m, 26 ft-lb)

T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



5) Take off transmission jack.

AUTOMATIC TRANSMISSION ASSEMBLY

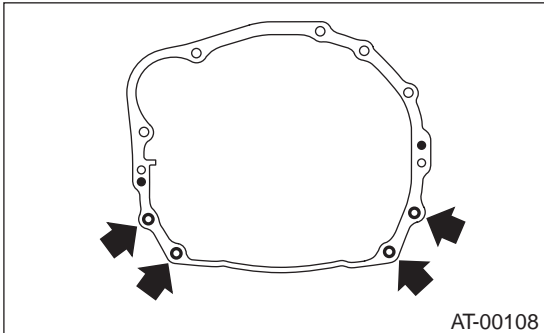
AUTOMATIC TRANSMISSION

6) Tighten nuts and bolts which hold lower side of transmission to engine.

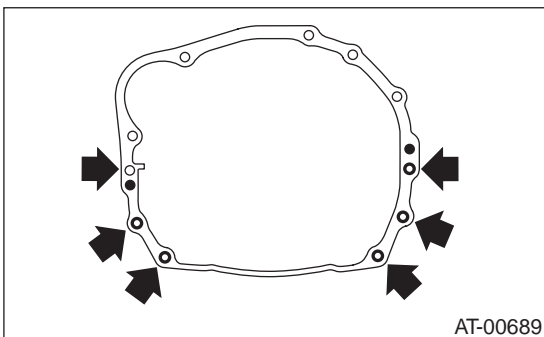
Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)

Except 3.0 L model



3.0 L model



7) Lower the vehicle.

8) Connect engine and transmission.

(1) Remove ST from torque converter clutch case.

NOTE:

Be careful not to drop the ST into the torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

(2) Install starter.

2.0 L non-TURBO and 2.5 L models

<Ref. to SC(H4SO)-6, INSTALLATION, Starter.>

3.0 L model

<Ref. to SC(H6DO)-6, INSTALLATION, Starter.>

2.0 L TURBO model

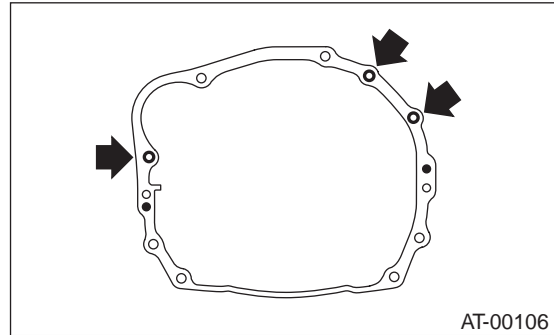
<Ref. to SC(H4DOSTC)-6, INSTALLATION, Starter.>

(3) Tighten bolt which holds right upper side of transmission to engine.

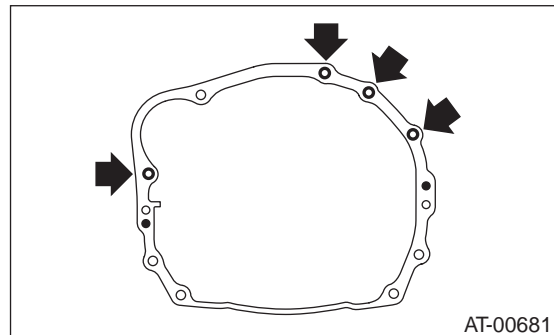
Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)

Except 3.0 L model



3.0 L model



9) Install torque converter clutch to drive plate.

(1) Tighten bolts which hold torque converter clutch to drive plate.

(2) Tighten other bolts while rotating the engine by using ST.

NOTE:

Be careful not to drop bolts into torque converter clutch housing.

• Except 2.0 L model

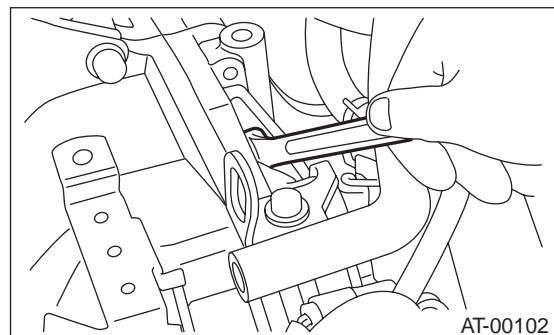
ST 499977100 CRANKSHAFT PULLEY WRENCH

• 2.0 L model

ST 499977400 CRANKSHAFT PULLEY WRENCH

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

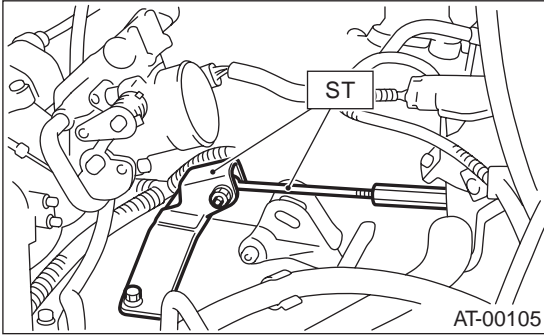


(3) Clog plug onto service hole.

AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

10) Remove ST.

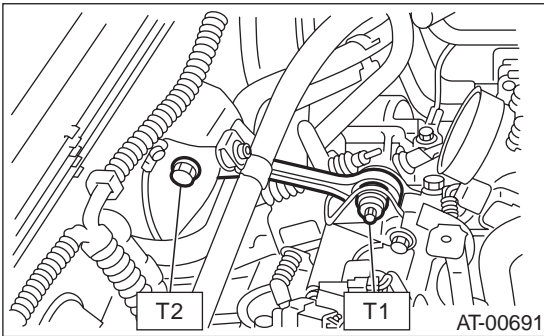


11) Install pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



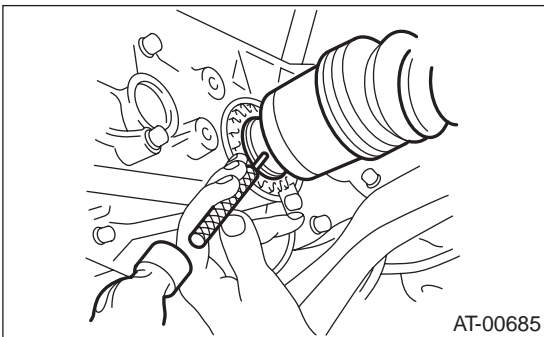
12) Lift-up the vehicle.

13) Install front drive shafts into transmission.

(1) Lift-up the vehicle.

(2) Install front drive shaft into transmission.

(3) New drive spring pin into chamfered hole of drive shaft.



14) Install ball joint into housing.

15) Connect stabilizer link to transverse link, and tighten bolts. (Non-TURBO model)

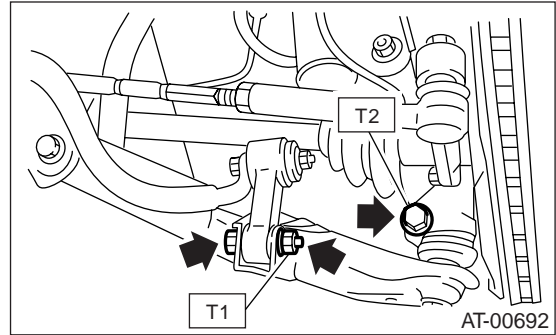
NOTE:

Discard loosened self-locking nut and replace with a new one.

Tightening torque:

T1: 30 N·m (3.1 kgf-m, 22.4 ft-lb)

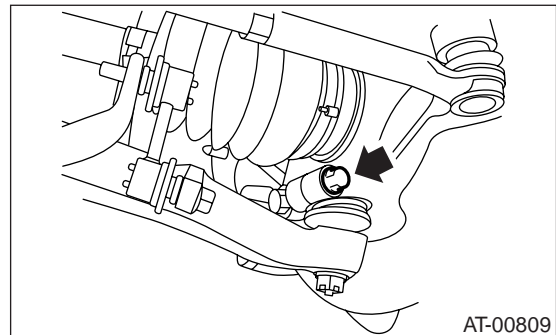
T2: 50 N·m (5.1 kgf-m, 37 ft-lb)



16) Tighten the installing bolts. (TURBO model)

Tightening torque:

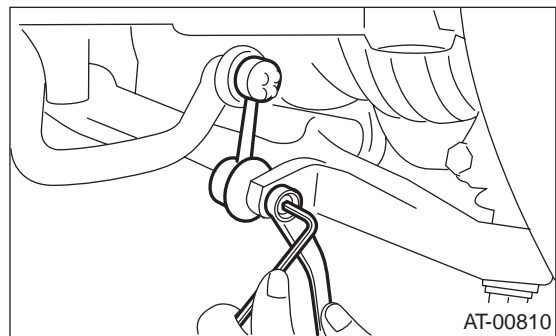
50 N·m (5.1 kgf-m, 36.9 ft-lb)



17) Install the stabilizer link to transverse link. (TURBO model)

Tightening torque:

45 N·m (4.6 kgf-m, 33.2 ft-lb)

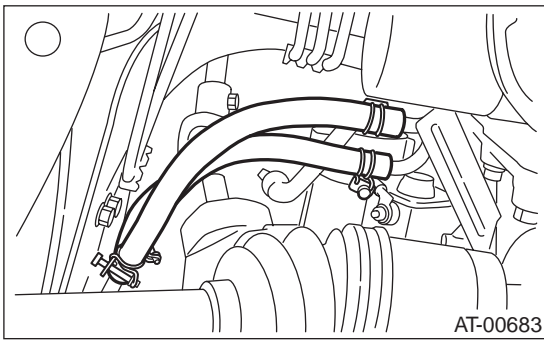


18) Install shift select cable onto select lever.
<Ref. to CS-13, INSTALLATION, Select Cable.>

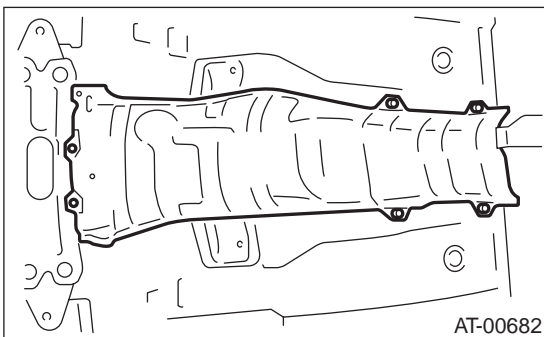
AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

- 19) Install ATF level gauge guide, and connect ATF cooler hoses to pipe.

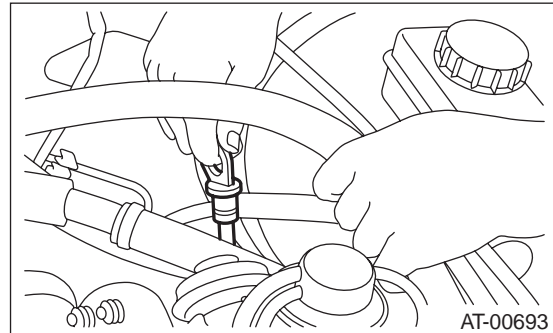


- 20) Install propeller shaft.
<Ref. to DS-15, INSTALLATION, Propeller Shaft.>
21) Install heat shield cover.



- 22) Install rear exhaust pipe and muffler assembly.
2.0 L non-TURBO and 2.5 L with OBD models
<Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
2.0 L non-TURBO and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, INSTALLATION, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
2.0 L TURBO model
<Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>
23) Install front and center exhaust pipe. (Non-TURBO model)
2.0 L and 2.5 L with OBD models
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>
2.0 L and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>
3.0 L model
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>

- 24) Install center exhaust pipe. (TURBO model)
<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>
25) Install under cover.
26) Lower the vehicle.
27) Install ATF level gauge.



- 28) Connect the following connectors.
(1) Transmission harness connectors
(2) Transmission ground terminal
29) Connect the following cables.
(1) Cruise control cable (With cruise control vehicles)
30) Install air cleaner case stay.

Tightening torque:

16 N·m (1.6 kgf·m, 11.6 ft·lb)

- 31) Install air cleaner case or air intake chamber. (Non-TURBO model)
2.0 L and 2.5 L models
<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>
3.0 L model
<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
32) Install air intake duct. (Non-TURBO model)
2.0 L and 2.5 L models
<Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>
3.0 L model
<Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.>
33) Install intercooler. (TURBO model)
<Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>
34) Connect battery ground cable.
35) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole. <Ref. to AT-30, Automatic Transmission Fluid.>
36) Take off vehicle from lift arms.
37) Check select lever operation.
<Ref. to AT-49, INSPECTION, Inhibitor Switch.>
38) Check the ATF level. <Ref. to AT-30, Automatic Transmission Fluid.>
39) Check road test.
<Ref. to AT-32, Road Test.>

TRANSMISSION MOUNTING SYSTEM

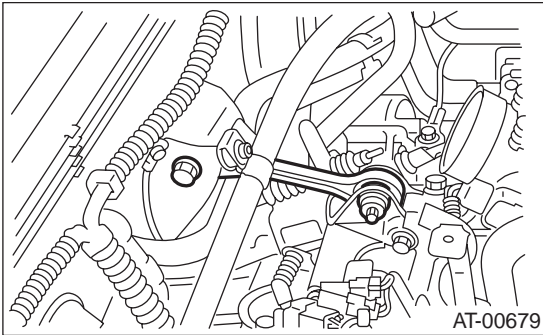
AUTOMATIC TRANSMISSION

10. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner case. (2.0 L non-TURBO and 2.5 L models)
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 3) Remove air intake chamber. (3.0 L model)
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
- 4) Remove intercooler. (2.0 L TURBO model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 5) Remove the pitching stopper.

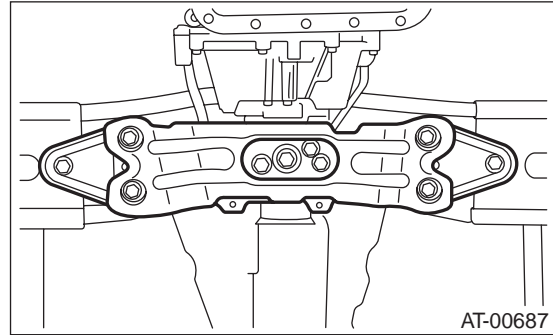


2. CROSSMEMBER AND CUSHION RUBBER

- 1) Disconnect the ground cable from battery.
- 2) Jack-up the vehicle and support it with sturdy racks.
- 3) Remove the front, center, rear exhaust pipes and muffler. (Non-TURBO model)
2.0 L and 2.5 L with OBD models
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.0 L and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
- 4) Remove center and rear exhaust pipes, and muffler. (TURBO model)
<Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, RE-

MOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>

- 5) Remove the heat shield cover.
- 6) Set the transmission jack under the transmission. Make sure that the support plates of transmission jack don't touch the oil pan.
- 7) Remove the transmission rear crossmember.



- 8) Remove the rear cushion rubber.

B: INSTALLATION

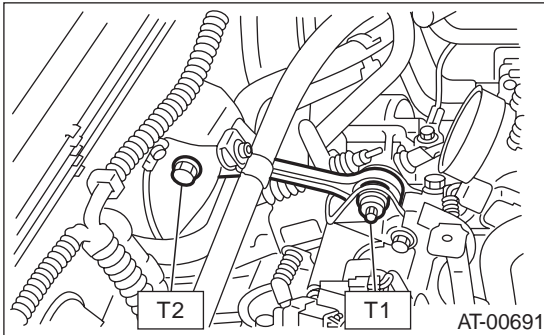
1. PITCHING STOPPER

- 1) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



- 2) Install the air cleaner case. (2.0 L non-TURBO and 2.5 L models)

<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

- 3) Remove air intake chamber. (3.0 L model)

<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>

- 4) Remove intercooler. (TURBO model)

<Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

2. CROSSMEMBER AND CUSHION RUBBER

- 1) Install the rear cushion rubber.

Tightening torque:

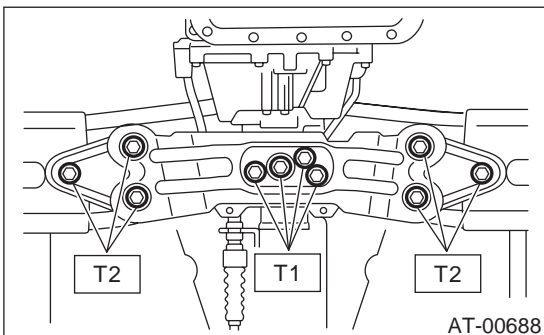
39 N·m (4.0 kgf-m, 29 ft-lb)

- 2) Install the crossmember.

Tightening torque:

T1: 35 N·m (3.6 kgf-m, 26 ft-lb)

T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



- 3) Remove the transmission jack.

- 4) Install the heat shield cover.

- 5) Install the front, center, rear exhaust pipes and the muffler. (Non-TURBO model)

With OBD

<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>

Without OBD

<Ref. to EX(H4SOw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SOw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, INSTALLATION, Muffler.>

3.0 L model

<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>

- 6) Install center and rear exhaust pipes, and muffler. (TURBO model)

<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked, or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked, or otherwise damaged.

EXTENSION CASE OIL SEAL

AUTOMATIC TRANSMISSION

11.Extension Case Oil Seal

A: INSPECTION

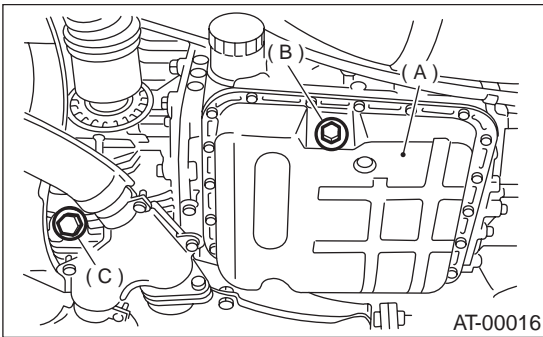
Make sure the ATF does not leak from the joint of transmission or propeller shaft. If so, replace the oil seal. <Ref. to AT-48, REPLACEMENT, Extension Case Oil Seal.>

B: REPLACEMENT

- 1) Clean the transmission exterior.
- 2) Drain the ATF completely.
- 3) Replace the gasket with a new one, and then tighten the ATF drain plug.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- (A) Oil pan
- (B) Drain plug
- (C) Differential oil drain plug

- 4) Remove the rear exhaust pipe and muffler.
2.0 L non-TURBO and 2.5 L with OBD models
<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.0 L non-TURBO and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
2.0 L TURBO model
<Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>
- 5) Remove the heat shield cover. (If equipped)
- 6) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
- 7) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY
- 8) Using the ST, install the oil seal.
ST 498057300 INSTALLER

- 9) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
- 10) Install the heat shield cover.
- 11) Install the rear exhaust pipe and muffler.
2.0 L non-TURBO and 2.5 L with OBD models
<Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
2.0 L non-TURBO and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, INSTALLATION, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
2.0 L TURBO model
<Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>
- 12) Pour ATF and check the ATF level. <Ref. to AT-30, Automatic Transmission Fluid.>

12. Inhibitor Switch

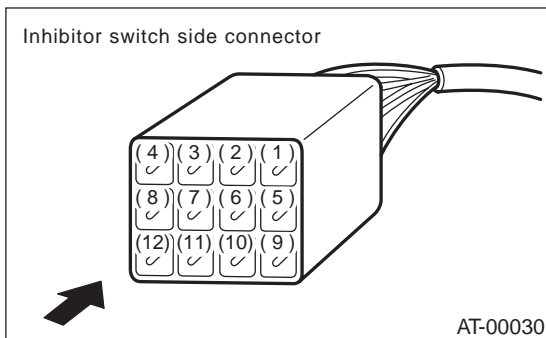
A: INSPECTION

When the driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

- 1) Disconnect the inhibitor switch connector.
 - 2) Check continuity in inhibitor switch circuits with the select lever moved to each position.
- Also check that continuity in ignition circuit does not exist when the select lever is in "R", "D", "3", "2" and "1" ranges.

If the inhibitor switch is inoperative, check for poor contact of connector on transmission side.

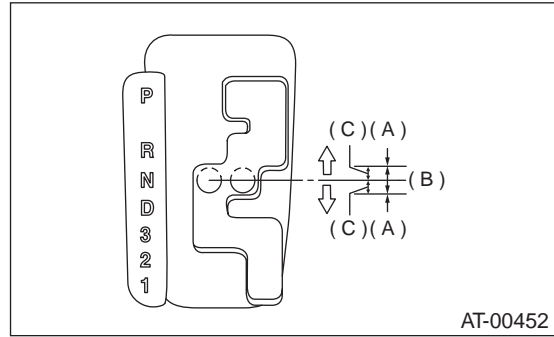
	Position	Pin No.	Value
Signal sent to TCM	P	4 — 3	Less than 1Ω
	R	4 — 2	
	N	4 — 1	
	D	4 — 8	
	3	4 — 7	
	2	4 — 6	
Ignition circuit	P/N	12 — 11	
Back-up light circuit	R	10 — 9	



- 3) Check if there is continuity at equal points when the select lever is turned 1.5° in both directions from "N" range.

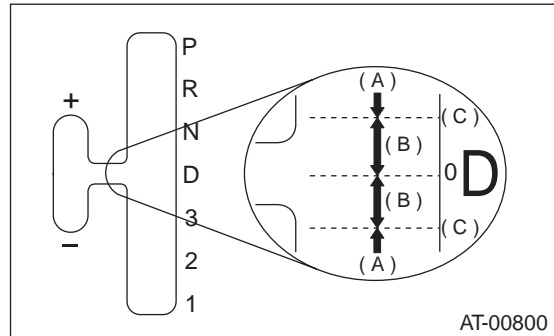
If there is continuity in one direction and the continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch. <Ref. to AT-50, ADJUSTMENT, Inhibitor Switch.>

- Except model with SPORT shift



- (A) Continuity does not exist.
- (B) Continuity exists.
- (C) 1.5°

- Model with SPORT shift



- (A) Continuity does not exist.
- (B) Continuity exists.
- (C) 1.5°

- 4) Repeat the above checks. If there are abnormalities, adjust the select cable. <Ref. to CS-14, ADJUSTMENT, Select Cable.>

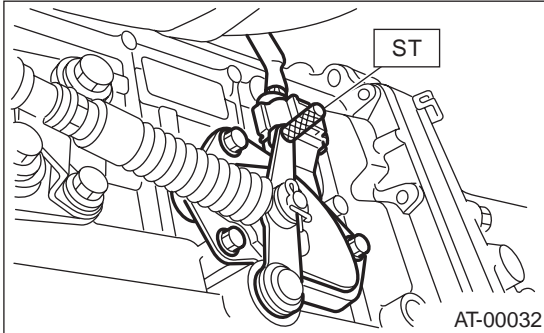
INHIBITOR SWITCH

AUTOMATIC TRANSMISSION

B: ADJUSTMENT

- 1) Shift the select lever to "N" range.
- 2) Loosen the three inhibitor switch securing bolts.
- 3) Insert the ST as vertical as possible into the holes in inhibitor switch lever and switch body.

ST 499267300 STOPPER PIN



- 4) Tighten the three inhibitor switch bolts.

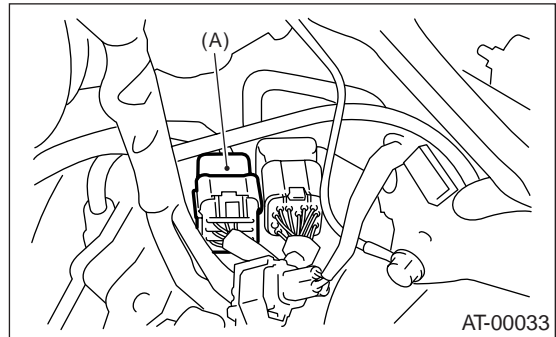
Tightening torque:

3.5 N·m (0.35 kgf-m, 2.5 ft-lb)

- 5) Repeat the above checks. If the inhibitor switch is determined to be "faulty", replace it.

C: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Move the select lever to "N" range.
- 3) Remove the air cleaner case. (2.0 L non-TURBO and 2.5 L models)
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 4) Remove air intake chamber. (3.0 L model)
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
- 5) Remove intercooler. (2.0 L non-TURBO model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 6) Disconnect the inhibitor switch connector.



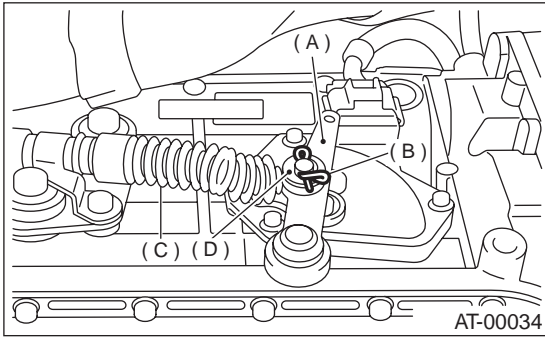
(A) Inhibitor switch

- 7) Remove the inhibitor switch connector from stay.
- 8) Lift-up the vehicle.
- 9) Remove the front and center exhaust pipes. (Non-TURBO model)
2.0 L and 2.5 L with OBD models
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>
2.0 L and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>
3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>
- 10) Remove center exhaust pipe. (TURBO model)
<Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>

INHIBITOR SWITCH

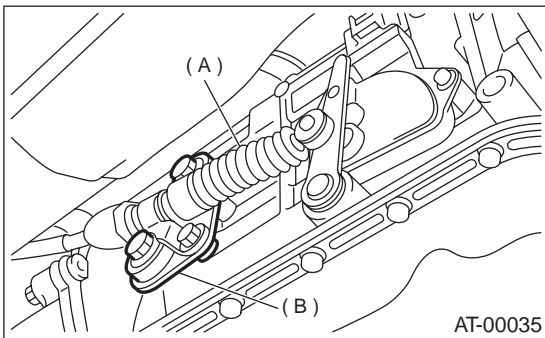
AUTOMATIC TRANSMISSION

11) Remove the snap pin and washer from range select lever.



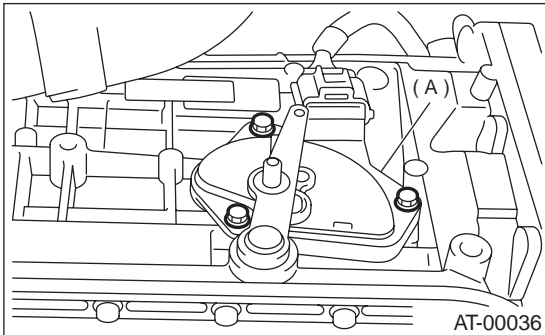
- (A) Range select lever
- (B) Snap pin
- (C) Select cable
- (D) Washer

12) Remove the plate assembly from transmission case.



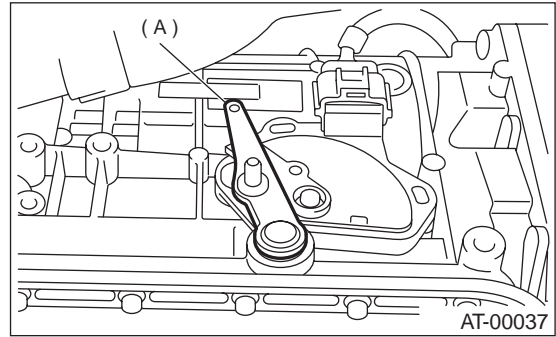
- (A) Select cable
- (B) Plate ASSY

13) Remove the bolts.



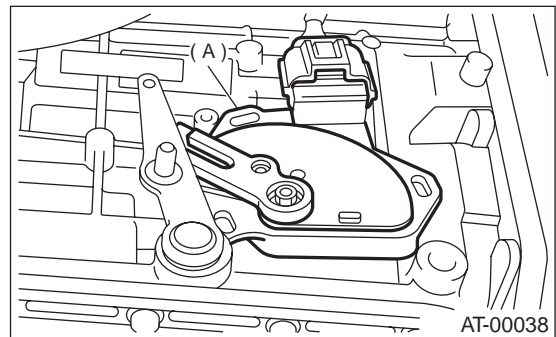
- (A) Inhibitor switch

14) Move the range select lever to parking position (left side).



- (A) Range select lever

15) Remove the inhibitor switch from transmission.



- (A) Inhibitor switch

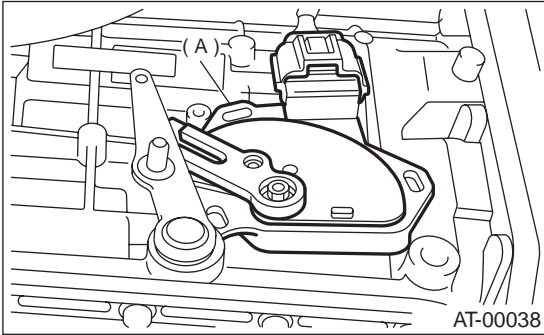
16) Disconnect the inhibitor switch harness connector from inhibitor switch.

INHIBITOR SWITCH

AUTOMATIC TRANSMISSION

D: INSTALLATION

- 1) Connect the inhibitor switch harness connector to inhibitor switch.
- 2) Install the inhibitor switch to transmission case.

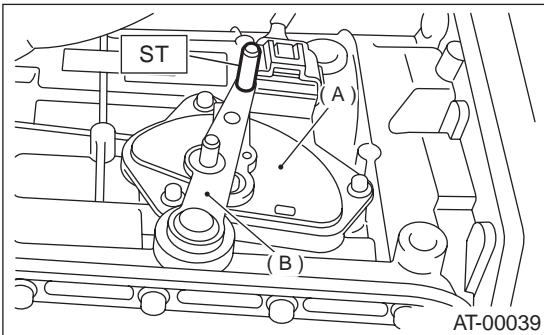


(A) Inhibitor switch

- 3) Move the range select lever to neutral position.
- 4) Place the inhibitor switch on specified position, and then tighten the bolts for inhibitor switch using ST.

ST 499267300 STOPPER PIN

Tightening torque:
3.4 N·m (0.35 kgf·m, 2.5 ft·lb)

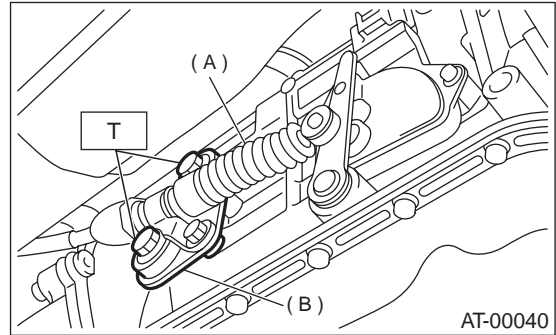


(A) Inhibitor switch
(B) Range select lever

- 5) Install the select cable to range select lever.

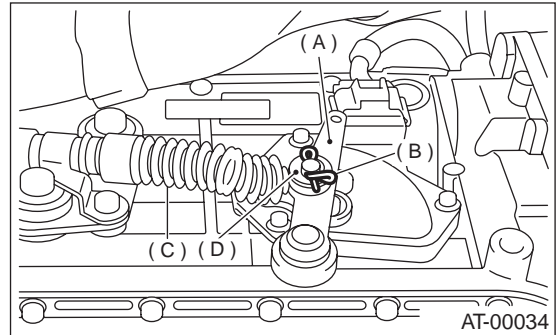
- 6) Install the plate assembly to transmission.

Tightening torque:
T: 25 N·m (2.5 kgf·m, 18.1 ft·lb)



(A) Select cable
(B) Plate ASSY

- 7) Install the washer and snap pin to range select lever.



(A) Range select lever
(B) Snap ring
(C) Select cable
(D) Washer

- 8) Install the front and center exhaust pipes. (Non-TURBO model)

2.0 L and 2.5 L with OBD models

<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

2.0 L and 2.5 L without OBD models

<Ref. to EX(H4SOw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>

3.0 L model

<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>

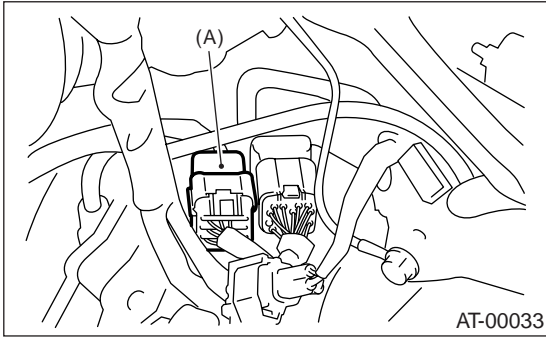
- 9) Install center exhaust pipe. (TURBO model)

<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>

- 10) Lower the vehicle.

- 11) Install the inhibitor switch connector to stay.

12) Connect the inhibitor switch connector.



(A) Inhibitor switch

13) Install the air cleaner case. (2.0 L non-TURBO and 2.5 L models)

<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

14) Install air intake chamber. (3.0 L model)

<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>

15) Install intercooler. (TURBO model)

<Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

16) Inspect the inhibitor switch. <Ref. to AT-49, INSPECTION, Inhibitor Switch.>

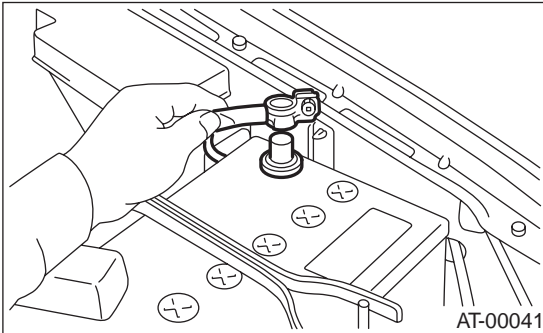
FRONT VEHICLE SPEED SENSOR

AUTOMATIC TRANSMISSION

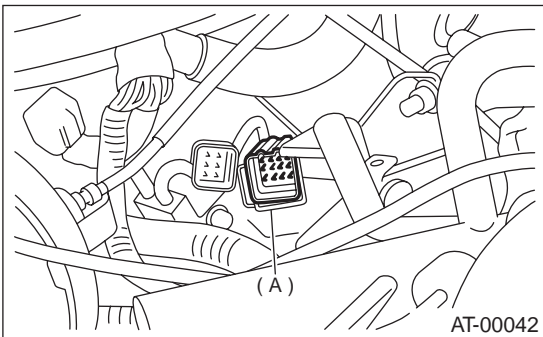
13. Front Vehicle Speed Sensor

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



- 3) Remove the air cleaner case. (2.0 L non-TURBO and 2.5 L models)
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 4) Remove air intake chamber. (3.0 L model)
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
- 5) Remove intercooler. (TURBO model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 6) Disconnect the transmission connector.



(A) Transmission connector

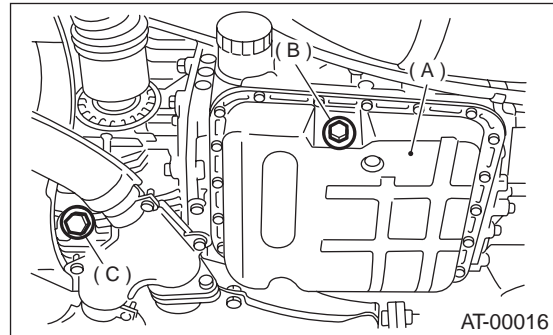
- 7) Remove the pitching stopper. <Ref. to AT-46, REMOVAL, Transmission Mounting System.>
- 8) Remove the transmission connector from stay.
- 9) Lift-up the vehicle.
- 10) Clean the transmission exterior.
- 11) Drain the ATF completely.

NOTE:

- Tighten the ATF drain plug after draining the ATF.
- Replace the gasket with a new one.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- (A) Oil pan
- (B) Drain plug
- (C) Differential oil drain plug

- 12) Remove the front, center, rear exhaust pipes and muffler. (Non-TURBO model)

With OBD

<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>

Without OBD

<Ref. to EX(H4SOw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>

3.0 L model

<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>

- 13) Remove center and rear exhaust pipes, and muffler. (TURBO model)

<Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>

- 14) Remove the shield cover. (If equipped)

- 15) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

- 16) Place the transmission jack under transmission.

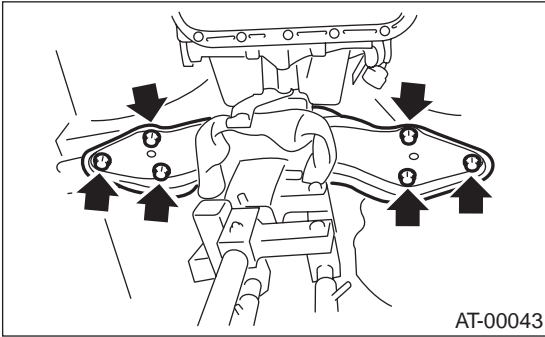
NOTE:

Make sure that the support plates of transmission jack don't touch the crossmember.

FRONT VEHICLE SPEED SENSOR

AUTOMATIC TRANSMISSION

17) Remove the transmission rear crossmember bolts.



18) Lower the AT jack.

NOTE:

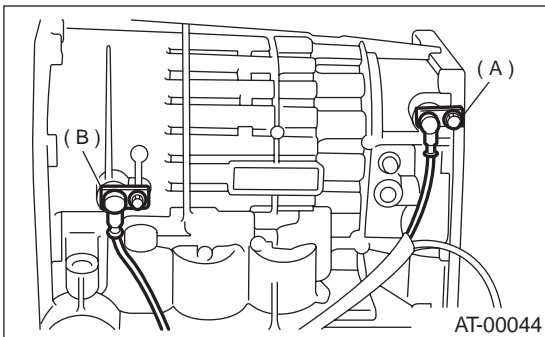
Do not separate the AT jack and transmission.

19) Remove the oil cooler inlet and outlet pipe.

NOTE:

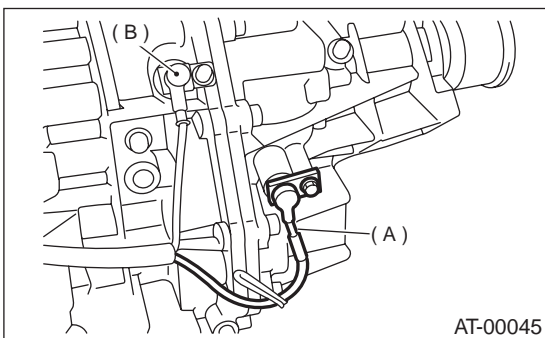
When removing the outlet pipe, be careful not to lose balls and springs used with retaining screws.

20) Remove the front torque converter turbine speed sensor.



- (A) Front vehicle speed sensor
- (B) Torque converter turbine speed sensor

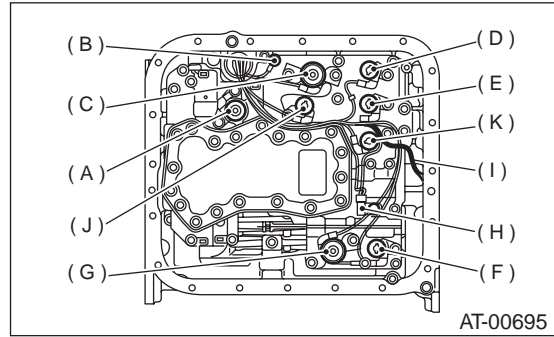
21) Remove the rear vehicle speed sensor.



- (A) Rear vehicle speed sensor
- (B) Front vehicle speed sensor

22) Remove the oil pan.

23) Disconnect each solenoid connector and remove ATF temperature sensor from control valve.



- (A) Lock-up duty solenoid (Blue)
- (B) Transmission ground
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)
- (J) Low clutch timing solenoid (Gray)
- (K) Sport shift solenoid (Beige) (if equipped)

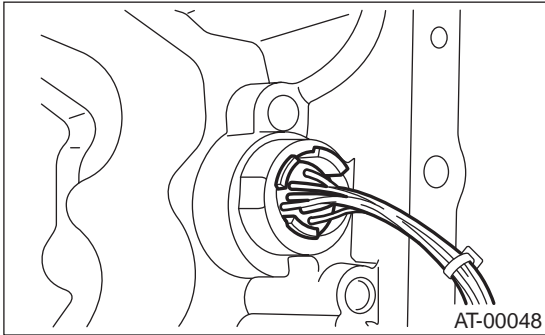
24) Remove the harness assembly.

FRONT VEHICLE SPEED SENSOR

AUTOMATIC TRANSMISSION

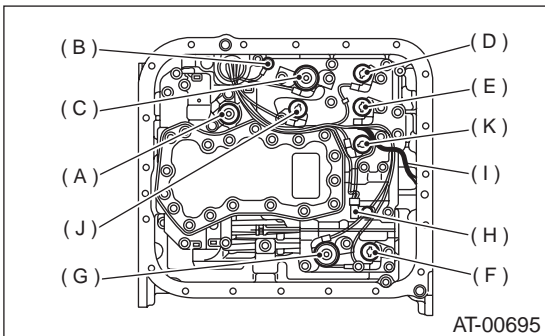
B: INSTALLATION

1) Pass the harness assembly through the hole in the transmission case.



2) Connect the harness connectors. Connect the connectors of same color, and secure the connectors to valve body using clips.

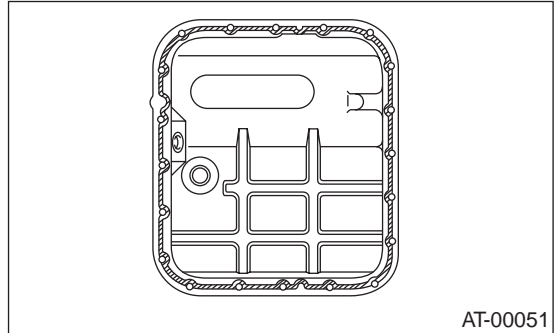
Tightening torque (Transmission ground cable and ATF temperature sensor)
8 N·m (0.8 kgf·m, 5.8 ft·lb)



- (A) Lock-up duty solenoid (Blue)
- (B) Transmission ground
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)
- (J) Low clutch timing solenoid (Gray)
- (K) Sport shift solenoid (Beige) (if equipped)

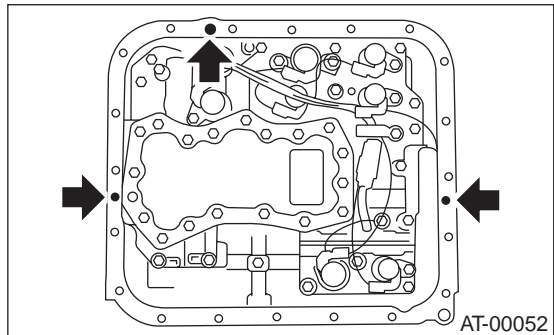
3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



4) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



5) Install the oil pan.

Tightening torque:
5 N·m (0.5 kgf·m, 3.6 ft·lb)

6) Install the front and rear vehicle speed sensor, and also the torque converter turbine speed sensor, and then fasten the harness.

Tightening torque:
7 N·m (0.7 kgf·m, 5.1 ft·lb)

FRONT VEHICLE SPEED SENSOR

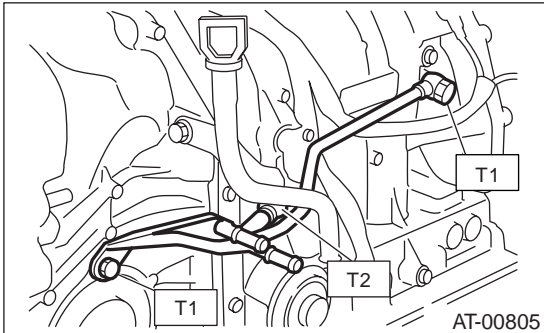
AUTOMATIC TRANSMISSION

7) Install a new aluminum washer and oil cooler pipes.

Tightening torque:

T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)



17) Install air intake chamber. (3.0 L model)
<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>

18) Install intercooler. (TURBO model)
<Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

19) Fill ATF and check ATF level.
<Ref. to AT-30, Automatic Transmission Fluid.>

8) Install the transmission rear crossmember bolts.

Tightening torque:

70 N·m (7.1 kgf-m, 51 ft-lb)

9) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>

10) Install the shield cover. (If equipped)

11) Install the front, center, rear exhaust pipes and muffler. (Non-TURBO model)

With OBD

<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>

Without OBD

<Ref. to EX(H4S0w/o0BD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4S0w/o0BD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4S0w/o0BD)-14, INSTALLATION, Muffler.>

3.0 L model

<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>

12) Install center and rear exhaust pipes, and muffler. (TURBO model)

<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>

13) Lower the vehicle.

14) Install the transmission connector to the stay.

15) Install the pitching stopper. <Ref. to AT-47, INSTALLATION, Transmission Mounting System.>

16) Install the air cleaner case. (2.0 L non-TURBO and 2.5 L models)

<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

REAR VEHICLE SPEED SENSOR

AUTOMATIC TRANSMISSION

14.Rear Vehicle Speed Sensor

A: REMOVAL

When removing the rear vehicle speed sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-54, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the rear vehicle speed sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-56, INSTALLATION, Front Vehicle Speed Sensor.>

15. Torque Converter Turbine Speed Sensor

A: REMOVAL

When removing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor."
<Ref. to AT-54, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor."
<Ref. to AT-56, INSTALLATION, Front Vehicle Speed Sensor.>

CONTROL VALVE BODY

AUTOMATIC TRANSMISSION

16. Control Valve Body

A: REMOVAL

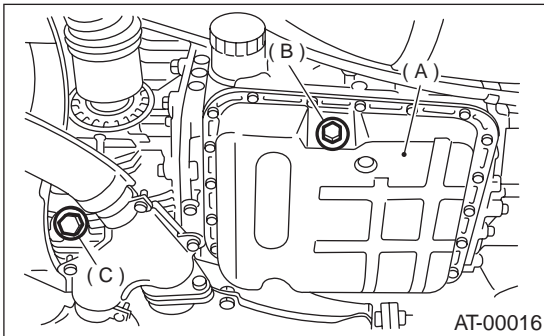
- 1) Lift-up the vehicle.
- 2) Clean the transmission exterior.
- 3) Drain the ATF completely.

NOTE:

- Tighten the ATF drain plug after draining the ATF.
- Replace the gasket with a new one.

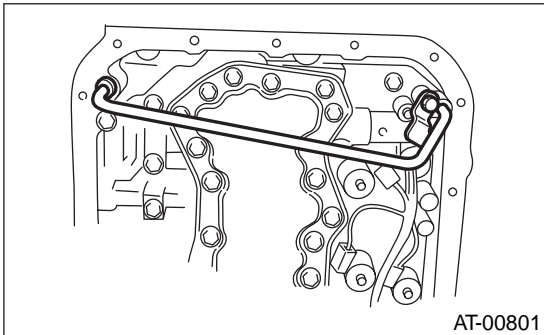
Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

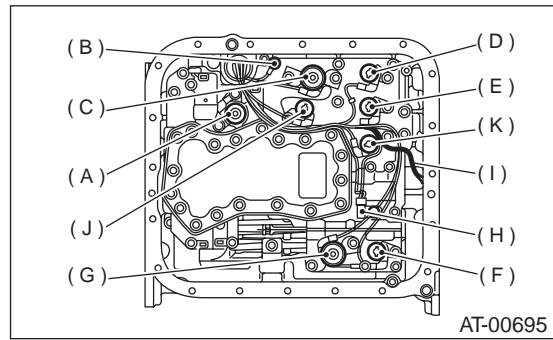


- (A) Oil pan
- (B) Drain plug
- (C) Differential oil drain plug

- 4) Remove the oil pan.
- 5) Remove and clean the magnet.
- 6) Remove the old gasket on the oil pan and transmission case completely.
- 7) Remove the pipe. (TURBO model)



- 8) Disconnect each solenoid connector and remove ATF temperature sensor from control valve.

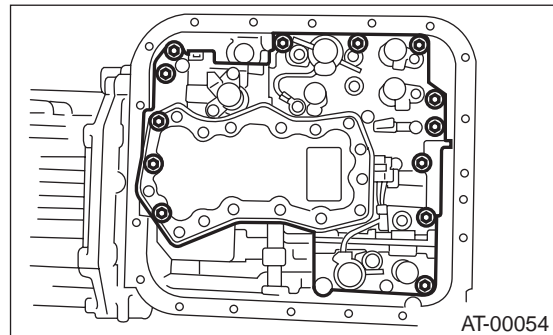


- (A) Lock-up duty solenoid (Blue)
- (B) Transmission ground
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)
- (J) Low clutch timing solenoid (Gray)
- (K) Sport shift solenoid (Beige) (if equipped)

- 9) Remove the control valve.

NOTE:

When removing the control valve body, be careful not to interfere with transfer duty solenoid wiring.

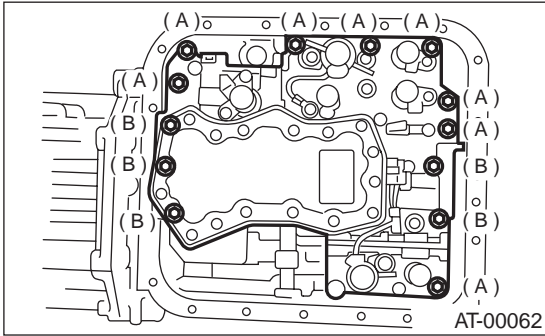


B: INSTALLATION

- 1) Set the range select lever in "N" range.
- 2) Install the control valve, ATF temperature sensor and ground connectors.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

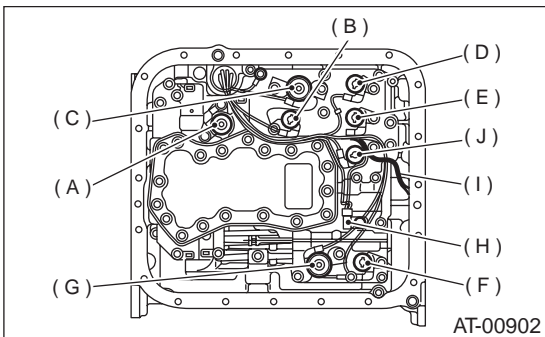


Bolt length mm (in)

(A) 30 (1.18)

(B) 55 (2.17)

- 3) Connect all connectors.

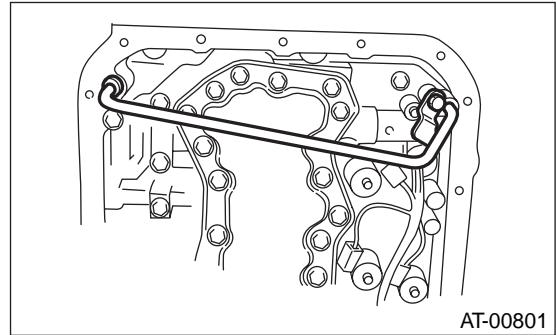


- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)
- (J) Sport shift solenoid (Beige) (if equipped)

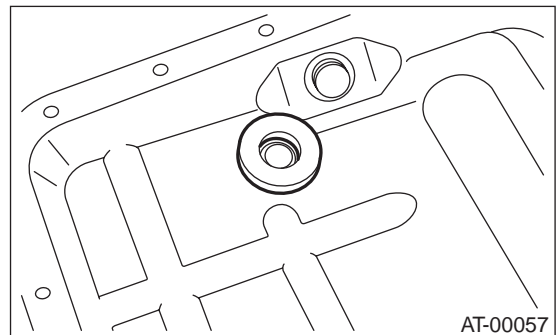
- 4) Install the pipe. (TURBO model)

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



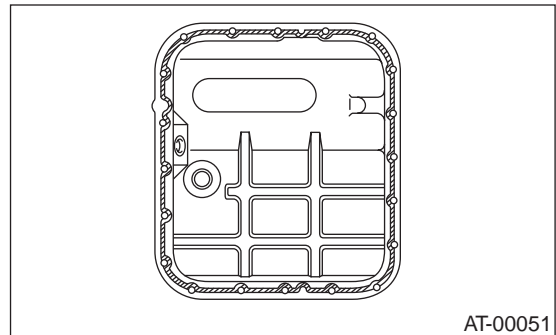
- 5) Attach the magnet at specified position.



- 6) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:

THREE BOND 1217B (Part No. K0877YA020)



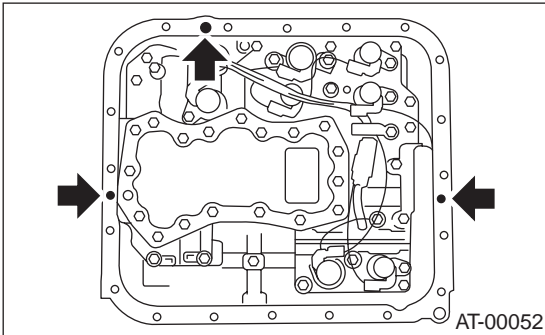
CONTROL VALVE BODY

AUTOMATIC TRANSMISSION

7) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Liquid gasket:

THREE BOND 1217B (Part No. K0877YA020)



8) Install the oil pan.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

9) Pour ATF into the oil charge pipe.

Recommended fluid:

Dexron III type automatic transmission fluid

Fluid capacity:

Fill the same amount of fluid drained from drain plug hole.

10) Check the level of ATF.

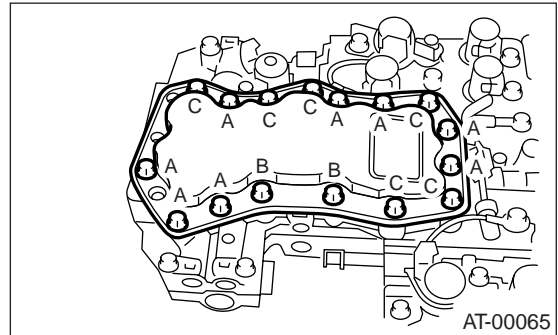
<Ref. to AT-30, Automatic Transmission Fluid.>

C: DISASSEMBLY

1) Remove oil strainer from lower control valve body.

NOTE:

Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolts length are different.

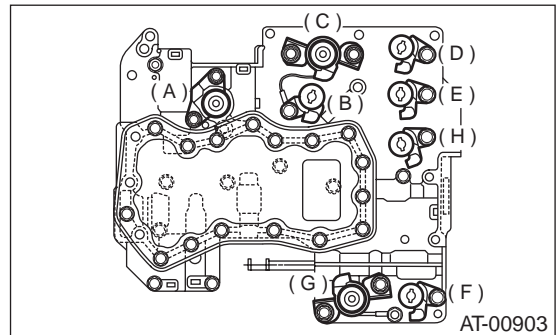


- (A) Short bolt
- (B) Middle bolt
- (C) Long bolt

2) Remove the duty solenoids, solenoids and sensor from the lower valve body.

NOTE:

Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolts length are different.



- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 1 (Yellow)
- (E) Shift solenoid 2 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) Sport shift solenoid (Beige) (if equipped)

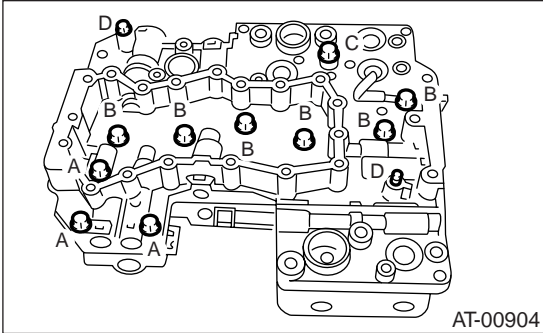
CONTROL VALVE BODY

AUTOMATIC TRANSMISSION

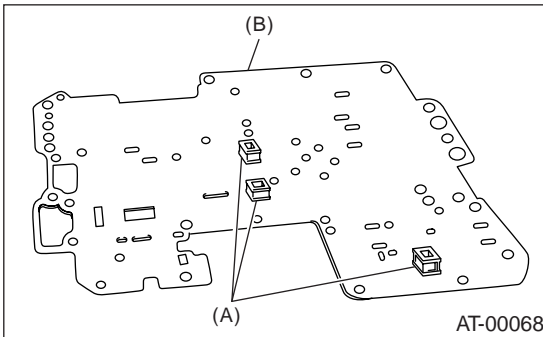
3) Remove the upper-lower valve body tightening bolts.

NOTE:

Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolts length are different.

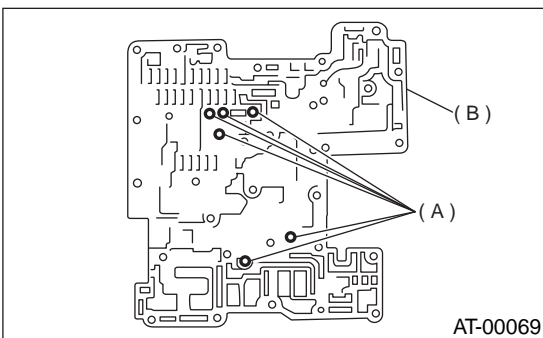


4) Remove the lower valve body.
5) Remove the oil filter and plate.



(A) Oil filter
(B) Plate

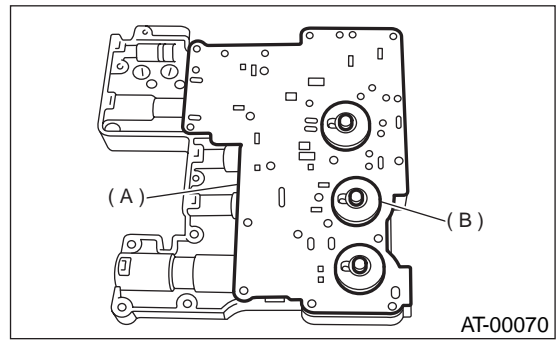
6) Remove six steel balls from middle valve body.



(A) Steel ball
(B) Middle valve body

7) Remove the middle valve body.

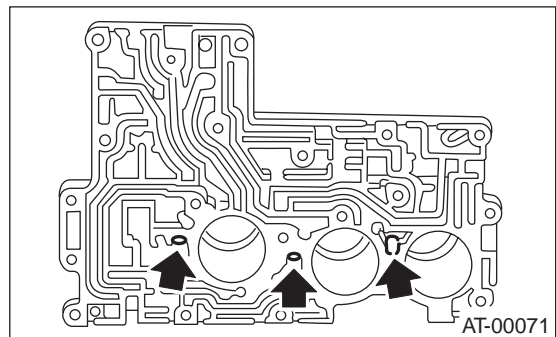
8) Remove upper separator plate from middle valve body.



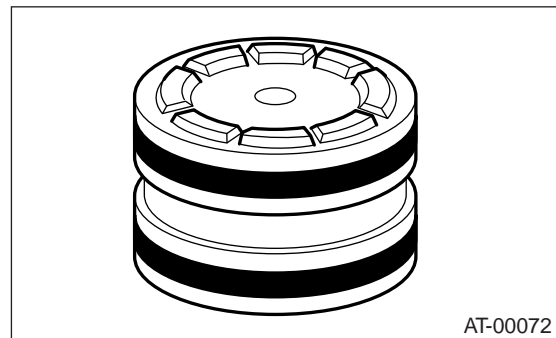
(A) Upper separator plate
(B) Side plate

9) Remove valve springs and four steel balls from upper valve body.

10) Place a shop cloth to the piston removal hole.
11) Using an air compressor, apply air slowly to each piston hole and remove the pistons.



12) Remove the seal ring from piston.

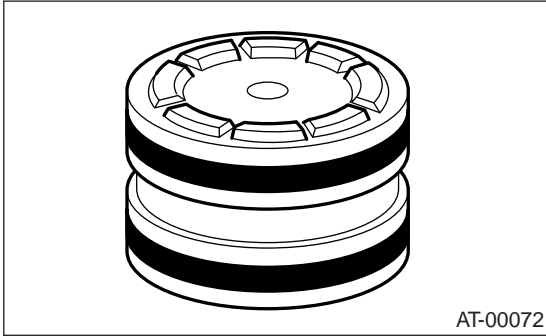


CONTROL VALVE BODY

AUTOMATIC TRANSMISSION

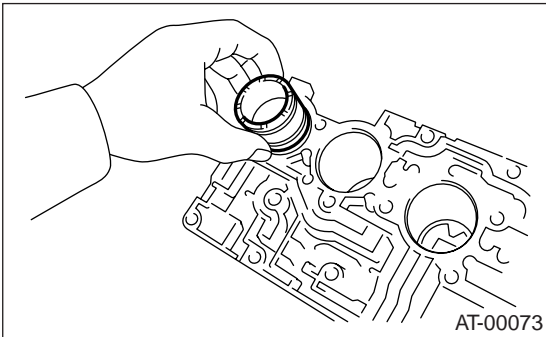
D: ASSEMBLY

1) Install a new seal ring to piston.

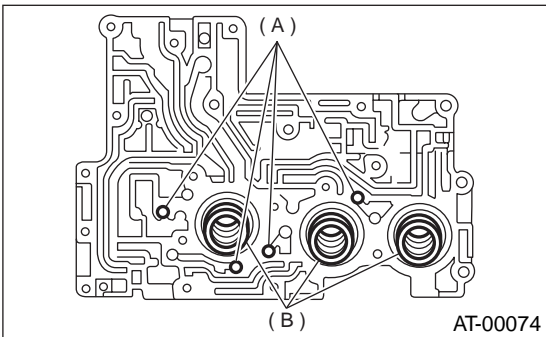


2) Apply ATF to the seal ring.

3) Insert the piston fully into upper valve body.



4) Install the spring and four steel balls to specified positions of upper valve body.

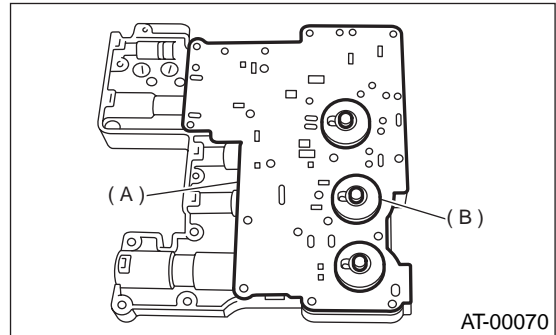


- (A) Steel ball
- (B) Spring

5) Align the hole in side plate with the hole in separator plate, and then install support plate and upper separator plate to middle valve body.

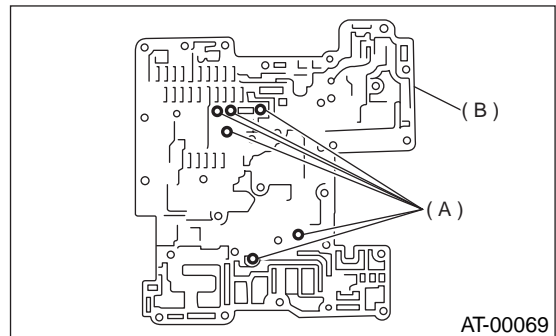
Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



- (A) Upper separator plate
- (B) Side plate

6) Insert six steel balls in their proper positions to middle valve body.

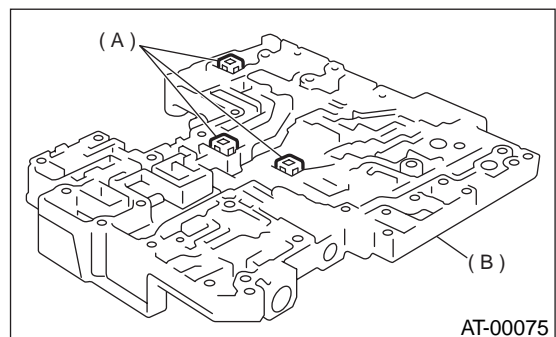


- (A) Steel ball
- (B) Middle valve body

7) Install three filters to lower valve body.

NOTE:

Pay attention to the location of filters.

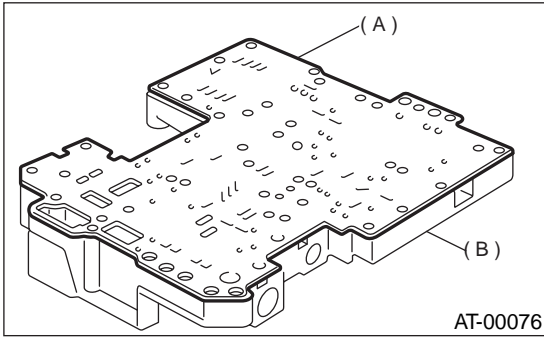


- (A) Strainer
- (B) Lower valve body

CONTROL VALVE BODY

AUTOMATIC TRANSMISSION

8) Install lower separate plate to lower valve body.

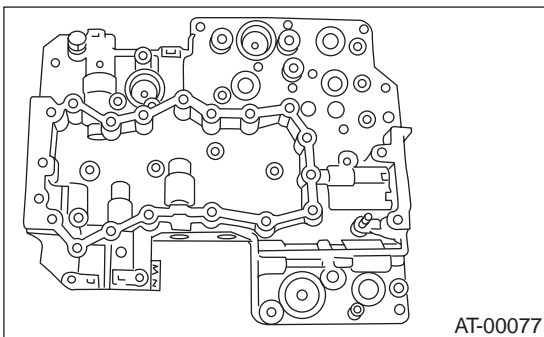


- (A) Lower separator plate
- (B) Lower valve body

9) Temporarily assemble valve body.

NOTE:

Be careful not to drop the middle valve body and upper body interior steel ball, or the lower body filter.



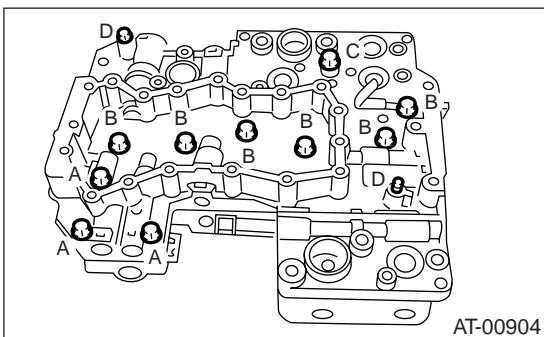
10) Tighten bolts.

NOTE:

Install the bolts (D) from upper valve body side.

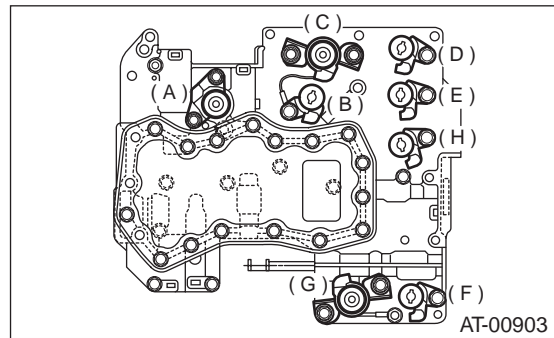
Tightening torque:

8 N-m (0.8 kgf-m, 5.8 ft-lb)



- Bolt length mm (in)
- (A) 40 (1.57)
 - (B) 62 (2.44)
 - (C) 73 (2.87)
 - (D) 79 (3.11)

11) Install the sensor, solenoids and duty solenoids to specified positions.

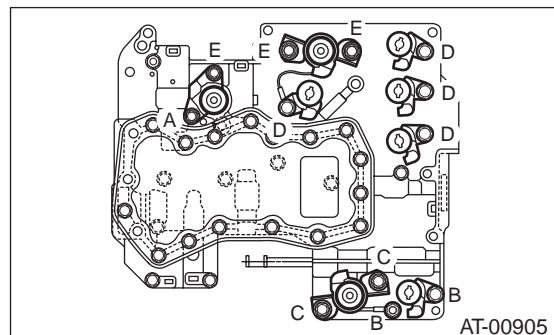


- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 1 (Yellow)
- (E) Shift solenoid 2 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) SPORT shift solenoid (Beige) (if equipped)

12) Tighten the bolts and nuts.

Tightening torque:

8 N-m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)

- (A) 12 (0.47)
- (B) 40 (1.57)
- (C) 45 (1.77)
- (D) 62 (2.44)
- (E) 73 (2.87)

CONTROL VALVE BODY

AUTOMATIC TRANSMISSION

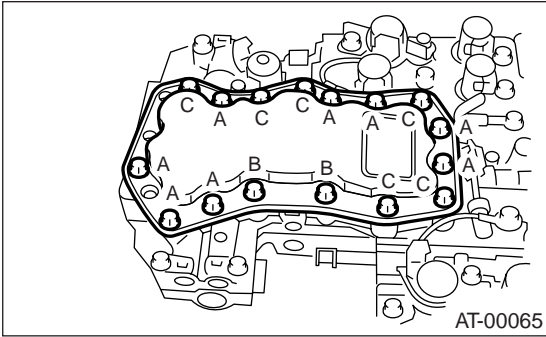
13) Install oil strainer to lower valve body.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

E: INSPECTION

Make sure that each component is free of harmful gouges, cuts, or dust.



Bolt length mm (in)

(A) 12 (0.47)

(B) 62 (2.44)

(C) 81 (3.19)

17. Shift Solenoids, Duty Solenoids and ATF Temperature Sensor

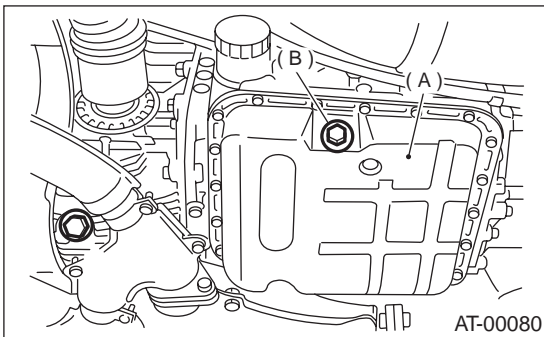
A: REMOVAL

1. SHIFT SOLENOIDS AND DUTY SOLENOIDS

- 1) Lift-up the vehicle.
- 2) Clean the transmission exterior.
- 3) Replace the gasket with a new one, and tighten the drain plug.
- 4) Drain the ATF completely.

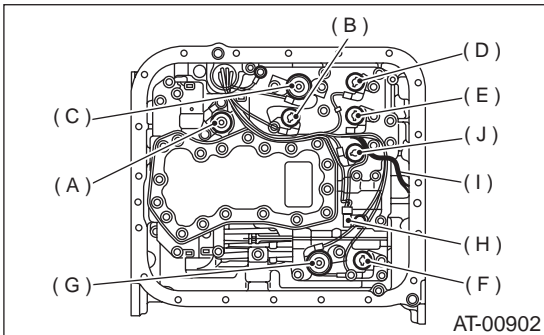
Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



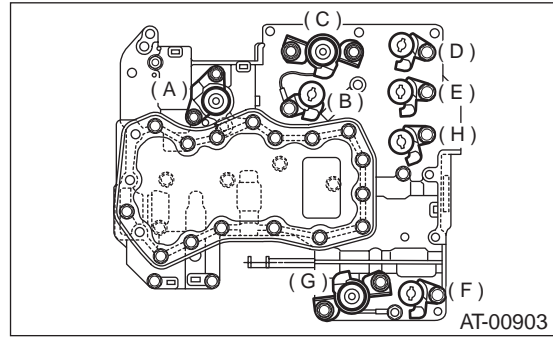
- (A) Oil pan
- (B) Drain plug

- 5) Remove the oil pan.
- 6) Disconnect the solenoid and duty solenoid connectors.



- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) Sport shift solenoid (Beige) (if equipped)

- 7) Remove the solenoids and duty solenoids.



- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) Sport shift solenoid (Beige) (if equipped)

2. ATF TEMPERATURE SENSOR

For removal of ATF temperature sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-54, REMOVAL, Front Vehicle Speed Sensor.>

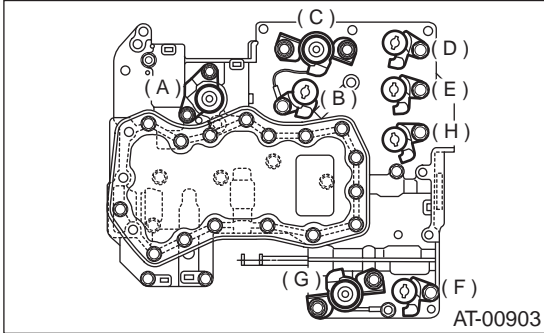
SHIFT SOLENOIDS, DUTY SOLENOIDS AND ATF TEMPERATURE SENSOR

AUTOMATIC TRANSMISSION

B: INSTALLATION

1. SHIFT SOLENOIDS AND DUTY SOLENOIDS

1) Insert solenoid and duty solenoid to specified position.

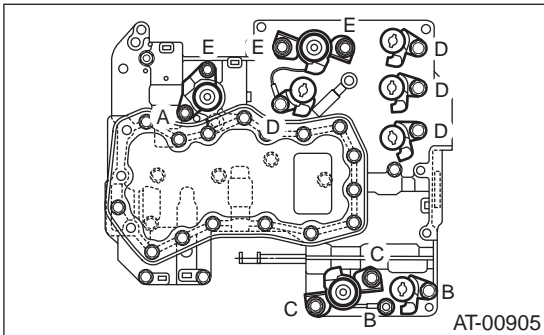


- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) SPORT shift solenoid (Beige) (if equipped)

2) Tighten the bolts and nuts.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

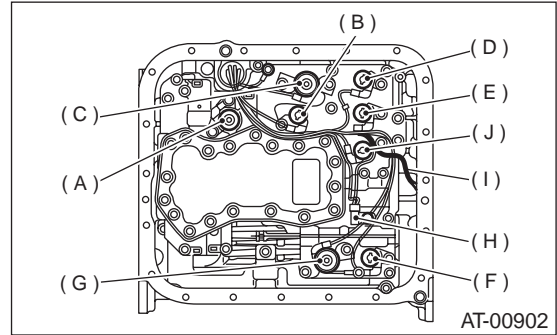


Bolt length mm (in)

- (A) 12 (0.47)
- (B) 40 (1.57)
- (C) 45 (1.77)
- (D) 62 (2.44)
- (E) 73 (2.87)

3) Connect the harness connectors.

Connect the connectors of same color, and secure the connectors to valve body using clips.

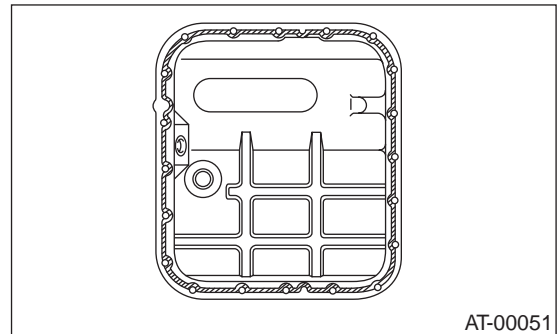


- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) SPORT shift solenoid (Beige) (if equipped)

4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:

THREE BOND 1217B (Part No. K0877YA020)



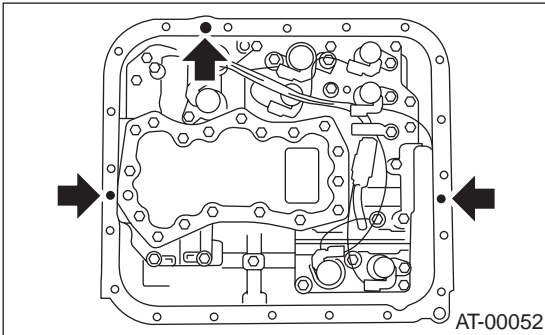
SHIFT SOLENOIDS, DUTY SOLENOIDS AND ATF TEMPERATURE SENSOR

AUTOMATIC TRANSMISSION

5) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Fluid packing:

THREE BOND 1217B (Part No. K0877YA020)



6) Install the oil pan.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

7) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole. <Ref. to AT-30, Automatic Transmission Fluid.>

8) Check the ATF level. <Ref. to AT-30, Automatic Transmission Fluid.>

2. ATF TEMPERATURE SENSOR

For installation of ATF temperature sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-56, INSTALLATION, Front Vehicle Speed Sensor.>

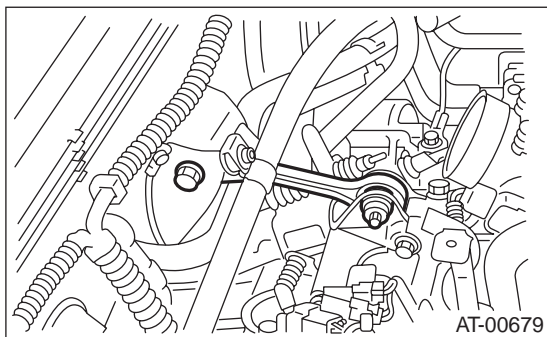
TRANSFER DUTY SOLENOID AND VALVE BODY

AUTOMATIC TRANSMISSION

18. Transfer Duty Solenoid and Valve Body

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air cleaner case. (2.0 L non-TURBO and 2.5 L models)
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 4) Remove air intake chamber. (3.0 L model)
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
- 5) Remove intercooler. (TURBO model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 6) Remove the pitching stopper.

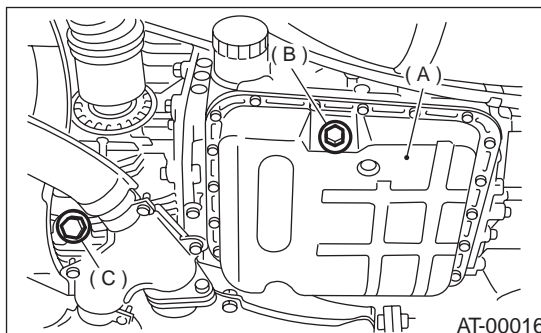


- 7) Remove the front exhaust pipe with center exhaust pipe. (Non-TURBO model)
2.0 L and 2.5 L with OBD models
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>
2.0 L and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>
3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>
- 8) Remove center exhaust pipe. (TURBO model)
<Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>
- 9) Remove the rear exhaust pipe and muffler.
2.0 L non-TURBO and 2.5 L with OBD models
<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.0 L and 2.5 L without OBD models
<Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>

TURBO model

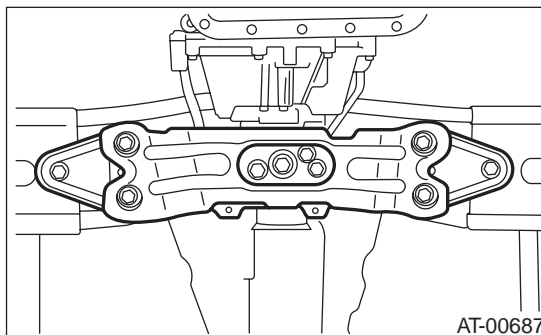
<Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>

- 10) Raise the vehicle and drain the ATF.

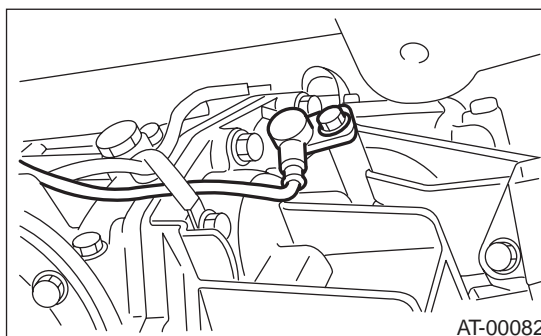


- (A) Oil pan
- (B) Drain plug
- (C) Deferential oil drain plug

- 11) Remove the heat shield cover. (If equipped)
- 12) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
- 13) Remove the transmission rear crossmember.
 - (1) Support the transmission using a transmission jack and raise slightly.
 - (2) Remove the bolts and nuts as shown in the figure.



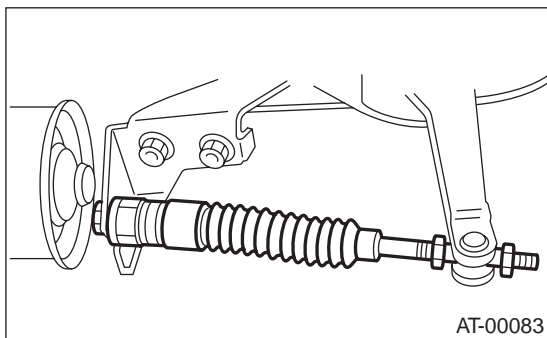
- 14) Remove the rear vehicle speed sensor.



TRANSFER DUTY SOLENOID AND VALVE BODY

AUTOMATIC TRANSMISSION

15) Remove the select cable nut.



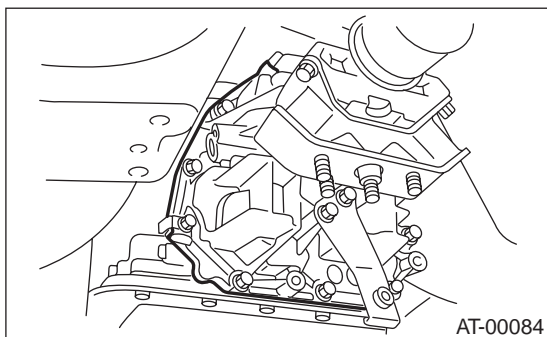
16) Move the gear select cable so that extension bolts can be removed.

17) Remove the bolts.

18) Remove the extension case.

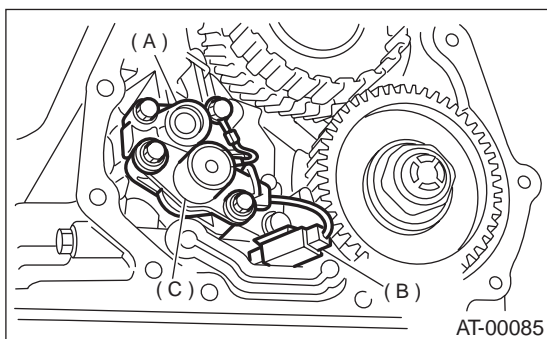
NOTE:

Use a container to catch oil flowing from extension.



19) Disconnect the transfer duty solenoid connector.

20) Remove the transfer duty solenoid and transfer valve body.



- (A) Transfer valve body
- (B) Transfer duty solenoid connector
- (C) Transfer duty solenoid

B: INSTALLATION

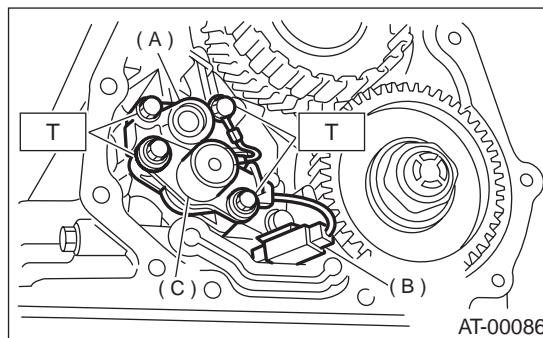
1) Install the transfer duty solenoid and transfer valve body.

(1) Install the transfer duty solenoid and transfer valve body.

Tightening torque:

T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

(2) Connect the transfer duty solenoid connector.



- (A) Transfer valve body
- (B) Transfer duty solenoid connector
- (C) Transfer duty solenoid

2) Install a new gasket and the extension case to transmission case.

(1) Tighten eleven bolts.

Tightening torque:

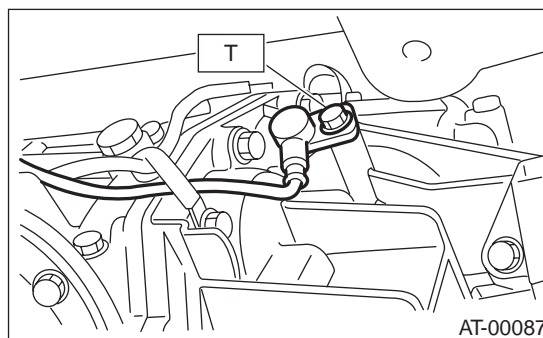
25 N·m (2.5 kgf-m, 18.1 ft-lb)

(2) Adjust the select cable. <Ref. to CS-14, ADJUSTMENT, Select Cable.>

3) Install the rear vehicle speed sensor.

Tightening torque:

T: 7 N·m (0.7 kgf-m, 5.1 ft-lb)



TRANSFER DUTY SOLENOID AND VALVE BODY

AUTOMATIC TRANSMISSION

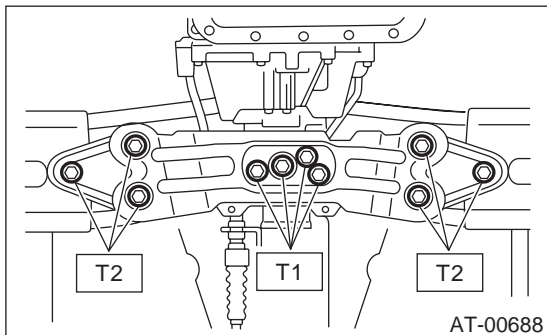
4) Install the transmission rear crossmember.

(1) Tighten the bolts.

Tightening torque:

T1: 35 N·m (3.6 kgf-m, 26 ft-lb)

T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



(2) Remove the transmission jack.

5) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>

6) Install the front, center rear exhaust pipe and muffler. (Non-TURBO model)

2.0 L and 2.5 L with OBD models

<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>

2.0 L and 2.5 L without OBD models

<Ref. to EX(H4SOw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SOw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, INSTALLATION, Muffler.>

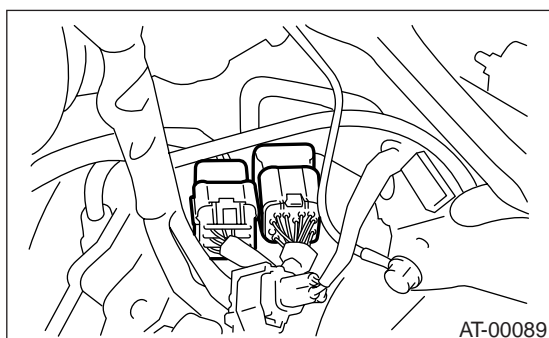
3.0 L model

<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>

7) Install center and rear exhaust pipes, and muffler. (TURBO model)

<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>

8) Connect the transmission harness connector.

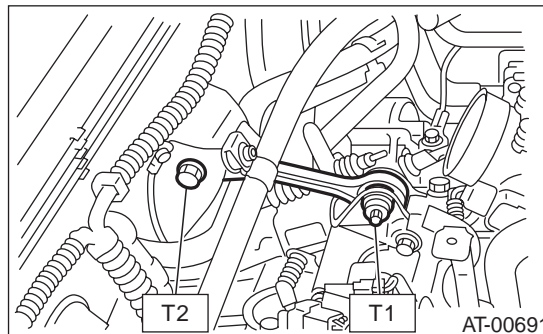


9) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



10) Install the air cleaner case. (2.0 L non-TURBO and 2.5 L models)

<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

11) Install air intake chamber. (3.0 L model)

<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>

12) Install intercooler. (TURBO model)

<Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

13) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole. <Ref. to AT-30, Automatic Transmission Fluid.>

14) Check the ATF level. <Ref. to AT-30, Automatic Transmission Fluid.>

19.ATF Filter

A: REMOVAL

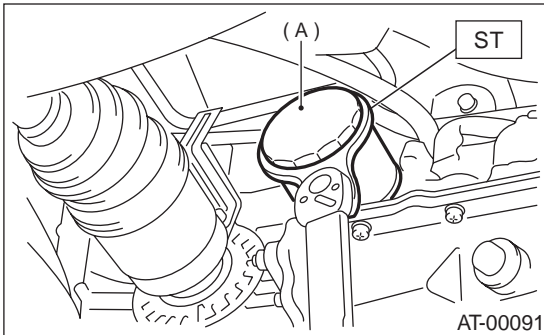
1. EXCEPT 3.0 L MODEL

NOTE:

The ATF filter is maintenance free.

- 1) Lift-up the vehicle.
- 2) Using ST, remove ATF filter.

ST 498545400 OIL FILTER WRENCH



(A) ATF filter

2. 3.0 L MODEL

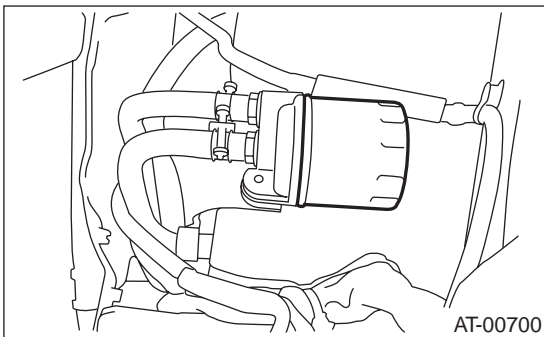
• ATF Filter

NOTE:

The ATF filter is maintenance free.

- 1) Lift-up the vehicle.
- 2) Remove front left mud guard.
<Ref. to EI-22, REMOVAL, Mud Guard.>
- 3) Using ST, remove ATF filter.

ST 498545400 OIL FILTER WRENCH



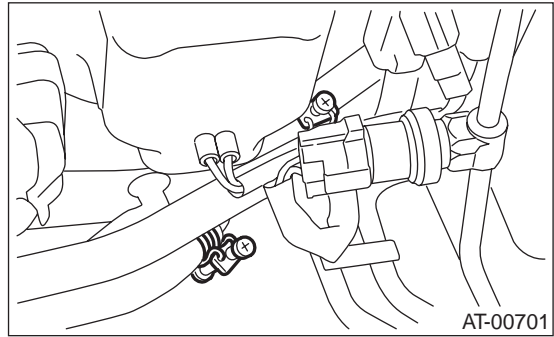
• ATF Filter Assembly

- 1) Remove battery.
- 2) Lift-up the vehicle.
- 3) Remove front left mud guard.
<Ref. to EI-22, REMOVAL, Mud Guard.>
- 4) Lower the vehicle.
- 5) Release clamp of IN, OUT of oil filter hose, and remove hose from pipe.

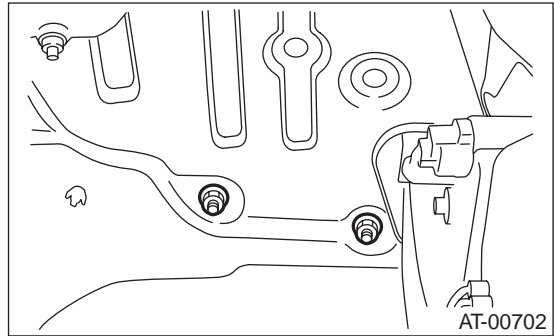
NOTE:

- Plug the pipe.

- Put a mark etc., to distinguish IN, OUT on pipe and hose.



- 6) Remove oil filter bracket installation nut.



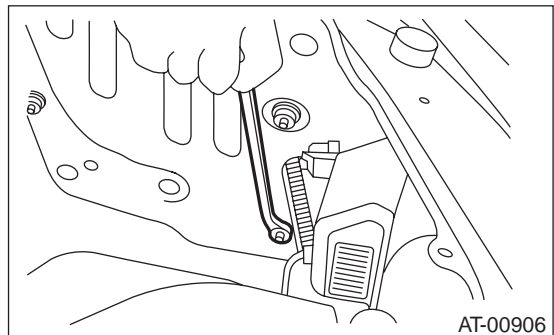
- 7) Remove ATF filter assembly.
- 8) Remove ATF filter with attachment to bracket.
- 9) Get new ATF filter and apply a thin coat of ATF to the oil seal.

3. TURBO MODEL

NOTE:

The ATF filter is maintenance free.

- 1) Set the vehicle on lift.
- 2) Remove the battery.
- 3) Remove oil filter bracket mounting bolts.



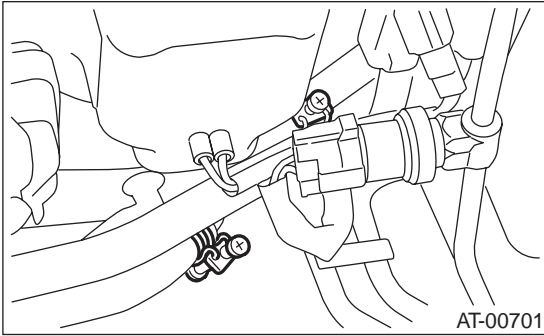
ATF FILTER

AUTOMATIC TRANSMISSION

4) Release clamp of IN, OUT of oil filter hose, and remove hose from pipe.

NOTE:

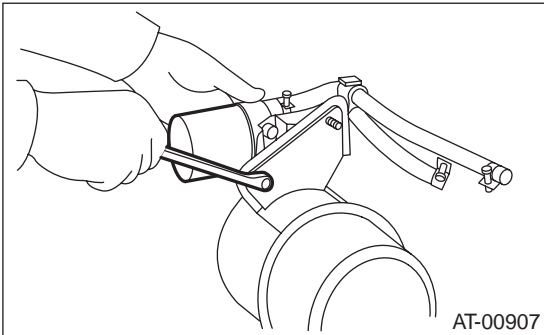
- Plug the pipe.
- Put a mark etc., to distinguish IN, OUT on pipe and hose.



5) Lift vehicle and remove front left mud guard.
<Ref. to EI-22, REMOVAL, Mud Guard.>

6) Remove the surge tank.
<Ref. to IN(H4DOSTC)-22, REMOVAL, Surge Tank.>

7) Remove oil filter assembly.



8) Secure oil filter assembly on a vise, etc and remove oil filter using Special Service Tool.
ST 498545400 OIL FILTER WRENCH

B: INSTALLATION

1. EXCEPT 3.0 L MODEL

1) Get new ATF filter and apply a thin coat of ATF to the oil seal.

2) Install ATF filter. Turn it by hand, being careful not to damage oil seal.

3) Using ST, tighten ATF filter.

Calculate ATF filter torque specifications using the following formula.

$$T2 = L2 / (L1 + L2) \times T1$$

T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)

[Required torque setting]

T2: Tightening torque

L1: ST length 0.078 m (3.07 in)

L2: Torque wrench length

Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

NOTE:

Align ST with torque wrench while tightening ATF filter.

ST 498545400 OIL FILTER WRENCH

4) Add ATF.

5) Inspect level of ATF. <Ref. to AT-30, Automatic Transmission Fluid.>

2. 3.0 L MODEL

• ATF Filter

1) Get new ATF filter and apply a thin coat of ATF to the oil seal.

2) Install AT oil filter. Turn it by hand, being careful not to damage oil seal.

3) Using ST, tighten AT oil filter.

Calculate AT filter torque specifications using the following formula.

$$T2 = L2 / (L1 + L2) \times T1$$

T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)

[Required torque setting]

T2: Tightening torque

L1: ST length 0.078 m (3.07 in)

L2: Torque wrench length

Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

NOTE:

Align ST with torque wrench while tightening AT oil filter.

ST 498545400 OIL FILTER WRENCH

4) Install front left mud guard. <Ref. to EI-22, INSTALLATION, Mud Guard.>

5) Add ATF.

6) Inspect level of ATF. <Ref. to AT-30, Automatic Transmission Fluid.>

• ATF Filter Assembly

1) Install ATF filter with attachment to bracket.

Tightening torque:

14 N·m (1.4 kgf-m, 10 ft-lb)

2) Install ATF filter assembly to vehicle.

Tightening torque:

16 N·m (1.6 kgf-m, 12 ft-lb)

3) Install AT oil filter. Turn it by hand, being careful not to damage oil seal.

4) Using ST, tighten AT oil filter.

Calculate AT filter torque specifications using the following formula.

$$T2 = L1/(L1 + L2) \times T1$$

T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)

[Required torque setting]

T2: Tightening torque

L1: ST length 0.078 m (3.07 in)

L2: Torque wrench length

Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

NOTE:

Align ST with torque wrench while tightening AT oil filter.

ST 498545400 OIL FILTER WRENCH

5) Install hoses to pipe.

NOTE:

Install hoses to pipe aligning marks on them.

6) Install front left mud guard.

<Ref. to EI-22, INSTALLATION, Mud Guard.>

7) Add ATF.

8) Inspect level of ATF. <Ref. to AT-30, Automatic Transmission Fluid.>

3. TURBO MODEL

1) Get new ATF filter and apply a thin coat of ATF to the oil seal.

2) Install ATF filter. Turn it by hand, being careful not to damage oil seal.

3) Using ST, tighten ATF filter.

Calculate ATF filter torque specifications using the following formula.

$$T2 = L2/(L1 + L2) \times T1$$

T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)

[Required torque setting]

T2: Tightening torque

L1: ST length 0.078 m (3.07 in)

L2: Torque wrench length

Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

NOTE:

Align ST with torque wrench while tightening ATF filter.

ST 498545400 OIL FILTER WRENCH

4) Install oil filter wrench assembly.

Tightening torque:

16 N·m (1.6 kgf-m, 10.1 ft-lb)

5) Install surge tank.

<Ref. to IN(H4DOSTC)-22, INSTALLATION, Surge Tank.>

6) Remove front left mud guard.

<Ref. to EI-22, INSTALLATION, Mud Guard.>

7) Tighten oil filter bracket mounting bolts.

Tightening torque:

16 N·m (1.6 kgf-m, 10.1 ft-lb)

8) Install hoses to pipe.

NOTE:

Align indicated matching marks between hose and pipe.

9) Install battery.

10) Inspect level of ATF. <Ref. to AT-30, Automatic Transmission Fluid.>

C: INSPECTION

Replace the part if any defect is found from the inspection.

Check for rust, hole, ATF leaks, and other damage.

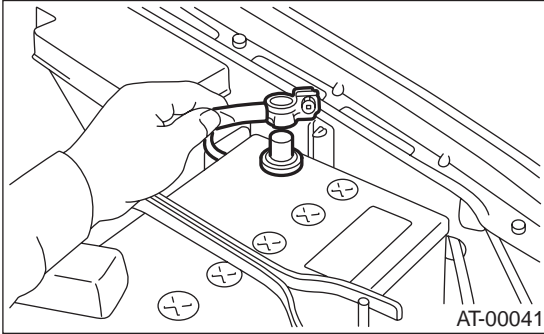
TRANSMISSION CONTROL MODULE (TCM)

AUTOMATIC TRANSMISSION

20. Transmission Control Module (TCM)

A: REMOVAL

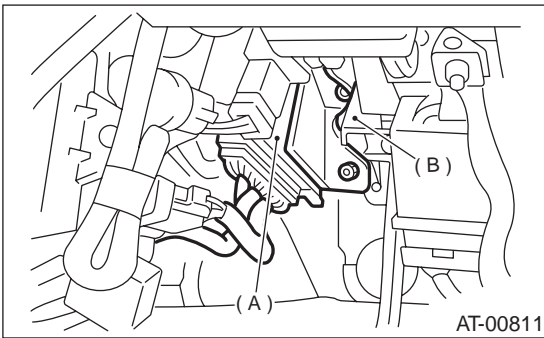
1) Disconnect the ground cable from battery.



2) Remove the lower cover and then disconnect the connector.

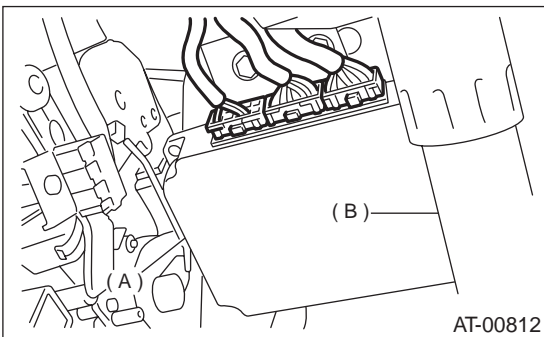
3) Disconnect the connectors from transmission control module.

LHD model



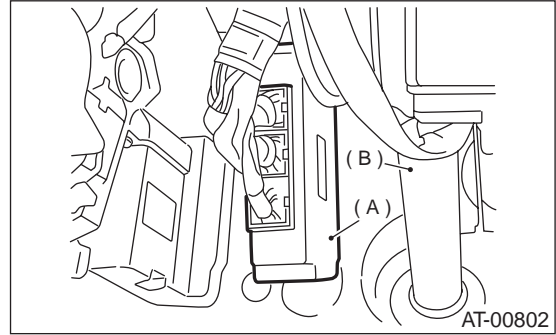
- (A) Transmission control module
- (B) Brake pedal

RHD model except for Europe



- (A) Transmission control module
- (B) Column shaft

RHD model for Europe



- (A) Transmission control module
- (B) Column shaft

4) Remove the transmission control module.

TRANSMISSION CONTROL MODULE (TCM)

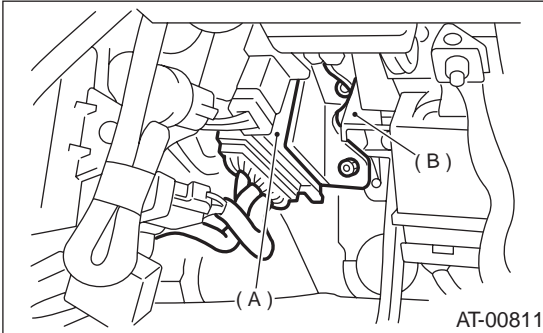
AUTOMATIC TRANSMISSION

B: INSTALLATION

1) Install the transmission control module.
LHD model

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

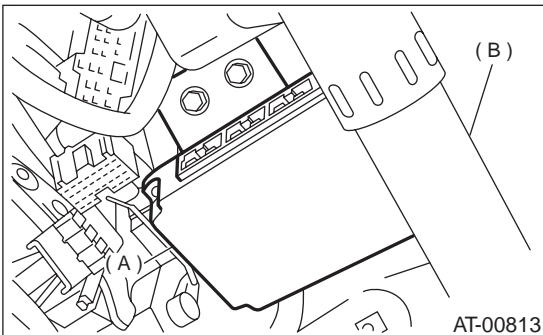


- (A) Transmission control module
- (B) Brake pedal

RHD model except for Europe

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

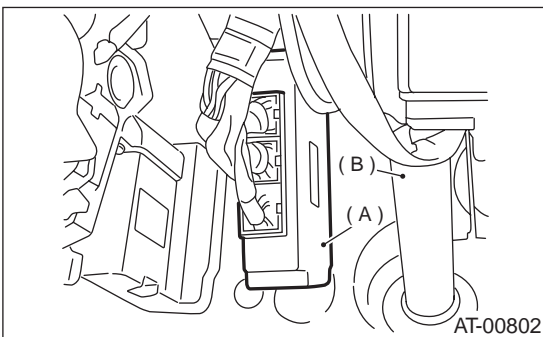


- (A) Transmission control module
- (B) Column shaft

RHD model for Europe

Tightening torque:

18 N·m (1.8 kgf-m, 13 ft-lb)



- (A) Transmission control module
- (B) Column shaft

2) Connect the connectors to transmission control module.

3) Install in the reverse order of removal.

ATF COOLER PIPE AND HOSE

AUTOMATIC TRANSMISSION

21. ATF Cooler Pipe and Hose

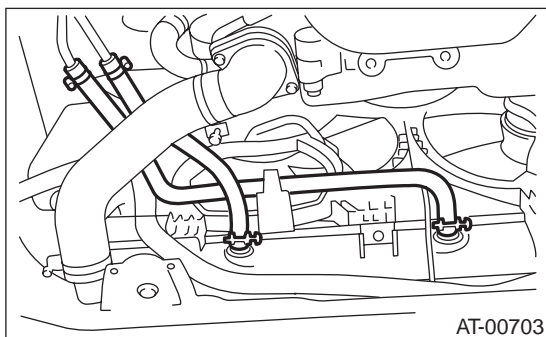
A: REMOVAL

1. EXCEPT 3.0 L MODEL

- 1) Set the vehicle on a lift.
- 2) Remove battery and washer tank.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Disconnect ATF cooler hose from radiator.

NOTE:

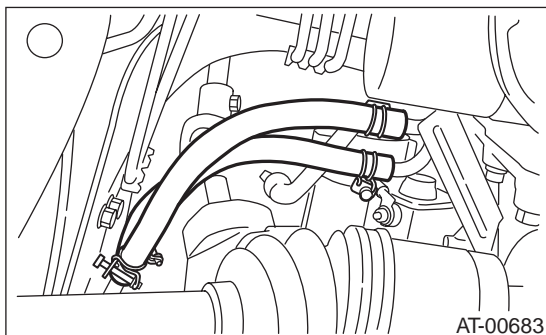
- Do not remove with a screwdriver or other pointed tools.
- When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.



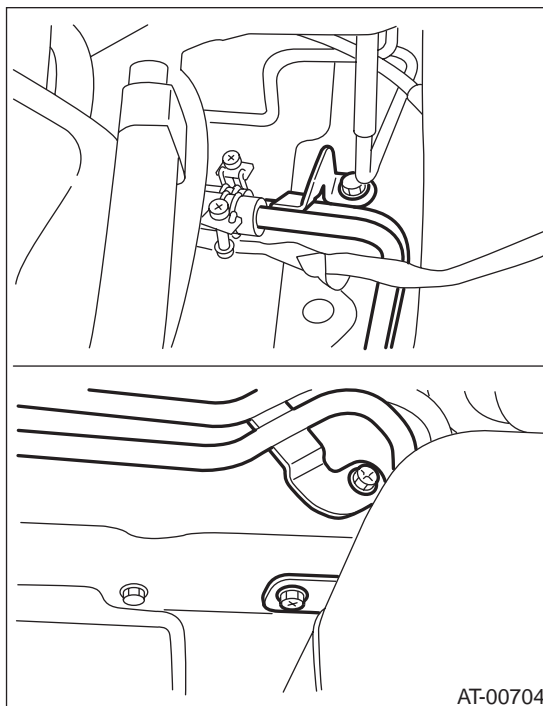
- 6) Disconnect ATF cooler hoses from pipes.

NOTE:

- Do not remove with a screwdriver or other pointed tools.
- When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.



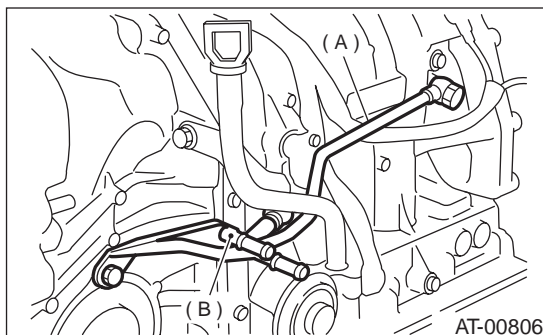
- 7) Remove ATF cooler pipe from frame.



- 8) Remove the oil cooler inlet and outlet pipes.

NOTE:

When removing outlet pipe, be careful not to lose ball and spring used with retaining screw.



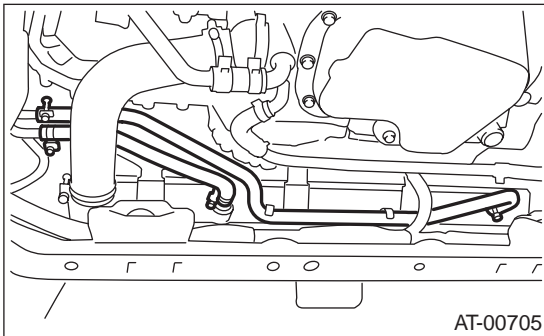
- (A) Inlet pipe
- (B) Outlet pipe

2. 3.0 L MODEL

- 1) Set the vehicle on a lift.
- 2) Remove battery and washer tank.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Disconnect ATF cooler hose from radiator.

NOTE:

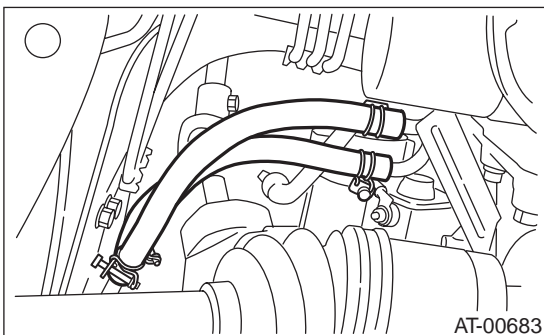
- Do not remove with a screwdriver or other pointed tools.
- When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.



- 6) Disconnect ATF cooler hoses from transmission.

NOTE:

- Do not remove with a screwdriver or other pointed tools.
- When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.

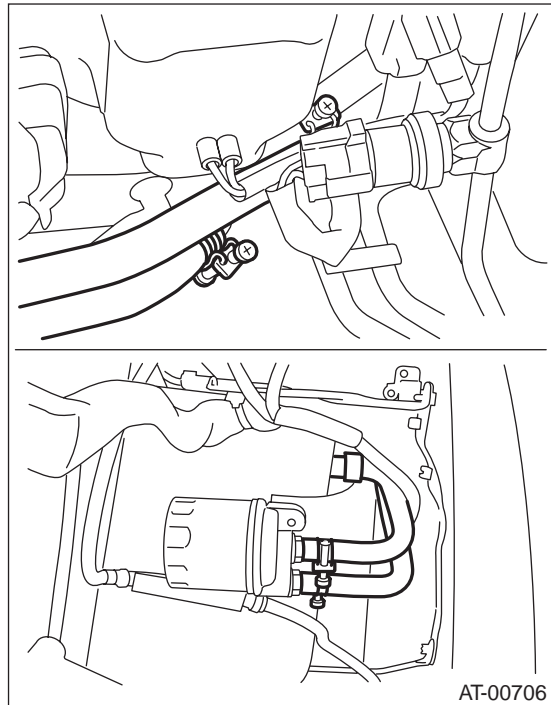


- 7) Remove front left mud guard.
<Ref. to EI-22, REMOVAL, Mud Guard.>
- 8) Disconnect ATF cooler hoses from ATF filter.

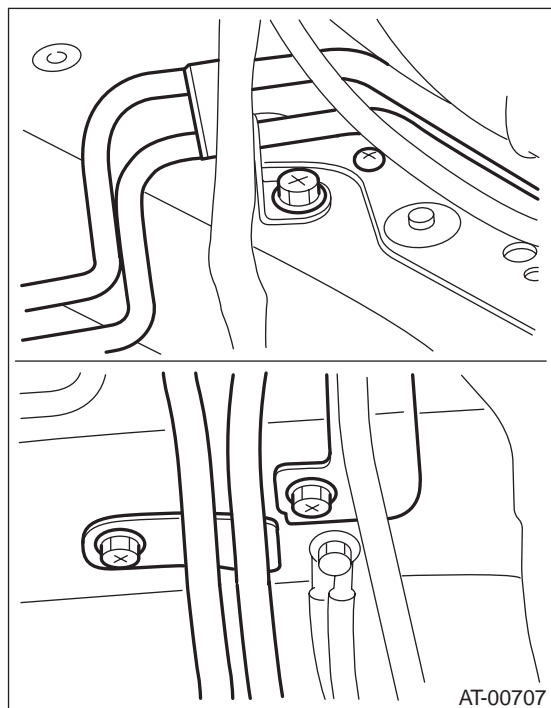
NOTE:

- Do not remove with a screwdriver or other pointed tools.

- When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.



- 9) Remove AT cooler pipe from frame.



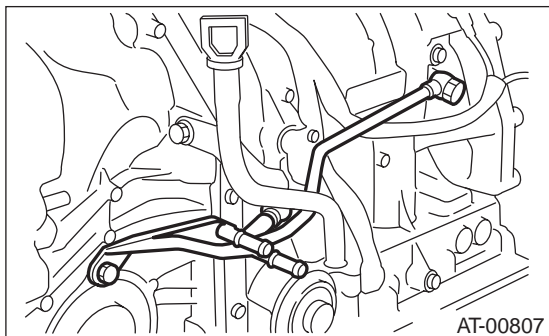
ATF COOLER PIPE AND HOSE

AUTOMATIC TRANSMISSION

10) Remove the oil cooler inlet and outlet pipes.

NOTE:

When removing outlet pipe, be careful not to lose ball and spring used with retaining screw.



B: INSTALLATION

1. EXCEPT 3.0 L MODEL

1) Install the oil cooler outlet and inlet pipes.

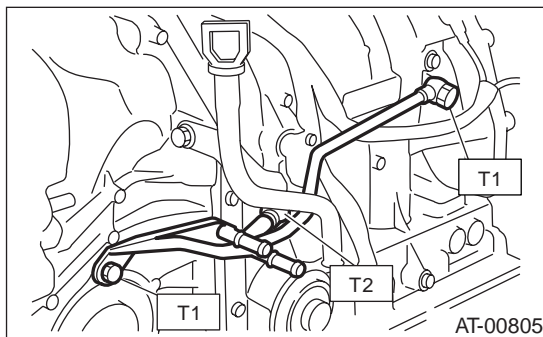
NOTE:

Be sure to use a new aluminum washer.

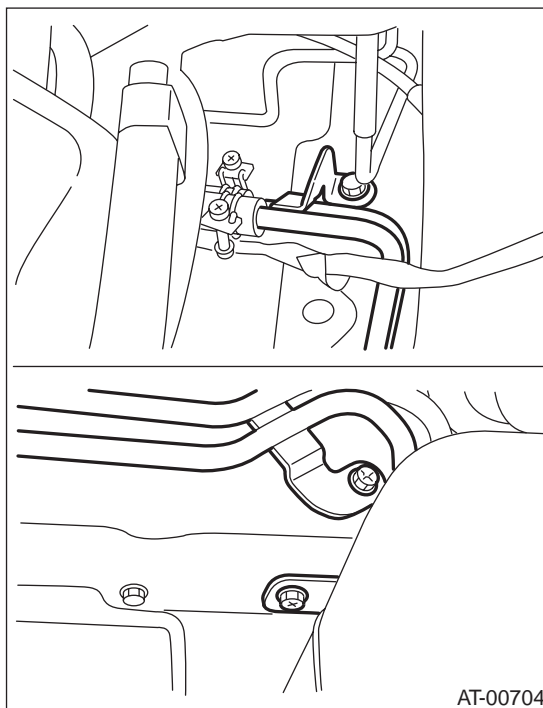
Tightening torque:

T1: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

T2: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



2) Install ATF cooler pipe to frame.



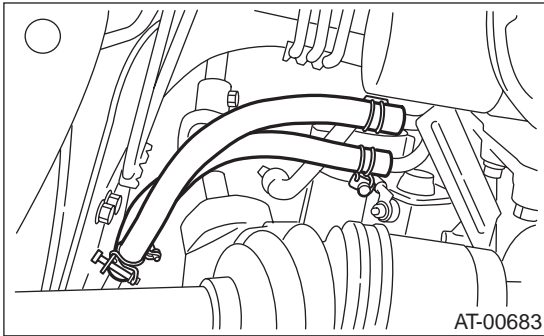
ATF COOLER PIPE AND HOSE

AUTOMATIC TRANSMISSION

3) Connect ATF cooler hose to pipe transmission side.

NOTE:

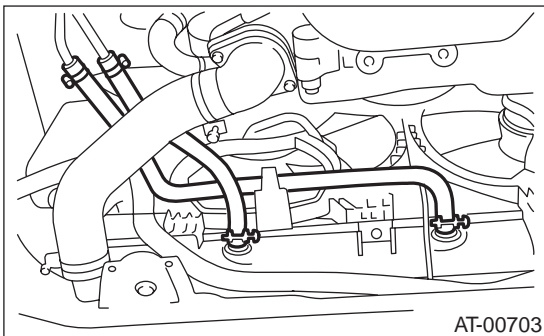
- Install so that the hose is not folded over, excessively bent, or twisted.
- Be careful to insert the hose to the specified position.



4) Connect ATF cooler hose to pipe of radiator side.

NOTE:

- Install so that the hose is not folded over, excessively bent, or twisted.
- Be careful to insert the hose to the specified position.



5) Install the under cover.

6) Install battery and washer tank.

7) Fill ATF. <Ref. to AT-30, Automatic Transmission Fluid.>

NOTE:

Make sure there are no ATF leaks in joints between the transmission, radiator, pipes, and hoses.

2. 3.0 L MODEL

1) Install the oil cooler outlet and inlet pipes.

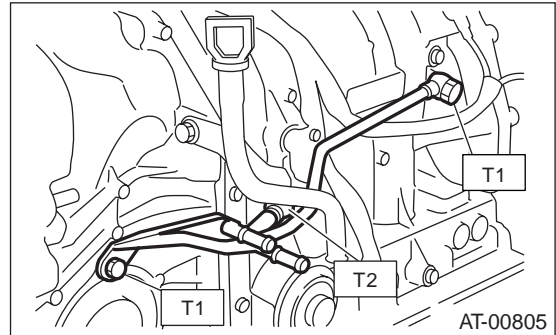
NOTE:

Be sure to use a new aluminum washer.

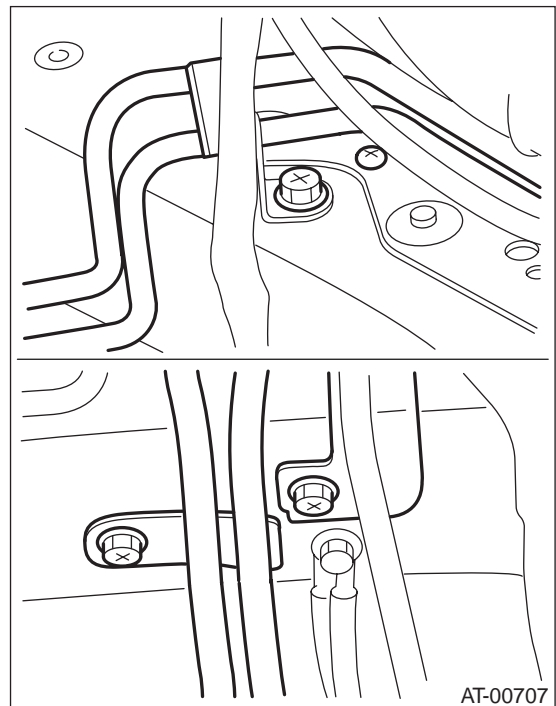
Tightening torque:

T1: 44 N·m (4.5 kgf·m, 32.5 ft·lb)

T2: 25 N·m (2.5 kgf·m, 18.1 ft·lb)



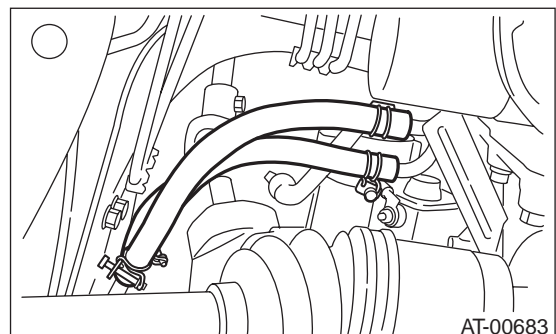
2) Install ATF cooler pipe to frame.



3) Connect ATF cooler hose to transmission.

NOTE:

- Install so that the hose is not folded over, excessively bent, or twisted.
- Be careful to insert the hose to the specified position.



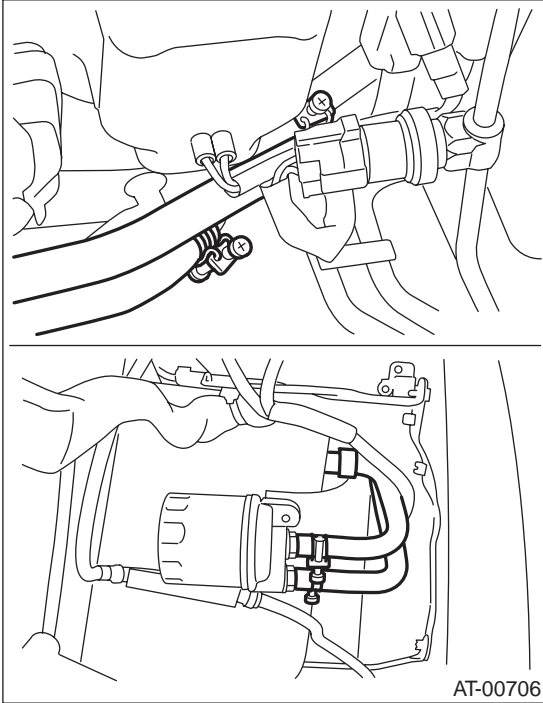
ATF COOLER PIPE AND HOSE

AUTOMATIC TRANSMISSION

4) Connect ATF cooler hoses from ATF filter.

NOTE:

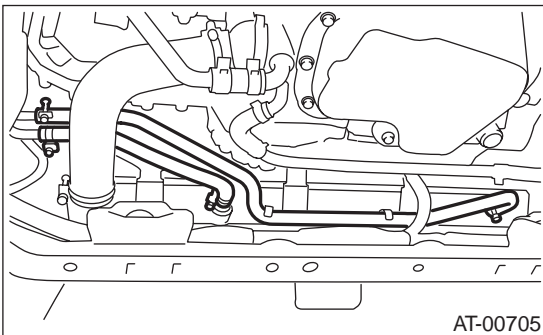
- Install so that the hose is not folded over, excessively bent, or twisted.
- Be careful to insert the hose to the specified position.



5) Connect ATF cooler hoses from radiator.

NOTE:

- Install so that the hose is not folded over, excessively bent, or twisted.
- Be careful to insert the hose to the specified position.



6) Install front left mud guard. <Ref. to EI-22, INSTALLATION, Mud Guard.>

7) Install the under cover.

8) Install battery and washer tank.

9) Fill ATF. <Ref. to AT-30, Automatic Transmission Fluid.>

NOTE:

Make sure there are no ATF leaks in joints between the transmission, radiator pipes and hoses.

C: INSPECTION

Repair or replace any defective hoses, pipes, clamps, and washers found from the inspection below.

- 1) Check for ATF leaks in joints between the transmission, radiator, pipes, and hoses.
- 2) Check for deformed clamps.
- 3) Lightly bend the hose and check for cracks in the surface and other damage.
- 4) Pinch the hose with your fingers and check for poor elasticity. Also check for poor elasticity in the parts where the clamp was by pressing with your fingernail.
- 5) Check for peeling, cracks, and deformation at the tip of the hose.

22. Air Breather Hose

A: REMOVAL

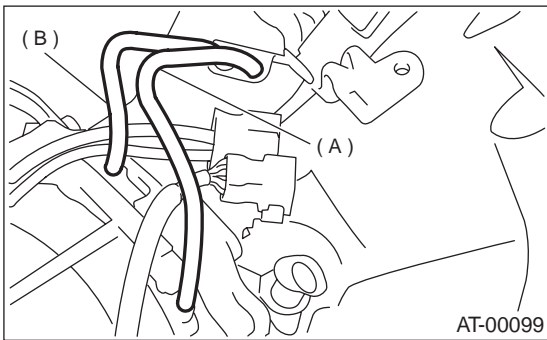
1) Remove the air cleaner case. (2.0 L non-TURBO and 2.5 L models)
 <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>

2) Remove air intake chamber. (3.0 L model)
 <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

3) Remove intercooler. (TURBO model)
 <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>

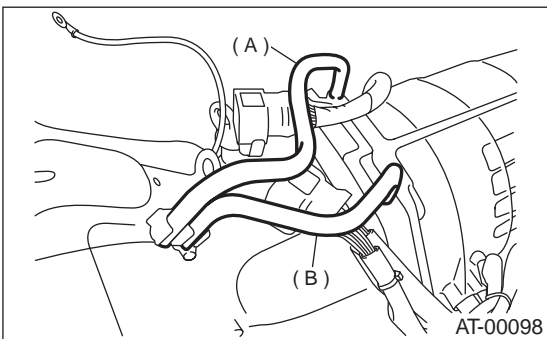
4) Disconnect the air breather hoses.

- Non-TURBO model



(A) Air breather hose (Transmission case)
 (B) Air breather hose (Oil pump housing)

- TURBO model

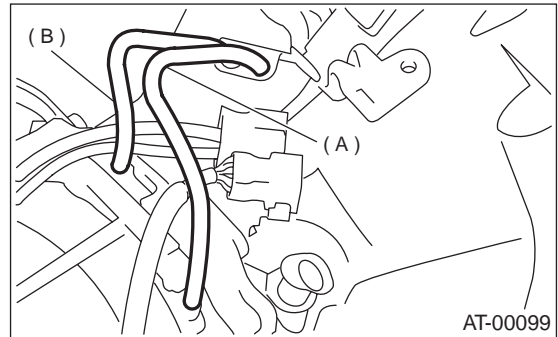


(A) Air breather hose (Transmission case)
 (B) Air breather hose (Oil pump housing)

B: INSTALLATION

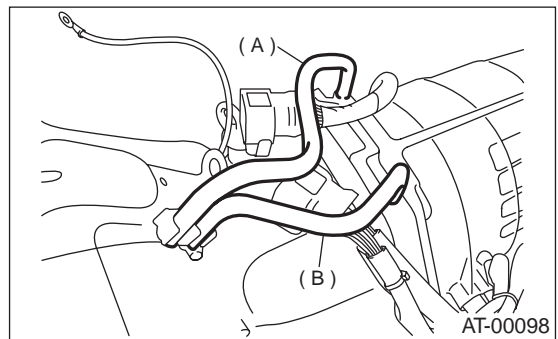
1) Install air breather hoses.

- Non-TURBO model



(A) Air breather hose (Transmission case)
 (B) Air breather hose (Oil pump housing)

- TURBO model



(A) Air breather hose (Transmission case)
 (B) Air breather hose (Oil pump housing)

2) Install the air cleaner case. (2.0 L non-TURBO and 2.5 L models)
 <Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

3) Install air intake chamber. (3.0 L model)
 <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>

4) Install intercooler. (TURBO model)
 <Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

C: INSPECTION

Make sure the hose is not cracked or clogged.

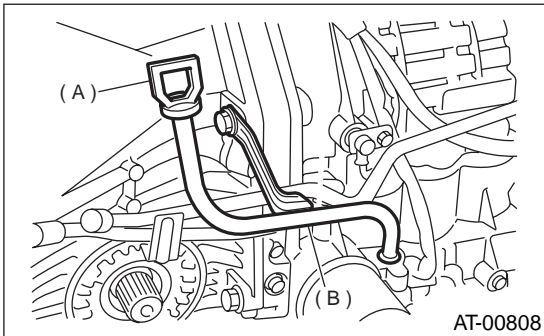
OIL CHARGER PIPE

AUTOMATIC TRANSMISSION

23.Oil Charger Pipe

A: REMOVAL

- 1) Remove the air cleaner case. (2.0 L non-TURBO and 2.5 L models)
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 2) Remove air intake chamber. (3.0 L model)
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove intercooler. (TURBO model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 4) Remove the oil charger pipe, and remove the O-ring from the flange face.



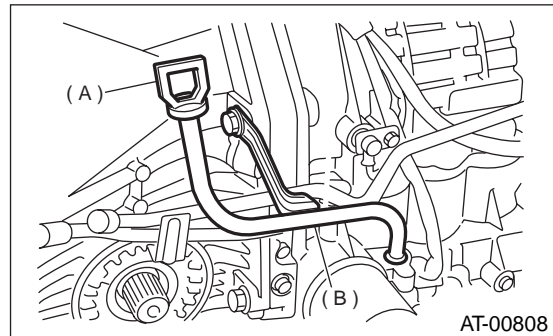
- (A) Oil level gauge
- (B) Oil charger pipe

B: INSTALLATION

- 1) Install the oil charger pipe with new O-ring.

Tightening torque:

41 N·m (4.2 kgf·m, 30.4 ft·lb)



- (A) Oil level gauge
- (B) Oil charger pipe

- 2) Install the air cleaner case. (2.0 L non-TURBO and 2.5 L models)
<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>
- 3) Install air intake chamber. (3.0 L model)
<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
- 4) Install intercooler. (TURBO model)
<Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

C: INSPECTION

Make sure the oil charger pipe is not deformed or otherwise damaged.

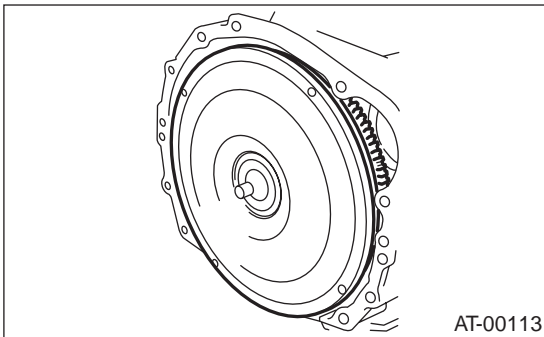
24. Torque Converter Clutch Assembly

A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch horizontally.

NOTE:

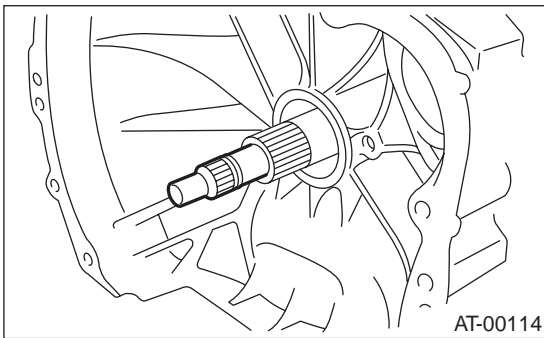
- Be careful not to scratch the bushing inside the oil pump shaft.
- Note that oil pump shaft also comes out.



- 3) Remove the input shaft.

NOTE:

When the torque converter clutch assembly is removed, the input shaft will come out.



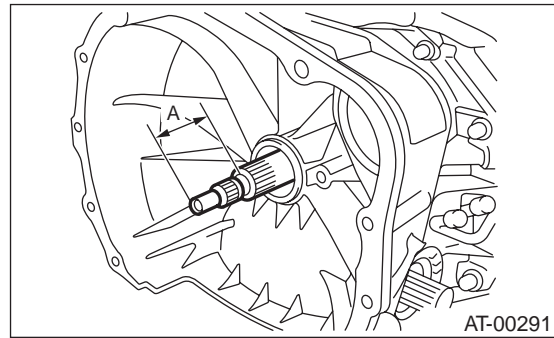
- 4) Extract the oil pump shaft from torque converter clutch.
- 5) Remove the clip from torque converter clutch.

B: INSTALLATION

- 1) Install the clip to torque converter clutch.
- 2) Install the oil pump shaft to the torque converter clutch, and then check the clip fits securely in its groove.
- 3) Insert the input shaft while turning lightly by hand.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



- 4) Holding the torque converter clutch assembly by hand, carefully install it to the torque converter clutch case. Be careful not to damage the bushing. Also avoid undue contact between the oil pump shaft bushing and stator shaft portion of the oil pump cover.
- 5) Rotate the shaft lightly by hand to engage the splines securely.

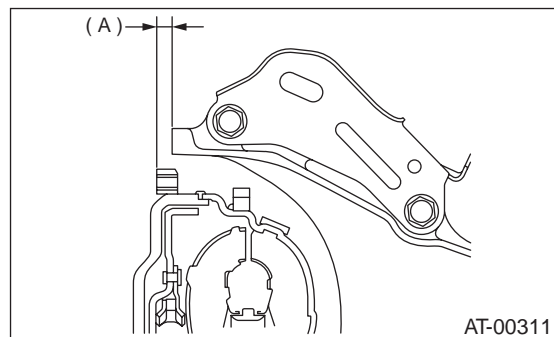
Dimension A:

2.0 L non-TURBO model

-1.3 — -1.1 mm (-0.051 — -0.043 in)

Except 2.0 L non-TURBO model

2.7 — 2.9 mm (0.106 — 0.114 in)



(A) Dimension A

- 6) Install the transmission assembly to vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Make sure the ring gear is not damaged and that the protrusion on the edge of the torque converter clutch is not deformed or otherwise damaged.

EXTENSION CASE

AUTOMATIC TRANSMISSION

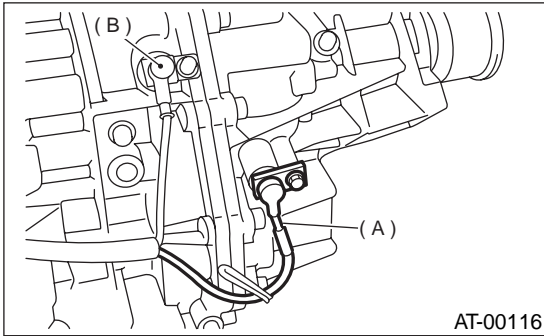
25.Extension Case

A: REMOVAL

1) Remove the transmission assembly. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>

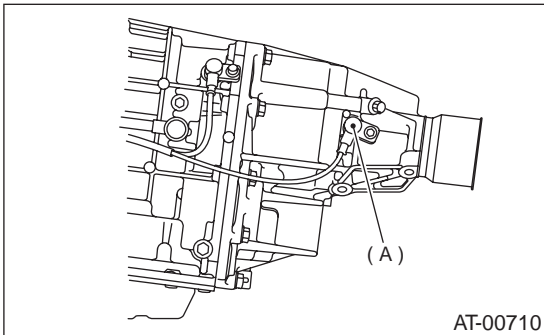
2) Remove rear vehicle speed sensor.

- MPT model



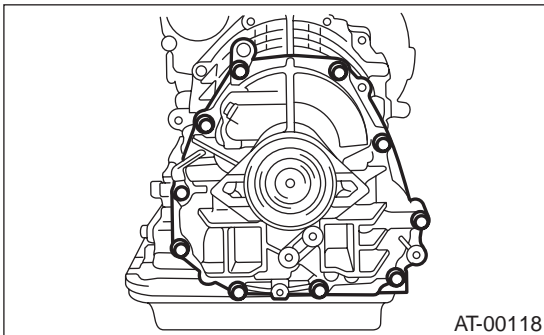
- (A) Rear vehicle speed sensor
- (B) Front vehicle speed sensor

- VTD model



- (A) Rear vehicle speed sensor

3) Separate transmission case and extension case sections.



B: INSTALLATION

1) Attach the selected thrust needle bearing to the end surface of reduction drive gear with vaseline.

NOTE:

Install thrust needle bearing in the correct direction.

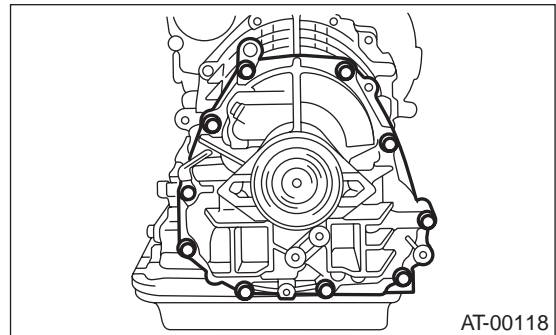
2) Install new gasket.

3) Install the extension case to the transmission case.

4) Tighten bolts to secure the case.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

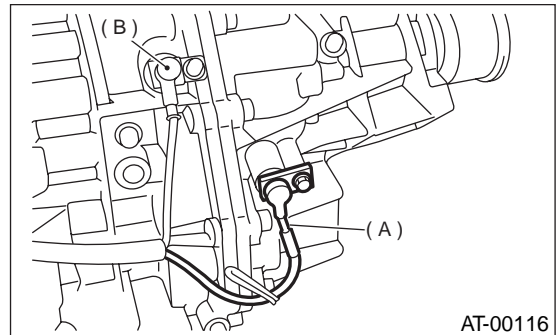


5) Install the rear vehicle speed sensor.

Tightening torque:

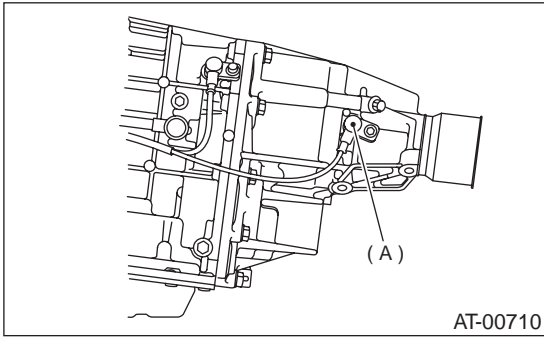
7 N·m (0.7 kgf·m, 5.1 ft·lb)

- MPT model



- (A) Rear vehicle speed sensor
- (B) Front vehicle speed sensor

- VTD model



(A) Rear vehicle speed sensor

6) Install the transmission assembly. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

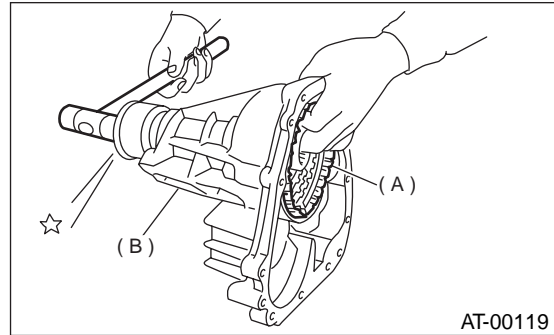
C: DISASSEMBLY

1. MPT MODEL

1) Take out the transfer clutch by lightly tapping the end of the rear drive shaft.

NOTE:

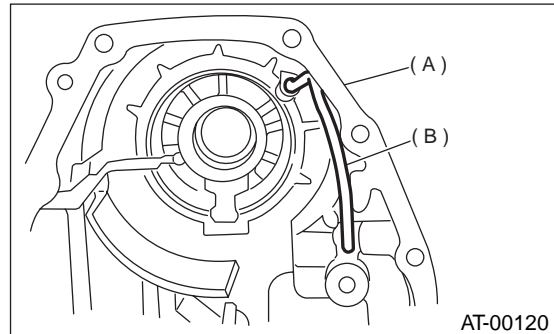
Be careful not to damage the oil seal in the extension.



(A) Extension case

(B) Transfer clutch

2) Remove the transmission clutch pipe without bending pipe.



(A) Extension case

(B) Transfer clutch pipe

2. VTD MODEL

1) Remove snap ring using ST1, ST2, ST3 and a press.

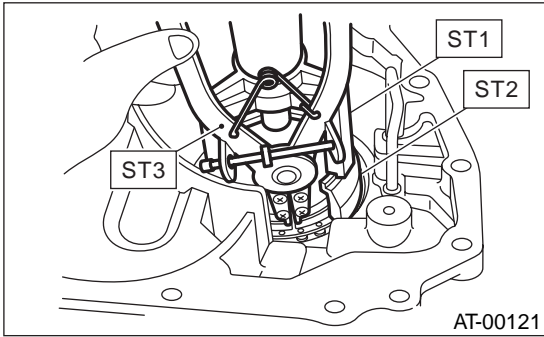
ST1 398673600 COMPRESSOR

ST2 498627100 SHEAT

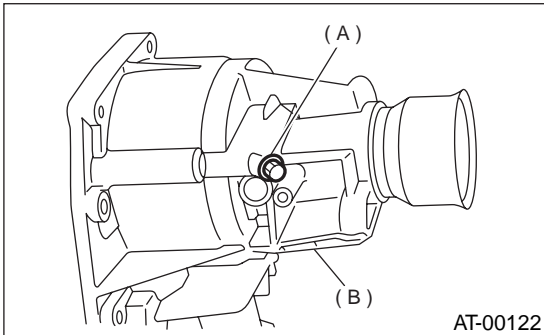
EXTENSION CASE

AUTOMATIC TRANSMISSION

ST3 398663600 PLYER

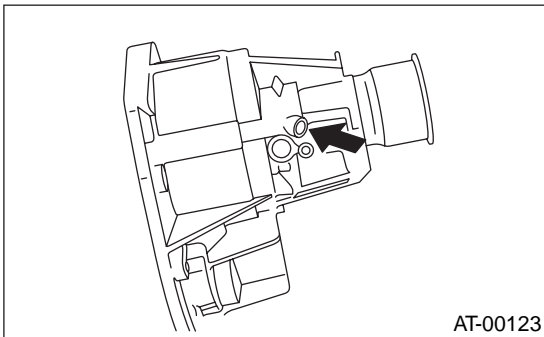


2) Remove test pulg.

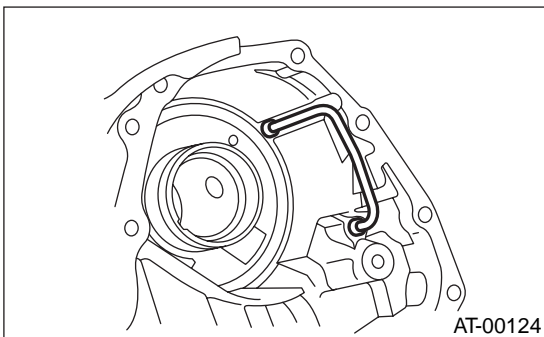


(A) Extension case
(B) Test plug

3) Remove clutch piston using compressed air.



4) Pay attention, not to bend pipe, and remove transfer clutch pipe.



5) Remove the dust cover from the extension case.
6) Remove the oil seal from the extension case.

D: ASSEMBLY

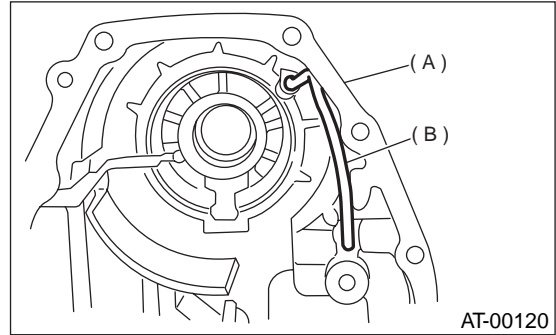
1. MPT MODEL

1) Using the ST and a press, press in a new oil seal.

ST 498057300 INSTALLER

2) Press in the dust cover.

3) Install the transfer clutch pipe to extension case without bending pipe.

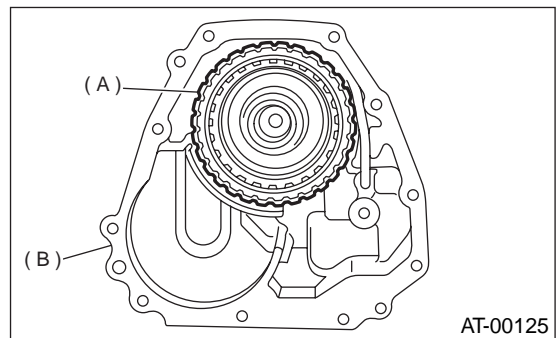


(A) Extension case
(B) Transfer clutch pipe

4) Install the transfer clutch assembly to the case.

NOTE:

- Be careful not to damage the seal rings.
- Insert the clutch assembly fully into position until the bearing shoulder bottoms.



(A) Transfer clutch
(B) Extension case

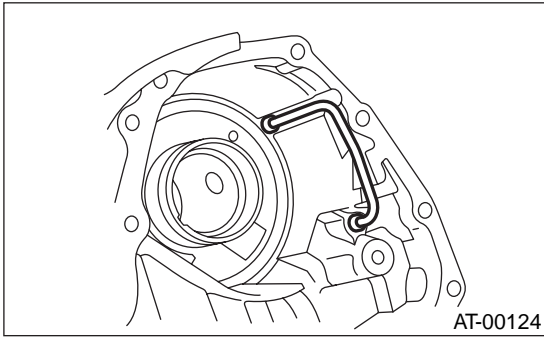
2. VTD MODEL

1) Press new oil seal using ST and a press.

ST 498057300 INSTALLER

2) Press dust cover.

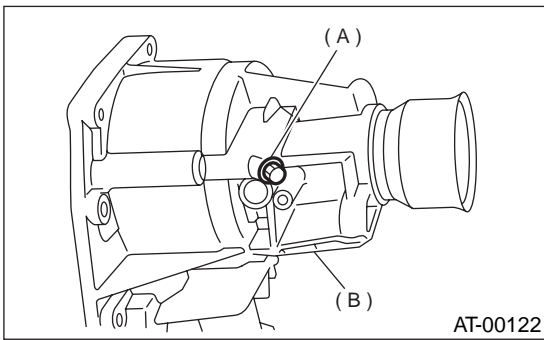
3) Install the transfer clutch pipe onto the extension case, taking care not to bend the pipe.



4) Install the test plug.

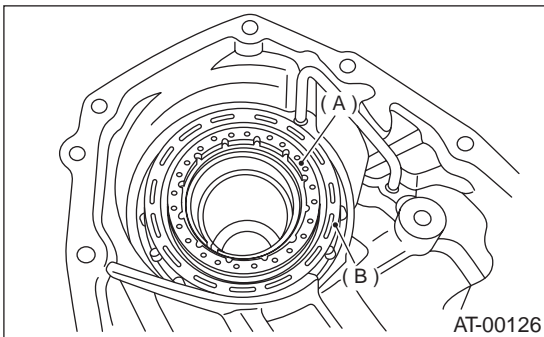
Tightening torque:

13 N·m (1.3 kgf·m, 9.4 ft·lb)



- (A) Test plug
- (B) Extension case

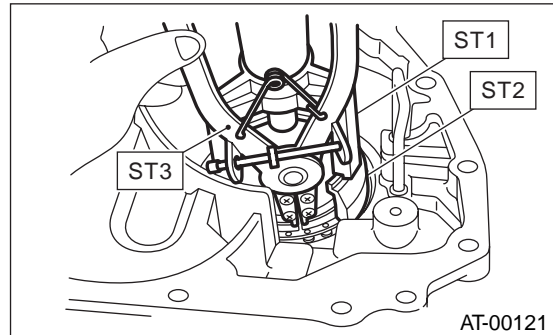
5) Insert the multi-plate clutch, drive plates, driven plates, and spring retainer.



- (A) Spring retainer
- (B) Multi-plate clutch (LSD) piston assembly

6) Install the snap ring using special tools 1, 2, and 3.

- ST1 398673600 COMPRESSOR
- ST2 498627100 SEAT
- ST3 398663600 PLIERS



E: INSPECTION

- Use forced air to make sure the transfer pipe and extension case routes are not clogged and do not leak.
 - Measure the extension end play and adjust it to within specifications.
- MPT model
 <Ref. to AT-94, MPT MODEL, ADJUSTMENT, Transfer Clutch.>
- VTD model
 <Ref. to AT-95, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

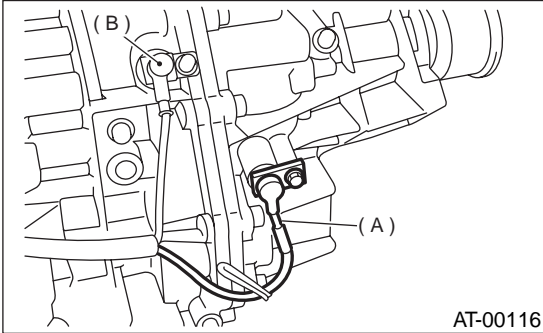
TRANSFER CLUTCH

AUTOMATIC TRANSMISSION

26. Transfer Clutch

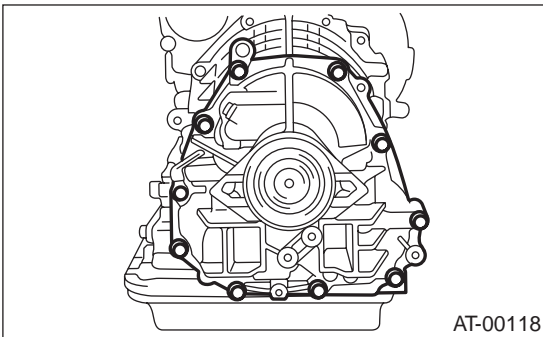
A: REMOVAL

- 1) Remove the transmission assembly from vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear vehicle speed sensor.

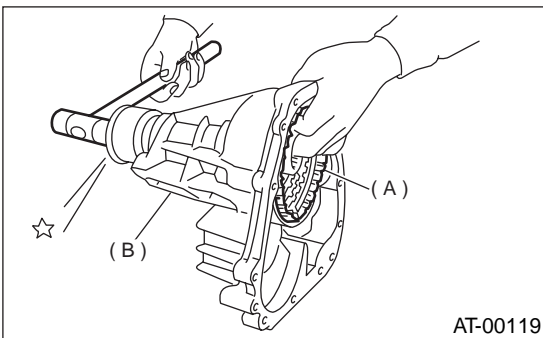


- (A) Rear vehicle speed sensor
- (B) Front vehicle speed sensor

- 3) Separate transmission case and extension case sections.



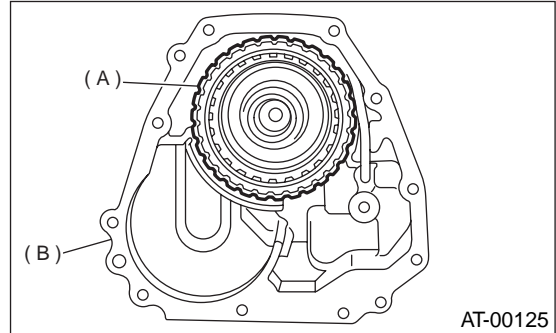
- 4) Take out the transfer clutch by lightly tapping the end of the rear drive shaft.



- (A) Transfer clutch
- (B) Extension case

B: INSTALLATION

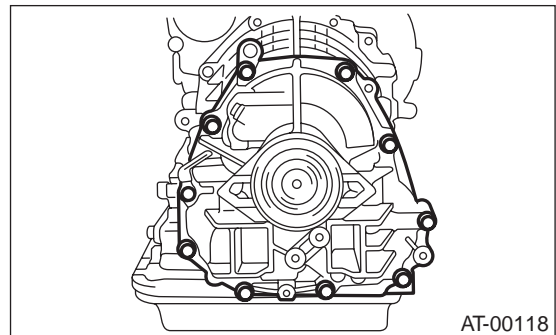
- 1) Select the thrust needle bearing.
- 2) Install the transfer clutch assembly to the case.



- (A) Transfer clutch
- (B) Extension case

- 3) Tighten bolts to secure the case.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



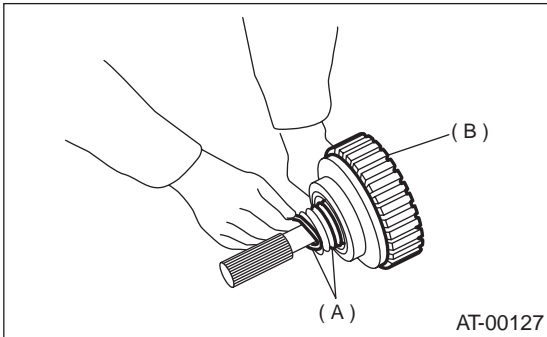
- 4) Install the transmission assembly to vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

TRANSFER CLUTCH

AUTOMATIC TRANSMISSION

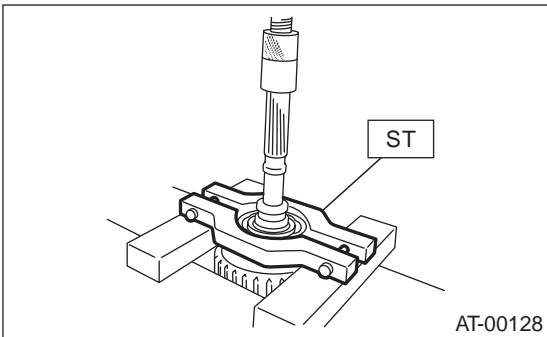
C: DISASSEMBLY

1) Remove the seal ring.

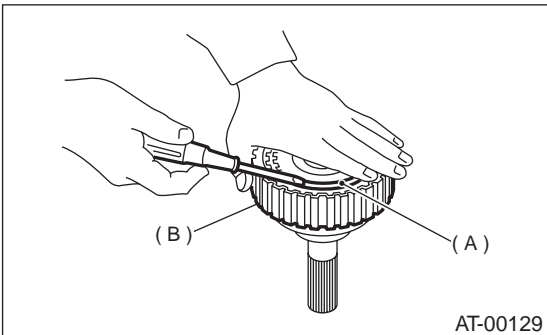


- (A) Seal ring
- (B) Transfer clutch

2) Using a press and ST, remove the ball bearing.
ST 498077600 REMOVER



3) Remove the snap ring, and take out the pressure plate, drive plates, and driven plates.

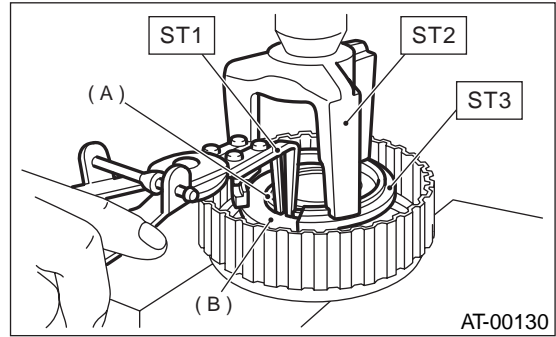


- (A) Snap ring
- (B) Transfer clutch

4) Remove the snap ring with ST1, ST2 and ST3, and take out the return spring and transfer clutch piston seal.

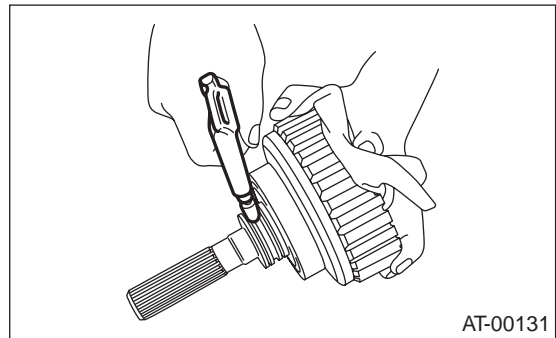
ST1 399893600 PLIERS
ST2 398673600 COMPRESSOR

ST3 398623600 SEAT



- (A) Snap ring
- (B) Transfer piston seal

5) Apply compressed air to the rear drive shaft to remove the piston.

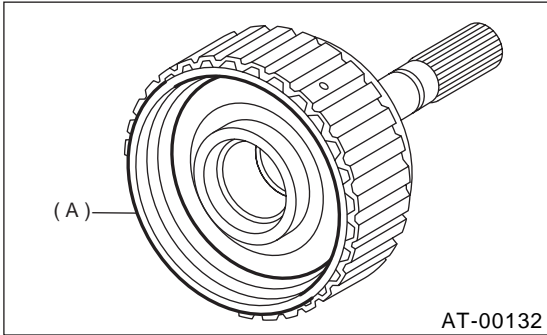


TRANSFER CLUTCH

AUTOMATIC TRANSMISSION

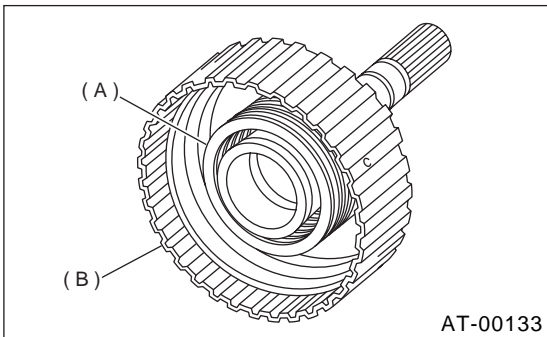
D: ASSEMBLY

1) Install the transfer clutch piston.



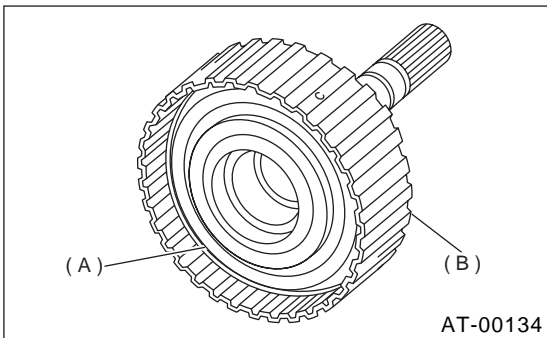
- (A) Transfer clutch piston
- (B) Rear drive shaft

2) Install return spring to transfer piston.



- (A) Return spring
- (B) Rear drive shaft

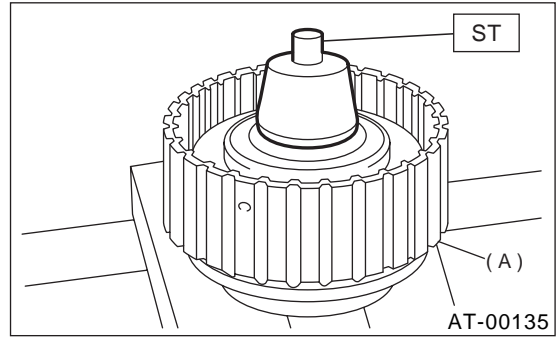
3) Install transfer clutch piston seal.



- (A) Transfer clutch piston seal
- (B) Rear drive shaft

4) Install ST to rear drive shaft.

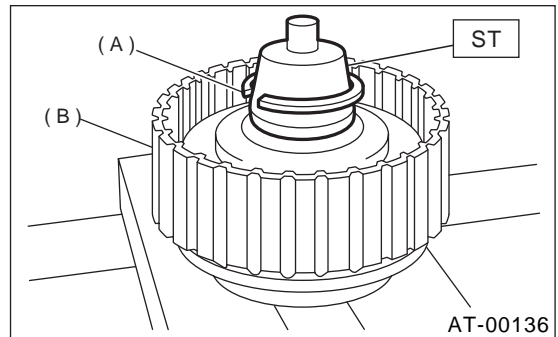
ST 499257300 SNAP RING OUTER GUIDE



- (A) Transfer clutch

5) Install snap ring to ST.

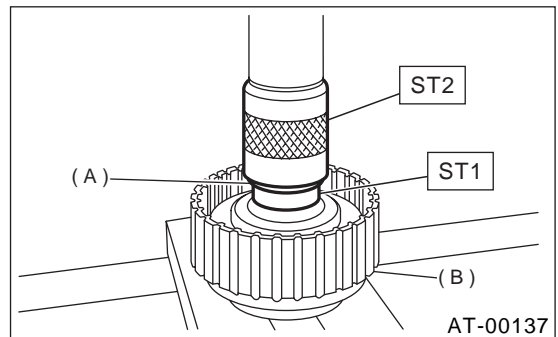
ST 499257300 SNAP RING OUTER GUIDE



- (A) Snap ring
- (B) Transfer clutch

6) Using ST1 and ST2, install snap ring to rear drive shaft.

ST1 499257300 SNAP RING OUTER GUIDE
ST2 499247400 INSTALLER

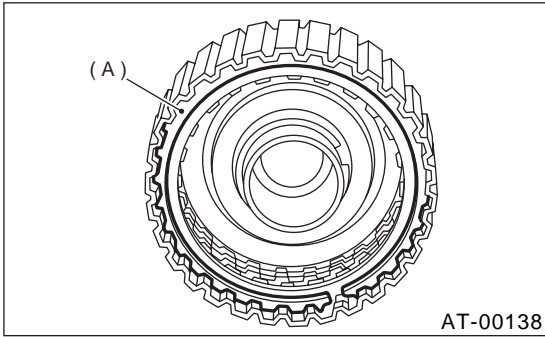


- (A) Snap ring
- (B) Transfer clutch

TRANSFER CLUTCH

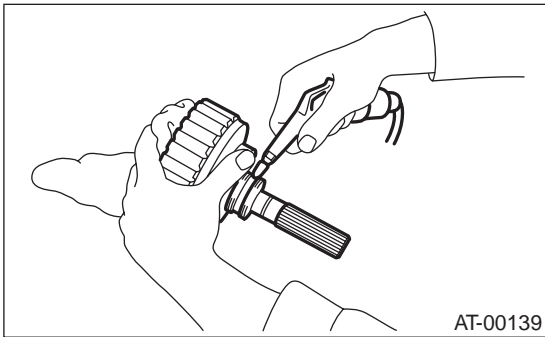
AUTOMATIC TRANSMISSION

7) Install the driven plates, drive plates, pressure plate and snap ring.



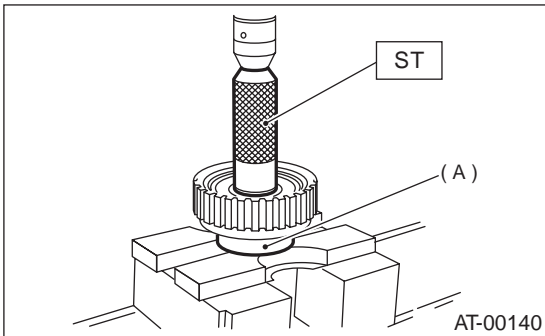
(A) Snap ring

8) Apply compressed air to see if the assembled parts move smoothly.



9) Check clearance between snap ring and pressure plate. <Ref. to AT-94, INSPECTION, Transfer Clutch.>

10) Press-fit a new ball bearing with ST.
ST 899580100 INSTALLER

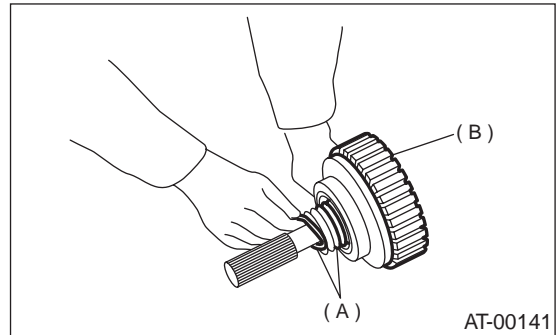


(A) Ball bearing

11) Coat a new seal ring with vaseline, and install it in the seal ring groove of the shaft.

NOTE:

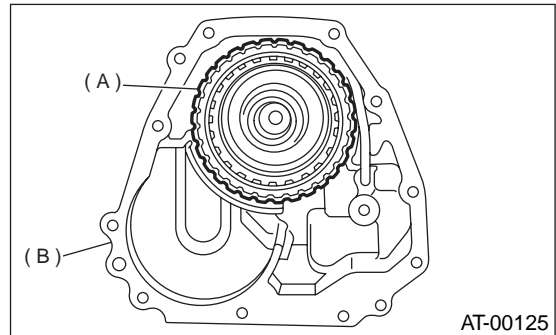
Do not expand the seal ring excessively when installing.



(A) Snap ring

(B) Transfer clutch

12) Install the transfer clutch assembly without damaging seal ring.



(A) Transfer clutch

(B) Extension case

TRANSFER CLUTCH

AUTOMATIC TRANSMISSION

E: INSPECTION

- Check the drive plate facing for wear and damage.
- Check the snap ring for wear, return spring for permanent set and breakage, and return spring for deformation.
- Check the D-ring for damage.
- Measure the extension end play and adjust it to within specifications.

<Ref. to AT-94, ADJUSTMENT, Transfer Clutch.>

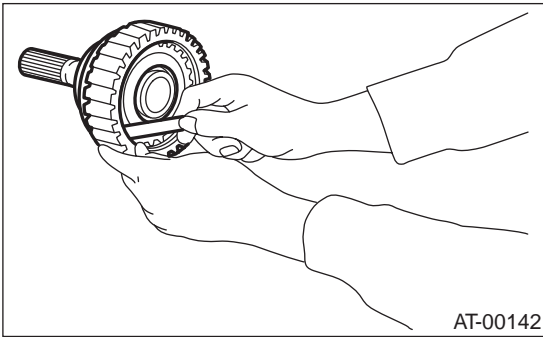
- 1) Inspect clearance between snap ring and pressure plate.
- 2) Before measuring clearance, place the same thickness of shim on both sides to prevent pressure plate from tilting.
- 3) If the clearance is not within specification, adjust it by selecting a suitable pressure plate on the transfer clutch piston side.

Standard value:

0.7 — 1.1 mm (0.028 — 0.043 in)

Allowable limit:

1.6 mm (0.063 in)



Available pressure plates	
Part No.	Thickness mm (in)
31593AA151	3.3 (0.130)
31593AA161	3.7 (0.146)
31593AA171	4.1 (0.161)
31593AA181	4.5 (0.177)

- 4) Check if the tight corner braking does not occur when the vehicle is started with steering wheel held at fully turned position. If tight corner braking occurs, perform the following procedures.

(1) With the steering wheel held at fully turned position, drive the vehicle in "D" range and with vehicle speed at approx. 5 km/h (3 MPH) in both clockwise and counterclockwise directions for approx. ten times each, while repeating acceleration and braking intermittently.

(2) If the tight corner braking still persists, drive the vehicle again in a circle for several laps.

F: ADJUSTMENT

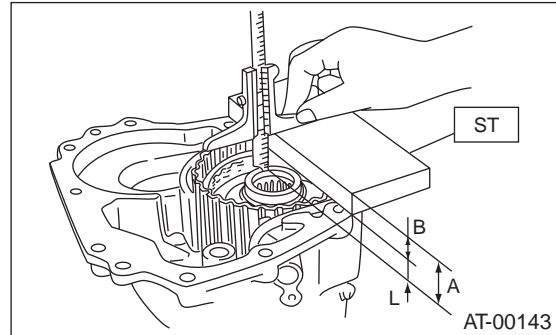
1. MPT MODEL

- 1) Measure distance "L" from end of extension case and rear drive shaft with ST.

ST 398643600 GAUGE

L = Measured value – 15 mm

(L = Measured value – 0.59 in)



A: Measured value

B: ST thickness [15 mm (0.59 in)]

L: Distance from end of extension case to end of rear drive shaft

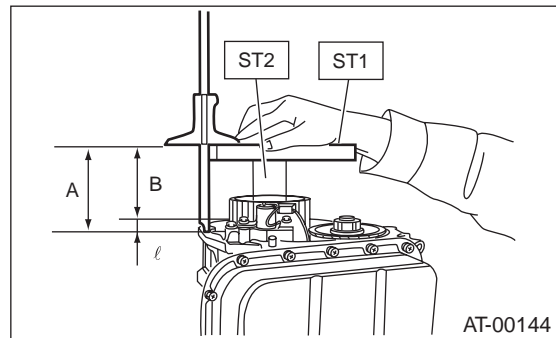
- 2) Measure the distance "ℓ" from the transmission case mating surface to the reduction drive gear end surface with ST1 and ST2.

ℓ = Measured value – 50 mm

(ℓ = Measured value – 1.97 in)

ST1 398643600 GAUGE

ST2 499577000 GAUGE



A: Measured value

B: ST thickness [50 mm (1.97 in)]

ℓ: Distance from end of transmission case to end of reduction drive gear

- 3) Calculation equation:

NOTE:

Calculate "H":

When clearance is at 0.05 mm (0.0020 in) and 0.25 mm (0.0098 in), then select a suitable thrust needle bearing from the table.

$H = (L + 0.45 \text{ mm}) - \ell - T$

[$H = (L + 0.0177 \text{ in}) - \ell - T$]

T: Thrust needle bearing thickness

TRANSFER CLUTCH

AUTOMATIC TRANSMISSION

L: Distance from end of extension case to end of rear drive shaft

0.45 mm (0.0177 in): Gasket thickness

ℓ: Distance from end of transmission case to end of reduction drive gear

H: Shim clearance

0.05 — 0.25 mm (0.0020 — 0.0098 in)

Example:

When, L = 18.60 mm (0.7323 in), ℓ = 15.05 mm (0.5925 in)

Calculation when clearance is 0.05 mm (0.0020 in)

$$H = (18.60 + 0.45) - 15.05 - 0.05 = 3.95$$

$$[H = (0.7323 + 0.0177) - 0.5925 - 0.0020 = 0.1555]$$

Calculation when clearance is 0.25 mm (0.0098 in)

$$H = (18.60 + 0.45) - 15.05 - 0.25 = 3.75$$

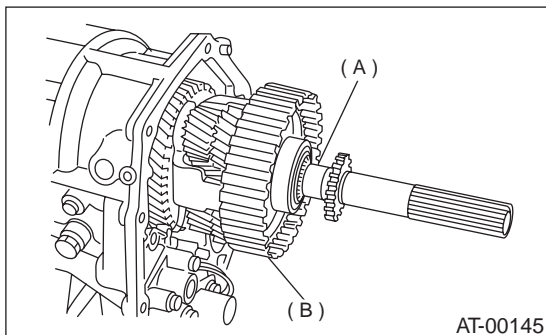
$$[H = (0.7323 + 0.0177) - 0.5925 - 0.0098 = 0.1476]$$

After calculation, the value of "H" becomes between 3.75 and 3.95, therefore select bearing thickness of 3.8.

Thrust needle bearing	
Part No.	Thickness mm (in)
806536020	3.8 (0.150)
806535030	4.0 (0.157)
806535040	4.2 (0.165)
806535050	4.4 (0.173)
806535060	4.6 (0.181)
806535070	4.8 (0.189)
806535090	5.0 (0.197)

2. VTD MODEL

1) Insert the rear driveshaft into the reduction drive gear and center differential assembly.



(A) Rear drive plate

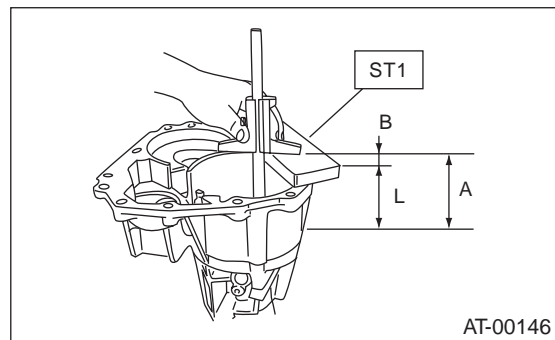
(B) Center differential carrier

2) Using the special tool, measure the distance "L" between the mating surface of extension case and multi-plate clutch (LSD) piston.

ST 398643600 GAUGE

L = Measured value – 15 mm

(L = Measured value – 0.59 in)



A: Measured value

B: Thickness of special tool [15 mm (0.59 in)]

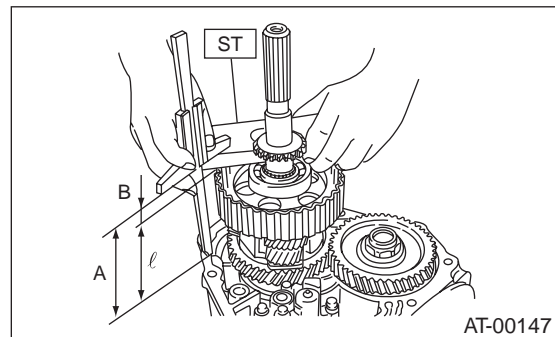
L: Distance between extension case edge and rear driveshaft edge

3) Using the special tool, measure the distance "ℓ" between the mating surface of transmission case and reduction drive gear edge.

ℓ = Measured value – 15 mm

(ℓ = Measured value – 0.59 in)

ST 398643600 GAUGE



A: Measured value

B: Thickness of special tool [15 mm (0.59 in)]

ℓ: Distance between extension case edge and reduction drive gear edge

4) Formula:

NOTE:

Calculation of "H":

When clearances are 0.05 mm (0.0020 in) and 0.25 mm (0.0098 in), select up to four adjusting shims from the table, suitable for clearance value.

$$H = (L + 0.45 \text{ mm}) - \ell - T$$

$$[H = (L + 0.0177 \text{ in}) - \ell - T]$$

T: Shim clearance

L: Distance between extension case edge and rear driveshaft edge

0.45 mm (0.0177 in): Gasket thickness

ℓ: Distance between transmission case edge and reduction drive gear edge

T: Shim thickness

0.05 — 0.25 mm (0.0020 — 0.0098 in)

Example:

TRANSFER CLUTCH

AUTOMATIC TRANSMISSION

When, $L = 90.50 \text{ mm}$ (3.5630 in), $\varnothing = 90.35 \text{ mm}$ (3.5571 in)

Calculation for 0.05 mm of clearance (0.0020 in)

$$H = (90.50 + 0.45) - 90.35 - 0.05 = 0.55$$

$$[H = (3.5630 + 0.0177) - 3.5571 - 0.0020 = 0.0217]$$

Calculation when clearance is 0.25 mm

(0.0098 in)

$$H = (90.50 + 0.45) - 90.35 - 0.25 = 0.35$$

$$[H = (3.5630 + 0.0177) - 3.5571 - 0.0098 = 0.0138]$$

After calculation, the value of "H" becomes between 0.35 mm (0.0138 in) and 0.55 mm (0.0216 in), therefore select two shims with thickness of 0.2 mm (0.010 in) or one shim with thickness of 0.5 mm (0.020 in).

Adjusting shim	
Part No.	Thickness mm (in)
33281AA001	0.2 (0.008)
33281AA011	0.5 (0.020)

27. Multi-plate Clutch

A: REMOVAL

Remove multi-plate clutch following the same instructions as for the extension case. <Ref. to AT-86, REMOVAL, Extension Case.>

B: INSTALLATION

Install multi-plate clutch following the same instructions as for the extension case. <Ref. to AT-86, INSTALLATION, Extension Case.>

C: INSPECTION

- Inspect drive plate facing for wear and damage.
- Make sure snap ring is not worn and return spring has no permanent distortion, damage, or deformation.
- Inspect D-ring for damage.
- Measure multi-plate clutch clearance and adjust it to within the specification range. <Ref. to AT-97, ADJUSTMENT, Multi-plate Clutch.>

D: ADJUSTMENT

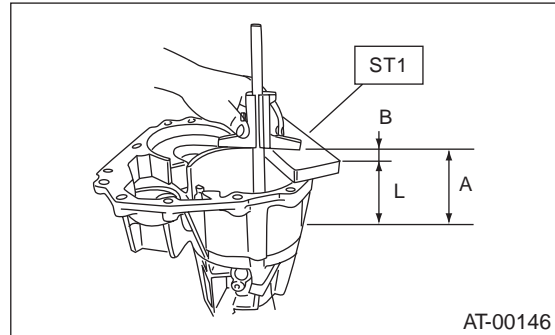
1) Remove drive plate and driven plate from center differential carrier.

2) Using the special tool, measure distance “L” from extension case joining surface to multi-plate clutch (LSD) piston.

ST 398643600 Gauge

L = Measured value – 15 mm

(L = Measured value – 0.59 in)



A: Measured value

B: Special tool thickness [15 mm (0.59 in)]

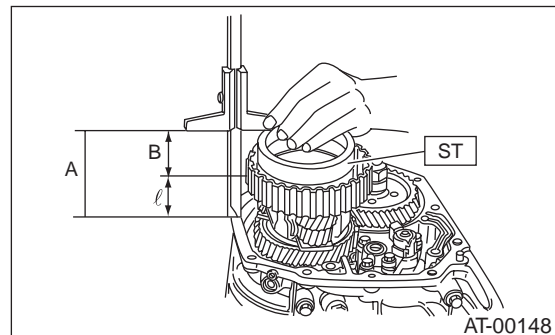
L: Distance from the extension case edge to the rear driveshaft edge.

3) Using ST, measure height “ \varnothing ” from transmission case joining edge to center differential clutch drum edge.

ST 398744300 GAUGE

\varnothing = Measurement value – 50 mm

(\varnothing = Measurement value – 1.97 in)



A: Measurement value

B: Special tool thickness [50 mm (1.97 in)]

\varnothing : Measure distance from transmission case joining surface to multi-plate clutch (LSD) piston.

4) Calculation formula

$$T = (L + 0.45 \text{ mm}) - \varnothing$$

$$[T = (L + 0.0177 \text{ in}) - \varnothing]$$

T: Measurement value between clutch drum and multi-plate clutch (LSD) piston

L: Distance from extension case joining surface to multi-plate clutch (LSD) piston

0.45: Gasket thickness

\varnothing : Distance from transmission case joining surface to center differential clutch drum edge

MULTI-PLATE CLUTCH

AUTOMATIC TRANSMISSION

NOTE:

Measure multi-plate clutch (LSD) driven and drive plate thickness to find the clearance between measurement value and “T”.

Standard value:

0.2 — 0.6 mm (0.008 — 0.024 in)

Limit value:

1.6 mm (0.063 in)

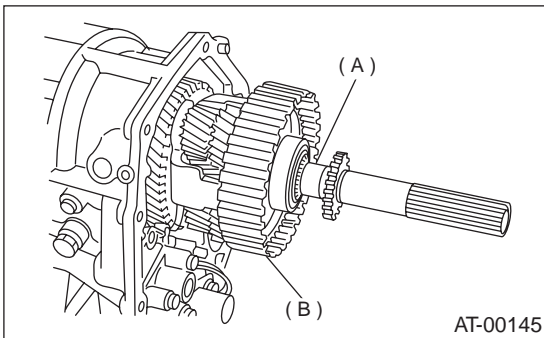
If outside the standard value, replace the plate set (drive and driven plate). Select a multi-plate clutch (LSD) piston side adjustment plate that will bring clearance within the standard value.

Obtainable driven plates	
Part No.	Thickness mm (in)
31589AA041	1.6 (0.063)
31589AA050	2.0 (0.079)
31589AA060	2.4 (0.094)
31589AA070	2.8 (0.110)

28.Rear Drive Shaft

A: REMOVAL

- 1) Remove transmission assembly. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear wheel speed sensor and separate extension case from transmission case. <Ref. to AT-86, REMOVAL, Extension Case.>
- 3) Pull out the rear driveshaft from the center differential assembly.



- (A) Rear driveshaft
- (B) Center differential carrier

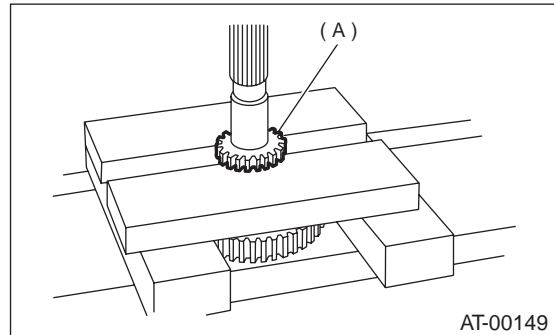
- 4) Remove drive plate and driven plate.

B: INSTALLATION

- 1) Select the appropriate shim. <Ref. to AT-95, VTD MODEL, ADJUSTMENT, Transfer Clutch.>
- 2) Install drive plate and driven plate.
- 3) Insert rear driveshaft into the center differential assembly.
- 4) Join transmission case and extension case. Install rear wheel speed sensor. <Ref. to AT-86, INSTALLATION, Extension Case.>
- 5) Install transmission assembly. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

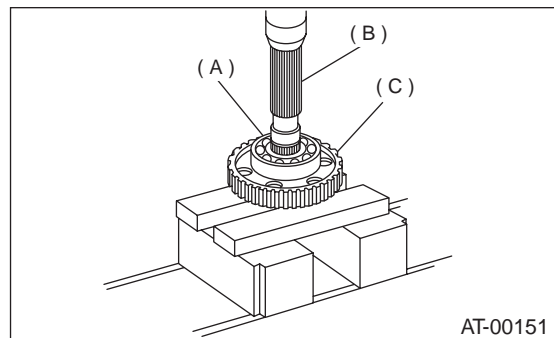
C: DISASSEMBLY

- 1) Using a press, remove revolution gear.



- (A) Revolution gear

- 2) Using a press, remove the front and rear side ball bearings and clutch hub.



- (A) Rear ball bearing
- (B) Rear driveshaft
- (C) Clutch hub

REAR DRIVE SHAFT

AUTOMATIC TRANSMISSION

D: ASSEMBLY

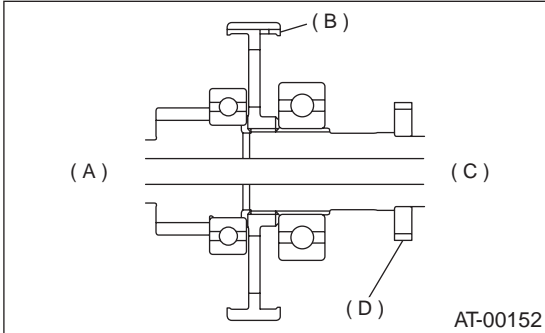
Assemble in the reverse order of disassembly.

NOTE:

- Use a new revolution gear and ball bearings.
- Make sure the clutch hub is oriented in the correct direction.

E: INSPECTION

- Inspect parts to make sure there are no holes, cuts, and that they are not dusty.
- Inspect extension end play and adjust it to within the standard value. <Ref. to AT-95, VTD MODEL, ADJUSTMENT, Transfer Clutch.>



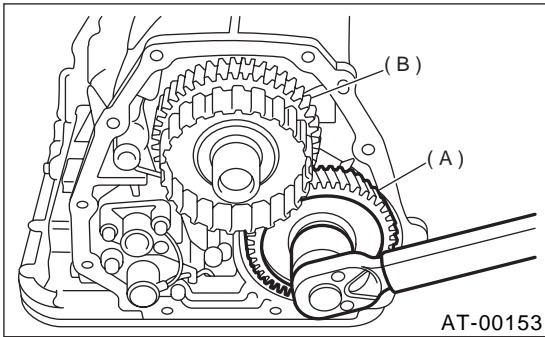
- (A) Front side
- (B) Clutch hub
- (C) Rear side
- (D) Revolution gear

29.Reduction Driven Gear

A: REMOVAL

1. MPT MODEL

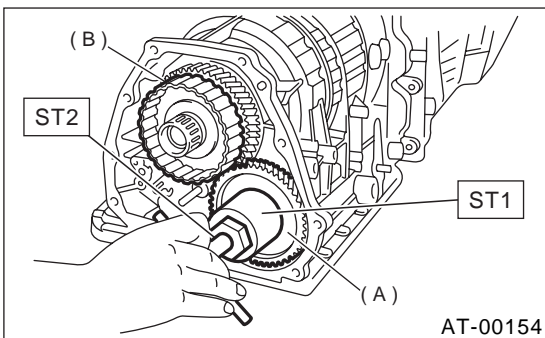
- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to AT-86, REMOVAL, Extension Case.>
- 3) Set the range select lever to "P".
- 4) Straighten the staked portion, and remove the lock nut.



- (A) Reduction driven gear
- (B) Reduction drive gear

- 5) Using the ST1 and ST2, extract the reduction driven gear.

ST1 499737000 PULLER
ST2 899524100 PULLER SET

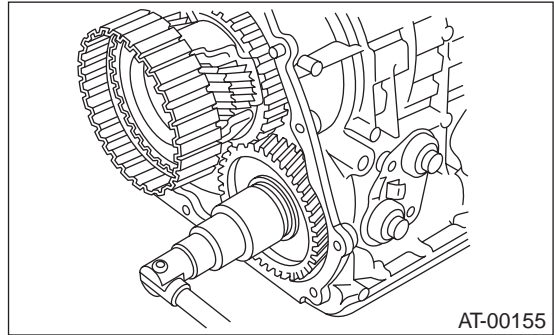


- (A) Reduction driven gear
- (B) Reduction drive gear

2. VTD MODEL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to AT-86, REMOVAL, Extension Case.>
- 3) Remove the rear drive shaft. <Ref. to AT-99, REMOVAL, Rear Drive Shaft.>

- 4) Set the range select lever to "P".
- 5) Straighten the staked portion, and remove the lock nut.



- (A) Reduction driven gear
- (B) Reduction drive gear

- 6) Using the ST1 and ST2, extract the reduction driven gear.

ST1 499737000 PULLER
ST2 899524100 PULLER SET

- 7) Pull out the center differential assembly. <Ref. to AT-106, REMOVAL, Center Differential Carrier.>

REDUCTION DRIVEN GEAR

AUTOMATIC TRANSMISSION

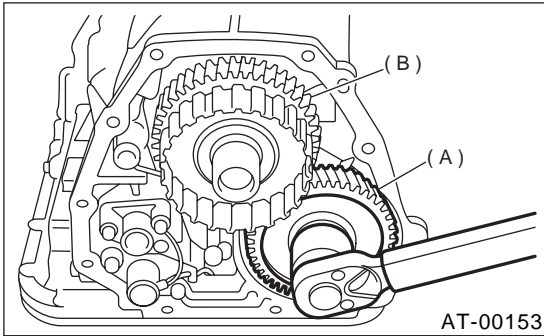
B: INSTALLATION

1. MPT MODEL

- 1) Set the select lever to "P" range.
- 2) Using a plastic hammer, install reduction driven gear assembly and new washer, and tighten new drive pinion lock nut.

Tightening torque:

100 N·m (10.2 kgf·m, 73.8 ft·lb)



- (A) Reduction driven gear
- (B) Reduction drive gear

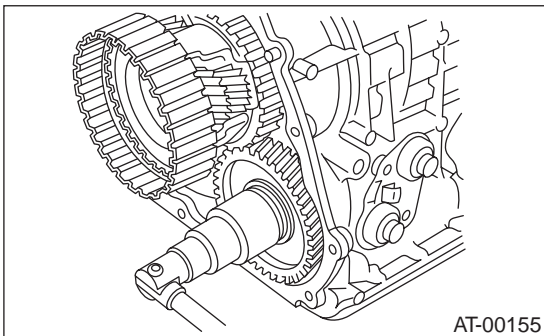
- 3) After tightening, stake the lock nut securely.
- 4) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to AT-86, INSTALLATION, Extension Case.>
- 5) Install the transmission assembly to vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

2. VTD MODEL

- 1) Set the select lever to "P" range.
- 2) Using a plastic hammer, install reduction driven gear assembly.
- 3) Using a plastic hammer, install the center differential assembly.
- 4) Install a new self-lock nut and a washer.

Tightening torque:

100 N·m (10.2 kgf·m, 73.8 ft·lb)

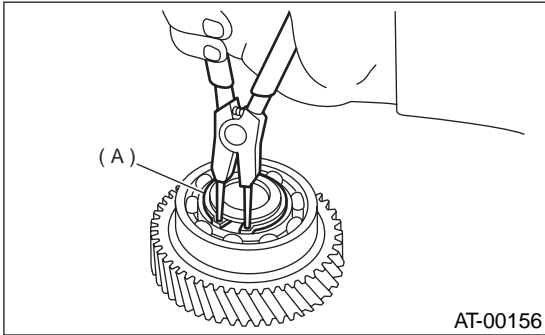


- (A) Reduction driven gear
- (B) Reduction drive gear

- 5) After tightening, stake the lock nut securely.
- 6) Insert the rear drive shaft assembly. <Ref. to AT-99, INSTALLATION, Rear Drive Shaft.>
- 7) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to AT-86, INSTALLATION, Extension Case.>
- 8) Install the transmission assembly to vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

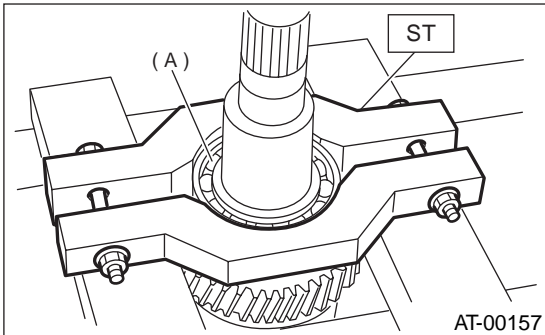
1) Remove snap ring from reduction driven gear.



(A) Snap ring

2) Using ST, remove ball bearing from reduction driven gear.

ST 498077600 REMOVER



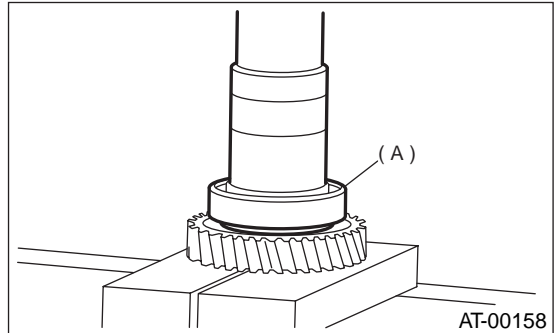
(A) Ball bearing

3) Remove snap ring reduction driven gear. (3.0 L model)

D: ASSEMBLY

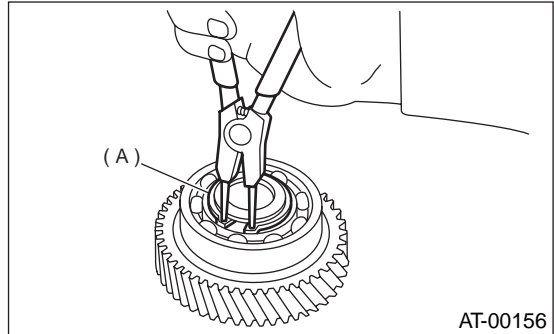
1) Install snap ring to reduction driven gear. (3.0 L model)

2) Using a press, install a new ball bearing to reduction driven gear.



(A) Ball bearing

3) Install snap ring to reduction driven gear.



(A) Snap ring

E: INSPECTION

Check ball bearing and gear for dents or damage.

REDUCTION DRIVE GEAR

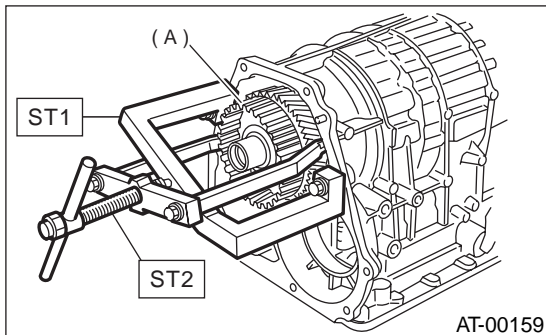
AUTOMATIC TRANSMISSION

30.Reduction Drive Gear

A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to AT-86, REMOVAL, Extension Case.>
- 3) Remove the reduction driven gear. <Ref. to AT-101, REMOVAL, Reduction Driven Gear.>
- 4) Using ST, extract the reduction drive gear.

ST1 499737100 PULLER
ST2 899524100 PULLER SET



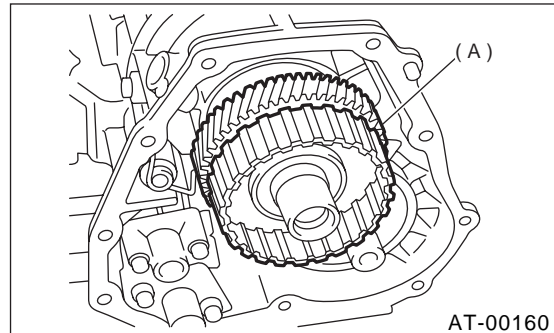
(A) Reduction drive gear

B: INSTALLATION

- 1) Install the reduction drive gear assembly.

NOTE:

Insert it fully into position until the bearing shoulder bottoms.

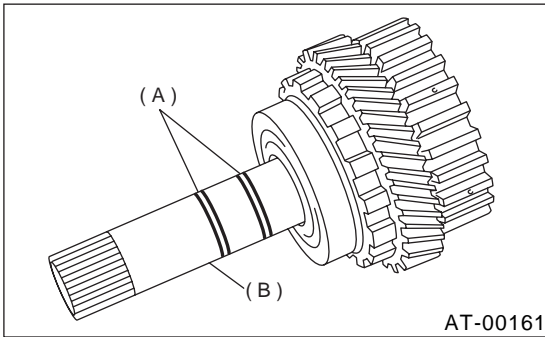


(A) Reduction drive gear

- 2) Install the reduction driven gear. <Ref. to AT-102, INSTALLATION, Reduction Driven Gear.>
- 3) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to AT-86, INSTALLATION, Extension Case.>
- 4) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

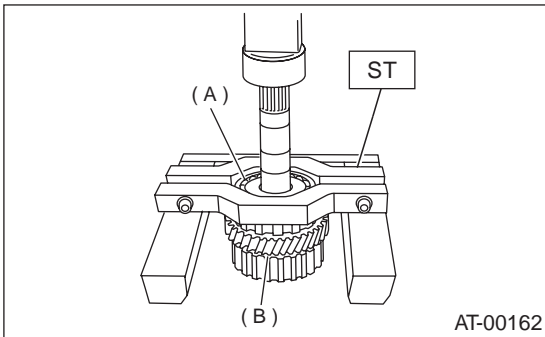
C: DISASSEMBLY

1) Take out the seal rings.



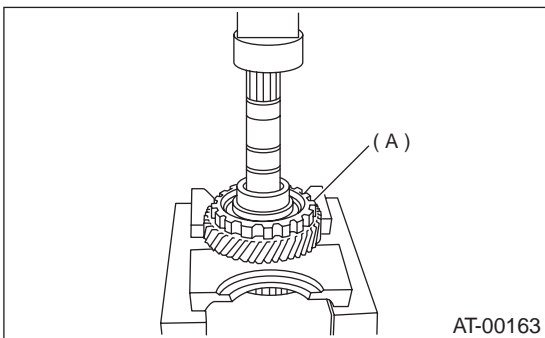
- (A) Seal rings
- (B) Reduction drive shaft

2) Using ST, remove the ball bearing.
ST 498077600 REMOVER



- (A) Ball bearing
- (B) Reduction drive gear

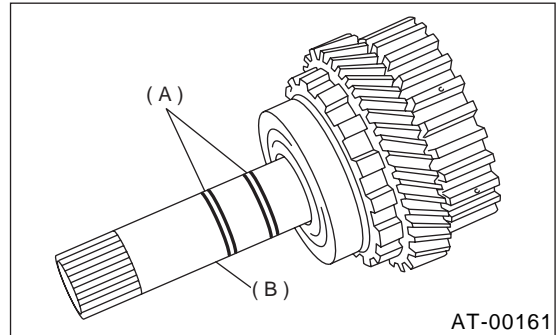
3) Using a press, remove the reduction drive gear.



- (A) Reduction drive gear

D: ASSEMBLY

- 1) Press-fit the reduction drive gear to the shaft.
- 2) Press-fit the a new ball bearing to the reduction drive gear.
- 3) Apply vaseline to outer surface of seal ring and shaft groove.
- 4) Attach new seal rings.



- (A) Seal rings
- (B) Reduction drive shaft

E: INSPECTION

- Rotate bearing by hand, make sure it rotates smoothly.
- Make sure that each component is free of harmful gouges, cuts, or dust.
- Measure the extension end play and adjust it to within specifications.<Ref. to AT-94, ADJUSTMENT, Transfer Clutch.>

CENTER DIFFERENTIAL CARRIER

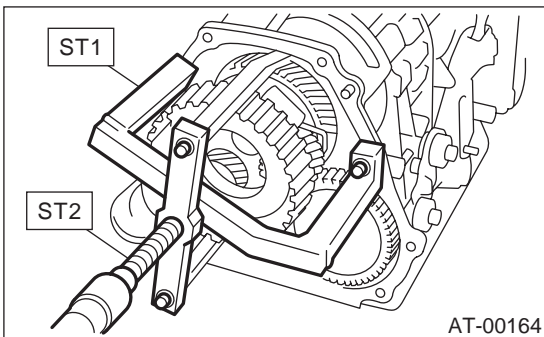
AUTOMATIC TRANSMISSION

31.Center Differential Carrier

A: REMOVAL

- 1) Remove the transmission assembly from vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear wheel speed sensor, and separate the extension case from the transmission case. <Ref. to AT-86, REMOVAL, Extension Case.>
- 3) Pull out the rear driveshaft. <Ref. to AT-99, REMOVAL, Rear Drive Shaft.>
- 4) Using the special tools, pull out the center differential carrier assembly.

ST1 499737100 PULLER
ST2 899524100 PULLER SET



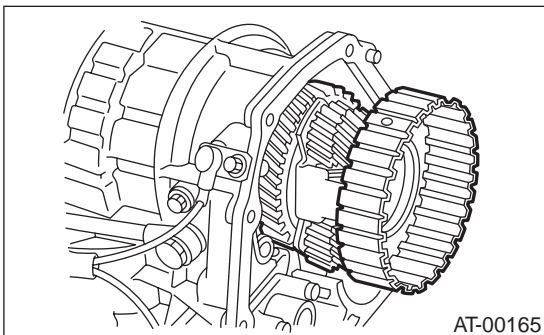
- 5) Pull out the shim(s) from transmission case.

B: INSTALLATION

- 1) Install the center differential assembly with the shim(s).

NOTE:

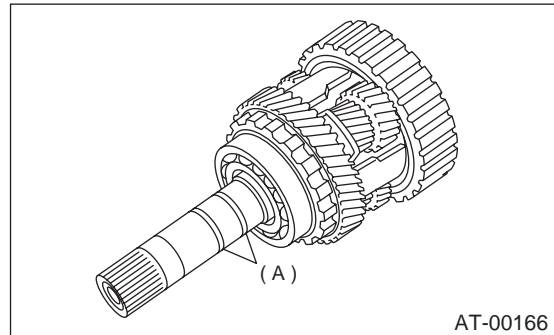
Insert the center differential assembly and shim(s) completely into the bearing shoulder bottom.



- 2) Insert the rear driveshaft. <Ref. to AT-99, INSTALLATION, Rear Drive Shaft.>
- 3) Connect the transmission case and extension case, and install the rear wheel speed sensor. <Ref. to AT-86, INSTALLATION, Extension Case.>
- 4) Install the transmission assembly onto vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

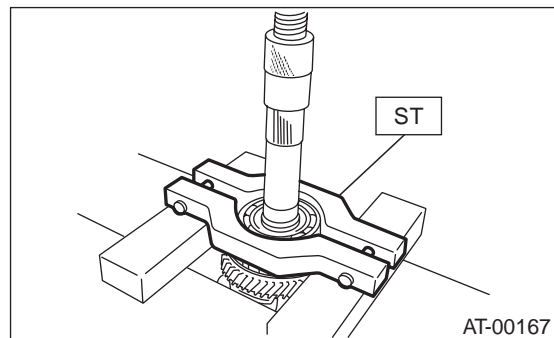
- 1) Remove the seal rings.



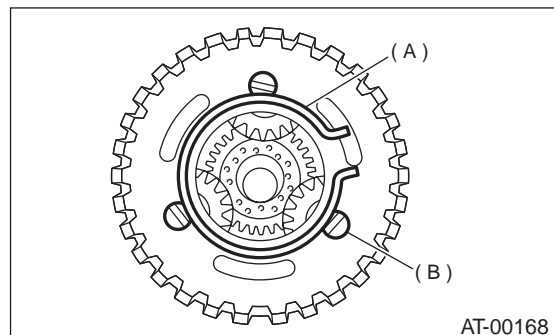
(A) Seal ring

- 2) Using a press and the special tool, remove the ball bearing.

ST 498077600 REMOVER



- 3) Remove the snap ring, and pull out the shaft from the center differential assembly.

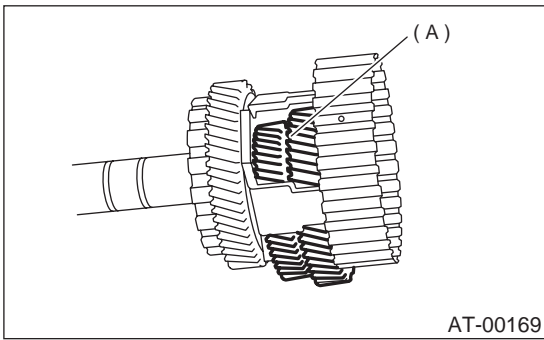


(A) Snap ring
(B) Shaft

CENTER DIFFERENTIAL CARRIER

AUTOMATIC TRANSMISSION

4) Remove the thrust washers, pinion gears, and washers from the center differential assembly.



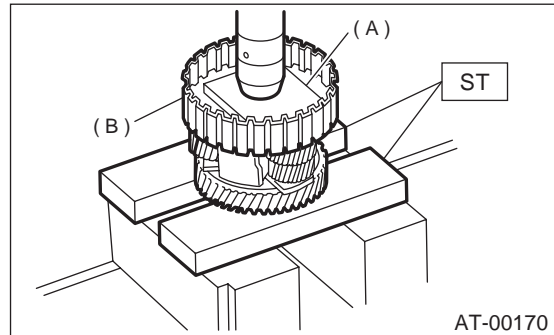
(A) Pinion gear

5) Pull out the intermediate shaft and thrust bearing.

D: ASSEMBLY

- 1) Install the thrust washer onto the intermediate shaft.
- 2) Install thrust bearing onto the intermediate shaft.
- 3) Install the pinion gears and washers.
- 4) Insert the shaft into the center differential assembly.
- 5) Install the snap ring.
- 6) Using a press, install a new ball bearing into the center differential assembly.

ST 498077000 REMOVER



(A) Plate

(B) Center differential carrier

7) Apply Vaseline onto the seal ring outer surface and shaft grooves.

8) Install new seal rings.

E: INSPECTION

- Check all parts for hole, score, or dirt.
- Check the play of the extension end, and if necessary, adjust it. <Ref. to AT-95, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

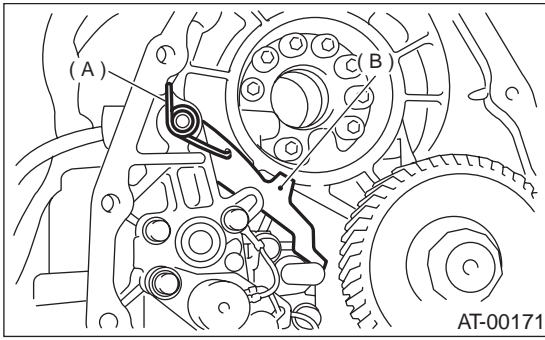
PARKING PAWL

AUTOMATIC TRANSMISSION

32. Parking Pawl

A: REMOVAL

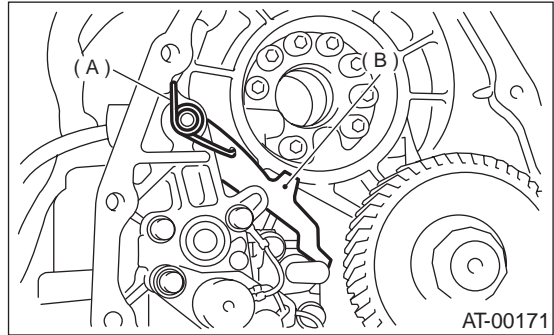
- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear vehicle speed sensor and separate transmission case and extension case sections. <Ref. to AT-86, REMOVAL, Extension Case.>
- 3) Remove the reduction drive gear. (MPT model) <Ref. to AT-104, REMOVAL, Reduction Drive Gear.>
- 4) Remove the center differential carrier. (VTD model) <Ref. to AT-106, REMOVAL, Center Differential Carrier.>
- 5) Remove the parking pawl, return spring and shaft.



- (A) Return spring
- (B) Parking pawl

B: INSTALLATION

- 1) Install the parking pawl, shaft and return spring.



- (A) Return spring
- (B) Parking pawl

- 2) Install the reduction drive gear. <Ref. to AT-104, INSTALLATION, Reduction Drive Gear.>
- 3) Install the center differential carrier. (VTD model) <Ref. to AT-106, INSTALLATION, Center Differential Carrier.>
- 4) Install the rear vehicle speed sensor and extension case. <Ref. to AT-86, INSTALLATION, Extension Case.>
- 5) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

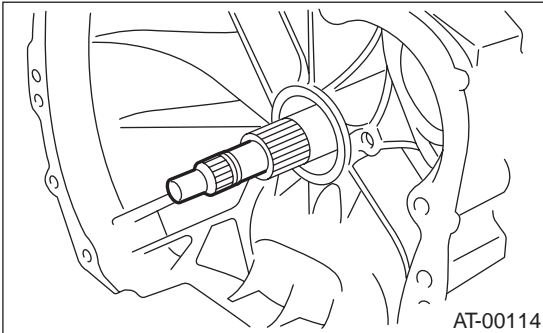
C: INSPECTION

Make sure that the tab of the packing pole on the reduction gear is not worn or otherwise damaged.

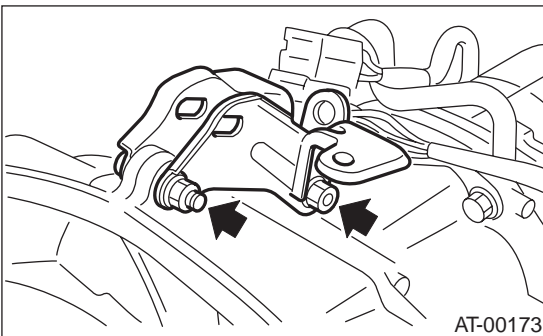
33. Torque Converter Clutch Case

A: REMOVAL

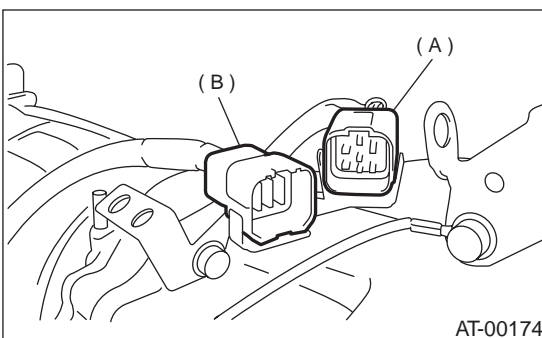
- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Remove air breather hose. <Ref. to AT-83, REMOVAL, Air Breather Hose.>
- 5) Remove pitching stopper bracket.



- 6) Lift-up lever behind the connector and disconnect it from stay.
- 7) Disconnect inhibitor switch connector from stay.



- (A) Transmission harness
- (B) Inhibitor switch harness

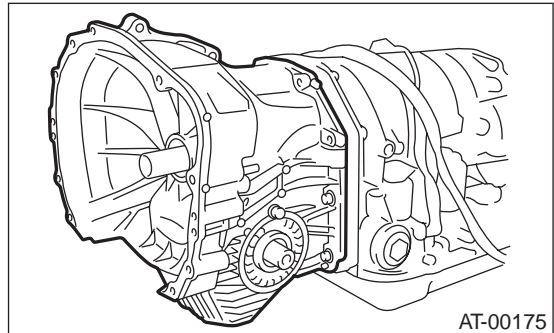
- 8) Remove the oil charger pipe. <Ref. to AT-84, REMOVAL, Oil Charger Pipe.>

- 9) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-78, REMOVAL, ATF Cooler Pipe and Hose.>

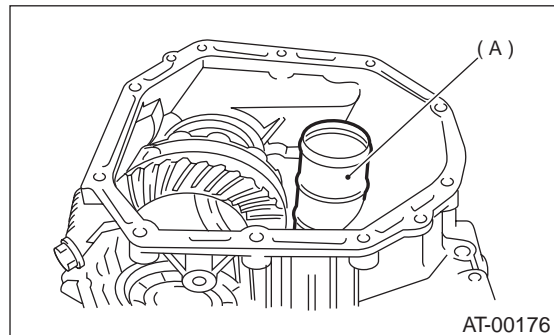
- 10) Lightly tapping the torque converter clutch case with plastic hammer, separate the transmission case and torque converter clutch case.

NOTE:

- Be careful not to damage the oil seal and bushing inside the torque converter clutch case by the oil pump cover.
- Be careful not to lose the rubber seal.



- 11) Remove the seal pipe if it is attached. (Reusing is not allowed.)



- (A) Seal pipe

- 12) Remove the differential assembly. <Ref. to AT-124, REMOVAL, Front Differential.>
- 13) Remove the oil seal from torque converter clutch case.

TORQUE CONVERTER CLUTCH CASE

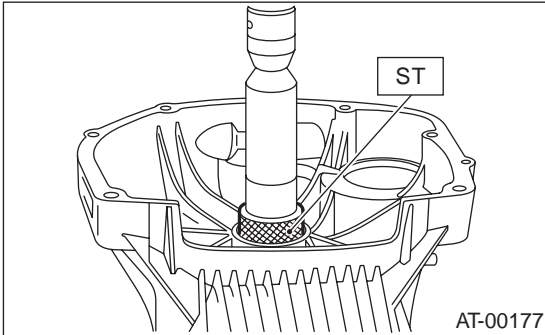
AUTOMATIC TRANSMISSION

B: INSTALLATION

1) Check the appearance of each component and clean.

2) Force-fit the oil seal to the torque converter clutch case with ST.

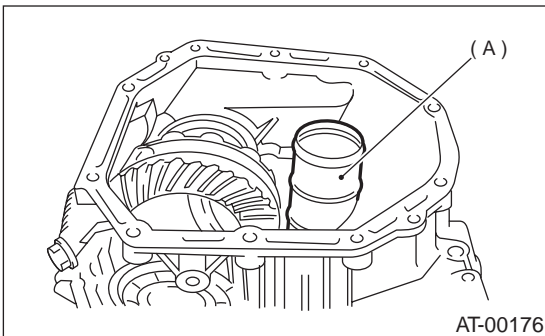
ST 398437700 DRIFT



3) Install the differential assembly to the case. <Ref. to AT-124, INSTALLATION, Front Differential.>

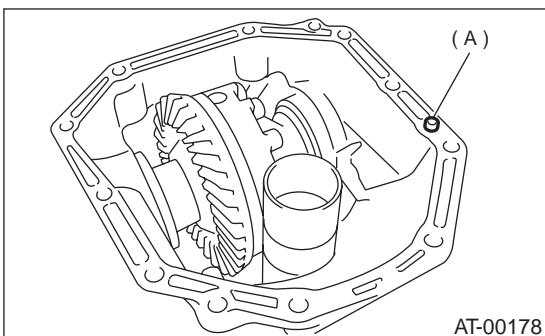
4) Install the left and right side retainers. <Ref. to AT-128, ADJUSTMENT, Front Differential.>

5) Install the new seal pipe to the torque converter clutch case.



(A) Seal pipe

6) Install the rubber seal to the torque converter clutch case.

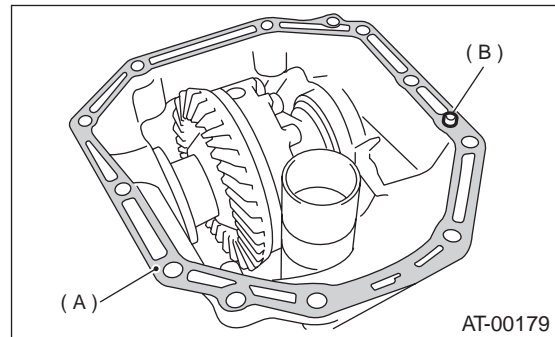


(A) Rubber seal

7) Apply proper amount of liquid gasket to the entire torque converter clutch case mating surface.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007)



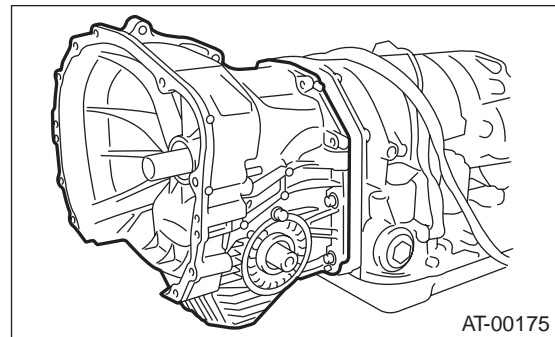
(A) THREE BOND 1215

(B) Rubber seal

8) Install the torque converter clutch case assembly without damaging bush and oil seal and secure with six bolts and four nuts.

Tightening torque:

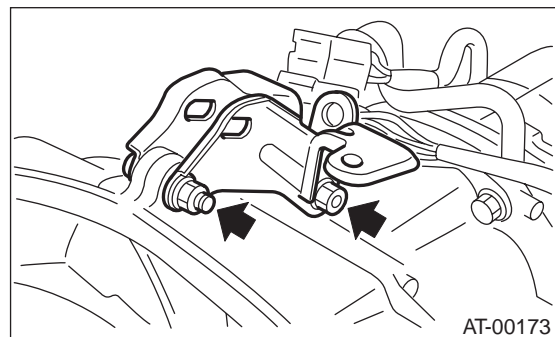
41 N·m (4.2 kgf·m, 30.4 ft·lb)



9) Install the pitching stopper bracket and transmission ground cable.

Tightening torque:

41 N·m (4.2 kgf·m, 30.4 ft·lb)



10) Insert inhibitor switch and transmission connector into stay.

11) Install air breather hose. <Ref. to AT-83, INSTALLATION, Air Breather Hose.>

12) Install the oil cooler pipes. <Ref. to AT-80, INSTALLATION, ATF Cooler Pipe and Hose.>

TORQUE CONVERTER CLUTCH CASE

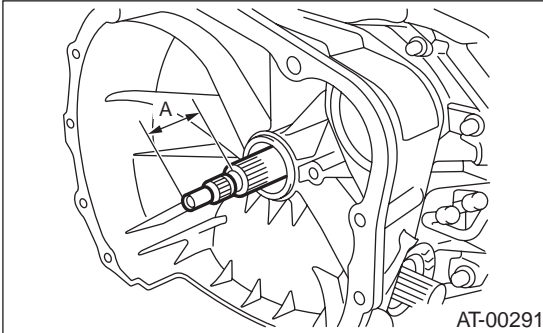
AUTOMATIC TRANSMISSION

13) Install the oil charger pipe with O-ring. <Ref. to AT-84, INSTALLATION, Oil Charger Pipe.>

14) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



15) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>

16) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

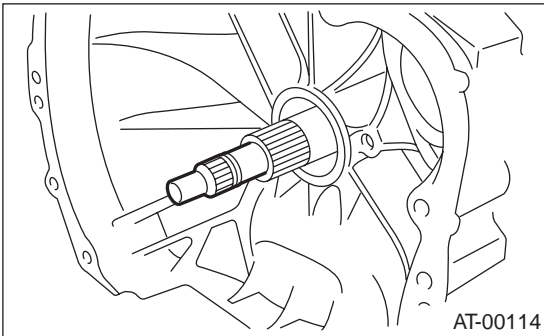
C: INSPECTION

Measure the backlash and adjust to within specifications. <Ref. to AT-121, ADJUSTMENT, Drive Pinion Shaft.>

34. Oil Pump

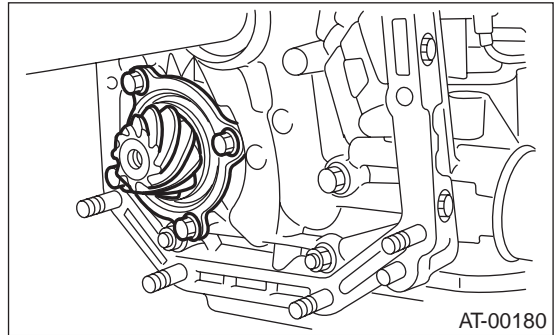
A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 5) Disconnect inhibitor switch connector from stay.
- 6) Disconnect the air breather hose. <Ref. to AT-83, REMOVAL, Air Breather Hose.>
- 7) Remove the oil charger pipe. <Ref. to AT-84, REMOVAL, Oil Charger Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-78, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separation of torque converter clutch case and transmission case sections <Ref. to AT-109, REMOVAL, Torque Converter Clutch Case.>
- 10) Separate transmission case and extension case sections. <Ref. to AT-86, REMOVAL, Extension Case.>
- 11) Remove the reduction drive gear. (MPT model) <Ref. to AT-104, REMOVAL, Reduction Drive Gear.>
- 12) Remove the center differential carrier. (VTD model) <Ref. to AT-106, REMOVAL, Center Differential Carrier.>
- 13) Remove the reduction driven gear. <Ref. to AT-101, REMOVAL, REMOVAL, Reduction Driven Gear.>

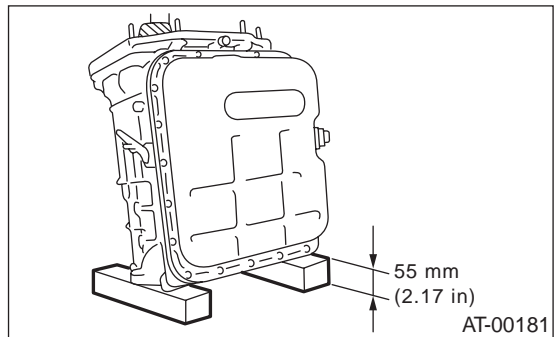
- 14) Loosen the taper roller bearing mounting bolts.



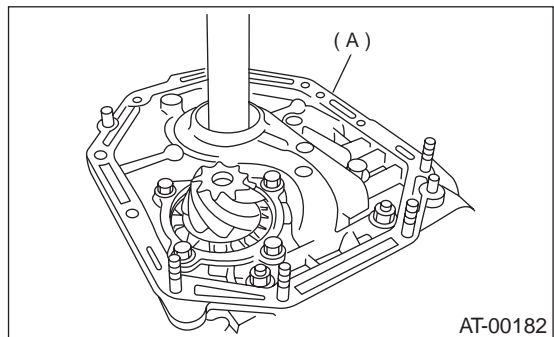
- 15) Place two wooden blocks on the workbench, and stand the transmission case with its rear end facing down.

NOTE:

- Be careful not to scratch the rear mating surface of the transmission case.
- Note that the parking rod and drive pinion protrude from the mating surface.

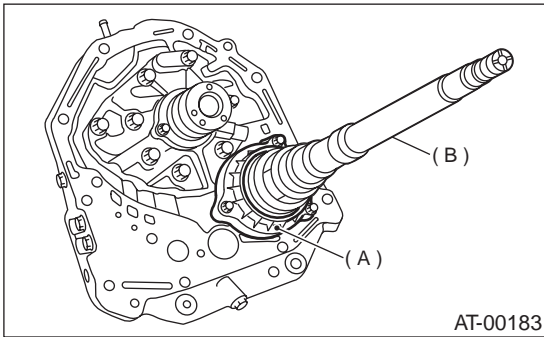


- 16) Remove the oil pump housing and adjusting thrust washer.



(A) Oil pump housing

- 17) Remove the oil seal retainer.
Also remove the O-ring and oil seal (air breather).



- (A) Oil seal retainer
(B) Drive pinion shaft

- 18) Remove O-rings from oil pump housing.
19) Remove the drive pinion assembly.

B: INSTALLATION

- 1) Assemble the drive pinion assembly to the oil pump housing.

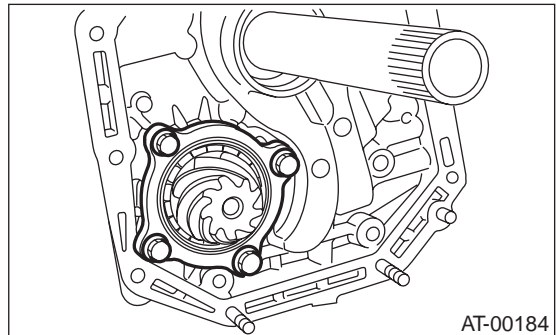
NOTE:

- Be careful not to bend the shims.
- Be careful not to force the pinion against the housing bore.

- 2) Tighten four bolts to secure the roller bearing.

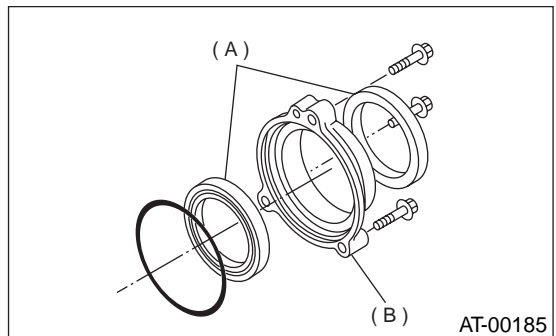
Tightening torque:

40 N·m (4.1 kgf-m, 30 ft-lb)



- 3) With pay attention to the orientation of the oil seals, install two new oil seals to the oil seal retainer using ST.

ST 499247300 INSTALLER

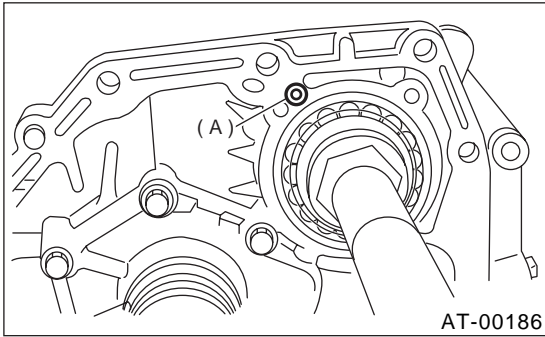


- (A) Oil seal
(B) Oil seal retainer

OIL PUMP

AUTOMATIC TRANSMISSION

4) Attach the new O-ring to the oil seal retainer with vaseline. Install the seal to the oil pump housing bore.

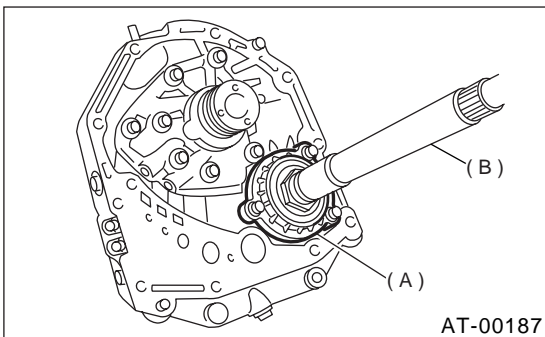


(A) O-ring

5) Install the oil seal retainer taking care not to damage the oil seal lips. Then secure with three bolts.

Tightening torque:

7 N·m (0.7 kgf·m, 5.1 ft·lb)



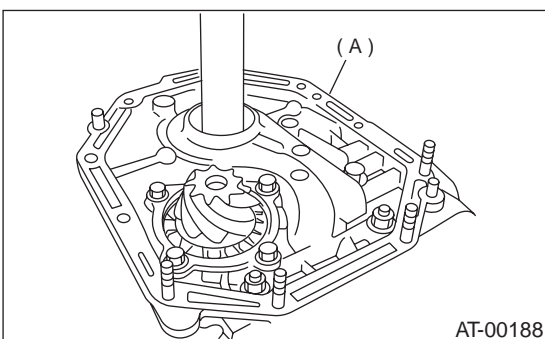
(A) Oil seal retainer
(B) Drive pinion shaft

6) Make sure the O-ring is fitted correctly in position.

7) Secure the housing with two nuts and the bolt.

Tightening torque:

42 N·m (4.3 kgf·m, 31 ft·lb)



(A) Oil pump housing

8) Install the torque converter clutch case assembly to the transmission case assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>

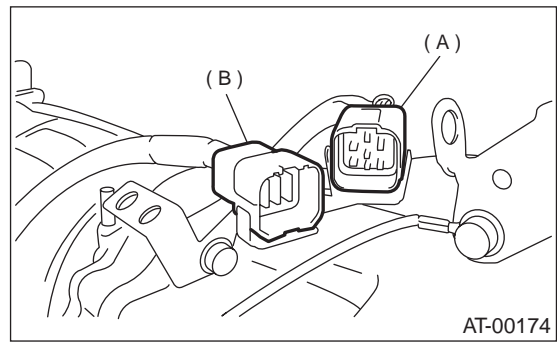
9) Install reduction driven gear. <Ref. to AT-102, INSTALLATION, Reduction Driven Gear.>

10) Install the reduction drive gear. (MPT model) <Ref. to AT-104, INSTALLATION, Reduction Drive Gear.>

11) Install the center differential carrier. (VTD model) <Ref. to AT-106, INSTALLATION, Center Differential Carrier.>

12) Combine the extension case with the transmission case, and install vehicle speed sensor 1 (rear). <Ref. to AT-86, INSTALLATION, Extension Case.>

13) Insert inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

14) Install air breather hose. <Ref. to AT-83, INSTALLATION, Air Breather Hose.>

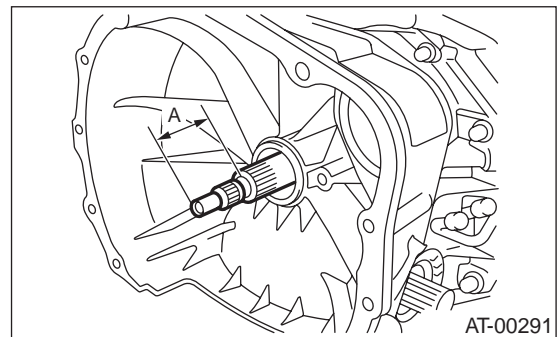
15) Install the oil cooler pipe. <Ref. to AT-80, INSTALLATION, ATF Cooler Pipe and Hose.>

16) Install the oil charger pipe with O-ring. <Ref. to AT-84, INSTALLATION, Oil Charger Pipe.>

17) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)

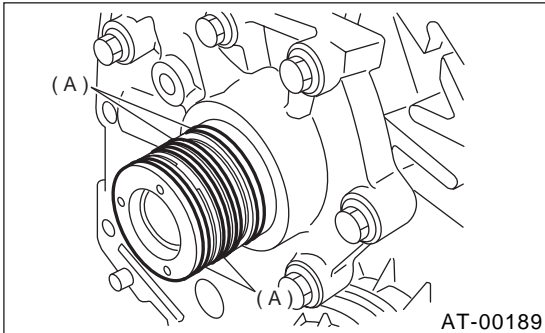


18) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>

19) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

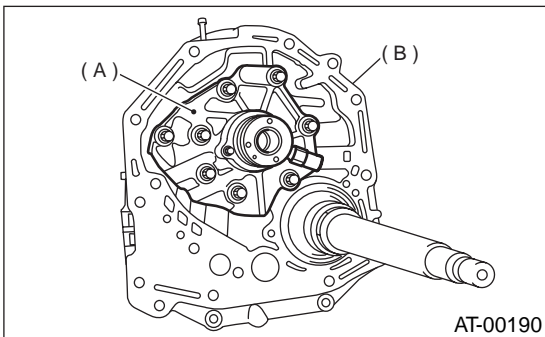
C: DISASSEMBLY

1) Remove four seal rings.



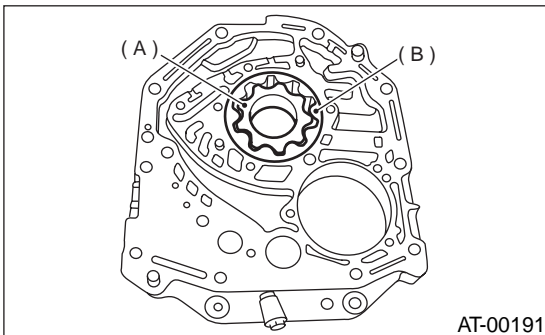
(A) Seal rings

2) Lightly tap the end of the stator shaft to remove the cover.



(A) Oil pump cover
(B) Oil pump housing

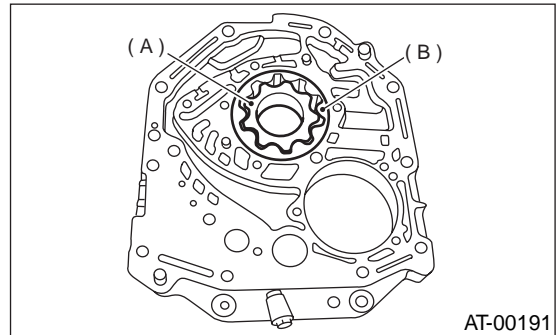
3) Remove the inner and outer rotor.



(A) Inner rotor
(B) Outer rotor

D: ASSEMBLY

1) Install oil pump rotor assembly to oil pump housing.

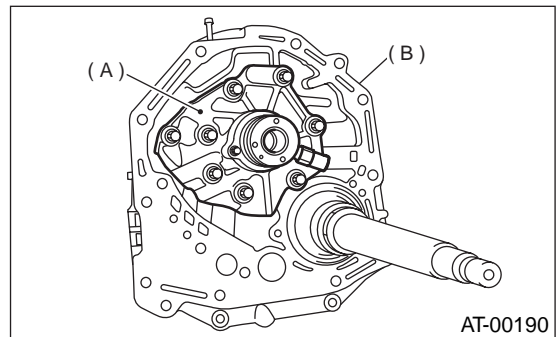


(A) Inner rotor
(B) Outer rotor

2) Align both pivots with the pivot holes of the cover, and install the oil pump cover being careful not to apply undue force to the pivots.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



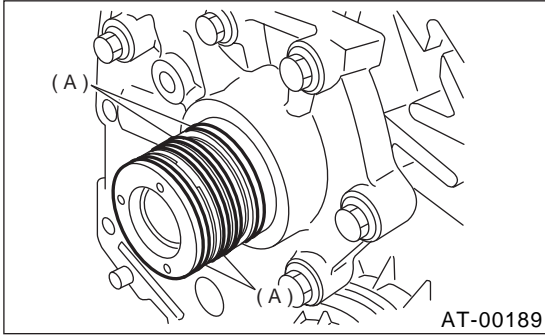
(A) Oil pump cover
(B) Oil pump housing

3) After assembling, turn the oil pump shaft to check for smooth rotation of the rotor.

OIL PUMP

AUTOMATIC TRANSMISSION

4) Install the oil seal retainer and new seal rings. After adjusting the drive pinion backlash and tooth contact. <Ref. to AT-117, ADJUSTMENT, Oil Pump.>



(A) Seal rings

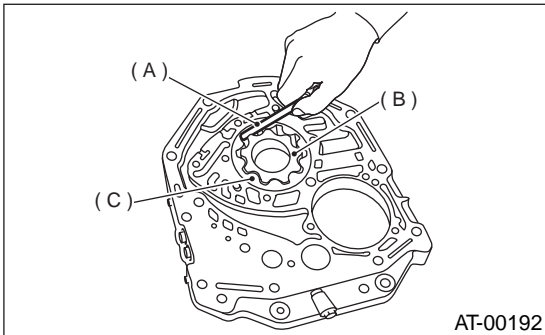
E: INSPECTION

- 1) Check seal ring and O-ring oil seal for breaks or damage.
- 2) Check other parts for dents or abnormalities.
- 3) Selection of oil pump rotor assembly
 - (1) Tip clearance

Install inner rotor and outer rotor to oil pump. With rotor gears facing each other, measure crest-to-crest clearance.

Tip clearance:

0.02 — 0.15 mm (0.0008 — 0.0059 in)



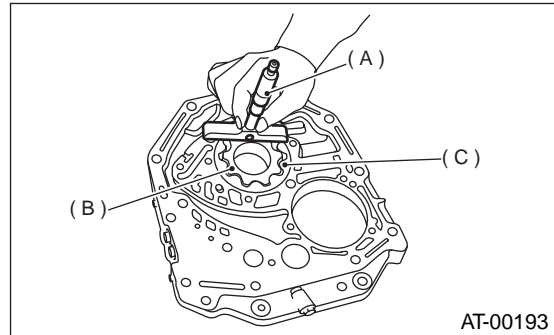
(A) Thickness gauge
(B) Inner rotor
(C) Outer rotor

(2) Side clearance

Set a depth gauge to oil pump housing, then measure oil pump housing-to-rotor clearances.

Side clearance:

0.02 — 0.04 mm (0.0008 — 0.0016 in)



(A) Depth gauge
(B) Inner rotor
(C) Outer rotor

- (3) If depth and/or side clearances are outside specifications, replace rotor assembly.

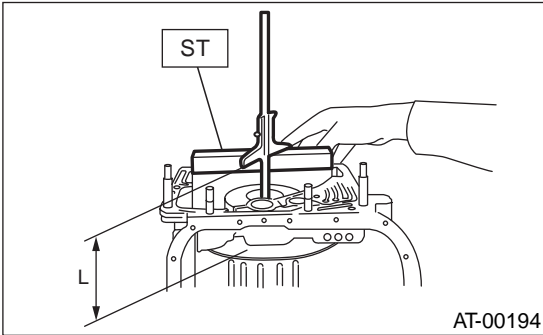
Oil pump rotor assembly	
Part No.	Thickness mm (in)
15008AA060	11.37 — 11.38 (0.4476 — 0.4480)
15008AA070	11.38 — 11.39 (0.4480 — 0.4484)
15008AA080	11.39 — 11.40 (0.4484 — 0.4488)

- Measure the total end play and adjust to within specifications. <Ref. to AT-117, ADJUSTMENT, Oil Pump.>

F: ADJUSTMENT

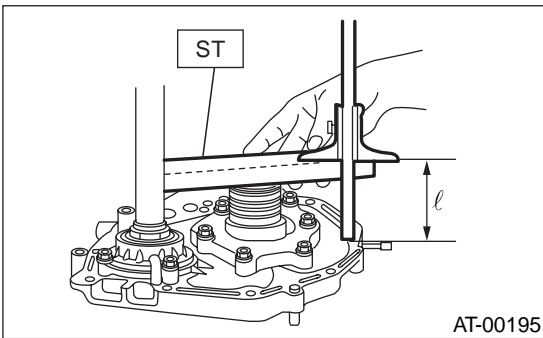
1) Using ST, measure the distance from the transmission case mating surface to the recessed portion of the high clutch drum "L".

ST 398643600 GAUGE



2) Using ST, measure the distance from the oil pump housing mating surface to the top surface of the oil pump cover with thrust needle bearing.

ST 398643600 GAUGE

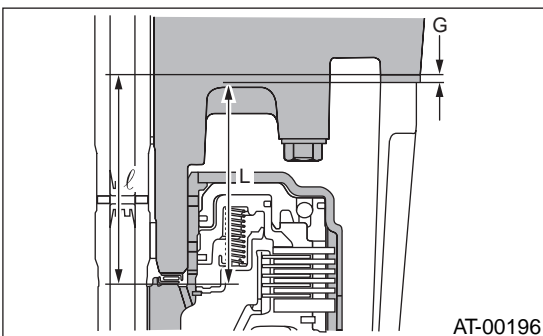


3) Calculation of total end play

Select suitable bearing race from among those listed in this table so that clearance C is in the 0.25 to 0.55 mm (0.0098 to 0.0217 in) range.

$$C = (L + G) - l$$

C	Clearance between concave portion of high clutch and end of clutch drum support
L	Length from case mating surface to concave portion of high clutch
G	Gasket thickness [0.28 mm (0.0110 in)]
l	Height from housing mating surface to upper surface of clutch drum support



Thrust needle bearing	
Part No.	Thickness mm (in)
806528050	4.1 (0.161)
806528060	4.3 (0.169)
806528070	4.5 (0.177)
806528080	4.7 (0.185)
806528090	4.9 (0.193)
806528100	5.1 (0.201)

4) After completing end play adjustment, insert the bearing race in the recess of the high clutch. Attach the thrust needle bearing to the oil pump cover with vaseline.

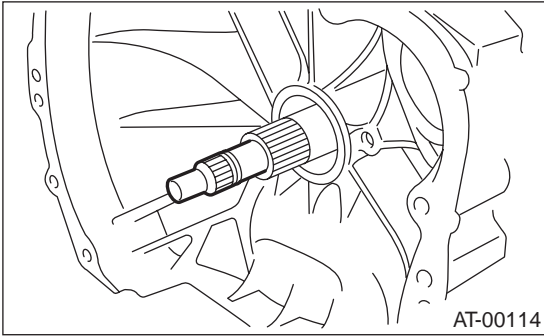
5) After correctly installing the new gasket to the case mating surface, carefully install the oil pump housing assembly. Be careful to avoid hitting the drive pinion against the inside of the case.

6) Install both parts with dowel pins aligned. Make sure no clearance exists at the mating surface.

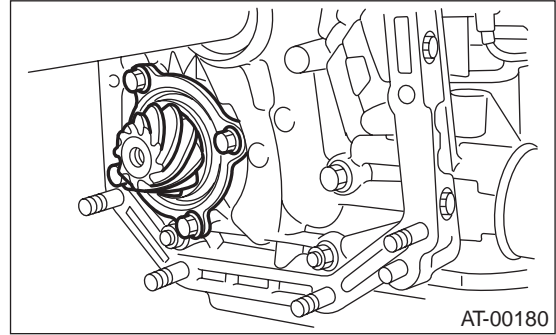
35. Drive Pinion Shaft

A: REMOVAL

- 1) Remove the transmission assembly from vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 14) Separation of drive pinion shaft and oil pump housing. <Ref. to AT-112, REMOVAL, Oil Pump.>



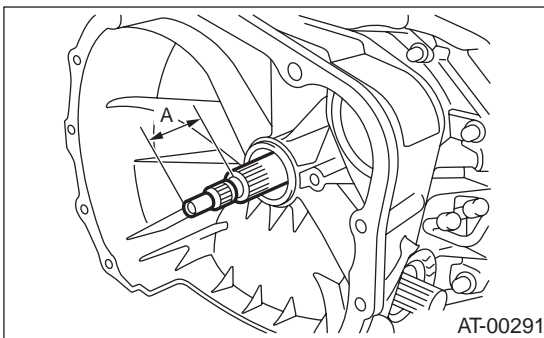
- 4) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 5) Disconnect inhibitor switch connector from stay.
- 6) Disconnect the air breather hose. <Ref. to AT-83, REMOVAL, Air Breather Hose.>
- 7) Remove the oil charger pipe. <Ref. to AT-84, REMOVAL, Oil Charger Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-78, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separation of torque converter clutch case and transmission case sections <Ref. to AT-109, REMOVAL, Torque Converter Clutch Case.>
- 10) Separate transmission case and extension case sections. <Ref. to AT-86, REMOVAL, Extension Case.>
- 11) Remove the reduction drive gear. (MPT model) <Ref. to AT-104, REMOVAL, Reduction Drive Gear.>
- 12) Remove the center differential carrier. (VTD model) <Ref. to AT-106, REMOVAL, Center Differential Carrier.>
- 13) Remove the reduction driven gear. <Ref. to AT-101, REMOVAL, Reduction Driven Gear.>

B: INSTALLATION

- 1) Assemble the drive pinion assembly to the oil pump housing. <Ref. to AT-113, INSTALLATION, Oil Pump.>
- 2) Install oil pump housing to transmission case. <Ref. to AT-113, INSTALLATION, Oil Pump.>
- 3) Combine the torque converter case with the transmission case. <Ref. to AT-110, INSTALLATION, Torque Converter Clutch Case.>
- 4) Install the reduction driven gear. <Ref. to AT-102, INSTALLATION, Reduction Driven Gear.>
- 5) Install the reduction drive gear. (MPT model) <Ref. to AT-104, INSTALLATION, Reduction Drive Gear.>
- 6) Install the center differential carrier. (VTD model) <Ref. to AT-106, INSTALLATION, Center Differential Carrier.>
- 7) Combine the extension case with the transmission case, and install vehicle speed sensor 1 (rear). <Ref. to AT-86, INSTALLATION, Extension Case.>
- 8) Insert inhibitor switch and transmission connector into stay.
- 9) Install air breather hose. <Ref. to AT-83, INSTALLATION, Air Breather Hose.>
- 10) Install the oil cooler inlet and outlet pipes. <Ref. to AT-80, INSTALLATION, ATF Cooler Pipe and Hose.>
- 11) Install the oil charger pipe with O-ring.
- 12) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)

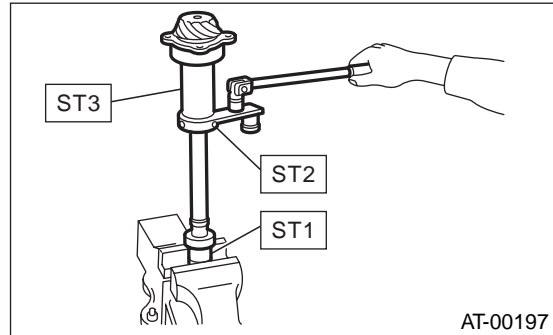


- 13) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>
- 14) Install the transmission assembly to vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

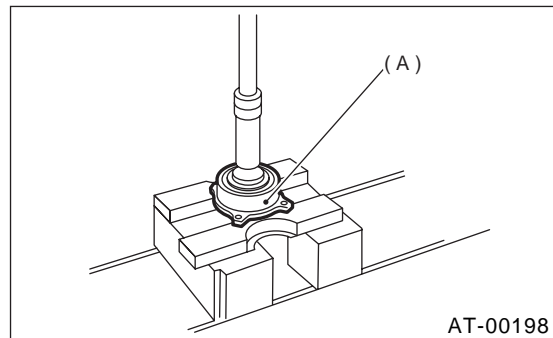
C: DISASSEMBLY

- 1) Straighten the staked portion of the lock nut, and remove the lock nut while locking the rear spline portion of the shaft with ST1 and ST2. Then pull off the drive pinion collar.

ST1 498937110 HOLDER
 ST2 499787700 WRENCH
 ST3 499787500 ADAPTER



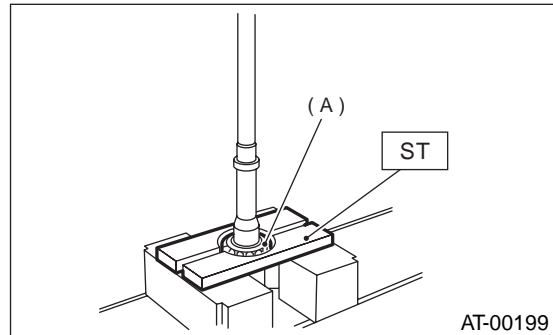
- 2) Remove the O-ring.
- 3) Using a press, separate the rear roller bearing and outer race from the shaft.



(A) Outer race

- 4) Using a press and ST, separate the front roller bearing from the shaft.

ST 498517000 REPLACER



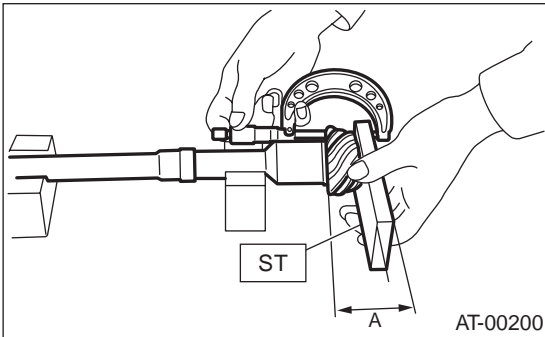
(A) Front roller bearing

DRIVE PINION SHAFT

AUTOMATIC TRANSMISSION

D: ASSEMBLY

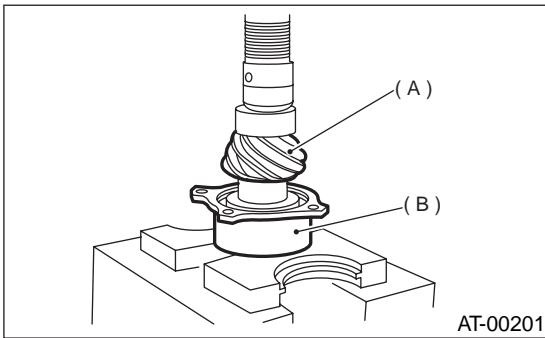
- 1) Measure dimension "A" of the drive pinion shaft.
ST 398643600 GAUGE



- 2) Using a press, force-fit a new roller bearing in position.

NOTE:

If too much pressure is applied, the roller bearing will not turn easily.



- (A) Drive pinion shaft
(B) Roller bearing

- 3) After fitting a new O-ring to the shaft, attach the drive pinion collar to the shaft.

- 4) Install the lock washer to drive pinion shaft in proper direction.

- 5) Tighten a new lock nut with ST1, ST2 and ST3. Calculate lock washer and lock nut specifications using the following formula.

$$T2 = L2 / (L1 + L2) \times T1$$

T1: 116 N·m (11.8 kgf-m, 85.3 ft-lb)

[Required torque setting]

T2: Tightening torque

L1: ST2 length 0.072 m (2.83 in)

L2: Torque wrench length

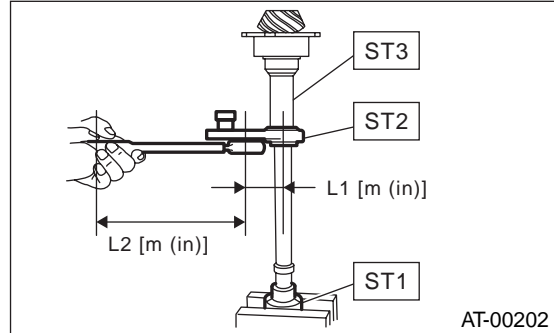
Example:

Torque wrench length m (in)	Tightening torque N·m (kgf-m, ft-lb)
0.4 (15.75)	98 (10.0, 72)
0.45 (17.72)	100 (10.2, 73.8)
0.5 (19.69)	101 (10.3, 74.5)
0.55 (21.65)	102 (10.4, 75)

- ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER

NOTE:

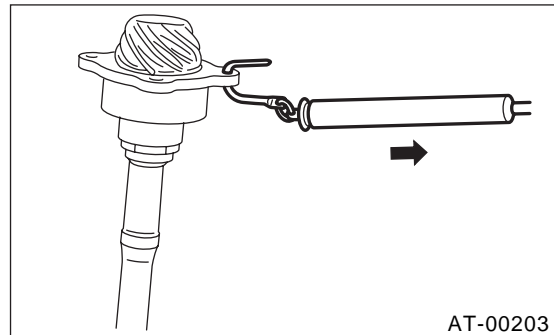
Install ST2 to torque wrench as straight as possible.



- 6) Measure the starting torque of the bearing. Make sure the starting torque is within the specified range. If out of the allowable range, replace the roller bearing.

Starting torque:

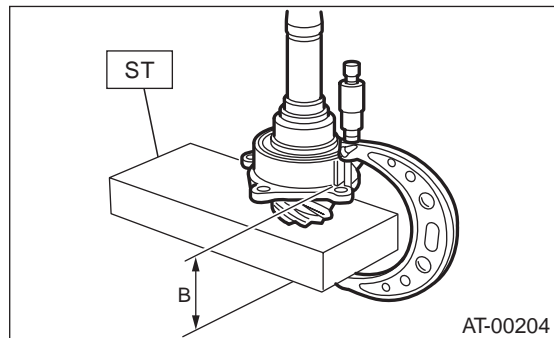
7.6 — 38.1 N (0.776 — 3.88 kgf, 1.7 — 8.6 lb)



- 7) Stake the lock nut securely at two places.

- 8) Measure dimension "B" of the drive pinion shaft.

ST 398643600 GAUGE



- 9) The thickness "t" (mm) of the drive pinion shim.

$$t = 6.5 \pm 0.0625 - (B - A)$$

- 10) Select three or less shims from following table.

Available drive pinion shims	
Part No.	Thickness mm (in)
31451AA050	0.150 (0.0059)
31451AA060	0.175 (0.0069)
31451AA070	0.200 (0.0079)
31451AA080	0.225 (0.0089)
31451AA090	0.250 (0.0098)
31451AA100	0.275 (0.0108)

E: INSPECTION

- Make sure that all component parts are free of harmful cuts, gouges, and other faults.
- Adjust the teeth alignment. <Ref. to AT-121, ADJUSTMENT, Drive Pinion Shaft.>

F: ADJUSTMENT

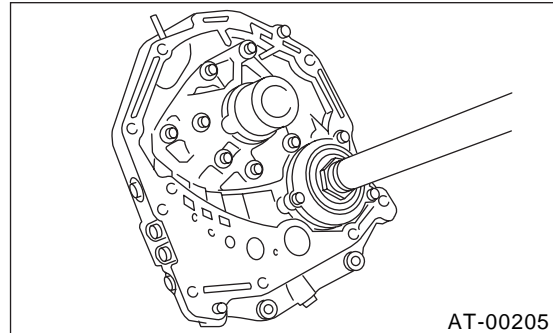
- 1) Thoroughly remove the liquid gasket from the case mating surface beforehand.
- 2) Install the oil pump housing assembly to the torque converter clutch case, and secure evenly by tightening four bolts.

NOTE:

Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.

Tightening torque:

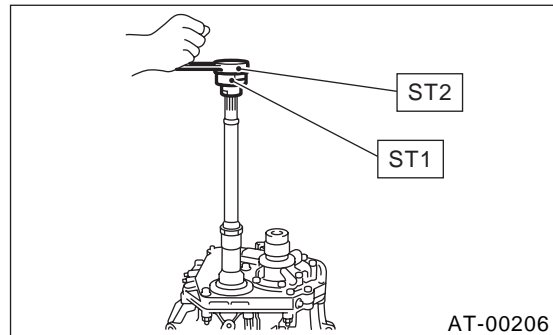
41 N·m (4.2 kgf-m, 30.4 ft-lb)



- 3) Rotate the drive pinion several times with ST1 and ST2.

ST1 498937110 HOLDER

ST2 499787700 WRENCH



- 4) Adjust the backlash between drive pinion and crown gear. <Ref. to AT-128, ADJUSTMENT, Front Differential.>

- 5) Apply red lead evenly to the surfaces of three or four teeth of the crown gear. Rotate the drive pinion in the forward and reverse directions several times. Then remove the oil pump housing, and check the tooth contact pattern.

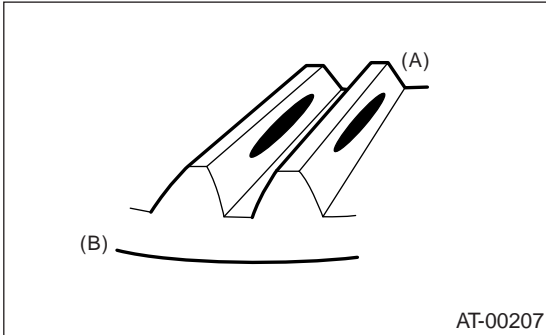
If tooth contact is improper, readjust the backlash or shim thickness. <Ref. to AT-128, ADJUSTMENT, Front Differential.>

DRIVE PINION SHAFT

AUTOMATIC TRANSMISSION

- Tooth contact

Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]

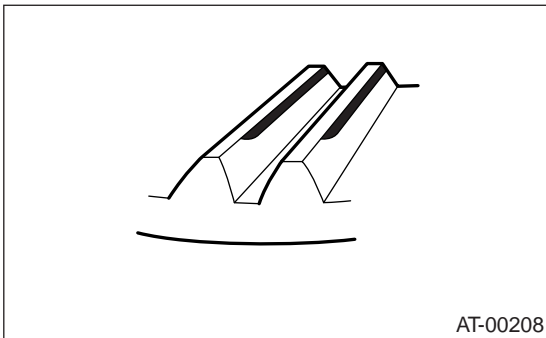


- (A) Toe side
- (B) Heel side

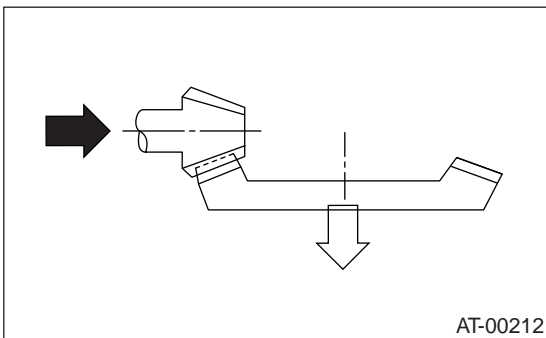
- Face contact

Checking item: Backlash is too large.

Contact pattern



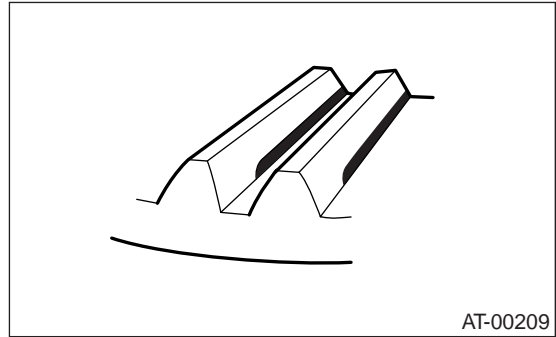
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



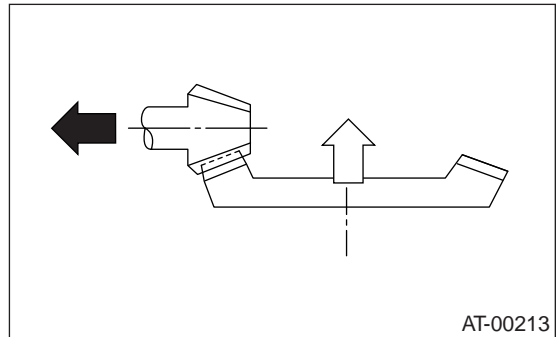
- Flank contact

Checking item: Backlash is too small.

Contact pattern



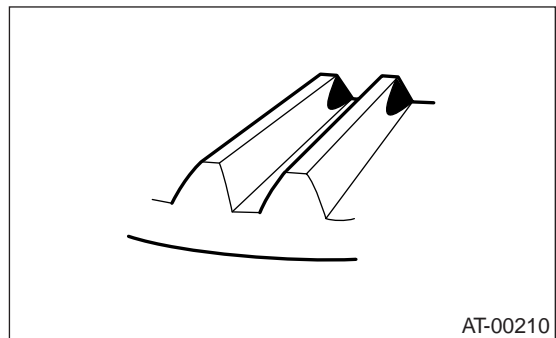
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



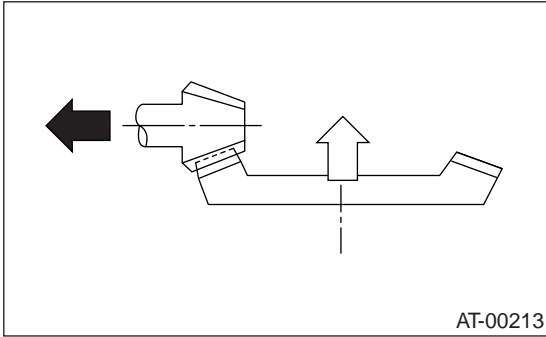
- Toe contact (Inside end contact)

Checking item: Contact areas is small.

Contact pattern



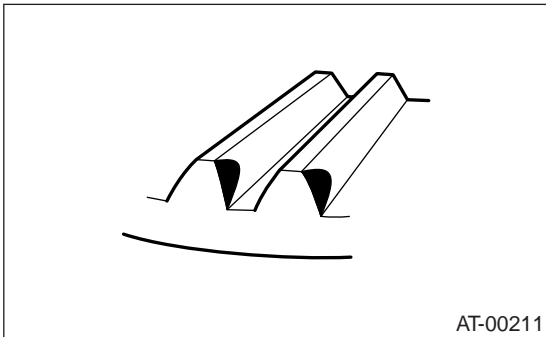
Corrective action: Decrease thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



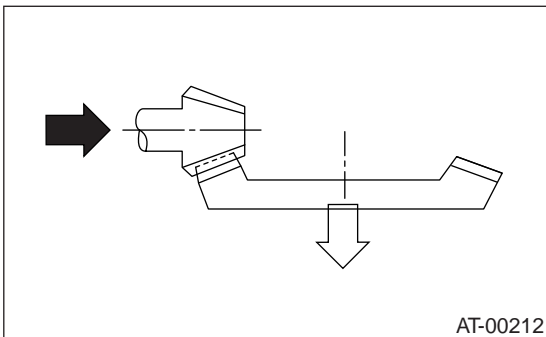
- Heel contact (Outside end contact)

Checking item: Contact areas is small.

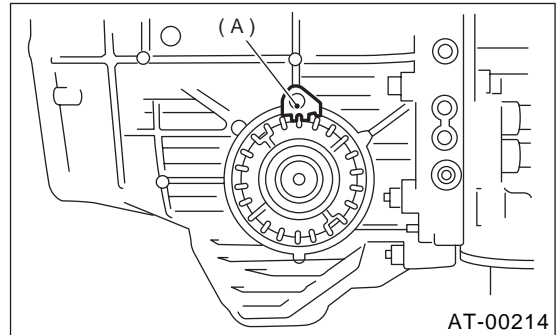
Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting shim in order to move drive pinion close to crown gear.



Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Lock plate

6) If tooth contact is correct, mark the retainer position and loosen it. After fitting a new O-ring and oil seal, screw in the retainer to the marked position. Then tighten the lock plate to the specified torque.

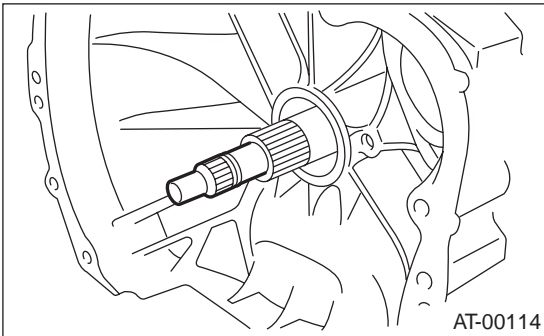
FRONT DIFFERENTIAL

AUTOMATIC TRANSMISSION

36. Front Differential

A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Disconnect the air breather hose. <Ref. to AT-83, REMOVAL, Air Breather Hose.>
- 5) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 6) Disconnect inhibitor switch from stay.
- 7) Remove the oil charger pipe. <Ref. to AT-84, REMOVAL, Oil Charger Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-78, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separation of torque converter clutch case and transmission case. <Ref. to AT-109, REMOVAL, Torque Converter Clutch Case.>
- 10) Remove the seal pipe if it is attached.
- 11) Remove the differential side retainer with ST.

NOTE:

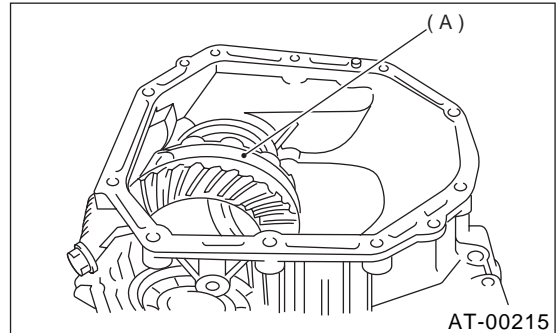
Hold the differential case assembly by hand to avoid damaging retainer mounting hole of the torque converter clutch case.

ST 499787000 WRENCH ASSY

- 12) Remove the differential assembly without damaging installation part of retainer.

B: INSTALLATION

- 1) Install the differential assembly to the case, paying special attention not to damage the inside of the case (particularly, the differential side retainer contact surface).

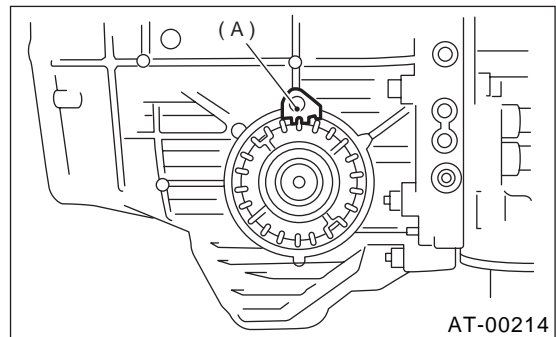


(A) Differential assembly

- 2) Remove the O-rings from left and right side retainer.
- 3) Using ST, install the side retainers. <Ref. to AT-124, REMOVAL, Front Differential.>
ST 499787000 WRENCH ASSY
- 4) Install the lock plate.

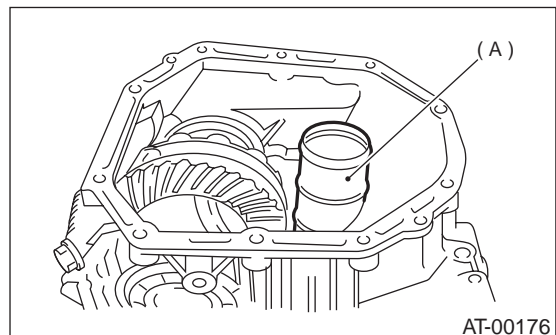
Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



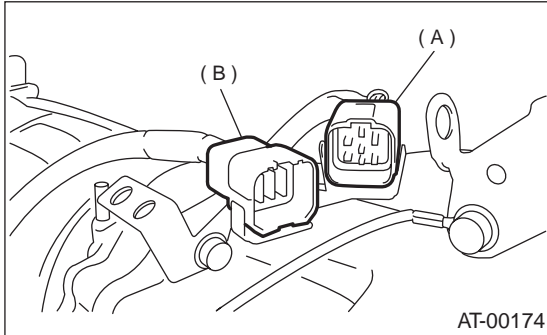
(A) Lock plate

- 5) Install the new seal pipe to the torque converter clutch case.



(A) Seal pipe

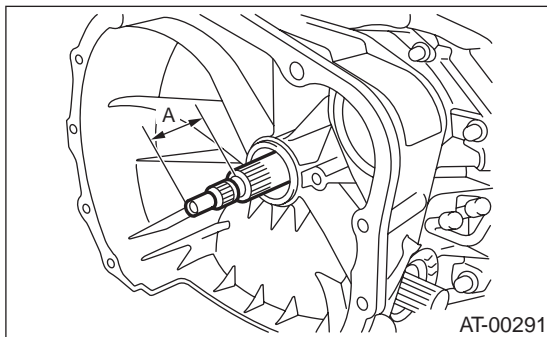
- 6) Install the torque converter clutch case to transmission case. <Ref. to AT-110, INSTALLATION, Torque Converter Clutch Case.>
- 7) Install air breather hose.
- 8) Insert inhibitor switch and transmission connector into stay.



- (A) Transmission harness
- (B) Inhibitor switch harness

- 9) Install oil cooler pipes. <Ref. to AT-80, INSTALLATION, ATF Cooler Pipe and Hose.>
- 10) Install the oil charger pipe with O-ring <Ref. to AT-84, INSTALLATION, Oil Charger Pipe.>
- 11) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



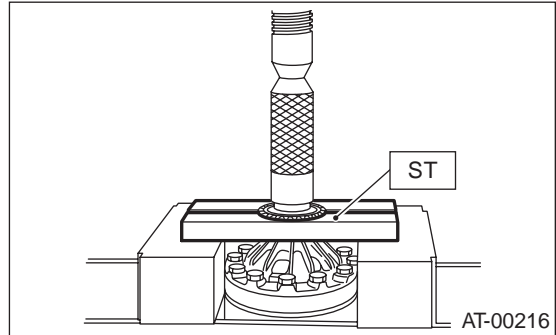
- 12) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>
- 13) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

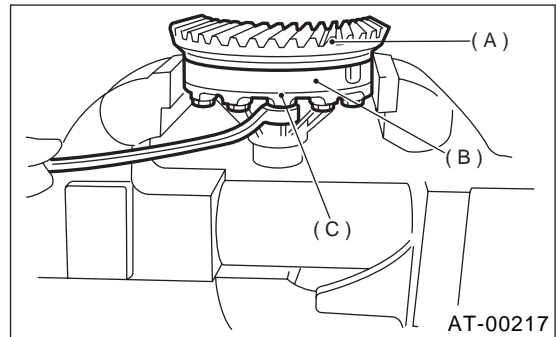
1. DIFFERENTIAL CASE ASSEMBLY

- 1) Using a press and ST, remove the taper roller bearing.

ST 498077000 REMOVER

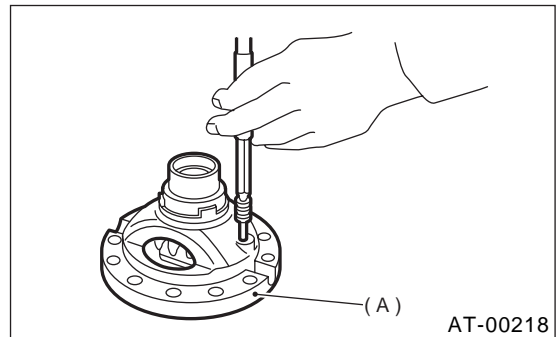


- 2) Secure the case in a vise and remove the crown gear tightening bolts, then separate the crown gear, case (RH) and case (LH).



- (A) Crown gear
- (B) Differential case (RH)
- (C) Differential case (LH)

- 3) Pull out the straight pin and shaft, and remove the differential bevel gear, washer, and differential bevel pinion.



- (A) Differential case (RH)

FRONT DIFFERENTIAL

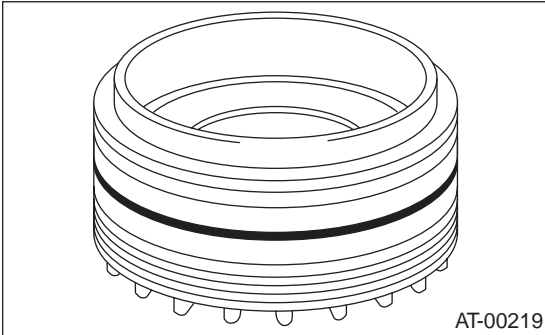
AUTOMATIC TRANSMISSION

2. SIDE RETAINER

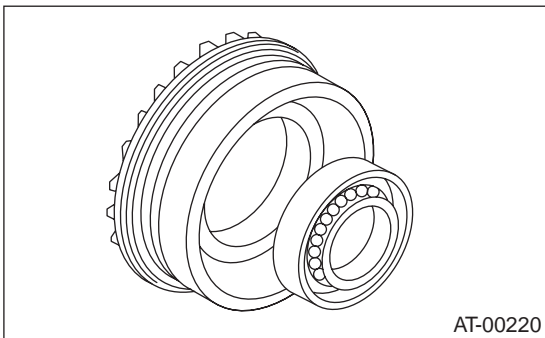
NOTE:

After adjusting the drive pinion backlash and tooth contact, remove and install the oil seal and O-ring.

1) Remove O-ring.

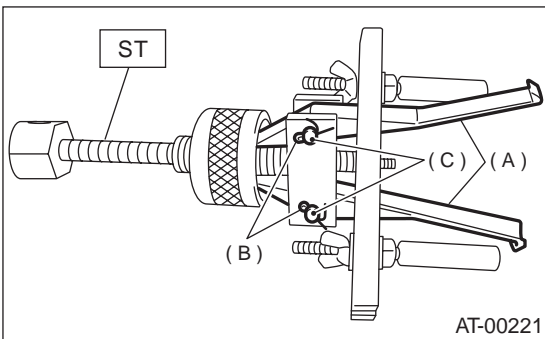


2) Remove oil seal.



3) Take out either split pin, remove claw.

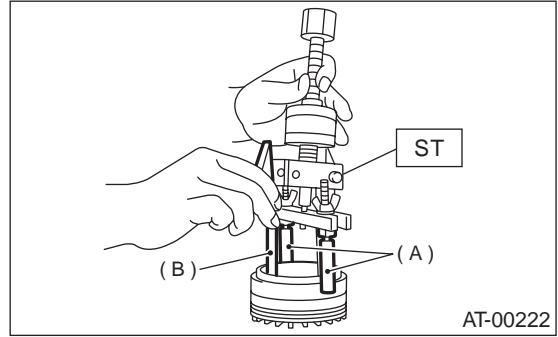
ST 398527700 PULLER ASSY



- (A) Claw
- (B) Split pin
- (C) Pin

4) Securely attach two claws to outer race, set ST to side retainer.

ST 398527700 PULLER ASSY



- (A) Shaft
- (B) Claw

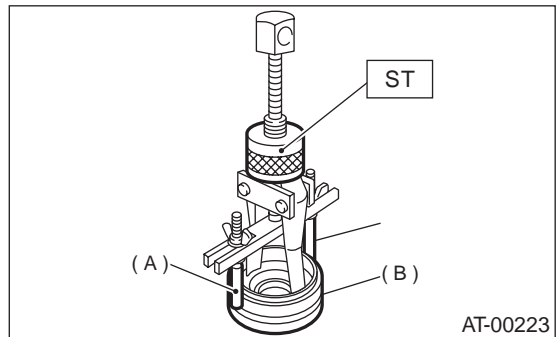
5) Return removed claw to the original position, and install pin and split pin.

6) Hold the shaft of ST to avoid removing from side retainer, and then remove the bearing outer race.

ST 398527700 PULLER ASSY

NOTE:

Replace bearing inner and outer races as a single unit.

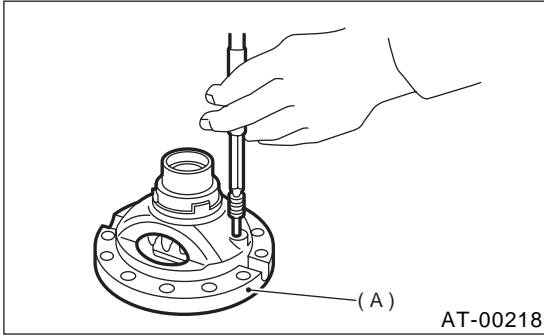


- (A) Shaft
- (B) Side retainer

D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

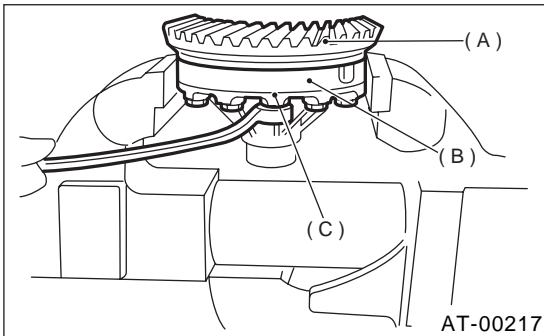
- 1) Install the washer, differential bevel gear and differential bevel pinion in the differential case (RH). Insert the pinion shaft.
- 2) Install straight pin from reverse direction.



(A) Differential case (RH)

- 3) Install the washer and differential bevel gear to the differential case (LH). Then put the case over the differential case (RH), and connect both cases.
- 4) Install the crown gear and secure by tightening the bolt.

Standard tightening torque:
62 N·m (6.3 kgf·m, 45.6 ft·lb)



- (A) Crown gear
- (B) Differential case (RH)
- (C) Differential case (LH)

- 5) Measurement of backlash (Selection of washer)
 - (1) Measure the gear backlash with ST1 and ST2, and insert ST2 through the access window of the case.

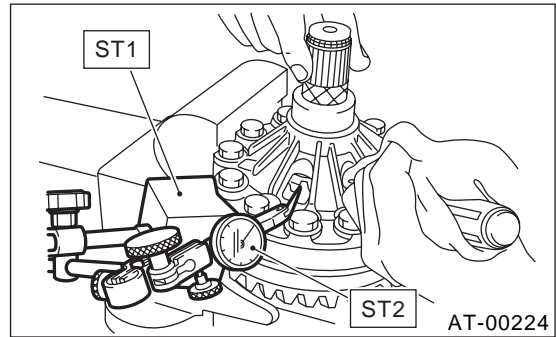
ST1 498247001 MAGNET BASE
 ST2 498247100 DIAL GAUGE

NOTE:

- Measure the backlash by applying a pinion tooth between two bevel gear teeth.
- Fix bevel pinion gear in place with a screwdriver or similar tool when measuring.

Standard value:

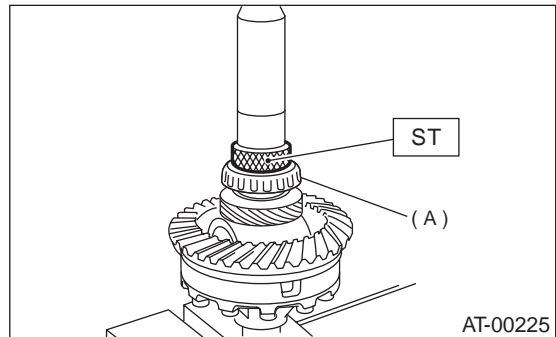
0.13 — 0.18 mm (0.0051 — 0.0071 in)



- (2) If backlash is not as specified, select a washer from the table below.

Washer	
Part No.	Thickness mm (in)
803038021	0.95 (0.037)
803038022	1.00 (0.039)
803038023	1.05 (0.041)

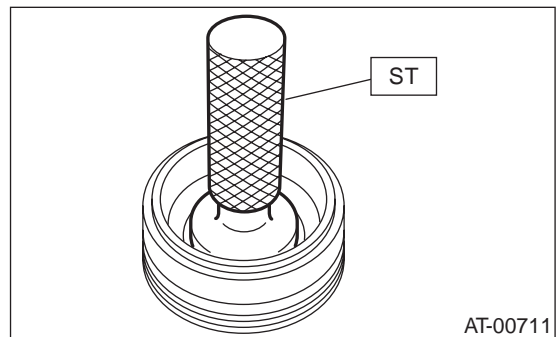
- 6) Using ST, install taper roller bearing.
 ST 398437700 DRIFT



(A) Taper roller bearing

2. SIDE RETAINER

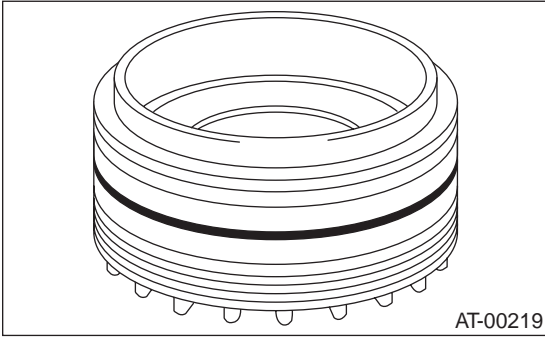
- 1) Install bearing outer race to side retainer.
- 2) Install a new oil seal using the ST and hammer.
 ST 499797000 INSTALLER



FRONT DIFFERENTIAL

AUTOMATIC TRANSMISSION

3) Install new O-ring.



E: INSPECTION

- Check each component for harmful cuts, damage and other faults.
- Measure the backlash and adjust to within specifications.

<Ref. to AT-128, ADJUSTMENT, Front Differential.>

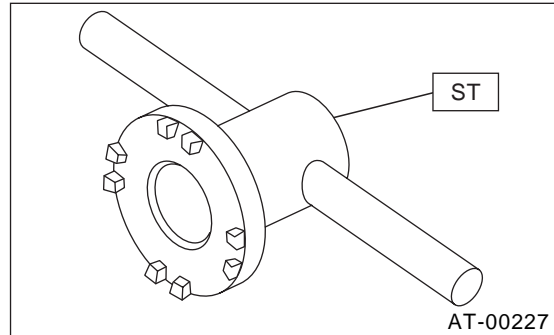
F: ADJUSTMENT

1) Using ST, screw in the retainer until light contact is felt.

NOTE:

Screw in the RH side slightly deeper than the LH side.

ST 499787000 WRENCH ASSY



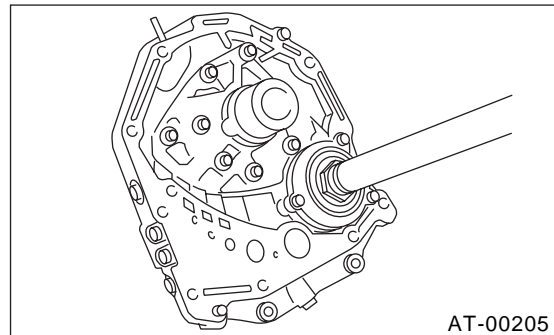
- 2) Remove the oil pump housing.
- 3) Thoroughly remove the liquid gasket from the case mating surface beforehand.
- 4) Install the oil pump housing assembly to the torque converter clutch case, and secure evenly by tightening four bolts.

NOTE:

Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.

Tightening torque:

41 N·m (4.2 kgf-m, 30.4 ft-lb)

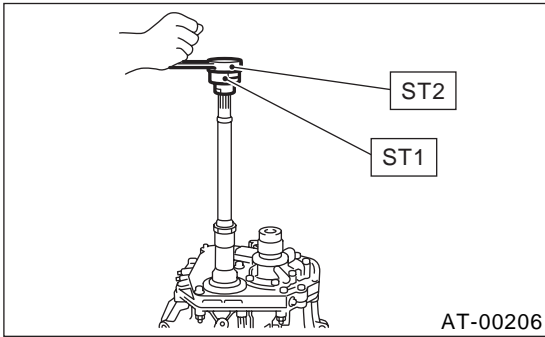


FRONT DIFFERENTIAL

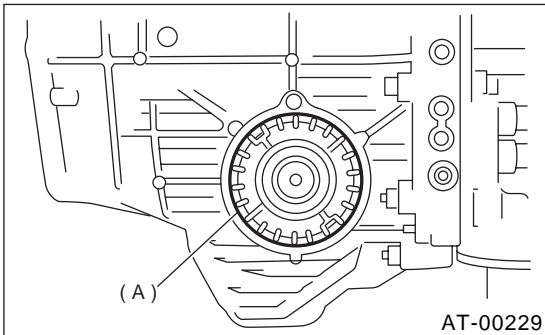
AUTOMATIC TRANSMISSION

5) Rotate the drive pinion several times with ST1 and ST2.

ST1 498937110 HOLDER
ST2 499787700 WRENCH

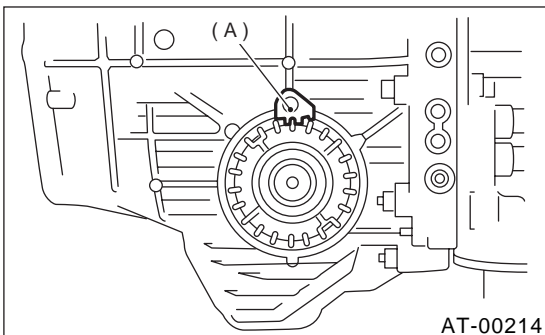


6) Tighten the LH retainer until contact is felt while rotating the shaft. Then loosen the RH retainer. Keep tightening the LH retainer and loosening the RH retainer until the pinion shaft can no longer be turned. This is the "zero" state.



(A) Retainer

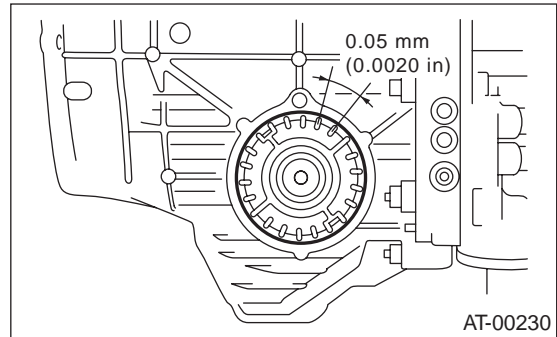
7) After the "zero" state is established, back off the LH retainer 3 notches and secure it with the lock plate. Then back off the RH retainer and retighten until it stops. Rotate drive pinion a few times. Tighten the RH retainer 1-3/4 notches further. This sets the preload. Finally, secure the retainer with its lock plate.



(A) Lock plate

NOTE:

Turning the retainer by one tooth changes the backlash about 0.05 mm (0.0020 in).

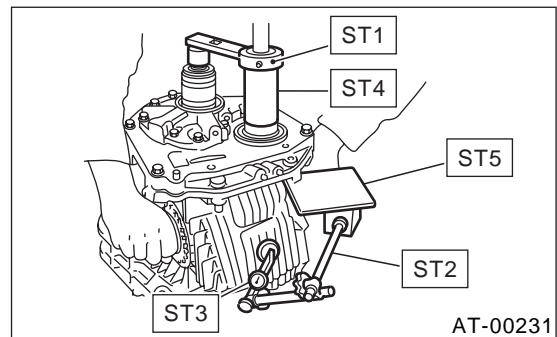


8) Turn the drive pinion several rotations with ST1 and check to see if the backlash is within the standard value with ST2, ST3, ST4 and ST5.

ST1 499787700 WRENCH
ST2 498247001 MAGNET BASE
ST3 498247100 DIAL GAUGE
ST4 499787500 ADAPTER
ST5 498255400 PLATE

Backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)



9) Adjust the tooth contact between front differential and drive shaft. <Ref. to AT-121, ADJUSTMENT, Drive Pinion Shaft.>

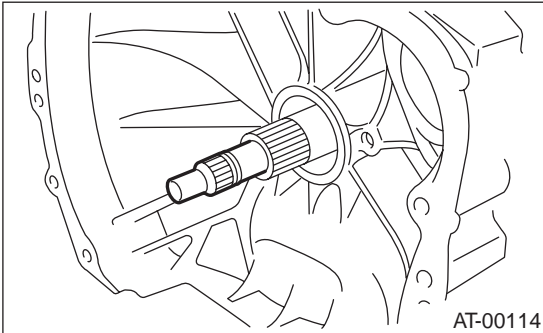
HIGH CLUTCH AND REVERSE CLUTCH

AUTOMATIC TRANSMISSION

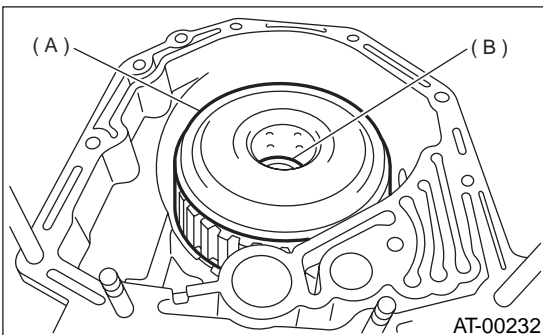
37.High Clutch and Reverse Clutch

A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.

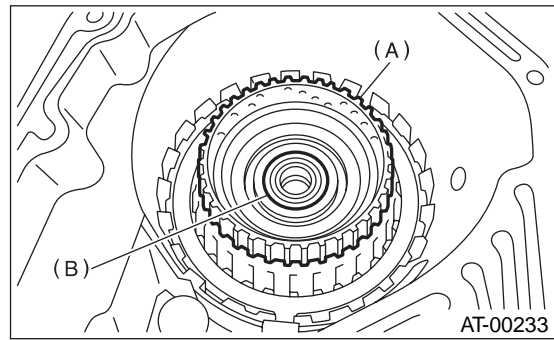


- 4) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 5) Disconnect inhibitor switch connector from stay.
- 6) Disconnect the air breather hose.
- 7) Remove the oil charger pipe. <Ref. to AT-84, REMOVAL, Oil Charger Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-78, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separation of torque converter clutch case and transmission case.<Ref. to AT-109, REMOVAL, Torque Converter Clutch Case.>
- 10) Remove the oil pump housing. <Ref. to AT-112, REMOVAL, Oil Pump.>
- 11) Take out the high clutch, thrust needle bearing and reverse clutch assembly.



- (A) High clutch and reverse clutch assembly
(B) Thrust needle bearing

- 12) Take out the high clutch hub and the thrust bearing.



- (A) High clutch hub
(B) Thrust needle bearing

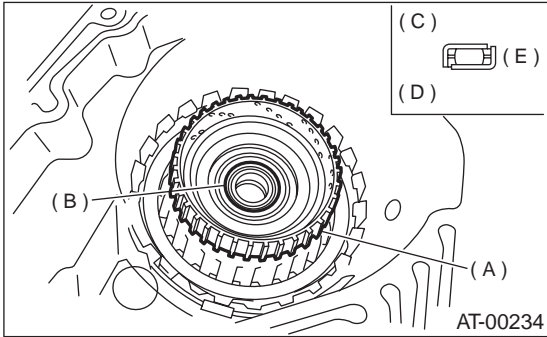
HIGH CLUTCH AND REVERSE CLUTCH

AUTOMATIC TRANSMISSION

B: INSTALLATION

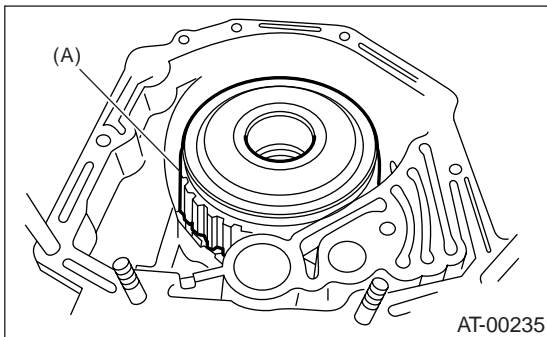
- 1) Apply vaseline to thrust needle bearing.
- 2) Install the high clutch hub and thrust needle bearing.

Attach the thrust needle bearing to the hub with vaseline and install the hub by correctly engaging the splines of the front planetary carrier.



- (A) High clutch hub
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

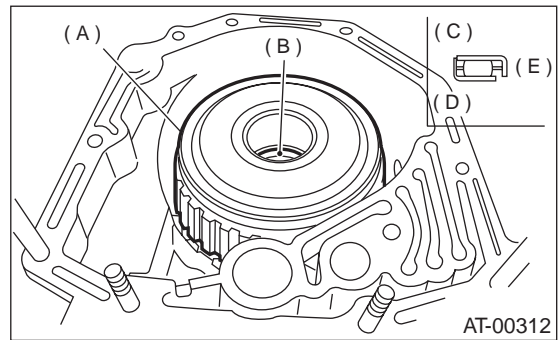
- 3) Install the high clutch assembly.



- (A) High clutch and reverse clutch assembly

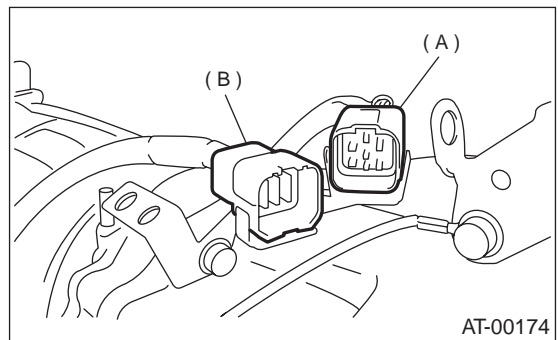
- 4) Adjust total end play. <Ref. to AT-117, ADJUSTMENT, Oil Pump.>

- 5) Install the thrust needle bearing in proper direction.



- (A) High clutch and reverse clutch ASSY
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

- 6) Install the oil pump housing assembly.
- 7) Install the torque converter clutch case assembly to the transmission case assembly. <Ref. to AT-110, INSTALLATION, Torque Converter Clutch Case.>
- 8) Insert inhibitor switch and transmission connector into stay.
- 9) Install air breather hose. <Ref. to AT-83, INSTALLATION, Air Breather Hose.>



- (A) Transmission harness
- (B) Inhibitor switch harness

- 10) Install oil cooler pipes. <Ref. to AT-80, INSTALLATION, ATF Cooler Pipe and Hose.>
- 11) Install the oil charger pipe with O-ring. <Ref. to AT-84, INSTALLATION, Oil Charger Pipe.>

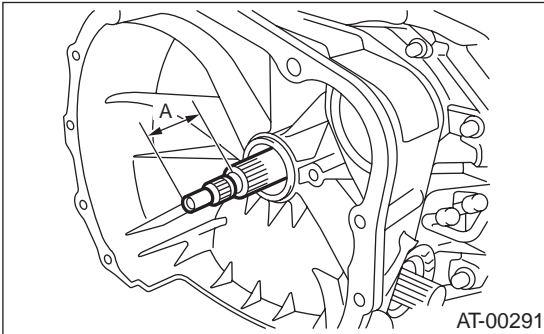
HIGH CLUTCH AND REVERSE CLUTCH

AUTOMATIC TRANSMISSION

12) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)

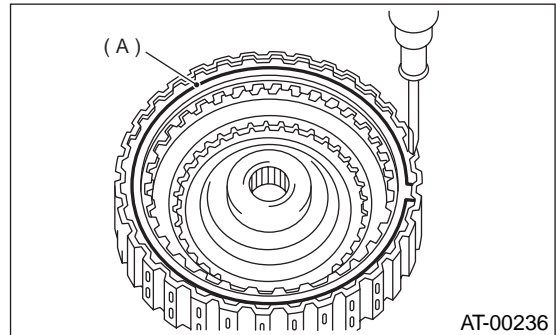


13) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>

14) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

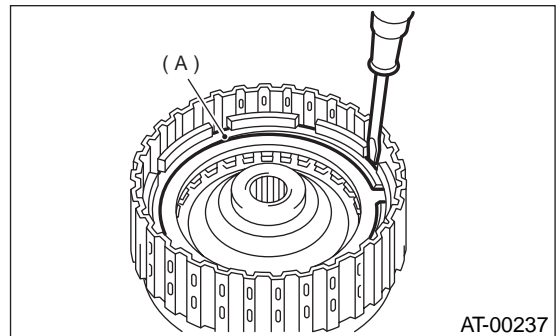
C: DISASSEMBLY

1) Remove the snap ring, and take out the retaining plate, drive plates, driven plates.



(A) Snap ring

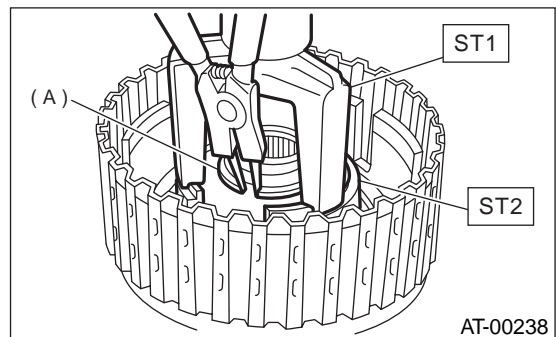
2) Remove snap ring, and take out the retaining plate, drive plates and driven plates.



(A) Snap ring

3) Using ST1 and ST2, remove snap ring.

ST1 398673600 COMPRESSOR
ST2 498627100 SEAT

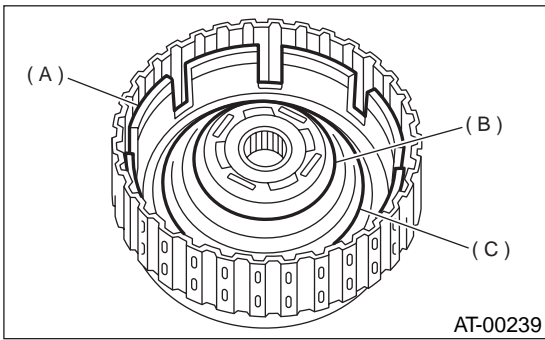


(A) Snap ring

HIGH CLUTCH AND REVERSE CLUTCH

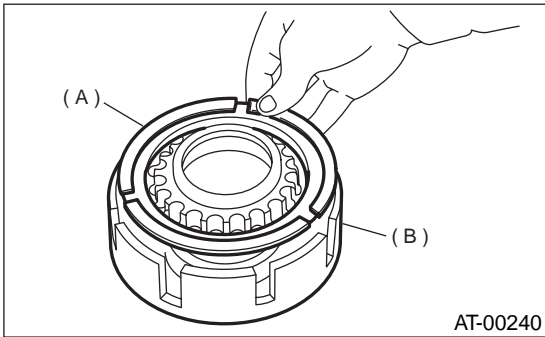
AUTOMATIC TRANSMISSION

4) Take out clutch cover, spring retainer, high clutch piston and reverse clutch piston.



- (A) Reverse clutch piston
- (B) Cover
- (C) Return spring

5) Remove seal rings and lip seal from high clutch piston and reverse clutch piston.

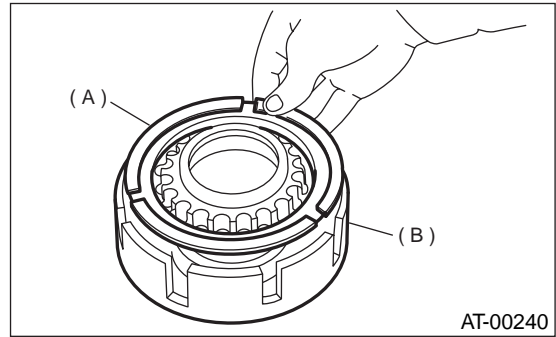


- (A) High clutch piston
- (B) Reverse clutch piston

D: ASSEMBLY

1) Install seal rings and lip seal to high clutch piston and reverse clutch piston.

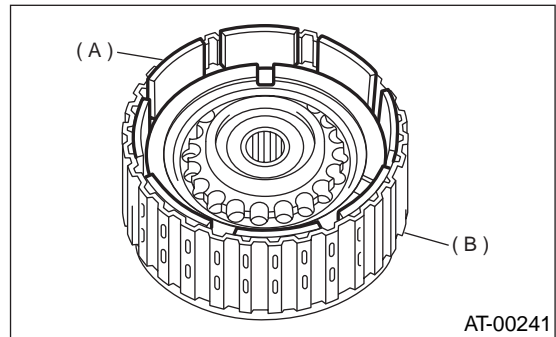
2) Install high clutch piston to reverse clutch piston.



- (A) High clutch piston
- (B) Reverse clutch piston

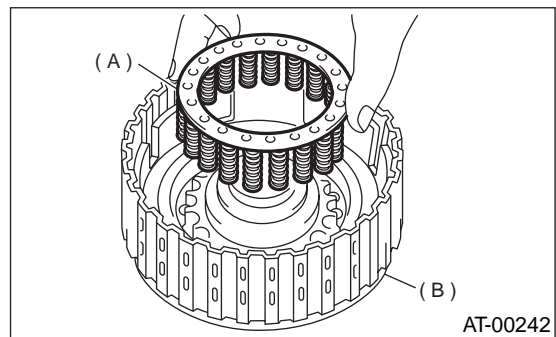
3) Install reverse clutch to high clutch drum.

Align the groove on the reverse clutch piston with the groove on the high clutch drum during installation.



- (A) Reverse clutch piston
- (B) High clutch drum

4) Install spring retainer to high clutch piston.

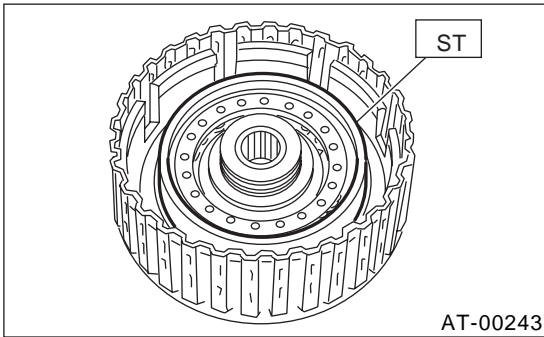


- (A) Return spring
- (B) High clutch drum

HIGH CLUTCH AND REVERSE CLUTCH

AUTOMATIC TRANSMISSION

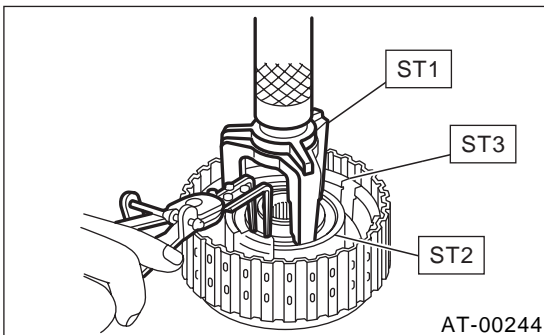
- 5) Install ST to high clutch piston.
ST 498437000 HIGH CLUTCH PISTON GAUGE



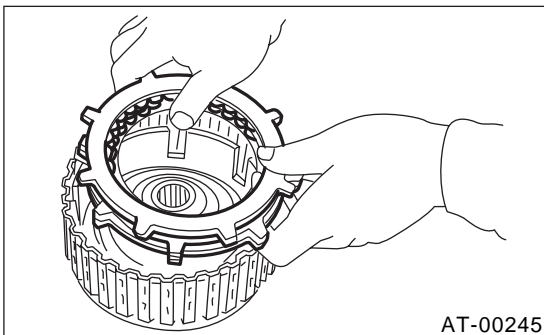
- 6) Avoid folding the high clutch piston seal, when installing the cover to high clutch piston.

- 7) Using ST1 and ST2, install snap ring.

- ST1 398673600 COMPRESSOR
ST2 498627100 SEAT
ST3 498437000 HIGH CLUTCH PISTON GAUGE

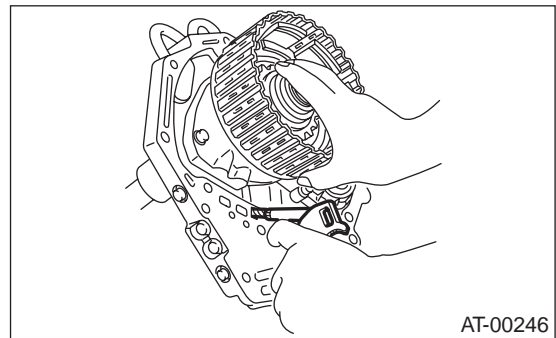


- 8) Install the thickest driven plate to piston side, and then install the driven plate, drive plate, retaining plate to high clutch drum.



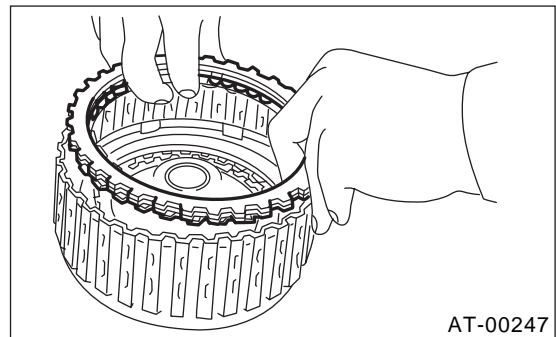
- 9) Install snap ring to high clutch drum.

- 10) Apply compressed air intermittently to check for operation.

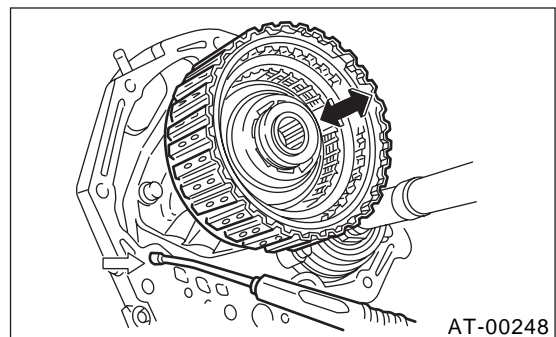


- 11) Measure the clearance between the retaining plate and snap ring.<Ref. to AT-135, INSPECTION, High Clutch and Reverse Clutch.>

- 12) Install driven plate, drive plate, retaining plate and snap ring.



- 13) Apply compressed air intermittently to check for operation.



- 14) Measure the clearance between the retaining plate and snap ring.<Ref. to AT-135, INSPECTION, High Clutch and Reverse Clutch.>

HIGH CLUTCH AND REVERSE CLUTCH

AUTOMATIC TRANSMISSION

E: INSPECTION

1) Inspect the following items.

- Drive plate facing for wear and damage
- Snap ring for wear, return spring for setting and breakage, and snap ring retainer for deformation
- Lip seal and D-ring for damage
- Piston and drum check ball for operation
- Adjust total end play. <Ref. to AT-117, ADJUSTMENT, Oil Pump.>

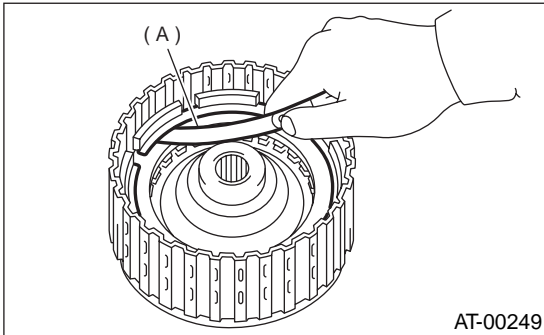
2) Inspect clearance between the retaining plate and snap ring. (High clutch) At this time, do not press down retaining plate.

Standard value:

0.8 — 1.1 mm (0.031 — 0.043 in)

Allowable limit:

1.5 mm (0.059 in)



(A) Thickness gauge

3) If specified tolerance limits are exceeded, select a suitable high clutch retaining plate.

High clutch retaining plate	
Part No.	Thickness mm (in)
31567AA710	4.7 (0.185)
31567AA720	4.8 (0.189)
31567AA730	4.9 (0.193)
31567AA740	5.0 (0.197)
31567AA670	5.1 (0.201)
31567AA680	5.2 (0.205)
31567AA690	5.3 (0.209)
31567AA700	5.4 (0.213)

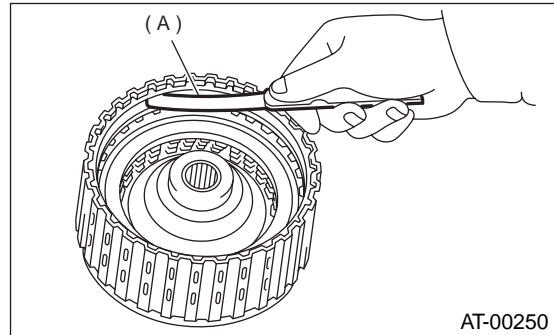
4) Inspect clearance between retaining plate and snap ring. (Reverse clutch) At this time, do not press down retaining plate.

Standard value:

0.5 — 0.8 mm (0.020 — 0.031 in)

Allowable limit:

1.2 mm (0.047 in)



(A) Thickness gauge

5) If specified tolerance limits are exceeded, select a suitable high clutch retaining plate.

Reverse clutch retaining plates	
Part No.	Thickness mm (in)
31567AA910	4.0 (0.157)
31567AA920	4.2 (0.165)
31567AA930	4.4 (0.173)
31567AA940	4.6 (0.181)
31567AA950	4.8 (0.189)
31567AA960	5.0 (0.197)
31567AA970	5.2 (0.205)
31567AA980	5.4 (0.213)

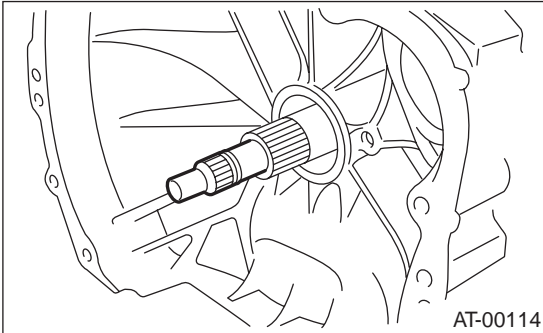
PLANETARY GEAR AND LOW CLUTCH

AUTOMATIC TRANSMISSION

38. Planetary Gear and Low Clutch

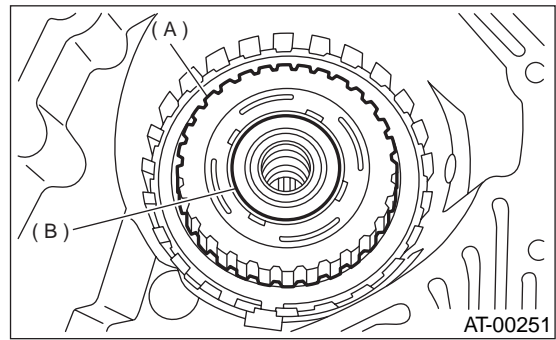
A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Disconnect the air breather hose. <Ref. to AT-83, REMOVAL, Air Breather Hose.>
- 5) Lift-up lever behind the transmission harness connector and disconnect from stay.
- 6) Disconnect inhibitor switch connector from stay.
- 7) Remove the oil charger pipe, and remove the O-ring from the flange face. Attach the O-ring to the pipe. <Ref. to AT-84, REMOVAL, Oil Charger Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-78, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to AT-86, REMOVAL, Extension Case.>
- 10) Remove reduction driven gear. <Ref. to AT-101, REMOVAL, Reduction Driven Gear.>
- 11) Separation of torque converter clutch case and transmission case. <Ref. to AT-109, REMOVAL, Torque Converter Clutch Case.>
- 12) Remove the oil pump housing. <Ref. to AT-112, REMOVAL, Oil Pump.>
- 13) Take out the high clutch and reverse clutch assembly. <Ref. to AT-130, REMOVAL, High Clutch and Reverse Clutch.>

- 14) Take out the front sun gear and the thrust bearing.

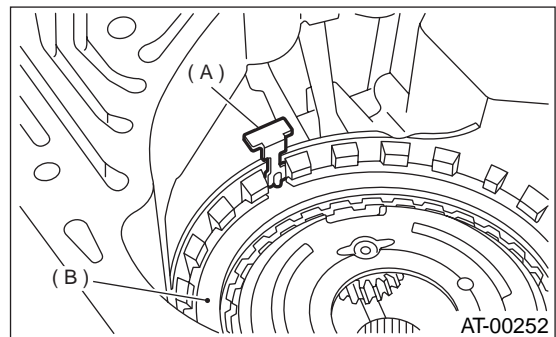


- (A) Front sun gear
(B) Thrust needle bearing

- 15) Pull out leaf spring without folding.

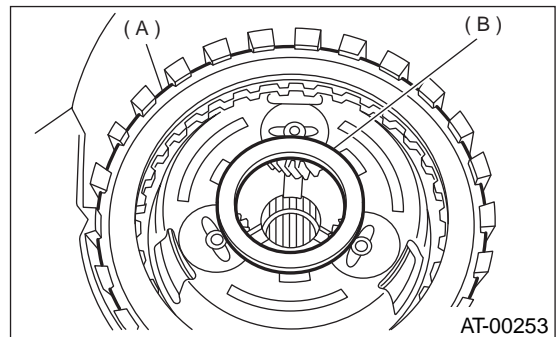
NOTE:

Remove it while pressing down on lower leaf spring.



- (A) Leaf spring
(B) Retaining plate

- 16) Remove snap ring and thrust needle bearing.

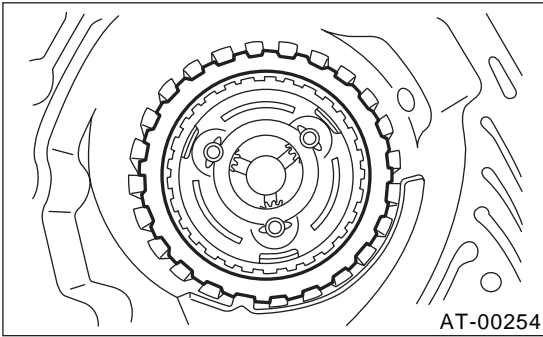


- (A) Snap ring
(B) Thrust needle bearing

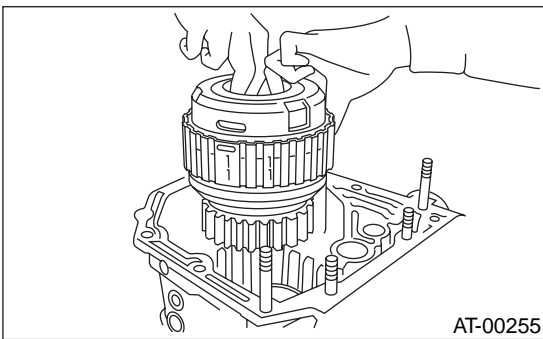
PLANETARY GEAR AND LOW CLUTCH

AUTOMATIC TRANSMISSION

17) Take out retaining plate, drive plate and driven plate of 2-4 brake.



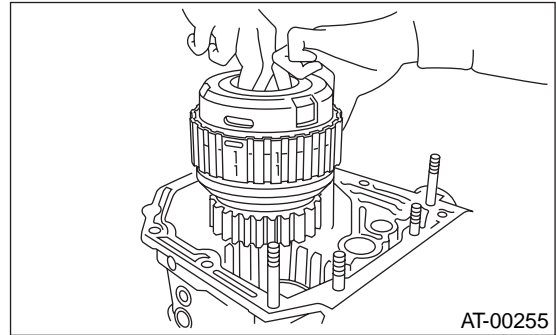
18) Take out the thrust needle bearing, planetary gear assembly and the low clutch assembly.



B: INSTALLATION

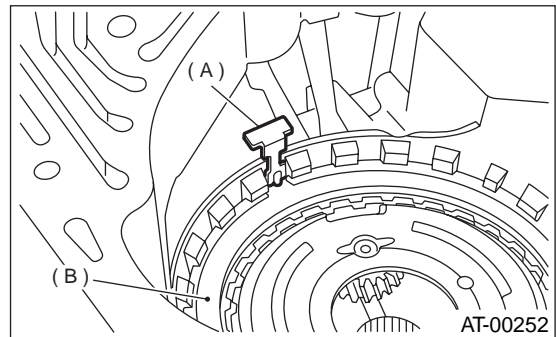
1) Install planetary gear and low clutch assembly to transmission case.

Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring.



2) Install the pressure plate, driven plate, drive plate, retaining plate and snap ring.

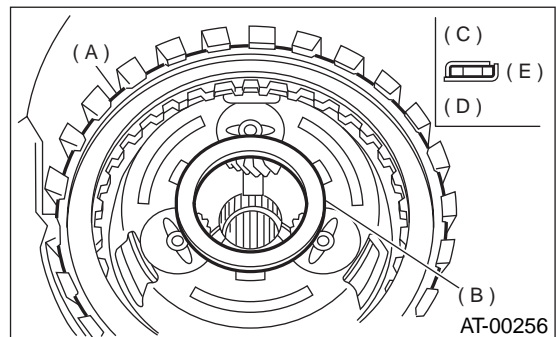
3) Be careful not to mistake the location of the leaf spring to be inserted.



(A) Leaf spring

(B) Retaining plate

4) Install thrust needle bearing in the correct direction.



(A) Snap ring

(B) Thrust needle bearing

(C) Upside

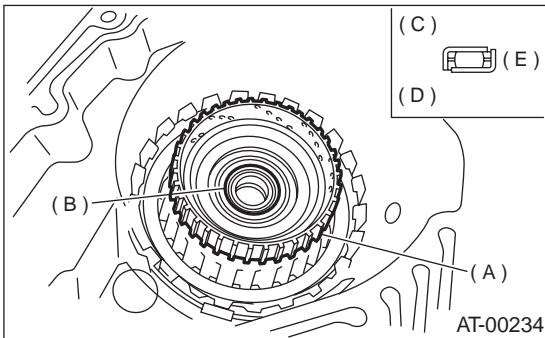
(D) Downside

(E) Outside

PLANETARY GEAR AND LOW CLUTCH

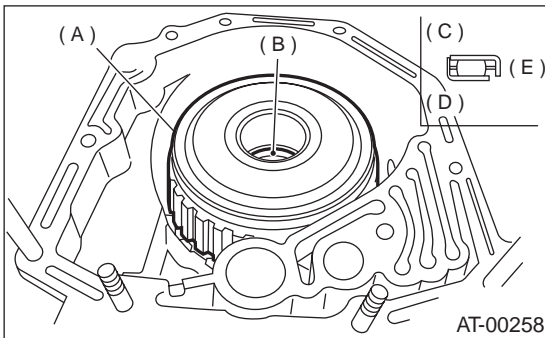
AUTOMATIC TRANSMISSION

- 5) Install front sun gear and thrust needle bearing.
- 6) Install the high clutch hub.
Attach the thrust needle bearing to the hub with vaseline and install the hub by correctly engaging the splines of the front planetary carrier.
- 7) Install the thrust needle bearing in proper direction.



- (A) High clutch hub
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

- 8) Install the high clutch assembly.
- 9) Install the thrust needle bearing in proper direction.

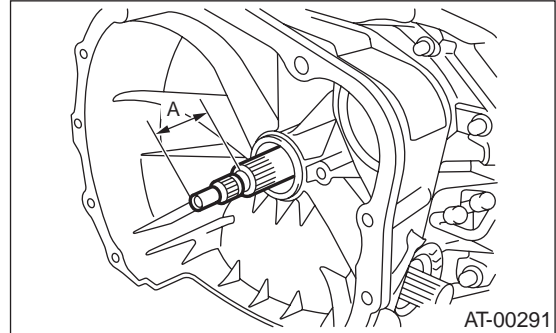


- (A) High clutch and reverse clutch assembly
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

- 10) Install oil pump housing assembly with new gasket.
- 11) Install torque converter clutch case. <Ref. to AT-110, INSTALLATION, Torque Converter Clutch Case.>
- 12) Insert inhibitor switch and transmission connector into stay.
- 13) Install air breather hose. <Ref. to AT-83, INSTALLATION, Air Breather Hose.>
- 14) Install oil cooler pipes. <Ref. to AT-80, INSTALLATION, ATF Cooler Pipe and Hose.>

- 15) Install the oil charger pipe with O-ring. <Ref. to AT-84, INSTALLATION, Oil Charger Pipe.>
- 16) Insert the input shaft while turning lightly by hand.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



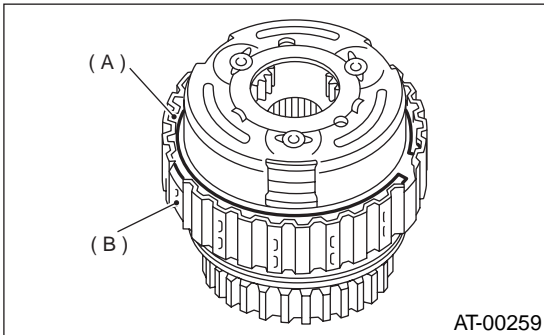
- 17) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>
- 18) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

PLANETARY GEAR AND LOW CLUTCH

AUTOMATIC TRANSMISSION

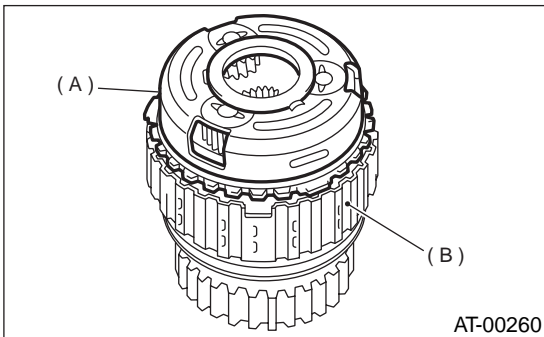
C: DISASSEMBLY

1) Remove snap ring from the low clutch drum.



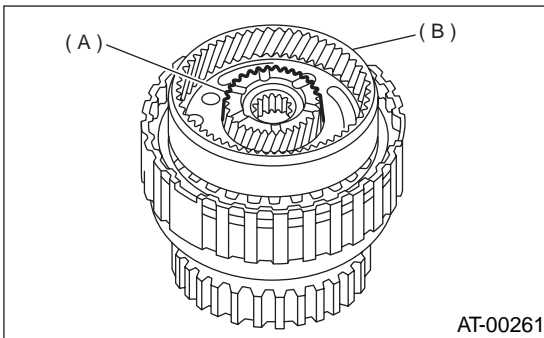
- (A) Snap ring
- (B) Low clutch drum

2) Take out front planetary carrier.



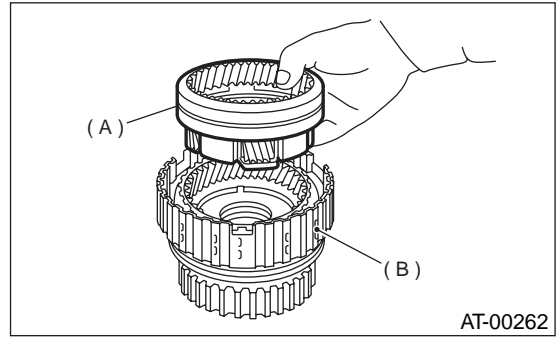
- (A) Front planetary carrier
- (B) Low clutch drum

3) Take out rear sun gear.



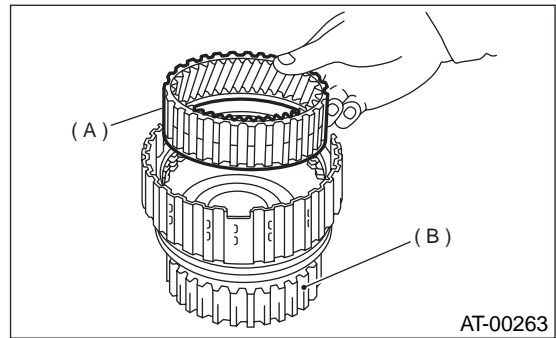
- (A) Rear sun gear
- (B) Rear planetary carrier

4) Take out rear planetary carrier, washer and thrust needle bearing.



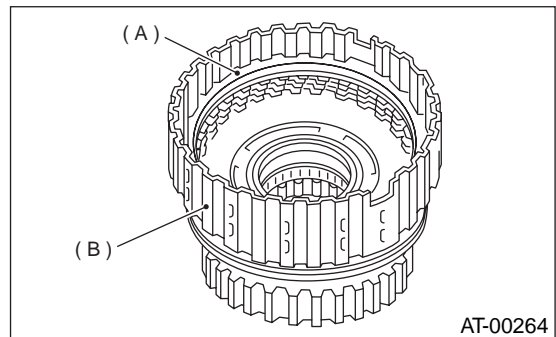
- (A) Rear planetary carrier
- (B) Low clutch drum

5) Take out rear internal gear.



- (A) Rear internal gear
- (B) Low clutch drum

6) Remove the snap ring from the low clutch drum.



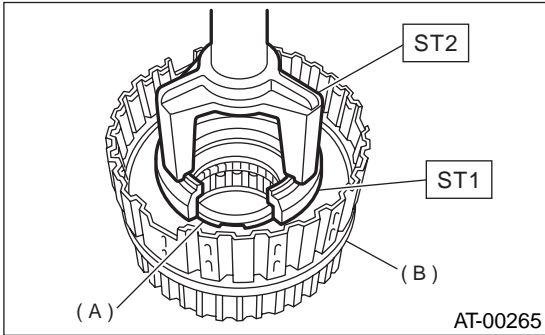
- (A) Snap ring
- (B) Low clutch drum

PLANETARY GEAR AND LOW CLUTCH

AUTOMATIC TRANSMISSION

7) Compress the spring retainer, and remove the snap ring from the low clutch drum, by using ST1 and ST2.

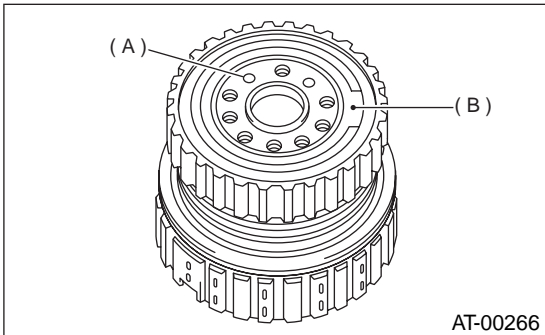
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR



- (A) Snap ring
- (B) Low clutch drum

8) Remove one-way clutch. <Ref. to AT-150, REMOVAL, One-way Clutch.>

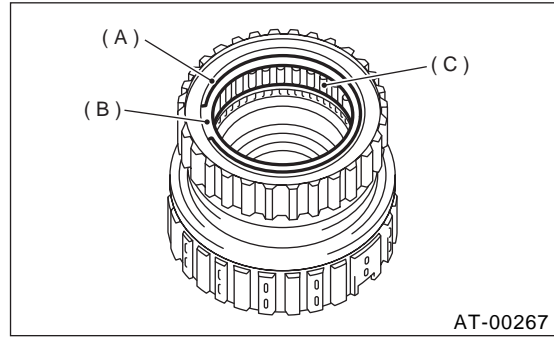
9) Install the one-way clutch inner race to the low clutch drum, and apply compressed air to remove the low clutch piston.



- (A) Apply compressed air
- (B) One-way clutch inner race

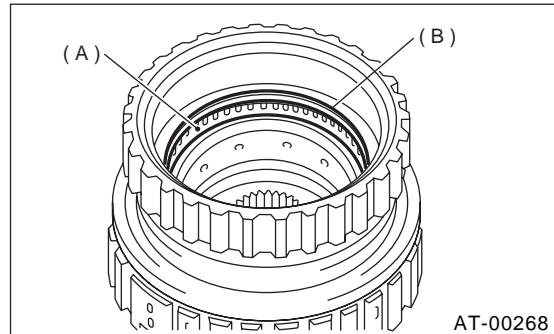
10) Remove the one-way clutch inner race.

11) Remove the one-way clutch after taking out the snap ring.



- (A) Snap ring
- (B) Plate
- (C) One-way clutch

12) Remove the needle bearing after taking out the snap ring.



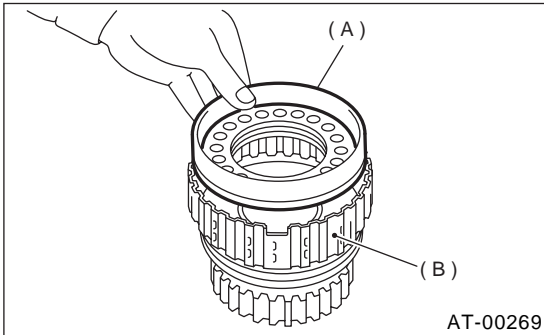
- (A) Needle bearing
- (B) Snap ring

PLANETARY GEAR AND LOW CLUTCH

AUTOMATIC TRANSMISSION

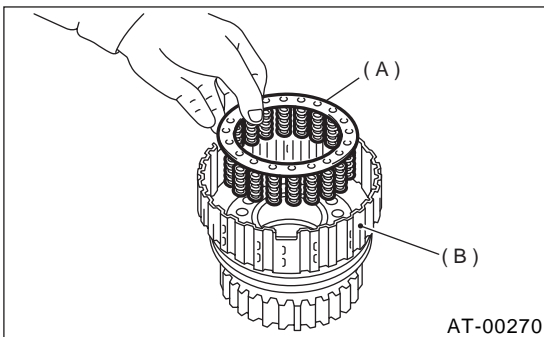
D: ASSEMBLY

- 1) Install D-ring to low clutch piston.
- 2) Fit the low clutch piston to the low clutch drum.



- (A) Low clutch piston
- (B) Low clutch drum

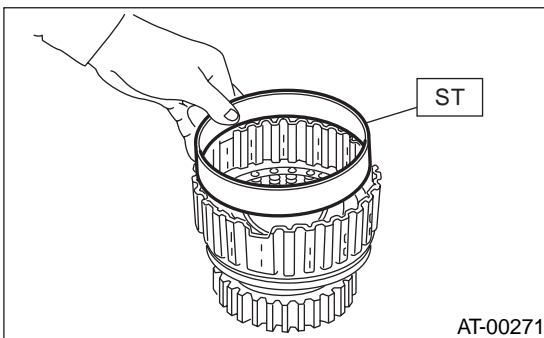
- 3) Install spring retainer to low clutch piston.



- (A) Spring retainer
- (B) Low clutch drum

- 4) Install ST to low clutch drum.

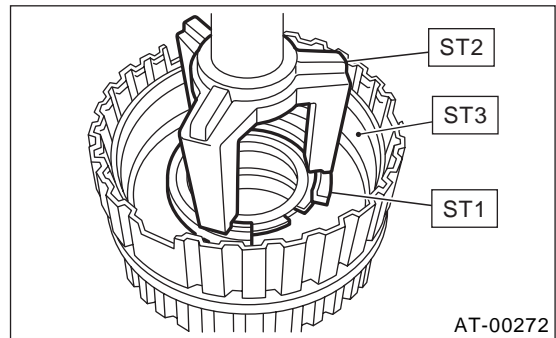
ST 498437100 LOW CLUTCH PISTON GUIDE



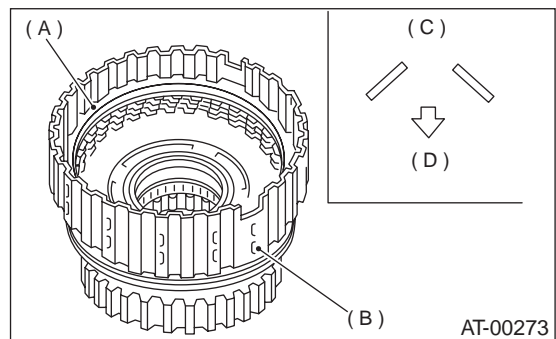
- 5) Set the cover on the piston with a press using ST1 and ST2, and attach the snap ring. At this time, be careful not to fold cover seal during installation.

ST1 498627100 SEAT
ST2 398673600 COMPRESSOR

ST3 498437100 LOW CLUTCH PISTON GUIDE



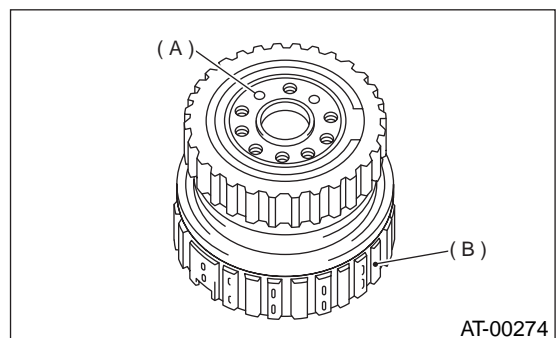
- 6) Install the dish plate, driven plates, drive plates, and retaining plate, and secure with the snap ring.



- (A) Snap ring
- (B) Low clutch drum
- (C) Dish plate
- (D) Low clutch piston side

- 7) Check the low clutch for operation.

- (1) Remove one-way clutch. <Ref. to AT-150, REMOVAL, One-way Clutch.>
- (2) Set the one-way clutch inner race, and apply compressed air for checking.



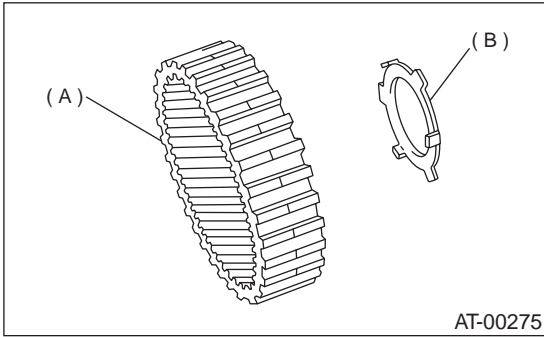
- (A) Apply compressed air
- (B) Low clutch drum

- 8) Checking low clutch clearance. <Ref. to AT-144, INSPECTION, Planetary Gear and Low Clutch.>

PLANETARY GEAR AND LOW CLUTCH

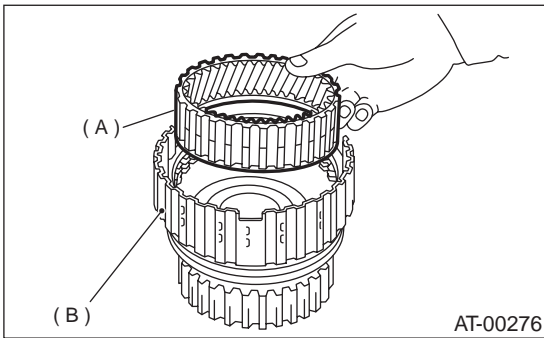
AUTOMATIC TRANSMISSION

9) Install washer to rear internal gear.



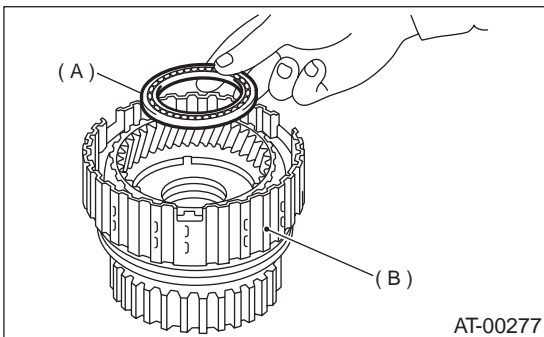
- (A) Rear internal gear
- (B) Washer

10) Install rear internal gear.



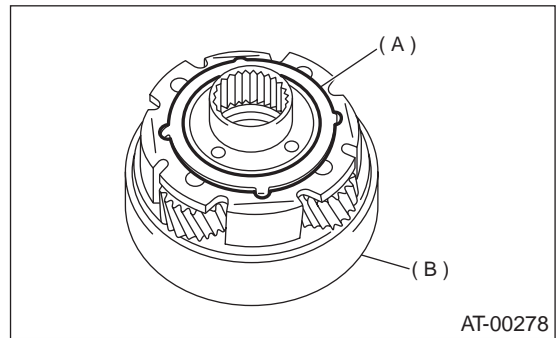
- (A) Rear internal gear
- (B) Low clutch drum

11) Install thrust needle bearing in the correct direction.



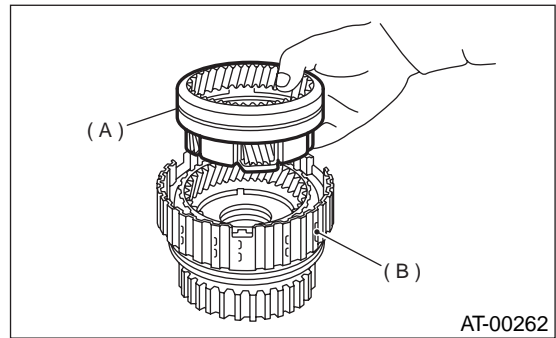
- (A) Thrust needle bearing
- (B) Low clutch drum

12) Install the washer by aligning protrusion of washer and hole of rear planetary carrier.



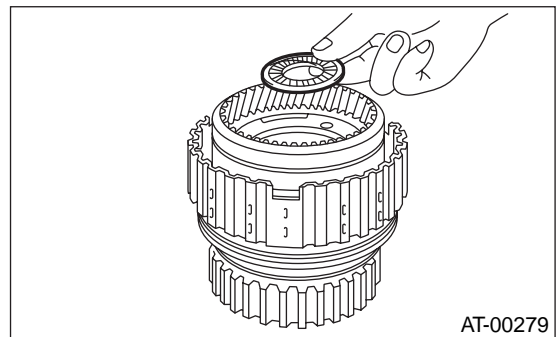
- (A) Washer
- (B) Rear planetary carrier

13) Install rear planetary carrier to low clutch drum.



- (A) Rear planetary carrier
- (B) Low clutch drum

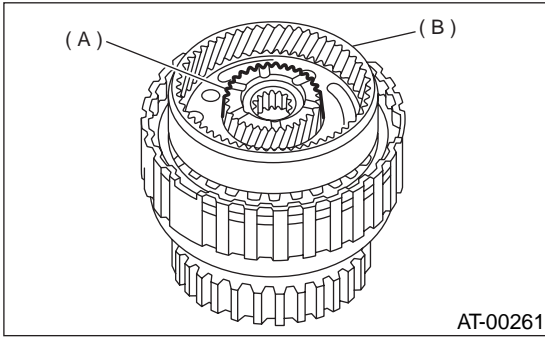
14) Install thrust needle bearing in the correct direction.



PLANETARY GEAR AND LOW CLUTCH

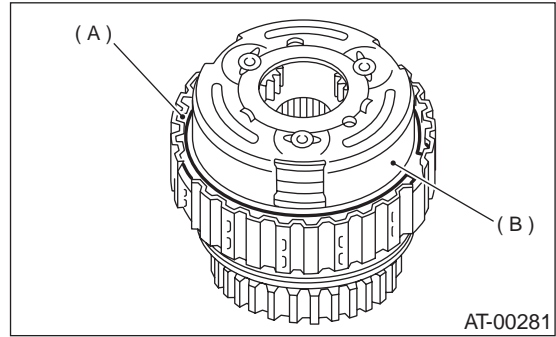
AUTOMATIC TRANSMISSION

15) Install the rear sun gear in proper direction.



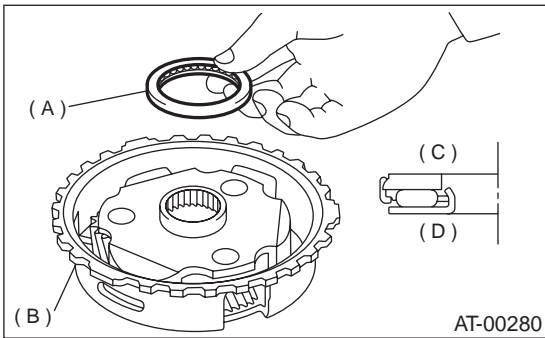
- (A) Rear sun gear
- (B) Rear planetary carrier

18) Install snap ring to low clutch drum.



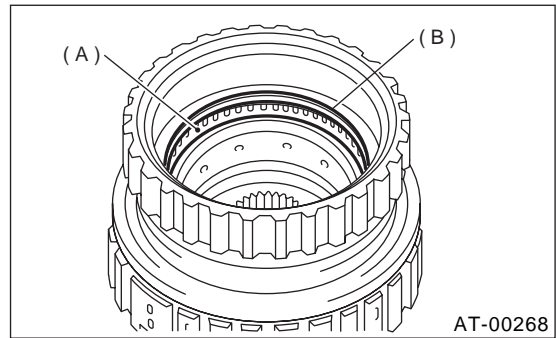
- (A) Snap ring
- (B) Front planetary carrier

16) Install the thrust needle bearing in proper direction.



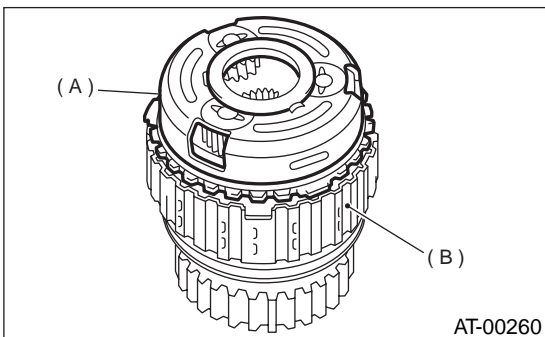
- (A) Thrust needle bearing
- (B) Front planetary carrier
- (C) Rear sun gear side
- (D) Front planetary carrier side

19) Install the needle bearing, and secure with the snap ring.



- (A) Needle bearing
- (B) Snap ring

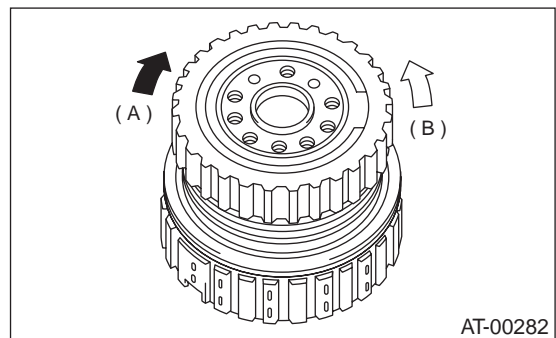
17) Install front planetary carrier to low clutch drum.



- (A) Front planetary carrier
- (B) Low clutch drum

20) Install the one-way clutch, one-way clutch inner race and plate, and secure with the snap ring.

21) Set the inner race. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.



- (A) Locked
- (B) Free

PLANETARY GEAR AND LOW CLUTCH

AUTOMATIC TRANSMISSION

E: INSPECTION

1) Inspect the following items.

- Drive plate facing for wear and damage
- Snap ring for wear, return spring for breakage or setting, and spring retainer for deformation
- Lip seal and D-ring for damage
- Piston check ball for operation
- Measure the total end play and adjust to within specifications.

<Ref. to AT-117, ADJUSTMENT, Oil Pump.>

2) Place the same thickness of shim on both sides to prevent retaining plate from tilting.

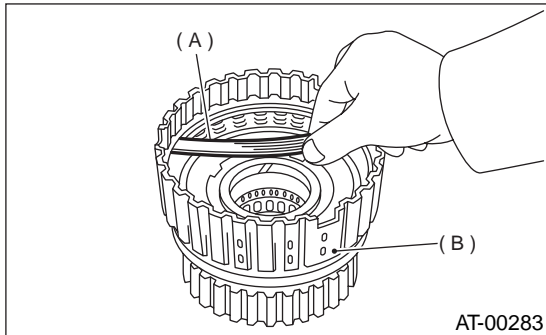
3) Inspect clearance between retaining plate and operation of the low clutch.

Standard value:

0.7 — 1.1 mm (0.028 — 0.043 in)

Allowable limit:

1.6 mm (0.063 in)



(A) Thickness gauge

(B) Low clutch drum

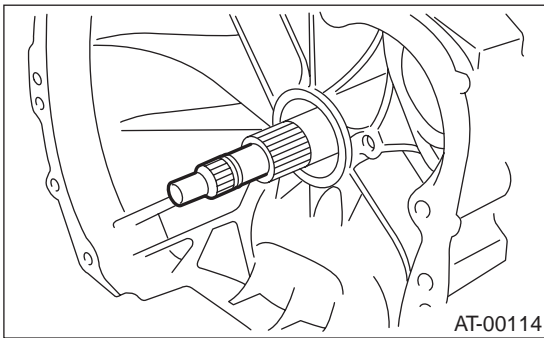
4) If the clearance is out of the specified range, select a proper retaining plate so that the standard clearance can be obtained.

Available retaining plates	
Part No.	Thickness mm (in)
31567AA830	3.8 (0.150)
31567AA840	4.0 (0.157)
31567AA850	4.2 (0.165)
31567AA860	4.4 (0.173)
31567AA870	4.6 (0.181)

39.2-4 Brake

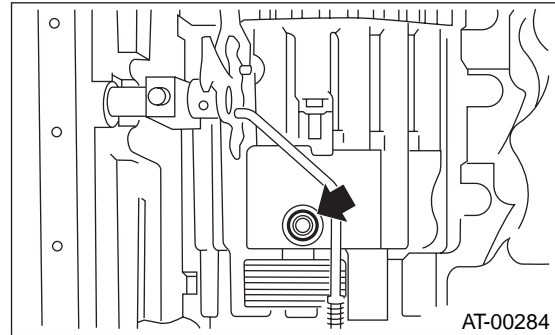
A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.

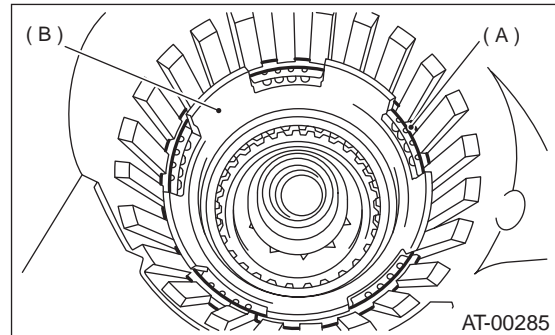


- 4) Disconnect the air breather hose. <Ref. to AT-83, REMOVAL, Air Breather Hose.>
- 5) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 6) Disconnect inhibitor switch connector from stay.
- 7) Remove the oil charger pipe. <Ref. to AT-84, REMOVAL, Oil Charger Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes with washers. <Ref. to AT-78, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to AT-86, REMOVAL, Extension Case.>
- 10) Remove the reduction drive gear. (MPT model) <Ref. to AT-104, REMOVAL, Reduction Drive Gear.>
- 11) Remove the center differential carrier. (VTD model) <Ref. to AT-106, REMOVAL, Center Differential Carrier.>
- 12) Remove reduction driven gear. <Ref. to AT-101, REMOVAL, Reduction Driven Gear.>
- 13) Separation of torque converter clutch case and transmission case. <Ref. to AT-109, REMOVAL, Torque Converter Clutch Case.>
- 14) Remove the oil pan and control valve body. <Ref. to AT-60, REMOVAL, Control Valve Body.>
- 15) Remove the oil pump housing. <Ref. to AT-112, REMOVAL, Oil Pump.>

- 16) Remove 2-4 brake seal.

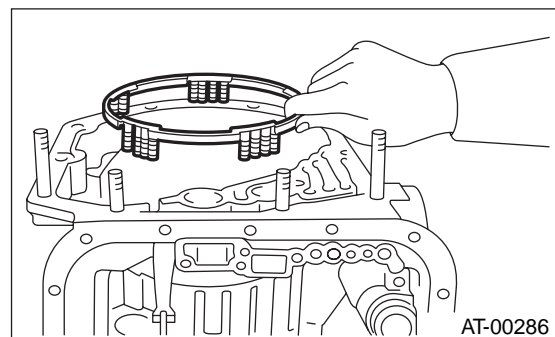


- 17) Take out the high clutch and reverse clutch assembly. <Ref. to AT-130, REMOVAL, High Clutch and Reverse Clutch.>
- 18) Take out the thrust needle bearing, planetary gear assembly and the low clutch assembly. <Ref. to AT-136, REMOVAL, Planetary Gear and Low Clutch.>
- 19) Remove snap ring.



- (A) Snap ring
- (B) 2-4 brake piston

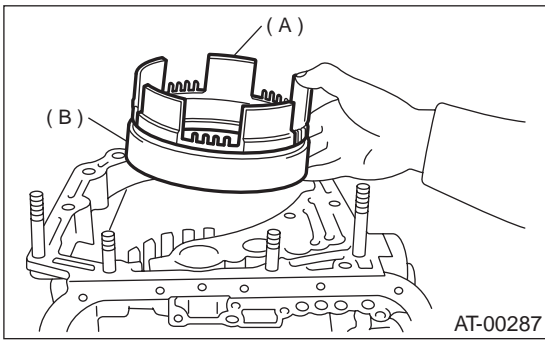
- 20) Take out 2-4 brake return spring.



2-4 BRAKE

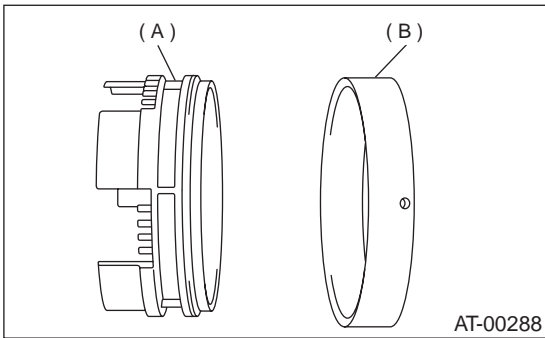
AUTOMATIC TRANSMISSION

21) Remove the 2-4 brake piston and piston retainer without damaging.



- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

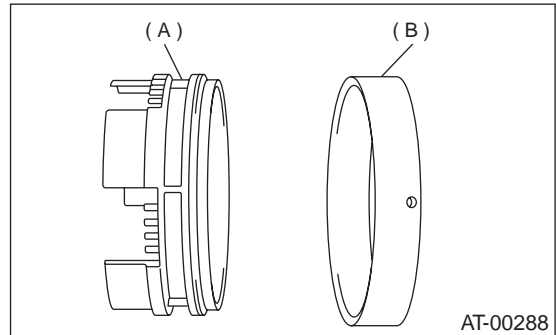
22) Separate 2-4 brake piston and piston retainer.



- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

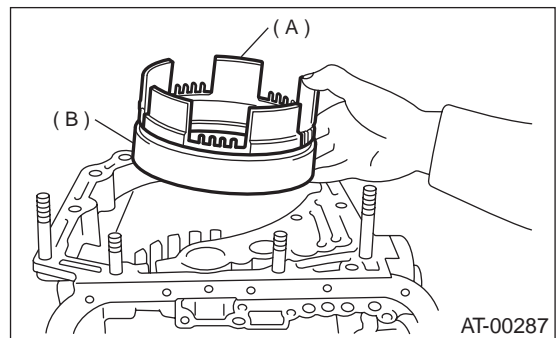
B: INSTALLATION

1) Install 2-4 brake piston to 2-4 brake piston retainer.



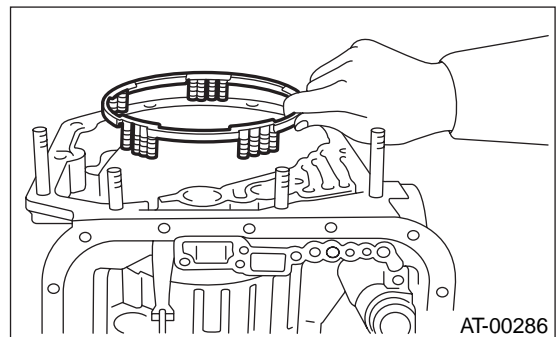
- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

2) Install the 2-4 brake piston and 2-4 brake retainer by aligning hole of 2-4 brake retainer and hole of transmission case.



- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

3) Install 2-4 brake piston return spring to transmission case.

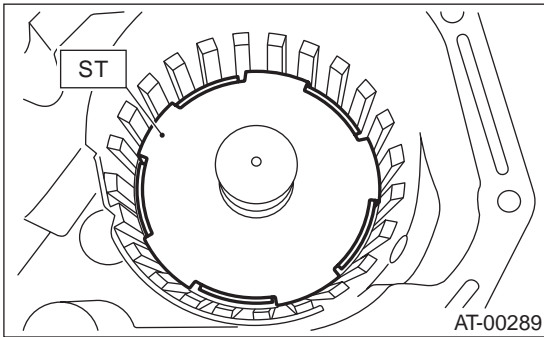


2-4 BRAKE

AUTOMATIC TRANSMISSION

4) Position snap ring in transmission. Using ST, press the snap ring into place.

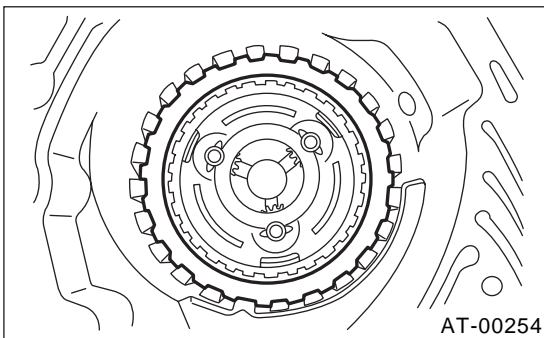
ST 498677100 COMPRESSOR



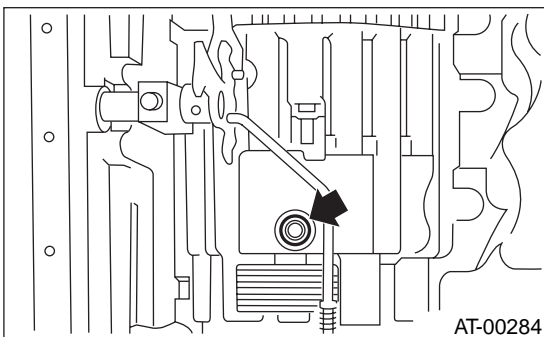
5) Install planetary gear and low clutch assembly to transmission case.

Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring. <Ref. to AT-137, INSTALLATION, Planetary Gear and Low Clutch.>

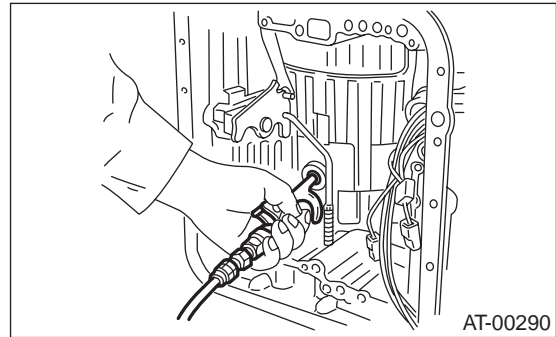
6) Install pressure plate, drive plate, driven plate, retaining plate and snap ring.



7) Install a new 2-4 brake oil seal to transmission case.

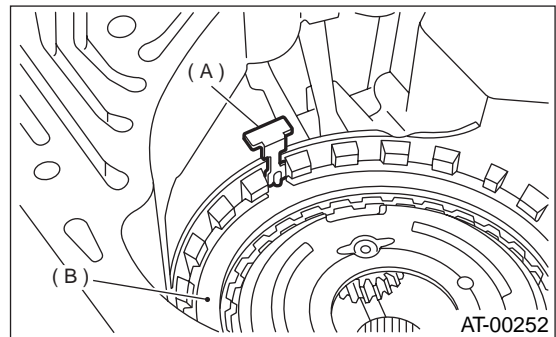


8) After all 2-4 brake component parts have been installed, blow in air intermittently and confirm the operation of the brake.



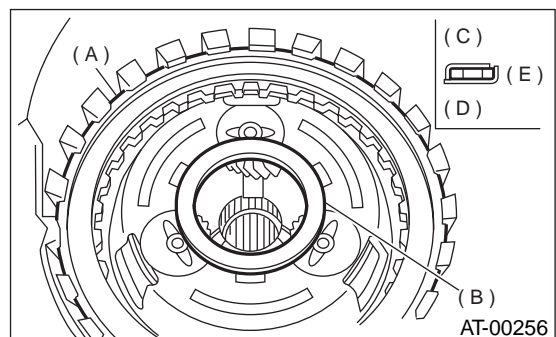
9) Check the clearance between the retaining plate and the snap ring. <Ref. to AT-149, INSPECTION, 2-4 Brake.>

10) Be careful not to mistake the location of the leaf spring to be inserted.



- (A) Leaf spring
- (B) Retaining plate

11) Install thrust needle bearing in the correct direction.



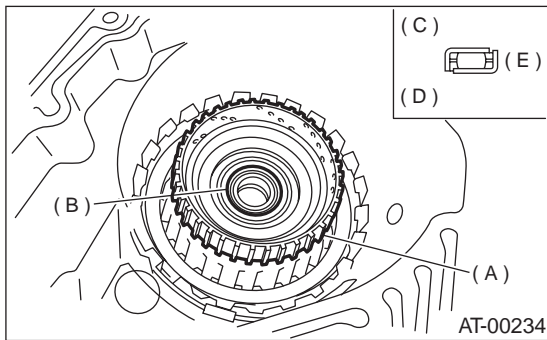
- (A) Snap ring
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside

12) Install front sun gear.

2-4 BRAKE

AUTOMATIC TRANSMISSION

13) Install thrust needle bearing in the correct direction.



- (A) High clutch hub
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

14) Install the high clutch assembly. <Ref. to AT-131, INSTALLATION, High Clutch and Reverse Clutch.>

15) Install oil pump housing to transmission case. <Ref. to AT-113, INSTALLATION, Oil Pump.>

16) Install the control valve body and oil pan. <Ref. to AT-61, INSTALLATION, Control Valve Body.>

17) Install the torque converter clutch case assembly to the transmission case assembly. <Ref. to AT-110, INSTALLATION, Torque Converter Clutch Case.>

18) Install the reduction driven gear. <Ref. to AT-102, INSTALLATION, Reduction Driven Gear.>

19) Install the reduction drive gear. (MPT model) <Ref. to AT-104, INSTALLATION, Reduction Drive Gear.>

20) Install the center differential carrier. (VTD model) <Ref. to AT-106, INSTALLATION, Center Differential Carrier.>

21) Insert inhibitor switch and transmission connector into stay.

22) Install air breather hose. <Ref. to AT-83, INSTALLATION, Air Breather Hose.>

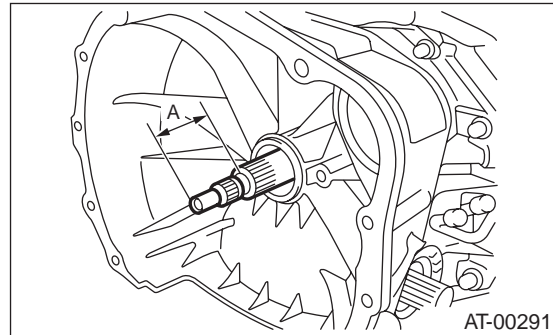
23) Install the oil cooler pipes. <Ref. to AT-80, INSTALLATION, ATF Cooler Pipe and Hose.>

24) Install the oil charger pipe with O-ring. <Ref. to AT-84, INSTALLATION, Oil Charger Pipe.>

25) Insert the input shaft while turning lightly by hand.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



26) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>

27) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

- Drive plate facing for wear and damage
- Snap ring for wear and spring retainer for deformation
- Lip seal and D-ring for damage
- Measure the total end play and adjust to within specifications.<Ref. to AT-117, ADJUSTMENT, Oil Pump.>

1) Inspect the clearance between the retaining plate and the snap ring.

NOTE:

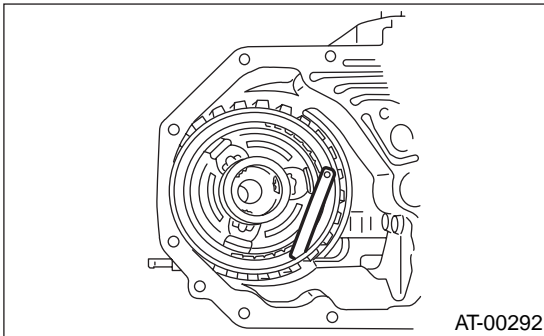
Select a retaining plate with a suitable value from the following table, so that the clearance becomes the standard value.

Standard value:

0.8 — 1.2 mm (0.031 — 0.047 in)

Allowable limit:

1.5 mm (0.059 in)



Available retaining plates	
Part No.	Thickness mm (in)
31567AA612	5.6 (0.220)
31567AA622	5.8 (0.228)
31567AA632	6.0 (0.236)
31567AA642	6.2 (0.244)
31567AA652	6.4 (0.252)
31567AA662	6.6 (0.260)

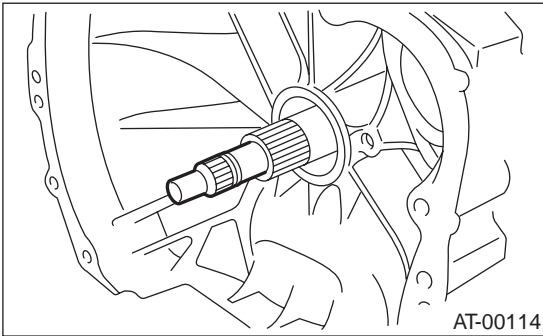
ONE-WAY CLUTCH

AUTOMATIC TRANSMISSION

40. One-way Clutch

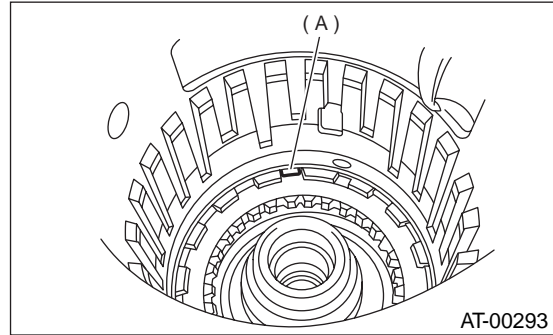
A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



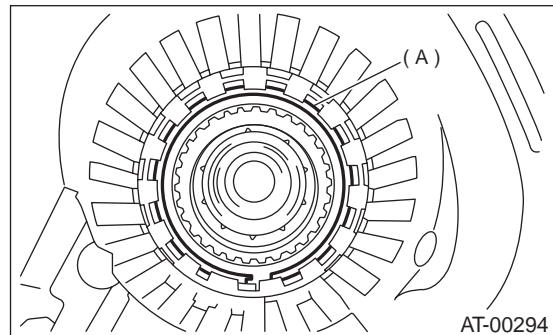
- 4) Disconnect the air breather hose. <Ref. to AT-83, REMOVAL, Air Breather Hose.>
- 5) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 6) Disconnect inhibitor switch connector from stay.
- 7) Remove the oil charger pipe. <Ref. to AT-84, REMOVAL, Oil Charger Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-78, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separation of torque converter clutch case and transmission case. <Ref. to AT-109, REMOVAL, Torque Converter Clutch Case.>
- 10) Separate transmission case and extension case sections. <Ref. to AT-86, REMOVAL, Extension Case.>
- 11) Remove the reduction driven gear. <Ref. to AT-101, REMOVAL, Reduction Driven Gear.>
- 12) Remove the reduction drive gear. (MPT model) <Ref. to AT-101, REMOVAL, Reduction Driven Gear.>
- 13) Remove the center differential carrier. (VTD model) <Ref. to AT-106, REMOVAL, Center Differential Carrier.>
- 14) Remove control valve assembly. <Ref. to AT-60, REMOVAL, Control Valve Body.>
- 15) Remove the oil pump housing. <Ref. to AT-112, REMOVAL, Oil Pump.>
- 16) Take out the high clutch and reverse clutch assembly. <Ref. to AT-130, REMOVAL, High Clutch and Reverse Clutch.>
- 17) Take out the thrust needle bearing, planetary gear assembly. <Ref. to AT-136, REMOVAL, Planetary Gear and Low Clutch.>

- 18) Take out 2-4 brake return spring, piston and piston retainer. <Ref. to AT-145, REMOVAL, 2-4 Brake.>
- 19) Pull out the leaf spring without folding.



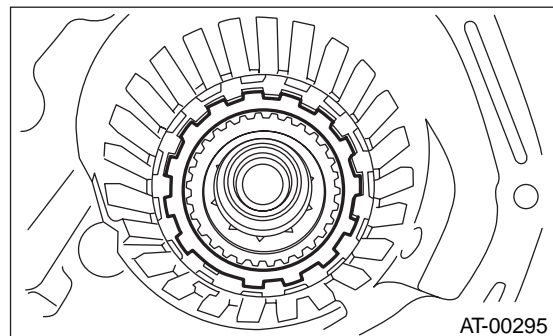
(A) Leaf spring

- 20) Remove snap ring.

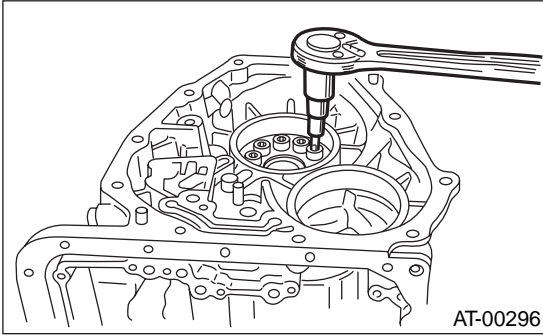


(A) Snap ring

- 21) Take out retaining plate, drive plate, driven plate and dish plate.



22) Turn the transmission case upside down, and then take out the socket bolts while holding the one-way clutch inner race with hand.

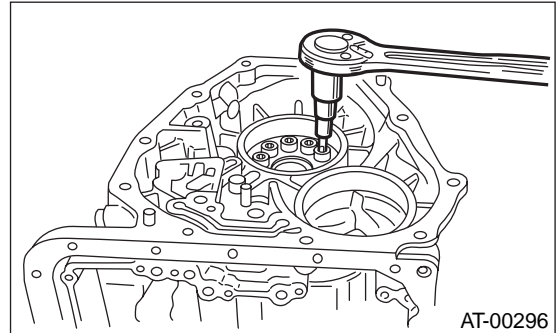


B: INSTALLATION

- 1) Install the one-way clutch inner race, spring retainer and return spring.
- 2) Tighten socket head bolts evenly from the rear side of the transmission case.

Tightening torque:

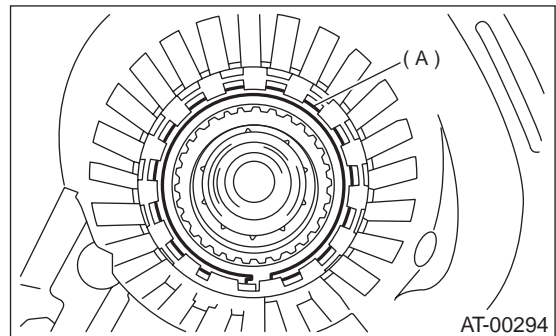
25 N·m (2.5 kgf·m, 18.1 ft·lb)



- 3) Place transmission case with the front facing up.
- 4) Install thrust needle bearing.
- 5) Installation of the low & reverse brake: Install dish plate, driven plates, drive plates, and a retaining plate, and secure with a snap ring.

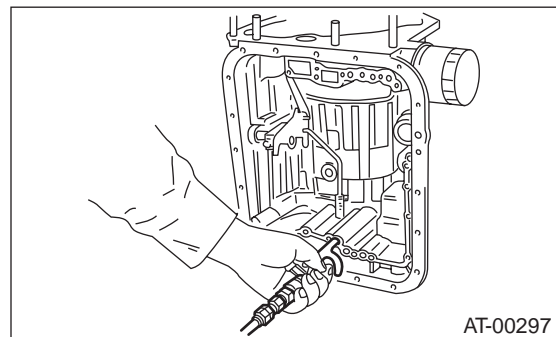
NOTE:

Pay attention to the orientation of the dish plate.



(A) Snap ring

- 6) Apply compressed air intermittently to check for operation.



- 7) Check the clearance and select retaining plate.
<Ref. to AT-157, INSPECTION, Low and Reverse Brake.>

ONE-WAY CLUTCH

AUTOMATIC TRANSMISSION

8) Install 2-4 brake. <Ref. to AT-146, INSTALLATION, 2-4 Brake.>

9) Install planetary gear and low clutch assembly to transmission case.

Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring. <Ref. to AT-137, INSTALLATION, Planetary Gear and Low Clutch.>

10) Install the high clutch assembly. <Ref. to AT-131, INSTALLATION, High Clutch and Reverse Clutch.>

11) Install the oil pump housing assembly. <Ref. to AT-113, INSTALLATION, Oil Pump.>

12) Install control valve assembly and oil pan. <Ref. to AT-61, INSTALLATION, Control Valve Body.>

13) Install the torque converter clutch case assembly. <Ref. to AT-110, INSTALLATION, Torque Converter Clutch Case.>

14) Install reduction driven gear. <Ref. to AT-102, INSTALLATION, Reduction Driven Gear.>

15) Install reduction drive gear. (MPT model)

16) Install the center differential carrier. (VTD model) <Ref. to AT-106, INSTALLATION, Center Differential Carrier.>

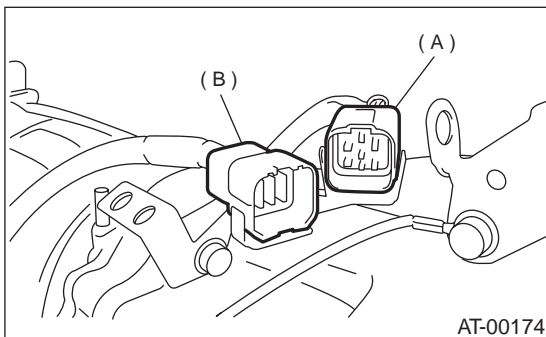
17) Install the extension case to the transmission case. <Ref. to AT-86, INSTALLATION, Extension Case.>

18) Install the rear vehicle speed sensor.

Tightening torque:

7 N·m (0.7 kgf-m, 5.1 ft-lb)

19) Insert inhibitor switch and transmission connector into stay.



(A) Transmission harness

(B) Inhibitor switch harness

20) Install air breather hose. <Ref. to AT-83, INSTALLATION, Air Breather Hose.>

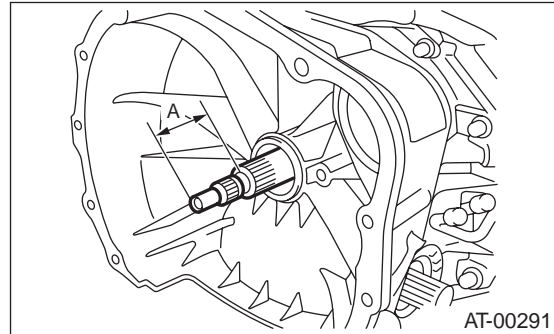
21) Install the oil cooler pipes. <Ref. to AT-80, INSTALLATION, ATF Cooler Pipe and Hose.>

22) Install the oil charger pipe with O-ring. <Ref. to AT-84, INSTALLATION, Oil Charger Pipe.>

23) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



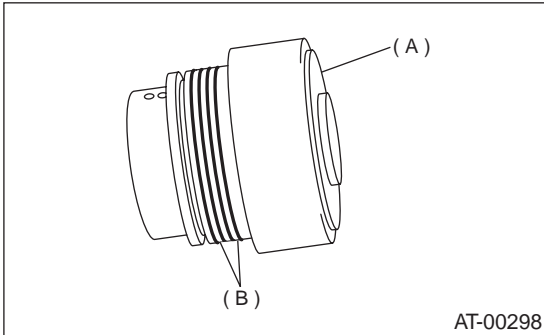
24) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>

25) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

1. ONE-WAY CLUTCH INNER RACE

1) Remove seal rings.

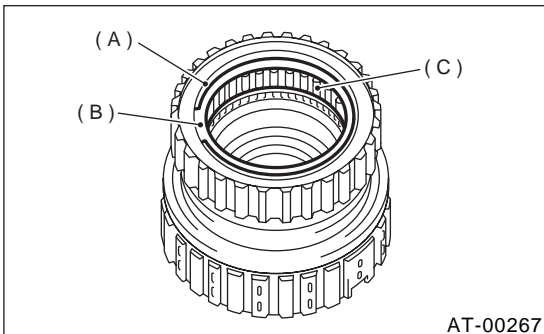


- (A) One way clutch inner race
- (B) Seal rings

2) Using ST, remove needle bearing.
ST 398527700 PULLER ASSY

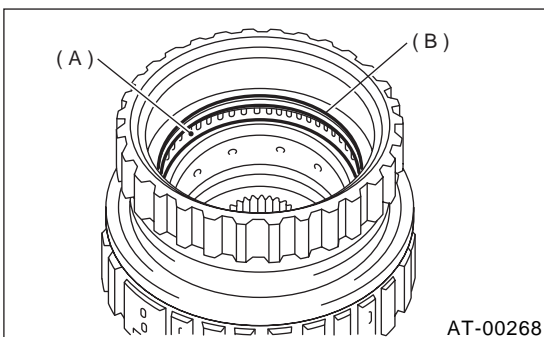
2. ONE-WAY CLUTCH OUTER RACE

1) Remove the one-way clutch after taking out the snap ring.



- (A) Snap ring
- (B) Plate
- (C) One-way clutch

2) Remove the needle bearing after taking out the snap ring.



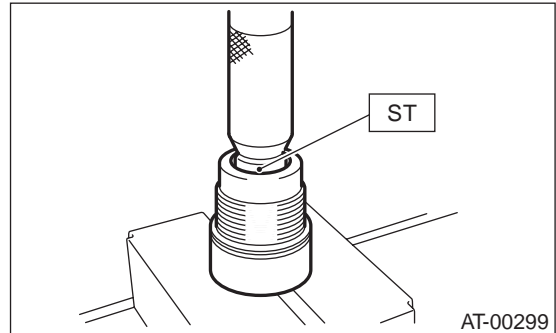
- (A) Needle bearing
- (B) Snap ring

D: ASSEMBLY

1. ONE-WAY CLUTCH INNER RACE

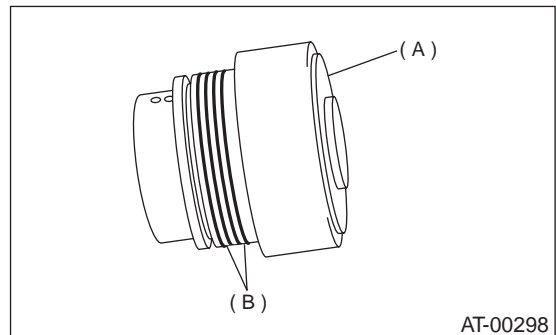
1) Using a press and ST, install the needle bearing to the inner race.

ST 398497701 ADAPTER



2) Apply vaseline to the groove of the inner race and to the seal ring.

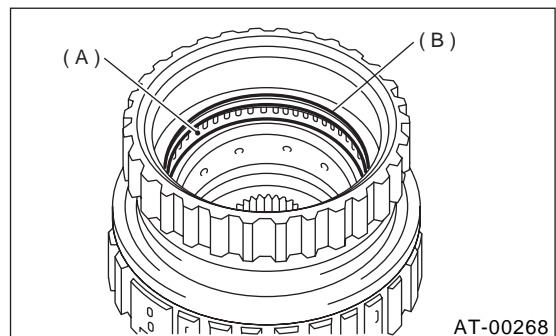
3) Install two seal rings to one-way clutch inner race.



- (A) One way clutch inner race
- (B) Seal rings

2. ONE-WAY CLUTCH OUTER RACE

1) Install the needle bearing, and secure with the snap ring.



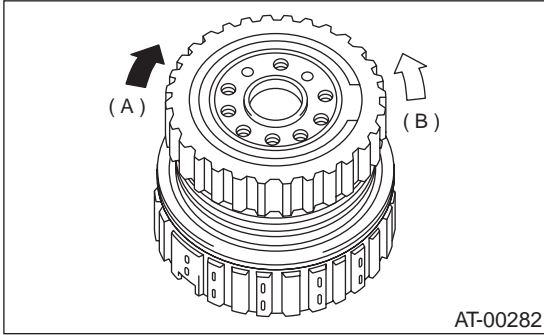
- (A) Needle bearing
- (B) Snap ring

2) Install the one-way clutch, one-way clutch inner race and plate, and secure with the snap ring.

ONE-WAY CLUTCH

AUTOMATIC TRANSMISSION

3) Set the inner race. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.



- (A) Locked
- (B) Free

E: INSPECTION

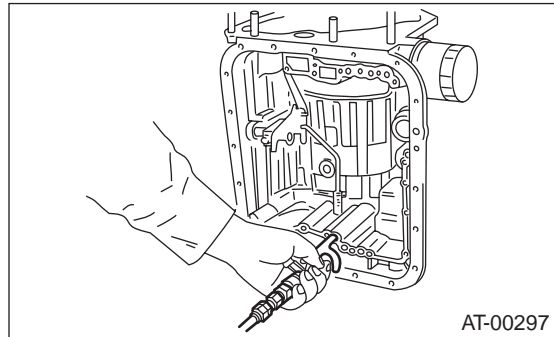
- Make sure the snap ring is not worn and the seal rings are not damaged.
- Measure the total end play and adjust to within specifications. <Ref. to AT-117, ADJUSTMENT, Oil Pump.>

41.Low and Reverse Brake

A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.
- 4) Disconnect the air breather hose. <Ref. to AT-83, REMOVAL, Air Breather Hose.>
- 5) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 6) Disconnect inhibitor switch connector from stay.
- 7) Remove the oil charger pipe. <Ref. to AT-84, REMOVAL, Oil Charger Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes. <Ref. to AT-78, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separation of torque converter clutch case and transmission case.<Ref. to AT-109, REMOVAL, Torque Converter Clutch Case.>
- 10) Separate transmission case and extension case sections. <Ref. to AT-86, REMOVAL, Extension Case.>
- 11) Remove the reduction drive gear. <Ref. to AT-104, REMOVAL, Reduction Drive Gear.>
- 12) Remove the center differential carrier. (VTD model) <Ref. to AT-106, REMOVAL, Center Differential Carrier.>
- 13) Remove the reduction driven gear. <Ref. to AT-101, REMOVAL, Reduction Driven Gear.>
- 14) Remove the oil pump housing. <Ref. to AT-112, REMOVAL, Oil Pump.>
- 15) Remove control valve assembly. <Ref. to AT-60, REMOVAL, Control Valve Body.>
- 16) Take out the high clutch and reverse clutch assembly. <Ref. to AT-130, REMOVAL, High Clutch and Reverse Clutch.>
- 17) Take out the thrust needle bearing, planetary gear assembly. <Ref. to AT-136, REMOVAL, Planetary Gear and Low Clutch.>
- 18) Take out 2-4 brake return spring, piston and piston retainer. <Ref. to AT-145, REMOVAL, 2-4 Brake.>
- 19) Remove one-way clutch inner race. <Ref. to AT-150, REMOVAL, One-way Clutch.>

- 20) Take out the low & reverse piston by applying compressed air.



- 21) Take out the spring retainer, return spring and low & reverse piston.

LOW AND REVERSE BRAKE

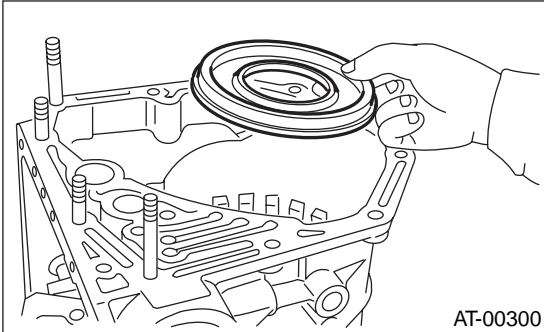
AUTOMATIC TRANSMISSION

B: INSTALLATION

1) Install the low and reverse piston without tilting.

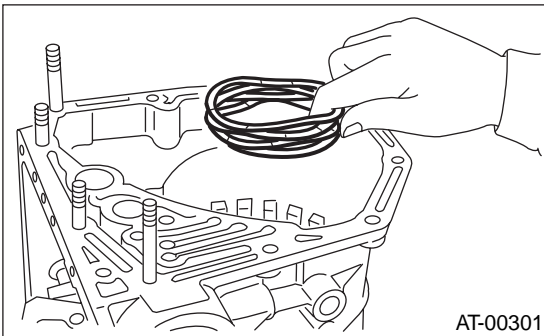
NOTE:

Be careful not to damage the lip seal.



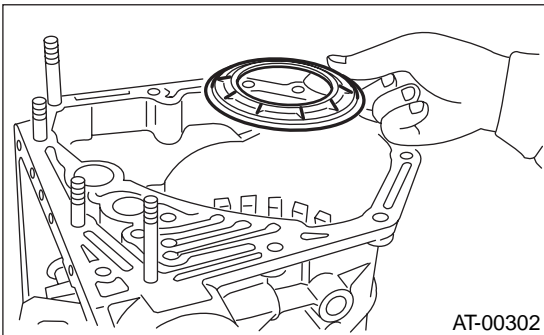
AT-00300

2) Install return spring.



AT-00301

3) Install spring retainer.



AT-00302

4) Install the one-way clutch inner race. <Ref. to AT-151, INSTALLATION, One-way Clutch.>

5) Install thrust needle bearing.

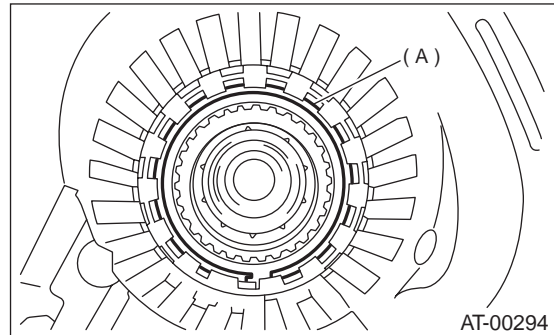
NOTE:

Place transmission case with the front facing up.

6) Installation of the low & reverse brake:
Install dish plate, driven plates, drive plates, and a retaining plate, and secure with a snap ring.

NOTE:

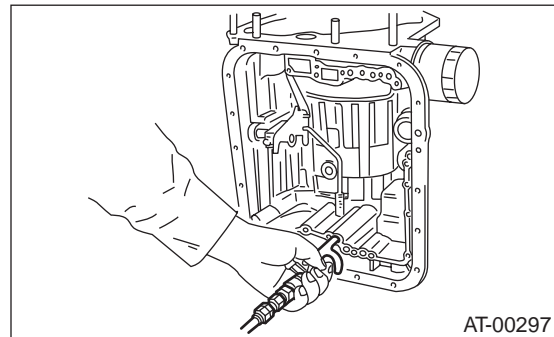
Pay attention to the orientation of the dish plate.



AT-00294

(A) Snap ring

7) Apply compressed air intermittently to check for operation.



AT-00297

8) Check the clearance and select retaining plate. <Ref. to AT-157, INSPECTION, Low and Reverse Brake.>

9) Install 2-4 brake piston, retainer and return spring to transmission case. <Ref. to AT-146, INSTALLATION, 2-4 Brake.>

10) Install planetary gear and low clutch assembly to transmission case.

Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring. <Ref. to AT-137, INSTALLATION, Planetary Gear and Low Clutch.>

11) Install the high clutch assembly. <Ref. to AT-131, INSTALLATION, High Clutch and Reverse Clutch.>

12) Install the oil pump housing assembly. <Ref. to AT-113, INSTALLATION, Oil Pump.>

13) Install the control assembly and oil pan. <Ref. to AT-61, INSTALLATION, Control Valve Body.>

14) Install the torque converter clutch case assembly to the transmission case assembly. <Ref. to AT-110, INSTALLATION, Torque Converter Clutch Case.>

15) Install reduction driven gear.

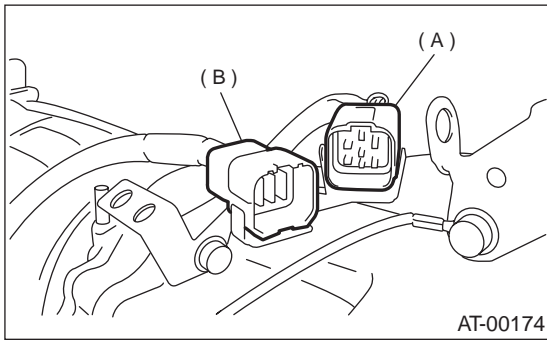
<Ref. to AT-102, INSTALLATION, Reduction Driven Gear.>

16) Install reduction drive gear. <Ref. to AT-104, INSTALLATION, Reduction Drive Gear.>

17) Install the center differential carrier. (VTD model) <Ref. to AT-106, INSTALLATION, Center Differential Carrier.>

18) Install the extension case and rear vehicle speed sensor to the transmission case. <Ref. to AT-86, INSTALLATION, Extension Case.>

19) Insert inhibitor switch and transmission connector into stay.



- (A) Transmission harness
- (B) Inhibitor switch harness

20) Install air breather hose. <Ref. to AT-83, INSTALLATION, Air Breather Hose.>

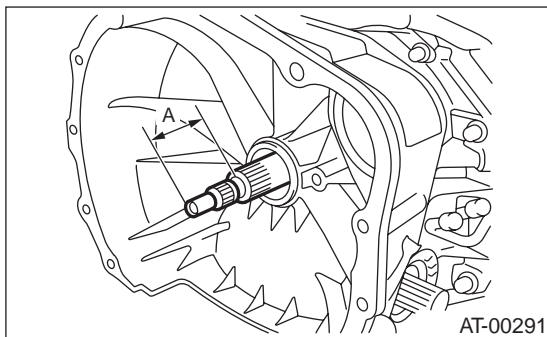
21) Install the oil cooler pipes. <Ref. to AT-80, INSTALLATION, ATF Cooler Pipe and Hose.>

22) Install the oil charger pipe with O-ring. <Ref. to AT-84, INSTALLATION, Oil Charger Pipe.>

23) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



24) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>

25) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Check for the following.

- Drive plate facing for wear or damage
- Snap ring for wear and spring retainer for deformation

1) Place the same thickness of shim on both sides to prevent retaining plate from tilting.

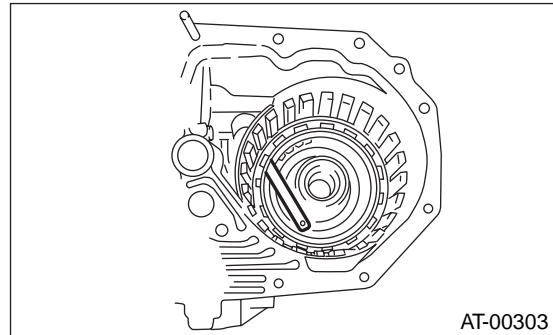
2) Inspect clearance and select retaining plate.

Standard value:

0.7 — 1.2 mm (0.028 — 0.047 in)

Allowable limit:

2.2 mm (0.087 in)



Available retaining plates	
Part No.	Thickness mm (in)
31667AA320	4.1 (0.161)
31667AA330	4.4 (0.173)
31667AA340	4.7 (0.185)
31667AA350	5.0 (0.197)
31667AA360	5.3 (0.209)
31667AA370	5.6 (0.220)
31667AA380	5.9 (0.232)

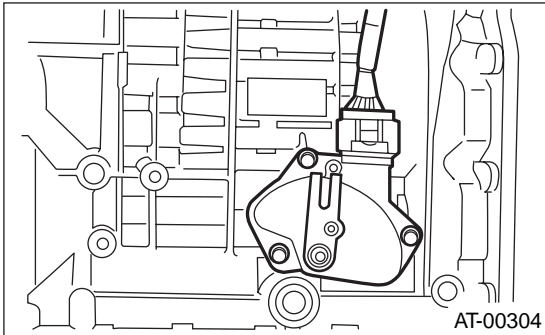
TRANSMISSION CONTROL DEVICE

AUTOMATIC TRANSMISSION

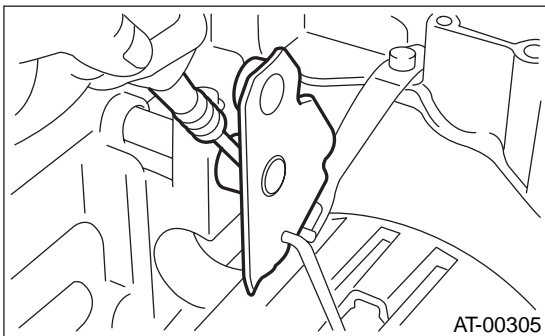
42. Transmission Control Device

A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to AT-39, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to AT-85, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.
- 4) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 5) Disconnect the air breather hoses. <Ref. to AT-83, REMOVAL, Air Breather Hose.>
- 6) Disconnect inhibitor switch connector from stay.
- 7) Wrap vinyl tape around the nipple attached to the air breather hose.
- 8) Remove pitching stopper bracket.
- 9) Remove the inhibitor switch.



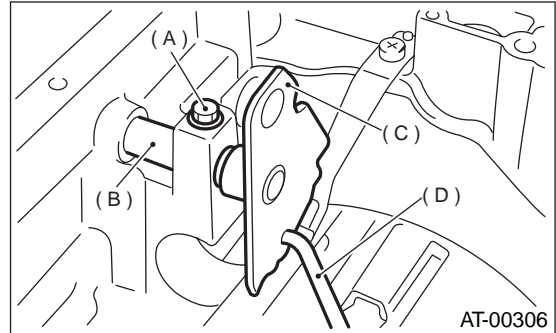
- 10) Remove control valve body assembly. <Ref. to AT-60, REMOVAL, Control Valve Body.>
- 11) Pull off the straight pin of manual plate.



- 12) Remove bolts securing select lever, then remove select lever, manual plate and parking rod.

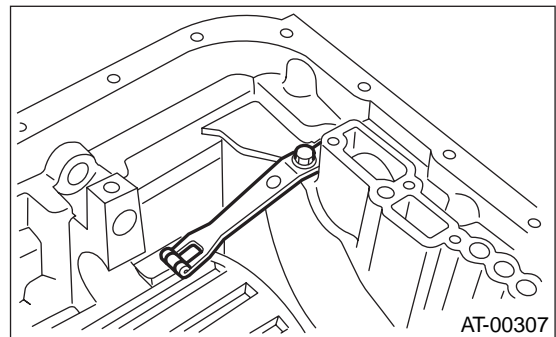
NOTE:

Be careful not to damage the lips of the press-fitted oil seal in the case.



- (A) Bolt
- (B) Range select lever
- (C) Manual plate
- (D) Parking rod

- 13) Remove the detention spring.



TRANSMISSION CONTROL DEVICE

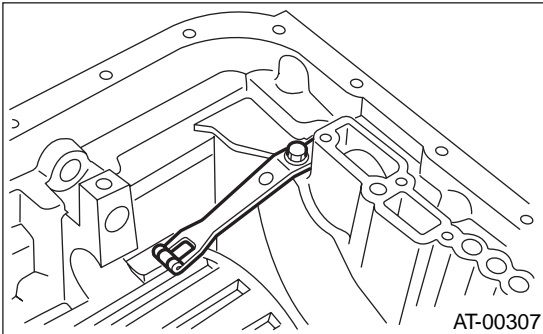
AUTOMATIC TRANSMISSION

B: INSTALLATION

1) Install detention spring to transmission case.

Tightening torque:

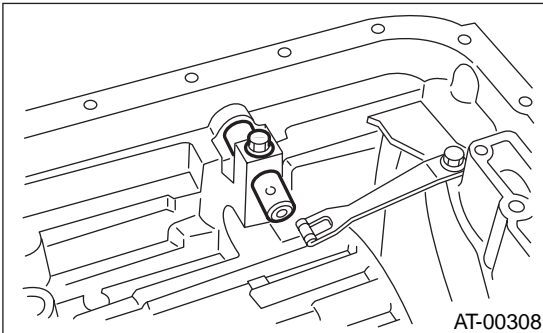
6 N·m (0.6 kgf-m, 4.3 ft-lb)



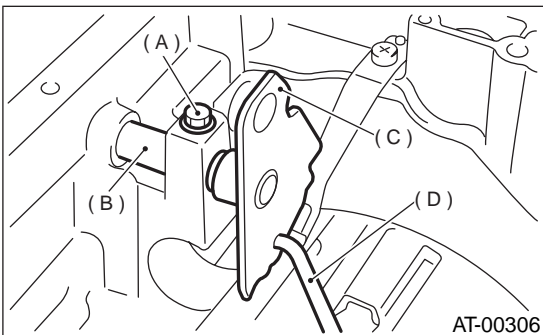
2) Insert range select lever, and tighten bolt.

Tightening torque:

6 N·m (0.6 kgf-m, 4.3 ft-lb)

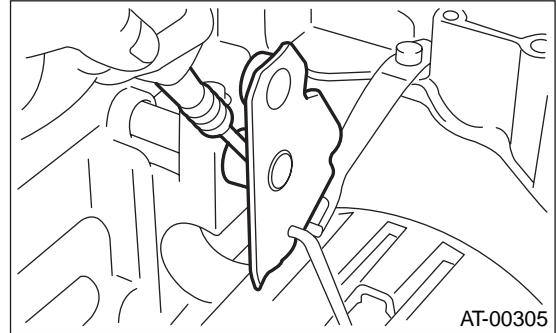


3) Insert manual plate and parking rod.



- (A) Bolt
- (B) Range select lever
- (C) Manual plate
- (D) Parking rod

4) Insert spring pin to manual plate.



5) Install control valve assembly and oil pan. <Ref. to AT-61, INSTALLATION, Control Valve Body.>

6) Turn over the transmission case to its original position.

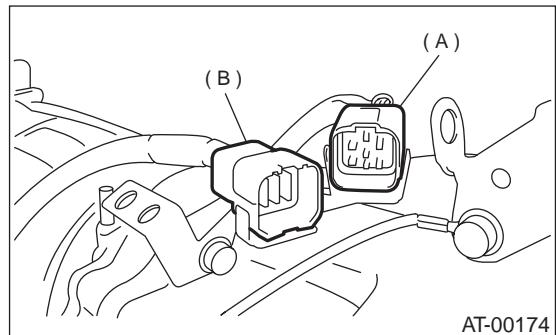
7) Install pitching stopper bracket.

Tightening torque:

41 N·m (4.2 kgf-m, 30.4 ft-lb)

8) Install inhibitor switch and adjust the inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>

9) Insert inhibitor switch and transmission connector into stay.



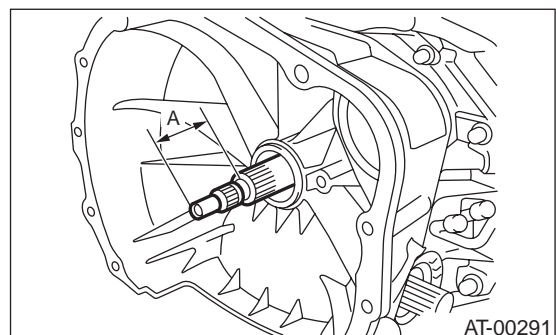
- (A) Transmission harness
- (B) Inhibitor switch harness

10) Install air breather hose. <Ref. to AT-83, INSTALLATION, Air Breather Hose.>

11) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



TRANSMISSION CONTROL DEVICE

AUTOMATIC TRANSMISSION

- 12) Install the torque converter clutch assembly. <Ref. to AT-85, INSTALLATION, Torque Converter Clutch Assembly.>
- 13) Install the transmission assembly to the vehicle. <Ref. to AT-42, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Make sure the manual lever and detention spring are not worn or otherwise damaged.

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

AT

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BASIC DIAGNOSTIC PROCEDURE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Value	Yes	No
<p>1 CHECK PRE-INSPECTION.</p> <p>1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to AT-5, Check List for Interview.></p> <p>2) Before performing diagnosis, inspect the following items which might influence the AT problems.</p> <ul style="list-style-type: none"> •General inspection <Ref. to AT-6, INSPECTION, General Description.> •Oil leak •Stall speed test <Ref. to AT-33, Stall Test.> •Line pressure test <Ref. to AT-36, Line Pressure Test.> •Transfer clutch pressure test <Ref. to AT-38, Transfer Clutch Pressure Test.> •Time lag test <Ref. to AT-35, Time Lag Test.> •Road test <Ref. to AT-32, Road Test.> •Inhibitor switch <Ref. to AT-47, INSTALLATION, Transmission Mounting System.> <p>Is unit that might influence the AT problem normal?</p>	Unit is normal.	Go to step 2.	Repair or replace each item.
<p>2 CHECK POWER INDICATOR LIGHT.</p> <p>Turn ignition switch to ON. Does not the POWER indicator light light up?</p>	Indicator light flashes.	Go to step 4.	Go to step 3.
<p>3 CHECK POWER INDICATOR LIGHT.</p> <p>1) Turn ignition switch to OFF. 2) Repair POWER indicator light circuit or power supply and ground line circuit. <Ref. to AT-30, Diagnostic Procedure for POWER Indicator Light.></p> <p>3) Turn ignition switch to ON. Is the POWER indicator light flashing?</p>	Indicator light flashes.	Go to step 4.	Go to step 5.
<p>4 CHECK INDICATION OF DTC.</p> <p>Calling up the DTC. Without Subaru Select Monitor <Ref. to AT-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).></p> <p>With Subaru Select Monitor <Ref. to AT-25, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).></p> <p>NOTE: If the communication function of the select monitor cannot be executed normally, check the communication circuit. <Ref. to AT-38, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Select Monitor Communication.></p> <p>Is the DTC displayed?</p>	DTC is displayed.	Go to step 6. NOTE: Record all DTCs.	Go to step 5.

BASIC DIAGNOSTIC PROCEDURE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 PERFORM THE GENERAL DIAGNOSTICS.</p> <p>1) Inspect using "Diagnostic Procedure for No-diagnostic Trouble Code (DTC)". <Ref. to AT-121, Diagnostic Procedure for No-diagnostic Trouble Code (DTC).></p> <p>2) Inspect using "Symptom Related Diagnostic". <Ref. to AT-160, Symptom Related Diagnostic.></p> <p>3) Perform the clear memory mode. With Subaru Select Monitor <Ref. to AT-27, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> Without Subaru Select Monitor <Ref. to AT-27, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.></p> <p>4) Perform the inspection mode. <Ref. to AT-26, Inspection Mode.> Calling up the diagnostic trouble code (DTC). Without Subaru Select Monitor <Ref. to AT-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With Subaru Select Monitor <Ref. to AT-25, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is the DTC displayed?</p>	DTC is displayed	Go to step 6.	Complete the diagnosis.

BASIC DIAGNOSTIC PROCEDURE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 PERFORM THE DIAGNOSIS.</p> <p>1) Inspect using “Diagnostics Chart with Diagnostic Trouble Code”. <Ref. to AT-42, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p>NOTE: For trouble code table, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to AT-29, List of Diagnostic Trouble Code (DTC).></p> <p>2) Repair trouble cause.</p> <p>3) Perform the clear memory mode. With Subaru Select Monitor <Ref. to AT-27, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> Without Subaru Select Monitor <Ref. to AT-27, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.></p> <p>4) Perform the inspection mode. <Ref. to AT-26, Inspection Mode.></p> <p>5) Calling up the diagnostic trouble code (DTC). Without Subaru Select Monitor <Ref. to AT-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With Subaru Select Monitor <Ref. to AT-25, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is the DTC displayed?</p>	<p>DTC is displayed</p>	<p>Inspect using “Diagnostics Chart with Diagnostic Connector”. <Ref. to AT-42, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>	<p>Complete the diagnosis.</p>

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

3. General Description

A: CAUTION

- **Supplemental Restraint System "Airbag"**

Airbag system wiring harness is routed near the transmission control module (TCM).

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage airbag system wiring harness when performing diagnostics and servicing the TCM.

- **Measurement**

When measuring voltage and resistance of the ECM, TCM or each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 0.65 mm (0.0256 in).

B: INSPECTION

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V or more

Specific gravity: Above 1.260

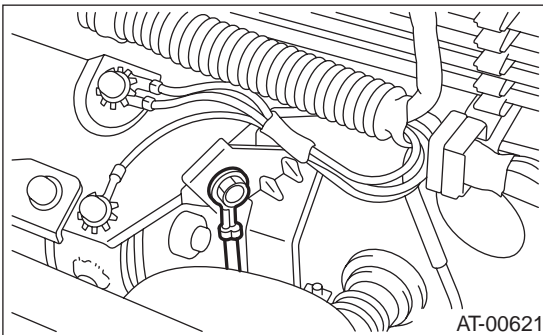
2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

- **Chassis side**

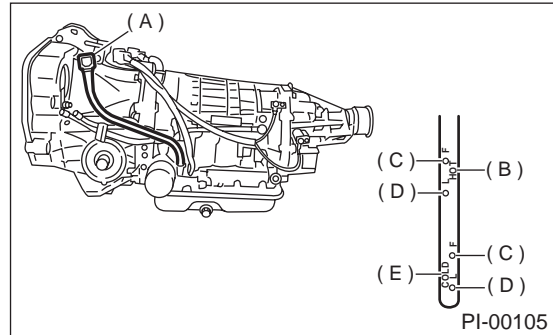
Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



3. ATF LEVEL

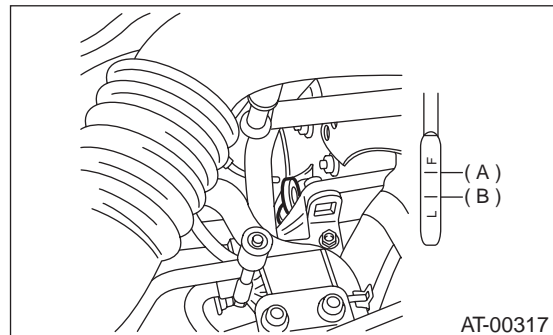
Make sure that ATF level is in the specification.
<Ref. to AT-30, Automatic Transmission Fluid.>



- (A) Level gauge
- (B) Inspection position at "HOT"
- (C) Upper level
- (D) Lower level
- (E) Inspection position at "COLD"

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that front differential oil level is in the specification.



- (A) Upper level
- (B) Lower level

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

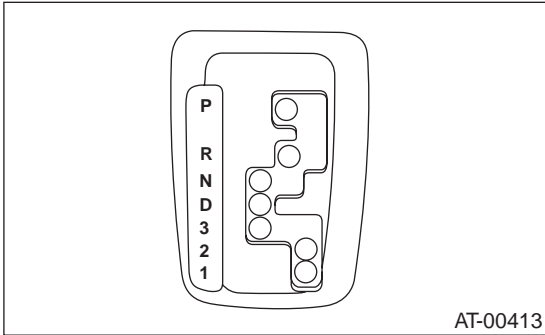
5. OPERATION OF SHIFT SELECT LEVER

Make sure there is no abnormal noise, dragging or contact pattern in each select lever range.

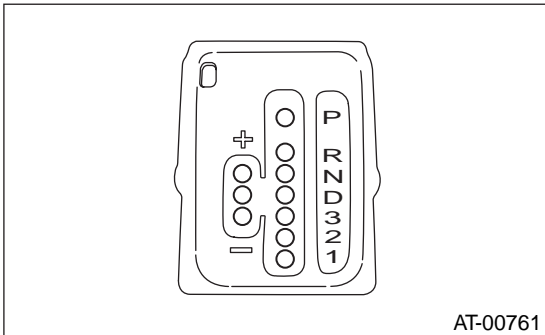
WARNING:

Stop the engine while checking operation of select lever.

- Without SPORT shift

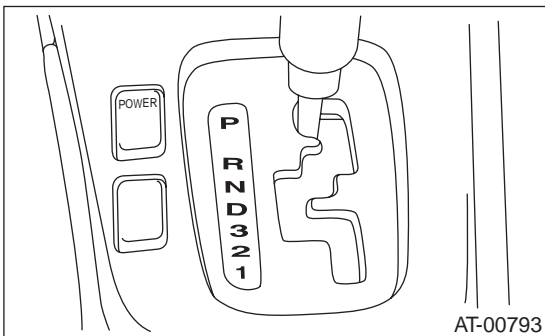


- With SPORT shift



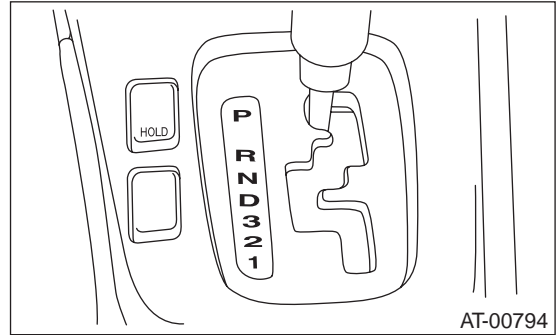
6. POWER SWITCH

Make sure that POWER indicator light in combination meter comes ON, when turning power switch to ON.



7. HOLD SWITCH

Make sure that HOLD indicator light in combination meter comes ON, when turning hold switch to ON.

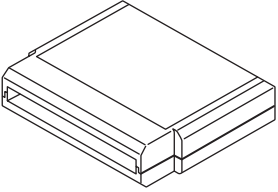



GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

ELECTRICAL COMPONENTS LOCATION

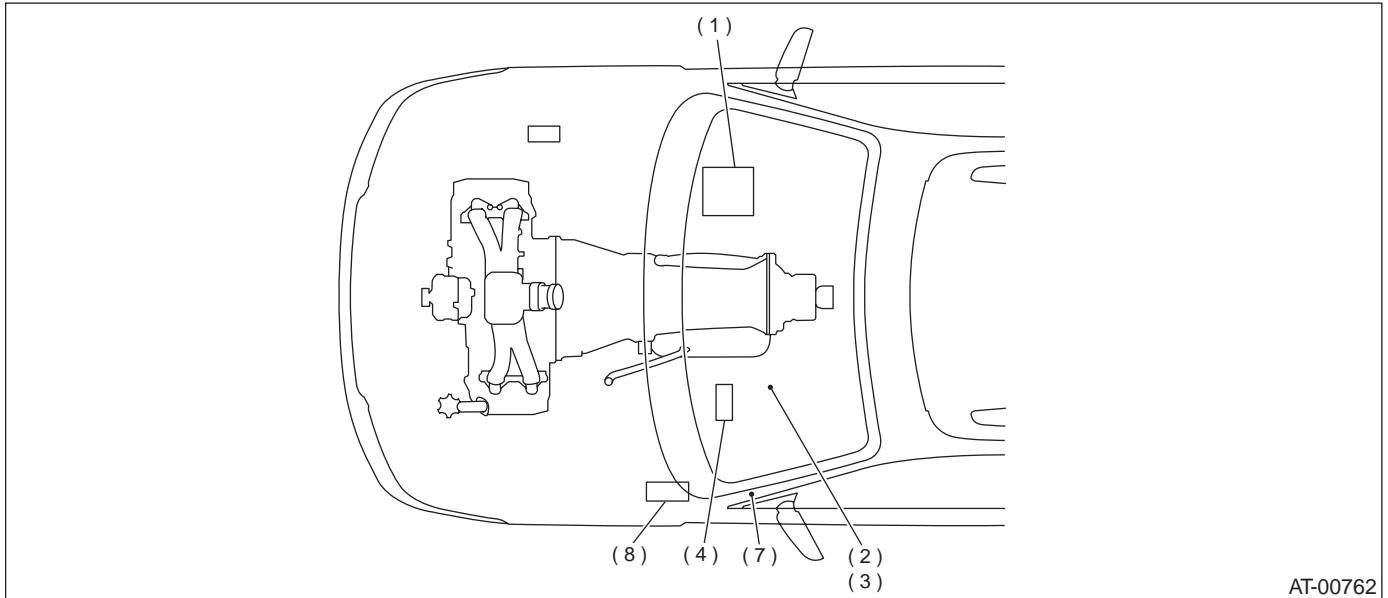
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

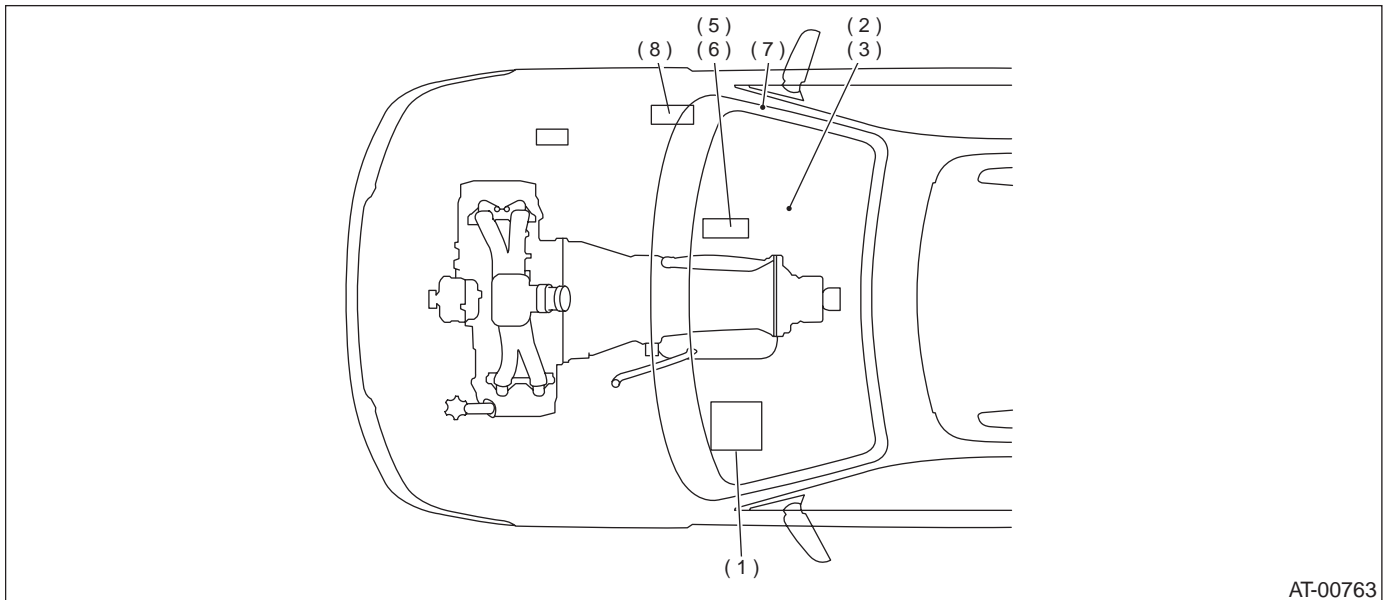
1. CONTROL MODULE

LHD MODEL



AT-00762

RHD MODEL

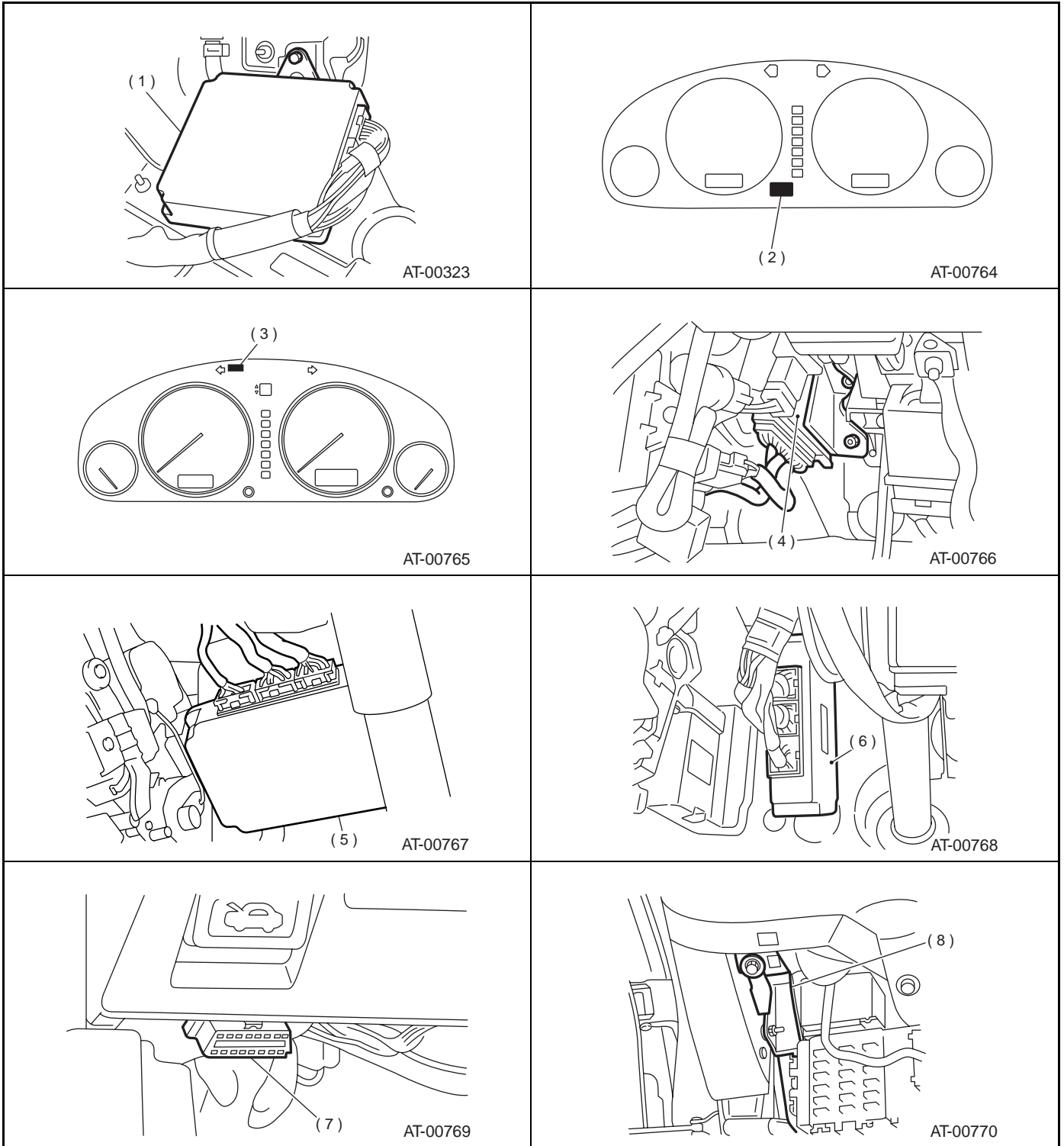


AT-00763

- | | | |
|--|---|--|
| (1) Engine control module (ECM) | (4) Transmission control module (TCM) | (7) Data link connector |
| (2) POWER indicator light (AT diagnostic indicator light) (Except 3.0 L and TURBO model) | (5) Transmission control module (TCM) (except Europe model) | (8) Vehicle dynamic control module (With VDC system) |
| (3) Power indicator light (AT diagnostic indicator light) (3.0 L and TURBO model) | (6) Transmission control module (TCM) (Europe model) | |

ELECTRICAL COMPONENTS LOCATION

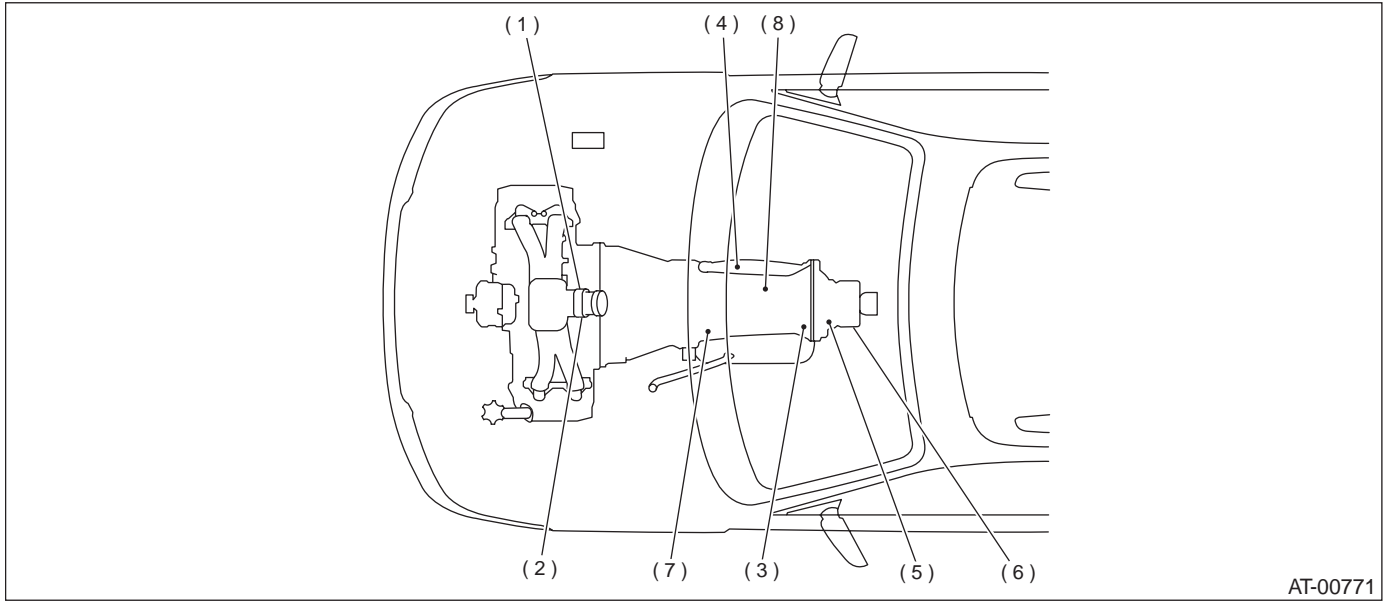
AUTOMATIC TRANSMISSION (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

2. SENSOR

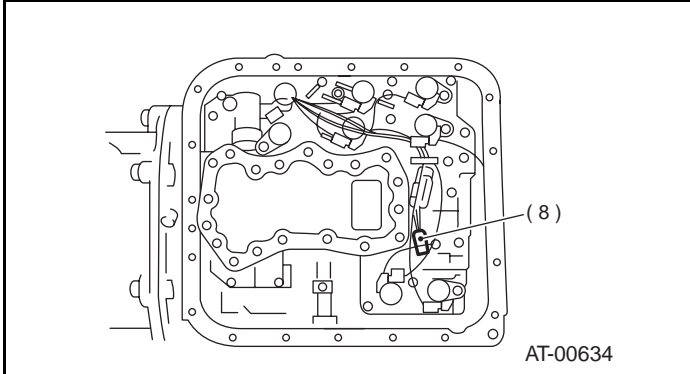
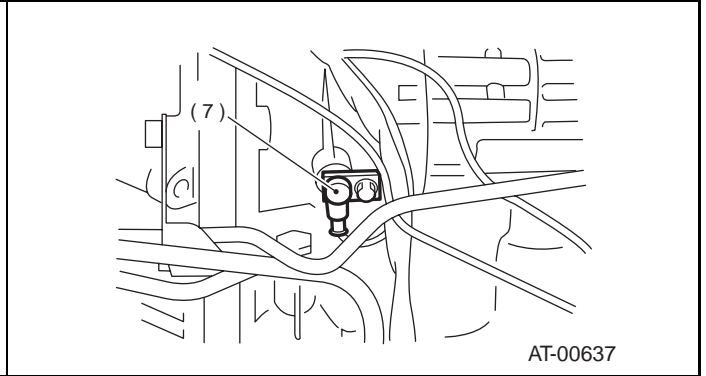
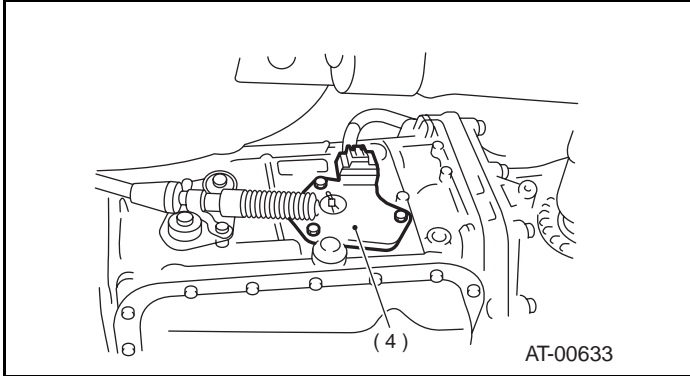
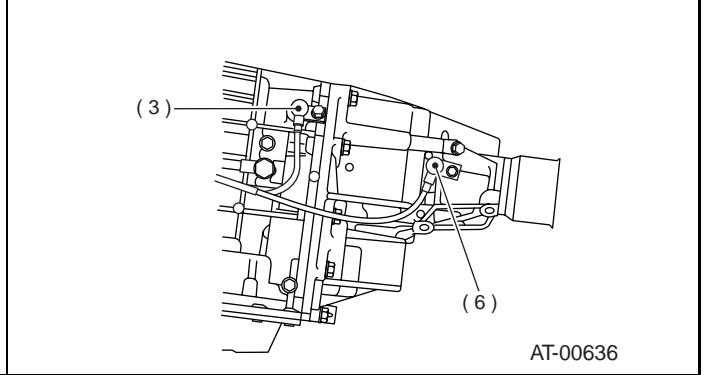
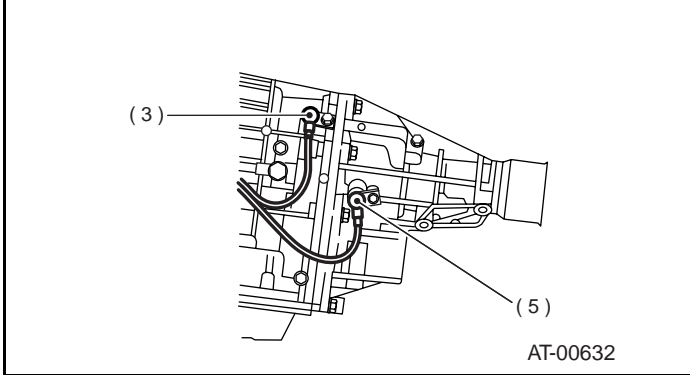
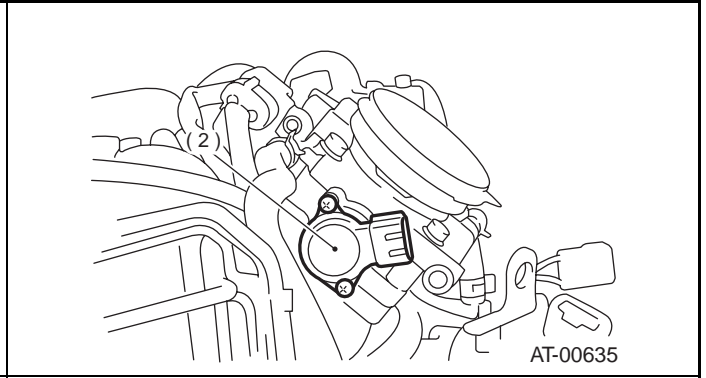
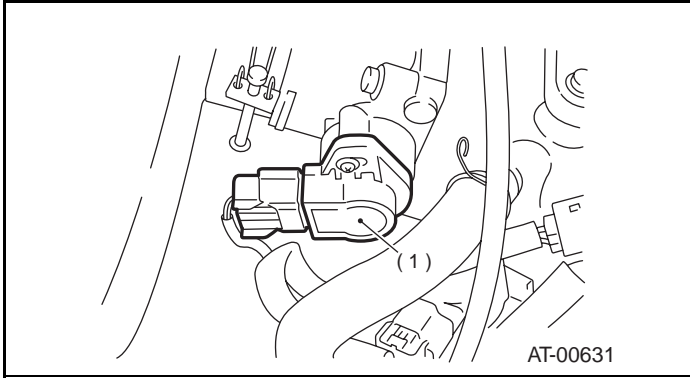


AT-00771

- | | | |
|--|--|--|
| (1) Throttle position sensor
(Except 3.0 L model) | (4) Inhibitor switch | (7) Torque converter turbine speed
signal |
| (2) Throttle sensor (3.0 L model) | (5) Rear vehicle speed sensor (with-
out VDC system or SPORT shift) | (8) ATF temperature sensor |
| (3) Front vehicle speed sensor | (6) Rear vehicle speed sensor (with
SPORT shift) | |

ELECTRICAL COMPONENTS LOCATION

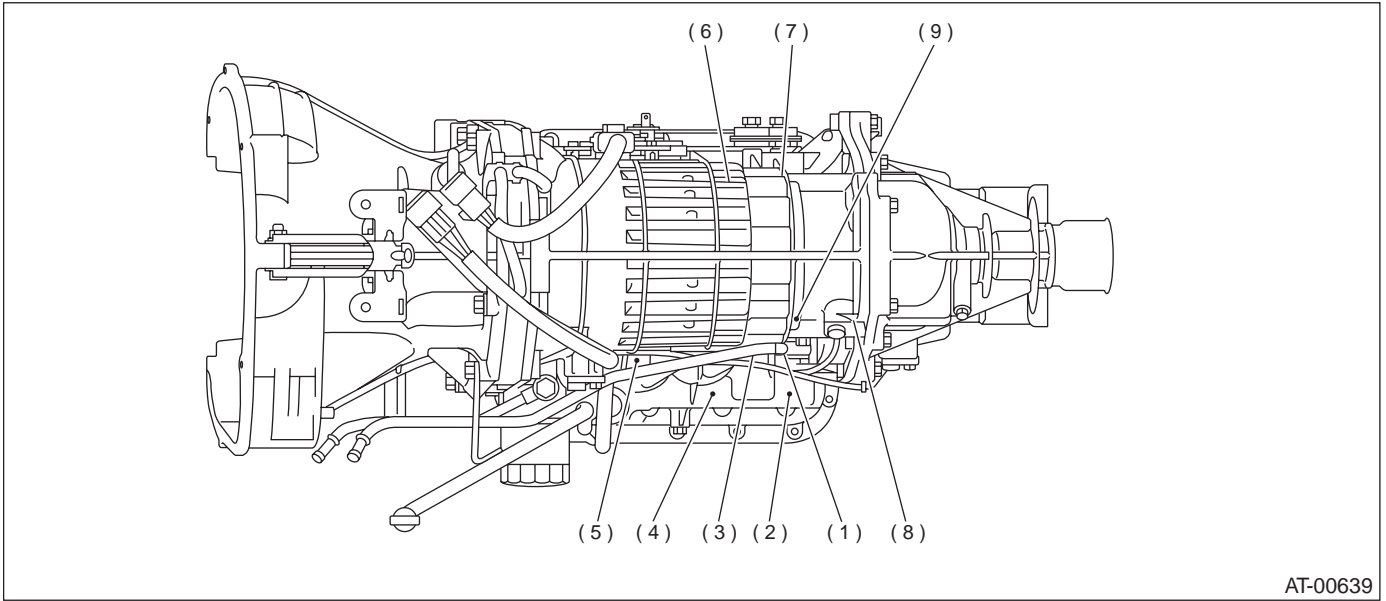
AUTOMATIC TRANSMISSION (DIAGNOSTICS)



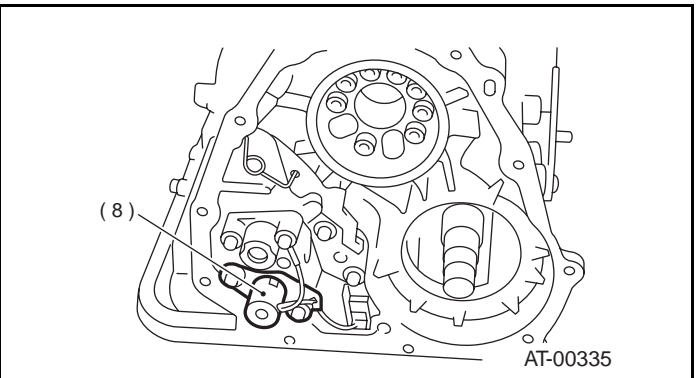
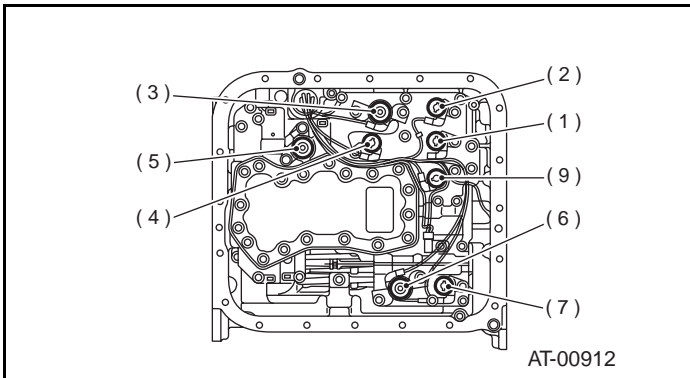
ELECTRICAL COMPONENTS LOCATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

3. SOLENOID



- | | | |
|---------------------------------|--------------------------------|---|
| (1) Solenoid 1 | (4) Low clutch timing solenoid | (7) 2-4 brake timing solenoid |
| (2) Solenoid 2 | (5) Lock-up duty solenoid | (8) Transfer duty solenoid |
| (3) Line pressure duty solenoid | (6) 2-4 brake duty solenoid | (9) Sport shift solenoid (with SPORT shift) |

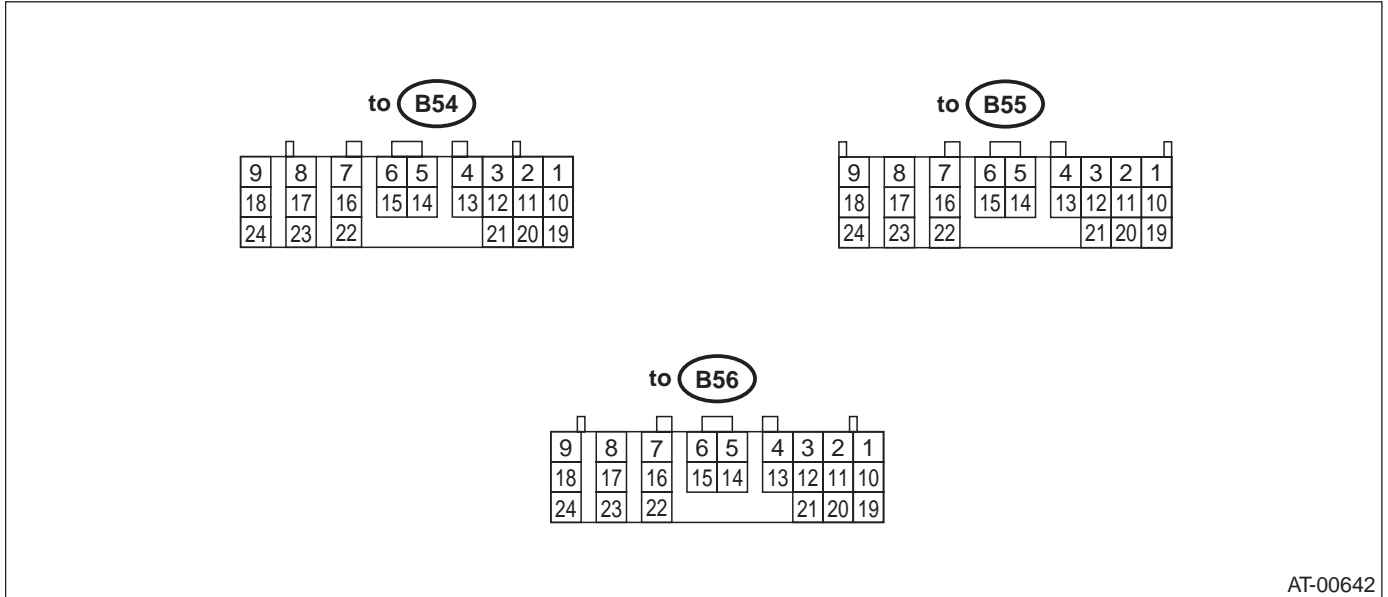


TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



AT-00642

Check with ignition switch ON.						
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)	
Back-up power supply	B56	1	Ignition switch OFF	10 — 13	—	
Ignition power supply	B54	23	Ignition switch ON (with engine OFF)	10 — 13	—	
	B54	24				
Inhibitor switch	“P” range switch	B55	1	Select lever in “P” range	Less than 1	—
				Select lever in any other than “P” range (except “N” range)	More than 8	
	“N” range switch	B55	14	Select lever in “N” range	Less than 1	—
				Select lever in any other than “N” range (except “P” range)	More than 8	
	“R” range switch	B55	3	Select lever in “R” range	Less than 1	—
				Select lever in any other than “R” range	More than 8	
	“D” range switch	B55	4	Select lever in “D” range	Less than 1	—
				Select lever in any other than “D” range	More than 8	
	“3” range switch	B55	5	Select lever in “3” range	Less than 1	—
				Select lever in any other than “3” range	More than 8	
	“2” range switch	B55	6	Select lever in “2” range	Less than 1	—
				Select lever in any other than “2” range	More than 8	
	“1” range switch	B55	7	Select lever in “1” range	Less than 1	—
				Select lever in any other than “1” range	More than 8	
Brake switch	B55	12	Brake pedal depressed.	More than 10.5	—	
			Brake pedal released.	Less than 1		
VDC communication signal +	B56	9	Ignition ON	(+) — (–) Pulse signal	—	
VDC communication signal –	B56	18		(+) — (–) Pulse signal	—	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Kick-down switch	B55	11	Throttle fully opened.	Less than 1	—
			Throttle fully closed.	More than 6.5	
AT OIL TEMP warning light	B56	10	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor	B54	3	Throttle fully closed.	0.2 — 1.0	—
			Throttle fully open.	4.2 — 4.7	
Throttle position sensor power supply	B54	2	Ignition switch ON (With engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B54	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
			ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor	B55	24	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	18	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor	B55	8	Engine idling after warm-up. (D range)	0	450 — 650
			Engine idling after warm-up. (N range)	More than 1 (AC range)	
Vehicle speed output signal	B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1 ← → More than 4	—
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	0	—
			Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal	B55	22	When cruise control is set (SET lamp ON)	Less than 1	—
			When cruise control is not set (SET lamp OFF)	More than 6.5	
Torque control signal 1	B56	5	Ignition switch ON (with engine ON)	More than 4	—
Torque control signal 2	B56	14	Ignition switch ON (with engine ON)	More than 4	—
Torque control cut signal	B55	10	Ignition switch ON	8	—
Intake manifold pressure signal (Non-TURBO model)	B54	1	Engine idling after warm-up.	0.4 — 1.6	—
Shift solenoid 1	B54	22	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Mass air flow signal (TURBO model)	B54	1	Idling condition after warm-up	0.9 — 1.4	—
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Ignition switch ON (with engine OFF) Throttle fully closed after warm-up.	1.5 — 4.0	2.0 — 4.5
			Ignition switch ON (with engine OFF) Throttle fully open after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	7	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid (Without VDC system and SPORT shift)	B54	6	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Transfer duty solenoid (VDC system or sport shift equipped vehicle)	B54	6	Wide open throttle condition	More than 8.5	10 — 17
			Wide open throttle condition	Less than 0.5	
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Hold switch	B55	16	Hold switch ON	Less than 1	—
			Hold switch OFF	More than 8	—
Power switch	B55	23	Power switch ON	Less than 1	—
			Power switch OFF	More than 10	—
Power indicator light	B56	11	Light ON	Less than 1	—
			Light OFF	More than 9	—
FWD switch (Without VDC system and SPORT shift)	B55	20	Fuse removed	6 — 9.1	—
			Fuse installed	Less than 1	—
FWD indicator light (Without VDC system and SPORT shift)	B56	2	Fused ON FWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	—
ABS signal (Without VDC system and SPORT shift)	B55	21	ABS switch ON	Less than 1	—
			ABS switch OFF	6.5 — 15	—
Sensor ground line 1	B54	20	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	21			
Sensor ground line 3	B54	10	—	0	Less than 1
Sensor ground line 4	B54	19	—	0	Less than 1
AT diagnosis signal (Waveform)	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—
SPORT shift solenoid (with SPORT shift)	B54	14	SPORT shift activated	More than 8	10 — 17
			SPORT shift deactivated	Less than 1	
SPORT shift mode switch (with SPORT shift)	B55	15	SPORT shift mode switch ON	Less than 1	—
			SPORT shift mode switch OFF	More than 8	
Shift up switch (with SPORT shift)	B55	13	Shift up switch ON	Less than 1	—
			Shift up switch OFF	More than 8	
Shift down switch (with SPORT shift)	B55	12	Shift down switch ON	Less than 1	—
			Shift down switch OFF	More than 8	
Buzzer (with SPORT shift)	B56	21	ON	Less than 1	—
			OFF	More than 8	
SPORT shift indicator (with SPORT shift)	B56	12	SPORT shift mode OFF	More than 4	—
			Shift down indicator ON	Less than 1	
SPORT shift indicator (with SPORT shift)	B56	13	SPORT shift mode OFF	More than 4	—
			SPORT shift mode with 4th gear	Less than 1	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

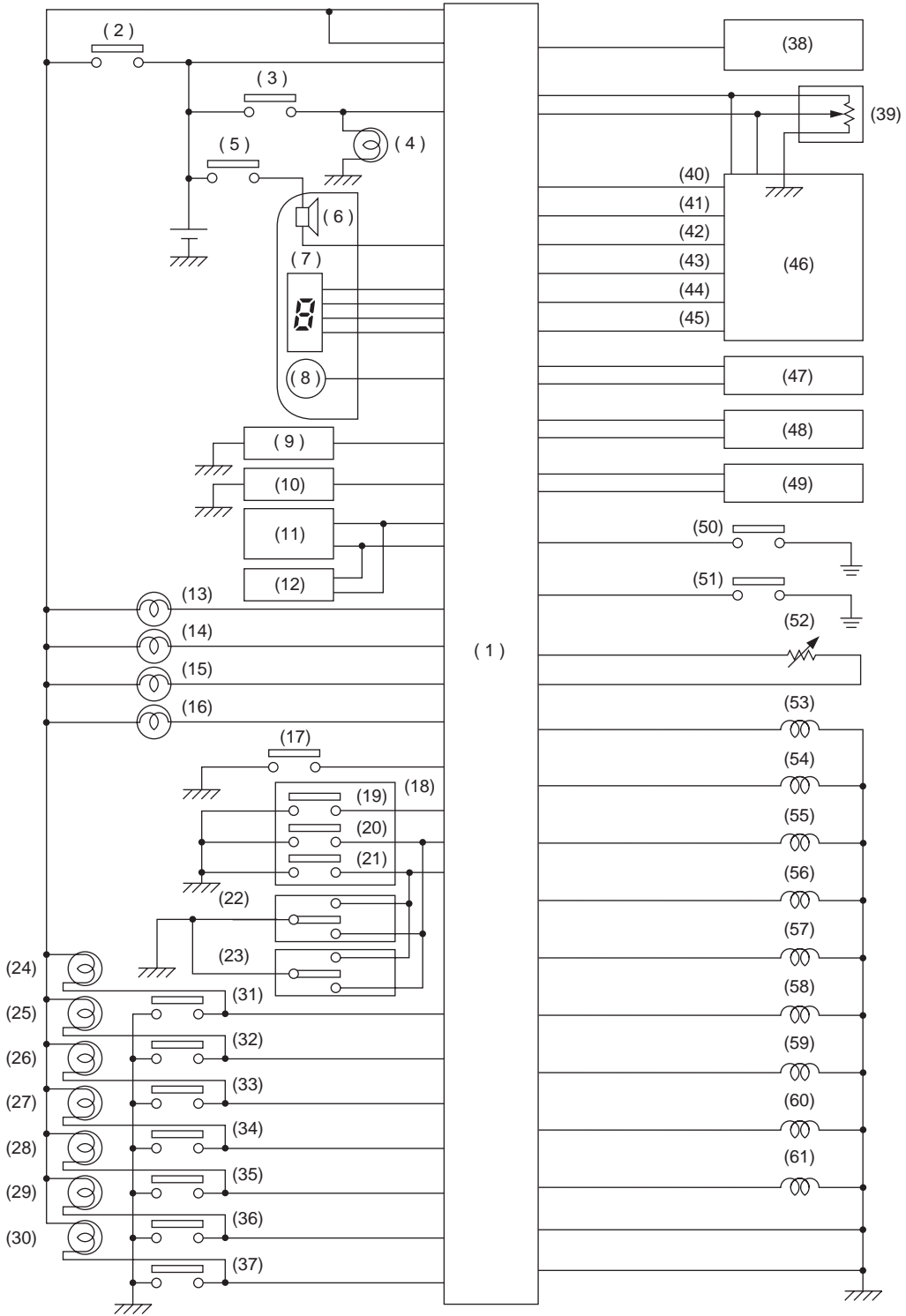
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
SPORT shift indicator (with SPORT shift)	B56	3	SPORT shift mode OFF	More than 4	—
			SPORT shift mode with 2nd and 3rd gear	Less than 1	
SPORT shift indicator (with SPORT shift)	B56	4	SPORT shift mode OFF	More than 4	—
			SPORT shift mode with 1st and 3rd gear	Less than 1	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: SCHEMATIC



AT-00772

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

(1) Transmission control module	(19) SPORT shift mode switch	(41) Torque control cut signal
(2) Ignition switch	(20) Up switch (with SPORT shift)	(42) Torque control signal 2
(3) Brake switch	(21) Down switch (with SPORT shift)	(43) Torque control signal 1
(4) Brake light	(22) Steering shift switch RH (with SPORT shift)	(44) Intake manifold pressure signal
(5) Ignition relay	(23) Steering shift switch LH (with SPORT shift)	(45) AT diagnosis signal
(6) Buzzer (with SPORT shift)	(24) "P" range indicator light	(46) Engine control module
(7) SPORT shift indicator (with SPORT shift)	(25) "R" range indicator light	(47) Front vehicle speed sensor
(8) Speedometer	(26) "N" range indicator light	(48) Rear vehicle speed sensor
(9) Cruise control module	(27) "D" range indicator light	(49) Torque converter turbine speed sensor
(10) ABS control module (without VDC system)	(28) "3" range indicator light	(50) POWER switch
(11) VDC control module (with VDC system)	(29) "2" range indicator light	(51) HOLD switch
(12) Steering angle sensor (with VDC system)	(30) "1" range indicator light	(52) ATF temperature sensor
(13) FWD indicator light (without VDC system and SPORT shift)	(31) "P" range switch	(53) Shift solenoid 1
(14) "AT OIL TEMP" warning light	(32) "R" range switch	(54) Shift solenoid 2
(15) POWER indicator light	(33) "N" range switch	(55) 2-4 brake timing solenoid
(16) HOLD indicator light	(34) "D" range switch	(56) 2-4 brake duty solenoid
(17) FWD switch (without VDC system and SPORT shift)	(35) "3" range switch	(57) Line pressure duty solenoid
(18) SPORT shift (with SPORT shift)	(36) "2" range switch	(58) Lock-up duty solenoid
	(37) "1" range switch	(59) Low clutch timing solenoid
	(38) Data link connector	(60) Transfer duty solenoid
	(39) Throttle position sensor	(61) SPORT shift solenoid (with SPORT shift)
	(40) Engine speed signal	

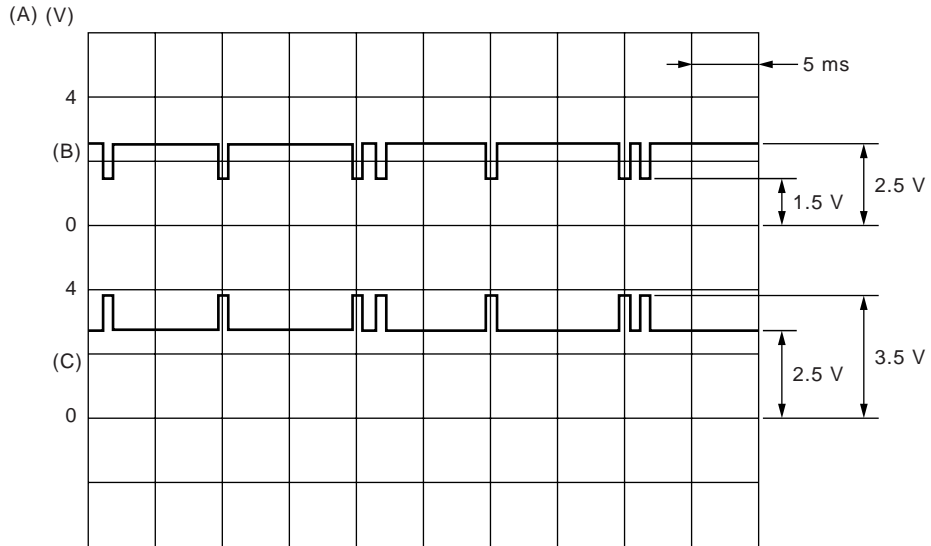
TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: MEASUREMENT

Only for models with VDC system, measure input/output signal voltage.

1. WAVEFORM



AT-00644

(A) Can communication line

(B) Terminal No.:
(B56) No. 9 — (B55) No. 9

(C) Terminal No.:
(B56) No. 18 — (B55) No. 9

SUBARU SELECT MONITOR

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

6. Subaru Select Monitor

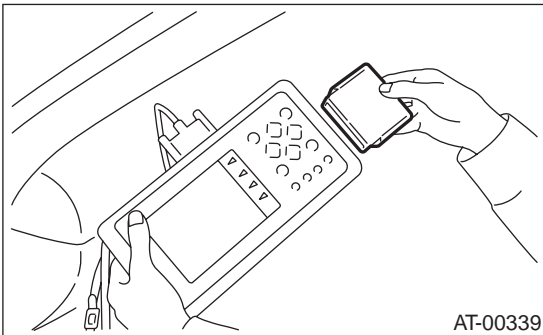
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE

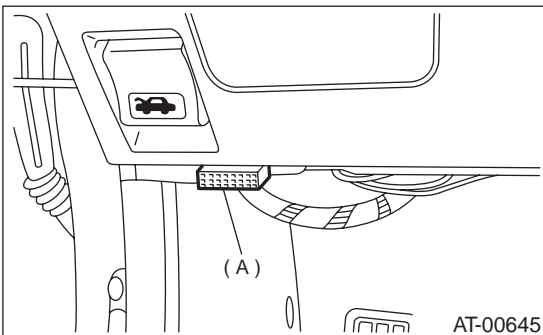
- 1) Prepare Subaru Select Monitor kit.
<Ref. to AT-8, PREPARATION TOOL, General Description.>



- 2) Connect diagnosis cable to Subaru Select Monitor.
- 3) Insert cartridge into Subaru Select Monitor.



- 4) Connect Subaru Select Monitor to data link connector.
 - (1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



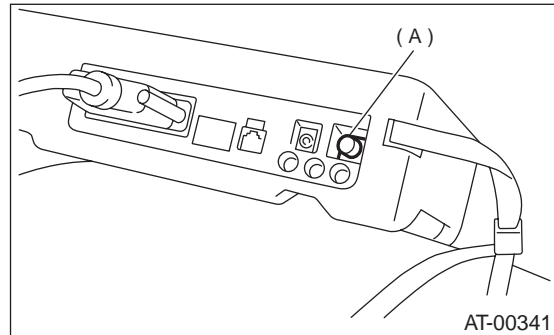
(A) Data link connector

- (2) Connect diagnosis cable to data link connector.

NOTE:

Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

- 5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

- 6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
- 8) Press the [YES] key after displayed the information of transmission type.
- 9) On the «Transmission Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
- 10) On the «Diagnostic Code(s) Display» display screen, select the {Latest Diagnostic Code(s)} or {Memorized Diagnostic Code(s)} and press the [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the DIAGNOSTIC TROUBLE CODE LIST. <Ref. to AT-29, List of Diagnostic Trouble Code (DTC).>

2. READ CURRENT DATA

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of transmission type.
- 4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
- 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.

SUBARU SELECT MONITOR

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

6) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Intake manifold pressure sensor voltage (Non-turbo model)	Mani. Pressure Voltage	V
Mass air flow sensor signal (Non-TURBO model)	Air Flow Sensor Voltage	V
FWD switch signal (Without VDC system and SPORT shift)	FWD Switch	ON or OFF
Stop lamp switch signal	Stop Light Switch	ON or OFF
Shift up signal (with SPORT shift)	Up Switch	ON or OFF
Shift down signal (with SPORT shift)	Down Switch	ON or OFF
SPORT shift mode (with SPORT shift)	Tip Mode Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Parking range signal	P Range Signal	ON or OFF
Neutral range signal	N Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal 1	ON or OFF
Torque control output signal #2	Torque Control Signal 2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
SPORT shift mode signal (with SPORT shift)	Tip Solenoid	ON or OFF
Automatic transmission diagnosis indicator lamp	Diagnosis Lamp	ON or OFF
Power mode switch signal	Power Mode Switch	ON or OFF
Hold mode switch signal	Hold Mode Switch	ON or OFF
Kick down switch signal	Kick Down Switch	ON or OFF
Automatic transmission fluid temperature lamp	ATF Temperature Lamp	ON or OFF

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of transmission type.
- 4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the `Done' and `Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

READ DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

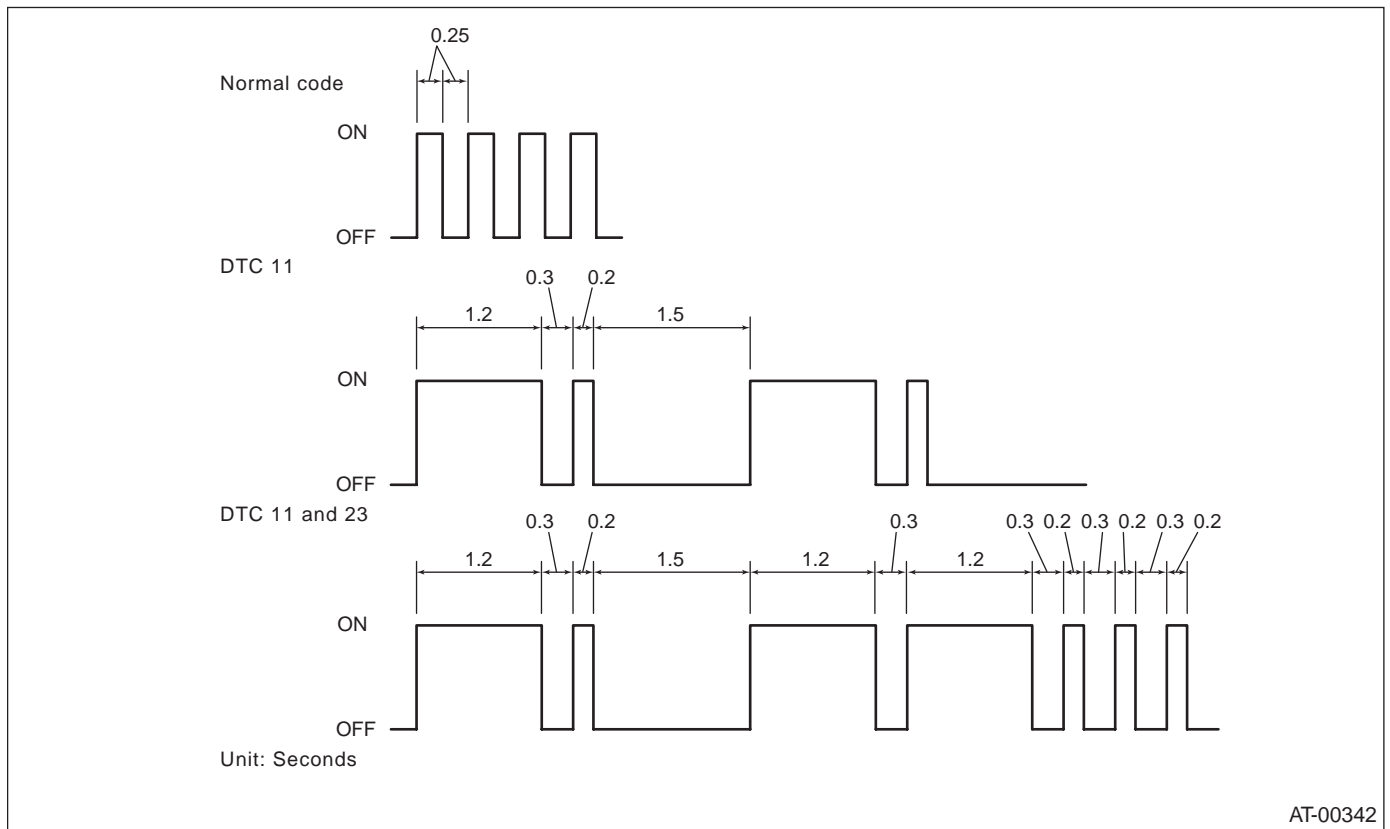
Step	Value	Yes	No
<p>1 PERFORM READ DIAGNOSTIC TROUBLE CODE (DTC). 1) Warm-up the engine. 2) Turn ignition switch to OFF. 3) Turn ignition switch to ON. 4) Start the engine. 5) Drive vehicle at speeds greater than 20 km/h (12 MPH). 6) Stop vehicle. 7) Brake pedal depressed and move select lever to 1 range. 8) Turn ignition switch to OFF. 9) Turn ignition switch to ON. 10) Move select lever 2 range. 11) Move select lever 1 range. 12) Move select lever 2 range. 13) Move select lever 3 range. 14) Move select lever D range. Does indicator light blinks at 4-Hz intervals? NOTE: Blinks every 0.125 (1/8) seconds (until ignition switch is turned OFF).</p>	<p>Indicator light blinks at every 4-Hz interval.</p>	<p>Go to step 2.</p>	<p>Repair power supply and ground circuit. <Ref. to AT-34, CHECK POWER SUPPLY AND GROUND LINE, Diagnostic Procedure for POWER Indicator Light.></p>
<p>2 CHECK INDICATOR LIGHT. Does indicator light blinks at 2-Hz intervals? NOTE: Blinks every 0.25 (1/4) seconds (until ignition switch is turned OFF).</p>	<p>Indicator light blinks at every 2-Hz interval.</p>	<p>AT system is normal.</p>	<p>Go to step 3.</p>
<p>3 CHECK INDICATOR LIGHT. Is DTC indicated?</p>	<p>DTC is displayed.</p>	<p>Inspect problem corresponding with DTC. NOTE: Record all DTCs.</p>	<p>Go to step 4.</p>
<p>4 CHECK INDICATOR LIGHT. Does indicator light remains illuminated?</p>	<p>Indicator light remains illuminated.</p>	<p>Repair power indicator light circuit <Ref. to AT-30, Diagnostic Procedure for POWER Indicator Light.> , or Inspect inhibitor switch, wiring, TCM, etc.</p>	<p>Calling up trouble code again.</p>

READ DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

The POWER indicator light flashes the code corresponding to the faulty part.

The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.2 sec on) signifies a “one”.



2. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to obtain and understand trouble codes.

<Ref. to AT-21, OPERATION, Subaru Select Monitor.>

INSPECTION MODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

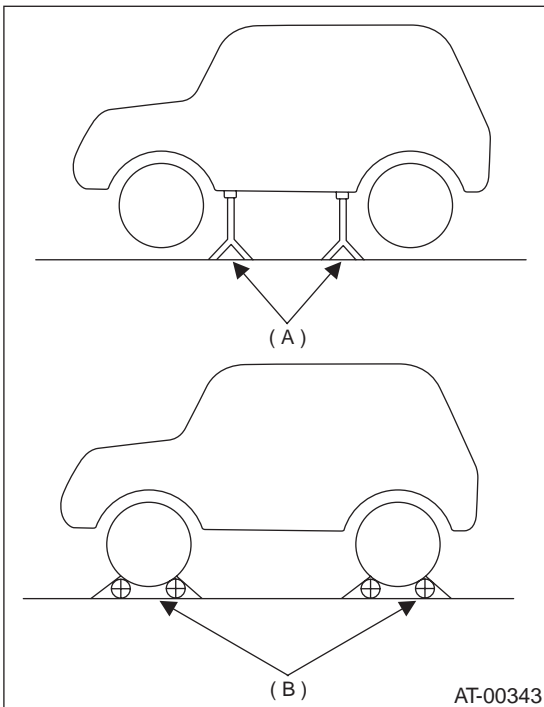
8. Inspection Mode

A: OPERATION

Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

WARNING:

- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



- (A) Safety stand
- (B) Free rollers

9. Clear Memory Mode

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

Current trouble codes shown on the display are cleared by turning the ignition switch OFF after conducting on-board diagnostics operation. Previous trouble codes, however, cannot be cleared since they are stored in the TCM memory which is operating on the back-up power supply. These trouble codes can be cleared by removing the specified. Remove TCM connector at least 2 minutes.

CLEAR MEMORY:

Remove TCM connector (B56).

- TCM connector is located in the line to the memory back-up power supply of the TCM. Removal of this connector clears the previous trouble codes stored in the TCM memory.
- Be sure to remove TCM connector for at least the specified length of time. Otherwise, trouble codes may not be cleared.

2. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to clear trouble codes.

<Ref. to AT-23, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

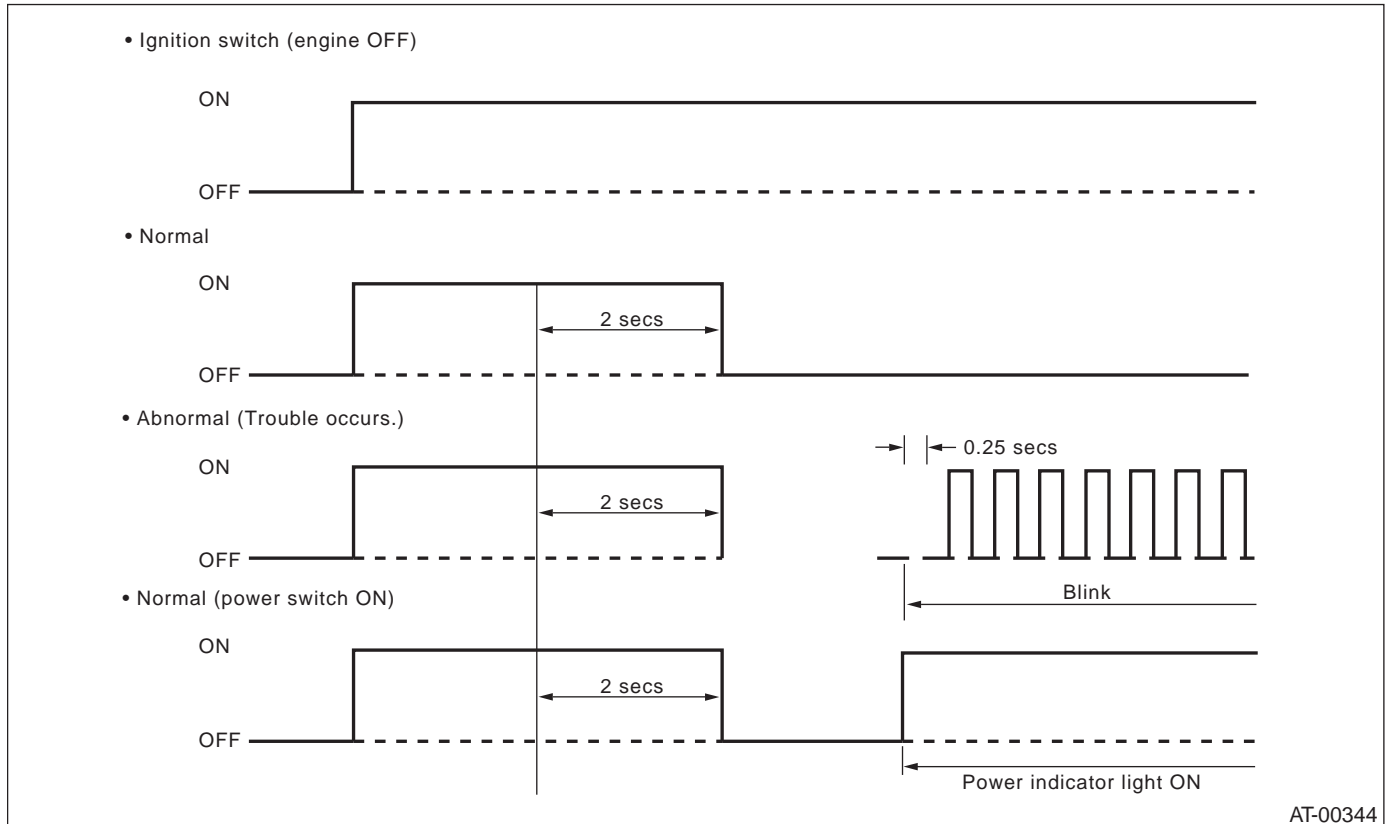
POWER INDICATOR LIGHT DISPLAY

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

10. POWER Indicator Light Display

A: INSPECTION

When any on-board diagnostics item is malfunctioning, the display on the POWER indicator light blinks from the time the malfunction is detected after starting the engine until the ignition switch is turned OFF. The malfunctioning part or unit can be determined by a DTC during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the POWER indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using the select monitor. Indicator signal is as shown in the figure.



AT-00344

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

11. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Content of diagnosis	Index
11	Engine speed signal	Detects open or shorted input signal circuit.	<Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Mass air flow signal (TURBO model)	Detects open or shorted output signal circuit.	<Ref. to AT-46, DTC 23 MASS AIR FLOW SIGNAL (TURBO MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ATF temperature sensor	Detects open or shorted input signal circuit.	<Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Throttle position sensor	Detects open or shorted input signal circuit.	<Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Front vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-58, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Torque converter turbine speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-64, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Torque control signal	Detects open or shorted input signal circuit.	<Ref. to AT-68, DTC 38 TORQUE CONTROL SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Intake manifold pressure signal (Non-TURBO model)	Detects open or shorted input signal circuit.	<Ref. to AT-70, DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL (NON-TURBO MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	Shift solenoid 1	Detects open or shorted output signal circuit.	<Ref. to AT-72, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
72	Shift solenoid 2	Detects open or shorted output signal circuit.	<Ref. to AT-76, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	Low clutch timing solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-80, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
74	2-4 brake timing solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-84, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
75	Line pressure duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-88, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
76	2-4 brake duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-92, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
77	Lock-up duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-96, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
78	SPORT shift solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-102, DTC 78 SPORT SHIFT SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
79	Transfer duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-106, DTC 79 TRANSFER DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
86	VDC communication signal	Detects open or shorted input signal circuit.	<Ref. to AT-112, DTC 86 VDC COMMUNICATION SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
93	Rear vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-116, DTC 93 REAR VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

12. Diagnostic Procedure for POWER Indicator Light

A: POWER INDICATOR LIGHT DOES NOT COME ON OR GO OFF

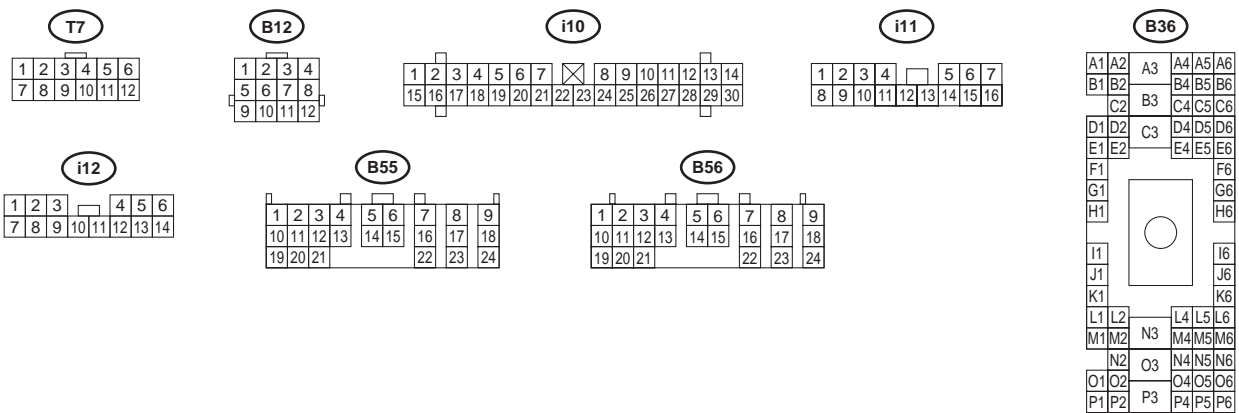
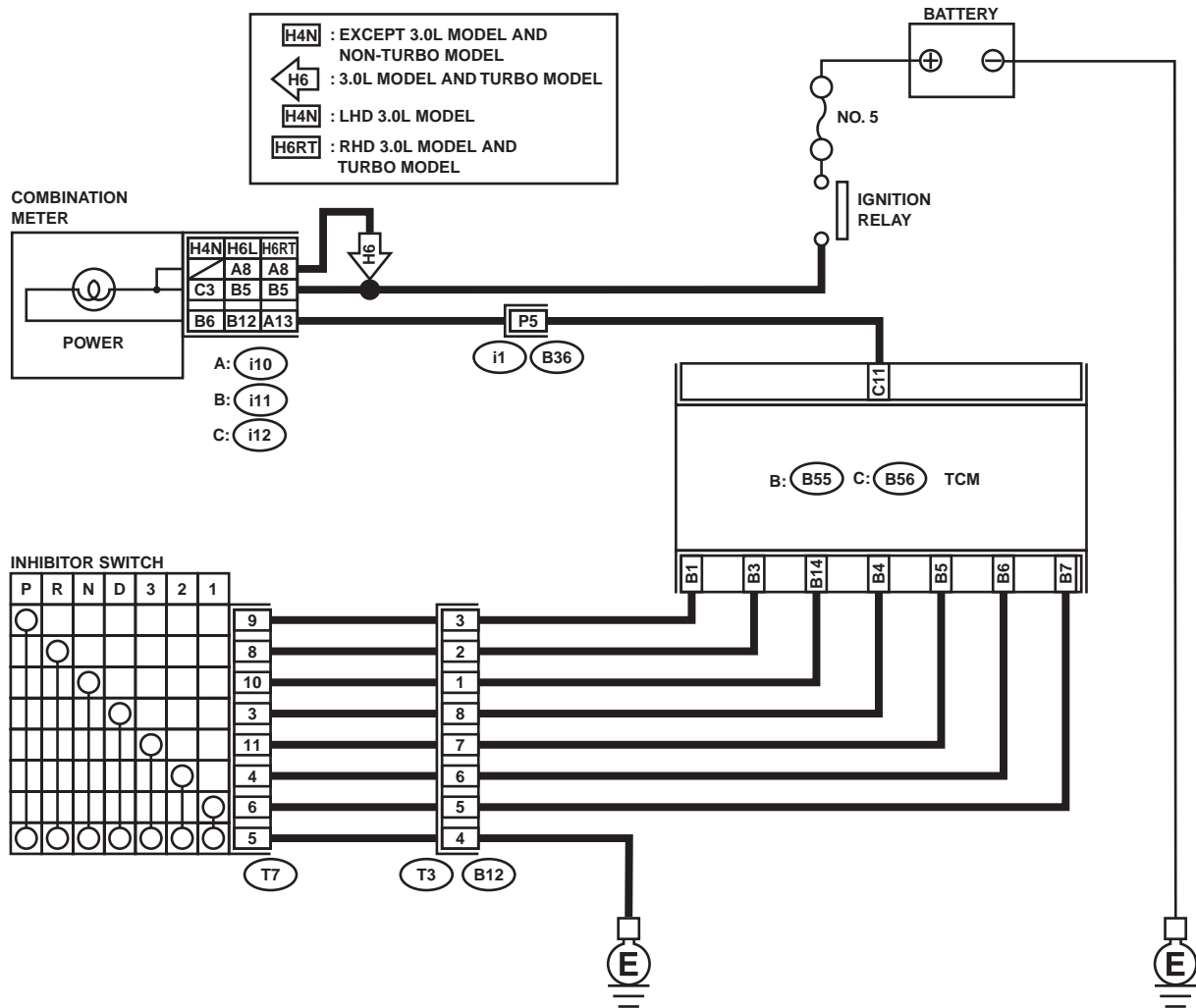
DIAGNOSIS:

The POWER Indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

- When ignition switch is turned to ON (engine OFF), POWER indicator light does not illuminate.
- When on-board diagnostics is performed, POWER indicator light remains illuminated.

WIRING DIAGRAM:



AT-00773

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK POWER INDICATOR LIGHT. Turn ignition switch to ON (engine OFF). Does POWER indicator light illuminate?	POWER indicator illuminates.	Go to step 3.	Go to step 2.
2 CHECK POWER INDICATOR LIGHT. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove POWER indicator light bulb from combination meter. Is POWER indicator light bulb OK?	Bulb is normal.	Go to step 4.	Replace POWER indicator light bulb.
3 CHECK POWER INDICATOR LIGHT. Perform "Read Diagnostic Trouble Code (DTC)". <Ref. to AT-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Does POWER indicator light blink?	Power indicator light illuminates.	A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM, inhibitor switch and combination meter.	Go to step 9.
4 CHECK FUSE (No. 5). Remove fuse (No. 5). Is the fuse (No. 5) blown out?	Fuse is blown.	Replace fuse (No. 5). If replaced fuse (No. 5) is blown out easily, repair short circuit in harness between fuse (No. 5) and combination meter.	Go to step 5.
5 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION RELAY. 1) Turn ignition switch to ON (engine OFF). 2) Measure voltage between combination meter connector and chassis ground. Connector & terminal Except 3.0 L model <i>(i12) No. 3 (+) — Chassis ground (-):</i> 3.0 L model <i>(i11) No. 5 (+) — Chassis ground (-):</i> <i>(i10) No. 8 (+) — Chassis ground (-):</i> Does the measured value exceed the specified value?	9 V	Go to step 6.	Repair open or short circuit in harness between combination meter and battery.
6 CHECK COMBINATION METER. Measure voltage between combination meter connector and chassis ground. Connector & terminal Except 3.0 L model and TURBO model <i>(i11) No. 6 (+) — Chassis ground (-):</i> LHD: 3.0 L model <i>(i11) No. 12 (+) — Chassis ground (-):</i> RHD: 3.0 L model and TURBO model <i>(i10) No. 13 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?	1 V	Repair combination meter. <Ref. to IDI-14, Combination Meter Assembly.>	Go to step 7.

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK OPEN CIRCUIT OF HARNESS.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect TCM and combination meter connector.</p> <p>3) Measure resistance of harness between combination meter.</p> <p>Connector & terminal Except 3.0 L model and TURBO model (B56) No. 11 — (i11) No. 6: LHD: 3.0 L model (B56) No. 11 — (i12) No. 12 RHD: 3.0 L and TURBO models (B56) No. 11 — (i0) No. 13</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair open circuit in harness between TCM and combination meter, and poor contact in coupling connector.
<p>8 CHECK INPUT SIGNAL FOR TCM.</p> <p>1) Connect connector to TCM and combination meter.</p> <p>2) Turn ignition switch to ON (engine OFF).</p> <p>3) Measure voltage between TCM connector and chassis ground.</p> <p>Connector & terminal (B56) No. 11 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Even if POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
<p>9 CHECK SUBARU SELECT MONITOR.</p> <p>Do you have Subaru Select Monitor?</p>	Subaru Select Monitor is available.	Go to step 10.	Go to step 11.
<p>10 CHECK INHIBITOR SWITCH.</p> <p>1) Connect Subaru Select Monitor to data link connector.</p> <p>2) Turn ignition switch to ON.</p> <p>3) Subaru Select Monitor to ON.</p> <p>4) Read data of range switch using Subaru Select Monitor.</p> <p>•Range switch is indicated in ON ⇔ OFF. When each range is selected, does LED of Subaru Select Monitor light up?</p>	LED lights up.	Go to step 11.	Check inhibitor switch circuit. <Ref. to AT-132, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
<p>11 CHECK SHORT CIRCUIT OF HARNESS.</p> <p>1) Disconnect connector from TCM.</p> <p>2) Remove combination meter.</p> <p>3) Disconnect connector from combination meter.</p> <p>4) Measure resistance of harness connector between TCM and chassis ground.</p> <p>Connector & terminal (B56) No. 11 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 MΩ	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>	Repair short circuit in harness between combination meter connector and TCM connector.

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

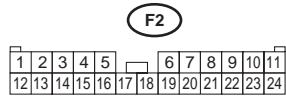
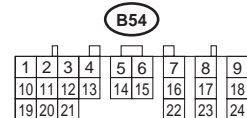
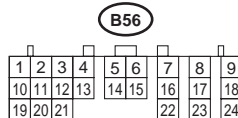
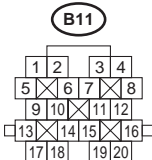
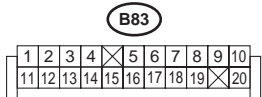
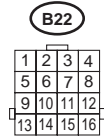
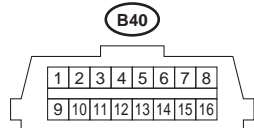
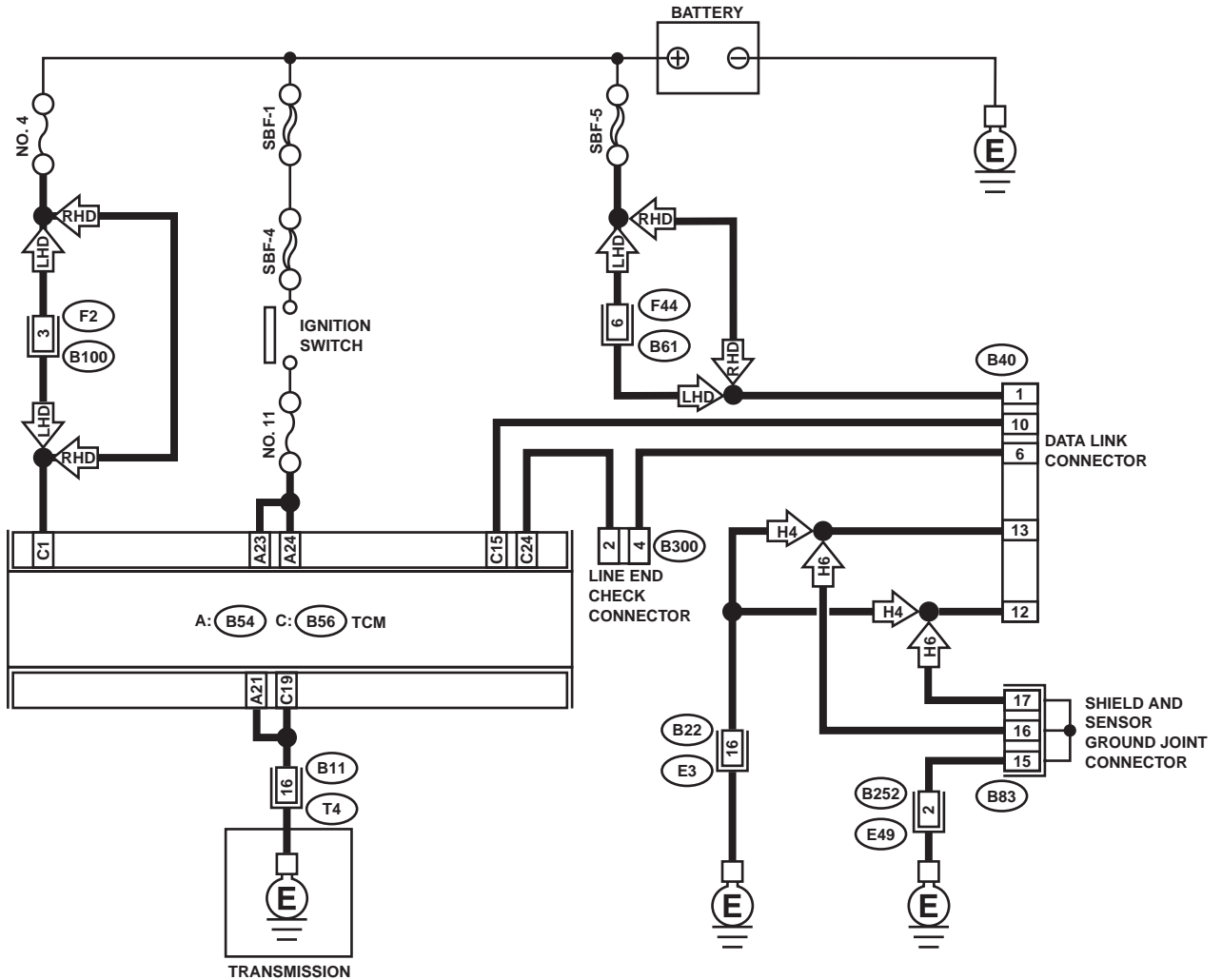
MEMO:

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: CHECK POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:



AT-00774

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK BATTERY TERMINAL. Turn ignition switch to OFF. Is there poor contact at battery terminal?	There is poor contact.	Repair battery terminal.	Go to step 6.
2 CHECK POWER SUPPLY OF TCM. 1) Disconnect connector from TCM. 2) Turn ignition switch to ON. 3) Measure voltage between TCM connector and chassis ground. Connector & terminal (B56) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Go to step 4.	Go to step 3.
3 CHECK FUSE (NO. 4). Remove fuse (No. 4). Is the fuse (No. 4) blown out?	Fuse is blown.	Replace fuse (No. 4). If replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.	Repair open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
4 CHECK IGNITION POWER SUPPLY CIRCUIT. 1) Turn ignition switch to ON (engine OFF). 2) Measure ignition power supply voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 23 (+) — Chassis ground (-): (B54) No. 24 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 6.	Go to step 5.
5 CHECK FUSE (NO. 11). Remove fuse (No. 11). Is the fuse (No. 11) blown out?	Fuse is blown.	Replace fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair open circuit in harness between fuse (No. 11) and TCM, or fuse (No. 11) and battery, and poor contact in coupling connector.
6 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B56) No. 19 — (B11) No. 16: (B54) No. 21 — (B11) No. 16: Is the measured value less than the specified value?	1 Ω	Go to step 7.	Repair open circuit in harness between TCM and transmission harness connector, and poor contact in coupling connector.

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND. Measure resistance of harness between transmission and transmission ground. Connector & terminal (T4) No. 16 — Transmission ground: Is the measured value less than the specified value?	1 Ω	Go to step 8 .	Repair open circuit in harness between transmission and transmission ground.
8 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in control module power supply and ground line?	There is poor contact.	Repair connector.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

13. Diagnostic Procedure for Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

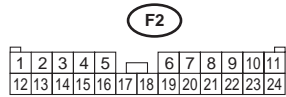
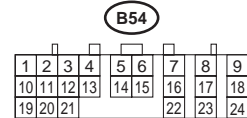
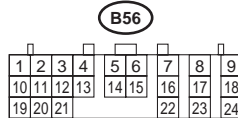
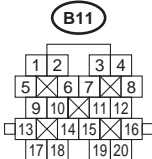
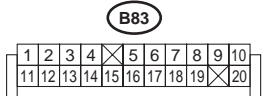
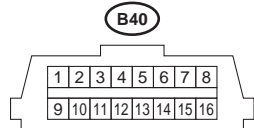
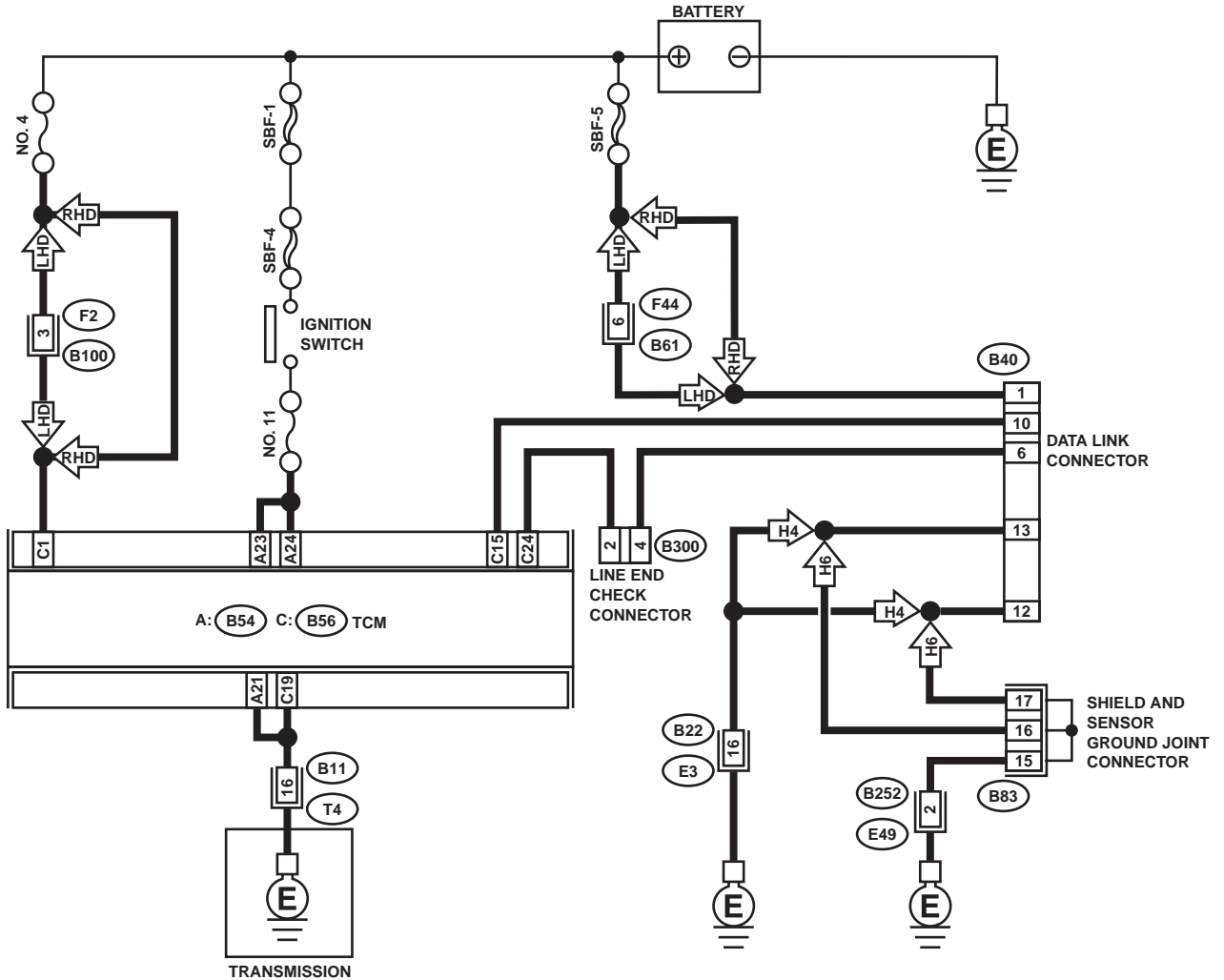
DIAGNOSIS:

- Faulty harness connector

TROUBLE SYMPTOM:

- Select monitor communication failure

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR SELECT MONITOR COMMUNICATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT. Measure voltage between data link connector and chassis ground. Connector & terminal (B40) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Repair harness and connector between battery and data link connector, and poor contact in coupling connector.
<p>2 CHECK SUBARU SELECT MONITOR GROUND CIRCUIT. Measure resistance of harness between data link connector and chassis ground. Connector & terminal (B40) No. 12 — Chassis ground: (B40) No. 13 — Chassis ground: Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	Repair open circuit in harness between data link connector and ground terminal, and poor contact in coupling connector.
<p>3 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to ON. 2) Using the select monitor, check whether communication to engine systems can be executed normally. Are the name and year of the system displayed on the select monitor?</p>	Name and year are displayed.	Go to step 6.	Go to step 4.
<p>4 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Disconnect TCM connector. 3) Check whether communication to engine systems can be executed normally. Are the name and year of the system displayed on the select monitor?</p>	Name and year are displayed.	Go to step 8.	Go to step 5.
<p>5 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Connect TCM connector. 3) Disconnect ECM connector. 4) Check whether communication to transmission systems can be executed normally. Are the name and year of the system displayed on the select monitor?</p>	Name and year are displayed.	Inspect ECM.	Go to step 6.
<p>6 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect TCM and ECM connectors. 3) Measure resistance between data link connector and chassis ground. Connector & terminal (B40) No. 10 — Chassis ground: (B40) No. 6 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Repair harness and connector between each control module and data link connector.

DIAGNOSTIC PROCEDURE FOR SELECT MONITOR COMMUNICATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK OUTPUT SIGNAL FOR TCM. 1) Turn ignition switch to ON. 2) Measure voltage between data link connector and chassis ground. Connector & terminal (B40) No. 10 (+) — Chassis ground (-): (B40) No. 6 (+) — Chassis ground (-): Does the measured value exceed the specified value?	1 V	Repair harness and connector between each control module and data link connector.	A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the circuit.
8 CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR. Measure resistance between TCM connector and data link connector. Connector & terminal (B56) No. 15 — (B40) No. 10: Is the measured value less than the specified value?	0.5 Ω	Go to step 9.	Repair harness and connector between TCM and data link connector.
9 CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR. Measure resistance between TCM connector and data link connector. Connector & terminal (B56) No. 24 — (B40) No. 6: Does the measured value exceed the specified value?	1 MΩ	Go to step 10.	Repair harness and connector between TCM and data link connector.
10 CHECK INSTALLATION OF TCM CONNECTOR. Turn ignition switch to OFF. Is TCM connector inserted into TCM?	TCM connector is inserted correctly.	Go to step 11.	Insert TCM connector into TCM.
11 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in control module and data link connector?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR SELECT MONITOR COMMUNICATION
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

14. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 ENGINE SPEED SIGNAL

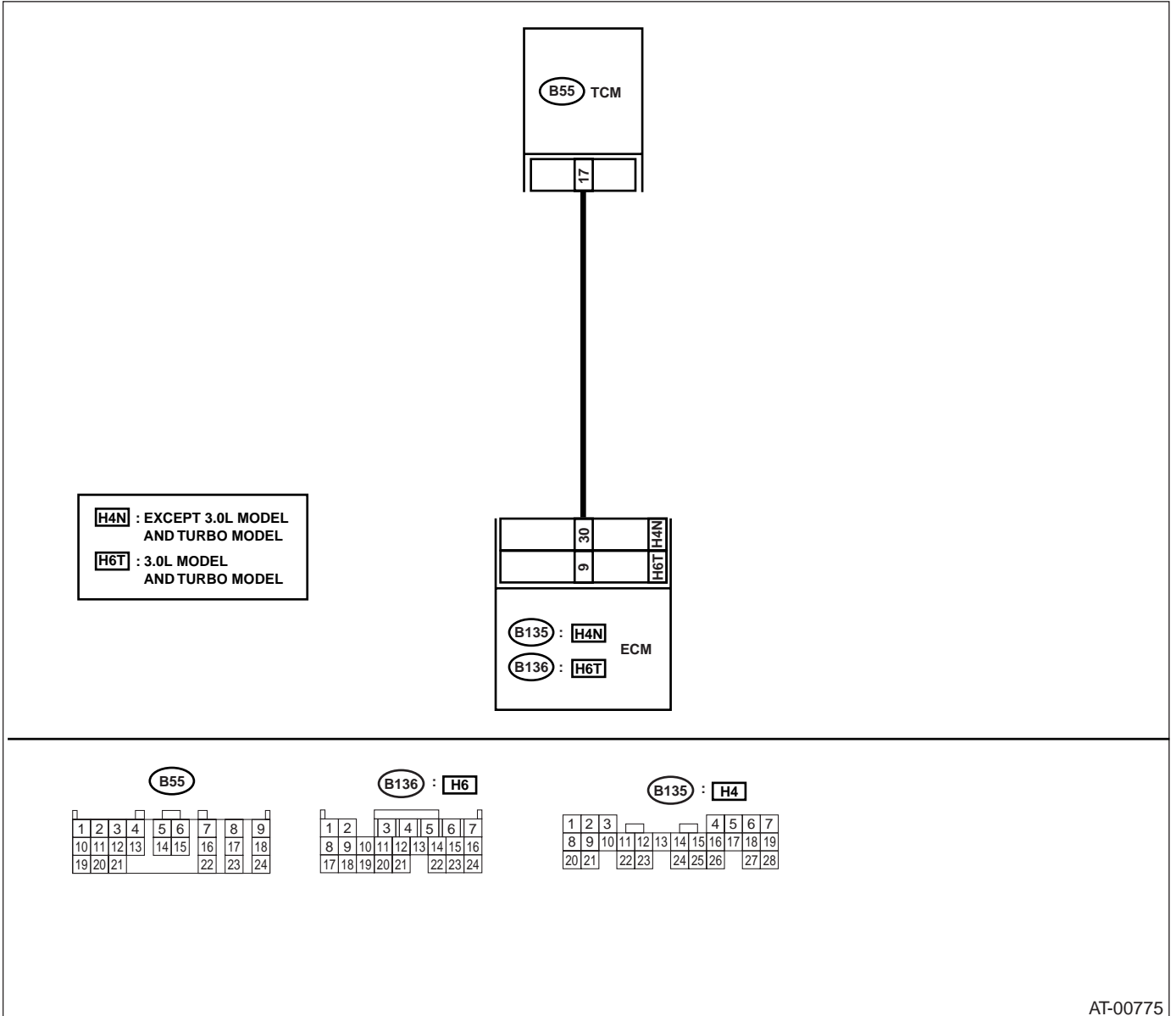
DIAGNOSIS:

Engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- POWER indicator light remains on when vehicle speed is "0".

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and ECM. 3) Measure resistance of harness between TCM and ECM connector.</p> <p>Connector & terminal Except 3.0 L model and TURBO model: (B55) No. 17 — (B135) No. 30: 3.0 L model and TURBO model: (B55) No. 17 — (B136) No. 9:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and ECM connector.
<p>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.</p> <p>Measure resistance of harness between TCM connector and chassis ground.</p> <p>Connector & terminal (B55) No. 17 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and ECM connector.
<p>3 PREPARE SUBARU SELECT MONITOR.</p> <p>Do you have a Subaru Select Monitor?</p>	Subaru Select Monitor is available.	Go to step 5.	Go to step 4.
<p>4 CHECK INPUT SIGNAL FOR TCM.</p> <p>1) Connect connectors to TCM and ECM. 2) Turn ignition switch to ON (engine OFF). 3) Measure voltage between TCM connector and chassis ground.</p> <p>Connector & terminal (B55) No. 17 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10.5 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step 6.
<p>5 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</p> <p>1) Connect connectors to TCM and ECM. 2) Connect Subaru Select Monitor to data link connector. 3) Start the engine, and turn Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Engine idling. 6) Read data of engine speed using Subaru Select Monitor.</p> <p>•Display shows engine speed signal value sent from ECM.</p> <p>Is the revolution value the same as the tachometer reading shown on the combination meter?</p>	Tachometer and select monitor value are the same.	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step 6.
<p>6 CHECK POOR CONTACT.</p> <p>Is there poor contact in engine speed signal circuit?</p>	There is poor contact.	Repair poor contact.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
7 CONFIRM DTC 11. Replace ECM with a new one. Does the diagnostic trouble code (DTC) appear again, after the memory has been cleared?	DTC11 is displayed.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>	Replace ECM.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: DTC 23 MASS AIR FLOW SIGNAL (TURBO MODEL)

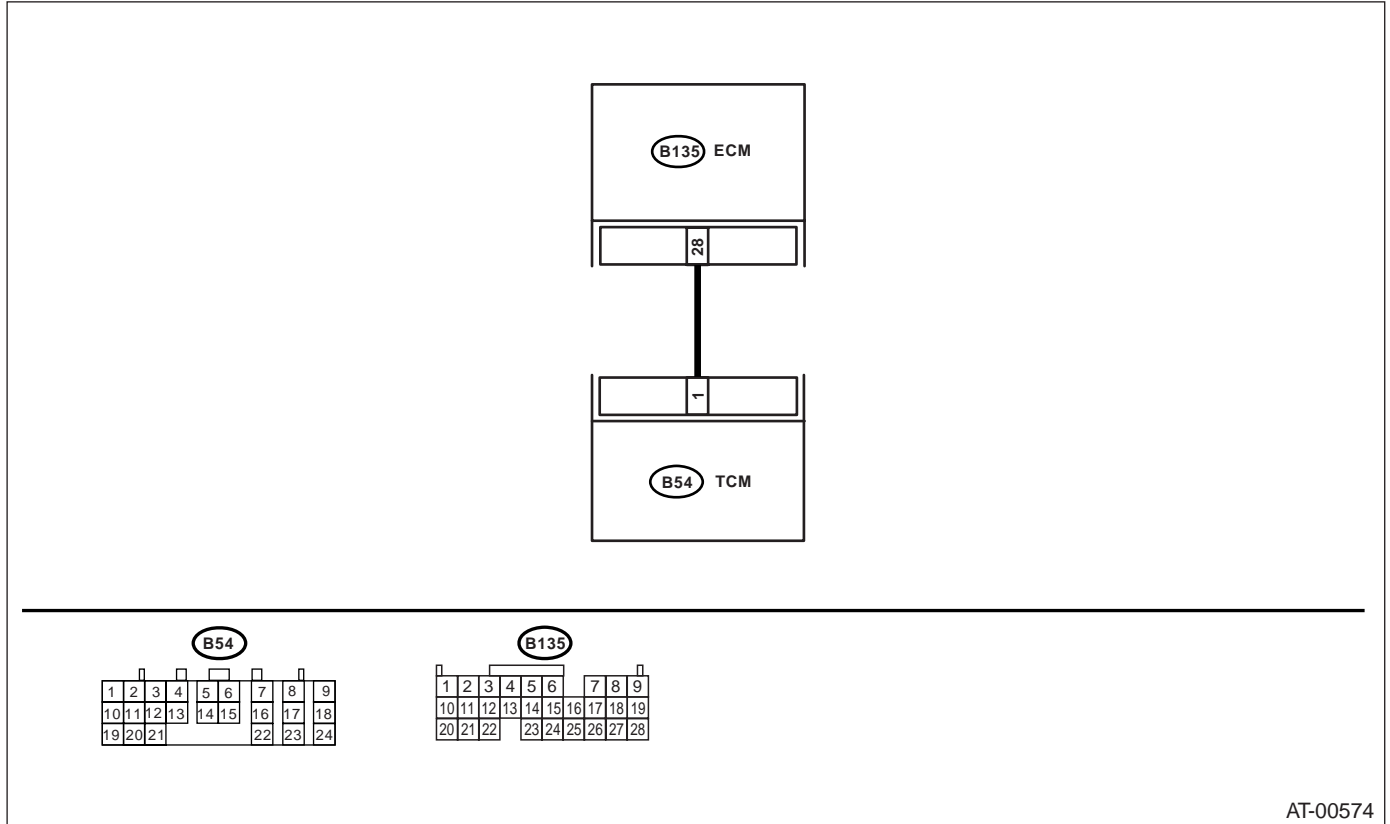
DIAGNOSIS:

The input signal circuit of TCM from ECM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



AT-00574

Step	Value	Yes	No
1 CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble?	There is a trouble.	Repair the ground terminal and/or ground circuit of ECM.	Go to step 2.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. Connector & terminal (B54) No. 1 — (B135) No. 28: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair the open circuit in harness between TCM and ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 1 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair the short circuit in harness between TCM and ECM connector.
4 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR TCM. 1) Connect the connectors to TCM and ECM. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Idle the engine. 4) Measure the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	0.9 — 1.4 V	Even if the power indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step 7.
6 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn the Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Idle the engine. 6) Read the data of mass air flow sensor signal using Subaru Select Monitor. •Display shows the mass air flow sensor signal value sent from ECM. Is the data of mass air flow sensor within the specified range?	0.9 — 1.4 V	Even if the power indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step 7.
7 CHECK POOR CONTACT. Is there poor contact in mass air flow sensor signal circuit?	There is poor contact.	Repair the poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: DTC 27 ATF TEMPERATURE SENSOR

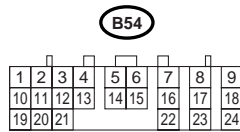
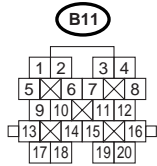
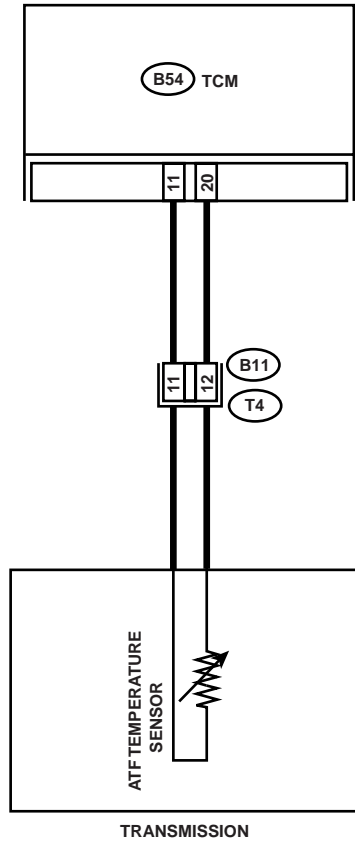
DIAGNOSIS:

Input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



AT-00776

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from transmission and TCM. 3) Measure resistance of harness between TCM and transmission connector.</p> <p>Connector & terminal (B54) No. 20 — (B11) No. 12:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
<p>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</p> <p>Measure resistance of harness between TCM and transmission connector.</p> <p>Connector & terminal (B54) No. 11 — (B11) No. 11:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	Repair open circuit in harness between TCM and transmission connector.
<p>3 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</p> <p>Measure resistance of harness between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 20 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Repair short circuit in harness between TCM and transmission connector.
<p>4 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</p> <p>Measure resistance of harness between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 11 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Repair short circuit in harness between TCM and transmission connector.
<p>5 CHECK ATF TEMPERATURE SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Connect connectors to transmission and TCM. 3) Turn ignition switch to ON and start engine. 4) Warm-up the transmission until ATF temperature reaches to 80°C (176°F).</p> <p>NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.</p> <p>5) Disconnect connector from transmission. 6) Measure resistance between transmission connector terminals.</p> <p>Connector & terminal (T4) No. 11 — No. 12:</p> <p>Is the measured value within the specified range?</p>	275 — 375 Ω	Go to step 6.	Replace with ATF sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

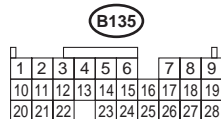
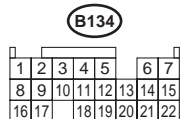
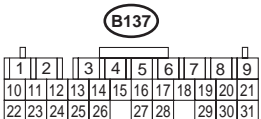
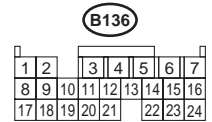
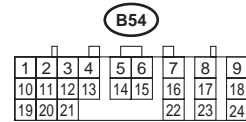
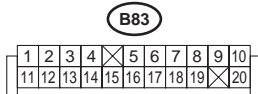
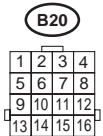
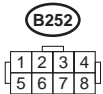
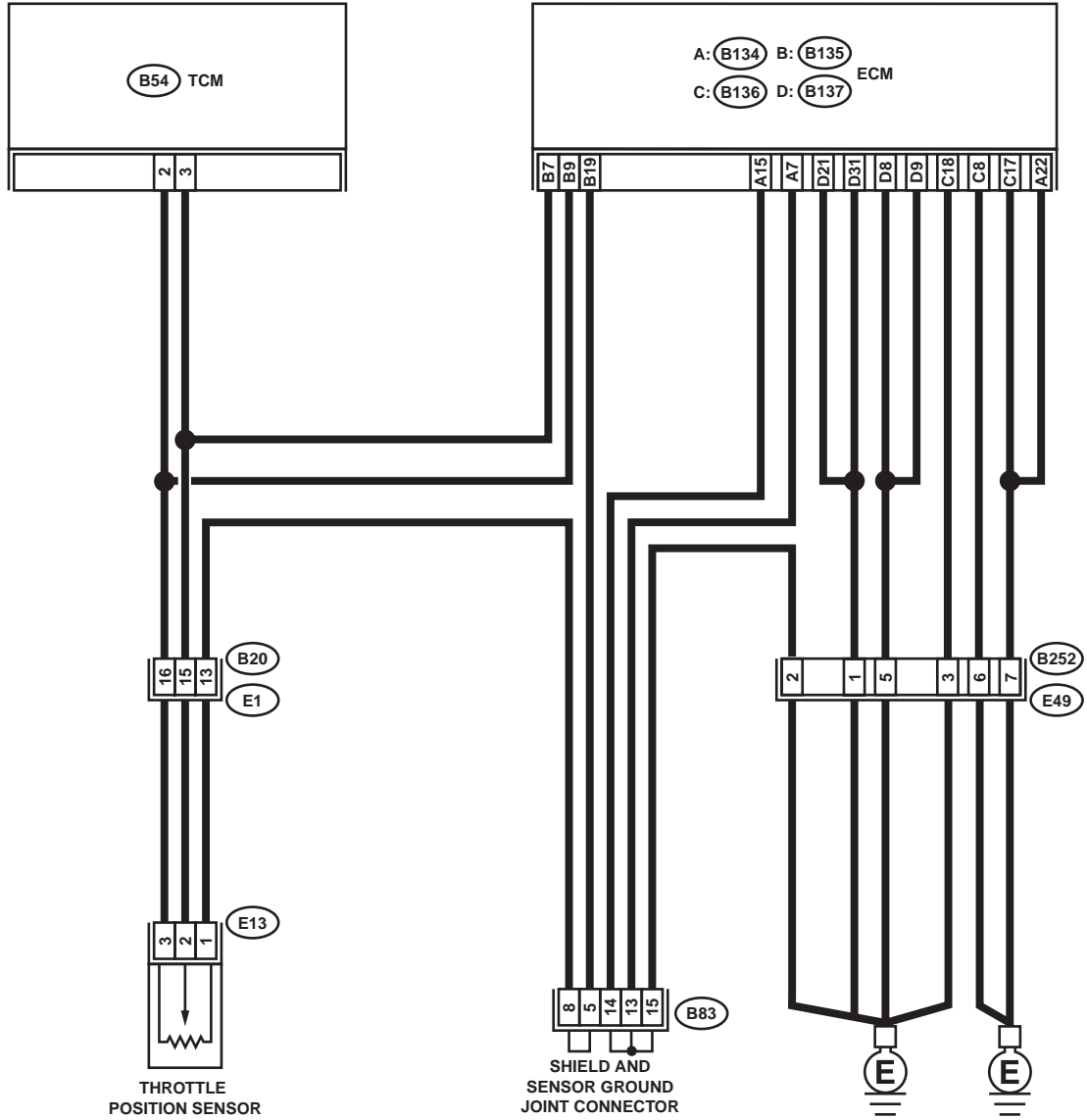
Step	Value	Yes	No
6 CHECK ATF TEMPERATURE SENSOR. 1) Turn ignition switch to ON (engine OFF). 2) Measure resistance between transmission connector terminals. Connector & terminal (T4) No. 11 — No. 12: Does the resistance value increase while the ATF temperature decreases?	Resistance value increases.	Go to step 7.	Replace ATF sensor.
7 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step 9.	Go to step 8.
8 CHECK INPUT SIGNAL FOR TCM. 1) Connect connector to transmission. 2) Warm-up the transmission until ATF temperature is about 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 3) Measure voltage between TCM connector terminal. Connector & terminal (B54) No. 11 (+) — No. 20 (-): Is the measured value within the specified range?	0.4 — 0.9 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the case. Repair harness or contact in the ATF temperature sensor and transmission connector.	Go to step 10.
9 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1) Connect connector to transmission. 2) Turn ignition switch to ON (engine OFF). Does the ATF temperature gradually decrease?	ATF temperature gradually increases.	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the case. Repair harness or contact in the ATF temperature sensor and transmission connector.	Go to step 10.
10 CHECK POOR CONTACT. Is there poor contact in ATF temperature sensor circuit?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

3.0 L MODEL



AT-00778

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ENGINE GROUND TERMINALS. Have engine ground terminals been tightened?	Engine ground terminals are tightened correctly.	Go to step 2.	Tighten engine ground terminals.
2 CHECK GROUND CIRCUIT OF ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and engine ground. Connector & terminal Non-TURBO without OBD model: (B134) No. 27 — Engine ground: (B134) No. 8 — Engine ground: (B134) No. 7 — Engine ground: (B136) No. 21 — Engine ground: (B136) No. 22 — Engine ground: (B135) No. 6 — Engine ground: Non-TURBO with OBD model: (B134) No. 7 — Engine ground: (B134) No. 35 — Engine ground: (B135) No. 21 — Engine ground: (B136) No. 5 — Engine ground: (B136) No. 16 — Engine ground: (B136) No. 26 — Engine ground: (B137) No. 14 — Engine ground: TURBO model: (B134) No. 7 — Engine ground: (B134) No. 12 — Engine ground: (B134) No. 15 — Engine ground: (B134) No. 22 — Engine ground: (B136) No. 8 — Engine ground: (B136) No. 17 — Engine ground: (B136) No. 18 — Engine ground: (B137) No. 8 — Engine ground: (B137) No. 9 — Engine ground: (B84) No. 1 — Engine ground: 3.0 L model: (B134) No. 7 — Engine ground: (B134) No. 15 — Engine ground: (B134) No. 22 — Engine ground: (B136) No. 8 — Engine ground: (B136) No. 17 — Engine ground: (B136) No. 18 — Engine ground: (B137) No. 8 — Engine ground: (B137) No. 9 — Engine ground: (B137) No. 21 — Engine ground: (B137) No. 31 — Engine ground: Is the measured value less than the specified value?	5 Ω	Go to step 3.	Repair open circuit in harness between ECM connector and engine grounding terminal.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>3 CHECK THROTTLE POSITION SENSOR.</p> <p>1) Disconnect connector from throttle position sensor.</p> <p>2) Measure resistance between throttle position sensor connector receptacle's terminals.</p> <p>Terminals Except 3.0 L model and TURBO model: No. 4 — No. 2: 3.0 L model: No. 1 — No. 3: TURBO model: No. 1 — No. 2:</p> <p>Is the measured value within the specified range?</p>	3.0 — 4.2 k Ω	Go to step 4.	Replace throttle position sensor.
<p>4 CHECK THROTTLE POSITION SENSOR.</p> <p>Measure resistance between throttle position sensor connector receptacle's terminals.</p> <p>Terminals Except 3.0 L model: No. 2 — No. 3: 3.0 L model: No. 1 — No. 2:</p> <p>Is the measured value within the specified range?</p>	0.35 — 0.5 k Ω	Go to step 5.	Replace throttle position sensor.
<p>5 CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.</p> <p>1) Disconnect connector from TCM.</p> <p>2) Measure resistance of harness between TCM and throttle position sensor connector.</p> <p>Connector & terminal Except 3.0 L model: (B55) No. 3 — (E13) No. 3: 3.0 L model: (B55) No. 3 — (E13) No. 2:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 6.	Repair open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
<p>6 CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.</p> <p>Measure resistance of harness between TCM and throttle position sensor connector.</p> <p>Connector & terminal Except 3.0 L model and TURBO model: (B54) No. 2 — (E13) No. 4: 3.0 L model: (B54) No. 2 — (E13) No. 3: TURBO model: (B54) No. 2 — (E13) No. 1:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 7.	Repair open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
<p>7 CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.</p> <p>Measure resistance of harness between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 3 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 8.	Repair short circuit in harness between TCM and throttle position sensor connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR. Measure resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 2 — Chassis ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 9.	Repair short circuit in harness between TCM and throttle position sensor connector.
<p>9 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure resistance of harness between TCM and ECM connector. Connector & terminal Non-TURBO without OBD model: (B54) No. 3 — (B136) No. 17: Non-TURBO with OBD model: (B54) No. 3 — (B135) No. 13: TURBO model: (B54) No. 3 — (B135) No. 7: 3.0 L model: (B54) No. 3 — (B135) No. 7: Is the measured value less than the specified value?</p>	1 Ω	Go to step 10.	Repair open circuit in harness between TCM and ECM connector.
<p>10 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure resistance of harness between TCM and ECM connector. Connector & terminal Non-TURBO without OBD model: (B54) No. 2 — (B136) No. 15: Non-TURBO with OBD model: (B54) No. 2 — (B135) No. 3: TURBO model: (B54) No. 2 — (B135) No. 9: 3.0 L model: (B54) No. 2 — (B135) No. 9: Is the measured value less than the specified value?</p>	1 Ω	Go to step 11.	Repair open circuit in harness between TCM and ECM connector.
<p>11 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?</p>	Subaru Select Monitor is available.	Go to step 14.	Go to step 12.
<p>12 CHECK INPUT SIGNAL FOR TCM. 1) Connect connectors to TCM, throttle position sensor and ECM. 2) Turn ignition switch to ON (engine OFF). 3) Close the throttle completely. 4) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 3 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	0.2 — 1.0 V	Go to step 13.	Go to step 18.
<p>13 CHECK INPUT SIGNAL FOR TCM. 1) Open the throttle completely. 2) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 3 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	4.2 — 4.7 V	Go to step 16.	Go to step 18.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
14 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1) Connect connectors to TCM, throttle position sensor and ECM. 2) Connect Subaru Select Monitor to data link connector. 3) Turn ignition switch to ON (engine OFF). 4) Turn Subaru Select Monitor switch to ON. 5) Throttle fully closed. 6) Read data of throttle position sensor using Subaru Select Monitor. •Throttle position sensor input signal is indicated. Is throttle sensor data within the specified range?	0.2 — 1.0 V	Go to step 15.	Go to step 18.
15 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. Throttle fully open. NOTE: Must be changed correspondingly with accelerator pedal operation (from “released” to “depressed” position). Is throttle sensor data within the specified range?	4.2 — 4.7 V	Go to step 18.	Go to step 17.
16 CHECK INPUT SIGNAL FOR TCM (THROTTLE POSITION SENSOR POWER SUPPLY). Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 2 (+) — Chassis ground (-): Is the measured value within the specified range?	4.8 — 5.3 V	Even if “POWER” indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in throttle position sensor circuit.	Go to step 18.
17 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR (THROTTLE POSITION SENSOR POWER SUPPLY). Read data of throttle position sensor power supply using Subaru Select Monitor. •Throttle position sensor power supply voltage is indicated. Is the measured value within the specified range?	4.8 — 5.3 V	Even if “POWER” indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in throttle position sensor circuit.	Go to step 18.
18 CHECK POOR CONTACT. Is there poor contact in throttle position sensor circuit?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

E: DTC 33 FRONT VEHICLE SPEED SENSOR

DIAGNOSIS:

- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

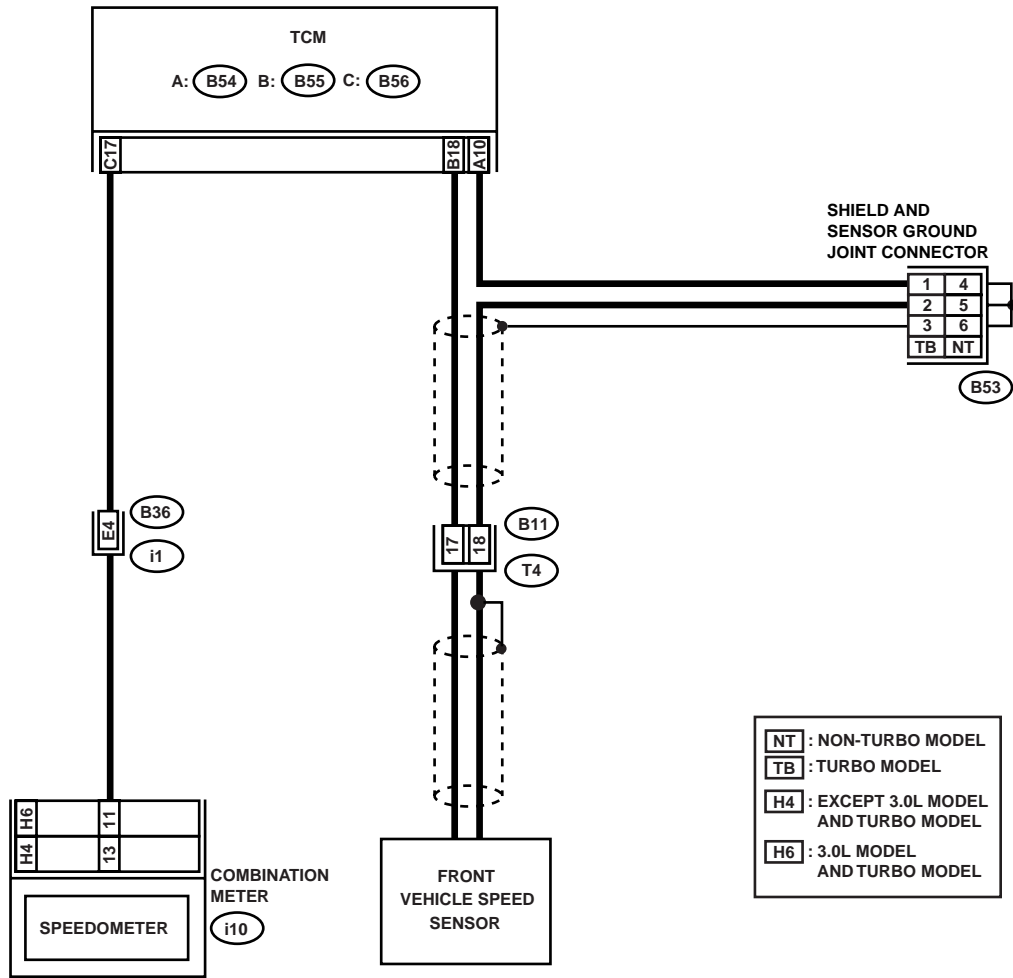
TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

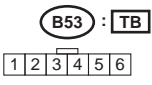
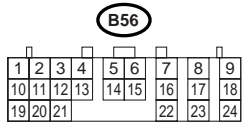
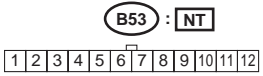
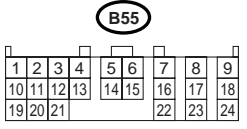
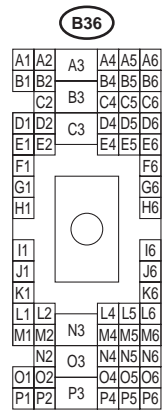
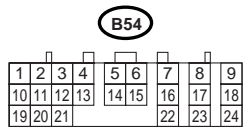
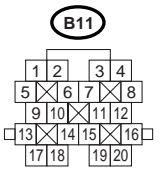
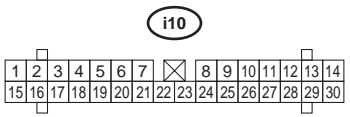
DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM:



NT : NON-TURBO MODEL
TB : TURBO MODEL
H4 : EXCEPT 3.0L MODEL AND TURBO MODEL
H6 : 3.0L MODEL AND TURBO MODEL



AT-00779

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B55) No. 18 — (B11) No. 17: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 10 — (B11) No. 18: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 10 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair short circuit in harness between TCM and transmission connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM and transmission connector. Connector & terminal (B55) No. 18 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 5.	Repair short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
5 CHECK FRONT VEHICLE SPEED SENSOR. Measure resistance between transmission connector receptacle's terminals. Connector & terminal (T4) No. 17 — No. 18: Is the measured value within the specified range?	450 — 650 Ω	Go to step 6.	Replace front vehicle speed sensor. <Ref. to AT-54, Front Vehicle Speed Sensor.>
6 PREPARE OSCILLOSCOPE. Do you have oscilloscope?	Oscilloscope is available.	Go to step 9.	Go to step 7.
7 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step 10.	Go to step 8.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK INPUT SIGNAL FOR TCM.</p> <p>1) Connect all connectors. 2) Lift-up or raise the vehicle and place safety stands.</p> <p>NOTE: Raise all wheels off floor.</p> <p>3) Start the engine and set vehicle in 20 km/h (12 MPH) condition.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>4) Measure voltage between TCM connector terminals. Connector & terminal (B55) No. 18 (+) — (B54) No. 10 (-): Does the measured value exceed the specified value?</p>	AC 1 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the case. Repair harness or connector in the front vehicle speed sensor circuit.	Go to step 11.
<p>9 CHECK FRONT VEHICLE SPEED SENSOR USING OSCILLOSCOPE.</p> <p>1) Connect all connectors. 2) Lift-up the vehicle and place safety stand.</p> <p>NOTE: Raise all wheels off ground.</p> <p>3) Set oscilloscope to TCM connector terminals. Connector & terminal Positive probe; (B55) No. 18 Ground; (B54) No. 10</p> <p>4) Start the engine, and drive the wheels slowly.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>5) Measure signal voltage indicated on oscilloscope. Does the measured value exceed the specified value?</p>	AC 1 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the case. Repair harness or connector in the front vehicle speed sensor circuit.	Go to step 11.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>10 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</p> <p>1) Connect all connectors. 2) Connect Subaru Select Monitor to data link connector. 3) Lift-up or raise the vehicle and place safety stands.</p> <p>NOTE: Raise all wheels off floor.</p> <p>4) Turn ignition switch to ON and turn Subaru Select Monitor switch to ON. 5) Start the engine. 6) Read data of vehicle speed using Subaru Select Monitor.</p> <p>•Compare speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in "km/h" or "MPH".</p> <p>7) Slowly increase vehicle speed to 60 km/h or 37 MPH.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p style="padding-left: 40px;">Does the speedometer indication increase as the Subaru Select Monitor data increases?</p>	<p>Subaru Select Monitor display also increases.</p>	<p>Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the case. Repair harness or connector in the front vehicle speed sensor circuit.</p>	<p>Go to step 11.</p>
<p>11 CHECK POOR CONTACT.</p> <p>Is there poor contact in front vehicle speed sensor circuit?</p>	<p>There is poor contact.</p>	<p>Repair poor contact.</p>	<p>Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
 AUTOMATIC TRANSMISSION (DIAGNOSTICS)

F: DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR

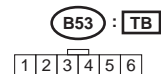
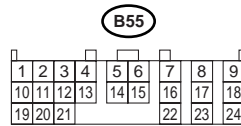
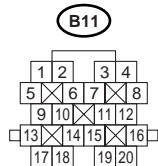
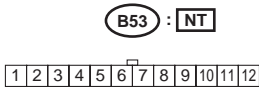
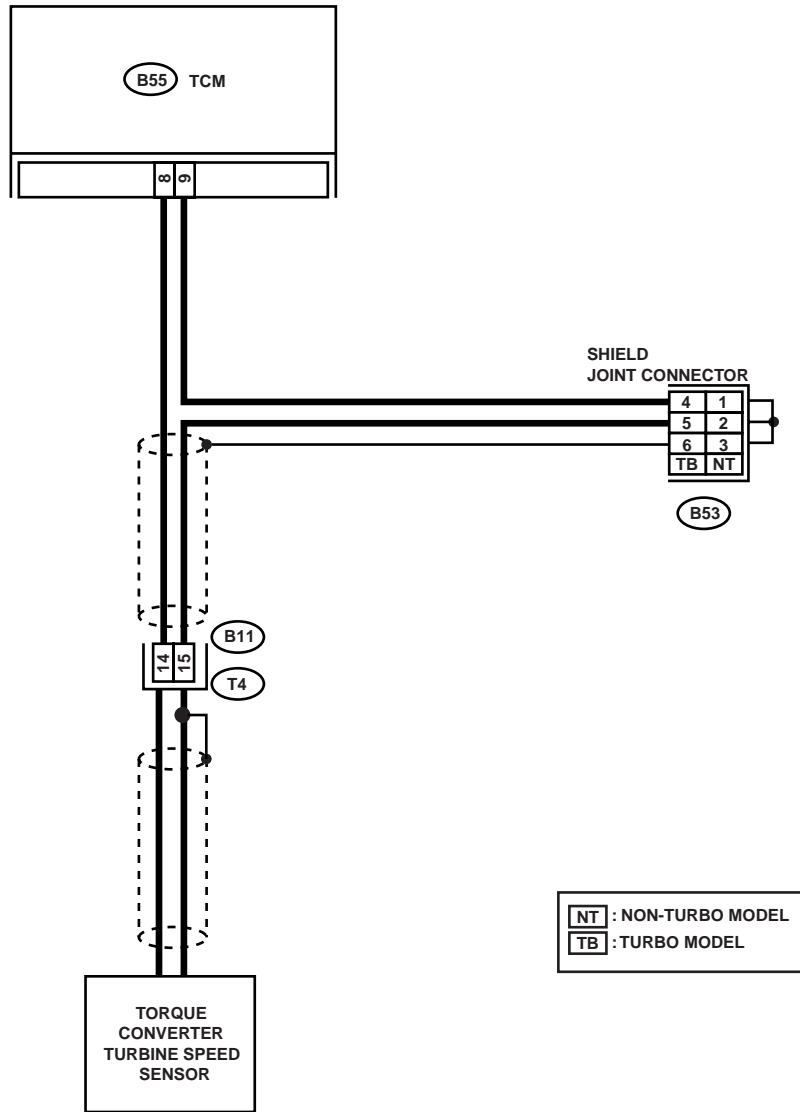
DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK TORQUE CONVERTER TURBINE SPEED SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from transmission. 3) Measure resistance between transmission connector receptacle's terminals. Connector & terminal (T4) No. 14 — No. 15: Is the measured value within the specified range?	450 — 650 Ω	Go to step 2.	Replace turbine speed sensor. <Ref. to AT-59, Torque Converter Turbine Speed Sensor.>
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Disconnect connector from TCM. 2) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B55) No. 8 — (B11) No. 14: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit in harness between TCM and transmission connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM and transmission connector. Connector & terminal (B55) No. 9 — (B11) No. 15: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 9 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 5.	Repair short circuit in harness between TCM and transmission connector.
5 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 8 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 6.	Repair short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
6 PREPARE OSCILLOSCOPE. Do you have oscilloscope?	Oscilloscope is available.	Go to step 10.	Go to step 7.
7 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step 9.	Go to step 8.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK INPUT SIGNAL FOR TCM.</p> <p>1) Connect connectors to TCM and transmission.</p> <p>2) Start the engine and move select lever to "P" or "N" range.</p> <p>3) Measure voltage between TCM connector terminals.</p> <p>Connector & terminal (B55) No. 8 (+) — No. 9 (-): Does the measured value exceed the specified value?</p>	AC 1 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and transmission.	Go to step 11.
<p>9 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</p> <p>1) Connect connectors to TCM and transmission.</p> <p>2) Connect Subaru Select Monitor to data link connector.</p> <p>3) Turn ignition switch to ON and turn Subaru Select Monitor switch to ON.</p> <p>4) Start the engine.</p> <p>5) Move select lever to "P" or "N" range.</p> <p>6) Read data of turbine speed using Subaru Select Monitor.</p> <p>•Compare tachometer with Subaru Select Monitor indications. Is the revolution value same as the tachometer reading shown on the combination meter?</p>	Same as tachometer value.	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and transmission.	Go to step 11.
<p>10 CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.</p> <p>1) Connect connectors to TCM and transmission.</p> <p>2) Set oscilloscope to TCM connector terminals.</p> <p>Connector & terminal Positive probe; (B55) No. 8 Ground; (B55) No. 9</p> <p>3) Start the engine and move select lever to "P" or "N" range. Does the measured value exceed the specified value?</p>	AC 1 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and transmission.	Go to step 11.
<p>11 CHECK POOR CONTACT.</p> <p>Is there poor contact in torque converter turbine speed sensor circuit?</p>	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

G: DTC 38 TORQUE CONTROL SIGNAL

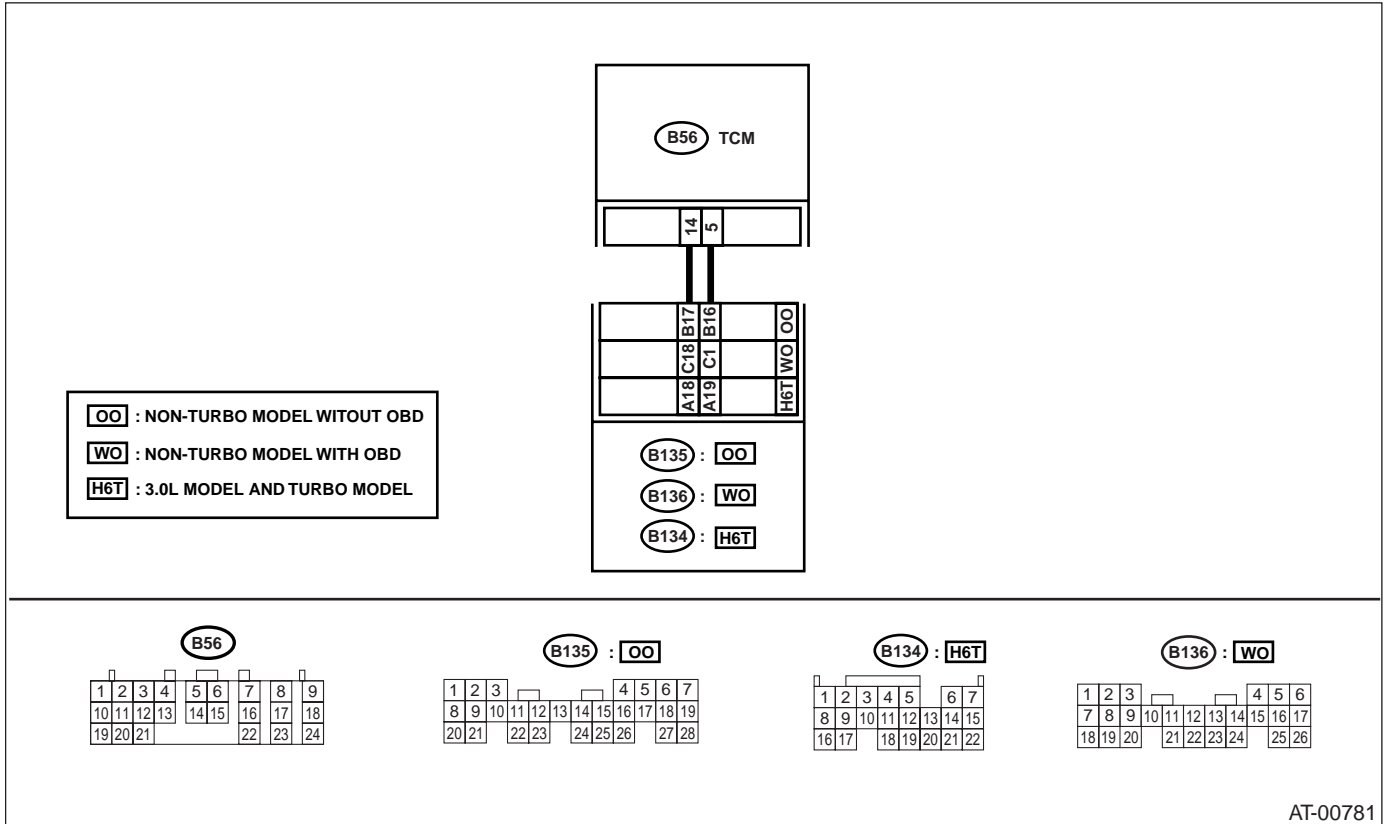
DIAGNOSIS:

- The signal circuit is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



AT-00781

Step	Value	Yes	No
<p>1</p> <p>CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connectors from TCM and ECM.</p> <p>3) Measure resistance of harness between TCM and ECM connector.</p> <p>Connector & terminal</p> <p>Non-TURBO without OBD model:</p> <p>(B56) No. 14 — (B135) No. 17:</p> <p>(B56) No. 5 — (B135) No. 16:</p> <p>Non-TURBO with OBD model:</p> <p>(B56) No. 14 — (B136) No. 18:</p> <p>(B56) No. 15 — (B136) No. 1:</p> <p>3.0 L model and TURBO model:</p> <p>(B56) No. 14 — (B134) No. 18:</p> <p>(B56) No. 5 — (B134) No. 19:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure resistance of harness between TCM connector and chassis ground. Connector & terminal (B56) No. 14 — Chassis ground: (B56) No. 5 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and ECM connector.
<p>3 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect connectors to TCM and ECM. 2) Turn ignition switch to ON (engine OFF). 3) Measure voltage between TCM connector terminals. Connector & terminal (B56) No. 14 (+) — Chassis ground (-): (B56) No. 5 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.8 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step 4.
<p>4 CHECK POOR CONTACT. Is there poor contact in torque control signal circuit?</p>	There is poor contact.	Repair poor contact.	Go to step 5.
<p>5 CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY. Check installing condition of ground line in transmission and body. Is there any dirt or rust at ground line installing point?</p>		Remove dirt and rust.	Go to step 6.
<p>6 CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY. Check installing condition of ground line in transmission and body. Is tightening torque value within specification?</p>	10 — 16 N·m (1.0 — 1.6 kgf·m, 7.2 — 11.6 ft·lb)	Go to step 7.	Tighten to specified torque.
<p>7 CHECK GROUND LINE INSIDE TRANSMISSION. 1) Drain AT fluid and remove oil pan. 2) Check tightening torque value of ground line installing bolt. Is tightening torque value within specification?</p>	7 — 9 N·m (0.7 — 0.9 kgf·m, 5.1 — 6.5 ft·lb)	Go to step 9.	Tighten to specified torque.
<p>8 CHECK GROUND CIRCUIT OF ECM. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble?</p>	Ground terminals and ground circuit has a problem.	Repair ground terminal and/or ground circuit of ECM.	Go to step 9.
<p>9 RECHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure voltage between TCM connector and chassis ground. Connector & terminal (B56) No. 14 (+) — Chassis ground (-): (B56) No. 5 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4.8 V	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>	Replace ECM.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

H: DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL (NON-TURBO MODEL)

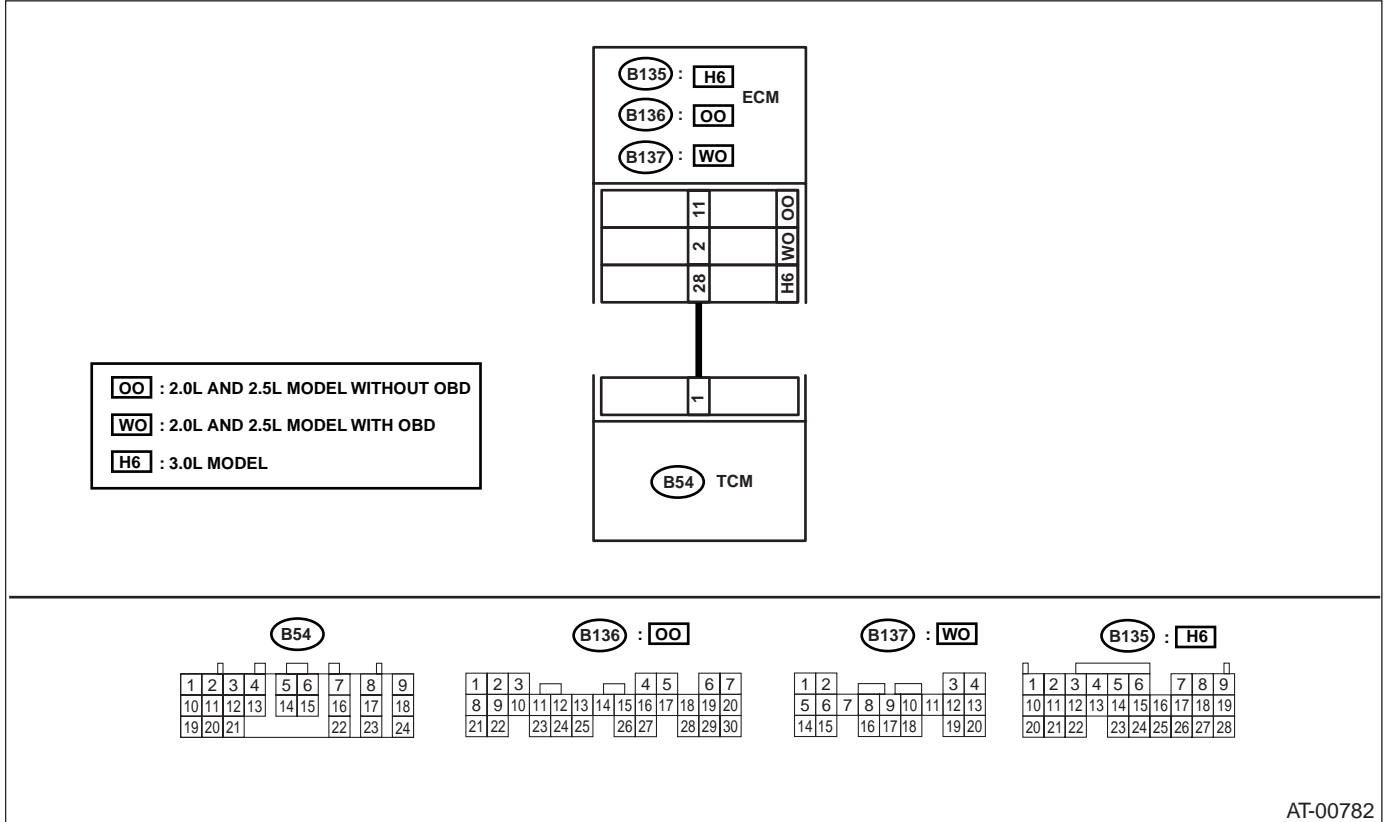
DIAGNOSIS:

Input signal circuit of TCM from ECM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



AT-00782

Step	Value	Yes	No
1 CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble?	Ground terminals and ground circuit has a problem.	Repair ground terminal and/or ground circuit of ECM.	Go to step 2.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and ECM. 3) Measure resistance of harness between TCM and ECM connector. Connector & terminal 2.0 L and 2.5 L without OBD model: (B54) No. 1 — (B136) No. 11: 2.0 L and 2.5 L with OBD model: (B54) No. 1 — (B137) No. 2: 3.0 L model: (B54) No. 1 — (B135) No. 28: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit in harness between TCM and ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 1 — Chassis ground: Is the measured value less than the specified value?	1 MΩ	Go to step 4.	Repair short circuit in harness between TCM and ECM connector.
4 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR TCM. 1) Connect connectors to TCM and ECM. 2) Start the engine, and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 3) Engine idling. 4) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	0.4 — 1.6 V	Even if “POWER” indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step 7.
6 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1) Connect connectors to TCM and ECM. 2) Connect Subaru Select Monitor to data link connector. 3) Start the engine, and turn Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Engine idling. 6) Read data of intake manifold pressure signal using Subaru Select Monitor. •Display shows intake manifold pressure signal value sent from ECM. Is intake manifold pressure data within the specified range?	0.4 — 1.6 V	Even if “POWER” indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step 7.
7 CHECK POOR CONTACT. Is there poor contact in intake manifold pressure signal circuit?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

I: DTC 71 SHIFT SOLENOID 1

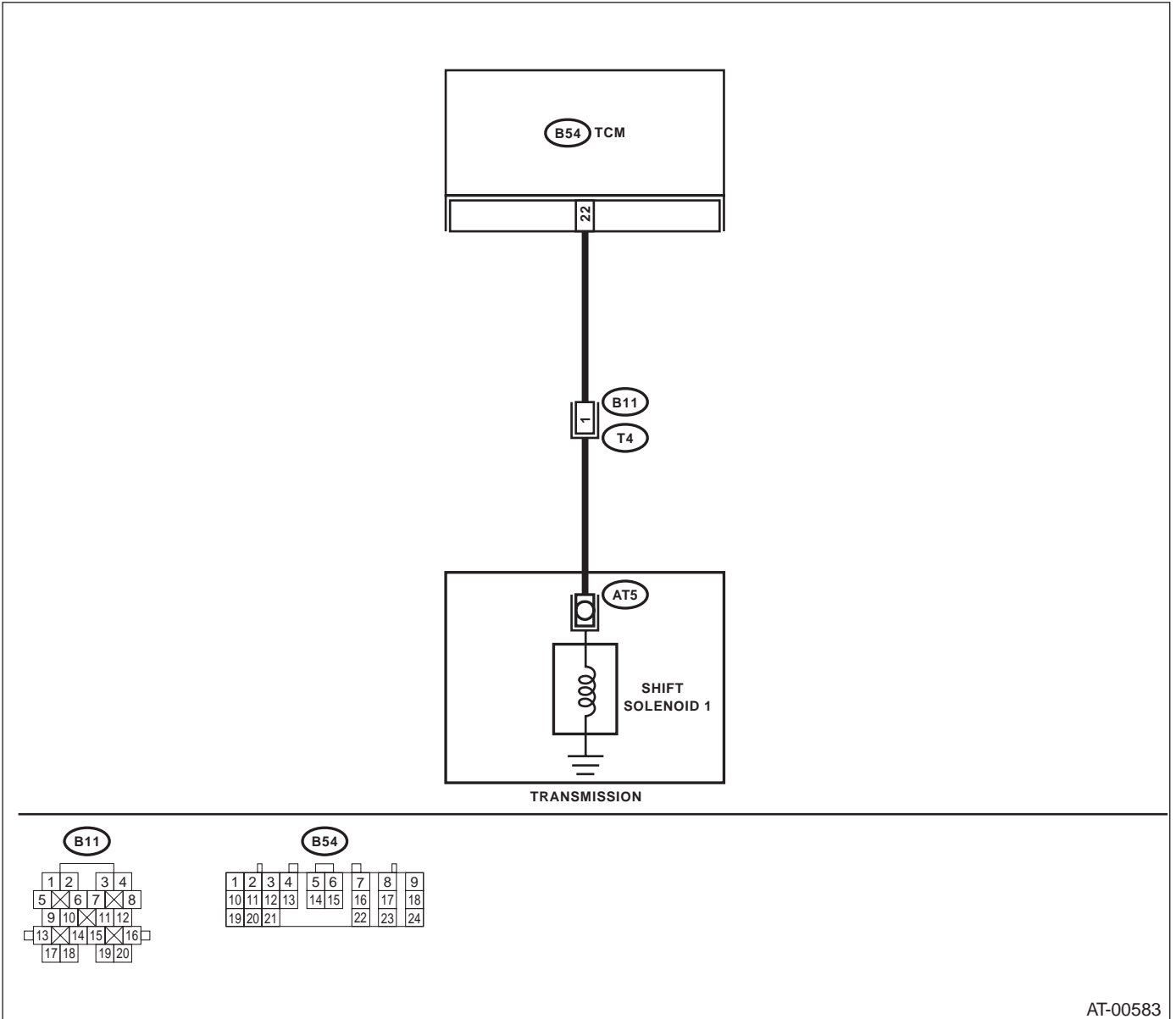
DIAGNOSIS:

Output signal circuit of shift solenoid 1 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



AT-00583

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and shift solenoid 1 connector. Connector & terminal (B54) No. 22 — (B11) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 22 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
3 CHECK SHIFT SOLENOID 1. Measure resistance between transmission connector terminals. Connector & terminal (T4) No. 1 — No. 16: Is the measured value within the specified range?	10 — 16 Ω	Go to step 4.	Go to step 7.
4 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect connectors to TCM and transmission. 2) Turn ignition switch to ON (engine OFF). 3) Move select lever to "D" range. 4) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 22 (+) — Chassis ground (-): Does the measured value exceed the specified value?	9V	Go to step 5.	Go to step 6.
5 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Hold switch to ON. 2) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 22 (+) — Chassis ground (-): Is the measured value less than the specified value?	1V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the TCM.	Go to step 6.
6 CHECK POOR CONTACT. Is there poor contact in shift solenoid 1 circuit?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK SHIFT SOLENOID 1 (IN TRANSMISSION).</p> <p>1) Remove transmission connector from bracket.</p> <p>2) Lift-up or raise the vehicle and support with safety stand.</p> <p>3) Drain automatic transmission fluid.</p> <p>CAUTION: Do not drain the automatic transmission fluid until it cools down.</p> <p>4) Remove oil pan, and disconnect connector from shift solenoid 1.</p> <p>5) Measure resistance between shift solenoid 1 connector and transmission ground.</p> <p>Terminal No. 1 — Transmission ground: Is the measured value within the specified range?</p>	10 — 16 Ω	Go to step 8.	Replace shift solenoid 1. <Ref. to AT-67, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
<p>8 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION. Measure resistance of harness between shift solenoid 1 and transmission connector.</p> <p>Connector & terminal (AT5) No. 1 — (T4) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 9.	Repair open circuit in harness between shift solenoid 1 and transmission connector.
<p>9 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION. Measure resistance of harness between shift solenoid 1 connector and transmission ground.</p> <p>Connector & terminal (T4) No. 1 — Transmission ground: Does the measured value exceed the specified value?</p>	1 MΩ	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in shift solenoid 1 and transmission.	Repair short circuit harness between shift solenoid 1 and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

J: DTC 72 SHIFT SOLENOID 2

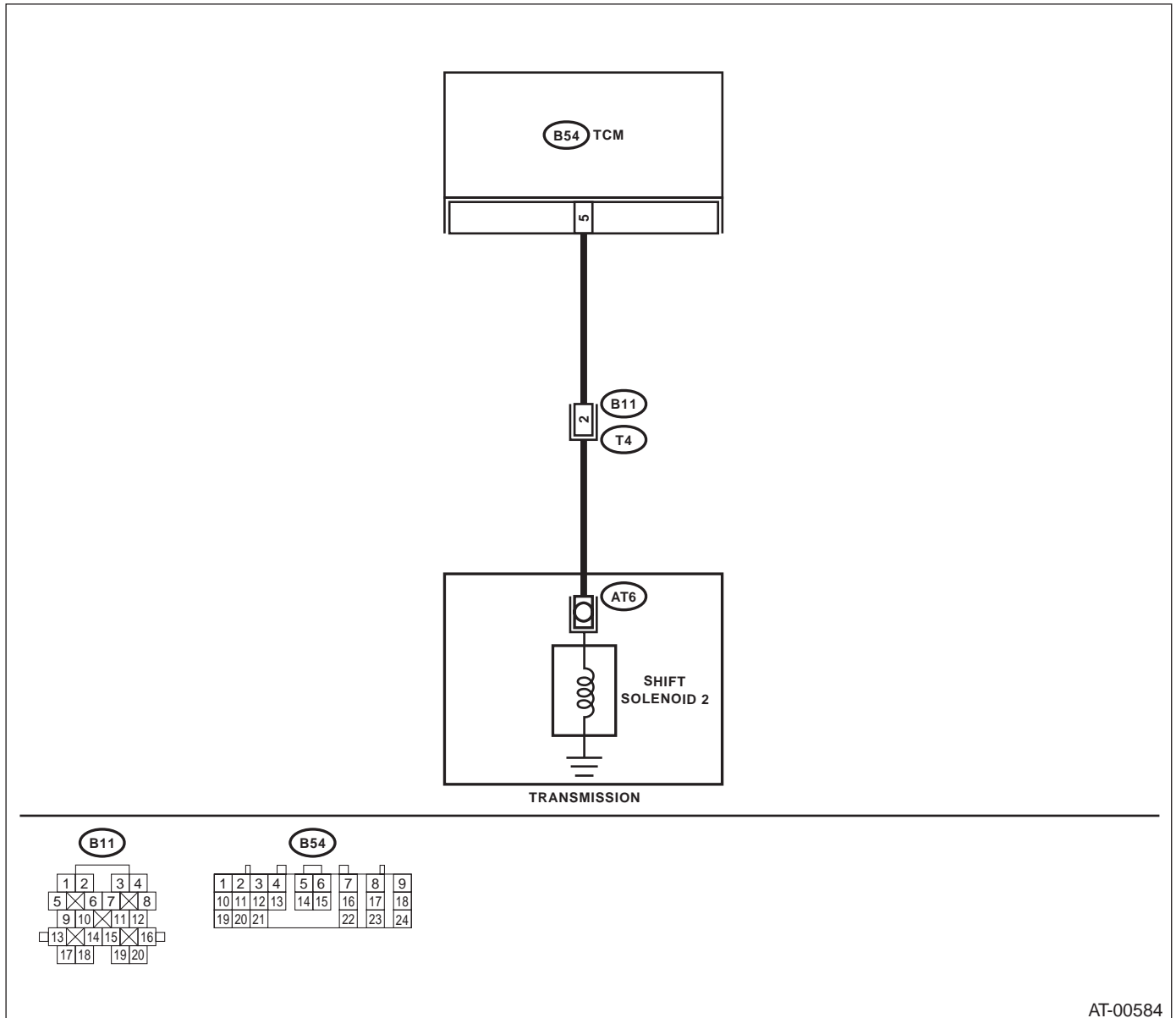
DIAGNOSIS:

Output signal circuit of shift solenoid 2 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



AT-00584

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and shift solenoid 2 connector. Connector & terminal (B54) No. 5 — (B11) No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
<p>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM connector and transmission ground. Connector & terminal (B54) No. 5 — Transmission ground: Does the measured value exceed the specified range?</p>	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
<p>3 CHECK SHIFT SOLENOID 2. Measure resistance between transmission connector terminals. Connector & terminal (T4) No. 2 — No. 16: Is the measured value within the specified range?</p>	10 — 16 Ω	Go to step 4.	Go to step 6.
<p>4 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect connectors to TCM and transmission. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 4) Move selector lever to “D”, and slowly increase vehicle speed to 50 km/h (31 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.> 5) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 22 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Even if “POWER” indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and transmission.	Go to step 5.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
5 CHECK POOR CONTACT. Is there poor contact in shift solenoid 2 circuit?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
6 CHECK SHIFT SOLENOID 2 (IN TRANSMISSION). 1) Remove transmission connector from bracket. 2) Drain automatic transmission fluid. CAUTION: Do not drain the automatic transmission fluid until it cools down. 3) Remove oil pan, and disconnect connector from shift solenoid 2. 4) Measure resistance between shift solenoid 2 connector and transmission ground. Connector & terminal No. 1 — Transmission ground: Is the measured value within the specified range?	10 — 16 Ω	Go to step 7.	Replace shift solenoid 2 assembly. <Ref. to AT-67, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
7 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION. Measure resistance of harness between shift solenoid 2 and transmission connector. Connector & terminal (AT6) No. 1 — (T4) No. 2: Is the measured value less than the specified value?	1 Ω	Go to step 8.	Repair open circuit in harness between shift solenoid 2 and transmission connector.
8 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION. Measure resistance of harness between shift solenoid 2 connector and transmission ground. Connector & terminal (T4) No. 2 — Transmission ground: Does the measured value exceed the specified value?	1 M Ω	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in shift solenoid 2 and transmission.	Repair short circuit harness between shift solenoid 2 and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

K: DTC 73 LOW CLUTCH TIMING SOLENOID

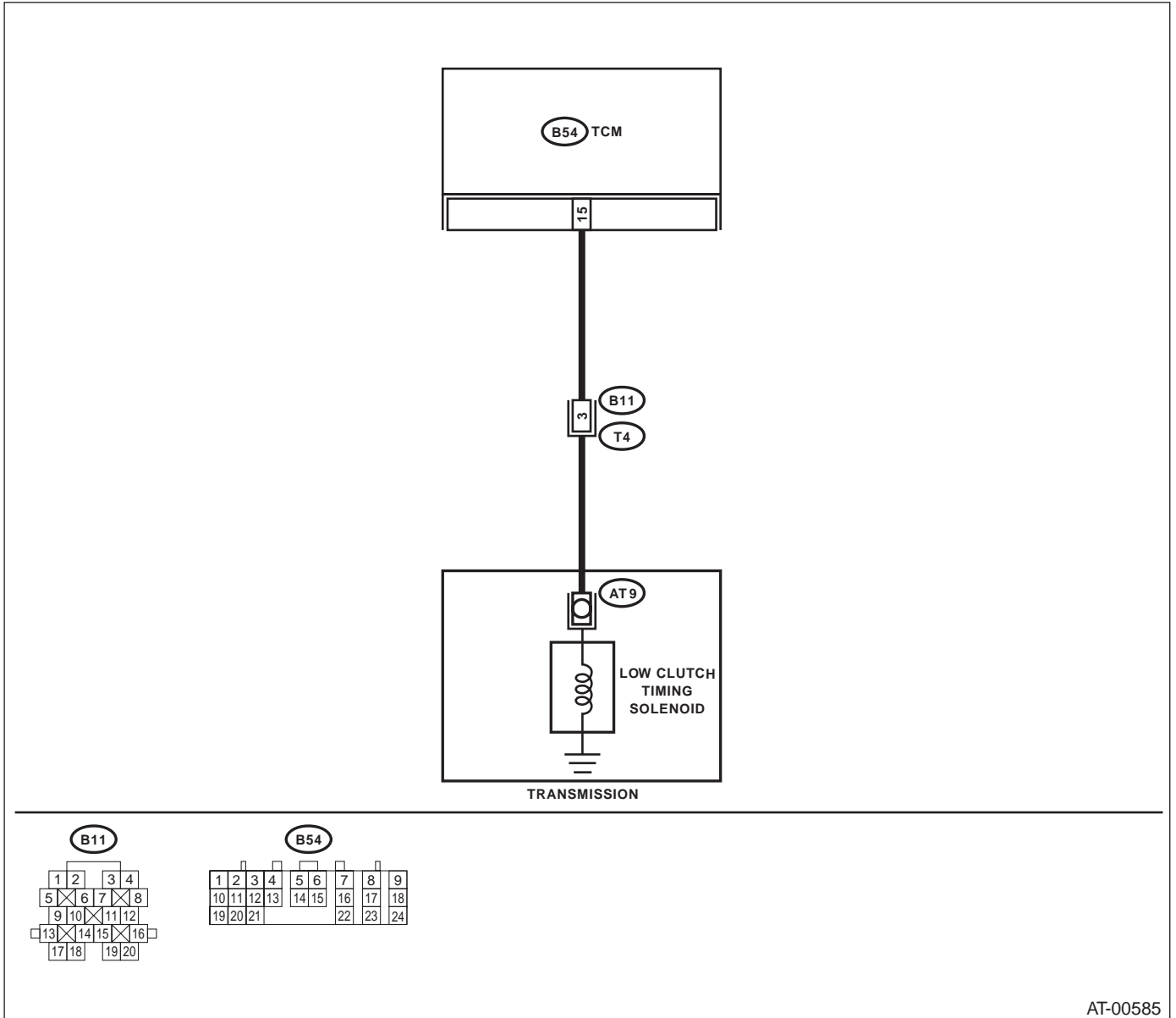
DIAGNOSIS:

Output signal circuit of low clutch timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



AT-00585

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 15 — (B11) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM connector and transmission ground. Connector & terminal (B54) No. 15 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
3 CHECK LOW CLUTCH TIMING SOLENOID. Measure resistance between transmission connector terminals. Connector & terminal (T4) No. 3 — No. 16: Is the measured value within the specified range?	10 — 16 Ω	Go to step 4.	Go to step 7.
4 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect connectors to TCM and transmission. 2) Turn ignition switch to ON (engine OFF). 3) Move select lever to "D" range. 4) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 15 (+) — Chassis ground (-): Does the measured value exceed the specified value?	9V	Go to step 5.	Go to step 6.
5 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Hold switch to ON. 2) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 15 (+) — Chassis ground (-): Is the measured value less than the specified value?	1V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the TCM and transmission.	Go to step 6.
6 CHECK POOR CONTACT. Is there poor contact in low clutch timing solenoid circuit?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>7</p> <p>CHECK LOW CLUTCH TIMING SOLENOID (IN TRANSMISSION).</p> <p>1) Remove transmission connector from bracket.</p> <p>2) Lift-up or raise the vehicle and support with safety stand.</p> <p>3) Drain automatic transmission fluid.</p> <p>CAUTION: Do not drain the automatic transmission fluid until it cools down.</p> <p>4) Remove oil pan, and disconnect connector from low clutch timing solenoid.</p> <p>5) Measure resistance between low clutch timing solenoid connector and transmission ground.</p> <p>Terminal No. 1 — Transmission ground: Is the measured value within the specified range?</p>	10 — 16 Ω	Go to step 8.	Replace low clutch timing solenoid. <Ref. to AT-67, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
<p>8</p> <p>CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.</p> <p>Measure resistance of harness between low clutch timing solenoid and transmission connector.</p> <p>Connector & terminal (AT9) No. 1 — (T4) No. 3: Is the measured value less than the specified value?</p>	1 Ω	Go to step 9.	Repair open circuit in harness between low clutch timing solenoid and transmission connector.
<p>9</p> <p>CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.</p> <p>Measure resistance of harness between low clutch timing solenoid connector and transmission ground.</p> <p>Connector & terminal (T4) No. 3 — Transmission ground: Does the measured value exceed the specified value?</p>	1 MΩ	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in low clutch timing solenoid and transmission.	Repair short circuit harness between low clutch timing solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

L: DTC 74 2-4 BRAKE TIMING SOLENOID

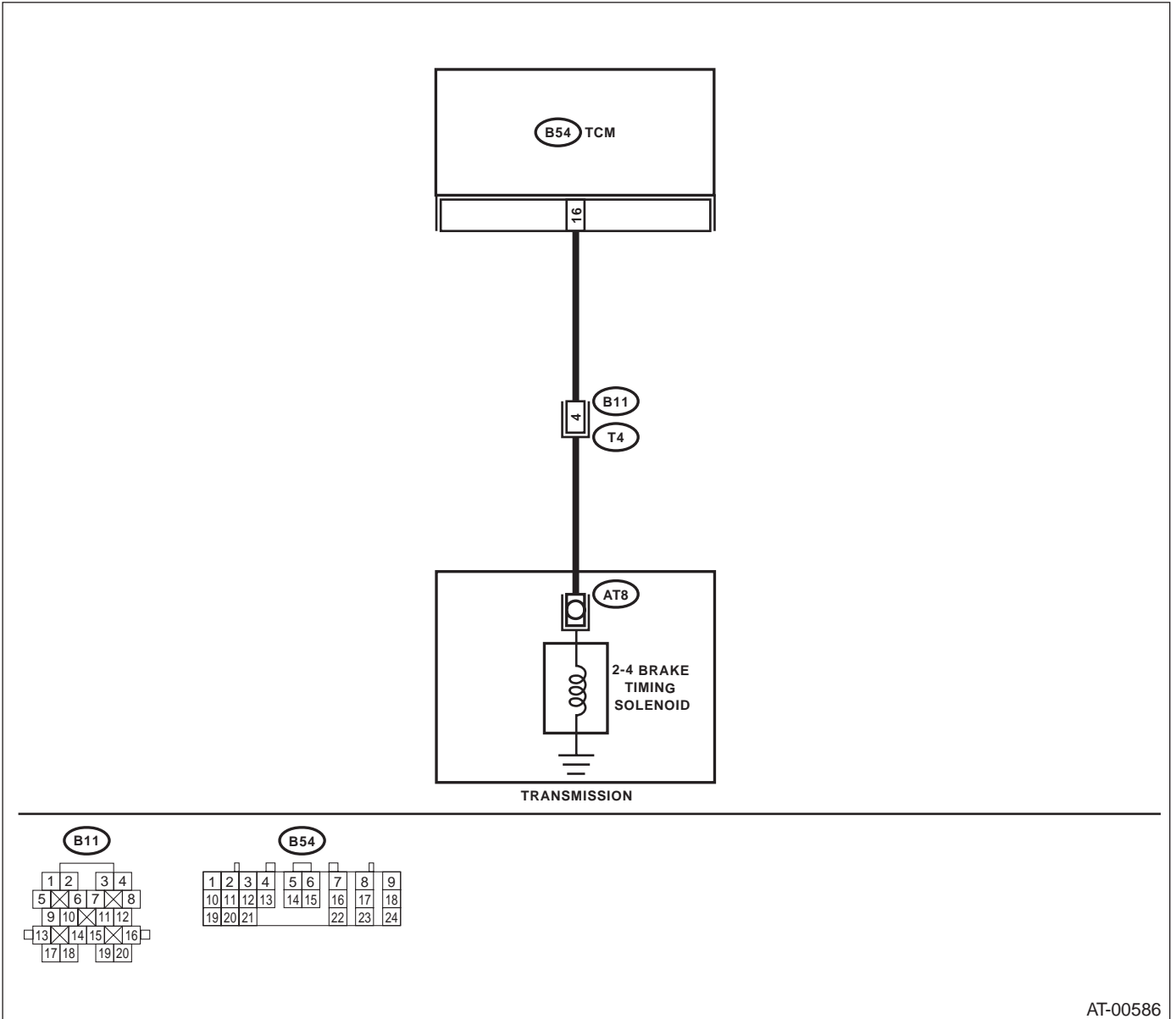
DIAGNOSIS:

Output signal circuit of 2-4 brake timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



AT-00586

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 16 — (B11) No. 4: Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
<p>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance between TCM connector and chassis ground. Connector & terminal (B54) No. 16 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
<p>3 CHECK 2-4 BRAKE TIMING SOLENOID. Measure resistance between transmission connector terminals. Connector & terminal (T4) No. 4 — No. 16: Is the measured value within the specified range?</p>	10 — 16 Ω	Go to step 4.	Go to step 7.
<p>4 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect connectors to TCM and transmission. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 4) Move selector lever to “1”, and slowly increase vehicle speed to 10 km/h (6 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.> 5) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 16 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK OUTPUT SIGNAL EMITTED FROM TCM.</p> <p>1) Move selector lever to "D", and slowly increase vehicle speed to 65 km/h (40 MPH).</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>2) Measure voltage between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 16 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	9 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the transmission.	Go to step 6.
<p>6 CHECK POOR CONTACT.</p> <p>Is there poor contact in 2-4 brake timing solenoid circuit?</p>	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
<p>7 CHECK 2-4 BRAKE TIMING SOLENOID (IN TRANSMISSION).</p> <p>1) Remove transmission connector from bracket.</p> <p>2) Lift-up or raise the vehicle and support with safety stand.</p> <p>NOTE: Raise all wheels off ground.</p> <p>3) Drain automatic transmission fluid.</p> <p>CAUTION: Do not drain the automatic transmission fluid until it cools down.</p> <p>4) Remove oil pan, and disconnect connector from 2-4 brake timing solenoid.</p> <p>5) Measure resistance between 2-4 brake timing solenoid connector and transmission ground.</p> <p>Terminal No. 1 — Transmission ground:</p> <p>Is the measured value within the specified range?</p>	10 — 16 Ω	Go to step 8.	Replace 2-4 brake timing solenoid. <Ref. to AT-67, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
<p>8 CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION.</p> <p>Measure resistance of harness between 2-4 brake timing solenoid and transmission connector.</p> <p>Connector & terminal (AT8) No. 1 — (T4) No. 4:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 9.	Repair open circuit in harness between 2-4 brake timing solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>9 CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION. Measure resistance of harness between 2-4 brake timing solenoid connector and transmission ground. Connector & terminal (T4) No. 4 — Transmission ground: Does the measured value exceed the specified value?</p>	1 MΩ	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in 2-4 brake timing solenoid and transmission.	Repair short circuit harness between 2-4 brake timing solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

M: DTC 75 LINE PRESSURE DUTY SOLENOID

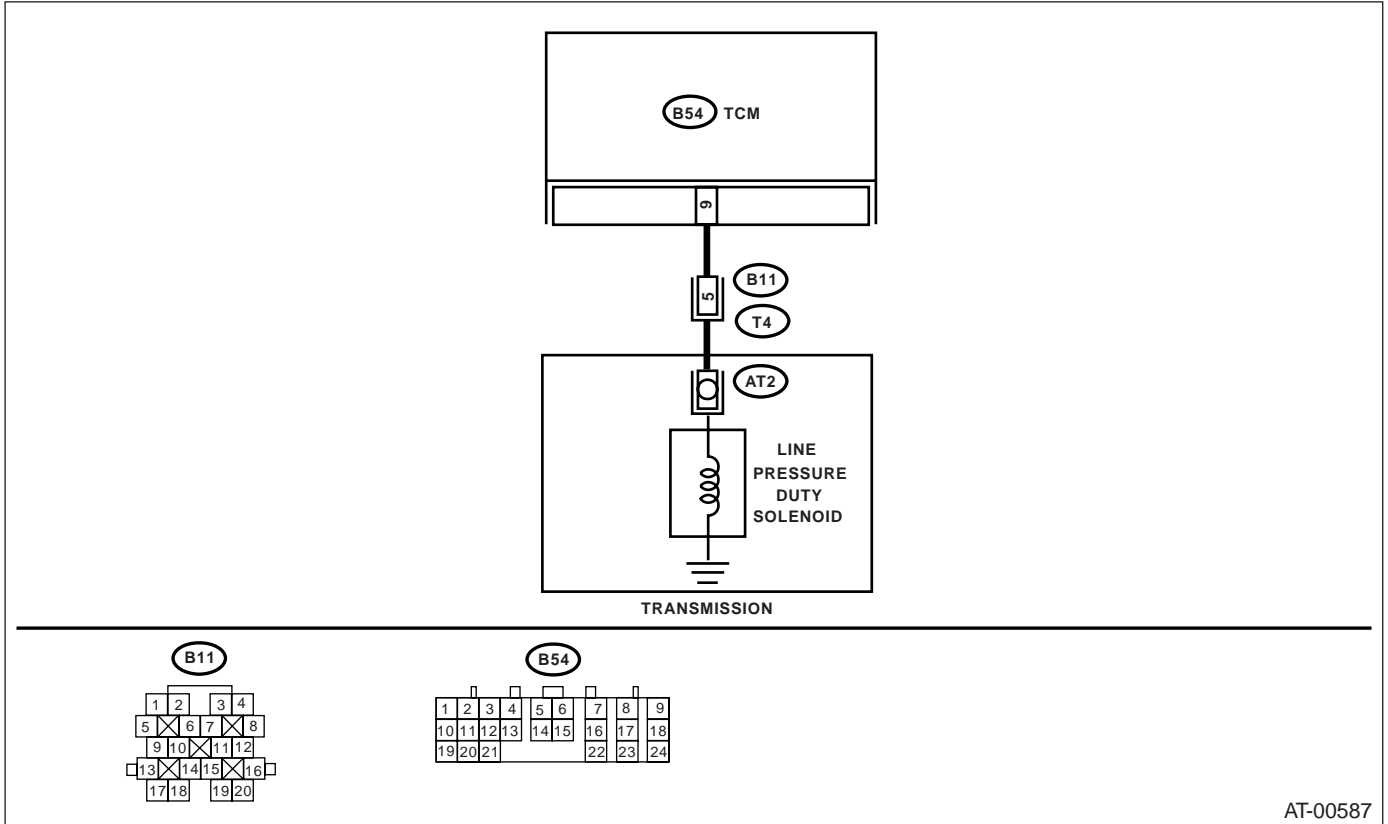
DIAGNOSIS:

Output signal circuit of line pressure duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



AT-00587

Step	Value	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from transmission and TCM. 3) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 9 — (B11) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B54) No. 9 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>3 CHECK LINE PRESSURE DUTY SOLENOID. Measure resistance between transmission connector receptacle's terminals.</p> <p>Terminal (T4) No. 5 — No. 16:</p> <p>Is the measured value within the specified range?</p>	2.0 — 4.5 Ω	Go to step 4.	Go to step 10.
<p>4 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?</p>	Subaru Select Monitor is available.	Go to step 7.	Go to step 5.
<p>5 CHECK OUTPUT SIGNAL EMITTED FROM TCM.</p> <p>1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F).</p> <p>NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.</p> <p>3) Turn ignition switch to ON (engine OFF). 4) Move select lever to "N". 5) Throttle is fully closed. 6) Measure voltage between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 9 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	1.5 — 5.0 V	Go to step 6.	Go to step 9.
<p>6 CHECK OUTPUT SIGNAL EMITTED FROM TCM.</p> <p>1) Throttle is fully open. 2) Measure voltage between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 9 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in transmission.	Go to step 9.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.</p> <ol style="list-style-type: none"> 1) Connect connectors to TCM and transmission. 2) Connect Subaru Select Monitor to data link connector. 3) Start the engine, and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). <p>NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.</p> <ol style="list-style-type: none"> 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move select lever to "N". 7) Read data of line pressure duty solenoid using Subaru Select Monitor. <p>•Line pressure duty solenoid is indicated in "%".</p> <ol style="list-style-type: none"> 8) Throttle is fully closed. Is line pressure duty solenoid data value the specified value? 	100%	Go to step 8.	Go to step 9.
<p>8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to ON (Engine OFF). 2) Throttle is fully open. 3) Read line pressure duty solenoid data using Subaru Select Monitor. Is line pressure duty solenoid data less than the specified value? 	25%	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in transmission.	Go to step 9.
<p>9 CHECK POOR CONTACT.</p> <p>Is there poor contact in line pressure duty solenoid circuit?</p>	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
<p>10 CHECK LINE PRESSURE DUTY SOLENOID (IN TRANSMISSION).</p> <ol style="list-style-type: none"> 1) Remove transmission connector from bracket. 2) Drain automatic transmission fluid. <p>CAUTION: Do not drain the automatic transmission fluid until it cools down.</p> <ol style="list-style-type: none"> 3) Remove oil pan, and disconnect connector from line pressure duty solenoid. 4) Measure resistance between line pressure duty solenoid connector and transmission ground. <p>Terminal No. 1 — Transmission ground: Is the measured value within the specified range?</p>	2.0 — 4.5 Ω	Go to step 11.	Replace line pressure duty solenoid. <Ref. to AT-67, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>11 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID. Measure resistance of harness between line pressure duty solenoid and transmission connector. <i>Connector & terminal</i> <i>(T4) No. 5 — (AT2) No. 1:</i> Is the measured value less than the specified value?</p>	1 Ω	Go to step 12.	Repair open circuit in harness between line pressure duty solenoid and transmission connector.
<p>12 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID. Measure resistance of harness between transmission connector and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 5 — Transmission ground:</i> Does the measured value exceed the specified value?</p>	1 MΩ	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in line pressure duty solenoid and transmission.	Repair short circuit in harness between line pressure duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

N: DTC 76 2-4 BRAKE DUTY SOLENOID

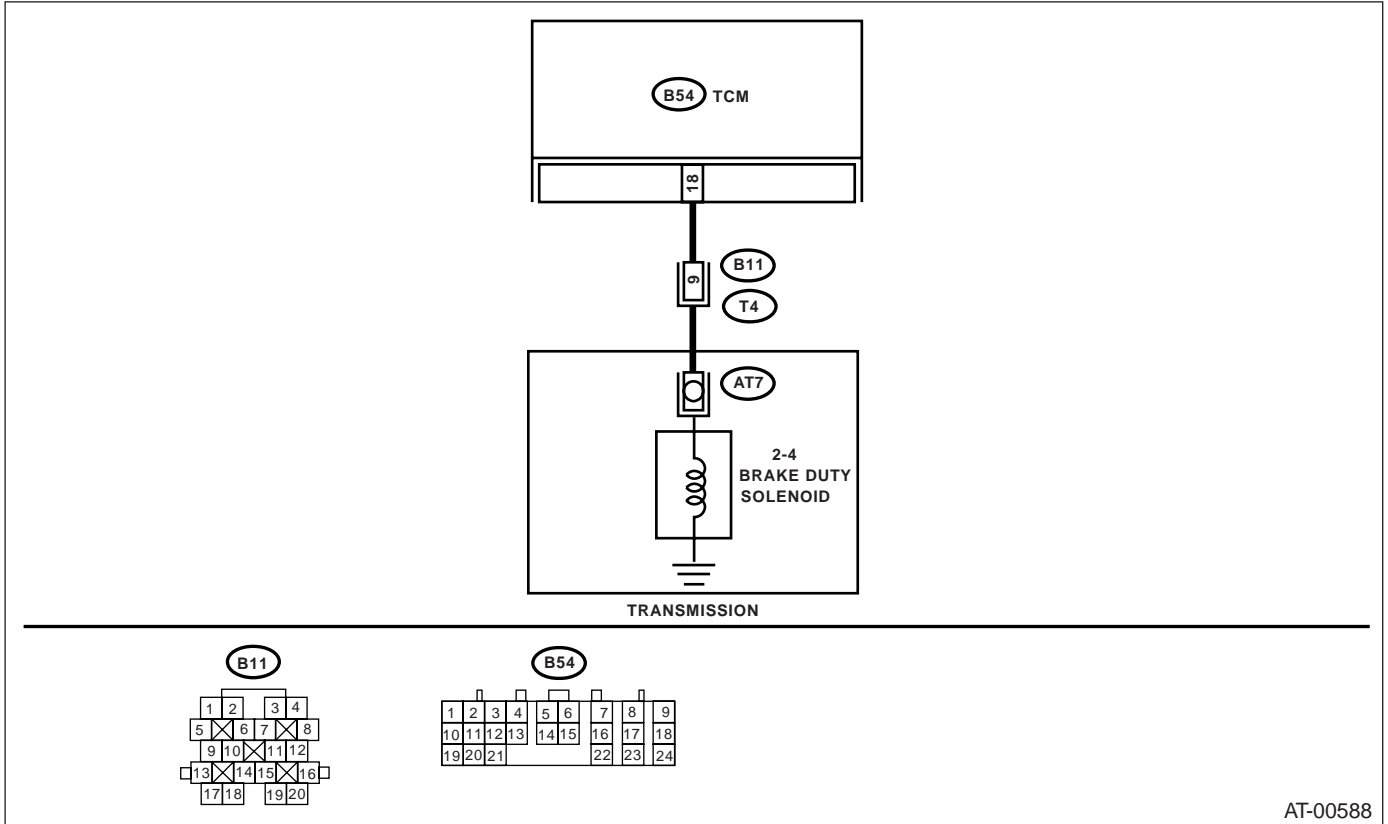
DIAGNOSIS:

Output signal circuit of 2-4 brake duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



AT-00588

Step	Value	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from transmission and TCM. 3) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 18 — (B11) No. 9: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B54) No. 18 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
3 CHECK 2-4 BRAKE DUTY SOLENOID. Measure resistance between transmission connector receptacle's terminals. <i>Terminal</i> <i>(T4) No. 16 — No. 9:</i> Is the measured value within the specified range?	2.0 — 4.5 Ω	Go to step 4.	Go to step 10.
4 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step 7.	Go to step 5.
5 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 3) Turn ignition switch to ON (engine OFF). 4) Move select lever to "N". 5) Throttle is fully closed. 6) Measure voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 18 (+) — Chassis ground (-):</i> Is the measured value within the specified range?	1.5 — 5.0 V	Go to step 6.	Go to step 9.
6 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Throttle is fully open. 2) Measure voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 18 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?	1 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM and transmission.	Go to step 9.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.</p> <ol style="list-style-type: none"> 1) Connect all connectors. 2) Connect Subaru Select Monitor to data link connector. 3) Start the engine, and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). <p>NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.</p> <ol style="list-style-type: none"> 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move select lever to "N". 7) Read data of 2-4 brake duty solenoid using Subaru Select Monitor. <p>•2-4 brake duty solenoid is indicated in "%".</p> <ol style="list-style-type: none"> 8) Throttle is fully closed. Is 2-4 brake duty solenoid data within the specified value? 	100%	Go to step 8.	Go to step 9.
<p>8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to ON (Engine OFF). 2) Throttle is fully open. 3) Read line pressure duty solenoid data using Subaru Select Monitor. Is line pressure duty solenoid data less than the specified value? 	25%	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM and transmission.	Go to step 9.
<p>9 CHECK POOR CONTACT. Is there poor contact in 2-4 brake duty solenoid circuit?</p>	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
<p>10 CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).</p> <ol style="list-style-type: none"> 1) Remove transmission connector from bracket. 2) Drain automatic transmission fluid. <p>CAUTION: Do not drain the automatic transmission fluid until it cools down.</p> <ol style="list-style-type: none"> 3) Remove oil pan, and disconnect connector from 2-4 brake duty solenoid. 4) Measure resistance between 2-4 brake duty solenoid connector and transmission ground. <p>Terminal No. 1 — Transmission ground: Is the measured value within the specified range?</p>	2.0 — 4.5 Ω	Go to step 11.	Replace 2-4 brake duty solenoid. <Ref. to AT-67, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>11 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID. Measure resistance of harness between 2-4 brake duty solenoid and transmission connector. <i>Connector & terminal</i> <i>(T4) No. 9 — (AT7) No. 1:</i> Is the measured value less than the specified value?</p>	1 Ω	Go to step 12.	Repair open circuit in harness between 2-4 brake duty solenoid and transmission connector.
<p>12 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID. Measure resistance of harness between transmission connector and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 9 — Transmission ground:</i> Does the measured value exceed the specified value?</p>	1 MΩ	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in line pressure duty solenoid and transmission.	Repair short circuit in harness between 2-4 brake duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

O: DTC 77 LOCK-UP DUTY SOLENOID

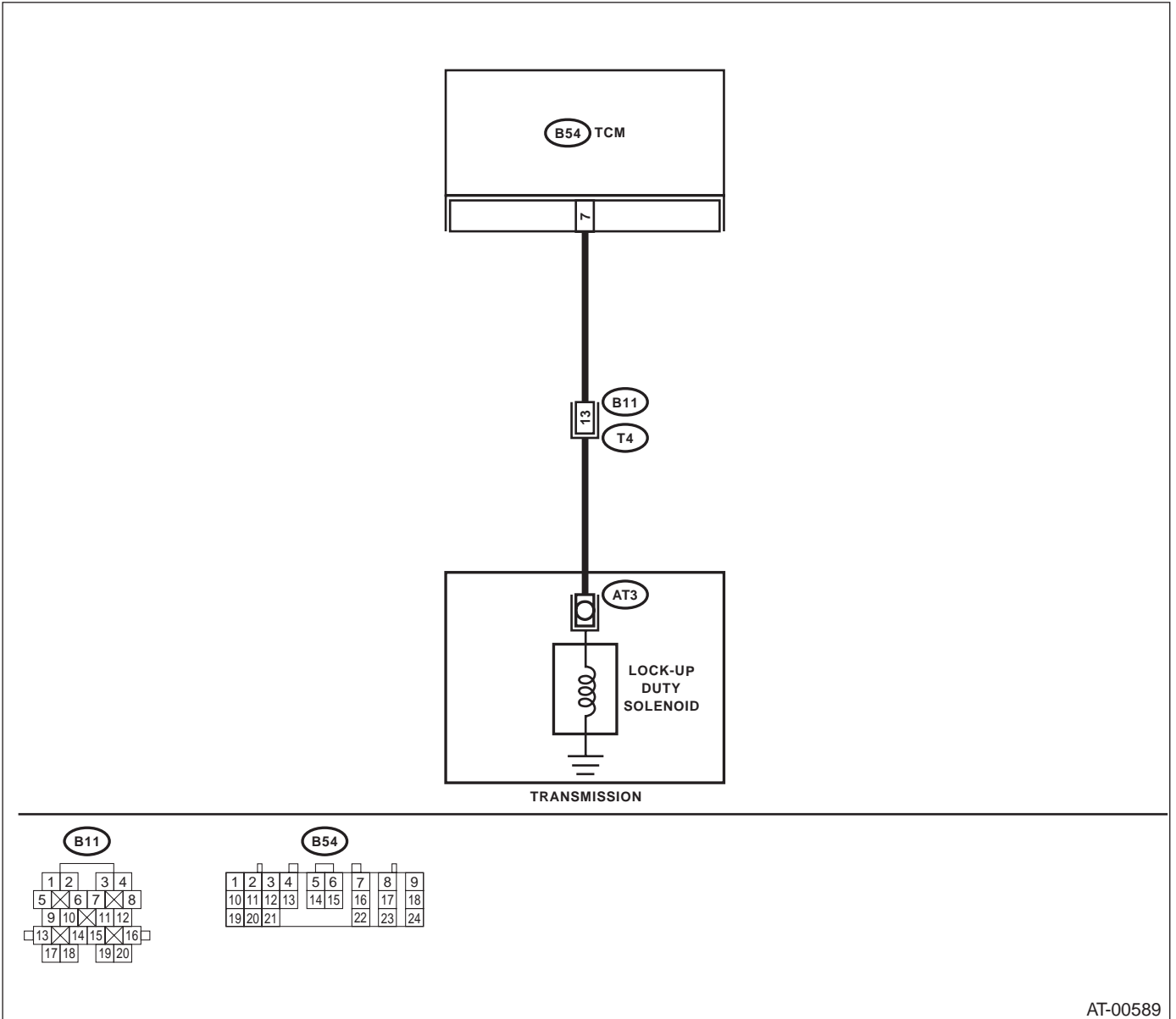
DIAGNOSIS:

Output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

No "lock-up" (after engine warm-up).

WIRING DIAGRAM:



AT-00589

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DTC. Do multiple trouble codes appear in the on-board diagnostics test mode?	DTC is displayed.	Go to another Diagnostic trouble code (DTC).	Go to step 2.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 7 — (B11) No. 13: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit in harness between TCM and transmission connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness connector between TCM and chassis ground. Connector & terminal (B54) No. 7 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair short circuit in harness between TCM and transmission connector.
4 CHECK LOCK-UP DUTY SOLENOID. Measure resistance between transmission connector receptacle's terminals. Connector & terminal (T4) No. 13 — No. 16: Is the measured value within the specified range?	10 — 17 Ω	Go to step 5.	Go to step 11.
5 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step 8.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK OUTPUT SIGNAL EMITTED FROM TCM.</p> <p>1) Connect connectors to TCM and transmission.</p> <p>2) Lift-up the vehicle and place safety stand.</p> <p>NOTE: Raise all wheels off ground.</p> <p>3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F).</p> <p>NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.</p> <p>4) Move selector lever to "D" and slowly increase vehicle speed to 75 km/h (47 MPH). Wheels will lock-up.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>5) Measure voltage between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 7 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	8.5 V	Go to step 7.	Go to step 10.
<p>7 CHECK OUTPUT SIGNAL EMITTED FROM TCM.</p> <p>1) Return the engine to idling speed and move select lever to "N".</p> <p>2) Measure voltage between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 7 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM and transmission.	Go to step 10.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.</p> <p>1) Connect connectors to TCM and transmission.</p> <p>2) Lift-up the vehicle and place safety stand.</p> <p>NOTE: Raise all wheels off ground.</p> <p>3) Connect Subaru Select Monitor to data link connector.</p> <p>4) Start the engine, and turn Subaru Select Monitor switch to ON.</p> <p>5) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F).</p> <p>NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.</p> <p>6) Read data of lock-up duty solenoid using Subaru Select Monitor.</p> <p>•Lock-up duty solenoid is indicated in “%”.</p> <p>7) Move selector lever to “D” and slowly increase vehicle speed to 75 km/h (47 MPH). Wheels will lock-up.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>Is lock-up duty solenoid data the specified value?</p>	95%	Go to step 9.	Go to step 10.
<p>9 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.</p> <p>1) Return the engine to idling speed and move selector lever to “N”.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>2) Read lock-up solenoid data using Subaru Select Monitor.</p> <p>Is lock-up solenoid data value the specified value?</p>	5%	Even if “POWER” indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM and transmission.	Go to step 10.
<p>10 CHECK POOR CONTACT.</p> <p>Is there poor contact in lock-up duty solenoid circuit?</p>	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>11 CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION).</p> <p>1) Remove transmission connector from bracket. 2) Drain automatic transmission fluid.</p> <p>CAUTION: Do not drain the automatic transmission fluid until it cools down.</p> <p>3) Remove oil pan, and disconnect connector from lock-up duty solenoid. 4) Measure resistance between lock-up duty solenoid connector and transmission ground.</p> <p>Terminal No. 1 — Transmission ground: Is the measured value within the specified range?</p>	10 — 17 Ω	Go to step 12.	Replace lock-up duty solenoid. <Ref. to AT-67, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
<p>12 CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.</p> <p>Measure resistance of harness between lock-up duty solenoid and transmission connector.</p> <p>Connector & terminal (T4) No. 13 — (AT3) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 13.	Repair open circuit in harness between TCM and transmission connector.
<p>13 CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.</p> <p>Measure resistance of harness between transmission connector and transmission ground.</p> <p>Connector & terminal (T4) No. 13 — Transmission ground: Does the measured value exceed the specified value?</p>	1 MΩ	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in lock-up duty solenoid and transmission.	Repair short circuit in harness between lock-up duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

P: DTC 78 SPORT SHIFT SOLENOID

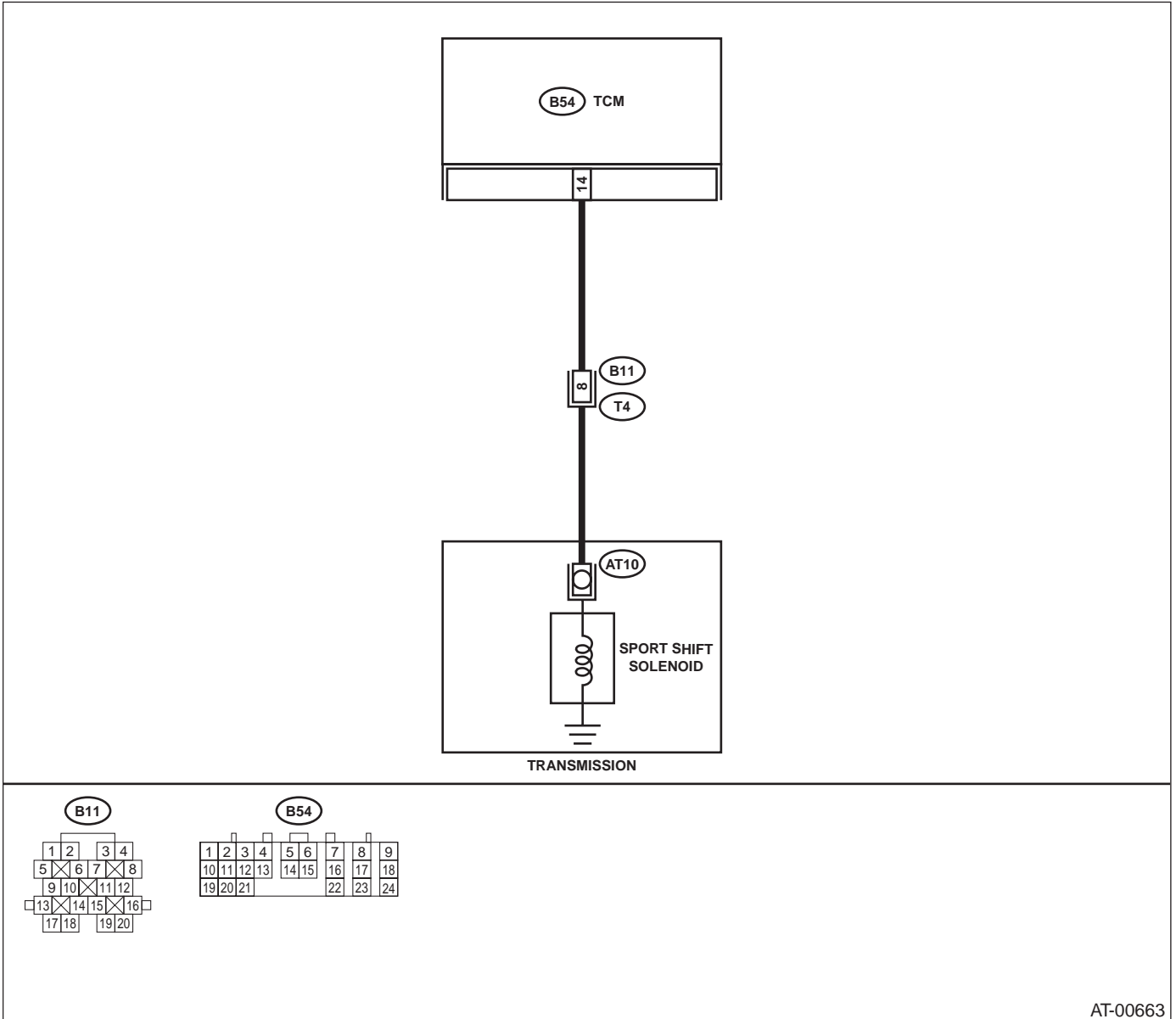
DIAGNOSIS:

Output signal circuit of SPORT shift solenoid is open or shorted.

TROUBLE SYMPTOM:

Engine brake is effective at D, 3, 2, ranges.

WIRING DIAGRAM:



AT-00663

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and SPORT shift solenoid connector. Connector & terminal (B54) No. 14 — (B11) No. 8: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 14 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
3 CHECK SPORT SHIFT SOLENOID. Measure resistance between transmission connector terminals. Connector & terminal (T4) No. 8 — No. 16: Is the measured value within the specified range?	10 — 16 Ω	Go to step 4.	Go to step 7.
4 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect connectors to TCM and transmission. 2) Turn ignition switch to ON (engine OFF). 3) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 14 (+) — Chassis ground (-): Does the measured value exceed the specified value?	9V	Go to step 5.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK OUTPUT SIGNAL EMITTED FROM TCM.</p> <p>1) Turn ignition switch OFF. 2) Lift-up the vehicle and place safety stand.</p> <p>NOTE: Raise all wheels off ground.</p> <p>3) Start engine, and warm transmission until ATF temperature becomes 80°C (176°F) or more. 4) Move select lever to SPORT shift mode. 5) Increase speed up to 25 km/h (16 MPH) at 2nd.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>6) Shift down to 1st speed, and effectively use engine brake. 7) Measure voltage between TCM connector and body ground when engine brake is effective.</p> <p>Connector & terminal (B54) No. 14 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the TCM.	Go to step 6.
<p>6 CHECK POOR CONTACT. Is there poor contact in SPORT shift solenoid circuit?</p>	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
<p>7 CHECK SHIFT SOLENOID 1 (IN TRANSMISSION).</p> <p>1) Remove transmission connector from bracket. 2) Lift-up or raise the vehicle and support with safety stand. 3) Drain automatic transmission fluid.</p> <p>CAUTION: Do not drain the automatic transmission fluid until it cools down.</p> <p>4) Remove oil pan, and disconnect connector from SPORT shift solenoid. 5) Measure resistance between SPORT shift solenoid connector and transmission ground.</p> <p>Terminal No. 1 — Transmission ground: Is the measured value within the specified range?</p>	10 — 16 Ω	Go to step 8.	Replace SPORT shift solenoid. <Ref. to AT-67, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK HARNESS CONNECTOR BETWEEN SPORT SHIFT SOLENOID AND TRANSMISSION.</p> <p>Measure resistance of harness between shift solenoid 1 and transmission connector.</p> <p>Connector & terminal (AT10) No. 1 — (T4) No. 8:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 9 .	Repair open circuit in harness between SPORT shift solenoid and transmission connector.
<p>9 CHECK HARNESS CONNECTOR BETWEEN SPORT SHIFT SOLENOID AND TRANSMISSION.</p> <p>Measure resistance of harness between SPORT shift solenoid connector and transmission ground.</p> <p>Connector & terminal (T4) No. 8 — Transmission ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in SPORT shift solenoid and transmission.	Repair short circuit harness between SPORT shift solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Q: DTC 79 TRANSFER DUTY SOLENOID

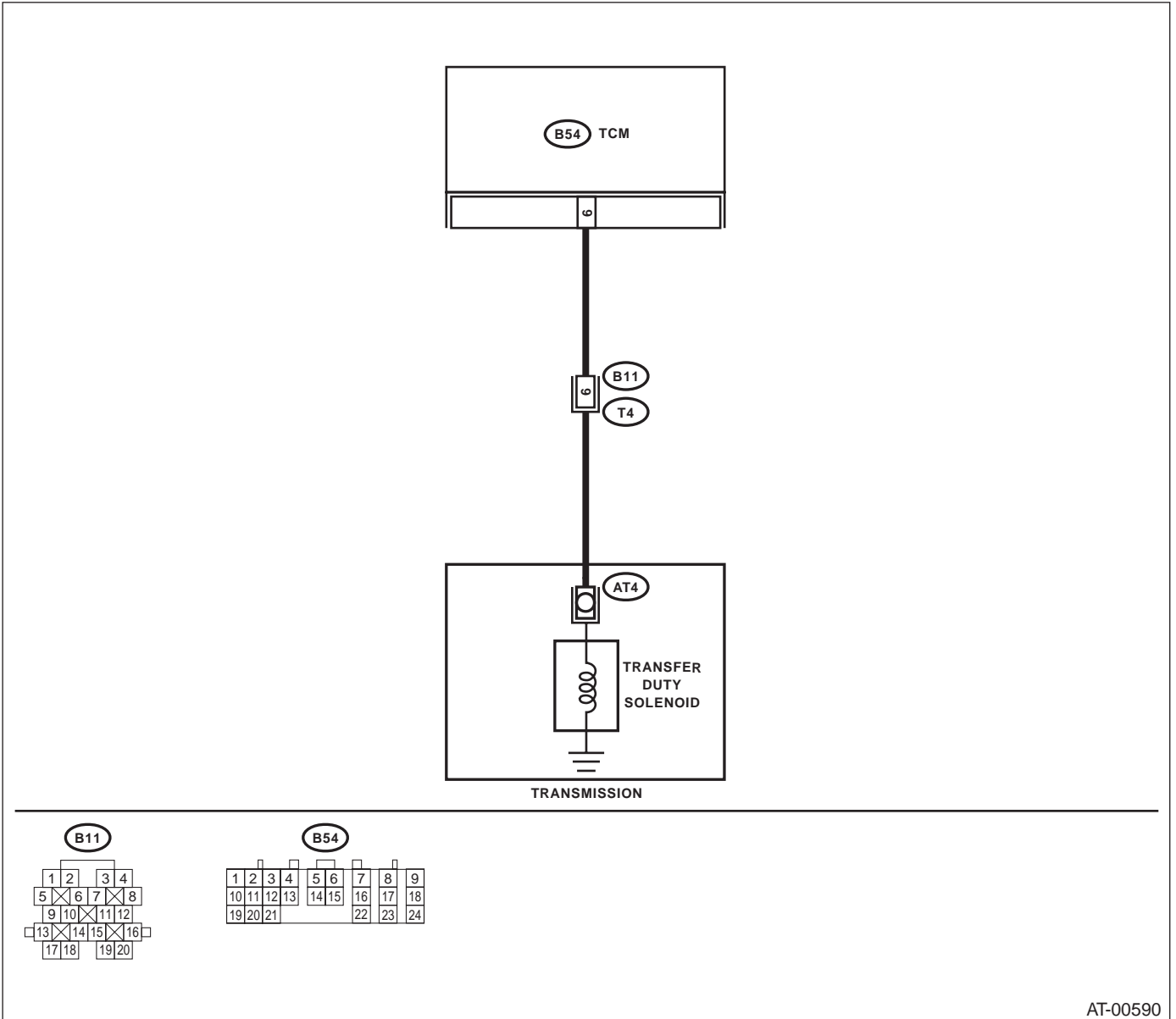
DIAGNOSIS:

Output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive "braking" in tight corners.

WIRING DIAGRAM:



AT-00590

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 6 — (B11) No. 6: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance harness connector between TCM and chassis ground. Connector & terminal (B54) No. 6 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
3 CHECK TRANSFER DUTY SOLENOID. Measure resistance between transmission connector and transmission terminals. Connector & terminal (T4) No. 6 — No. 16: Is the measured value within the specified range?	10 — 17 Ω	Go to step 4.	Go to step 13.
4 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step 7.	Go to step 5.
5 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect connectors to TCM and transmission. 2) Turn ignition switch to ON (engine OFF). 3) Select lever is moved to P range. 4) Throttle is fully closed. 5) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 9.	Go to step 12.
6 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Select lever is moved to D range. 2) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 6 (+) — Chassis ground (-): Is the measured value within the specified range?	5 — 7 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the transfer duty solenoid and TCM connector.	Go to step 12.
7 CHECK SPECIFICATIONS. Is VDC system or SPORT shift equipped?	The vehicle is equipped with the VDC system or SPORT shift.	Go to step 10.	Go to step 8.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Connect connectors to TCM and transmission. 2) Connect Subaru Select Monitor to data link connector. 3) Turn ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4) Shift select lever to D and open throttle fully (vehicle speed 0 km/h or 0 MPH). 5) Read data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in “%”. Is transfer duty solenoid data within the specified range?	5 — 10%	Go to step 9.	Go to step 12.
9 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Move select lever to “N” with throttle fully closed (vehicle speed 0 km/h or 0 MPH). 2) Read data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in “%”. Is transfer duty solenoid data within the specified range?	Approx. 60 — 70%	Even if “POWER” indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the transfer duty solenoid and TCM connector.	Go to step 12.
10 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Connect connectors to TCM and transmission. 2) Connect Subaru Select Monitor to data link connector. 3) Turn ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4) Shift select lever to D and open throttle fully (vehicle speed 0 km/h or 0 MPH). 5) Read data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in “%”. Is transfer duty solenoid data within the specified range?	80 — 95%	Go to step 11.	Go to step 12.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
11 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Move select lever to "N" with throttle fully close (vehicle speed 0 km/h or 0 MPH). 2) Rear data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in "%". Is transfer duty solenoid data the specified value?	Approx. 40%	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the transfer duty solenoid and TCM connector.	Go to step 12.
12 CHECK POOR CONTACT. Is there poor contact in transfer duty solenoid circuit?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
13 CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION). 1) Lift-up the vehicle and place safety stand. 2) Drain automatic transmission fluid. CAUTION: Do not drain the automatic transmission fluid until it cools down. 3) Remove extension case, and disconnect connector from transfer duty solenoid. 4) Measure resistance between transfer duty solenoid connector and transmission ground. Connector & terminal (AT4) No. 1 — Transmission ground: Is the measured value within the specified range?	10 — 17 Ω	Go to step 14.	Replace transfer duty solenoid.
14 CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION. Measure resistance of harness between transfer duty solenoid and transmission connector. Connector & terminal (T4) No. 6 — (AT4) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 15.	Repair open circuit in harness between transfer duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>15 CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION. Measure resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 6 — Transmission ground: Does the measured value exceed the specified value?</p>	1 MΩ	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the transfer duty solenoid and transmission connector.	Repair short circuit in harness between transfer duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

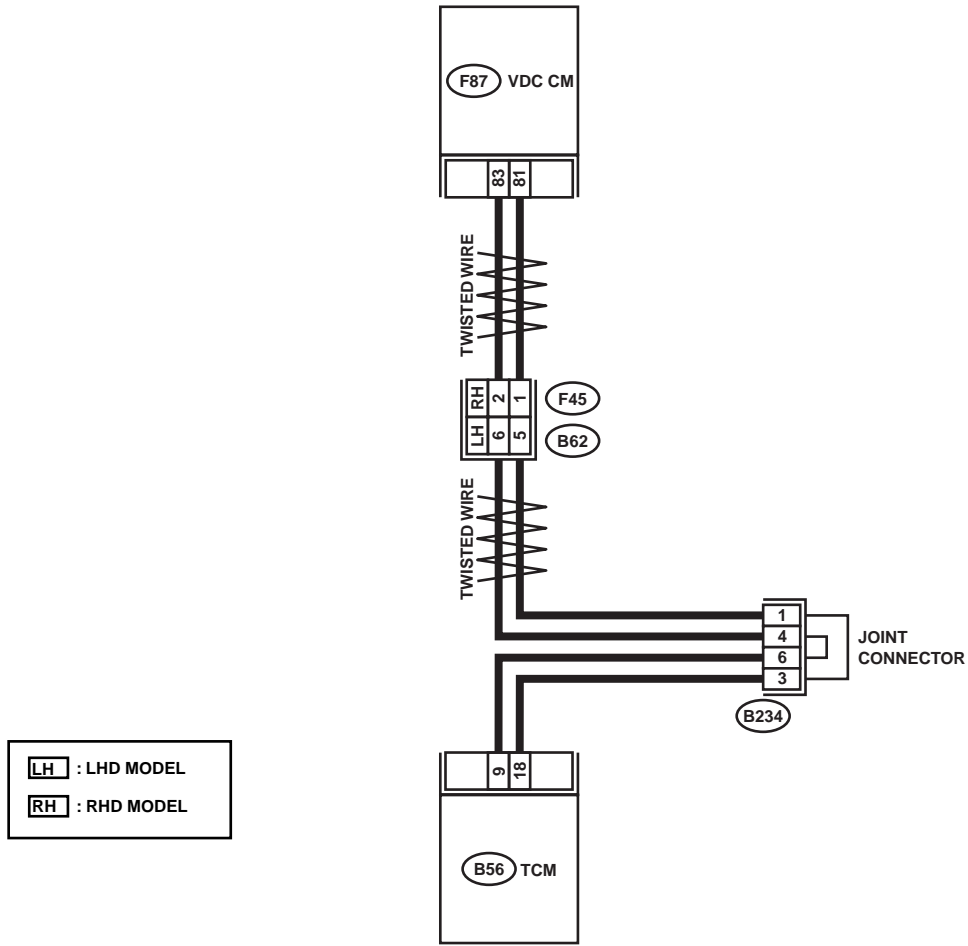
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

R: DTC 86 VDC COMMUNICATION SIGNAL

DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

WIRING DIAGRAM:



B234

1	2	3	4	5	6
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F96

1	2	3	4	5	6
7	8	9	10	11	12
13	14				

B56

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21				22	23	24

F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗	
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	⊗

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK TROUBLE CODE. Do multiple trouble codes appear in the on-board diagnostics test mode?	DTC is displayed.	Go to another trouble code.	Go to step 2.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and VDCCM. 3) Measure resistance of harness between TCM and VDCCM connector. Connector & terminal (B56) No. 18 — (F87) No. 81: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit in harness between TCM and VDCCM, and poor contact in coupling connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM. Measure resistance of harness between TCM and VDCCM connector. Connector & terminal (B56) No. 9 — (F87) No. 83: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair open circuit in harness between TCM and VDCCM, and poor contact in coupling connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM. Measure resistance of harness between TCM and VDCCM connector. Connector & terminal (B56) No. 18 — Chassis ground: Is the measured value less than the specified value?	1 MΩ	Go to step 5.	Repair short circuit in harness between TCM and VDCCM connector.
5 CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM. Measure resistance of harness between TCM and VDCCM connector. Connector & terminal (B56) No. 9 — Chassis ground: Is the measured value less than the specified value?	1 MΩ	Go to step 6.	Repair short circuit in harness between TCM and VDCCM connector.
6 PREPARE OSCILLOSCOPE. Do you have oscilloscope?	Oscilloscope is available.	Go to step 8.	Go to step 7.
7 CHECK INPUT SIGNAL FOR TCM. 1) Connect connectors to TCM and VDCCM. 2) Turn ignition switch to ON (engine OFF). 3) Measure voltage between TCM connector and chassis ground. Connector & terminal (B56) No. 9 (+) — Chassis ground (-): (B56) No. 18 (+) — Chassis ground (-): Does input voltage value change?	Input voltage varies.	Go to step 10.	Repair poor contact in VDCCM.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.</p> <p>1) Set oscilloscope to TCM connector terminals.</p> <p style="padding-left: 20px;">Connector & terminal Positive probe; (B56) No. 9 Ground; (B55) No. 9</p> <p>2) Turn ignition switch to ON (engine OFF). Check signal waveform pattern on oscilloscope. <Ref. to AT-20, WAVEFORM, MEASUREMENT, Transmission Control Module (TCM) I/O Signal.> Is waveform pattern same as that shown in the figure?</p>	Same wave form as shown in figure.	Go to step 9 .	Repair poor contact in VDCCM.
<p>9 CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.</p> <p>1) Set oscilloscope to TCM connector terminals.</p> <p style="padding-left: 20px;">Connector & terminal Positive probe; (B56) No. 18 Ground; (B55) No. 9</p> <p>2) Turn ignition switch to ON (engine OFF). Check signal waveform pattern on oscilloscope. <Ref. to AT-20, WAVEFORM, MEASUREMENT, Transmission Control Module (TCM) I/O Signal.> Is waveform pattern same as that shown in the figure?</p>	Same wave form as shown in figure.	Go to step 10 .	Repair poor contact in VDCCM.
<p>10 CHECK POOR CONTACT.</p> <p>Is there poor contact in TCM?</p>	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

S: DTC 93 REAR VEHICLE SPEED SENSOR

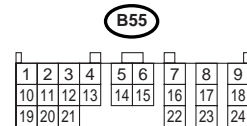
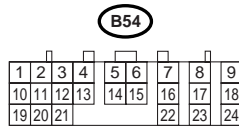
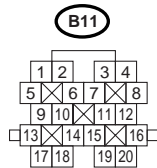
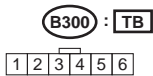
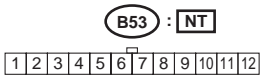
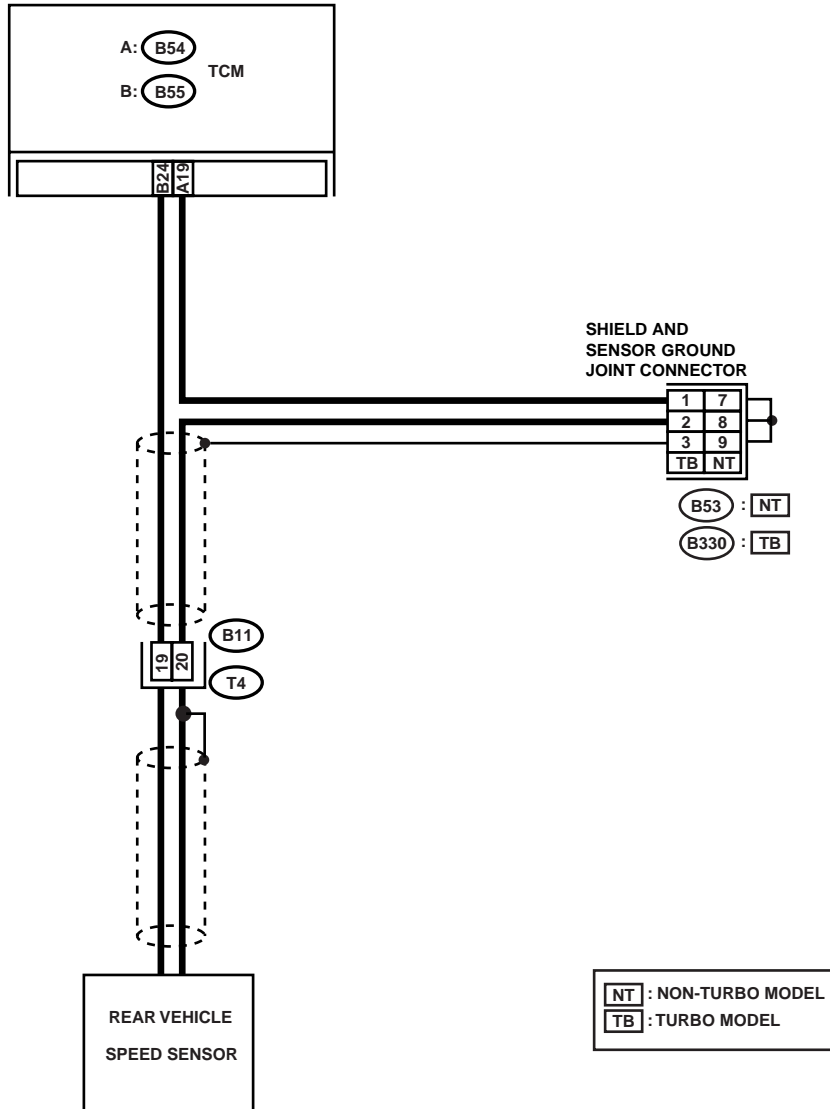
DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock-up or excessive tight corner "braking".

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and transmission connector. Connector & terminal (B55) No. 24 — (B11) No. 19: Is the measured value less than the specified value?	1 Ω	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 19 — (B11) No. 20: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit in harness between TCM and transmission, and poor contact in coupling connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 24 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Repair short circuit in harness between TCM and transmission connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM and chassis ground. Connector & terminal (B54) No. 19 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 5.	Repair short circuit in harness between TCM and transmission connector.
5 CHECK REAR VEHICLE SPEED SENSOR. Measure resistance between transmission connector receptacle's terminals. Connector & terminal (T4) No. 19 — No. 20: Is the measured value within the specified range?	450 — 650 Ω	Go to step 6.	Replace rear vehicle speed sensor. <Ref. to AT-58, Rear Vehicle Speed Sensor.>
6 PREPARE OSCILLOSCOPE. Do you have oscilloscope?	Oscilloscope is available.	Go to step 10.	Go to step 7.
7 PREPARE SUBARU SELECT MONITOR. Do you have a Subaru Select Monitor?	Subaru Select Monitor is available.	Go to step 9.	Go to step 8.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK INPUT SIGNAL FOR TCM.</p> <p>1) Connect connectors to TCM and transmission.</p> <p>2) Lift-up or raise the vehicle and place safety stands.</p> <p>NOTE: Raise all wheels off floor.</p> <p>3) Start the engine and set vehicle in 20 km/h (12 MPH) condition.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>4) Measure voltage between TCM connector terminals.</p> <p>Connector & terminal (B55) No. 24 (+) — (B54) No. 19 (-): Does the measured value exceed the specified value?</p>	AC 1 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and transmission.	Go to step 11.
<p>9 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</p> <p>1) Connect connectors to TCM and transmission.</p> <p>2) Connect Subaru Select Monitor to data link connector.</p> <p>3) Lift-up or raise the vehicle and place safety stands.</p> <p>NOTE: Raise all wheels off floor.</p> <p>4) Turn ignition switch to ON and turn Subaru Select Monitor switch to ON.</p> <p>5) Start the engine.</p> <p>6) Read data of vehicle speed using Subaru Select Monitor.</p> <p>•Compare speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in "km/h" or "MPH".</p> <p>7) Slowly increase vehicle speed to 60 km/h or 37 MPH.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>Does the speedometer indication increase as the Subaru Select Monitor data increases?</p>	Speedometer indication increases as the Subaru Select Monitor data increases	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and transmission.	Go to step 11.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>10 CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.</p> <p>1) Connect connectors to TCM and transmission.</p> <p>2) Lift-up or raise the vehicle and place safety stands.</p> <p>NOTE: Raise all wheels off floor.</p> <p>3) Set oscilloscope to TCM connector terminals.</p> <p style="padding-left: 20px;">Connector & terminal Positive probe; (B55) No. 24 Ground; (B54) No. 19</p> <p>4) Start the engine and set vehicle in 20 km/h (12 MPH) condition.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p> <p>5) Measure signal voltage indicated on oscilloscope. Does signal voltage exceed the the specified value?</p>	AC 1 V	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and transmission.	Go to step 11.
<p>11 CHECK POOR CONTACT.</p> <p>Is there poor contact in rear vehicle speed sensor circuit?</p>	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

15. Diagnostic Procedure for No-diagnostic Trouble Code (DTC)

A: CHECK GEAR POSITION.

Step	Value	Yes	No
<p>1 CHECK GEAR POSITION.</p> <p>1) Lift-up the vehicle and place safety stand.</p> <p>NOTE: Raise all wheels off ground.</p> <p>2) Start the engine.</p> <p>3) Move select lever to "D", and drive vehicle.</p> <p>4) Read data of gear position using Subaru Select Monitor.</p> <p>•Gear position is indicated.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> or <Ref. to VDC-25, Clear Memory Mode.></p>	<p>Does the transmission gear correspond to the gear which is shown on display?</p>	<p>Go to step 2.</p>	<p>Check shift solenoid 1 and shift solenoid 2 signal circuit. <Ref. to AT-72, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and <Ref. to AT-76, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>
<p>2 CHECK SPECIFICATIONS.</p> <p>Is vehicle with VDC system or SPORT shift?</p>	<p>With VDC system or SPORT shift</p>	<p>Go to step CHECK BRAKE SWITCH. <Ref. to AT-125, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).></p>	<p>Go to step CHECK FWD SWITCH. <Ref. to AT-122, CHECK FWD SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).></p>

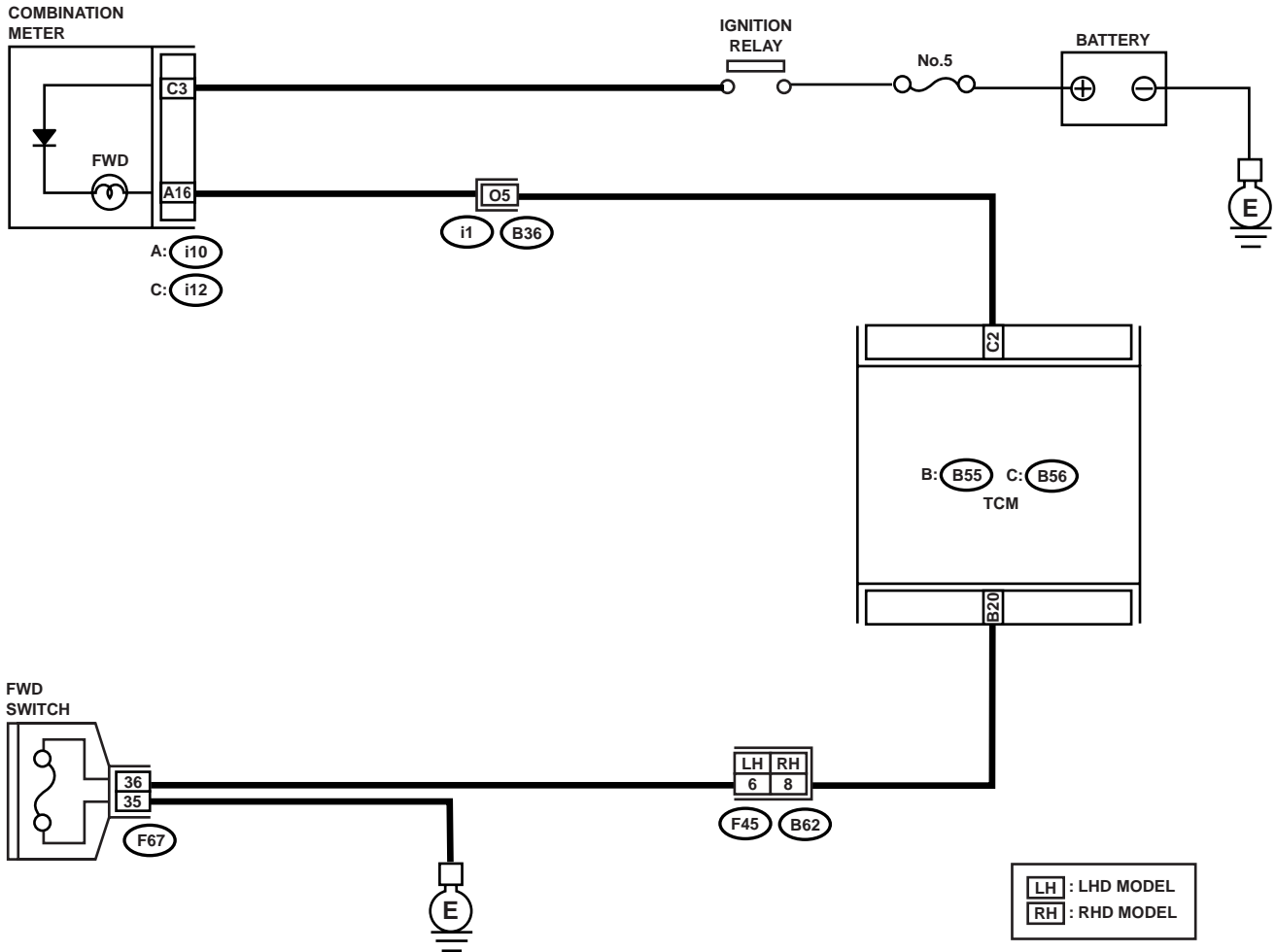
DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: CHECK FWD SWITCH.

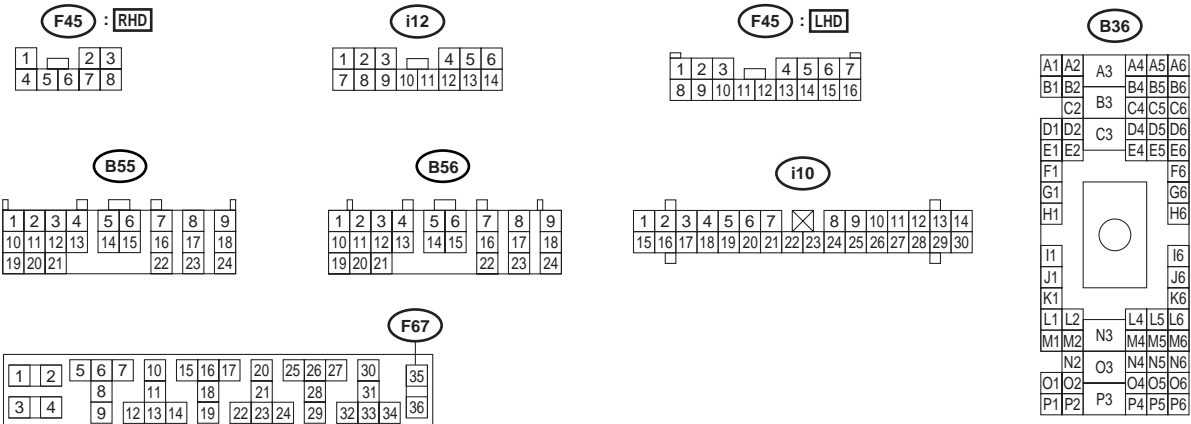
DIAGNOSIS:

- LED does not come on even if FWD switch is ON.
- FWD switch circuit is open or shorted.

WIRING DIAGRAM:



LH : LHD MODEL
RH : RHD MODEL



AT-00786

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FWD SWITCH. When fuse is inserted to FWD switch, does LED light up?	LED lights up.	Go to step CHECK BRAKE SWITCH.<Ref. to AT-125, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FWD INDICATOR LIGHT. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove FWD indicator light bulb from combination meter. Is FWD indicator light bulb OK?	Bulb is normal.	Go to step 3.	Replace FWD indicator light bulb.<Ref. to IDI-14, Combination Meter Assembly.>
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and FWD switch. 3) Measure resistance of harness between TCM and FWD switch connector. Connector & terminal (B55) No. 20 — (F67) No. 36: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair open circuit in harness between TCM and FWD switch connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH. Measure resistance of harness connector between TCM and body to make sure that circuit does not short. Connector & terminal (B55) No. 20 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 5.	Repair short circuit in harness between TCM and FWD switch connector.
5 CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND. Measure resistance of harness between FWD switch and chassis ground. Connector & terminal (F67) No. 35 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair open circuit in harness between FWD switch connector and chassis ground.
6 CHECK INPUT SIGNAL FOR TCM. 1) Turn ignition switch to OFF. 2) Connect connector to TCM and FWD switch. 3) Turn ignition switch to ON. 4) Measure signal voltage for TCM while installing the fuse to FWD switch connector. Connector & terminal (B55) No. 20 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 7.	Go to step 11.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK INPUT SIGNAL FOR TCM. Measure signal voltage for TCM while removing the fuse from FWD switch connector. Connector & terminal (B55) No. 20 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	9 V	Go to step 8.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
<p>8 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and combination meter. 3) Measure resistance of harness between TCM and diagnosis connector. Connector & terminal (B56) No. 2 — (I10) No. 16: Is the measured value less than the specified value?</p>	1 Ω	Go to step 9.	Repair open circuit in harness between TCM and combination meter and poor contact in coupling connector.
<p>9 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. Measure resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. Connector & terminal (B56) No. 2 — Chassis ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 10.	Repair short circuit in harness between TCM and combination meter connector.
<p>10 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Turn ignition switch to OFF. 2) Connect connector to TCM and combination meter. 3) Turn ignition switch to ON. 4) Measure signal voltage for TCM while installing and removing the fuse to FWD switch connector. Connector & terminal (B56) No. 2 — Chassis ground: Is the measured value less than the specified value?</p>	1 V	Go to step 11.	Go to step 12.
<p>11 CHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure signal voltage for TCM while removing the fuse from FWD switch connector. Connector & terminal (B56) No. 2 — Chassis ground: Does the measured value exceed the specified value?</p>	9 V	Go to step 12.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
<p>12 CHECK POOR CONTACT. Is there poor contact in FWD switch circuit?</p>	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
 AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: CHECK BRAKE SWITCH.

Step	Value	Yes	No
1 CHECK BRAKE SWITCH. When the brake pedal is depressed, does LED light up?	LED lights up.	Go to step CHECK ABS SWITCH. <Ref. to AT-125, CHECK ABS SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Check brake switch circuit. <Ref. to WI-92, A/T Control System.>

D: CHECK ABS SWITCH.

Step	Value	Yes	No
1 CHECK ABS SWITCH. Does the LED of ABS switch light up?	LED lights up.	Check ABS switch circuit. <Ref. to ABS-118, DTC 44 ABS-AT CONTROL (NON CONTROLLED), Diagnostics Chart with Subaru Select Monitor.> and <Ref. to ABS-120, DTC 44 ABS-AT CONTROL (CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>	Go to step CHECK CRUISE CONTROL SWITCH. <Ref. to AT-125, CHECK CRUISE CONTROL SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>

E: CHECK CRUISE CONTROL SWITCH.

Step	Value	Yes	No
1 CHECK CRUISE CONTROL SWITCH. When cruise control is set, does LED light up?	LED lights up.	Go to step CHECK KICK-DOWN SWITCH. <Ref. to AT-126, CHECK KICK-DOWN SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Check cruise control. <Ref. to CC-12, Diagnostics Chart with Symptom.>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

F: CHECK KICK-DOWN SWITCH.

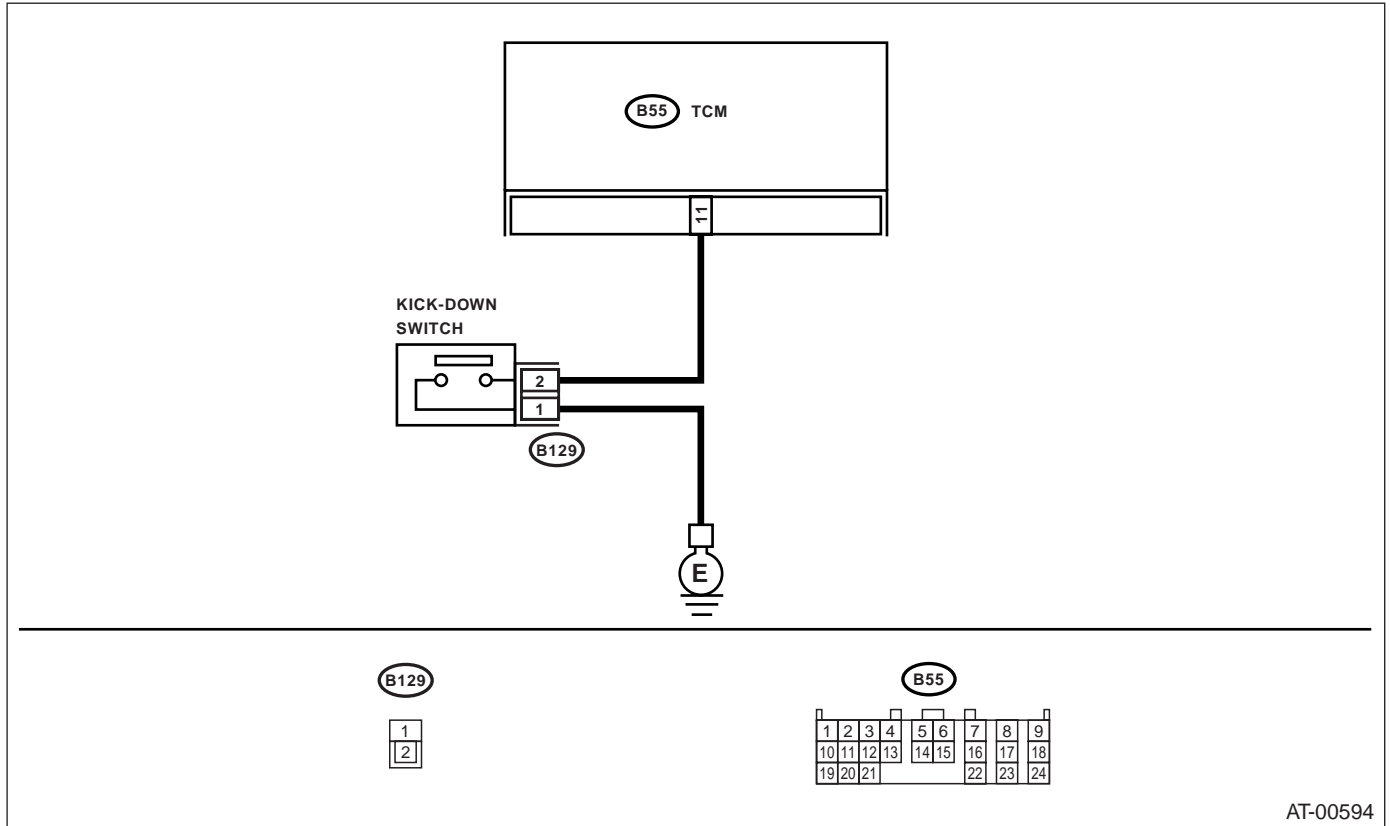
DIAGNOSIS:

- The kick-down switch is not ON when the throttle is fully open but is OFF when the throttle is partially open or fully closed.
- Kick-down switch circuit is open or shorted.

TROUBLE SYMPTOM:

No kick-down occurs (when the throttle is fully open).

WIRING DIAGRAM:



AT-00594

Step	Value	Yes	No
1 CHECK KICK-DOWN SWITCH OPERATION. When the accelerator pedal is depressed, does "ON" displayed?	ON is displayed.	Go to step CHECK POWER MODE SWITCH. <Ref. to AT-128, CHECK POWER MODE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK KICK-DOWN SWITCH GROUND LINE. 1) Disconnect connector from kick-down switch. 2) Measure resistance of harness connector between kick-down switch and chassis ground. Connector & terminal (B129) No. 1 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair open circuit in harness between kick-down switch and chassis ground.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
3 CHECK KICK-DOWN SWITCH. Measure resistance for kick-down switch when depressing the accelerator pedal. <i>Terminals</i> <i>No. 1 — No. 2:</i> Is the measured value less than the specified value?	1 Ω	Go to step 4.	Replace kick-down switch.
4 CHECK KICK-DOWN SWITCH. Measure resistance for kick-down switch when pressing the accelerator pedal. <i>Terminals</i> <i>No. 1 — No. 2:</i> Does the measured value exceed the specified value?	1 M Ω	Go to step 5.	Replace kick-down switch.
5 CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH. 1) Turn ignition switch OFF. 2) Disconnect connectors from kick-down switch. 3) Measure resistance of harness connector between TCM and kick-down switch. <i>Connector & terminal</i> <i>(B55) No. 11 — (B129) No. 2:</i> Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair open circuit in harness between TCM and kick-down switch.
6 CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH. Measure resistance of harness connector between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 11 — Chassis ground:</i> Does the measured value exceed the specified value?	1 M Ω	Go to step 7.	Repair short circuit in harness between TCM and chassis ground.
7 CHECK INPUT SIGNAL FOR TCM. 1) Turn ignition switch to OFF. 2) Connect connector to kick-down switch. 3) Turn ignition switch ON (with engine OFF). 4) Measure signal voltage for TCM when depressing the accelerator pedal. <i>Connector & terminal</i> <i>(B55) No. 11 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?	1 V	Go to step 8.	Go to step 9.
8 CHECK INPUT SIGNAL FOR TCM. Measure signal voltage for TCM when pressing the accelerator pedal. <i>Connector & terminal</i> <i>(B55) No. 11 (+) — Chassis ground (-):</i> Does the measured value exceed the specified value?	6.5 V	A temporary poor contact of the connector and harness may be the cause. Repair harness and connector in the TCM.	Go to step 9.
9 CHECK POOR CONTACT. Is there poor contact?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

G: CHECK POWER MODE SWITCH.

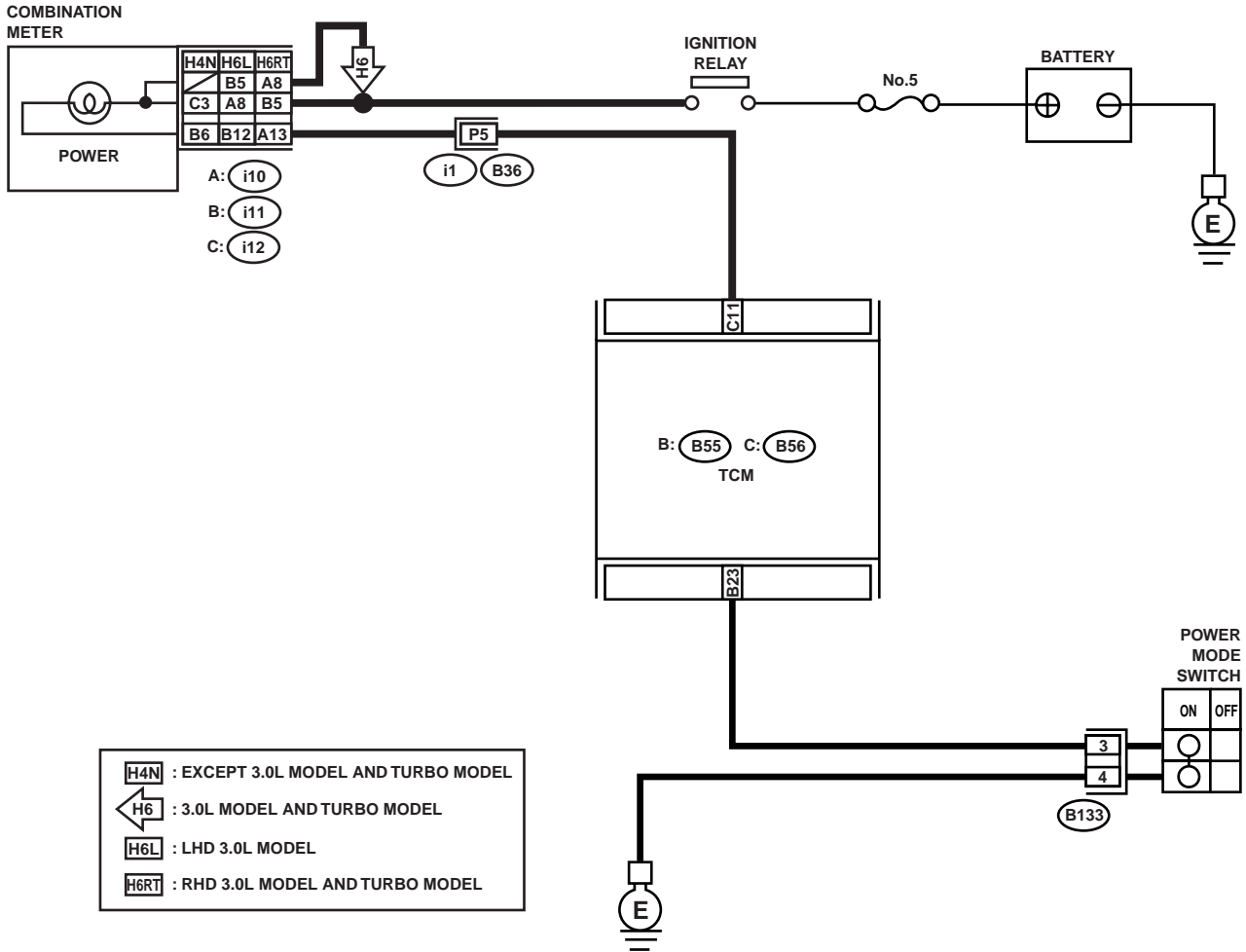
DIAGNOSIS:

- LED does not come on when power switch is ON.
- Power switch circuit is open or shorted.

TROUBLE SYMPTOM:

No power mode occurs.

WIRING DIAGRAM:



i12

1	2	3	4	5	6		
7	8	9	10	11	12	13	14

i11

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

B55

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24			

B36

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C1	C2	C3	C4	C5	C6
D1	D2	D3	D4	D5	D6
E1	E2	E3	E4	E5	E6
F1					F6
G1					G6
H1					H6
I1					I6
J1					J6
K1					K6
L1	L2		L4	L5	L6
M1	M2	N3	M4	M5	M6
N1	O3		N4	N5	N6
O1	O2		O4	O5	O6
P1	P2	P3	P4	P5	P6

B133

1	2		
3	4	5	6

B56

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24			

i10

1	2	3	4	5	6	7	8	9	10	11	12	13	14		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK POWER SWITCH OPERATION. When power switch is turned OFF, does LED light up?	LED lights up.	Go to step 5.	Go to step 2.
2 CHECK POWER SWITCH OPERATION. When power switch is turned ON, does LED light up?	LED lights up.	Go to step CHECK INHIBITOR SWITCH. <Ref. to AT-132, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK POWER INDICATOR LIGHT. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove POWER indicator light bulb from combination meter. Is POWER indicator light bulb OK?	Bulb is normal.	Go to step 4.	Replace POWER indicator light bulb. <Ref. to IDI-14, Combination Meter Assembly.>
4 CHECK POWER SWITCH GROUND LINE. 1) Turn ignition switch to OFF. 2) Disconnect connector from power switch. 3) Measure resistance of harness connector between power switch and chassis ground. Connector & terminal (B133) No. 4 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair open circuit in harness between power switch and chassis ground.
5 CHECK POWER SWITCH. 1) Power switch turned ON. 2) Measure resistance between terminals of power switch. Terminals No. 3 — No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair power switch.
6 CHECK POWER SWITCH. 1) Power switch turned OFF. 2) Measure resistance between terminals of power switch. Terminals No. 3 — No. 4: Does the measured value exceed the specified value?	1 M Ω	Go to step 7.	Repair power switch.
7 CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH. Measure resistance of harness connector between TCM and power switch. Connector & terminal (B55) No. 23 — (B133) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 8.	Repair open circuit in harness between TCM and power switch connector.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH. Measure resistance of harness connector between TCM and chassis ground. Connector & terminal (B55) No. 23 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 9.	Repair short circuit in harness between TCM and power switch connector.
9 CHECK INPUT SIGNAL FOR TCM. 1) Connect connectors to TCM and power switch. 2) Turn ignition switch ON (with engine OFF). 3) Measure signal voltage for TCM while turning power switch OFF. Connector & terminal (B55) No. 23 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 10.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
10 CHECK INPUT SIGNAL FOR TCM. Measure signal voltage for TCM while turning power switch ON. Connector & terminal (B55) No. 23 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 11.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
11 CHECK POOR CONTACT. Is there poor contact?	There is poor contact.	Repair poor contact.	A temporary poor contact of the connector or harness in power switch circuit.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

H: CHECK INHIBITOR SWITCH.

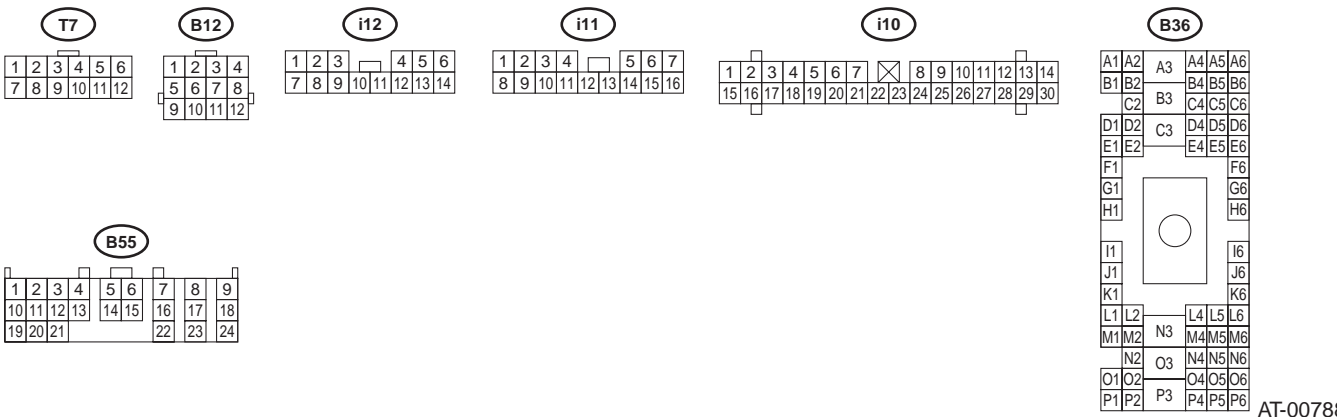
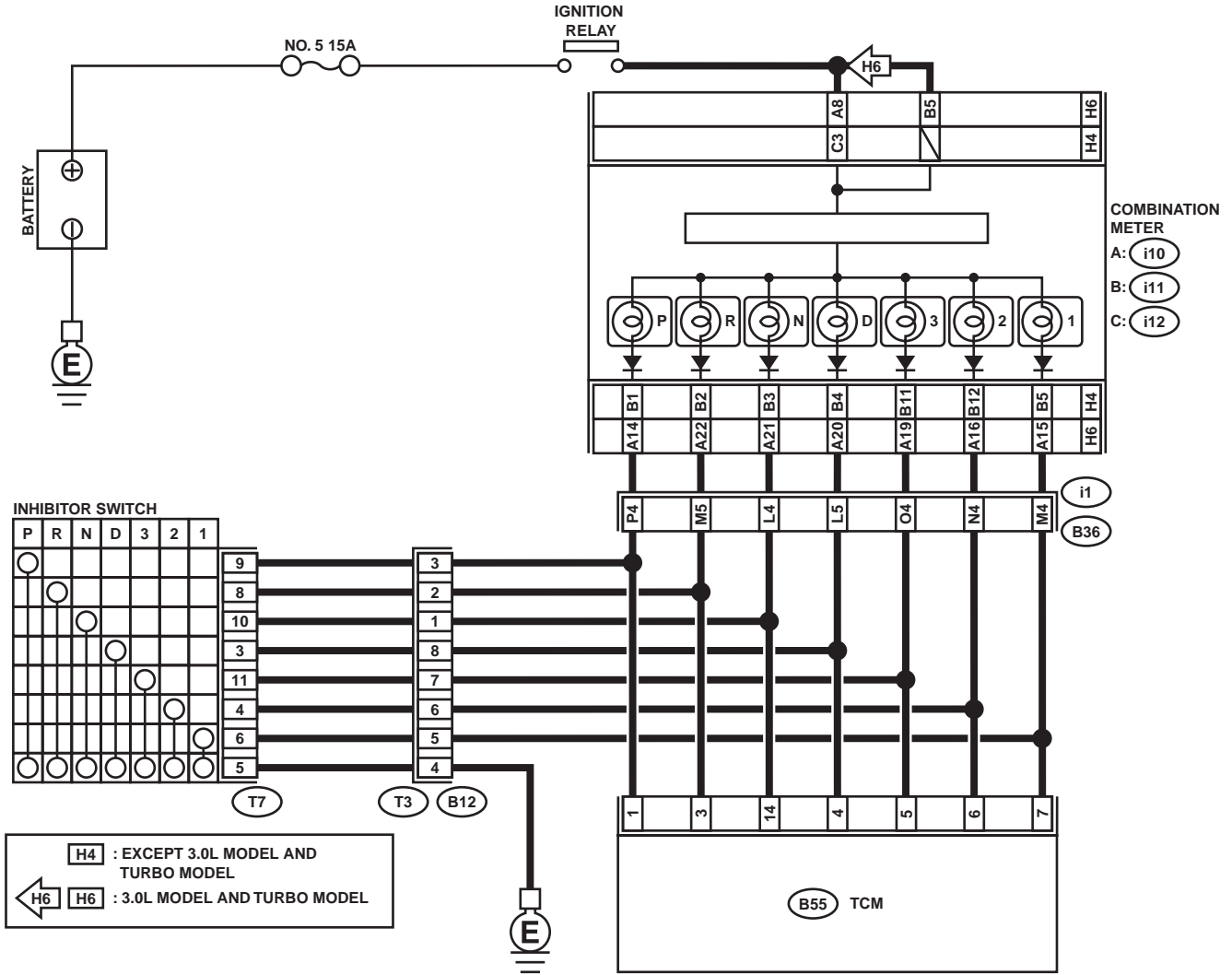
DIAGNOSIS:

Input signal circuit of inhibitor switch is open or shorted.

TROUBLE SYMPTOM:

- Shift characteristics are erroneous.
- Engine brake is not effected when selector lever is in "3" range.
- Engine brake is not effected when selector lever is in "2" range.
- Engine brake is not effected when selector lever is in "1" range.

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK "P" RANGE SWITCH. When "P" range is selected, does LED light up?	LED lights up.	Go to step 2 .	Go to step 22 .
2 CHECK INDICATOR LIGHT. Does combination meter "P" range indicator illuminate?	P range indicator lights up.	Go to step 3 .	Go to step 26 .
3 CHECK "P" RANGE SWITCH. When the "R" range is selected, does "P" range LED light up?	LED lights up.	Go to step 28 .	Go to step 4 .
4 CHECK "R" RANGE SWITCH. When the "R" range is selected, does LED light up?	LED lights up.	Go to step 5 .	Go to step 29 .
5 CHECK INDICATOR LIGHT. Does combination meter "R" range indicator illuminate?	R range indicator lights up.	Go to step 6 .	Go to step 32 .
6 CHECK "R" RANGE SWITCH. When the "N" range is selected, does "R" range LED light up?	LED lights up.	Go to step 34 .	Go to step 7 .
7 CHECK "N" RANGE SWITCH. When the "N" range is selected, does LED light up?	LED lights up.	Go to step 8 .	Go to step 35 .
8 CHECK INDICATOR LIGHT. Does combination meter "N" range indicator illuminate?	N range indicator lights up.	Go to step 9 .	Go to step 38 .
9 CHECK "N" RANGE SWITCH. When the "D" range is selected, does "N" range LED light up?	LED lights up.	Go to step 40 .	Go to step 10 .
10 CHECK "D" RANGE SWITCH. When the "D" range is selected, does LED light up?	LED lights up.	Go to step 11 .	Go to step 41 .
11 CHECK INDICATOR LIGHT. Does combination meter "D" range indicator illuminate?	D range indicator lights up.	Go to step 12 .	Go to step 44 .
12 CHECK "D" RANGE SWITCH. When the "3" range is selected, does "D" range LED light up?	LED lights up.	Go to step 46 .	Go to step 13 .
13 CHECK "3" RANGE SWITCH. When the "3" range is selected, does LED light up?	LED lights up.	Go to step 14 .	Go to step 47 .
14 CHECK INDICATOR LIGHT. Does combination meter "3" range indicator illuminate?	3 range indicator lights up.	Go to step 15 .	Go to step 50 .
15 CHECK "3" RANGE SWITCH. When the "2" range is selected, does "3" range LED light up?	LED lights up.	Go to step 52 .	Go to step 16 .
16 CHECK "2" RANGE SWITCH. When the "2" range is selected, does LED light up?	LED lights up.	Go to step 17 .	Go to step 53 .
17 CHECK INDICATOR LIGHT. Does combination meter "2" range indicator illuminate?	2 range indicator lights up.	Go to step 18 .	Go to step 56 .
18 CHECK "2" RANGE SWITCH. When the "1" range is selected, does "2" range LED light up?	LED lights up.	Go to step 58 .	Go to step 19 .
19 CHECK "1" RANGE SWITCH. When the "1" range is selected, does LED light up?	LED lights up.	Go to step 20 .	Go to step 59 .

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
20 CHECK INDICATOR LIGHT. Does combination meter "1" range indicator illuminate?	1 range indicator lights up.	Go to step 21.	Go to step 62.
21 CHECK "1" RANGE SWITCH. When the "2" range is selected, does "1" range LED light UP?	LED lights up.	Go to step 64.	Go to step CHECK HOLD SWITCH. <Ref. to AT-144, CHECK HOLD SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
22 CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect connector from inhibitor switch. 3) Measure resistance of harness between inhibitor switch and chassis ground. Connector & terminal (T7) No. 5 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 23.	Repair open circuit in harness between inhibitor switch connector and chassis ground, and poor contact in coupling connector.
23 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and inhibitor switch. 3) Measure resistance of harness between TCM and inhibitor switch connector. Connector & terminal (B55) No. 1 — (T7) No. 9 Is the measured value less than the specified value?	1 Ω	Go to step 24.	Repair open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
24 CHECK INPUT SIGNAL FOR TCM. 1) Turn ignition switch to OFF. 2) Connect connector to TCM and inhibitor switch. 3) Turn ignition switch to ON. 4) Move select lever to P range. 5) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 1 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 25.	Go to step 65.
25 CHECK INPUT SIGNAL FOR TCM. 1) Position select lever to any other than P range. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 65.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
26 CHECK "P" RANGE INDICATOR LIGHT BULB. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove "P" range indicator light bulb from combination meter. Is "P" range indicator light bulb OK?	Bulb is normal.	Go to step 27.	Replace "P" range indicator light bulb. <Ref. to IDI-14, Combination Meter Assembly.>
27 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect connectors from TCM and combination meter. 2) Measure resistance of harness between TCM and combination meter. Connector & terminal Except 3.0 L model and TURBO model: (B55) No. 1 — (i11) No. 1: 3.0 L model and TURBO model: (B55) No. 1 — (i10) No. 14: Does the measured value exceed the specified value?	1 Ω	Go to step 65.	Repair open circuit in harness between inhibitor switch connector and combination meter, and poor contact in coupling connector.
28 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM, inhibitor switch and combination meter. 3) Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 1 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 29.	Repair ground short circuit in "P" range circuit.
29 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and inhibitor switch. 3) Measure resistance of harness between TCM and inhibitor switch connector. Connector & terminal (B55) No. 3 — (T7) No. 8: Is the measured value less than the specified value?	1 Ω	Go to step 30.	Repair open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
30 CHECK INPUT SIGNAL FOR TCM. 1) Turn ignition switch to OFF. 2) Connect connector to TCM and inhibitor switch. 3) Turn ignition switch to ON. 4) Move select lever to R range. 5) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 3 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 31.	Go to step 65.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
31 CHECK INPUT SIGNAL FOR TCM. 1) Position select lever to any other than R range. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 65.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
32 CHECK "R" RANGE INDICATOR LIGHT BULB. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove "R" range indicator light bulb from combination meter. Is "R" range indicator light bulb OK?	Bulb is normal.	Go to step 33.	Replace "R" range indicator light bulb. <Ref. to IDI-14, Combination Meter Assembly.>
33 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect connectors from TCM and combination meter. 2) Measure resistance of harness between TCM and combination meter. Connector & terminal Except 3.0 L model and TURBO model: (B55) No. 3 — (i11) No. 2: 3.0 L model and TURBO model: (B55) No. 3 — (i10) No. 22: Is the measured value less than the specified value?	1 Ω	Go to step 65.	Repair open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
34 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM, inhibitor switch and combination meter. 3) Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 3 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 35.	Repair ground short circuit in "R" range circuit.
35 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and inhibitor switch. 3) Measure resistance of harness between TCM and inhibitor switch connector. Connector & terminal (B55) No. 14 — (T7) No. 10: Is the measured value less than the specified value?	1 Ω	Go to step 36.	Repair open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
36 CHECK INPUT SIGNAL FOR TCM. 1) Turn ignition switch to OFF. 2) Connect connector to TCM and inhibitor switch. 3) Turn ignition switch to ON. 4) Move select lever to N range. 5) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 14 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 37.	Go to step 65.
37 CHECK INPUT SIGNAL FOR TCM. 1) Position select lever to any other than N range. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 14 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 65.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
38 CHECK "N" RANGE INDICATOR LIGHT BULB. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove "N" range indicator light bulb from combination meter. Is "N" range indicator light bulb OK?	Bulb is normal.	Go to step 39.	Replace "N" range indicator light bulb. <Ref. to IDI-14, Combination Meter Assembly.>
39 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect connectors from TCM and combination meter. 2) Measure resistance of harness between TCM and combination meter. Connector & terminal Except 3.0 L model and TURBO model: (B55) No. 14 — (i11) No. 3: 3.0 L model and TURBO model: (B55) No. 14 — (i10) No. 21: Does the measured value exceed the specified value?	1 Ω	Go to step 65.	Repair open circuit in harness between inhibitor switch connector and combination meter.
40 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM, inhibitor switch and combination meter. 3) Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 14 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 41.	Repair ground short circuit in "N" range circuit.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
41 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and inhibitor switch. 3) Measure resistance of harness between TCM and inhibitor switch connector. Connector & terminal (B55) No. 4 — (T7) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 42.	Repair open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
42 CHECK INPUT SIGNAL FOR TCM. 1) Turn ignition switch to OFF. 2) Connect connector to TCM and inhibitor switch. 3) Turn ignition switch to ON. 4) Move select lever to D range. 5) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 4 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 43.	Go to step 65.
43 CHECK INPUT SIGNAL FOR TCM. 1) Position select lever to any other than D range. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 4 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 65.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
44 CHECK "D" RANGE INDICATOR LIGHT BULB. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove "D" range indicator light bulb from combination meter. Is "D" range indicator light bulb OK?	Bulb is normal.	Go to step 45.	Replace "D" range indicator light bulb. <Ref. to IDI-14, Combination Meter Assembly.>
45 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect connectors from TCM and combination meter. 2) Measure resistance of harness between TCM and combination meter. Connector & terminal Except 3.0 L model and TURBO model: (B55) No. 4 — (i11) No. 4: 3.0 L model and TURBO model: (B55) No. 4 — (i10) No. 20: Does the measured value exceed the specified value?	1 Ω	Go to step 65.	Repair open circuit in harness between inhibitor switch connector and combination meter.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
46 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM, inhibitor switch and combination meter. 3) Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 4 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 47.	Repair ground short circuit in "D" range circuit.
47 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and inhibitor switch. 3) Measure resistance of harness between TCM and inhibitor switch connector. Connector & terminal (B55) No. 5 — (B12) No. 7: Is the measured value less than the specified value?	1 Ω	Go to step 48.	Repair open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
48 CHECK INPUT SIGNAL FOR TCM. 1) Turn ignition switch to OFF. 2) Connect connector to TCM and inhibitor switch. 3) Turn ignition switch to ON. 4) Move select lever to 3 range. 5) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 5 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 49.	Go to step 65.
49 CHECK INPUT SIGNAL FOR TCM. 1) Position select lever to any other than 3 range. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 5 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 65.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
50 CHECK "3" RANGE INDICATOR LIGHT BULB. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove "3" range indicator light bulb from combination meter. Is "3" range indicator light bulb OK?	Bulb is normal.	Go to step 51.	Replace "3" range indicator light bulb. <Ref. to IDI-14, Combination Meter Assembly.>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
51 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect connectors from TCM and combination meter. 2) Measure resistance of harness between TCM and combination meter. Connector & terminal Except 3.0 L model and TURBO model: (B55) No. 5 — (i11) No. 11: 3.0 L model and TURBO model: (B55) No. 5 — (i10) No. 19: Does the measured value exceed the specified value?	1 Ω	Go to step 65.	Repair open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
52 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM, inhibitor switch and combination meter. 3) Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 5 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 53.	Repair ground short circuit in "3" range circuit.
53 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and inhibitor switch. 3) Measure resistance of harness between TCM and inhibitor switch connector. Connector & terminal (B55) No. 6 — (T7) No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 54.	Repair open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
54 CHECK INPUT SIGNAL FOR TCM. 1) Turn ignition switch to OFF. 2) Connect connector to TCM and inhibitor switch. 3) Turn ignition switch to ON. 4) Move select lever to 2 range. 5) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 55.	Go to step 65.
55 CHECK INPUT SIGNAL FOR TCM. 1) Position select lever to any other than 2 range. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 6 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 65.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
56 CHECK "2" RANGE INDICATOR LIGHT BULB. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove "2" range indicator light bulb from combination meter. Is "2" range indicator light bulb OK?	Bulb is normal.	Go to step 57.	Replace "2" range indicator light bulb. <Ref. to IDI-14, Combination Meter Assembly.>
57 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect connectors from TCM and combination meter. 2) Measure resistance of harness between TCM and combination meter. Connector & terminal Except 3.0 L model and TURBO model: (B55) No. 6 — (i11) No. 12: 3.0 L model and TURBO model: (B55) No. 6 — (i10) No. 16: Does the measured value exceed the specified value?	1 Ω	Go to step 65.	Repair open circuit in harness between TCM and combination meter, and poor contact in TCM connector.
58 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM, inhibitor switch and combination meter. 3) Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 6 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 59.	Repair ground short circuit in "2" range circuit.
59 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and inhibitor switch. 3) Measure resistance of harness between TCM and inhibitor switch connector. Connector & terminal (B55) No. 7 — (T7) No. 6: Is the measured value less than the specified value?	1 Ω	Go to step 60.	Repair open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
60 CHECK INPUT SIGNAL FOR TCM. 1) Turn ignition switch to OFF. 2) Connect connector to TCM and inhibitor switch. 3) Turn ignition switch to ON. 4) Move select lever to 1 range. 5) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 7 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 61.	Go to step 65.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
61 CHECK INPUT SIGNAL FOR TCM. 1) Position select lever to any other than 1 range. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 7 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 65.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
62 CHECK "1" RANGE INDICATOR LIGHT BULB. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove "1" range indicator light bulb from combination meter. Is "1" range indicator light bulb OK?	Bulb is normal.	Go to step 63.	Replace "1" range indicator light bulb. <Ref. to IDI-14, Combination Meter Assembly.>
63 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect connectors from TCM and combination meter. 2) Measure resistance of harness between TCM and combination meter. Connector & terminal Except 3.0 L model and TURBO model: (B55) No. 7 — (i11) No. 5: 3.0 L model and TURBO model: (B55) No. 7 — (i10) No. 15: Does the measured value exceed the specified value?	1 Ω	Go to step 65.	Repair open circuit in harness between TCM and combination meter, and poor contact in TCM connector.
64 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM, inhibitor switch and combination meter. 3) Measure resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 7 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 65.	Repair ground short circuit in "1" range circuit.
65 CHECK POOR CONTACT. Is there poor contact in inhibitor switch circuit?	There is poor contact.	Repair poor contact.	Adjust inhibitor switch and select cable. <Ref. to AT-50, ADJUSTMENT, Inhibitor Switch.> and <Ref. to CS-12, Select Cable.>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

I: CHECK HOLD SWITCH.

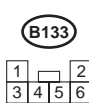
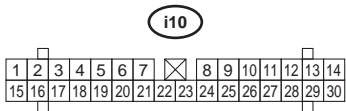
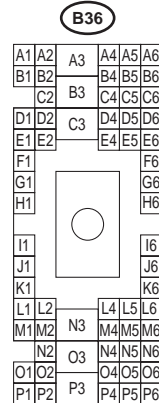
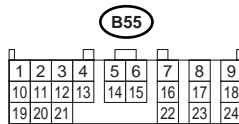
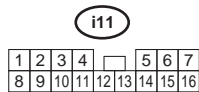
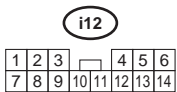
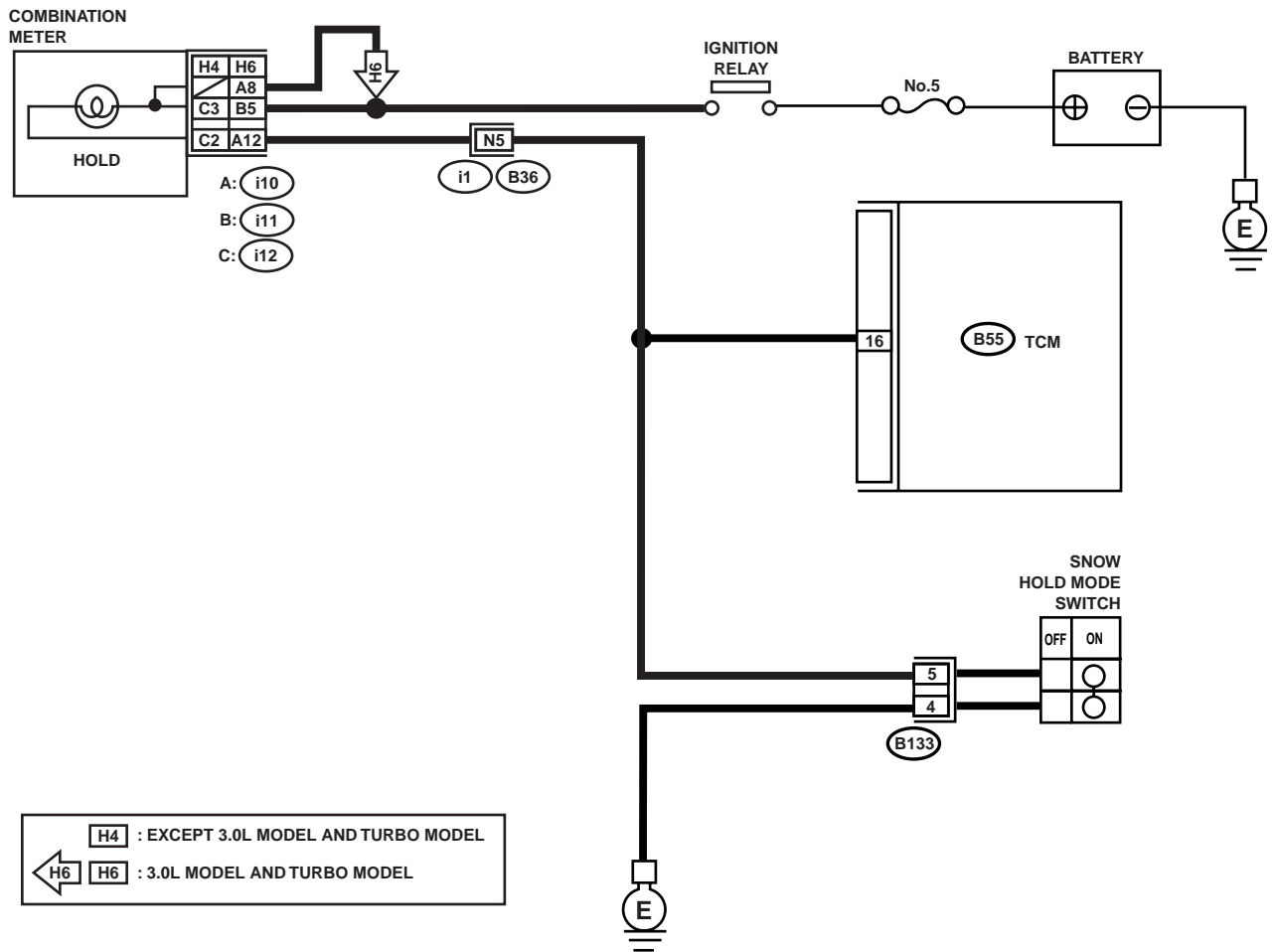
DIAGNOSIS:

- LED does not come on when hold switch is ON.
- Hold switch circuit is open or shorted.

TROUBLE SYMPTOM:

- 2nd gear is not held.
- Failure of vehicle to start in 2nd gear except 1st range.

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HOLD SWITCH OPERATION. When hold switch is turned OFF, does LED light up?	LED lights up.	Go to step 5.	Go to step 2.
2 CHECK HOLD SWITCH OPERATION. When hold switch is turned ON, does LED light up?	LED lights up.	Go to step Inspection of SPORT shift switch. <Ref. to AT-148, CHECK SPORT SHIFT SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK HOLD INDICATOR LIGHT. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove HOLD indicator light bulb from combination meter. Is HOLD indicator light bulb OK?	Bulb is normal.	Go to step 4.	Replace HOLD indicator light bulb. <Ref. to IDI-14, Combination Meter Assembly.>
4 CHECK HOLD SWITCH GROUND LINE. 1) Turn ignition switch to OFF. 2) Disconnect connector from hold switch. 3) Measure resistance of harness connector between hold switch and chassis ground. Connector & terminal (B133) No. 4 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair open circuit in harness between hold switch and chassis ground.
5 CHECK HOLD SWITCH. 1) Hold switch turned ON. 2) Measure resistance between terminals of hold switch. Terminals No. 4 — No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair hold switch.
6 CHECK HOLD SWITCH. 1) Hold switch turned OFF. 2) Measure resistance between terminals of hold switch. Terminals No. 4 — No. 5: Does the measured value exceed the specified value?	1 MΩ	Go to step 7.	Repair hold switch.
7 CHECK HARNESS CONNECTOR BETWEEN TCM AND HOLD SWITCH. 1) Disconnect connector TCM and combination meter. 2) Measure resistance of harness connector between TCM and hold switch. Connector & terminal (B55) No. 16 — (B133) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 8.	Repair open circuit in harness between TCM and hold switch connector and poor contact in coupling connector.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. Measure resistance of harness connector TCM and combination meter. Connector & terminal Except 3.0 L model and TURBO model: (B55) No. 16 — (i12) No. 2: 3.0 L model and TURBO model: (B55) No. 16 — (i10) No. 12: Is the measured value less than the specified value?	1 Ω	Go to step 9.	Repair open circuit in harness between TCM and combination meter, and poor contact in coupling connector.
9 CHECK HARNESS CONNECTOR BETWEEN TCM AND HOLD SWITCH. Measure resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. Connector & terminal (B55) No. 16 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 10.	Repair short circuit in harness between TCM, hold switch and combination meter connector.
10 CHECK INPUT SIGNAL FOR TCM. 1) Connect connectors to TCM and hold switch. 2) Turn ignition switch ON (with engine OFF). 3) Measure signal voltage for TCM while turning hold switch OFF. Connector & terminal (B55) No. 16 (+) — Chassis ground (-): Does the measured value exceed the specified value?	8 V	Go to step 11.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
11 CHECK INPUT SIGNAL FOR TCM. Measure signal voltage for TCM while turning hold switch ON. Connector & terminal (B55) No. 16 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 12.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
12 CHECK POOR CONTACT. Is there poor contact?	There is poor contact.	Repair poor contact.	A temporary poor contact of the connector or harness or connector in hold switch circuit.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

J: CHECK SPORT SHIFT SWITCH.

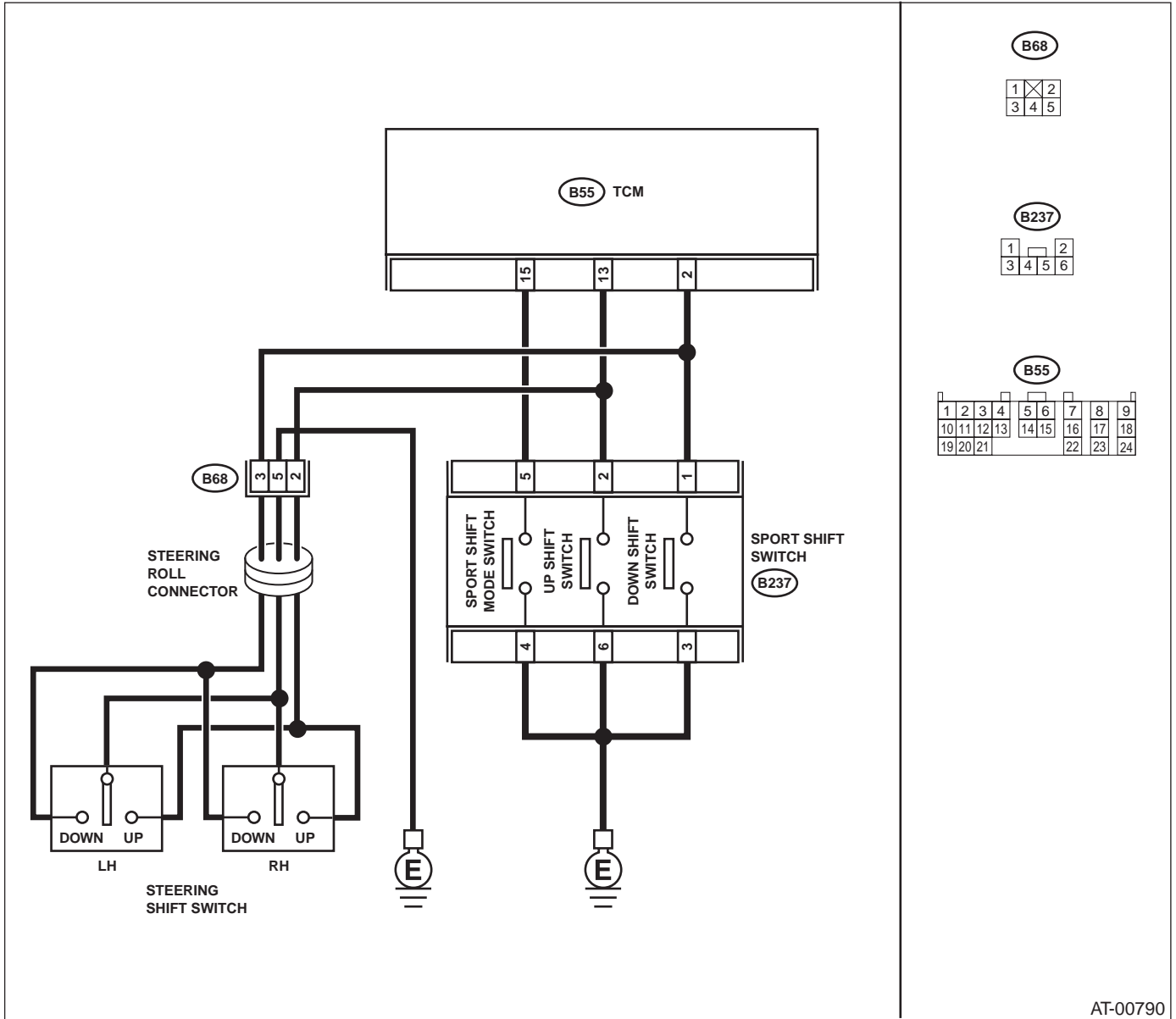
DIAGNOSIS:

SPORT shift switch input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No SPORT shift mode occurs.
- Does not shift gears in SPORT shift mode.

WIRING DIAGRAM:



AT-00790

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK VEHICLE. Is the target model equipped with SPORT shift?	Model with sport shift	Go to step 2.	Go to step SYMPTOM RELATED DIAGNOSTIC. <Ref. to AT-160, Symptom Related Diagnostic.>
2 CHECK SPORT SHIFT SWITCH. Does LED light up when select lever is moved to SPORT shift mode?	Lights up.	Go to step 3.	Go to step 7.
3 CHECK SPORT SHIFT SWITCH. Does LED light up when select lever is moved to shift up side?	Lights up.	Go to step 4.	Go to step 14.
4 CHECK SPORT SHIFT SWITCH. Does LED light up when select lever is moved to shift down side?	Lights up.	Go to step 5.	Go to step 21.
5 CHECK STEERING SHIFT SWITCH. Does LED light up when steering shift switch + side is pressed?	Lights up.	Go to step 6.	Go to step 28.
6 CHECK STEERING SHIFT SWITCH. Does LED light up when steering shift switch – side is pressed?	Lights up.	Go to “Inspection of SPORT shift indicator” procedures. <Ref. to AT-156, CHECK SPORT SHIFT INDICATOR., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step 32.
7 CHECK SPORT SHIFT SWITCH GROUND LINE. 1) Turn ignition switch to OFF. 2) Disconnect connector from SPORT shift switch. 3) Measure resistance of harness between SPORT shift switch connector and chassis ground. Connector & terminal (B237) No. 4 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 8.	Repair open circuit in harness between SPORT shift switch and chassis ground.
8 CHECK SPORT SHIFT SWITCH. Measure resistance between SPORT shift switch terminals. Connector & terminal (B237) No. 4 — No. 5: Does the measured value exceed the specified value?	1 MΩ	Go to step 9.	Replace lever plate assembly.
9 CHECK SPORT SHIFT SWITCH. 1) Move select lever to SPORT shift mode. 2) Measure resistance between SPORT shift switch terminals. Connector & terminal (B237) No. 4 — No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 10.	Replace lever plate assembly.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
10 CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH. 1) Disconnect connector from TCM. 2) Measure resistance of harness between TCM connector and SPORT shift switch connector. Connector & terminal (B237) No. 5 — (B55) No. 15: Is the measured value less than the specified value?	1 Ω	Go to step 11.	Repair open circuit in harness between SPORT shift switch connector and TCM connector and poor contact in coupling connector.
11 CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH. 1) Disconnect connector from TCM. 2) Measure resistance of harness between SPORT shift switch connector and chassis ground. Connector & terminal (B237) No. 5 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 12.	Repair short circuit in harness between SPORT shift switch connector and TCM connector.
12 CHECK INPUT SIGNAL FOR TCM. 1) Connect connector to TCM and SPORT shift switch. 2) Turn ignition switch to ON. (Engine is stopped.) 3) Move select lever to normal mode. 4) Measure signal voltage for TCM. Connector & terminal (B55) No. 15 (+) — Chassis ground (-): Does the measured value exceed the specified value?	9 V	Go to step 13.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
13 CHECK INPUT SIGNAL FOR TCM. 1) Move select lever to SPORT shift mode. 2) Measure signal voltage for TCM. Connector & terminal (B55) No. 15 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 35.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
14 CHECK SPORT SHIFT SWITCH GROUND LINE. 1) Turn ignition switch to OFF. 2) Disconnect connector from SPORT shift switch. 3) Measure resistance of harness between SPORT shift switch connector and chassis ground. Connector & terminal (B237) No. 6 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 15.	Repair open circuit in harness between SPORT shift switch and chassis ground.
15 CHECK SPORT SHIFT SWITCH. 1) Measure resistance between SPORT shift switch terminals. Connector & terminal (B237) No. 6 — No. 2: Does the measured value exceed the specified value?	1 MΩ	Go to step 16.	Replace guide plate assembly.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
16 CHECK SPORT SHIFT SWITCH. 1) Move select lever to SPORT shift mode. 2) Measure resistance between SPORT shift switch terminals. Connector & terminal (B237) No. 6 — No. 2: Is the measured value less than the specified value?	1 Ω	Go to step 17.	Replace guide plate assembly.
17 CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH. 1) Disconnect connector from TCM. 2) Measure resistance of harness between TCM connector and SPORT shift switch connector. Connector & terminal (B237) No. 2 — (B55) No. 13: Is the measured value less than the specified value?	1 Ω	Go to step 18.	Repair open circuit in harness between SPORT shift switch connector and TCM connector and poor contact in coupling connector.
18 CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH. 1) Disconnect connector from steering roll connector. 2) Measure resistance of harness between SPORT shift switch connector and chassis ground. Connector & terminal (B237) No. 2 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 19.	Repair short circuit in harness between SPORT shift switch connector and TCM connector.
19 CHECK INPUT SIGNAL FOR TCM. 1) Connect all connectors. 2) Turn ignition switch to ON. (Engine is stopped.) 3) Measure signal voltage for TCM. Connector & terminal (B55) No. 13 (+) — Chassis ground (-): Does the measured value exceed the specified value?	9 V	Go to step 20.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
20 CHECK INPUT SIGNAL FOR TCM. 1) Move select lever to shift up side. 2) Measure signal voltage for TCM. Connector & terminal (B55) No. 13 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 35.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
21 CHECK SPORT SHIFT SWITCH GROUND LINE. 1) Turn ignition switch to OFF. 2) Disconnect connector from SPORT shift switch. 3) Measure resistance of harness between SPORT shift switch connector and chassis ground. Connector & terminal (B237) No. 3 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 22.	Repair open circuit in harness between SPORT shift switch and chassis ground.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
22 CHECK SPORT SHIFT SWITCH. Measure resistance between SPORT shift switch terminals. Connector & terminal (B237) No. 3 — No. 1: Does the measured value exceed the specified value?	1 M Ω	Go to step 24.	Replace guide plate assembly.
23 CHECK SPORT SHIFT SWITCH. 1) Move select lever to SPORT shift mode. 2) Measure resistance between SPORT shift switch terminals. Connector & terminal (B237) No. 3 — No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 24.	Replace guide plate assembly.
24 CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH. 1) Disconnect connector from TCM. 2) Measure resistance of harness between TCM connector and SPORT shift switch connector. Connector & terminal (B237) No. 1 — (B55) No. 2: Is the measured value less than the specified value?	1 Ω	Go to step 25.	Repair open circuit in harness between SPORT shift switch connector and TCM connector and poor contact in coupling connector.
25 CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH. 1) Disconnect steering roll connector. 2) Measure resistance of harness between SPORT shift switch connector and chassis ground. Connector & terminal (B237) No. 1 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	Go to step 26.	Repair short circuit in harness between SPORT shift switch connector and TCM connector.
26 CHECK INPUT SIGNAL FOR TCM. 1) Connect all connectors. 2) Turn ignition switch to ON. (Engine is stopped.) 3) Measure signal voltage for TCM. Connector & terminal (B55) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	9 V	Go to step 27.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
27 CHECK INPUT SIGNAL FOR TCM. 1) Move select lever to shift up side. 2) Measure signal voltage for TCM. Connector & terminal (B55) No. 2 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 35.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
28 CHECK ground circuit of steering shift switch. 1) Turn ignition switch OFF. 2) Disconnect connector from steering roll connector. 3) Measure resistance of harness between steering roll connector and chassis ground. Connector & terminal (B68) No. 5 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 29 .	Repair open circuit between steering roll connector and body ground.
29 CHECK steering shift switch. Measure resistance between steering roll connector terminals. Connector & terminal (B68) No. 5 — No. 2: Does the measured value exceed the the specified value?	1 MΩ	Go to step 30 .	Replace steering roll connector or steering shift switch. Repair connector poor contact.
30 CHECK steering shift switch. 1) Press steering shift switch + side and hold it. 2) Measure resistance between terminals between steering shift switch. Connector & terminal (B68) No. 5 — No. 2: Is the measured value less than the specified value?	1 Ω	Go to step 31 .	Replace steering roll connector or steering shift switch. Repair connector poor contact.
31 CHECK harness connector between TCM and Steering roll connector. 1) Disconnect connector from TCM. 2) Measure harness resistance between TCM connector and steering roll connector. Connector & terminal (B55) No. 13 — (B68) No. 2: Is the measured value less than the specified value?	1 Ω	The circuit is returned to a normal condition. Temporary poor contact of the harness may be the case. Repair poor contact of steering roll connector and steering shift switch harness or connector.	Repair poor contact or harness disconnection between connectors of TCM connector and steering roll connector
32 CHECK Steering shift switch. 1) Turn ignition switch to OFF. 2) Disconnect connector from steering roll connector. 3) Measure resistance value between steering roll connectors. Connector & terminal (B68) No. 5 — No. 3: Does the measured value exceed the specified value?	1 MΩ	Go to step 33 .	Replace steering roll connector or steering shift switch. Repair connector poor contact.
33 CHECK Steering shift switch. 1) Press steering shift switch + side and hold it. 2) Measure resistance between terminals of steering shift switch. Connector & terminal (B68) No. 5 — No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 34 .	Replace steering roll connector or steering shift switch. Repair connector poor contact.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
34 CHECK harness connector between TCM and Steering roll connector. 1) Disconnect connector from TCM. 2) Measure harness resistance between TCM connector and steering roll connector. Connector & terminal (B55) No. 1 — (B68) No. 3: Is the measured value less than the specified value?	1 Ω	The circuit is returned to a normal condition. Temporary poor contact of the harness may be the case. Repair poor contact of steering roll connector and steering shift switch harness or connector.	Repair poor contact or harness disconnection between connectors of TCM connector and steering roll connector
35 CHECK POOR CONTACT. Is there poor contact in SPORT shift switch circuit?	There is poor contact.	Repair poor contact.	Intermittent poor contact in SPORT shift switch circuit connector or harness

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

K: CHECK SPORT SHIFT INDICATOR.

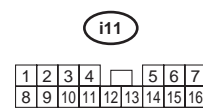
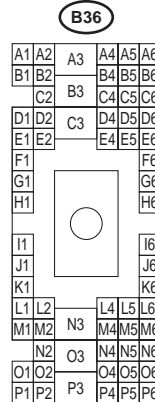
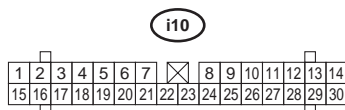
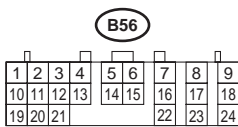
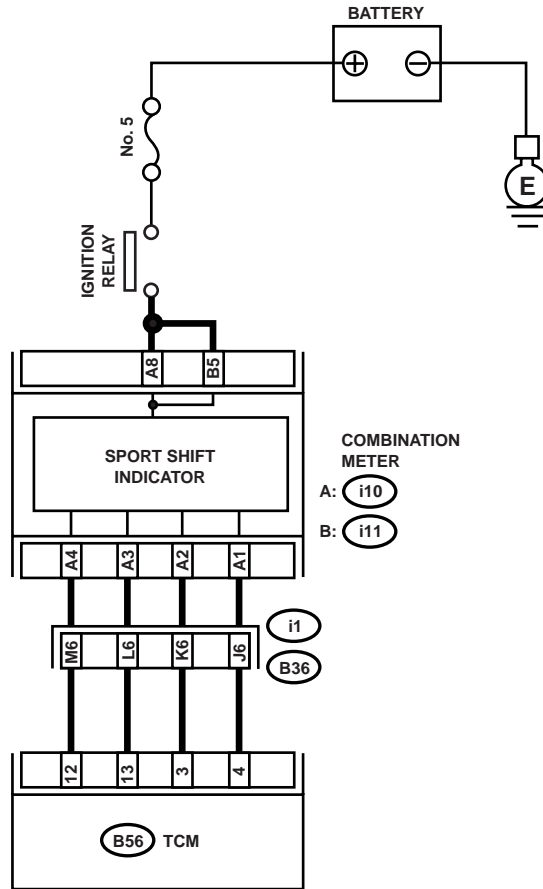
DIAGNOSIS:

SPORT shift indicator output signal circuit is open or shorted.

TROUBLE SYMPTOM:

- SPORT shift indicator does not illuminate or remains illuminated.
- SPORT shift indicator display does not change.

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SPORT SHIFT INDICATOR. Does SPORT shift indicator operate normally when driving in SPORT shift mode?	SPORT shift indicator operates normally.	<Ref. to AT-158, CHECK BUZZER., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK COMBINATION METER. Do meters and indicators other than SPORT shift indicator operate normally?	Combination meter operates normally.	Go to step 3.	Check combination meter.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and combination meter. 3) Measure resistance of harness between TCM and combination meter. Connector & terminal (B56) No. 3 — (i10) No. 2: (B56) No. 4 — (i10) No. 1: (B56) No. 12 — (i10) No. 4: (B56) No. 13 — (i10) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair open circuit in harness between TCM and combination meter connector and poor contact in coupling connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. Measure resistance between TCM and chassis ground. Connector & terminal (B56) No. 3 — Chassis ground: (B56) No. 4 — Chassis ground: (B56) No. 12 — Chassis ground: (B56) No. 13 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 5.	Repair short circuit in harness between TCM and combination meter connector.
5 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect connector to TCM and combination meter. 2) Turn ignition switch to ON. (Engine is stopped.) 3) Measure voltage between TCM and chassis ground. Connector & terminal (B56) No. 3 (+) — Chassis ground (-): (B56) No. 4 (+) — Chassis ground (-): (B56) No. 12 (+) — Chassis ground (-): (B56) No. 13 (+) — Chassis ground (-): Does the measured value exceed the specified value?	4 V	Go to step 6.	Replace combination meter.
6 CHECK POOR CONTACT. Is there poor contact in SPORT shift indicator circuit?	There is poor contact.	Repair poor contact.	Replace TCM.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

L: CHECK BUZZER.

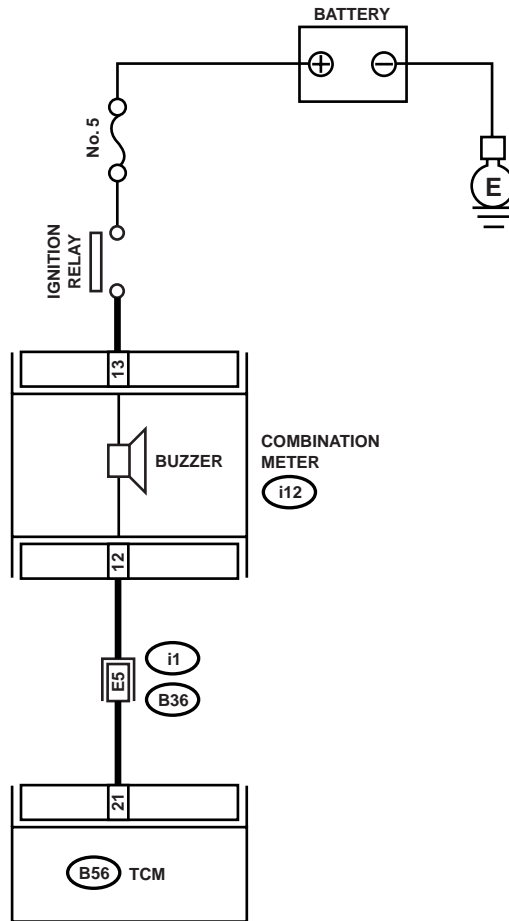
DIAGNOSIS:

Buzzer output signal circuit is open or shorted.

TROUBLE SYMPTOM:

Buzzer remains sounded.

WIRING DIAGRAM:



B56

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21				22	23	24

i12

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
						17	18

B36

A1	A2	A3	A4	A5	A6
B1	B2		B4	B5	B6
	C2	B3	C4	C5	C6
D1	D2	C3	D4	D5	D6
E1	E2		E4	E5	E6
F1					F6
G1					G6
H1					H6
I1					I6
J1					J6
K1					K6
L1	L2		L4	L5	L6
M1	M2	N3	M4	M5	M6
	N2	O3	N4	N5	N6
O1	O2		O4	O5	O6
P1	P2	P3	P4	P5	P6

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK HARNESS BETWEEN TCM AND COMBINATION METER. 1) Turn ignition switch to OFF. 2) Disconnect connector from combination meter and TCM. 3) Measure resistance between TCM connector and chassis ground. Connector & terminal (B56) No. 21 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 2.	Repair short circuit in harness between TCM and combination meter connector.
2 CHECK COMBINATION METER. 1) Connect connector to combination meter. 2) Turn ignition switch to ON. (Engine is stopped.) Does buzzer sound?	Buzzer sounds.	Replace combination meter.	Go to step 3.
3 CHECK POOR CONTACT. Is there poor contact in buzzer circuit?	There is poor contact.	Repair poor contact.	Replace TCM.

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

16.Symptom Related Diagnostic

A: INSPECTION

Symptom	Problem parts
Starter does not rotate when select lever is in "P" or "N"; starter rotates when select lever is in "R", "D", "3" or "2".	<ul style="list-style-type: none"> • Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when select lever is in "P" or "N".	<ul style="list-style-type: none"> • Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	<ul style="list-style-type: none"> • Strainer • ATF level too high or too low
Noise occurs while driving in "D1".	<ul style="list-style-type: none"> • Final gear • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in "D2".	
Noise occurs while driving in "D3".	<ul style="list-style-type: none"> • Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in "D4".	<ul style="list-style-type: none"> • Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Engine stalls while shifting from one range to another.	<ul style="list-style-type: none"> • Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in "N".	<ul style="list-style-type: none"> • TCM • Low clutch
Shock occurs when select lever is moved from "N" to "D".	<ul style="list-style-type: none"> • TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from "N" to "D".	<ul style="list-style-type: none"> • Control valve • Low clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Shock occurs when select lever is moved from "N" to "R".	<ul style="list-style-type: none"> • TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from "N" to "R".	<ul style="list-style-type: none"> • Control valve • Low & reverse clutch • Reverse clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Vehicle does not start in any shift range (engine stalls).	<ul style="list-style-type: none"> • Parking brake mechanism • Planetary gear

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
Vehicle does not start in any shift range (engine revving up).	<ul style="list-style-type: none"> • Strainer • Line pressure duty solenoid • Control valve • Drive pinion • Hypoid gear • Axle shaft • Differential gear • Oil pump • Input shaft • Output shaft • Planetary gear • Drive plate • ATF level too low • Front gasket transmission case
Vehicle does not start in "R" range only (engine revving up).	<ul style="list-style-type: none"> • Select cable • Select lever • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in "R" range only (engine stalls).	<ul style="list-style-type: none"> • Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in "D", "3" range only (engine revving up).	<ul style="list-style-type: none"> • Low clutch • One-way clutch
Vehicle does not start in "D", "3" or "2" range only (engine revving up).	<ul style="list-style-type: none"> • Low clutch
Vehicle does not start in "D", "3" or "2" range only (engine stalls).	<ul style="list-style-type: none"> • Reverse clutch
Vehicle starts in "R" range only (engine revving up).	<ul style="list-style-type: none"> • Control valve
Acceleration during standing starts is poor (high stall rpm).	<ul style="list-style-type: none"> • Control valve • Low clutch • Reverse clutch • ATF level too low • Front gasket transmission case • Differential gear oil level too high or too low
Acceleration during standing starts is poor (low stall rpm).	<ul style="list-style-type: none"> • Oil pump • Torque converter one-way clutch • Engine performance
Acceleration is poor when select lever is in "D", "3" or "2" range (normal stall rpm).	<ul style="list-style-type: none"> • TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in "R" (normal stall rpm).	<ul style="list-style-type: none"> • Control valve • High clutch • 2-4 brake • Planetary gear
No shift occurs from 1st to 2nd gear.	<ul style="list-style-type: none"> • TCM • Rear vehicle speed sensor • Front vehicle speed sensor • Throttle position sensor • Shift solenoid 1 • Control valve • 2-4 brake
No shift occurs from 2nd to 3rd gear.	<ul style="list-style-type: none"> • TCM • Control valve • High clutch • Shift solenoid 2

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
No shift occurs from 3rd to 4th gear.	<ul style="list-style-type: none"> • TCM • Shift solenoid 1 • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is in "3" range.	<ul style="list-style-type: none"> • Inhibitor switch • TCM • Throttle position sensor • Control valve
Engine brake is not effected when select lever is in "3" or "2" range.	<ul style="list-style-type: none"> • Control valve
Engine brake is not effected when select lever is in "1" range.	<ul style="list-style-type: none"> • Control valve • Low & reverse brake
Shift characteristics are erroneous.	<ul style="list-style-type: none"> • Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • Control valve • Ground earth
No lock-up occurs.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake is not effected.	<ul style="list-style-type: none"> • Select cable
Shift lever cannot be moved or is hard to move from "P" range.	<ul style="list-style-type: none"> • Select lever • Parking mechanism
ATF spurts out.	<ul style="list-style-type: none"> • ATF level too high
Differential oil spurts out.	<ul style="list-style-type: none"> • Differential gear oil too high
Differential oil level changes excessively.	<ul style="list-style-type: none"> • Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	<ul style="list-style-type: none"> • High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs from 1st to 2nd gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 1st to 2nd gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid • High clutch

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
Shock occurs from 2nd to 3rd gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 2nd to 3rd gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • 2-4 brake timing solenoid
Shock occurs from 3rd to 4th gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake timing solenoid • 2-4 brake • ATF deterioration • Engine performance • Low clutch timing solenoid • Low clutch
Slippage occurs from 3rd to 4th gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid
Shock occurs when select lever is moved from "3" to "2" range.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • 2-4 brake timing solenoid
Shock occurs when select lever is moved from "D" to "1" range.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
Shock occurs when select lever is moved from "2" to "1" range.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Shock occurs when accelerator pedal is released at medium speeds.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Lock-up damper • Engine performance • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Vibration occurs during straight-forward operation.	<ul style="list-style-type: none"> • TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper
Vibration occurs during turns (tight corner "braking" phenomenon).	<ul style="list-style-type: none"> • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • ATF temperature sensor • Transfer clutch • Transfer valve • Transfer duty solenoid • ATF deterioration • Harness • Hold switch
Front wheel slippage occurs during standing starts.	<ul style="list-style-type: none"> • TCM • Front vehicle speed sensor • FWD switch • Throttle position sensor • ATF temperature sensor • Control valve • Transfer clutch • Transfer valve • Transfer pipe • Transfer duty solenoid
Vehicle is not set in FWD mode.	<ul style="list-style-type: none"> • TCM • FWD switch • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	<ul style="list-style-type: none"> • Select cable • Select lever • Detent spring • Manual plate
Select lever is too high to move (unreasonable resistance).	<ul style="list-style-type: none"> • Detent spring • Manual plate

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
Select lever slips out of operation during acceleration or while driving on rough terrain.	<ul style="list-style-type: none">• Select cable• Select lever• Detent spring• Manual plate
System does not shift to SPORT shift mode.	SPORT shift mode switch
Engine brake is not effected in SPORT shift mode with 1st gear.	<ul style="list-style-type: none">• SPORT shift solenoid• Control valve• Low and reverse clutch

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

MEMO:

MANUAL TRANSMISSION AND DIFFERENTIAL

MT

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GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

1. General Description

A: SPECIFICATIONS

1. MANUAL TRANSMISSION AND DIFFERENTIAL

Item		Model				
		2.0 L non-TURBO	2.5 L			2.0 L TURBO
		General and Europe		Australia		
		Except OUTBACK	OUTBACK	Except OUTBACK	OUTBACK	
Type		5-forward speeds and 1-reverse (5 x 2-forward speeds and 1 x 2-reverse)*				
Transmission gear ratio		1st	3.454			3.166
		2nd	2.062			1.882
		3rd	1.448			1.296
		4th	1.088			0.972
		5th	0.825	0.780	0.825	0.738
		Reverse	3.333			
Auxiliary transmission gear ratio*		High	1.000			—
		Low	1.447	1.196		—
Front reduction gear	Final	Type of gear	Hypoid			
		Gear ratio	3.900	3.700	3.900	4.111
Rear reduction gear	Transfer	Type of gear	Helical			
		Gear ratio	1.000			
	Final	Type of gear	Hypoid			
		Gear ratio	3.900	3.700	3.900	4.111
Front dif-ferential	Type and number of gear	Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)				
Center dif-ferential	Type and number of gear	Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling)				
Transmission gear oil		GL-5				
Transmission gear oil capacity		Single-range model	3.5 ℓ (3.7 US qt, 3.1 Imp qt)			
		Dual-range model	4.0 ℓ (4.2 US qt, 3.5 Imp qt)			—

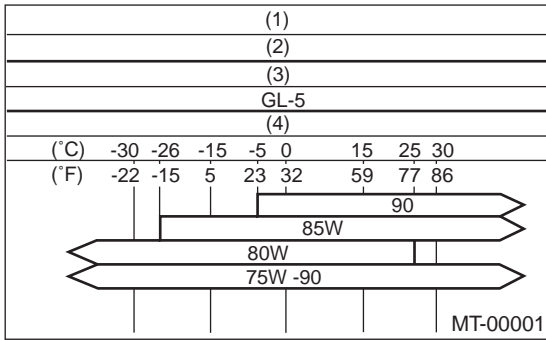
*: Dual-range model only

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

2. TRANSMISSION GEAR OIL

Recommended oil



- (1) ITEM
- (2) Transmission gear oil
- (3) API Classification
- (4) SAE Viscosity No. and Applicable Temperature

3. TRANSMISSION CASE ASSEMBLY

Drive pinion shim adjustment

Hypoid gear backlash

0.13 — 0.18 mm (0.0051 — 0.0071 in)

Drive pinion shim			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)	32295AA071	0.250 (0.0098)
32295AA041	0.175 (0.0069)	32295AA081	0.275 (0.0108)
32295AA051	0.200 (0.0079)	32295AA091	0.300 (0.0118)
32295AA061	0.225 (0.0089)	32295AA101	0.500 (0.0197)

Selection of main shaft rear plate

Main shaft rear plate		
Dimension "A" mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

Snap ring to counter washer clearance

0.05 — 0.35 mm (0.0020 — 0.0138 in)

Snap ring (Outer-19)	
Part No.	Thickness mm (in)
031319000	1.50 (0.0591)
805019010	1.72 (0.0677)

Input shaft holder adjustment

Dimension "D" mm (in)	Number of shim
52.50 — 53.11 (2.0669 — 2.0909)	—
52.00 — 52.49 (2.0472 — 2.0665)	1
51.26 — 51.99 (2.0181 — 2.0468)	2

4. DRIVE PINION ASSEMBLY

Preload adjustment of thrust bearing

Starting torque

0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

5. INPUT SHAFT ASSEMBLY

Snap ring (Outer-28) to ball bearing clearance

0 — 0.12 mm (0 — 0.0047 in)

Snap ring (Outer-28)	
Part No.	Thickness mm (in)
805028050	2.48 (0.0976)
805028060	2.56 (0.1008)
805028070	2.64 (0.1039)

Snap ring (Inner-68) to bearing clearance

0 — 0.12 mm (0 — 0.0047 in)

Snap ring (Inner-68)	
Part No.	Thickness mm (in)
805168020	1.84 (0.0724)
805168030	1.92 (0.0756)
805168040	2.00 (0.0787)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

6. MAIN SHAFT

Snap ring (Outer-25) to synchronizer hub clearance

0.060 — 0.100 mm (0.0024 — 0.0039 in)

Snap ring (Outer-25)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805025051	2.42 (0.0953)	805025055	2.62 (0.1031)
805025052	2.47 (0.0972)	805025056	2.67 (0.1051)
805025053	2.52 (0.0992)	805025057	2.72 (0.1071)
805025054	2.57 (0.1012)	805025058	2.37 (0.0933)

7. REVERSE IDLER GEAR

Adjustment of reverse idler gear position

Reverse idler gear to transmission case (LH) wall clearance

6.0 — 7.5 mm (0.236 — 0.295 in)

Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to the case wall

After installing a suitable reverse shifter lever, adjust reverse idler gear to transmission case wall clearance to within 0 to 0.5 mm (0 to 0.020 in) using washers.

Washer (20.5 × 26 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803020151	0.4 (0.016)	803020154	1.9 (0.075)
803020152	1.1 (0.043)	803020155	2.3 (0.091)
803020153	1.5 (0.059)	—	—

8. SHIFTER FORK AND ROD

Select suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchromesh mechanisms.

Rod end clearance

A: 1st-2nd — 3rd-4th

0.4 — 1.4 mm (0.016 — 0.055 in)

B: 3rd-4th — 5th

0.5 — 1.3 mm (0.020 — 0.051 in)

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in)
32804AA070	No mark	Standard
32804AA080	3	Approach to 2nd gear by 0.2 mm (0.008 in)

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA071	No mark	Standard
32810AA101	3	Approach to 3rd gear by 0.2 mm (0.008 in)

5th shifter fork (Non-TURBO model)		
Part No.	Mark	Remarks
32812AA201	7	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA211	No mark	Standard
32812AA221	9	Become distant from 5th gear by 0.2 mm (0.008 in)

5th shifter fork (TURBO model)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA241	No mark	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in)

9. TRANSFER CASE

Neutral position adjustment

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA090	3	Neutral position is closer to 1st.
32188AA100	0	Standard
32188AA110	1	Neutral position is closer to reverse gear.

Reverse check plate adjustment

Reverse check plate			
Part No.	Mark	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
33189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

10. EXTENSION ASSEMBLY

Thrust washer (50 × 61 × t) to taper roller bearing table outer race side clearance

0.2 — 0.3 mm T (0.0008 — 0.012 in T)

NOTE:

Clearance should be within the specified value.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

Thrust washer to center differential side clearance

0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

11. FRONT DIFFERENTIAL

Bevel gear to pinion backlash

0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 × 50 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)	803038023	1.025 — 1.050 (0.0404 — 0.0413)
803038022	0.975 — 1.000 (0.0384 — 0.0394)	—	—

Pinion shaft to axle drive shaft clearance

0 — 0.2 mm (0 — 0.008 in)

Snap ring (Outer-28)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805028011	1.05 (0.0413)	805028012	1.20 (0.0472)

12. TRANSFER DRIVE GEAR

Snap ring (Outer-30) to ball bearing clearance

0.01 — 0.15 mm (0.004 — 0.0050 in)

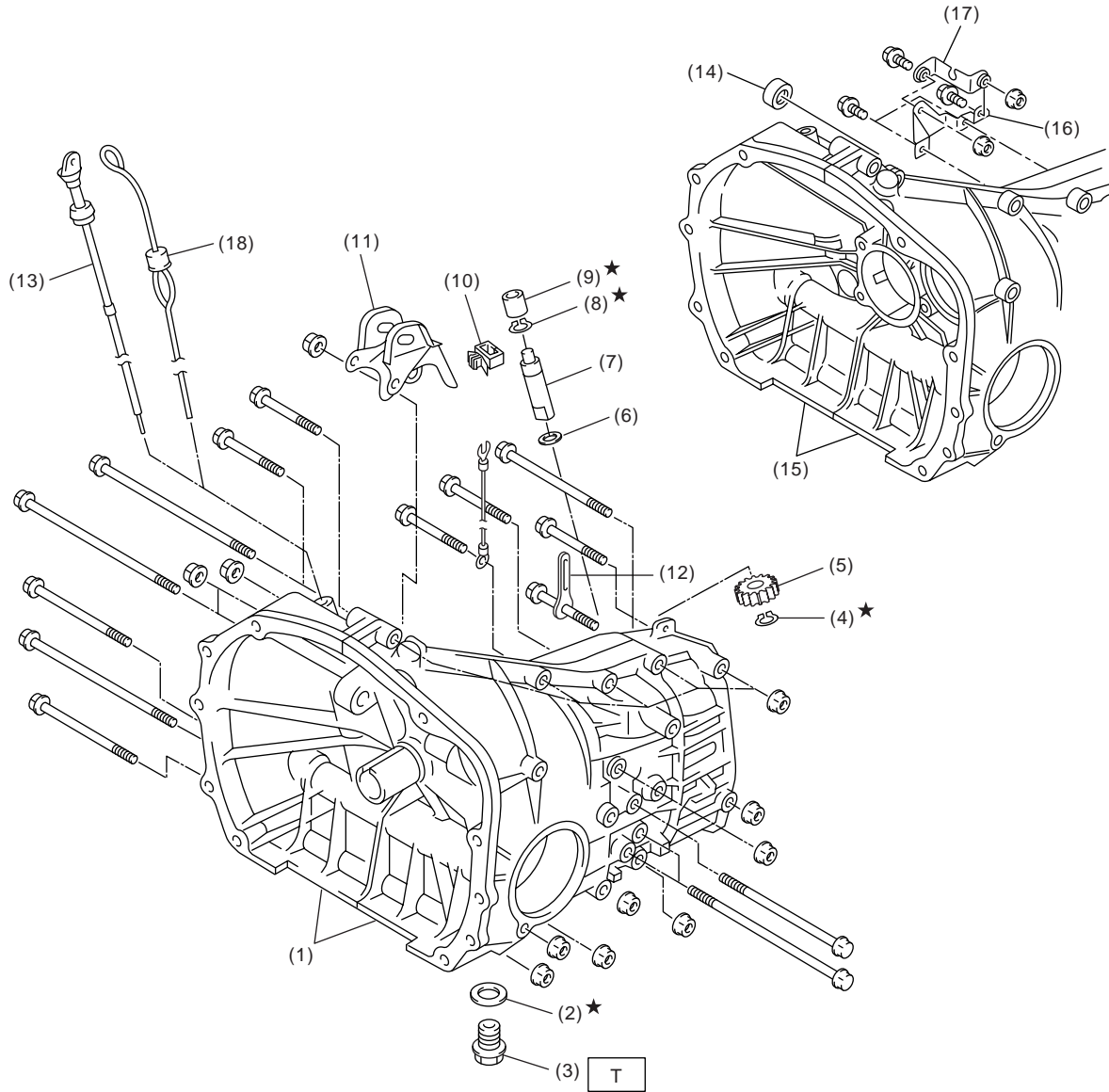
Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

B: COMPONENT

1. TRANSMISSION CASE



MT-00002

GENERAL DESCRIPTION

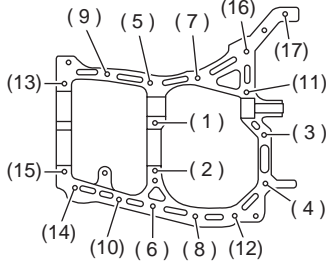
MANUAL TRANSMISSION AND DIFFERENTIAL

- | | | |
|-----------------------------|--|--|
| (1) Transmission case ASSY | (11) Pitching stopper bracket | (17) High-low cable bracket B (Dual-range) |
| (2) Gasket | (12) Clip (Dual-range) | (18) Oil level gauge (TURBO model) |
| (3) Drain plug | (13) Oil level gauge (Non-TURBO model) | |
| (4) Snap ring (Outer) | (14) Oil seal (Dual-range) | |
| (5) Speedometer driven gear | (15) Transmission case ASSY (Dual-range) | |
| (6) Washer | (16) High-low cable bracket A (Dual-range) | |
| (7) Speedometer shaft | | |
| (8) Snap ring (Outer) | | |
| (9) Oil seal | | |
| (10) Clamp | | |

Tightening torque: N·m (kgf·m, ft·lb)

T: 44 (4.5, 32.5)

• Transmission case tightening torque

	Bolt No.	Bolt size	Tightening torque: N·m (kgf·m, ft·lb)
		<5> to <15>	8 mm
	<1> to <4> <16>, <17>	10 mm	39 (4.0, 28.9)

MT-00003

GENERAL DESCRIPTION

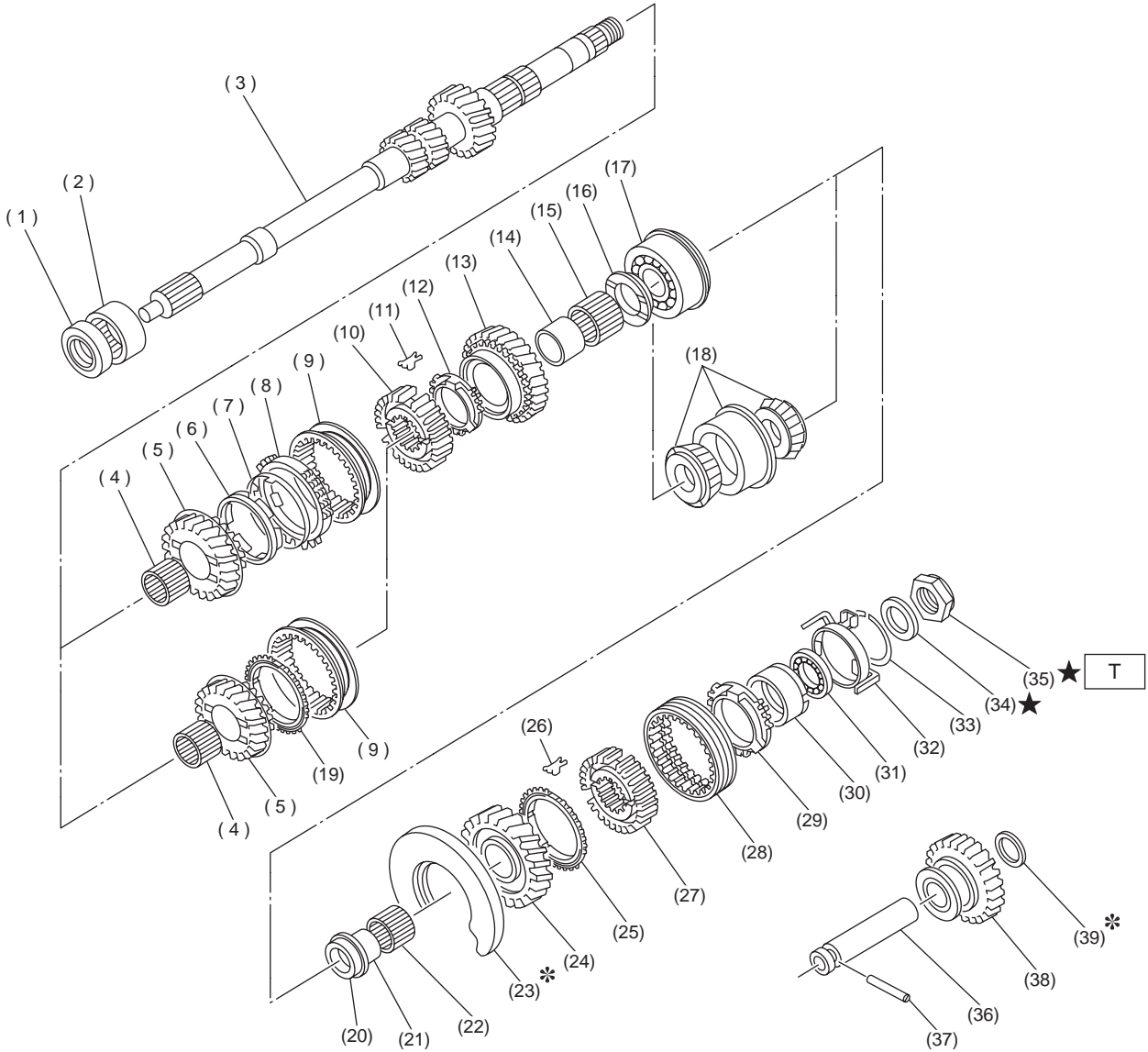
MANUAL TRANSMISSION AND DIFFERENTIAL

MEMO:

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

3. MAIN SHAFT ASSEMBLY (SINGLE-RANGE)



MT-00380

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

- | | | |
|--|-----------------------------------|-------------------------------|
| (1) Oil seal | (14) 4th needle bearing race | (30) Rev synchro cone |
| (2) Needle bearing | (15) Needle bearing | (31) Ball bearing |
| (3) Transmission main shaft | (16) 4th gear thrust washer | (32) Synchro cone stopper |
| (4) Needle bearing | (17) Ball bearing (Non-TURBO) | (33) Snap ring |
| (5) 3rd drive gear | (18) Taper roller bearing (TURBO) | (34) Lock washer |
| (6) Inner baulk ring (Except 2.0 L SOHC) | (19) Baulk ring (2.0 L SOHC) | (35) Lock nut |
| (7) 3rd synchro cone (Except 2.0 L SOHC) | (20) 5th gear thrust washer | (36) Reverse idler gear shaft |
| (8) Outer baulk ring (Except 2.0 L SOHC) | (21) 5th needle bearing race | (37) Straight pin |
| (9) 3rd-4th coupling sleeve | (22) Needle bearing | (38) Reverse idler gear |
| (10) 3rd-4th synchronizer hub | (23) Main shaft rear plate | (39) Washer |
| (11) 3rd-4th shifting insert key | (24) 5th drive gear | |
| (12) 4th baulk ring | (25) 5th baulk ring | |
| (13) 4th drive gear | (26) 5th-Rev shifting insert key | |
| | (27) 5th-Rev synchronizer hub | |
| | (28) 5th-Rev coupling sleeve | |
| | (29) Rev baulk ring | |

Tightening torque: N-m (kgf-m, ft-lb)

T: 118 (12.0, 86.8)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

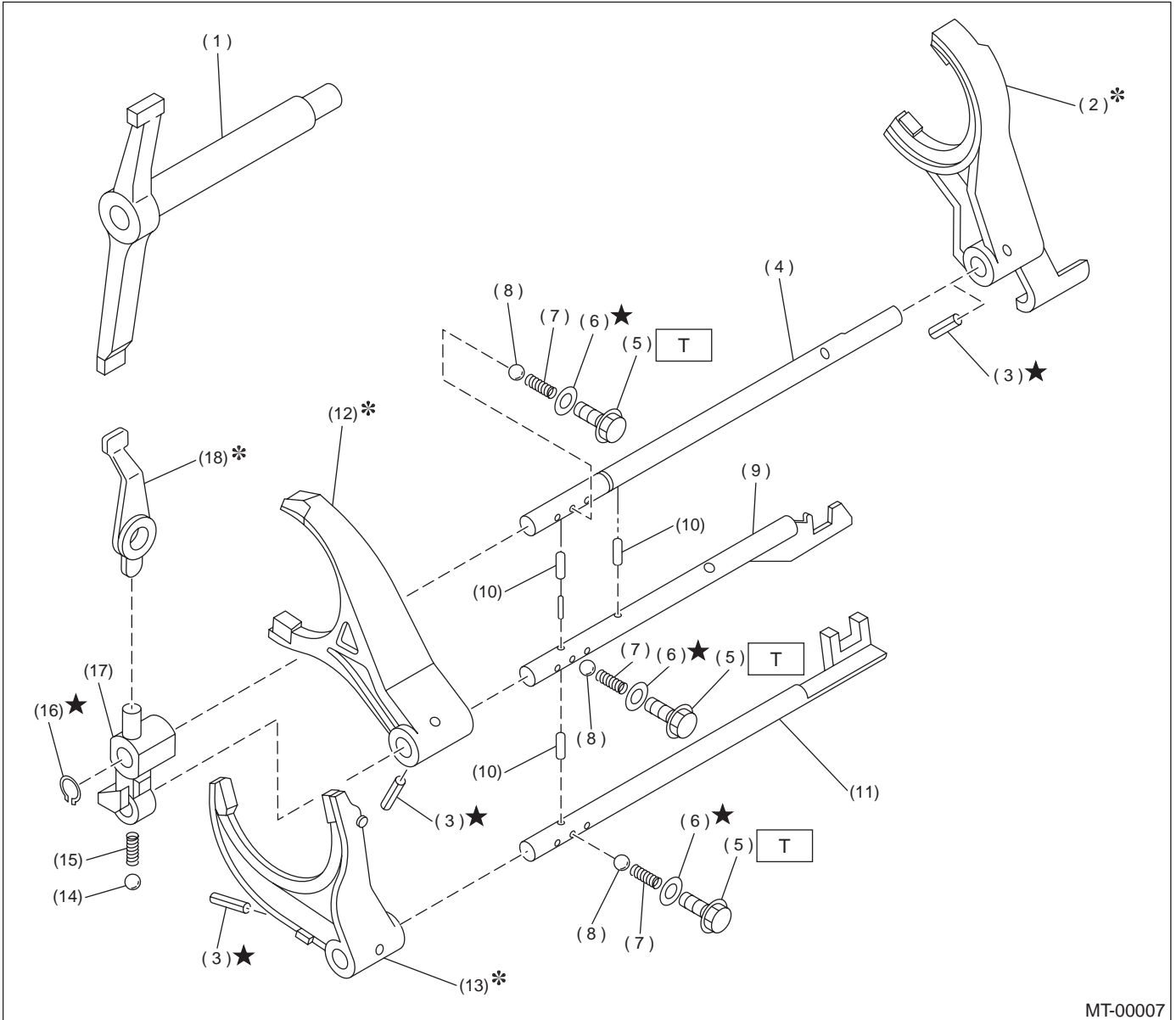
(1) O-ring	(31) Input low gear spacer	(61) Synchro cone stopper
(2) High/low counter shaft	(32) Ball	(62) Snap ring
(3) Knock pin	(33) Main shaft	(63) Lock washer
(4) High/low counter washer	(34) Needle bearing	(64) Lock nut
(5) Counter gear	(35) 3rd drive gear	(65) Reverse idler gear shaft
(6) Needle bearing	(36) Inner baulk ring (2.5 L model)	(66) Straight pin
(7) Counter gear collar	(37) Synchro cone (2.5 L model)	(67) Reverse idler gear
(8) Snap ring (Outer 19)	(38) Outer baulk ring (2.5 L model)	(68) Washer
(9) Input shaft holder	(39) Baulk ring (2.0 L model)	(69) Straight pin
(10) Input shaft shim	(40) 3rd-4th coupling sleeve	(70) High-low shifter lever
(11) Oil seal	(41) 3rd-4th synchronizer hub	(71) High-low shifter shaft
(12) O-ring	(42) 3rd-4th shifting insert key	(72) Low switch
(13) Snap ring (Outer 28)	(43) 4th baulk ring	(73) Gasket
(14) Oil squeeze	(44) 4th drive gear	(74) Straight pin
(15) Straight pin	(45) 4th needle bearing race	(75) High-low shifter fork
(16) Snap ring (Outer 28)	(46) Needle bearing	(76) High-low shifter piece
(17) Ball bearing	(47) 4th gear thrust washer	(77) Ball
(18) Snap ring (Inner 68)	(48) Ball bearing	(78) Spring
(19) Input shaft	(49) 5th gear thrust washer	(79) Gasket
(20) Needle bearing	(50) 5th needle bearing	(80) Plug
(21) Snap ring (Outer 25)	(51) Needle bearing	
(22) High/low baulk ring	(52) Main shaft rear plate	
(23) High/low coupling sleeve	(53) 5th drive gear	
(24) High/low synchronizer spring	(54) 5th baulk ring	
(25) High/low synchronizer hub	(55) 5th-Rev shifting insert key	
(26) Shifting insert key	(56) 5th-Rev synchronizer hub	
(27) High/low baulk ring	(57) 5th-Rev coupling sleeve	
(28) Friction damper	(58) Rev baulk ring	
(29) Input low gear	(59) Rev sychro cone	
(30) Needle bearing	(60) Ball bearing	

Tightening torque: N·m (kgf·m, ft·lb)**T1: 9.75 (1.0, 7.2)****T2: 20 (2.0, 14.5)****T3: 25 (2.5, 18.1)****T4: 118 (12.0, 86.8)**

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

5. SHIFTER FORK AND SHIFTER ROD



MT-00007

- | | | |
|--------------------------|---------------------------|----------------------------|
| (1) Shifter arm | (9) 3rd-4th fork rod | (17) Reverse fork rod arm |
| (2) 5th shifter fork | (10) Interlock plunger | (18) Reverse shifter lever |
| (3) Straight pin | (11) 1st-2nd fork rod | |
| (4) Reverse fork rod | (12) 3rd-4th shifter fork | |
| (5) Checking ball plug | (13) 1st-2nd shifter fork | |
| (6) Gasket | (14) Ball | |
| (7) Checking ball spring | (15) Spring | |
| (8) Ball | (16) Snap ring (Outer) | |

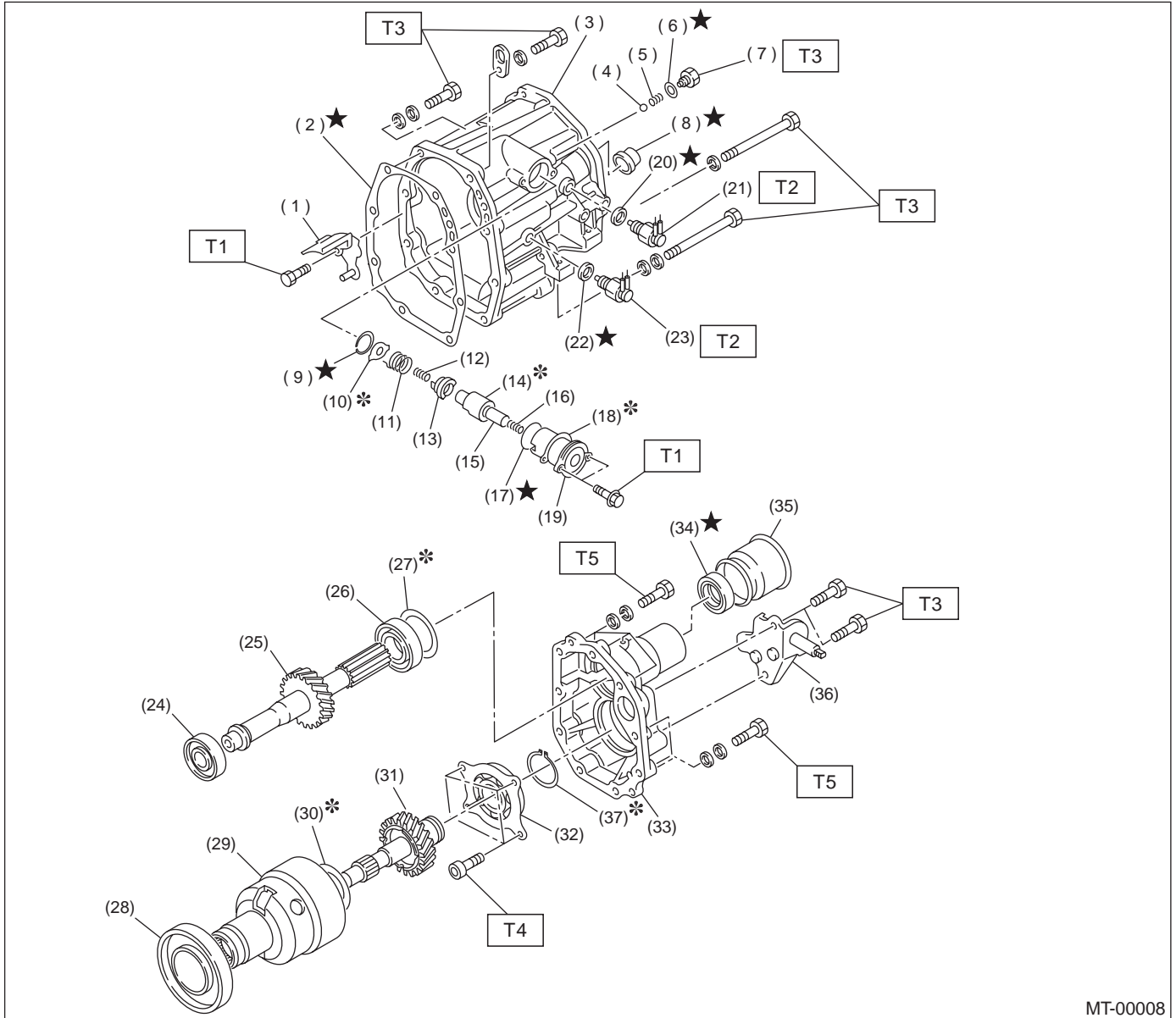
Tightening torque: N-m (kgf-m, ft-lb)

T: 20 (2.0, 14.5)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

6. TRANSFER CASE AND EXTENSION



MT-00008

- | | | |
|----------------------------|----------------------------|--------------------------|
| (1) Oil guide | (16) Return spring | (31) Transfer drive gear |
| (2) Gasket | (17) O-ring | (32) Ball bearing |
| (3) Transfer case | (18) Adjusting select shim | (33) Extension case |
| (4) Ball | (19) Reverse check sleeve | (34) Oil seal |
| (5) Reverse accent spring | (20) Gasket | (35) Dust cover |
| (6) Gasket | (21) Neutral switch | (36) Shift bracket |
| (7) Plug | (22) Gasket | (37) Snap ring |
| (8) Oil seal | (23) Back-up light switch | |
| (9) Snap ring (Inner) | (24) Roller bearing | |
| (10) Reverse check plate | (25) Transfer driven gear | |
| (11) Reverse check spring | (26) Roller bearing | |
| (12) Reverse return spring | (27) Adjusting washer | |
| (13) Reverse check cam | (28) Ball bearing | |
| (14) Reverse accent shaft | (29) Center differential | |
| (15) Return spring cap | (30) Adjusting washer | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 9.75 (1.0, 7.2)

T3: 24.5 (2.5, 18.1)

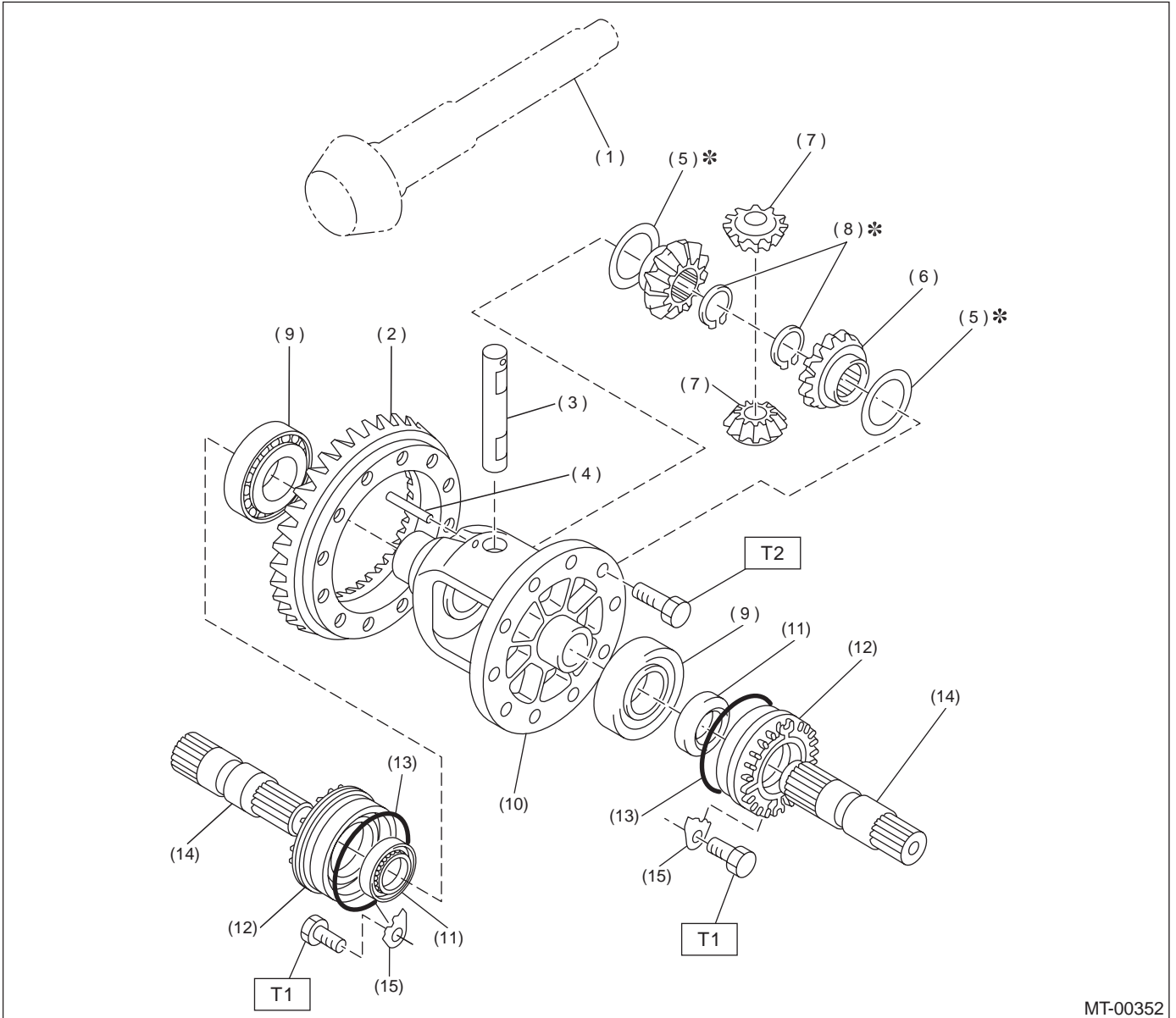
T4: 26 (2.7, 20)

T5: 40 (4.1, 29.7)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

7. FRONT DIFFERENTIAL



MT-00352

- | | |
|-------------------------------|---------------------------------|
| (1) Drive pinion shaft | (8) Snap ring (Outer) |
| (2) Hypoid driven gear | (9) Roller bearing |
| (3) Pinion shaft | (10) Differential case |
| (4) Straight pin | (11) Oil seal |
| (5) Washer | (12) Differential side retainer |
| (6) Differential bevel gear | (13) O-ring |
| (7) Differential bevel pinion | (14) Axle drive shaft |

- (15) Retainer lock plate

Tightening torque: N·m (kgf·m, ft·lb)

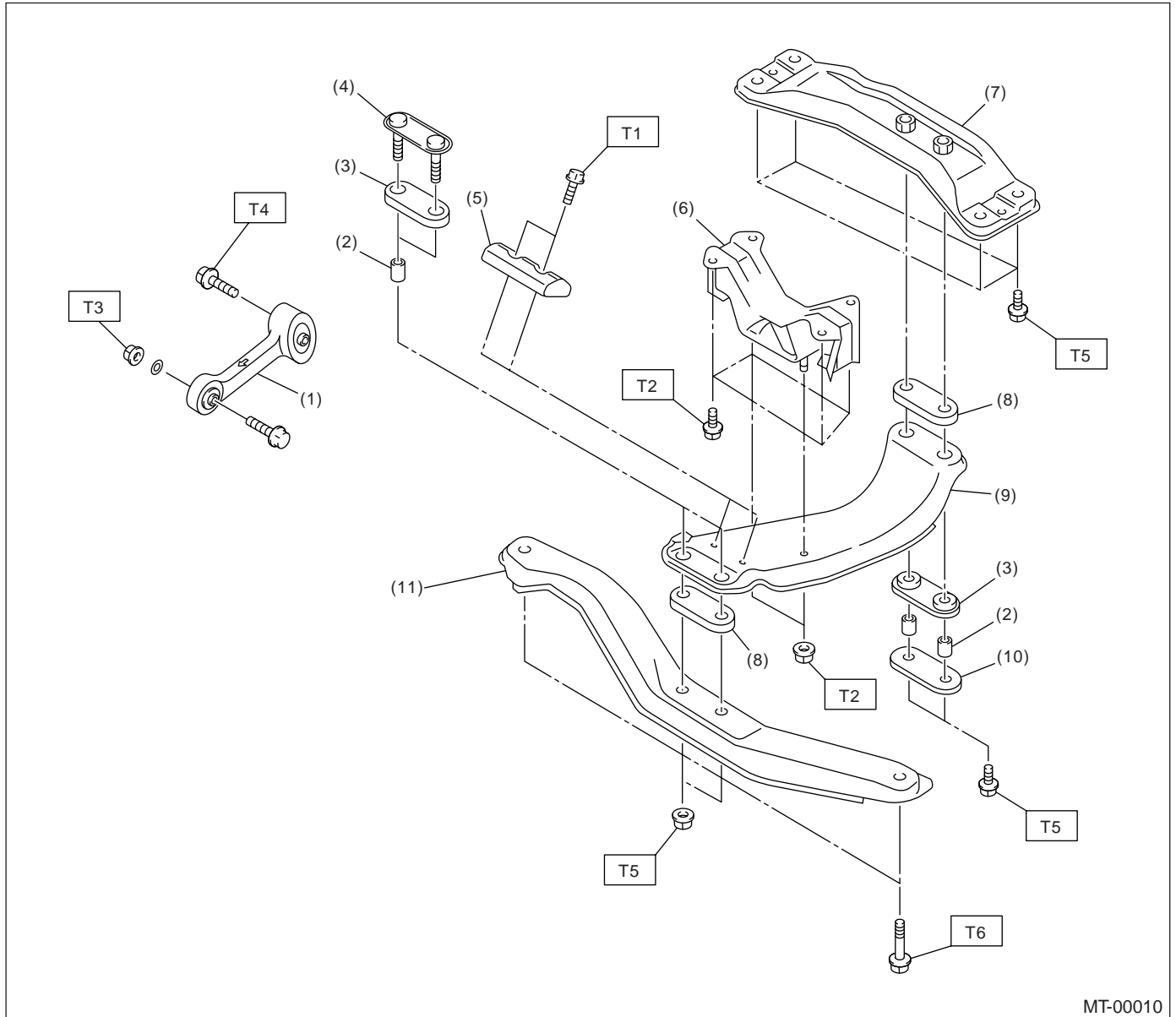
T1: 25 (2.5, 18.1)

T2: 62 (6.3, 45.6)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

8. TRANSMISSION MOUNTING



- | | |
|--|--|
| (1) Pitching stopper | (7) Rear crossmember |
| (2) Spacer | (8) Cushion D |
| (3) Cushion C | (9) Center crossmember |
| (4) Front plate | (10) Rear plate |
| (5) Dynamic damper (Except Australia TURBO MT model) | (11) Front crossmember (OUTBACK model) |
| (6) Rear cushion rubber | |

Tightening torque: N-m (kgf-m, ft-lb)

- T1: 7.5 (0.76, 5.5)**
T2: 35 (3.6, 26)
T3: 50 (5.1, 37)
T4: 58 (5.9, 43)
T5: 70 (7.1, 51)
T6: 140 (14.3, 103)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

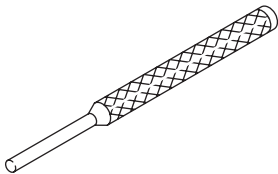
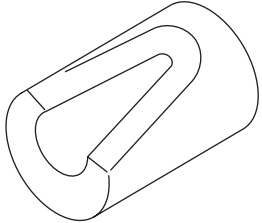
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation, and disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Replace deformed or otherwise damaged snap rings with new ones.
- Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old seal.

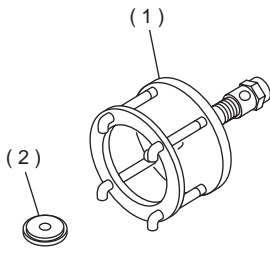
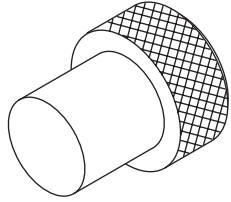
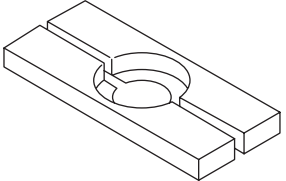
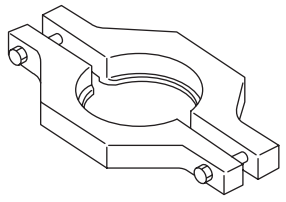
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398791700	398791700	REMOVER II	Used for removing and installing spring pin (6 mm).
 ST-399411700	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.

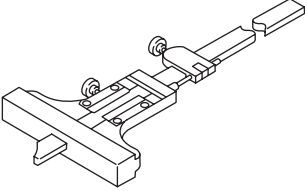
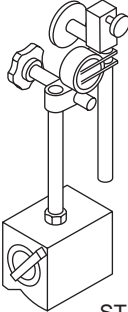
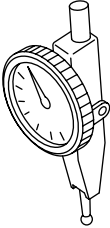
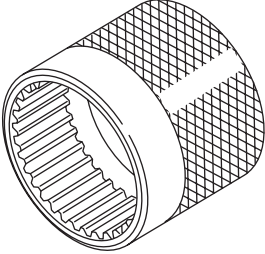
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-899524100</p>	899524100	PULLER SET	Used for removing and installing roller bearing (Differential). (1) PULLER (2) CAP
 <p style="text-align: center;">ST-399780104</p>	399780104	WEIGHT	Used for measuring preload on roller bearing.
 <p style="text-align: center;">ST-498077000</p>	498077000	5TH DRIVEN GEAR REMOVER	Used for removing roller bearing of drive pinion shaft.
 <p style="text-align: center;">ST-498077300</p>	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.

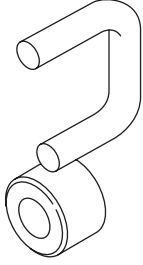
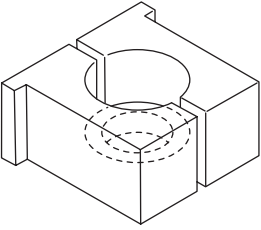
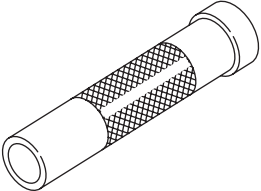
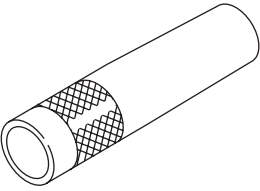
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498147000</p>	<p style="text-align: center;">498147000</p>	<p style="text-align: center;">DEPTH GAUGE</p>	<p>Used for adjusting main shaft axial end play.</p>
 <p style="text-align: center;">ST-498247001</p>	<p style="text-align: center;">498247001</p>	<p style="text-align: center;">MAGNET BASE</p>	<ul style="list-style-type: none"> • Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 <p style="text-align: center;">ST-498247100</p>	<p style="text-align: center;">498247100</p>	<p style="text-align: center;">DIAL GAUGE</p>	<ul style="list-style-type: none"> • Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).
 <p style="text-align: center;">ST-498427100</p>	<p style="text-align: center;">498427100</p>	<p style="text-align: center;">STOPPER</p>	<p>Used for securing the drive pinion shaft assembly and driven gear assembly when removing the drive pinion shaft assembly lock nut.</p>

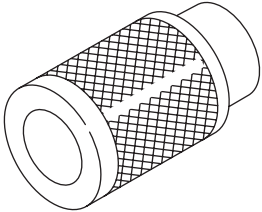
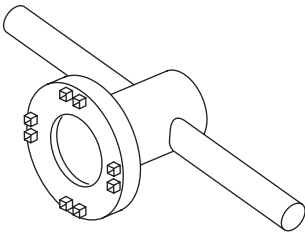
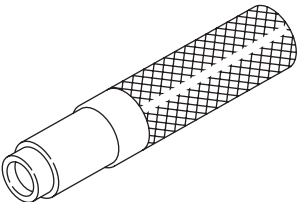
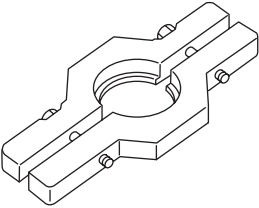
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498787100</p>	<p style="text-align: center;">498787100</p>	<p>MAIN SHAFT STOPPER</p>	<p>Used for removing and installing transmission main shaft lock nut.</p>
 <p style="text-align: center;">ST-498937000</p>	<p style="text-align: center;">498937000</p>	<p>TRANSMISSION HOLDER</p>	<p>Used for removing and installing transmission main shaft lock nut.</p>
 <p style="text-align: center;">ST-499277100</p>	<p style="text-align: center;">499277100</p>	<p>BUSHING 1-2 INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing 1st driven gear thrust plate and 1st-2nd driven gear bushing. • Used for installing roller bearing outer races to differential case.
 <p style="text-align: center;">ST-499277200</p>	<p style="text-align: center;">499277200</p>	<p>INSTALLER</p>	<p>Used for press-fitting the 2nd driven gear, roller bearings, and 5th driven gear onto the driven shaft.</p>

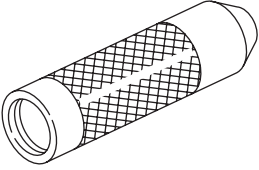
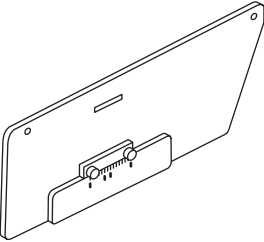
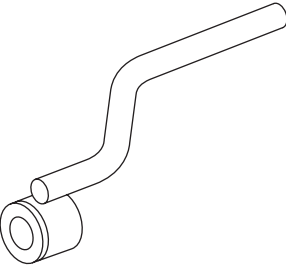
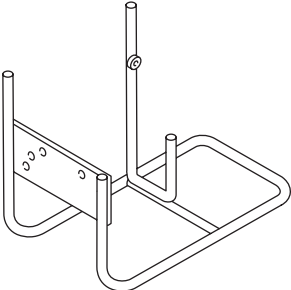
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499757002</p>	<p style="text-align: center;">499757002</p>	<p>INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing snap ring (OUT 25), and ball bearing (25 x 26 x 17). • Used for installing bearing cone of transfer driven gear (extension core side).
 <p style="text-align: center;">ST-499787000</p>	<p style="text-align: center;">499787000</p>	<p>WRENCH ASSY</p>	<p>Used for removing and installing differential side retainer.</p>
 <p style="text-align: center;">ST-499827000</p>	<p style="text-align: center;">499827000</p>	<p>PRESS</p>	<p>Used for installing speedometer oil seal.</p>
 <p style="text-align: center;">ST-499857000</p>	<p style="text-align: center;">499857000</p>	<p>5TH DRIVEN GEAR REMOVER</p>	<p>Used for removing 5th driven gear.</p>

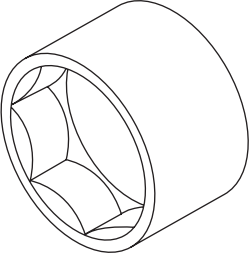
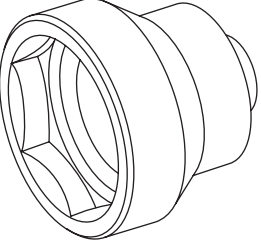
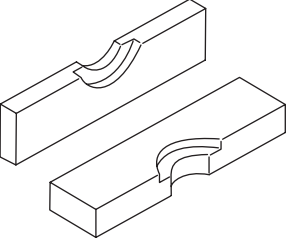
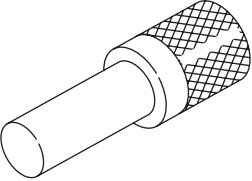
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-499877000</p>	499877000	RACE 4-5 INSTALLER	<ul style="list-style-type: none"> • Used for installing 4th needle bearing race and ball bearing onto transmission main shaft. • Used with REMOVER (899714110).
 <p>ST-499917500</p>	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting drive pinion shim.
 <p>ST-499927100</p>	499927100	HANDLE	Used for fitting transmission main shaft.
 <p>ST-499937100</p>	499937100	TRANSMISSION STAND SET	Stand used for transmission disassembly and assembly.

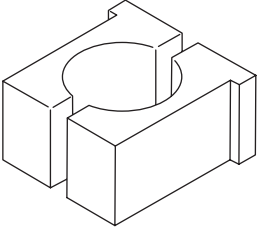
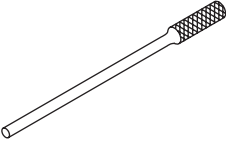
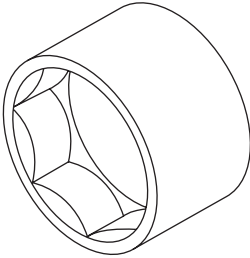
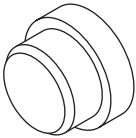
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499987003</p>	<p style="text-align: center;">499987003</p>	<p>SOCKET WRENCH (35)</p>	<p>Used for removing and installing driven pinion lock nut and main shaft lock nut.</p>
 <p style="text-align: center;">ST-499987300</p>	<p style="text-align: center;">499987300</p>	<p>SOCKET WRENCH (50)</p>	<p>Used for removing and installing driven gear assembly lock nut.</p>
 <p style="text-align: center;">ST-899714110</p>	<p style="text-align: center;">899714110</p>	<p>REMOVER</p>	<p>Used for fixing transmission main shaft, drive pinion, rear drive shaft.</p>
 <p style="text-align: center;">ST-899864100</p>	<p style="text-align: center;">899864100</p>	<p>REMOVER</p>	<p>Used for removing parts on transmission main shaft and drive pinion.</p>

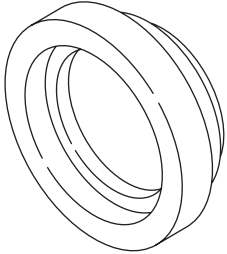
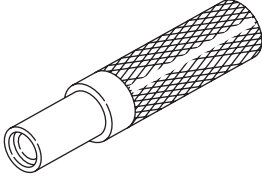
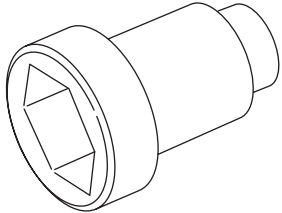
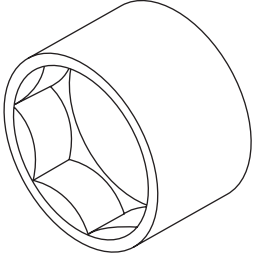
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-899884100</p>	899884100	HOLDER	Used for tightening lock nut on sleeve.
 <p style="text-align: center;">ST-899904100</p>	899904100	REMOVER	Used for removing and installing straight pin.
 <p style="text-align: center;">ST-899988608</p>	899988608	SOCKET WRENCH (27)	Used for removing and installing drive pinion lock nut.
 <p style="text-align: center;">ST-398497701</p>	398497701	ADAPTER	<ul style="list-style-type: none"> • Used for installing roller bearing onto differential case. • Used with INSTALLER (499277100).

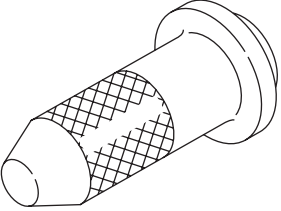
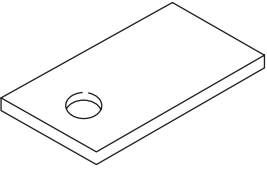
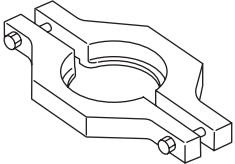
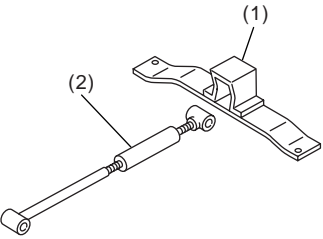
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587000	499587000	INSTALLER	Used for installing driven gears to driven shaft.
 ST-899824100	899824100	PRESS	Used for installing speedometer shaft oil seal.
 ST-499987100	499987100	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 ST-899984103	899984103	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.

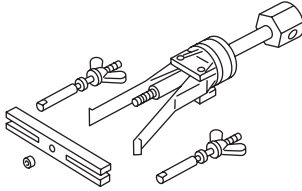
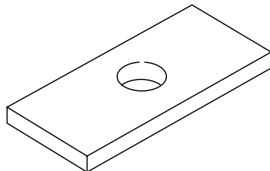
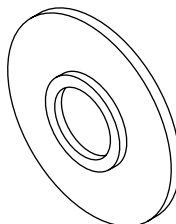
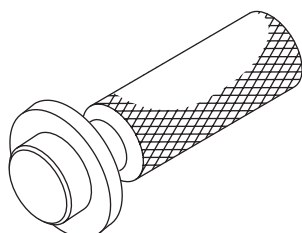
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498057300</p>	<p style="text-align: center;">498057300</p>	<p style="text-align: center;">INSTALLER</p>	<p>Used for installing extension oil seal.</p>
 <p style="text-align: center;">ST-498255400</p>	<p style="text-align: center;">498255400</p>	<p style="text-align: center;">PLATE</p>	<p>Used for measuring backlash.</p>
 <p style="text-align: center;">ST-498077400</p>	<p style="text-align: center;">498077400</p>	<p style="text-align: center;">REMOVER</p>	<ul style="list-style-type: none"> • Used for removing synchronizer cone of main shaft. • Used for removing 5th driven gear of drive pinion shaft.
 <p style="text-align: center;">ST41099AA000</p>	<p style="text-align: center;">41099AA000</p>	<p style="text-align: center;">ENGINE SUPPORT BRACKET</p>	<p>Used for supporting engine. (1) ENGINE SUPPORT BRACKET (41099AA010) (2) ENGINE SUPPORT (41099AA020)</p>

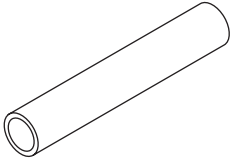
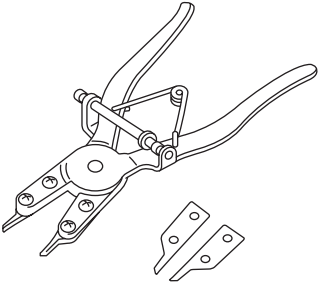
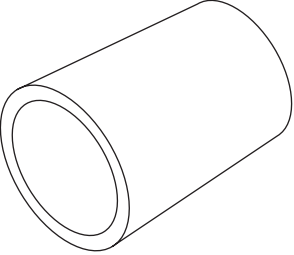
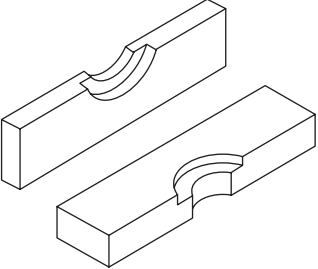
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398527700</p>	398527700	PULLER ASSY	<ul style="list-style-type: none"> • Used for removing and extension case roller bearing. • Used for removing front idfferential side retainer Bearing outer race.
 <p style="text-align: center;">ST-398643600</p>	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 <p style="text-align: center;">ST-398177700</p>	398177700	INSTALLER	Used for installing bearing cone of transfer driven gear (transfer case side).
 <p style="text-align: center;">ST-499797000</p>	499797000	INSTALLER	Used for installing differential side retainer oil seal.

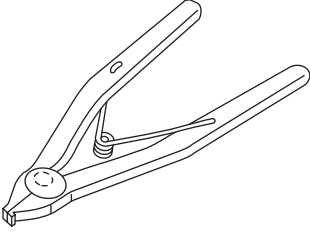
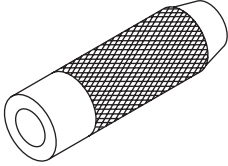
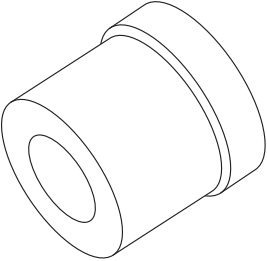
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507703	398507703	DUMMY COLLAR	<ul style="list-style-type: none">• Used for installing input shaft holder oil seal.• For dual-range model.
 ST-398663600	398663600	PLIERS	<ul style="list-style-type: none">• Used for removing and installing input shaft snap ring.• For dual-range model.
 ST-499757001	499757001	SNAP RING GUIDE	<ul style="list-style-type: none">• Used for installing snap ring (OUT 25).• For dual-range model.
 ST-899858600	899858600	RETAINER II	<ul style="list-style-type: none">• Used for removing ball bearing.• For dual-range model.

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-899474100</p>	899474100	EXPANDER	<ul style="list-style-type: none"> • Used for removing and installing snap ring. • For dual-range model.
 <p style="text-align: center;">ST-899580100</p>	899580100	INSTALLER	<ul style="list-style-type: none"> • Used when pressing ball bearings into input shaft. • For dual-range model.
 <p style="text-align: center;">ST-399513600</p>	399513600	INSTALLER	<ul style="list-style-type: none"> • Used when pressing ball bearings into input shaft. • For dual-range model.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

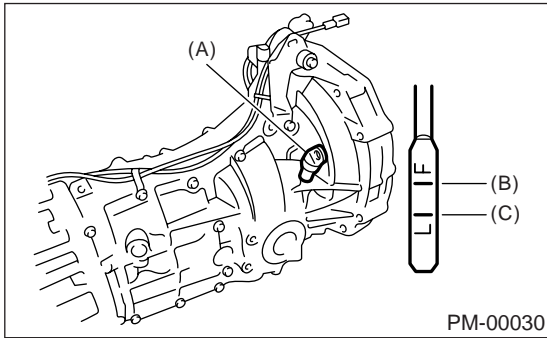
TRANSMISSION GEAR OIL

MANUAL TRANSMISSION AND DIFFERENTIAL

2. Transmission Gear Oil

A: INSPECTION

- 1) Park vehicle on a level surface.
- 2) Turn ignition switch to OFF.
- 3) Remove oil level gauge and wipe it clean.
- 4) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper direction.
- 5) Pull out the oil level gauge again and check the oil level is between lower and upper levels. If it is below the lower level, check oil leakage and add oil through the oil level gauge hole to bring the level up to the upper level.



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

B: REPLACEMENT

- 1) Pull out oil level gauge.
- 2) Lift-up the vehicle.
- 3) Drain transmission gear oil completely.

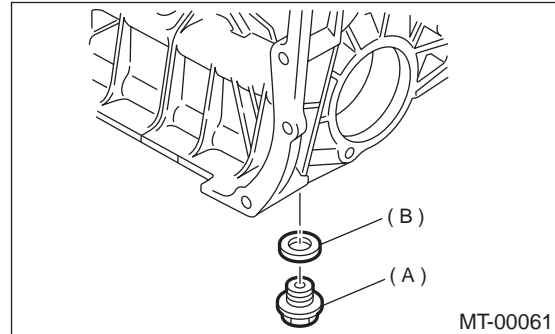
CAUTION:

- **Directly after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.**
- **Be careful not to splash transmission gear oil on exhaust pipe; it may cause smoke or fire. If transmission gear oil splashes to exhaust pipes, wipe clean them.**

- 4) Tighten transmission gear oil drain plug with new gasket.

Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb)



- (A) Drain plug
- (B) Gasket

- 5) Lower the vehicle.
- 6) Pour gear oil into the gauge hole.

Recommended gear oil:

Use GL-5 (75W-90) or equivalent.

Gear oil capacity:

Single-range model;

3.5 ℓ (3.7 US qt, 3.1 Imp qt)

Dual-range model;

4.0 ℓ (4.2 US qt, 3.5 Imp qt)

- 7) Check the level of the transmission gear oil, and confirm that the level is within the specified range marked on the gauge.

NOTE:

When inserting the level gauge into transmission gear, align the protrusion on the side of the top part of the level gauge with the notch in the gauge hole.

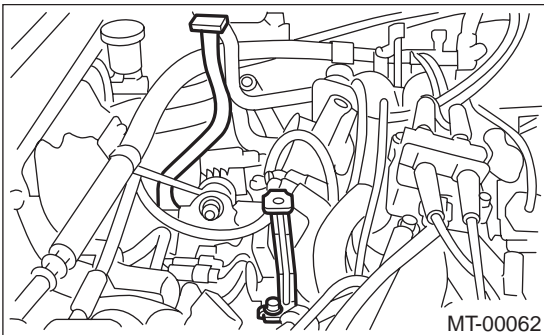
MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

3. Manual Transmission Assembly

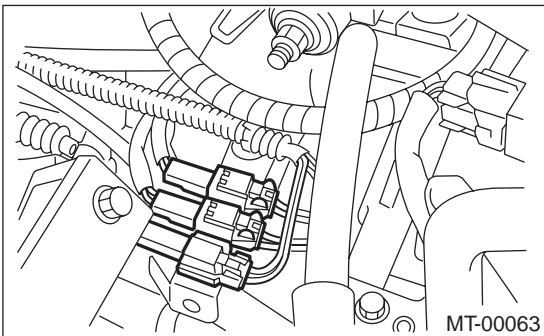
A: REMOVAL

- 1) Set vehicle on a lift.
- 2) Open front hood fully, and support with stay.
- 3) Disconnect battery ground cable.
- 4) Move shift lever to "N", and release the parking brake.
- 5) Remove air intake duct and cleaner case. (NA model) <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- 6) Remove the intercooler. (TURBO model) <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 7) Remove air cleaner case stay.

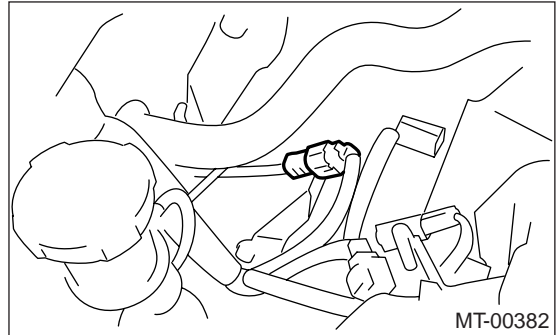


- 8) Disconnect the following connectors.
 - (1) Neutral position switch connector
 - (2) Back-up light switch connector
 - (3) High-low switch connector (Dual-range model)

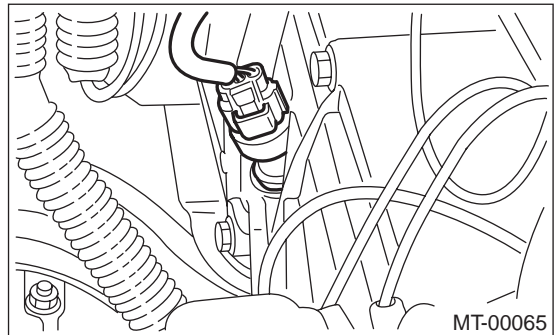
Non-TURBO model



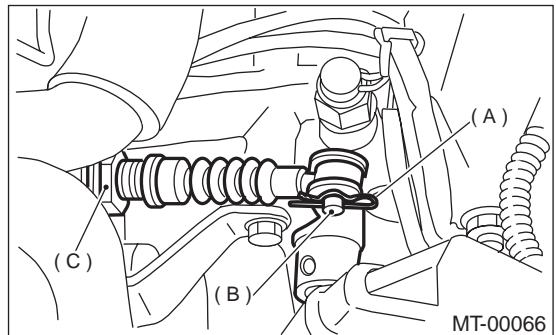
TURBO model



- (4) Vehicle speed sensor



- 9) Remove snap pin and pin from the drive select cable.
- 10) Remove the drive select cable on the transmission. (Dual-range model)



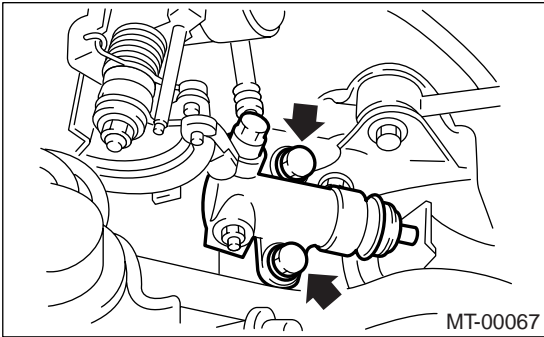
- (A) Snap pin
- (B) Pin
- (C) Drive select cable

- 11) Remove starter.
Non-TURBO model
<Ref. to SC(H4SO)-6, REMOVAL, Starter.>
TURBO model
<Ref. to SC(H4DOSTC)-6, REMOVAL, Starter.>

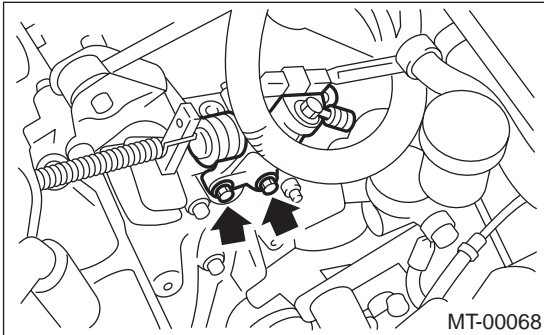
MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

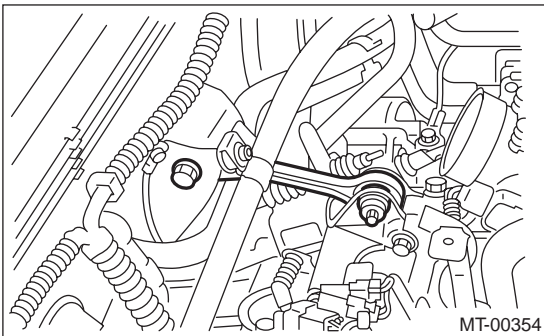
- 12) Remove operating cylinder from transmission.
Non-TURBO model



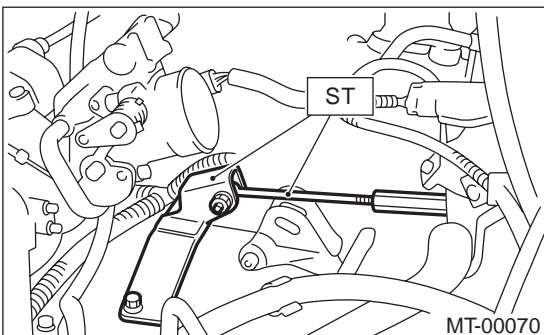
TURBO model



- 13) Remove pitching stopper.

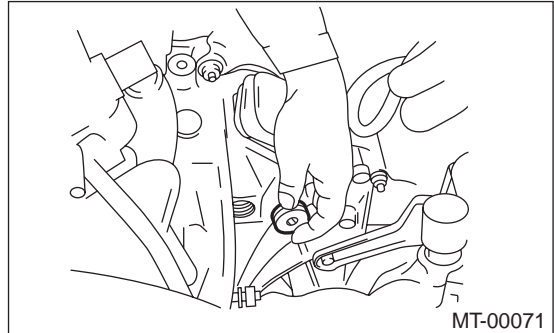


- 14) Set ST.
ST 41099AA000 ENGINE SUPPORT ASSY

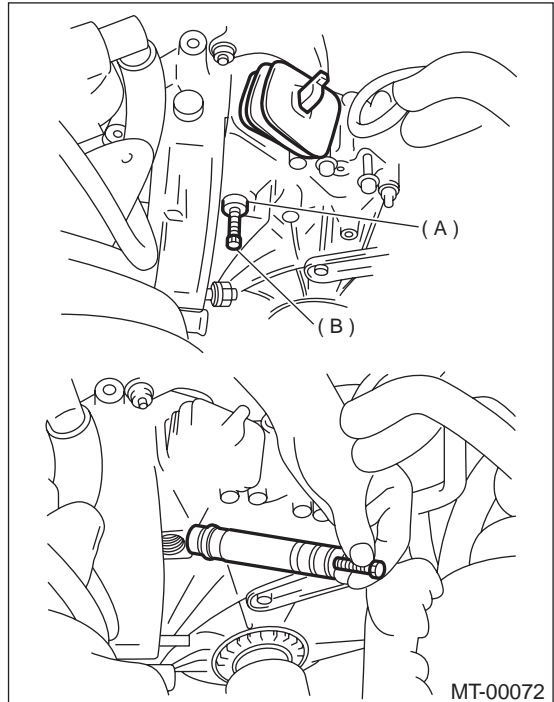


- 15) Separate the clutch release fork from release bearing. (TURBO model)

- (1) Remove the clutch operating cylinder from transmission.
(2) Remove the plug using 10 mm hexagon wrench.



- (3) Screw the 6 mm dia. bolt into the release fork shaft, and remove it.



- (A) Shaft
(B) Bolt

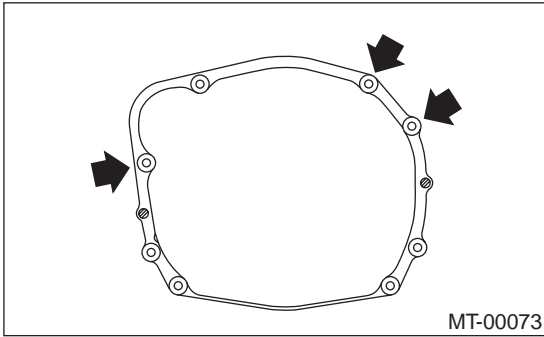
- (4) Raise the release fork and unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with the engine when removing the engine from transmission.

MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

16) Remove bolt which holds right upper side of transmission to engine.



17) Remove under cover.

18) Remove front and center exhaust pipes. (Non-TURBO model)

Without OBD

<Ref. to EX(H4SOw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

With OBD

<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>

19) Remove center exhaust pipe. (TURBO model)
<Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>

20) Remove rear exhaust pipe and muffler.

Non-TURBO model without OBD

<Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>

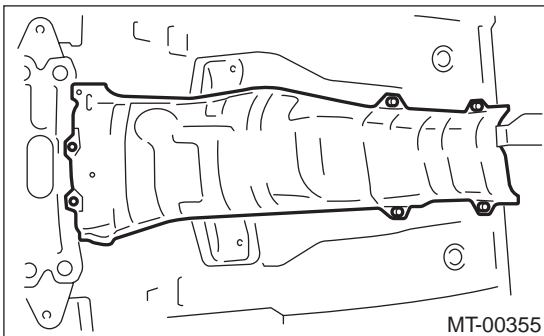
Non-TURBO with OBD

<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>

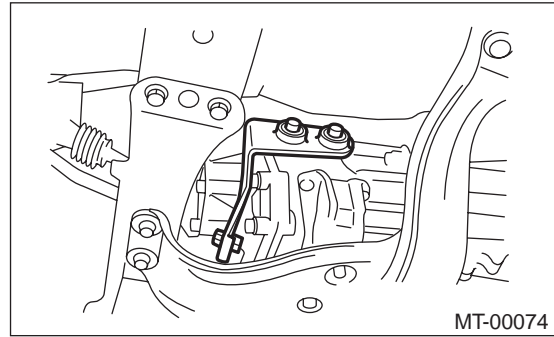
TURBO model

<Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>

21) Remove heat shield cover. (If equipped)



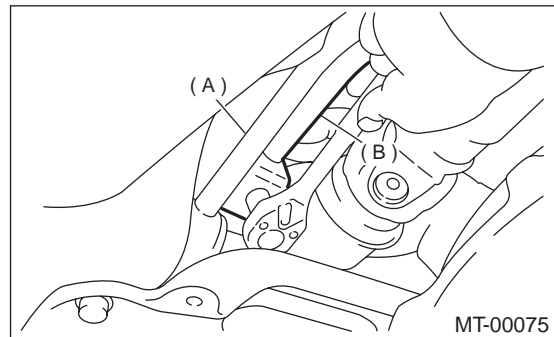
22) Remove hanger bracket from right side of transmission.



23) Remove propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

24) Remove gear shift rod and stay from transmission.

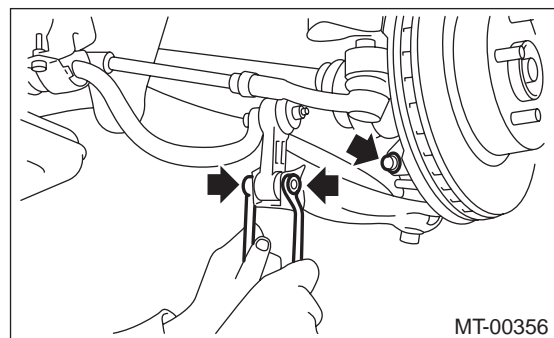
- (1) Disconnect stay from transmission.
- (2) Disconnect rod from transmission.



- (A) Stay
(B) Rod

25) Disconnect stabilizer link from transverse link.

26) Remove bolt securing ball joint of transverse link to housing.



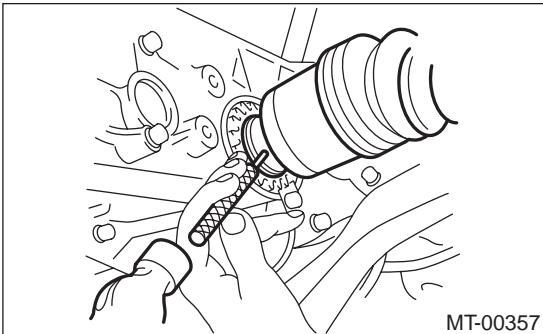
MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

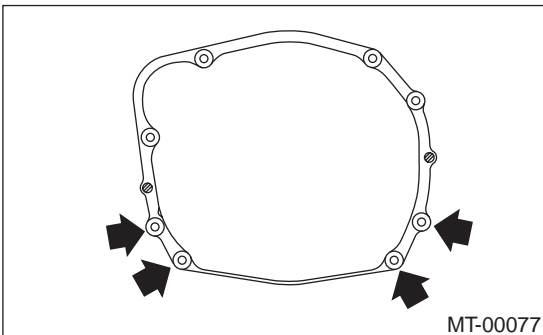
27) Remove spring pins and separate front drive shafts from each side of the transmission.

NOTE:

Discard removing spring pin. Replace with a new one.



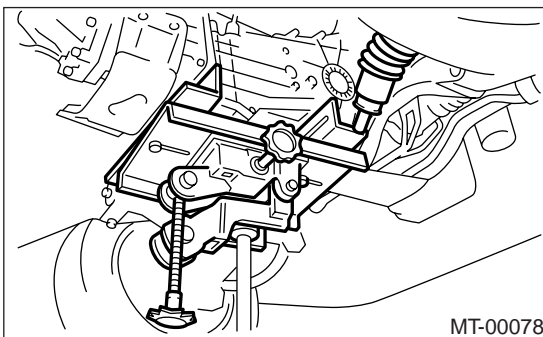
28) Remove nuts which hold lower side of transmission to engine.



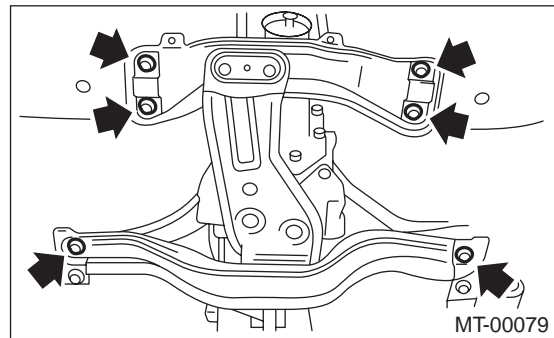
29) Place transmission jack under transmission.

CAUTION:

- Always support transmission case with a transmission jack.
- Fix transmission with a band etc.



30) Remove transmission rear crossmember from vehicle.



31) Move transmission jack toward rear until main shaft is withdrawn from clutch cover.

32) Separate transmission assembly and rear cushion rubber.

B: INSTALLATION

1) Install clutch release bearing and lever to transmission. (TURBO model)

<Ref. to CL-22, INSTALLATION, Release Bearing and Lever.>

2) Install rear cushion rubber to transmission assembly.

Tightening torque:

35 N·m (3.6 kgf·m, 26 ft·lb)

3) Install transmission onto engine.

(1) Gradually raise transmission with transmission jack.

(2) Engage them at splines.

NOTE:

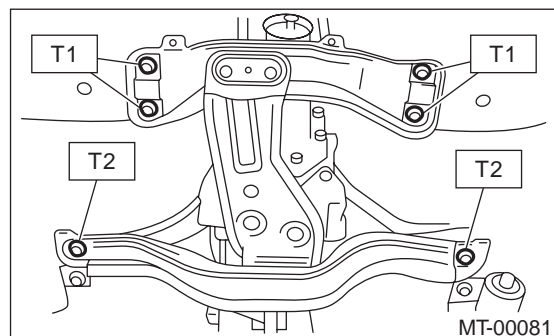
Be careful not to strike main shaft against clutch cover.

4) Install transmission rear crossmember.

Tightening torque:

T1: 70 N·m (7.1 kgf·m, 51 ft·lb)

T2: 140 N·m (14.3 kgf·m, 103 ft·lb)



5) Take off transmission jack.

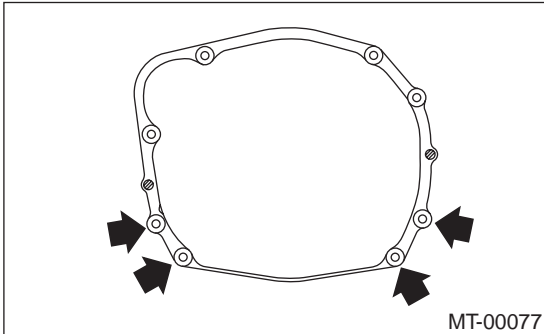
MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

6) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)



7) Connect engine and transmission.

(1) Install starter.

Non-TURBO model

<Ref. to SC(H4SO)-6, INSTALLATION, Starter.>

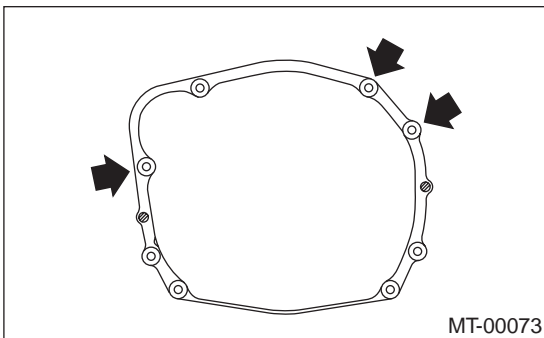
TURBO model

<Ref. to SC(H4DOSTC)-6, INSTALLATION, Starter.>

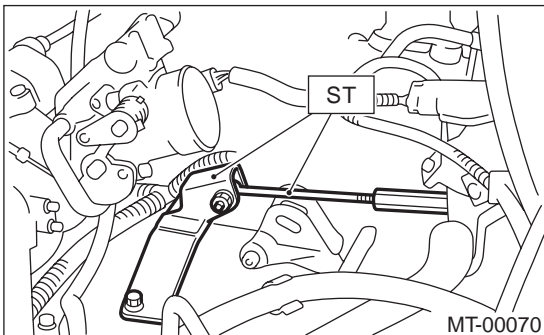
(2) Tighten bolt which holds right upper side of transmission to engine.

Tightening torque:

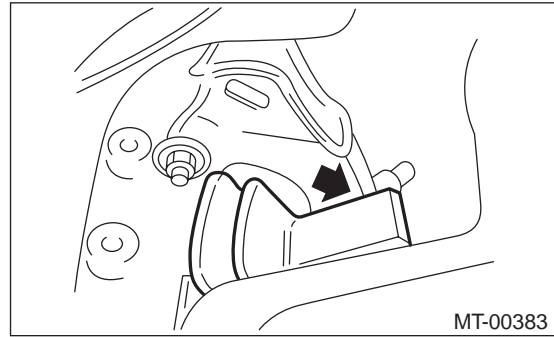
50 N·m (5.1 kgf-m, 37 ft-lb)



8) Remove ST.



9) Push the clutch release lever to fit bearing into clutch cover.

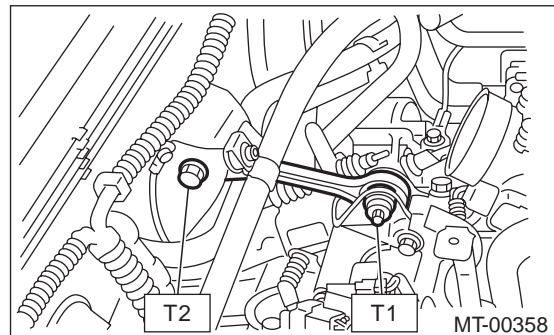


10) Install pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

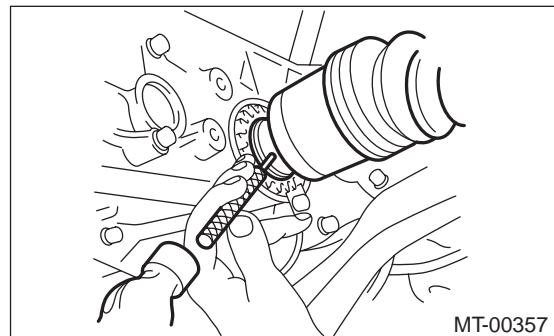
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



11) Lift up the vehicle.

12) Install front drive shafts into transmission.

13) New drive spring pin into chamfered hole of drive shaft.



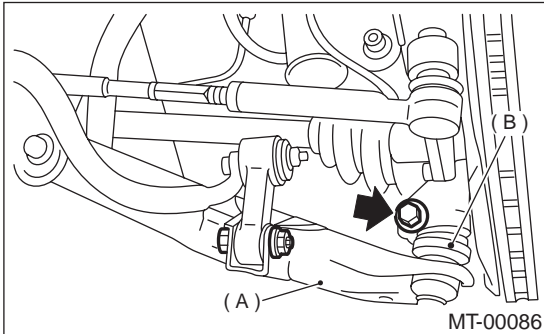
MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

14) Install ball joints of lower arm into knuckle arm of housing, and tighten installing bolts.

Tightening torque:

50 N·m (5.1 kgf·m, 37 ft·lb)

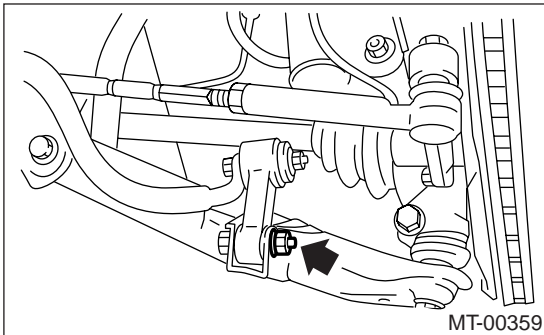


- (A) Transverse link
- (B) Ball joint

15) Install stabilizer link from transverse link.
Non-TURBO model

Tightening torque:

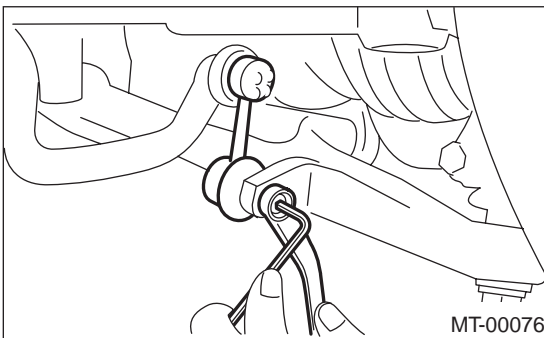
30 N·m (3.1 kgf·m, 22.1 ft·lb)



TURBO model

Tightening torque:

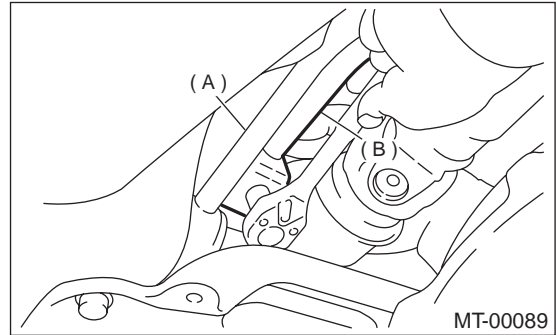
45 N·m (4.6 kgf·m, 33.2 ft·lb)



16) Connect rod to the joint.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

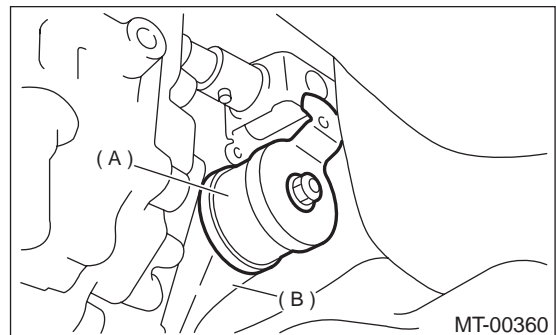


- (A) Joint
- (B) Rod

17) Connect stay to transmission bracket.

Tightening torque:

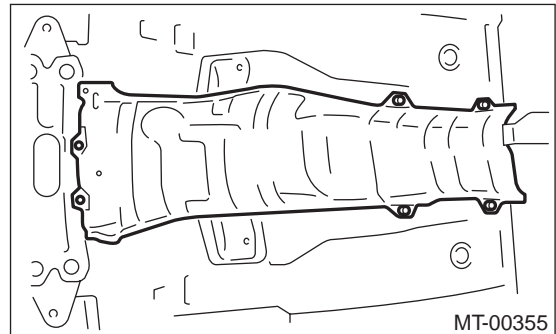
18 N·m (1.8 kgf·m, 13.0 ft·lb)



- (A) Stay
- (B) Transmission bracket

18) Install propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>

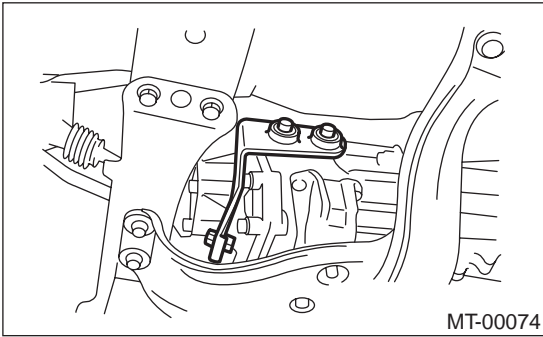
19) Install heat shield cover. (If equipped)



MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

20) Install hanger bracket on right side of transmission.



21) Install front, center, rear, exhaust pipe and muffler. (Non-TURBO model)

Without OBD

<Ref. to EX(H4SOw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SOw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, INSTALLATION, Muffler.>

With OBD

<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>

22) Install center, rear exhaust pipe and muffler. (TURBO model)

<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>

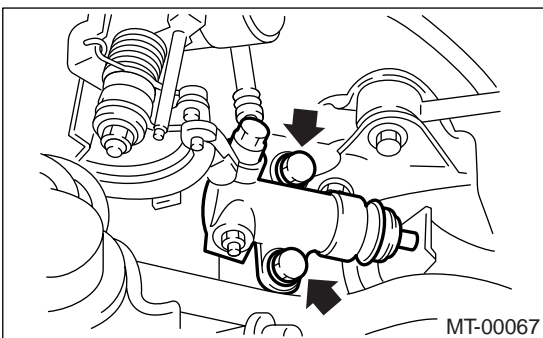
23) Install under cover.

24) Install operating cylinder.

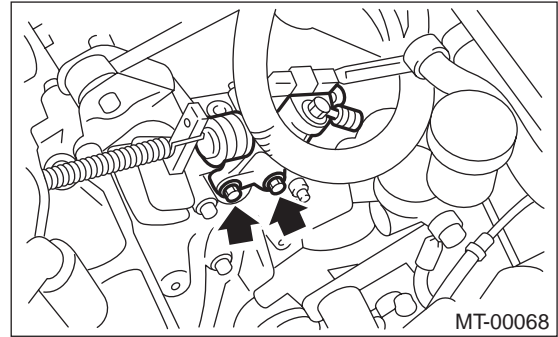
Tightening torque:

37 N·m (3.8 kgf-m, 27.5 ft-lb)

Non-TURBO model



TURBO model



25) Connect the following connectors.

- (1) Transmission ground terminal

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

- (2) Vehicle speed sensor connector
- (3) Neutral position switch connector
- (4) Back-up light switch connector
- (5) High-low switch connector (Dual-range model)

26) Install air cleaner case stay. (Non-TURBO model)

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)

27) Install air cleaner case and intake duct. (Non-TURBO model)

<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>

28) Install the intercooler. (Non-TURBO model)

<Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

29) Connect battery ground cable.

30) Pour gear oil and check the oil level. <Ref. to MT-31, Transmission Gear Oil.>

31) Take off vehicle from lift arms.

TRANSMISSION MOUNTING SYSTEM

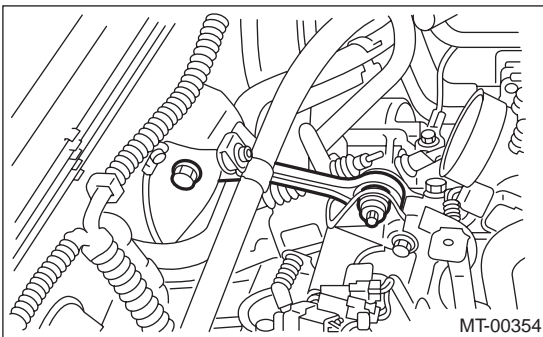
MANUAL TRANSMISSION AND DIFFERENTIAL

4. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

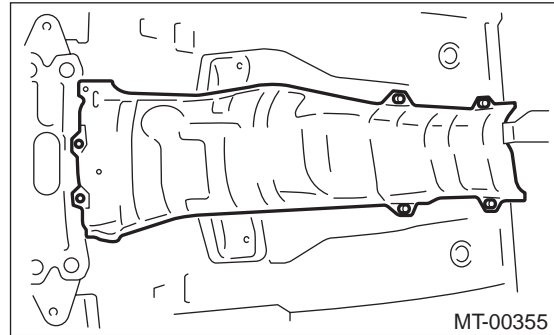
- 1) Disconnect battery ground cable.
- 2) Remove the air cleaner case. (Non-TURBO model)
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 3) Remove the intercooler. (TURBO model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 4) Remove the pitching stopper.



2. CROSSMEMBER AND CUSHION RUBBER

- 1) Disconnect battery ground cable.
- 2) Jack-up vehicle and support it with sturdy racks.
- 3) Remove the front, center, rear exhaust pipes and muffler. (Non-TURBO model)
Without OBD
<Ref. to EX(H4SOw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>
With OBD
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
- 4) Remove center, rear exhaust pipe and muffler. (TURBO model)
<Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>

- 5) Remove the heat shield cover. (If equipped)

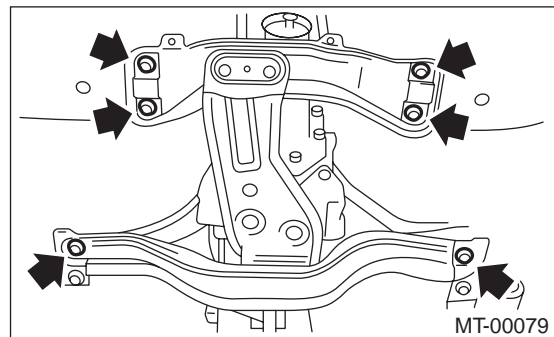


- 6) Set the transmission jack under the transmission body.

CAUTION:

Always support transmission case with a transmission jack.

- 7) Remove the rear crossmember.



- 8) Remove the rear cushion rubber.

B: INSTALLATION

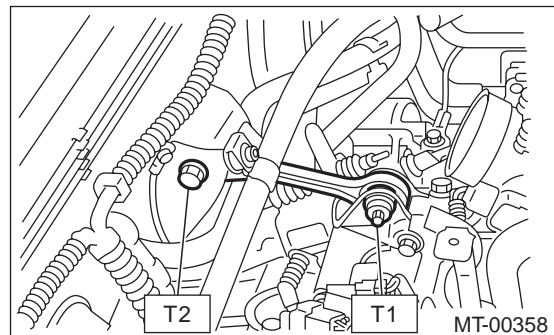
1. PITCHING STOPPER

- 1) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



- 2) Install the air cleaner case. (Non-TURBO model)
<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>
- 3) Install the intercooler. (TURBO model) <Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

TRANSMISSION MOUNTING SYSTEM

MANUAL TRANSMISSION AND DIFFERENTIAL

4) Connect battery ground cable.

2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:

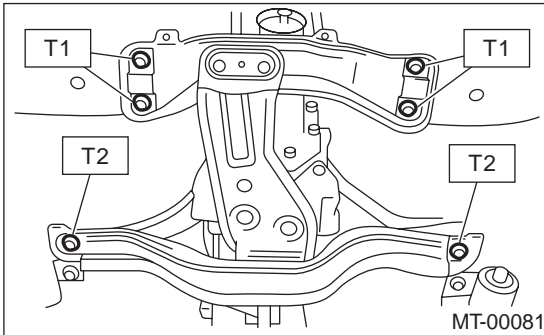
35 N·m (3.6 kgf-m, 26 ft-lb)

2) Install the rear crossmember.

Tightening torque:

T1: 70 N·m (7.1 kgf-m, 51 ft-lb)

T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



3) Remove the transmission jack.

4) Install the heat shield cover. (If equipped)

5) Install the front, center, rear exhaust pipes and the muffler. (Non-TURBO model)

Without OBD

<Ref. to EX(H4SOw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SOw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, INSTALLATION, Muffler.>

With OBD

<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>

6) Install center, rear exhaust pipe and muffler. (TURBO model)

<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked, or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked, or otherwise damaged.

5. Oil Seal

A: INSPECTION

Check oil seal portion for leakage. If leakage is found, replace oil seal with new one.

B: REPLACEMENT

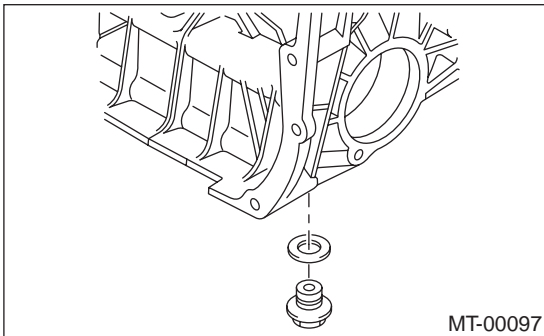
- 1) Clean transmission exterior.
- 2) Drain gear oil completely.

NOTE:

Tighten drain plug after draining gear oil.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



- 3) Remove rear exhaust pipe and muffler.

Non-TURBO model without OBD

<Ref. to EX(H4SOw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, REMOVAL, Muffler.>

Non-TURBO model with OBD

<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>

TURBO model

<Ref. to EX(H4DOSTC)-12, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, REMOVAL, Muffler.>

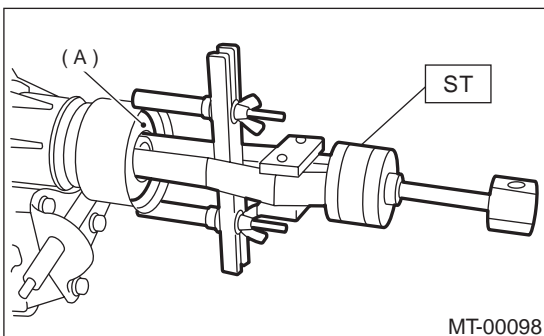
- 4) Remove heat shield cover. (If equipped)

- 5) Remove propeller shaft.

<Ref. to DS-14, REMOVAL, Propeller Shaft.>

- 6) Using ST, remove the oil seal.

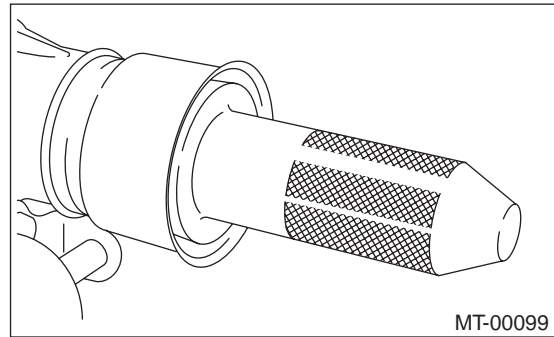
ST 398527700 PULLER ASSY



(A) Oil seal

- 7) Using ST and hammer, install the oil seal.

ST 498057300 INSTALLER



- 8) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>

- 9) Install the heat shield cover. (If equipped)

- 10) Install the rear exhaust pipe and muffler.

Non-TURBO model without OBD

<Ref. to EX(H4SOw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SOw/oOBD)-14, INSTALLATION, Muffler.>

Non-TURBO model with OBD

<Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>

TURBO model

<Ref. to EX(H4DOSTC)-12, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOSTC)-13, INSTALLATION, Muffler.>

- 11) Pour gear oil and check the oil level. <Ref. to MT-31, REPLACEMENT, Transmission Gear Oil.>

SWITCHES AND HARNESS

MANUAL TRANSMISSION AND DIFFERENTIAL

6. Switches and Harness

A: REMOVAL

1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

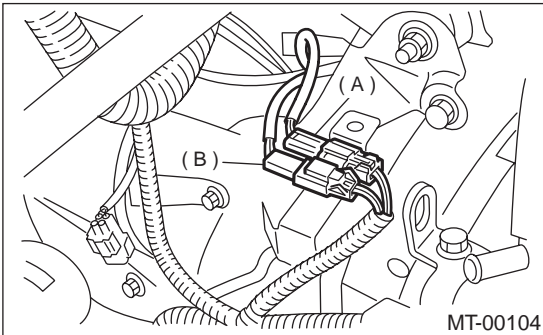
- 1) Disconnect connector battery ground cable.
- 2) Remove air intake duct and cleaner case. (Non-TURBO model)

<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>

- 3) Remove the intercooler (TURBO model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>

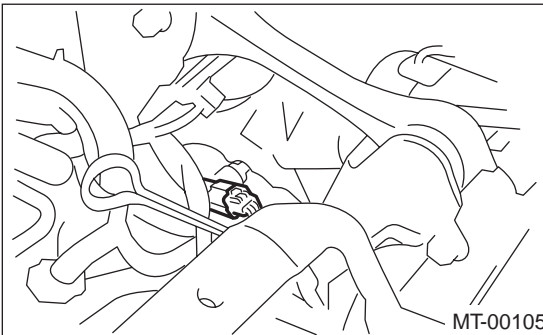
- 4) Disconnect connector back-up light switch and neutral position switch.

Non-TURBO model



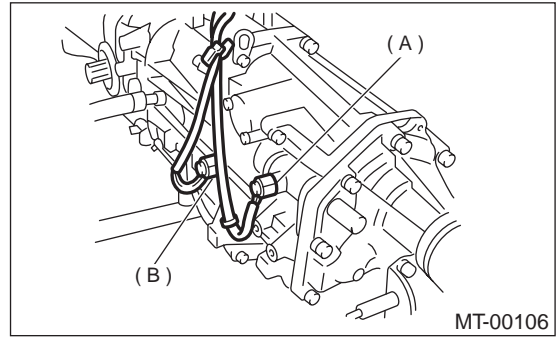
- (A) Neutral switch (Brown)
- (B) Back-up light switch (Gray)

TURBO model



- 5) Lift-up the vehicle.

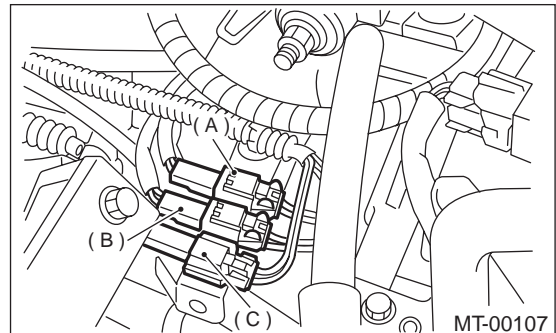
- 6) Remove back-up light switch and neutral position switch with harness.



- (A) Neutral switch (Brown connector)
- (B) Back-up light switch (Gray connector)

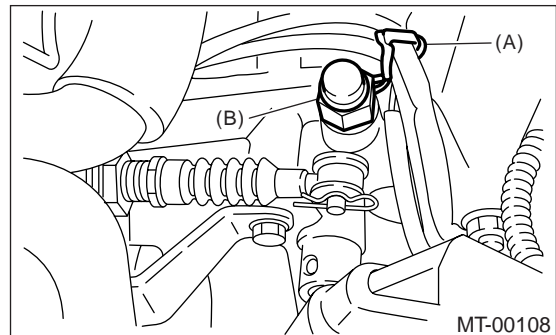
2. HIGH-LOW SWITCH

- 1) Disconnect connector battery ground cable.
- 2) Remove air intake duct and cleaner case.
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- 3) Disconnect connector high-low switch.



- (A) Neutral switch (Brown)
- (B) Back-up light switch (Gray)
- (C) High-low switch (Black)

- 4) Remove HI-LO switch cable from clamp.
- 5) Remove HI-LO switch.



- (A) Clamp
- (B) High-low switch

SWITCHES AND HARNESS

MANUAL TRANSMISSION AND DIFFERENTIAL

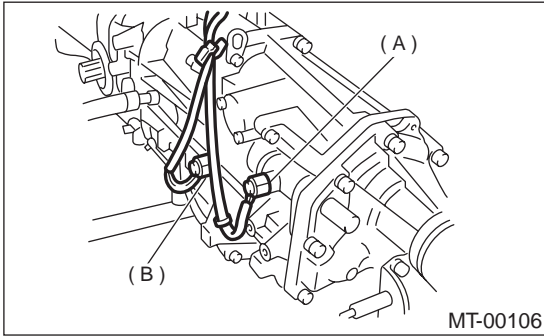
B: INSTALLATION

1. BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH

1) Install back-up light switch and neutral position switch with harness.

Tightening torque:

24.5 N·m (2.5 kgf·m, 18.1 ft-lb)



- (A) Neutral switch
- (B) Back-up light switch

2) Connect connector of back-up light switch and neutral position switch.

3) Install air intake duct and cleaner case. (Non-TURBO model)

<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>

4) Install the intercooler (TURBO model)

<Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

5) Connect battery ground cable.

2. HIGH-LOW SWITCH

1) Install high-low switch.

Tightening torque:

24.5 N·m (2.5 kgf·m, 18.1 ft-lb)

2) Install HI-LO switch cable to the clamp.

3) Connect connector high-low switch.

4) Install air intake duct and cleaner case.

<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>

5) Connect battery ground cable.

C: INSPECTION

1. BACK-UP LIGHT SWITCH

Inspect the back-up light switch. <Ref. to LI-7, INSPECTION, Back-up Light System.>

2. NEUTRAL POSITION SWITCH

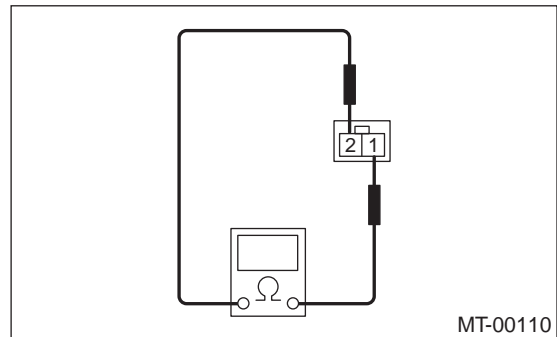
1) Turn ignition switch to OFF.

2) Disconnect connector neutral position switch.

3) Measure resistance between neutral position switch terminals.

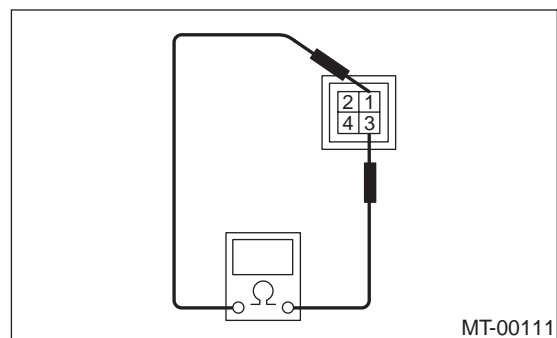
Non-TURBO model

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	More than 1 MΩ
Other positions		Less than 1 Ω



TURBO model

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	More than 1 MΩ
Other positions		Less than 1 Ω



4) Replace defective parts if outside the standard value.

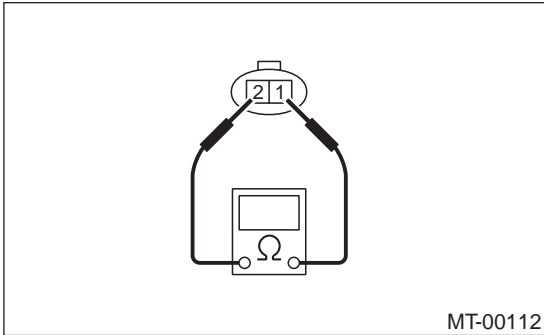
SWITCHES AND HARNESS

MANUAL TRANSMISSION AND DIFFERENTIAL

3. HIGH-LOW SWITCH

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector high-low switch.
- 3) Measure resistance between HIGH-LOW switch terminals.

Gear shift position	Terminal No.	Specified resistance
Lo position	1 and 2	Less than 1 Ω
Hi position		More than 1 M Ω

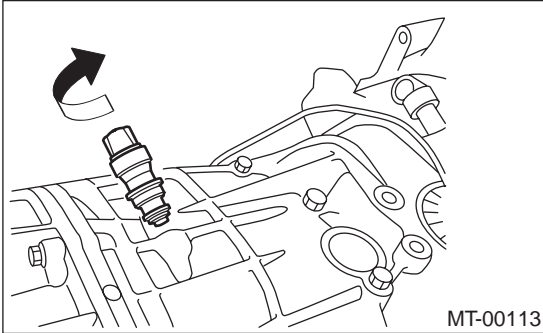


- 4) Replace defective parts if outside the standard value.

7. Vehicle Speed Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.
- 2) Lift-up the vehicle.
- 3) Remove front, center exhaust pipes. (Non-TURBO model)
Without OBD
<Ref. to EX(H4SOw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>
With OBD
<Ref. to EX-<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>
- 4) Remove center exhaust pipes. (TURBO model)
<Ref. to EX(H4DOSTC)-7, REMOVAL, Center Exhaust Pipe.>
- 5) Disconnect connector from vehicle speed sensor.
- 6) Turn and remove vehicle speed sensor.



B: INSTALLATION

NOTE:

- Discard vehicle speed sensor and after removal, replace with a new one.
- Ensure sensor mounting hole is clean and free of foreign matter.
- Align tip end of key with key groove on end of speedometer shaft during installation.

- 1) Hand tighten vehicle speed sensor.
- 2) Tighten vehicle speed sensor using suitable tool.

Tightening torque:

5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

- 3) Connect connector to vehicle speed sensor.
- 4) Install front, center exhaust pipes. (Non-TURBO model)
Without OBD
<Ref. to EX(H4SOw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>
With OBD
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>
- 5) Install center exhaust pipes. (TURBO model)
<Ref. to EX(H4DOSTC)-8, INSTALLATION, Center Exhaust Pipe.>

- 6) Lower the vehicle.
- 7) Connect battery ground cable.

C: INSPECTION

Inspect the vehicle speed sensor. <Ref. to IDI-18, INSPECTION, Speedometer.>

PREPARATION FOR OVERHAUL

MANUAL TRANSMISSION AND DIFFERENTIAL

8. Preparation for Overhaul

A: PROCEDURE

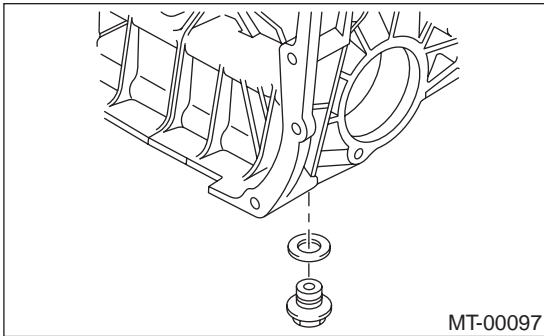
- 1) Clean oil, grease, dirt and dust from transmission.
- 2) Remove drain plug to drain oil. After draining, re-tighten it as before.

NOTE:

Replace gasket with a new one.

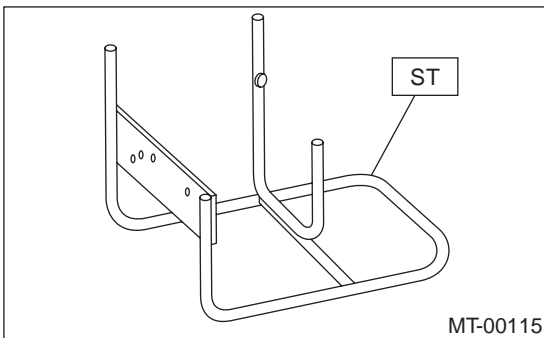
Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



- 3) Attach transmission to ST.

ST 499937100 TRANSMISSION STAND SET



- 4) Rotating parts should be coated with oil prior to assembly.
- 5) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
- 6) Gaskets, lock washers and lock nut must be replaced with new ones.
- 7) Liquid gasket should be used where specified to prevent leakage.

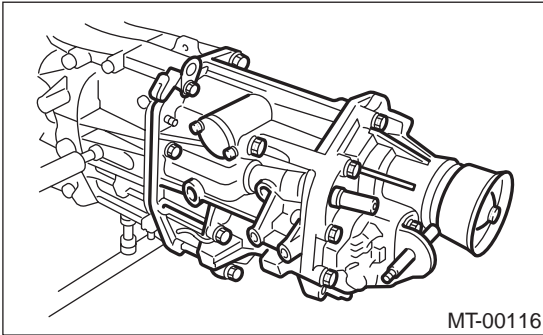
TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

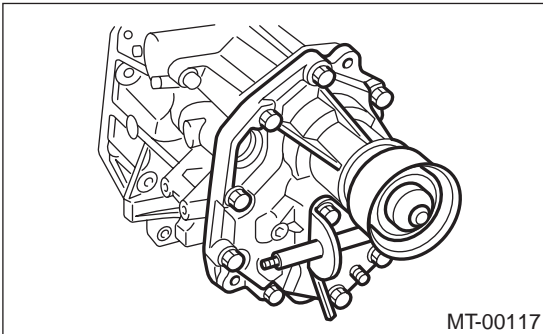
9. Transfer Case and Extension Case Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-42, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly.

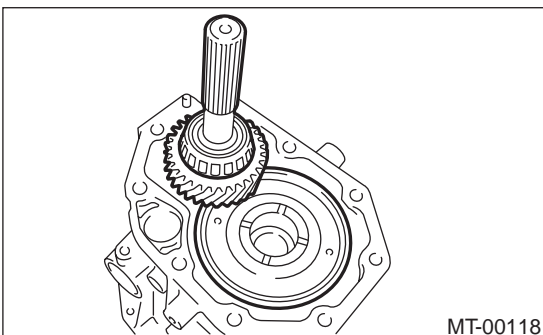


- 4) Remove shifter arm.
- 5) Remove extension case assembly.

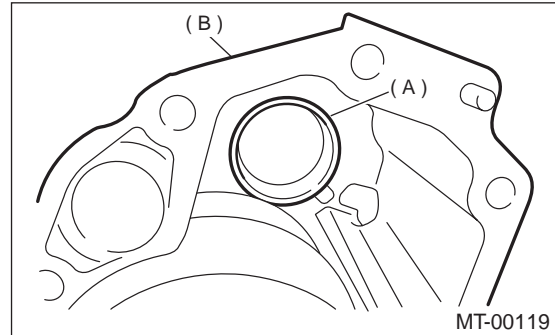


B: INSTALLATION

- 1) Install center differential and transfer driven gear into transfer case.

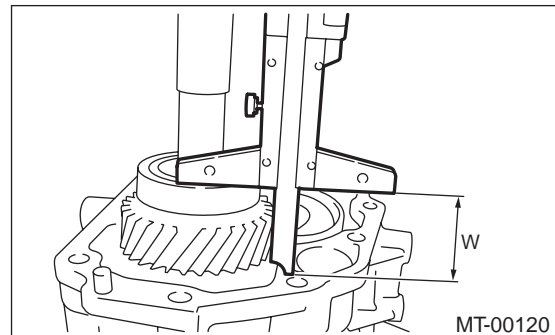


- 2) Remove bearing cone from the extension case assembly, and install to taper roller bearing of the transfer driven gear.



- (A) Bearing cone (Extension case)
(B) Extension case

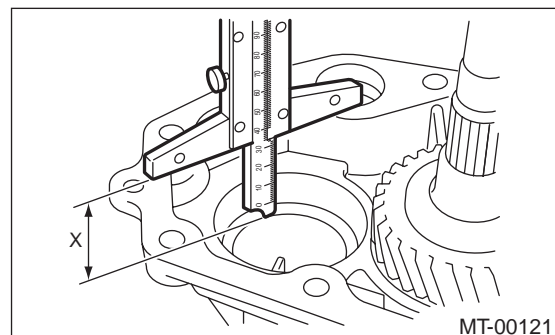
- 3) While pressing the bearing cone horizontally, turn the driven shaft ten rotations.
- 4) Measure height "W" between transfer case and taper roller bearing on the transfer driven gear.



- 5) Measure depth "X".

NOTE:

Measure with bearing cone and thrust washer removed.



- 6) Calculate space "t" using the following equation:
 $t = X - W + 0.2 \text{ to } 0.3 \text{ mm (0.008 to 0.012 in)}$

TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

7) Select nearest washer in the following table:

Standard clearance between thrust washer and taper roller bearing:

0.2 — 0.3 mm (0.008 — 0.012 in)

NOTE:

Ensure clearance is within the specified value.

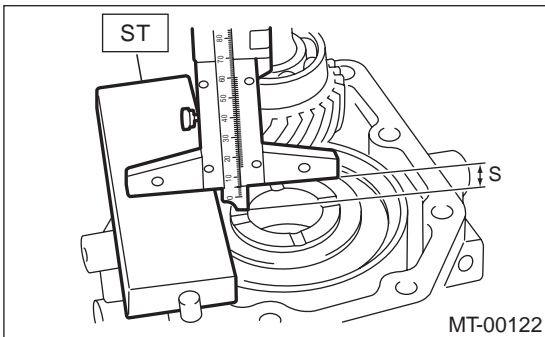
Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

8) Fit thrust washers on transfer drive shaft.

9) Install bearing cone into extension case.

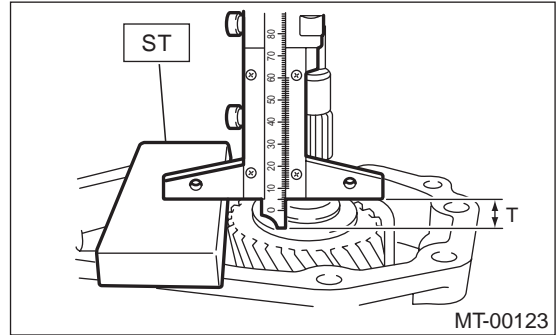
10) Measure depth "S" between transfer case and center differential.

ST 398643600 GAUGE



11) Measure depth "T" between extension case and transfer drive gear.

ST 398643600 GAUGE



12) Calculate space "U" using the following equation: $U = S + T - 30 \text{ mm (1.18 in)}$ [Thickness of ST]

13) Select suitable washer in the following table:

Standard clearance:

0.15 — 0.35 mm (0.0059 — 0.0138 in)

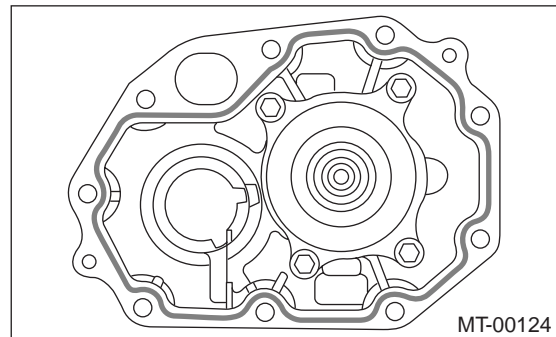
Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

14) Fit thrust washer on center differential.

15) Apply proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007)



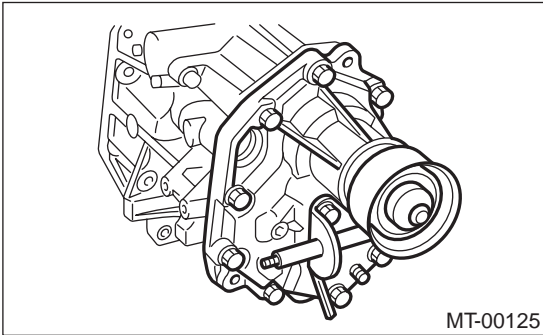
TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

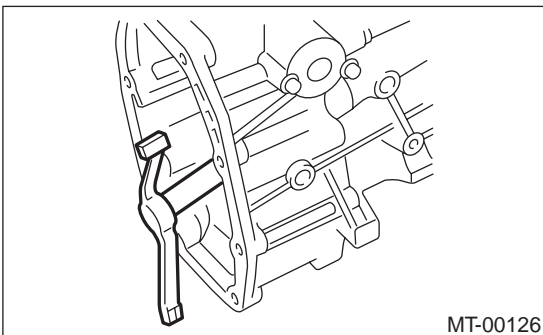
16) Install extension assembly into transfer case.

Tightening torque:

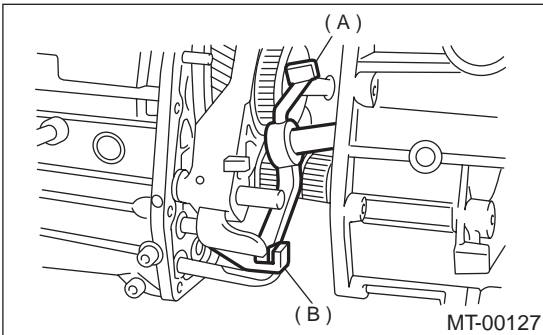
40 N·m (4.1 kgf-m, 29.7 ft-lb)



17) Install shifter arm to transfer case.



18) Hang the shifter arm on the 3rd-4th fork rod.



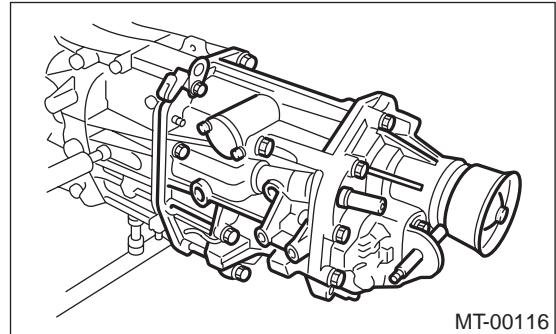
(A) Shifter arm

(B) 3rd - 4th fork rod

19) Install transfer case with extension case assembly to transmission case.

Tightening torque:

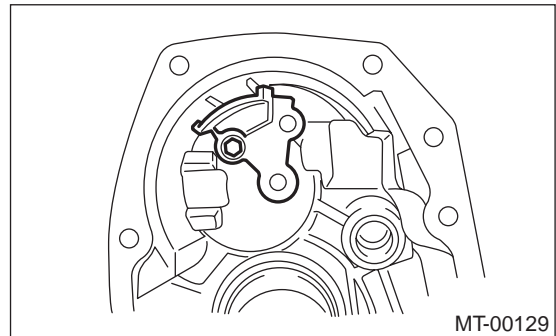
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



C: DISASSEMBLY

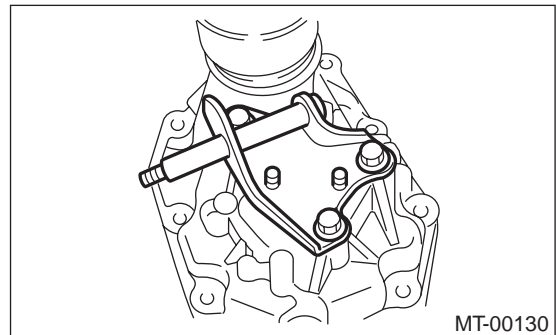
1. TRANSFER CASE

- 1) Remove reverse check assembly. <Ref. to MT-56, REMOVAL, Reverse Check Sleeve.>
- 2) Remove oil guide.



2. EXTENSION CASE

- 1) Remove transfer drive gear assembly. <Ref. to MT-51, REMOVAL, Transfer Drive Gear.>
- 2) Remove shift bracket.



- 3) Remove oil seal from extension case. <Ref. to MT-41, Oil Seal.>

TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

D: ASSEMBLY

1. EXTENSION CASE

1) Using ST, install oil seal to extension case. <Ref. to MT-41, Oil Seal.>

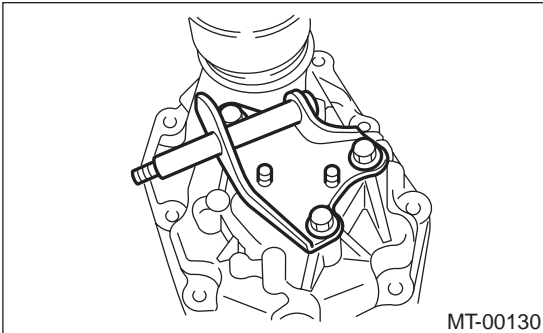
NOTE:

Use new oil seal.

2) Install shift bracket to extension case.

Tightening torque:

24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



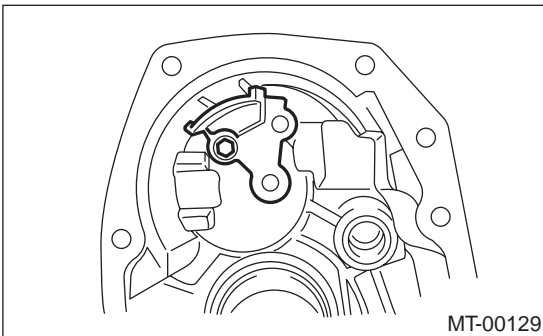
3) Install transfer drive gear to extension case. <Ref. to MT-51, INSTALLATION, Transfer Drive Gear.>

2. TRANSFER CASE

1) Install oil guide to transfer case.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Install reverse check sleeve assembly to transfer case. <Ref. to MT-56, INSTALLATION, Reverse Check Sleeve.>

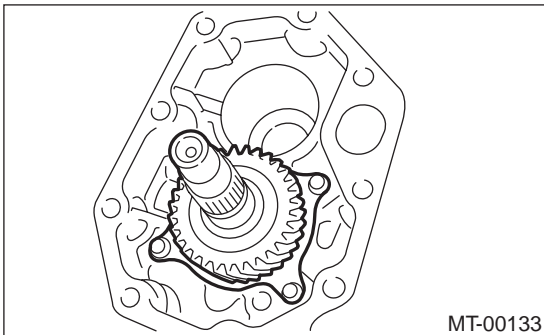
TRANSFER DRIVE GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

10. Transfer Drive Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-42, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove extension case assembly.
- 5) Remove transfer driven gear.
- 6) Remove transfer drive gear.

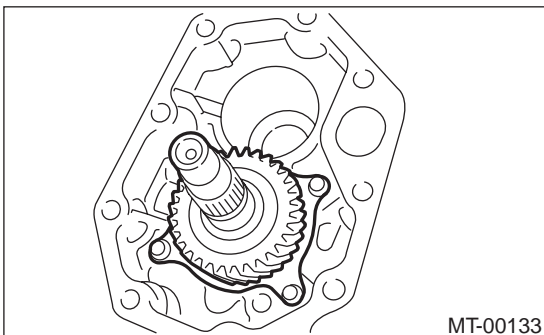


B: INSTALLATION

- 1) Install transfer drive gear.

Tightening torque:

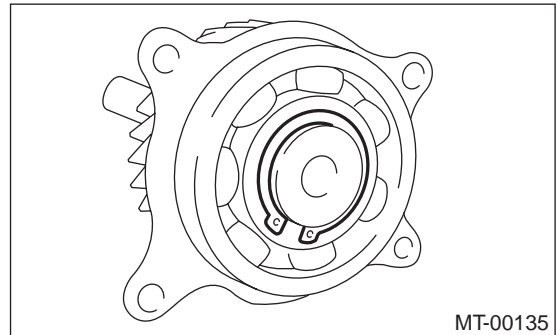
26 N·m (2.7 kgf-m, 20 ft-lb)



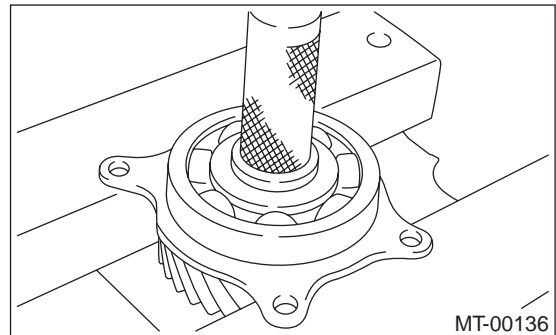
- 2) Install transfer driven gear.
- 3) Install the extension case assembly.
- 4) Install transfer case and extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install back-up light switch and neutral position switch. <Ref. to MT-43, INSTALLATION, Switches and Harness.>
- 6) Install the manual transmission assembly from vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

- 1) Remove snap ring.



- 2) Remove ball bearing.



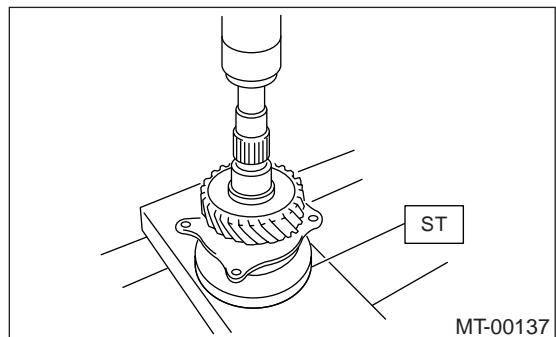
D: ASSEMBLY

- 1) Set ST to inner race of bearing and install to drive shaft.

ST 39817700 INSTALLER

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



- 2) Install snap ring on transfer drive shaft.
- 3) Inspect clearance between snap ring and inner race of ball bearing. <Ref. to MT-52, INSPECTION, Transfer Drive Gear.>

TRANSFER DRIVE GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

E: INSPECTION

1) Bearings

Replace bearings in the following cases:

- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

2) Drive gear

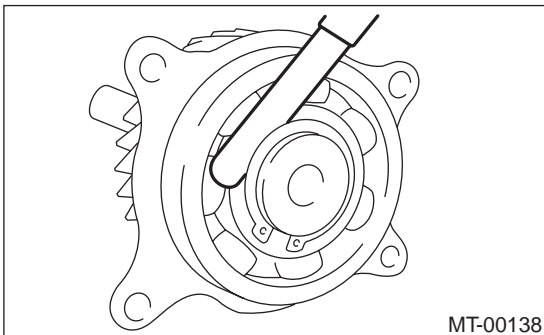
Replace drive gear in the following cases:

- If their tooth surfaces and shaft are excessively broken or damaged.

3) Measure clearance between snap ring and inner race of ball bearing with a thickness gauge.

Clearance:

0.01 — 0.15 mm (0.0004 — 0.0059 in)



If the measurement is not within the specification, select suitable snap ring.

Snap ring	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.697)

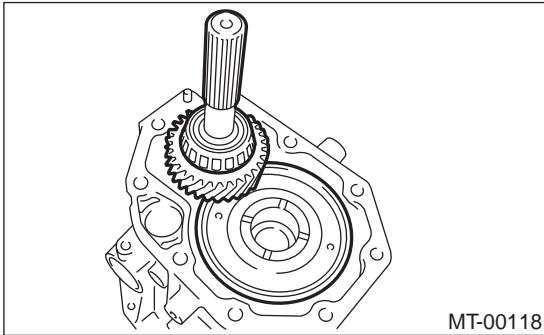
TRANSFER DRIVEN GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

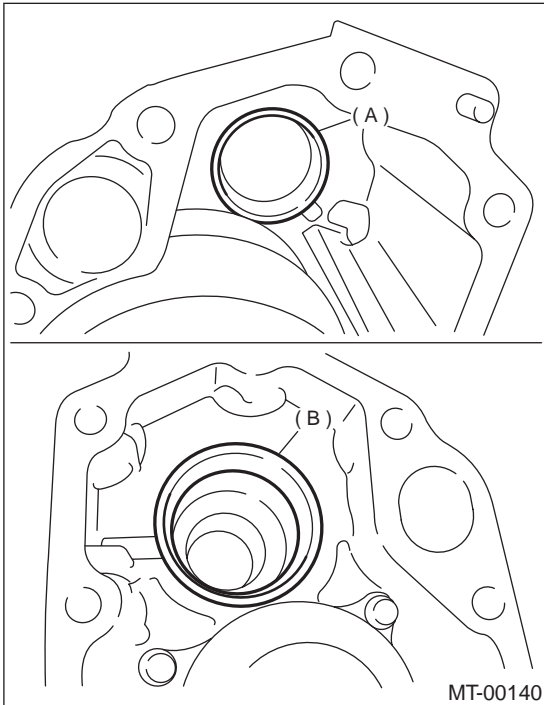
11. Transfer Driven Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-42, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove extension case assembly.
- 5) Remove transfer driven gear.



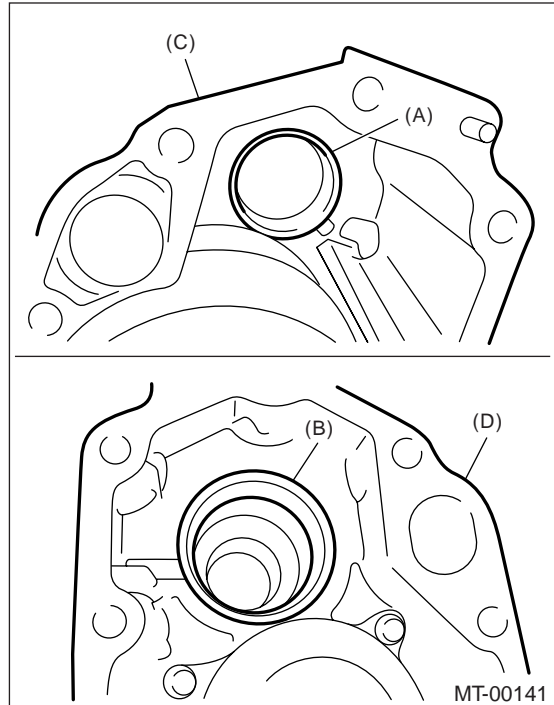
- 6) Remove bearing outer race from extension case and transfer case.



- (A) Bearing outer race (transfer case)
(B) Bearing outer race (extension case)

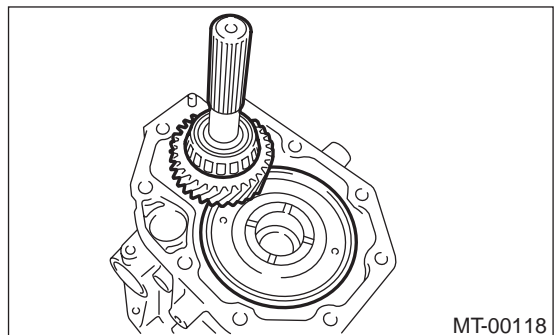
B: INSTALLATION

- 1) Install bearing outer race to extension case and transfer case.



- (A) Bearing outer race
(B) Bearing outer race
(C) Transfer case
(D) Extension case

- 2) Install transfer driven gear.



- 3) Install transfer case and extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install back-up light switch and neutral position switch. <Ref. to MT-43, INSTALLATION, Switches and Harness.>
- 5) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

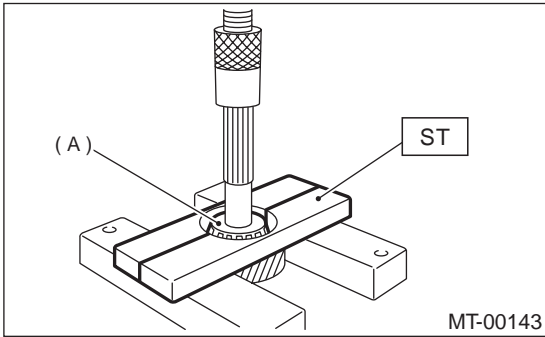
TRANSFER DRIVEN GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

C: DISASSEMBLY

1) Using ST, remove roller bearing (extension case side).

ST 498077000 REMOVER

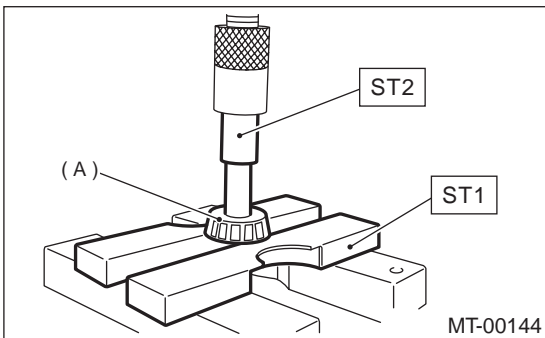


(A) Roller bearing

2) Using ST1 and ST2, remove roller bearing (transfer case side).

ST1 498077000 REMOVER

ST2 899864100 REMOVER



(A) Roller bearing

D: ASSEMBLY

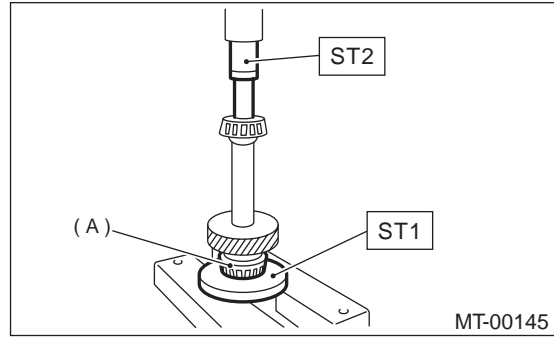
1) Using ST, install roller bearing (extension case side).

ST1 398177700 INSTALLER

ST2 899864100 REMOVER

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



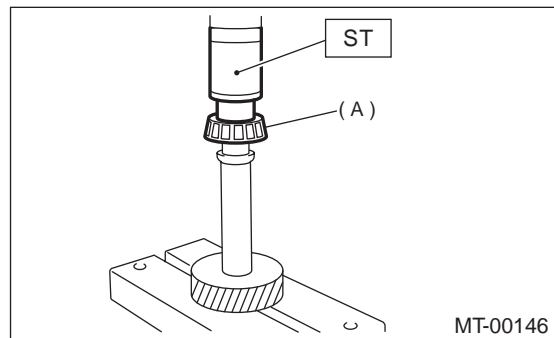
(A) Roller bearing

2) Using ST, install roller bearing (transfer case side).

ST 499757002 INSTALLER

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

E: INSPECTION

1) Bearings

Replace bearings in the following cases:

- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

2) Driven gear

Replace drive gear in the following cases:

- If their tooth surfaces and shaft are excessively broken or damaged.

CENTER DIFFERENTIAL

MANUAL TRANSMISSION AND DIFFERENTIAL

12.Center Differential

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transfer driven gear. <Ref. to MT-53, REMOVAL, Transfer Driven Gear.>
- 5) Remove the center differential.

B: INSTALLATION

- 1) Install the center differential into transfer case.
- 2) Install the transfer driven gear. <Ref. to MT-53, INSTALLATION, Transfer Driven Gear.>
- 3) Install the extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install the transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 5) Install the back-up light switch and neutral position switch. <Ref. to MT-42, REMOVAL, Switches and Harness.>
- 6) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

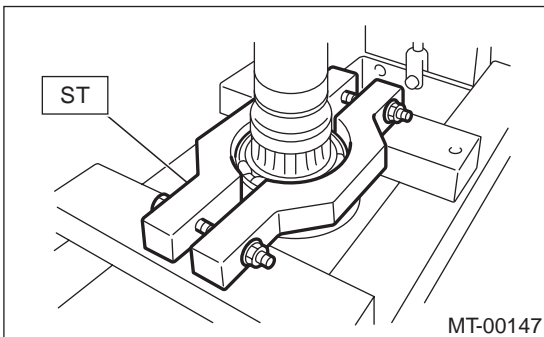
C: DISASSEMBLY

- 1) Remove ball bearing using ST.

NOTE:

Do not reuse ball bearing.

ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER



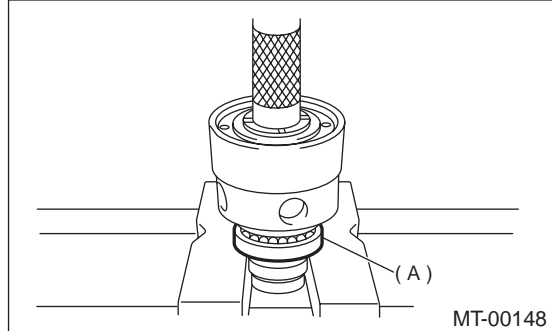
- 2) Do not disassemble center differential because it is a non-disassemble part.

D: ASSEMBLY

Install new ball bearing to center differential assembly.

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Ball bearing

E: INSPECTION

- 1) Bearings

Replace bearings in the following cases:

- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

- 2) Center differential

Replace center differential assembly in the following case:

- Worn or damaged

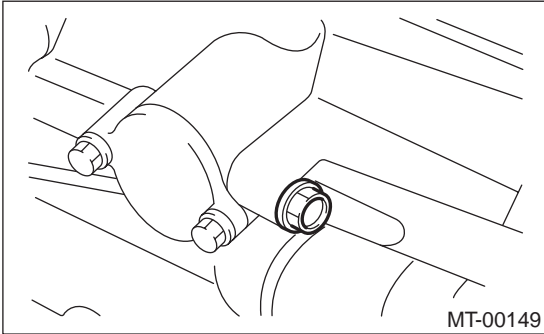
REVERSE CHECK SLEEVE

MANUAL TRANSMISSION AND DIFFERENTIAL

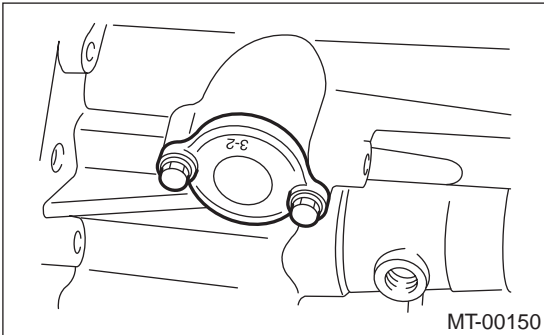
13.Reverse Check Sleeve

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove shifter arm.
- 4) Remove plug, spring washer and reverse check ball.



- 5) Remove the reverse check sleeve.

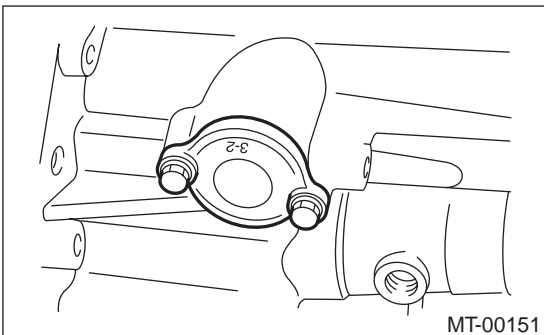


B: INSTALLATION

- 1) Install the reverse check sleeve.

Tightening torque:

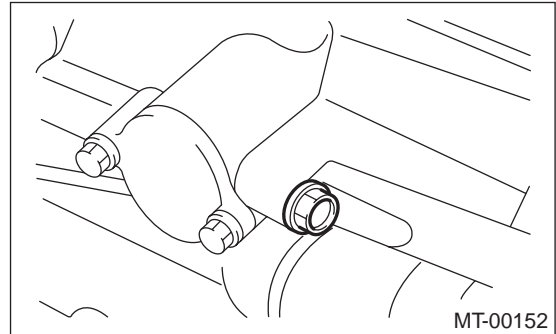
6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



- 2) Install ball, spring, washer and plug to transfer case.

Tightening torque:

10 N·m (1.0 kgf·m, 7.2 ft·lb)



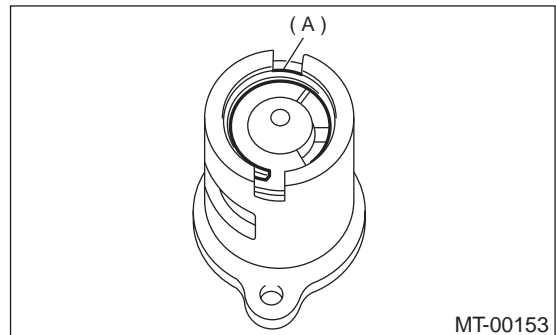
- 3) Install the shifter arm to transfer case assembly.
- 4) Install the transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

- 1) Cover the reverse check sleeve with a rag, and remove snap ring using a screwdriver.

NOTE:

Replace snap ring with a new one if deformed or weakened.

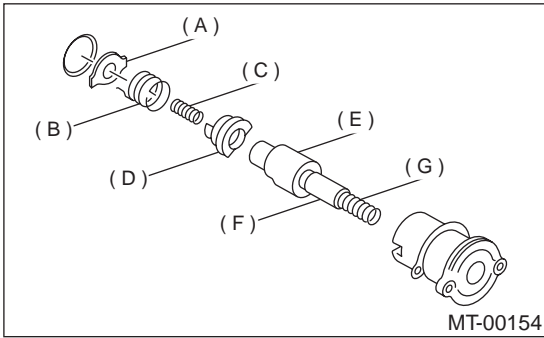


(A) Snap ring

REVERSE CHECK SLEEVE

MANUAL TRANSMISSION AND DIFFERENTIAL

2) Remove reverse check plate, reverse check spring, reverse check cam, return spring (5th-Rev), reverse accent shaft, return spring cap and return spring (1st-2nd).



- (A) Reverse check plate
- (B) Reverse check spring
- (C) Return spring (5th-Rev)
- (D) Reverse check cam
- (E) Reverse accent shaft
- (F) Return spring cap
- (G) Return spring (1st-2nd)

3) Remove O-ring.

NOTE:

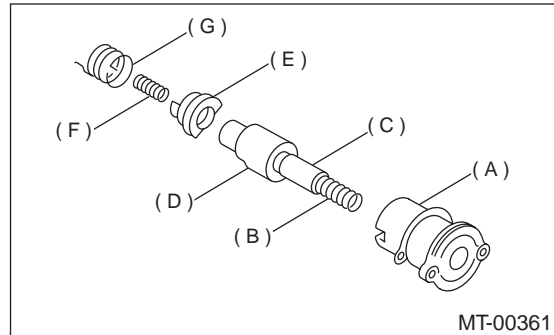
- Reverse check sleeve assembly uses an O-ring which should not be scratched.
- Be careful not to break adjustment shim placed between reverse check sleeve assembly and case.

D: ASSEMBLY

1) Install return spring (1st-2nd), return spring cap, reverse accent shaft, check cam, return spring and check spring onto reverse check sleeve.

NOTE:

Be sure the bent section of reverse check spring is positioned in the groove in check cam.



- (A) Reverse check sleeve
- (B) Return spring (1st-2nd)
- (C) Return spring cap
- (D) Reverse accent shaft
- (E) Return spring (5th-Rev)
- (F) Reverse check cam
- (G) Reverse check spring

2) Hook the bent section of reverse check spring over reverse check plate.

3) Rotate cam so that the protrusion of reverse check cam is at the opening in plate.

4) With cam held in that position, install plate onto reverse check sleeve and hold with snap ring.

5) Position new O-ring in groove in sleeve.

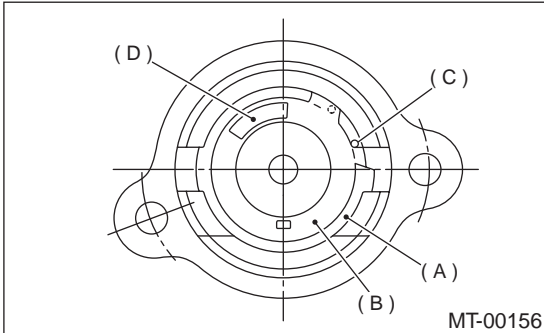
REVERSE CHECK SLEEVE

MANUAL TRANSMISSION AND DIFFERENTIAL

E: INSPECTION

- Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse check sleeve.
- Spin cam by hand for smooth rotation.
- Move cam and shaft all the way toward plate and release.

If cam does not return properly, replace reverse check spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace spring.



- (A) Snap ring
- (B) Reverse check plate
- (C) Check spring
- (D) Check cam

- Select a suitable reverse accent shaft and reverse check plate. <Ref. to MT-58, ADJUSTMENT, Reverse Check Sleeve.>

F: ADJUSTMENT

1. NEUTRAL POSITION ADJUSTMENT

- 1) Shift gear into 3rd gear position.
- 2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of the return spring, until arm contacts the stopper.
- 3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).
- 4) To adjust, remove bolts holding reverse check sleeve assembly to the case, move sleeve assembly outward, and place adjustment shim (0 to 1 ea.) between sleeve assembly and case to adjust the clearance.

NOTE:

- Be careful not to break O-ring when placing shim(s).
- When shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
- If shims alone cannot adjust the clearance, replace reverse accent shaft and re-adjust.

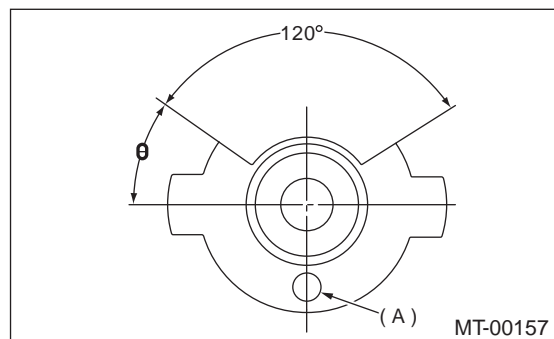
Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA090	3	Neutral position is closer to 1st gear.
32188AA100	0	Standard
32188AA110	1	Neutral position is closer to reverse gear.

2. REVERSE CHECK PLATE ADJUSTMENT

- 1) Shift shifter arm to "5th" and then to reverse to see if reverse check mechanism operates properly.
- 2) Also check to see if arm returns to neutral when released from the reverse position. If arm does not return properly, replace reverse check plate.

Reverse check plate			
Part No.	(A): No.	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
32189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.



TRANSMISSION CASE

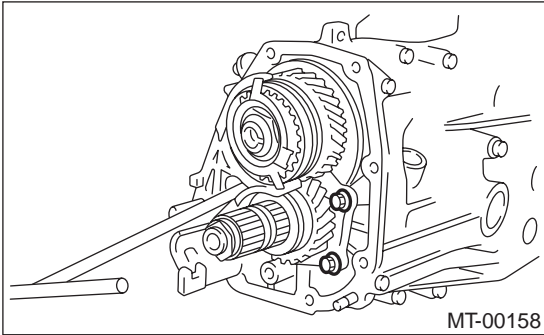
MANUAL TRANSMISSION AND DIFFERENTIAL

14. Transmission Case

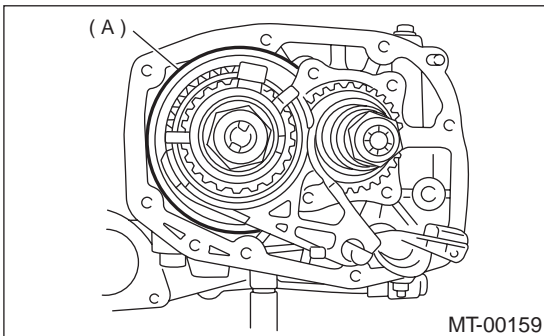
A: REMOVAL

1. SINGLE-RANGE

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove clutch release lever. <Ref. to CL-22, REMOVAL, Release Bearing and Lever.>
- 3) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove bearing mounting bolts.

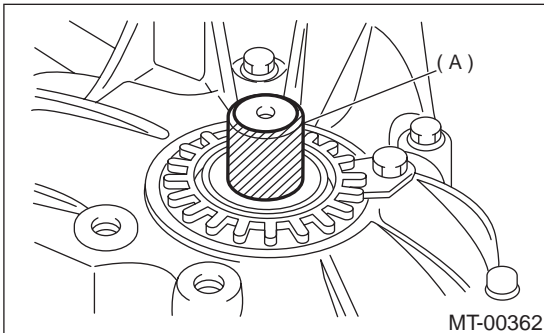


- 5) Remove main shaft rear plate.



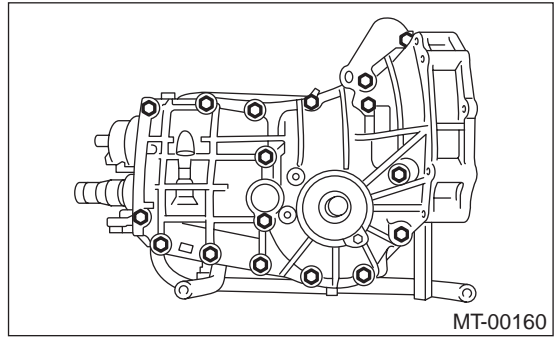
(A) Main shaft rear plate

- 6) Put vinyl tape around splines of right and left axle drive shafts to prevent damage to oil seal.



(A) Vinyl tape

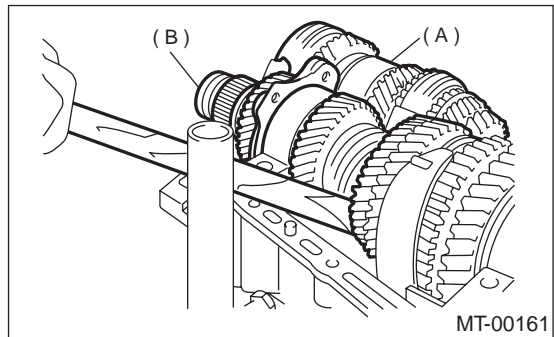
- 7) Separate transmission case into right and left cases by loosening coupling bolts and nuts.



- 8) Remove drive pinion shaft assembly from left side transmission case.

NOTE:

Use a hammer handle, etc. to remove if too tight.



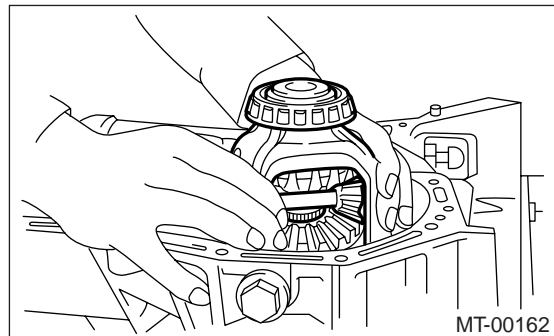
(A) Main shaft assembly

(B) Drive pinion shaft assembly

- 9) Remove main shaft assembly.
- 10) Remove differential assembly.

NOTE:

- Be careful not to confuse right and left roller bearing outer races.
- Be careful not to damage retainer oil seal.

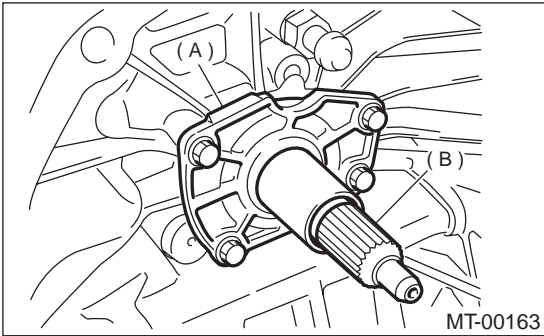


TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

2. DUAL-RANGE

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove clutch release lever. <Ref. to CL-22, REMOVAL, Release Bearing and Lever.>
- 3) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the input shaft holder.

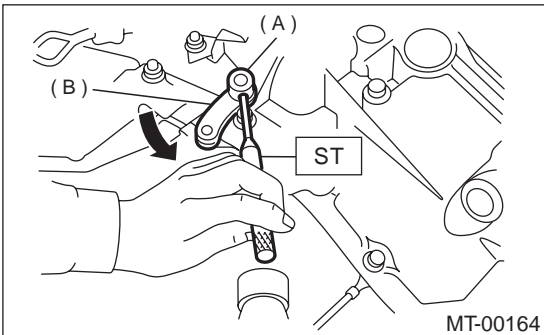


- (A) Input shaft holder
- (B) Input shaft

- 5) Remove the high-low switch. <Ref. to MT-42, REMOVAL, Switches and Harness.>
- 6) Using ST, drive out straight pin, and remove high-low shifter lever.
ST 398791700 STRAIGHT PIN REMOVER 2

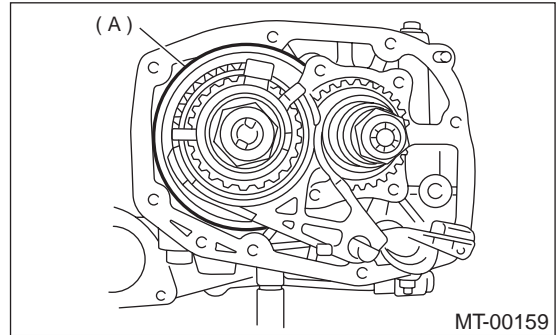
NOTE:

When driving out straight pin, remove it in the direction that it does not butt against transmission case.



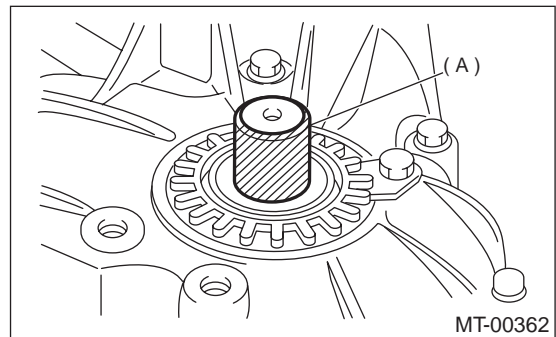
- (A) Straight pin
- (B) High-low shifter lever

- 7) Remove main shaft rear plate.



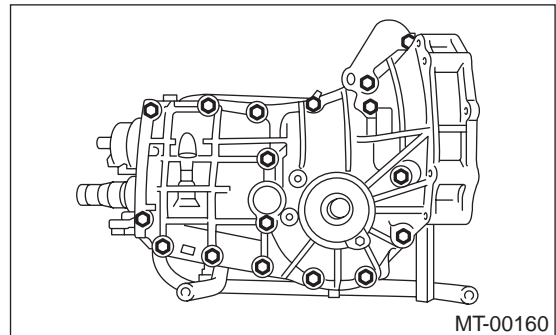
- (A) Main shaft rear plate

- 8) Put vinyl tape around splines of right and left axle drive shafts to prevent damage to oil seals.



- (A) Vinyl tape

- 9) Separate transmission case into right and left cases by loosening seventeen coupling bolts and nuts.



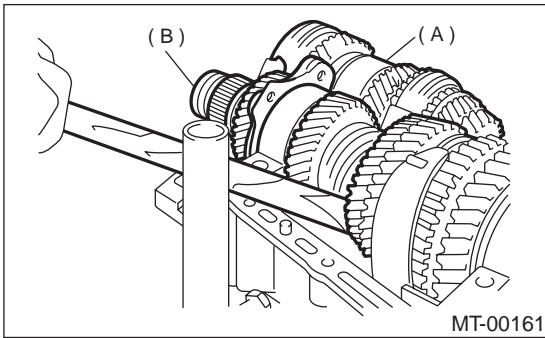
TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

10) Remove drive pinion shaft assembly from left side transmission case.

NOTE:

Use a hammer handle, etc. to remove if too tight.



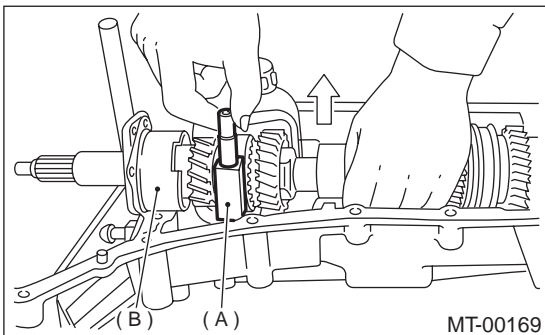
- (A) Main shaft assembly
- (B) Drive pinion shaft assembly

11) Removing high-low shifter fork

Raise main shaft assembly slightly, and remove high-low shifter fork together with high-low shifter shaft and washer.

NOTE:

Be careful not to drop the two high-low shifter pieces.

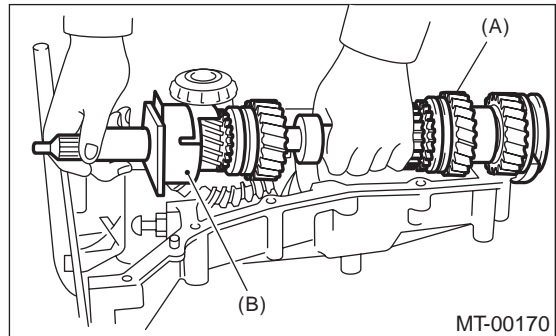


- (A) High-low shifter fork
- (B) Input shaft ASSY

12) Remove main shaft assembly and input shaft assembly.

NOTE:

Be careful not to drop input shaft and main shaft as they are separable.

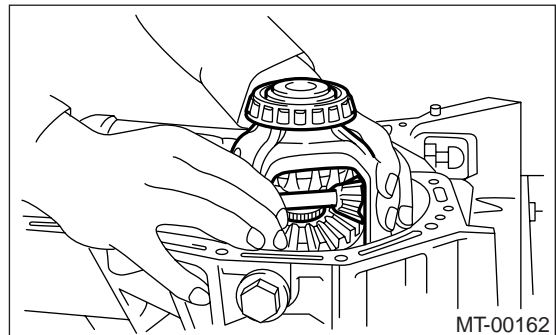


- (A) Main shaft ASSY
- (B) Input shaft ASSY

13) Remove differential assembly.

NOTE:

- Be careful not to confuse right and left roller bearing outer races.
- Be careful not to damage retainer oil seal.



B: INSTALLATION

1. SINGLE-RANGE

- 1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
- 2) Install the front differential assembly.
- 3) Install the main shaft assembly.
Install needle bearing knock pin hole into transmission case knock pin.
- 4) Install the drive pinion shaft assembly.
Install roller bearing knock pin hole into transmission case knock pin.
- 5) Apply liquid gasket, and then put case right side and left side together.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent

TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

6) Tighten 17 bolts with bracket, clip, etc. as shown in the figure.

NOTE:

- Insert bolts from the bottom and tighten nuts at the top.
- Put cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
- Confirm that speedometer gear is meshed.

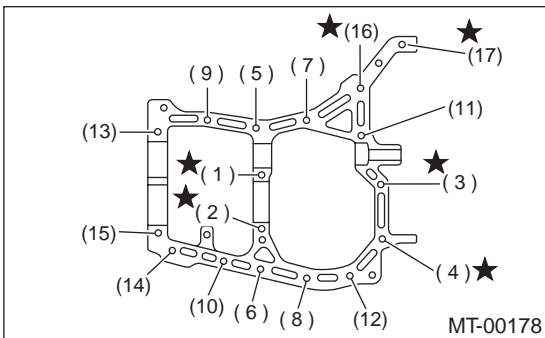
Tightening torque:

8 mm bolt

25 N·m (2.5 kgf-m, 18.1 ft-lb)

★ 10 mm bolt

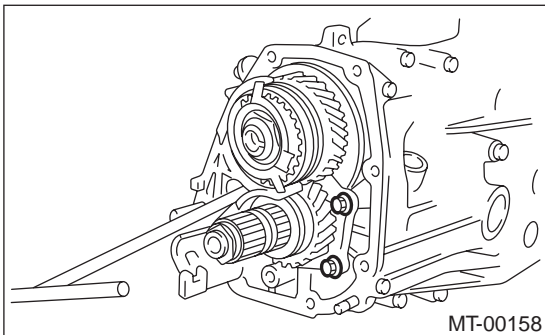
39 N·m (4.0 kgf-m, 28.9 ft-lb)



7) Tighten ball bearing attachment bolts.

Tightening torque:

29 N·m (3.0 kgf-m, 21.7 ft-lb)

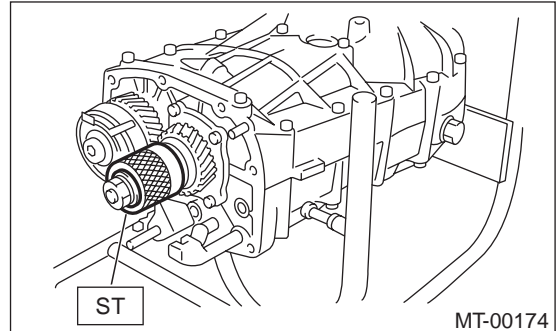


8) Backlash adjustment of hypoid gear and preload adjustment of roller bearing

NOTE:

Support drive pinion assembly with ST.

ST 498427100 STOPPER



9) Place the transmission with case left side facing downward and put ST1 on bearing outer race.

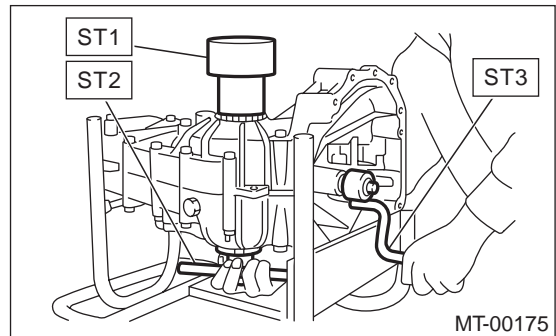
10) Screw retainer assembly into left case from the bottom with ST2. Fit ST3 on the transmission main shaft. Shift gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2.

This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

ST1 399780104 WEIGHT

ST2 499787000 WRENCH ASSY

ST3 499927100 HANDLE



TRANSMISSION CASE

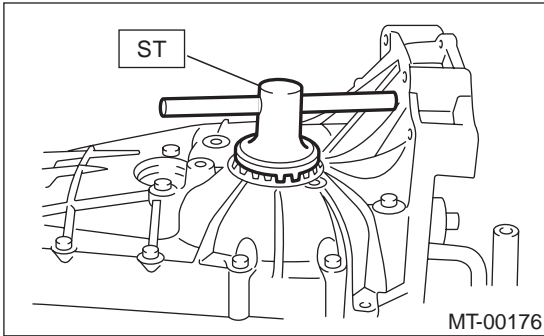
MANUAL TRANSMISSION AND DIFFERENTIAL

11) Remove weight and screw in retainer without O-ring on the upper side and stop at the point where slight resistance is felt.

NOTE:

At this point, the backlash between the hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



12) Fit lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on the upper side by the same amount in order to obtain the backlash.

NOTE:

The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

13) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.

14) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.

15) Turn transmission main shaft several times while tapping around retainer lightly with plastic hammer.

16) Inspect and adjust backlash and tooth contact of hypoid gear. <Ref. to MT-99, INSPECTION, Front Differential Assembly.>

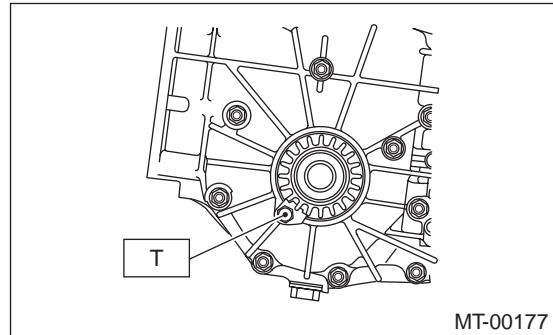
17) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen retainer until the new O-ring groove appears. Fit new O-ring into the groove and tighten retainer into the position where retainer has been tightened in. Tighten lock plate.

NOTE:

Carry out this job on both upper and lower retainers.

Tightening torque:

T: 25 N·m (2.5 kgf·m, 18.1 ft·lb)



18) Selecting of main shaft rear plate <Ref. to MT-73, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

19) Install clutch release lever and bearing. <Ref. to CL-22, INSTALLATION, Release Bearing and Lever.>

20) Install transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install the manual transmission assembly into the vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

2. DUAL-RANGE

1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.

2) Install the front differential assembly.

3) Install the main shaft assembly and input shaft assembly.

Connect main shaft assembly and input shaft assembly, and install needle bearing knock pin hole into transmission case knock pin.

4) Install the drive pinion shaft assembly.

Install roller bearing knock pin hole into transmission case knock pin.

5) Apply liquid gasket, and then put case right side and left side together.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent

6) Tighten 17 bolts with bracket, clip, etc. as shown in the figure.

NOTE:

- Insert bolts from the bottom and tighten nuts at the top.

- Put cases together so that drive pinion shim and input shaft holder shim are not caught up in between.

- Confirm that speedometer gear is meshed.

TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

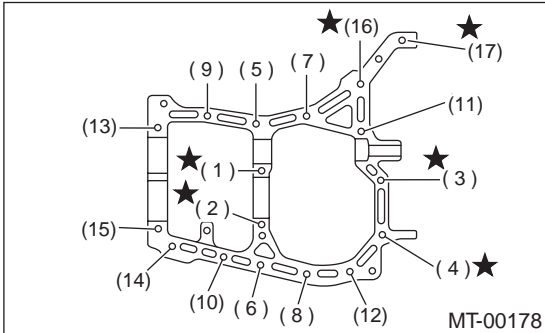
Tightening torque:

8 mm bolt

25 N·m (2.5 kgf·m, 18.1 ft-lb)

★ **10 mm bolt**

39 N·m (4.0 kgf·m, 28.9 ft-lb)

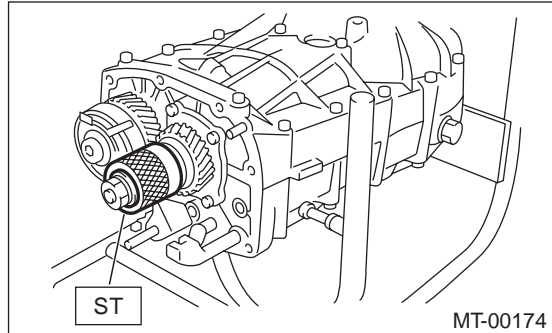


9) Backlash adjustment of hypoid gear and preload adjustment of roller bearing

NOTE:

Support drive pinion assembly with ST.

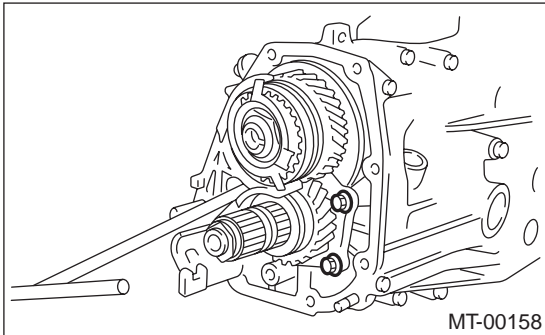
ST 498427100 STOPPER



7) Tighten ball bearing attachment bolts.

Tightening torque:

29 N·m (3.0 kgf·m, 21.7 ft-lb)



10) Place the transmission with case left side facing downward and put ST1 on bearing outer race.

11) Screw retainer assembly into left case from the bottom with ST2. Fit ST3 on the transmission main shaft. Shift gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2.

This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

ST1 399780104 WEIGHT

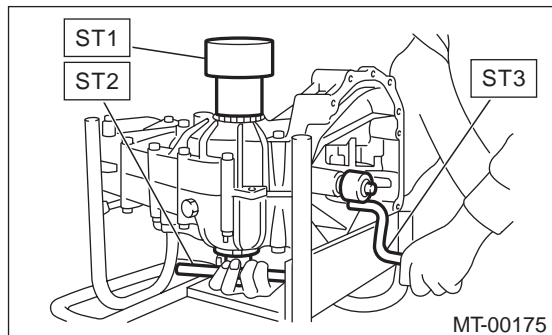
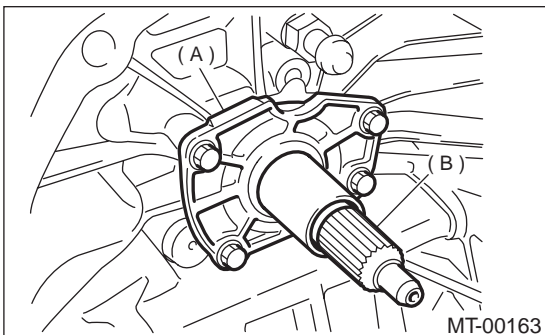
ST2 499787000 WRENCH ASSY

ST3 499927100 HANDLE

8) Tighten input shaft holder attaching bolts.

Tightening torque:

20 N·m (2.0 kgf·m, 14.5 ft-lb)



(A) Input shaft holder

(B) Input shaft

TRANSMISSION CASE

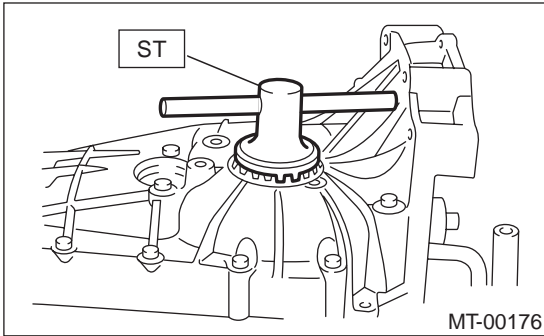
MANUAL TRANSMISSION AND DIFFERENTIAL

12) Remove weight and screw in retainer without O-ring on the upper side and stop at the point where slight resistance is felt.

NOTE:

At this point, the backlash between the hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



13) Fit lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on the upper side by the same amount in order to obtain the backlash.

NOTE:

The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

14) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.

15) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.

16) Turn transmission main shaft several times while tapping around retainer lightly with plastic hammer.

17) Inspect and adjust backlash and tooth contact of hypoid gear. <Ref. to MT-99, INSPECTION, Front Differential Assembly.>

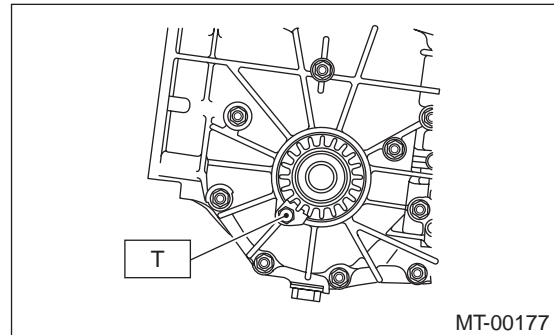
18) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen retainer until the O-ring groove appears. Fit new O-ring into the groove and tighten retainer into the position where retainer has been tightened in. Tighten lock plate.

NOTE:

Carry out this job on both upper and lower retainers.

Tightening torque:

T: 25 N·m (2.5 kgf·m, 18.1 ft·lb)



19) Selection of main shaft rear plate <Ref. to MT-73, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

20) Install transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install clutch release lever and bearing. <Ref. to CL-22, INSTALLATION, Release Bearing and Lever.>

22) Install the manual transmission assembly into the vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, and oil leaks.

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

15. Main Shaft Assembly for Single-Range

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove transmission case. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove main shaft assembly.

B: INSTALLATION

- 1) Install the needle bearing and oil seal onto the front of transmission main shaft assembly.

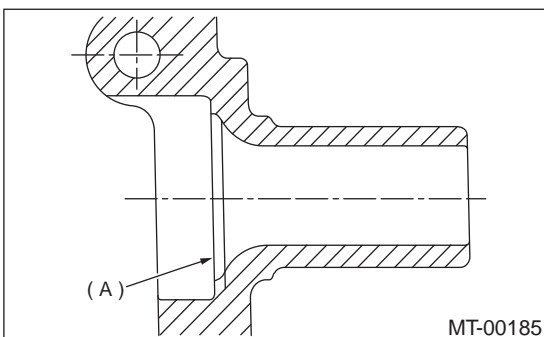
NOTE:

- Wrap clutch splined section with vinyl tape to prevent damage to oil seal.
- Apply grease (Unilube #2 or equivalent) to the sealing lip of oil seal.
- Use a new one.

- 2) Install needle bearing outer race knock pin hole into transmission case knock pin.

NOTE:

Align the end face of seal with surface (A) when installing oil seal.



- 3) Install the drive pinion assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>
- 4) Install transmission case. <Ref. to MT-61, INSTALLATION, Transmission Case.>
- 5) Install transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 6) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

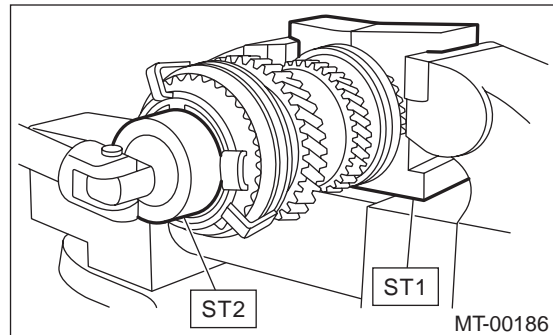
C: DISASSEMBLY

- 1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.
- 2) Remove lock nut from transmission main shaft assembly.

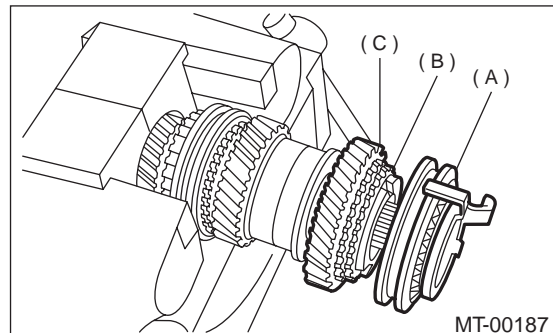
NOTE:

Remove caulking before taking off lock nut.

- ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)

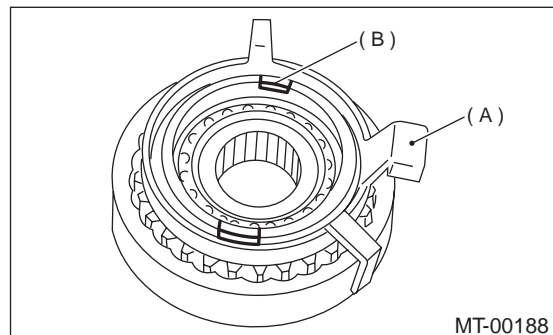


- 3) Remove 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



- (A) 5th-Rev sleeve and hub ASSY
(B) Baulk ring
(C) 5th drive gear

- 4) Remove snap ring and synchro cone stopper from 5th-Rev sleeve and hub assembly.



- (A) Synchro cone stopper
(B) Snap ring

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

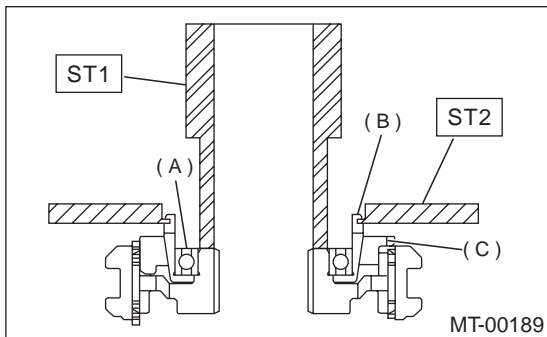
MANUAL TRANSMISSION AND DIFFERENTIAL

5) Using ST1, ST2 and a press, remove ball bearing, synchro cone and baulk ring (Rev).

NOTE:

- Replace sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.
- Do not reuse ball bearing.

ST1 499757002 INSTALLER
ST2 498077400 SYNCHRO CONE REMOVER



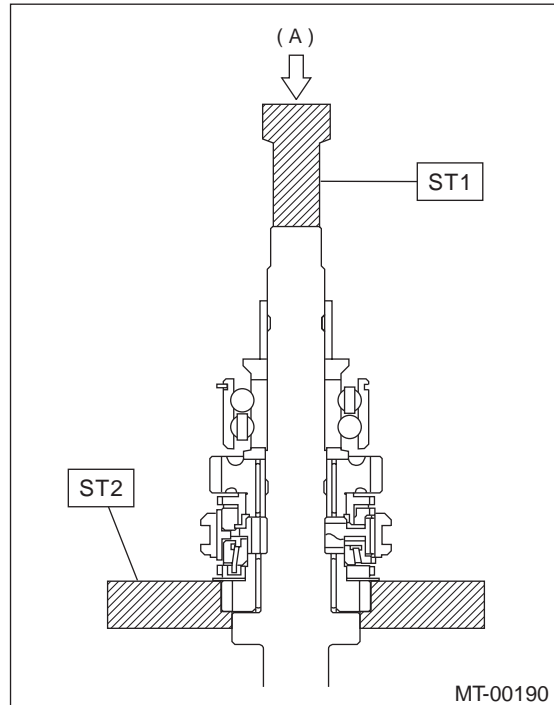
- (A) Ball bearing
- (B) Synchro cone
- (C) Baulk ring

6) Using ST1 and ST2, remove the rest of parts.

NOTE:

Replace sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, marking engagement point on splines beforehand.

ST1 899864100 REMOVER
ST2 899714110 REMOVER



- (A) Press

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

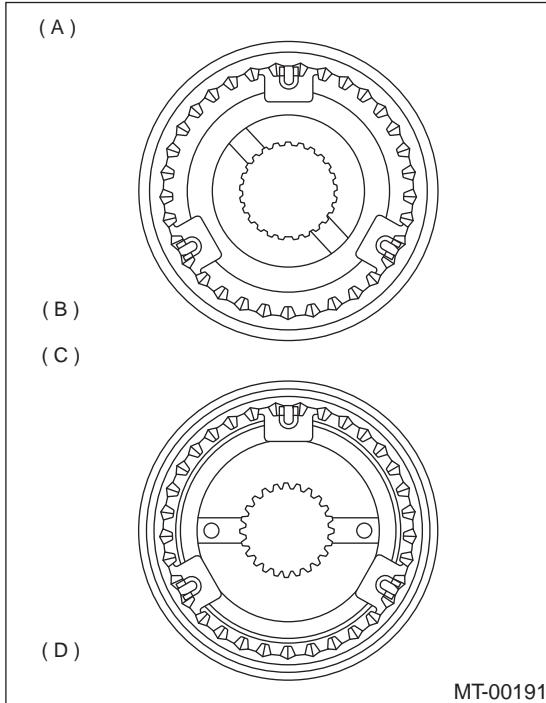
D: ASSEMBLY

1. 2.0 L SOHC

1) Assemble when each sleeve and hub assembly are disassembled.

NOTE:

Position open ends of spring 120° apart.



- (A) 3rd-4th hub ASSY
- (B) 3rd gear side
- (C) 5th-Rev hub ASSY
- (D) 5th gear side

2) Install 3rd drive gear, baulk ring, sleeve and hub assembly for 3rd needle bearing on transmission main shaft.

NOTE:

Align groove in baulk ring with shifting insert.

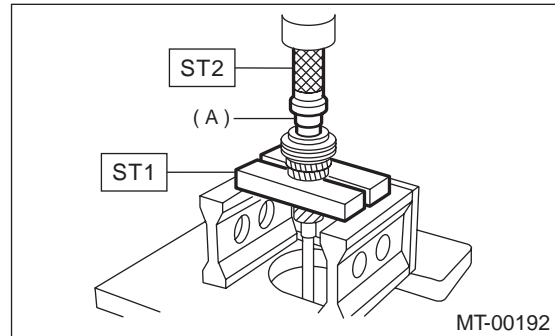
3) Install 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER

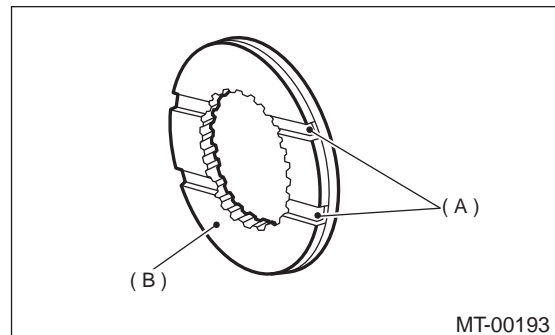


(A) 4th needle bearing race

4) Install baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:

Align baulk ring and gear & hub assembly with key groove.



- (A) Groove
- (B) 4th gear side

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

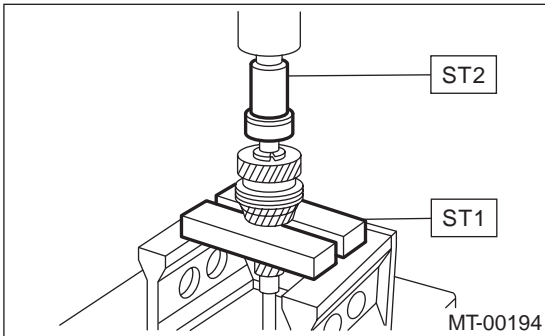
5) Drive ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



6) Using ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

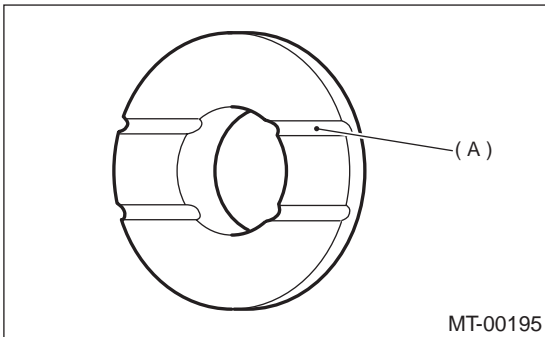
NOTE:

• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

• Face thrust washer in the correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to 5th gear side.

7) Install bearing onto synchro cone.

8) Install baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

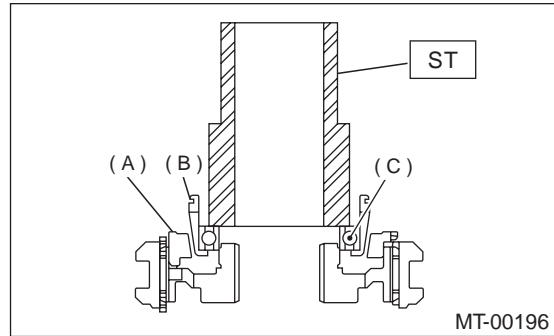
NOTE:

• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

• Use new ball bearing.

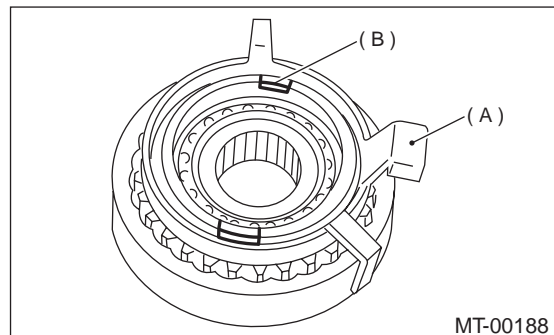
• After press fitting, make sure synchro cone rotates freely.

ST 499757002 INSTALLER



- (A) Baulk ring
- (B) Synchro cone
- (C) Ball bearing

9) Install synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.



- (A) Synchro cone stopper
- (B) Snap ring

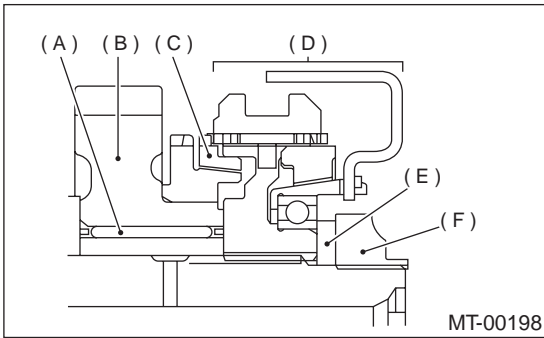
MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

10) Install the rest parts to the rear section of transmission main shaft.

NOTE:

Align groove in baulk ring with shifting insert.



- (A) Needle bearing
- (B) 5th drive gear
- (C) Baulk ring
- (D) 5th-Rev sleeve and hub ASSY
- (E) Lock washer
- (F) Lock nuts

11) Tighten lock nuts to the specified torque using ST1 and ST2.

NOTE:

Secure lock nuts in two places after tightening.

- ST1 499987003 SOCKET WRENCH
- ST2 498937000 TRANSMISSION HOLDER

Tightening torque:

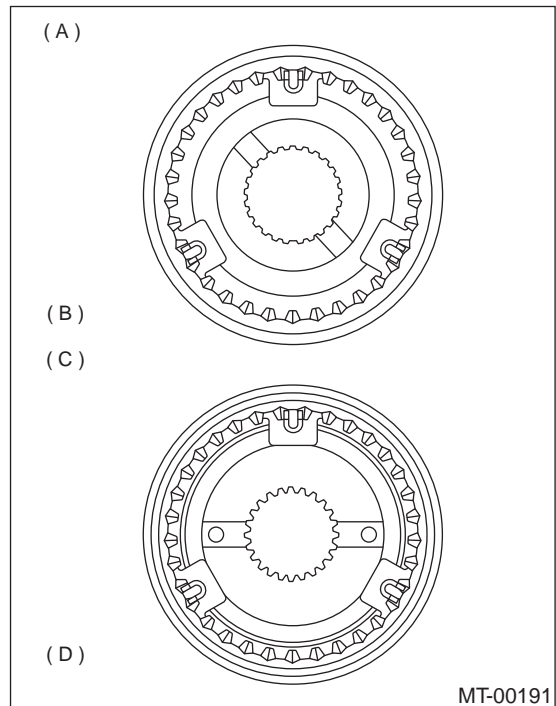
118 N·m (12.0 kgf·m, 86.8 ft·lb)

2. EXCEPT 2.0 L SOHC

1) Assemble each sleeve and hub assembly.

NOTE:

Position open ends of spring 120° apart.



- (A) 3rd-4th hub ASSY
- (B) 3rd gear side
- (C) 5th-Rev hub ASSY
- (D) 5th gear side

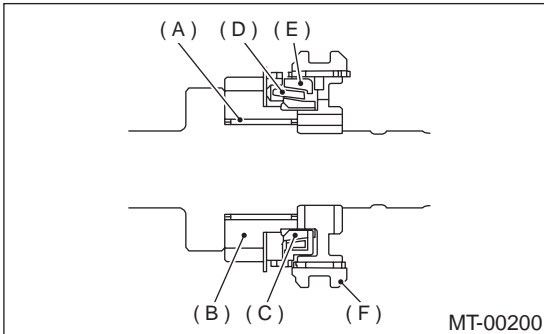
MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

2) Install 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve and hub assembly for 3rd needle bearing on transmission main shaft.

NOTE:

Align groove in baulk ring with shifting insert.



- (A) 3rd needle bearing
- (B) 3rd drive gear
- (C) Inner baulk ring
- (D) Synchro cone
- (E) Outer baulk ring
- (F) Sleeve and hub ASSY

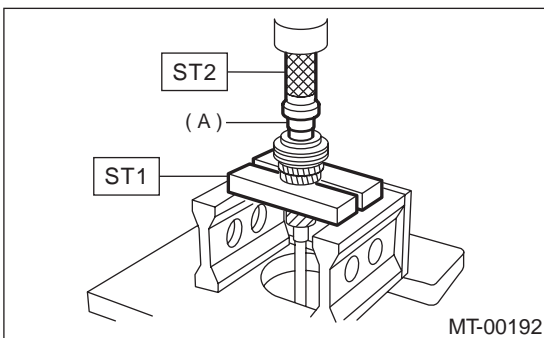
3) Install 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER

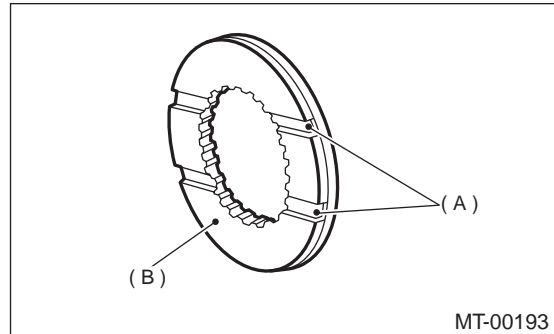


- (A) 4th needle bearing race

4) Install baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:

Align baulk ring and gear & hub assembly with key groove.



- (A) Groove
- (B) 4th gear side

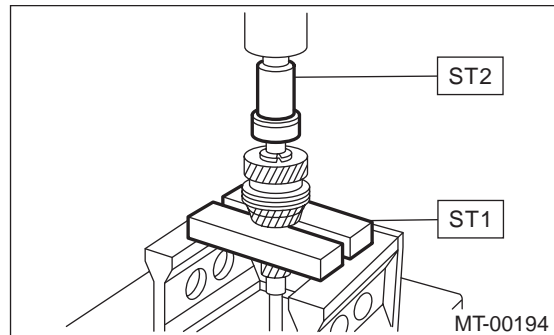
5) Drive ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

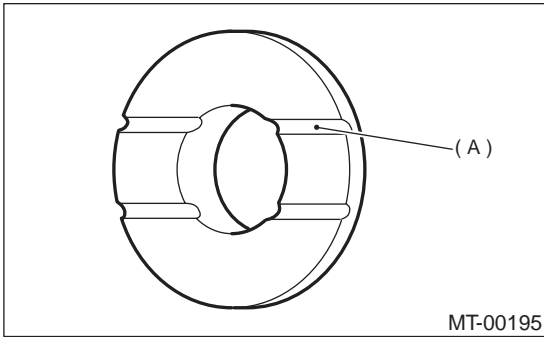
MANUAL TRANSMISSION AND DIFFERENTIAL

6) Using ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

NOTE:

- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Face thrust washer in the correct direction.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



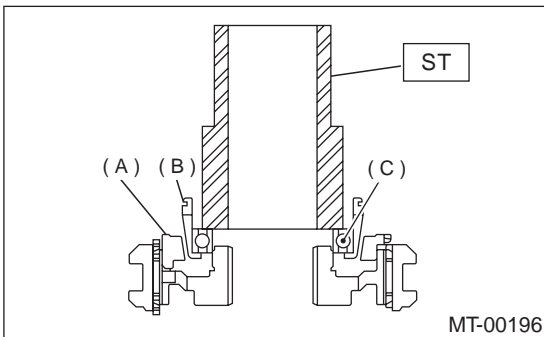
(A) Face this surface to 5th gear side.

7) Install bearing onto synchro cone.
8) Install baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

NOTE:

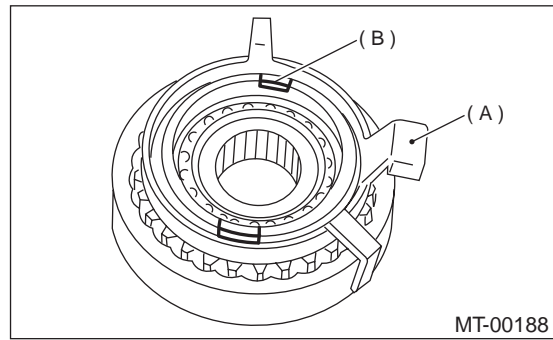
- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Use new ball bearing.
- After press fitting, make sure synchro cone rotates freely.

ST 499757002 INSTALLER



(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

9) Install synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.

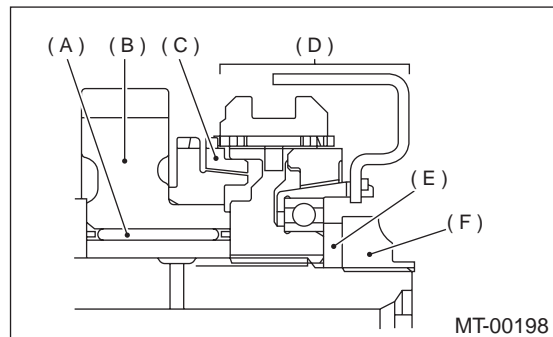


(A) Synchro cone stopper
(B) Snap ring

10) Install the rest parts to the rear section of transmission main shaft.

NOTE:

Align groove in baulk ring with shifting insert.



(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th-Rev sleeve and hub ASSY
(E) Lock washer
(F) Lock nuts

11) Tighten lock nuts to the specified torque using ST1 and ST2.

NOTE:

Secure lock nuts in two places after tightening.

ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:

120 N·m (12.2 kgf-m, 88.2 ft-lb)

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears

- Replace gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
- Correct or replace if the cone that contacts the baulk ring is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

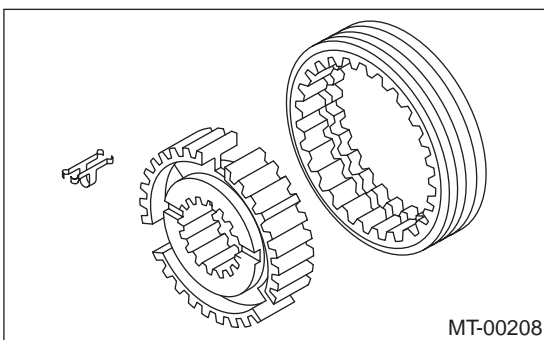
4) Baulk ring

Replace the ring in the following cases:

- When the inner surface and end face are damaged.
- When the ring inner surface is abnormally or partially worn down.
- When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.



6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

F: ADJUSTMENT

Selection of main shaft rear plate

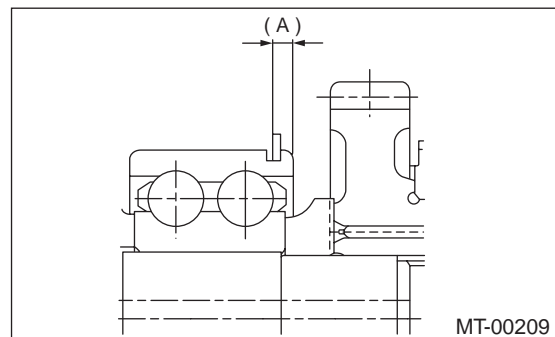
Using ST, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table:

NOTE:

Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

ST 498147000 DEPTH GAUGE

Dimension (A) mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2



MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

16. Main Shaft Assembly for Dual-Range

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove transmission case. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove main shaft assembly and input shaft assembly.

B: INSTALLATION

- 1) Install the needle bearing onto the front of transmission main shaft assembly.
- 2) Connect main shaft assembly and input shaft assembly.
- 3) Install needle bearing outer race knock pin hole into transmission case knock pin.
- 4) Install the drive pinion assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>
- 5) Install transmission case. <Ref. to MT-61, INSTALLATION, Transmission Case.>
- 6) Install transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 7) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

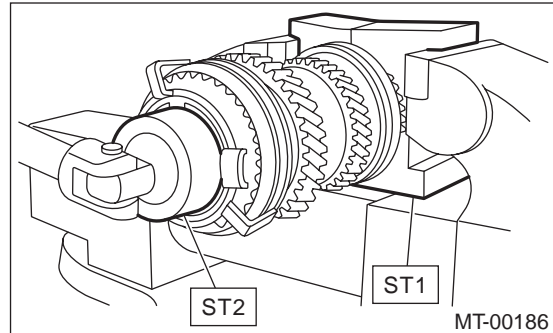
C: DISASSEMBLY

- 1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.
- 2) Remove lock nut from transmission main shaft assembly.

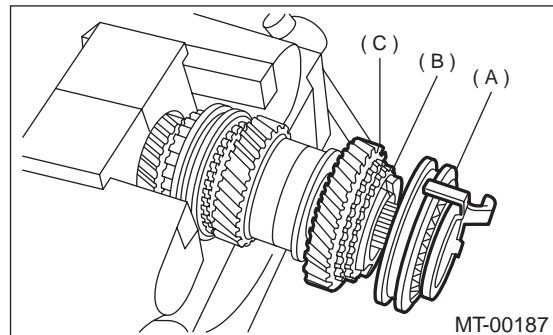
NOTE:

Remove caulking before taking off lock nut.

- ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)

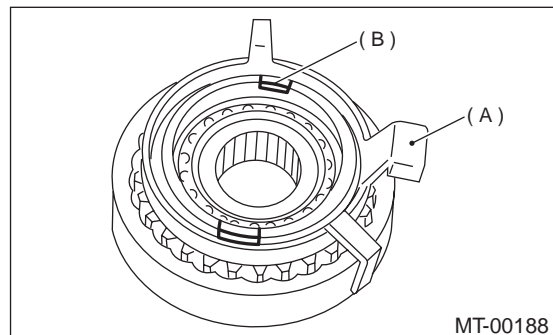


- 3) Remove 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



- (A) 5th-Rev sleeve and hub ASSY
(B) Baulk ring
(C) 5th drive gear

- 4) Remove snap ring and synchro cone stopper from 5th-Rev sleeve and hub assembly.



- (A) Synchro cone stopper
(B) Snap ring

MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

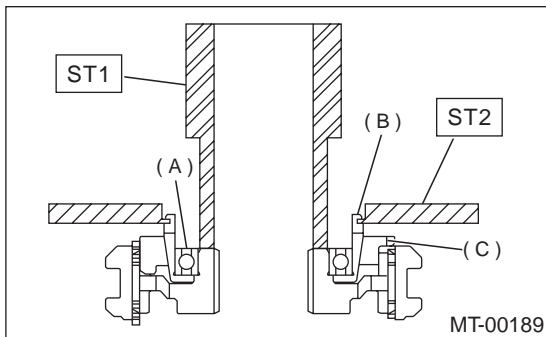
MANUAL TRANSMISSION AND DIFFERENTIAL

5) Using ST1, ST2 and a press, remove ball bearing, synchro cone and baulk ring (Rev).

NOTE:

- Replace sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.
- Do not reuse ball bearing.

ST1 499757002 INSTALLER
ST2 498077400 SYNCHRO CONE REMOVER



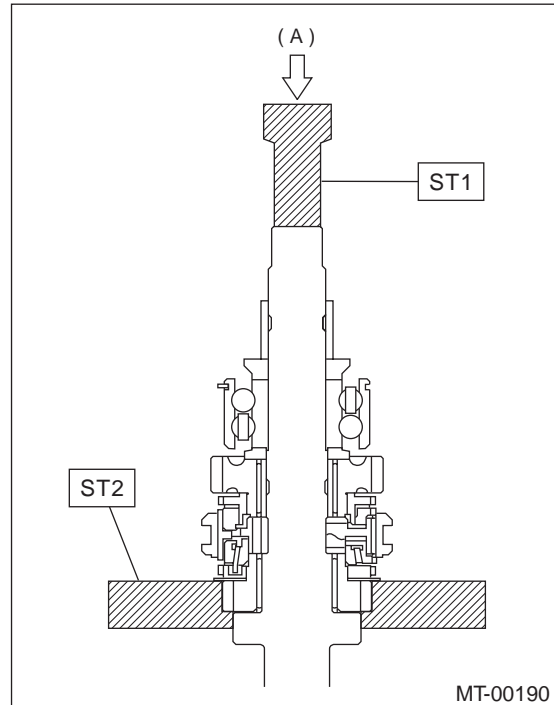
- (A) Ball bearing
- (B) Synchro cone
- (C) Baulk ring

6) Using ST1 and ST2, remove the rest of parts.

NOTE:

Replace sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, marking engagement point on splines beforehand.

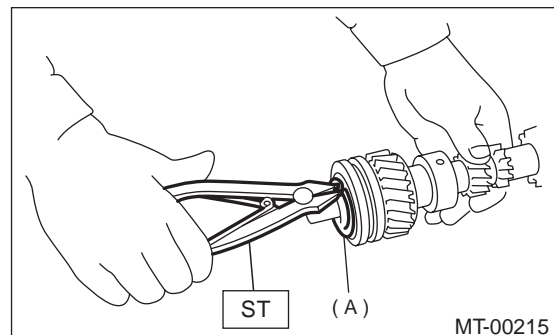
ST1 899864100 REMOVER
ST2 899714110 REMOVER



- (A) Press

7) Remove snap ring from main shaft.

ST 899474100 EXPANDER

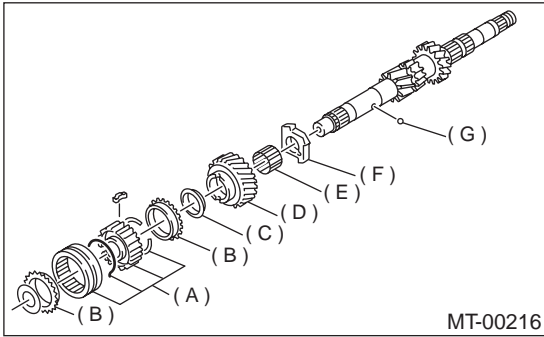


- (A) Snap ring

MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

8) Remove the rest of parts.



- (A) Sleeve and hub ASSY
- (B) High-low baulk ring
- (C) Friction damper
- (D) Low input gear
- (E) Needle bearing
- (F) Input low gear spacer
- (G) Ball

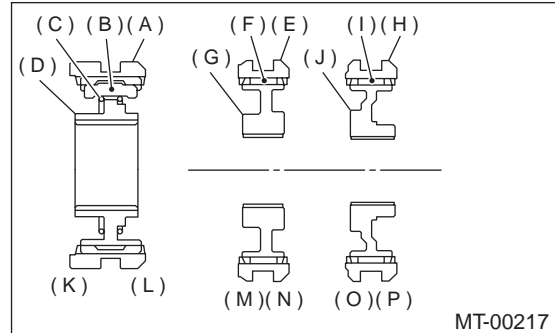
D: ASSEMBLY

1. 2.0 L

1) Assemble when each sleeve and hub assembly are disassembled.

NOTE:

Position open ends of spring 120° apart.



- (A) High-low coupling sleeve
- (B) Shifting insert
- (C) High-low synchronizer spring
- (D) High-low synchronizer hub
- (E) Sleeve
- (F) Insert key
- (G) 3rd-4th synchronizer hub
- (H) Sleeve
- (I) Insert key
- (J) 5th-Rev synchronizer hub
- (K) High side
- (L) Low side
- (M) 3rd side
- (N) 4th side
- (O) 5th side
- (P) Rev side

MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

2) Install 3rd drive gear, baulk ring, sleeve and hub assembly for 3rd-4th needle bearing on transmission main shaft.

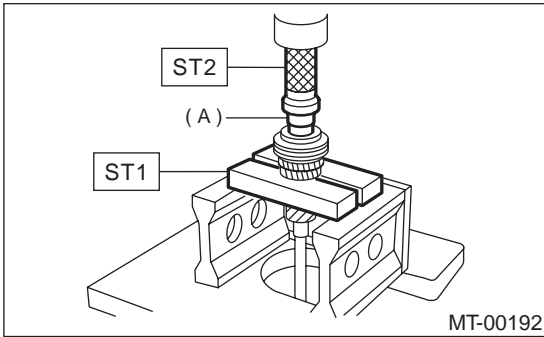
NOTE:

Align groove in baulk ring with shifting insert.

3) Install 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER

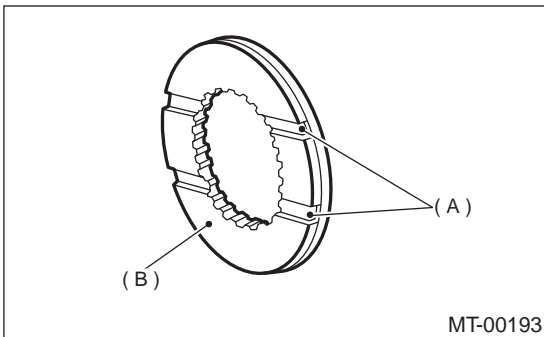


(A) 4th needle bearing race

4) Install baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:

Face thrust washer in the correct direction.



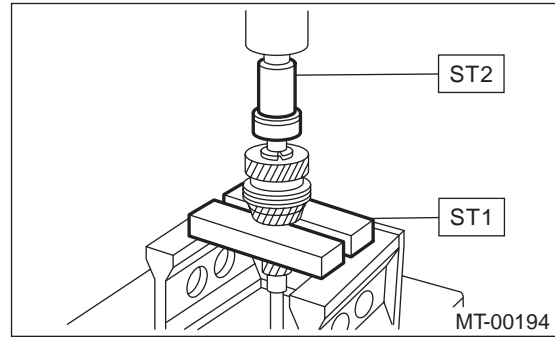
(A) Groove

(B) 4th gear side

5) Drive ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



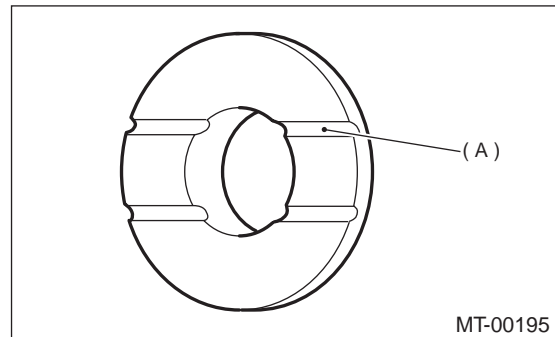
6) Using ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

NOTE:

Face thrust washer in the correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to 5th gear side.

7) Install bearing onto synchro cone.

MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

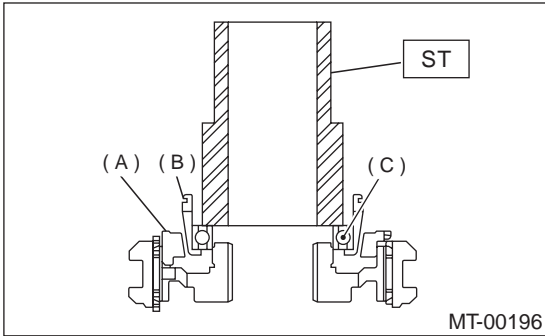
MANUAL TRANSMISSION AND DIFFERENTIAL

8) Install new baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

NOTE:

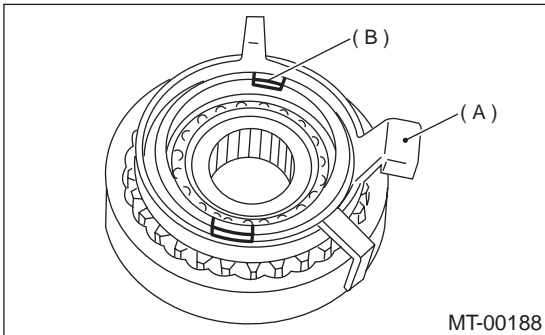
After press fitting, make sure synchro cone rotates freely.

ST 499757002 INSTALLER



- (A) Baulk ring
- (B) Synchro cone
- (C) Ball bearing

9) Install synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.

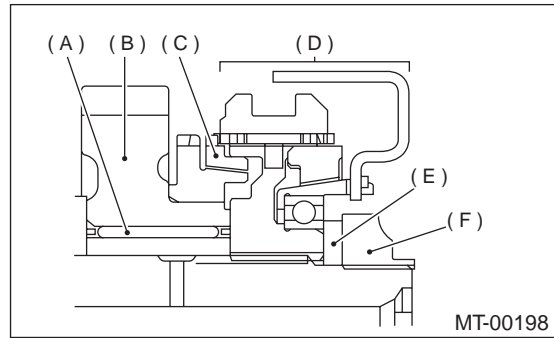


- (A) Synchro cone stopper
- (B) Snap ring

10) Install the rest parts to the rear section of transmission main shaft.

NOTE:

Align groove in baulk ring with shifting insert.



- (A) Needle bearing
- (B) 5th drive gear
- (C) Baulk ring
- (D) 5th-Rev sleeve and hub ASSY
- (E) Lock washer
- (F) Lock nuts

11) Tighten lock nuts to the specified torque using ST1 and ST2.

NOTE:

Secure lock nuts in two places after tightening.

ST1 499987003 SOCKET WRENCH

ST2 498937000 TRANSMISSION HOLDER

Tightening torque:

120 N·m (12.2 kgf·m, 88.2 ft·lb)

12) Install needle bearing on main shaft.

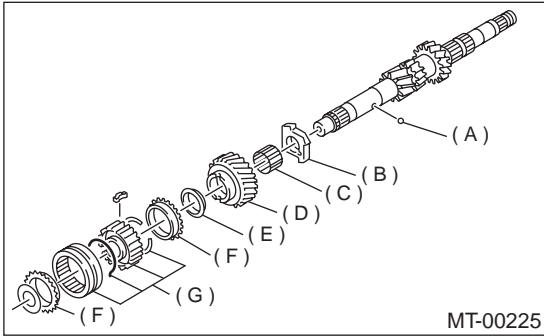
MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

13) Install the parts to the front section of transmission main shaft.

NOTE:

- Be careful not to damage the graded section of transmission main shaft when installing needle bearing.
- Face the grooved side toward input gear.
- Align high-low baulk ring's groove with shifting insert.



- (A) Ball
- (B) Input low gear spacer
- (C) Needle bearing
- (D) Low input gear
- (E) Friction damper
- (F) High-low baulk ring
- (G) Sleeve and hub ASSY

14) Install new snap ring to the rod section of transmission main shaft using ST1 and ST2.

NOTE:

Select a suitable outer snap ring so that axial clearance between snap ring and hub is held within 0.060 to 0.100 mm (0.0024 to 0.0039 in).

- ST1 499757002 INSTALLER
- ST2 499757001 SNAP RING GUIDE

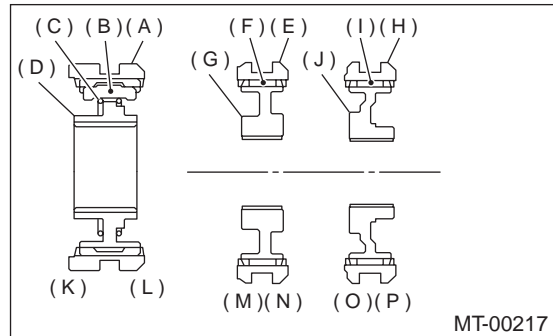
Snap ring	
Part No.	Thickness mm (in)
805025051	2.42 (0.0953)
805025052	2.47 (0.0972)
805025053	2.52 (0.0992)
805025054	2.57 (0.1012)
805025055	2.62 (0.1031)
805025056	2.67 (0.1051)
805025057	2.72 (0.1071)
805025058	2.37 (0.0933)

2. EXCEPT 2.0 L

1) Assemble when each sleeve and hub assembly are disassembled.

NOTE:

Position open ends of spring 120° apart.

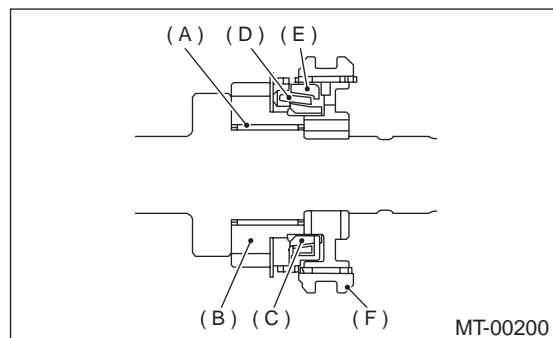


- (A) High-low coupling sleeve
- (B) Shifting insert
- (C) High-low synchronizer spring
- (D) High-low synchronizer hub
- (E) Sleeve
- (F) Insert key
- (G) 3rd-4th synchronizer hub
- (H) Sleeve
- (I) Insert key
- (J) 5th-Rev synchronizer hub
- (K) High side
- (L) Low side
- (M) 3rd side
- (N) 4th side
- (O) 5th side
- (P) Rev side

2) Install 3rd drive gear, inner baulk ring, outer baulk ring, synchro cone sleeve and hub assembly for 3rd needle bearing on transmission main shaft.

NOTE:

Align groove in baulk ring with shifting insert.

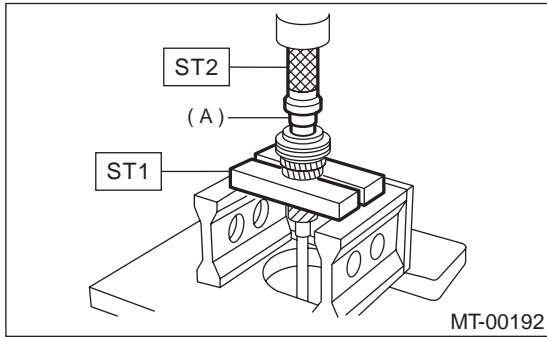


MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

3) Install 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

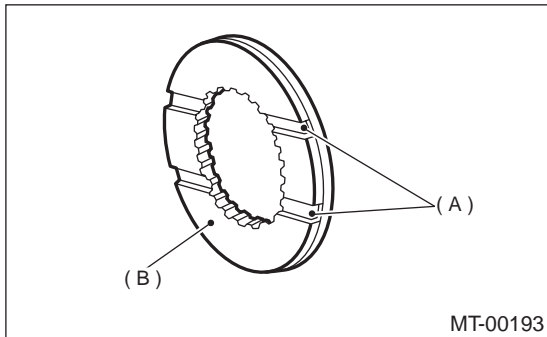
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

4) Install baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

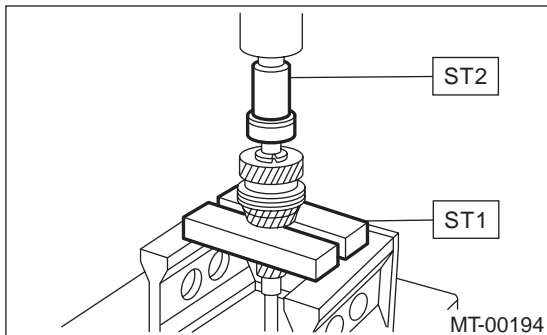
NOTE:
Face thrust washer in the correct direction.



(A) Groove
(B) 4th gear side

5) Drive ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

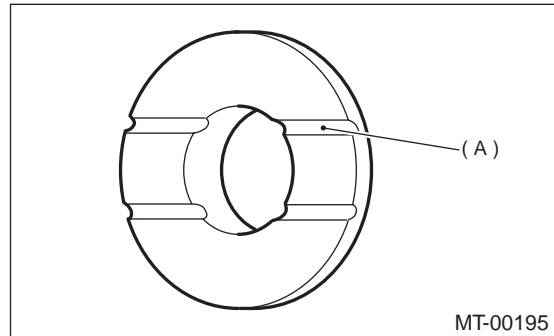
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



6) Using ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

NOTE:
Face thrust washer in the correct direction.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

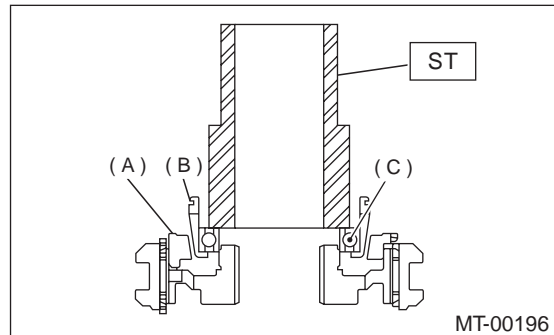


(A) Face this surface to 5th gear side.

7) Install bearing onto synchro cone.
8) Install new baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

NOTE:
After press fitting, make sure synchro cone rotates freely.

ST 499757002 INSTALLER

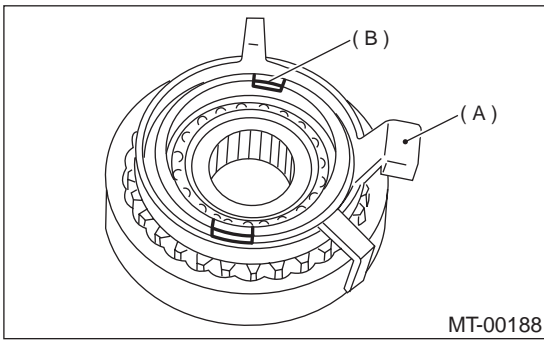


(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

9) Install synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.

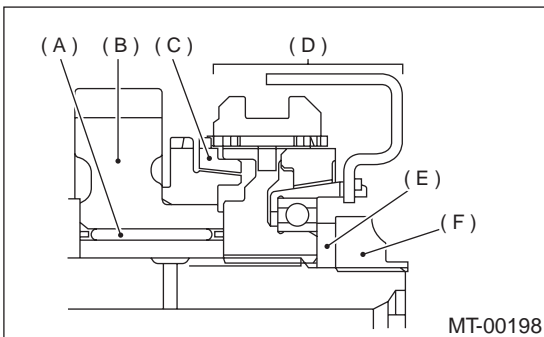


- (A) Synchro cone stopper
- (B) Snap ring

10) Install the rest parts to the rear section of transmission main shaft.

NOTE:

Align groove in baulk ring with shifting insert.



- (A) Needle bearing
- (B) 5th drive gear
- (C) Baulk ring
- (D) 5th-Rev sleeve and hub ASSY
- (E) Lock washer
- (F) Lock nuts

11) Tighten lock nuts to the specified torque using ST1 and ST2.

NOTE:

Secure lock nuts in two places after tightening.

- ST1 499987003 SOCKET WRENCH
- ST2 498937000 TRANSMISSION HOLDER

Tightening torque:

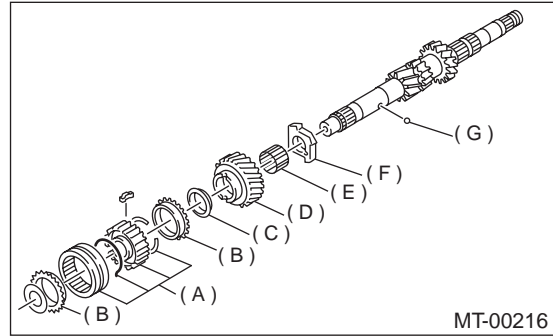
120 N·m (12.2 kgf·m, 88.2 ft·lb)

12) Install needle bearing on main shaft.

13) Install the parts to the front section of transmission main shaft.

NOTE:

- Be careful not to damage the graded section of transmission main shaft when installing needle bearing.
- Face the grooved side toward input gear.
- Align high-low baulk ring's groove with shifting insert.



- (A) Sleeve and hub ASSY
- (B) High-low baulk ring
- (C) Friction damper
- (D) Low input gear
- (E) Needle bearing
- (F) Input low gear spacer
- (G) Ball

14) Install new snap ring to the rod section of transmission main shaft using ST1 and ST2.

NOTE:

Select a suitable outer snap ring so that axial clearance between snap ring and hub is held within 0.060 to 0.100 mm (0.0024 to 0.0039 in).

- ST1 499757002 INSTALLER
- ST2 499757001 SNAP RING GUIDE

Snap ring	
Part No.	Thickness mm (in)
805025051	2.42 (0.0953)
805025052	2.47 (0.0972)
805025053	2.52 (0.0992)
805025054	2.57 (0.1012)
805025055	2.62 (0.1031)
805025056	2.67 (0.1051)
805025057	2.72 (0.1071)
805025058	2.37 (0.0933)

MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears

- Replace gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
- Correct or replace if the cone that contacts the baulk ring is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

4) Baulk ring

Replace the ring in the following cases:

- When the inner surface and end face are damaged.
- When the ring inner surface is abnormally or partially worn down.
- When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.

6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

F: ADJUSTMENT

Choose main shaft rear plate. <Ref. to MT-73, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

INPUT SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

17. Input Shaft Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove transmission case. <Ref. to MT-59, REMOVAL, Transmission Case.>
- 4) Remove drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove main shaft assembly and input shaft assembly.

B: INSTALLATION

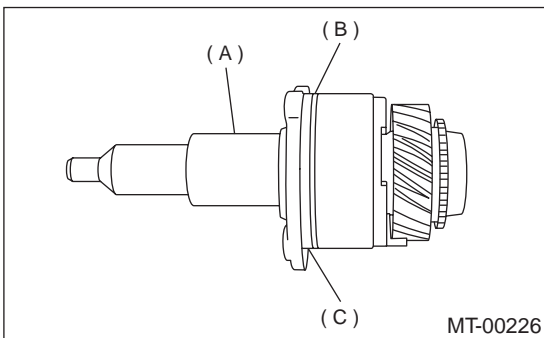
- 1) Install the needle bearing onto the front of the transmission main shaft assembly.
- 2) Connect main shaft assembly and input shaft assembly.
- 3) Install needle bearing outer race knock pin hole into transmission case knock pin.
- 4) Install the drive pinion assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>
- 5) Install the transmission case. <Ref. to MT-61, INSTALLATION, Transmission Case.>
- 6) Install the transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 7) Install manual transmission assembly on vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

- 1) Remove O-ring from input shaft holder. Also, remove input shaft holder shim.

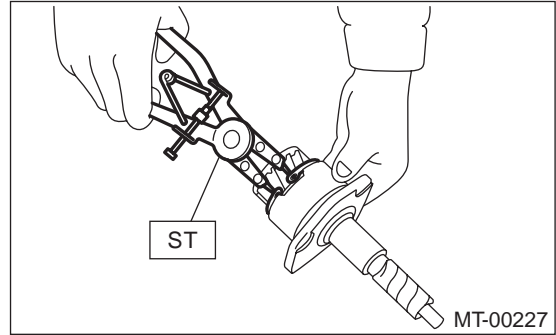
NOTE:

Sometimes, shim may not be available.

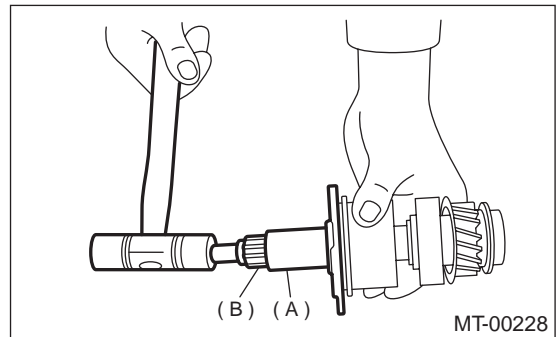


- (A) Input shaft holder
- (B) O-ring
- (C) Input shaft holder shim

- 2) Put vinyl tape around input shaft splines to protect oil seal from damage.
- 3) Remove inner snap ring.
ST 398663600 PLIERS

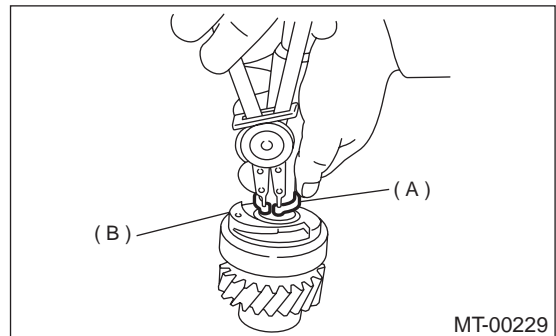


- 4) Hold input shaft holder stationary and remove input shaft by tapping its end with a plastic hammer.



- (A) Input shaft holder
- (B) Input shaft

- 5) Remove outer snap ring. Then remove oil squeeze plate and straight pin.

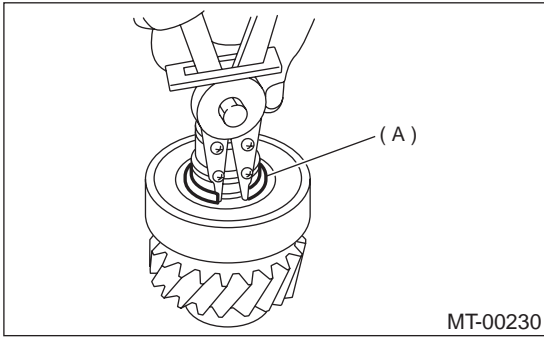


- (A) Snap ring
- (B) Oil squeeze plate

INPUT SHAFT ASSEMBLY

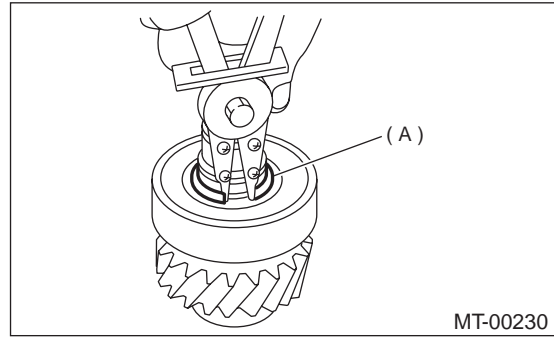
MANUAL TRANSMISSION AND DIFFERENTIAL

6) Remove snap ring.



(A) Snap ring

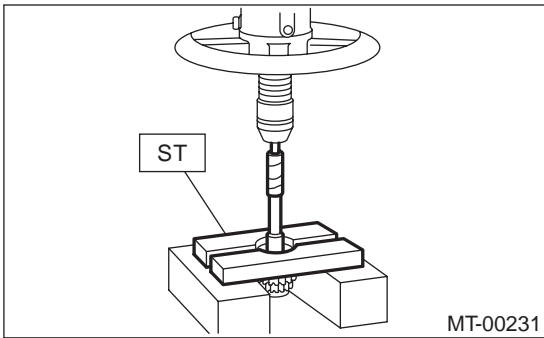
2) Install snap ring on input shaft.



(A) Snap ring

7) Remove inner snap ring.

8) Using a press and ST, remove ball bearing.
ST 498077000 RETAINER



9) Remove oil seal from input shaft holder.

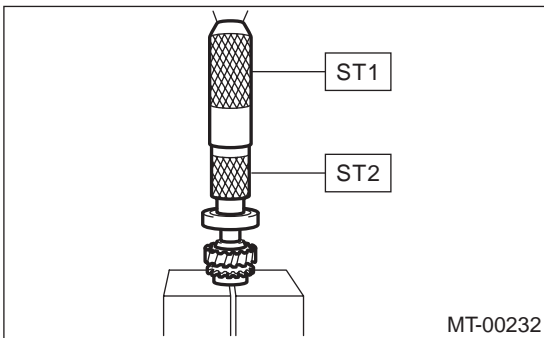
D: ASSEMBLY

1) Install ball bearing onto input shaft.

NOTE:

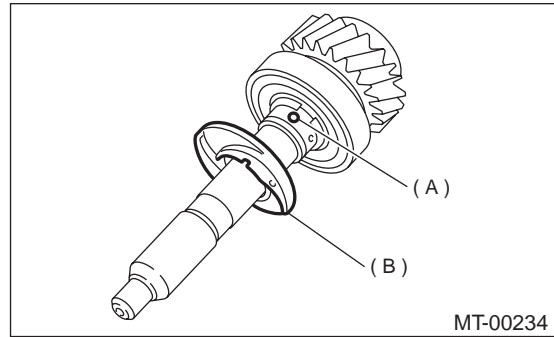
Place snap ring between input shaft gear and ball bearing beforehand. Use the table at 8) as a guide in selecting a suitable snap ring.

ST1 899580100 INSTALLER
ST2 399513600 INSTALLER



3) Inspect clearance between ball bearing and snap ring. <Ref. to MT-85, INSPECTION, Input Shaft Assembly.>

4) Install straight pin and oil squeeze plate to input shaft.



(A) Straight pin

(B) Oil squeeze plate

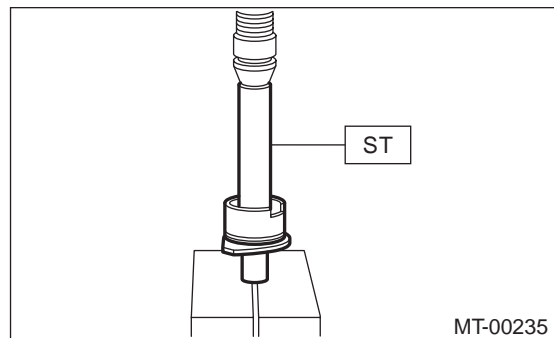
5) Install snap ring.

6) Drive oil seal into input shaft holder.

NOTE:

Apply a coat of grease to sealing lips before installing oil seal.

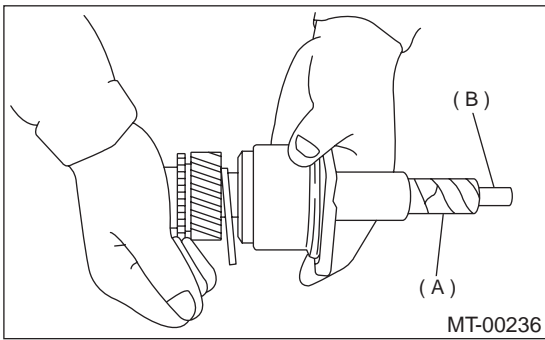
ST 398507703 DUMMY COLLAR



INPUT SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

7) Wind vinyl tape around shaft splines and insert input shaft into holder by lightly tapping it by hand.



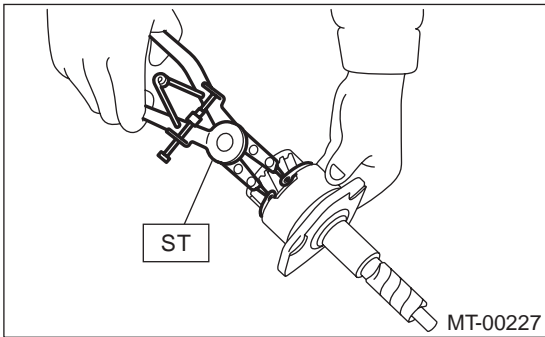
- (A) Vinyl tape
- (B) Input shaft

8) Install snap ring to input shaft holder.

NOTE:

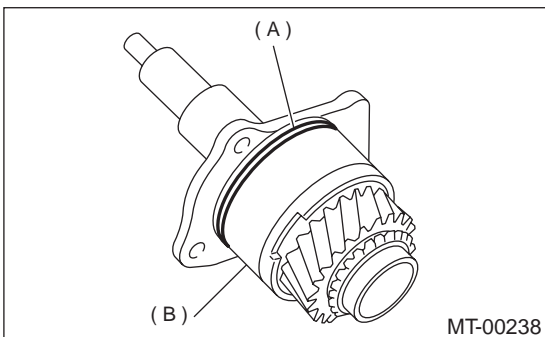
Select a suitable snap ring so that clearance between snap ring and bearing is held within 0 to 0.12 mm (0 to 0.0047 in).

ST 398663600 PLIERS



Snap ring	
Part No.	Thickness mm (in)
805168020	1.84 (0.0724)
805168030	1.92 (0.0756)
805168040	2.00 (0.0787)

9) Install new O-ring on input shaft holder.



- (A) O-ring
- (B) Input shaft holder

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears

- Replace gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
- Correct or replace if the cone that contacts the baulk ring is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

4) Baulk ring

Replace the ring in the following cases:

- When the inner surface and end face are damaged.
- When the ring inner surface is abnormally or partially worn down.
- When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.

6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

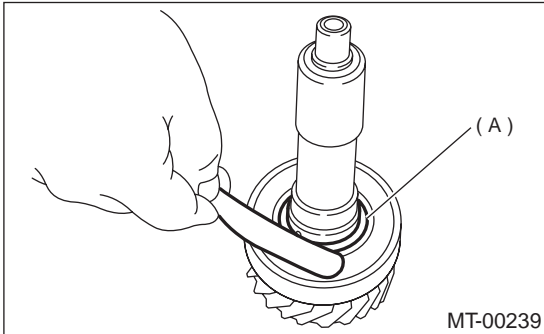
INPUT SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

9) Measure clearance between snap ring and ball bearing.

Clearance:

0 — 0.12 mm (0 — 0.0047 in)



(A) Snap ring

If the measurement is not within specifications, select suitable snap ring.

Snap ring	
Part No.	Thickness mm (in)
805028050	2.48 (0.0976)
805028060	2.56 (0.1008)
805028070	2.64 (0.1039)

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

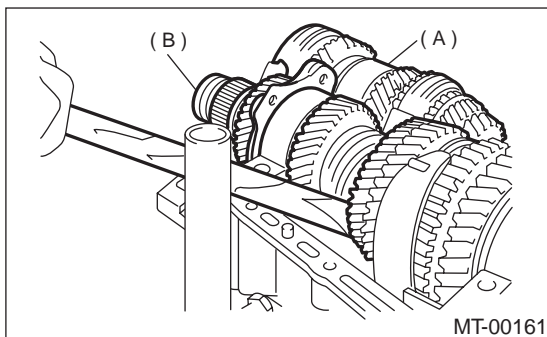
18. Drive Pinion Shaft Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove transmission case. <Ref. to MT-59, REMOVAL, Transmission Case.>
- 4) Remove drive pinion shaft assembly.

NOTE:

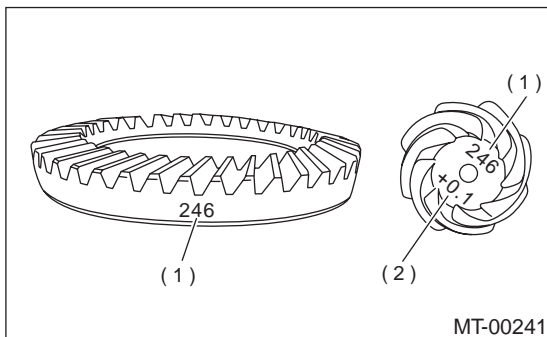
Use a hammer handle, etc. to remove if too tight.



- (A) Main shaft assembly
- (B) Drive pinion shaft assembly

B: INSTALLATION

- 1) Remove differential assembly.
- 2) Alignment marks/numbers on hypoid gear set
The upper number on driven pinion is the match number for combining it with hypoid driven gear. The lower number is for shim adjustment. If no lower number is shown, the value is zero. The number on hypoid driven gear indicates a number for combination with drive pinion.



- (1) Match number
- (2) Shim adjustment number

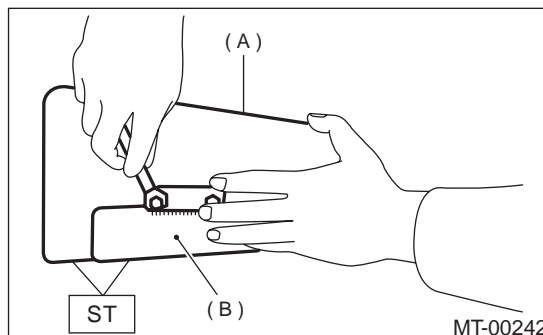
- 3) Place drive pinion shaft assembly on right hand transmission main case without shim and tighten bearing mounting bolts.

- 4) Inspection and adjustment of ST

NOTE:

- Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.
- Tighten the two bolts.

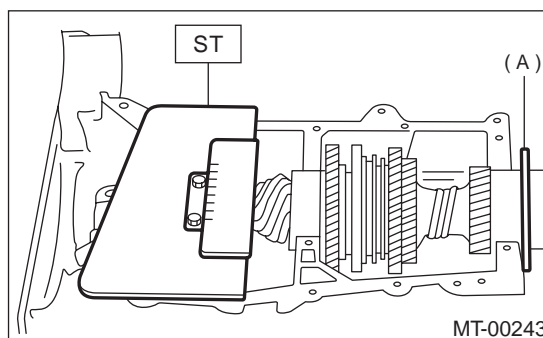
ST 499917500 DRIVE PINION GAUGE ASSY



- (A) Plate
- (B) Scale

- 5) Position the ST by inserting the knock pin of ST into the knock hole in the transmission case.
ST 499917500 DRIVE PINION GAUGE ASSY

- 6) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.
ST 499917500 DRIVE PINION GAUGE ASSY



- (A) Adjust clearance to zero without shim.

- 7) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on the ST. (Add if the number on drive pinion is prefixed by + and subtract if the number is prefixed by -.)

ST 499917500 DRIVE PINION GAUGE ASSY

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

8) Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the said value.

Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

9) Install differential assembly. <Ref. to MT-95, INSTALLATION, Front Differential Assembly.>

10) Set transmission main shaft assembly and drive pinion assembly in position. (So there is no clearance between the two when moved all the way to the front). Inspect suitable 1st — 2nd, 3rd — 4th and 5th shifter fork so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms. <Ref. to MT-92, INSPECTION, Drive Pinion Shaft Assembly.>

11) Install transmission case. <Ref. to MT-61, INSTALLATION, Transmission Case.>

12) Install transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>

13) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

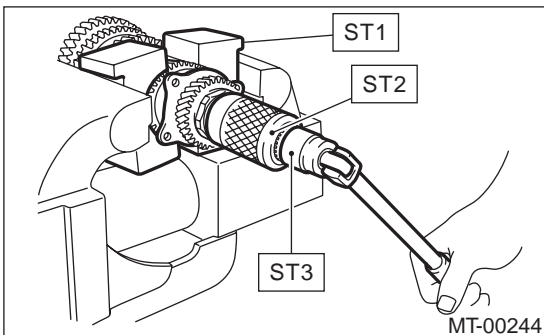
C: DISASSEMBLY

NOTE:

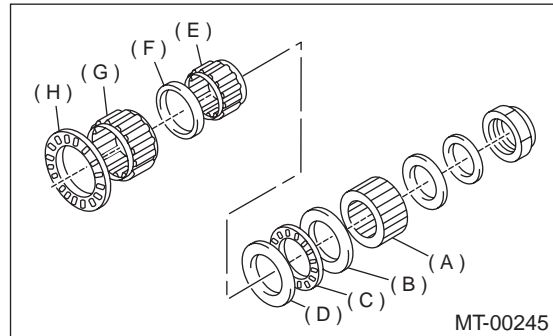
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) during disassembly or reassembly to prevent damage.

1) Straighten lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.

ST1 899884100 HOLDER
 ST2 498427100 STOPPER
 ST3 899988608 SOCKET WRENCH



2) Withdraw drive pinion from driven shaft. Remove differential bevel gear sleeve, adjusting washer No. 1, adjusting washer No. 2, thrust bearing, needle bearing, drive pinion collar, needle bearing and thrust bearing.



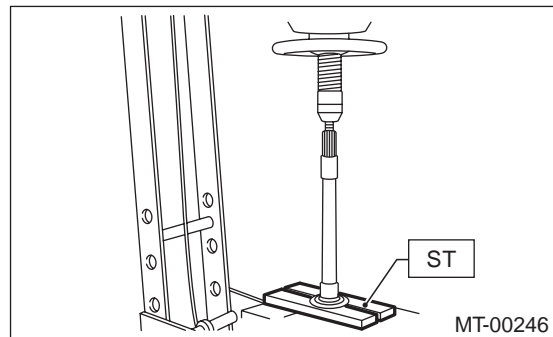
- (A) Differential bevel gear sleeve
- (B) Washer No. 1 (25 × 37.5 × t)
- (C) Thrust bearing (25 × 37.5 × 3)
- (D) Washer No. 2 (25 × 37.5 × 4)
- (E) Needle bearing (25 × 30 × 20)
- (F) Drive pinion collar
- (G) Needle bearing (30 × 37 × 23)
- (H) Thrust bearing (33 × 50 × 3)

3) Remove roller bearing and washer using ST and press.

NOTE:

Do not reuse roller bearing.

ST 498077000 REMOVER

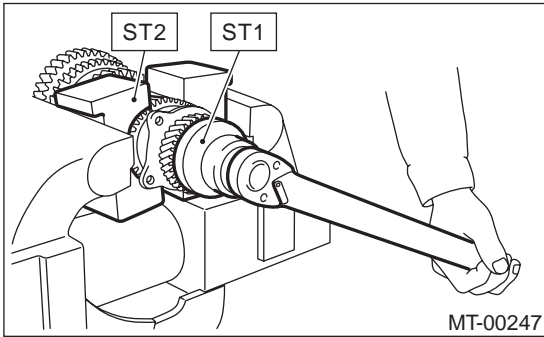


DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

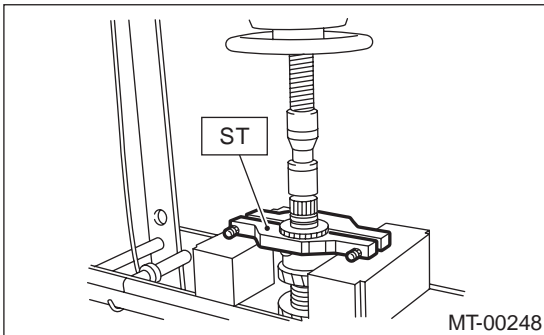
4) Straighten lock nut at staked portion. Remove the lock nut using ST1 and ST2.

ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



5) Remove 5th driven gear using ST.

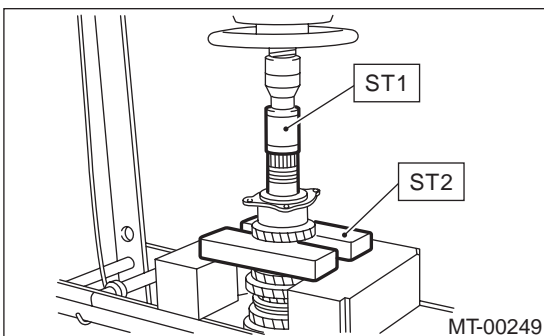
ST 499857000 5TH DRIVEN GEAR REMO-
VER



6) Remove woodruff key.

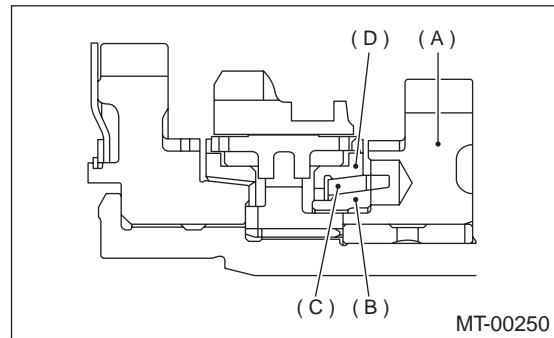
7) Remove roller bearing, 3rd-4th driven gear using ST1 and ST2.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER



8) Remove the key.

9) Remove 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring.



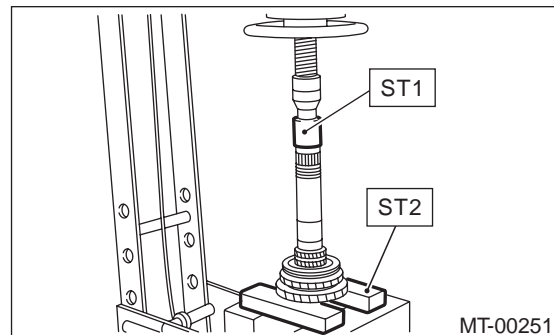
(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

10) Remove 1st driven gear, 2nd gear bushing, gear and hub using ST1 and ST2.

NOTE:

Replace gear and hub if necessary. Do not attempt to disassemble if at all possible because they must engage at a specified point. If they have to be disassembled, mark the engaging point beforehand.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER



11) Remove sub gear for 1st driven gear.

DRIVE PINION SHAFT ASSEMBLY

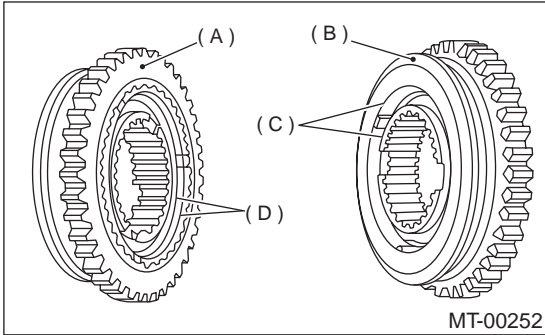
MANUAL TRANSMISSION AND DIFFERENTIAL

D: ASSEMBLY

1) Install sleeve and assembly by matching alignment marks.

NOTE:

- Use new gear and hub assembly, if gear or hub have been replaced.



- (A) 1st gear side
- (B) 2nd gear side
- (C) Flush surface
- (D) Stepped surface

2) Install washer, snap ring and sub gear (except for Europe model) to 1st driven gear.

3) Install 1st driven gear, 1st baulk ring, gear and hub assembly onto driven shaft.

NOTE:

- Take care to install gear and hub assembly in proper direction.
- Align baulk ring and gear & hub assembly with key groove.

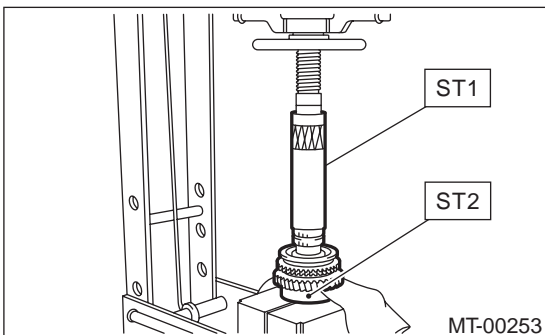
4) Install 2nd driven gear bushing onto driven shaft using ST1, ST2 and press.

NOTE:

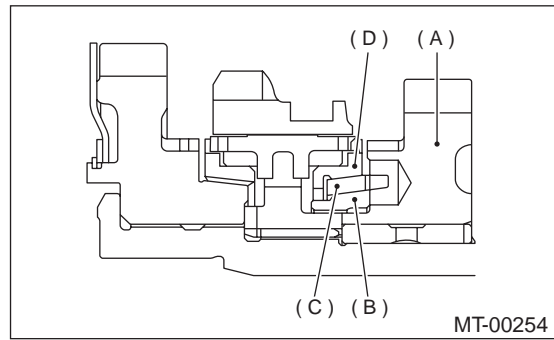
- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Attach a cloth to the end of driven shaft to prevent damage.
- When press fitting, align oil holes of shaft and bush.

ST1 499277200 INSTALLER

ST2 499587000 INSTALLER



5) Install 2nd driven gear, inner baulk ring, synchro cone, outer baulk ring and insert onto driven shaft.



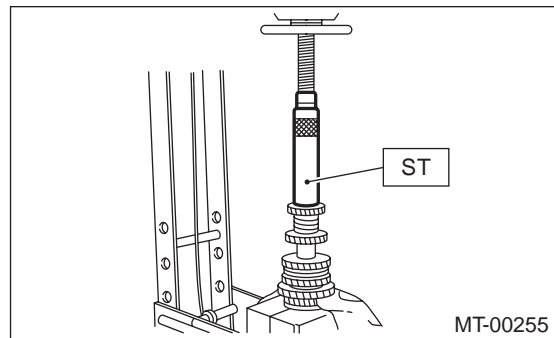
- (A) 2nd driven gear
- (B) Inner baulk ring
- (C) Synchro cone
- (D) Outer baulk ring

6) After installing key on driven shaft, install 3rd-4th driven gear using ST and press.

NOTE:

- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Align groove in baulk ring with insert.

ST 499277200 INSTALLER

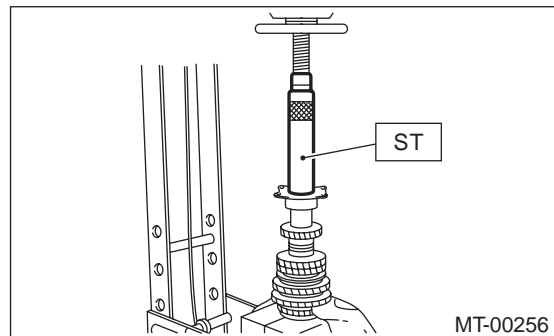


7) Install a set of roller bearings onto the driven shaft using ST and press.

NOTE:

- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST 499277200 INSTALLER



DRIVE PINION SHAFT ASSEMBLY

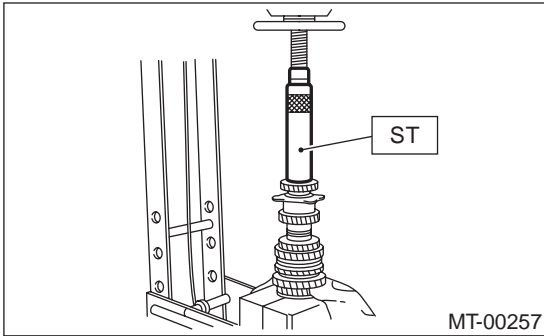
MANUAL TRANSMISSION AND DIFFERENTIAL

8) Position woodruff key in groove on the rear of driven shaft. Install 5th driven gear onto drive shaft using ST and press.

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST 499277200 INSTALLER

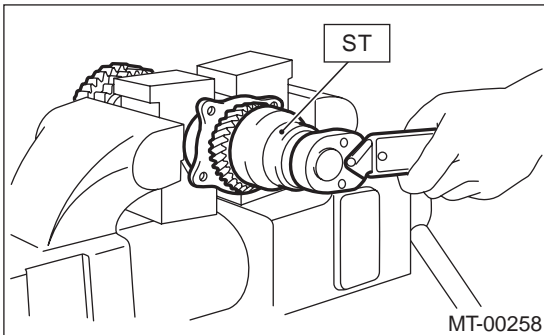


9) Install lock washer. Install lock nut and tighten to the specified torque using ST.

ST 499987300 SOCKET WRENCH (50)

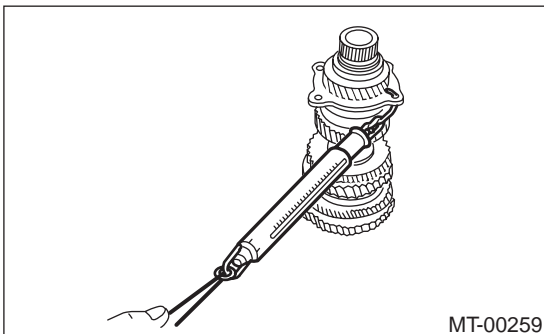
Tightening torque:

260 N·m (26.5 kgf·m, 192 ft·lb)



10) Stake lock nut at two points.

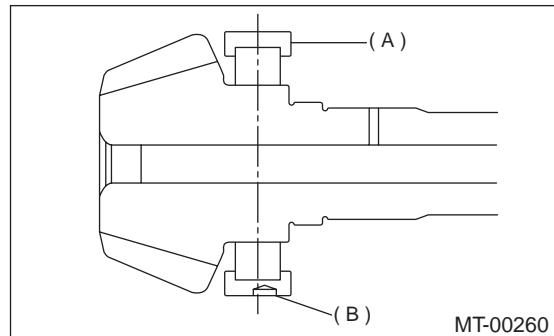
11) Using spring balancer, check that starting torque of roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.33ft).



12) Install roller bearing onto drive pinion.

NOTE:

When installing roller bearing, note its directions (front and rear) because knock pin hole in outer race is offset.



(A) Roller bearing

(B) Knock pin hole

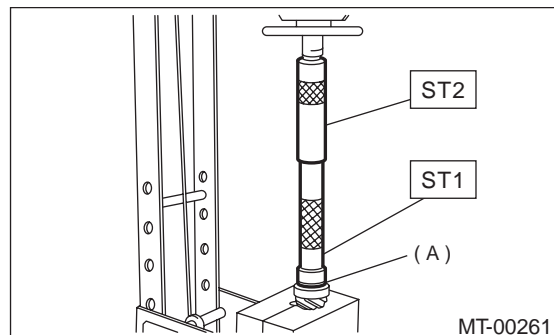
13) Install washer using ST1, ST2 and press.

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

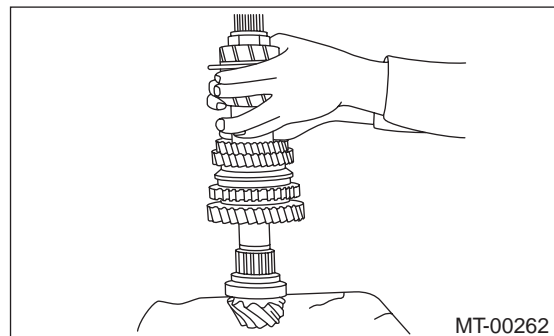
ST1 499277100 BUSHING 1-2 INSTALLER

ST2 499277200 INSTALLER



(A) Washer

14) Install thrust bearing and needle bearing. Install driven shaft assembly.



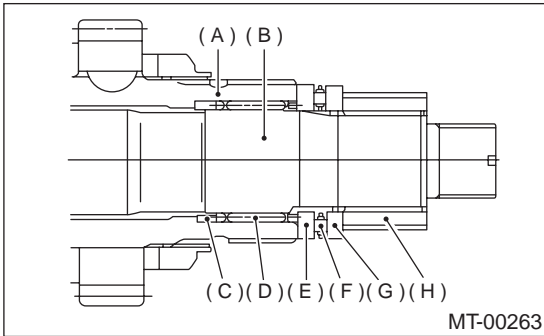
DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

15) Install drive pinion collar, needle bearing, adjusting washer No. 2, thrust bearing, adjusting washer No. 1 and differential bevel gear sleeve in that order.

NOTE:

Be careful because spacer must be installed in proper direction.



- (A) Driven shaft
- (B) Drive shaft
- (C) Drive pinion collar
- (D) Needle bearing (25 × 30 × 20)
- (E) Washer No. 2 (25 × 36 × 4)
- (F) Thrust bearing (25 × 37.5 × 3)
- (G) Washer No. 1 (25 × 36 × t)
- (H) Differential bevel gear sleeve

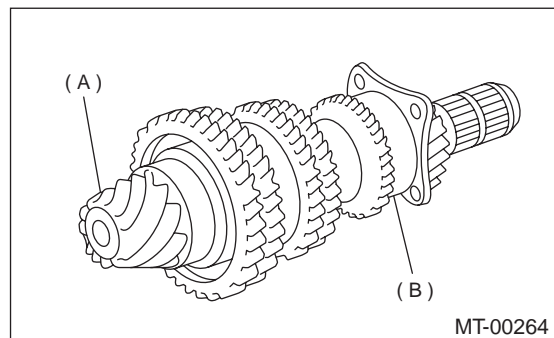
E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- The ball bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike the other bearings.



- (A) Drive pinion shaft
- (B) Ball bearing

- Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears

- Replace gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
- Correct or replace if the cone that contacts the baulk ring is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

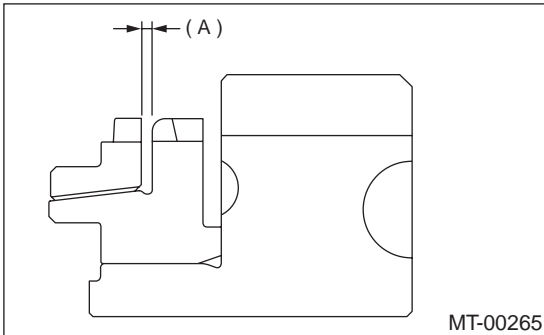
4) Baulk ring

Replace the ring in the following cases:

- When the inner surface and end face are damaged.
- When the ring inner surface is abnormally or partially worn down.
- If the gap between the end faces of the ring and the gear splined part is excessively small when the ring is pressed against the cone.

Clearance (A):

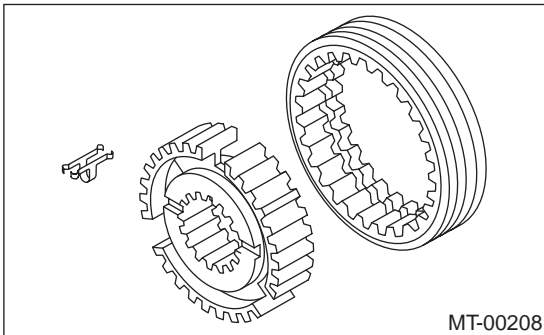
0.5 — 1.0 mm (0.020 — 0.040 in)



- When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.



6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

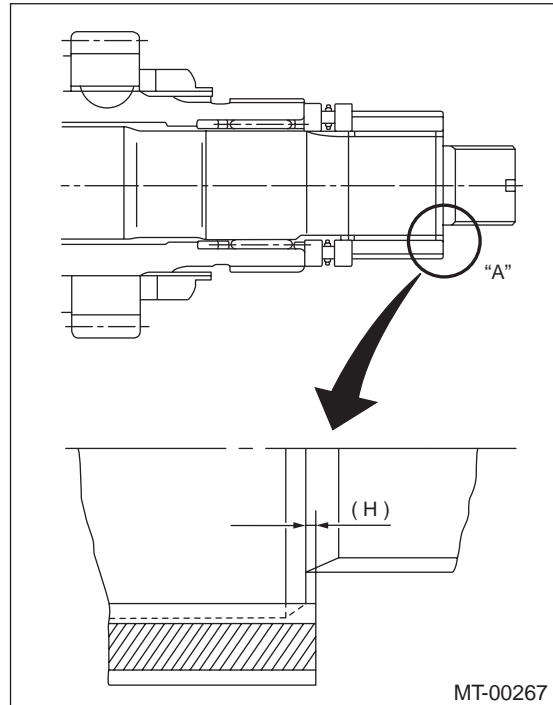
7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

1) After completing the preceding steps 1) through 3), select adjusting washer No. 1 so that dimension (H) is zero through visual check. Position washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and install lock nut (18 × 13.5).

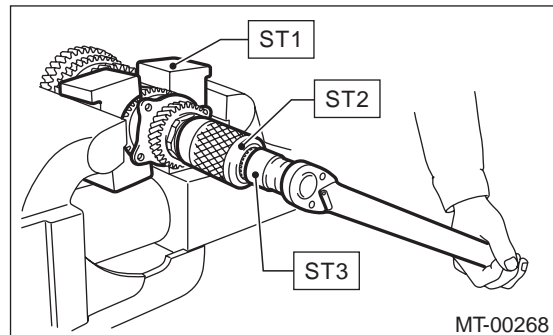


2) Using ST1, ST2 and ST3, tighten lock nut to the specified torque.

ST1	899884100	HOLDER
ST2	498427100	STOPPER
ST3	899988608	SOCKET WRENCH (27)

Tightening torque:

120 N·m (12.2 kgf·m, 88.2 ft·lb)



DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

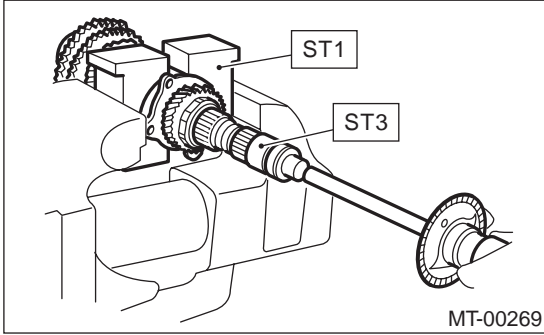
3) After removing ST2, measure starting torque using torque driver.

ST1 899884100 HOLDER

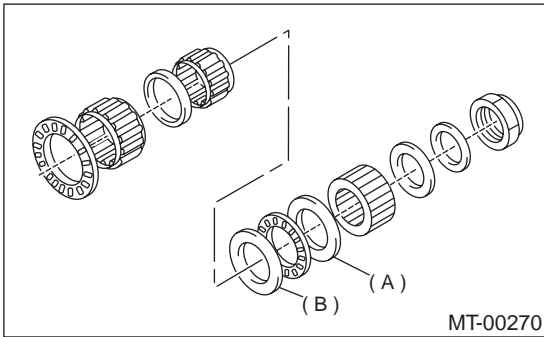
ST3 899988608 SOCKET WRENCH (27)

Starting torque:

0.3 — 0.8 N·m (0.03 — 0.08 kgf·m, 0.2 — 0.6 ft·lb)



4) If starting torque is not within specified limit, select new adjusting washer No. 1 and recheck starting torque.

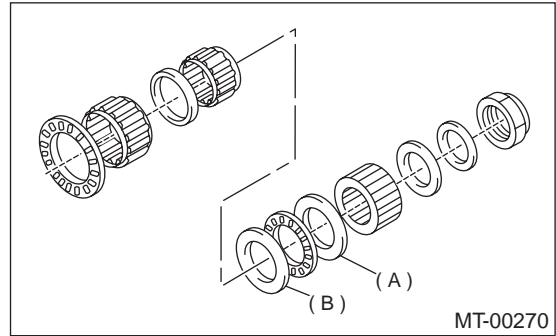


(A) Adjusting washer No. 1

(B) Adjusting washer No. 2

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

5) If specified starting torque range cannot be obtained when a No. 1 adjusting washer is used, then select a suitable No. 2 adjusting washer from those listed in the following table. Repeat steps 1) through 4) to adjust starting torque.



(A) Adjusting washer No. 1

(B) Adjusting washer No. 2

Starting torque	Dimension H	Washer No. 2
Low	Small	Select thicker one.
High	Large	Select thinner one.

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

6) Recheck that starting torque is within specified range, then clinch lock nut at four positions.

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

19. Front Differential Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>

2) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>

3) Remove transmission case. <Ref. to MT-59, REMOVAL, Transmission Case.>

4) Remove drive pinion shaft assembly. Remove transfer case with extension case assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>

5) Remove main shaft assembly.

Single-range model:

<Ref. to MT-66, REMOVAL, Main Shaft Assembly for Single-Range.>

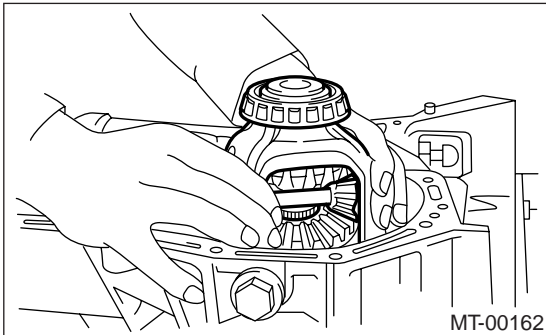
Dual-range model:

<Ref. to MT-74, REMOVAL, Main Shaft Assembly for Dual-Range.>

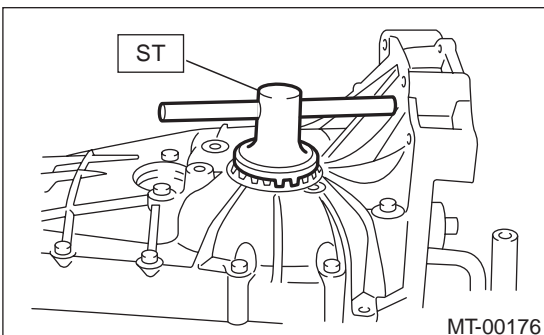
6) Remove differential assembly.

NOTE:

- Be careful not to confuse right and left roller bearing outer races.
- Be careful not to damage retainer oil seal.



7) Remove differential side retainers using ST.
ST 499787000 WRENCH ASSY



8) Remove side bearing outer race from transmission case.

B: INSTALLATION

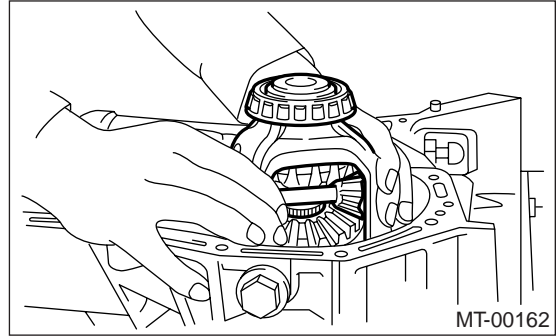
1) Install differential side retainers using ST.

ST 499787000 WRENCH ASSY

2) Install differential assembly.

NOTE:

- Be careful not to fold the sealing lip of oil seal.
- Wrap the left and right splines sections of axle shaft with vinyl tape to prevent scratches.



3) Install main shaft assembly.

Single-range model:

<Ref. to MT-66, INSTALLATION, Main Shaft Assembly for Single-Range.>

Dual-range:

<Ref. to MT-74, INSTALLATION, Main Shaft Assembly for Dual-Range.>

4) Install drive pinion assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>

5) Install transmission case. <Ref. to MT-61, INSTALLATION, Transmission Case.>

6) Install transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>

7) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

C: DISASSEMBLY

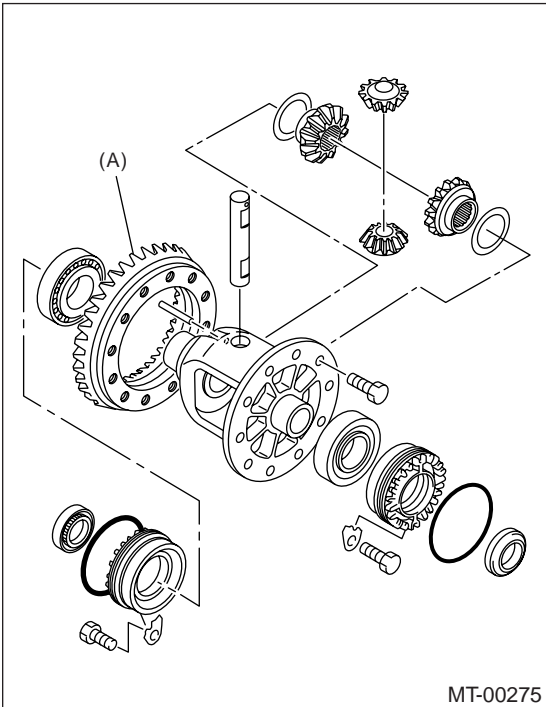
1. DIFFERENTIAL CASE ASSEMBLY

1) Remove right and left snap rings from differential, and then remove two axle drive shafts.

NOTE:

During reassembly, reinstall each axle drive shaft in the same place from which it was removed.

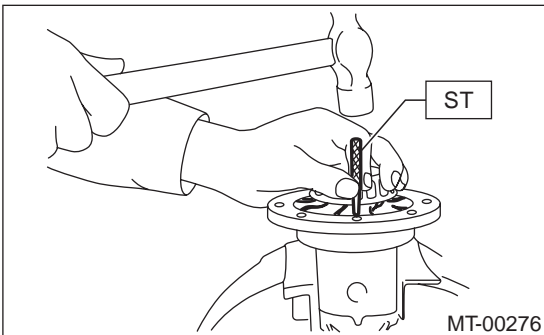
2) Loosen twelve bolts and remove hypoid driven gear.



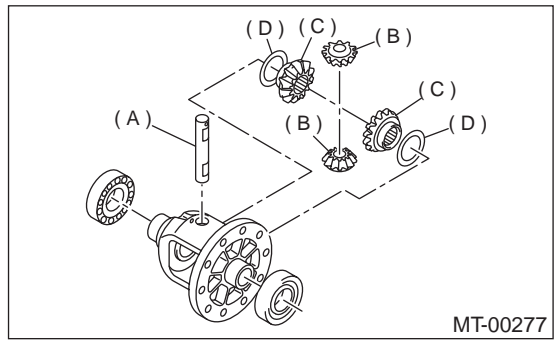
(A) Hypoid driven gear

3) Drive out straight pin from differential assembly toward hypoid driven gear.

ST 899904100 REMOVER

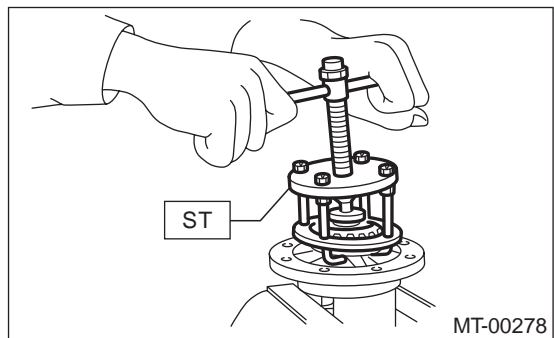


4) Pull out pinion shaft, and remove differential bevel pinion and gear and washer.



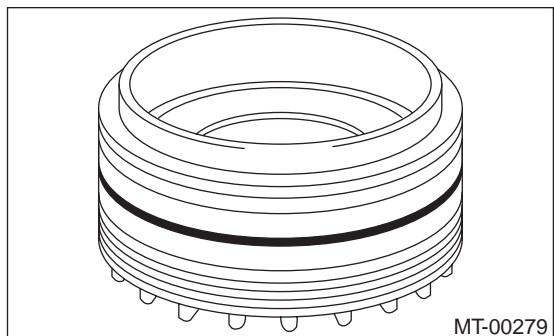
- (A) Pinion shaft
- (B) Bevel pinion
- (C) Bevel gear
- (D) Washer

5) Remove roller bearing using ST.
ST 399527700 PULLER SET



2. SIDE RETAINER

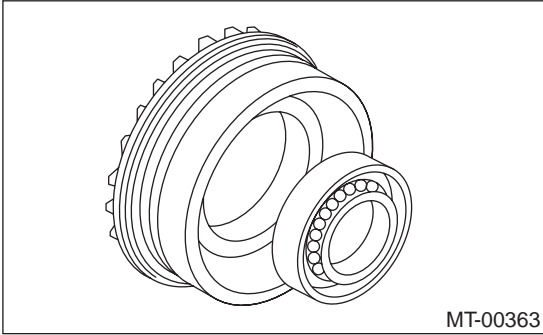
1) Remove O-ring.



FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

2) Remove oil seal.



2) Measure backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it. <Ref. to MT-100, ADJUSTMENT, Front Differential Assembly.>

NOTE:

Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE

ST2 498247100 DIAL GAUGE

Standard backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

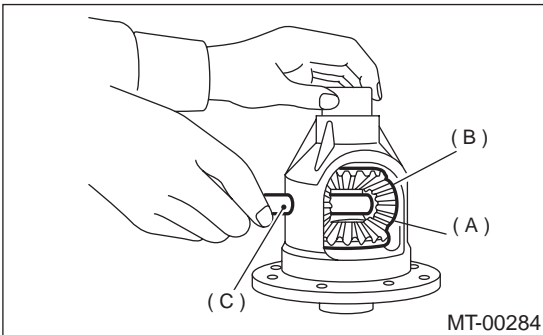
D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install bevel gear and bevel pinion together with washers, and insert pinion shaft.

NOTE:

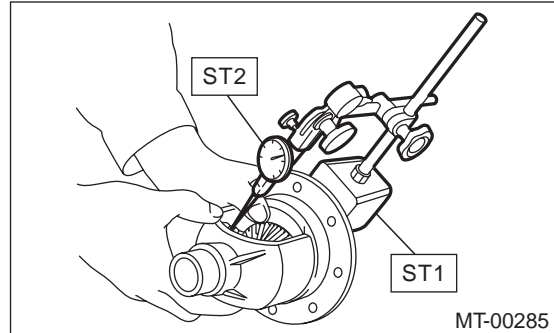
Face the chamfered side of washer toward gear.



(A) Bevel pinion

(B) Bevel gear

(C) Pinion shaft

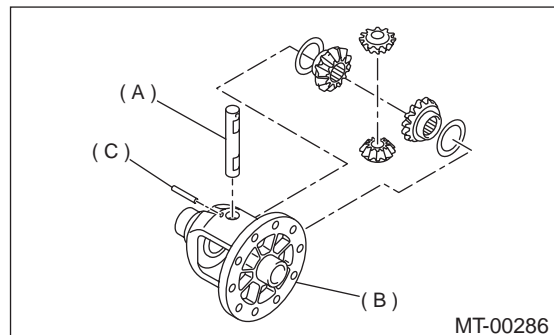


3) Align pinion shaft and differential case at their holes, and drive straight pin into holes from the hypoid driven gear side, using ST.

NOTE:

Lock straight pin after installing.

ST 899904100 REMOVER



(A) Pinion shaft

(B) Differential case

(C) Straight pin

FRONT DIFFERENTIAL ASSEMBLY

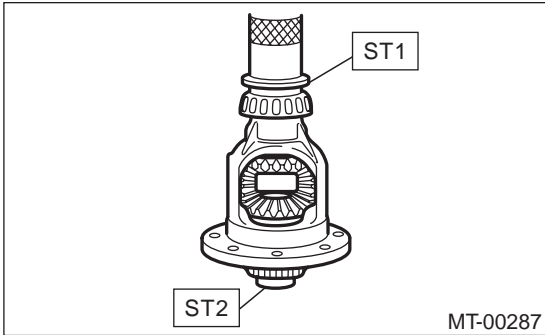
MANUAL TRANSMISSION AND DIFFERENTIAL

4) Install roller bearing to differential case.

NOTE:

- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Be careful because roller bearing outer races are used as a set.

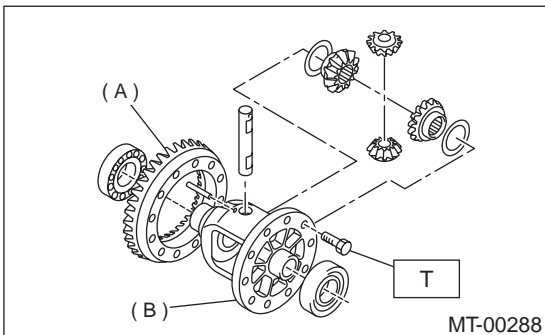
ST1 499277100 BUSHING 1-2 INSTALLER
ST2 398497701 ADAPTER



5) Install hypoid driven gear to differential case using twelve bolts.

Tightening torque:

T: 62 N·m (6.3 kgf·m, 45.6 ft·lb)



- (A) Hypoid driven gear
- (B) Differential case

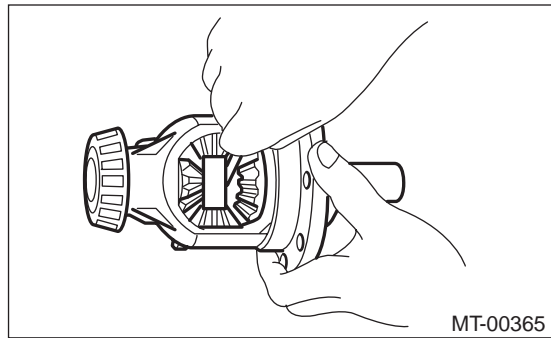
6) Position drive axle shaft in differential case and hold it with outer snap ring (28). Using a thickness gauge, measure clearance between the shaft and case is within specifications.

NOTE:

It is not within specifications, replace snap ring with a suitable one.

Clearance:

0 — 0.25 mm (0 — 0.0098 in)



Snap ring (Outer-28)	
Part No.	Thickness mm (in)
805028011	1.05 (0.0413)
805028012	1.20 (0.0472)

2. SIDE RETAINER

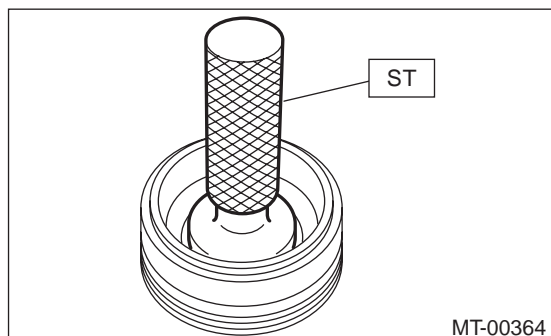
1) Install bearing outer race to side retainer.

NOTE:

Press-in while being careful not to scratch side retainer and bearing outer race.

2) Install new oil seal.

ST 499797000 INSTALLER



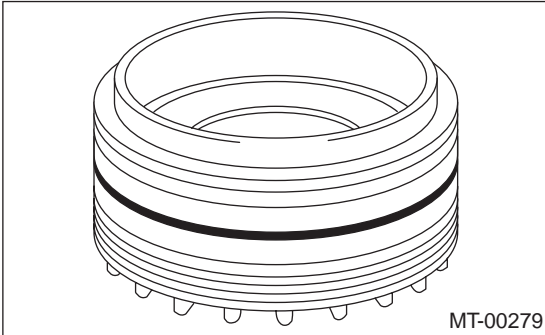
FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

3) Install new O-ring.

NOTE:

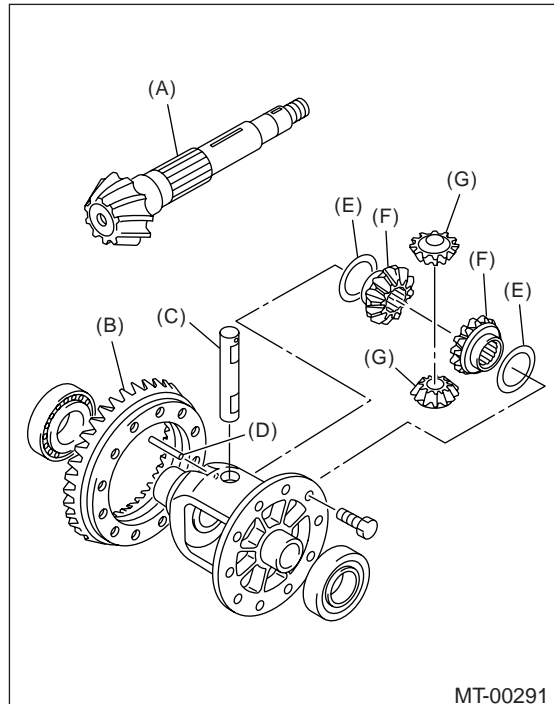
Do not stretch or damage O-ring.



E: INSPECTION

Repair or replace the differential gear in the following cases:

- The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.
- The roller bearing on the drive pinion shaft has a worn or damaged roller path.
- There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.
- The differential case has worn or damaged sliding surfaces.



- (A) Drive pinion shaft
- (B) Hypoid driven gear
- (C) Pinion shaft
- (D) Straight pin
- (E) Washer
- (F) Differential bevel gear
- (G) Differential bevel pinion

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

1. BEVEL PINION GEAR BACKLASH

Measure backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

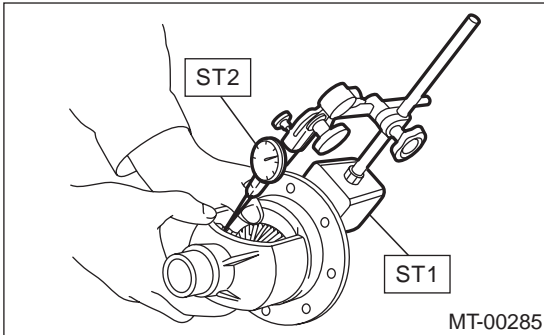
NOTE:

Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Standard backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)



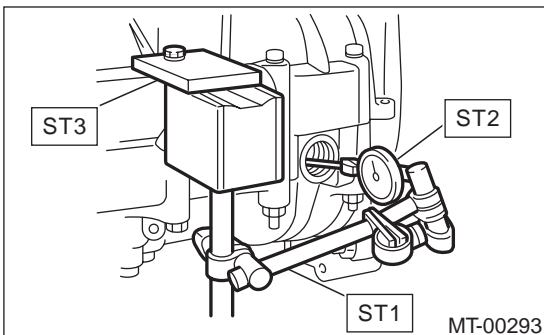
2. HYPOID GEAR BACKLASH

Set ST1, ST2 and ST3. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle and check the backlash.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE
ST3 498255400 PLATE

Backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)



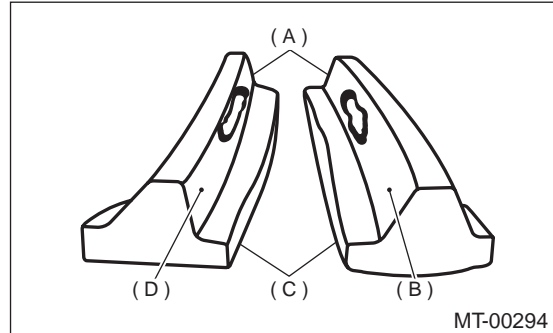
NOTE:

If backlash is outside specified range, adjust it by turning holder in right side case.

3. TOOTH CONTACT OF HYPOID GEAR

Check tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is inaccurate, make adjustment. <Ref. to MT-100, ADJUSTMENT, Front Differential Assembly.>

- Tooth contact is correct.



- (A) Toe
- (B) Coast side
- (C) Heel
- (D) Drive side

F: ADJUSTMENT

1. BEVEL PINION GEAR BACKLASH

- 1) Disassemble the front differential. <Ref. to MT-95, REMOVAL, Front Differential Assembly.>
- 2) Select a different washer from the table and install.

Washer	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

- 3) Adjust until the specified value is obtained.

Standard backlash:

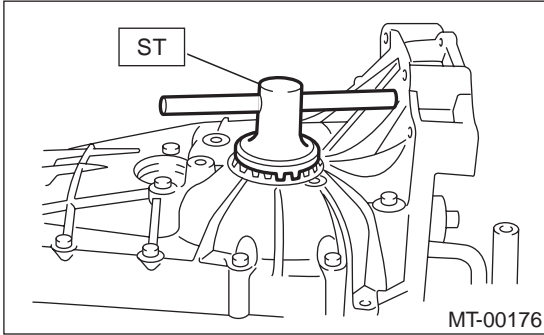
0.13 — 0.18 mm (0.0051 — 0.0071 in)

FRONT DIFFERENTIAL ASSEMBLY

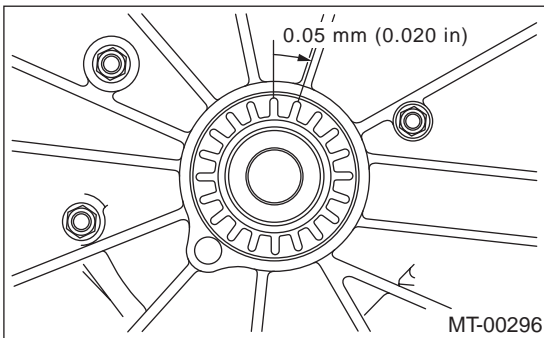
MANUAL TRANSMISSION AND DIFFERENTIAL

2. HYPOID GEAR BACKLASH

Adjust backlash by turning holder in right side case.
ST 499787000 WRENCH ASSY



NOTE:
Each time holder rotates one tooth, backlash changes by 0.05 mm (0.020 in).

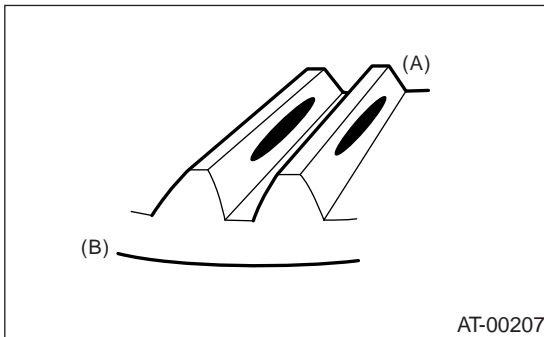


3. TOOTH CONTACT OF HYPOID GEAR

Adjust until the teeth contact is correct.
Check and adjust the teeth contact with following table.

- Tooth contact

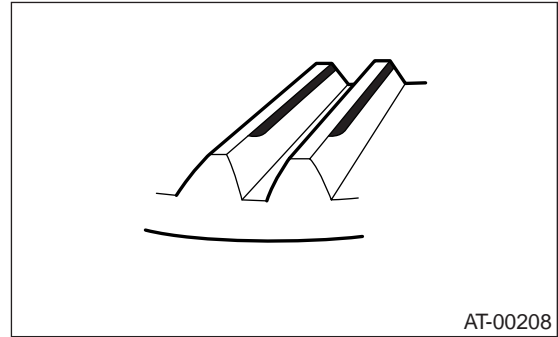
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



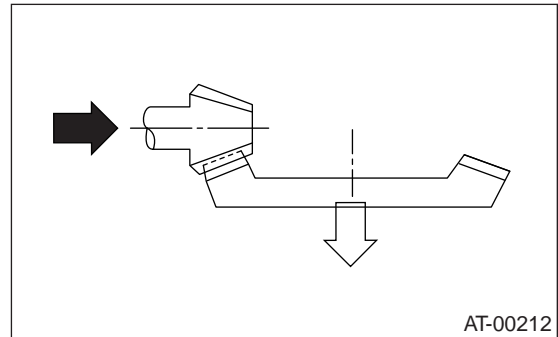
- (A) Toe side
- (B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

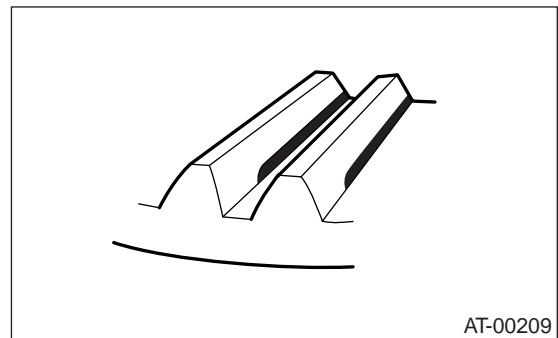


Corrective action: Decrease thickness of drive pinion adjusting shim in order to bring drive pinion close to driven gear.



- Flank contact

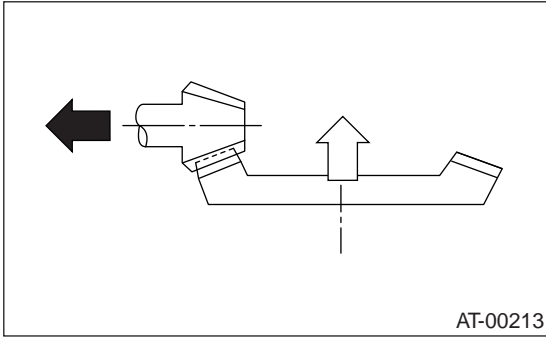
Checking item: Backlash is too small.
Contact pattern



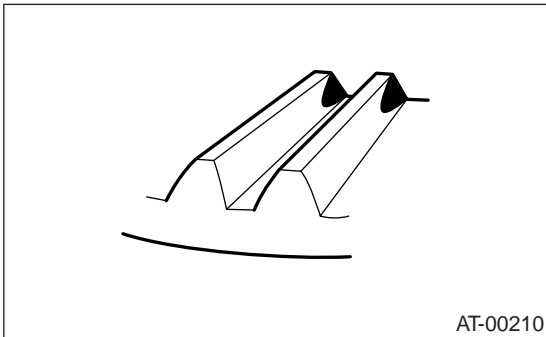
FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

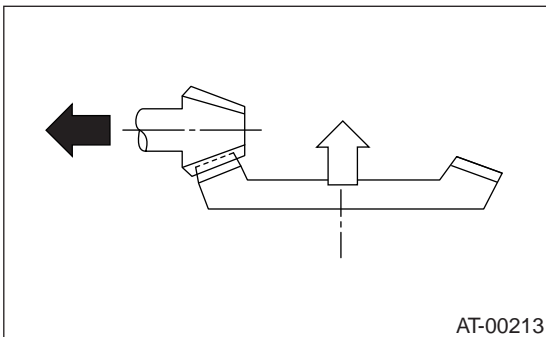
Corrective action: Increase thickness of drive pinion adjusting shim in order to move drive pinion away from driven gear.



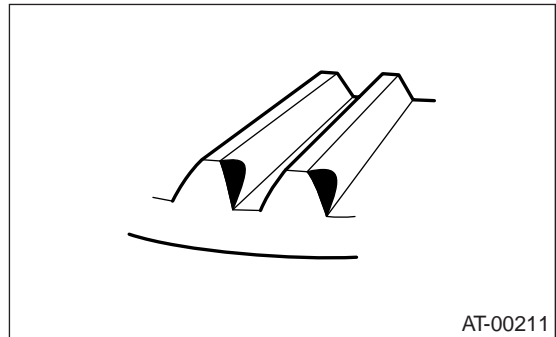
• Toe contact (Inside end contact)
Checking item: Contact areas is small.
Contact pattern



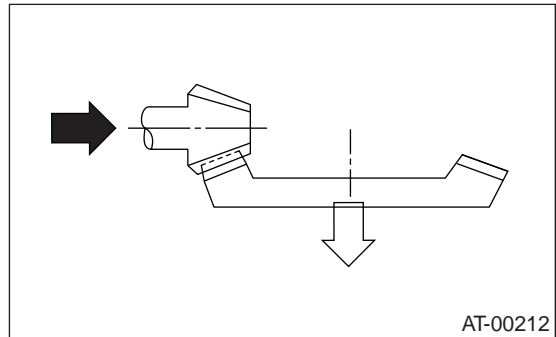
Corrective action: Increase thickness of drive pinion adjusting shim in order to bring drive pinion close to driven gear.



• Heel contact (Outside end contact)
Checking item: Contact areas is small.
Contact pattern



Corrective action: Reduce thickness of drive pinion adjusting shim in order to move drive pinion away from driven gear.



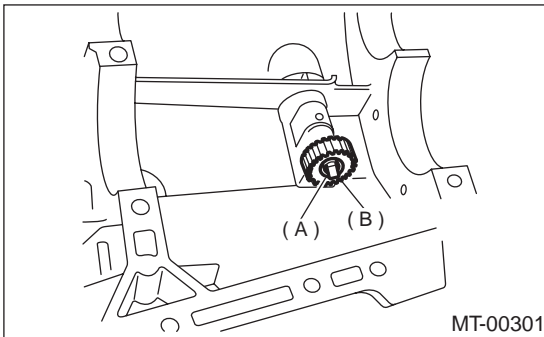
SPEEDOMETER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

20.Speedometer Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-42, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove transmission case. <Ref. to MT-59, REMOVAL, Transmission Case.>
- 5) Remove vehicle speed sensor. <Ref. to MT-45, REMOVAL, Vehicle Speed Sensor.>
- 6) Remove outer snap ring and pull out speedometer driven gear. Next, remove oil seal, speedometer shaft and washer.



- (A) Outer snap ring
- (B) Speedometer driven gear

B: INSTALLATION

- 1) Install washer and speedometer shaft, and press fit oil seal with ST.

NOTE:

Use new oil seal, if it has been removed.

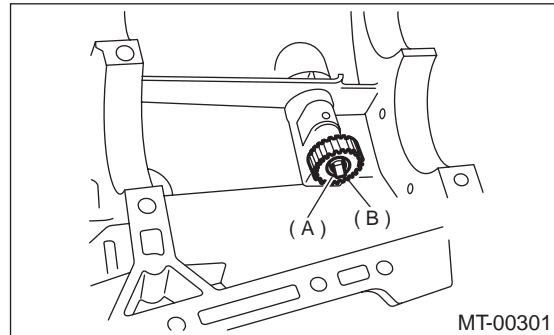
ST 899824100 or 499827000 PRESS

- 2) Install vehicle speed sensor. <Ref. to MT-45, INSTALLATION, Vehicle Speed Sensor.>

- 3) Install speedometer driven gear and snap ring.

NOTE:

Use new snap ring, if it has been removed.



- (A) Outer snap ring
- (B) Speedometer driven gear

- 4) Install transmission case. <Ref. to MT-61, INSTALLATION, Transmission Case.>

- 5) Install transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>

- 6) Install back-up light switch and neutral position switch. <Ref. to MT-43, INSTALLATION, Switches and Harness.>

- 7) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the speedometer gear, oil seal and speedometer shaft for damage. Replace if damaged.

REVERSE IDLER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

21.Reverse Idler Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>

2) Remove back-up light switch and neutral position switch. <Ref. to MT-42, REMOVAL, Switches and Harness.>

3) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>

4) Remove transmission case. <Ref. to MT-59, REMOVAL, Transmission Case.>

5) Remove drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>

6) Remove main shaft assembly.

Single-range model:

<Ref. to MT-66, REMOVAL, Main Shaft Assembly for Single-Range.>

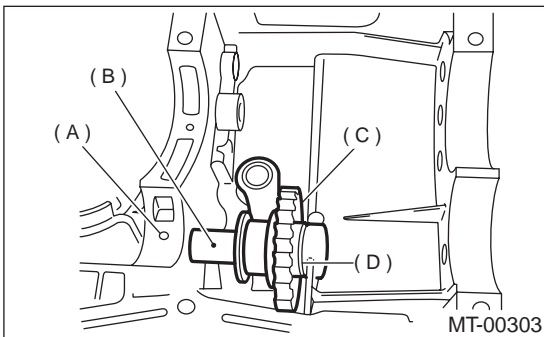
Dual-range model:

<Ref. to MT-74, REMOVAL, Main Shaft Assembly for Dual-Range.>

7) Remove differential assembly. <Ref. to MT-95, REMOVAL, Front Differential Assembly.>

8) Remove shifter forks and rods. <Ref. to MT-106, REMOVAL, Shifter Fork and Rod.>

9) Pull out straight pin, and remove idler gear shaft, reverse idler gear and washer.



- (A) Straight pin
- (B) Idler gear shaft
- (C) Idler gear
- (D) Washer

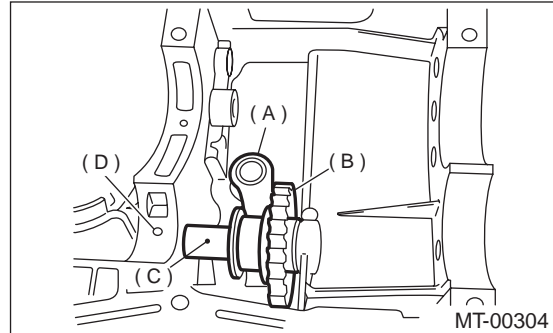
10) Remove reverse shifter lever.

B: INSTALLATION

1) Install reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure with straight pin.

NOTE:

Be sure to install reverse idler shaft from the rear side.



- (A) Reverse shifter lever
- (B) Reverse idler gear
- (C) Reverse idler gear shaft
- (D) Straight pin

2) Inspect and adjust clearance between reverse idler gear and transmission case wall. <Ref. to MT-104, INSTALLATION, Reverse Idler Gear.> and <Ref. to MT-105, ADJUSTMENT, Reverse Idler Gear.>

3) Install shifter forks and rods. <Ref. to MT-106, INSTALLATION, Shifter Fork and Rod.>

4) Install differential assembly. <Ref. to MT-95, INSTALLATION, Front Differential Assembly.>

5) Install main shaft assembly.

Single-range model:

<Ref. to MT-66, INSTALLATION, Main Shaft Assembly for Single-Range.>

Dual-range:

<Ref. to MT-74, INSTALLATION, Main Shaft Assembly for Dual-Range.>

6) Install drive pinion shaft assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>

7) Install transmission case. <Ref. to MT-61, INSTALLATION, Transmission Case.>

8) Install transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>

9) Install back-up light switch and neutral position switch. <Ref. to MT-43, INSTALLATION, Switches and Harness.>

10) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

REVERSE IDLER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

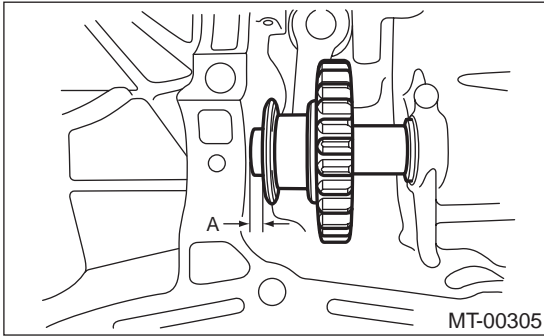
C: INSPECTION

1) Move the reverse shifter rod toward the reverse side. Inspect clearance between reverse idler gear and transmission case wall.

If out of specification, select the appropriate reverse shifter lever and adjust.

Clearance A:

6.0 — 7.5 mm (0.236 — 0.295 in)

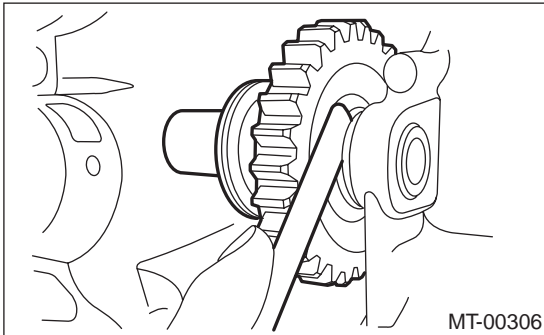


2) After installing a suitable reverse shifter lever, shift into neutral. Inspect clearance between reverse idler gear and transmission case wall.

If out of specification, select the appropriate washer and adjust.

Clearance:

0 — 0.5 mm (0 — 0.020 in)



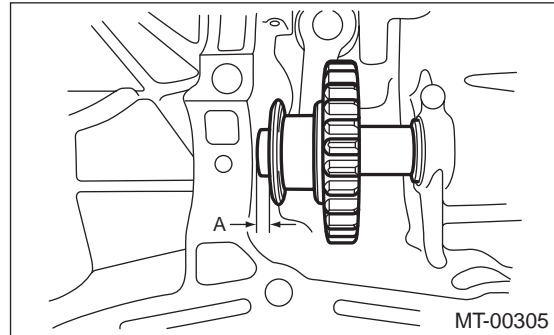
3) Check the reverse idler gear and shaft for damage. Replace if damaged.

D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance A:

6.0 — 7.5 mm (0.236 — 0.295 in)

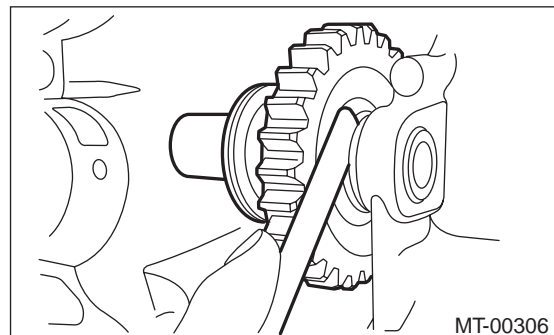


Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to case wall

2) Select the appropriate washer from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance:

0 — 0.5 mm (0 — 0.020 in)



Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

22. Shifter Fork and Rod

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>

2) Remove back-up light switch and neutral position switch. <Ref. to MT-42, REMOVAL, Switches and Harness.>

3) Remove transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>

4) Remove transmission case. <Ref. to MT-59, REMOVAL, Transmission Case.>

5) Remove drive pinion shaft assembly. <Ref. to MT-87, REMOVAL, Drive Pinion Shaft Assembly.>

6) Remove main shaft assembly.

Single-range model:

<Ref. to MT-66, REMOVAL, Main Shaft Assembly for Single-Range.>

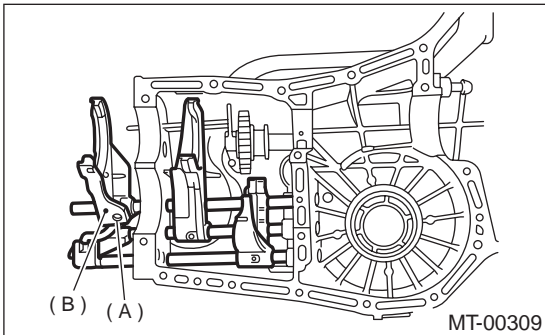
Dual-range model:

<Ref. to MT-74, REMOVAL, Main Shaft Assembly for Dual-Range.>

7) Remove differential assembly. <Ref. to MT-95, REMOVAL, Front Differential Assembly.>

8) Drive out straight pin with ST, and 5th shifter fork.

ST 398791700 STRAIGHT PIN REMOVER



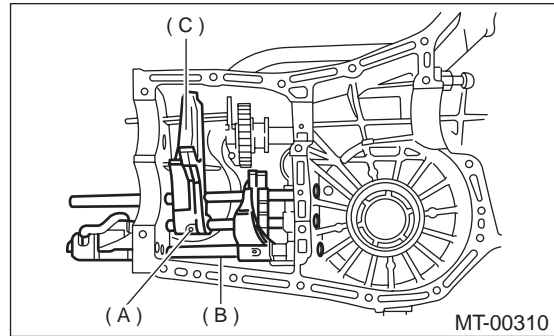
- (A) Straight pin
- (B) 5th shifter fork

9) Remove plugs, springs and checking balls.

10) Drive out straight pin, and pull out 3-4 fork rod and shifter fork.

NOTE:

When removing rod, keep other rods in neutral. Also, when pulling out straight pin, remove it toward the inside of the case so that it does not hit against the case.



- (A) Straight pin
- (B) 3-4 fork rod
- (C) Shifter fork

11) Drive out straight pin, and pull out 1-2 fork rod and shifter fork.

12) Remove outer snap ring, and pull out reverse shifter rod arm from reverse fork rod. Then take out ball, spring and interlock plunger from rod. And then remove rod.

NOTE:

When pulling out reverse shifter rod arm, be careful not to let ball pop out of arm.

13) Remove reverse shifter lever.

B: INSTALLATION

1) Install reverse arm fork spring, ball and interlock plunger to reverse fork rod arm. Insert reverse fork rod into hole in reverse fork rod arm, and hold it with outer snap ring using ST.

NOTE:

Apply grease to plunger to prevent it from falling.

ST 399411700 ACCENT BALL INSTALLER

2) Position ball, spring and new gasket in reverse shifter rod hole, on left side transmission case, and tighten checking ball plug.

3) Install 1-2 fork rod into 1-2 shifter fork via the hole on the rear of the transmission case.

4) Align the holes in rod and fork, and new drive straight pin into these holes using ST.

NOTE:

- Set other rods to neutral.
- Make sure interlock plunger is on the 3-4 fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

5) Install interlock plunger onto 3-4 fork rod.

NOTE:

Apply a coat of grease to plunger to prevent it from falling.

6) Install 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.

7) Align the holes in rod and fork, and drive new straight pin into these holes.

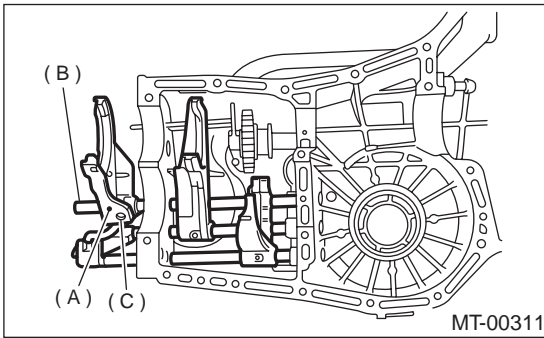
NOTE:

- Set reverse fork rod to neutral.
- Make sure interlock plunger (installing before) is on the reverse fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

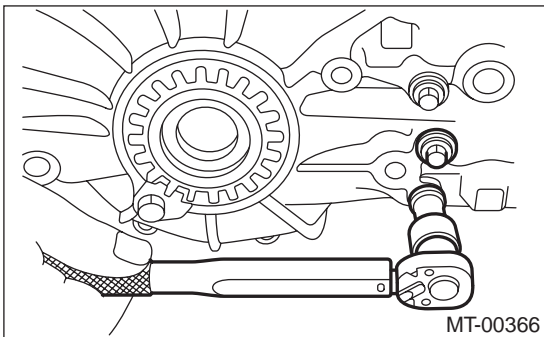
8) Install 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and drive new straight pin into place.

ST 398791700 STRAIGHT PIN REMOVER



- (A) 5th shifter fork
- (B) Reverse fork rod
- (C) Straight pin

9) Position balls, checking ball springs and new gaskets into 3-4 and 1-2 rod holes, and install plugs.



10) Install differential assembly. <Ref. to MT-95, INSTALLATION, Front Differential Assembly.>

11) Install main shaft assembly.

12) Install drive pinion shaft assembly. <Ref. to MT-87, INSTALLATION, Drive Pinion Shaft Assembly.>

13) Install transmission case. <Ref. to MT-61, INSTALLATION, Transmission Case.>

14) Install transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>

15) Install back-up light switch and neutral position switch. <Ref. to MT-43, INSTALLATION, Switches and Harness.>

16) Install the manual transmission assembly to vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

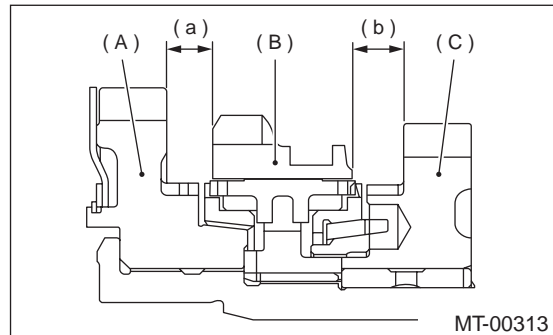
1) Check the shift shaft and shift rod for damage. Replace if damaged.

2) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

3) Inspect clearance between 1st, 2nd driven gear and reverse driven gear. If any clearance is not within specifications, replace shifter fork as required.

Clearance (a) and (b):
9.5 mm (0.374 in)



- (A) 1st driven gear
- (B) Reverse driven gear
- (C) 2nd driven gear

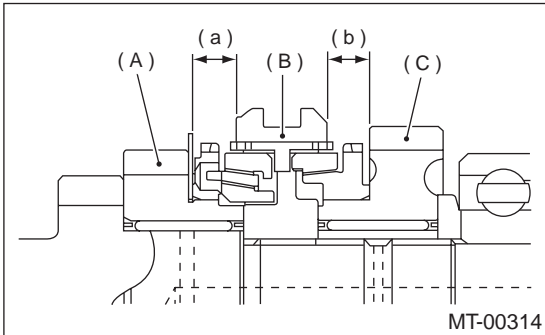
1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in).
32804AA070	No mark	Standard
32804AA080	3	Become distant from 2nd gear by 0.2 mm (0.008 in).

SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

4) Inspect clearance between 3rd, 4th drive gear and coupling sleeve. If any clearance is not within specifications, replace shifter fork as required.

Clearance (a) and (b):
9.3 mm (0.366 in)

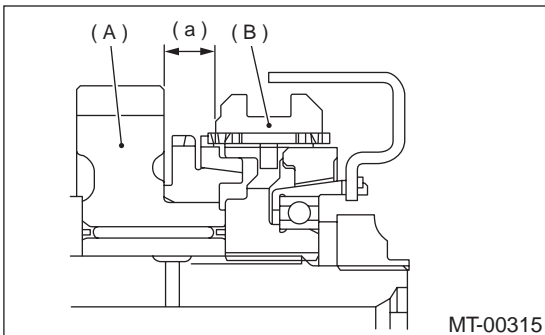


- (A) 3rd drive gear
- (B) Coupling sleeve
- (C) 4th drive gear

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in).
32810AA071	No mark	Standard
32810AA101	3	Become distant from 3rd gear by 0.2 mm (0.008 in).

5) Inspect clearance between 5th drive gear and coupling sleeve. If any clearance is not within specifications, replace shifter fork as required.

Clearance (a):
9.3 mm (0.366 in)



- (A) 5th drive gear
- (B) Coupling sleeve

5th shifter fork (Non-TURBO model)		
Part No.	Mark	Remarks
32812AA201	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA211	No mark	Standard
32812AA221	9	Become distant from 5th gear by 0.2 mm (0.008 in).

5th shifter fork (TURBO model)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA241	No mark	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in).

6) Inspect rod end clearances (A) and (B). If any clearance is not within specifications, replace rod or fork as required.

Clearance (A):

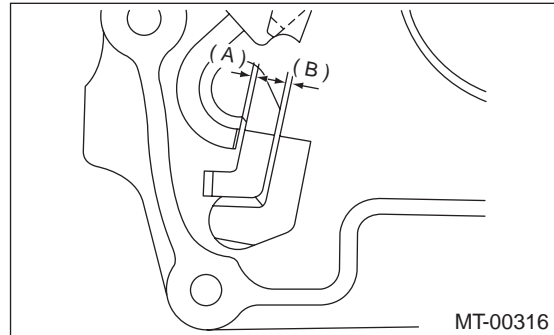
3rd — 4th to 5th:

0.5 — 1.3 mm (0.020 — 0.051 in)

Clearance (B):

1st — 2nd to 3rd — 4th:

0.4 — 1.4 mm (0.016 — 0.055 in)



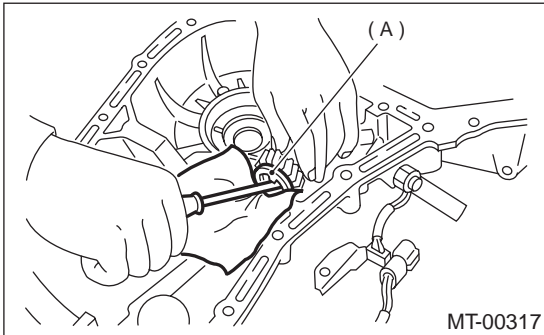
COUNTER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

23. Counter Gear

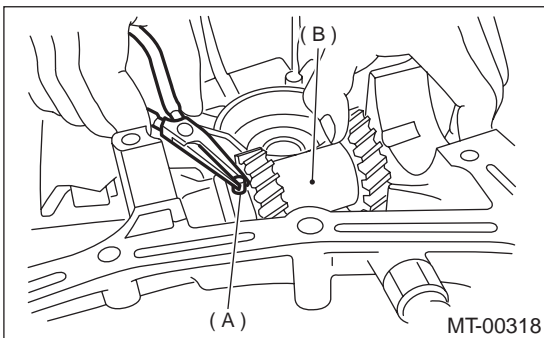
A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-47, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove transmission case. <Ref. to MT-59, REMOVAL, Transmission Case.>
- 4) Move counter gear shaft until it touches transmission case, and remove snap ring with a suitable tool.



(A) Snap ring

- 5) Slide washer at rear of high-low counter shaft, and remove straight pin from counter shaft.



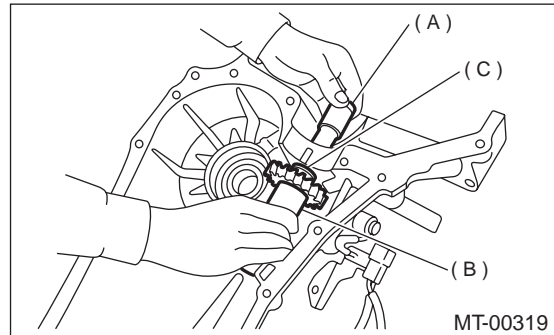
(A) Straight pin
(B) Counter gear

- 6) Remove counter shaft from transmission case, taking care not to drop counter gear and the two washers.

NOTE:

- Be careful not to damage O-ring.
- Be careful not to drop straight pin on front side.

- Be careful not to drop two needle bearings and collar contained in counter gear.



(A) Counter shaft
(B) Counter gear
(C) Washers

B: INSTALLATION

- 1) Install new O-ring and straight pin onto counter gear shaft.
- 2) Install the following parts in main case (Right-side), and push the shaft perfectly into case.
 - Counter gear shaft
 - Two counter gear washers
 - Two needle bearings
 - Counter gear collar
 - Counter gear
 - Straight pin
 - Snap ring
- 3) Install the transmission case. <Ref. to MT-61, INSTALLATION, Transmission Case.>
- 4) Install the transfer case with extension case assembly. <Ref. to MT-47, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the manual transmission assembly on vehicle. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

NOTE:

- Make sure that cut-out end surface of counter gear shaft does not protrude above the end surface of the case.
- Position the cut-out portion of counter gear shaft as shown in the figure.

C: INSPECTION

- 1) After installing snap ring, measure clearance between snap ring and counter washer.

Clearance:

0.05 — 0.35 mm (0.0020 — 0.0138 in)

- 2) If the clearance is out of measured value, select a snap ring and install to put clearance within measured value. <Ref. to MT-110, ADJUSTMENT, Counter Gear.>

COUNTER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

D: ADJUSTMENT

Selection of snap ring

If the measurement is not within the specification,
select suitable snap ring.

Snap ring	
Part No.	Thickness mm (in)
031319000	1.50 (0.0591)
805019010	1.72 (0.0677)

24. General Diagnostic

A: INSPECTION

1. MANUAL TRANSMISSION

Symptom	Possible cause	Remedy
1. Gears are difficult to intermesh. NOTE: The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	(a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear	Replace.
	(b) Worn, damaged or burred chamfer of spline of gears	Replace.
	(c) Worn or scratched bushings	Replace.
	(d) Incorrect contact between synchronizer ring and gear cone or wear	Correct or replace.
2. Gear slips out. • Gear slips out when coasting on rough road. • Gear slips out during acceleration.	(a) Defective pitching stopper or looseness of installation bolt	Tighten or replace.
	(b) Loose engine mounting bolts	Tighten or replace.
	(c) Worn fork shifter, broken shifter fork rail spring	Replace.
	(d) Worn or damaged ball bearing	Replace.
	(e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve	Replace.
	(f) Worn tooth step of synchronizer hub (responsible for slip-out of 3rd gear)	Replace.
	(g) Worn 1st driven gear, needle bearing and race	Replace.
	(h) Worn 2nd driven gear, needle bearing and race	Replace.
	(i) Worn 3rd drive gear and bushing	Replace.
	(j) Worn 4th drive gear and bushing	Replace.
3. Unusual noise comes from transmission. NOTE: If an unusual noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.	(a) Insufficient or improper lubrication	Lubricate or replace with specified oil.
	(b) Worn or damaged gears and bearings	Replace.
	NOTE: If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds.	

GENERAL DIAGNOSTIC

MANUAL TRANSMISSION AND DIFFERENTIAL

2. DIFFERENTIAL

Symptom	Possible cause	Remedy
<p>1. Broken differential (case, gear, bearing, etc.)</p> <p>NOTE: Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.</p>	(a) Insufficient or improper oil	Disassemble differential and replace broken components and at the same time check other components for any trouble, and replace if necessary.
	(b) Use of vehicle under severe conditions such as excessive load and improper use of clutch	Readjust bearing preload and backlash and face contact of gears.
	(c) Improper adjustment of taper roller bearing	Adjust.
	(d) Improper adjustment of drive pinion and hypoid driven gear	Adjust.
	(e) Excessive backlash due to worn differential side gear, washer or differential pinion vehicle under severe operating conditions.	Add recommended oil to specified level. Do not use vehicle under severe operating conditions.
	(f) Loose hypoid driven gear clamping bolts	Tighten.
<p>2. Differential and hypoid gear noises</p> <p>Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises.</p> <ul style="list-style-type: none"> • Gear noise when driving: If noise increases as vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. • Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment • Bearing noise when driving or when coasting: Cracked, broken or damaged bearings • Noise which mainly occurs when turning: Unusual noise from differential side gear, differential pinion, differential pinion shaft, etc. 	(a) Insufficient oil	Lubricate.
	(b) Improper adjustment of hypoid driven gear and drive pinion	Check tooth contact.
	(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust bearing preload.
	(d) Loose roller bearing	Readjust hypoid driven gear to drive pinion backlash and check tooth contact.
	(e) Distorted hypoid driven gear or differential case	Replace.
	(f) Worn washer and differential pinion shaft	Replace.

CLUTCH SYSTEM

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GENERAL DESCRIPTION

CLUTCH SYSTEM

1. General Description

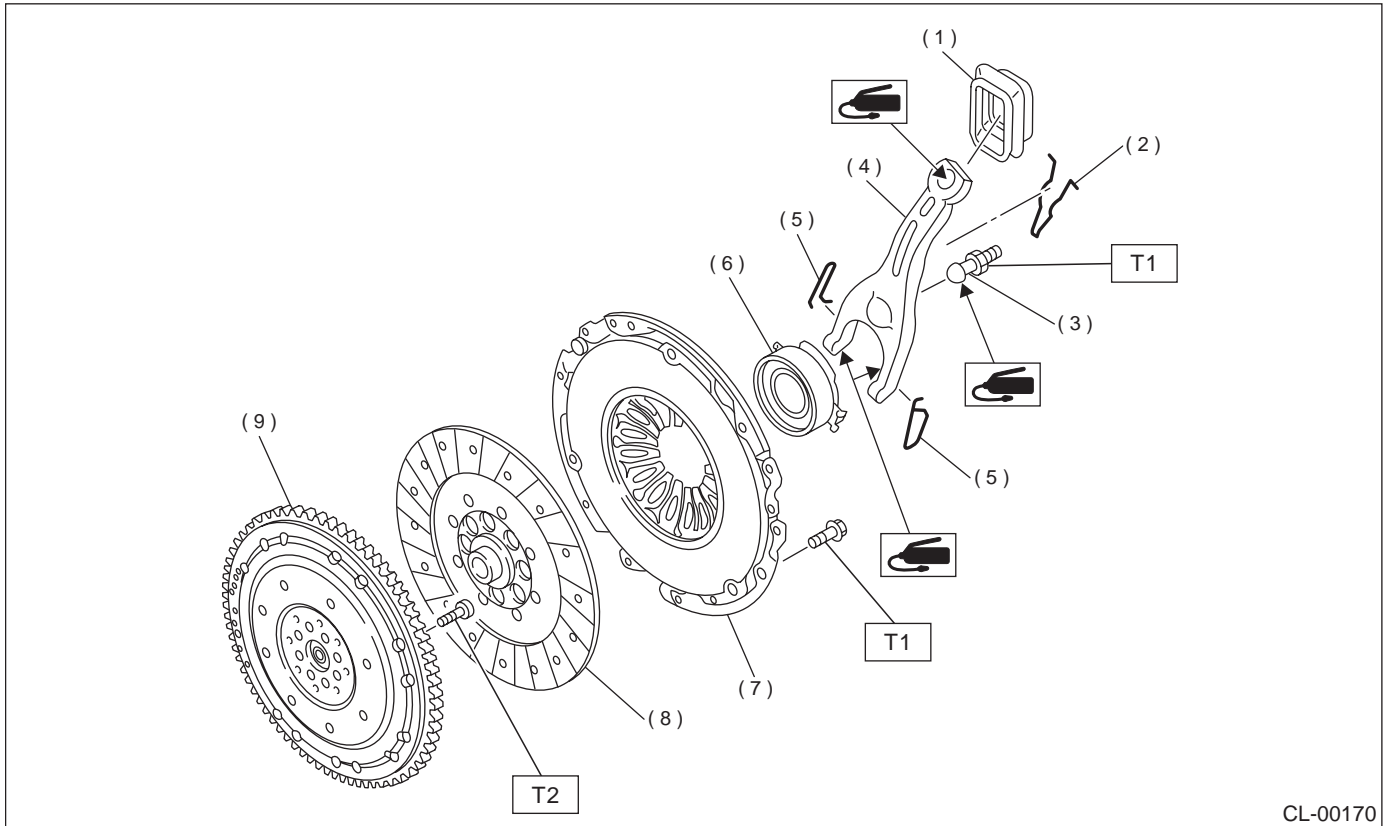
A: SPECIFICATIONS

Model		Europe and Australia		Except Europe and Australia	
		2.0 L Non-Turbo	2.5 L	2.0 L Non-Turbo	2.5 L
Clutch cover	Diaphragm set load	kgf (lb)		550 (1,213)	450 (992) 580 (1,279)
Clutch disc	Facing material		Woven		
	O.D. × I.D. × thickness		mm (in)		228.6 × 155 × 2.95 (9.00 × 6.10 × 0.1161) 225 × 150 × 3.5 (8.86 × 5.91 × 0.138)
	Spline O.D.		mm (in)		25.2 (0.992)
	Depth of rivet head mm (in) Wear limit		0.3 (0.012)		
	Limit for deflection		mm (in)		1.0 (0.039) at R = 107 (4.21)
Clutch release lever ratio		1.6			
Clutch pedal	Full stroke	mm (in)		130 — 135 (5.12 — 5.31)	

Model		Australia			
		2.0 L Turbo			
Clutch cover	Diaphragm set load	kgf (lb)		830 (1,830)	
Clutch disc	Facing material		Woven		
	O.D. × I.D. × thickness		mm (in)		Flywheel side 230 × 150 × 3.2 (9.06 × 5.91 × 0.126) Pressure plate side 230 × 150 × 3.5 (9.06 × 5.91 × 0.138)
	Spline O.D.		mm (in)		25.2 (0.992)
	Depth of rivet head mm (in) Wear limit		0.3 (0.012)		
	Limit for deflection		mm (in)		0.8 (0.031) at R = 110 (4.33)
Clutch release lever ratio		1.7			
Clutch pedal	Full stroke	mm (in)		130 — 135 (5.12 — 5.31)	

B: COMPONENT

1. CLUTCH ASSEMBLY FOR EUROPE AND AUSTRALIA NON-TURBO MODELS



CL-00170

- | | |
|-------------------------------|------------------------|
| (1) Clutch release lever seal | (6) Release bearing |
| (2) Retainer spring | (7) Clutch cover |
| (3) Pivot | (8) Clutch disc |
| (4) Release lever | (9) Dual mass flywheel |
| (5) Clip | |

Tightening torque: N·m (kgf-m, ft-lb)

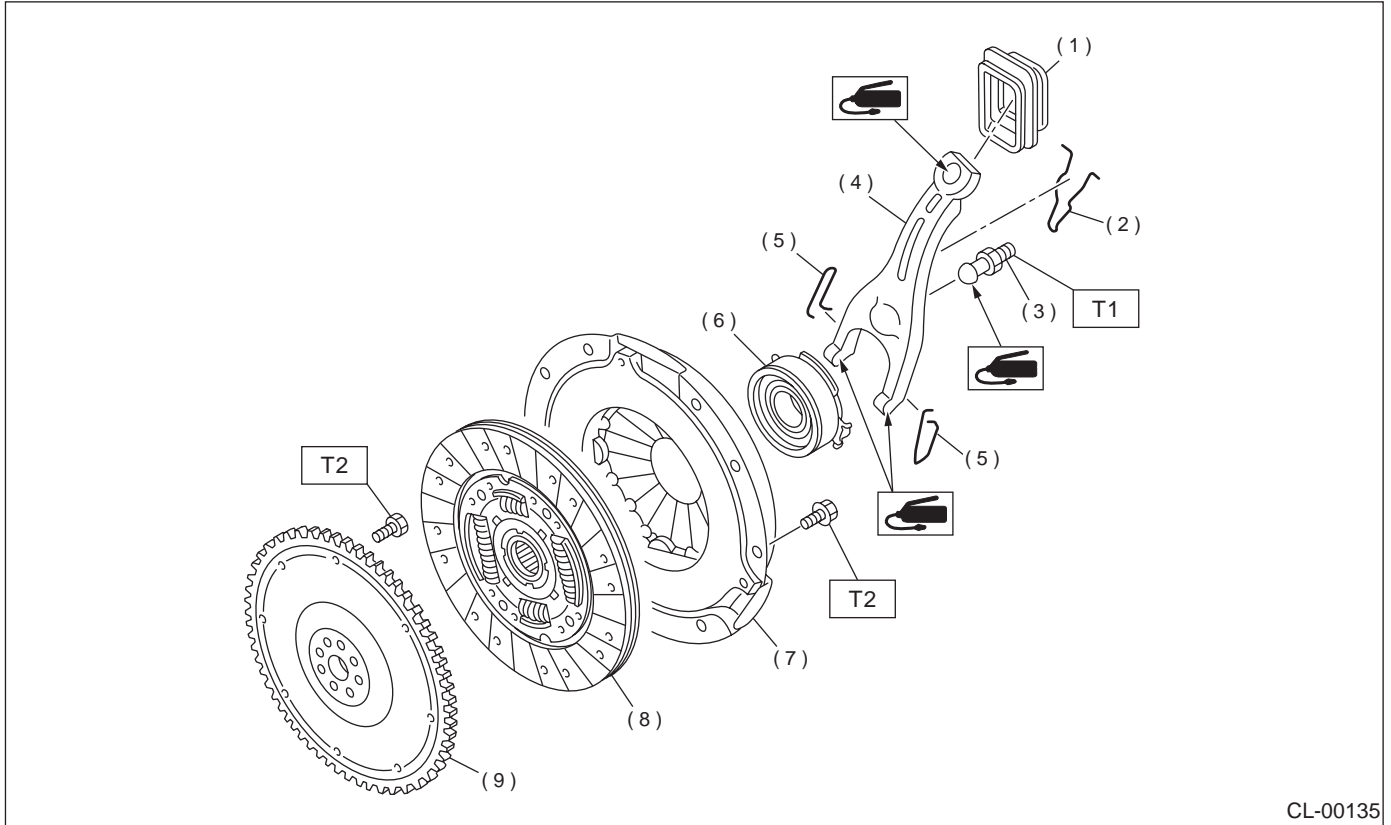
T1: 15.7 (1.6, 11.6)

T2: 72 (7.3, 52.8)

GENERAL DESCRIPTION

CLUTCH SYSTEM

2. CLUTCH ASSEMBLY FOR EXCEPT EUROPE AND AUSTRALIA NON-TURBO MODELS



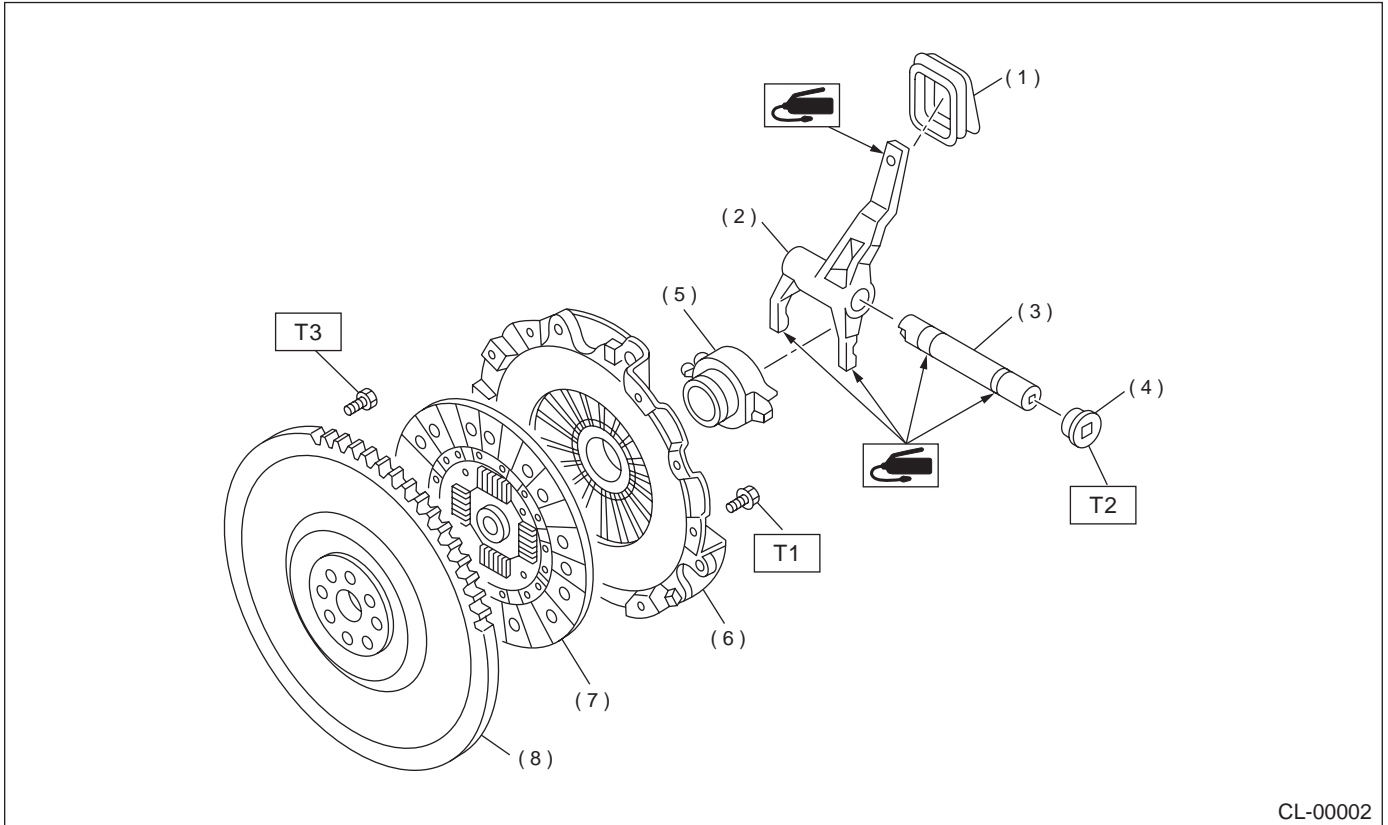
- | | |
|----------------------------------|----------------------------|
| (1) Clutch release lever sealing | (6) Clutch release bearing |
| (2) Retainer spring | (7) Clutch cover |
| (3) Pivot | (8) Clutch disc |
| (4) Clutch release lever | (9) Flywheel |
| (5) Clip | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 15.7 (1.6, 11.6)

T2: 72 (7.3, 52.8)

3. CLUTCH ASSEMBLY (TURBO MODEL)



CL-00002

- | | |
|----------------------------------|------------------|
| (1) Clutch release lever sealing | (6) Clutch cover |
| (2) Clutch release lever | (7) Clutch disc |
| (3) Clutch release lever shaft | (8) Flywheel |
| (4) Plug | |
| (5) Clutch release bearing | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 15.7 (1.6, 11.6)

T2: 44 (4.5, 32.5)

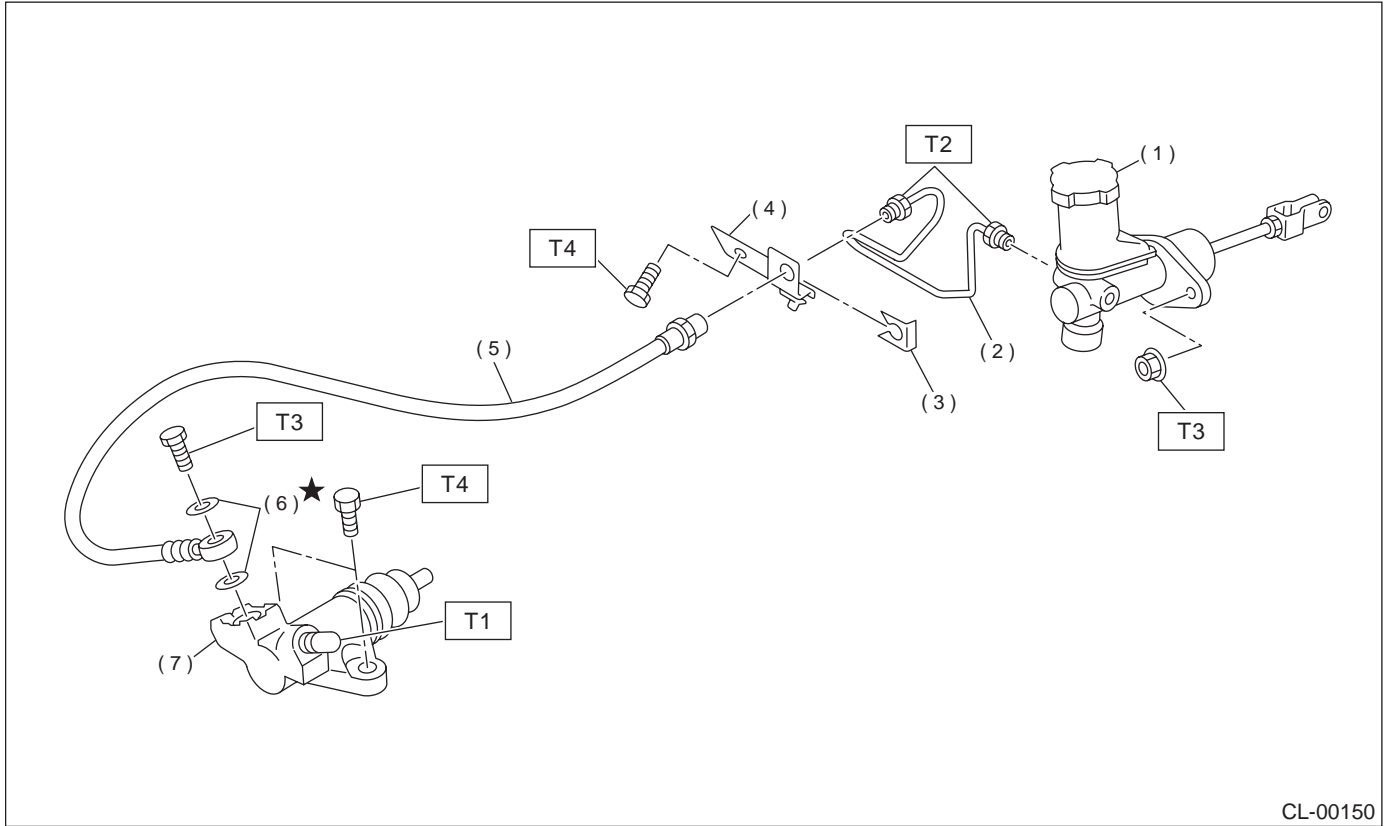
T3: 72 (7.3, 52.8)

GENERAL DESCRIPTION

CLUTCH SYSTEM

4. CLUTCH PIPE AND HOSE (NON-TURBO MODEL)

• LHD Model



CL-00150

- | | |
|--------------------------|------------------------|
| (1) Master cylinder ASSY | (6) Washer |
| (2) Clutch pipe | (7) Operating cylinder |
| (3) Clamp | |
| (4) Bracket | |
| (5) Clutch hose | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

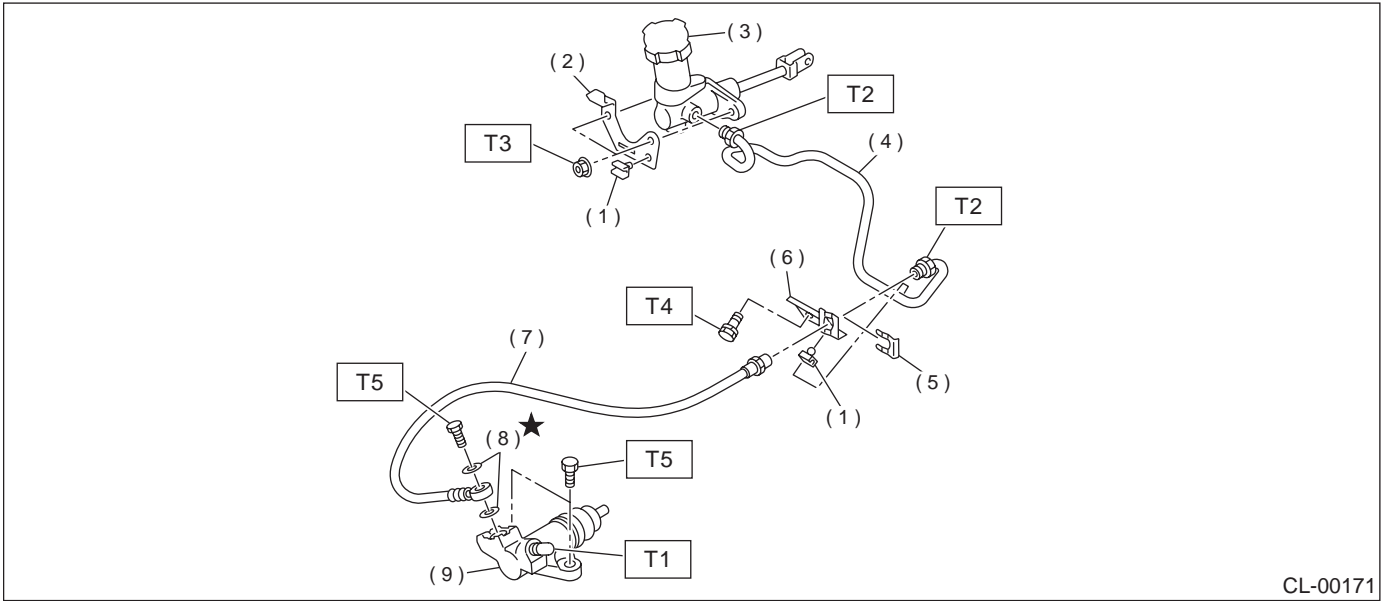
T2: 15 (1.5, 10.8)

T3: 18 (1.8, 13.0)

T4: 37 (3.8, 27.5)

GENERAL DESCRIPTION

• RHD Model



- (1) Clip
- (2) Bracket A
- (3) Master cylinder ASSY
- (4) Clutch pipe
- (5) Clamp
- (6) Bracket B
- (7) Clutch hose
- (8) Washer
- (9) Operating cylinder

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 15 (1.5, 10.8)

T3: 18 (1.8, 13.0)

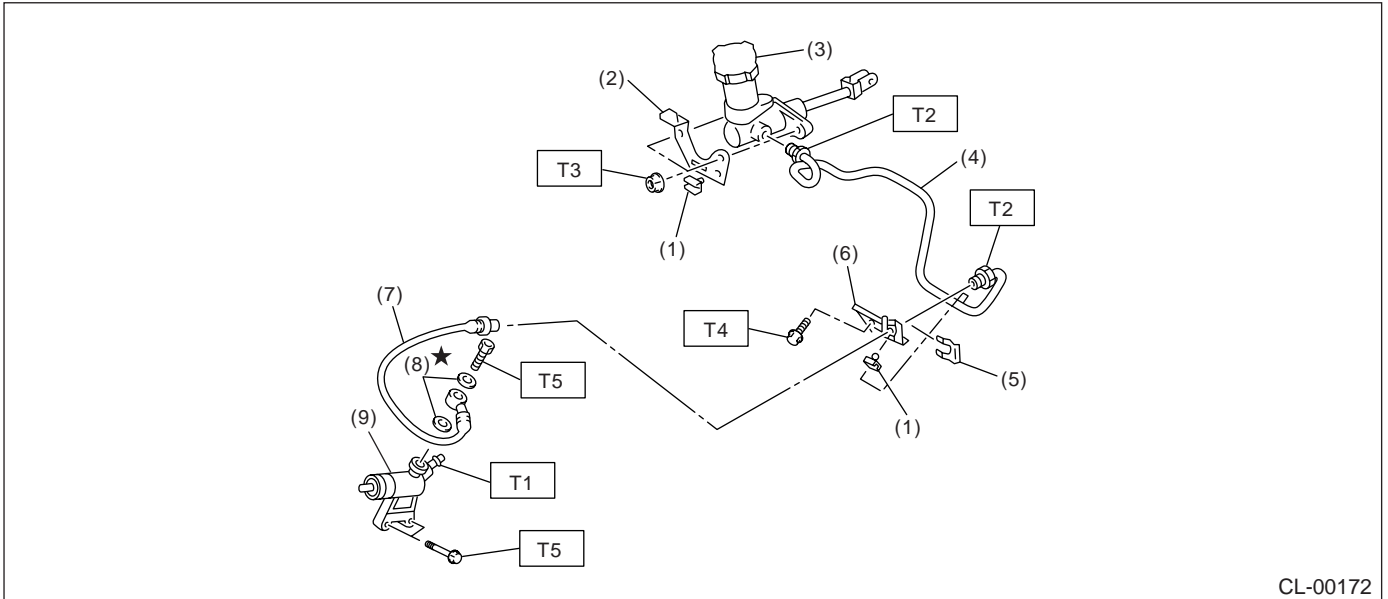
T4: 25 (2.5, 18.1)

T5: 37 (3.8, 27.5)

GENERAL DESCRIPTION

CLUTCH SYSTEM

5. CLUTCH PIPE AND HOSE (TURBO MODEL)



- | | |
|--------------------------|------------------------|
| (1) Clip | (7) Clutch hose |
| (2) Bracket A | (8) Washer |
| (3) Master cylinder ASSY | (9) Operating cylinder |
| (4) Clutch pipe | |
| (5) Clamp | |
| (6) Bracket B | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

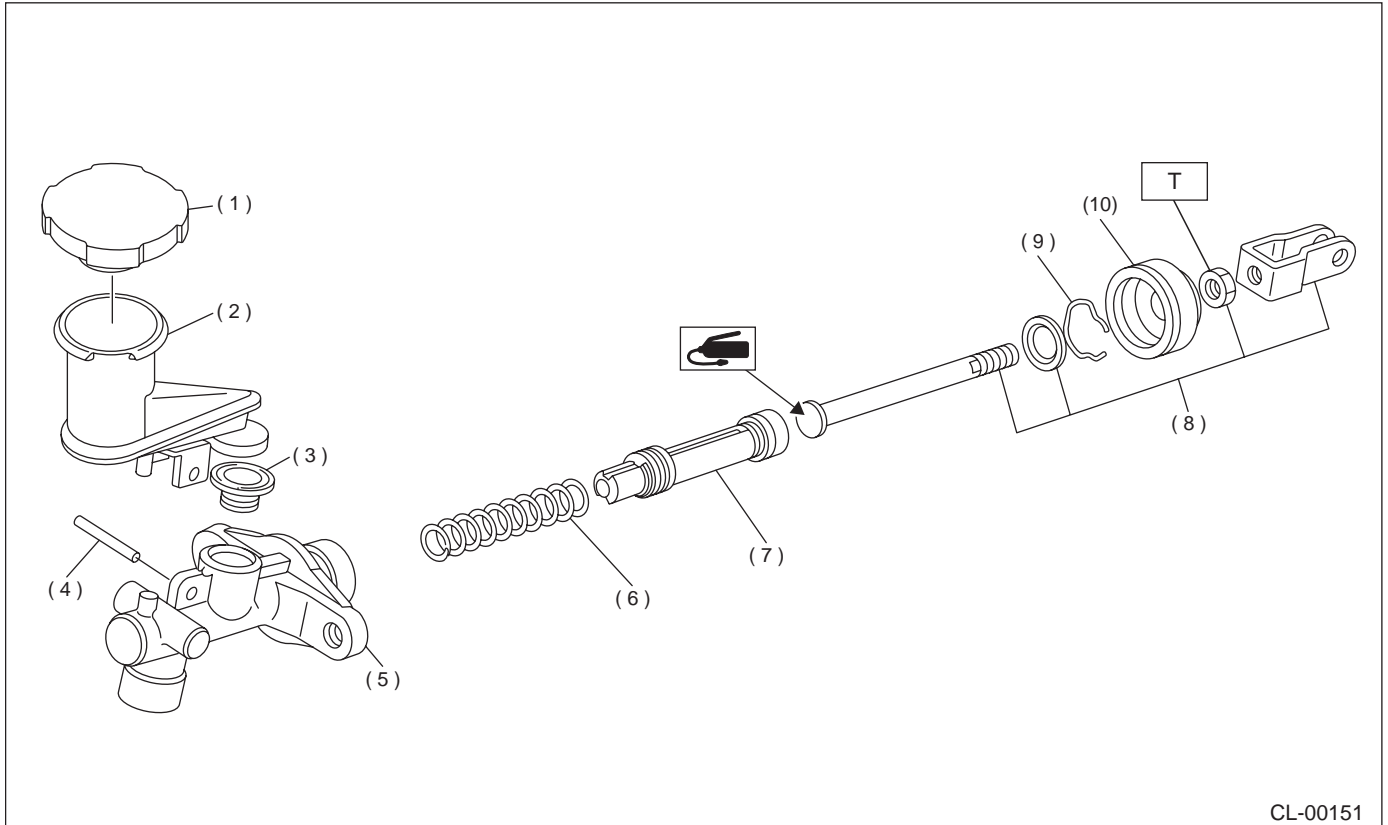
T2: 15 (1.5, 10.8)

T3: 18 (1.8, 13.0)

T4: 25 (2.5, 18.1)

T5: 37 (3.8, 27.5)

6. MASTER CYLINDER (NON-TURBO MODEL)



CL-00151

- | | |
|---------------------|----------------------|
| (1) Reservoir cap | (6) Return spring |
| (2) Reservoir tank | (7) Piston |
| (3) Oil seal | (8) Push rod |
| (4) Straight pin | (9) Piston stop ring |
| (5) Master cylinder | (10) Cylinder boot |

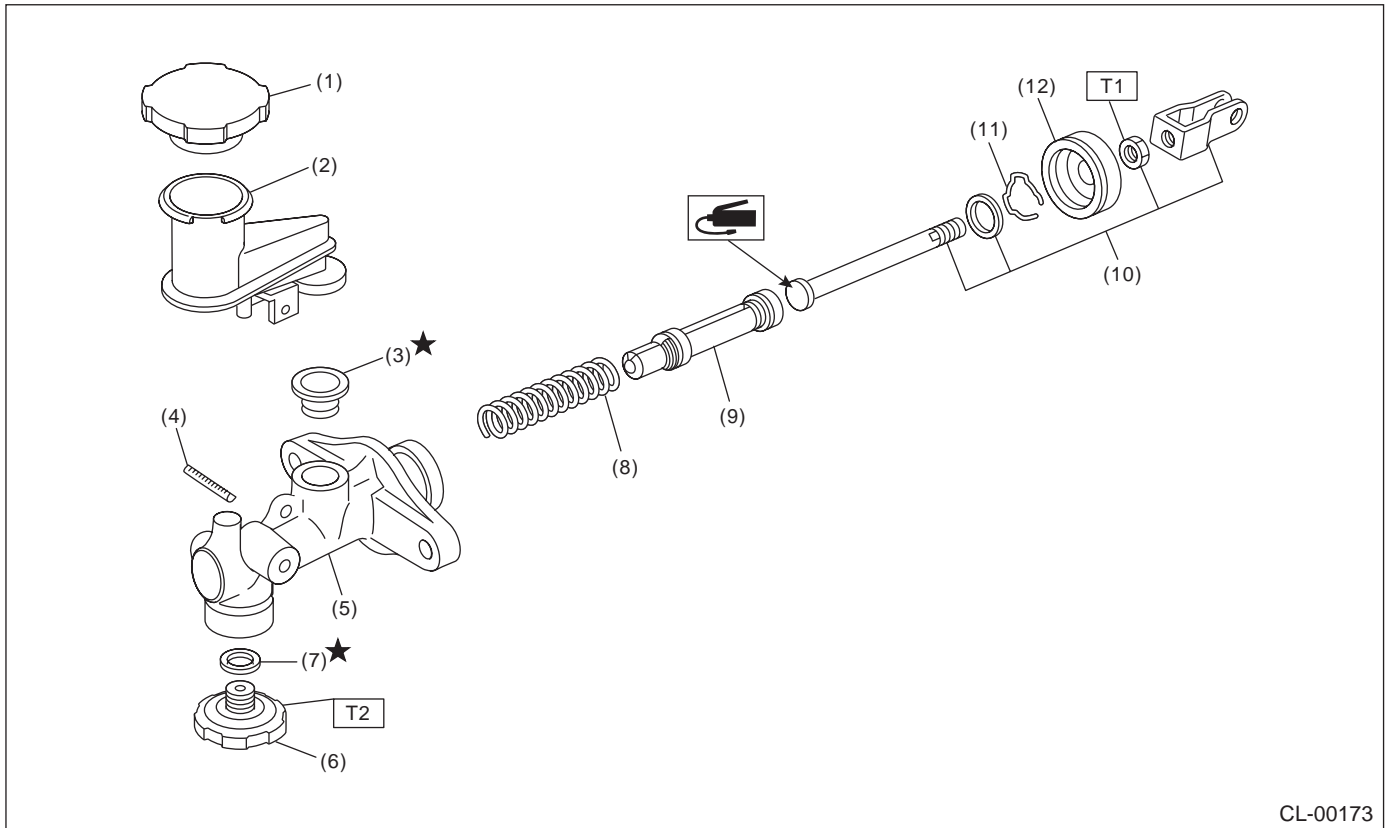
Tightening torque: N·m (kgf·m, ft·lb)

T: 10 (1.0, 7)

GENERAL DESCRIPTION

CLUTCH SYSTEM

7. MASTER CYLINDER (TURBO MODEL)



CL-00173

- | | |
|---------------------|-----------------------|
| (1) Reservoir cap | (7) Gasket |
| (2) Reservoir tank | (8) Return spring |
| (3) Oil seal | (9) Piston |
| (4) Straight pin | (10) Push rod |
| (5) Master cylinder | (11) Piston stop ring |
| (6) Clutch damper | (12) Cylinder boot |

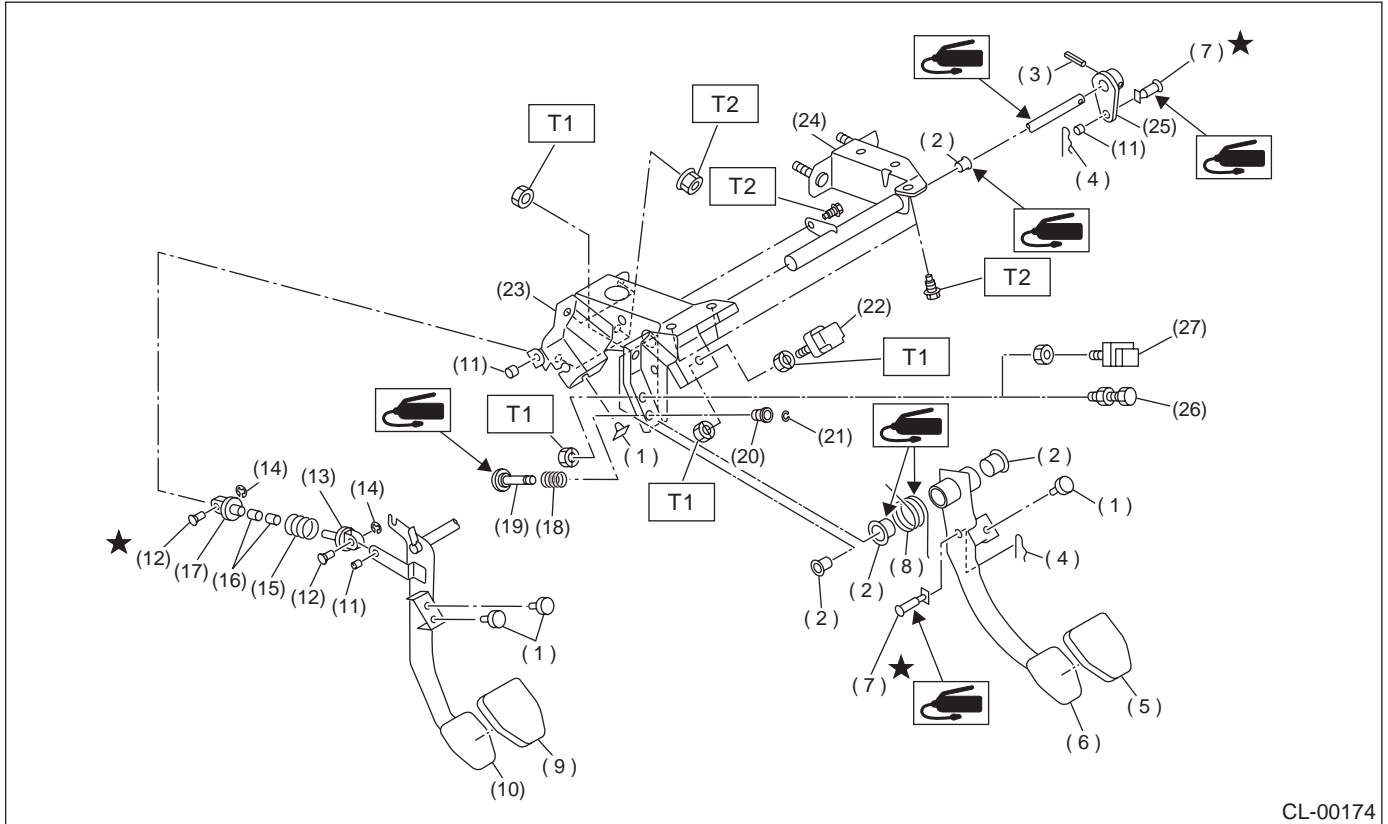
Tightening torque: N-m (kgf-m, ft-lb)

T1: 10 (1.0, 7)

T2: 46.6 (4.75, 34.4)

8. CLUTCH PEDAL

• LHD Model



CL-00174

- | | | |
|------------------------|------------------------------|--|
| (1) Stopper | (12) Clutch clevis pin | (23) Pedal bracket |
| (2) Bushing | (13) Assist rod A | (24) Clutch master cylinder bracket |
| (3) Spring pin | (14) Clip | (25) Lever |
| (4) Snap pin | (15) Assist spring | (26) Adjusting bolt |
| (5) Brake pedal pad | (16) Assist bushing | (27) Clutch switch (With cruise control) |
| (6) Brake pedal | (17) Assist rod B | |
| (7) Clevis pin | (18) Spring A (If equipped) | |
| (8) Brake pedal spring | (19) Rod (If equipped) | |
| (9) Clutch pedal pad | (20) Bushing B (If equipped) | |
| (10) Clutch pedal | (21) Clip (If equipped) | |
| (11) Bushing C | (22) Stop light switch | |

Tightening torque: N·m (kgf·m, ft·lb)

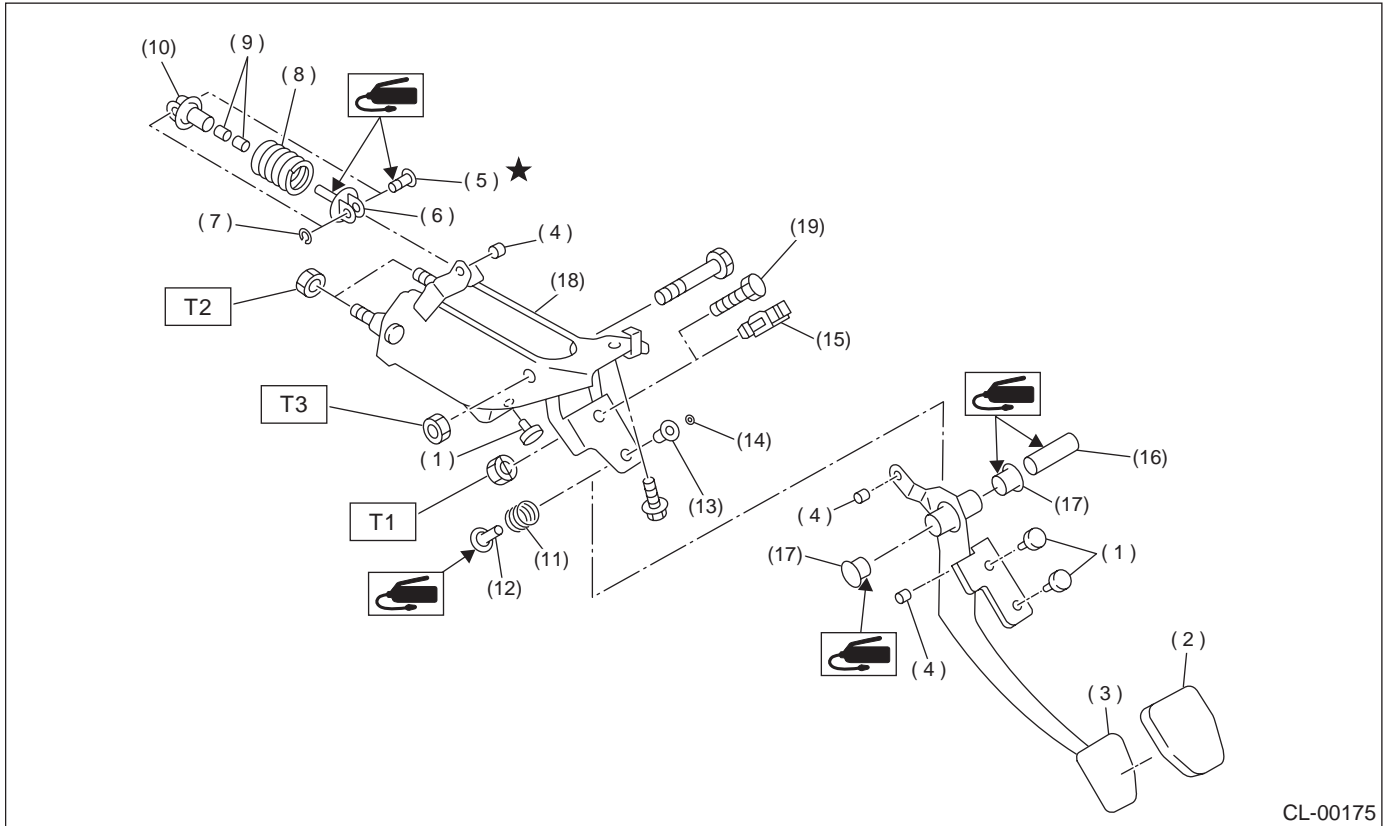
T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

GENERAL DESCRIPTION

CLUTCH SYSTEM

• RHD Model



- | | | |
|-----------------------|--|---------------------------|
| (1) Stopper | (9) Assist bushing | (17) Bushing |
| (2) Clutch pedal pad | (10) Assist rod B | (18) Clutch pedal bracket |
| (3) Clutch pedal | (11) Spring A (If equipped) | (19) Adjusting bolt |
| (4) Bushing C | (12) Rod (If equipped) | |
| (5) Clutch clevis pin | (13) Bushing B (If equipped) | |
| (6) Assist rod A | (14) Clip (If equipped) | |
| (7) Clip | (15) Clutch switch (With cruise control) | |
| (8) Assist spring | (16) Spacer | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 30 (3.1, 22.4)

C: CAUTION

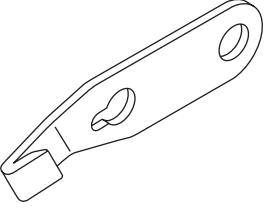
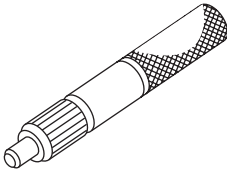
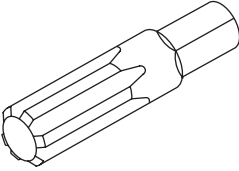
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep fluid away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

GENERAL DESCRIPTION

CLUTCH SYSTEM

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498497100</p>	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening tightening bolt, etc.
 <p style="text-align: center;">ST-499747100</p>	499747100	CLUTCH DISC GUIDE	Used when removing and installing clutch disc to flywheel.
 <p style="text-align: center;">ST-499057000</p>	499057000	TORX PLUS	Used for removing and installing flywheel (Dual mass flywheel type).

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Dial Gauge	Used for measuring clutch disk run-out.

2. Clutch Disc and Cover

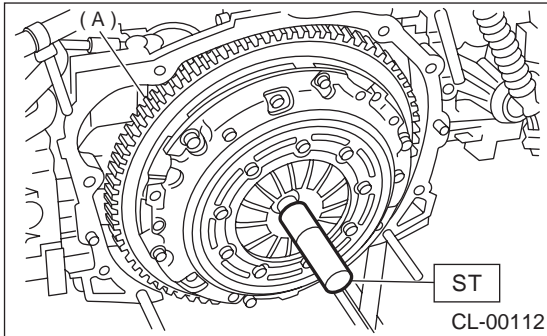
A: REMOVAL

1. EUROPE AND AUSTRALIA NON-TURBO MODELS

1) Remove transmission assembly from vehicle body. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>

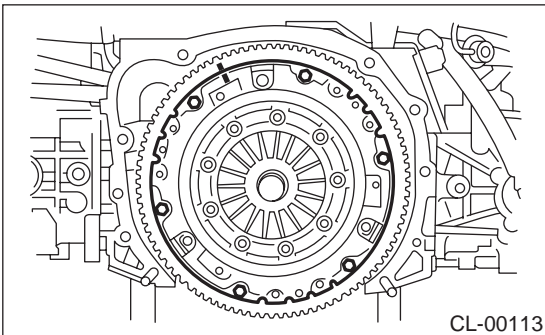
2) Insert ST on flywheel.

ST 499747100 CLUTCH DISC GUIDE



(A) Dual mass flywheel

3) Put matching marks on flywheel and clutch cover before removing clutch cover.



4) Remove clutch cover and clutch disc.

NOTE:

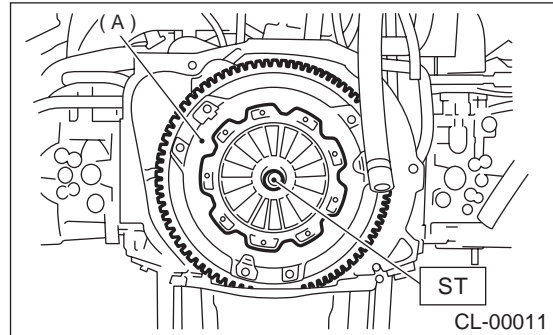
- Take care not to allow oil on the clutch disc facing.
- Do not disassemble either clutch cover or clutch disc.
- Put matching marks to flywheel and clutch cover before removing clutch cover.

2. EXCEPT EUROPE AND AUSTRALIA NON-TURBO MODELS AND TURBO MODEL

1) Remove transmission assembly from vehicle body. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>

2) Install ST on flywheel.

ST 499747100 CRANKSHAFT STOPPER



(A) Clutch cover

3) Remove clutch cover and clutch disc.

NOTE:

- Take care not to allow oil on the clutch disc facing.
- Do not disassemble either clutch cover or clutch disc.

B: INSTALLATION

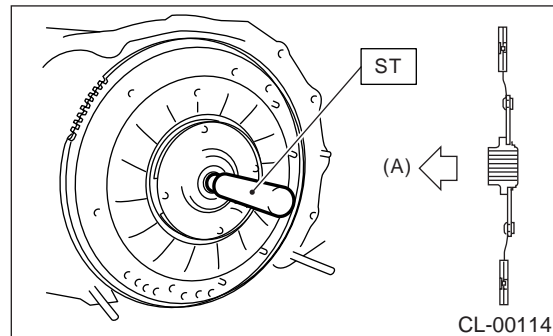
1. EUROPE AND AUSTRALIA NON-TURBO MODELS

1) Insert ST into the clutch disc and install them on the flywheel by inserting the ST end into the pilot bearing.

NOTE:

When installing clutch disc, be careful its direction.

ST 499747100 CLUTCH DISC GUIDE



(A) Flywheel

(B) Flywheel side

CLUTCH DISC AND COVER

CLUTCH SYSTEM

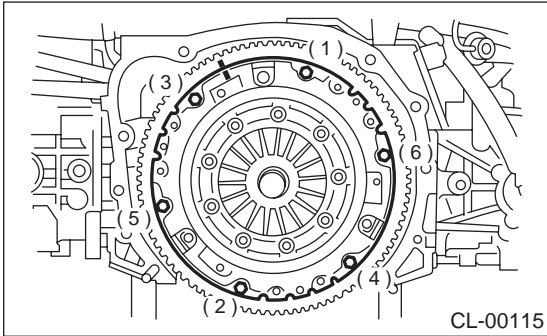
2) Install clutch cover on flywheel and tighten bolts to the specified torque.

NOTE:

- Align matching marks.
- Note the front and rear of the clutch disc when installing.
- Tighten clutch cover installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:

15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



3) Remove ST.

ST 499747100 CLUTCH DISC GUIDE

4) Install transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

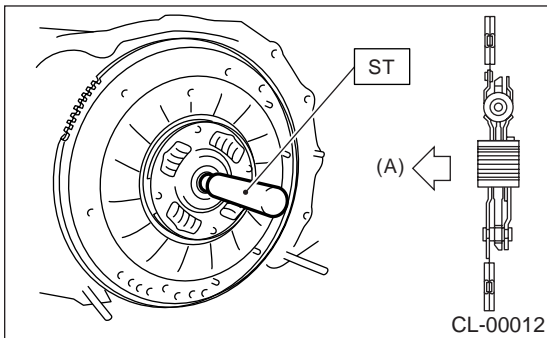
2. EXCEPT EUROPE AND AUSTRALIA NON-TURBO MODELS AND TURBO MODEL

1) Insert ST into the clutch disc and install them on the flywheel by inserting the ST end into the pilot bearing.

NOTE:

When installing clutch disc, be careful its direction.

ST 499747100 CLUTCH DISC GUIDE



(A) Flywheel side

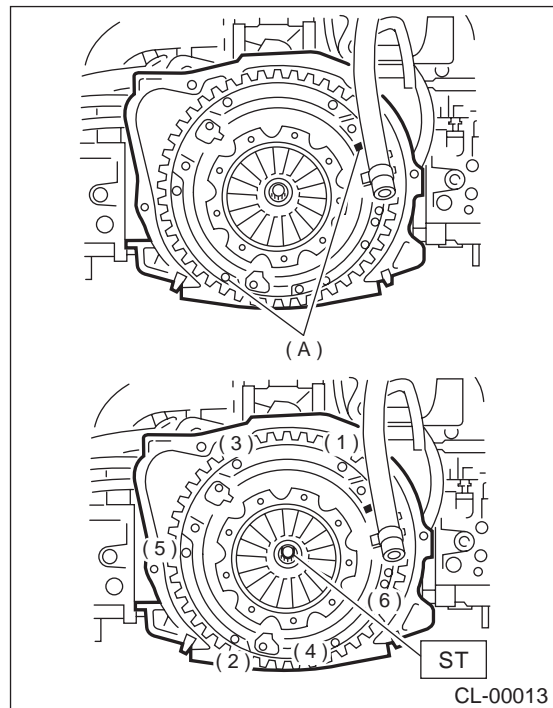
2) Install clutch cover on flywheel and tighten bolts to the specified torque.

NOTE:

- When installing the clutch cover on the flywheel, position the clutch cover so that there is a gap of 120° or more between “0” marks on the flywheel and clutch cover. (“0” marks indicate the directions of residual unbalance.)
- Note the front and rear of the clutch disc when installing.
- Temporarily tighten bolts by hand. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:

15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



(A) “0” marks

3) Remove ST.

ST 499747100 CLUTCH DISC GUIDE

4) Install transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1. CLUTCH DISC

1) Facing wear

Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

Depth of rivet head:

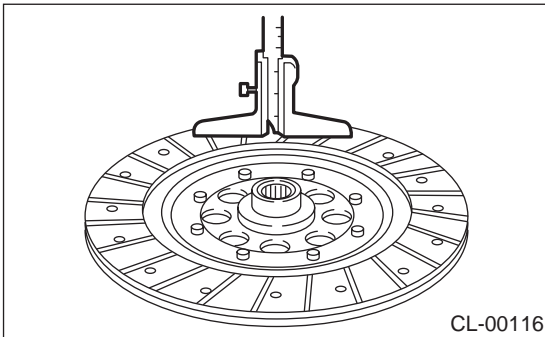
Limit of sinking

0.3 mm (0.012 in)

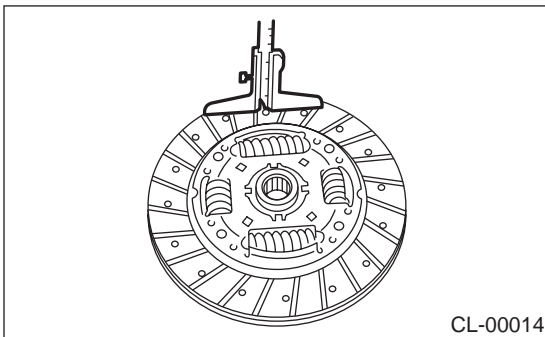
NOTE:

Do not wash clutch disc with any cleaning fluid.

Europe and Australia Non-Turbo models



Except Europe and Australia Non-Turbo models and Turbo model



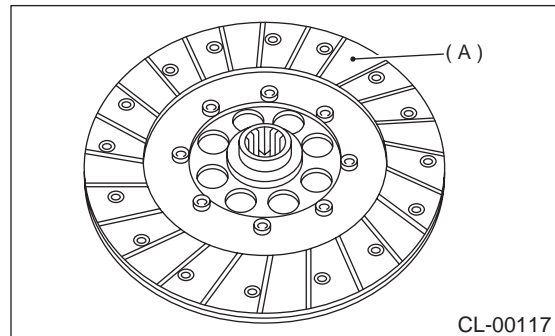
2) Hardened facing

Correct by using emery paper or replace.

3) Oil soakage on facing

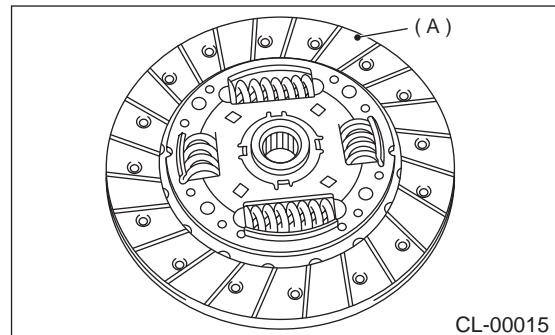
Replace clutch disc and inspect transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.

Europe and Australia Non-Turbo models



(A) Clutch facing

Except Europe and Australia Non-Turbo models and Turbo model



(A) Clutch facing

CLUTCH DISC AND COVER

CLUTCH SYSTEM

4) Deflection on facing

If deflection exceeds the specified value at the outer circumference of facing, repair or replace.

ST 499747100 CLUTCH DISC GUIDE

Limit for deflection:

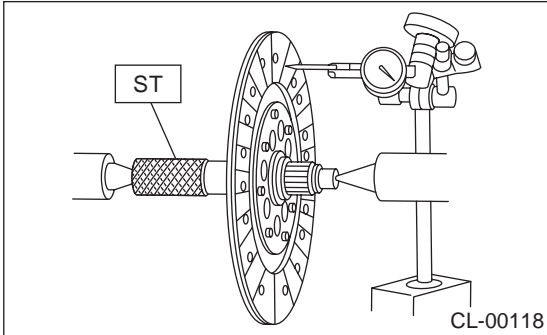
Non-Turbo model

1.0 mm (0.039 in) at R = 107 mm (4.21 in)

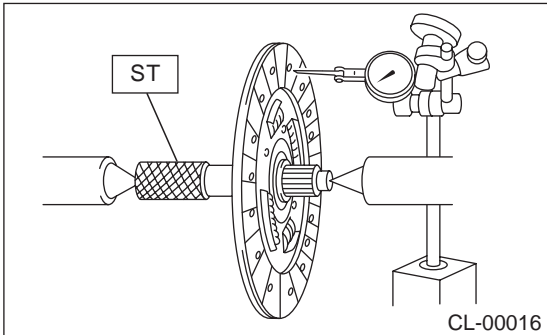
Turbo model

0.8 mm (0.03 in) at R = 110 mm (4.33 in)

Europe and Australia Non-Turbo models



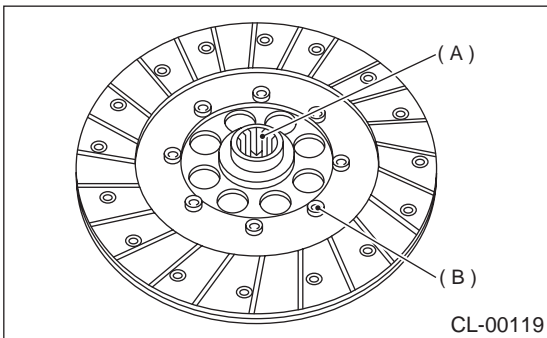
Except Europe and Australia Non-Turbo models and Turbo model



5) Worn spline, loose rivets and torsion spring failure

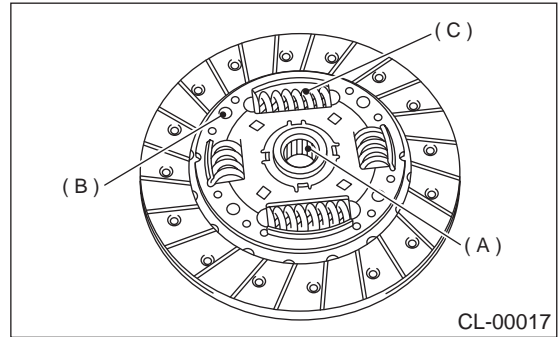
Replace defective parts.

Europe and Australia Non-Turbo models



- (A) Spline
- (B) Rivet
- (C) Torsion spring

Except Europe and Australia Non-Turbo models and Turbo model



- (A) Spline
- (B) Rivet
- (C) Torsion spring

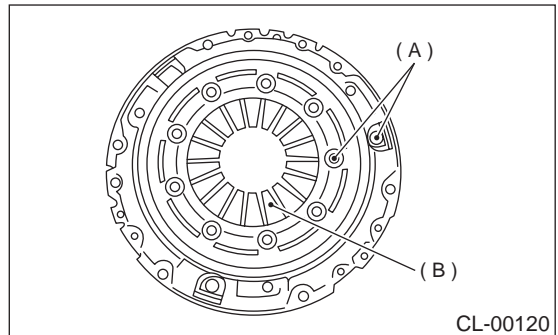
2. CLUTCH COVER

NOTE:

Visually check for the following items without disassembling, and replace or repair if defective.

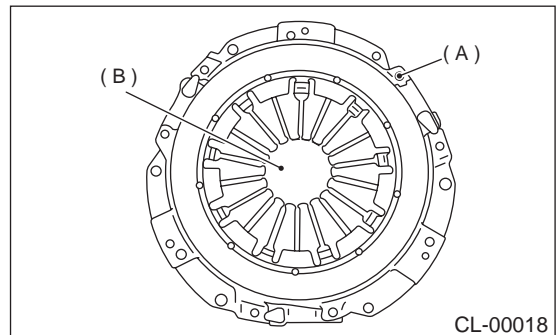
- 1) Loose thrust rivet.
- 2) Damaged or worn bearing contact area at center of diaphragm spring.

Europe and Australia Non-Turbo models



- (A) Thrust rivet
- (B) Diaphragm spring

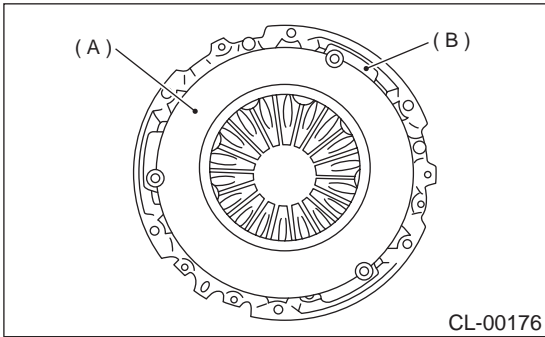
Except Europe and Australia models



- (A) Thrust rivet
- (B) Diaphragm spring

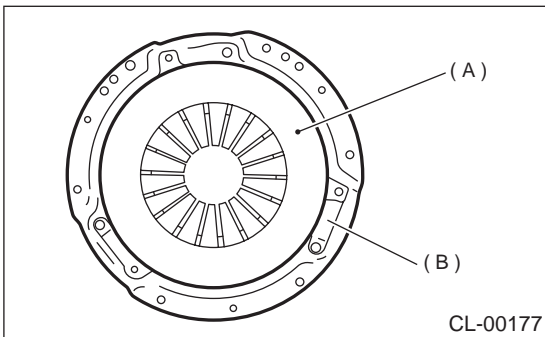
- 3) Damaged or worn disc contact surface of pressure plate.
- 4) Loose strap plate setting bolt.
- 5) Worn diaphragm sliding surface.

Europe and Australia Non-Turbo models



- (A) Pressure plate
- (B) Strap plate

Except Europe and Australia Non-Turbo models and Turbo model



- (A) Pressure plate
- (B) Strap plate

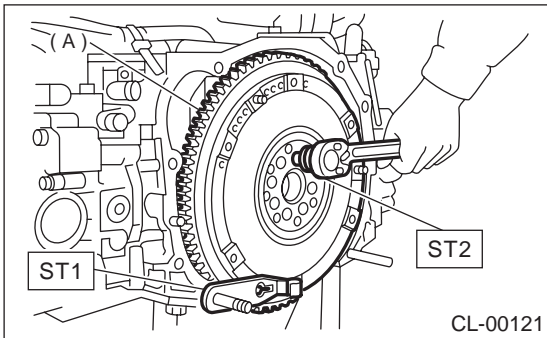
3. Flywheel

A: REMOVAL

1. EUROPE AND AUSTRALIA NON-TURBO MODELS

- 1) Remove transmission assembly. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove clutch cover and clutch disc. <Ref. to CL-15, REMOVAL, Clutch Disc and Cover.>
- 3) Remove flywheel using ST1 and ST2.

ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS

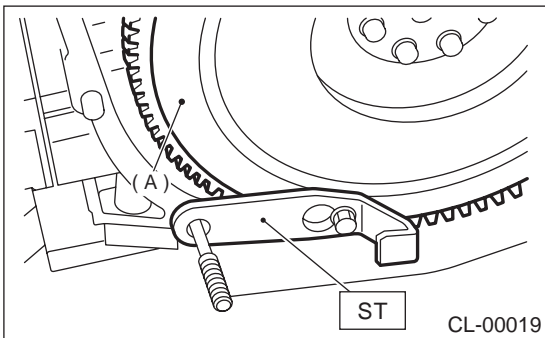


(A) Flywheel

2. EXCEPT EUROPE AND AUSTRALIA NON-TURBO MODELS AND TURBO MODEL

- 1) Remove transmission assembly. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>
- 2) Remove clutch cover and clutch disc. <Ref. to CL-15, REMOVAL, Clutch Disc and Cover.>
- 3) Using ST, remove flywheel.

ST 498497100 CRANKSHAFT STOPPER



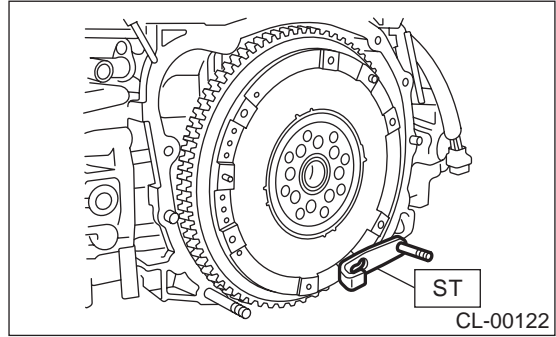
(A) Flywheel

B: INSTALLATION

1. EUROPE AND AUSTRALIA NON-TURBO MODELS

- 1) Install flywheel and ST.

ST 498497100 CRANKSHAFT STOPPER



- 2) Tighten the flywheel attaching bolts to the specified torque.

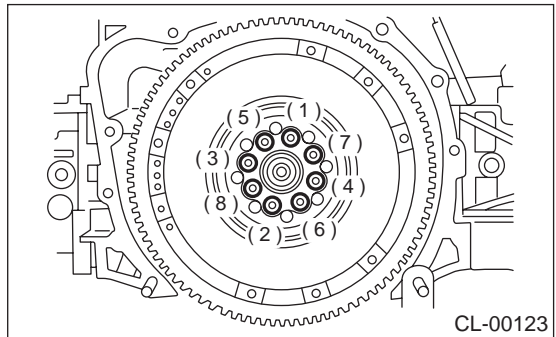
ST 499057000 TORX PLUS

NOTE:

Tighten flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:

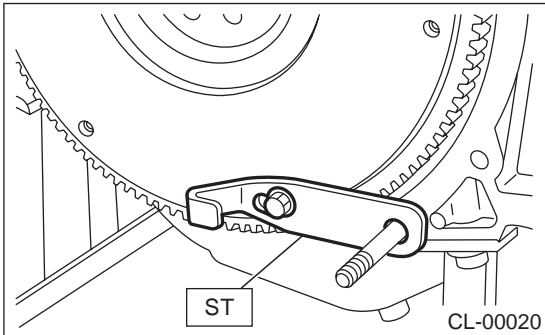
72 N·m (7.3 kgf-m, 52.8 ft-lb)



- 3) Install clutch disc and cover. <Ref. to CL-15, EUROPE AND AUSTRALIA NON-TURBO MODELS, INSTALLATION, Clutch Disc and Cover.>
- 4) Install transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

2. EXCEPT EUROPE AND AUSTRALIA NON-TURBO MODELS AND TURBO MODEL

- 1) Install flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER



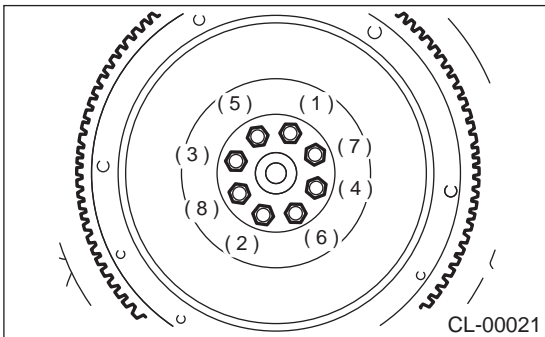
- 2) Tighten the flywheel attaching bolts to the specified torque.

NOTE:

Tighten flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:

72 N·m (7.3 kgf-m, 52.8 ft-lb)



- 3) Install clutch disc and cover. <Ref. to CL-16, EXCEPT EUROPE AND AUSTRALIA NON-TURBO MODELS AND TURBO MODEL, INSTALLATION, Clutch Disc and Cover.>

- 4) Install transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

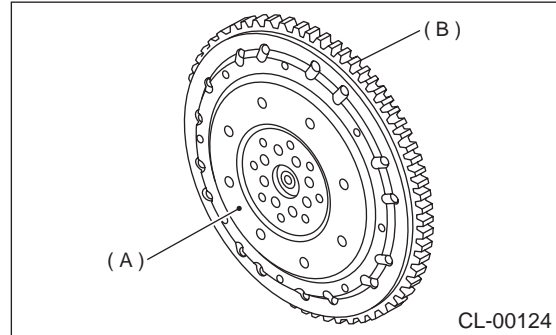
C: INSPECTION

CAUTION:

Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent.

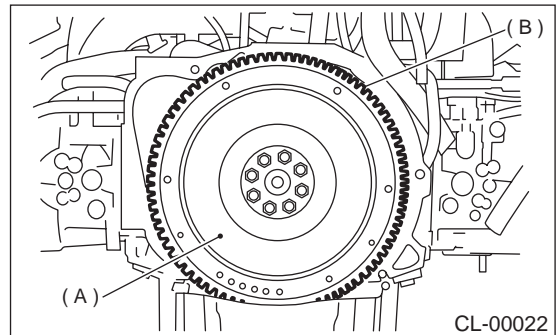
- 1) Damage of facing and ring gear
If defective, replace flywheel.

Europe and Australia Non-Turbo models



- (A) Flywheel
- (B) Ring gear

Except Europe and Australia Non-Turbo models and Turbo model



- (A) Flywheel
- (B) Ring gear

- 2) Smoothness of rotation

Rotate ball bearing applying pressure in thrust direction.

- 3) If noise or excessive play is noted, replace flywheel.

RELEASE BEARING AND LEVER

CLUTCH SYSTEM

4. Release Bearing and Lever

A: REMOVAL

1. NON-TURBO MODEL

1) Remove transmission assembly from vehicle body.

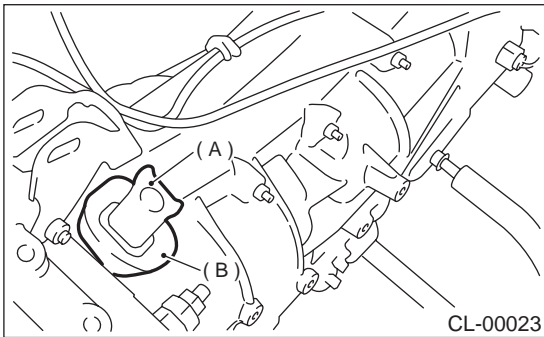
<Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>

2) Remove the two clips from clutch release lever and remove release bearing.

NOTE:

Be careful not to deform clips.

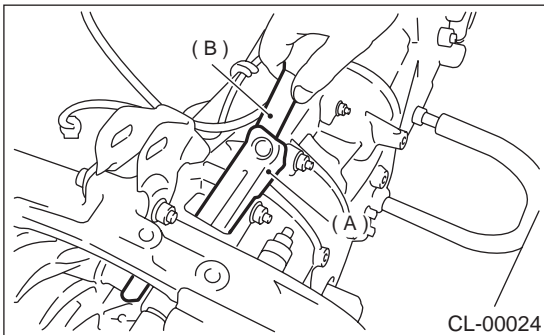
3) Remove release lever seal.



(A) Clutch release lever

(B) Release lever seal

4) Remove release lever retainer spring from release lever pivot with a screwdriver by accessing it through clutch housing release lever hole. Then remove release lever.



(A) Clutch release lever

(B) Screwdriver

5) Remove pivot

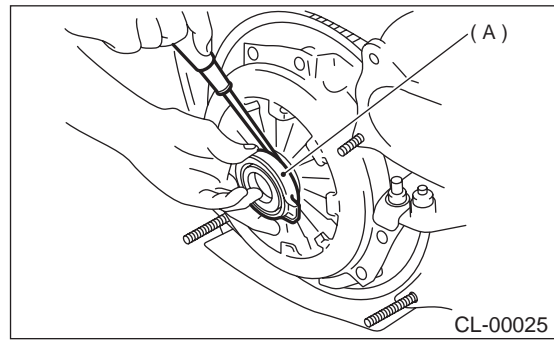
2. TURBO MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to MT-32, REMOVAL, Manual Transmission Assembly.>

2) Remove the clutch release lever from transmission.

3) Put the clutch release bearing in engine side.

4) Remove the clutch release bearing from clutch cover using a flat-type screwdriver.



(A) Clutch release bearing

B: INSTALLATION

1. NON-TURBO MODEL

NOTE:

Before or during assembling, lubricate the following points with a light coat of grease.

- Contact surface of lever and pivot
- Contact surface of lever and bearing
- Transmission main shaft spline (Use grease containing molybdenum disulphide.)
- Contact surface of lever and operating cylinder

1) Install pivot.

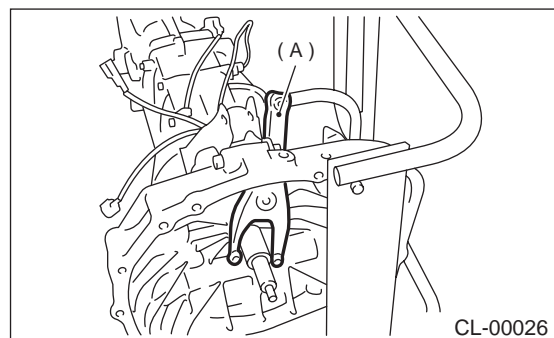
Tightening torque:

15.7 N·m (1.6 kgf·m, 11.6 ft·lb)

2) While pushing release lever to pivot and twisting it to both sides, fit retainer spring onto the constricted portion of pivot.

NOTE:

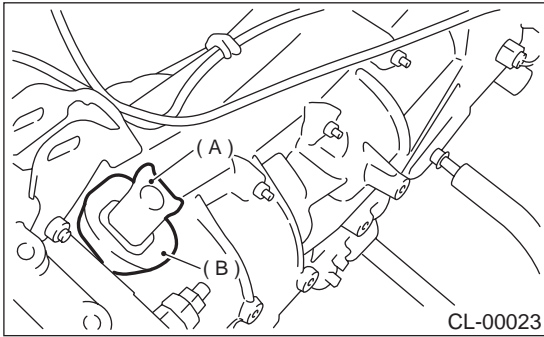
- Apply grease (SUNLIGHT 2: P/N 003602010) to contact point of release lever and operating cylinder. <Ref. to CL-3, COMPONENT, General Description.>
- Confirm that retainer spring is securely fitted by observing it through the main case hole.



(A) Release lever

3) Install release bearing and fasten it with two clips.

4) Install release lever seal.

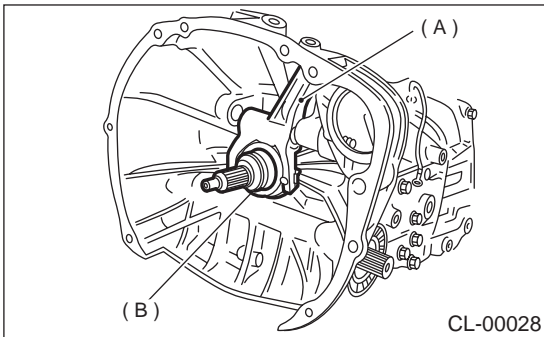


- (A) Release lever
- (B) Release lever seal

5) Install transmission assembly.
 <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

2. TURBO MODEL

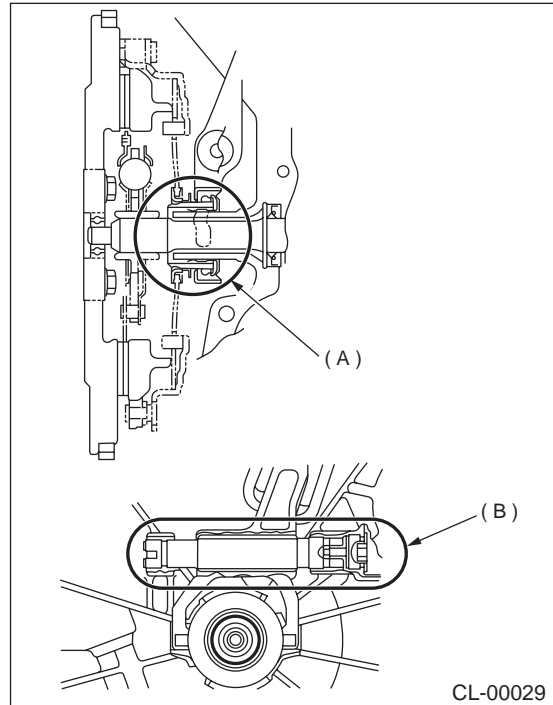
- 1) Install the release bearing on transmission.
- 2) Insert the release fork into release bearing tab.



- (A) Release fork
- (B) Release bearing

3) Apply grease to the specified points:

- Spline FX2200 (Part No. 000040901)
- Shaft SUNLIGHT 2 (Part No. 003602010)

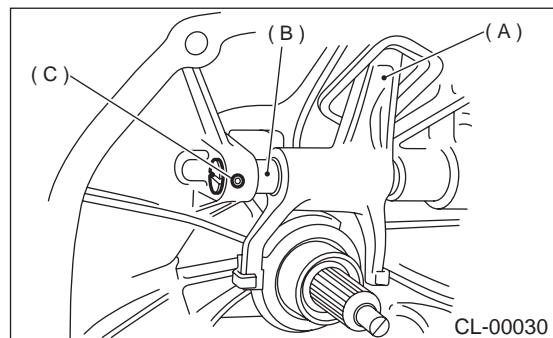


- (A) Spline (FX2200)
- (B) Shaft (SUNLIGHT 2)

4) Insert the release fork shaft into release fork.

NOTE:

Make sure the cutout portion of release fork shaft contacts spring pin.



- (A) Release fork
- (B) Release shaft
- (C) Spring pin

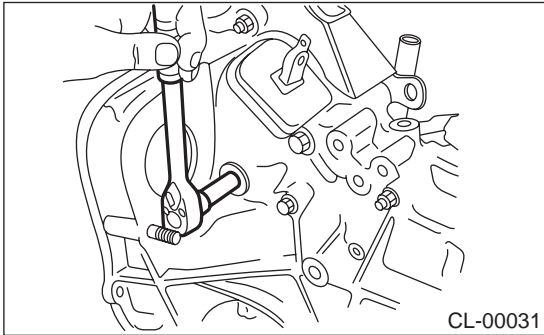
RELEASE BEARING AND LEVER

CLUTCH SYSTEM

5) Tighten the plug.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



6) Install the transmission assembly. <Ref. to MT-35, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1. RELEASE BEARING

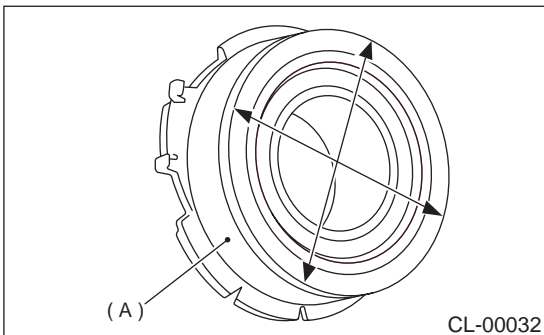
NOTE:

Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent when servicing the clutch.

1) Check the bearing for smooth movement by applying force in the radial direction.

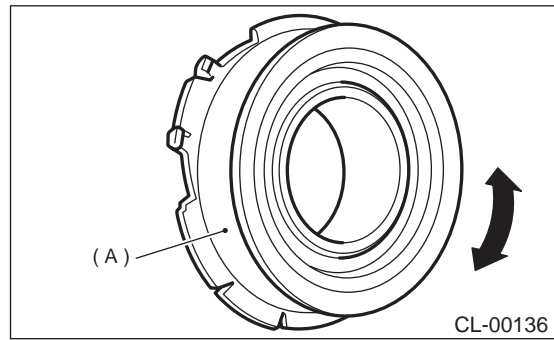
Radial direction stroke:

1.4 mm (0.055 in)



(A) Bearing case

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.

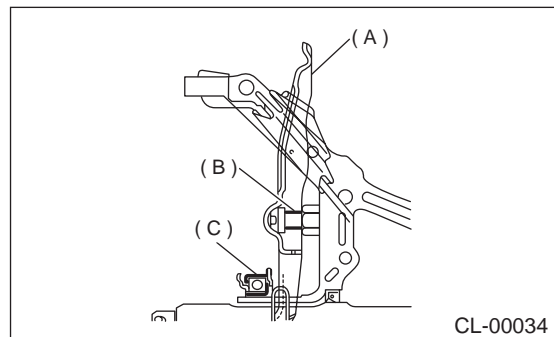


(A) Bearing case

3) Check wear and damage of bearing case surface contacting with lever.

2. RELEASE LEVER

1) Check lever pivot portion and the point of contact with release bearing case for wear.



(A) Clutch release lever

(B) Pivot

(C) Clutch release bearing

5. Operating Cylinder

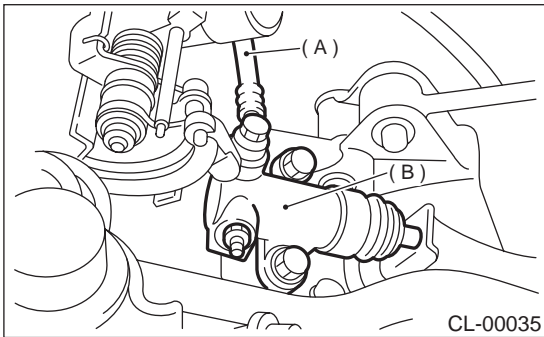
A: REMOVAL

- 1) Remove air cleaner case. (Non-Turbo model)
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 2) Remove intercooler. (Turbo model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 3) Remove clutch hose from operating cylinder.

CAUTION:

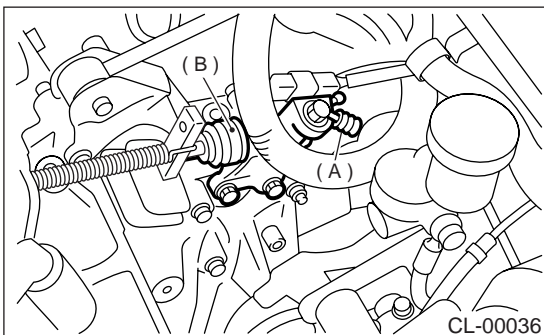
Cover hose joint to prevent clutch fluid from flowing out.

- Non-Turbo model



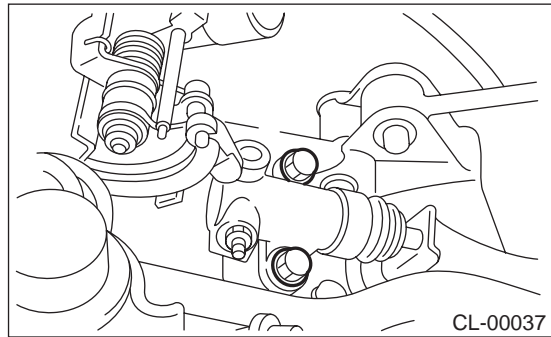
- (A) Clutch hose
- (B) Operating cylinder

- Turbo model

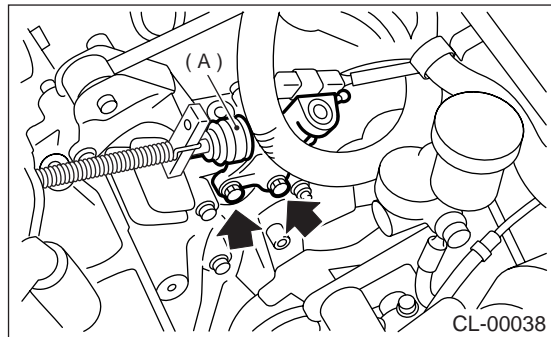


- (A) Clutch hose
- (B) Operating cylinder

- 4) Remove operating cylinder from transmission.
- Non-Turbo model



- Turbo model



- (A) Operating cylinder

B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

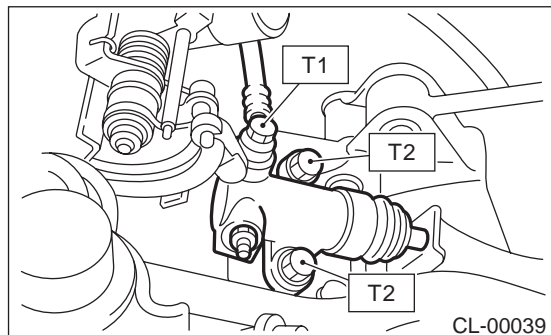
Before installing operating cylinder, apply grease (SUNLIGHT 2: P/N 003602010) to contact point of release lever and operating cylinder.

Tightening torque:

T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)

T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)

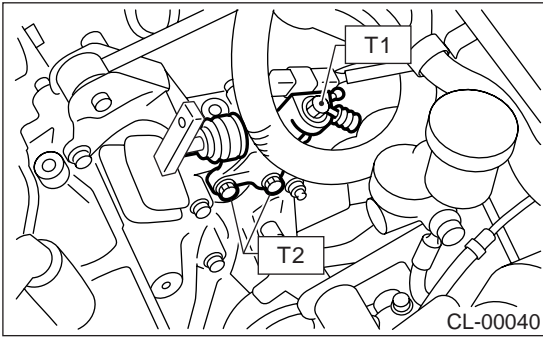
- Non-Turbo model



OPERATING CYLINDER

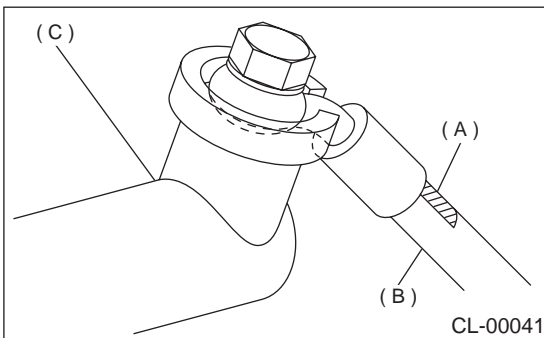
CLUTCH SYSTEM

- Turbo model



NOTE:

- Install the clutch hose facing mark upward.
- Do not twist clutch hose while installing.



- (A) Mark
- (B) Clutch hose
- (C) Operating cylinder

2) After bleeding air from operating cylinder, ensure that clutch operates properly.

<Ref. to CL-31, Clutch Fluid Air Bleeding.>

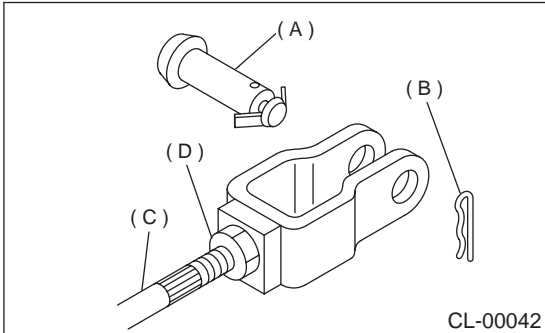
C: INSPECTION

- 1) Check operating cylinder for damage. If operating cylinder is damaged, replace it.
- 2) Check operating cylinder for fluid leakage or damage on boot. If any leakage or damage is found, replace operating cylinder.

6. Master Cylinder

A: REMOVAL

- 1) Thoroughly drain brake fluid from reservoir tank.
- 2) Remove snap pin, clevis pin and separate push rod of master cylinder from clutch pedal.

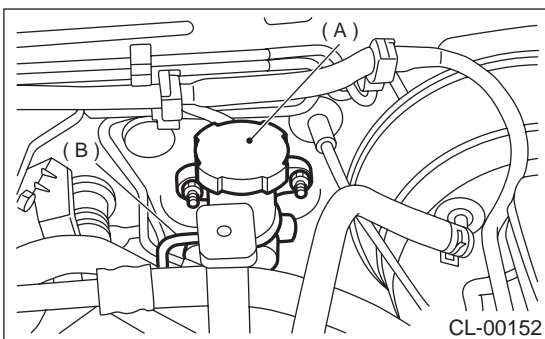


- (A) Clevis pin
- (B) Snap pin
- (C) Push rod
- (D) Lock nut

- 3) Remove air cleaner case. (Non-Turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 4) Remove intercooler. (Turbo model) <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 5) Remove clutch pipe from master cylinder.
- 6) Remove master cylinder with reservoir tank.

CAUTION:

Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; wipe it off quickly if spilt.



- (A) Master cylinder
- (B) Clutch pipe

B: INSTALLATION

- 1) Install master cylinder to body, and install clutch pipe to master cylinder.

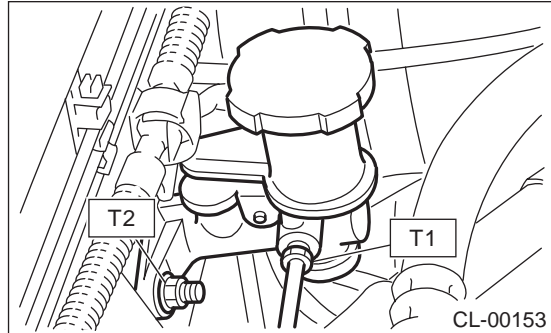
CAUTION:

Check that pipe is routed properly.

Tightening torque:

T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

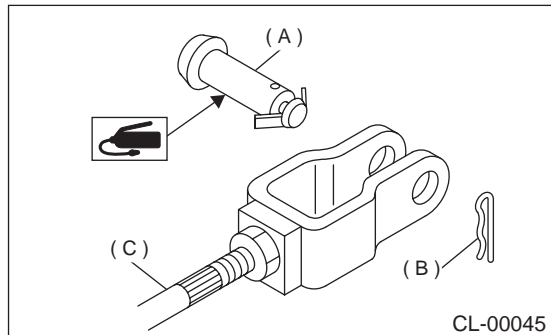
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 2) Connect push rod of master cylinder to clutch pedal, and install clevis pin and snap pin.

NOTE:

Apply grease to clevis pin.



- (A) Clevis pin
- (B) Snap pin
- (C) Push rod

- 3) After bleeding air from system, ensure that clutch operates properly.

<Ref. to CL-31, Clutch Fluid Air Bleeding.>

- 4) Install air cleaner case. (Non-Turbo model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

- 5) Install intercooler. (Turbo model)

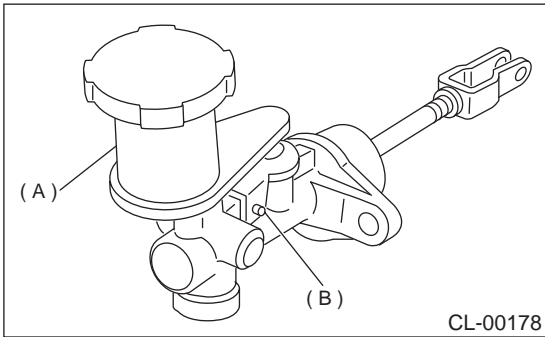
<Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

MASTER CYLINDER

CLUTCH SYSTEM

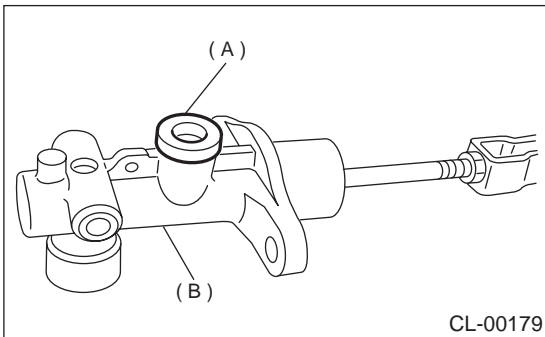
C: DISASSEMBLY

1) Remove straight pin and reservoir tank.



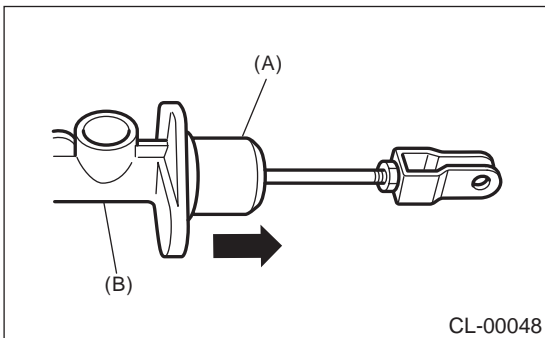
- (A) Reservoir tank
- (B) Straight pin

2) Remove oil seal.



- (A) Oil seal
- (B) Master cylinder

3) Move the cylinder boot backward.



- (A) Cylinder boot
- (B) Master cylinder

4) Remove snap ring.

CAUTION:

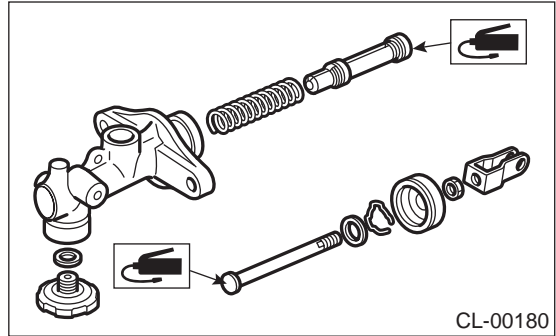
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

D: ASSEMBLY

1) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

Grease:

SILICONE GREASE G40M (Part No. 004404003)



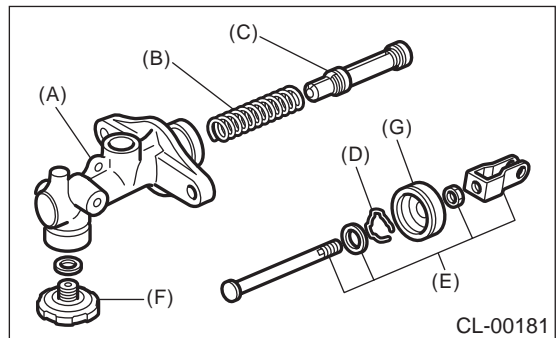
2) To assemble the master cylinder reverse the sequence of disassembly procedure.

Tightening torque:

T: 10 N·m (1.0 kgf·m, 7 ft·lb)

E: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, fluid reservoir, return spring and gasket, replace the faulty part.

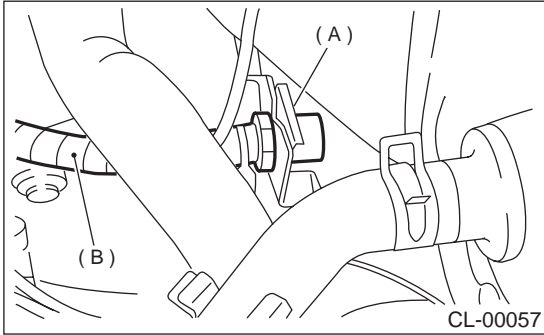


- (A) Master cylinder body
- (B) Return spring
- (C) Piston
- (D) Snap ring
- (E) Rod ASSY
- (F) Clutch dumper (Turbo model)
- (G) Cylinder boot

7. Clutch Pipe and Hose

A: REMOVAL

- 1) Remove air cleaner case and air intake duct.
- 2) Drain clutch fluid. <Ref. to CL-30, Clutch Fluid.>
- 3) Remove clutch pipe from the clutch hose and master cylinder.
- 4) Pull out clamp, then remove clutch hose from bracket.



- (A) Clamp
- (B) Clutch hose

- 5) Remove hose from operating cylinder.

B: INSTALLATION

Install in the reverse order of removal.

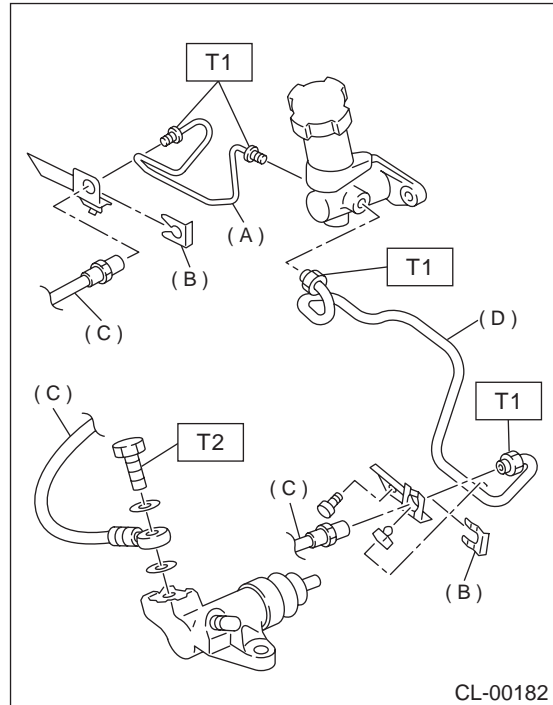
NOTE:

Bleed clutch fluid. <Ref. to CL-31, Clutch Fluid Air Bleeding.>

Tightening torque:

T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)



- (A) Clutch pipe (LHD model)
- (B) Clamp
- (C) Clutch hose
- (D) Clutch pipe (RHD model)

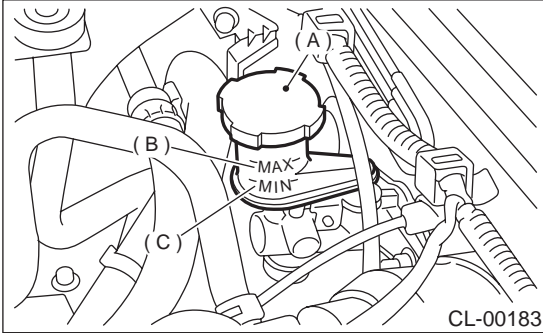
C: INSPECTION

Check pipes and hoses for cracks, breakage, or damage. Check joints for fluid leakage. If any cracks, breakage, damage, or leakage is found, repair or replace the applicable pipe or hose.

8. Clutch Fluid

A: INSPECTION

- 1) Park vehicle on a level surface.
- 2) Check the clutch fluid for significant deterioration. If it is deteriorated, replace it.
- 3) Inspect the fluid level using the scale on the outside of the clutch master cylinder tank. If the level is below "MIN", add clutch fluid to bring it up to "MAX".



- (A) Reservoir tank
- (B) Maximum (MAX) level
- (C) Maximum (MIN) level

B: REPLACEMENT

CAUTION:

- The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
- Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
- Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:

- During bleeding operation, keep the clutch reservoir tank filled with brake fluid to eliminate entry of air.
- Clutch pedal operating must be very slow.
- For convenience and safety, it is advisable to have two men working.
- The amount of brake fluid required is approximately 70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for total clutch system.

- 1) Remove air cleaner case. (Non-Turbo model)
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 2) Remove intercooler. (Turbo model)
<Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 3) Draw out the brake fluid from reservoir tank with syringe.

- 4) Refill reservoir tank with recommended brake fluid.

Recommended brake fluid:

FMVSS No. 116, fresh DOT3 or 4 brake fluid

- 5) Drain fluid in the same method as the air bleeding.
- 6) Refill brake fluid before reservoir tank becomes empty, and drain contaminated fluid again.
- 7) Repeat the above procedure until the contaminated fluid is completely drained.

9. Clutch Fluid Air Bleeding

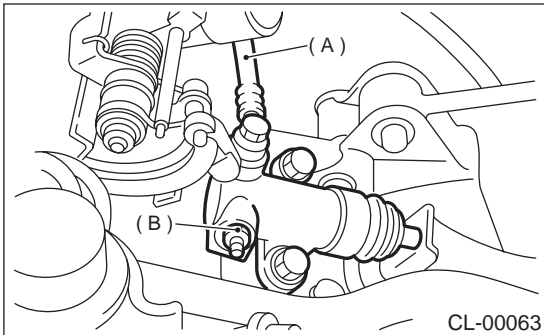
A: PROCEDURE

1. NON-TURBO MODEL

NOTE:

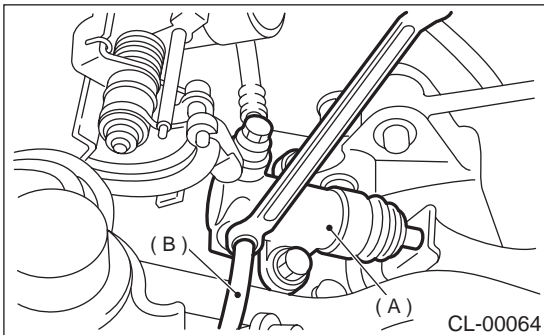
Bleed air from oil line with the help of a co-worker.

- 1) Remove air cleaner case.
<Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
- 2) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.



- (A) Clutch hose
- (B) Air bleeder

- 3) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid. Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.



- (A) Operating cylinder
- (B) Vinyl tube

- 4) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:

Cover bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

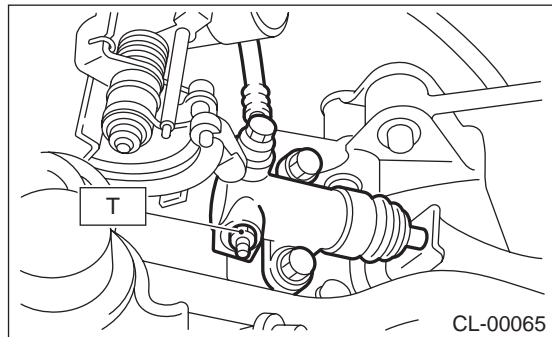
NOTE:

During bleeding operation, keep the clutch reservoir tank filled with brake fluid to eliminate entry of air.

- 5) Tighten air bleeder.

Tightening torque:

T: 8 N·m (0.8 kgf·m, 5.8 ft-lb)



- 6) Check the fluid level. <Ref. to CL-30, INSPECTION, Clutch Fluid.>
- 7) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
- 8) After bleeding air from system, ensure that clutch operates properly.
- 9) Install air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>

2. TURBO MODEL

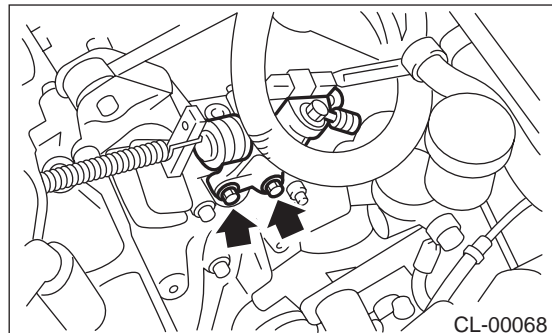
NOTE:

Bleed air from the oil line with help of a co-worker.

- 1) Remove the intercooler. <Ref. to IN(H4DOSTC)-13, REMOVAL, Intercooler.>
- 2) Remove the operating cylinder.

NOTE:

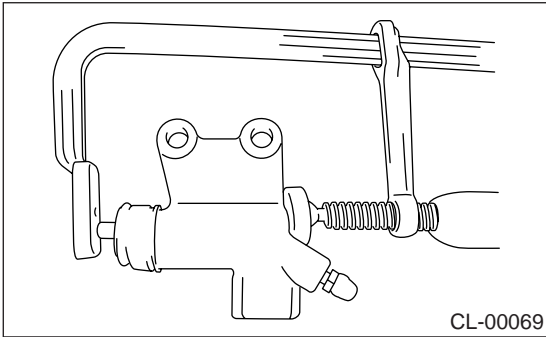
Do not remove the clutch hose.



CLUTCH FLUID AIR BLEEDING

CLUTCH SYSTEM

3) Fix the piston with clamp to avoid the piston from jumping out of cylinder.



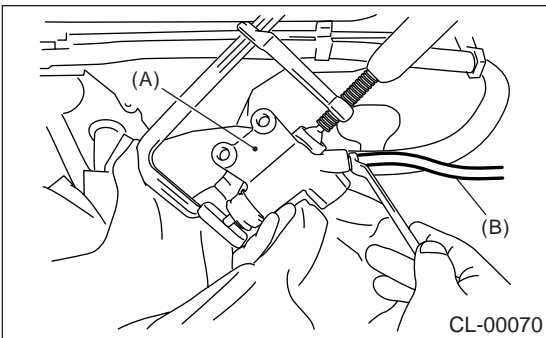
4) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.

5) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.

Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.

NOTE:

Set the air breather part higher than tip of operating cylinder when performing this procedure.



- (A) Operating cylinder
- (B) Vinyl tube

6) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:

Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

7) Tighten the air bleeder.

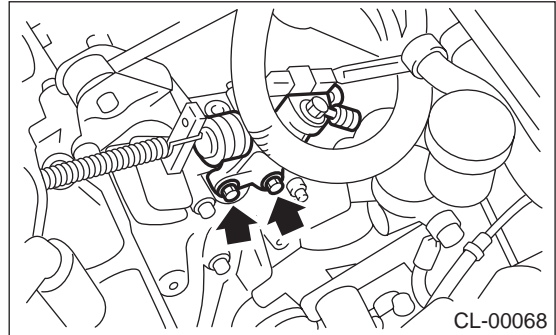
Tightening torque:

T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

8) Install the operation cylinder.

Tightening torque:

T: 37 N·m (3.8 kgf-m, 27.5 ft-lb)



9) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.

10) After bleeding air from the system, ensure that the clutch operates properly.

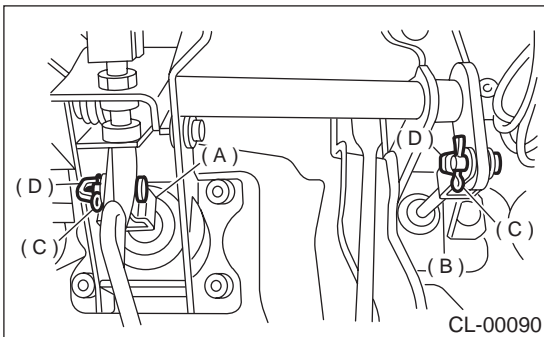
11) Install the intercooler. <Ref. to IN(H4DOSTC)-14, INSTALLATION, Intercooler.>

10. Clutch Pedal

A: REMOVAL

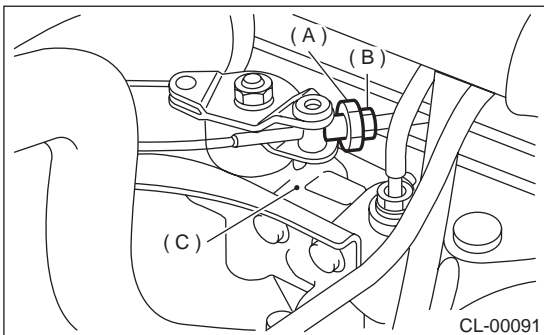
1. LHD MODEL

- 1) Remove steering column. <Ref. to PS-28, REMOVAL, Tilt Steering Column.>
- 2) Disconnect connectors from stop light and clutch switches.
- 3) Remove snap pins which secure lever to push rod and operating rod.
- 4) Remove clevis pins which secure lever to push rod and operating rod.



- (A) Operating rod
- (B) Push rod
- (C) Snap pin
- (D) Clevis pin

- 5) Remove PHV adjusting nut and lock nut.

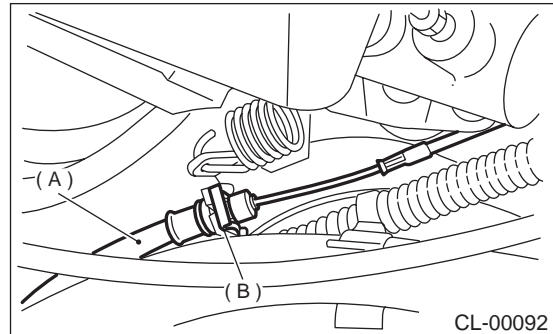


- (A) Adjusting nut
- (B) Lock nut
- (C) PHV

- 6) Remove cable clamp, and disconnect PHV cable from PHV.

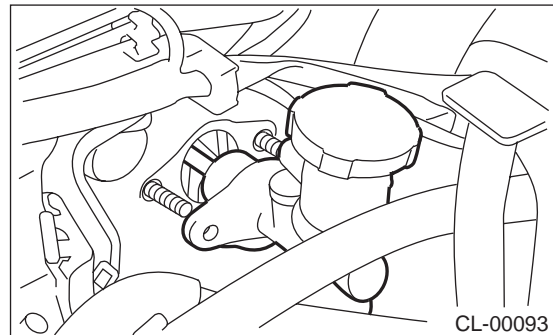
NOTE:

Carefully protect boot and inner cable from damage when disconnecting PHV cable.



- (A) PHV cable
- (B) Clamp

- 7) Remove nut which secures clutch master cylinder.



- 8) Remove bolts and nuts which secure brake and clutch pedals, and remove pedal assembly.

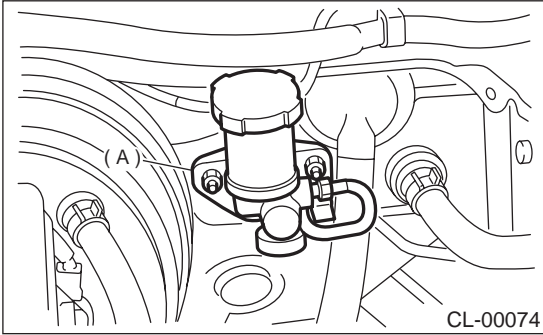
2. RHD MODEL

- 1) Disconnect ground cable from battery.
- 2) Remove lower cover under the steering wheel.
- 3) Disconnect connector from clutch. (With cruise control)
- 4) Remove snap pin and clevis pin that join push rod and clutch pedal.

CLUTCH PEDAL

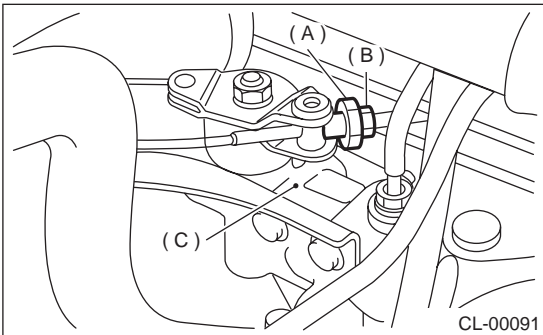
CLUTCH SYSTEM

5) Remove master cylinder mounting nuts.



(A) Master cylinder

6) Remove PHV adjusting nut and lock nut. (Non-Turbo model)

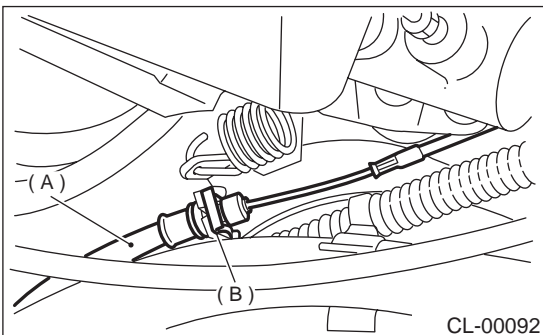


(A) Adjusting nut
(B) Lock nut
(C) PHV

7) Remove cable clamp and disconnect PHV cable from PHV.

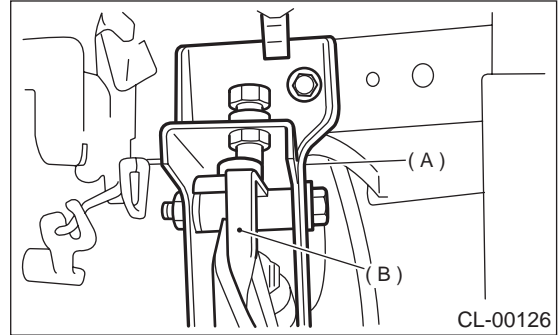
NOTE:

Carefully protect boot and inner cable from damage when disconnecting PHV cable.



(A) PHV cable
(B) Clamp

8) Remove clutch pedal and bracket as a unit.



(A) Clutch pedal bracket
(B) Clutch pedal

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:

- If cable clamp is damaged, replace it with a new one.
- Never fail to cover outer cable end with boot.
- Be careful not to kink accelerator cable.
- Always use new clevis pins.

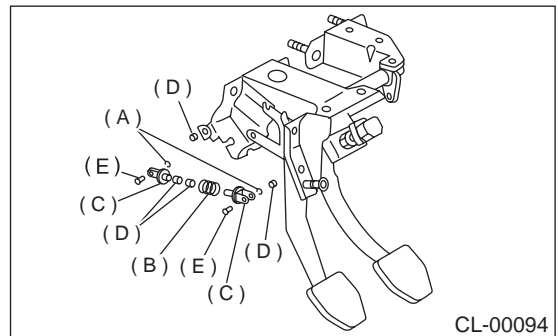
2) Adjust clutch pedal. <Ref. to CL-37, ADJUSTMENT, Clutch Pedal.>

3) Adjust hill holder. (Non-Turbo model) <Ref. to BR-49, ADJUSTMENT, Hill Holder.>

C: DISASSEMBLY

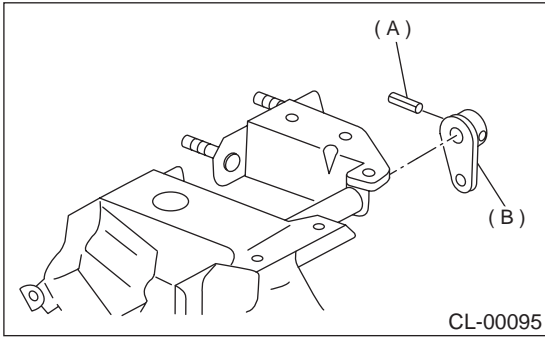
1. LHD MODEL

- 1) Remove clutch switches.
- 2) Remove clips, assist spring, rod and bushing.



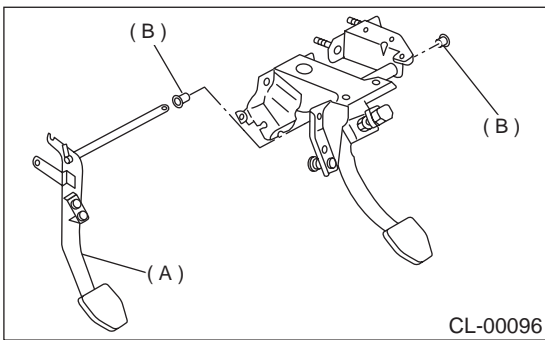
(A) Clip
(B) Assist spring
(C) Assist rod
(D) Bushing
(E) Clevis pin

3) Remove spring pin and lever.



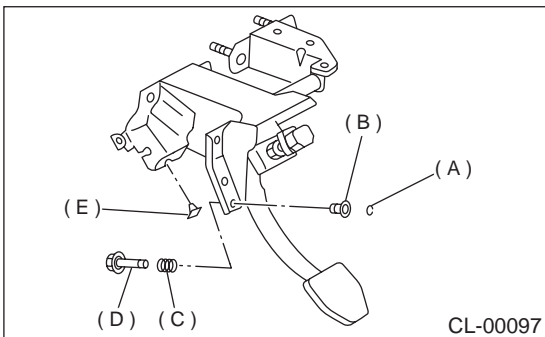
- (A) Pin
- (B) Lever

4) Remove clutch pedal and bushings.



- (A) Clutch pedal
- (B) Bushing

5) Remove stopper, clip, O-ring, rod S, and then remove spring and bushing S.



- (A) Clip (If equipped)
- (B) Bushing S (If equipped)
- (C) Spring S (If equipped)
- (D) Rod S (If equipped)
- (E) Stopper

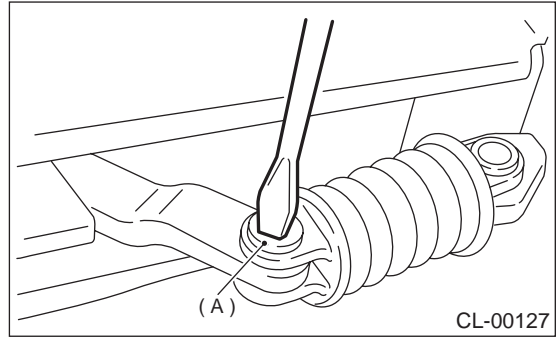
6) Remove stoppers from clutch pedal.

7) Remove clutch pedal pad.

2. RHD MODEL

1) Remove clutch switch.

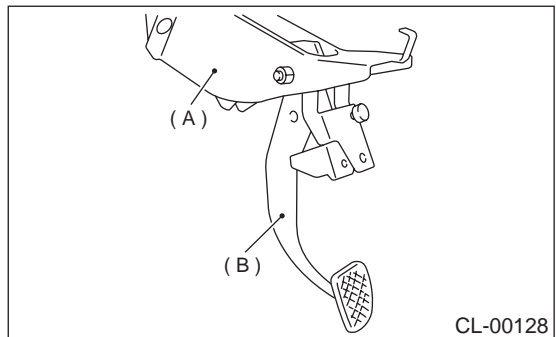
2) Remove clip, pull out clevis pin.



- (A) Clevis pin

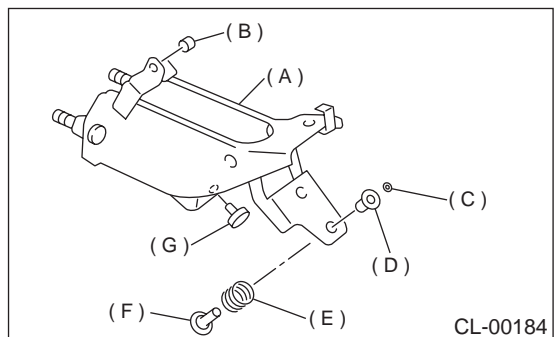
3) Remove assist rod, spring and bushing.

4) Remove clutch pedal from clutch pedal bracket.



- (A) Clutch pedal bracket
- (B) Clutch pedal

5) Remove following parts (B to G) from clutch pedal bracket (A) as shown in figure.

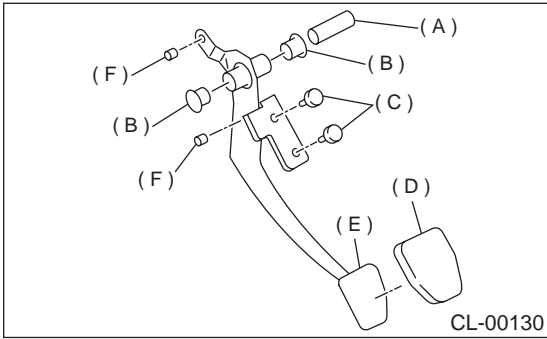


- (A) Clutch pedal bracket
- (B) Bushing C
- (C) Clip (If equipped)
- (D) Bushing S (If equipped)
- (E) Spring S (If equipped)
- (F) Rod S (If equipped)
- (G) Bushing

CLUTCH PEDAL

CLUTCH SYSTEM

6) Remove spacer, bushing and pedal pad from clutch pedal.



- (A) Spacer
- (B) Bushing
- (C) Bushing
- (D) Pedal pad
- (E) Clutch pedal
- (F) Bushing C

D: ASSEMBLY

1. LHD MODEL

- 1) Attach clutch switch, etc. to pedal bracket temporarily.
- 2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.
- 3) Align bores of pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring, assist rods, and spring, and bushing.

NOTE:

Clean up inside of bushings and apply grease before installing spacer.

4) Install hill holder cable to the clutch pedal. (Vehicle with hill holder)

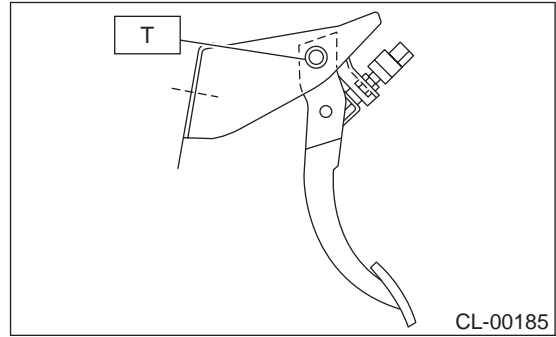
2. RHD MODEL

- 1) Clean and apply grease to hole of sliding portion between clutch pedal and bushing.
- 2) Install pad, stopper, bushing C, spacer and bushing to clutch pedal.
- 3) Install rod S, spring S, bushing S, clip, bushing, clutch switch and bushing C to clutch pedal bracket.

4) Install clutch pedal to pedal bracket.

Tightening torque:

T: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



5) Install assist rod, bushing and assist spring to clutch pedal and pedal bracket.

6) Install PHV cable to clutch pedal. (Vehicle with hill holder).

E: INSPECTION

1. CLUTCH PEDAL

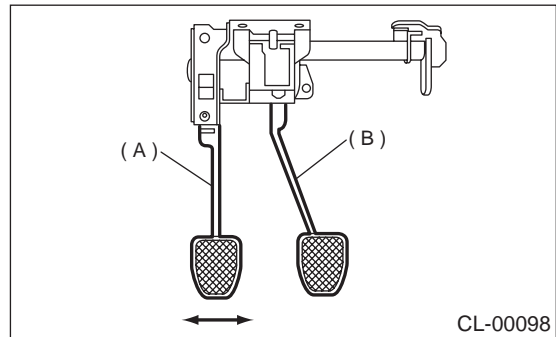
Move clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

If excessive deflection is noted, replace bushings with new ones.

Deflection of clutch pedal:

Service limit

5.0 mm (0.197 in) or less



- (A) Clutch pedal
- (B) Brake pedal

F: ADJUSTMENT

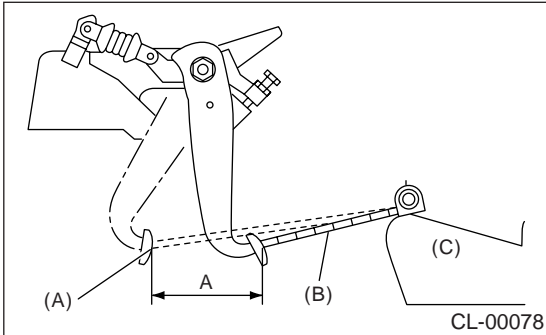
1. LHD MODEL

1) Measure the full stroke amount of clutch pedal.

NOTE:

- Measure the length between seat cushion front end and center portion of clutch pedal.
- Slide the seat at seventh notch from first notch.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

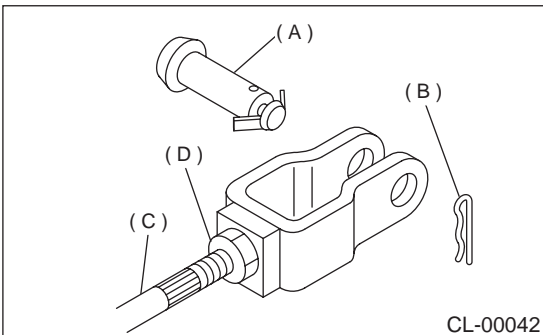


- (A) Clutch (Full stroke condition)
- (B) Scale
- (C) Seat

2) If not as specified, loosen the clutch stopper nut to adjust it.

Tightening torque (Clutch stopper nut):
8 N·m (0.8 kgf·m, 5.8 ft·lb)

3) Loosen the push rod lock nut.

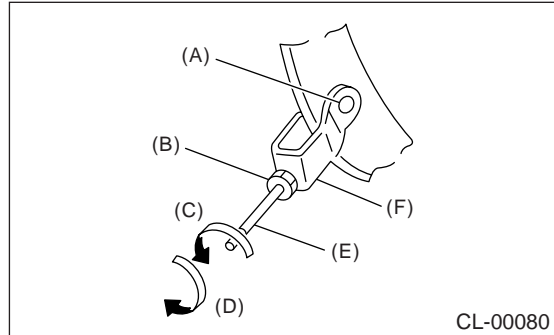


- (A) Clevis pin
- (B) Snap pin
- (C) Push rod
- (D) Push rod lock nut

4) Turn the push rod to adjust.

(1) Ensure that the clutch pedal contacts stopper bolt, when releasing the clutch pedal.

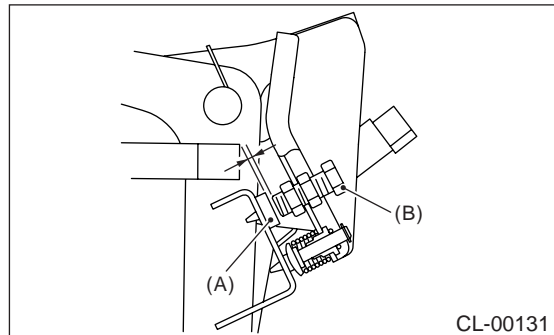
(2) Ensure that the clutch pedal contacts clutch pedal bracket stopper, when fully depressing the clutch pedal.



- (A) Clevis hole
- (B) Push rod lock nut
- (C) Lengthening direction
- (D) Shortening direction
- (E) Push rod
- (F) U shaped bracket

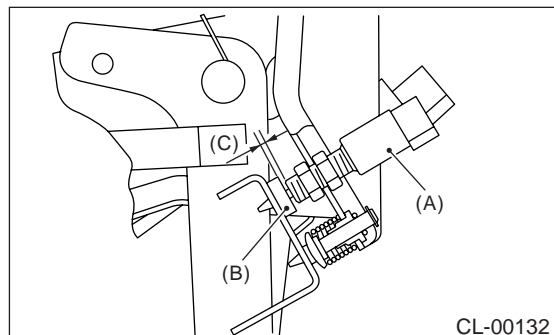
5) Turn the push rod clockwise to shorten until clearance is made at stopper bolt or clutch switch.

- Without cruise control



- (A) Stopper
- (B) Stopper bolt

- With cruise control

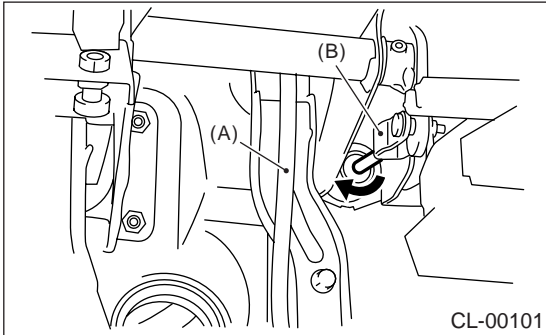


- (A) Clutch switch
- (B) Stopper
- (C) Clearance

CLUTCH PEDAL

CLUTCH SYSTEM

- 6) Turn the push rod counter clockwise to lengthen until clutch pedal contacts to stopper bolt or clutch switch.
- 7) Turn the push rod further 270° counterclockwise to lengthen (arrow direction as shown in the figure).



- (A) Accelerator pedal
- (B) Clevis

- 8) Move the clevis pin in lateral direction to ensure it moves smoothly.
- 9) Tighten the push rod lock nut.

Tightening torque (Clutch stopper nut):
10 N·m (1.0 kgf-m, 7.2 ft-lb)

- 10) Measure the full stroke amount of clutch pedal again.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

- 11) Install the clutch switch. <Ref. to CL-40, INSTALLATION, Clutch Switch.>

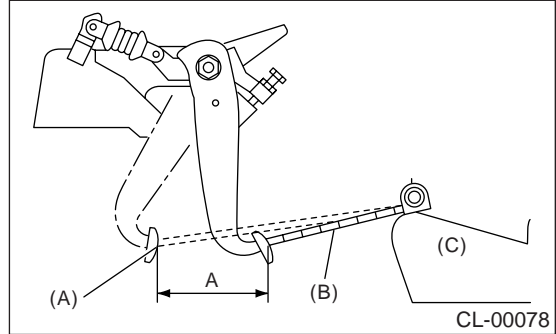
2. RHD MODEL

- 1) Measure the full stroke amount of clutch pedal.

NOTE:

- Measure the length between seat cushion front end and center portion of clutch pedal.
- Slide the seat at seventh notch from first notch.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

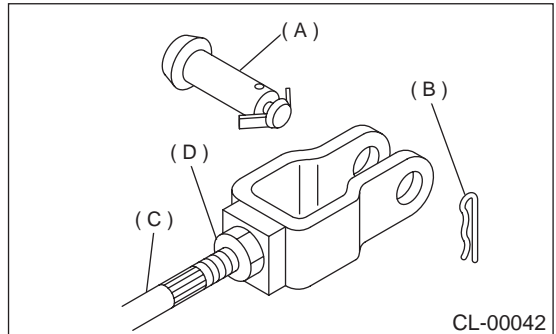


- (A) Clutch (Full stroke condition)
- (B) Scale
- (C) Seat

- 2) If not as specified, adjust it with stopper bolt or clutch switch.

Tightening torque (Clutch stopper nut):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

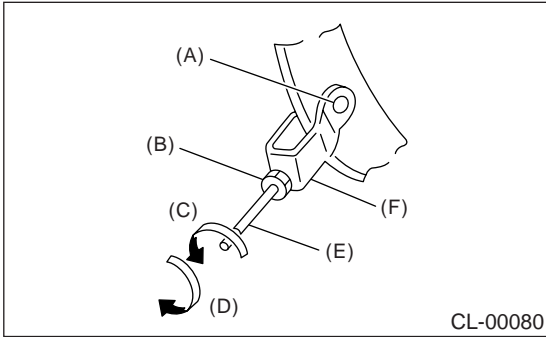
- 3) Loosen the push rod lock nut.



- (A) Clevis pin
- (B) Snap pin
- (C) Push rod
- (D) Push rod lock nut

- 4) Turn the push rod to adjust.
 - (1) Ensure that the clutch pedal contacts stopper bolt, when releasing the clutch pedal.

(2) Ensure that the clutch pedal contacts clutch pedal bracket stopper, when fully depressing the clutch pedal.



- (A) Clevis hole
- (B) Push rod lock nut
- (C) Lengthening direction
- (D) Shortening direction
- (E) Push rod
- (F) U shaped bracket

8) Move the clevis pin in lateral direction to ensure it moves smoothly.

9) Tighten the push rod lock nut.

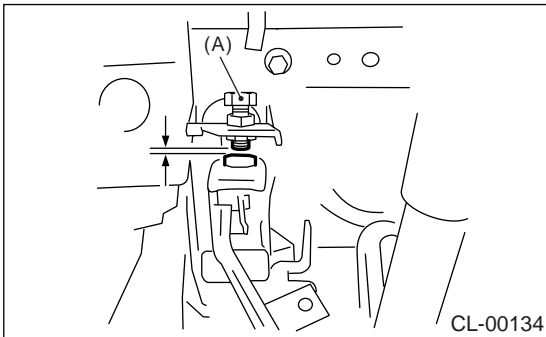
Tightening torque (Clutch stopper nut):
10 N·m (1.0 kgf-m, 7.2 ft-lb)

10) Measure the full stroke amount of clutch pedal again.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

11) Install the clutch switch. <Ref. to CL-40, INSTALLATION, Clutch Switch.>

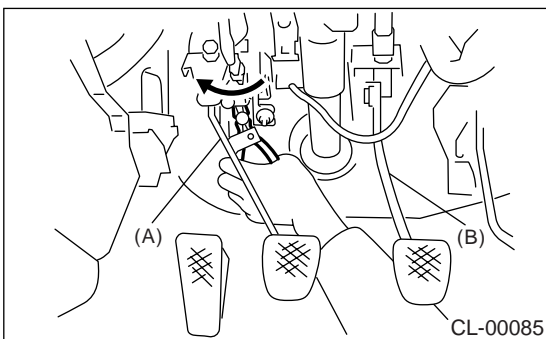
5) Turn the push rod clockwise to shorten until clearance is made at stopper bolt or clutch switch.



- (A) Stopper bolt

6) Turn the push rod counter clockwise to lengthen until clutch pedal contacts to stopper bolt or clutch switch.

7) Turn the push rod further 270° counterclockwise to lengthen (arrow direction as shown in the figure).



- (A) Clutch pedal
- (B) Brake pedal

CLUTCH SWITCH

CLUTCH SYSTEM

11. Clutch Switch

A: REMOVAL

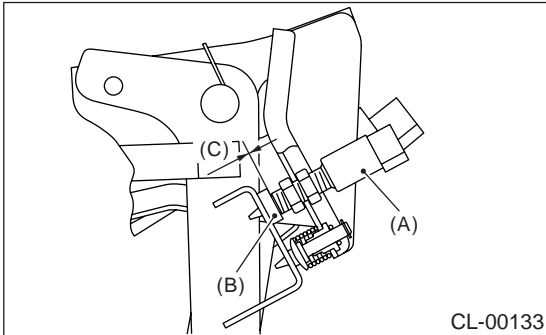
- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover.
- 3) Disconnect the connector from clutch start switch.

B: INSTALLATION

- 1) Install the clutch switch and clutch pedal stopper so that the gap between them is 0 mm (0 in).

Tightening torque:

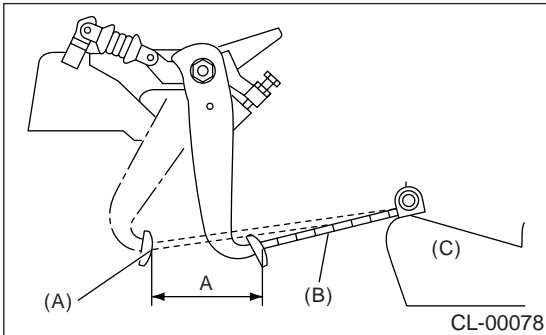
8 N·m (0.8 kgf·m, 5.8 ft·lb)



- (A) Clutch switch
- (B) Stopper
- (C) 0 mm (0 in)

- 2) Measure stroke of clutch pedal.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)



- 3) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-37, ADJUSTMENT, Clutch Pedal.>

- 4) Connect clutch switch connector.

C: INSPECTION

- 1) Check the clutch switch continuity. If continuity is not as specified, replace the switch.

- (1) Disconnect the clutch switch connector.
- (2) Measure the resistance between 1 and 2 of switch terminal.

- 3) Check clutch switch continuity. If continuity is not as specified, replace the switch.

- (1) Disconnect the clutch switch connector.
- (2) Measure the resistance between 1 and 2 of switch terminal.

Terminals/Specified resistance

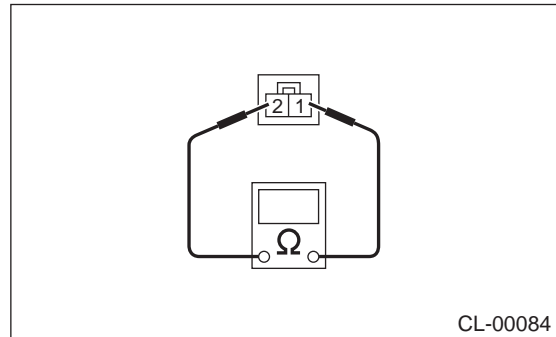
When clutch pedal depressed:

1 — 2/Less than 1Ω

Terminals / Specified resistance

When clutch pedal not depressed:

1 — 2/More than 1 MΩ



D: ADJUSTMENT

Refer to “ADJUSTMENT” for clutch pedal. <Ref. to CL-37, ADJUSTMENT, Clutch Pedal.>

12. General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptom	Possible cause	Corrective
<p>1. Clutch slippage.</p> <p>It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms</p> <ul style="list-style-type: none"> • Engine speed up when shifting. • High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. • Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing. • Method of testing: Put the vehicle in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not start off and the engine does not stall. 	(a) Clutch facing smeared by oil	Replace.
	(b) Worn clutch facing	Replace.
	(c) Deteriorated diaphragm spring	Replace.
	(d) Distorted pressure plate or fly-wheel	Correct or replace.
	(e) Defective release bearing holder	Correct or replace.
<p>2. Clutch drags.</p> <p>As a symptom of this trouble, a harsh scratching noise develops and control becomes quite difficult when shifting gears. The symptom becomes more apparent when shifting into the first gear. However, because much trouble of this sort is due to defective synchronization mechanism, carry out the test as described after.</p> <ul style="list-style-type: none"> • Method of testing: <Ref. to CL-42, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.> <p>It may be judged as insufficient disengagement of clutch if any noise occurs during this test.</p>	(a) Worn or rusty clutch disc hub spline	Replace clutch disc.
	(b) Excessive deflection of clutch disc facing	Correct or replace.
	(c) Seized crankshaft pilot needle bearing	Replace.
	(d) Cracked clutch disc facing	Replace.
	(e) Sticked clutch disc (smeared by oil or water)	Replace.
<p>3. Clutch chatters.</p> <p>Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.</p>	(a) Adhesion of oil on the facing	Replace clutch disc.
	(b) Weak or broken torsion spring	Replace clutch disc.
	(c) Defective facing contact or excessive disc	Replace clutch disc deflection.
	(d) Warped pressure plate or fly-wheel	Correct or replace.
	(e) Loose disc rivets	Replace clutch disc.
	(f) Loose engine mounting	Retighten or replace mounting.
	(g) Faulty pitching stopper	Replace.
<p>4. Noisy clutch</p> <p>Examine whether the noise is generated when the clutch is disengaged, engaged, or partially engaged.</p>	(a) Broken, worn or unlubricated release bearing	Replace release bearing.
	(b) Insufficient lubrication of pilot bearing	Apply grease.
	(c) Loose clutch disc hub	Replace clutch disc.
	(d) Loose torsion spring retainer	Replace clutch disc.
	(e) Deteriorated or broken torsion spring	Replace clutch disc.

GENERAL DIAGNOSTIC TABLE

CLUTCH SYSTEM

Symptom	Possible cause	Corrective
5. Clutch grabs. When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start.	(a) Grease or oil on facing	Replace clutch disc.
	(b) Deteriorated cushioning spring	Replace clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace clutch disc or main shaft.
	(d) Deteriorated or broken torsion spring	Replace clutch disc.
	(e) Loose engine mounting	Retighten or replace mounting.
	(f) Deteriorated diaphragm spring	Replace.

2. CLUTCH PEDAL

Trouble	Corrective action
Insufficient pedal play	Adjust pedal play.
Clutch pedal free play insufficient	Adjust pedal free play.
Excessively worn and damaged pedal shaft and/or bushing	Replace bushing and/or shaft with new one.

3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

Step	Value	Yes	No
1 CHECK GEAR NOISE. 1) Start the engine. 2) Disengage the clutch and shift quickly from neutral to reverse in idling condition.	Is an abnormal noise heard from the transmission gears?	Go to step 2.	Clutch is normal.
2 CHECK GEAR NOISE. With the engine idling, disengage the clutch and shift quickly (between 0.5 to 1.0 s) from neutral to reverse.	Is an abnormal noise heard from the transmission gears?	Go to step 3.	Defective transmission or excessive clutch drag torque. Inspect pilot bearing, clutch disc, transmission and clutch disc hub spline.
3 CHECK GEAR NOISE. With the engine idling, disengage the clutch and shift quickly (between 0.5 to 1.0 s) from neutral to reverse shift repeatedly between neutral and reverse with clutch disengaged.	Is an abnormal noise heard from the transmission gears?	Clutch is not disengaged properly. Inspect clutch disc, clutch cover, clutch release system, and clutch pedal free play.	Clutch disc and flywheel are locked together. Inspect clutch disc and clutch disc hub spline.

CHASSIS SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FRONT SUSPENSION	FS
REAR SUSPENSION	RS
WHEEL AND TIRE SYSTEM	WT
DIFFERENTIALS	DI
TRANSFER CASE	TC
DRIVE SHAFT SYSTEM	DS
ABS	ABS
ABS (DIAGNOSTICS)	ABS
VDC	VDC
VDC (DIAGNOSTICS)	VDC
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

FRONT SUSPENSION



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5. Front Strut	17
6. Front Stabilizer	21
7. Front Crossmember	22
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GENERAL DESCRIPTION

FRONT SUSPENSION

1. General Description

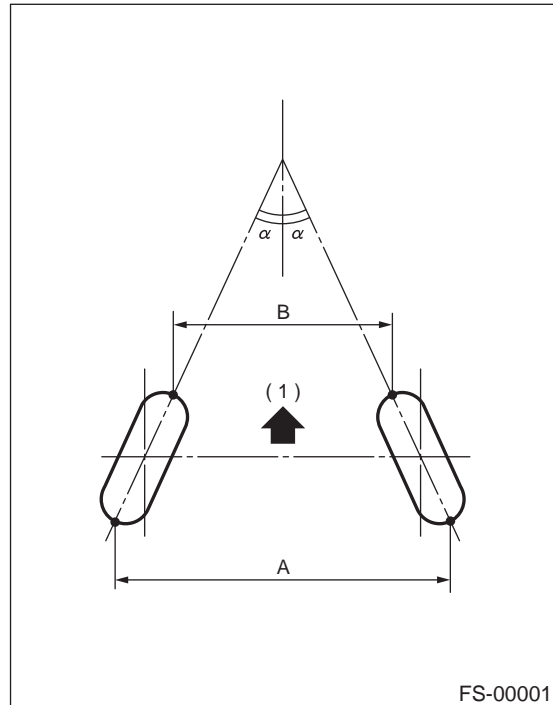
A: SPECIFICATIONS

	Model	Sedan		Wagon		OUTBACK		TURBO
		2.0 L	2.5 L	2.0 L	2.5 L	Except Australia	Australia	Australia
Front	Camber (Tolerance: $\pm 0^{\circ}30'$)	$-0^{\circ}05'$		$-0^{\circ}05'$		$0^{\circ}25'$		$-0^{\circ}15'$
	Caster	$3^{\circ}05'$		$2^{\circ}50'$		$2^{\circ}40'$		$3^{\circ}10'$
	Toe-in	0 ± 3 mm (0 ± 0.12 in) Each toe angle: $\pm 0^{\circ}15'$						
	Kingpin angle	$14^{\circ}15'$		$14^{\circ}15'$		$13^{\circ}30'$		$14^{\circ}30'$
	Wheel arch height [Tolerance: $+12/-24$ mm ($+0.47/-0.94$ in)]	388 mm (15.28 in)		388 mm (15.28 in)		428 mm (16.85 in)		378 mm (14.88 in)
	Diameter of stabilizer	19 mm (0.75 in)	21 mm (0.83 in)	19 mm (0.75 in)	21 mm (0.83 in)	21 mm (0.83 in)		20 mm (0.79 in)
Rear	Camber (Tolerance: $\pm 0^{\circ}45'$)	$-0^{\circ}30'$		$-0^{\circ}20'$		$-0^{\circ}10'$		$-0^{\circ}45'$
	Toe-in	0 ± 3 mm (0 ± 0.12 in) Each toe angle: $\pm 0^{\circ}15'$						
	Thrust angle	$0^{\circ} \pm 30'$						
	Wheel arch height [Tolerance: $+12/-24$ mm ($+0.47/-0.94$ in)]	371 mm (14.61 in)		381 mm (15.00 in)		421 mm (16.57 in)	431 mm (16.97 in)	361 mm (14.21 in)
	Diameter of stabilizer	14 mm (0.55 in)		15 mm (0.59 in)	14 mm (0.55 in)	14 mm (0.55 in)		17 mm (0.67 in)

NOTE:

- Front and rear toe-in and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the middle value of specification.
- The other items indicated in the specification table cannot be adjusted. If the other items exceed specifications, check suspension parts and con-

nections for deformities; replace with new ones as required.

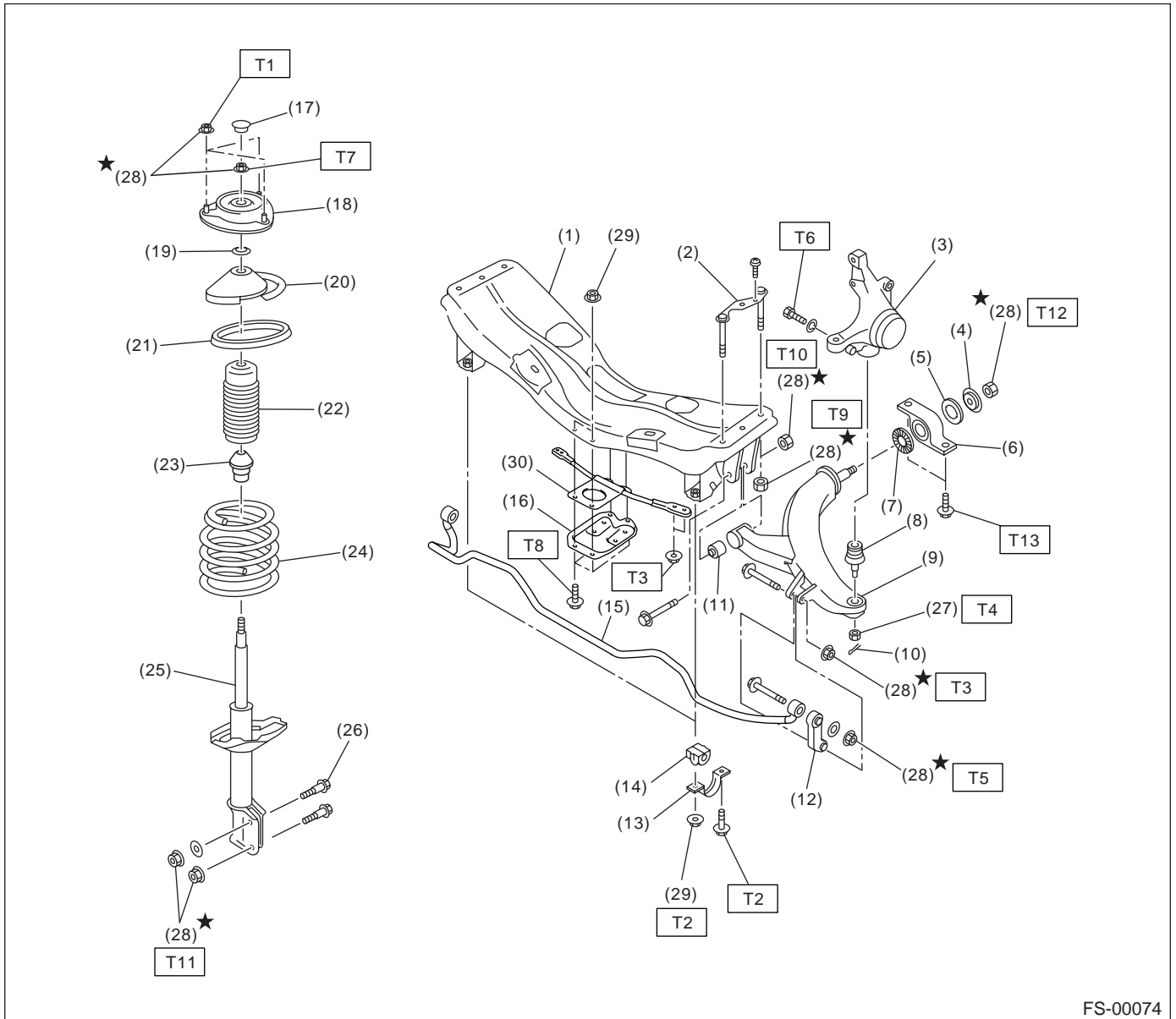


(1) Front

A – B = Positive: Toe-in, Negative: Toe-out

α = Each toe angle

B: COMPONENT



FS-00074

- | | |
|----------------------------|--------------------------------------|
| (1) Front crossmember | (16) Jack-up plate |
| (2) Bolt ASSY | (17) Dust seal |
| (3) Housing | (18) Strut mount |
| (4) Washer | (19) Spacer |
| (5) Stopper rubber (Rear) | (20) Upper spring seat |
| (6) Rear bushing | (21) Rubber seat |
| (7) Stopper rubber (Front) | (22) Dust cover |
| (8) Ball joint | (23) Helper |
| (9) Transverse link | (24) Coil spring |
| (10) Cotter pin | (25) Damper strut |
| (11) Front bushing | (26) Adjusting bolt |
| (12) Stabilizer link | (27) Castle nut |
| (13) Clamp | (28) Self-locking nut |
| (14) Bushing | (29) Flange nut |
| (15) Stabilizer | (30) Front support arm (TURBO model) |

Tightening torque: N-m (kgf-m, ft-lb)

- | | |
|-------------|------------------------|
| T1: | 20 (2.0, 14.5) |
| T2: | 25 (2.5, 18.1) |
| T3: | 30 (3.1, 22) |
| T4: | 39 (4, 29) |
| T5: | 45 (4.6, 33) |
| T6: | 50 (5.1, 37) |
| T7: | 55 (5.6, 41) |
| T8: | 70 (7.1, 51) |
| T9: | 100 (10.2, 74) |
| T10: | 125 (12.7, 92) |
| T11: | 175 (17.8, 129) |
| T12: | 186 (19.0, 137) |
| T13: | 245 (25.0, 181) |

GENERAL DESCRIPTION

FRONT SUSPENSION

C: CAUTION

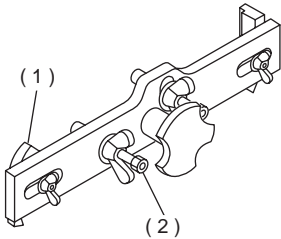
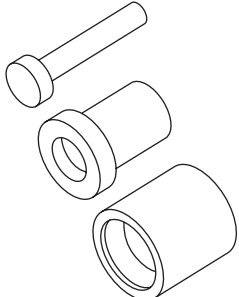
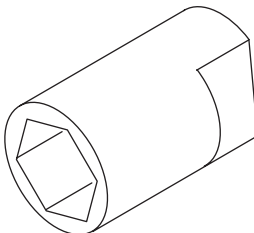
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

GENERAL DESCRIPTION

FRONT SUSPENSION

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927380002</p>	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 <p style="text-align: center;">ST-927680000</p>	927680000	INSTALLER & REMOVER SET	Used for replacing transverse link bushing.
 <p style="text-align: center;">ST-927760000</p>	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Dial gauge	Used for damper strut measurement.

WHEEL ALIGNMENT

FRONT SUSPENSION

2. Wheel Alignment

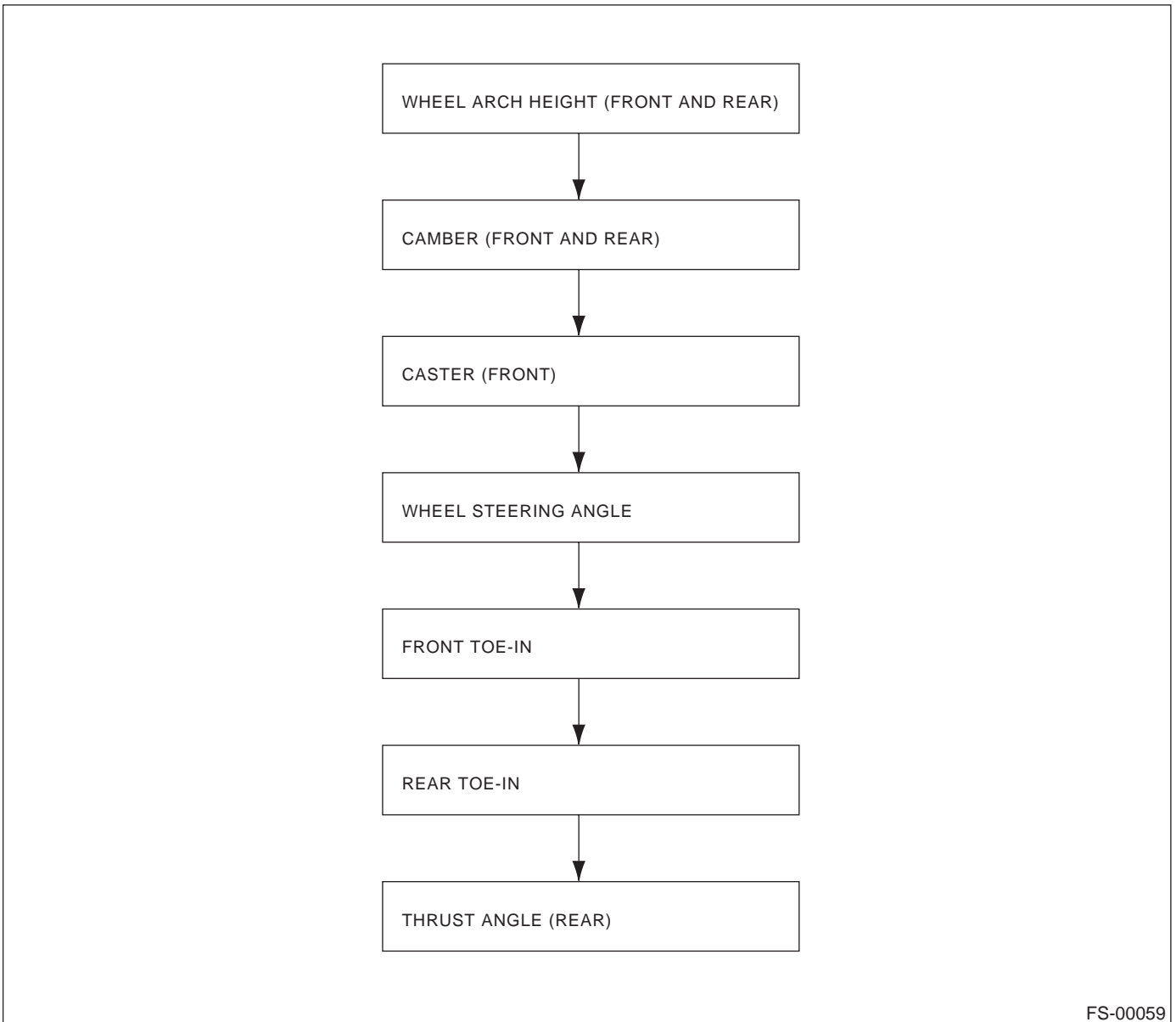
A: INSPECTION

Check the following items before taking wheel alignment measurement.

Check items before taking wheel alignment measurement:

- tire air pressure
- unbalanced right and left tire wear, size difference
- tire run-out
- ball joint excessive play, wear
- tie rod end excessive play, wear
- wheel bearing excessive play
- right and left wheel base imbalance
- steering link part deformed, excessive play
- suspension part deformed, excessive play

Check, adjust and/or measure wheel alignment in accordance with procedures indicated in figure:

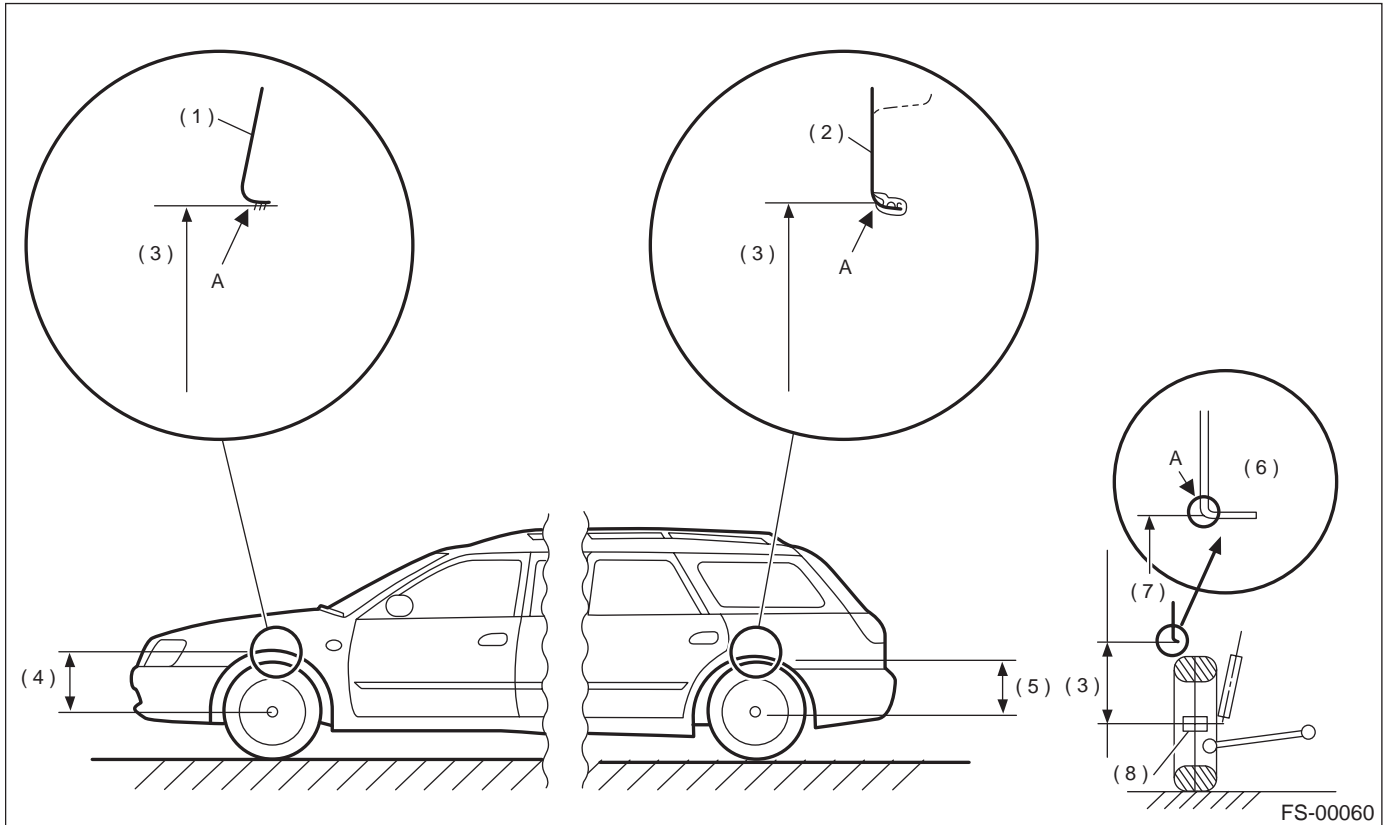


WHEEL ALIGNMENT

FRONT SUSPENSION

1. WHEEL ARCH HEIGHT

- 1) Set vehicle on a level surface.
- 2) Set vehicle to "curb weight" conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
- 3) Set steering wheel in a straight line, then move the vehicle straight ahead more than 5 m (16 ft) to settle the suspension.
- 4) Suspend thread from wheel arch (point "A" in figure below) to determine a point directly above center of wheel.
- 5) Measure distance between measuring point "A" and center of wheel.



FS-00060

- | | | |
|------------------------|-----------------------------|---------------------|
| (1) Front fender | (4) Front wheel arch height | (7) Measuring point |
| (2) Outer rear quarter | (5) Rear wheel arch height | (8) End of spindle |
| (3) Wheel arch height | (6) Cross-section of arch | |

Model	Specified wheel arch height	
	Front	Rear
Sedan	388 ⁺¹² / ₋₂₄ mm (15.28 ^{+0.47} / _{-0.94} in)	371 ⁺¹² / ₋₂₄ mm (14.61 ^{+0.47} / _{-0.94} in)
Wagon	388 ⁺¹² / ₋₂₄ mm (15.28 ^{+0.47} / _{-0.94} in)	381 ⁺¹² / ₋₂₄ mm (15.00 ^{+0.47} / _{-0.94} in)
OUTBACK	428 ⁺¹² / ₋₂₄ mm (16.85 ^{+0.47} / _{-0.94} in)	421 ⁺¹² / ₋₂₄ mm (16.57 ^{+0.47} / _{-0.94} in)*
TURBO	378 ⁺¹² / ₋₂₄ mm (14.88 ^{+0.47} / _{-0.94} in)	361 ⁺¹² / ₋₂₄ mm (14.21 ^{+0.47} / _{-0.94} in)

* Model for Australia: 431⁺¹²/₋₂₄ mm (16.97^{+0.47}/_{-0.94} in)

WHEEL ALIGNMENT

FRONT SUSPENSION

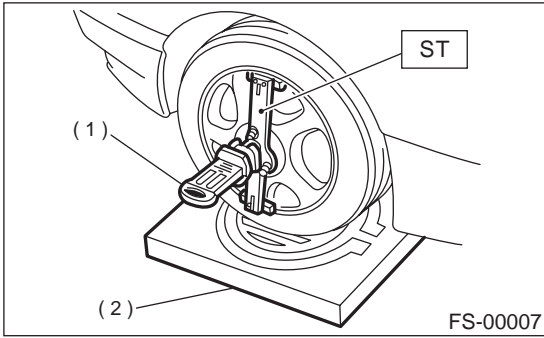
2. CAMBER

• Inspection

1) Place front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.

2) Set ST into the center of the wheel, and then install the wheel alignment gauge.

ST 927380002 ADAPTER



- (1) Alignment gauge
- (2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure the camber angle.

NOTE:

Refer to the "SPECIFICATIONS" for the camber values.

Front: <Ref. to FS-2, SPECIFICATIONS, General Description.>

Rear: <Ref. to RS-2, SPECIFICATIONS, General Description.>

• Front Camber Adjustment

1) Loosen two self-locking nuts located at lower front portion of strut.

CAUTION:

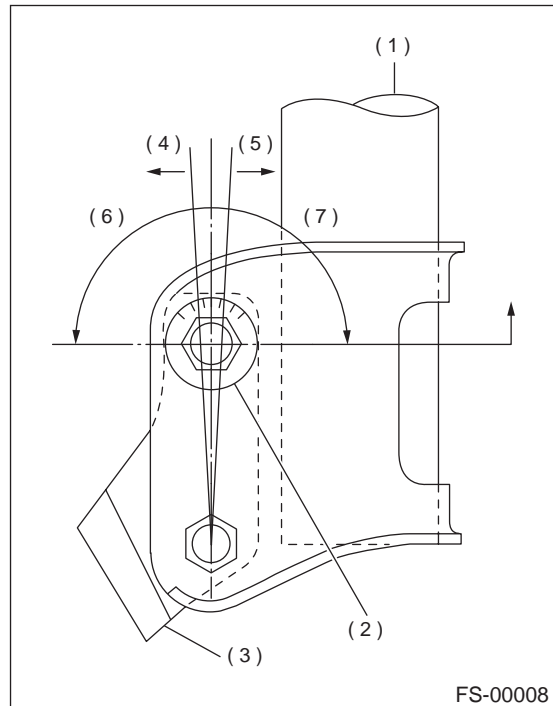
• When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.

• Discard loosened self-locking nut and replace with a new one.

2) Turn camber adjusting bolt so that camber is set at the specification.

NOTE:

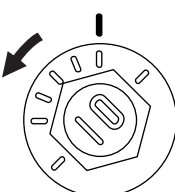
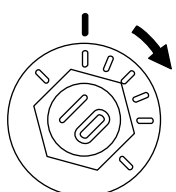
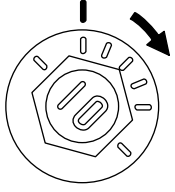
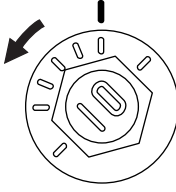
Moving the adjusting bolt by one scale graduation changes camber by approximately $0^{\circ}10'$.



- (1) Strut
- (2) Adjusting bolt
- (3) Housing
- (4) Outer
- (5) Inner
- (6) Camber is increased.
- (7) Camber is decreased.

WHEEL ALIGNMENT

FRONT SUSPENSION

	Left side	Right side
Camber is increased.	 <p>FS-00009</p> <p>Rotate counter-clockwise.</p>	 <p>FS-00010</p> <p>Rotate clockwise.</p>
Camber is decreased.	 <p>FS-00010</p> <p>Rotate clockwise.</p>	 <p>FS-00009</p> <p>Rotate counter-clockwise.</p>

3) Tighten the two self-locking nuts.

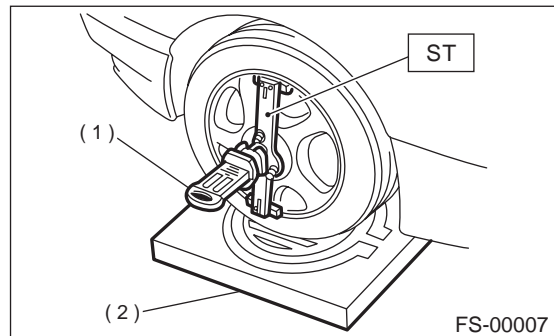
Tightening torque:

152 N·m (16 kgf·m, 116 ft·lb)

3. CASTER

• Inspection

- 1) Place front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
 - 2) Set ST into the center of the wheel, and then install the wheel alignment gauge.
- ST 927380002 ADAPTER



- (1) Alignment gauge
- (2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure the caster angle.

NOTE:

Refer to the "SPECIFICATIONS" for the caster values. <Ref. to FS-2, SPECIFICATIONS, General Description.>

WHEEL ALIGNMENT

FRONT SUSPENSION

4. STEERING ANGLE

• Inspection

- 1) Place vehicle on a turning radius gauge.
- 2) While depressing brake pedal, turn steering wheel fully to the left and right. With steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

Steering angle:

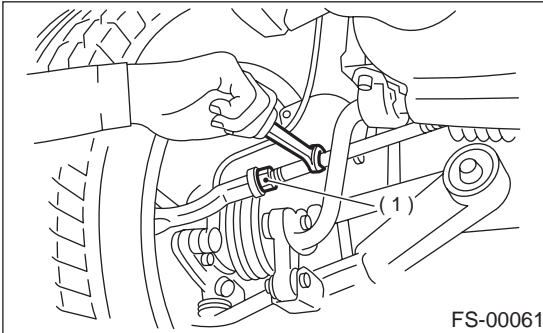
Model	Except OUTBACK		OUTBACK	TURBO
	15 inch wheel	16 inch wheel		
Inner wheel	36.3°±1.5°		34.5°±1.5°	34.7°±1.5°
Outer wheel	31.6°±1.5°		30.3°±1.5°	30.4°±1.5°

• Adjustment

Turn tie-rod to adjust steering angle of both inner and outer wheels.

CAUTION:

- Check toe-in.
- Correct boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• Inspection

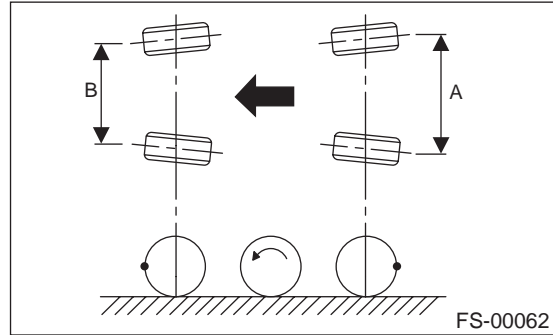
- 1) Using a toe gauge, measure front wheel toe-in.

Toe-in:

0±3 mm (0±0.12 in)

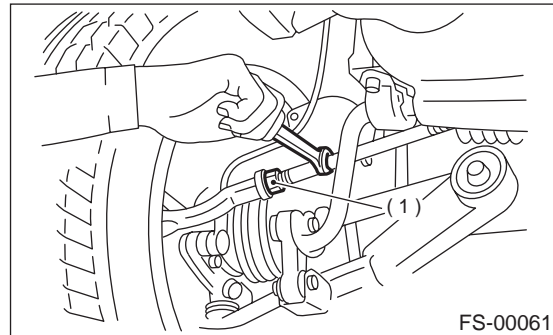
- 2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance "A" between marks.
- 3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.
- 4) Measure distance "B" between left and right marks. Toe-in can then be obtained by the following equation:

$$A - B = \text{Toe-in}$$



• Adjustment

- 1) Loosen the left and right side steering tie-rod lock nuts.
- 2) Turn the left and right tie rods equal amounts until the toe-in is at the specification. Both the left and right tie-rod are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from the inside of the vehicle).



(1) Lock nut

- 3) Tighten tie-rod lock nut.

Tightening torque:

83 N·m (8.5 kgf-m, 61.5 ft-lb)

CAUTION:

Correct tie-rod boot, if it is twisted.

NOTE:

Check the left and right wheel steering angle is within specifications.

6. REAR WHEEL TOE-IN

• Inspection

1) Using a toe-in gauge, measure rear wheel toe-in.

Toe-in:

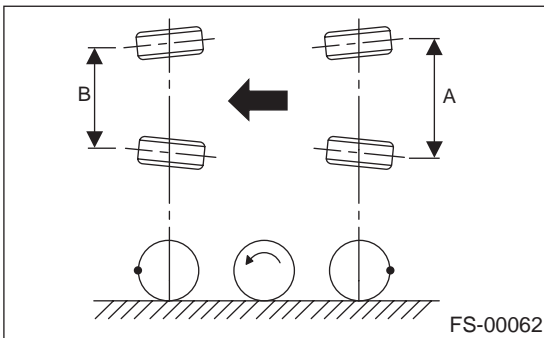
$0 \pm 3 \text{ mm } (0 \pm 0.12 \text{ in})$

2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance "A" between marks.

3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.

4) Measure distance "B" between left and right marks. Toe-in can then be obtained by the following equation:

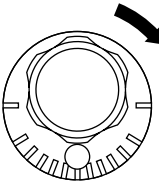
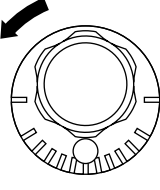
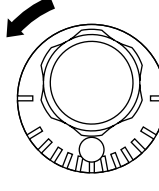
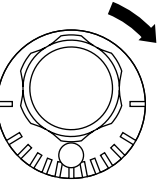
$A - B = \text{Toe-in}$



2) Turn adjusting bolt head until toe-in is at the specification.

NOTE:

When left and right wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approximately 3 mm (0.12 in).

	Left side	Right side
Toe-in is increased.	 Rotate clockwise. FS-00066	 Rotate counter-clockwise. FS-00067
Toe-in is decreased.	 Rotate counter-clockwise. FS-00067	 Rotate clockwise. FS-00066

3) Tighten self-locking nut.

Tightening torque:

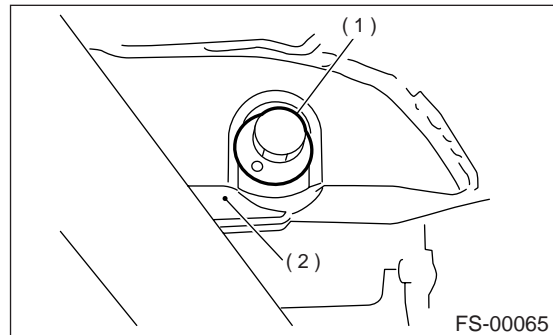
$120 \text{ N}\cdot\text{m } (12.2 \text{ kgf}\cdot\text{m}, 88 \text{ ft}\cdot\text{lb})$

• Adjustment

1) Loosen self-locking nut on inner side of link rear.

CAUTION:

- When loosening or tightening adjusting bolt, hold bolt head and turn self-locking nut.
- Discard loosened self-locking nut and replace with a new one.



- (1) Adjusting bolt
- (2) Link rear

WHEEL ALIGNMENT

FRONT SUSPENSION

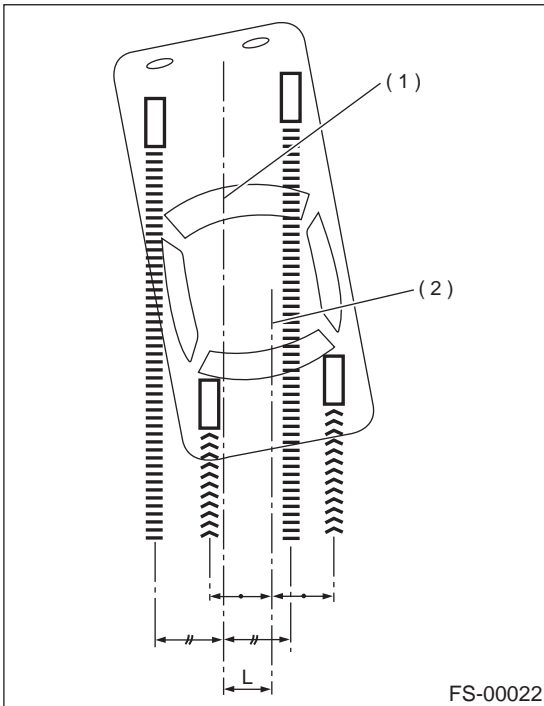
7. THRUST ANGLE

• Inspection

- 1) Position vehicle on a level surface.
- 2) Move vehicle 3 to 4 meters (10 to 13 ft) directly forward.
- 3) Determine locus of both front and rear axles.
- 4) Measure distance "L" between center line of loci of the axles.

Thrust angle:

Less than 30' when "L" is equal to or less than 23 mm (0.91 in).



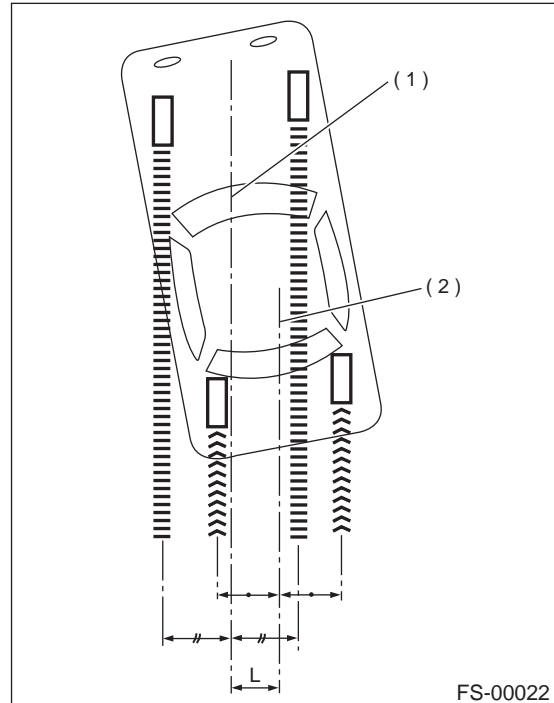
- (1) Center line of loci (front axle)
- (2) Center line of loci (rear axle)

• Adjustment

- 1) Make thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.
- 2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.
- 3) When left and right adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approximately 10' ["L" is almost equal to 7.5 mm (0.295 in)].

Thrust angle:

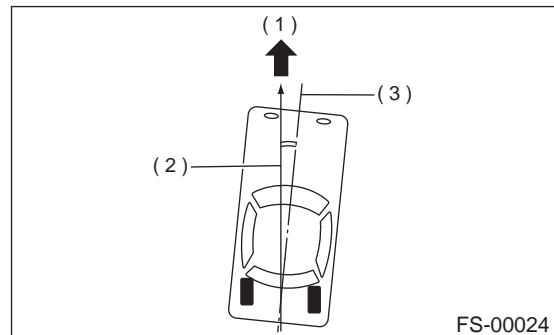
0°±30'



- (1) Center line of loci (front axle)
- (2) Center line of loci (rear axle)

NOTE:

Thrust angle refers to a mean value of left and right rear wheel toe angles in relation to vehicle body center line. Vehicle is driven straight in the thrust angle direction while swinging in the oblique direction depending on the degree of the mean thrust angle.



- (1) Front
- (2) Thrust angle
- (3) Body center line

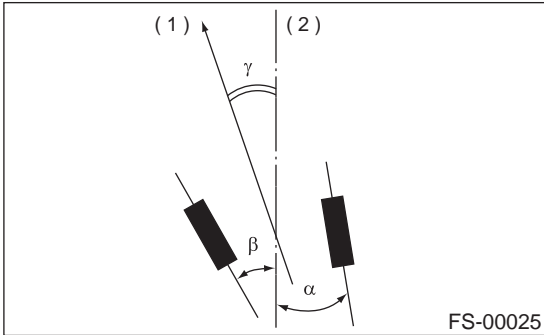
Thrust angle: $r = (\alpha - \beta)/2$

α : Right rear wheel toe-in angle

β : Left rear wheel toe-in angle

NOTE:

Here, use only positive toe-in values from each wheel to substitute for α and β in the equation.



- (1) Front
- (2) Body center line

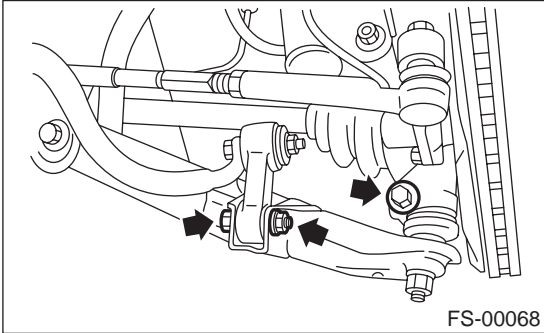
FRONT TRANSVERSE LINK

FRONT SUSPENSION

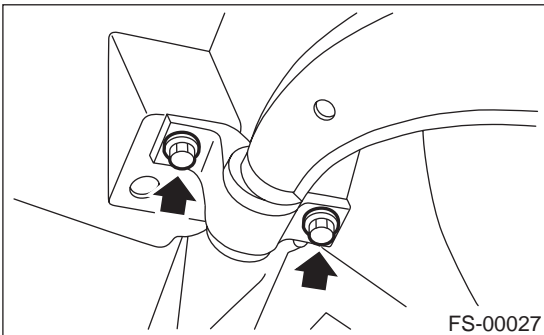
3. Front Transverse Link

A: REMOVAL

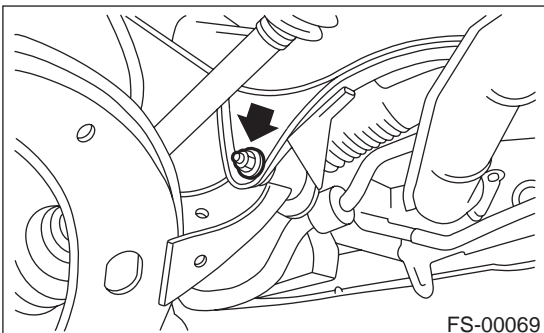
- 1) Set vehicle on a lift.
- 2) Disconnect ground cable from battery.
- 3) Lift-up the vehicle and remove the wheel.
- 4) Disconnect stabilizer link from transverse link.
- 5) Remove bolt securing ball joint of transverse link to housing.



- 6) Remove nut (do not remove bolt.) securing transverse link to crossmember.
- 7) Remove two bolts securing bushing bracket of transverse link to vehicle body at rear bushing location.



- 8) Extract ball joint from housing.
- 9) Remove bolt securing transverse link to crossmember and extract transverse link from crossmember.



B: INSTALLATION

- 1) Temporarily tighten the two bolts used to secure rear bushing of the transverse link to body.

NOTE:

These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

- 2) Install bolts used to connect transverse link to crossmember and temporarily tighten with nut.

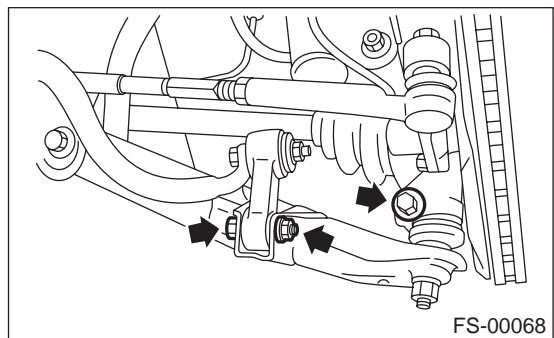
CAUTION:

Discard loosened self-locking nut and replace with a new one.

- 3) Insert ball joint into housing.
- 4) Connect stabilizer link to transverse link, and temporarily tighten bolts.

CAUTION:

Discard loosened self-locking nut and replace with a new one.



- 5) Tighten the following points in the order shown below when wheels are in full contact with the ground and vehicle is at curb weight.

- (1) Transverse link and stabilizer

Tightening torque:

30 N·m (3.1 kgf-m, 22 ft-lb)

- (2) Transverse link and crossmember

Tightening torque:

100 N·m (10.2 kgf-m, 74 ft-lb)

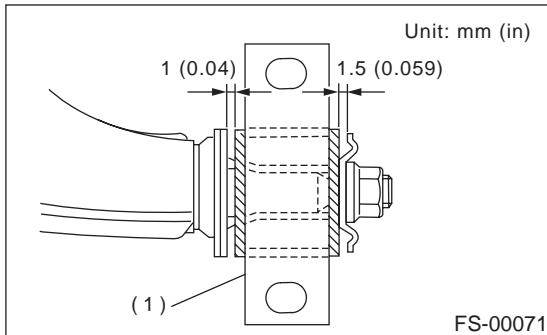
- (3) Transverse link rear bushing and body

Tightening torque:

245 N·m (25 kgf-m, 181 ft-lb)

NOTE:

- Move rear bushing back and forth until transverse link-to-rear bushing clearance is established (as indicated in figure.) before tightening.
- Check wheel alignment and adjust if necessary.



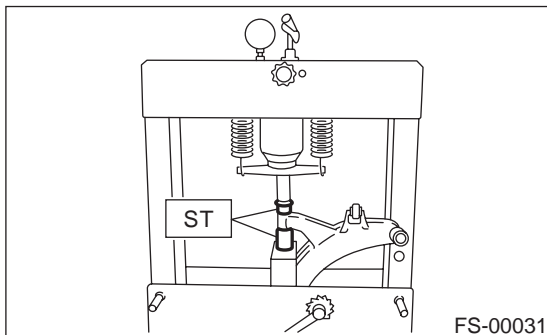
(1) Rear bushing

C: DISASSEMBLY

1. FRONT BUSHING

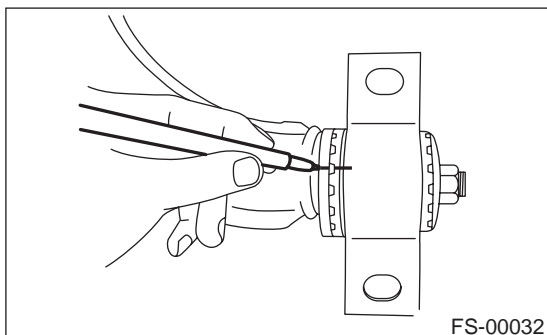
Using ST, press front bushing out of place.

ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

- 1) Scribe an aligning mark on transverse link and rear bushing.
- 2) Loosen nut and remove rear bushing.



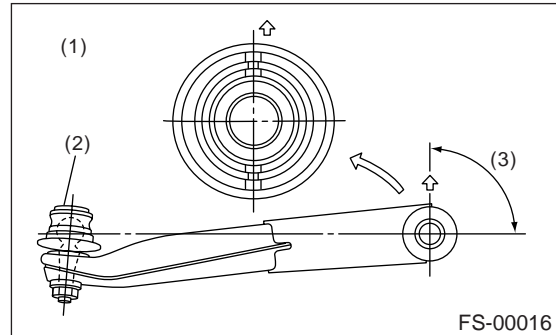
D: ASSEMBLY

1. FRONT BUSHING

To reassemble, reverse disassembly procedures.

CAUTION:

Install front bushing in correct direction, as shown in figure.



- (1) Face bushing toward center of ball joint
- (2) Ball joint

2. REAR BUSHING

- 1) Install rear bushing to transverse link and align aligning marks scribed on the two.
- 2) Tighten self-locking nut.

CAUTION:

- Discard loosened self-locking nut and replace with a new one.
- While holding rear bushing so as not to change position of aligning marks, tighten self-locking nut.

Tightening torque:

186 N·m (19.0 kgf·m, 137 ft·lb)

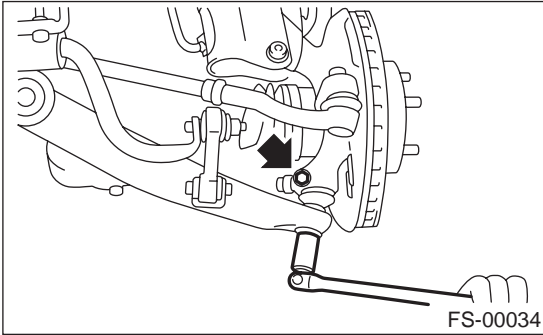
E: INSPECTION

- 1) Check transverse link for wear, damage and cracks, and correct or replace if defective.
- 2) Check bushings for cracks, fatigue or damage.
- 3) Check rear bushing for oil leaks.

4. Front Ball Joint

A: REMOVAL

- 1) Set vehicle on a lift.
- 2) Disconnect ground cable from battery.
- 3) Lift-up the vehicle and remove the wheel.
- 4) Pull out the cotter pin from the ball stud, remove the castle nut, and extract the ball stud from the transverse link.
- 5) Remove the bolt securing the ball joint to the housing.



- 6) Extract the ball joint from the housing.

B: INSTALLATION

- 1) Install ball joint onto housing.

Tightening torque (Bolt):

50 N·m (5.1 kgf-m, 37 ft-lb)

CAUTION:

Do not apply grease to tapered portion of ball stud.

- 2) Connect ball joint to transverse link.

Tightening torque (Castle nut):

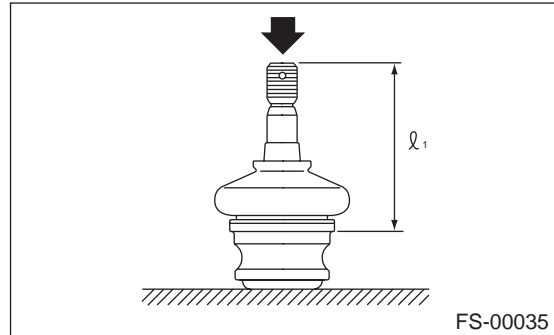
39 N·m (4.0 kgf-m, 29 ft-lb)

- 3) Retighten castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert new cotter pin and bend it around castle nut.
- 4) Install front wheel.

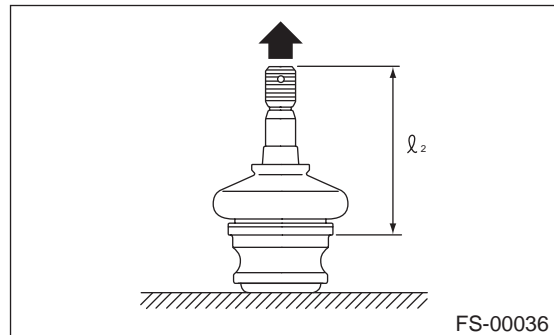
C: INSPECTION

- 1) Measure free play of ball joint by the following procedures. Replace with a new one when the free play exceeds the specified value.

- (1) With 686 N (70 kgf, 154 lb) loaded in the direction shown in the figure, measure dimension l_1 .



- (2) With 686 N (70 kgf, 154 lb) loaded in the opposite direction shown in the figure, measure dimension l_2 .



- (3) Calculate free play from the following formula. $S = l_2 - l_1$

- (4) When free play is larger than the following value, replace with a new one.

FRONT BALL JOINT

Specified play for replacement: S

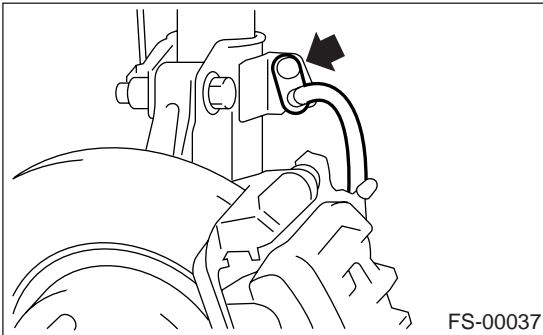
Less than 0.3 mm (0.012 in)

- 2) When free play is smaller than the specified value, visually inspect the dust cover.
- 3) The ball joint and cover that have been removed must be checked for wear, damage or cracks, and any defective part must be replaced.
- 4) If the dust cover is damaged, replace with the new ball joint.

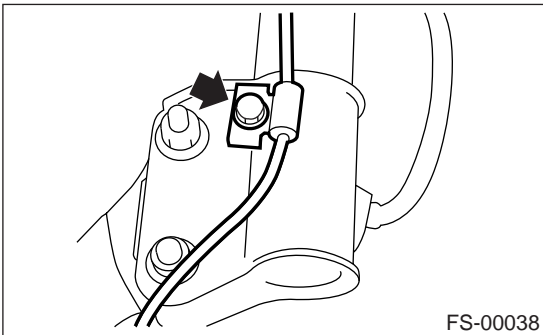
5. Front Strut

A: REMOVAL

- 1) Set vehicle on a lift.
- 2) Disconnect ground cable from battery.
- 3) Lift-up the vehicle and remove the wheel.
- 4) Remove bolt securing brake hose to strut.



- 5) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
- 6) Remove bolt securing the ABS sensor harness.

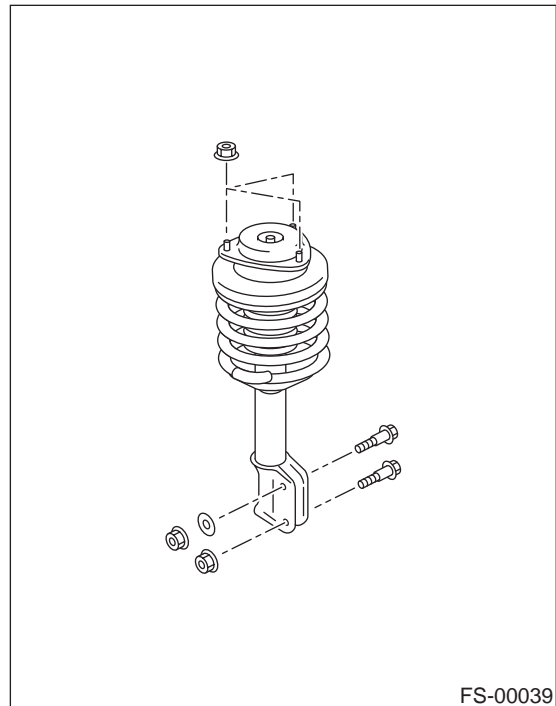


- 7) Remove two bolts securing housing to strut.

CAUTION:

While holding head of adjusting bolt, loosen self-locking nut.

- 8) Remove the three nuts securing strut mount to body.



B: INSTALLATION

- 1) Install strut mount at upper side of strut to body and tighten with nuts.

Tightening torque:

20 N·m (2.0 kgf·m, 14.5 ft·lb)

- 2) Position aligning mark on camber adjustment bolt with aligning mark on lower side of strut.

CAUTION:

- While holding head of adjusting bolt, tighten self-locking nut.
- Be sure to use new self-locking nut.

Tightening torque:

175 N·m (17.8 kgf·m, 129 ft·lb)

- 3) Install ABS sensor harness to strut.

Tightening torque:

32 N·m (3.3 kgf·m, 23.9 ft·lb)

- 4) Install bolts which secure brake hose to strut.

Tightening torque:

32 N·m (3.3 kgf·m, 23.9 ft·lb)

- 5) Install wheels.

NOTE:

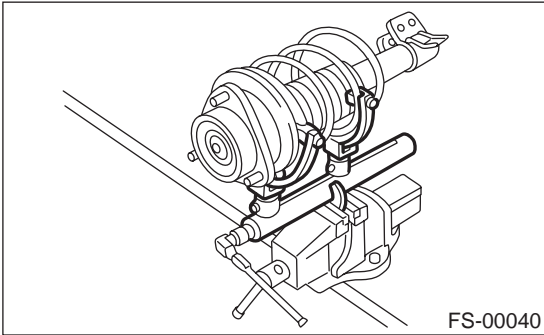
Check wheel alignment and adjust if necessary.

FRONT STRUT

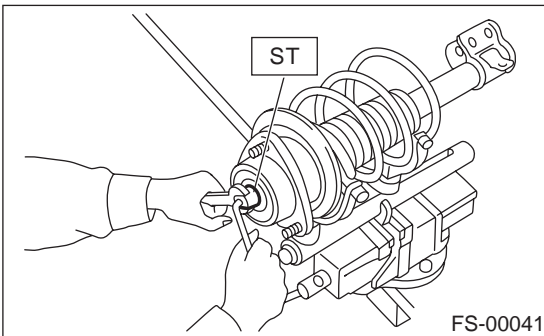
FRONT SUSPENSION

C: DISASSEMBLY

- 1) Using a coil spring compressor, compress coil spring.



- 2) Using ST, remove self-locking nut.
ST 927760000 STRUT MOUNT SOCKET



- 3) Remove strut mount, upper spring seat and rubber seat from strut.
- 4) Gradually decreasing compression force, and remove coil spring.
- 5) Remove dust cover and helper spring.

D: ASSEMBLY

- 1) Before installing coil spring, strut mount, etc., on the strut, check for the presence of air in the dampening force generating mechanism of the strut since air prevents proper dampening force from being produced.

- 2) Checking for the presence of air
 - (1) Place the strut vertically with the piston rod facing up.
 - (2) Move the piston rod to the center of its entire stroke.
 - (3) While holding the piston rod end with fingertips, move the rod up and down.
 - (4) If the piston rod moves at least 10 mm (0.39 in) in the former step, purge air from the strut.

- 3) Air purging procedure
 - (1) Place the strut vertically with the piston rod facing up.
 - (2) Fully extend the piston rod.
 - (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.
 - (4) Fully contract the piston rod.
 - (5) Repeat 3 or 4 times from the first step.

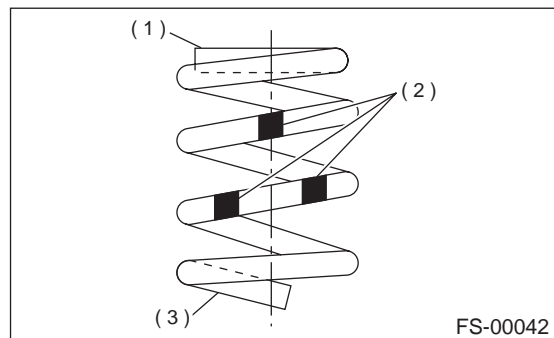
NOTE:

After completely purging air from the strut, be sure to place the strut with the piston rod facing up. If it is laid down, check for entry of air in the strut as outlined under "Checking for the presence of air".

- 4) Using a coil spring compressor, compress the coil spring.

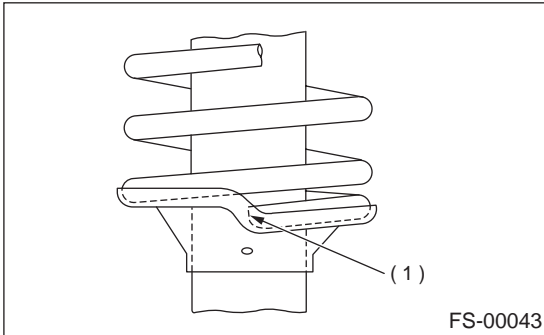
NOTE:

Make sure that the vertical installing direction of coil spring is as shown in figure.



- (1) Flat (top side)
- (2) Identification paint
- (3) Inclined (bottom side)

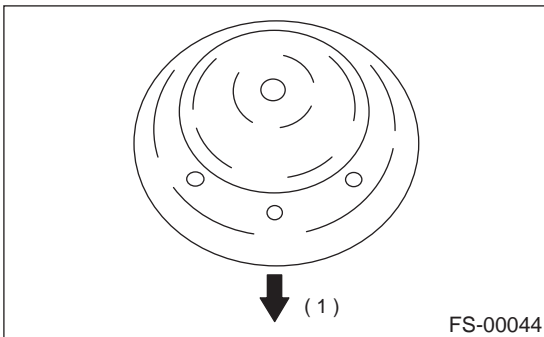
- 5) Set the coil spring correctly so that its end face (1) fits well into the spring seat as shown in the figure.



- 6) Install helper and dust cover to the piston rod.
7) Pull the piston rod fully upward, and install rubber seat and upper spring seat.

NOTE:

Ensure that upper spring seat is positioned as shown in figure.



(1) Outside of body

- 8) Install strut mount to the piston rod, and tighten the self-locking nut temporarily.

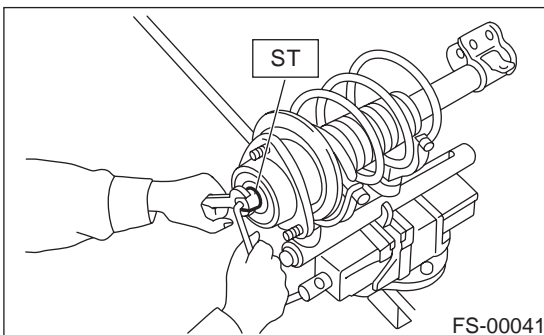
CAUTION:

Be sure to use a new self-locking nut.

- 9) Using hexagon wrench to prevent strut rod from turning, tighten self-locking nut with ST.
ST 927760000 STRUT MOUNT SOCKET

Tightening torque:

55 N·m (5.6 kgf-m, 41 ft-lb)



- 10) Loosen the coil spring carefully.

E: INSPECTION

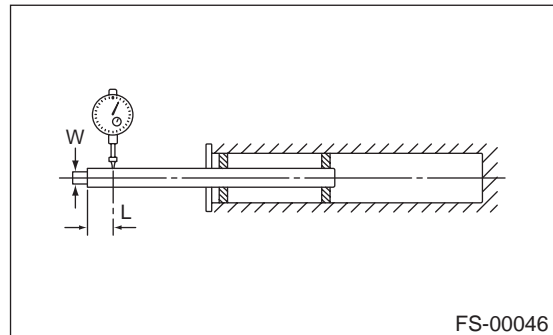
Check the disassembled parts for cracks, damage and wear, and replace with new parts if defective.

1. DAMPER STRUT

- 1) Check for oil leakage.
- 2) Move the piston rod up and down to check it operates smoothly without any binding.
- 3) Play of piston rod

- Measure the play as follows:

Fix outer shell and fully extend the rod. Set a dial gauge at the end of the rod: L [10 mm (0.39 in)], then apply a force of W [20 N (2 kgf, 4 lb)] to threaded portion. With the force of 20 N (2 kgf, 4 lb) applied, read dial gauge indication: P₁. Apply a force of 20 N (2 kgf, 4 lb) in the opposite direction of "W", then read dial gauge indication: P₂.



The free play is determined by the following equation:

$$\text{Play} = P_1, P_2$$

Limit of play:

Less than 0.8 mm (0.031 in)

If the play is greater, replace the strut.

2. STRUT MOUNT

Check rubber part for creep, cracks and deterioration, and replace it with new one if defective.

3. DUST COVER

If any cracks or damage are found, replace it with a new one.

4. COIL SPRING

One having permanent strain should be replaced with a new one. When vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check coil spring for its free length referring to specifications, cracks, etc., and replace it with a new one if defective.

5. HELPER

Replace it with new one if cracked or damaged.

FRONT STRUT

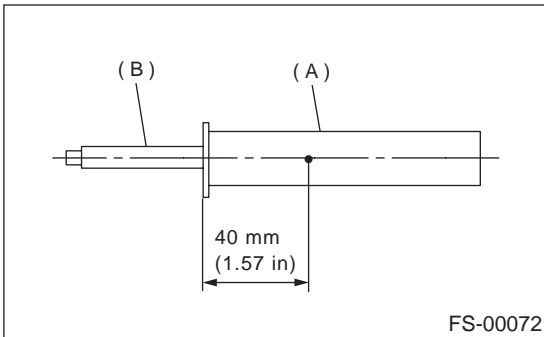
FRONT SUSPENSION

F: DISPOSAL

CAUTION:

- Do not disassemble the strut damper or place it into a fire.
- Drill a hole before disposal of strut.
- Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and/or filings.

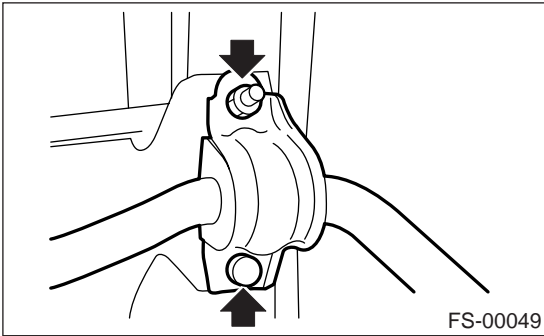
- 1) Place the gas filled strut (A) on a flat and level surface with piston rod (B) fully extended.
- 2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make a hole in area shown in the figure.



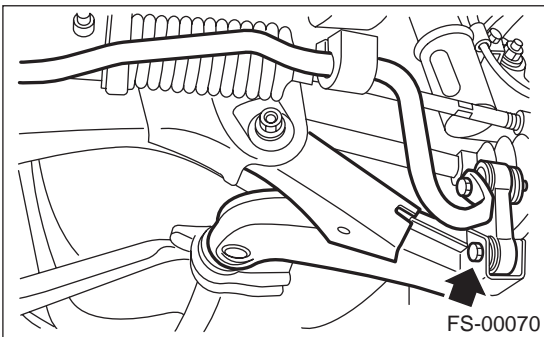
6. Front Stabilizer

A: REMOVAL

- 1) Jack-up the front part of the vehicle and support it with safety stand (rigid racks).
- 2) Remove jack-up plate from lower part of cross-member.
- 3) Remove bolts which secure stabilizer to cross-member.



- 4) Remove bolts which secure stabilizer link to front transverse link.



B: INSTALLATION

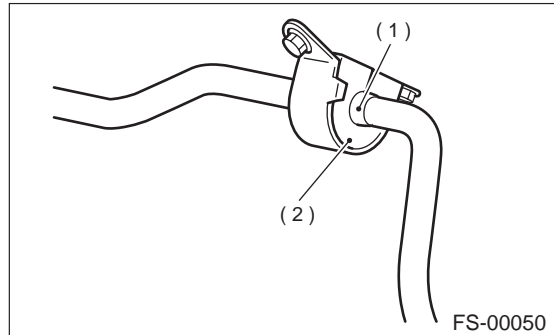
CAUTION:

Discard old self-locking nut and replace with a new one.

- 1) Install in the reverse order of removal.

NOTE:

- Install bushing (on front crossmember side) while aligning it with paint mark on stabilizer.
- Ensure that bushing and stabilizer have the same identification colors when installing.



- (1) Mark stamped on stabilizer
- (2) Bushing identification color

- 2) Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is at curb weight.

Tightening torque:

Jack-up plate to crossmember:

70 N·m (7.1 kgf-m, 51 ft-lb)

Stabilizer link to front transverse link:

30 N·m (3.1 kgf-m, 22 ft-lb)

Stabilizer to crossmember:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

C: INSPECTION

- 1) Check bushing for cracks, fatigue or damage.
- 2) Check stabilizer link for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

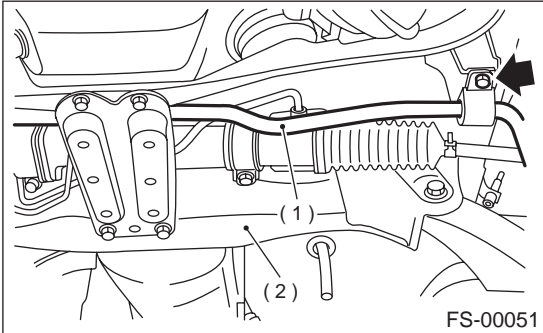
FRONT CROSSMEMBER

FRONT SUSPENSION

7. Front Crossmember

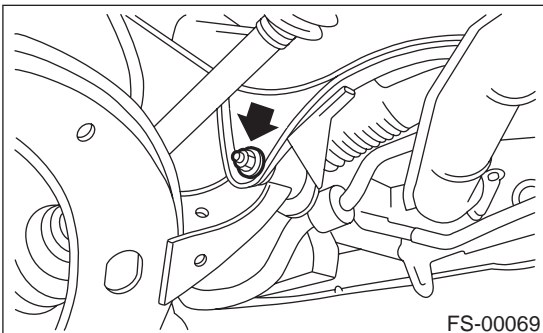
A: REMOVAL

- 1) Set vehicle on a lift.
- 2) Disconnect ground cable from battery.
- 3) Lift-up vehicle and remove front tires and wheels.
- 4) Remove both stabilizer and jack-up plate.

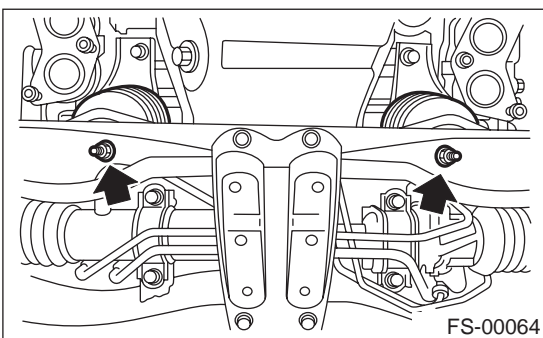


- (1) Front stabilizer
- (2) Front crossmember

- 5) Disconnect tie-rod end from housing.
- 6) Remove front exhaust pipe.
- 7) Remove front transverse link from front crossmember and body.



- 8) Remove nuts attaching engine mount cushion rubber to crossmember.



- 9) Remove steering universal joint. <Ref. to PS-25, REMOVAL, Universal Joint.>
- 10) Disconnect power steering pipe from steering gear box.

11) Lift engine by approx. 10 mm (0.39 in) by using chain block.

12) Support crossmember with a jack, remove nuts securing crossmember to body and gradually lower crossmember along with steering gearbox.

CAUTION:

When removing crossmember downward, be careful that tie-rod end does not interfere with SFJ boot.

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Always tighten rubber bushing when wheels are in full contact with the ground and vehicle is at curb weight.

Tightening torque:

Transverse link bushing to crossmember:
125 N·m (12.5 kgf-m, 90 ft-lb)

Stabilizer to bushing:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

Tie-rod end to housing:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

Front cushion rubber to crossmember:
74 N·m (7.5 kgf-m, 54.2 ft-lb)

Universal joint to pinion shaft:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

Crossmember to body:
100 N·m (10.2 kgf-m, 74 ft-lb)

- 2) Purge air from power steering system.

NOTE:

Check wheel alignment and adjust if necessary.

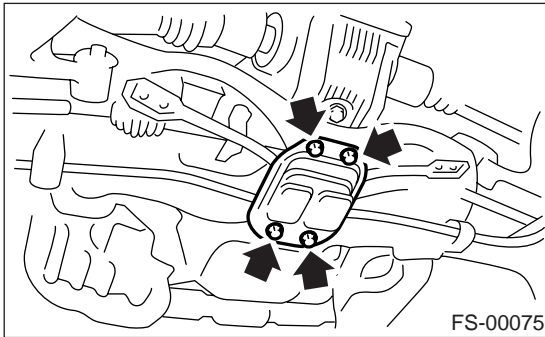
C: INSPECTION

Check crossmember for wear, damage and cracks, and correct or replace if defective.

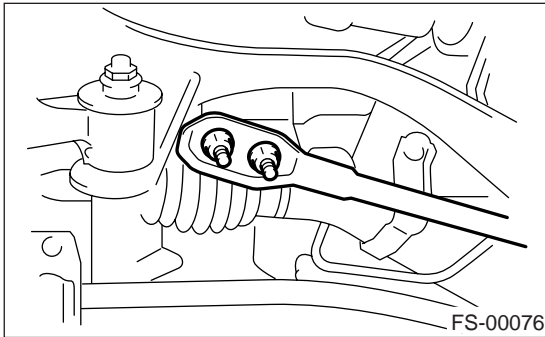
8. Front Support Arm

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Remove the four bolts and jack-up plate.



- 5) Remove the two nuts at both ends of the arm respectively.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Front support arm to crossmember:

30 N·m (3.1 kgf-m, 22.1 ft-lb)

Jack-up plate to crossmember:

70 N·m (7.1 kgf-m, 51.6 ft-lb)

C: INSPECTION

Check the front support arm for wear, damage and cracks, and correct or replace if defective.

GENERAL DIAGNOSTIC TABLE

FRONT SUSPENSION

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut and/or shock absorber	Replace.
(3) Installation of wrong strut and/or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

- 1) Large rebound shock
- 2) Rocking of vehicle continues too long after running over bump and/or hump.
- 3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace coil springs with new ones.
(4) Fault in operation of damper strut and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or shock absorber mount	Replace.
(6) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut and/or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut and/or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

REAR SUSPENSION

RS

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4. Rear Arm	10
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6. Rear Shock Absorber	16
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8. Link Rear	19
9. Support Sub Frame Front	21
10. Rear Sub Frame	22
11. Helper	23
12. General Diagnostic Table	24

GENERAL DESCRIPTION

REAR SUSPENSION

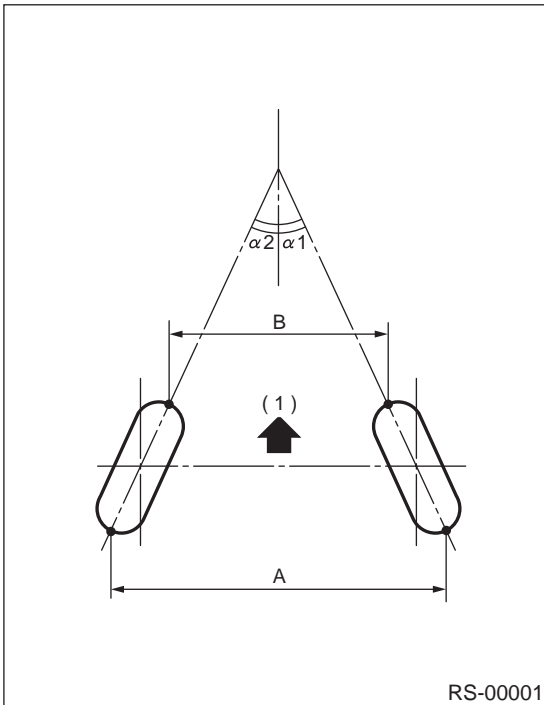
1. General Description

A: SPECIFICATIONS

	Model	Sedan	Wagon		OUTBACK		TURBO
		2.0 L	2.0 L	2.5 L	Except Australia	Australia	Australia
Rear	Camber (Tolerance: $\pm 0^{\circ}45'$)	$-0^{\circ}30'$	$-0^{\circ}20'$		$-0^{\circ}10'$		$-0^{\circ}45'$
	Toe-in	0 ± 3 mm (0 ± 0.12 in) Each toe angle: $\pm 0^{\circ}15'$					
	Thrust angle	$0^{\circ} \pm 30'$					
	Wheel arch height [Tolerance: $+12/-24$ mm ($+0.47/-0.94$ in)]	371 mm (14.61 in)	381 mm (14.99 in)		421 mm (16.57 in)	431 mm (16.97 in)	361 mm (14.21 in)
	Diameter of stabilizer	14 mm (0.55 in)	15 mm (0.59 in)	14 mm (0.55 in)	14 mm (0.55 in)		17 mm (0.67 in)

NOTE:

- Front and rear toe-in and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the middle value of specification.
- The other items indicated in the specification table cannot be adjusted. If the other items exceed specifications, check suspension parts and connections for deformities; replace with new ones as required.



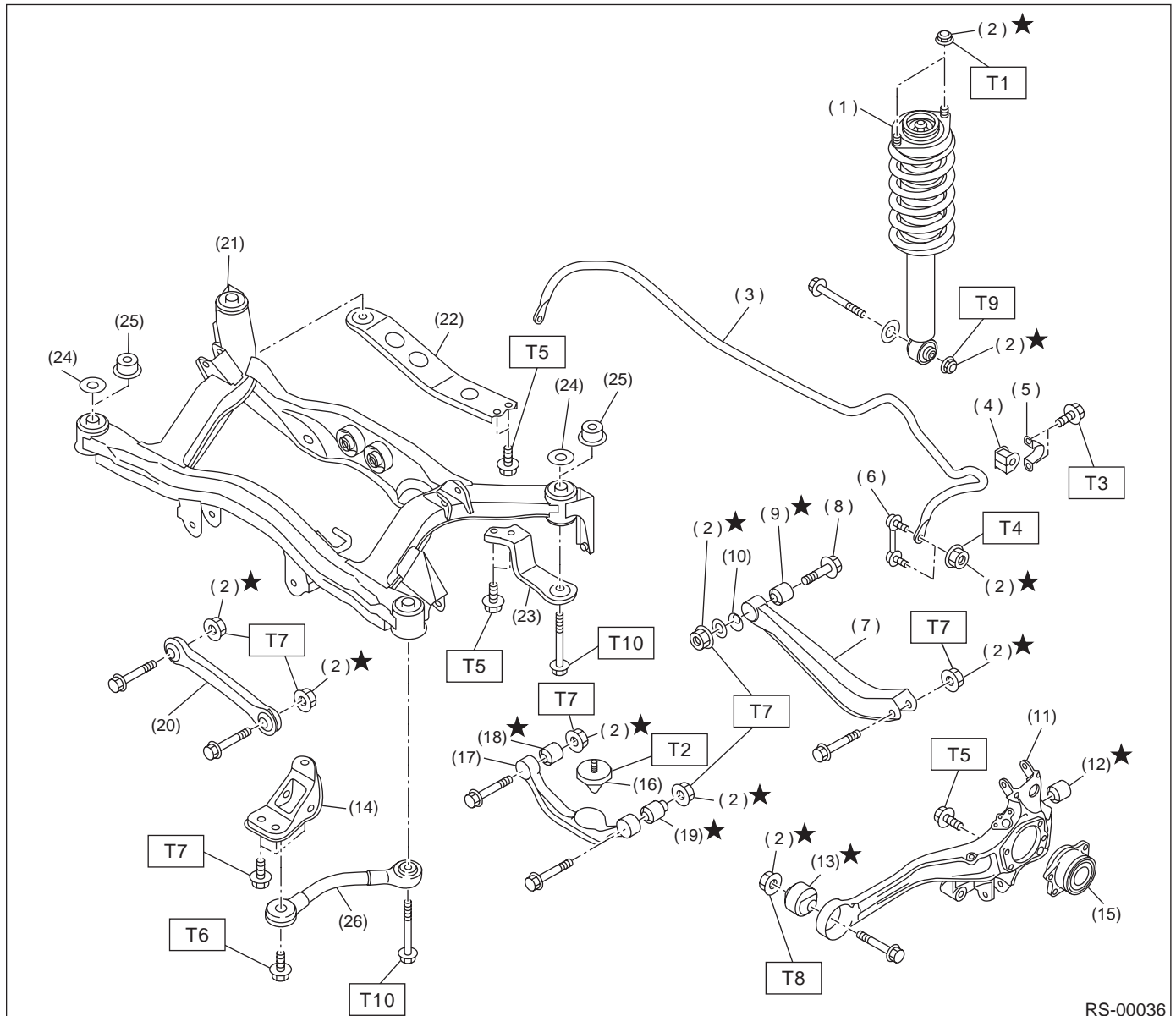
(1) Front

A - B = Positive: Toe-in, Negative: Toe-out

$\alpha 1, \alpha 2$: Each toe-in angle

B: COMPONENT

1. REAR SUSPENSION



RS-00036

- | | |
|-----------------------------|---|
| (1) Shock absorber | (15) Hub bearing unit |
| (2) Self-locking nut | (16) Helper |
| (3) Stabilizer | (17) Link upper |
| (4) Stabilizer bushing | (18) Link upper bushing (Inside) |
| (5) Clamp | (19) Link upper bushing (Outside) |
| (6) Stabilizer link | (20) Link front |
| (7) Link rear | (21) Rear sub frame |
| (8) Adjusting bolt | (22) Support sub frame (RH) |
| (9) Link rear bushing | (23) Support sub frame (LH) |
| (10) Adjusting washer | (24) Stopper upper (Except OUTBACK model) |
| (11) Rear arm | (25) Stopper upper (OUTBACK MODEL) |
| (12) Rear arm rear bushing | (26) Support sub frame front |
| (13) Rear arm front bushing | |
| (14) Rear arm bracket | |

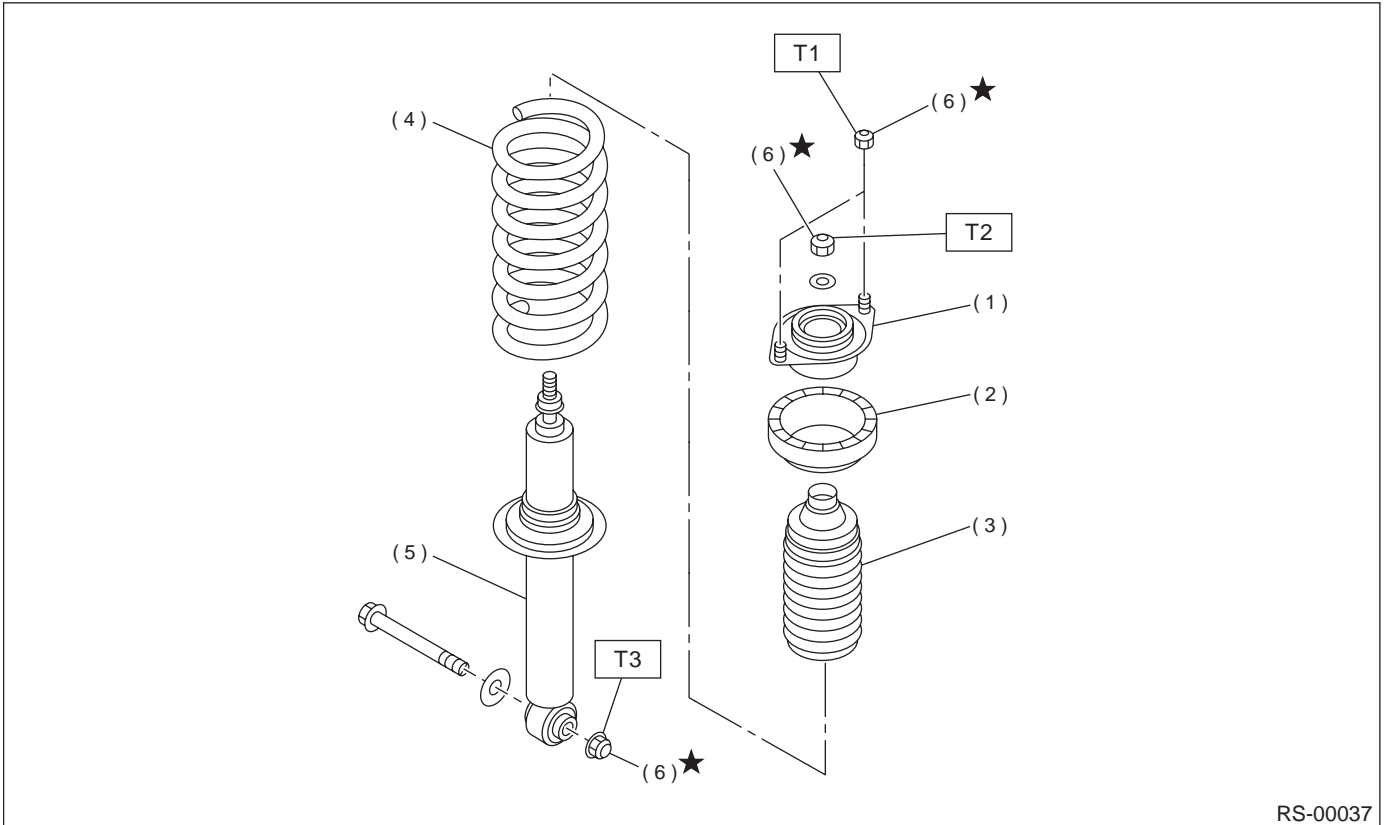
Tightening torque: N-m (kgf-m, ft-lb)

- | | |
|-------------|------------------------|
| T1: | 30 (3.1, 22.4) |
| T2: | 32 (3.3, 24) |
| T3: | 40 (4.1, 30) |
| T4: | 44 (4.5, 32.5) |
| T5: | 65 (6.6, 48) |
| T6: | 80 (8.2, 59) |
| T7: | 120 (12.2, 88) |
| T8: | 150 (15.3, 111) |
| T9: | 160 (16.3, 118) |
| T10: | 175 (17.8, 129) |

GENERAL DESCRIPTION

REAR SUSPENSION

2. SHOCK ABSORBER



- (1) Mount
- (2) Rubber seat upper
- (3) Dust cover
- (4) Coil spring
- (5) Shock absorber
- (6) Self-locking nut

Tightening torque: N·m (kgf·m, ft·lb)

T1: 30 (3.1, 22.4)

T2: 35 (3.6, 26)

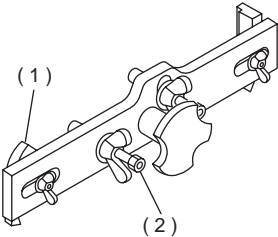
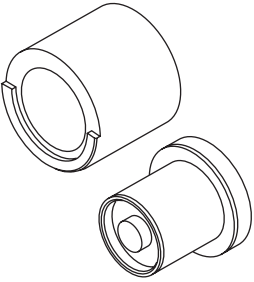
T3: 160 (16.3, 118)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.

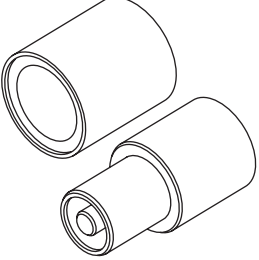
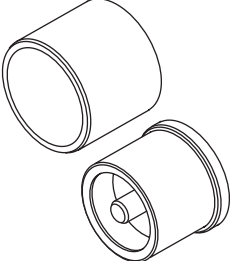
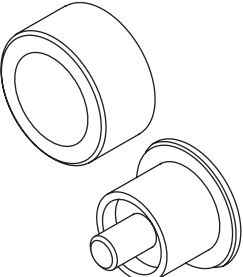
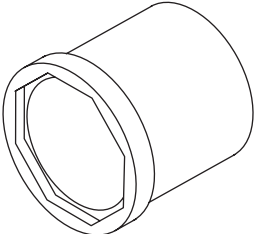
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927380002</p>	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 <p style="text-align: center;">ST20099AE000</p>	20099AE000	INSTALLER & REMOVER	Used for replacing link rear bushing.

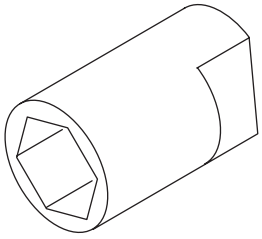
GENERAL DESCRIPTION

REAR SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST20099AE010</p>	20099AE010	INSTALLER & REMOVER	Used for replacing link upper bushing.
 <p style="text-align: center;">ST20099AE020</p>	20099AE020	INSTALLER & REMOVER SET	Used for replacing rear arm front bushing.
 <p style="text-align: center;">ST20099AE040</p>	20099AE040	INSTALLER & REMOVER SET	Used for replacing rear arm rear bushing.
 <p style="text-align: center;">ST20099AE030</p>	20099AE030	HELPER SOCKET WRENCH	Used for replacing helper.

GENERAL DESCRIPTION

REAR SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Transmission jack	Used for suspension assembly/disassembly.
Bearing puller	Used for removing bushings.

2. Wheel Alignment

A: INSPECTION

NOTE:

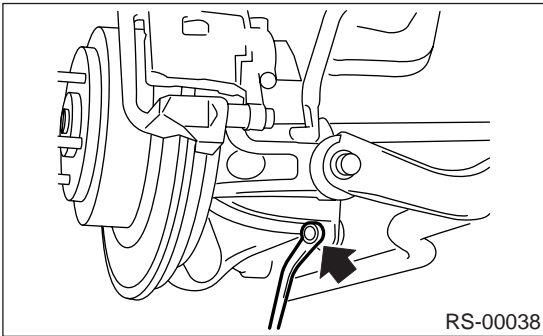
The front and rear wheel alignment must be measured and/or adjusted at once to obtain accuracy. Measure and/or adjust the rear wheel alignment together with the front.

Follow the procedure in "FS" section "Wheel Alignment" for measurement and/or adjustment of wheel alignment. <Ref. to FS-6, Wheel Alignment.>

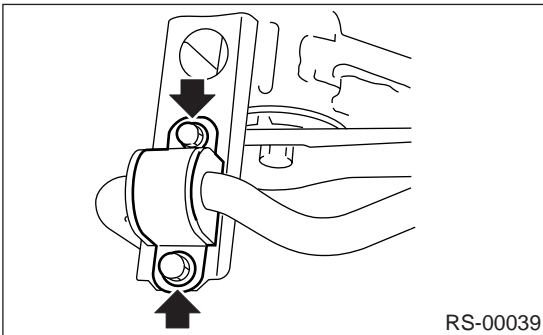
3. Rear Stabilizer

A: REMOVAL

- 1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).
- 2) Remove bolts which secure stabilizer link to rear arm.



- 3) Remove bolts which secure stabilizer to sub frame.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Ensure that bushing and stabilizer have the same identification colors when installing.

CAUTION:

Discard old self-locking nut and replace with a new one.

Tightening torque:

Stabilizer link to rear arm

44 N·m (4.5 kgf-m, 32.5 ft-lb)

Clamp to sub frame

40 N·m (4.1 kgf-m, 30 ft-lb)

C: INSPECTION

- 1) Check bushing for cracks, fatigue or damage.
- 2) Check stabilizer links for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

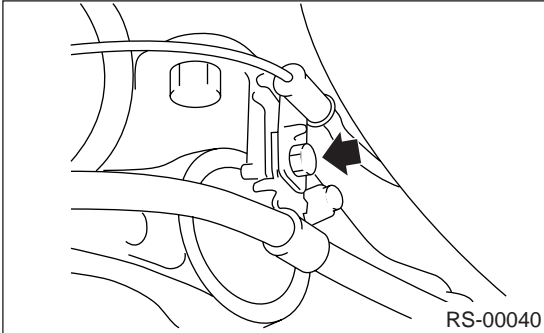
REAR ARM

REAR SUSPENSION

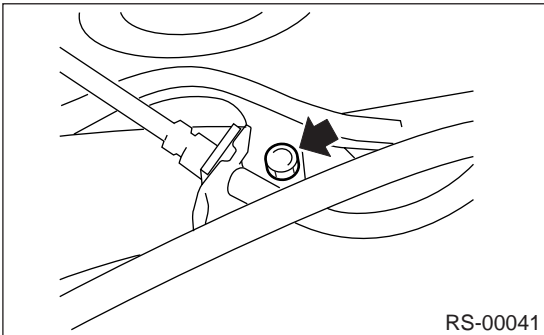
4. Rear Arm

A: REMOVAL

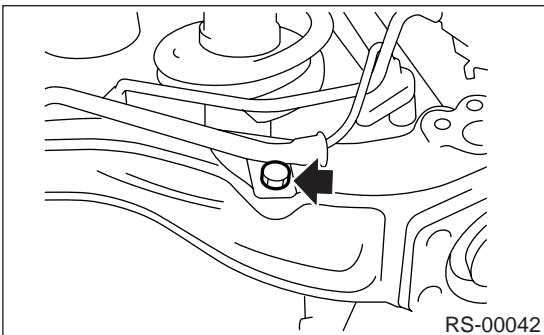
- 1) Lift-up the vehicle and remove rear wheel.
- 2) Remove support sub frame front.
<Ref. to RS-21, REMOVAL, Support Sub Frame Front.>
- 3) Remove bearing unit.
<Ref. to DS-23, REMOVAL, Hub Unit Bearing.>
- 4) Remove bolt securing parking brake cable clamp to rear arm.



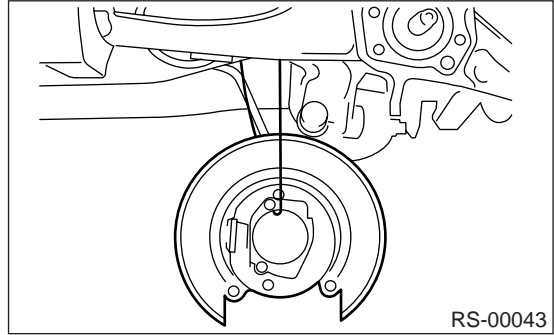
- 5) Remove bolt securing brake hose to rear arm.



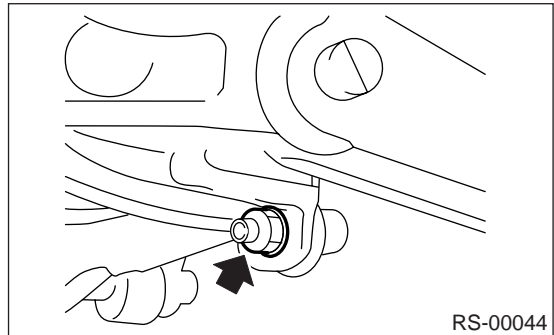
- 6) Remove bolt securing ABS sensor to rear arm.



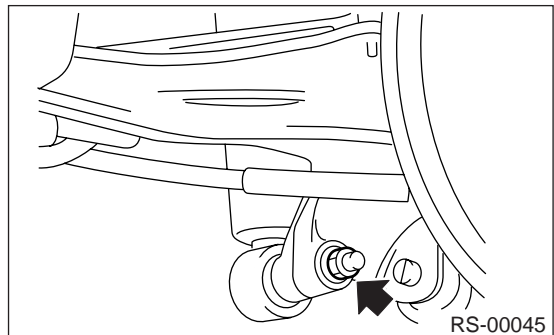
- 7) Suspend the back plate from sub frame.



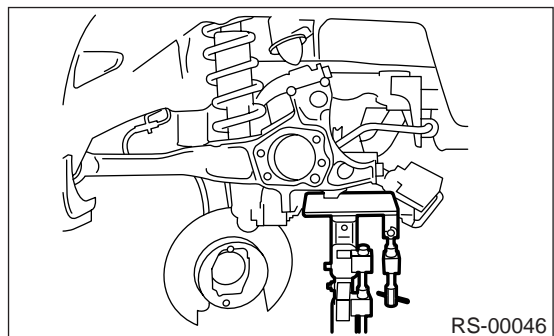
- 8) Remove nut securing stabilizer link to rear arm.



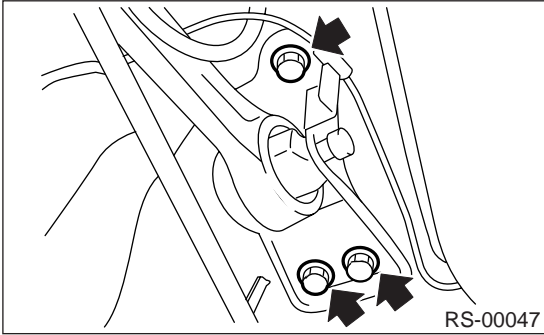
- 9) Remove bolt securing shock absorber to rear arm.



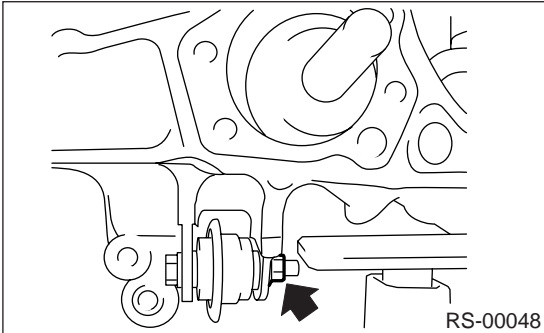
- 10) Use transmission jack to support rear arm horizontally.



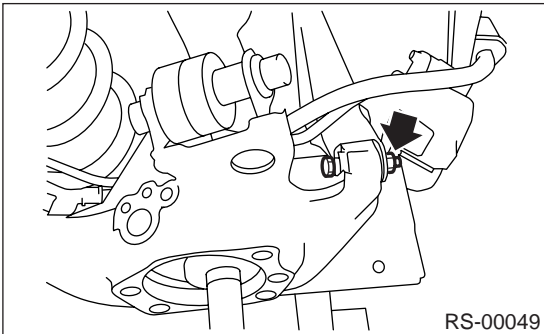
11) Remove bolt securing rear arm to body.



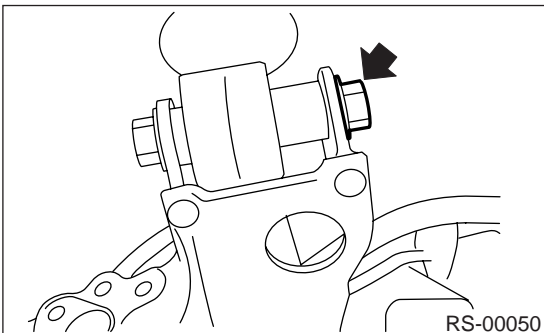
12) Loosen nut securing link front to rear arm.



13) Loosen nut securing link rear to rear arm.



14) Loosen nut securing link upper to rear arm.



15) Remove bolts securing rear arm to links and remove rear arm.

B: INSTALLATION

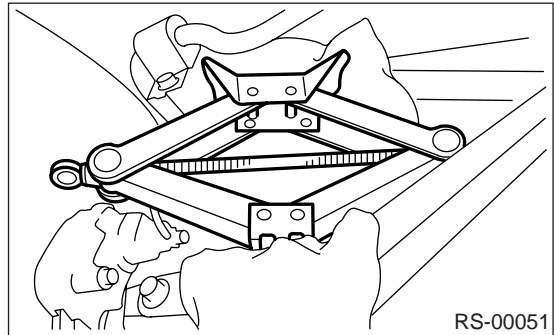
CAUTION:

Discard old self-locking nut and replace with a new one.

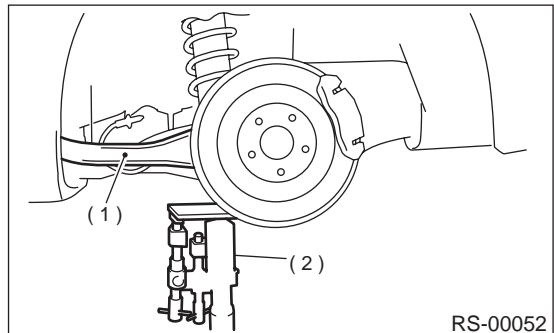
- 1) Use a transmission jack to support the rear arm.
- 2) Install rear arm and temporarily tighten bolts securing rear arm to links.
- 3) Install bearing unit.
<Ref. to DS-24, INSTALLATION, Hub Unit Bearing.>
- 4) Install bolt securing ABS sensor to rear arm.
- 5) Install bolt securing brake hose to rear arm.
- 6) Install bolt securing parking brake cable clamp to rear arm.
- 7) Place jack (furnished with vehicle) upside down and position it between link rear and sub frame. Adjust jack position so rear shock absorber is aligned with rear arm at their corresponding holes. Install lower shock absorber bolts.

CAUTION:

Put a cloth between jack and its mating area to protect link rear and sub frame from scratches.



8) Using transmission jack, support rear arm horizontally and tighten nuts and bolts securing rear arm, link front, link rear, link upper and shock absorber.



- (1) Rear arm
- (2) Transmission jack

REAR ARM

REAR SUSPENSION

9) Install support sub frame front.

NOTE:

Check wheel alignment and adjust if necessary.

Tightening torque:

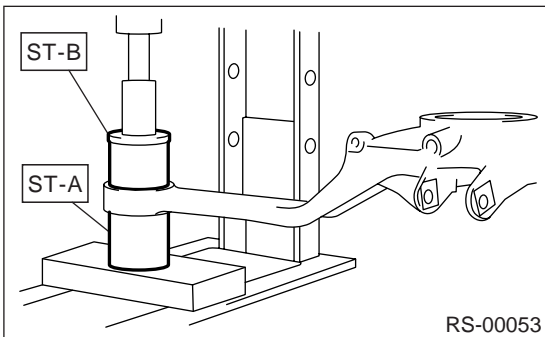
Refer to COMPONENT of General Description for tightening torque. <Ref. to RS-3, REAR SUSPENSION, COMPONENT, General Description.>

C: DISASSEMBLY

1. FRONT BUSHING

1) Using ST-A, B, press front bushing out of place.
ST-A, B 20099AE020INSTALLER & REMOVER SET

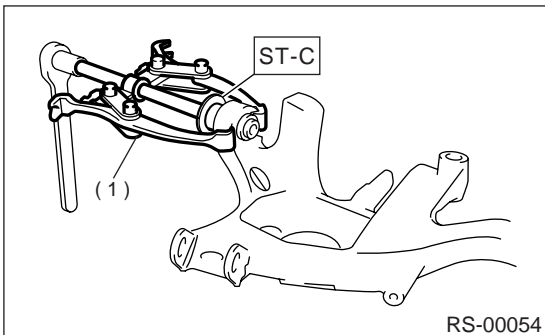
- (1) Set ST-A in position with larger inside diameter side facing up.
- (2) Set rear arm with protruded bushing side facing down.
- (3) Place ST-B on upper side of bushing, then press bushing out of position.



2. REAR BUSHING

Using ST-C and bearing puller, press rear bushing out of place.

ST-C 20099AE040INSTALLER & REMOVER SET



(1) Bearing puller

D: ASSEMBLY

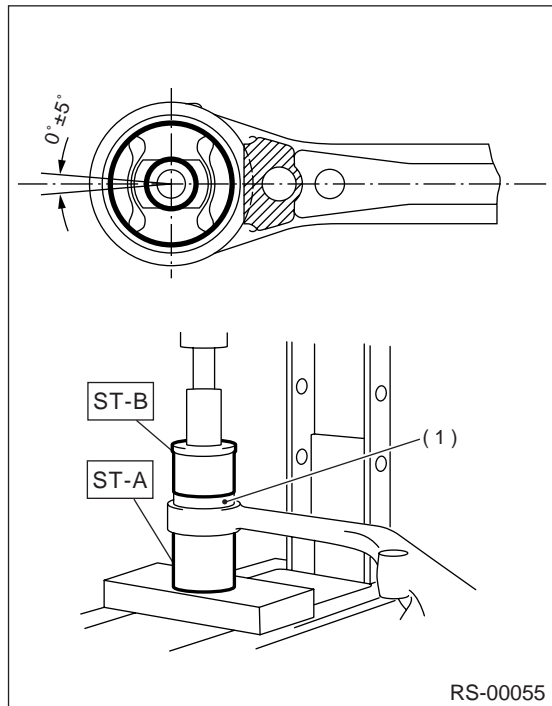
1. FRONT BUSHING

1) Using ST-A, B, press bushing into rear arm.
ST-A, B 20099AE020INSTALLER & REMOVER SET

- (1) Set ST-A in position with smaller inside diameter side facing up.
- (2) Set rear arm in position with outer side of vehicle body facing down.
- (3) Place bushing on upper side of rear arm.
- (4) Place ST-B on upper side of bushing, then press bushing into position.

CAUTION:

- Install bushing with painted side facing up.
- Install front bushing in the proper direction, as shown in figure.



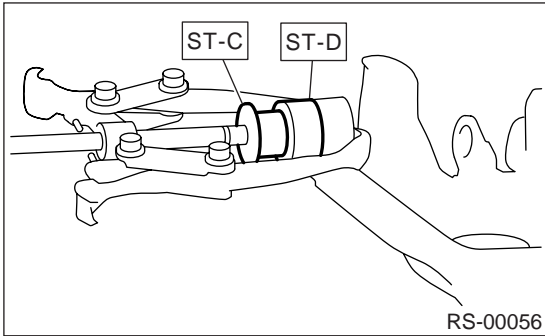
(1) Bushing

2. REAR BUSHING

1) Using ST-C, D and bearing puller, press bushing into rear arm.

ST-C, D 20099AE040INSTALLER & REMOVER SET

- (1) Insert bushing into bore in ST-D.
- (2) Set ST-C, ST-D and bearing puller in position, as shown in the figure, and press bushing into position.



E: INSPECTION

Check rear arm for bends, corrosion or damage.

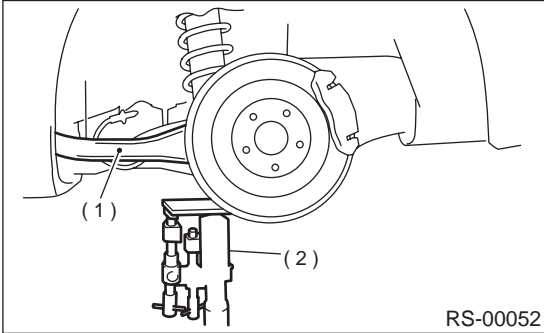
LINK UPPER

REAR SUSPENSION

5. Link Upper

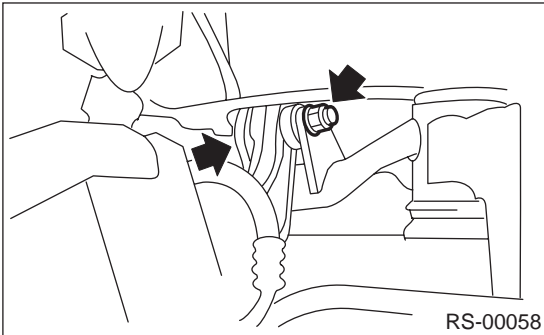
A: REMOVAL

- 1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
- 2) Use transmission jack to support rear arm horizontally.

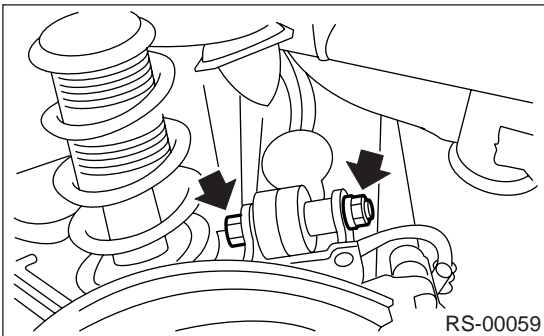


- (1) Rear arm
- (2) Transmission jack

- 3) Remove bolt securing link upper to sub frame.



- 4) Remove bolts which secure link upper to rear arm and detach link upper.

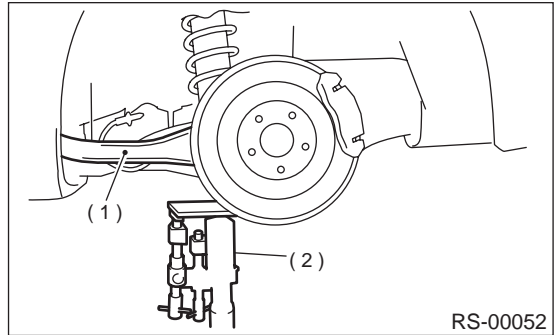


B: INSTALLATION

Install in the reverse order of removal, observing the following instructions.

CAUTION:

- Using transmission jack, support rear arm horizontally, install link upper and tighten nuts to specified torque.



- (1) Rear arm
- (2) Transmission jack

- Tighten nut when installing adjusting bolt.
- Replace self-locking nut.

NOTE:

Check wheel alignment and adjust if necessary.

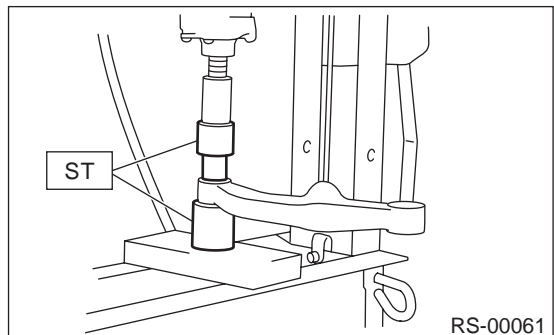
Tightening torque:

120 N·m (12.2 kgf·m, 88 ft·lb)

C: DISASSEMBLY

Using ST, press bushing out of place.

ST 20099AE010 INSTALLER & REMOVER



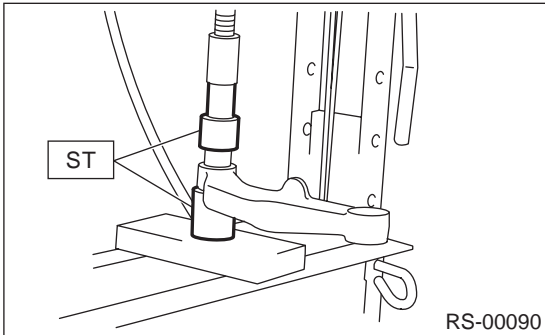
D: ASSEMBLY

1) Using ST, press bushing into place.

ST 20099AE010 INSTALLER & REMOVER

CAUTION:

Outer bushing has a “directional” design. Be sure to install bushing with longer inner housing side facing vehicle rear.



E: INSPECTION

Visually check link upper for damage or bends.

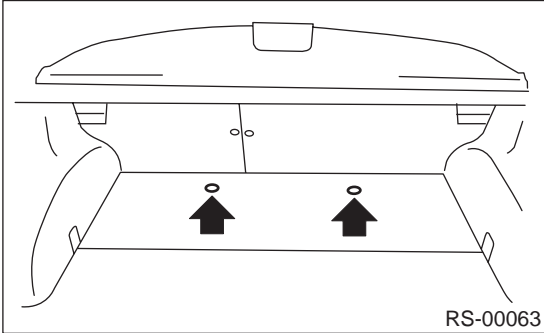
REAR SHOCK ABSORBER

REAR SUSPENSION

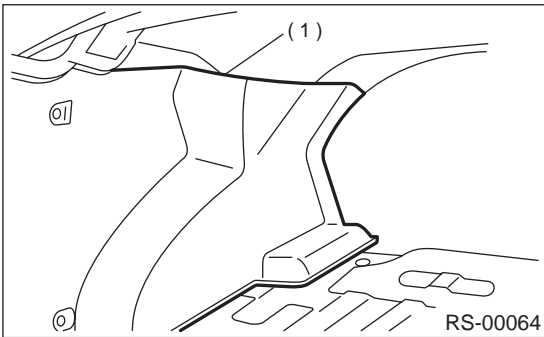
6. Rear Shock Absorber

A: REMOVAL

- 1) Lift-up vehicle and remove rear wheels.
- 2) Remove clip and detach floor mat. (Wagon model)

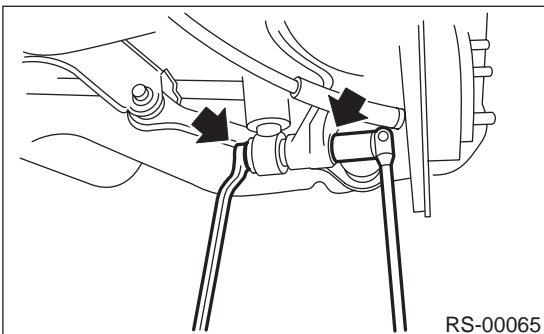


- 3) Detach trunk mat. (Sedan model)
- 4) Roll up the trunk side trim. (Sedan model)



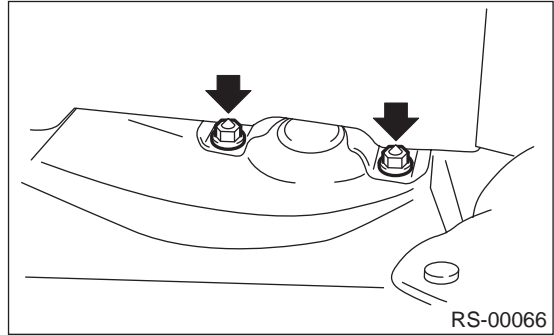
(1) Trunk side trim

- 5) Remove bolt securing shock absorber to rear arm.

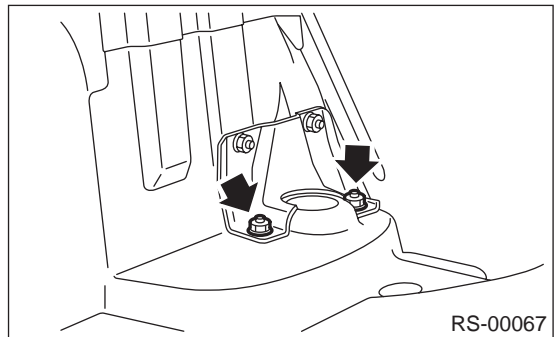


- 6) Use a jack to support the shock absorber.
- 7) Remove nuts securing shock absorber mount to body.

• Wagon



• Sedan



- 8) Remove shock absorber.

B: INSTALLATION

- 1) Use a jack to support the shock absorber.
- 2) Tighten self-locking nut used to secure shock absorber to vehicle body.

CAUTION:

Use a new self-locking nut.

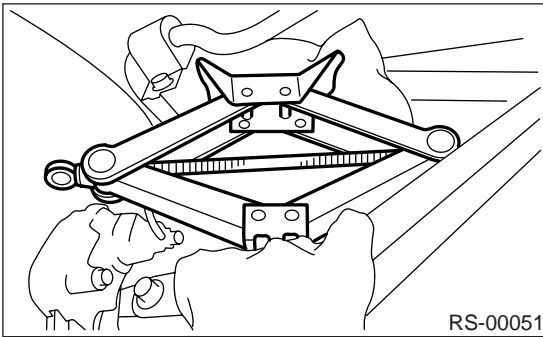
Tightening torque:

30 N·m (3.1 kgf-m, 22 ft-lb)

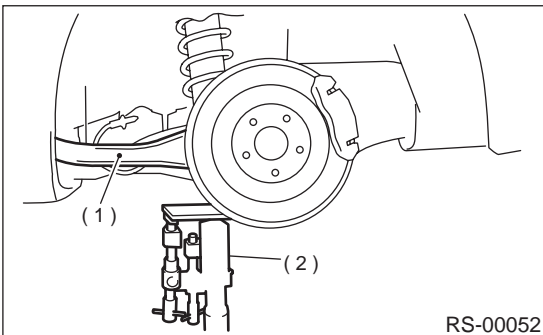
- 3) Place jack (furnished with vehicle) upside down and position it between link rear and sub frame. Adjust jack position so rear shock absorber is aligned with rear arm at their corresponding holes. Install lower shock absorber bolts.

CAUTION:

Put a cloth between jack and its mating area to protect link rear and sub frame from scratches.



- 4) Using transmission jack, support rear arm horizontally and tighten shock absorber nuts and bolts to specified torque.



- (1) Rear arm
- (2) Transmission jack

Tightening torque:

160 N·m (16.3 kgf-m, 118 ft-lb)

CAUTION:

Use a new self-locking nut.

- 5) Install floor mat. (Wagon model)
- 6) Set trunk side trim. (Sedan model)

- 7) Install trunk mat. (Sedan model)

NOTE:

Check wheel alignment and adjust if necessary.

C: DISASSEMBLY

For disassembly of shock absorber, refer to procedures outlined under front strut as a guide.
<Ref. to FS-18, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures.
<Ref. to FS-18, ASSEMBLY, Front Strut.>

E: INSPECTION

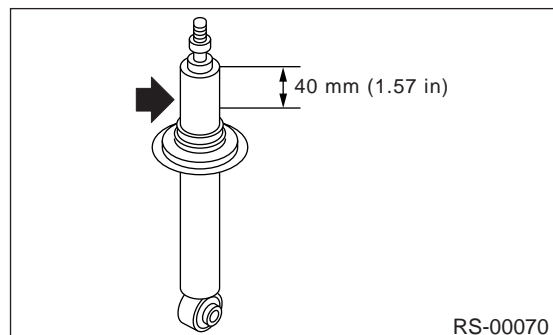
Refer to Front Strut as a guide for inspection procedures.
<Ref. to FS-19, INSPECTION, Front Strut.>

F: DISPOSAL

CAUTION:

- Before handling shock absorber, be sure to wear goggles to protect eyes from gas, oil and/or filings.
- Completely discharge the gas from the shock absorber before disposal. Follow the disposal procedure outlined below.
- Do not disassemble shock absorber or place into a fire.
- Drill holes before disposing of shock absorber.

- 1) Place shock absorber on a flat and level surface with piston rod fully extended.
- 2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, drill 30 mm (1.18 in) deep holes in areas shown in the figure.



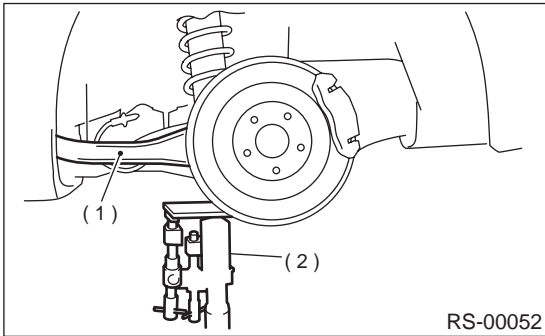
LINK FRONT

REAR SUSPENSION

7. Link Front

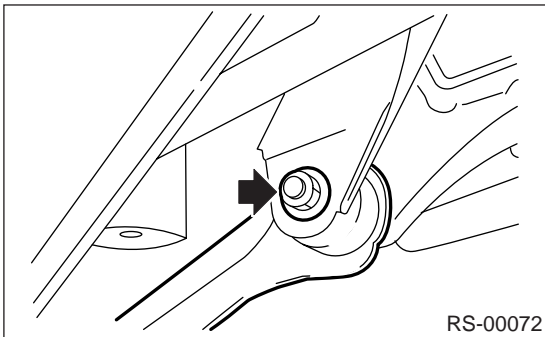
A: REMOVAL

- 1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
- 2) Use transmission jack to support rear arm horizontally.

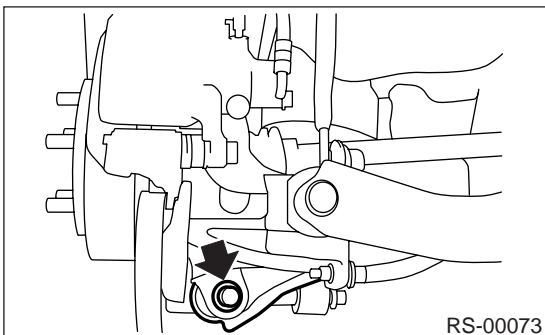


- (1) Rear arm
- (2) Transmission jack

- 3) Remove bolt securing link front to sub frame.



- 4) Remove bolts which secure link front to rear arm and detach link front.



NOTE:

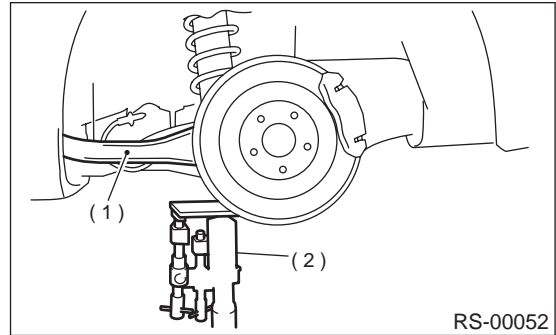
Link front bushing cannot be replaced alone. Always replace link front and bushing as a single unit.

B: INSTALLATION

Install in the reverse order of removal, observing the following instructions.

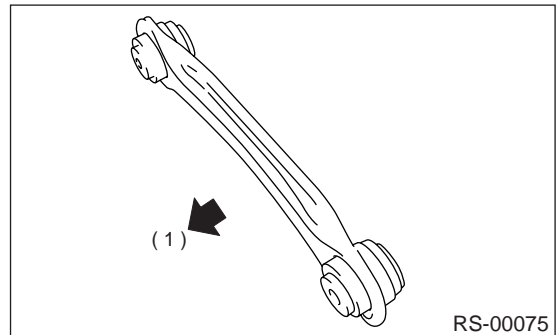
CAUTION:

- Using transmission jack, support rear arm horizontally, install link front and tighten nuts to specified torque.



- (1) Rear arm
- (2) Transmission jack

- Install link front with protruded side facing front.



- (1) Front

- Replace self-locking nut.

NOTE:

Check wheel alignment and adjust if necessary.

Tightening torque:

120 N·m (12.2 kgf-m, 88 ft-lb)

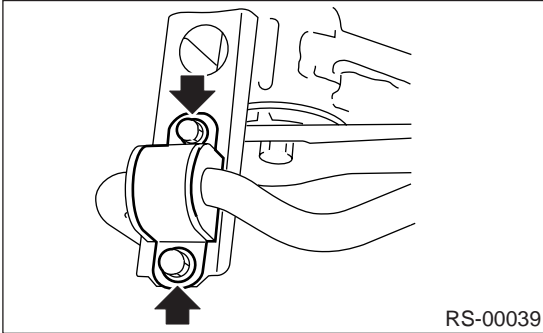
C: INSPECTION

Visually check link front for damage or bends.

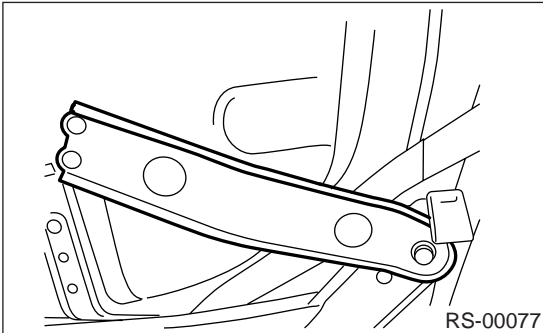
8. Link Rear

A: REMOVAL

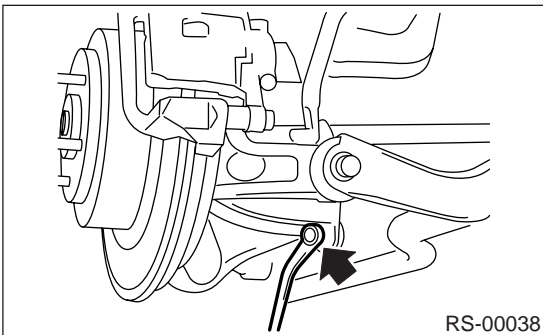
- 1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
- 2) Remove bolt securing stabilizer clamps to sub frame.



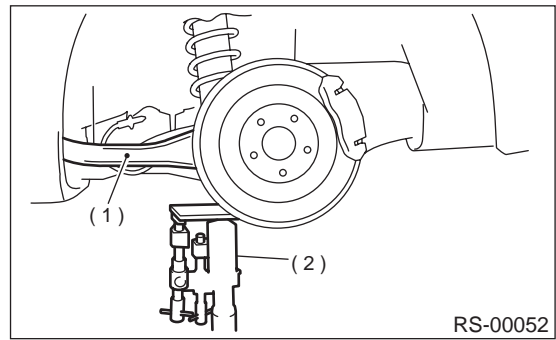
- 3) Remove support sub frame RH. (When removing RH side link rear.)



- 4) Remove stabilizer link.

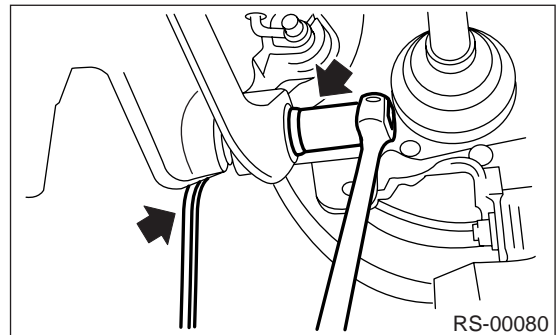


- 5) Use transmission jack to support rear arm horizontally.



- (1) Rear arm
- (2) Transmission jack

- 6) Remove bolt securing link rear to rear arm.

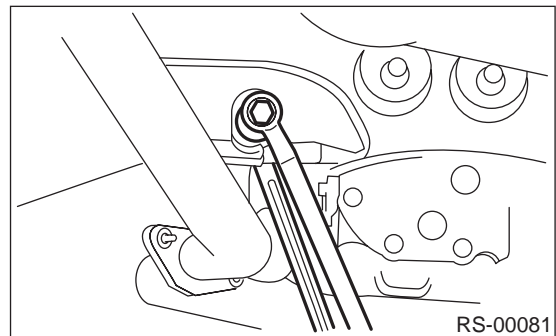


- 7) Scribe an alignment mark on link rear adjusting bolt and sub frame.

- 8) Remove bolts securing link rear to sub frame, detach link rear.

CAUTION:

To loosen adjusting bolt, always loosen nut while holding the head of adjusting bolt.



LINK REAR

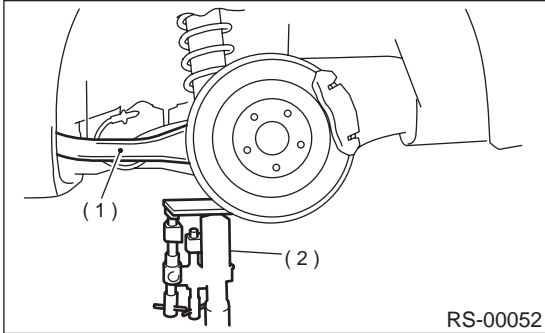
REAR SUSPENSION

B: INSTALLATION

Install in the reverse order of removal, observing the following instructions.

CAUTION:

- Using transmission jack, support rear arm horizontally, install link rear and tighten nuts to specified torque.



- (1) Rear arm
- (2) Transmission jack

- Tighten nut when installing adjusting bolt.
- Replace self-locking nut.

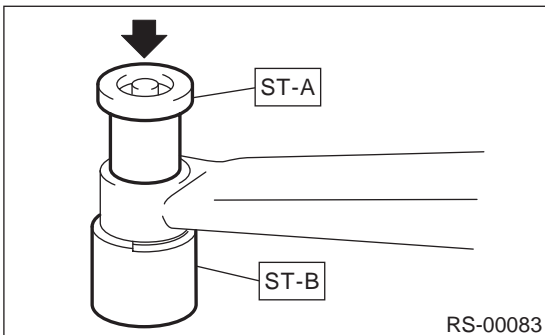
NOTE:

Check wheel alignment and adjust if necessary.

C: DISASSEMBLY

Using ST-A, B, press bushing out of place.

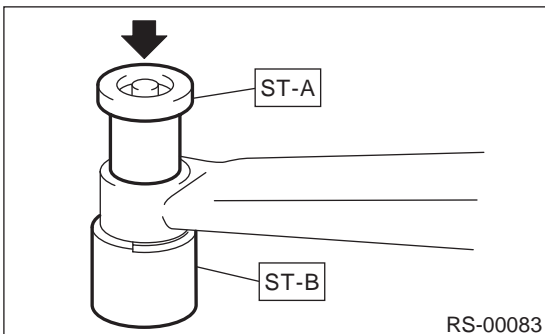
ST-A, B 20099AE000INSTALLER & REMOVER



D: ASSEMBLY

Using ST-A and ST-B, press bushing into place.

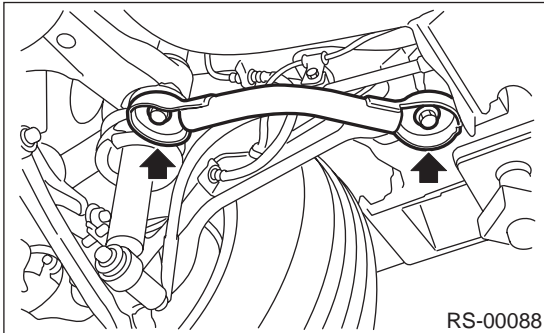
ST-A, B 20099AE000INSTALLER & REMOVER



9. Support Sub Frame Front

A: REMOVAL

- 1) Lift-up the vehicle, using support stand to support rear sub frame.
- 2) Remove support sub frame front.



B: INSTALLATION

- 1) Install in reverse order of removal.

Tightening torque:

Support sub frame front to rear arm bracket

80 N·m (8.2 kgf-m, 59 ft-lb)

Support sub frame front to rear sub frame

175 N·m (17.8 kgf-m, 129 ft-lb)

C: INSPECTION

Visually check support sub frame front for damage or bends.

REAR SUB FRAME

REAR SUSPENSION

10. Rear Sub Frame

A: REMOVAL

1) Separate front exhaust pipe and rear exhaust pipe.

2) Remove rear exhaust pipe and muffler.

3) Remove rear differential.

With T-type

<Ref. to DI-24, REMOVAL, Rear Differential for T-type.>

With VA-type

<Ref. to DI-41, REMOVAL, Rear Differential for VA-type.>

4) Disconnect link front from sub frame.

<Ref. to RS-18, REMOVAL, Link Front.>

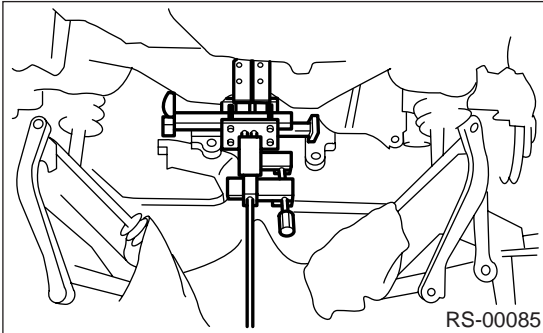
5) Disconnect link rear from sub frame.

<Ref. to RS-19, REMOVAL, Link Rear.>

6) Disconnect link upper from sub frame.

<Ref. to RS-14, REMOVAL, Link Upper.>

7) Place transmission jack under sub frame.



8) Remove support sub frame front.

9) After removing bolts, remove sub frame and support sub frame from vehicle body.

B: INSTALLATION

1) Install in reverse order of removal.

2) For installation and tightening torque of rear differential.

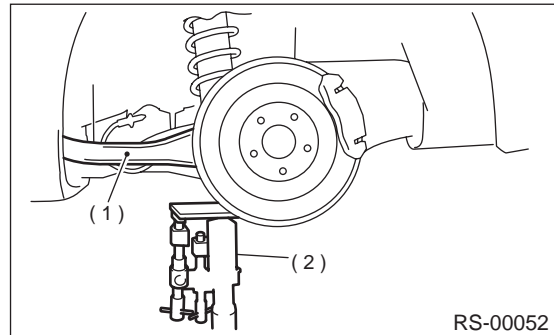
With T-type

<Ref. to DI-25, INSTALLATION, Rear Differential for T-type.>

With VA-type

<Ref. to DI-42, INSTALLATION, Rear Differential for VA-type.>

3) Using transmission jack, support rear arm horizontally and tighten nuts and bolts securing rear arm, link front, link rear, link upper and shock absorber.



(1) Rear arm

(2) Transmission jack

4) Install support sub frame front.

NOTE:

Check wheel alignment and adjust if necessary.

C: INSPECTION

Check removed parts for wear, damage and cracks, and correct or replace if defective.

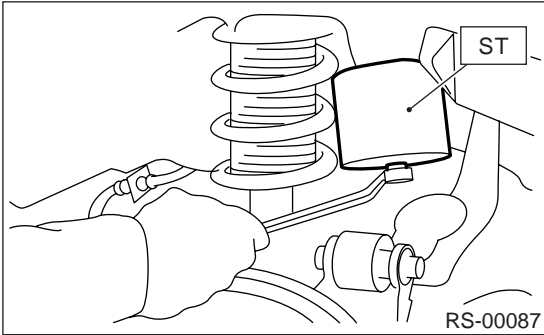
11.Helper

A: REMOVAL

1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).

2) Using ST, remove helper.

ST 20099AE030 HELPER SOCKET WRENCH



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)

C: INSPECTION

Check helper for cracks, fatigue or damage.

GENERAL DIAGNOSTIC TABLE

REAR SUSPENSION

12. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut and/or shock absorber	Replace.
(3) Installation of wrong strut and/or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

- 1) Large rebound shock
- 2) Rocking of vehicle continues too long after running over bump and/or hump.
- 3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace coil springs with new ones.
(4) Fault in operation of damper strut and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or shock absorber mount	Replace.
(6) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut and/or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut and/or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

WHEEL AND TIRE SYSTEM

WT

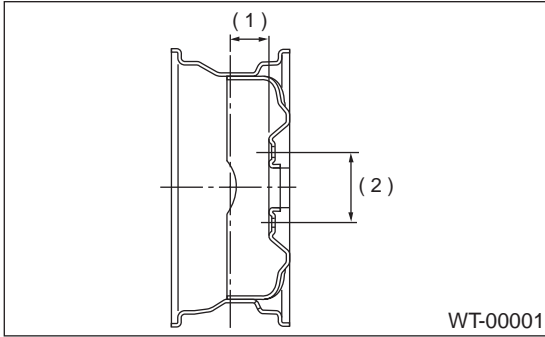
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GENERAL DESCRIPTION

WHEEL AND TIRE SYSTEM

1. General Description

A: SPECIFICATIONS



(1) Offset

(2) P.C.D.

		Tire size	Rim size	Rim offset	P.C.D.
2.0 L model	Front and Rear	195/60R15 88V	15 × 6JJ	55 mm (2.17 in)	100 mm (3.94 in) dia.
2.5 L model	Front and Rear	205/50R16 87V	16 × 6 1/2JJ	55 mm (2.17 in)	
		195/60R15 88V	15 × 6JJ	55 mm (2.17 in)	
OUTBACK model	Front and Rear	215/60R16 95H*1 215/60R16 95V	16 × 6 1/2JJ	48 mm (1.89 in)	
Turbo model	Front and Rear	215/45ZR17 87W	17 × 7JJ	55 mm (2.17 in)	
	T-type tire	T135/70 D16	16 × 4T	50 mm (1.97 in)	

		Tire size	Tire inflation pressure kPa (kg/cm ² , psi)		
			Light load	Full load	Trailer towing
2.0 L model	Front and Rear	195/60R15 88V	Ft: 220 (2.2, 32) Rr: 210 (2.1, 30)	Ft: 220 (2.2, 32) Rr: 250 (2.5, 36)	Ft: 220 (2.2, 32) Rr: 270 (2.7, 39)
2.5 L model	Front and Rear	205/50R16 87V	Ft: 230 (2.3, 33), 220 (2.2, 32)*2	Ft: 230 (2.3, 33), 220 (2.2, 32)*2	Ft: 230 (2.3, 33), 220 (2.2, 32)*2
		195/60R15 88V*2	Rr: 220 (2.2, 32), 210 (2.1, 30)*2	Rr: 250 (2.5, 36)	Rr: 270 (2.7, 39)
OUTBACK model	Front and Rear	215/60R16 95H*1 215/60R16 95V	Ft: 200 (2.0, 29) Rr: 190 (1.9, 28), 200 (2.0, 29)*1	Ft: 200 (2.0, 29) Rr: 250 (2.5, 36)	Ft: 200 (2.0, 29) Rr: 250 (2.5, 36)
Turbo model	Front and Rear	215/45R ZR17	Ft: 230 (2.3, 33) Rr: 220 (2.2, 32)	Ft: 230 (2.3, 33) Rr: 250 (2.5, 36)	Ft: 230 (2.3, 33) Rr: 270 (2.7, 39)
	T-type tire	T135/70 D16	420 (4.2, 60)		—

*1: Australia spec. vehicles

*2: General spec. vehicles

GENERAL DESCRIPTION

WHEEL AND TIRE SYSTEM

1. SERVICE DATA

Item	Axial runout	Radial runout
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

2. ADJUSTING PARTS

Wheel balancing	Standard	Service limit
Dynamic unbalance	Less than 5 g (0.18 oz)	

Balance weight part number (For steel wheel)	Weight
28101AA001	5 g (0.18 oz)
28101AA011	10 g (0.35 oz)
28101AA021	15 g (0.53 oz)
28101AA031	20 g (0.71 oz)
28101AA041	25 g (0.88 oz)
28101AA051	30 g (1.06 oz)
28101AA061	35 g (1.23 oz)
28101AA071	40 g (1.41 oz)
28101AA081	45 g (1.59 oz)
28101AA091	50 g (1.76 oz)
—	55 g (1.94 oz)
28101AA111	60 g (2.12 oz)

Balance weight part number (For aluminum wheel)	Weight
23141GA462	5 g (0.18 oz)
23141GA472	10 g (0.35 oz)
23141GA482	15 g (0.53 oz)
23141GA492	20 g (0.71 oz)
23141GA502	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

B: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Air Pressure Gauge	Used for measuring tire air pressure.
Dial Gauge	Used for measuring wheel runout.

2. Tire

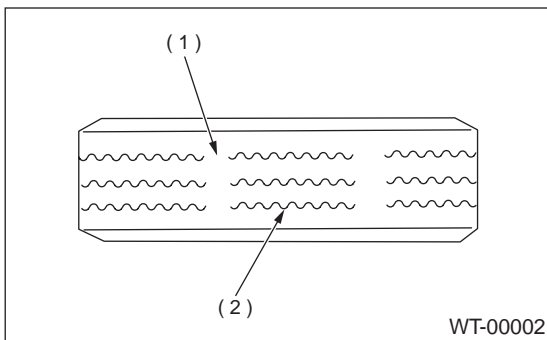
A: INSPECTION

- 1) Take stone, glass, nail etc. off the tread groove.
- 2) Replace tire:

CAUTION:

- When replacing a tire, make sure to use only the same size, construction and load range as originally installed.
- Avoid mixing radial, belted bias or bias tires on the vehicle.

- (1) When large crack on side wall, damage or crack on tread is found.
- (2) When the "tread wear indicator" appears as a solid band across the tread.



- (1) Tread wear indicator
- (2) Tire tread

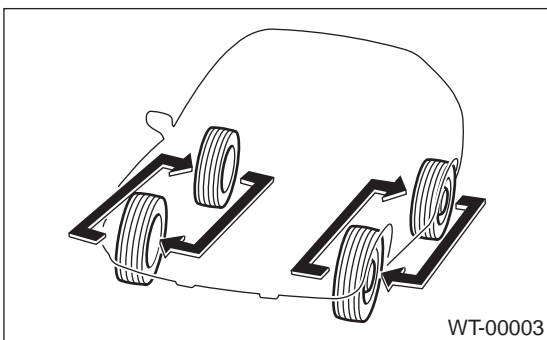
- 3) When extremely biased wear on tire tread can be seen, after replacing tire, check wheel alignment. <Ref. to FS-6, Wheel Alignment.>

1. TIRE ROTATION

If tires are maintained at the same positions for a long period of time, uneven wear results. Therefore, they should be periodically rotated. This lengthens service life of tires.

CAUTION:

When rotating tires, replace unevenly worn or damaged tires with new ones.



3. Steel Wheel

A: REMOVAL

- 1) Apply parking brake, and position select lever to "P" or "LOW".
- 2) Set shop jacks or a lift to the specified point, and support the vehicle with its wheels slightly contacting the floor.
- 3) Loosen wheel nuts.
- 4) Raise the vehicle until its wheels take off the ground using a jack or a lift.
- 5) Remove wheel nuts and wheels.

NOTE:

- While removing wheels, prevent hub bolts from damage.
- Place wheels with their outer sides facing up-ward to prevent wheels from damage.

B: INSTALLATION

- 1) Attach the wheel to the hub by aligning the wheel bolt hole with the hub bolt.
- 2) Temporarily attach the wheel nuts to the hub bolts. (In the case of aluminum wheel, use SUBARU genuine wheel nut for aluminum wheel.)
- 3) Manually tighten the nuts making sure the wheel hub hole is aligned correctly to the guide portion of hub.
- 4) Tighten the wheel nuts in a diagonal selection to the specified torque. Use a wheel nut wrench.

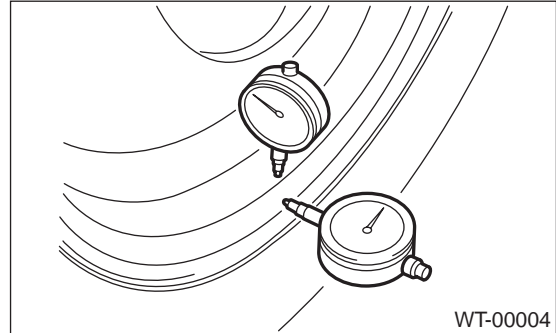
Wheel nut tightening torque:
88 N·m (9 kgf-m, 65 ft-lb)

CAUTION:

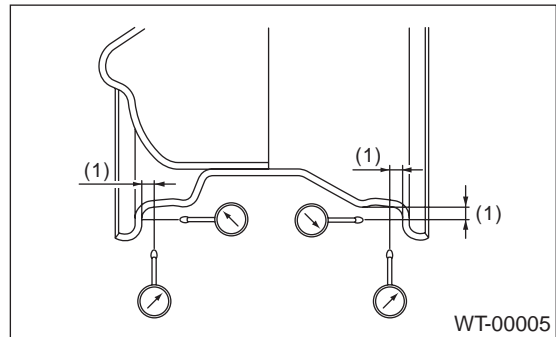
- Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached. For drum brake models, excess tightening of wheel nuts may cause wheels to "judder".
 - Do not depress the wrench with a foot; Always use both hands when tightening.
 - Make sure the bolt, nut and the nut seating surface of the wheel are free from oils.
- 5) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

C: INSPECTION

- 1) Deformation or damage on the rim can cause air leakage. Check the rim flange for deformation, crack, or damage, and repair or replace as necessary.
- 2) Jack-up vehicle until wheels clear the floor.
- 3) Slowly rotate wheel to check rim "runout" using a dial gauge.



Axial runout limit	Radial runout limit
1.5 mm (0.059 in)	



(1) Approx. 7 mm (0.28 in)

- 4) If rim runout exceeds specifications, remove tire from rim and check runout while attaching dial gauge to positions shown in figure.
- 5) If measured runout still exceeds specifications, replace the wheel.

4. Aluminum Wheel

A: REMOVAL

Refer to Steel Wheel for removal procedure of aluminum wheels.

<Ref. to WT-5, REMOVAL, Steel Wheel.>

B: INSTALLATION

Refer to Steel Wheel for installation procedure of aluminum wheels.

<Ref. to WT-5, INSTALLATION, Steel Wheel.>

C: INSPECTION

Refer to Steel Wheel for inspection procedure of aluminum wheels.

<Ref. to WT-5, INSPECTION, Steel Wheel.>

Rim runout:

Axial runout limit	Radial runout limit
1.0 mm (0.039 in)	

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the following:

- 1) Do not damage aluminum wheels during removal, disassembly, installation, wheel balancing, etc. After removing aluminum wheels, place them on a rubber mat, etc.
- 2) While vehicle is being driven, be careful not to ride over sharp obstacles or allow aluminum wheels to contact the shoulder of the road.
- 3) When installing tire chain, be sure to install it properly not to have a slack; otherwise it may hit wheel while driving.
- 4) When washing aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleanser including abrasive, hard brushes or an automatic car washer.

5. Wheel Balancing

A: REPLACEMENT

- 1) Remove balance weights.
- 2) Using dynamic balancing, measure wheel balance.
- 3) Select a weight close to the value measured by dynamic balancing.

Balance weight part number (For steel wheel)	Weight
28101AA001	5 g (0.18 oz)
28101AA011	10 g (0.35 oz)
28101AA021	15 g (0.53 oz)
28101AA031	20 g (0.71 oz)
28101AA041	25 g (0.88 oz)
28101AA051	30 g (1.06 oz)
28101AA061	35 g (1.23 oz)
28101AA071	40 g (1.41 oz)
28101AA081	45 g (1.59 oz)
28101AA091	50 g (1.76 oz)
—	55 g (1.94 oz)
28101AA111	60 g (2.12 oz)

Balance weight part number (For aluminum wheel)	Weight
23141GA462	5 g (0.18 oz)
23141GA472	10 g (0.35 oz)
23141GA482	15 g (0.53 oz)
23141GA492	20 g (0.71 oz)
23141GA502	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

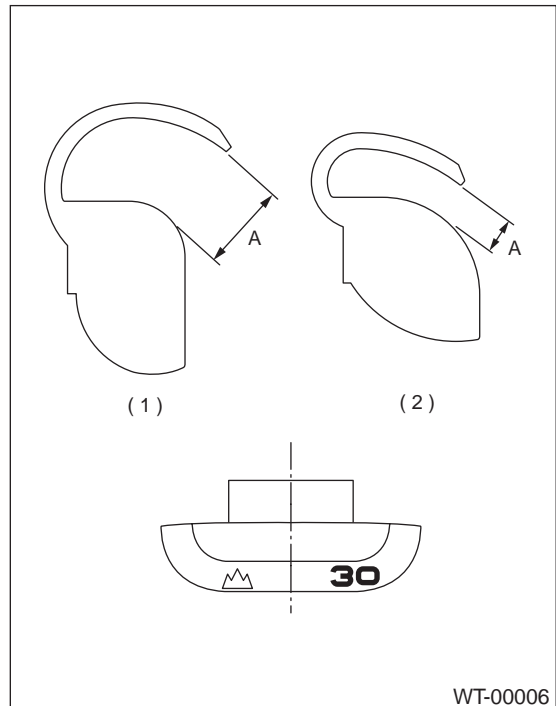
- 4) Install the selected weight to the point designated by dynamic balancing.
- 5) Using dynamic balancing, measure wheel balance again. Check that wheel balance is correctly adjusted.

B: INSPECTION

- 1) Proper wheel balance may be lost if the tire is repaired or if it wears. Check the tire for dynamic balance, and repair as necessary.
- 2) To check for dynamic balance, use a dynamic balancer. Drive in the balance weight on both the top and rear sides of the rim.
- 3) Some types of balancer can cause damage to the wheel. Use an appropriate balancer when adjusting the wheel balance.
- 4) Use genuine balance weights.

CAUTION:

Balance weights are available for use with any of 14- to 17-inch wheels.



- (1) Weight for aluminum wheel
- (2) Weight for steel wheel

Service limit: A

**Weight for steel wheel;
2.16 mm (0.085 in)**

**Weight for aluminum wheel;
4.5 mm (0.177 in)**

6. “T-type” Tire

A: NOTE

“T-type” tire for temporary use is prepared as a spare tire.

CAUTION:

- Do not use a tire chain with the “T-type” tire. Because of the smaller tire size, a tire chain will not fit properly and will result in damage to the vehicle and the tire.
- Do not drive at a speed greater than 80 km/h (50 MPH).
- Drive as slowly as possible and avoid passing over bumps.

B: REPLACEMENT

Refer to Removal and Installation of Steel Wheel for removal/installation of “T-type” tires. <Ref. to WT-5, Steel Wheel.>

CAUTION:

Replace with a conventional tire as soon as possible since the “T-type” tire is only for temporary use.

C: INSPECTION

- 1) Check tire inflation pressure.

Specification:

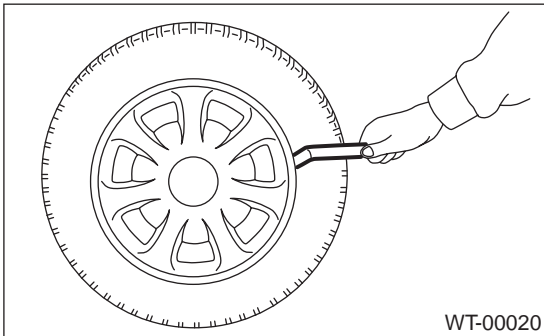
420 kPa (4.2 kg/cm², 60 psi)

- 2) Take stones, glass, nails, etc. out of the tread groove.
- 3) Check tires for deformation, cracks, partial wear, or wear.

7. Full Wheel Cap

A: REMOVAL

Pry off the full wheel cap with a wheel cap remover inserted between openings in the cap.



B: INSTALLATION

Align the valve hole in the wheel cap with the valve on the wheel and secure the wheel cap by tapping four points by hand.

C: INSPECTION

- 1) Check wheels for missing wheel caps.
- 2) Check pawls of wheel caps for damage or bend.
- 3) Check wheel caps for cracks.

GENERAL DIAGNOSTIC TABLE

WHEEL AND TIRE SYSTEM

8. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Front wheel shimmy	• Worn or improperly inflated of tire.	Replace
	• Wheel is out of balance.	Adjustment
Abnormal tire wear	• Improperly inflated of tire.	Replace
Sways/pitches	• Worn or improperly inflated of tire.	Replace
Wander/pulls	• Worn or improperly inflated of tire.	Replace

DIFFERENTIALS

DI

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GENERAL DESCRIPTION

DIFFERENTIALS

1. General Description

A: SPECIFICATIONS

When replacing a rear differential assembly, select the correct one according to the following table.

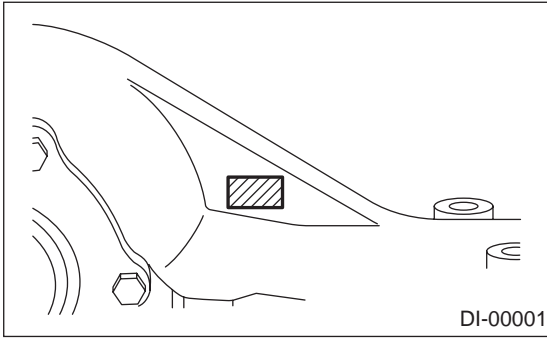
NOTE:

Using the different rear differential assembly causes the drive line and tires to “drag” or emit abnormal noise when AWD is selected.

Model	Except OUTBACK						
	2.0 L non-TURBO		2.0 L TURBO		2.5 L		
	AT	MT	AT	MT	AT	MT	
						Australia	Except Australia
Rear differential type	VA type		T type				
	XJ	T1	JP (With LSD)		T2	VB	
Gear ratio (Number of gear teeth)	4.111 (37/9)		3.900 (39/10)		4.111 (37/9)		3.700 (37/10)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)						
Rear differential gear oil	GL-5						
Gear	Hypoid gear						

Model	OUTBACK				
	2.5 L				3.0 L
	AT (without VDC)		AT (with VDC)	MT	AT (with VDC)
	Except for Latin America and South America	Latin America and South America			
Rear differential type	T type				
	TP	CF (with LSD)	BL	T1	T2
Gear ratio (Number of gear teeth)	4.444 (40/9)			4.111 (37/9)	
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)				
Rear differential gear oil	GL-5				
Gear	Hypoid gear				

• **Identification**

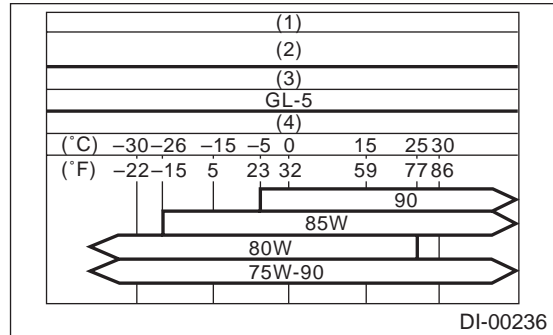


• **Rear differential gear oil**

Recommended oil

NOTE:

Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.



- (1) Item
- (2) Differential gear oil
- (3) API Classification
- (4) SAE Viscosity No. and Application Temperature

1. SERVICE DATA

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	New bearing	T-type	19.6 — 28.4 (2.0 — 2.9, 4.4 — 6.4)
		VA-type	12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3)
	Used bearing	T-type	8.34 — 16.67 (0.85 — 1.7, 1.87 — 3.75)
		VA-type	0.10 — 0.20 (0.0039 — 0.0079)
Side gear backlash mm (in)		VA-type	0.05 — 0.15 (0.0020 — 0.0059)
Side bearing standard width mm (in)			20.00 (0.7874)
Crown gear to drive pinion backlash mm (in)		T-type	0.10 — 0.20 (0.0039 — 0.0079)
		VA-type	0.10 — 0.15 (0.0039 — 0.0059)
Crown gear runout on its back surface mm (in)			Less than 0.05 (0.0020)

GENERAL DESCRIPTION

DIFFERENTIALS

2. ADJUSTING PARTS

• VA-type

Item	Part No.	Length or thickness
Preload adjusting spacer	32288AA040	52.3 mm (2.059 in)
	32288AA050	52.5 mm (2.067 in)
	31454AA100	52.6 mm (2.071 in)
	32288AA060	52.7 mm (2.075 in)
	31454AA110	52.8 mm (2.079 in)
	32288AA070	52.9 mm (2.083 in)
	31454AA120	53.0 mm (2.087 in)
	32288AA080	53.1 mm (2.091 in)
	32288AA090	53.3 mm (2.098 in)
Preload adjusting washer	38336AA000	1.500 mm (0.0591 in)
	38336AA120	1.513 mm (0.0596 in)
	38336AA010	1.525 mm (0.0600 in)
	38336AA130	1.538 mm (0.0606 in)
	38336AA020	1.550 mm (0.0610 in)
	38336AA140	1.563 mm (0.0615 in)
	38336AA030	1.575 mm (0.0620 in)
	38336AA150	1.588 mm (0.0625 in)
	38336AA040	1.600 mm (0.0630 in)
	38336AA160	1.613 mm (0.0635 in)
	38336AA050	1.625 mm (0.0640 in)
	38336AA170	1.638 mm (0.0645 in)
	38336AA060	1.650 mm (0.0650 in)
	38336AA180	1.663 mm (0.0655 in)
	38336AA070	1.675 mm (0.0659 in)
	38336AA190	1.688 mm (0.0665 in)
	38336AA080	1.700 mm (0.0669 in)
	38336AA200	1.713 mm (0.0674 in)
	38336AA090	1.725 mm (0.0679 in)
	38336AA210	1.738 mm (0.0684 in)
38336AA100	1.750 mm (0.0689 in)	
38336AA220	1.763 mm (0.0694 in)	
38336AA110	1.775 mm (0.0699 in)	
Pinion height adjusting shim	32295AA200	0.150 mm (0.0059 in)
	32295AA210	0.175 mm (0.0069 in)
	32295AA220	0.200 mm (0.0079 in)
	32295AA230	0.225 mm (0.0089 in)
	32295AA240	0.250 mm (0.0098 in)
	32295AA250	0.275 mm (0.0108 in)
Side gear thrust washer	803135011	0.925 — 0.950 mm (0.0364 — 0.0374 in)
	803135012	0.950 — 0.975 mm (0.0374 — 0.0384 in)
	803135013	0.975 — 1.000 mm (0.0384 — 0.0394 in)
	803135014	1.000 — 1.025 mm (0.0394 — 0.0404 in)
	803135015	1.025 — 1.050 mm (0.0404 — 0.0413 in)

GENERAL DESCRIPTION

DIFFERENTIALS

• T-type

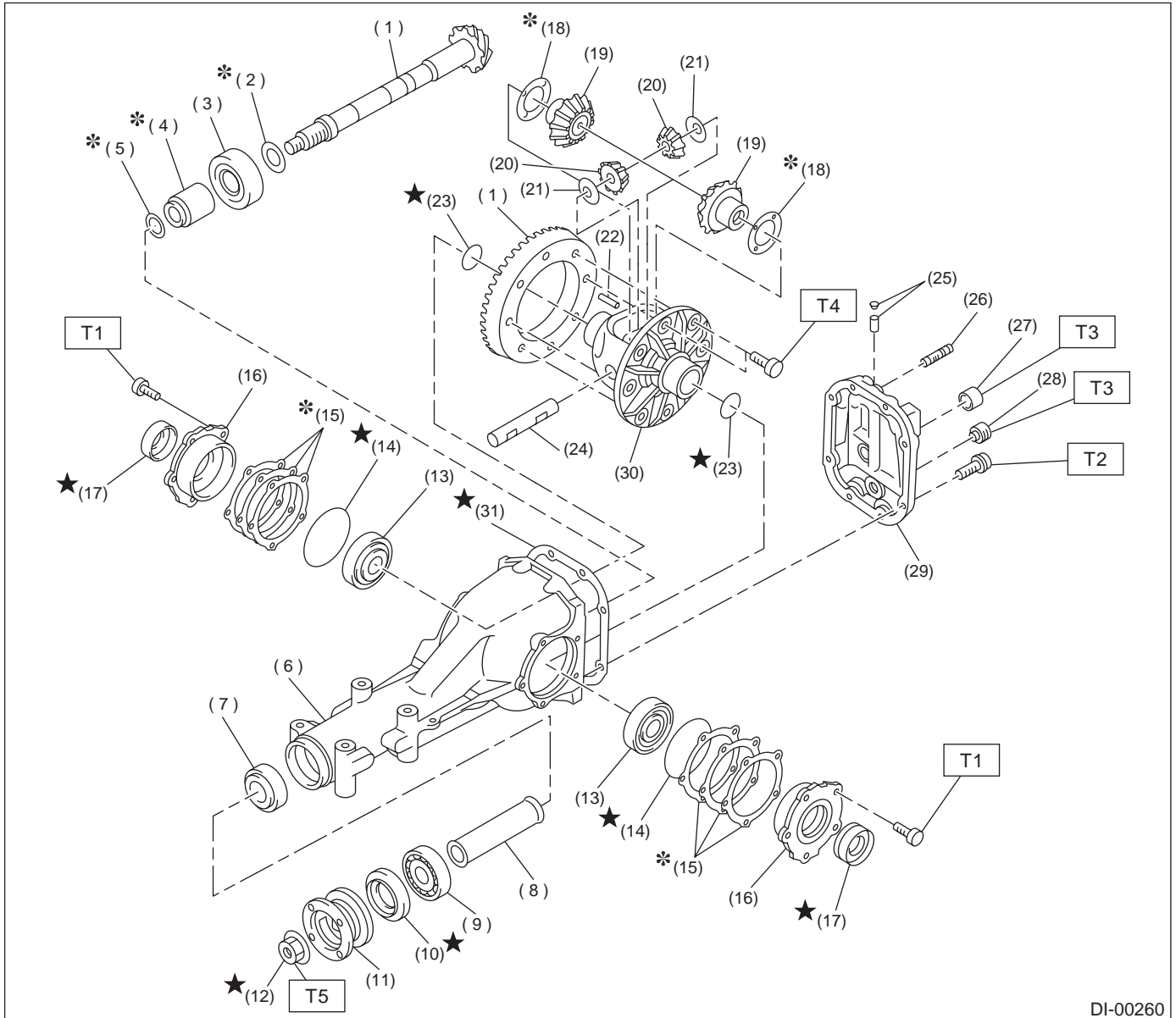
Item	Part No.	Length or thickness
Preload adjusting spacer	383695201	56.2 mm (2.213 in)
	383695202	56.4 mm (2.220 in)
	383695203	56.6 mm (2.228 in)
	383695204	56.8 mm (2.236 in)
	383695205	57.0 mm (2.244 in)
	383695206	57.2 mm (2.252 in)
Preload adjusting washer	383705200	2.59 mm (0.1020 in)
	383715200	2.57 mm (0.1012 in)
	383725200	2.55 mm (0.1004 in)
	383735200	2.53 mm (0.0996 in)
	383745200	2.51 mm (0.0988 in)
	383755200	2.49 mm (0.0980 in)
	383765200	2.47 mm (0.0972 in)
	383775200	2.45 mm (0.0965 in)
	383785200	2.43 mm (0.0957 in)
	383795200	2.41 mm (0.0949 in)
	383805200	2.39 mm (0.0941 in)
	383815200	2.37 mm (0.0933 in)
	383825200	2.35 mm (0.0925 in)
	383835200	2.33 mm (0.0917 in)
	383845200	2.31 mm (0.0909 in)
Pinion height adjusting shim	383495200	3.09 mm (0.1217 in)
	383505200	3.12 mm (0.1228 in)
	383515200	3.15 mm (0.1240 in)
	383525200	3.18 mm (0.1252 in)
	383535200	3.21 mm (0.1264 in)
	383545200	3.24 mm (0.1276 in)
	383555200	3.27 mm (0.1287 in)
	383565200	3.30 mm (0.1299 in)
	383575200	3.33 mm (0.1311 in)
	383585200	3.36 mm (0.1323 in)
	383595200	3.39 mm (0.1335 in)
	383605200	3.42 mm (0.1346 in)
	383615200	3.45 mm (0.1358 in)
	383625200	3.48 mm (0.1370 in)
	383635200	3.51 mm (0.1382 in)
	383645200	3.54 mm (0.1394 in)
	383655200	3.57 mm (0.1406 in)
383665200	3.60 mm (0.1417 in)	
383675200	3.63 mm (0.1429 in)	
383685200	3.66 mm (0.1441 in)	
Side gear thrust washer (Without LSD)	383445201	0.75 — 0.80 mm (0.0295 — 0.0315 in)
	383445202	0.80 — 0.85 mm (0.0315 — 0.0335 in)
	383445203	0.85 — 0.90 mm (0.0335 — 0.0354 in)
Side bearing retainer shim	383475201	0.20 mm (0.0079 in)
	383475202	0.25 mm (0.0098 in)
	383475203	0.30 mm (0.0118 in)
	383475204	0.40 mm (0.0157 in)
	383475205	0.50 mm (0.0197 in)

GENERAL DESCRIPTION

DIFFERENTIALS

B: COMPONENT

1. REAR DIFFERENTIAL FOR T-TYPE WITHOUT LSD



DI-00260

- | | | |
|--|---------------------------------|------------------------|
| (1) Pinion crown gear and drive pinion set | (14) O-ring | (28) Oil drain plug |
| (2) Pinion height adjusting washer | (15) Side bearing retainer shim | (29) Rear cover |
| (3) Rear bearing | (16) Side bearing retainer | (30) Differential case |
| (4) Bearing preload adjusting spacer | (17) Side oil seal | (31) Gasket |
| (5) Bearing preload adjusting washer | (18) Side gear thrust washer | |
| (6) Differential carrier | (19) Side gear | |
| (7) Front bearing | (20) Pinion mate gear | |
| (8) Collar | (21) Pinion mate gear washer | |
| (9) Pilot bearing | (22) Pinion shaft lock pin | |
| (10) Front oil seal | (23) Circlip | |
| (11) Companion flange | (24) Pinion mate shaft | |
| (12) Self-locking nut | (25) Air breather cap | |
| (13) Side bearing | (26) Stud bolt | |
| | (27) Oil filler plug | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 10.3 (1.05, 7.6)

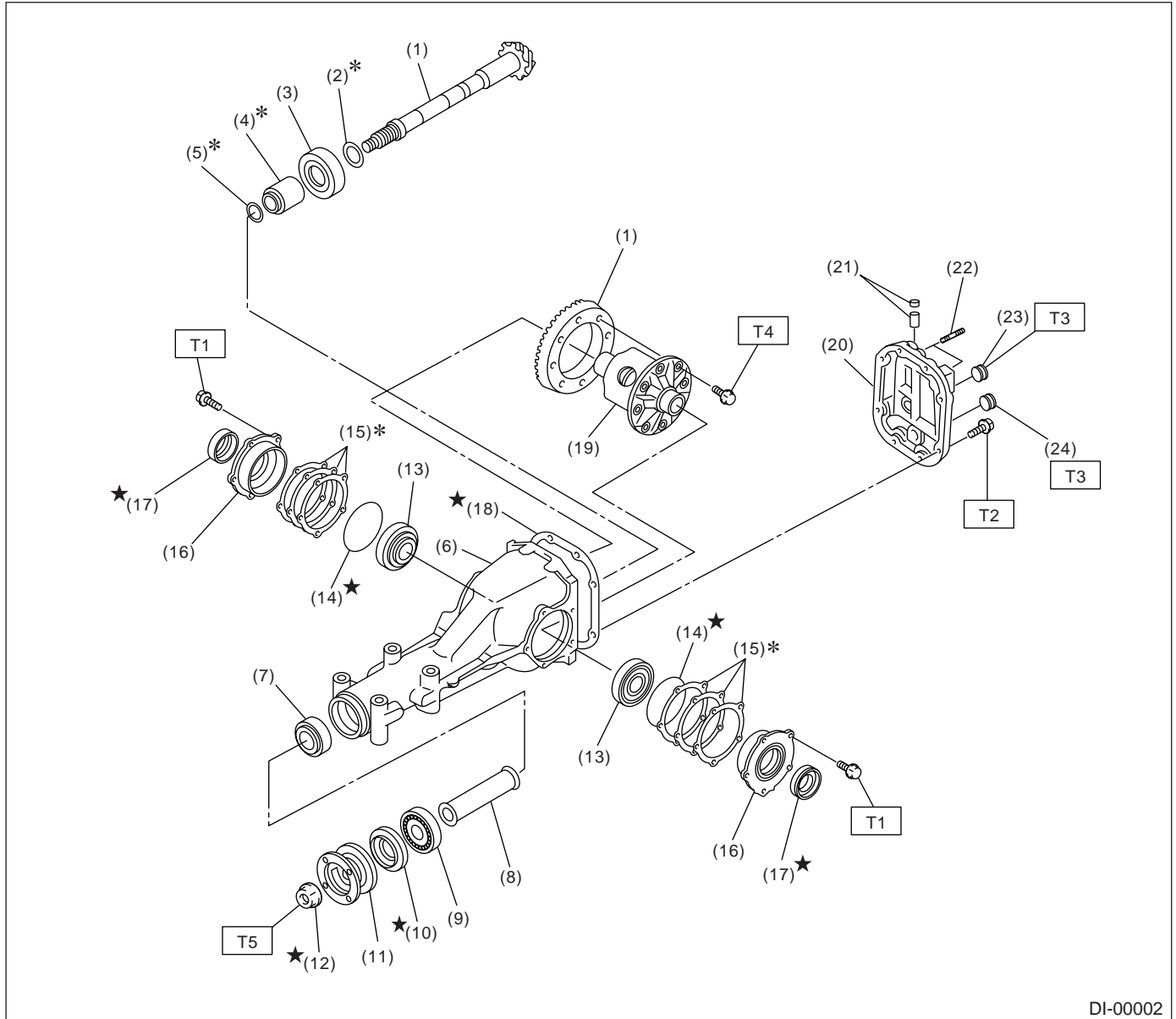
T2: 29.4 (3.00, 21.7)

T3: 49.0 (5.0, 36.2)

T4: 103.0 (10.50, 75.9)

T5: 181.4 (18.50, 133.8)

2. REAR DIFFERENTIAL FOR T-TYPE WITH LSD



DI-00002

- | | |
|--|---------------------------------|
| (1) Pinion crown gear and drive pinion set | (11) Companion flange |
| (2) Pinion height adjusting shim | (12) Self-locking nut |
| (3) Rear bearing | (13) Side bearing |
| (4) Bearing preload adjusting spacer | (14) O-ring |
| (5) Bearing preload adjusting washer | (15) Side bearing retainer shim |
| (6) Differential carrier | (16) Side bearing retainer |
| (7) Front bearing | (17) Side oil seal |
| (8) Collar | (18) Gasket |
| (9) Pilot bearing | (19) Differential case |
| (10) Front oil seal | (20) Rear cover |
| | (21) Air breather cap |

- | |
|----------------------|
| (22) Stud bolt |
| (23) Oil filler plug |
| (24) Oil drain plug |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 10.3 (1.05, 7.6)

T2: 29.4 (3.00, 21.7)

T3: 49.0 (5.00, 36.2)

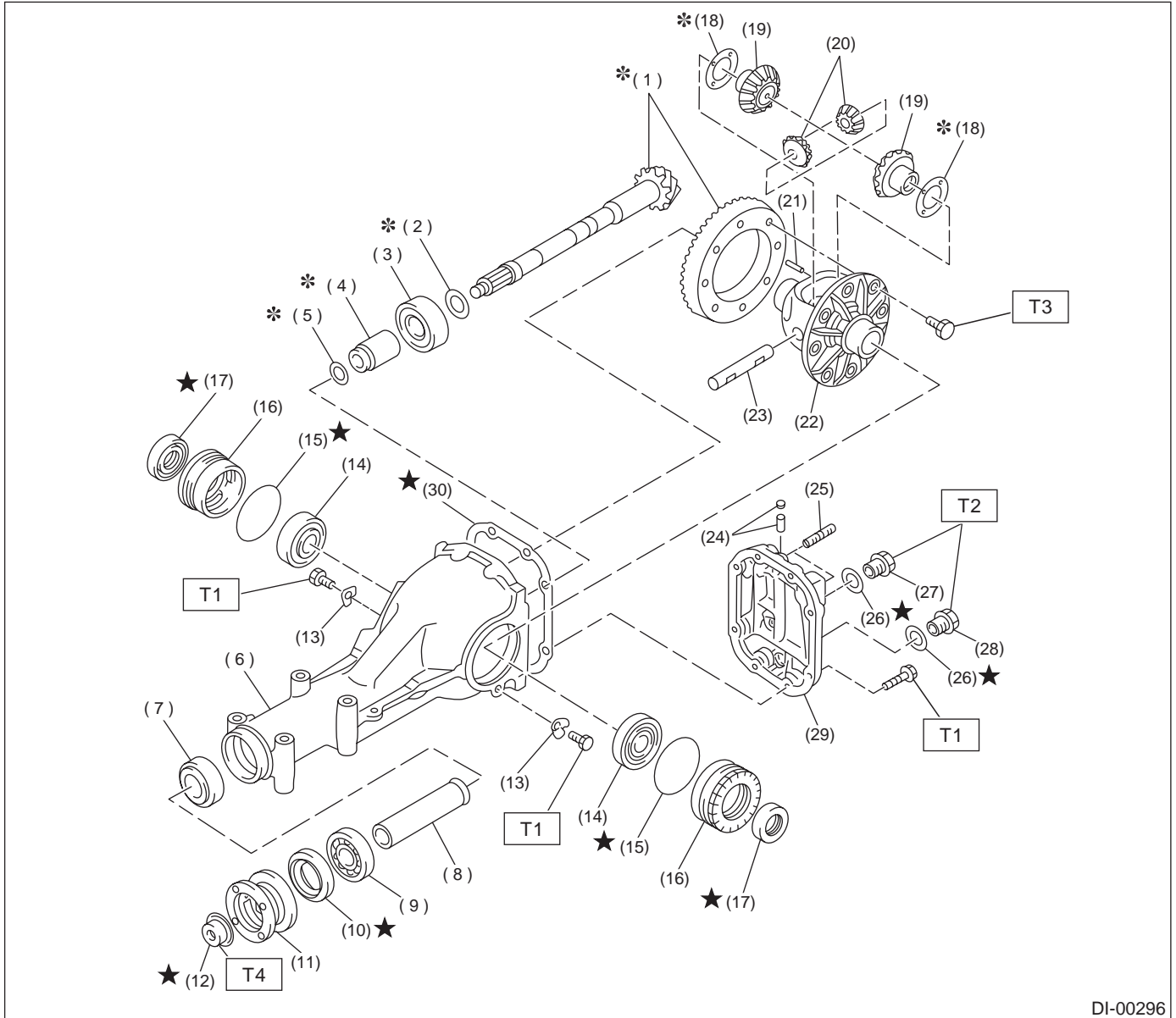
T4: 103.0 (10.50, 75.9)

T5: 181.4 (18.50, 133.8)

GENERAL DESCRIPTION

DIFFERENTIALS

3. REAR DIFFERENTIAL FOR VA-TYPE



DI-00296

- | | | |
|--------------------------------------|------------------------------|----------------------|
| (1) Pinion crown gear set | (14) Side bearing | (27) Oil filler plug |
| (2) Pinion height adjusting shim | (15) O-ring | (28) Oil drain plug |
| (3) Rear bearing | (16) Axle shaft holder | (29) Rear cover |
| (4) Bearing preload adjusting spacer | (17) Side oil seal | (30) Gasket |
| (5) Bearing preload adjusting washer | (18) Side gear thrust washer | |
| (6) Differential carrier | (19) Side gear | |
| (7) Front bearing | (20) Pinion mate gear | |
| (8) Collar | (21) Pinion shaft lock pin | |
| (9) Pilot bearing | (22) Differential case | |
| (10) Front oil seal | (23) Pinion mate shaft | |
| (11) Companion flange | (24) Air breather cap | |
| (12) Self-locking nut | (25) Stud bolt | |
| (13) Lock plate | (26) Gasket | |

Tightening torque: N·m (kgf·m, ft·lb)

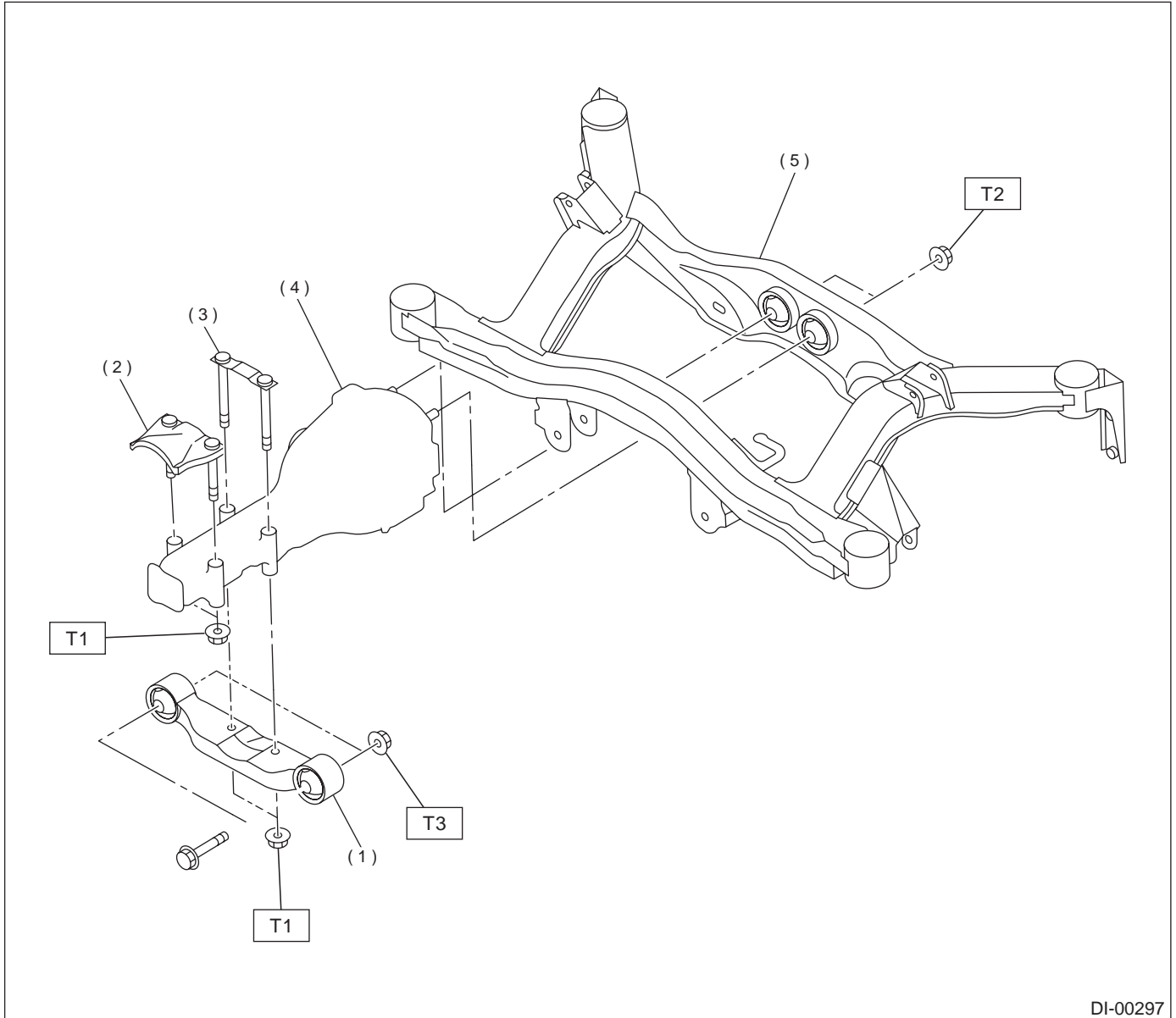
T1: 25 (2.5, 18.1)

T2: 34 (3.5, 25.3)

T3: 62 (6.3, 45.6)

T4: 188 (19.2, 139)

4. REAR DIFFERENTIAL MOUNTING SYSTEM



- | | |
|------------------------------------|---------------|
| (1) Rear differential front member | (5) Sub frame |
| (2) Protector | |
| (3) Rear differential member plate | |
| (4) Rear differential ASSY | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 65 (6.6, 48)

T2: 70 (7.1, 51)

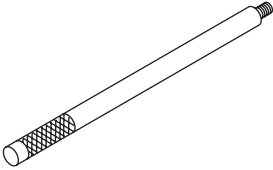
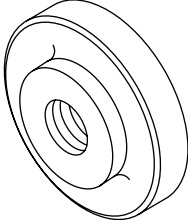
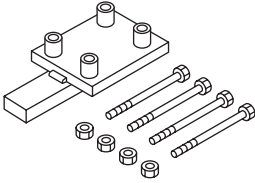
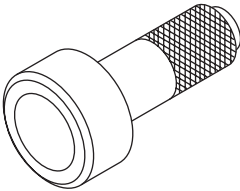
T3: 110 (11.2, 81)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating face of the case.

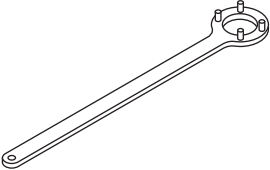
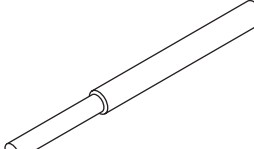
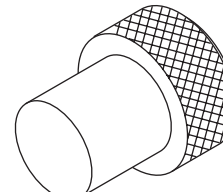
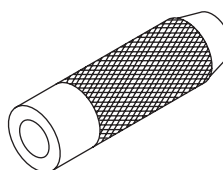
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-398477701</p>	398477701	HANDLE	Used for installing front and rear bearing cone.
 <p>ST-398477702</p>	398477702	DRIFT	Used press-fitting the bearing cone of differential carrier (front).
 <p>ST-398217700</p>	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 <p>ST-498447120</p>	498447120	INSTALLER	Used for installing front oil seal.

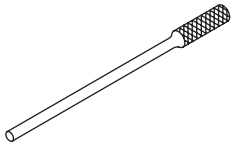
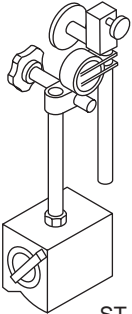
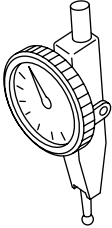
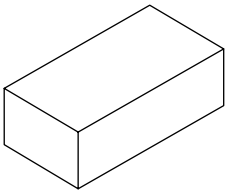
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498427200</p>	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when loosening and tightening self-lock nut.
 <p style="text-align: center;">ST-398467700</p>	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 <p style="text-align: center;">ST-399780104</p>	399780104	WEIGHT	Used for installing front bearing cone, pilot bearing companion flange.
 <p style="text-align: center;">ST-899580100</p>	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.

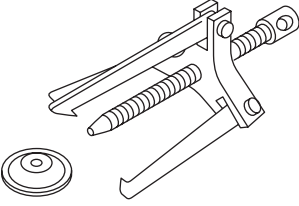
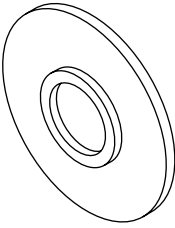
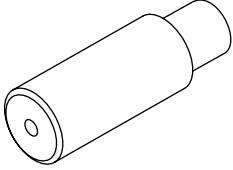
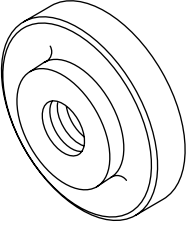
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-899904100</p>	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 <p style="text-align: center;">ST-498247001</p>	498247001	MAGNET BASE	<ul style="list-style-type: none"> • Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 <p style="text-align: center;">ST-498247100</p>	498247100	DIAL GAUGE	<ul style="list-style-type: none"> • Used measuring backlash between side gear and pinion, hypoid gear. • Used with MAGNET BASE (498247001).
 <p style="text-align: center;">ST-398507704</p>	398507704	BLOCK	Used for adjusting pinion height and preload.

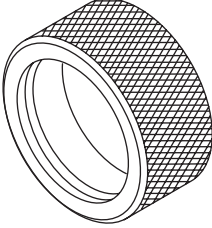
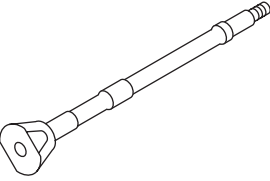
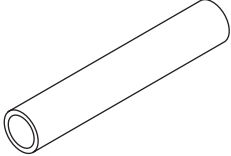
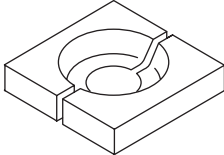
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-399703600</p>	399703600	PULLER ASSY	Use for removing companion flange.
 <p style="text-align: center;">ST-398177700</p>	398177700	INSTALLER	<ul style="list-style-type: none"> • Used for installing rear bearing cone. • For T-type.
 <p style="text-align: center;">ST-398457700</p>	398457700	ATTACHMENT	<ul style="list-style-type: none"> • Used for removing side bearing retainer. • For T-type.
 <p style="text-align: center;">ST-398477703</p>	398477703	DRIFT 2	<ul style="list-style-type: none"> • Used for press-fitting the bearing race (rear) of differential carrier. • For T-type.

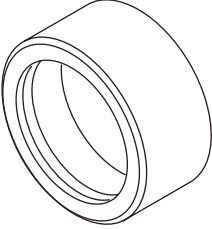
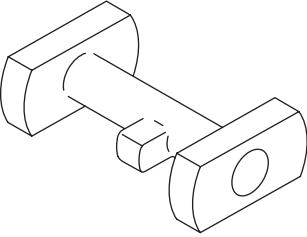
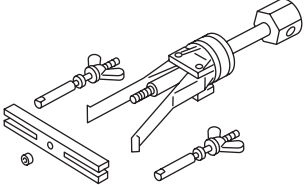
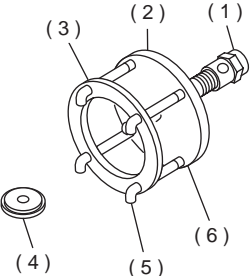
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398437700</p>	<p style="text-align: center;">398437700</p>	<p>DRIFT</p>	<ul style="list-style-type: none"> • Used for installing side oil seal. • For T-type.
 <p style="text-align: center;">ST-398507702</p>	<p style="text-align: center;">398507702</p>	<p>DUMMY SHAFT</p>	<ul style="list-style-type: none"> • Used for adjusting pinion height and preload. • For T-type.
 <p style="text-align: center;">ST-398507703</p>	<p style="text-align: center;">398507703</p>	<p>DUMMY COLLAR</p>	<ul style="list-style-type: none"> • Used for adjusting pinion height and preload. • For T-type.
 <p style="text-align: center;">ST-398517700</p>	<p style="text-align: center;">398517700</p>	<p>REPLACER</p>	<ul style="list-style-type: none"> • Used for removing rear bearing cone. • For T-type.

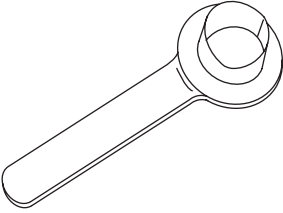
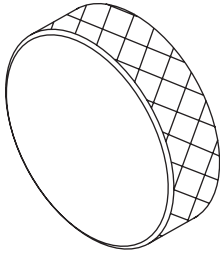
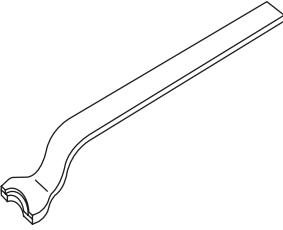
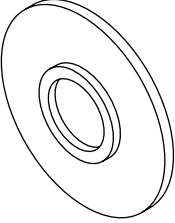
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398487700</p>	398487700	DRIFT	<ul style="list-style-type: none"> • Used for press-fitting the side bearing cone. • For T-type.
 <p style="text-align: center;">ST-398507701</p>	398507701	GAUGE	<ul style="list-style-type: none"> • Used for adjusting pinion height. • For T-type.
 <p style="text-align: center;">ST-398527700</p>	398527700	PULLEY ASSY	<ul style="list-style-type: none"> • Used for removing oil seal and side bearing cup. • For T-type.
 <p style="text-align: center;">ST-399527700</p>	399527700	PULLER SET	<ul style="list-style-type: none"> • Used for extracting side bearing cone. (1) BOLT (2) PULLER (3) HOLDER (4) ADAPTER (5) BOLT (6) NUT • For T-type.

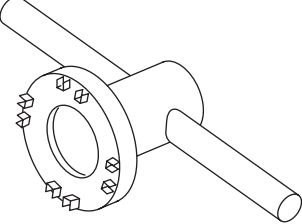
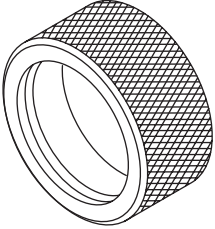
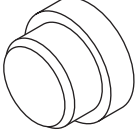
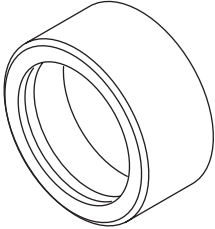
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST28099PA090</p>	<p style="text-align: center;">28099PA090</p>	<p>OIL SEAL PROTECTOR</p>	<ul style="list-style-type: none"> • Used for installing rear drive shaft into rear differential. • For protecting oil seal. • For T-type.
 <p style="text-align: center;">ST-398237700</p>	<p style="text-align: center;">398237700</p>	<p>GAUGE</p>	<ul style="list-style-type: none"> • Used for installing side bearing. • For T-type.
 <p style="text-align: center;">ST28099PA100</p>	<p style="text-align: center;">28099PA100</p>	<p>DRIVE SHAFT REMOVER</p>	<ul style="list-style-type: none"> • Used for removing rear drive shaft from rear differential. • For T-type.
 <p style="text-align: center;">ST-498175500</p>	<p style="text-align: center;">498175500</p>	<p>INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing rear bearing cone. • For VA-type.

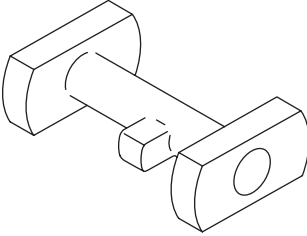
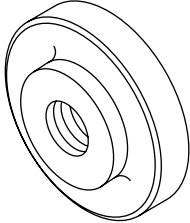
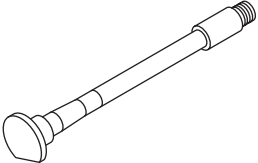
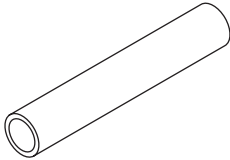
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499785500</p>	<p style="text-align: center;">499785500</p>	<p>WRENCH ASSY</p>	<ul style="list-style-type: none"> • Used for removing and installing side oil seal holder. • For VA-type.
 <p style="text-align: center;">ST-498447100</p>	<p style="text-align: center;">498447100</p>	<p>INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing oil seal. • For VA-type.
 <p style="text-align: center;">ST-399520105</p>	<p style="text-align: center;">399520105</p>	<p>SEAT</p>	<ul style="list-style-type: none"> • Used for removing side bearing cone. • Used with PULLER SET (899524100). • For VA-type.
 <p style="text-align: center;">ST-498485400</p>	<p style="text-align: center;">498485400</p>	<p>DRIFT</p>	<ul style="list-style-type: none"> • Used for installing side bearing cone. • For VA-type.

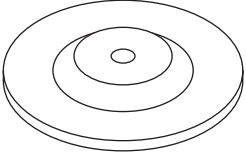
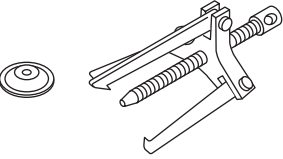
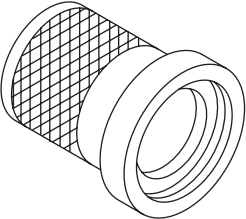
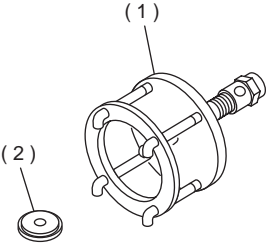
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498505501</p>	<p style="text-align: center;">498505501</p>	<p>GAUGE</p>	<ul style="list-style-type: none"> • Used for adjusting pinion height. • For VA-type.
 <p style="text-align: center;">ST-498447110</p>	<p style="text-align: center;">498447110</p>	<p>BEARING OUTER RACE DRIFT</p>	<ul style="list-style-type: none"> • Used for press-fitting the bearing race (front) of differential carrier. • For VA-type.
 <p style="text-align: center;">ST-498447150</p>	<p style="text-align: center;">498447150</p>	<p>DUMMY SHAFT</p>	<ul style="list-style-type: none"> • Used for adjusting pinion height and pre-load. • For VA-type.
 <p style="text-align: center;">ST32285AA000</p>	<p style="text-align: center;">32285AA000</p>	<p>DUMMY COLLAR</p>	<ul style="list-style-type: none"> • Used for adjusting pinion height and pre-load. • For VA-type.

GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499705404</p>	499705404	SEAT	<ul style="list-style-type: none"> • Used for removing side bearing race. • Used with PULLER ASSY (499705401). • For VA-type.
 <p style="text-align: center;">ST-499705401</p>	499705401	PULLER ASSY	<ul style="list-style-type: none"> • Used for removing side bearing race. • Used with SEAT (499705404). • For VA-type.
 <p style="text-align: center;">ST-899874100</p>	899874100	INSTALLER	<ul style="list-style-type: none"> • Used for installing companion flange. • For VA-type.
 <p style="text-align: center;">ST-899524100</p>	899524100	DIFFERENTIAL BEARING PULLER SET	<ul style="list-style-type: none"> • Used for removing side bearing cone of differential. • For VA-type. (1) Puller (2) Cap

GENERAL DESCRIPTION

DIFFERENTIALS

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Transmission Jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer. (T-type)
Thickness Gauge	Used for measuring clearance.
Tire Lever	Used for removal of rear drive shaft. (VA-type)

DIFFERENTIAL GEAR OIL

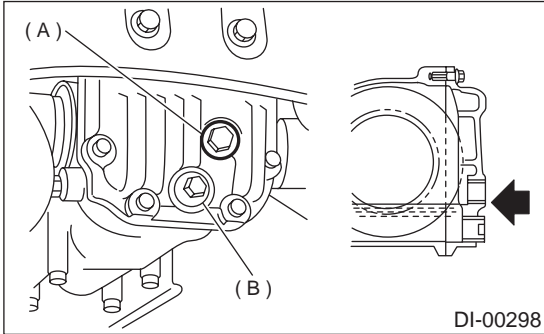
DIFFERENTIALS

2. Differential Gear Oil

A: INSPECTION

1) Take out filler plug, and replace gear oil if it is contaminated or deteriorated. <Ref. to DI-22, REPLACEMENT, Differential Gear Oil.>

2) Check gear oil level is up to the bottom part of filler bolt. If the level is low, refill up to the bottom of filler bolt.



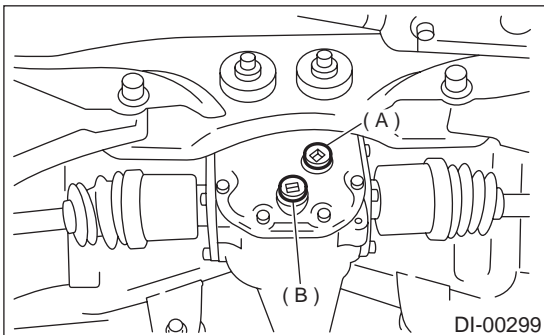
- (A) Filler plug
- (B) Drain plug

B: REPLACEMENT

- 1) Disconnect ground cable from battery.
- 2) Jack-up vehicle and support it with sturdy racks.
- 3) Remove the oil drain plug and filler plug, and drain the gear oil.

NOTE:

Be careful not to burn your hands, because gear oil becomes extremely hot after running.



- (A) Filler plug
- (B) Drain plug

4) Tighten oil drain plug.

NOTE:

- Apply fluid packing to drain plug in T-type.
- VA-type uses a new aluminum gasket.

Fluid packing:

**THREE BOND 1105 (Part No.: 004403010)
or equivalent**

Tightening torque:

T-type;

49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

VA-type;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

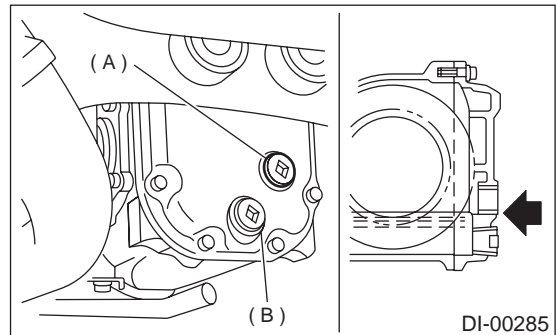
5) Fill differential carrier with gear oil to the upper plug level.

CAUTION:

Carefully refill oil while watching the level. Excess or insufficient oil must be avoided.

Oil capacity:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)



- (A) Filler plug
- (B) Drain plug

6) Install filler plug.

NOTE:

- Apply fluid packing to filler plug in T-type.
- VA-type uses a new aluminum gasket.

Fluid packing:

**THREE BOND 1105 (Part No.: 004403010)
or equivalent**

Tightening torque:

T-type;

49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

VA-type;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

3. Front Differential

A: NOTE

1. AT MODEL

For front differential of automatic transmission, refer to "AT" section. <Ref. to AT-124, Front Differential.>

2. MT MODEL

For front differential of manual transmission, refer to "MT" section. <Ref. to MT-95, Front Differential Assembly.>

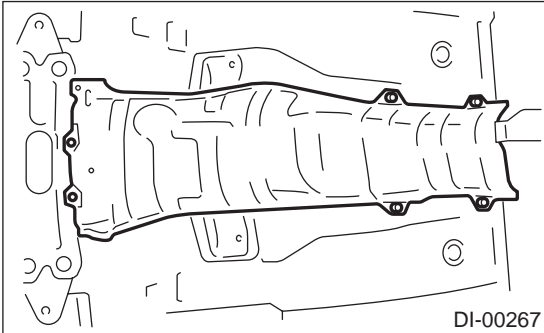
REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

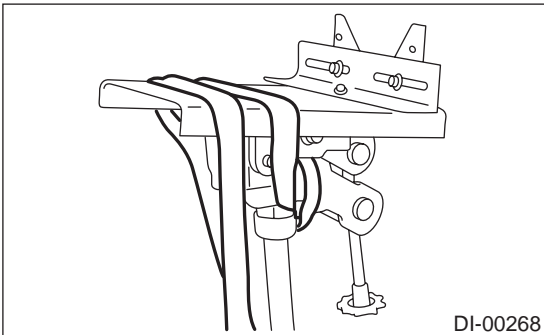
4. Rear Differential for T-type

A: REMOVAL

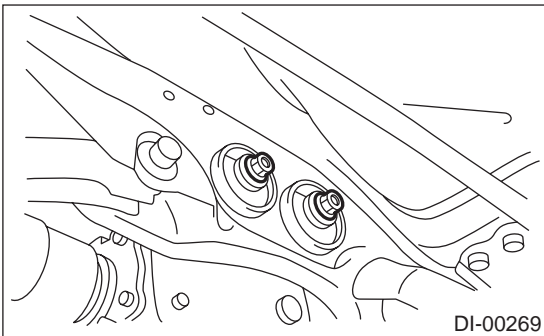
- 1) Disconnect ground cable from battery.
- 2) Move select lever or gear shift lever to "N".
- 3) Loosen wheel nuts.
- 4) Release the parking brake.
- 5) Jack-up vehicle and support it with sturdy racks.
- 6) Remove wheels.
- 7) Remove rear exhaust pipe and muffler.
- 8) Remove heat shield cover. (If equipped.)



- 9) Remove propeller shaft.
<Ref. to DS-14, REMOVAL, Propeller Shaft.>
- 10) Prepare a transmission jack and a band.

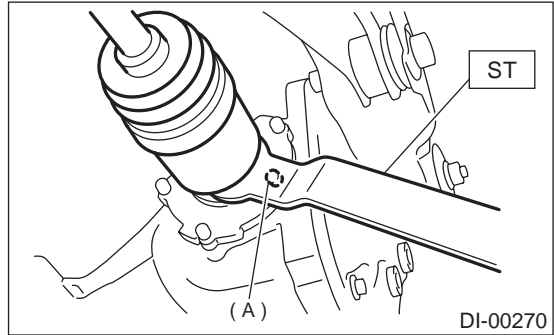


- 11) Loosen self-locking nuts connecting rear differential to rear crossmember.



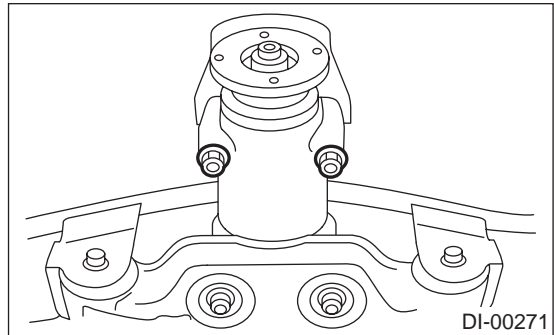
- 12) Remove DOJ of rear drive shaft from rear differential using ST.

ST 28099PA100 DRIVE SHAFT REMOVER

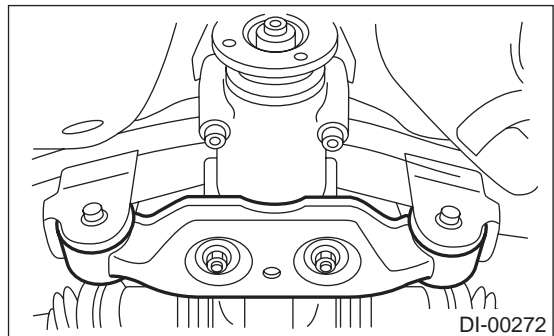


(A) Bolt

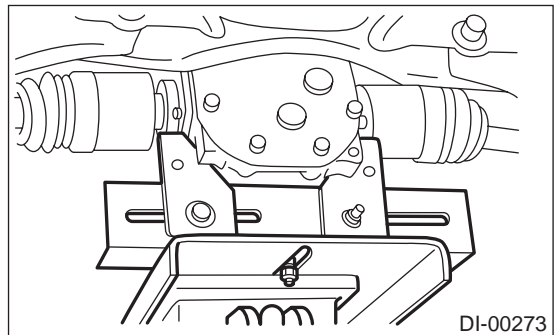
- 13) Remove protector nuts.



- 14) Remove rear differential front member.



- 15) Support rear differential with transmission jack.



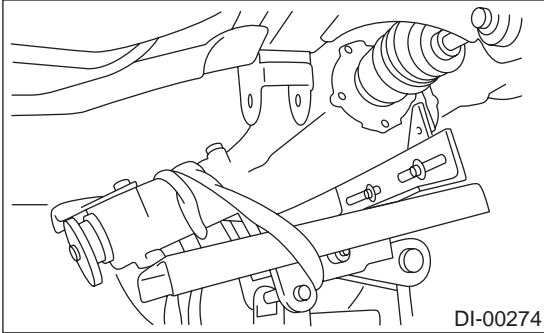
- 16) Be sure to secure differential to transmission jack by hand.

17) Remove self-locking nuts connecting rear differential to crossmember.

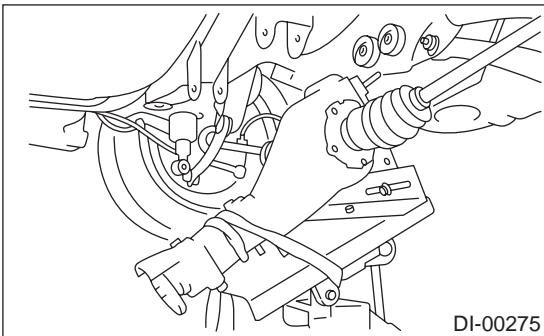
18) Remove rear differential stud bolt from rear crossmember bushing.

NOTE:

Carefully adjust angle and position of transmission jack and jack stand as required during stud bolt removal.



19) After removing rear differential stud bolt from rear crossmember, lower transmission jack stand. Do not allow rear drive shaft to strike lateral link bolt.

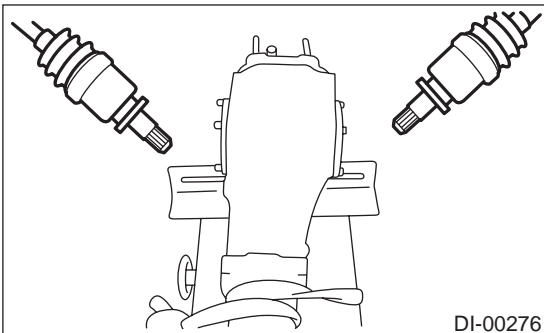


20) Pull out axle shaft from rear differential.

NOTE:

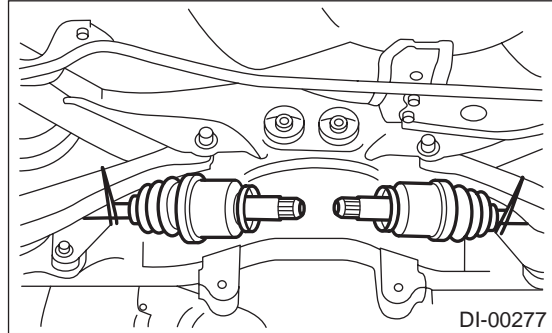
If axle shaft is difficult to remove from rear differential, use ST to remove it.

ST 28099PA100 DRIVE SHAFT REMOVER

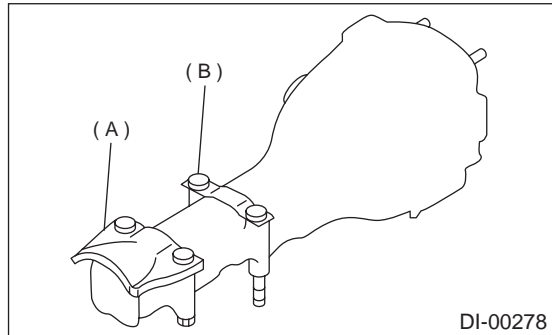


21) Take down transmission jack.

22) Secure rear drive shaft to lateral link use wire.



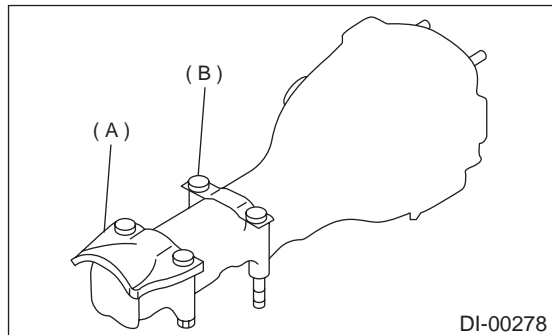
23) Remove protector and rear differential member plate from rear differential.



- (A) Protector
- (B) Rear differential member plate

B: INSTALLATION

1) Install protector and rear differential member plate to rear differential.



- (A) Protector
- (B) Rear differential member plate

2) Set rear differential to transmission jack.

NOTE:

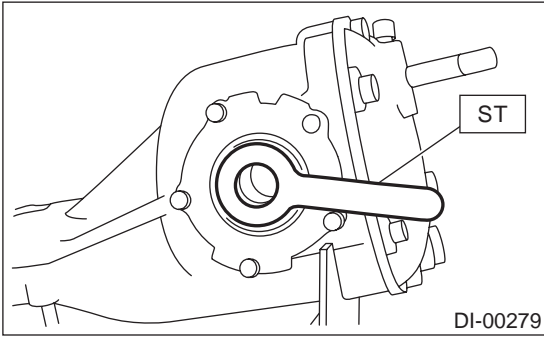
Secure rear differential to transmission jack using a band.

REAR DIFFERENTIAL FOR T-TYPE

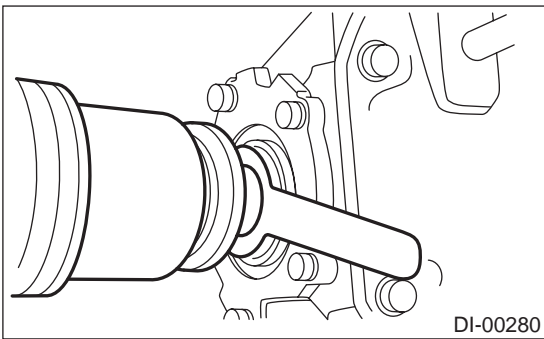
DIFFERENTIALS

3) Install ST to rear differential.

ST 28099PA090 OIL SEAL PROTECTOR



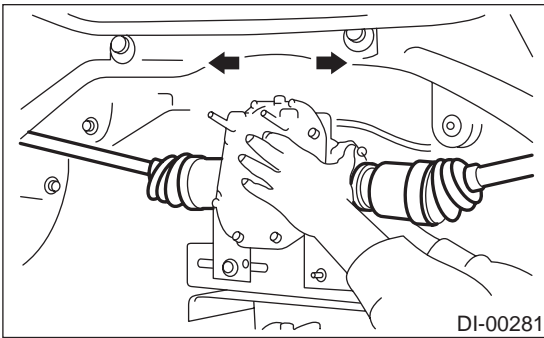
4) Insert the spline shaft until the spline portion is inside the side oil seal.



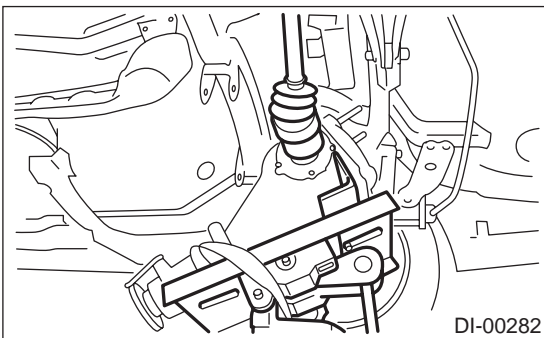
5) Remove ST from rear differential.

ST 28099PA090 OIL SEAL PROTECTOR

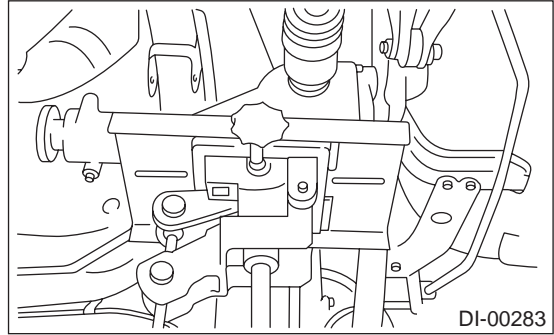
6) Completely insert axle shaft into rear differential by pressing rear differential.



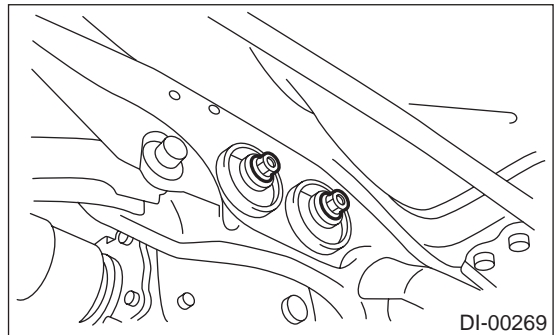
7) Adjust transmission jack as required so rear differential stud bolt is properly inserted into rear crossmember bushing.



8) After rear differential stud bolt has been inserted into rear crossmember bushing, raise transmission jack to make jack rear differential level.



9) Temporarily tighten rear crossmember self-locking nuts.



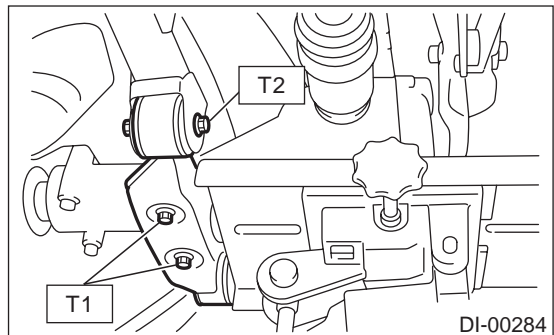
10) Remove band from rear differential. Raise rear differential just enough to move transmission jack away from it.

11) Install rear differential front member.

Tightening torque:

T1: 65 N·m (6.6 kgf-m, 48 ft-lb)

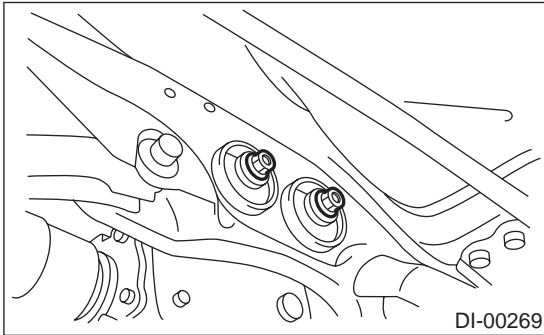
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



12) Tighten self-locking nuts.

Tightening torque:

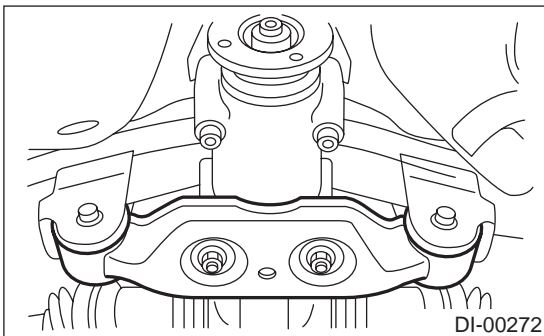
70 N·m (7.1 kgf·m, 51 ft·lb)



13) Tighten protector nut.

Tightening torque:

65 N·m (6.6 kgf·m, 48.0 ft·lb)



14) Take down transmission jack.

15) Install propeller shaft.

<Ref. to DS-15, INSTALLATION, Propeller Shaft.>

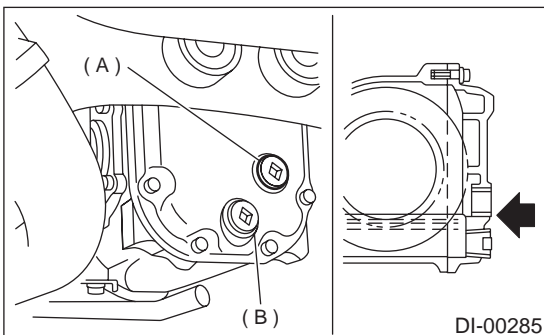
16) Install heat shield cover.

17) Install rear exhaust pipe and muffler.

18) After installing rear differential carrier on vehicle, remove filler plug and replenish gear oil up to upper level mark.

Oil capacity:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)



- (A) Filler plug
- (B) Drain plug

19) Tighten filler plug.

NOTE:

Apply fluid packing to plug.

Fluid packing:

THREE BOND 1105 (Part No.: 04403010) or equivalent

Tightening torque:

49.0 N·m (5.0 kgf·m, 36.2 ft·lb)

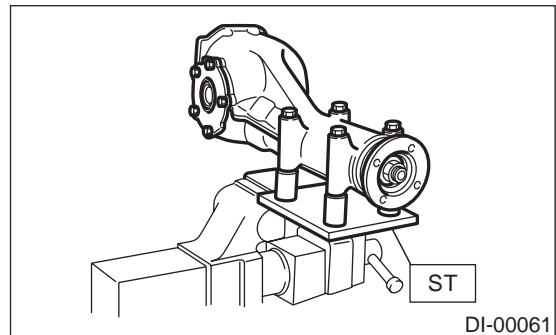
C: DISASSEMBLY

To detect real cause of trouble, inspect the following items before disassembling.

- Tooth contact of crown gear and pinion, and backlash
- Runout of crown gear at its back surface
- Turning resistance of drive pinion

1) Set ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT

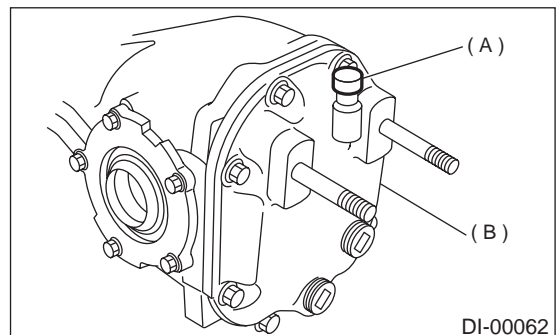


2) Drain gear oil by removing plug.

3) Remove the air breather cap.

NOTE:

Do not attempt to replace the air breather cap unless necessary.

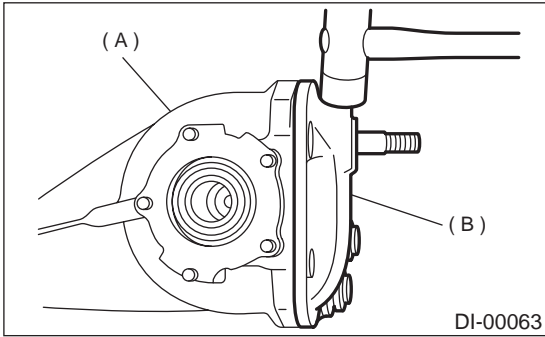


- (A) Air breather cap
- (B) Rear cover

REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

4) Remove rear cover by loosening retaining bolts.



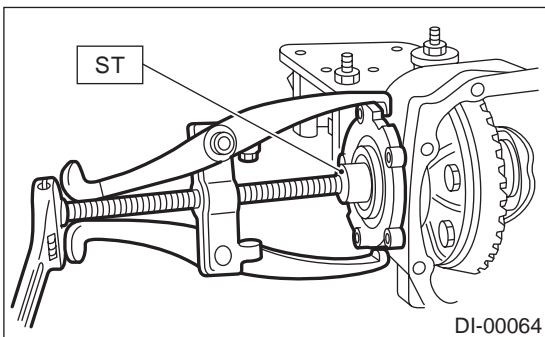
- (A) Rear cover
- (B) Differential carrier

5) Make right and left side bearing retainers in order to identify them at reassembly. Remove side bearing retainer attaching bolts, set ST to differential case, and extract right and left side bearing retainers with a puller.

NOTE:

Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

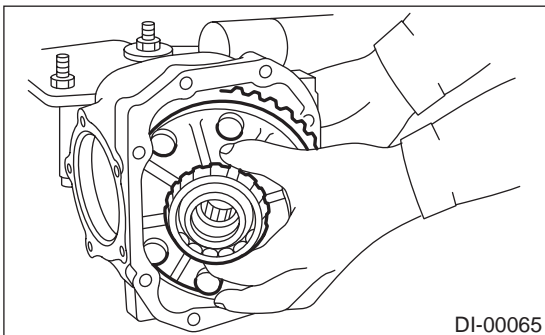
ST 398457700 ATTACHMENT



6) Pull out differential case assembly from differential carrier.

CAUTION:

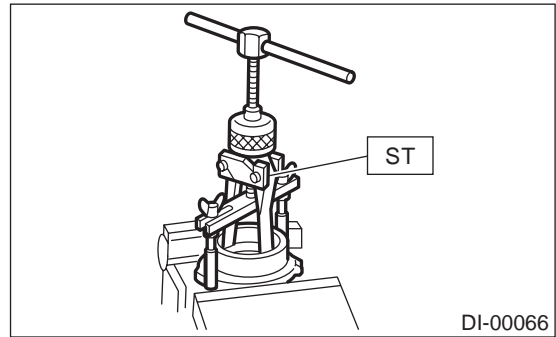
Be careful not to hit the teeth against the case.



- 7) Remove O-ring from side bearing retainer.
- 8) Remove oil seal from side bearing retainer.

9) When replacing side bearing, pull bearing cup from side bearing retainer using ST.

ST 398527700 PULLER ASSY

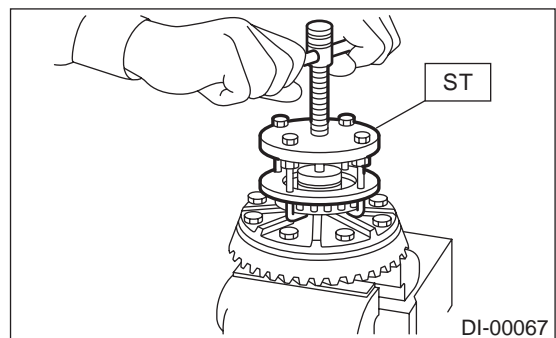


10) Extract bearing cone with ST.

NOTE:

- Do not attempt to disassemble the parts unless necessary.
- Set puller so that its claws catch the edge of the bearing cone.
- Never mix up the right and left hand bearing races and cones.

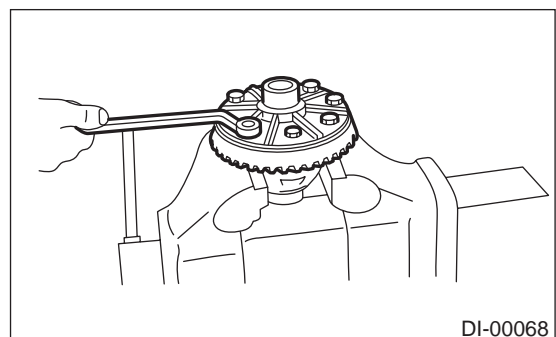
ST 399527700 PULLER SET



11) Remove crown gear by loosening crown gear bolts.

NOTE:

For rear differential case with LSD, differential case should not be disassembled.

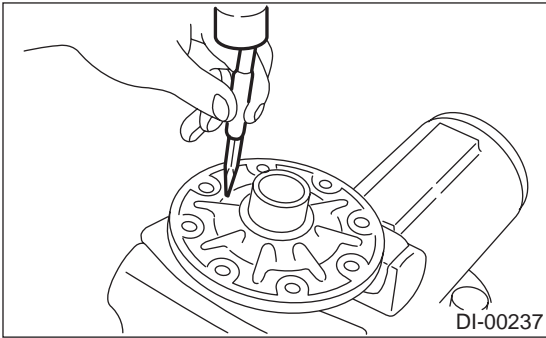


12) Drive out pinion shaft lock pin from crown gear side. (Without LSD)

NOTE:

The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.

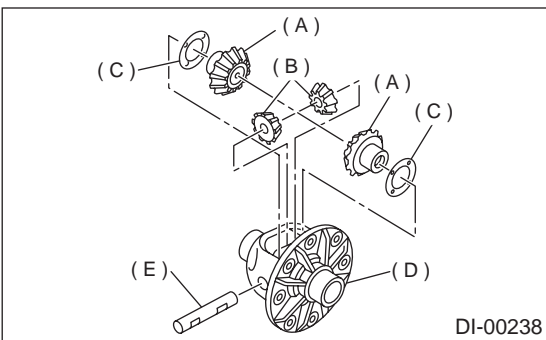
ST 899904100 STRAIGHT PIN REMOVER



13) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Without LSD)

NOTE:

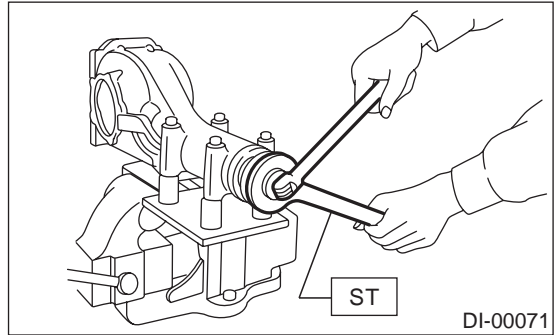
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



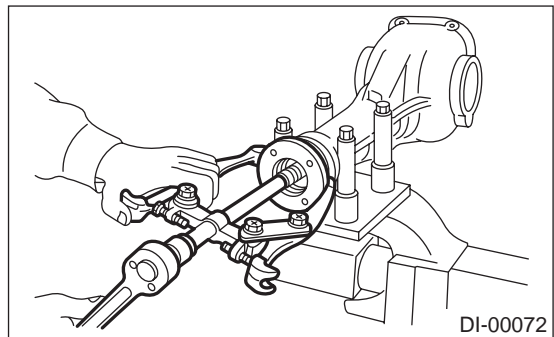
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

14) Hold companion flange with ST and remove drive pinion nut.

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.

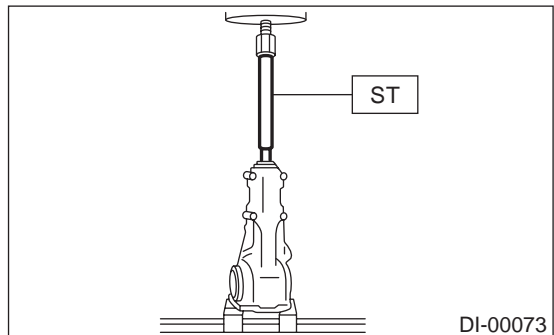


16) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT



REAR DIFFERENTIAL FOR T-TYPE

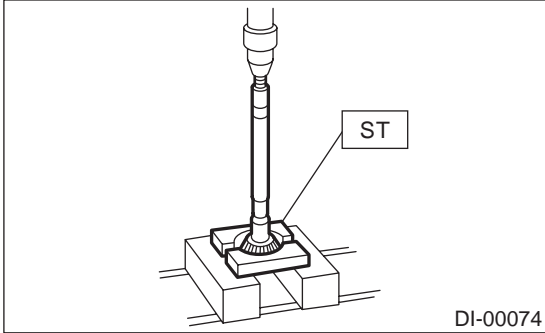
DIFFERENTIALS

17) Remove rear bearing cone from drive pinion by supporting cone with ST.

NOTE:

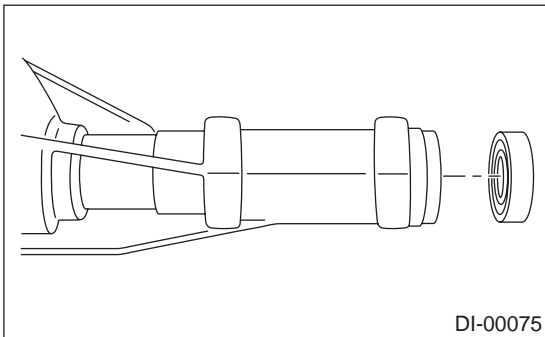
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



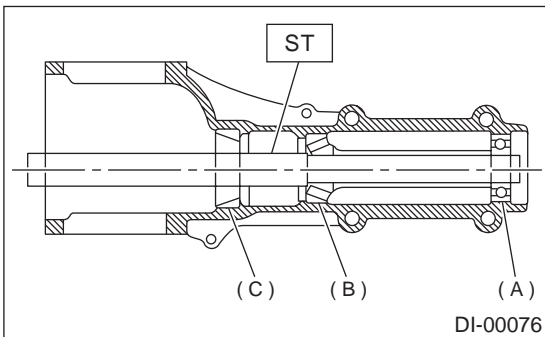
18) Remove front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



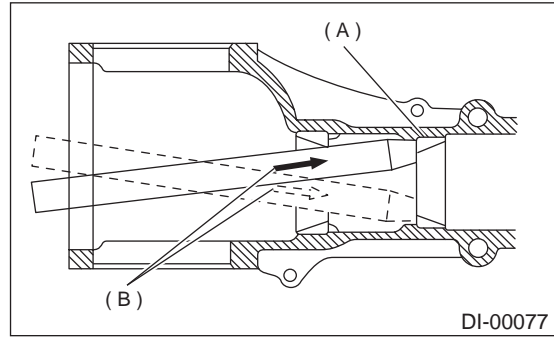
19) Remove pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT



- (A) Pinion bearing
- (B) Front bearing
- (C) Rear bearing cup

20) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.

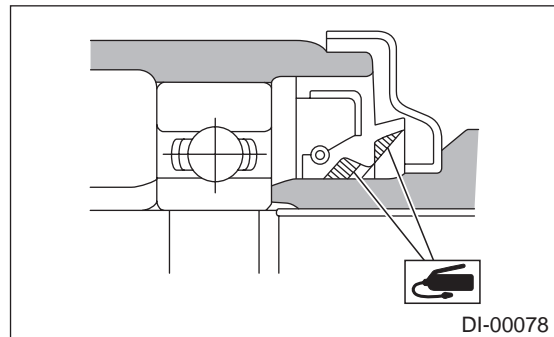


- (A) 2 cutouts along diagonal lines
- (B) Tap alternately with brass bar.

D: ASSEMBLY

NOTE:

- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not misinstalled.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the right and left hand races of the bearings.
- Replace the oil seal with new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.

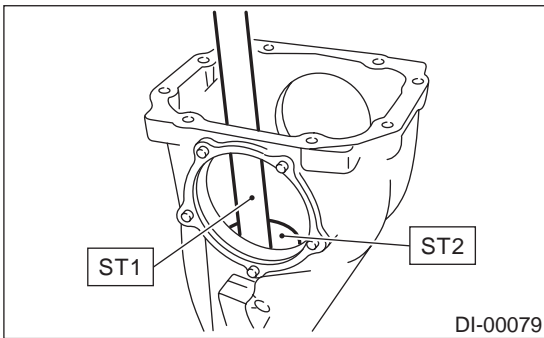


- Use new O-rings and gaskets.

1) Adjusting preload for front and rear bearings
Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press rear bearing race (rear) into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



(2) Install rear bearing race (front) to differential using ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477702 DRIFT

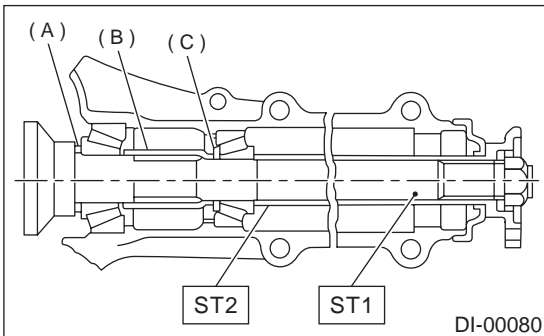
(3) Insert ST1 into carrier with pinion height adjusting washer and new rear bearing cone fitted onto it.

NOTE:

Before assembly inspection, when tooth contact is normal, confirm that washer is not deformed and re-use the used washer.

(4) Then install preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



- (A) Pinion height adjusting shim
- (B) Preload adjusting spacer
- (C) Preload adjusting washer

(5) Turn ST1 with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

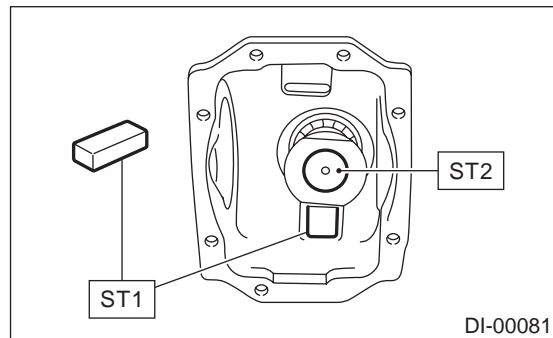
NOTE:

- Use a new lock nut.
- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.

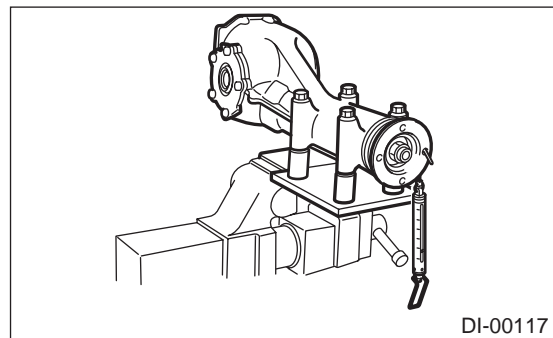
ST1 398507704 BLOCK
ST2 398507702 DUMMY SHAFT

Tightening torque:

181 N·m (18.5 kgf·m, 134 ft·lb)



Front and rear bearing preload
For new bearing: 19.6 — 28.4 N (2.0 — 2.9 kgf, 4.4 — 6.4 lb) at companion flange bolt hole
For used bearing: 8.34 — 16.67 N (0.85 — 1.7 kgf, 1.87 — 3.75 lb) at companion flange bolt hole



REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

Preload adjusting washer	Part No.	Thickness mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
383845200	2.31 (0.0909)	
Preload adjusting spacer	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
383695206	57.2 (2.252)	

2) Adjusting drive pinion height

Adjust drive pinion height with shim installed between rear bearing cone and the back of pinion gear.

(1) Make sure that pinion bearing preload adjustment on previous item is complete for ST1, ST2 and ST3.

Front and rear bearing preload
For new bearing: 19.6 — 28.4 N (2.0 — 2.9 kgf, 4.4 — 6.4 lb) at companion flange bolt hole
For used bearing: 8.34 — 16.67 N (0.85 — 1.7 kgf, 1.87 — 3.75 lb) at companion flange bolt hole

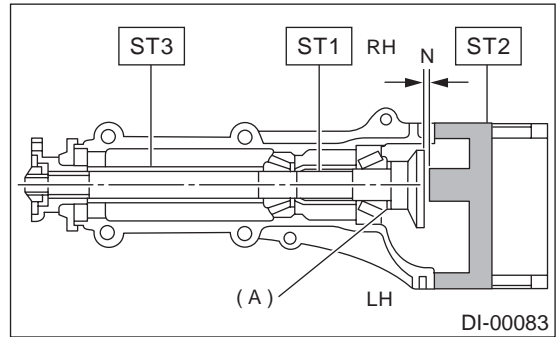
Adjusting preload for front and rear bearings

NOTE:

At this time, install a pinion height adjusting shim which is temporarily selected or the same as that used before. Measure and record the thickness.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE

ST3 398507703 DUMMY COLLAR



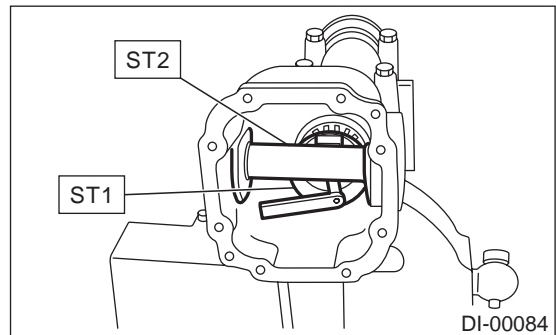
(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:

Make sure there is no clearance between the case and ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



REAR DIFFERENTIAL FOR T-TYPE

(3) Obtain the thickness of pinion height adjusting shim to be inserted from the following formula, and replace the temporarily installed shim with this one.

$$T = T_o + N - (H \times 0.01) - 0.20 \text{ mm (0.0079 in)}$$

NOTE:

Use copies of this page.

T	Thickness of pinion height adjusting shim mm (in)	
T _o	Thickness of shim temporarily inserted mm (in)	
N	Reading of thickness gauge mm (in)	
H	Figure marked on drive pinion head	
Memo:		

(Example of calculation)

$$T_o = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$N = 0.23 \text{ mm}$$

$$H = + 1,$$

$$T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42$$

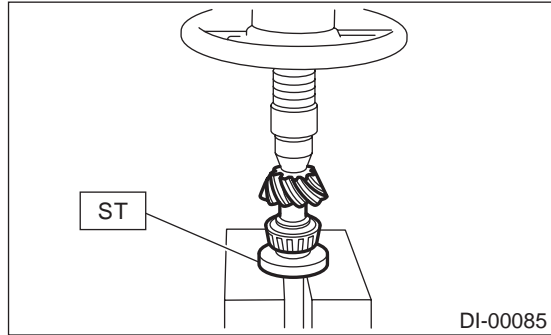
Result: Thickness = 3.42 mm

Therefore use the shim 383605200.

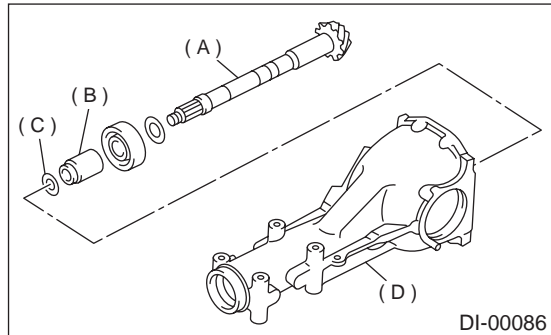
Pinion height adjusting shim	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

3) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 398177700 INSTALLER



4) Insert drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



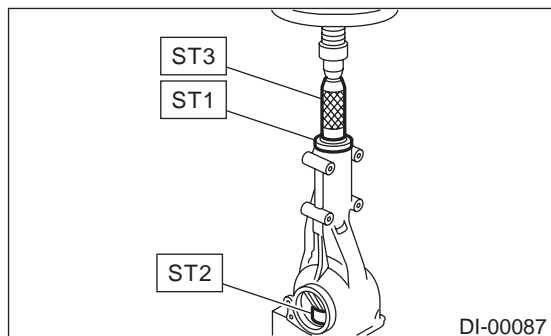
- (A) Drive pinion
- (B) Bearing adjusting spacer
- (C) Washer
- (D) Differential carrier

5) Press-fit front bearing cone into case with ST1, ST2 and ST3.

ST1 398507703 DUMMY COLLAR

ST2 399780104 WEIGHT

ST3 899580100 INSTALLER

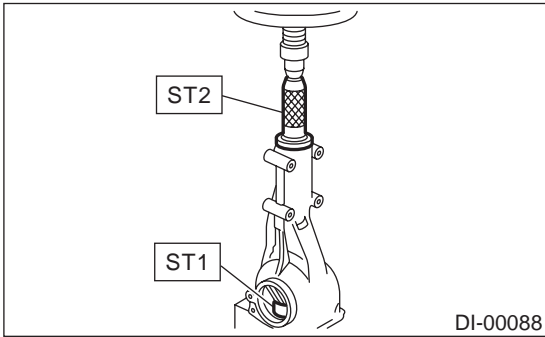


REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

6) Insert spacer, then press-fit pilot bearing with ST1 and ST2.

ST1 399780104 WEIGHT
ST2 899580100 INSTALLER

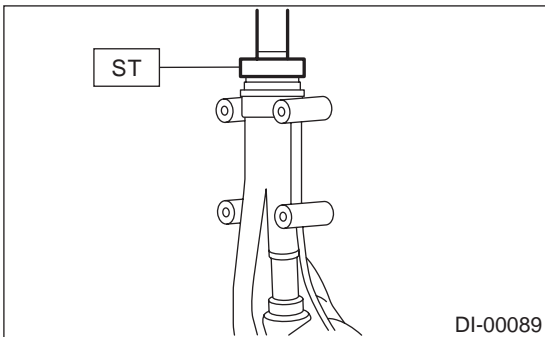


7) Fit a new oil seal with ST.

NOTE:

- Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
- Apply grease between the oil seal lips.

ST 498447120 OIL SEAL INSTALLER

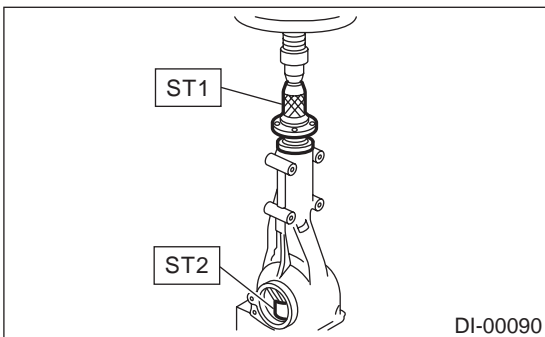


8) Press-fit companion flange with ST1 and ST2.

NOTE:

Be careful not to damage bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT

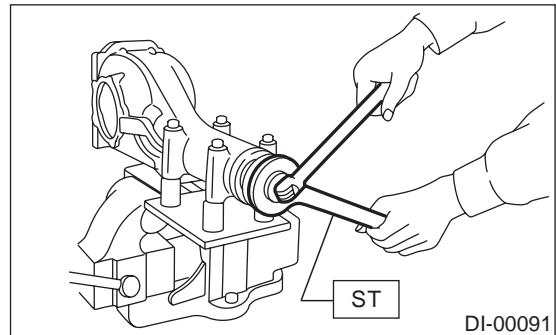


9) Install new self-locking nut, fix companion flange with ST and then tighten.

ST 498427200 FLANGE WRENCH

Tightening torque:

181 N·m (18.5 kgf·m, 134 ft·lb)

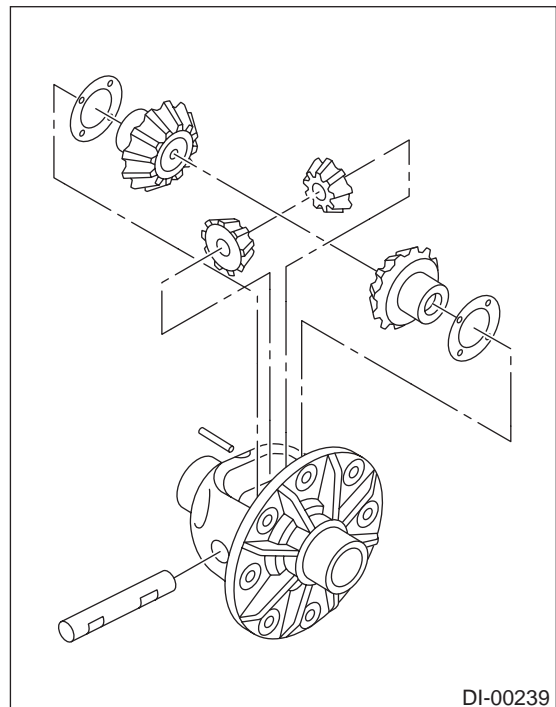


10) Assembling differential case (Without LSD)

Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

NOTE:

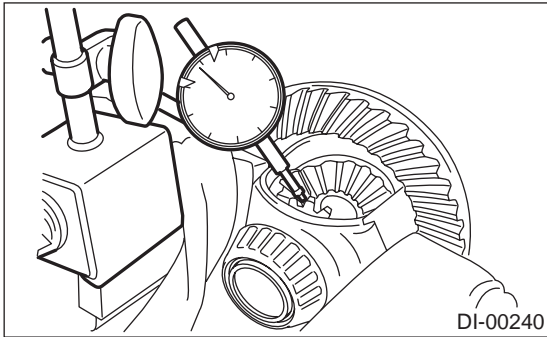
- Apply gear oil on both sides of the washer and on the side gear shaft before installing.
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

Side gear back clearance:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



(2) Adjust the backlash as specified by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
383445201	0.75 — 0.80 (0.0295 — 0.0315)
383445202	0.80 — 0.85 (0.0315 — 0.0335)
383445203	0.85 — 0.90 (0.0335 — 0.0354)
383445204	0.90 — 0.95 (0.0354 — 0.0374)
383445205	0.95 — 1.00 (0.0374 — 0.0394)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

(4) After inserting pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

11) Install crown gear on differential case.

NOTE:

- Before installing bolts, apply Lock Tite to bolt threads.

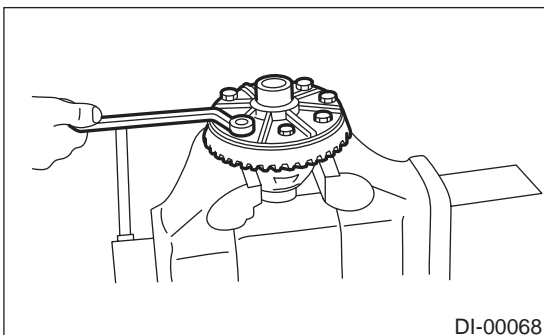
Lock Tite:

THREE BOND 1324 (Part No.: 004403042) or equivalent

- Tighten diagonally while tapping the bolt heads.

Tightening torque:

103 N·m (10.5 kgf·m, 76 ft·lb)

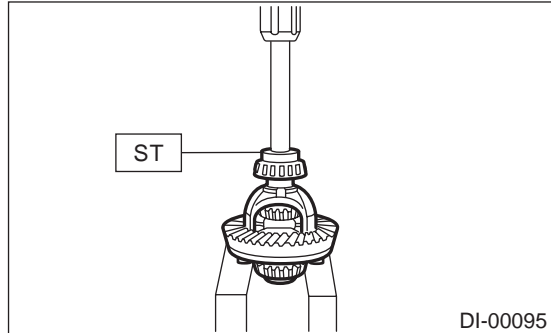


12) Press side bearing cone onto differential case with ST.

ST 398487700 DRIFT

NOTE:

When replacing bearing cone, replace it with bearing cap as a set.



13) Install bearing cup to side bearing retainer.

NOTE:

- Press in while be careful not to scratch bearing cup and side bearing retainer.
- When replacing bearing cup, replace it with bearing cone as a set.

14) Using ST, press in new oil seal to side bearing retainer.

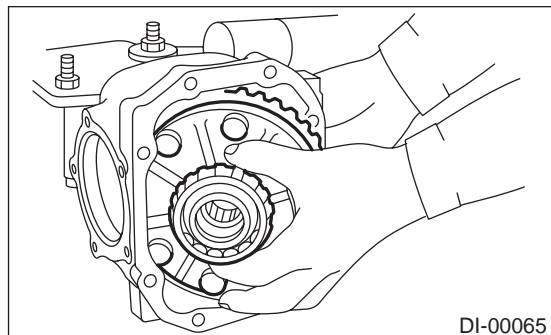
ST 398437700 DRIFT

NOTE:

Apply thin oil gear oil on the mating surface of side bearing retainer and oil seal.

15) Adjusting side bearing retainer shims

- (1) The driven gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.
- (2) Install the differential case assembly into differential carrier in the reverse order of disassembly.



REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

(3) Install side retainer shims to the left and right retainers from which they were removed.

NOTE:

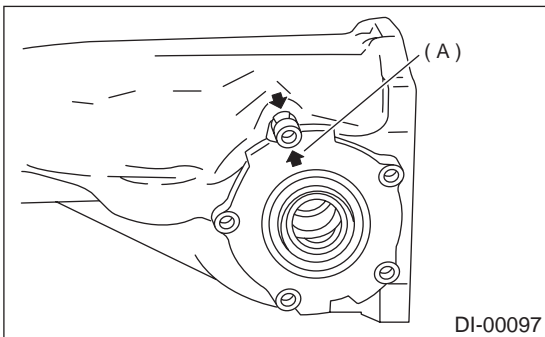
- Replace broken or cracked O-ring with new one.
- Replace broken or corroded side retainer shim with new one of same thickness.

Side bearing retainer shim	
Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

(4) Align arrow marked on differential carrier with that marked on side retainer during installation.

NOTE:

Be careful that side bearing outer race is not damaged by bearing roller.

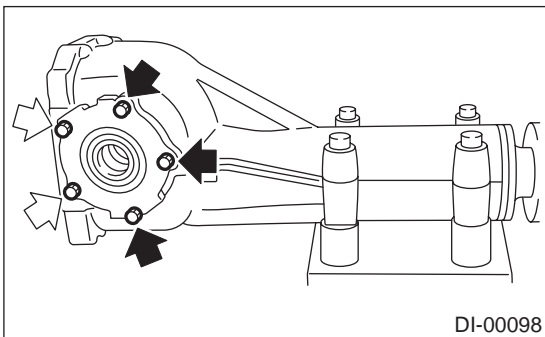


(A) Arrow mark

(5) Tighten side bearing retainer bolts.

Tightening torque:

10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



(6) Measure the crown gear-to-drive pinion backlash. Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.

When backlash is out of standard range, adjust side retainer shim with the following procedure.

When backlash is more than 0.20 mm (0.0079 in):

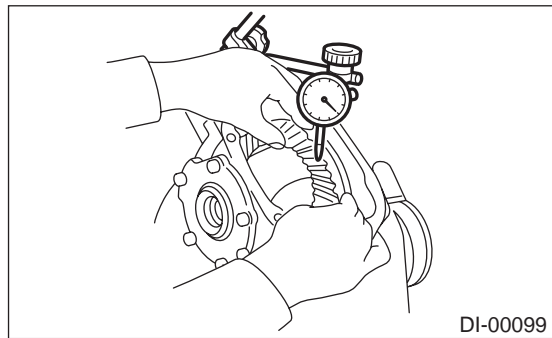
Reduce shim thickness on crown gear back, increase shim thickness on crown gear side.

When backlash is less than 0.10 mm (0.0039 in):

Increase shim thickness on crown gear back, reduce shim thickness on crown gear side.

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



(7) At the same time, measure the turning resistance of drive pinion. Compared with the resistance when differential case is not installed, when turning resistance increase is out of standard value, adjust by both increasing and decreasing with the same amount of side bearing retainer shim thickness.

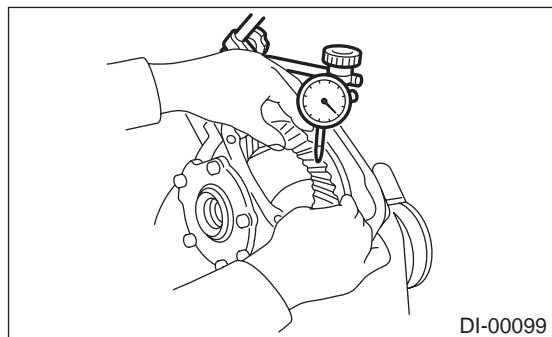
Turning resistance increase:

2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

16) Re-check crown gear-to-pinion backlash.

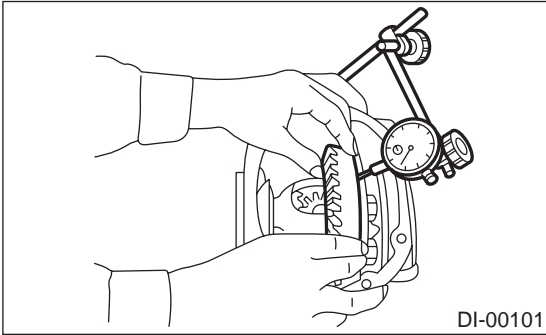
Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



17) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotate smoothly.

Limit of runout:
Less than 0.05 mm (0.0020 in)



18) Checking and adjusting tooth contact of crown gear

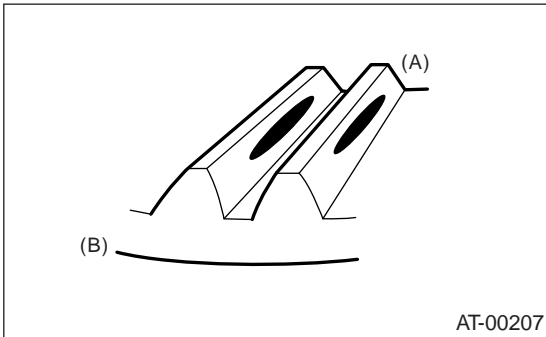
- (1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.
- (2) When the contact pattern is incorrect, readjust according to the instructions given in "TOOTH CONTACT PATTERN".

NOTE:

Be sure to wipe off red lead completely after adjustment is completed.

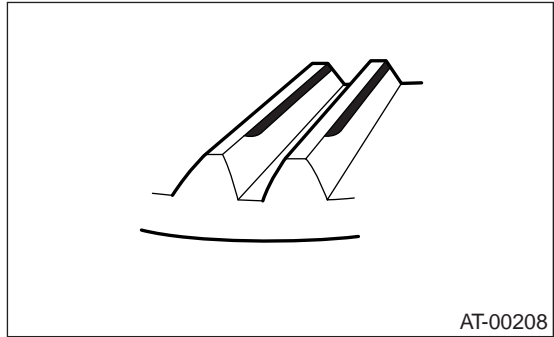
- Correct tooth contact

Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)

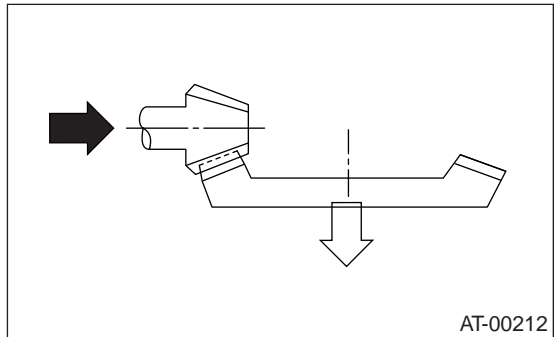


- (A) Toe side
- (B) Heel side

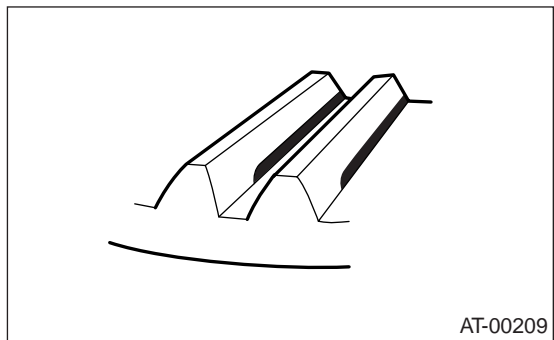
- Face contact
Checking item: Backlash is too large.
 Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



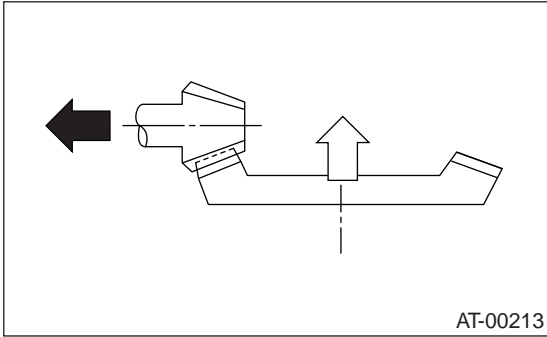
- Flank contact
Checking item: Backlash is too small.
 Contact pattern



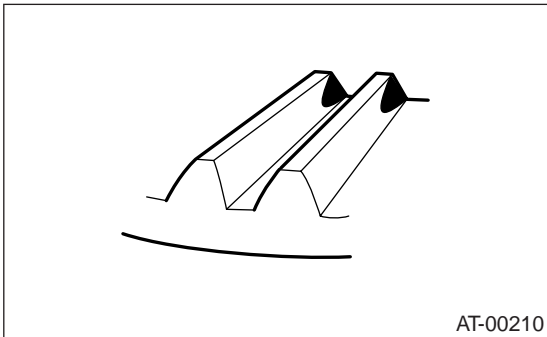
REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

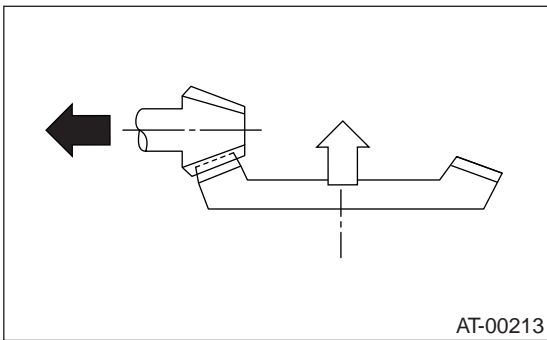
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



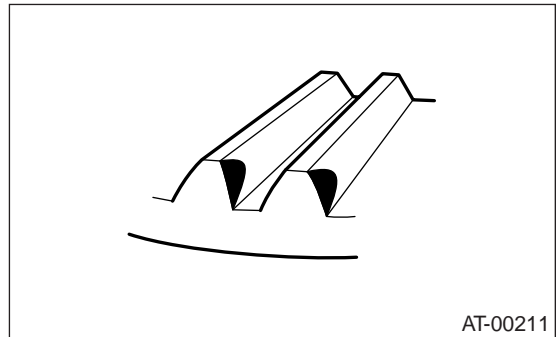
• Toe contact (Inside end contact)
Checking item: Contact area is small.
 Contact pattern



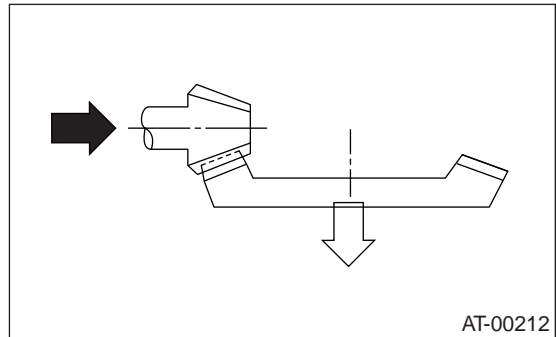
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



• Heel contact (Outside end contact)
Checking item: Contact area is small.
 Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.

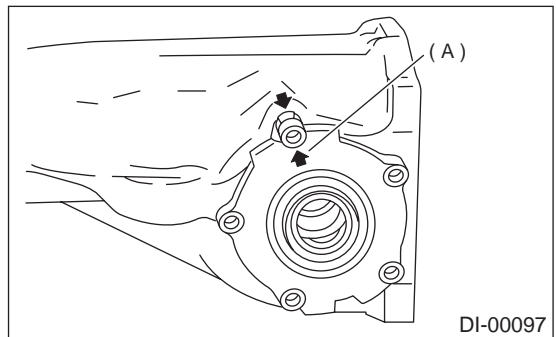


19) If proper tooth contact is not obtained, once again adjust the drive pinion height changing RH and LH side bearing retainer shims and the hypoid gear backlash.

20) Remove LH/RH side bearing retainers.

21) Install O-ring and side retainer shim on side bearing retainer on LH/RH.

22) Align the arrow mark on differential carrier with the mark on side retainer during installation.



(A) Arrow mark

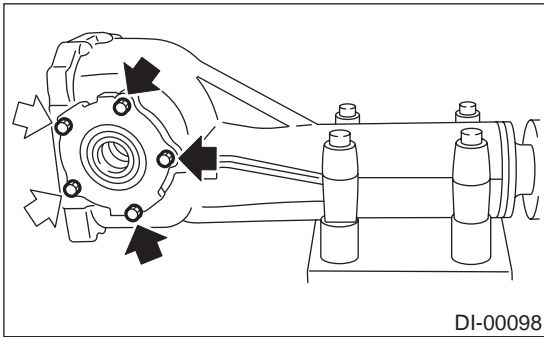
23) Tighten the side bearing retainer bolts.

Lock Tite:

**THREE BOND 1105 (Part No.: 004403010)
or equivalent**

Tightening torque:

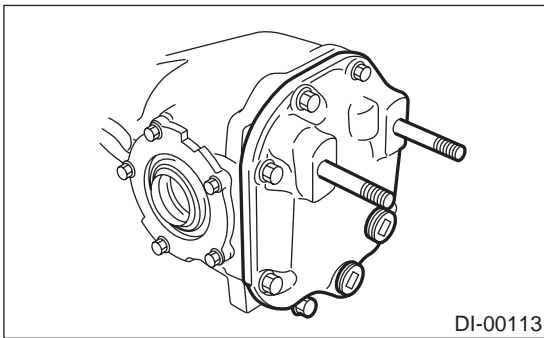
10.5 N-m (1.07 kgf-m, 7.7 ft-lb)



24) Install a new gasket and rear cover, and tighten bolts to specified torque.

Tightening torque:

29 N-m (3.0 kgf-m, 21.7 ft-lb)



E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

1) Crown gear and drive pinion

- If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.
- If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if crack, score, or other defects are evident on tooth surface.
- Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washers of side gear and pinion mate gear

Replace if seizure, flaw, abnormal wear or other defect is evident.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if its sliding surfaces are worn or cracked.

8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

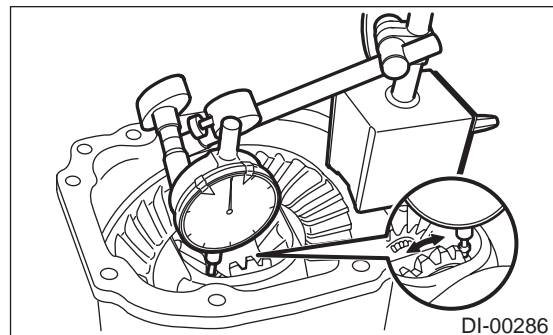
1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear. (Without LSD)

Side gear backlash:

0.1 — 0.2 mm (0.004 — 0.008 in)

If side gear backlash is not within the specification, adjust clearance as specified by selecting side gear thrust washer.



REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

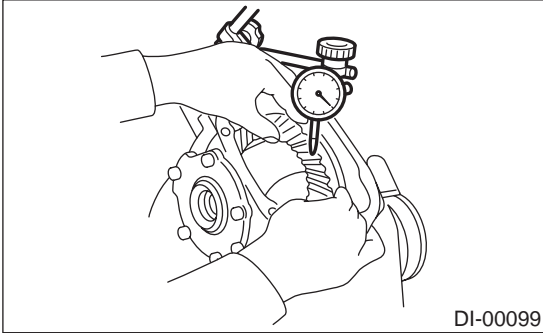
2. CROWN GEAR BACKLASH

Using a dial gauge, check the backlash of the crown gear.

Crown gear backlash:

0.1 — 0.2 mm (0.004 — 0.008 in)

If crown gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.



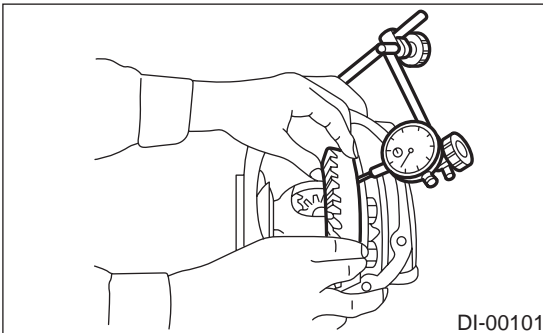
3. CROWN GEAR RUNOUT

Using a dial gauge, check the crown gear runout.

Crown gear runout:

Less than 0.05 mm (0.0020 in)

If the crown gear runout exceeds 0.05 mm (0.0020 in), replace the crown gear.



4. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Inspect tooth contact between crown gear and drive pinion. <Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

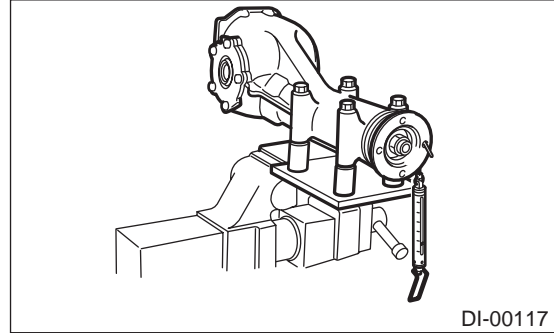
5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Turning resistance increase:

2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

If the increase of the resistance is not within the specification, adjust the side bearing retainer shims.



F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust side gear backlash.

<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

2. CROWN GEAR BACKLASH

Adjust crown gear backlash.

<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear.

<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

4. TOTAL PRELOAD

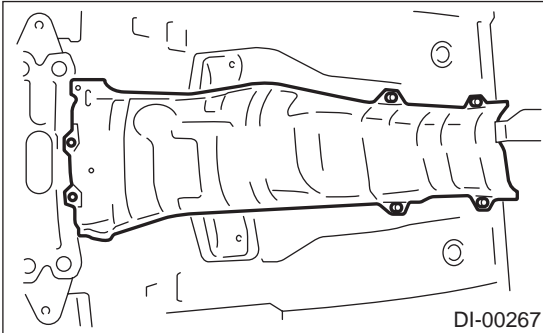
Adjust side bearing shim.

<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

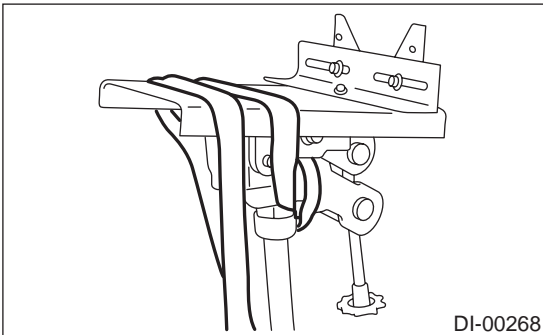
5. Rear Differential for VA-type

A: REMOVAL

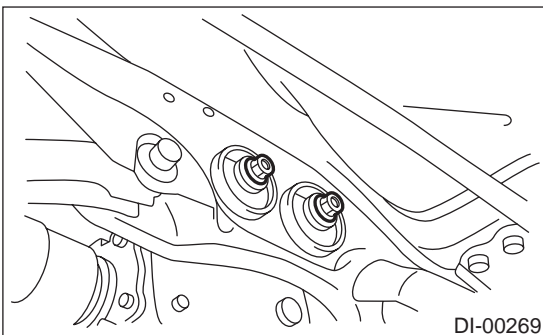
- 1) Disconnect ground cable from battery.
- 2) Move select lever or gear shift lever to "N".
- 3) Loosen wheel nuts.
- 4) Release the parking brake.
- 5) Jack-up vehicle and support it with sturdy racks.
- 6) Remove wheels.
- 7) Remove rear exhaust pipe and muffler.
- 8) Remove heat shield cover.



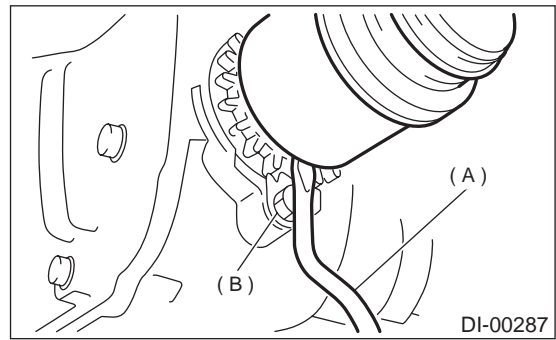
- 9) Remove propeller shaft.
<Ref. to DS-14, REMOVAL, Propeller Shaft.>
- 10) Prepare a transmission jack and a band.



- 11) Loosen self-locking nuts connecting rear differential to rear crossmember.

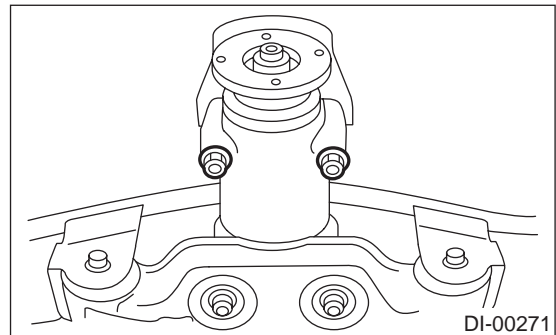


- 12) Remove DOJ of rear drive shaft from rear differential.

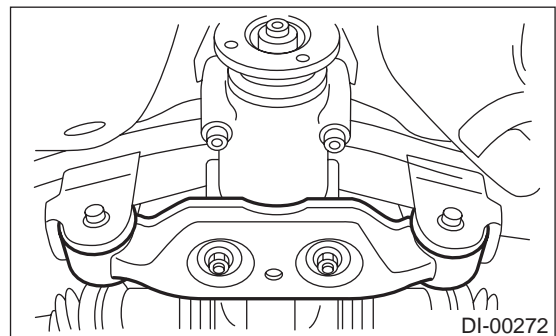


- (A) Tire lever
- (B) Bolt

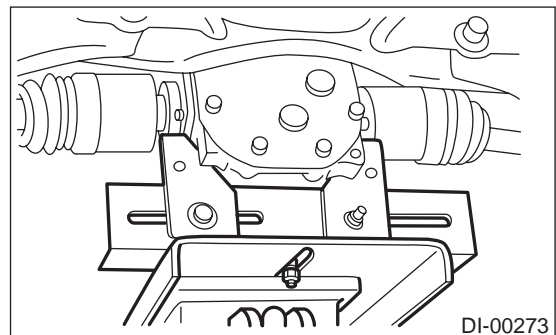
- 13) Remove protector nuts.



- 14) Remove nuts which secure rear differential front member.



- 15) Support rear differential with transmission jack.



- 16) Remove rear differential front member.
- 17) Fix rear differential at band.

REAR DIFFERENTIAL FOR VA-TYPE

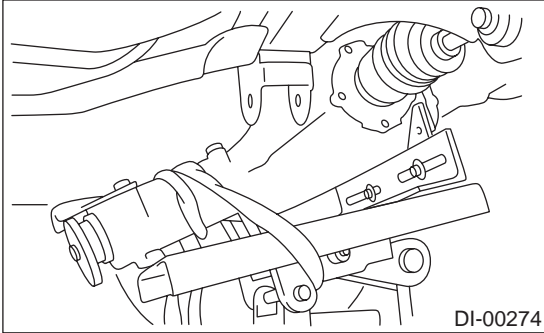
DIFFERENTIALS

18) Remove self-locking nuts connecting rear differential to rear crossmember.

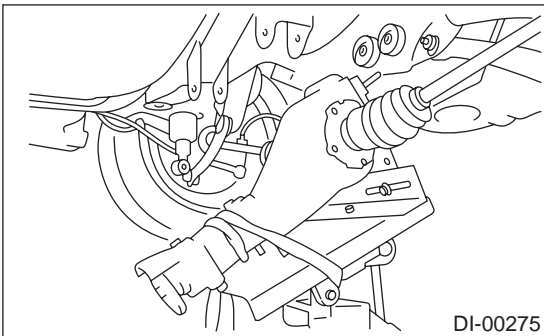
19) Remove rear differential stud bolt from rear crossmember bushing.

NOTE:

Carefully adjust angle and position of transmission jack and jack stand as required during stud bolt removal.



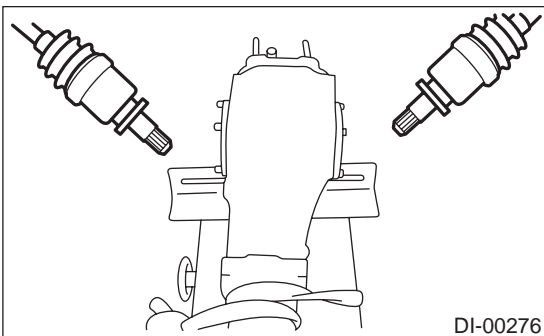
20) After removing rear differential stud bolt from rear crossmember, lower transmission jack stand. Do not allow rear drive shaft to strike lateral link bolt.



21) Pull out axle shaft from rear differential.

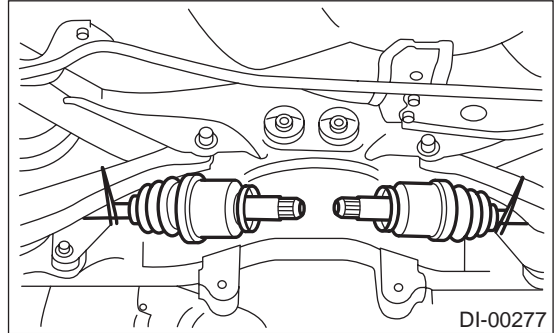
NOTE:

If axle shaft is difficult to remove from rear differential, use a tire lever to remove it.

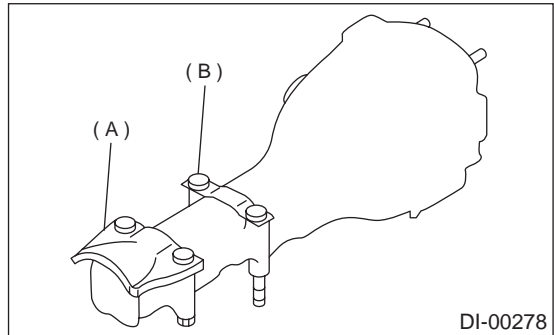


22) Take down transmission jack.

23) Secure rear drive shaft to lateral link using wire.



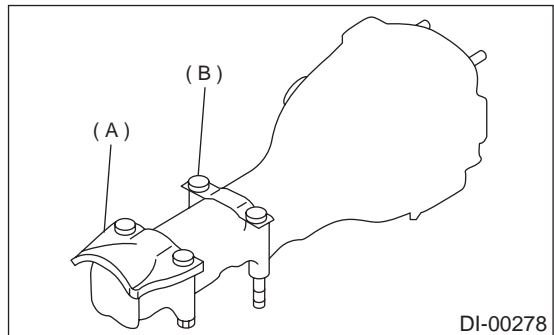
24) Remove protector and rear differential member plate from rear differential.



- (A) Protector
- (B) Rear differential member plate

B: INSTALLATION

1) Insert protector and plate to rear differential.



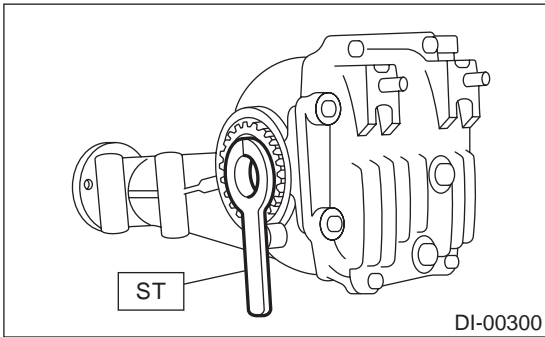
- (A) Protector
- (B) Rear differential member plate

2) Set rear differential to transmission jack.

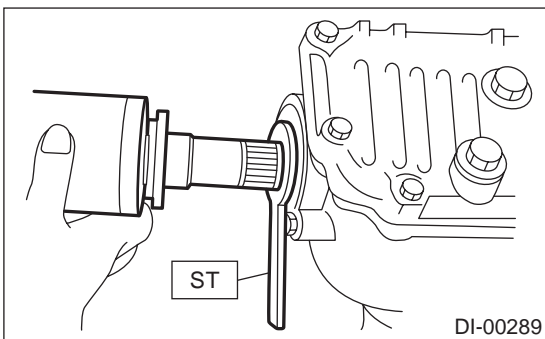
NOTE:

Secure rear differential to transmission jack using a band.

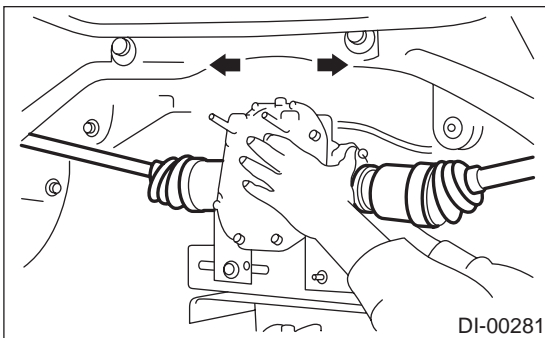
- 3) Install ST to rear differential.
ST 28099PA090 OIL SEAL PROTECTOR



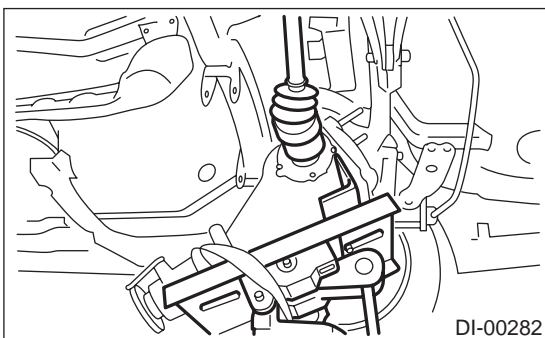
- 4) Insert the spline shaft until the spline portion is inside the side oil seal.



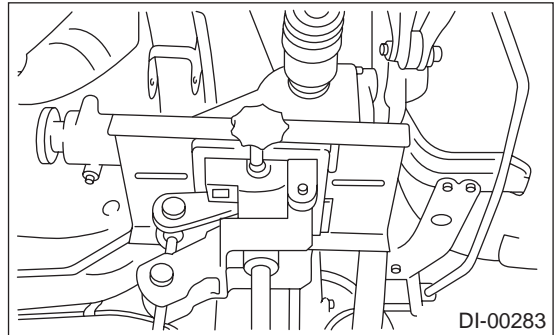
- 5) Remove ST from rear differential.
ST 28099PA090 OIL SEAL PROTECTOR
6) Completely insert axle shaft into rear differential by pressing rear differential.



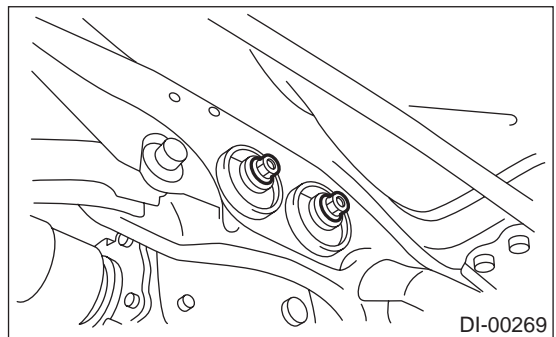
- 7) Adjust transmission jack as required so rear differential stud bolt is properly inserted into rear crossmember bushing.



- 8) After rear differential stud bolt has been inserted into rear crossmember bushing, raise transmission jack to make jack rear differential level.



- 9) Temporarily tighten rear crossmember self-locking nuts.



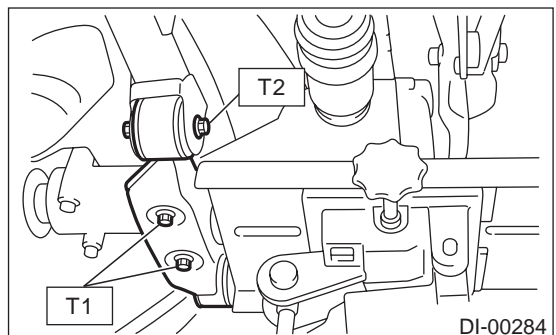
- 10) Remove band from rear differential. Raise rear differential just enough to move transmission jack away from it.

- 11) Install rear differential front member.

Tightening torque:

T1: 65 N·m (6.6 kgf-m, 48 ft-lb)

T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



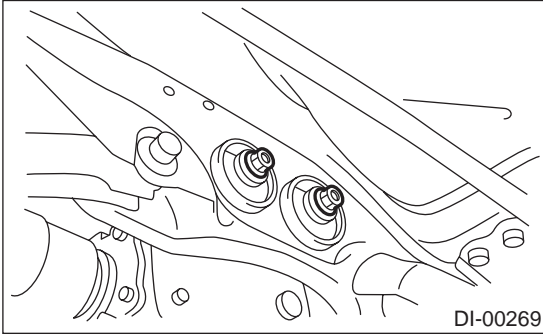
REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

12) Tighten self-locking nuts.

Tightening torque:

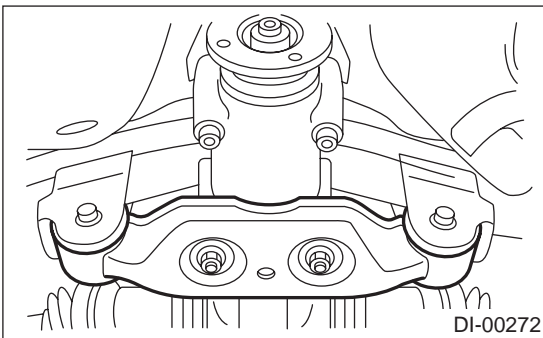
70 N·m (7.1 kgf·m, 51 ft·lb)



13) Tighten protector nut.

Tightening torque:

65 N·m (6.6 kgf·m, 48.0 ft·lb)



14) Take down transmission jack.

15) Install propeller shaft.

<Ref. to DS-15, INSTALLATION, Propeller Shaft.>

16) Install heat shield cover.

17) Install rear exhaust pipe and muffler.

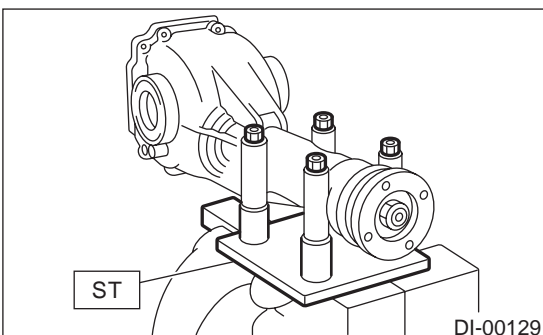
C: DISASSEMBLY

To detect real cause of trouble, inspect the following items before disassembling.

- Tooth contact of crown gear and pinion, and backlash
- Runout of crown gear at its back surface
- Turning resistance of drive pinion

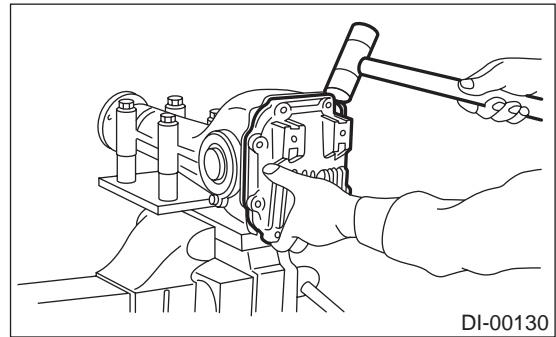
1) Set ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT



2) Drain gear oil by removing plug.

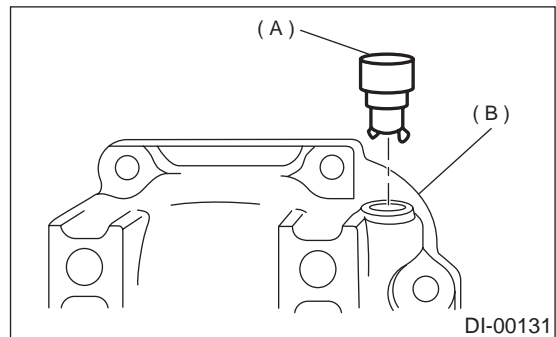
3) Remove rear cover by loosening retaining bolts.



4) Replace air breather cap.

NOTE:

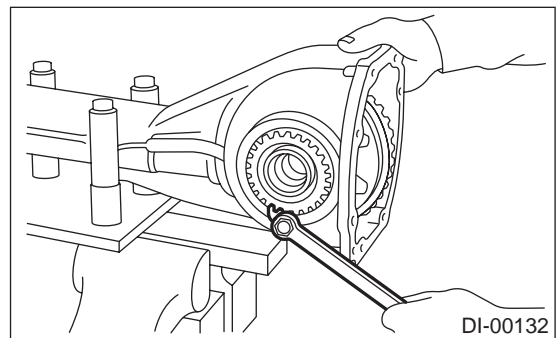
Do not attempt to replace the air breather cap unless necessary.



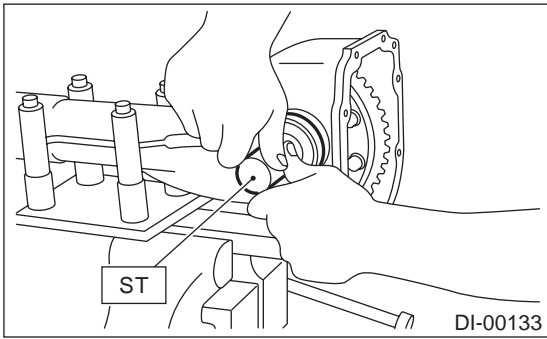
(A) Air breather cap

(B) Rear cover

5) Remove right and left lock plates.



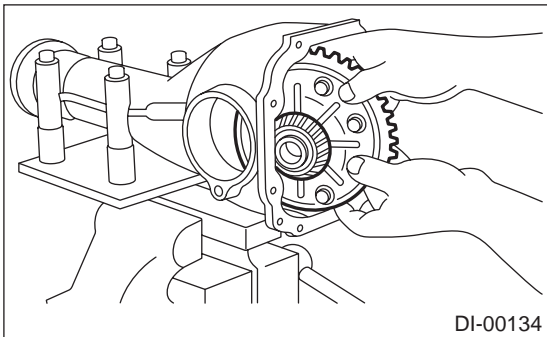
6) Remove right and left holders with ST.
ST 399780111 WRENCH



7) Pull out differential assembly from differential case.

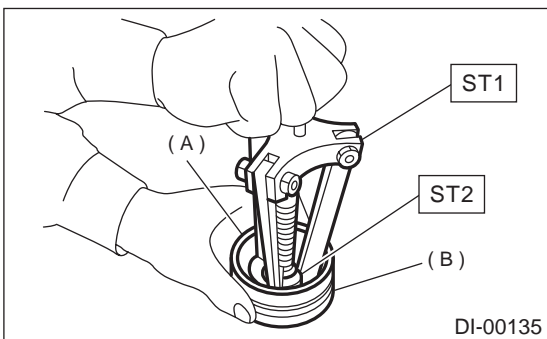
NOTE:

Be careful not to hit the teeth against the case.



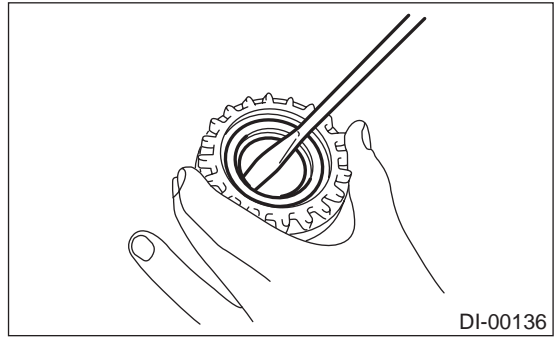
8) Remove bearing race from right and left holders with ST1 and ST2.

ST1 499705401 BEARING OUTER RACE PULLER ASSY
ST2 499705404 OUTER RACE PULLER SEAT



(A) Bearing race
(B) Holder

9) Remove oil seal from right and left holders with screwdriver.

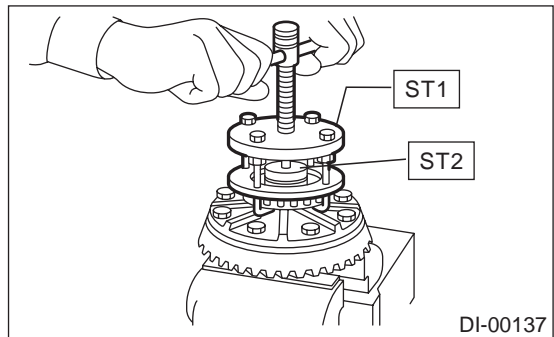


10) Extract bearing cone with ST1 and ST2.

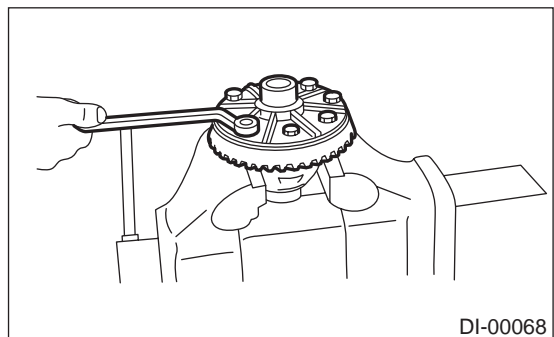
NOTE:

- Do not attempt to disassemble the parts unless necessary.
- Set puller so that its claws catch the edge of the bearing cone.
- Never mix up the right and left hand bearing races and cones.

ST1 899524100 PULLER SET
ST2 399520105 SEAT



11) Remove crown gear by loosening crown gear bolts.



REAR DIFFERENTIAL FOR VA-TYPE

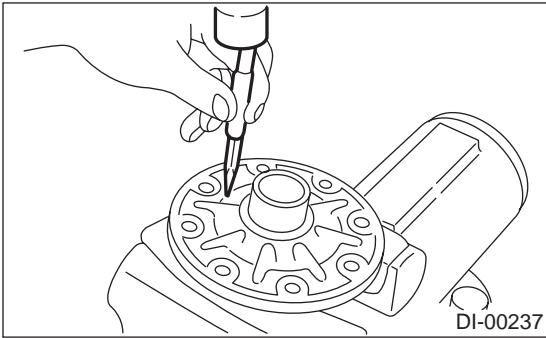
DIFFERENTIALS

12) Drive out pinion shaft lock pin from crown gear side.

NOTE:

The lock pin is staked at the pin hole end on the differential case; do not drive it out forcibly before unstaking it.

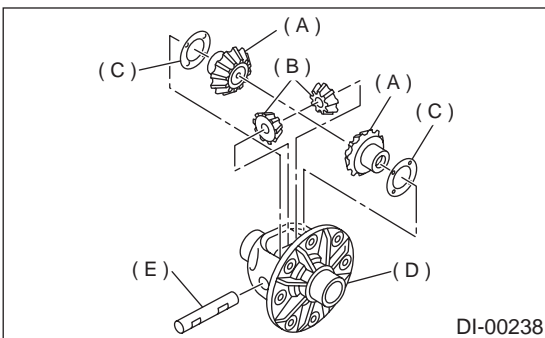
ST 899904100 STRAIGHT PIN REMOVER



13) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

NOTE:

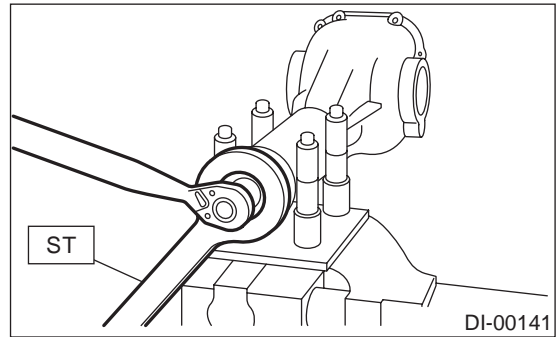
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



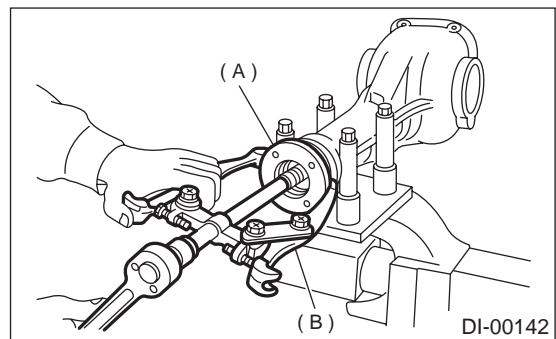
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

14) Hold companion flange with ST and remove self-locking nut.

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.



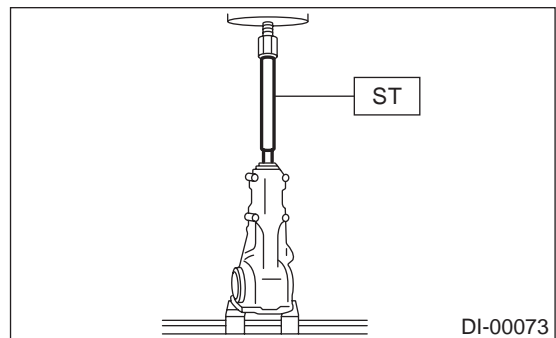
- (A) Companion
- (B) Puller

16) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

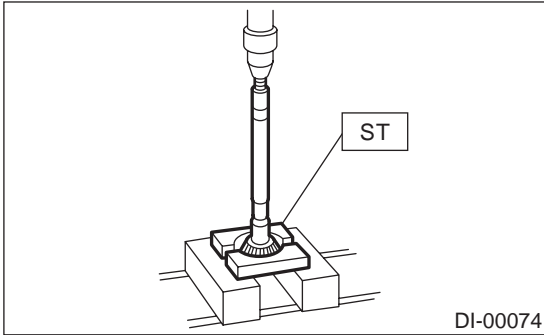


17) Remove rear bearing cone from drive pinion by supporting cone with ST.

NOTE:

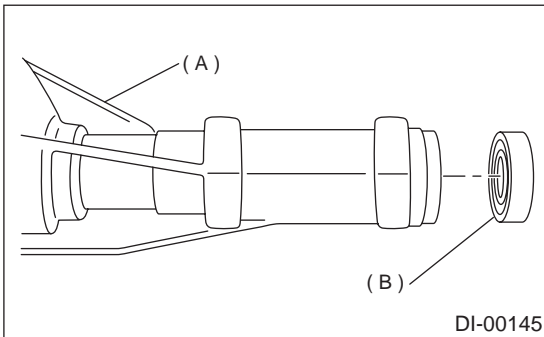
Place the replacer so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER



18) Remove front oil seal from differential carrier using ST.

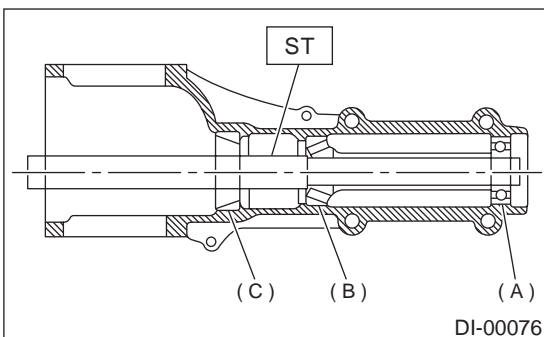
ST 398527700 PULLER ASSY



- (A) Differential carrier
- (B) Front oil seal

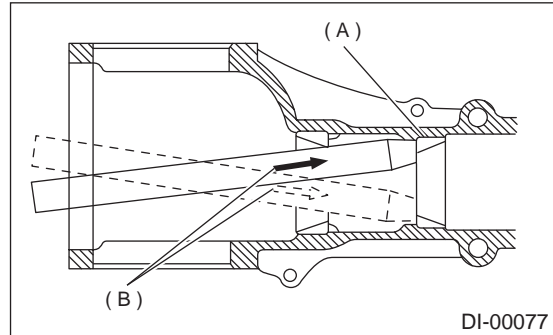
19) Remove pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT



- (A) Pilot bearing
- (B) Front bearing
- (C) Rear bearing cup

20) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.

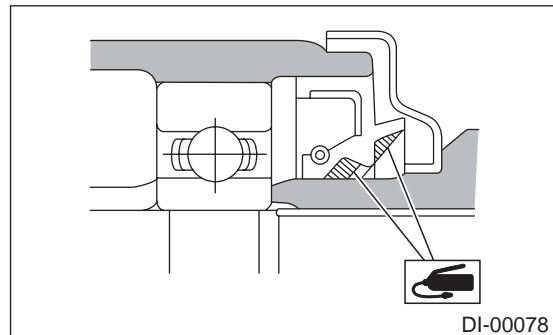


- (A) 2 cutouts along diagonal lines
- (B) Tap alternately with brass bar.

D: ASSEMBLY

NOTE:

- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not misinstalled.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the right and left hand races of the bearings.
- Replace the oil seal with new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



- Use new O-rings and gaskets.

REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

1) Adjust preload for front and rear bearings. Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press rear bearing race (rear) into differential carrier with ST1 and ST2.

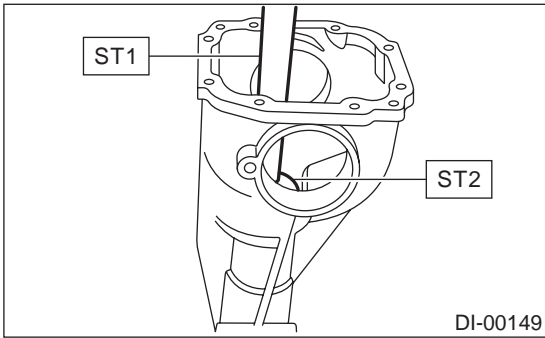
ST1 398477701 HANDLE

ST2 398477702 DRIFT

(2) Press front bearing race (front) into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE

ST2 498447110 DRIFT



(3) Insert new front bearing cone.

(4) Insert ST1 into case with pinion height adjusting shim and new rear bearing cone fitted onto it.

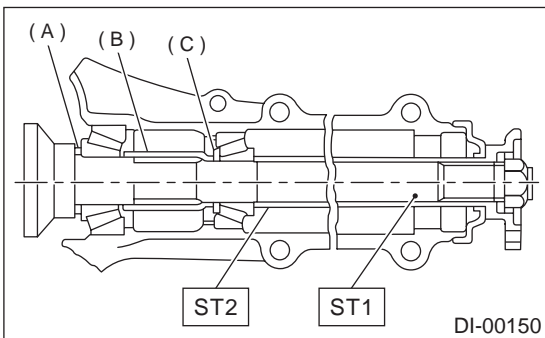
NOTE:

Before assembly inspection, when tooth contact is normal, confirm that washer is not deformed and re-use the used washer.

(5) Then install preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and self-locking nut.

ST1 498447150 DUMMY SHAFT

ST2 32285AA000 DUMMY COLLAR



- (A) Pinion height adjusting shim
- (B) Preload adjusting spacer
- (C) Preload adjusting washer

(6) Turn ST1 with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

NOTE:

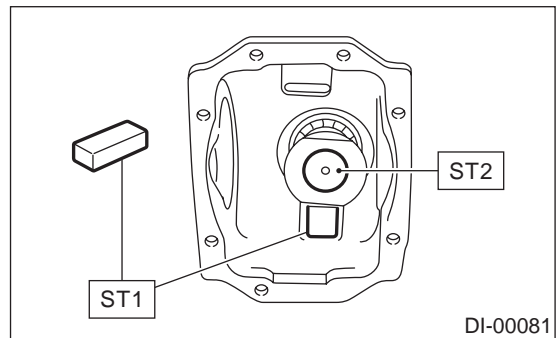
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST2 with ST1 as shown in the figure.

ST1 398507704 BLOCK

ST2 498447150 DUMMY SHAFT

Tightening torque:

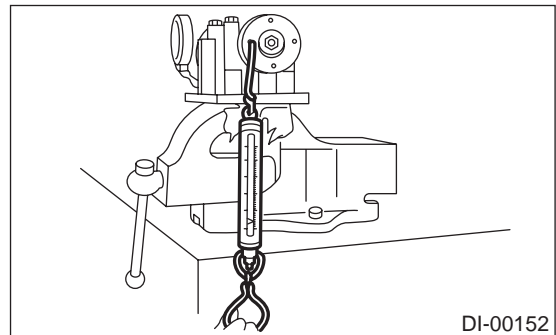
188 N·m (19.2 kgf·m, 139 ft·lb)



Front and rear bearing preload

For new bearing:

12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb)
at companion flange bolt hole



REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

Preload adjusting washer	Part No.	Thickness mm (in)
	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
38336AA210	1.738 (0.0684)	
38336AA100	1.750 (0.0689)	
38336AA220	1.763 (0.0694)	
38336AA110	1.775 (0.0699)	
Preload adjusting spacer	Part No.	Length mm (in)
	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
32288AA090	53.3 (2.098)	

2) Adjusting drive pinion height

Adjust drive pinion height with shim installed between rear bearing cone and the back of pinion gear.

(1) Install ST1, ST2 and ST3, as shown in the figure, and apply the specified preload on the bearings

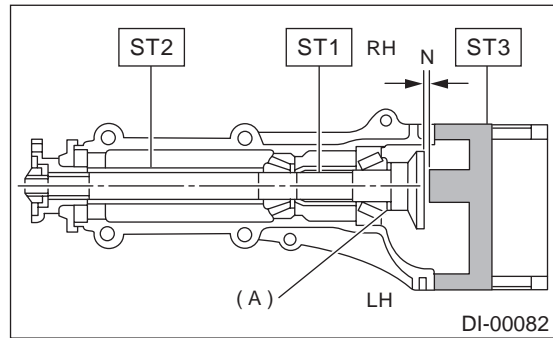
Front and rear bearing preload
For new bearing: 12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb) at companion flange bolt hole

Adjusting preload for front and rear bearings

NOTE:

At this time, install an original pinion height adjusting shim.

- ST1 498447150 DUMMY SHAFT
- ST2 32285AA000 DUMMY COLLAR
- ST3 498505501 DIFFERENTIAL CARRIER GAUGE



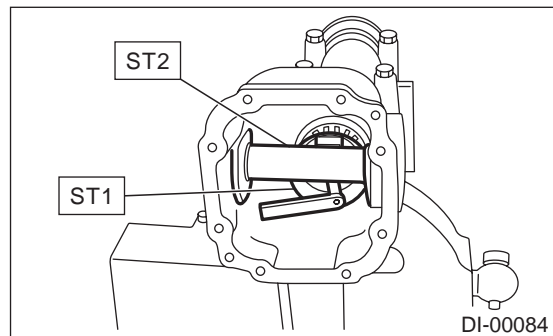
(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST3 and the end surface of ST1 by using a thickness gauge.

NOTE:

Make sure there is no clearance between the case and ST3.

- ST1 498447150 DUMMY SHAFT
- ST2 498505501 DIFFERENTIAL CARRIER GAUGE



REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed shim with this one.

NOTE:

Use 1 to 3 shims as required for adjustment.

$$T = T_o + N - 0.05 \text{ (mm)}$$

where

T = Thickness of pinion height adjusting shim (mm)

T_o = Thickness of shim originally installed (mm)

N = Reading of thickness gauge (mm)

H = Figure marked on drive pinion head

(Example of calculation)

$$T_o = 0.15 \text{ mm}$$

$$N = 0.1 \text{ mm}$$

$$T = 0.15 + 0.1 - 0.05 = 0.2 \text{ mm}$$

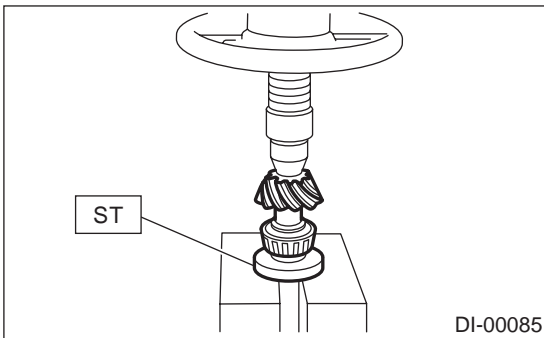
Result: Thickness = 0.2 mm

Therefore use the 32295AA220.

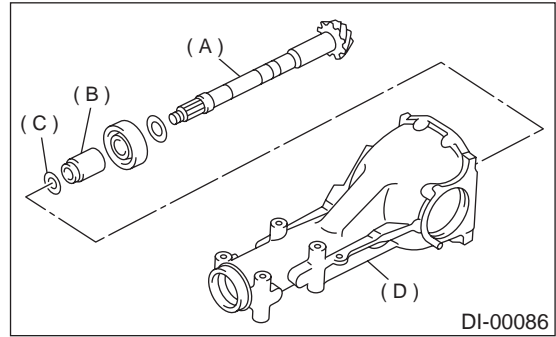
Pinion height adjusting shim	
Part No.	Thickness mm (in)
32295AA200	0.150 (0.0059)
32295AA210	0.175 (0.0069)
32295AA220	0.200 (0.0079)
32295AA230	0.225 (0.0089)
32295AA240	0.250 (0.0098)
32295AA250	0.275 (0.0108)

3) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 498175500 INSTALLER



4) Insert drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



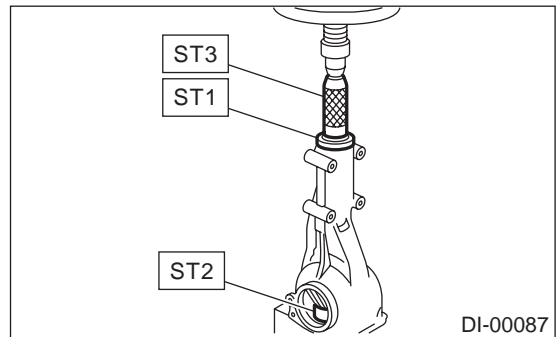
- (A) Drive pinion
- (B) Bearing preload adjusting spacer
- (C) Bearing preload adjusting washer
- (D) Differential carrier

5) Press-fit front bearing cone into carrier with ST1, ST2 and ST3.

ST1 32285AA000 DUMMY COLLAR

ST2 399780104 WEIGHT

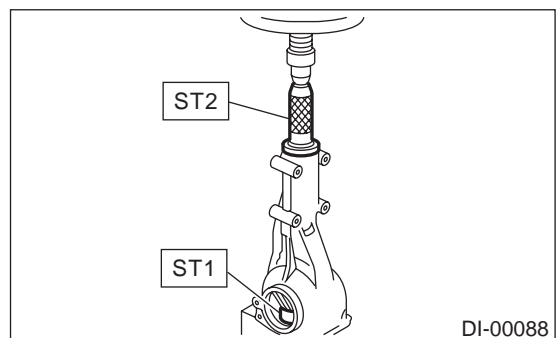
ST3 899580100 INSTALLER



6) Insert spacer, then press-fit pilot bearing with ST1 and ST2.

ST1 399780104 WEIGHT

ST2 899580100 INSTALLER

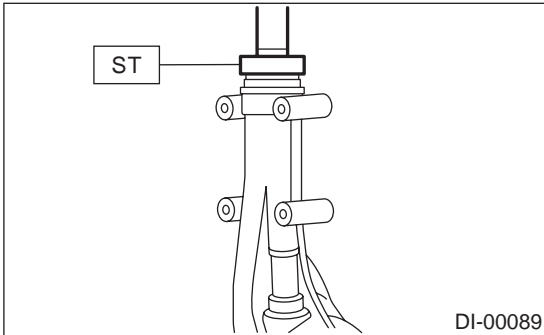


7) Fit a new oil seal with ST.

NOTE:

- Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
- Apply grease between the oil seal lips.

ST 498447120 OIL SEAL INSTALLER



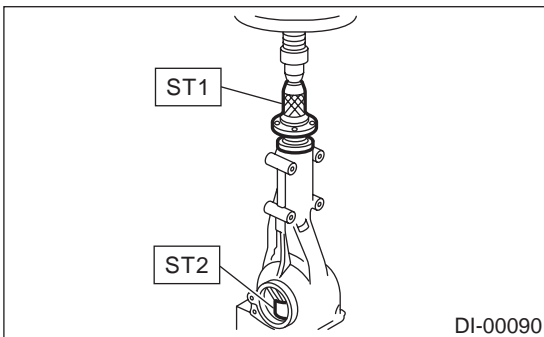
8) Press-fit companion flange with ST1 and ST2.

NOTE:

Be careful not to damage bearing.

ST1 899874100 INSTALLER

ST2 399780104 WEIGHT

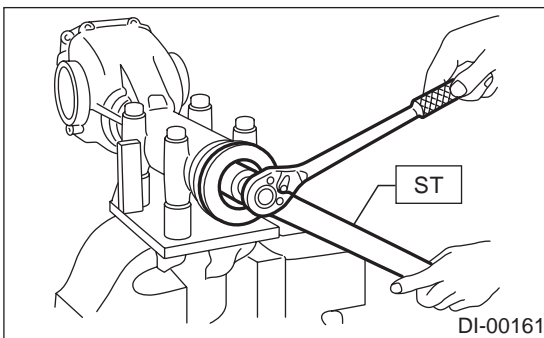


9) Install self-locking nut. Then tighten it with ST.

ST 398427200 FLANGE WRENCH

Tightening torque:

188 N·m (19.2 kgf·m, 139 ft·lb)

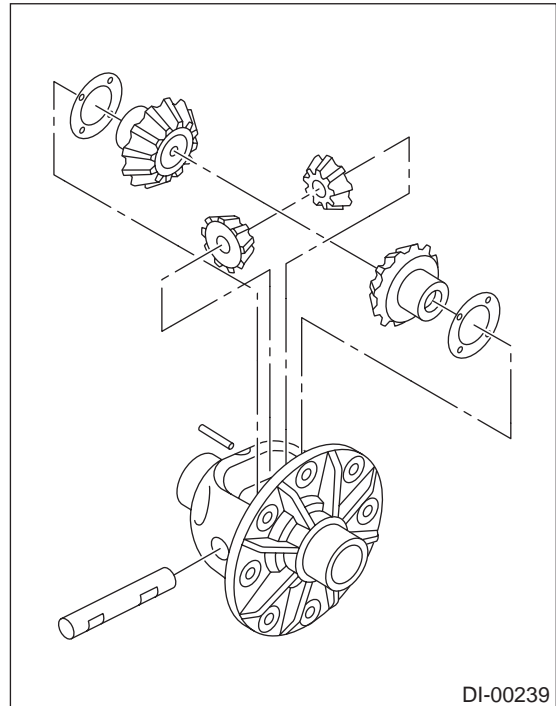


10) Assembling differential case

Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

NOTE:

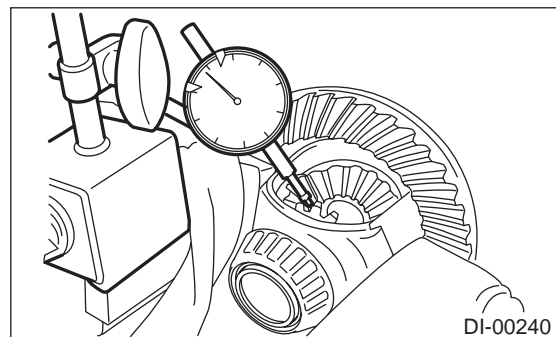
- Apply gear oil on both sides of the washer and on the side gear shaft before installing.
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

Side gear back clearance:

0.05 — 0.15 mm (0.0020 — 0.0059 in)



(2) Adjust the side gear backlash as specified by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
803135011	0.925 — 0.950 (0.0364 — 0.0374)
803135012	0.950 — 0.975 (0.0374 — 0.0384)
803135013	0.975 — 1.000 (0.0384 — 0.0394)
803135014	1.000 — 1.025 (0.0394 — 0.0404)
803135015	1.025 — 1.050 (0.0404 — 0.0413)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

- (4) After driving in pinion shaft lock pin, stake the both sides of the hole to prevent pin from falling off.
- (5) Install crown gear on differential case.

NOTE:

- Before installing bolts, apply Lock Tite to bolt threads.

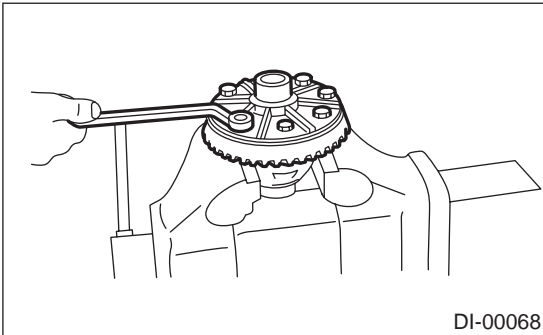
Lock Tite

**THREE BOND 1324 (Part No.: 004403042)
or equivalent**

- Tighten diagonally while tapping the bolt heads.

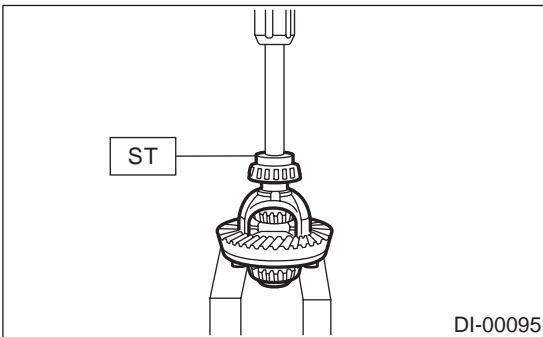
Tightening torque:

62 N·m (6.3 kgf·m, 45.6 ft·lb)



- 11) Press side bearing cone onto differential case with ST.

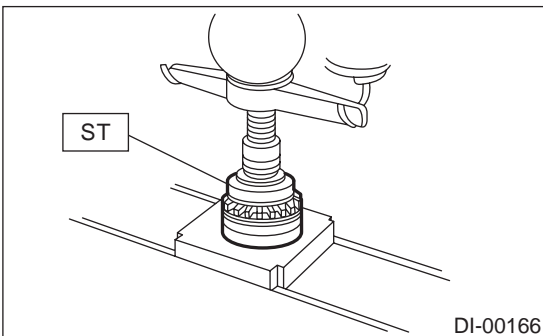
ST 498485400 DRIFT



- 12) Assemble holders.

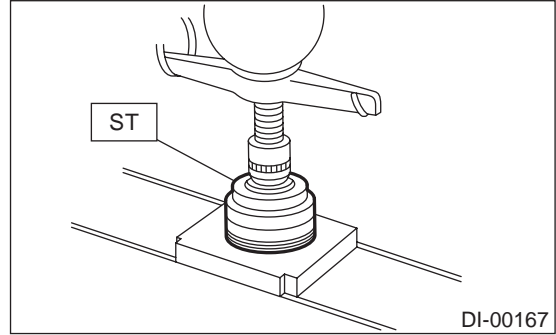
- (1) Install oil seal into right and left holders.

ST 498447100 AXLE SHAFT OIL SEAL INSTALLER

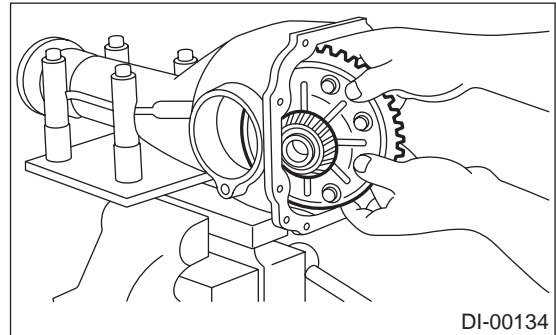


- (2) Install bearing race into right and left holders.

ST 398477702 BEARING OUTER RACE DRIFT



- (3) Install the differential case assembly into differential carrier in the reverse order of disassembly.

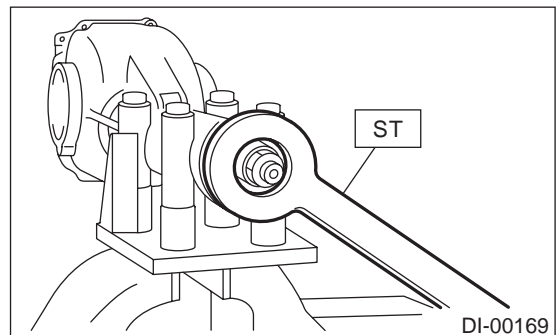


- (4) Lightly screw-in side holders of RH an LH into differential carrier and install.

- 13) Perform adjustment of backlash of pinion crown gear set and adjustment of preload of differential side bearing.

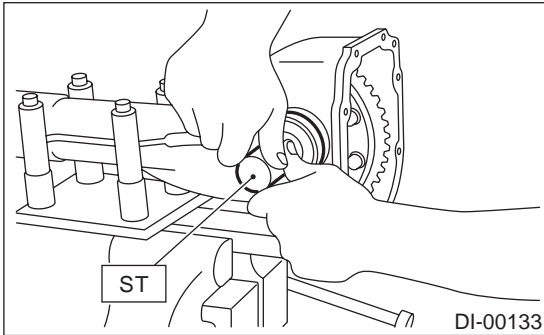
- (1) Turn drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



(2) Screw in side (left-side) holder until light contact is made with ST.

ST 399780111 WRENCH



(3) Back off side (left-side) holder approximately 1 1/2 teeth of holder, and tighten left-side holder by approximately 2 teeth (approximately 1 1/2 + 1/2 teeth).

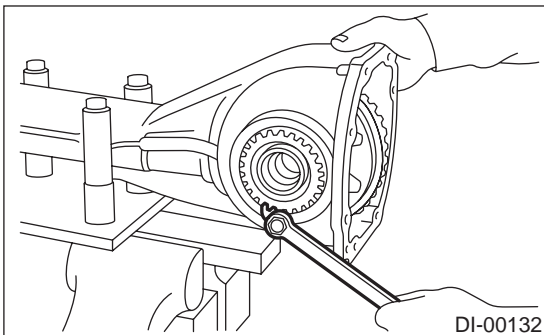
[Back off amount of side (left-side) holder + 1/2 tooth.]

This + 1/2 tooth gives preload.

(4) Temporarily tighten lock plate.

NOTE:

Turn over lock plate to displace holder 1/2 tooth.



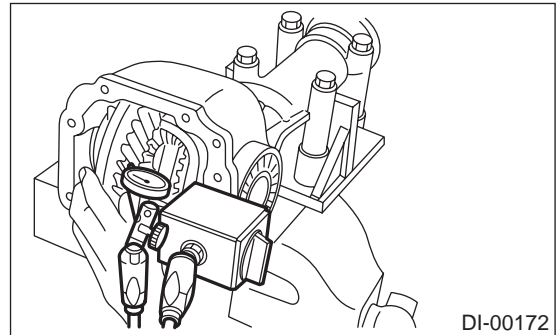
(5) Measure the crown gear-to-drive pinion backlash. Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.

NOTE:

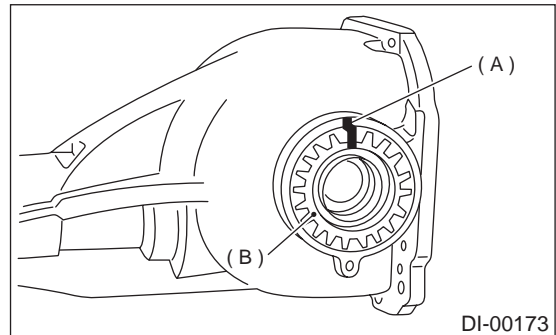
If measured backlash is not within specified range, repeat procedures for pinion crown gear set backlash adjustment and differential side bearing preload adjustment.

Backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)



14) Draw a matching mark on both differential carrier and holder. Remove holder one side at a time. Replace in the original position after inserting an O-ring and applying grease to threaded portion.

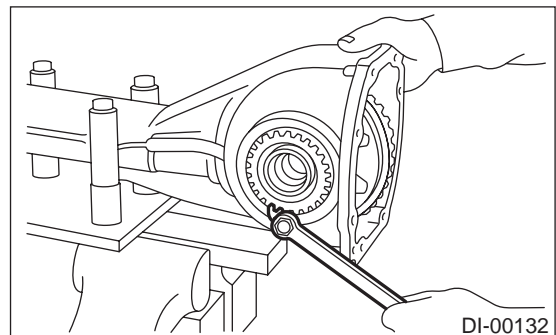


- (A) Matching mark
- (B) Holder

15) Tighten bolt of lock plate to specified torque.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



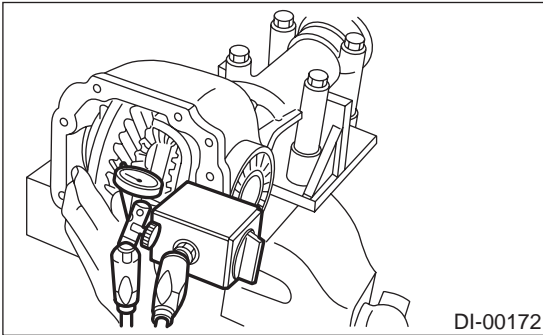
REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

16) Re-check crown gear-to-pinion backlash.

Backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)



17) Checking and adjusting tooth contact of crown gear.

(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

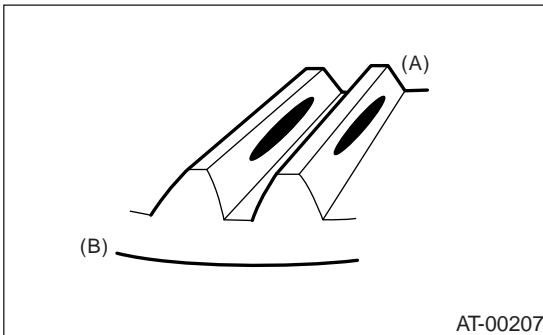
(2) When the contact pattern is incorrect, readjust according to the instructions given in "TOOTH CONTACT PATTERN".

NOTE:

Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)

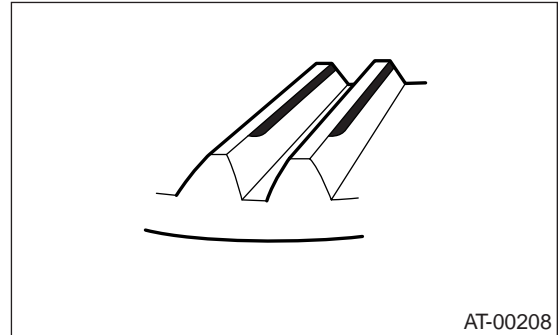


- (A) Toe side
- (B) Heel side

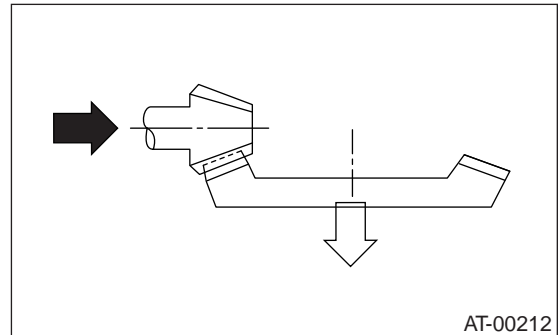
- Face contact

Checking item: Backlash is too large.

Contact pattern



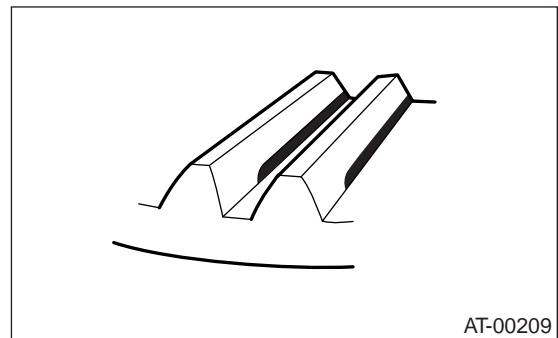
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



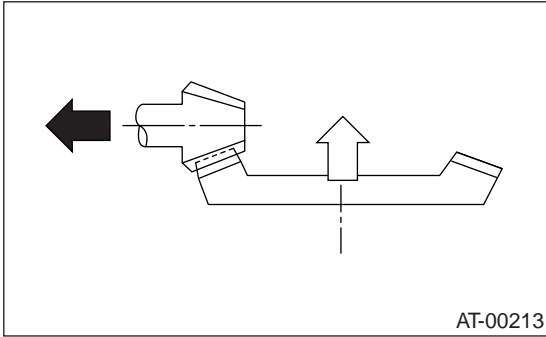
- Flank contact

Checking item: Backlash is too small.

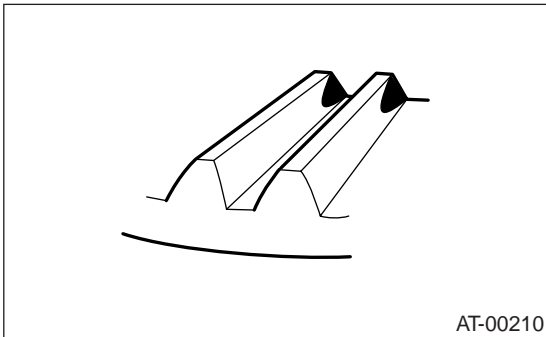
Contact pattern



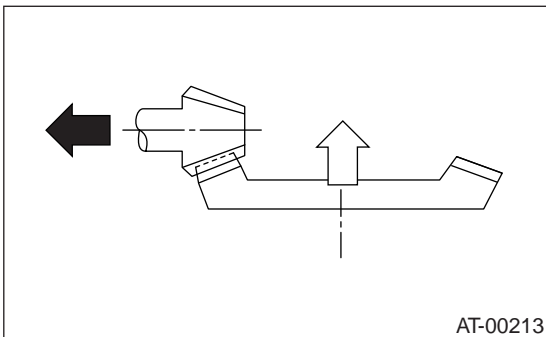
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



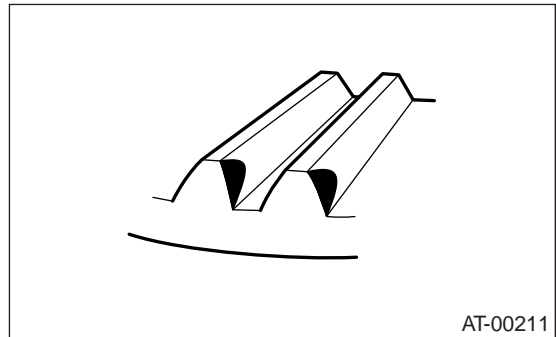
• Toe contact (Inside end contact)
Checking item: Contact area is small.
 Contact pattern



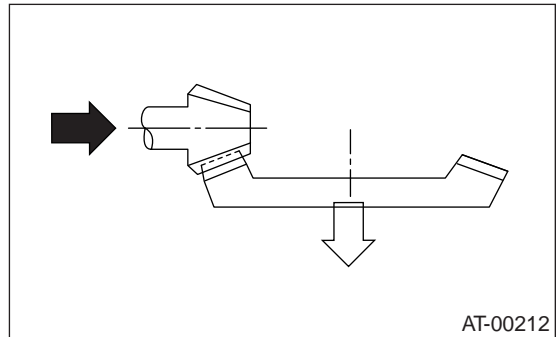
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



• Heel contact (Outside end contact)
Checking item: Contact area is small.
 Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



NOTE:

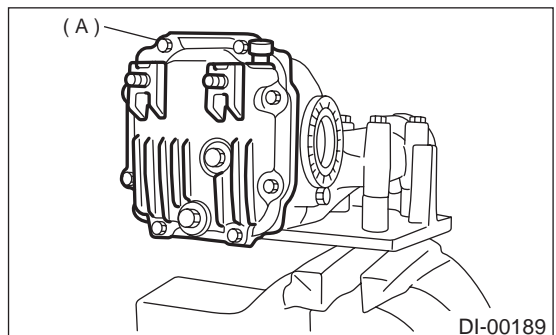
Be sure to wipe off red lead completely after adjustment is completed.

18) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.

19) Install new gasket and rear cover, and tighten bolts to specified torque.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



(A) Rear cover

REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

1) Crown gear and drive pinion

- If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.
- If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if crack, score, or other defects are evident on tooth surface.
- Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washers of side gear and pinion mate gear

Replace if seizure, flaw, abnormal wear or other defect is evident.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if its sliding surfaces are worn or cracked.

8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

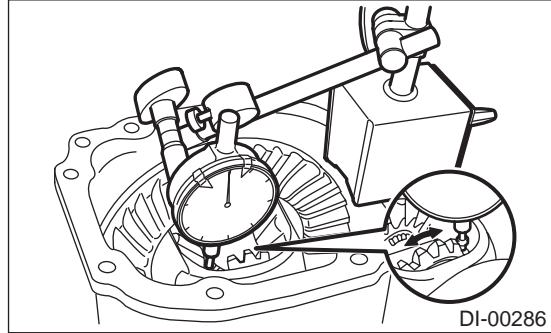
1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear.

Side gear backlash:

0.05 — 0.15 mm (0.0020 — 0.0059 in)

If side gear backlash is not within the specification, adjust clearance as specified by selecting side gear thrust washer.



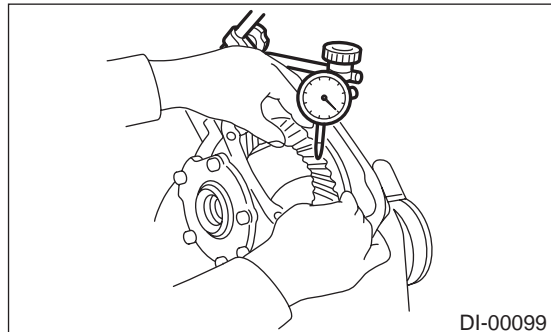
2. CROWN GEAR BACKLASH

Using a dial gauge, check the backlash of the crown gear.

Crown gear backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)

If crown gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.



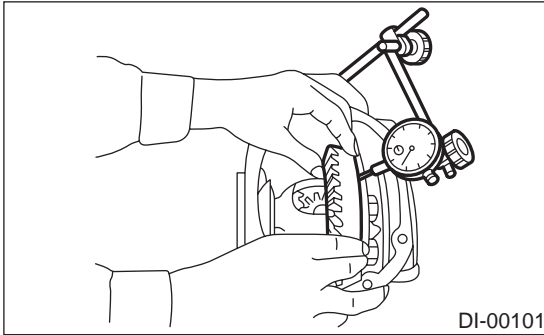
3. CROWN GEAR RUNOUT

Using a dial gauge, check the crown gear runout.

Crown gear runout:

Less than 0.05 mm (0.0020 in)

If the crown gear runout exceeds 0.05 mm (0.0020 in), replace the crown gear.



4. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Inspect tooth contact between crown gear and drive pinion.

<Ref. to DI-47, ASSEMBLY, Rear Differential for VA-type.>

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust side gear backlash.

<Ref. to DI-47, ASSEMBLY, Rear Differential for VA-type.>

2. CROWN GEAR BACKLASH

Adjust crown gear backlash.

<Ref. to DI-47, ASSEMBLY, Rear Differential for VA-type.>

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear.

<Ref. to DI-47, ASSEMBLY, Rear Differential for VA-type.>

REAR DIFFERENTIAL FRONT OIL SEAL

DIFFERENTIALS

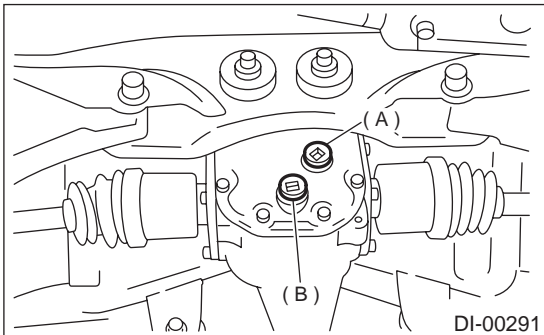
6. Rear Differential Front Oil Seal

A: INSPECTION

Check front oil seal portion for oil leakage, if any leak is found, replace the oil seal and inspect propeller shaft.

B: REPLACEMENT

- 1) Disconnect ground cable from battery.
- 2) Move select lever or gear shift lever to "N".
- 3) Release the parking brake.
- 4) Remove oil drain plug, and drain gear oil.



- (A) Filler plug
- (B) Drain plug

- 5) Install oil drain plug.

NOTE:

- Apply fluid packing to oil drain plug in T-type.
- VA-type uses a new aluminum gasket.

Fluid packing:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

T-type;

49 N·m (5.0 kgf-m, 36.2 ft-lb)

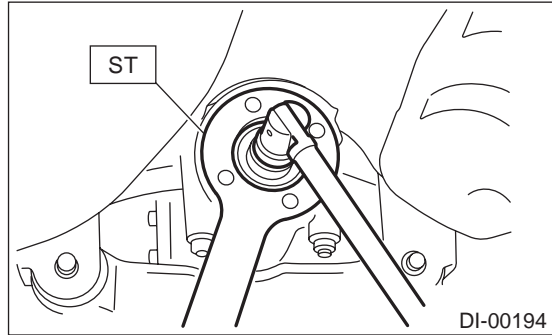
VA-type;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

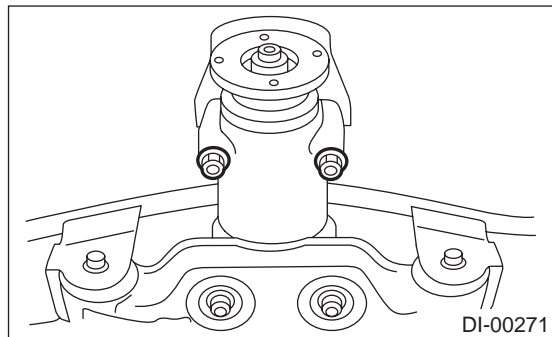
- 6) Jack-up rear wheels and support the vehicle body with sturdy racks.
- 7) Remove rear exhaust pipe and muffler.
- 8) Remove propeller shaft from body. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

- 9) Remove self-locking nut while holding companion flange with ST.

ST 498427200 FLANGE WRENCH

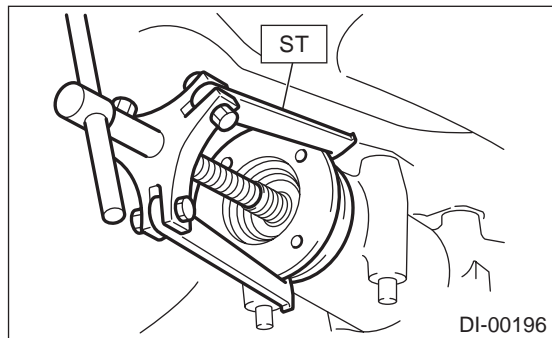


- 10) Remove protector nuts.



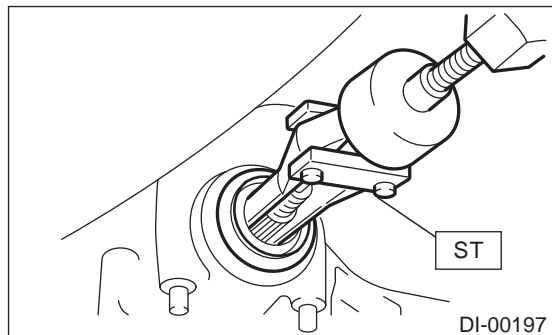
- 11) Extract companion flange using ST.

ST 399703602 PULLER ASSY



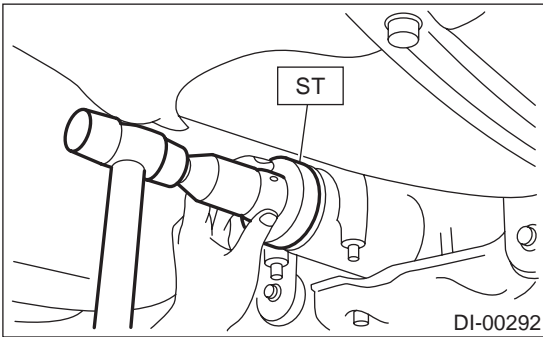
- 12) Remove oil seal using ST.

ST 398527700 PULLER ASSY



13) Fit a new oil seal using ST.

ST 498447120 OIL SEAL INSTALLER



14) Install companion flange.

NOTE:

Use a plastic hammer to install companion flange.

15) Tighten self-locking nut within the specified torque range so that the turning resistance of companion flange becomes the same as that before replacing oil seal.

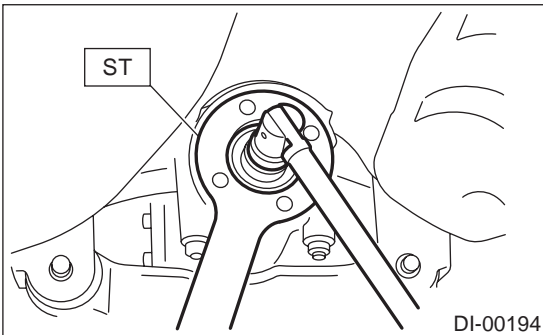
ST 498427200 FLANGE WRENCH

NOTE:

Use a new self-locking nut.

Tightening torque:

181.4 N·m (18.50 kgf-m, 133.8 ft-lb)

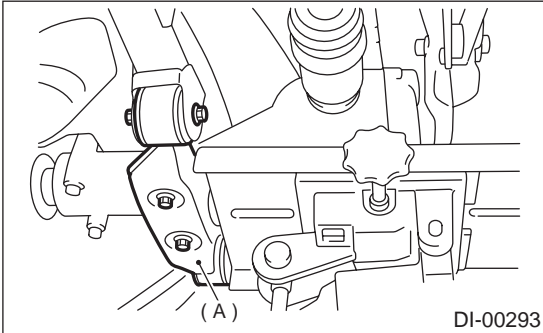


16) Reassembling procedure hereafter is the reverse of the disassembling.

7. Rear Differential Front Member

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Jack-up the vehicle.
- 3) Using a transmission jack, support rear differential, and remove rear differential front member.



(A) Rear differential front member

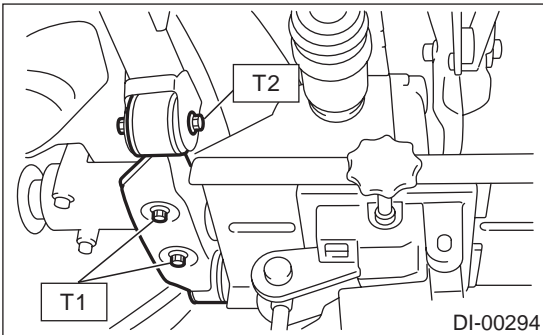
B: INSTALLATION

- 1) Install rear differential front member.

Tightening torque:

T1: 65 N·m (6.6 kgf-m, 48 ft-lb)

T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



C: INSPECTION

- 1) Check rear differential front member for damage, bend, or corrosion.
If damage, bend, or corrosion is excessive, replace rear differential front member.
- 2) Check bushings of rear differential front member for cracking, hardening, or damage.
If cracking, hardening, or damage is excessive, replace rear differential front member.

8. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered, or excessively worn sliding surface of companion flange.	Repair or replace.
	Clogged or damaged air breather.	Clean, repair or replace.
	Loose bolts on side retainer, or incorrectly fitted O-ring.	Tighten bolts to specified torque. Replace O-ring.
	Loose rear cover attaching bolts or damaged gasket.	Tighten bolts to specified torque. Replace gasket and apply liquid packing.
	Loose oil filler or drain plug.	Retighten and apply liquid packing.
	Wear, damage or incorrectly fitting for side retainer and oil seal.	Repair or replace.
2. Seizure NOTE: Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	Insufficient backlash for hypoid gear.	Readjust or replace.
	Excessive preload for side, rear, or front bearing.	Readjust or replace.
	Insufficient or improper oil used.	Replace seized part and fill with specified oil to specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	Improper backlash for hypoid gear.	Replace.
	Insufficient or excessive preload for side, rear, or front bearing.	Readjust or replace.
	Excessive backlash for differential gear.	Replace gear or thrust washer.
	Loose bolts and nuts such as crown gear bolt.	Retighten.
	Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly.	Excessive backlash for hypoid gear.	Readjust.
	Excessive backlash for differential gear.	Replace gear or thrust washer.
	Insufficient preload for front or rear bearing.	Readjust.
	Loose drive pinion nut.	Tighten to specified torque.
	Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	Damaged differential gear.	Replace.
	Excessive wear or damage of thrust washer.	Replace.
	Broken pinion mate shaft.	Replace.
	Seized or damaged side bearing.	Replace.
6. Gear noises NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	Improper tooth contact of hypoid gear.	Readjust or replace hypoid gear set.
	Improper backlash for hypoid gear.	Readjust.
	Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
	Seized hypoid gear.	Replace hypoid gear set.
	Improper preload for front or rear bearings.	Readjust.
	Seized, scored, or chipped front or rear bearing.	Replace.
	Seized, scored, or chipped side bearing.	Replace.
	Vibrating differential carrier.	Replace.

GENERAL DIAGNOSTIC TABLE

DIFFERENTIALS

MEMO:

TRANSFER CASE

TC

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GENERAL DESCRIPTION

TRANSFER CASE

1. General Description

A: NOTE

For general description, refer to "AT" section or "MT" section.

AT model:

<Ref. to AT-2, General Description.>

MT model:

<Ref. to MT-2, General Description.>

**2. Transfer Case and Extension
for MT**

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-47, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch and Extension for AT

A: NOTE

For removal, installation and inspection work, refer to "AT" section. <Ref. to AT-90, Transfer Clutch.>

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to "AT" section or "MT" section.

AT model:

<Ref. to AT-48, Extension Case Oil Seal.>

MT model:

<Ref. to MT-41, Oil Seal.>

5. Transfer Drive Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-51, Transfer Drive Gear.>

6. Transfer Driven Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-53, Transfer Driven Gear.>

7. Reduction Drive Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to "AT" section. <Ref. to AT-104, Reduction Drive Gear.>

8. Reduction Drive Gear with VTD

A: NOTE

For removal, installation and inspection work, refer to "AT" section. <Ref. to AT-104, Reduction Drive Gear.>

9. Reduction Driven Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to "AT" section. <Ref. to AT-101, Reduction Driven Gear.>

10.Reduction Driven Gear with VTD

A: NOTE

For removal, installation and inspection work, refer to "AT" section. <Ref. to AT-101, Reduction Driven Gear.>

11.Center Differential

A: NOTE

For removal, installation and inspection work, refer to "AT" or "MT" section.

AT model:

<Ref. to AT-106, Center Differential Carrier.>

MT model:

<Ref. to MT-55, Center Differential.>

12. Transfer Clutch Pressure Test

A: NOTE

For transfer clutch pressure work, refer to "AT" section. <Ref. to AT-38, Transfer Clutch Pressure Test.>

13. Transfer Duty Solenoid and Valve Body

A: NOTE

For removal, installation and inspection work, refer to "AT" section. <Ref. to AT-70, Transfer Duty Solenoid and Valve Body.>

DRIVE SHAFT SYSTEM

DS

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1. General Description	2
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3. Front Axle.....	17
4. Hub Unit Bearing.....	23
5. Front Drive Shaft	28
6. Rear Drive Shaft.....	34
7. General Diagnostic Table.....	38



GENERAL DESCRIPTION

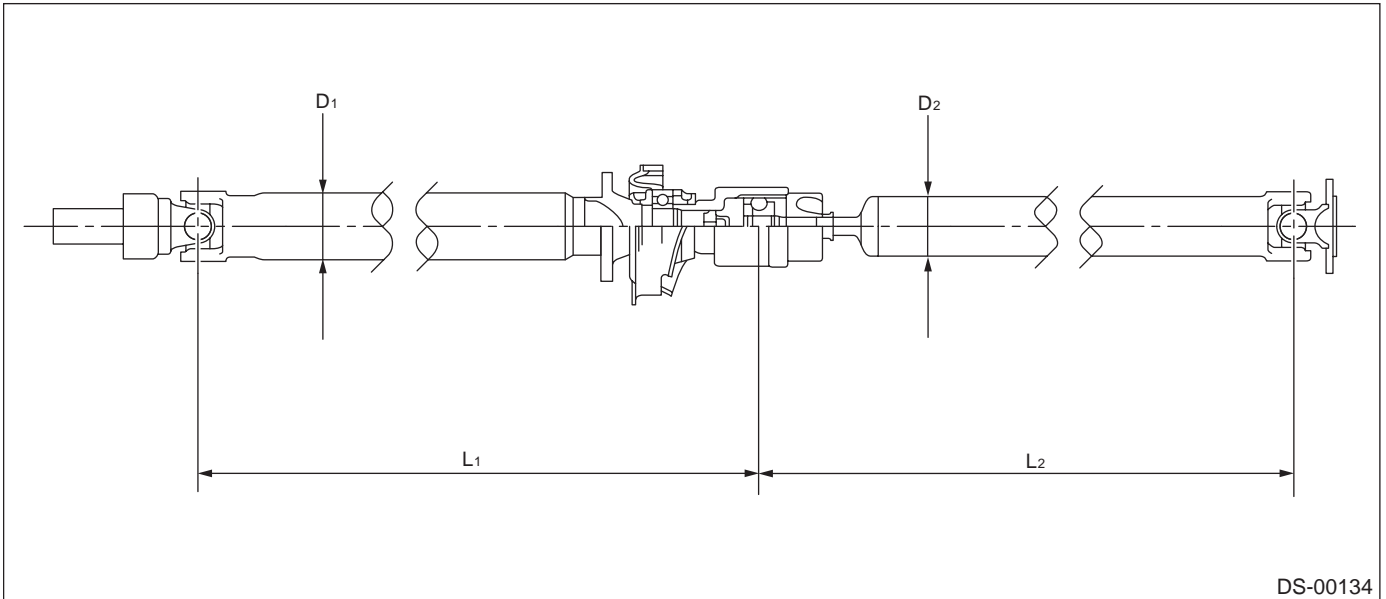
DRIVE SHAFT SYSTEM

1. General Description

A: SPECIFICATIONS

1. PROPELLER SHAFT

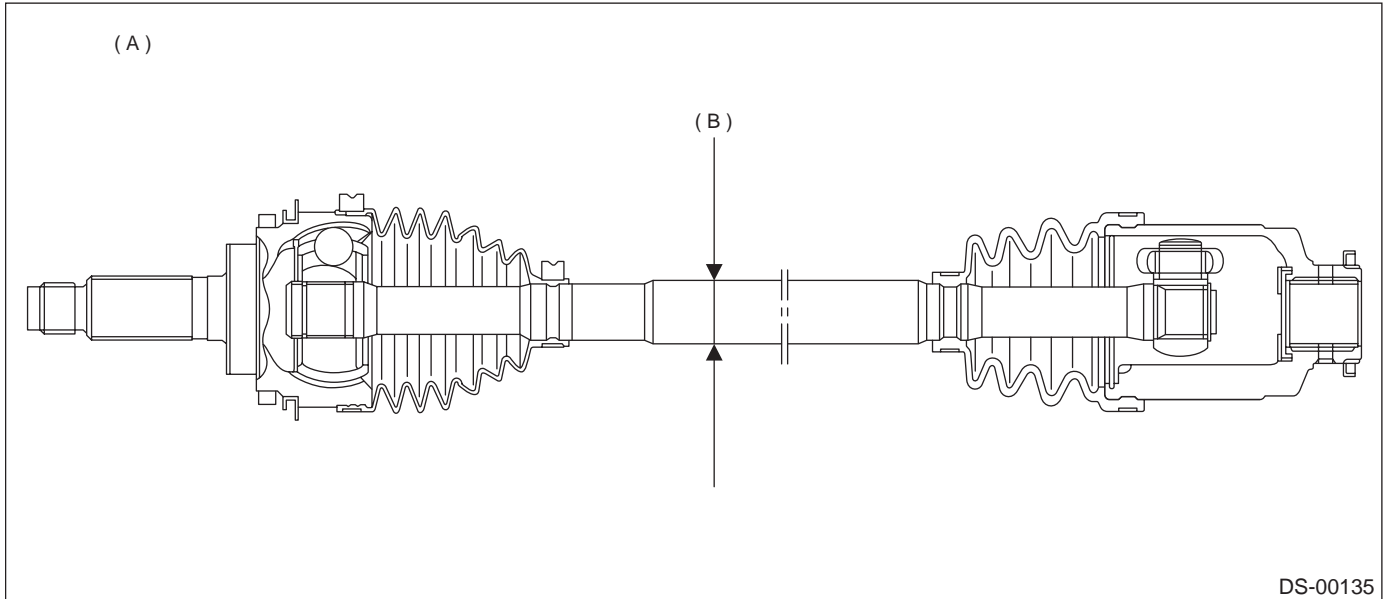
Propeller shaft type		DOJ type
Front propeller shaft Joint-to-joint length: L_1 mm (in)	AT	629 (24.76)
	MT	688 (27.09)
Rear propeller shaft Joint-to-joint length: L_2 mm (in)		773 (30.43)
Outside diameter of tube: mm (in)	D_1	63.5 (2.500)
	D_2	57.0 (2.244)



DS-00134

2. FRONT DRIVE SHAFT ASSEMBLY

Model	Type of drive shaft assembly	SHAFT	Boot band identification
		Shaft diameter	Color
2.5 L MT	BJ87+SFJ82	28 mm (1.10 in)	Pink
Except 2.5 L MT	BJ87+SFJ82	26 mm (1.02 in)	—
TURBO	BJ87+SFJ82	26 mm (1.02 in)	Yellow



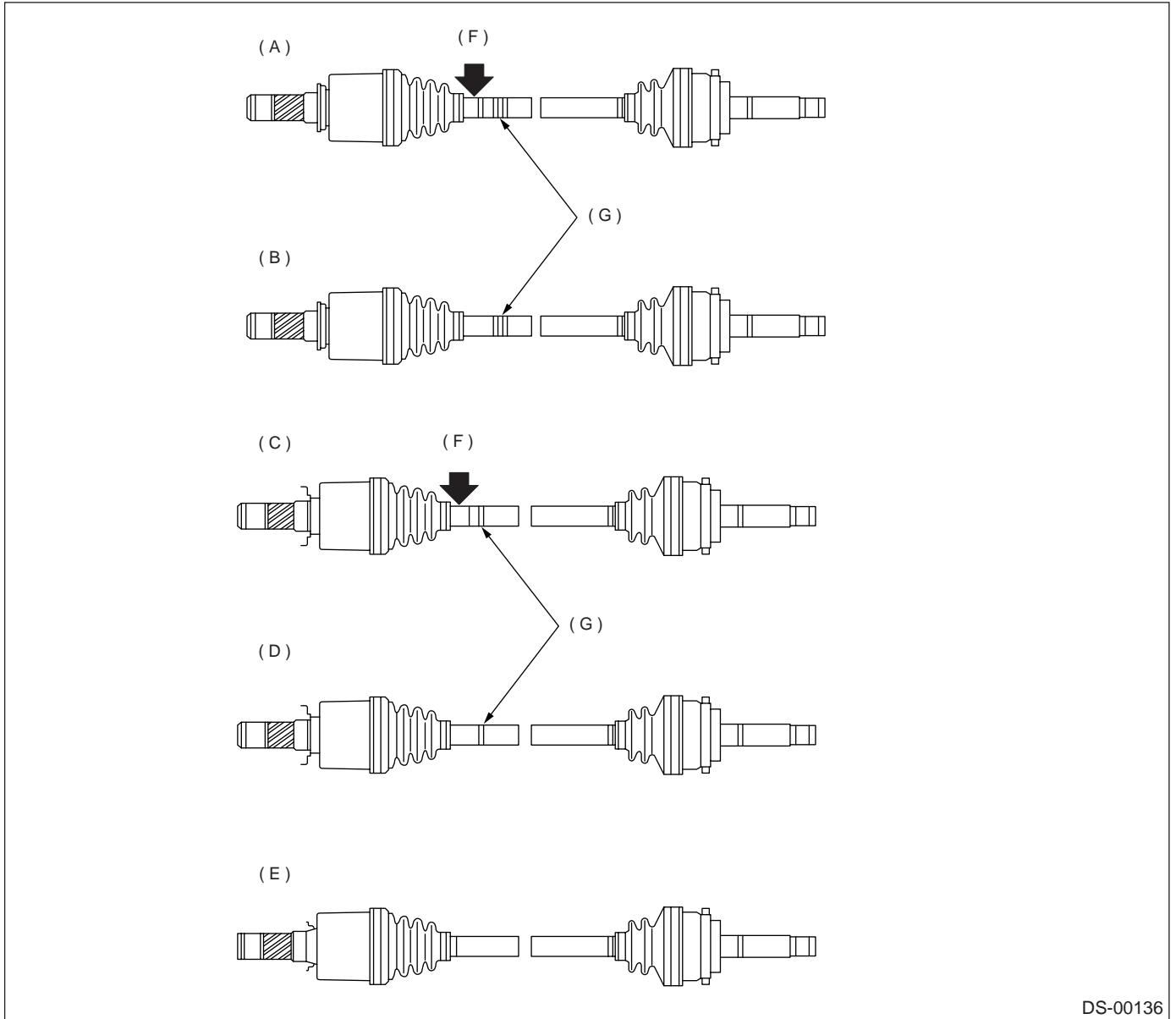
- (A) BJ87+SFJ82
- (B) Measuring point

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

3. REAR DRIVE SHAFT ASSEMBLY

Model	2.0 L		2.5 L			3.0 L	TURBO
	AT	MT	MT	AT (Without VDC)	AT (With VDC)		
Shaft	79AC	79AC-RH, 79AC-LH			82AC-RH, 82AC-LH		
No. of identification protrusion on shaft	None	1 (One)			2 (Two)		



DS-00136

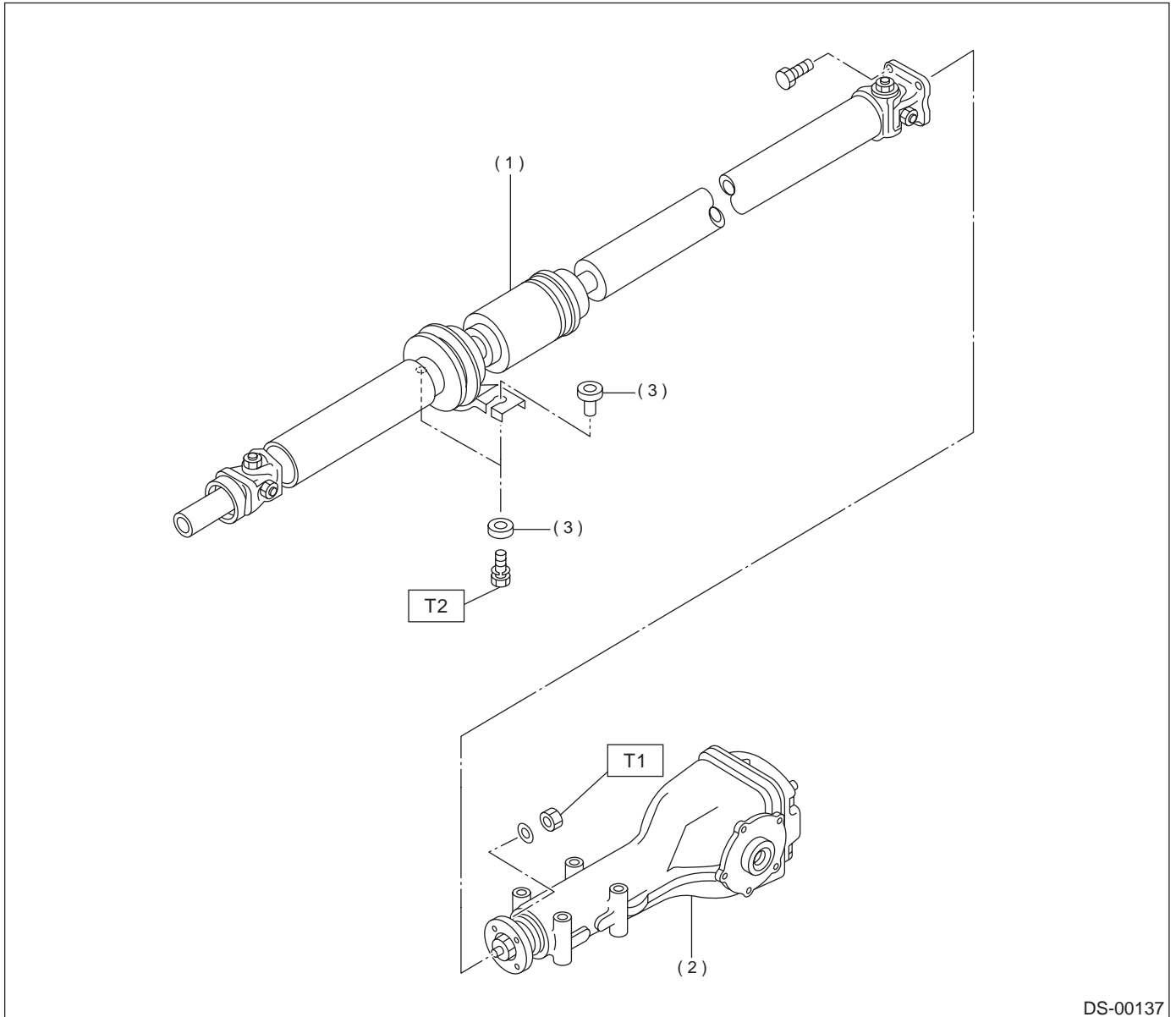
- (A) 82AC-RH
- (B) 82AC-LH
- (C) 79AC-RH

- (D) 79AC-LH
- (E) 79AC
- (F) Indication mark of RH

- (G) Identification protrusion

B: COMPONENT

1. PROPELLER SHAFT



DS-00137

- (1) Propeller shaft
- (2) Rear differential
- (3) Bushing

Tightening torque: N·m (kgf·m, ft·lb)

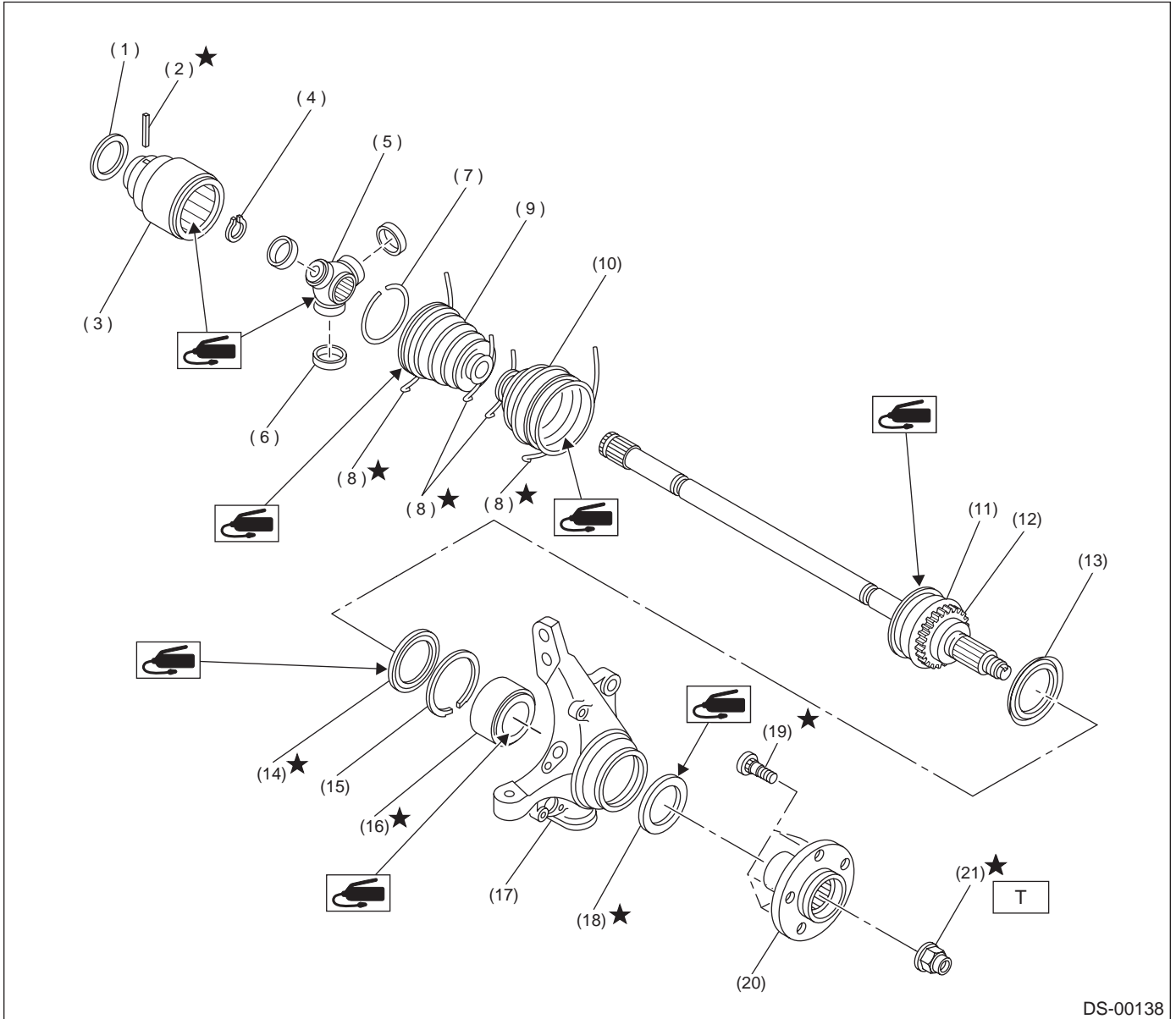
T1: 31 (3.2, 23.1)

T2: 52 (5.3, 38.3)

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

2. FRONT AXEL



DS-00138

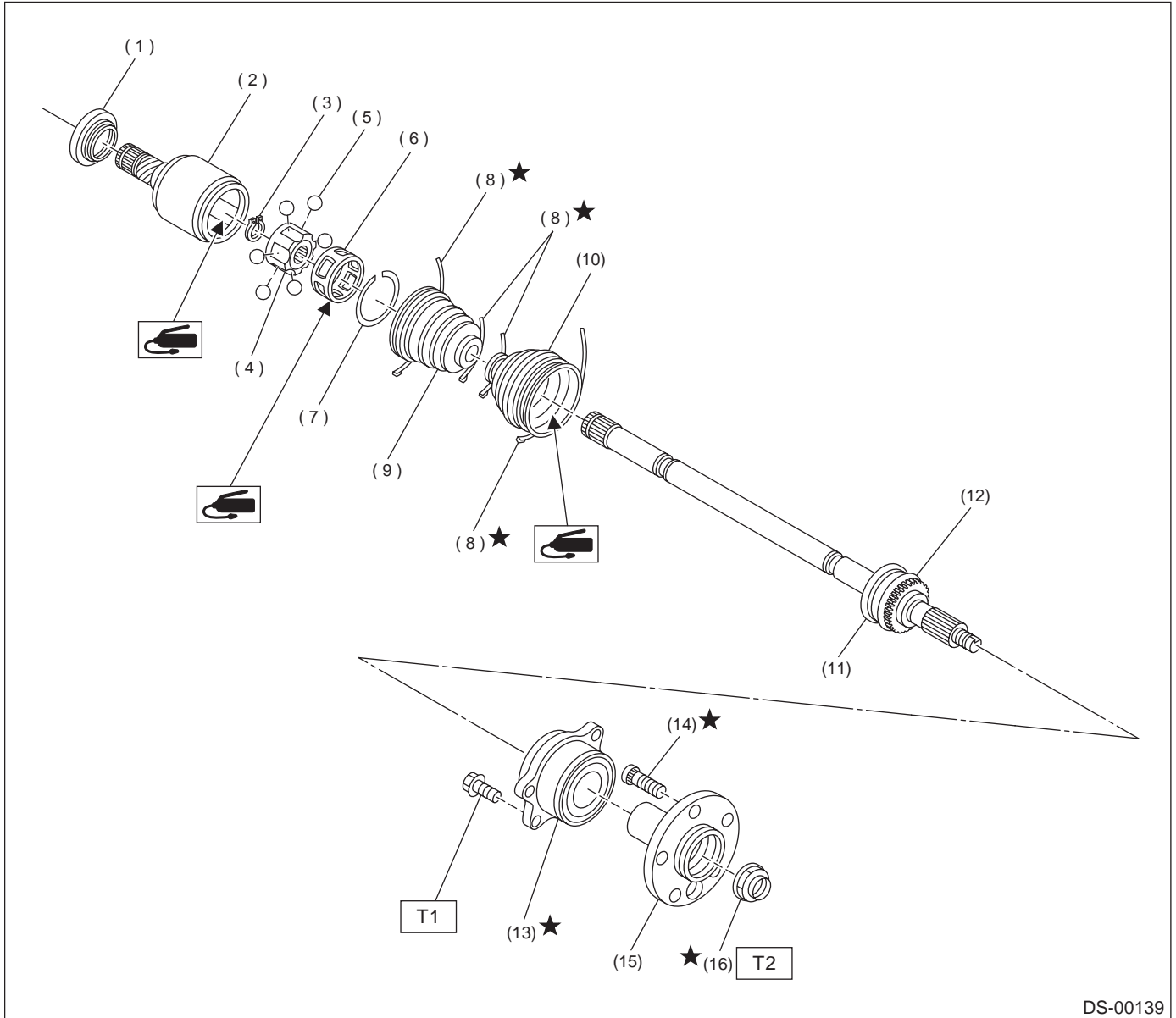
- (1) Baffle plate (SFJ)
- (2) Spring pin ★
- (3) Outer race (SFJ)
- (4) Snap ring
- (5) Trunnion
- (6) Free ring
- (7) Circlip
- (8) Boot band ★
- (9) Boot (SFJ)

- (10) Boot (BJ)
- (11) BJ ASSY
- (12) Tone wheel
- (13) Baffle plate
- (14) Oil seal (IN) ★
- (15) Snap ring
- (16) Bearing ★
- (17) Housing
- (18) Oil seal (OUT) ★

- (19) Hub bolt ★
- (20) Hub
- (21) Axle nut (Olive color) ★

Tightening torque: N-m (kgf-m, ft-lb)
T: 216 (22, 159)

3. REAR AXLE



DS-00139

- (1) Baffle plate (DOJ)
- (2) Outer race (DOJ)
- (3) Snap ring
- (4) Inner race
- (5) Ball
- (6) Cage
- (7) Circlip

- (8) Boot band
- (9) Boot (DOJ)
- (10) Boot (BJ)
- (11) BJ ASSY
- (13) Hub unit bearing
- (14) Hub bolt

- (15) Hub
- (16) Axle nut (Olive color)

Tightening torque: N-m (kgf-m, ft-lb)

T1: 66 (6.7, 48.5)

T2: 186 (19, 137)

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

C: CAUTION

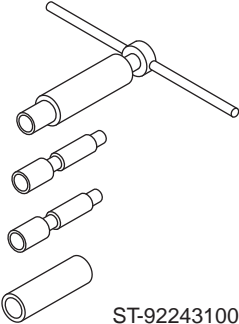
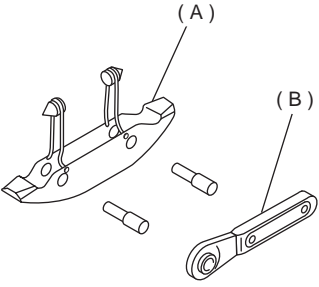
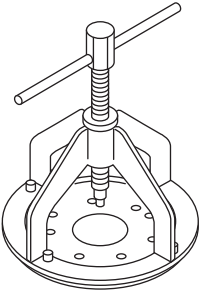
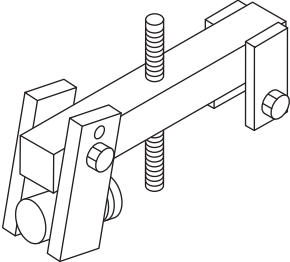
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

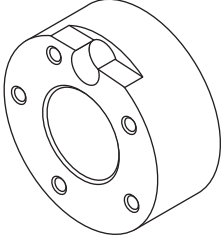
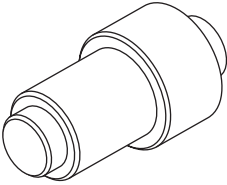
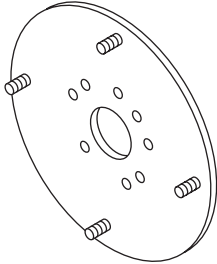
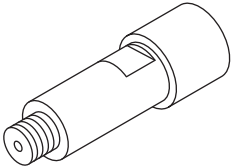
D: MPREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-922431000</p>	922431000	AXLE SHAFT INSTALLER	<ul style="list-style-type: none"> • Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 <p style="text-align: center;">ST-925091000</p>	925091000	BAND TIGHTENING TOOL	<ul style="list-style-type: none"> • Used for tightening boot band. (A) Jig for band (B) Ratchet wrench
 <p style="text-align: center;">ST-926470000</p>	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 <p style="text-align: center;">ST-927060000</p>	927060000	HUB REMOVER	<ul style="list-style-type: none"> • Used for removing front hub. • Used with HUB STAND (927080000).

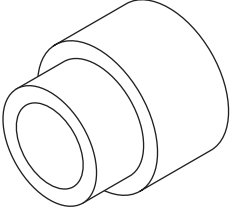
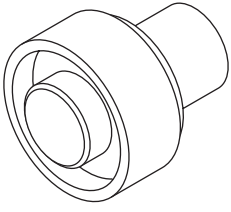
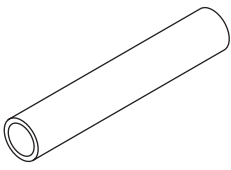
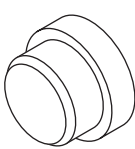
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927080000</p>	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.
 <p style="text-align: center;">ST-927100000</p>	927100000	BEARING PULLER	<ul style="list-style-type: none"> • Used for disassembling and assembling front housing bearing. • Used with HOUSING STAND (927400000).
 <p style="text-align: center;">ST-927140000</p>	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).
 <p style="text-align: center;">ST-927390000</p>	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).

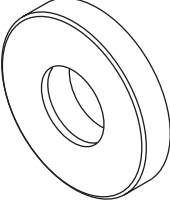
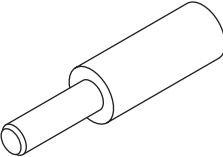
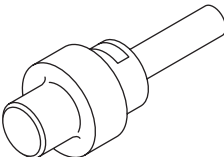
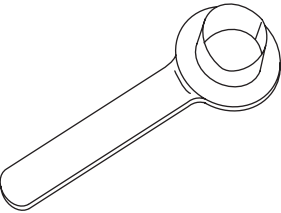
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927400000</p>	<p style="text-align: center;">927400000</p>	<p>HOUSING STAND</p>	<ul style="list-style-type: none"> • Used for disassembling and assembling front housing bearing. • Used with BEARING PULLER (927100000).
 <p style="text-align: center;">ST-927410000</p>	<p style="text-align: center;">927410000</p>	<p>OIL SEAL INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing oil seal into front housing. • Used with HOUSING STAND (927400000).
 <p style="text-align: center;">ST-398507703</p>	<p style="text-align: center;">398507703</p>	<p>DUMMY COLLAR</p>	<p>Used for removing hub ASSY from hub unit.</p>
 <p style="text-align: center;">ST-399520105</p>	<p style="text-align: center;">399520105</p>	<p>SEAT</p>	<p>Used for removing inner race from hub ASSY.</p>

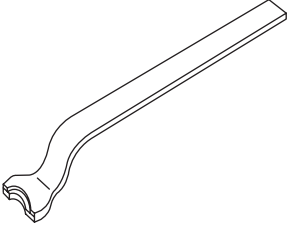
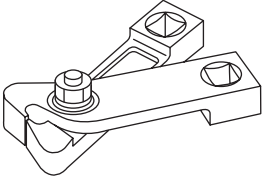
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST28499AE000</p>	28499AE000	BEARING SPACER	Used for installing hub unit into hub ASSY.
 <p style="text-align: center;">ST-927120000</p>	927120000	HUB INSTALLER	Used for installing hub.
 <p style="text-align: center;">ST-927450000</p>	927450000	HUB INSTALLER	<ul style="list-style-type: none"> • Used for installing hub unit into hub ASSY. • Used with BEARING SPACER (28499AE000) and HUB STAND (927080000).
 <p style="text-align: center;">ST28099PA090</p>	28099PA090	OIL SEAL PRO-TECTOR	<ul style="list-style-type: none"> • Used for installing rear drive shaft into rear differential. • For protecting oil seal.

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.
 ST28099AC000	28099AC000	BOOT BAND PLI- ERS	Used for tightening front BJ boot band.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Puller	Used for removing ball joint from knuckle arm.
Dial Gauge	Used for inspecting propeller shaft run-out.
Snap Ring Pliers	Used for installing and removing snap ring.

PROPELLER SHAFT

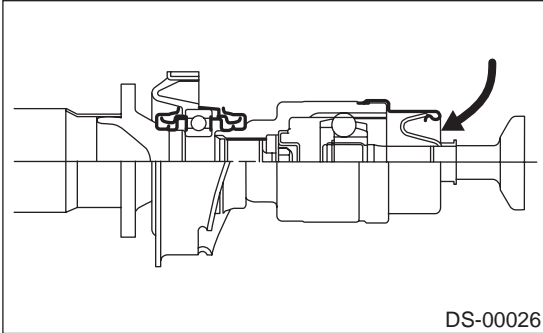
DRIVE SHAFT SYSTEM

2. Propeller Shaft

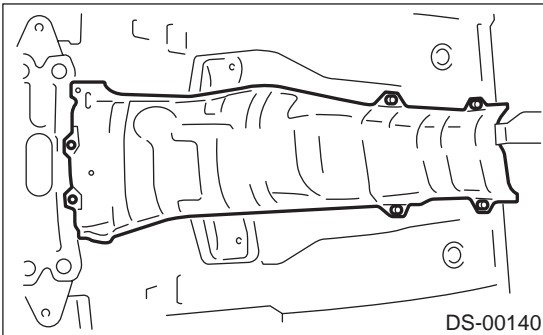
A: REMOVAL

NOTE:

- Before removing propeller shaft, wrap metal parts with a cloth or rubber material.
- In case of DOJ type, before removing propeller shaft, wrap metal parts (installed at the rubber boot of center DOJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be damaged due to interference with adjacent metal parts while bending the DOJ during removal.



- 1) Disconnect ground cable from battery.
- 2) Move select lever or gear shift lever to "N".
- 3) Release the parking brake.
- 4) Jack-up vehicle and support it with sturdy racks.
- 5) Remove center exhaust pipes.
- 6) Remove rear exhaust pipe and muffler.
- 7) Remove heat shield cover.

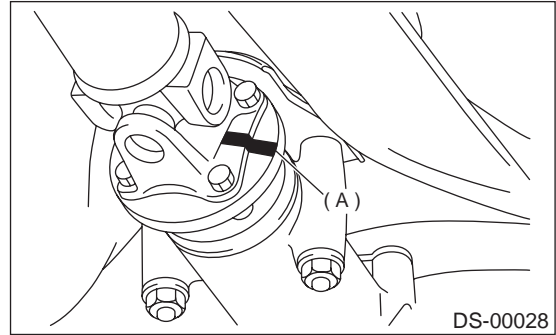


- 8) Put matching marks on propeller shaft and rear differential.

- 9) Remove the four bolts which hold propeller shaft to rear differential.

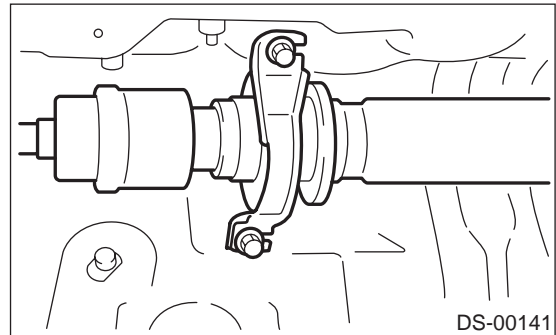
NOTE:

Remove all but one bolt.



(A) Matching mark

- 10) Remove the two bolts which hold center bearing to vehicle body.



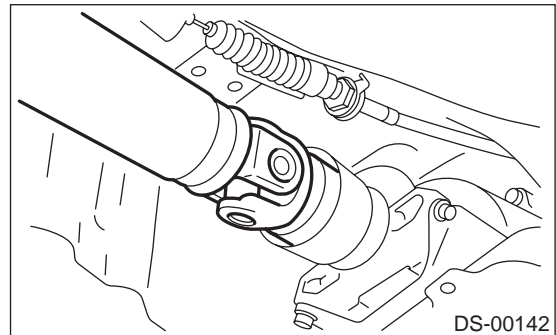
- 11) Remove propeller shaft from transmission.

CAUTION:

Be sure not to damage oil seals and the frictional surface of sleeve yoke.

NOTE:

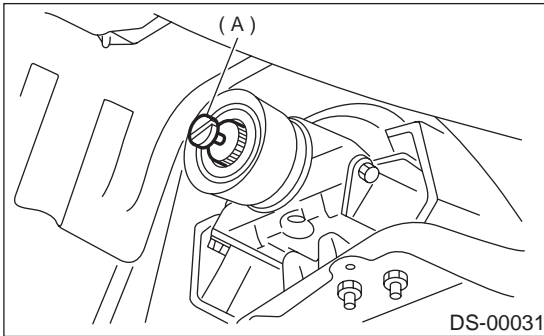
- Be sure to use an empty oil can to catch oil flowing out when removing propeller shaft.
- Be sure to plug the opening in transmission after removal of propeller shaft.



12) Install the extension cap to transmission.

NOTE:

If extension cap is not available, cover the opening with a vinyl bag in order to prevent gear oil or ATF leakage.



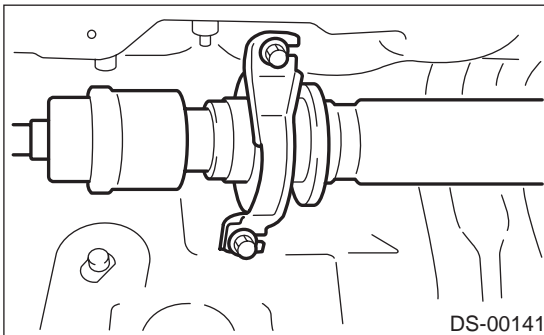
(A) Extension cap

B: INSTALLATION

1) Insert sleeve yoke into transmission and attach center bearing to vehicle body.

Tightening torque:

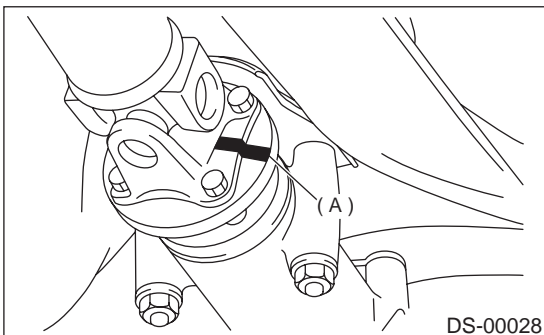
52 N·m (5.3 kgf-m, 38.3 ft-lb)



2) Align matching marks and connect flange yoke and rear differential.

Tightening torque:

31 N·m (3.2 kgf-m, 23.1 ft-lb)



(A) Matching mark

3) Install heat shield cover.
4) Install center exhaust pipes.

5) Install rear exhaust pipe and muffler.

C: INSPECTION

NOTE:

Do not disassemble propeller shaft. Check the following and replace if necessary.

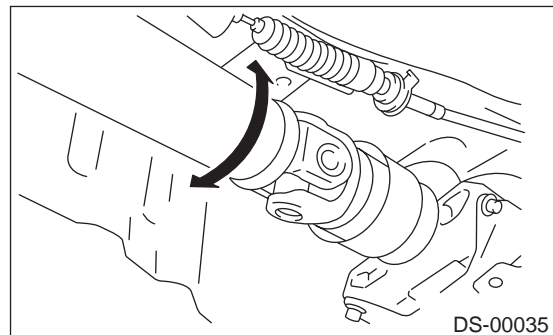
- 1) Tube surfaces for dents or cracks
 - 2) Splines for deformation or abnormal wear
 - 3) Joints for non-smooth operation or abnormal noise
 - 4) Center bearing for free play, noise or non-smooth operation
 - 5) Oil seals for abnormal wear or damage
 - 6) Center bearing for breakage
- Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

- 1) Remove center exhaust pipes.
- 2) Remove heat shield cover.
- 3) Check for any looseness of yoke flange connecting bolts and center bearing retaining bolts.

2. SPLINES AND BEARING LOCATIONS

- 1) Remove center exhaust pipes.
- 2) Remove rear exhaust pipe and muffler.
- 3) Remove heat shield cover.
- 4) Turn propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to see if abnormal free play exists at spiders and bearings.



PROPELLER SHAFT

DRIVE SHAFT SYSTEM

3. RUNOUT OF PROPELLER SHAFT

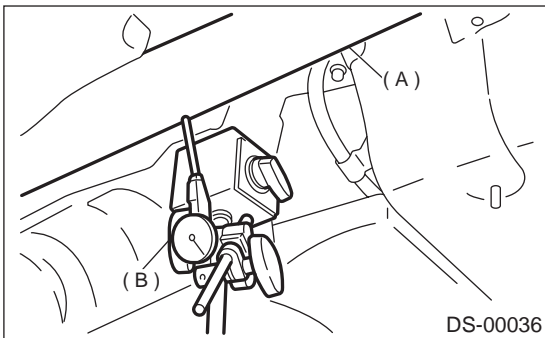
- 1) Remove center exhaust pipes.
- 2) Remove rear exhaust pipe and muffler.
- 3) Remove heat shield cover.
- 4) Turn rear wheels by hand to check for “runout” of propeller shaft.

NOTE:

Measure runout with a dial gauge at the center of front and rear propeller shaft tubes.

Runout:

Limit 0.6 mm (0.024 in)

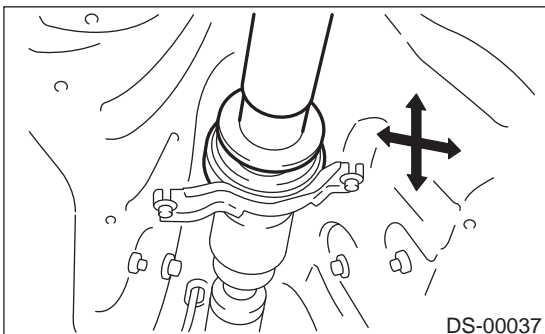


(A) Propeller shaft

(B) Dial gauge

4. CENTER BEARING FREE PLAY

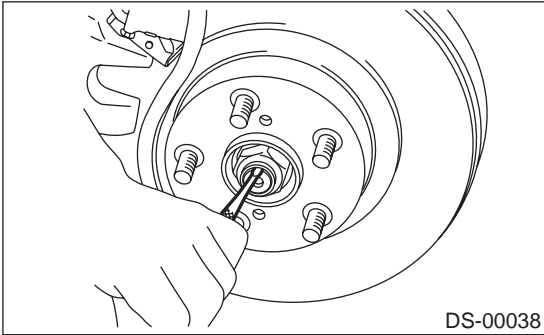
- 1) Remove front and center exhaust pipes.
- 2) Remove rear exhaust pipe and muffler.
- 3) Remove heat shield cover.
- 4) While holding propeller shaft near center bearing with your hand, move it up and down, and left and right to check for any abnormal bearing free play.



3. Front Axle

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Jack-up vehicle, support it with safety stands, and remove front wheels.
- 3) Unlock axle nut.

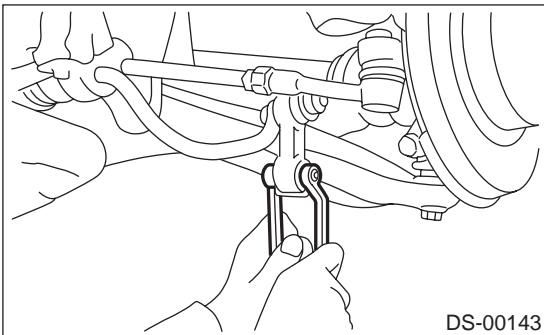


- 4) Remove axle nut using a socket wrench.

CAUTION:

Be sure to loose and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

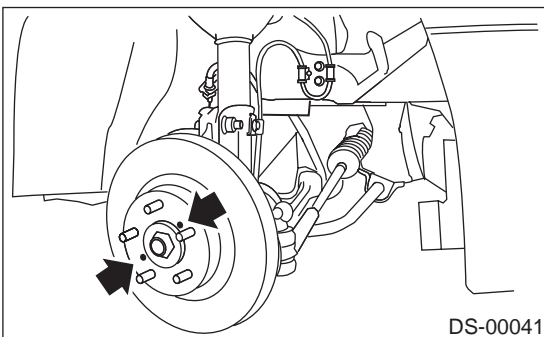
- 5) Remove stabilizer link.



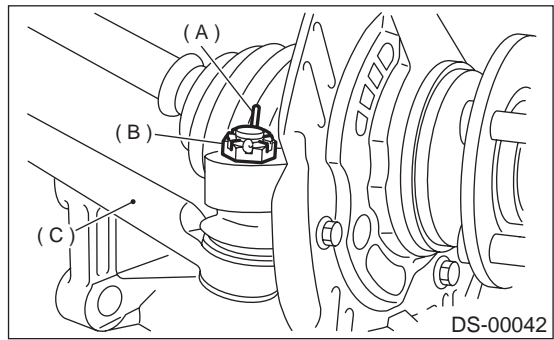
- 6) Remove disc brake caliper from housing, and suspend it from strut using a wire.

- 7) Remove disc rotor from hub.

If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on the rotor.

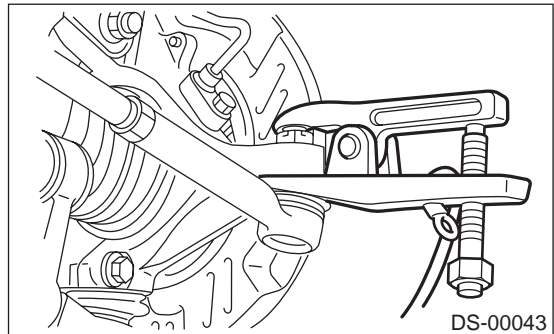


- 8) Remove cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

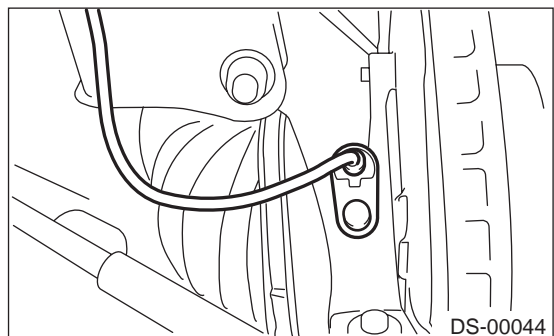


- (A) Cotter pin
- (B) Castle nut
- (C) Tie-rod

- 9) Using a puller, remove tie-rod ball joint from knuckle arm.



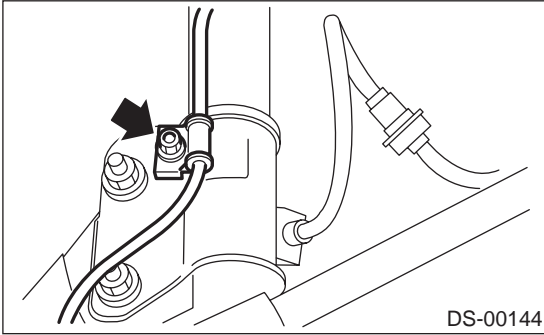
- 10) Remove ABS sensor assembly and harness in advance.



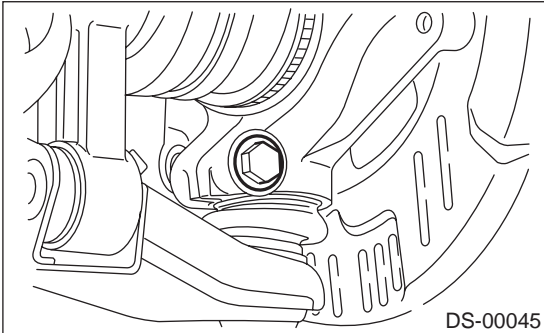
FRONT AXLE

DRIVE SHAFT SYSTEM

11) Remove bolt which secures sensor harness to strut.



12) Remove transverse link ball joint from housing.



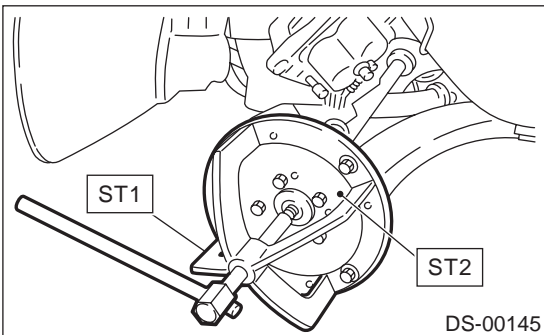
13) Remove SFJ from transmission spindle.

14) Remove front drive shaft assembly from hub. If it is hard to remove, use STs.

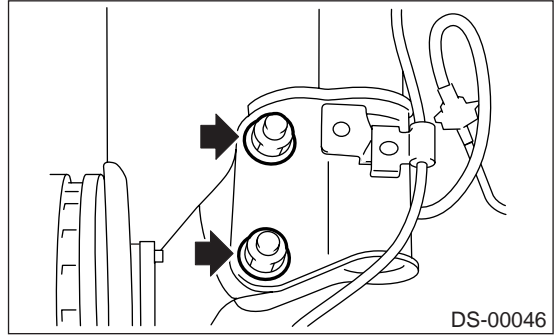
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:

- Be careful not to damage oil seal lip and tone wheel when removing front drive shaft.
- When replacing front drive shaft, also replace inner oil seal.



15) After scribing an alignment mark on camber adjusting bolt head, remove bolts which connect housing and strut, and disconnect housing from strut.



B: INSTALLATION

1) While aligning alignment mark on camber adjusting bolt head, connect housing and strut.

CAUTION:

Use a new self-locking nut.

Tightening torque:

177 N·m (18.0 kgf-m, 130 ft-lb)

2) Install front drive shaft. <Ref. to DS-28, INSTALLATION, Front Drive Shaft.>

3) Install transverse link ball joint to housing.

Tightening torque:

49 N·m (5.0 kgf-m, 36 ft-lb)

4) Install ABS sensor harness on strut.

5) Install ABS sensor on housing.

Tightening torque:

32 N·m (3.3 kgf-m, 23.9 ft-lb)

6) Install disc rotor on hub.

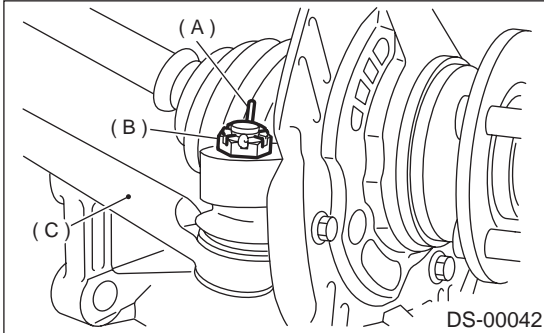
7) Install disc brake caliper on housing.

Tightening torque:

78 N·m (8 kgf-m, 57.9 ft-lb)

- 8) Connect stabilizer link.
- 9) Connect tie-rod end ball joint and knuckle arm with a castle nut, and insert cotter pin into tie-rod end.

Tightening torque:
27.0 N·m (2.75 kgf·m, 19.9 ft·lb)



- (A) Cotter pin
- (B) Castle nut
- (C) Tie-rod

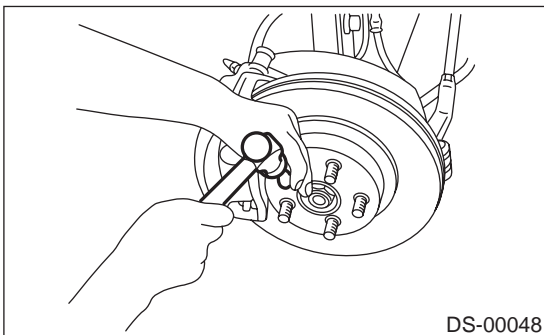
- 10) While depressing brake pedal, tighten axle nut and lock it securely.

Tightening torque:
216 N·m (22 kgf·m, 159 ft·lb)

CAUTION:

- Use a new axle nut (Olive color).
- Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

- 11) After tightening axle nut, lock it securely.

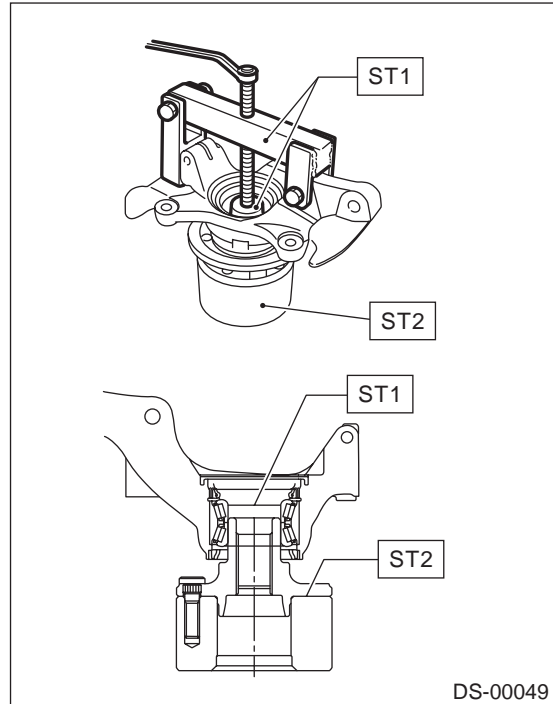


- 12) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:
88 N·m (9 kgf·m, 65 ft·lb)

C: DISASSEMBLY

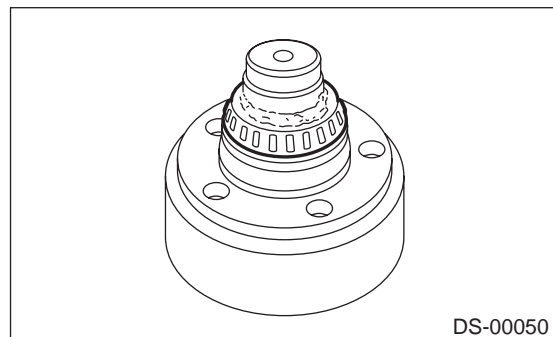
- 1) Using ST1, support housing and hub securely.
 - 2) Attach ST2 to housing and drive hub out.
- ST1 927060000 HUB REMOVER
 ST2 927080000 HUB STAND



If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

CAUTION:

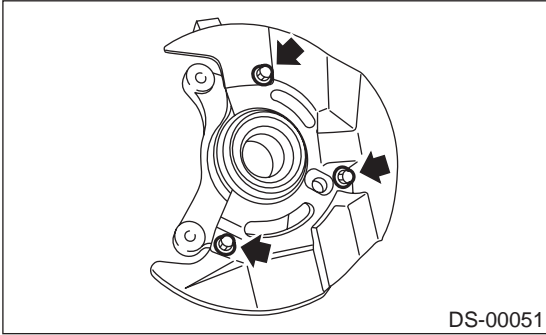
- Be careful not to scratch polished area of hub.
- Be sure to install inner race on the side of outer race from which it was removed.



FRONT AXLE

DRIVE SHAFT SYSTEM

3) Remove disc cover from housing.

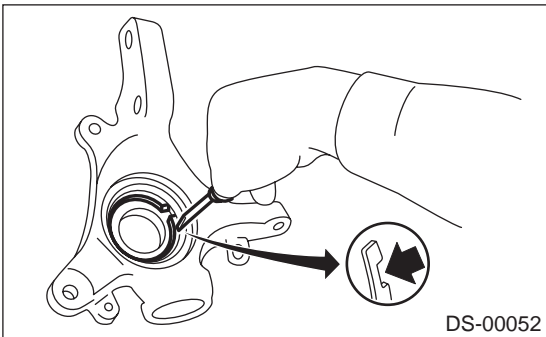


4) Using a standard screwdriver, remove outer and inner oil seals.

CAUTION:

Do not use old oil seals.

5) Using flat-bladed screwdriver, remove snap ring.



6) Using ST1, support housing securely.

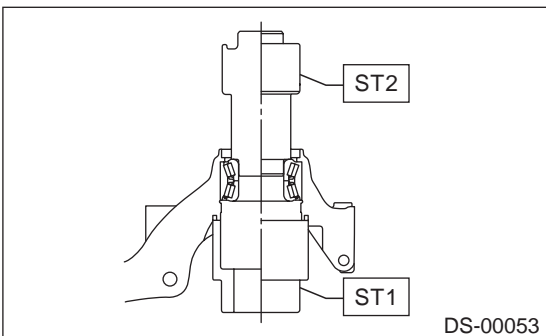
7) Using ST2, press inner race to drive out outer bearing.

ST1 927400000 HOUSING STAND

ST2 927100000 BEARING REMOVER

CAUTION:

- Do not remove outer race unless it is faulty.
- Discard outer race after removal.
- Do not replace inner or outer race separately; always replace as a unit.

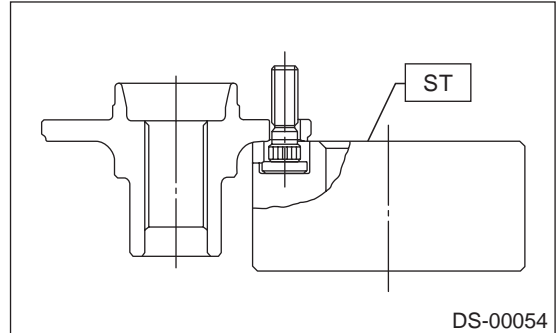


8) Using ST and a hydraulic press, drive hub bolts out.

ST 927080000 HUB STAND

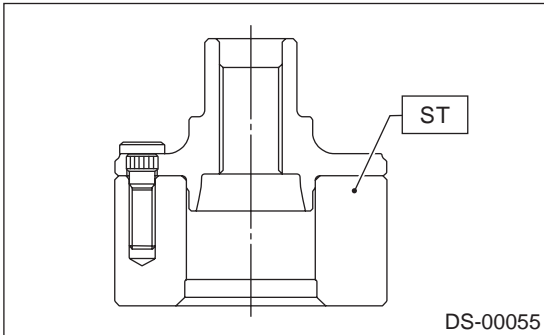
CAUTION:

Be careful not to hammer hub bolts. This may deform hub.



D: ASSEMBLY

- 1) Attach hub to ST securely.
 ST 927080000 HUB STAND



- 2) Using a hydraulic press, press new hub bolts into place.

CAUTION:
 Be sure to press hub bolts until their seating surfaces contact the hub.

NOTE:

Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

- 3) Clean dust or foreign particles from inside the housing.

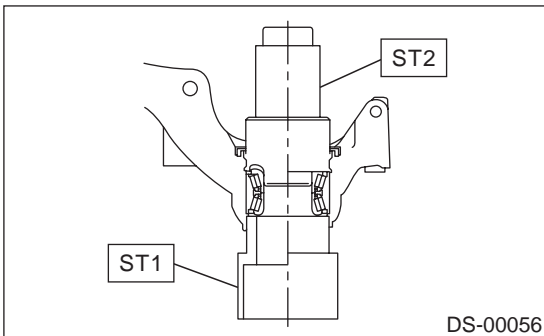
- 4) Using ST1 and ST2, press a new bearing into place.

- ST1 927400000 HOUSING STAND
 ST2 927100000 BEARING REMOVER

CAUTION:

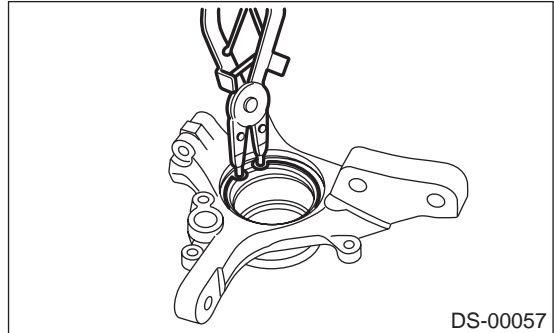
- Always press outer race when installing bearing.
- Be careful not to remove plastic lock from inner race when installing bearing.
- Charge bearing with new grease when outer race is not removed.

Specified grease:
SHELL 6459N



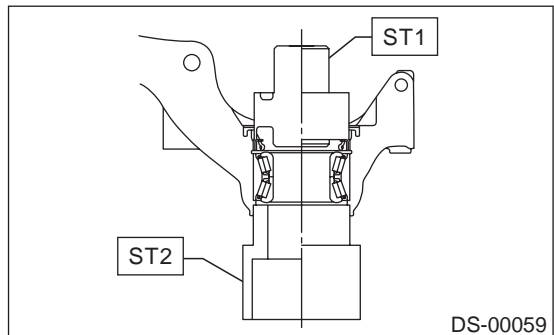
- 5) Using pliers, install snap ring in its groove.

CAUTION:
 Make sure to install it firmly to groove.



- 6) Using ST1 and ST2, press inner oil seal until it contacts circlip.

- ST1 927410000 OIL SEAL INSTALLER
 ST2 927400000 HOUSING STAND

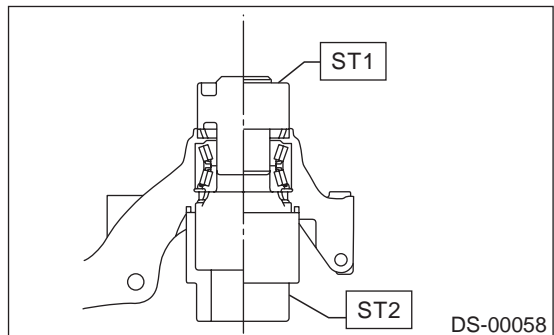


- 7) Invert ST and housing.

- ST 927400000 HOUSING STAND

- 8) Using ST1 and ST2, press outer oil seal until it contacts the bottom of housing.

- ST1 927410000 OIL SEAL INSTALLER
 ST2 927400000 HOUSING STAND



FRONT AXLE

DRIVE SHAFT SYSTEM

9) Apply sufficient grease to oil seal lip.

Specified grease
SHELL 6459N

CAUTION:

- If specified grease is not available, remove bearing grease and apply Auto Rex A instead.
- Do not mix different types of grease.

10) Install disc cover to housing the three bolts.

Tightening torque:

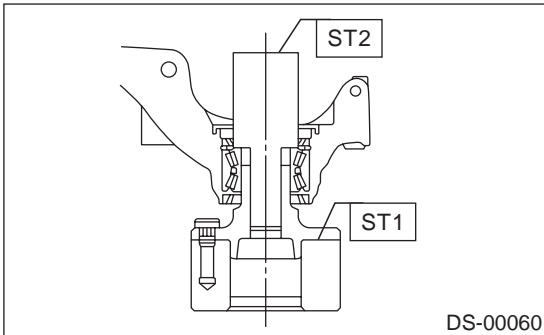
18 N·m (1.8 kgf·m, 13.0 ft·lb)

11) Attach hub to ST1 securely.

12) Clean dust or foreign particles from the polished surface of hub.

13) Using ST2, press bearing into hub by driving inner race.

ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER

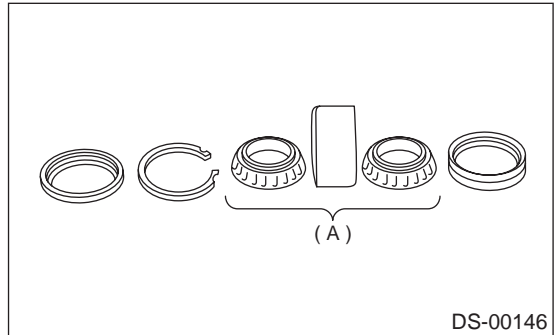


E: INSPECTION

Check the removed parts for wear and damage. If defective, replace with new ones.

CAUTION:

- If bearing is faulty, replace it as the bearing set.
- Be sure to replace oil seal at every overhaul.



(A) Replace as a set.

4. Hub Unit Bearing

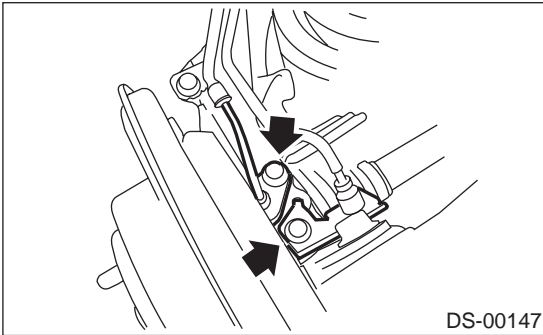
A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Jack-up vehicle, and remove rear wheel cap and wheels.

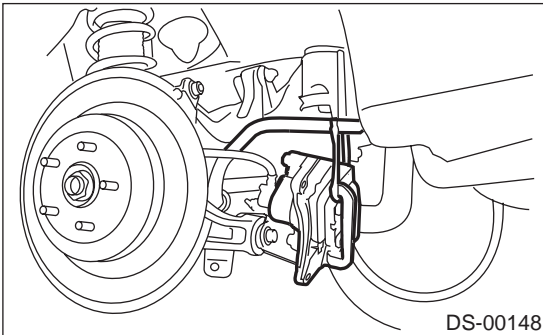
CAUTION:

Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

- 3) Unlock axle nut.
- 4) Remove axle nut using a socket wrench.
- 5) Return parking brake lever.
- 6) Remove ABS sensor.



- 7) Remove brake caliper from back plate and suspend it from stabilizer using a piece of wire.

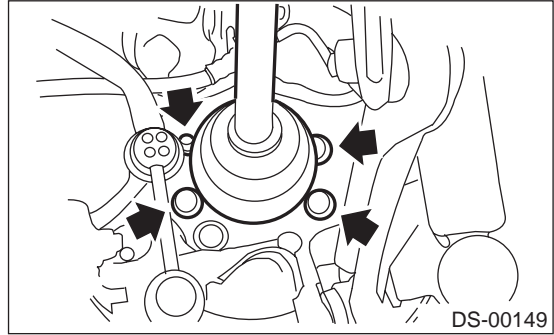


- 8) Remove disc rotor from hub.

NOTE:

- Before removing disc rotor, mark the matching surface of hub and disc rotor so as not to be confused when installing.
- If disc rotor seizes up within hub, drive it out by installing an 8 mm bolt into disc rotor bolt hole.

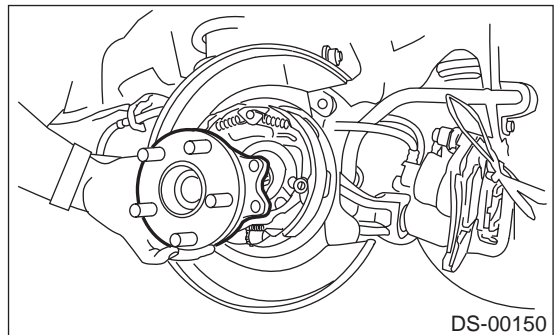
- 9) Remove four bolts from rear arm.



- 10) Remove hub unit bearing.

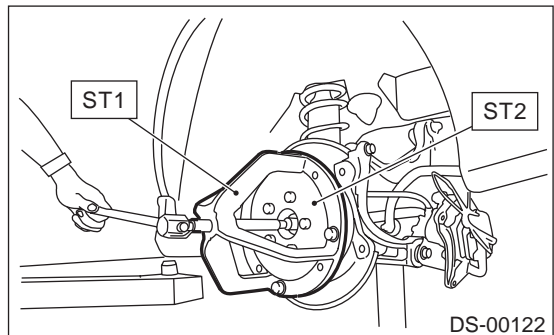
CAUTION:

Be careful not to damage tone wheel.



If it is hard to remove, use STs.

- | | | |
|-----|-----------|-------------------|
| ST1 | 926470000 | AXLE SHAFT PULLER |
| ST2 | 927140000 | PLATE |



HUB UNIT BEARING

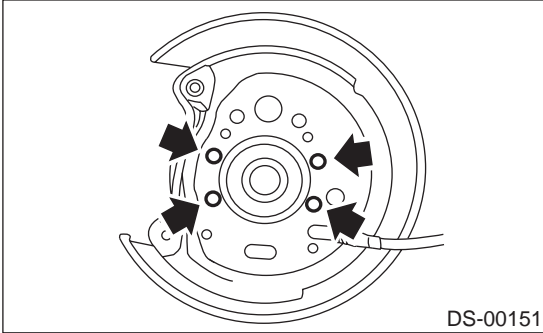
DRIVE SHAFT SYSTEM

B: INSTALLATION

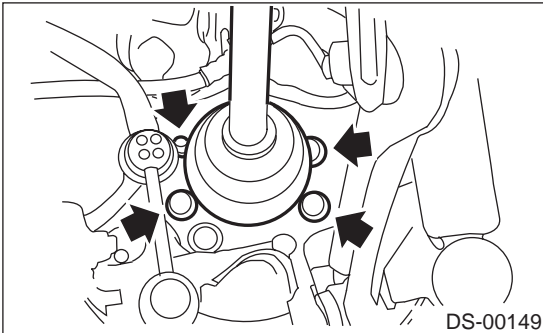
1) Align hub unit bearing with back plate at mounting holes and install hub unit assembly and back plate. Temporarily tighten axle nuts.

CAUTION:

Be careful not to damage tone wheel.



2) Tighten four bolts to back plate.

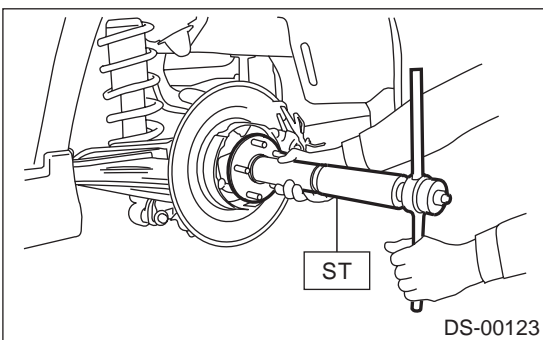


3) Remove axle nut.

4) Using ST1 and ST2, pull axle shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER

ST2 927390000 ADAPTER



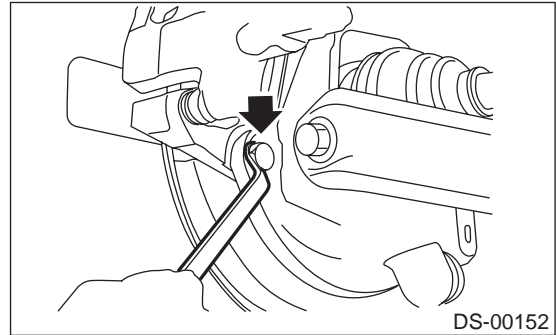
5) Temporarily tighten axle nuts.

6) Install disc rotor on hub.

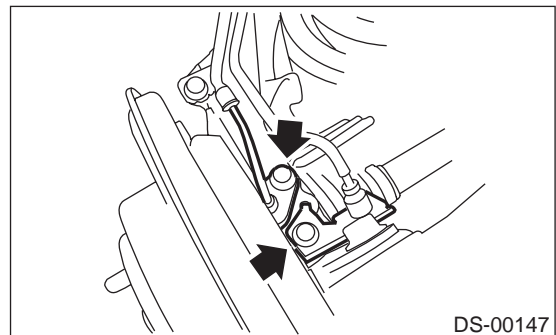
7) Install disc brake caliper on back plate.

Tightening torque:

52 N·m (5.3 kgf·m, 38.3 ft·lb)



8) Install rear ABS sensor and brake cable bracket.



9) Adjust parking brake lever stroke by turning adjuster. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

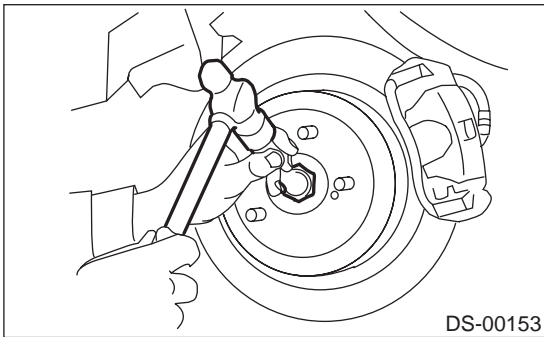
10) Move brake lever back to apply brakes. While depressing brake pedal, tighten axle nut using a socket wrench. Lock axle nut after tightening.

Tightening torque:

186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:

- Use a new axle nut for rear use only (Olive color).
- Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.



11) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:

88 N·m (9 kgf-m, 65 ft-lb)

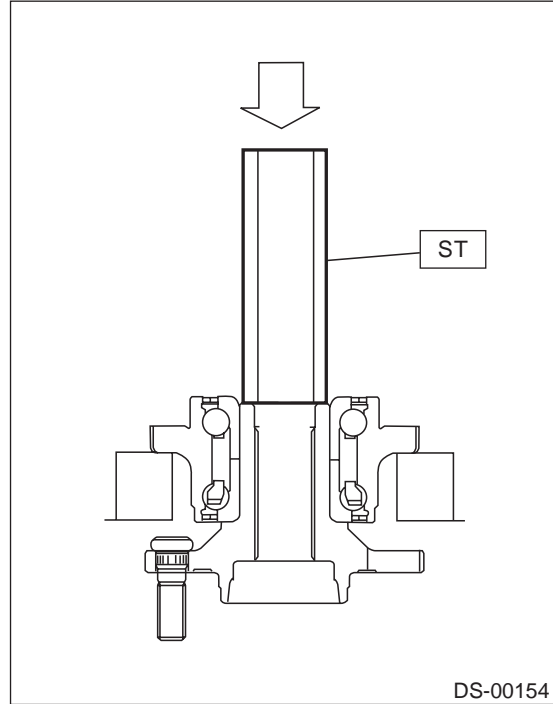
C: DISASSEMBLY

1) Using ST, remove hub unit from hub assembly.

CAUTION:

Securely set hub assembly so that it does not lean.

ST 398507703 DUMMY COLLAR



HUB UNIT BEARING

DRIVE SHAFT SYSTEM

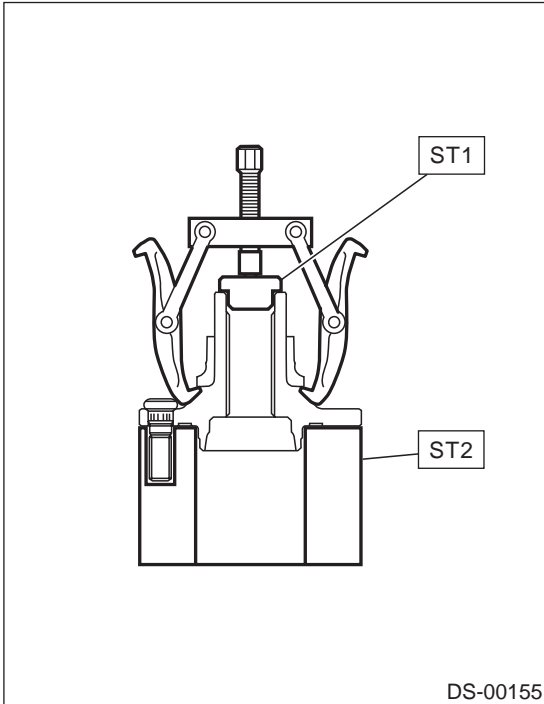
2) Using ST and a puller (common hand tool), remove bearing inner race.

ST1 399520105 SEAT

ST2 927080000 HUB STAND

CAUTION:

- Do not remove hub unit bearing unless damaged.
- Do not re-use hub unit bearing after removal.

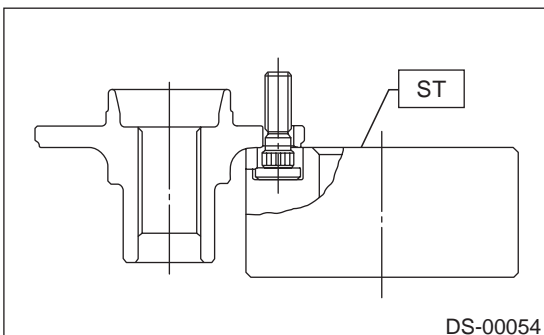


3) Using ST, press hub bolt out.

ST 927080000 HUB STAND

CAUTION:

Be careful not to hammer hub bolts. This may deform hub.



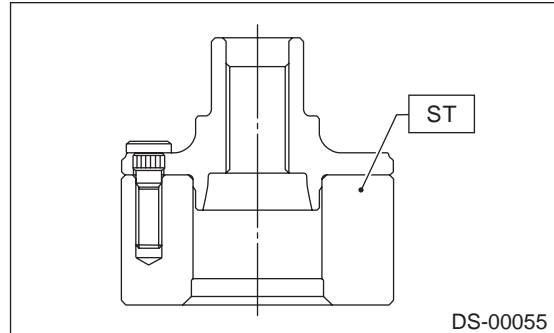
D: ASSEMBLY

1) Using ST, press new hub bolt into place.

CAUTION:

- Ensure hub bolt closely contacts hub.
- Use a 12 mm (0.47 in) hole in the ST to prevent hub bolt from tilting during installation.

ST 927080000 HUB STAND

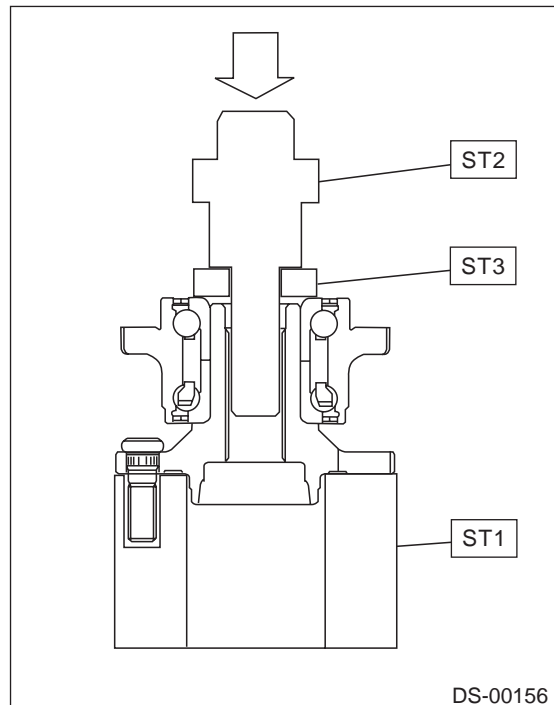


2) Using ST1, ST2 and ST3, press hub unit bearing into hub.

ST1 927080000 HUB STAND

ST2 927450000 HUB INSTALLER

ST3 28499AE000 SPACER



CAUTION:

- Always press inner race when installing hub unit bearing.
- Use a new hub unit bearing.

E: INSPECTION

Check the removed parts for wear and damage. If defective, replace with new ones.

CAUTION:

If a bearing is faulty, replace it as a hub unit bearing.

FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

5. Front Drive Shaft

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Jack-up vehicle, support it with safety stands (rigid rocks), and remove front wheel cap and wheels.
- 3) Unlock axle nut.
- 4) Depress brake pedal and remove axle nut using a socket wrench.

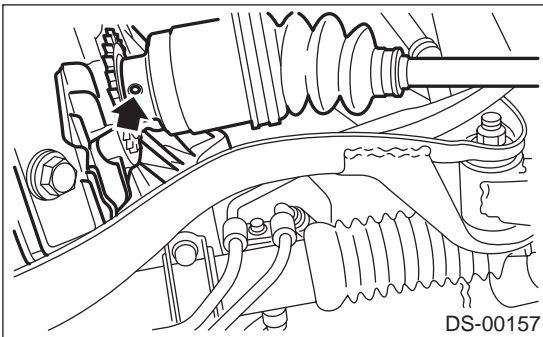
CAUTION:

Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

- 5) Remove stabilizer link from transverse link.
- 6) Disconnect transverse link from housing.
- 7) Remove spring pin which secures transmission spindle to SFJ.

CAUTION:

Use a new spring pin.

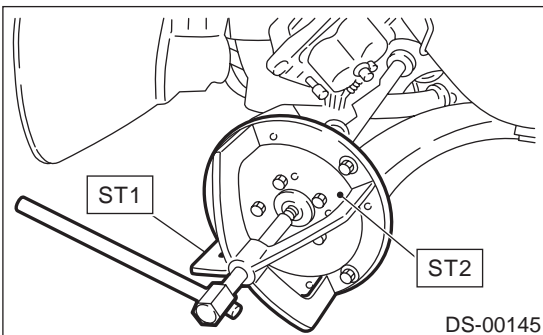


- 8) Remove front drive shaft assembly. If it is hard to remove, use ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:

- Be careful not to damage oil seal lip and tone wheel when removing front drive shaft.
- When front drive shaft is to be replaced, also replace inner oil seal.



B: INSTALLATION

- 1) Insert BJ into hub splines.

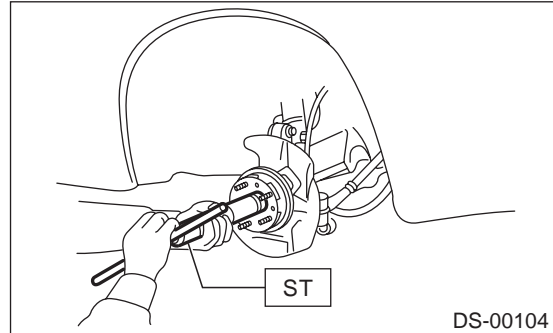
CAUTION:

Be careful not to damage inner oil seal lip and tone wheel.

- 2) Using ST1 and ST2, pull drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

CAUTION:

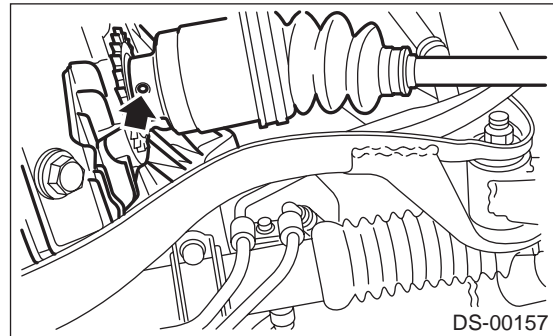
Do not hammer drive shaft when installing it.



- 3) Tighten axle nut temporarily.
- 4) Install SFJ on transmission spindle and drive spring pin into place.

CAUTION:

Always use a new spring pin.



- 5) Connect transverse link to housing.

Tightening torque (self-locking nut):
49 N·m (5.0 kgf·m, 36 ft·lb)

CAUTION:

Use a new self-locking nut.

- 6) Install stabilizer bracket.

7) While depressing brake pedal, tighten axle nut to the specified torque.

Tightening torque:

216 N·m (22 kgf·m, 159 ft·lb)

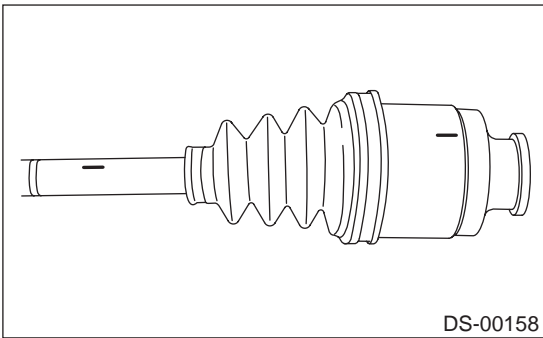
CAUTION:

- Use a new axle nut (Olive color).
- Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

8) After tightening axle nut, lock it securely.

C: DISASSEMBLY

1) Place alignment marks on shaft and outer race.

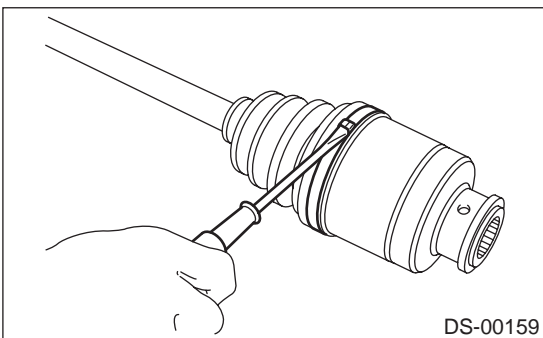


DS-00158

2) Remove SFJ boot band and boot.

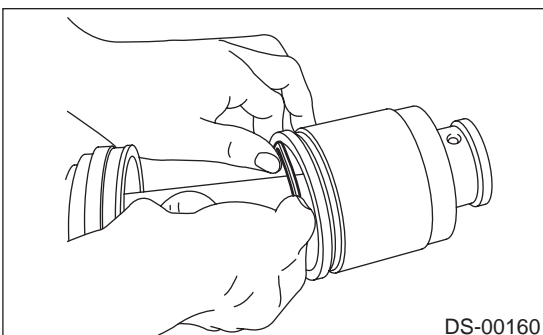
CAUTION:

Be careful not to damage boot.



DS-00159

3) Remove circlip from SFJ outer race using screwdriver.



DS-00160

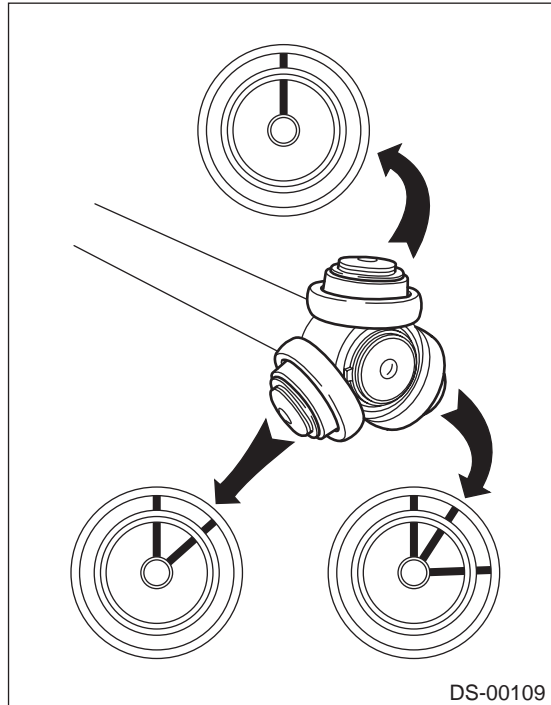
4) Remove SFJ outer race from shaft assembly.

5) Wipe off grease.

CAUTION:

The grease is a special grease. Do not confuse with other greases.

6) Place alignment mark on free ring and trunnion.



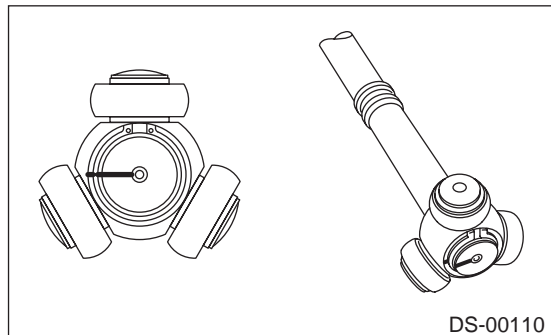
DS-00109

7) Remove free ring from trunnion.

CAUTION:

Be careful with the free ring position.

8) Place alignment mark on trunnion and shaft.

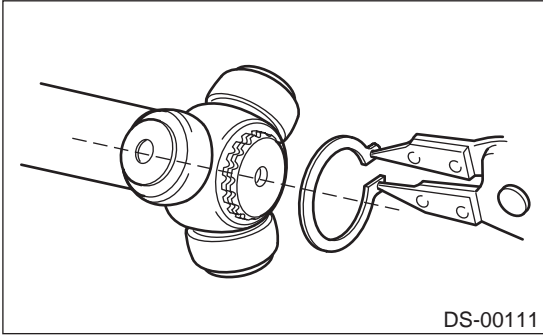


DS-00110

FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

9) Remove snap ring and trunnion.



CAUTION:

Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

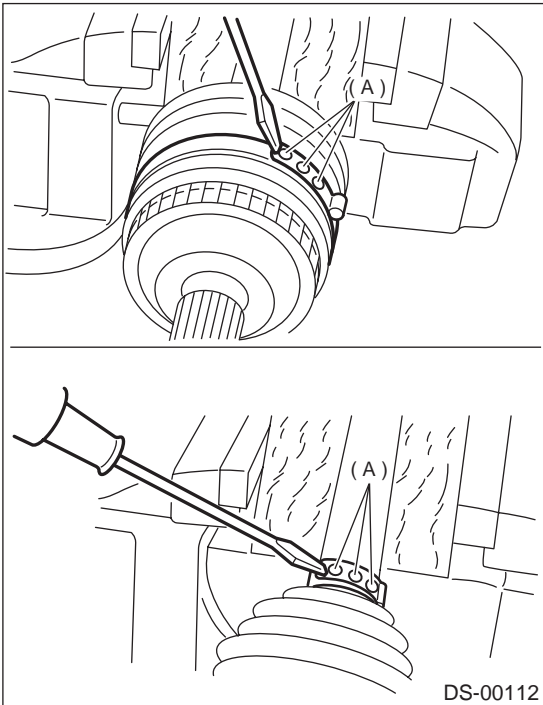
10) Remove SFJ boot.

11) Place drive shaft in a vise between wooden blocks.

CAUTION:

Do not place drive shaft directly in the vise; use wooden block.

12) Raise boot band claws by means of screwdriver and hammer.

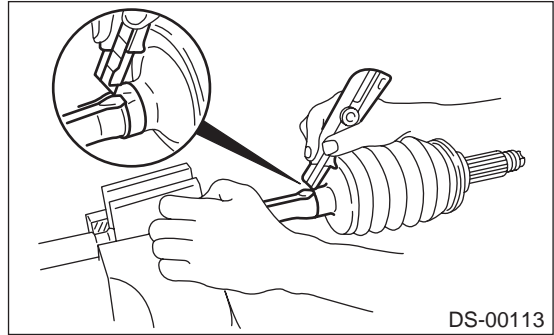


(A) Boot band claws

13) Cut and remove the boot.

CAUTION:

The boot must be replaced with a new one whenever it is removed.



14) Disassembly of axle is completed at steps above because BJ cannot be disassembled.

D: ASSEMBLY

CAUTION:

Use specified grease.

BJ side:

NTG2218 (Part No. 28093AA000)

SFJ side:

SSG6003 (Part No. 28093TA000)

1) Place BJ boot and small boot band on BJ side of shaft.

CAUTION:

Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

2) Place drive shaft in a vise.

CAUTION:

Do not place drive shaft directly in the vise; use wooden blocks.

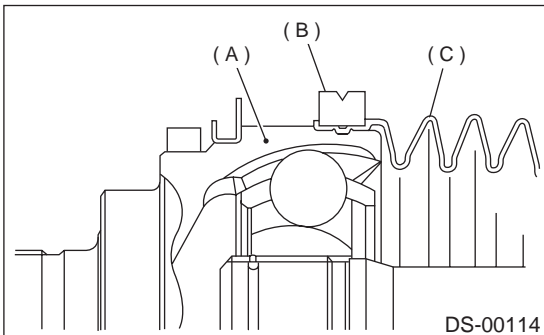
3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to BJ.

4) Apply an even coat of specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.

NOTE:

The inside of the larger end of BJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.

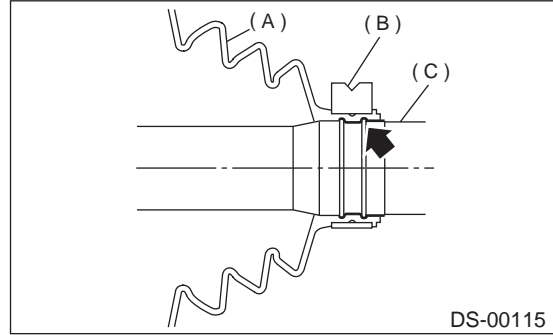
5) Install boot projecting portion to BJ groove.



- (A) BJ
- (B) Large boot band
- (C) Boot

6) Set large boot band in place.

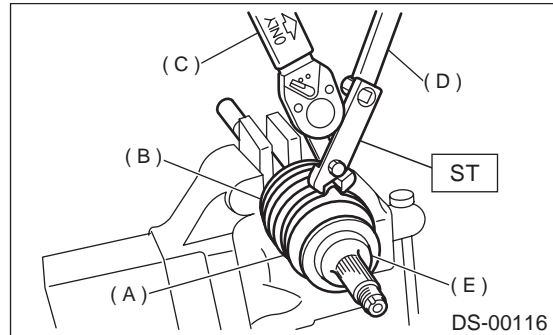
7) Install boot projecting portion to shaft groove.



- (A) Boot
- (B) Small boot band
- (C) Shaft

8) Tighten boot bands using ST, torque wrench and socket flex handle.

ST 28099AC000 BOOT BAND PLIER



- (A) Large boot band
- (B) Boot
- (C) Torque wrench
- (D) Socket flex handle
- (E) BJ

Tightening torque:

Large boot band

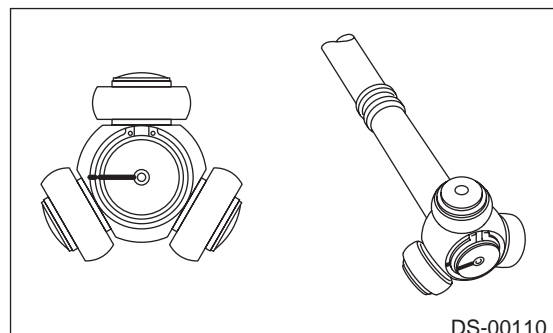
157 N·m (16.0 kgf-m, 116 ft-lb) or more

Small boot band

133 N·m (13.6 kgf-m, 98 ft-lb) or more

9) Place SFJ boot at the center of shaft.

10) Align alignment marks and install trunnion on shaft.



DS-00110

FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

11) Install snap ring to shaft.

CAUTION:

Confirm that the snap ring is completely fitted in the shaft groove.

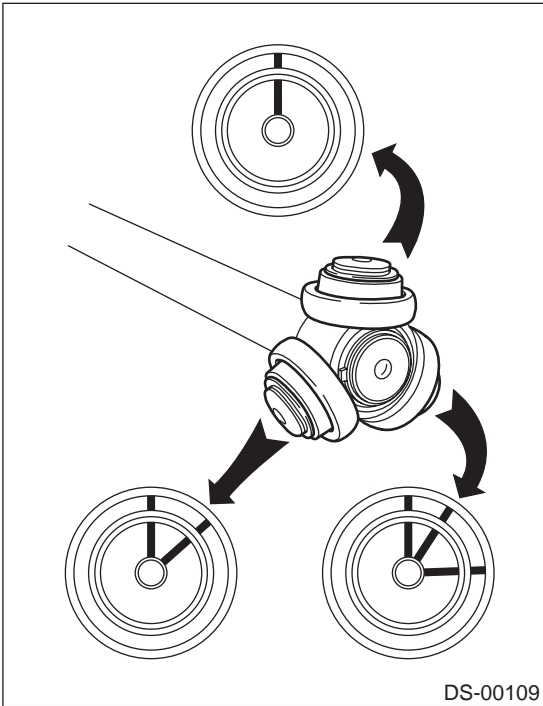
12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of SFJ outer race.

13) Apply a coat of specified grease to free ring and trunnion.

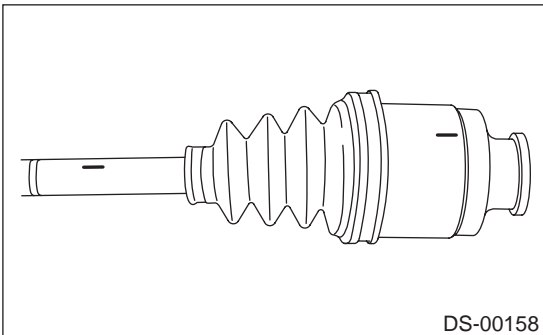
14) Align alignment marks on free ring and trunnion and install free ring.

CAUTION:

Be careful with the free ring position.



15) Align alignment marks on shaft and outer race, and install outer race.



16) Install circlip in the groove on SFJ outer race.

CAUTION:

Pull the shaft lightly and assure that the circlip is completely fitted in the groove.

17) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.

18) Install SFJ boot taking care not to twist it.

CAUTION:

The inside of the larger end of SFJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.

When installing SFJ boot, position outer race of SFJ at center of its travel.

19) Put a band through the clip and wind twice in alignment with band groove of boot.

CAUTION:

Use a new band.

20) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:

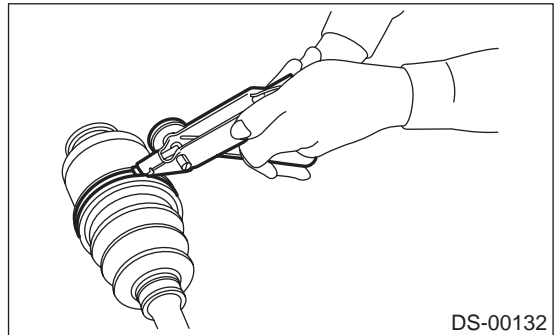
When tightening boot, exercise care so that the air within the boot is appropriate.

21) Tighten band by using ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten band until it cannot be moved by hand.

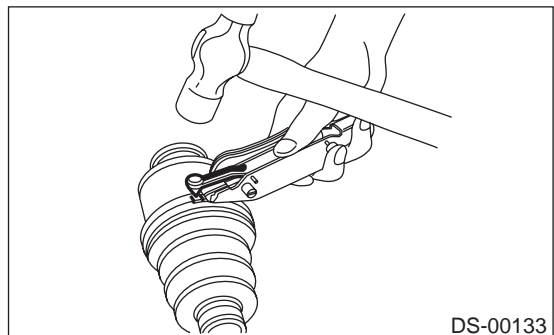


22) Tap on the clip with the punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

CAUTION:

Tap to an extent that the boot underneath is not damaged.



23) Cut off band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:

Be careful so that the end of the band is in close contact with clip.

24) Fix up boot on BJ in the same manner.

NOTE:

Extend and retract SFJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.

1) DOJ (Double Offset Joint)

Check seizure, corrosion, damage, wear and excessive play.

2) SFJ (Shudder-less Free-ring tripod Joint)

Check seizure, corrosion, damage and excessive play.

3) Shaft

Check excessive bending, twisting, damage and wear.

4) BJ (Bell Joint)

Check seizure, corrosion, damage and excessive play.

5) Boot

Check for wear, warping, breakage or scratches.

6) Grease

Check for discoloration or fluidity.

REAR DRIVE SHAFT

DRIVE SHAFT SYSTEM

6. Rear Drive Shaft

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Lift-up vehicle, and remove rear wheel cap and wheels.

CAUTION:

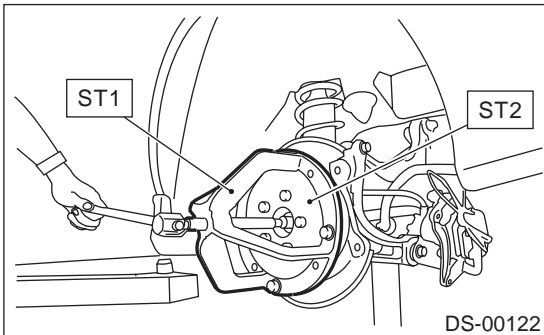
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

- 3) Unlock axle nut.
- 4) Remove axle nut using a socket wrench.
- 5) Remove rear differential assembly.
With T-type
<Ref. to DI-24, REMOVAL, Rear Differential for T-type.>
With VA-type
<Ref. to DI-41, REMOVAL, Rear Differential for VA-type.>
- 6) Remove axle nut and drive shaft. If it is hard to remove, use ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:

Be careful not to damage tone wheel when removing rear drive shaft.



B: INSTALLATION

- 1) Insert BJ into rear hub splines.

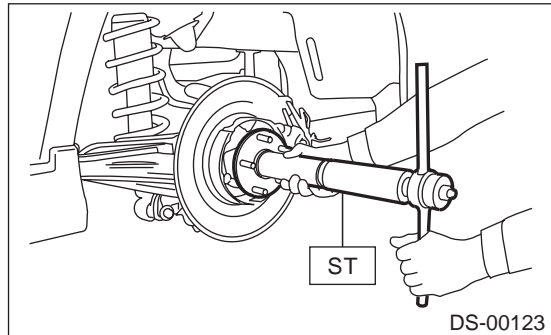
CAUTION:

Be careful not to damage tone wheel.

- 2) Using ST1 and ST2, pull drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

CAUTION:

Do not hammer drive shaft when installing it.



- 3) Tighten axle nut temporarily.
- 4) Install rear differential.
With T-type
<Ref. to DI-25, INSTALLATION, Rear Differential for T-type.>
With VA-type
<Ref. to DI-42, INSTALLATION, Rear Differential for VA-type.>
- 5) While depressing brake pedal, tighten axle nut using a socket wrench.

Tightening torque:

186 N·m (19 kgf-m, 137 ft-lb)

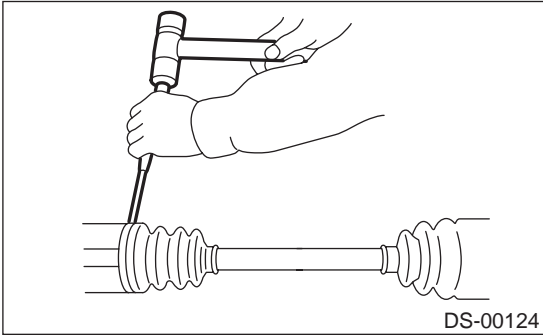
CAUTION:

- Use a new axle nut for rear use only (Olive color).
- Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

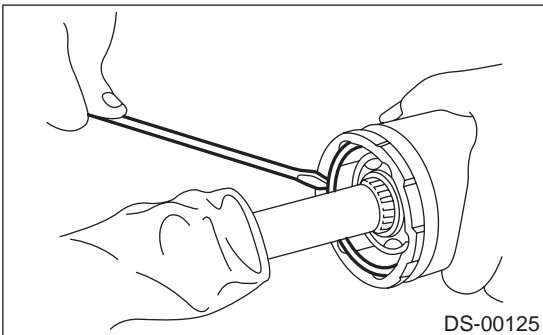
- 6) After tightening axle nut, lock it securely.

C: DISASSEMBLY

- 1) Straighten bent claw of larger end of DOJ boot.
- 2) Loosen band by means of screwdriver or pliers, being careful not to damage the boot.



- 3) Remove boot band on the small end of DOJ boot in the same manner.
- 4) Remove the larger end of DOJ boot from DOJ outer race.
- 5) Pry and remove round circlip located at the neck of DOJ outer race with a screwdriver.



- 6) Take out DOJ outer race from shaft assembly.

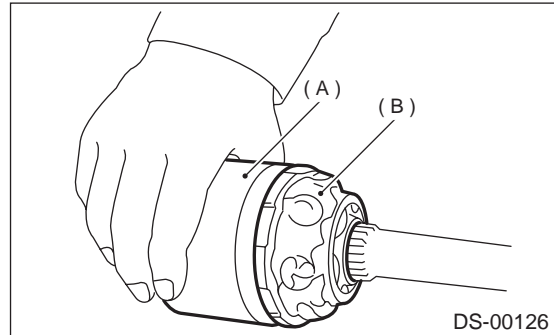
- 7) Wipe off grease and take out balls.

CAUTION:

The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.

NOTE:

Disassemble exercising care not to lose balls (6 pcs).



- (A) Outer race
- (B) Grease

- 8) To remove the cage from the inner race, turn the cage by a half pitch to the track groove of the inner race and shift the cage.
- 9) Remove snap ring, which fixes inner race to shaft, by using pliers.
- 10) Take out DOJ inner race.
- 11) Take off DOJ cage from shaft and remove DOJ boot.

CAUTION:

Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

- 12) Remove BJ boot in the same procedure as DOJ boot.
- 13) Disassembly of axle is completed at steps above because BJ cannot be disassembled.

REAR DRIVE SHAFT

DRIVE SHAFT SYSTEM

D: ASSEMBLY

CAUTION:

Use specified grease.

BJ side:

Molylex No. 2 (Part No. 723223010)

DOJ side:

VU-3A702 (Yellow) (Part No. 23223GA050)

- 1) Install BJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
- 2) Place DOJ boot at the center of shaft.

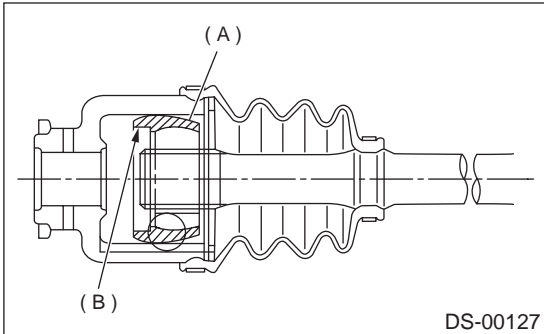
CAUTION:

Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

- 3) Insert DOJ cage onto shaft.

NOTE:

Insert the cage with the cut-out portion facing the shaft end, since the cage has an orientation.

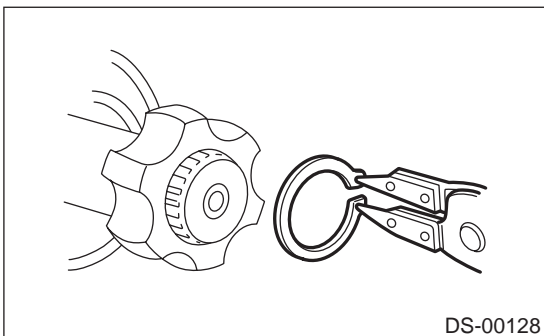


- (A) Cage
- (B) Cut-out portion

- 4) Install DOJ inner race on shaft and fit snap ring with pliers.

NOTE:

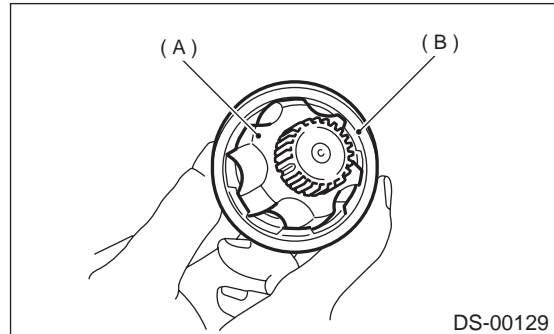
Confirm that the snap ring is completely fitted in the shaft groove.



- 5) Install cage, which was previously fitted, to inner race fixed upon shaft.

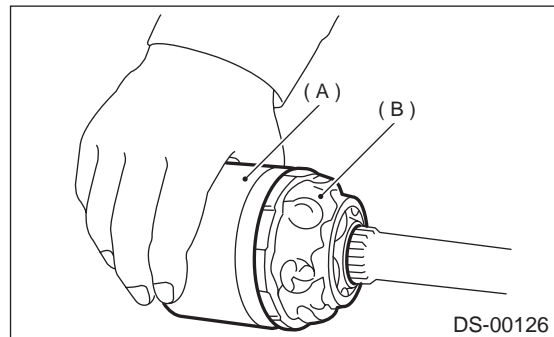
NOTE:

Fit the cage with the protruded part aligned with the track on the inner race and then turn by a half pitch.



- (A) Inner race
- (B) Cage

- 6) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.
- 7) Apply a coat of specified grease to the cage pocket and six balls.
- 8) Insert six balls into the cage pocket.
- 9) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit outer race.

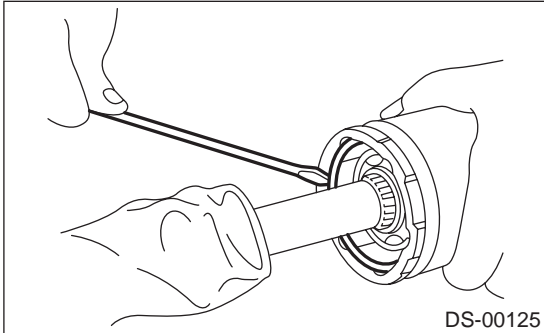


- (A) Outer race
- (B) Grease

10) Install circlip in the groove on DOJ outer race.

NOTE:

- Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
- Exercise care not to place the matched position of circlip in the ball groove of outer race.
- Pull the shaft lightly and assure that the circlip is completely fitted in the groove.



11) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.

12) Install DOJ boot taking care not to twist it.

NOTE:

- The inside of the larger end of DOJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.
- When installing DOJ boot, position outer race of DOJ at center of its travel.

13) Put a band through the clip and wind twice in alignment with band groove of boot.

CAUTION:

Use a new band.

14) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:

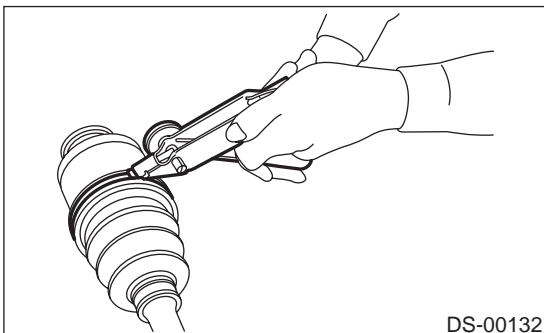
When tightening boot, exercise care so that the air within the boot is appropriate.

15) Tighten band by using ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten band until it cannot be moved by hand.

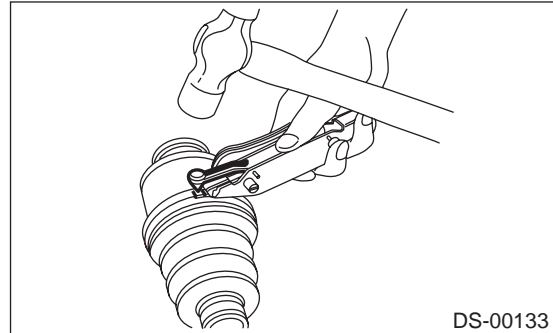


16) Tap on the clip with the punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

CAUTION:

Tap to an extent that the boot underneath is not damaged.



17) Cut off band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:

Be careful so that the end of the band is in close contact with clip.

18) Fix up boot on BJ in the same manner.

NOTE:

Extend and retract DOJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.

1) DOJ (Double Offset Joint)

Check seizure, corrosion, damage, wear and excessive play.

2) SFJ (Shudder-less Free-ring tripod Joint)

Check seizure, corrosion, damage and excessive play.

3) Shaft

Check excessive bending, twisting, damage and wear.

4) BJ (Bell Joint)

Check seizure, corrosion, damage and excessive play.

5) Boot

Check for wear, warping, breakage or scratches.

6) Grease

Check for discoloration or fluidity.

GENERAL DIAGNOSTIC TABLE

DRIVE SHAFT SYSTEM

7. General Diagnostic Table

A: INSPECTION

NOTE:

Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Remedy
1. Vibration of propeller shaft NOTE: Vibration is caused by propeller shaft during operation and is transferred to vehicle body. Generally vibration increases in proportion to vehicle speed.	(1) Worn or damaged universal joint.	Replace.
	(2) Unbalanced propeller shaft due to bend or dent.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Worn or damaged center bearing and damaged center mounting rubber.	Replace.
2. Tapping when starting and noise while cruising, caused by propeller shaft.	(1) Worn or damaged universal joint.	Replace.
	(2) Worn spline of sleeve yoke.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Loose installation of joint.	Replace.
	(5) Worn or damaged center bearing and damaged center mounting rubber.	Replace.

ABS

ABS

	Page
1. General Description	2
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)	6
3. ABS Sequence Control	9
4. Front ABS Sensor	12
5. Rear ABS Sensor	15
6. Front Tone Wheel	19
7. Rear Tone Wheel	20
8. G Sensor	21



GENERAL DESCRIPTION

ABS

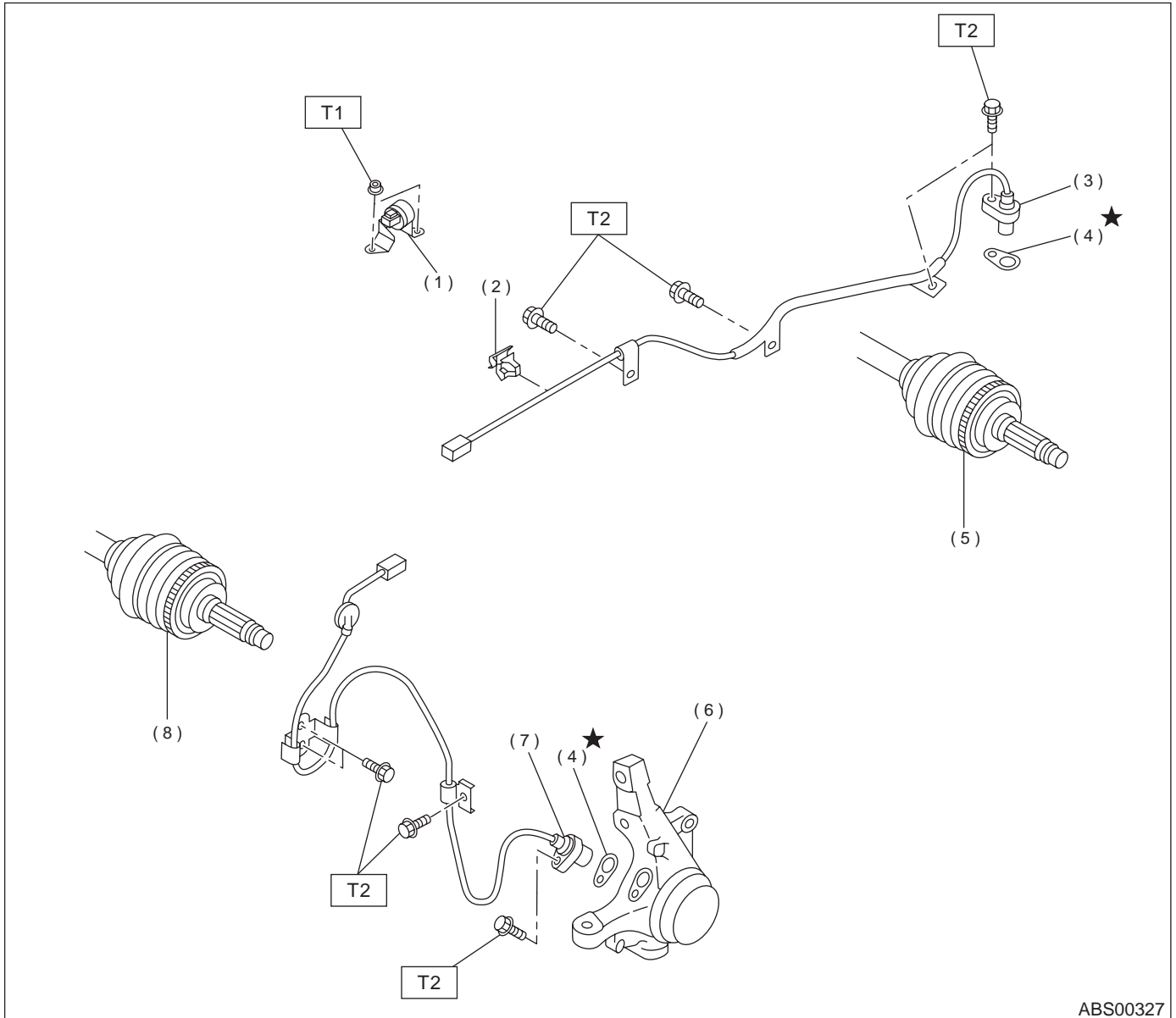
1. General Description

A: SPECIFICATIONS

Item			Standard or remarks	
ABS sensor	ABS sensor gap	Front	0.3 — 0.8 mm (0.012 — 0.031 in)	
		Rear	0.44 — 0.94 mm (0.0173 — 0.0370 in)	
	ABS sensor resistance		1.25±0.25 kΩ	
	Marks of the harness	Front LH	Except OUTBACK	Yellow
			OUTBACK	Brown
		Front RH	Except OUTBACK	White
			OUTBACK	Light blue
		Rear LH		Yellow
Rear RH		White		
G sensor	G sensor voltage		2.3±0.2 V	
ABS control module and hydraulic control unit (ABSCM&H/U) marks	AT (Except OUTBACK)		CG	
	MT (Except OUTBACK)		CH	
	AT (OUTBACK)		CI	
	MT (OUTBACK)		CJ	

B: COMPONENT

1. SENSOR



ABS00327

- | | |
|------------------------|-------------------------|
| (1) G sensor | (5) Tone wheel (Rear) |
| (2) Clip | (6) Housing |
| (3) Rear ABS sensor LH | (7) Front ABS sensor LH |
| (4) ABS spacer | (8) Tone wheel (Front) |

Tightening torque: N.m (kgf-m, ft-lb)

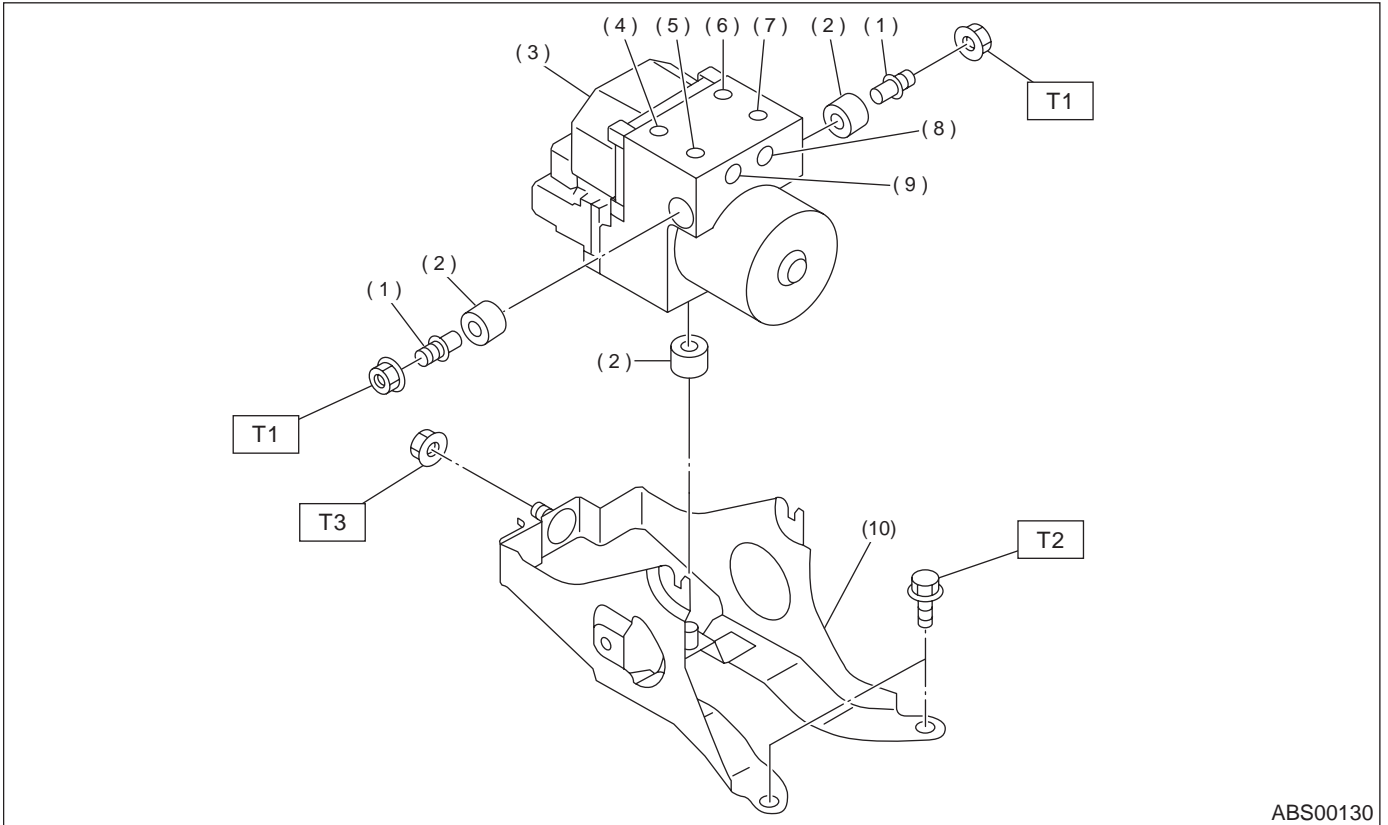
T1: 7.5 (0.75, 5.4)

T2: 33 (3.3, 24)

GENERAL DESCRIPTION

ABS

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



- | | |
|---|---------------------|
| (1) Stud bolt | (6) Front-RH outlet |
| (2) Damper | (7) Primary inlet |
| (3) ABS control module and hydraulic control unit | (8) Rear-LH outlet |
| (4) Front-LH outlet | (9) Rear-RH outlet |
| (5) Secondary inlet | (10) Bracket |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 18 (1.8, 13.06)

T2: 33 (3.3, 24)

T3: 38 (3.8, 27)

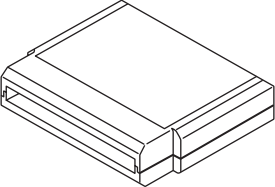

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Pressure Gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

ABS

2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

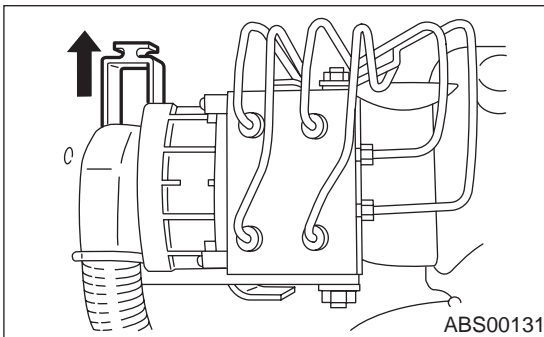
A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove air intake duct from engine compartment to facilitate removal of ABSCM&H/U.
- 3) Use an air gun to get rid of water around the ABSCM&H/U.

CAUTION:

The contact will be insufficient if the terminal gets wet.

- 4) Pull off the lock of the ABSCM&H/U connector to remove it.



- 5) Disconnect connector from ABSCM&H/U.

CAUTION:

Be careful not to let water or other foreign matter contact the ABSCM&H/U terminal.

- 6) Unlock cable clip.
- 7) Disconnect brake pipes from ABSCM&H/U.

CAUTION:

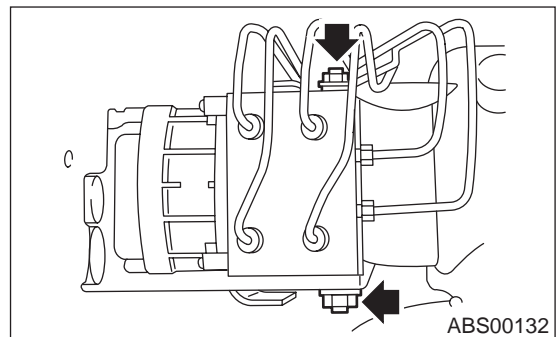
Wrap brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

- 8) Remove ABSCM&H/U ground terminal from bracket.

- 9) Remove ABSCM&H/U from engine compartment.

CAUTION:

- ABSCM&H/U cannot be disassembled. Do not attempt to loosen bolts and nuts.
- Do not drop or bump ABSCM&H/U.
- Do not turn the ABSCM&H/U upside down or place it on its side.
- Be careful to prevent foreign particles from getting into ABSCM&H/U.
- Apply a coat of rust-preventive wax (Nippeco LT or GB) to bracket attaching bolt after tightening.
- Do not pull harness when disconnecting connector.



B: INSTALLATION

- 1) Install ABSCM&H/U.

CAUTION:

Confirm that the specifications of the ABSCM&H/U conforms to the vehicle specifications.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 2) Install ABSCM&H/U ground terminal to bracket.

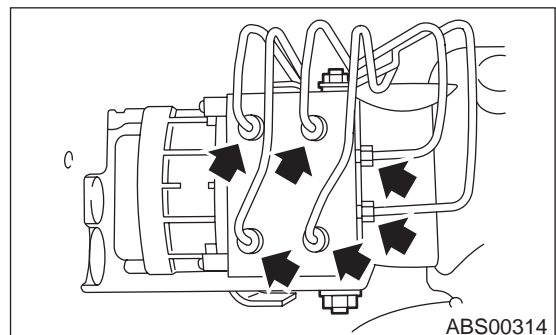
Tightening torque:

33 N·m (3.3 kgf-m, 24 ft-lb)

- 3) Connect brake pipes to their correct ABSCM&H/U connections.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)



- 4) Using cable clip, secure ABSCM&H/U harness to bracket.
- 5) Connect connector to ABSCM&H/U.

CAUTION:

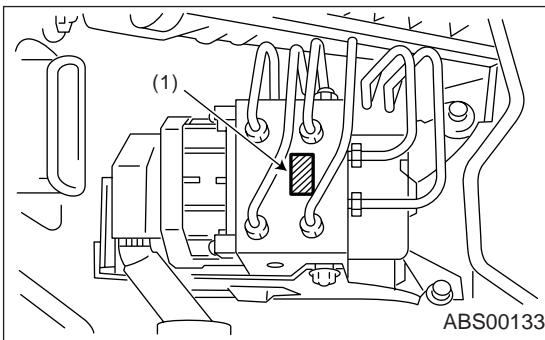
- Be sure to remove all foreign matter from inside the connector before connecting.
- Ensure that the ABSCM&H/U connector is securely locked.

- 6) Install air intake duct.
- 7) Connect ground cable to battery.
- 8) Bleed air from the brake system.

C: INSPECTION

- 1) Check connected and fixed condition of connector.
- 2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
CG	AT (Except OUTBACK)
CH	MT (Except OUTBACK)
CI	AT (OUTBACK)
CJ	MT (OUTBACK)



(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

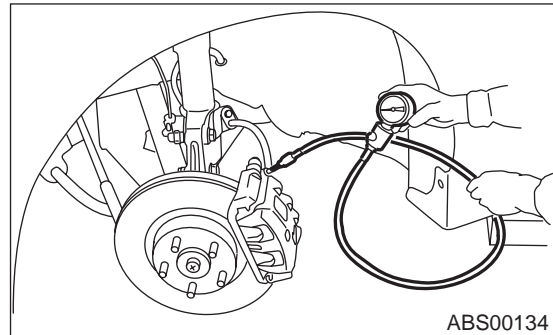
- 1) Lift-up vehicle and remove wheels.
- 2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
- 3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:

- Pressure gauges used exclusively for brake fluid must be used.
- Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:

Wrap sealing tape around the pressure gauge.



- 4) Bleed air from the pressure gauges.
- 5) Perform ABS sequence control. <Ref. to ABS-9, ABS Sequence Control.>
- 6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
- 7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
Initial value	3,432 kPa (35 kg/cm ² , 498 psi)	3,432 kPa (35 kg/cm ² , 498 psi)
When decompressed	490 kPa (5 kg/cm ² , 71 psi) or less	490 kPa (5 kg/cm ² , 71 psi) or less
When compressed	3,432 kPa (35 kg/cm ² , 498 psi) or more	3,432 kPa (35 kg/cm ² , 498 psi) or more

- 8) Remove pressure gauges from FL and FR caliper bodies.
- 9) Remove air bleeder screws from the RL and RR caliper bodies.
- 10) Connect the air bleeder screws to the FL and FR caliper bodies.
- 11) Connect two pressure gauges to the RL and RR caliper bodies.
- 12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
- 13) Perform ABS sequence control. <Ref. to ABS-9, ABS Sequence Control.>
- 14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
- 15) Read values indicated on the pressure gauges and check if they meet the standard value.
- 16) After checking, remove the pressure gauges from caliper bodies.

ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

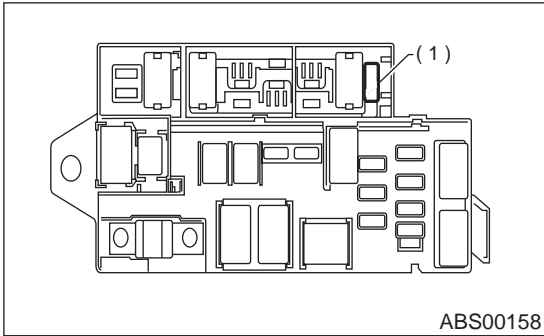
ABS

17) Connect the air bleeder screws to RL and RR caliper bodies.

18) Bleed air from brake line.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

1) In the case of AWD AT vehicles, install a spare fuse with the FWD connector in the main fuse box to simulate FWD vehicles.

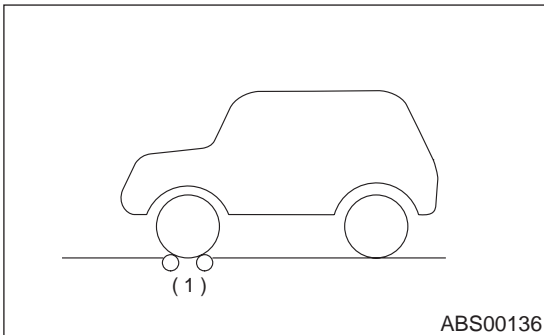


(1) FWD connector

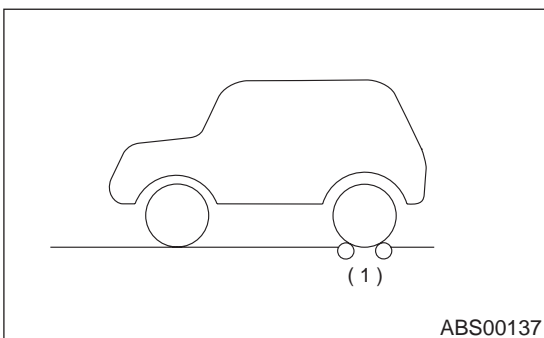
2) Prepare for operating ABS sequence control.

<Ref. to ABS-9, ABS Sequence Control.>

3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "neutral".



(1) Brake tester



(1) Brake tester

4) Operate the brake tester.

5) Perform ABS sequence control.

<Ref. to ABS-9, ABS Sequence Control.>

6) Hydraulic unit begins to work; and check the following working sequence.

(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.

(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.

7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	981 N (100 kgf, 221 lb)	981 N (100 kgf, 221 lb)
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less
When compressed	981 N (100 kgf, 221 lb) or more	981 N (100 kgf, 221 lb) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

3. ABS Sequence Control

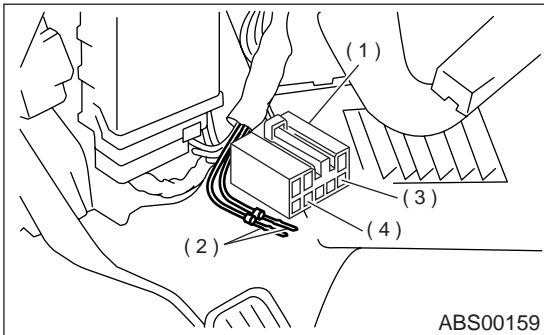
A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.

2) ABS sequence control can be started by diagnosis connector or select monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 5 and No. 8 of the diagnosis connector beside driver's seat heater unit.



- (1) Diagnosis connector
- (2) Diagnosis terminal
- (3) 8 terminal
- (4) 5 terminal

2) Set the speed of all wheels at 2.75 km/h (2 MPH) or less.

3) Turn ignition switch OFF.

4) Depress the brake pedal within 0.5 seconds after the ABS warning light goes out and hold it immediately after ignition switch is turned to ON.

CAUTION:

Do not depress the clutch pedal.

NOTE:

- When the ignition switch is set to on, the brake pedal must not be depressed.
- Engine must not operate.

5) After completion of ABS sequence control, turn ignition switch OFF.

2. ABS SEQUENCE CONTROL WITH SELECT MONITOR

NOTE:

- In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to "ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR".

<Ref. to ABS-9, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, ABS Sequence Control.>

- When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect select monitor to data link connector under driver's seat instrument panel lower cover.

2) Turn ignition switch ON.

3) Turn select monitor switch ON.

4) Put select monitor to "BRAKE CONTROL" mode.

5) When "Function check sequence" is selected, 'ABS sequence control' will start.

6) The message 'Press Brake Pedal Firmly' is displayed as follows:

(1) When using the brake tester, depress brake pedal with braking force of 981 N (100 kgf, 221 lb).

(2) When using the pressure gauge, depress brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kg/cm², 498 psi).

CAUTION:

Do not depress the clutch pedal.

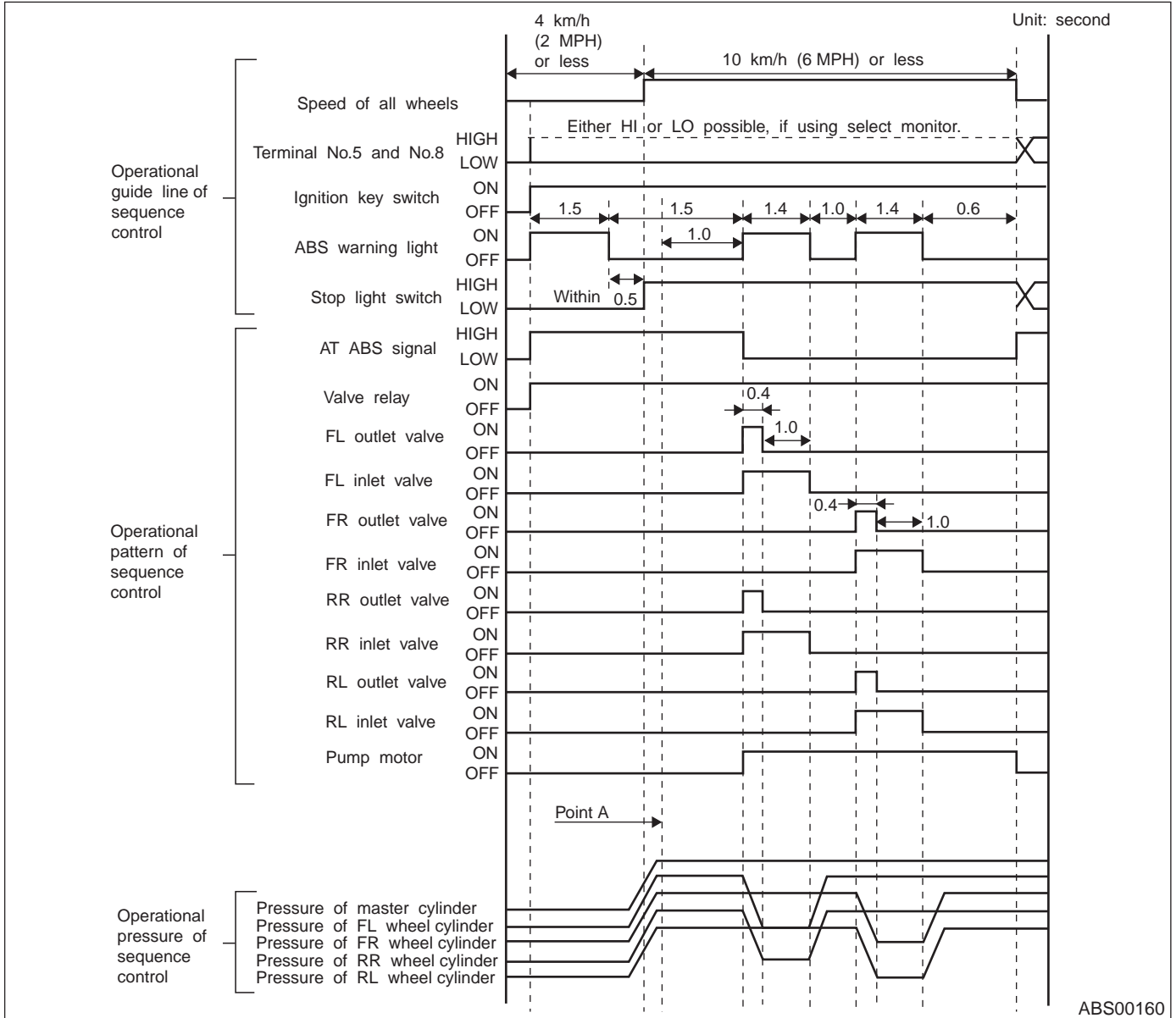
7) When the message "Press YES" is displayed, press «YES» key.

8) Operation points will be displayed on select monitor.

ABS SEQUENCE CONTROL

ABS

3. CONDITIONS FOR ABS SEQUENCE CONTROL



NOTE:

- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

- 1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
- 2) When terminal No. 5 or No. 8 are separated from diagnosis terminals. (When select monitor is not used.)
- 3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
- 4) When brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When select monitor is not used.)
- 5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When select monitor is not used.)
- 6) After completion of the sequence control.
- 7) When malfunction is detected. (When select monitor is used.)

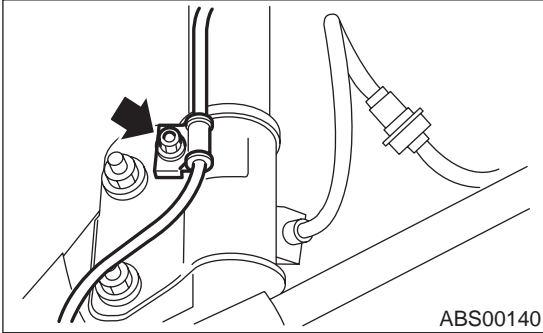
FRONT ABS SENSOR

ABS

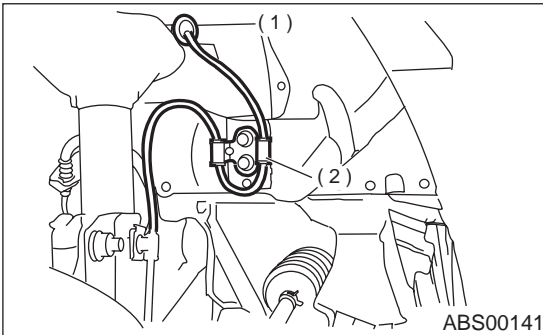
4. Front ABS Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.
- 2) Disconnect front ABS sensor connector located next to front strut mounting house in engine compartment.
- 3) Remove bolts which secure sensor harness to strut.



- 4) Remove bolts which secure sensor harness to body.

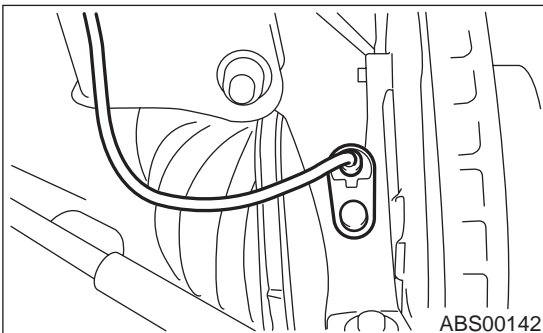


- (1) To front ABS sensor connector
- (2) Bracket

- 5) Remove bolts which secure front ABS sensor to housing, and remove front ABS sensor.

CAUTION:

- Be careful not to damage pole piece located at tip of the sensor and teeth faces during removal.
- Do not pull sensor harness during removal.

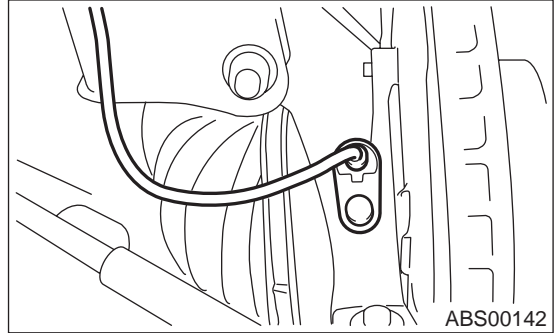


B: INSTALLATION

- 1) Temporarily install front ABS sensor on housing.

CAUTION:

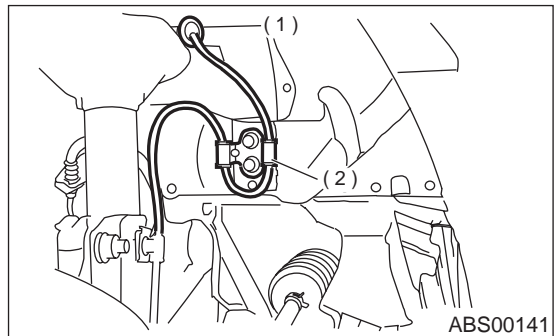
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.



- 2) Install front ABS sensor on strut and wheel apron bracket.

Tightening torque:

33 N·m (3.3 kgf·m, 24 ft·lb)

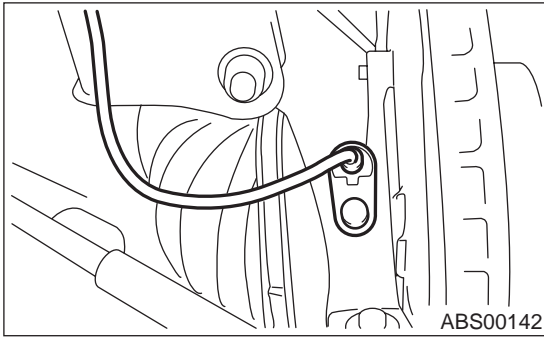


- (1) To front ABS sensor connector
- (2) Bracket

3) Place a thickness gauge between ABS sensor's pole piece and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten ABS sensor on housing to specified torque.

ABS sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

Tightening torque:
33 N·m (3.3 kgf-m, 24 ft-lb)



CAUTION:
 Check the marks on the harness to make sure that no distortion exists.

Model	LH	RH
Except OUTBACK	Yellow	White
OUTBACK	Brown	Light blue

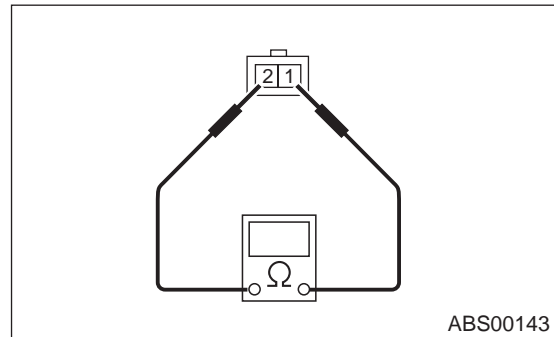
NOTE:
 If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

- 4) After confirmation of the ABS sensor clearance, connect connector to ABS sensor.
- 5) Connect connector to battery ground cable.

C: INSPECTION

1. ABS SENSOR

- 1) Check pole piece of ABS sensor for foreign particles or damage. If necessary, clean pole piece or replace ABS sensor.
- 2) Measure ABS sensor resistance.



Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

CAUTION:
 If resistance is outside the standard value, replace ABS sensor with new one.

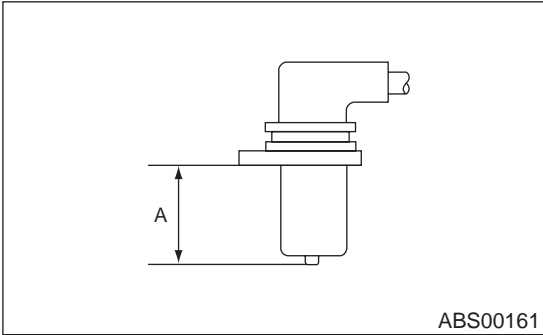
NOTE:
 Check ABS sensor cable for discontinuity. If necessary, replace with a new one.

FRONT ABS SENSOR

ABS

2. SENSOR GAP

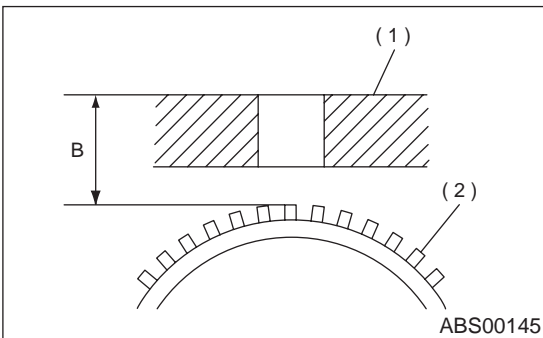
1) Measure the distance "A" between ABS sensor surface and sensor pole face.



2) Measure the distance "B" between surface where the front axle housing meets the ABS sensor, and the tone wheel.

NOTE:

Measure so that the gauge touches the tone wheel teeth top.



- (1) Axle housing
- (2) Tone wheel

3) Find the gap between the ABS sensor pole face and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.

$$\text{ABS sensor clearance} = B - A$$

ABS sensor standard clearance:

$$0.3 - 0.8 \text{ mm } (0.012 - 0.031 \text{ in})$$

NOTE:

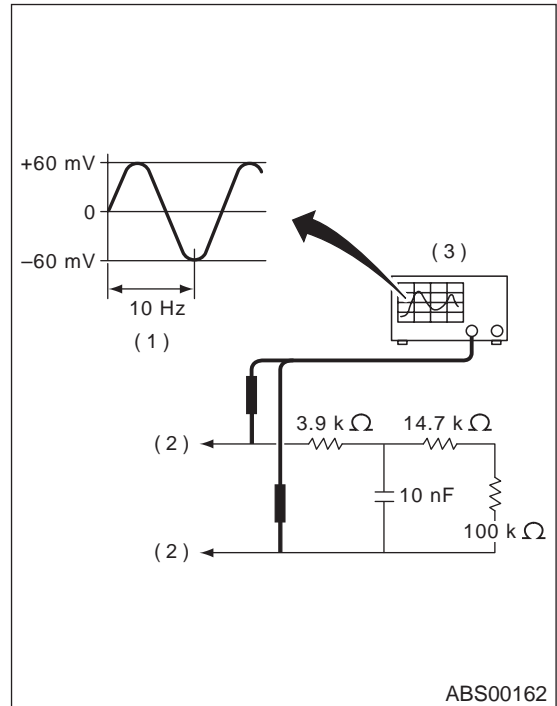
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install resistor and condenser, then rotate wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:

Regarding terminal No., please refer to item 1. ABS SENSOR.



- (1) Standard output voltage:
Approx. 120 mV (When it is 10 Hz)
- (2) To terminal
- (3) Oscilloscope

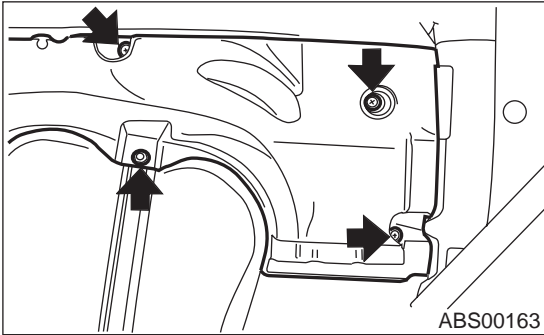
D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

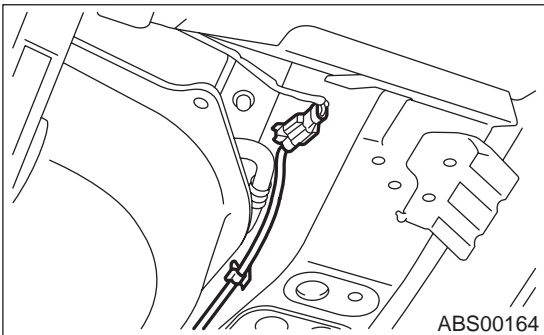
5. Rear ABS Sensor

A: REMOVAL

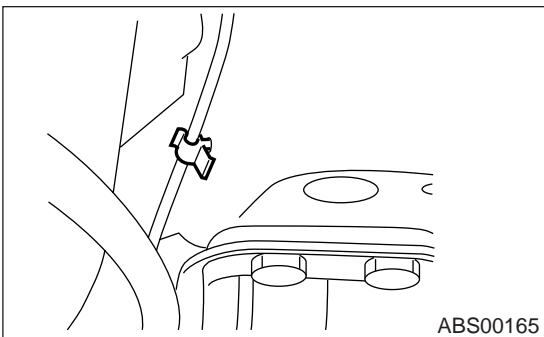
- 1) Disconnect battery ground cable.
- 2) Lift-up the vehicle.
- 3) Remove fuel tank cover.



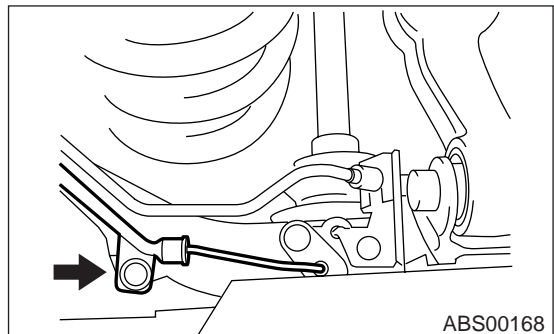
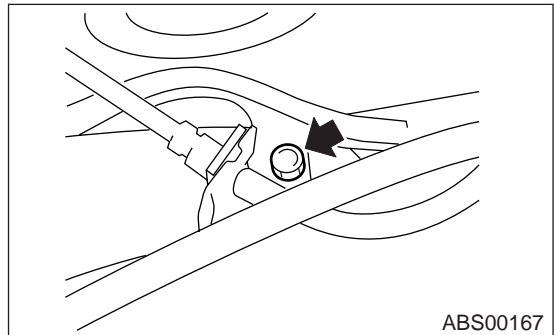
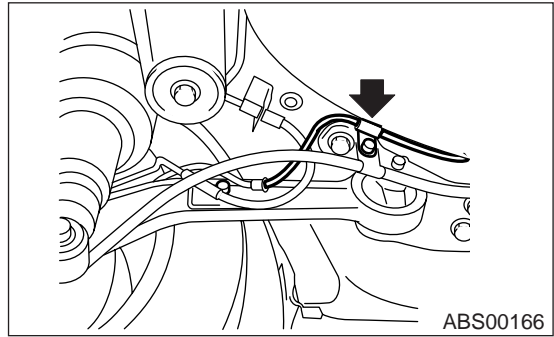
- 4) Disconnect rear ABS sensor connector.



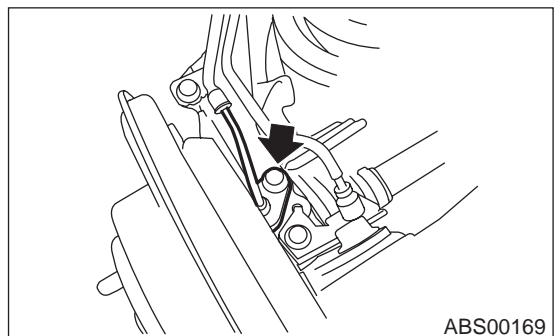
- 5) Remove rear sensor harness from clip on body side.



- 6) Remove bolts which hold rear sensor harness brackets.



- 7) Remove rear ABS sensor from rear arm.



REAR ABS SENSOR

ABS

8) When inspecting rear tone wheel, remove rear drive shaft as rear tone wheel is unitized with BJ assembly of rear drive shaft.

<Ref. to DS-34, REMOVAL, Rear Drive Shaft.>

CAUTION:

- Be careful not to damage pole piece located at tip of the sensor and teeth faces during removal.
- Do not pull sensor harness during removal.

B: INSTALLATION

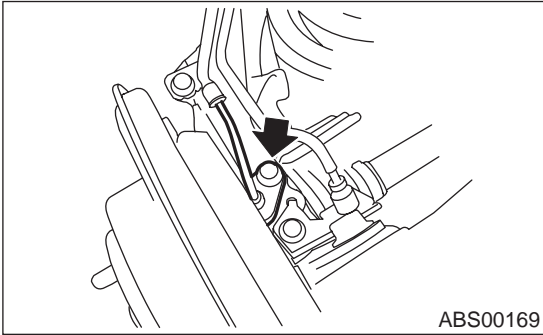
1) Install rear drive shaft to the vehicle.

<Ref. to DS-34, INSTALLATION, Rear Drive Shaft.>

2) Temporarily install rear ABS sensor on rear arm.

CAUTION:

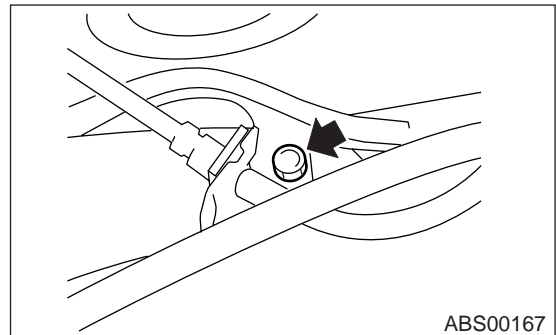
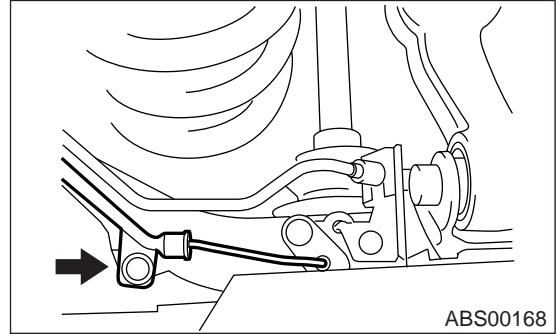
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.



3) Install rear sensor harness brackets in the original positions and install harness on the clip.

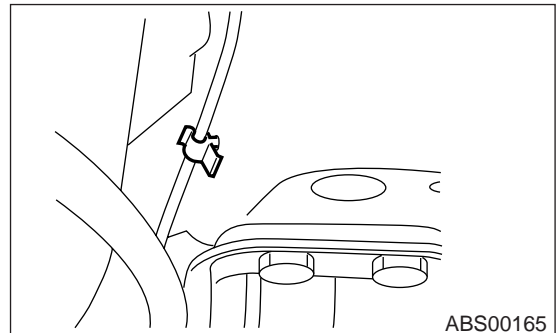
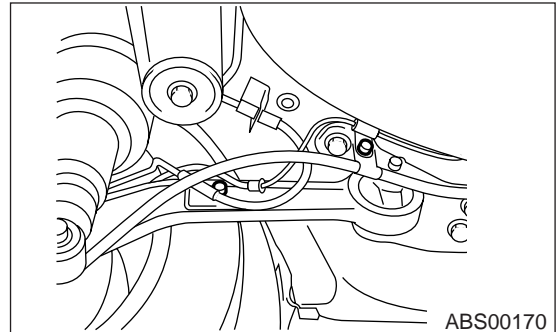
Tightening torque:

33 N·m (3.3 kgf·m, 24 ft·lb)



Tightening torque:

33 N·m (3.3 kgf·m, 24 ft·lb)



4) Place a thickness gauge between ABS sensor's and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten ABS sensor on rear arm to specified torque.

ABS sensor standard clearance:
 0.44 — 0.94 mm (0.0173 — 0.0370 in)

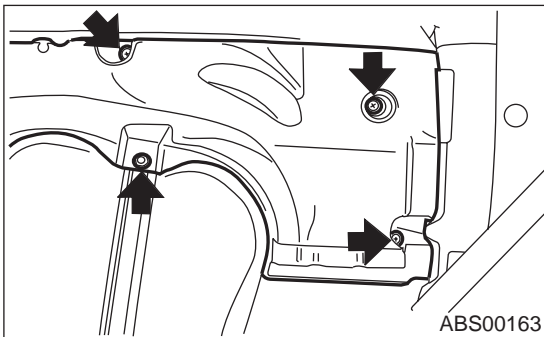
Tightening torque:
 33 N·m (3.3 kgf-m, 24 ft-lb)

CAUTION:
 Check the marks on the harness to make sure that no distortion exists.

	LH	RH
Mark	Yellow	White

NOTE:
 If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

5) After confirmation of the ABS sensor clearance, connect connector to ABS sensor and install fuel tank cover.

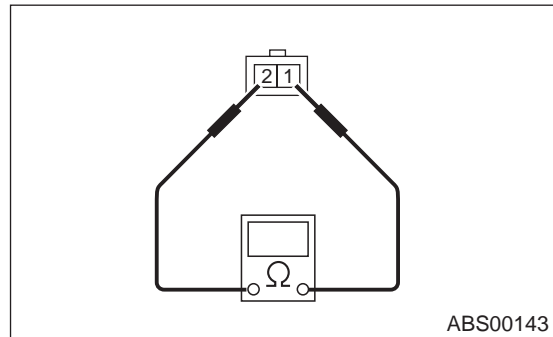


6) Connect connector to battery ground cable.

C: INSPECTION

1. ABS SENSOR

- 1) Check pole piece of ABS sensor for foreign particles or damage. If necessary, clean pole piece or replace ABS sensor.
- 2) Measure ABS sensor resistance.



Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

CAUTION:
 If resistance is outside the standard value, replace ABS sensor with new one.

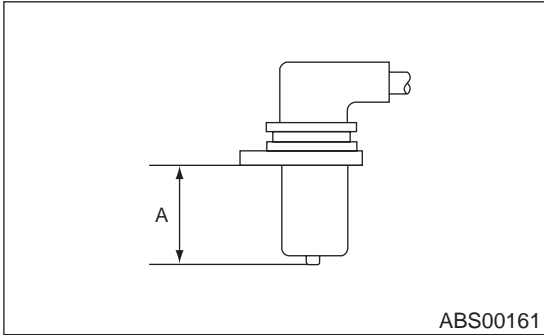
NOTE:
 Check ABS sensor cable for discontinuity. If necessary, replace with a new one.

REAR ABS SENSOR

ABS

2. SENSOR GAP

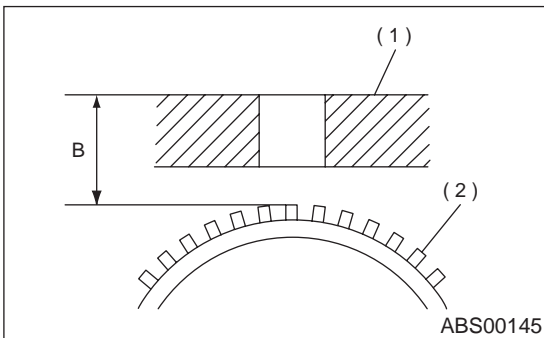
1) Measure the distance "A" between ABS sensor surface and sensor pole face.



2) Measure the distance "B" between surface where the front axle housing meets the ABS sensor, and the tone wheel.

NOTE:

Measure so that the gauge touches the tone wheel teeth top.



- (1) Axle housing
- (2) Tone wheel

3) Find the gap between the ABS sensor pole face and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.

$$\text{ABS sensor clearance} = B - A$$

ABS sensor standard clearance:

$$0.44 - 0.94 \text{ mm } (0.0173 - 0.0370 \text{ in})$$

NOTE:

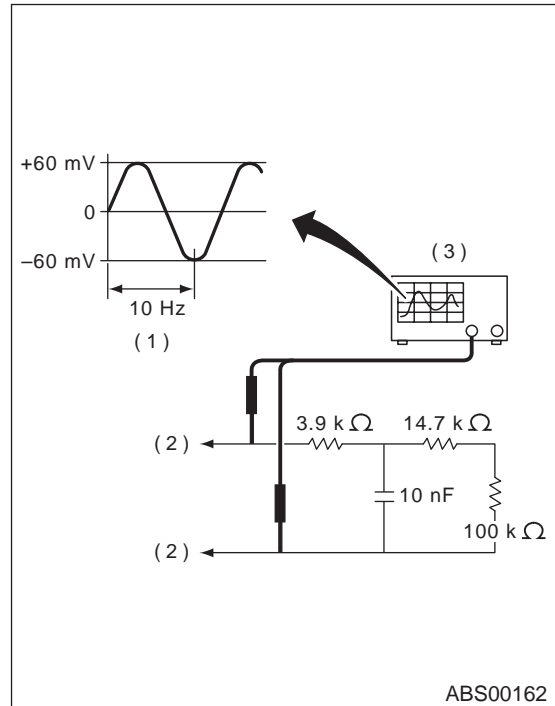
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install resistor and condenser, then rotate wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:

Regarding terminal No., refer to item 1. ABS SENSOR.



- (1) Standard output voltage:
Approx. 120 mV (When it is 10 Hz)
- (2) To terminal
- (3) Oscilloscope

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

6. Front Tone Wheel

A: REMOVAL

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.

<Ref. to DS-28, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.

<Ref. to DS-28, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check tone wheels teeth (44 pieces) for cracks or dents. If necessary, replace tone wheel with a new one.

NOTE:

Replace BJ assembly with new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

7. Rear Tone Wheel

A: REMOVAL

Refer to Rear Drive Shaft, because rear tone wheel is integrated with rear drive shaft.

<Ref. to DS-34, REMOVAL, Rear Drive Shaft.>

B: INSTALLATION

Refer to Rear Drive Shaft, because rear tone wheel is integrated with rear drive shaft.

<Ref. to DS-34, INSTALLATION, Rear Drive Shaft.>

C: INSPECTION

Visually check tone wheels teeth (44 pieces) for cracks or dents. If necessary, replace tone wheel with a new one.

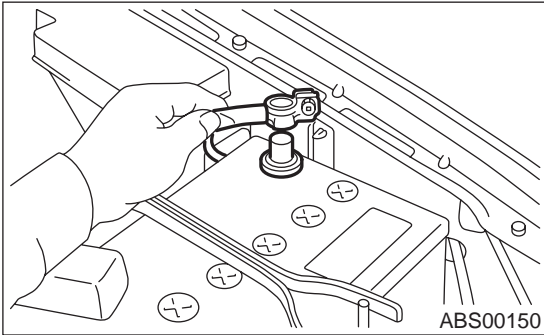
NOTE:

Replace BJ assembly with new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

8. G Sensor

A: REMOVAL

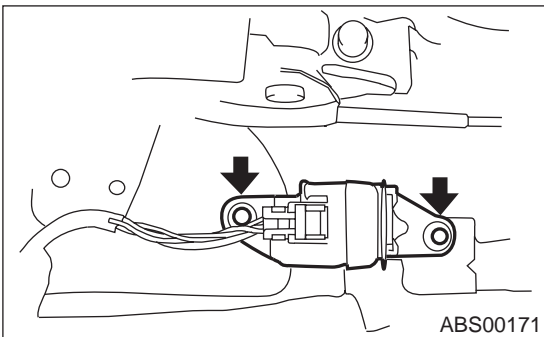
- 1) Disconnect battery ground cable.



- 2) Remove console cover.
<Ref. to EI-34, REMOVAL, Console Box.>
- 3) Disconnect connector from G sensor.
- 4) Remove G sensor from body.

CAUTION:

Do not drop or bump G sensor.

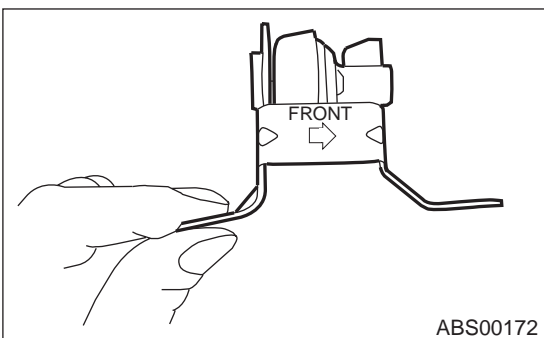


B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

Do not install G sensor in the wrong direction. There is an arrow mark on the sensor showing which side faces the vehicle front.



G SENSOR

ABS

C: INSPECTION

Step	Value	Yes	No
1 DO YOU HAVE SUBARU SELECT MONITOR?	Available.	Go to step 5.	Go to step 2.
2 CHECK G SENSOR. 1) Turn ignition switch to OFF. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. Connector & terminal: (R70) No. 2 (+) — No. 3 (-) Is the voltage within the specified value when G sensor is horizontal?	2.1 — 2.5 V	Go to step 3.	Replace G sensor.
3 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal: (R70) No. 2 (+) — No. 3 (-) Is the voltage within the specified value when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step 4.	Replace G sensor.
4 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal: (R70) No. 2 (+) — No. 3 (-) Is the voltage within the specified value when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	G sensor is normal.	Replace G sensor.
5 CHECK G SENSOR. 1) Turn ignition switch to OFF. 2) Connect select monitor connector to data link connector. 3) Turn select monitor into {BRAKE CONTROL} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output voltage. Is the indicated reading within the specified value when the vehicle is in horizontal position?	201 — 2.5 V	Go to step 6.	Replace G sensor.
6 CHECK G SENSOR. 1) Remove console box. 2) Remove G sensor from vehicle. (Do not disconnect connector.) 3) Read the select monitor display. Is the voltage within the specified value when G sensor is inclined forwards to 90°?	3.7 — 4.1 V	Go to step 7.	Replace G sensor.
7 CHECK G SENSOR. Read the select monitor display. Is the voltage within the specified value when G sensor is inclined backwards to 90°?	0.5 — 0.9 V	G sensor is normal.	Replace G sensor.

ABS (DIAGNOSTICS)

ABS

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BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

CAUTION:

Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:

- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- When ABS warning light illuminates, read and record diagnostic trouble code (DTC) indicated by ABS warning light.

Step	Value	Yes	No
1 CHECK PRE-INSPECTION. 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS-5, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the ABS problem. <Ref. to ABS-8, INSPECTION, General Description.> Is the component part that might influence the ABS problem normal?	Component part is normal.	Go to step 2.	Repair or replace each unit.
2 CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC). Calling up diagnostic trouble code (DTC). <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).> Is ABS warning light normal?	ABS warning light is normal.	Go to step 3.	Inspect using diagnostic chart for ABS warning light failure.<Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.> NOTE: Call up diagnostic trouble code (DTC) again after inspecting ABS warning light. <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).>
3 CHECK DIAGNOSTIC TROUBLE CODE (DTC). NOTE: Record all diagnostic trouble codes (DTC). Is only the start code displayed?	Only the start code displayed.	Go to step 4.	Go to step 5.

BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

Step	Value	Yes	No
4 PERFORM THE GENERAL DIAGNOSTICS. 1) Inspect using "General Diagnostics Table". <Ref. to ABS-149, General Diagnostics Table.> 2) Perform the clear memory mode. <Ref. to ABS-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> Calling up the diagnostic trouble code (DTC). <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).> Is only the start code displayed?	Only the start code displayed.	Complete the diagnosis.	Go to step 5.
5 PERFORM THE DIAGNOSIS. 1) Inspect using "Diagnostics Chart with Diagnostic Connector". <Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.> NOTE: For diagnostic trouble code (DTC) list, refer to "List of Diagnostics Trouble Code (DTC)". <Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to ABS-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).> Is only the start code displayed?	Only the start code displayed.	Complete the diagnosis.	Inspect using "Diagnostics Chart with Diagnostic Connector". <Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

CAUTION:

Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:

- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- Check list for interview. <Ref. to ABS-25, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).>

Step	Value	Yes	No
1 CHECK PRE-INSPECTION. 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS-5, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the ABS problem. <Ref. to ABS-8, INSPECTION, General Description.> Is unit that might influence the ABS problem normal?	Component part is normal.	Go to step 2.	Repair or replace each unit.

BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>2 CHECK INDICATION OF TROUBLE CODE DISPLAY.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Connect the SUBARU SELECT MONITOR to data link connector. 3) Turn ignition switch to ON and SUBARU SELECT MONITOR to ON. <p>NOTE: If the communication function of the select monitor cannot be executed normally, check the communication circuit. <Ref. to ABS-80, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.></p> <ol style="list-style-type: none"> 4) Read diagnostic trouble code (DTC). <Ref. to ABS-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5) Record all diagnostic trouble codes (DTC) and frame data. Is the DTC displayed? 	DTC not indicated.	Go to step 3.	Go to step 4.
<p>3 PERFORM THE GENERAL DIAGNOSTICS.</p> <ol style="list-style-type: none"> 1) Inspect using "General Diagnostics Table". <Ref. to ABS-149, General Diagnostics Table.> 2) Perform the clear memory mode. <Ref. to ABS-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 4) Calling up the diagnostic trouble code (DTC). <Ref. to ABS-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Confirm that no DTC is displayed. Does ABS warning light remain off? 	ABS warning light remains off.	Complete the diagnosis.	Go to step 4.
<p>4 PERFORM THE DIAGNOSIS.</p> <ol style="list-style-type: none"> 1) Inspect using "Diagnostics Chart with Subaru Select Monitor". <Ref. to ABS-80, Diagnostics Chart with Subaru Select Monitor.> <p>NOTE: For diagnostic trouble code (DTC) list, refer to "List of Diagnostics Trouble Code (DTC)". <Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).></p> <ol style="list-style-type: none"> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to ABS-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to ABS-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Confirm that no DTC is displayed. Does ABS warning light remain off? 	ABS warning light remains off.	Complete the diagnosis.	Inspect using "Diagnostics Chart with Subaru Select Monitor". <Ref. to ABS-80, Diagnostics Chart with Subaru Select Monitor.>, Diagnostics Chart with Subaru Select Monitor.>

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on • When / how long does it come on?:		
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (before starting engine) <input type="checkbox"/> START <input type="checkbox"/> On after starting (Engine is running) <input type="checkbox"/> On after starting (Engine is stop)		
Timing	<input type="checkbox"/> Immediately after ignition is ON. <input type="checkbox"/> Immediately after ignition starts.		
	<input type="checkbox"/> When advancing	km/h to	km/h
		MPH to	MPH
	<input type="checkbox"/> While traveling at a constant speed	km/h	MPH
	<input type="checkbox"/> When decelerating	km/h to	km/h
		MPH to	MPH
	<input type="checkbox"/> When turning to right	Steering angle :	deg
		Steering time :	sec
	<input type="checkbox"/> When turning to left	Steering angle :	deg
		Steering time :	sec
<input type="checkbox"/> When moving other electrical parts	• Parts name : • Operating condition :		

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

2. SYMPTOMS

ABS operating condition	<input type="checkbox"/> Performs no work.		
	<input type="checkbox"/> Operates only when abruptly applying brakes.	Vehicle speed :	km/h
			MPH
	• How to step on brake pedal :		
	a) Operating time :		sec
	b) Operating noise : <input type="checkbox"/> Produce / <input type="checkbox"/> Does not produce		
	• What kind of noise?	<input type="checkbox"/> Knock <input type="checkbox"/> Gong gong <input type="checkbox"/> Bong <input type="checkbox"/> Buzz <input type="checkbox"/> Gong gong buzz <input type="checkbox"/> Others :	
c) Reaction force of brake pedal			
	<input type="checkbox"/> Stick <input type="checkbox"/> Press down once with a clunk <input type="checkbox"/> Press and released <input type="checkbox"/> Others :		
Behavior of vehicle	a) Directional stability cannot be obtained or steering arm refuses to work when applying brakes : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• When :	<input type="checkbox"/> Vehicle turns to right <input type="checkbox"/> Vehicle turns to left <input type="checkbox"/> Spins <input type="checkbox"/> Others :	
	b) Directional stability cannot be obtained or steering arm refuses to work when accelerating : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• When :	<input type="checkbox"/> Vehicle turns to right <input type="checkbox"/> Vehicle turns to left <input type="checkbox"/> Spins <input type="checkbox"/> Others :	
	c) Brakes are out of order : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• What :	<input type="checkbox"/> Braking distance is long <input type="checkbox"/> Brakes lock or drag <input type="checkbox"/> Pedal stroke is long <input type="checkbox"/> Pedal sticks <input type="checkbox"/> Others :	
	d) Poor acceleration : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• What :	<input type="checkbox"/> Fails to accelerate <input type="checkbox"/> Engine stalls <input type="checkbox"/> Others :	
	e) Occurrence of vibration : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• Where		
	• What kind :		
	f) Occurrence of abnormal noise : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• Where		
• What kind :			
g) Occurrence of other phenomena : <input type="checkbox"/> Yes / <input type="checkbox"/> No			
• What kind :			

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

3. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others :		
	b) Ambient temperature	°F (°C)		
	c) Road	<input type="checkbox"/> Urban area <input type="checkbox"/> Suburbs <input type="checkbox"/> Highway <input type="checkbox"/> General road <input type="checkbox"/> Ascending slope <input type="checkbox"/> Descending slope <input type="checkbox"/> Paved road <input type="checkbox"/> Gravel road <input type="checkbox"/> Muddy road <input type="checkbox"/> Sandy place <input type="checkbox"/> Others :		
	d) Road surface	<input type="checkbox"/> Dry <input type="checkbox"/> Wet <input type="checkbox"/> New-fallen snow <input type="checkbox"/> Compressed snow <input type="checkbox"/> Frozen slope <input type="checkbox"/> Others :		
Condition	a) Brakes	Deceleration : g		
		<input type="checkbox"/> Continuous / <input type="checkbox"/> Intermittent		
	b) Accelerator	Acceleration : g		
		<input type="checkbox"/> Continuous / <input type="checkbox"/> Intermittent		
	c) Vehicle speed	km/h	MPH	
		<input type="checkbox"/> Advancing <input type="checkbox"/> Accelerating <input type="checkbox"/> Reducing speed <input type="checkbox"/> Low speed <input type="checkbox"/> Turning <input type="checkbox"/> Others :		
	d) Tire inflation pressure	Front RH tire :	kPa	
		Front LH tire :	kPa	
		Rear RH tire :	kPa	
		Rear LH tire :	kPa	
	e) Degree of wear	Front RH tire :		
		Front LH tire :		
		Rear RH tire :		
		Rear LH tire :		
	f) Genuine parts are used. :	<input type="checkbox"/> Yes / <input type="checkbox"/> No		
g) Chain is passed around tires. :	<input type="checkbox"/> Yes / <input type="checkbox"/> No			
h) T tire is used. :	<input type="checkbox"/> Yes / <input type="checkbox"/> No			
i) Condition of suspension alignment :				
j) Loading state :				
k) Repair parts are used. :	<input type="checkbox"/> Yes / <input type="checkbox"/> No			
• What :				
l) Others :				

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

Airbag system wiring harness is routed near the ABS sensor, ABS control module and hydraulic control unit.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage airbag system wiring harness when servicing the ABS sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect ABS problems:

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

- 1) Check brake fluid level.
- 2) Check brake fluid leakage.

3. HYDRAULIC UNIT

Check the hydraulic unit.

- With brake tester <Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
- Without brake tester <Ref. to ABS-7, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

4. BRAKE DRAG

Check brake drag.

5. BRAKE PAD AND ROTOR

Check brake pad and rotor.

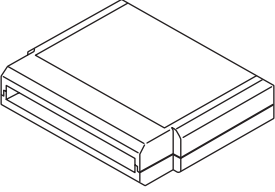

- Front <Ref. to BR-21, INSPECTION, Front Brake Pad.> and <Ref. to BR-22, INSPECTION, Front Disc Rotor.>
- Rear <Ref. to BR-26, INSPECTION, Rear Brake Pad.> and <Ref. to BR-27, INSPECTION, Rear Disc Rotor.>

6. TIRE

Check tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATIONS, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

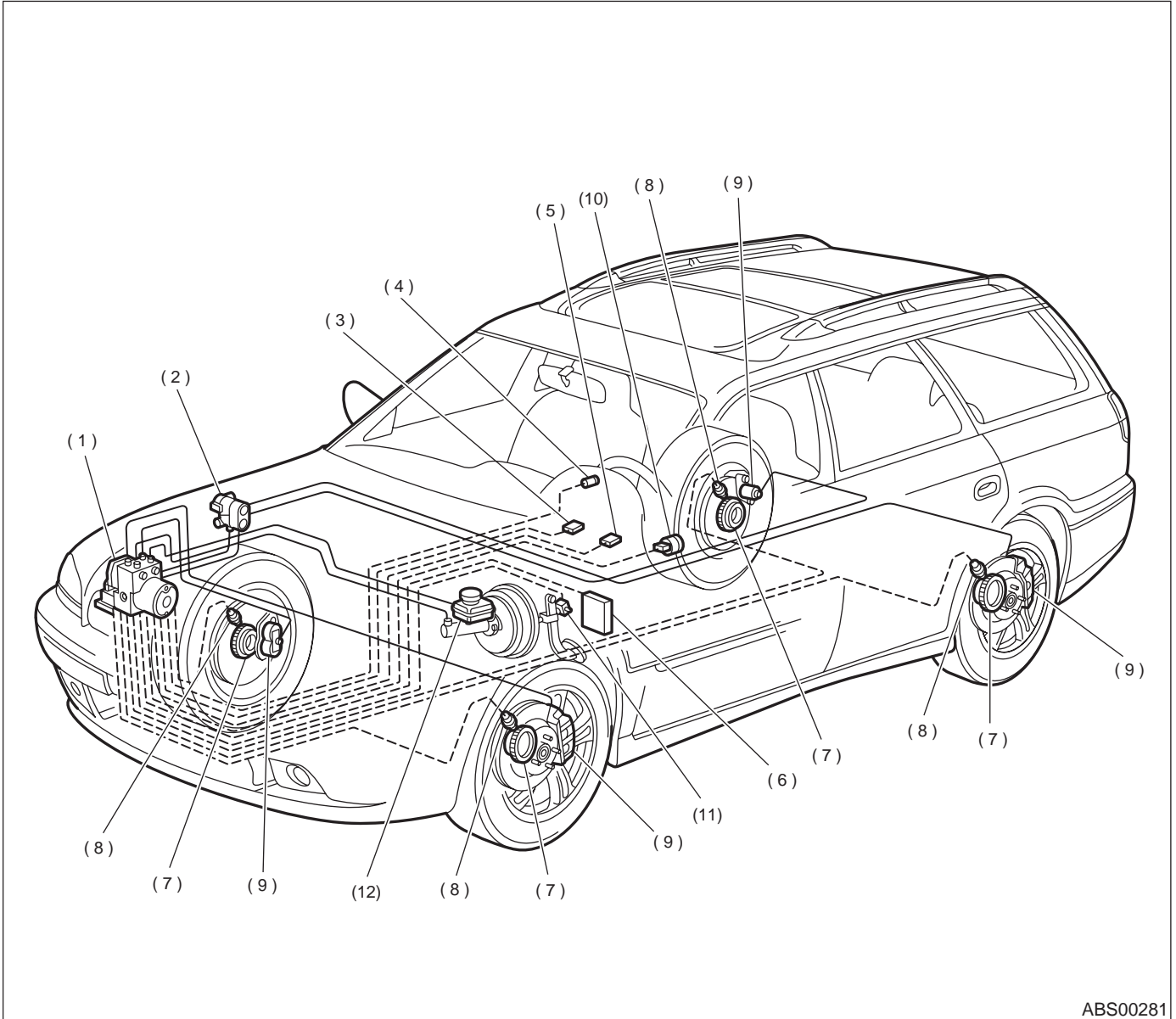
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

ELECTRICAL COMPONENTS LOCATION

ABS (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

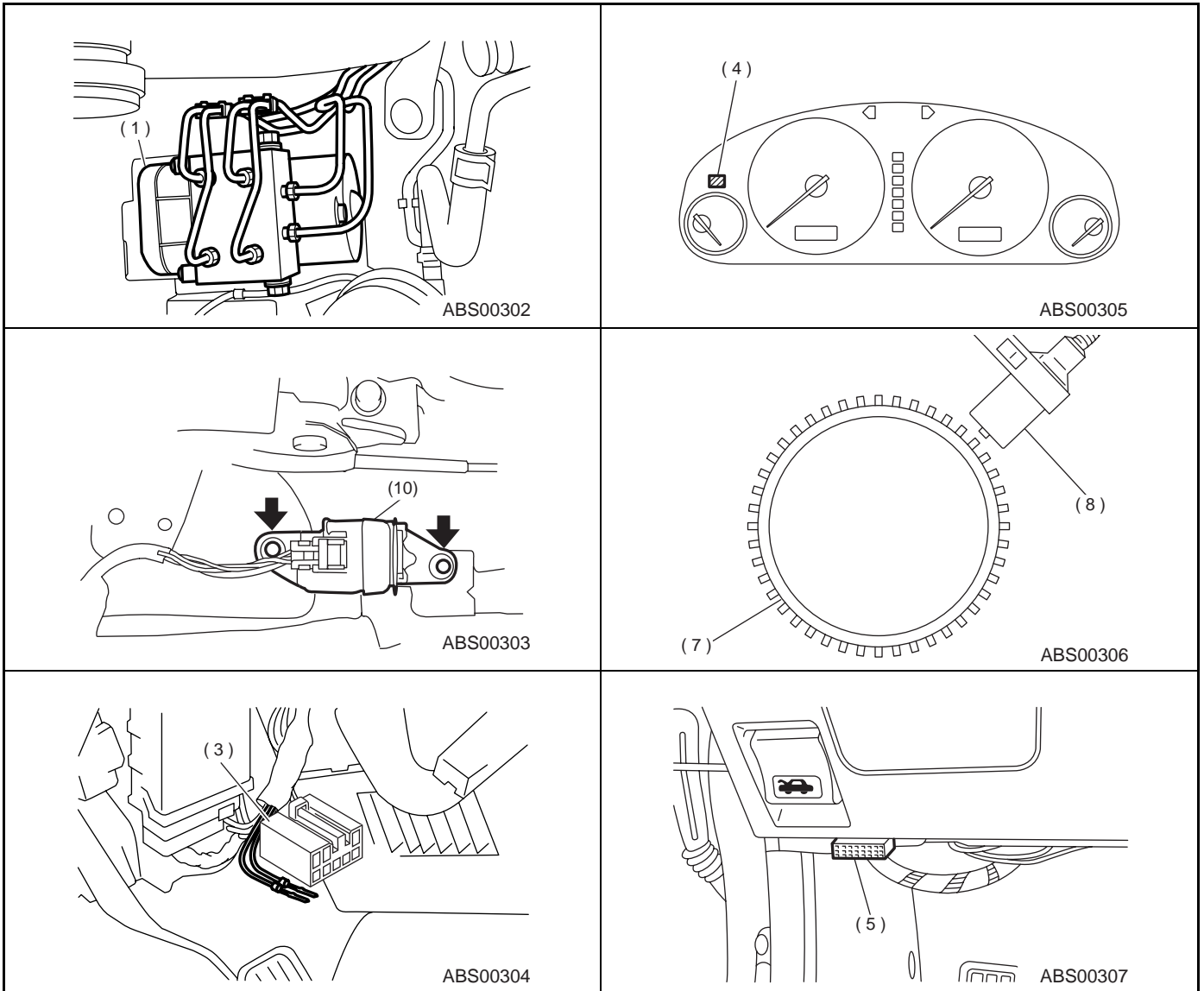


ABS00281

- | | | |
|---|---|------------------------|
| (1) ABS control module and hydraulic control unit (ABSCM&H/U) | (5) Data link connector (for Subaru select monitor) | (8) ABS sensor |
| (2) Proportioning valve | (6) Transmission control module (only AT vehicle) | (9) Wheel cylinder |
| (3) Diagnosis connector | (7) Tone wheel | (10) G sensor |
| (4) ABS warning light | | (11) Stop light switch |
| | | (12) Master cylinder |

ELECTRICAL COMPONENTS LOCATION

ABS (DIAGNOSTICS)

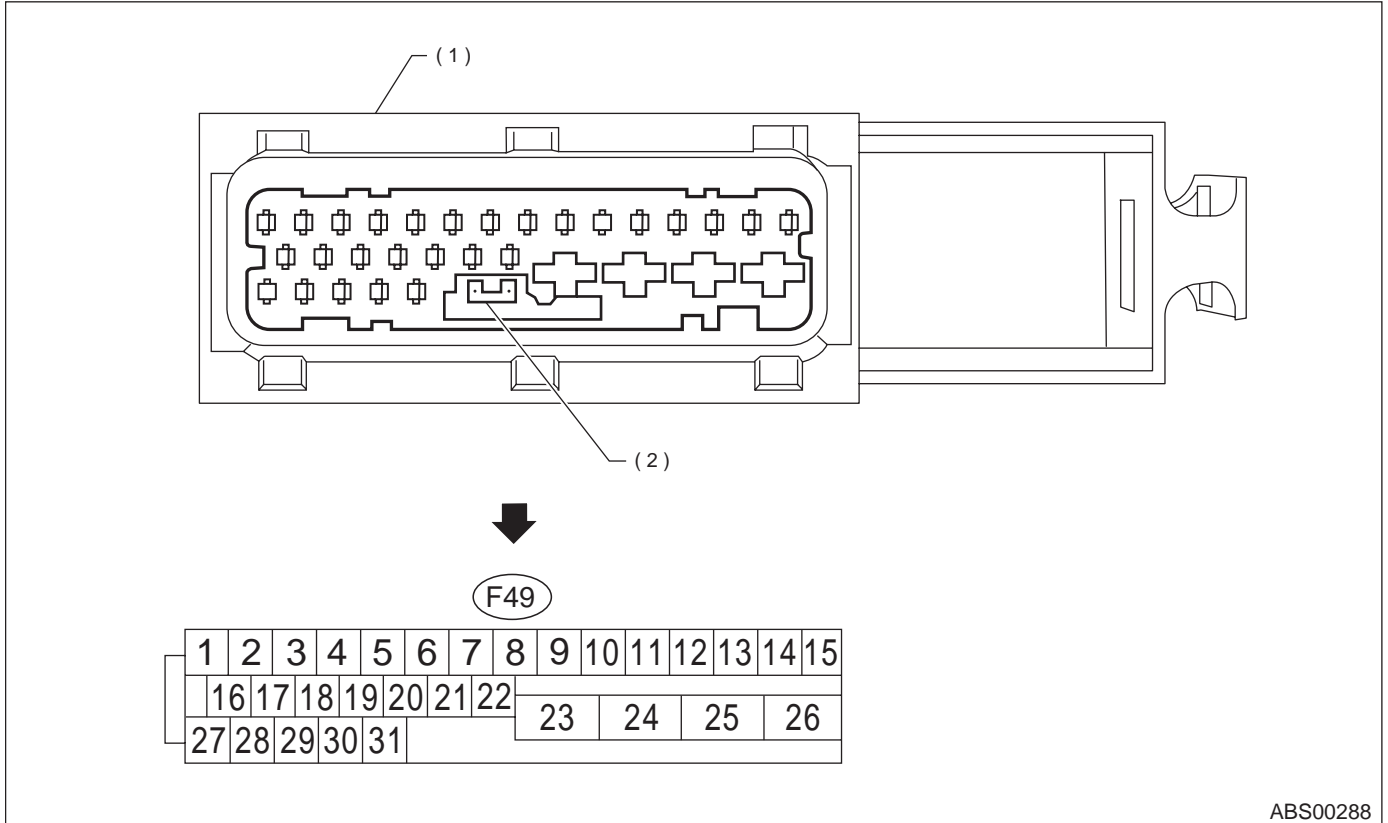


CONTROL MODULE I/O SIGNAL

ABS (DIAGNOSTICS)

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



ABS00288

- (1) ABSCM&HU connector
- (2) Connector switch

NOTE:

- The terminal numbers in the ABS control module and hydraulic control unit connector are as shown in the figure.
- When the connector is removed from the ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

CONTROL MODULE I/O SIGNAL

ABS (DIAGNOSTICS)

Contents		Terminal No. (+)(-)	Input/Output signal
			Measured value and measuring conditions
ABS sensor*2 (Wheel speed sensor)	Front left wheel	9—10	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	11—12	
	Rear left wheel	7—8	
	Rear right wheel	14—15	
Valve relay power supply		24—23	10 — 15 V
Motor relay power supply		25—23	10 — 15 V
G sensor*2	power supply	30—28	4.75 — 5.25 V
	ground	28	—
	output	6—28	2.3±0.2 V when vehicle is in horizontal position.
Stop light switch*1		2—23	Less than 1.5 V when the stop light is OFF and, 10 — 15 V when the stop light is ON.
ABS warning light*2		22—23	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
AT ABS signal*2 (AT model only)		31—23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
ABS operation signal monitor*2		3—23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
Select monitor*2	Data is received.	20—23	Less than 1.5 V when no data is received.
	Data is sent.	5—23	4.75 — 5.25 V when no data is sent.
ABS diagnosis connector*2	Terminal No. 3	29—23	10 — 15 V when ignition switch is ON.
	Terminal No. 6	4—23	10 — 15 V when ignition switch is ON.
Power supply*1		1—23	10 — 15 V when ignition switch is ON.
Grounding line		23	—
Grounding line		26	—

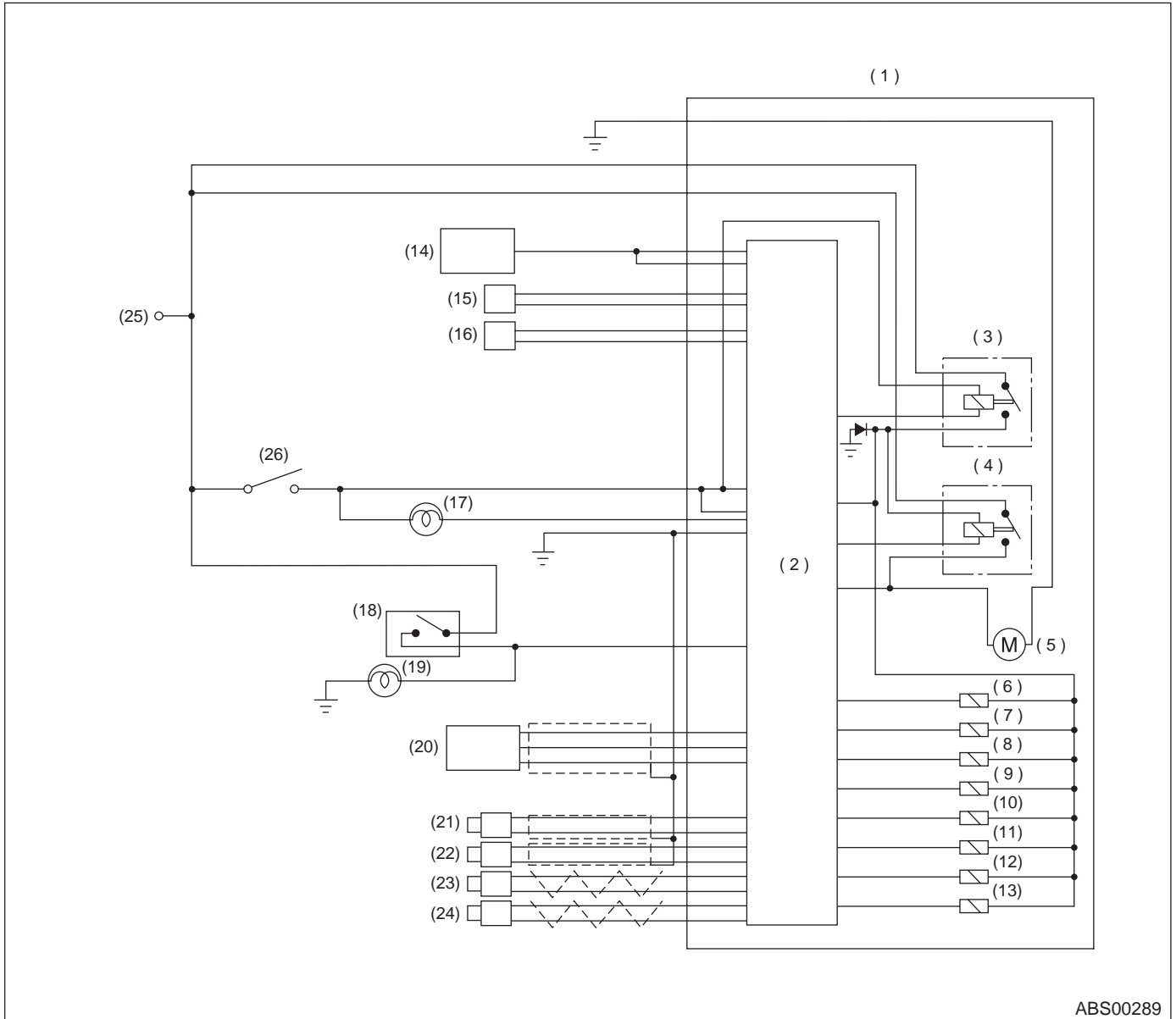
*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.

*2: Measure the I/O signal voltage at connector (B62) or (F55).

CONTROL MODULE I/O SIGNAL

ABS (DIAGNOSTICS)

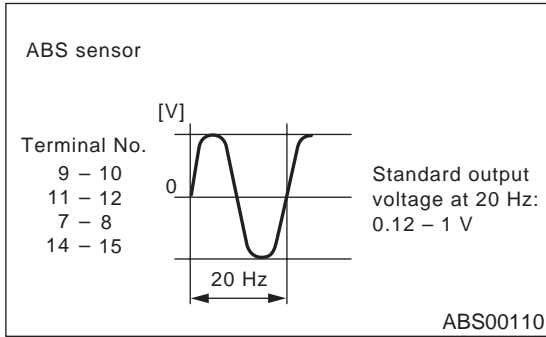
B: SCHEMATIC



ABS00289

- | | | |
|---|--|-----------------------------|
| (1) ABS control module and hydraulic control unit (ABSCM&H/U) | (10) Rear left inlet solenoid valve | (18) Stop light switch |
| (2) ABS control module area | (11) Rear left outlet solenoid valve | (19) Stop light |
| (3) Valve relay | (12) Rear right inlet solenoid valve | (20) G sensor |
| (4) Motor relay | (13) Rear right outlet solenoid valve | (21) Front left ABS sensor |
| (5) Motor | (14) Transmission control module (only AT model) | (22) Front right ABS sensor |
| (6) Front left inlet solenoid valve | (15) Diagnosis connector | (23) Rear left ABS sensor |
| (7) Front left outlet solenoid valve | (16) Data link connector | (24) Rear right ABS sensor |
| (8) Front right inlet solenoid valve | (16) Data link connector | (25) Battery |
| (9) Front right outlet solenoid valve | (17) ABS warning light | (26) IGN |

C: WAVEFORM



SUBARU SELECT MONITOR

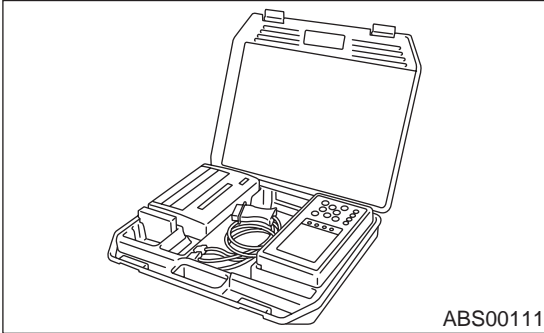
ABS (DIAGNOSTICS)

6. Subaru Select Monitor

A: OPERATION

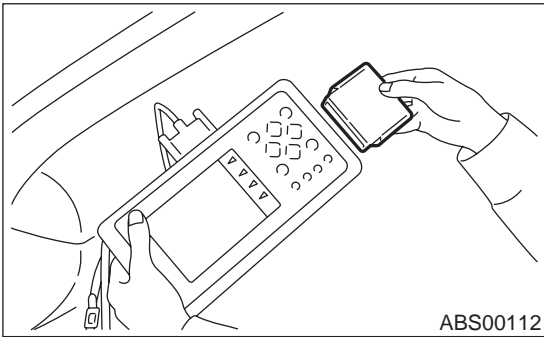
1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare Subaru Select Monitor kit.



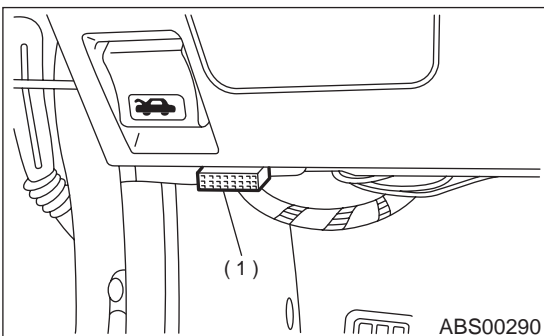
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to ABS-9, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

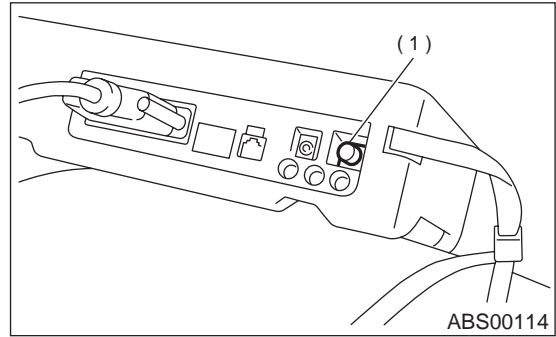
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(1) Data link connector

(2) Connect diagnosis cable to data link connector.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.

7) On the «System Selection Menu» display screen, select the {Brake Control System} and press the [YES] key.

8) Press the [YES] key after displayed the information of ABS type.

9) On the «ABS Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.

10) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the LIST OF DIAGNOSTICS TROUBLE CODE. <Ref. to ABS-24, List of Diagnostics Trouble Code (DTC).>
- A maximum of 3 DTC are displayed in order of occurrence.
- If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark "?", appears on the select monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
Latest	The most recent trouble code appears on the select monitor display.
Old	The second most recent trouble code appears on the select monitor display.
Older	The third most recent trouble code appears on the select monitor display.
Reference	A specified period of time preceding trouble code appears on the select monitor display.

2. READ CURRENT DATA

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the «YES» key.
 - 2) On the «System Selection Menu» display screen, select the {Brake Control System} and press the «YES» key.
 - 3) Press the «YES» key after displayed the information of ABS type.
 - 4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display & Save} and press the «YES» key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the «YES» key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Display screen	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by the Front Right ABS sensor is displayed	km/h or MPH
FL Wheel Speed	Wheel speed detected by the Front Left ABS sensor is displayed	km/h or MPH
RR Wheel Speed	Wheel speed detected by the Rear Right ABS sensor is displayed	km/h or MPH
RL Wheel Speed	Wheel speed detected by the Rear Left ABS sensor is displayed	km/h or MPH
Stop Light Switch	Stop light switch signal	ON or OFF
Stop Light Switch	Stop light switch monitor voltage is displayed.	V
G sensor output Signal	Refers to vehicle acceleration detecting by the analog G sensor. It appears on the select monitor display in volts.	V
Valve Relay Signal	Valve Relay Signal	ON or OFF
Motor Relay Signal	Motor Relay Signal	ON or OFF
ABS Signal to TCM	ABS operation signal from ABS control module to TCM	ON or OFF
ABS Warning Lamp	ON operation of the ABS warning light is displayed.	ON or OFF
Motor Relay Monitor	Operating condition of the motor relay is displayed.	ON or OFF
Valve Relay Monitor	Operating condition of the valve relay is displayed.	ON or OFF
CCM Signal	ABS operation signal from ABS control module to TCM	ON or OFF

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the «YES» key.
- 2) On the «System Select Menu» display screen, select {Brake System} and press the «YES» key.
- 3) Press the «YES» key after displayed the information of ABS type.
- 4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press the «YES» key.

Display screen	Contents to be monitored
Clear memory?	Function of clearing trouble code.

- 5) When the “Done” and “turn ignition switch OFF” are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. ABS SEQUENCE CONTROL

Display screen	Contents to be monitored	Index No.
ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to ABS-9, ABS Sequence Control.>

SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

5. FREEZE FRAME DATA

NOTE:

- Data stored at the time of trouble occurrence is shown on display.
- Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
- If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a DTC, preceded by a question mark “?”, appears on the select monitor display. This shows it may be an unreliable reading.
- In case of no trouble code, the initial value of freeze frame data will be displayed.

Display screen	Contents to be monitored	Initial value
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed in km/h or mile/h.	255 km/h [158 mile/h]
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed in km/h or mile/h.	↑
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed in km/h or mile/h.	↑
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor is displayed in km/h or mile/h.	↑
ABSCM power voltage	Power (in volts) supplied to ABSCM&H/U appears on the select monitor display.	18 V
G sensor output voltage	Refers to vehicle acceleration detected by the analog G sensor. It appears on the select monitor display in volts.	5 V
Motor relay monitor	Motor relay operation monitor signal	ON
Stop light switch	Stop light switch signal	OFF
ABS signal to TCM	ABS operation signal from ABS control module to TCM	OFF
ABS-AT control	ABS operation signal from ABS control module to TCM	OFF
ABS operation signal	ABS operation signal	ON

6. ANALOG DATA ARE DISPLAYED.

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor is displayed in km/h or mile/h.
Stop light switch	Stop light switch monitor voltage is displayed.
G sensor output voltage	Refers to vehicle acceleration detecting by the analog G sensor. It appears on the select monitor display in volts.

7. ON/OFF DATA ARE DISPLAYED.

Display screen	Contents to be monitored
Stop light switch	Stop light switch signal
Valve relay signal	Valve relay signal
Motor relay signal	Motor relay signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS warning light	ABS warning light
Valve relay monitor	Valve relay operation monitor signal
Motor relay monitor	Motor relay operation monitor signal
CCM signal	ABS operation signal from ABS control module to TCM

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

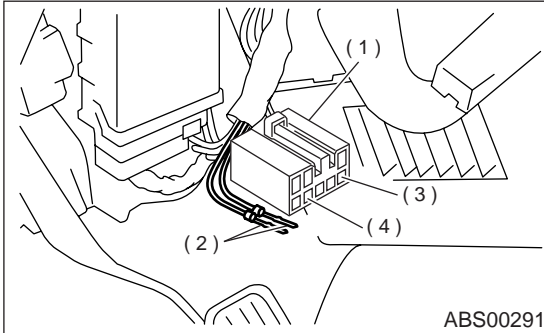
1) Take out diagnosis connector from side of driver's seat heater unit.

2) Turn ignition switch OFF.

3) Connect diagnosis connector terminal 8 to diagnosis terminal.

4) Turn ignition switch ON.

5) ABS warning light is set in the diagnostic mode and blinks to identify diagnostic trouble code (DTC).



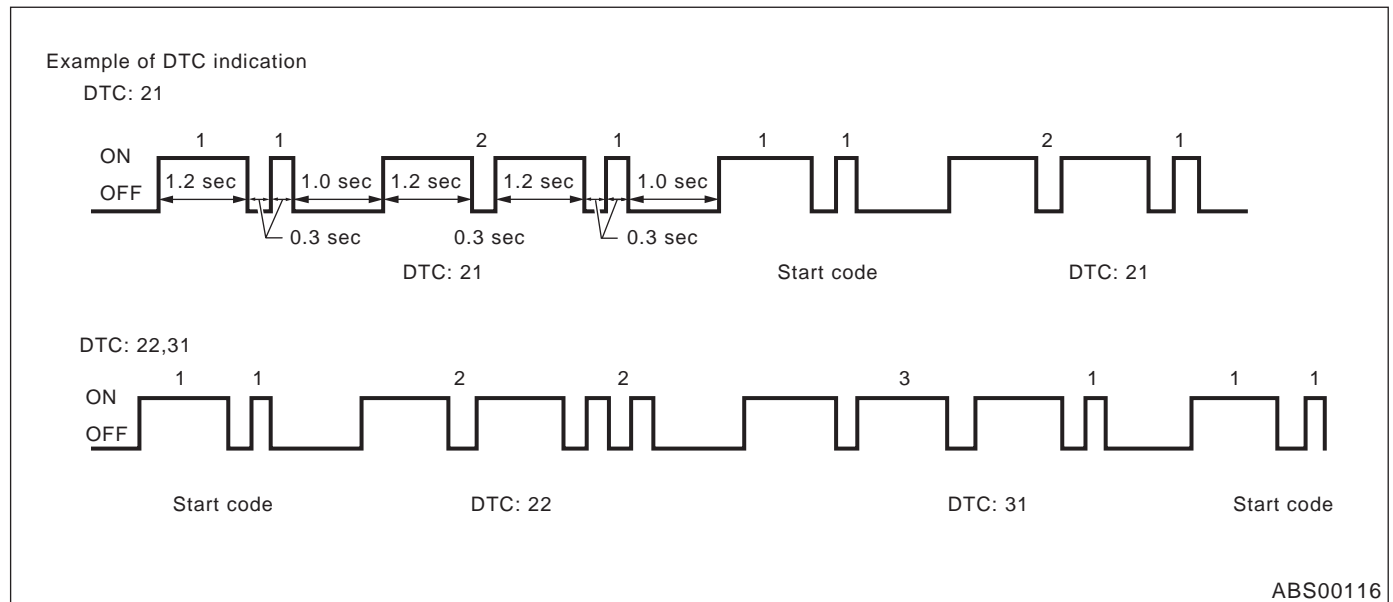
- (1) Diagnosis connector
- (2) Diagnosis terminal
- (3) 8 terminal
- (4) 5 terminal

6) After the start code (11) is shown, the diagnostic trouble codes (DTC) will be shown in order of the last information first.

These repeat for a maximum of 3 minutes.

NOTE:

- When there are no diagnostic trouble codes (DTC) in memory, only the start code (11) is shown.
- When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in the EEPROM as a diagnostic trouble code (DTC). When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



READ DIAGNOSTIC TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand diagnostic trouble codes (DTC). <Ref. to ABS-16, Subaru Select Monitor.>

8. Inspection Mode

A: OPERATION

Reproduce the condition under which the problem has occurred as much as possible.

Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

CLEAR MEMORY MODE

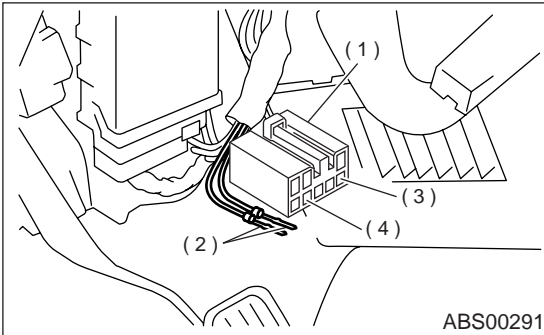
ABS (DIAGNOSTICS)

9. Clear Memory Mode

A: OPERATION

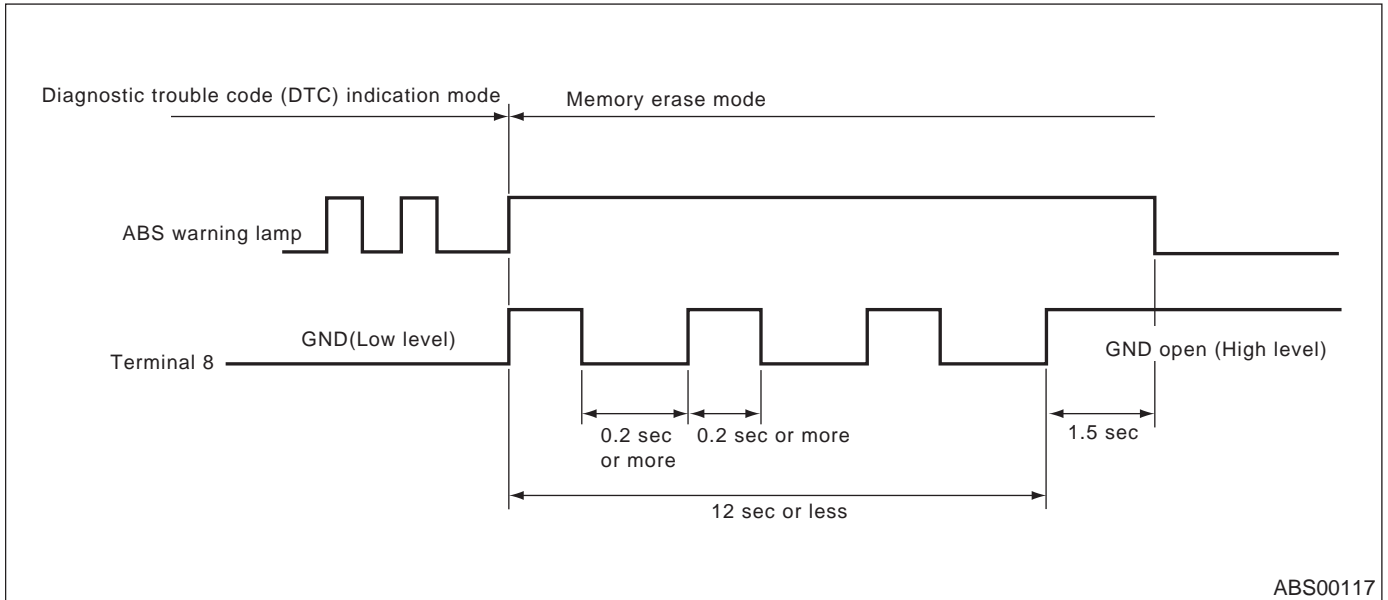
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a diagnostic trouble code (DTC), disconnect diagnosis connector terminal 8 from diagnosis terminal.



- (1) Diagnosis connector
- (2) Diagnosis terminal
- (3) 8 terminal
- (4) 5 terminal

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 8 and diagnosis terminal for at least 0.2 seconds each time.



NOTE:

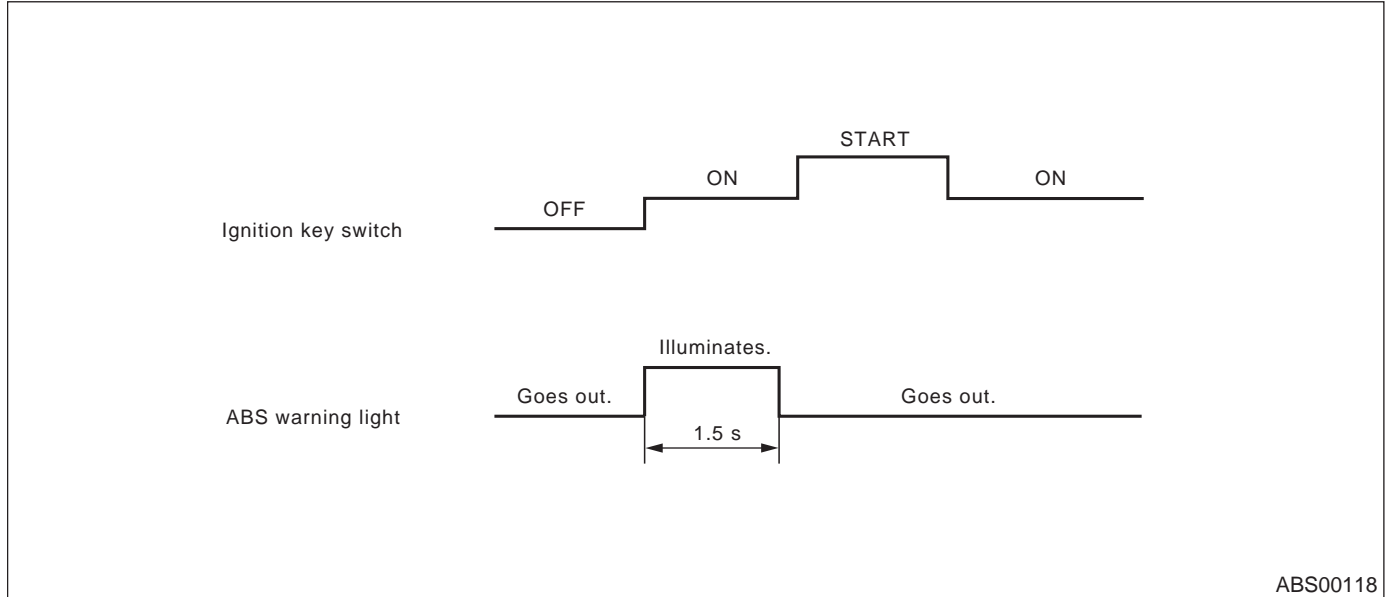
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear diagnostic trouble codes (DTC).
<Ref. to ABS-16, Subaru Select Monitor.>

10.ABS Warning Light Illumination Pattern

A: INSPECTION



ABS00118

1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.

2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit. <Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.>

NOTE:

Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the ABS warning light is illuminated.

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

11. List of Diagnostics Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC No.	Contents of diagnosis		Index No.
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor	<Ref. to ABS-38, DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
23		Front left ABS sensor	<Ref. to ABS-38, DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
25		Rear right ABS sensor	<Ref. to ABS-38, DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
27		Rear left ABS sensor	<Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor	<Ref. to ABS-44, DTC 22 ABNORMAL ABS SENSOR (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
24		Front left ABS sensor	<Ref. to ABS-44, DTC 24 ABNORMAL ABS SENSOR (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
26		Rear right ABS sensor	<Ref. to ABS-44, DTC 26 ABNORMAL ABS SENSOR (REAR RH), Diagnostics Chart with Diagnosis Connector.>
28		Rear left ABS sensor	<Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>
29		Any one of four	<Ref. to ABS-50, DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR), Diagnostics Chart with Diagnosis Connector.>
31	Abnormal solenoid valve circuit(s) in ABS control module and hydraulic unit	Front right inlet valve	<Ref. to ABS-54, DTC 31 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
32		Front right outlet valve	<Ref. to ABS-58, DTC 32 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
33		Front left inlet valve	<Ref. to ABS-54, DTC 33 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
34		Front left outlet valve	<Ref. to ABS-58, DTC 34 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
35		Rear right inlet valve	<Ref. to ABS-54, DTC 35 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Chart with Diagnosis Connector.>
36		Rear right outlet valve	<Ref. to ABS-58, DTC 36 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Chart with Diagnosis Connector.>
37		Rear left inlet valve	<Ref. to ABS-56, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>
38		Rear left outlet valve	<Ref. to ABS-60, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

DTC No.	Contents of diagnosis	Index No.
41	Abnormal ABS control module	<Ref. to ABS-62, DTC 41 ABNORMAL ABS CONTROL MODULE, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.	<Ref. to ABS-64, DTC 42 SOURCE VOLTAGE IS ABNORMAL., Diagnostics Chart with Diagnosis Connector.>
44	A combination of AT control abnormal	<Ref. to ABS-66, DTC 44 A COMBINATION OF AT CONTROL ABNORMAL, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay	<Ref. to ABS-70, DTC 51 ABNORMAL VALVE RELAY, Diagnostics Chart with Diagnosis Connector.>
52	Abnormal motor and/or motor relay	<Ref. to ABS-72, DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY, Diagnostics Chart with Diagnosis Connector.>
54	Abnormal stop light switch	<Ref. to ABS-74, DTC 54 ABNORMAL STOP LIGHT SWITCH, Diagnostics Chart with Diagnosis Connector.>
56	Abnormal G sensor output voltage	<Ref. to ABS-76, DTC 56 ABNORMAL G SENSOR OUTPUT VOLTAGE, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

DTC No.	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Select monitor communication failure	<Ref. to ABS-80, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.>
—	No trouble code	Although no diagnostic trouble code appears on the select monitor display, the ABS warning light remains on.	<Ref. to ABS-83, NO TROUBLE CODE, Diagnostics Chart with Subaru Select Monitor.>
21	Open or short circuit in front right ABS sensor circuit	Open or short circuit in front right ABS sensor circuit	<Ref. to ABS-86, DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
22	Front right ABS sensor abnormal signal	Front right ABS sensor abnormal signal	<Ref. to ABS-93, DTC 22 FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
23	Open or short circuit in front left ABS sensor circuit	Open or short circuit in front left ABS sensor circuit	<Ref. to ABS-86, DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
24	Front left ABS sensor abnormal signal	Front left ABS sensor abnormal signal	<Ref. to ABS-93, DTC 24 FRONT LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
25	Open or short circuit in rear right ABS sensor circuit	Open or short circuit in rear right ABS sensor circuit	<Ref. to ABS-86, DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
26	Rear right ABS sensor abnormal signal	Rear right ABS sensor abnormal signal	<Ref. to ABS-93, DTC 26 REAR RIGHT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
27	Open or short circuit in rear left ABS sensor circuit	Open or short circuit in rear left ABS sensor circuit	<Ref. to ABS-88, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
28	Rear left ABS sensor abnormal signal	Rear left ABS sensor abnormal signal	<Ref. to ABS-94, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
29	Abnormal ABS sensor signal on any one of four sensor	Abnormal ABS sensor signal on any one of four	<Ref. to ABS-100, DTC 29 ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR, Diagnostics Chart with Subaru Select Monitor.>
31	Front right inlet valve malfunction	Front right inlet valve malfunction	<Ref. to ABS-104, DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
32	Front right outlet valve malfunction	Front right outlet valve malfunction	<Ref. to ABS-108, DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

DTC No.	Display screen	Contents of diagnosis	Index No.
33	Front left inlet valve malfunction	Front left inlet valve malfunction	<Ref. to ABS-104, DTC 33 FRONT LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
34	Front left outlet valve malfunction	Front left outlet valve malfunction	<Ref. to ABS-108, DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
35	Rear right inlet valve malfunction	Rear right inlet valve malfunction	<Ref. to ABS-104, DTC 35 REAR RIGHT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
36	Rear right outlet valve malfunction	Rear right outlet valve malfunction	<Ref. to ABS-108, DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
37	Rear left inlet valve malfunction	Rear left inlet valve malfunction	<Ref. to ABS-106, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
38	Rear left outlet valve malfunction	Rear left outlet valve malfunction	<Ref. to ABS-110, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
41	ABS control module malfunction	ABS control module and hydraulic control unit malfunction	<Ref. to ABS-112, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too low	Power supply voltage too low	<Ref. to ABS-114, DTC 42 POWER SUPPLY VOLTAGE TOO LOW, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too high	Power supply voltage too high	<Ref. to ABS-116, DTC 42 POWER SUPPLY VOLTAGE TOO HIGH, Diagnostics Chart with Subaru Select Monitor.>
44	ABS-AT control (Non Controlled)	ABS-AT control (Non Controlled)	<Ref. to ABS-118, DTC 44 ABS-AT CONTROL (NON CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>
44	ABS-AT control (Controlled)	ABS-AT control (Controlled)	<Ref. to ABS-120, DTC 44 ABS-AT CONTROL (CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS-122, DTC 51 VALVE RELAY MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay ON failure	Valve relay ON failure	<Ref. to ABS-124, DTC 51 VALVE RELAY ON FAILURE, Diagnostics Chart with Subaru Select Monitor.>
52	Open circuit in motor relay circuit	Open circuit in motor relay circuit	<Ref. to ABS-126, DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
52	Motor relay ON failure	Motor relay ON failure	<Ref. to ABS-128, DTC 52 MOTOR RELAY ON FAILURE, Diagnostics Chart with Subaru Select Monitor.>
52	Motor malfunction	Motor malfunction	<Ref. to ABS-130, DTC 52 MOTOR MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
54	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS-132, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
56	Open or short circuit in G sensor circuit	Open or short circuit in G sensor circuit	<Ref. to ABS-134, DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
56	Battery short in G sensor circuit	Battery short in G sensor circuit	<Ref. to ABS-138, DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
56	Abnormal G sensor high μ output	Abnormal G sensor high μ output	<Ref. to ABS-142, DTC 56 ABNORMAL G SENSOR HIGH M OUTPUT, Diagnostics Chart with Subaru Select Monitor.>
56	Detection of G sensor stick	Detection of G sensor stick	<Ref. to ABS-146, DTC 56 DETECTION OF G SENSOR STICK, Diagnostics Chart with Subaru Select Monitor.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

12. Diagnostics Chart with Diagnosis Connector

A: ABS WARNING LIGHT DOES NOT COME ON.

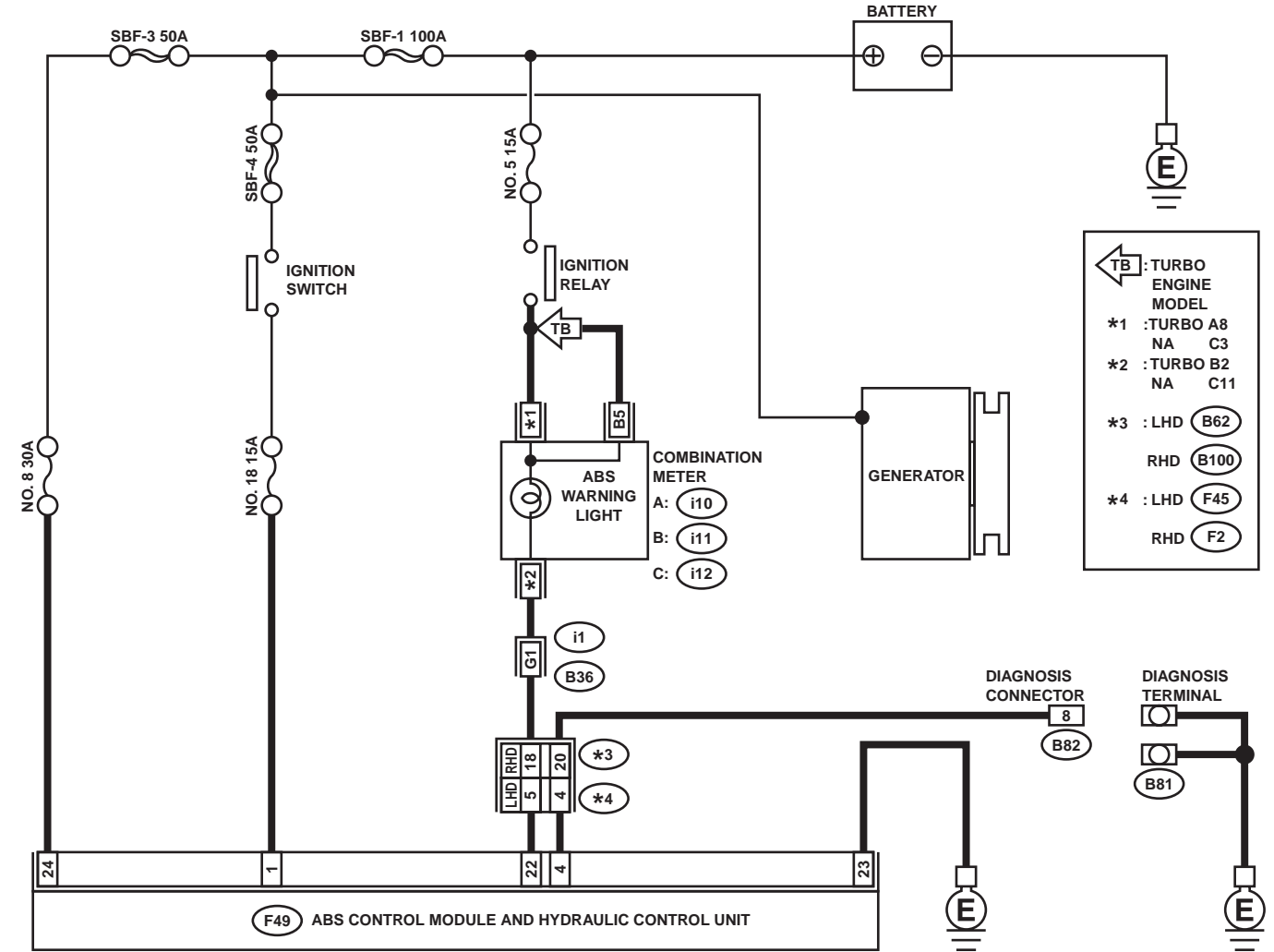
DIAGNOSIS:

- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When ignition switch is turned ON (engine OFF), ABS warning light does not come on

WIRING DIAGRAM:



← TB	: TURBO ENGINE MODEL
*1	: TURBO A8 NA C3
*2	: TURBO B2 NA C11
*3	: LHD (B62) RHD (B100)
*4	: LHD (F45) RHD (F2)

1	2	3		4	5	6	7	8
9	10	11	12	13	14	15	16	17

1	2	3		4	5	6	7	8
9	10	11	12	13	14	15	16	17

1	2	3		4	5	6	7	8
9	10	11	12	13	14	15	16	17

1	2	3	4		5	6	7	8
9	10	11	12	13	14	15	16	17

A1	A2	A3	A4	A5	A6	F6
B1	B2	B3	B4	B5	B6	G6
C2	C3	C4	C5	C6		H6
D1	D2	D3	D4	D5	D6	
E1	E2	E3	E4	E5	E6	
F1						
G1						
H1						
I1						16
J1						J6
K1						K6
L1	L2		L4	L5	L6	
M1	M2	N3	M4	M5	M6	
N2			N4	N5	N6	
O1	O2	O3	O4	O5	O6	
P1	P2	P3	P4	P5	P6	

1	2	3	4	5	6		7	8	9	10	11	
12	13	14	15	16	17	18	19	20	21	22	23	24

1	2	3	4	5	6	7	⊗	8	9	10	11	12	13	14	
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22		23	24	25	26			
27	28	29	30	31										

ABS00308

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK IF OTHER WARNING LIGHTS TURN ON. Turn ignition switch to ON (engine OFF). Do other warning lights turn on?</p>	Other warning light turns on.	Go to step 2.	Repair combination meter. -<Ref. to IDI-14, Combination Meter Assembly.>
<p>2 CHECK ABS WARNING LIGHT BULB. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove ABS warning light bulb from combination meter. Is ABS warning light bulb OK?</p>	OK.	Go to step 3.	Replace ABS warning light bulb. <Ref. to IDI-14, Combination Meter Assembly.>
<p>3 CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS. 1) Disconnect connector (B62) or (B100) from connector (F45) or (F2). 2) Measure voltage between connector (B62) and chassis ground. Connector & terminal LHD: (B62) No. 5 (+) — Chassis ground (-): RHD: (B100) No. 18 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	3 V	Go to step 4.	Repair warning light harness.
<p>4 CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between connector (B62) or (B100) and chassis ground. Connector & terminal LHD: (B62) No. 5 (+) — Chassis ground (-): LHD: (B100) No. 18 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	3 V	Go to step 5.	Repair warning light harness.
<p>5 CHECK WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Install ABS warning light bulb from combination meter. 3) Install combination meter. 4) Turn ignition switch to ON. 5) Measure voltage between connector (B62) or (B100) and chassis ground. Connector & terminal LHD: (B62) No. 5 (+) — Chassis ground (-): RHD: (B100) No. 18 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 - 15 V	Go to step 6.	Repair wiring harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS. 1) Turn ignition switch to OFF. 2) Measure voltage between connector (F45) or (F2) and chassis ground. Connector & terminal LHD: (F45) No. 5 (+) — Chassis ground (-): RHD: (F2) No. 18 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	3 V	Go to step 7.	Repair wiring harness.
<p>7 CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between connector (F45) or (F2) and chassis ground. Connector & terminal LHD: (F45) No. 5 (+) — Chassis ground (-): RHD: (F2) No. 18 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	3 V	Go to step 8.	Repair wiring harness.
<p>8 CHECK GROUND CIRCUIT OF ABSCM&H/U. Measure resistance between ABSCM&H/U and chassis ground. Connector & terminal (F49) No. 23 — GND: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 9.	Repair ABSCM&H/U ground harness.
<p>9 CHECK WIRING HARNESS. Measure resistance between connector (F45) or (F2) and chassis ground. Connector & terminal LHD: (F45) No. 5 — Chassis ground: RHD: (F2) No. 18— Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 10.	Repair harness/connector.
<p>10 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connectors between combination meter and ABSCM&H/U?</p>	There is no poor contact.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair connector.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

B: ABS WARNING LIGHT DOES NOT GO OFF.

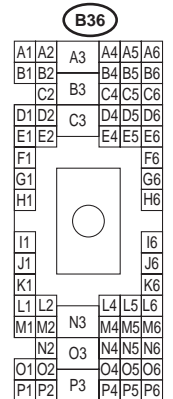
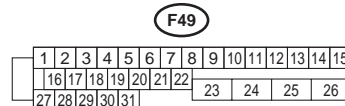
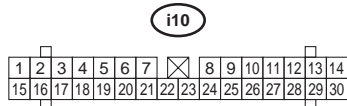
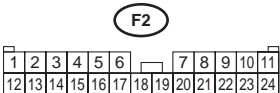
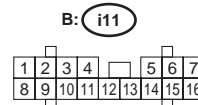
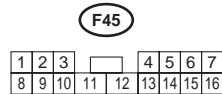
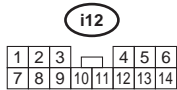
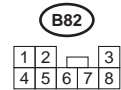
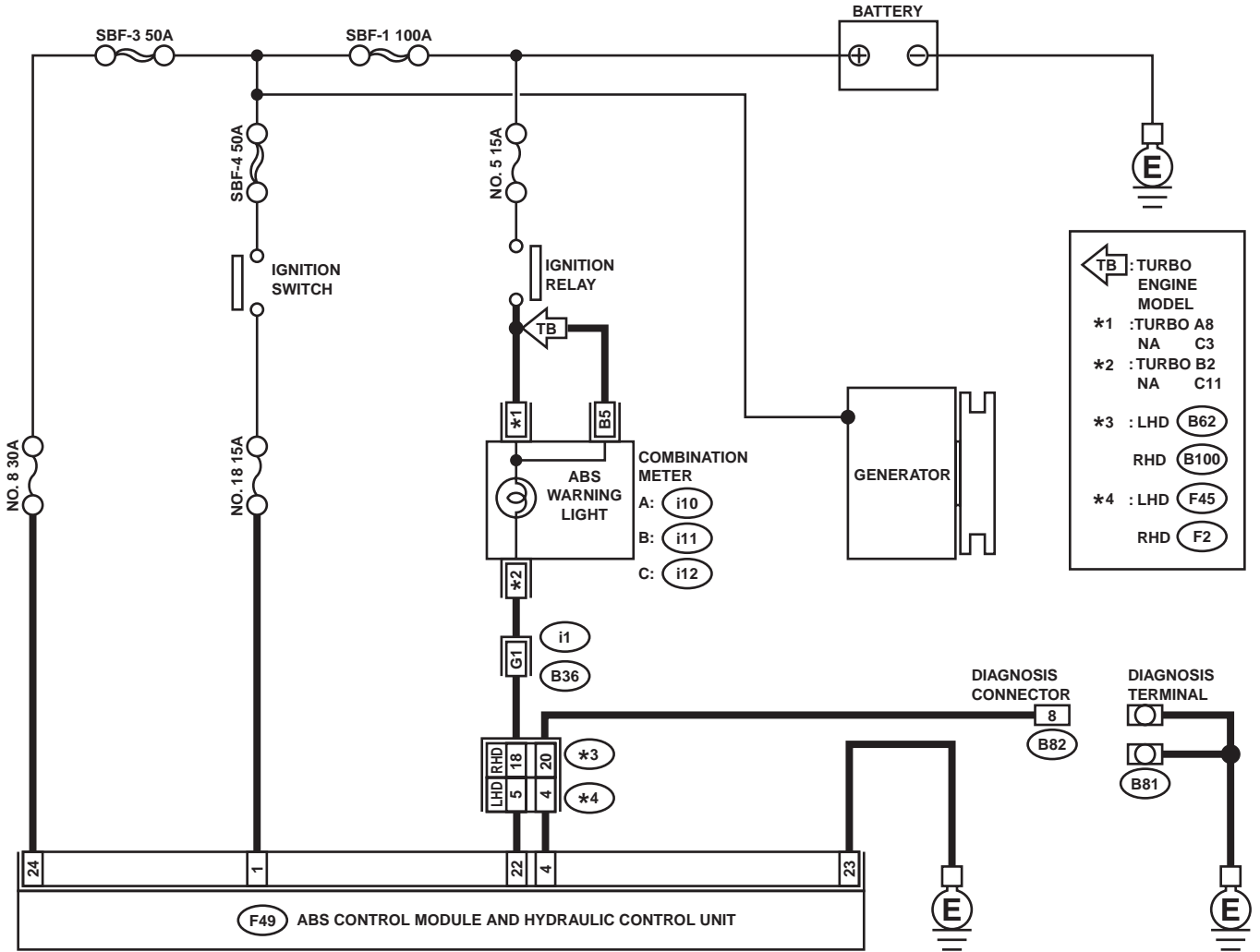
DIAGNOSIS:

- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while ABS warning light is kept ON.

WIRING DIAGRAM:



ABS00308

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK INSTALLATION OF ABSCM&H/U CONNECTOR. Turn ignition switch to OFF. Is ABSCM&H/U connector inserted into ABSCM until the clamp locks onto it?</p>	Connector is locked securely.	Go to step 2.	Insert ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.
<p>2 CHECK DIAGNOSIS TERMINAL. Measure resistance between diagnosis terminals (B81) and chassis ground. Terminals Diagnosis terminal (A) — Chassis ground: Diagnosis terminal (B) — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Repair diagnosis terminal harness.
<p>3 CHECK DIAGNOSIS LINE. 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 4 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 4.	Repair harness connector between ABSCM&H/U and diagnosis connector.
<p>4 CHECK GENERATOR. 1) Start the engine. 2) Idle the engine. 3) Measure voltage between generator and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 - 15 V	Go to step 5.	Repair generator. H4 engine model: <Ref. to SC(H4SO)-14, Generator.> H6 engine model: <Ref. to SC(H6DO)-14, Generator.>
<p>5 CHECK BATTERY TERMINAL. Turn ignition switch to OFF. Is there poor contact at battery terminal?</p>	There is no poor contact.	Go to step 6.	Repair battery terminal.
<p>6 CHECK POWER SUPPLY OF ABSCM. 1) Disconnect connector from ABSCM&H/U. 2) Start engine. 3) Idle the engine. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 - 15 V	Go to step 7.	Repair ABSCM&H/U power supply circuit.
<p>7 CHECK WIRING HARNESS. 1) Disconnect connector (F45) from connector (B62). 2) Turn ignition switch to ON. Does the ABS warning light turn on?</p>	ABS warning light remains off.	Go to step 8.	Repair front wiring harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK ABSCM&H/U TERMINAL. 1) Turn ignition switch to OFF. 2) Check for damage at the ABSCM&H/U terminal. Is there any damage on terminal?	There is no damage on terminal.	Go to step 9 .	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
9 CHECK ABSCM&H/U. Measure resistance between ABSCM&H/U terminals. <i>Terminal</i> <i>No. 22 — No. 23:</i> Does the measured value exceed the specified value?	1 M Ω	Go to step 10 .	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
10 CHECK WIRING HARNESS. Measure resistance between connector (F45) or (F2) and chassis ground. <i>Connector & terminal</i> <i>LHD: (F45) No. 5 — Chassis ground:</i> <i>RHD: (F2) No. 18 — Chassis ground (-):</i> Is the measured value less than the specified value?	0.5 Ω	Go to step 11 .	Repair harness.
11 CHECK WIRING HARNESS. 1) Connect connector to ABSCM&H/U. 2) Measure resistance between connector (F45) or (F2) and chassis ground. <i>Connector & terminal</i> <i>LHD: (F45) No. 5 — Chassis ground:</i> <i>RHD: (F2) No. 18 — Chassis ground (-):</i> Is the measured value within the specified range?	1 M Ω	Go to step 12 .	Repair harness.
12 CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR. Is there poor contact in ABSCM&H/U connector?	There is no poor contact.	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

C: DIAGNOSTIC TROUBLE CODE (DTC) DOES NOT APPEAR.

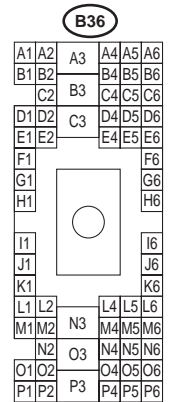
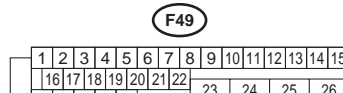
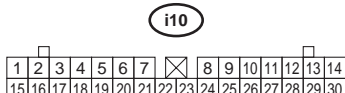
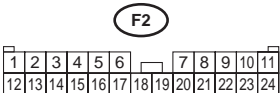
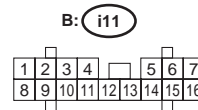
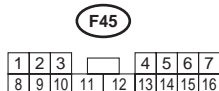
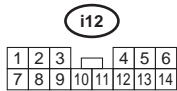
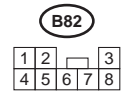
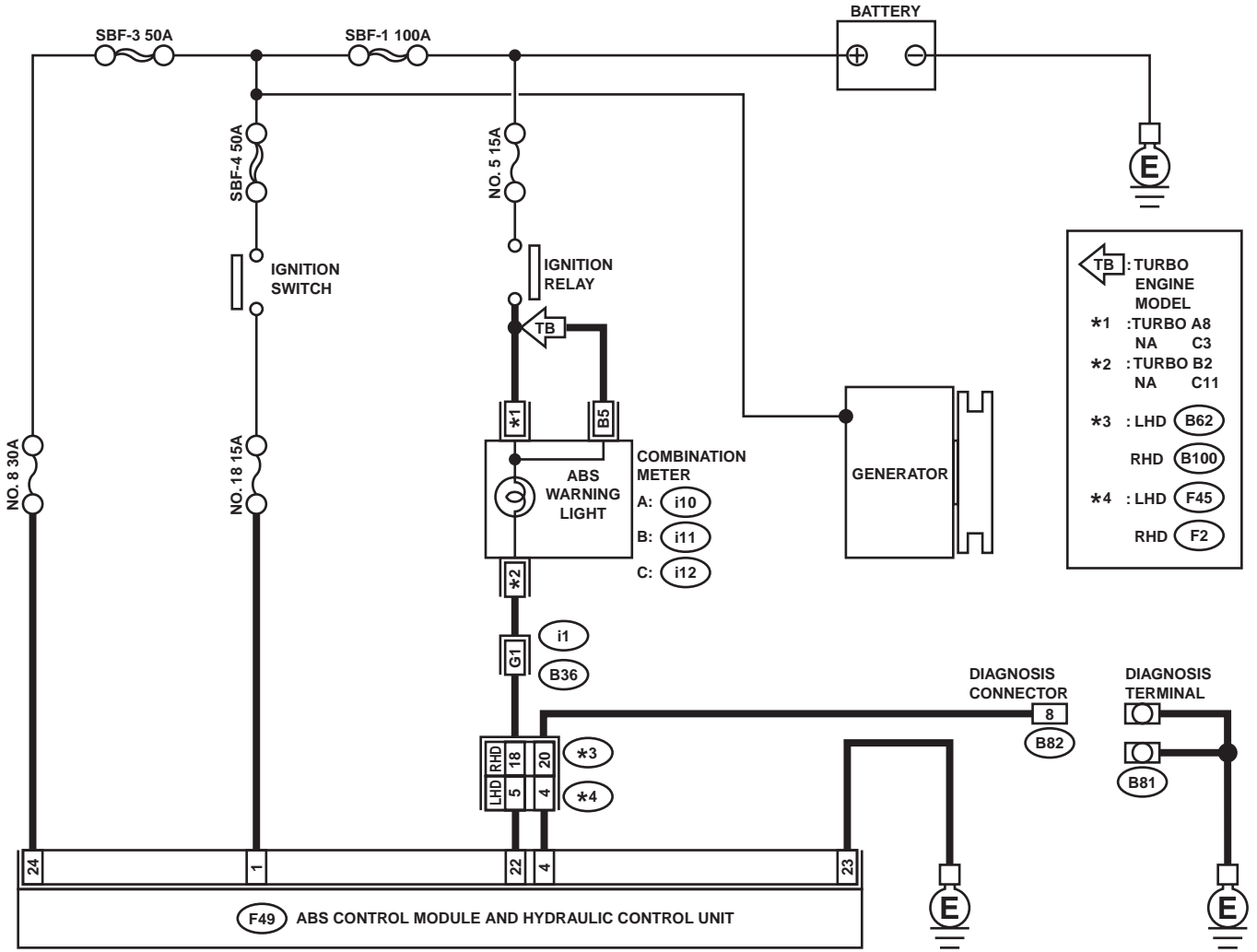
DIAGNOSIS:

- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

WIRING DIAGRAM:



ABS00308

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK DIAGNOSIS TERMINAL. 1) Turn ignition switch to OFF. 2) Measure resistance between diagnosis terminals (B81) and chassis ground.</p> <p>Terminals Diagnosis terminal (A) — Chassis ground: Diagnosis terminal (B) — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Repair diagnosis terminal harness.
<p>2 CHECK DIAGNOSIS LINE. 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground.</p> <p>Connector & terminal (F49) No. 4 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Repair harness connector between ABSCM&H/U and diagnosis connector.
<p>3 CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR. Is there poor contact in ABSCM&H/U connector?</p>	There is no poor contact.	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

D: DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH)

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

E: DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH)

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

F: DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH)

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

G: DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH)

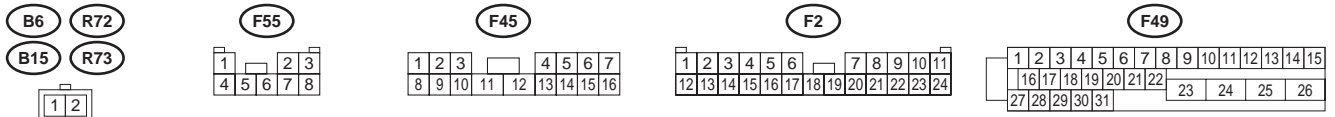
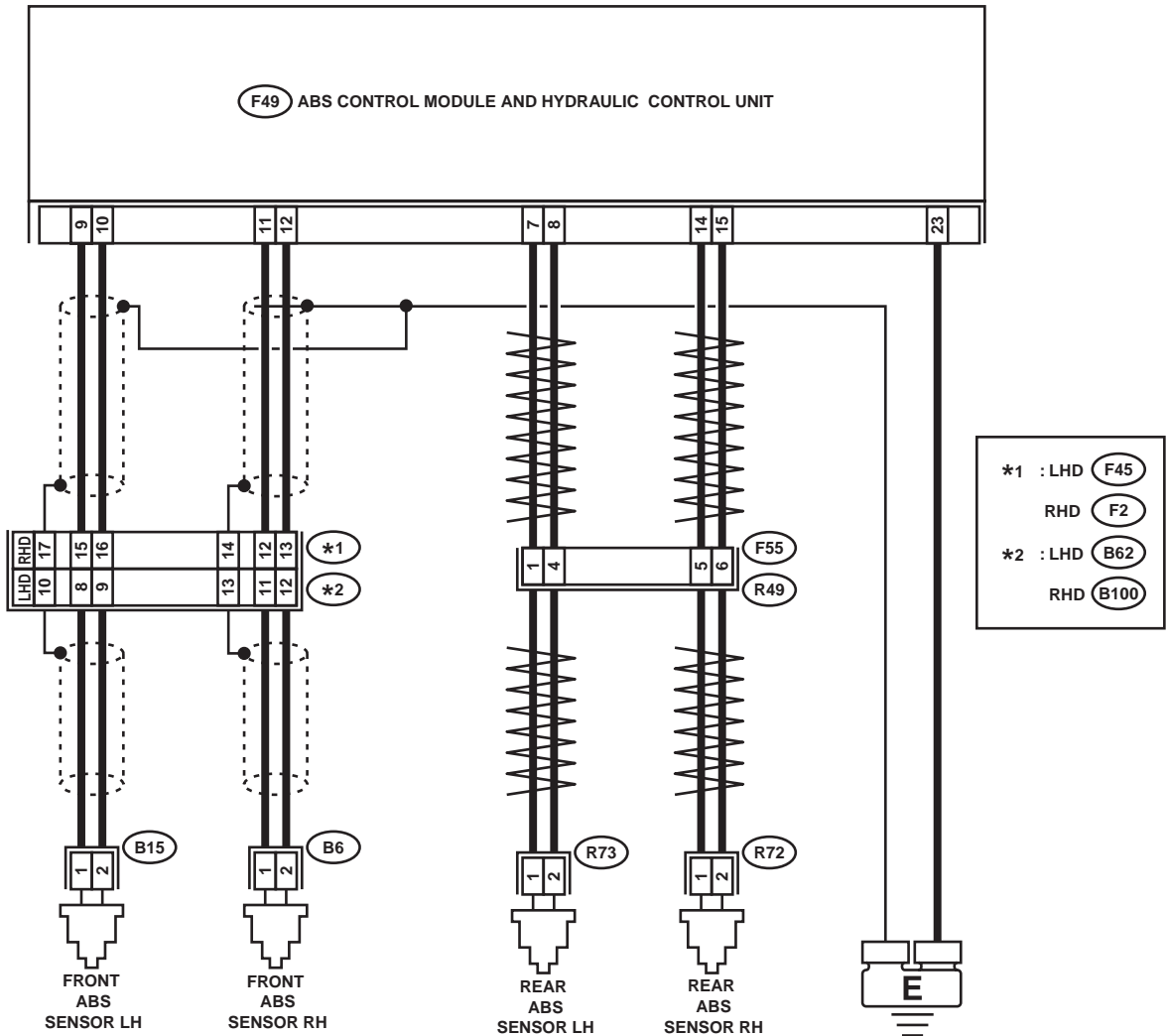
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK ABS SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals.</p> <p>Terminal Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:</p> <p>Is the measured value within the specified range?</p>	1 - 1.5 kΩ	Go to step 2.	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
<p>2 CHECK BATTERY SHORT OF ABS SENSOR.</p> <p>1) Disconnect connector from ABSCM&H/U. 2) Measure voltage between ABS sensor and chassis ground.</p> <p>Terminal Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 1 (+) — Chassis ground (-): Rear LH No. 1 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 3.	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
<p>3 CHECK BATTERY SHORT OF ABS SENSOR.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground.</p> <p>Terminal Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 1 (+) — Chassis ground (-): Rear LH No. 1 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 4.	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
<p>4 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminals.</p> <p>Connector & terminal DTC 21 / (F49) No. 11 — No. 12: DTC 23 / (F49) No. 9 — No. 10: DTC 25 / (F49) No. 14 — No. 15: DTC 27 / (F49) No. 7 — No. 8:</p> <p>Is the measured value within the specified range?</p>	1 - 1.5 kΩ	Go to step 5.	Repair harness/connector between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK BATTERY SHORT OF HARNESS. Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 21 / (F49) No. 11 (+) — Chassis ground (-): DTC 23 / (F49) No. 9 (+) — Chassis ground (-): DTC 25 / (F49) No. 14 (+) — Chassis ground (-): DTC 27 / (F49) No. 7 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 6.	Repair harness between ABSCM&H/U and ABS sensor.
<p>6 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 21 / (F49) No. 11 (+) — Chassis ground (-): DTC 23 / (F49) No. 9 (+) — Chassis ground (-): DTC 25 / (F49) No. 14 (+) — Chassis ground (-): DTC 27 / (F49) No. 7 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 7.	Repair harness between ABSCM&H/U and ABS sensor.
<p>7 CHECK INSTALLATION OF ABS SENSOR. Turn ignition switch to OFF. Are the ABS sensor installation bolts tightened with the specified torque?</p>	33 N·m (3.4 kgf-m, 25 ft-lb)	Go to step 8.	Tighten ABS sensor installation bolts securely.
<p>8 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?</p>	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step 9.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
<p>9 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value less than the specified value?</p>	0.05 mm (0.0020 in)	Go to step 10.	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
10 CHECK GROUND SHORT OF ABS SENSOR. 1) Turn ignition switch to ON. 2) Measure resistance between ABS sensor and chassis ground. Terminal <i>Front RH No. 1 — Chassis ground:</i> <i>Front LH No. 1 — Chassis ground:</i> <i>Rear RH No. 1 — Chassis ground:</i> <i>Rear LH No. 1 — Chassis ground:</i> Does the measured value exceed the specified value?	1 MΩ	Go to step 11.	Replace ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
11 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminal and chassis ground. Connector & terminal <i>DTC 21 / (F49) No. 11 — Chassis ground:</i> <i>DTC 23 / (F49) No. 9 — Chassis ground:</i> <i>DTC 25 / (F49) No. 14 — Chassis ground:</i> <i>DTC 27 / (F49) No. 7 — Chassis ground:</i> Does the measured value exceed the specified value?	1 MΩ	Go to step 12.	Repair harness between ABSCM&H/U and ABS sensor. Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
12 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step 13.	Repair connector.
13 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 14.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
14 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

H: DTC 22 ABNORMAL ABS SENSOR (FRONT RH)

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

I: DTC 24 ABNORMAL ABS SENSOR (FRONT LH)

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

J: DTC 26 ABNORMAL ABS SENSOR (REAR RH)

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

K: DTC 28 ABNORMAL ABS SENSOR (REAR LH)

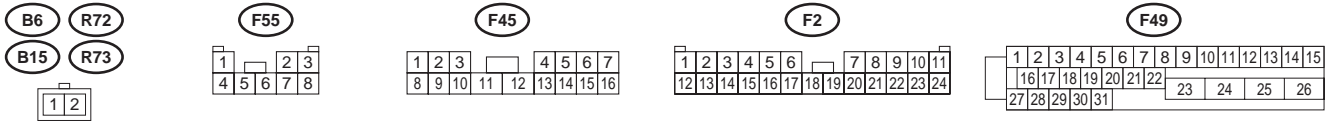
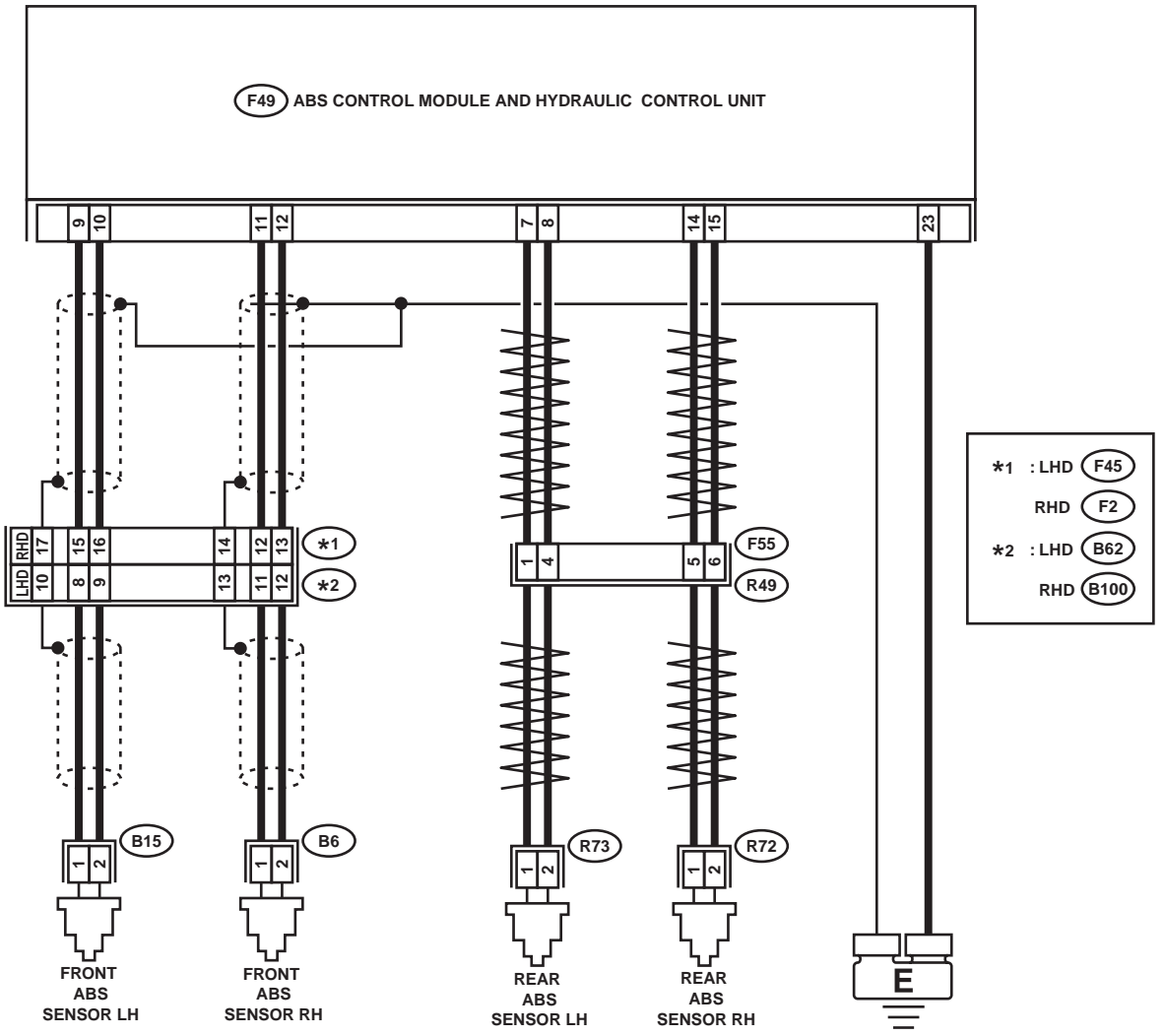
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INSTALLATION OF ABS SENSOR. Turn ignition switch to OFF. Are the ABS sensor installation bolts tightened with the specified torque?	33±10 N·m (3.4±1.0 kgf-m, 25±7 ft-lb)	Go to step 2.	Tighten ABS sensor installation bolts securely.
2 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step 3.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
3 PREPARE OSCILLOSCOPE. Is an oscilloscope available?	Available.	Go to step 4.	Go to step 5.
4 CHECK ABS SENSOR SIGNAL. 1) Lift-up the vehicle. 2) Turn ignition switch OFF. 3) Connect the oscilloscope to the connector. 4) Turn ignition switch ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS control module sometimes stores the trouble code 29. Connector & terminal DTC 22 / LHD: (F45) No. 11 (+) — No. 12 (-): RHD: (F2) No. 12 (+) — No. 13 (-): DTC 24/ LHD: (F45) No. 8 (+) — No. 9 (-): RHD: (F2) No. 15 (+) — No. 16 (-): DTC 26 : (F55) No. 5 (+) — No. 6 (-): DTC 28 : (F55) No. 1 (+) — No. 4 (-): Is the measured value same as the specified value?	Oscilloscope pattern is as in figure.	Go to step 8.	Go to step 7.
5 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL. Remove disc rotor or drum from hub in accordance with trouble code. Is the ABS sensor piece or the tone wheel contaminated by mud or other foreign matter?	ABS sensor piece or the tone wheel is not contaminated.	Go to step 6.	Thoroughly remove mud or other foreign matter.
6 CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL. Are there broken or damaged in the ABS sensor piece or the tone wheel?	Not broken or damaged.	Go to step 7.	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step 8 .	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
8 CHECK RESISTANCE OF ABS SENSOR. 1) Turn ignition switch OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. Terminal <i>Front RH No. 1 — No. 2:</i> <i>Front LH No. 1 — No. 2:</i> <i>Rear RH No. 1 — No. 2:</i> <i>Rear LH No. 1 — No. 2:</i> Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step 9 .	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
9 CHECK GROUND SHORT OF ABS SENSOR. Measure resistance between ABS sensor and chassis ground. Terminal <i>Front RH No. 1 — Chassis ground:</i> <i>Front LH No. 1 — Chassis ground:</i> <i>Rear RH No. 1 — Chassis ground:</i> <i>Rear LH No. 1 — Chassis ground:</i> Does the measured value exceed the specified value?	1 MΩ	Go to step 10 .	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
10 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR. 1) Connect connector to ABS sensor. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance at ABSCM&H/U connector terminals. Connector & terminal <i>DTC 22 / (F49) No. 11 — No. 12:</i> <i>DTC 24 / (F49) No. 9 — No. 10:</i> <i>DTC 26 / (F49) No. 14 — No. 15:</i> <i>DTC 28 / (F49) No. 7 — No. 8:</i> Is the measured value within the specified range?	1 - 1.5 kΩ	Go to step 11 .	Repair harness/connector between ABSCM&H/U and ABS sensor.
11 CHECK GROUND SHORT OF HARNESS. Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal <i>DTC 22 / (F49) No. 11 — Chassis ground:</i> <i>DTC 24 / (F49) No. 9 — Chassis ground:</i> <i>DTC 26 / (F49) No. 14 — Chassis ground:</i> <i>DTC 28 / (F49) No. 7 — Chassis ground:</i> Does the measured value exceed the specified value?	1 MΩ	Go to step 12 .	Repair harness/connector between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
12 CHECK GROUND CIRCUIT OF ABSCM&H/U. Measure resistance between ABSCM&H/U and chassis ground. Connector & terminal (F49) No. 23 — GND: Is the measured value less than the specified value?	0.5 Ω	Go to step 13 .	Repair ABSCM&H/U ground harness.
13 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step 14 .	Repair connector.
14 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step 15 .	Properly install the car telephone or the wireless transmitter.
15 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step 16 .	Install the noise sources apart from the sensor harness.
16 CHECK SHIELD CIRCUIT. 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. Connector & terminal DTC 22 / LHD: (F45) No. 13 — Chassis ground: RHD: (F2) No. 14 — Chassis ground: DTC 24 / LHD: (F45) No. 10 — Chassis ground: RHD: (F2) No. 17 — Chassis ground: NOTE: For the DTC 26 and 28 : Go to step 17 . Is the measured value less than the specified value?	0.5 Ω	Go to step 17 .	Repair shield harness.
17 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 18 .	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary noise interference.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

L: DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR)

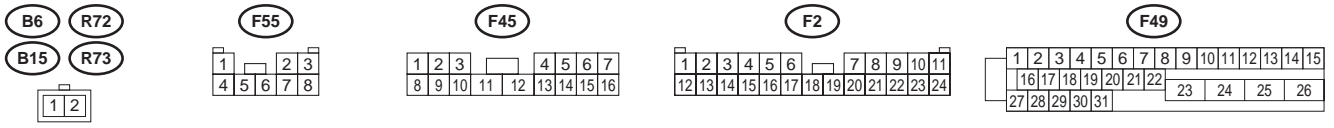
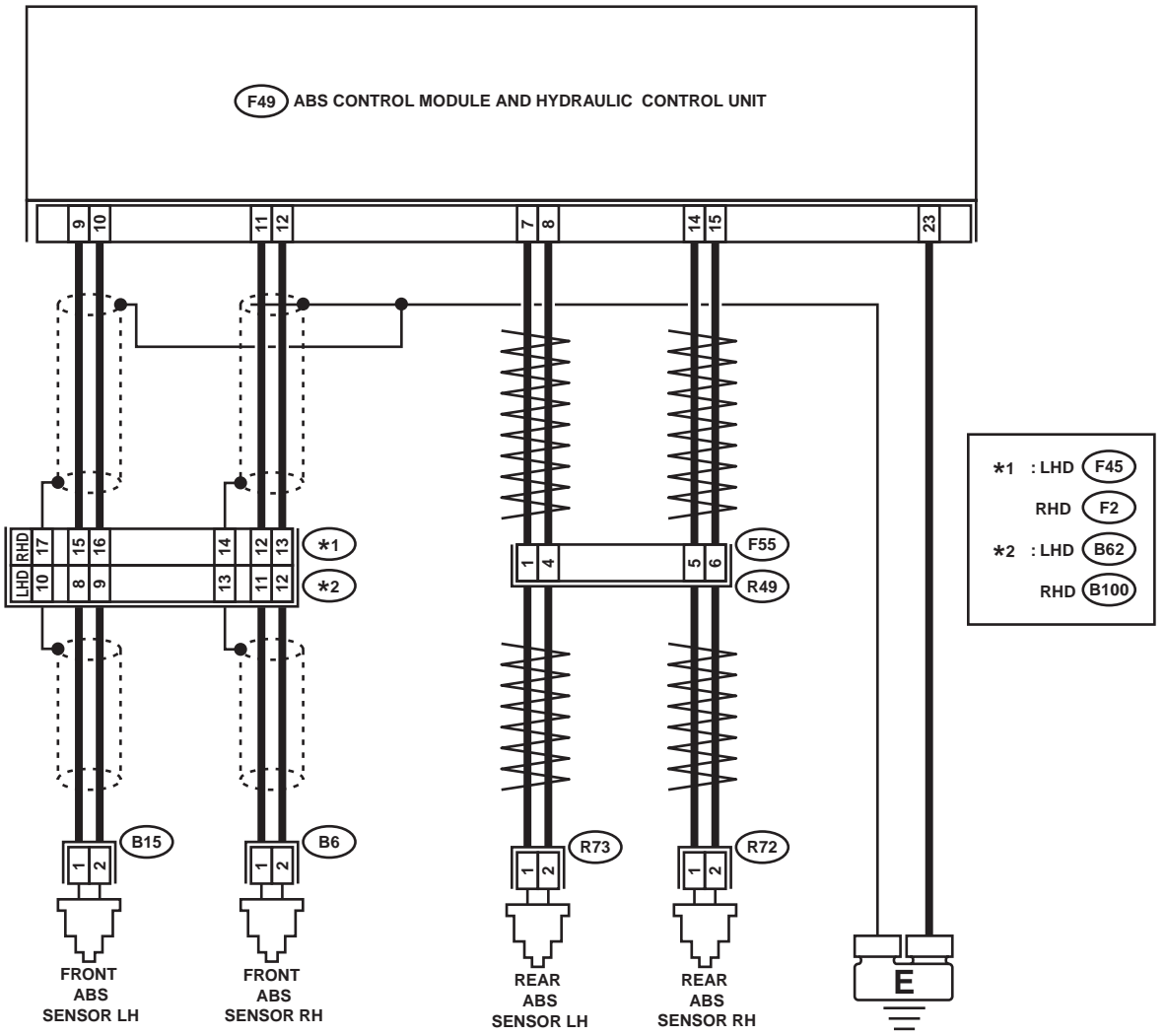
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Turning wheels freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK IF THE WHEELS HAVE TURNED FREELY. Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Wheels have not turned freely.	Go to step 2.	NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur. The ABS is normal. Erase the DTC.
2 CHECK TIRE SPECIFICATIONS. Turn ignition switch to OFF. Are the tire specifications correct?	Correct specification.	Go to step 3.	Replace tire.
3 CHECK WEAR OF TIRE. Is the tire worn excessively?	Not worn excessively.	Go to step 4.	Replace tire.
4 CHECK TIRE PRESSURE. Is the tire pressure correct?	Correct tire pressure.	Go to step 5.	Adjust tire pressure.
5 CHECK INSTALLATION OF ABS SENSOR. <i>Tightening torque:</i> Are the ABS sensor installation bolts tightened with the specified torque?	33±10 N·m (3.4±1.0 kgf·m, 25±7 ft·lb)	Go to step 6.	Tighten ABS sensor installation bolts.
6 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step 7.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7 PREPARE OSCILLOSCOPE. Is an oscilloscope available?	Available.	Go to step 8.	Go to step 9.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK ABS SENSOR SIGNAL.</p> <p>1) Lift up the vehicle. 2) Turn ignition switch OFF. 3) Connect the oscilloscope to the connector. 4) Turn ignition switch ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.></p> <p>NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the DTC 29.</p> <p>Connector & terminal</p> <p>Front RH LHD: (F45) No. 11 (+) — No. 12 (-): RHD: (F2) No. 12 (+) — No. 13 (-):</p> <p>Front LH LHD: (F45) No. 8 (+) — No. 9 (-): RHD: (F2) No. 15 (+) — No. 16 (-):</p> <p>Rear RH (F55) No. 5 (+) — No. 6 (-):</p> <p>Rear LH (F55) No. 1 (+) — No. 4 (-):</p> <p>Is the measured value same with the specified value?</p>	Oscilloscope pattern is as shown in figure.	Go to step 12.	Go to step 9.
<p>9 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.</p> <p>Remove disc rotor from hub. Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?</p>	ABS sensor piece or the tone wheel is not contaminated.	Go to step 10.	Thoroughly remove dirt or other foreign matter.
<p>10 CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.</p> <p>Are there broken or damaged teeth in the ABS sensor piece or the tone wheel?</p>	Not broken or damaged.	Go to step 11.	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
<p>11 CHECK TONE WHEEL RUNOUT.</p> <p>Measure tone wheel runout. Is the measured value less than the specified value?</p>	0.05 mm (0.0020 in)	Go to step 12.	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
<p>12 CHECK ABSCM&H/U.</p> <p>1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?</p>	Same DTC is not indicated.	Go to step 13.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

	Step	Value	Yes	No
13	CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

M: DTC 31 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH)

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-56, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

N: DTC 33 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH)

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-56, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

O: DTC 35 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH)

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-56, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

P: DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH)

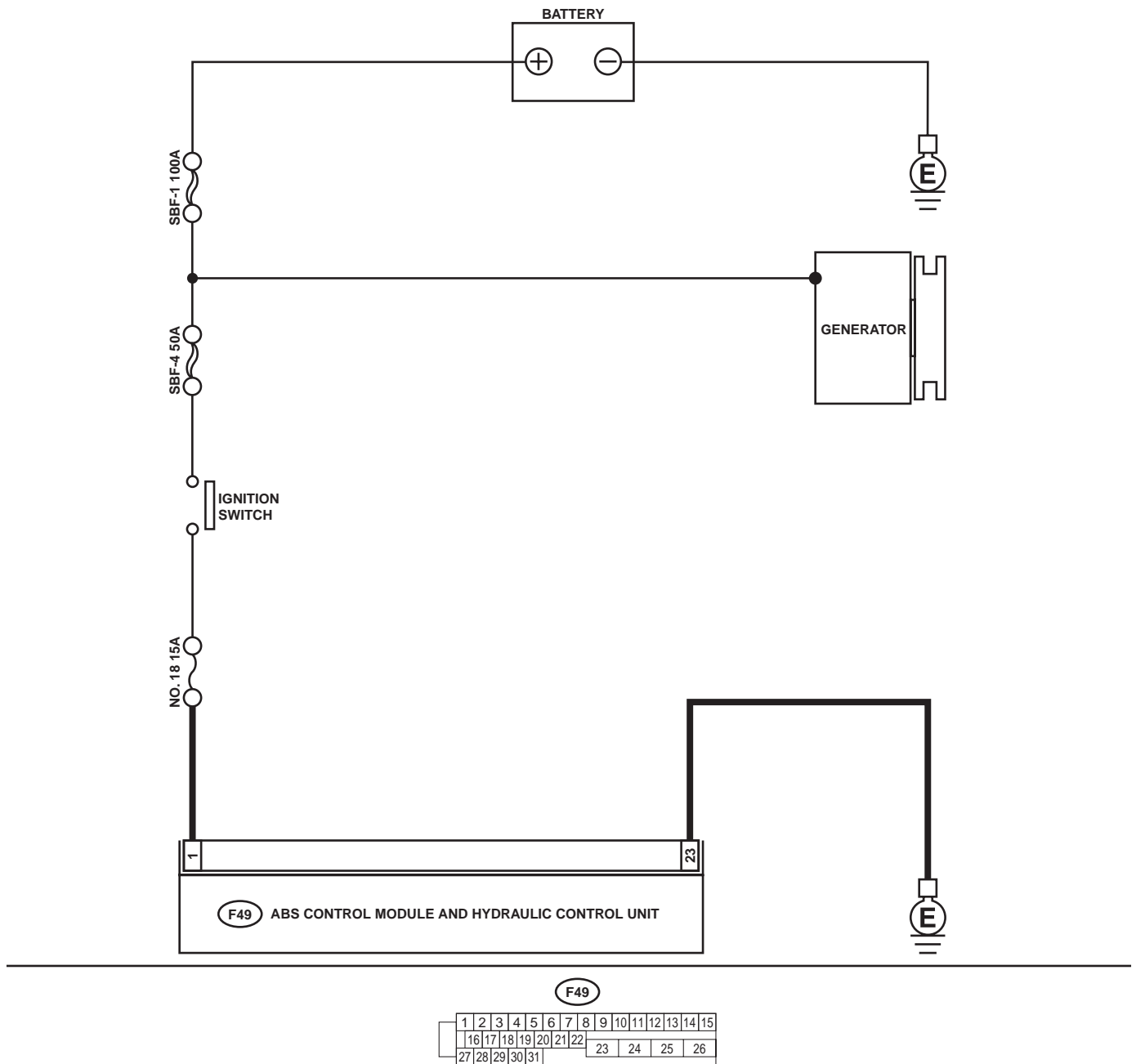
DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 2.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 4.	Repair connector.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 5.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Q: DTC 32 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/ U (FRONT RH)

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-60, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

R: DTC 34 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/ U (FRONT LH)

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-60, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

S: DTC 36 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/ U (REAR RH)

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-60, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

T: DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/ U (REAR LH)

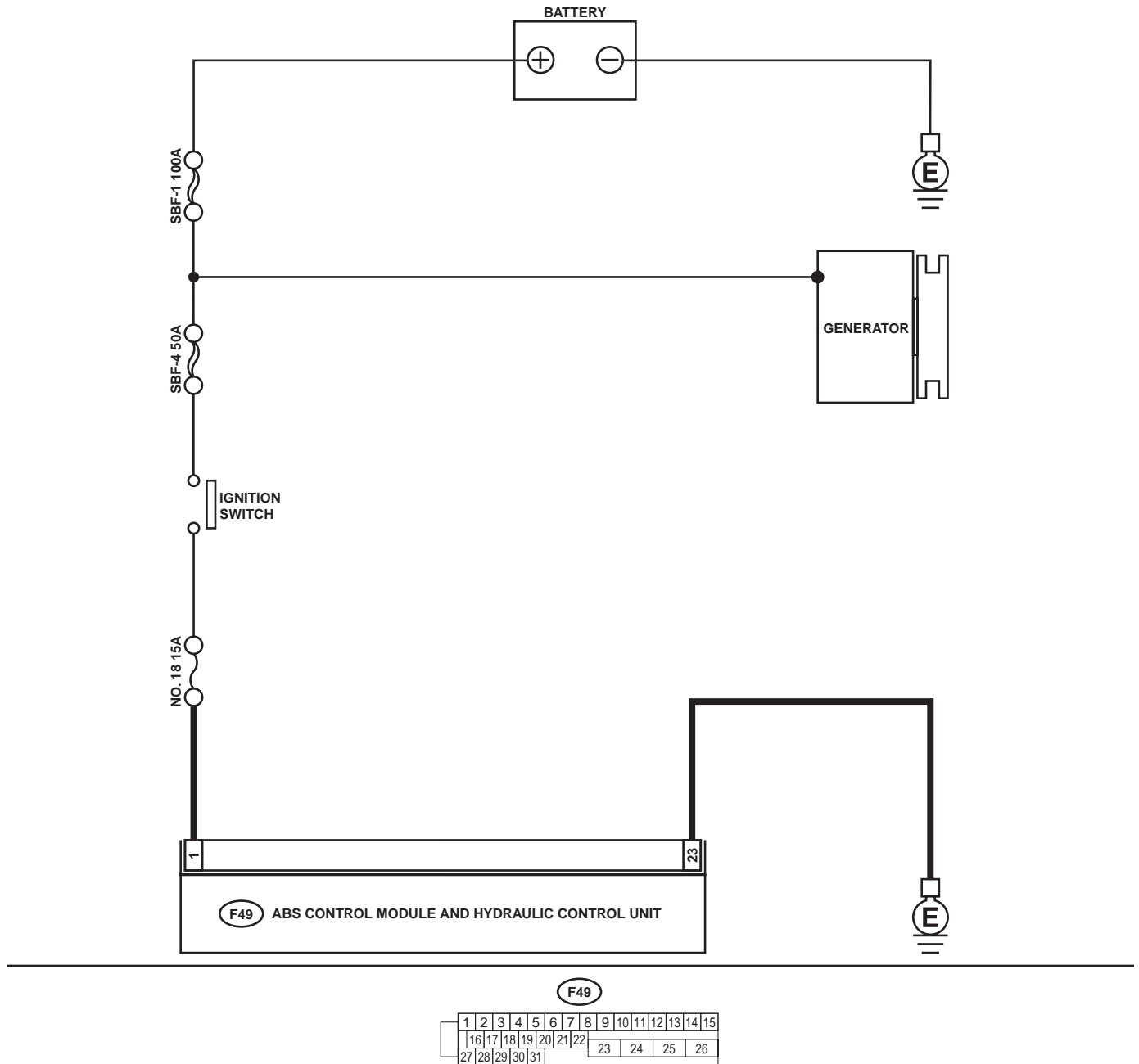
DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 2.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 4.	Repair connector.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 5.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

U: DTC 41 ABNORMAL ABS CONTROL MODULE

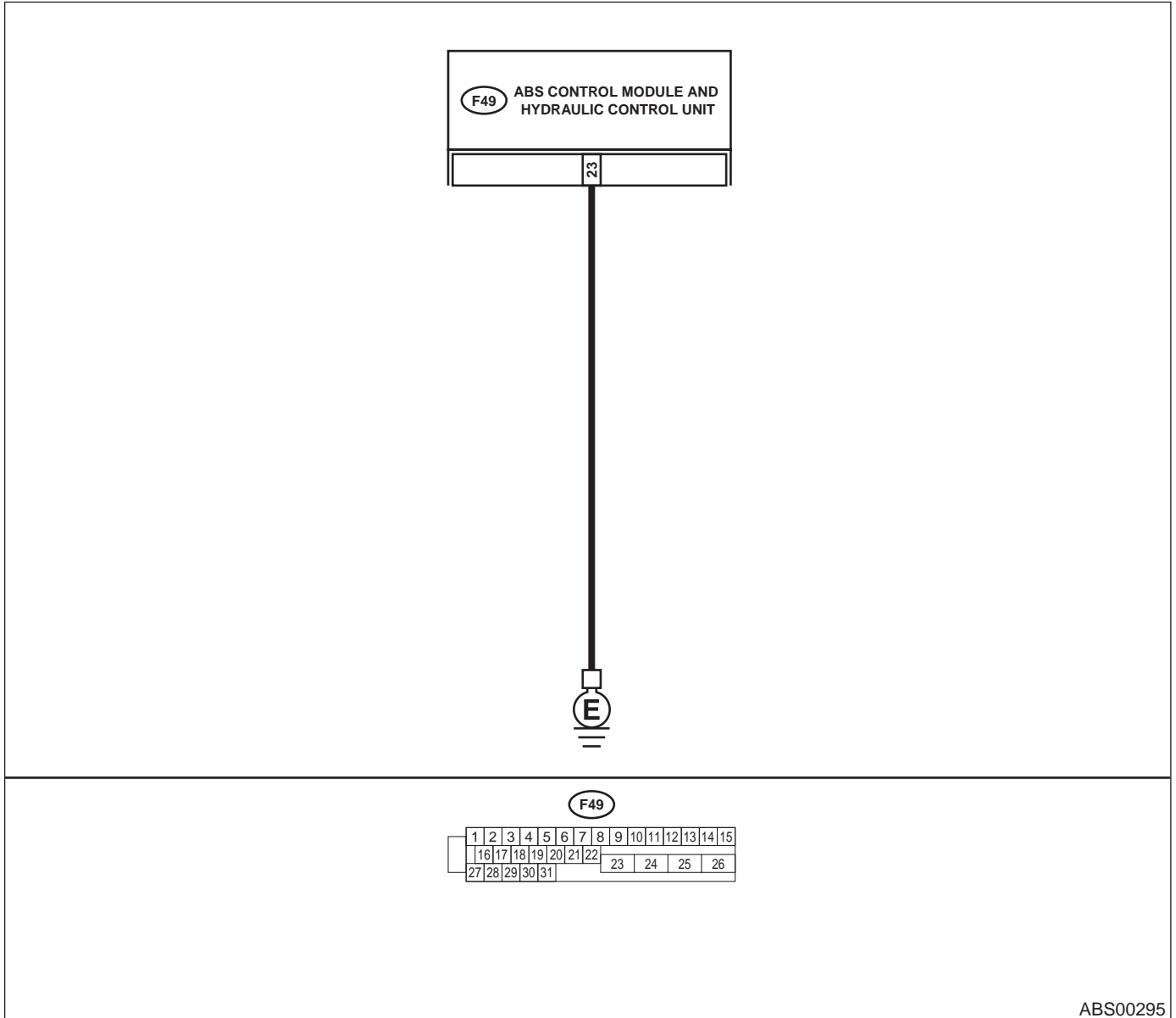
DIAGNOSIS:

- Faulty ABSCM&H/U.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



Step	Value	Yes	No
1 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 2.	Repair ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
2 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	There is no poor contact.	Go to step 3 .	Repair connector.
3 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Installed properly	Go to step 4 .	Properly install the car telephone or the wireless transmitter.
4 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step 5 .	Install the noise sources apart from the sensor harness.
5 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not indicated.	Go to step 6 .	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

V: DTC 42 SOURCE VOLTAGE IS ABNORMAL.

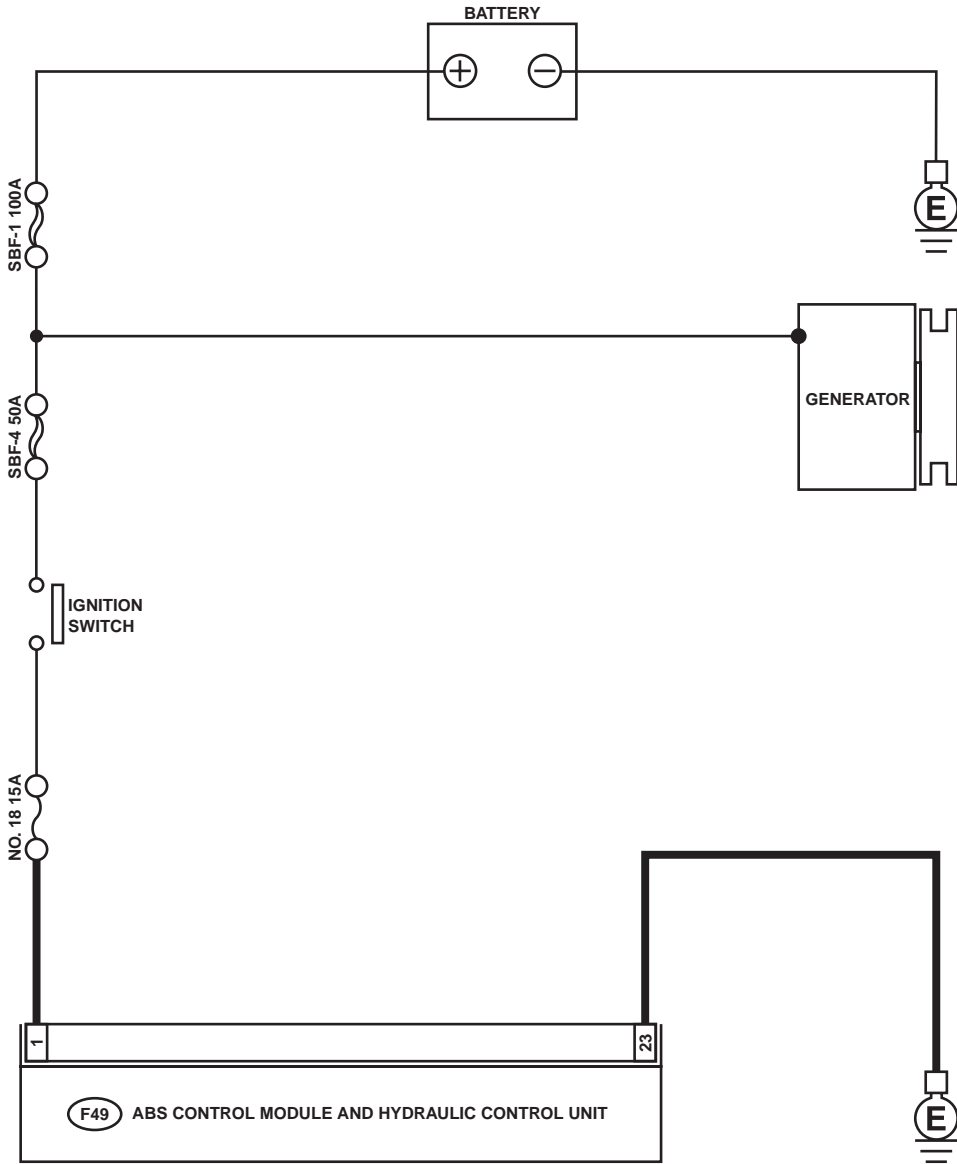
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low or high.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

ABS00294

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GENERATOR. 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground.</p> <p>Terminal Generator B terminal — Chassis ground: Is the measured value within the specified range?</p>	10 - 17 V	Go to step 2.	Repair generator. H4 engine model: <Ref. to SC-<Ref. to SC(H4SO)-14, Generator.>, Generator.> H6 engine model: <Ref. to SC(H6)-<Ref. to SC(H6DO)-14, Generator.>, Generator.>
<p>2 CHECK BATTERY TERMINAL. Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?</p>	Terminals are tightened securely.	Go to step 3.	Tighten the clamp of terminal.
<p>3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground.</p> <p>Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 - 17 V	Go to step 4.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
<p>4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground.</p> <p>Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 5.	Repair ABSCM&H/U ground harness.
<p>5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?</p>	There is no poor contact.	Go to step 6.	Repair connector.
<p>6 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?</p>	Same DTC is not indicated.	Go to step 7.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>7 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?</p>	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

W: DTC 44 A COMBINATION OF AT CONTROL ABNORMAL

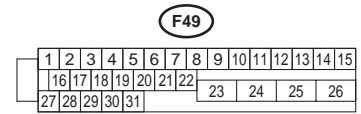
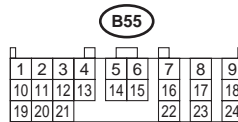
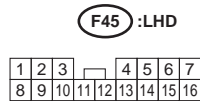
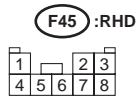
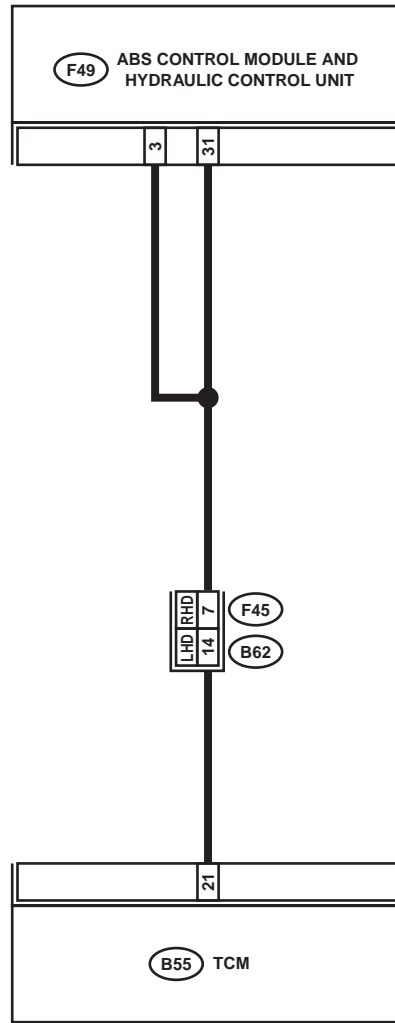
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00310

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK SPECIFICATIONS OF THE AB-SCM&H/U. Check specifications of the mark to the ABSCM&H/U. CG: AT (Except OUTBACK) CH: MT (Except OUTBACK) CI: AT (OUTBACK) CJ: MT (OUTBACK)</p> <p>Do the vehicle specification and the specification of ABSCM&HU match?</p>	Both are the same specifications.	Go to step 2.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>2 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 3 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair harness between TCM and ABSCM&H/U.
<p>3 CHECK BATTERY SHORT OF HARNESS. Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 3 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 4.	Repair harness between TCM and ABSCM&H/U.
<p>4 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 3 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Repair harness between TCM and ABSCM&H/U.
<p>5 CHECK TCM. 1) Turn ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn ignition switch to ON. 4) Measure voltage between TCM connector terminal and chassis ground. Connector & terminal (B55) No. 21 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 - 15 V	Go to step 7.	Go to step 6.
<p>6 CHECK AT. Is the AT functioning normally?</p>	Function of AT is normal.	Replace TCM.	Repair AT.
<p>7 CHECK OPEN CIRCUIT OF HARNESS. Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 3 (+) — Chassis ground (-): (F49) No. 31 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 - 15 V	Go to step 8.	Repair harness/connector between TCM and ABSCM&H/U.
<p>8 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between TCM and ABSCM&H/U?</p>	There is no poor contact.	Go to step 9.	Repair connector.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
9 CHECK ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 10 .	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Mod- ule and Hydraulic Control Unit (ABSCM&H/U).>
10 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corre- sponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

X: DTC 51 ABNORMAL VALVE RELAY

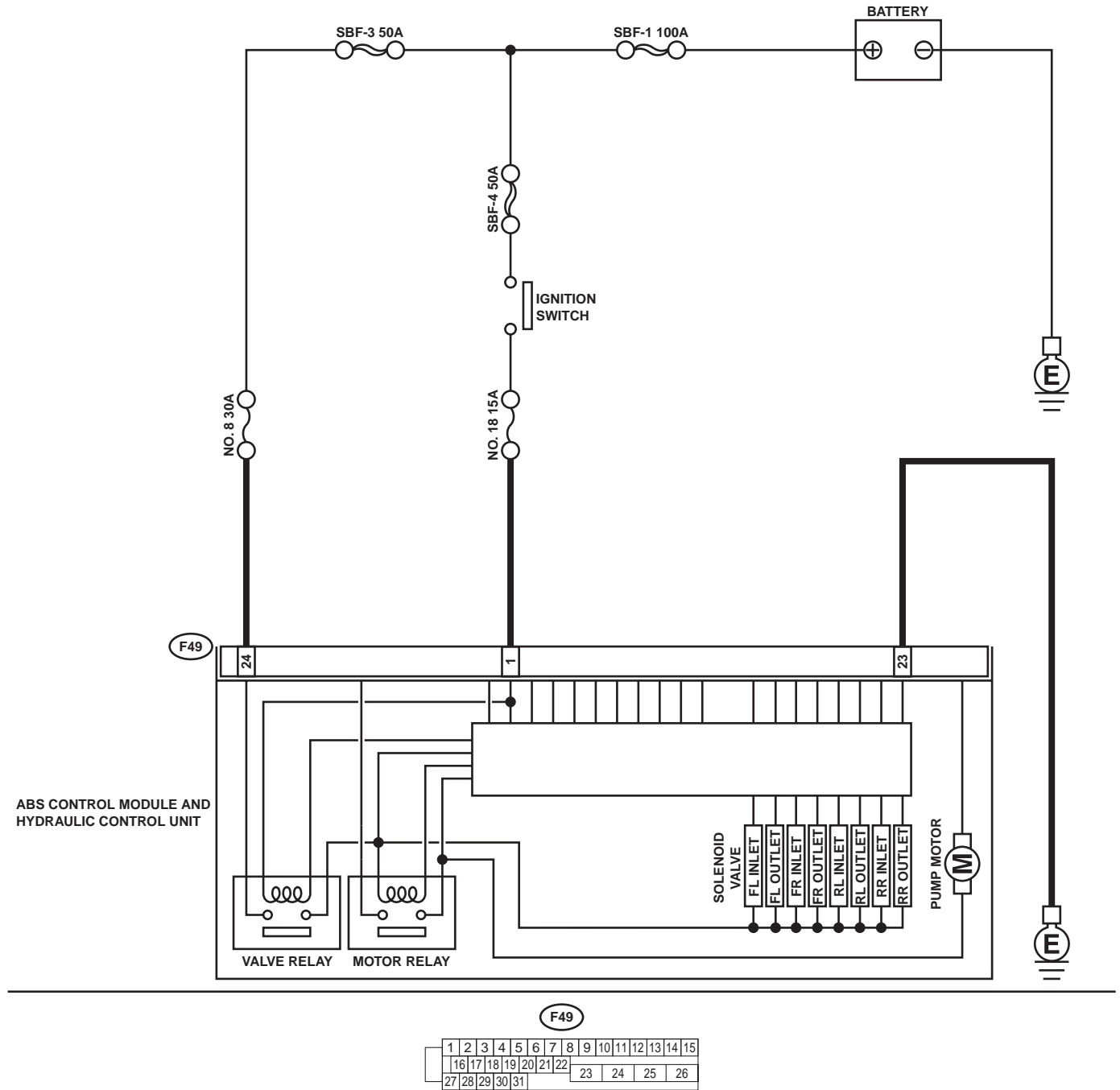
DIAGNOSIS:

- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

ABS00297

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): (F49) No. 24 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 - 15 V	Go to step 2.	Repair harness connector between battery and ABSCM&H/U.
<p>2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Repair ABSCM&H/U ground harness.
<p>3 CHECK VALVE RELAY IN ABSCM&H/U. Measure resistance between ABSCM&H/U and terminals. Terminals No. 23 — No. 24 : Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>4 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?</p>	There is no poor contact.	Go to step 5.	Repair connector.
<p>5 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?</p>	Same DTC is not indicated.	Go to step 6.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>6 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?</p>	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Y: DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY

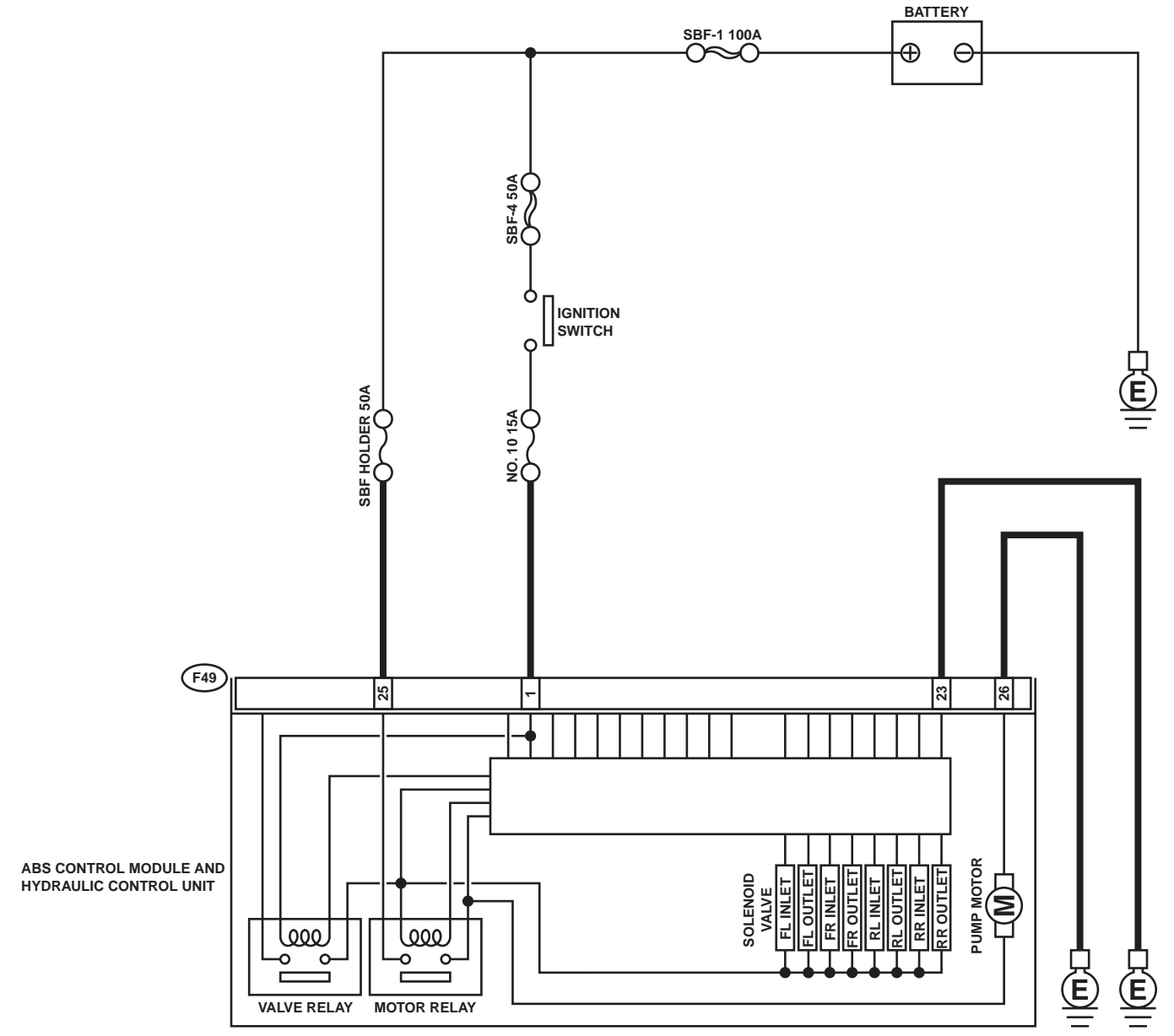
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 25 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 - 15 V	Go to step 2.	Repair harness/connector between battery and ABSCM&H/U and check fuse SBF-holder.
<p>2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 26 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Repair ABSCM&H/U ground harness.
<p>3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Run the engine at idle. 2) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 - 15 V	Go to step 4.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
<p>4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 5.	Repair ABSCM&H/U ground harness.
<p>5 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence control?</p>	Operating sound is produced.	Go to step 6.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>6 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?</p>	There is no poor contact.	Go to step 7.	Repair connector.
<p>7 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?</p>	Same DTC is not indicated.	Go to step 8.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>8 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?</p>	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Z: DTC 54 ABNORMAL STOP LIGHT SWITCH

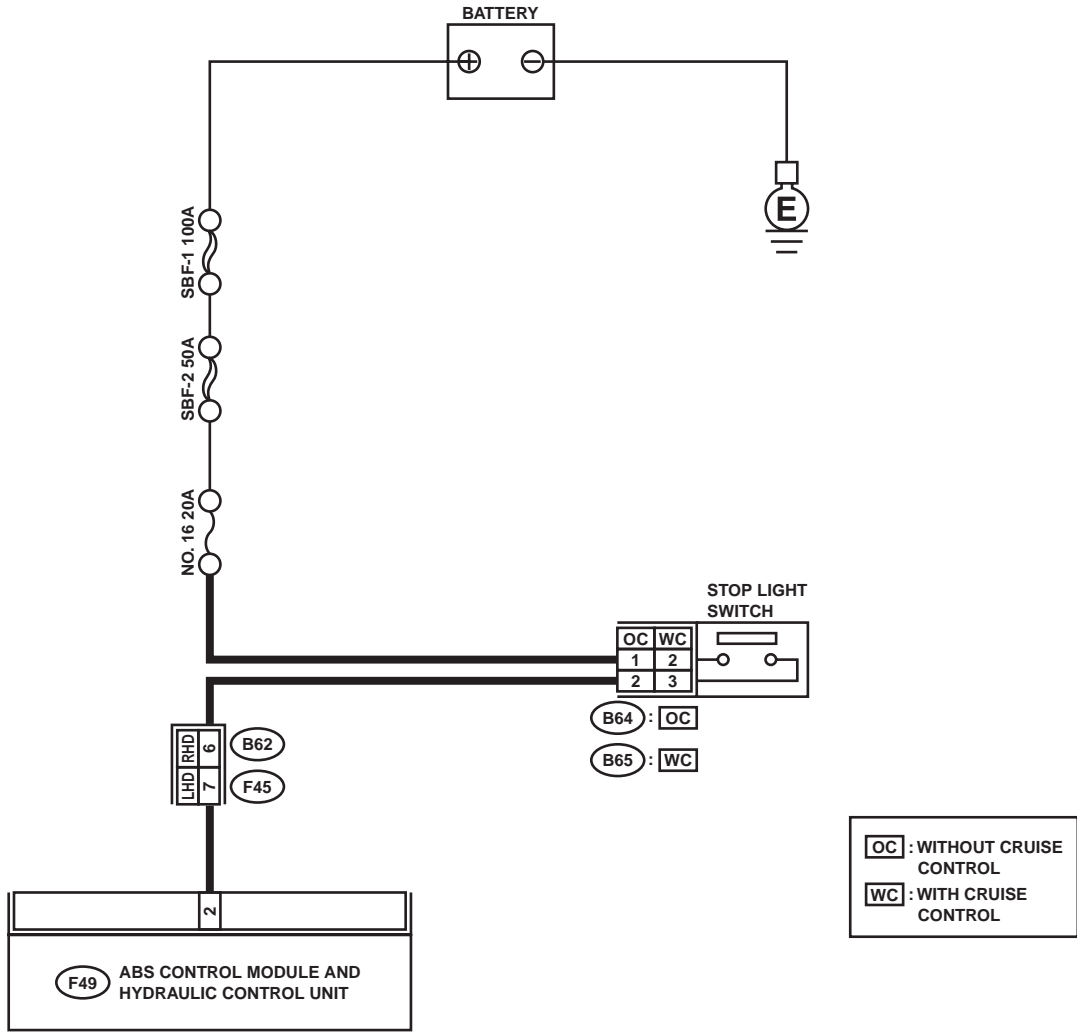
DIAGNOSIS:

- Faulty stop light switch

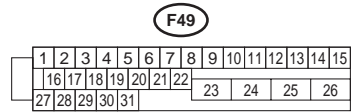
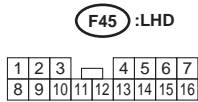
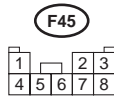
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



OC : WITHOUT CRUISE CONTROL
WC : WITH CRUISE CONTROL



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK STOP LIGHTS COME ON. Depress the brake pedal. Do stop lights come on?	Stop lights come on.	Go to step 2.	Repair stop lights circuit.
2 CHECK OPEN CIRCUIT IN HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Depress brake pedal. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 2 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 3.	Repair harness between stop light switch and ABSCM&H/U.
3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between stop light switch and ABSCM&H/U?	There is no poor contact.	Go to step 4.	Repair connector.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 5.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

AA:DTC 56 ABNORMAL G SENSOR OUTPUT VOLTAGE

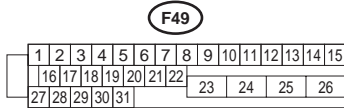
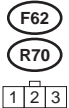
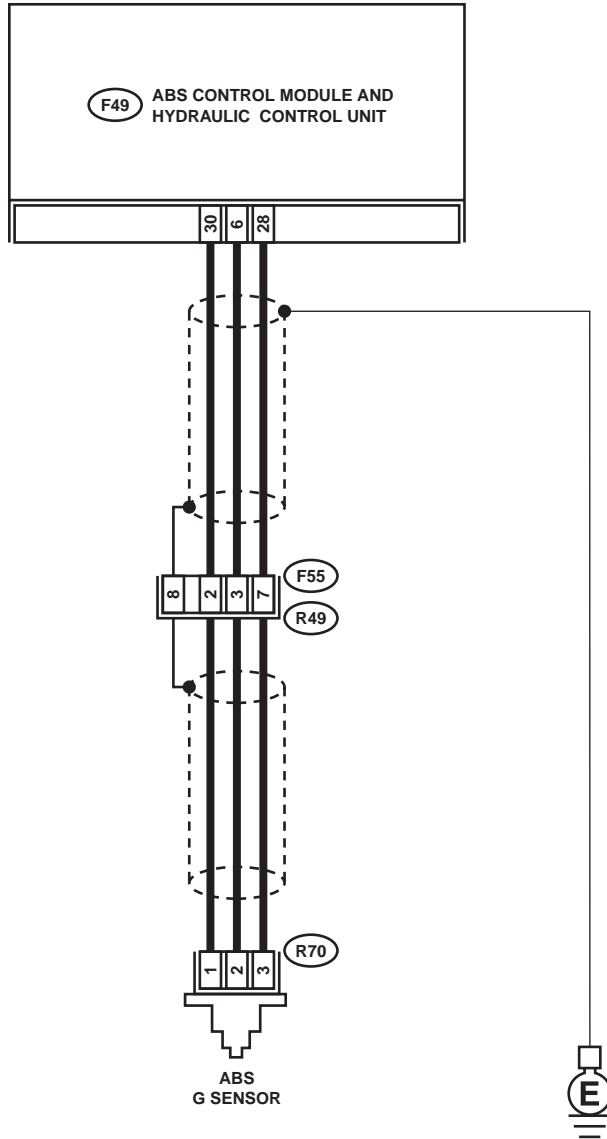
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00312

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK WHEELS FOR FREE TURNING. Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?	Wheels have not turned freely.	Go to step 2.	The ABS is normal. Erase the DTC.
2 CHECK SPECIFICATIONS OF ABSCM&H/U. Check specifications of the mark to the ABSCM&H/U. CG: AT (Except OUTBACK) CH: MT (Except OUTBACK) CI: AT (OUTBACK) CJ: MT (OUTBACK) Does the vehicle specification and the ABSCM&H/U specification match?	Both are the same specifications.	Go to step 3.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> CAUTION: Be sure to turn ignition switch to OFF when removing ABSCM&H/U.
3 CHECK INPUT VOLTAGE OF G SENSOR. 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect G sensor from body. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 1 (+) — No. 3 (-): Is the measured value within the specified range?	4.75 - 5.25 V	Go to step 4.	Repair harness/connector between G sensor and ABSCM&H/U.
4 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. Connector & terminal (F49) No. 6 — No. 28: Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step 5.	Repair harness/connector between G sensor and ABSCM&H/U.
5 CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS. 1) Disconnect connector from G sensor. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 6 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 6.	Repair harness between G sensor and ABSCM&H/U.
6 CHECK BATTERY SHORT OF HARNESS. Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 7.	Repair harness between G sensor and ABSCM&H/U.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 8.	Repair harness between G sensor and ABSCM&H/U.
8 CHECK GROUND SHORT OF HARNESS. Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 28 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 9.	Repair harness between G sensor and ABSCM&H/U. Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
9 CHECK G SENSOR. 1) Turn ignition switch to OFF. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Connect connector to ABSCM&H/U. 5) Turn ignition switch to ON. 6) Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the measured value within the specified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step 10.	Replace G sensor. <Ref. to ABS-21, G Sensor.>
10 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the measured value within the specified range when G sensor is inclined forward to 90°?	3.7 - 4.1 V	Go to step 11.	Replace G sensor. <Ref. to ABS-21, G Sensor.>
11 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the measured value within the specified range when G sensor is inclined backward to 90°?	0.5 - 0.9 V	Go to step 12.	Replace G sensor. <Ref. to ABS-21, G Sensor.>
12 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step 13.	Repair connector.
13 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 14.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

	Step	Value	Yes	No
14	CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

13. Diagnostics Chart with Subaru Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

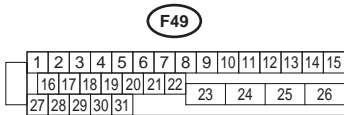
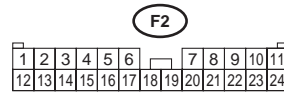
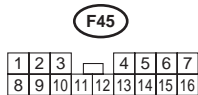
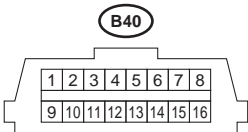
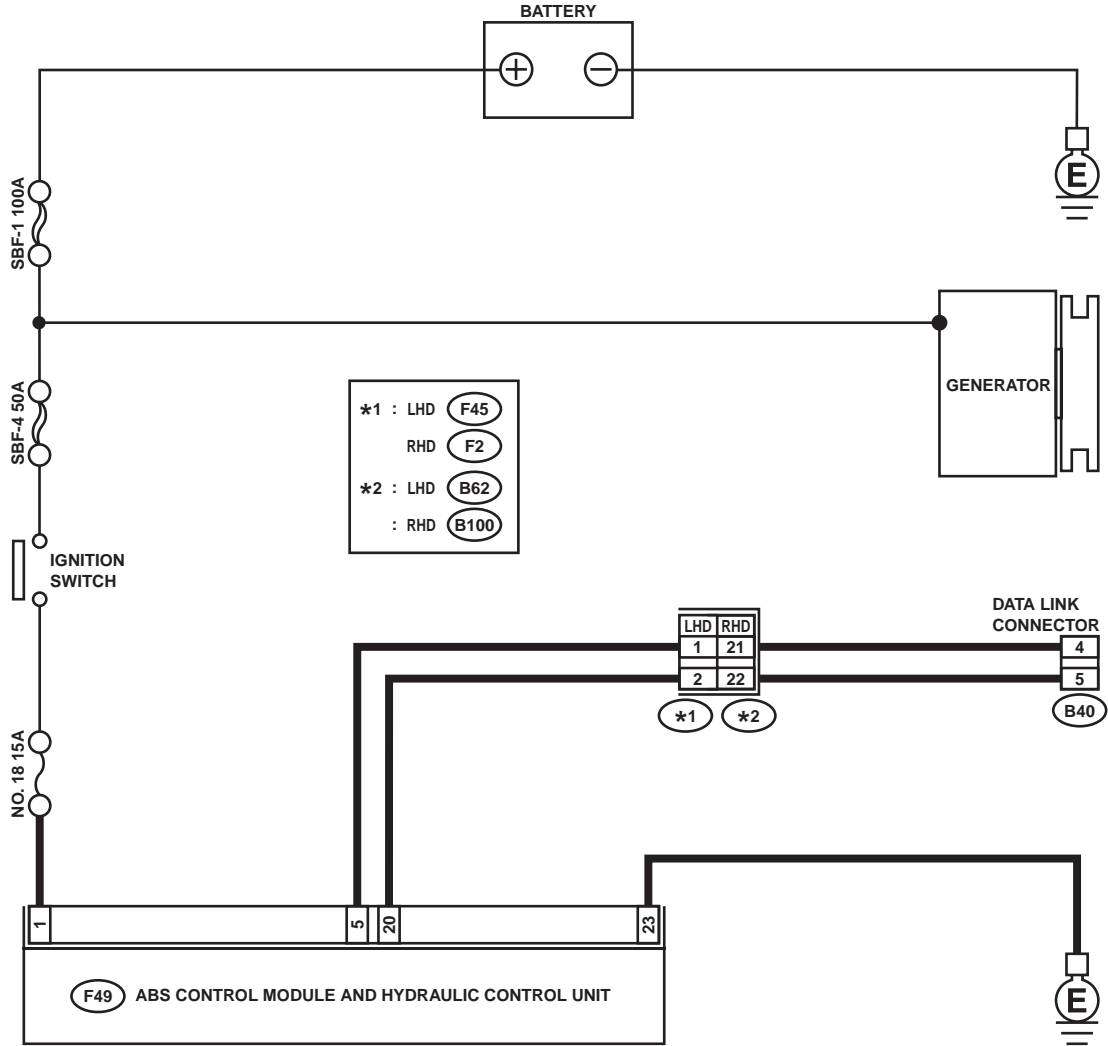
DIAGNOSIS:

- Faulty harness connector

TROUBLE SYMPTOM:

- ABS warning light remains on.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK IGNITION SWITCH. Is ignition switch to ON?	Ignition switch is to ON.	Go to step 2.	Turn ignition switch to ON, and select ABS mode using the select monitor.
2 CHECK BATTERY. 1) Turn ignition switch to OFF. 2) Measure battery voltage. Does the measured value exceed the specified value?	11 V	Go to step 3.	Charge or replace battery.
3 CHECK BATTERY TERMINAL. Is there poor contact at battery terminal?	There is no poor contact.	Go to step 4.	Repair or tighten battery terminal.
4 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to ON. 2) Using the select monitor, check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor?	Name and year of the system are displayed.	Go to step 7.	Go to step 5.
5 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Disconnect ABSCM&H/U connector. 3) Check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor?	Name and year of the system are displayed.	Go to step 7.	Go to step 6.
6 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect ABSCM&H/U, cruise control module and immobilizer control module connectors. 3) Measure resistance between data link connector and chassis ground. Connector & terminal (B40) No. 5 — Chassis ground: (B40) No. 4 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 7.	Repair harness and connector between each control module and data link connector.
7 CHECK OUTPUT SIGNAL FOR ABSCM&H/U. 1) Turn ignition switch to ON. 2) Measure voltage between data link connector and chassis ground. Connector & terminal (B40) No. 5 (+) — Chassis ground (-): (B40) No. 4 (+) — Chassis ground (-): Does the measured value exceed the specified value?	1 V	Repair harness and connector between each control module and data link connector.	Go to step 8.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR. Measure resistance between ABSCM&H/U connector and data link connector. Connector & terminal (F49) No. 20 — (B40) No. 5: (F49) No. 5 — (B40) No. 4: Is the measured value less than the specified value?	0.5 Ω	Repair harness and connector between ABSCM&H/U and data link connector.	Go to step 9.
9 CHECK INSTALLATION OF ABSCM&H/U CONNECTOR. Turn ignition switch to OFF. Is ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it?	ABSCM&HU connector inserted securely.	Go to step 10.	Insert ABSCM&H/U connector into ABSCM&H/U.
10 CHECK POWER SUPPLY CIRCUIT. 1) Turn ignition switch to ON (engine OFF). 2) Measure ignition power supply voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 11.	Repair open circuit in harness between ABSCM&H/U and battery.
11 CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U and transmission. 3) Measure resistance of harness between ABSCM&H/U and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 12.	Repair open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in control module power supply, ground line and data link connector?	There is no poor contact.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair connector.

B: NO TROUBLE CODE

DIAGNOSIS:

- ABS warning light circuit is shorted.

TROUBLE SYMPTOM:

- ABS warning light remains on.
- NO TROUBLE CODE displayed on the select monitor.

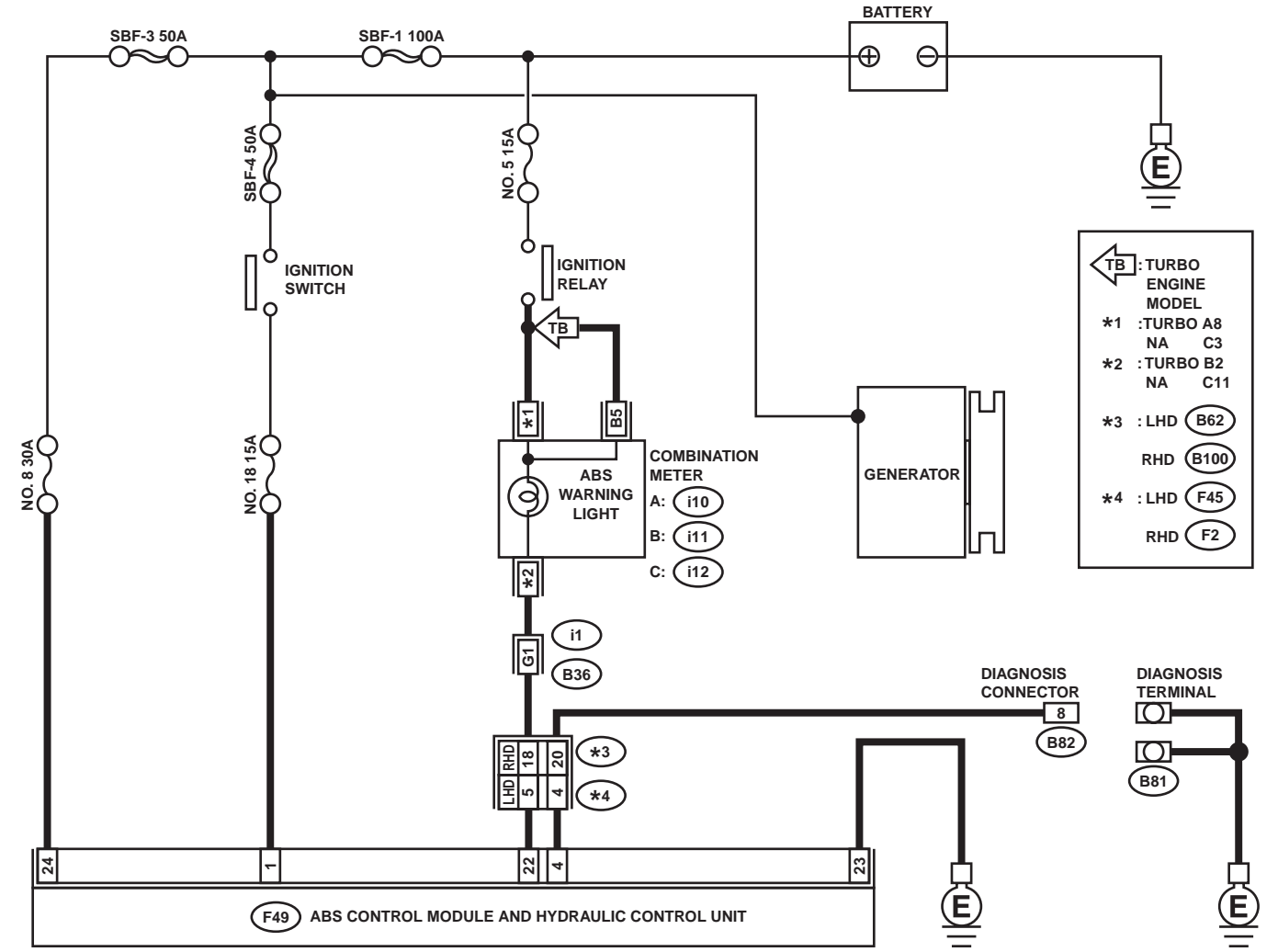
NOTE:

When the ABS warning light is OFF and "NO TROUBLE CODE" is displayed on the select monitor, the system is in normal condition.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



← TB	: TURBO ENGINE MODEL
*1	: TURBO A8 NA C3
*2	: TURBO B2 NA C11
*3	: LHD (B62) RHD (B100)
*4	: LHD (F45) RHD (F2)

B82

1	2	3
4	5	6

i12

1	2	3	4	5	6
7	8	9	10	11	12

F45

1	2	3	4	5	6	7
8	9	10	11	12	13	14

B: i11

1	2	3	4	5	6	7
8	9	10	11	12	13	14

B36

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C1	C2	C3	C4	C5	C6
D1	D2	C3	D4	D5	D6
E1	E2	E3	E4	E5	E6
F1					F6
G1					G6
H1					H6
I1					I6
J1					J6
K1					K6
L1	L2		L4	L5	L6
M1	M2	N3	M4	M5	M6
N1	O3		N4	N5	N6
O1	O2		O4	O5	O6
P1	P2	P3	P4	P5	P6

F2

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24									

i10

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30												

F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

ABS00308

Step	Value	Yes	No
1 CHECK WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector (F45) or (F2) from connector (B62) or (B100). 3) Turn ignition switch to ON. Does the ABS warning light turn on?	ABS warning light does not turn on.	Go to step 2.	Repair front wiring harness.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
2 CHECK PROJECTION AT ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Check for broken projection at the ABSCM&H/U terminal. Is there any damage on ABSCM&HU terminal?	There is no damage on terminal.	Go to step 3.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3 CHECK ABSCM&H/U. Measure resistance between ABSCM&H/U terminals. Terminals No. 22 — No. 23: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK WIRING HARNESS. Measure resistance between connector (F45) or (F2) and chassis ground. Connector & terminal LHD: (F45) No. 5 — Chassis ground: RHD: (F2) No. 18 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 5.	Repair harness.
5 CHECK WIRING HARNESS. 1) Connect connector to ABSCM&H/U. 2) Measure resistance between connector (F45) or (F2) and chassis ground. Connector & terminal LHD: (F45) No. 5 — Chassis ground: RHD: (F2) No. 18 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 6.	Repair harness.
6 CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR. Is there poor contact in ABSCM&H/U connector?	There is no poor contact.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair connector.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

C: DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-88, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

D: DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-88, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

E: DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-88, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

F: DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT

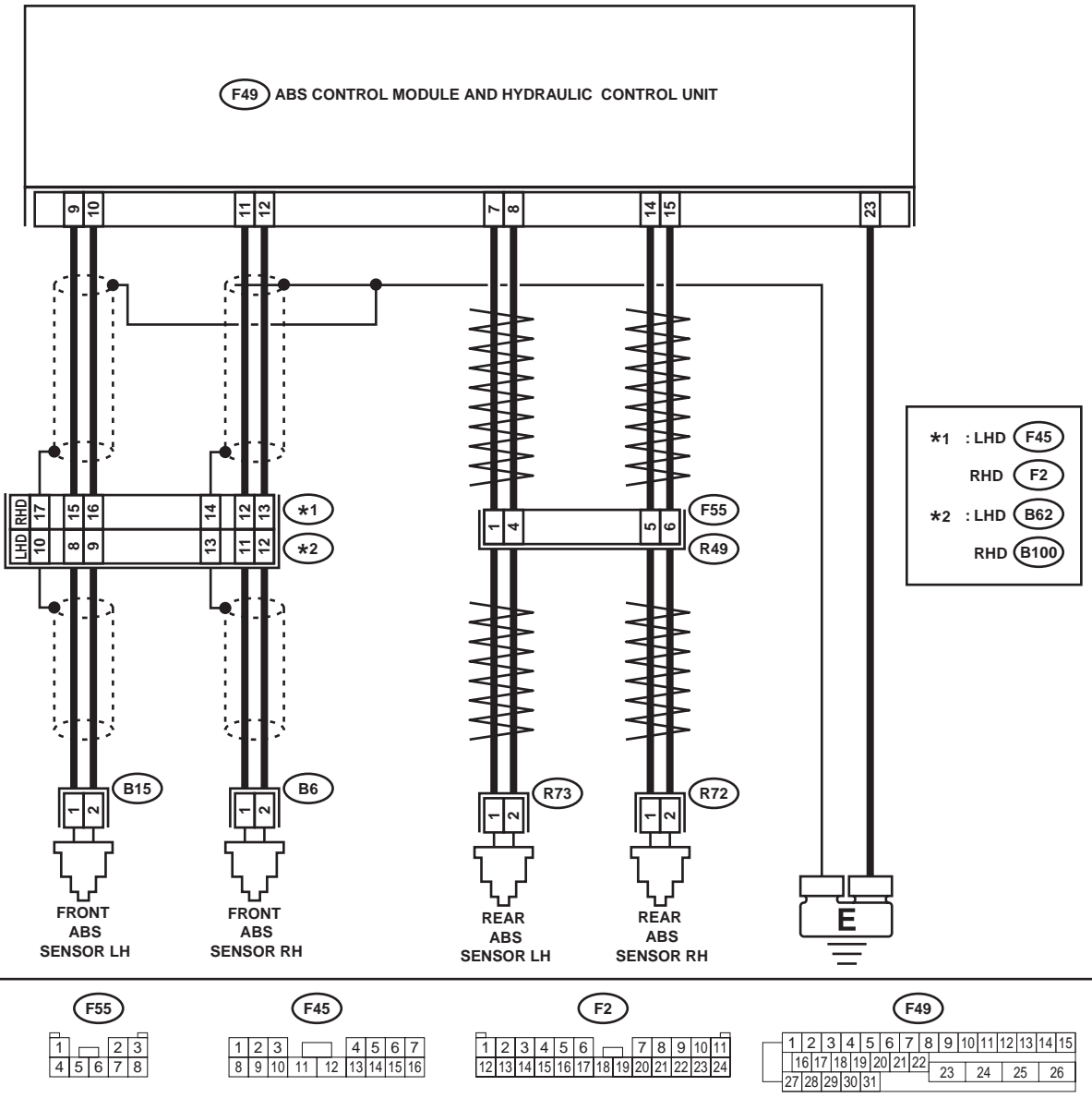
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode. Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Change as same.	Go to step 2.	Go to step 8.
2 CHECK INSTALLATION OF ABS SENSOR. Are the ABS sensor installation bolts tightened with the specified torque?	33±10 N·m (3.4±1.0 kgf·m, 25±7 ft·lb)	Go to step 3.	Tighten ABS sensor installation bolts securely.
3 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step 4.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
4 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step 5.	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
5 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step 6.	Repair connector.
6 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 7.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK ABS SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals.</p> <p>Terminal <i>Front RH No. 1 — No. 2:</i> <i>Front LH No. 1 — No. 2:</i> <i>Rear RH No. 1 — No. 2:</i> <i>Rear LH No. 1 — No. 2:</i></p> <p>Is the measured value within the specified range?</p>	1 - 1.5 kΩ	Go to step 9.	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
<p>9 CHECK BATTERY SHORT OF ABS SENSOR. 1) Disconnect connector from ABSCM&H/U. 2) Measure voltage between ABS sensor and chassis ground.</p> <p>Terminal <i>Front RH No. 1 (+) — Chassis ground (-):</i> <i>Front LH No. 1 (+) — Chassis ground (-):</i> <i>Rear RH No. 1 (+) — Chassis ground (-):</i> <i>Rear LH No. 1 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 10.	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
<p>10 CHECK BATTERY SHORT OF ABS SENSOR. 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground.</p> <p>Terminal <i>Front RH No. 1 (+) — Chassis ground (-):</i> <i>Front LH No. 1 (+) — Chassis ground (-):</i> <i>Rear RH No. 1 (+) — Chassis ground (-):</i> <i>Rear LH No. 1 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 11.	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
<p>11 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR. 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminals.</p> <p>Connector & terminal <i>DTC 21 / (F49) No. 11 — No. 12:</i> <i>DTC 23 / (F49) No. 9 — No. 10:</i> <i>DTC 25 / (F49) No. 14 — No. 15:</i> <i>DTC 27 / (F49) No. 7 — No. 8:</i></p> <p>Is the measured value within the specified range?</p>	1 - 1.5 kΩ	Go to step 12.	Repair harness/connector between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
12 CHECK BATTERY SHORT OF HARNESS. Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal <i>DTC 21 / (F49) No. 11 (+) — Chassis ground (-):</i> <i>DTC 23 / (F49) No. 9 (+) — Chassis ground (-):</i> <i>DTC 25 / (F49) No. 14 (+) — Chassis ground (-):</i> <i>DTC 27 / (F49) No. 7 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?	1 V	Go to step 13.	Repair harness between ABSCM&H/U and ABS sensor.
13 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal <i>DTC 21 / (F49) No. 11 (+) — Chassis ground (-):</i> <i>DTC 23 / (F49) No. 9 (+) — Chassis ground (-):</i> <i>DTC 25 / (F49) No. 14 (+) — Chassis ground (-):</i> <i>DTC 27 / (F49) No. 7 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?	1 V	Go to step 14.	Repair harness between ABSCM&H/U and ABS sensor.
14 CHECK INSTALLATION OF ABS SENSOR. Are the ABS sensor installation bolts tightened with the specified torque?	33±10 N·m (3.4±1.0 kgf·m, 25±7 ft·lb)	Go to step 15.	Tighten ABS sensor installation bolts securely.
15 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step 16.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
16 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value within the specified range?	0.05 mm (0.0020 in)	Go to step 17.	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
17 CHECK GROUND SHORT OF ABS SENSOR. 1) Turn ignition switch to ON. 2) Measure resistance between ABS sensor and chassis ground. Terminal <i>Front RH No. 1 — Chassis ground:</i> <i>Front LH No. 1 — Chassis ground:</i> <i>Rear RH No. 1 — Chassis ground:</i> <i>Rear LH No. 1 — Chassis ground:</i> Does the measured value exceed the specified value?	1 MΩ	Go to step 18.	Replace ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminal and chassis ground. Connector & terminal <i>DTC 21 / (F49) No. 11 — Chassis ground:</i> <i>DTC 23 / (F49) No. 9 — Chassis ground:</i> <i>DTC 25 / (F49) No. 14 — Chassis ground:</i> <i>DTC 27 / (F49) No. 7 — Chassis ground:</i> Does the measured value exceed the specified value?	1 MΩ	Go to step 19.	Repair harness between ABSCM&H/U and ABS sensor. And replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
19 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step 20.	Repair connector.
20 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 21.	Replace ABSCM&H/U.
21 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.	Proceed with the diagnosis corresponding to the DTC.

G: DTC 22 FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-94, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>

H: DTC 24 FRONT LEFT ABNORMAL ABS SENSOR SIGNAL

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-94, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>

I: DTC 26 REAR RIGHT ABNORMAL ABS SENSOR SIGNAL

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-94, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

J: DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL

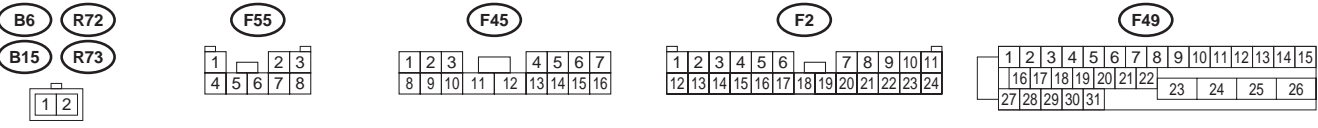
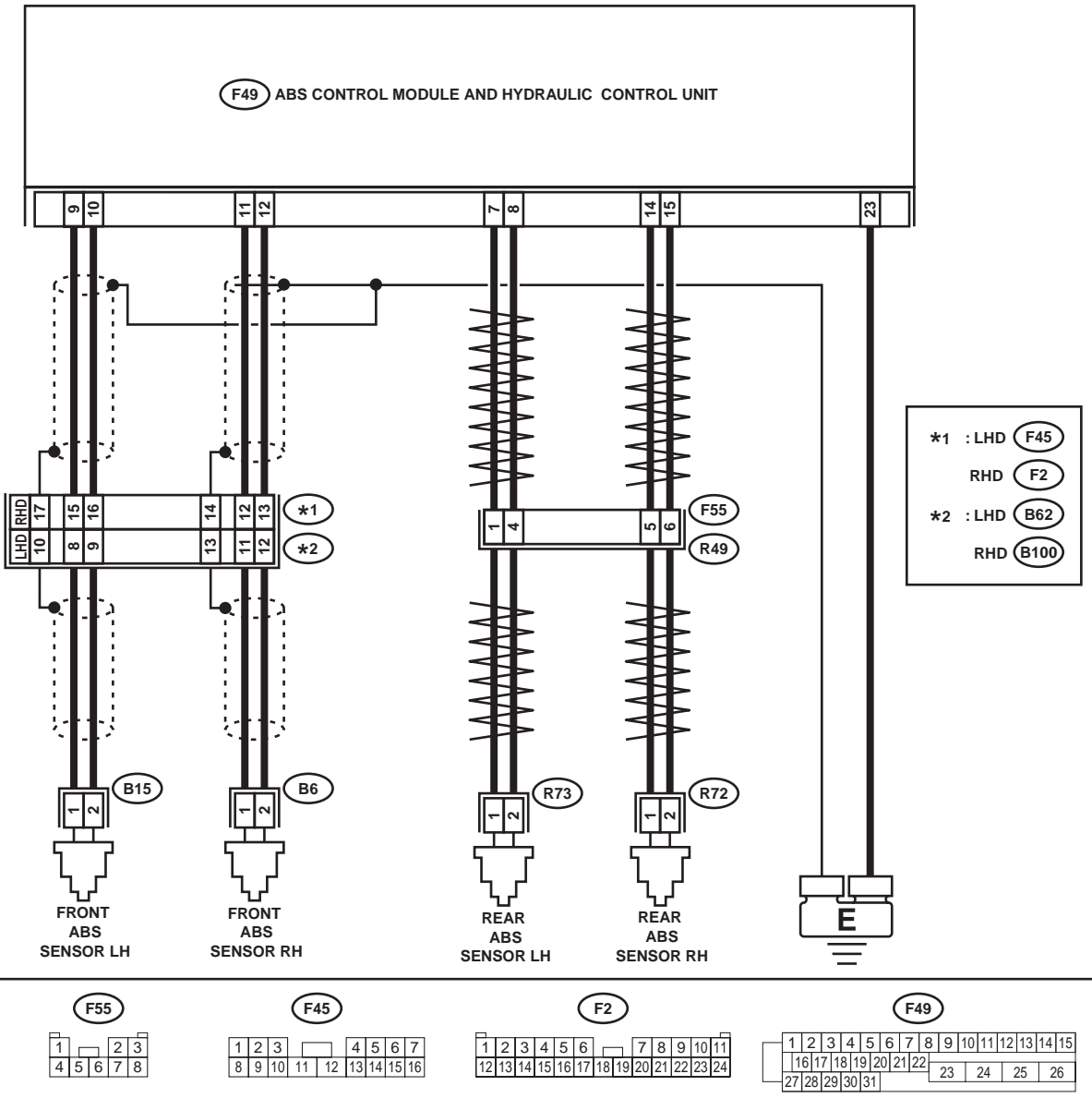
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode. Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Change as same.	Go to step 2.	Go to step 8.
2 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step 3.	Repair connector.
3 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step 4.	Properly install the car telephone or the wireless transmitter.
4 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step 5.	Install the noise sources apart from the sensor harness.
5 CHECK SHIELD CIRCUIT. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Measure resistance between shield connector and chassis ground. Connector & terminal <i>DTC 22 / LHD: (F45) No. 13 — Chassis ground:</i> <i>RHD: (F2) No. 14 — Chassis ground:</i> <i>DTC 24 / LHD: (F45) No. 10 — Chassis ground:</i> <i>RHD: (F2) No. 17 — Chassis ground:</i> Is the measured value less than the specified value? NOTE: For the DTC 26 and 28 : Go to step 6.	0.5 Ω	Go to step 6.	Repair shield harness.
6 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 7.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary noise interference.	Proceed with the diagnosis corresponding to the DTC.
8 CHECK INSTALLATION OF ABS SENSOR. Are the ABS sensor installation bolts tightened with the specified torque?	33±10 N·m (3.4±1.0 kgf·m, 25±7 ft·lb)	Go to step 9.	Tighten ABS sensor installation bolts securely.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
9 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step 10 .	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
10 PREPARE OSCILLOSCOPE. Is an oscilloscope available?	Available.	Go to step 11 .	Go to step 12 .
11 CHECK ABS SENSOR SIGNAL. 1) Lift-up the vehicle. 2) Turn ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn ignition switch to ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS-CM&H/U sometimes stores the trouble code 29. Connector & terminal <i>DTC 22 / LHD: (F45) No. 11 (+) — No. 12 (-):</i> <i>RHD: (F2) No. 12 (+) — No. 13 (-):</i> <i>DTC 24/LHD: (F45) No. 8 (+) — No. 9 (-):</i> <i>RHD: (F2) No. 15 (+) — No. 16 (-):</i> <i>DTC 26 / (F55) No. 5 (+) — No. 6 (-):</i> <i>DTC 28 / (F55) No. 1 (+) — No. 4 (-):</i> Is the measured value same with the specified value?	Oscilloscope pattern is as shown in figure.	Go to step 15 .	Go to step 12 .
12 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL. Remove disc rotor from hub in accordance with diagnostic trouble code. Is the ABS sensor piece or the tone wheel contaminated by mud or other foreign matter?	ABS sensor piece or the tone wheel is not contaminated.	Go to step 13 .	Thoroughly remove dirt or other foreign matter.
13 CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL. Are there broken or damaged in the ABS sensor piece or the tone wheel?	No broken or damaged.	Go to step 14 .	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>14 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value less than the specified value?</p>	0.05 mm (0.0020 in)	Go to step 15.	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
<p>15 CHECK RESISTANCE OF ABS SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. Terminal Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2: Is the measured value within the specified range?</p>	1 - 1.5 kΩ	Go to step 16.	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
<p>16 CHECK GROUND SHORT OF ABS SENSOR. Measure resistance between ABS sensor and chassis ground. Terminal Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 17.	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
<p>17 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR. 1) Connect connector to ABS sensor. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance at ABSCM&H/U connector terminals. Connector & terminal DTC 22 / (F49) No. 11 — No. 12: DTC 24 / (F49) No. 9 — No. 10: DTC 26 / (F49) No. 14 — No. 15: DTC 28 / (F49) No. 7 — No. 8: Is the measured value within the specified range?</p>	1 - 1.5 kΩ	Go to step 18.	Repair harness/connector between ABSCM&H/U and ABS sensor.
<p>18 CHECK GROUND SHORT OF HARNESS. Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 22 / (F49) No. 11 — Chassis ground: DTC 24 / (F49) No. 9 — Chassis ground: DTC 26 / (F49) No. 14 — Chassis ground: DTC 28 / (F49) No. 7 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 19.	Repair harness/connector between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
19 CHECK GROUND CIRCUIT OF ABSCM&H/U. Measure resistance between ABSCM&H/U and chassis ground. Connector & terminal (F49) No. 23 — GND: Is the measured value less than the specified value?	0.5 Ω	Go to step 20.	Repair ABSCM&H/U ground harness.
20 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	There is no poor contact.	Go to step 21.	Repair connector.
21 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step 22.	Properly install the car telephone or the wireless transmitter.
22 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step 23.	Install the noise sources apart from the sensor harness.
23 CHECK SHIELD CIRCUIT. 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. Connector & terminal DTC 22 / LHD: (F45) No. 13 — Chassis ground: RHD: (F2) No. 14 — Chassis ground: DTC 24 / LHD: (F45) No. 10 — Chassis ground: RHD: (F2) No. 17 — Chassis ground: Is the measured value less than the specified value? NOTE: For the DTC 26 and 28 : Go to step 24 .	0.5 Ω	Go to step 24.	Repair shield harness.
24 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 25.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
25 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary noise interference.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

K: DTC 29 ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR

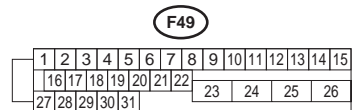
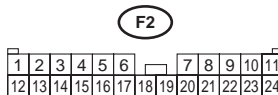
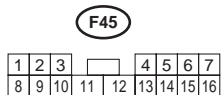
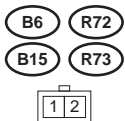
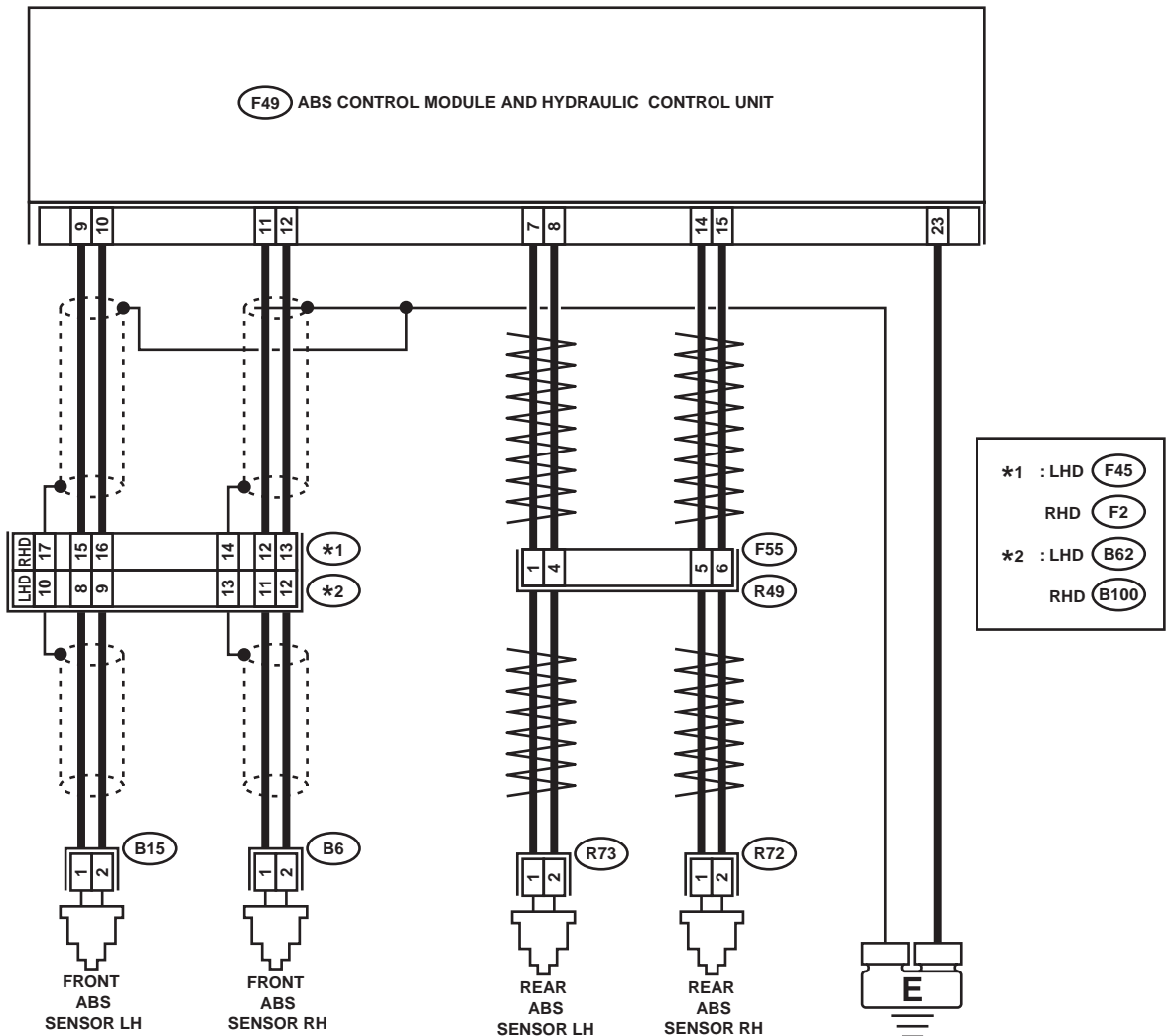
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK WHEELS FOR FREE TURNING. Have wheels been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Wheels have not turned freely.	Go to step 2.	The ABS is normal. Erase the diagnostic trouble code. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.
2 CHECK TIRE SPECIFICATIONS. Turn ignition switch to OFF. Are the tire specifications correct?	Correct specification.	Go to step 3.	Replace tire.
3 CHECK WEAR OF TIRE. Is the tire worn excessively?	Not worn excessively.	Go to step 4.	Replace tire.
4 CHECK TIRE PRESSURE. Is the tire pressure correct?	Correct tire pressure.	Go to step 5.	Adjust tire pressure.
5 CHECK INSTALLATION OF ABS SENSOR. Are the ABS sensor installation bolts tightened with the specified torque?	33±10 N·m (3.4±1.0 kgf·m, 25±7 ft·lb)	Go to step 6.	Tighten ABS sensor installation bolts securely.
6 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step 7.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7 PREPARE OSCILLOSCOPE. Is an oscilloscope available?	Available.	Go to step 8.	Go to step 9.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK ABS SENSOR SIGNAL.</p> <p>1) Lift up the vehicle. 2) Turn ignition switch to OFF. 3) Connect the oscilloscope to the connector (B62) in accordance with trouble code. 4) Turn ignition switch to ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.></p> <p>NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the DTC 29.</p> <p>Connector & terminal</p> <p>Front RH LHD: (F45) No. 11 (+) — No. 12 (-) : RHD: (F2) No. 12 (+) — No. 13 (-) :</p> <p>Front LH LHD: (F45) No. 8 (+) — No. 9 (-) : RHD: (F2) No. 15 (+) — No. 16 (-) :</p> <p>Rear RH (F55) No. 5 (+) — No. 6 (-) :</p> <p>Rear LH (F55) No. 1 (+) — No. 4 (-) :</p> <p>Is the measured value same as the specified value?</p>	Oscilloscope pattern is as shown in figure.	Go to step 12.	Go to step 9.
<p>9 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.</p> <p>Remove disc rotor from hub. Is the ABS sensor piece or the tone wheel contaminated by mud or other foreign matter?</p>	ABS sensor piece or the tone wheel is not contaminated.	Go to step 10.	Thoroughly remove mud or other foreign matter.
<p>10 CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.</p> <p>Are there broken or damaged teeth in the ABS sensor piece or the tone wheel?</p>	Not broken or damaged.	Go to step 11.	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
<p>11 CHECK TONE WHEEL RUNOUT.</p> <p>Measure tone wheel runout. Is the measured value less than the specified value?</p>	0.05 mm (0.0020 in)	Go to step 12.	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
<p>12 CHECK ABSCM&H/U.</p> <p>1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?</p>	Same DTC is not indicated.	Go to step 13.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

	Step	Value	Yes	No
13	CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

L: DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-106, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

M: DTC 33 FRONT LEFT INLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-106, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

N: DTC 35 REAR RIGHT INLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-106, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

O: DTC 37 REAR LEFT INLET VALVE MALFUNCTION

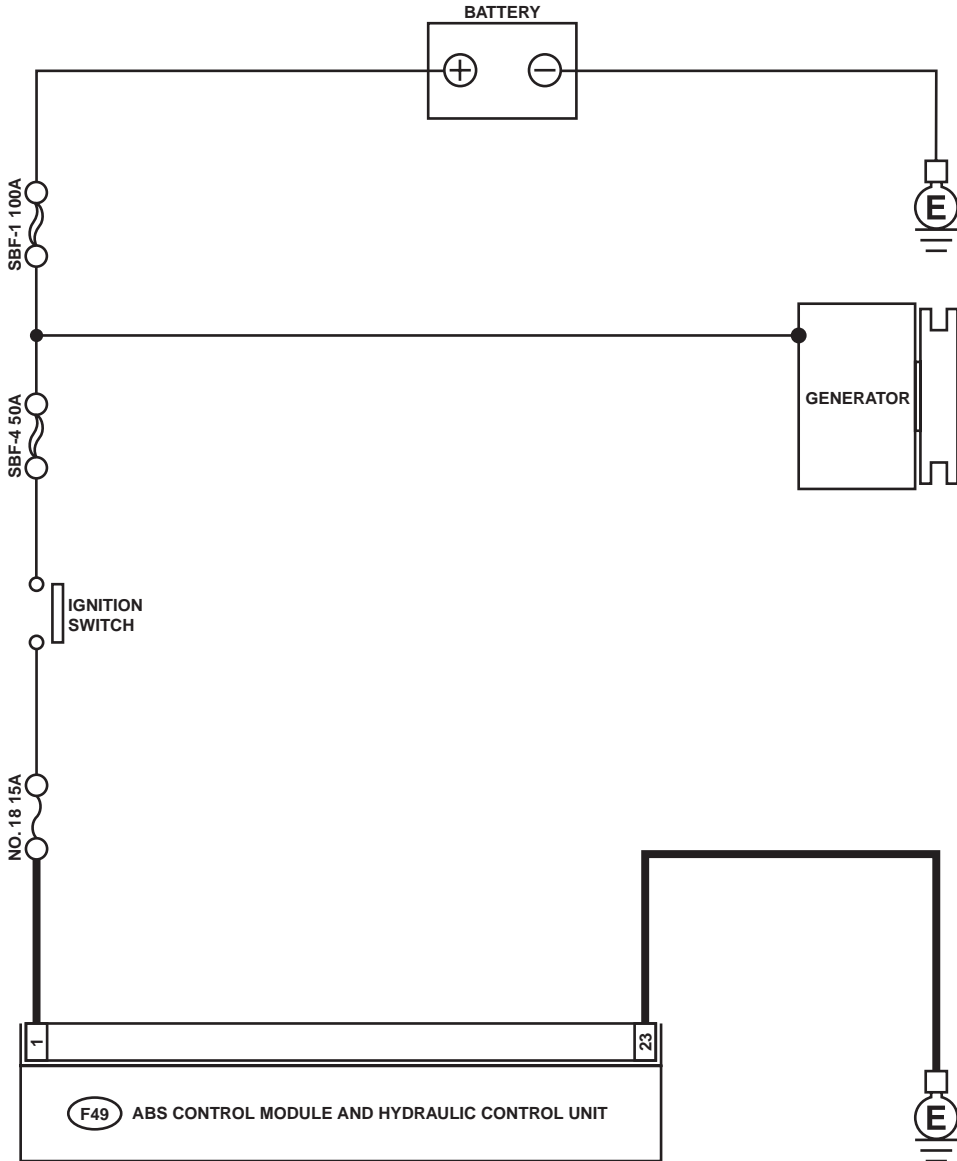
DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22		23	24	25	26			
27	28	29	30	31										

ABS00294

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 2.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 4.	Repair connector.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 5.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

P: DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-110, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

Q: DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-110, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

R: DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-110, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

S: DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION

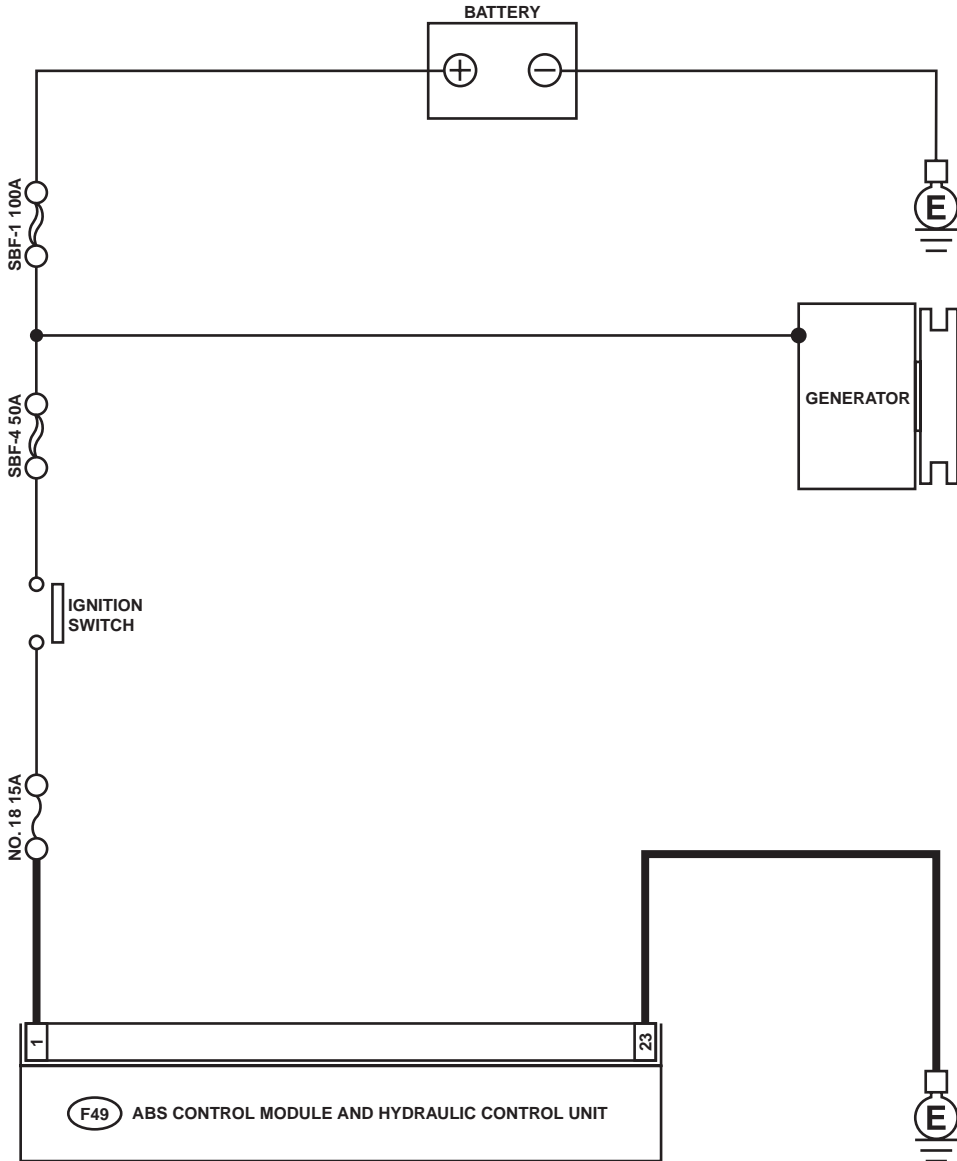
DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22		23	24	25	26			
27	28	29	30	31										

ABS00294

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 2.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 4.	Repair connector.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not indicated.	Go to step 5.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

T: DTC 41 ABS CONTROL MODULE MALFUNCTION

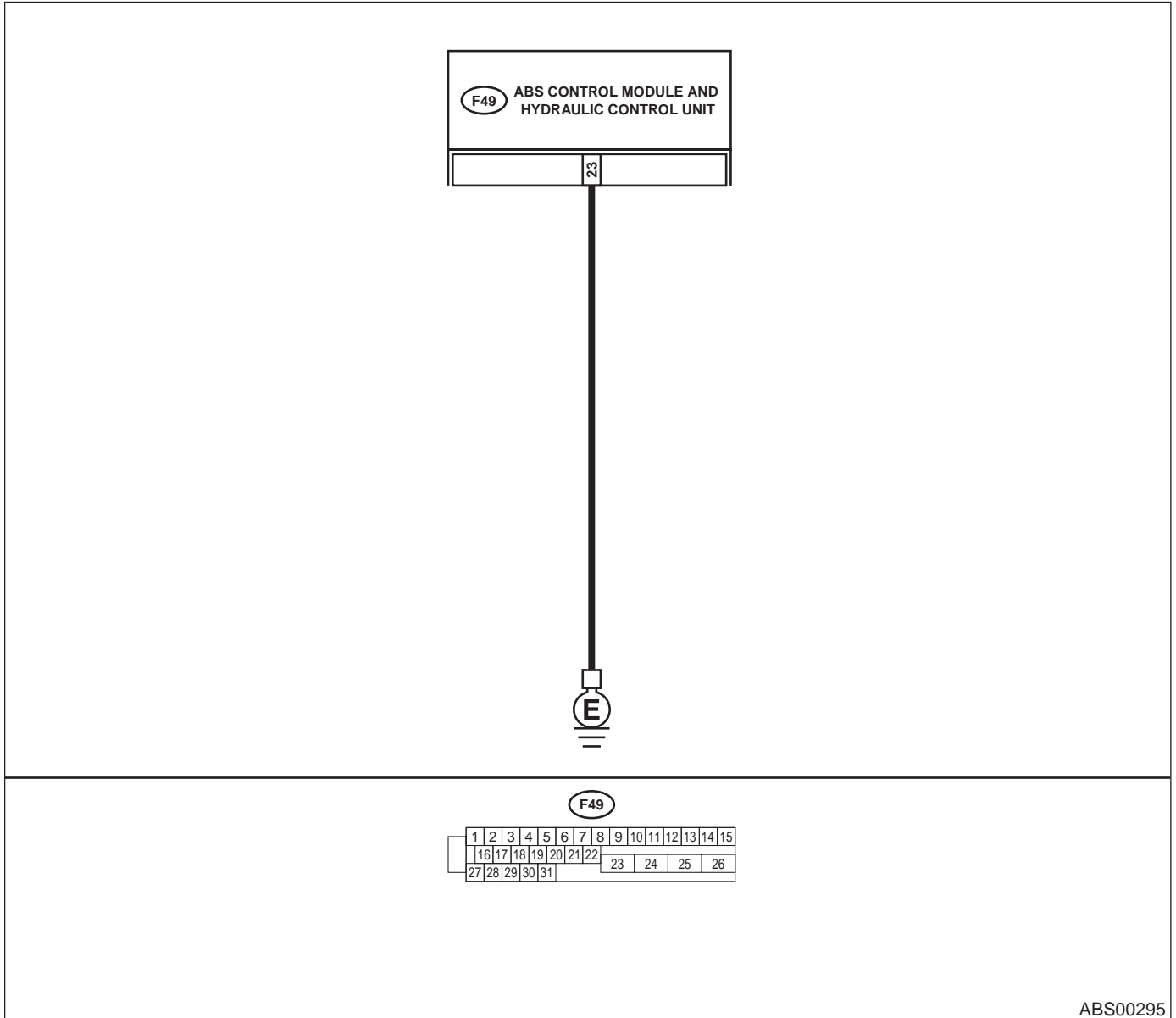
DIAGNOSIS:

- Faulty ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



Step	Value	Yes	No
1 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 2.	Repair ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
2 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	There is no poor contact.	Go to step 3 .	Repair connector.
3 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step 4 .	Properly install the car telephone or the wireless transmitter.
4 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Noise source is not installed near the sensor harness.	Go to step 5 .	Install the noise sources apart from the sensor harness.
5 CHECK ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC as in the current diagnosis still being output?	Same DTC is not indicated.	Go to step 6 .	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

U: DTC 42 POWER SUPPLY VOLTAGE TOO LOW

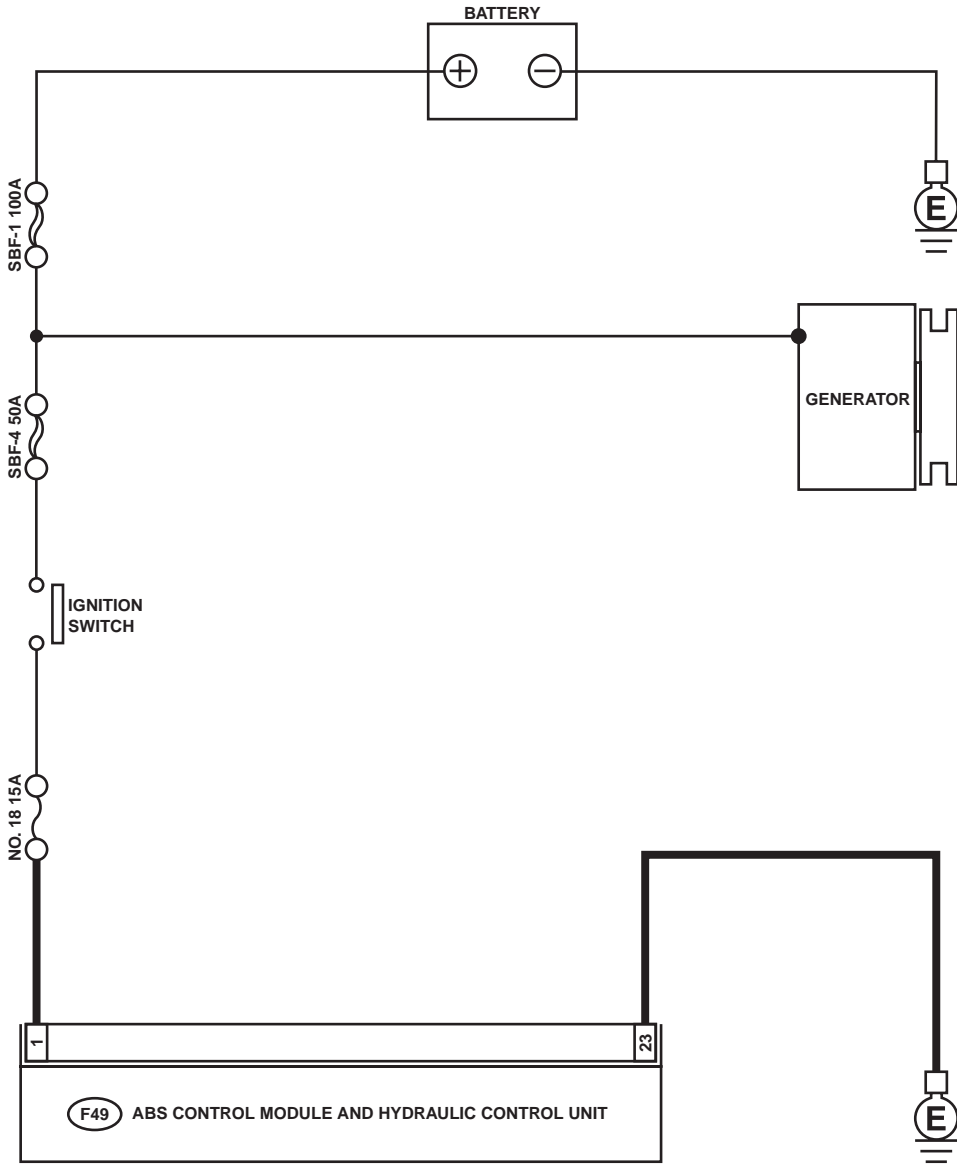
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

ABS00294

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK GENERATOR. 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. Terminal Generator B terminal — Chassis ground: Is the measured value within the specified range?	10 - 15 V	Go to step 2.	i) Repair generator. ii) H4 engine model: iii) <Ref. to SC(H4SO)-14, Generator.> iv) H6 engine model: v) <Ref. to SC(H6DO)-14, Generator.>
2 CHECK BATTERY TERMINAL. Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Terminals are tightened securely.	Go to step 3.	Tighten the clamp of terminal.
3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 4.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 5.	Repair ABSCM&H/U ground harness.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 6.	Repair connector.
6 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 7.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

V: DTC 42 POWER SUPPLY VOLTAGE TOO HIGH

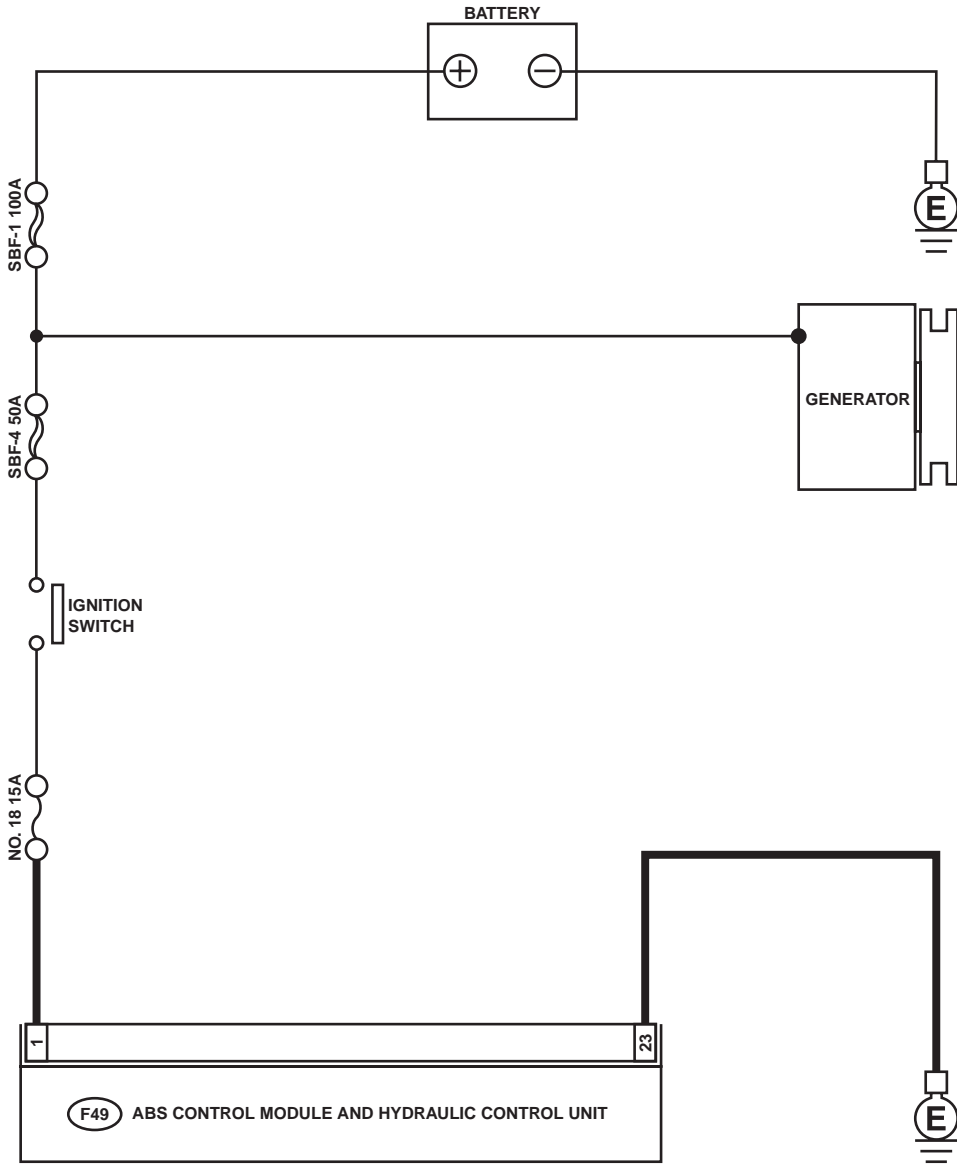
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is high.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

ABS00294

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK GENERATOR. 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. Terminal Generator B terminal — Chassis ground: Is the measured value within the specified range?	10 - 17 V	Go to step 2.	i) Repair generator. ii) H4 engine model: iii) <Ref. to SC(H4SO)-14, Generator.> iv) H6 engine model: v) <Ref. to SC(H6DO)-14, Generator.>
2 CHECK BATTERY TERMINAL. Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Terminals are tightened securely.	Go to step 3.	Tighten the clamp of terminal.
3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 17 V	Go to step 4.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 5.	Repair ABSCM&H/U ground harness.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 6.	Repair connector.
6 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 7.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

W: DTC 44 ABS-AT CONTROL (NON CONTROLLED)

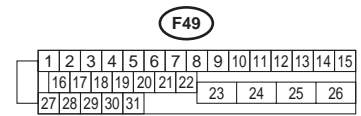
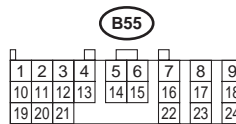
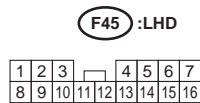
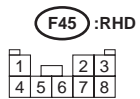
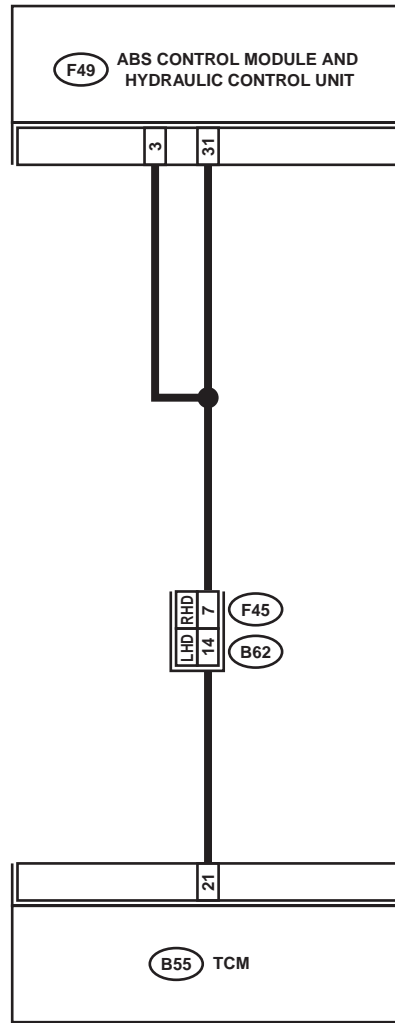
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00310

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK SPECIFICATIONS OF THE ABSCM&H/U. Check specifications of the mark to the ABSCM&H/U. CG: AT (except OUTBACK) CH: MT (except OUTBACK) CI: AT (OUTBACK) CJ: MT (OUTBACK)</p> <p>Do the vehicle specification and the specification of ABSCM&HU match?</p>	Both are the same specifications.	Go to step 2.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>2 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 3 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair harness between TCM and ABSCM&H/U.
<p>3 CHECK TCM. 1) Connect all connectors to TCM. 2) Turn ignition switch to ON. 3) Measure voltage between TCM connector terminal and chassis ground. Connector & terminal (B55) No. 21 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	10 - 15 V	Go to step 5.	Go to step 4.
<p>4 CHECK AT. Is the AT functioning normally?</p>	Function of AT is normal.	Replace TCM.	Repair AT.
<p>5 CHECK OPEN CIRCUIT OF HARNESS. Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 3 (+) — Chassis ground (-): (F49) No. 31 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	10 - 15 V	Go to step 6.	Repair harness/connector between TCM and ABSCM&H/U.
<p>6 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between TCM and ABSCM&H/U?</p>	There is no poor contact.	Go to step 7.	Repair connector.
<p>7 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?</p>	Same DTC is not indicated.	Go to step 8.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>8 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?</p>	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

X: DTC 44 ABS-AT CONTROL (CONTROLLED)

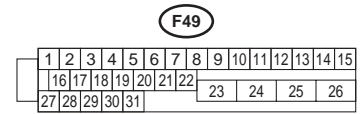
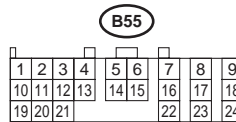
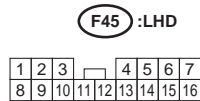
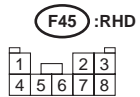
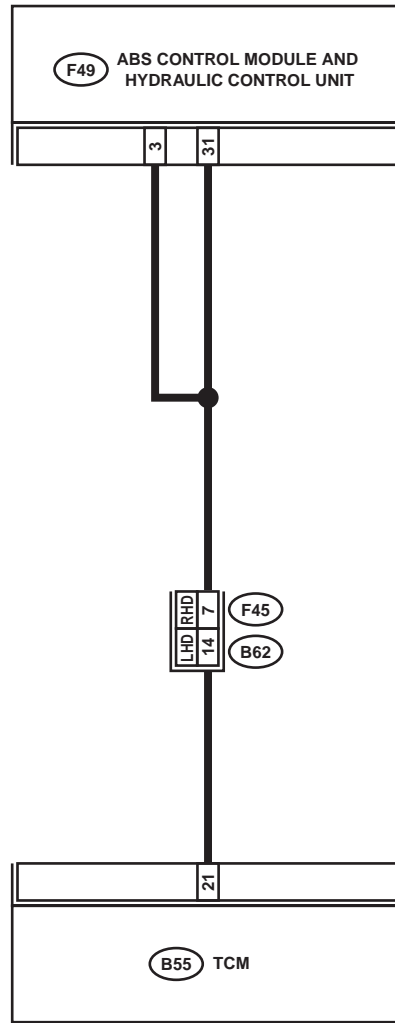
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00310

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Disconnect connector from ABSCM&H/U. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 3 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 2.	Repair harness between TCM and ABSCM&H/U.
2 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 3 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 3.	Repair harness between TCM and ABSCM&H/U.
3 CHECK OPEN CIRCUIT OF HARNESS. 1) Turn ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 3 (+) — Chassis ground (-): (F49) No. 31 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 13 V	Go to step 4.	Repair harness/connector between TCM and ABSCM&H/U.
4 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connectors between TCM and ABSCM&H/U?	There is no poor contact.	Go to step 5.	Repair connector.
5 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 6.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Y: DTC 51 VALVE RELAY MALFUNCTION

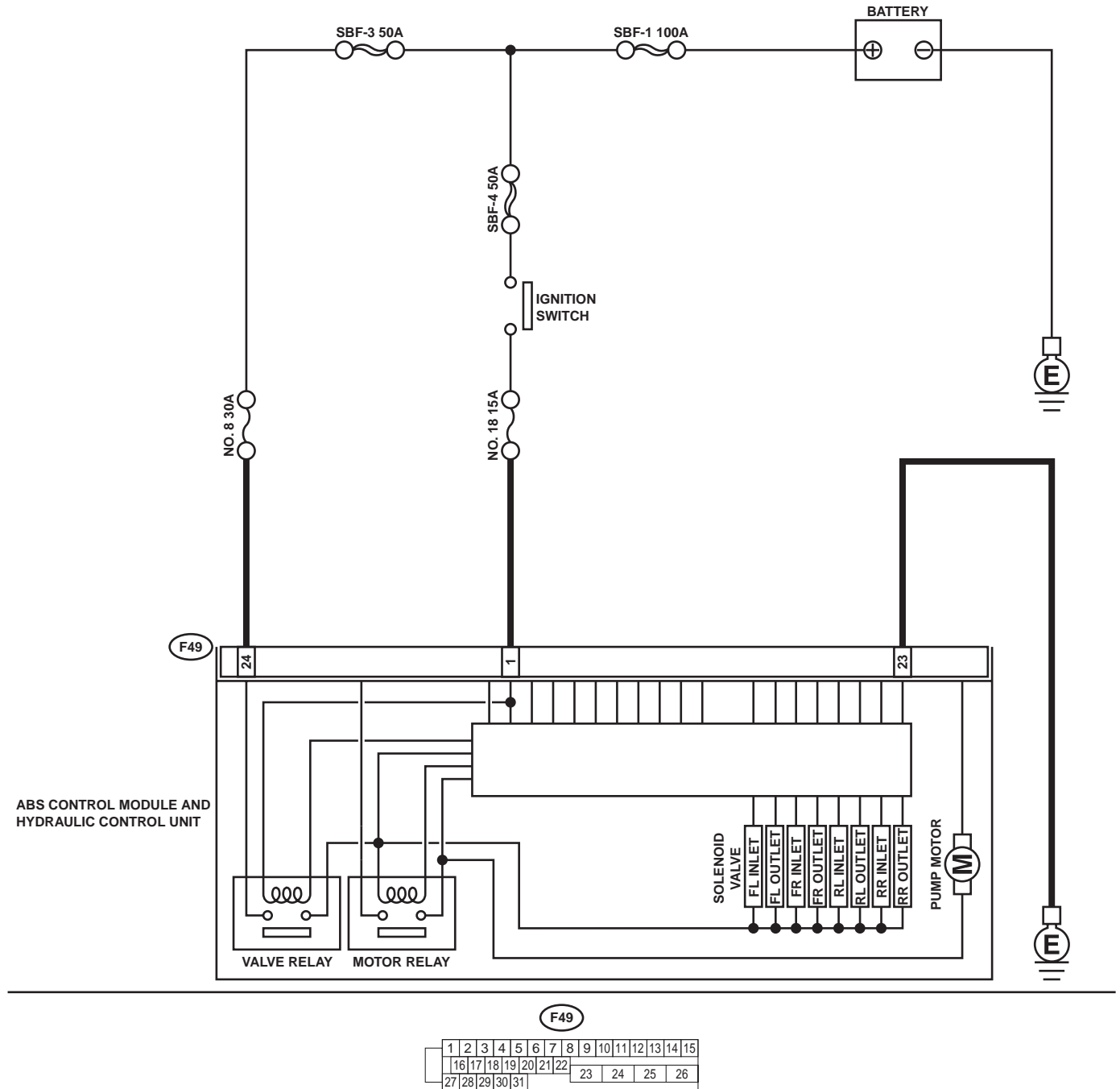
DIAGNOSIS:

- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00297

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): (F49) No. 24 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 2.	Repair harness connector between battery and ABSCM&H/U.
2 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair ABSCM&H/U ground harness.
3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 4.	Repair connector.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 5.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Z: DTC 51 VALVE RELAY ON FAILURE

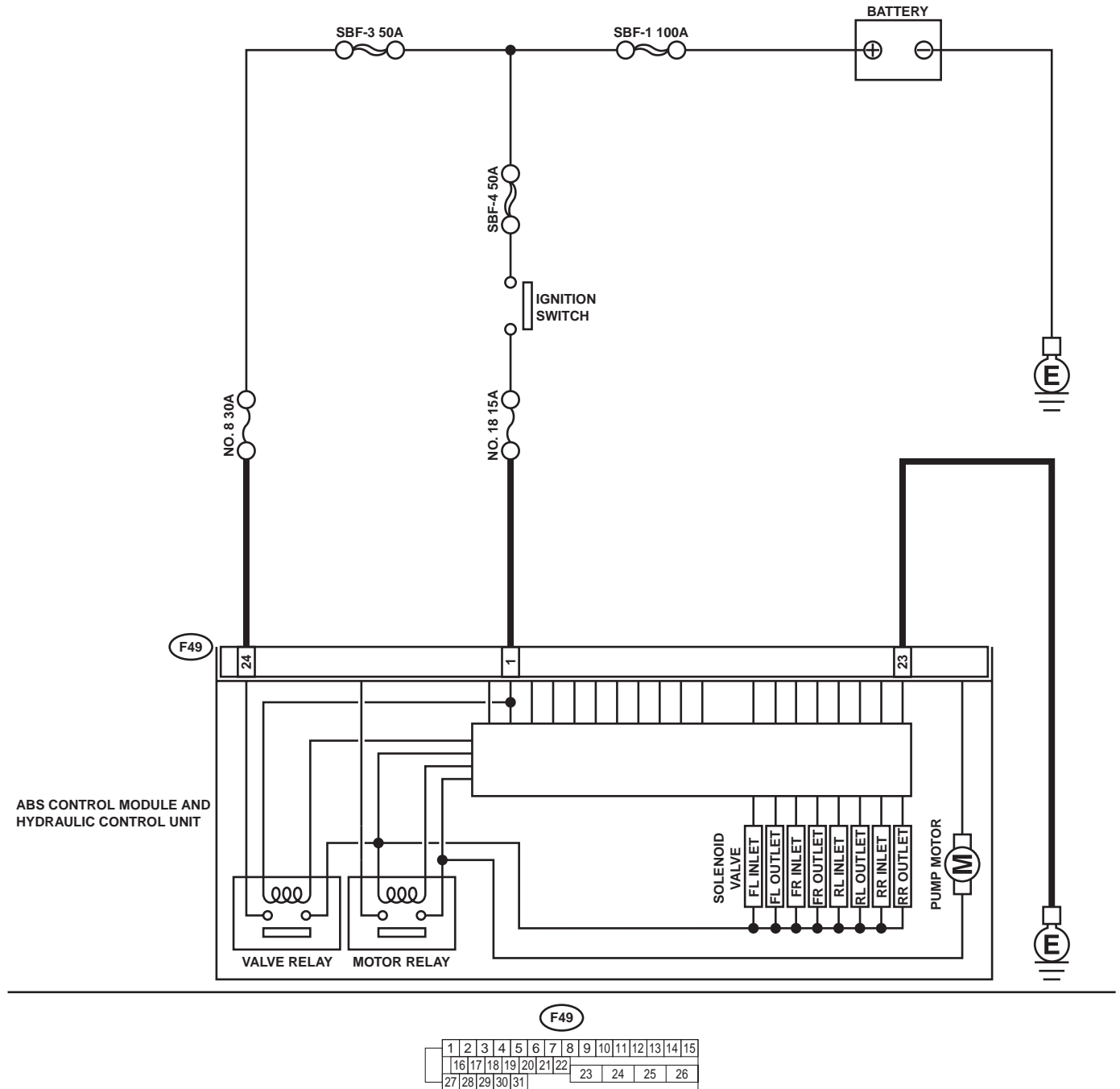
DIAGNOSIS:

- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00297

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK VALVE RELAY IN ABSCM&H/U. Measure resistance between ABSCM&H/U terminals. <i>Terminals</i> No. 23 — No. 24: Does the measured value exceed the specified value?	1 MΩ	Go to step 2.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 3.	Repair connector.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 4.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AA:DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT

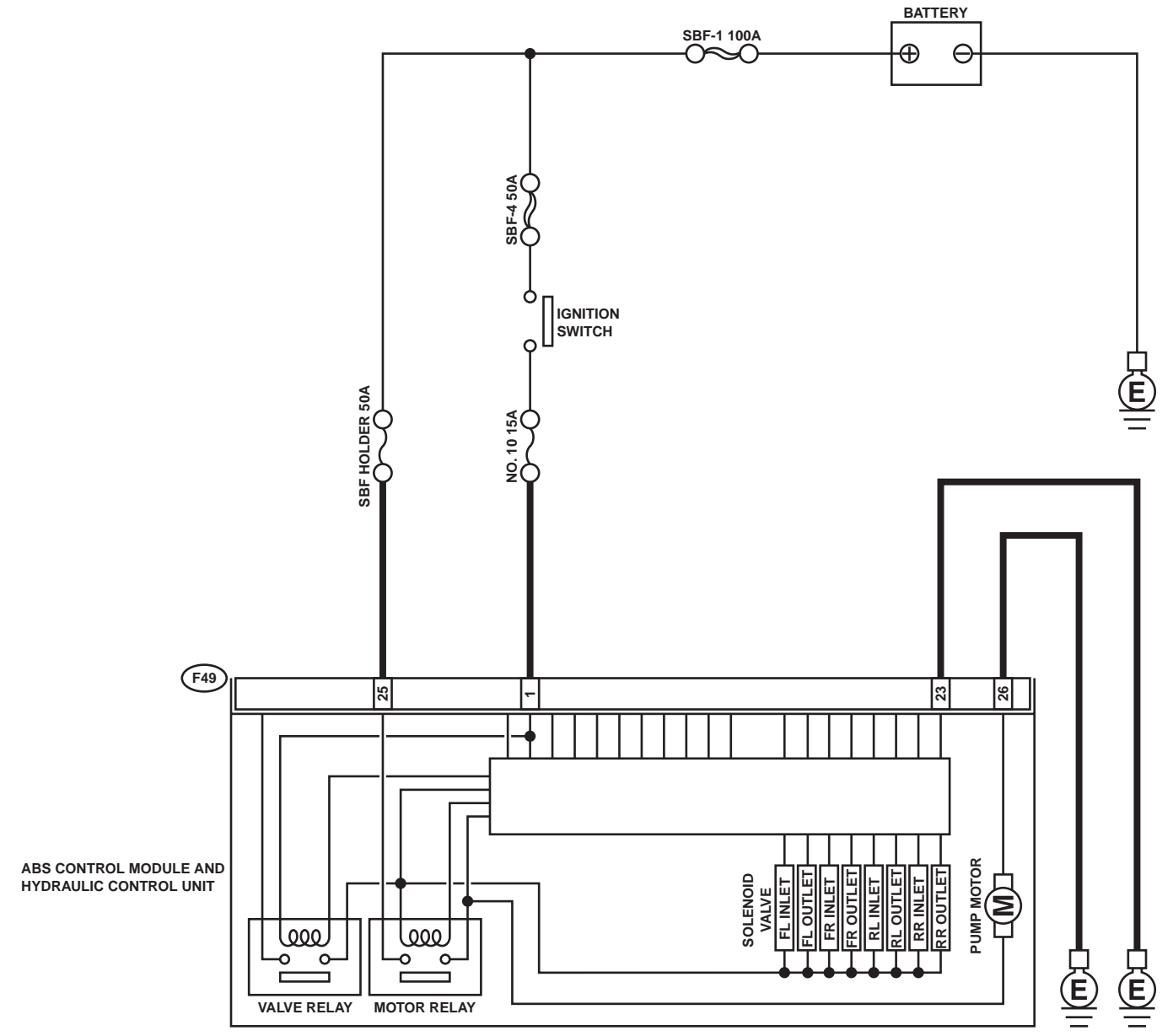
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

ABS00298

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 25 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 2.	Repair harness/connector between battery and ABSCM&H/U and check fuse SBF6.
2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 26 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair ABSCM&H/U ground harness.
3 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence?	Operating sound is produced.	Go to step 4.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 5.	Repair connector.
5 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 6.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AB:DTC 52 MOTOR RELAY ON FAILURE

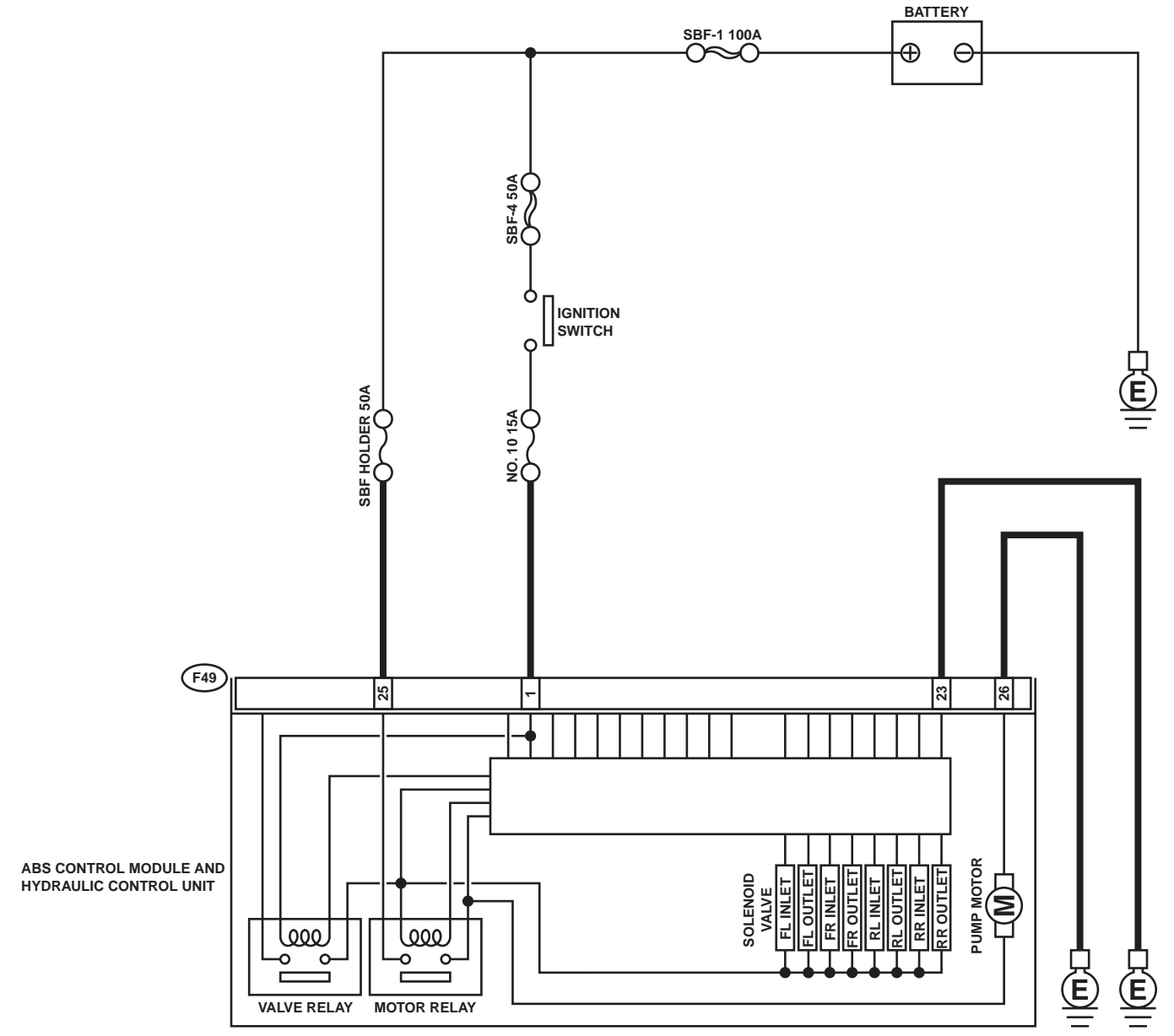
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

ABS00298

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK MOTOR RELAY IN ABSCM&H/U. Measure resistance between ABSCM&H/U terminals. Terminals No. 25 — No. 26: Does the measured value exceed the specified value?	1 MΩ	Go to step 2.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence control?	There is no poor contact.	Go to step 3.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	Operating sound is produced.	Go to step 4.	Repair connector.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 5.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
5 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AC:DTC 52 MOTOR MALFUNCTION

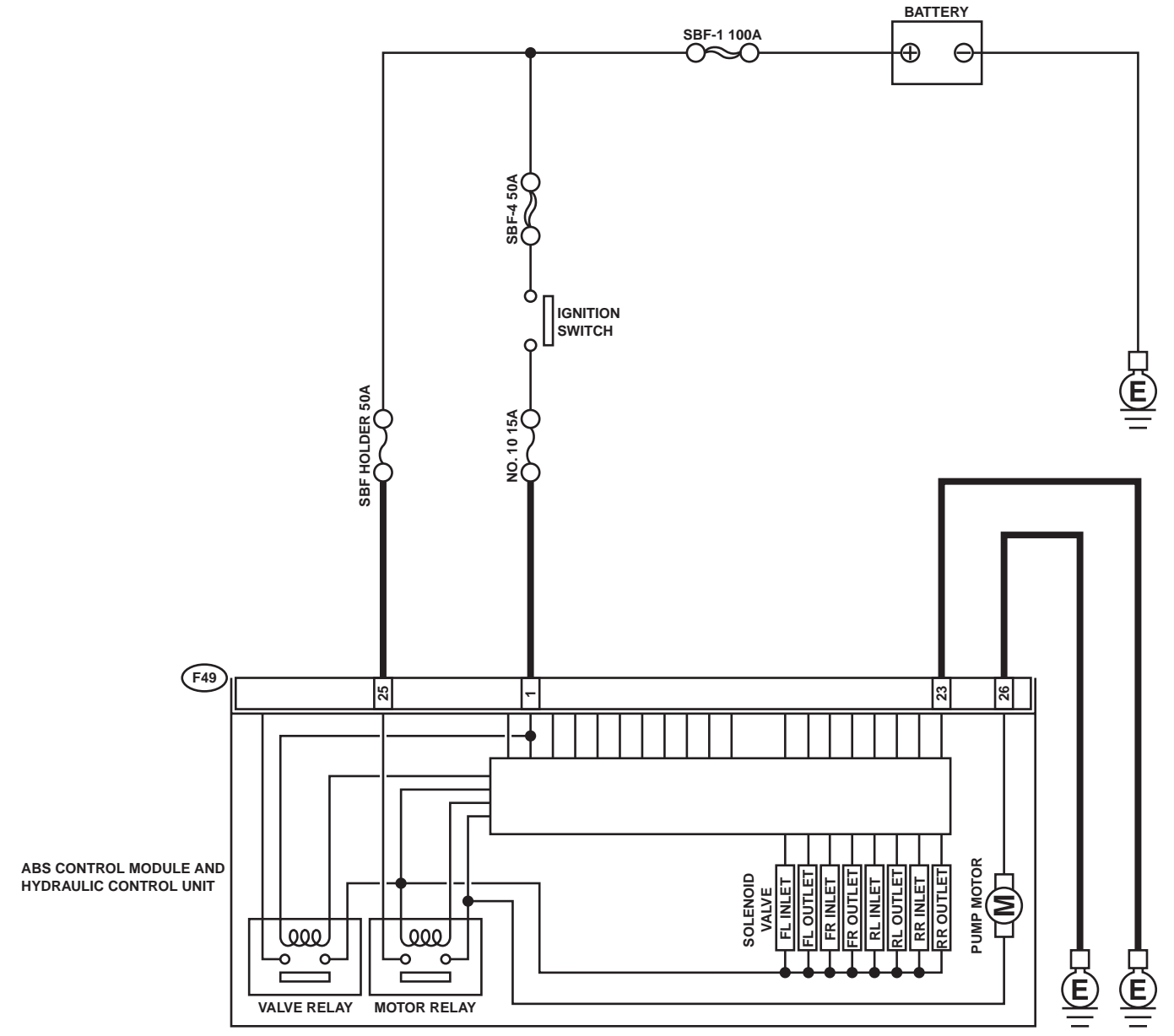
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 25 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 2.	Repair harness/connector between battery and ABSCM&H/U and check fuse SBF6.
2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 26 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair ABSCM&H/U ground harness.
3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Run the engine at idle. 2) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?	10 - 15 V	Go to step 4.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 23 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 5.	Repair ABSCM&H/U ground harness.
5 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control. Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Operating sound is produced.	Go to step 6.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between generator, battery and ABSCM&H/U?	There is no poor contact.	Go to step 7.	Repair connector.
7 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 8.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
8 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AD:DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

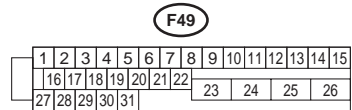
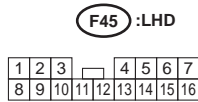
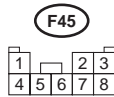
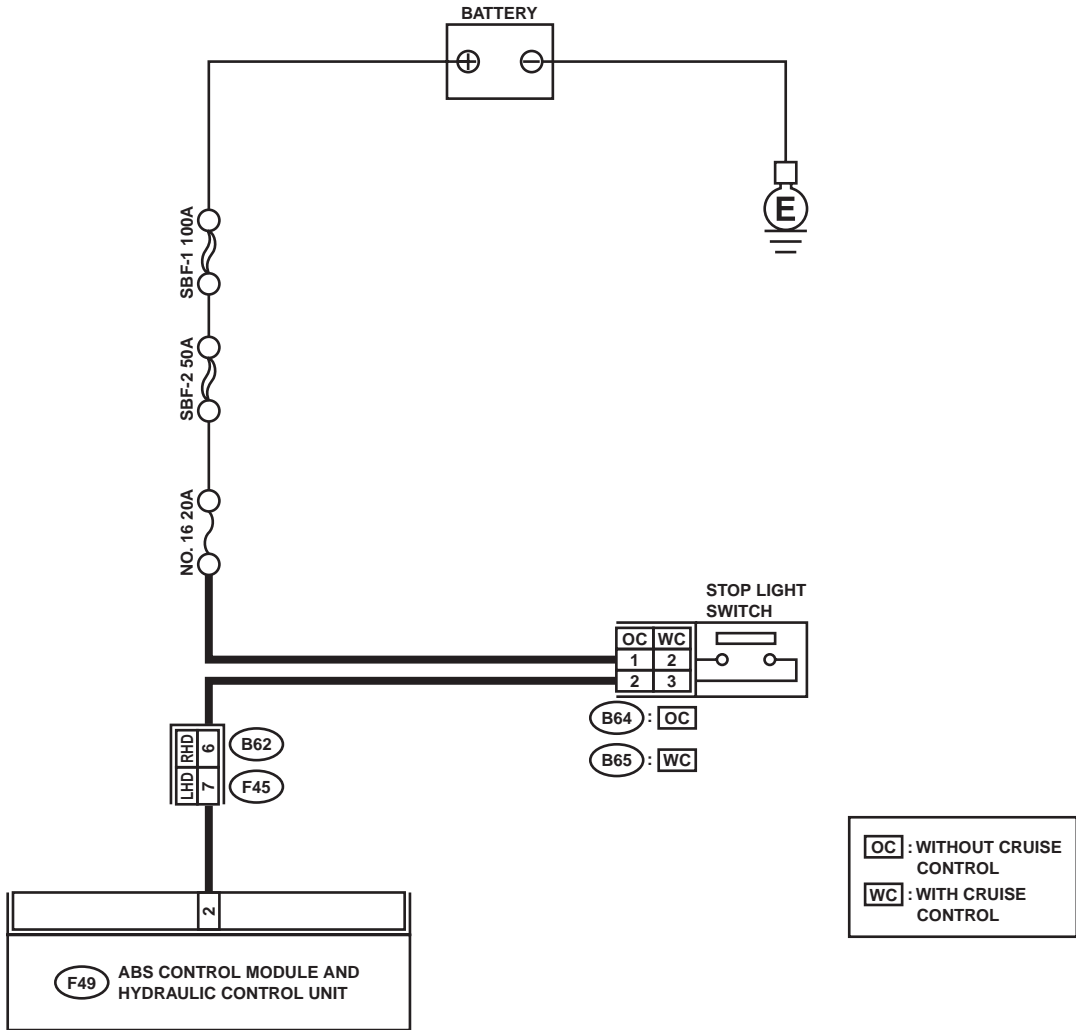
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00311

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Release the brake pedal. 3) Read the stop light switch output in the select monitor data display. Is the reading indicated on monitor display less than the specified value?	1.5 V	Go to step 2.	Go to step 3.
2 CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR. 1) Depress the brake pedal. 2) Read the stop light switch output in the select monitor data display. Is the reading indicated on monitor display within the specified range?	10 - 15 V	Go to step 5.	Go to step 3.
3 CHECK IF STOP LIGHTS COME ON. Depress the brake pedal. Do stop lights turn on?	Stop lights come on.	Go to step 4.	Repair stop lights circuit.
4 CHECK OPEN CIRCUIT IN HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Depress brake pedal. 4) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 2 — Chassis ground: Is the measured value within the specified range?	10 - 15 V	Go to step 5.	Repair harness between stop light switch and ABSCM&H/U connector.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between stop light switch and ABSCM&H/U?	There is no poor contact.	Go to step 6.	Repair connector.
6 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 7.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AE:DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT

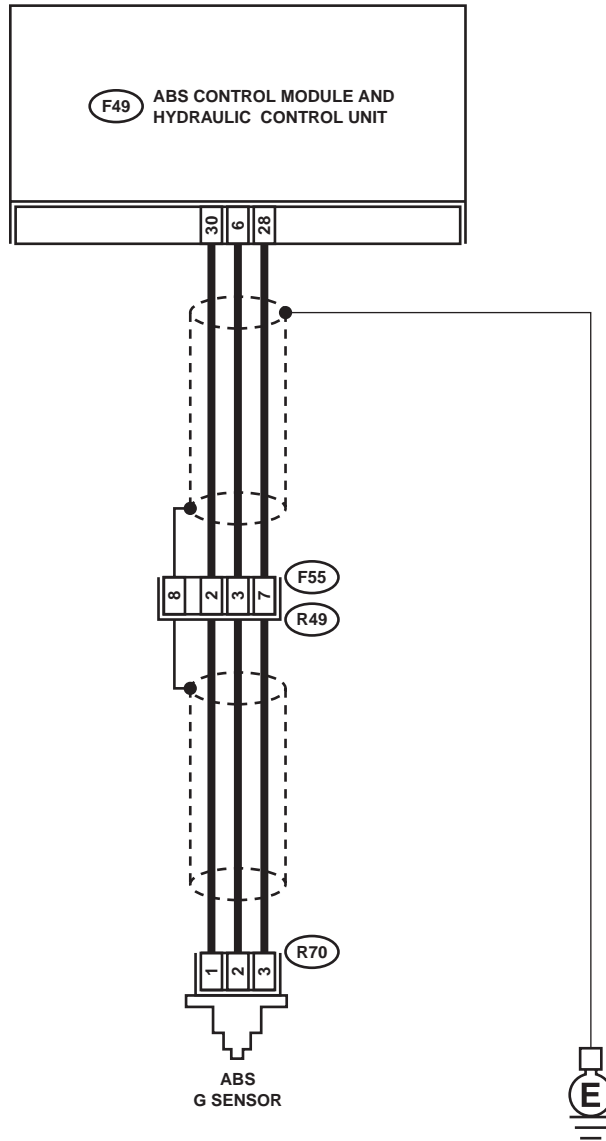
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



F62

R70

1	2	3
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F55

1	2	3		
4	5	6	7	8

F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

ABS00312

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT OF G SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read the G sensor output in select monitor data display. Is the G sensor output on the monitor display within the specified range when the G sensor is in horizontal position?	2.1 - 2.5 V	Go to step 2.	Go to step 5.
2 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step 3.	Repair connector.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 4.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
5 CHECK INPUT VOLTAGE OF G SENSOR. 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect G sensor from body. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 1 (+) — No. 3 (-): Is the measured value within the specified range?	4.75 - 5.25 V	Go to step 6.	Repair harness/connector between G sensor and ABSCM&H/U.
6 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. Connector & terminal (F49) No. 6 — No. 28: Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step 7.	Repair harness/connector between G sensor and ABSCM&H/U.
7 CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS. 1) Disconnect connector from G sensor. 2) Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 6 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 8.	Repair harness between G sensor and ABSCM&H/U.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK G SENSOR. 1) Connect connector to G sensor. 2) Connect connector to ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage between within the specified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step 9 .	Replace G sensor. <Ref. to ABS-21, G Sensor.>
9 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage between within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step 10 .	Replace G sensor. <Ref. to ABS-21, G Sensor.>
10 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage between within the specified range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step 11 .	Replace G sensor. <Ref. to ABS-21, G SENSOR, .>
11 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step 12 .	Repair connector.
12 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 13 .	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AF:DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT

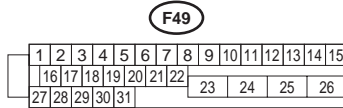
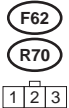
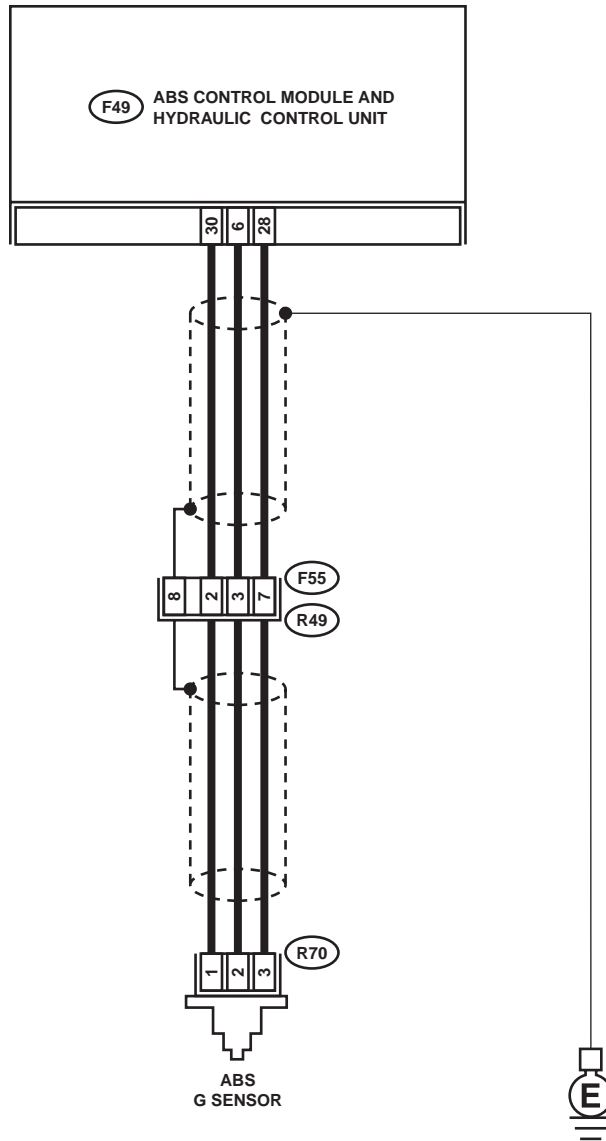
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00312

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT OF G SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read the G sensor output in select monitor data display. Is the G sensor output on the monitor display between within the specified range when the G sensor is in horizontal position?	2.1 - 2.5 V	Go to step 2.	Go to step 5.
2 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step 3.	Repair connector.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 4.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
5 CHECK FREEZE FRAME DATA. 1) Select "Freeze frame data" on the select monitor. 2) Read front right wheel speed on the select monitor display. Is the front right wheel speed on monitor display same as the specified value?	0 km/h (0 MPH)	Go to step 6.	Go to step 16.
6 CHECK FREEZE FRAME DATA. Read front left wheel speed on the select monitor display. Is the front left wheel speed on monitor display same as the specified value?	0 km/h (0 MPH)	Go to step 7.	Go to step 16.
7 CHECK FREEZE FRAME DATA. Read rear right wheel speed on the select monitor display. Is the rear right wheel speed on monitor display same as the specified value?	0 km/h (0 MPH)	Go to step 8.	Go to step 16.
8 CHECK FREEZE FRAME DATA. Read rear left wheel speed on the select monitor display. Is the rear left wheel speed on monitor display same as the specified value?	0 km/h (0 MPH)	Go to step 9.	Go to step 16.
9 CHECK FREEZE FRAME DATA. Read G sensor output on the select monitor display. Does measured value exceed the specified value on monitor display?	3.65 V	Go to step 10.	Go to step 16.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
10 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. Connector & terminal (F49) No. 6 — No. 28: Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step 11.	Repair harness/connector between G sensor and ABSCM&H/U.
11 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect connector from G sensor. 4) Disconnect connector from ABSCM&H/U. 5) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 12.	Repair harness between G sensor and ABSCM&H/U.
12 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 13.	Repair harness between G sensor and ABSCM&H/U.
13 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step 14.	Repair connector.
14 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 15.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
15 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
16 CHECK INPUT VOLTAGE OF G SENSOR. 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect G sensor from body. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 1 (+) — No. 3 (-): Is the measured value within the specified range?	4.75 - 5.25 V	Go to step 17.	Repair harness/connector between G sensor and ABSCM&H/U.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
17 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. Connector & terminal (F49) No. 6 — No. 28: Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step 18 .	Repair harness/connector between G sensor and ABSCM&H/U.
18 CHECK G SENSOR. 1) Connect connector to G sensor. 2) Connect connector to ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage within the specified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step 19 .	Replace G sensor. <Ref. to ABS-21, G Sensor.>
19 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step 20 .	Replace G sensor. <Ref. to ABS-21, G Sensor.>
20 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage within the specified range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step 21 .	Replace G sensor. <Ref. to ABS-21, G Sensor.>
21 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step 22 .	Repair connector.
22 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 23 .	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
23 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AG:DTC 56 ABNORMAL G SENSOR HIGH M OUTPUT

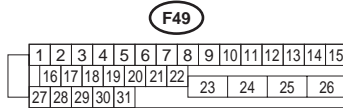
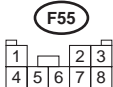
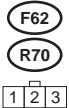
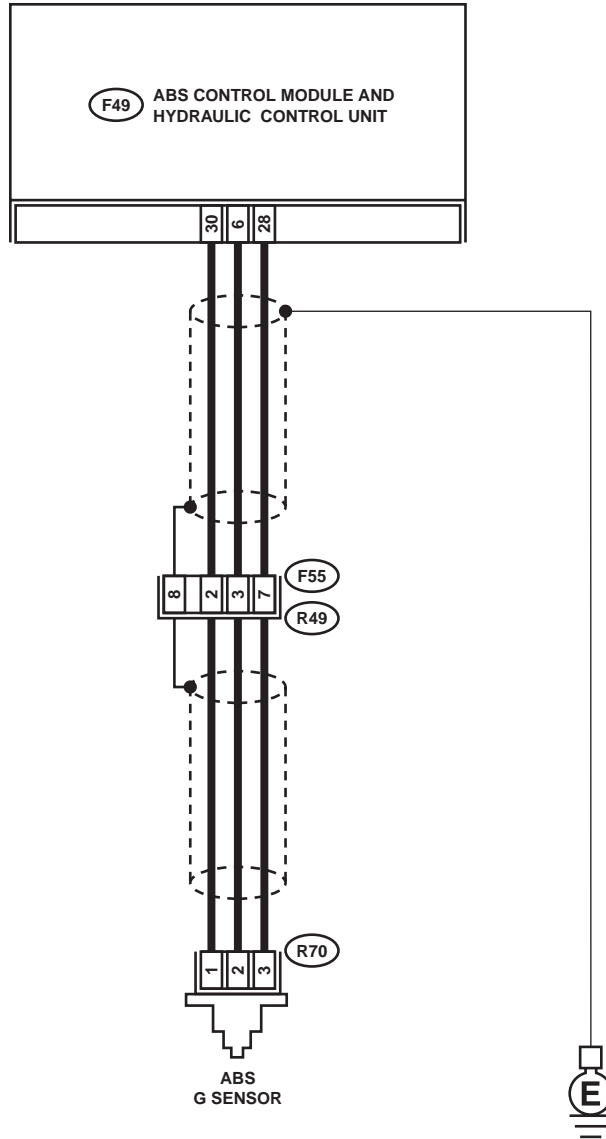
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00312

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT OF G SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read G sensor output on the select monitor display. Is the G sensor output on monitor display within the specified range when the G sensor is in horizontal position?	2.1 - 2.5 V	Go to step 2.	Go to step 6.
2 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step 3.	Repair connector.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 4.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
5 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. Connector & terminal (F49) No. 6 — No. 28: Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step 6.	Repair harness/connector between G sensor and ABSCM&H/U.
6 CHECK GROUND SHORT OF HARNESS. Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 28 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 7.	Repair harness between G sensor and ABSCM&H/U. Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7 CHECK G SENSOR. 1) Remove console box. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Connect connector to ABSCM&H/U. 5) Turn ignition switch to ON. 6) Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage within the specified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step 8.	Replace G sensor. <Ref. to ABS-21, G Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK G SENSOR. Measure voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(R70) No. 2 (+) — No. 3 (-):</i> Is the voltage within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step 9 .	Replace G sensor. <Ref. to ABS-21, G Sensor.>
9 CHECK G SENSOR. Measure voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(R70) No. 2 (+) — No. 3 (-):</i> Is the voltage within the specified range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step 10 .	Replace G sensor. <Ref. to ABS-21, G Sensor.>
10 CHECK ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 11 .	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
11 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AH:DTC 56 DETECTION OF G SENSOR STICK

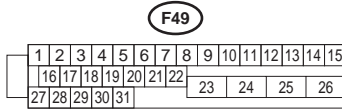
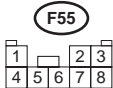
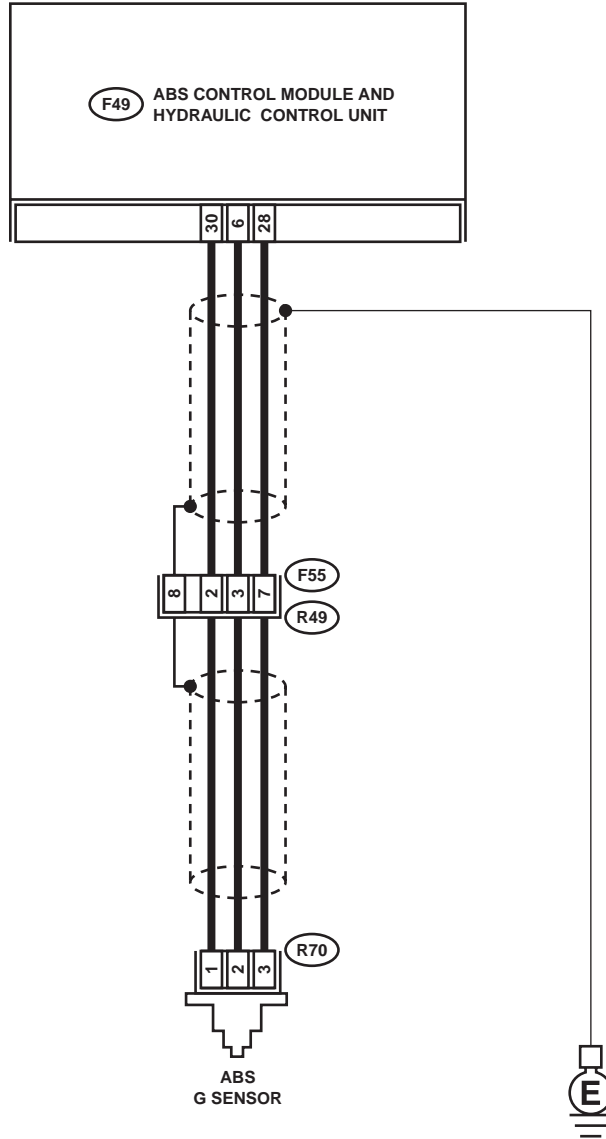
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00312

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK WHEELS FOR FREE TURNING. Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?	Wheel have not turned freely.	Go to step 2.	The ABS is normal. Erase the trouble code.
2 CHECK OUTPUT OF G SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read the select monitor display. Is the G sensor output on the monitor display within the specified range when the vehicle is in horizontal position?	2.1 - 2.5 V	Go to step 3.	Go to step 8.
3 CHECK OUTPUT OF G SENSOR USING SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Remove console box. 3) Remove G sensor from vehicle. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Select "Current data display & Save" on the select monitor. 6) Read the select monitor display. Is the G sensor output on the monitor display within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step 4.	Replace G sensor. <Ref. to ABS-21, G Sensor.>
4 CHECK OUTPUT OF G SENSOR USING SELECT MONITOR. Read the select monitor display. Is the G sensor output on the monitor display within the specified range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step 5.	Replace G sensor. <Ref. to ABS-21, G Sensor.>
5 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between ABSCM&H/U and G sensor?	There is no poor contact.	Go to step 6.	Repair connector.
6 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 7.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.
8 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. Connector & terminal (F49) No. 6 — No. 28: Is the measured value within the specified range?	5.0 - 5.6 kΩ	Go to step 9.	Repair harness/connector between G sensor and ABSCM&H/U.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Value	Yes	No
9 CHECK G SENSOR. 1) Remove console box. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Connect connector to ABSCM&H/U. 5) Turn ignition switch to ON. 6) Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage within the specified range when G sensor is horizontal?	2.1 - 2.5 V	Go to step 10.	Replace G sensor. <Ref. to ABS-21, G Sensor.>
10 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage within the specified range when G sensor is inclined forwards to 90°?	3.7 - 4.1 V	Go to step 11.	Replace G sensor. <Ref. to ABS-21, G Sensor.>
11 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (R70) No. 2 (+) — No. 3 (-): Is the voltage within the specified range when G sensor is inclined backwards to 90°?	0.5 - 0.9 V	Go to step 12.	Replace G sensor. <Ref. to ABS-21, G Sensor.>
12 CHECK ABSCM&H/U. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC. Is the same DTC still being output?	Same DTC is not indicated.	Go to step 13.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
13 CHECK ANY OTHER DTC APPEARANCE. Are other DTC being output?	Other DTC is not indicated.	A temporary poor contact.	Proceed with the diagnosis corresponding to the DTC.

14. General Diagnostics Table

A: INSPECTION

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either side.	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Wheel alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS sensor • Brake (pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor braking	Long braking/stopping distance	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • Brake (pads) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve, motor) • ABS sensor • Incorrect wiring or piping connections
	Brake dragging	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS sensor • Master cylinder • Brake (caliper & piston) • Parking brake • Axle & wheels • Brake pedal play
	Long brake pedal stroke	<ul style="list-style-type: none"> • Air in brake line • Brake pedal play
	Vehicle pitching	<ul style="list-style-type: none"> • Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
	Excessive pedal vibration	<ul style="list-style-type: none"> • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Noise from ABSCM&H/U	<ul style="list-style-type: none"> • ABSCM&H/U (mount bushing) • ABS sensor • Brake piping
	Noise from front of vehicle	<ul style="list-style-type: none"> • ABSCM&H/U (mount bushing) • ABS sensor • Master cylinder • Brake (caliper & piston, pads, rotor) • Brake piping • Brake booster & check valve • Suspension play or fatigue
	Noise from rear of vehicle	<ul style="list-style-type: none"> • ABS sensor • Brake (caliper & piston, pads, rotor) • Parking brake • Brake piping • Suspension play or fatigue

GENERAL DIAGNOSTICS TABLE

ABS (DIAGNOSTICS)

MEMO:

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GENERAL DESCRIPTION

VDC

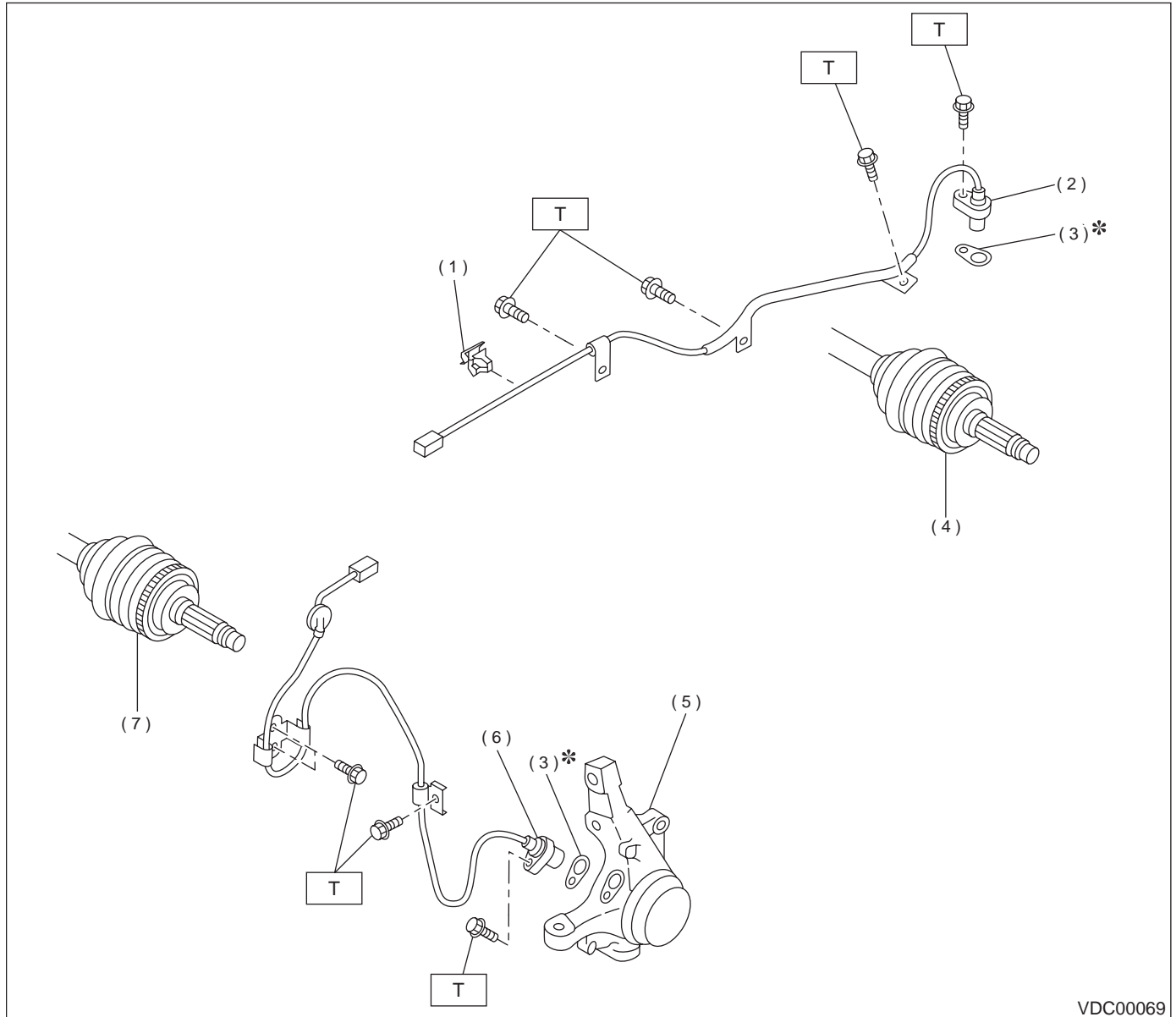
1. General Description

A: SPECIFICATIONS

Item			Standard or remarks	
ABS sensor	ABS sensor gap	Front	0.3 — 0.8 mm (0.012 — 0.031 in)	
		Rear	0.44 — 0.94 mm (0.0173 — 0.0370 in)	
	ABS sensor resistance		1.25±0.25 kΩ	
	Marks of the harness	Front LH	Except OUTBACK	Yellow
			OUTBACK	Brown
		Front RH	Except OUTBACK	White
			OUTBACK	Light blue
		Rear LH	Except OUTBACK	Yellow
			OUTBACK	Yellow
		Rear RH	Except OUTBACK	White
OUTBACK			White	
Yaw rate and lateral G sensor	Lateral G sensor voltage		2.5±0.2 V	
VDC hydraulic control unit marks			D2	
VDC control module marks	Except Australia spec.	Except OUTBACK		K
		OUTBACK	Except 3.0 L model	M
			3.0 L model	N
	Australia spec.	Except OUTBACK		J
		OUTBACK		Y

B: COMPONENT

1. ABS SENSOR



VDC00069

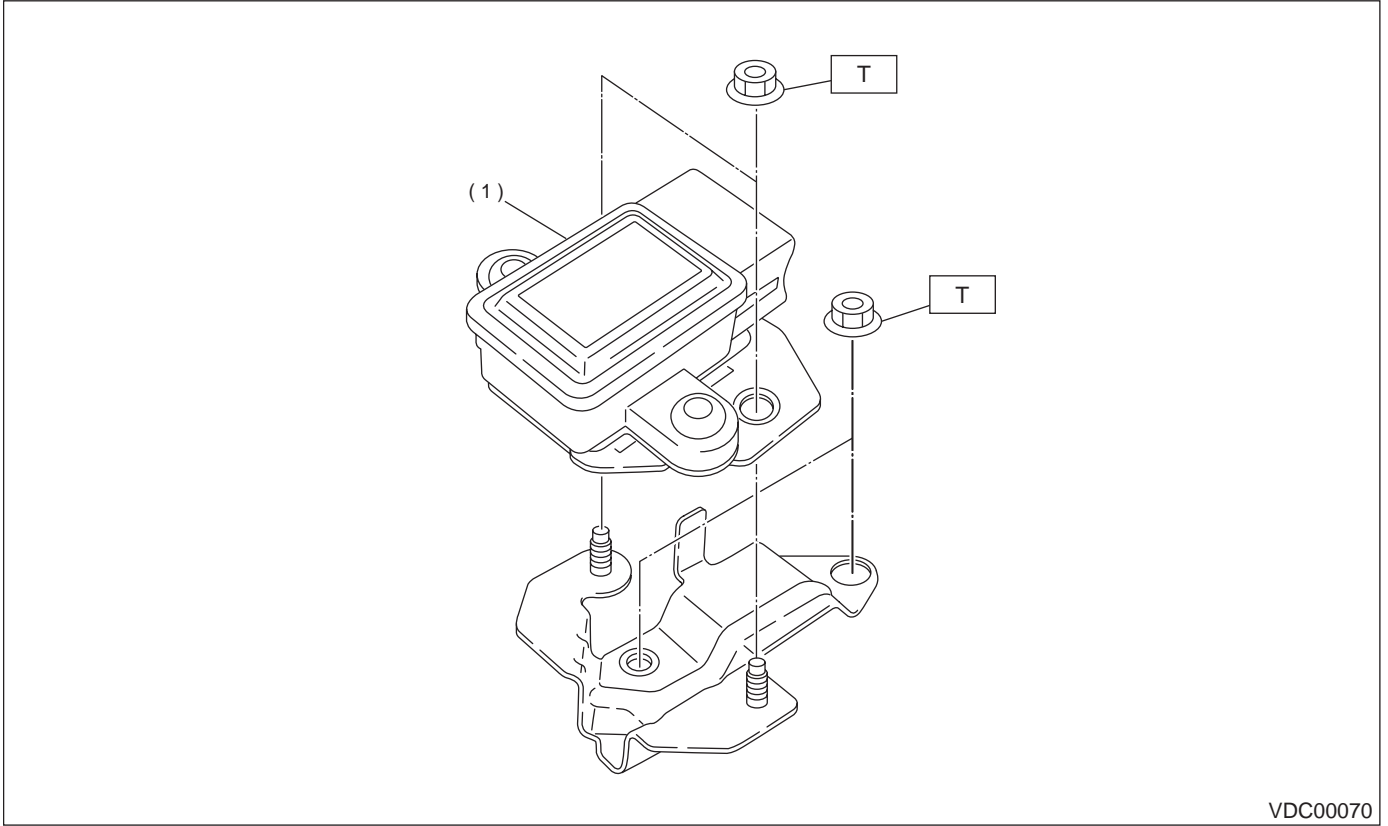
- | | |
|-----------------------|------------------------|
| (1) Clip | (5) Housing |
| (2) Rear ABS sensor | (6) Front ABS sensor |
| (3) ABS spacer | (7) Tone wheel (Front) |
| (4) Tone wheel (Rear) | |

Tightening torque: N·m (kgf·m, ft·lb)
T: 33 (3.3, 24)

GENERAL DESCRIPTION

VDC

2. YAW RATE AND LATERAL G SENSOR

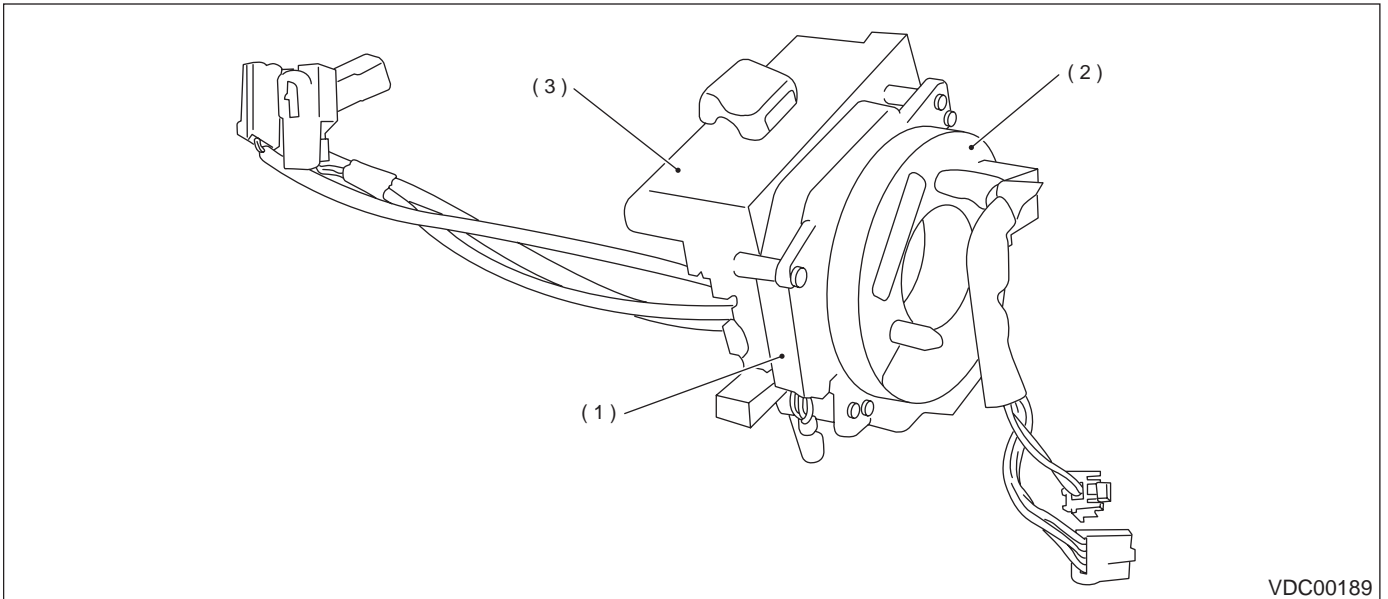


VDC00070

(1) Yaw rate and lateral G sensor

Tightening torque: N·m (kgf·m, ft·lb)
T: 7.5 (0.76, 5.5)

3. STEERING ANGLE SENSOR



VDC00189

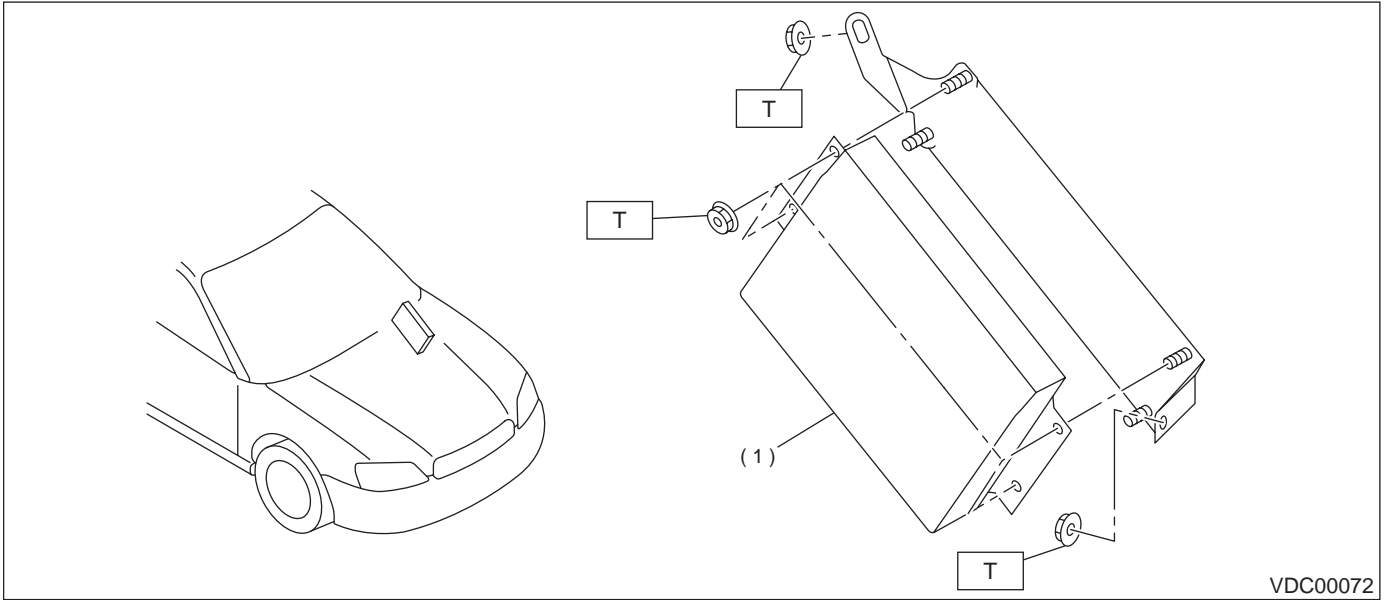
(1) Steering angle sensor

(2) Roll connector

(3) Combination base switch

4. VDC CONTROL MODULE (VDCCM)

• LHD model



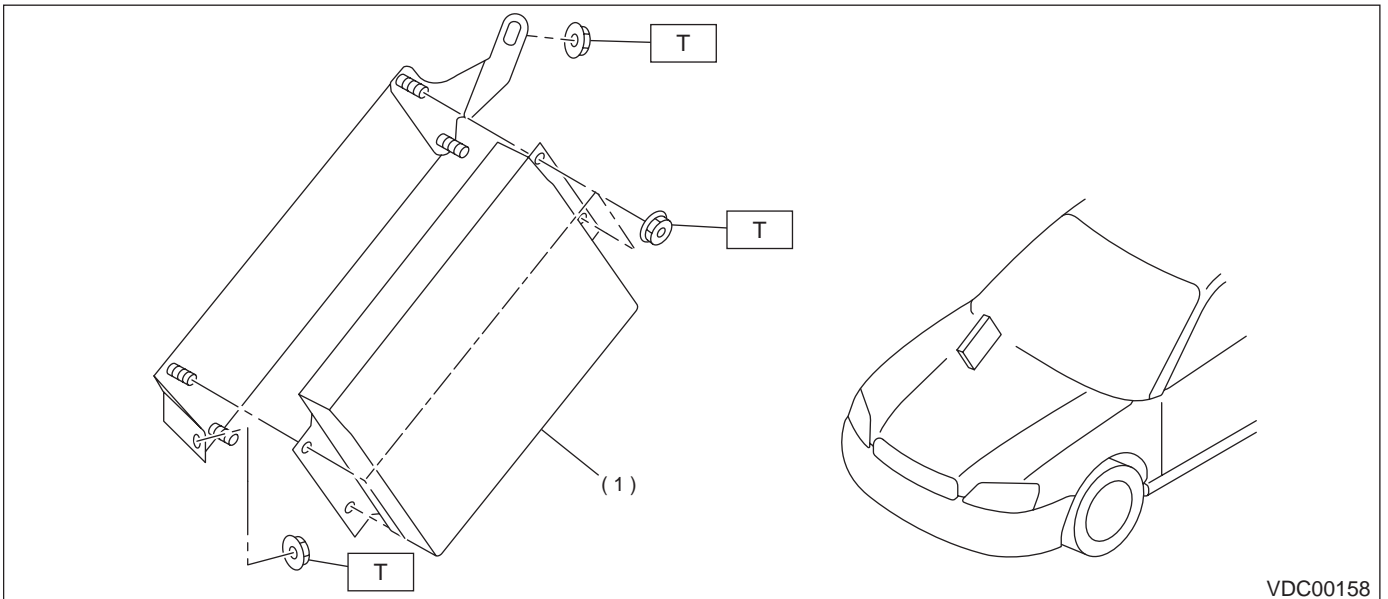
VDC00072

(1) VDC control module

Tightening torque: N·m (kgf·m, ft·lb)

T: 7.5 (0.76, 5.5)

• RHD model



VDC00158

(1) VDC control module

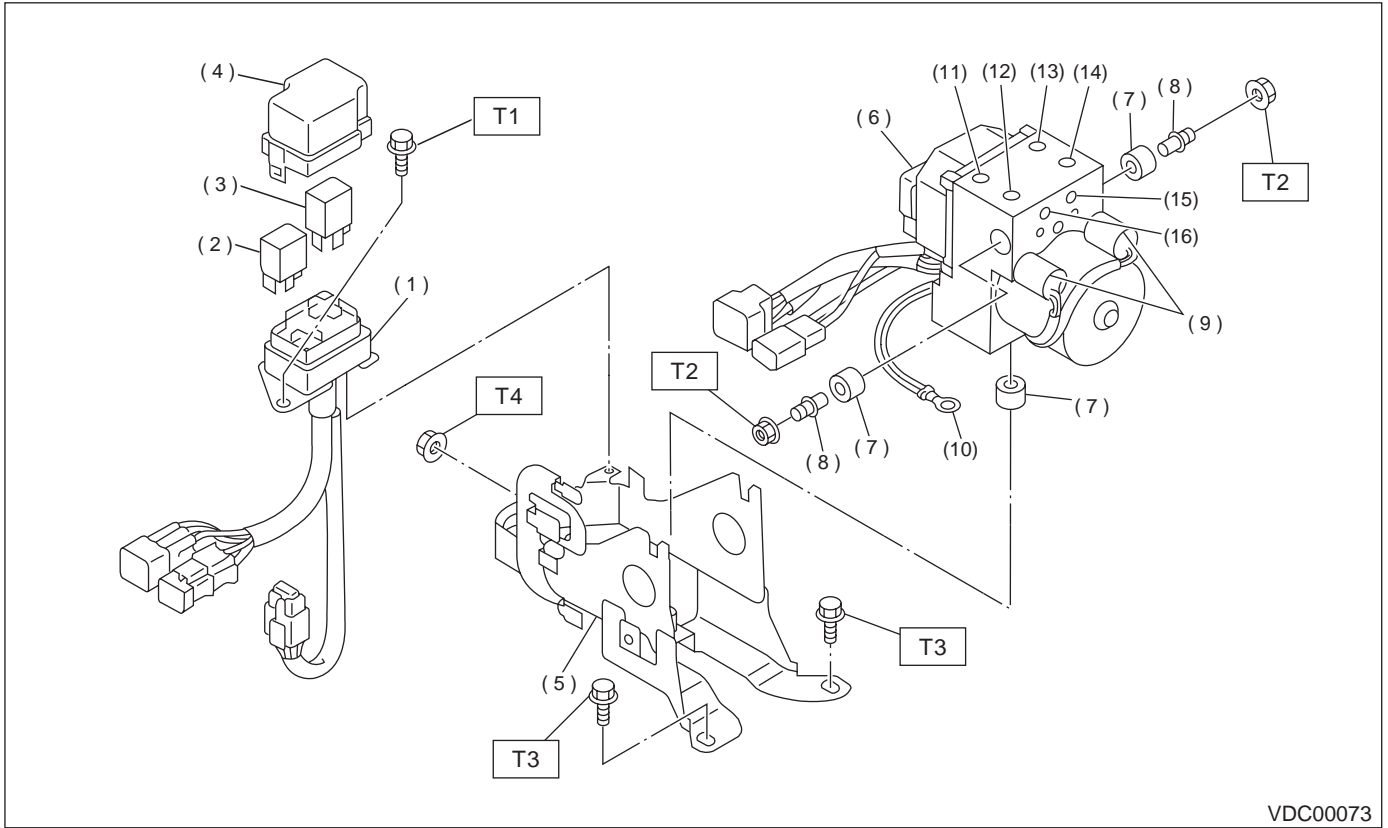
Tightening torque: N·m (kgf·m, ft·lb)

T: 7.5 (0.76, 5.5)

GENERAL DESCRIPTION

VDC

5. HYDRAULIC CONTROL UNIT (H/U)



VDC00073

- | | |
|----------------------------|----------------------|
| (1) Relay box | (9) Pressure sensor |
| (2) Motor relay | (10) Ground terminal |
| (3) Valve relay | (11) Front-LH outlet |
| (4) Cap | (12) Secondary inlet |
| (5) Bracket | (13) Front-RH outlet |
| (6) Hydraulic control unit | (14) Primary inlet |
| (7) Damper | (15) Rear-LH outlet |
| (8) Stud bolt | (16) Rear-RH outlet |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 13 (1.3, 9.4)

T2: 18 (1.8, 13.0)

T3: 33 (3.3, 24)

T4: 38 (3.9, 28)

GENERAL DESCRIPTION

VDC

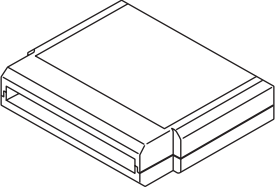

C: CAUTION

- Wear working clothing, including, a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST24082AA210</p>	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 <p>ST22771AA030</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Pressure Gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

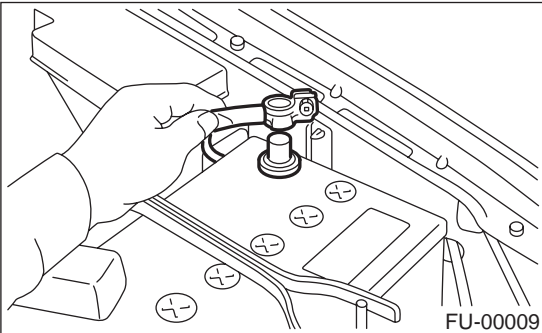
VDC CONTROL MODULE (VDCCM)

VDC

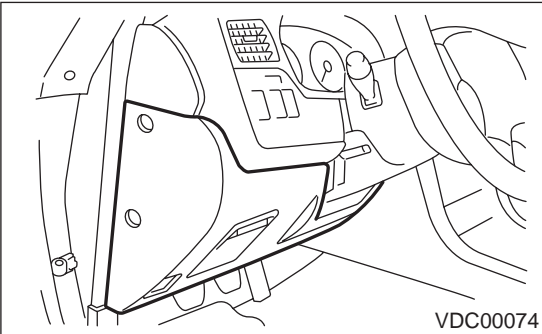
2. VDC Control Module (VDC-CM)

A: REMOVAL

1) Disconnect battery ground cable.

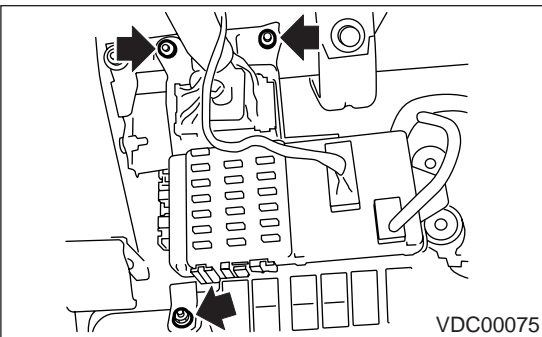


2) Remove lower cover of instrument panel and disconnect connectors on the back side of the cover.

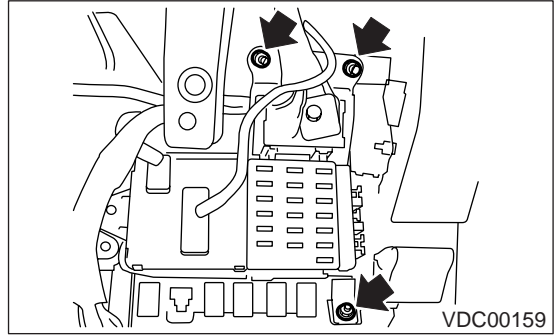


3) Remove three bolts which secure the fuse box onto body side, then move the fuse box aside.

LHD model

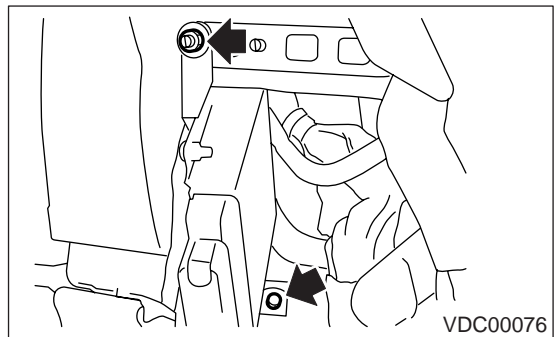


RHD model

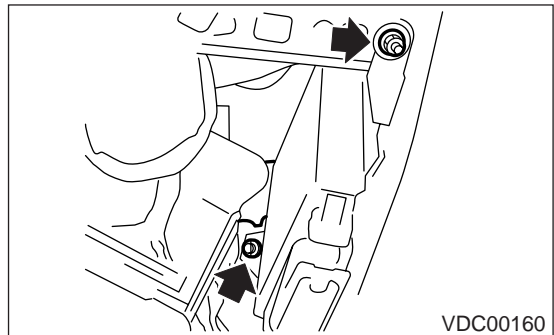


4) Remove two bolts which install VDCCM onto body side bracket.

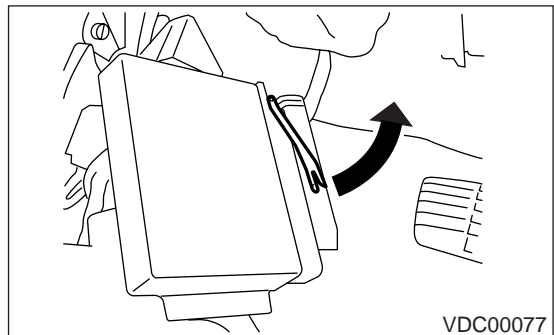
LHD model



RHD model



5) Disconnect connector from VDCCM by pulling up the securing holder.



6) Remove VDCCM.

B: INSTALLATION

Install in the reverse order of removal.

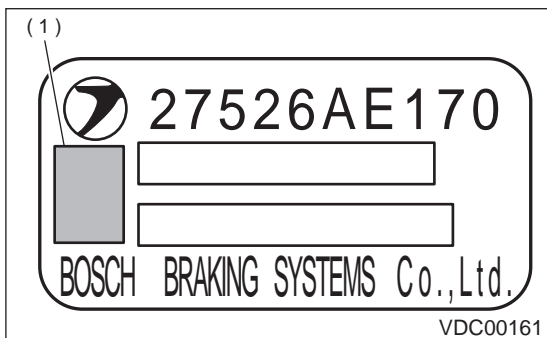
CAUTION:

After completion of installation procedure, the following two position settings must be made.

- Steering angle sensor center positioning
 - Yaw rate and lateral G sensor 0 positioning
- These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>.

C: INSPECTION

Check the VDCCM identification mark.



(1) Specification mark

Vehicle specifications			VDCCM identification mark
Except Australia spec.	Except OUTBACK		K
	OUTBACK	Except 3.0 L model	M
		3.0 L model	N
Australia spec.	Except OUTBACK		J
	OUTBACK		Y

D: ADJUSTMENT

Always conduct steering angle sensor center positioning and yaw rate and lateral G sensor 0 positioning whenever you have replaced, removed or installed the following items.

- VDCCM
- Combination base switch assembly (Steering angle sensor)
- Yaw rate and lateral G sensor
- Steering wheel parts (including airbag)
- Suspension parts
- Adjustment of wheel alignment

1. WITHOUT SUBARU SELECT MONITOR

- 1) Park the vehicle in a straight ahead position on a horizontal surface.
- 2) Confirm the steering wheel center position. (If the center position is not accurate, adjust wheel alignment.)
- 3) Drive the vehicle approx. 10 km (6 MPH) preferably on a straight road, then turn ignition switch OFF. Then drive the vehicle approx. 10 km (6 MPH) again confirming that ABS and VDC warning lights do not go ON while vehicle is being driven. Also make sure there are no abnormalities of the VDC function or steering operation.

NOTE:

If it is not possible to drive the vehicle, use SUBARU SELECT MONITOR.

<Ref. to VDC-9, WITH SUBARU SELECT MONITOR, ADJUSTMENT, VDC Control Module (VDCCM).>

- 4) If there are any abnormalities found, conduct the procedure over again.

2. WITH SUBARU SELECT MONITOR

- 1) Park the vehicle in a straight ahead position on a horizontal surface. (Engine running in gear position of P or N)
- 2) Confirm the steering wheel center position. (If the center position is not accurate, adjust wheel alignment.)
- 3) Set the SUBARU SELECT MONITOR on the vehicle and select "Set Mode Str.A.Sen.N & Lat.Gsen.0p" in "Function Check Sequence" display menu. (Follow the instructions in the display.)
- 4) Select "Current Data display & Save" in {Brake Control System} display menu and confirm if the steering angle sensor is indicated as "0 deg".
- 5) If the display does not indicate {0 deg}, conduct the procedure over again and make sure it indicates "0 deg".
- 6) Drive the vehicle approx. 10 minutes and confirm that ABS and VDC warning lights do not go ON while vehicle is being driven.
- 7) If there are any abnormalities in VDC function or steering operation found while vehicle is being driven, conduct the procedure over again.

HYDRAULIC CONTROL UNIT (H/U)

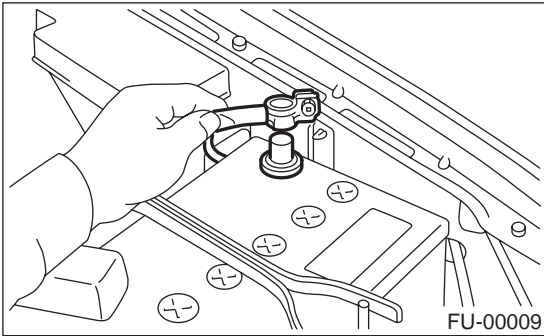
VDC

3. Hydraulic Control Unit (H/U)

A: REMOVAL

1. HYDRAULIC UNIT (H/U)

- 1) Disconnect ground cable from battery.



- 2) Remove air intake duct from engine compartment to facilitate removal of hydraulic unit.
- 3) Disconnect connector from hydraulic unit.

CAUTION:

Be careful not to let water or other foreign matter contact the H/U terminal.

- 4) Unlock cable clip.
- 5) Disconnect brake pipes from hydraulic unit.

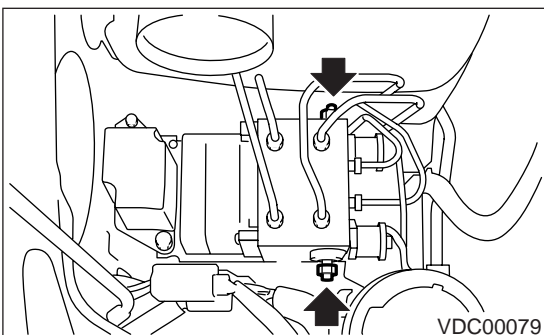
CAUTION:

Wrap brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

- 6) Remove nuts and bolt which secure hydraulic unit bracket, and remove hydraulic unit from engine compartment.

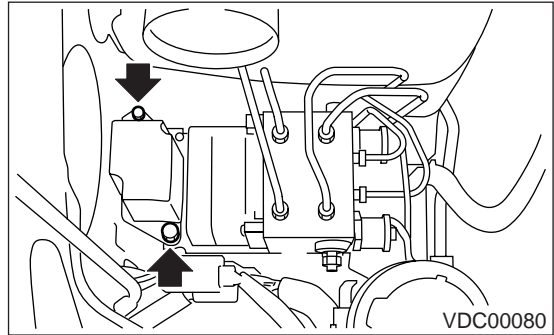
CAUTION:

- Hydraulic unit cannot be disassembled. Do not attempt to loosen bolts and nuts.
- Do not drop or bump hydraulic unit.
- Do not turn the hydraulic unit upside down or place it on its side.
- Be careful to prevent foreign particles from getting into hydraulic unit.
- When a new hydraulic unit is installed, apply a coat of rust-preventive wax (Nippeco LT or GB) to bracket attaching bolt after tightening.
- Do not pull harness disconnecting harness connector.



2. RELAY BOX

- 1) Disconnect ground cable from battery.
- 2) Remove air intake duct from engine compartment to facilitate removal of relay box.
- 3) Disconnect connector from relay box.
- 4) Unlock cable clip.
- 5) Remove nuts which secure relay box, and remove relay box and connector bracket.



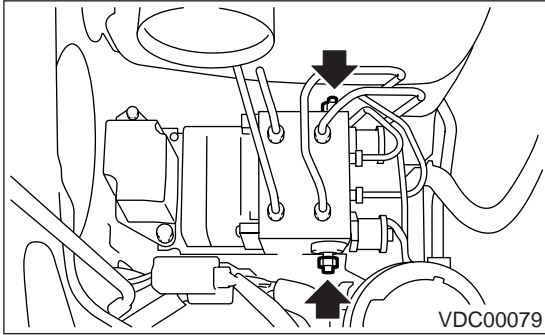
CAUTION:

Do not drop or bump relay box.

B: INSTALLATION

1. HYDRAULIC UNIT (H/U)

- 1) Install hydraulic unit.



Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 2) Connect hydraulic unit ground cable to body.

Tightening torque:

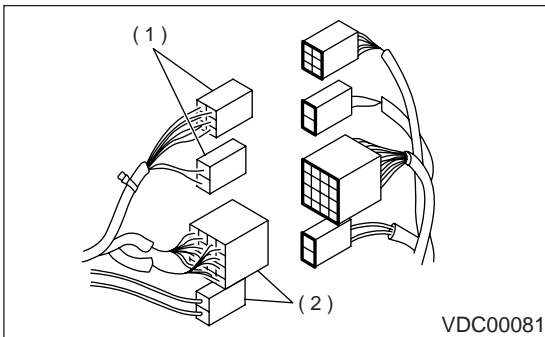
33 N·m (3.4 kgf-m, 25 ft-lb)

- 3) Connect brake pipes to their correct hydraulic unit connections.
- 4) Secure hydraulic unit connector to connector bracket.

CAUTION:

Align connector with mating receptacle.

- 5) Connect connector to hydraulic unit.



- (1) Relay box connector
- (2) Hydraulic unit connector

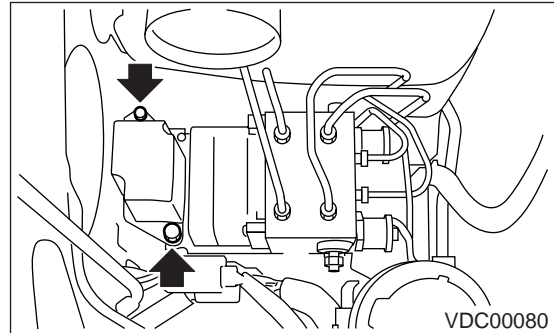
- 6) Install air intake duct.
- 7) Connect ground cable to battery.
- 8) Bleed air from the brake system.

2. RELAY BOX

- 1) Install relay box and connector bracket.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

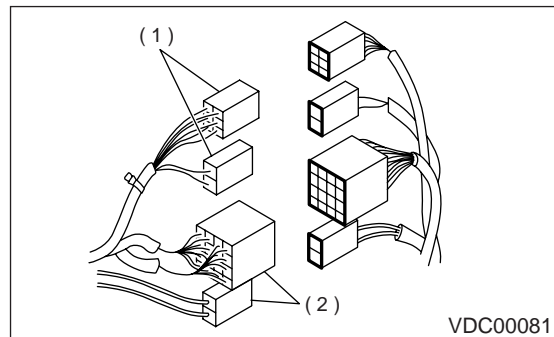


- 2) Secure relay box connector to connector bracket.

CAUTION:

Align connector with mating receptacle.

- 3) Connect connector to relay box.



- (1) Relay box connector
- (2) Hydraulic unit connector

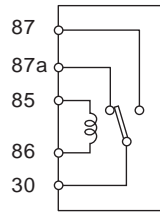
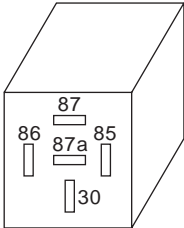
- 4) Install air intake duct.
- 5) Connect ground cable to battery.

HYDRAULIC CONTROL UNIT (H/U)

VDC

C: INSPECTION

- 1) Check connected and fixed condition of connector.
- 2) Check valve relay and motor relay for discontinuity or short circuits.

	Condition	Terminal number	Standard	Diagram	Terminal location
Valve relay	Turning off electricity.	85 — 86	103±10 Ω	 <p>VDC00082</p>	 <p>VDC00083</p>
		30 — 87a	Less than 0.5 Ω		
		30 — 87	More than 1 MΩ		
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87a	More than 1 MΩ		
30 — 87		Less than 0.5 Ω			

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

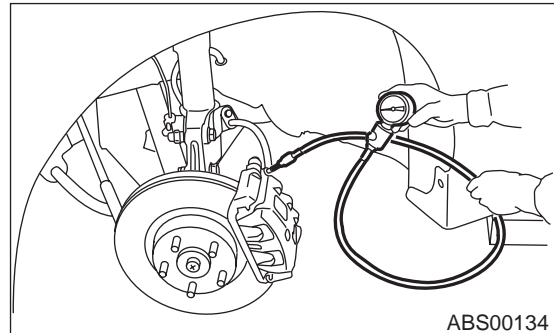
- 1) Lift-up vehicle and remove wheels.
- 2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
- 3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:

- Pressure gauges used exclusively for brake fluid must be used.
- Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:

Wrap sealing tape around the pressure gauge.



- 4) Bleed air from the pressure gauges.
- 5) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
- 6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.

7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
Initial value	3,432 kPa (35 kg/cm ² , 498 psi)	3,432 kPa (35 kg/cm ² , 498 psi)
When decompressed	490 kPa (5 kg/cm ² , 71 psi) or less	490 kPa (5 kg/cm ² , 71 psi) or less
When compressed	3,432 kPa (35 kg/cm ² , 498 psi) or more	3,432 kPa (35 kg/cm ² , 498 psi) or more

8) Remove pressure gauges from FL and FR caliper bodies.

9) Remove air bleeder screws from the RL and RR caliper bodies.

10) Connect the air bleeder screws to the FL and FR caliper bodies.

11) Connect two pressure gauges to the RL and RR caliper bodies.

12) Bleed air from the pressure gauges and the FL and FR caliper bodies.

13) Perform ABS sequence control.

<Ref. to VDC-16, ABS Sequence Control.>

14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.

15) Read values indicated on the pressure gauges and check if they meet the standard values.

16) After checking, remove the pressure gauges from caliper bodies.

17) Connect the air bleeder screws to RL and RR caliper bodies.

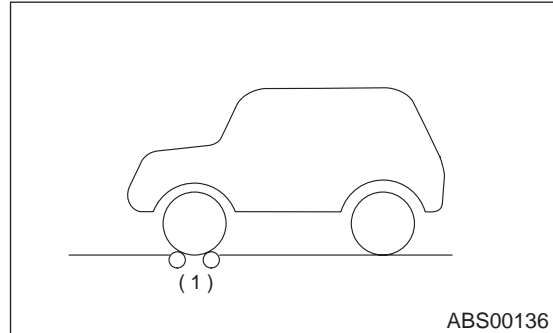
18) Bleed air from brake line.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

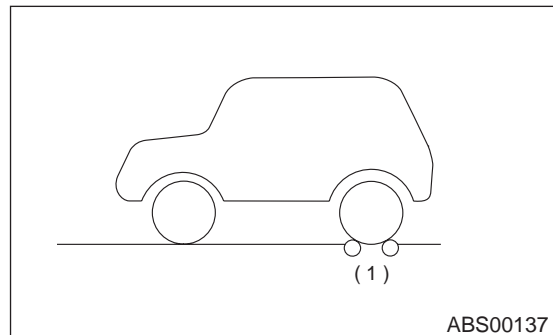
1) Prepare for operating ABS sequence control.

<Ref. to VDC-16, ABS Sequence Control.>

2) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "neutral".



(1) Brake tester



(1) Brake tester

3) Operate the brake tester.

4) Perform ABS sequence control.

<Ref. to VDC-16, ABS Sequence Control.>

5) When the hydraulic unit begins to work, check the following working sequence.

(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.

(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.

HYDRAULIC CONTROL UNIT (H/U)

VDC

6) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	981 N (100 kgf, 221 lb)	981 N (100 kgf, 221 lb)
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less
When compressed	981 N (100 kgf, 221 lb) or more	981 N (100 kgf, 221 lb) or more

7) After checking, also check if any irregular brake pedal tightness is felt.

3. CHECKING THE HYDRAULIC UNIT VDC OPERATION BY PRESSURE GAUGE

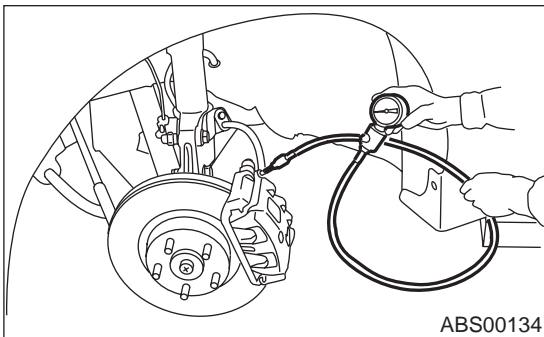
- 1) Lift-up vehicle and remove wheels.
- 2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
- 3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:

- Pressure gauges used exclusively for brake fluid must be used.
- Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:

Wrap sealing tape around the pressure gauge.



- 4) Bleed air from the pressure gauges.
- 5) Perform VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
- 6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.

7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
When compressed	2,942 kPa (30 kg/cm ² , 427 psi) or more	1,961 kPa (20 kg/cm ² , 284 psi) or more
When decompressed	490 kPa (5 kg/cm ² , 71 psi) or less	490 kPa (5 kg/cm ² , 71 psi) or less

8) Remove pressure gauges from FL and FR caliper bodies.

9) Remove air bleeder screws from the RL and RR caliper bodies.

10) Connect the air bleeder screws to the FL and FR caliper bodies.

11) Connect two pressure gauges to the RL and RR caliper bodies.

12) Bleed air from the pressure gauges and the FL and FR caliper bodies.

13) Perform VDC sequence control.

<Ref. to VDC-19, VDC Sequence Control.>

14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.

15) Read values indicated on the pressure gauges and check if they meet the standard value.

16) After checking, remove the pressure gauges from caliper bodies.

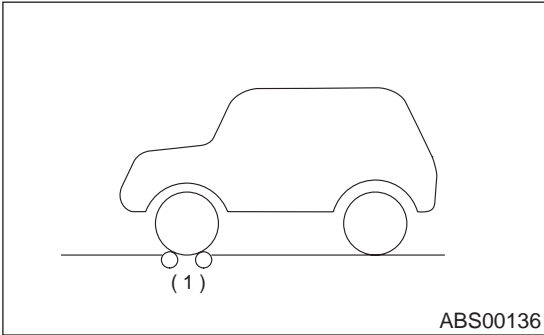
17) Connect the air bleeder screws to RL and RR caliper bodies.

18) Bleed air from brake line.

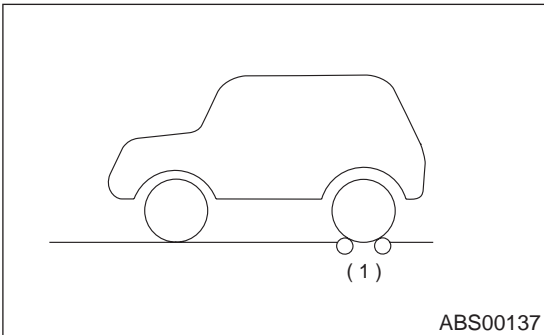
4. CHECKING THE HYDRAULIC UNIT VDC OPERATION WITH BRAKE TESTER

7) After checking, also check if any irregular brake pedal tightness is felt.

- 1) Prepare for operating VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
- 2) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "neutral".



(1) Brake tester



(1) Brake tester

- 3) Operate the brake tester.
- 4) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
- 5) When the hydraulic unit begins to work, check the following working sequence.
 - (1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.
 - (2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.
- 6) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
When compressed	1,961 N (200 kgf, 441 lb) or more	981 N (100 kgf, 221 lb) or more
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less

4. ABS Sequence Control

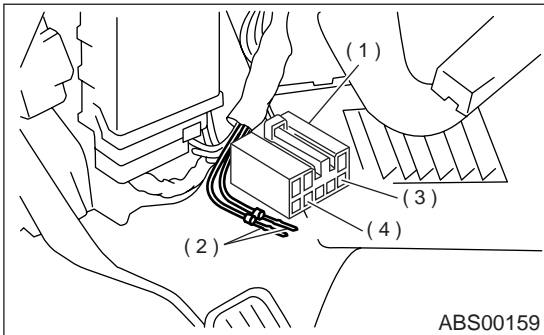
A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.

2) ABS sequence control can be started by diagnosis connector or select monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 5 and No. 8 of the diagnosis connector beside driver's seat heater unit.



- (1) Diagnosis connector
- (2) Diagnosis terminal
- (3) 8 terminal
- (4) 5 terminal

2) Set the speed of all wheels at 2.75 km/h (2 MPH) or less.

3) Turn ignition switch OFF.

4) Within 0.5 seconds after the ABS and VDC warning light goes out, depress the brake pedal and hold it immediately after ignition switch is turned to ON.

CAUTION:

Do not depress the clutch pedal.

NOTE:

- When the ignition switch is set to on, the brake pedal must not be depressed.
- Engine must not operate.

5) After completion of ABS sequence control, turn ignition switch OFF.

2. ABS SEQUENCE CONTROL WITH SELECT MONITOR

NOTE:

- In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to "ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR".

<Ref. to VDC-16, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, ABS Sequence Control.>

- When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect select monitor to data link connector beside driver's seat instrument panel lower cover.

2) Turn ignition switch ON.

3) Turn select monitor switch ON.

4) Put select monitor to "BRAKE CONTROL" mode.

5) When "Function check sequence" is selected, 'ABS sequence control' will start.

6) The message 'Press Brake Pedal Firmly' is displayed as follows:

(1) When using the brake tester, depress brake pedal with braking force of 981 N (100 kgf, 221 lb).

(2) When using the pressure gauge, depress brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kg/cm², 498 psi).

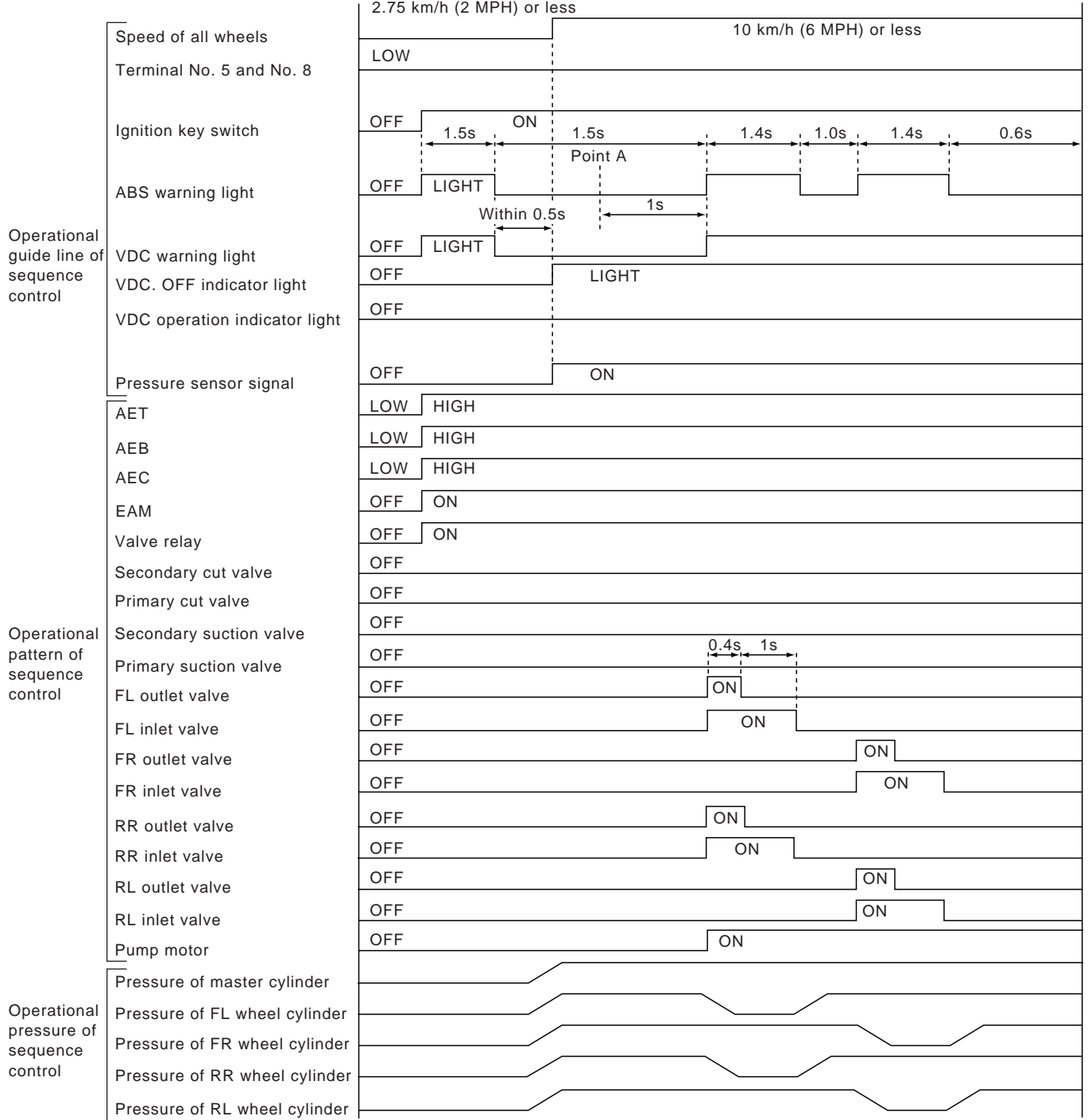
CAUTION:

Do not depress the clutch pedal.

7) When the message "Press YES" is displayed, press «YES» key.

8) Operation points will be displayed on select monitor.

3. CONDITIONS FOR ABS SEQUENCE CONTROL



VDC00086

NOTE:

- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

- 1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
- 2) When terminal No. 5 or No. 8 are separated from diagnosis terminals. (When select monitor is not used.)
- 3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
- 4) When brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When select monitor is not used.)
- 5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When select monitor is not used.)
- 6) After completion of the sequence control.
- 7) When malfunction is detected. (When select monitor is used.)

5. VDC Sequence Control

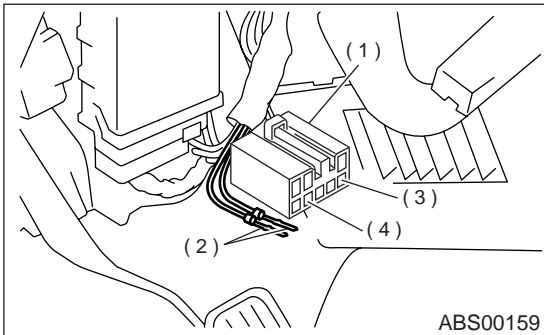
A: OPERATION

1) Under the VDC sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.

2) VDC sequence control can be started by diagnosis connector or select monitor.

1. VDC SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 5 and No. 8 of the diagnosis connector beside driver's seat heater unit.



- (1) Diagnosis connector
- (2) Diagnosis terminal
- (3) 8 terminal
- (4) 5 terminal

2) Set the speed of all wheels at 2.75 km/h (2 MPH) or less.

3) Turn ignition switch OFF.

4) Turn ignition switch ON and start engine immediately, confirming that ABS and VDC warning light goes ON and then OFF. After ABS and VDC warning light goes OFF, within 0.5 seconds depress the brake pedal once, then within 3 second depress the brake pedal twice more and release it.

CAUTION:

Do not depress the clutch pedal.

NOTE:

- When the ignition switch is set to on, the brake pedal must not be depressed.
 - Engine must operate.
 - If the VDC sequence control does not start, do the procedure over again.
- 5) After completion of VDC sequence control, turn ignition switch OFF.

2. VDC SEQUENCE CONTROL WITH SELECT MONITOR

NOTE:

• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to "VDC SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR".

<Ref. to VDC-19, VDC SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, VDC Sequence Control.>

• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect select monitor to data link connector beside driver's seat instrument panel lower cover.

2) Turn ignition switch ON.

3) Turn select monitor switch ON.

4) Put select monitor to "BRAKE CONTROL" mode.

5) Select "VDC Check Mode" in {Function check sequence} menu to start `VDC sequence control'.

CAUTION:

Do not depress the clutch pedal.

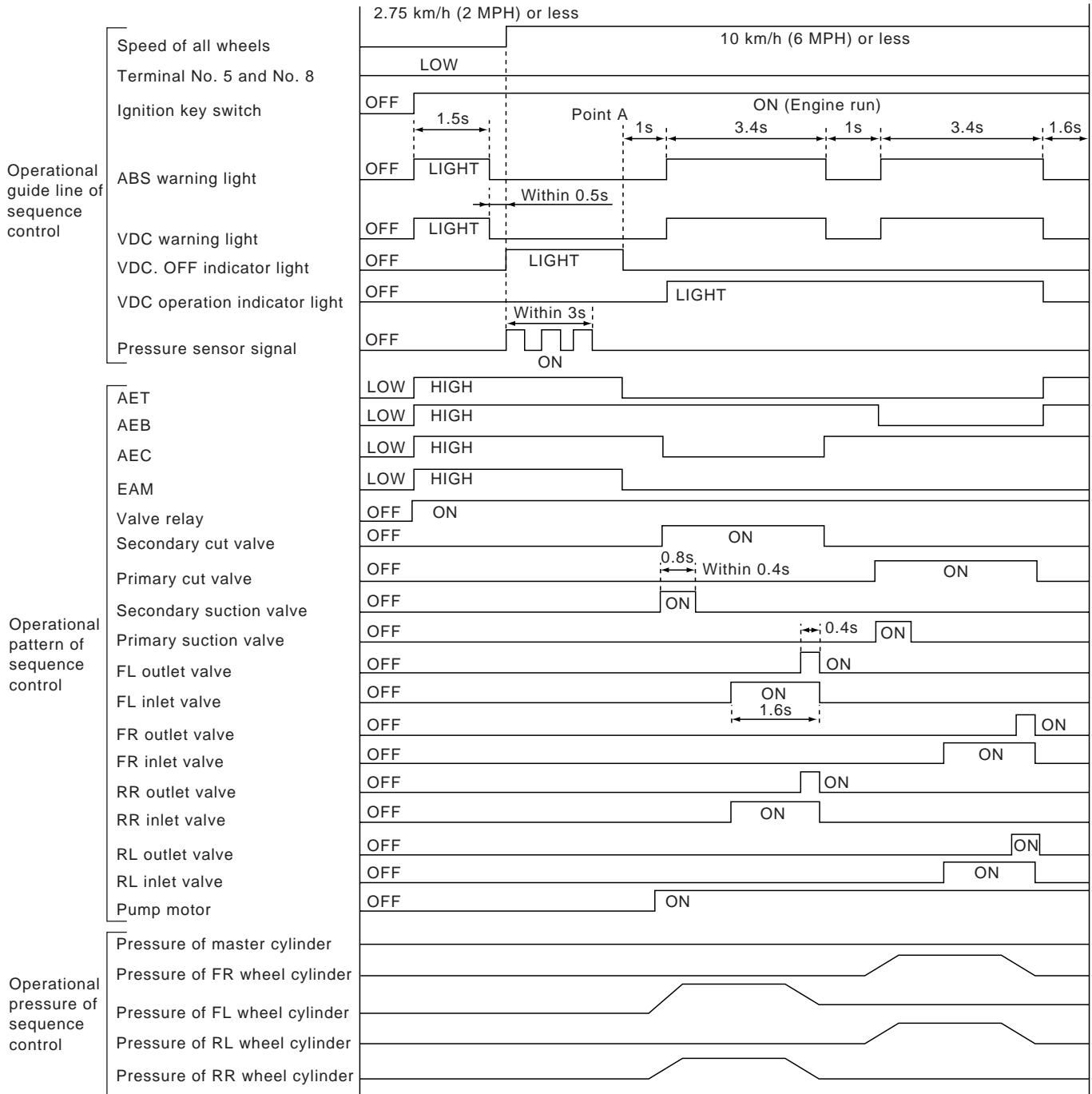
6) When the message "Press YES" is displayed, press «YES» key.

7) Operation points will be displayed on select monitor.

VDC SEQUENCE CONTROL

VDC

3. CONDITIONS FOR VDC SEQUENCE CONTROL



VDC00087

NOTE:

- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

When the following conditions develop, the VDC sequence control stops and VDC operation is returned to the normal control mode.

- 1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
- 2) When terminal No. 5 or No. 8 are separated from diagnosis terminals. (When select monitor is not used.)
- 3) When the brake pedal is pressed during sequence control and the braking lamp switch is set to on.
- 4) When brake pedal is depressed after ignition key is turned to ON, and before VDC warning light goes out. (When select monitor is not used.)
- 5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after VDC warning light goes out. (When select monitor is not used.)
- 6) After completion of the sequence control.
- 7) When malfunction is detected. (When select monitor is used.)

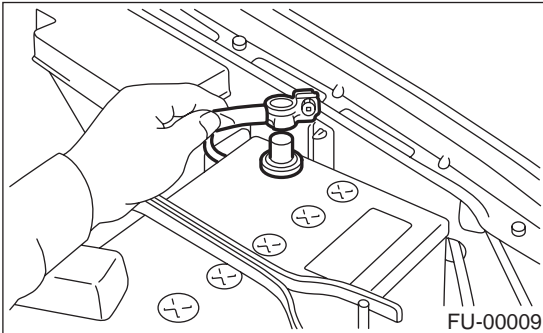
YAW RATE AND LATERAL G SENSOR

VDC

6. Yaw Rate and Lateral G Sensor

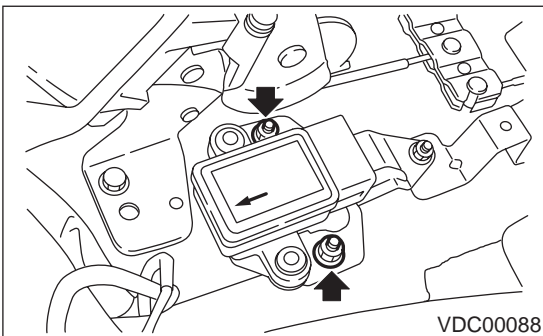
A: REMOVAL

- 1) Disconnect battery ground cable.

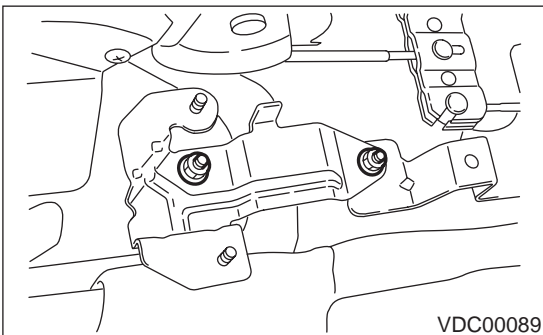


- 2) Remove console cover.
<Ref. to EI-34, Console Box.>
- 3) Disconnect connector from yaw rate and lateral G sensor.
- 4) Remove yaw rate and lateral G sensor.

CAUTION:
Do not drop or bump yaw rate and lateral G sensor.



- 5) Remove bracket from body.

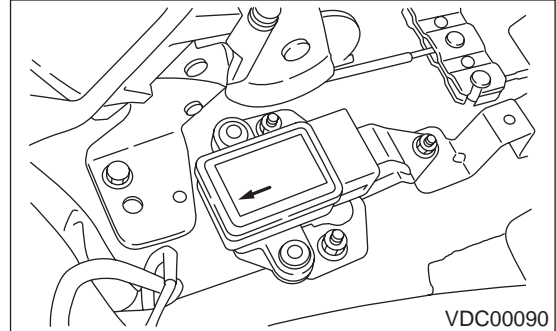


B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Do not install yaw rate and lateral G sensor in the wrong direction. There is an arrow on the sensor showing which side faces the front of the vehicle.



CAUTION:

After completion of installation procedure, the following two position settings must be made.

- Steering angle sensor center positioning
 - Yaw rate and lateral G sensor 0 positioning
- These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>.

C: INSPECTION

1. LATERAL G SENSOR SIGNAL

Step	Value	Yes	No
1 CHECK SUBARU SELECT MONITOR.	Do you have SUBARU select Monitor?	Go to step 5.	Go to step 2.
2 CHECK YAW RATE AND LATERAL G SENSOR. 1) Move the vehicle to a flat location. 2) Turn ignition switch to OFF. 3) Connect connector to yaw rate and lateral G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. Connector & terminal (R100) No. 5 (+) — No. 6 (-) Is the voltage within the specified range when yaw rate and lateral G sensor is horizontal?	2.5±0.2 V	Go to step 3.	Replace yaw rate and lateral G sensor.
3 CHECK YAW RATE AND LATERAL G SENSOR. 1) Remove yaw rate and lateral G sensor from vehicle. 2) Measure voltage between yaw rate and lateral G sensor connector terminals. Connector & terminal (R100) No. 5 (+) — No. 6 (-) NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory. Is the voltage within the specified range when yaw rate and lateral G sensor is inclined right to 90°?	3.5±0.2 V	Go to step 4.	Replace yaw rate and lateral G sensor.
4 CHECK YAW RATE AND LATERAL G SENSOR. Measure voltage between yaw rate and lateral G sensor connector terminals. Connector & terminal (R100) No. 5 (+) — No. 6 (-) NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory. Is the voltage within the specified range when yaw rate and lateral G sensor is inclined left to 90°?	1.5±0.2 V	Go to step 5.	Replace yaw rate and lateral G sensor.

YAW RATE AND LATERAL G SENSOR

VDC

Step	Value	Yes	No
<p>5 CHECK YAW RATE AND LATERAL G SENSOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Connect select monitor connector to data link connector. 3) Turn ignition switch to ON. 4) Turn select monitor into {BRAKE CONTROL} mode. 5) Set the display in the {Current Data Display & Save} mode. 6) Read the yaw rate and lateral G sensor output voltage. <p>NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory.</p> <p style="padding-left: 40px;">Is the indicated reading within the specified range when the vehicle is in horizontal position?</p>	2.5±0.2 V	Go to step 6.	Replace yaw rate and lateral G sensor.
<p>6 CHECK YAW RATE AND LATERAL G SENSOR.</p> <ol style="list-style-type: none"> 1) Remove console box. 2) Remove yaw rate and lateral G sensor from vehicle. (Do not disconnect connector.) 3) Read the select monitor display. <p>NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory.</p> <p style="padding-left: 40px;">Is the voltage within the specified range when yaw rate and lateral G sensor is inclined right to 90°?</p>	3.5±0.2 V	Go to step 7.	Replace yaw rate and lateral G sensor.
<p>7 CHECK YAW RATE AND LATERAL G SENSOR.</p> <p>Read the select monitor display.</p> <p>NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory.</p> <p style="padding-left: 40px;">Is the voltage within the specified range when yaw rate and lateral G sensor is inclined left to 90°?</p>	1.5±0.2 V	Yaw rate and lateral G sensor is normal.	Replace yaw rate and lateral G sensor.

2. YAW RATE SENSOR SIGNAL

Step	Value	Yes	No
1 CHECK YAW RATE AND LATERAL G SENSOR USING OSCILLOSCOPE. 1) Connect all connectors. 2) Set oscilloscope to TCM connector terminals. Positive probe; (R100) No. 4 Earth lead; (R100) No. 6 3) Start the engine. 4) Measure signal voltage indicated on oscilloscope. <Ref. to VDC-17, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> Is the voltage within the specified range?	2.1 V — 2.9 V	Go to step 2.	Replace yaw rate and lateral G sensor is normal.
2 CHECK YAW USING OSCILLOSCOPE. 1) Turn ignition switch to OFF. 2) Set oscilloscope to TCM connector terminals. Positive probe; (R100) No. 2 Earth lead; (R100) No. 6 3) Start the engine. 4) Measure signal voltage indicated on oscilloscope. <Ref. to VDC-17, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> Is the voltage within the specified range?	5 V	Yaw rate and lateral G sensor is normal.	Replace yaw rate and lateral G sensor.

7. Steering Angle Sensor

A: REMOVAL

The steering angle sensor must be always replace as assembly with combination base switch,if any problem is found,because this sensor can not be disassembled.

Remove combination base switch assembly and refer to LI section for installation.<Ref. to LI-xx, Combination Base Switch Assembly.>

CAUTION:

After completion of installation procedure, the following two position settings must be made.

- Steering angle sensor center positioning
- Yaw rate and lateral G sensor 0 positioning

These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>.

B: INSPECTION

Refer to “VDC section” for inspection procedures of steering angle sensor.

<Ref. to VDC-114, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>

8. Front ABS Sensor

A: NOTE

The ABS sensor installed on VDC equipped vehicles is the same as the one on ABS equipped vehicles. Therefore, for removal, inspection and installation, refer to "ABS" section.

<Ref. to ABS-12, Front ABS Sensor.>

9. Rear ABS Sensor

A: NOTE

The ABS sensor installed on VDC equipped vehicles is the same as the one on ABS equipped vehicles. Therefore, for removal, inspection and installation, refer to "ABS" section.

<Ref. to ABS-15, Rear ABS Sensor.>

10. Front Tone Wheel

A: NOTE

As front tone wheel is integrated with front drive shaft, refer to "DS section" for removal, installation, and inspection procedures.

<Ref. to DS-28, Front Drive Shaft.>

11.Rear Tone Wheel

A: NOTE

As rear tone wheel is integrated with rear drive shaft, refer to "DS section" for removal, installation, and inspection procedures.

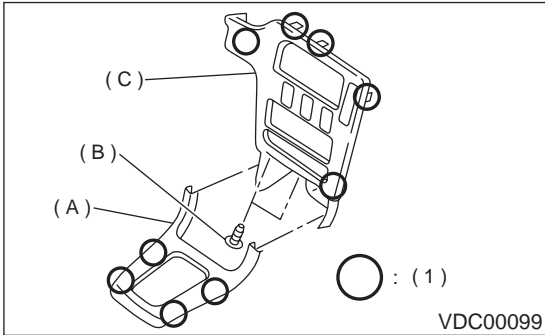
<Ref. to DS-34, Rear Drive Shaft.>

12.VDC Off Switch

A: REMOVAL

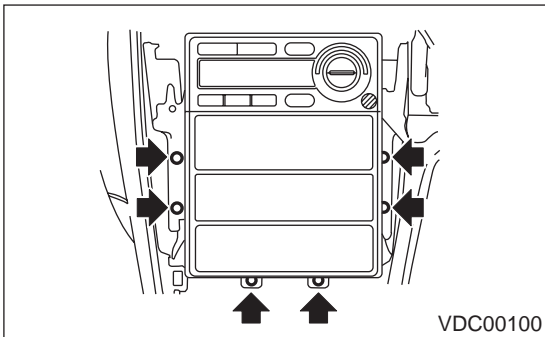
1. LHD MODEL

- 1) Remove screws and clip from instrument panel lower cover.
- 2) Remove front cover (A) while disconnecting connector.
- 3) Remove two screws (B) and then remove center panel (C) while disconnecting connector.

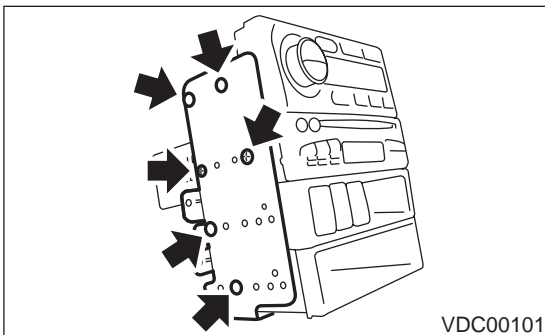


(1) Hook pawl

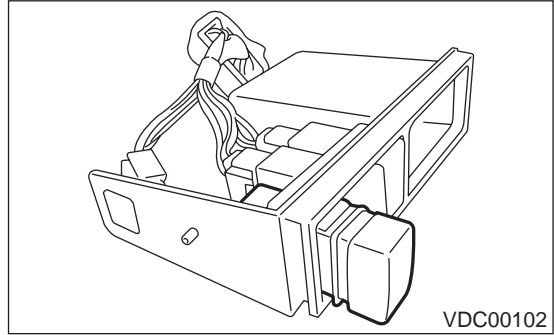
- 4) Remove fitting screws, and slightly pull radio and switch assembly out from center console.



- 5) Disconnect electric connectors and antenna feeder cord and then disconnect heater control unit.
- 6) Remove screw and detach the bracket and then remove switch panel.

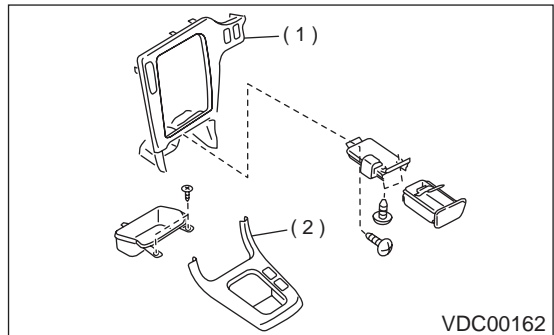


- 7) Remove VDC off switch by pushing it outward.



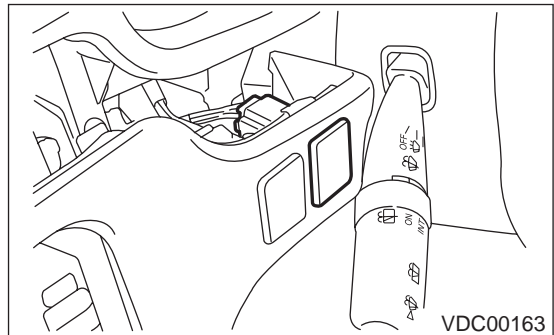
2. RHD MODEL

- 1) Remove front cover, ash tray and center panel.



- (1) Center panel
- (2) Front cover

- 2) Remove VDC off switch by pushing it outward.



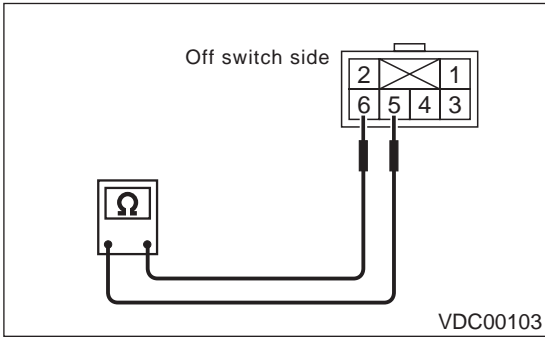
B: INSTALLATION

Install is in the reverse order of removal.

VDC OFF SWITCH

VDC

C: INSPECTION



Check continuity between VDC off switch terminals.

Switch position	Tester connection	Specified condition
OFF	6 — 5	More than 1 M Ω
ON	6 — 5	Less than 1 Ω

If NG, replace VDC off switch.

VDC (DIAGNOSTICS)

VDC

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BASIC DIAGNOSTIC PROCEDURE

VDC (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

Step	Value	Yes	No
1 CHECK PRE-INSPECTION. 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to VDC-6, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the VDC problem. <Ref. to VDC-9, INSPECTION, General Description.> Is unit that might influence the VDC problem normal?	Normal	Go to step 2.	Repair or replace each unit.
2 CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC). Calling up diagnostic trouble code (DTC). <Ref. to VDC-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is diagnostic trouble code (DTC) readable?	Can be read.	Go to step 3.	Inspect using diagnostic chart for warning light failure. <Ref. to VDC-33, ABS WARNING LIGHT, VDC WARNING LIGHT, VDC OPERATING INDICATOR LIGHT OR VDC OFF INDICATOR LIGHT DOES NOT COME ON., Diagnostics Chart with Diagnosis Connector.> NOTE: Call up diagnostic trouble code (DTC) again after inspecting warning light. <Ref. to VDC-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>
3 CHECK DIAGNOSTIC TROUBLE CODE (DTC). Is only the start code issued? NOTE: Record all diagnostic trouble codes (DTCs).	Only start code indicated.	Go to step 4.	Go to step 5.

BASIC DIAGNOSTIC PROCEDURE

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>4 PERFORM THE GENERAL DIAGNOSTICS.</p> <p>1) Inspect using "General Diagnostics Table". <Ref. to VDC-275, General Diagnostic Table.></p> <p>2) Perform the clear memory mode. <Ref. to VDC-25, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.></p> <p>3) Perform the inspection mode. <Ref. to VDC-24, Inspection Mode.></p> <p>Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).></p> <p>Is only the start code issued?</p>	Only start code indicated.	Complete the diagnosis.	Go to step 5.
<p>5 PERFORM THE DIAGNOSIS.</p> <p>1) Inspect using "Diagnostics Chart with Diagnostic Connector". <Ref. to VDC-33, Diagnostics Chart with Diagnosis Connector.></p> <p>NOTE: For diagnostic trouble code (DTC) list, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to VDC-27, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).></p> <p>2) Repair trouble cause.</p> <p>3) Perform the clear memory mode. <Ref. to VDC-25, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.></p> <p>4) Perform the inspection mode. <Ref. to VDC-24, Inspection Mode.></p> <p>5) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).></p> <p>Is only the start code issued?</p>	Only start code indicated.	Complete the diagnosis.	Inspect using "Diagnostics Chart with Diagnostic Connector". <Ref. to VDC-33, Diagnostics Chart with Diagnosis Connector.>

CAUTION:

Remove foreign matter (dust, water, etc.) from the VDCCM connector during removal and installation.

NOTE:

- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- When ABS and/or VDC warning light illuminates, read and record diagnostic trouble code (DTC) indicated by ABS warning light.

BASIC DIAGNOSTIC PROCEDURE

VDC (DIAGNOSTICS)

2. WITH SUBARU SELECT MONITOR

Step	Value	Yes	No
1 CHECK PRE-INSPECTION. 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to VDC-6, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the VDC problem. <Ref. to VDC-9, INSPECTION, General Description.> Is unit that might influence the VDC problem normal?	Normal	Go to step 2.	Repair or replace each unit.
2 CHECK INDICATION OF TROUBLE CODE DISPLAY. 1) Turn ignition switch to OFF. 2) Connect the SUBARU SELECT MONITOR to data link connector. 3) Turn ignition switch to ON and SUBARU SELECT MONITOR to ON. 4) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Record all diagnostic trouble codes (DTCs) and frame data. Is diagnostic trouble code (DTC) is displayed?	DTC is indicated.	Go to step 3.	Go to step 5.
3 CHECK WARNING LIGHT. Check lighting pattern of the warning light. <Ref. to VDC-26, INSPECTION, Warning Light Illumination Pattern.> Is the warning light lighting pattern normal?	Normal	Go to step 4.	Check warning light. <Ref. to VDC-33, ABS WARNING LIGHT, VDC WARNING LIGHT, VDC OPERATING INDICATOR LIGHT OR VDC OFF INDICATOR LIGHT DOES NOT COME ON., Diagnostics Chart with Diagnosis Connector.>
4 PERFORM THE GENERAL DIAGNOSTICS. 1) Inspect using "General Diagnostics Table". <Ref. to VDC-275, INSPECTION, General Diagnostic Table.> 2) Perform the clear memory mode. <Ref. to VDC-25, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to VDC-24, OPERATION, Inspection Mode.> 4) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is no diagnostic trouble code (DTC) displayed or do VDC and ABS warning lights constantly remain on?	DTC is indicated.	Complete the diagnosis.	Go to step 5.

BASIC DIAGNOSTIC PROCEDURE

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 PERFORM THE DIAGNOSIS.</p> <p>1) Inspect using "Diagnostics Chart with Subaru Select Monitor". <Ref. to VDC-130, Diagnostics Chart with Select Monitor.></p> <p>NOTE: For diagnostic trouble code (DTC) list, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to VDC-29, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).></p> <p>2) Repair trouble cause.</p> <p>3) Perform the clear memory mode. <Ref. to VDC-25, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.></p> <p>4) Perform the inspection mode. <Ref. to VDC-24, OPERATION, Inspection Mode.></p> <p>5) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-23, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> Is diagnostic trouble code (DTC) displayed?</p>	DTC is indicated.	Inspect using "Diagnostics Chart with Subaru Select Monitor". <Ref. to VDC-130, Diagnostics Chart with Select Monitor.>	Complete the diagnosis.

NOTE:

- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- Check list for interview. <Ref. to VDC-6, Check List for Interview.>

CHECK LIST FOR INTERVIEW

VDC (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS AND/OR VDC WARNING LIGHT

ABS and/or VDC warning light comes on.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on • When / how long does it come on?:		
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (before starting engine) <input type="checkbox"/> START <input type="checkbox"/> On after starting (Engine running)		
Timing	<input type="checkbox"/> Immediately after ignition is ON. <input type="checkbox"/> Immediately after ignition starts.		
	<input type="checkbox"/> When advancing		km/h to km/h MPH to MPH
	<input type="checkbox"/> While traveling at a constant speed	km/h	MPH
	<input type="checkbox"/> When decelerating		km/h to km/h MPH to MPH
	<input type="checkbox"/> When turning to right	Steering angle :	deg
		Steering time :	sec
	<input type="checkbox"/> When turning to left	Steering angle :	deg
		Steering time :	sec
	<input type="checkbox"/> When moving other electrical parts • Parts name : • Operating condition :		

2. STATE OF VDC OFF INDICATOR LIGHT

VDC OFF indicator light comes on.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on • When / how long does it come on?:		
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (before starting engine) <input type="checkbox"/> START <input type="checkbox"/> On after starting (Engine is running) <input type="checkbox"/> On after starting (Engine is stop)		
Timing	<input type="checkbox"/> Immediately after ignition is ON. <input type="checkbox"/> Immediately after ignition starts.		
	<input type="checkbox"/> When advancing		km/h to km/h MPH to MPH
	<input type="checkbox"/> While traveling at a constant speed	km/h	MPH
	<input type="checkbox"/> When decelerating		km/h to km/h MPH to MPH
	<input type="checkbox"/> When turning to right	Steering angle :	deg
		Steering time :	sec
	<input type="checkbox"/> When turning to left	Steering angle :	deg
		Steering time :	sec
	<input type="checkbox"/> When moving other electrical parts • Parts name : • Operating condition :		

CHECK LIST FOR INTERVIEW

VDC (DIAGNOSTICS)

3. STATE OF VDC OPERATION INDICATOR LIGHT

VDC operation indicator light comes on.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on • When / how long does it come on?:		
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (before starting engine) <input type="checkbox"/> START <input type="checkbox"/> On after starting (Engine running) <input type="checkbox"/> On after starting (Engine stopped)		
Timing	<input type="checkbox"/> Immediately after ignition is ON. <input type="checkbox"/> Immediately after ignition starts.		
	<input type="checkbox"/> When advancing		km/h to km/h MPH to MPH
	<input type="checkbox"/> While traveling at a constant speed	km/h	MPH
	<input type="checkbox"/> When decelerating		km/h to km/h MPH to MPH
	<input type="checkbox"/> When turning to right	Steering angle :	deg
		Steering time :	sec
	<input type="checkbox"/> When turning to left	Steering angle :	deg
		Steering time :	sec
	<input type="checkbox"/> When moving other electrical parts		
	• Parts name :		
• Operating condition :			

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others :
	b) Ambient temperature	°C (°F)
	c) Road	<input type="checkbox"/> Urban area <input type="checkbox"/> Suburbs <input type="checkbox"/> Highway <input type="checkbox"/> General road <input type="checkbox"/> Ascending slope <input type="checkbox"/> Descending slope <input type="checkbox"/> Paved road <input type="checkbox"/> Gravel road <input type="checkbox"/> Muddy road <input type="checkbox"/> Sandy place <input type="checkbox"/> Straight <input type="checkbox"/> Sharp curve <input type="checkbox"/> Slow curve <input type="checkbox"/> S-shaped curve <input type="checkbox"/> Road with inclination on each side <input type="checkbox"/> Others :
	d) Road surface	<input type="checkbox"/> Dry <input type="checkbox"/> Wet <input type="checkbox"/> New-fallen snow <input type="checkbox"/> Compressed snow <input type="checkbox"/> Frozen slope <input type="checkbox"/> Others :

CHECK LIST FOR INTERVIEW

VDC (DIAGNOSTICS)

Condition	a) Brakes	Deceleration : g	
		<input type="checkbox"/> Continuous / <input type="checkbox"/> Intermittent	
	b) Accelerator	Acceleration : g	
		<input type="checkbox"/> Continuous / <input type="checkbox"/> Intermittent	
	c) Vehicle speed	km/h	MPH
		<input type="checkbox"/> Advancing <input type="checkbox"/> Accelerating <input type="checkbox"/> Reducing speed <input type="checkbox"/> Low speed <input type="checkbox"/> Turning <input type="checkbox"/> Others :	
	d) Tire inflation pressure	Front RH tire :	kPa
		Front LH tire :	kPa
		Rear RH tire :	kPa
		Rear LH tire :	kPa
	e) Degree of wear	Front RH tire :	
		Front LH tire :	
		Rear RH tire :	
		Rear LH tire :	
	f) Steering wheel	<input type="checkbox"/> Sharp turn <input type="checkbox"/> Slow turn <input type="checkbox"/> Straight-ahead operation <input type="checkbox"/> Returned slowly <input type="checkbox"/> Returned quickly	
g) Tire/wheel size	<input type="checkbox"/> Specified <input type="checkbox"/> Other than specified ()		
h) Tire type	<input type="checkbox"/> Summer tire <input type="checkbox"/> Studless tire (Brand name:)		
i) Chain is passed around tires. : <input type="checkbox"/> Yes / <input type="checkbox"/> No			
j) T tire is used. : <input type="checkbox"/> Yes / <input type="checkbox"/> No			
k) Condition of suspension alignment :			
l) Loading state :			
m) Repair parts are used. : <input type="checkbox"/> Yes / <input type="checkbox"/> No			
• What :			
n) Others :			

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

Airbag system wiring harness is routed near the ABS sensor, ABS control module and hydraulic control unit.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage airbag system wiring harness when servicing the ABS sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect VDC problems:

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

- 1) Check brake fluid level.
- 2) Check brake fluid leakage.

3. HYDRAULIC UNIT

Check the hydraulic unit VDC.

- With brake tester <Ref. to VDC-13, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, Hydraulic Control Unit (H/U).>
- Without brake tester <Ref. to VDC-14, CHECKING THE HYDRAULIC UNIT VDC OPERATION BY PRESSURE GAUGE, INSPECTION, Hydraulic Control Unit (H/U).>

4. BRAKE DRAG

Check brake drag.

5. BRAKE PAD AND ROTOR

Check brake pad and rotor.

- Front <Ref. to BR-21, INSPECTION, Front Brake Pad.><Ref. to BR-22, INSPECTION, Front Disc Rotor.>
- Rear <Ref. to BR-26, INSPECTION, Rear Brake Pad.><Ref. to BR-27, INSPECTION, Rear Disc Rotor.>

6. TIRE

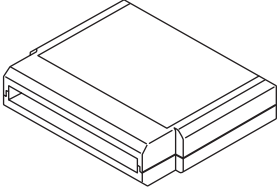

Check tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATIONS, General Description.>

GENERAL DESCRIPTION

VDC (DIAGNOSTICS)

C: PREPARATION TOOL

1. SPECIAL TOOLS

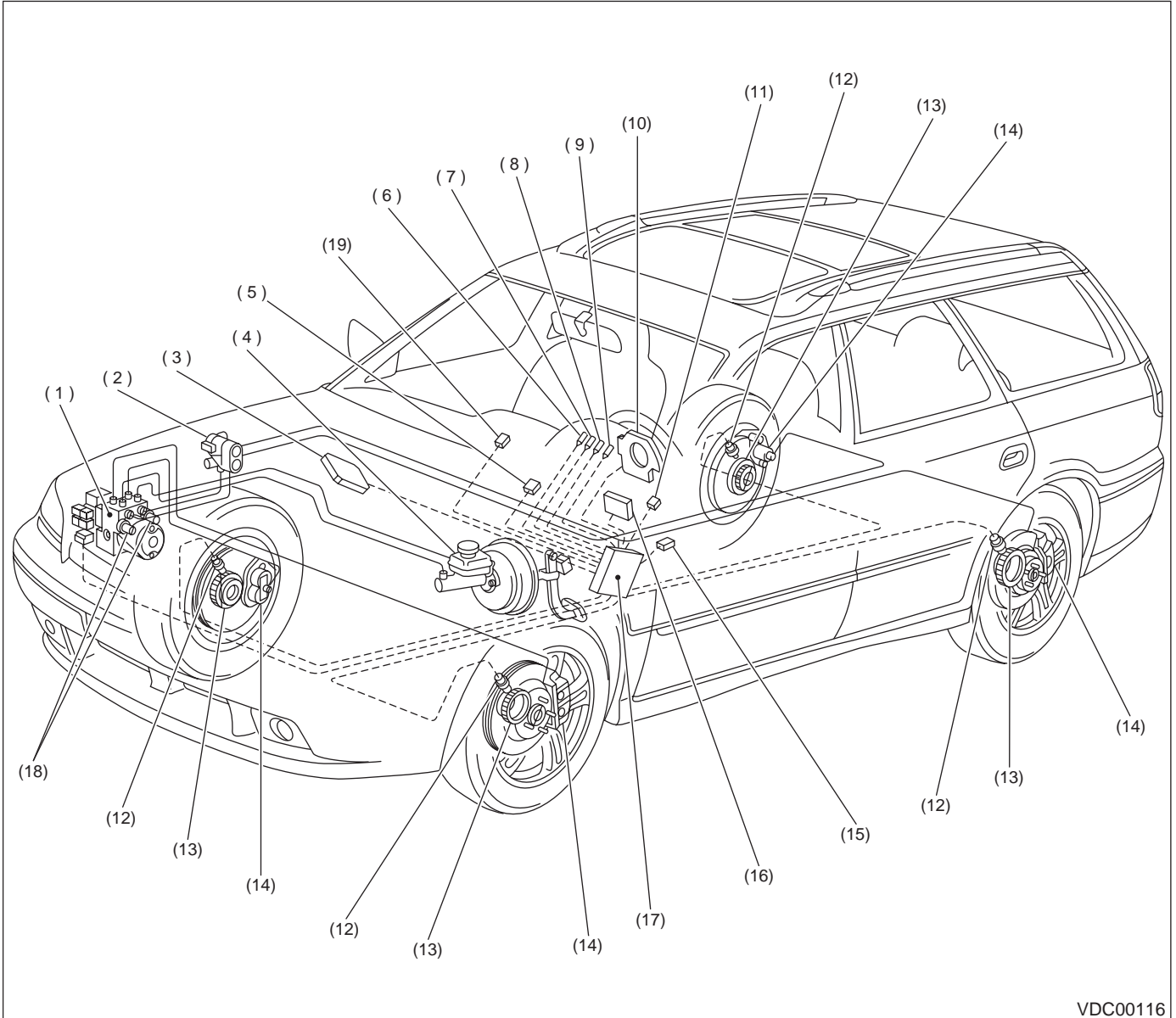
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-2082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONI-TOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

4. Electrical Components Location

A: LOCATION

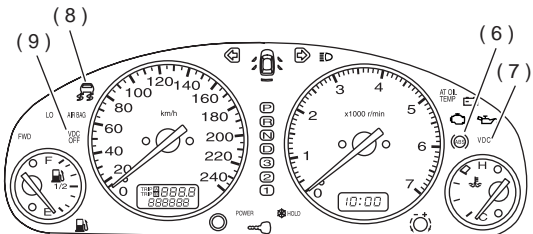
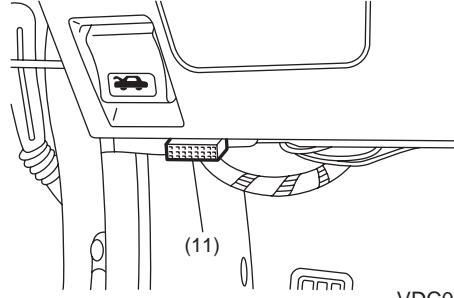
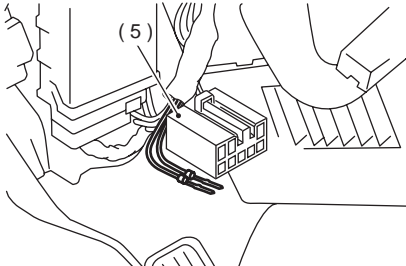
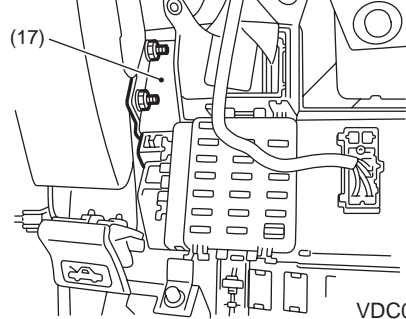
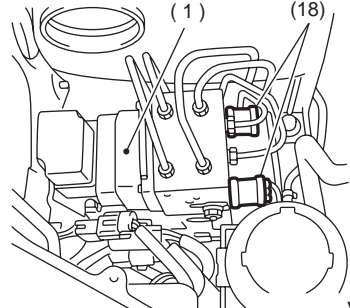
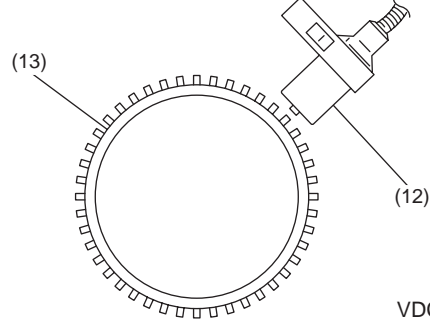
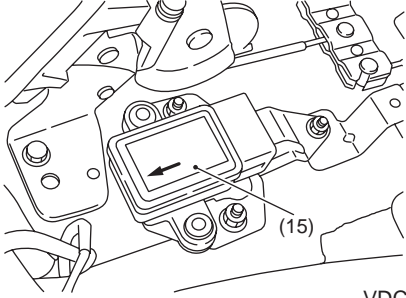
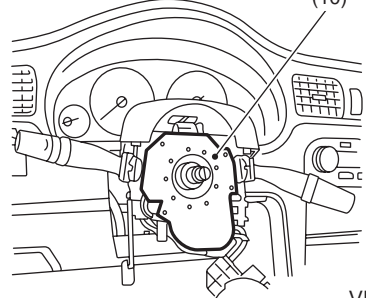


VDC00116

- | | | |
|---|--|----------------------------------|
| (1) VDC hydraulic control unit (VDCH/U) | (7) VDC warning light | (13) Tone wheel |
| (2) Proportioning valve | (8) VDC operating indicator light | (14) Wheel cylinder |
| (3) Engine control module | (9) VDC OFF indicator light | (15) Yaw rate & lateral G sensor |
| (4) Master cylinder | (10) Steering angle sensor | (16) Transmission control module |
| (5) Diagnosis connector | (11) Data link connector (for SUBARU select monitor) | (17) VDC control module (VDCCM) |
| (6) ABS warning light | (12) ABS sensor | (18) Pressure sensor |
| | | (19) VDC OFF switch |

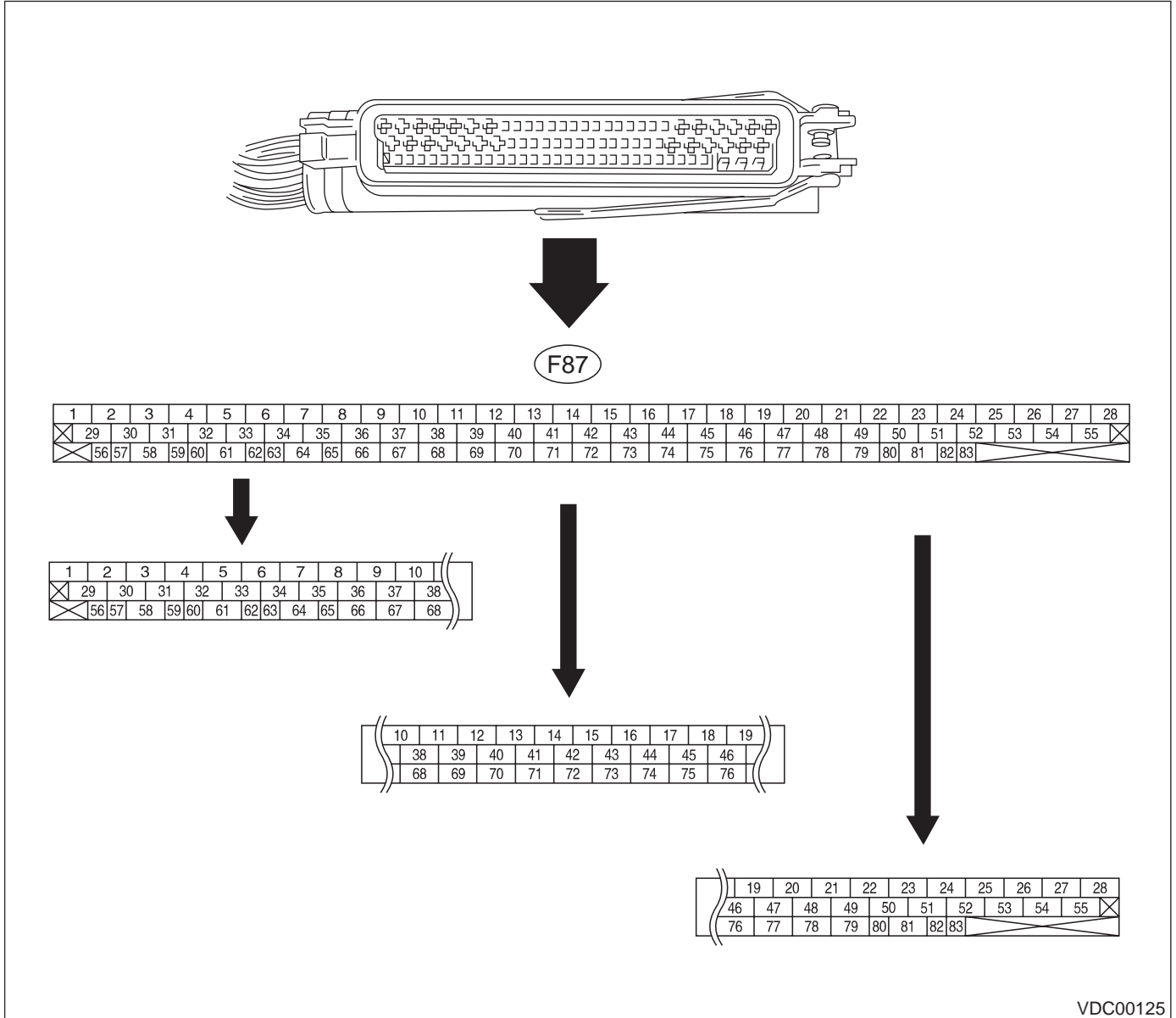
ELECTRICAL COMPONENTS LOCATION

VDC (DIAGNOSTICS)

 <p>VDC00156</p>	 <p>VDC00169</p>
 <p>VDC00166</p>	 <p>VDC00157</p>
 <p>VDC00167</p>	 <p>VDC00170</p>
 <p>VDC00168</p>	 <p>VDC00171</p>

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:

- The terminal numbers in the VDC control module connector are as shown in the figure.
- When the connector is removed from the VDCCM, the connector switch closes the circuit between terminal No. 53, No. 54 and No. 55. The ABS and VDC warning light illuminate.

CONTROL MODULE I/O SIGNAL

VDC (DIAGNOSTICS)

Contents		Terminal No. (+)(-)	Input/Output signal
			Measured value and measuring condition
Ignition switch		28—1	10 — 15 V when ignition switch is ON.
ABS sensor (Wheel speed sensor)	Front left wheel	49—19	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	14—15	
	Rear left wheel	16—17	
	Rear right wheel	18—46	
Yaw rate and lateral G sensor	Output (Lateral G sensor)	70—64	2.2 — 2.8 V when vehicle is in horizontal position.
	Power supply	63—64	10 — 15 V when ignition switch is ON.
	Output (Yaw rate sensor)	65—64	Wave form <Ref. to VDC-17, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Reference (Yaw rate sensor)	66—64	2.1 — 2.9 V
	Test	67—64	40 ms pulse signal with a cycle of 5 — 1 V <Ref. to VDC-17, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Ground	64	—
CAN communication line (+)		81—1	2.5 — 1.5 V pulse signal <Ref. to VDC-17, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
CAN communication line (-)		83—1	3.5 — 2.5 V pulse signal <Ref. to VDC-17, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
Engine module	AET	21—1	1.5 V or less (ABS/TCS/VDC operating); 10 V or more (ABS/TCS/VDC not operating)
	AEB	43—1	10 — 15 V (Ignition switch ON and vehicle at standstill)
	AEC	8—1	10 — 15 V (Ignition switch ON and vehicle at standstill)
	EAS	75—1	3.5 — 1.5 V pulse signal
	EAC	45—1	3.5 — 1.5 V pulse signal
	Revolution	9—1	10 — 1.5 V pulse signal
Relay box	Valve relay power supply	27—1	10 — 15 V when ignition switch is ON.
	Valve relay coil	47—1	Less than 1.5 V when ignition switch is ON.
	Motor relay coil	22—1	1.5 V or less (ABS/TCS/VDC operating); 10 V or more (ABS/TCS/VDC not operating)
	Motor monitoring	10—1	10 V or less (ABS/TCS/VDC operating); 1.5 V or more (ABS/TCS/VDC not operating)
Hydraulic control unit	Front left inlet solenoid valve	24—1	10 — 15 V when the valve is OFF and less than 1.5 V when the valve is ON.
	Front right inlet solenoid valve	30—1	
	Rear left inlet solenoid valve	31—1	
	Rear right inlet solenoid valve	23—1	
	Front left outlet solenoid valve	51—1	
	Front right outlet solenoid valve	3—1	
	Rear left outlet solenoid valve	4—1	
	Rear right outlet solenoid valve	50—1	
	Primary cut solenoid valve	25—1	
	Secondary cut solenoid valve	26—1	
	Primary suction solenoid valve	29—1	
	Secondary suction solenoid valve	2—1	
Pressure sensor	Power supply	78—76	4.75 — 5.25 V when ignition switch is ON.
	Primary output	77—76	0.48 — 0.72 V (Brake pedal released)
	Ground	76	—
	Secondary output	36—76	0.48 — 0.72 V (Brake pedal released)
VDC operation indicator light		32—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
VDC OFF indicator light		52—1	1.5 V or less (Ignition switch ON and VDC OFF indicator light ON); 10 — 15 V (Ignition switch ON and VDC OFF indicator light OFF)

CONTROL MODULE I/O SIGNAL

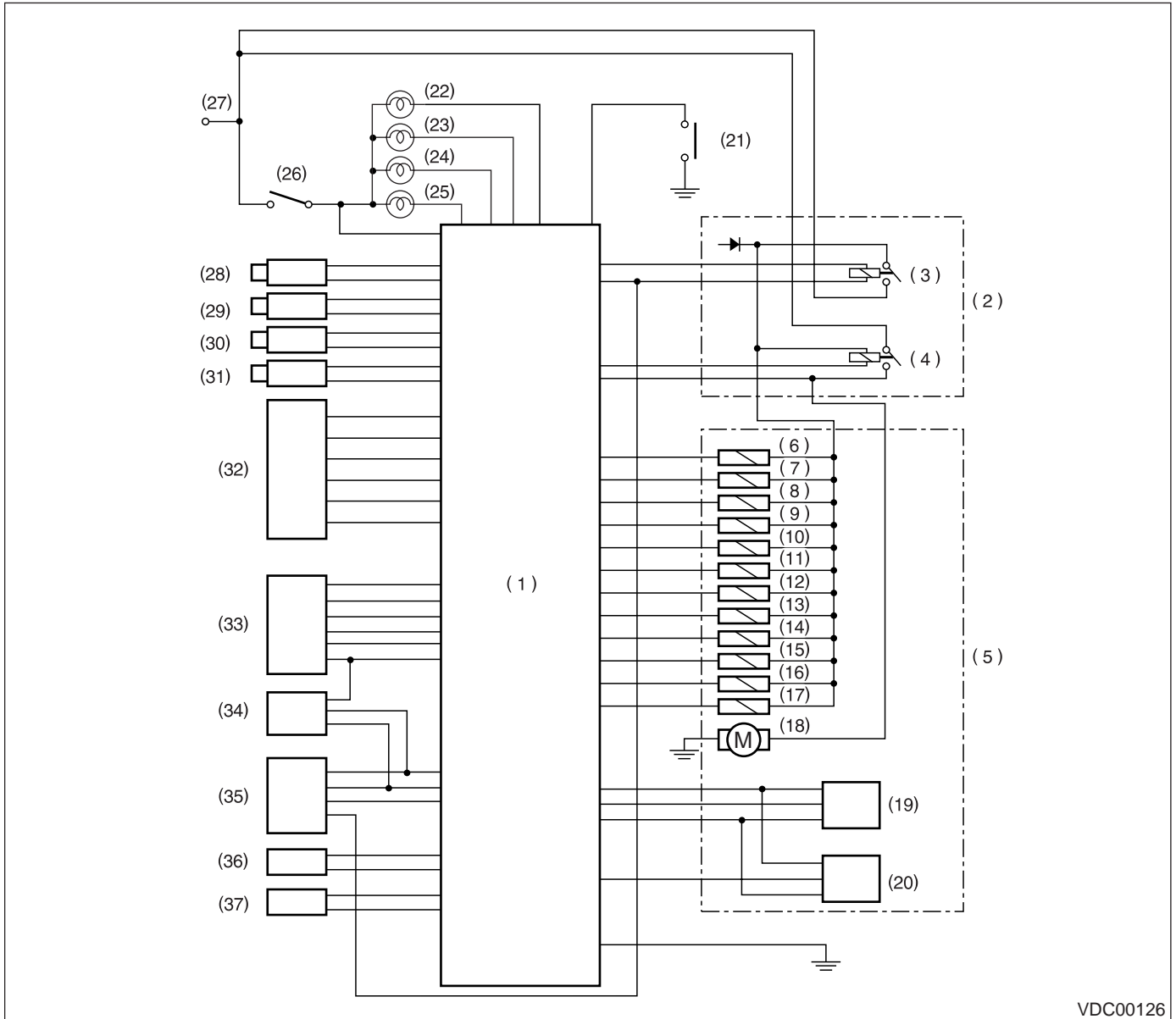
VDC (DIAGNOSTICS)

VDC warning light		53—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
ABS warning light		54—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
Diagnosis connector	Terminal No. 8	13	—
	Terminal No. 5	74	—
Select monitor	Data is received.	11—1	Less than 1.5 V when no data is received.
	Data is sent.	38—1	4.75 — 5.25 V when no data is sent.
VDC OFF switch		40—1	10 — 15 V when ignition switch is ON. 0 V (While pushing the switch)
Ground		1	—
Ground		55	—

CONTROL MODULE I/O SIGNAL

VDC (DIAGNOSTICS)

B: SCHEMATIC



VDC00126

- | | | |
|---------------------------------------|---------------------------------------|------------------------------------|
| (1) VDC control module | (14) Primary suction solenoid valve | (27) BATTERY |
| (2) Relay box | (15) Primary cut solenoid valve | (28) Front left ABS sensor |
| (3) Valve relay | (16) Secondary suction solenoid valve | (29) Front right ABS sensor |
| (4) Motor relay | (17) Secondary cut solenoid valve | (30) Rear left ABS sensor |
| (5) Hydraulic control unit | (18) Motor | (31) Rear right ABS sensor |
| (6) Front left inlet solenoid valve | (19) Primary pressure sensor | (32) Yaw rate and lateral G sensor |
| (7) Front left outlet solenoid valve | (20) Secondary pressure sensor | (33) Engine control module |
| (8) Front right inlet solenoid valve | (21) VDC OFF switch | (34) Transmission control module |
| (9) Front right outlet solenoid valve | (22) ABS warning light | (35) Steering angle sensor |
| (10) Rear left inlet solenoid valve | (23) VDC warning light | (36) Diagnosis connector |
| (11) Rear left outlet solenoid valve | (24) VDC operating indicator light | (37) Data link connector |
| (12) Rear right inlet solenoid valve | (25) VDC OFF indicator light | |
| (13) Rear right outlet solenoid valve | (26) Ignition relay | |

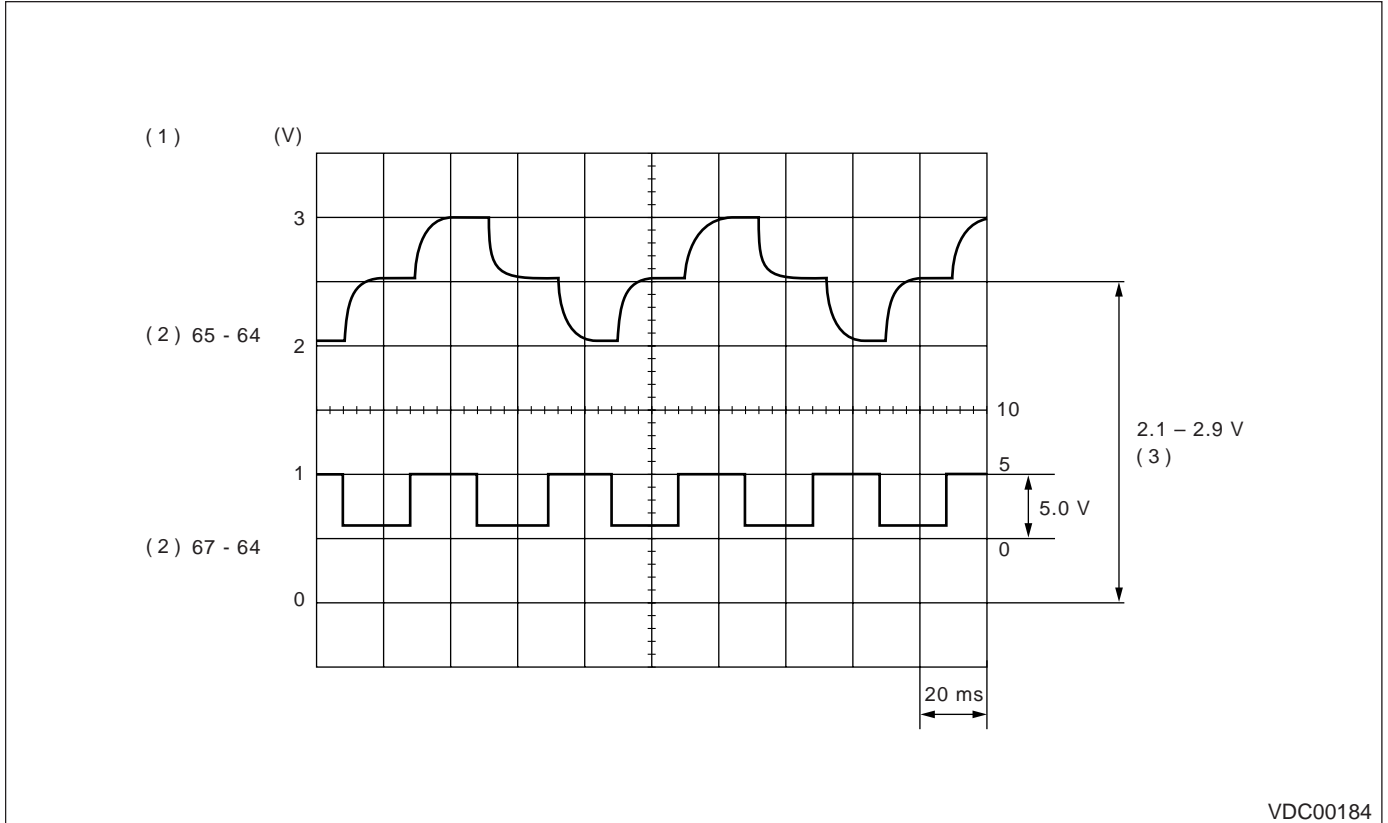
C: MEASUREMENT

Measure input/output signal voltage.

NOTE:

Measure with the VDCCM connector cover removed. <Ref. to VDC-19, VDCCM Connector Cover.>

1. WAVEFORM

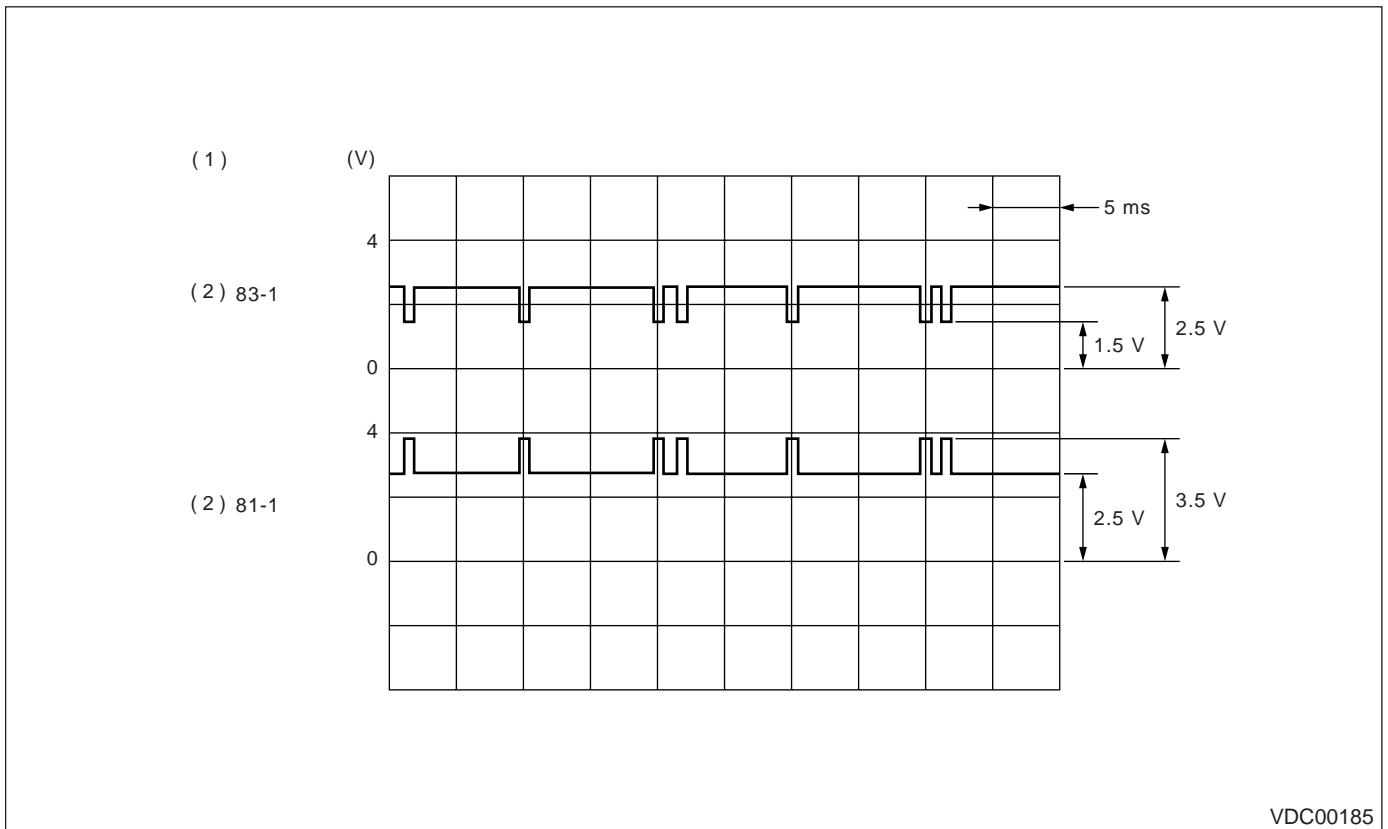


VDC00184

- (1) Yaw rate sensor
- (2) Terminal No.
- (3) (When the vehicle is stopped)

CONTROL MODULE I/O SIGNAL

VDC (DIAGNOSTICS)



VDC00185

- (1) Can communication line
- (2) Terminal No.

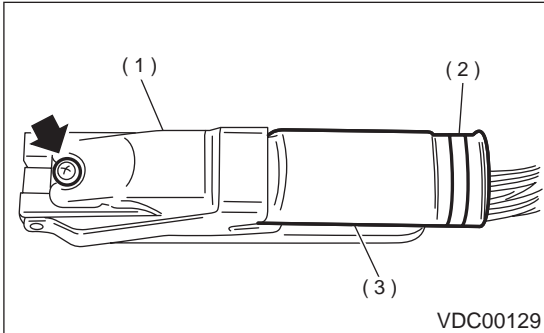
6. VDCCM Connector Cover

A: REMOVE

- 1) Turn ignition switch OFF.
- 2) Disconnect connector from VDCCM.
- 3) Remove band.
- 4) Remove cable clamp cover.
- 5) Remove screws securing connector cover.

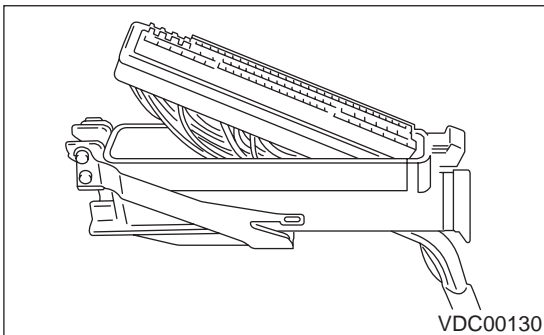
CAUTION:

Do not allow harness to catch on adjacent parts during installation.



- (1) Connector cover
- (2) Band
- (3) Cable clamp cover

- 6) Remove connector cover.

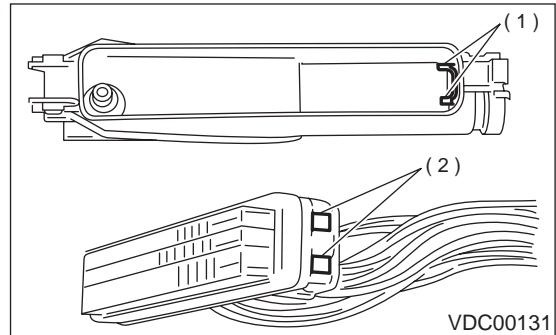


B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Align connector cover rib with connector hole before installation.



- (1) Rib
- (2) Hole

SUBARU SELECT MONITOR

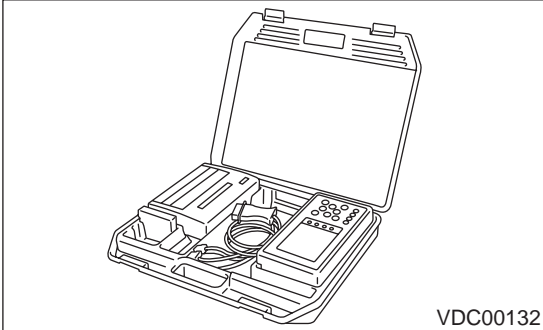
VDC (DIAGNOSTICS)

7. Subaru Select Monitor

A: OPERATION

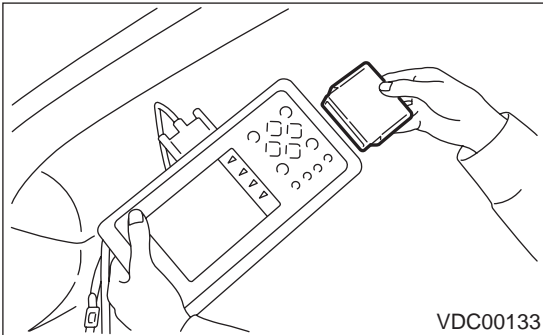
1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare Subaru Select Monitor kit.



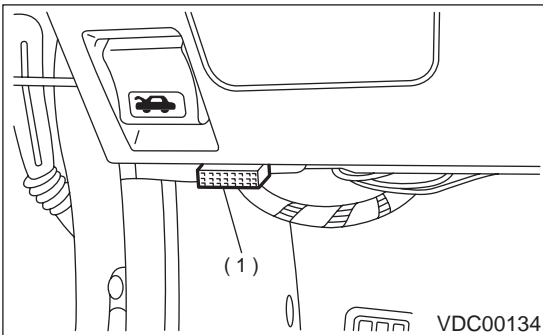
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor.
<Ref. to VDC-10, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

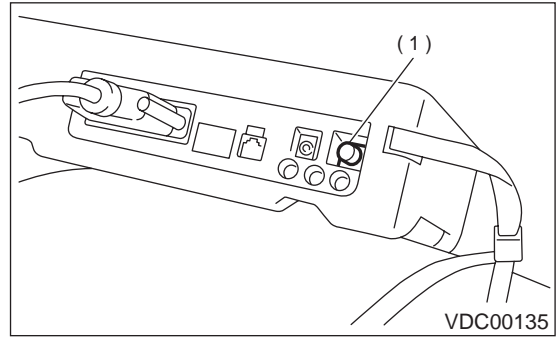
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(1) Data link connector

(2) Connect diagnosis cable to data link connector.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.

7) On the «System Selection Menu» display screen, select the {Brake Control System} and press the [YES] key.

8) Press the [YES] key after displayed the information of engine type.

9) On the «Brake Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.

10) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

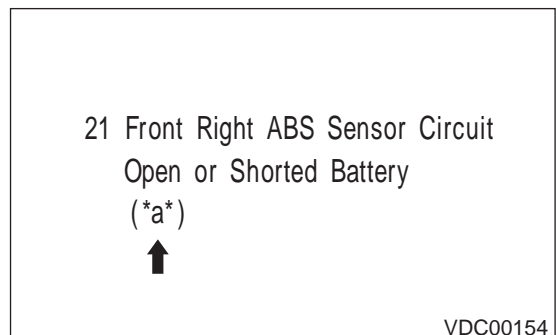
NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For detailed concerning diagnostic trouble codes, refer to the DIAGNOSTIC TROUBLE CODE LIST.

<Ref. to VDC-27, List of Diagnostic Trouble Code (DTC).>

- A maximum of 3 trouble codes are displayed in order of occurrence.



a refers to the troubles in order of occurrence (Latest, Old, Older).

SUBARU SELECT MONITOR

VDC (DIAGNOSTICS)

Display screen	Contents to be monitored
Latest	The most recent trouble code appears on the select monitor display.
Old	The second most recent trouble code appears on the select monitor display.
Older	The third most recent trouble code appears on the select monitor display.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select {Each System Check} and press the «YES» key.

2) On the «System Selection Menu» display screen, select {Brake Control System} and press «YES» key.

3) Press the «YES» key after the VDC type is displayed.

4) On the «Brake Control Diagnosis» display screen, select {Current Data Display & Save} and press the «YES» key.

5) On the «Data Display Menu» display screen, select {Data Display} and press the «YES» key.

6) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Display screen	Contents to be monitored.	Unit of measure
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed.	km/h or MPH
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed.	km/h or MPH
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed.	km/h or MPH
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor is displayed.	km/h or MPH
Steering angle sensor	Steering wheel angle detected by the steering angle sensor is displayed.	deg
Yaw rate sensor	Vehicle's angular velocity detected by the yaw rate sensor is displayed.	deg/s
Lateral G sensor	Vehicle's lateral acceleration detected by the lateral G sensor is displayed.	V
Pressure sensor 1	Brake fluid pressure detected by the primary pressure sensor is displayed.	V
Pressure sensor 2	Brake fluid pressure detected by the secondary pressure sensor is displayed.	V
Longitudinal G sensor	Longitudinal G sensor is not equipped on vehicles after '00MY. But longitudinal G sensor will remain on monitor and 0 V will be displayed.	V
ABS CM power voltage	Voltage supplied to VDCCM is displayed.	V
Torque driver requires	Engine torque requested by the driver is displayed.	N·m
Current torque	Current engine torque is displayed.	N·m
Valve relay signal	Drive condition of the valve relay is displayed.	ON or OFF
Motor relay signal	Drive condition of the motor relay is displayed.	ON or OFF
VDC OFF lamp	ON operation of the VDC OFF indicator lamp is displayed.	ON or OFF
Motor relay monitor	Operating condition of the motor relay is displayed.	High or Low
PW signal	Accelerator position signal is displayed.	1 or 0
AET signal	Engine control start signal is displayed.	OPEN or GND
AEB signal	Engine control signal is displayed.	OPEN or GND
AEC signal	Engine control signal is displayed.	OPEN or GND
EAM signal	Engine control command signal is displayed.	1 or 0

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

SUBARU SELECT MONITOR

VDC (DIAGNOSTICS)

3. CLEAR MEMORY MODE

- 1) On the «Main Menu» display screen, select {2. Each System Check} and press the «YES» key.
- 2) On the «System Select Menu» display screen, select {Brake System} and press the «YES» key.
- 3) Press the «YES» key after the engine type is displayed.

4) On the «Brake Control Diagnosis» display screen, select {Clear Memory} and press the «YES» key.

5) When `Done' and `turn ignition switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. FUNCTION CHECK

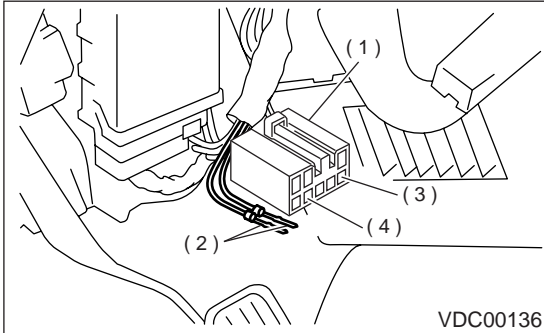
Display screen	Contents to be monitored	Index No.
ABS sequence control mode	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to VDC-16, ABS Sequence Control.>
VDC check mode	Perform VDC sequence control by operating valve and pump motor sequentially.	<Ref. to VDC-19, VDC Sequence Control.>
Set mode St. r. A. Sen. N & Lat. G Sen. Op	Set both the neutral position of the steering angle sensor and the zero "0" point of the lateral G sensor.	<Ref. to VDC-26, Steering Angle Sensor.>

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

1) Take out diagnosis connector from side of driver's seat heater unit.

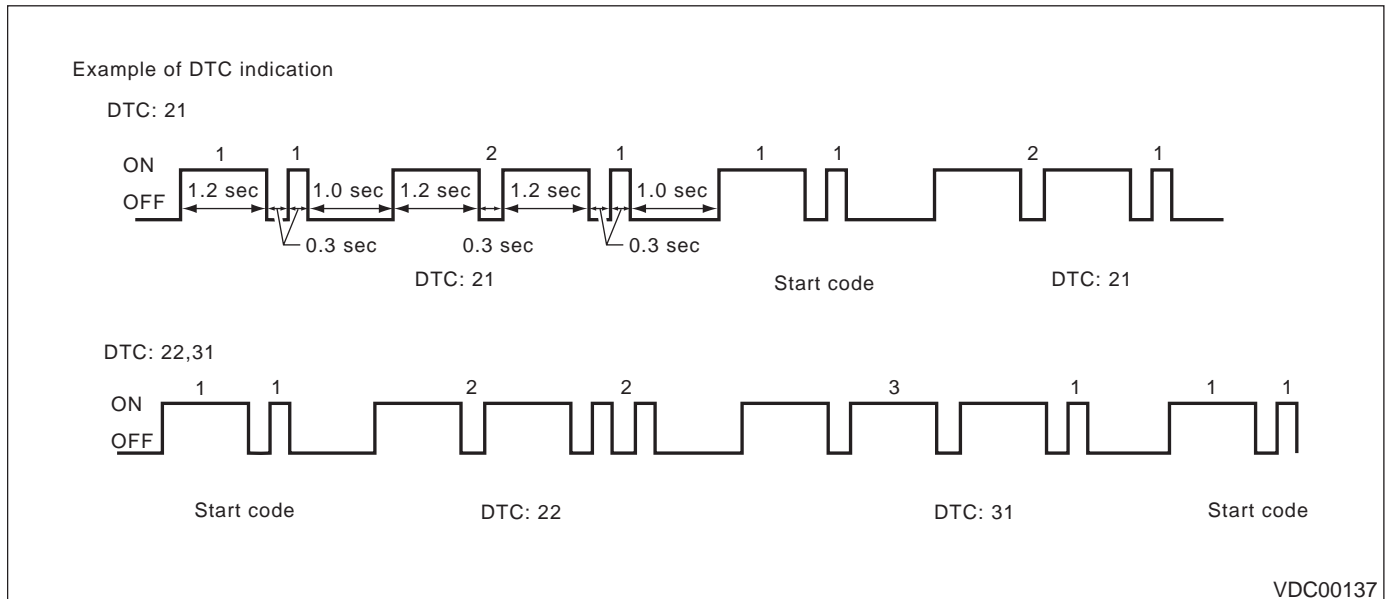


- (1) Diagnosis connector
- (2) Diagnosis terminal
- (3) 8 terminal
- (4) 5 terminal

- 2) Turn ignition switch OFF.
 - 3) Connect diagnosis connector terminal 8 to diagnosis terminal.
 - 4) Turn ignition switch ON.
 - 5) ABS warning light is set in the diagnostic mode and blinks to identify diagnostic trouble code (DTC).
 - 6) After the start code (11) is shown, the diagnostic trouble codes (DTCs) will be shown in order of the last information first.
- These repeat for a maximum of 5 minutes.

NOTE:

- When there are no diagnostic trouble codes (DTCs) in memory, only the start code (11) is shown.
- When on-board diagnosis of the VDC control module detects a problem, the information (up to a maximum of three) will be stored in the EEP ROM as a diagnostic trouble code (DTC). When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand diagnostic trouble codes (DTCs). <Ref. to VDC-20, Subaru Select Monitor.>

9. Inspection Mode

A: OPERATION

Reproduce the condition under which the problem has occurred as much as possible.

Drive the vehicle at least ten minutes.

NOTE:

Make sure vehicle does not pull to one side during normal driving.

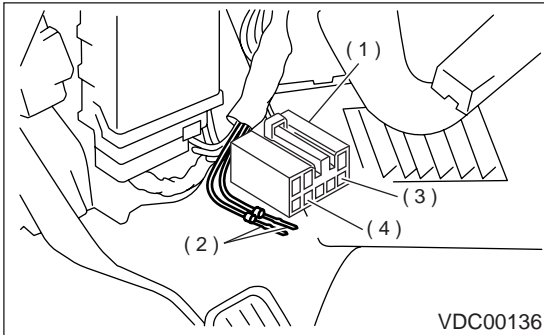
10. Clear Memory Mode

A: OPERATION

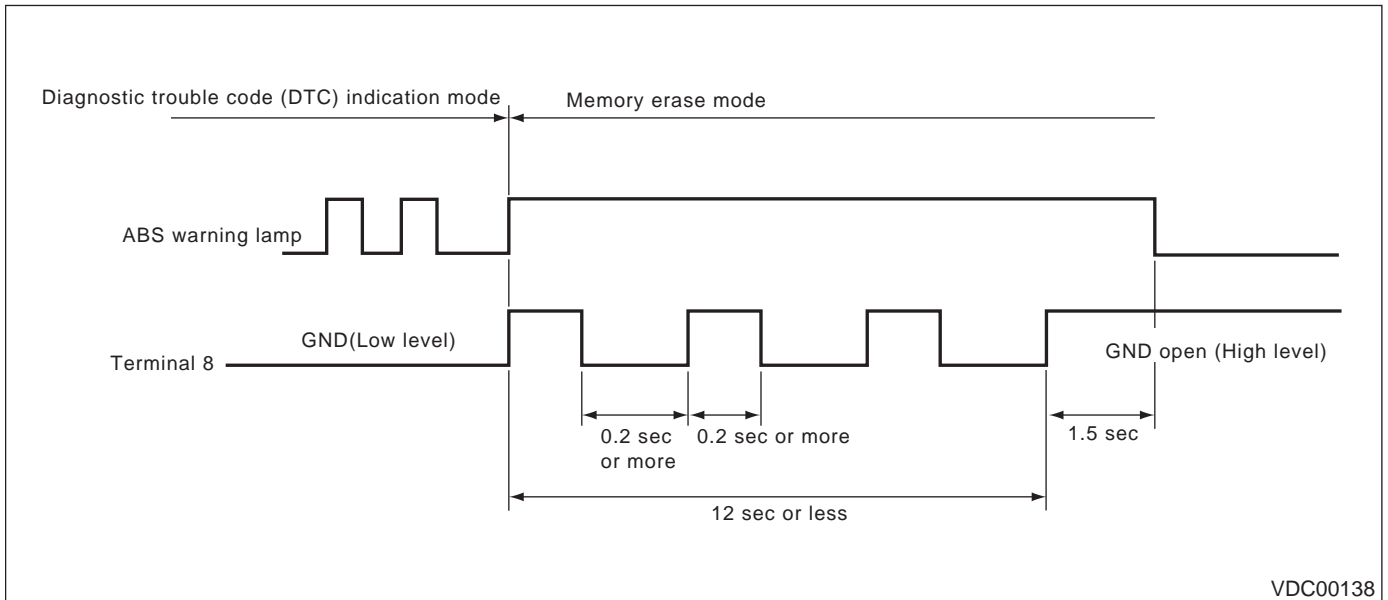
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a diagnostic trouble code (DTC), disconnect diagnosis connector terminal 8 from diagnosis terminal.

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 8 and diagnosis terminal for at least 0.2 seconds each time.



- (1) Diagnosis connector
- (2) Diagnosis terminal
- (3) 8 terminal
- (4) 5 terminal



NOTE:

After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

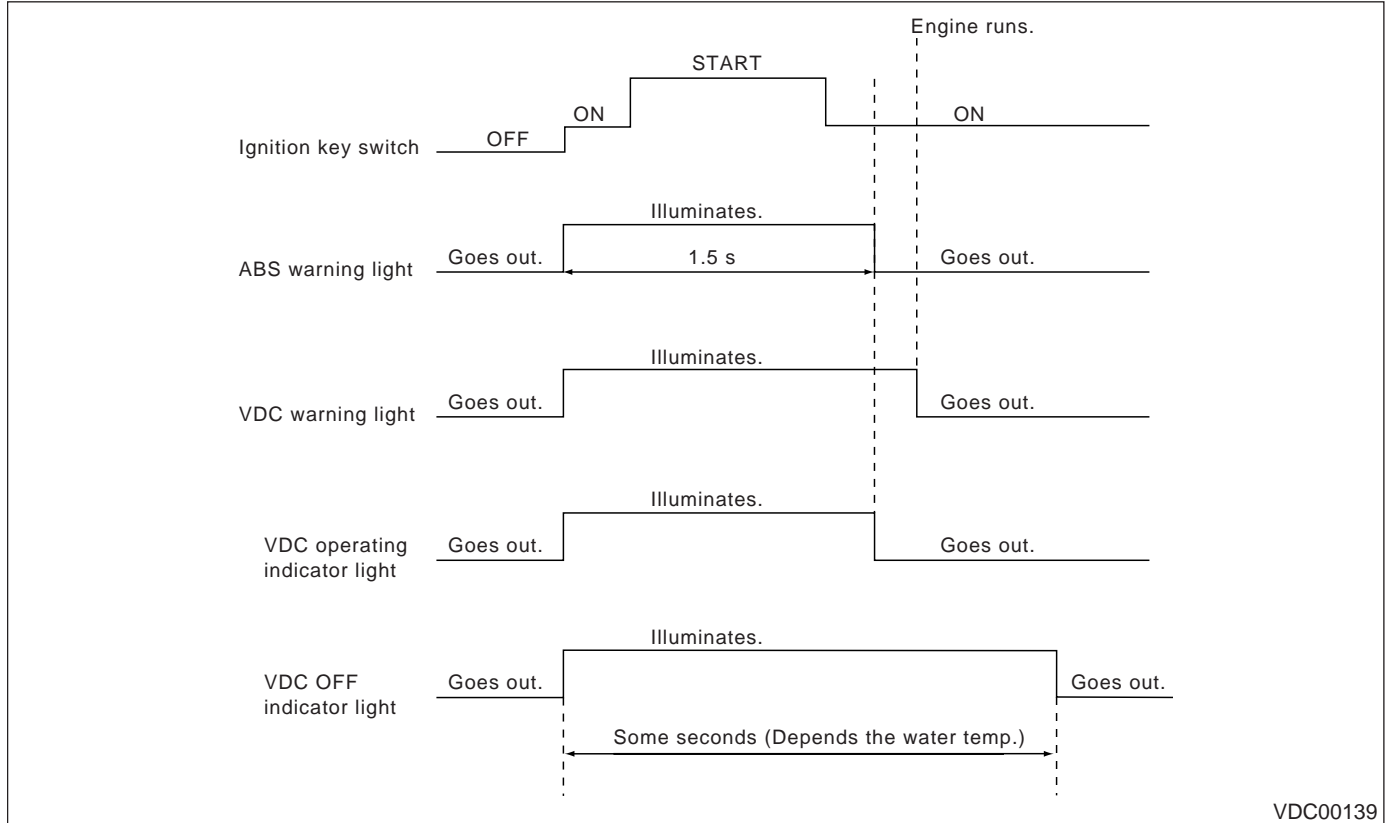
Refer to SUBARU SELECT MONITOR for information about how to clear diagnostic trouble codes (DTCs). <Ref. to VDC-20, Subaru Select Monitor.>

WARNING LIGHT ILLUMINATION PATTERN

VDC (DIAGNOSTICS)

11.Warning Light Illumination Pattern

A: INSPECTION



1) When the warning and/or indicator lights do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.

2) When the warning and/or indicator lights remain constantly OFF, repair the warning and/or indicator lights circuit or diagnosis circuit. <Ref. to VDC-33, ABS WARNING LIGHT, VDC WARNING LIGHT, VDC OPERATING INDICATOR LIGHT OR VDC OFF INDICATOR LIGHT DOES NOT COME ON., Diagnostics Chart with Diagnosis Connector.>

NOTE:

- Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the VDC system operates normally when the warning light goes out while driving at approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the ABS warning light is illuminated.
- It may take a few minutes for the VDC OFF indicator light to go out when the vehicle is exposed for some time in a low temperature area. This is not a problem because of low engine coolant temperatures.
- If a vehicle wheel is stuck or free-spinning for approximately 1 minute, power transfer fluctuation to the remaining wheels will occur. Power transfer conditions will differ from those occurring during

normal vehicle operation. The ABS sensor will detect this condition. The ABS and VDC warning lights will illuminate. If the vehicle is operated with the four wheels lifted off the ground or with the four wheels placed on rollers, the VDCCM will detect a problem with the speed sensor and the ABS and VDC warning lights may illuminate. In this case, there is no abnormality. Clear the diagnostic code from memory.

- When the engine is started and vehicle movement begins, the VDCH/U motor pump and solenoid valve will operate for a few seconds. This permits checking of VDC function. Normal motor pump and solenoid valve operational noise will be heard. Normal brake pedal kick back will be felt when the brake pedal is depressed. In this case, there is no abnormality.

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

VDC (DIAGNOSTICS)

12. List of Diagnostic Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC No.	Contents of diagnosis	Index No.
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.	—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor <Ref. to VDC-49, DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
23		Front left ABS sensor <Ref. to VDC-49, DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
25		Rear right ABS sensor <Ref. to VDC-49, DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
27		Rear left ABS sensor <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor <Ref. to VDC-54, DTC 22 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
24		Front left ABS sensor <Ref. to VDC-54, DTC 24 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
26		Rear right ABS sensor <Ref. to VDC-54, DTC 26 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
28		Rear left ABS sensor <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>
29		Any one of four <Ref. to VDC-60, DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR), Diagnostics Chart with Diagnosis Connector.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

VDC (DIAGNOSTICS)

DTC No.	Contents of diagnosis	Index No.
31	Abnormal solenoid valve circuit(s)	Front right inlet valve <Ref. to VDC-63, DTC 31 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT RH INLET), Diagnostics Chart with Diagnosis Connector.>
32		Front right outlet valve <Ref. to VDC-68, DTC 32 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT RH OUTLET), Diagnostics Chart with Diagnosis Connector.>
33		Front left inlet valve <Ref. to VDC-63, DTC 33 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT LH INLET), Diagnostics Chart with Diagnosis Connector.>
34		Front left outlet valve <Ref. to VDC-68, DTC 34 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT LH OUTLET), Diagnostics Chart with Diagnosis Connector.>
35		Rear right inlet valve <Ref. to VDC-63, DTC 35 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR RH INLET), Diagnostics Chart with Diagnosis Connector.>
36		Rear right outlet valve <Ref. to VDC-68, DTC 36 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR RH OUTLET), Diagnostics Chart with Diagnosis Connector.>
37		Rear left inlet valve <Ref. to VDC-63, DTC 37 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR LH INLET), Diagnostics Chart with Diagnosis Connector.>
38		Rear left outlet valve <Ref. to VDC-68, DTC 38 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR LH OUTLET), Diagnostics Chart with Diagnosis Connector.>
61		Primary cut valve <Ref. to VDC-63, DTC 61 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (PRIMARY CUT), Diagnostics Chart with Diagnosis Connector.>
62		Secondary cut valve <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>
63		Primary suction valve <Ref. to VDC-68, DTC 63 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (PRIMARY SUCTION), Diagnostics Chart with Diagnosis Connector.>
64		Secondary suction valve <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>
41	Abnormal VDC control module	<Ref. to VDC-74, DTC 41 ABNORMAL VDC CONTROL MODULE, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.	<Ref. to VDC-76, DTC 42 SOURCE VOLTAGE IS ABNORMAL., Diagnostics Chart with Diagnosis Connector.>
43	Faulty VDCCM-ECM communication line	<Ref. to VDC-78, DTC 43 FAULTY VDCCM — ECM COMMUNICATION LINE, Diagnostics Chart with Diagnosis Connector.>
44	A communication with AT control abnormal	<Ref. to VDC-82, DTC 44 A COMMUNICATION WITH AT CONTROL ABNORMAL, Diagnostics Chart with Diagnosis Connector.>
45	Control module out of specification	<Ref. to VDC-84, DTC 45 CONTROL MODULE OUT OF SPECIFICATION, Diagnostics Chart with Diagnosis Connector.>
46	Abnormal voltage of 5 V power supply	<Ref. to VDC-86, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Diagnosis Connector.>
47	Faulty CAN communication line	<Ref. to VDC-90, DTC 47 FAULTY CAN COMMUNICATION LINE, Diagnostics Chart with Diagnosis Connector.>
48	Faulty ECM-VDCCM communication line	<Ref. to VDC-94, DTC 48 FAULTY ECM — VDCCM COMMUNICATION LINE, Diagnostics Chart with Diagnosis Connector.>
49	Abnormal engine speed signal	<Ref. to VDC-98, DTC 49 ABNORMAL ENGINE SPEED SIGNAL, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay	<Ref. to VDC-100, DTC 51 ABNORMAL VALVE RELAY, Diagnostics Chart with Diagnosis Connector.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

VDC (DIAGNOSTICS)

DTC No.	Contents of diagnosis	Index No.
52	Abnormal motor and/or motor relay	<Ref. to VDC-108, DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY, Diagnostics Chart with Diagnosis Connector.>
71	Abnormal steering angle sensor	<Ref. to VDC-114, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
72	Abnormal yaw rate sensor	<Ref. to VDC-118, DTC 72 ABNORMAL YAW RATE SENSOR, Diagnostics Chart with Diagnosis Connector.>
73	Abnormal lateral G sensor	<Ref. to VDC-122, DTC 73 ABNORMAL LATERAL G SENSOR, Diagnostics Chart with Diagnosis Connector.>
74	Abnormal pressure sensor	<Ref. to VDC-126, DTC 74 ABNORMAL PRESSURE SENSOR, Diagnostics Chart with Diagnosis Connector.>

If any of the following multiple diagnostic trouble codes (DTCs) are present in memory, check the area corresponding to the first diagnostic trouble code (DTC). If no problem is detected, check the areas corresponding to the other diagnostic trouble codes (DTCs) in order of their appearance.

Combination of DTC No.	Problem area	Index No.
46, 74	(F87) — No. 78, 68 or 69 lead circuit is shorted to ground or battery.	<Ref. to VDC-86, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Diagnosis Connector.>
44, 71	(F87) — No. 83 or 81 lead circuit is open.	<Ref. to VDC-114, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
51, 48, 71	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-114, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
71, 51, 44	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-114, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
72, 73	(F87) — No. 63 lead circuit is open.	<Ref. to VDC-122, DTC 73 ABNORMAL LATERAL G SENSOR, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

DTC No.	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Select monitor communication failure	<Ref. to VDC-130, COMMUNICATION FOR INITIALIZING IMPOSSIBLE (SELECT MONITOR COMMUNICATION FAILURE), Diagnostics Chart with Select Monitor.>
—	No trouble code	Although no diagnostic trouble code appears on the select monitor display, the ABS warning light and/or VDC warning light and/or VDC operating indicator light and/or VDC OFF indicator light remains on.	<Ref. to VDC-33, Diagnostics Chart with Diagnosis Connector.>
—	No trouble code	Although no diagnostic trouble code appears on the select monitor display, the ABS warning light and/or VDC warning light and/or VDC operating indicator light and/or VDC OFF indicator light remains off.	<Ref. to VDC-33, Diagnostics Chart with Diagnosis Connector.>
21	Front right ABS sensor circuit open or shorted battery	Open or short circuit in front right ABS sensor circuit	<Ref. to VDC-133, DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
22	Front right ABS sensor signal	Front right ABS sensor abnormal signal	<Ref. to VDC-139, DTC 22 FRONT RIGHT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

VDC (DIAGNOSTICS)

DTC No.	Display screen	Contents of diagnosis	Index No.
23	Front left ABS sensor circuit open or shorted battery	Open or short circuit in front left ABS sensor circuit	<Ref. to VDC-133, DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
24	Front left ABS sensor signal	Front left ABS sensor abnormal signal	<Ref. to VDC-139, DTC 24 FRONT LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
25	Rear right ABS sensor circuit open or shorted battery	Open or short circuit in rear right ABS sensor circuit	<Ref. to VDC-133, DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
26	Rear right ABS sensor signal	Rear right ABS sensor abnormal signal	<Ref. to VDC-139, DTC 26 REAR RIGHT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
27	Rear left ABS sensor circuit open or shorted battery	Open or short circuit in rear left ABS sensor circuit	<Ref. to VDC-134, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
28	Rear left ABS sensor signal	Rear left ABS sensor abnormal signal	<Ref. to VDC-140, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
29	Any one of four ABS sensor signal	Abnormal ABS sensor signal on any one of four sensor	<Ref. to VDC-146, DTC 29 ANY ONE OF FOUR ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
31	FR hold valve malfunction	Front right inlet solenoid valve	<Ref. to VDC-149, DTC 31 FR HOLD VALVE MALFUNCTION (FRONT RIGHT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
32	FR pressure reducing valve malfunction	Front right outlet solenoid valve malfunction	<Ref. to VDC-154, DTC 32 FR PRESSURE REDUCING VALVE MALFUNCTION (FRONT RIGHT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
33	FL hold valve malfunction	Front left inlet solenoid valve malfunction	<Ref. to VDC-149, DTC 33 FL HOLD VALVE MALFUNCTION (FRONT LEFT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
34	FL pressure reducing valve malfunction	Front left outlet solenoid valve	<Ref. to VDC-154, DTC 34 FL PRESSURE REDUCING VALVE MALFUNCTION (FRONT LEFT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
35	RR hold valve malfunction	Rear right inlet solenoid valve malfunction	<Ref. to VDC-149, DTC 35 RR HOLD VALVE MALFUNCTION (REAR RIGHT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
36	RR pressure reducing valve malfunction	Rear right outlet solenoid valve	<Ref. to VDC-154, DTC 36 RR PRESSURE REDUCING VALVE MALFUNCTION (REAR RIGHT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
37	RL hold valve malfunction	Rear left inlet solenoid valve malfunction	<Ref. to VDC-149, DTC 37 RL HOLD VALVE MALFUNCTION (REAR LEFT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
38	RL pressure reducing valve malfunction	Rear left outlet solenoid valve	<Ref. to VDC-154, DTC 38 RL PRESSURE REDUCING VALVE MALFUNCTION (REAR LEFT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
41	Electrical control module	VDC control module malfunction	<Ref. to VDC-160, DTC 41 ELECTRICAL CONTROL MODULE (VDC CONTROL MODULE MALFUNCTION), Diagnostics Chart with Select Monitor.>
42	Power supply voltage low	Power supply voltage too low	<Ref. to VDC-162, DTC 42 POWER SUPPLY VOLTAGE LOW, Diagnostics Chart with Select Monitor.>
43	AET communication line malfunction	AET communication line malfunction	<Ref. to VDC-164, DTC 43 AET COMMUNICATION LINE MALFUNCTION, Diagnostics Chart with Select Monitor.>
43	AEB communication line malfunction	AEB communication line malfunction	<Ref. to VDC-168, DTC 43 AEB COMMUNICATION LINE MALFUNCTION, Diagnostics Chart with Select Monitor.>
43	AEC communication line malfunction	AEC communication line malfunction	<Ref. to VDC-172, DTC 43 AEC COMMUNICATION LINE MALFUNCTION, Diagnostics Chart with Select Monitor.>
44	TCM communication circuit	TCM communication line malfunction	<Ref. to VDC-176, DTC 44 TCM COMMUNICATION CIRCUIT, Diagnostics Chart with Select Monitor.>
45	Incorrect VDC control module	Incorrect VDC control module	<Ref. to VDC-178, DTC 45 INCORRECT VDC CONTROL MODULE, Diagnostics Chart with Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

VDC (DIAGNOSTICS)

DTC No.	Display screen	Contents of diagnosis	Index No.
45	TCM malfunction specifications	TCM malfunction specifications	<Ref. to VDC-180, DTC 45 TCM MALFUNCTION SPECIFICATIONS, Diagnostics Chart with Select Monitor.>
46	Abnormal voltage of 5 V power supply	Abnormal voltage of 5 V power supply	<Ref. to VDC-182, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Select Monitor.>
47	Improper CAN communication	CAN communication line malfunction	<Ref. to VDC-186, DTC 47 IMPROPER CAN COMMUNICATION, Diagnostics Chart with Select Monitor.>
48	Improper EAC communication	EAC communication line malfunction	<Ref. to VDC-190, DTC 48 IMPROPER EAC COMMUNICATION, Diagnostics Chart with Select Monitor.>
48	EAS communication line grounding shorted	EAS communication line grounding	<Ref. to VDC-194, DTC 48 EAS COMMUNICATION LINE GROUNDING SHORTED, Diagnostics Chart with Select Monitor.>
48	Erroneous communication from EGI to VDC	Faulty ECM-VDCCM communication line	<Ref. to VDC-196, DTC 48 ERRONEOUS COMMUNICATION FROM EGI TO VDC, Diagnostics Chart with Select Monitor.>
49	Abnormal engine speed signal	Abnormal engine speed signal	<Ref. to VDC-200, DTC 49 ABNORMAL ENGINE SPEED SIGNAL, Diagnostics Chart with Select Monitor.>
51	Valve relay	Valve relay malfunction	<Ref. to VDC-202, DTC 51 VALVE RELAY, Diagnostics Chart with Select Monitor.>
51	Valve relay ON failure	Valve relay ON failure	<Ref. to VDC-208, DTC 51 VALVE RELAY ON FAILURE, Diagnostics Chart with Select Monitor.>
52	Motor and motor relay OFF failure	Motor and motor relay OFF failure	<Ref. to VDC-214, DTC 52 MOTOR AND MOTOR RELAY OFF FAILURE, Diagnostics Chart with Select Monitor.>
52	Motor and motor relay ON failure	Motor and motor relay ON failure	<Ref. to VDC-218, DTC 52 MOTOR AND MOTOR RELAY ON FAILURE, Diagnostics Chart with Select Monitor.>
52	Motor malfunction	Motor malfunction	<Ref. to VDC-224, DTC 52 MOTOR MALFUNCTION, Diagnostics Chart with Select Monitor.>
61	Normal opening valve 2 malfunction	Primary cut valve malfunction	<Ref. to VDC-149, DTC 61 NORMAL OPENING VALVE 2 MALFUNCTION (PRIMARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
62	Normal opening valve 1 malfunction	Secondary cut valve malfunction	<Ref. to VDC-150, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
63	Normal closing valve 2 malfunction	Primary suction valve malfunction	<Ref. to VDC-154, DTC 63 NORMAL CLOSING VALVE 2 MALFUNCTION (PRIMARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
64	Normal closing valve 1 malfunction	Secondary suction valve malfunction	<Ref. to VDC-156, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
71	Steering angle sensor offset is too big.	Steering angle sensor offset is too big.	<Ref. to VDC-228, DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG., Diagnostics Chart with Select Monitor.>
71	Change range of steering angle sensor is too big.	Change range of steering angle sensor is too big.	<Ref. to VDC-230, DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG., Diagnostics Chart with Select Monitor.>
71	Steering angle sensor malfunction	Steering angle sensor malfunction	<Ref. to VDC-232, DTC 71 STEERING ANGLE SENSOR MALFUNCTION, Diagnostics Chart with Select Monitor.>
71	No signal from steering angle sensor	No signal from steering angle sensor	<Ref. to VDC-234, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
72	Abnormal yaw rate sensor output	Abnormal yaw rate sensor output	<Ref. to VDC-238, DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT, Diagnostics Chart with Select Monitor.>
72	Voltage inputted to yaw rate sensor exceeds specification.	Voltage inputted to yaw rate sensor exceeds specification.	<Ref. to VDC-242, DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION., Diagnostics Chart with Select Monitor.>
72	Abnormal yaw rate sensor reference voltage	Abnormal yaw rate sensor reference voltage	<Ref. to VDC-246, DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE, Diagnostics Chart with Select Monitor.>
72	Change range of yaw rate sensor signal is too big.	Change range of yaw rate sensor signal is too big.	<Ref. to VDC-250, DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG., Diagnostics Chart with Select Monitor.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

VDC (DIAGNOSTICS)

DTC No.	Display screen	Contents of diagnosis	Index No.
73	Lateral G sensor offset is too big.	Lateral G sensor offset is too big.	<Ref. to VDC-254, DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG., Diagnostics Chart with Select Monitor.>
73	Abnormal lateral G sensor output	Abnormal lateral G sensor output	<Ref. to VDC-254, DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostics Chart with Select Monitor.>
73	Change range of lateral G sensor is too big.	Change range of lateral G sensor is too big.	<Ref. to VDC-254, DTC 73 CHANGE RANGE OF LATERAL G SENSOR IS TOO BIG., Diagnostics Chart with Select Monitor.>
73	Excessive lateral G sensor signal	Excessive lateral G sensor signal	<Ref. to VDC-256, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
73	Voltage inputted to lateral G sensor exceeds specification.	Voltage inputted to lateral G sensor exceeds specification.	<Ref. to VDC-258, DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION., Diagnostics Chart with Select Monitor.>
74	Voltage inputted to pressure sensor 1 exceeds specification.	Voltage inputted to primary pressure sensor exceeds specification.	<Ref. to VDC-262, DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 1 EXCEEDS SPECIFICATION. (PRIMARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Voltage inputted to pressure sensor 2 exceeds specification.	Voltage inputted to secondary pressure sensor exceeds specification.	<Ref. to VDC-266, DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 2 EXCEEDS SPECIFICATION. (SECONDARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Pressure sensor 1 offset is too big.	Primary pressure sensor offset is too big.	<Ref. to VDC-269, DTC 74 PRESSURE SENSOR 1 OFFSET IS TOO BIG. (PRIMARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Pressure sensor 2 offset is too big.	Secondary pressure sensor offset is too big.	<Ref. to VDC-270, DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG. (SECONDARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Differential pressure of pressure sensor is too big.	Differential pressure of pressure sensor is too big.	<Ref. to VDC-272, DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG., Diagnostics Chart with Select Monitor.>

If any of the following multiple diagnostic trouble codes (DTCs) are present in memory, check the area corresponding to the first diagnostic trouble code (DTC). If no problem is detected, check the areas corresponding to the other diagnostic trouble codes (DTCs) in order of their appearance.

Combination of DTC No.	Problem area	Index No.
46 Abnormal voltage of 5 V power supply 74 Voltage inputted to pressure sensor 2 exceeds specification.	(F87) — No. 78, 68 or 69 lead circuit is shorted to ground or battery.	<Ref. to VDC-182, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Select Monitor.>
44 TCM communication circuit 71 No signal from steering angle sensor	(F87) — No. 83 or 81 lead circuit is open.	<Ref. to VDC-234, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
51 Valve relay 48 Improper EAC communication 71 No signal from steering angle sensor	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-234, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
71 No signal from steering angle sensor 51 Valve relay 44 TCM communication circuit	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-234, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
73 Voltage inputted to lateral G sensor exceeds specification. 72 Voltage inputted to yaw rate sensor exceeds specifications.	(F87) — No. 23 lead circuit is open.	<Ref. to VDC-256, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

13. Diagnostics Chart with Diagnosis Connector

A: ABS WARNING LIGHT, VDC WARNING LIGHT, VDC OPERATING INDICATOR LIGHT OR VDC OFF INDICATOR LIGHT DOES NOT COME ON.

DIAGNOSIS:

- ABS warning light circuit is open or shorted.
- VDC warning light circuit is open or shorted.
- VDC operating indicator light circuit is open or shorted.
- VDC OFF indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

- When ignition switch is turned ON (engine OFF), ABS warning light, VDC warning light, VDC operating indicator light or VDC OFF indicator light does not come on.

NOTE:

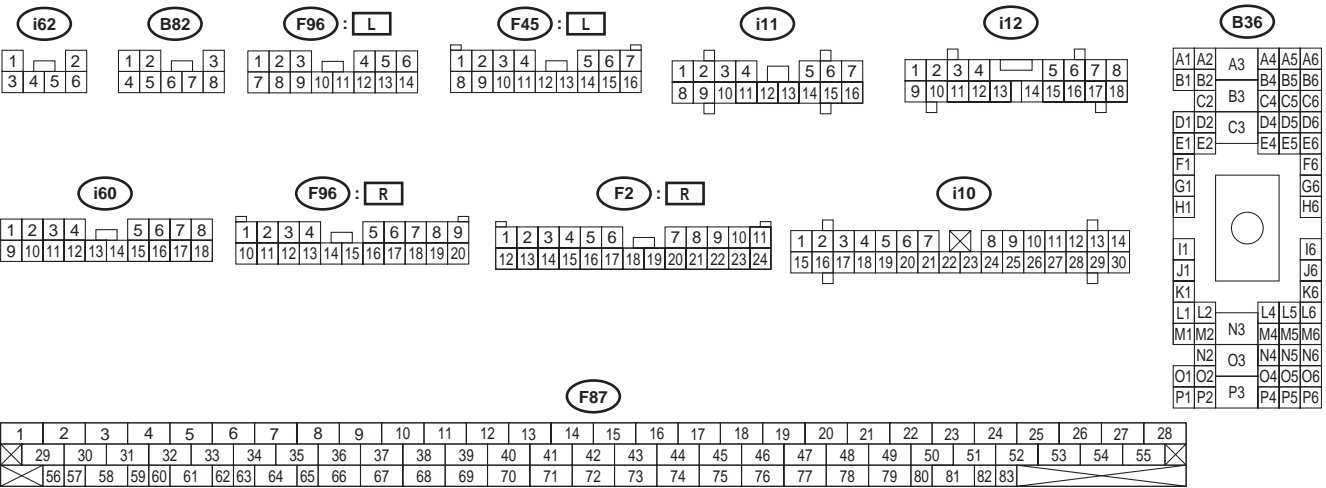
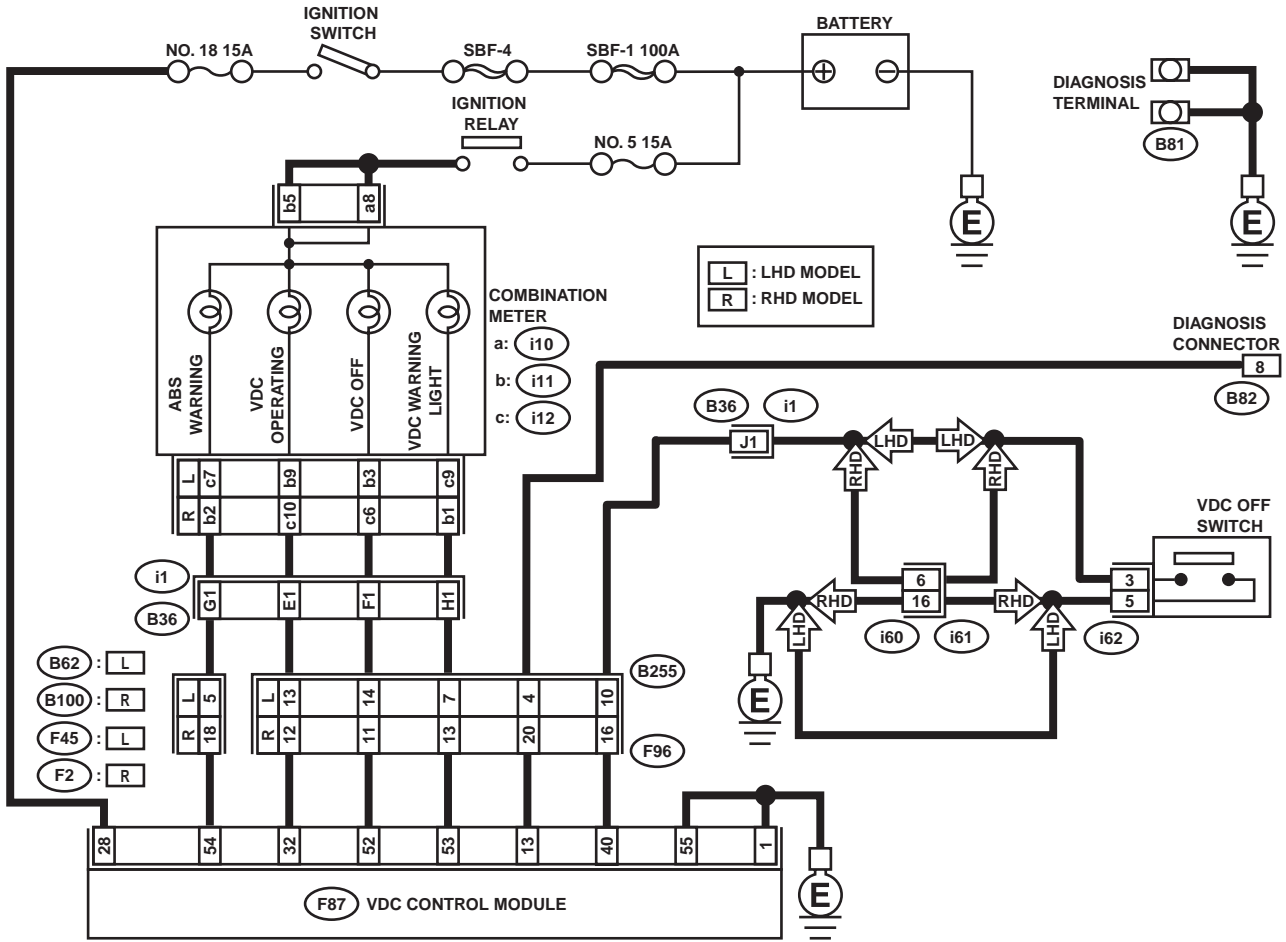
When pushing the VDC OFF switch for 10 seconds or more while revving the engine, the VDC OFF indicator light goes off and operations cannot be continued. Turn ignition switch from OFF to ON again to recover the previous condition.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

WIRING DIAGRAM:

- 3.0 L model

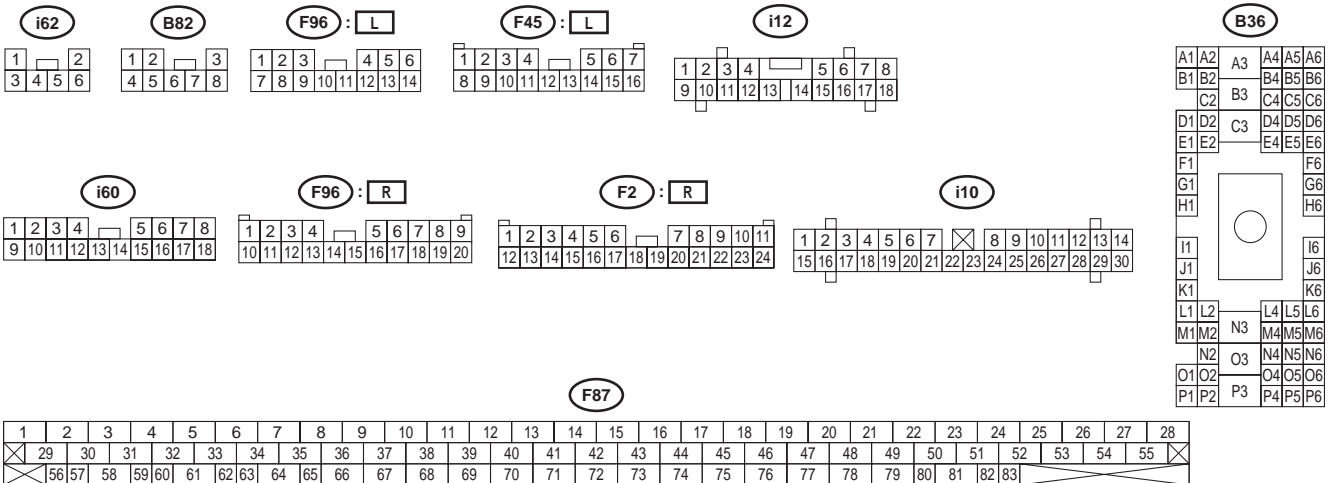
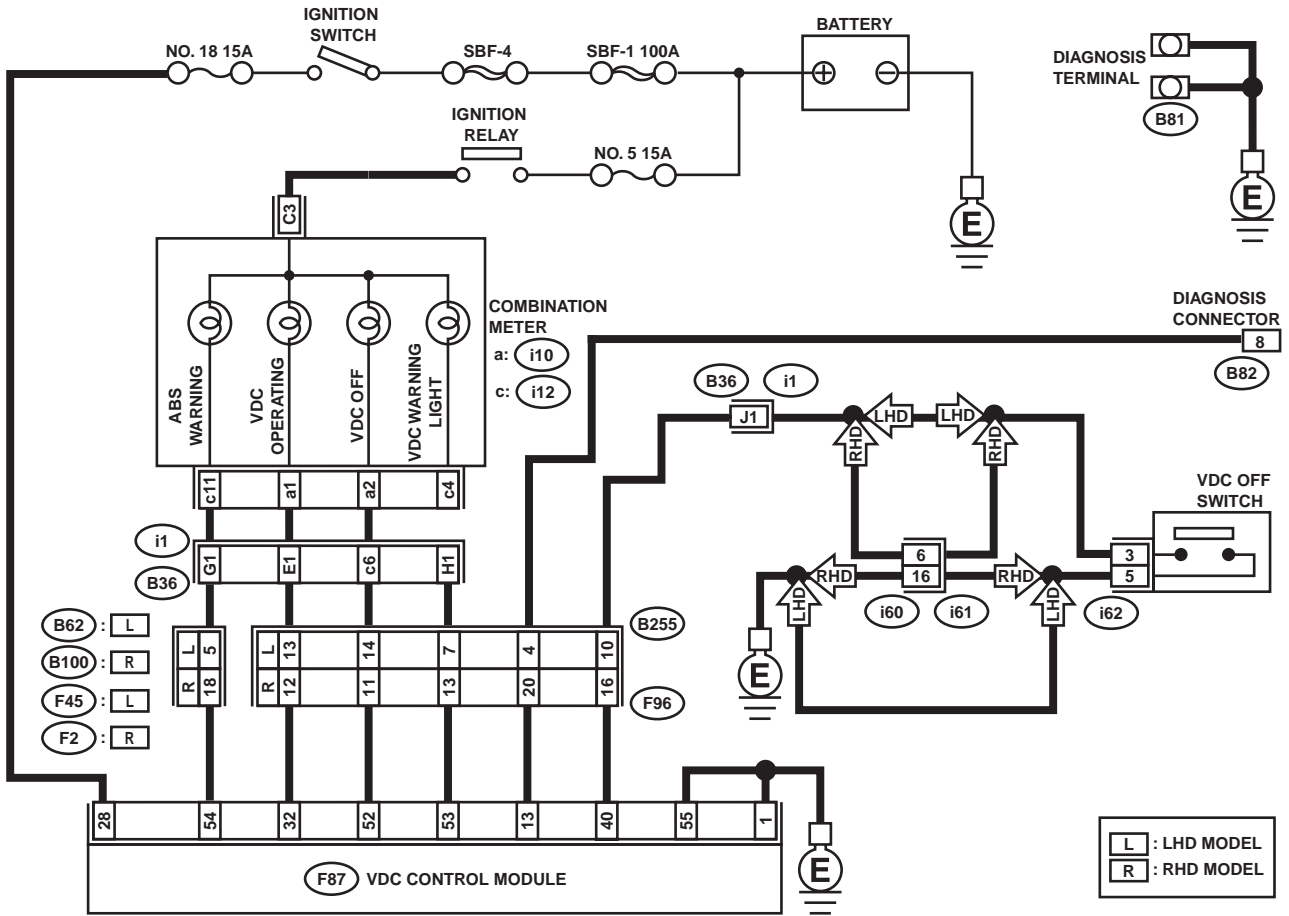


VDC00173

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

- Except 3.0 L model



VDC00172

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK IF OTHER WARNING LIGHTS TURN ON. Turn ignition switch to ON (engine OFF). Do other warning lights turn on?	Warning lights turn on.	Go to step 2.	Repair combination meter. <Ref. to IDI-14, Combination Meter Assembly.>
2 CHECK LIGHT BULB. 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove ABS warning light bulb, VDC warning light bulb, VDC operating indicator light bulb or VDC OFF indicator light bulb from combination meter. Is light bulb OK?	OK.	Go to step 3.	Replace faulty light bulb. <Ref. to IDI-15, DISASSEMBLY, Combination Meter Assembly.>
3 CHECK BATTERY SHORT OF LIGHT HARNESS. 1) Disconnect VDCCM connector from VDCCM. 2) Place a sheet of thick paper [thickness 1.5 mm (0.059 in)] in switch area of VDCCM connector. 3) Turn ignition switch to ON. 4) Measure voltage between VDC connector and chassis ground. Connector & terminal ABS warning light (F87) No. 54 (+) — Chassis ground (-): VDC warning light (F87) No. 53 (+) — Chassis ground (-): VDC operating indicator light (F87) No. 32 (+) — Chassis ground (-): VDC OFF indicator light (F87) No. 52 (+) — Chassis ground (-): Does the measured value exceed the specified value?	3 V	Go to step 4.	Repair light harness.
4 CHECK WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Install ABS warning light bulb from combination meter. 3) Install combination meter. 4) Place a sheet of thick paper [thickness 1.5 mm (0.059 in)] in switch area of VDCCM connector. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector and chassis ground. Connector & terminal ABS warning light (F87) No. 54 (+) — Chassis ground (-): VDC warning light (F87) No. 53 (+) — Chassis ground (-): VDC operating indicator light (F87) No. 32 (+) — Chassis ground (-): VDC OFF indicator light (F87) No. 52 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Go to step 5.	Repair wiring harness.
5 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connectors between combination meter and VDCCM?	There is poor contact.	Repair connector.	Go to step 6.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK WARNING AND INDICATOR LIGHTS. 1) Connect connector to VDCCM. 2) Turn ignition switch to ON. Do ABS warning light, VDC warning light, VDC operating indicator light and VDC OFF indicator light turn on?	Turn(s) on.	A temporary poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

B: ABS AND VDC WARNING LIGHTS DO NOT GO OFF.

DIAGNOSIS:

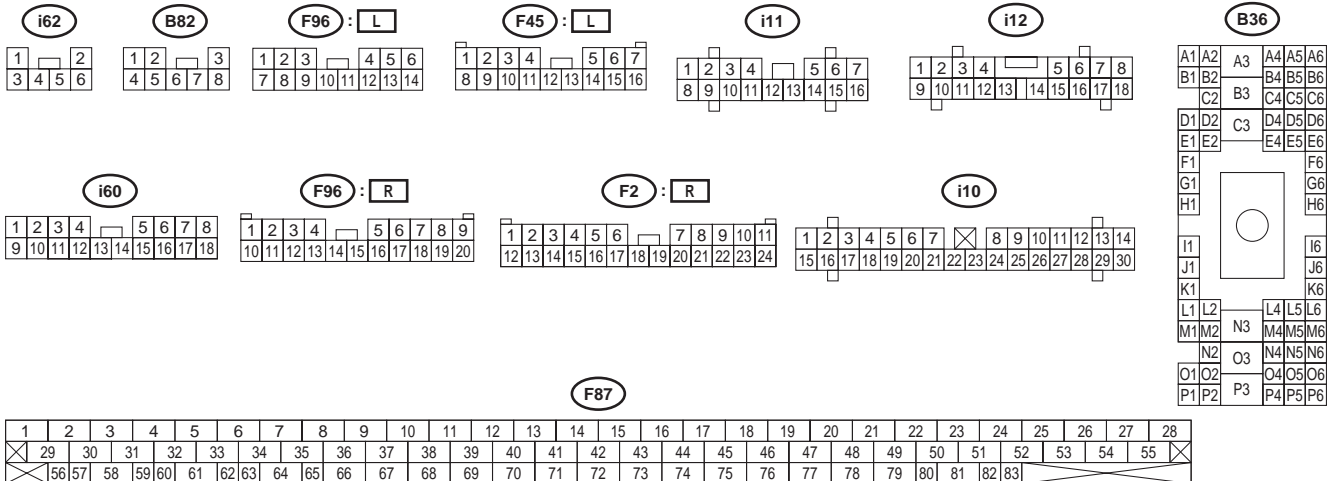
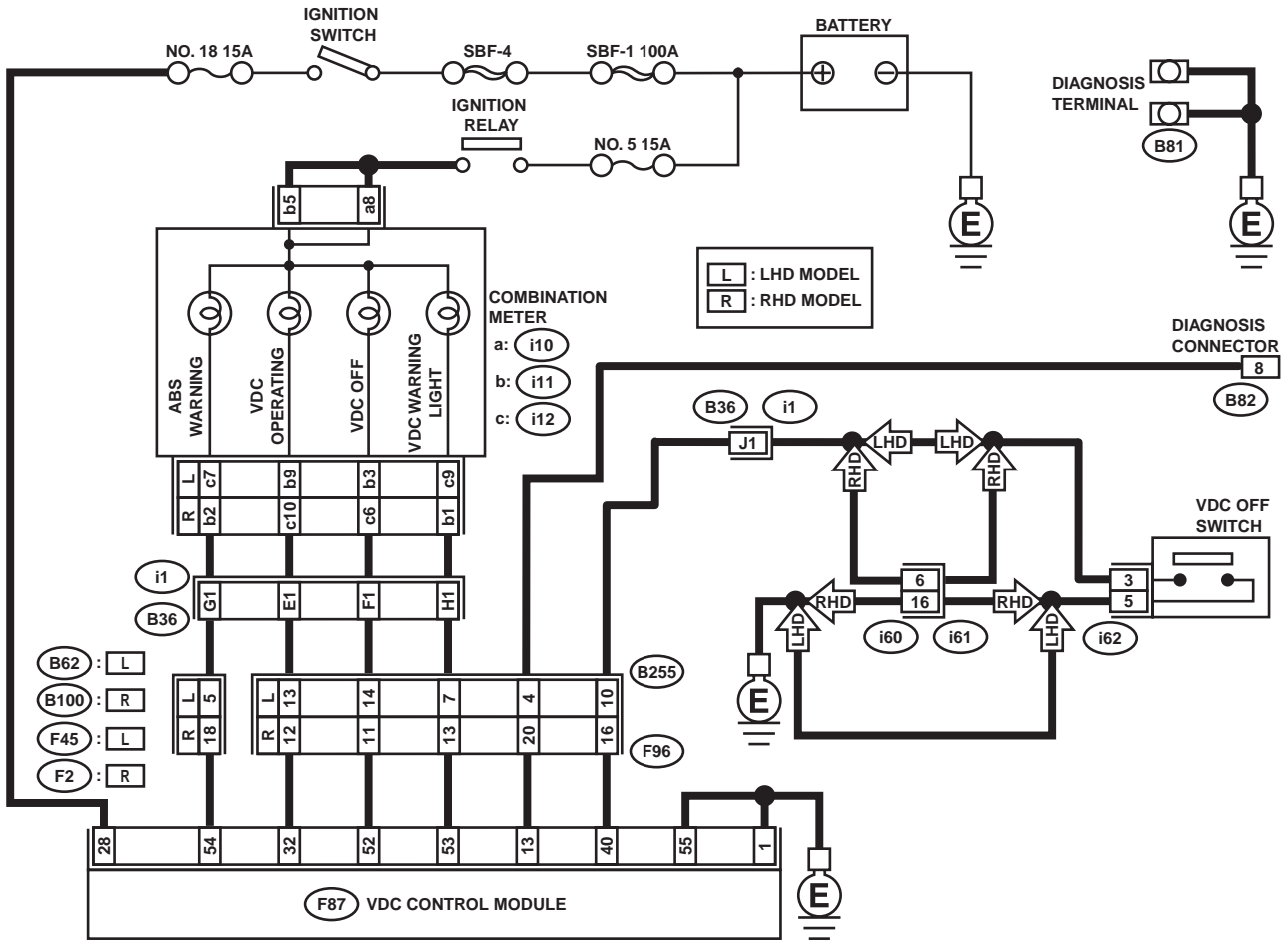
- ABS warning light circuit is open or shorted.
- VDC warning light circuit is open or shorted.
- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- When starting the engine and while ABS and/or VDC warning light is kept ON.

WIRING DIAGRAM:

- 3.0 L model



VDC00173

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK INSTALLATION OF VDCCM CONNECTOR. Turn ignition switch to OFF. Is VDCCM connector inserted into VDCCM until the clamp locks onto it?</p>	VDCCM connector is connected and the clamp is locked.	Go to step 2.	Insert VDCCM connector into VDCCM until the clamp locks onto it.
<p>2 CHECK DIAGNOSIS TERMINAL. Measure resistance between diagnosis terminals (B81) and chassis ground. Terminals Diagnosis terminal (A) — Chassis ground: Diagnosis terminal (B) — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Repair diagnosis terminal harness.
<p>3 CHECK DIAGNOSIS LINE. 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from VDCCM. 4) Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 13 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 4.	Repair harness connector between VDCCM and diagnosis connector.
<p>4 CHECK WIRING HARNESS. 1) Place a sheet of thick paper [thickness 1.5 mm (0.059 in)] in switch area of VDCCM connector. 2) Turn ignition switch to ON. Do the ABS warning light and VDC warning light remain off?</p>	Warning lights remain off.	Go to step 5.	Repair front wiring harness.
<p>5 CHECK VDCCM TERMINAL. 1) Turn ignition switch to OFF. 2) Check, if there is any faulty condition of VDCCM terminal. Is there any faulty condition of VDCCM terminal?</p>	There is no problem.	Go to step 6.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>6 CHECK POWER SUPPLY OF VDCCM. 1) Disconnect connector from VDCCM. 2) Start engine. 3) Idle the engine. 4) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 28 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 7.	Repair VDCCM power supply circuit.
<p>7 CHECK POOR CONTACT IN VDCCM CONNECTOR. Is there poor contact in VDCCM connector?</p>	There is poor contact.	Repair connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

C: VDC OPERATING INDICATOR LIGHT DOES NOT GO OFF.

DIAGNOSIS:

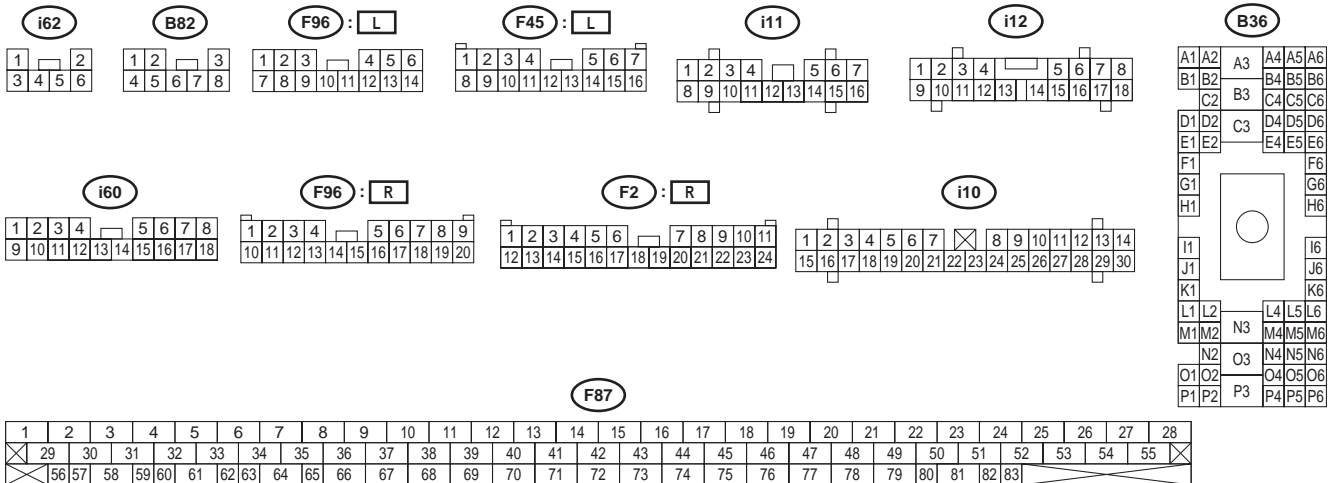
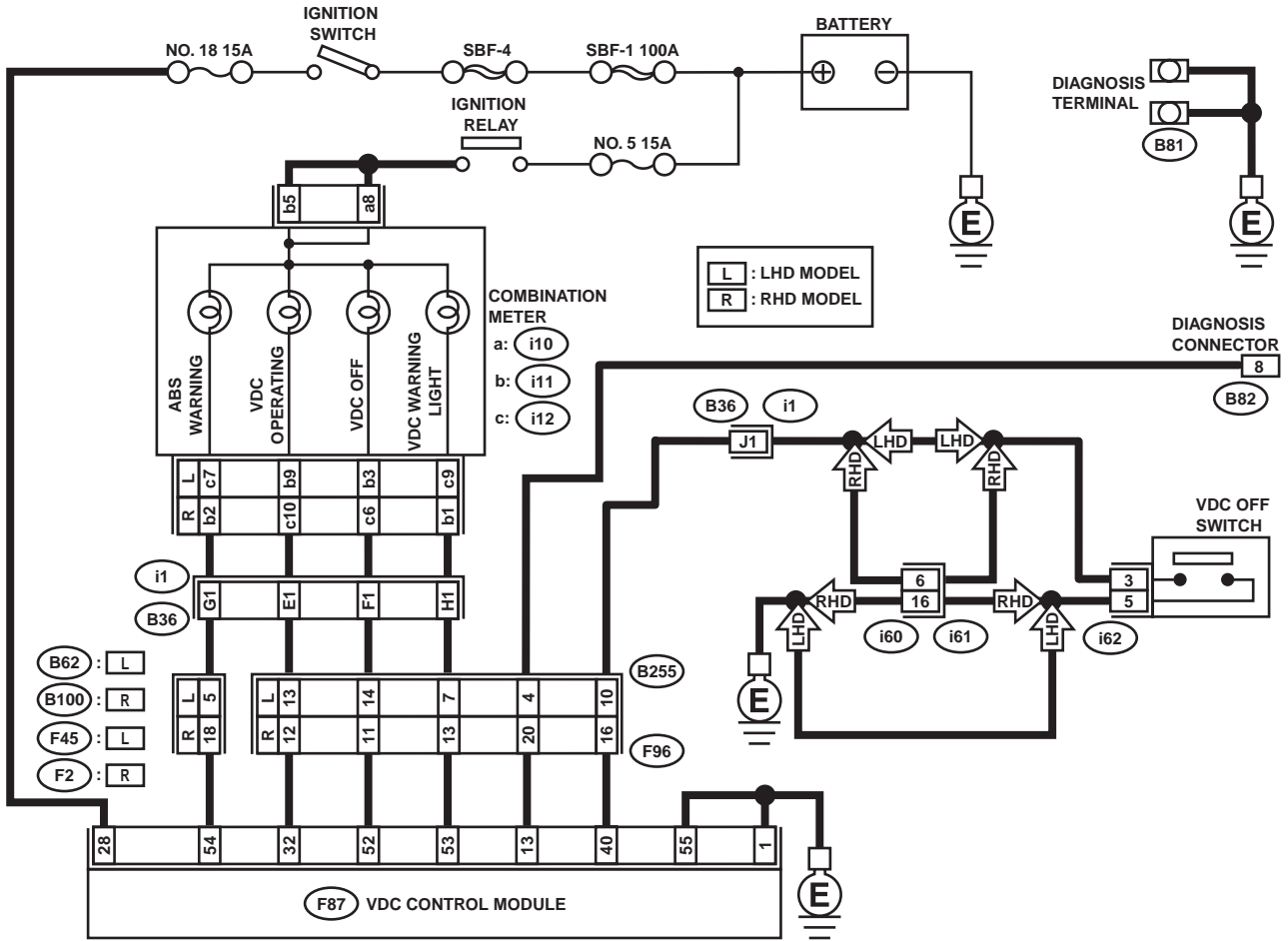
- VDC operating indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while VDC operating indicator light is kept ON.

WIRING DIAGRAM:

- 3.0 L model

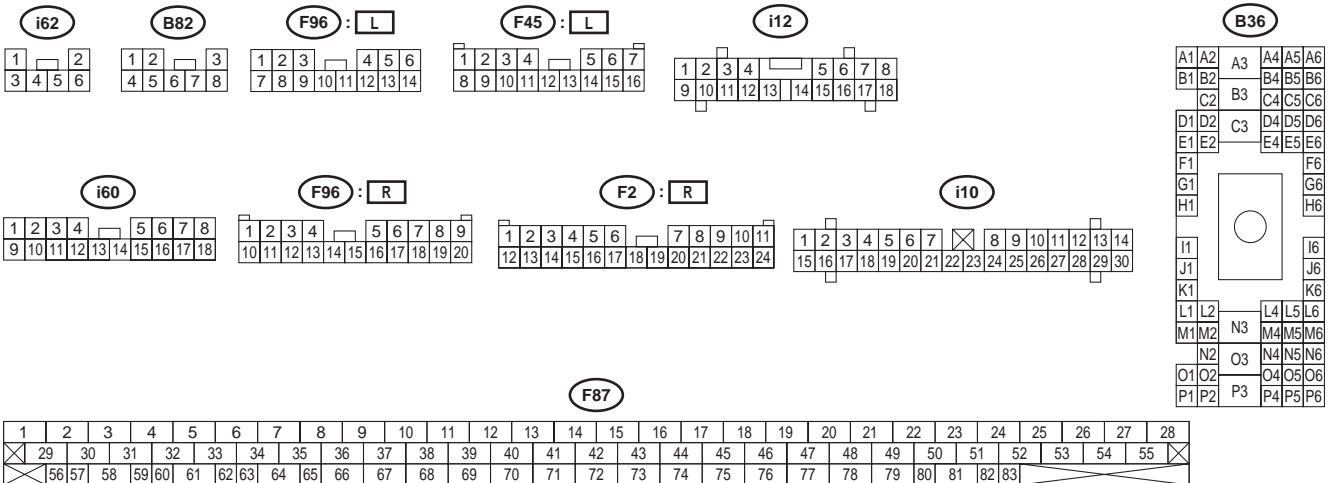
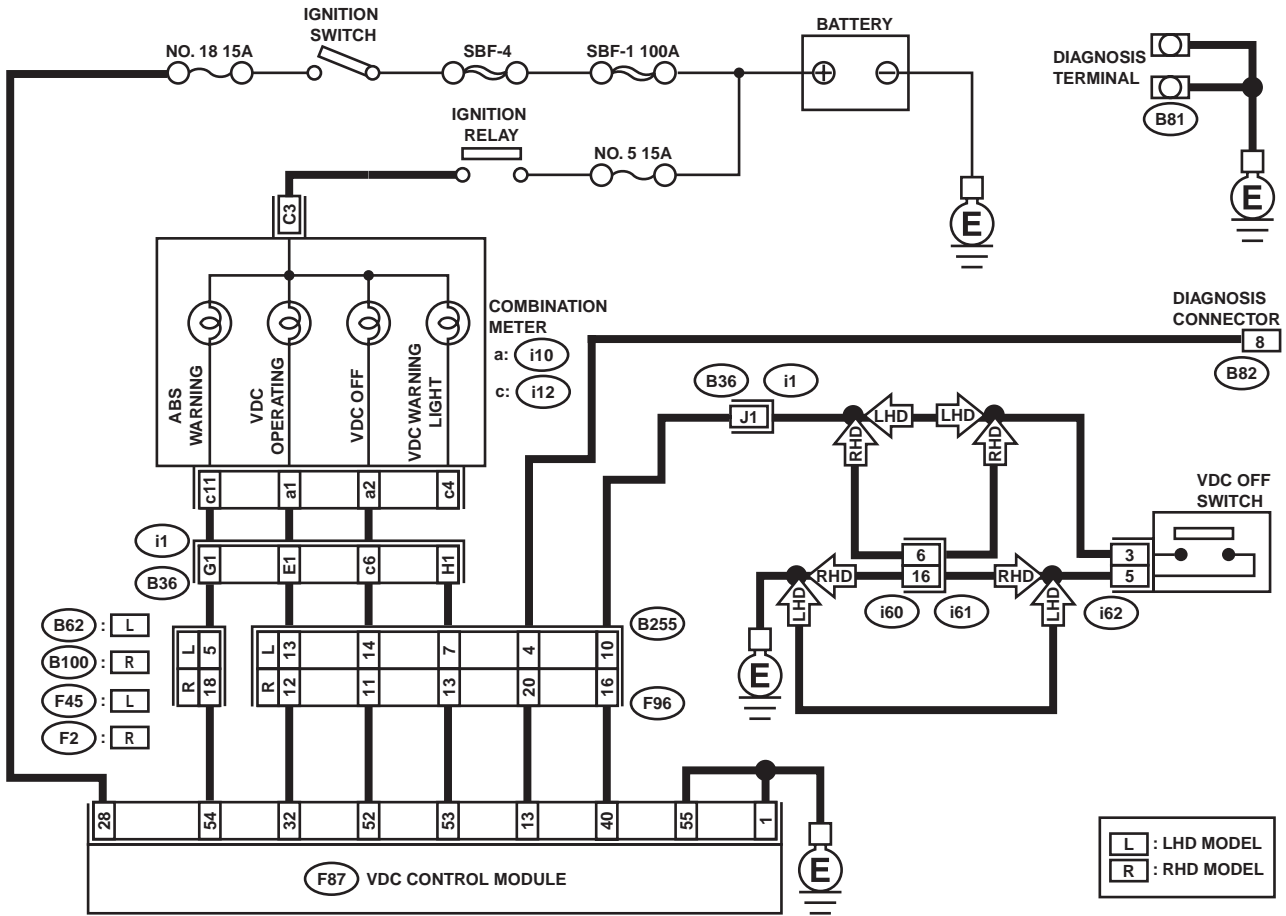


VDC00173

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

- Except 3.0 L model



VDC00172

Step	Value	Yes	No
1 CHECK WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect VDCCM connector from VDCCM. 3) Turn ignition switch to ON. Does the VDC operating indicator light remain off?	Indicator light remains off.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair wiring harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

D: VDC OFF INDICATOR LIGHT DOES NOT GO OFF.

DIAGNOSIS:

- VDC OFF indicator light circuit is open or shorted.
- VDC OFF switch is shorted.

TROUBLE SYMPTOM:

- When starting the engine and while VDC OFF indicator light is kept ON.

NOTE:

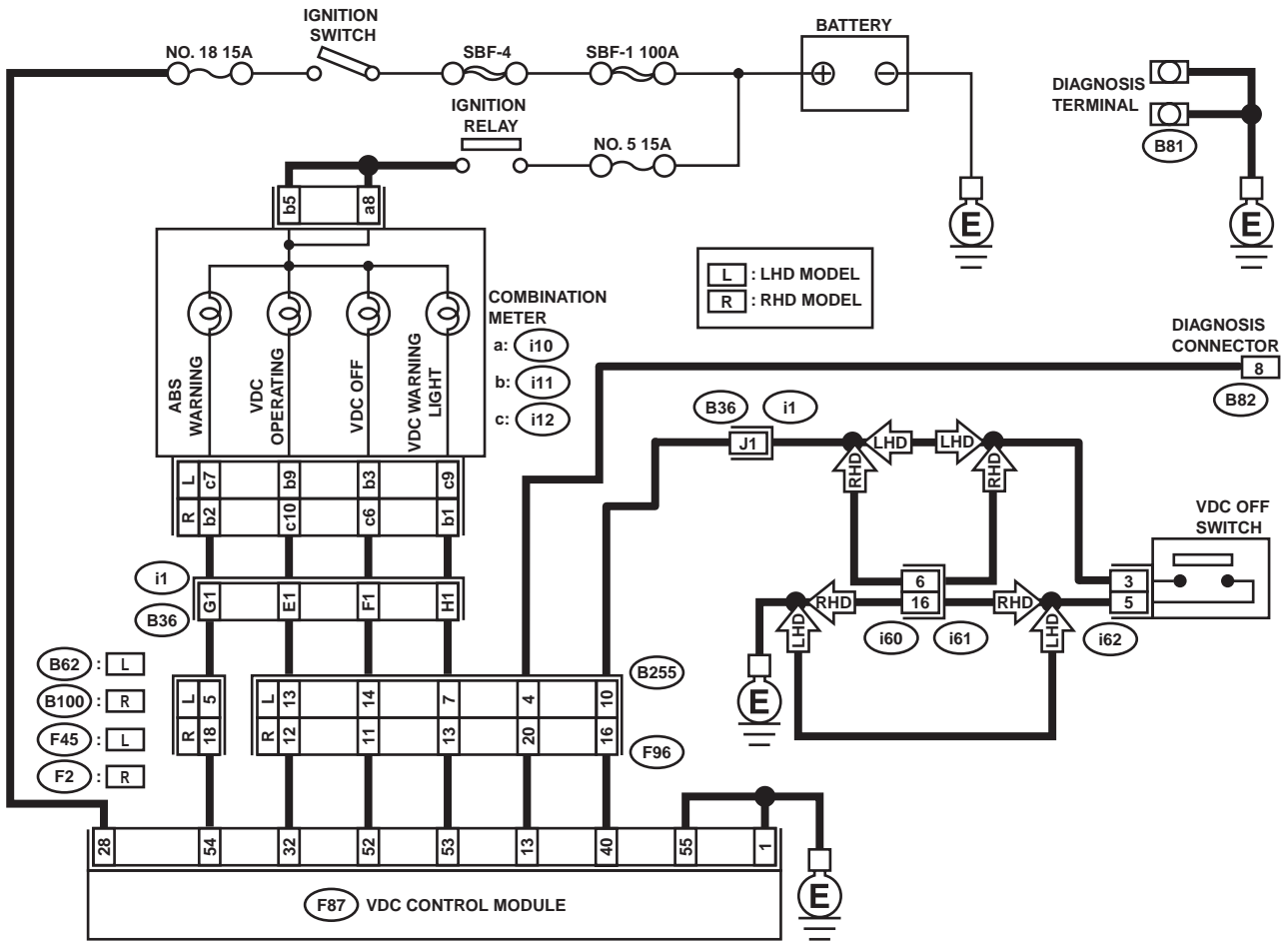
When pushing the VDC OFF switch for 10 seconds or more while revving the engine, the VDC OFF indicator light goes off and operations cannot be continued. Turn ignition switch from OFF to ON again to recover the previous condition.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

WIRING DIAGRAM:

- 3.0 L model



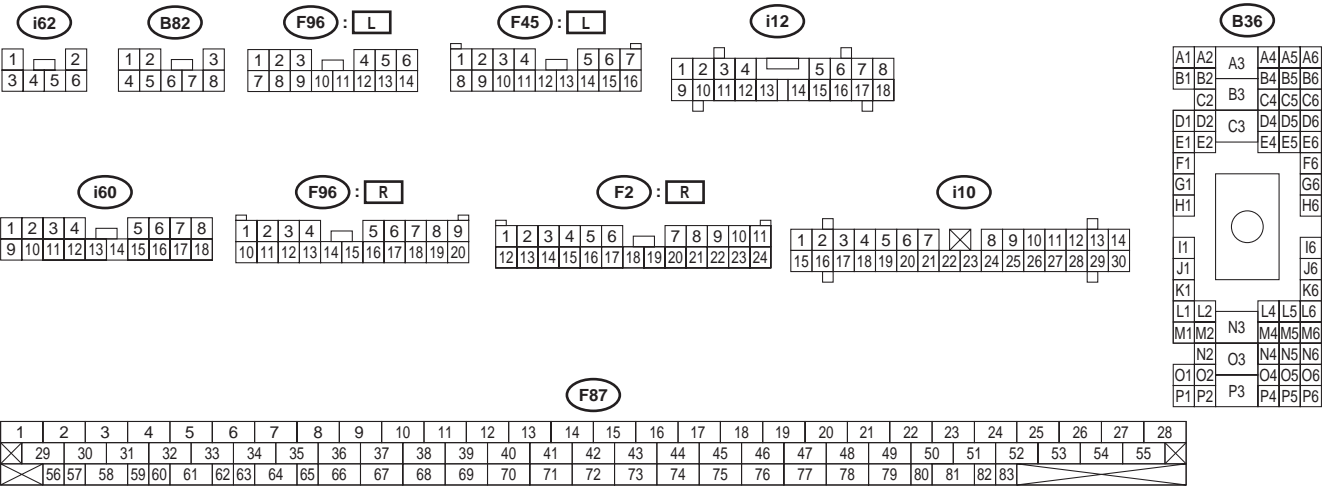
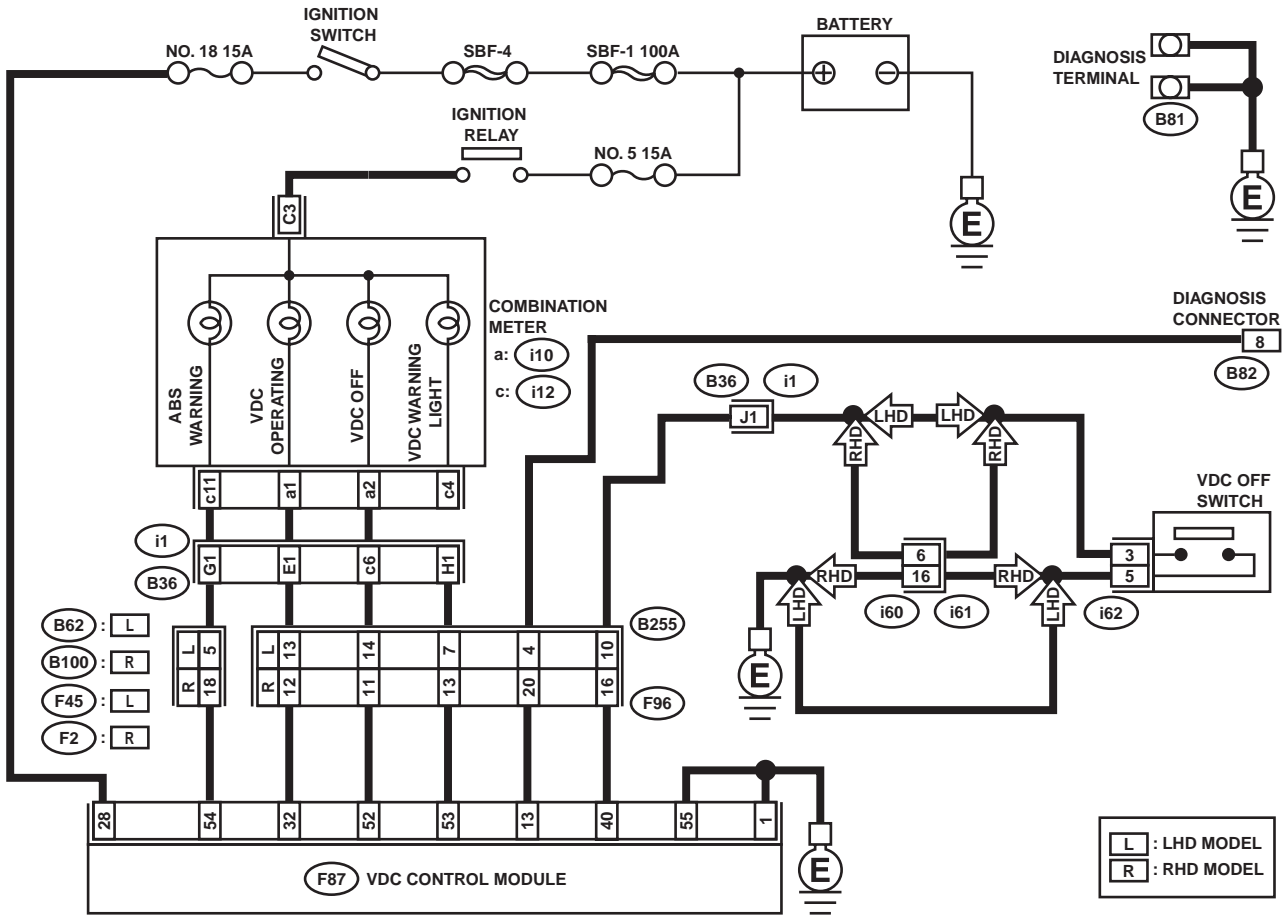
i62	B82	F96 : L	F45 : L	i11	i12	B36
1 2 3 4 5 6	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10 11 12 13 14	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	A1 A2 A3 A4 A5 A6 B1 B2 B3 B4 B5 B6 C1 C2 C3 C4 C5 C6 D1 D2 C3 D4 D5 D6 E1 E2 E4 E5 E6 F1 F6 G1 G6 H1 H6 I1 I6 J1 J6 K1 K6 L1 L2 L4 L5 L6 M1 M2 N3 M4 M5 M6 N2 O3 N4 N5 N6 O1 O2 O4 O5 O6 P1 P2 P3 P4 P5 P6
i60	F96 : R	F2 : R	i10			
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30			
F87						
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28						
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55						
56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83						

VDC00173

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

- Except 3.0 L model



VDC00172

Step	Value	Yes	No
1 OPERATE VDC OFF SWITCH. 1) Operate VDC OFF switch. 2) Turn ignition switch OFF, then turn ignition switch ON. Is VDC OFF indicator light off?	Indicator lights off.	The VDC is normal.	Go to step 2.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
2 CHECK ENGINE COOLANT TEMPERATURE. Does VDC OFF indicator light come on when engine coolant temperature is too low? Does it go out after engine has warmed up?	Indicator lights on, when engine coolant temperature is too low and goes out after warmed up.	The VDC is normal.	Go to step 3.
3 CHECK VDC OFF SWITCH. Remove and check VDC OFF switch. <Ref. to VDC-31, VDC Off Switch.> Is VDC OFF switch OK?	OK.	Go to step 4.	Replace VDC OFF switch.
4 CHECK WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect VDCCM connector from VDCCM. 3) Turn ignition switch to ON. Does the VDC OFF indicator light remain off?	Indicator lights off.	Go to step 5.	Repair wiring harness.
5 CHECK VDC OFF SWITCH LINE. 1) Disconnect fuse from VDC OFF switch. 2) Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 40 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair VDC OFF switch circuit.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

E: DIAGNOSTIC TROUBLE CODE (DTC) DOES NOT APPEAR.

DIAGNOSIS:

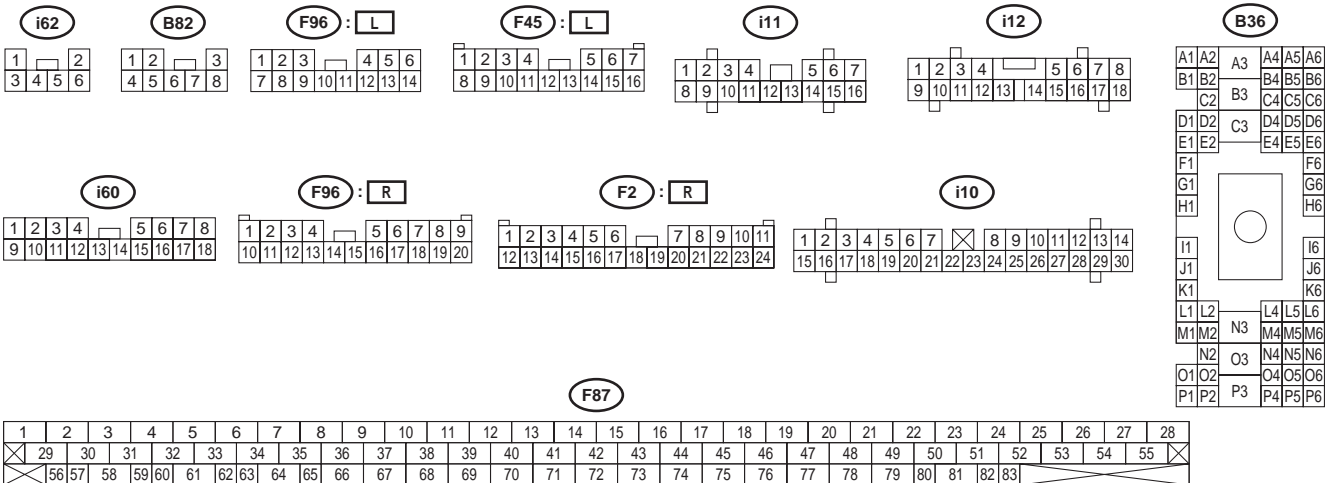
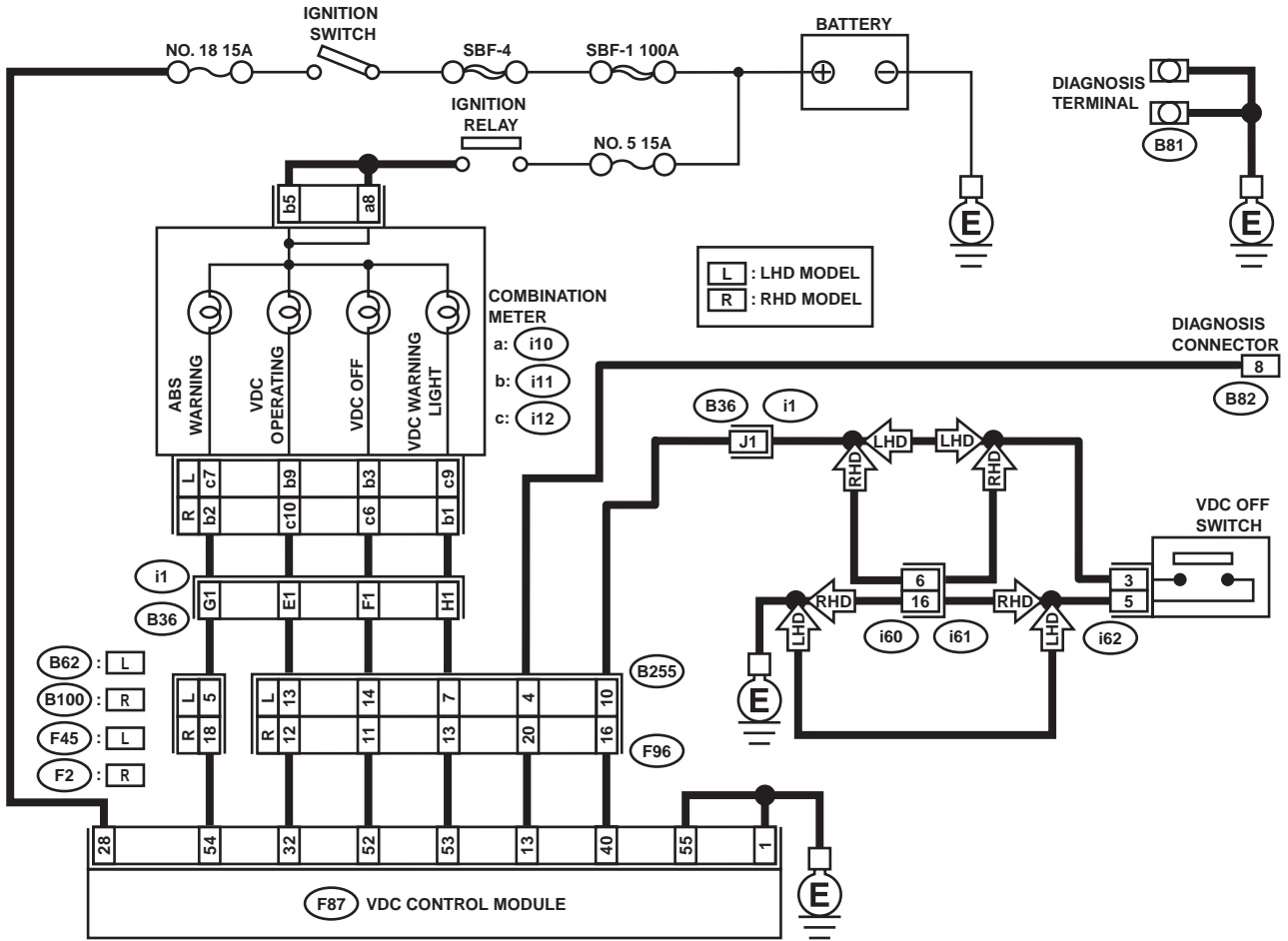
- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

WIRING DIAGRAM:

- 3.0 L model

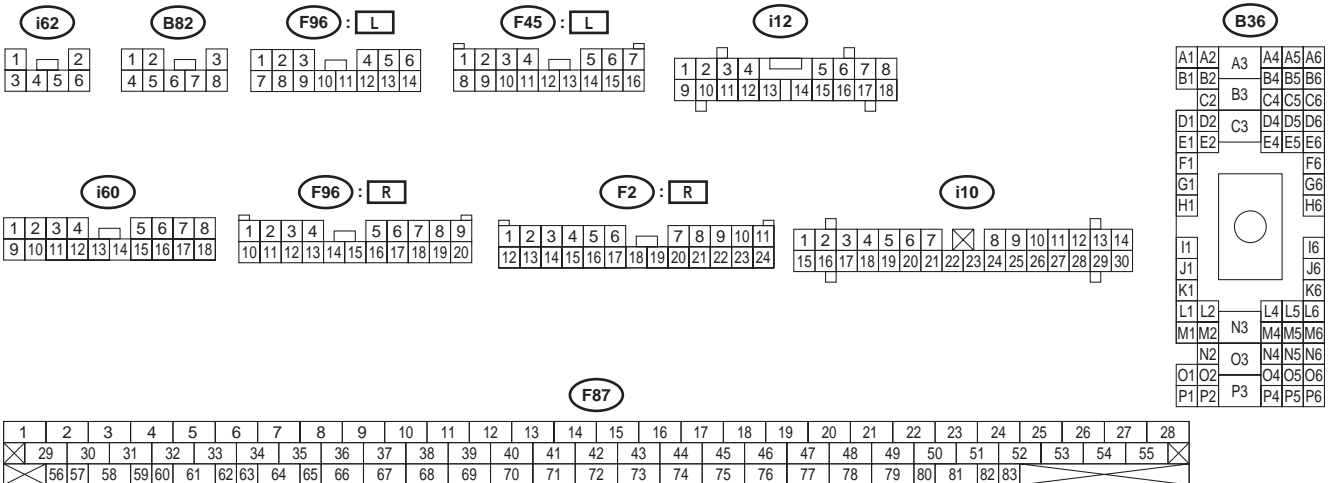
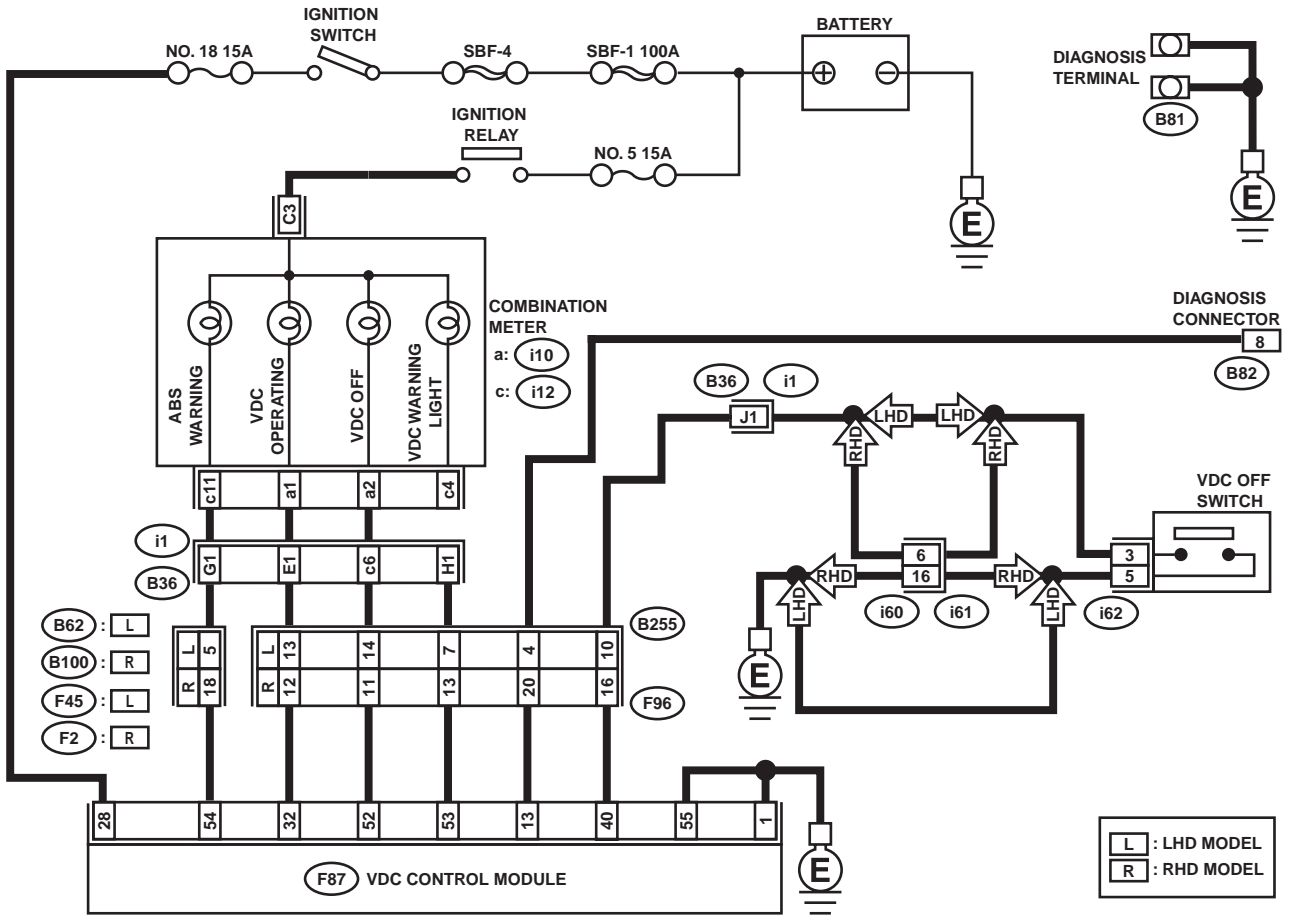


VDC00173

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

- Except 3.0 L model



VDC00172

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DIAGNOSIS TERMINAL. Measure resistance between diagnosis terminals (B81) and chassis ground. Terminals <i>Diagnosis terminal (A) — Chassis ground:</i> <i>Diagnosis terminal (B) — Chassis ground:</i> Is the measured value less than the specified value?	0.5 Ω	Go to step 2.	Repair diagnosis terminal harness.
2 CHECK DIAGNOSIS LINE. 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from VDCCM. 4) Measure resistance between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 13 — Chassis ground:</i> Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair harness connector between VDCCM and diagnosis connector.
3 CHECK POOR CONTACT IN VDCCM CONNECTOR. Is there poor contact in VDCCM connector?	There is poor contact.	Repair connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

F: DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH)

NOTE:

For diagnostic procedure, refer to DTC 27. <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

G: DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH)

NOTE:

For diagnostic procedure, refer to DTC 27. <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

H: DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH)

NOTE:

For diagnostic procedure, refer to DTC 27. <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

I: DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH)

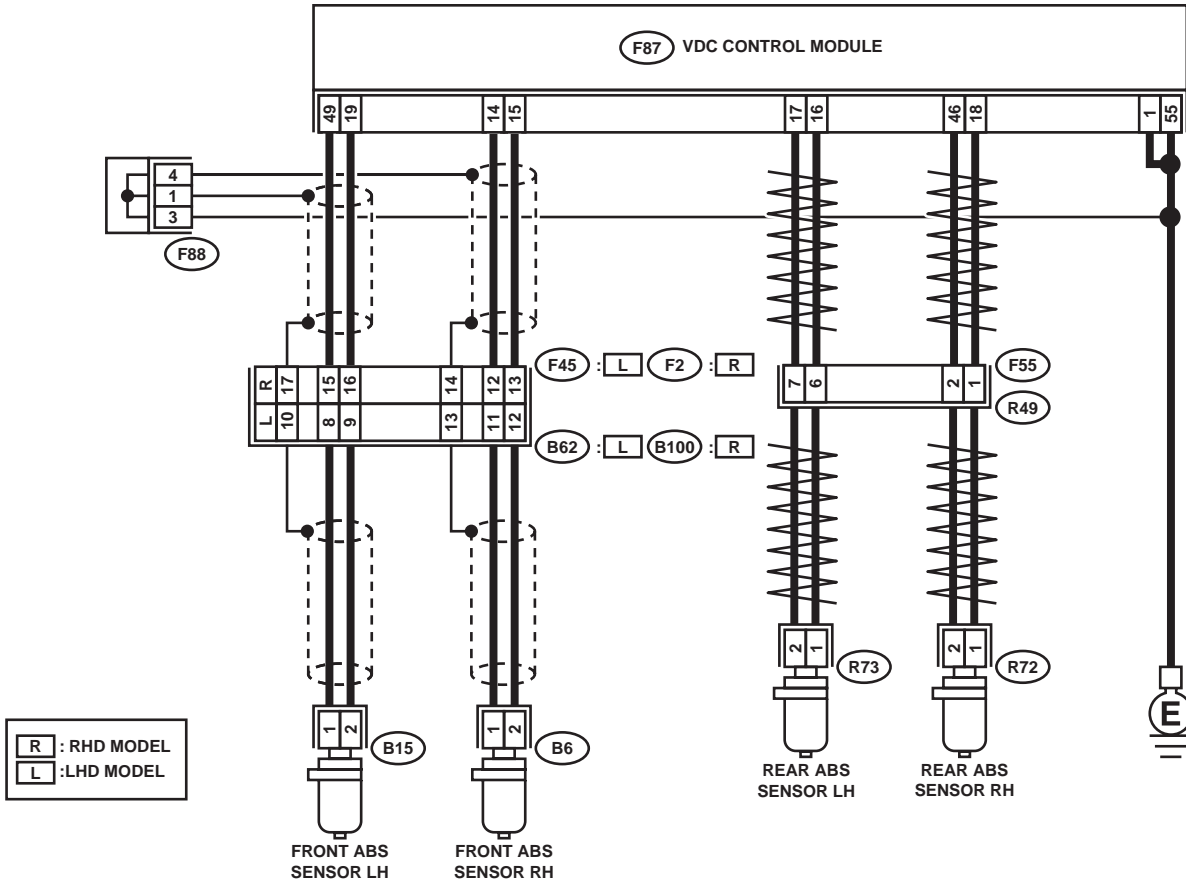
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

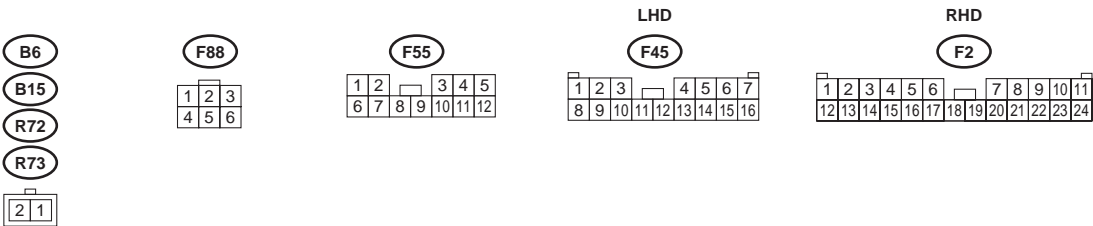
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



R : RHD MODEL
L : LHD MODEL



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00174

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK ABS SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals.</p> <p>Terminal Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:</p> <p>Is the measured value within the specified range?</p>	1.0 — 1.5 k Ω	Go to step 2.	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>2 CHECK BATTERY SHORT OF ABS SENSOR.</p> <p>1) Disconnect connector from VDCCM. 2) Measure voltage between ABS sensor and chassis ground.</p> <p>Terminal Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 1 (+) — Chassis ground (-): Rear LH No. 1 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 3.	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>3 CHECK BATTERY SHORT OF ABS SENSOR.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground.</p> <p>Terminal Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 1 (+) — Chassis ground (-): Rear LH No. 1 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 4.	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>4 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between VDCCM connector terminals.</p> <p>Connector & terminal DTC 21 / (F87) No. 14 — No. 15: DTC 23 / (F87) No. 49 — No. 19: DTC 25 / (F87) No. 18 — No. 46: DTC 27 / (F87) No. 16 — No. 17:</p> <p>Is the measured value within the specified range?</p>	1.0 — 1.5 k Ω	Go to step 5.	Repair harness/connector between VDCCM and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM connector and chassis ground. Connector & terminal DTC 21 / (F87) No. 14 (+) — Chassis ground (-): DTC 23 / (F87) No. 49 (+) — Chassis ground (-): DTC 25 / (F87) No. 18 (+) — Chassis ground (-): DTC 27 / (F87) No. 16 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 6.	Repair harness between VDCCM and ABS sensor.
<p>6 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal DTC 21 / (F87) No. 14 (+) — Chassis ground (-): DTC 23 / (F87) No. 49 (+) — Chassis ground (-): DTC 25 / (F87) No. 18 (+) — Chassis ground (-): DTC 27 / (F87) No. 16 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 7.	Repair harness between VDCCM and ABS sensor.
<p>7 CHECK INSTALLATION OF ABS SENSOR. Tightening torque: 33±10 N·m (3.3±1.0 kgf·m, 24±7 ft·lb) Are the ABS sensor installation bolts tightened securely?</p>	Tightened securely.	Go to step 8.	Tighten ABS sensor installation bolts securely.
<p>8 CHECK ABS SENSOR GAP. Measure tone wheel-to-pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?</p>	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step 9.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
<p>9 CHECK HUB AND TONE WHEEL RUNOUT. Measure hub and tone wheel runout. Is the measured value less than the specified value?</p>	0.05 mm (0.0020 in)	Go to step 10.	Repair hub and tone wheel. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>10 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and ABS sensor?</p>	There is poor contact.	Repair connector.	Go to step 11.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
11 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Mod- ule (VDCCM).>	Go to step 12 .
12 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between VDCCM and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

J: DTC 22 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH)

NOTE:

For diagnostic procedure, refer to DTC 28. <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

K: DTC 24 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH)

NOTE:

For diagnostic procedure, refer to DTC 28. <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

L: DTC 26 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH)

NOTE:

For diagnostic procedure, refer to DTC 28. <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

M: DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH)

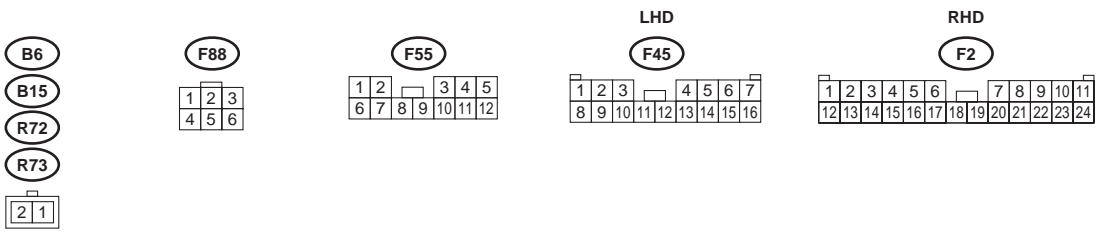
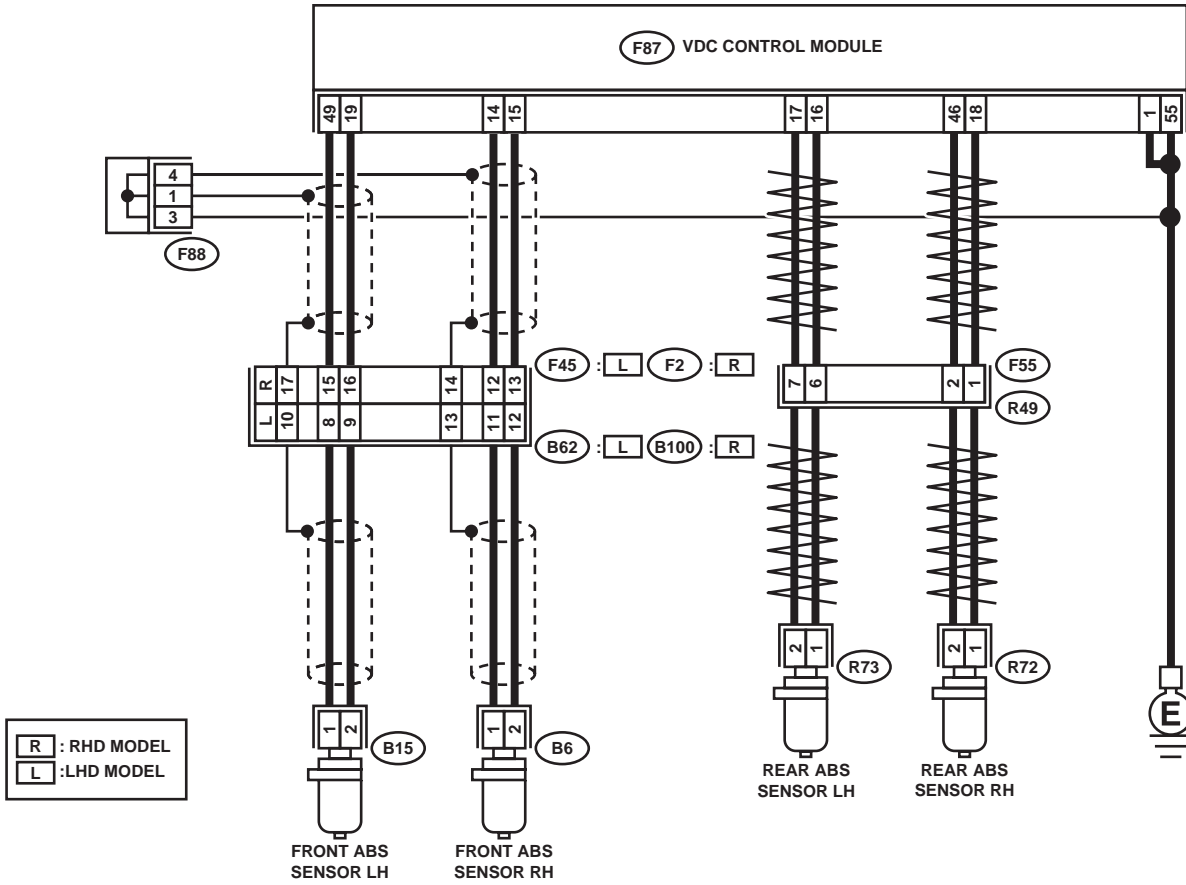
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00174

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INSTALLATION OF ABS SENSOR. Tightening torque: 32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb) Are the ABS sensor installation bolts tightened securely?	Tightened securely.	Go to step 2.	Tighten ABS sensor installation bolts securely.
2 CHECK ABS SENSOR GAP. Measure tone wheel to pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step 3.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
3 CHECK OSCILLOSCOPE. Is an oscilloscope available?	Available.	Go to step 4.	Go to step 5.
4 CHECK ABS SENSOR SIGNAL. 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. Connector & terminal DTC 22 / (F87) No. 14 (+) — No. 15 (-): DTC 24 / (F87) No. 49 (+) — No. 19 (-): DTC 26 / (F87) No. 18 (+) — No. 46 (-): DTC 28 / (F87) No. 16 (+) — No. 17 (-): Is oscilloscope pattern smooth, as shown in figure?	Smooth pattern.	Go to step 8.	Go to step 5.
5 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL. Remove disc rotor from hub in accordance with diagnostic trouble code. Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Dirt or foreign matter found.	Thoroughly remove dirt or other foreign matter.	Go to step 6.
6 CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL. Are there broken or damaged in the ABS sensor pole piece or the tone wheel?	Broken or damaged.	Replace ABS sensor or tone wheel. Front <Ref. to VDC-27, Front ABS Sensor.> and <Ref. to VDC-29, Front Tone Wheel.> Rear <Ref. to VDC-28, Rear ABS Sensor.> and <Ref. to VDC-30, Rear Tone Wheel.>	Go to step 7.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value less than the specified value?</p>	0.05 mm (0.0020 in)	Go to step 8 .	Repair tone wheel. Front <Ref. to VDC-29, Front Tone Wheel.> Rear <Ref. to VDC-30, Rear Tone Wheel.>
<p>8 CHECK RESISTANCE OF ABS SENSOR. 1) Turn ignition switch OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. Terminal Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2: Is the measured value within the specified range?</p>	1.0 — 1.5 kΩ	Go to step 9 .	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>9 CHECK GROUND SHORT OF ABS SENSOR. Measure resistance between ABS sensor and chassis ground. Terminal Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 10 .	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>10 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR. 1) Connect connector to ABS sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance at VDCCM connector terminals. Connector & terminal DTC 22 / (F87) No. 14 — No. 15: DTC 24 / (F87) No. 49 — No. 19: DTC 26 / (F87) No. 18 — No. 46: DTC 28 / (F87) No. 16 — No. 17: Is the measured value within the specified range?</p>	1.0 — 1.5 kΩ	Go to step 11 .	Repair harness/connector between VDCCM and ABS sensor.
<p>11 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM connector and chassis ground. Connector & terminal DTC 22 / (F87) No. 14 — Chassis ground: DTC 24 / (F87) No. 49 — Chassis ground: DTC 26 / (F87) No. 18 — Chassis ground: DTC 28 / (F87) No. 16 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 12 .	Repair harness/connector between VDCCM and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
12 CHECK GROUND CIRCUIT OF VDCCM. Measure resistance between VDCCM and chassis ground. Connector & terminal (F87) No. 1 — Chassis ground: (F87) No. 55 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 13.	Repair VDCCM ground harness.
13 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step 14.
14 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step 15.	Properly install the car telephone or the wireless transmitter.
15 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Installed properly.	Install the noise sources apart from the sensor harness.	Go to step 16.
16 CHECK SHIELD CIRCUIT. 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. Connector & terminal RHD model DTC 22 / (F45) No. 14 — Chassis ground: DTC 24 / (F45) No. 17 — Chassis ground: LHD model DTC 22 / (F45) No. 13 — Chassis ground: DTC 24 / (F45) No. 10 — Chassis ground: Is the measured value less than the specified value? NOTE: For the DTC 26 and 28, Go to step 17.	0.5 Ω	Go to step 17.	Repair shield harness.
17 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 18.
18 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

N: DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR)

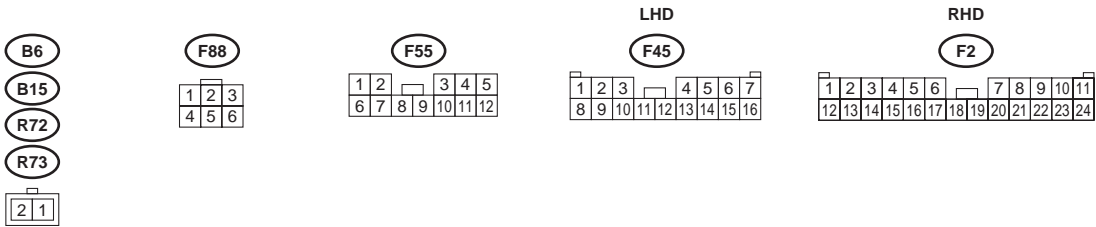
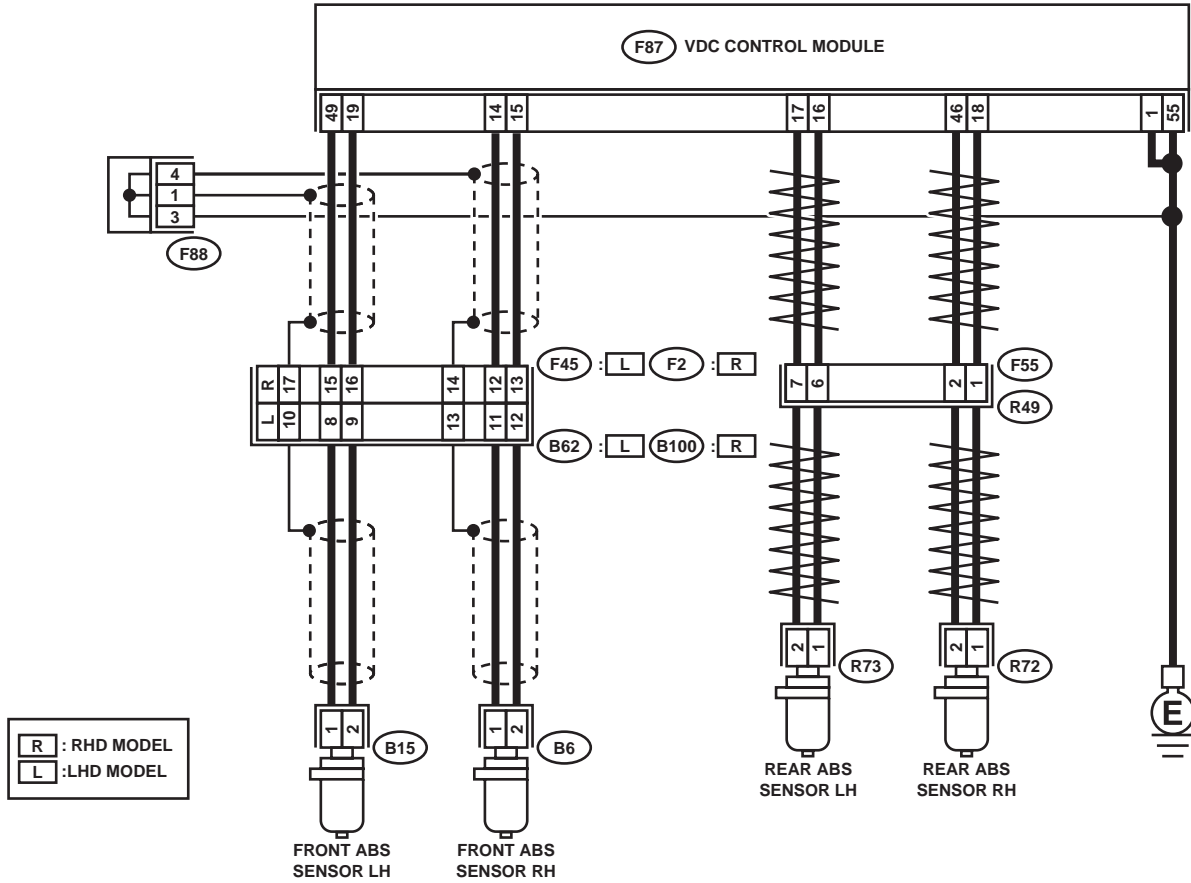
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00174

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK IF THE WHEELS HAVE TURNED FREELY. Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.</p>	Turned freely over 1 minutes.	The VDC is normal. Erase the diagnostic trouble code. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.	Go to step 2.
<p>2 CHECK TIRE SPECIFICATIONS. Are the tire specifications correct?</p>	Correct specification.	Go to step 3.	Replace tire.
<p>3 CHECK WEAR OF TIRE. Is the tire worn excessively?</p>	Worn excessively.	Replace tire.	Go to step 4.
<p>4 CHECK TIRE PRESSURE. Is the tire pressure correct?</p>	Correct tire pressure.	Go to step 5.	Adjust tire pressure.
<p>5 CHECK INSTALLATION OF ABS SENSOR. <i>Tightening torque:</i> 33±10 N·m (3.3±1.0 kgf·m, 24±7 ft·lb) Are the ABS sensor installation bolts tightened securely?</p>	Tightened securely.	Go to step 6.	Tighten ABS sensor installation bolts securely.
<p>6 CHECK ABS SENSOR GAP. Measure tone wheel to pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?</p>	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step 7.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
<p>7 CHECK OSCILLOSCOPE. Is an oscilloscope available?</p>	Available.	Go to step 8.	Go to step 9.
<p>8 CHECK ABS SENSOR SIGNAL. 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. Connector & terminal (F87) No. 14 (+) — No. 15 (-) (Front RH): (F87) No. 49 (+) — No. 19 (-) (Front LH): (F87) No. 18 (+) — No. 46 (-) (Rear RH): (F87) No. 16 (+) — No. 17 (-) (Rear LH): Is oscilloscope pattern smooth, as shown in figure?</p>	Smooth pattern.	Go to step 12.	Go to step 9.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
9 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL. Remove disc rotor from hub. Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Dirt or foreign matter found.	Thoroughly remove dirt or other foreign matter.	Go to step 10 .
10 CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL. Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?	Broken or damaged.	Replace ABS sensor or tone wheel. Front <Ref. to VDC-27, Front ABS Sensor.> and <Ref. to VDC-29, Front Tone Wheel.> Rear <Ref. to VDC-28, Rear ABS Sensor.> and <Ref. to VDC-30, Rear Tone Wheel.>	Go to step 11 .
11 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step 12 .	Repair tone wheel. Front <Ref. to VDC-29, Front Tone Wheel.> Rear <Ref. to VDC-30, Rear Tone Wheel.>
12 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the diagnostic same trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 13 .
13 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

O: DTC 31 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT RH INLET)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

P: DTC 33 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT LH INLET)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

Q: DTC 35 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR RH INLET)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

R: DTC 37 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR LH INLET)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

S: DTC 61 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (PRI- MARY CUT)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

T: DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT)

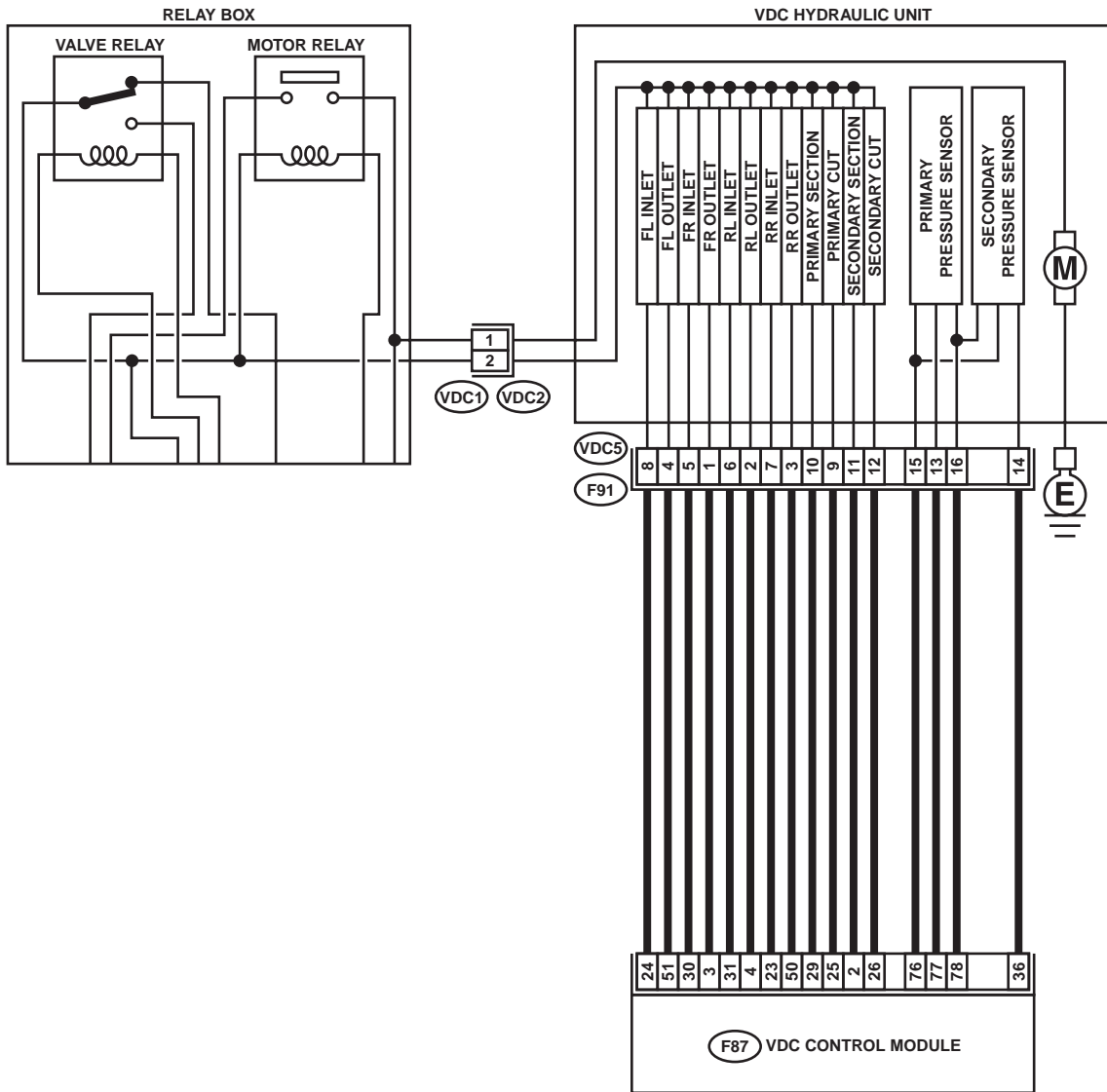
DIAGNOSIS:

- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC1



F91



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00142

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK RESISTANCE OF SOLENOID VALVE.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals.</p> <p>Connector & terminal</p> <p><i>DTC 31/(VDC5) No. 5 — (VDC2) No. 2:</i> <i>DTC 33/(VDC5) No. 8 — (VDC2) No. 2:</i> <i>DTC 35/(VDC5) No. 7 — (VDC2) No. 2:</i> <i>DTC 37/(VDC5) No. 6 — (VDC2) No. 2:</i> <i>DTC 61/(VDC5) No. 9 — (VDC2) No. 2:</i> <i>DTC 62/(VDC5) No. 12 — (VDC2) No. 2:</i></p> <p>Is the measured value within the specified range?</p>	8.04 — 9.04 Ω	Go to step 2.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>2</p> <p>CHECK GROUND SHORT OF SOLENOID VALVE.</p> <p>Measure resistance between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p><i>DTC 31/(VDC5) No. 5 — Chassis ground:</i> <i>DTC 33/(VDC5) No. 8 — Chassis ground:</i> <i>DTC 35/(VDC5) No. 7 — Chassis ground:</i> <i>DTC 37/(VDC5) No. 6 — Chassis ground:</i> <i>DTC 61/(VDC5) No. 9 — Chassis ground:</i> <i>DTC 62/(VDC5) No. 12 — Chassis ground:</i></p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>3</p> <p>CHECK BATTERY SHORT OF SOLENOID VALVE.</p> <p>1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p><i>DTC 31/(VDC5) No. 5 (+) — Chassis ground (-):</i> <i>DTC 33/(VDC5) No. 8 (+) — Chassis ground (-):</i> <i>DTC 35/(VDC5) No. 7 (+) — Chassis ground (-):</i> <i>DTC 37/(VDC5) No. 6 (+) — Chassis ground (-):</i> <i>DTC 61/(VDC5) No. 9 (+) — Chassis ground (-):</i> <i>DTC 62/(VDC5) No. 12 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 4.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>4 CHECK BATTERY SHORT OF SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal <i>DTC 31/(VDC5) No. 5 (+) — Chassis ground (-):</i> <i>DTC 33/(VDC5) No. 8 (+) — Chassis ground (-):</i> <i>DTC 35/(VDC5) No. 7 (+) — Chassis ground (-):</i> <i>DTC 37/(VDC5) No. 6 (+) — Chassis ground (-):</i> <i>DTC 61/(VDC5) No. 9 (+) — Chassis ground (-):</i> <i>DTC 62/(VDC5) No. 12 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>5 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal <i>DTC 31/(F87) No. 30 (+) — Chassis ground (-):</i> <i>DTC 33/(F87) No. 24 (+) — Chassis ground (-):</i> <i>DTC 35/(F87) No. 23 (+) — Chassis ground (-):</i> <i>DTC 37/(F87) No. 31 (+) — Chassis ground (-):</i> <i>DTC 61/(F87) No. 25 (+) — Chassis ground (-):</i> <i>DTC 62/(F87) No. 26 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 6.	Repair harness between VDCCM and VDCH/U.
<p>6 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal <i>DTC 31/(F87) No. 30 (+) — Chassis ground (-):</i> <i>DTC 33/(F87) No. 24 (+) — Chassis ground (-):</i> <i>DTC 35/(F87) No. 23 (+) — Chassis ground (-):</i> <i>DTC 37/(F87) No. 31 (+) — Chassis ground (-):</i> <i>DTC 61/(F87) No. 25 (+) — Chassis ground (-):</i> <i>DTC 62/(F87) No. 26 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 7.	Repair harness between VDCCM and VDCH/U.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. Connector & terminal <i>DTC 31/(F87) No. 30 — Chassis ground:</i> <i>DTC 33/(F87) No. 24 — Chassis ground:</i> <i>DTC 35/(F87) No. 23 — Chassis ground:</i> <i>DTC 37/(F87) No. 31 — Chassis ground:</i> <i>DTC 61/(F87) No. 25 — Chassis ground:</i> <i>DTC 62/(F87) No. 26 — Chassis ground:</i> Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 8 .	Repair harness between VDCCM and VDCH/U.
<p>8 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U. 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. Connector & terminal <i>DTC 31/(F87) No. 30 — (VDC2) No. 2:</i> <i>DTC 33/(F87) No. 24 — (VDC2) No. 2:</i> <i>DTC 35/(F87) No. 23 — (VDC2) No. 2:</i> <i>DTC 37/(F87) No. 31 — (VDC2) No. 2:</i> <i>DTC 61/(F87) No. 25 — (VDC2) No. 2:</i> <i>DTC 62/(F87) No. 26 — (VDC2) No. 2:</i> Is the measured value within the specified range?</p>	7 — 10 Ω	Go to step 9 .	Repair harness/connector between VDCCM and VDCH/U.
<p>9 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and VDCH/U?</p>	There is poor contact.	Repair connector.	Go to step 10 .
<p>10 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Repair VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 11 .
<p>11 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?</p>	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

U: DTC 32 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT RH OUTLET)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

V: DTC 34 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT LH OUTLET)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

W: DTC 36 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR RH OUTLET)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

X: DTC 38 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR LH OUTLET)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

Y: DTC 63 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (PRIMARY SUCTION)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Z: DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION)

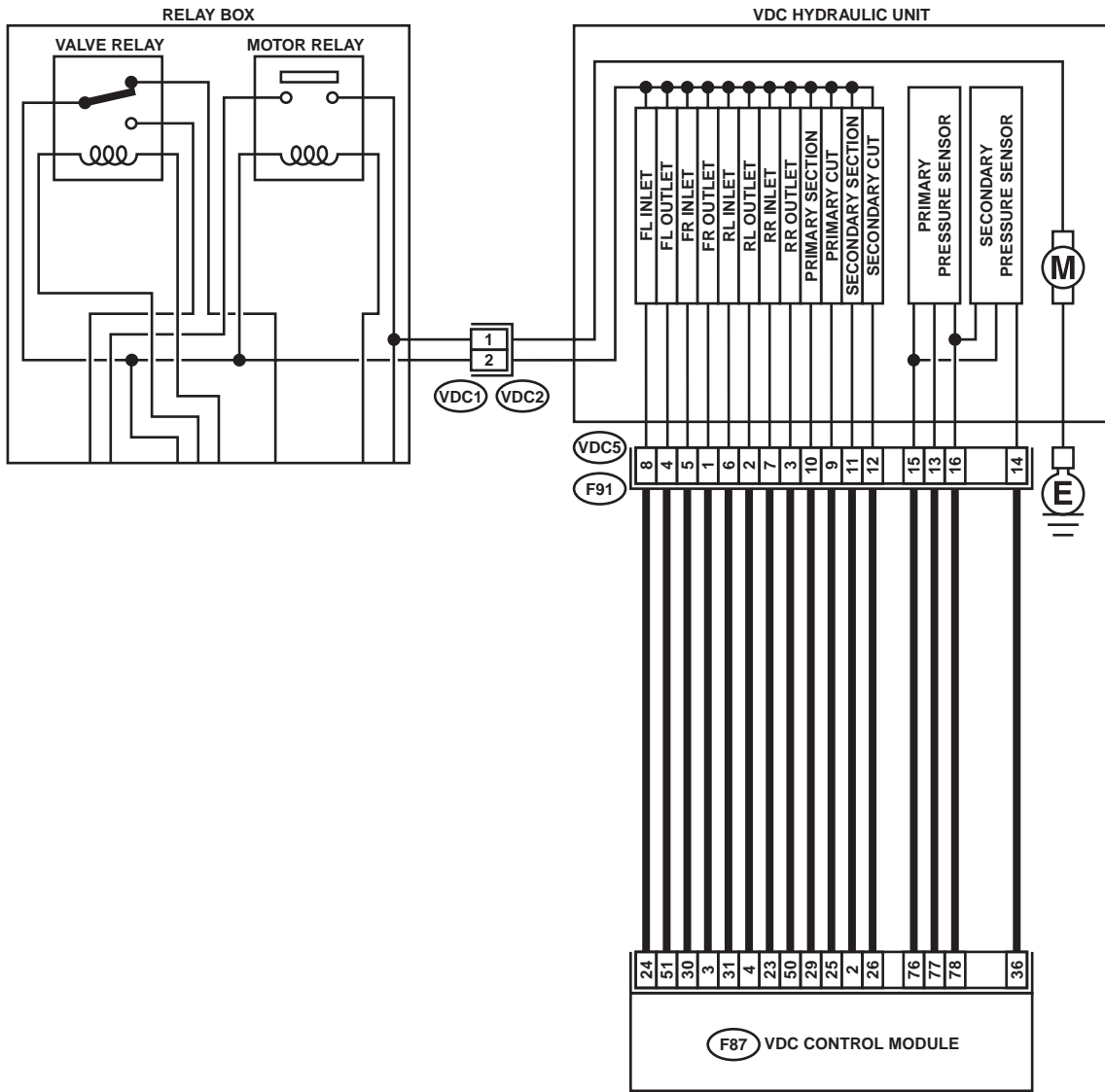
DIAGNOSIS:

- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC1



F91



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00142

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK RESISTANCE OF SOLENOID VALVE.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals.</p> <p>Connector & terminal DTC 32/(VDC5) No. 1 — (VDC2) No. 2: DTC 34/(VDC5) No. 4 — (VDC2) No. 2: DTC 36/(VDC5) No. 3 — (VDC2) No. 2: DTC 38/(VDC5) No. 2 — (VDC2) No. 2: DTC 63/(VDC5) No. 10 — (VDC2) No. 2: DTC 64/(VDC5) No. 11 — (VDC2) No. 2:</p> <p>Is the measured value within the specified range?</p>	3.8 — 4.8 Ω	Go to step 2.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>2</p> <p>CHECK GROUND SHORT OF SOLENOID VALVE.</p> <p>Measure resistance between VDCH/U connector and chassis ground.</p> <p>Connector & terminal DTC 32/(VDC5) No. 1 — Chassis ground: DTC 34/(VDC5) No. 4 — Chassis ground: DTC 36/(VDC5) No. 3 — Chassis ground: DTC 38/(VDC5) No. 2 — Chassis ground: DTC 63/(VDC5) No. 10 — Chassis ground: DTC 64/(VDC5) No. 11 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>3</p> <p>CHECK BATTERY SHORT OF SOLENOID VALVE.</p> <p>1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal DTC 32/(VDC5) No. 1 (+) — Chassis ground (-): DTC 34/(VDC5) No. 4 (+) — Chassis ground (-): DTC 36/(VDC5) No. 3 (+) — Chassis ground (-): DTC 38/(VDC5) No. 2 (+) — Chassis ground (-): DTC 63/(VDC5) No. 10 (+) — Chassis ground (-): DTC 64/(VDC5) No. 11 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 4.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>4 CHECK BATTERY SHORT OF SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal <i>DTC 32/(VDC5) No. 1 (+) — Chassis ground (-):</i> <i>DTC 34/(VDC5) No. 4 (+) — Chassis ground (-):</i> <i>DTC 36/(VDC5) No. 3 (+) — Chassis ground (-):</i> <i>DTC 38/(VDC5) No. 2 (+) — Chassis ground (-):</i> <i>DTC 63/(VDC5) No. 10 (+) — Chassis ground (-):</i> <i>DTC 64/(VDC5) No. 11 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>5 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal <i>DTC 32/(F87) No. 3 (+) — Chassis ground (-):</i> <i>DTC 34/(F87) No. 51 (+) — Chassis ground (-):</i> <i>DTC 36/(F87) No. 50 (+) — Chassis ground (-):</i> <i>DTC 38/(F87) No. 4 (+) — Chassis ground (-):</i> <i>DTC 63/(F87) No. 29 (+) — Chassis ground (-):</i> <i>DTC 64/(F87) No. 2 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 6.	Repair harness between VDCCM and VDCH/U.
<p>6 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal <i>DTC 32/(F87) No. 3 (+) — Chassis ground (-):</i> <i>DTC 34/(F87) No. 51 (+) — Chassis ground (-):</i> <i>DTC 36/(F87) No. 50 (+) — Chassis ground (-):</i> <i>DTC 38/(F87) No. 4 (+) — Chassis ground (-):</i> <i>DTC 63/(F87) No. 29 (+) — Chassis ground (-):</i> <i>DTC 64/(F87) No. 2 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 7.	Repair harness between VDCCM and VDCH/U.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. Connector & terminal <i>DTC 32/(F87) No. 3 — Chassis ground:</i> <i>DTC 34/(F87) No. 51 — Chassis ground:</i> <i>DTC 36/(F87) No. 50 — Chassis ground:</i> <i>DTC 38/(F87) No. 4 — Chassis ground:</i> <i>DTC 63/(F87) No. 29 — Chassis ground:</i> <i>DTC 64/(F87) No. 2 — Chassis ground:</i> Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 8 .	Repair harness between VDCCM and VDCH/U.
<p>8 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U. 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. Connector & terminal <i>DTC 32/(F87) No. 3 — (VDC2) No. 1:</i> <i>DTC 34/(F87) No. 51 — (VDC2) No. 1:</i> <i>DTC 36/(F87) No. 50 — (VDC2) No. 1:</i> <i>DTC 38/(F87) No. 4 — (VDC2) No. 1:</i> <i>DTC 63/(F87) No. 29 — (VDC2) No. 1:</i> <i>DTC 64/(F87) No. 2 — (VDC2) No. 1:</i> Is the measured value within the specified range?</p>	3 — 6 Ω	Go to step 9 .	Repair harness/connector between VDCCM and VDCH/U.
<p>9 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and VDCH/U?</p>	There is poor contact.	Repair connector.	Go to step 10 .
<p>10 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 11 .
<p>11 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?</p>	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AA:DTC 41 ABNORMAL VDC CONTROL MODULE

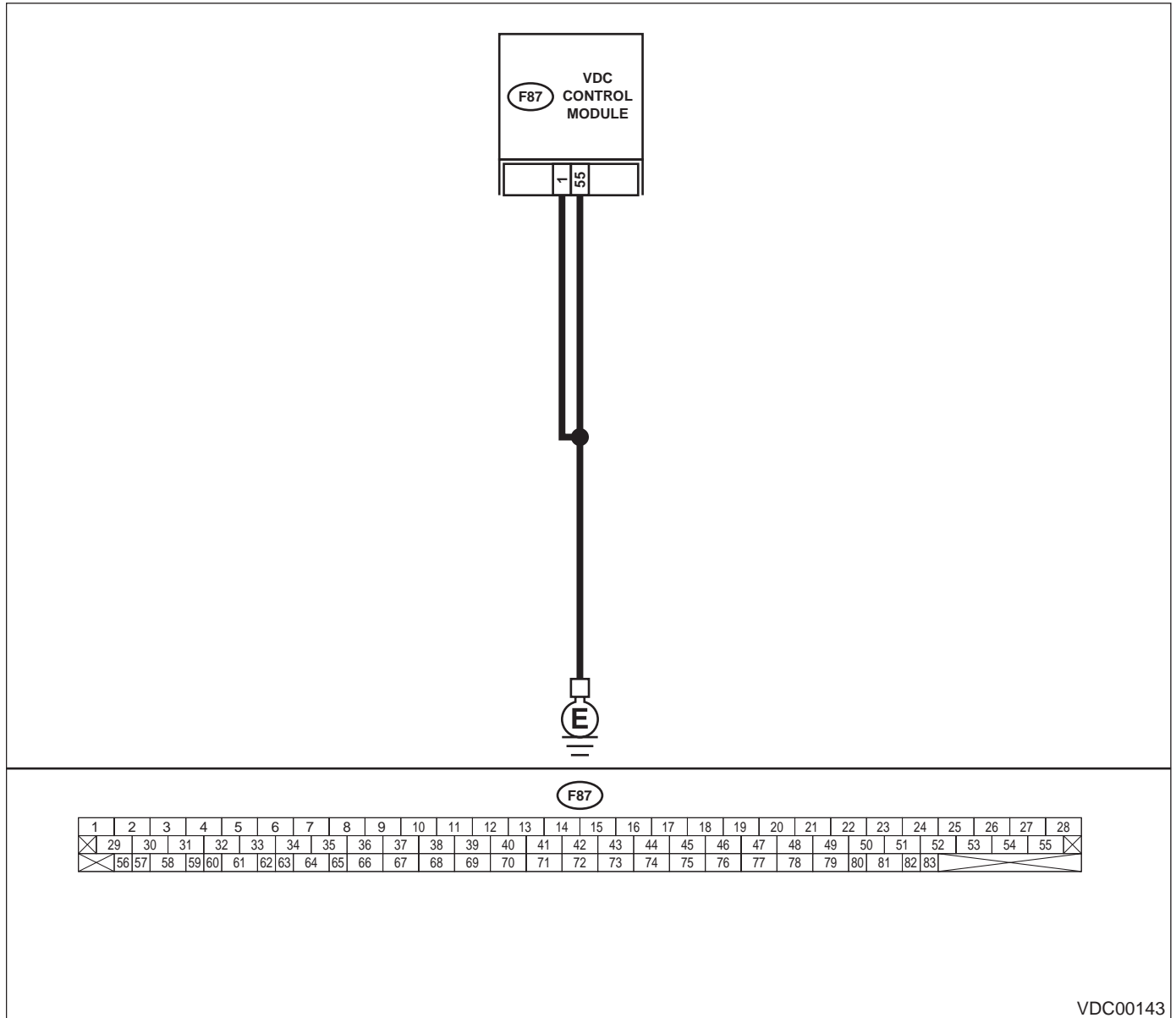
DIAGNOSIS:

- Faulty VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK GROUND CIRCUIT OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM and chassis ground. Connector & terminal <i>(F87) No. 1 — Chassis ground:</i> <i>(F87) No. 55 — Chassis ground:</i> Is the measured value less than the specified value?	0.5 Ω	Go to step 2.	Repair VDCCM ground harness.
2 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between battery, ignition switch and VDCCM?	There is poor contact.	Repair connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Tightened securely.	Go to step 4.	Properly install the car telephone or the wireless transmitter.
4 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Installed properly.	Install the noise sources apart from the sensor harness.	Go to step 5.
5 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 6.
6 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AB:DTC 42 SOURCE VOLTAGE IS ABNORMAL.

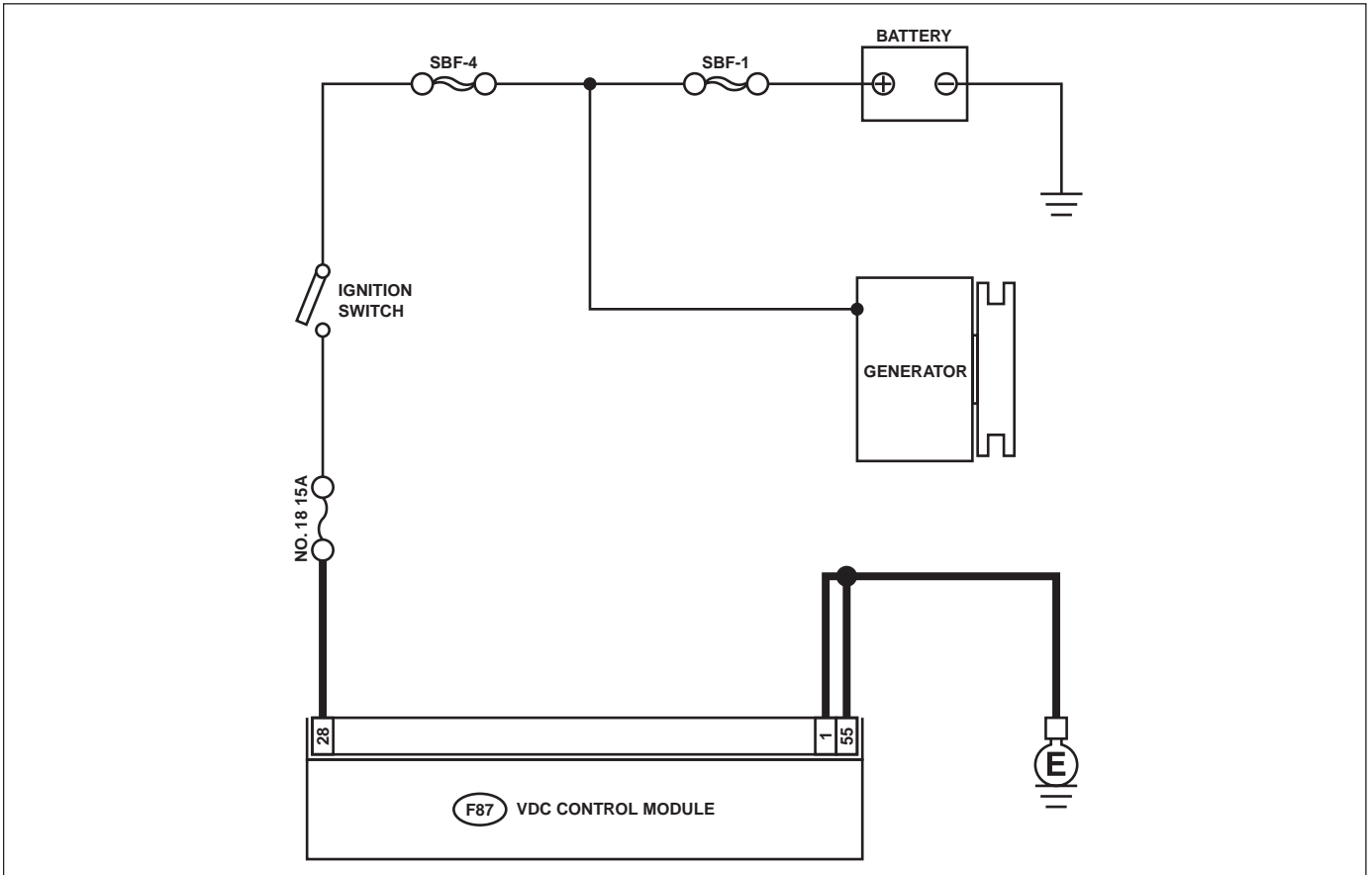
DIAGNOSIS:

- Power source voltage of the VDCCM is low.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗	
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	⊗

VDC00144

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK GENERATOR. 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. Terminal Generator B terminal — Chassis ground: Is the measured value within the specified range?	10 — 15 V	Go to step 2.	Repair generator.
2 CHECK BATTERY TERMINAL. Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Clamped securely.	Go to step 3.	Tighten the clamp of terminal.
3 CHECK INPUT VOLTAGE OF VDCCM. 1) Disconnect connector from VDCCM. 2) Run the engine at idle. 3) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 28 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Go to step 4.	Repair harness connector between battery, ignition switch and VDCCM.
4 CHECK GROUND CIRCUIT OF VDCCM. 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 1 — Chassis ground: (F87) No. 55 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 5.	Repair VDCCM ground harness.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and VDCCM?	There is poor contact.	Repair connector.	Go to step 6.
6 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 7.
7 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AC:DTC 43 FAULTY VDCCM — ECM COMMUNICATION LINE

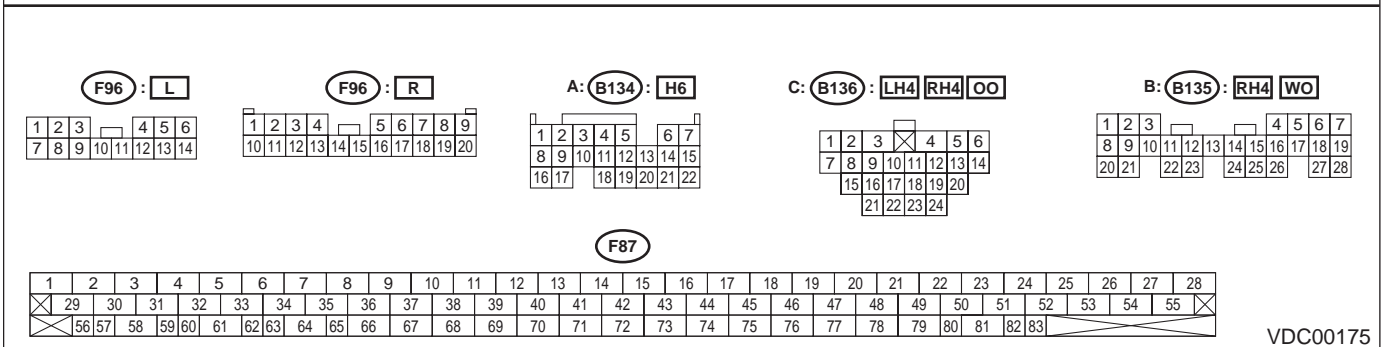
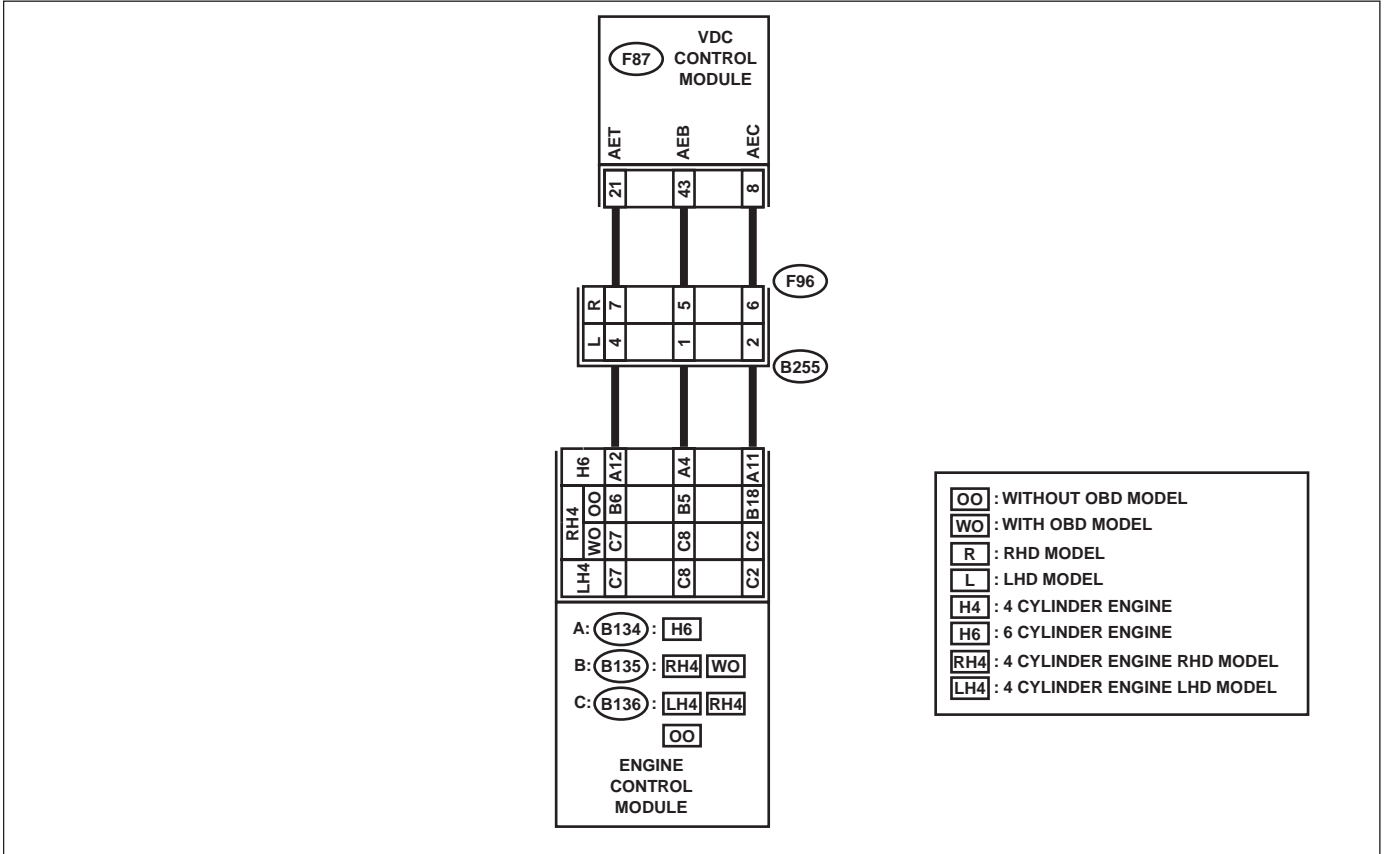
DIAGNOSIS:

- AET communication line is broken or short circuited.
- AEB communication line is broken or short circuited.
- AEC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM.</p> <p>Connector & terminal</p> <p>H4 engine RHD without OBD model (F87) No. 21 — (B136) No. 7: (F87) No. 43 — (B136) No. 8: (F87) No. 8 — (B136) No. 2:</p> <p>H4 engine RHD with OBD model (F87) No. 21 — (B135) No. 6: (F87) No. 43 — (B135) No. 5: (F87) No. 8 — (B135) No. 18:</p> <p>H4 engine LHD model (F87) No. 21 — (B136) No. 7: (F87) No. 43 — (B136) No. 8: (F87) No. 8 — (B136) No. 2:</p> <p>H6 engine model (F87) No. 21 — (B134) No. 12: (F87) No. 43 — (B134) No. 4: (F87) No. 8 — (B134) No. 11:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Repair harness/connector between VDCCM and ECM.
<p>2 CHECK GROUND SHORT OF HARNESS.</p> <p>Measure resistance between VDCCM connector and chassis ground.</p> <p>Connector & terminal</p> <p>(F87) No. 21 — Chassis ground: (F87) No. 43 — Chassis ground: (F87) No. 8 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair harness/connector between VDCCM and ECM.
<p>3 CHECK BATTERY SHORT OF HARNESS.</p> <p>Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal</p> <p>(F87) No. 21 (+) — Chassis ground (-): (F87) No. 43 (+) — Chassis ground (-): (F87) No. 8 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 4.	Repair harness/connector between VDCCM and ECM.
<p>4 CHECK BATTERY SHORT OF HARNESS.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal</p> <p>(F87) No. 21 (+) — Chassis ground (-): (F87) No. 43 (+) — Chassis ground (-): (F87) No. 8 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Repair harness/connector between VDCCM and ECM.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 21 (+) — Chassis ground (-): (F87) No. 43 (+) — Chassis ground (-): (F87) No. 8 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	10 — 15 V	Go to step 6.	Go to step 9.
<p>6 CHECK POOR CONTACT IN CONNECTORS.</p> <p>Is there poor contact in connectors between ECM and VDCCM?</p>	There is poor contact.	Repair connector.	Go to step 7.
<p>7 CHECK VDCCM.</p> <p>1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.</p> <p>Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 8.
<p>8 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.</p> <p>Are other diagnostic trouble codes being output?</p>	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
<p>9 CHECK ECM.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground.</p> <p>Connector & terminal H4 engine RHD without OBD model (B136) No. 7 (+) — Chassis ground (-): (B136) No. 8 (+) — Chassis ground (-): (B136) No. 2 (+) — Chassis ground (-): H4 engine RHD with OBD model (B135) No. 6 (+) — Chassis ground (-): (B135) No. 5 (+) — Chassis ground (-): (B135) No. 18 (+) — Chassis ground (-): H4 engine LHD model (B136) No. 7 (+) — Chassis ground (-): (B136) No. 8 (+) — Chassis ground (-): (B136) No. 2 (+) — Chassis ground (-): H6 engine model (B134) No. 12 (+) — Chassis ground (-): (B134) No. 4 (+) — Chassis ground (-): (B134) No. 11 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	10 — 15 V	Repair harness/connector between ECM and VDCCM.	Go to step 10.
<p>10 CHECK POOR CONTACT IN CONNECTORS.</p> <p>Is there poor contact in connector ECM?</p>	There is poor contact.	Repair connector.	Go to step 11.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
11 CHECK ENGINE. Is the engine functioning normally?	Operates properly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AD:DTC 44 A COMMUNICATION WITH AT CONTROL ABNORMAL

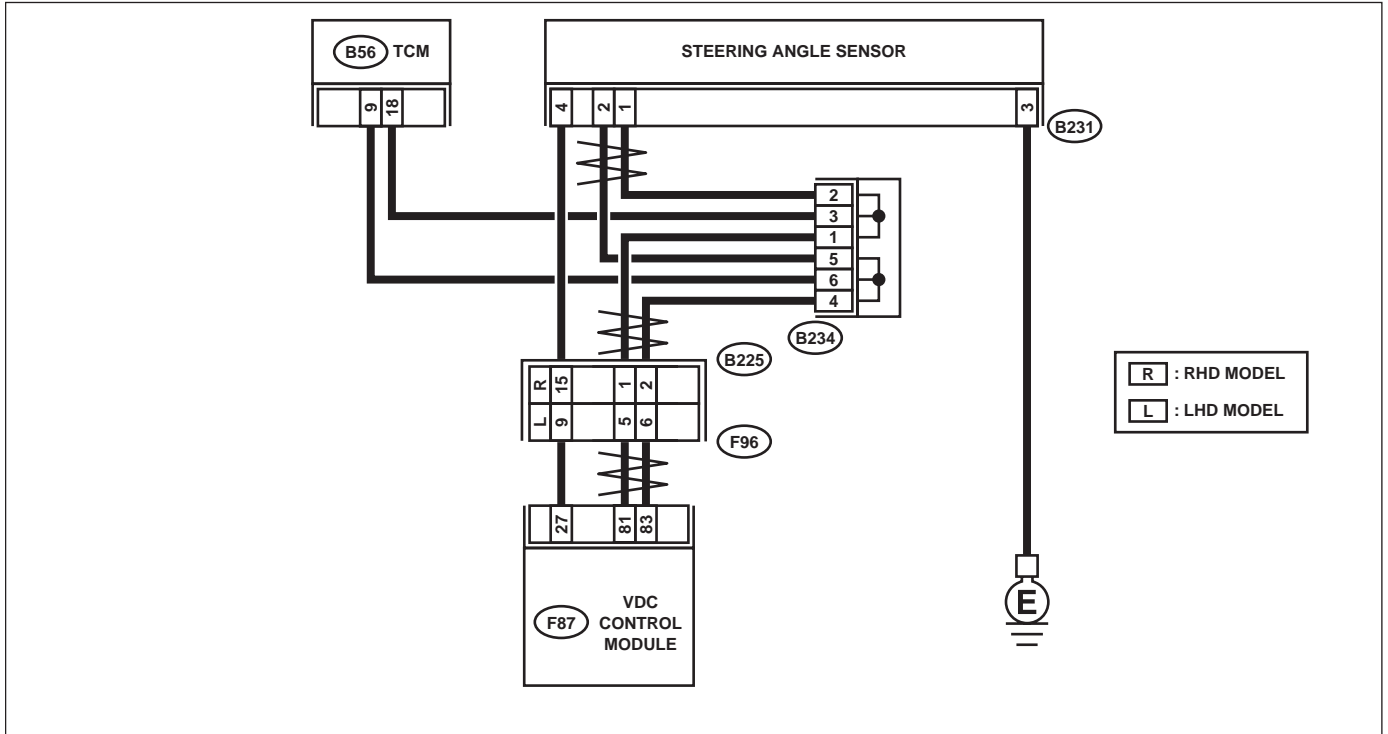
DIAGNOSIS:

- Communication with AT control faults

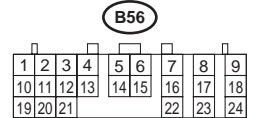
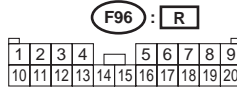
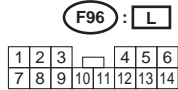
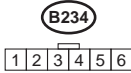
TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



R : RHD MODEL
L : LHD MODEL



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗	
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	⊗

VDC00176

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK RESISTANCE OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Measure resistance between TCM connector terminals. Connector & terminal (B56) No. 9 — No. 18: Is the measured value within the specified range?	57 — 63 Ω	Go to step 2.	Repair harness between TCM and VDCCM.
2 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in TCM connectors?	There is poor contact.	Repair connector.	Go to step 3.
3 CHECK TCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>	Go to step 4.
4 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AE:DTC 45 CONTROL MODULE OUT OF SPECIFICATION

DIAGNOSIS:

- Control module out of specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step	Value	Yes	No
1 CHECK TCM. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step 2.	Proceed with the diagnosis corresponding to the diagnostic trouble code.
2 CHECK VDCCM SPECIFICATIONS. Check the VDCCM identification mark. VDCCM identification mark <i>H4 engine model</i> K <i>OUTBACK H4 engine model</i> M <i>OUTBACK H6 engine model</i> N <i>H4 engine model for Australia</i> J <i>H6 engine model for Australia OUTBACK</i> Y Does the VDCCM identification mark agree with the vehicle specifications?	Agree.	Go to step 3.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3 CHECK TCM SPECIFICATIONS. Check the TCM identification mark. TCM identification mark <i>LHD H4 engine model</i> YZ <i>RHD H4 engine model</i> ZG <i>LHD OUTBACK H4 engine model</i> ZB <i>RHD OUTBACK H4 engine model</i> ZJ <i>LHD OUTBACK H6 engine model</i> ZD <i>RHD OUTBACK H6 engine model</i> ZL Does the TCM identification mark agree with the vehicle specifications?	Agree.	Go to step 4.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
4 CHECK TCM. 1) Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).> 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step 5.	The original TCM has been faulty.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
5 CHECK VDCCM. 1) Install original TCM. 2) Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).> 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step 6.	The original VDCCM has been faulty.
6 CHECK VDCCM. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>	Proceed with the diagnosis corresponding to the diagnostic trouble code.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AF:DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY

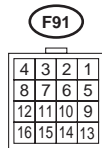
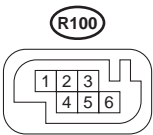
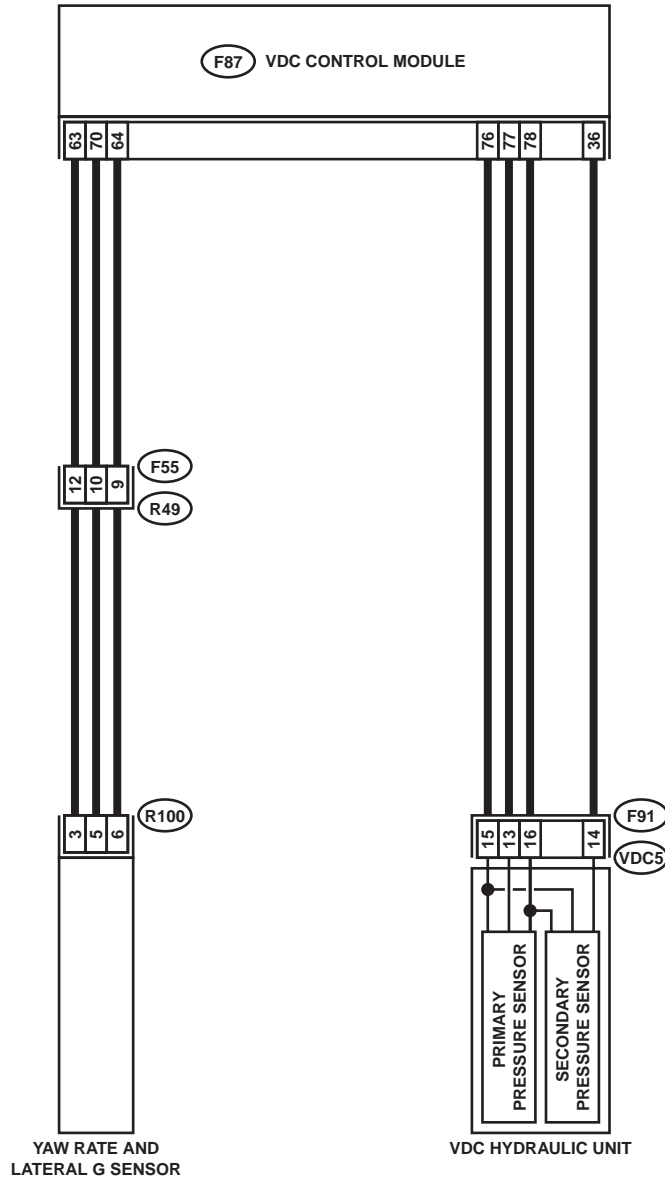
DIAGNOSIS:

- 5 volt power supply is abnormal.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	

VDC00177

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND SHORT OF SENSOR AND HARNESS. 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 63 — Chassis ground (Lateral G sensor):</i> <i>(F87) No. 78 — Chassis ground (Pressure sensor):</i> Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Go to step 2.
<p>2 CHECK GROUND SHORT OF HARNESS. 1) Disconnect connector from faulty sensors. 2) Measure resistance between VDCCM and chassis ground. Connector & terminal <i>(F87) No. 63 — Chassis ground (Lateral G sensor):</i> <i>(F87) No. 78 — Chassis ground (Pressure sensor):</i> Does the measured value exceed the specified value?</p>	1 MΩ	Replace faulty sensors.	Repair or replace harness connector between VDCCM and faulty sensor.
<p>3 CHECK BATTERY SHORT OF SENSOR AND HARNESS. Measure voltage between VDCCM and chassis ground. Connector & terminal <i>(F87) No. 63 (+) — Chassis ground (-) (Lateral G sensor):</i> <i>(F87) No. 78 (+) — Chassis ground (-) (Pressure sensor):</i> Is the measured value less than the specified value?</p>	0.5 V	Go to step 4.	Go to step 5.
<p>4 CHECK BATTERY SHORT OF SENSOR AND HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 63 (+) — Chassis ground (-) (Lateral G sensor):</i> <i>(F87) No. 78 (+) — Chassis ground (-) (Pressure sensor):</i> Is the measured value less than the specified value?</p>	0.5 V	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
<p>5 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from faulty sensors. 3) Measure voltage between VDCCM and chassis ground. Connector & terminal <i>(F87) No. 63 (+) — Chassis ground (-) (Lateral G sensor):</i> <i>(F87) No. 78 (+) — Chassis ground (-) (Pressure sensor):</i> Is the measured value less than the specified value?</p>	0.5 V	Go to step 6.	Repair or replace harness connector between VDCCM and faulty sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground.</p> <p>Connector & terminal <i>(F87) No. 63 (+) — Chassis ground (-)</i> <i>(Lateral G sensor):</i> <i>(F87) No. 78 (+) — Chassis ground (-)</i> <i>(Pressure sensor):</i></p> <p>Is the measured value less than the specified value?</p>	0.5 V	Replace faulty sensor.	Repair or replace harness connector between VDCCM and faulty sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AG:DTC 47 FAULTY CAN COMMUNICATION LINE

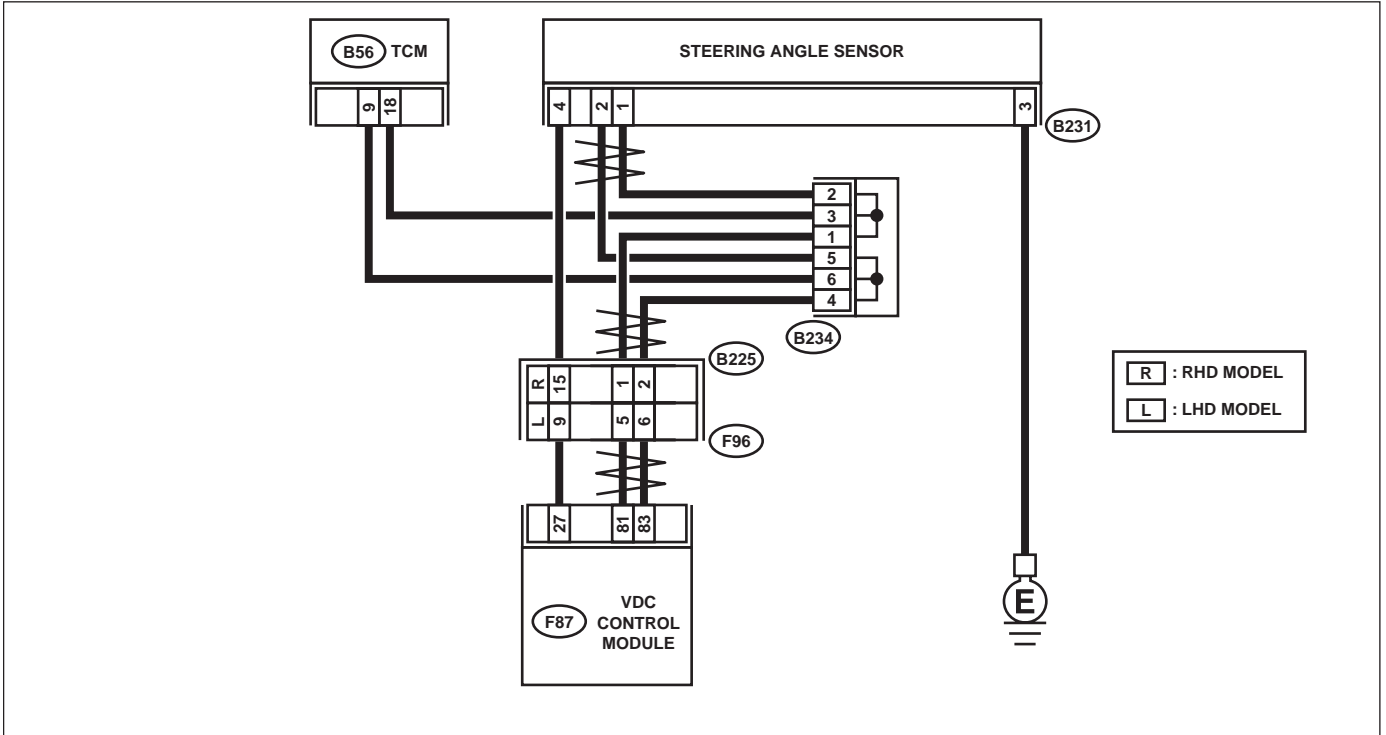
DIAGNOSIS:

- CAN communication line is broken or short circuited.

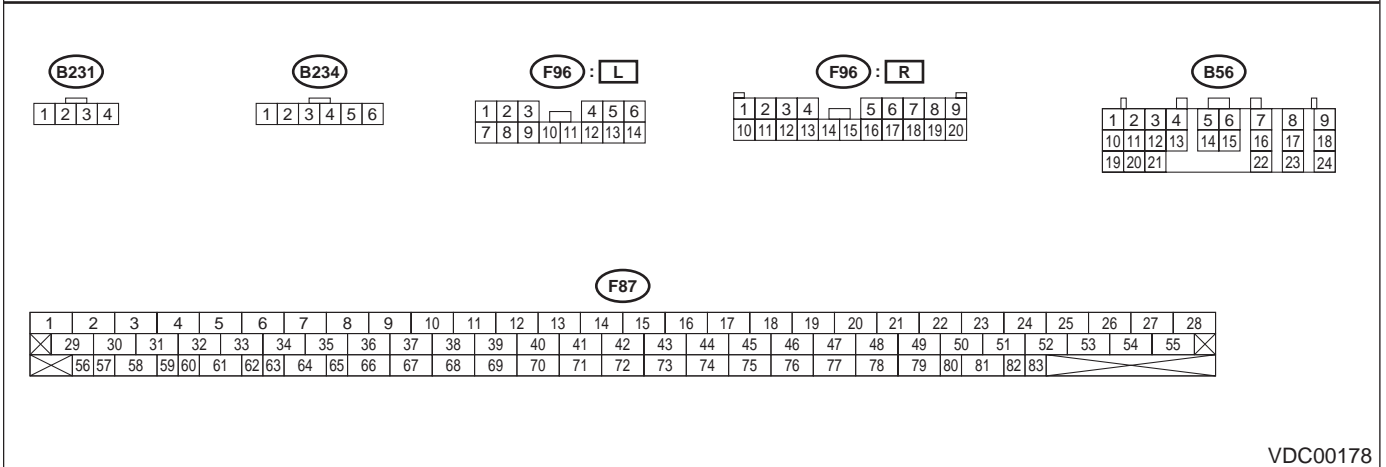
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



R : RHD MODEL
L : LHD MODEL



VDC00178

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN VDCCM, STEERING ANGLE SENSOR AND TCM.</p> <p>1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM, TCM and steering angle sensor. 3) Measure resistance between VDCCM, TCM and steering angle sensor.</p> <p>Connector & terminal (F87) No. 83 — (B56) No. 9: (F87) No. 81 — (B56) No. 18: (F87) No. 83 — (B231) No. 2: (F87) No. 81 — (B231) No. 1:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Go to step 2.
<p>2 CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND TCM.</p> <p>Measure resistance between TCM and steering angle sensor.</p> <p>Connector & terminal (B56) No. 9 — (B231) No. 2: (B56) No. 18 — (B231) No. 1:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Repair or replace harness connector between VDCCM and steering angle sensor.	Repair or replace harness connector between TCM and steering angle sensor.
<p>3 CHECK GROUND SHORT OF HARNESS.</p> <p>Measure resistance between VDCCM and chassis ground.</p> <p>Connector & terminal (F87) No. 83 — Chassis ground: (F87) No. 81 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
<p>4 CHECK BATTERY SHORT OF SENSOR.</p> <p>Measure voltage between VDCCM and chassis ground.</p> <p>Connector & terminal (F87) No. 83 — Chassis ground: (F87) No. 81 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 5.	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
<p>5 CHECK BATTERY SHORT OF SENSOR.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground.</p> <p>Connector & terminal (F87) No. 83 — Chassis ground: (F87) No. 81 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 6.	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
<p>6 CHECK STEERING ANGLE SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Connect connector to steering angle sensor. 3) Measure resistance between VDCCM connector terminals.</p> <p>Connector & terminal (F87) No. 83 — No. 81:</p> <p>Is the measured value within the specified range?</p>	114 — 126 Ω	Go to step 8.	Go to step 7.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in steering angle sensor?	There is poor contact.	Replace steering angle sensor.	Repair or replace steering angle sensor connector.
8 CHECK VDCCM. 1) Connect connector to VDCCM. 2) Disconnect connector from steering angle sensor. 3) Measure resistance between steering angle sensor connector terminals. Connector & terminal (B231) No. 1 — No. 2: Is the measured value within the specified range?	114 — 126 Ω	Go to step 10.	Go to step 9.
9 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in steering angle sensor?	There is poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair or replace VDCCM connector.
10 CHECK TCM. 1) Connect connector to TCM. 2) Disconnect connector from VDCCM. 3) Measure resistance between steering angle sensor terminals. Connector & terminal (B231) No. 1 — No. 2: Does the measured value exceed the specified value?	1 MΩ	Go to step 12.	Go to step 11.
11 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in steering angle sensor?	There is poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>	Repair or replace TCM connector.
12 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Are other diagnostic trouble codes being output?	Other DTC indicated.	Go to step 13.	A temporary poor contact.
13 CHECK DIAGNOSTIC TROUBLE CODE. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step 14.	Proceed with the diagnosis corresponding to the diagnostic trouble code.
14 CHECK AT SYSTEM DIAGNOSTIC TROUBLE CODE. Is the AT system diagnostic trouble code is same as the specification?	DTC 86	Replace steering angle sensor.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AH:DTC 48 FAULTY ECM — VDCCM COMMUNICATION LINE

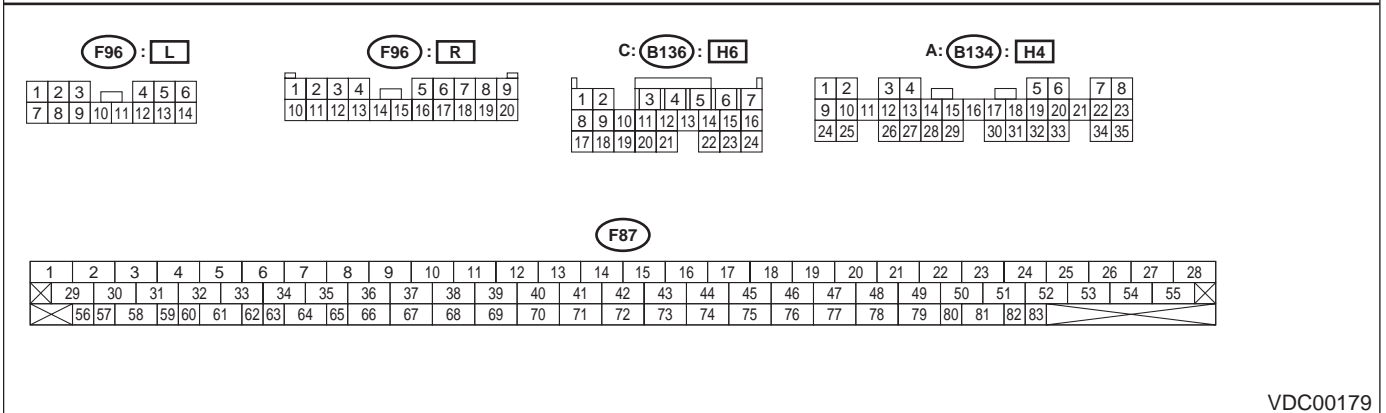
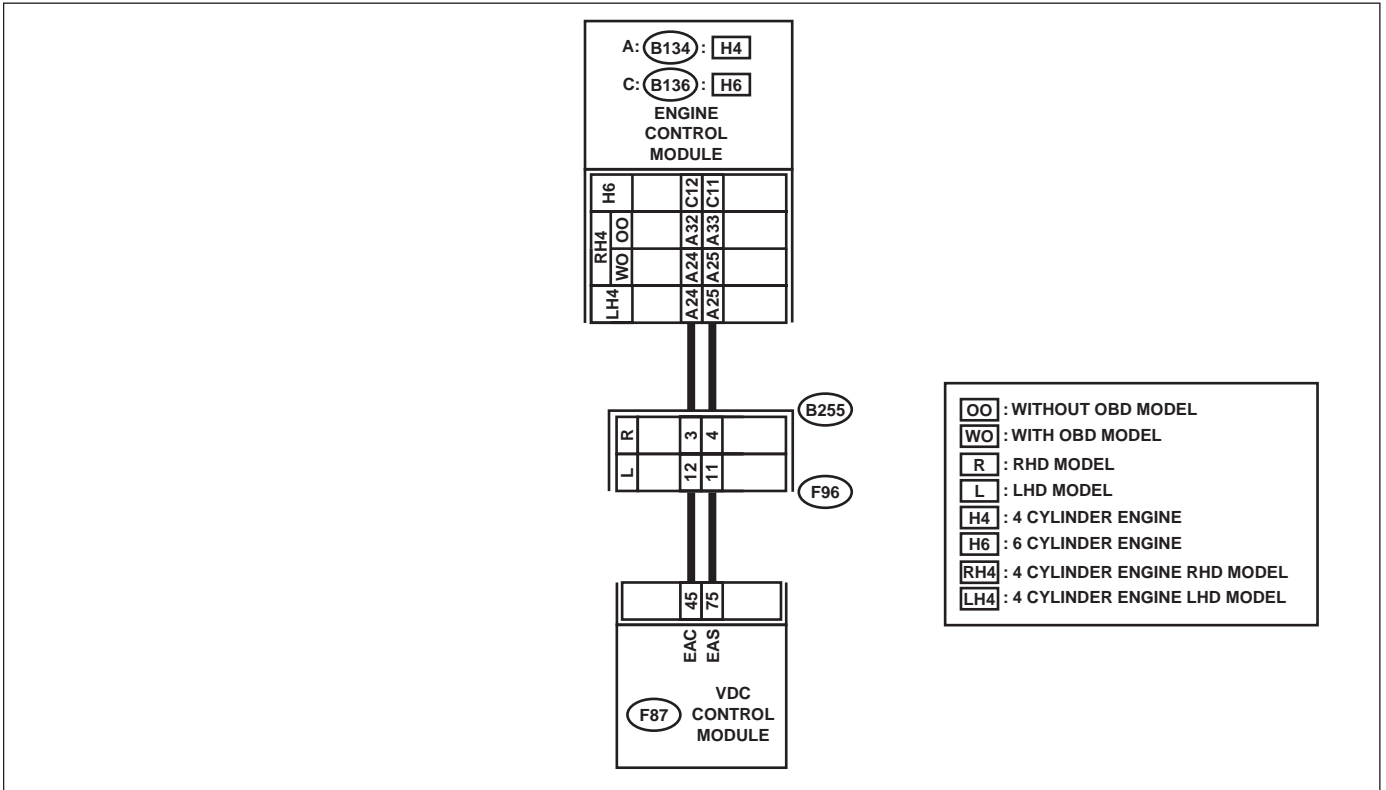
DIAGNOSIS:

- EAS communication line is broken or short circuited.
- EAC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00179

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND VDCCM.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM.</p> <p>Connector & terminal H4 engine RHD without OBD model (F87) No. 45 — (B134) No. 24: (F87) No. 75 — (B134) No. 25: H4 engine RHD with OBD model (F87) No. 45 — (B134) No. 32: (F87) No. 75 — (B134) No. 33: H4 engine LHD model (F87) No. 45 — (B134) No. 24: (F87) No. 75 — (B134) No. 25: H6 engine model (F87) No. 45 — (B136) No. 12: (F87) No. 75 — (B136) No. 11:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Repair or replace open circuit between VDCCM and ECM.
<p>2 CHECK GROUND SHORT OF HARNESS.</p> <p>Measure resistance between VDCCM and ECM.</p> <p>Connector & terminal (F87) No. 75 — Chassis ground: (F87) No. 45 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair or replace ground short circuit between VDCCM and ECM.
<p>3 CHECK BATTERY SHORT OF HARNESS.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground.</p> <p>Connector & terminal (F87) No. 75 — Chassis ground: (F87) No. 45 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 4.	Repair or replace battery short circuit between VDCCM and ECM.
<p>4 CHECK INPUT VOLTAGE TO ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect connector to VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground.</p> <p>Connector & terminal H4 engine RHD without OBD model (B134) No. 24 (+) — Chassis ground (-): (B134) No. 25 (+) — Chassis ground (-): H4 engine RHD with OBD model (B134) No. 32 (+) — Chassis ground (-): (B134) No. 33 (+) — Chassis ground (-): H4 engine LHD model (B134) No. 24 (+) — Chassis ground (-): (B134) No. 25 (+) — Chassis ground (-): H6 engine model (B136) No. 12 (+) — Chassis ground (-): (B136) No. 11 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	10 — 15 V	Go to step 6.	Go to step 5.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
5 CHECK POOR CONTACT IN ECM CONNECTORS. Is there poor contact in ECM connector?	There is poor contact.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
6 ERASE MEMORY. 1) Connect all connectors. 2) Erase the memory. Can the memory be erased?	Can be erased.	Go to step 7.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7 CHECK DIAGNOSTIC TROUBLE CODE. 1) Perform inspection mode. 2) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AI: DTC 49 ABNORMAL ENGINE SPEED SIGNAL

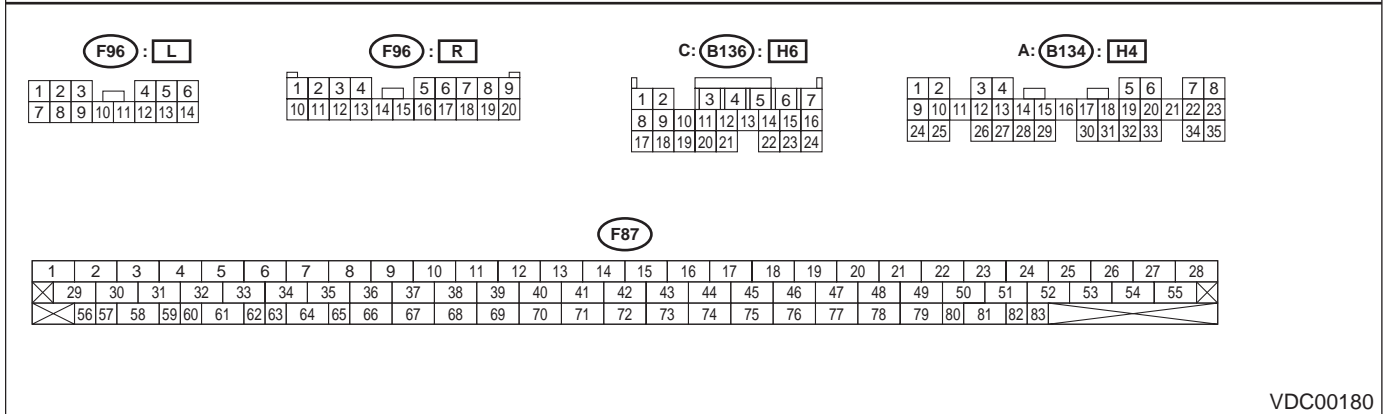
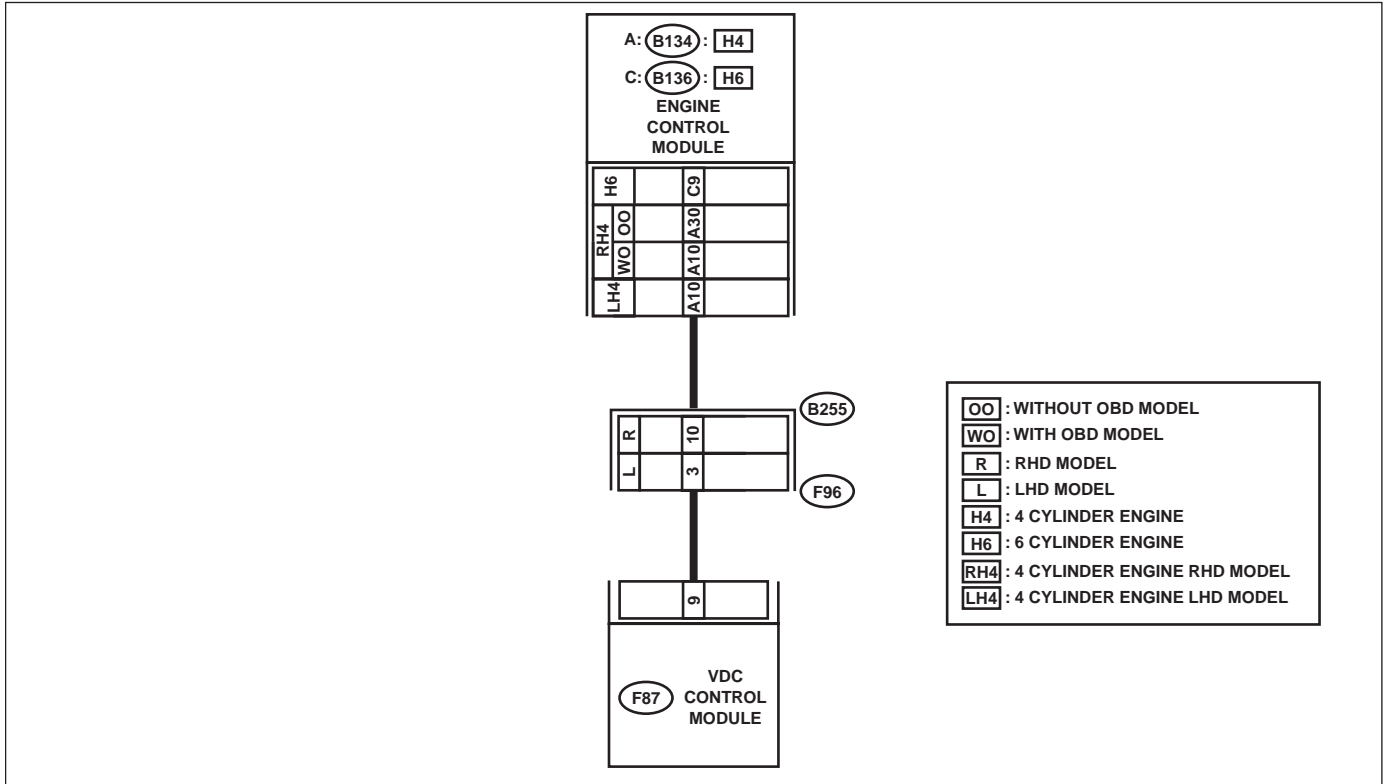
DIAGNOSIS:

- Engine speed signal line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK TACHOMETER OPERATION IN COMBINATION METER. Does tachometer operate normally?	Operates properly.	Go to step 2.	Repair tachometer.
2 CHECK HARNESS BETWEEN VDCCM AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM connector and ECM. Connector & terminal <i>H4 engine RHD without OBD model</i> (F87) No. 9 — (B134) No. 10: <i>H4 engine RHD with OBD model</i> (F87) No. 9 — (B134) No. 30: <i>H4 engine LHD model</i> (F87) No. 9 — (B134) No. 10: <i>H6 engine model</i> (F87) No. 9 — (B136) No. 9: Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair harness connector between VDCCM and ECM.
3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and ECM?	There is poor contact.	Repair connector.	Go to step 4.
4 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
5 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AJ:DTC 51 ABNORMAL VALVE RELAY

DIAGNOSIS:

- Faulty valve relay

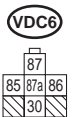
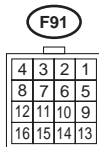
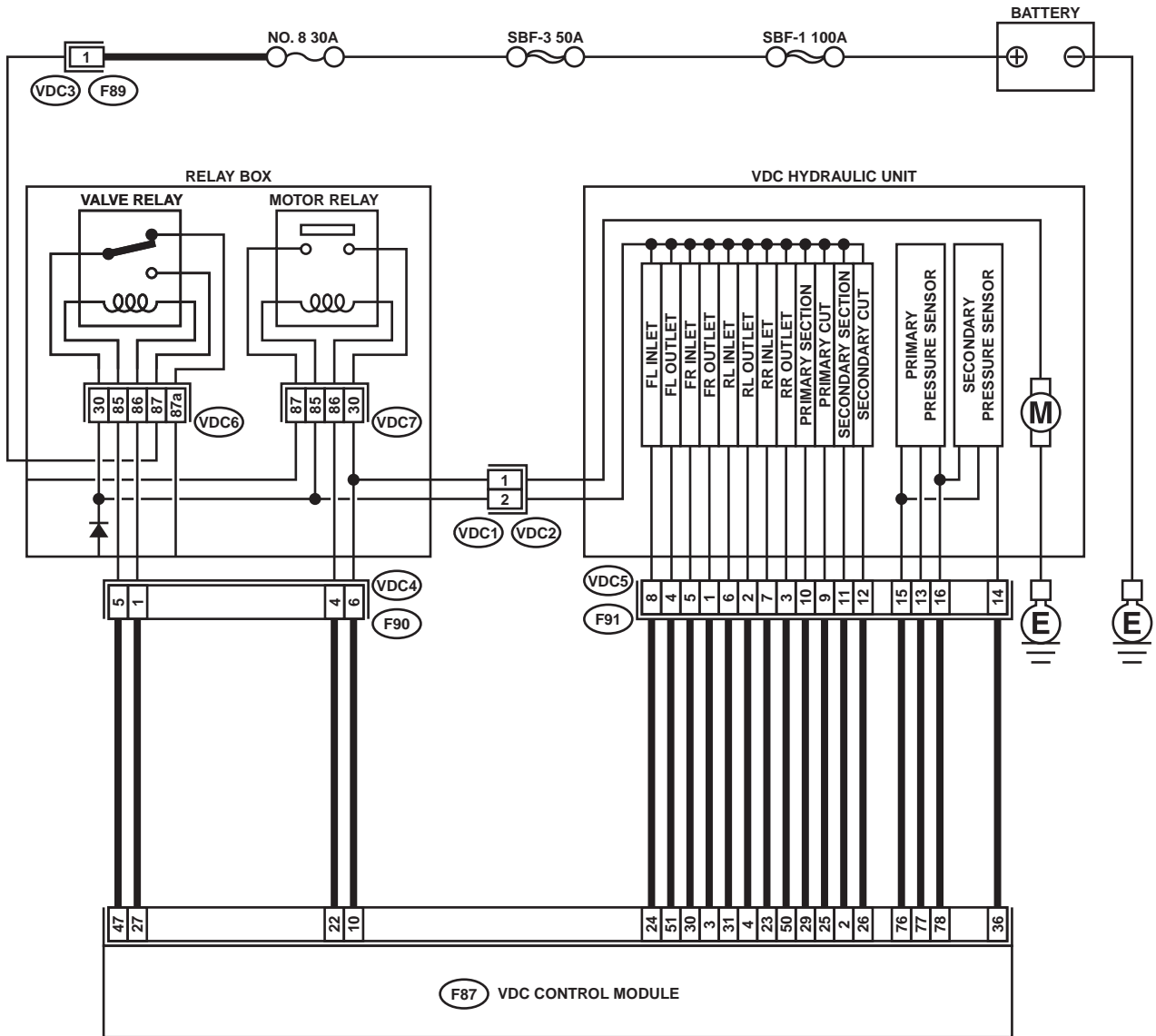
NOTE:

When DTC 74 ABNORMAL PRESSURE SENSOR procedure 4 is carried out, DTC 51 is memorized.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK RESISTANCE OF VALVE RELAY. 1) Turn ignition switch to OFF. 2) Remove valve relay from relay box. 3) Measure resistance between valve relay terminals. Terminals No. 85 — No. 86: Is the measured value within the specified range?</p>	93 — 113 Ω	Go to step 2.	Replace valve relay.
<p>2 CHECK CONTACT POINT OF VALVE RELAY. 1) Connect battery to valve relay terminals No. 85 and No. 86. 2) Measure resistance between valve relay terminals. Terminals No. 30 — No. 87: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Replace valve relay.
<p>3 CHECK CONTACT POINT OF VALVE RELAY. Measure resistance between valve relay terminals. Terminals No. 30 — No. 87a: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Replace valve relay.
<p>4 CHECK CONTACT POINT OF VALVE RELAY. 1) Disconnect battery from valve relay terminals. 2) Measure resistance between valve relay terminals. Terminals No. 30 — No. 87: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Replace valve relay.
<p>5 CHECK CONTACT POINT OF VALVE RELAY. Measure resistance between valve relay terminals. Terminals No. 30 — No. 87a: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 6.	Replace valve relay.
<p>6 CHECK SHORT OF VALVE RELAY. Measure resistance between valve relay terminals. Terminals No. 86 — No. 87: No. 86 — No. 87a: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Replace valve relay.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK POWER SUPPLY FOR VALVE RELAY. 1) Disconnect connector (F89) from relay box. 2) Measure voltage between relay box connector and chassis ground. Connector & terminal (F89) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 8.	Repair harness between battery and relay box connector. Check fuse No. 8.
<p>8 CHECK OPEN CIRCUIT AND GROUND SHORT IN POWER SUPPLY CIRCUIT OF RELAY BOX. 1) Disconnect connector (VDC1) from VDCH/U. 2) Connect connector (F89) to relay box. 3) Measure voltage of relay box. Connector & terminal (VDC6) No. 87 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 9.	Replace relay box and check fuse No. 8.
<p>9 CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX. 1) Turn ignition switch to OFF. 2) Disconnect connector (F90) from relay box. 3) Measure resistance between relay box connector and valve relay installing point. Connector & terminal (VDC4) No. 5 — (VDC6) No. 85: (VDC4) No. 1 — (VDC6) No. 86: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 10.	Replace relay box.
<p>10 CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. Measure resistance between relay box connector and chassis ground. Connector & terminal (VDC4) No. 5 (+) — Chassis ground (-): (VDC4) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 11.	Replace relay box and check fuse No. 8.
<p>11 CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. Measure voltage between relay box connector and chassis ground. Connector & terminal (VDC4) No. 5 (+) — Chassis ground (-): (VDC4) No. 1 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 12.	Replace relay box. Check fuse No. 8.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>12 CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground.</p> <p>Connector & terminal (VDC4) No. 5 (+) — Chassis ground (-): (VDC4) No. 1 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 13.	Replace relay box. Check fuse No. 8.
<p>13 CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and relay box connector.</p> <p>Connector & terminal (F87) No. 47 — (F90) No. 5: (F87) No. 27 — (F90) No. 1:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 14.	Repair harness between VDCCM and relay box.
<p>14 CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY. Measure resistance between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 47 (+) — Chassis ground (-): (F87) No. 27 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 15.	Repair harness between VDCCM and relay box and check all fuses.
<p>15 CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY. Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 27 (+) — Chassis ground (-): (F87) No. 47 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 16.	Repair harness between VDCCM and relay box.
<p>16 CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 27 (+) — Chassis ground (-): (F87) No. 47 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 17.	Repair harness between VDCCM and relay box.
<p>17 CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX. Measure resistance between VDCH/U connector and valve relay installing point.</p> <p>Connector & terminal (VDC1) No. 2 — (VDC6) No. 30:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 18.	Replace relay box.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>18 CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. Measure resistance between VDCH/U connector and chassis ground. Connector & terminal (VDC1) No. 2 — Chassis ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 19.	Replace relay box and check fuse No. 8.
<p>19 CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC1) No. 2 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 20.	Replace relay box. Check fuse No. 8.
<p>20 CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC1) No. 2 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 21.	Replace relay box. Check fuse No. 8.
<p>21 CHECK RESISTANCE OF INLET AND CUT SOLENOID VALVES. 1) Disconnect connector from VDCH/U. 2) Measure resistance between VDCH/U connector terminals. Connector & terminal (VDC5) No. 8 — (VDC2) No. 2: (VDC5) No. 5 — (VDC2) No. 2: (VDC5) No. 6 — (VDC2) No. 2: (VDC5) No. 7 — (VDC2) No. 2: (VDC5) No. 9 — (VDC2) No. 2: (VDC5) No. 12 — (VDC2) No. 2: Is the measured value within the specified range?</p>	8.04 — 9.04 Ω	Go to step 22.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>22 CHECK RESISTANCE OF OUTLET SOLENOID VALVE. Measure resistance between VDCH/U connector terminals. Connector & terminal (VDC5) No. 4 — (VDC2) No. 2: (VDC5) No. 1 — (VDC2) No. 2: (VDC5) No. 2 — (VDC2) No. 2: (VDC5) No. 3 — (VDC2) No. 2: (VDC5) No. 10 — (VDC2) No. 2: (VDC5) No. 11 — (VDC2) No. 2: Is the measured value within the specified range?</p>	4.04 — 4.54 Ω	Go to step 23.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>23 CHECK GROUND SHORT OF SOLENOID VALVE. Measure resistance between VDCH/U connector and chassis ground. Connector & terminal (VDC2) No. 2 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 24.	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>24 CHECK BATTERY SHORT OF SOLENOID VALVE. Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC2) No. 2 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 25.	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>25 CHECK BATTERY SHORT OF SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC2) No. 2 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 26.	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>26 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 30 (+) — Chassis ground (-): (F87) No. 24 (+) — Chassis ground (-): (F87) No. 23 (+) — Chassis ground (-): (F87) No. 31 (+) — Chassis ground (-): (F87) No. 26 (+) — Chassis ground (-): (F87) No. 25 (+) — Chassis ground (-): (F87) No. 3 (+) — Chassis ground (-): (F87) No. 51 (+) — Chassis ground (-): (F87) No. 50 (+) — Chassis ground (-): (F87) No. 4 (+) — Chassis ground (-): (F87) No. 2 (+) — Chassis ground (-): (F87) No. 29 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 27.	Repair harness between VDCH/U and VDCCM and check all fuses.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>27 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 30 (+) — Chassis ground (-):</i> <i>(F87) No. 24 (+) — Chassis ground (-):</i> <i>(F87) No. 23 (+) — Chassis ground (-):</i> <i>(F87) No. 31 (+) — Chassis ground (-):</i> <i>(F87) No. 26 (+) — Chassis ground (-):</i> <i>(F87) No. 25 (+) — Chassis ground (-):</i> <i>(F87) No. 3 (+) — Chassis ground (-):</i> <i>(F87) No. 51 (+) — Chassis ground (-):</i> <i>(F87) No. 50 (+) — Chassis ground (-):</i> <i>(F87) No. 4 (+) — Chassis ground (-):</i> <i>(F87) No. 2 (+) — Chassis ground (-):</i> <i>(F87) No. 29 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 28 .	Repair harness between VDCH/U and VDCCM and check all fuses.
<p>28 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 30 — Chassis ground:</i> <i>(F87) No. 24 — Chassis ground:</i> <i>(F87) No. 23 — Chassis ground:</i> <i>(F87) No. 31 — Chassis ground:</i> <i>(F87) No. 26 — Chassis ground:</i> <i>(F87) No. 25 — Chassis ground:</i> <i>(F87) No. 3 — Chassis ground:</i> <i>(F87) No. 51 — Chassis ground:</i> <i>(F87) No. 50 — Chassis ground:</i> <i>(F87) No. 4 — Chassis ground:</i> <i>(F87) No. 2 — Chassis ground:</i> <i>(F87) No. 29 — Chassis ground:</i></p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 29 .	Repair harness between VDCH/U and VDCCM.
<p>29 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U. 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. Connector & terminal <i>(F87) No. 30 — (VDC2) No. 2:</i> <i>(F87) No. 24 — (VDC2) No. 2:</i> <i>(F87) No. 23 — (VDC2) No. 2:</i> <i>(F87) No. 31 — (VDC2) No. 2:</i> <i>(F87) No. 26 — (VDC2) No. 2:</i> <i>(F87) No. 25 — (VDC2) No. 2:</i></p> <p>Is the measured value within the specified range?</p>	8.0 — 10.0 Ω	Go to step 30 .	Repair harness/connector between VDCH/U and VDCCM.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
30 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U. Measure resistance between VDCCM connector and VDCH/U connector. Connector & terminal <i>(F87) No. 3 — (VDC2) No. 2:</i> <i>(F87) No. 51 — (VDC2) No. 2:</i> <i>(F87) No. 50 — (VDC2) No. 2:</i> <i>(F87) No. 4 — (VDC2) No. 2:</i> <i>(F87) No. 2 — (VDC2) No. 2:</i> <i>(F87) No. 29 — (VDC2) No. 2:</i> Is the measured value within the specified range?	4.0 — 6.0 Ω	Go to step 31 .	Repair harness/connector between VDCH/U and VDCCM.
31 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between VDCCM and VDCH/U?	There is poor contact.	Repair connector.	Go to step 32 .
32 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 33 .
33 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AK:DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY

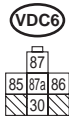
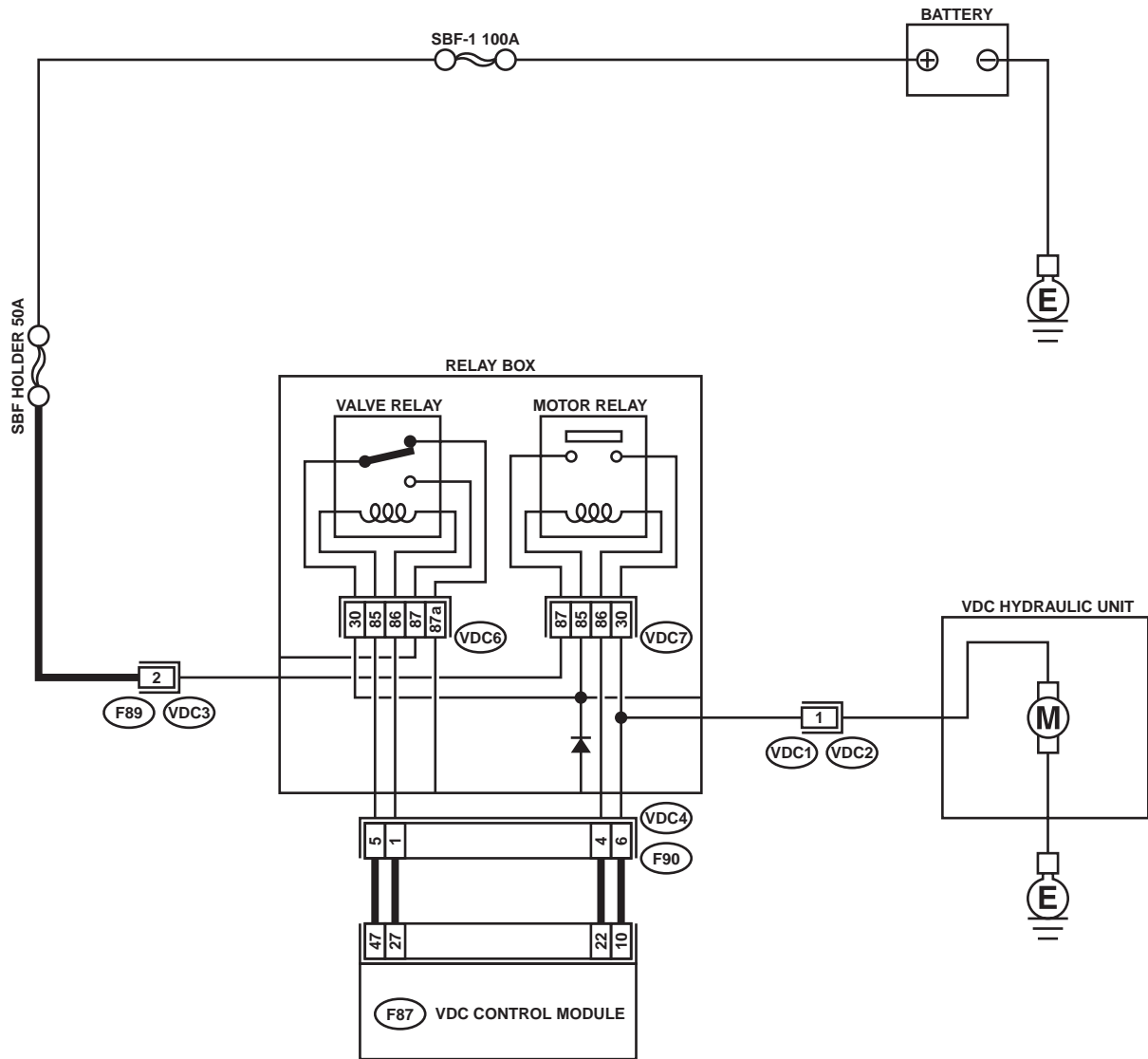
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83			

VDC00155

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK RESISTANCE OF MOTOR RELAY. 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Measure resistance between motor relay terminals. Terminals No. 85 — No. 86: Is the measured value within the specified range?</p>	70 — 90 Ω	Go to step 2.	Replace motor relay.
<p>2 CHECK CONTACT POINT OF MOTOR RELAY. 1) Connect battery to motor relay terminals No. 85 and No. 86. 2) Measure resistance between motor relay terminals. Terminals No. 30 — No. 87: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Replace motor relay.
<p>3 CHECK CONTACT POINT OF MOTOR RELAY. 1) Disconnect battery from motor relay terminals. 2) Measure resistance between motor relay terminals. Terminals No. 30 — No. 87: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 4.	Replace motor relay.
<p>4 CHECK SHORT OF MOTOR RELAY. Measure resistance between motor relay terminals. Terminals No. 85 — No. 30: No. 85 — No. 87: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 5.	Replace motor relay.
<p>5 CHECK INPUT VOLTAGE OF RELAY BOX. 1) Disconnect connector (F89) from relay box. 2) Disconnect connector from VDCCM. 3) Measure voltage between relay box connector and chassis ground. Connector & terminal (F89) No. 2 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 6.	Repair harness/connector between battery and relay box, and check fuse SBF holder.
<p>6 CHECK INPUT VOLTAGE OF MOTOR RELAY. 1) Connect connector (F89) to relay box. 2) Measure voltage between relay box and chassis ground. Connector & terminal (VDC7) No. 87 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 7.	Replace relay box.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX. 1) Turn ignition switch to OFF. 2) Disconnect connectors (VDC2, F90) from relay box. 3) Measure resistance between relay box connector unit and motor relay installing portion. Connector & terminal (VDC1) No. 1 — (VDC7) No. 30: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 8.	Replace relay box.
<p>8 CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX. Measure resistance between relay box connector and motor relay installing point. Connector & terminal (VDC4) No. 6 — (VDC7) No. 30: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 9.	Replace relay box.
<p>9 CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX. Measure resistance between motor relay installing point and relay box connector. Connector & terminal (VDC4) No. 4 — (VDC7) No. 86: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 10.	Replace relay box.
<p>10 CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX. 1) Remove valve relay from relay box. 2) Measure resistance between motor relay installing point and valve relay installing point. Connector & terminal (VDC7) No. 85 — (VDC6) No. 30: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 11.	Replace relay box.
<p>11 CHECK GROUND SHORT IN CIRCUIT OF RELAY BOX. Measure resistance between relay box connector unit and chassis ground. Connector & terminal (VDC4) No. 4 — Chassis ground: (VDC4) No. 6 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 12.	Replace relay box.
<p>12 CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX. Measure voltage between relay box connector and chassis ground. Connector & terminal (VDC4) No. 4 (+) — Chassis ground (-): (VDC4) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 13.	Replace relay box.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>13 CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX. 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. Connector & terminal (VDC4) No. 4 (+) — Chassis ground (-): (VDC4) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 14.	Replace relay box.
<p>14 CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS. 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and relay box connector. Connector & terminal (F87) No. 22 — (F90) No. 4: (F87) No. 10 — (F90) No. 6: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 15.	Repair harness connector between VDCCM and relay box.
<p>15 CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM. Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 22 — Chassis ground: (F87) No. 10 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 16.	Repair harness between VDCCM and relay box. Check fuse SBF holder.
<p>16 CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM. Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 22 (+) — Chassis ground (-): (F87) No. 10 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 17.	Repair harness between VDCCM and relay box. Check fuse SBF holder.
<p>17 CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 22 (+) — Chassis ground (-): (F87) No. 10 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 18.	Repair harness between VDCCM and relay box. Check fuse SBF holder.
<p>18 CHECK CONDITION OF MOTOR GROUND. Tightening torque: 33±10 N·m (3.3±1.0 kgf·m, 24±7 ft·lb) Is the motor ground terminal tightly clamped?</p>	Clamped securely.	Go to step 19.	Tighten the clamp of motor ground terminal.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
19 CHECK VDCCM MOTOR DRIVE TERMINAL. 1) Turn ignition switch OFF. 2) Remove VDC connector cover. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect all connectors. 4) Install motor relay and valve relay to relay box. 5) Operate the ABS check sequence. <Ref. to VDC-16, ABS Sequence Control.> 6) Measure voltage between VDCCM connector terminals. Connector & terminal (F87) No. 22 (+) — No. 1 (-): Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?	Drop from 10 — 13 V to less than 1.5 V, and rise to 10 — 13 V again when carrying out the check sequence.	Go to step 20.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
20 CHECK MOTOR OPERATION. Operate the check sequence. <Ref. to VDC-19, VDC Sequence Control.> Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Noise heard	Go to step 21.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
21 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between VDCH/U, relay box and VDCCM?	There is poor contact.	Repair connector.	Go to step 22.
22 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 23.
23 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AL:DTC 71 ABNORMAL STEERING ANGLE SENSOR

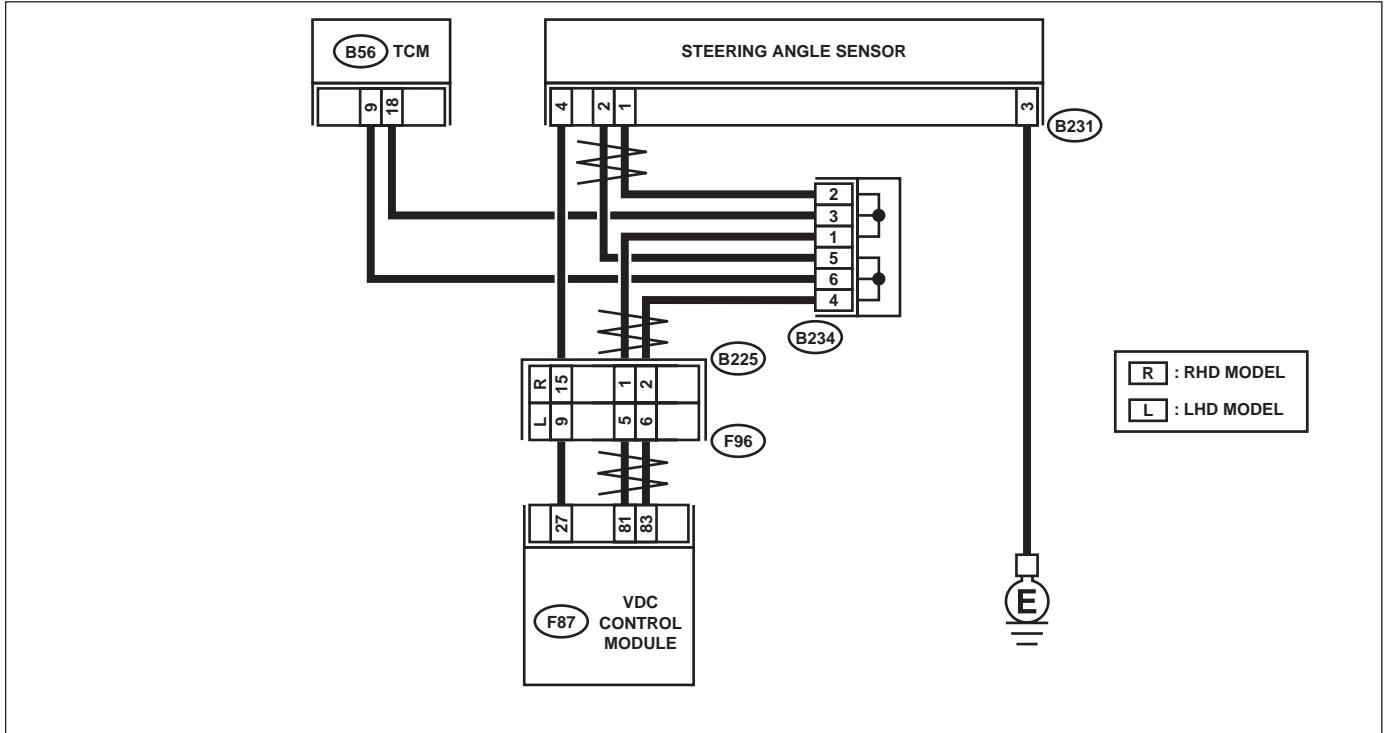
DIAGNOSIS:

- Faulty steering angle sensor

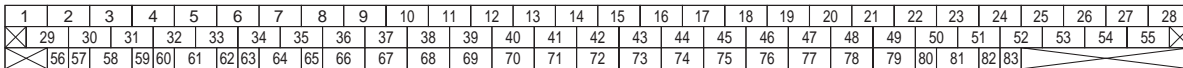
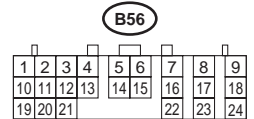
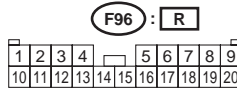
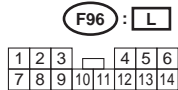
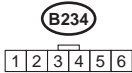
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



R : RHD MODEL
L : LHD MODEL



VDC00178

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK THE STEERING WHEEL. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel. Is the measured value less than the specified value?	5°	Go to step 2.	Perform centering alignment of steering.
2 CHECK RUNNING FIELD. Check if the vehicle was driven on banked road surfaces or sandy surfaces (not dirt road surfaces). Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces)?	Driven	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) sometimes results in a VDCCM memory trouble code.	Go to step 3.
3 CHECK POWER SUPPLY OF STEERING ANGLE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from steering angle sensor. 3) Turn ignition switch to ON. 4) Measure voltage between steering angle sensor and chassis ground. Connector & terminal (B231) No. 4 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Go to step 6.	Go to step 4.
4 CHECK OUTPUT VOLTAGE OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 27 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Repair harness between yaw rate sensor and VDCCM.	Go to step 5.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in yaw rate sensor connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6 CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR. Measure resistance between steering sensor and chassis ground. Connector & terminal (B231) No. 3 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 7.	Repair steering angle sensor ground harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK HARNESS OF STEERING ANGLE SENSOR. 1) Connect connector to steering angle sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. Connector & terminal (F87) No. 81 — No. 83: Is the measured value within the specified range?	114 — 126 Ω	Repair harness between steering angle sensor and VDCCM.	Go to step 8 .
8 CHECK STEERING ANGLE SENSOR. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step 10 .	Go to step 9 .
9 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
10 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Replace steering angle sensor. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 11 .
11 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	The original steering angle sensor has been faulty.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AM:DTC 72 ABNORMAL YAW RATE SENSOR

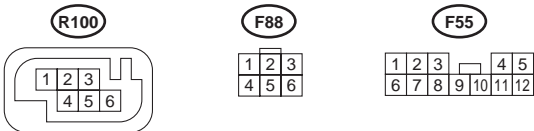
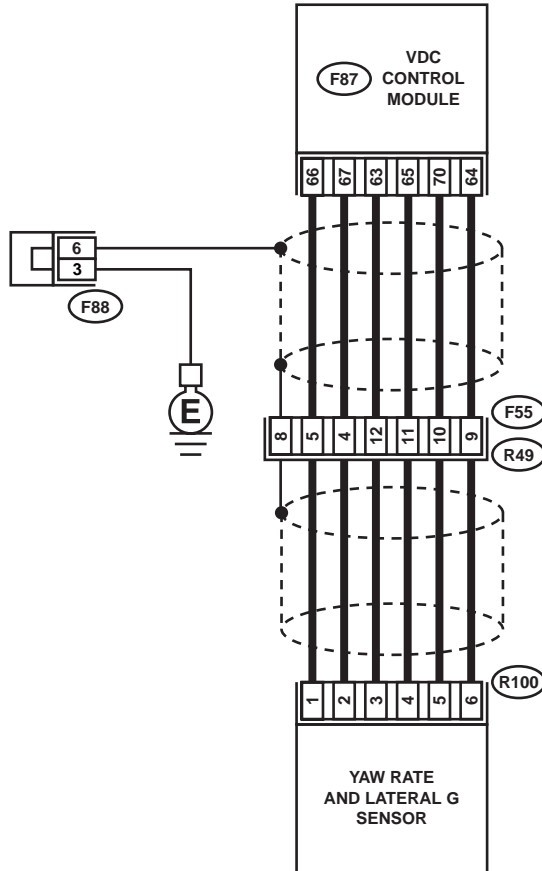
DIAGNOSIS:

- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00182

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK THE STEERING WHEEL. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel. Is the measured value less than the specified value?	5°	Go to step 2.	Perform centering alignment of steering.
2 CHECK RUNNING FIELD. Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces) or surfaces with holes or bumps at high speeds?	Driven	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) or surfaces with holes or bumps at high speeds, sometimes results in a VDCCM memory trouble code.	Go to step 3.
3 CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR. Check installation of yaw rate and lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?	Fixed securely.	Go to step 4.	Install yaw rate and lateral G sensor securely.
4 CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. Connector & terminal (R100) No. 3 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Go to step 7.	Go to step 5.
5 CHECK OUTPUT VOLTAGE OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 63 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step 6.
6 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in yaw rate and lateral G sensor connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK GROUND CIRCUIT OF YAW RATE AND LATERAL G SENSOR. Measure resistance between yaw rate and lateral G sensor and chassis ground. Connector & terminal (R100) No. 6 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 10.	Go to step 8.
<p>8 CHECK GROUND CIRCUIT OF VDCCM. 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 64 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step 9.
<p>9 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in VDCCM connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>10 CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR. 1) Disconnect connector from VDCCM. 2) Measure resistance between VDCCM and yaw rate and lateral G sensor. Connector & terminal (F87) No. 65 — (R100) No. 4: (F87) No. 66 — (R100) No. 1: (F87) No. 67 — (R100) No. 2: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 11.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>11 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 65 — Chassis ground: (F87) No. 66 — Chassis ground: (F87) No. 67 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 12.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>12 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 65 (+) — Chassis ground (-): (F87) No. 66 (+) — Chassis ground (-): (F87) No. 67 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 13.	Repair harness between yaw rate and lateral G sensor and VDCCM.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>13 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. Connector & terminal <i>(F87) No. 65 (+) — Chassis ground (-):</i> <i>(F87) No. 66 (+) — Chassis ground (-):</i> <i>(F87) No. 67 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?</p>	0.5 V	Go to step 14.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>14 CHECK YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch to OFF. 2) Install yaw rate and lateral G sensor to body. 3) Connect all connectors. 4) Turn ignition switch to ON. 5) Measure voltage between VDCCM connector terminals. Connector & terminal <i>(F87) No. 66 (+) — No. 64 (-):</i> Is the measured value within the specified range?</p>	2.1 — 2.9 V	Go to step 15.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
<p>15 CHECK YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch to ON. 2) Check oscilloscope signal pattern between VDCCM connector terminals.<Ref. to VDC-17, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> Connector & terminal <i>(F87) No. 67 (+) — No. 64 (-):</i> Is the oscilloscope pattern the same as shown in the figure?</p>	Same pattern.	Go to step 16.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>16 CHECK YAW RATE SENSOR. Check oscilloscope pattern between yaw rate and lateral G sensor terminals.<Ref. to VDC-17, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> Connector & terminal <i>(F87) No. 65 (+) — No. 64 (-):</i> Is the oscilloscope pattern the same as shown in the figure?</p>	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace yaw rate and lateral G sensor. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AN:DTC 73 ABNORMAL LATERAL G SENSOR

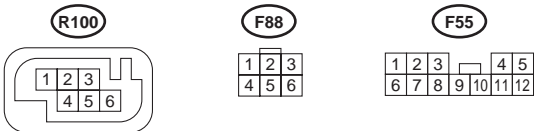
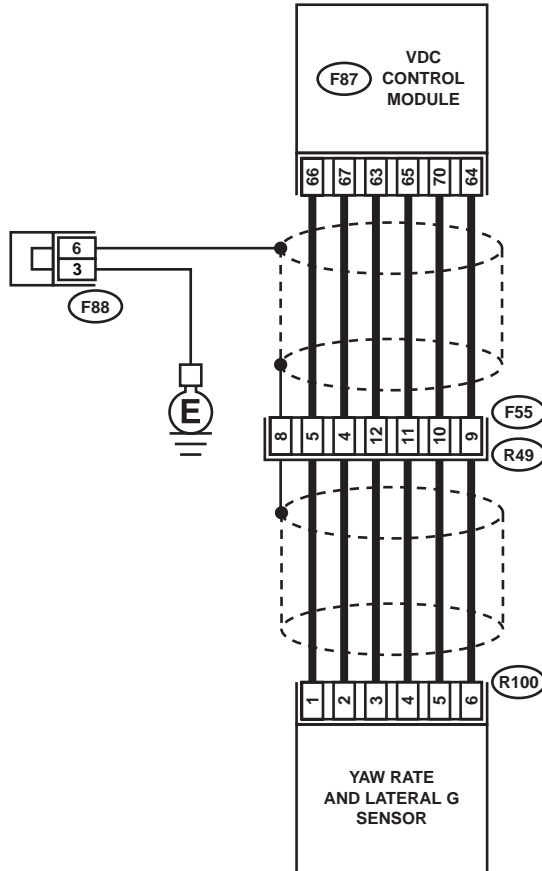
DIAGNOSIS:

- Faulty lateral G sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00182

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK INSTALLATION OF LATERAL G SENSOR. Check installation of lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?</p>	Fixed securely.	Go to step 2.	Install yaw rate and lateral G sensor securely.
<p>2 CHECK INPUT VOLTAGE OF G SENSOR. 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect connector from yaw rate and lateral G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. Connector & terminal (R100) No. 3 (+) — No. 6 (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 3.	Repair harness/connector between yaw rate and lateral G sensor and VDCCM.
<p>3 CHECK YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch to OFF. 2) Measure resistance between yaw rate and lateral G sensor terminals. Terminals No. 3 — No. 5: Is the measured value within the specified range?</p>	4.3 — 4.9 kΩ	Go to step 4.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
<p>4 CHECK OPEN CIRCUIT IN YAW RATE AND LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Connect connector to yaw rate and lateral G sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. Connector & terminal (F87) No. 63 — No. 70: Is the measured value within the specified range?</p>	4.3 — 4.9 kΩ	Go to step 5.	Repair harness/connector between yaw rate and lateral G sensor and VDCCM.
<p>5 CHECK GROUND SHORT IN YAW RATE AND LATERAL G SENSOR HARNESS. 1) Disconnect connector from yaw rate and lateral G sensor. 2) Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 63 — Chassis ground: (F87) No. 70 — Chassis ground: (F87) No. 64 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>6 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 63 (+) — Chassis ground (-): (F87) No. 70 (+) — Chassis ground (-): (F87) No. 64 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 7.	Repair harness between yaw rate and lateral G sensor and VDCCM.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 63 (+) — Chassis ground (-):</i> <i>(F87) No. 70 (+) — Chassis ground (-):</i> <i>(F87) No. 64 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?</p>	1 V	Go to step 8.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>8 CHECK LATERAL G SENSOR. 1) Turn ignition switch to OFF. 2) Remove yaw rate and lateral G sensor from vehicle. 3) Connect connector to yaw rate and lateral G sensor. 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between yaw rate and lateral G sensor connector terminals. Connector & terminal <i>(R100) No. 5 (+) — No. 6 (-):</i> Is the measured value within the specified range when yaw rate and lateral G sensor is horizontal?</p>	2.3 — 2.7 V	Go to step 9.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
<p>9 CHECK YAW RATE AND LATERAL G SENSOR. Measure voltage between yaw rate and lateral G sensor connector terminals. Connector & terminal <i>(R100) No. 5 (+) — No. 6 (-):</i> Is the measured value within the specified range when yaw rate and lateral G sensor is inclined 90° to left?</p>	3.3 — 3.7 V	Go to step 10.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
<p>10 CHECK YAW RATE AND LATERAL G SENSOR. Measure voltage between yaw rate and lateral G sensor connector terminals. Connector & terminal <i>(R100) No. 5 (+) — No. 6 (-):</i> Is the measured value within the specified range when yaw rate and lateral G sensor is inclined 90° to right?</p>	1.3 — 1.7 V	Go to step 11.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
<p>11 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?</p>	There is poor contact.	Repair connector.	Go to step 12.
<p>12 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 13.
<p>13 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?</p>	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

AO:DTC 74 ABNORMAL PRESSURE SENSOR

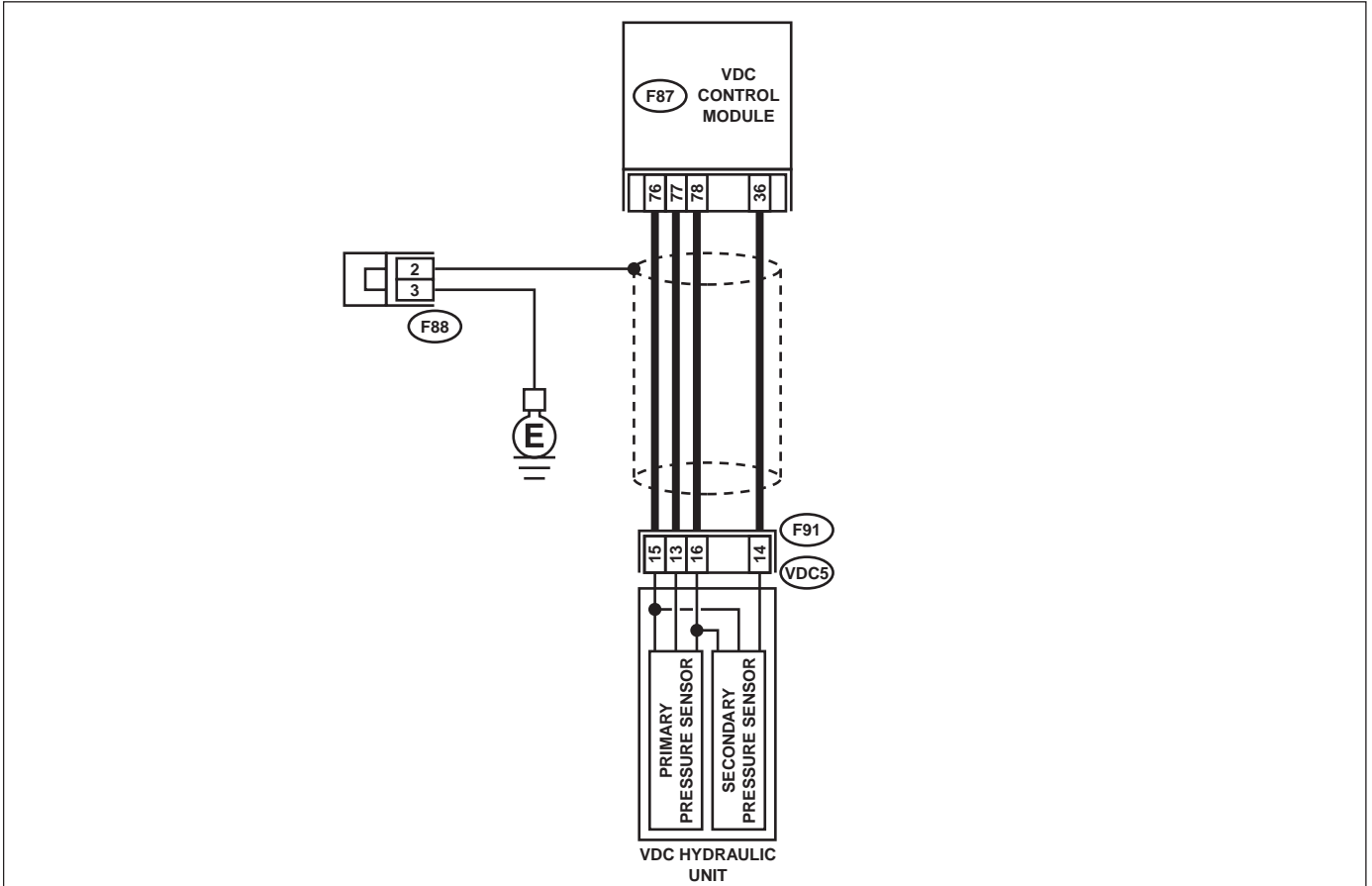
DIAGNOSIS:

- Faulty pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F88

1	2	3
4	5	6

F91

4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13

F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗	
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	⊗

VDC00181

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND CIRCUIT OF PRESSURE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector (F91) from VDCH/U. 3) Measure resistance between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 15 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 4.	Go to step 2.
<p>2 CHECK GROUND CIRCUIT OF VDCCM. 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. Connector & terminal (F87) No. 76 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Replace harness between VDCH/U and VDCCM.	Go to step 3.
<p>3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in VDCCM connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>4 CHECK POWER SUPPLY OF PRESSURE SENSOR. NOTE: When this inspection is carried out, DTC 51 ABNORMAL VALVE RELAY is memorized, but this does not indicate valve relay malfunction. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector terminals. Connector & terminal (F91) No. 16 (+) — No. 15 (-): Is the measured value within the specified range?</p>	4.75 — 5.25 V	Go to step 7.	Go to step 5.
<p>5 CHECK POWER SUPPLY OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. Connector & terminal (F87) No. 78 (+) — No. 76 (-): Is the measured value within the specified range?</p>	4.75 — 5.25 V	Repair harness between VDCH/U and VDCCM.	Go to step 6.
<p>6 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in VDCCM connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 13 — Chassis ground: (F91) No. 14 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 8.	Repair harness between VDCH/U and VDCCM.
<p>8 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 13 (+) — Chassis ground (-): (F91) No. 14 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 9.	Repair harness between VDCH/U and VDCCM.
<p>9 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 13 (+) — Chassis ground (-): (F91) No. 14 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 10.	Repair harness between VDCH/U and VDCCM.
<p>10 CHECK OUTPUT VOLTAGE OF PRESSURE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. Connector & terminal (F87) No. 77 (+) — No. 76 (-): (F87) No. 36 (+) — No. 76 (-): Is the measured value within the specified range?</p>	0.48 — 0.72 V	Go to step 11.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>11 CHECK BRAKE FLUID LEAKAGE. Inspect fluid leakage between brake master cylinder and VDCH/U. Does brake fluid leak?</p>	Fluid leaks.	Retighten or replace.	Go to step 12.
<p>12 CHECK BRAKE MASTER CYLINDER. Inspect brake master cylinder hydraulic pressure. <Ref. to BR-36, OPERATION CHECK (WITH GAUGES), INSPECTION, Brake Booster.> Is hydraulic pressure normal?</p>	Normal.	Go to step 13.	Replace master cylinder.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
13 CHECK BRAKE PEDAL STROKE. Measure the stroke between non-forced pedal position and forced pedal position with 50 kg (110 lb). Is the measured value less than the specified value?	95 mm (3.74 in)	Go to step 14.	Perform bleeding.
14 CHECK INPUT VOLTAGE OF PRESSURE SENSOR. 1) Depress the brake pedal with 50 kg (110 lb). 2) Measure voltage between VDCCM connector terminals. Connector & terminal A (F87) No. 77 (+) — No. 76 (-): B (F87) No. 36 (+) — No. 76 (-): Does the voltage difference between A and B exceed the specified value?	0.2 V	Go to step 15.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
15 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between VDCCM and pressure sensor?	There is poor contact.	Repair connector.	Go to step 16.
16 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 17.
17 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

14. Diagnostics Chart with Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE (SELECT MONITOR COMMUNICATION FAILURE)

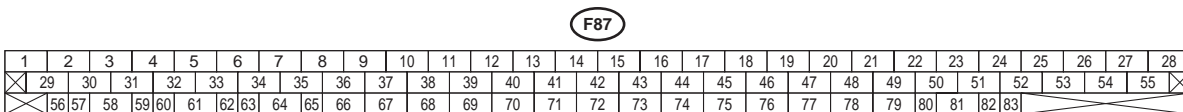
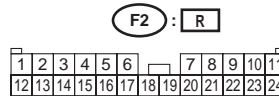
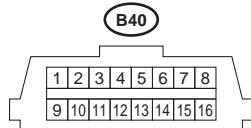
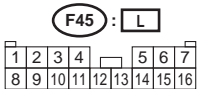
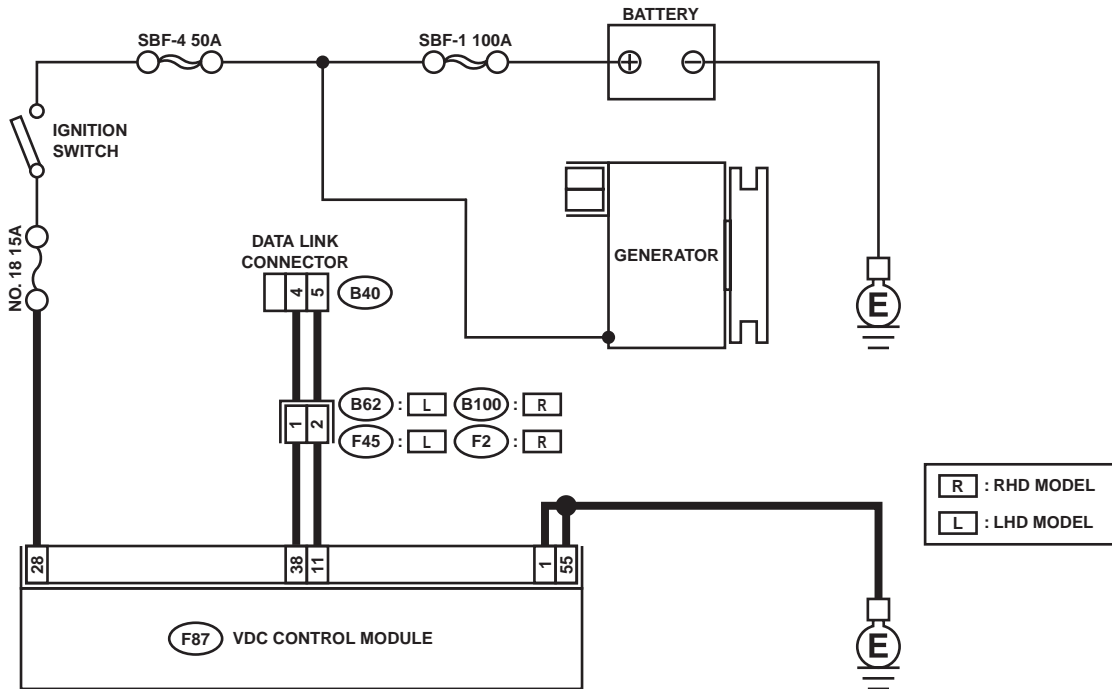
DIAGNOSIS:

- Faulty harness connector

TROUBLE SYMPTOM:

- ABS warning light remains on.

WIRING DIAGRAM:



VDC00183

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK IGNITION SWITCH.	Is ignition switch to ON?	Go to step 2.	Turn ignition switch to ON, and select VDCCM mode using the select monitor.
2 CHECK BATTERY. 1) Turn ignition switch to OFF. 2) Measure battery voltage. Does the measured value exceed the specified value?	11 V	Go to step 3.	Charge or replace battery.
3 CHECK BATTERY TERMINAL. Is there poor contact at battery terminal?	There is poor contact.	Repair or tighten battery terminal.	Go to step 4.
4 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to ON. 2) Using the select monitor, check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor?	Displayed.	Go to step 9.	Go to step 5.
5 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Disconnect VDCCM connector. 3) Check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor?	Displayed.	Go to step 10.	Go to step 6.
6 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Connect VDCCM module connector. 3) Disconnect cruise control module connector. 4) Check whether communication to other systems can be executed normally. Are the name and year of the system displayed on the select monitor? NOTE: If the vehicle is not equipped with cruise control: Go to step 7.	Displayed.	Inspect cruise control module.	Go to step 7.
7 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect VDCCM, and cruise control module connectors. 3) Measure resistance between data link connector and chassis ground. Connector & terminal (B40) No. 5 — Chassis ground: (B40) No. 4 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 8.	Repair harness and connector between each control module and data link connector.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK OUTPUT SIGNAL FOR VDCCM. 1) Turn ignition switch to ON. 2) Measure voltage between data link connector and chassis ground. Connector & terminal (B40) No. 5 (+) — Chassis ground (-): (B40) No. 4 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Repair harness and connector between each control module and data link connector.	Go to step 9.
<p>9 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND DATA LINK CONNECTOR. Measure resistance between VDCCM connector and data link connector. Connector & terminal (F87) No. 11 — (B40) No. 5: (F87) No. 38 — (B40) No. 4: Does the measured value exceed the specified value?</p>	0.5 Ω	Repair harness and connector between VDCCM and data link connector.	Go to step 10.
<p>10 CHECK INSTALLATION OF VDCCM CONNECTOR. Turn ignition switch to OFF. Is VDCCM connector inserted into VDCCM until the clamp locks onto it?</p>	VDCCM connector is connected and the clamp is locked.	Go to step 11.	Insert VDCCM connector into VDCCM until the clamp locks onto it.
<p>11 CHECK POWER SUPPLY CIRCUIT. 1) Turn ignition switch to ON (engine OFF). 2) Measure ignition power supply voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 28 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	10 V	Go to step 12.	Repair open circuit in harness between VDCCM and battery.
<p>12 CHECK HARNESS CONNECTOR BETWEEN VDCCM AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and transmission. 3) Measure resistance of harness between VDCCM and chassis ground. Connector & terminal (F87) No. 1 — Chassis ground: (F87) No. 55 — Chassis ground: Is the measured value less than the specified value? Does the measured value exceed the specified value?</p>	1 Ω	Go to step 13.	Repair open circuit in harness between VDCCM and inhibitor side connector, and poor contact in coupling connector.
<p>13 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in control module power supply, ground line and data link connector?</p>	There is poor contact.	Repair connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

B: DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:

For diagnostic procedure, refer to DTC 27. <Ref. to VDC-134, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>

C: DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:

For diagnostic procedure, refer to DTC 27. <Ref. to VDC-134, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>

D: DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:

For diagnostic procedure, refer to DTC 27. <Ref. to VDC-134, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

E: DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

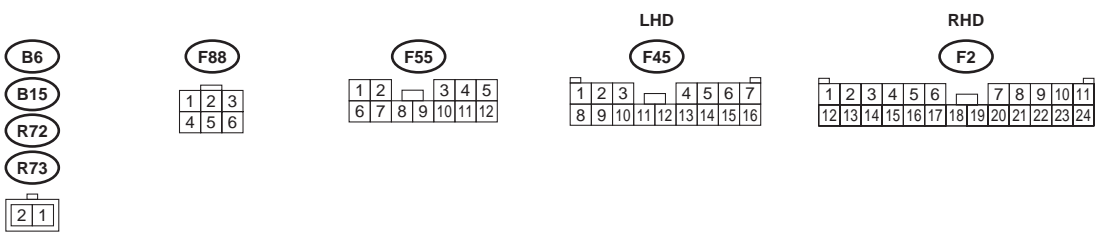
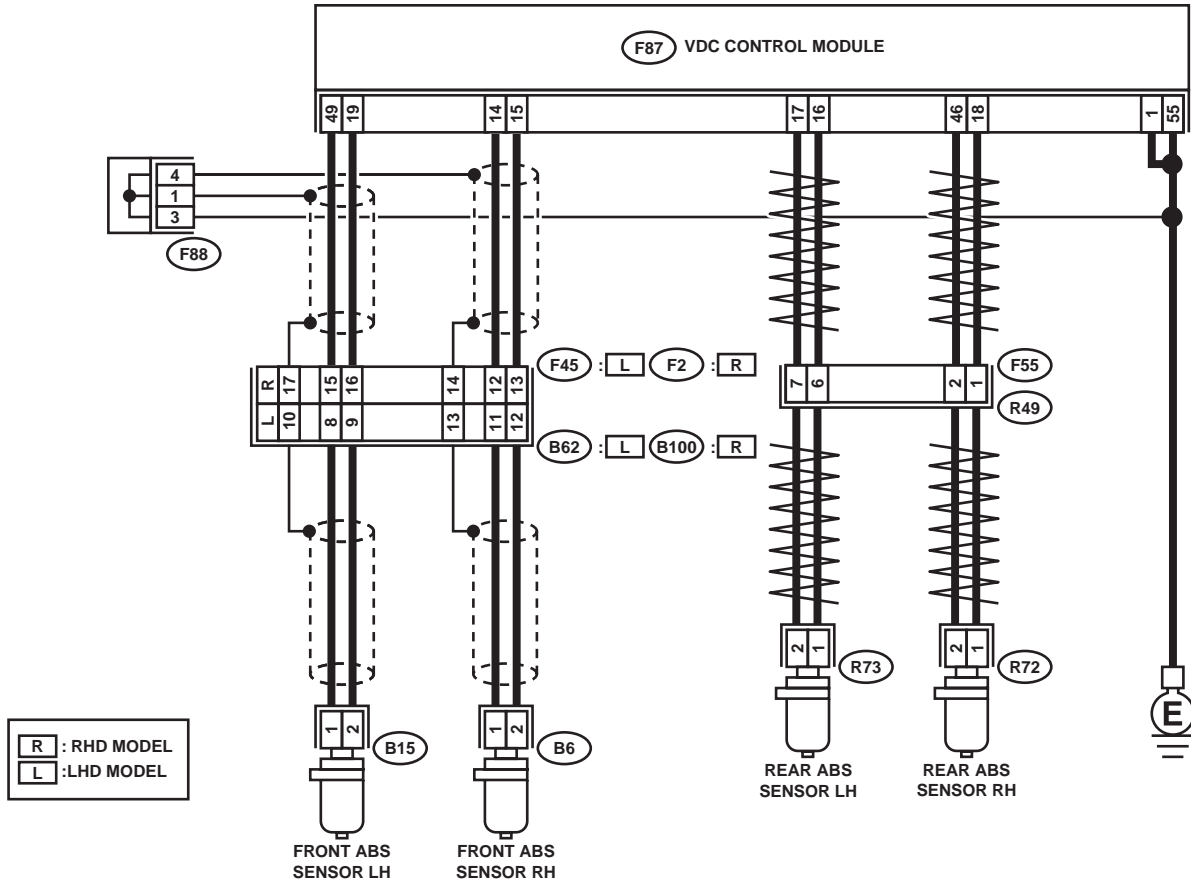
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00174

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode. Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Change	Go to step 2.	Go to step 9.
2 CHECK INSTALLATION OF ABS SENSOR. Are the ABS sensor installation bolts tightened securely? <i>Tightening torque:</i> <i>33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)</i>	Tightened securely.	Go to step 3.	Tighten ABS sensor installation bolts securely.
3 CHECK ABS SENSOR GAP. Measure tone wheel-to-pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step 4.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
4 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step 5.	Repair tone wheel. Front <Ref. to VDC-29, Front Tone Wheel.> Rear <Ref. to VDC-30, Rear Tone Wheel.>
5 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step 6.
6 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 7.
7 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between VDCCM and ABS sensor.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>8 CHECK ABS SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals.</p> <p>Terminal <i>Front RH No. 1 — No. 2:</i> <i>Front LH No. 1 — No. 2:</i> <i>Rear RH No. 1 — No. 2:</i> <i>Rear LH No. 1 — No. 2:</i></p> <p>Is the measured value within the specified range?</p>	1.0 — 1.5 k Ω	Go to step 9.	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>9 CHECK BATTERY SHORT OF ABS SENSOR. 1) Disconnect connector from VDCCM. 2) Measure voltage between ABS sensor and chassis ground.</p> <p>Terminal <i>Front RH No. 1 (+) — Chassis ground (-):</i> <i>Front LH No. 1 (+) — Chassis ground (-):</i> <i>Rear RH No. 1 (+) — Chassis ground (-):</i> <i>Rear LH No. 1 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 10.	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>10 CHECK BATTERY SHORT OF ABS SENSOR. 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground.</p> <p>Terminal <i>Front RH No. 1 (+) — Chassis ground (-):</i> <i>Front LH No. 1 (+) — Chassis ground (-):</i> <i>Rear RH No. 1 (+) — Chassis ground (-):</i> <i>Rear LH No. 1 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 11.	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>11 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR. 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between VDCCM connector terminals.</p> <p>Connector & terminal <i>DTC 21 / (F87) No. 14 — No. 15:</i> <i>DTC 23 / (F87) No. 49 — No. 19:</i> <i>DTC 25 / (F87) No. 18 — No. 46:</i> <i>DTC 27 / (F87) No. 16 — No. 17:</i></p> <p>Is the measured value within the specified range?</p>	1.0 — 1.5 k Ω	Go to step 12.	Repair harness/connector between VDCCM and ABS sensor.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>12 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM connector and chassis ground. Connector & terminal DTC 21 / (F87) No. 14 (+) — Chassis ground (-): DTC 23 / (F87) No. 49 (+) — Chassis ground (-): DTC 25 / (F87) No. 18 (+) — Chassis ground (-): DTC 27 / (F87) No. 16 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 13.	Repair harness between VDCCM and ABS sensor.
<p>13 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal DTC 21 / (F87) No. 14 (+) — Chassis ground (-): DTC 23 / (F87) No. 49 (+) — Chassis ground (-): DTC 25 / (F87) No. 18 (+) — Chassis ground (-): DTC 27 / (F87) No. 16 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 14.	Repair harness between VDCCM and ABS sensor.
<p>14 CHECK INSTALLATION OF ABS SENSOR. Are the ABS sensor installation bolts tightened securely? Tightening torque: 33±10 N·m (3.3±1.0 kgf·m, 24±7 ft·lb)</p>	Tightened securely.	Go to step 15.	Tighten ABS sensor installation bolts securely.
<p>15 CHECK ABS SENSOR GAP. Measure tone wheel-to-pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?</p>	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step 16.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
<p>16 CHECK HUB AND TONE WHEEL RUNOUT. Measure hub and tone wheel runout. Is the measured value less than the specified value?</p>	0.05 mm (0.0020 in)	Go to step 17.	Repair hub and tone wheel. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>17 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and ABS sensor?</p>	There is poor contact.	Repair connector.	Go to step 18.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
18 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 19 .
19 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between VDCCM and ABS sensor.

F: DTC 22 FRONT RIGHT ABS SENSOR SIGNAL

NOTE:

For diagnostic procedure, refer to DTC 28. <Ref. to VDC-140, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

G: DTC 24 FRONT LEFT ABS SENSOR SIGNAL

NOTE:

For diagnostic procedure, refer to DTC 28. <Ref. to VDC-140, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

H: DTC 26 REAR RIGHT ABS SENSOR SIGNAL

NOTE:

For diagnostic procedure, refer to DTC 28. <Ref. to VDC-140, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

I: DTC 28 REAR LEFT ABS SENSOR SIGNAL

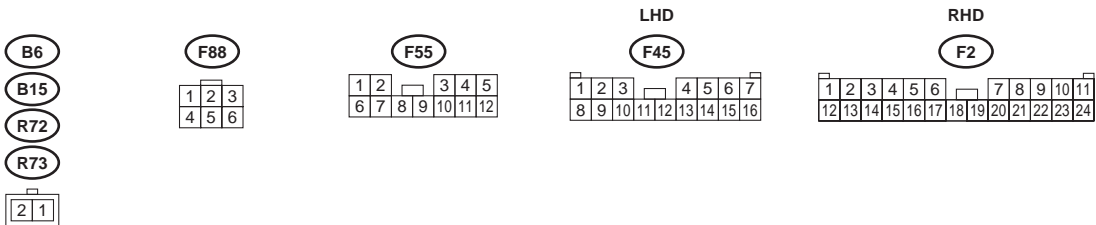
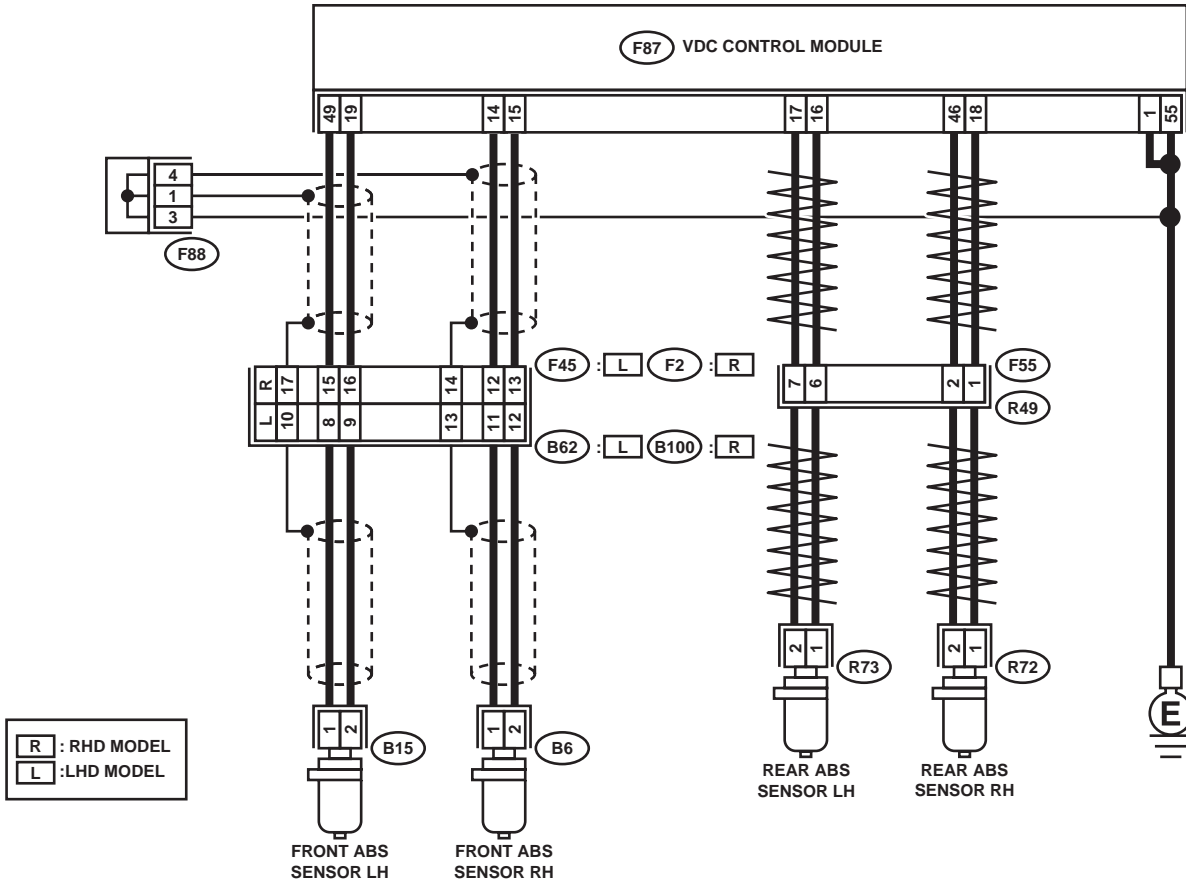
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00174

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode. Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Change	Go to step 2.	Go to step 8.
2 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step 4.	Properly install the car telephone or the wireless transmitter.
4 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Installed	Install the noise sources apart from the sensor harness.	Go to step 5.
5 CHECK SHIELD CIRCUIT. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Measure resistance between shield connector and chassis ground. Connector & terminal <i>DTC 22 / (F45) No. 10 — Chassis ground:</i> <i>DTC 22 / (F2) No. 17 — Chassis ground:</i> <i>DTC 24 / (F45) No. 10 — Chassis ground:</i> <i>DTC 24 / (F2) No. 17 — Chassis ground:</i> Is the measured value less than the specified value? NOTE: For the DTC 26 and 28, Go to step 6.	0.5 Ω	Go to step 6.	Repair shield harness.
6 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 7.
7 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.
8 CHECK INSTALLATION OF ABS SENSOR. Tightening torque: 33±10 N·m (3.3±1.0 kgf·m, 24±7 ft·lb) Are the ABS sensor installation bolts tightened securely?	Tightened securely.	Go to step 9.	Tighten ABS sensor installation bolts securely.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
9 CHECK ABS SENSOR GAP. Measure tone wheel to pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step 10.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
10 CHECK OSCILLOSCOPE. Is an oscilloscope available?	Available	Go to step 11.	Go to step 12.
11 CHECK ABS SENSOR SIGNAL. 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. Connector & terminal <i>DTC 22 / (F87) No. 14 (+) — No. 15 (-):</i> <i>DTC 24 / (F87) No. 49 (+) — No. 19 (-):</i> <i>DTC 26 / (F87) No. 18 (+) — No. 46 (-):</i> <i>DTC 28 / (F87) No. 16 (+) — No. 17 (-):</i> Is oscilloscope pattern smooth, as shown in figure?	Smooth pattern.	Go to step 15.	Go to step 12.
12 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL. Remove disc rotor from hub in accordance with diagnostic trouble code. Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Dirt or foreign matter found.	Thoroughly remove dirt or other foreign matter.	Go to step 13.
13 CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL. Are there broken or damaged in the ABS sensor pole piece or the tone wheel?	Broken or damaged.	Replace ABS sensor or tone wheel. Front <Ref. to VDC-27, Front ABS Sensor.> and <Ref. to VDC-29, Front Tone Wheel.> Rear <Ref. to VDC-28, Rear ABS Sensor.> and <Ref. to VDC-30, Rear Tone Wheel.>	Go to step 14.
14 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step 15.	Repair tone wheel. Front <Ref. to VDC-29, Front Tone Wheel.> Rear <Ref. to VDC-30, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>15 CHECK RESISTANCE OF ABS SENSOR. 1) Turn ignition switch OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals.</p> <p>Terminal <i>Front RH No. 1 — No. 2:</i> <i>Front LH No. 1 — No. 2:</i> <i>Rear RH No. 1 — No. 2:</i> <i>Rear LH No. 1 — No. 2:</i></p> <p>Is the measured value within the specified range?</p>	1.0 — 1.5 k Ω	Go to step 16.	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>16 CHECK GROUND SHORT OF ABS SENSOR. Measure resistance between ABS sensor and chassis ground.</p> <p>Terminal <i>Front RH No. 1 — Chassis ground:</i> <i>Front LH No. 1 — Chassis ground:</i> <i>Rear RH No. 1 — Chassis ground:</i> <i>Rear LH No. 1 — Chassis ground:</i></p> <p>Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 17.	Replace ABS sensor. Front <Ref. to VDC-27, Front ABS Sensor.> Rear <Ref. to VDC-28, Rear ABS Sensor.>
<p>17 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR. 1) Connect connector to ABS sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance at VDCCM connector terminals.</p> <p>Connector & terminal <i>DTC 22 / (F87) No. 14 — No. 15:</i> <i>DTC 24 / (F87) No. 49 — No. 19:</i> <i>DTC 26 / (F87) No. 18 — No. 46:</i> <i>DTC 28 / (F87) No. 16 — No. 17:</i></p> <p>Is the measured value within the specified range?</p>	1.0 — 1.5 k Ω	Go to step 18.	Repair harness/connector between VDCCM and ABS sensor.
<p>18 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM connector and chassis ground.</p> <p>Connector & terminal <i>DTC 22 / (F87) No. 14 — Chassis ground:</i> <i>DTC 24 / (F87) No. 49 — Chassis ground:</i> <i>DTC 26 / (F87) No. 18 — Chassis ground:</i> <i>DTC 28 / (F87) No. 16 — Chassis ground:</i></p> <p>Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 19.	Repair harness/connector between VDCCM and ABS sensor.
<p>19 CHECK GROUND CIRCUIT OF VDCCM. Measure resistance between VDCCM and chassis ground.</p> <p>Connector & terminal <i>(F87) No. 1 — Chassis ground:</i> <i>(F87) No. 55 — Chassis ground:</i></p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 20.	Repair VDCCM ground harness.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
20 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and ABS sensor?	There is poor contact.	Repair connector.	Go to step 21 .
21 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Installed properly.	Go to step 22 .	Properly install the car telephone or the wireless transmitter.
22 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Installed.	Install the noise sources apart from the sensor harness.	Go to step 23 .
23 CHECK SHIELD CIRCUIT. 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. Connector & terminal <i>DTC 22 / (F45) No. 10 — Chassis ground:</i> <i>DTC 22 / (F2) No. 17 — Chassis ground:</i> <i>DTC 24 / (F45) No. 10 — Chassis ground:</i> <i>DTC 24 / (F2) No. 17 — Chassis ground:</i> Is the measured value less than the specified value? NOTE: For the DTC 26 and 28, Go to step 25 .	0.5 Ω	Go to step 24 .	Repair shield harness.
24 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 25 .
25 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

J: DTC 29 ANY ONE OF FOUR ABS SENSOR SIGNAL

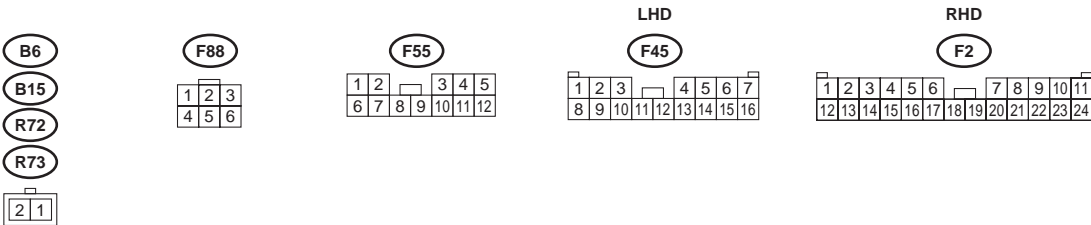
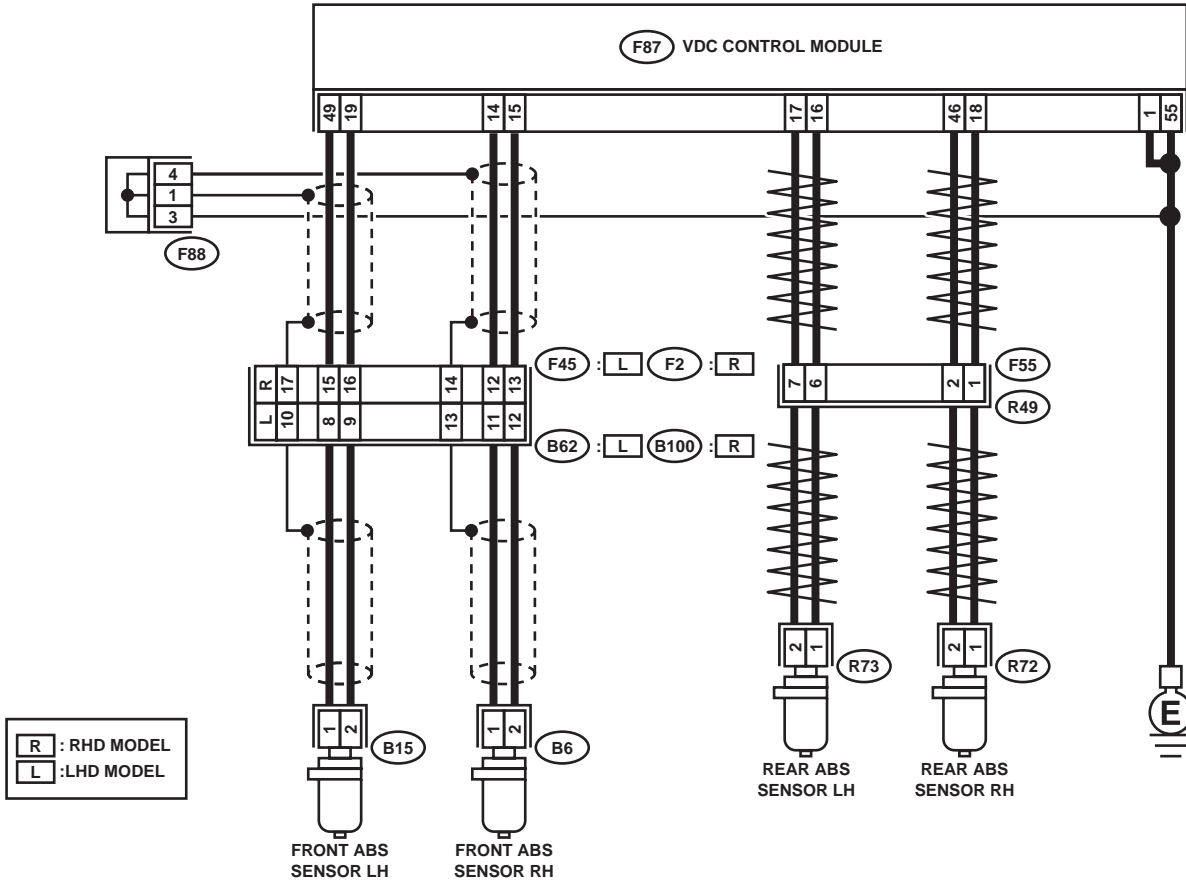
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	28
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00174

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK IF THE WHEELS HAVE TURNED FREELY. Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.</p>	Turned freely over 1 minutes.	The VDC is normal. Erase the diagnostic trouble code. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or under full-lock cornering locked in full, this trouble code may sometimes occur.	Go to step 2.
<p>2 CHECK TIRE SPECIFICATIONS. Are the tire specifications correct?</p>	Turned freely over 1 minutes.	Go to step 3.	Replace tire.
<p>3 CHECK WEAR OF TIRE. Is the tire worn excessively?</p>	Worn excessively.	Replace tire.	Go to step 4.
<p>4 CHECK TIRE PRESSURE. Is the tire pressure correct?</p>	Correct tire pressure.	Go to step 5.	Adjust tire pressure.
<p>5 CHECK INSTALLATION OF ABS SENSOR. <i>Tightening torque:</i> 33±10 N·m (3.3±1.0 kgf·m, 24±7 ft·lb) Are the ABS sensor installation bolts tightened securely?</p>	Tightened securely.	Go to step 6.	Tighten ABS sensor installation bolts securely.
<p>6 CHECK ABS SENSOR GAP. Measure tone wheel to pole piece gap over entire perimeter of the wheel. Is the measured value within the specified range?</p>	Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step 7.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
<p>7 CHECK OSCILLOSCOPE. Is an oscilloscope available?</p>	Available	Go to step 8.	Go to step 9.
<p>8 CHECK ABS SENSOR SIGNAL. 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. Connector & terminal (F49) No. 14 (+) — No. 15 (-) (Front RH): (F49) No. 49 (+) — No. 19 (-) (Front LH): (F49) No. 18 (+) — No. 46 (-) (Rear RH): (F49) No. 16 (+) — No. 17 (-) (Rear LH): Is oscilloscope pattern smooth, as shown in figure?</p>	Smooth pattern.	Go to step 12.	Go to step 9.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
9 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL. Remove disc rotor from hub. Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Dirt or foreign matter found.	Thoroughly remove dirt or other foreign matter.	Go to step 10 .
10 CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL. Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?	Broken or damaged.	Replace ABS sensor or tone wheel. Front <Ref. to VDC-27, Front ABS Sensor.> and <Ref. to VDC-29, Front Tone Wheel.> Rear <Ref. to VDC-28, Rear ABS Sensor.> and <Ref. to VDC-30, Rear Tone Wheel.>	Go to step 11 .
11 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout. Is the measured value less than the specified value?	0.05 mm (0.0020 in)	Go to step 12 .	Repair tone wheel. Front <Ref. to VDC-29, Front Tone Wheel.> Rear <Ref. to VDC-30, Rear Tone Wheel.>
12 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 13 .
13 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

K: DTC 31 FR HOLD VALVE MALFUNCTION (FRONT RIGHT INLET VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-150, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

L: DTC 33 FL HOLD VALVE MALFUNCTION (FRONT LEFT INLET VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-150, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

M: DTC 35 RR HOLD VALVE MALFUNCTION (REAR RIGHT INLET VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-150, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

N: DTC 37 RL HOLD VALVE MALFUNCTION (REAR LEFT INLET VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-150, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

O: DTC 61 NORMAL OPENING VALVE 2 MALFUNCTION (PRIMARY CUT VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 62. <Ref. to VDC-150, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

P: DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION)

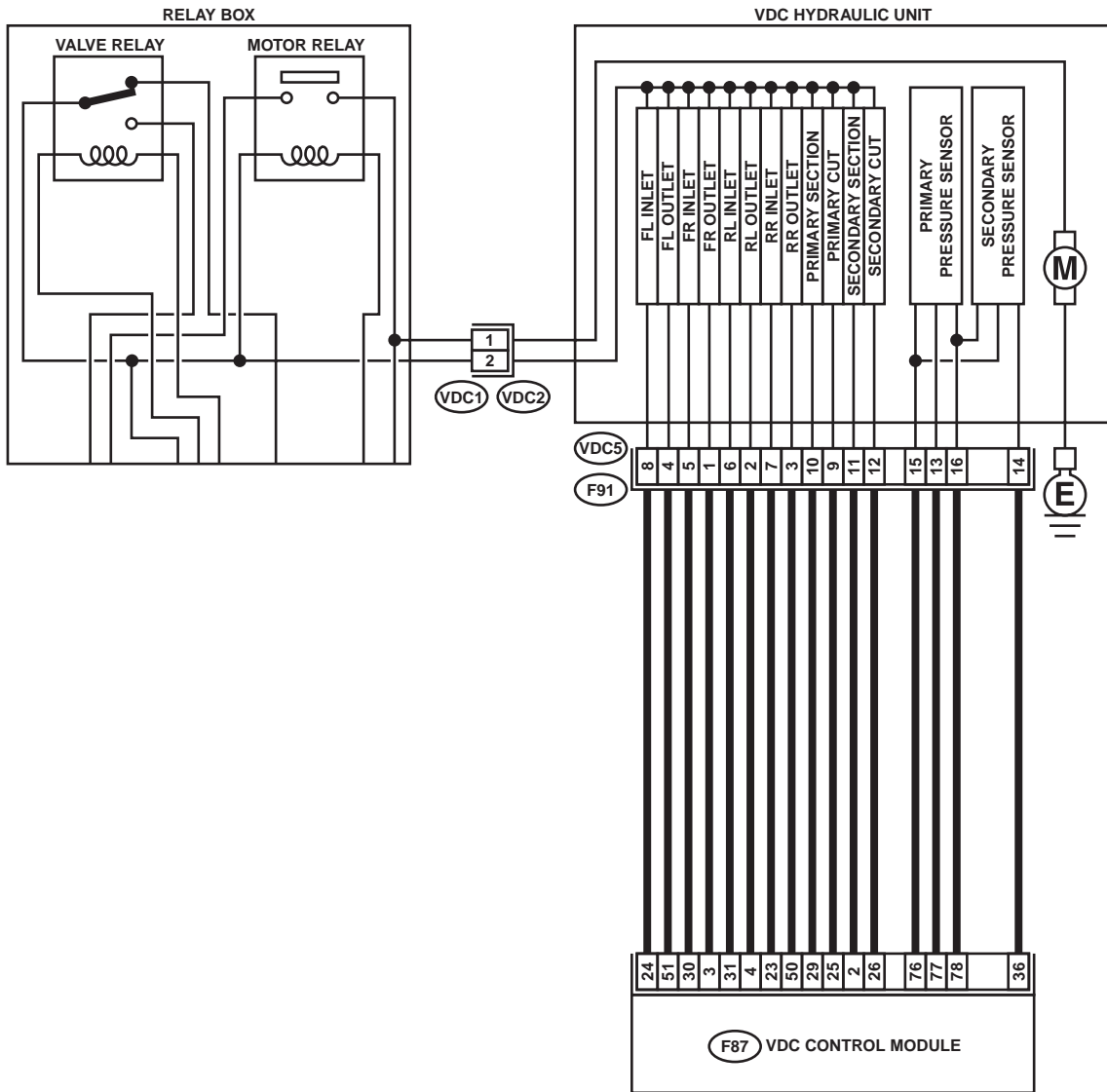
DIAGNOSIS:

- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC1

1 2

F91



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

VDC00142

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK RESISTANCE OF SOLENOID VALVE.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals.</p> <p>Connector & terminal</p> <p><i>DTC 31/(VDC5) No. 5 — (VDC2) No. 2:</i> <i>DTC 33/(VDC5) No. 8 — (VDC2) No. 2:</i> <i>DTC 35/(VDC5) No. 7 — (VDC2) No. 2:</i> <i>DTC 37/(VDC5) No. 6 — (VDC2) No. 2:</i> <i>DTC 61/(VDC5) No. 9 — (VDC2) No. 2:</i> <i>DTC 62/(VDC5) No. 12 — (VDC2) No. 2:</i></p> <p>Is the measured value within the specified range?</p>	<p>8.04 — 9.04 Ω</p>	<p>Go to step 2.</p>	<p>Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).></p>
<p>2</p> <p>CHECK GROUND SHORT OF SOLENOID VALVE.</p> <p>Measure resistance between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p><i>DTC 31/(VDC5) No. 5 — Chassis ground:</i> <i>DTC 33/(VDC5) No. 8 — Chassis ground:</i> <i>DTC 35/(VDC5) No. 7 — Chassis ground:</i> <i>DTC 37/(VDC5) No. 6 — Chassis ground:</i> <i>DTC 61/(VDC5) No. 9 — Chassis ground:</i> <i>DTC 62/(VDC5) No. 12 — Chassis ground:</i></p> <p>Does the measured value exceed the specified value?</p>	<p>1 MΩ</p>	<p>Go to step 3.</p>	<p>Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).></p>
<p>3</p> <p>CHECK BATTERY SHORT OF SOLENOID VALVE.</p> <p>1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p><i>DTC 31/(VDC5) No. 5 (+) — Chassis ground (-):</i> <i>DTC 33/(VDC5) No. 8 (+) — Chassis ground (-):</i> <i>DTC 35/(VDC5) No. 7 (+) — Chassis ground (-):</i> <i>DTC 37/(VDC5) No. 6 (+) — Chassis ground (-):</i> <i>DTC 61/(VDC5) No. 9 (+) — Chassis ground (-):</i> <i>DTC 62/(VDC5) No. 12 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	<p>1 V</p>	<p>Go to step 4.</p>	<p>Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).></p>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>4 CHECK BATTERY SHORT OF SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal <i>DTC 31/(VDC5) No. 5 (+) — Chassis ground (-):</i> <i>DTC 33/(VDC5) No. 8 (+) — Chassis ground (-):</i> <i>DTC 35/(VDC5) No. 7 (+) — Chassis ground (-):</i> <i>DTC 37/(VDC5) No. 6 (+) — Chassis ground (-):</i> <i>DTC 61/(VDC5) No. 9 (+) — Chassis ground (-):</i> <i>DTC 62/(VDC5) No. 12 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>5 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal <i>DTC 31/(F87) No. 30 (+) — Chassis ground (-):</i> <i>DTC 33/(F87) No. 24 (+) — Chassis ground (-):</i> <i>DTC 35/(F87) No. 23 (+) — Chassis ground (-):</i> <i>DTC 37/(F87) No. 31 (+) — Chassis ground (-):</i> <i>DTC 61/(F87) No. 25 (+) — Chassis ground (-):</i> <i>DTC 62/(F87) No. 26 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 6.	Repair harness between VDCCM and VDCH/U.
<p>6 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal <i>DTC 31/(F87) No. 30 (+) — Chassis ground (-):</i> <i>DTC 33/(F87) No. 24 (+) — Chassis ground (-):</i> <i>DTC 35/(F87) No. 23 (+) — Chassis ground (-):</i> <i>DTC 37/(F87) No. 31 (+) — Chassis ground (-):</i> <i>DTC 61/(F87) No. 25 (+) — Chassis ground (-):</i> <i>DTC 62/(F87) No. 26 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 7.	Repair harness between VDCCM and VDCH/U.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. Connector & terminal <i>DTC 31/(F87) No. 30 — Chassis ground:</i> <i>DTC 33/(F87) No. 24 — Chassis ground:</i> <i>DTC 35/(F87) No. 23 — Chassis ground:</i> <i>DTC 37/(F87) No. 31 — Chassis ground:</i> <i>DTC 61/(F87) No. 25 — Chassis ground:</i> <i>DTC 62/(F87) No. 26 — Chassis ground:</i> Does the measured value exceed the specified value?	1 MΩ	Go to step 8 .	Repair harness between VDCCM and VDCH/U.
8 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U. 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. Connector & terminal <i>DTC 31/(F87) No. 30 — (VDC2) No. 2:</i> <i>DTC 33/(F87) No. 24 — (VDC2) No. 2:</i> <i>DTC 35/(F87) No. 23 — (VDC2) No. 2:</i> <i>DTC 37/(F87) No. 31 — (VDC2) No. 2:</i> <i>DTC 61/(F87) No. 25 — (VDC2) No. 2:</i> <i>DTC 62/(F87) No. 26 — (VDC2) No. 2:</i> Is the measured value within the specified range?	7 — 10 Ω	Go to step 9 .	Repair harness/connector between VDCCM and VDCH/U.
9 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and VDCH/U?	There is poor contact.	Repair connector.	Go to step 10 .
10 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Repair VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 11 .
11 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Q: DTC 32 FR PRESSURE REDUCING VALVE MALFUNCTION (FRONT RIGHT OUTLET VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-156, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

R: DTC 34 FL PRESSURE REDUCING VALVE MALFUNCTION (FRONT LEFT OUTLET VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-156, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

S: DTC 36 RR PRESSURE REDUCING VALVE MALFUNCTION (REAR RIGHT OUTLET VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-156, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

T: DTC 38 RL PRESSURE REDUCING VALVE MALFUNCTION (REAR LEFT OUTLET VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-156, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

U: DTC 63 NORMAL CLOSING VALVE 2 MALFUNCTION (PRIMARY SUCTION VALVE MALFUNCTION)

NOTE:

For diagnostic procedure, refer to DTC 64. <Ref. to VDC-156, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

V: DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUC-TION VALVE MALFUNCTION)

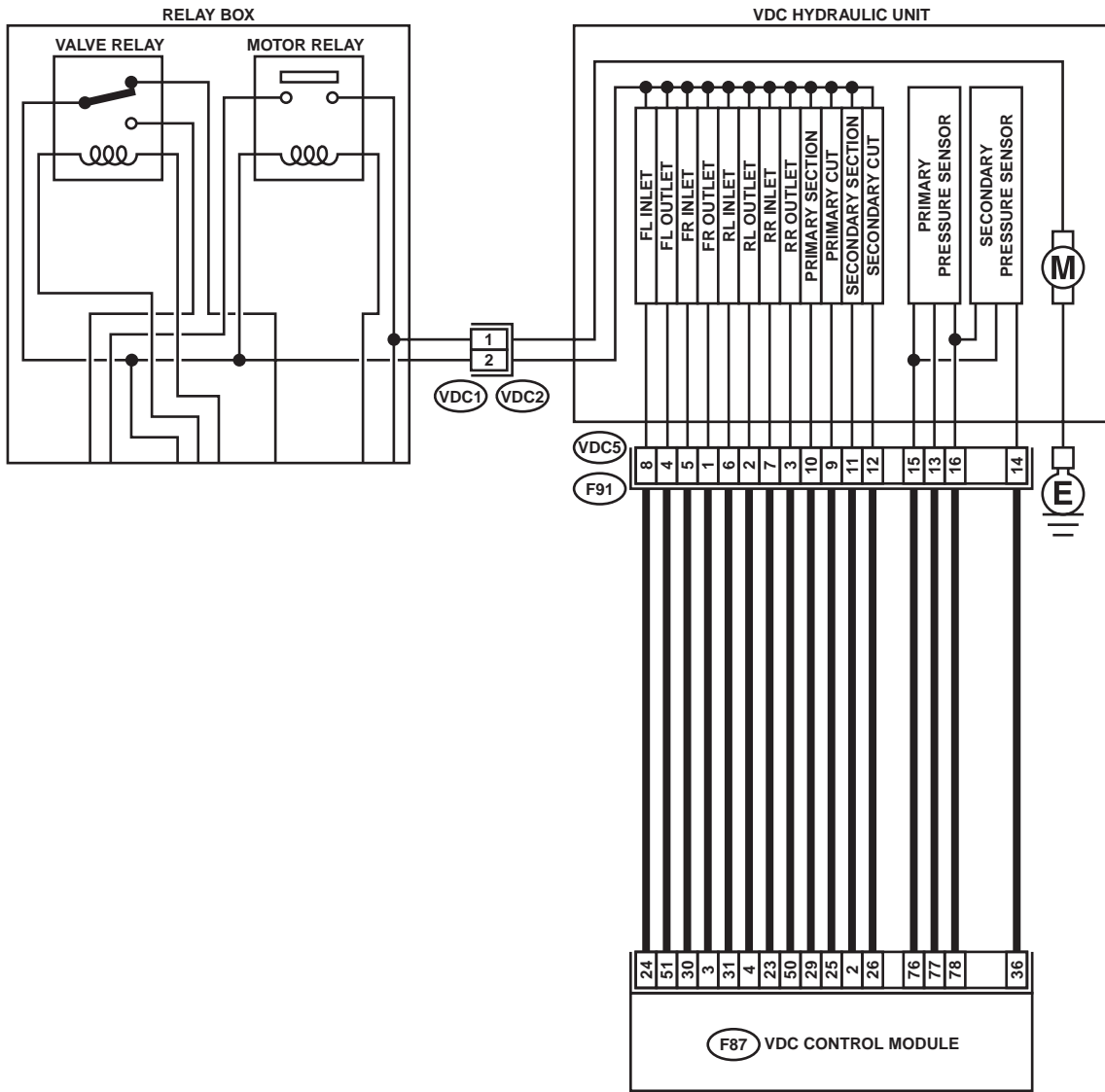
DIAGNOSIS:

- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC1

1 2

F91



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

VDC00142

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK RESISTANCE OF SOLENOID VALVE.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals.</p> <p>Connector & terminal</p> <p><i>DTC 32/(VDC5) No. 1 — (VDC2) No. 2:</i> <i>DTC 34/(VDC5) No. 4 — (VDC2) No. 2:</i> <i>DTC 36/(VDC5) No. 3 — (VDC2) No. 2:</i> <i>DTC 38/(VDC5) No. 2 — (VDC2) No. 2:</i> <i>DTC 63/(VDC5) No. 10 — (VDC2) No. 2:</i> <i>DTC 64/(VDC5) No. 11 — (VDC2) No. 2:</i></p> <p>Is the measured value within the specified range?</p>	3.8 — 4.8 Ω	Go to step 2.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>2</p> <p>CHECK GROUND SHORT OF SOLENOID VALVE.</p> <p>Measure resistance between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p><i>DTC 32/(VDC5) No. 1 — Chassis ground:</i> <i>DTC 34/(VDC5) No. 4 — Chassis ground:</i> <i>DTC 36/(VDC5) No. 3 — Chassis ground:</i> <i>DTC 38/(VDC5) No. 2 — Chassis ground:</i> <i>DTC 63/(VDC5) No. 10 — Chassis ground:</i> <i>DTC 64/(VDC5) No. 11 — Chassis ground:</i></p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>3</p> <p>CHECK BATTERY SHORT OF SOLENOID VALVE.</p> <p>1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p><i>DTC 32/(VDC5) No. 1 (+) — Chassis ground (-):</i> <i>DTC 34/(VDC5) No. 4 (+) — Chassis ground (-):</i> <i>DTC 36/(VDC5) No. 3 (+) — Chassis ground (-):</i> <i>DTC 38/(VDC5) No. 2 (+) — Chassis ground (-):</i> <i>DTC 63/(VDC5) No. 10 (+) — Chassis ground (-):</i> <i>DTC 64/(VDC5) No. 11 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 4.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>4 CHECK BATTERY SHORT OF SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal <i>DTC 32/(VDC5) No. 1 (+) — Chassis ground (-):</i> <i>DTC 34/(VDC5) No. 4 (+) — Chassis ground (-):</i> <i>DTC 36/(VDC5) No. 3 (+) — Chassis ground (-):</i> <i>DTC 38/(VDC5) No. 2 (+) — Chassis ground (-):</i> <i>DTC 63/(VDC5) No. 10 (+) — Chassis ground (-):</i> <i>DTC 64/(VDC5) No. 11 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>5 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal <i>DTC 32/(F87) No. 3 (+) — Chassis ground (-):</i> <i>DTC 34/(F87) No. 51 (+) — Chassis ground (-):</i> <i>DTC 36/(F87) No. 50 (+) — Chassis ground (-):</i> <i>DTC 38/(F87) No. 4 (+) — Chassis ground (-):</i> <i>DTC 63/(F87) No. 29 (+) — Chassis ground (-):</i> <i>DTC 64/(F87) No. 2 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 6.	Repair harness between VDCCM and VDCH/U.
<p>6 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal <i>DTC 32/(F87) No. 3 (+) — Chassis ground (-):</i> <i>DTC 34/(F87) No. 51 (+) — Chassis ground (-):</i> <i>DTC 36/(F87) No. 50 (+) — Chassis ground (-):</i> <i>DTC 38/(F87) No. 4 (+) — Chassis ground (-):</i> <i>DTC 63/(F87) No. 29 (+) — Chassis ground (-):</i> <i>DTC 64/(F87) No. 2 (+) — Chassis ground (-):</i></p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 7.	Repair harness between VDCCM and VDCH/U.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. Connector & terminal <i>DTC 32/(F87) No. 3 — Chassis ground:</i> <i>DTC 34/(F87) No. 51 — Chassis ground:</i> <i>DTC 36/(F87) No. 50 — Chassis ground:</i> <i>DTC 38/(F87) No. 4 — Chassis ground:</i> <i>DTC 63/(F87) No. 29 — Chassis ground:</i> <i>DTC 64/(F87) No. 2 — Chassis ground:</i> Does the measured value exceed the specified value?	1 MΩ	Go to step 8 .	Repair harness between VDCCM and VDCH/U.
8 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U. 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. Connector & terminal <i>DTC 32/(F87) No. 3 — (VDC2) No. 1:</i> <i>DTC 34/(F87) No. 51 — (VDC2) No. 1:</i> <i>DTC 36/(F87) No. 50 — (VDC2) No. 1:</i> <i>DTC 38/(F87) No. 4 — (VDC2) No. 1:</i> <i>DTC 63/(F87) No. 29 — (VDC2) No. 1:</i> <i>DTC 64/(F87) No. 2 — (VDC2) No. 1:</i> Is the measured value within the specified range?	3 — 6 Ω	Go to step 9 .	Repair harness/connector between VDCCM and VDCH/U.
9 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and VDCH/U?	Tightened securely.	Repair connector.	Go to step 10 .
10 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	There is poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 11 .
11 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Same DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

W: DTC 41 ELECTRICAL CONTROL MODULE (VDC CONTROL MODULE MAL-FUNCTION)

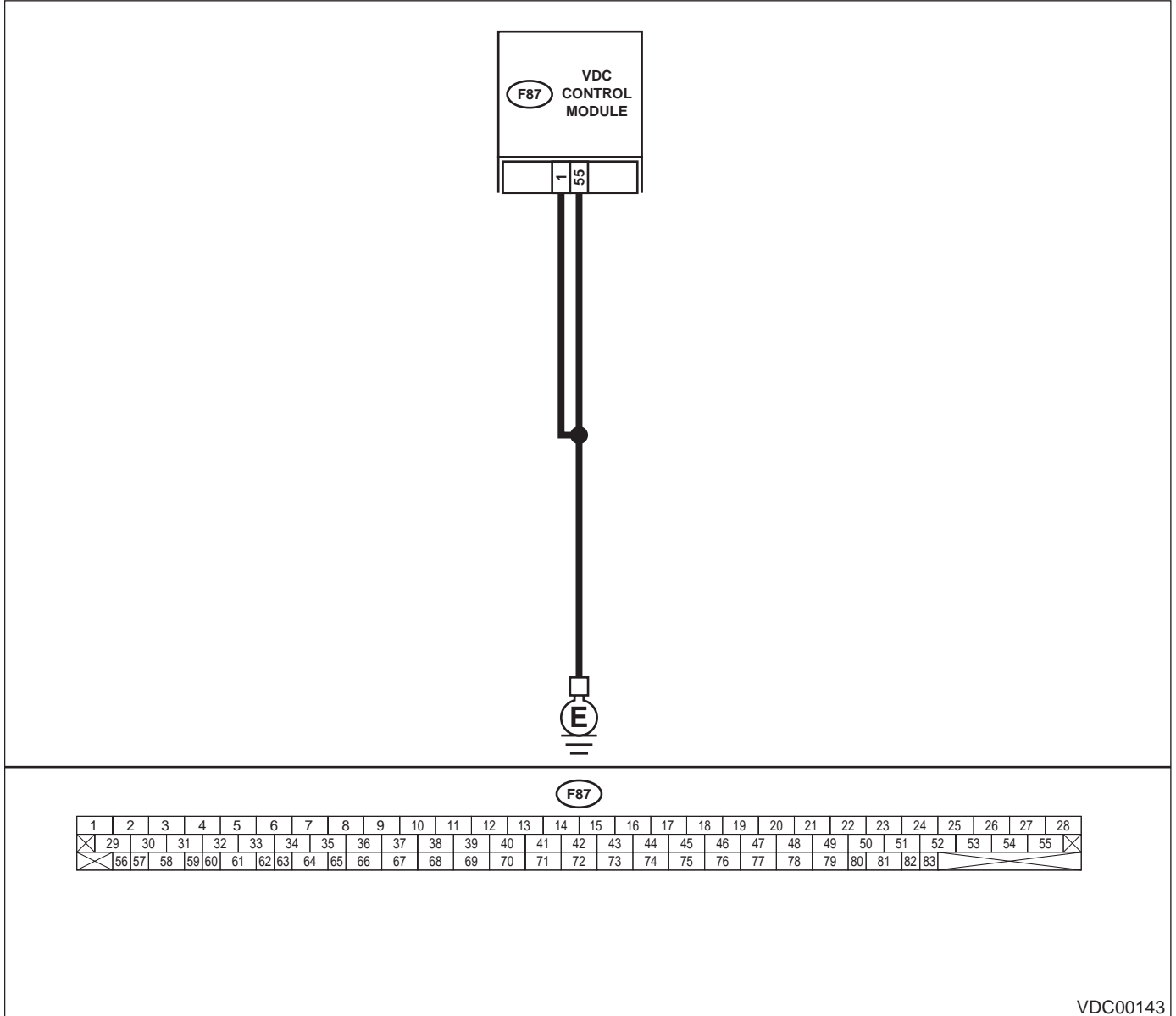
DIAGNOSIS:

- Faulty VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK GROUND CIRCUIT OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM and chassis ground. Connector & terminal <i>(F87) No. 1 — Chassis ground:</i> <i>(F87) No. 55 — Chassis ground:</i> Is the measured value less than the specified value?	0.5 Ω	Go to step 2.	Repair VDCCM ground harness.
2 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between battery, ignition switch and VDCCM?	There is poor contact.	Repair connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE. Is the car telephone or the wireless transmitter properly installed?	Tightened securely.	Go to step 4.	Properly install the car telephone or the wireless transmitter.
4 CHECK SOURCES OF SIGNAL NOISE. Are noise sources (such as an antenna) installed near the sensor harness?	Installed properly.	Install the noise sources apart from the sensor harness.	Go to step 5.
5 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 6.
6 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

X: DTC 42 POWER SUPPLY VOLTAGE LOW

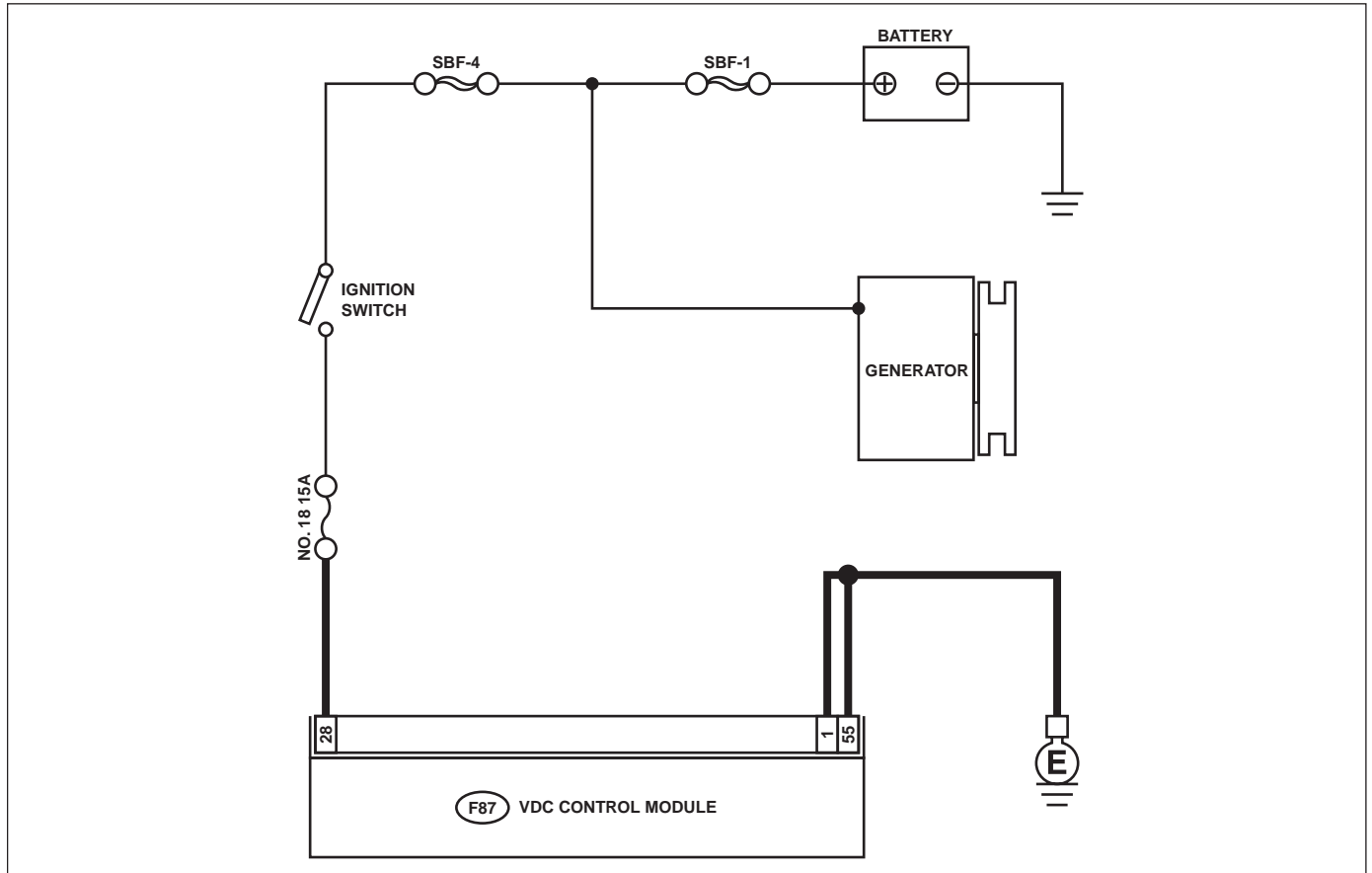
DIAGNOSIS:

- Power source voltage of the VDCCM is low.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗	
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	⊗

VDC00144

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK GENERATOR. 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Go to step 2.	Repair generator.
2 CHECK BATTERY TERMINAL. Turn ignition switch to OFF. Are the positive and negative battery terminals tightly clamped?	Clamped securely.	Go to step 3.	Tighten the clamp of terminal.
3 CHECK INPUT VOLTAGE OF VDCCM. 1) Disconnect connector from VDCCM. 2) Run the engine at idle. 3) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 28 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Go to step 4.	Repair harness connector between battery, ignition switch and VDCCM.
4 CHECK GROUND CIRCUIT OF VDCCM. 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM and chassis ground. Connector & terminal (F87) No. 1 — Chassis ground: (F87) No. 55 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 5.	Repair VDCCM ground harness.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between generator, battery and VDCCM?	There is poor contact.	Repair connector.	Go to step 6.
6 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 7.
7 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Y: DTC 43 AET COMMUNICATION LINE MALFUNCTION

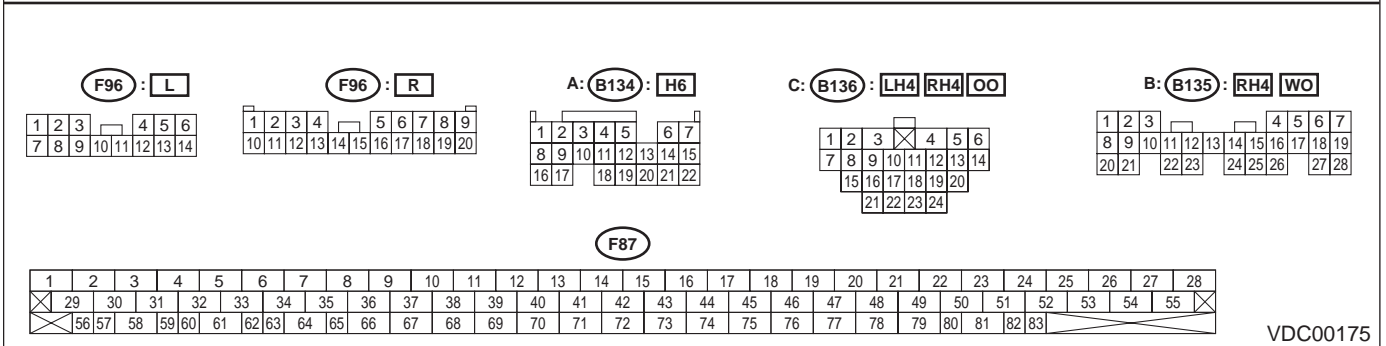
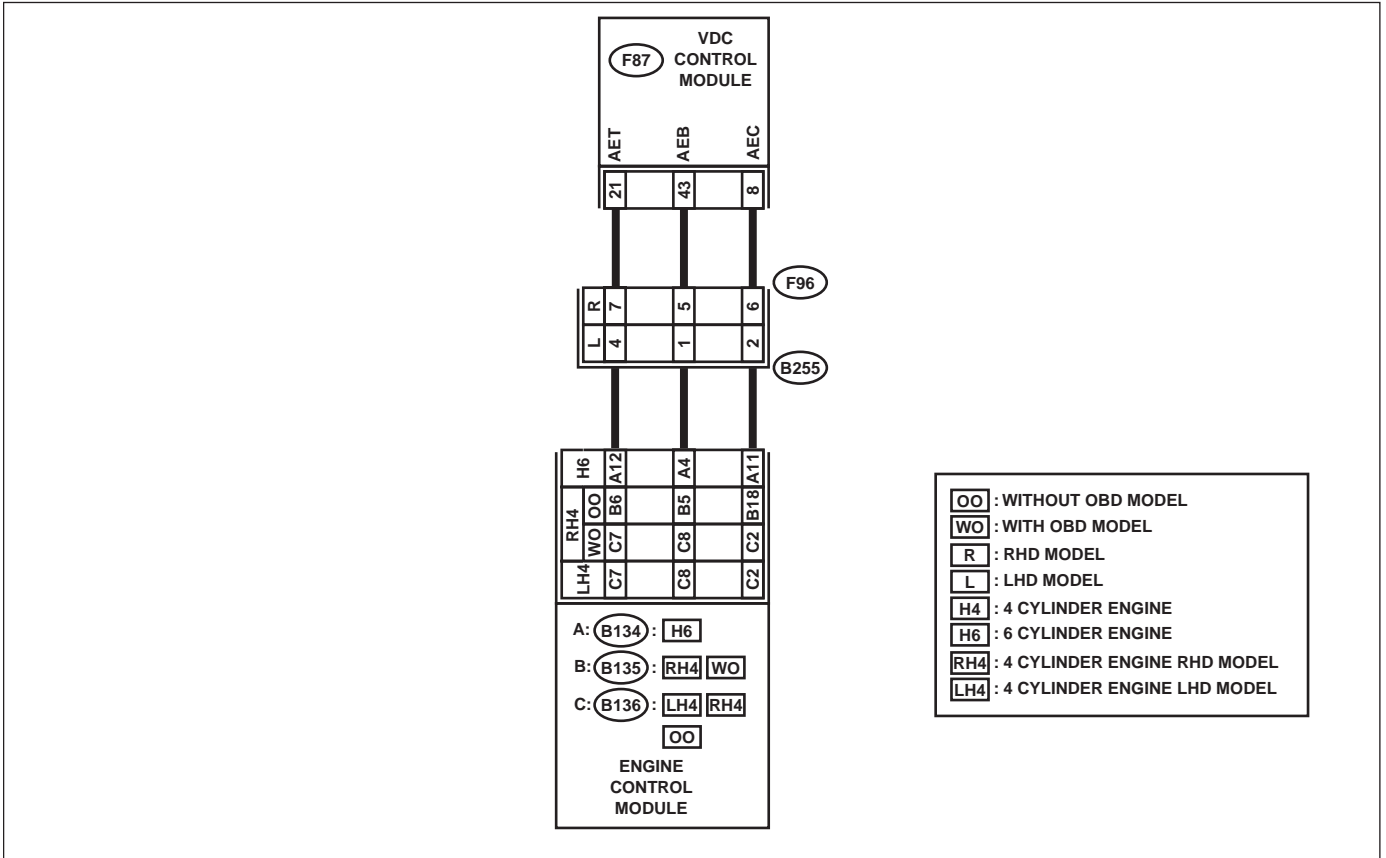
DIAGNOSIS:

- AET communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00175

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM.</p> <p>Connector & terminal H4 engine RHD without OBD model (F87) No. 21 — (B136) No. 7: H4 engine RHD with OBD model (F87) No. 21 — (B135) No. 6: H4 engine LHD model (F87) No. 21 — (B136) No. 7: H6 engine model (F87) No. 21 — (B134) No. 12:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Repair harness/connector between VDCCM and ECM.
<p>2 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 21 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair harness/connector between VDCCM and ECM.
<p>3 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM connector and chassis ground.</p> <p>Terminal (F87) No. 21 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 4.	Repair harness/connector between VDCCM and ECM.
<p>4 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Terminal (F87) No. 21 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Repair harness/connector between VDCCM and ECM.
<p>5 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM. 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 21 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	10 — 15 V	Go to step 6.	Go to step 9.
<p>6 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between ECM and VDCCM?</p>	Tightened securely.	Repair connector.	Go to step 7.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 8 .
8 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9 CHECK ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. Connector & terminal H4 engine RHD without OBD model (B136) No. 7 (+) — Chassis ground (-): H4 engine RHD with OBD model (B135) No. 6 (+) — Chassis ground (-): H4 engine LHD model (B136) No. 7 (+) — Chassis ground (-): H6 engine model (B134) No. 12 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Repair harness/connector between ECM and VDCCM.	Go to step 10 .
10 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector ECM?	There is poor contact.	Repair connector.	Go to step 11 .
11 CHECK ENGINE. Is the engine functioning normally?	Operates properly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Z: DTC 43 AEB COMMUNICATION LINE MALFUNCTION

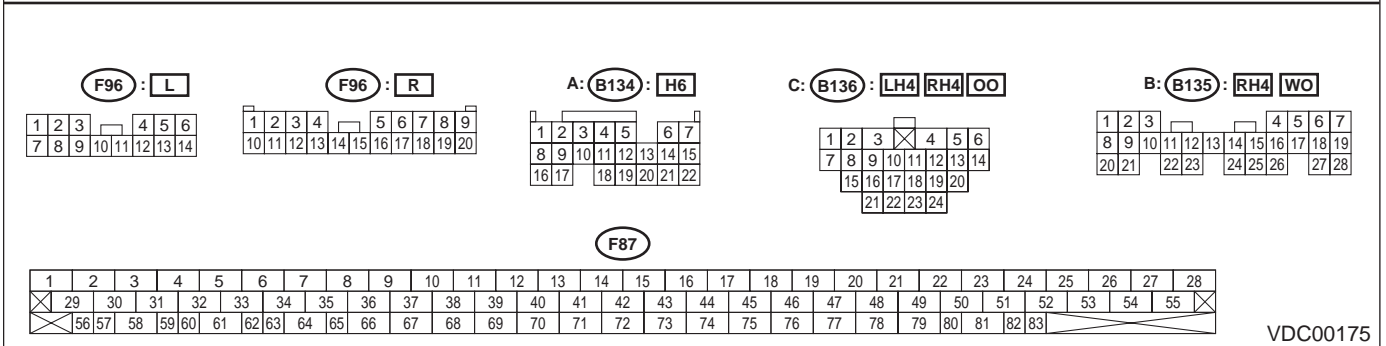
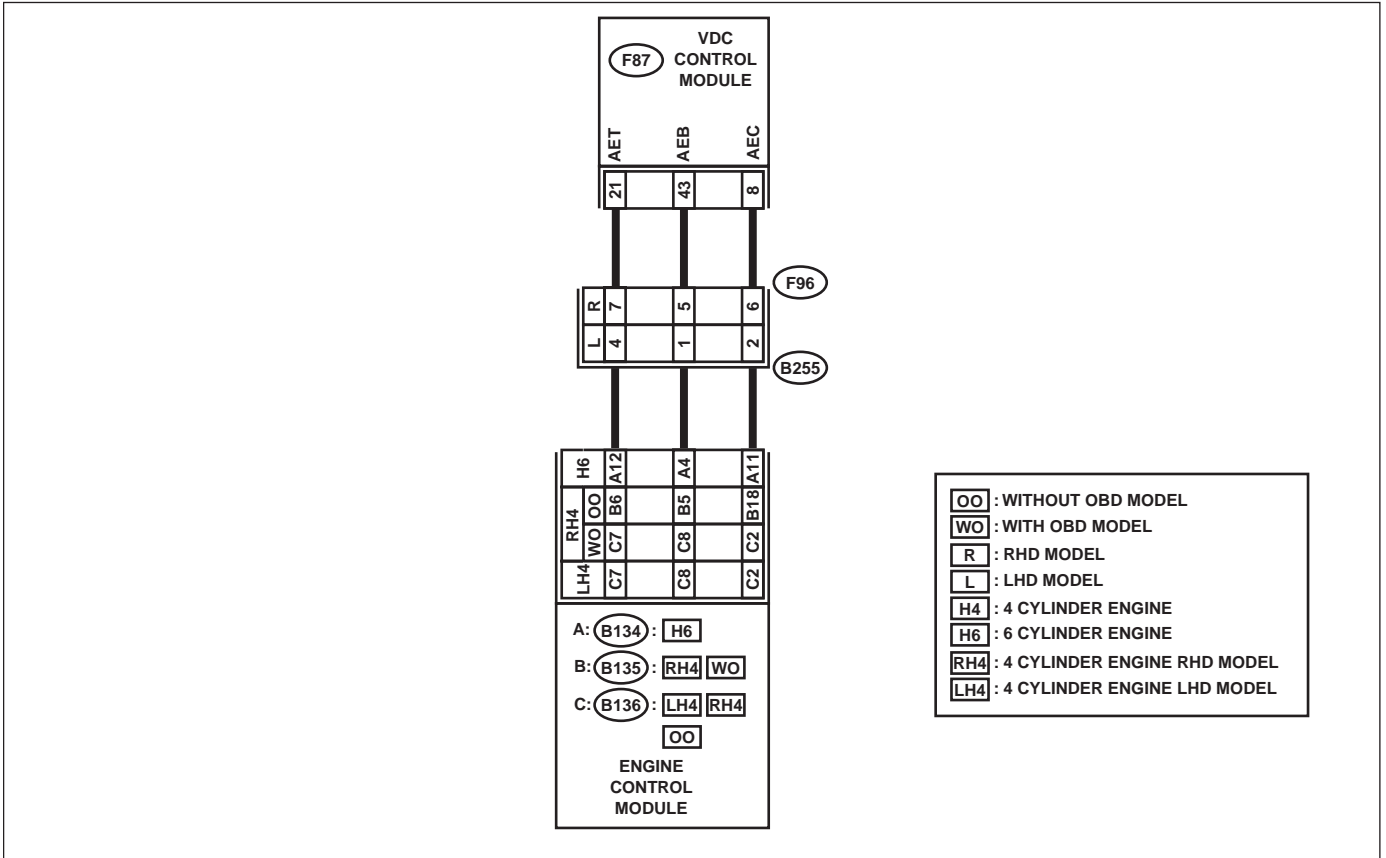
DIAGNOSIS:

- AEB communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM.</p> <p>Connector & terminal H4 engine RHD without OBD model (F87) No. 43 — (B136) No. 8: H4 engine RHD with OBD model (F87) No. 43 — (B135) No. 5: H4 engine LHD model (F87) No. 43 — (B136) No. 8: H6 engine model (F87) No. 43 — (B134) No. 4:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Repair harness/connector between VDCCM and ECM.
<p>2 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 43 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair harness/connector between VDCCM and ECM.
<p>3 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 43 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 4.	Repair harness/connector between VDCCM and ECM.
<p>4 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 43 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Repair harness/connector between VDCCM and ECM.
<p>5 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM. 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 43 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	10 — 15 V	Go to step 6.	Go to step 9.
<p>6 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between ECM and VDCCM?</p>	There is poor contact.	Repair connector.	Go to step 7.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 8 .
8 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9 CHECK ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. Connector & terminal H4 engine RHD without OBD model (B136) No. 8 (+) — Chassis ground (-): H4 engine RHD with OBD model (B135) No. 5 (+) — Chassis ground (-): H4 engine LHD model (B136) No. 8 (+) — Chassis ground (-): H6 engine model (B134) No. 4 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Repair harness/connector between ECM and VDCCM.	Go to step 10 .
10 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector ECM?	There is poor contact.	Repair connector.	Go to step 11 .
11 CHECK ENGINE. Is the engine functioning normally?	Operates properly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AA:DTC 43 AEC COMMUNICATION LINE MALFUNCTION

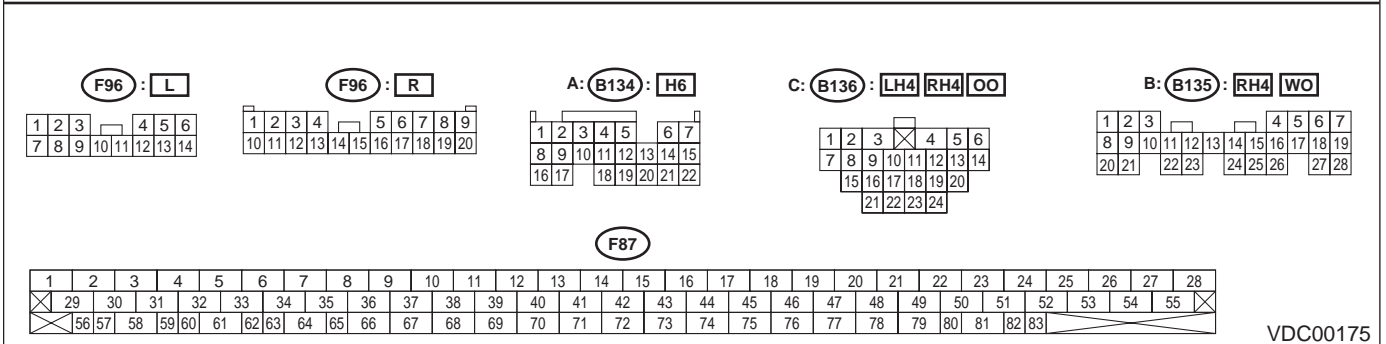
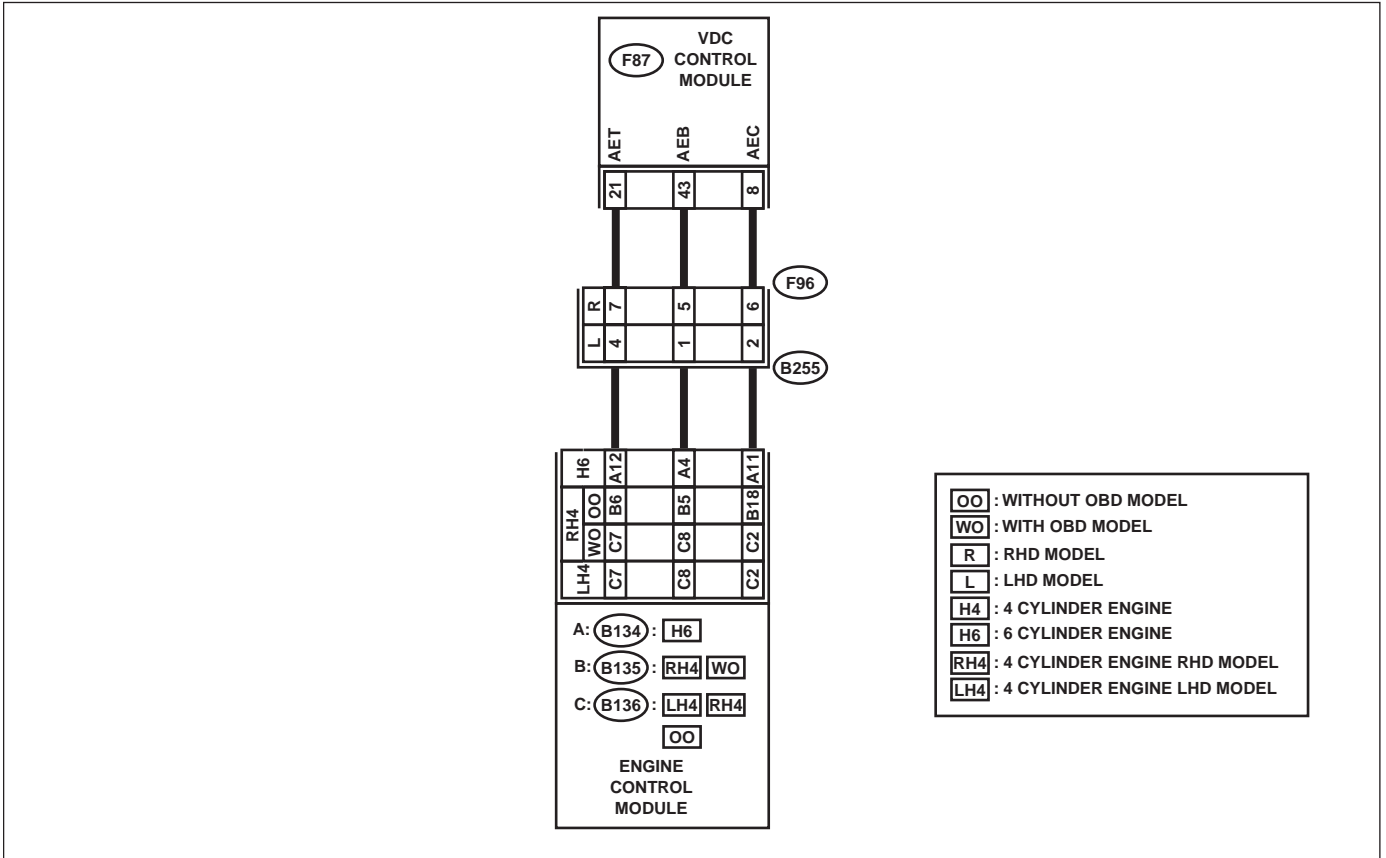
DIAGNOSIS:

- AEC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM.</p> <p>Connector & terminal <i>H4 engine RHD without OBD model</i> (F87) No. 8 — (B136) No. 2: <i>H4 engine RHD with OBD model</i> (F87) No. 8 — (B135) No. 18: <i>H4 engine LHD model</i> (F87) No. 8 — (B136) No. 2: <i>H6 engine model</i> (F87) No. 8 — (B134) No. 11:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Repair harness/connector between VDCCM and ECM.
<p>2 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 8 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair harness/connector between VDCCM and ECM.
<p>3 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 8 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 4.	Repair harness/connector between VDCCM and ECM.
<p>4 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 8 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Repair harness/connector between VDCCM and ECM.
<p>5 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM. 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 8 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	10 — 15 V	Go to step 6.	Go to step 9.
<p>6 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between ECM and VDCCM?</p>	There is poor contact.	Repair connector.	Go to step 7.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 8 .
8 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9 CHECK ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. Connector & terminal H4 engine RHD without OBD model (B136) No. 2 (+) — Chassis ground (-): H4 engine RHD with OBD model (B135) No. 18 (+) — Chassis ground (-): H4 engine LHD model (B136) No. 2 (+) — Chassis ground (-): H6 engine model (B134) No. 11 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Repair harness/connector between ECM and VDCCM.	Go to step 10 .
10 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector ECM?	There is poor contact.	Repair connector.	Go to step 11 .
11 CHECK ENGINE. Is the engine functioning normally?	Operates properly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AB:DTC 44 TCM COMMUNICATION CIRCUIT

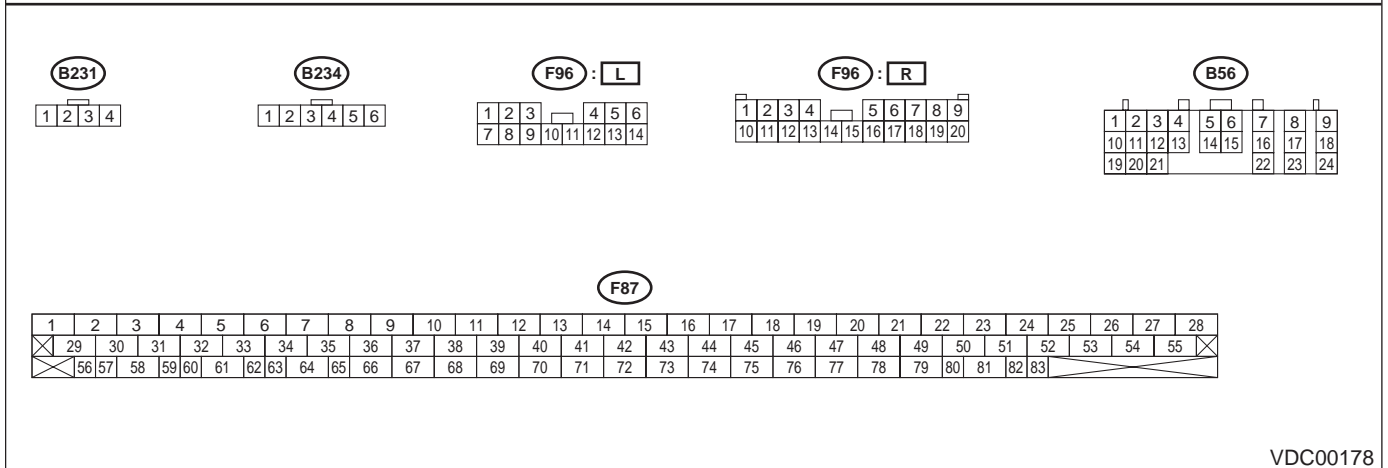
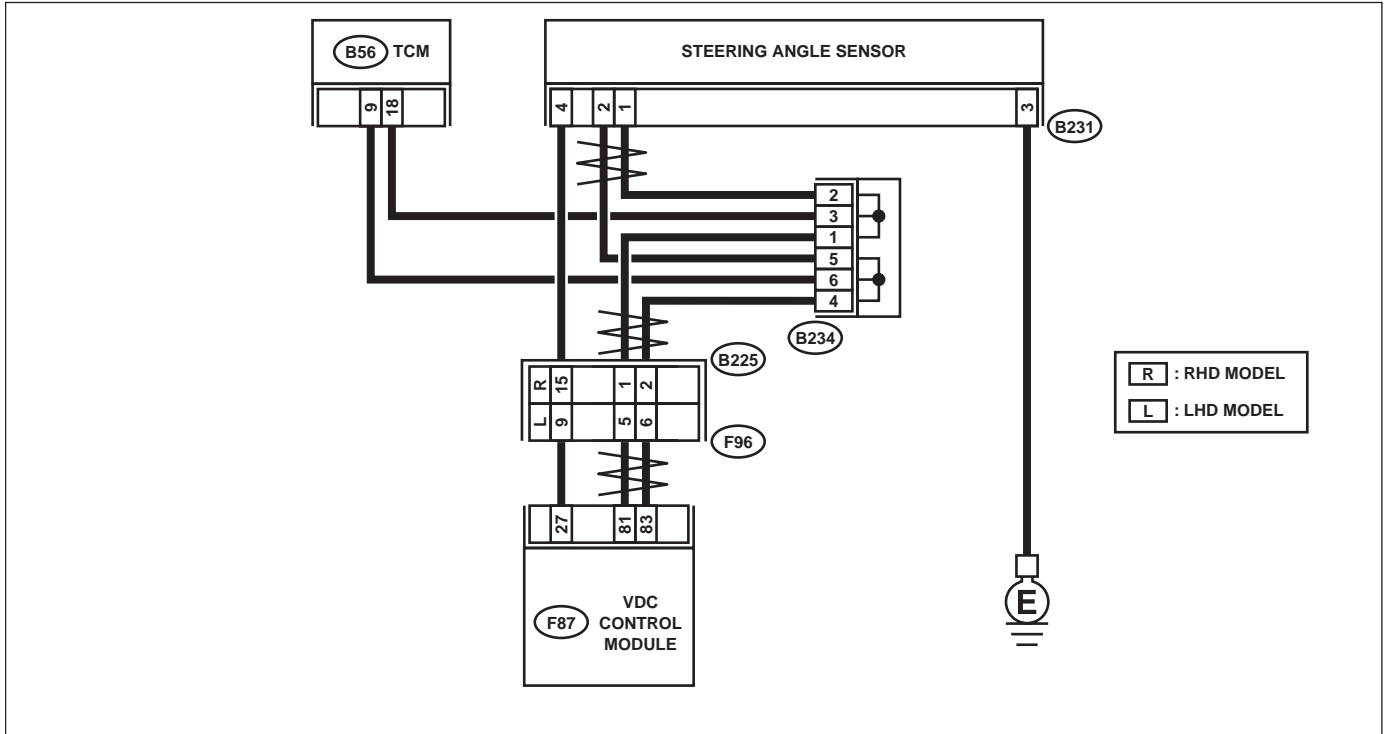
DIAGNOSIS:

- Communication with AT control faults

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00178

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK RESISTANCE OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Measure resistance between TCM connector terminals. Connector & terminal (B56) No. 9 — No. 18: Is the measured value within the specified range?	57 — 63 Ω	Go to step 2.	Repair harness between TCM and VDCCM.
2 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in TCM connectors?	There is poor contact.	Repair connector.	Go to step 3.
3 CHECK TCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>	Go to step 4.
4 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AC:DTC 45 INCORRECT VDC CONTROL MODULE

DIAGNOSIS:

- Control module out of specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step	Value	Yes	No
<p>1 CHECK VDCCM SPECIFICATIONS. Check the VDCCM identification mark. <i>VDCCM identification mark</i> <i>H4 engine model</i> K OUTBACK H4 engine model M OUTBACK H6 engine model N H4 engine model for Australia J H6 engine model for Australia OUT- BACK Y</p> <p>Does the VDCCM identification mark agree with the vehicle specifications?</p>	Agree.	Go to step 2.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>2 CHECK TCM SPECIFICATIONS. Check the TCM identification mark. <i>TCM identification mark</i> <i>LHD H4 engine model</i> YZ RHD H4 engine model ZG LHD OUTBACK H4 engine model ZB RHD OUTBACK H4 engine model ZJ LHD OUTBACK H6 engine model ZD RHD OUTBACK H6 engine model ZL</p> <p>Does the TCM identification mark agree with the vehicle specifications?</p>	Agree.	Go to step 3.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>
<p>3 CHECK TCM. 1) Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).> 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Go to step 4.	The original TCM has been faulty.
<p>4 CHECK TCM.</p>	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step 5.	Proceed with the diagnosis corresponding to the diagnostic trouble code.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
5 CHECK VDCCM. 1) Install original TCM. 2) Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).> 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step 6.	The original VDCCM has been faulty.
6 CHECK VDCCM. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>	Proceed with the diagnosis corresponding to the diagnostic trouble code.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AD:DTC 45 TCM MALFUNCTION SPECIFICATIONS

DIAGNOSIS:

- Control module out of specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Value	Yes	No
1	CHECK AT SYSTEM. 1) Start the engine. 2) Check AT system diagnostic trouble code. Is the AT system diagnostic trouble code is same with the specification?	Indicated.	Repair AT system.	Replace VDCCM. <Ref. to VDC-8, VDC Control Mod- ule (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AE:DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY

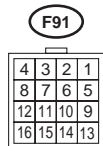
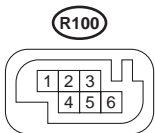
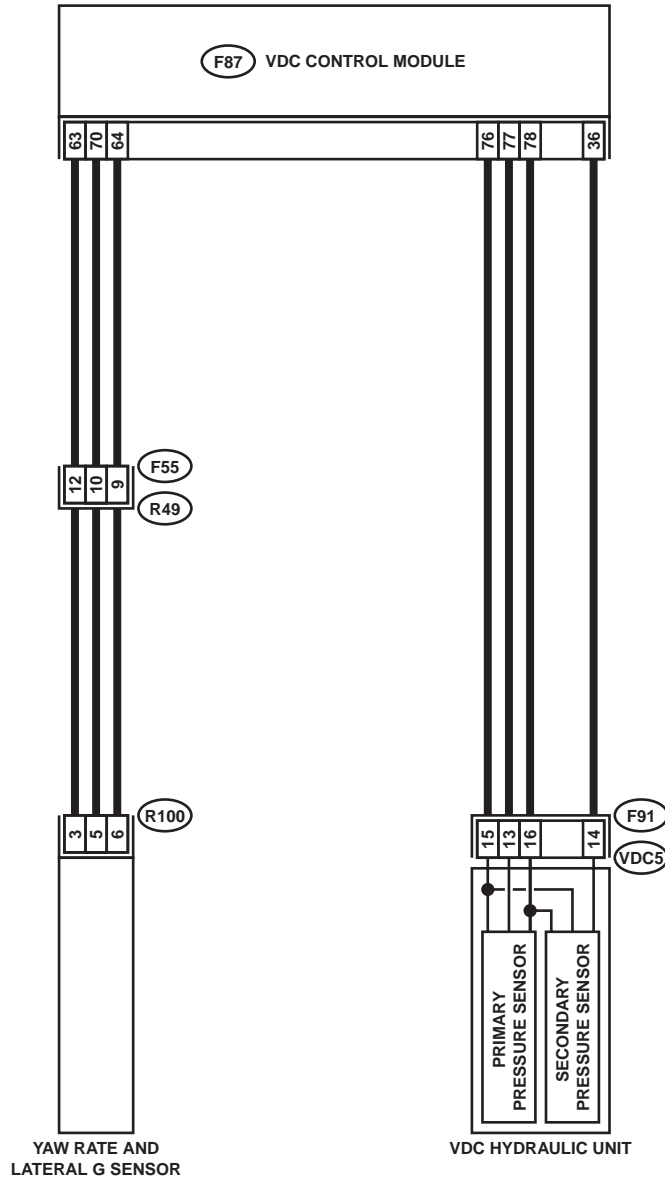
DIAGNOSIS:

- 5 volt power supply is abnormal.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

VDC00177

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND SHORT OF SENSOR AND HARNESS. 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 63 — Chassis ground (Lateral G sensor):</i> <i>(F87) No. 78 — Chassis ground (Pressure sensor):</i> Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Go to step 2.
<p>2 CHECK GROUND SHORT OF HARNESS. 1) Disconnect connector from faulty sensors. 2) Measure resistance between VDCCM and chassis ground. Connector & terminal <i>(F87) No. 63 — Chassis ground (Lateral G sensor):</i> <i>(F87) No. 78 — Chassis ground (Pressure sensor):</i> Does the measured value exceed the specified value?</p>	1 MΩ	Replace faulty sensors.	Repair or replace harness connector between VDCCM and faulty sensor.
<p>3 CHECK BATTERY SHORT OF SENSOR AND HARNESS. Measure voltage between VDCCM and chassis ground. Connector & terminal <i>(F87) No. 63 (+) — Chassis ground (-) (Lateral G sensor):</i> <i>(F87) No. 78 (+) — Chassis ground (-) (Pressure sensor):</i> Is the measured value less than the specified value?</p>	0.5 V	Go to step 4.	Go to step 5.
<p>4 CHECK BATTERY SHORT OF SENSOR AND HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 63 (+) — Chassis ground (-) (Lateral G sensor):</i> <i>(F87) No. 78 (+) — Chassis ground (-) (Pressure sensor):</i> Is the measured value less than the specified value?</p>	0.5 V	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
<p>5 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from faulty sensors. 3) Measure voltage between VDCCM and chassis ground. Connector & terminal <i>(F87) No. 63 (+) — Chassis ground (-) (Lateral G sensor):</i> <i>(F87) No. 78 (+) — Chassis ground (-) (Pressure sensor):</i> Is the measured value less than the specified value?</p>	0.5 V	Go to step 6.	Repair or replace harness connector between VDCCM and faulty sensor.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground.</p> <p>Connector & terminal <i>(F87) No. 63 (+) — Chassis ground (-)</i> <i>(Lateral G sensor):</i> <i>(F87) No. 78 (+) — Chassis ground (-)</i> <i>(Pressure sensor):</i></p> <p>Is the measured value less than the specified value?</p>	0.5 V	Replace faulty sensor.	Repair or replace harness connector between VDCCM and faulty sensor.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AF:DTC 47 IMPROPER CAN COMMUNICATION

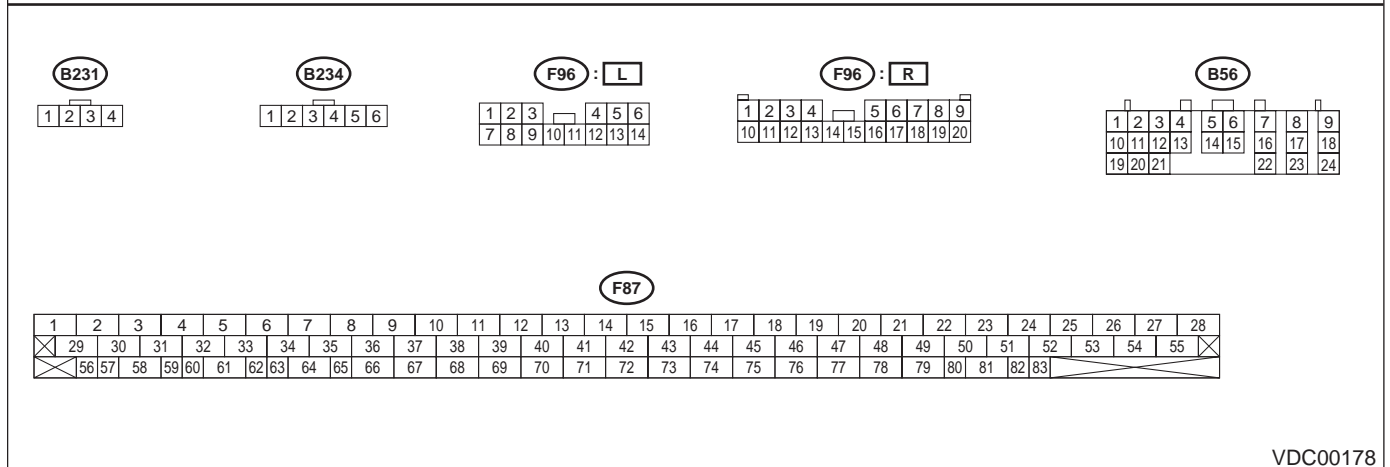
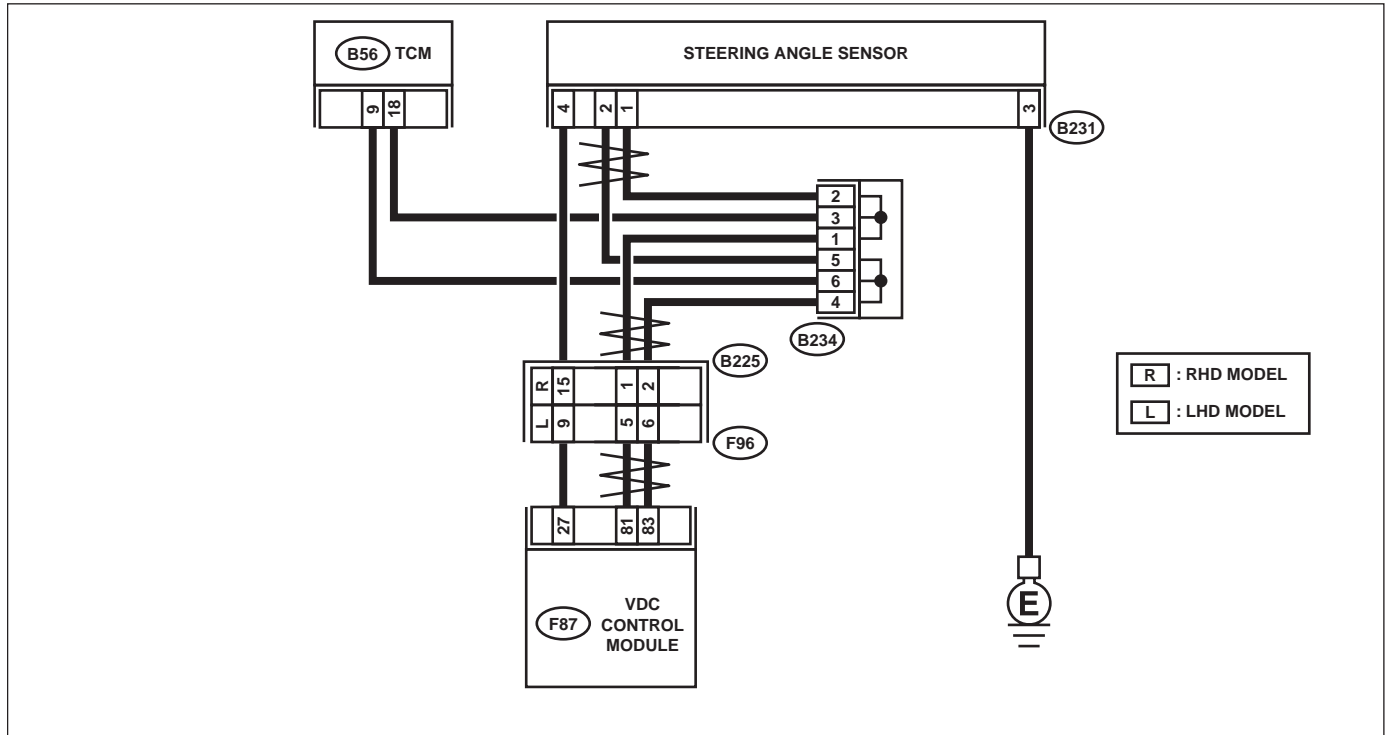
DIAGNOSIS:

- CAN communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00178

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN VDCCM, STEERING ANGLE SENSOR AND TCM.</p> <p>1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM, TCM and steering angle sensor. 3) Measure resistance between VDCCM, TCM and steering angle sensor.</p> <p>Connector & terminal (F87) No. 83 — (B56) No. 9: (F87) No. 81 — (B56) No. 18: (F87) No. 83 — (B231) No. 2: (F87) No. 81 — (B231) No. 1:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Go to step 2.
<p>2 CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND TCM.</p> <p>Measure resistance between TCM and steering angle sensor.</p> <p>Connector & terminal (B56) No. 9 — (B231) No. 2: (B56) No. 18 — (B231) No. 1:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Repair or replace harness connector between VDCCM and steering angle sensor.	Repair or replace harness connector between TCM and steering angle sensor.
<p>3 CHECK GROUND SHORT OF HARNESS.</p> <p>Measure resistance between VDCCM and chassis ground.</p> <p>Connector & terminal (F87) No. 83 — Chassis ground: (F87) No. 81 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
<p>4 CHECK BATTERY SHORT OF SENSOR.</p> <p>Measure voltage between VDCCM and chassis ground.</p> <p>Connector & terminal (F87) No. 83 — Chassis ground: (F87) No. 81 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 5.	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
<p>5 CHECK BATTERY SHORT OF SENSOR.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground.</p> <p>Connector & terminal (F87) No. 83 — Chassis ground: (F87) No. 81 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 6.	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
<p>6 CHECK STEERING ANGLE SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Connect connector to steering angle sensor. 3) Measure resistance between VDCCM connector terminals.</p> <p>Connector & terminal (F87) No. 83 — No. 81:</p> <p>Is the measured value within the specified range?</p>	114 — 126 Ω	Go to step 8.	Go to step 7.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in steering angle sensor?	There is poor contact.	Replace steering angle sensor.	Repair or replace steering angle sensor connector.
8 CHECK VDCCM. 1) Connect connector to VDCCM. 2) Disconnect connector from steering angle sensor. 3) Measure resistance between steering angle sensor connector terminals. Connector & terminal (B231) No. 1 — No. 2: Is the measured value within the specified range?	114 — 126 Ω	Go to step 10.	Go to step 9.
9 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in steering angle sensor?	There is poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair or replace VDCCM connector.
10 CHECK TCM. 1) Connect connector to TCM. 2) Disconnect connector from VDCCM. 3) Measure resistance between steering angle sensor terminals. Connector & terminal (B231) No. 1 — No. 2: Does the measured value exceed the specified value?	1 MΩ	Go to step 12.	Go to step 11.
11 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in steering angle sensor?	There is poor contact.	Replace TCM. <Ref. to AT-76, Transmission Control Module (TCM).>	Repair or replace TCM connector.
12 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Are other diagnostic trouble codes being output?	Other DTC indicated.	Go to step 13.	A temporary poor contact.
13 CHECK DIAGNOSTIC TROUBLE CODE. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step 14.	Proceed with the diagnosis corresponding to the diagnostic trouble code.
14 CHECK AT SYSTEM DIAGNOSTIC TROUBLE CODE. Is the AT system diagnostic trouble code is same with the specification?	DTC 86	Replace steering angle sensor.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AG:DTC 48 IMPROPER EAC COMMUNICATION

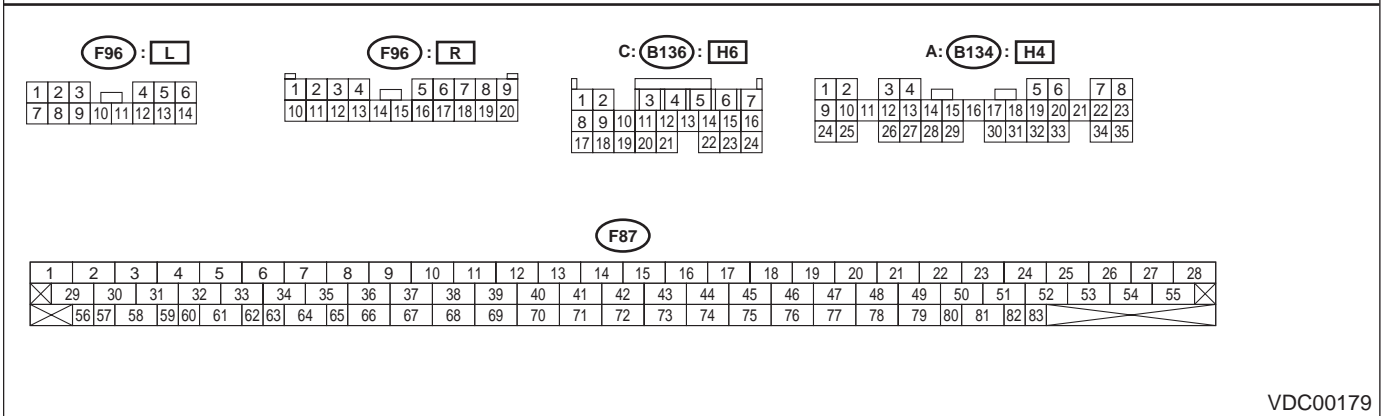
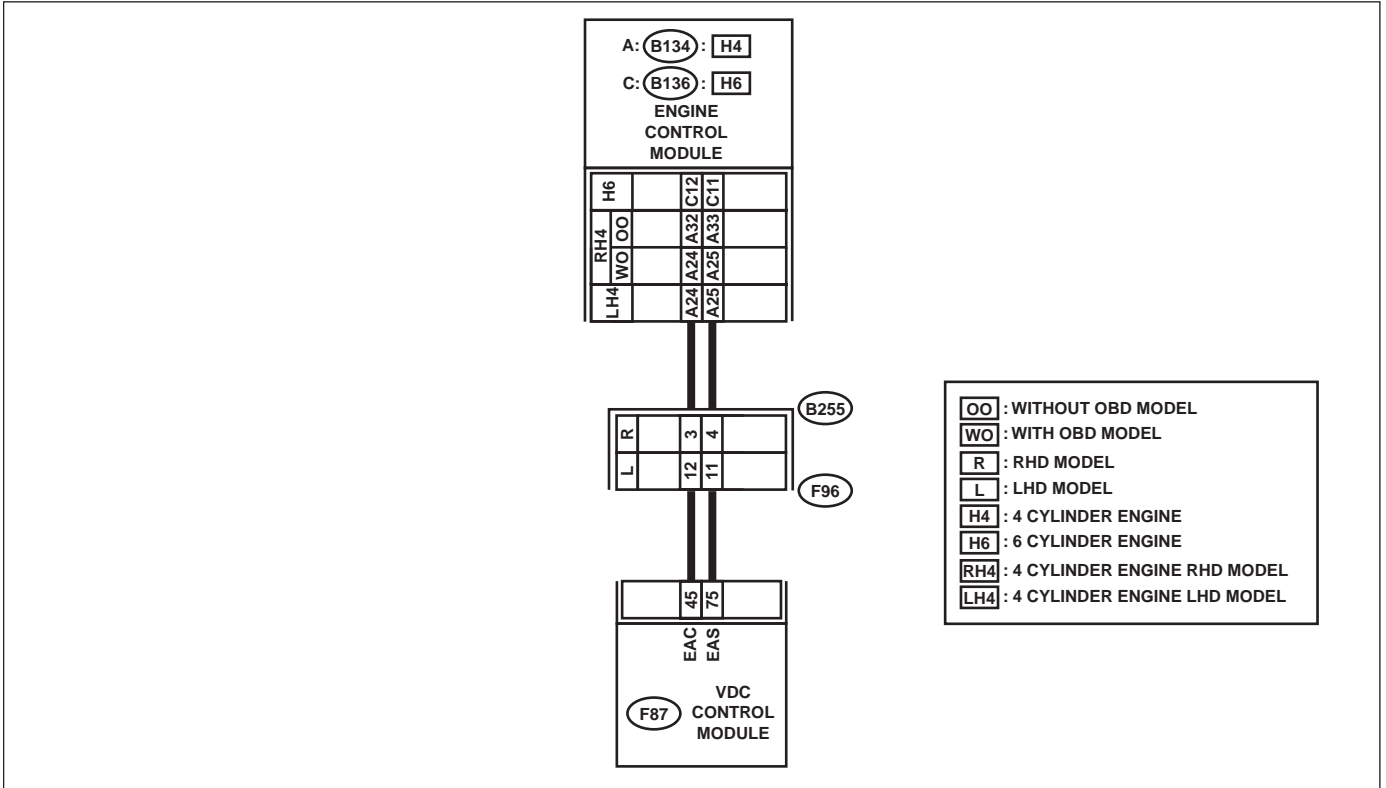
DIAGNOSIS:

- EAC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00179

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. Connector & terminal <i>H4 engine RHD without OBD model</i> (F87) No. 45 — (B134) No. 24: <i>H4 engine RHD with OBD model</i> (F87) No. 45 — (B134) No. 32: <i>H4 engine LHD model</i> (F87) No. 45 — (B134) No. 24: <i>H6 engine model</i> (F87) No. 45 — (B136) No. 12: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Repair or replace open circuit between VDCCM and ECM.
<p>2 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM and ECM. Connector & terminal (F87) No. 45 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Repair or replace ground short circuit between VDCCM and ECM.
<p>3 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 45 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 4.	Repair or replace battery short circuit between VDCCM and ECM.
<p>4 CHECK INPUT VOLTAGE FROM ECM. 1) Turn ignition switch to OFF. 2) Connect connector to VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. Connector & terminal <i>H4 engine RHD without OBD model</i> (B134) No. 24 (+) — Chassis ground (-): <i>H4 engine RHD with OBD model</i> (B134) No. 32 (+) — Chassis ground (-): <i>H4 engine LHD model</i> (B134) No. 24 (+) — Chassis ground (-): <i>H6 engine model</i> (B136) No. 12 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 6.	Go to step 5.
<p>5 CHECK POOR CONTACT IN ECM CONNECTORS. Is there poor contact in ECM connector?</p>	There is poor contact.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
<p>6 ERASE MEMORY. 1) Connect all connectors. 2) Erase the memory. Can the memory be erased?</p>	Can be erased.	Go to step 7.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK DIAGNOSTIC TROUBLE CODE. 1) Perform inspection mode. 2) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AH:DTC 48 EAS COMMUNICATION LINE GROUNDING SHORTED

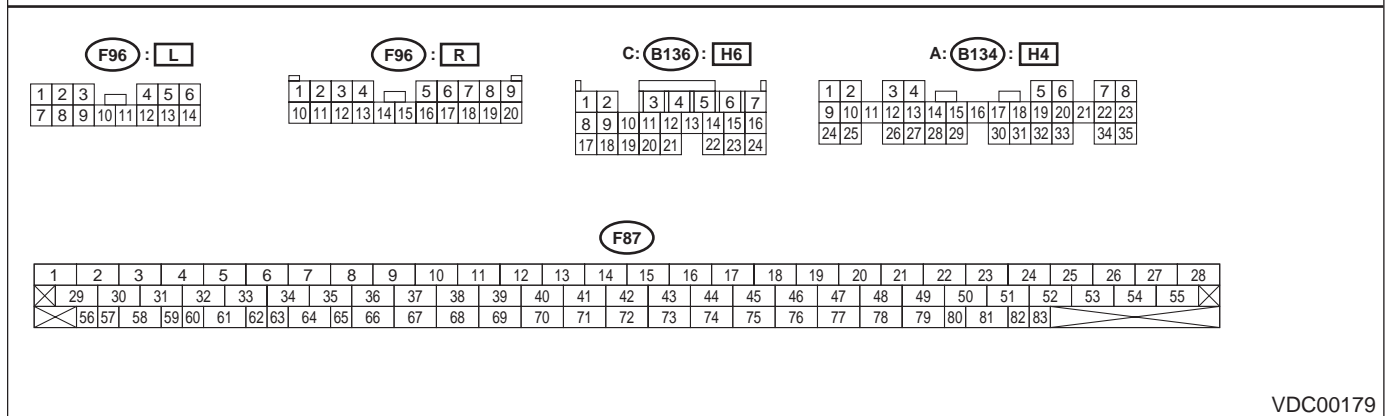
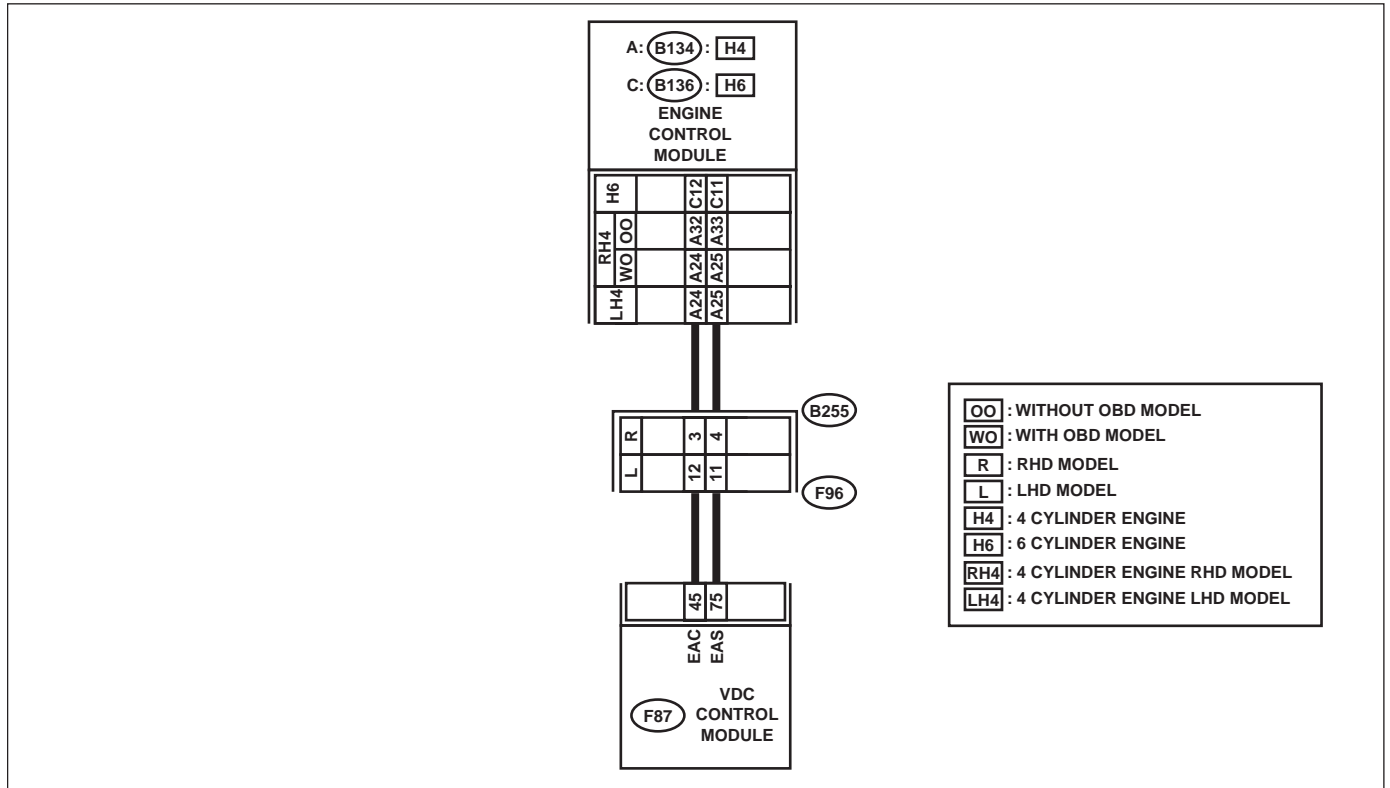
DIAGNOSIS:

- EAS communication line is short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00179

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. Connector & terminal (F87) No. 75 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 2.	Repair or replace ground short circuit between VDCCM and ECM.
<p>2 CHECK INPUT VOLTAGE FROM ECM. 1) Connect connector to VDCCM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. Connector & terminal H4 engine RHD without OBD model (B134) No. 25 (+) — Chassis ground (-): H4 engine RHD with OBD model (B134) No. 33 (+) — Chassis ground (-): H4 engine LHD model (B134) No. 25 (+) — Chassis ground (-): H6 engine model (B136) No. 11 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 4.	Go to step 3.
<p>3 CHECK POOR CONTACT IN ECM CONNECTORS. Is there poor contact in ECM connector?</p>	There is poor contact.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
<p>4 ERASE MEMORY. 1) Connect all connectors. 2) Erase the memory. Can the memory be erased?</p>	Can be erased.	Go to step 5.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>5 CHECK DIAGNOSTIC TROUBLE CODE. 1) Perform inspection mode. 2) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AI: DTC 48 ERRONEOUS COMMUNICATION FROM EGI TO VDC

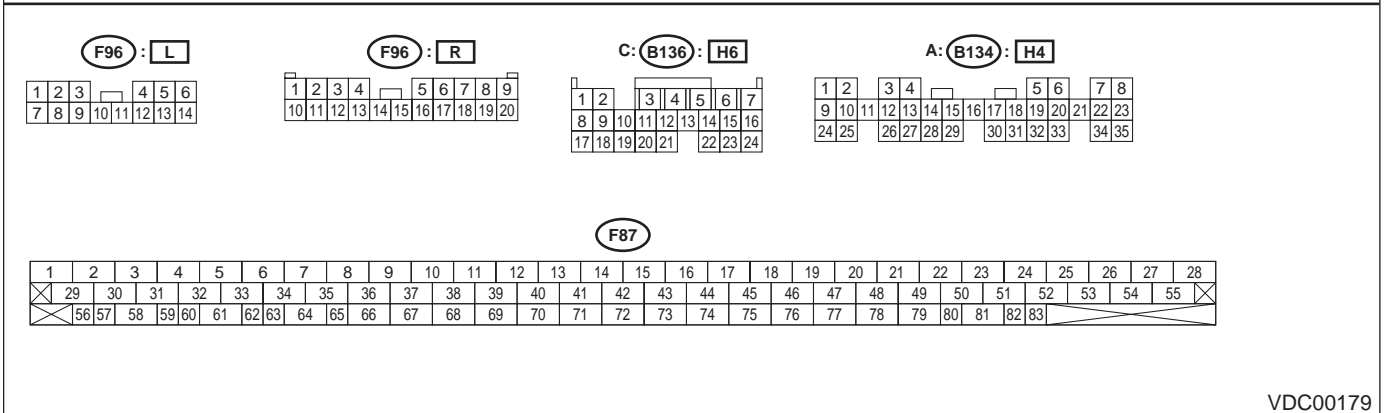
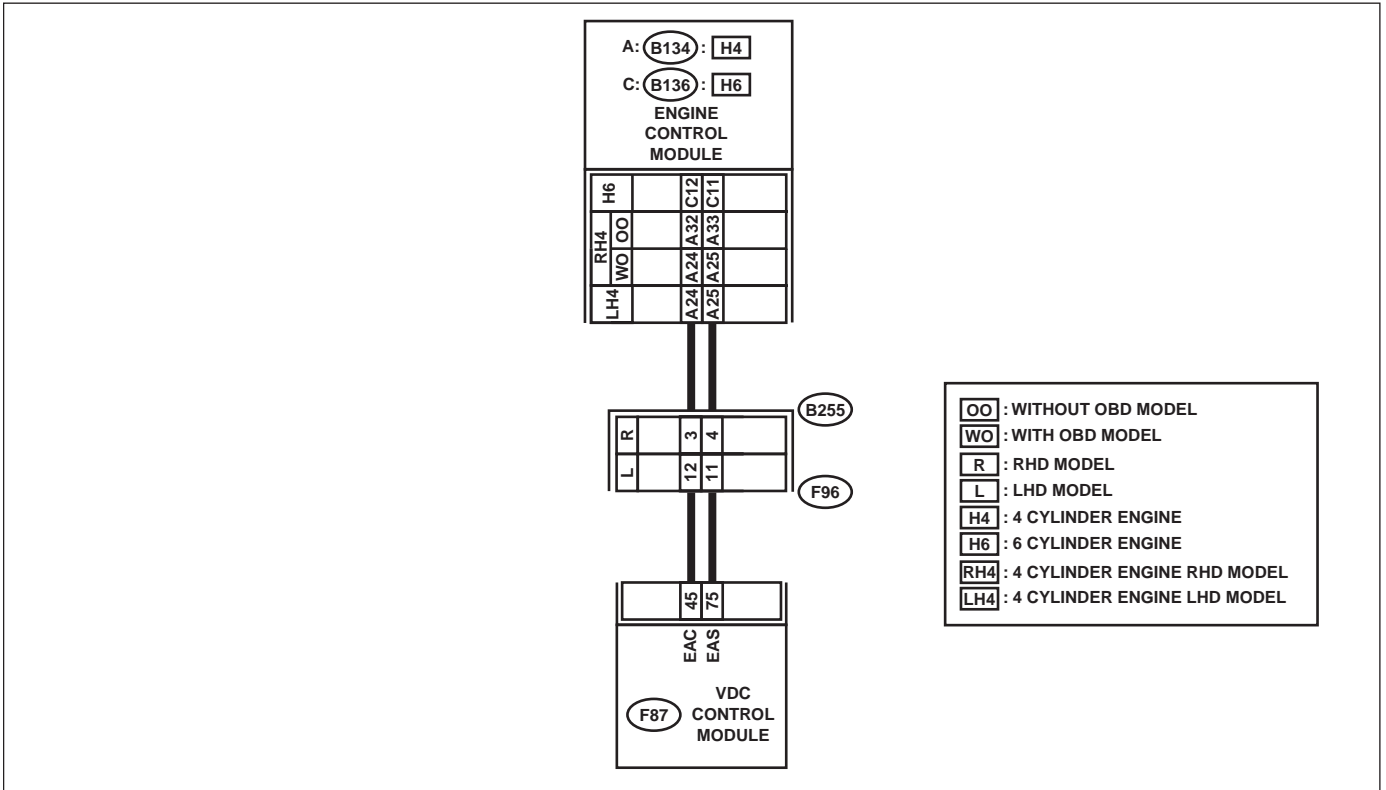
DIAGNOSIS:

- EAS communication line is broken or short circuited.
- EAC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00179

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND VDCCM.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM.</p> <p>Connector & terminal H4 engine RHD without OBD model (F87) No. 45 — (B134) No. 24: (F87) No. 75 — (B134) No. 25: H4 engine RHD with OBD model (F87) No. 45 — (B134) No. 32: (F87) No. 75 — (B134) No. 33: H4 engine LHD model (F87) No. 45 — (B134) No. 24: (F87) No. 75 — (B134) No. 25: H6 engine model (F87) No. 45 — (B136) No. 12: (F87) No. 75 — (B136) No. 11:</p> <p>Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Repair or replace open circuit between VDCCM and ECM.
<p>2 CHECK BATTERY SHORT OF HARNESS.</p> <p>1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground.</p> <p>Connector & terminal (F87) No. 75 (+) — Chassis ground (-): (F87) No. 45 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 3.	Repair or replace battery short circuit between VDCCM and ECM.
<p>3 CHECK INPUT VOLTAGE FROM ECM.</p> <p>1) Turn ignition switch to OFF. 2) Connect connector to VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground.</p> <p>Connector & terminal H4 engine RHD without OBD model (B134) No. 24 (+) — Chassis ground (-): (B134) No. 25 (+) — Chassis ground (-): H4 engine RHD with OBD model (B134) No. 32 (+) — Chassis ground (-): (B134) No. 33 (+) — Chassis ground (-): H4 engine LHD model (B134) No. 24 (+) — Chassis ground (-): (B134) No. 25 (+) — Chassis ground (-): H6 engine model (B136) No. 12 (+) — Chassis ground (-): (B136) No. 11 (+) — Chassis ground (-):</p> <p>Is the measured value within the specified range?</p>	10 — 15 V	Go to step 5.	Go to step 4.
<p>4 CHECK POOR CONTACT IN ECM CONNECTORS.</p> <p>Is there poor contact in ECM connector?</p>	There is poor contact.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
5 ERASE MEMORY. 1) Connect all connectors. 2) Erase the memory. Can the memory be erased?	Can be erased.	Go to step 6.	Replace VDCCM. <Ref. to VDC-8, VDC Control Mod- ule (VDCCM).>
6 CHECK DIAGNOSTIC TROUBLE CODE. 1) Perform inspection mode. 2) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AJ:DTC 49 ABNORMAL ENGINE SPEED SIGNAL

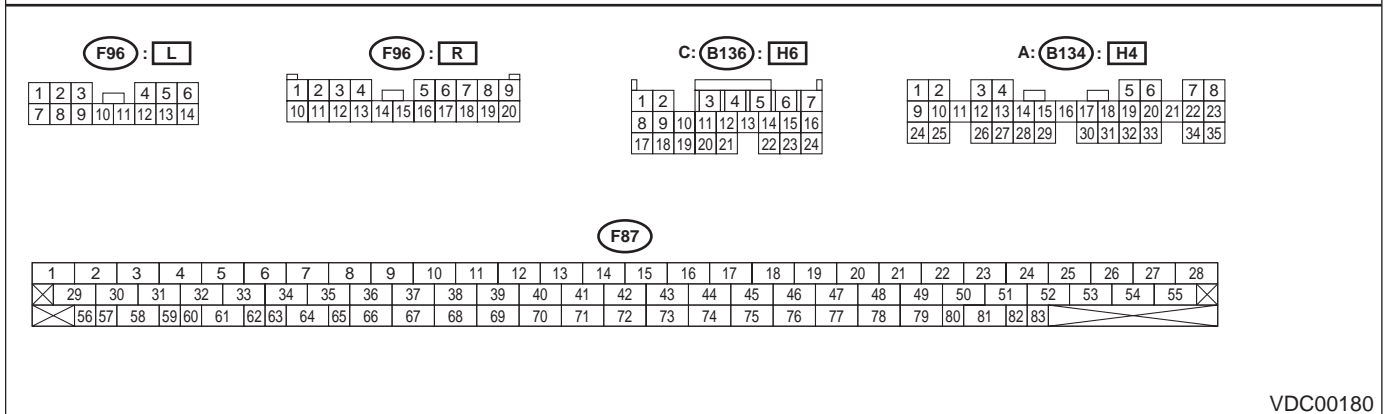
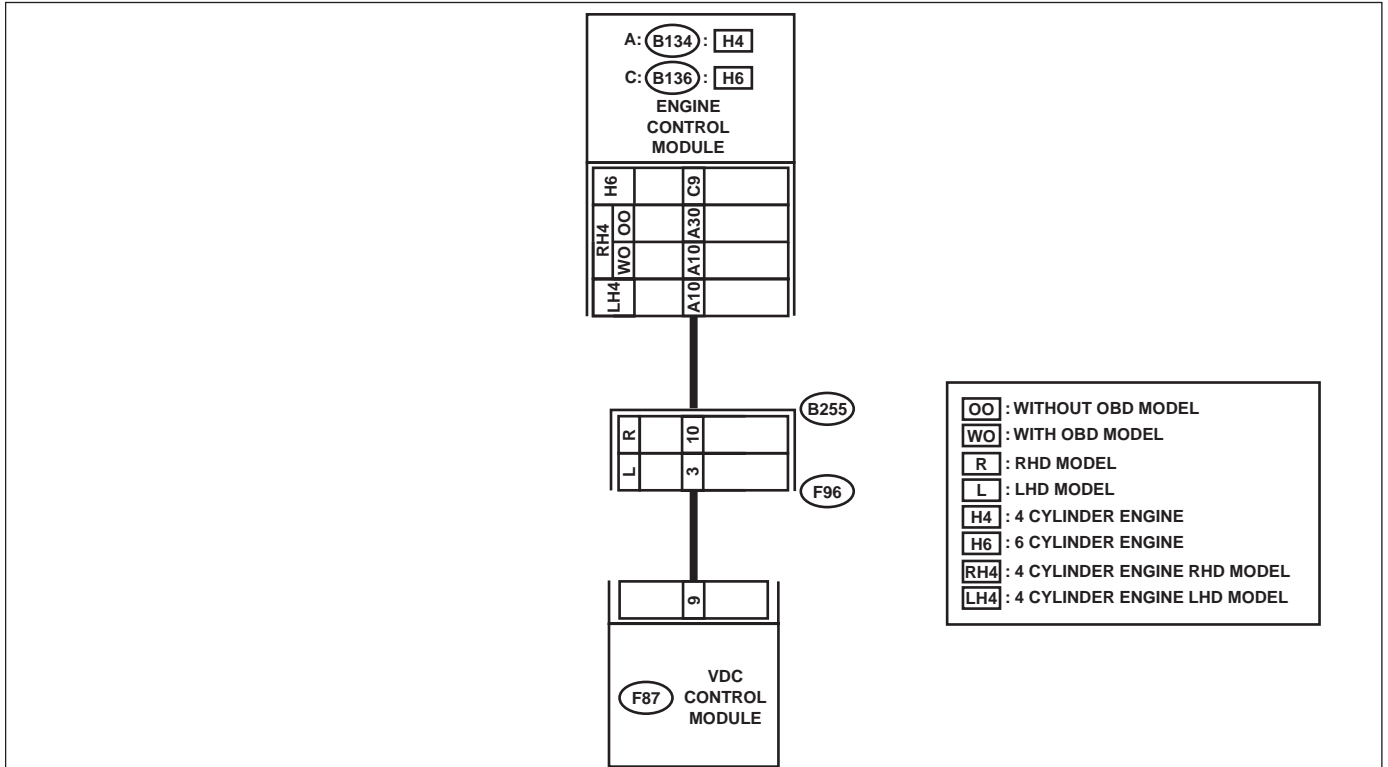
DIAGNOSIS:

- Engine speed signal line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00180

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK TACHOMETER OPERATION IN COMBINATION METER. Does tachometer operate normally?	Operates properly.	Go to step 2.	Repair tachometer.
2 CHECK HARNESS BETWEEN VDCCM AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM connector and ECM. Connector & terminal <i>H4 engine RHD without OBD model</i> (F87) No. 9 — (B134) No. 10: <i>H4 engine RHD with OBD model</i> (F87) No. 9 — (B134) No. 30: <i>H4 engine LHD model</i> (F87) No. 9 — (B134) No. 10: <i>H6 engine model</i> (F87) No. 9 — (B136) No. 9: Is the measured value less than the specified value?	0.5 Ω	Go to step 3.	Repair harness connector between VDCCM and ECM.
3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connectors between VDCCM and ECM?	There is poor contact.	Repair connector.	Go to step 4.
4 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
5 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AK:DTC 51 VALVE RELAY

DIAGNOSIS:

- Faulty valve relay

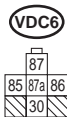
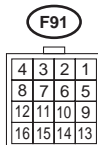
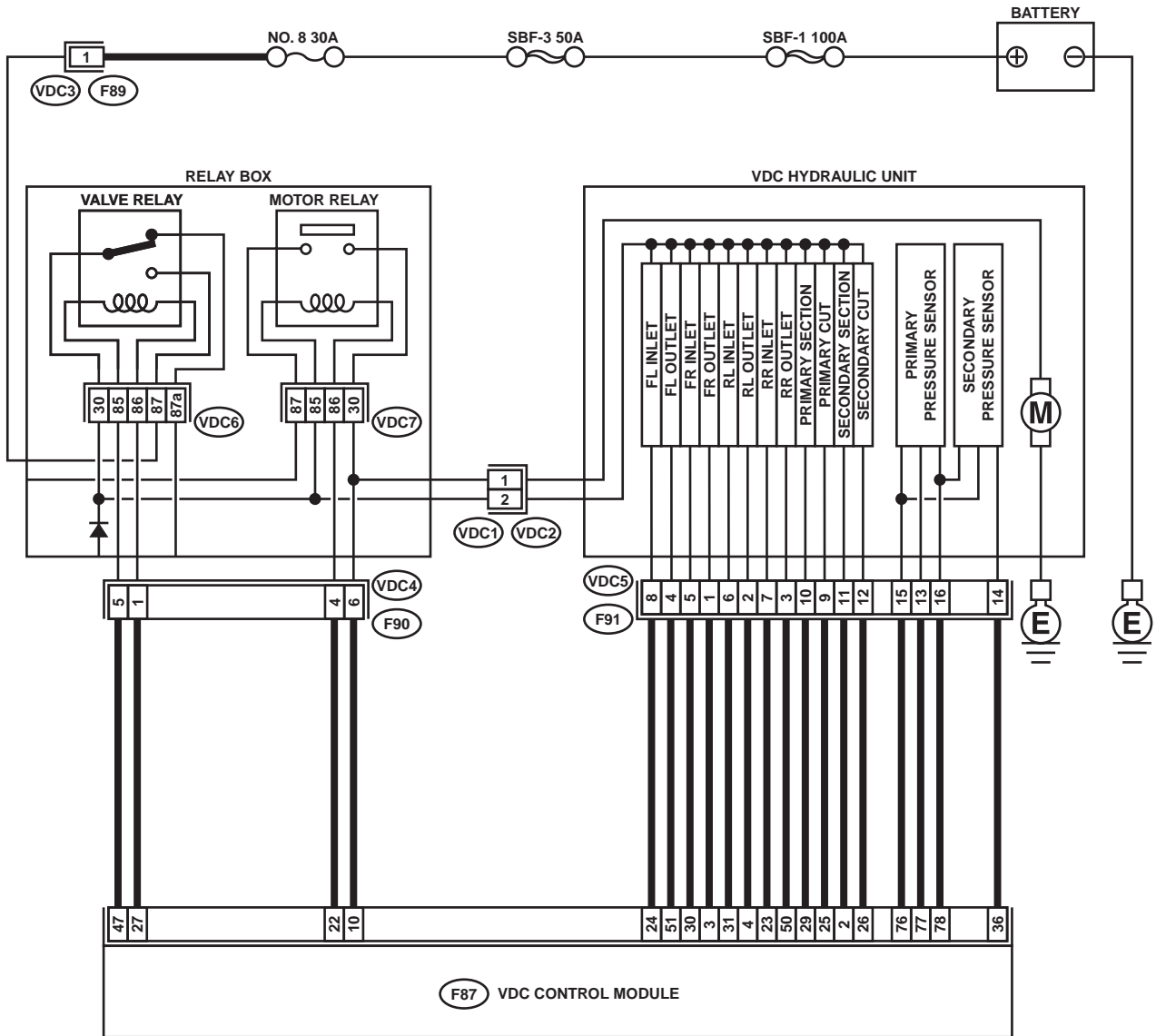
NOTE:

When DTC 74 inspection is carried out, DTC 51 is memorized.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK RESISTANCE OF VALVE RELAY. 1) Turn ignition switch to OFF. 2) Remove valve relay from relay box. 3) Measure resistance between valve relay terminals. Terminals No. 85 — No. 86: Is the measured value within the specified range?</p>	93 — 113 Ω	Go to step 2.	Replace valve relay.
<p>2 CHECK CONTACT POINT OF VALVE RELAY. 1) Connect battery to valve relay terminals No. 85 and No. 86. 2) Measure resistance between valve relay terminals. Terminals No. 30 — No. 87: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Replace valve relay.
<p>3 CHECK CONTACT POINT OF VALVE RELAY. Measure resistance between valve relay terminals. Terminals No. 30 — No. 87a: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Replace valve relay.
<p>4 CHECK CONTACT POINT OF VALVE RELAY. 1) Disconnect battery from valve relay terminals. 2) Measure resistance between valve relay terminals. Terminals No. 30 — No. 87: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 5.	Replace valve relay.
<p>5 CHECK CONTACT POINT OF VALVE RELAY. Measure resistance between valve relay terminals. Terminals No. 30 — No. 87a: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 6.	Replace valve relay.
<p>6 CHECK SHORT OF VALVE RELAY. Measure resistance between valve relay terminals. Terminals No. 86 — No. 87: No. 86 — No. 87a: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Replace valve relay.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK POWER SUPPLY FOR VALVE RELAY. 1) Disconnect connector (F89) from relay box. 2) Turn ignition switch to ON. 3) Measure voltage between relay box connector and chassis ground. Connector & terminal (F89) No. 1 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 8.	Repair harness between battery and relay box connector. Check fuse No. 8.
<p>8 CHECK OPEN CIRCUIT AND GROUND SHORT IN POWER SUPPLY CIRCUIT OF RELAY BOX. 1) Disconnect connector (VDC1) from VDCH/U. 2) Connect connector (F89) to relay box. 3) Turn ignition switch to ON. 4) Measure voltage of relay box. Connector & terminal (VDC6) No. 87 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 9.	Replace relay box and check fuse No. 8.
<p>9 CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX. 1) Turn ignition switch to OFF. 2) Disconnect connector (F90) from relay box. 3) Measure resistance between relay box connector and valve relay installing point. Connector & terminal (VDC4) No. 5 — (VDC6) No. 85: (VDC4) No. 1 — (VDC6) No. 86: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 10.	Replace relay box.
<p>10 CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. Measure resistance between relay box connector and chassis ground. Connector & terminal (VDC4) No. 5 — Chassis ground: (VDC4) No. 1 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 11.	Replace relay box and check fuse SBF6.
<p>11 CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and relay box connector. Connector & terminal (F87) No. 47 — (F90) No. 5: (F87) No. 27 — (F90) No. 1: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 12.	Repair harness between VDCCM and relay box.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>12 CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY. Measure resistance between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 47 — Chassis ground:</i> <i>(F87) No. 27 — Chassis ground:</i> Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 13.	Repair harness between VDCCM and relay box.
<p>13 CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX. Measure resistance between VDCH/U connector and valve relay installing point. Connector & terminal <i>(VDC1) No. 2 — (VDC6) No. 30:</i> Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 14.	Replace relay box.
<p>14 CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. Measure resistance between VDCH/U connector and chassis ground. Connector & terminal <i>(VDC1) No. 2 — Chassis ground:</i> Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 15.	Replace relay box and check fuse No. 8.
<p>15 CHECK RESISTANCE OF INLET AND CUT SOLENOID VALVES. 1) Disconnect connector from VDCH/U. 2) Measure resistance between VDCH/U connector terminals. Connector & terminal <i>(VDC5) No. 8 — (VDC2) No. 2:</i> <i>(VDC5) No. 5 — (VDC2) No. 2:</i> <i>(VDC5) No. 6 — (VDC2) No. 2:</i> <i>(VDC5) No. 7 — (VDC2) No. 2:</i> <i>(VDC5) No. 9 — (VDC2) No. 2:</i> <i>(VDC5) No. 12 — (VDC2) No. 2:</i> Is the measured value within the specified range?</p>	8.04 — 9.04 Ω	Go to step 16.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>16 CHECK RESISTANCE OF OUTLET SOLENOID VALVE. Measure resistance between VDCH/U connector terminals. Connector & terminal <i>(VDC5) No. 4 — (VDC2) No. 2:</i> <i>(VDC5) No. 1 — (VDC2) No. 2:</i> <i>(VDC5) No. 2 — (VDC2) No. 2:</i> <i>(VDC5) No. 3 — (VDC2) No. 2:</i> <i>(VDC5) No. 10 — (VDC2) No. 2:</i> <i>(VDC5) No. 11 — (VDC2) No. 2:</i> Is the measured value within the specified range?</p>	4.04 — 4.54 Ω	Go to step 17.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>17 CHECK GROUND SHORT OF SOLENOID VALVE. Measure resistance between VDCH/U connector and chassis ground. Connector & terminal (VDC2) No. 2 — Chassis ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 18.	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>18 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 30 — Chassis ground: (F87) No. 24 — Chassis ground: (F87) No. 23 — Chassis ground: (F87) No. 31 — Chassis ground: (F87) No. 26 — Chassis ground: (F87) No. 25 — Chassis ground: (F87) No. 3 — Chassis ground: (F87) No. 51 — Chassis ground: (F87) No. 50 — Chassis ground: (F87) No. 4 — Chassis ground: (F87) No. 2 — Chassis ground: (F87) No. 29 — Chassis ground: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 19.	Repair harness between VDCH/U and VDCCM.
<p>19 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U. 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U Connector & terminal (F87) No. 30 — (VDC2) No. 2: (F87) No. 24 — (VDC2) No. 2: (F87) No. 23 — (VDC2) No. 2: (F87) No. 31 — (VDC2) No. 2: (F87) No. 26 — (VDC2) No. 2: (F87) No. 25 — (VDC2) No. 2: Is the measured value within the specified range?</p>	8.0 — 10.0 Ω	Go to step 20.	Repair harness/connector between VDCH/U and VDCCM.
<p>20 CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U. Measure resistance between VDCCM connector terminals. Connector & terminal (F87) No. 3 — (VDC2) No. 2: (F87) No. 51 — (VDC2) No. 2: (F87) No. 50 — (VDC2) No. 2: (F87) No. 4 — (VDC2) No. 2: (F87) No. 2 — (VDC2) No. 2: (F87) No. 29 — (VDC2) No. 2: Is the measured value within the specified range?</p>	4.0 — 6.0 Ω	Go to step 21.	Repair harness/connector between VDCH/U and VDCCM.
<p>21 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between VDCCM and VDCH/U?</p>	There is poor contact.	Repair connector.	Go to step 22.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
22 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Mod- ule (VDCCM).>	Go to step 23 .
23 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AL:DTC 51 VALVE RELAY ON FAILURE

DIAGNOSIS:

- Faulty valve relay

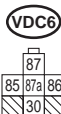
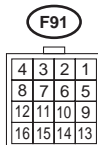
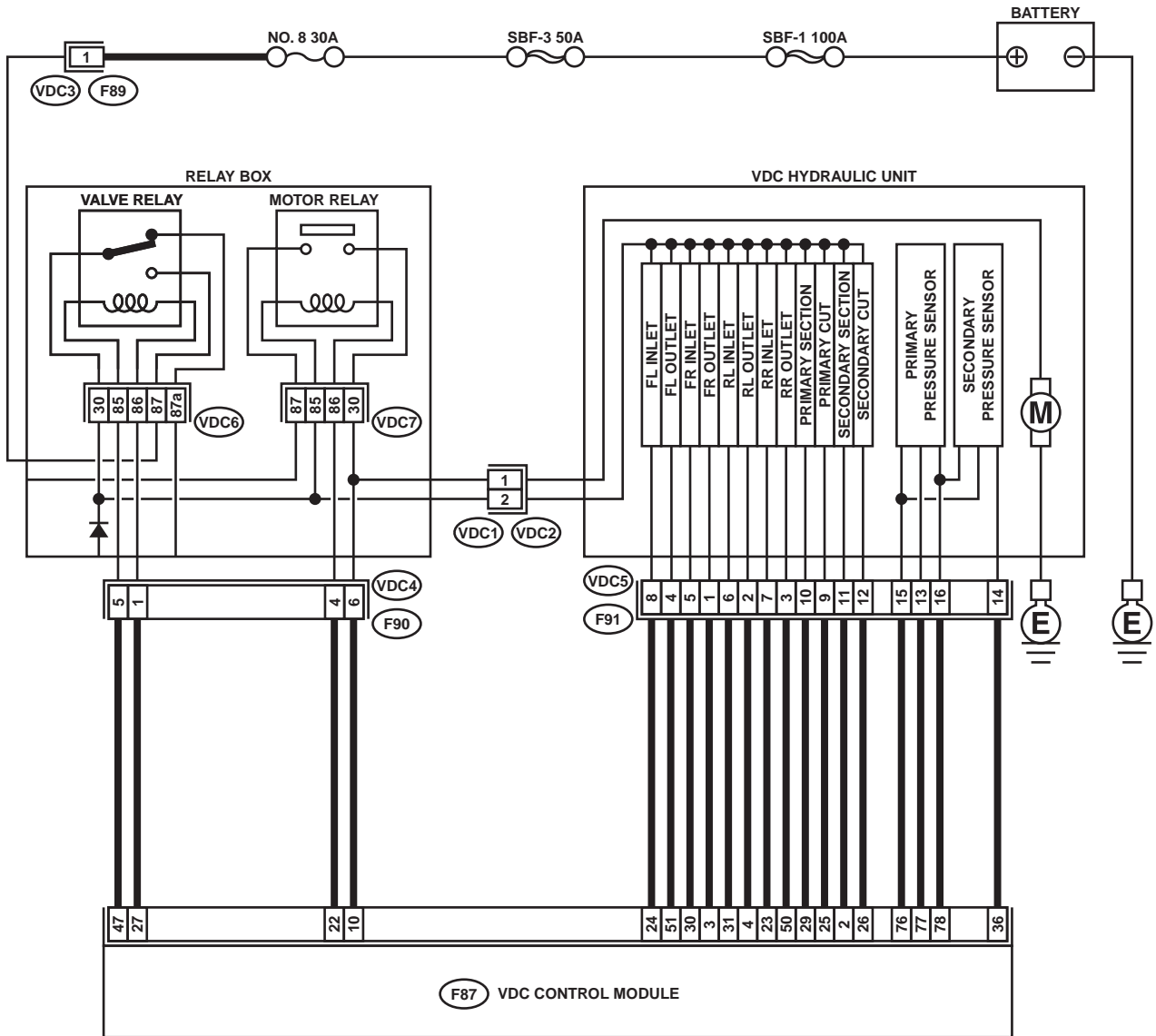
NOTE:

When DTC 74 inspection is carried out, DTC 51 is memorized.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00150

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CONTACT POINT OF VALVE RELAY. 1) Turn ignition switch to OFF. 2) Remove valve relay from relay box. 3) Connect battery to valve relay terminals No. 85 and No. 86. 4) Measure resistance between valve relay terminals.</p> <p>Terminals No. 30 — No. 87: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Replace valve relay.
<p>2 CHECK CONTACT POINT OF VALVE RELAY. Measure resistance between valve relay terminals.</p> <p>Terminals No. 30 — No. 87a: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Replace valve relay.
<p>3 CHECK CONTACT POINT OF VALVE RELAY. 1) Disconnect battery from valve relay terminals. 2) Measure resistance between valve relay terminals.</p> <p>Terminals No. 30 — No. 87: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Replace valve relay.
<p>4 CHECK CONTACT POINT OF VALVE RELAY. Measure resistance between valve relay terminals.</p> <p>Terminals No. 30 — No. 87a: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 5.	Replace valve relay.
<p>5 CHECK SHORT OF VALVE RELAY. Measure resistance between valve relay terminals.</p> <p>Terminals No. 86 — No. 87: No. 86 — No. 87a: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Replace valve relay.
<p>6 CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. 1) Disconnect connector (F90) from relay box. 2) Measure voltage between relay box connector and chassis ground.</p> <p>Connector & terminal (VDC4) No. 5 (+) — Chassis ground (-): (VDC4) No. 1 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 7.	Replace relay box. Check fuse No. 8 and SBF3.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal <i>(VDC4) No. 5 (+) — Chassis ground (-):</i> <i>(VDC4) No. 1 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?</p>	1 V	Go to step 8 .	Replace relay box. Check fuse No. 8 and SBF3.
<p>8 CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from VDCH/U. 4) Measure voltage between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 27 (+) — Chassis ground (-):</i> <i>(F87) No. 47 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?</p>	1 V	Go to step 9 .	Repair harness between VDCCM and relay box and check all fuses.
<p>9 CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal <i>(F87) No. 27 (+) — Chassis ground (-):</i> <i>(F87) No. 47 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?</p>	1 V	Go to step 10 .	Repair harness between VDCCM and relay box and check all fuses.
<p>10 CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. 1) Disconnect connector VDC1 from relay box. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal <i>(VDC1) No. 2 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?</p>	1 V	Go to step 11 .	Replace relay box.
<p>11 CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal <i>(VDC1) No. 2 (+) — Chassis ground (-):</i> Is the measured value less than the specified value?</p>	1 V	Go to step 12 .	Replace relay box.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>12 CHECK BATTERY SHORT OF SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC2) No. 2 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 13.	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>13 CHECK BATTERY SHORT OF SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC2) No. 2 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 14.	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>14 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 30 (+) — Chassis ground (-): (F87) No. 24 (+) — Chassis ground (-): (F87) No. 23 (+) — Chassis ground (-): (F87) No. 31 (+) — Chassis ground (-): (F87) No. 26 (+) — Chassis ground (-): (F87) No. 25 (+) — Chassis ground (-): (F87) No. 3 (+) — Chassis ground (-): (F87) No. 51 (+) — Chassis ground (-): (F87) No. 50 (+) — Chassis ground (-): (F87) No. 4 (+) — Chassis ground (-): (F87) No. 2 (+) — Chassis ground (-): (F87) No. 29 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 15.	Repair harness between VDCH/U and VDCCM and check all fuses.
<p>15 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 30 (+) — Chassis ground (-): (F87) No. 24 (+) — Chassis ground (-): (F87) No. 23 (+) — Chassis ground (-): (F87) No. 31 (+) — Chassis ground (-): (F87) No. 26 (+) — Chassis ground (-): (F87) No. 25 (+) — Chassis ground (-): (F87) No. 3 (+) — Chassis ground (-): (F87) No. 51 (+) — Chassis ground (-): (F87) No. 50 (+) — Chassis ground (-): (F87) No. 4 (+) — Chassis ground (-): (F87) No. 2 (+) — Chassis ground (-): (F87) No. 29 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 16.	Repair harness between VDCH/U and VDCCM and check all fuses.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
16 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between VDCCM and VDCH/U?	There is poor contact.	Repair connector.	Go to step 17.
17 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 18.
18 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AM:DTC 52 MOTOR AND MOTOR RELAY OFF FAILURE

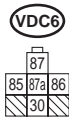
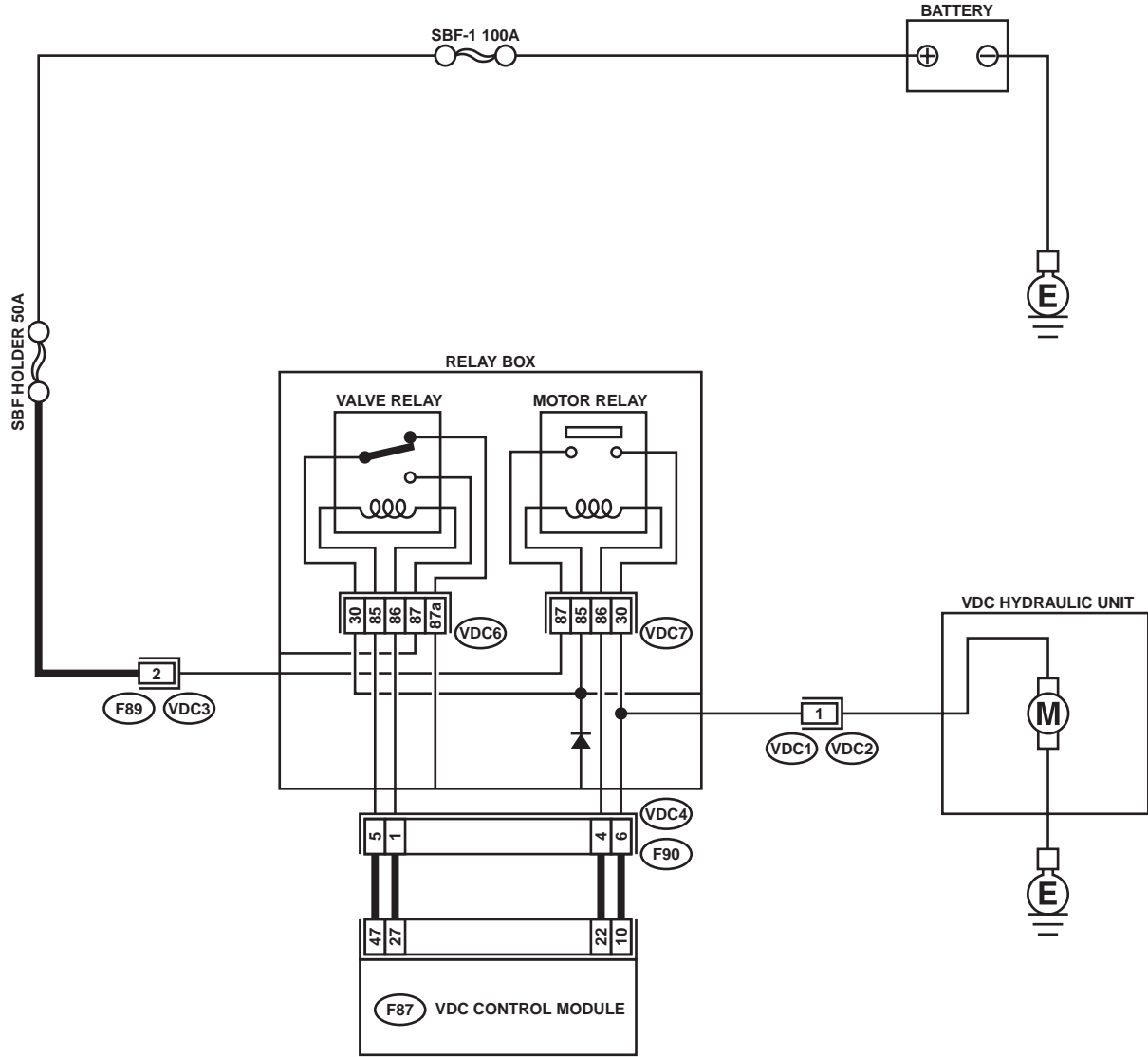
DIAGNOSIS:

- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

VDC00155

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CONTACT POINT OF MOTOR RELAY. 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Measure resistance between motor relay terminals. Terminals No. 30 — No. 87: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 2.	Replace motor relay.
<p>2 CHECK SHORT OF MOTOR RELAY. Measure resistance between motor relay terminals. Terminals No. 85 — No. 30: No. 85 — No. 87: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Replace motor relay.
<p>3 CHECK GROUND SHORT IN CIRCUIT OF RELAY BOX. 1) Disconnect connector (F90) from relay box. 2) Measure resistance between relay box connector unit and chassis ground. Connector & terminal (VDC4) No. 4 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Replace relay box.
<p>4 CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX. Measure voltage between relay box connector and chassis ground. Connector & terminal (VDC4) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 5.	Replace relay box.
<p>5 CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX. 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. Connector & terminal (VDC4) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 6.	Replace relay box.
<p>6 CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 22 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Repair harness between VDCCM and relay box. Check fuse SBF holder.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM. Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 10 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 8 .	Repair harness between VDCCM and relay box.
8 CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 10 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 9 .	Repair harness between VDCCM and relay box.
9 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between VDCH/U, relay box and VDCCM?	There is poor contact.	Repair connector.	Go to step 10 .
10 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 11 .
11 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AN:DTC 52 MOTOR AND MOTOR RELAY ON FAILURE

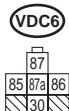
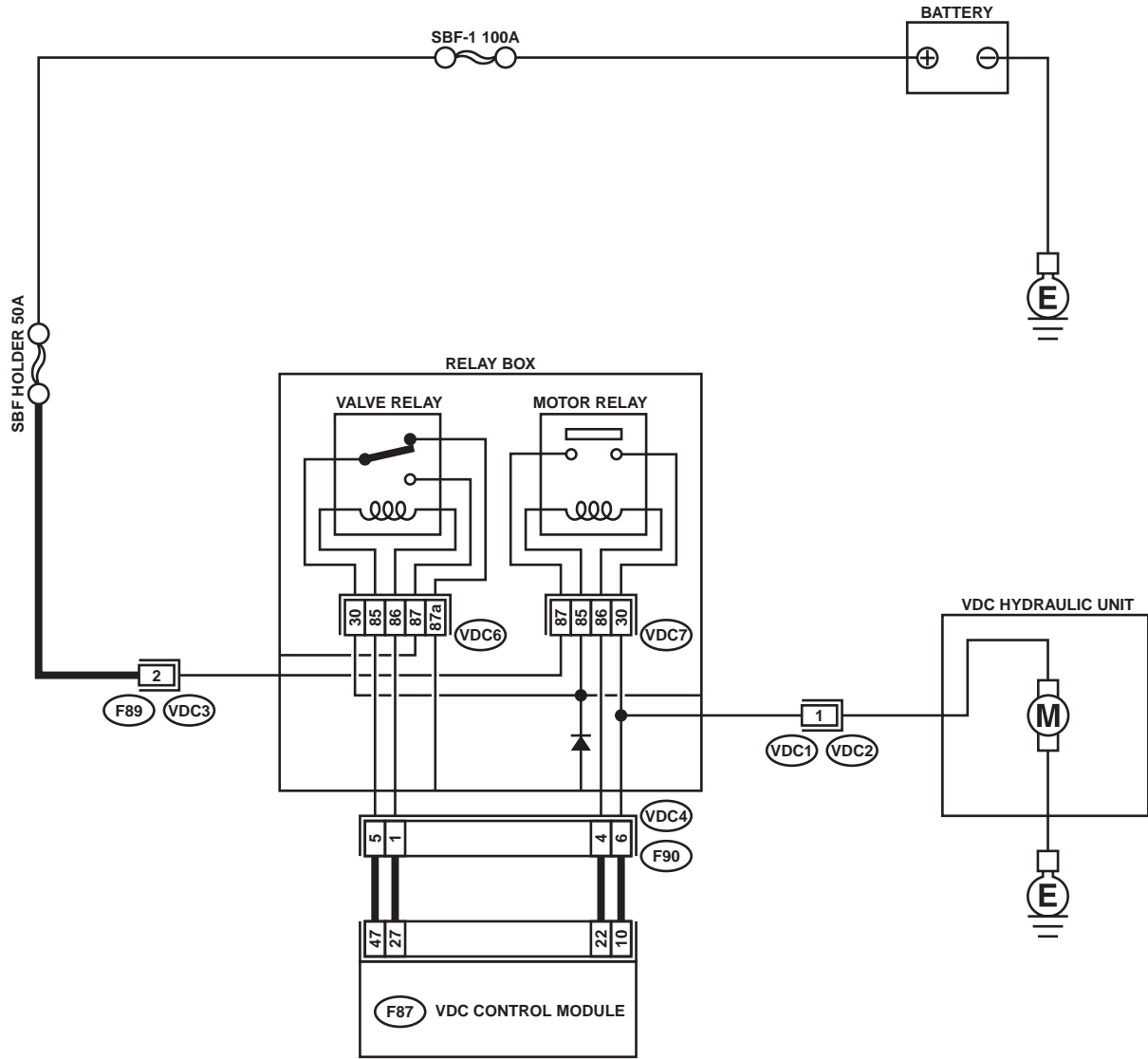
DIAGNOSIS:

- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

VDC00155

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK RESISTANCE OF MOTOR RELAY. 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Measure resistance between motor relay terminals. Terminals No. 85 — No. 86: Is the measured value within the specified range?</p>	70 — 90 Ω	Go to step 2.	Replace motor relay.
<p>2 CHECK CONTACT POINT OF MOTOR RELAY. 1) Connect battery to motor relay terminals No. 85 and No. 86. 2) Measure resistance between motor relay terminals. Terminals No. 30 — No. 87: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 3.	Replace motor relay.
<p>3 CHECK SHORT OF MOTOR RELAY. Measure resistance between motor relay terminals. Terminals No. 85 — No. 30: No. 85 — No. 87: Does the measured value exceed the specified value?</p>	1 M Ω	Go to step 4.	Replace motor relay.
<p>4 CHECK INPUT VOLTAGE OF RELAY BOX. 1) Disconnect connector (F89) from relay box. 2) Disconnect connector from VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between relay box connector and chassis ground. Connector & terminal (F89) No. 2 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 5.	Repair harness/connector between battery and relay box, and check fuse SBF holder.
<p>5 CHECK INPUT VOLTAGE OF MOTOR RELAY. 1) Turn ignition switch to OFF. 2) Connect connector (F89) to relay box. 3) Turn ignition switch to ON. 4) Measure voltage between relay box and chassis ground. Connector & terminal (VDC7) No. 87 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 6.	Replace relay box.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX. 1) Turn ignition switch to OFF. 2) Disconnect connectors (VDC2, F90) from relay box. 3) Measure resistance between relay box connector unit and motor relay installing portion. Connector & terminal (VDC1) No. 1 — (VDC7) No. 30: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 7.	Replace relay box.
<p>7 CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX. Measure resistance between relay box connector and motor relay installing point. Connector & terminal (VDC4) No. 6 — (VDC7) No. 30: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 8.	Replace relay box.
<p>8 CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX. Measure resistance between motor relay installing point and relay box connector. Connector & terminal (VDC4) No. 4 — (VDC7) No. 86: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 9.	Replace relay box.
<p>9 CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX. 1) Remove valve relay from relay box. 2) Measure resistance between motor relay installing point and valve relay installing point. Connector & terminal (VDC7) No. 85 — (VDC6) No. 30: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 10.	Replace relay box.
<p>10 CHECK GROUND SHORT IN CIRCUIT OF RELAY BOX. Measure resistance between relay box connector and chassis ground. Connector & terminal (VDC4) No. 4 — Chassis ground: (VDC4) No. 6 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 11.	Replace relay box.
<p>11 CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX. Measure voltage between relay box connector and chassis ground. Connector & terminal (VDC4) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 12.	Replace relay box.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>12 CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX. 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. Connector & terminal (VDC4) No. 6 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 13.	Replace relay box.
<p>13 CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS. Measure resistance between VDCCM connector and relay box connector. Connector & terminal (F87) No. 22 — (F90) No. 4: (F87) No. 10 — (F90) No. 6: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 14.	Repair harness connector between VDCCM and relay box.
<p>14 CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM. Measure resistance between VDCCM connector and chassis ground. Connector & terminal (F87) No. 22 — Chassis ground: (F87) No. 10 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 15.	Repair harness between VDCCM and relay box. Check fuse SBF holder.
<p>15 CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM. Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 10 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 16.	Repair harness between VDCCM and relay box. Check fuse SBF holder.
<p>16 CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. Connector & terminal (F87) No. 10 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	1 V	Go to step 17.	Repair harness between VDCCM and relay box. Check fuse SBF holder.
<p>17 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between VDCH/U, relay box and VDCCM?</p>	There is poor contact.	Repair connector.	Go to step 18.
<p>18 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 19.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

	Step	Value	Yes	No
19	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AO:DTC 52 MOTOR MALFUNCTION

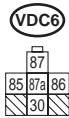
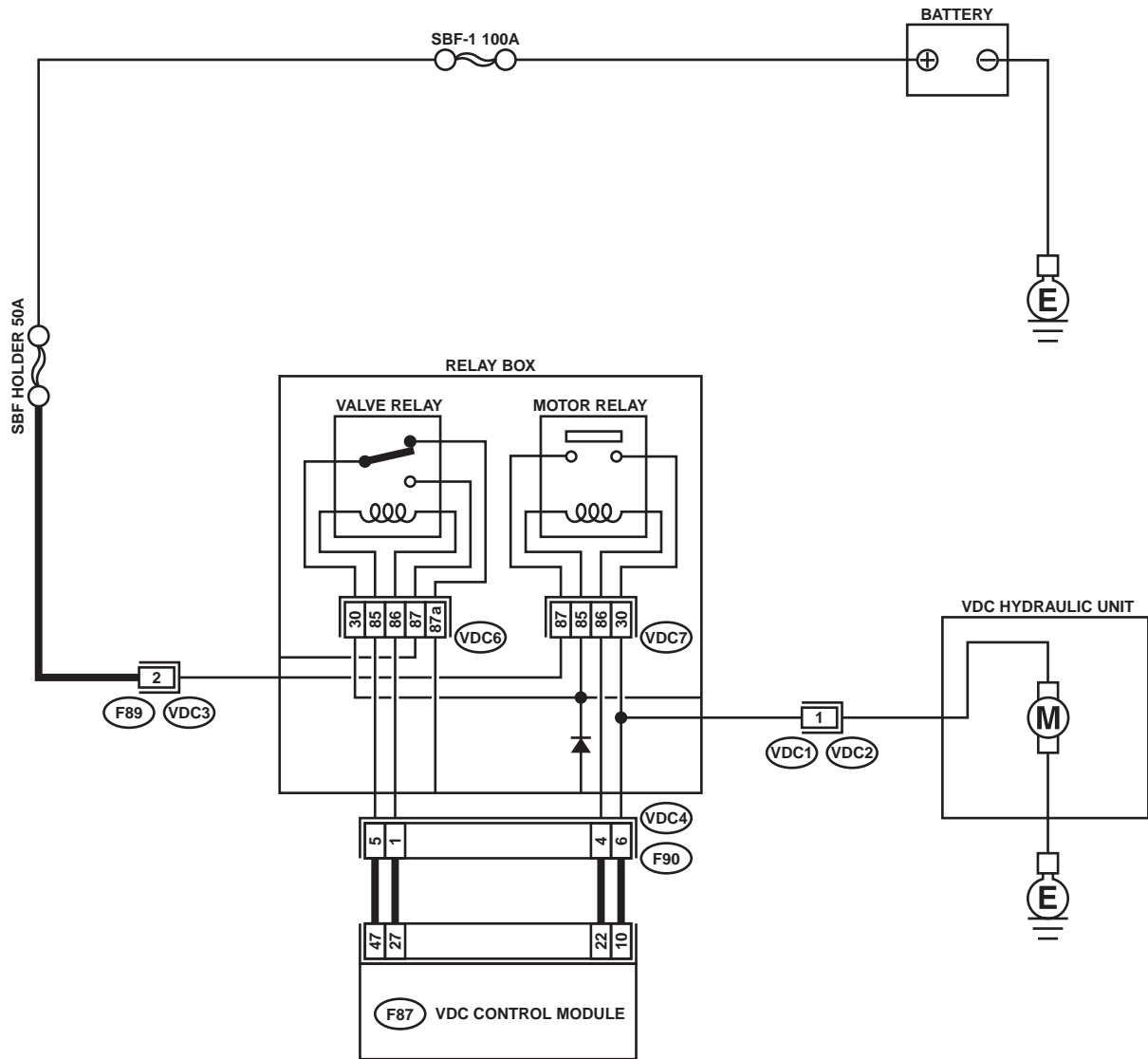
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

VDC00155

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CONTACT POINT OF MOTOR RELAY.</p> <p>1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Connect battery to motor relay terminals No. 85 and No. 86. 4) Measure resistance between motor relay terminals.</p> <p>Terminals No. 30 — No. 87: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 2.	Replace motor relay.
<p>2 CHECK CONTACT POINT OF MOTOR RELAY.</p> <p>1) Disconnect battery from motor relay terminals. 2) Measure resistance between motor relay terminals.</p> <p>Terminals No. 30 — No. 87: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 3.	Replace motor relay.
<p>3 CHECK INPUT VOLTAGE OF RELAY BOX.</p> <p>1) Disconnect connector (F89) from relay box. 2) Disconnect connector from VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between relay box connector and chassis ground.</p> <p>Connector & terminal (F89) No. 2 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 4.	Repair harness/connector between battery and relay box, and check fuse SBF holder.
<p>4 CHECK INPUT VOLTAGE OF MOTOR RELAY.</p> <p>1) Turn ignition switch to OFF. 2) Connect connector (F89) to relay box. 3) Turn ignition switch to ON. 4) Measure voltage between relay box and chassis ground.</p> <p>Connector & terminal (VDC7) No. 87 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 5.	Replace relay box.
<p>5 CHECK CONDITION OF MOTOR GROUND.</p> <p>Tightening torque: 33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb) Is the motor ground terminal tightly clamped?</p>	Clamped securely.	Go to step 6.	Tighten the clamp of motor ground terminal.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK VDCCM MOTOR DRIVE TERMINAL. 1) Turn ignition switch OFF. 2) Remove VDC connector cover. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect all connectors. 4) Install motor relay. 5) Operate the ABS check sequence. <Ref. to VDC-16, ABS Sequence Control.> 6) Measure voltage between VDCCM connector terminals. Connector & terminal (F87) No. 22 (+) — No. 1 (-): Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?	Drop from 10 — 13 V to less than 1.5 V, and rise to 10 — 13 V again when carrying out the check sequence.	Go to step 7.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7 CHECK MOTOR OPERATION. Operate the check sequence. <Ref. to VDC-19, VDC Sequence Control.> Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Noise heard	Go to step 8.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
8 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between VDCH/U, relay box and VDCCM?	There is poor contact.	Repair connector.	Go to step 9.
9 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 10.
10 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AP:DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG.

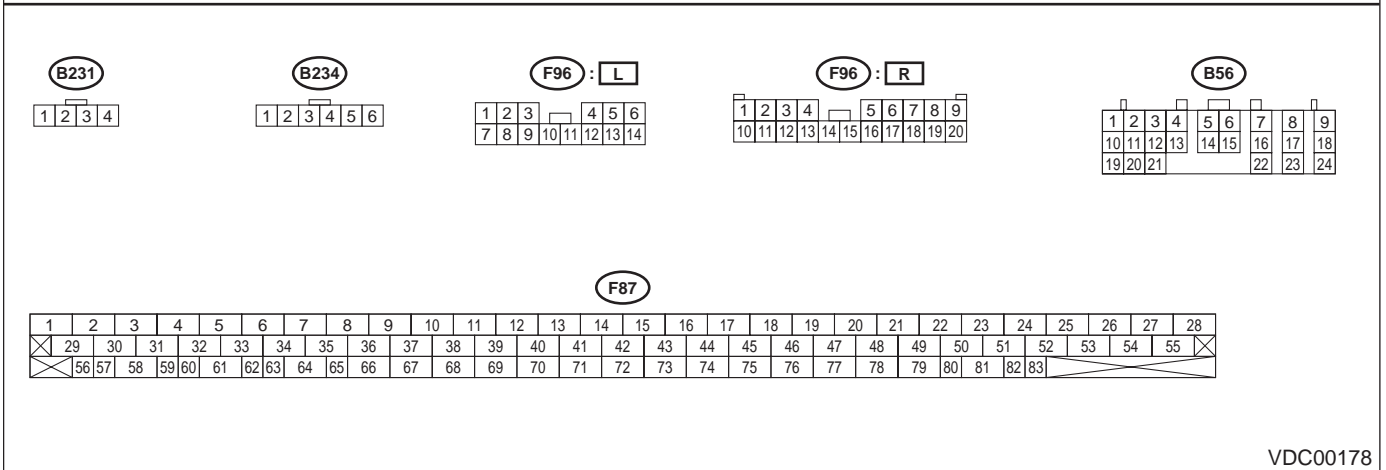
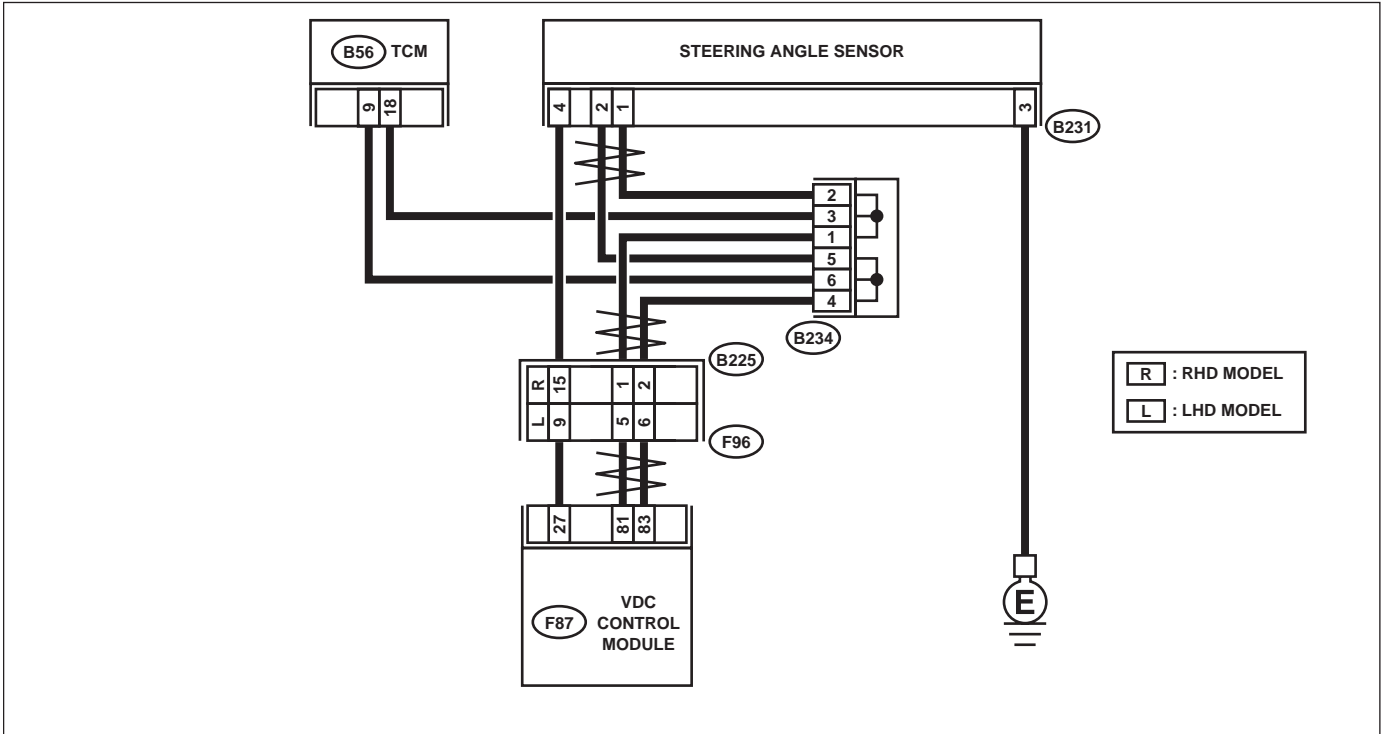
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00178

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK THE STEERING WHEEL. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel. Is the measured value less than the specified value?	5°	Go to step 2.	Perform centering alignment of steering wheel.
2 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 3.
3 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AQ:DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG.

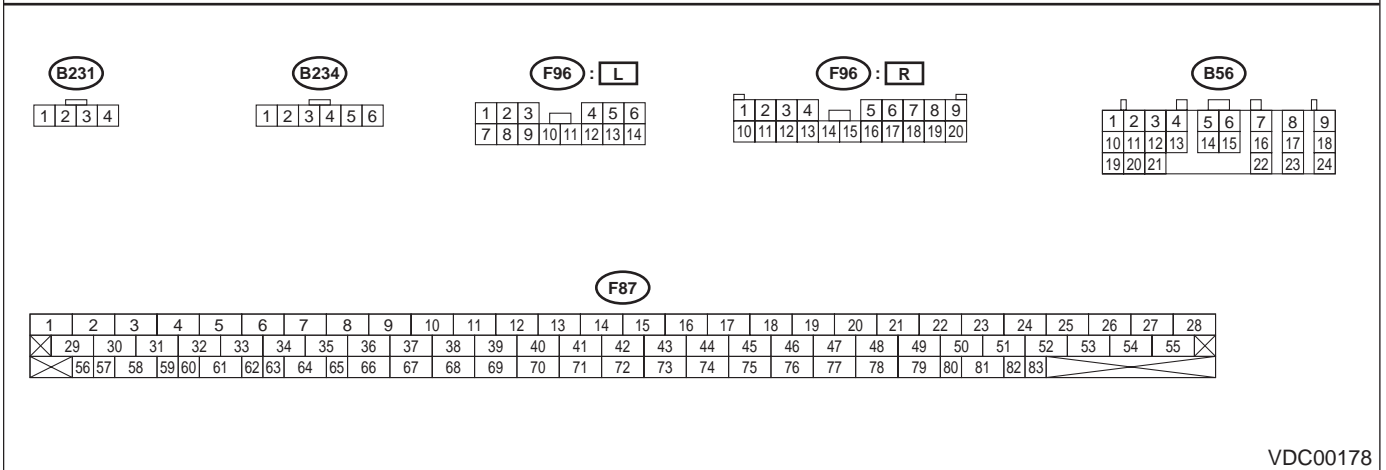
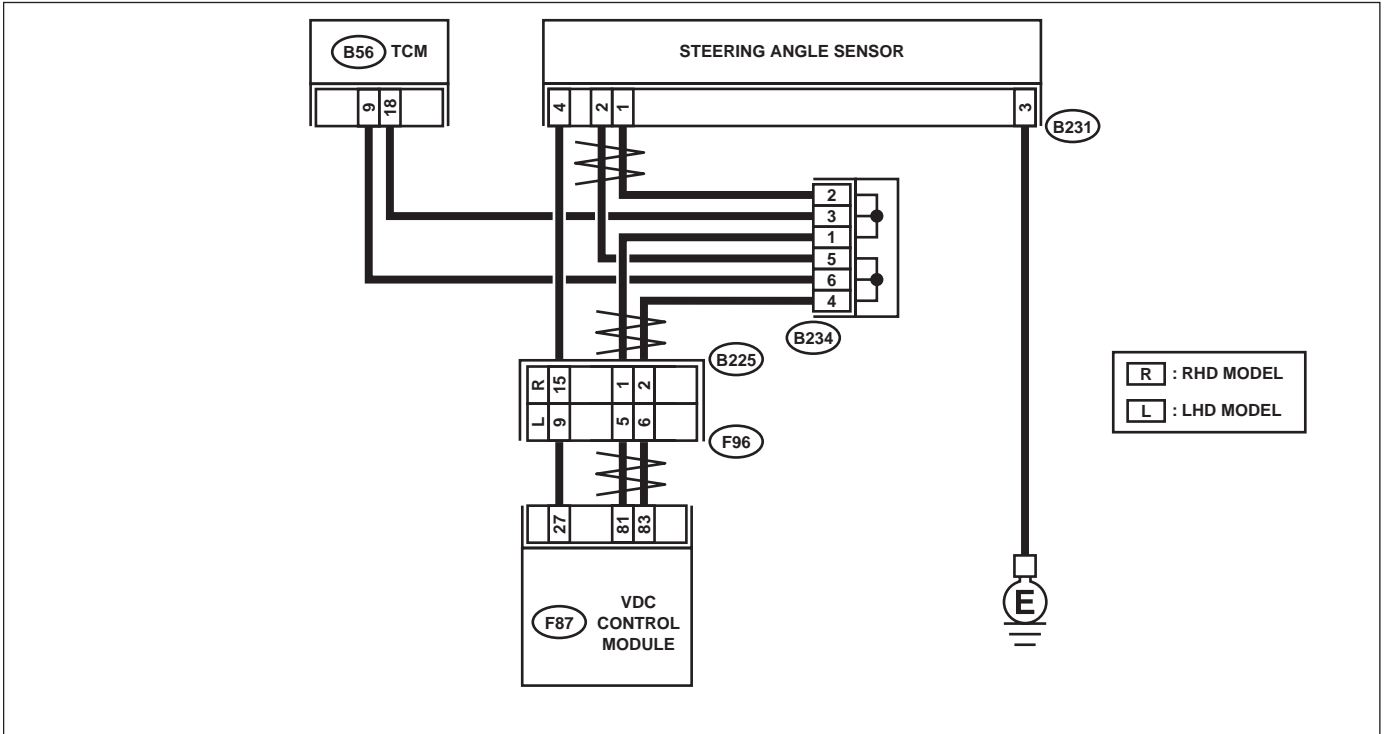
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00178

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Mod- ule (VDCCM).>	Go to step 2 .
2 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AR:DTC 71 STEERING ANGLE SENSOR MALFUNCTION

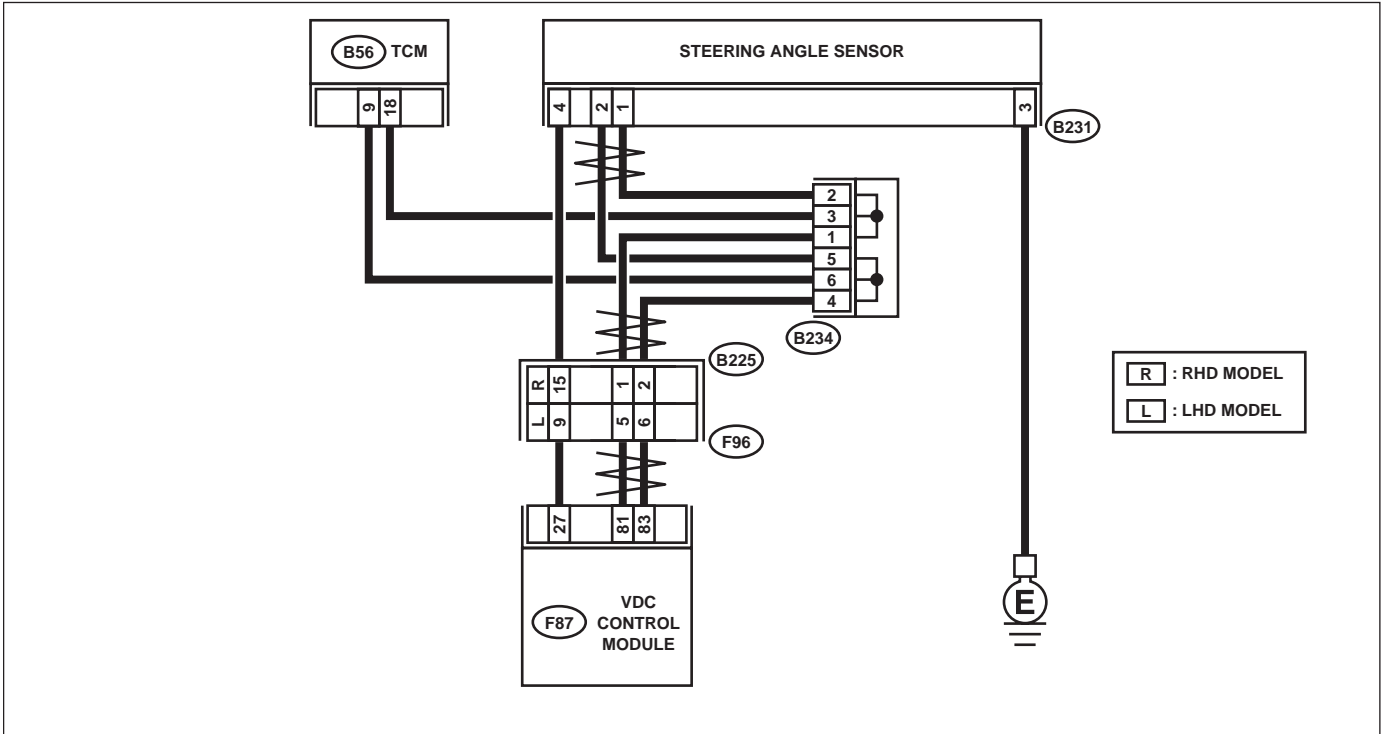
DIAGNOSIS:

- Faulty steering angle sensor

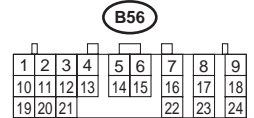
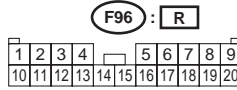
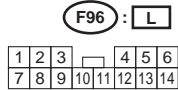
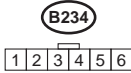
TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



R : RHD MODEL
L : LHD MODEL



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗	
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	⊗

VDC00178

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK THE STEERING WHEEL. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel. Is the measured value less than the specified value?	5°	Go to step 2.	Perform centering alignment of steering.
2 CHECK OUTPUT OF STEERING ANGLE SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read steering angle sensor output on the select monitor display. Does the steering angle sensor output (value) change on the monitor display when the steering wheel is turned in either direction?	Change	Go to step 3.	Replace steering angle sensor.
3 CHECK RUNNING FIELD. Check if the vehicle was driven on banked road surfaces or sandy surfaces (not dirt road surfaces). Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces)?	Driven.	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) sometimes results in a VDCCM memory trouble code.	Go to step 4.
4 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
5 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AS:DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR

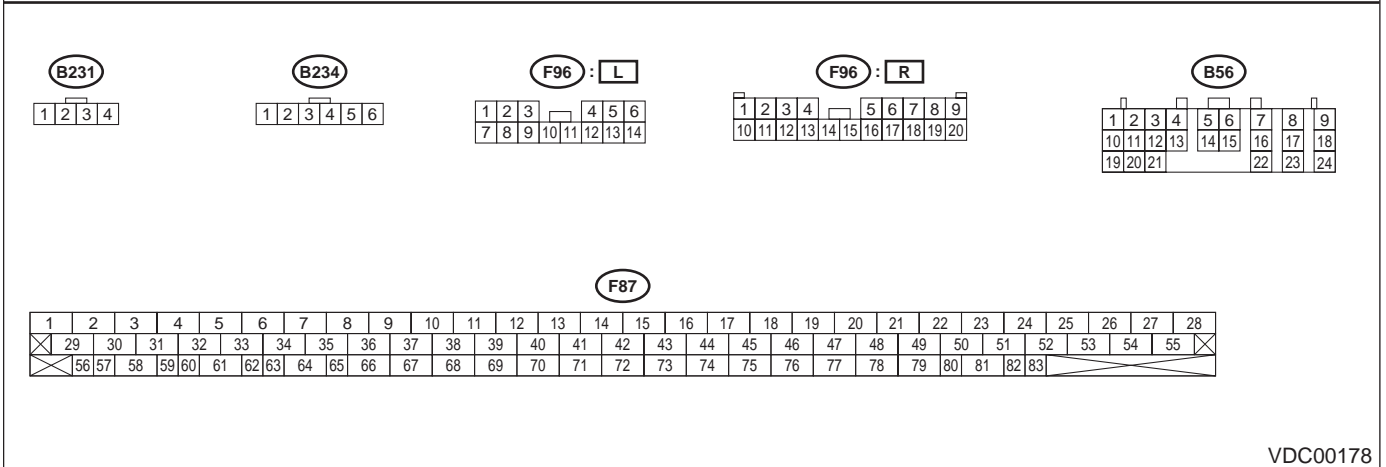
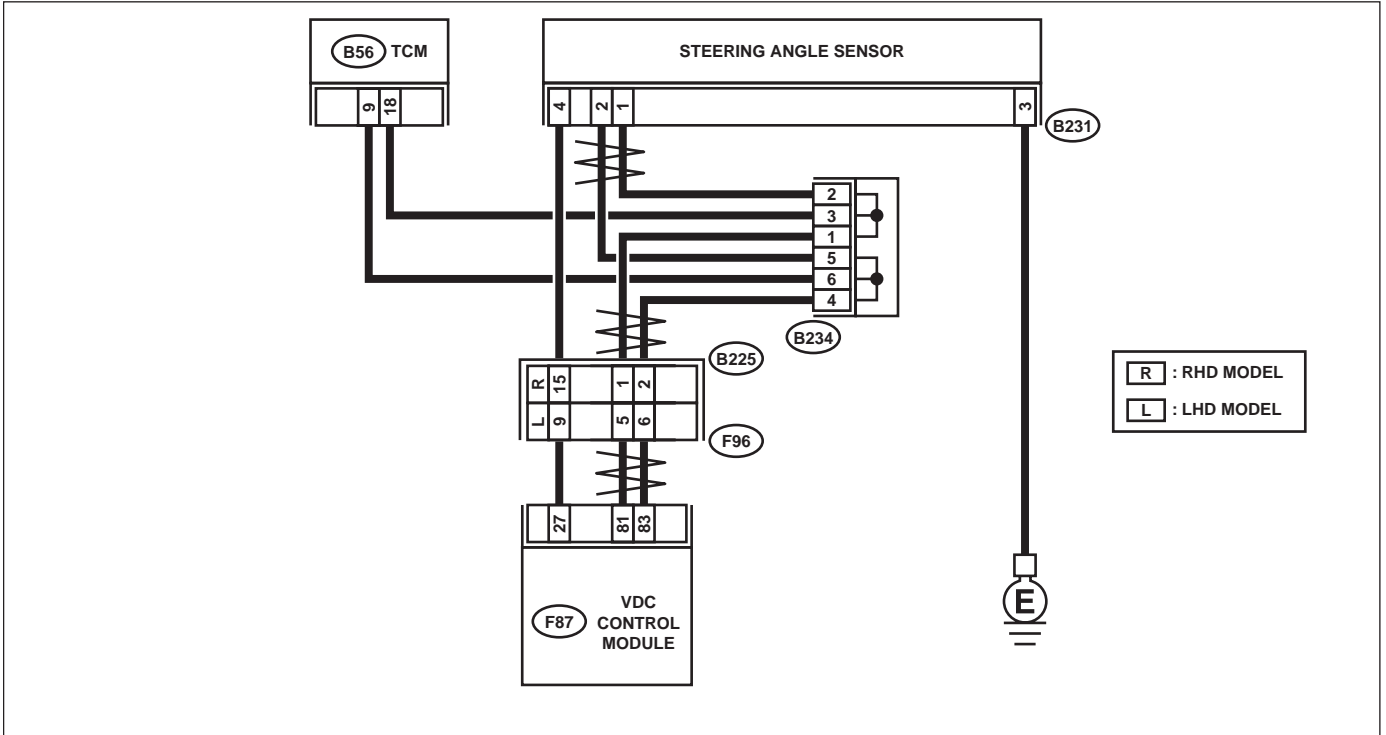
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00178

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY OF STEERING ANGLE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from steering angle sensor. 3) Turn ignition switch to ON. 4) Measure voltage between steering angle sensor and chassis ground. Connector & terminal (B231) No. 4 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 4.	Go to step 2.
<p>2 CHECK OUTPUT VOLTAGE OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, VDC Sequence Control.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 27 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Repair harness between yaw rate sensor and VDCCM.	Go to step 3.
<p>3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in yaw rate sensor connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>4 CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR. Measure resistance between steering sensor and chassis ground. Connector & terminal (B231) No. 3 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 5.	Repair steering angle sensor ground harness.
<p>5 CHECK HARNESS OF STEERING ANGLE SENSOR. 1) Connect connector to steering angle sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. Connector & terminal (F87) No. 81 — No. 83: Is the measured value within the specified range?</p>	114 — 126 Ω	Repair harness between steering angle sensor and VDCCM.	Go to step 6.
<p>6 CHECK STEERING ANGLE SENSOR. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Go to step 8.	Go to step 7.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
8 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Replace steering angle sensor. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 9 .
9 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	The original steering angle sensor has been faulty.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AT:DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT

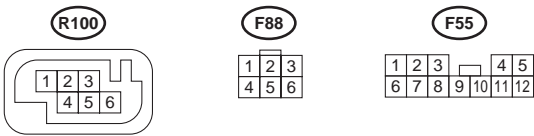
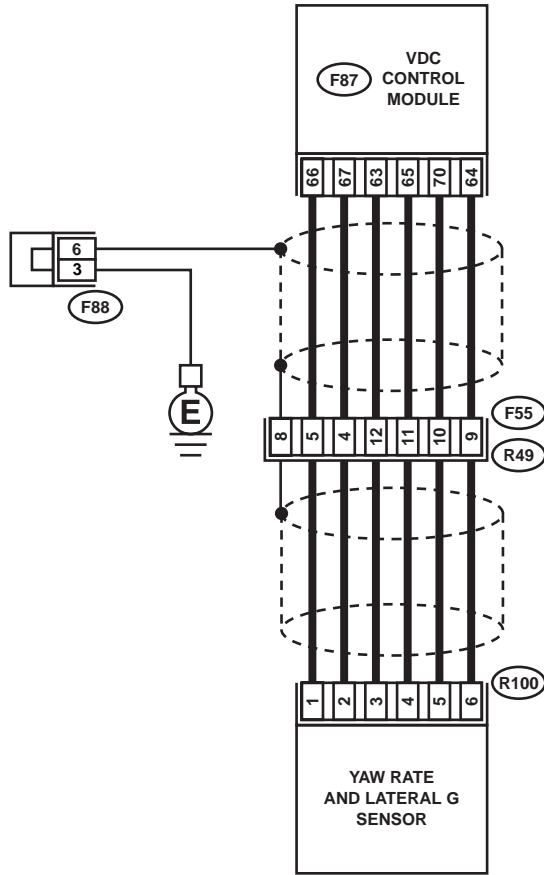
DIAGNOSIS:

- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00182

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK RUNNING FIELD. Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces)?	Driven.	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) sometimes results in a VDCCM memory diagnostic trouble code.	Go to step 2.
2 CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR. Check installation of yaw rate and lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?	Fixed securely.	Go to step 3.	Install yaw rate and lateral G sensor securely.
3 CHECK OUTPUT OF YAW RATE AND LATERAL G SENSOR USING SELECT MONITOR. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Select "Current data display & Save" on the select monitor. 4) Read yaw rate and lateral G sensor output on the select monitor display. Is the measured value within the specified range?	0±5.25 deg/s	Go to step 4.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
4 CHECK OUTPUT OF STEERING ANGLE SENSOR USING SELECT MONITOR. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Select "Current data display & Save" on the select monitor. 4) Read steering angle sensor output on the select monitor display. Is the measured value within the specified range?	0±2.5 deg	Go to step 5.	Perform centering alignment of steering wheel.
5 CHECK YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Go to step 6.	Go to step 7.
6 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
7 CHECK VDCCM. 1) Turn ignition switch to OFF. 2) Replace yaw rate and lateral G sensor. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 8.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	The original yaw rate and lateral G sensor has been faulty.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AU:DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION.

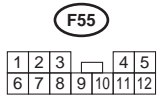
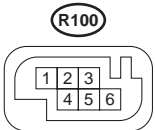
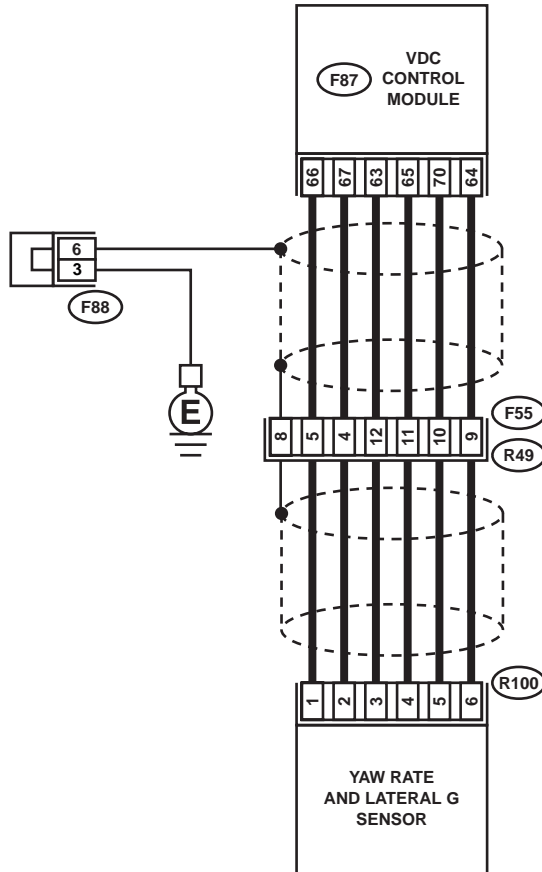
DIAGNOSIS:

- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00182

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. Connector & terminal (R100) No. 3 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 4.	Go to step 2.
<p>2 CHECK OUTPUT VOLTAGE OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 63 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step 3.
<p>3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in yaw rate and lateral G sensor connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>4 CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM and yaw rate and lateral G sensor. Connector & terminal (F87) No. 65 — (R100) No. 4: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 5.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>5 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM and chassis ground. Connector & terminal (F87) No. 65 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>6 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 65 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 7.	Repair harness between yaw rate and lateral G sensor and VDCCM.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 65 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>	Repair harness between yaw rate and lateral G sensor and VDCCM.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AV:DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE

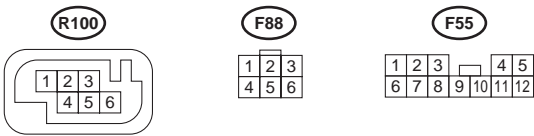
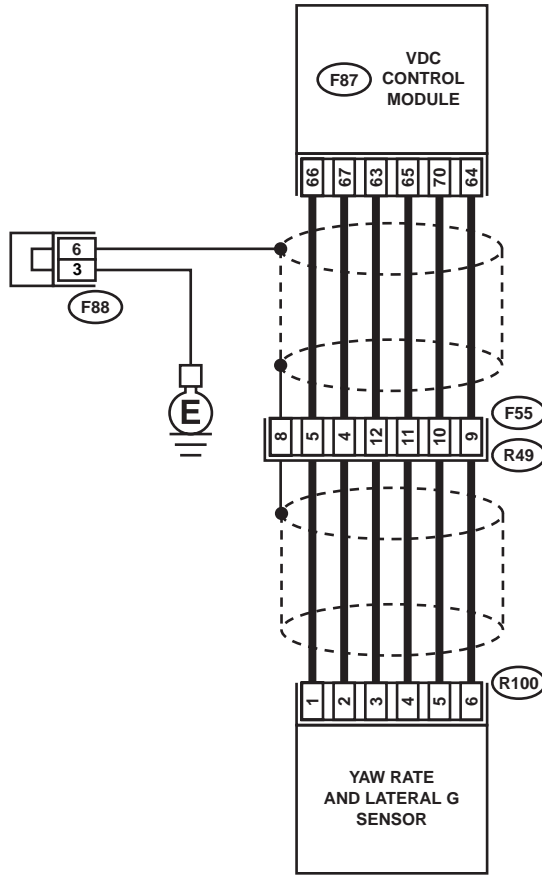
DIAGNOSIS:

- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00182

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. Connector & terminal (R100) No. 3 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 4.	Go to step 2.
<p>2 CHECK OUTPUT VOLTAGE OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 63 (+) — Chassis ground (-): Is the measured value within the specified range?</p>	10 — 15 V	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step 3.
<p>3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in yaw rate and lateral G sensor connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>4 CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR. 1) Disconnect connector from VDCCM. 2) Measure resistance between VDCCM and yaw rate and lateral G sensor. Connector & terminal (F87) No. 66 — (R100) No. 1: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 5.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>5 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM and chassis ground. Connector & terminal Does the measured value exceed the specified value? (F87) No. 66 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 6.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>6 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 66 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 7.	Repair harness between yaw rate and lateral G sensor and VDCCM.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 66 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 8 .	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>8 CHECK YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch to OFF. 2) Install yaw rate and lateral G sensor to body. 3) Remove VDCCM connector cover. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect all connectors. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. Connector & terminal (F87) No. 66 (+) — No. 64 (-): Is the measured value within the specified range?</p>	2.1 — 2.9 V	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AW:DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG.

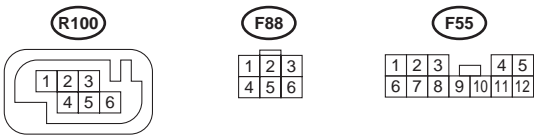
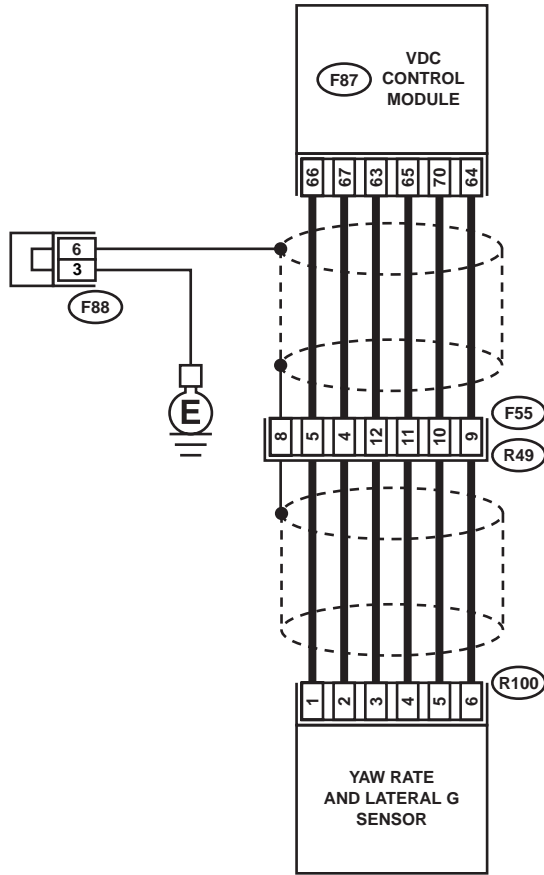
DIAGNOSIS:

- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00182

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK RUNNING FIELD. Was the vehicle driven on surfaces with holes or bumps at high speeds?	Driven.	When driving on surfaces with holes or bumps at high speeds, VDCCM sometimes records trouble codes in memory.	Go to step 2.
2 CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR. Check installation of yaw rate and lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?	Fixed securely.	Go to step 3.	Install yaw rate and lateral G sensor securely.
3 CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR. 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. Connector & terminal (R100) No. 3 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Go to step 6.	Go to step 4.
4 CHECK OUTPUT VOLTAGE OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 63 (+) — Chassis ground (-): Is the measured value within the specified range?	10 — 15 V	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step 5.
5 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in yaw rate and lateral G sensor connector?	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6 CHECK GROUND CIRCUIT OF YAW RATE AND LATERAL G SENSOR. Measure resistance between yaw rate and lateral G sensor and chassis ground. Connector & terminal (R100) No. 6 — Chassis ground: Is the measured value less than the specified value?	0.5 Ω	Go to step 9.	Go to step 7.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK GROUND CIRCUIT OF VDCCM. 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM connector. <Ref. to VDC-19, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. Connector & terminal (F87) No. 64 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step 8.
<p>8 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in VDCCM connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>9 CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR. 1) Disconnect connector from VDCCM. 2) Measure resistance between VDCCM and yaw rate and lateral G sensor. Connector & terminal (F87) No. 65 — (R100) No. 4: (F87) No. 66 — (R100) No. 1: (F87) No. 67 — (R100) No. 2: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 10.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>10 CHECK GROUND SHORT OF HARNESS. Measure resistance between VDCCM and chassis ground. Connector & terminal (F87) No. 65 — Chassis ground: (F87) No. 66 — Chassis ground: (F87) No. 67 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 11.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>11 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 65 (+) — Chassis ground (-): (F87) No. 66 (+) — Chassis ground (-): (F87) No. 67 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 12.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>12 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. Connector & terminal (F87) No. 65 (+) — Chassis ground (-): (F87) No. 66 (+) — Chassis ground (-): (F87) No. 67 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 13.	Repair harness between yaw rate and lateral G sensor and VDCCM.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>13 CHECK YAW RATE AND LATERAL G SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Install yaw rate and lateral G sensor to body. 3) Connect all connectors. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals.</p> <p>Connector & terminal <i>(F87) No. 66 (+) — No. 64 (-):</i></p> <p>Is the measured value within the specified range?</p>	2.1 — 2.9 V	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

AX:DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG.

NOTE:

For diagnostic procedure, refer to DTC 73. <Ref. to VDC-256, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

AY:DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT

NOTE:

For diagnostic procedure, refer to DTC 73. <Ref. to VDC-256, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

AZ:DTC 73 CHANGE RANGE OF LATERAL G SENSOR IS TOO BIG.

NOTE:

For diagnostic procedure, refer to DTC 73. <Ref. to VDC-256, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

BA:DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL

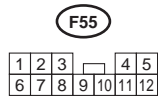
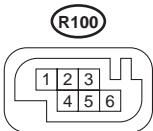
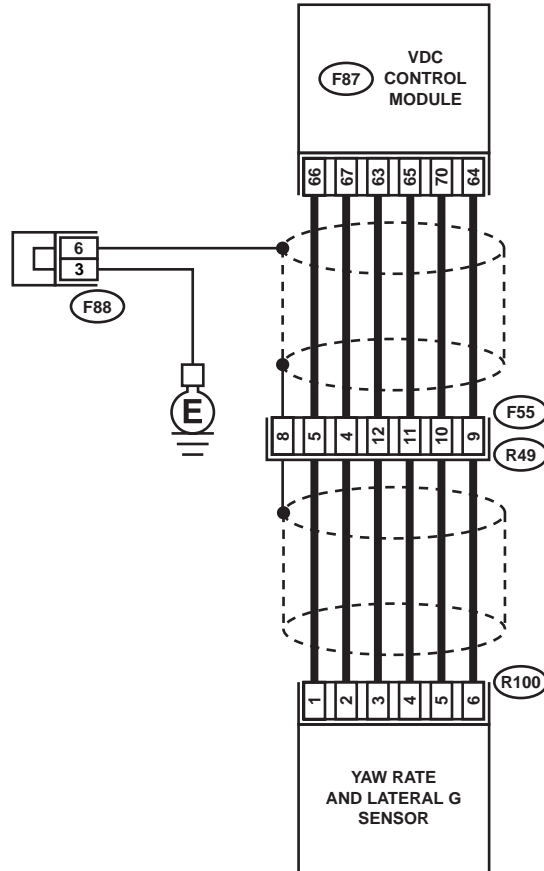
DIAGNOSIS:

- Faulty lateral G sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
×	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	×	
×	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	×

VDC00182

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR. Check installation of yaw rate and lateral G sensor. Is the yaw rate and lateral G sensor fixed securely?	Fixed securely.	Go to step 2.	Install yaw rate and lateral G sensor securely.
2 CHECK OUTPUT OF LATERAL G SENSOR USING SELECT MONITOR. 1) Stop the vehicle on a flat road. 2) Select "Current data display & Save" on the select monitor. 3) Read yaw rate and lateral G sensor output on the select monitor display. Is the measured value within the specified range?	2.3 — 2.7 V	Go to step 3.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
3 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	There is poor contact.	Repair connector.	Go to step 4.
4 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
5 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

BB:DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION.

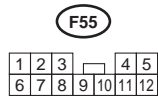
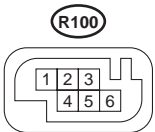
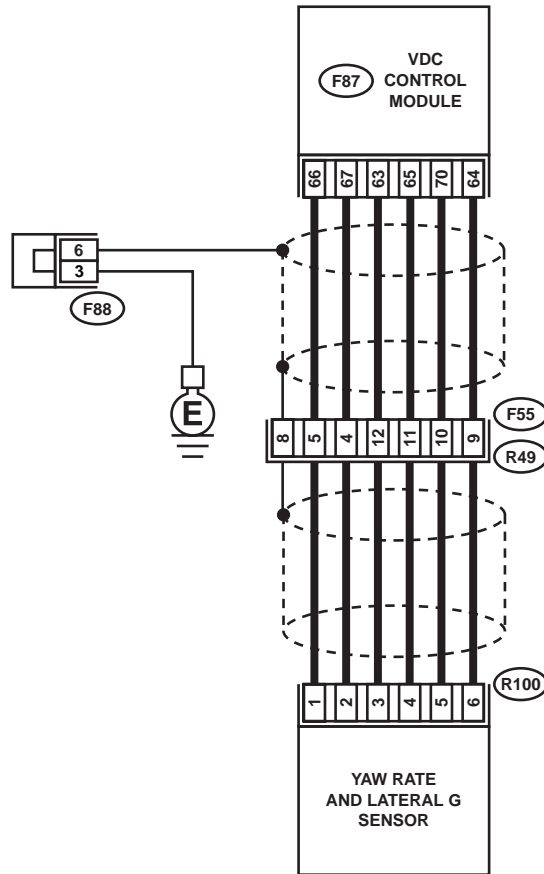
DIAGNOSIS:

- Faulty lateral G sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK OUTPUT OF YAW RATE AND LATERAL G SENSOR USING SELECT MONITOR.</p> <p>1) Stop the vehicle on a flat road. 2) Select "Current data display & Save" on the select monitor. 3) Read yaw rate and lateral G sensor output on the select monitor display. Is the measured value within the specified range?</p>	2.3 — 2.7 V	Go to step 2.	Go to step 5.
<p>2 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF. Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?</p>	There is poor contact.	Repair connector.	Go to step 3.
<p>3 CHECK VDCCM.</p> <p>1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 4.
<p>4 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?</p>	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
<p>5 CHECK INPUT VOLTAGE OF YAW RATE AND LATERAL G SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect connector from yaw rate and lateral G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. Connector & terminal (R100) No. 3 (+) — No. 6 (-): Is the measured value within the specified range?</p>	10 — 15 V	Go to step 6.	Repair harness/connector between yaw rate and lateral G sensor and VDCCM.
<p>6 CHECK YAW RATE AND LATERAL G SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between yaw rate and lateral G sensor terminals. Terminals No. 3 — No. 5: Is the measured value within the specified range?</p>	4.3 — 4.9 kΩ	Go to step 7.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK OPEN CIRCUIT IN YAW RATE AND LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.</p> <p>1) Connect connector to yaw rate and lateral G sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals.</p> <p>Connector & terminal (F87) No. 70 — No. 64:</p> <p>Is the measured value within the specified range?</p>	4.3 — 4.9 kΩ	Go to step 8.	Repair harness/connector between yaw rate and lateral G sensor and VDCCM.
<p>8 CHECK GROUND SHORT IN YAW RATE AND LATERAL G SENSOR HARNESS.</p> <p>1) Disconnect connector from yaw rate and lateral G sensor. 2) Measure resistance between VDCCM connector and chassis ground.</p> <p>Connector & terminal (F87) No. 63 — Chassis ground: (F87) No. 70 — Chassis ground: (F87) No. 64 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9.	Repair harness between yaw rate and lateral G sensor and VDCCM.
<p>9 CHECK YAW RATE AND LATERAL G SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Remove yaw rate and lateral G sensor from vehicle. 3) Connect connector to yaw rate and lateral G sensor. 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between yaw rate and lateral G sensor connector terminals.</p> <p>Connector & terminal (R100) No. 5 (+) — No. 6 (-):</p> <p>Is the measured value within the specified range when yaw rate and lateral G sensor is horizontal?</p>	2.3 — 2.7 V	Go to step 10.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
<p>10 CHECK YAW RATE AND LATERAL G SENSOR.</p> <p>Measure voltage between yaw rate and lateral G sensor connector terminals.</p> <p>Connector & terminal (R100) No. 5 (+) — No. 6 (-):</p> <p>Is the measured value within the specified range when yaw rate and lateral G sensor is inclined 90x to left?</p>	3.3 — 3.7 V	Go to step 11.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
<p>11 CHECK YAW RATE AND LATERAL G SENSOR.</p> <p>Measure voltage between yaw rate and lateral G sensor connector terminals.</p> <p>Connector & terminal (R100) No. 5 (+) — No. 6 (-):</p> <p>Is the measured value within the specified range when yaw rate and lateral G sensor is inclined 90x to right?</p>	1.3 — 1.7 V	Go to step 12.	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
12 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	There is poor contact.	Repair connector.	Go to step 13 .
13 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same pattern.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 14 .
14 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

BC:DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 1 EXCEEDS SPECIFICATION. (PRIMARY PRESSURE SENSOR)

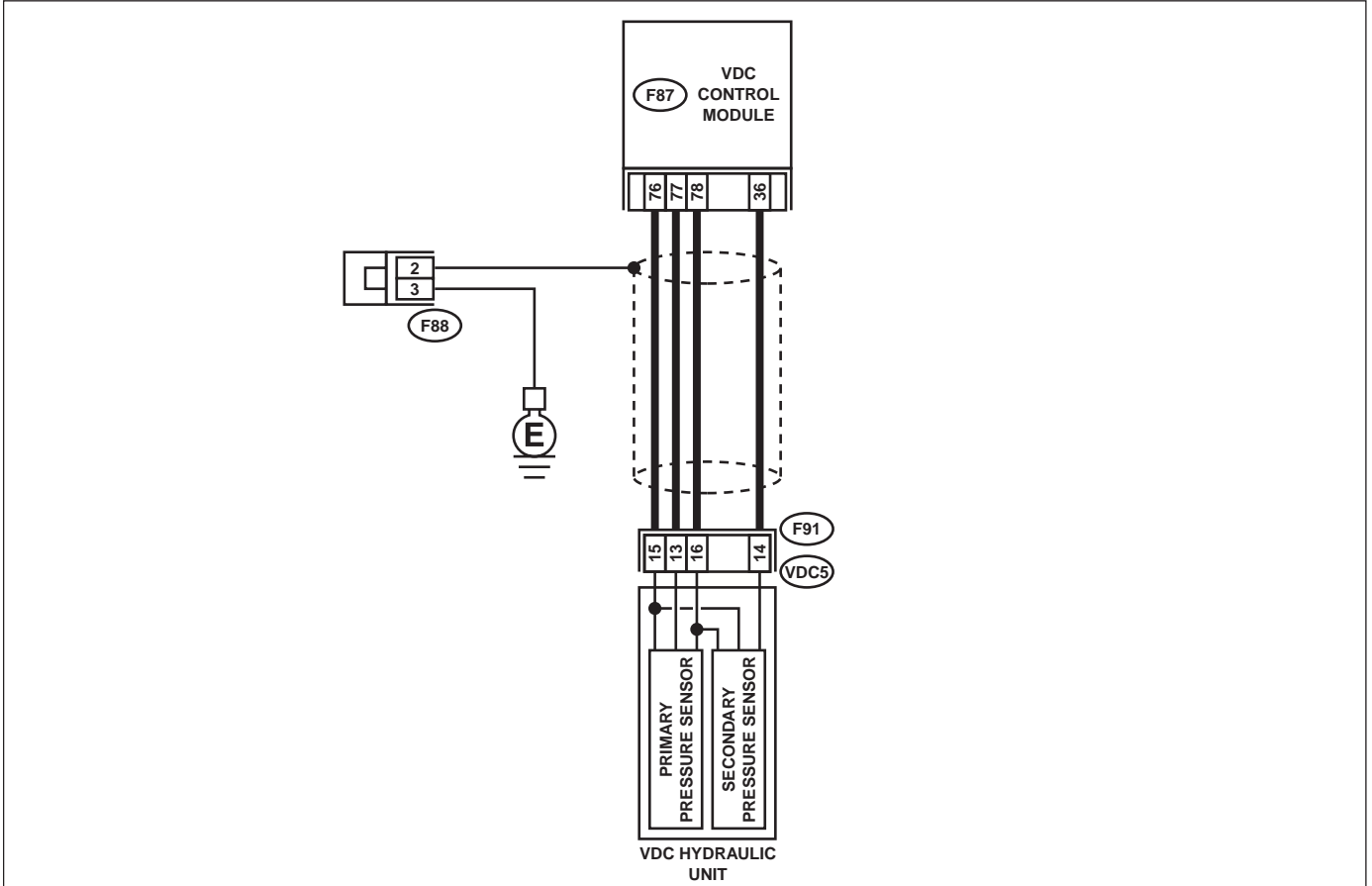
DIAGNOSIS:

- Faulty primary pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F88

1	2	3
4	5	6

F91

4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13

F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	

VDC00181

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND CIRCUIT OF PRESSURE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector (F91) from VDCH/U. 3) Measure resistance between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 15 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 4.	Go to step 2.
<p>2 CHECK GROUND CIRCUIT OF VDCCM. 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM. <Ref. to VDC-19, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. Connector & terminal (F87) No. 76 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Replace harness between VDCH/U and VDCCM.	Go to step 3.
<p>3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in VDCCM connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>4 CHECK POWER SUPPLY OF PRESSURE SENSOR. NOTE: When this inspection is carried out, DTC 51 ABNORMAL VALVE RELAY is memorized, but this does not indicate valve relay malfunction. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector terminals. Connector & terminal (F91) No. 16 (+) — No. 15 (-): Is the measured value within the specified range?</p>	4.75 — 5.25 V	Go to step 7.	Go to step 5.
<p>5 CHECK POWER SUPPLY OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. Connector & terminal (F87) No. 78 (+) — No. 76 (-): Is the measured value within the specified range?</p>	4.75 — 5.25 V	Repair harness between VDCH/U and VDCCM.	Go to step 6.
<p>6 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in VDCCM connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 13 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 8.	Repair harness between VDCH/U and VDCCM.
<p>8 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 13 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 9.	Repair harness between VDCH/U and VDCCM.
<p>9 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 13 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 10.	Repair harness between VDCH/U and VDCCM.
<p>10 CHECK INPUT VOLTAGE OF PRESSURE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. Connector & terminal (F87) No. 77 (+) — No. 76 (-): Is the measured value within the specified range?</p>	0.48 — 0.72 V	Go to step 11.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>11 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between VDCCM and pressure sensor?</p>	There is poor contact.	Repair connector.	Go to step 12.
<p>12 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 13.
<p>13 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?</p>	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

MEMO:

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

BD:DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 2 EXCEEDS SPECIFICATION. (SECONDARY PRESSURE SENSOR)

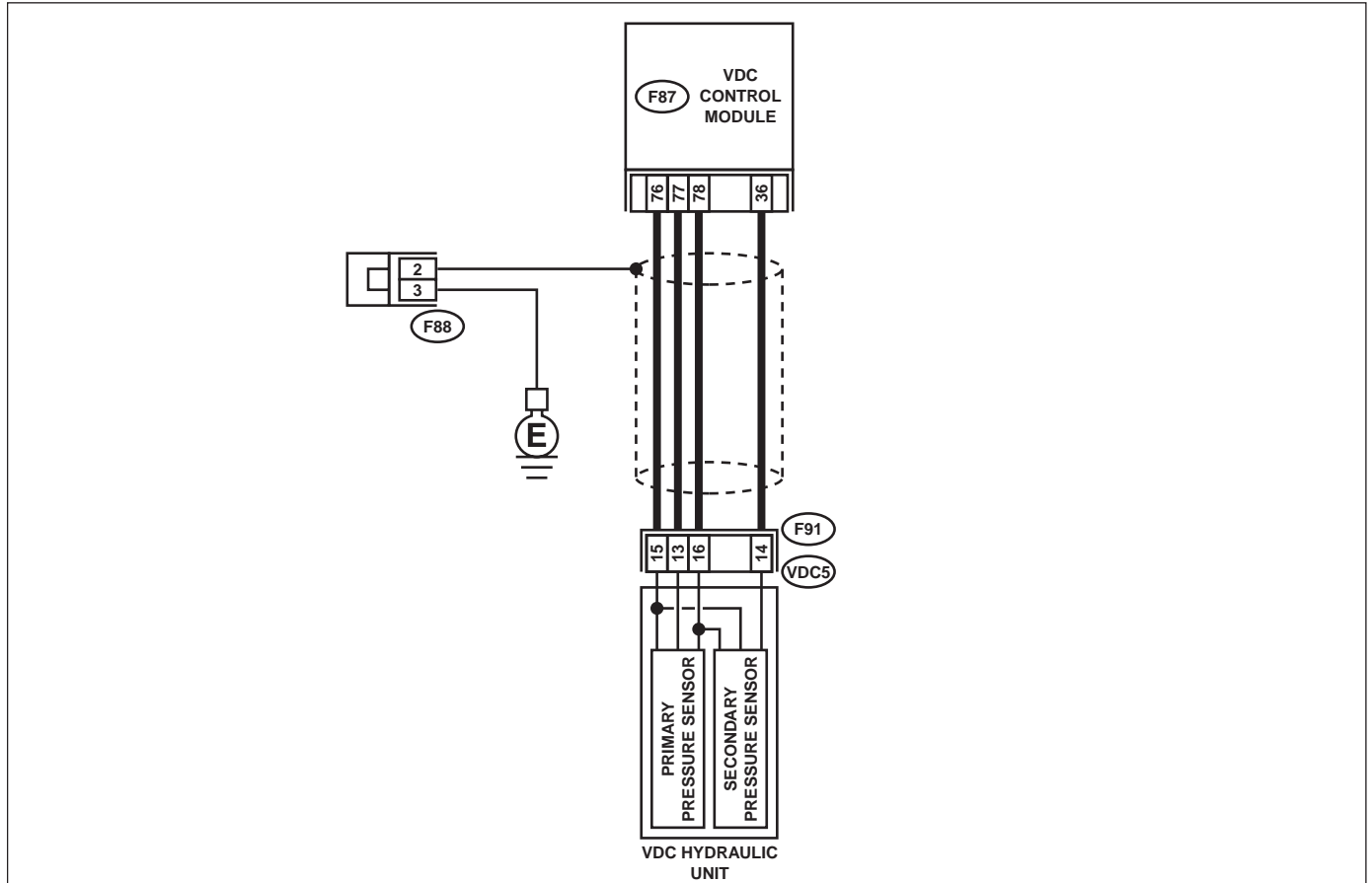
DIAGNOSIS:

- Faulty secondary pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F88

1	2	3
4	5	6

F91

4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13

F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗	
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	⊗

VDC00181

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND CIRCUIT OF PRESSURE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector (F91) from VDCH/U. 3) Measure resistance between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 15 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Go to step 4.	Go to step 2.
<p>2 CHECK GROUND CIRCUIT OF VDCCM. 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. Connector & terminal (F87) No. 76 — Chassis ground: Is the measured value less than the specified value?</p>	0.5 Ω	Replace harness between VDCH/U and VDCCM.	Go to step 3.
<p>3 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in VDCCM connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>4 CHECK POWER SUPPLY OF PRESSURE SENSOR. NOTE: When this inspection is carried out, DTC 51 ABNORMAL VALVE RELAY is memorized, but this does not indicate valve relay malfunction. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector terminals. Connector & terminal (F91) No. 16 (+) — No. 15 (-): Is the measured value within the specified range?</p>	4.75 — 5.25 V	Go to step 7.	Go to step 5.
<p>5 CHECK POWER SUPPLY OF VDCCM. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. Connector & terminal (F87) No. 78 (+) — No. 76 (-): Is the measured value within the specified range?</p>	4.75 — 5.25 V	Repair harness between VDCH/U and VDCCM.	Go to step 6.
<p>6 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in VDCCM connector?</p>	There is poor contact.	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 14 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 8 .	Repair harness between VDCH/U and VDCCM.
<p>8 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 14 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 9 .	Repair harness between VDCH/U and VDCCM.
<p>9 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. Connector & terminal (F91) No. 13 (+) — Chassis ground (-): (F91) No. 14 (+) — Chassis ground (-): Is the measured value less than the specified value?</p>	0.5 V	Go to step 10 .	Repair harness between VDCH/U and VDCCM.
<p>10 CHECK INPUT VOLTAGE OF PRESSURE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. Connector & terminal (F87) No. 36 (+) — No. 76 (-): Is the measured value within the specified range?</p>	0.48 — 0.72 V	Go to step 11 .	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>11 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between VDCCM and pressure sensor?</p>	There is poor contact.	Repair connector.	Go to step 12 .
<p>12 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?</p>	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 13 .
<p>13 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?</p>	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

BE:DTC 74 PRESSURE SENSOR 1 OFFSET IS TOO BIG. (PRIMARY PRESSURE SENSOR)

NOTE:

For diagnostic procedure, refer to DTC 74. <Ref. to VDC-270, DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG. (SECONDARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

BF:DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG. (SECONDARY PRESSURE SENSOR)

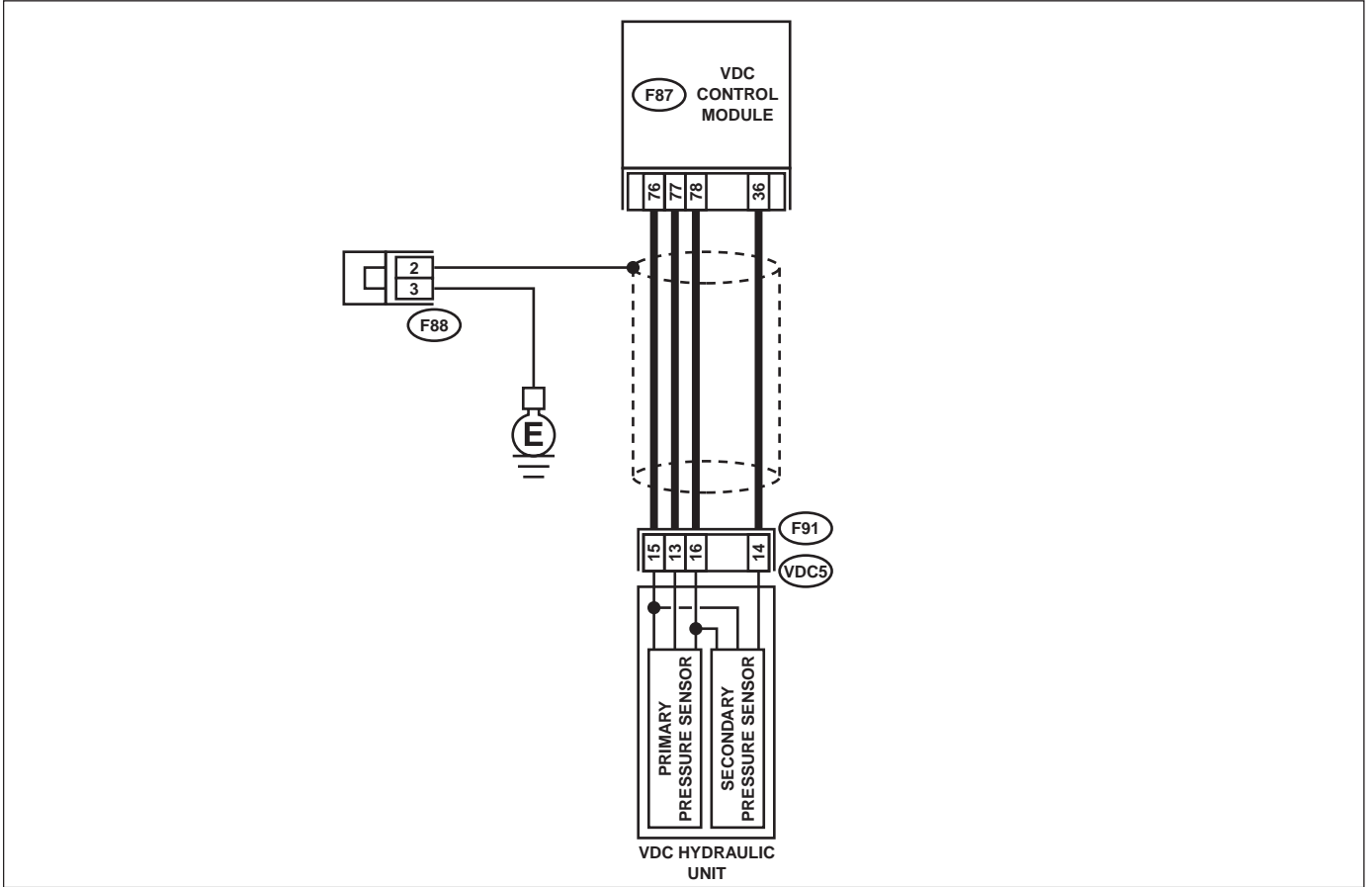
DIAGNOSIS:

- Faulty pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F88

1	2	3
4	5	6

F91

4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13

F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗	
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	⊗

VDC00181

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DRIVING TECHNIC. Check the driver's technic. Are the accelerator and brake pedals depressed simultaneously while driving?	Depressed.	The VDC is normal. Erase the diagnostic trouble code. NOTE: Driving the vehicle with both the accelerator pedal and brake pedal depressed may store a diagnostic trouble code in the memory.	Go to step 2.
2 CHECK OUTPUT OF PRESSURE SENSOR USING SELECT MONITOR. 1) Select "Current data display & Save" on the select monitor. 2) Read pressure sensor output on the select monitor display. Is the measured value within the specified range when brake pedal is depressed?	0.48 — 0.72 V	Go to step 3.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 4.
4 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

BG:DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG.

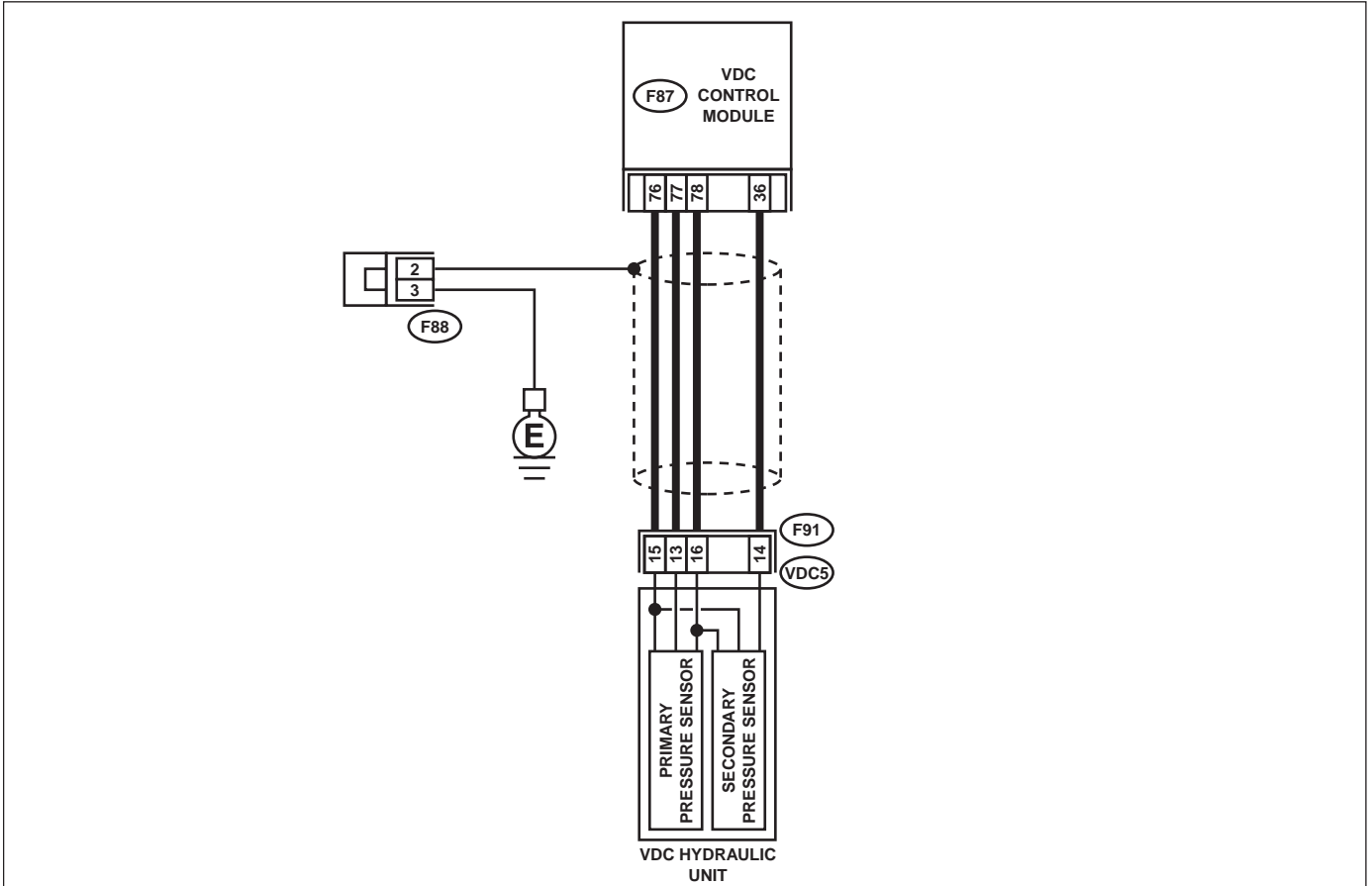
DIAGNOSIS:

- Faulty pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



F88

1	2	3
4	5	6

F91

4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13

F87

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗	
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	⊗

VDC00181

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK GROUND SHORT OF HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector (F91) from VDCH/U. 4) Measure resistance between VDCH/U connector and chassis ground.</p> <p>Connector & terminal (F91) No. 13 — Chassis ground: (F91) No. 14 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 2.	Repair harness between VDCH/U and VDCCM.
<p>2 CHECK BATTERY SHORT OF HARNESS. Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal (F91) No. 13 (+) — Chassis ground (-): (F91) No. 14 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 3.	Repair harness between VDCH/U and VDCCM.
<p>3 CHECK BATTERY SHORT OF HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal (F91) No. 13 (+) — Chassis ground (-): (F91) No. 14 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	0.5 V	Go to step 4.	Repair harness between VDCH/U and VDCCM.
<p>4 CHECK INPUT VOLTAGE OF PRESSURE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-19, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals.</p> <p>Connector & terminal (F87) No. 77 (+) — No. 76 (-): (F87) No. 36 (+) — No. 76 (-):</p> <p>Is the measured value within the specified range?</p>	0.48 — 0.72 V	Go to step 5.	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
<p>5 CHECK BRAKE FLUID LEAKAGE. Inspect fluid leakage between brake master cylinder and VDCH/U. Does brake fluid leak?</p>	Fluid leaks.	Retighten or replace.	Go to step 6.
<p>6 CHECK BRAKE MASTER CYLINDER. Inspect brake master cylinder hydraulic pressure. <Ref. to BR-36, OPERATION CHECK (WITH GAUGES), INSPECTION, Brake Booster.> Is hydraulic pressure normal?</p>	Normal.	Go to step 7.	Replace master cylinder.

DIAGNOSTICS CHART WITH SELECT MONITOR

VDC (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK BRAKE PEDAL STROKE. Measure the stroke between non-forced pedal position and forced pedal position with 50 kg (110 lb). Is the measured value less than the specified value?	95 mm (3.74 in)	Go to step 8 .	Perform bleeding from brake system.
8 CHECK INPUT VOLTAGE OF PRESSURE SENSOR. 1) Depress the brake pedal with 50 kg (110 lb). 2) Measure voltage between VDCCM connector terminals. Connector & terminal A (F87) No. 77 (+) — No. 76 (-): B (F87) No. 36 (+) — No. 76 (-): Does the voltage difference between A and B exceed the specified value?	0.2 V	Go to step 9 .	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
9 CHECK POOR CONTACT IN CONNECTORS. Is there poor contact in connector between VDCCM and pressure sensor?	There is poor contact.	Repair connector.	Go to step 10 .
10 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code. Is the same diagnostic trouble code as in the current diagnosis still being output?	Same DTC indicated.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 11 .
11 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE. Are other diagnostic trouble codes being output?	Other DTC indicated.	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

15. General Diagnostic Table

A: INSPECTION

Symptom		Primary probable cause	Secondary probable cause
Poor braking effectiveness	Long braking distance	VDCH/U VDCCM Brake pads Air in brake line Tire specifications, wear and pressures Incorrect wiring or piping	Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Proportioning valve Master cylinder Brake caliper Disc rotor Brake pipe Brake booster
	Wheel locks	VDCH/U VDCCM Faulty ABS sensor or sensor gap Incorrect wiring or piping	Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Proportioning valve Brake caliper Brake pipe
	Brake dragging	VDCH/U VDCCM Faulty ABS sensor or sensor gap Master cylinder Brake caliper Parking brake Axle & wheels Brake pedal play	Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake pads Brake pipe
	Long brake pedal stroke	Air in brake line Brake pedal play	VDCH/U Proportioning valve Master cylinder Brake caliper Brake pads Brake pipe Brake booster
	Vehicle pitching	VDCH/U VDCCM Uneven road Suspension play or fatigue (reduced damping) Incorrect wiring or piping	Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation
	Unstable or uneven braking	VDCH/U VDCCM Faulty ABS sensor or sensor gap Brake caliper Brake pads Uneven road Tire specifications, wear and pressures Incorrect wiring or piping	Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Master cylinder Disc rotor Brake pipe Axle & wheels Crowned road or banked road Suspension play or fatigue (reduced damping)

GENERAL DIAGNOSTIC TABLE

VDC (DIAGNOSTICS)

Symptom		Primary probable cause	Secondary probable cause
Vibration and/or noise <ul style="list-style-type: none"> • During abrupt braking • During rapid acceleration • During slippery road driving 	Excessive brake pedal vibration	Uneven road Incorrect wiring or piping	VDCH/U Proportioning valve Brake booster Suspension play or fatigue (reduced damping)
	Noise from VDCH/U	VDCH/U (mount bushing) Faulty ABS sensor or sensor gap Brake pipe	VDCCM Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation
	Noise from front of vehicle	VDCH/U (mount bushing) Faulty ABS sensor or sensor gap Master cylinder Brake caliper Brake pads Disc rotor Brake pipe Brake booster Suspension play or fatigue (reduced damping)	Axle & wheels Tire specifications, wear and pressures
	Noise inside passenger compartment		VDCCM Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation
	Noise from rear of vehicle	Faulty ABS sensor or sensor gap Brake caliper Brake pads Disc rotor Parking brake Brake pipe Suspension play or fatigue (reduced damping)	Axle & wheels Tire specifications, wear and pressures
Engine does not accelerate or engine stalls during rapid acceleration or on slippery roads.	VDCH/U VDCCM Faulty ABS sensor or sensor gap Master cylinder Brake caliper Parking brake Incorrect wiring or piping	Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake pads Brake pipe	

GENERAL DIAGNOSTIC TABLE

VDC (DIAGNOSTICS)

Symptom		Primary probable cause	Secondary probable cause
Poor TCS's directional operation stability	Deviation in either left or right direction	VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake caliper Brake pads Wheel alignment Uneven road Crowned road or banked road Tire specifications, wear and pressures Incorrect wiring or piping	Proportioning valve Disc rotor Brake pipe Axle & wheels Suspension play or fatigue (reduced damping)
	Vehicle spin	VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake pads Tire specifications, wear and pressures Incorrect wiring or piping	Proportioning valve Brake caliper Brake pipe
Steering wheel drags during operation.		VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Incorrect wiring or piping connections Power steering system	Brake caliper Brake pads Disc rotor Wheel alignment Uneven road Crowned road or banked road Suspension play or fatigue (reduced damping) Tire specifications, wear and pressures
VDC activates during ordinary driving.		VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Wheel alignment Uneven road Crowned road or banked road Suspension play or fatigue (reduced damping) Tire specifications, wear and pressures Incorrect wiring or piping Power steering system	
VDC OFF indicator light does not illuminate when VDC OFF switch is pushed. NOTE: When pushing the VDC OFF switch for 10 seconds or more while revving the engine, the VDC OFF indicator light goes off and operations cannot be continued. Turn ignition switch from OFF to ON again to recover the previous condition.		Harness Indicator light bulb VDC OFF switch	

GENERAL DIAGNOSTIC TABLE

VDC (DIAGNOSTICS)

MEMO:

BRAKE

BR

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GENERAL DESCRIPTION

BRAKE

1. General Description

A: SPECIFICATIONS

	Size	15 inch type	16 inch type	16 inch type (Turbo model)
Front disc brake	Type	Disc (Floating type, ventilated)		
	Effective disc diameter	228 mm (8.98 in)	248 mm (9.76 in)	
	Disc thickness × Outer diameter	24 × 277 mm (0.94 × 10.91 in)	24 × 294 mm (0.94 × 11.57 in)	
	Effective cylinder diameter	42.8 mm (1.685 in) × 2		
	Pad dimensions (length × width × thickness)	112.3 × 50.0 × 11.0 mm (4.421 × 1.969 × 0.433 in)		
	Clearance adjustment	Automatic adjustment		
	Rear disc brake	Type	Disc (Floating type)	
Effective disc diameter		254 mm (10.0 in)		
Disc thickness × Outer diameter		10 × 290 mm (0.39 × 11.42 in)	18 × 290 mm (0.71 × 11.42 in)	
Effective cylinder diameter		38.1 mm (1.500 in)		
Pad dimensions (length × width × thickness)		82.4 × 33.7 × 9.0 mm (3.244 × 1.327 × 0.354 in)		
Clearance adjustment		Automatic adjustment		
Master cylinder	Type	Tandem		
	Effective diameter	26.99 mm (1-1/16 in)	RHD without VDC: 25.4 mm (1 in) LHD and RHD with VDC: 26.99 mm (1-1/16 in)	26.99 mm (1-1/16 in)
	Reservoir type	Sealed type		
	Brake fluid reservoir capacity	205 cm ³ (12.51 cu in)		
Brake booster	Type	Vacuum suspended		
	Effective diameter	205 + 230 mm (8.07 + 9.06 in)		
Proportioning valve	Split point	2,942 kPa (30 kg/cm ² , 427 psi)	With VDC: 3,678 kPa (37.5 kg/cm ² , 533 psi) Without VDC: 2,942 kPa (30 kg/cm ² , 427 psi)	2,942 kPa (30 kg/cm ² , 427 psi)
	Reducing ratio	0.3		
Brake line	Dual circuit system			
Brake fluid	FMVSS No. 116, DOT3 or DOT4			
CAUTION: <ul style="list-style-type: none"> • Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading. • When brake fluid is supplemented, be careful not to allow any dust into the reservoir. • Use fresh DOT3 or 4 brake fluid when replacing or refilling the fluid. 				

NOTE:

Refer to "PB" section for parking brake SPECIFICATIONS.

GENERAL DESCRIPTION

BRAKE

ITEM		STANDARD	SERVICE LIMIT
Front brake	Pad thickness (including back metal)	17 mm (0.67 in)	7.5 mm (0.295 in)
	Disc thickness	24 mm (0.94 in)	22 mm (0.87 in)
	Disc runout	—	0.075 mm (0.0030 in)
Rear brake	Pad thickness (including back metal)	14 mm (0.55 in)	6.5 mm (0.256 in)
	Disc thickness	Turbo model: 18 mm (0.71 in) Non-turbo model: 10 mm (0.39 in)	Turbo model: 16 mm (0.63 in) Non-turbo model: 8.5 mm (0.335 in)
	Disc runout	—	0.070 mm (0.0028 in)
Parking brake	Inside diameter	170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness	3.2 mm (0.126 in)	1.5 mm (0.059 in)
	Lever stroke	7 to 8 notches/196 N (20 kgf, 44 lb)	

	Model	OUTBACK		Except OUTBACK	
		RHD without VDC	RHD with VDC, LHD	Non-turbo model	Turbo model
	Brake pedal force	Fluid pressure		Fluid pressure	
Brake fluid pressure without engine running	147 N (15 kgf, 33 lb)	686 kPa (7 kg/cm ² , 100 psi)	588 kPa (6 kg/cm ² , 85 psi)	588 kPa (6 kg/cm ² , 85 psi)	686 kPa (7 kg/cm ² , 100 psi)
	294 N (30 kgf, 66 lb)	1,863 kPa (19 kg/cm ² , 270 psi)	1,667 kPa (17 kg/cm ² , 242 psi)	1,667 kPa (17 kg/cm ² , 242 psi)	1,765 kPa (18 kg/cm ² , 256 psi)
Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lb)	5,884 kPa (60 kg/cm ² , 853 psi)	5,688 kPa (58 kg/cm ² , 825 psi)	5,688 kPa (58 kg/cm ² , 825 psi)	6,082 kPa (62 kg/cm ² , 882 psi)
	294 N (30 kgf, 66 lb)	10,886 kPa (111 kg/cm ² , 1,578 psi)	9,703 kPa (99 kg/cm ² , 1,408 psi)	9,702 kPa (99 kg/cm ² , 1,407 psi)	11,674 kPa (119 kg/cm ² , 1,693 psi)

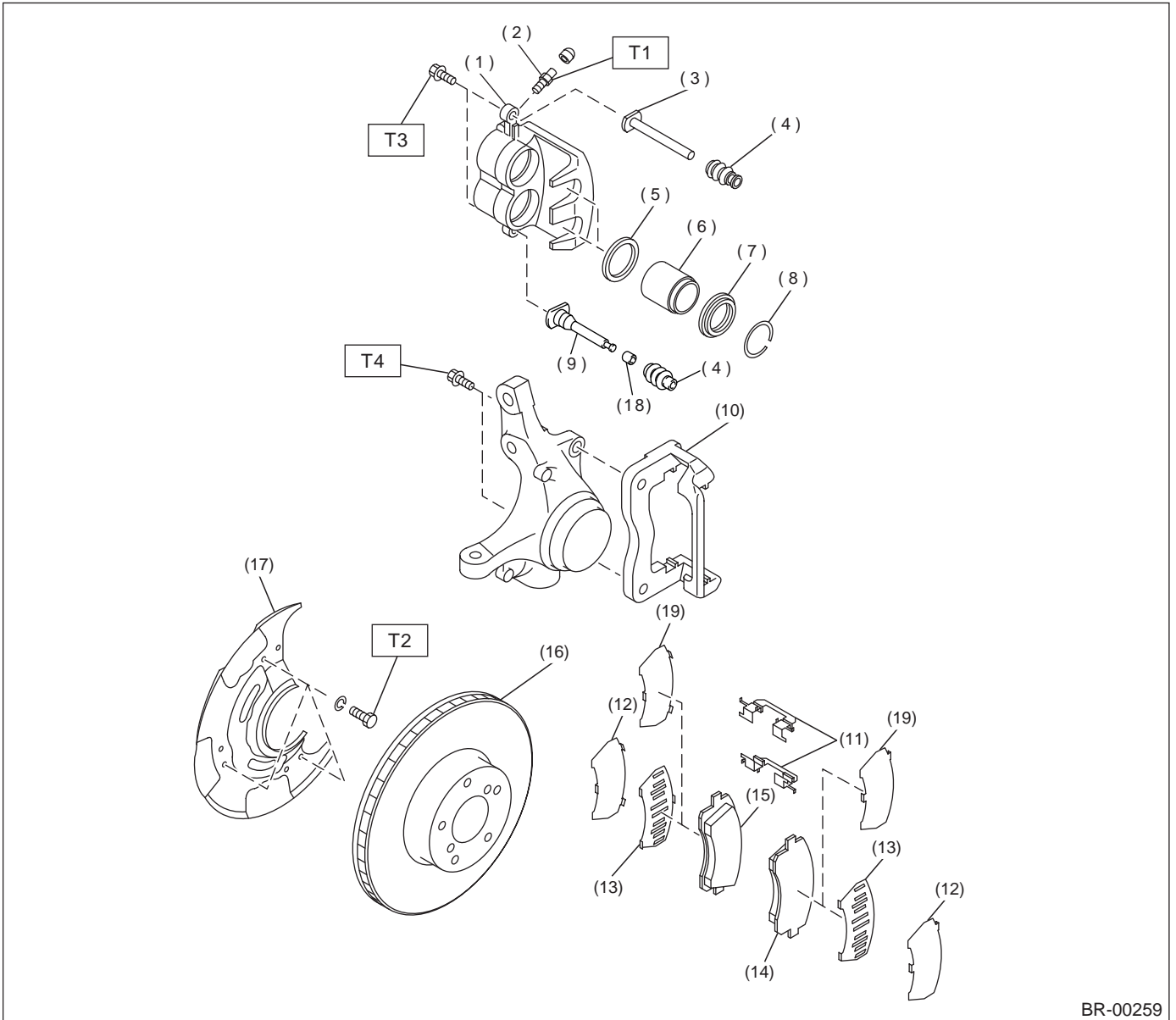
Brake pedal	Free play	1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]
-------------	-----------	--

GENERAL DESCRIPTION

BRAKE

B: COMPONENT

1. FRONT DISC BRAKE



BR-00259

(1) Caliper body	(11) Pad clip	(19) Adhesive shim [Option code*: EC, EK, KA (B4 MT)]
(2) Air bleeder screw	(12) Outer shim [Option code*: KO, K1, K4, KA (Except B4 MT), KS]	
(3) Guide pin (Green)	(13) Inner shim [Option code*: KO, K1, K4, KA (Except B4 MT), KS]	
(4) Pin boot	(14) Pad (Outside)	
(5) Piston seal	(15) Pad (Inside)	
(6) Piston	(16) Disc rotor	
(7) Piston boot	(17) Disc cover	
(8) Boot ring	(18) Bushing	
(9) Lock pin (Yellow)		
(10) Support		

Tightening torque: N-m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

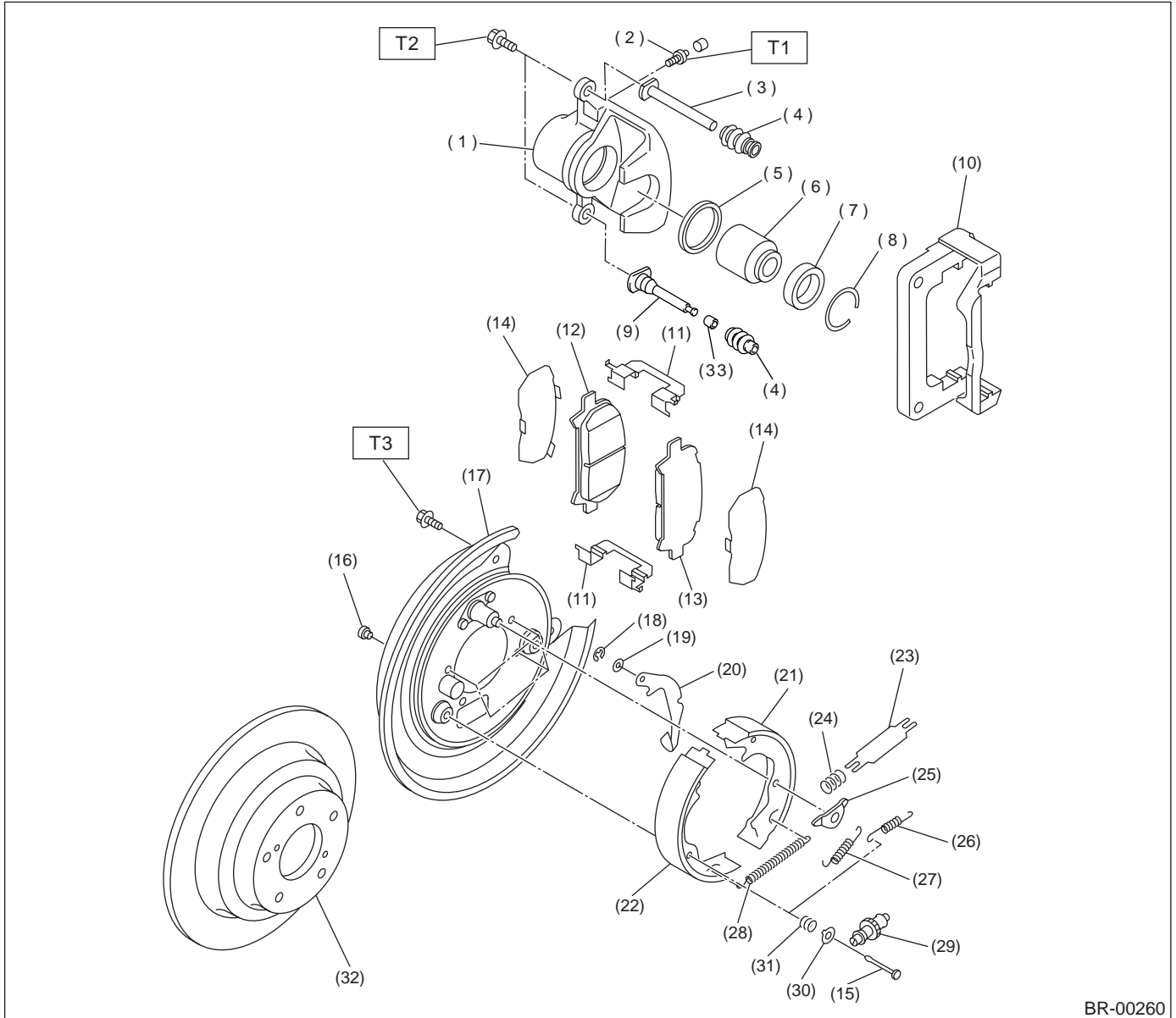
T2: 18 (1.8, 13.0)

T3: 39 (4.0, 28.9)

T4: 78 (8.0, 58)

*: Refer to ID section for the option code. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

2. REAR DISC BRAKE



BR-00260

- | | | |
|-----------------------|-------------------------------------|---------------------------------|
| (1) Caliper body | (14) Shim | (27) Primary shoe return spring |
| (2) Air bleeder screw | (15) Shoe hold-down pin | (28) Adjusting spring |
| (3) Guide pin (Green) | (16) Cover | (29) Adjuster |
| (4) Pin boot | (17) Back plate | (30) Shoe hold-down cup |
| (5) Piston seal | (18) Retainer | (31) Shoe hold-down spring |
| (6) Piston | (19) Spring washer | (32) Disc rotor |
| (7) Piston boot | (20) Parking brake lever | (33) Bushing |
| (8) Boot ring | (21) Parking brake shoe (Secondary) | |
| (9) Lock pin (Yellow) | (22) Parking brake shoe (Primary) | |
| (10) Support | (23) Strut | |
| (11) Pad clip | (24) Strut shoe spring | |
| (12) Pad (Inner) | (25) Shoe guide plate | |
| (13) Pad (Outer) | (26) Secondary shoe return spring | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

T2: 39 (4.0, 28.9)

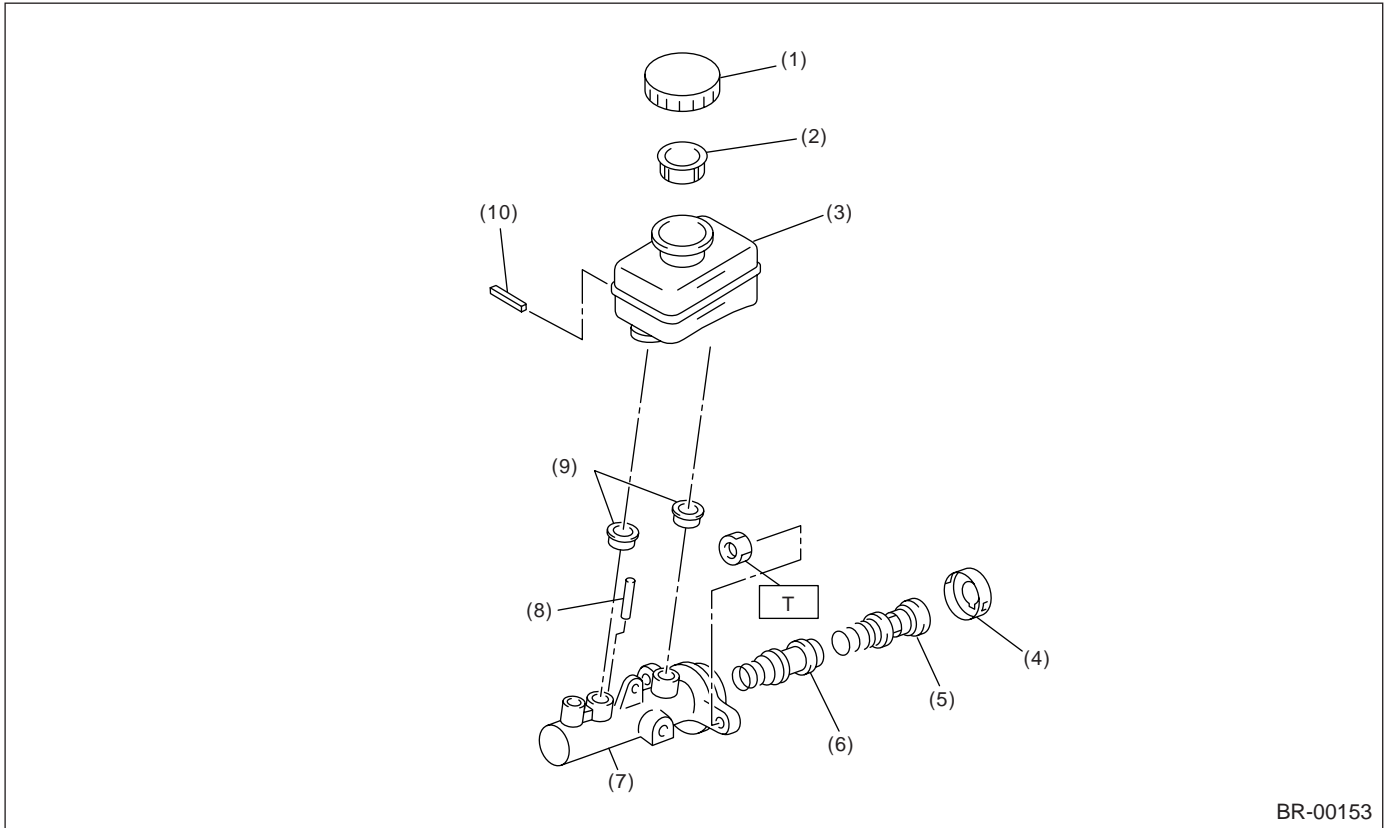
T3: 52 (5.3, 38.3)

GENERAL DESCRIPTION

BRAKE

3. MASTER CYLINDER

- LHD models without VDC



BR-00153

- | | |
|---------------------|-----------------------------|
| (1) Cap | (6) Secondary piston |
| (2) Filter | (7) Cylinder body |
| (3) Reservoir tank | (8) Cylinder pin (With ABS) |
| (4) Piston retainer | (9) Seal |
| (5) Primary piston | (10) Pin |

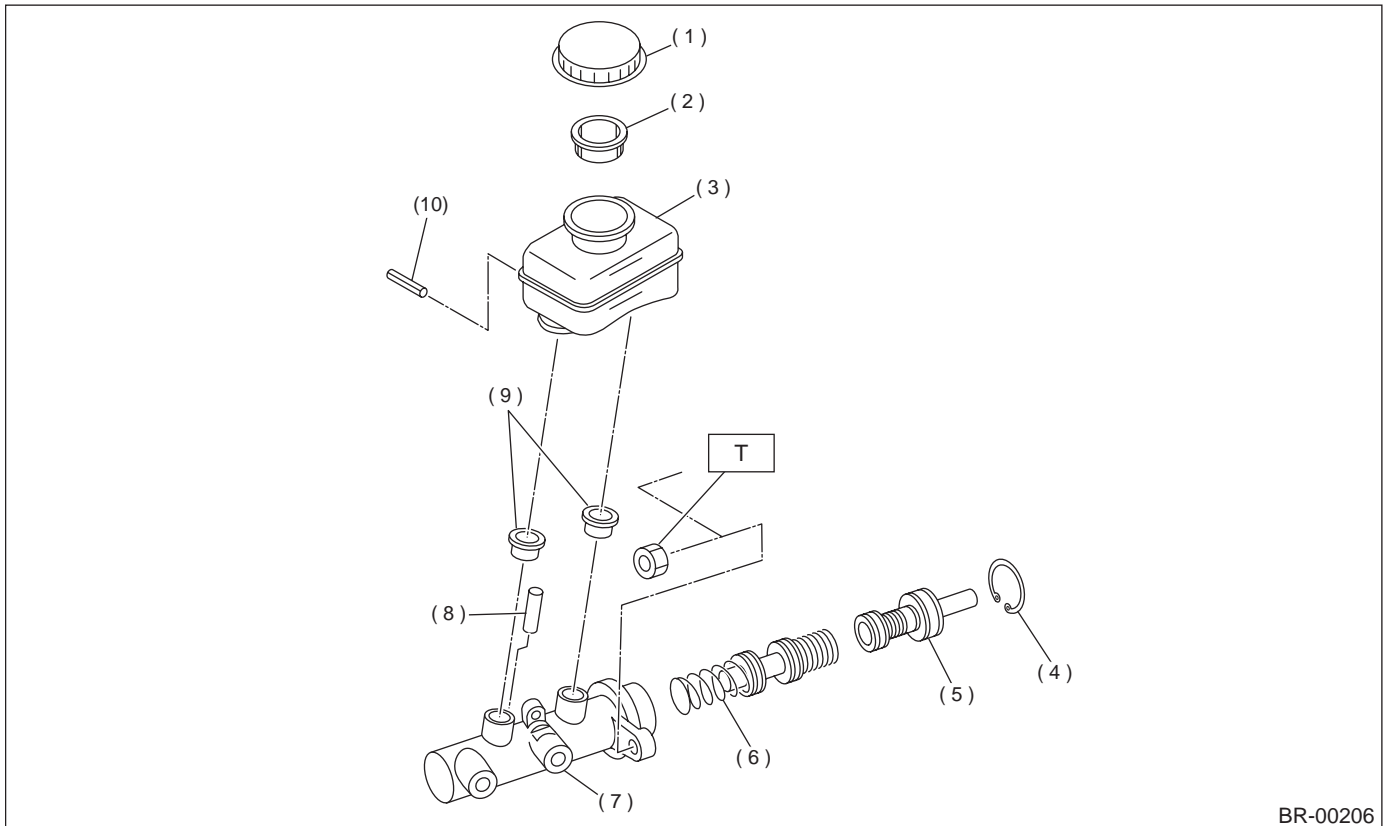
Tightening torque: N·m (kgf-m, ft-lb)

T: 14 (1.4, 10.1)

GENERAL DESCRIPTION

BRAKE

• LHD model with VDC



- | | |
|--------------------|----------------------|
| (1) Cap | (6) Secondary piston |
| (2) Filter | (7) Cylinder body |
| (3) Reservoir tank | (8) Cylinder pin |
| (4) C-ring | (9) Seal |
| (5) Primary piston | (10) Pin |

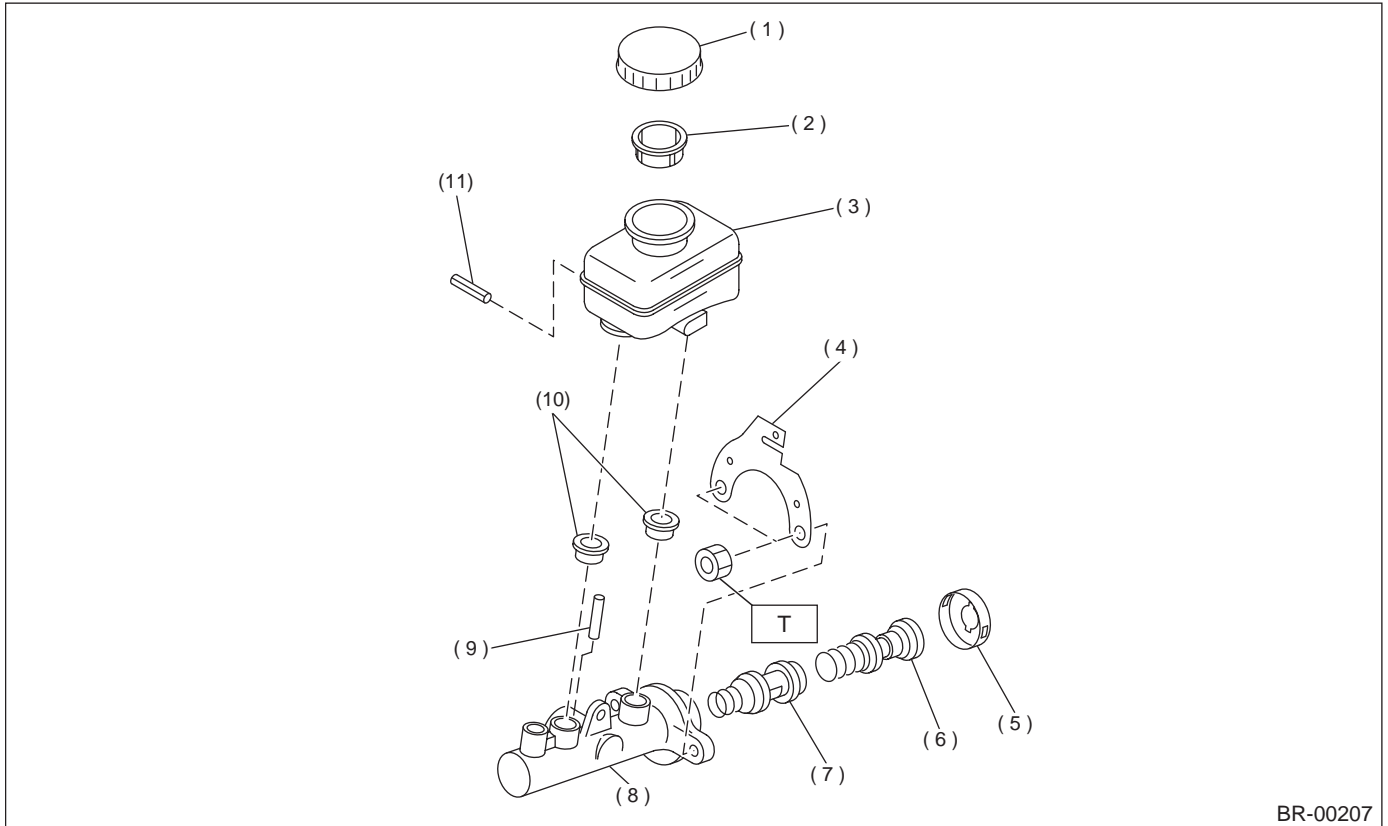
Tightening torque: N·m (kgf-m, ft-lb)

T: 14 (1.4, 10.1)

GENERAL DESCRIPTION

BRAKE

• RHD model



- (1) Cap
- (2) Filter
- (3) Reservoir tank
- (4) Bracket
- (5) Piston retainer

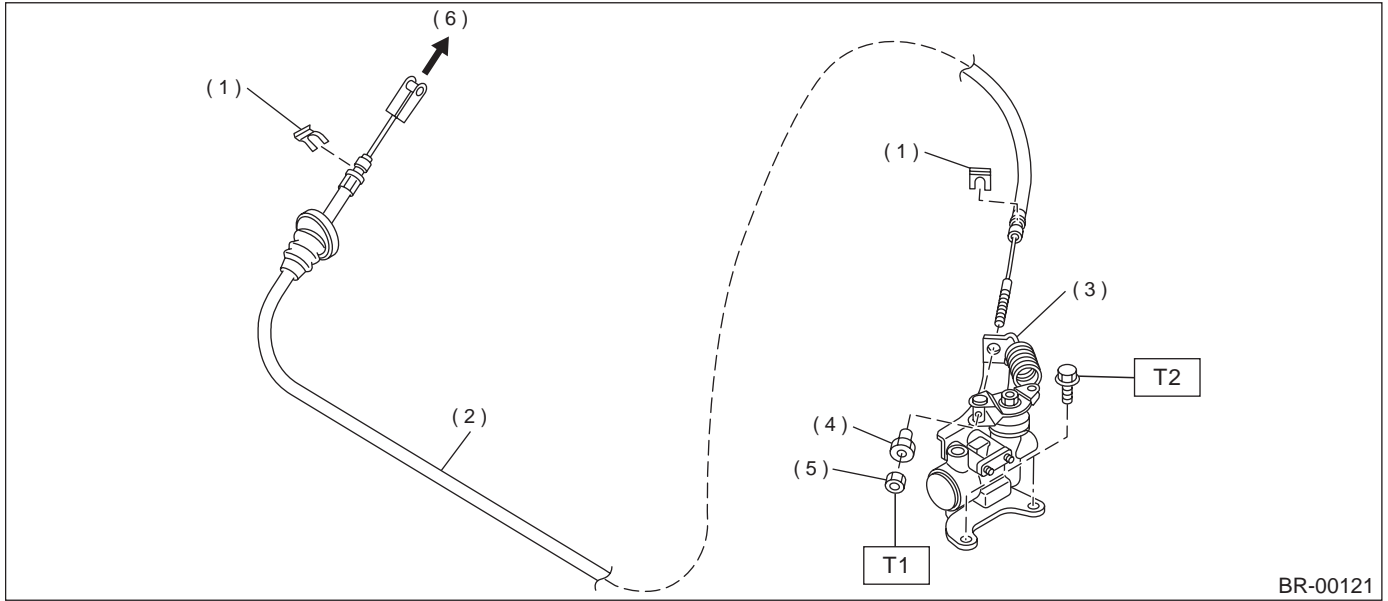
- (6) Primary piston
- (7) Secondary piston
- (8) Cylinder body
- (9) Cylinder pin (With ABS)
- (10) Seal

- (11) Pin

Tightening torque: N-m (kgf-m, ft-lb)

T: 14 (1.4, 10.1)

4. HILL HOLDER



- | | |
|-------------------------------|---------------------|
| (1) Clamp | (4) Adjusting nut |
| (2) PHV cable | (5) Lock nut |
| (3) PHV (Pressure hold valve) | (6) To clutch pedal |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 3.5 (0.35, 2.5)

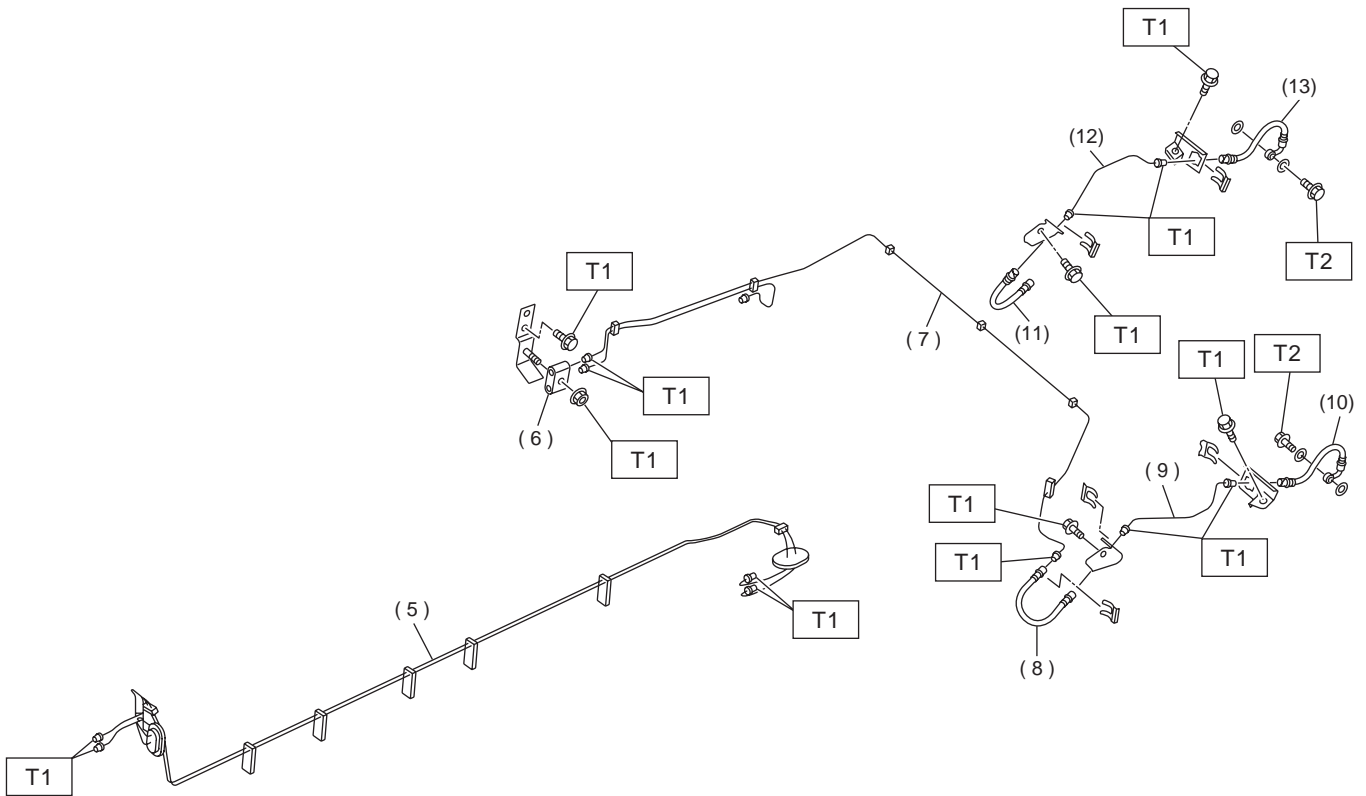
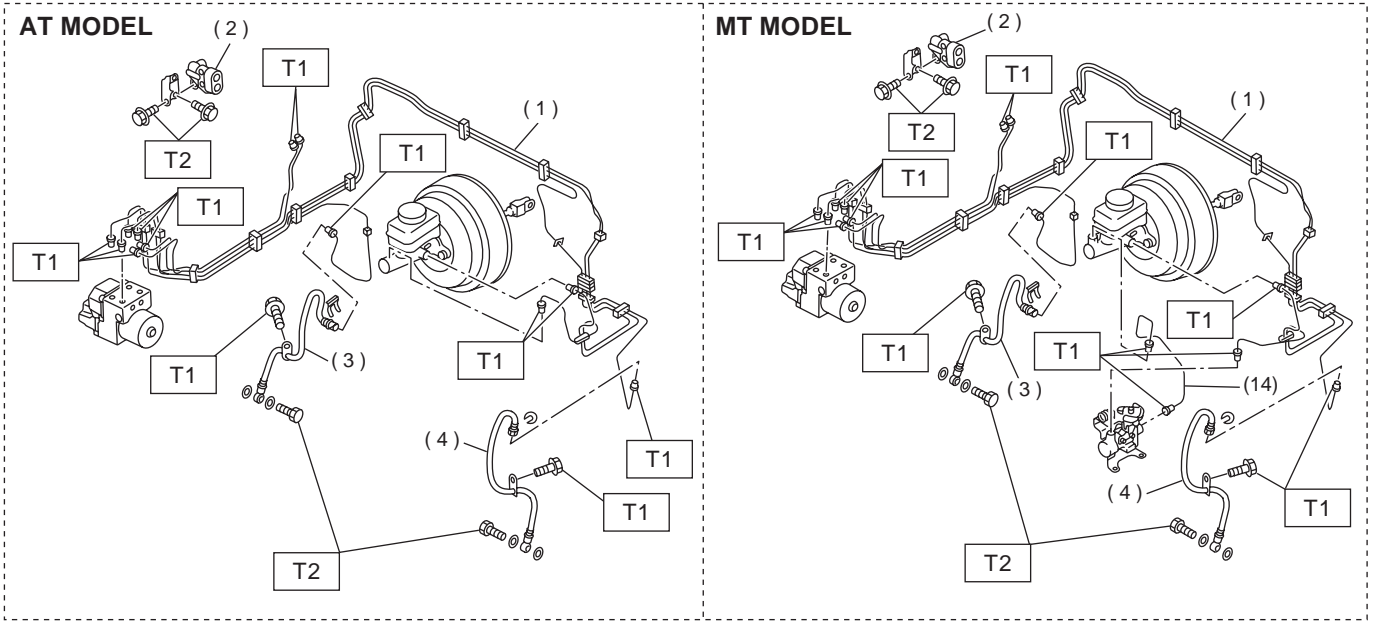
T2: 18 (1.8, 13.0)

GENERAL DESCRIPTION

BRAKE

5. BRAKE PIPES AND HOSE

• LHD model



BR-00209

GENERAL DESCRIPTION

BRAKE

- | | |
|--------------------------------|------------------------------|
| (1) Front brake pipe assembly | (8) Rear brake hose LH |
| (2) Proportioning valve | (9) Rear brake pipe LH |
| (3) Front brake hose RH | (10) Rear brake hose rear LH |
| (4) Front brake hose LH | (11) Rear brake hose RH |
| (5) Center brake pipe assembly | (12) Rear brake pipe RH |
| (6) Two-way connector | (13) Rear brake hose rear RH |
| (7) Rear brake pipe assembly | (14) Adapter pipe |

Tightening torque: N-m (kgf-m, ft-lb)

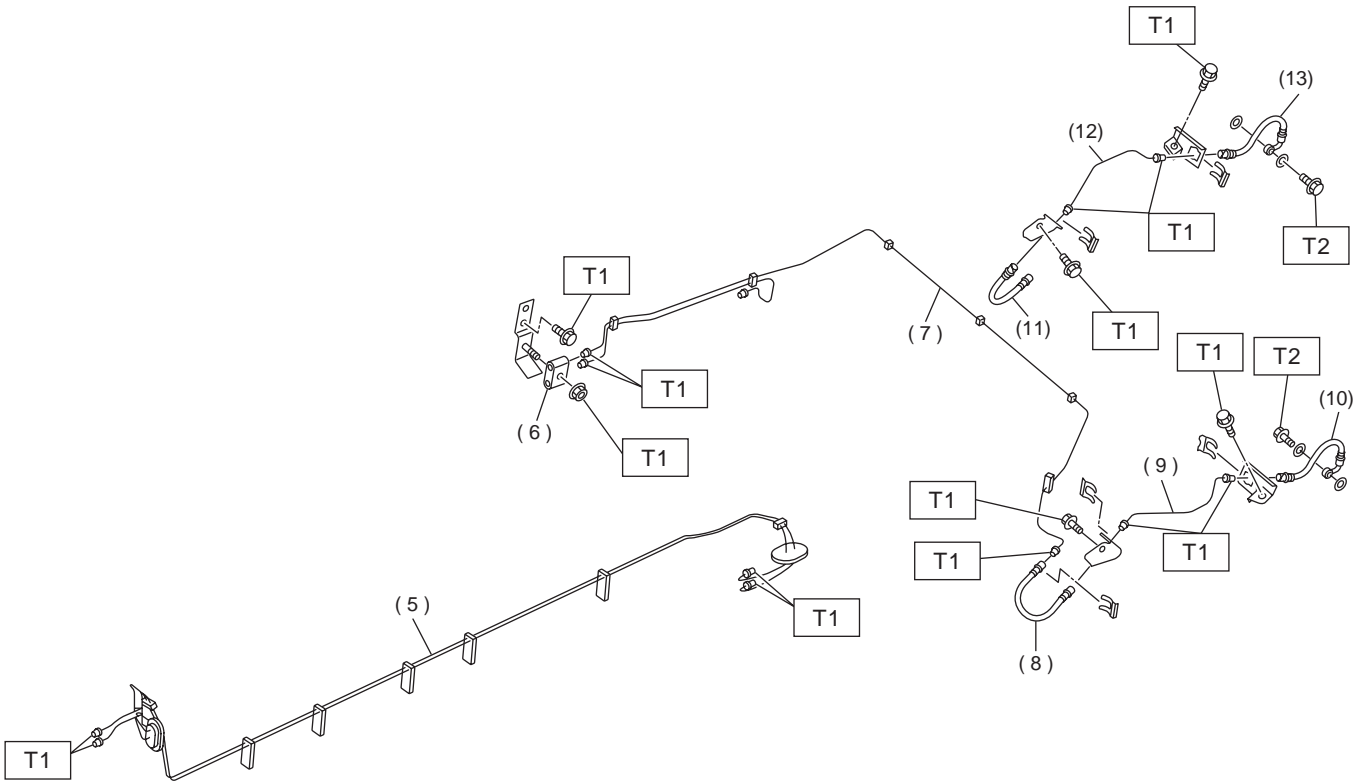
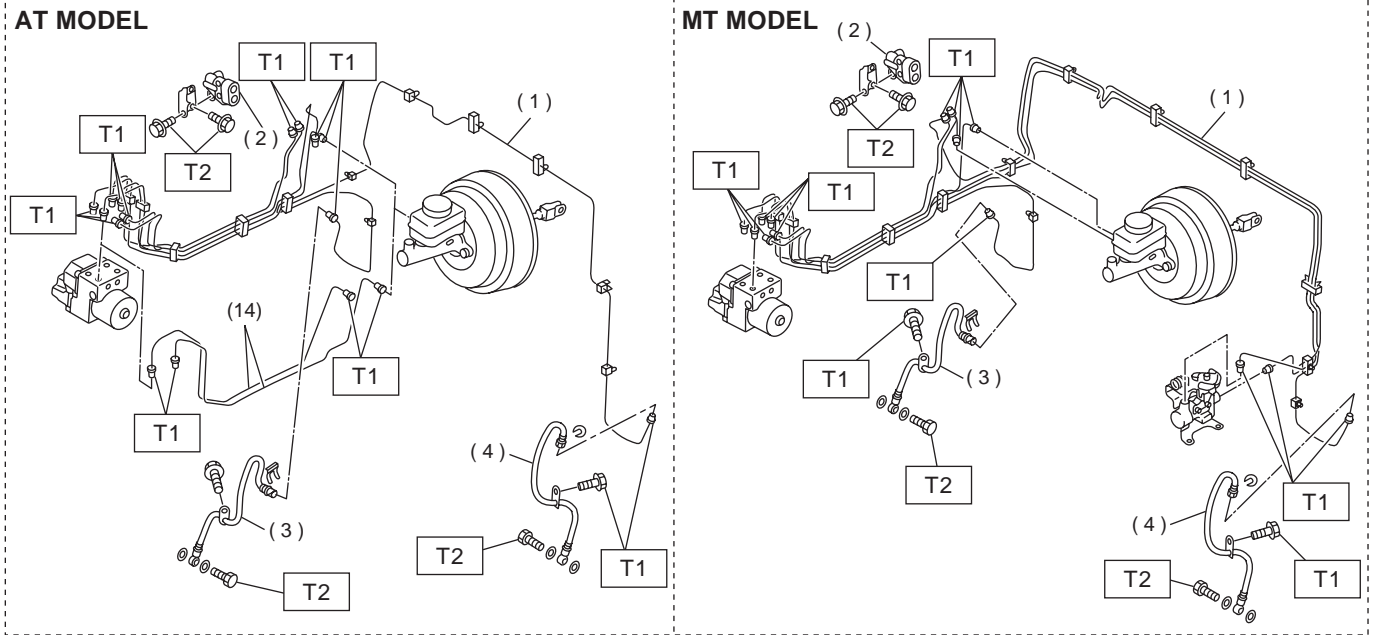
T1: 15 (1.5, 10.8)

T2: 18 (1.8, 13.0)

GENERAL DESCRIPTION

BRAKE

• RHD model



BR-00210

GENERAL DESCRIPTION

BRAKE

- | | |
|--------------------------------|------------------------------|
| (1) Front brake pipe assembly | (8) Rear brake hose LH |
| (2) Proportioning valve | (9) Rear brake pipe LH |
| (3) Front brake hose RH | (10) Rear brake hose rear LH |
| (4) Front brake hose LH | (11) Rear brake hose RH |
| (5) Center brake pipe assembly | (12) Rear brake pipe RH |
| (6) Two-way connector | (13) Rear brake hose rear RH |
| (7) Rear brake pipe assembly | (14) Adapter pipe (With VDC) |

Tightening torque: N·m (kgf-m, ft-lb)

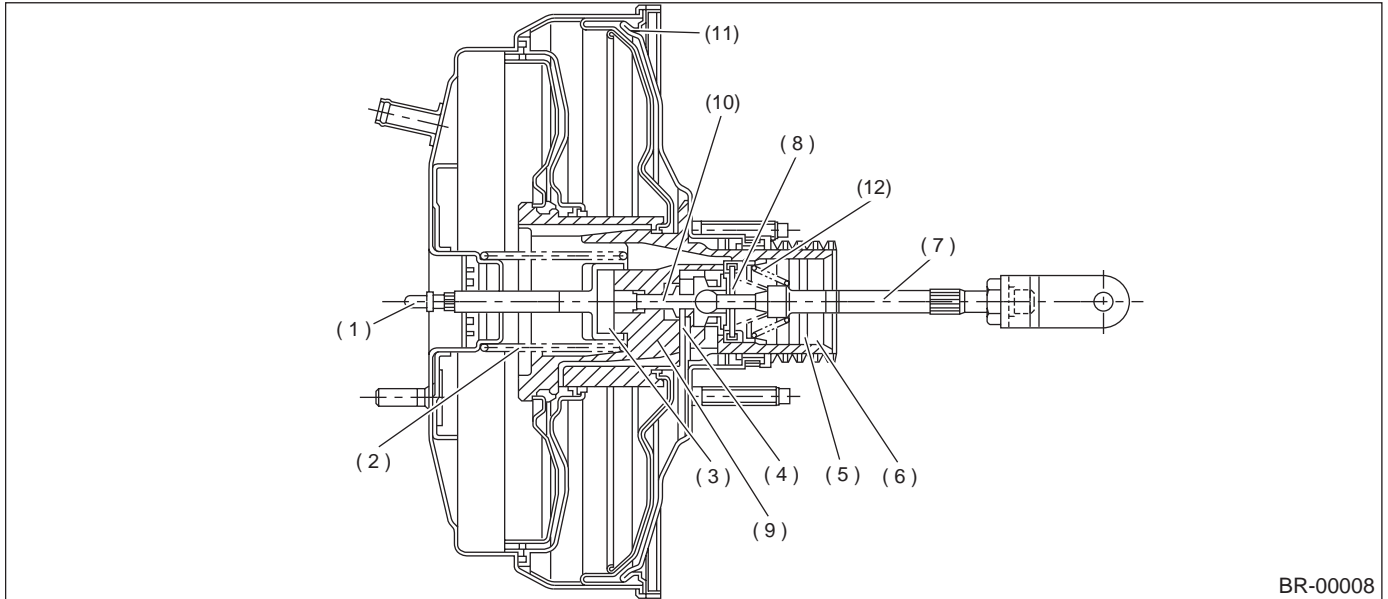
T1: 15 (1.5, 10.8)

T2: 18 (1.8, 13.0)

GENERAL DESCRIPTION

BRAKE

6. BRAKE BOOSTER

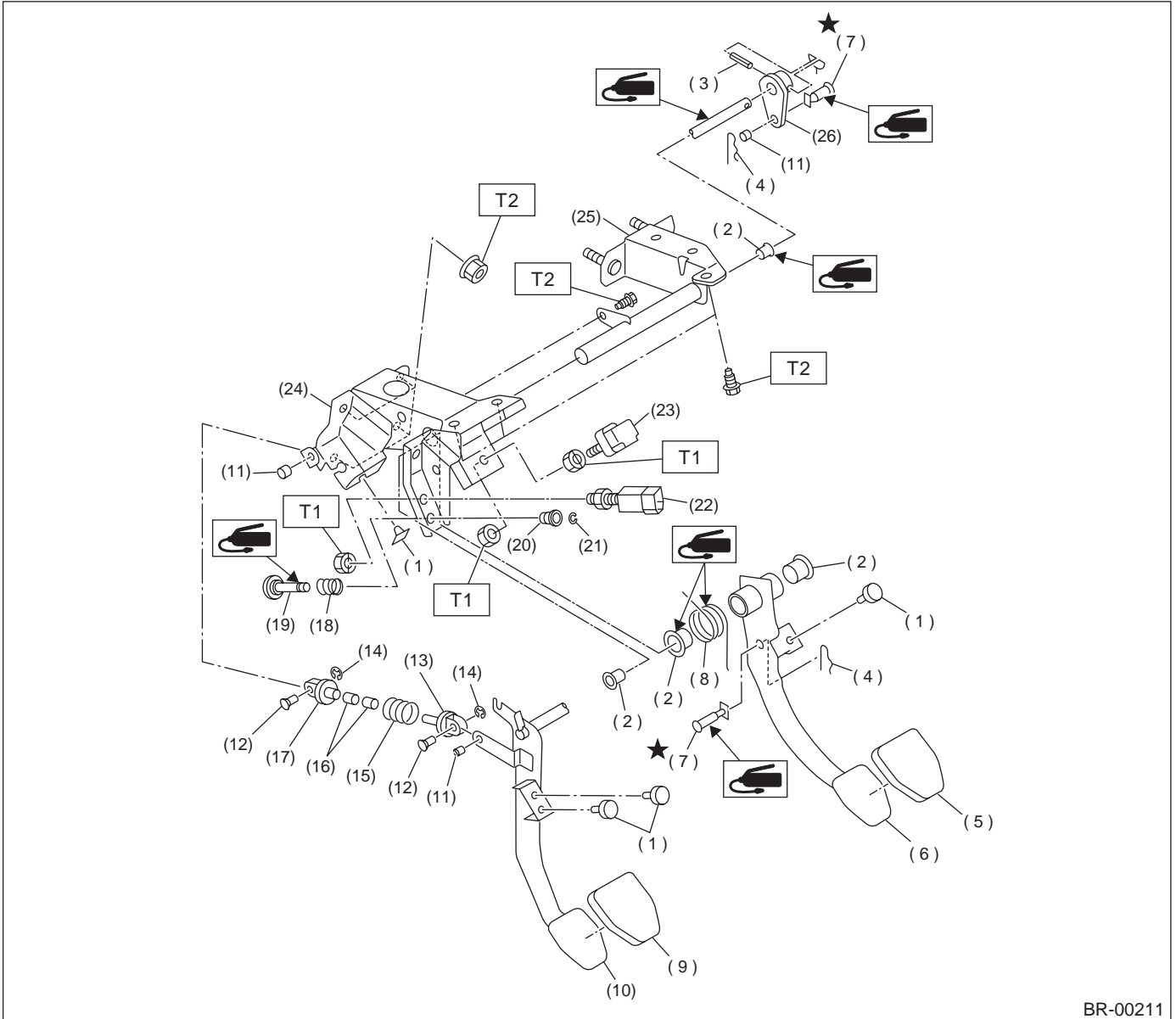


BR-00008

- | | | |
|-------------------|-------------------|--------------------------|
| (1) Push rod | (5) Filter | (9) Valve body |
| (2) Return spring | (6) Silencer | (10) Plunger valve |
| (3) Reaction disc | (7) Operating rod | (11) Diaphragm plate |
| (4) Key | (8) Poppet valve | (12) Valve return spring |

7. BRAKE PEDAL FOR MT MODEL

• LHD model



BR-00211

- | | | |
|------------------------|--|-------------------------------------|
| (1) Stopper | (12) Clutch clevis pin | (23) Stop light switch |
| (2) Bushing | (13) Assist rod A | (24) Pedal bracket |
| (3) Spring pin | (14) Clip | (25) Clutch master cylinder bracket |
| (4) Snap pin | (15) Assist spring | (26) Lever |
| (5) Brake pedal pad | (16) Assist bushing | |
| (6) Brake pedal | (17) Assist rod B | |
| (7) Clevis pin | (18) Spring S | |
| (8) Brake pedal spring | (19) Rod S | |
| (9) Clutch pedal pad | (20) Bushing S | |
| (10) Clutch pedal | (21) Clip | |
| (11) Bushing C | (22) Clutch switch (With cruise control) | |

Tightening torque: N-m (kgf-m, ft-lb)

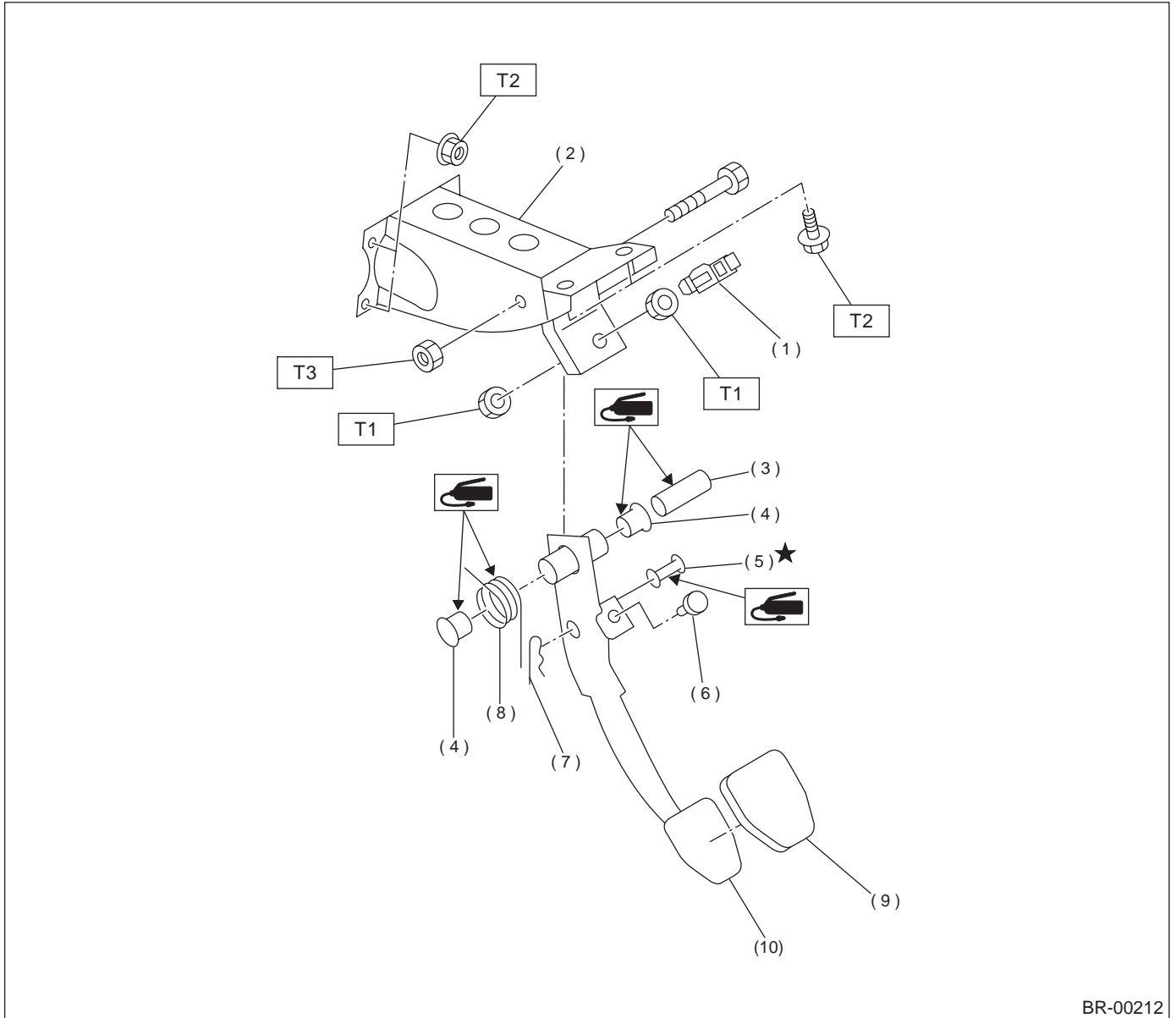
T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

GENERAL DESCRIPTION

BRAKE

• RHD model



BR-00212

- | | |
|-----------------------|------------------------|
| (1) Stop light switch | (6) Stopper |
| (2) Pedal bracket | (7) Snap pin |
| (3) Spacer | (8) Brake pedal spring |
| (4) Bushing | (9) Brake pedal pad |
| (5) Clevis pin | (10) Brake pedal |

Tightening torque: N-m (kgf-m, ft-lb)

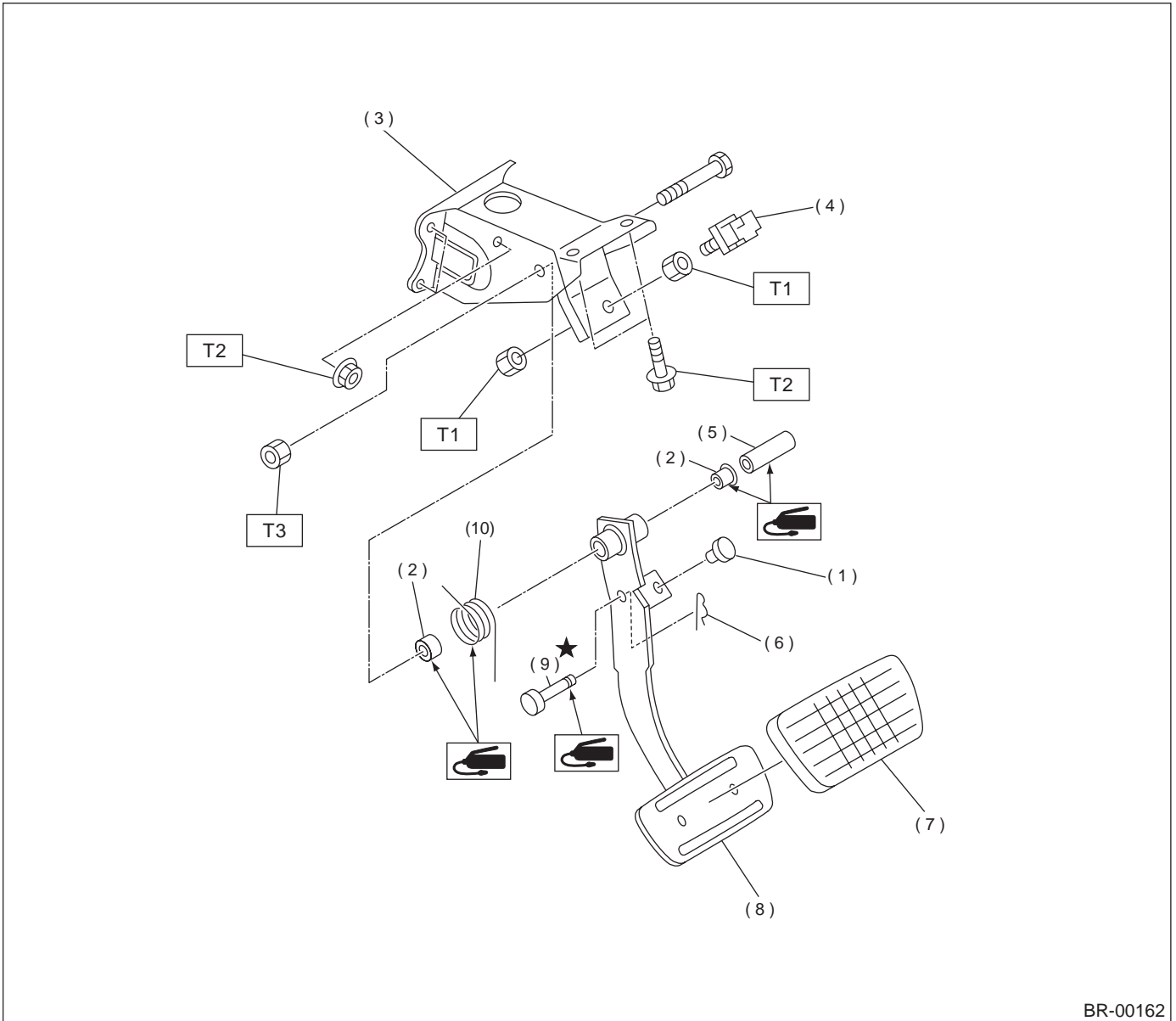
T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 29 (3.0, 21.7)

8. BRAKE PEDAL FOR AT MODEL

• LHD model



BR-00162

- | | |
|-----------------------|-------------------------|
| (1) Stopper | (7) Brake pedal pad |
| (2) Bushing | (8) Brake pedal |
| (3) Pedal bracket | (9) Clevis pin |
| (4) Stop light switch | (10) Brake pedal spring |
| (5) Spacer | |
| (6) Snap pin | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

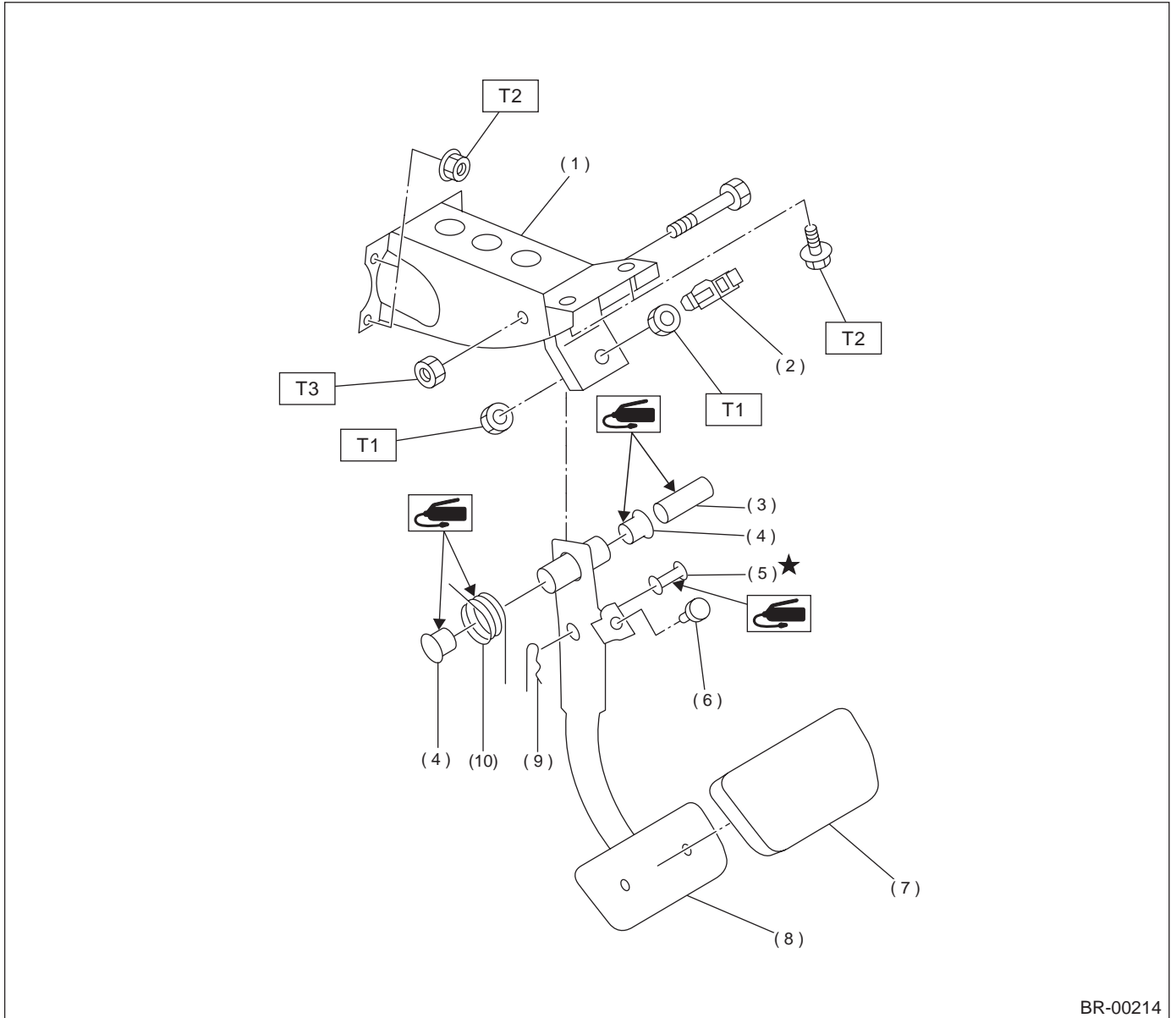
T2: 18 (1.8, 13.0)

T3: 30 (3.1, 22.4)

GENERAL DESCRIPTION

BRAKE

• RHD model



BR-00214

- | | |
|-----------------------|-------------------------|
| (1) Pedal bracket | (7) Brake pedal pad |
| (2) Stop light switch | (8) Brake pedal |
| (3) Spacer | (9) Snap pin |
| (4) Bushing | (10) Brake pedal spring |
| (5) Clevis pin | |
| (6) Stopper | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 30 (3.1, 22.4)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolving surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Do not put fluid on body. If the body is tainted, wash away with water.

D: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Snap Ring Pliers	Used for removing and installing snap ring.

FRONT BRAKE PAD

BRAKE

2. Front Brake Pad

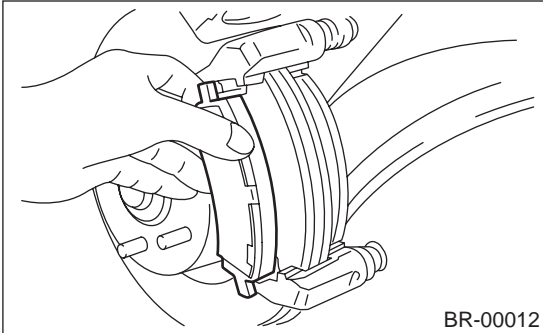
A: REMOVAL

- 1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
- 2) Remove bottom bolt.
- 3) Raise caliper body and suspend it securely.

NOTE:

Do not disconnect brake hose from caliper body.

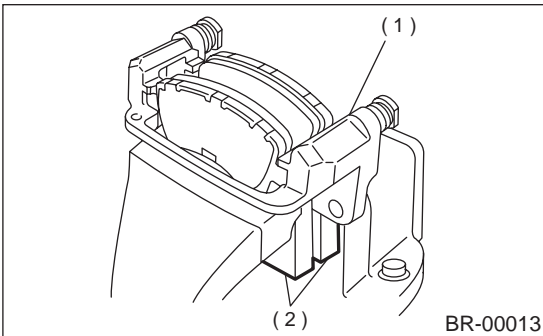
- 4) Remove pad.



NOTE:

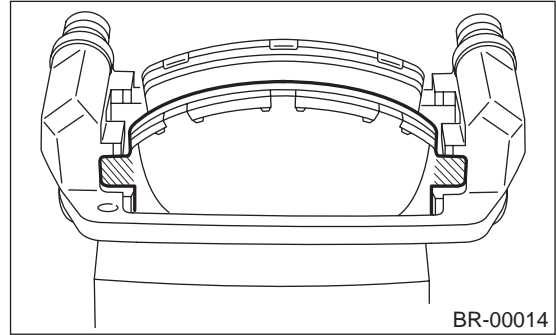
If brake pad is difficult to remove, proceed as follows:

- (1) Remove caliper body and fasten it provisionally to coil spring.
- (2) Remove support.
- (3) Fix a support in a vise between wooden blocks.



- (1) Support
- (2) Wooden blocks

- (4) Place a rod of less than 12 mm (0.47 in) dia. on the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.



B: INSTALLATION

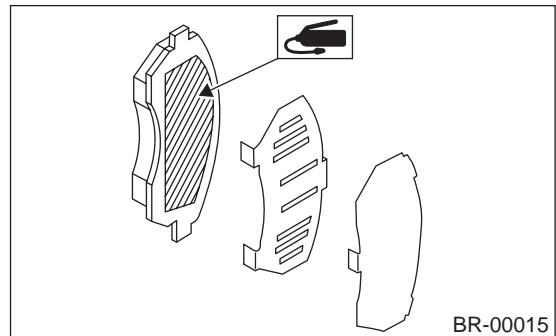
- 1) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.
 - 2) Apply thin coat of Molykote AS880N (Part No. 26298AC000) between pad and pad inner shim.
- [Option code KO, K1, K4, KA (Except B4 MT), only KS]

NOTE:

Refer to ID section for the option code. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

CAUTION:

Do not allow oil or grease to adhere to the sliding surface of pad and disc rotor.



- 3) Check disc rotor thickness and runout. <Ref. to BR-22, INSPECTION, Front Disc Rotor.>
- 4) Install pads on support.
- 5) Install caliper body on support.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

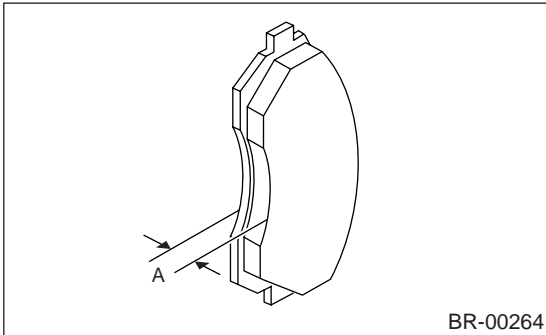
NOTE:

If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.

- 6) Depress brake pedal several times.
- 7) Check that brake fluid level is at max. line.

C: INSPECTION

Check pad thickness A.



Pad thickness (including back metal)	Standard value	17 mm (0.67 in)
	Wear limit	7.5 mm (0.295 in)

CAUTION:

- Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace pad if there is oil or grease on it.

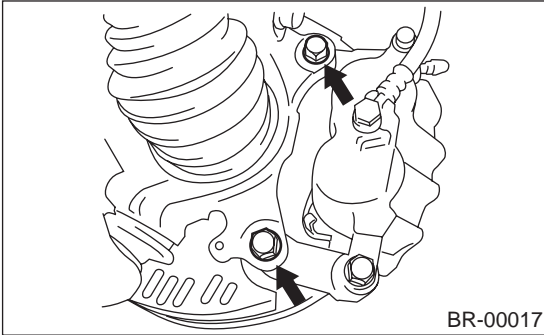
FRONT DISC ROTOR

BRAKE

3. Front Disc Rotor

A: REMOVAL

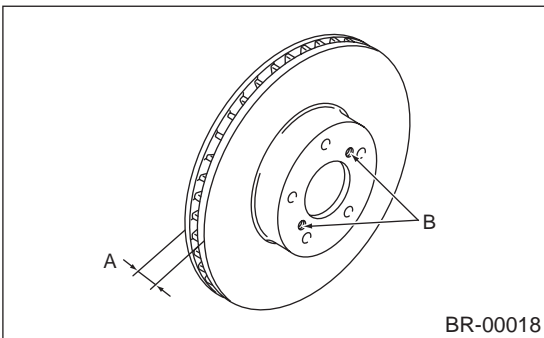
- 1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
- 2) Remove caliper body from housing, and suspend it from strut using a wire.



- 3) Remove the disc rotor.

NOTE:

If disc rotor seizes up within the hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.



- 4) Clean mud and foreign particles from caliper body assembly and support.

B: INSTALLATION

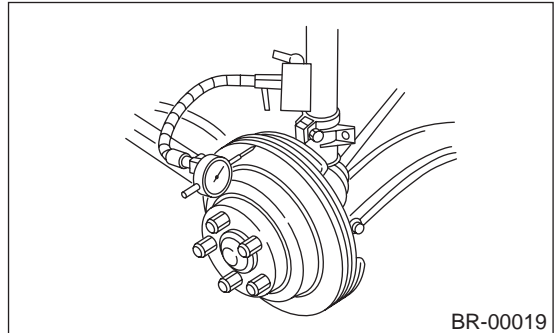
- 1) Install the disc rotor.
- 2) Install the caliper body to housing.

Tightening torque:

78 N·m (8 kgf·m, 58 ft·lb)

C: INSPECTION

- 1) Secure disc rotor by tightening the five wheel nuts.
- 2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.



NOTE:

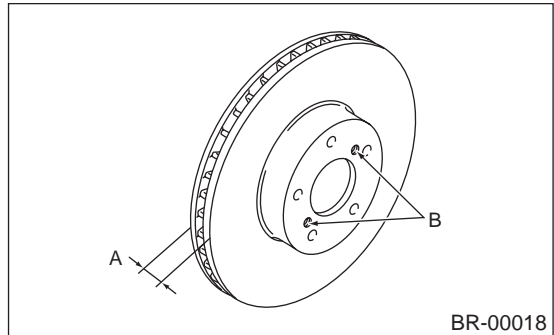
- Make sure that dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.
- If disc rotor runout is above standard value, inspect play of hub bearing axial direction and runout of axle hub.
<Ref. to DS-22, INSPECTION, Front Axle.>
If bearing and hub are normal, replace disc rotor.

Disc rotor runout limit:

0.075 mm (0.0030 in)

- 3) Measure disc rotor thickness.

If thickness of disc rotor is outside the standard value, replace disc rotor.



NOTE:

Make sure that micrometer is set 5 mm (0.20 in) inward of rotor outer perimeter.

		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	15"	24.0 mm (0.945 in)	22.0 mm (0.866 in)	277 mm (10.91 in)
	16"	24.0 mm (0.945 in)	22.0 mm (0.866 in)	294 mm (11.57 in)

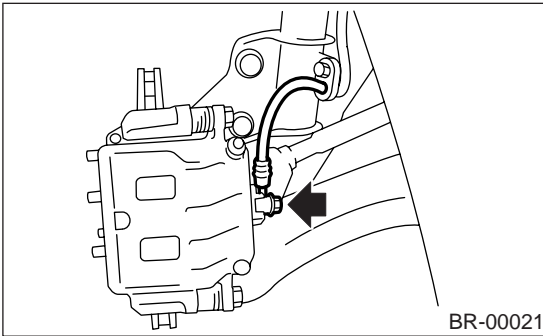
4. Front Disc Brake Assembly

A: REMOVAL

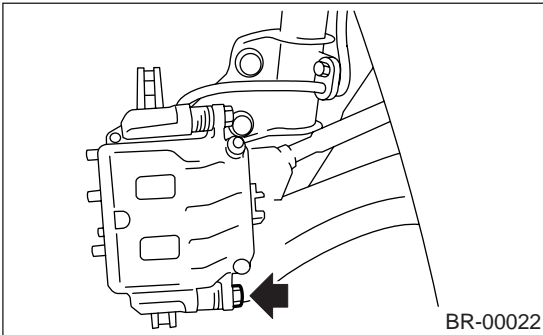
- 1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
- 2) Remove union bolt and disconnect brake hose from caliper body assembly.

CAUTION:

Do not spill brake fluid on painted surface. Wash it off immediately.



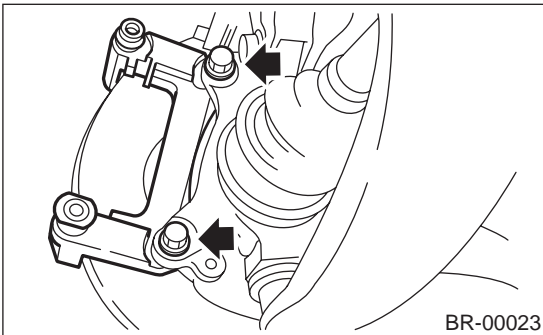
- 3) Remove bolt securing lock pin to caliper body.



- 4) Raise caliper body and move it toward vehicle center to separate it from support.
- 5) Remove support from housing.

NOTE:

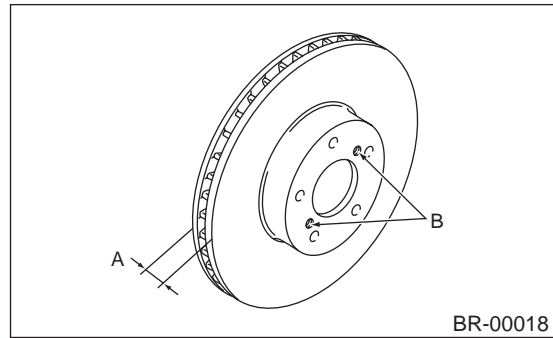
Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.



- 6) Remove disc rotor from hub.

NOTE:

If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.



- 7) Clean mud and foreign particles from caliper body assembly and support.

B: INSTALLATION

- 1) Install disc rotor on hub.
- 2) Install support on housing.

Tightening torque:

78 N·m (8 kgf·m, 58 ft·lb)

CAUTION:

- Replace pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- When replacing the pads, replace pads of the right and left wheels at the same time.

- 3) Install pads on support. <Ref. to BR-20, INSTALLATION, Front Brake Pad.>
- 4) Install caliper body on support.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

- 5) Connect brake hose.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

CAUTION:

Replace brake hose gaskets with new ones.

- 6) Bleed air from brake system. <Ref. to BR-42, PROCEDURE, Air Bleeding.>

FRONT DISC BRAKE ASSEMBLY

BRAKE

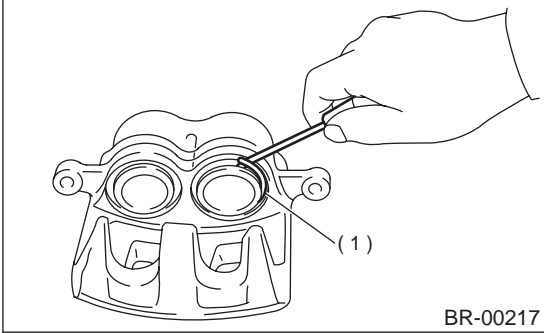
C: DISASSEMBLY

1) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:

Be careful not to allow foreign particles to enter inlet (at brake hose connector).

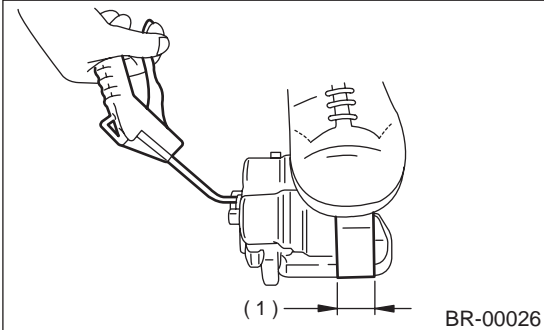
2) Using a standard screwdriver, remove boot ring from piston.



(1) Boot ring

3) Remove the boot from piston end.

4) Place a wooden block as shown in the figure to prevent damage to the piston. Gradually supply compressed air via inlet of the brake hose to force piston out.

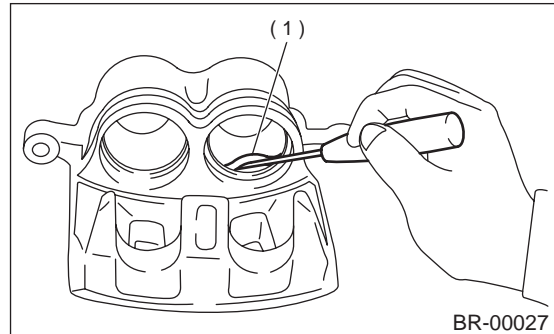


(1) Place a 30 mm (1.18 in) wide wooden block here.

5) Remove the piston seal from caliper body cylinder.

CAUTION:

Be careful not to scratch the inner surface of cylinder and piston seal groove.



(1) Piston seal

6) Remove the lock pin boot and guide pin boot.

D: ASSEMBLY

1) Clean the caliper body interior using brake fluid.

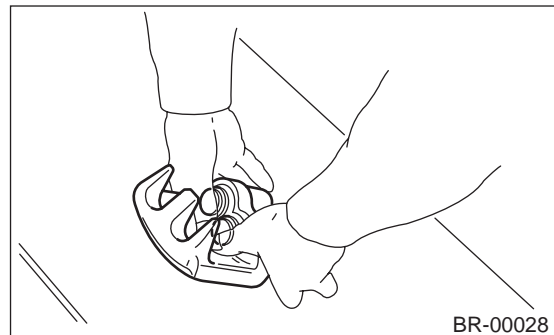
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.

3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.

4) Insert the piston into cylinder.

CAUTION:

Do not force the piston into cylinder.

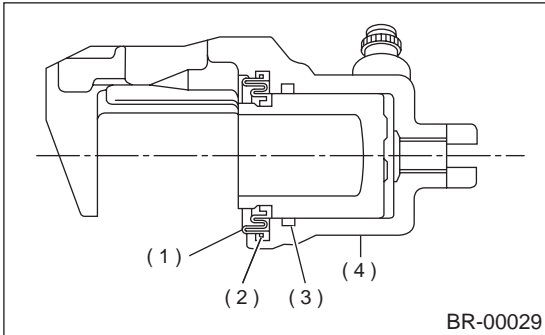


5) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and piston.

Grease:

NIGLUBE RX-2 (Part No. 003606000)

To facilitate installation, fit boot starting with piston end.

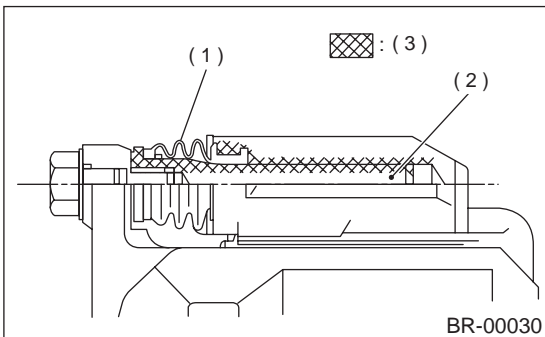


- (1) Piston boot
- (2) Boot ring
- (3) Piston seal
- (4) Caliper body

6) Position boot in grooves on cylinder and piston.
 7) Install boot ring. Be careful not scratch boot.
 8) Apply a coat of specified grease to the lock pin and guide pin, outer surface, cylinder inner surface, and boot grooves.

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)



- (1) Pin boot
- (2) Lock pin or guide pin
- (3) Apply grease.

9) Install the lock pin boot and guide pin boot on support.

E: INSPECTION

- 1) Repair or replace the faulty parts.
- 2) Check the caliper body and piston for uneven wear, damage or rust.
- 3) Check the rubber parts for damage or deterioration.

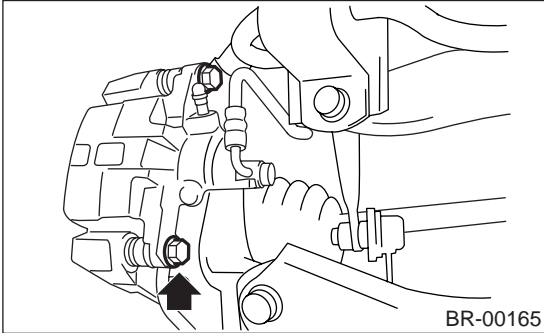
REAR BRAKE PAD

BRAKE

5. Rear Brake Pad

A: REMOVAL

- 1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
- 2) Remove bottom bolt.



- 3) Raise caliper body and suspend it securely.

NOTE:

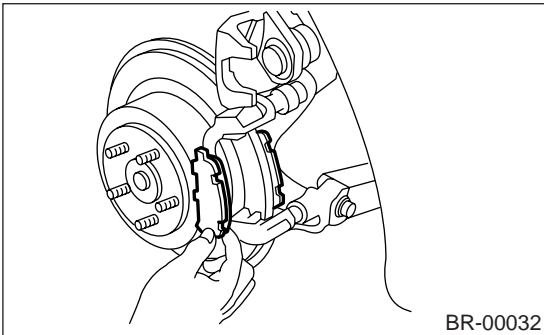
Do not disconnect brake hose from caliper body.

- 4) Remove pad from support.

NOTE:

If brake pad is difficult to remove, use the same procedure as for front disc brake pad.

<Ref. to BR-20, REMOVAL, Front Brake Pad.>



B: INSTALLATION

- 1) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.

CAUTION:

Do not allow oil or grease to adhere to the sliding surface of pad and disc rotor.

- 2) Check disc rotor thickness and runout.
<Ref. to BR-27, INSPECTION, Rear Disc Rotor.>
- 3) Install pad on support.
- 4) Install caliper body on support.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.

- 5) Depress brake pedal several times.

- 6) Check that brake fluid level is at max. line.

C: INSPECTION

Check pad thickness (including back metal).

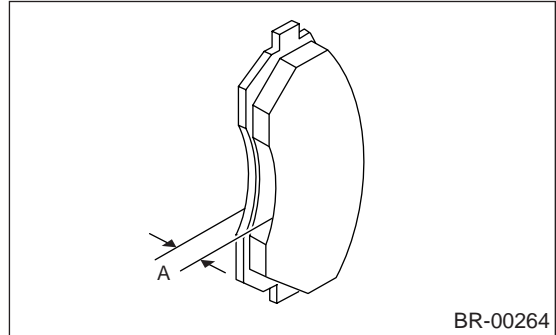
Pad thickness: A

Standard value

14.0 mm (0.551 in)

Wear limit

6.5 mm (0.256 in)



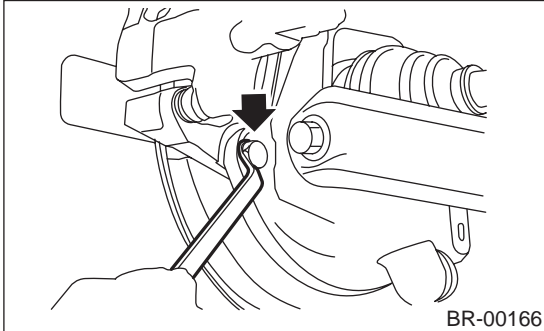
CAUTION:

- Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

- 1) Lift-up vehicle and remove wheels.
- 2) Remove the two mounting bolts and remove the disc brake assembly.

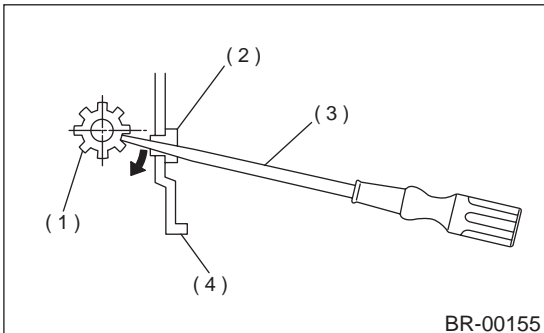


- 3) Suspend the disc brake assembly so that the hose is not stretched.
- 4) Pull down and release parking brake.
- 5) Remove the disc rotor.

NOTE:

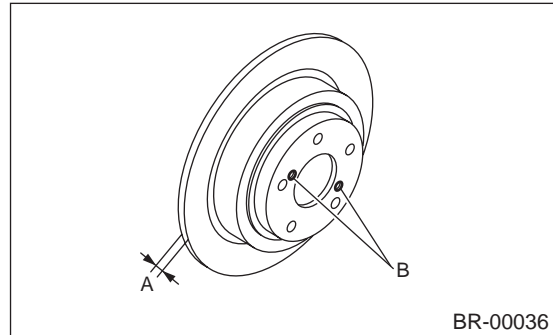
If the disc rotor is difficult to remove try the following two methods in order.

- (1) Turn adjusting screw using a slot-type screwdriver until brake shoe gets away enough from the disc rotor.



- (1) Adjusting screw
- (2) Cover
- (3) Slot-type screwdriver
- (4) Back plate

- (2) If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.



B: INSTALLATION

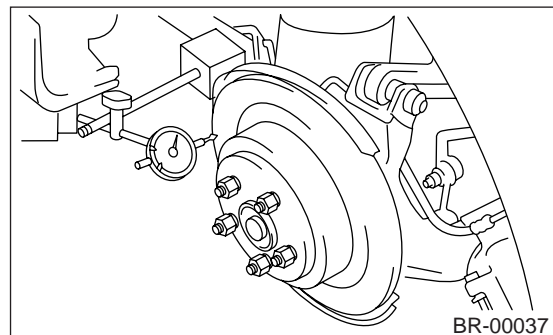
- 1) Install in the reverse order of removal.
- 2) Adjust parking brake. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly.>

C: INSPECTION

- 1) Secure disc rotor by tightening the five wheel nuts.
- 2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.

CAUTION:

Securely fix disc rotor to hub.



NOTE:

- Make sure that dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.
- If disc rotor runout is above standard value, inspect play of hub bearing axial direction and runout of axle hub. <Ref. to DS-27, INSPECTION, Hub Unit Bearing.>

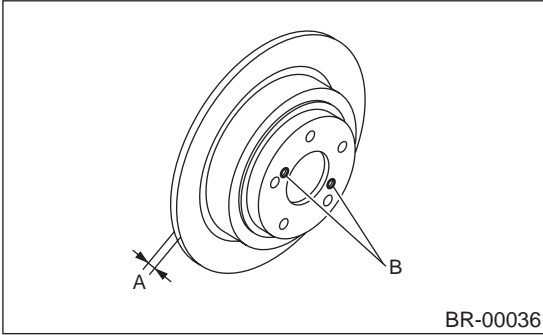
Disc rotor runout limit:

0.075 mm (0.0030 in)

REAR DISC ROTOR

BRAKE

3) Measure disc rotor thickness.



NOTE:

Make sure that micrometer is set 5 mm (0.20 in) inward of rotor outer perimeter.

Disc rotor thickness: A

Standard value

10 mm (0.39 in)

Service limit

8.5 mm (0.335 in)

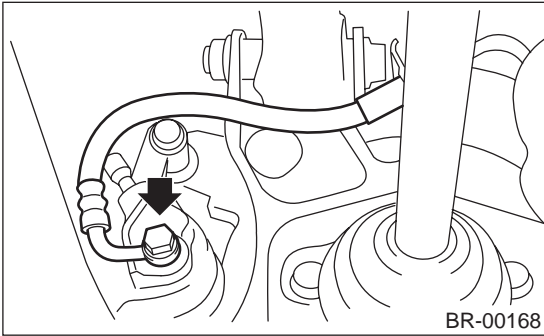
7. Rear Disc Brake Assembly

A: REMOVAL

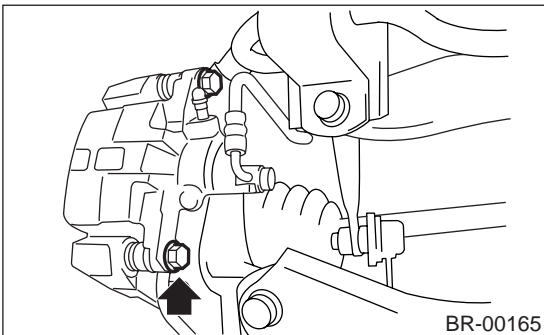
- 1) Lift-up vehicle and remove wheels.
- 2) Disconnect brake hose from caliper body assembly.

CAUTION:

Do not spill brake fluid on painted surface. Wash it off immediately.



- 3) Remove bolt securing lock pin to caliper body.



- 4) Raise caliper body and move it toward vehicle center to separate it from support.
- 5) Remove support from back plate.

NOTE:

Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.

- 6) Clean mud and foreign particles from caliper body assembly and support.

CAUTION:

Be careful not to allow foreign particles to enter inlet (at brake hose connector).

B: INSTALLATION

- 1) Install disc rotor on hub.
- 2) Install support on back plate.

Tightening torque:

78 N·m (8.0 kgf·m, 58 ft·lb)

CAUTION:

- Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace pads if there is oil or grease on them.

CAUTION:

Do not allow oil or grease to adhere to the sliding surface of pad and disc rotor.

- 3) Install pads on support. <Ref. to BR-26, INSTALLATION, Rear Brake Pad.>
- 4) Install caliper body on support.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

- 5) Connect brake hose.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

CAUTION:

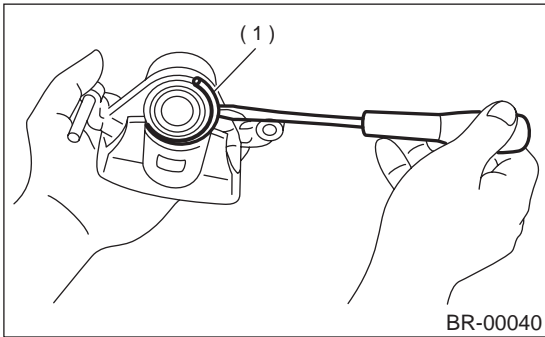
- The brake hose must be connected without any twist.
 - Replace brake hose gaskets with new ones.
- 6) Bleed air from brake system. <Ref. to BR-42, PROCEDURE, Air Bleeding.>

REAR DISC BRAKE ASSEMBLY

BRAKE

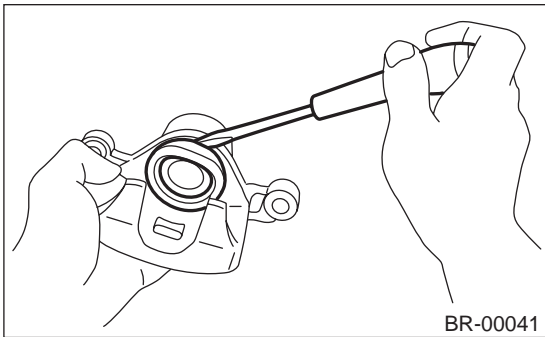
C: DISASSEMBLY

1) Remove the boot ring.



(1) Boot ring

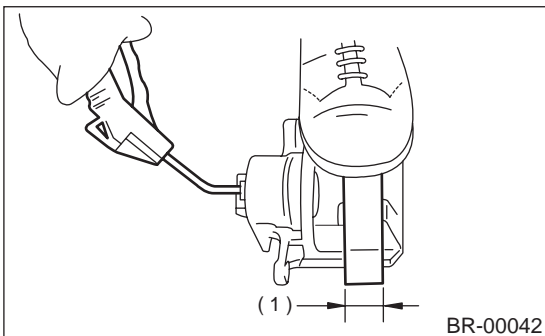
2) Remove the piston boot.



3) Gradually supply compressed air via inlet of caliper body to force piston out.

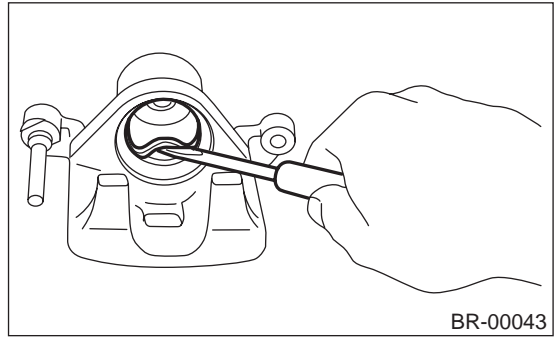
CAUTION:

- Place a wooden block as shown in Figure to prevent damage to piston.
- Do not apply excessively high-pressure.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove piston seal from caliper body cylinder.



5) Remove lock pin sleeve and boot from caliper body.

6) Remove guide pin boot.

D: ASSEMBLY

1) Clean caliper body interior using brake fluid.

2) Apply a coat of brake fluid to piston seal and fit piston seal in groove on caliper body.

3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.

4) Insert piston into cylinder.

CAUTION:

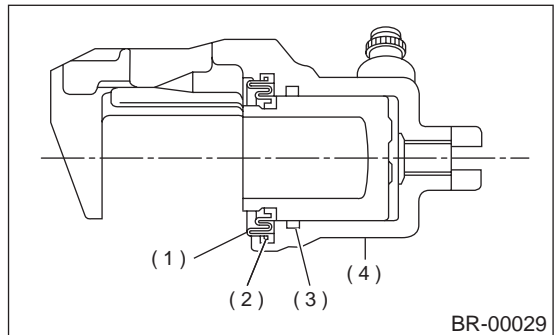
Do not force piston into cylinder.

5) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and piston.

Grease:

NIGLUBE RX-2 (Part No. 003606000)

6) Install the piston boot to the caliper body, and attach boot ring.

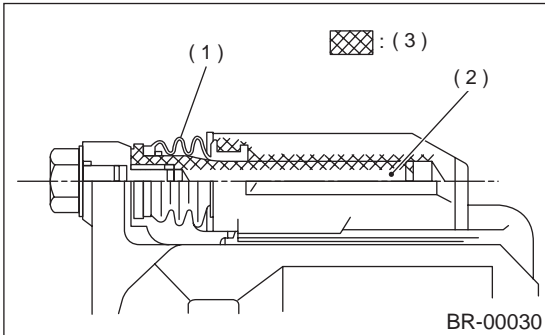


- (1) Piston boot
- (2) Boot ring
- (3) Piston seal
- (4) Caliper body

7) Apply a coat of specified grease to guide pin, outer surface, sleeve outer surface, cylinder inner surface, and boot grooves.

Grease:

NIGLUBE RX-2 (Part No. 003606000)



- (1) Pin boot
- (2) Lock pin or guide pin
- (3) Apply grease.

8) Install guide pin boot on caliper body.
9) Install lock pin boot on caliper body and insert lock pin sleeve into place.

E: INSPECTION

- 1) Repair or replace faulty parts.
- 2) Check caliper body and piston for uneven wear, damage or rust.
- 3) Check rubber parts for damage or deterioration.

MASTER CYLINDER

BRAKE

8. Master Cylinder

A: REMOVAL

- 1) Thoroughly drain brake fluid from reservoir tank.
- 2) Disconnect fluid level indicator harness connector.
- 3) Remove brake pipes from master cylinder.
- 4) Remove master cylinder mounting nuts, and take out master cylinder from brake booster.

CAUTION:

Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wash it off quickly if spilt.

B: INSTALLATION

- 1) To install the master cylinder to the body, reverse the sequence of removal procedure.

Tightening torque:

Master cylinder mounting nut

14 N·m (1.4 kgf-m, 10.1 ft-lb)

Piping flare nut

15 N·m (1.5 kgf-m, 10.8 ft-lb)

- 2) Bleed air from the brake system. <Ref. to BR-42, PROCEDURE, Air Bleeding.>

CAUTION:

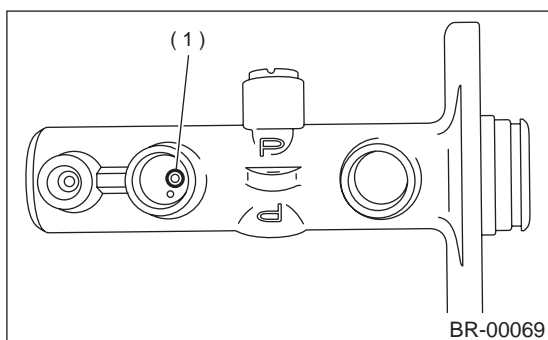
Be sure to use recommended brake fluid.

C: DISASSEMBLY

CAUTION:

- Remove mud and dirt from the surface of brake master cylinder.
- Prepare tools necessary for disassembly operation, and arrange them neatly on work bench.
- Clean work bench.

- 1) Remove pin with drift pin which secures reserve tank to master cylinder.
- 2) Remove cylinder pin with magnetic pick-up tool while pushing in primary piston.

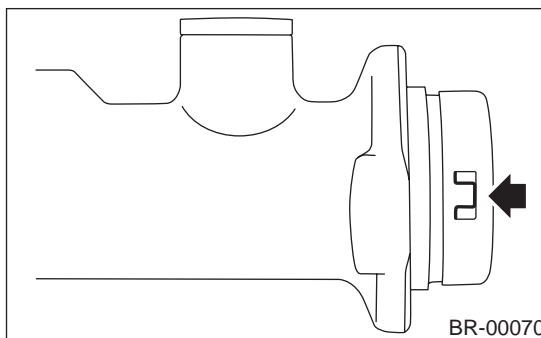


(1) Cylinder pin

- 3) Pry up the pawl and remove the piston retainer. (Without VDC)

NOTE:

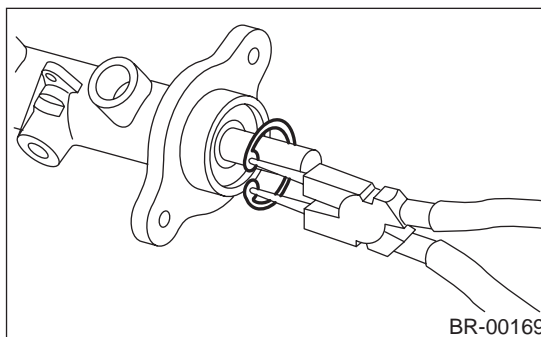
Piston may jump out from master cylinder.



- 4) Using pliers, remove C-ring. (With VDC)

NOTE:

Piston may jump out from master cylinder.



- 5) Extract primary piston assembly and secondary piston assembly.

CAUTION:

- Do not disassemble the piston assembly; otherwise, the spring set value may be changed.
- Use brake fluid to wash inside wall of cylinder, pistons and piston cups. Be careful not to damage parts when washing.

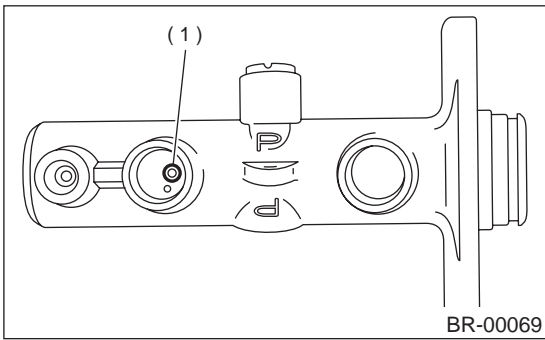
D: ASSEMBLY

CAUTION:

- When assembling, be sure to use recommended brake fluid.
- Ensure that the inside wall of cylinder, pistons, and piston cups are free from dirt when assembling.
- Be extremely careful not to damage, scratch, or dent cylinder inside wall, pistons, and piston cups.
- Do not drop parts. Never attempt to use any part that has been dropped accidentally.

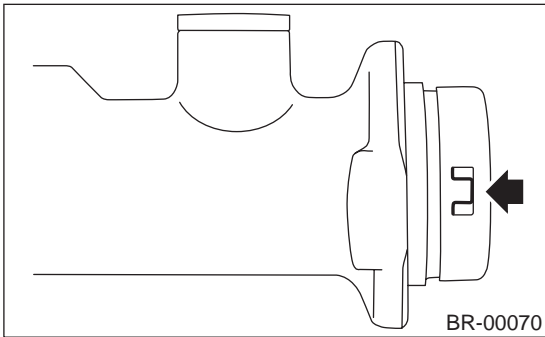
- 1) Apply recommended brake fluid to inside wall of cylinder, and to outer surface of piston assembly, and install piston assemblies carefully into cylinder.

2) Install cylinder pin while pushing in primary piston.



(1) Cylinder pin

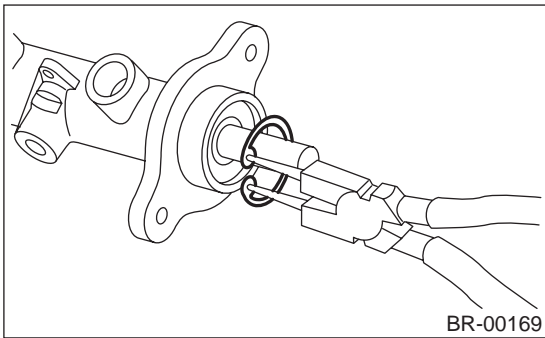
3) Press the pawl and install the piston retainer into the master cylinder. (Without VDC)



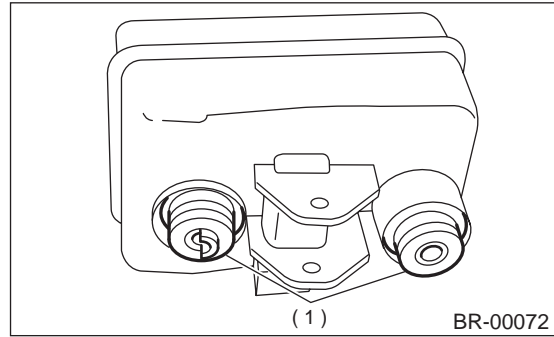
4) Using pliers, install C-ring in its groove. (With VDC)

CAUTION:

Make sure to install it firmly to groove.



5) Install seal to reservoir tank.



(1) Seal

6) Install pin with drift pins which secures reservoir tank to master cylinder.

E: INSPECTION

If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly, secondary piston assembly, supply valve stopper, or gasket, replace the faulty part.

CAUTION:

- The primary and secondary pistons must be replaced as complete assemblies.
- The service limit of the clearance between each piston and the master cylinder inner dia. is 0.11 mm (0.0043 in).
- When handling parts, be extremely careful not to damage or scratch the parts, or let any foreign matter get on them.

BRAKE BOOSTER

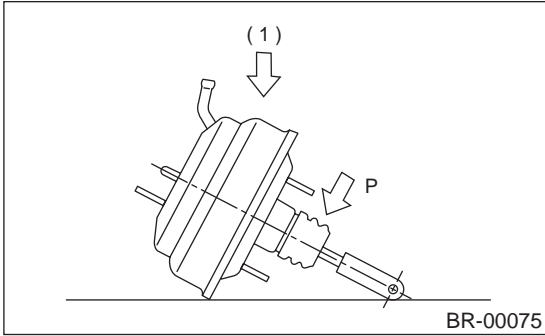
BRAKE

9. Brake Booster

A: REMOVAL

CAUTION:

If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by "P", may be damaged.



(1) Force

- 1) Pull up parking brake lever, and block tires.
- 2) Disconnect battery ground cable.
- 3) Remove or disconnect the following parts at engine compartment.
 - (1) Disconnect connector for brake fluid level indicator.
 - (2) Remove brake pipes from master cylinder.
 - (3) Remove master cylinder installing nuts.
 - (4) Disconnect vacuum hose from brake booster.
- 4) Remove the following parts from the pedal bracket.
 - (1) Snap pin and clevis pin
 - (2) Four brake booster installing nuts
- 5) Remove brake booster while shunning brake pipes.

NOTE:

- Be careful not to drop brake booster. Brake booster should be discarded if it has been dropped.
- Use special care when handling operating rod. If excessive force is applied to operating rod, sufficient to cause a change in the angle in excess of $\pm 3^\circ$, it may result in damage to the power piston cylinder.
- Use care when placing brake booster on the floor.
- Do not change the push rod length. If it has been changed, reset the projected length "L" to the standard length.

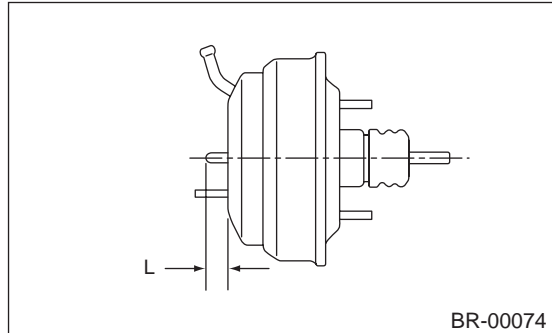
Standard:

Without VDC

L = 10 mm (0.39 in)

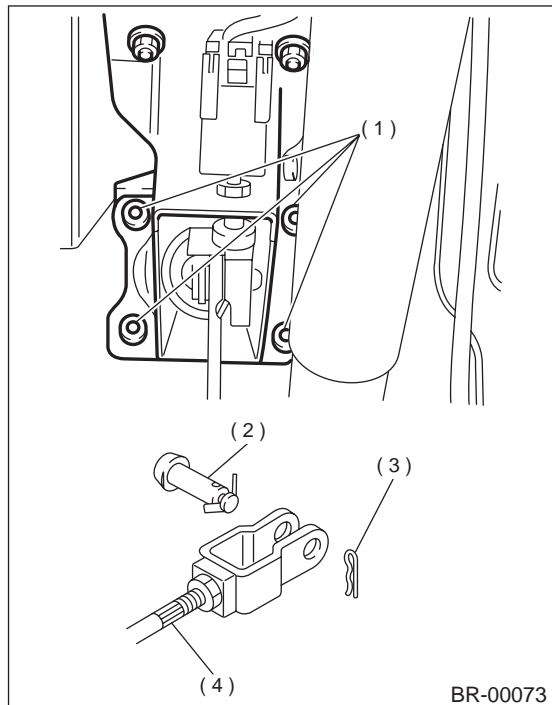
With VDC

L = 1.8 mm (0.071 in)



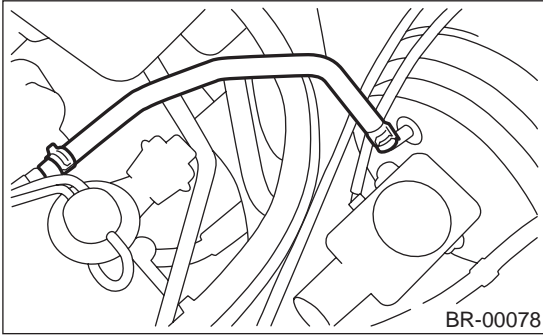
B: INSTALLATION

- 1) Mount brake booster in position.
- 2) Connect operating rod to brake pedal with clevis pin and snap pin.



- (1) Nuts
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod

3) Connect vacuum hose to brake booster.



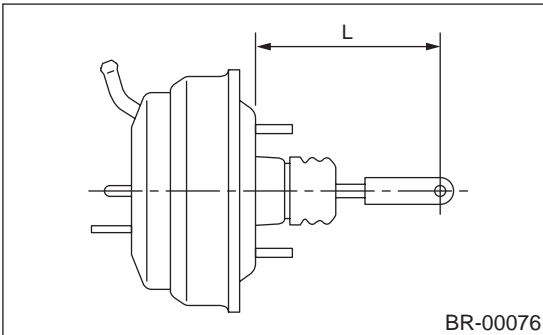
- 4) Mount master cylinder onto brake booster.
- 5) Connect brake pipes to master cylinder.
- 6) Connect electric connector for brake fluid level indicator.
- 7) Adjust operating rod of brake booster.

Standard: L

LHD: 144.6 mm (5.69 in)

RHD: 173.2 mm (6.82 in)

If it is not in specified value, adjust it by adjusting brake booster operating rod.



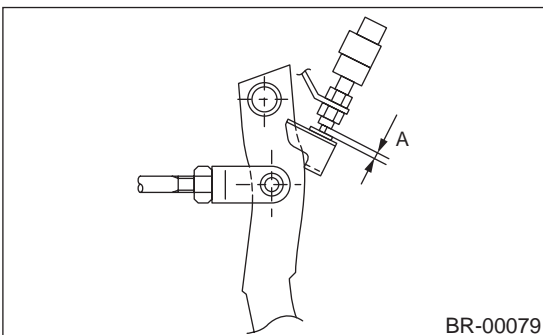
- 8) Measure the clearance between threaded end of stop light switch and stopper.
- If it is not in specified value, adjust it by adjusting position of stop light switch.

CAUTION:

Be careful not to rotate stop light switch.

Stop light switch clearance: A

0.3 mm (0.012 in)



- 9) Apply grease to operating rod connecting pin to prevent it from wearing.
- 10) Bleed air from brake system.

Tightening torque (Air bleeder screw):

8 N·m (0.8 kgf-m, 5.8 ft-lb)

- 11) Conduct road tests to ensure brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

CAUTION:

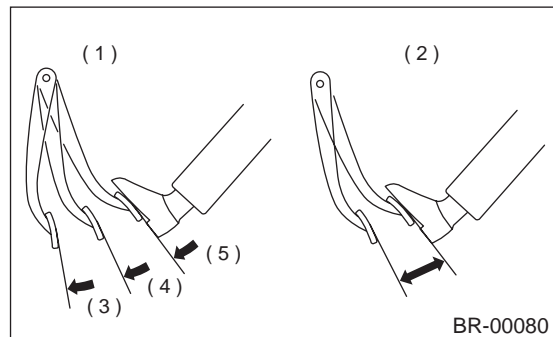
When checking operation, be sure to securely apply the hand brake.

• **Checking without gauges**

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of the failure if checking is conducted in accordance with the following procedures.

• **Air tightness check**

Start engine, and run it for 1 to 2 minutes, then turn it off. Depress brake pedal several times applying the same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on the 1st depression, and it should become smaller with each successive depression. If no change occurs in the pedal height while in a depressed state, brake booster is faulty.



- (1) OK
- (2) NOT OK
- (3) 1st
- (4) 2nd
- (5) 3rd

NOTE:

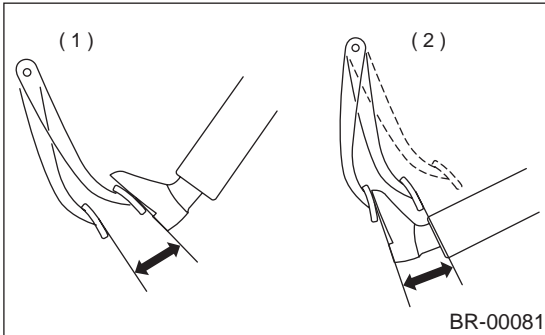
- In the event of defective operation, inspect the condition of the check valve and vacuum hose.
- Replace them if faulty and conduct the test again.
- If no improvement is observed, check precisely with gauges.

BRAKE BOOSTER

BRAKE

• Operation check

1) With engine off, depress brake pedal several times applying the same pedal force and make sure that the pedal height does not vary with each depression of the pedal.



- (1) When engine is stopped
- (2) When engine is started

2) With brake pedal depressed, start engine.
3) As engine starts, brake pedal should move slightly toward the floor. If no change occurs in the pedal height, brake booster is faulty.

NOTE:

If faulty, check precisely with gauges.

• Loaded air tightness check

Depress brake pedal while engine is running, and turn off engine while the pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, brake booster is functioning normally; if the pedal height increases, it is faulty.

NOTE:

If faulty, check precisely with gauges.

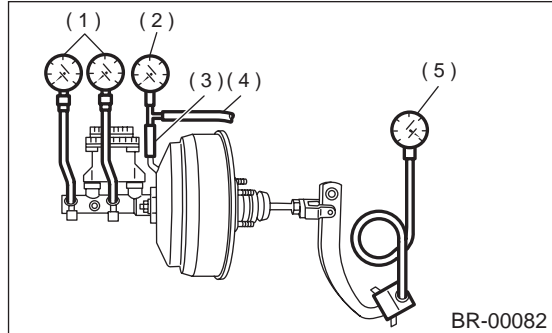
2. OPERATION CHECK (WITH GAUGES)

CAUTION:

When checking operation, be sure to securely apply the hand brake.

• Checking with gauges

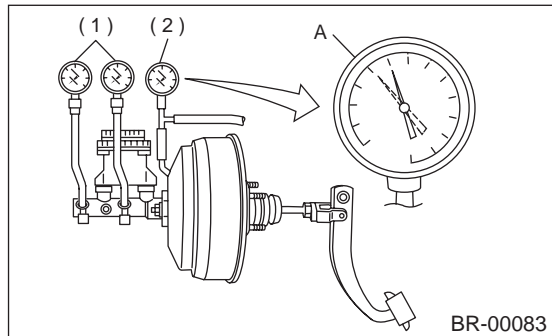
Connect gauges as shown in Figure. After bleeding air from pressure gauges, proceed to each check.



- (1) Pressure gauge
- (2) Vacuum gauge
- (3) Adapter hose
- (4) Vacuum hose
- (5) Pedal force gauge

• Air tightness check

1) Start engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress brake pedal.



- (1) Pressure gauge
- (2) Vacuum gauge

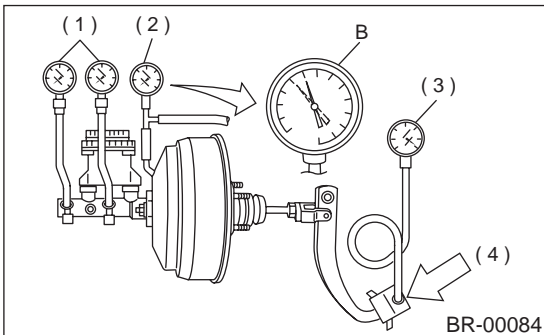
2) Stop engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 in-Hg) within 15 seconds after stopping engine, brake booster is functioning properly.

If defective, the cause may be one of those listed below.

- Check valve malfunction
- Leak from vacuum hose
- Leak from the shell jointed portion or stud bolt welded portion

- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion
- **Loaded air tightness check**

1) Start engine and depress brake pedal with pedal force of 196 N (20 kgf, 44 lb). Keep engine running until a vacuum of 66.7 kPa (500 mmHg, 19.69 in-Hg) = point B is indicated on vacuum gauge while the pedal is still depressed.



- (1) Pressure gauge
- (2) Vacuum gauge
- (3) Pedal force gauge
- (4) Depress

2) Stop engine and watch vacuum gauge.

If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.

If defective, refer to "AIR TIGHTNESS CHECK".

<Ref. to BR-35, INSPECTION, Brake Booster.>

BRAKE BOOSTER

BRAKE

• Lack of boosting action check

Turn off engine, and depress the brake pedal until the vacuum gauge reading indicates "0". Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Model	OUTBACK		Except OUTBACK
	RHD without VDC	RHD with VDC, LHD	
Brake pedal force	Fluid pressure		Fluid pressure
147 N (15 kgf, 33 lb)	686 kPa (7 kg/cm ² , 100 psi)	588 kPa (6 kg/cm ² , 85 psi)	588 kPa (6 kg/cm ² , 85 psi)
294 N (30 kgf, 66 lb)	1,863 kPa (19 kg/cm ² , 270 psi)	1,667 kPa (17 kg/cm ² , 242 psi)	1,667 kPa (17 kg/cm ² , 242 psi)

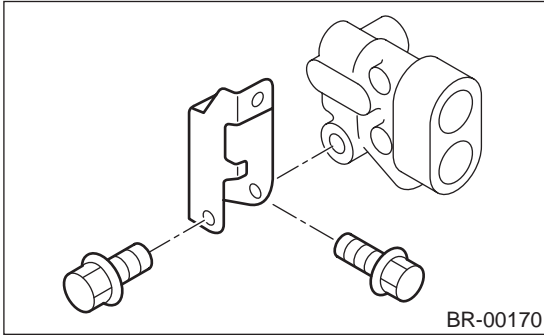
• Boosting action check

Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Model	OUTBACK		Except OUTBACK
	RHD without VDC	RHD with VDC, LHD	
Brake pedal force	Fluid pressure		Fluid pressure
147 N (15 kgf, 33 lb)	5,884 kPa (60 kg/cm ² , 853 psi)	5,688 kPa (58 kg/cm ² , 825 psi)	5,688 kPa (58 kg/cm ² , 825 psi)
294 N (30 kgf, 66 lb)	10,886 kPa (111 kg/cm ² , 1,578 psi)	9,702 kPa (98.96 kg/cm ² , 1,406.8 psi)	9,702 kPa (98.96 kg/cm ² , 1,406.8 psi)

10. Proportioning Valve

A: REMOVAL



- 1) Pull up parking brake lever, and block the tires.
- 2) Remove brake pipe from proportioning valve at four places.
- 3) Remove proportioning valve from its bracket.

CAUTION:

Do not disassemble or adjust the proportioning valve. (The proportioning valve must be replaced as an assembly.)

B: INSTALLATION

- 1) Install proportioning valve to bracket.
- 2) Connect brake pipes correctly to proportioning valve.
- 3) Bleed air, then check each joint of brake pipe for oil leaks.

Tightening torque:

Proportioning valve to brake pipe flare nut:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

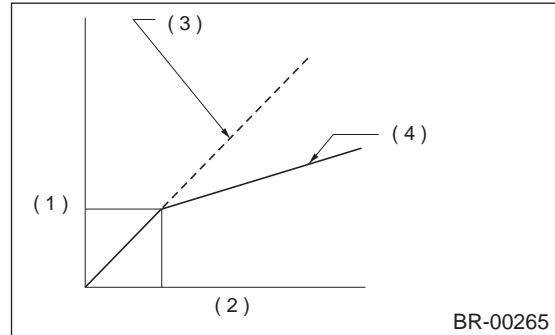
Proportioning valve to bracket:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: INSPECTION

- 1) Install oil pressure gauges to measure the master cylinder fluid pressure (front wheel brake fluid pressure) and rear wheel cylinder fluid pressure.
- 2) Bleed air from oil pressure gauges.
- 3) Check the master cylinder fluid pressure and rear wheel cylinder fluid pressure.

The standard values are shown in Figure.



- (1) Rear wheel cylinder fluid pressure: P3
- (2) Master cylinder fluid pressure: P2
- (3) In case of failure in one circuit
- (4) When both circuits are normal

- 4) For the oil pressure in case of split point, refer to "SPECIFICATIONS".

<Ref. to BR-2, SPECIFICATIONS, General Description.>

11. Brake Fluid

A: INSPECTION

1) Check that brake fluid level remains between "MIN" and "MAX". If out of the specified range, refill or drain fluid. If fluid level becomes close to "MIN", refill fluid.

2) Check fluid for discoloration. If fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

CAUTION:

- Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wash it off quickly if spilt.
- To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
- The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
- Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
- Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

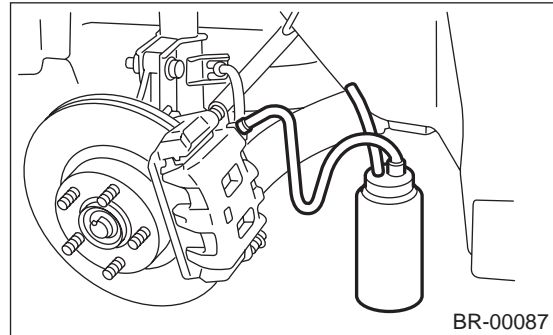
NOTE:

- During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - Brake pedal operation must be very slow.
 - For convenience and safety, two people should do the work.
 - The amount of brake fluid required is approximately 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.
- 1) Either jack-up vehicle and place a safety stand under it, or lift up vehicle.
 - 2) Remove both front and rear wheels.
 - 3) Draw out the brake fluid from master cylinder with syringe.
 - 4) Refill reservoir tank with recommended brake fluid.

Recommended brake fluid:

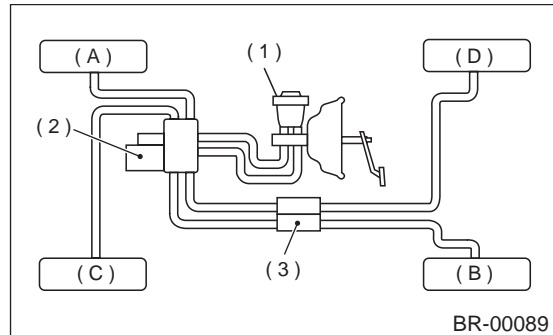
FMVSS No. 116, fresh DOT3 or 4 brake fluid

- 5) Install one end of a vinyl tube onto the air bleeder and insert the other end into a container to collect the brake fluid.



CAUTION:

Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



- (1) Master cylinder
- (2) Hydraulic unit
- (3) Proportioning valve

- 6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
- 7) Loosen bleeder screw approximately 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten screw.
- 8) Repeat steps 6) and 7) above until there are no air bubbles in drained brake fluid and new fluid flows through vinyl tube.

NOTE:

Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.

- 9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque (Bleeder screw):

8 N·m (0.8 kgf-m, 5.8 ft-lb)

- 10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 7) above.

11) Depress brake pedal with a force of approximately 294 N (30 kgf, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it shows any unusual movement.

Visually inspect bleeder screws and brake pipe joints to make sure that there is no fluid leakage.

12) Install wheels, and drive vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

12. Air Bleeding

A: PROCEDURE

CAUTION:

- The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
- Cover bleeder with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
- Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.
- Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wash it off quickly if spilt.

NOTE:

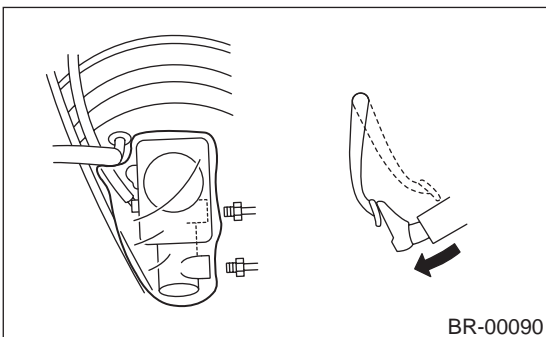
- Start with the brakes (wheels) connected to the secondary chamber of the master cylinder.
- The time interval between two brake pedal operations (from the time when the pedal is released to the time when it is depressed another time) should be approximately 3 seconds.
- The air bleeder on each brake should be released for 1 to 2 seconds.

1. MASTER CYLINDER

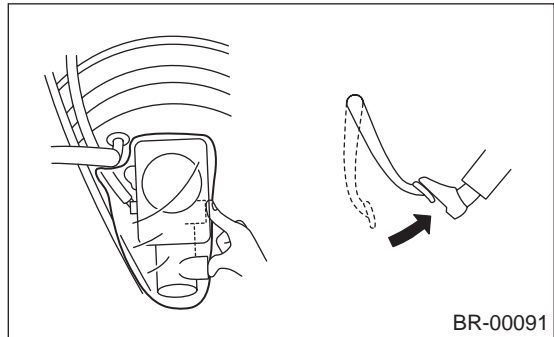
NOTE:

- If master cylinder is disassembled or reservoir tank is empty, bleed master cylinder.
- During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
- Brake pedal operation must be very slow.
- For convenience and safety, two people should do the work.

- 1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
- 2) Disconnect brake line at primary and secondary sides.
- 3) Put plastic bag cover on the master cylinder.
- 4) Carefully depress and hold brake pedal.



- 5) Close outlet plug with your finger, and release brake pedal.



- 6) Repeat above steps 4) and 5) until master cylinder is completely bled.
- 7) Install brake pipes to master cylinder.

Tightening torque:

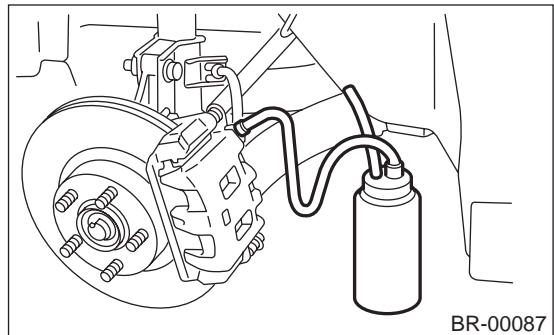
8 N·m (0.8 kgf-m, 5.8 ft-lb)

- 8) Cleanly wash away brake fluid spilt on master cylinder etc.
- 9) Bleed air from brake system. <Ref. to BR-42, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

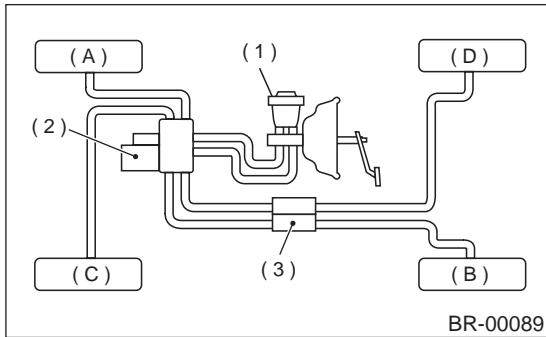
NOTE:

- During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - Brake pedal operation must be very slow.
 - For convenience and safety, two people should do the work.
- 1) Make sure that there is no leak from joints and connections of the brake system.
 - 2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.



CAUTION:

Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



- (1) Master cylinder
- (2) Hydraulic unit
- (3) Proportioning valve

3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.

Release air bleeder for 1 to 2 seconds.

Next, with the bleeder closed, slowly release the brake pedal.

Repeat these steps until there are no more air bubbles in the vinyl tube.

Allow 3 to 4 seconds between two brake pedal operations.

CAUTION:

Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

NOTE:

Brake pedal operating must be very slow.

4) Tighten air bleeder securely when no air bubbles are visible.

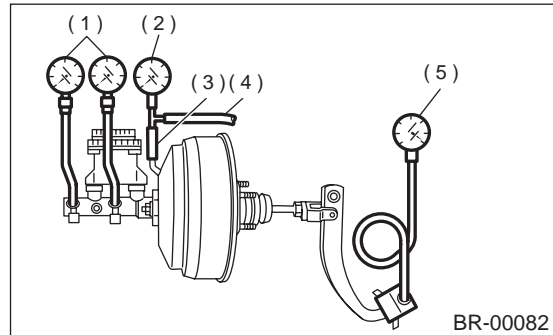
Air bleeder tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

5) Perform these steps for the brakes connecting to the secondary chamber of master cylinder, first, and then for the ones connecting to primary chamber. With all procedures completed, fully depress the brake pedal and keep it in that position for approximately 20 seconds to make sure that there is no leak evident in the entire system.

6) Check the pedal stroke.

While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between the brake pedal and steering wheel. With the brake pedal released, measure the distance between the pedal and steering wheel again. The difference between the two measurements must be more than specified.



- (1) Pressure gauge
- (2) Vacuum gauge
- (3) Adapter hose
- (4) Vacuum hose
- (5) Pedal force gauge

Specified pedal stroke:

95 mm (3.74 in)

When depressing brake pedal with a 490 N (50 kgf, 110 lb) load.

7) If the distance is more than specifications, there is a possibility that air is in the brake line. Bleed brake line until pedal stroke meets the specification.

8) Operate hydraulic control unit in the sequence control mode.

With ABS: <Ref. to ABS-9, ABS Sequence Control.>

With VDC: <Ref. to VDC-19, VDC Sequence Control.>

9) Recheck the brake stroke.

10) If the distance is more than specifications, there is a possibility air is in the inside of the hydraulic unit. Repeat above steps 2) to 9) above until pedal stroke meets the specification.

11) Add brake fluid to the required level (MAX. level) of reservoir tank.

12) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

13. Brake Hose

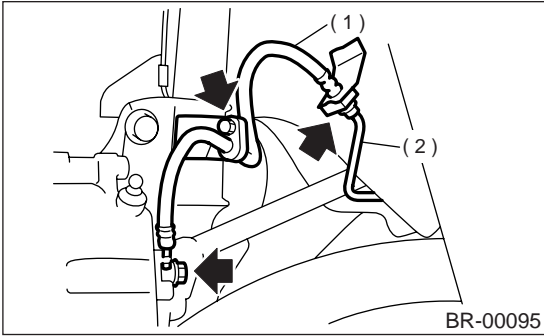
A: REMOVAL

1. FRONT BRAKE HOSE

1) Separate brake pipe from brake hose.

NOTE:

Always use flare nut wrench and be careful not to deform flare nut.



- (1) Brake hose
- (2) Brake pipe

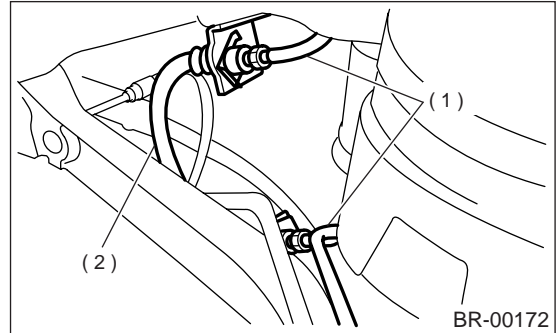
- 2) Pull out clamp to remove brake hose.
- 3) Remove bolt at strut and union bolt.

2. REAR BRAKE HOSE

1) Separate brake pipe from brake hose.

NOTE:

Always use flare nut wrench and be careful not to deform flare nut.



- (1) Brake pipe
- (2) Brake hose



- (1) Brake pipe

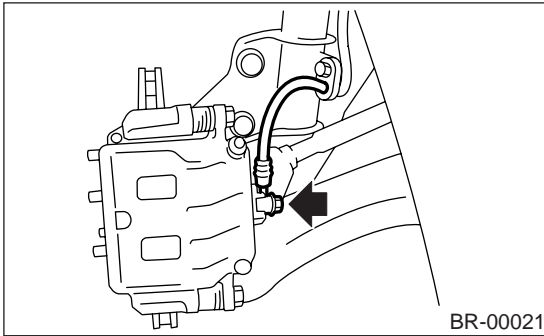
2) Pull out clamp to remove brake hose.

B: INSTALLATION

1. FRONT BRAKE HOSE

- 1) Route end of brake hose (on caliper side) through hole in brake hose bracket at strut location.
- 2) Tighten end of brake hose at caliper using a union bolt.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 3) Secure middle fitting of brake hose to bracket at strut location using a clamp.
- 4) Position disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

CAUTION:

Be sure brake hose is not twisted.

- 5) Temporarily tighten flare nut to connect brake pipe and hose.
- 6) Fix brake hose with clamp at wheel apron bracket.
- 7) While holding hexagonal part of brake hose fitting with a wrench, tighten flare nut to the specified torque.

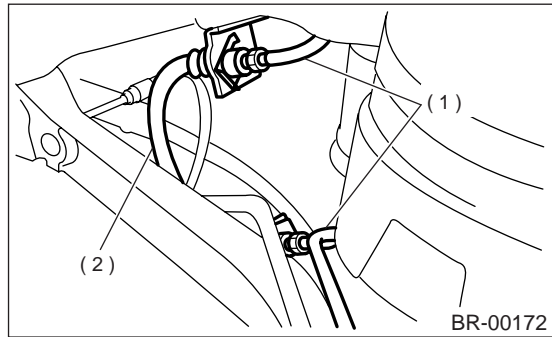
Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

- 8) Bleed air from the brake system.

2. REAR BRAKE HOSE

- 1) Pass brake hose through the hole of bracket, and lightly tighten flare nut to connect brake pipe.
- 2) Insert clamp upward to fix brake hose.
- 3) While holding hexagonal part of brake hose fitting with a wrench, tighten flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)



- (1) Brake pipe
- (2) Brake hose



- (1) Brake pipe

- 4) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage, or damage on hoses. Check joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace hose.

14.Brake Pipe

A: REMOVAL

NOTE:

Airbag system wiring harness is routed near the center brake pipe.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage airbag system wiring harness when servicing the center brake pipe.
- When removing the brake pipe, make sure that it is not bent.

B: INSTALLATION

NOTE:

Airbag system wiring harness is routed near the center brake pipe.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage airbag system wiring harness when servicing the center brake pipe.
- When installing the brake pipe, make sure that it is not bent.
- After installing the brake pipe and hose, bleed the air.
- After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

Brake pipe tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace pipe.

NOTE:

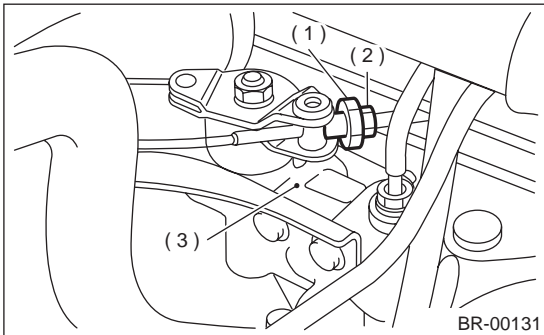
Use a mirror when inspecting low-visible part or back side.

15.Hill Holder

A: REMOVAL

1. PHV (PRESSURE HOLD VALVE)

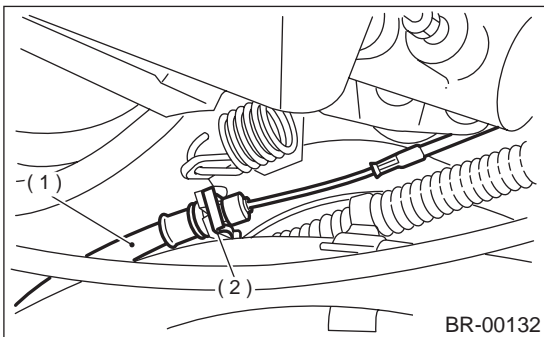
- 1) Drain brake fluid from reservoir of master cylinder.
- 2) Remove adjusting nut and lock nut.



- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 3) Remove cable clamp, and disconnect PHV cable from PHV.

CAUTION:
Carefully protect boots and inner cable from damage when disconnecting PHV cable.



- (1) PHV cable
- (2) Clamp

- 4) Disconnect brake pipes from PHV.

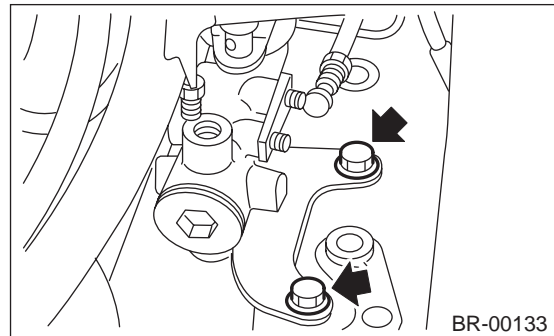
CAUTION:

- Pay attention not to drop brake fluid onto body painting since it may dissolve paint.
- Pay attention not to damage hexagonal head of flare nut by using pipe wrench without fail.

- 5) Detach PHV along with support from side frame.

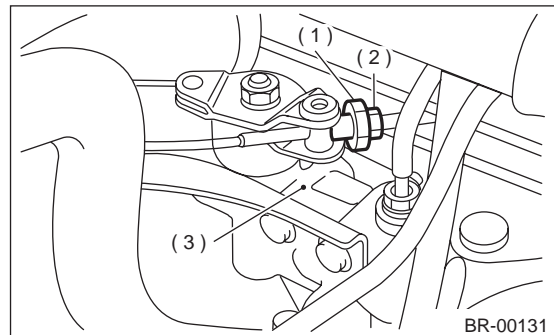
CAUTION:

Exercise utmost care to prevent foreign matter from entering into PHV when removing it.



2. PHV CABLE

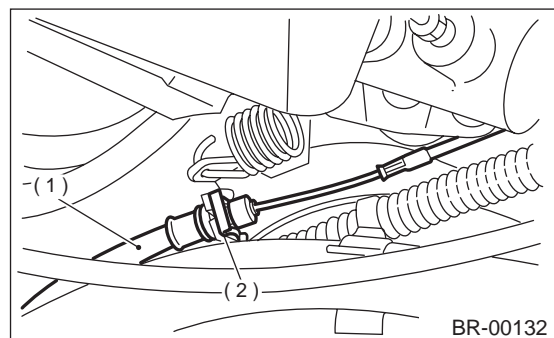
- 1) Remove adjusting nut and lock nut.



- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 2) Remove cable clamp, and disconnect PHV cable from PHV.

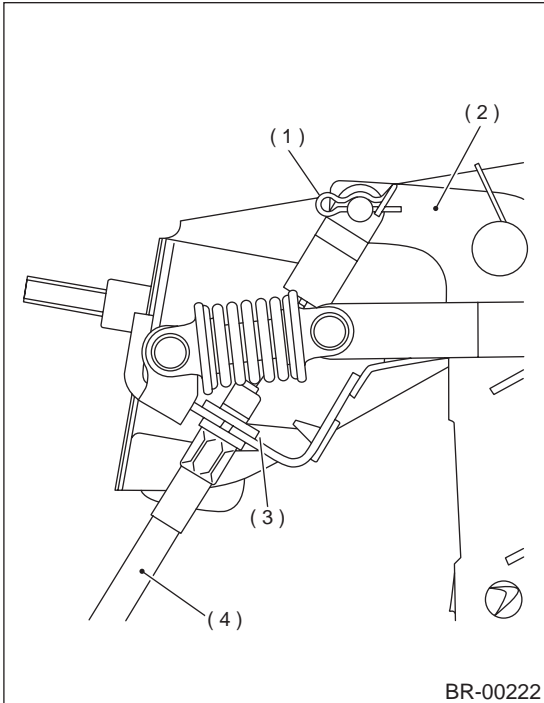
CAUTION:
Carefully protect boot and inner cable from damage when disconnecting PHV cable.



- (1) PHV cable
- (2) Clamp

- 3) Remove clutch pedal. <Ref. to CL-33, REMOVAL, Clutch Pedal.>

4) Remove PHV cable.



- (1) Snap ring
- (2) Clutch pedal
- (3) Clamp
- (4) PHV cable

B: INSTALLATION

1. PHV (PRESSURE HOLD VALVE)

1) Install PHV onto side frame.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Connect brake pipes to PHV.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

CAUTION:

Confirm that brake pipes are not deformed and/or damaged. Replace them with new ones if necessary.

3) Install PHV cable to PHV.

CAUTION:

If cable clamp (and clips) is damaged, replace it with a new one.

4) Connect PHV cable with clips.

NOTE:

Avoid sharp bending of PHV cable as it may cause breakage.

5) Apply grease to the following points.

- Hook portion of return spring
- Cable end portion of lever

Grease:

SUNLIGHT 2 (Part No. 003602010)

6) Be sure to bleed air from the brake system.

7) Adjust PHV cable. <Ref. to BR-49, Adjustment.>

CAUTION:

After replacing PHV cable with new one, operate clutch pedal about 30 times as a running-in operation prior to adjustment.

2. PHV CABLE

1) Install PHV cable in the reverse order of removal.

CAUTION:

- **If cable clamp is damaged, replace it with a new one.**
- **Avoid sharp bending of PHV cable as it may cause breakage.**

2) Apply grease to the following points.

- Hook portion of return spring
- Cable end portion of lever

Grease:

SUNLIGHT 2 (Part No. 003602010)

3) Adjust PHV cable. <Ref. to BR-49, Adjustment.>

CAUTION:

After replacing PHV cable with new one, operate clutch pedal about 30 times as a running-in operation prior to adjustment.

C: INSPECTION

Check up removed parts as follows, and replace defective ones.

- 1) Check if boots of PHV cable are damaged or degraded, and if inner cable is damaged or corroded.
- 2) Check if return spring is worn out, damaged or corroded.
- 3) Confirm that rolling sound of ball is heard with PHV inclined and lever rotates smoothly.

CAUTION:

Never disassemble PHV. Replace entire PHV assembly if necessary.

D: ADJUSTMENT

Confirm stopping and starting performances by activating hill holder on an uphill road of 3° or higher inclination.

- 1) If vehicle does not stop;
Tighten adjusting nut of PHV cable.
- 2) If vehicle does not start properly;

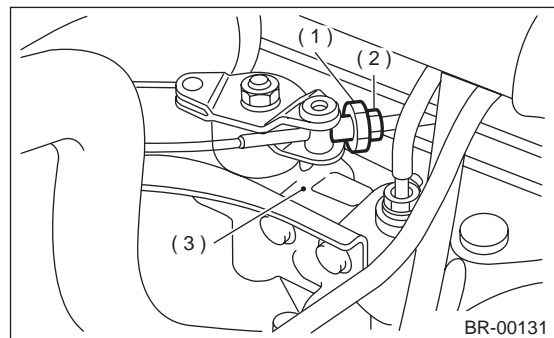
- Case A — When hill holder is released later than engagement of clutch pedal (Engine tends to stall.): Loosen adjusting nut gradually until smooth starting is enabled.

- Case B — When hill holder is released earlier than engagement of clutch pedal (Vehicle slips down slightly.):

Tighten adjusting nut so that hill holder is released later than engagement of clutch pedal (status in Case A). Then make adjustment the same as in Case A.

CAUTION:

Whenever turning adjusting nut, prevent PHV cable from revolving.



- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 3) Tighten lock nut.

Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

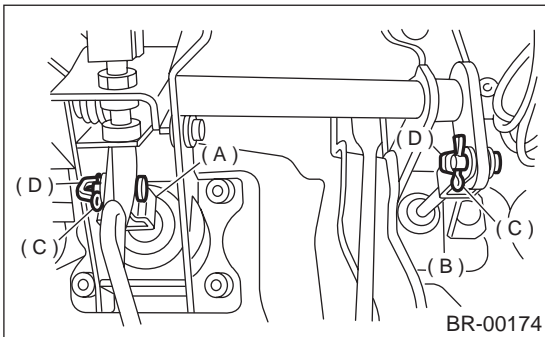
16. Brake Pedal

A: REMOVAL

1. MT MODEL

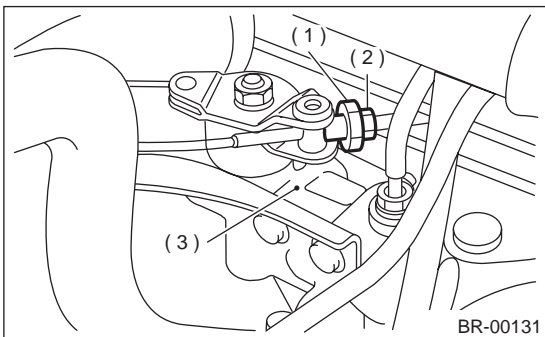
• LHD model

- 1) Pull up parking brake lever and block tires.
- 2) Disconnect battery ground cable.
- 3) Remove steering column.
<Ref. to PS-28, REMOVAL, Tilt Steering Column.>
- 4) Disconnect connectors from stop light and clutch switches.
- 5) Remove snap pins which secure lever to push rod and operating rod.
- 6) Remove clevis pins which secure lever to push rod and operating rod.



- (A) Operating rod
- (B) Push rod
- (C) Snap pin
- (D) Clevis pin

- 7) Remove PHV adjusting nut and lock nut.

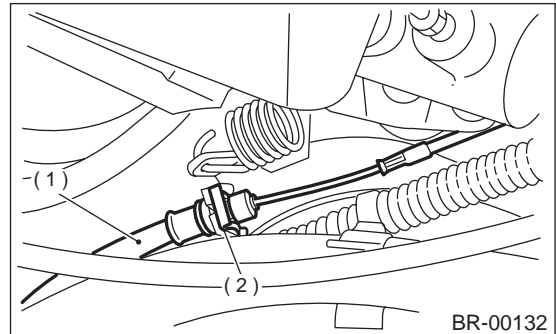


- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 8) Remove cable clamp, and disconnect PHV cable from PHV.

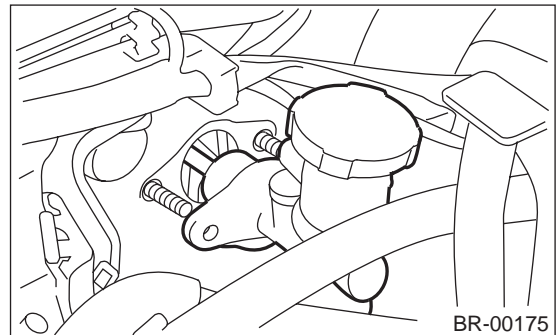
CAUTION:

Carefully protect boot and inner cable from damage when disconnecting PHV cable.



- (1) PHV cable
- (2) Clamp

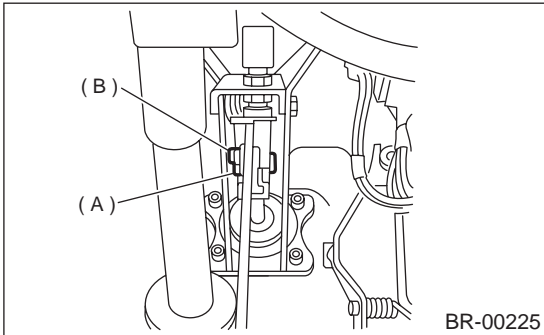
- 9) Remove nut which secures clutch master cylinder.



- 10) Remove bolts and nuts which secure brake and clutch pedals, and remove pedal assembly.

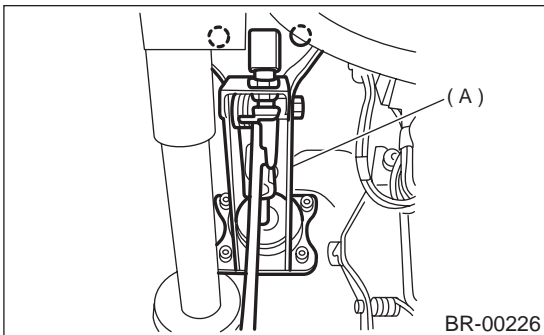
• RHD model

- 1) Pull up parking brake lever and block tires.
- 2) Disconnect ground cable from battery.
- 3) Remove instrument panel lower cover from instrument panel.
- 4) Remove clevis pin which secures brake pedal to brake booster operating rod. Also disconnect electrical connectors (for stop light switch, etc.).



- (A) Snap pin
(B) Clevis pin

- 5) Remove nuts and bolts which secure pedal bracket.

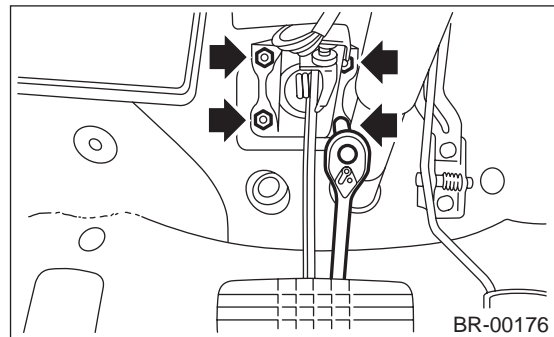


- (A) Brake pedal bracket

2. AT MODEL

• LHD model

- 1) Pull up parking brake lever.
- 2) Disconnect ground cable from battery.
- 3) Remove instrument panel lower cover from instrument panel.
- 4) Remove clevis pin which secures brake pedal to brake booster operating rod. Also disconnect stop light switch connector.
- 5) Remove AT unit from brake panel (2 nuts).
- 6) Remove two bolts and four nuts which secure brake pedal to pedal.



• RHD model

NOTE:

For removal procedures, refer to "MT MODEL".
<Ref. to BR-50, MT MODEL, REMOVAL, Brake Pedal.>

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

- If cable clamp is damaged, replace it with a new one.
- Never fail to cover outer cable end with boot.
- Be careful not to kink accelerator cable.
- Always use new clevis pins.

- 2) Adjustment of clutch pedal <Ref. to BR-53, ASSEMBLY, Brake Pedal.>
- 3) Inspect after pedal installation <Ref. to BR-53, INSPECTION, Brake Pedal.>

BRAKE PEDAL

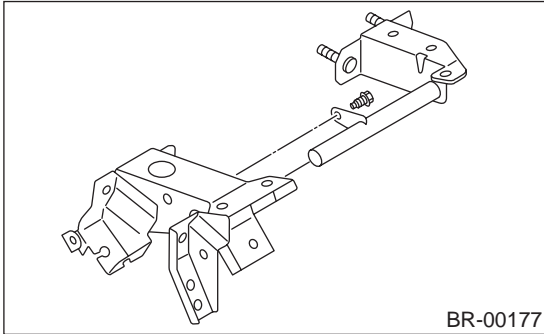
BRAKE

C: DISASSEMBLY

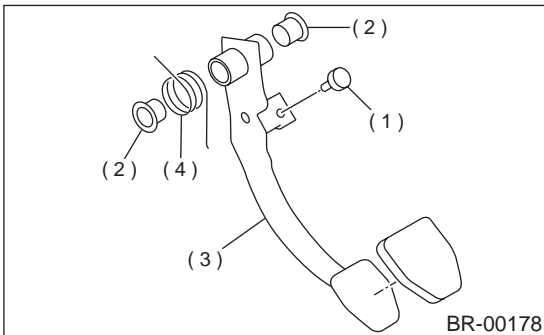
1. MT MODEL

• LHD model

- 1) Remove the brake switch.
<Ref. to BR-55, REMOVAL, Stop Light Switch.>
- 2) Remove the clutch pedal.
<Ref. to CL-34, DISASSEMBLY, Clutch Pedal.>
- 3) Remove the clutch master cylinder bracket.



- 4) Remove bushing, spring and stopper.



- (1) Stopper
- (2) Bushing
- (3) Brake pedal
- (4) Brake pedal spring

- 5) Remove the brake pedal pad.

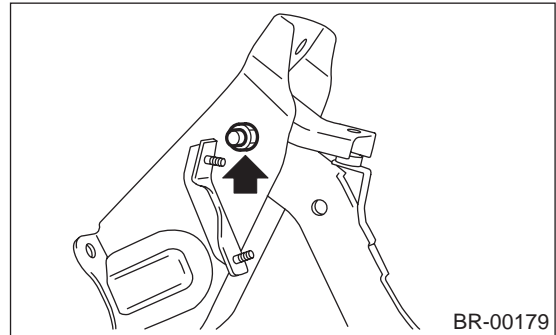
• RHD model

NOTE:

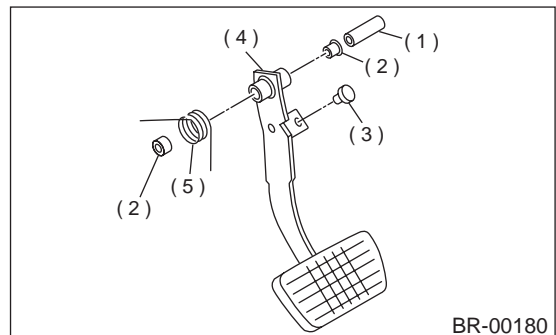
For disassembly procedures, refer to "AT MODEL".
<Ref. to BR-52, AT MODEL, DISASSEMBLY, Brake Pedal.>

2. AT MODEL

- 1) Remove the brake switch.
- 2) Unbolt, and then remove the brake pedal.



- 3) Remove bushing, spacer and spring.



- (1) Spacer
- (2) Bushing
- (3) Stopper
- (4) Brake pedal
- (5) Brake pedal spring

- 4) Remove the brake pedal pad.

D: ASSEMBLY

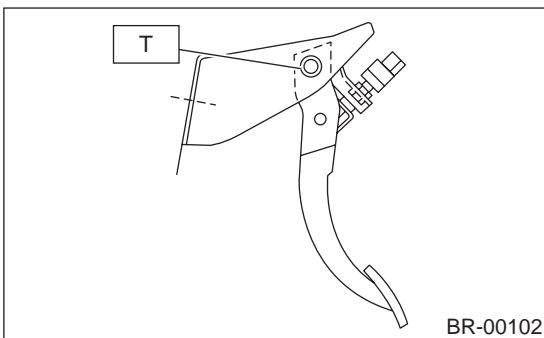
- 1) Attach stop light switch, etc. to pedal bracket temporarily.
- 2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.
- 3) Align bores of pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring and clutch pedal effort reducing spring (vehicle with hill holder), and then install pedal bolt.

NOTE:

Clean up inside of bushings and apply grease before installing spacer.

Tightening torque:

T: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



- 4) Set brake pedal position by adjusting position of stop light switch.

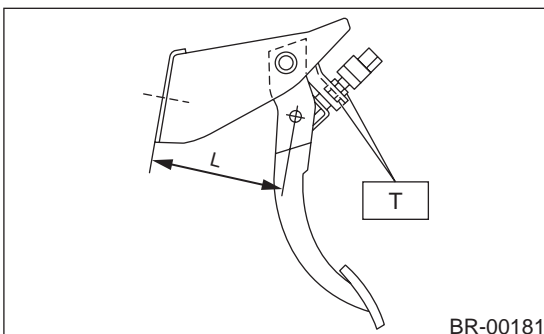
Pedal position: L

LHD: 126.4 mm (4.98 in)

RHD: 154.9 mm (6.10 in)

Tightening torque:

T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

**E: INSPECTION**

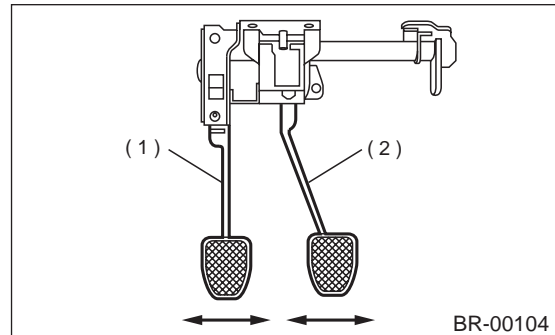
- 1) Move brake and clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

CAUTION:

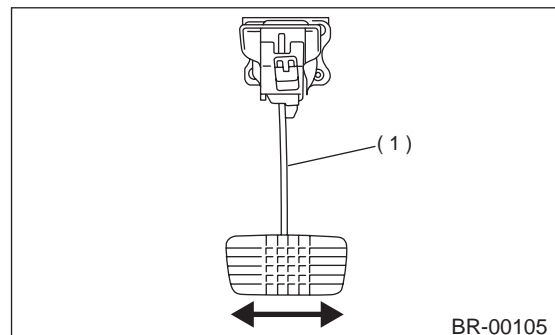
If excessive deflection is noted, replace bushings with new ones.

Deflection of brake and clutch pedal:**Service limit**

5.0 mm (0.197 in) or less



- (1) Clutch pedal
- (2) Brake pedal



- (1) Brake pedal

BRAKE PEDAL

BRAKE

2) Check position of pedal pad.

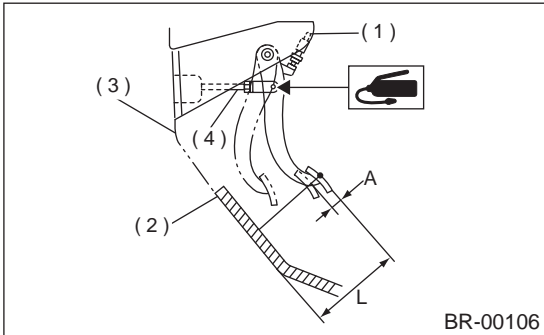
Pedal height: L

AT: 158 mm (6.22 in)

MT: 153 mm (6.02 in)

Brake pedal free play: A

1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]



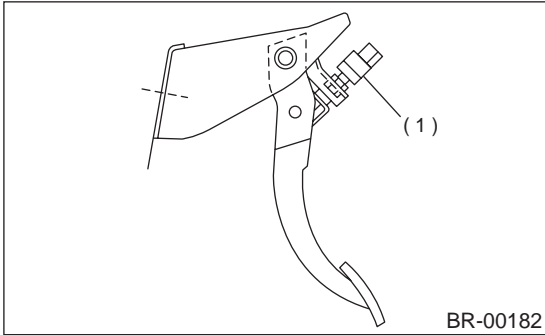
- (1) Stop light switch
- (2) Mat
- (3) Toe board
- (4) Brake booster operating rod

3) If it is not in specified value, adjust it by adjusting brake booster operating rod length.

17. Stop Light Switch

A: REMOVAL

- 1) Disconnect battery ground cable.
- 2) Disconnect stop light switch connector.
- 3) Loosen nuts, and unscrew stop light switch to remove.



(1) Stop light switch

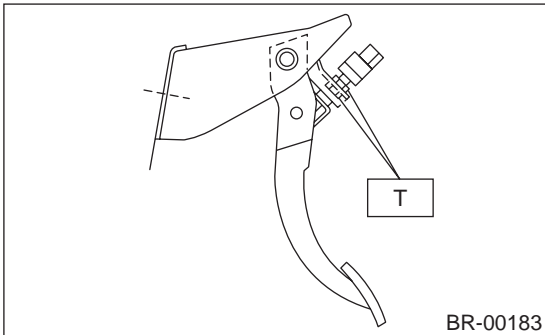
B: INSTALLATION

- 1) Screw the stop light switch onto a bracket and secure it temporarily with a nut.
- 2) Adjust stop light switch position, and then tighten the nut.

<Ref. to BR-56, ADJUSTMENT, Stop Light Switch.>

Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)

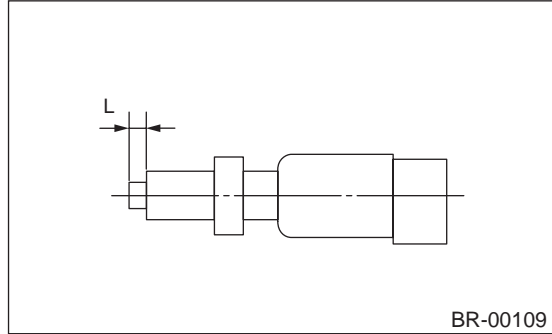


C: INSPECTION

- 1) If stop light switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position: L

$2^{+1.5}/_0$ mm ($0.079^{+0.059}/_0$ in)



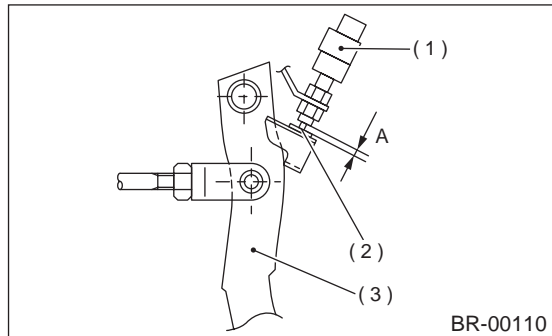
- 2) Measure the clearance between threaded end of stop light switch and stopper.

CAUTION:

Be careful not to rotate stop light switch.

Stop light switch clearance: A

0.3 mm (0.012 in)



- (1) Stop light switch
- (2) Stopper
- (3) Brake pedal

- 3) If it is not in specified value, adjust it by adjusting position of stop light switch.

CAUTION:

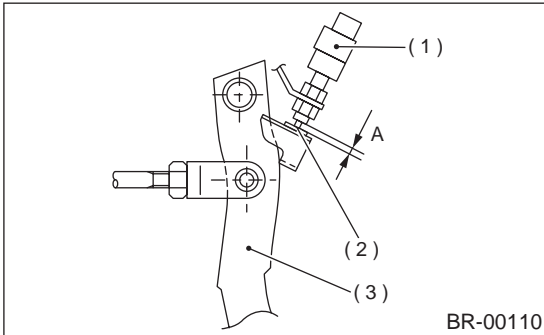
Be careful not to rotate stop light switch.

STOP LIGHT SWITCH

BRAKE

D: ADJUSTMENT

Loosen the lock nut, and adjust stop light switch position until the clearance (A) between threaded end of the stop light switch and the stopper becomes 0.3 mm (0.012 in). Then, tighten the lock nut.



- (1) Stop light switch
- (2) Stopper
- (3) Brake pedal

18. General Diagnostics

A: INSPECTION

1. BRAKE SYSTEM

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(2) Entry of air into the hydraulic mechanism	Bleed the air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining or rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Rotor eccentricity	Correct or replace the rotor.
	(3) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(4) Deformed back plate	Correct or replace.
	(5) Improper tire inflation	Inflate to correct pressure.
	(6) Disordered wheel alignment	Adjust alignment.
	(7) Loosened back plate or the support installing bolts	Retighten.
	(8) Loosened wheel bearing	Retighten to normal tightening torque or replace.
	(9) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
	(10) Uneven effect of the parking brake	Check, adjust, or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed the air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Correct or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Improper adjusted wheel bearing	Adjust or replace.
5. Brake noise (1) (creak sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loosened back plate or the support installing bolts	Retighten.
	(4) Loose wheel bearing	Retighten to normal tightening torque.
	(5) Dirty rotor	Clean the rotor, or clean and replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improper installed shoe or pad	Correct or replace the shoe assembly or pad.
	(3) Loose or bent rotor	Retighten or replace.
7. Brake noise (3) (click sound)	(1) Excessively worn pad or the support	Replace the pad or the support.
	(2) Lack of oil on the shoe ridge surface and anchor	Add more grease.

GENERAL DIAGNOSTICS

BRAKE

2. HILL HOLDER

CAUTION:

- Description in parentheses is a characteristic of hill holder and does not indicate abnormality. Depressing force required for clutch pedal equipped to hill holder specifications is 20 to 29 N (2 to 3 kgf, 4 to 7 lb) larger than the conventional specifications, which does not constitute abnormality.
- When vehicle cannot travel (brake cannot be released) because return spring is broken, remove adjust nut, disconnect clutch and PHV, and then return PHV lever to release the brake. (Be sure to apply the parking brake before starting this operation.)
- The hill holder may not be activated on a slope of an extremely small inclination.

	Trouble and possible cause	Corrective action
1. Counterforce of clutch pedal is too strong.	(1) PHV cable is damaged or does not operate properly.	Repair or replace.
	(2) Lever of PHV is defective.	Replace entire PHV assembly.
	(3) Clutch system is anomalous.	Replace clutch system.
2. Vehicle does not stop on uphill road of 3° or higher inclination.	(1) Front side of vehicle is lowered.	Replace suspension.
	(2) PHV cable is broken.	Replace.
	(3) Play of clutch is excessive.	Adjust.
	(4) PHV cable is elongated.	Adjust.
	(5) Sealing of PHV is poor.	Replace entire PHV assembly.
3. Shock is felt when starting.	(1) Poor adjustment of starting performance.	Adjust.
	(2) When depressing the brake pedal strongly:	(The stronger brake pedal depressing force, the later hill holder releases.)
	(3) When starting on flat road after stopping reverse movement:	(Because hill holder is activated.)
4. Vehicle slips down when starting.	(1) PHV cable is elongated.	Adjust.
	(2) Clutch facing is worn out.	Adjust or replace.
	(3) Bracket (cable) or stay (PHV) is deformed.	Repair or replace.
5. Vehicle cannot start after stoppage.	(1) Return spring is fatigued or broken.	Replace.
	(2) PHV lever won't return.	Replace entire PHV assembly.
	(3) When intentionally depressing brake pedal strongly:	[When the brake pedal is depressed by a force of 1,177 N (120 kgf, 265 lb) or more.]
6. Abnormal sound is generated upon releasing brake pedal when stopping.	(1) Rotor and pad matched with each other due to inadequate depressing force to brake pedal.	(Abnormal sound is not generated when depressing brake pedal a little stronger.)
7. Abnormal sound is generated when operating clutch pedal.	(1) Grease is inadequate for the hook of return spring and sliding portion of PHV cable end.	Apply grease.
	(2) When releasing after maintaining high fluid pressure:	(Flowing sound of fluid when releasing high fluid pressure.)
	(3) Clutch system is anomalous.	Replace clutch system.

PARKING BRAKE

PB

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2. Parking Brake Lever.....	6
3. Parking Brake Cable	7
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GENERAL DESCRIPTION

PARKING BRAKE

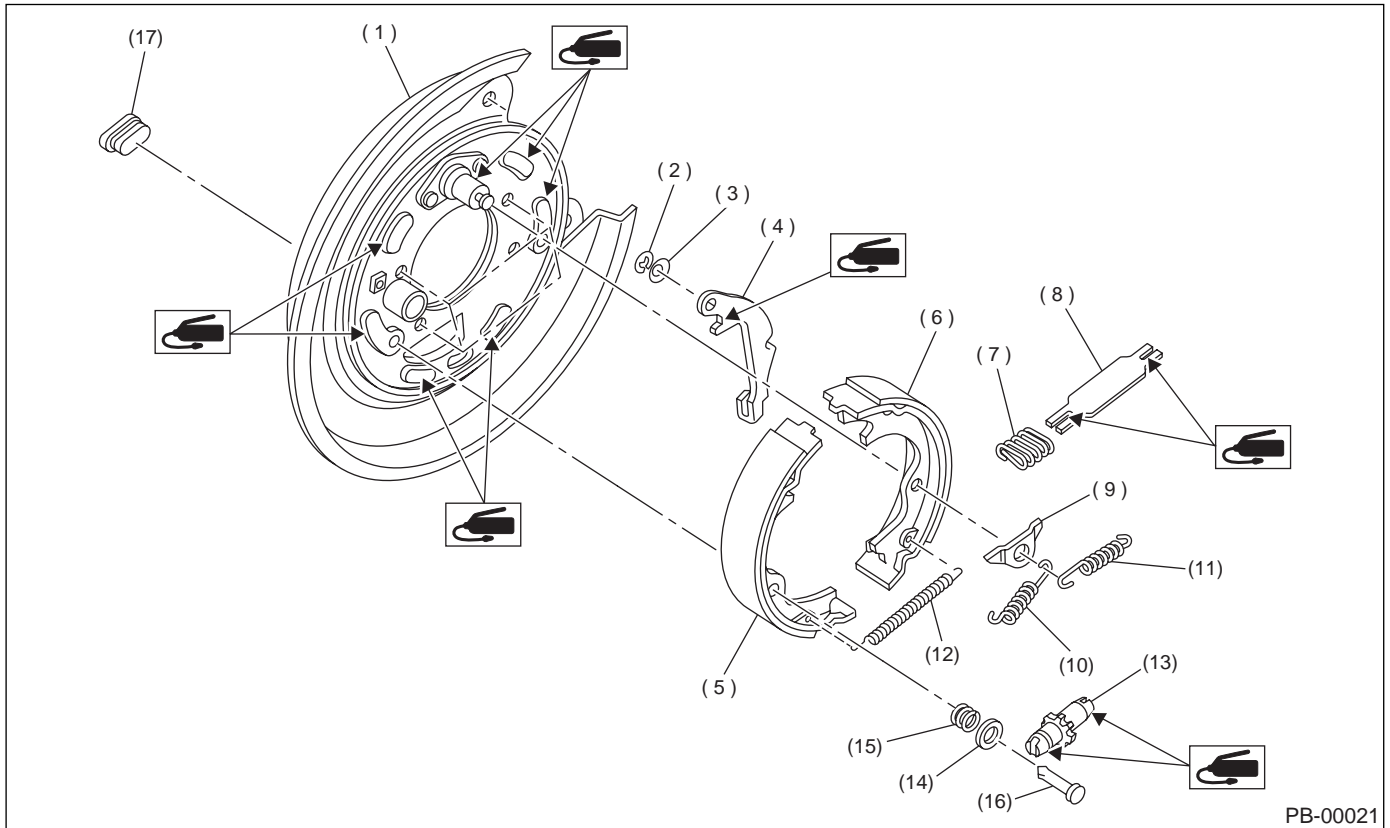
1. General Description

A: SPECIFICATIONS

Type		Mechanical on rear brakes, drum in disc
Effective drum diameter	mm (in)	170 (6.69)
Lining dimensions (length × width × thickness)	mm (in)	162.6 × 30.0 × 3.2 (6.40 × 1.181 × 0.126)
Clearance adjustment		Manual adjustment
Lever stroke	notches/N (kgf, lb)	7 to 8/196 (20, 44)

B: COMPONENT

1. PARKING BRAKE



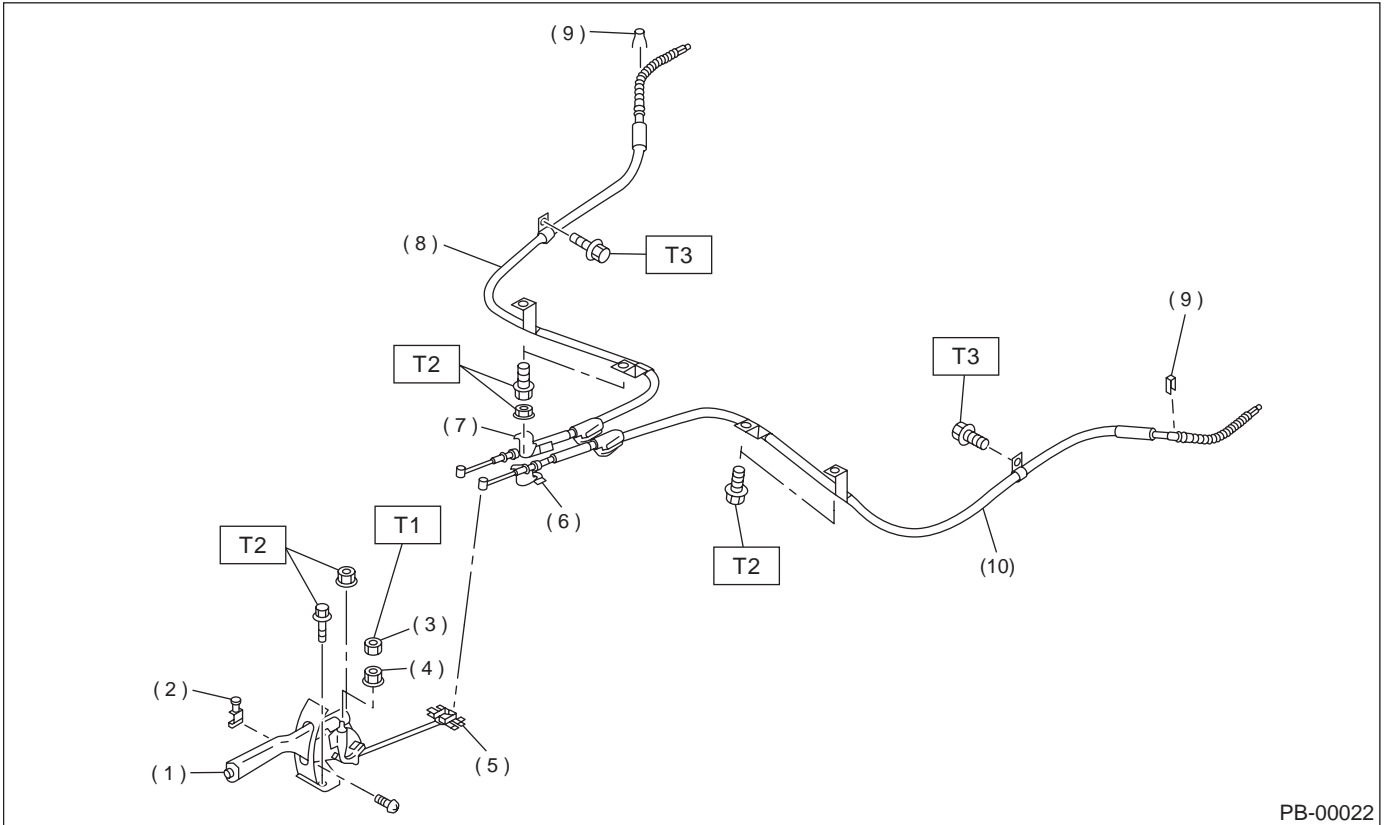
PB-00021

- | | | |
|------------------------------------|------------------------------|----------------------------|
| (1) Back plate | (7) Strut spring | (13) Adjuster |
| (2) Retainer | (8) Strut | (14) Shoe hold-down cup |
| (3) Spring washer | (9) Shoe guide plate | (15) Shoe hold-down spring |
| (4) Lever | (10) Primary return spring | (16) Shoe hold-down pin |
| (5) Parking brake shoe (Primary) | (11) Secondary return spring | (17) Adjusting hole cover |
| (6) Parking brake shoe (Secondary) | (12) Adjusting spring | |

GENERAL DESCRIPTION

PARKING BRAKE

2. PARKING BRAKE CABLE



- | | |
|--------------------------|--|
| (1) Parking brake lever | (7) Clamp |
| (2) Parking brake switch | (8) Parking brake cable RH |
| (3) Lock nut | (9) Clamp (Rear disc brake model only) |
| (4) Adjusting nut | (10) Parking brake cable LH |
| (5) Equalizer | |
| (6) Bracket | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 5.9 (0.60, 4.3)

T2: 18 (1.8, 13.0)

T3: 32 (3.3, 24)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep grease etc. away from parking brake shoes.

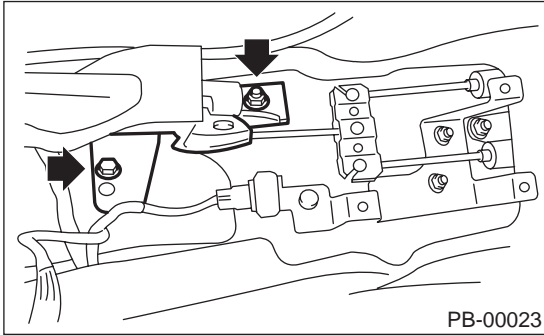
PARKING BRAKE LEVER

PARKING BRAKE

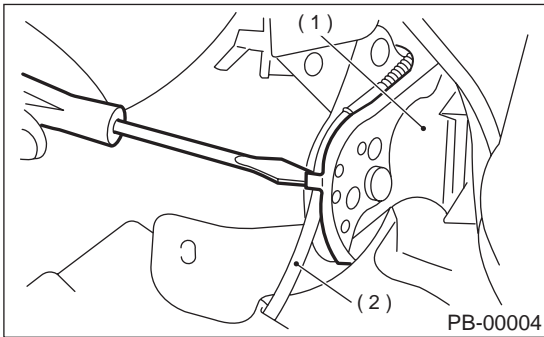
2. Parking Brake Lever

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove rear tire and wheel.
- 3) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>
- 4) Loosen parking cable adjusting nut and console bracket.
- 5) Remove parking brake lever.



- 6) Unbend parking brake lever pawls and remove cable.



- (1) Parking brake lever
- (2) Cable

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Parking brake lever;

18 N·m (1.8 kgf·m, 13.0 ft·lb)

Lock nut;

5.9 N·m (0.6 kgf·m, 4.3 ft·lb)

NOTE:

- Be sure to pass cable through guide inside the tunnel.
- Be sure to adjust the lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

While pulling parking brake lever upward, count the notches.

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Incorrect, adjust the parking brake. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly.>

D: ADJUSTMENT

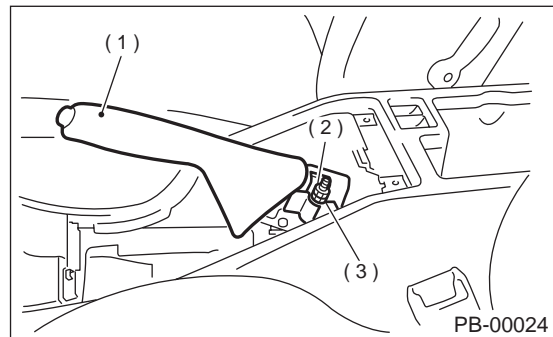
- 1) Remove console cover.
- 2) Forcibly pull parking brake lever 3 to 5 times.
- 3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).
- 4) Tighten lock nut.

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Lock nut):

5.9 N·m (0.60 kgf·m, 4.3 ft·lb)



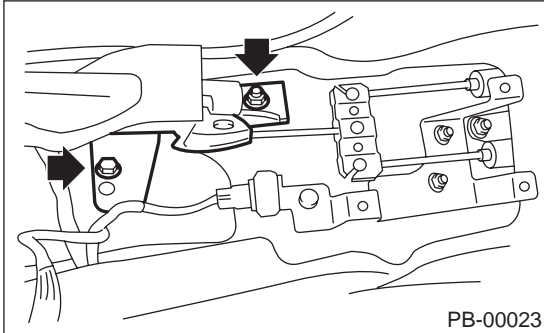
- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

- 5) Install console cover.

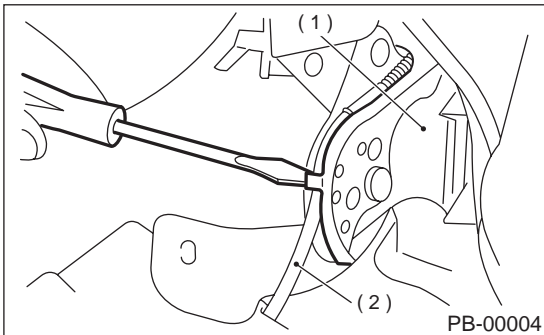
3. Parking Brake Cable

A: REMOVAL

- 1) Lift-up vehicle.
- 2) Remove rear tires and wheels.
- 3) Remove rear seat cushion. <Ref. to SE-17, REMOVAL, Rear Seat.>
- 4) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>
- 5) Loosen parking cable adjusting nut and console bracket.
- 6) Remove parking brake lever.

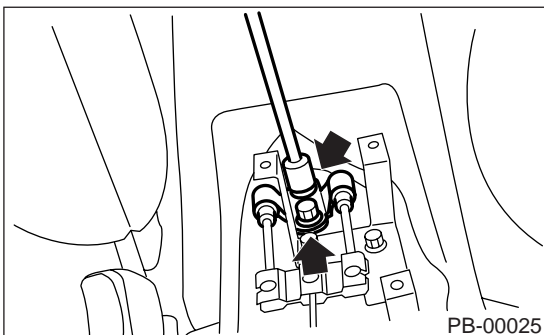


- 7) Unbend parking brake lever pawls and remove cable.

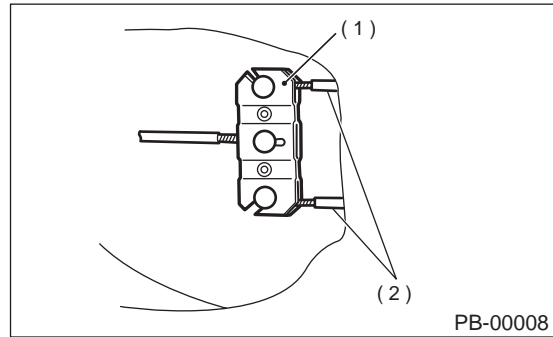


- (1) Parking brake lever
- (2) Cable

- 8) Roll up floor mat and remove clamps.

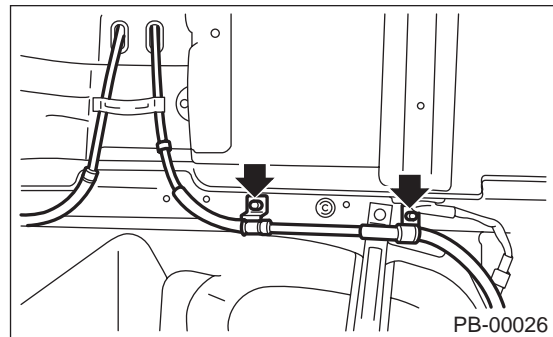


- 9) Remove equalizer cover.
- 10) Remove inner cable end from equalizer.



- (1) Equalizer
- (2) Inner cable end

- 11) Pull out parking brake cable from rear brake. <Ref. to PB-9, REMOVAL, Parking Brake Assembly.>
- 12) Pull out clamp from rear brake.
- 13) Remove bolt and bracket from trailing link bracket.
- 14) Remove bolt and clamp from rear floor.



- 15) Detach grommet from rear floor.
- 16) Remove cable assembly from cabin by forcibly pulling it backward.
- 17) Detach parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

Install (new) parking brake assembly in the reverse order of removal.

NOTE:

- Be sure to pass cable through cable guide inside the tunnel.
- Be sure to adjust the lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

PARKING BRAKE CABLE

PARKING BRAKE

C: INSPECTION

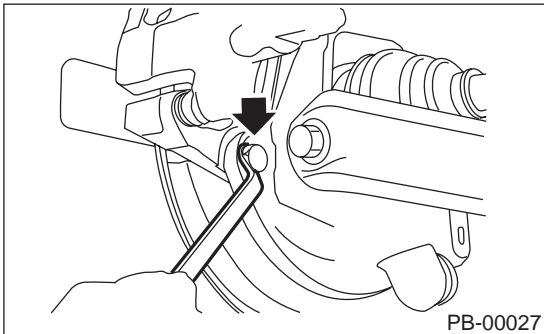
Check the removed cable and replace if damaged, rusty, or malfunctioning.

- 1) Check for smooth operation of the cable.
- 2) Check the inner cable for damage and rust.
- 3) Check the outer cable for damage, bends, and cracks.
- 4) Check the boot for damage, cracks, and deterioration.

4. Parking Brake Assembly

A: REMOVAL

1) Remove the two mounting bolts and remove the disc brake assembly.

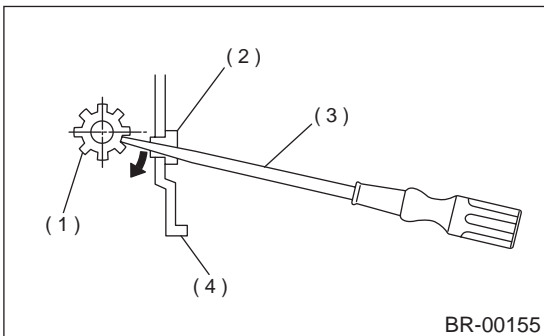


- 2) Suspend the disc brake assembly so that the hose is not stretched.
- 3) Pull down and release parking brake.
- 4) Remove the disc rotor.

NOTE:

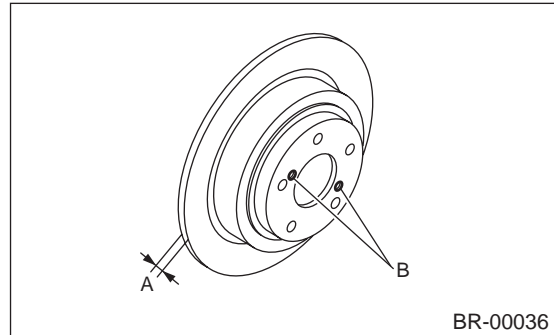
If the disc rotor is difficult to remove, try the following two methods in order.

(1) Turn adjusting screw using a slot-type screwdriver until brake shoe gets away enough from the disc rotor.

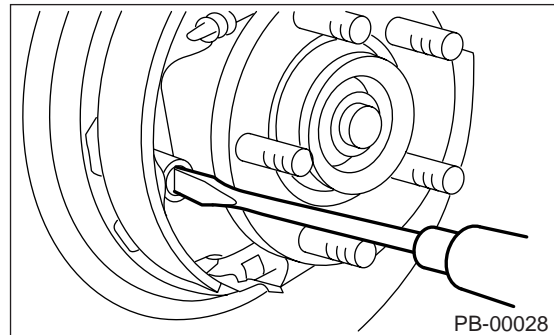


- (1) Adjusting screw
- (2) Cover (rubber)
- (3) Slot-type screwdriver
- (4) Back plate

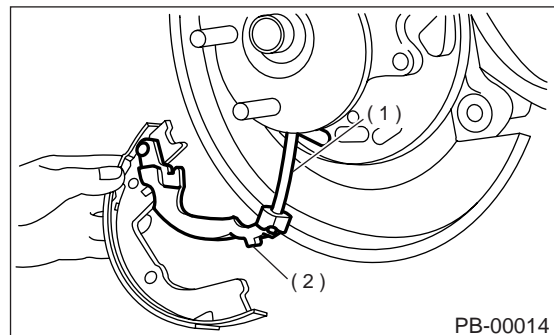
(2) If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.



- 5) Remove shoe return spring from parking brake assembly.
- 6) Using a standard screwdriver, remove front shoe hold-down spring and pin.



- 7) Remove strut and strut spring.
- 8) Remove adjuster assembly from parking brake assembly.
- 9) Using a standard screwdriver, remove rear shoe hold-down spring and pin.
- 10) Remove brake shoe.
- 11) Remove parking cable from parking lever.



- (1) Parking brake cable
- (2) Parking brake lever

12) Using a standard screwdriver, raise retainer. Remove parking lever and washer from brake shoe.

PARKING BRAKE ASSEMBLY

PARKING BRAKE

B: INSTALLATION

CAUTION:

Be sure lining surface is free from oil contamination.

Brake grease:

Dow Corning Molykote No. 7439 (Part No. 725191460)

1) Apply brake grease to the following places.

- Six contact surfaces of shoe rim and back plate packing
- Contact surface of shoe wave and anchor pin
- Contact surface of lever and strut
- Contact surface of shoe wave and adjuster assembly
- Contact surface of shoe wave and strut
- Contact surface of lever and shoe wave

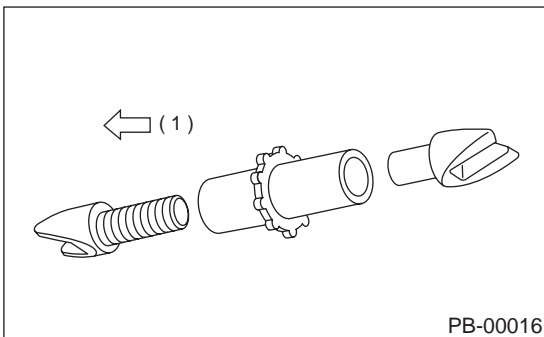
2) Install in reverse order of removal.

CAUTION:

- **Use new retainers and clinch them when installing brake shoes to levers.**
- **Ensure that parking lever moves smoothly.**
- **Do not confuse left parking lever with right one.**
- **Do not confuse left strut with right one.**

NOTE:

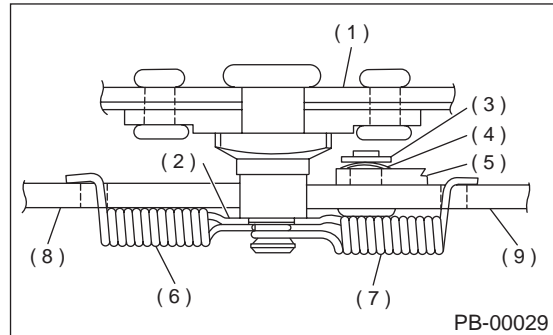
Ensure that adjuster assembly is securely installed with screw in the left side, facing vehicle front.



(1) LEFT

NOTE:

Ensure that shoe return spring is installed as shown in Figure.



- (1) Back plate
- (2) Shoe guide plate
- (3) Retainer
- (4) Spring washer
- (5) Lever
- (6) Primary shoe return spring (Blue)
- (7) Secondary shoe return spring (Yellow)
- (8) Parking brake shoe (Primary)
- (9) Parking brake shoe (Secondary)

3) Adjust parking brakes. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly.>

CAUTION:

After replacing parking brake lining, be sure to drive vehicle for "break-in" purposes.

- (1) Drive the vehicle about 35 km/h (22 MPH).
- (2) With the parking brake release button pushed in, pull the parking brake lever gently.
- (3) Drive the vehicle for about 200 meter (0.12 mile) in this condition.
- (4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
- (5) After breaking-in, re-adjust parking brakes.

C: INSPECTION

1) Measure brake disc inside diameter. If the disc is scored or worn, replace the brake disc.

Disc inside diameter:

Standard

170 mm (6.69 in)

Service limit

171 mm (6.73 in)

2) Measure the lining thickness. If it exceeds the limit, replace shoe assembly.

Lining thickness:

Standard

3.2 mm (0.126 in)

Service limit

1.5 mm (0.059 in)

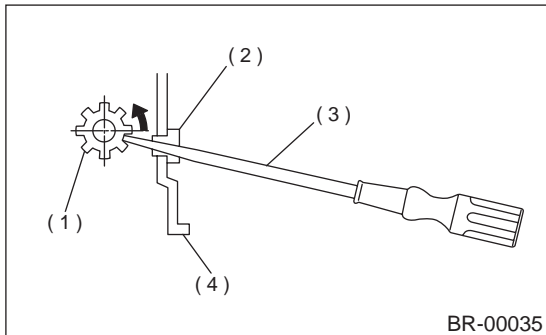
CAUTION:

Replace the brake shoes on the right and left brake assembly at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove adjusting hole cover from back plate.
2) Turn adjusting screw using a slot-type screwdriver until brake shoe is in close contact with disc rotor.



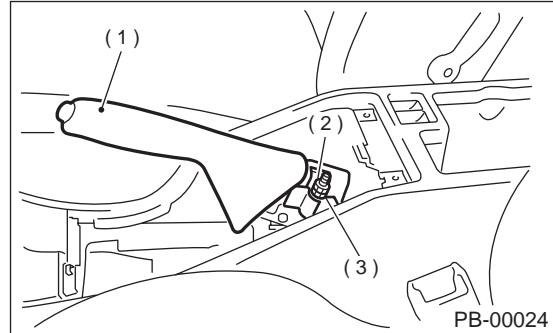
- (1) Adjusting screw
- (2) Cover (rubber)
- (3) Slot-type screwdriver
- (4) Back plate

3) Turn back (downward) adjusting screw 3 or 4 notches.

4) Install adjusting hole cover to back plate.

2. LEVER STROKE

1) Remove console box cover.
2) Forcibly pull parking brake lever 3 to 5 times.
3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 6 notches with operating force of 196 N (20 kgf, 44 lb).



- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

4) Tighten lock nut.
5) Install console box cover.

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Adjuster lock nut):
5.9 N·m (0.60 kgf·m, 4.3 ft·lb)

GENERAL DIAGNOSTIC TABLE

PARKING BRAKE

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Brake drag	• Parking brake lever is maladjusted.	• Adjustment.
	• Parking brake cable does not move.	• Repair or replace.
	• Parking brake shoe clearance is maladjusted.	• Adjustment.
	• Return spring is faulty.	• Replace.
Noise from brake	• Return spring is faulty.	• Replace.
	• Shoe hold-down spring is faulty.	• Replace.

POWER ASSISTED SYSTEM (POWER STEERING)

PS

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GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

1. General Description

A: SPECIFICATIONS

Model		Except OUTBACK			OUTBACK	
		15 inch wheel	16 inch wheel	Turbo model	Except 3.0 L	3.0 L
Whole system	Minimum turning radius m (ft)	5.4±0.5 (17.7±1.6)		5.6±0.5 (18.4±1.6)	5.6±0.5 (18.4±1.6)	
	Steering angle (Inside — Outside)	36.3°±1.5° — 31.6°±1.5°		34.7°±1.5° — 30.4°±1.5°	34.5°±1.5° — 30.3°±1.5°	
	Steering wheel diameter mm (in)	385 (15.16)				
	Overall gear ratio	16.5			19.0 — 15.2	
	Turns lock to lock	3.1		3.0	3.0	
Gearbox	Type	Rack and pinion, Integral				
	Backlash	0 (Automatically adjustable)				
	Valve (Power steering system)	Rotary valve				
Pump (Power steering system)	Type	Vane pump				
	Oil tank	Installed on body				
	Output cm ³ (cu in)/ rev.	7.2 (0.439)			9.6 — 0.65 (0.586 — 0.040)	
	Relief pressure kPa (kg/cm ² , psi)	9,807 (100, 1,422)		7,846 (80, 1,138)	9,807 (100, 1,422)	7,846 (80, 1,138)
	Hydraulic fluid control	Dropping in response to increased engine revolutions				
	Hydraulic fluid ℓ (US qt, Imp qt)	1,000 rpm: 6 (6.3, 5.3) 3,000 rpm: 5 (5.3, 4.4)		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)	1,000 rpm: 6 (6.3, 5.3) 3,000 rpm: 5 (5.3, 4.4)	1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)
	Range of revolution	500 — 9,000				500 — 8,000
	Revolving direction	Clockwise				
Working fluid (Power steering system)	Name		ATF DEXRON III or equipment			
	Capacity	Oil tank ℓ (US qt, Imp qt)	0.3 (0.3, 0.3)			
		Total ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)			

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

Model			LHD	RHD	
Steering wheel	Free play	mm (in)	17 (0.67)		
Steering shaft	Clearance between steering wheel and column cover	mm (in)	3.0 (0.118)		
Steering gearbox (Power steering system)	Sliding resistance		304.0 (31.0, 68.4) or less		
	Rack shaft play in radial direction	Right-turn steering	mm (in)	0.15 (0.0059) or less	Horizontal movement: 0.6 (0.024) or less Vertical movement: 0.4 (0.016) or less
		Left-turn steering	mm (in)	Horizontal movement: 0.3 (0.012) or less Vertical movement: 0.15 (0.0059) or less	0.4 (0.016) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less	
		In axial direction	mm (in)	0.1 (0.004) or less	
	Turning resistance		N (kgf, lb)	Within 30 mm (1.18 in) from rack center in straight ahead position: Less than 11.18 (1.14, 2.51) Maximum allowable value: 12.7 (1.3, 2.9)	
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less	
		Axial play	mm (in)	0.6 (0.024) or less	
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less	
		Resistance to rotation	N (kgf, lb)	9.22 (0.94, 2.07) or less	
	Regular pressure		kPa (kg/cm ² , psi)	981 (10, 142) or less	
	Relief pressure		kPa (kg/cm ² , psi)	<Except 3.0 L and Turbo> 9,807 (100, 1,422) <3.0 L and Turbo> 7,846 (80, 1,138)	
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road		N (kgf, lb)	29.4 (3.0, 6.6) or less	
	At standstill with engine stalled on a concrete road		N (kgf, lb)	294.2 (30, 66.2) or less	

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

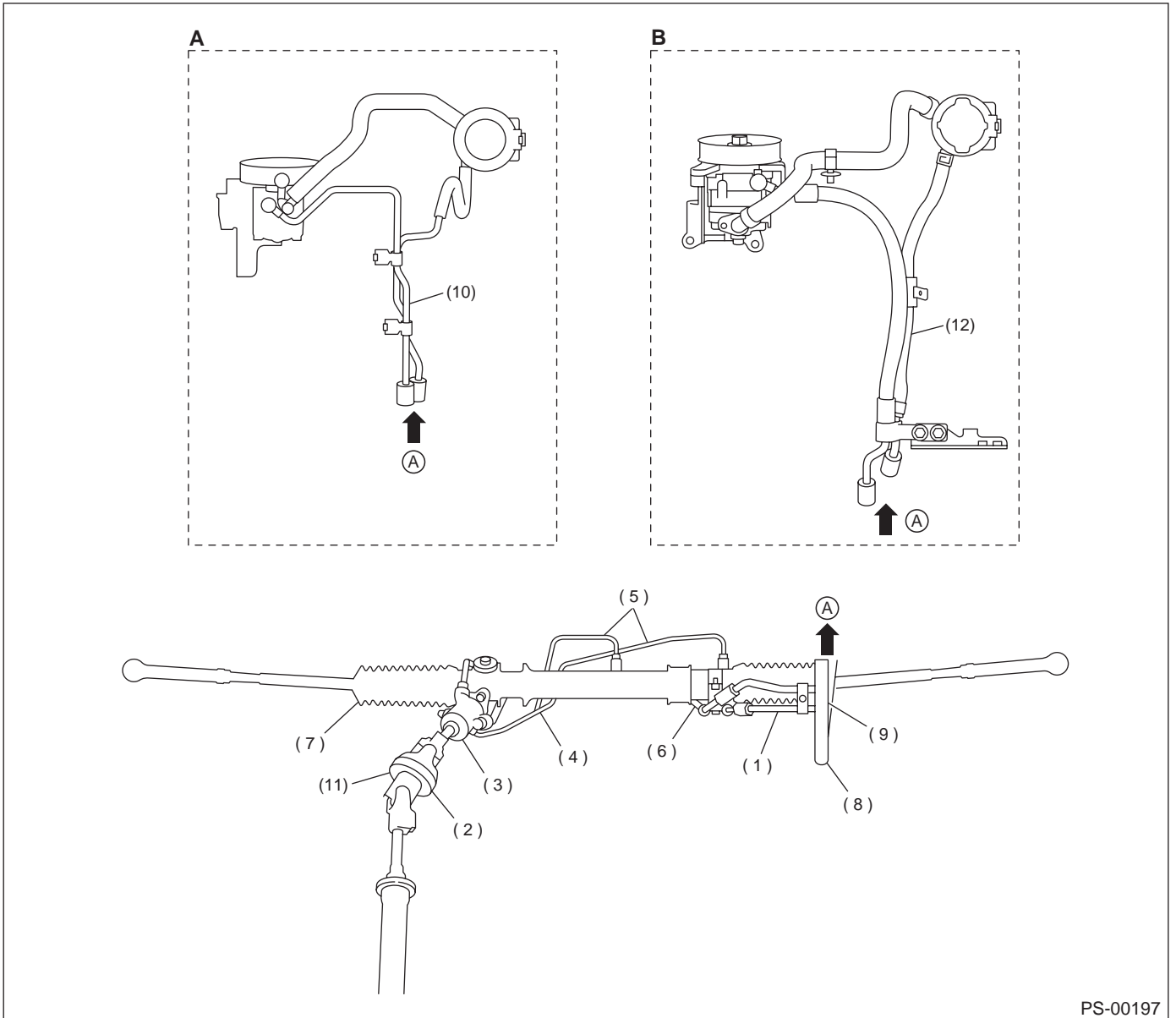
CAUTION:

This table lists various clearances that must be correctly adjusted to ensure normal vehicle driving without interfering noise, or any other faults.

Location	Minimum allowance	
	Except 3.0 L and Turbo model	3.0 L and Turbo model
(1) Crossmember — Pipe	5 mm (0.20 in)	
(2) DOJ — Shaft or joint	14 mm (0.55 in)	
(3) DOJ — Valve housing	11 mm (0.43 in)	
(4) Pipe — Pipe	2 mm (0.08 in)	
(5) Stabilizer — Pipe	5 mm (0.20 in)	
(6) Exhaust pipe — Pipe	15 mm (0.59 in)	
(7) Exhaust pipe — Gearbox boot	15 mm (0.59 in)	
(8) Side frame — Hose A and B	15 mm (0.59 in)	
(9) Cruise control pump — Hose A and B	15 mm (0.59 in)	
(10) Pipe portion of hose A — Pipe portion of hose B	1.5 mm (0.059 in)	—
(11) AT cooling hose — Joint	20 mm (0.79 in)	
(12) Pressure hose — Return hose	—	3.0 mm (0.12 in)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)



PS-00197

(A) Except 3.0 L and Turbo model

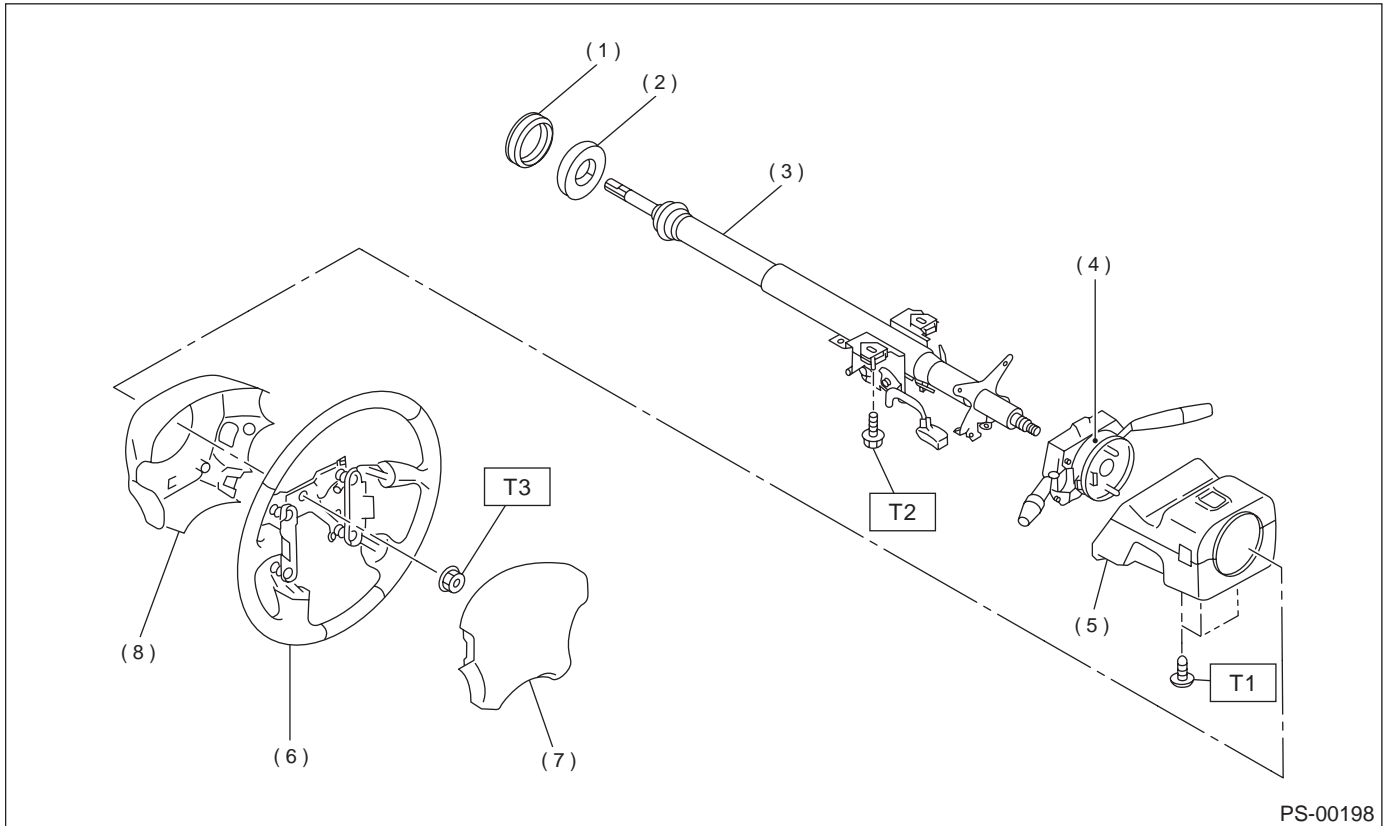
(B) 3.0 L and Turbo model

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

B: COMPONENT

1. STEERING WHEEL AND COLUMN



- (1) Bushing
- (2) Seal
- (3) Steering shaft
- (4) Steering roll connector
- (5) Column cover
- (6) Steering wheel
- (7) Airbag module
- (8) Lower steering wheel cover

Tightening torque: N-m (kgf-m, ft-lb)

T1: 1.2 (0.12, 0.9)

T2: 25 (2.5, 18.1)

T3: 44 (4.5, 32.5)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

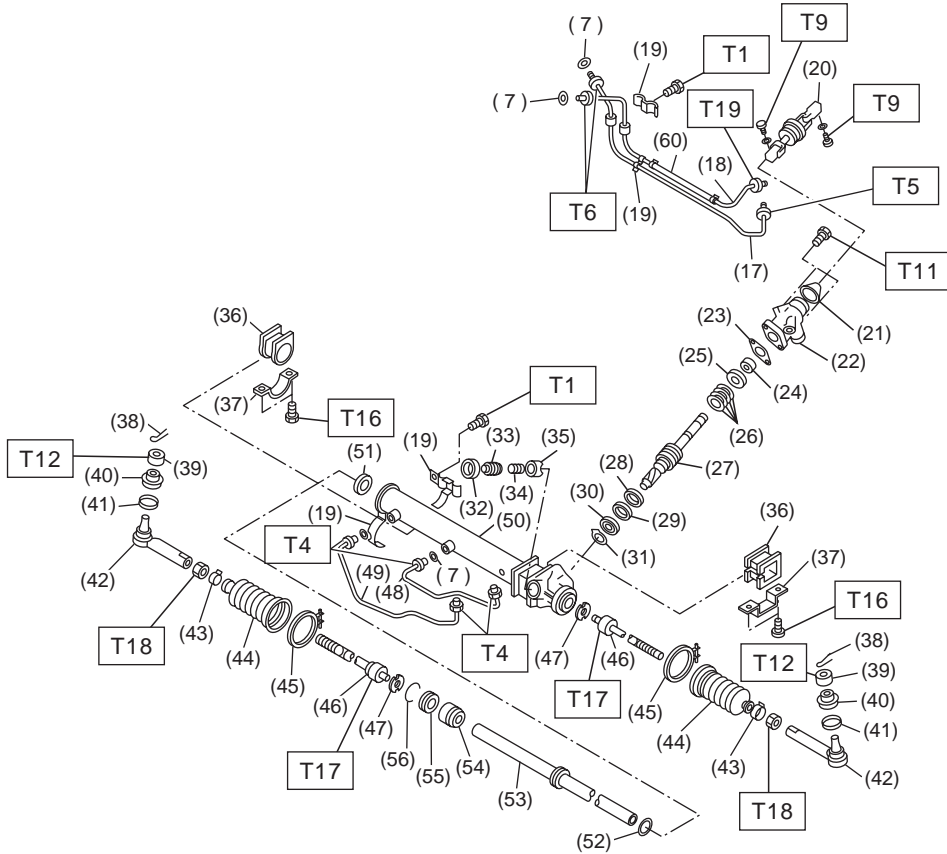
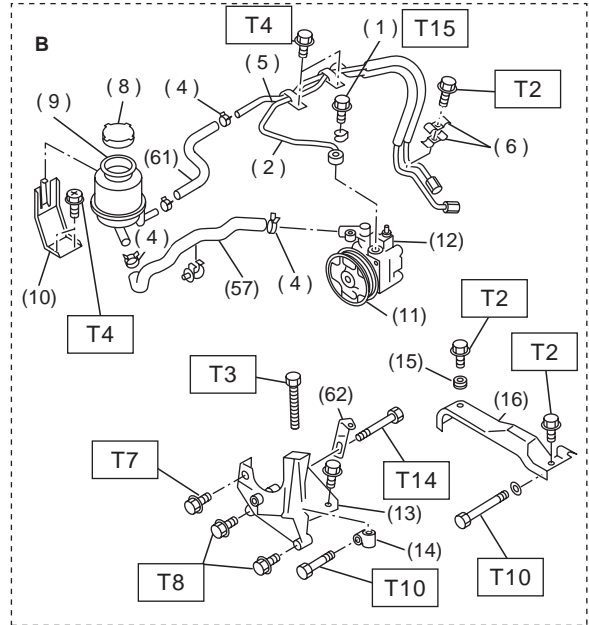
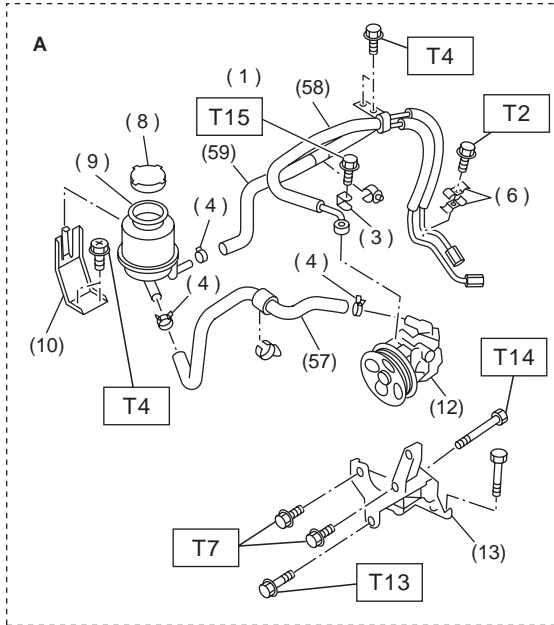
MEMO:

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

2. POWER ASSISTED SYSTEM

• LHD Model



PS-00275

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

A EXCEPT 3.0 L and Turbo model

- (1) Eye bolt
- (2) Pipe C
- (3) Gasket
- (4) Clip
- (5) Pipe D
- (6) Clamp E
- (7) O-ring
- (8) Cap
- (9) Reservoir tank
- (10) Reservoir tank bracket
- (11) Pulley
- (12) Oil pump
- (13) Bracket
- (14) Belt tension nut
- (15) Bushing
- (16) Belt cover
- (17) Pipe E
- (18) Pipe F
- (19) Clamp plate
- (20) Universal joint
- (21) Dust cover
- (22) Valve housing
- (23) Gasket
- (24) Oil seal
- (25) Special bearing
- (26) Seal ring
- (27) Pinion and valve ASSY
- (28) Oil seal

B 3.0 L and Turbo model

- (29) Back-up washer
- (30) Ball bearing
- (31) Snap ring
- (32) Lock nut
- (33) Adjusting screw
- (34) Spring
- (35) Sleeve
- (36) Adapter
- (37) Clamp
- (38) Cotter pin
- (39) Castle nut
- (40) Dust seal
- (41) Clip
- (42) Tie-rod end
- (43) Clip
- (44) Boot
- (45) Band
- (46) Tie-rod
- (47) Lock washer
- (48) Pipe B
- (49) Pipe A
- (50) Steering body
- (51) Oil seal
- (52) Piston ring
- (53) Rack
- (54) Rack bushing
- (55) Rack stopper
- (56) Circlip

- (57) Suction hose
- (58) Pressure hose ASSY
- (59) Return hose ASSY
- (60) Hose
- (61) Return hose
- (62) Harness bracket

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6 (0.6, 4.3)

T2: 7.4 (0.75, 5.4)

T3: 8 (0.8, 5.8)

T4: 13 (1.3, 9.4)

T5: 15 (1.5, 10.8)

T6: 15 (1.5, 10.8)

T7: 15.7 (1.6, 11.6)

T8: 22 (2.2, 15.9)

T9: 24 (2.4, 17.4)

T10: 24.5 (2.5, 18.1)

T11: 25 (2.5, 18.1)

T12: 27 (2.75, 19.9)

T13: 33 (3.4, 25)

T14: 37.3 (3.8, 27.5)

T15: 39 (4.0, 28.9)

T16: 59 (6.0, 43)

T17: 78 (8.0, 58)

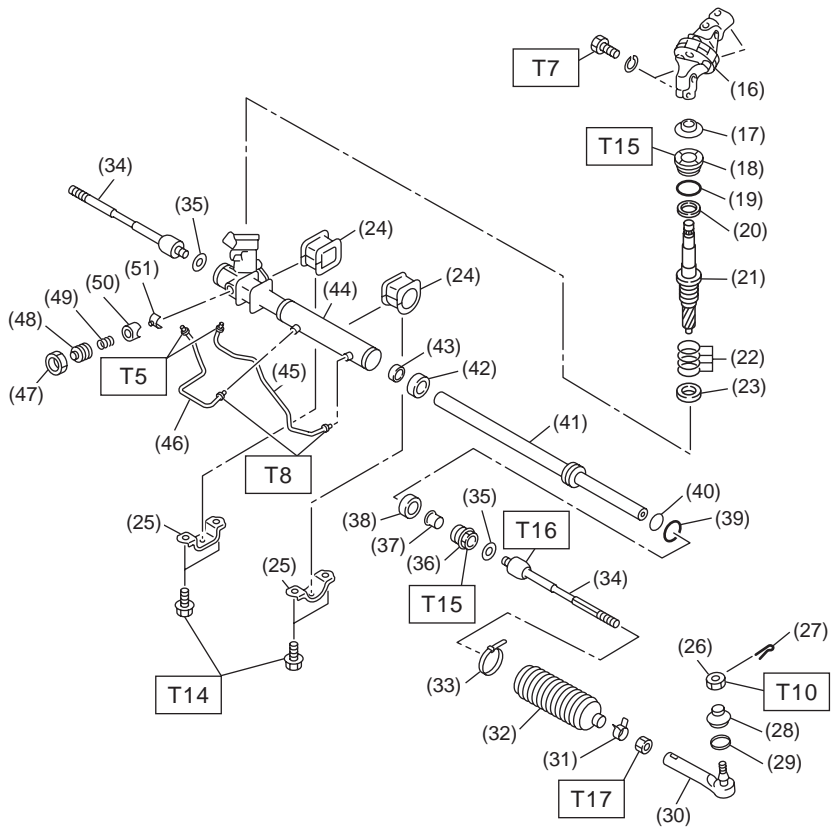
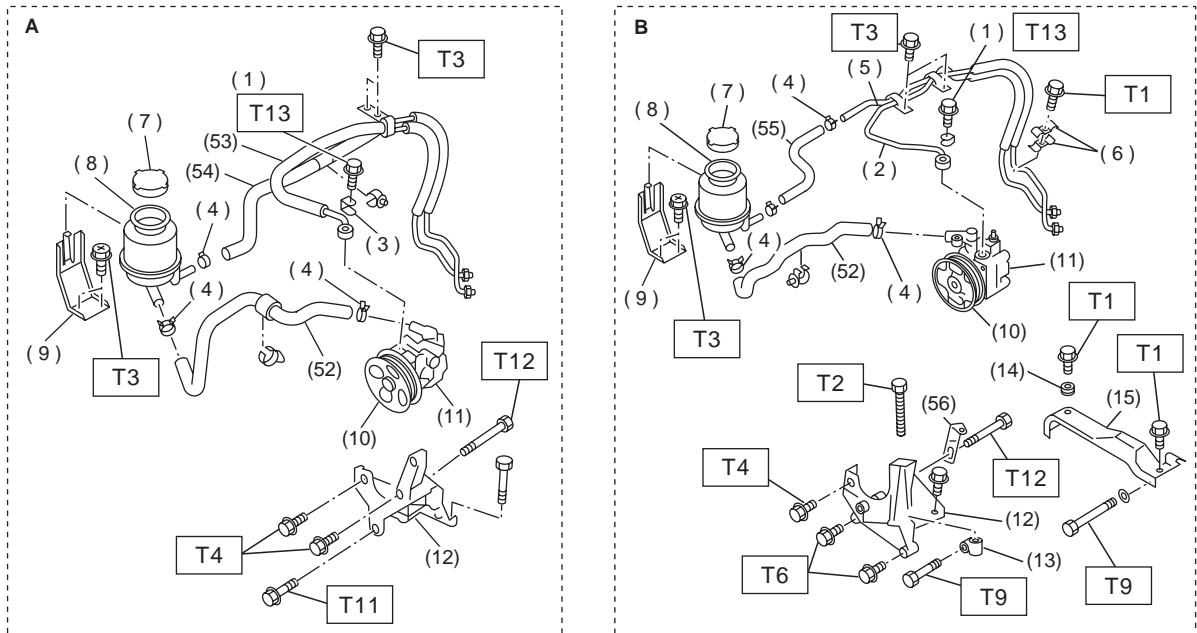
T18: 83 (8.5, 61.5)

T19: 25 (2.5, 18.1)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

• RHD Model



PS-00276

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

A EXCEPT 3.0 L and Turbo model

- (1) Eye bolt
- (2) Pipe C (Pressure pipe ASSY)
- (3) Gasket
- (4) Clip
- (5) Pipe D (Return pipe ASSY)
- (6) Clamp E
- (7) Cap
- (8) Reservoir tank
- (9) Reservoir tank bracket
- (10) Pulley
- (11) Oil pump
- (12) Bracket
- (13) Belt tension nut
- (14) Bushing
- (15) Belt cover
- (16) Universal joint
- (17) Dust cover
- (18) Plug
- (19) O-ring
- (20) Oil seal
- (21) Pinion
- (22) Seal ring
- (23) Oil seal
- (24) Adapter
- (25) Clamp
- (26) Castle nut

B 3.0 L and Turbo model

- (27) Cotter pin
- (28) Dust seal
- (29) Clip
- (30) Tie-rod end
- (31) Clip
- (32) Boot
- (33) Boot band
- (34) Tie-rod
- (35) Lock washer
- (36) Holder
- (37) Bushing
- (38) Oil seal
- (39) Seal ring
- (40) O-ring
- (41) Rack
- (42) Oil seal
- (43) Back-up ring
- (44) Steering body
- (45) Pipe A
- (46) Pipe B
- (47) Lock nut
- (48) Adjusting screw
- (49) Spring
- (50) Sleeve
- (51) Seat pad
- (52) Suction hose

- (53) Pressure hose ASSY
- (54) Return hose ASSY
- (55) Return hose
- (56) Harness bracket

Tightening torque: N-m (kgf-m, ft-lb)

- T1: 7.4 (0.75, 5.4)**
T2: 8 (0.8, 5.8)
T3: 13 (1.3, 9.4)
T4: 15.7 (1.6, 11.6)
T5: 20 (2.0, 14.5)
T6: 22 (2.2, 15.9)
T7: 24 (2.4, 17.4)
T8: 24 (2.4, 17.4)
T9: 24.5 (2.50, 18.1)
T10: 27.0 (2.75, 19.9)
T11: 33 (3.4, 25)
T12: 37.3 (3.8, 27.5)
T13: 39 (4.0, 28.9)
T14: 59 (6.0, 43)
T15: 64 (6.5, 47)
T16: 78 (8.0, 58)
T17: 83 (8.5, 61.5)
-

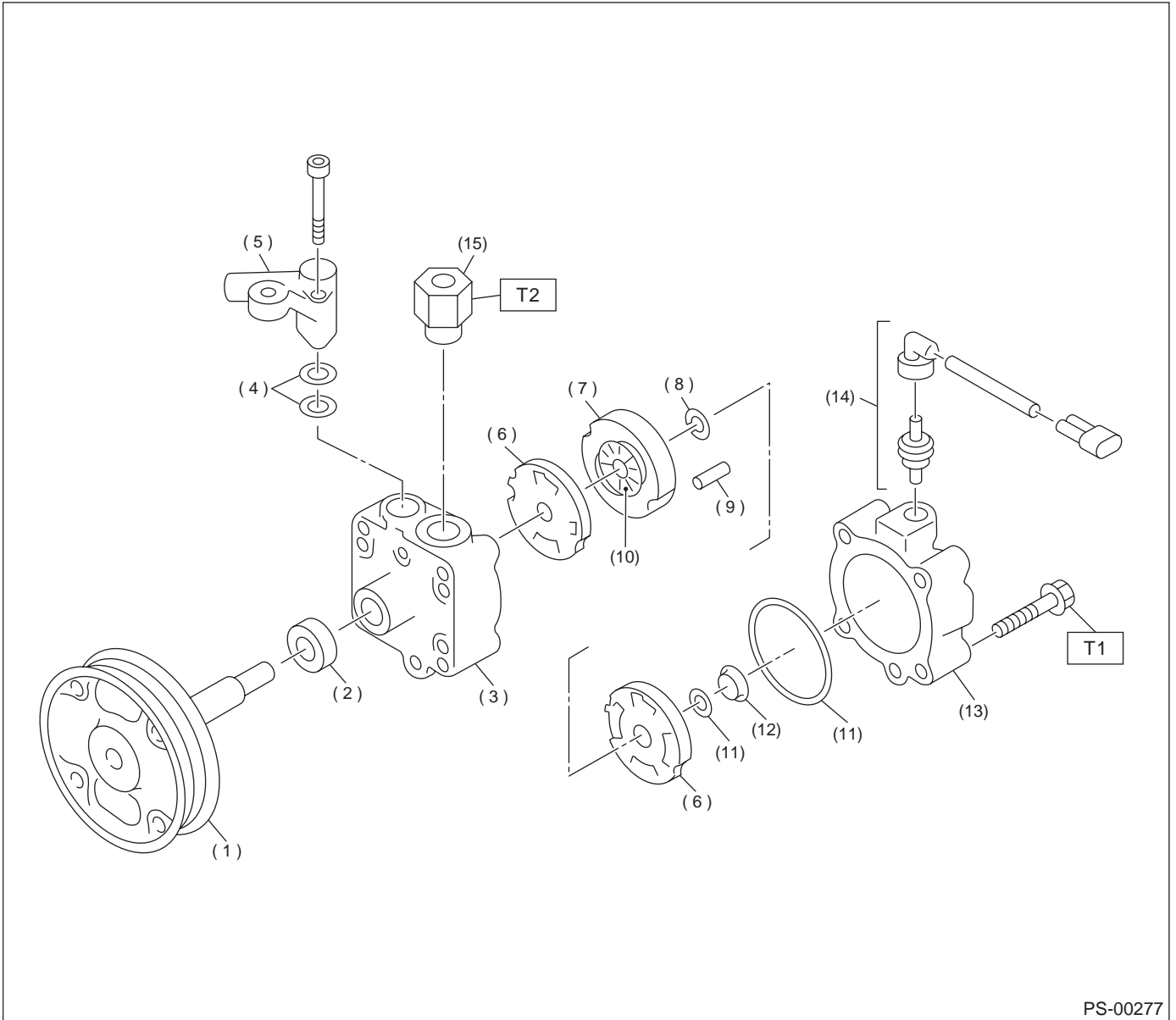
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

3. OIL PUMP

NOTE:

The illustration except for 3.0 L and Turbo model is shown below. (Not shown for 3.0 L and Turbo model because it cannot be disassembled.)



PS-00277

- (1) Pulley
- (2) Oil seal
- (3) Front casing
- (4) O-ring
- (5) Socket
- (6) Pressure plate

- (7) Cam ring
- (8) Circlip
- (9) Straight pin
- (10) Rotor
- (11) O-ring
- (12) Seal ring

- (13) Rear body
- (14) Pressure switch
- (15) Connector

Tightening torque: N-m (kgf-m, ft-lb)

T1: 27.5 (2.8, 20.3)

T2: 63.5 (6.48, 47)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

C: CAUTION

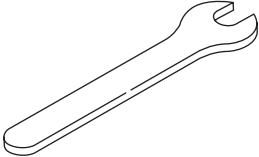
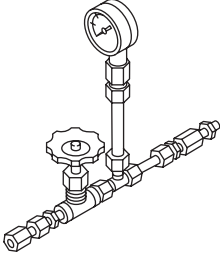
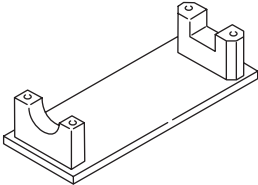
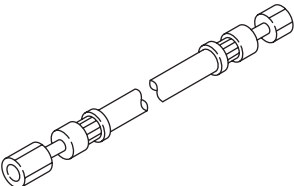
- This section includes Airbag related repair works. For those corresponding to the repair procedures, read carefully CAUTION items in AB section before working and be sure to follow the instructions.
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine steering fluid, grease etc. or the equivalent. Do not mix steering fluid, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply steering fluid onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of steering fluid to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

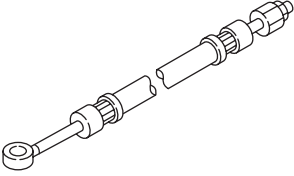
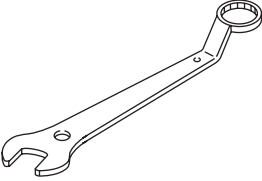
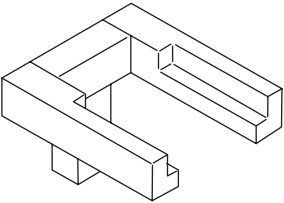
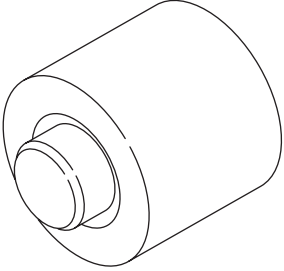
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925700000	925700000	WRENCH	<ul style="list-style-type: none">Used for removing and installing tie-rod.Apply this tool to rack.
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

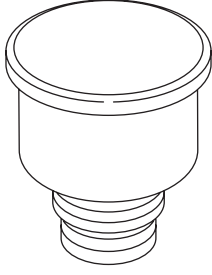
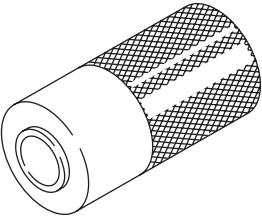
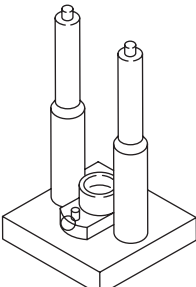
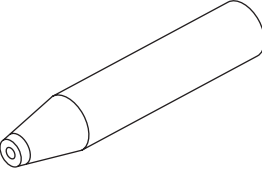
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST34099AC020</p>	<p style="text-align: center;">34099AC020</p>	<p>ADAPTER HOSE B</p>	<p>Used with PRESSURE GAUGE (925711000).</p>
 <p style="text-align: center;">ST-926230000</p>	<p style="text-align: center;">926230000</p>	<p>SPANNER</p>	<ul style="list-style-type: none"> • For the lock nut when adjusting backlash of gearbox. • Measurement of rotating resistance of gearbox assembly.
 <p style="text-align: center;">ST34199AE020</p>	<p style="text-align: center;">34199AE020</p>	<p>MOUNT</p>	<p>Used for disassembling oil pump.</p>
 <p style="text-align: center;">ST34199AE030</p>	<p style="text-align: center;">34199AE030</p>	<p>INSTALLER</p>	<p>Used for installing oil seal into oil pump.</p>

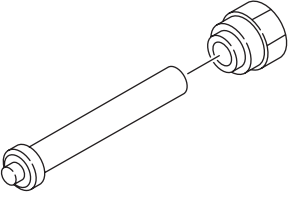
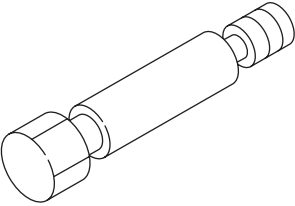
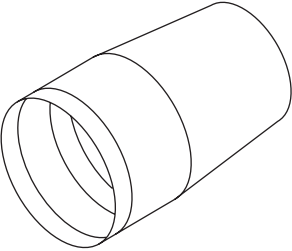
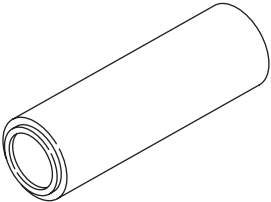
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST34199AE040</p>	<p style="text-align: center;">34199AE040</p>	<p>OIL CHARGE GUIDE</p>	<p>Used for charging power steering oil.</p>
 <p style="text-align: center;">ST-927640000</p>	<p style="text-align: center;">927640000</p>	<p>INSTALLER B</p>	<p>Used for installing ball bearing into housing.</p>
 <p style="text-align: center;">ST-926370000</p>	<p style="text-align: center;">926370000</p>	<p>INSTALLER A</p>	<ul style="list-style-type: none"> • Used for installing valve assembly into valve housing assembly. • Used with STAND BASE (927630000).
 <p style="text-align: center;">ST-926390001</p>	<p style="text-align: center;">926390001</p>	<p>COVER & REMOVER ASSY</p>	<p>Used for assembling rack assembly.</p>

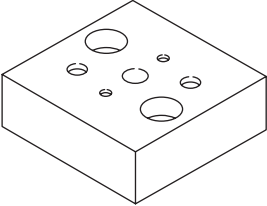
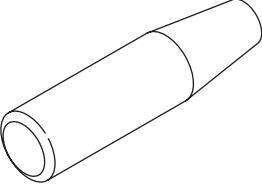
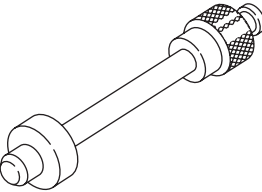
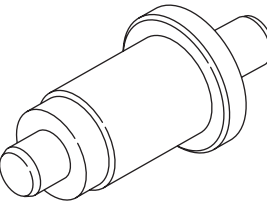
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-926420000</p>	926420000	PLUG	<p>When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.</p>
 <p style="text-align: center;">ST-926400000</p>	926400000	GUIDE	<ul style="list-style-type: none"> • Right side of rack when installing rack bushing. • Used with GUIDE (927660000).
 <p style="text-align: center;">ST-927660000</p>	927660000	GUIDE	<ul style="list-style-type: none"> • Right side of rack when installing rack bushing. • Used with GUIDE (926400000).
 <p style="text-align: center;">ST-927620000</p>	927620000	INSTALLER B	<ul style="list-style-type: none"> • Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).

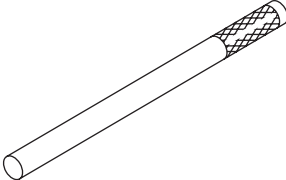
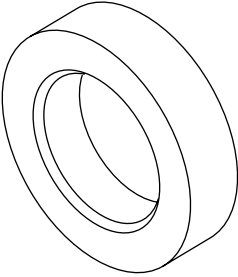
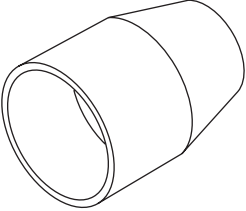
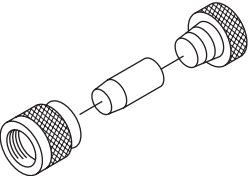
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST34099FA100</p>	<p style="text-align: center;">34099FA100</p>	<p style="text-align: center;">STAND BASE</p>	<p>Used for assembling power steering gearbox.</p>
 <p style="text-align: center;">ST-926360000</p>	<p style="text-align: center;">926360000</p>	<p style="text-align: center;">INSTALLER A</p>	<ul style="list-style-type: none"> • Used as a guide to install oil seal. • Used with INSTALLER B (927620000).
 <p style="text-align: center;">ST34199AE060</p>	<p style="text-align: center;">34199AE060</p>	<p style="text-align: center;">INSTALLER</p>	<p>Used for installing oil seal.</p>
 <p style="text-align: center;">ST34099FA120</p>	<p style="text-align: center;">34099FA120</p>	<p style="text-align: center;">INSTALLER & REMOVER SEAL</p>	<ul style="list-style-type: none"> • Used for installing valve housing oil seal. • Used with INSTALLER SEAL. (34099FA130) • Used for installing valve housing ball bearing. • Used for removing oil seal and ball bearing from valve housing.

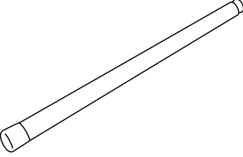
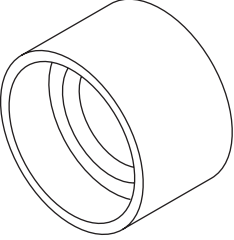
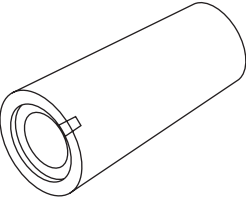
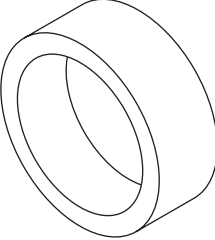
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST34199AE050</p>	34199AE050	REMOVER OIL SEAL	Used for removing back-up ring and oil seal.
 <p>ST34099FA130</p>	34099FA130	INSTALLER SEAL	<ul style="list-style-type: none"> • Used for installing valve housing oil seal. • Used with INSTALLER AND REMOVER SEAL (34099FA120).
 <p>ST-926250000</p>	926250000	GUIDE	Used for installing holder ASSY into rack housing.
 <p>ST-927490000</p>	927490000	INSTALLER A, B, C	Used for installing oil seal into rack ASSY.

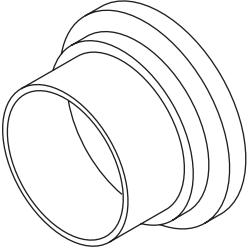
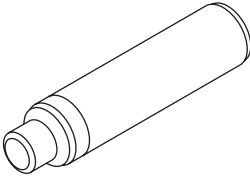
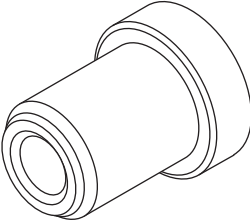
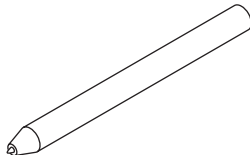
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927580000</p>	927580000	REMOVER	Used for removing back-up ring and oil seal.
 <p style="text-align: center;">ST-927520000</p>	927520000	INSTALLER D	Used for installing pinion bearing.
 <p style="text-align: center;">ST-927530000</p>	927530000	INSTALLER E	Used for installing pinion bearing.
 <p style="text-align: center;">ST-927570000</p>	927570000	SPACER	Used for installing pinion oil seal.

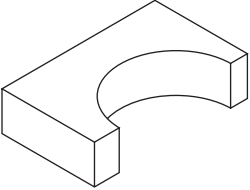
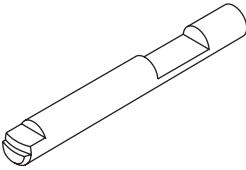
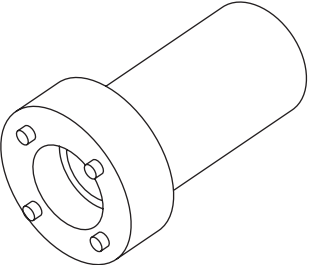
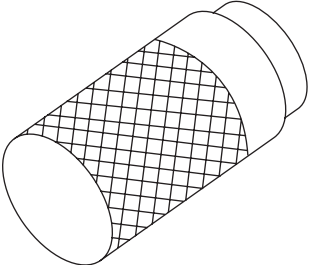
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE000	34199AE000	RACK OIL SEAL GUIDE	Used for installing rack and seal into housing assembly.
 ST34099FA030	34099FA030	INSTALLER & REMOVER	Used for removing and installing rack oil seal (outer & inner).
 ST34199AE010	34199AE010	INSTALLER	Used for installing rack oil seal (outer).
 ST34099FA060	34099FA060	PUNCH	Used for caulking.

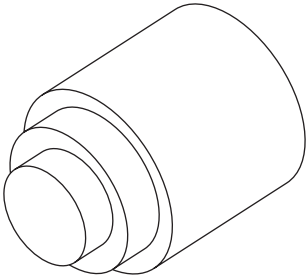
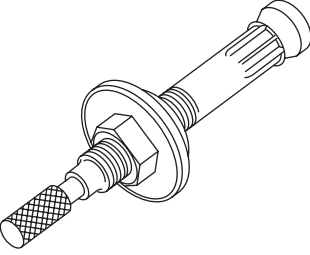
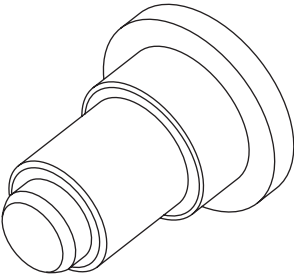
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST34099FA070</p>	34099FA070	BASE	Used for supporting housing assembly.
 <p style="text-align: center;">ST34099FA080</p>	34099FA080	PUNCH	Used for removing caulking.
 <p style="text-align: center;">ST34199AE090</p>	34199AE090	PLUG WRENCH	Used for removing plug.
 <p style="text-align: center;">ST34199AE100</p>	34199AE100	PLUG OIL SEAL REMOVER	Used for removing plug oil seal.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE110	34199AE110	PLUG OIL SEAL INSTALLER	Used for installing plug oil seal.
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	Used for removing gearbox oil seal.
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	Used for installing gearbox oil seal.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Spring scale	Used for measuring tightening torque.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring steering gearbox.

STEERING WHEEL

POWER ASSISTED SYSTEM (POWER STEERING)

2. Steering Wheel

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Set tires to straight-ahead position.
- 3) Remove airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

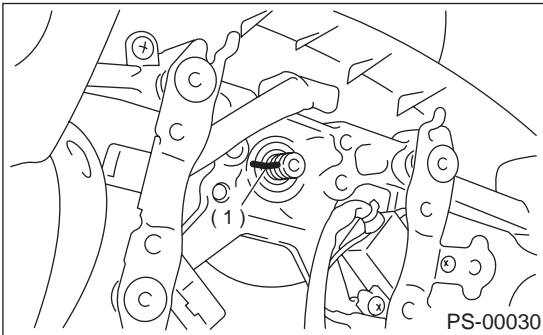
WARNING:

Always refer to “Airbag System” before performing airbag module service (if so equipped). <Ref. to AB-12, INSPECTION, Driver's Airbag Module.>

- 4) Remove steering wheel nut, and then draw out steering wheel from shaft using steering puller.

NOTE:

Make matching marks on steering wheel and steering column in advance.



(1) Matching mark

B: INSTALLATION

- 1) Align center of roll connector. <Ref. to AB-19, ADJUSTMENT, Roll Connector.>
- 2) Install in the reverse order of removal.

NOTE:

Align matching marks on steering wheel and steering column.

Tightening torque:

4.5 N·m (4.5 kgf-m, 32.5 ft-lb)

Column cover-to-steering wheel clearance:

2 — 4 mm (0.08 — 0.16 in)

WARNING:

Always refer to “Airbag System” before performing airbag module service (if so equipped). <Ref. to AB-12, INSPECTION, Driver's Airbag Module.>

CAUTION:

Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

C: INSPECTION

- 1) Check steering wheel for deformation. If the deformation is excessive, replace steering wheel.
- 2) Check splines on steering wheel for damage. If the damage is excessive, replace steering wheel.

UNIVERSAL JOINT

POWER ASSISTED SYSTEM (POWER STEERING)

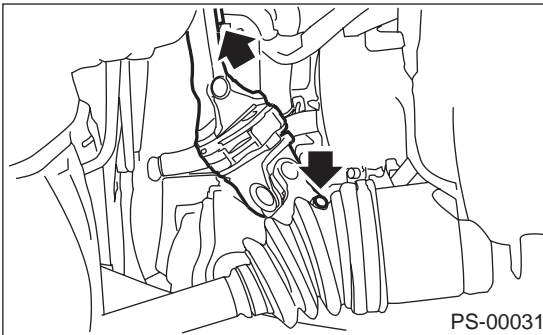
3. Universal Joint

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the steering wheel. <Ref. to PS-24, REMOVAL, Steering Wheel.>
- 3) Lift-up the vehicle.
- 4) Remove universal joint bolts and then remove universal joint.

CAUTION:

Scribe alignment marks on universal joint so that it can be reassembled at the original serration.



B: INSTALLATION

- 1) Install universal joint.
 - (1) Align bolts hole on the long yoke side of universal joint with the cutout at the serrated section of shaft end, and insert universal joint.
 - (2) Align bolt hole on the short yoke side of universal joint with the cutout at the serrated section of gearbox assembly. Lower universal joint completely.
 - (3) Temporarily tighten bolt on the short yoke side. Raise universal joint to make sure the bolt is properly passing through the cutout at the serrated section.
 - (4) Tighten bolt on the long yoke, then that on the short yoke side.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:

- Make sure that universal joint bolt is tightened through notch in shaft serration.
- Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:

Over 15 mm (0.59 in)

- 2) Lower the vehicle.

- 3) Align center of roll connector. <Ref. to AB-19, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure that front wheel are set straight forward direction.

- 4) Install steering wheel and airbag module. <Ref. to PS-24, INSTALLATION, Steering Wheel.>

WARNING:

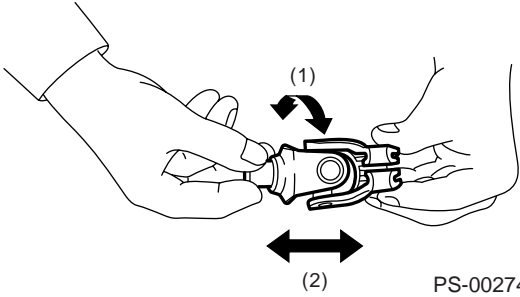
Always refer to “Airbag System” before performing airbag module service (if so equipped). <Ref. to AB-12, INSPECTION, Driver's Airbag Module.> and <Ref. to AB-12, INSTALLATION, Driver's Airbag Module.>

UNIVERSAL JOINT

POWER ASSISTED SYSTEM (POWER STEERING)

C: INSPECTION

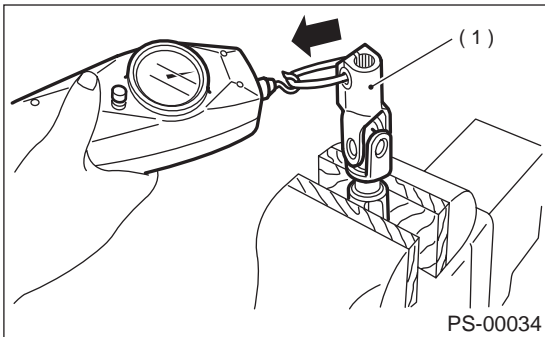
Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

Inspection	Corrective action
<p>(1) Free play (2) Swinging torque Yawing torque Looseness</p>  <p>Standard value of universal joint free play: 0 mm (0 in) Max. value of universal joint swinging torque: 0.3 N·m (0.03 kgf·m, 0.2 ft·lb)</p>	<p>Replace if faulty.</p>

Measurement of folding torque of universal joint is as shown in the figures.

Service limit:

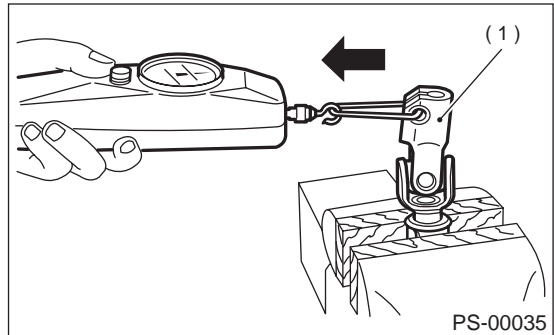
Maximum load; 5.49 N (0.56 kgf, 1.23 lb) or less



(1) Long yoke

Service limit:

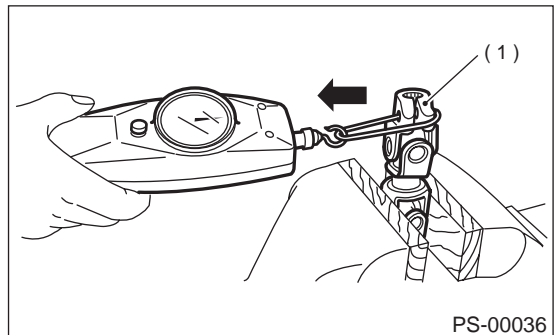
Maximum load; 5.49 N (0.56 kgf, 1.23 lb) or less



(1) Long yoke

Service limit:

Maximum load; 8.43 N (0.86 kgf, 1.90 lb) or less



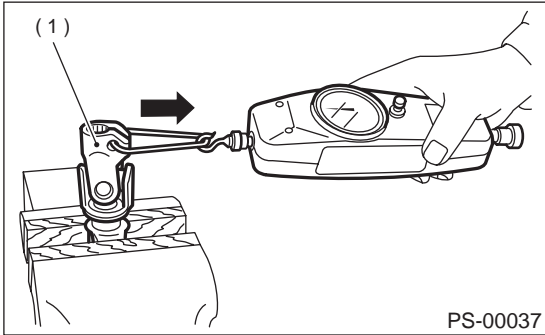
(1) Short yoke

UNIVERSAL JOINT

POWER ASSISTED SYSTEM (POWER STEERING)

Service limit:

Maximum load; 8.43 N (0.86 kgf, 1.90 lb) or less



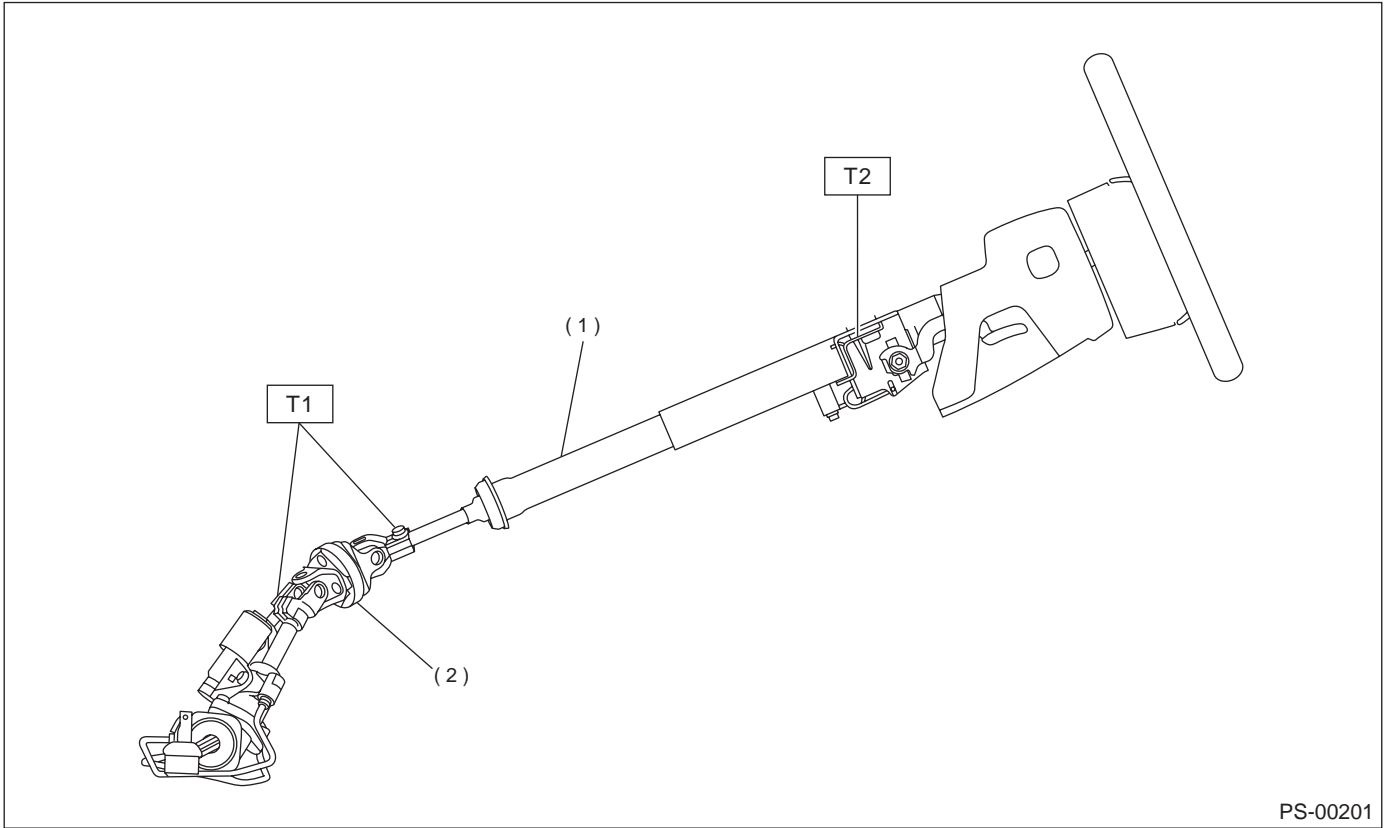
(1) Short yoke

TILT STEERING COLUMN

POWER ASSISTED SYSTEM (POWER STEERING)

4. Tilt Steering Column

A: REMOVAL



PS-00201

- (1) Tilt steering column
- (2) Universal joint

Tightening torque: N·m (kgf-m, ft-lb)

T1: 24 (2.4, 17.4)

T2: 25 (2.5, 18.1)

TILT STEERING COLUMN

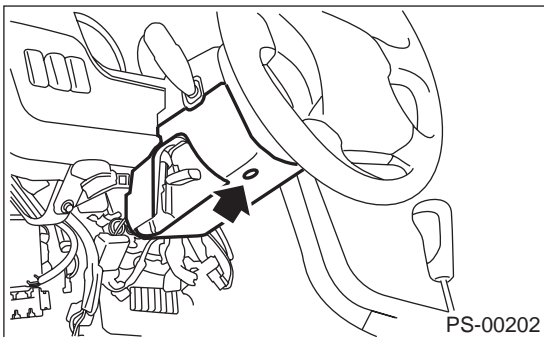
POWER ASSISTED SYSTEM (POWER STEERING)

- 1) Set the vehicle on the lift.
- 2) Disconnect battery minus ground cable.
- 3) Remove airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

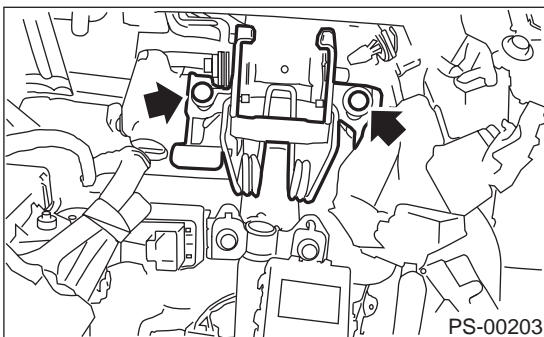
WARNING:

Always refer to "Airbag System" before performing airbag module service (if so equipped). <Ref. to AB-12, INSPECTION, Driver's Airbag Module.>

- 4) Remove steering wheel. <Ref. to PS-24, REMOVAL, Steering Wheel.>
- 5) Lift-up the vehicle.
- 6) Remove universal joint. <Ref. to PS-25, REMOVAL, Universal Joint.>
- 7) Lower the vehicle.
- 8) Remove trim panel under instrument panel.
- 9) Remove the screw securing lower steering column cover.



- 10) Remove all connectors from steering column.
- 11) Remove the two bolts under instrument panel securing steering column.



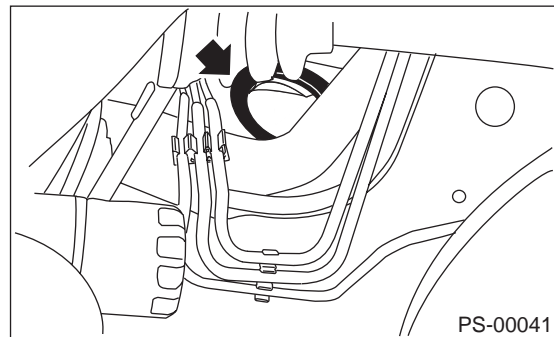
- 12) Pull out steering shaft assembly from hole on toe board.

CAUTION:

Be sure to remove universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing of other parts.

B: INSTALLATION

- 1) Set grommet to toe board.



- 2) Insert end of steering shaft into toe board grommet.
- 3) Tighten steering shaft mounting bolts under instrument panel.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

- 4) Connect all connectors under instrument panel.
- 5) Connect airbag system connector at harness spool.

NOTE:

Make sure to apply double lock.

- 6) Install lower column cover with tilt lever held in the lowered position.
- 7) Install universal joint. <Ref. to PS-25, INSTALLATION, Universal Joint.>
- 8) Align center of roll connector. <Ref. to AB-19, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure that front wheels are set in straight forward direction.

- 9) Install steering wheel. <Ref. to PS-24, INSTALLATION, Steering Wheel.>
Set steering wheel to neutral and install it onto steering shaft.

CAUTION:

Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

- 10) Install airbag module to steering wheel.

WARNING:

Always refer to "Airbag System" before performing the service operation. <Ref. to AB-12, INSPECTION, Driver's Airbag Module.>

TILT STEERING COLUMN

POWER ASSISTED SYSTEM (POWER STEERING)

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and the two screws securing combination switch, then remove related parts.

D: ASSEMBLY

1) Insert combination switch to upper column shaft, and install upper column cover. Then route ignition key harness and combination switch harness between column cover mounting bosses.

Tightening torque:

1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

CAUTION:

Don't overtorque screw.

E: INSPECTION

1. BASIC INSPECTION

Measure overall length of steering column and if it is out of standard value, replace it.

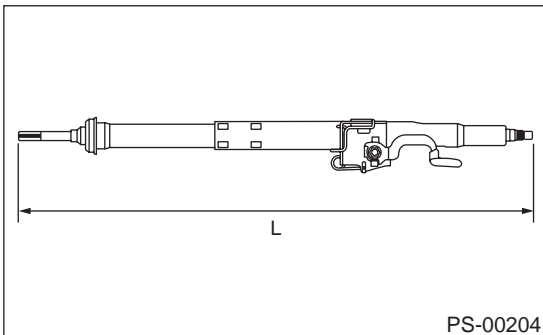
Standard value:

Overall length (L)

Except OUTBACK model: $849^{+1.5}/_{-0.5}$ mm

($33.425^{+0.059}/_{-0.020}$ in)

OUTBACK model: $817^{+1.5}/_{-0.5}$ mm ($32.197^{+0.059}/_{-0.020}$ in)



2. AIRBAG MODEL INSPECTION

WARNING:

For airbag model inspection procedures, refer to "Airbag System". <Ref. to AB-12, INSPECTION, Driver's Airbag Module.>

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

5. Steering Gearbox [LHD MODEL]

A: REMOVAL

- 1) Disconnect battery ground cable.
- 2) Loosen front wheel nut.
- 3) Lift vehicle and remove front wheels.
- 4) Remove front exhaust pipe assembly.

2.5 L model

<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>

3.0 L model

<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>

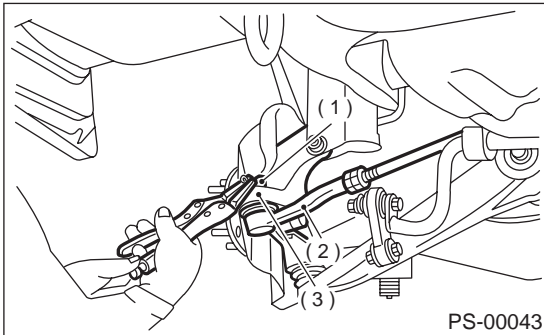
Turbo model

<Ref. to EX(H4DOSTC)-5, REMOVAL, Front Exhaust Pipe.>

WARNING:

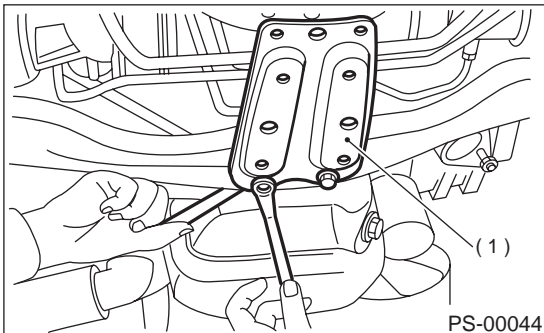
Be careful, exhaust pipe is hot.

- 5) Using a puller, remove tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



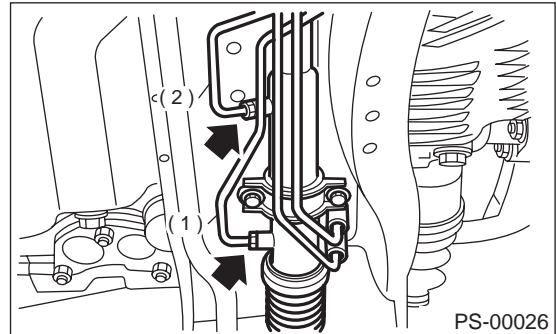
- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

- 6) Remove jack-up plate and front stabilizer. <Ref. to FS-21, REMOVAL, Front Stabilizer.>



- (1) Jack-up plate

- 7) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



- (1) Pipe A
- (2) Pipe B

- 8) Remove universal joint. <Ref. to PS-25, REMOVAL, Universal Joint.>

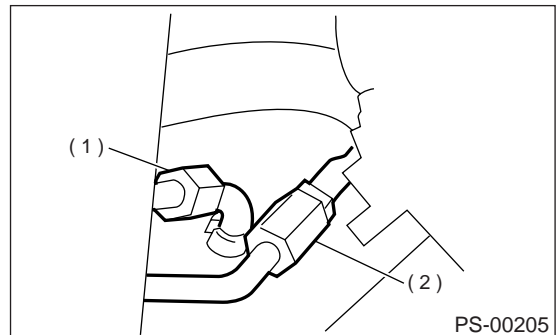
- 9) Disconnect pipes C (Pressure pipe assembly) and D (Return pipe assembly) from pipe of gearbox.

CAUTION:

Be careful not to damage these pipes.

NOTE:

Disconnect upper pipe D (Return hose assembly) first, and lower pipe C (Pressure hose assembly) second.

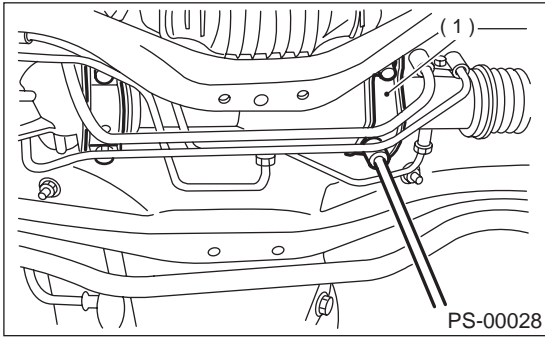


- (1) Pipe C
- (2) Pipe D

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

10) Remove clamp bolts securing gearbox to crossmember, and remove gearbox.



(1) Clamp

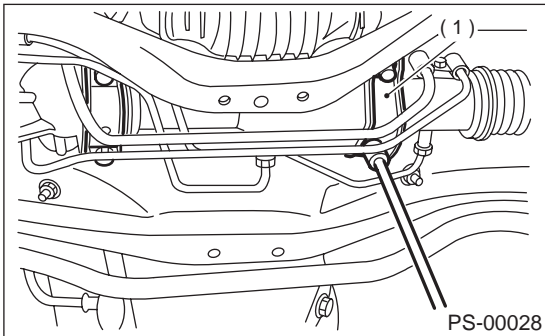
B: INSTALLATION

1) Insert gearbox into crossmember, being careful not to damage gearbox boot.

2) Tighten gearbox to crossmember bracket via clamp with bolt to the specified torque.

Tightening torque:

59 N·m (6.0 kgf-m, 43 ft-lb)



(1) Clamp

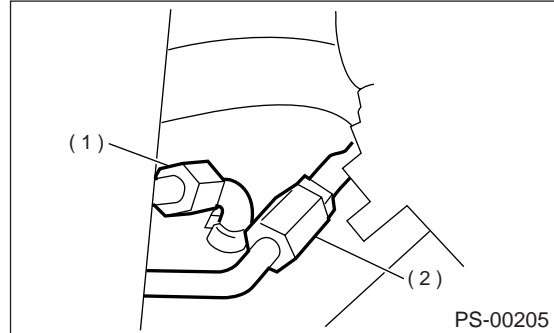
3) Connect pipes C and D to pipe of gearbox.

NOTE:

Connect lower pipe C first, and upper pipe D second.

CAUTION:

Be careful not to damage these pipes.



(1) Pipe C

(2) Pipe D

4) Install universal joint. <Ref. to PS-25, INSTALLATION, Universal Joint.>

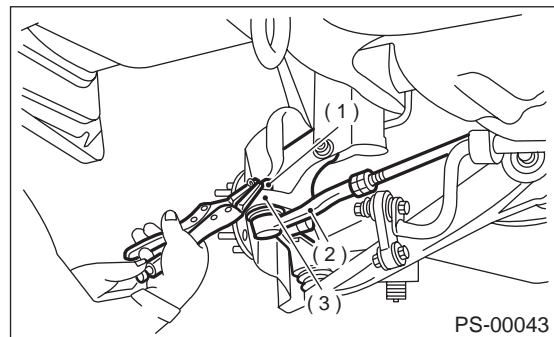
5) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

Castle nut tightening torque:

Tighten to 27.0 N·m (2.75 kgf-m, 19.9 ft-lb), and tighten further within 60° until cotter pin hole is aligned with a slot in the nut.

CAUTION:

When connecting, do not hit cap at the bottom of tie-rod end with hammer.



(1) Castle nut

(2) Tie-rod end

(3) Knuckle arm

6) Install front stabilizer to vehicle. <Ref. to FS-21, INSTALLATION, Front Stabilizer.>

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

7) Install front exhaust pipe assembly. <Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

2.5 L model

<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

3.0 L model

<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>

Turbo model

<Ref. to EX(H4DOSTC)-5, INSTALLATION, Front Exhaust Pipe.>

8) Install tires.

9) Tighten wheel nuts to the specified torque.

Tightening torque:

88 N·m (9.0 kgf-m, 65 ft-lb)

10) Connect battery ground cable.

11) Pour fluid into oil tank, and bleed air.

<Ref. to PS-92, Power Steering Fluid.>

12) Check for fluid leaks. <Ref. to PS-49, OIL LEAKING, INSPECTION, Steering Gearbox [LHD MODEL].>

13) Install jack-up plate.

14) Lower vehicle.

15) Check fluid level in oil tank.

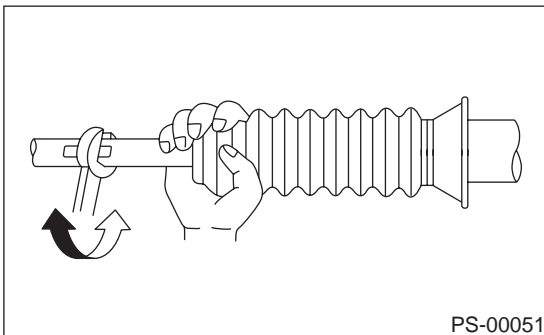
16) After adjusting toe-in and steering angle, tighten lock nut on tie-rod end.

Tightening torque:

83 N·m (8.5 kgf-m, 61.5 ft-lb)

CAUTION:

When adjusting toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

1. RACK HOUSING ASSEMBLY

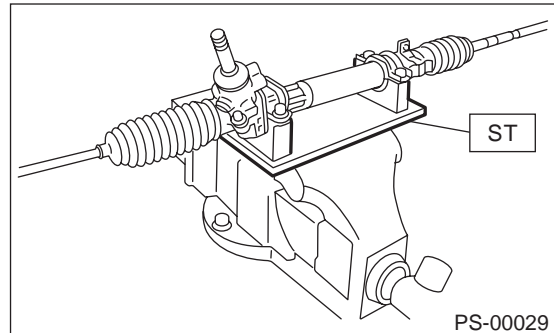
1) Disconnect four pipes from gearbox.

2) Secure gearbox removed from vehicle in vise using ST.

ST 92620000 STAND

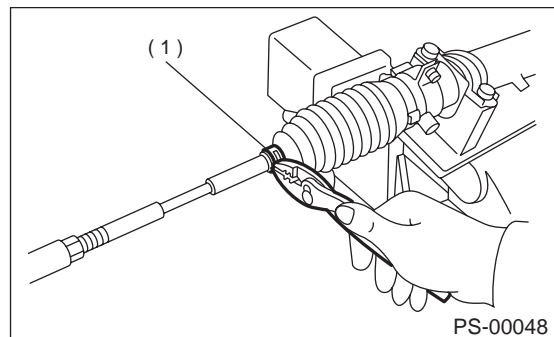
CAUTION:

Secure the gearbox in a vise using the ST as shown. Do not attempt to secure it without this ST.



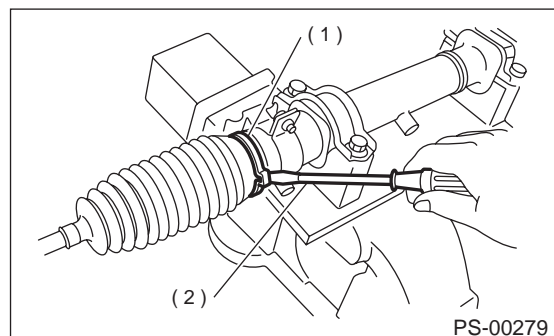
3) Remove tie-rod end and lock nut from gearbox.

4) Remove small clip from boot using pliers, and move boot to tie-rod end side.



(1) Clip

5) Using standard screwdriver, remove band from boot.



(1) Band

(2) Standard screwdriver

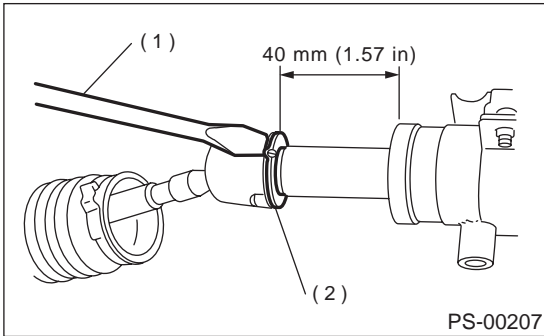
STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6) Extend rack approximately 40 mm (1.57 in) out. Unlock lock wire at lock washer on each side of tie-rod end using a standard screwdriver.

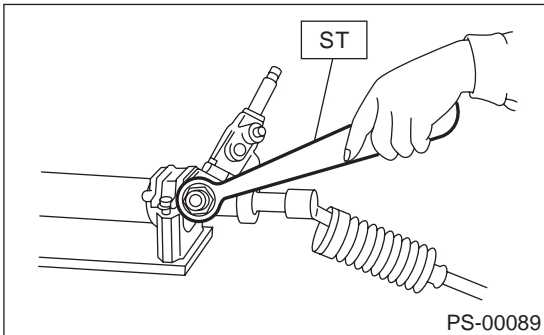
CAUTION:

Be careful not to scratch rack surface as oil leaks may result.

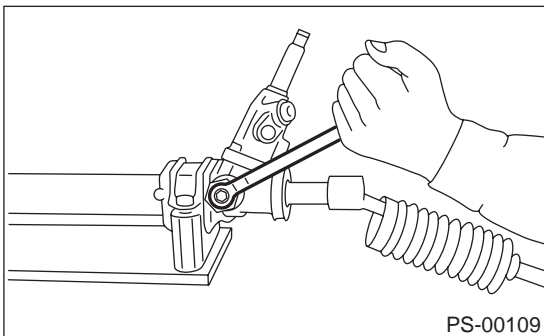


- (1) Standard screwdriver
- (2) Lock washer

7) Using ST, loosen lock nut.
ST 926230000 SPANNER



8) Tighten adjusting screw until it no longer tightens.

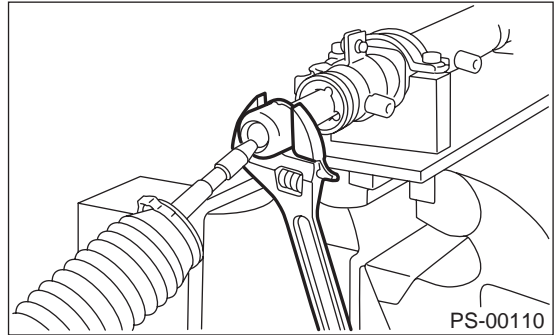


9) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove tie-rod.

CAUTION:

• Check ball joint for free play, and tie-rod for bends. Replace if necessary.

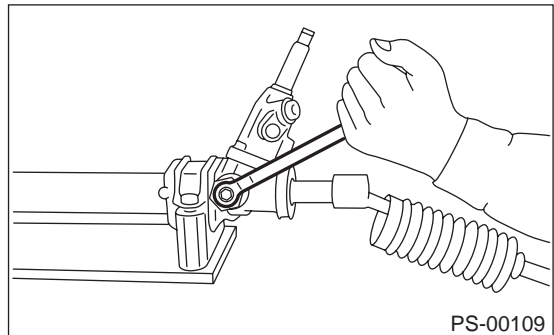
• Check dust seals used with tie-rod end ball joint for damage or deterioration. Replace if necessary.



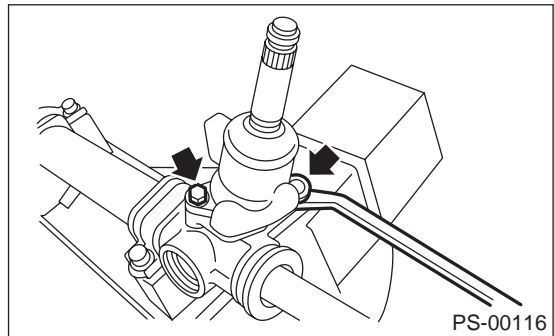
10) Loosen adjusting screw and remove spring and sleeve.

CAUTION:

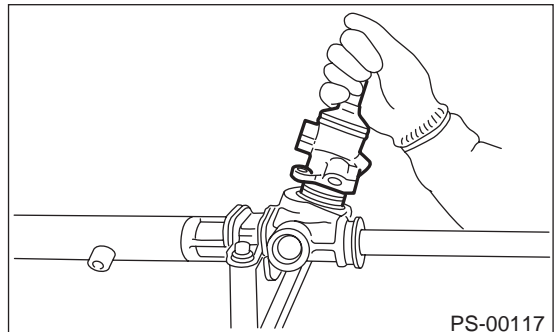
Replace spring and/or sleeve if damaged.



11) Remove two bolts securing valve assembly.



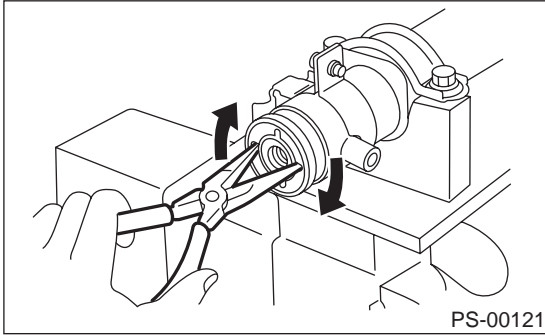
12) Carefully draw out input shaft and remove valve assembly.



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

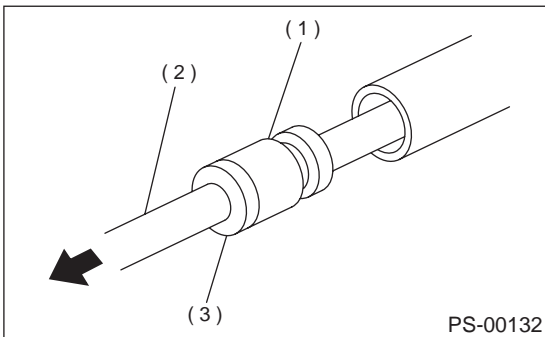
13) Using a sharp pointed pliers, rotate the rack stopper in the direction of the arrow until the end of the circlip comes out of the stopper. Rotate the circlip in the opposite direction and pull it out.



14) Pull rack assembly from cylinder side, and draw out rack bushing and rack stopper together with rack assembly.

CAUTION:

Be careful not to contact rack to inner wall of cylinder when drawing out. Any scratch on cylinder inner wall will cause oil leakage.



- (1) Rack bushing
- (2) Rack ASSY
- (3) Rack stopper

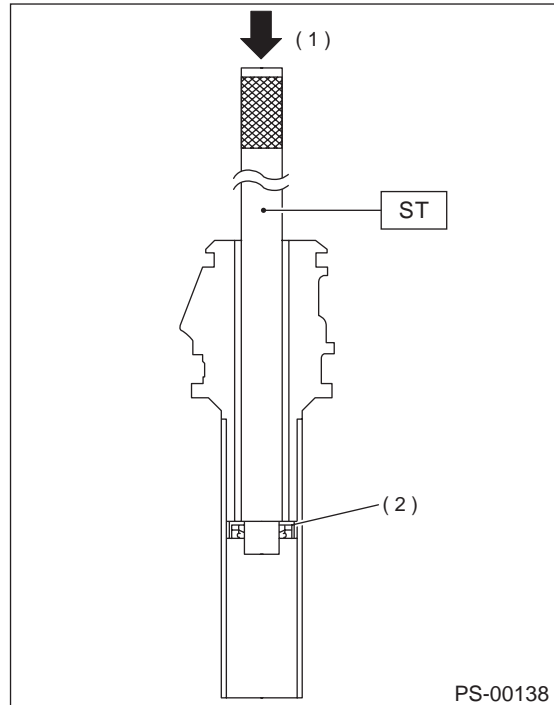
15) Remove rack bushing and rack stopper from rack assembly.

CAUTION:

Do not reuse removed rack bushing and circlip.

16) Insert ST from pinion housing side and remove oil seal using a press.

ST 34199AE050 OIL SEAL REMOVER



- (1) Press
- (2) Oil seal

NOTE:

Discard removed oil seal.

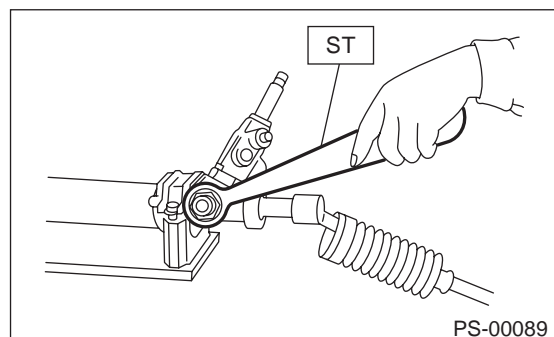
2. CONTROL VALVE ASSEMBLY

NOTE:

Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

1) Using ST, loosen lock nut.

ST 926230000 SPANNER



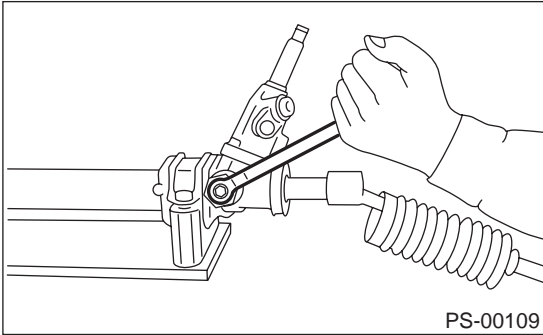
STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

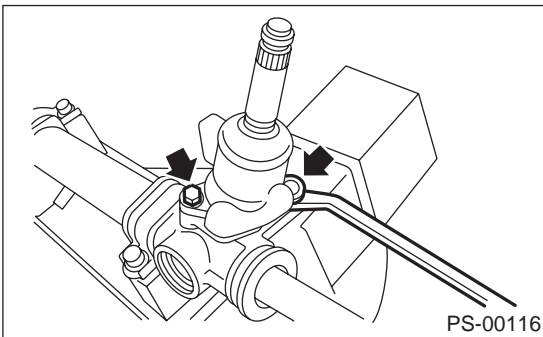
2) Loosen adjusting screw and remove spring and sleeve.

CAUTION:

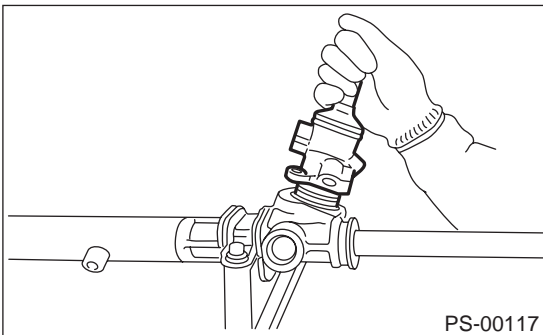
Replace spring and/or sleeve if damaged.



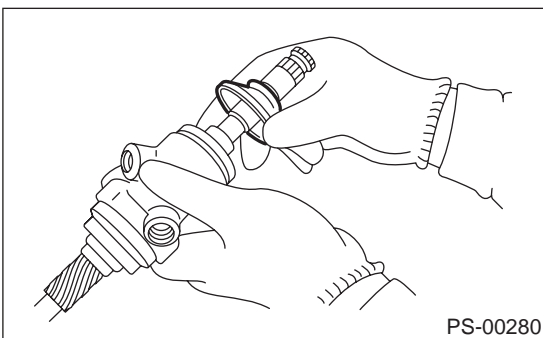
3) Remove two bolts securing valve assembly.



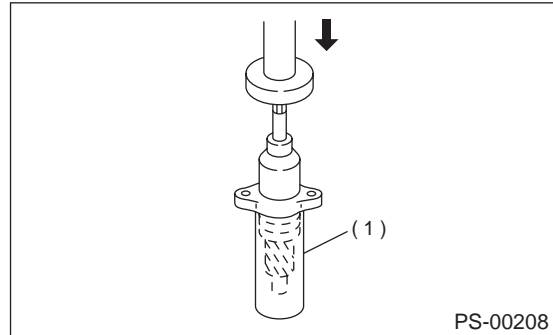
4) Carefully draw out input shaft and remove valve assembly.



5) Slide dust cover out.



6) Draw out pinion and valve assembly from valve housing, using pipe of I.D. 44 to 46 mm (1.73 to 1.81 in) and a press.



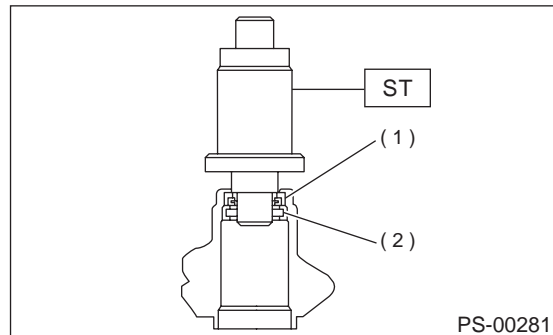
(1) Pipe

7) Using ST and press, remove oil seal and special bearing from valve housing.

ST 34099FA120 INSTALLER & REMOVER SEAL

CAUTION:

- Do not apply a force to end surface of valve housing.
- Do not reuse oil seal after removal.



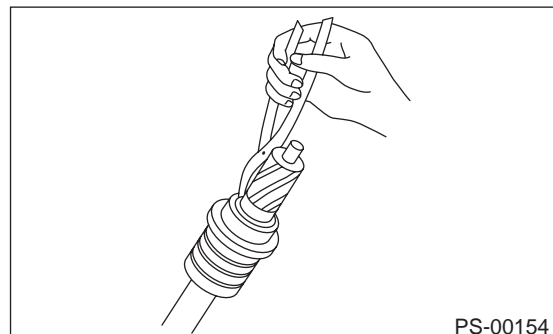
(1) Oil seal

(2) Special bearing

8) Remove snap ring using snap ring pliers.

CAUTION:

- Do not reuse removed snap ring.
- Be careful not to scratch pinion and valve assembly.



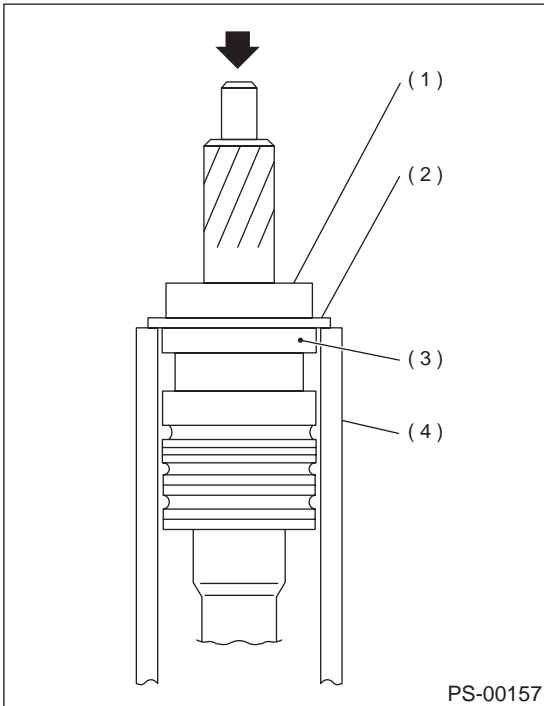
STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

9) Press out bearing together with backing washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.

CAUTION:

Do not reuse removed bearing.



- (1) Bearing
- (2) Backing washer
- (3) Oil seal
- (4) Pipe

10) Remove oil seal.

CAUTION:

Do not reuse removed oil seal.

D: ASSEMBLY

1. RACK HOUSING ASSEMBLY

CAUTION:

Use only SUBARU genuine grease for gearbox.

Grease:

VALIANT GREASE M2

[Part No. 003608001, net 0.5 kg (1.1 lb)]

1) Force-fit oil seal using ST.

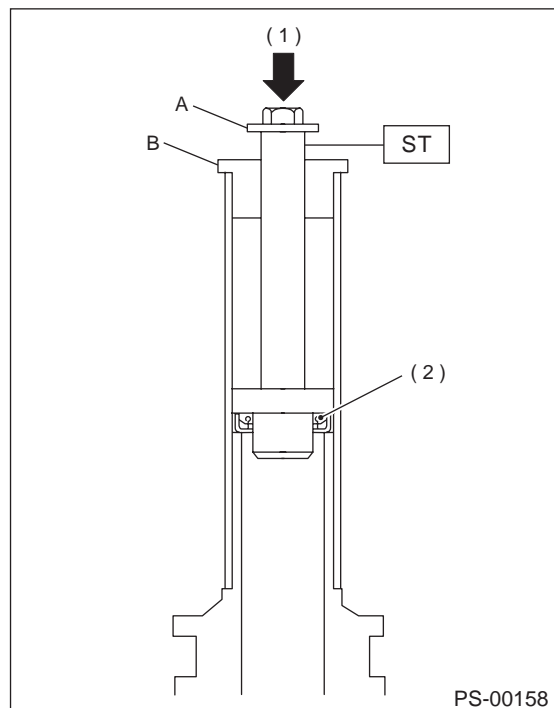
ST 34199AE050 INSTALLER

CAUTION:

Be careful not to damage or scratch cylinder inner wall.

NOTE:

- Apply specified power steering fluid to oil seal.
- Pay special attention not to install oil seal in wrong direction.
- Push oil seal until the stepped portion of A contacts end face of B.



- (1) Press
- (2) Oil seal

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

2) Fixing rack housing

Fix rack housing in vise using ST.

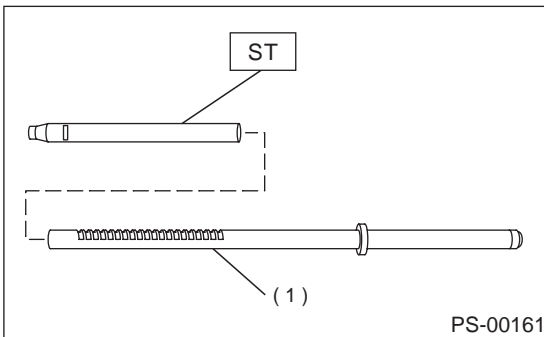
ST 926200000 STAND

CAUTION:

- When fixing rack housing in vise, be sure to use this special tool. Do not fix rack housing in vise using pad such as aluminum plates, etc.
- When using old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

3) Fit ST over toothed portion of rack assembly, and check for binding or unsmooth insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.

ST 926390001 COVER & REMOVER



(1) Rack ASSY

4) Apply genuine grease to teeth of thoroughly washed rack assembly, and fit ST over the toothed portion.

CAUTION:

- Be careful not to block air passage hole with grease. Remove excessive grease.
- After fitting cover, check air passage hole for clogging. If clogged, open by removing grease from the hole.
- Check rack shaft for damage.
- Apply specified power steering fluid to this ST and surface of piston ring to prevent seal from being damaged.

5) Insert rack assembly into rack housing from cylinder side, and remove ST after it has passed completely through oil seal.

NOTE:

Before inserting rack assembly, apply a coat of specified power steering fluid to surfaces of ST and rack piston.

ST 926390001 COVER & REMOVER

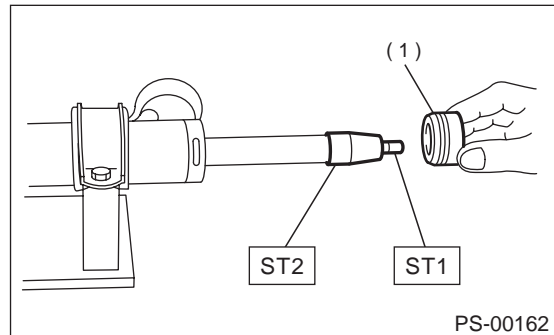
6) Fit ST1 and ST2 over the end of rack, and install rack bushing.

ST1 926400000 GUIDE

ST2 927660000 GUIDE

CAUTION:

- If burrs, or nicks are found on this guide and rack shaft portion, remove by filing.
- Dip rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.



(1) Rack bushing ASSY

7) Insert rack stopper into cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn rack stopper with ST so that rack stopper hole is seen through cylinder slits.

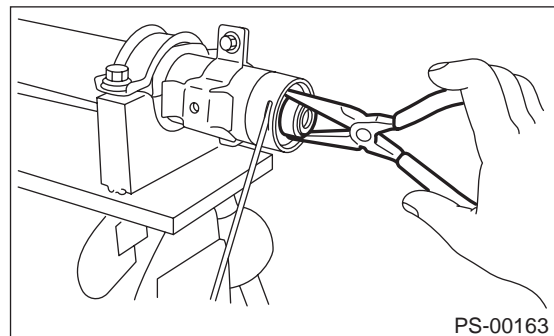
8) Insert rack stopper into rack housing, and wrap circlip using a sharp pointed pliers to secure rack stopper in position.

CAUTION:

Be careful not to scratch rack while winding circlip.

NOTE:

Rotate wrench another 90 to 180° after the end of circlip has been wrapped in.

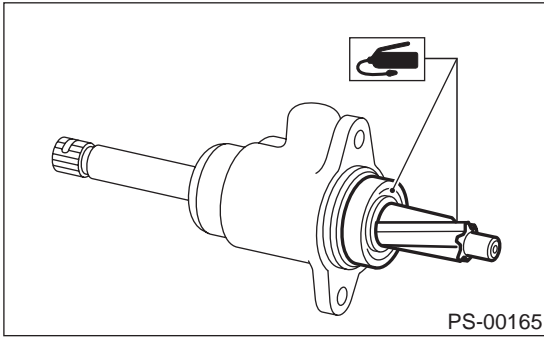


9) Fit mounting rubber onto rack housing.

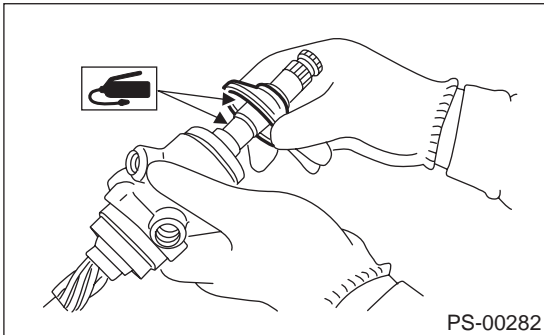
STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

10) Apply genuine grease to pinion gear and bearing of valve assembly.



11) Apply specified grease to dust cover.



12) Install dust cover on valve assembly.

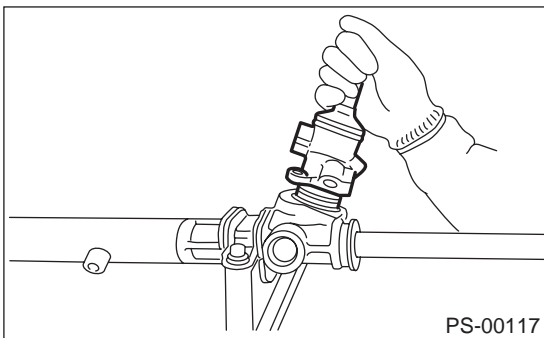
13) Install gasket on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

CAUTION:

Be sure to use a new gasket.

NOTE:

Do not allow packing to be caught when installing valve assembly.



14) Tighten bolts alternately to secure valve assembly.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

CAUTION:

Be sure to alternately tighten bolts.

15) Apply grease to teeth of rack so that grease applied is about as high as teeth, and also apply a thin film of grease to sliding portion of rack shaft.

CAUTION:

- When moving rack to stroke end without tie-rod attached, prevent shocks from being applied at the end.
- Do not apply grease to threaded portion at end of rack shaft.
- Move rack shaft to stroke end two (2) or three (3) times to squeeze grease which accumulates on both ends. Remove grease to prevent it from choking air passage hole.

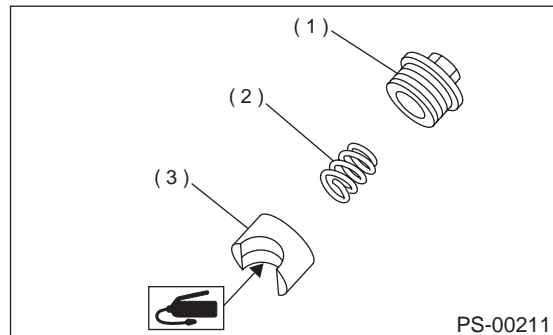
16) Apply grease to sleeve insertion hole.

17) Apply grease to dust seal insertion hole.

CAUTION:

Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

18) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.

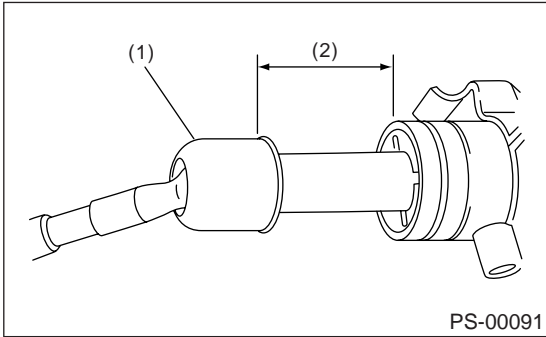


- (1) Adjusting screw
- (2) Spring
- (3) Sleeve

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

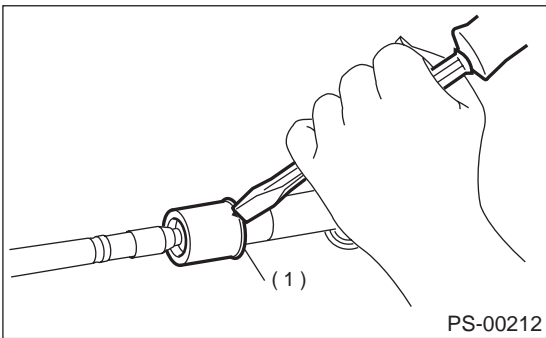
- 19) Install lock washers and tighten left and right tie-rods into rack ends. **Tightening torque: 78 N·m (8.0 kgf-m, 58 ft-lb)**



- (1) Tie-rod
(2) Approx. 40 mm (1.57 in)

- 20) Bend lock washer, using chisel.

CAUTION:
Be careful not to scratch rack when bending lock washer.

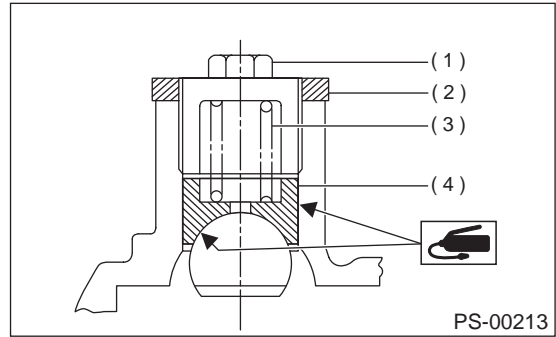


- (1) Lock washer

- 21) Rack and pinion backlash adjustment

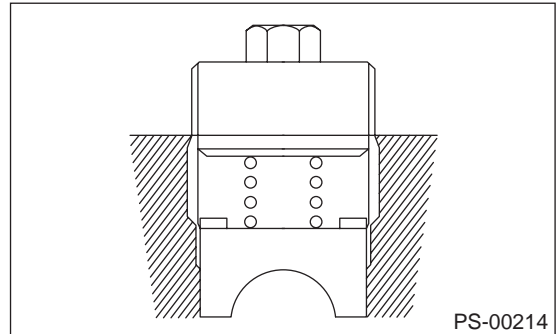
- (1) Loosen adjusting screw.
(2) Rotate input shaft so that rack is in the straight ahead direction.

- (3) Apply grease to sleeve.



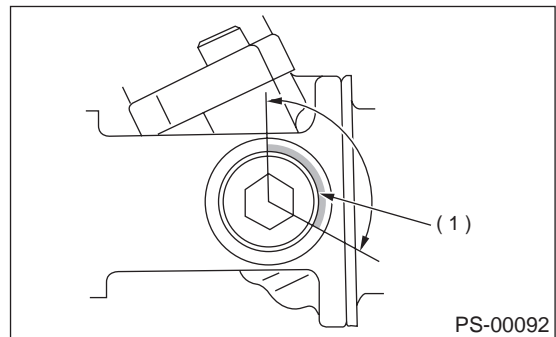
- (1) Adjusting screw
(2) Lock nut
(3) Spring
(4) Sleeve

- (4) Tighten adjusting screw by approx. two threads.



- (5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



- (1) Apply liquid packing to at least 1/3 of entire perimeter.

- (6) Tighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.

- (7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST. 926230000 SPANNER

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

Tightening torque (Lock nut):
39 N·m (4.0 kgf·m, 29 ft·lb)

NOTE:

- Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.
- Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

22) Inspect for service limit as per article of "Service limit". <Ref. to PS-47, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].> Make replacement and adjustment if necessary.

23) Install boot to housing.

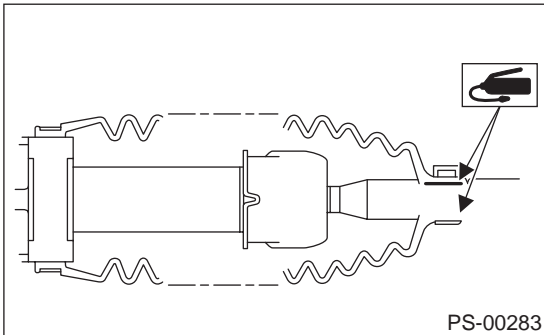
NOTE:

- Before installing boot, be sure to apply grease to the groove of tie-rod.
- Install fitting portions of boots to the following portions in both sides of assembled steering gearbox.

The groove on gearbox

The groove on the rod

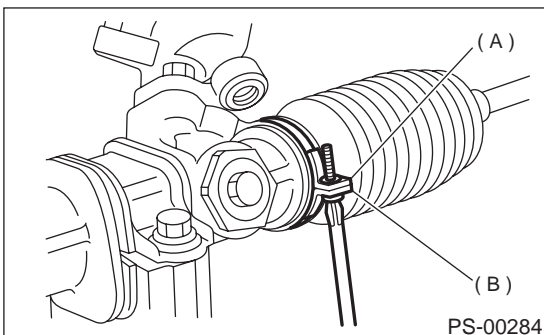
- Make sure that boot is installed without unusual inflation or deflation.



24) Using a screwdriver, tighten the screw until the ends "A" and "B" of the band come into contact with each other.

NOTE:

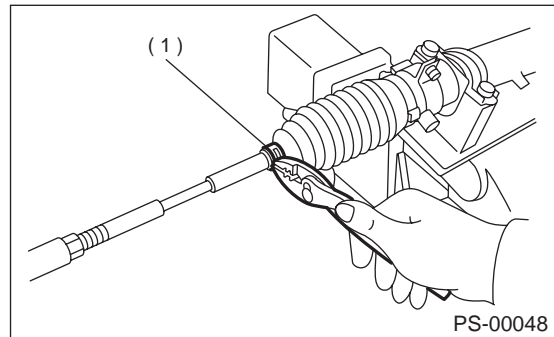
Always tighten the band from the underside of the gear box.



25) Fix boot end with clip (small).

CAUTION:

After installing, check boot end is positioned into groove on tie-rod.



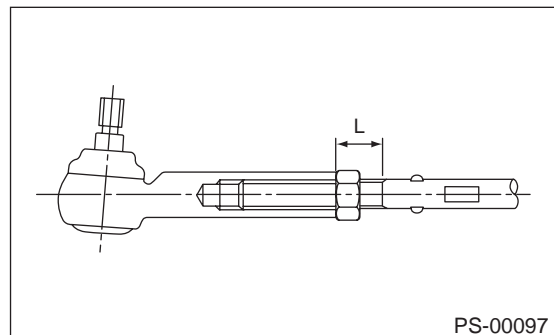
(1) Clip

26) If tie-rod end was removed, screw in lock nut and tie-rod end to screwed portion of tie-rod, and tighten lock nut temporarily in a position as shown in figure.

Installed tie-rod length: L
15 mm (0.59 in)

NOTE:

Pay attention to difference between right and left tie-rod ends.



STEERING GEARBOX [LHD MODEL]

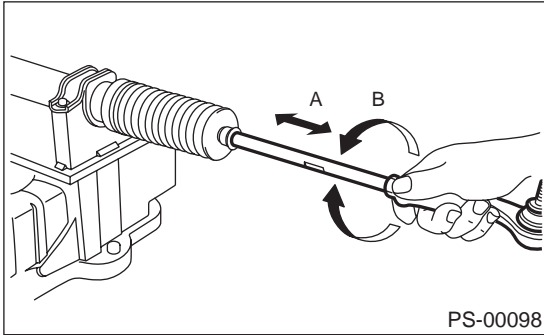
POWER ASSISTED SYSTEM (POWER STEERING)

27) Inspect gearbox as follows:

“A” Holding tie-rod end, repeat lock to lock two or three times as quickly as possible.

“B” Holding tie-rod end, turn it slowly at a radius one or two times as large as possible.

After all, make sure that boot is installed in the specified position without deflation.



28) Remove gearbox from ST.

ST 926200000 STAND

29) Install four pipes on gearbox.

(1) Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A.

Tightening torque:

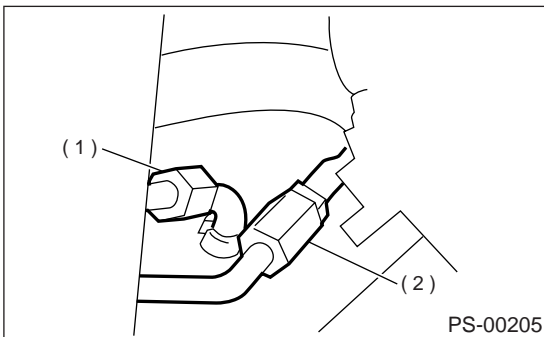
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect pipes C and D to gearbox.

Connect lower pipe C first, and upper pipe D second.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Pipe C

(2) Pipe D

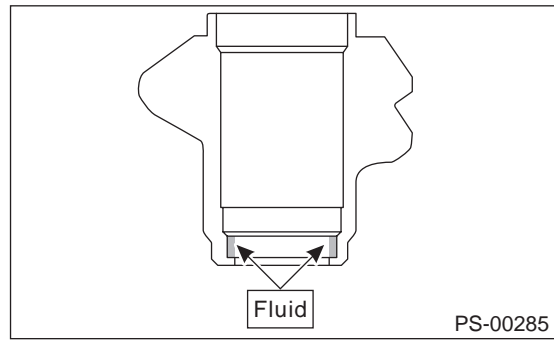
2. CONTROL VALVE ASSEMBLY

Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

1) Clean all parts and tools before reassembling.

2) Apply a coat of specified power steering fluid to inner wall of valve housing.



3) Attach ST2 to ST1, and press oil seal into place using a press.

ST1 34099FA120 INSTALLER & REMOVER SEAL

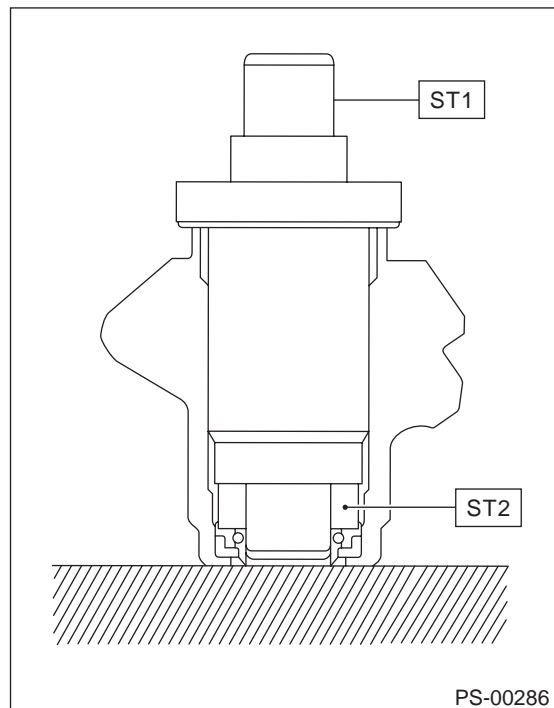
SEAL

ST2 34099FA130 INSTALLER SEAL

(1) Face oil seal in the direction shown in figure when installing.

(2) To avoid scratching oil seal, apply a coat of grease to contact surface of installer and oil seal.

(3) To facilitate installation, attach oil seal to installer and position in valve housing before pressing into place.



4) Put vinyl tape around pinion shaft splines to protect oil seal from damage.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

5) Fit pinion and valve assembly into valve housing.

NOTE:

Apply specified power steering fluid to outer diameter surface of input shaft and outer surface of valve body seal ring, and pay special attention not to damage seal when inserting pinion and valve assembly.

6) Secure valve assembly to ST1 and ST2.

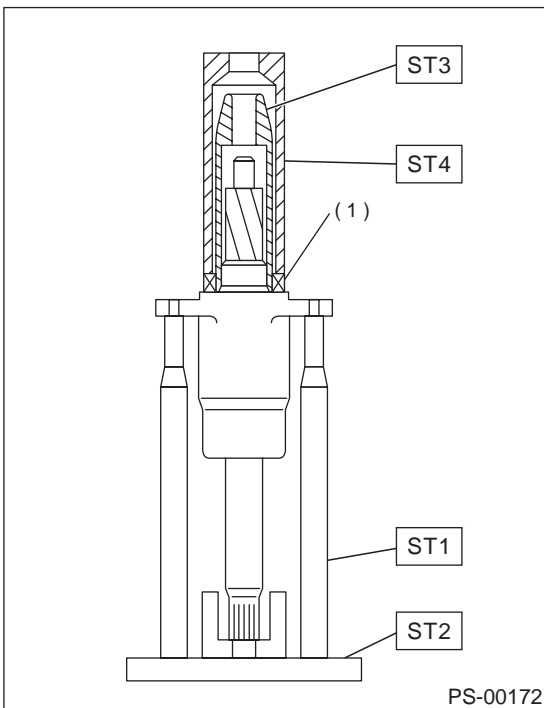
7) Put ST3 over pinion, and insert oil seal, then force-fit oil seal into housing using ST4.

ST1 926370000 INSTALLER A

ST2 927630000 STAND BASE

ST3 926360000 INSTALLER A

ST4 927620000 INSTALLER B



(1) Oil seal

NOTE:

- Apply specified power steering fluid to oil seal and ST3, being careful not to damage oil seal lip.
- Push oil seal until ST3 contacts housing end face.

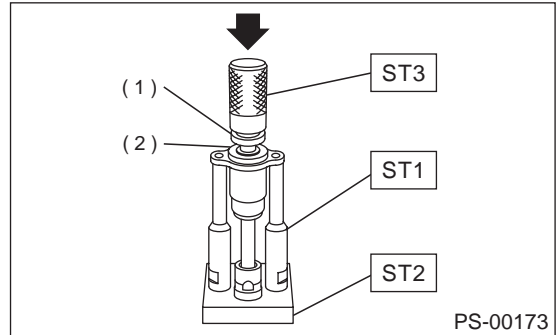
8) Remove ST3, and fit backing washer.

9) Force-fit ball bearing using ST3.

ST1 926370000 INSTALLER A

ST2 34099FA100 STAND BASE

ST3 927640000 INSTALLER B



(1) Ball bearing

(2) Backing washer

NOTE:

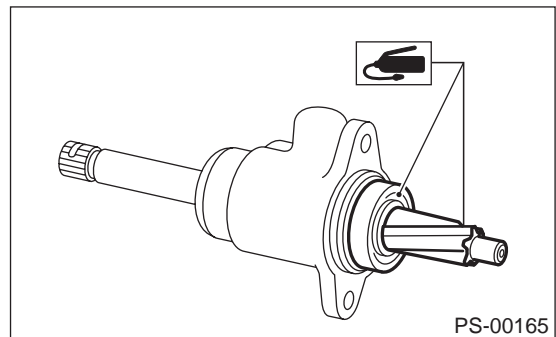
Be careful not to tilt ball bearing during installation.

10) Install snap ring using snap ring pliers.

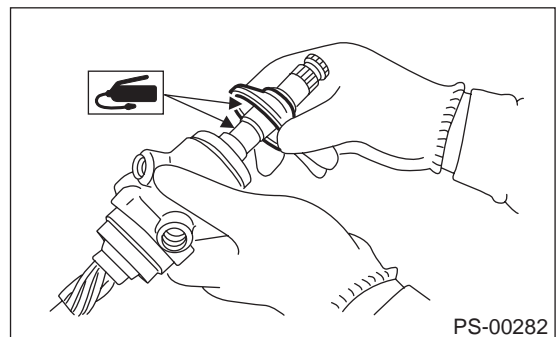
NOTE:

Rotate snap ring to check for proper installation.

11) Apply genuine grease to pinion gear and bearing of valve assembly.



12) Apply specified grease to dust cover.



13) Install dust cover on valve assembly.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

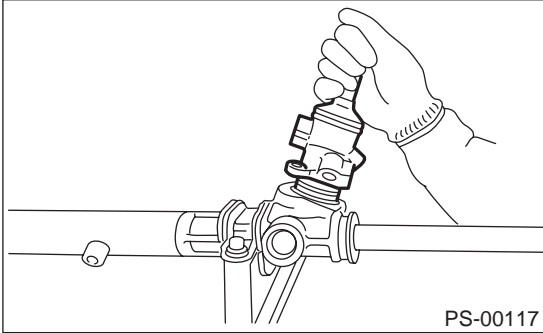
14) Install gasket on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

CAUTION:

Be sure to use a new gasket.

NOTE:

Do not allow packing to be caught when installing valve assembly.



15) Tighten bolts alternately to secure valve assembly.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

CAUTION:

Be sure to alternately tighten bolts.

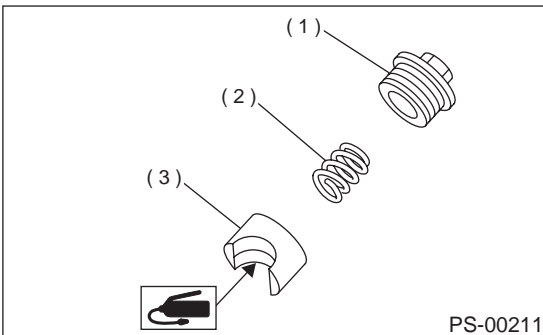
16) Apply grease to sleeve insertion hole.

17) Apply grease to dust seal insertion hole.

CAUTION:

Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

18) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.



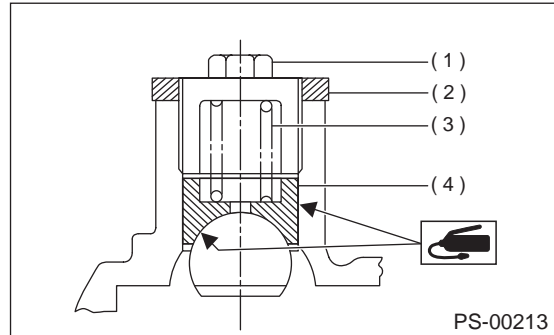
- (1) Adjusting screw
- (2) Spring
- (3) Sleeve

19) Rack and pinion backlash adjustment

- (1) Loosen adjusting screw.

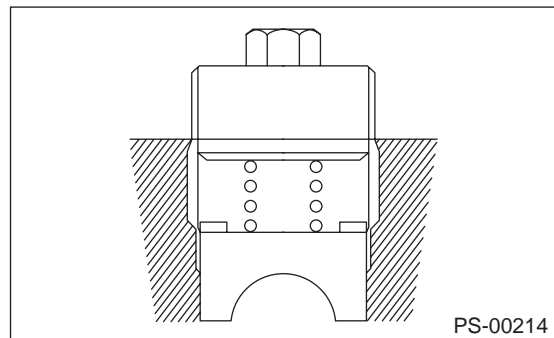
(2) Rotate input shaft so that rack is in the straight ahead direction.

(3) Apply grease to sleeve.



- (1) Adjusting screw
- (2) Lock nut
- (3) Spring
- (4) Sleeve

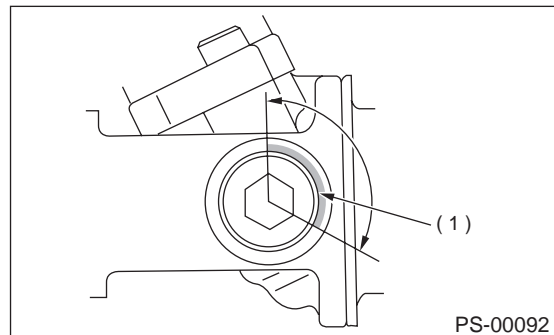
(4) Tighten adjusting screw by approx. two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:

THREE BOND 1141



- (1) Apply liquid packing to at least 1/3 of entire perimeter.

(6) Tighten adjusting screw to 7.4 N·m (0.75 kgf·m, 5.4 ft·lb) and back off 25°.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

(7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):

39 N·m (4.0 kgf-m, 29 ft-lb)

NOTE:

- Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.
- Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

20) Check for service limit as per article of "Service limit". <Ref. to PS-47, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].> Make replacement and adjustment if necessary.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.

2) When disassembling, check inside of gearbox for water. If any water is found, carefully check boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If bend or damage is excessive, replace entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If outer wall slips, lip is worn out or damage is found, replace it with new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust backlash properly. By measuring turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to "Service limit".) (2) Keeping rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace gearbox with new one.
		(4) Wear or damage on rack bush	If free play of rack shaft in radial direction is out of the specified range, replace gearbox with new one. (Refer to "Service limit".)
		(5) Wear on input shaft bearing	If free plays of input shaft in radial and axial directions are out of the specified ranges, replace gearbox with new one. (Refer to "Service limit".)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

2. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

NOTE:

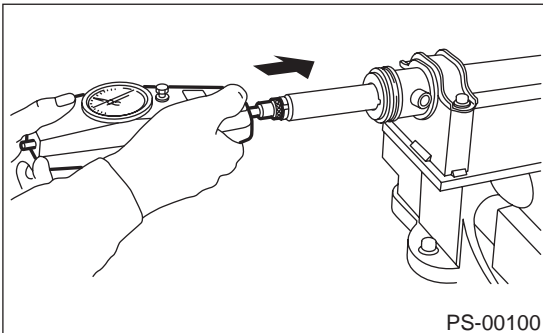
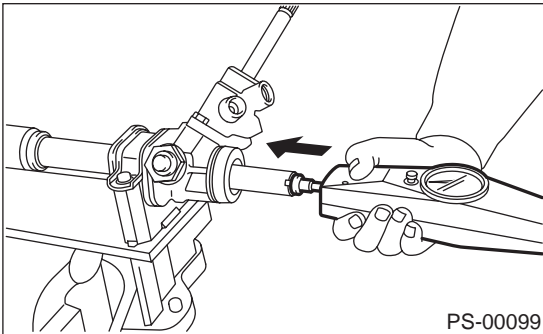
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit

304 N (31 kgf, 68 lb) or less



3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

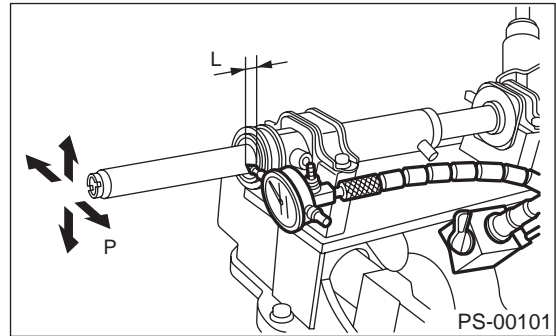
Service limit

0.19 mm (0.0075 in) or less

On condition

L: 5 mm (0.20 in)

P: 122.6 N (12.5 kgf, 27.6 lb)



Left-turn steering:

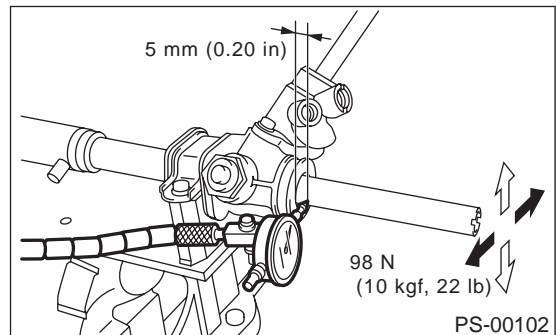
Service limit

Direction \longleftrightarrow

0.3 mm (0.012 in) or less

Direction \longleftrightarrow

0.15 mm (0.0059 in) or less



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

4. INPUT SHAFT PLAY

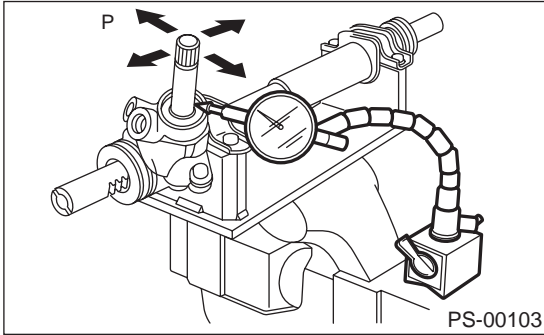
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

On condition

P: 98 N (10 kgf, 22 lb)



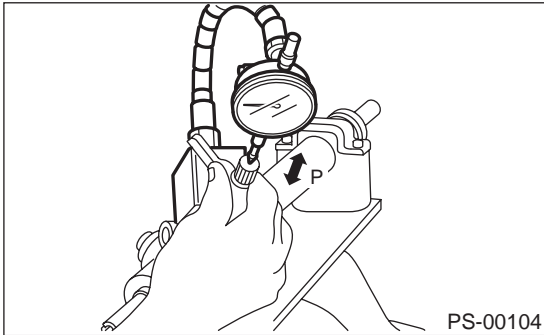
In axial direction:

Service limit

0.5 mm (0.020 in) or less

On condition

P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



5. TURNING RESISTANCE OF GEARBOX

Using ST, measure gearbox turning resistance.

ST 926230000 SPANNER

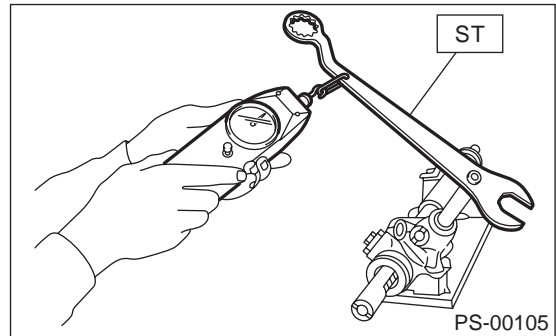
Service limit:

Straight-ahead position within 30 mm (1.18 in) from rack center

Less than 11.18 N (1.14 kgf, 2.51 lb)

Maximum allowable resistance

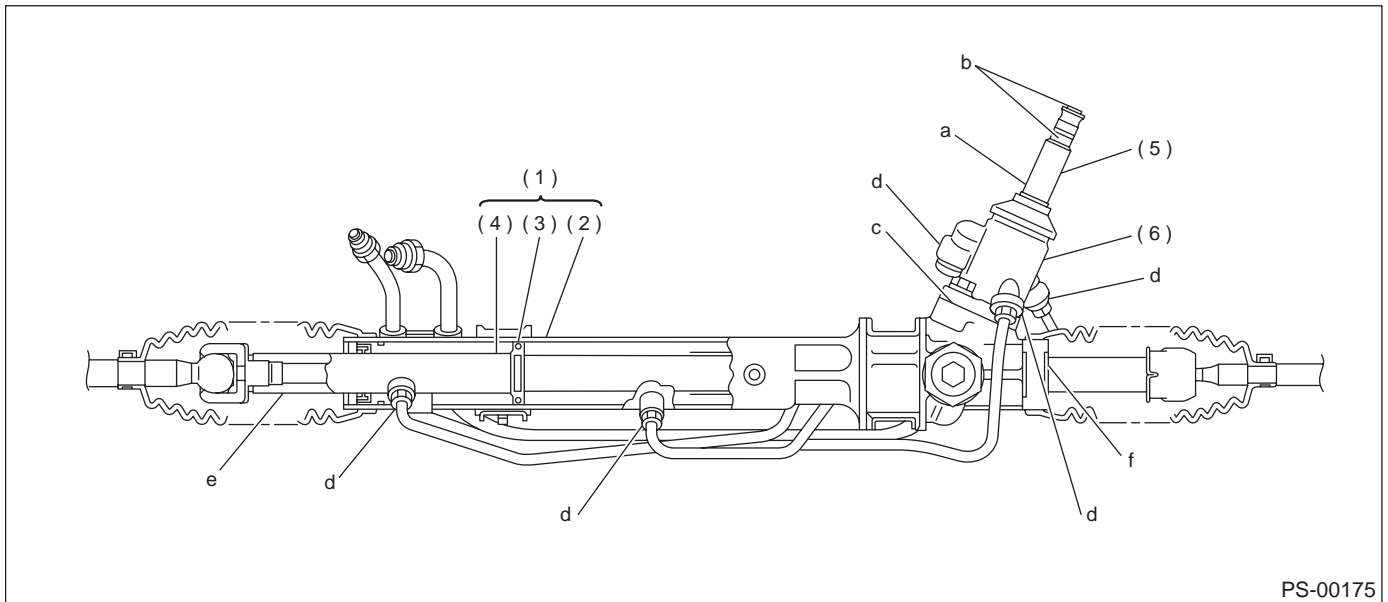
12.7 N (1.3 kgf, 2.9 lb)



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6. OIL LEAKING



(1) Power cylinder
(2) Cylinder

(3) Rack piston
(4) Rack axle

(5) Input shaft
(6) Valve housing

• Oil leaking points

1) If leak point is other than a, b, c, or d, perform the 5th step in "Oil leak check procedure and replacement parts" before dismounting gearbox from vehicle. <Ref. to "Oil leak check procedure and replacement parts".> If gearbox is dismounted without confirming where the leak is, it must be mounted again to locate the leak point.

2) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the oil from the suspected portion and turn the steering wheel from lock to lock about 30 to 40 times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.

3) Before starting oil leak repair work, be sure to clean the gearbox, hoses, pipes, and surrounding parts. After completing repair work, clean these areas again.

• Oil leak check procedure and replacement parts

NOTE:

Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

1) Leakage from "a"

The oil seal is damaged. Replace valve assembly with a new one.

2) Leakage from "b"

The torsion bar O-ring is damaged. Replace valve assembly with a new one.

3) Leakage from "c"

The oil seal is damaged. Replace valve assembly or oil seal with a new one.

4) Leakage from "d"

The pipe is damaged. Replace the faulty pipe or O-ring.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

5) If leak is other than a, b, c, or d, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove oil from the surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.

(1) Leakage from "e"

The cylinder seal is damaged. Replace rack bush with a new one.

(2) Leakage from "f"

There are two possible causes. Take following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.

CAUTION:

• If leakage from "f" is noted again:

The oil seal of pinion and valve assembly is damaged. Replace pinion and valve assembly with a new one. Or replace the oil seal and the parts that are damaged during disassembly with new ones.

• If oil stops leaking from "f":

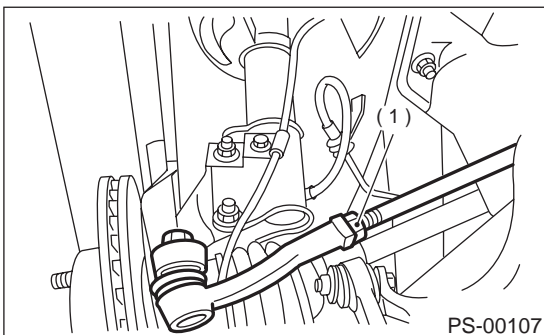
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust front toe.

Standard of front toe:

IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



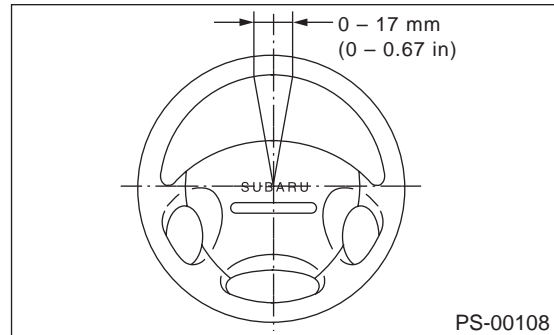
(1) Lock nut

2) Adjust steering angle of wheels.

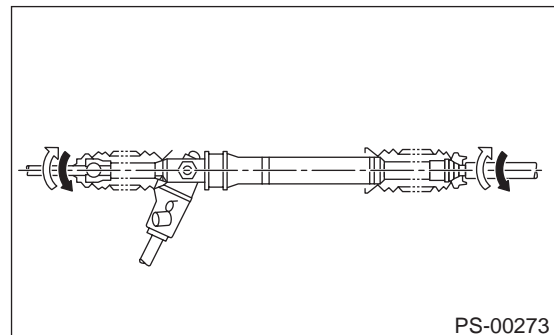
Standard of steering angle:

Model	Except OUTBACK	OUTBACK
Inner wheel	36.3°±1.5°	34.5°±1.5°
Outer wheel	31.6°±1.5°	30.3°±1.5°

3) If steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



4) If steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the same direction by the same turns.



STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6. Steering Gearbox [RHD Model]

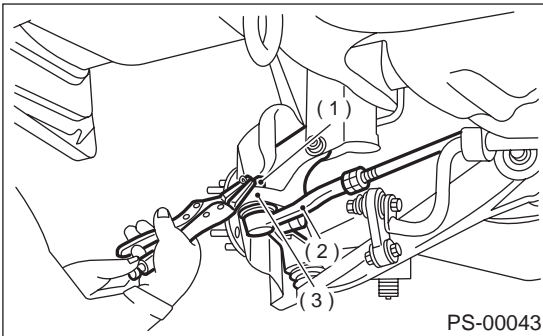
A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.
- 3) Remove air intake duct.
- 4) Disconnect connector from O₂ sensor. (If equipped.)

WARNING:

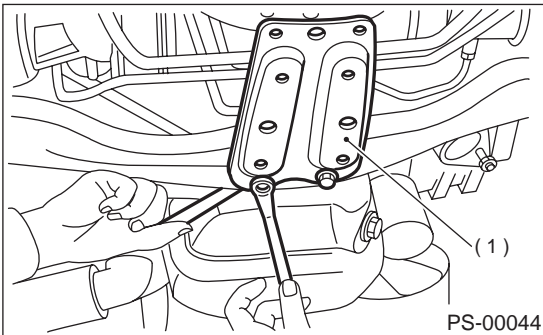
Be careful as exhaust pipe is hot.

- 5) Raise vehicle with a jack and remove front wheel.
- 6) Disconnect front exhaust pipe assembly.
- 7) Remove cotter pin and castle nut. Using a puller, remove tie-rod end from knuckle arm.



- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

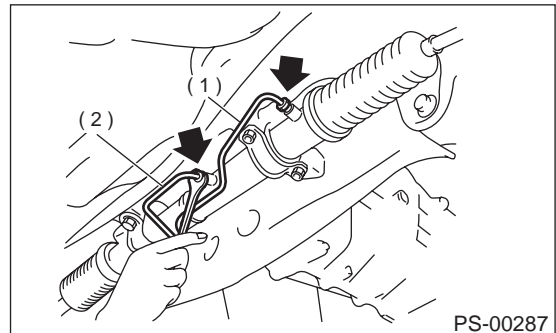
- 8) Remove jack-up plate.



- (1) Jack-up plate

- 9) Remove front stabilizer. <Ref. to FS-21, REMOVAL, Front Stabilizer.>

- 10) Disconnect one pipe joint A from center of gearbox assembly, and connect a vinyl hose to it. While turning steering wheel to the left and right, drain fluid through the hose. Similarly, drain fluid from the other pipe joint B.



- (1) Pipe A
- (2) Pipe B

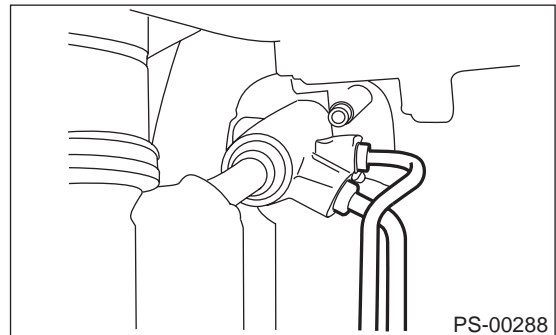
- 11) Remove universal joint. <Ref. to PS-25, REMOVAL, Universal Joint.>

- 12) Remove flare nuts from control valve of gearbox assembly, and disconnect pipe C and D.

CAUTION:

- Always disconnect pipes C and D in that order.
- Be careful not to damage the hoses during removal.

- 13) Remove clamp bolts securing gearbox to crossmember, and detach gearbox.



- 14) Remove clamp bolts securing gearbox to crossmember, and detach gearbox.

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

- 1) Insert gearbox into crossmember, being careful not to damage gearbox boot.
- 2) Tighten gearbox to crossmember bracket via clamp with bolt to the specified torque.

Tightening torque:

59 N·m (6.0 kgf-m, 43 ft-lb)

- 3) Connect pipes C and D to control valve of gear box assembly.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

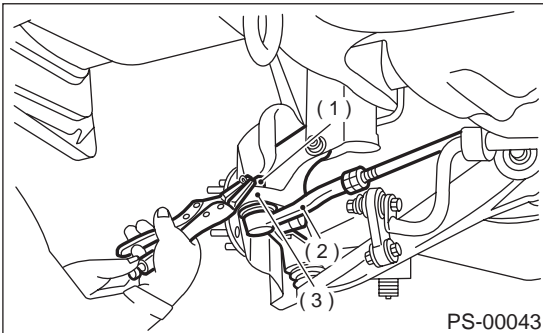
- 4) Install universal joint. <Ref. to PS-25, INSTALLATION, Universal Joint.>
- 5) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

Castle nut tightening torque:

Tighten to 27.0 N·m (2.75 kgf-m, 19.9 ft-lb), and tighten further within 60° until cotter pin hole is aligned with a slot in the nut.

CAUTION:

When connecting, do not hit cap at the bottom of tie-rod end with hammer.



- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

- 6) Install front stabilizer to vehicle.
- 7) Install front exhaust pipe assembly.
- 8) Lower the vehicle.
- 9) Align center of roll connector. <Ref. to AB-19, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure that front wheels are set in straight forward direction.

- 10) Install steering wheel. <Ref. to PS-24, INSTALLATION, Steering Wheel.>
- 11) Install tires.
- 12) Tighten wheel nuts to the specified torque.

Tightening torque:

88 N·m (9.0 kgf-m, 65 ft-lb)

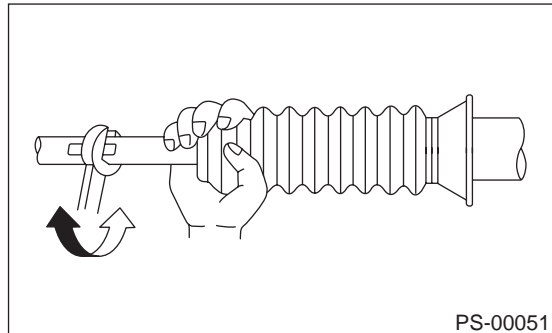
- 13) Connect connector to O₂ sensor. (if equipped)
- 14) Connect ground cable to battery.
- 15) Pour fluid into oil tank, and bleed air. <Ref. to PS-92, Power Steering Fluid.>
- 16) Install air intake duct.
- 17) Lift-up the vehicle.
- 18) Check for fluid leaks.
- 19) Install jack-up plate.
- 20) Lower vehicle.
- 21) Check fluid level in oil tank.
- 22) After adjusting toe-in and steering angle, tighten lock nut on tie-rod end.

Tightening torque:

83 N·m (8.5 kgf-m, 61.5 ft-lb)

CAUTION:

When adjusting toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



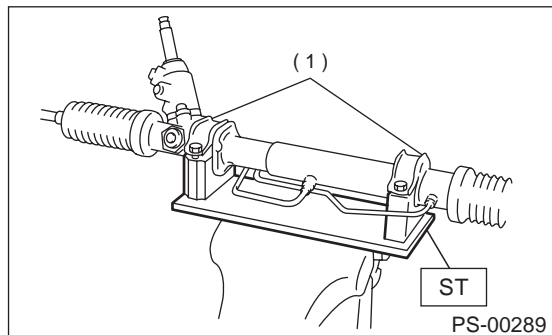
C: DISASSEMBLY

- 1) Secure gearbox removed from vehicle in vise using ST.

ST 926200000 STAND

CAUTION:

Secure the gearbox assembly in a vise using the ST as shown. Do not attempt to secure it without this ST.

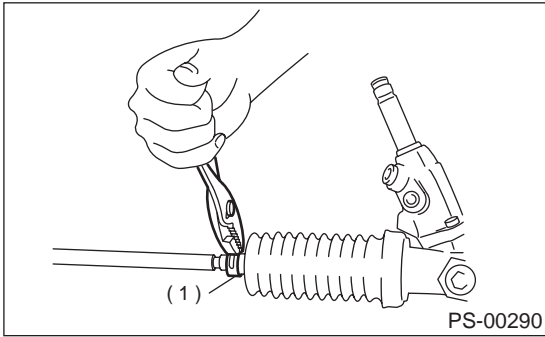


- (1) Clamp

STEERING GEARBOX [RHD MODEL]

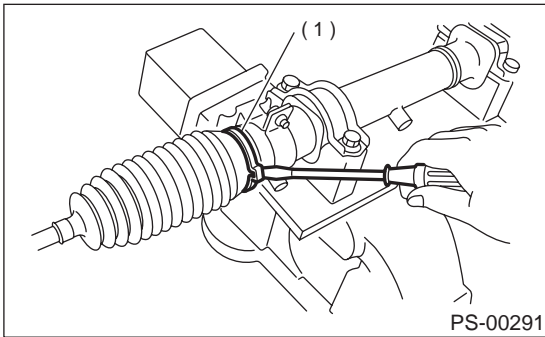
POWER ASSISTED SYSTEM (POWER STEERING)

2) Pry off clip from outer end of boot, and slide boot toward tie-rod end.



(1) Clip

3) Using standard screwdriver, remove band from boot.

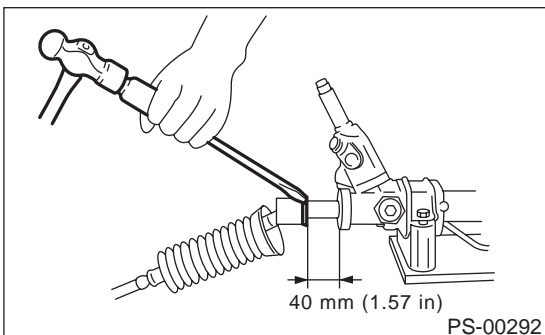


(1) Band

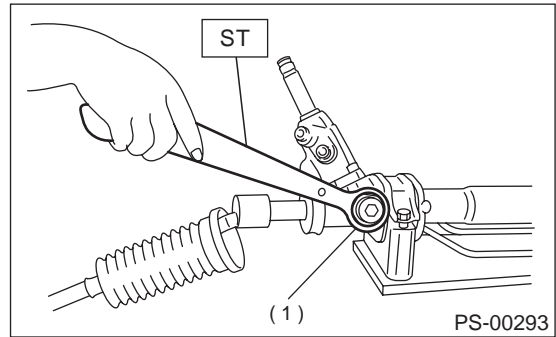
4) Extend rack approximately 40 mm (1.57 in) out. Unlock lock wire at lock washer on each side of tie-rod end using a standard screwdriver.

CAUTION:

Be careful not to scratch rack surface as oil leaks may result.

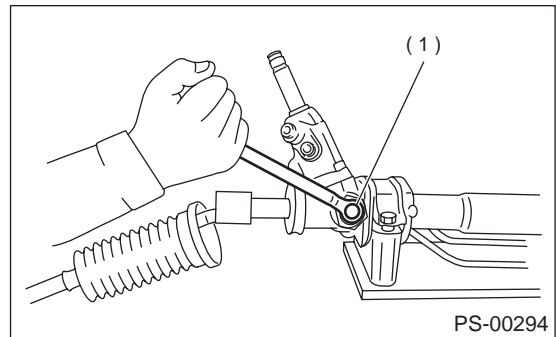


5) Using ST, loosen lock nut.
ST 926230000 SPANNER



(1) Lock nut

6) Tighten adjusting screw until it no longer tightens.

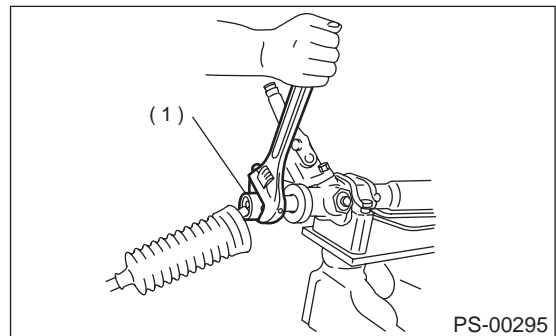


(1) Adjusting screw

7) Using a wrench (32 mm width across flats) or adjustable wrench, remove tie-rod.

CAUTION:

- Check ball joint for free play, and tie-rod for bends. Replace if necessary.
- Check dust seals used with tie-rod end ball joint for damage or deterioration. Replace if necessary.



(1) Tie-rod

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

8) Loosen adjusting screw and remove spring and sleeve.

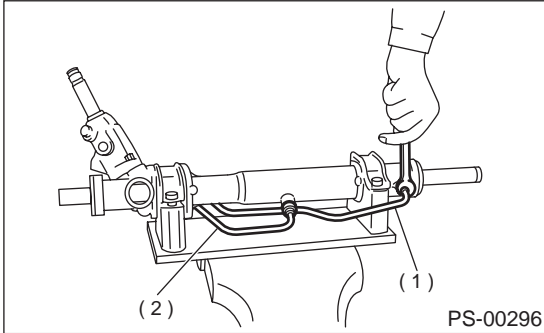
CAUTION:

Replace spring and/or sleeve if damaged.

9) Disconnect pipes A and B from steering body and control valve housing.

CAUTION:

Replace pipes and/or flare nuts if damaged.



(1) Pipe A

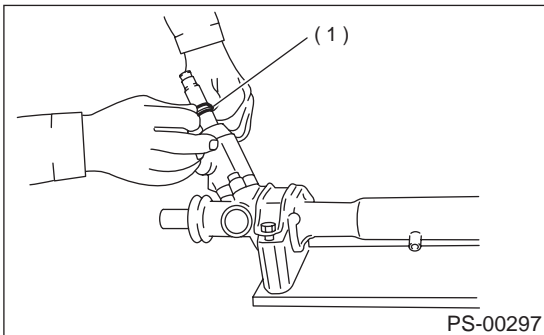
(2) Pipe B

10) Slide dust cover out.

CAUTION:

• **Be careful not to scratch housing or input shaft during dust cover removal. Also do not allow foreign matter to enter housing interior.**

• **Replace dust cover with a new one if its inside bore or lips are worn or damaged.**



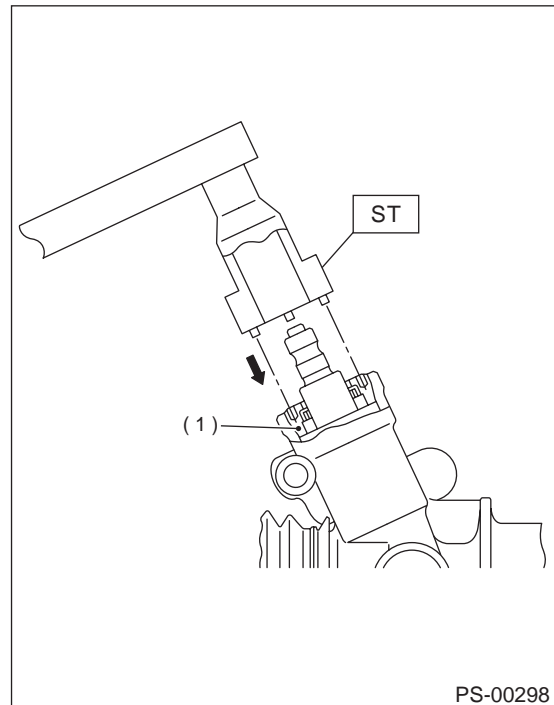
(1) Dust cover

11) Using ST, remove plug.

ST 34199AE090 PLUG WRENCH

NOTE:

Make sure to align ST pin to plug hole.



(1) Plug

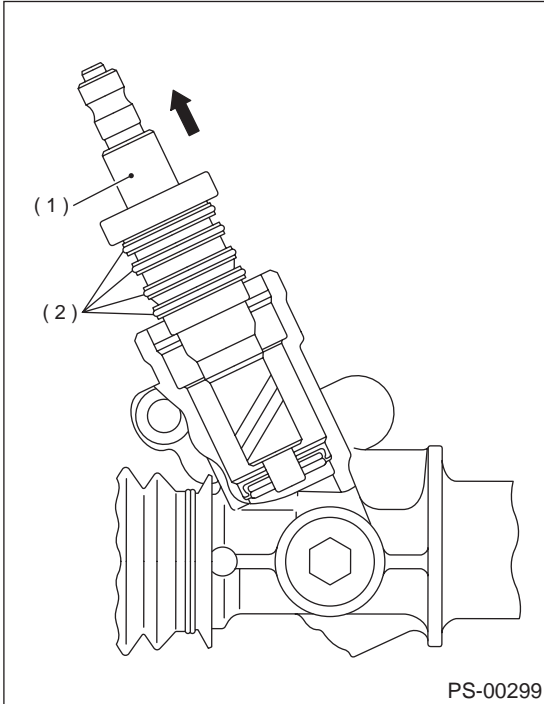
STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

12) Remove valve assembly.

CAUTION:

Be careful not to scratch seal ring.

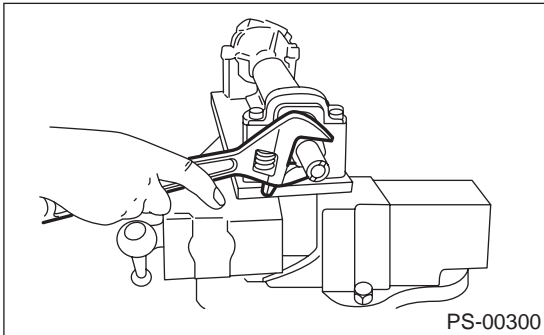


- (1) Valve ASSY
- (2) Seal ring

13) Remove holder using a 32 mm wrench or adjustable wrench.

CAUTION:

Discard old holder and replace with new one.

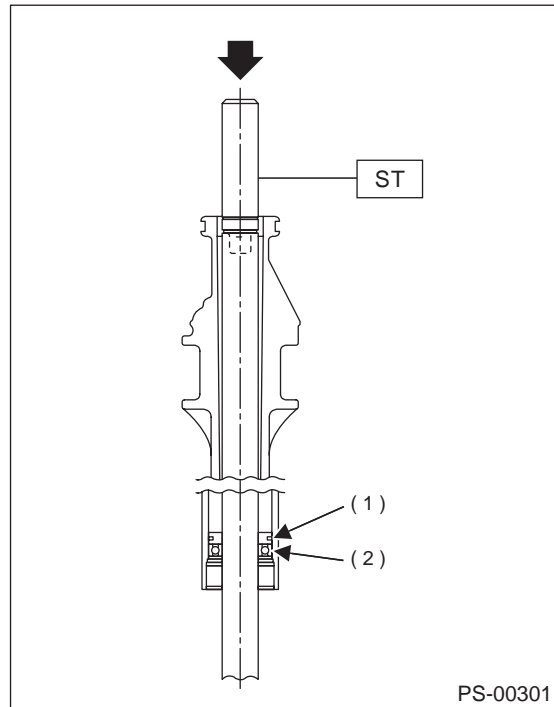


14) Install ST on valve side of rack and press outer side oil seal out.

ST 34099FA030 INSTALLER & REMOVER

CAUTION:

- Block pipe connection of steering body to prevent fluid from flowing out.
- Do not allow rack to come in contact with inner wall of cylinder. Otherwise, cylinder wall may be scratched, resulting in oil leaks.
- Remove holder and rack as a unit.
- Check rack and steering body for bends or cracks; replace as required.
- Discard oil seal after removal and replace with new ones.



- (1) Rack piston
- (2) Outer side oil seal

STEERING GEARBOX [RHD MODEL]

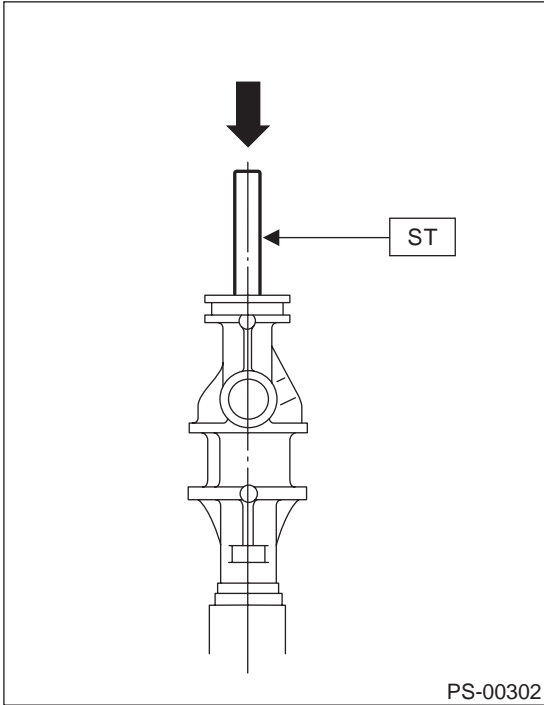
POWER ASSISTED SYSTEM (POWER STEERING)

15) Insert ST from valve side and press back-up ring and oil seal out.

CAUTION:

Discard back-up ring and oil seal after removal and replace with new ones.

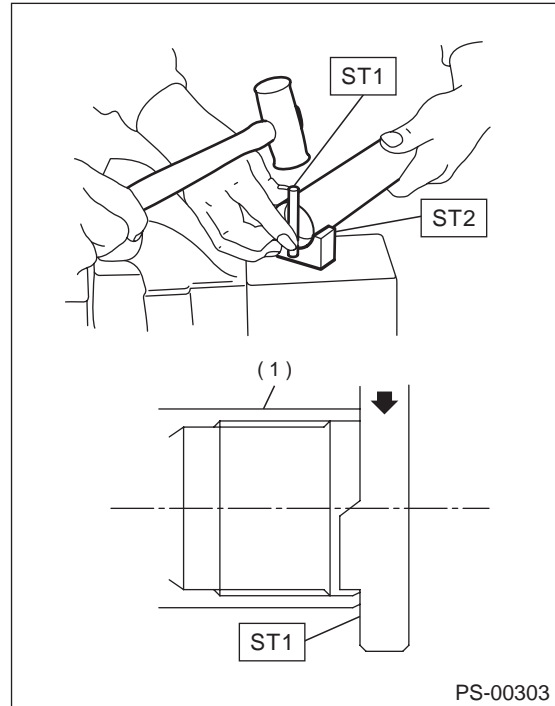
ST 927580000 REMOVER



16) Using ST1 and ST2, repair cylinder's clinched sections.

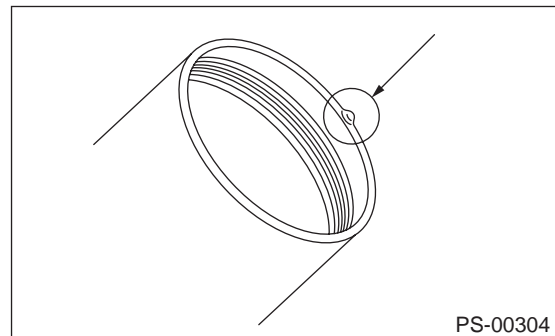
ST1 34099FA080 PUNCH

ST2 34099FA070 BASE



(1) Cylinder

17) If cylinder edge is deformed in a convex shape, repair using an oil stone.

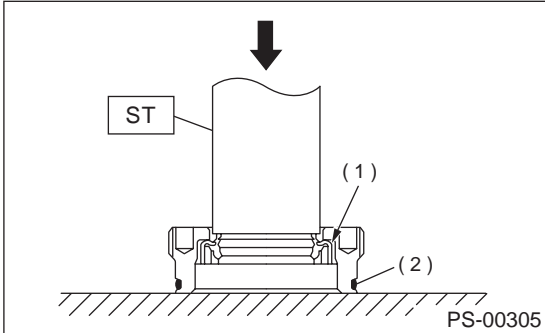


STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

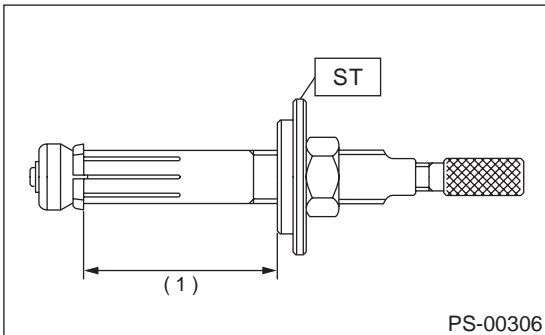
18) Remove oil seal using ST and press from plug.
ST 34199AE100 PLUG OIL SEAL REMOVER

CAUTION:
Do not apply force on plug edge surface.
Replace plug circumference O-rings with new ones.



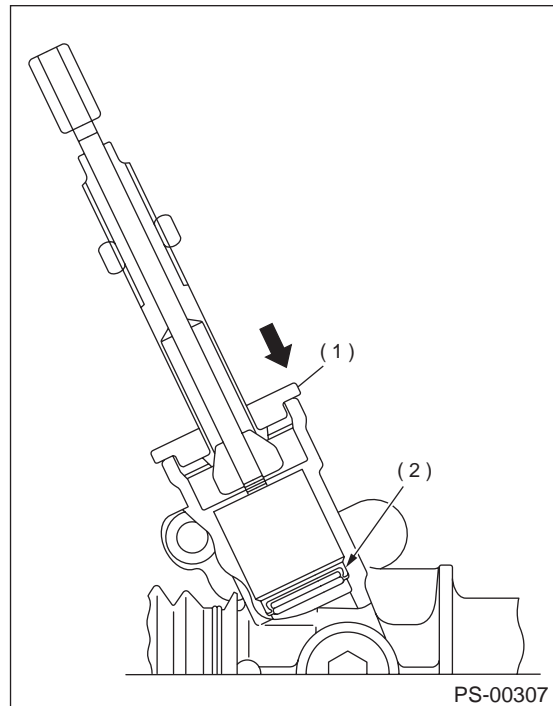
- (1) Oil seal
- (2) O-ring

19) Set ST on drawing dimension.
ST 34199AE120 GEARBOX OIL SEAL RE-
MOVER



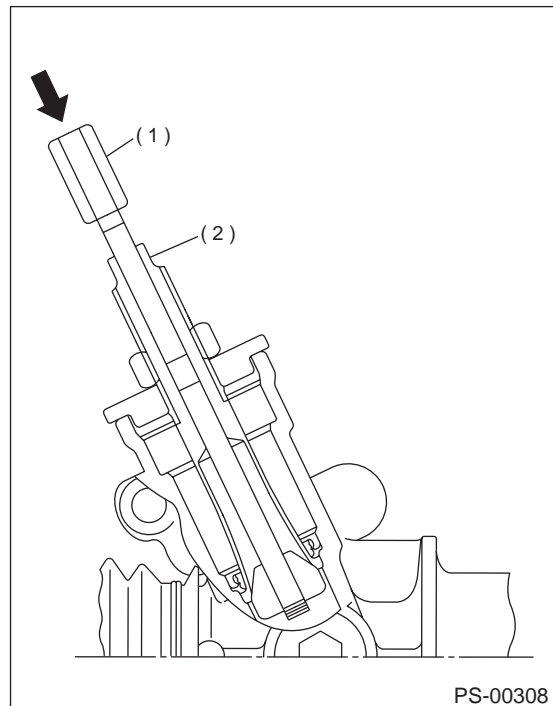
- (1) 70 mm (2.76 in)

20) Insert ST into gearbox, while setting stopper in advance.



- (1) Stopper
- (2) Oil seal

21) By fixing 2-surface width, press in by rotating rod and attach to oil seal.

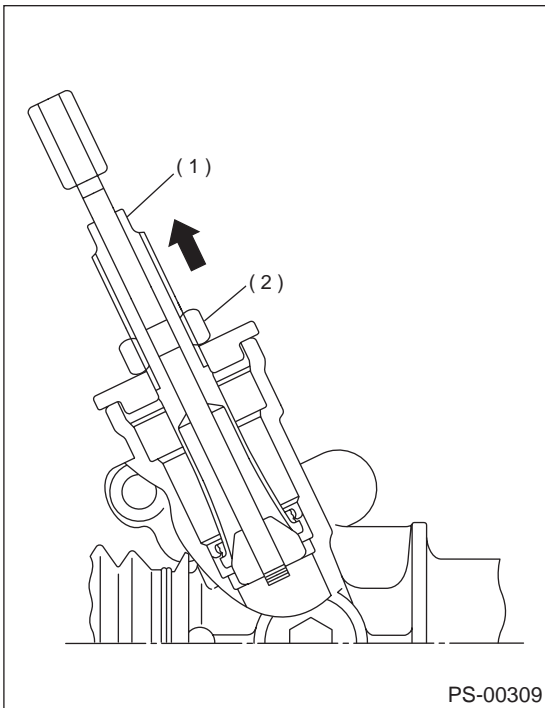


- (1) Rod
- (2) 2-surface width

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

22) While fixing 2-surface width, pull out oil seal by rotating nut.



- (1) 2-surface width
- (2) Nut

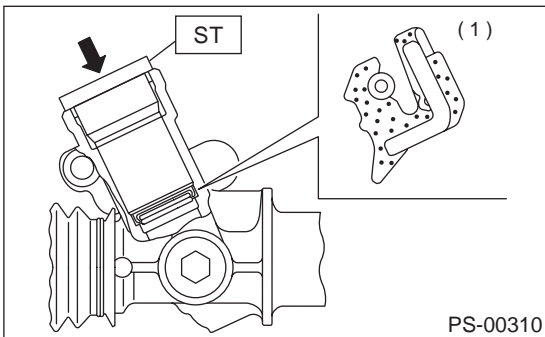
D: ASSEMBLY

Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

1) Apply grease inside and outside of oil seal and press in using ST and press.

ST 34199AE130 GEARBOX OIL SEAL INSTALLER

CAUTION:
Pay attention to oil seal direction, and attaching position.
Be careful no to scratch gearbox inside surface.



- (1) Oil seal

2) Attach steering body to ST as shown. Apply a coat of grease to needle bearing.

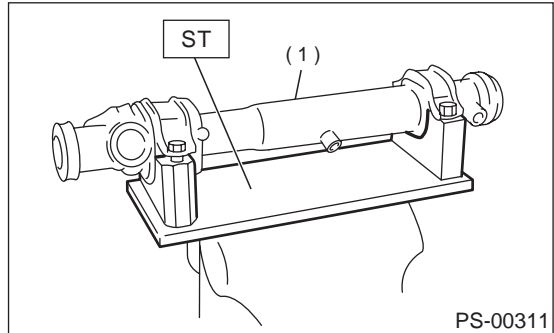
ST 926200000 STAND

CAUTION:

- Use a ST to support steering body.
- Ensure that needle bearing is free from defects. If it is faulty, replace steering body with a new one.

NOTE:

If steering body is removed from vehicle, be sure to remove rust and clean.



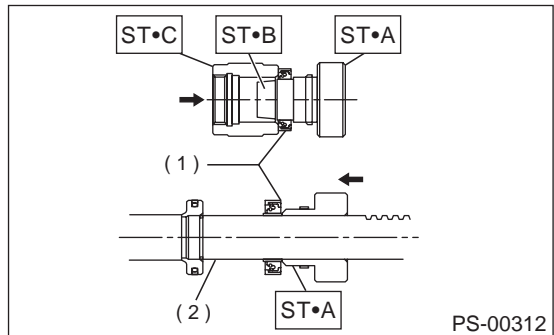
- (1) Steering body

3) Using ST-B and ST-C, attach oil seal to ST-A. Insert ST-A into rack from gear side. Remove oil seal from ST-A when it approaches piston and remove STs from rack.

ST 927490000 INSTALLER; A-B-C

NOTE:

Face oil seal in the direction shown in figure.

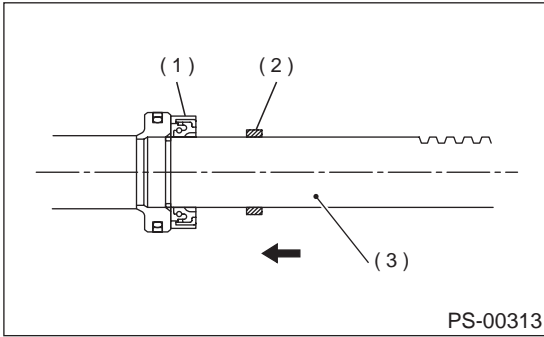


- (1) Oil seal
- (2) Rack

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

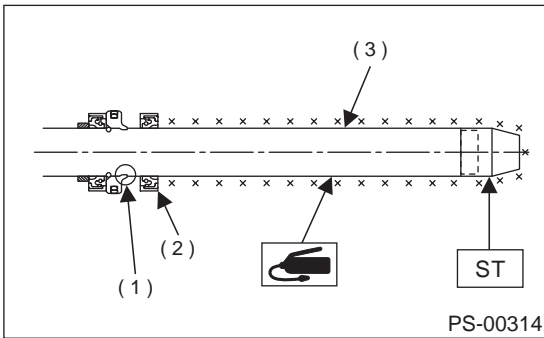
4) Install back-up ring from gear side of rack.



- (1) Oil seal
- (2) Back-up ring
- (3) Rack

5) Install ST on rack and equally apply a thin coat of grease to rack and ST, then install oil seal.
ST 926250000 GUIDE

CAUTION:
Be careful not to scratch oil seal lips with piston's pawl section.

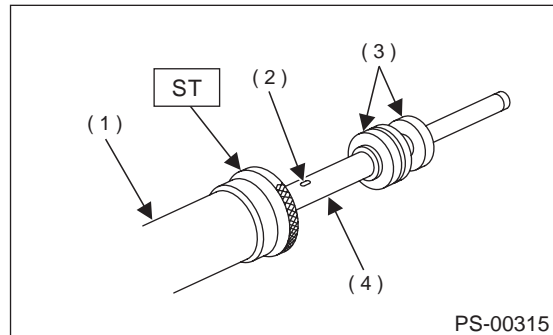


- (1) Piston's pawl section
- (2) Outer side oil seal
- (3) Rack

6) Apply a coat of grease to grooves in rack, sliding surface of sleeve and sealing surface of piston. Install ST on the end of steering body cylinder. Then insert rack into steering body from cylinder side.
ST 34199AE000 GUIDE (Oil seal)

CAUTION:

- Be sure to apply grease so that it covers the entire surface of rack gear teeth.
- Do not allow grease to block air vent hole on rack.



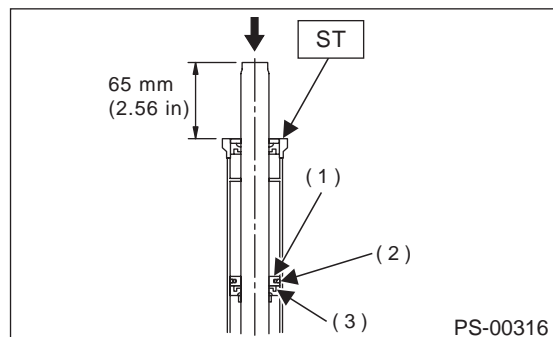
- (1) Cylinder side of steering body
- (2) Air vent hole
- (3) Oil seal
- (4) Rack

7) Slowly press inner side oil seal with a rack until distance between ST and end of rack is 65 mm (2.56 in).

ST 34199AE000 GUIDE (Oil seal)

CAUTION:

Ensure ST's inner wall is free of scratches. Otherwise, it may damage oil seal during installation.



- (1) Rack piston
- (2) Inner side oil seal
- (3) Back-up ring

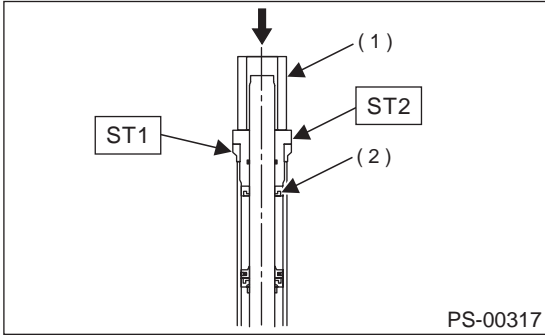
STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

8) Pass ST2 and pipe through rack and press outer side oil seal until ST1 is in contact with ST2.

ST1 34199AE000 GUIDE (Oil seal)

ST2 34199AE010 INSTALLER (Oil seal)

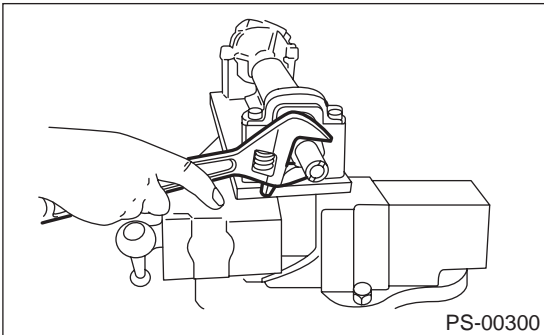


- (1) Pipe
- (2) Outer side oil seal

9) Install holder from cylinder side of steering body.

Tightening torque:

$64 \pm 5 \text{ N}\cdot\text{m}$ ($6.5 \pm 0.5 \text{ kgf}\cdot\text{m}$, $47.0 \pm 3.6 \text{ ft}\cdot\text{lb}$)

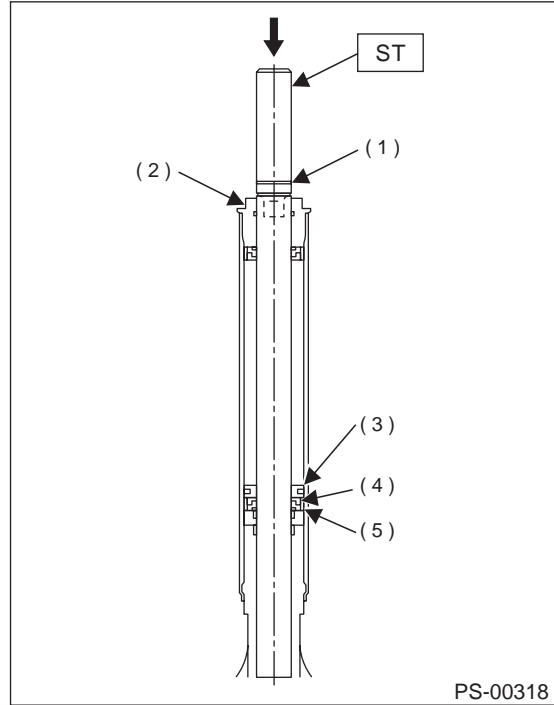


10) Attach ST to rack cylinder. Using a press, install back-up ring and oil seal.

NOTE:

Press ST until its groove is aligned with end of holder.

ST 34099FA030 INSTALLER & REMOVER



- (1) Installer guide
- (2) Holder
- (3) Rack piston
- (4) Oil seal
- (5) Back-up ring

STEERING GEARBOX [RHD MODEL]

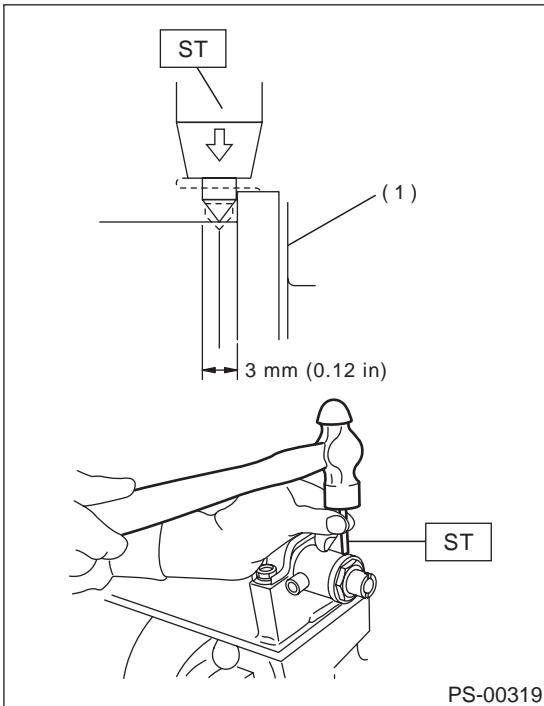
POWER ASSISTED SYSTEM (POWER STEERING)

11) Using ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

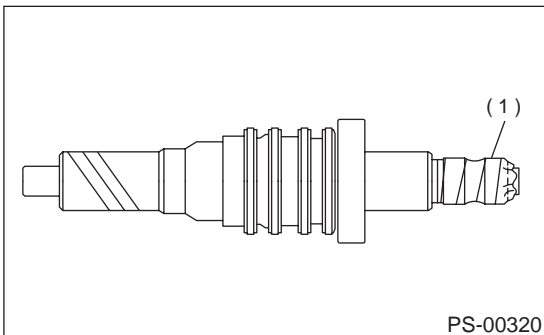
CAUTION:

Be careful not to deform holder.

ST 34099FA060 PUNCH HOLDER



12) Roll vinyl tape on serration part of valve assembly, and apply grease on tape surface.



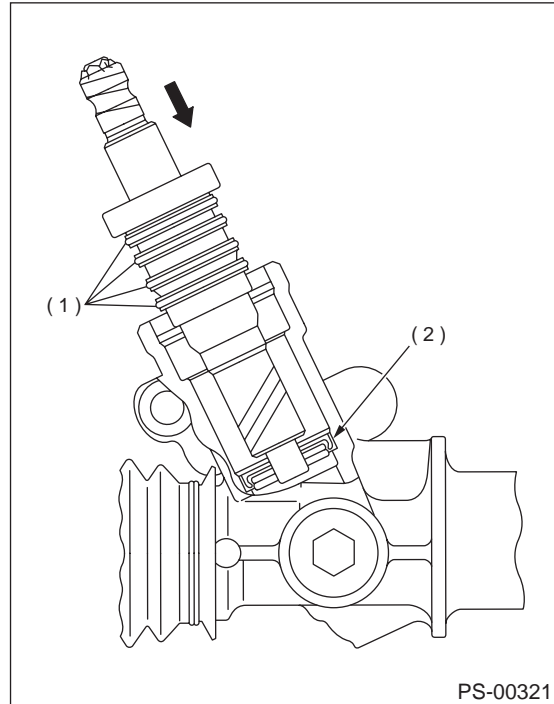
(1) Vinyl tape

13) Apply grease on gear teeth of valve assembly and attach valve assembly.

CAUTION:

• **Be careful not to scratch oil seal on valve gear teeth.**

• **Be careful not to scratch seal ring of valve circumference.**



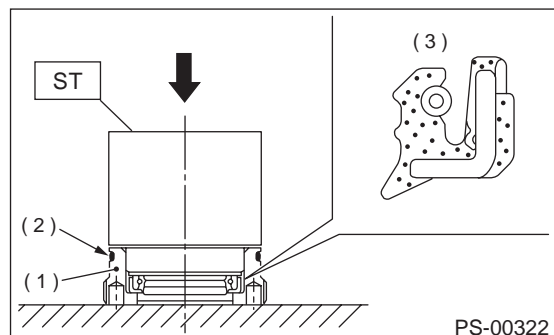
(1) Seal ring
(2) Oil seal

14) Apply grease on oil seal circumference, press in to plug using ST and a press. Replace plug circumference O-rings with new ones.

ST 34199AE110 PLUG OIL SEAL INSTALLER

CAUTION:

Pay attention to oil seal direction, and attaching position.

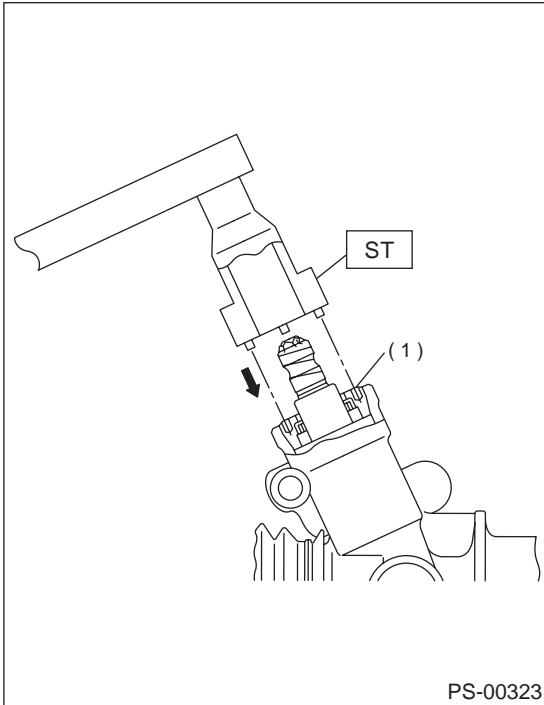


(1) Plug
(2) O-ring
(3) Oil seal

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

15) Using ST, install plug.



(1) Plug

Tightening torque:

64 N·m (6.5 kgf-m, 47 ft-lb)

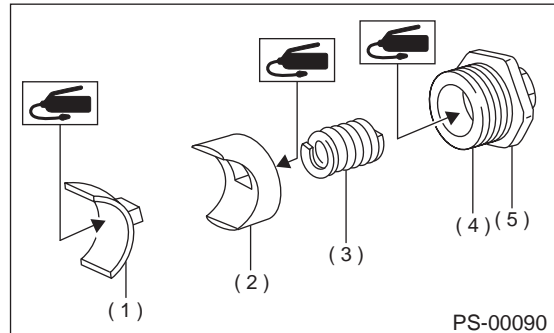
16) Temporarily install the rack, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

CAUTION:

If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

17) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert sleeve into steering body.

Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



- (1) Seat pad
- (2) Sleeve
- (3) Spring
- (4) Adjusting screw
- (5) Lock nut

18) Tighten the adjusting screw to specified torque.

Tightening torque:

First step; 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

Second step; Back off 25°.

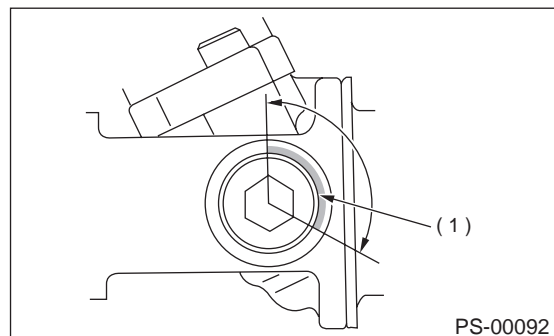
19) Remove the tie-rod.

20) Verify that play is within specified value. <Ref. to PS-37, SERVICE LIMIT, INSPECTION, Steering Gearbox.>

21) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:

THREE BOND 1141



- (1) Apply liquid gasket to at least 1/3 of entire perimeter.

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

22) Tighten the adjusting screw to specified torque.

Tightening torque:

First step; 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

Second step; Back off 25°.

23) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):

39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

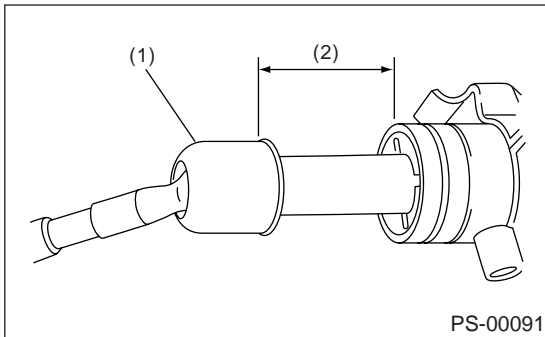
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

24) Extend the rack approx. 40 mm (1.57 in) beyond side of steering body.

25) Install the tie-rod and a new lock washer into rack.

Tightening torque:

78 N·m (8.0 kgf-m, 57.9 ft-lb)

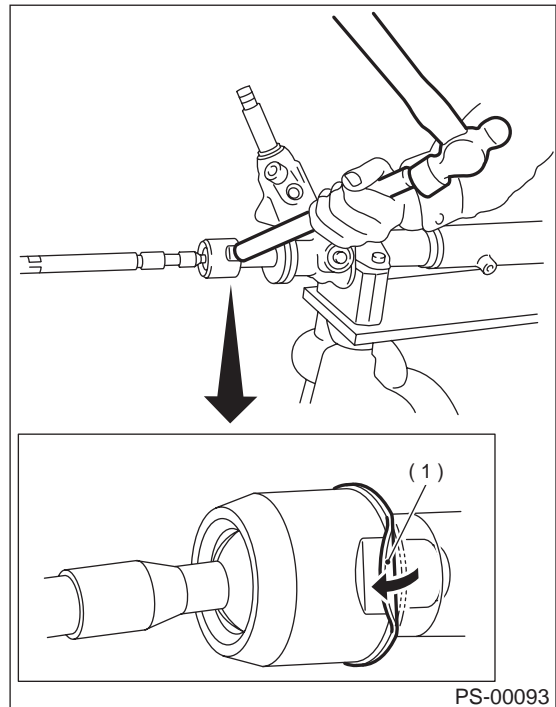


- (1) Tie-rod
- (2) Approx. 40 mm (1.57 in)

26) Bend the lock washer.

CAUTION:

Be careful not to scratch the rack when bending lock washer.

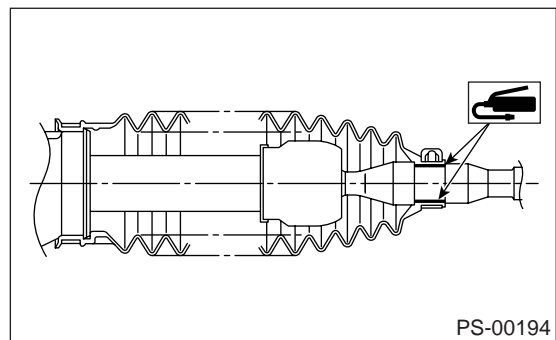


- (1) Lock washer

27) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:

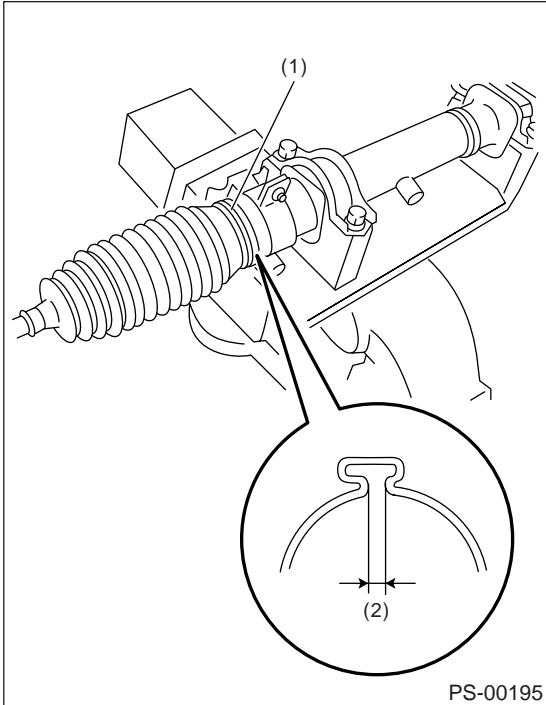
Make sure that the boot is installed without unusual inflation or deflation.



STEERING GEARBOX [RHD MODEL]

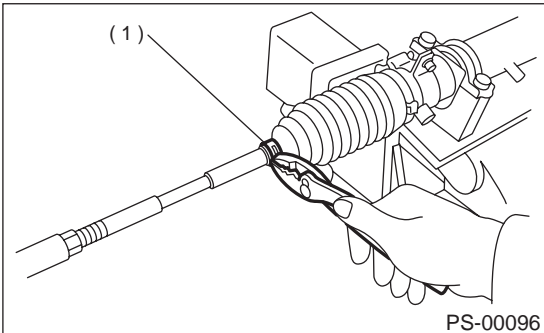
POWER ASSISTED SYSTEM (POWER STEERING)

28) Install a new boot band. Using band clamp pliers, caulk the boot band to make clearance of caulking part 2 mm (0.079 in) or less.



- (1) Boot band
- (2) 2 mm (0.079 in) or less

29) Fix the boot end with clip (small).

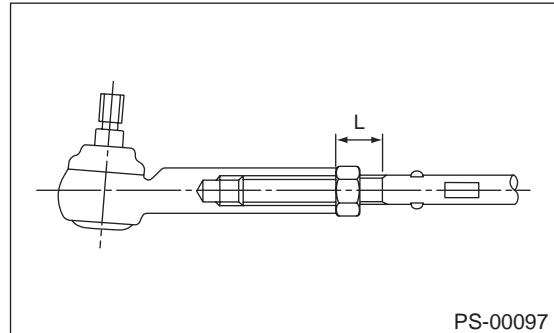


- (1) Clip
- (2) 2 mm (0.079 in) or less

30) After installing, check the boot end is positioned into groove on tie-rod.

31) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length: L
15 mm (0.59 in)



STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.

2) When disassembling, check inside of gearbox for water. If any water is found, carefully check boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If bend or damage is excessive, replace entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If outer wall slips, lip is worn out or damage is found, replace it with new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust backlash properly. By measuring turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to "Service limit".) (2) Keeping rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace gearbox with new one.
		(4) Wear or damage on rack bush	If free play of rack shaft in radial direction is out of the specified range, replace gearbox with new one. (Refer to "Service limit".)
		(5) Wear on input shaft bearing	If free plays of input shaft in radial and axial directions are out of the specified ranges, replace gearbox with new one. (Refer to "Service limit".)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

2. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

NOTE:

When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

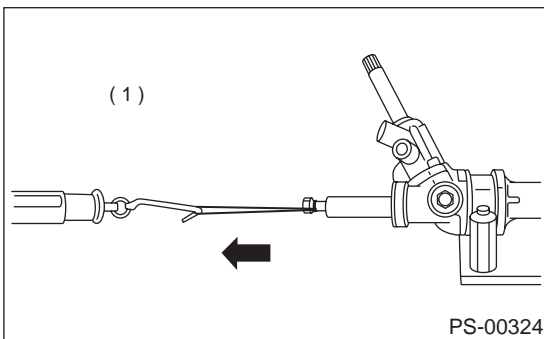
Sliding resistance of rack shaft:

Service limit

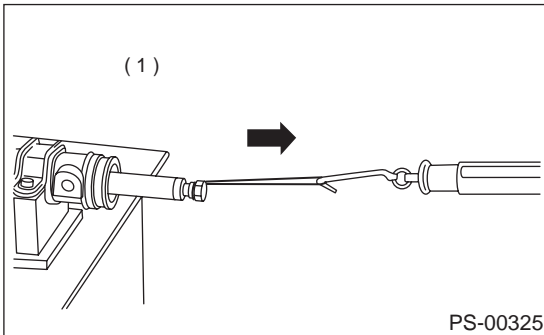
304 N (31 kgf, 68 lb) or less

Difference between left and right sliding resistance

Less than 20%



(1) Right turn steering



(1) Left turn steering

3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

Service limit

Less than 0.4 mm (0.016 in) (direction \longleftrightarrow)

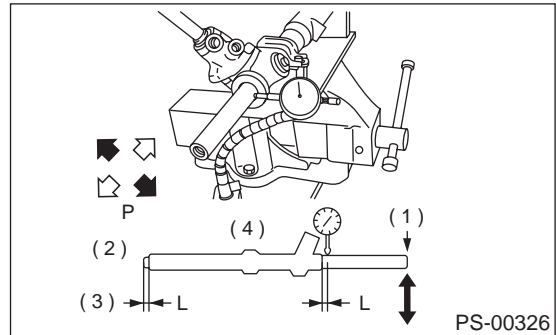
Less than 0.6 mm (0.024 in) (direction \longleftrightarrow)

\longleftrightarrow

On condition

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lb)



- (1) Lower side
- (2) Right turn
- (3) Measuring point
- (4) Right

Left-turn steering:

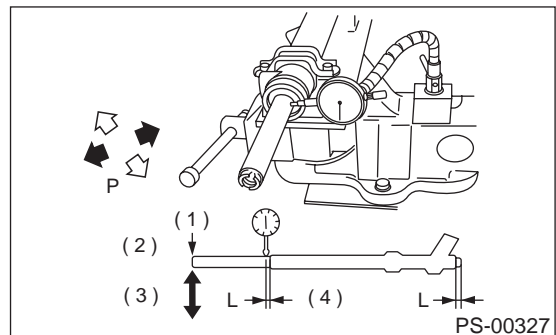
Service limit

Less than 0.4 mm (0.016 in) (direction \longleftrightarrow and \longleftrightarrow)

On condition

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lb)



- (1) Lower side
- (2) Left turn
- (3) Measuring point
- (4) Left

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

4. INPUT SHAFT PLAY

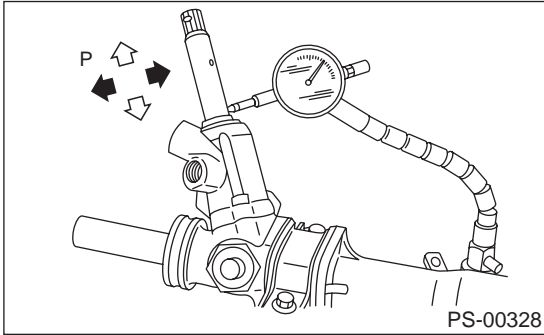
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

On condition

P: 98 N (10 kgf, 22 lb)



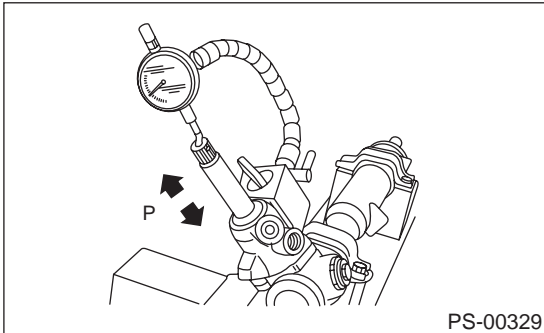
In axial direction:

Service limit

0.27 mm (0.0106 in) or less

On condition

P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



5. TURNING RESISTANCE OF GEARBOX

Using ST, measure gearbox turning resistance.

ST 926230000 SPANNER

Service limit:

Straight-ahead position within 30 mm (1.18 in) from rack center

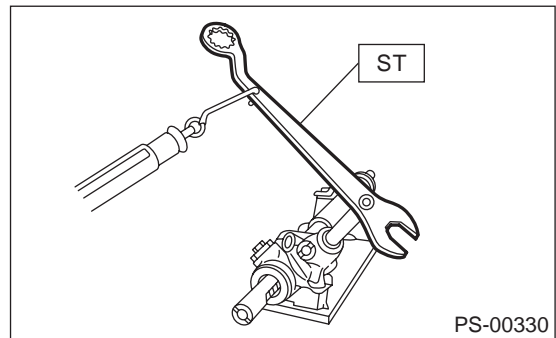
Less than 11.18 N (1.14 kgf, 2.51 lb)

Maximum allowable resistance

15.79 N (1.61 kgf, 3.55 lb) or less

Difference between left and right sliding resistance:

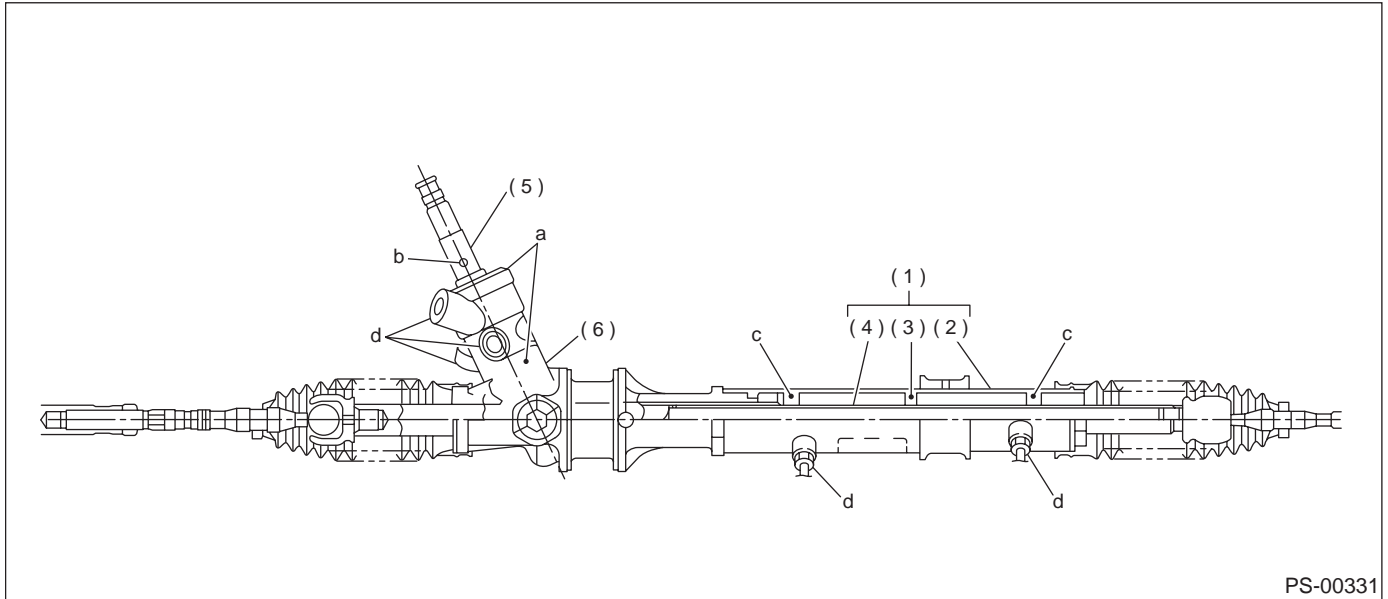
Less than 20%



STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6. OIL LEAKING



(1) Power cylinder

(3) Rack piston

(5) Input shaft

(2) Cylinder

(4) Rack

(6) Valve housing

• Oil leaking points

1) If leak point is other than a, b, c, or d, perform the 5th step in "Oil leak check procedure and replacement parts" before dismounting gearbox from vehicle. <Ref. to "Oil leak check procedure and replacement parts".> If gearbox is dismounted without confirming where the leak is, it must be mounted again to locate the leak point.

2) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the oil from the suspected portion and turn the steering wheel from lock to lock about 30 to 40 times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.

3) Before starting oil leak repair work, be sure to clean the gearbox, hoses, pipes, and surrounding parts. After completing repair work, clean these areas again.

• Oil leak check procedure and replacement parts

NOTE:

Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

1) Leakage from "a"

The oil seal is damaged. Replace valve assembly with a new one.

2) Leakage from "b"

The torsion bar O-ring is damaged. Replace valve assembly with a new one.

3) Leakage from "c"

The oil seal is damaged. Replace oil seal with a new one.

4) Leakage from "d"

The pipe is damaged. Replace the faulty pipe or O-ring.

5) If leak is other than a, b, c, or d, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove oil from the surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.

(1) Leakage from "e"

The cylinder seal is damaged. Replace rack bush with a new one.

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

(2) Leakage from “f”

There are two possible causes. Take following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.

CAUTION:

- If leakage from “f” is noted again:
The oil seal of pinion and valve assembly is damaged. Replace pinion and valve assembly with a new one. Or replace the oil seal and the parts that are damaged during disassembly with new ones.

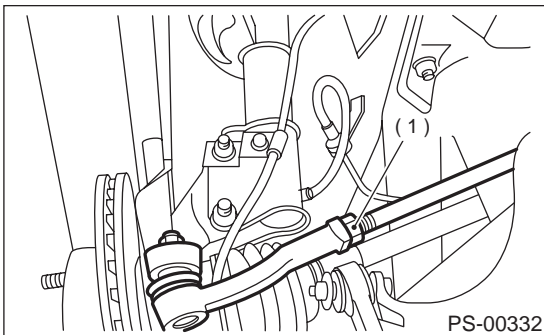
- If oil stops leaking from “f”:
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust front toe.

Standard of front toe:

IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



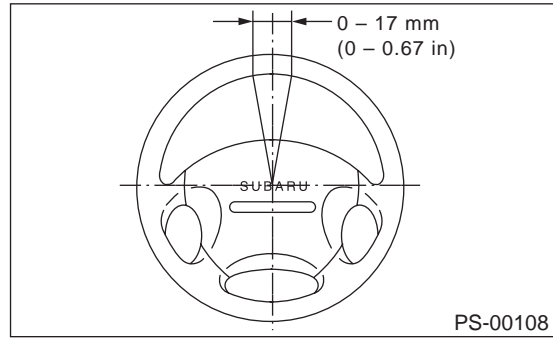
(1) Lock nut

2) Adjust steering angle of wheels.

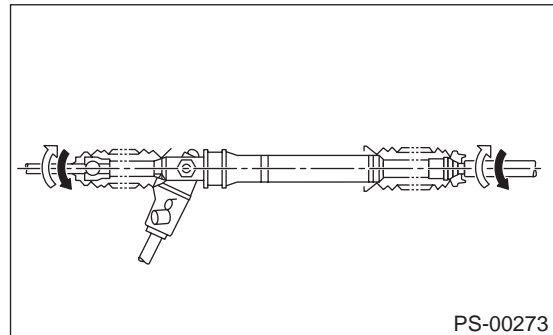
Standard of steering angle:

Model	Except OUTBACK		OUT- BACK
	15 inch wheel	16 inch wheel	
Inner wheel	37.5°±1.5°	36.3°±1.5°	34.5°±1.5°
Outer wheel	32.6°±1.5°	31.6°±1.5°	30.3°±1.5°

3) If steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



4) If steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rod in the same direction by the same amount.



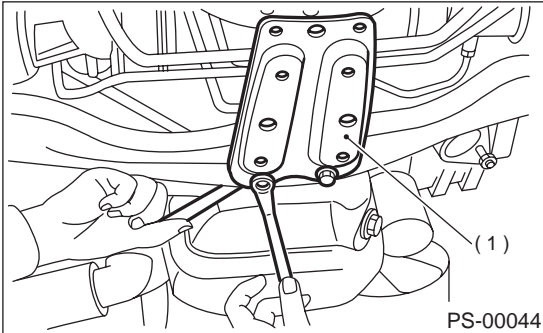
PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

7. Pipe Assembly

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.
- 3) Lift vehicle and remove jack-up plate.



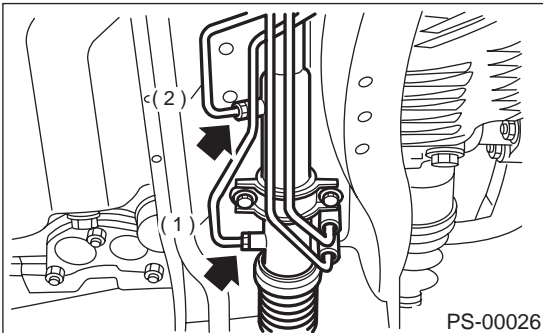
- (1) Jack-up plate

4) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

CAUTION:

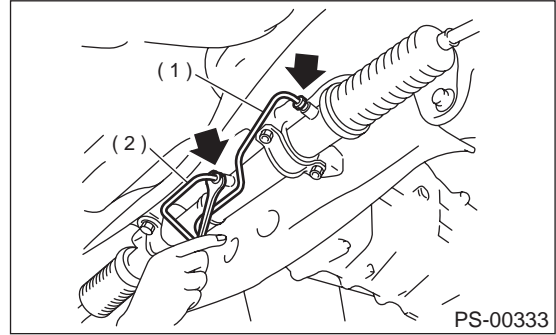
Improper removal and installation of parts often causes fluid leak trouble. To prevent this, clean the surrounding portions before disassembly and reassembly, and pay special attention to keep dirt and other foreign matter from mating surfaces.

LHD model



- (1) Pipe A
(2) Pipe B

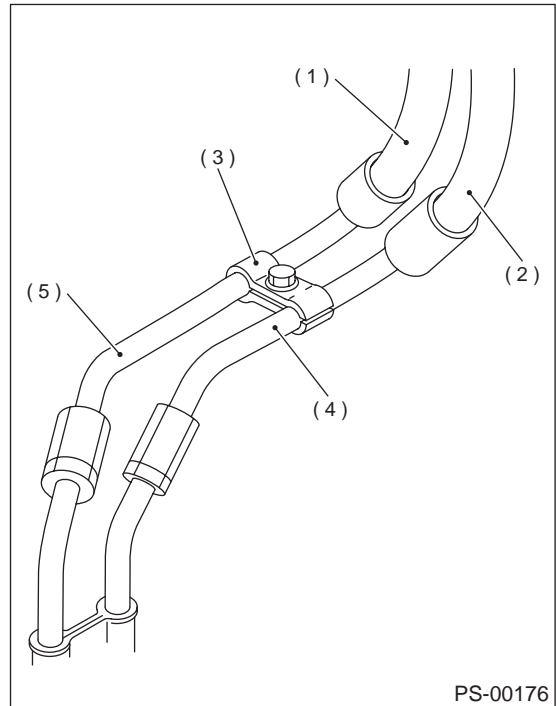
RHD model



- (1) Pipe A
(2) Pipe B

5) Remove clamp E from pipes.

LHD model

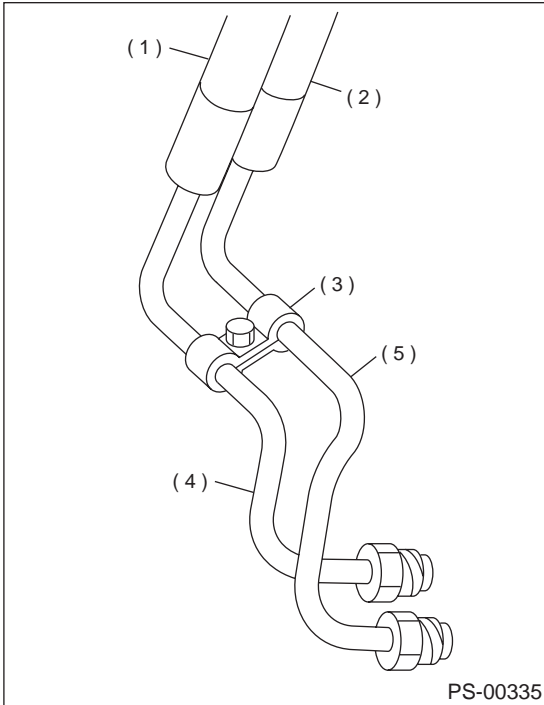


- (1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

RHD model (Except 3.0 L)



- (1) Pressure hose
- (2) Return hose
- (3) Clamp E
- (4) Pipe C
- (5) Pipe D

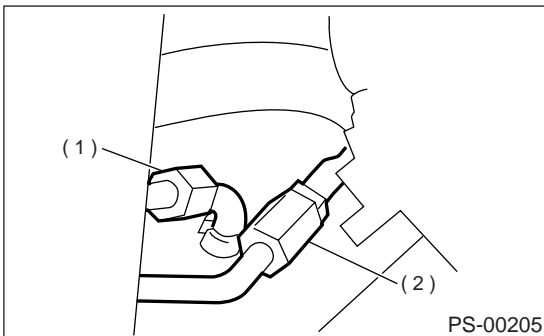
6) Disconnect pipe C-D.

LHD model

Disconnect pipe C-D from pipe (on the gearbox side).

CAUTION:

- When disconnecting pipe C-D, use two wrenches to prevent deformities.
- Be careful to keep pipe connections free from foreign matter.



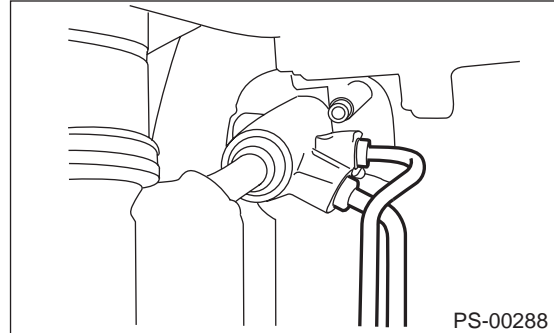
- (1) Pipe C
- (2) Pipe D

RHD model

Remove flare nuts from control valve of gearbox assembly, and then disconnect pipe.

CAUTION:

- When disconnecting pipes, use two wrenches to prevent deformities.
- Be careful to keep pipe connections free from foreign matter.



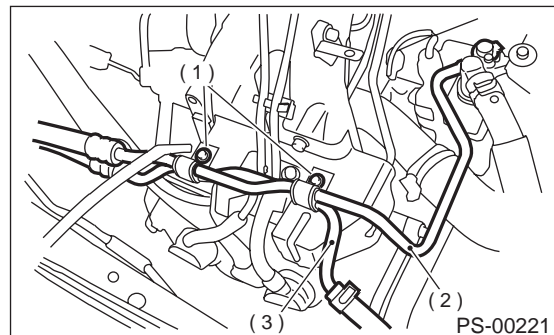
- 7) Lower the vehicle.
- 8) Remove intake duct.
- 9) Remove bolt A.

Except 3.0 L and Turbo model

Disconnect pipe C from oil pump. Disconnect pipe D from return hose.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

PIPE ASSEMBLY

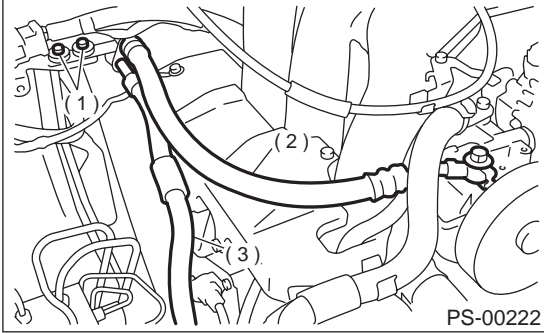
POWER ASSISTED SYSTEM (POWER STEERING)

3.0 L and Turbo model

Disconnect pressure hose from oil pump. Disconnect return hose from reservoir tank.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pressure hose
- (3) Return hose

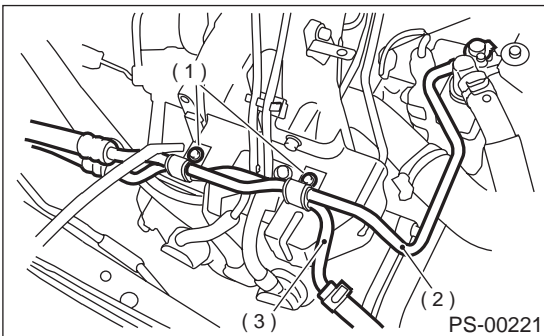
B: INSTALLATION

1) Tighten bolt A.

CAUTION:

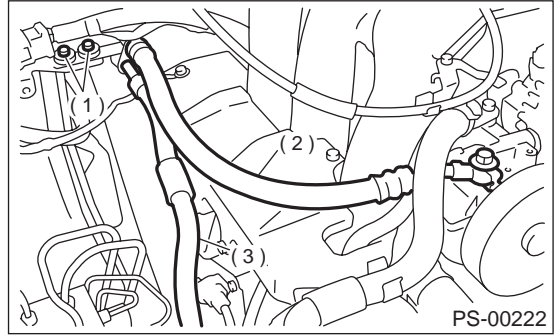
Visually check that hose between tank and pipe D is free from bending or twisting.

Except 3.0 L and Turbo model



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

3.0 L and Turbo model



- (1) Bolt A
- (2) Pressure hose
- (3) Return hose

- (1) Connect pipe D or return hose to oil tank.
- (2) Connect pipe C or pressure hose to oil pump.

CAUTION:

Use anew gasket.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

- (3) Tighten bolt A.

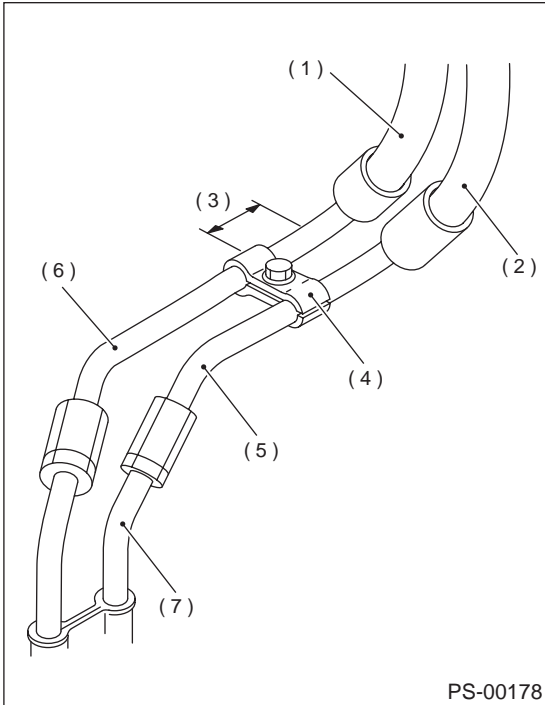
Tightening torque:

13 N·m (1.3 kgf·m, 9.4 ft·lb)

PIPE ASSEMBLY

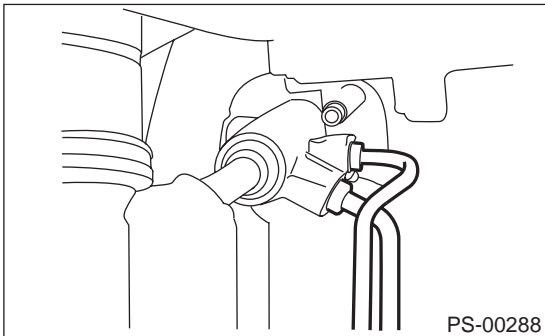
POWER ASSISTED SYSTEM (POWER STEERING)

2) Temporarily connect pipes C and D.



- (1) Return hose
- (2) Pressure hose
- (3) Approx. 30 mm (1.18 in)
- (4) Clamp E
- (5) Pipe C
- (6) Pipe
- (7) Pipe (on gearbox side)

RHD model



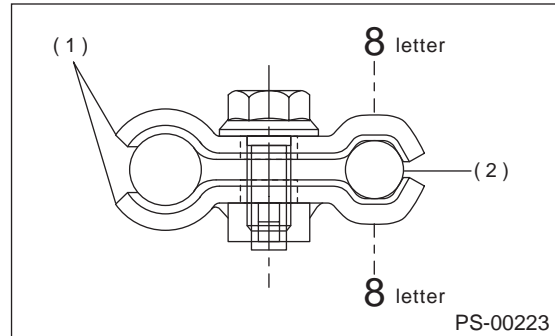
3) Temporarily install clamp E on pipes C and D, and tighten clamp E firmly.

CAUTION:

Ensure that the letter “8” on each clamp are diagonally opposite each other as shown in figure.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



- (1) Clamp E
- (2) Pipe C

4) Tighten joint nut.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

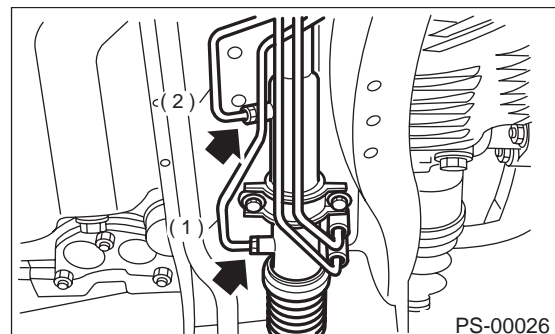
5) Connect pipe A and B.

Connect pipes A and B to four pipe joints of gear-box. Connect upper pipe B first, and lower pipe A second.

LHD model

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



- (1) Pipe A
- (2) Pipe B

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

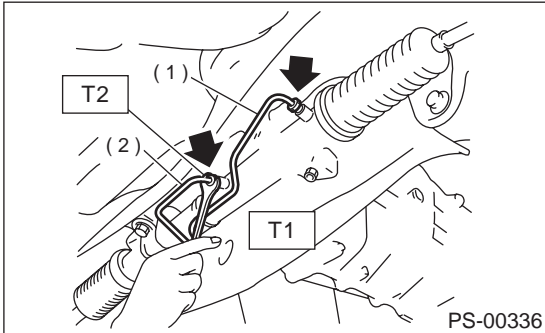
RHD model

Connect pipes A and B to four pipe joints of gear-box. Connect upper pipe A first, and lower pipe B second.

Tightening torque:

T1: 20 N·m (2.0 kgf-m, 14.5 ft-lb)

T2: 24 N·m (2.4 kgf-m, 17.4 ft-lb)



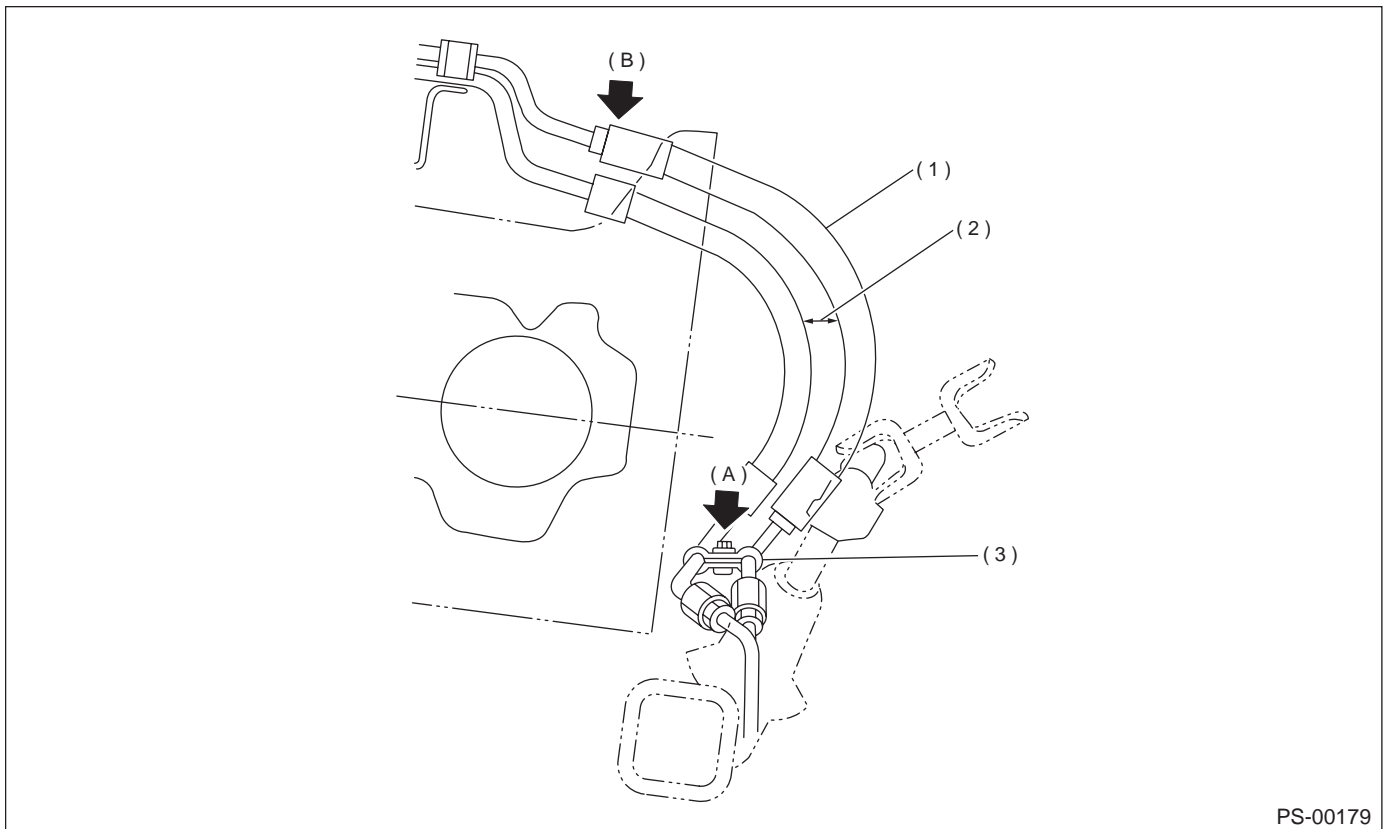
- (1) Pipe A
- (2) Pipe B

- 6) Install jack-up plate.
- 7) Connect battery ground cable.
- 8) Feed the specified fluid.

NOTE:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

LHD model

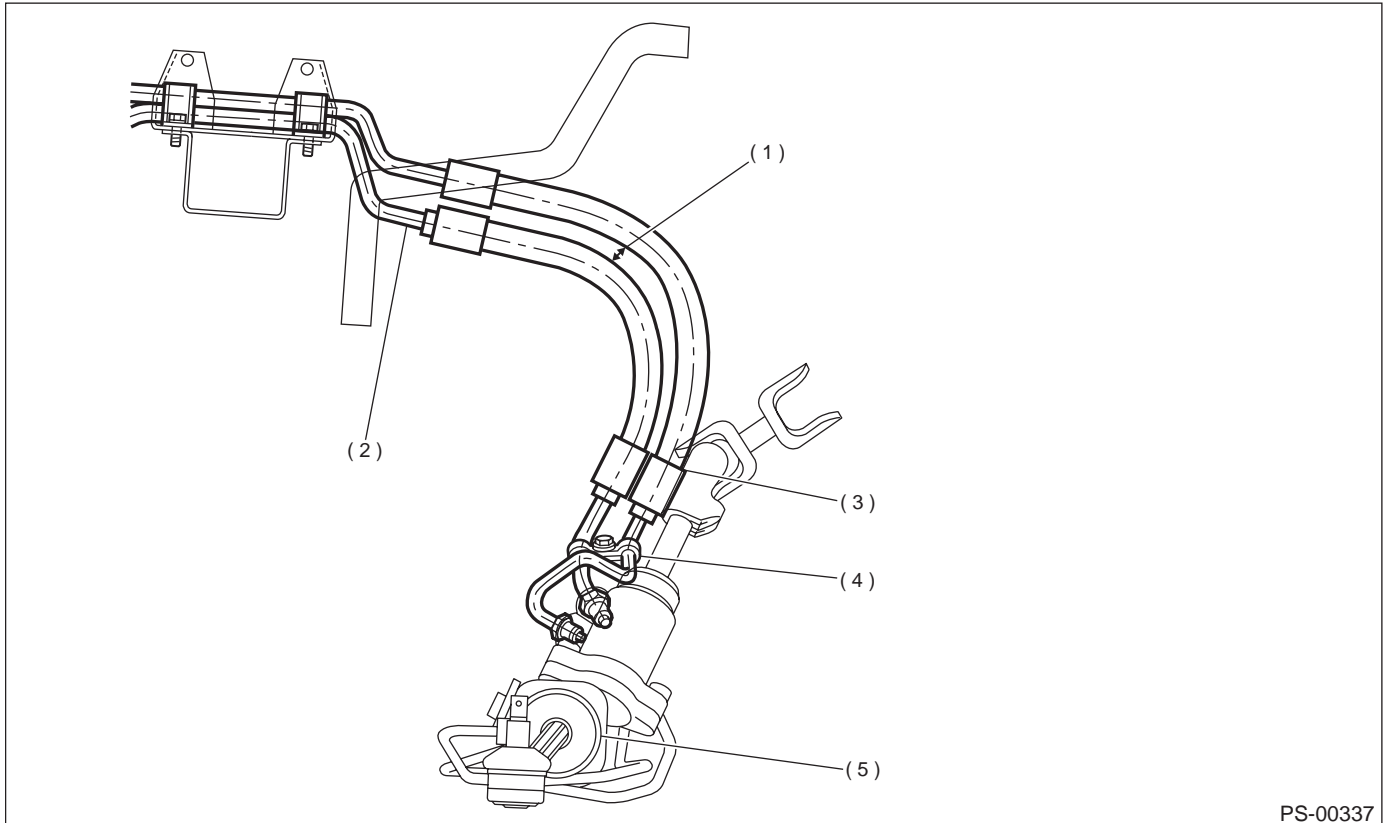


- (1) High-pressure hose
- (2) No interference is allowed between hoses.
- (3) Clearance between crossmember and pipe: 3 - 8 (0.12 - 0.31)

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

RHD model



PS-00337

- | | | |
|--|--|--|
| (1) No interference is allowed between hoses. | (3) Clearance between side frame and hose: 15 mm (0.59 in) or more | (4) Clearance between crossmember and pipe: 5 — 13 mm (0.20 — 0.51 in) |
| (2) Clearance between blow-by hose and pipe: 3 — 5 mm (0.12 — 0.20 in) | | (5) Steering gearbox |

9) Finally check clearance between pipes and/or hoses, as shown above.

If clearance between cruise control pump and power steering hose is less than 10 mm (0.39 in), proceed as follows:

- (1) Move clamped section (A) (refer to figure above.) down to a point where pipe is close to crossmember.

**Pipe-to-crossmember clearance:
10 mm (0.39 in), min.**

- (2) Check that clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend section (B) down until a clearance of at least 10 mm (0.39 in) is obtained.

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
Pipe	<ul style="list-style-type: none"> • O-ring fitting surface for damage • Nut for damage • Pipe for damage 	Replace with new one.
Clamp	<ul style="list-style-type: none"> • Clamps for weak clamping force 	Replace with new one.
Hose	<ul style="list-style-type: none"> • Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation 	Replace with new one.

CAUTION:

Although surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.

Since resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather area and/or a driving condition in which many steering operations are required in short time.

Particularly continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

So, avoid to keep this kind of condition when servicing as well as driving.

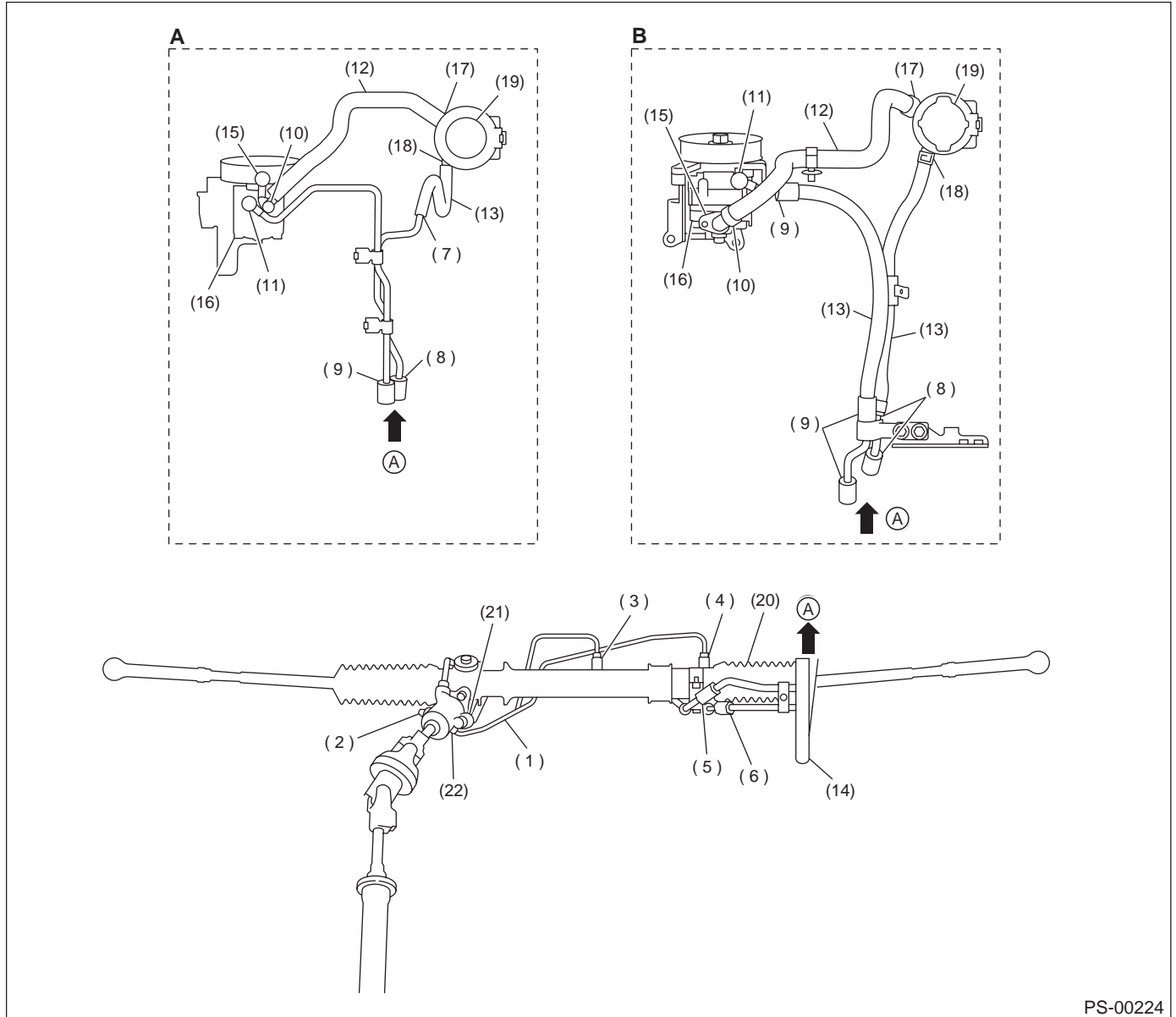
Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace defective parts.
	Improper stop position of pitching stopper	Replace defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct customers.

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



PS-00224

(A) Except 3.0 L and Turbo model

(B) 3.0 L and Turbo model

PIPE ASSEMBLY

POWER ASSISTED SYSTEM (POWER STEERING)

Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (11) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace clamp.
	Damaged O-ring or gasket	Replace O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose (12), (13) and (14) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (15) and (16) in figure	Damaged O-ring	Replace oil pump.
	Damaged gasket	Replace oil pump.
Leakage from oil tank (17) and (18) in figure	Crack in oil tank	Replace oil tank.
Leakage from filler neck (19)	Damaged cap packing	Replace cap.
	Crack in root of filler neck	Replace oil tank.
	High fluid level *1	Adjust fluid level.
Leakage from surrounding of power cylinder of gearbox (20) in figure	Damaged oil seal	Replace oil seal.
Leakage from control valve of gearbox (21) and (22) in figure	Damaged packing or oil seal	Replace problem parts.
	Damage in control valve	Replace control valve.

NOTE:

Fluid level is specified at optimum position (range) for ordinary use. Accordingly, if the vehicle is used often under hard conditions such as on very rough roads or in mountainous areas, fluid may bleed out from cap air vent hole. This is not a problem. If a customer complains strongly and is not likely to be satisfied with the leakage, lower the fluid level to the extent that fluid will not bleed out under the conditions described, and have the customer check the fluid level and its quality more frequency than usual.

OIL PUMP

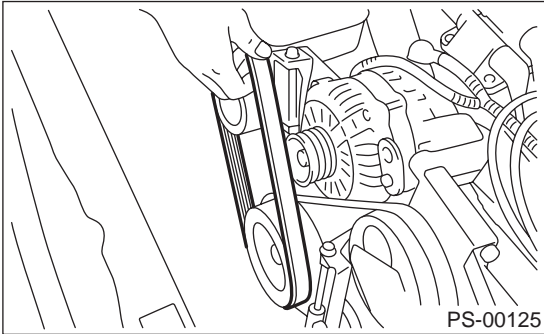
POWER ASSISTED SYSTEM (POWER STEERING)

8. Oil Pump

A: REMOVAL

1. EXCEPT 3.0 L AND TURBO MODEL

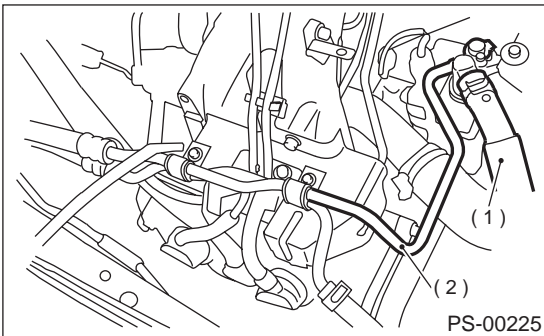
- 1) Remove ground cable from battery.
- 2) Remove pulley belt cover bracket.
- 3) Loosen lock bolt and slider bolt and remove power steering pump drive V-belt.



- 4) Disconnect connector from power steering pump switch.
- 5) Disconnect pipe C and suction hose from oil pump.

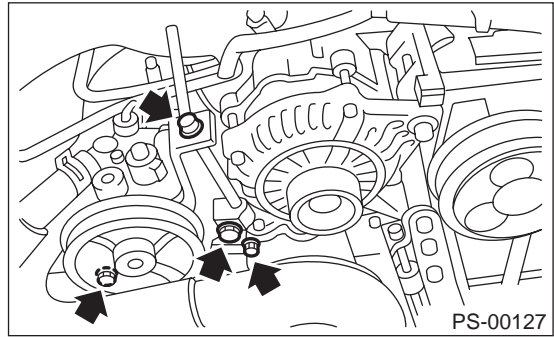
CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Suction hose
- (2) Pipe C

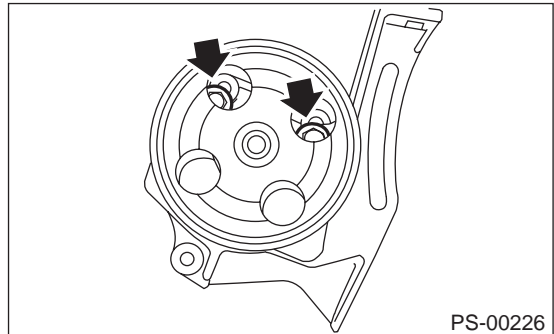
- 6) Remove bolts which install power steering pump bracket.



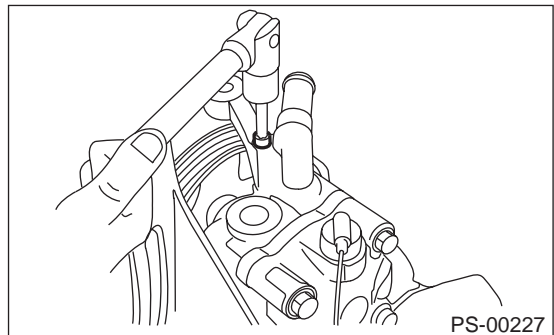
- 7) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

CAUTION:

Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



- 8) Remove socket from oil pump.

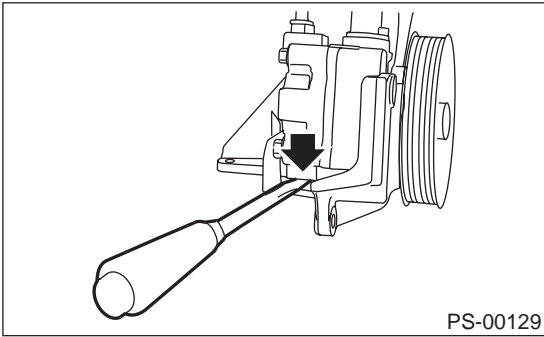


- 9) Remove bolt from the rear side of oil pump.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

10) Disassemble oil pump and bracket by inserting a screwdriver as shown in the figure.

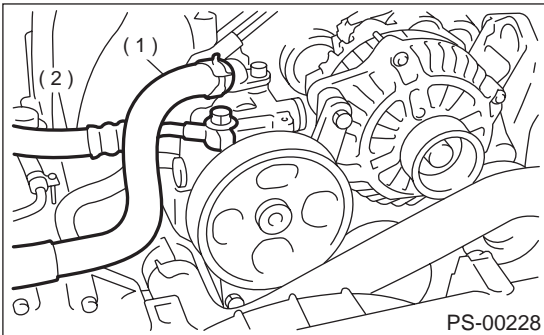


2. 3.0 L AND TURBO MODEL

- 1) Remove ground cable from battery.
- 2) Remove pulley belt cover.
- 3) Remove V-belt.
- 4) Disconnect connector from power steering pressure switch.
- 5) Remove tensioner adjuster.
- 6) Disconnect pressure hose and suction hose from oil pump.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



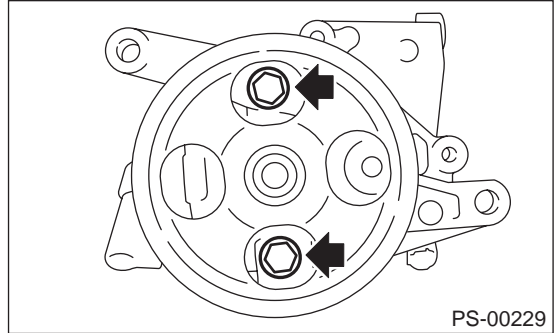
- (1) Pressure hose
- (2) Suction hose

7) Remove bolts, which install power steering pump bracket.

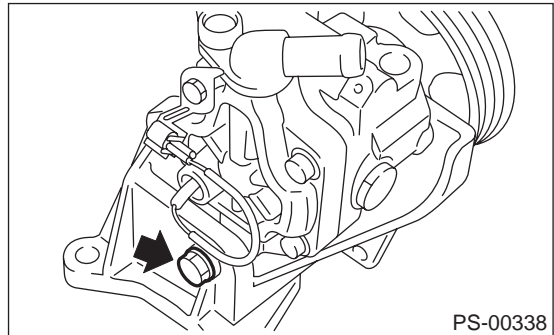
8) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

CAUTION:

Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



9) Remove bolt from the rear side of oil pump.



10) Remove oil pump from bracket.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

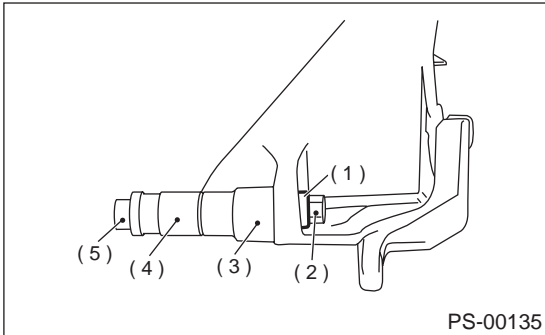
1. EXCEPT 3.0 L AND TURBO MODEL

1) Install oil pump to bracket.

(1) Place oil pump bracket in a vise. Tighten bushing using a 12.7 mm (1/2") type 14- and 21-mm box wrench until it is in contact with oil pump mounting surface.

CAUTION:

Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

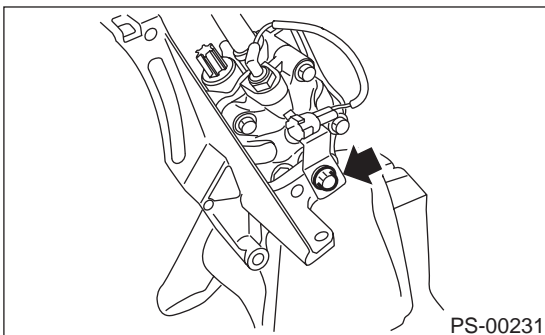


- (1) Bushing
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

(2) Tighten bolt which installs oil pump and switch bracket to bracket.

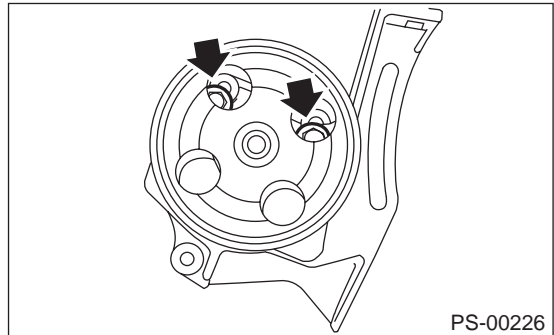
Tightening torque:

37.3 N·m (3.8 kgf·m, 27.5 ft·lb)



Tightening torque:

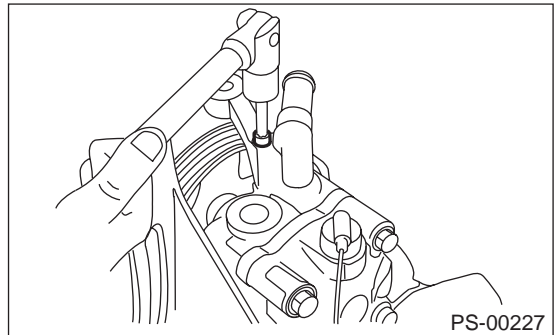
15.7 N·m (1.6 kgf·m, 11.6 ft·lb)



2) Install socket to oil pump.

Tightening torque:

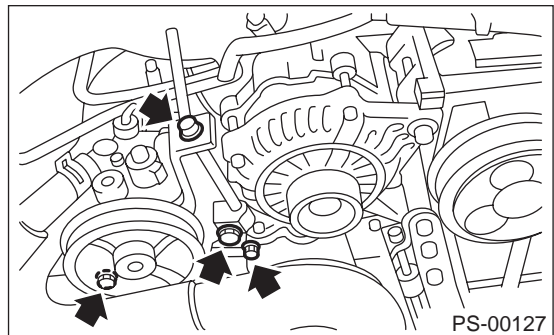
6.5 N·m (0.66 kgf·m, 4.8 ft·lb)



3) Tighten bolts which install power steering pump bracket.

Tightening torque:

22 N·m (2.2 kgf·m, 15.9 ft·lb)



OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

4) Interconnect pipes C and suction hose.

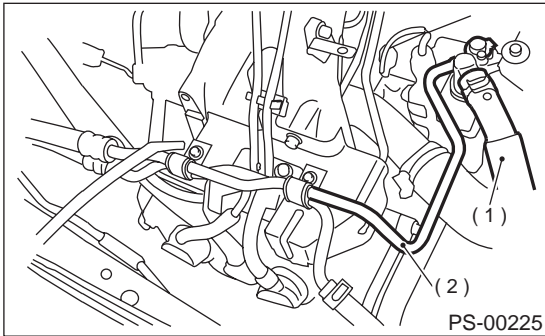
Tightening torque:

Joint nut

39.2 N·m (4 kgf-m, 28.9 ft-lb)

CAUTION:

If a hose is twisted at this step, the hose may come into contact with some other parts.



- (1) Suction hose
- (2) Pipe C

5) Connect connector to power steering oil pressure switch.

6) Install pulley belt to oil pump.

7) Check pulley belt tension. <Ref. to ME(H4SO)-41, V-belt.> and <Ref. to ME(H6DO)-28, V-belt.>

8) Tighten lock bolt.

Tightening torque:

24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

9) Tighten bolt belt tension.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

10) Install pulley belt cover bracket.

11) Connect ground terminal of battery.

12) Feed the specified power steering fluid <Ref. to PS-92, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

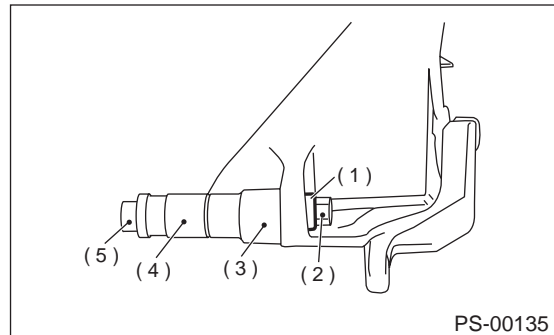
2. 3.0 L AND TURBO MODEL

1) Install oil pump to bracket.

(1) Place oil pump bracket in a vise. Tighten bushing using a 12.7 mm (1/2") type 14 and 21-mm box wrench until it is in contact with oil pump mounting surface.

CAUTION:

Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

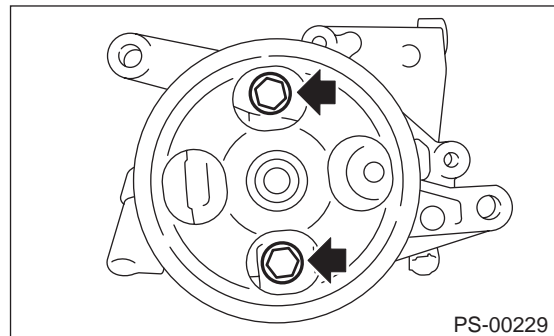


- (1) Bushing
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

(2) Tighten bolt which installs oil pump to bracket.

Tightening torque:

15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

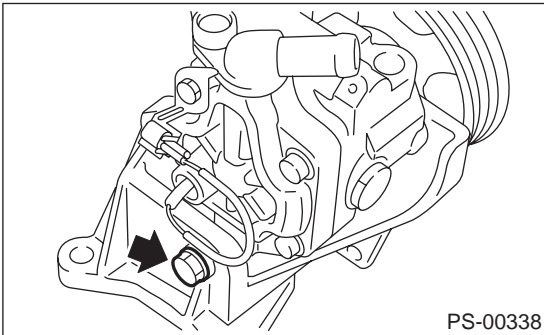


OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

Tightening torque:

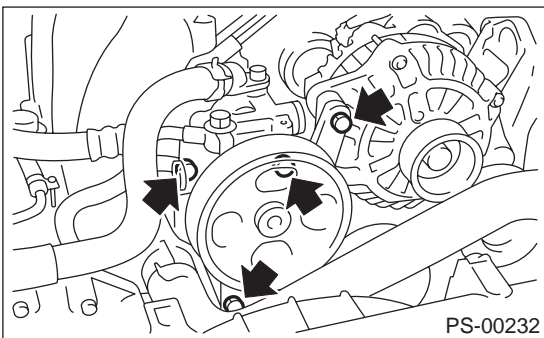
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten bolts which install power steering pump bracket.

Tightening torque:

33.3 N·m (3.4 kgf-m, 24.5 ft-lb)



3) Interconnect pressure hose and suction hose.

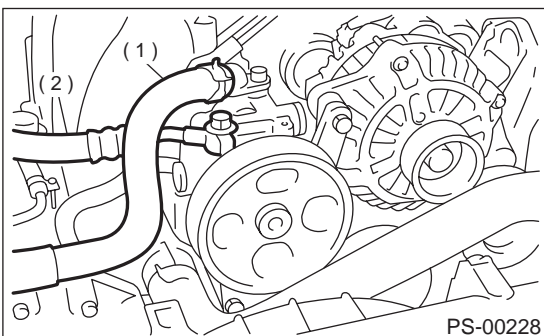
Tightening torque:

Eye bolt

39.2 N·m (4 kgf-m, 28.9 ft-lb)

CAUTION:

If a hose is twisted at this step, the hose may come into contact with some other parts.



- (1) Suction hose
- (2) Pressure hose

4) Connect connector to power steering oil pressure switch.

5) Install tensioner adjuster.

6) Install V-belt.

7) Install pulley belt cover.

8) Connect ground terminal of battery.

9) Feed the specified power steering fluid. <Ref. to PS-92, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

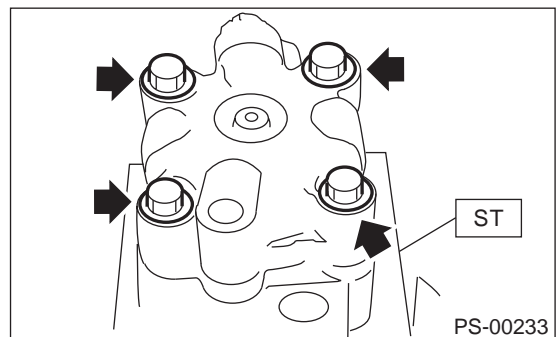
C: DISASSEMBLY

NOTE:

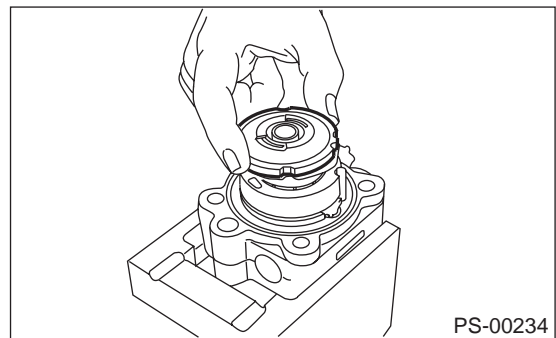
Oil pump for 3.0 L and Turbo model cannot be disassembled. If the oil pump is malfunctioning, replace the oil pump as an assembly.

1) Using ST, place oil pump in a vise and remove four bolts which secure rear cover.

ST 34199AE020 ATTACHMENT



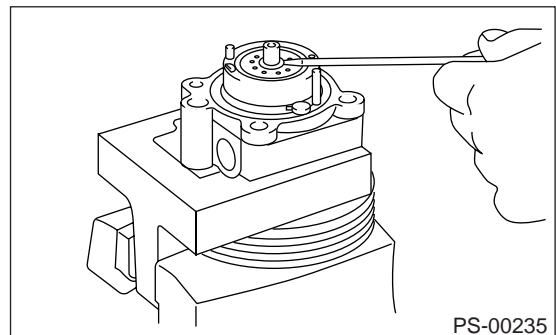
2) Remove pressure plate.



3) Using a screwdriver, pry retaining ring off.

CAUTION:

Do not remove cam ring, rotor, etc.

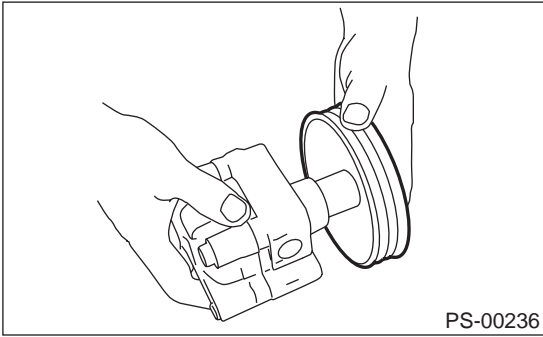


4) Install pressure plate.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

- 5) Temporarily install rear cover to front casing.
- 6) Remove oil pump pulley.



- 7) Place oil pump in a vise.

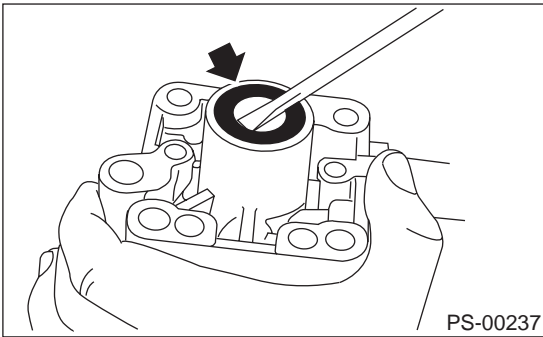
CAUTION:

Do not place oil pump directly in the vise, use soft pads and hold oil pump lightly to protect the pump.

- 8) Pry oil seal off using a screwdriver.

CAUTION:

Be careful not to scratch inner surface of casing.



D: ASSEMBLY

- 1) Reassembly precautions

- (1) Whenever O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.
- (2) Thoroughly wash parts and allow to dry. They must be kept free from cleaning oil and dust.
- (3) Reassembly procedure must be performed in clean place. Ensure that parts are kept away from waste threads or other dust particles.
- (4) Cleaning oil tends to stay inside the front casing. Remove it completely by blowing compressed air.
- (5) Ensure that parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)
- (6) Reverse the sequence of disassembly procedures.

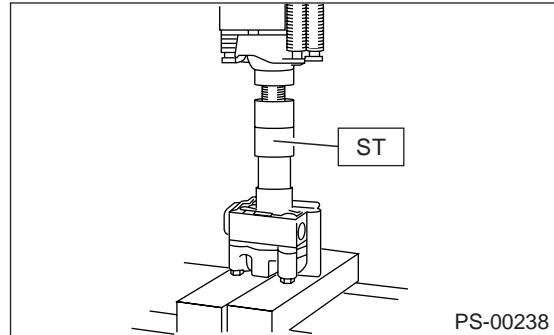
- 2) Apply grease to oil seal and inner surface of front casing (at bearing location).

CAUTION:

Make sure that the front body internal surfaces are free from damage.

- 3) Temporarily install rear cover to front body.
- 4) Attach ST to front body. Using a press, install oil seal.

ST 34199AE030 INSTALLER



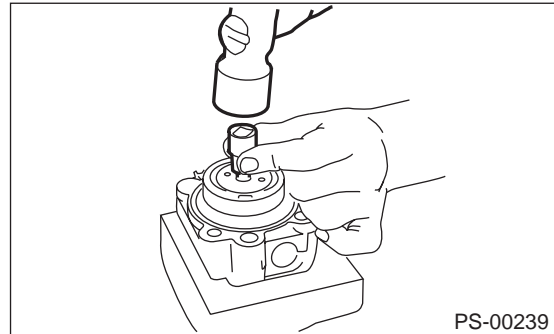
- 5) Install pump pulley to front body.

- 6) Using ST, place oil pump in a vise.

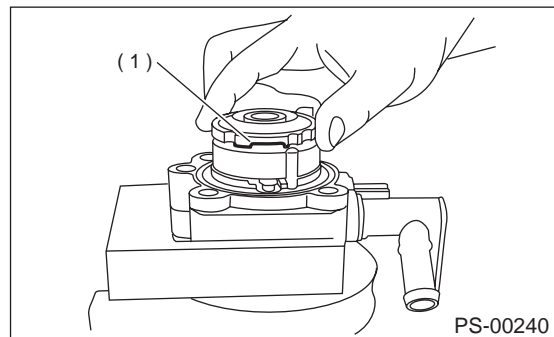
ST 34199AE020 ATTACHMENT

- 7) Remove rear cover.

- 8) Using 10-mm box wrench, tap retaining ring into shaft groove.



- 9) Install pressure plate as shown in the figure.



- (1) Groove

- 10) Apply specified hydraulic oil to O-rings and fit them into front casing and pressure plate.

- 11) Install seal ring to pressure plate.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

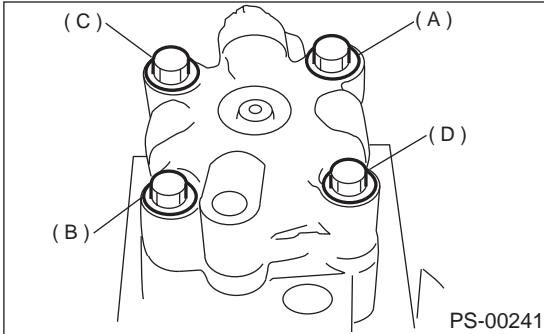
12) With knock pin positions aligned, install rear cover.

Tightening torque:

27.5 N·m (2.8 kgf-m, 20.3 ft-lb)

CAUTION:

Loosely tighten bolts in the sequence (A), (B), (C), and (D) shown in figure. Then, tighten in the same sequence.



13) When reassembly procedures have been completed, turn shaft by hand to ensure it turns smoothly. If it binds or other unusual conditions are evident, disassemble again and check for foreign matter trapped on sliding surfaces and improper installation. Eliminate the cause of trouble.

14) Check followings by referring to “CHECK” article.

- Excessive play in pulley shaft
- Ditch deflection of pulley
- Resistance to rotation of pulley
- Measurement of generated oil pressure

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

Part name	Description	Remedy
1. Front casing	1) Damage on body surfaces 2) Excessive wear on hole, into which spool valve is inserted. 3) Wear and damage on cartridge assembly mounting surface 4) Wear and damage on surfaces in contact with shaft and oil seal	Replace with a new one together with spool valve as selective fit is made.
2. Rear cover	1) Damage on body surfaces 2) Wear and damage on sliding surfaces	Replace with a new one.
3. Shaft	1) Shaft bend 2) Wear and damage on surfaces in contact with bushing and oil seal 3) Wear and damage on rotor mounting surfaces 4) Bearing damage	Replace with a new one.
4. Pressure plate	Wear and damage on sliding surfaces	Replace with a new one.
5. Cam ring	Ridge wear on sliding surfaces	If damage is serious, replace with a new cartridge assembly.
6. Vane	Excessive wear on nose radius and side surfaces	
7. Rotor	1) Wear and damage on sliding surfaces 2) Ridge wear on vane sliding grooves (If light leaks with vane in slit against light source) 3) Damage resulting from snap ring removal	
8. Connector	Damage on threads	Correct with oil stone. If damage is serious, replace with a new cartridge assembly.
9. Spring	Damage	Replace with a new one.
10. Bolts and nuts	Damage on threads	Replace with a new one.

• In accordance with the following table, check all removed parts for wear and damage, and make repair or replacement if necessary.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace oil pump with a new one.
		(2) Play of pulley shaft	Measure radial play and axial play. If any of these exceeds the service limit, replace oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure V ditch deflection. If it exceeds the service limit, replace pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check resistance to rotation of pulley. If it is past the service limit, replace oil pump with a new one.
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace oil pump with a new one.
4	O-ring	Crack or deterioration	Replace it with a new one.
5	Bracket	Crack	Replace it with a new one.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

2. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:

- Fix oil pump on a vise to make a measurement. At this time, hold oil pump with the least possible force between two wood pieces.
- Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

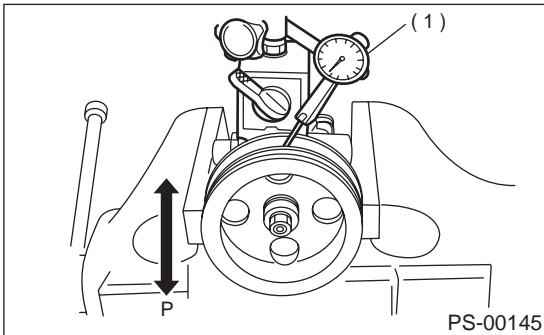
1) Play of pulley shaft

On condition:

P: 9.8 N (1.0 kgf, 2.2 lb)

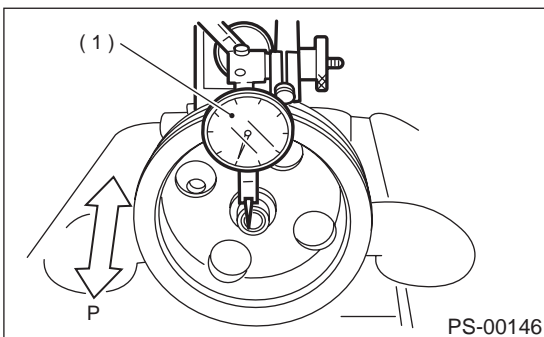
Service limit:

Radial play (Direction \longleftrightarrow)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction \longleftrightarrow)
0.6 mm (0.024 in) or less



(1) Dial indicator

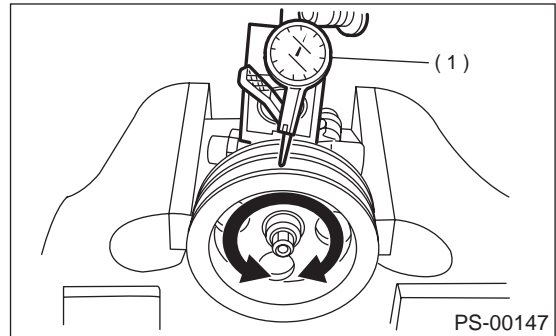
2) Ditch deflection of pulley

Service limit:

1.0 mm (0.039 in) or less

NOTE:

Read the value for one surface of V ditch, and then the value for another off the dial.



(1) Dial indicator

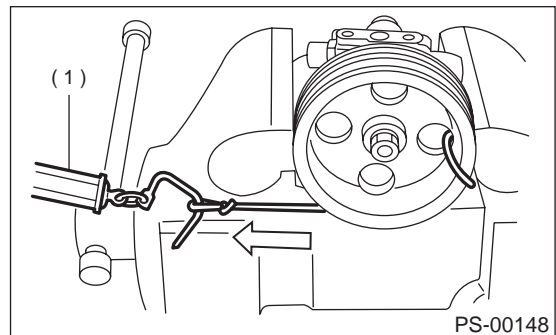
3) Resistance to rotation of pulley

Service limit:

Maximum load; 9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:

- A rather higher value may be indicated when pulley starts turning.
- Measure the load during rotation and make a judgment.



(1) Spring balance

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

3. HYDRAULIC PRESSURE

CAUTION:

- Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-94, INSPECTION, General Diagnostic Table.>
- Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
- Put cotton cloth waste at a place where fluid drops before pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

NOTE:

Keep engine idling during the measurement.

1) REGULAR PRESSURE MEASUREMENT

- (1) Connect ST1, ST2 and ST3.

ST1 92511000 PRESSURE GAUGE

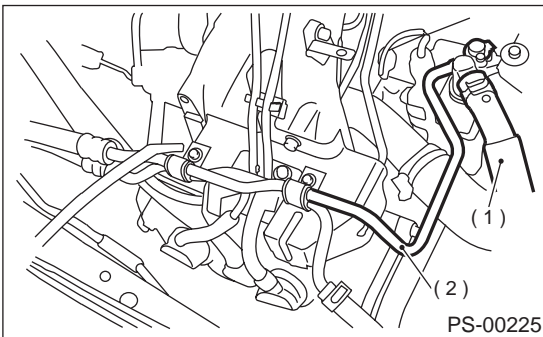
ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A

- (2) Disconnect pressure hose from the pump.

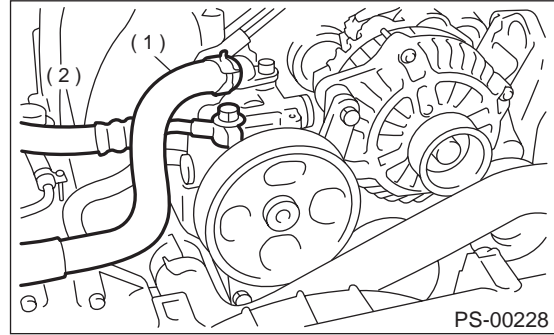
- (3) Using gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), instal ST2 to the pump instead of pressure hose.

Except 3.0 L and Turbo model:



- (1) Suction hose
(2) Pressure hose

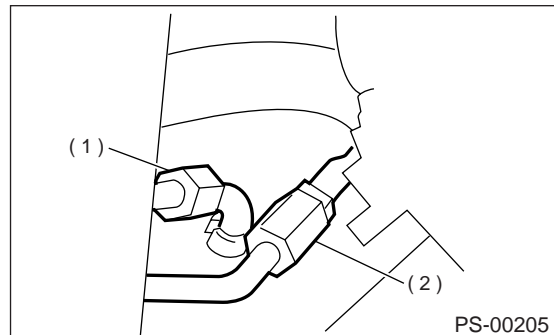
3.0 L and Turbo model:



- (1) Suction hose
(2) Pressure hose

- (4) Disconnect pipe C form pipe (on gearbox side).

- (5) Install ST3 to pipe C.



- (1) Pipe C
(2) Pipe D

- (6) Replenish power steering fluid up to specified level.

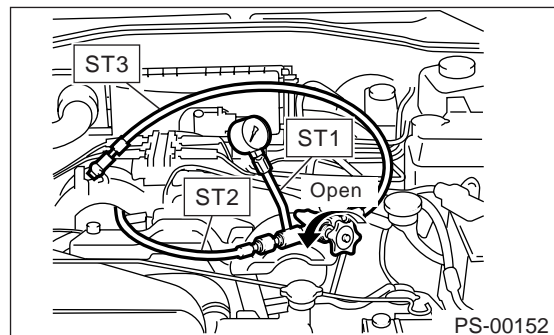
- (7) Open valve, and start the engine.

- (8) Measure regular pressure.

ST1 925711000 PRESSURE GAUGE

ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A



Service limit:

981 kPa (10 kg/cm², 142 psi) or less

OIL PUMP

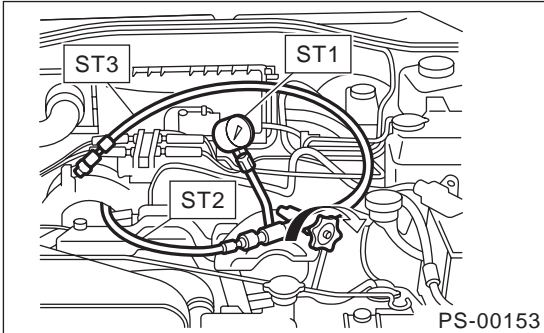
POWER ASSISTED SYSTEM (POWER STEERING)

(9) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

2) Measure relief pressure.

- (1) Using STs, measure relief pressure.
- (2) Close valve.
- (3) Measure relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:

Except 3.0 L and Turbo model

**9,611 — 10,199 kPa (98 — 104 kg/cm²,
1,394 — 1,479 psi)**

3.0 L and Turbo model

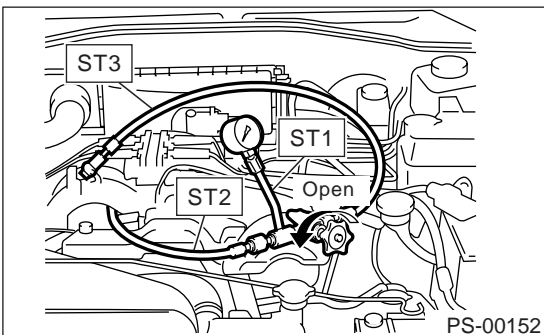
**7,650 — 8,340 kPa (78.03 — 88.13 kg/cm²,
1,109 — 1,209 psi)**

(4) If it is not within the specified value, replace the oil pump.

3) Measure working pressure.

- (1) Using STs, measure working pressure.
- (2) Open valve.
- (3) Measure working pressure of control valve by turning wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:

Except 3.0 L and Turbo model

**9,611 — 10,199 kPa (98 — 104 kg/cm²,
1,394 — 1,479 psi)**

3.0 L and Turbo model

**7,650 — 8,340 kPa (78.03 — 88.13 kg/cm²,
1,109 — 1,209 psi)**

(4) If it is within the specified value, measure steering effort. <Ref. to PS-97, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace control valve itself or control valve and pinion as a single unit with new ones.

RESERVOIR TANK

POWER ASSISTED SYSTEM (POWER STEERING)

9. Reservoir Tank

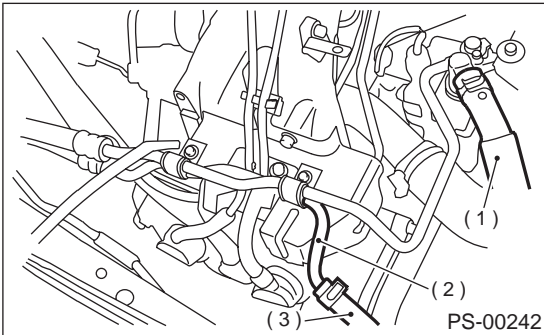
A: REMOVAL

1. EXCEPT 3.0 L AND TURBO MODEL

- 1) Drain fluid from the reservoir tank.
- 2) Disconnect pipe D from return hose and suction hose from oil pump.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Suction hose
- (2) Pipe D
- (3) Return hose

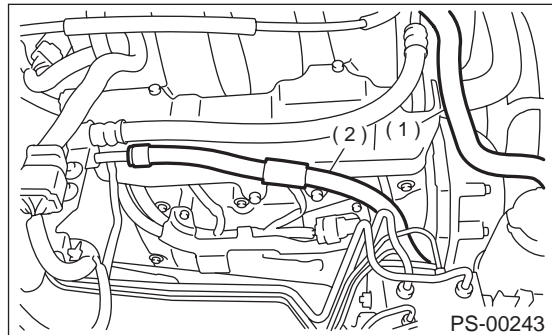
- 3) Remove reservoir tank from bracket by pulling it upwards.

2. 3.0 L AND TURBO MODEL

- 1) Drain fluid from the reservoir tank.
- 2) Disconnect return hose and suction hose from reservoir tank.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



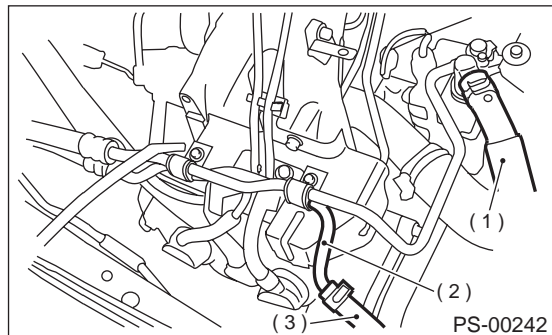
- (1) Suction hose
- (2) Return hose

- 3) Remove reservoir tank from bracket by pulling it upwards.

B: INSTALLATION

1. EXCEPT 3.0 L AND TURBO MODEL

- 1) Install reservoir tank to bracket.
- 2) Connect pipes D to return hose and suction hose to oil pump.



- (1) Suction hose
- (2) Pipe D
- (3) Return hose

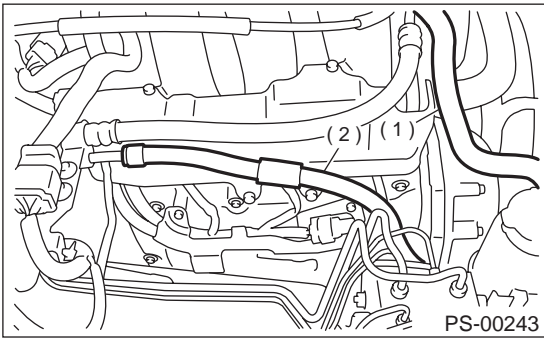
- 3) Feed the specified power steering fluid. <Ref. to PS-92, Power Steering Fluid.>

RESERVOIR TANK

POWER ASSISTED SYSTEM (POWER STEERING)

2. 3.0 L AND TURBO MODEL

- 1) Install reservoir tank to bracket.
- 2) Connect return hose and suction hose to reservoir tank.



- (1) Suction hose
- (2) Return hose

- 3) Feed the specified power steering fluid. <Ref. to PS-92, Power Steering Fluid.>

C: INSPECTION

Check reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace reservoir tank.

POWER STEERING FLUID

POWER ASSISTED SYSTEM (POWER STEERING)

10. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid	Manufacturer
DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

B: INSPECTION

1) Check power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.

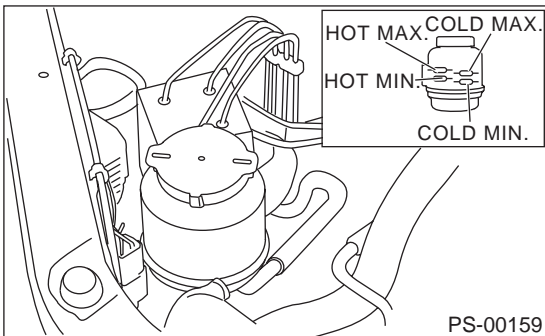
2) Check joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.

3) Inspect fluid level on flat and level surface with engine "OFF" by indicator of reservoir tank.

If the level is at lower point or below, add fluid to keep the level in the specified range of the indicator. If at upper point or above, drain fluid by using a syringe or the like.

(1) Check at temperature 20°C (68°F) on reservoir surface of oil pump; read the fluid level on the "COLD" side.

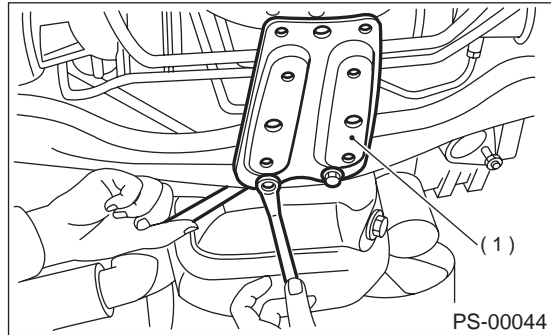
(2) Check at temperature 80°C (176°F) on reservoir surface of oil pump; read the fluid level on the "HOT" side.



C: REPLACEMENT

- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.
- 3) Remove air intake duct.
- 4) Drain fluid from the reservoir tank.
- 5) Lift-up the vehicle.
- 6) Remove under cover.

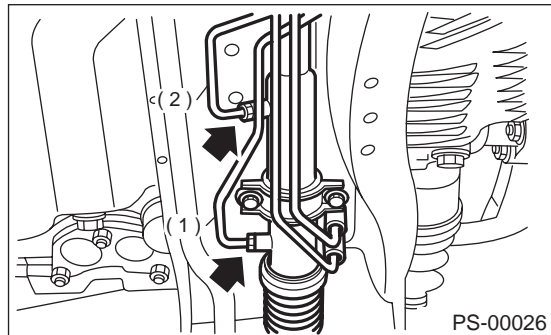
7) Remove jack-up plate.



(1) Jack-up plate

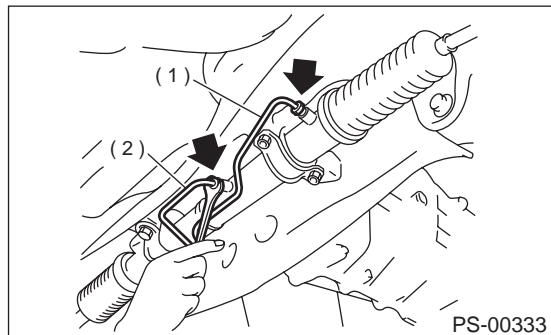
8) Disconnect one pipe joint A from center of gear-box assembly, and connect a vinyl hose to it. While turning steering wheel to the left and right, drain fluid through the hose. Similarly, drain fluid from the other pipe joint B.

LHD model



- (1) Pipe A
- (2) Pipe B

RHD model



- (1) Pipe A
- (2) Pipe B

9) Connect pipe joint A and B.

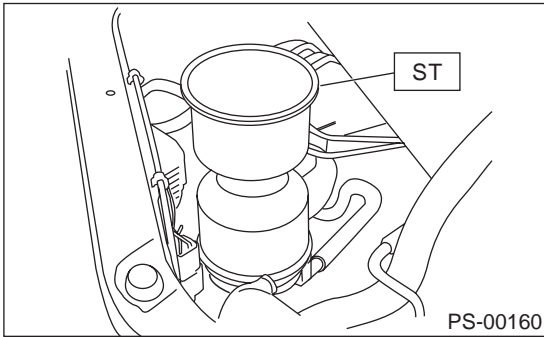
POWER STEERING FLUID

POWER ASSISTED SYSTEM (POWER STEERING)

D: INSTALLATION

1) Set ST on top of reservoir tank and fill it about half way with the specified fluid.

ST 34199AE040 OIL CHARGE GUIDE



2) Jack-up vehicle and support it with safety stands, then turn steering wheel with engine stopped.

3) Continue to turn steering wheel slowly from lock to lock until bubbles stop appearing in the tank while keeping the fluid at that level.

4) In case air is absorbed to deliver bubbles into piping because the fluid level is lower, leave it about half an hour and then do the step 2) all over again.

5) Start and idle the engine.

6) Continue to turn steering wheel slowly from lock to lock again until bubbles stop appearing in the tank while keeping the fluid at that level.

It is normal that bubbles stop appearing after three times turning of steering wheel.

7) In case bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 5) all over again.

8) Stop the engine, and take out safety stands after jacking up vehicle again.

Then lower the vehicle, and idle the engine.

9) Continue to turn steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).

10) In case the following happens, leave it about half an hour and then do step 8) again.

(1) The fluid level changes over 3 mm (0.12 in).

(2) Bubbles remain on the upper surface of the fluid.

(3) Grinding noise is generated from oil pump.

11) Check the fluid leakage at flare nuts after turning steering wheel from lock to lock with engine running.

CAUTION:

- Before checking, wipe off any fluid on flare nuts and piping.

- In case the fluid leaks from flare nut, it is caused by dust (or the like) and/or damage between flare and tapered seat in piping.

- Remove the flare nut and tighten again it to the specified torque after cleaning flare and tapered seat. If flare or tapered seat is damaged, replace with a new one.

12) Install jack-up plate.

13) Install under cover.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

11. General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
<ul style="list-style-type: none"> • Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning. 	1. Pulley belt <ul style="list-style-type: none"> • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys except oil pump pulley • Poor revolution of oil pump pulley 	Adjust or replace.
	2. Tire and rim <ul style="list-style-type: none"> • Improper tires out of specification • Improper rims out of specification • Tires not properly inflated*1 	Replace or reinflate.
	3. Fluid <ul style="list-style-type: none"> • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2 	Refill, bleed air, replace or instruct customer.
	4. Idling speed <ul style="list-style-type: none"> • Lower idling speed • Excessive drop of idling speed at start or at turning steering wheel *3 	Adjust or instruct customer.
	5. Measure hydraulic pressure.<Ref. to PS-86, INSPECTION, Oil Pump.>	Replace problem parts.
	6. Measure steering effort.<Ref. to PS-94, INSPECTION, General Diagnostic Table.>	Adjust or replace.
<ul style="list-style-type: none"> • Vehicle leads to one side or the other. • Poor return of steering wheel to center • Steering wheel surges when turning. 	1. Fluid line <ul style="list-style-type: none"> • Folded hose • Flattened pipe 	Reform or replace.
	2. Tire and rim <ul style="list-style-type: none"> • Flat tire • Mix use of different tires • Mix use of different rims • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure 	Fix or replace.
	3. Front alignment <ul style="list-style-type: none"> • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension 	Adjust or retighten.
	4. Others <ul style="list-style-type: none"> • Damaged joint assembly • Unbalanced height • One-sided weight 	Replace, adjust or instruct customer.
	5. Measure steering effort.<Ref. to PS-94, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or rims are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.

*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.

*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

1. NOISE AND VIBRATION

CAUTION:

Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:

- Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
- Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
- When stopping with service brake and/or parking brake applied, power steering can be operated easily due to its light steering effort. If doing so, the disk rotates slightly and makes creaking noise. The noise is generated by creaking between the disk and pads. If the noise goes off when the brake is released, there is no abnormal function in the system.
- There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts are properly adjusted and have no defects.

Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.

This phenomena does not indicate there is some abnormal function in the system.

The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in "D" range for automatic transmission vehicle.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	Defective Replace oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check clearance. Correct if necessary. <Ref. to PS-76, INSPECTION, Pipe Assembly.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace bad parts of the gearbox or oil pump.
Knocking When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Loosened tightening or play of tie-rod, tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace oil pump.
	Pulley bearing seizing of oil pump	Replace oil pump.
	Folded hose, flat pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix wrong part causing aeration. Replace fluid and vent air.
	Damaged pipe of gearbox	Replace pipe.
	Abnormal inside of hose or pipe Flat hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace bad parts of gearbox or hose.
Whine or growl (continuous or intermittent) While engine is running with/without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace bad parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/without steering turned.	Too low engine speed at start	Adjust and instruct customers.
	Vane pump aeration	Fix wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace oil pump, bad parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

2. MEASUREMENT OF STEERING EFFORT

Step	Value	Yes	No
1 CHECK STEERING EFFORT. 1) Stop the vehicle on a concrete road. 2) Start the engine. 3) Idle the engine. 4) Install spring scale on the steering wheel. 5) Pull spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort. Is the steering effort less than the specified value? NOTE: When turning steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem.	29.4 N (3.0 kgf, 6.6 lb)	Go to step 2.	Adjustment backlash.
2 CHECK STEERING EFFORT. 1) Stop the engine. 2) Pull spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort. Is the steering effort less than the specified value?	29.4 N (3.0 kgf, 6.6 lb)	Go to step 3.	Adjustment.
3 CHECK STEERING WHEEL EFFORT. 1) Remove universal joint. 2) Measure steering wheel effort. Is the maximum force steering wheel effort less than the specified value?	2.26 N (0.23 kgf, 0.51 lb)	Go to step 4.	Check, adjust and replace if necessary.
4 CHECK STEERING WHEEL EFFORT. Measure steering wheel effort. Is the fluctuation width less than the specified value?	1.08 N (0.11 kgf, 0.24 lb)	Go to step 5.	Check, adjust and replace if necessary.
5 CHECK UNIVERSAL JOINT. Measure folding torque of the joint (short yoke). <Ref. to PS-26, INSPECTION, Universal Joint.> Is the fluctuation width less than the specified value?	8.43 N (0.86 kgf, 1.90 lb)	Go to step 6.	Replace with new one.
6 CHECK UNIVERSAL JOINT. Measure folding torque of the joint (long yoke). <Ref. to PS-26, INSPECTION, Universal Joint.> Is the folding torque less than the specified value?	5.49 N (0.56 kgf, 1.23 lb)	Go to step 7.	Replace with new one.
7 CHECK FRONT WHEEL. Is there any trouble indicated in "Value" column?	Unsteady revolution or rattling of front wheels. Dragging of brake.	Inspect, readjust and replace if necessary.	Go to step 8.
8 CHECK TIE-ROD ENDS. Remove the tie-rod ends. Is there any trouble indicated in "Value" column?	Unsteady revolution or rattling of tie-rod ends of suspension.	Inspect and replace if necessary.	Go to step 9.
9 CHECK BALL JOINT. Is there any trouble indicated in "Value" column?	Unsteady revolution or rattling of ball joints of suspension.	Inspect and replace if necessary.	Go to step 10.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

Step	Value	Yes	No
10 CHECK GEARBOX. Measure rotating of gearbox. <Ref. to PS-48, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [LHD MODEL].> Is the measured rotating resistance same with the specified value?	11.18 N (1.14 kgf, 2.51 lb) or less around center position and 15.79 N (1.61 kgf, 3.55 lb) or less in all positions within 20% difference between clockwise and counterclockwise?	Go to step 11.	Readjust backlash, and if ineffective, replace bad parts.
11 CHECK GEARBOX. Measure sliding of gearbox. <Ref. to PS-47, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].> Is the measured rotating resistance within the specified range?	304 N (31 kgf, 68 lb) or less with 20% difference between left and right direction?	Steering effort is normal.	Readjust backlash, and if ineffective, replace bad parts.

BODY SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)	AC
HVAC SYSTEM (DIAGNOSTICS)	AC
AIRBAG SYSTEM	AB
AIRBAG SYSTEM (DIAGNOSTICS)	AB
SEAT BELT SYSTEM	SB
LIGHTING SYSTEM	LI
WIPER AND WASHER SYSTEMS	WW
ENTERTAINMENT	ET
COMMUNICATION SYSTEM	COM
GLASS/WINDOWS/MIRRORS	GW
BODY STRUCTURE	BS
INSTRUMENTATION/DRIVER INFO	IDI
SEATS	SE
SECURITY AND LOCKS	SL
SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)	SR
EXTERIOR/INTERIOR TRIM	EI
EXTERIOR BODY PANELS	EB

BODY SECTION

CRUISE CONTROL SYSTEM CC

CRUISE CONTROL SYSTEM (DIAGNOSTICS) CC

IMMOBILIZER (DIAGNOSTICS) IM

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

AC

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GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

1. General Description

A: SPECIFICATIONS

1. HEATER SYSTEM

Item		Specifications		Condition
Heating capacity		LHD model	5.0 kW (4,300 kcal/h, 17,062 BTU/h) or more	<ul style="list-style-type: none"> • Mode selector switch: HEAT • Temperature control switch: FULL HOT • Temperature difference between hot water and inlet air: 65°C (149°F) • Hot water flow rate: 360 ℓ (95.1 US gal, 79.2 Imp gal)/h
		RHD model	5.58 kW (4,800 kcal/h, 19,046 BTU/h) or more	
Air flow rate		LHD model	300 m ³ (10,593 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
		RHD model	300 m ³ (10,593 cu ft)/h	
Max air flow rate		LHD model	500 m ³ (17,655 cu ft)/h	<ul style="list-style-type: none"> • Temperature control switch: FULL COLD • Blower fan speed: 4th position • Mode selector lever: RECIRC
		RHD model	480 m ³ (16,949 cu ft)/h	
Heater core size (height × length × width)		LHD model	193.5 × 152 × 35.0 mm (7.62 × 5.98 × 1.378 in)	—
		RHD model	181.5 × 160 × 27 mm (7.15 × 6.30 × 1.06 in)	
Blower motor	Type	LHD model	Magnet motor 230 W or less	at 12 V
		RHD model	Magnet motor 220 W or less	
	Fan type and size (diameter × width)	LHD model	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	—
		RHD model	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

2. A/C SYSTEM (4 CYLINDER)

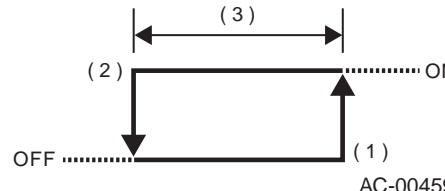
• LHD Model

Item		Specifications	
Type of air conditioner		Reheat air-mix type	
Cooling capacity		5.2 kW (4,471 kcal/h, 17,741 BTU/h)	
Refrigerant		HFC-134a (CH ₂ FCF ₃) [0.65±0.05 kg (1.43±0.11 lb)]	
Compressor	Type	5-vane rotary, fix volume (DKV-14G)	
	Discharge	140 cm ³ (8.54 cu in)/rev	
	Max. permissible speed	7,000 rpm	
Magnet clutch	Type	Dry, single-disc type	
	Power consumption	38 W	
	Type of belt	V-Ribbed 4 PK	
	Pulley dia. (effective dia.)	125 mm (4.92 in)	
	Pulley ratio	1.064	
Condenser	Type	Corrugated fin (Multi-flow)	
	Core face area	0.22 m ² (2.37 sq ft)	
	Core thickness	21 mm (0.83 in)	
	Radiation area	6.52 m ² (70 sq ft)	
Receiver drier	Effective inner capacity	250 cm ³ (15.26 cu in)	
Expansion valve	Type	External equalizing	
Evaporator	Type	Single tank	
	Dimensions (W × H × T)	235 × 224 × 60 mm (9.25 × 8.82 × 2.36 in)	
Blower fan	Fan type	Sirocco fan	
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)	
	Power consumption	230 W at 12 V	
Condenser fan (Sub fan)	Motor type	Magnet	
	Power consumption	75 W at 12 V	
	Fan outer diameter	300 mm (11.81 in)	
Radiator fan (Main fan)	Motor type	Magnet	
	Power consumption	75 W at 12 V	
	Fan outer diameter	300 mm (11.81 in)	
Idling speed (A/C ON)	MPFI model	850±100 rpm	
Dual switch (Pressure switch)	Low-pressure switch operat- ing pressure	ON → OFF	177±25 kPa (1.80±0.25 kg/cm ² , 25.6±3.6 psi)
		OFF → ON	216 ⁺³⁹ / ₋₂₅ kPa (2.2 ^{+0.4} / _{-0.25} kg/cm ² , 31 ^{+5.7} / _{-3.6} psi)
	High-pres- sure switch operating pressure	ON → OFF	2,942±196 kPa (30±2 kg/cm ² , 427±28 psi)
		DIFF	588±196 kPa (6±2 kg/cm ² , 85±28 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			(1) 1.5±0.5°C (35±0.9°F) (2) 3.0±0.3°C (37±0.5°F) (3) Repeat

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• RHD Model

Item		Specifications	
Type of air conditioner		Reheat air-mix type	
Cooling capacity		4.7 kW (4,041 kcal/h, 16,035 BTU/h)	
Refrigerant		HFC-134a (CH ₂ FCF ₃) [0.45±0.05 kg (0.99±0.11 lb)]	
Compressor	Type	Through vane type (TV-12C)	
	Discharge	127 cm ³ (7.75 cu in)/rev	
	Max. permissible speed	6,000 rpm	
Magnet clutch	Type	Dry, single-disc type	
	Power consumption	40 W	
	Type of belt	V-Ribbed 4 PK	
	Pulley dia. (effective dia.)	120 mm (4.72 in)	
	Pulley ratio	1.11	
Condenser	Type	Corrugated fin (Sub cool type)	
	Core face area	0.19 m ² (2.04 sq ft)	
	Core thickness	16 mm (0.63 in)	
	Radiation area	4.786 m ² (51.50 sq ft)	
Receiver drier	Effective inner capacity	250 cm ³ (15.26 cu in)	
Expansion valve	Type	Externally equalizing	
Evaporator	Type	Multi tank	
	Dimensions (W × H × T)	214.4 × 195 × 58 mm (8.44 × 7.68 × 2.28 in)	
Blower fan	Fan type	Sirocco fan	
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)	
	Power consumption	220 W at 12 V	
Condenser fan (Sub fan)	Motor type	Magnet	
	Power consumption	75 W at 12 V	
	Fan outer diameter	300 mm (11.81 in)	
Radiator fan (Main fan)	Motor type	Magnet	
	Power consumption	75 W at 12 V	
	Fan outer diameter	300 mm (11.81 in)	
Idling speed (A/C ON)		MPFI model 850±100 rpm	
Dual switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	196±20 kPa (2.0±0.2 kg/cm ² , 28.4±2.8 psi)
		OFF → ON	226±29 kPa (2.3±0.3 kg/cm ² , 33±4 psi)
	High-pressure switch operating pressure	ON → OFF	3,138±196 kPa (32±2 kg/cm ² , 455±28 psi)
		DIFF	588±196 kPa (6±2 kg/cm ² , 85±28 psi)
		OFF → ON	2,550±196 kPa (26±2 kg/cm ² , 370±28 psi)
Thermo control amplifier working temperature (Evaporator outlet air)		 <p>(1) 1±0.5°C (34±0.9°F) (2) 3±1.5°C (37±2.7°F) (3) Repeat</p> <p style="text-align: center;">AC-00459</p>	

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

3. A/C SYSTEM (6 CYLINDER)

• LHD Model

Item		Specifications	
Type of air conditioner		Reheat air-mix type	
Cooling capacity		5.2 kW (4,471 kcal/h, 17,741 BTU/h)	
Refrigerant		HFC-134a (CH ₂ FCF ₃) [0.65±0.05 kg (1.43±0.11 lb)]	
Compressor	Type	5-vane rotary, fix volume (DKV-14G)	
	Discharge	140 cm ³ (8.54 cu in)/rev	
	Max. permissible speed	7,000 rpm	
Magnet clutch	Type	Dry, single-disc type	
	Power consumption	38 W	
	Type of belt	V-Ribbed 6 PK	
	Pulley dia. (effective dia.)	125 mm (4.92 in)	
	Pulley ratio	1.064	
Condenser	Type	Corrugated fin (Multi-flow)	
	Core face area	0.22 m ² (2.37 sq ft)	
	Core thickness	21 mm (0.83 in)	
	Radiation area	6.52 m ² (70 sq ft)	
Receiver drier	Effective inner capacity	250 cm ³ (15.26 cu in)	
Expansion valve	Type	Internal equalizing	
Evaporator	Type	Single tank	
	Dimensions (W × H × T)	235 × 224 × 60 mm (9.25 × 8.82 × 2.36 in)	
Blower fan	Fan type	Sirocco fan	
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)	
	Power consumption	230 W at 12 V	
Condenser fan (Sub fan)	Motor type	Magnet	
	Power consumption	120 W at 12 V	
	Fan outer diameter	320 mm (12.60 in)	
Radiator fan (Main fan)	Motor type	Magnet	
	Power consumption	120 W at 12 V	
	Fan outer diameter	320 mm (12.60 in)	
Idling speed (A/C ON)	MPFI model	850±100 rpm	
Dual switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	177±25 kPa (1.80±0.25 kg/cm ² , 25.6±3.6 psi)
		OFF → ON	216 ⁺³⁹ / ₋₂₅ kPa (2.2 ^{+0.4} / _{-0.25} kg/cm ² , 31 ^{+5.7} / _{-3.6} psi)
	High-pressure switch operating pressure	ON → OFF	2,942±196 kPa (30±2 kg/cm ² , 427±28 psi)
		DIFF	588±196 kPa (6±2 kg/cm ² , 85±28 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			
		(1) 1.5±0.5°C (35±0.9°F) (2) 3.0±0.3°C (37±0.5°F) (3) Repeat	

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• RHD Model

Item		Specifications	
Type of air conditioner		Reheat air-mix type	
Cooling capacity		4.7 kW (4,041 kcal/h, 16,035 BTU/h)	
Refrigerant		HFC-134a (CH ₂ FCF ₃) [0.45±0.05 kg (0.99±0.11 lb)]	
Compressor	Type	Through vane type (TV-14C)	
	Discharge	142 cm ³ (8.66 cu in)/rev	
	Max. permissible speed	6,000 rpm	
Magnet clutch	Type	Dry, single-disc type	
	Power consumption	40 W	
	Type of belt	V-Ribbed 6 PK	
	Pulley dia. (effective dia.)	120 mm (4.72 in)	
	Pulley ratio	1.11	
Condenser	Type	Corrugated fin (Sub cool type)	
	Core face area	0.19 m ² (2.04 sq ft)	
	Core thickness	16 mm (0.63 in)	
	Radiation area	4.786 m ² (51.50 sq ft)	
Receiver drier	Effective inner capacity	250 cm ³ (15.26 cu in)	
Expansion valve	Type	Externally equalizing	
Evaporator	Type	Multi tank	
	Dimensions (W × H × T)	214.4 × 195 × 58 mm (8.44 × 7.68 × 2.28 in)	
Blower fan	Fan type	Sirocco fan	
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)	
	Power consumption	220 W at 12 V	
Condenser fan (Sub fan)	Motor type	Magnet	
	Power consumption	120 W at 12 V	
	Fan outer diameter	320 mm (12.60 in)	
Radiator fan (Main fan)	Motor type	Magnet	
	Power consumption	120 W at 12 V	
	Fan outer diameter	320 mm (12.60 in)	
Idling speed (A/C ON)		MPI model 850±100 rpm	
Dual switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	196±20 kPa (2.0±0.2 kg/cm ² , 28.4±2.8 psi)
		OFF → ON	226±29 kPa (2.3±0.3 kg/cm ² , 33±4 psi)
	High-pressure switch operating pressure	ON → OFF	3,138±196 kPa (32±2 kg/cm ² , 455±28 psi)
		DIFF	588±196 kPa (6±2 kg/cm ² , 85±28 psi)
		OFF → ON	2,550±196 kPa (26±2 kg/cm ² , 370±28 psi)

Thermo control amplifier working temperature (Evaporator outlet air)		(1) 1±0.5°C (34±0.9°F) (2) 3±1.5°C (37±2.7°F) (3) Repeat
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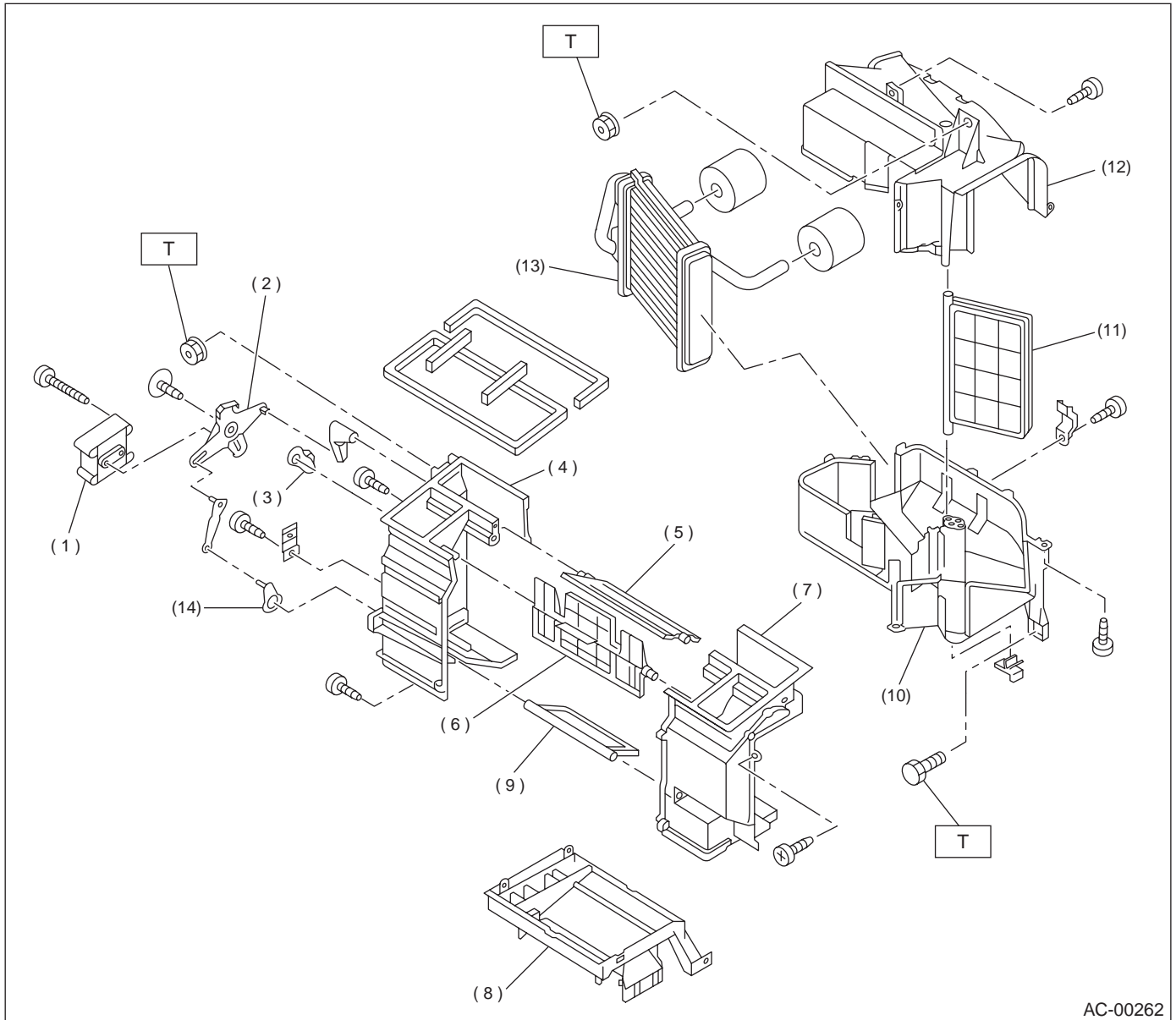
GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

B: COMPONENT

1. HEATER UNIT

• LHD Model



AC-00262

- | | | |
|------------------------|--|---|
| (1) Vent door actuator | (9) Mix door actuator
(With AUTO A/C model) | (16) Aspirator inlet
(With AUTO A/C model) |
| (2) Side link | (10) Mix lever | (17) Foot door |
| (3) Vent lever | (11) Case D | |
| (4) Case A | (12) Mix door | |
| (5) DEF door | (13) Case C | |
| (6) Vent door | (14) Heater core | |
| (7) Case B | (15) Foot door lever | |
| (8) Foot duct | | |

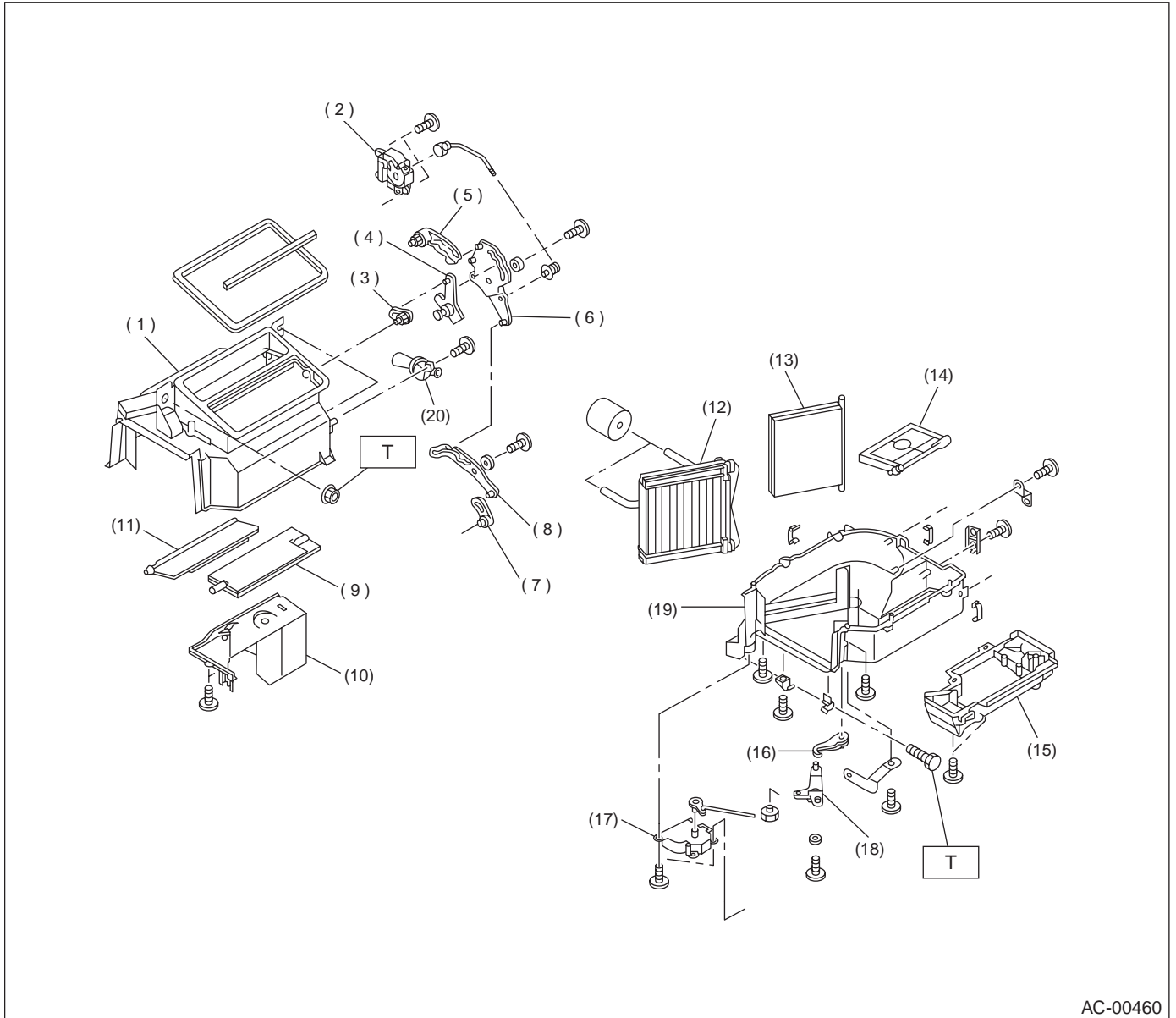
Tightening torque: N·m (kgf·m, ft·lb)

T: 7.35 (0.750, 5.421)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• RHD Model



AC-00460

- | | | |
|-----------------------|---|---|
| (1) Heater case upper | (10) Heater case | (18) Mix door lever B |
| (2) Mode actuator | (11) DEF door | (19) Heater case lower |
| (3) Vent door lever A | (12) Heater core | (20) Aspirator inlet
(With AUTO A/C model) |
| (4) Vent door lever B | (13) Mix door | |
| (5) DEF door lever | (14) Foot door | |
| (6) Side link A | (15) Foot duct | |
| (7) Foot door lever | (16) Mix door lever A | |
| (8) Side link B | (17) Mix door actuator
(With AUTO A/C model) | |
| (9) Vent door | | |

Tightening torque: N-m (kgf-m, ft-lb)

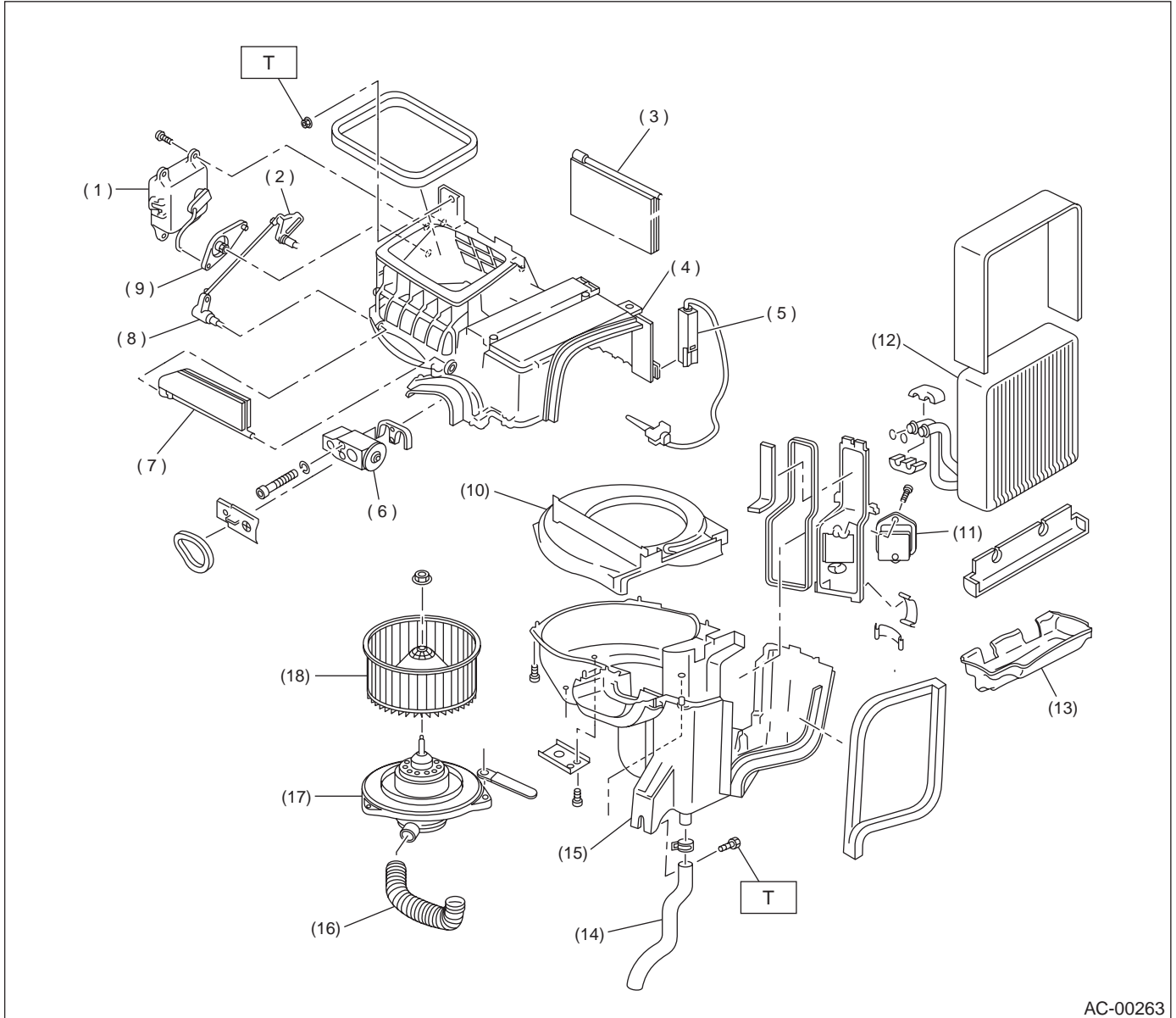
T: 7.35 (0.750, 5.421)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

2. INTAKE UNIT WITH EVAPORATOR

• LHD Model



- | | | |
|---|---------------------------------------|---------------------|
| (1) Intake door actuator | (8) Lever (B) | (16) Aspirator pipe |
| (2) Lever (A) | (9) Lever (C) | (17) Blower motor |
| (3) Door (A) | (10) Blower plate | (18) Fan |
| (4) Intake unit case upper | (11) Resistor | |
| (5) Thermistor (With A/C model) | (12) Evaporator (With A/C model) | |
| (6) Block expansion valve
(With A/C model) | (13) Evaporator case (With A/C model) | |
| (7) Door (B) | (14) Drain hose | |
| | (15) Intake unit case lower | |

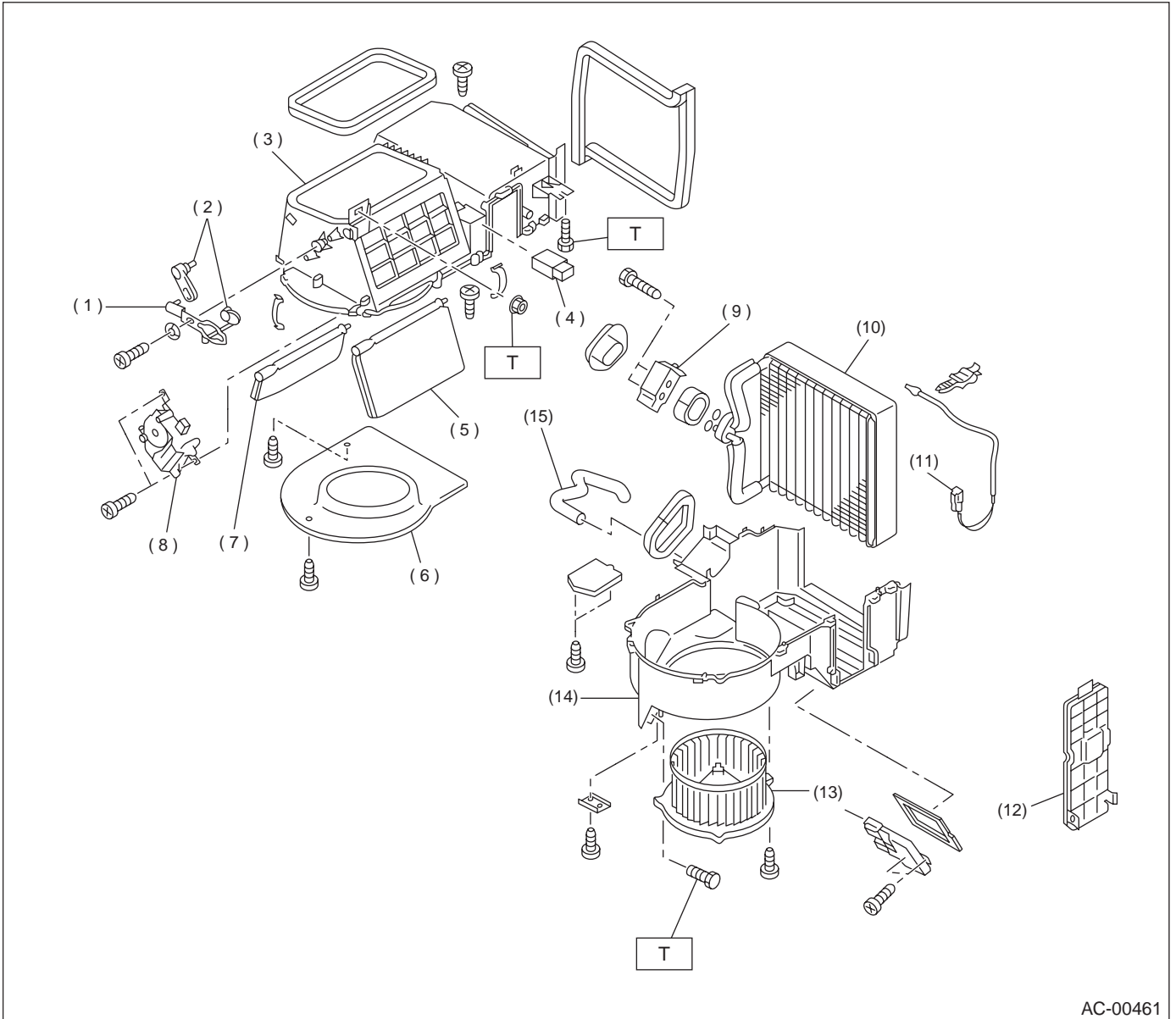
Tightening torque: N·m (kgf·m, ft·lb)

T: 7.4 (0.75, 5.4)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• RHD Model



- | | | |
|----------------------------|---|-----------------------------|
| (1) Link | (8) Intake door actuator | (14) Intake unit case lower |
| (2) Door lever | (9) Block expansion valve
(With A/C model) | (15) Drain hose |
| (3) Intake unit case upper | (10) Evaporator (With A/C model) | |
| (4) Resistor | (11) Thermistor (With A/C model) | |
| (5) Door (A) | (12) Cover | |
| (6) Separator | (13) Blower motor ASSY | |
| (7) Door (B) | | |

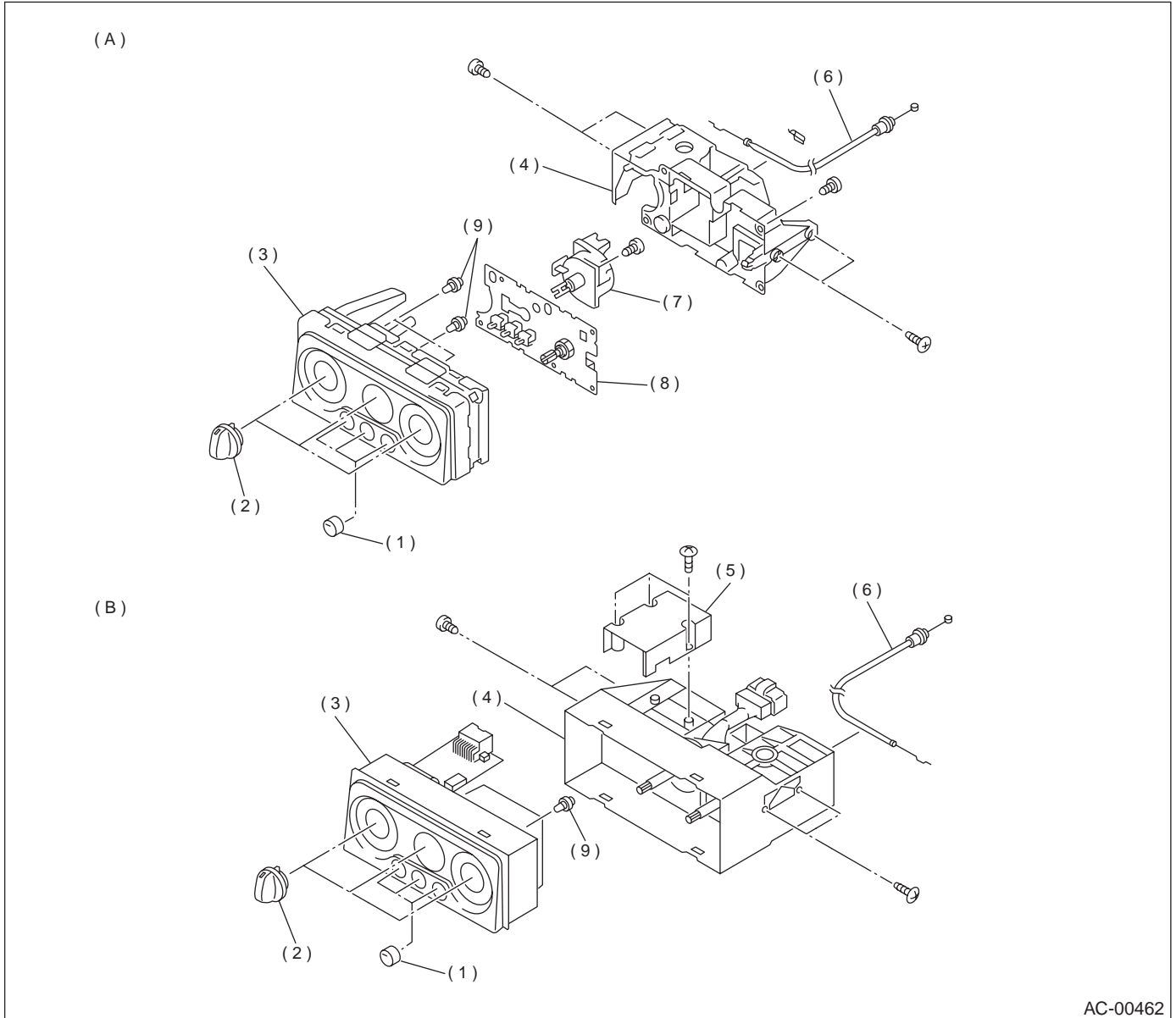
Tightening torque: N·m (kgf·m, ft·lb)

T: 7.4 (0.75, 5.4)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

3. CONTROL UNIT (MANUAL A/C)



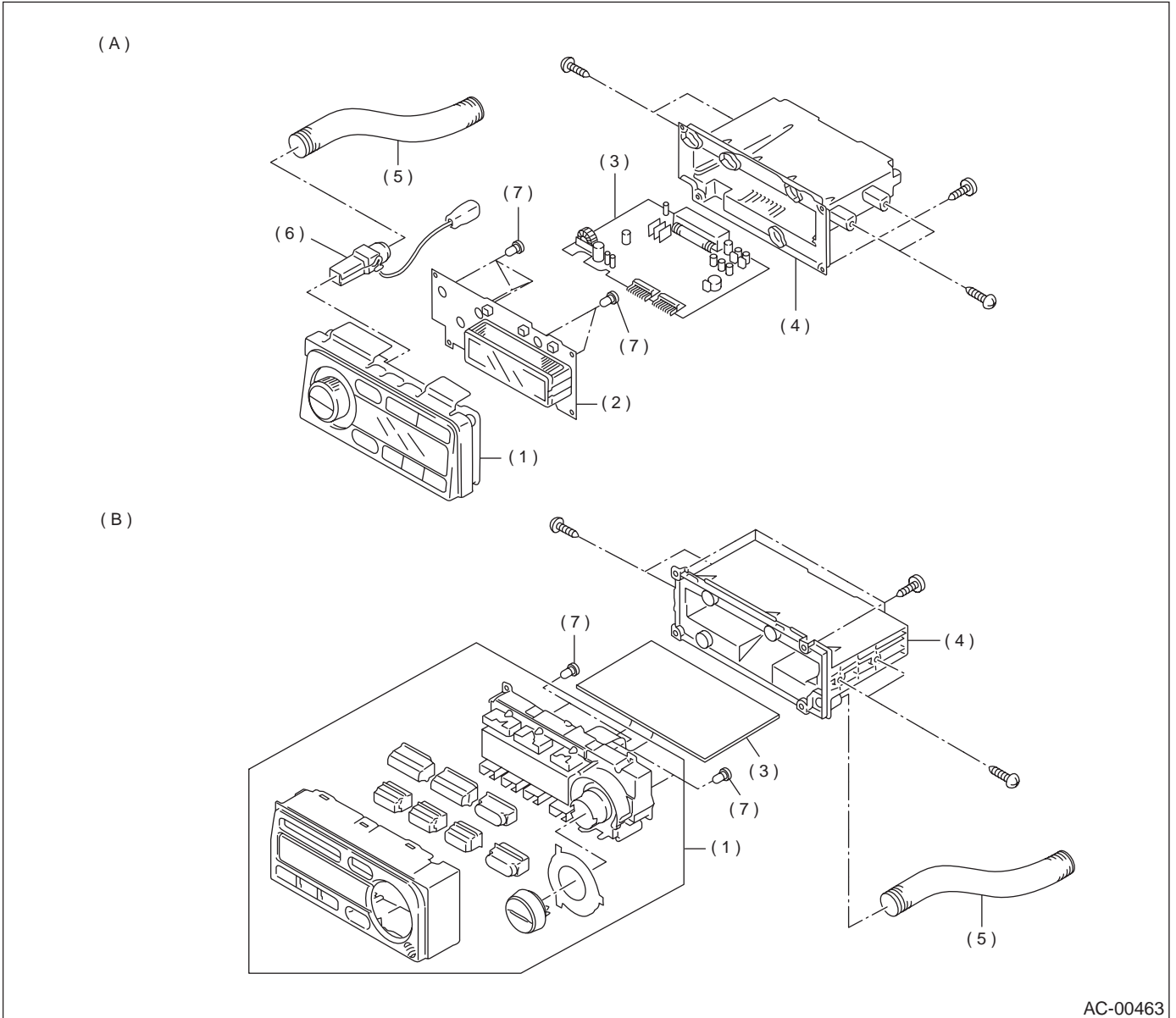
AC-00462

- | | | |
|-----------------------------|-------------------------------|---------------------|
| (A) LHD model | (B) RHD model | (7) Fan switch ASSY |
| (1) Switch | (4) Base unit | (8) Circuit ASSY |
| (2) Dial knob | (5) Cover | (9) Bulb |
| (3) Control unit panel ASSY | (6) Temperature control cable | |

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

4. CONTROL UNIT (AUTO A/C)



- (A) LHD model
- (1) Control unit panel
- (2) Circuit ASSY
- (3) Electronic control unit

- (B) RHD model
- (4) Control unit case
- (5) In-car sensor
- (6) Aspirator hose

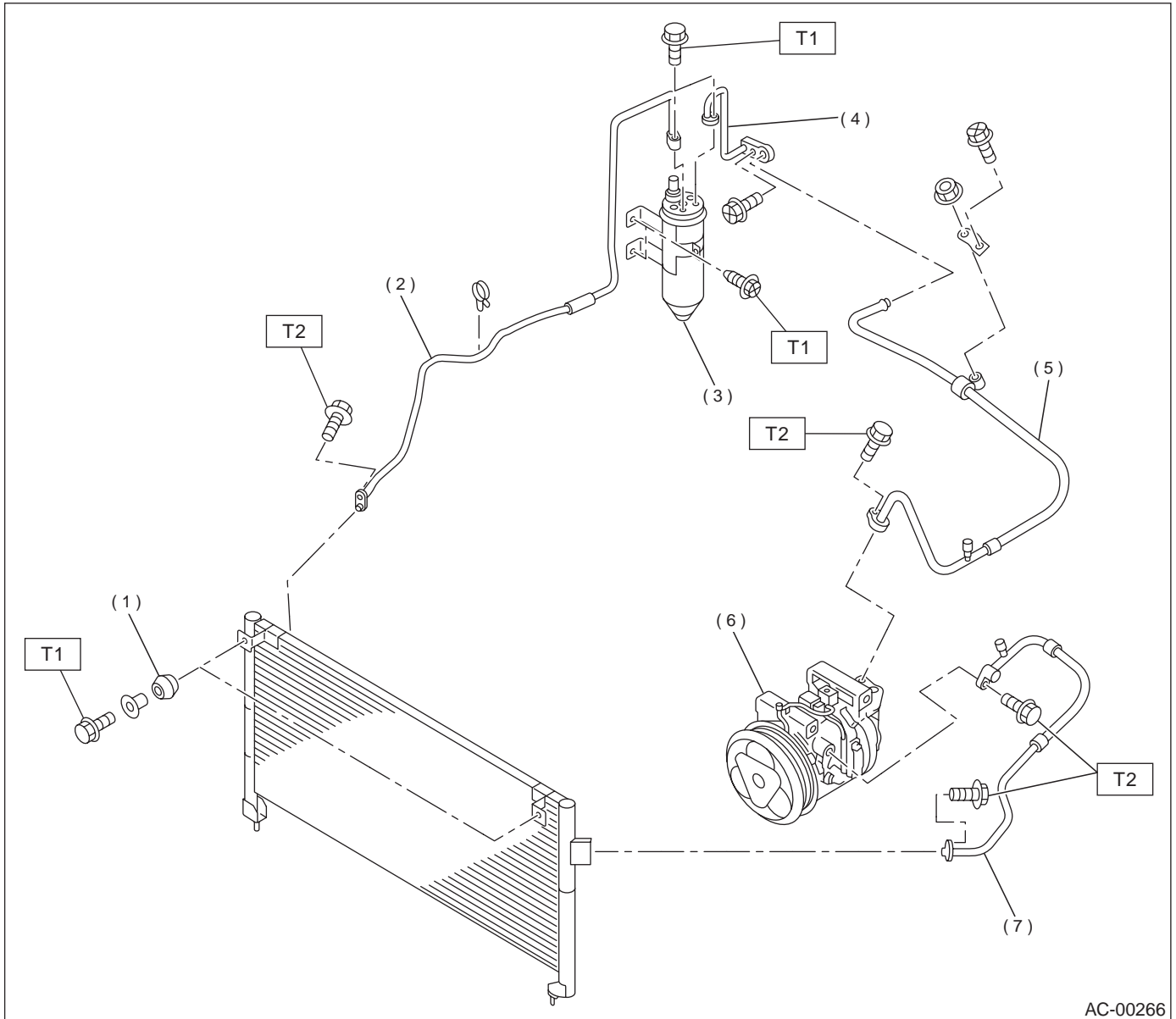
- (7) Bulb

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

5. AIR CONDITIONING UNIT

• LHD Model



- (1) Condenser
- (2) Pipe (Condenser — Receiver drier)
- (3) Receiver drier
- (4) Pipe (Receiver drier — C/unit)
- (5) Hose (Low-pressure)
- (6) Compressor
- (7) Hose (High-pressure)

Tightening torque: N·m (kgf·m, ft·lb)

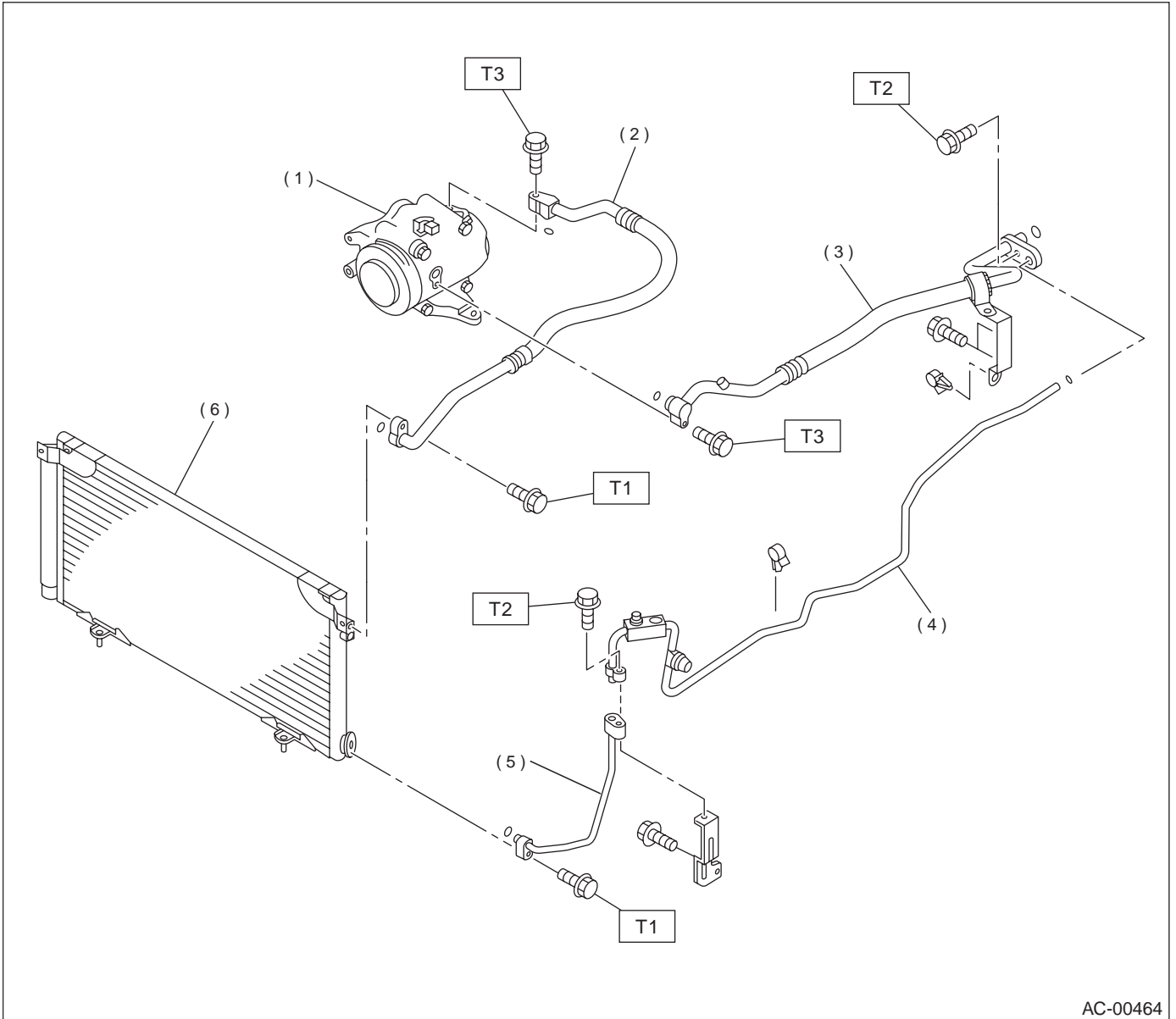
T1: 7.4 (0.75, 5.4)

T2: 15 (1.5, 10.8)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• RHD Model



- (1) Compressor
- (2) Hose (High-pressure)
- (3) Hose (Low-pressure)
- (4) Pipe A (Condenser — C/unit)

- (5) Pipe B (Condenser — C/unit)
- (6) Condenser

Tightening torque: N-m (kgf-m, ft-lb)

T1: 5.5 (0.56, 4.1)

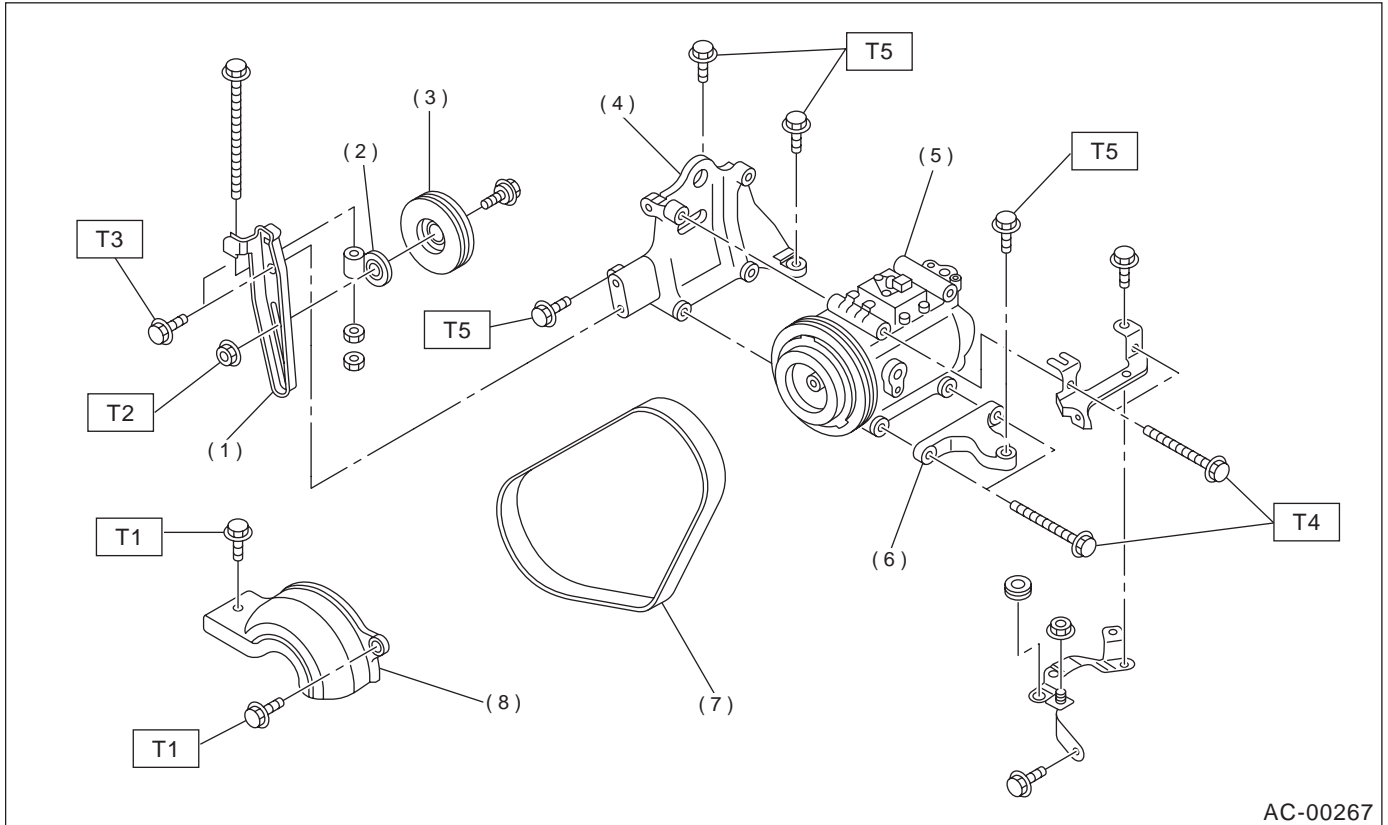
T2: 7.4 (0.75, 5.4)

T3: 10 (1.0, 7.2)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

6. COMPRESSOR



AC-00267

- | | |
|-----------------------------|---------------------------|
| (1) Idler pulley bracket | (7) V-belt |
| (2) Idler pulley adjuster | (8) Compressor belt cover |
| (3) Idler pulley | |
| (4) Compressor bracket main | |
| (5) Compressor | |
| (6) Compressor bracket sub | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.4 (0.75, 5.4)

T2: 23 (2.3, 17)

T3: 23.0 (2.35, 17.0)

T4: 28.9 (2.95, 21.3)

T5: 35 (3.6, 26)

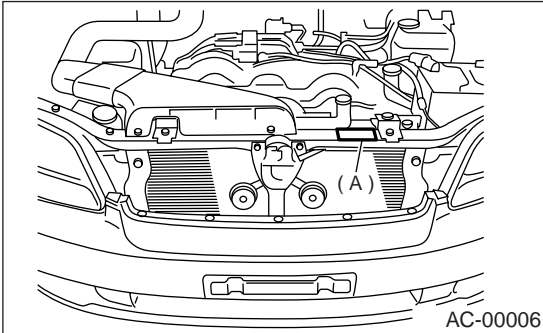
GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

C: CAUTION

1. HFC-134A A/C SYSTEM

- Unlike the old conventional HFC-12 system components, the cooling system components for the HFC-134a system such as the refrigerant and compressor oil are incompatible.
- Vehicles with the HFC-134a system can be identified by the label “A” attached to the vehicle. Before maintenance, check which A/C system is installed in the vehicle.



2. COMPRESSOR OIL

- HFC-134a compressor oil has no compatibility with that for R12 system.
- Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use ZXL200PG for LHD model or DENSO OIL9 for RHD model.
- Do not mix multiple compressor oils.

If HFC-12 compressor oil is used in a HFC-134a A/C system, the compressor may become stuck due to poor lubrication, or the refrigerant may leak due to swelling of rubber parts.

On the other hand, if HFC-134a compressor oil is used in a HFC-12 A/C system, the durability of the A/C system will be lowered.

- HFC-134a compressor oil is very hygroscopic. When replacing or installing/removing A/C parts, immediately isolate the oil from the atmosphere using a plug or tape. In order to avoid moisture, store the oil in a container with its cap tightly closed.

3. REFRIGERANT

- The HFC-12 refrigerant cannot be used in the HFC-134a A/C system. The HFC-134a refrigerant, also, cannot be used in the HFC-12 A/C system.
- If an incorrect or no refrigerant is used, poor lubrication will result and the compressor itself may be damaged.

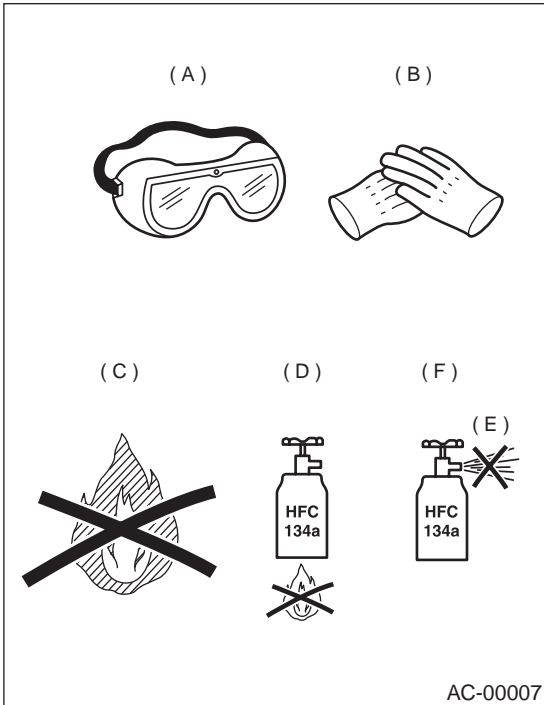
4. HANDLING OF REFRIGERANT

- The refrigerant boils at approx. -30°C (-22°F). When handling it, be sure to wear safety goggles and protective gloves. Direct contact of the refrigerant with skin may cause frostbite. If the refrigerant gets into your eye, avoid rubbing your eyes with your hands. Wash your eye with plenty of water, and receive medical treatment from an eye doctor.
- Do not heat a service can. If a service can is directly heated, or put into boiling water, the inside pressure will become extremely high. This may cause the can to explode. If a service can must be warmed up, use hot water in 40°C (104°F) max.
- Do not drop or impact a service can. (Observe the precautions and operation procedure described on the refrigerant can.)
- When the engine is running, do not open the high-pressure valve of the manifold gauge. The high-pressure gas will back-flow resulting in an explosion of the can.
- The refrigerant is non-toxic and harmless under normal operating circumstance, but it may change to phosgene (a noxious fume) under open flames or high temperatures (caused by a cigarette or heater).
- Provide good ventilation and do not work in a closed area.
- Never perform a gas leak test using a halide torch-type leak tester.

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

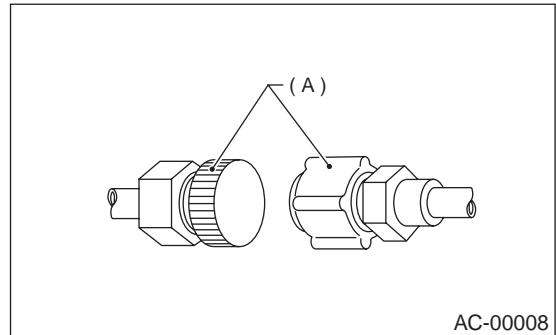
- In order to avoid destroying the ozone layer, prevent HFC-134a from being released into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.



- (A) Goggle
- (B) Gloves
- (C) Avoid open flame
- (D) No direct heat on container
- (E) Do not discharge
- (F) Loosen

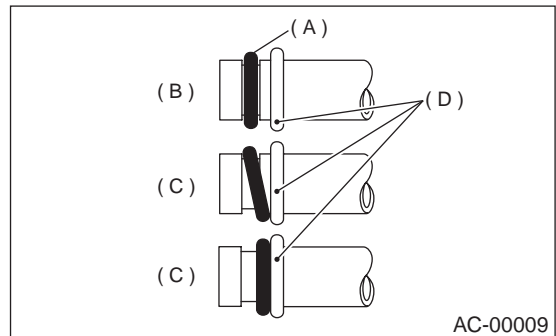
5. O-RING CONNECTIONS

- Use new O-rings.
- In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform operations without gloves and shop towels.
- Apply the compressor oil to the O-rings to avoid sticking, then install them.
- Use a torque wrench to tighten the O-ring fittings: Over-tightening will damage the O-ring and tube end distortion.
- If the operation is interrupted before completing a pipe connection, recap the tubes, components, and fittings with a plug or tape to prevent contamination from entering.



(A) Seal

- Visually check the surfaces and mating surfaces of O-rings, threads, and connecting points. If a failure is found, replace the applicable parts.
- Install the O-rings at right angle to the tube beards.

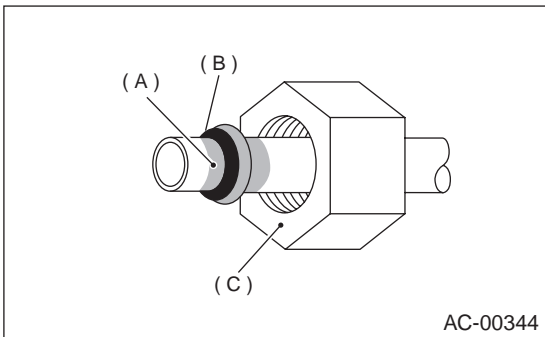
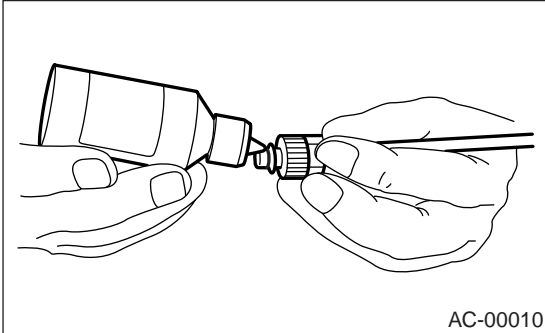


- (A) O-ring
- (B) O.K.
- (C) N.G.
- (D) Bead

GENERAL DESCRIPTION

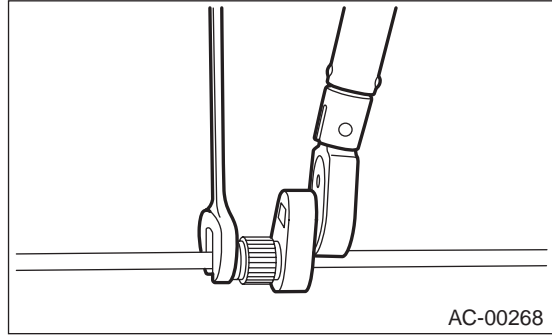
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

- Use the oil specified in the service manual to lubricate the O-rings. Apply the oil to the top and sides of the O-rings before installation. Apply the oil to the area including the O-rings and tube beads.



- (A) Apply refrigerant oil.
- (B) O-ring
- (C) Do not apply refrigerant oil to the threads.

- If any leakage is suspected after tightening, do not retighten the connections, Disconnect the connections, remove the O-rings, and check the O-rings, threads, and connections.



- When connecting hoses or pipes, use 2 wrenches (a torque wrench for tightening). While securing one side with a wrench, tighten the other side to the specified torque with a torque wrench. If only one wrench is used to tighten, the tightening torque will be excessive or insufficient. This may cause a pipe distortion or gas leak, resulting in damage to hoses and pipes.
- After tightening, using a clean shop towel to remove excess oil from the connections and any oil which may have run on the vehicle body or other parts.

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

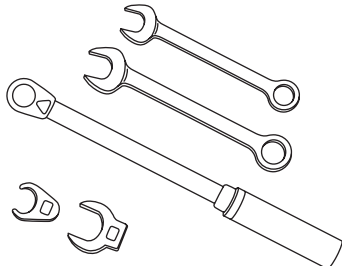
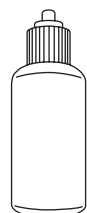
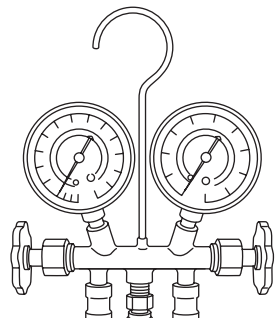
D: PREPARATION TOOL

CAUTION:

When working on vehicles with the HFC-134a system, only use HFC-134a specified tools and parts. Do not mix with CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, poor lubrication will result and the compressor itself may be destroyed.

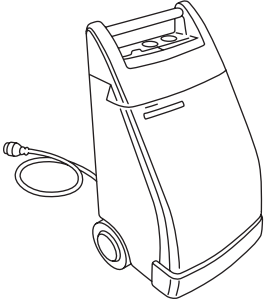
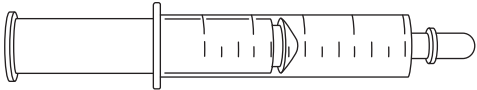
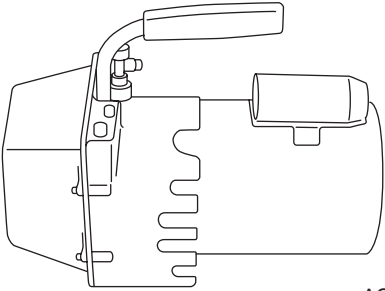
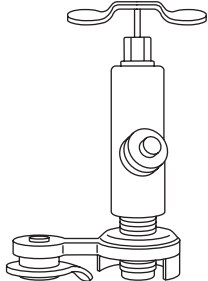
In order to help prevent mixing HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.

	HFC-134a	CFC-12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

Tools and Equipment	Description
<p>Wrench</p> <p>Various WRENCHES will be required to service any A/C system. A 7 to 40 N·m (0.7 to 4.1 kg-m, 5 to 30 ft-lb) torque wrench with various crowfoot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.</p>	 <p>AC-00347</p>
<p>Applicator bottle</p> <p>A small APPLICATOR BOTTLE is recommended to apply refrigerant oil to the various parts. They can be obtained at a hardware or drug store.</p>	 <p>AC-00348</p>
<p>Manifold gauge set</p> <p>A MANIFOLD GAUGE SET (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.</p>	 <p>AC-00349</p>

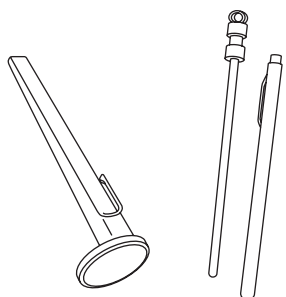
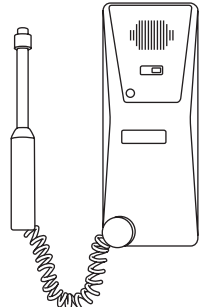

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Tools and Equipment	Description
<p>Refrigerant recovery system</p> <p>A REFRIGERANT RECOVERY SYSTEM is used for the recovery and reuse of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.</p>	 <p style="text-align: right;">AC-00350</p>
<p>Syringe</p> <p>A graduated plastic SYRINGE will be needed to add oil back into the system. The syringe can be found at a pharmacy or drug store.</p>	 <p style="text-align: right;">AC-00351</p>
<p>Vacuum pump</p> <p>A VACUUM PUMP (in good working condition) is necessary, and may be obtained from either a commercial refrigeration supply house or an automotive equipment supplier.</p>	 <p style="text-align: right;">AC-00352</p>
<p>Can tap</p> <p>A CAN TAP for the 397 g (14 oz) can is available from an auto supply store.</p>	 <p style="text-align: right;">AC-00353</p>

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Tools and Equipment	Description
<p>Thermometer</p> <p>Pocket THERMOMETERS are available from either industrial hardware store or commercial refrigeration supply houses.</p>	 <p>AC-00354</p>
<p>Electronic leak detector</p> <p>An ELECTRONIC LEAK DETECTOR can be obtained from either a specialty tool supply or an A/C equipment supplier.</p>	 <p>AC-00355</p>
<p>Weight scale</p> <p>A WEIGHT SCALE such as an electronic charging scale or a bathroom scale with digital display will be needed if a 13.6 kg (30 lb) refrigerant container is used.</p>	 <p>AC-00356</p>

REFRIGERANT PRESSURE WITH MANIFOLD GAUGE SET

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

2. Refrigerant Pressure with Manifold Gauge Set

A: OPERATION

- 1) Place the vehicle in the shade and draftless condition.
- 2) Connect the manifold gauge set.
- 3) Open the front windows and close all doors.
- 4) Open the hood.
- 5) Increase engine speed to 1,500 rpm.
- 6) Turn ON the A/C switch.
- 7) Turn the temperature control switch to MAX COOL.
- 8) Put in RECIRC position.
- 9) Turn the blower control switch to HI.
- 10) Read the gauge.

Standard:

Low pressure: 127 — 196 kPa (1.3 — 2.0 kg/cm², 18 — 28 psi)

High pressure: 1,471 — 1,667 kPa (15 — 17 kg/cm², 213 — 242 psi)

Ambient temperature: 30 — 35 °C (86 — 95 °F)

B: INSPECTION

Symptom	Probable cause	Repair order
High-pressure side is unusually high.	<ul style="list-style-type: none">• Defective condenser fan motor• Clogged condenser fan• Too much refrigerant• Air inside the system• Defective receiver dryer	<ul style="list-style-type: none">• Replace the fan motor.• Clean the condenser fin.• Discharge refrigerant.• Replace the receiver dryer.
High-pressure side is unusually low.	<ul style="list-style-type: none">• Defective compressor• Not enough refrigerant• Clogged expansion valve• Expansion valve frozen temporarily by moisture	<ul style="list-style-type: none">• Replace the compressor.• Check for leaks.• Replace the expansion valve.
Low-pressure side is unusually high.	<ul style="list-style-type: none">• Defective compressor• Defective expansion valve• Too much refrigerant	<ul style="list-style-type: none">• Replace the compressor.• Replace the expansion valve.• Discharge refrigerant.
Low-pressure side is unusually low.	<ul style="list-style-type: none">• Not enough refrigerant• Clogged expansion valve• Expansion valve frozen temporarily by moisture• Saturated receiver dryer	<ul style="list-style-type: none">• Check for leaks.• Replace the expansion valve• Replace the receiver dryer.

REFRIGERANT RECOVERY PROCEDURE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

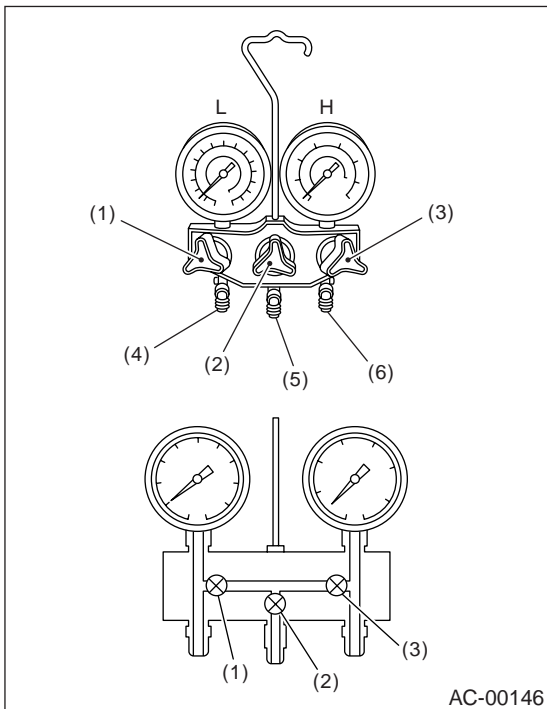
3. Refrigerant Recovery Procedure

A: OPERATION

CAUTION:

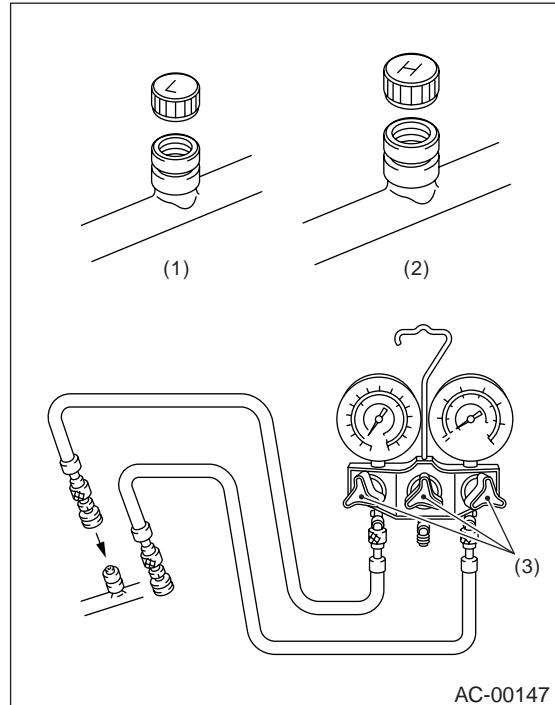
- During operation, be sure to wear safety goggles and protective gloves.
- Connect the refrigerant recovery system with the manifold gauge set to discharge the refrigerant from the A/C system and reuse it.
- When reusing the discharged refrigerant, keep service cans on hand. Because the discharge rate with the recovery system is approx. 90%, service cans are necessary to charge the refrigerant.
- Follow the detailed operation procedure described in the operation manual attached to the refrigerant recovery system.

- 1) Perform the compressor oil return operation. <Ref. to AC-29, OPERATION, Compressor Oil.>
- 2) Stop the engine.
- 3) Make sure the valves on low-/high-pressure sides of manifold gauge set are fully closed.



- L: Low-pressure gauge
- H: High-pressure gauge
- (1) Low-pressure valve
- (2) Vacuum pump valve
- (3) High-pressure valve
- (4) For low-pressure
- (5) For vacuum pump
- (6) For high-pressure

- 4) Install the low-/high-pressure hoses to the service ports on the low-/high-pressure sides of the vehicle respectively.



- (1) Low service port
- (2) High service port
- (3) Close

- 5) Connect the center hose to the refrigerant recovery system.
- 6) Follow the operation manual to activate the refrigerant recovery system.

REFRIGERANT CHARGING PROCEDURE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

4. Refrigerant Charging Procedure

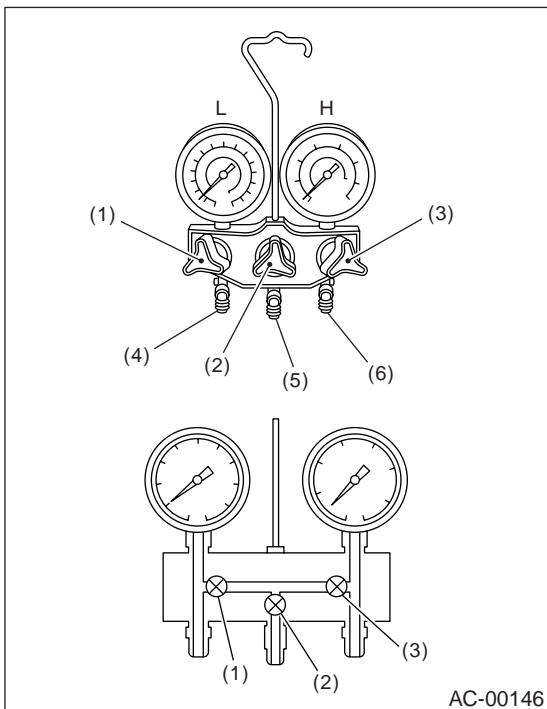
A: OPERATION

CAUTION:

- During operation, be sure to wear safety goggles and protective gloves.
- If air is mixed in refrigeration cycle, poor cooling may result, and also if moisture is mixed in refrigeration cycle, clogging (freezing) or rust may result.

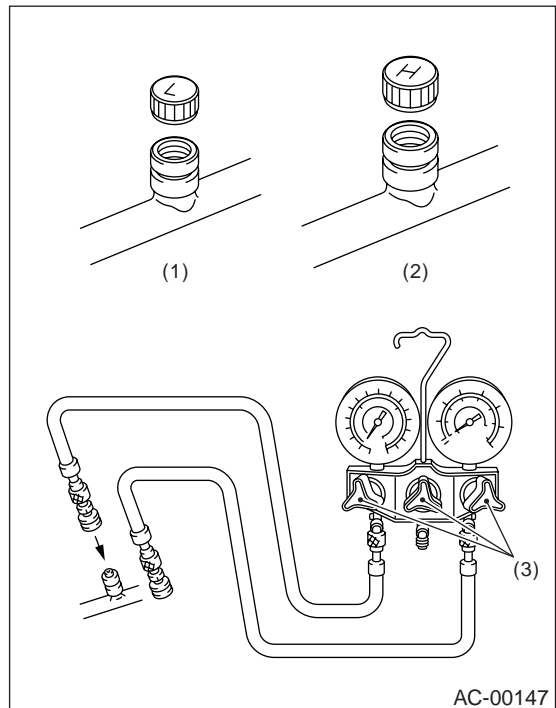
Before charging the refrigerant, evacuate the system using vacuum pump to remove air and moisture in the system. Moisture can be evaporated and removed easily even at normal temperature, if the system is evacuated using vacuum pump.

1) Close all valves of manifold gauge.



- L: Low-pressure gauge
- H: High-pressure gauge
- (1) Low-pressure valve
- (2) Vacuum pump valve
- (3) High-pressure valve
- (4) For low-pressure
- (5) For vacuum pump
- (6) For high-pressure

2) Install the low-/high-pressure hoses to corresponding service ports on vehicle.

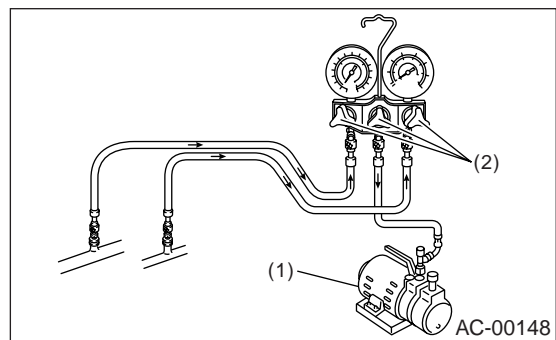


- (1) Low service port
- (2) High service port
- (3) Close

CAUTION:

Be sure that the hoses are securely connected.

- 3) Connect the center hose of manifold gauge with vacuum pump.
- 4) Activate the vacuum pump and then open the valves on low-/high-pressure sides.



- (1) Vacuum pump
- (2) Open

CAUTION:

Be sure to evacuate the system using vacuum pump.

REFRIGERANT CHARGING PROCEDURE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

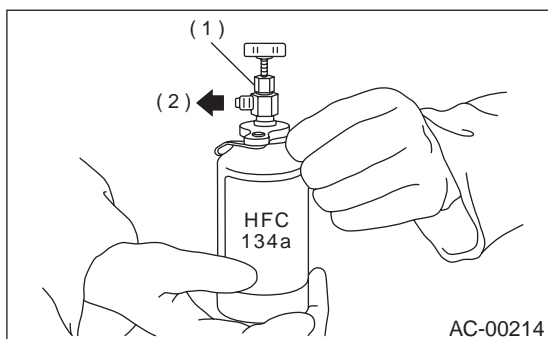
5) After at least 5 minutes of evacuation, if the low-pressure gauge reading shows 100.0 kPa (750 mmHg, 29.5 inHg) or higher, close the valves on center hose to stop the vacuum pump.

6) Leave it at least 5 to 10 minutes after closing the valves on low-/high-pressure sides, and then check the low-pressure gauge reading for any changes. When the gauge reading changes, this is a sign of leakage. Check the pipe or hose connector points, and repair if necessary. Repeat the procedure from 1) after repairing the faulty part.

7) If there are no leaks, further evacuate the system 20 to 30 minutes.

8) Close all valves and stop the vacuum pump.

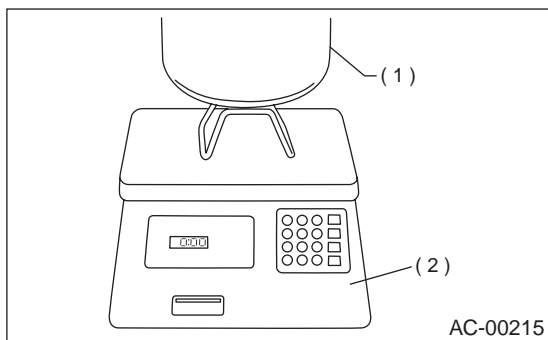
9) Following the can tap operation manual instructions, install it to refrigerant can.



- (1) Tap valve
- (2) Connect to center hose

10) Disconnect the vacuum pump from center hose, and connect the hose to tap valve.

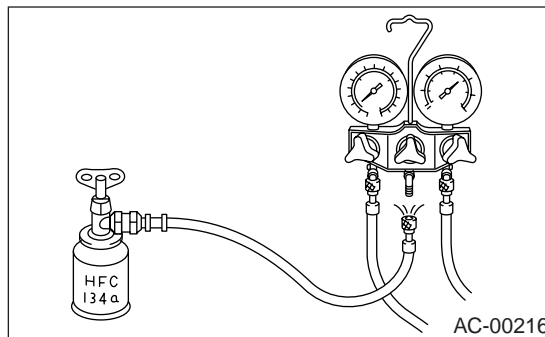
11) When a refrigerant recovery container is used, measure the refrigerant amount in use using a weighting scale before connecting to center hose.



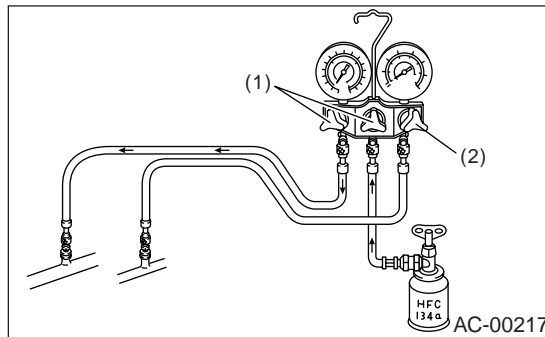
- (1) Refrigerant recovery container
- (2) Weighting scale

12) Open the valve on HFC-134a source.

13) Loosen the center hose connection on manifold gauge (if applicable, press a purge valve on manifold gauge) only for a couple of seconds to allow the air in the center hose to escape by the refrigerant.



14) Make sure that the high-pressure valve of manifold gauge is closed, and then open the low-pressure side valve only to charge the refrigerant.



- (1) Open
- (2) Close

CAUTION:

Do not open the high-pressure valve. Be sure to open the low-pressure valve.

15) Close the low-pressure valve when the low-pressure gauge reading reaches 200 kPa (1,500 mmHg, 59.1 inHg).

16) Using a leak tester, check the system for refrigerant leaks.

17) After confirming that there are no leaks with the leak test, charge the required amount of refrigerant.

18) If the HFC-134a source is empty, close the low-pressure valve and then close the valve on can tap before replacing the empty source. Restart charging operation after replacing the HFC-134a source with a new one and purging.

19) Close the low-pressure valve if the charge rate of refrigerant becomes worse.

20) Confirm that both the low-/high-pressure valves are closed. Start the engine with A/C switch OFF.

21) Quickly repeat A/C switch ON-OFF cycles a few times to prevent initial compressor damage.

REFRIGERANT CHARGING PROCEDURE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

22) Set up the vehicle to the following status:

- A/C switch ON
- Engine running at 1,500 rpm
- Blower speed setting to “Hi”
- Temperature setting to “MAX COOL”
- Air inlet setting to “RECIRC”
- Window open

23) Open the low-pressure valve and charge the specified amount of refrigerant.

24) Close all valves and disconnect the hoses from service port after charging the refrigerant.

25) Install the cap to service port.

REFRIGERANT LEAK CHECK

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

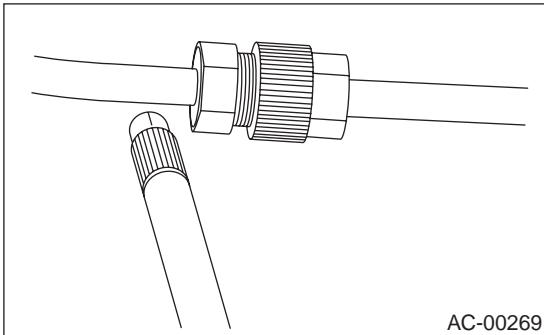
5. Refrigerant Leak Check

A: INSPECTION

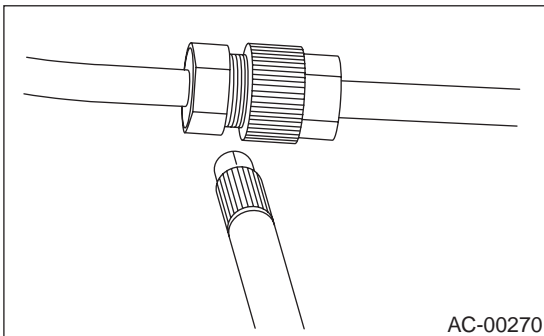
1) Operate the A/C system for approx. 10 minutes, and confirm that the high-side pressure shows at least 690 kPa (7.03 kg/cm², 100 psi). Then stop the engine to start the leak test.

2) Starting from the connection between the high-pressure tube and evaporator, check the system for leaks along the high-pressure side through the compressor. The following items must be checked thoroughly.

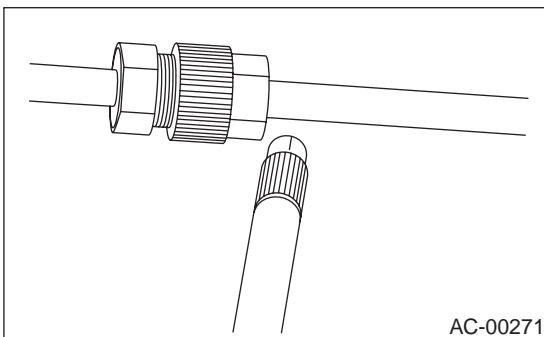
- Connection between the tube and tube fitting



- Connection between 2 parts



- Connection between the tube and nut



3) Check the joint and seam between the pressure switch (dual switch) and receiver dryer.

4) Check the connections between the condenser and tubes, and welded joints on the condenser. The leak tester may detect the oil on the condenser fins as a leak.

5) Check the joint between the compressor and hoses.

6) Check the machined area of compressor and other joints on the compressor.

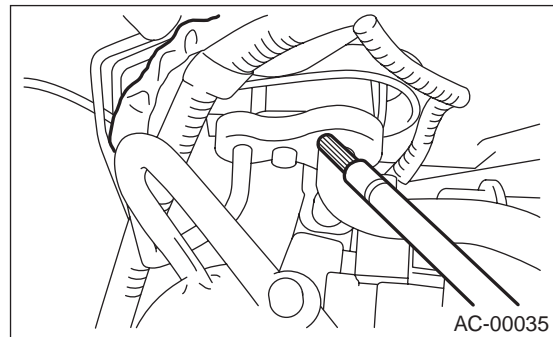
7) Check the thermal limiter (if equipped) on the compressor housing.

8) Check the compressor shaft seal at the area near the center of compressor clutch pulley.

Some shaft seals show a slight amount of leakage about 28 g (1.0 oz) per year. This is not a problem.

9) Starting from the connection between the low-pressure tube and evaporator, check the system for leakage along the high-pressure side through the compressor. The following items must be checked thoroughly.

- Connection between the tube and tube fitting
- Connection between 2 parts
- Connection between the tube and nut

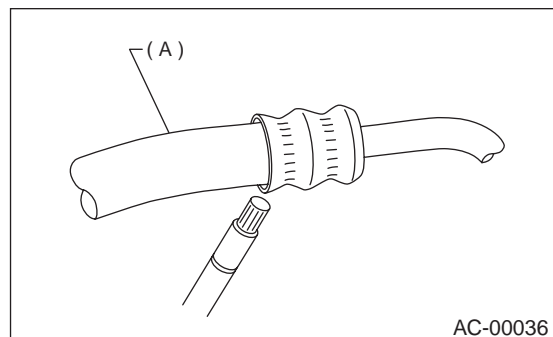


10) Visually check the rubber area of the flexible hose for cracks.

Check the entire length of the flexible hose, especially the connection with the metal hose end.

CAUTION:

Carefully check the external surface of hoses and tubes at approx. 25 mm (0.98 in) per second.



(A) Flexible hose

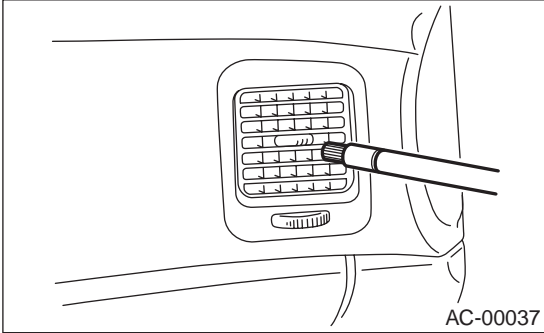
11) Disconnect the drain hose from the evaporator case, and check the hose end for at least 10 seconds.

After the test is finished, reconnect the drain hose.

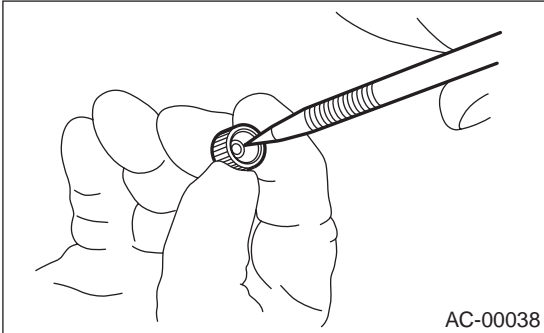
REFRIGERANT LEAK CHECK

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

12) Turn the ignition key to ON position, and run the blower at high speed for 1 minute. Stop the blower to check the ventilation grille on the instrument panel. While moving the tester closer to the grille, run the blower for 1 or 2 seconds, then stop it. Check the grille at that point for at least 10 seconds.



13) Check the valve in the service port.
14) Visually check the rubber seal in the service port cap.



6. Compressor Oil

A: OPERATION

NOTE:

Before making repairs, conduct the oil return operation to return the compressor oil in circulation with the refrigerant to the compressor.

- 1) Increase engine speed to 1,500 rpm.
- 2) Turn ON the A/C switch.
- 3) Turn the temperature control switch to MAX COOL.
- 4) Put in RECIRC position.
- 5) Turn the blower control switch to HI.
- 6) Leave in this condition for 10 minutes.

B: REPLACEMENT

NOTE:

- If a component is replaced, add an appropriate amount of compressor oil.
- When replacing the compressor, the new compressor will already have the specified amount of oil in it. Install the new compressor after removing the same amount of oil that is remaining in the compressor removed.

Replacement parts	Amount of oil replenishment
Evaporator	114 m ℓ (3.9 US fl oz, 4.0 Imp fl oz)
Receiver drier	5 m ℓ (0.2 US fl oz, 0.2 Imp fl oz)
Condenser	2 m ℓ (0.07 US fl oz, 0.07 Imp fl oz)
Hose	1 m ℓ (0.03 US fl oz, 0.04 Imp fl oz)

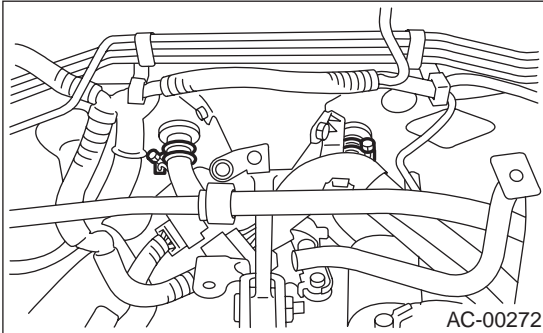
HEATER UNIT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

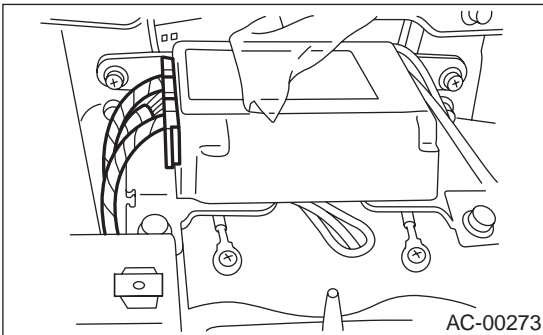
7. Heater Unit

A: REMOVAL

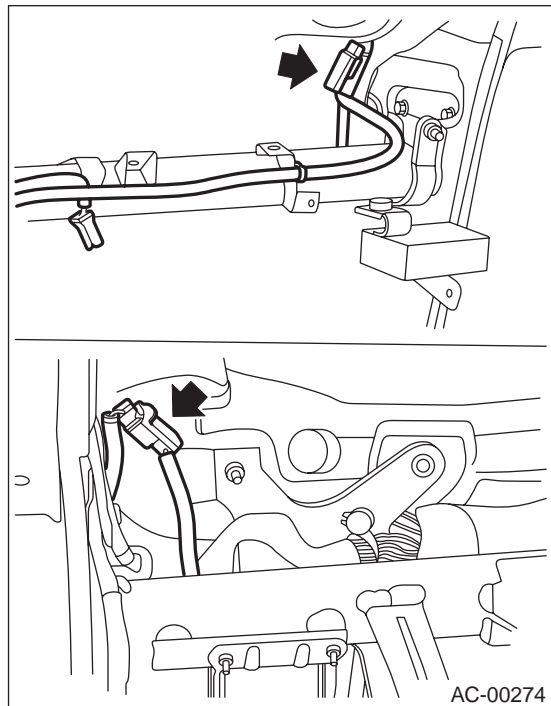
- 1) Disconnect ground cable from battery.
- 2) Pull out LLC.
- 3) Remove air cleaner case.
- 4) Release heater hose clamps in engine compartment to remove the hoses.



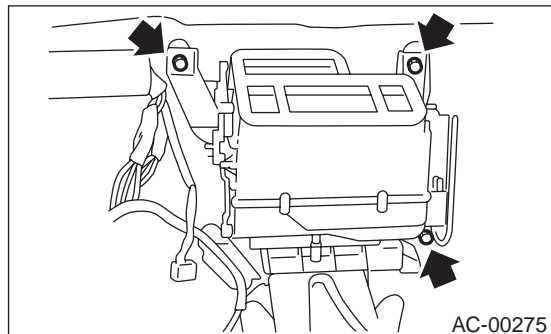
- 5) Remove A/C unit. <Ref. to AC-40, Intake Unit.>
- 6) Using a Torx wrench, remove airbag control unit.



- 7) Disconnect connector of airbag main harness near steering support beam.



- 8) Loosen bolts and nuts of support beam to remove support beam.
- 9) Disconnect servo connector.
- 10) Loosen bolts and nuts of heater unit to remove heater unit.



B: INSTALLATION

Install in the reverse order of removal.

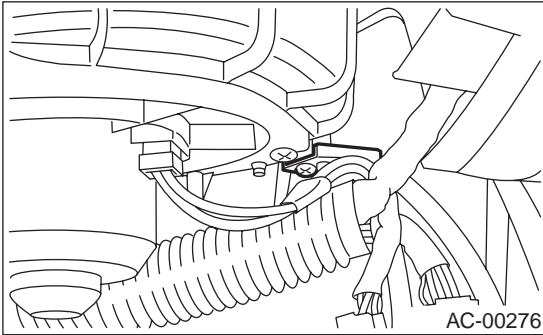
BLOWER MOTOR ASSEMBLY

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

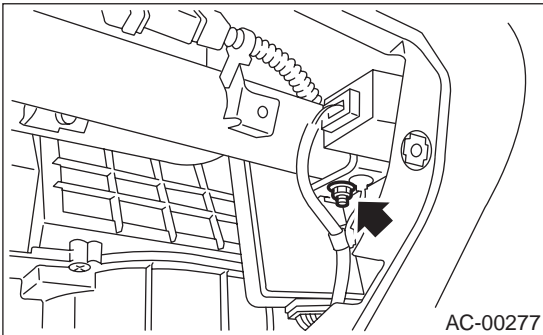
8. Blower Motor Assembly

A: REMOVAL

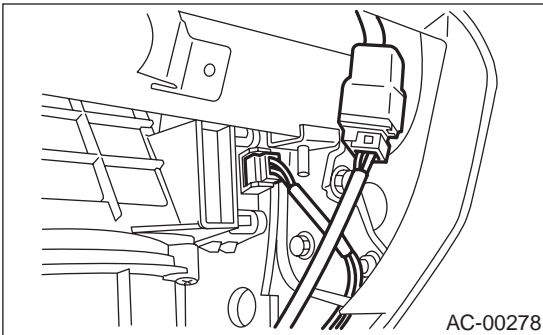
- 1) Disconnect ground cable from battery.
- 2) Remove glove box. <Ref. to EI-32, REMOVAL, Glove Box.>
- 3) Remove mounting bolts of harness stay.



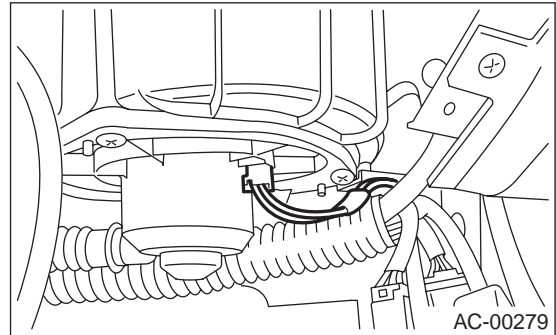
- 4) Remove nuts of keyless unit stay and CRU unit stay.



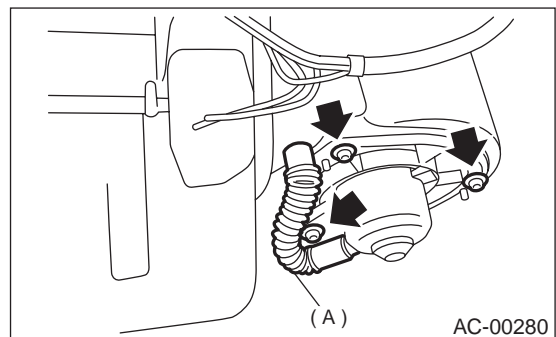
- 5) Disconnect connector of sunroof.
- 6) Disconnect servo connector.



- 7) Disconnect motor connector.



- 8) Remove 3 screws.
- 9) Disconnect aspirator pipe (A) and remove blower motor.

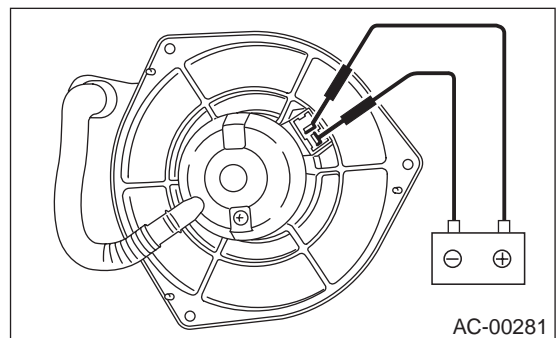


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Connect motor connector terminal 1 from the battery to the positive (+) lead and terminal 2 to the negative (-) lead. Make sure the motor runs smoothly.



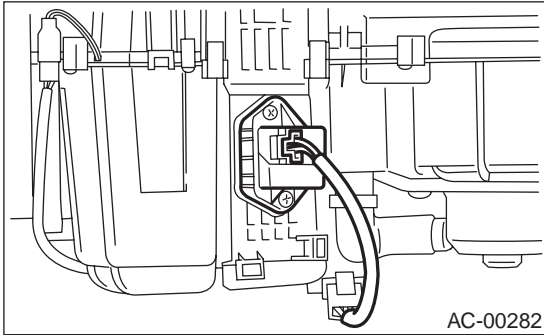
HEATER BLOWER RESISTOR

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

9. Heater Blower Resistor

A: REMOVAL

- 1) Remove glove box. <Ref. to EI-32, REMOVAL, Glove Box.>
- 2) Disconnect power transistor connector.
- 3) Loosen 2 screws to remove power transistor.

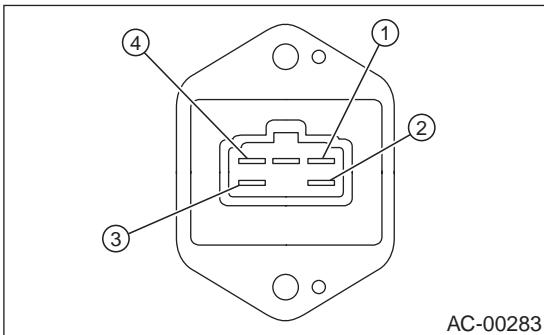


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. MANUAL A/C



Measure switch resistance.

Terminal No.	Condition	Standard
4 and 3	Constant	Approx. 0.46 Ω
3 and 2	Constant	Approx. 0.85 Ω
2 and 1	Constant	Approx. 1.77 Ω

If NG, replace the blower resistor.

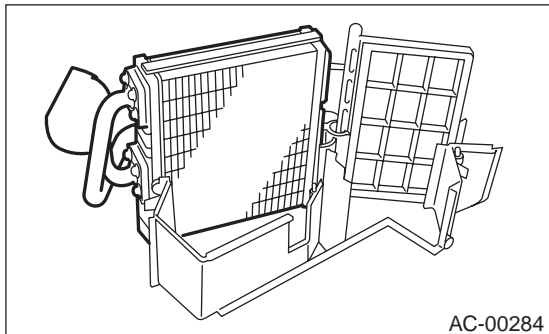
HEATER CORE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

10.Heater Core

A: REMOVAL

- 1) Remove heater unit. <Ref. to AC-30, REMOVAL, Heater Unit.>
- 2) Remove screws to separate heater unit case.
- 3) Remove heater core.



B: INSTALLATION

Install in the reverse order of removal.

CONTROL UNIT

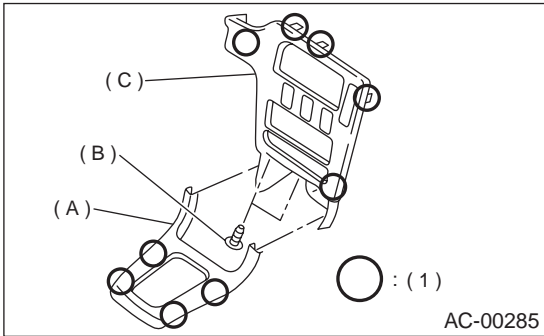
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

11. Control Unit

A: REMOVAL

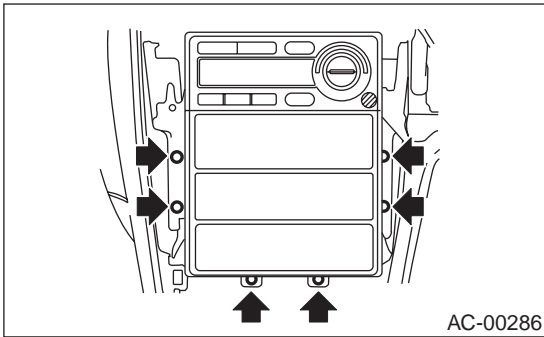
1. AUTO A/C

- 1) Disconnect ground cable from battery.
- 2) Remove front cover (A).
- 3) Loosen 2 screws (B) to remove center panel (C).



(A) Hook pawl

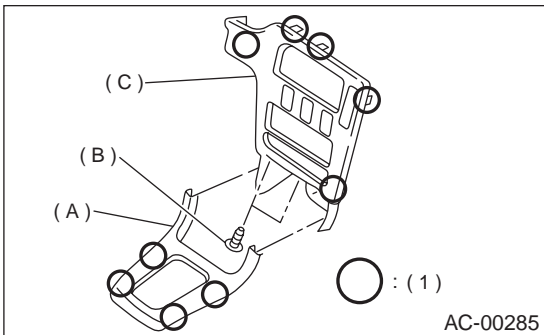
- 4) Loosen screws to pull control unit slightly out of center console.



- 5) Disconnect connector from antenna cable to remove control unit.

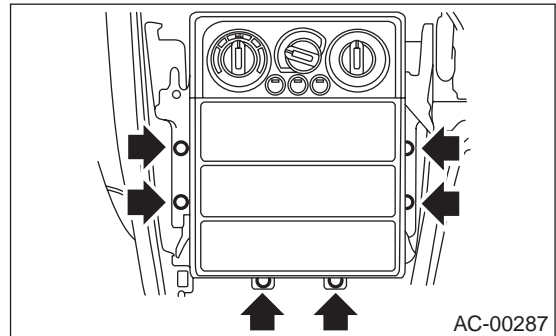
2. MANUAL A/C

- 1) Disconnect ground cable from battery.
- 2) Remove front cover (A).
- 3) Loosen 2 screws (B) to remove center panel (C).



(A) Hook pawl

- 4) Set temperature control switch to "FULL HOT", and disconnect temperature control cable from heater unit.
- 5) Loosen screws to pull control unit slightly out of center console.



- 6) Disconnect connector from antenna cable to remove control unit.

B: INSTALLATION

1. AUTO A/C

Install in the reverse order of removal.

2. MANUAL A/C

- 1) Install in the reverse order of removal.
- 2) Before installation, set temperature control switch to "FULL HOT".

COMPRESSOR

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

12. Compressor

A: INSPECTION

1. MAGNETIC CLUTCH CLEARANCE

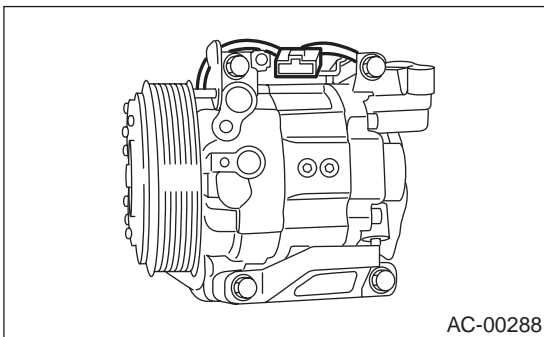
1) Check the clearance of the entire circumference around the drive plate and pulley.

Standard:

$0.45 \pm 0.15 \text{ mm } (0.0177 \pm 0.0059 \text{ in})$

2. MAGNETIC CLUTCH OPERATION

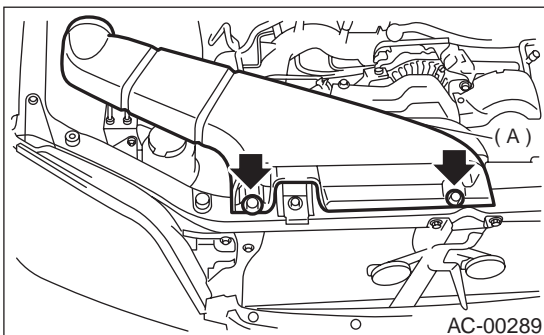
1) Disconnect the compressor connector.
2) Connect the No. 3 terminal of the compressor connector from the battery to the positive (+) lead. Ground the negative (-) lead to the body.



3) Make sure the magnet clutch engages.
If NG, replace the compressor.

B: REMOVAL

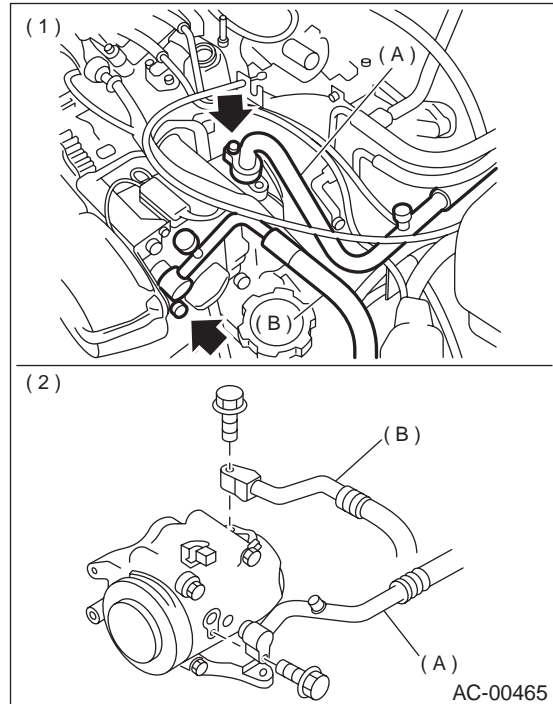
1) Perform oil return operation. <Ref. to AC-29, OPERATION, Compressor Oil.>
2) Turn A/C switch OFF and stop the engine.
3) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-23, OPERATION, Refrigerant Recovery Procedure.>
4) Disconnect ground cable from battery.
5) Remove duct (A).



6) Disconnect low-pressure hose (A) and high-pressure hose (B).

CAUTION:

Be careful not to lose O-rings on hose. Immediately seal hose with a plug or vinyl tape to prevent the entry of contamination.



(1) LHD model

(2) RHD model

7) Remove V-belt.

H4 model <Ref. to ME(H4SO)-41, REMOVAL, V-belt.>

H4 model <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>

8) Remove generator.

H4 non-TURBO model <Ref. to SC(H4SO)-14, REMOVAL, Generator.>

H4 TURBO model <Ref. to SC(H4DOSTC)-14, REMOVAL, Generator.>

H6 model <Ref. to SC(H6DO)-14, REMOVAL, Generator.>

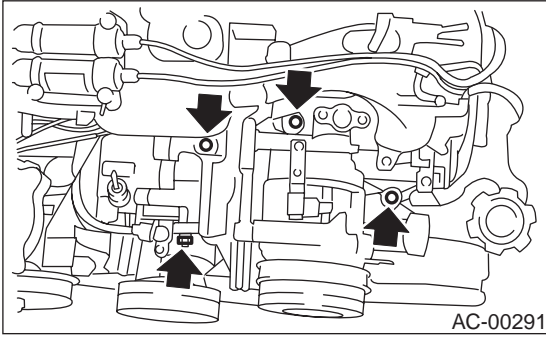
9) Disconnect compressor harness from body harness.

10) Remove bolts from compressor bracket.

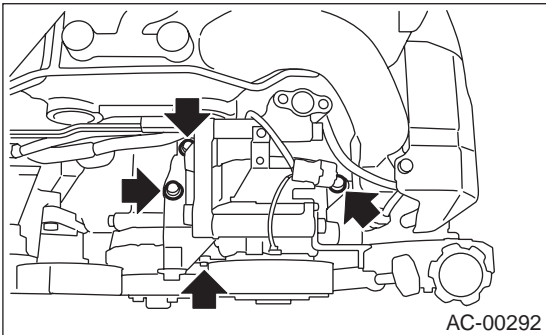
COMPRESSOR

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

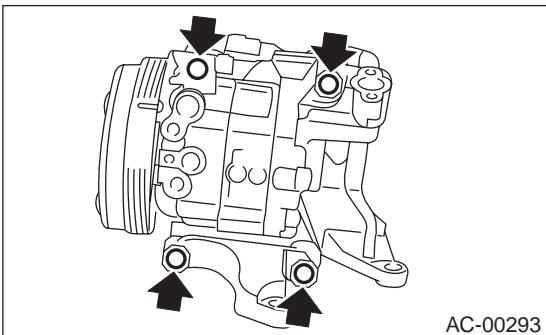
4 CYLINDERS:



6 CYLINDERS:



11) Loosen bolts to remove compressor from bracket.



C: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Replace O-rings on low-/high-pressure hoses with new ones, then apply compressor oil.
- 3) When replacing compressor, adjust amount of compressor oil. <Ref. to AC-29, Compressor Oil.>
- 4) Charge refrigerant. <Ref. to AC-24, OPERATION, Refrigerant Charging Procedure.>

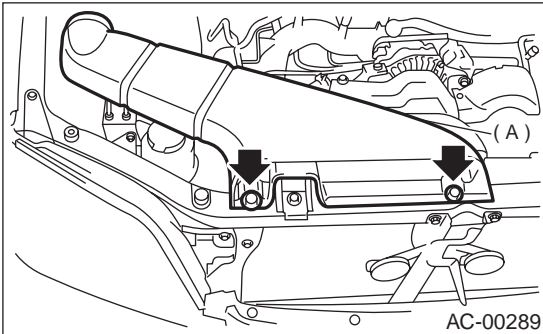
CONDENSER

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

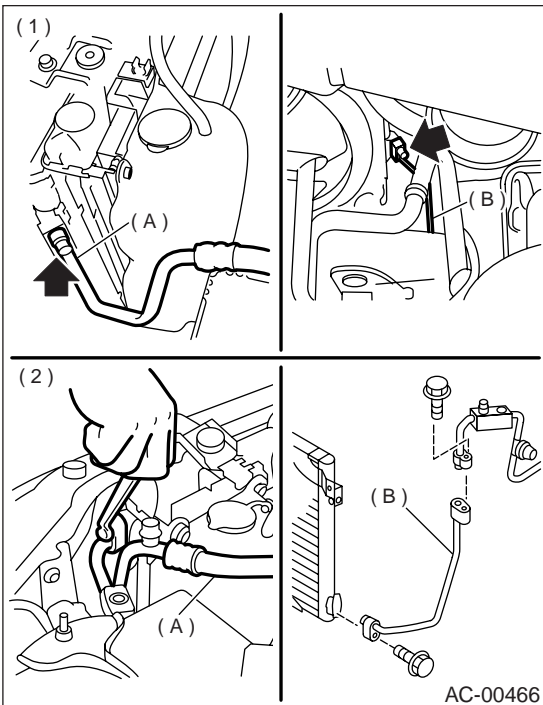
13. Condenser

A: REMOVAL

- 1) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-23, OPERATION, Refrigerant Recovery Procedure.>
- 2) Disconnect ground cable from battery.
- 3) Remove duct (A).

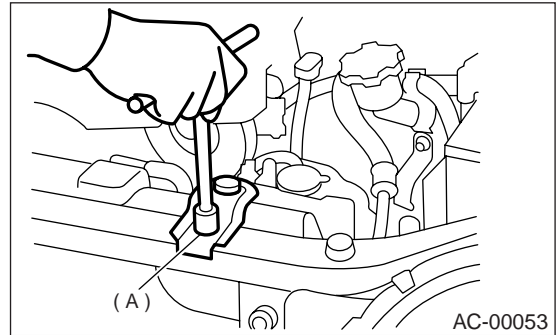


- 4) Disconnect high-pressure hose (A) and low-pressure hose (B) from condenser.

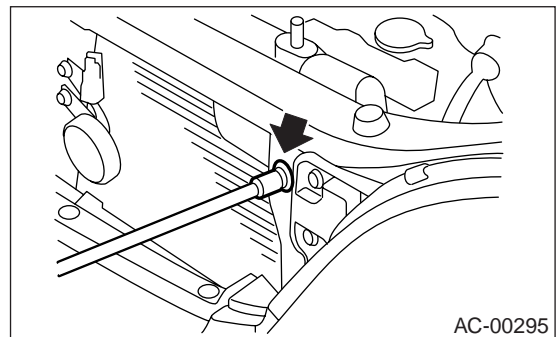


- (1) LHD model
- (2) RHD model

- 5) Remove radiator bracket (A).



- 6) Remove 2 bolts. While lifting condenser, pull it out through the space between the radiator and the radiator panel.



CAUTION:

Be careful not to damage condenser fins. If a damaged fin is found, repair it using a thin screwdriver.

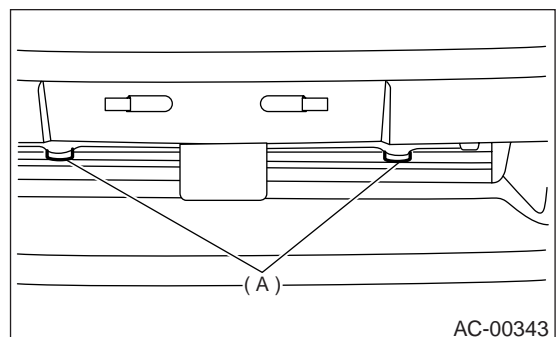
If condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-29, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Replace O-rings on hoses or pipes with new ones, and then apply compressor oil. Confirm that lower guide of condenser has been fitted into holes on radiator panel.



- 2) Charge refrigerant. <Ref. to AC-24, OPERATION, Refrigerant Charging Procedure.>

CONDENSER

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

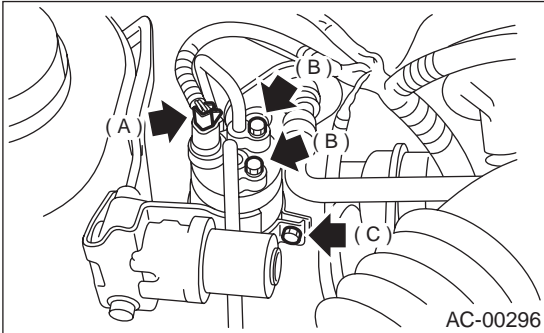
C: INSPECTION

- 1) Confirm that no dust or insects are found on the condenser fins. Air-blow or flush fins with water as needed.
- 2) Confirm that no oil leaks from condenser. If a failure is found, replace condenser with a new one.

14. Receiver Drier

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-23, OPERATION, Refrigerant Recovery Procedure.>
- 3) Disconnect pressure switch harness (A).
- 4) Disconnect pipe (B).
- 5) Loosen mounting bolts (C) to remove receiver drier.



CAUTION:

The receiver drier contains a desiccant. After disconnecting receiver drier, plug it to avoid moisture.

If receiver drier is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-29, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Replace O-rings with new ones, and apply compressor oil.

- 2) Charge refrigerant. <Ref. to AC-24, OPERATION, Refrigerant Charging Procedure.>

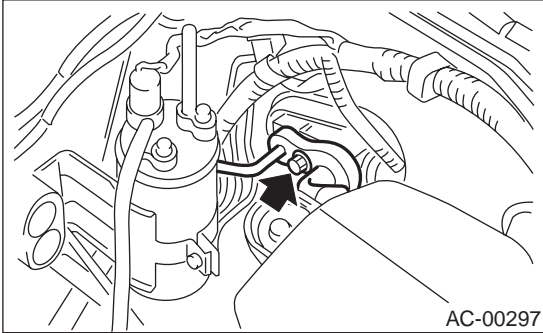
INTAKE UNIT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

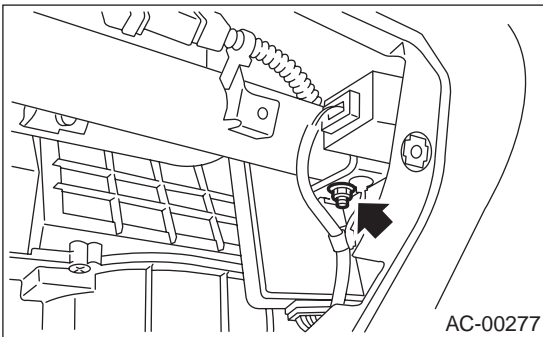
15. Intake Unit

A: REMOVAL

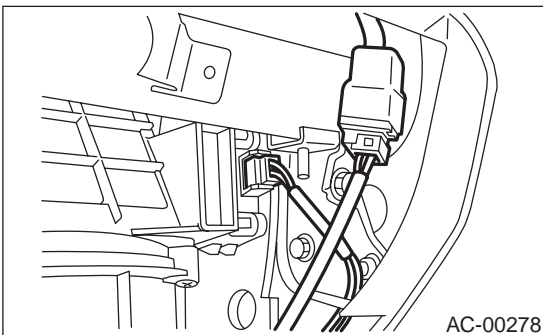
- 1) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-23, OPERATION, Refrigerant Recovery Procedure.>
- 2) Disconnect ground cable from battery.
- 3) Remove bolts securing expansion valve and pipe in engine compartment.



- 4) Remove instrument panel. <Ref. to EI-35, REMOVAL, Instrument Panel Assembly.>
- 5) Remove keyless unit and CRU unit.

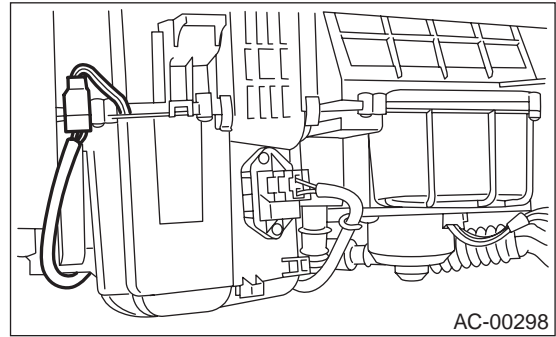


- 6) Disconnect sunroof connector.
- 7) Disconnect servo motor connector.

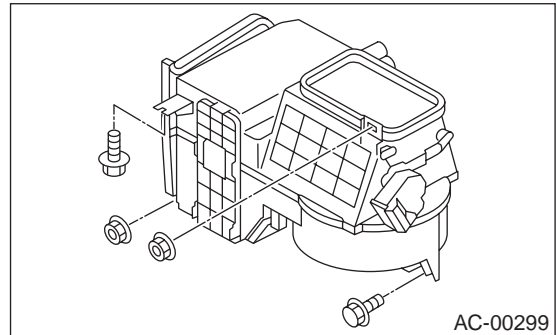


- 8) Disconnect heater blower power transistor connector.
- 9) Disconnect heater blower motor connector.

- 10) Disconnect in-vehicle temperature sensor connector.



- 11) Remove bolts and nuts on the unit.



- 12) Disconnect drain hose.
- 13) Remove the unit.

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Replace O-rings with new ones, and apply compressor oil.

- 2) Charge refrigerant. <Ref. to AC-24, OPERATION, Refrigerant Charging Procedure.>

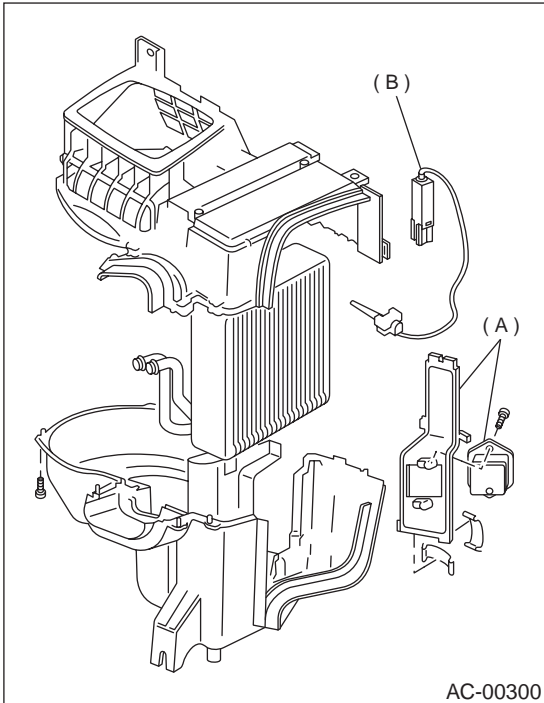
INTAKE UNIT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

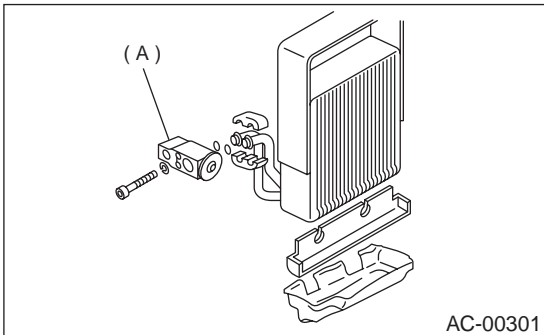
C: DISASSEMBLY

1. LHD MODEL

- 1) Remove resistor (A) and thermistor (B) from intake unit case.
- 2) Remove screws and clips to separate intake unit.



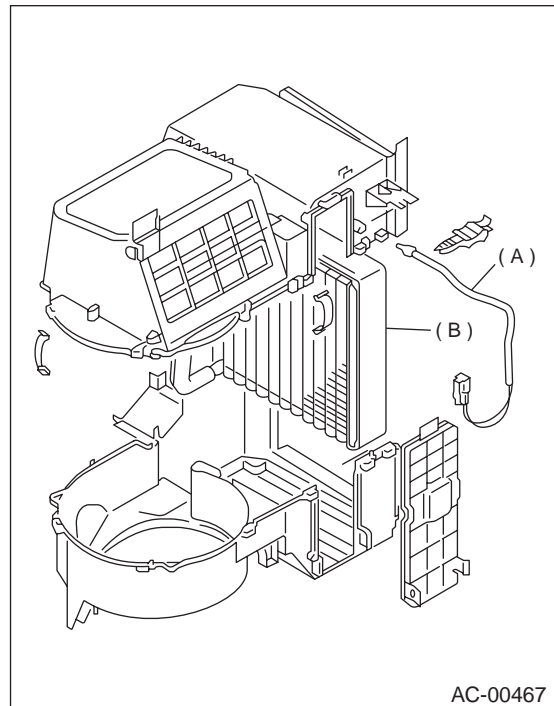
- 3) Remove expansion valve (A) from evaporator.



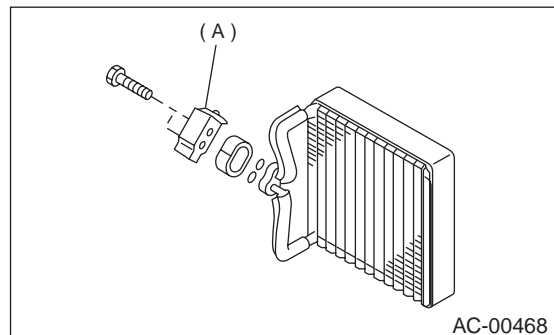
2. RHD MODEL

- 1) Remove some screws and clips, then separate intake unit case.

- 2) Remove thermostat (A) and then detach evaporator (B).



- 3) Remove the block expansion valve (A) from evaporator.



CAUTION:

If evaporator is replaced, add appropriate amount of compressor oil to evaporator. <Ref. to AC-29, REPLACEMENT, Compressor Oil.>

D: ASSEMBLY

Assemble in the reverse order of disassembly.

CAUTION:

Replace O-rings with new ones, and then apply compressor oil.

FLEXIBLE HOSE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

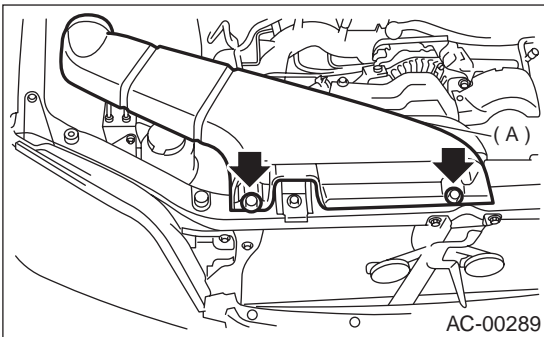
16.Flexible Hose

A: REMOVAL

CAUTION:

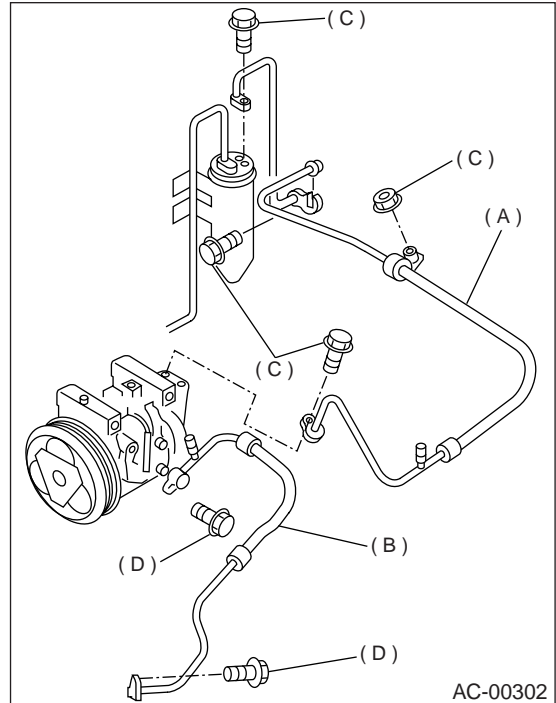
- When disconnecting/connecting hoses, do not apply excessive force them. Confirm that no torsion and excessive tension exist after installing.
- Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.

- 1) Disconnect ground cable from battery.
- 2) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-23, OPERATION, Refrigerant Recovery Procedure.>
- 3) Remove duct (A).

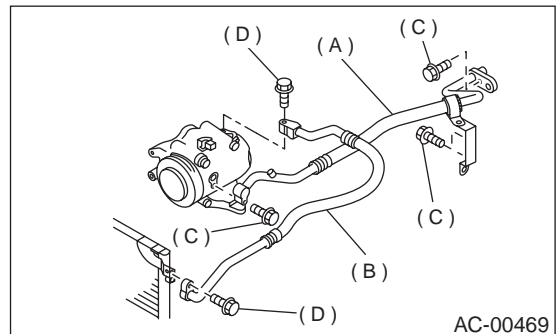


- 4) Remove hose attaching bolts (C).
- 5) Disconnect hose from evaporator unit.
- 6) Disconnect hose from compressor.
- 7) Remove low-pressure hose (A) from the vehicle.
- 8) Remove hose attaching bolts (D).
- 9) Disconnect hose from compressor.
- 10) Disconnect hose from condenser.
- 11) Disconnect high-pressure hose (B) from the vehicle.

• LHD model



• RHD model



B: INSTALLATION

CAUTION:

When disconnecting/connecting hoses, do not apply an excessive force them. Confirm that no torsion and excessive tension exist after installing. Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.

- 1) Install in the reverse order of removal.
- 2) Charge refrigerant. <Ref. to AC-24, OPERATION, Refrigerant Charging Procedure.>

C: INSPECTION

NOTE:

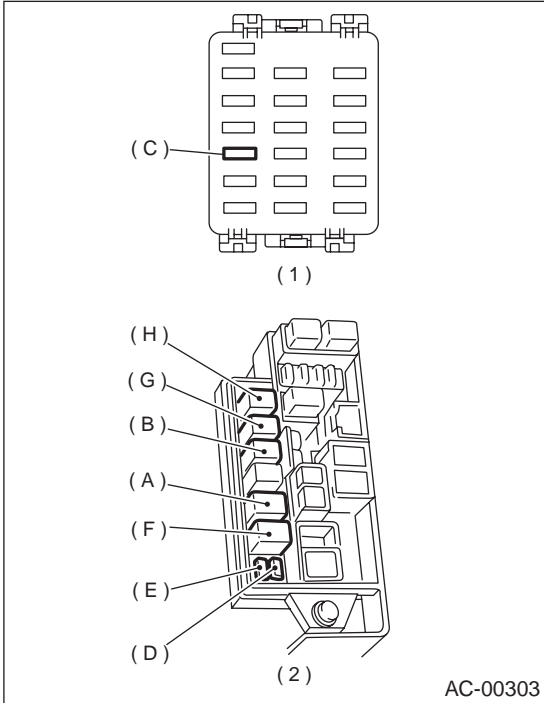
If cracking, damage, or swelling is found on a hose, replace it with a new one.

RELAY AND FUSE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

17. Relay and Fuse

A: LOCATION



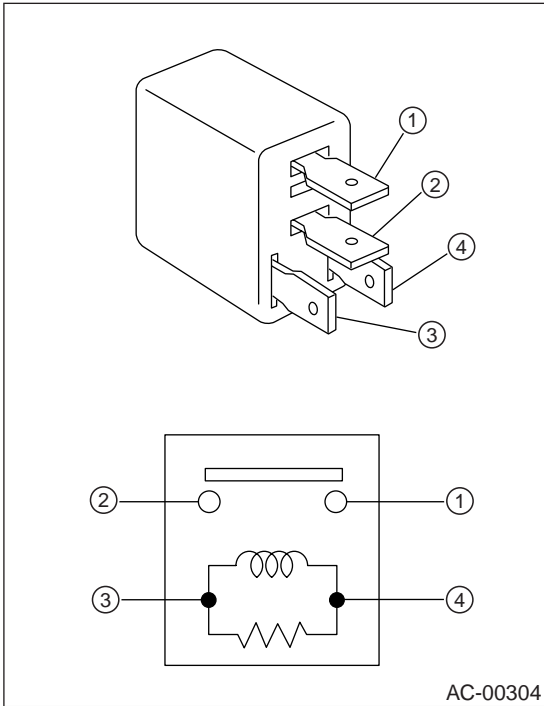
- (1) Joint box
- (2) Main fuse box

	4 cylinder engine model	6 cylinder engine model
Main fan relay	F	—
Sub fan relay	B	—
A/C relay	A	A
Main fan relay 1	—	F
Sub fan relay 1	—	G
Main fan relay 2	—	B
Sub fan relay 2	—	H
A/C fuse	C	C
Main fan fuse	E (20 A)	E (30 A)
Sub fan fuse	D (20 A)	D (30 A)

RELAY AND FUSE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

B: INSPECTION



(3) — (4): Continuity exists.

(1) — (2): No continuity

While applying battery voltage to the cable between (3) and (4), check continuity between (1) and (2).

If no continuity exists, replace the relay with a new one.

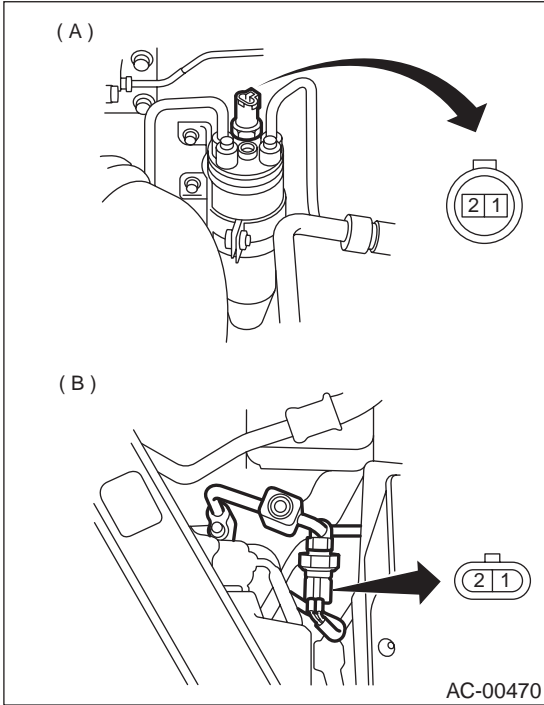
PRESSURE SWITCH (DUAL SWITCH)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

18. Pressure Switch (Dual Switch)

A: INSPECTION

- 1) Connect the manifold gauge to the service valve on the high-pressure side.
- 2) Remove the pressure switch harness connector. Using a circuit tester, inspect the ON-OFF operation of the pressure switch.



- (A) LHD model
(B) RHD model

	Tester connection	Operation	Specified condition kPa (kg/cm ² , psi)
High and low pressure switch	1 — 2	Turns OFF.	Increasing to 2,942±196 (30±2, 427±28): LHD model 3,138±196 (32±2, 455±28): RHD model
			Decreasing to 177±25 (1.8±0.25, 25.6±3.6): LHD model 196±20 (2.0±0.2, 28.4±2.8): RHD model
		Turns ON.	Increasing to 216 (2.2, 31) or less: LHD model 226±29 (2.3±0.3, 33±4): RHD model
			Decreasing to 2,354±196 (24±2, 341±28): LHD model 2,550±196 (26±2, 370±28): RHD model

PRESSURE SWITCH (TRIPLE SWITCH)

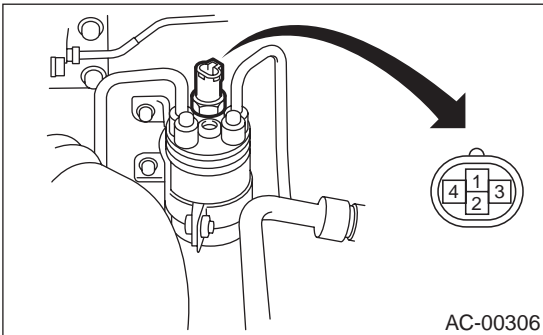
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

19. Pressure Switch (Triple Switch)

A: INSPECTION

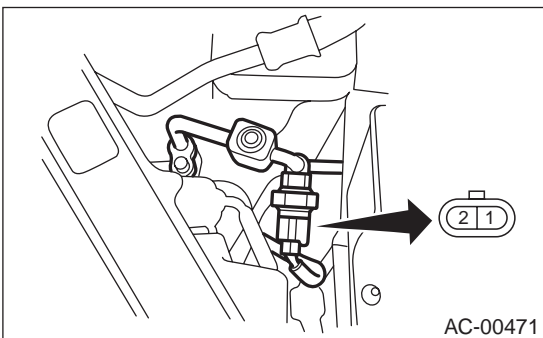
- 1) Connect the manifold gauge to the service manifold on the high-pressure side.
- 2) Remove the pressure switch harness connector. Using a circuit tester, inspect the ON-OFF operation of the pressure switch.

LHD model



	Tester connection	Operation	Specified condition kPa (kg/cm ² , psi)
High and low pressure switch	1 — 2	Turns OFF.	Increasing to 2,940±196 (29.98±2.00, 426±28)
			Decreasing to 177±20 (1.8±0.2, 26±3)
		Turns ON.	Increasing to 216 or less (2.2, 31)
			Decreasing to 2,350±196 (23.97±2.00, 341±28)
Middle pressure switch	3 — 4	Turns OFF.	1,370±120 (13.97±1.22, 199±17)
		Turns ON.	1,770±100 (18.05±1.02, 257±15)

RHD model

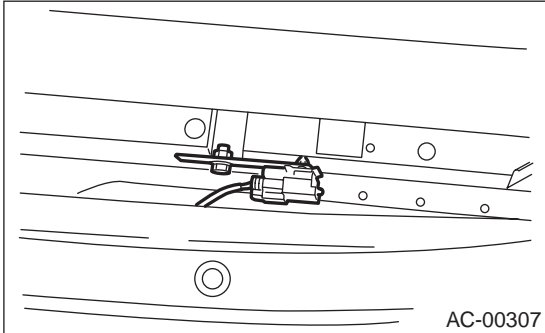


	Tester connection	Operation	Specified condition kPa (kg/cm ² , psi)
High and low pressure switch	1 — 2	Turns OFF.	Increasing to 3,140 ⁺⁵⁰ / ₋₂₀₀ (32.02 ^{+0.51} / _{-2.04} , 455.3 ^{+7.3} / _{-29.0})
			Decreasing to 196±20 (2.0±0.2, 28±3)
		Turns ON.	Increasing to 225 ⁺²⁵ / ₋₂₉ (2.29 ^{+0.25} / _{-0.30} , 32.6 ^{+3.6} / _{-4.3})
			Decreasing to 2,550±200 (26.0±2.04, 370±29)
Middle pressure switch	3 — 4	Turns OFF.	1,370±120 (13.97±1.22, 198.7±17.3)
		Turns ON.	1,770±80 (18.05±0.82, 256.7±11.7)

20.Ambient Sensor (Auto A/C)

A: REMOVAL

- 1) Open front hood.
- 2) Disconnect ground cable from battery.
- 3) Disconnect ambient sensor connector.
- 4) Remove ambient sensor from radiator lower panel.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

<Ref. to AC-50, DTC 21 OR -21 (AMBIENT SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC) (LHD Model).>

<Ref. to AC-66, DTC 22 OR -22 (AMBIENT SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC) (RHD Model).>

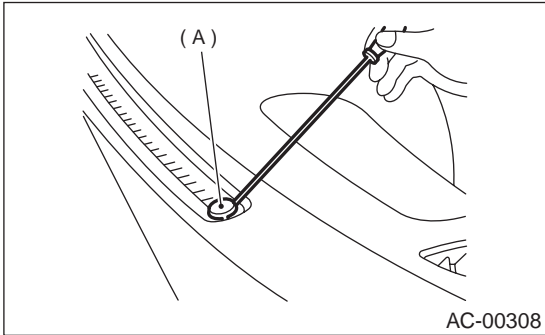
SUNLOAD SENSOR (AUTO A/C)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

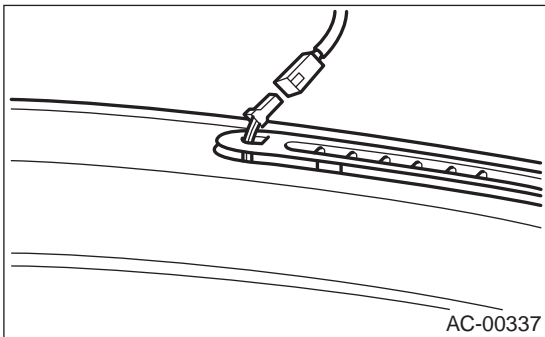
21. Sunload Sensor (Auto A/C)

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Insert a slotted screwdriver to remove sunload sensor.



- 3) Disconnect sunload sensor connector.



NOTE:

Be careful not to damage sensors and interior trims when removing them.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

<Ref. to AC-56, DTC 25 OR -25 (SUNLOAD SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC) (LHD Model).>

<Ref. to AC-70, DTC 25 OR -25 (SUNLOAD SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC) (RHD Model).>

AIR VENT GRILLE

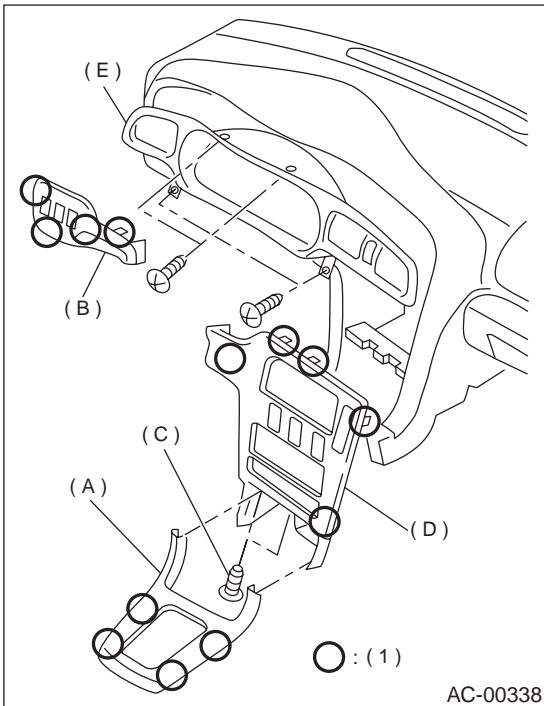
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

22. Air Vent Grille

A: REMOVAL

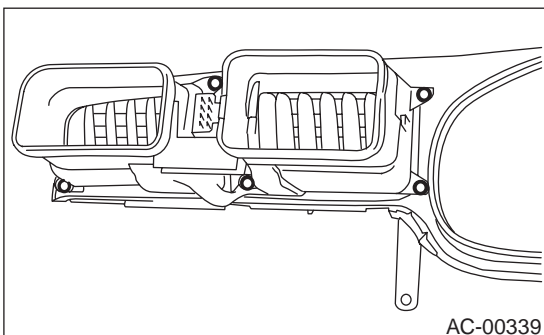
1. AIR VENT GRILLE DRIVER SIDE

- 1) Disconnect ground cable from battery.
- 2) Set tilt steering to the lowest position.
- 3) Disconnect each electrical connector to remove front cover (A) and switch panel (B).
- 4) Loosen screw (C) to remove center panel (D).
- 5) Remove meter visor (E).



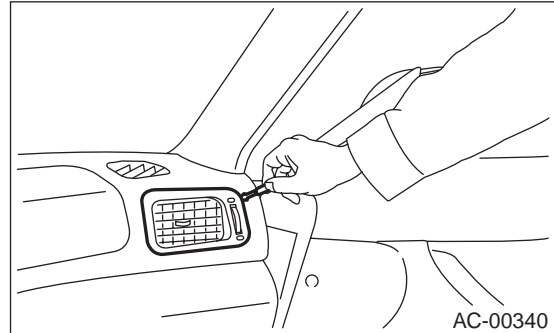
(1) Hook pawl

- 6) Loosen screws to remove grille.



2. AIR VENT GRILLE PASSENGER SIDE

- 1) Remove grille using sharp-edged screwdriver.



NOTE:

Wrap screwdriver with vinyl tape to prevent damage to interior parts.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

The direction and amount of air should be adjusted smoothly.

The adjustment should be kept in each position.

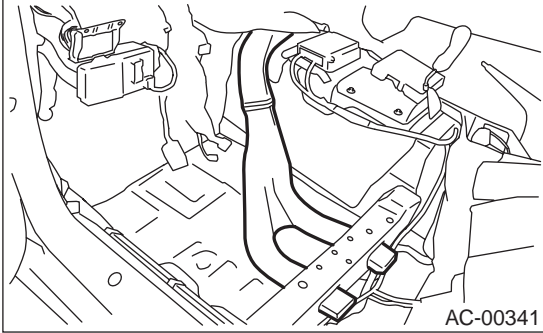
HEATER DUCT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

23.Heater Duct

A: REMOVAL

- 1) Remove heater unit. <Ref. to AC-30, REMOVAL, Heater Unit.>
- 2) Remove front seat. <Ref. to SE-7, REMOVAL, Front Seat.>
- 3) Remove front side sill cover.
- 4) Pull off floor mat to remove heater duct.



B: INSTALLATION

Install in the reverse order of removal.

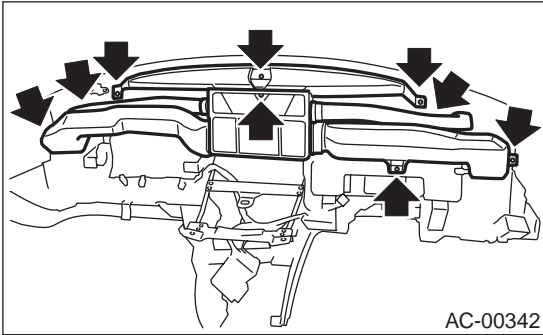
HEATER VENT DUCT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

24.Heater Vent Duct

A: REMOVAL

- 1) Remove instrument panel. <Ref. to EI-35, REMOVAL, Instrument Panel Assembly.>
- 2) Remove nine screws.
- 3) Remove heater vent duct.



B: INSTALLATION

Install in the reverse order of removal.

GENERAL DIAGNOSTICS

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

25. General Diagnostics

A: INSPECTION

Symptom		Repair order
Blower motor	Doesn't move.	Fuse
		Blower motor relay
		Blower motor
		Blower motor resistor
		Blower switch
		Wire harness
	Strange noise.	Blower motor
Compressor	Doesn't move.	Refrigerant
		Fuse
		Air conditioning relay
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
		Wire harness
	Strange noise	V-Belt
		Magnet clutch
		Compressor
Cold air not emitted.	Refrigerant	
	V-Belt	
	Magnet clutch	
	Compressor	
	Pressure switch	
	A/C switch	
	Blower switch	
	Wire harness	
	Heater duct	
	Heater vent duct	
Warm air not emitted.	Engine coolant	
	Blower switch	
	Heater core	
Temperature of air from vents does not change.	Engine coolant	
	Mode actuator	
	Wire harness	
Unable to switch blow vents.	Mode actuator	
	Air flow switch	
	Wire harness	
Unable to switch suction vents.	Air inlet select switch	
	FRESH/RECIRC actuator	
	Wire harness	

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

AC

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BASIC DIAGNOSTIC PROCEDURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Value	Yes	No
1 START INSPECTIONS. 1) Perform pre-inspection. 2) Perform self-diagnosis. LHD: <Ref. to AC-14, OPERATION, Self-Diagnosis Procedure (LHD Model).> RHD: <Ref. to AC-18, OPERATION, Self-Diagnosis Procedure (RHD Model).> Does self-diagnosis operate?	Self-diagnosis operates.	Go to step 2.	LHD: <Ref. to AC-20, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure (LHD Model).> RHD: <Ref. to AC-32, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure (RHD Model).>
2 CHECK DTC. Check DTC. Is DTC indicated?	DTC indicated.	LHD: <Ref. to AC-50, Diagnostic Procedure with Diagnostic Trouble Code (DTC) (LHD Model).> RHD: <Ref. to AC-65, Diagnostic Procedure with Diagnostic Trouble Code (DTC) (RHD Model).>	Go to step 3.
3 CHECK BLOWER MOTOR OPERATION. 1) Turn blower switch ON. 2) Check blower motor operation. Is blower motor rotated?	Blower motor rotates.	Go to step 4.	LHD: <Ref. to AC-22, BLOWER MOTOR DOES NOT ROTATE, Diagnostics for A/C System Failure (LHD Model).> RHD: <Ref. to AC-34, BLOWER MOTOR DOES NOT ROTATE, Diagnostics for A/C System Failure (RHD Model).> and <Ref. to AC-38, BLOWER MOTOR ROTATES ABNORMALLY, Diagnostics for A/C System Failure (RHD Model).>

BASIC DIAGNOSTIC PROCEDURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
4 CHECK FRESH/RECIRC MODE. Change FRESH/RECIRC mode by pushing mode switch. Is FRESH/RECIRC mode changed?	FRESH/RECIRC mode changes.	Go to step 5.	LHD: <Ref. to AC-30, FRESH/RECIRC DOES NOT CHANGE, Diagnostics for A/C System Failure (LHD Model).> RHD: <Ref. to AC-41, FRESH/RECIRC DOES NOT CHANGE, Diagnostics for A/C System Failure (RHD Model).>
5 CHECK COMPARTMENT TEMPERATURE. 1) Turn A/C switch ON. 2) Set temperature at 18°C (65°F) (FULL COOL). 3) Check compartment temperature changes. Is the compartment temperature changed?	Compartment temperature changes.	Go to step 6.	LHD: <Ref. to AC-24, COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM "SET" TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure (LHD Model).> RHD: <Ref. to AC-44, COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM "SET" TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure (RHD Model).>

BASIC DIAGNOSTIC PROCEDURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK A/C SYSTEM RESPONSE. Change the temperature setting, and check response of A/C system. Dose A/C system respond quickly?	A/C system responds quickly.	A/C system is OK.	LHD: <Ref. to AC-24, COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM "SET" TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure (LHD Model).> RHD: <Ref. to AC-44, COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM "SET" TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure (RHD Model).>

GENERAL DESCRIPTION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

2. General Description

A: CAUTION

- 1) Never connect the battery in reverse polarity.
 - The auto A/C control module may be destroyed instantly.
- 2) Do not disconnect the battery terminals while the engine is running.
 - A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as A/C control module.
- 3) Before disconnecting the connectors of each sensor and the A/C control module, be sure to turn off the ignition switch.
 - Otherwise, the Auto A/C control module may be damaged.
- 4) Every auto A/C-related part is a precision part. Do not drop them.
- 5) Airbag system wiring harness is routed near the A/C control panel (A/C control module) and junction box.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage Airbag system wiring harness when servicing the A/C control panel (A/C control module) and junction box.

B: INSPECTION

Before performing diagnosis, check the following items which might affect engine problems.

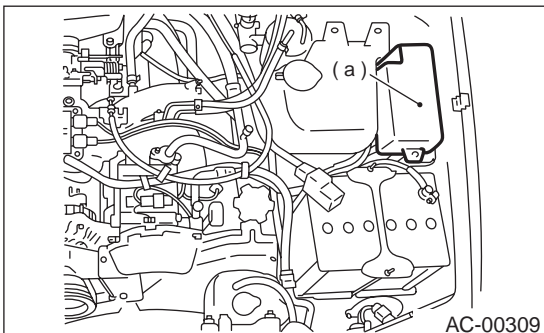
1. BATTERY

- 1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V

Specific gravity: Above 1.260

- 2) Check the condition of the fuses for A/C, heater and other fuses.

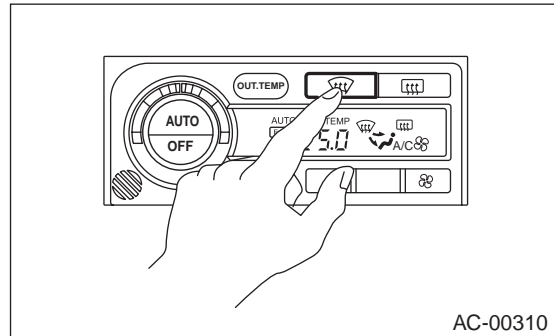


(a) Main fuse box

- 3) Check the condition of the harnesses and harness connectors connection.

2. ASPIRATOR HOSE

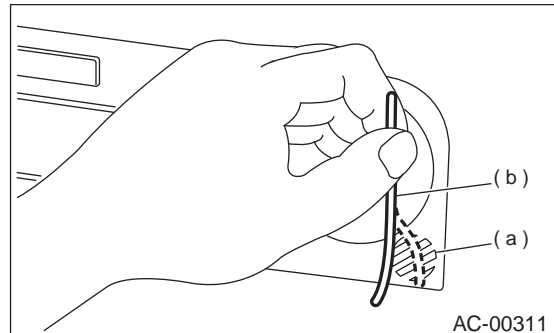
- 1) Turn ignition switch to ON.
- 2) Push "DEF" switch and then blower fan switch to turn the blower fan to maximum speed.



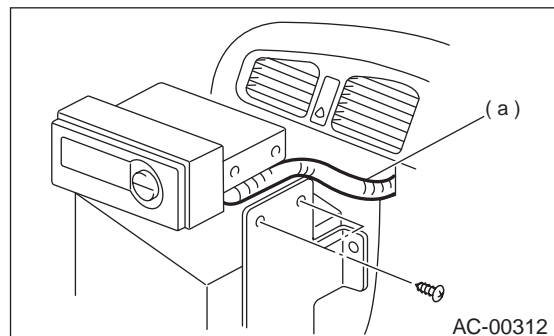
- 3) Firmly hold a thin thread (b) in front of the in-vehicle sensor suction port (a) for the auto A/C control unit and check that the thread moves towards the port indicating that air is being sucked into the port.

NOTE:

- Ensure the thread does not get sucked into the port.



- 4) If the thread does not move at all, remove the auto A/C control unit <Ref. to AC-34, REMOVAL, Control Unit.> and check for improper connection of the aspirator hose (a) and auto A/C control unit and secure as necessary.

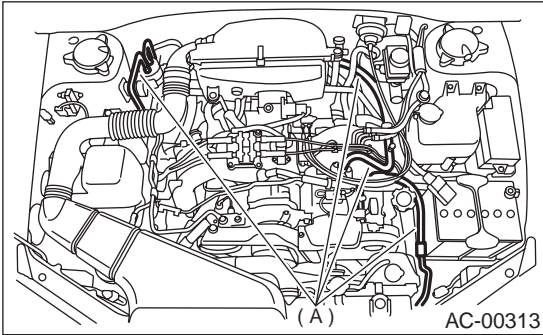


GENERAL DESCRIPTION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

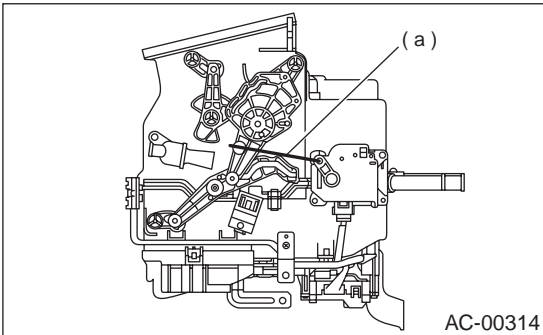
3. REFRIGERANT LINE

Check contact for refrigerant line (A).



4. CONTROL LINKAGE

- 1) Check state of mode door control rod and linkage.
- 2) Check state of air mix door control rod and linkage.
- 3) Check state of intake door control rod and linkage.



(a) Control rod

GENERAL DESCRIPTION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

5. CONTROL SWITCHES

Start and warm up engine completely.

1) Inspection using switches.

No.	Point to check	Switch operation	Judgement standard
1	OFF switch	OFF switch "ON"	"SET" temperature display go out. <ul style="list-style-type: none"> • Air flow → OFF • Outlet → HEAT • Inlet → FRESH • Compressor → OFF
2	AUTO switch	A. AUTO switch "ON" B. Temp. control dial 18°C (65°F) (Max. Cold)	a. AUTO switch display illuminates. b. <ul style="list-style-type: none"> • Outlet air → Cool • Air flow → HI (AUTO) • Outlet → VENT • Inlet → AUTO • Compressor → AUTO
		C. TEMP control dial is gradually set from 18°C (65°F) to 32°C (85°F).	c. Air and air outlet mode change as follows: <ul style="list-style-type: none"> • Outlet air: cool → hot • Air flow: AUTO • Outlet: VENT → BI-LEVEL → HEAT • Inlet: AUTO
		D. Temp. control dial 32°C (85°F) (Max. Hot)	d. Outlet air → Hot <ul style="list-style-type: none"> • Air flow → HI (AUTO) • Outlet → HEAT • Inlet → FRESH (AUTO) • Compressor → AUTO
3	DEF switch	A. DEF switch "ON" B. Temp. control dial 18 — 32°C (65 — 85°F)	a. DEF switch display illuminates. b. <ul style="list-style-type: none"> • Outlet air temperature (AUTO control) • Air flow (AUTO control) • Outlet → DEF • Inlet → FRESH • Compressor → ON
4	FRESH/RECIRC switch	FRESH/RECIRC switch "ON"	Changes from RECIRC → FRESH, or FRESH → RECIRC.
5	MODE switch	MODE switch "ON"	Outlet changes from VENT → BI-LEVEL → HEAT → DEF/HEAT each time MODE switch is pushed.
6	FAN switch	FAN switch "ON"	Fan speed changes from LO → M1 → M2 → HI each time FAN switch is pushed.
7	OUT-TEMP switch	OUT-TEMP switch "ON"	Ambient temperature flashes on "set" temperature display, and "set" temperature appears.

2) Compressor operation inspection

No.	Point to check	Switch operation	Judgement standard	Remarks
1	Compressor	A. AUTO switch "ON" B. A/C switch "ON" C. DEF switch "ON"	a. Compressor ON b. Compressor ON c. Compressor ON	Compressor turns OFF several seconds after AUTO switch is turned ON.

3) Illumination control inspection

No.	Point to check	Switch operation	Judgement standard	Remarks
1	Illumination	Lighting switch "ON"	Illumination light illuminates and both switch light and "set" temperature display dim.	Green lights remain on although OFF and OUT-TEMP switches remain ON.
		Press OFF switch longer than 1 second.	Dimming of illumination is canceled.	

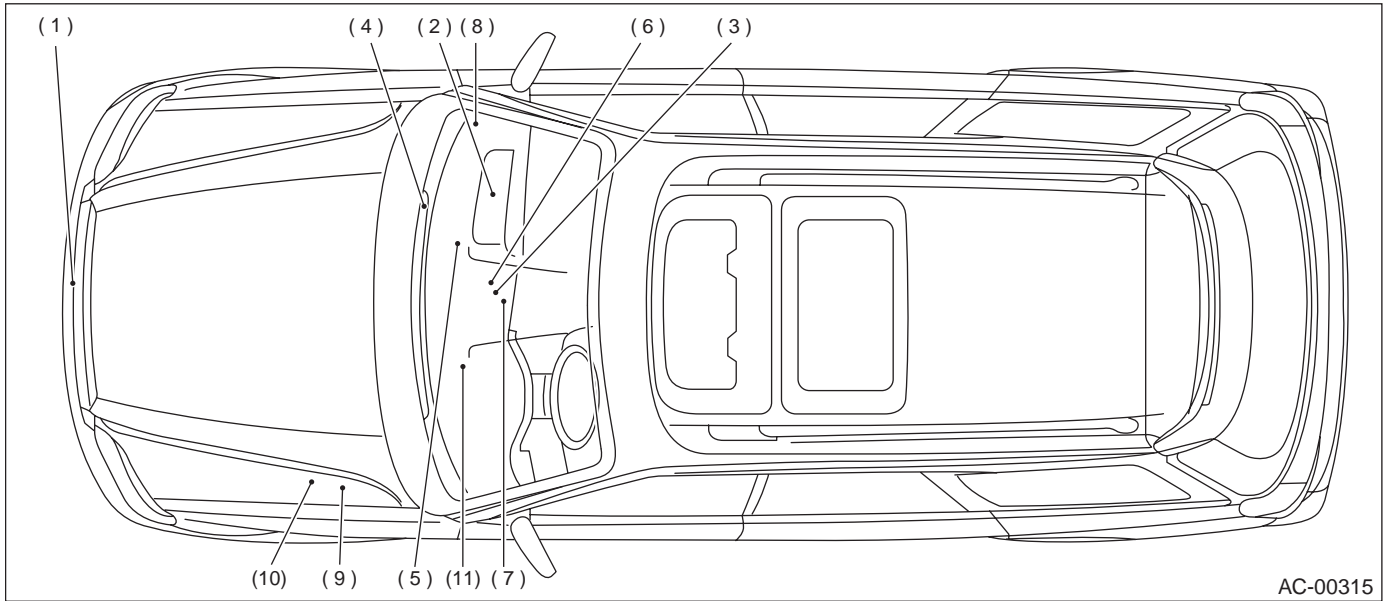
ELECTRICAL COMPONENTS LOCATION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

3. Electrical Components Location

A: LOCATION

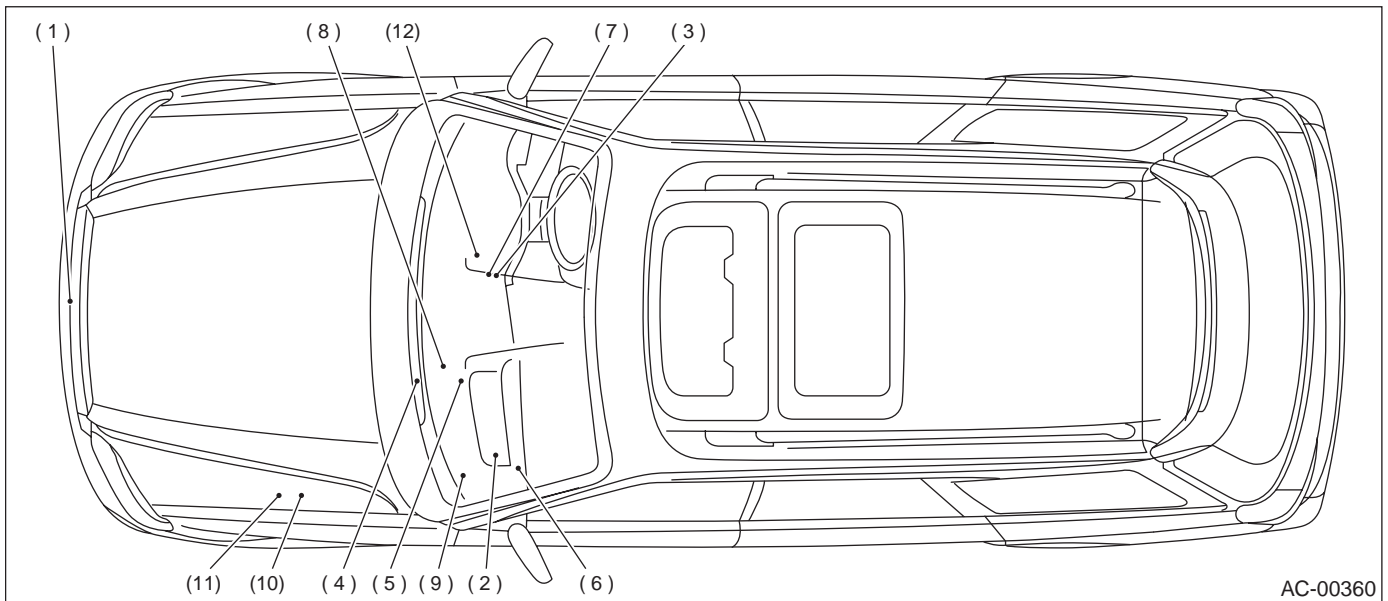
1. LHD MODEL



AC-00315

- | | | |
|-----------------------|-----------------------------|-------------------------|
| (1) Ambient sensor | (5) Evaporator sensor | (9) A/C relay |
| (2) Blower motor | (6) Auto A/C control module | (10) A/C fuse |
| (3) In-vehicle sensor | (7) Air mix door actuator | (11) Mode door actuator |
| (4) Sunload sensor | (8) Intake door actuator | |

2. RHD MODEL



AC-00360

- | | | |
|-----------------------|-----------------------------|--------------------------|
| (1) Ambient sensor | (5) Evaporator sensor | (9) Intake door actuator |
| (2) Heater module | (6) Blower module | (10) A/C relay |
| (3) In-vehicle sensor | (7) Auto A/C control module | (11) A/C fuse |
| (4) Sunload sensor | (8) Air mix door actuator | (12) Mode door actuator |

ELECTRICAL COMPONENTS LOCATION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

MEMO:

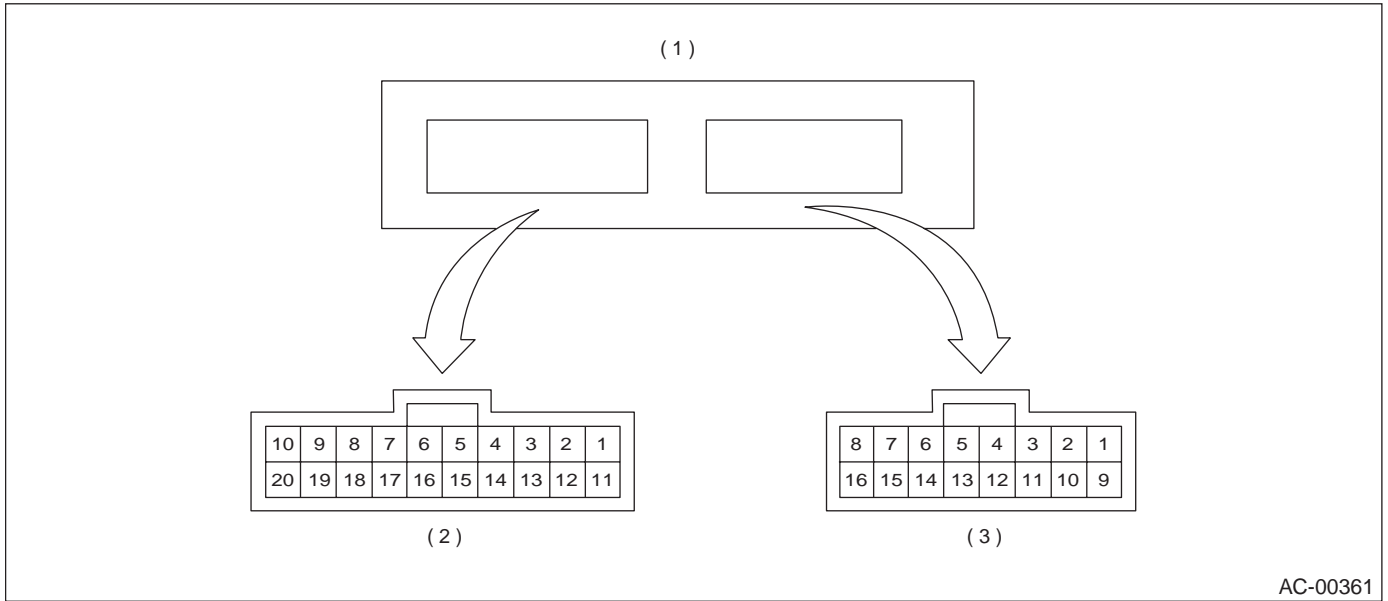
A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

4. A/C Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

1. LHD MODEL



(1) A/C control module

(2) To (i49): b

(3) To (i48): a

A/C CONTROL MODULE I/O SIGNAL

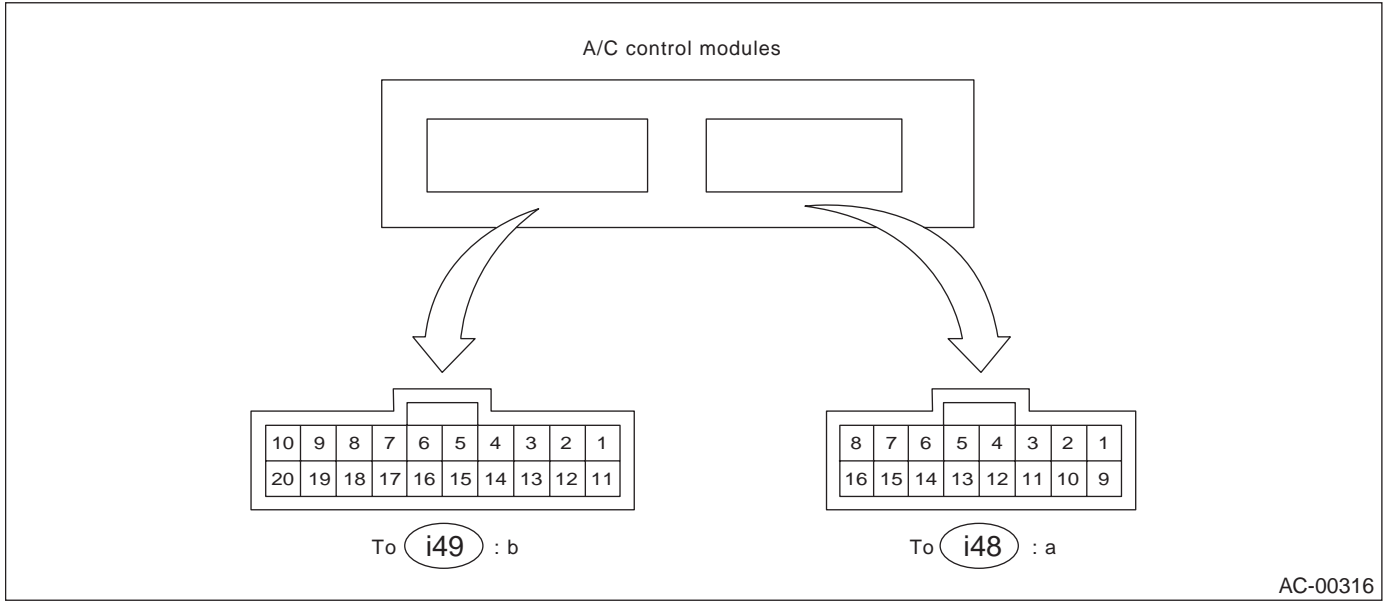
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Content	Connector & Terminal No.	Signal (V)
BATT voltage (Memory back-up)	b1—b12	BATT voltage, 13 — 14 (engine running)
IGN power supply	a8—b12	Battery voltage (ignition switch ON), 13 — 14 (engine running)
ACC power supply (OFF: ignition in START or diagnosis system reset)	b2—b12	BATT voltage, 0 (engine cranking), BATT voltage (during engine starts)
A/C control module ground circuit	b12—body	0 (ignition switch ON) — circuit constantly grounded
Sensor ground circuit	b17—body	0 (ignition switch ON) — circuit constantly grounded
Ambient sensor	b6—b17	Approx. 3.3 (disconnect connector, and ignition switch ON)
Evaporator sensor	b7—b17	
Thermometer	b15—b12	
Sunload sensor	b16—b17	Approx. 4.2 (disconnect connector, and ignition switch ON)
Air mix door actuator	a4—a3	BATT voltage (AUTO mode) positive “+” at terminal “a4” and negative “-” at “a3” [temperature set at 18°C (65°F)]; negative “-” at terminal “a4” and positive “+” at “a3” [temperature set at 32°C (90°F)]
Air mix door actuator P.B.R.	a12—b17	Approx. 0.5 [temperature set at 18°C (65°F) in AUTO mode] Approx. 4.5 [temperature set at 32°C (90°F) in AUTO mode]
Mode actuator VENT	a5—b17	BATT voltage (ignition switch ON in MANUAL mode); positive “+” at terminal “a5” and negative “-” at “b17” (VENT); negative “-” at “a5” and positive “+” at “b17” (DEF)
Mode actuator DEF	a6—b17	BATT voltage (ignition switch ON in MANUAL mode) Approx. 4.5 (VENT); approx. 0.5 (DEF)
Intake door actuator FRS voltage	a7—a15	BATT voltage (CIRC switch OFF)
Intake door actuator CIRC voltage	a15—a7	BATT voltage (CIRC switch ON)
Blower fan relay	b14—body	BATT voltage (ignition switch ON)
A/C relay	b3—b12	0 (ignition and A/C switches ON) BATT voltage (A/C switch OFF)
Illumination control signal	b10—b20	BATT voltage (ignition and lighting switches ON)
Rear defogger	a13—b12	0 (IGN ON, R Def SW ON)

A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

2. RHD MODEL



(1) A/C control module

(2) To (i49): b

(3) To (i48): a

A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Content	Connector & Terminal No.	Signal (V)
BATT voltage (Memory back-up)	a1—a9	BATT voltage, 13 — 14 (engine running)
IGN power supply	a2—a9	Battery voltage (ignition switch ON), 13 — 14 (engine running)
ACC power supply (OFF: ignition in START or diagnosis system reset)	a3—a9	BATT voltage, 0 (engine cranking), BATT voltage during engine starts
Sensor standard voltage	a5—a9	5 (ignition switch ON)
A/C control module ground circuit	a9—body	0 (ignition switch ON) — circuit constantly grounded
Sensor ground circuit	a10—body	0 (ignition switch ON) — circuit constantly grounded
Ambient sensor	a11—a10	Approx. 3.3 (disconnect connector, and ignition switch ON)
Evaporator sensor	a12—a10	
Thermometer	a13—a9	
Sunload sensor	a5—a4	Approx. 4.2 (disconnect connector, and ignition switch ON)
Air mix door actuator	b1—b11	BATT voltage (AUTO mode) positive “+” at terminal “b1” and negative “-” at “b11” [temperature set at 18°C (65°F)]; negative “-” at terminal “b1” and positive “+” at “b11” [temperature set at 32°C (90°F)]
Air mix door actuator P.B.R.	a6—a10	Approx. 0.5 [temperature set at 18°C (65°F) in AUTO mode] Approx. 4.5 [temperature set at 32°C (90°F) in AUTO mode]
Mode door actuator	a8—a16	BATT voltage (ignition switch ON in MANUAL mode); positive “+” at terminal “a8” and negative “-” at “a8” (VENT); negative “-” at “a16” and positive “+” at “a16” (DEF)
Mode door actuator P.B.R.	a14—a10	BATT voltage (ignition switch ON in MANUAL mode) Approx. 4.5 (VENT); approx. 0.5 (DEF)
Intake door FRS actuator voltage	b2—a9	BATT voltage (DEF switch ON)
Intake door CIRC actuator voltage	b12—a9	BATT voltage (CIRC switch ON)
Blower fan relay	b3—a9	BATT voltage (ignition switch ON, blower switch OFF)
Blower fan relay	b5—a9	0 (ignition ON, manual blower HI) 5 (ignition ON, manual blower LO)
Rear defogger relay	b13—a9	0 (ignition switch ON, Rear DEF switch ON)
A/C relay	a7—a9	BATT voltage (ignition and A/C switches ON) 0 (A/C switch OFF)
Illumination control signal	b10—a9	BATT voltage (ignition and lighting switches ON)

B: SCHEMATIC

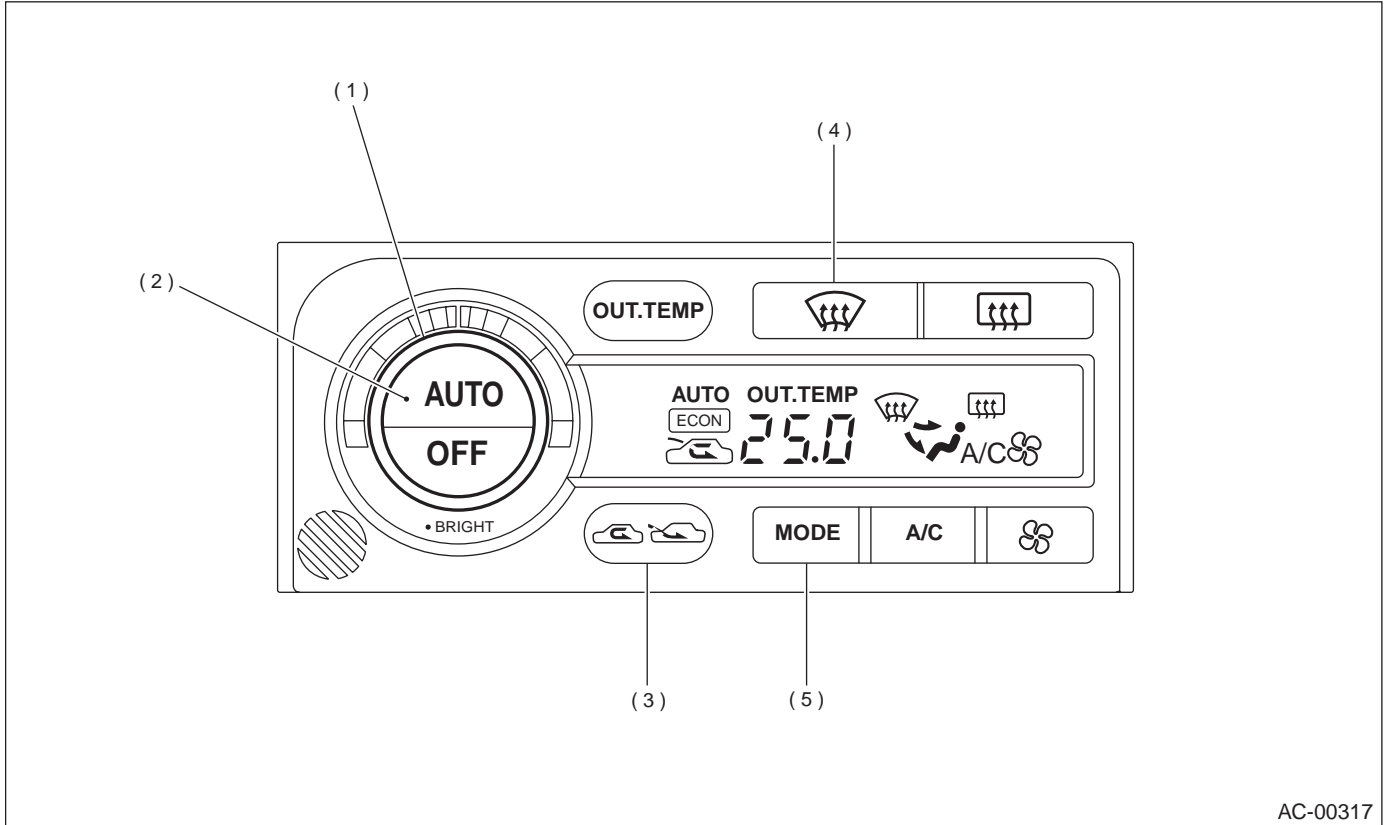
<Ref. to WI-62, SCHEMATIC, Air Conditioning System.>

SELF-DIAGNOSIS PROCEDURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

5. Self-Diagnosis Procedure (LHD Model)

A: OPERATION



AC-00317

- (1) Temperature control dial
- (2) AUTO switch

- (3) FRESH/RECIRC switch

- (5) MODE switch

- (4) DEF switch

SELF-DIAGNOSIS PROCEDURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 SELECT CONTROL PANEL TO SELF-DIAGNOSIS MODE. 1) Turn ignition switch to OFF. 2) While pushing "AUTO" and "FRESH/RECIRC" switches, start the engine. Can it be moved to the self-diagnosis mode?	It can be moved to self-diagnosis mode.	Go to step 2.	<Ref. to AC-20, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure (LHD Model).>
2 CHECK INDICATOR. 1) Turn temperature control dial clockwise by one click. 2) Make sure that all characters illuminate on the display. Does each character illuminate?	Each character illuminates.	Go to step 3.	Go to step 7.
3 CHECK EACH SENSOR AND EACH POTENTIOMETER. 1) Turn temperature control dial clockwise by one click. 2) If system has the trouble for each sensor and/or each potentiometer, DTC is indicated on indicator. 3) If system has no trouble, DTC "20" is indicated on indicator. NOTE: When the sunload sensor is checked inside the passenger compartment or in the shade, DTC "25" may appear on the indicator. Always check the sunload sensor in a place where it senses direct sunlight. Is the DTC "20" indicated on indicator?	DTC "20" indicated.	Go to step 4.	Perform diagnosis procedure according to the displayed DTC. <Ref. to AC-49, DTC FOR SENSOR AND POTENTIOMETER, LIST (LHD MODEL), List of Diagnostic Trouble Code (DTC).>
4 CHECK DOOR MOTOR POSITION SWITCH. 1) Turn temperature control dial clockwise by one click. 2) If system has the trouble for each door position switch, DTC is indicated on indicator. 3) If system has no trouble, DTC "30" is indicated on indicator. Is the DTC "30" indicated on indicator?	DTC "30" indicated.	Go to step 5.	Perform diagnosis procedure for mode door actuator. <Ref. to AC-58, DTC 31, 32, 33, 34 OR 35 (MODE DOOR ACTUATOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC) (LHD Model).>
5 CHECK OPERATION OF EACH ACTUATOR, BLOWER FAN AND COMPRESSOR CLUTCH. 1) Turn temperature control dial clockwise by one click. 2) Select operating mode by pushing every "DEF" switch. 3) Check the operation for each mode. •Air inlet: •Air outlet: •Air mix door: •Blower fan: •A/C compressor: Does each mode displayed match the operating mode table? <Ref. to AC-16, OPERATING MODE TABLE, OPERATION, Self-Diagnosis Procedure (LHD Model).>	Each mode displayed match the operating mode table.	Go to step 6.	Go to step 7.

SELF-DIAGNOSIS PROCEDURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK INDICATED VALUE OF EACH SENSOR. 1) Turn temperature control dial clockwise by one click. 2) Each time the "DEF" switch is pressed, the value indicated on the display changes to correspond with the ambient sensor, in-vehicle sensor and intake sensor, in that order. 3) Make sure there is no big difference between the temperature indicated on the display and the measured temperature. Is a proper input signal value displayed in each sensor?	Proper input signal value displayed.	End	Go to step 7.
7 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

1. OPERATING MODE TABLE

Mode display	41	42	43	44	45	46	47	48
Air inlet	REC	REC	REC	FRE	FRE	FRE	FRE	FRE
Air outlet	VENT	VENT	B/L	B/L	B/L	HEAT	D/H	DEF
Air mix door	FULL COOL	FULL COOL	FULL COOL	FULL HOT	FULL HOT	FULL HOT	FULL HOT	FULL HOT
Blower fan	5V	5V	Power supply voltage	8.5V	8.5V	8.5V	8.5V	Power supply voltage
A/C compressor	ON	ON	ON	OFF	OFF	OFF	ON	ON

SELF-DIAGNOSIS PROCEDURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

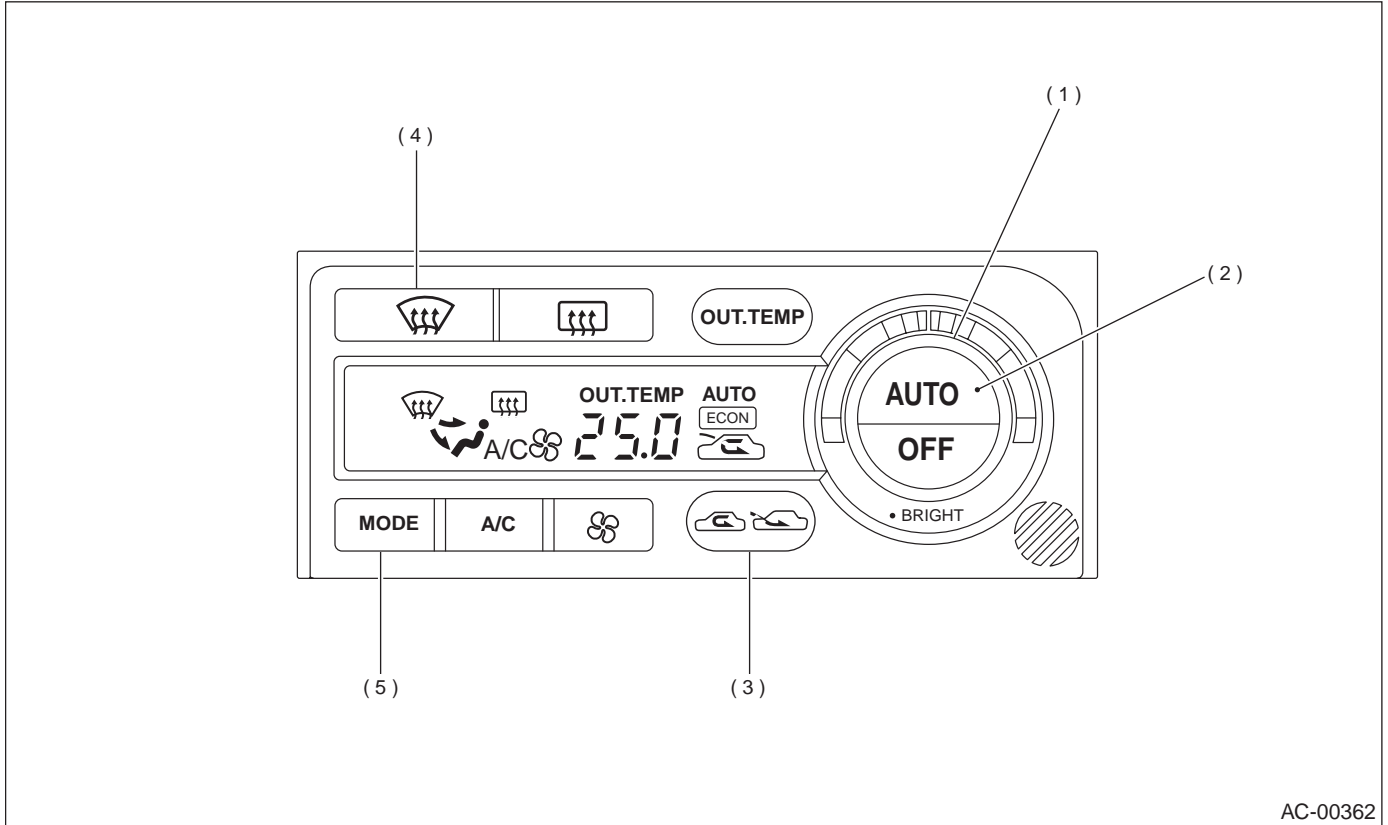
MEMO:

SELF-DIAGNOSIS PROCEDURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

6. Self-Diagnosis Procedure (RHD Model)

A: OPERATION



AC-00362

- (1) Temperature control dial
- (2) AUTO switch
- (3) FRESH/RECIRC switch
- (4) DEF switch
- (5) MODE switch

Step	Value	Yes	No
1 SELECT CONTROL PANEL TO SELF-DIAGNOSIS MODE. 1) Turn ignition switch to OFF. 2) While pushing "AUTO" and "FRESH/RECIRC" switches, turn ignition switch to ON. 3) Make sure that all characters on the display blinks four times. Can it be moved to the self-diagnosis mode?	It can be moved to self-diagnosis mode.	Go to step 2.	<Ref. to AC-32, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure (RHD Model).>

SELF-DIAGNOSIS PROCEDURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
2 CHECK EACH SENSOR AND EACH POTENTIOMETER. 1) When indicator check ends, it automatically switches to sensor and potentiometer check mode. 2) If system has the trouble for each sensor and/or each potentiometer, DTC is indicated on indicator. 3) If system has no trouble, DTC "20" is indicated on indicator. NOTE: When the sunload sensor is checked inside the passenger compartment or in the shade, DTC "25" may appear on the indicator. Always check the sunload sensor in a place where it senses direct sunlight. NOTE: Diagnosis code appears in order each time the "A/C" switch is pushed. Is the DTC "20" indicated on indicator?	DTC "20" is indicated on indicator.	Go to step 3.	Perform diagnosis procedure according to the displayed DTC. <Ref. to AC-49, DTC FOR SENSOR AND POTENTIOMETER, LIST (RHD MODEL), List of Diagnostic Trouble Code (DTC).>
3 CHECK OPERATION OF EACH ACTUATOR, BLOWER FAN AND COMPRESSOR CLUTCH. 1) After finishing sensor and potentiometer check modes, display goes to actuator check mode when "DEF" switch is pushed. 2) Operate the actuator displaying the DTCs two times within two seconds of each mode in order. 3) Select operating mode by pushing every "DEF" switch. 4) Check the operation for each mode. <ul style="list-style-type: none"> • Air inlet: • Air outlet: • Air mix door: • Blower fan: • A/C compressor: Does each mode displayed match the operating mode table? <Ref. to AC-19, OPERATING MODE TABLE, OPERATION, Self-Diagnosis Procedure (RHD Model).>	Each mode displayed matches the operating mode table.	End	Go to step 4.
4 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact in A/C control module.	Replace A/C control module.	Repair connector.

1. OPERATING MODE TABLE

Mode display	31	32	33	34	35	36	37	38
Air inlet	FRE	REC	REC	FRE	FRE	FRE	FRE	FRE
Air outlet	VENT	VENT	VENT	B/L	HEAT	HEAT	D/H	DEF
Air mix door	FULL COOL	FULL COOL	FULL COOL	50%	50%	FULL HOT	FULL HOT	FULL HOT
Blower fan	LO	LO	ML	ML	ML	MH	MH	HI
A/C compressor	OFF	ON	ON	ON	ON	ON	ON	ON

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

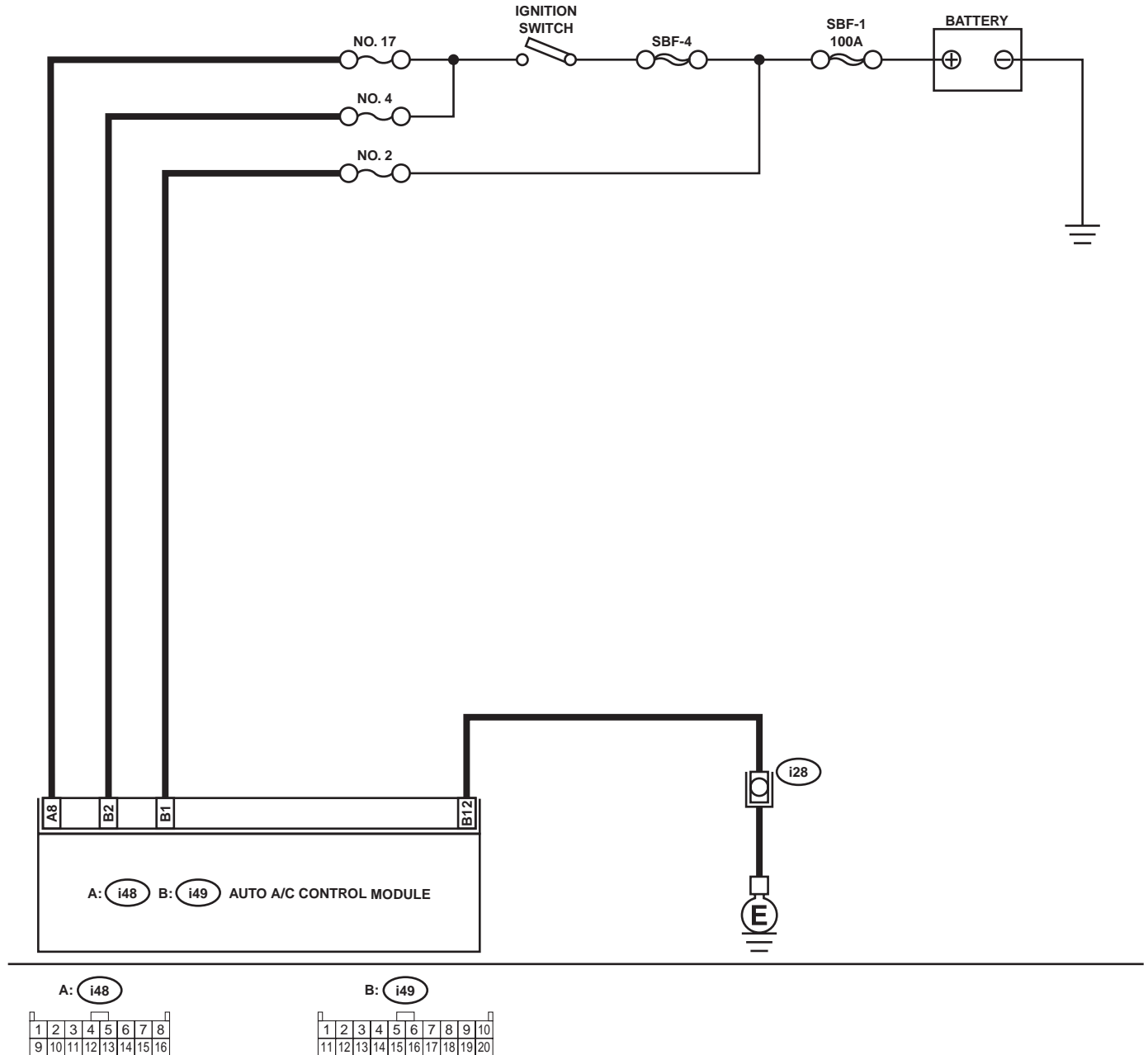
7. Diagnostics for A/C System Failure (LHD Model)

A: A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE

TROUBLE SYMPTOM:

- "Set" temperature is not indicated on display, switch LEDs are faulty and switches do not operate.
- Self-diagnosis system does not operate.

WIRING DIAGRAM:



AC-00318

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 2 from main fuse box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is not blown-out.	Go to step 2.	Replace fuse.
2 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuses No. 4 and No. 17 from fuse & relay box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is not blown-out.	Go to step 3.	Replace fuse.
3 CHECK A/C CONTROL MODULE POWER CIRCUIT. 1) Disconnect A/C control module connector. 2) Measure voltage between A/C control module connector terminal and chassis ground when turning ignition switch to OFF. Connector & terminal <i>(i49) No. 1 (+) — Chassis ground (-):</i> Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair harness for power supply line.
4 CHECK A/C CONTROL MODULE POWER CIRCUIT. Measure voltage between A/C control module connector terminal and chassis ground when turning ignition switch to ACC. Connector & terminal <i>(i49) No. 2 (+) — Chassis ground (-):</i> Does the measured value exceed the specified value?	10 V	Go to step 5.	Repair harness for power supply line.
5 CHECK A/C CONTROL MODULE POWER CIRCUIT. Measure voltage between A/C control module connector terminal and chassis ground when turning ignition switch to ON. Connector & terminal <i>(i48) No. 8 (+) — Chassis ground (-):</i> Does the measured value exceed the specified value?	10 V	Go to step 6.	Repair harness for power supply line.
6 CHECK A/C CONTROL MODULE GROUND CIRCUIT. Measure resistance of harness between A/C control module and chassis ground. Connector & terminal <i>(i49) No. 12 — Chassis ground:</i> Is the measured value less than the specified value?	1 Ω	Go to step 7.	Repair harness for ground line.
7 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

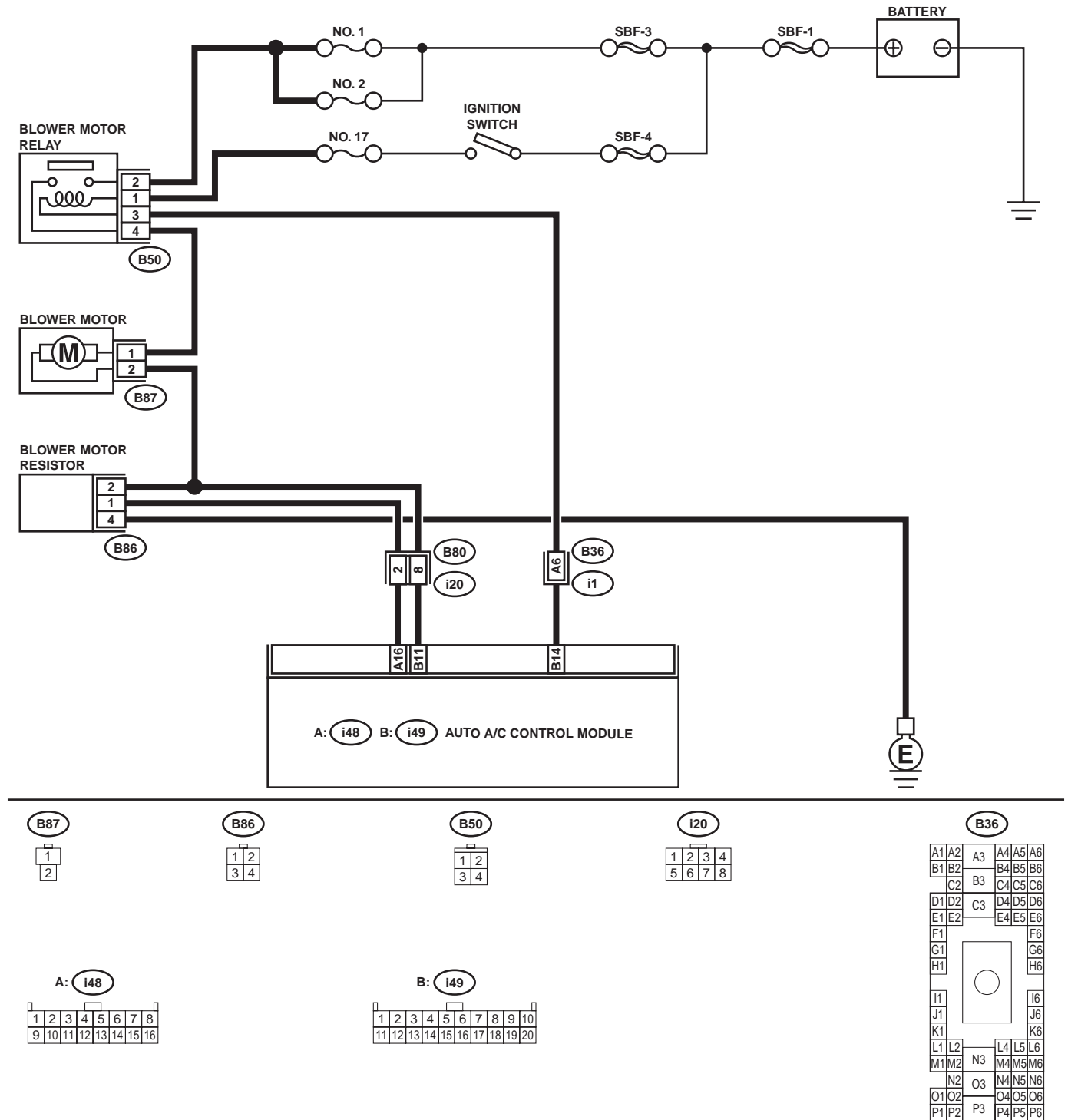
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: BLOWER MOTOR DOES NOT ROTATE

TROUBLE SYMPTOM:

- Blower motor does not rotate.
- Blower motor does not rotate in "HI".

WIRING DIAGRAM:



AC-00319

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FUSE. 1) Remove No. 1, No. 2 and No. 17 fuses in fuse & relay box. 2) Check condition of fuses. Are any of the fuses blown-out?	Fuse is not blown-out.	Go to step 2.	Replace fuse.
2 CHECK POWER SUPPLY TO BLOWER FAN MOTOR. 1) Turn ignition switch to ON. 2) Turn blower switch to ON. 3) Measure voltage between blower fan motor and chassis ground. Connector & terminal (B87) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Repair harness for blower fan motor power supply line.
3 CHECK BLOWER FAN MOTOR RELAY. 1) Turn ignition switch to OFF. 2) Remove blower fan motor relay. 3) Connect terminals as follows: Positive terminal (+) of battery to terminal No. 1 of blower fan motor relay Negative terminal (-) of battery to terminal No. 3 of blower fan motor relay 4) Measure resistance between No. 2 and No. 4 terminals. Terminals No. 2 — No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Replace blower fan motor relay.
4 CHECK BLOWER FAN MOTOR. 1) Disconnect connector from blower fan motor. 2) Connect terminals as follows: Positive terminal (+) of battery to terminal No. 1 of blower fan motor relay Negative terminal (-) of battery to terminal No. 2 of blower fan motor relay 3) Make sure that blower fan motor is operated. Does the blower fan motor operate?	Blower fan motor operates.	Go to step 5.	Replace blower fan motor.
5 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There no poor contact.	Replace A/C control module.	Repair connector.

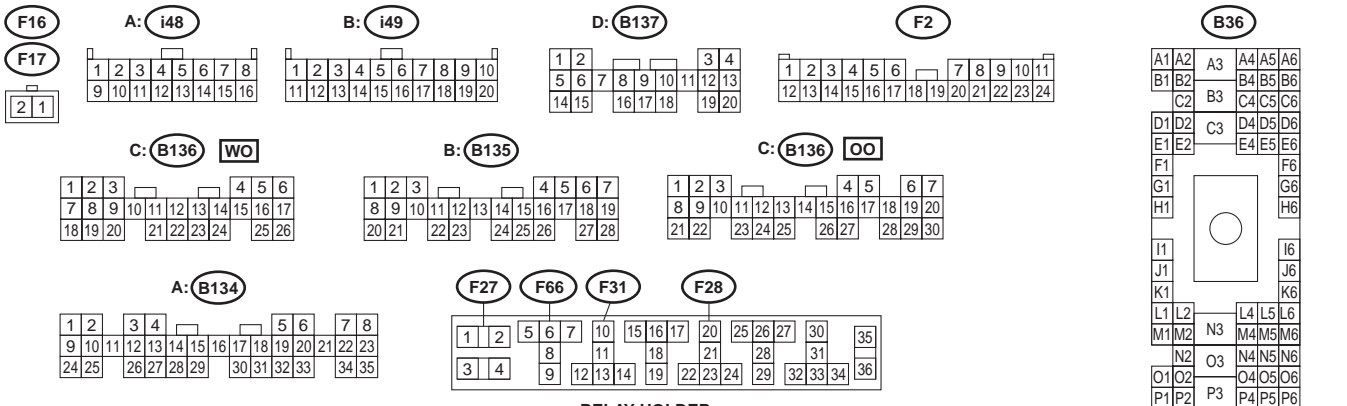
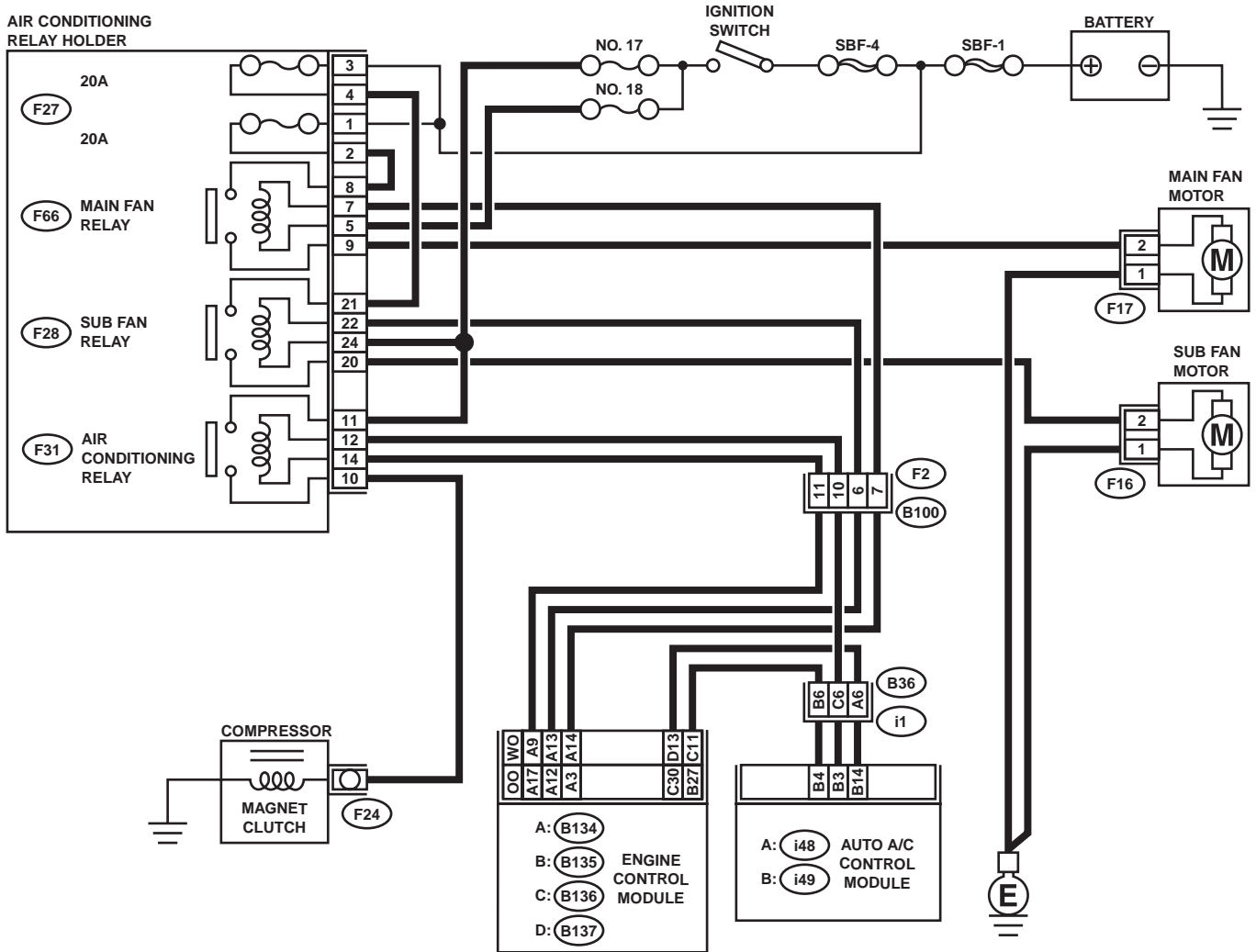
DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM "SET" TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY

WIRING DIAGRAM:

- 4 CYLINDER MODEL

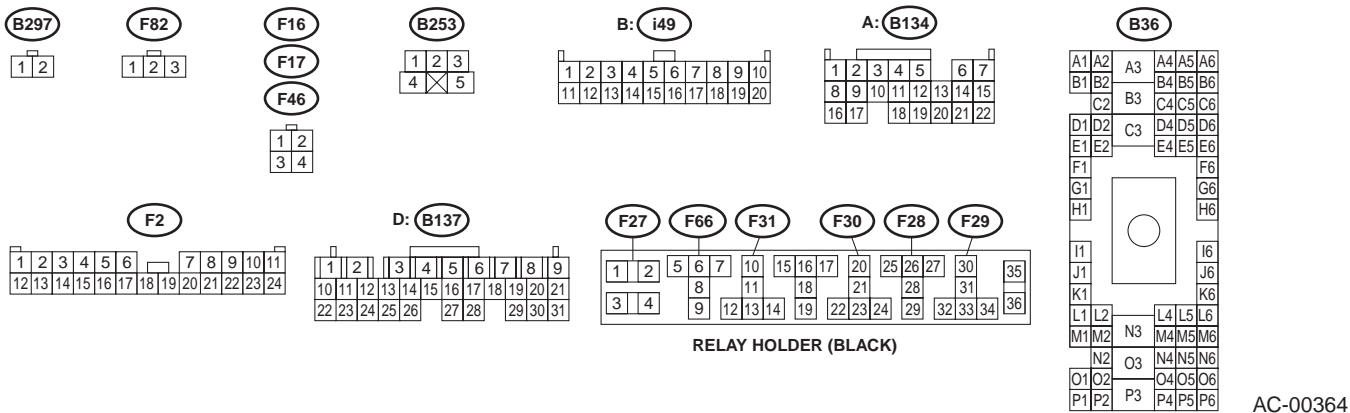
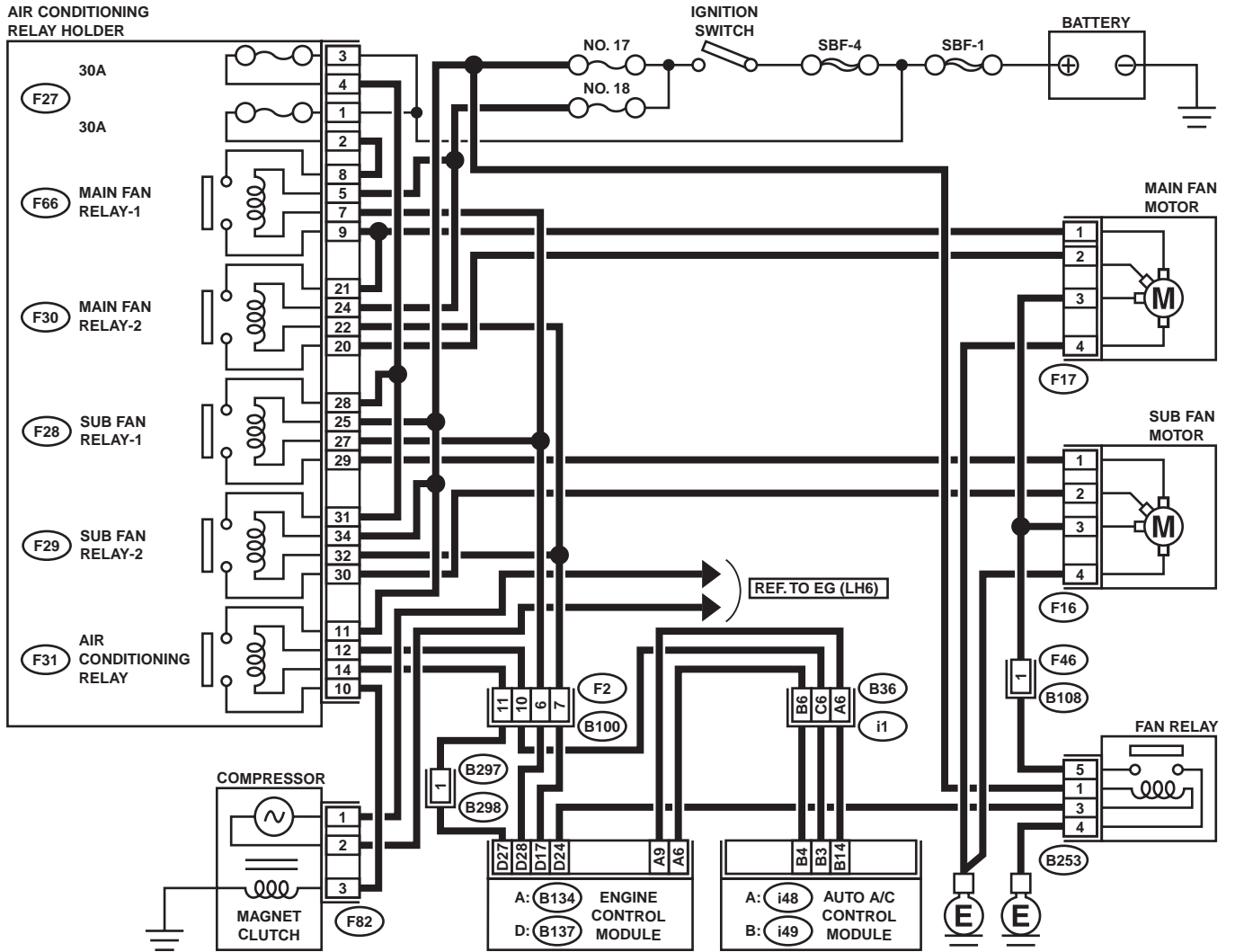


AC-00363

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

• 6 CYLINDER MODEL



RELAY HOLDER (BLACK)

AC-00364

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove No. 2 fuse in main fuse box. 3) Check condition of fuse. Is the fuse blown-out?	No fuse blown out.	Replace fuse.	Go to step 2.
2 CHECK POWER SUPPLY TO MAGNET CLUTCH OF A/C COMPRESSOR. 1) Start the engine, and turn A/C switch to ON. 2) Set the compartment temperature at 18°C (65°F) (FULL COOL). 3) Measure voltage between magnet clutch connector and chassis ground. Connector & terminal 4 CYLINDER MODEL (F24) No. 1 (+) — Chassis ground (-): 6 CYLINDER MODEL (F82) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Repair harness for power supply line of the A/C compressor.
3 CHECK SIGNAL VOLTAGE FROM A/C RELAY. 1) Turn ignition switch to ON. 2) Turn A/C switch to ON. 3) Measure voltage to A/C relay and chassis ground. Connector & terminal (F31) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair harness for power supply line.
4 CHECK A/C RELAY. 1) Remove A/C relay in main fuse box. 2) Check A/C relay. <Ref. to AC-44, INSPECTION, Relay and Fuse.> Is the operation of each relay OK?	Relay operates normally.	Go to step 5.	Replace A/C relay.
5 CHECK OPERATION OF MAIN FAN MOTOR. 1) Start the engine. 2) Turn A/C switch to ON. 3) Check operation of main fan motor. Does the radiator main fan operate?	Main fan motor operates.	Go to step 10.	Go to step 6.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK POWER SUPPLY TO MAIN FAN MOTOR.</p> <p>CAUTION: Be careful not to overheat engine during repair.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between main fan motor connector and chassis ground. <p>Connector & terminal 4 CYLINDER MODEL <i>(F17) No. 2 (+) — Chassis ground (-):</i> 6 CYLINDER MODEL <i>(F17) No. 1, 2, 3 (+) — Chassis ground (-):</i></p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 7.	Repair harness for power supply circuit.
<p>7 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground. <p>Connector & terminal 4 CYLINDER MODEL <i>(F17) No. 1 — Chassis ground:</i> 6 CYLINDER MODEL <i>(F17) No. 4 — Chassis ground:</i></p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair harness between main fan motor connector and chassis ground.
<p>8 CHECK POOR CONTACT.</p> <p>Check poor contact in main fan motor connector.</p> <p>Is there poor contact in connector?</p>	There is poor contact.	Go to step 9.	Repair poor contact in main fan motor connector.
<p>9 CHECK MAIN FAN MOTOR.</p> <p>4 CYLINDER MODEL Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of main fan motor connector.</p> <p>6 CYLINDER MODEL Connect battery positive (+) terminal to terminal No. 1, 2, 3, and negative (-) terminal to terminal No. 4 of main fan motor connector.</p> <p>Does the main fan rotate?</p>	Main fan motor operates.	Go to step 10.	Replace main fan motor with a new one.
<p>10 CHECK OPERATION OF SUB FAN MOTOR.</p> <p>Check operation of sub fan motor.</p> <p>Does the radiator sub fan operate?</p>	Sub fan motor operates.	Go to step 15.	Go to step 11.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>11 CHECK POWER SUPPLY TO SUB FAN MOTOR.</p> <p>CAUTION: Be careful not to overheat engine during repair.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between sub fan motor connector and chassis ground.</p> <p>Connector & terminal 4 CYLINDER MODEL (F16) No. 2 (+) — Chassis ground (-): 6 CYLINDER MODEL (F16) No. 1, 2, 3 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 12.	Repair harness for power supply circuit.
<p>12 CHECK GROUND CIRCUIT OF SUB FAN MOTOR.</p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground.</p> <p>Connector & terminal 4 CYLINDER MODEL (F16) No. 1 — Chassis ground: 6 CYLINDER MODEL (F16) No. 4 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 Ω	Go to step 13.	Repair harness between sub fan motor connector and chassis ground.
<p>13 CHECK POOR CONTACT.</p> <p>Check poor contact in sub fan motor connector. Is there poor contact in connector?</p>	There is no poor contact.	Go to step 14.	Repair poor contact in sub fan motor connector.
<p>14 CHECK SUB FAN MOTOR.</p> <p>4 CYLINDER MODEL Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of sub fan motor connector. 6 CYLINDER MODEL Connect battery positive (+) terminal to terminal No. 1, 2, 3, and negative (-) terminal to terminal No. 4 of sub fan motor connector. Does the sub fan rotate?</p>	Sub fan motor rotates.	Go to step 15.	Replace sub fan motor with a new one.
<p>15 CHECK EACH SENSOR AND POTENTIOMETER.</p> <p>Check the sensors and potentiometer for proper operation using the self-diagnostic function. <Ref. to AC-14, OPERATION, Self-Diagnosis Procedure (LHD Model).> Is the operation of each sensor and potentiometer normal?</p>	Each sensor and potentiometer operate normally.	Go to step 16.	Replace sensor and/or potentiometer.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
16 CHECK CONNECTION OF ASPIRATOR DUCT. Make sure that the connection of aspirator duct is correct. Is the connection of duct correct?	There is no poor connection.	Go to step 17 .	Repair aspirator duct connection.
17 CHECK EACH ACTUATOR. Check the actuators for proper operation using the self-diagnostic function.<Ref. to AC-14, OPERATION, Self-Diagnosis Procedure (LHD Model).> Is the operation of each actuator normal?	Actuator operates normally.	Go to step 18 .	Replace actuator.
18 CHECK POOR CONTACT. Check poor contact in A/C control module. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

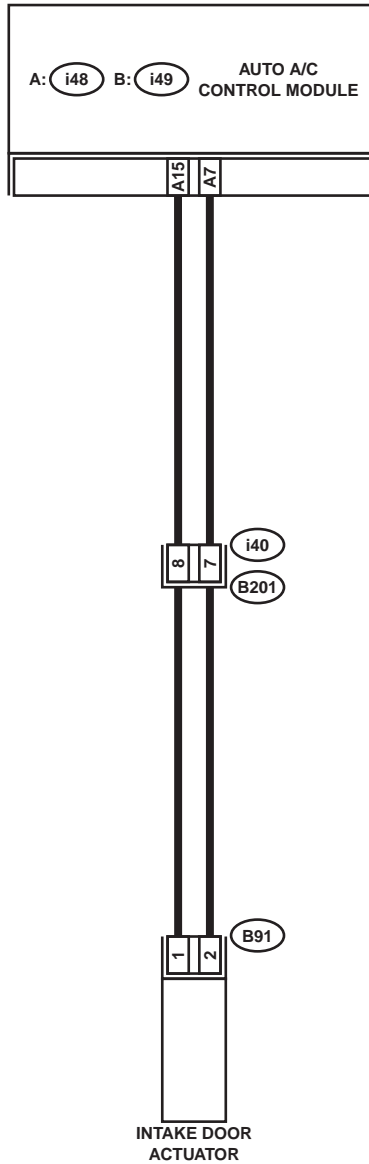
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

D: FRESH/RECIRC DOES NOT CHANGE

TROUBLE SYMPTOM:

FRESH/RECIRC mode door does not change.

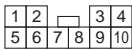
WIRING DIAGRAM:



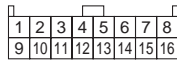
B91



i40



A: i48



AC-00365

DIAGNOSTICS FOR A/C SYSTEM FAILURE (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SWITCH OPERATION. Make sure that the mode selection on display is changed when pushing the "FRESH/RECIRC" switch. Does the mode selection change?	Mode selection changes.	Go to step 7.	Go to step 2.
2 CHECK FUSE. 1) Remove No. 17 fuse in fuse & relay box. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is not blown-out.	Go to step 3.	Replace fuse.
3 CHECK SIGNAL VOLTAGE. 1) Change display to RECIRC by pushing FRESH/RECIRC switch. 2) Measure voltage between A/C control module and chassis ground. Connector & terminal (i48) No. 15 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 4.	Repair short circuit in harness between A/C control module and intake door actuator.
4 CHECK SIGNAL VOLTAGE. 1) Change display to FRESH with pushing FRESH/RECIRC switch. 2) Measure voltage between A/C control module and chassis ground. Connector & terminal (i48) No. 7 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 5.	Repair short circuit in harness between A/C control module and intake door actuator.
5 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND INTAKE DOOR ACTUATOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from A/C control module and intake door motor. 3) Measure resistance of harness between A/C control module and intake door actuator. Connector & terminal (i48) No. 15 — (B91) No. 1: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair open circuit in harness between A/C control module and intake door actuator.
6 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND INTAKE DOOR ACTUATOR. Measure resistance of harness between A/C control module and intake door actuator. Connector & terminal (i48) No. 7 — (B91) No. 2: Is the measured value less than the specified value?	1 Ω	Go to step 7.	Repair open circuit in harness between A/C control module and intake door actuator.
7 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

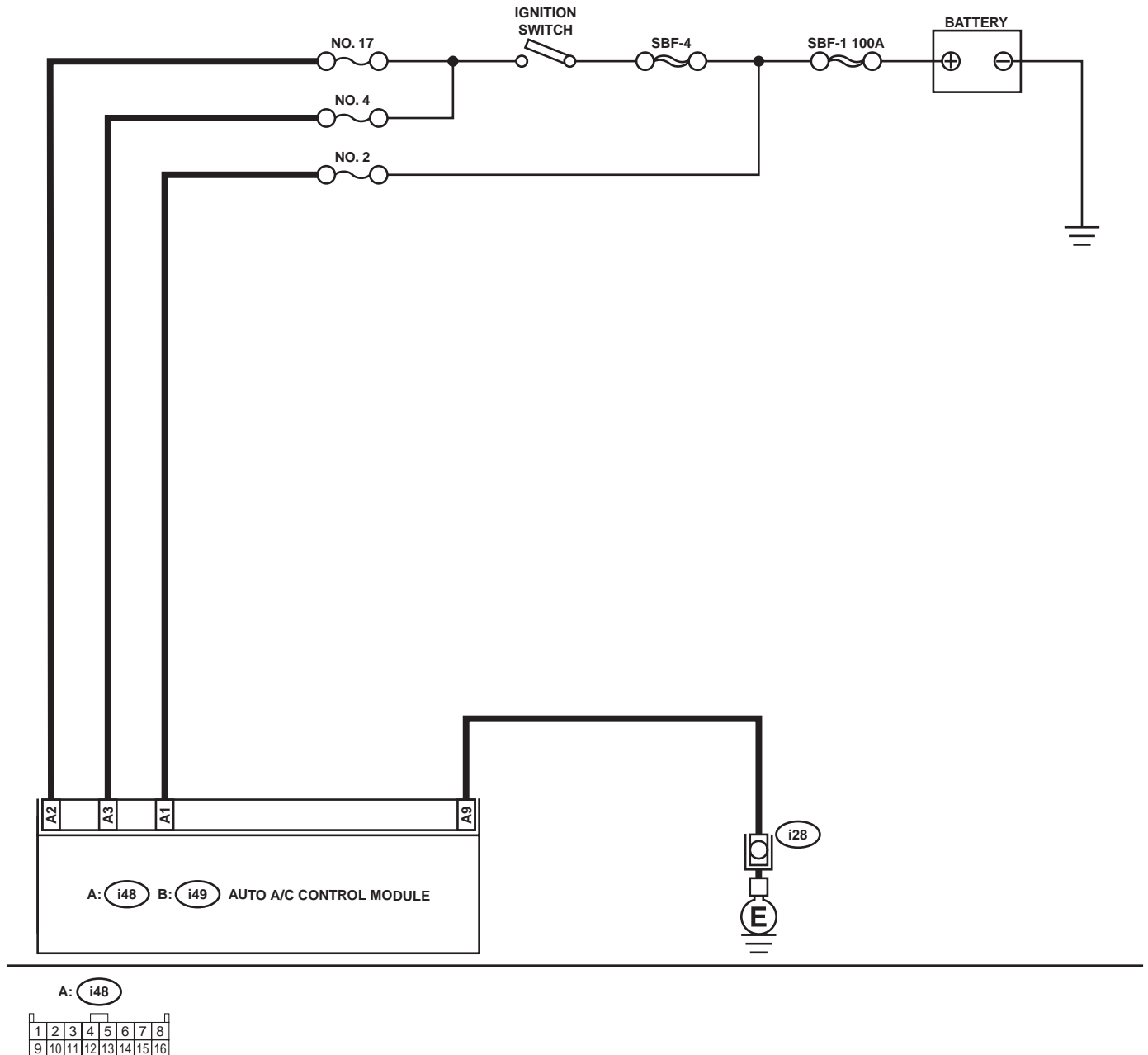
8. Diagnostics for A/C System Failure (RHD Model)

A: A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE

TROUBLE SYMPTOM:

- "Set" temperature is not indicated on display, switch LEDs are faulty and switches do not operate.
- Self-diagnosis system does not operate.

WIRING DIAGRAM:



AC-00366

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 2 from main fuse box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is not blown.	Go to step 2.	Replace fuse.
2 CHECK FUSE. 1) Remove fuse No. 4 and No. 17 from fuse & relay box. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is not blown.	Go to step 3.	Replace fuse.
3 CHECK A/C CONTROL MODULE POWER CIRCUIT. 1) Disconnect A/C control module. 2) Measure voltage between A/C control module connector terminal and chassis ground when turning ignition switch to OFF. Connector & terminal (i48) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair harness for power supply line.
4 CHECK A/C CONTROL MODULE POWER CIRCUIT. Measure voltage between A/C control module connector terminal and chassis ground when turning ignition switch to ACC. Connector & terminal (i48) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 5.	Repair harness for power supply line.
5 CHECK A/C CONTROL MODULE POWER CIRCUIT. Measure voltage between A/C control module connector terminal and chassis ground when turning ignition switch to ON. Connector & terminal (i48) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 6.	Repair harness for power supply line.
6 CHECK A/C CONTROL MODULE CIRCUIT. Measure resistance of harness between A/C control module and chassis ground. Connector & terminal (i48) No. 9 (+) — Chassis ground (-): Is the measured value less than the specified value?	10 V	Go to step 7.	Repair harness ground line.
7 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in A/C control module?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

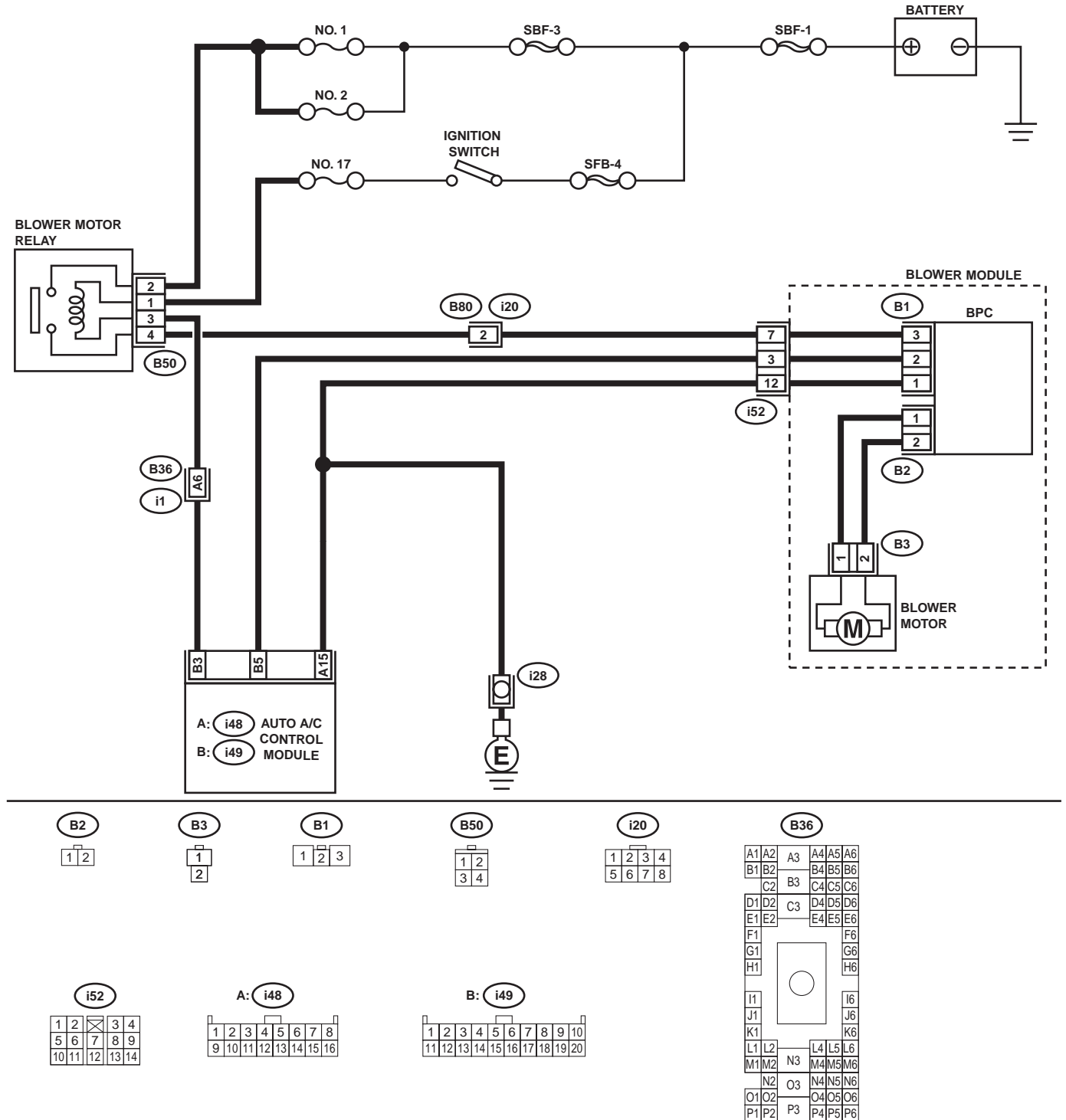
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: BLOWER MOTOR DOES NOT ROTATE

TROUBLE SYMPTOM:

- Blower motor does not rotate.
- Blower motor does not rotate in "HI".

WIRING DIAGRAM:



AC-00367

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove No. 1, No. 2 and No. 17 fuses in fuse & relay box. 3) Check condition of each fuse. Are any of the fuses blown-out?	Fuse is not blown.	Go to step 2.	Replace fuse.
2 CHECK POWER SUPPLY TO BLOWER FAN MOTOR. 1) Turn ignition switch to ON. 2) Turn blower switch to ON (Hi). 3) Measure voltage between blower fan motor and chassis ground. Connector & terminal (B1) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 7.
3 CHECK RESISTANCE BETWEEN BPC AND CHASSIS GROUND. Measure resistance between BPC connector and chassis ground. Connector & terminal (B1) No. 1 — Chassis ground: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair harness between BPC and chassis ground.
4 CHECK BPC. Measure voltage between BPC connector and chassis ground. Connector & terminal (B1) No. 2 (+) — Chassis ground (-): Is the measured value same as the specified value?	Approximately 0 V	Go to step 5.	Replace BPC.
5 CHECK BPC. Measure voltage between BPC connector. Connector & terminal (B2) No. 1 (+) — (B2) No. 2 (-): Does the measured value exceed as the specified value?	10 V	Go to step 6.	Replace BPC.
6 CHECK A/C CONTROL MODULE. Measure voltage between A/C control module connector and chassis ground. Connector & terminal (i49) No. 5 (+) — Chassis ground (-): Is the measured value same as the specified value?	Approx. 0 V	Go to step 7.	Go to step 10.
7 CHECK A/C CONTROL MODULE. Measure voltage between A/C control module connector and chassis ground. Connector & terminal (i49) No. 3 (+) — Chassis ground (-): Is the measured value same as the specified value?	Approx. 0 V	Go to step 8.	Go to step 10.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK BLOWER FAN MOTOR RELAY. 1) Turn ignition switch OFF. 2) Remove blower fan motor relay. 3) Connect battery positive (+) terminal to terminal No. 1, negative (-) terminal to terminal No. 3 of blower fan motor relay. 4) Measure resistance between No. 2 and No. 4 terminals. Terminals No. 2 — No. 4: Is the measured value is less than the specified value?	1 Ω	Go to step 9.	Replace blower fan motor relay.
9 CHECK BLOWER FAN MOTOR. 1) Disconnect connector from blower fan motor. 2) Connect battery positive (+) terminal to terminal No. 1, negative (-) terminal to terminal No. 2 of blower fan motor connector. 3) Make sure blower fan motor rotates. Does blower fan motor rotate?	Blower fan motor rotates.	Repair harness blower fan motor and BPC.	Replace blower fan motor.
10 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

MEMO:

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

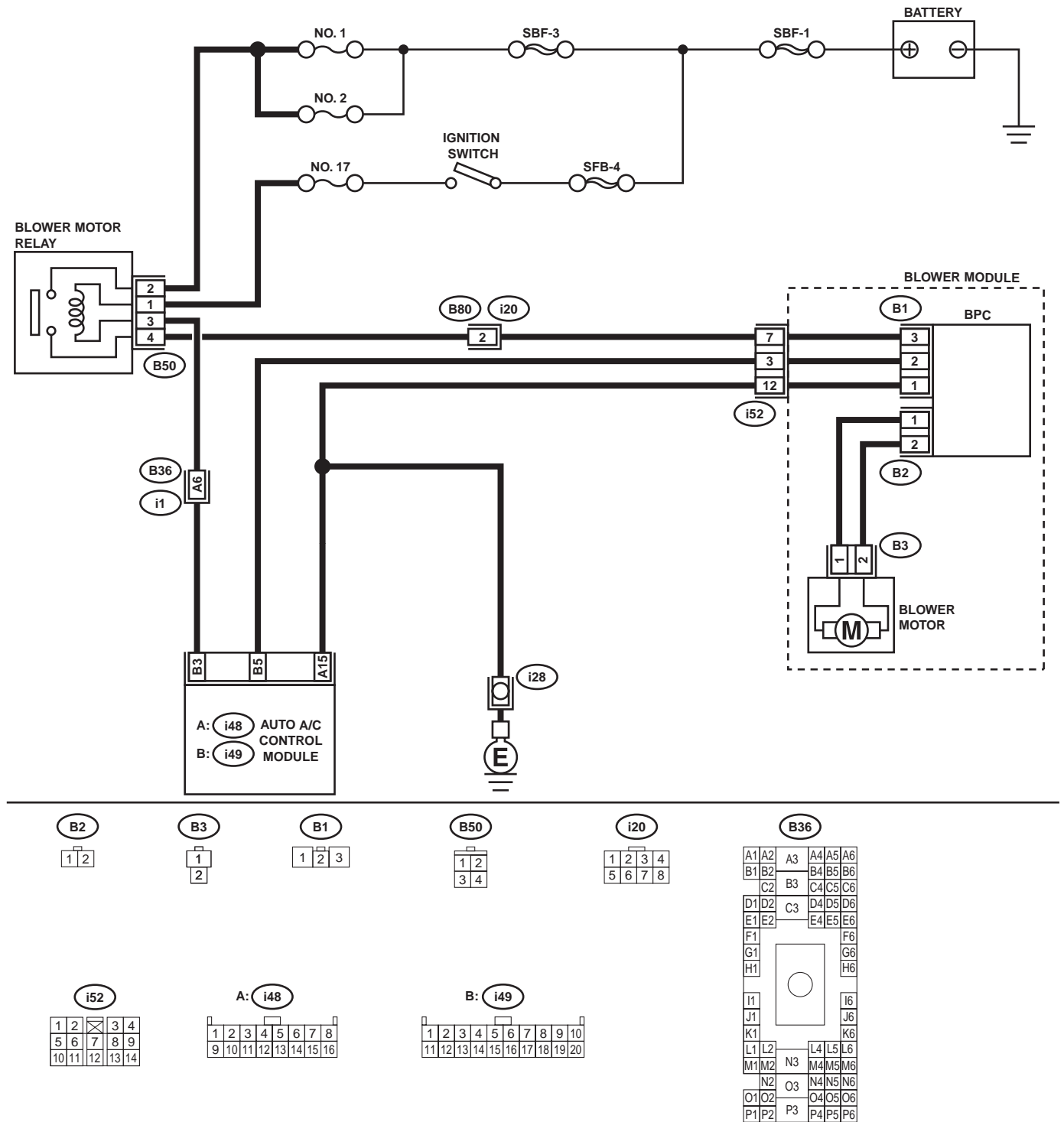
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: BLOWER MOTOR ROTATES ABNORMALLY

TROUBLE SYMPTOM:

Blower motor rotates abnormally.

WIRING DIAGRAM:



AC-00367

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK WITH MANUAL OPERATION. 1) Start the engine and turn the A/C switch to ON. 2) Select MANUAL mode. 3) Check, if blower fan runs with HI speed under MANUAL mode. Does run the blower fan with HI speed?	Blower fan runs with HI speed.	Go to step 2.	<Ref. to AC-34, BLOWER MOTOR DOES NOT ROTATE, Diagnostics for A/C System Failure (RHD Model).>
2 CHECK WITH MANUAL OPERATION. Check, if blower fan runs with LO speed under MANUAL mode. Does run the blower fan with LO speed?	Blower fan runs with LO speed.	Go to step 5.	Go to step 3.
3 CHECK OUTPUT SIGNAL TO BPC. 1) Turn the ignition switch to OFF. 2) Remove glove box. 3) Disconnect connector from BPC. 4) Start the engine and turn the A/C switch to ON. 5) Select MANUAL mode. 6) Measure voltage between BPC harness connector and chassis ground with switching rotating speed of blower fan. Connector & terminal (B1) No. 2 (+) — Chassis ground (-): Is the measured value same as the specified value?	LO: Approx. 0 \longleftrightarrow 5 V, OFF: Approx. 5 V, HI: Approx. 0 V	Replace BPC.	Go to step 4.
4 CHECK HARNESS BETWEEN BPC AND A/C CONTROL MODULE. 1) Turn the ignition switch to OFF. 2) Disconnect connector from A/C control module. 3) Measure harness resistance between BPC and A/C control module. Connector & terminal (B1) No. 2 — (i49) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 9.	Repair harness between BPC and A/C control module.
5 CHECK WITH MANUAL OPERATION. Check, if blower fan is turned OFF under MANUAL mode. Is the blower fan turned OFF?	Blower fan is turned OFF.	Go to step 8.	Go to step 6.
6 CHECK BLOWER FAN MOTOR RELAY. 1) Turn the ignition switch to OFF. 2) Remove blower fan motor relay. 3) Connect battery positive (+) terminal to terminal No. 1 and battery negative (-) terminal to terminal No. 3 of blower fan motor relay. 4) Measure resistance between terminals No. 2 and No. 4. Terminal No. 2 — No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 7.	Replace blower fan motor relay.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK HARNESS BETWEEN BLOWER FAN MOTOR RELAY AND A/C CONTROL MODULE.</p> <p>1) Disconnect connector from A/C control module.</p> <p>2) Measure resistance between blower fan motor relay and A/C control module harness connector.</p> <p>Connector & terminal (B50) No. 3 — (i49) No. 3:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 8 .	Repair harness between blower fan motor relay and A/C control module.
<p>8 CHECK UNDER AUTO MODE.</p> <p>1) Connect all of removed relays and disconnected connectors.</p> <p>2) Start the engine and turn the A/C switch to ON.</p> <p>3) Select AUTO mode.</p> <p>4) Check, if blower fan speed changes. Does change the blower fan speed?</p>	Blower fan speed changes.	Blower fan is OK.	Go to step 9 .
<p>9 CHECK FOR POOR CONTACT.</p> <p>Check, if there is poor contact in A/C control module connector.</p> <p>Is there poor contact in the connector?</p>	There is no poor contact.	Replace A/C control module.	Repair poor contact in connector.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

D: FRESH/RECIRC DOES NOT CHANGE

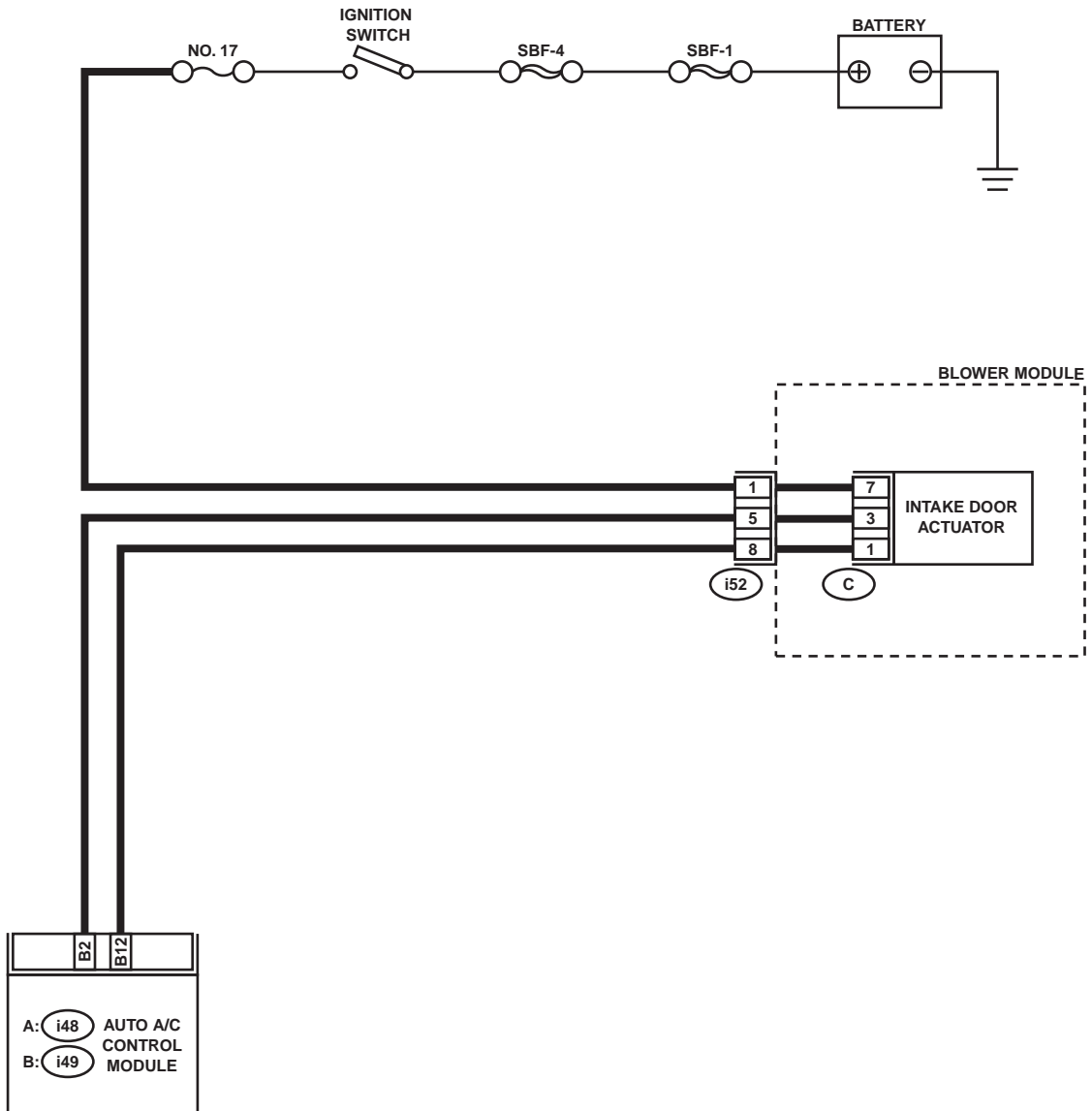
TROUBLE SYMPTOM:

FRESH/RECIRC mode door does not change.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

WIRING DIAGRAM:



AC-00368

Step	Value	Yes	No
1 CHECK SWITCH OPERATION. Make sure that the mode selection on display is changed when pushing the FRESH/RECIRC switch. Does the mode selection change?	Mode selection changes.	Go to step 8.	Go to step 2.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

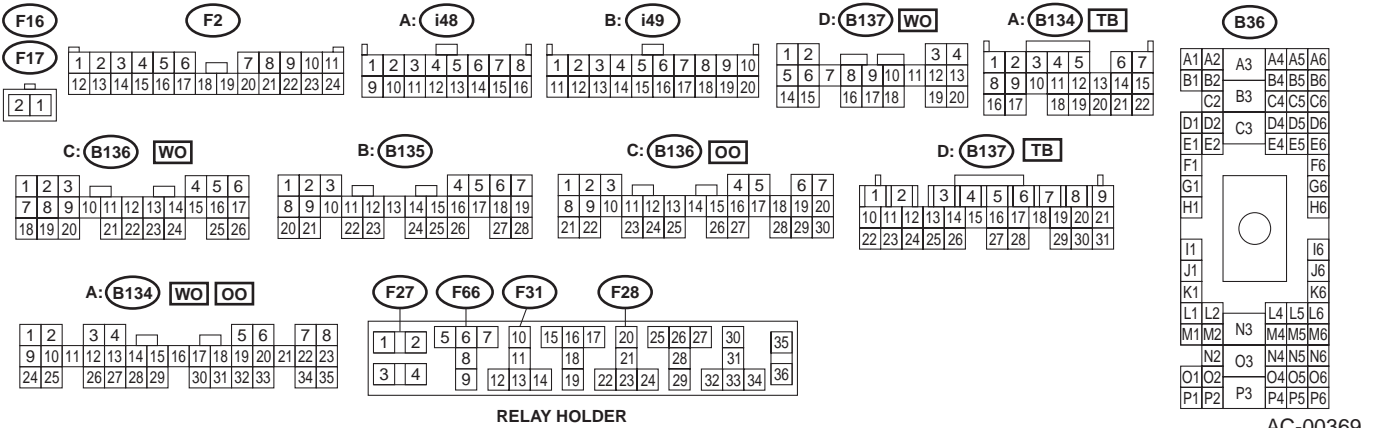
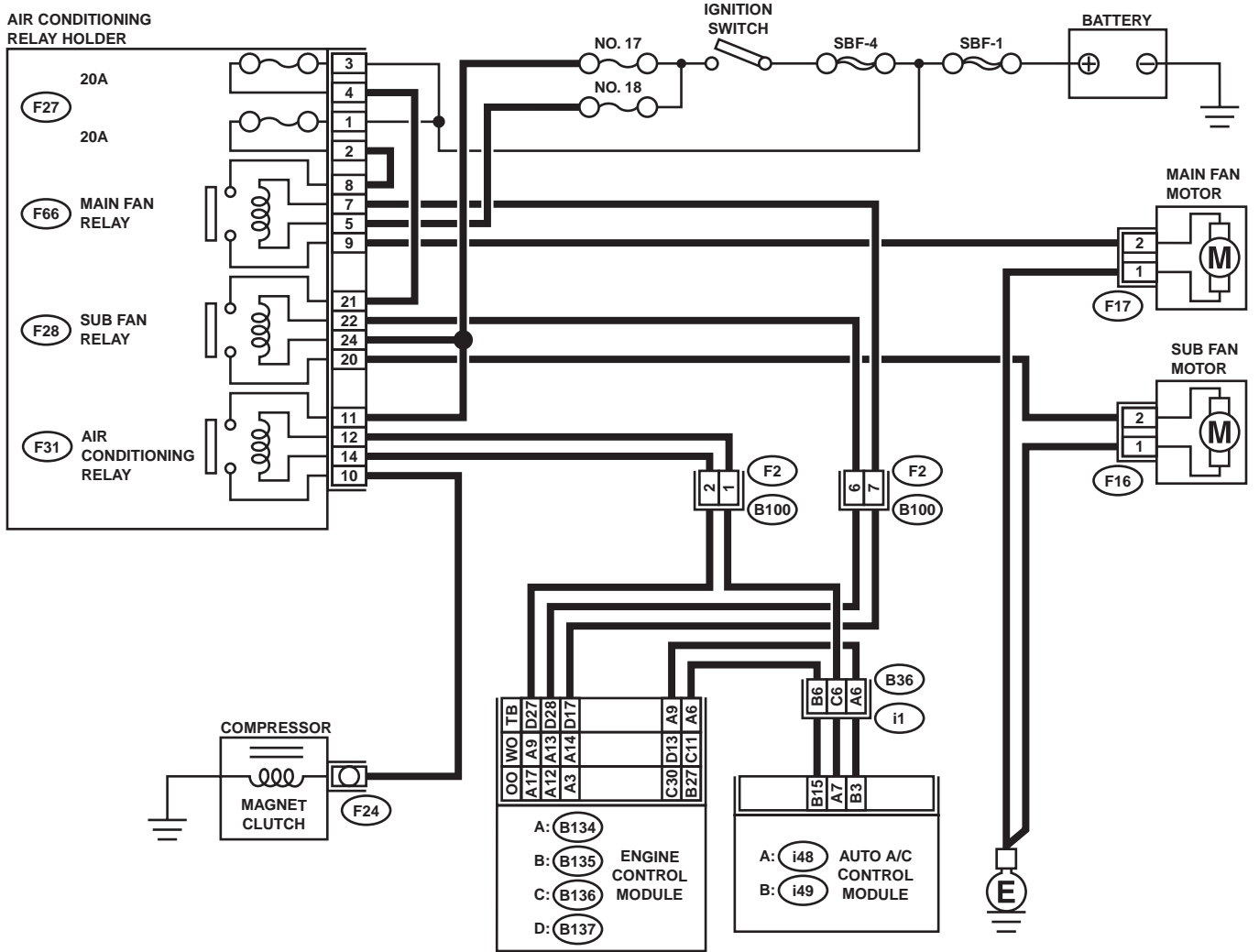
Step	Value	Yes	No
2 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove No. 17 fuse in fuse & relay box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is not blown.	Go to step 3.	Replace fuse.
3 CHECK POWER SUPPLY VOLTAGE TO BLOWER MODULE. 1) Remove glove box. 2) Turn ignition switch to ON. 3) Measure voltage between blower module and chassis ground. Connector & terminal (i52) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair harness for power supply line.
4 CHECK SIGNAL VOLTAGE. 1) Change display to RECIRC by pushing FRESH/RECIRC switch. 2) Measure voltage between A/C control module and chassis ground. Connector & terminal (i49) No. 12 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 5.	Repair harness for power supply line.
5 CHECK SIGNAL VOLTAGE. 1) Change display to FRESH by pushing FRESH/RECIRC switch. 2) Measure voltage between A/C control module and chassis ground. Connector & terminal (i49) No. 2 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Go to step 6.	Repair harness for power supply line.
6 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND BLOWER MODULE. 1) Turn ignition switch to OFF. 2) Disconnect connector from A/C control module and blower module. 3) Measure resistance of harness between A/C control module and blower module. Connector & terminal (i49) No. 12 — (i52) No. 8: Is the measured value less than the specified value?	1 Ω	Go to step 7.	Repair harness between A/C control module and blower module.
7 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND BLOWER MODULE. Measure resistance of harness between A/C control module and blower module. Connector & terminal (i49) No. 2 — (i52) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 8.	Repair harness between A/C control module and blower module.
8 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

E: COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM "SET" TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY

WIRING DIAGRAM: 4 CYLINDER MODEL

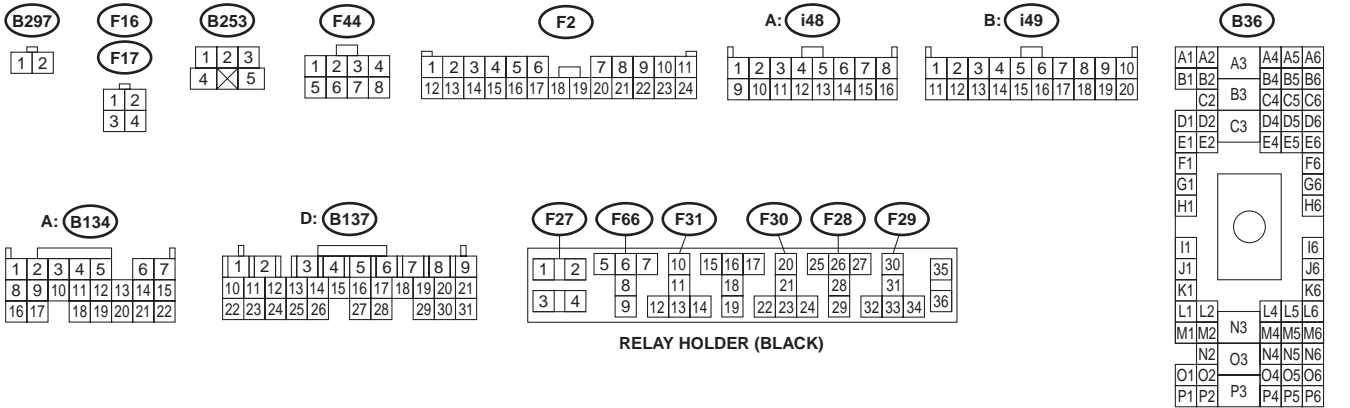
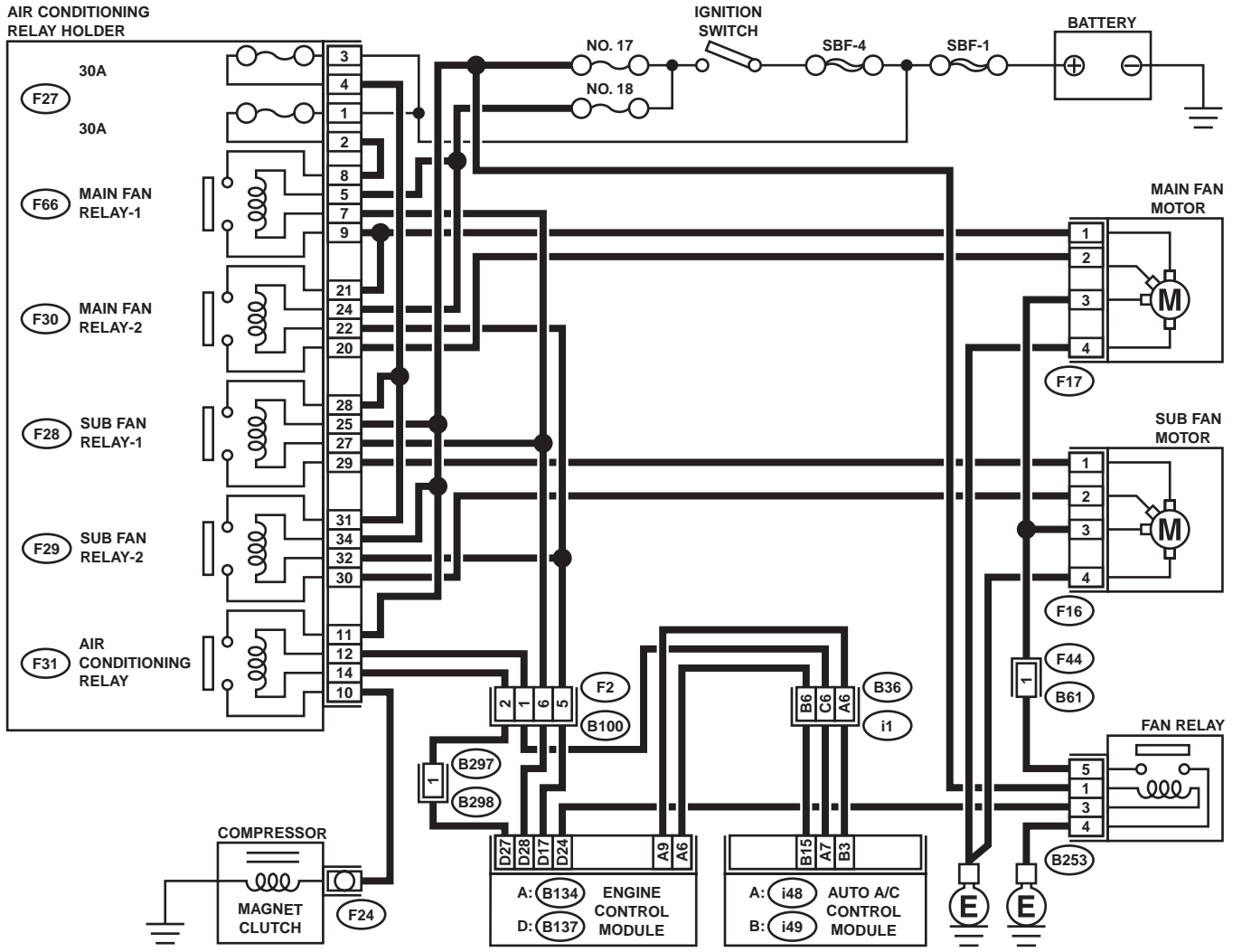


AC-00369

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

6 CYLINDER MODEL



AC-00370

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove No. 2 fuse in main fuse box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is not blown.	Go to step 2.	Replace fuse.
2 CHECK POWER SUPPLY TO MAGNET CLUTCH OF A/C COMPRESSOR. 1) Start the engine, and turn A/C switch to ON. 2) Set the compartment temperature at 18°C (65°F) (FULL COOL). 3) Measure voltage between magnet clutch connector and chassis ground. Connector & terminal (F24) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Repair harness for power supply line of the A/C compressor.
3 CHECK SIGNAL VOLTAGE FROM A/C RELAY. 1) Turn ignition switch to ON. 2) Turn A/C switch to ON. 3) Measure voltage between A/C relay and chassis ground. Connector & terminal (F31) No. 10 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 4.	Repair harness for power supply line.
4 CHECK A/C RELAY. 1) Remove A/C relay in main fuse box. 2) Check A/C relay. <Ref. to AC-44, INSPECTION, Relay and Fuse.> Is the operation of relay OK?	Operation of each relay is OK.	Go to step 5.	Replace A/C relay.
5 CHECK OPERATION OF MAIN FAN MOTOR. 1) Start the engine. 2) Turn A/C switch to ON. 3) Check operation of main fan motor. Does the main fan operate?	Main fan motor operates.	Go to step 10.	Go to step 6.
6 CHECK POWER SUPPLY TO MAIN FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between main fan motor connector and chassis ground. Connector & terminal 4 CYLINDER MODEL (F17) No. 2 (+) — Chassis ground (-): 6 CYLINDER MODEL (F17) No. 1, 2, 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 7.	Repair harness for power supply circuit.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground.</p> <p>Connector & terminal 4 CYLINDER MODEL <i>(F17) No. 1 — Chassis ground:</i> 6 CYLINDER MODEL <i>(F17) No. 4 — Chassis ground:</i></p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 8.	Repair harness between main fan motor connector and chassis ground.
<p>8 CHECK POOR CONTACT. Check poor contact in main fan motor connector. Is there poor contact in connector?</p>	There is no poor contact.	Go to step 9.	Repair poor contact in main fan motor connector.
<p>9 CHECK MAIN FAN MOTOR. 4 CYLINDER MODEL Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of main fan motor connector. 6 CYLINDER MODEL Connect battery positive (+) terminal to terminal No. 1, 2, 3, and negative (-) terminal to terminal No. 4 of main fan motor connector. Does the main fan rotate?</p>	Main fan motor rotates.	Go to step 10.	Replace main fan motor with a new one.
<p>10 CHECK OPERATION OF SUB FAN MOTOR. Check operation of sub fan motor. Does the sub fan motor operate?</p>	Sub fan motor operates.	Go to step 15.	Go to step 11.
<p>11 CHECK POWER SUPPLY TO SUB FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between sub fan motor connector and chassis ground.</p> <p>Connector & terminal 4 CYLINDER MODEL <i>(F16) No. 2 (+) — Chassis ground (-):</i> 6 CYLINDER MODEL <i>(F16) No. 1, 2, 3 (+) — Chassis ground (-):</i></p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 12.	Repair harness for power supply circuit.

DIAGNOSTICS FOR A/C SYSTEM FAILURE (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>12 CHECK GROUND CIRCUIT OF SUB FAN MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground. Connector & terminal 4 CYLINDER MODEL (F16) No. 1 — Chassis ground: 6 CYLINDER MODEL (F16) No. 4 — Chassis ground: Is the measured value less than the specified value?</p>	1 Ω	Go to step 13.	Repair harness between sub fan motor connector and chassis ground.
<p>13 CHECK POOR CONTACT. Check poor contact in sub fan motor connector. Is there poor contact in connector?</p>	There is no poor contact in connector.	Go to step 14.	Repair poor contact in sub fan motor connector.
<p>14 CHECK SUB FAN MOTOR. 4 CYLINDER MODEL Connect battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of sub fan motor connector. 6 CYLINDER MODEL Connect battery positive (+) terminal to terminal No. 1, 2, 3, and negative (-) terminal to terminal No. 4 of sub fan motor connector. Does the sub fan motor rotate?</p>	Sub fan motor rotates.	Go to step 15.	Replace sub fan motor with a new one.
<p>15 CHECK EACH SENSOR AND POTENTIOMETER. Check the sensors and potentiometer for proper operation using the self-diagnostic function. <Ref. to AC-18, OPERATION, Self-Diagnosis Procedure (RHD Model).> Is the operation of each sensor and potentiometer normal?</p>	Operation of each sensor and potentiometer is OK.	Go to step 16.	Replace sensor and/or potentiometer.
<p>16 CHECK CONNECTION OF ASPIRATOR DUCT. Make sure that the connection of aspirator duct is correct. Is the connection of duct correct?</p>	Connection is OK.	Go to step 17.	Repair aspirator duct connection.
<p>17 CHECK EACH ACTUATOR. Check the actuators for proper operation using the self-diagnostic function. <Ref. to AC-18, OPERATION, Self-Diagnosis Procedure (RHD Model).> Is the operation of each actuator normal?</p>	Operation of each actuator is OK.	Go to step 18.	Replace actuator.
<p>18 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?</p>	There is no poor contact.	Replace A/C control module.	Repair connector.

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

9. List of Diagnostic Trouble Code (DTC)

A: LIST (LHD MODEL)

1. DTC FOR SENSOR AND POTENTIOMETER

DTC	Trouble Unit	Contents
20	No Trouble	—
21	Ambient sensor	Open
-21		Short
22	In-vehicle sensor	Open
-22		Short
24	Evaporator sensor	Open
-24		Short
25	Sunload sensor	Open
-25		Short
26	Mode door actuator	Open
-26		Short

2. DTC FOR MODE DOOR POSITION SWITCH

DTC	30	31	32	33	34	35
Faulty Door	No Trouble	VENT	B/L	HEAT	D/H	DEF

B: LIST (RHD MODEL)

1. DTC FOR SENSOR AND POTENTIOMETER

DTC	Trouble Unit	Contents
20	No Trouble	—
21	In-vehicle sensor	Open
-21		Short
22	Ambient sensor	Open
-22		Short
23	Evaporator sensor	Open
-23		Short
25	Sunload sensor	Open
-25		Short
26	Air mix door actuator	FULL COOL
27		FULL HOT
28	Mode door actuator	FULL VENT
29		FULL DEF

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

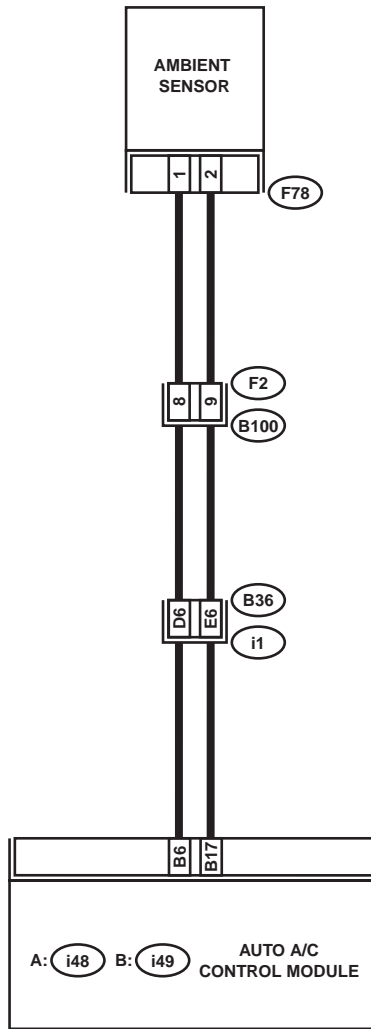
10. Diagnostic Procedure with Diagnostic Trouble Code (DTC) (LHD Model)

A: DTC 21 OR -21 (AMBIENT SENSOR)

TROUBLE SYMPTOM:

Fan speed, outlets and inlets are not switched when AUTO or ECON switch is ON.

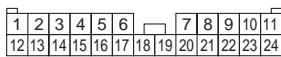
WIRING DIAGRAM:



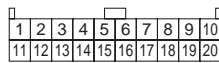
F78



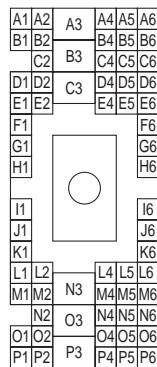
F2



B: i49



B36



AC-00371

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK AMBIENT SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ambient sensor. 3) Measure resistance between connector terminals of ambient sensor. Terminals No. 1 — No. 2: Is the measured value the same as specified value?	Approx. 2.2 k Ω : 25°C (77°F)	Go to step 2.	Replace ambient sensor.
2 CHECK INPUT SIGNALS FOR AMBIENT SENSOR. 1) Turn ignition ON. 2) Measure voltage between ambient sensor harness connector terminals. Connector & terminal (F78) No. 1 (+) — No. 2 (-): Is the measured value the same as specified value?	Approx. 4.5 V	Go to step 6.	Go to step 3.
3 CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE. 1) Turn ignition switch to OFF. 2) Pull out A/C control panel. 3) Disconnect connector from ambient sensor. 4) Turn ignition switch to ON. 5) Measure voltage between connector terminals of A/C control module. Connector & terminal (i49) No. 6 (+) — No. 17 (-): Is the measured value the same as specified value?	Approx. 4.5 V	Go to step 4.	Go to step 6.
4 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AMBIENT SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from A/C control module. 3) Measure resistance of harness between A/C control module and ambient sensor. Connector & terminal (F78) No. 1 — (i49) No. 6: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair harness between A/C control module and ambient sensor.
5 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AMBIENT SENSOR. Measure resistance of harness between A/C control module and ambient sensor. Connector & terminal (F78) No. 2 — (i49) No. 17: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair harness between A/C control module and ambient sensor.
6 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: DTC 22 OR -22 (IN-VEHICLE SENSOR)

TROUBLE SYMPTOM:

When turning AUTO switch to ON, blower fan speed, outlet port and inlet port is not changed.

If DTC 22 or -22 appears on the display, replace the A/C control module. The in-vehicle sensor is built into the A/C control module and cannot be replaced as a single unit.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

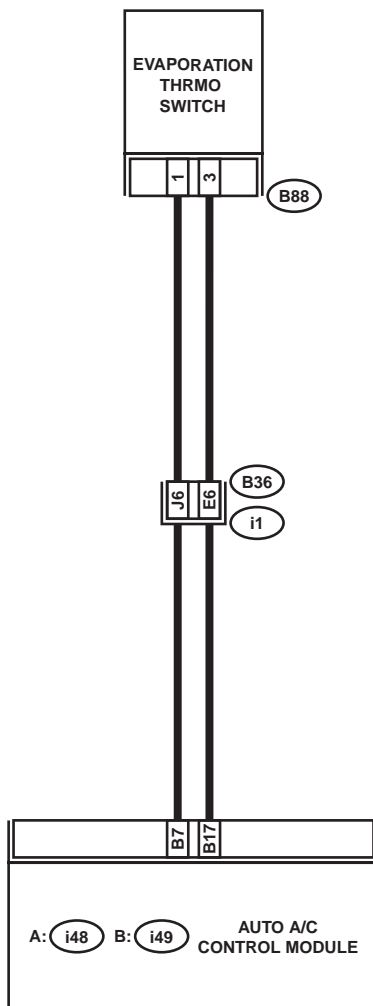
MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: DTC 24 OR -24 (EVAPORATOR SENSOR)

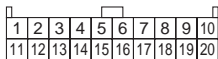
WIRING DIAGRAM:



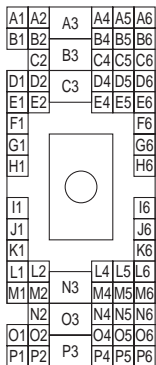
B88



B: i49



B36



AC-00323

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK EVAPORATOR SENSOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Remove glove box. 3) Disconnect connector from evaporator sensor. 4) Measure resistance between connector terminals of evaporator sensor. <p>Terminals No. 1 — No. 3: Is the measured value within the specified range?</p>	Approx. 1.8 to 2.0 k Ω : 20°C (68°F)	Go to step 2.	Replace evaporator sensor.
<p>2 CHECK INPUT SIGNALS FOR EVAPORATOR SENSOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to ON. 2) Measure voltage between evaporator sensor harness connector terminal and chassis ground. <p>Connector & terminal (B88) No. 1 (+) — Chassis ground (-): Is the measured value the same as specified value?</p>	Approx. 4.5 V	Go to step 6.	Go to step 3.
<p>3 CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Pull out A/C control module. 3) Turn ignition switch to ON. 4) Measure voltage between A/C control module connector terminals. <p>Connector & terminal (i49) No. 7 (+) — No. 17 (-): Is the measured value the same as specified value?</p>	Approx. 4.5 V	Go to step 4.	Go to step 6.
<p>4 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to OFF. 2) Disconnect connectors from A/C control module. 3) Measure resistance of harness between A/C control module and evaporator sensor. <p>Connector & terminal (B88) No. 1 — (i49) No. 7: Is the measured value less than the specified value?</p>	1 Ω	Go to step 5.	Repair harness between A/C control module and evaporator sensor.
<p>5 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.</p> <p>Measure resistance of harness between A/C control module and evaporator sensor.</p> <p>Connector & terminal (B88) No. 3 — (i49) No. 17: Is the measured value less than the specified value?</p>	1 Ω	Go to step 6.	Repair harness between A/C control module and evaporator sensor.
<p>6 CHECK POOR CONTACT.</p> <p>Check poor contact in A/C control module connector. Is there poor contact in connector?</p>	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

D: DTC 25 OR -25 (SUNLOAD SENSOR)

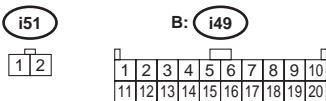
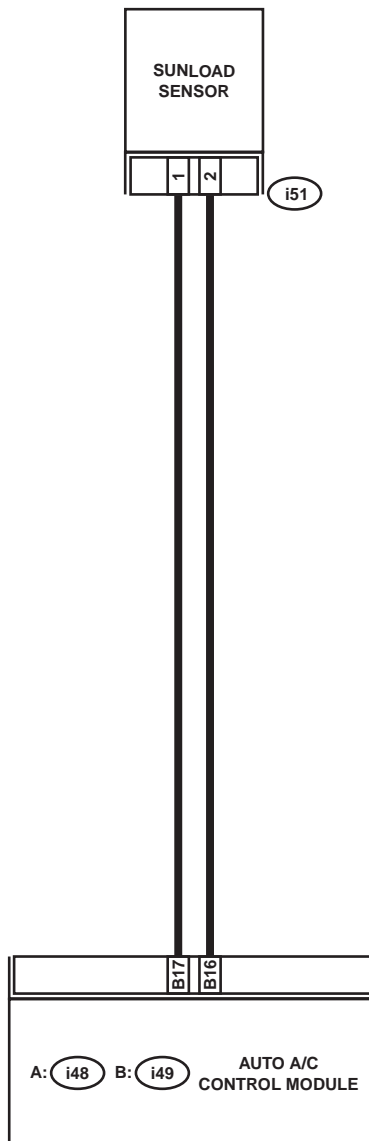
TROUBLE SYMPTOM:

- Sensor identified that sunlight is at maximum. Then, A/C system is controlled to COOL side.
- Sensor identified that sunlight is at minimum. Then, A/C system is controlled to HOT side.

NOTE:

When the sunload sensor is checked inside the passenger compartment or in the shade, DTC "25" may appear on the indicator. Always check the sunload sensor in a place where it senses direct sunlight.

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INPUT VOLTAGE TO SUNLOAD SENSOR. 1) Turn ignition switch to OFF. 2) Remove sunload sensor. <Ref. to AC-48, REMOVAL, Sunload Sensor (Auto A/C).> 3) Turn ignition switch to ON. 4) Measure input voltage to sunload sensor. Connector & terminal <i>(i51) No. 2 (+) — No. 1 (-):</i> Is the measured value the same as specified value?	Approx. 4.2 V	Go to step 4.	Go to step 2.
2 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from A/C control module. 3) Measure resistance of harness between A/C control module and sunload sensor. Connector & terminal <i>(i51) No. 2 — (i49) No. 16:</i> Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair harness between A/C control module and sunload sensor.
3 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR. Measure resistance of harness between A/C control module and sunload sensor. Connector & terminal <i>(i51) No. 1 — (i49) No. 17:</i> Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair harness between A/C control module and sunload sensor.
4 CHECK VOLTAGE OF INPUT SIGNAL TO A/C CONTROL MODULE. 1) Connect connectors to A/C control module and sunload sensor. 2) Turn ignition switch to ON. 3) Measure voltage between A/C control module connectors. Connector & terminal <i>(i49) No. 16 (+) — No. 17 (-):</i> Is the measured value the same as specified value?	Approx. 2.5 V	Go to step 5.	Replace sunload sensor.
5 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

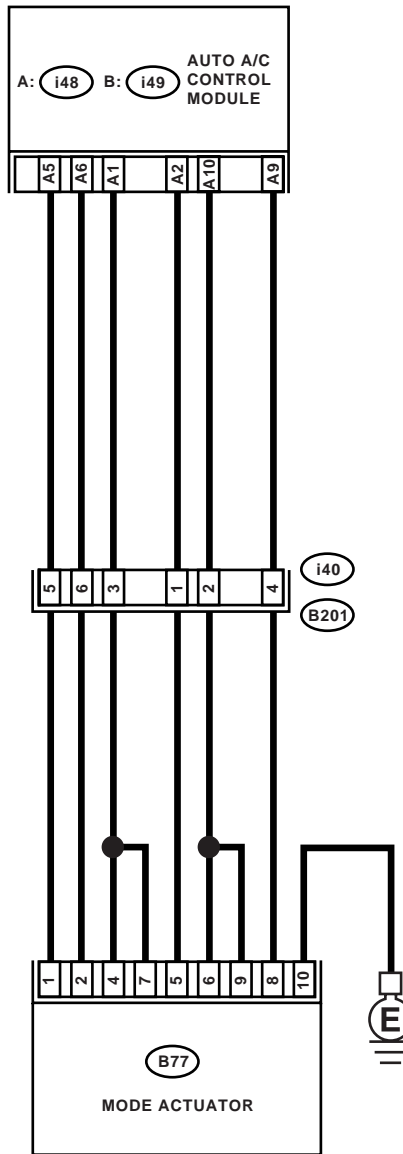
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

E: DTC 31, 32, 33, 34 OR 35 (MODE DOOR ACTUATOR)

TROUBLE SYMPTOM:

Air flow outlet is not changed.

WIRING DIAGRAM:



(B77)

1	2	3	4	5	6	7	8	9	10
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(i40)

1	2	3	4
5	6	7	8

A: (i48)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

AC-00372

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.</p> <p>1) Turn the ignition switch to ON. 2) Press the mode switch to VENT position. 3) Press the DEF switch and measure the voltage between auto A/C control module and chassis ground when VENT is changed to DEF position.</p> <p>Connector & terminal (i48) No. 6 (+) — Chassis ground (-): Is the measured value more than specified value?</p>	12 V	Go to step 2.	Replace the auto A/C control module.
<p>2 CHECK POWER SUPPLY FOR ACTUATOR SIDE.</p> <p>1) Press the mode switch to VENT position. 2) Press the DEF switch and measure the voltage between mode door actuator harness connector and chassis ground when VENT is changed to DEF position.</p> <p>Connector & terminal (B77) No. 2 (+) — Chassis ground (-): Is the measured value more than specified value?</p>	7 V (At normal temperature)	Go to step 3.	Repair the harness between auto A/C control module and mode door actuator.
<p>3 CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.</p> <p>1) Press the DEF switch. 2) Press the mode switch to VENT position and measure the voltage between auto A/C control module and chassis ground when DEF is changed to VENT position.</p> <p>Connector & terminal (i48) No. 5 (+) — Chassis ground (-): Is the measured value more than specified value?</p>	12 V	Go to step 4.	Replace the auto A/C control module.
<p>4 CHECK POWER SUPPLY FOR ACTUATOR SIDE.</p> <p>1) Press the DEF switch. 2) Press the mode switch to VENT position and measure the voltage between mode door actuator harness connector and chassis ground when DEF is changed to VENT position.</p> <p>Connector & terminal (B77) No. 1 (+) — Chassis ground (-): Is the measured value more than specified value?</p>	7 V (At normal temperature)	Go to step 5.	Repair the harness between auto A/C control module and mode door actuator.
<p>5 CHECK ACTUATOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Connect the battery positive (+) terminal to terminal No. 1 and ground (-) terminal to terminal No. 2 of mode door actuator to make sure that actuator operates. 4) Connect the battery positive (+) terminal to terminal No. 2 and ground (-) terminal to terminal No. 1 of mode door actuator to make sure that actuator operates. Does the motor operate normally?</p>	The motor operates normally.	Go to step 6.	Replace the mode door actuator.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
6 CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE. 1) Turn the ignition switch to ON. 2) Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. Connector & terminal (i48) No. 2 (+) — Chassis ground (-): Is the measured value within specified value?	HEAT, D/H, DEF: 5 V, VENT, BI-LEVEL: 0 V	Go to step 9 .	Go to step 7 .
7 CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. Connector & terminal (B77) No. 5 (+) — Chassis ground (-): Is the measured value within specified value?	5 V	Go to step 9 .	Go to step 8 .
8 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. Connector & terminal (i48) No. 2 — (B77) No. 5: Is the measured value less than specified value?	1 Ω	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
9 CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE. 1) Turn ignition switch to ON. 2) Press the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. Connector & terminal (i48) No. 10 (+) — Chassis ground (-): Is the measured value within specified value?	VENT, D/H: 5 V, BI-LEVEL, HEAT, DEF: 0 V	Go to step 12 .	Go to step 10 .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>10 CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. <p>Connector & terminal (B77) No. 6, 9 (+) — Chassis ground (-):</p> <p>Is the measured value within specified value?</p>	5 V	Go to step 12.	Go to step 11.
<p>11 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. <p>Connector & terminal (i48) No. 10 — (B77) No. 6, 9:</p> <p>Is the measured value less than specified value?</p>	1 Ω	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
<p>12 CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.</p> <ol style="list-style-type: none"> 1) Turn ignition switch to ON. 2) Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. <p>Connector & terminal (i48) No. 1 (+) — Chassis ground (-):</p> <p>Is the measured value within specified value?</p>	BI-LEVEL, DEF: 5 V, VENT, HEAT, D/H: 0 V	Go to step 15.	Go to step 13.
<p>13 CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. <p>Connector & terminal (B77) No. 4, 7 (+) — Chassis ground (-):</p> <p>Is the measured value within specified value?</p>	5 V	Go to step 15.	Go to step 14.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>14 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator.</p> <p>Connector & terminal <i>(i48) No. 1 — (B77) No. 4, 7:</i></p> <p>Is the measured value less than specified value?</p>	1 Ω	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
<p>15 CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.</p> <p>1) Turn ignition switch to ON. 2) Press the mode switch and measure voltage between auto A/C control module harness connector and chassis ground for each mode.</p> <p>Connector & terminal <i>(i48) No. 9 (+) — Chassis ground (-):</i></p> <p>Is the measured value within specified value?</p>	VENT, BI-LEVEL, HEAT: 5V, D/H, DEF: 0 V	Go to step 19.	Go to step 16.
<p>16 CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground.</p> <p>Connector & terminal <i>(B77) No. 8 (+) — Chassis ground (-):</i></p> <p>Is the measured value within specified value?</p>	5 V	Go to step 18.	Go to step 17.
<p>17 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator.</p> <p>Connector & terminal <i>(i48) No. 9 — (B77) No. 8:</i></p> <p>Is the measured value less than specified value?</p>	1 Ω	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>18 CHECK ACTUATOR GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Measure the resistance of harness between mode door actuator and chassis ground. Connector & terminal (B77) No. 10 — Chassis ground: Is the measured value less than specified value?</p>	<p>1 Ω</p>	<p>Replace the mode door actuator.</p>	<p>Repair the harness between auto A/C control module and mode door actuator.</p>
<p>19 CHECK POOR CONTACT. Check poor contact in auto A/C control module connector. Is there poor contact in connector?</p>	<p>There is no poor contact.</p>	<p>Repair the poor contact in auto A/C control module.</p>	<p>Repair the connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (LHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

MEMO:

11. Diagnostic Procedure with Diagnostic Trouble Code (DTC) (RHD Model)

A: DTC 21 OR -21 (IN-VEHICLE SENSOR)

TROUBLE SYMPTOM:

When turning AUTO switch to ON, blower fan speed, outlet port and inlet port is not changed.

NOTE:

If DTC 21 or -21 appears on the display, replace the A/C control module. The in-vehicle sensor is built into the A/C control module and cannot be replaced as a single unit.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

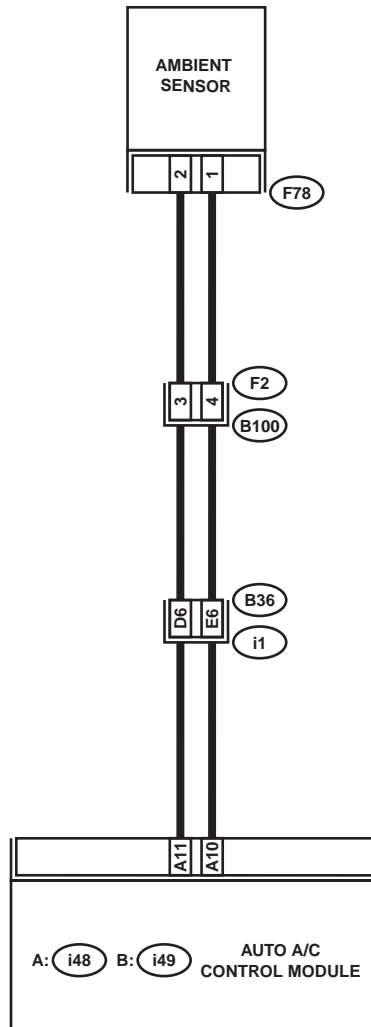
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: DTC 22 OR -22 (AMBIENT SENSOR)

TROUBLE SYMPTOM:

Fan speed, outlets and inlets are not switched when AUTO or ECON switch is ON.

WIRING DIAGRAM:



F78

1	2
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A: i48

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

F2

1	2	3	4	5	6	7	8	9	10	11		
12	13	14	15	16	17	18	19	20	21	22	23	24

B36

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C1	C2	C3	C4	C5	C6
D1	D2	D3	D4	D5	D6
E1	E2	E3	E4	E5	E6
F1					F6
G1					G6
H1					H6
I1					I6
J1					J6
K1					K6
L1	L2		L4	L5	L6
M1	M2	N3	M4	M5	M6
N2	O3		N4	N5	N6
O1	O2		O4	O5	O6
P1	P2	P3	P4	P5	P6

AC-00373

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

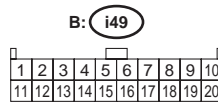
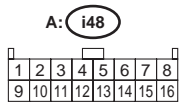
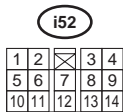
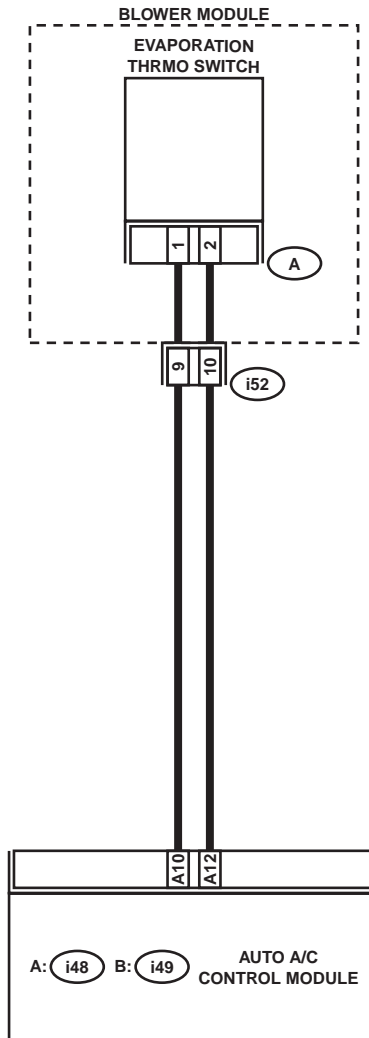
Step	Value	Yes	No
1 CHECK AMBIENT SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ambient sensor. 3) Measure resistance connector terminals of ambient sensor. Terminals No. 1 — No. 2: Is the measured value same as the specified value?	Approx. 1.7 kΩ at 25°C (77°F)	Go to step 2.	Replace ambient sensor.
2 CHECK INPUT SIGNAL FOR AMBIENT SENSOR. 1) Turn ignition ON. 2) Measure voltage between ambient sensor harness connector terminals. Connector & terminal (F78) No. 2 (+) — No. 1 (-): Is the measured value same as the specified value?	Approx. 4.5 V	Go to step 6.	Go to step 3.
3 CHECK OUTPUT SIGNAL FROM A/C CONTROL MODULE. 1) Turn ignition switch to OFF. 2) Pull out A/C control panel. 3) Disconnect connector from ambient sensor. 4) Turn ignition switch to ON. 5) Measure voltage between connector terminals of A/C control module. Connector & terminal (i48) No. 11 (+) — No. 10 (-): Is the measured value same as the specified value?	Approx. 4.5 V	Go to step 4.	Go to step 6.
4 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AMBIENT SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from A/C control module. 3) Measure resistance of harness between A/C control module and ambient sensor. Connector & terminal (F78) No. 1 — (i48) No. 10: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Repair harness between A/C control module and ambient sensor.
5 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AMBIENT SENSOR. Measure resistance of harness between A/C control module and ambient sensor. Connector & terminal (F78) No. 2 — (i48) No. 11: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair harness between A/C control module and ambient sensor.
6 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: DTC 23 OR -23 (EVAPORATOR SENSOR)

WIRING DIAGRAM:



AC-00374

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK EVAPORATOR SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Remove glove box. 3) Disconnect connector from evaporator sensor. 4) Measure resistance between connector terminals of evaporator sensor.</p> <p>Terminals No. 1 — No. 2: Is the measured value within the specified value?</p>	Approx. 1.8 to 2.0 k Ω at 20°C (68°F)	Go to step 2.	Replace evaporator sensor.
<p>2 CHECK INPUT SIGNAL FOR EVAPORATOR SENSOR.</p> <p>1) Turn ignition switch to ON. 2) Measure signal voltage between connector terminal of evaporator sensor and chassis ground.</p> <p>Connector & terminal (A) No. 2 (+) — Chassis ground (-): Is the measured value same as the specified value?</p>	Approx. 3.3 V	Go to step 6.	Go to step 3.
<p>3 CHECK OUTPUT SIGNAL FROM A/C CONTROL MODULE.</p> <p>1) Turn ignition switch to OFF. 2) Pull out A/C control module. 3) Turn ignition switch to ON. 4) Measure voltage between A/C control module connector terminals.</p> <p>Connector & terminal (i48) No. 12 (+) — No. 10 (-): Is the measured value same as the specified value?</p>	Approx. 3.3 V	Go to step 4.	Go to step 6.
<p>4 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from A/C control module. 3) Measure resistance of harness between A/C control module and evaporator sensor.</p> <p>Connector & terminal (i48) No. 12 — (A) No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 5.	Repair harness between A/C control module and evaporator sensor.
<p>5 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.</p> <p>Measure resistance of harness between A/C control module and evaporator sensor.</p> <p>Connector & terminal (i48) No. 10 — (A) No. 1: Is the measured value less than the specified value?</p>	1 Ω	Go to step 6.	Repair harness between A/C control module and evaporator sensor.
<p>6 CHECK POOR CONTACT.</p> <p>Check poor contact in A/C control module connector. Is there poor contact in connector?</p>	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

D: DTC 25 OR -25 (SUNLOAD SENSOR)

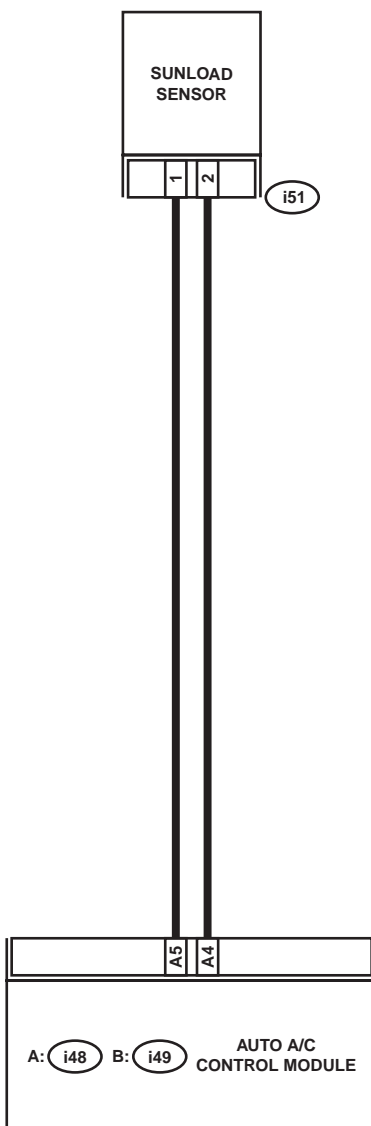
TROUBLE SYMPTOM:

- Sensor identified that sunlight is at maximum. Then, A/C system is controlled to COOL side.
- Sensor identified that sunlight is at minimum. Then, A/C system is controlled to HOT side.

NOTE:

When the sunload sensor is checked inside the passenger compartment or in the shade, DTC "25" may appear on the indicator. Always check the sunload sensor in a place where it senses direct sunlight.

WIRING DIAGRAM:



i51

1	2
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A: i48

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

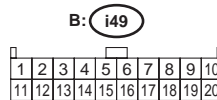
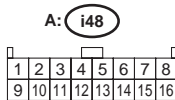
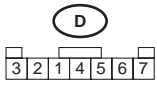
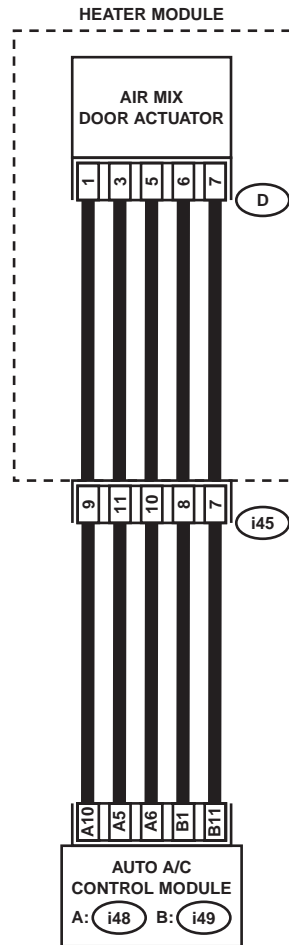
Step	Value	Yes	No
1 CHECK SUNLOAD SENSOR. 1) Turn ignition switch to OFF. 2) Remove sunload sensor. <Ref. to AC-48, REMOVAL, Sunload Sensor (Auto A/C).> 3) Turn ignition switch ON. 4) Measure sunload sensor input voltage. Connector & terminal (i51) No. 2 (+) — No. 1 (-): Is the measured value same as the specified value?	Approx. 4.2 V	Go to step 4.	Go to step 2.
2 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from A/C control module. 3) Measure resistance of harness between A/C control module and sunload sensor. Connector & terminal (i51) No. 1 — (i48) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 3.	Repair harness between A/C control module and sunload sensor.
3 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR. Measure resistance of harness between A/C control module and sunload sensor. Connector & terminal (i51) No. 2 — (i48) No. 4: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Repair harness between A/C control module and sunload sensor.
4 Check A/C control module input voltage. 1) Connect A/C control module and sunload sensor connector. 2) Turn ignition switch ON. 3) Measure voltage between A/C control module connector terminals. Connector & terminal (i48) No. 4 (+) — No. 5 (-): Is the measured value same as the specified value?	Approx. 2.5 V	Go to step 5.	Replace sunload sensor.
5 CHECK POOR CONTACT. Check poor contact in A/C control module connector. Is there poor contact in connector?	There is no poor contact.	Replace A/C control module.	Repair connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

E: DTC 26 OR 27 (AIR MIX MOTOR POTENTIOMETER LINE)

WIRING DIAGRAM:



AC-00376

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK AIR MIX DOOR ACTUATOR. 1) Turn ignition switch to OFF. 2) Remove air mix door actuator. 3) Make sure that air mix door actuator is operated when connecting battery positive (+) terminal to terminal No. 6, battery negative (-) terminal to terminal No. 7 of air mix door actuator. Does the air mix door actuator operate?	Air mix door actuator operates.	Go to step 2.	Replace air mix door actuator.
2 CHECK POTENTIOMETER. Measure resistance for the power supply line of the potentiometer. Terminals (D) No. 1 — No. 3: Is the measured value same as the specified value?	Approx. 6.0 kΩ	Go to step 3.	Replace air mix door actuator.
3 CHECK POTENTIOMETER. Measure resistance for the signal line of the potentiometer, when the lever is in the FULL COOL position. Terminals (D) No. 1 — No. 5: Is the measured value same as the specified value?	Approx. 1.2 kΩ	Go to step 4.	Replace air mix door actuator.
4 CHECK POTENTIOMETER. Measure resistance for the signal line of the potentiometer, when the lever is in the FULL HOT position. Terminals (D) No. 1 — No. 5: Is the measured value same as the specified value?	Approx. 4.5 kΩ	Go to step 5.	Replace air mix door actuator.
5 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR. 1) Disconnect connector from A/C control module. 2) Measure resistance of harness between A/C control module and air mix door actuator. Connector & terminal (i48) No. 6 — (D) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair harness between A/C control module and air mix door actuator.
6 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR. Measure resistance of harness between A/C control module and air mix door actuator. Connector & terminal (i48) No. 5 — (D) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 7.	Repair harness between A/C control module and air mix door actuator.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR. Measure resistance of harness between A/C control module and air mix door actuator. <i>Connector & terminal</i> <i>(i48) No. 10 — (D) No. 1:</i> Is the measured value less than the specified value?</p>	1 Ω	Go to step 8 .	Repair harness between A/C control module and air mix door actuator.
<p>8 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR. Measure resistance of harness between A/C control module and air mix door actuator. <i>Connector & terminal</i> <i>(i49) No. 1 — (D) No. 6:</i> Is the measured value less than the specified value?</p>	1 Ω	Go to step 9 .	Repair harness between A/C control module and air mix door actuator.
<p>9 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR. Measure resistance of harness between A/C control module and air mix door actuator. <i>Connector & terminal</i> <i>(i49) No. 11 — (D) No. 7:</i> Is the measured value less than the specified value?</p>	1 Ω	Go to step 10 .	Repair harness between A/C control module and air mix door actuator.
<p>10 CHECK POOR CONTACT. Check poor contact in A/C control module. Is there poor connection in connector?</p>	There is no poor connection.	Replace A/C control module.	Replace connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

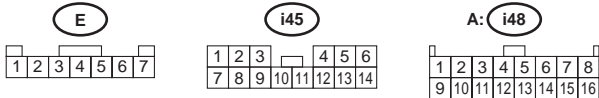
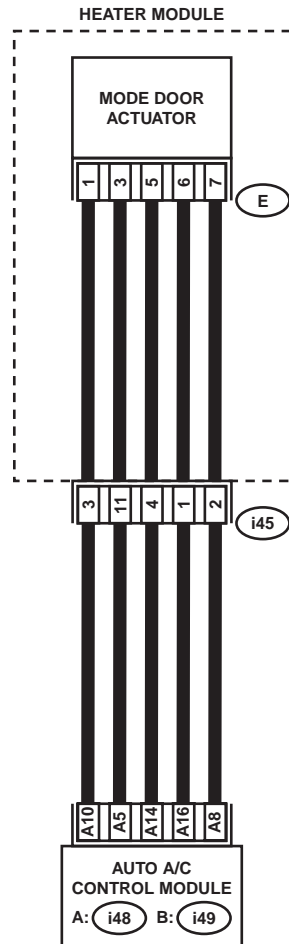
MEMO:

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

F: DTC 28 OR 29 (MODE DOOR ACTUATOR POTENTIOMETER LINE)

WIRING DIAGRAM:



AC-00377

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK MODE DOOR ACTUATOR. 1) Turn ignition switch to OFF. 2) Remove mode door actuator. 3) Make sure that mode door actuator is operated when connecting battery positive (+) terminal to terminal No. 6 and negative (-) terminal to terminal No. 7 of mode door actuator. Does the mode door actuator operate?	Ventilation motor operates.	Go to step 2.	Replace mode door actuator.
2 CHECK POTENTIOMETER. Measure resistance for the power supply line of the potentiometer. Terminals (E) No. 1 — No. 3: Is the measured value same as the specified value?	Approx. 6.0 kΩ	Go to step 3.	Replace mode door actuator.
3 CHECK POTENTIOMETER. Measure resistance for the signal line of the potentiometer, when the lever is in the FULL VENT position. Terminals (E) No. 1 — No. 5: Is the measured value same as the specified value?	Approx. 1.2 kΩ	Go to step 4.	Replace mode door actuator.
4 CHECK POTENTIOMETER. Measure resistance for the signal line of the potentiometer, when the lever is in the FULL DEF position. Terminals (E) No. 1 — No. 5: Is the measured value same as the specified value?	Approx. 4.5 kΩ	Go to step 5.	Replace mode door actuator.
5 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND MODE DOOR ACTUATOR. 1) Disconnect connector from A/C control module. 2) Measure resistance of harness between A/C control module and mode door actuator. Connector & terminal (i48) No. 14 — (E) No. 5: Is the measured value less than the specified value?	1 Ω	Go to step 6.	Repair harness between A/C control module and mode door actuator.
6 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND MODE DOOR ACTUATOR. Measure resistance of harness between A/C control module and mode door actuator. Connector & terminal (i48) No. 5 — (E) No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 7.	Repair harness between A/C control module and mode door actuator.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) (RHD MODEL)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Value	Yes	No
<p>7 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND MODE DOOR ACTUATOR. Measure resistance of harness between A/C control module and mode door actuator. <i>Connector & terminal</i> <i>(i48) No. 10 — (E) No. 1:</i> Is the measured value less than the specified value?</p>	1 Ω	Go to step 8 .	Repair harness between A/C control module and mode door actuator.
<p>8 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND MODE DOOR ACTUATOR. Measure resistance of harness between A/C control module and mode door actuator. <i>Connector & terminal</i> <i>(i48) No. 8 — (E) No. 7:</i> Is the measured value less than the specified value?</p>	1 Ω	Go to step 9 .	Repair harness between A/C control module and mode door actuator.
<p>9 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND MODE DOOR ACTUATOR. Measure resistance of harness between A/C control module and mode door actuator. <i>Connector & terminal</i> <i>(i48) No. 16 — (E) No. 6:</i> Is the measured value less than the specified value?</p>	1 Ω	Go to step 10 .	Repair harness between A/C control module and mode door actuator.
<p>10 CHECK POOR CONTACT. Check poor contact in A/C control module. Is there poor connection in connector?</p>	There is no poor connection.	Replace A/C control module.	Repair connector.

SYMPTOM RELATED DIAGNOSTIC

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

12.Symptom Related Diagnostic

A: GENERAL DIAGNOSTICS TABLE

Symptom	A/C system fails to operate when IG SW is turned "ON".	Burned-out fuse.	Previous mode immediately before resetting operation is not retained in memory.	No indication appears on display.	Illumination does not dim at night.	Blower motor does not rotate or rotates erroneously.	A/C does not change from "Fresh" to "Recirc" or vice versa.	Air vents cannot be switched.	Compartment temperature does not increase (No hot air is discharged).	Compartment temperature does not decrease (No cool air is discharged).	Compartment temperature is higher than or lower than the set value.	Compartment temperature does not quickly respond to the set value.	Condenser fan does not operate during A/C operation.
Component parts													
Fuses (M/B No. 2, F/B No. 17)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor connector contacts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ground	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A/C control module	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Air mix door actuator and potentiometer (including links)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mode door actuator and potentiometer (including links)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Intake door actuator and potentiometer (including links)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Blower fan motor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Power transistor & fuse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Blower fan relay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A/C relay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Magnet clutch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Radiator fan motors (Main and sub)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Radiator fan relays (Main and sub)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sensors (In-vehicle, ambient, water temperature, evaporator, sunload, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-vehicle sensor aspirator duct	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

AC-00378

SYMPTOM RELATED DIAGNOSTIC

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

MEMO:

AIRBAG SYSTEM

AB

	Page
1. General Description	2
2. Airbag Connector	8
3. Inspection Locations After a Collision	10
4. Driver's Airbag Module	12
5. Passenger's Airbag Module	13
6. Side Airbag Module	14
7. Main Harness	15
8. Side Airbag Harness	16
9. Airbag Control Module	17
10. Side Airbag Sensor	18
11. Roll Connector	19
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13. Front Sub Sensor Harness.....	21
14. Disposal of Airbag Module (Deploying While Installed in Vehicle)	22
15. Disposal of Airbag Module (Deploying After Removal from Vehicle)	26

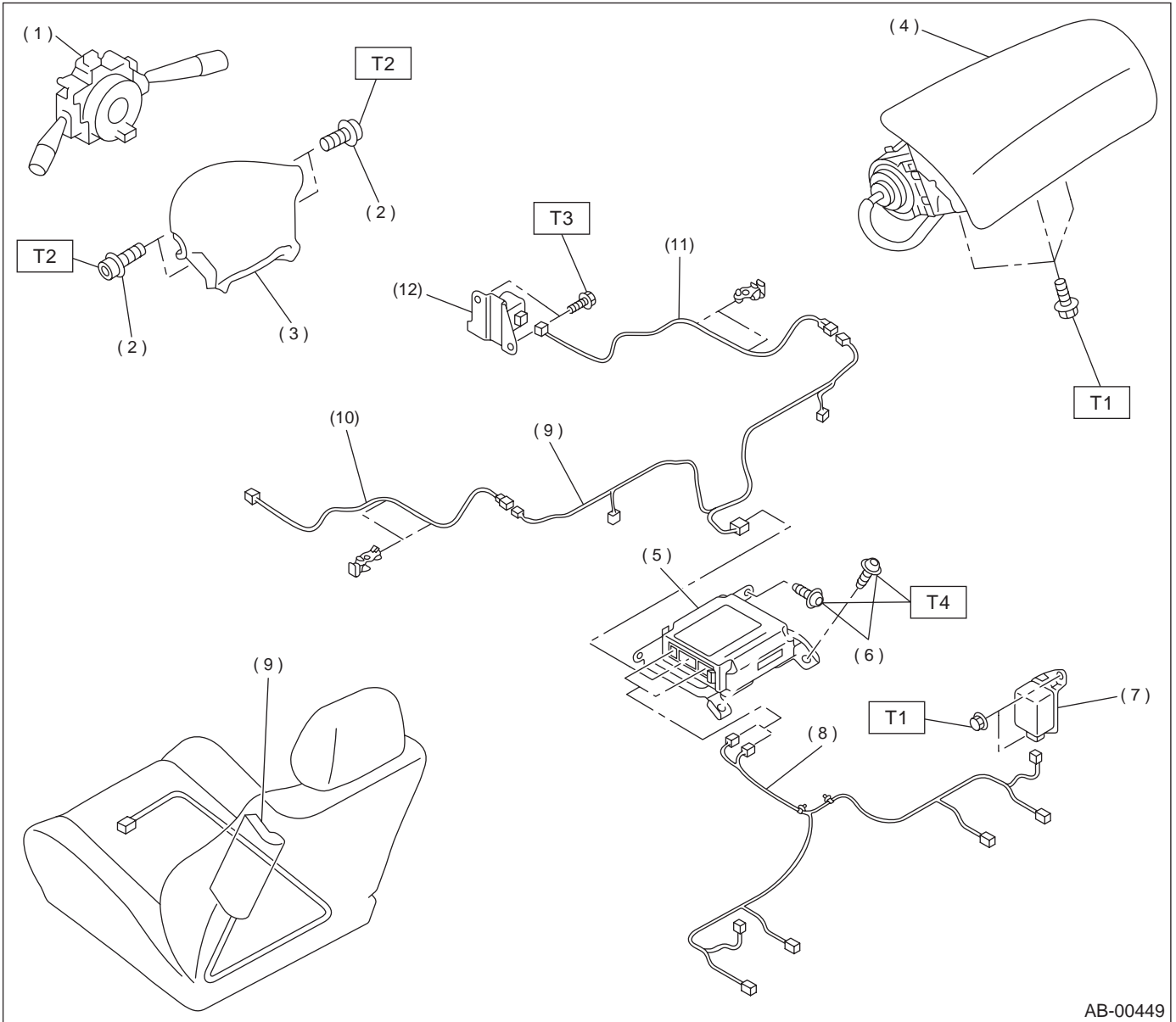
GENERAL DESCRIPTION

AIRBAG SYSTEM

1. General Description

A: COMPONENT

1. SRS AIRBAG



AB-00449

- | | |
|---|-------------------------------|
| (1) Combination switch ASSY with roll connector | (7) Side airbag sensor |
| (2) TORX® bolt T30 | (8) Side airbag harness |
| (3) Airbag module ASSY (Driver) | (9) Side airbag module |
| (4) Airbag module ASSY (Passenger) | (10) Airbag main harness |
| (5) Airbag control module | (11) Front sub sensor harness |
| (6) TORX® bolt T40 | (12) Front sub sensor |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.4 (0.75, 5.4)

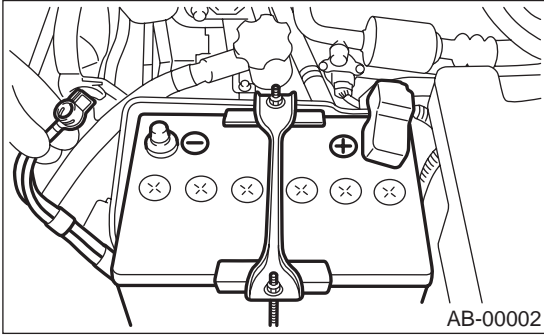
T2: 10 (1.0, 7.2)

T3: 20 (2.0, 14.5)

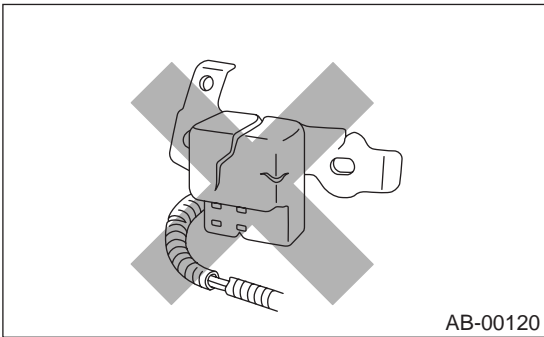
T4: 25 (2.5, 18.1)

B: CAUTION

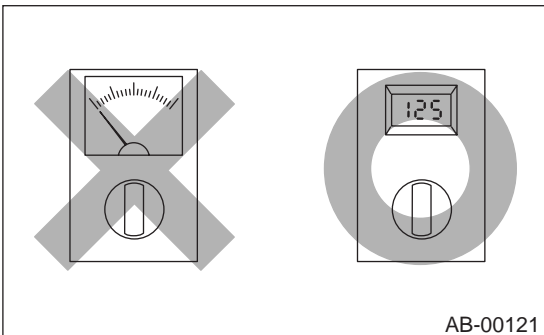
- When servicing a vehicle, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait for more than 20 seconds before starting work.
- The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.



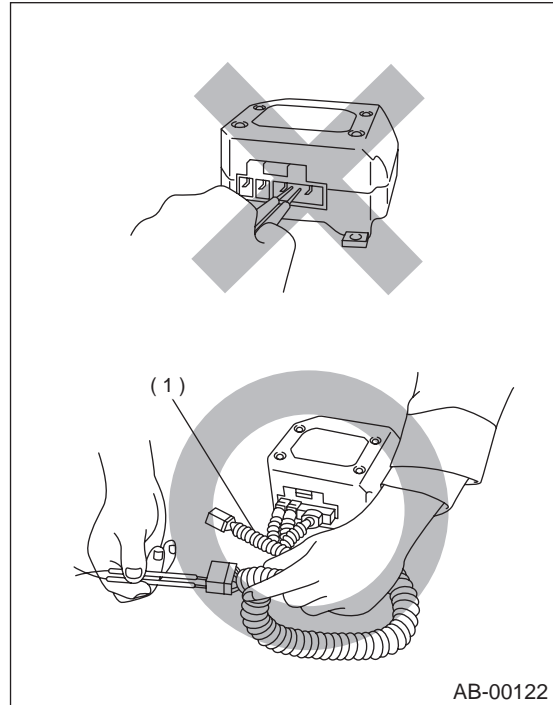
- If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.



- When checking the system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously.

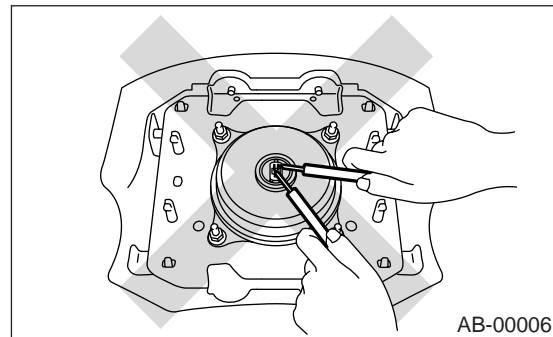


- When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.



(1) Test harness

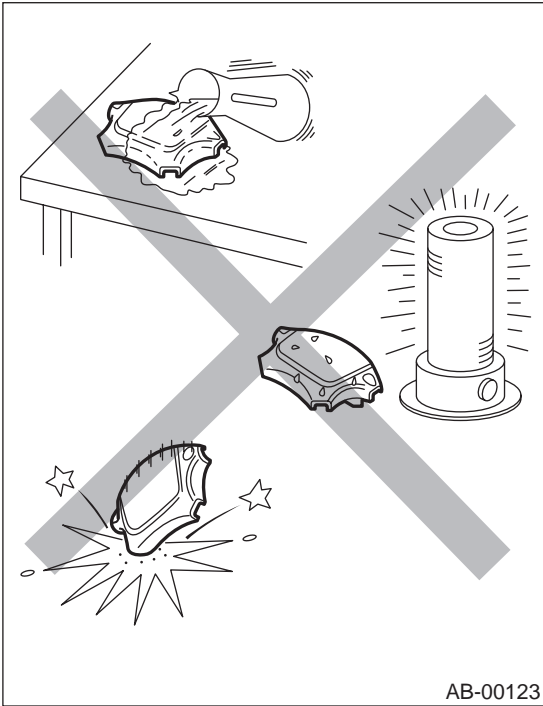
- Do not check continuity of either of the airbag modules for, passenger or side, or pretensioner.



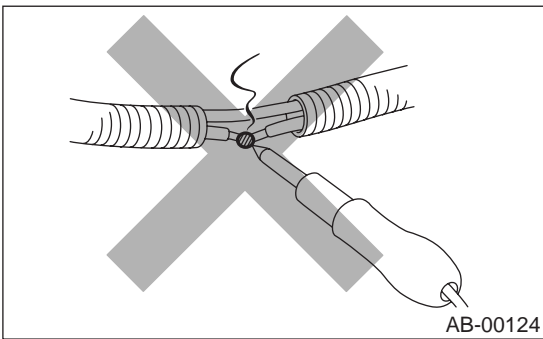
GENERAL DESCRIPTION

AIRBAG SYSTEM

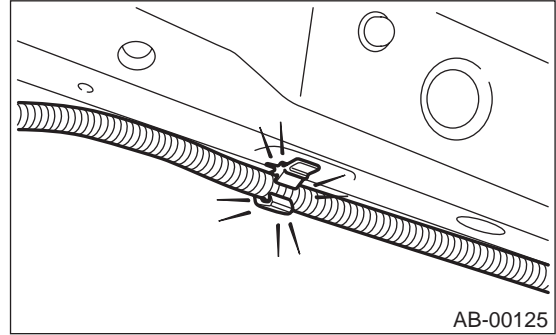
- Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



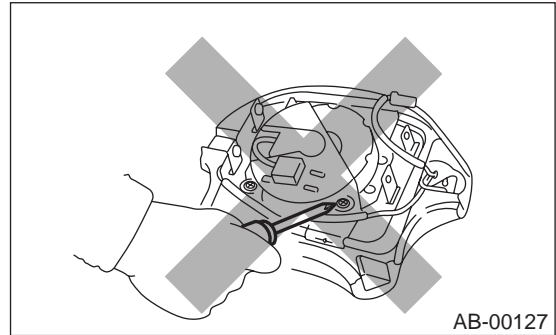
- If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



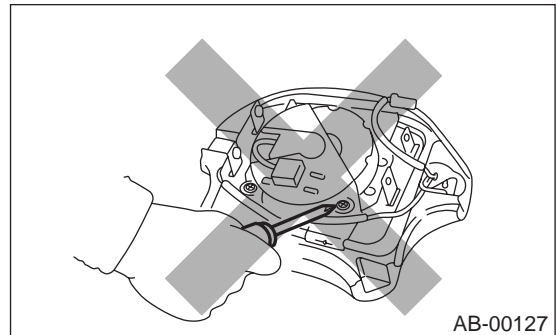
- Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



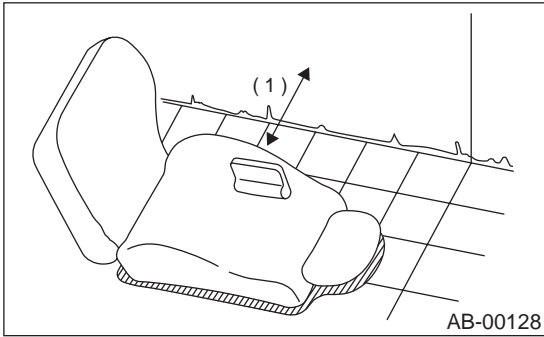
- Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



- Either of the airbag parts, or pretensioner must not be disassembled.

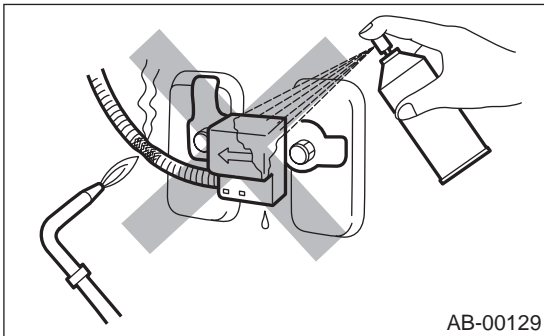


- The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



(1) More than 200 mm (8 in)

- Do not use the airbag or pretensioner parts from other vehicles. Always replace defective parts with new parts.
- Never re-use a deployed airbag or pretensioner.
- When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove parts and take utmost care not to apply paint or the flame of the welding burner directly to the front sub sensors and wire harness of the airbag system.
- When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove parts and take utmost care not to apply paint or the flame of the welding burner directly to the side airbag sensors and wire harness of the airbag system.

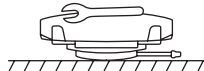
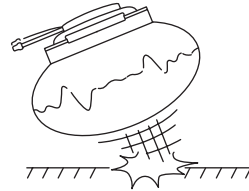
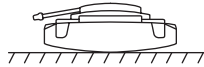
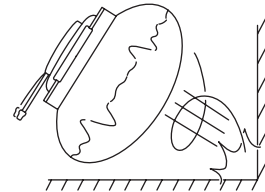
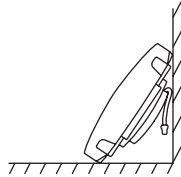
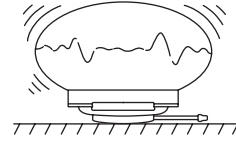
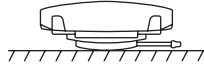


GENERAL DESCRIPTION

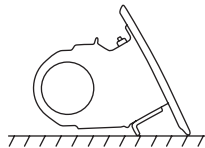
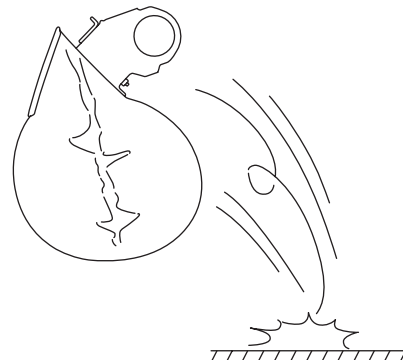
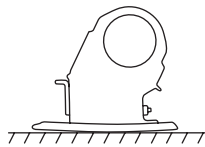
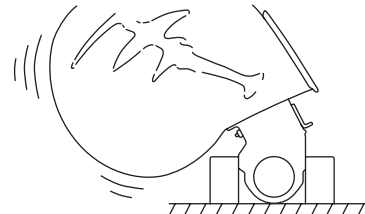
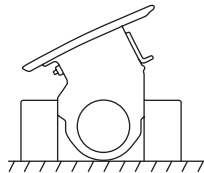
AIRBAG SYSTEM

- When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.

(1)



(2)



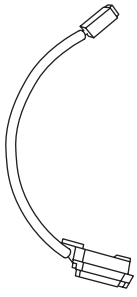
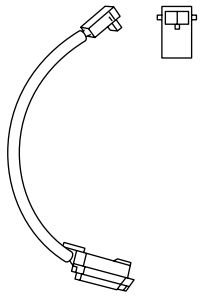
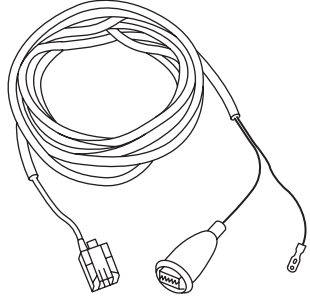
AB-00130

(1) Driver side

(2) Passenger side

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST98299FC030</p>	98299FC030	DEPLOYMENT TOOL ADAPTER A	<ul style="list-style-type: none"> Used for deploying the driver's airbag module, passenger's airbag module, side airbag module and seat belt pretensioner. Used with DEPLOYMENT TOOL (98299PA030).
 <p style="text-align: center;">ST98299SA010</p>	98299SA010	TEST HARNESS ADAPTER D	<ul style="list-style-type: none"> Used for deploying the driver's airbag module. Used with DEPLOYMENT TOOL (98299PA030). Can not reuse.
 <p style="text-align: center;">ST98299PA030</p>	98299PA030	DEPLOYMENT TOOL	<ul style="list-style-type: none"> Used for deploying the airbag module. Used with DEPLOYMENT ADAPTER A (98299FC030).

2. GENERAL TOOL

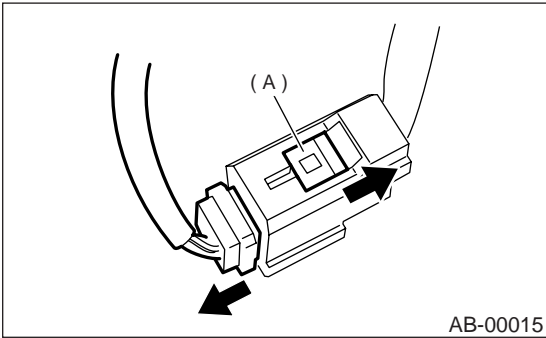
TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of driver's airbag module
TORX® T40 (Tamper resistant type)	Used for removal/installation of airbag control module
TORX® E12	Used for removal of side airbag sensor.

2. Airbag Connector

A: OPERATION

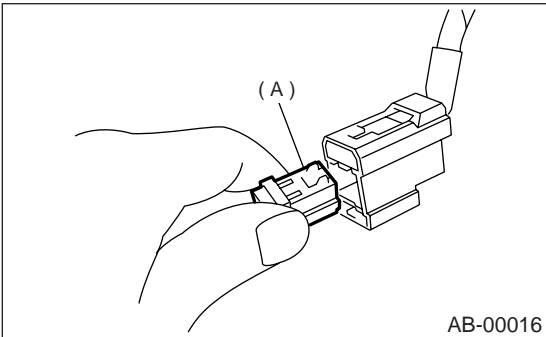
1. POWER SUPPLY

- 1) How to disconnect:
 - (1) Move the slide lock (A) in the direction of the arrow.
 - (2) Pull the female connector in the direction of the arrow with slide lock (A) moved.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

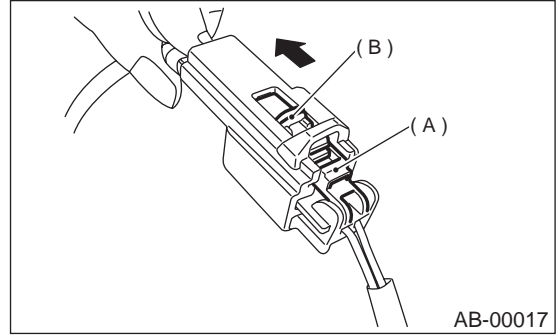
- 2) How to connect:
Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

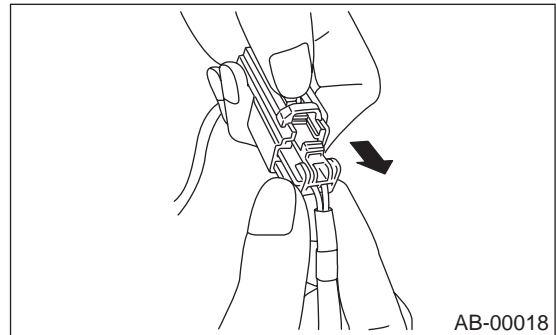
2. DRIVER'S AIRBAG, PASSENGER'S AIRBAG, SIDE AIRBAG, FRONT SUB SENSOR HARNESS TO AIRBAG MAIN HARNESS AND PRETENSIONER

- 1) How to disconnect:
 - (1) Push lock arm (A).
 - (2) With lock arm (A) pushed in, move slide lock (B) in the direction of the arrow.



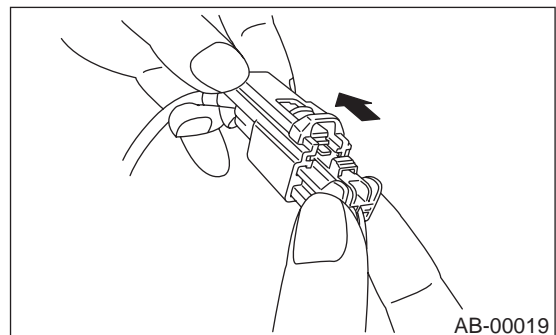
- (3) With slide lock (B) pulled, remove lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



- 2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

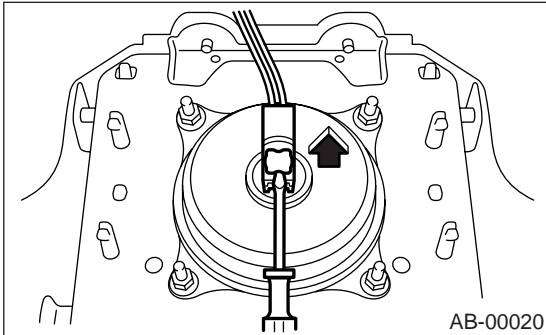
CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



3. DRIVER'S AIRBAG (ROLL CONNECTOR AND AIRBAG MODULE)

1) How to disconnect:

- (1) Using a flat tip screwdriver, pry the push lock upward to unlock.



- (2) Pull the connector to disconnect from driver's side airbag module assembly.

2) How to connect:

Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

CAUTION:

Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

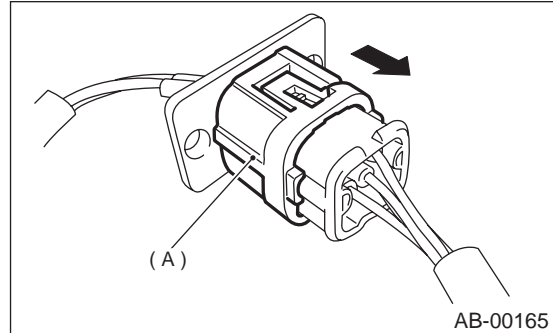
4. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR

1) How to disconnect:

- Holding outer part (A), pull it in the direction of the arrow.

CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

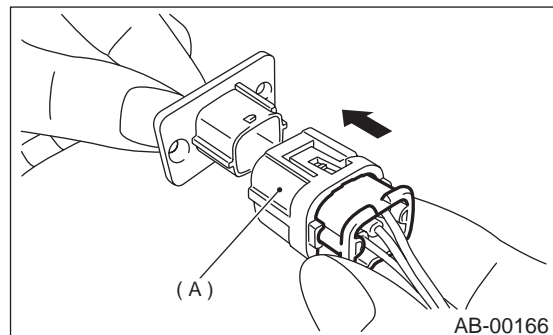


2) How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:

- Outer (A) moves back, and so do not put your hand on the outer part.
- Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



INSPECTION LOCATIONS AFTER A COLLISION

AIRBAG SYSTEM

3. Inspection Locations After a Collision

A: INSPECTION

If the vehicle is involved in a collision on any side, even if it is a slight collision, be sure to check the following system parts.

1. AIRBAG MODULE (DRIVER)

1) Check for the following, and replace damaged parts with new parts.

- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
- The module surface is fouled with grease, oil, water or cleaning solvent.

2) When installing a new driver's airbag module, check the following. If necessary, install a new airbag module and steering wheel.

- The clearance between the driver's airbag module and steering wheel is not constant.
- Free play of the steering wheel is over specifications in axial and radial directions.

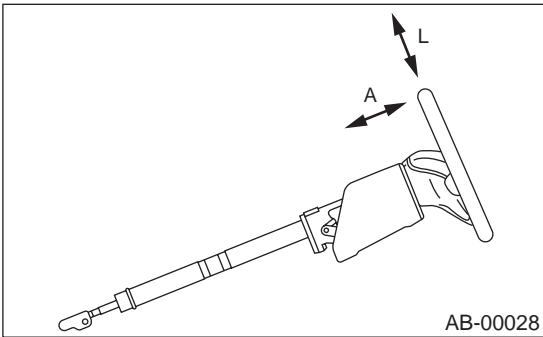
Specifications:

Height deflection

Less than 6 mm (0.24 in)

O.D. deflection

Less than 7 mm (0.28 in)



2. AIRBAG MODULE (PASSENGER)

Check for the following, and replace damaged parts with new parts.

- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
- Mounting bracket is cracked or deformed.

3. AIRBAG MODULE (SIDE)

Check for the following, and replace damaged parts with new parts.

- Front seat is damaged or deformed.
- Harness and/or connector is cracked, deformed or open.
- Lead wire is exposed.

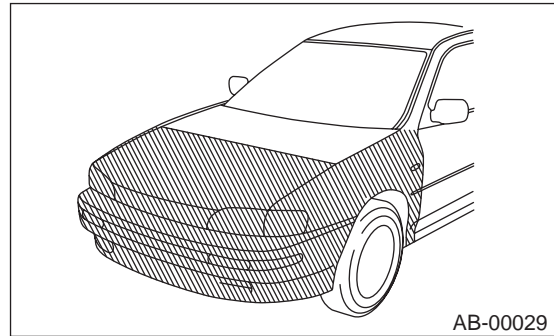
4. AIRBAG CONTROL MODULE

Check for the following, and replace damaged parts with new parts.

- Control module is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or deformed.
- Airbag is deployed.
- Side airbag is deployed.

5. FRONT SUB SENSOR

If the front section of vehicle as shown in the figure is damaged:



Check for the following, and replace damaged parts with new parts.

- Front sub sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Airbag is deployed.

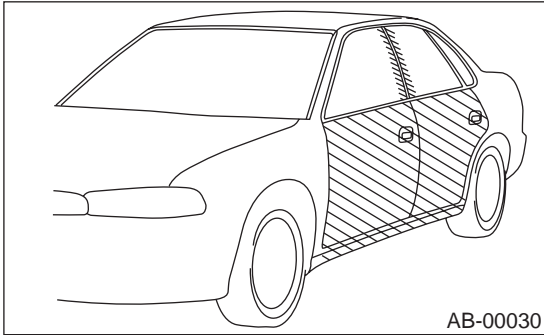
6. FRONT SUB SENSOR HARNESS

Check for the following, and replace damaged parts with new parts.

- Harness is open, lead wire is exposed, and corrugated tube is noticeably cracked.
- Connector is scratched or cracked.

7. SIDE AIRBAG SENSOR

If the side section of vehicle as shown in the figure is damaged:



Check for the following, and replace damaged parts with new parts.

- Side airbag sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Side airbag is deployed. (operating side)

8. SIDE AIRBAG SENSOR HARNESS

Check for the following, and replace damaged parts with new parts.

- Harness is open, lead wire is exposed, and corrugated tube is noticeably cracked.
- Connector is scratched or cracked.

9. MAIN HARNESS

Check for the following, and replace damaged parts with new parts.

- Harness is open, lead wire is exposed, and corrugated tube is noticeably cracked.
- Connector is scratched or cracked.

10. ROLL CONNECTOR

Check for the following, and replace damaged parts with new parts.

- Combination switch or steering roll connector is cracked or deformed.

11. STEERING SHAFT

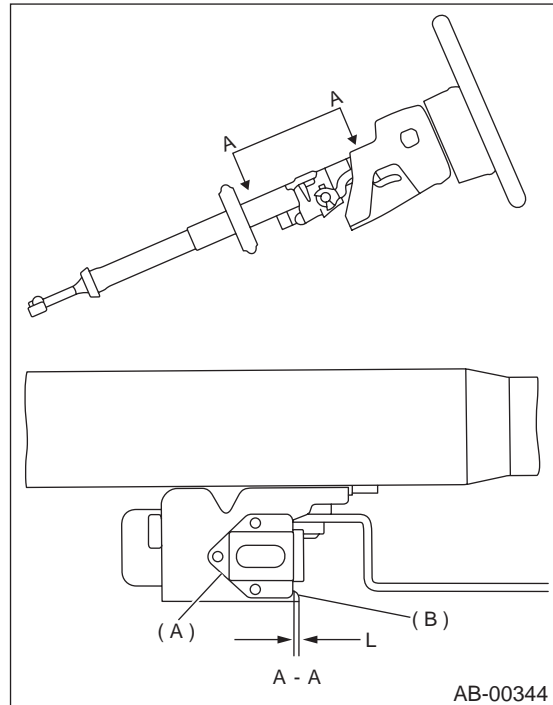
Check for the following, and replace damaged parts with new parts.

The clearance between capsule (A) and tip of column bracket (B) on steering column upper side should be within specifications.

Specifications:

Clearance between capsule and tip of column bracket L

More than 1.3 mm (0.051 in)



If necessary, replace them with new parts.

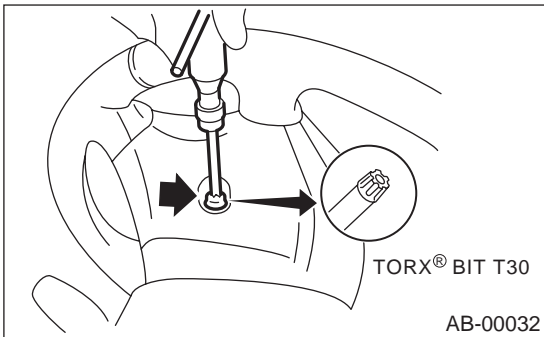
4. Driver's Airbag Module

A: REMOVAL

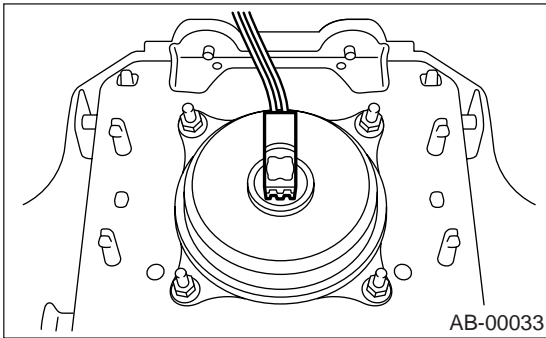
CAUTION:

Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

- 1) Position front wheels straight ahead. (After moving a vehicle more than 5 m (16 ft) with front wheels positioned straight ahead, make sure that the vehicle moves straight ahead).
- 2) Turn ignition switch OFF.
- 3) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 4) Using TORX® BIT T30, remove two TORX® bolts on side of steering wheel.



- 5) Disconnect airbag connector on back of airbag module, and then remove airbag module.



- 6) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Do not allow harness and connectors to interfere or get tangled up with other parts.

C: INSPECTION

CAUTION:

Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

Check for the following, and replace damaged parts with new parts.

- Airbag module, harness, connector, and mounting bracket are damaged.

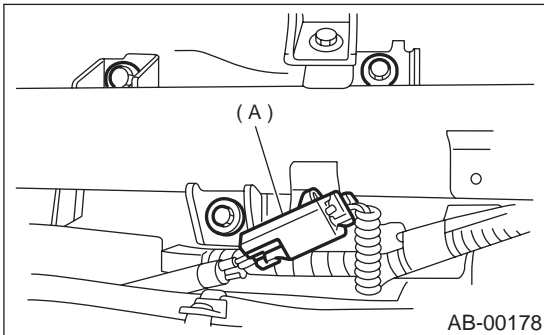
5. Passenger's Airbag Module

A: REMOVAL

CAUTION:

Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove glove box. <Ref. to EI-32, REMOVAL, Glove Box.>
- 4) Disconnect airbag connector (A), and then detach airbag connector from support beam bracket.
- 5) Remove three bolts, and then carefully remove airbag module.



- 6) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Do not allow harness and connectors to interfere or get tangled up with other parts.

C: INSPECTION

CAUTION:

Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

Check for the following, and replace damaged parts with new parts.

- Airbag module, harness, connector, and mounting bracket are damaged.

6. Side Airbag Module

A: REMOVAL

CAUTION:

Refer to “CAUTION” in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

When replacing side airbag module: <Ref. to SE-9, DISASSEMBLY, Front Seat.>

B: INSTALLATION

<Ref. to SE-8, INSTALLATION, Front Seat.>

C: INSPECTION

CAUTION:

Refer to “CAUTION” in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

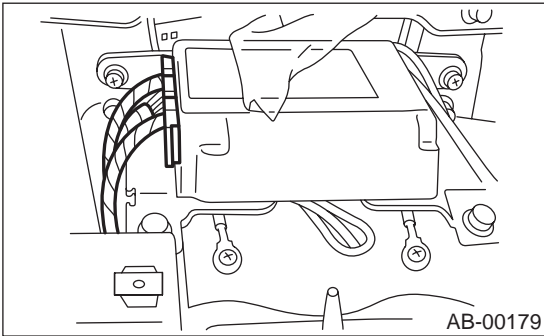
Check for the following, and replace damaged parts with new parts.

- Front seat is deformed or damaged.
- Harness and/or connector is cracked, deformed or open.
- Lead wire is exposed.

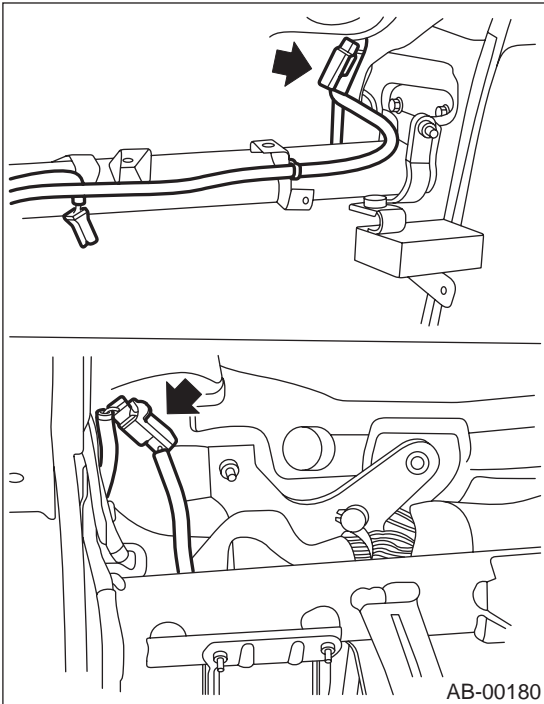
7. Main Harness

A: REMOVAL

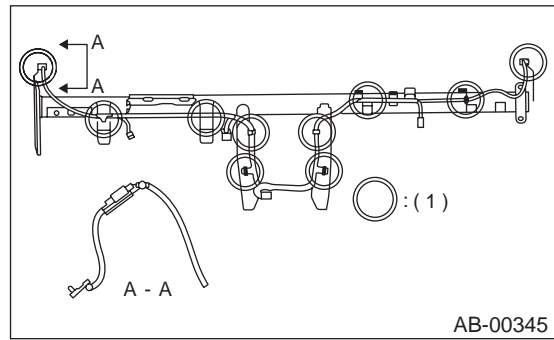
- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery and wait for at least 20 seconds before starting work.
- 3) Remove instrument panel. <Ref. to EI-35, REMOVAL, Instrument Panel Assembly.>
- 4) Disconnect connector from airbag control module.



- 5) Disconnect front sub sensor connector (blue) from airbag main harness.



- 6) Detach clips from steering support beam, and remove main harness.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

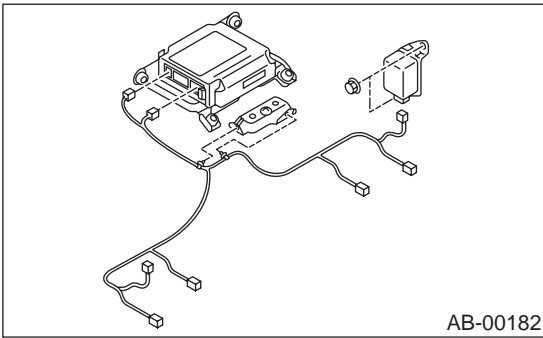
Check for the following, and replace damaged parts with new parts.

- Harness and/or connector is damaged.

8. Side Airbag Harness

A: REMOVAL

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove front seat. <Ref. to SE-7, REMOVAL, Front Seat.>
- 4) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>
- 5) Roll up floor mat, and then disconnect two 12-pin yellow connectors from airbag control module.
- 6) Disconnect connector from side airbag sensor. <Ref. to AB-18, REMOVAL, Side Airbag Sensor.>
- 7) Detach clips, and then remove side airbag harness.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check for the following, and replace damaged parts with new parts.

- Harness and/or connector is damaged.

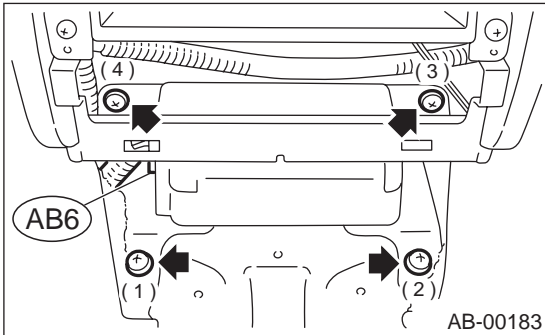
9. Airbag Control Module

A: REMOVAL

CAUTION:

- Do not disassemble the airbag control module.
- If the airbag control module is deformed or if water damage is suspected, replace the airbag control module with a new genuine part.
- Do not drop the airbag control module.
- After removal, keep the airbag control module on a dry, clean surface away from moisture, heat, and dust.

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>
- 4) Disconnect connector from airbag control module.
- 5) Using T40[®] TORX bit (Tamper resistant type), remove four TORX[®] bolts in the order shown in the figure.



B: INSTALLATION

CAUTION:

- Use new TORX[®] bolts during re-assembly.
Install in the reverse order of removal.**

C: INSPECTION

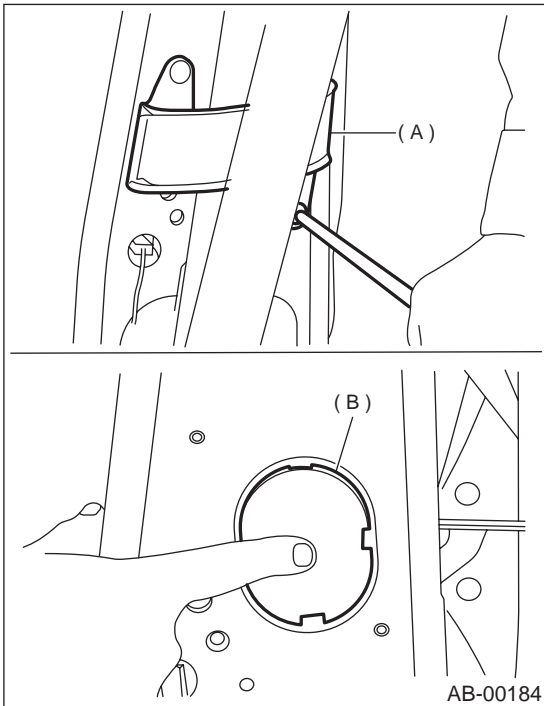
Check for the following, and replace damaged parts with new parts.

- Control module, connector, and mounting bracket are damaged.
- Airbag is deployed.
- Side airbag is deployed.

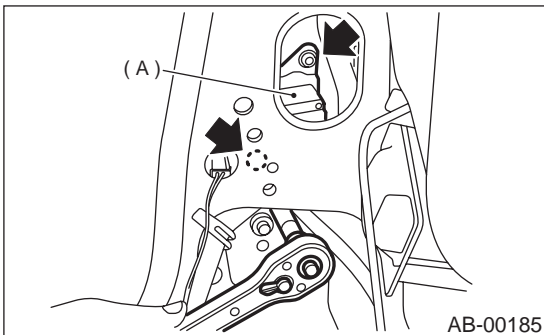
10. Side Airbag Sensor

A: REMOVAL

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove center pillar lower trim. <Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 4) Remove Outer Belt (FRONT). <Ref. to SB-7, OUTER BELT (FRONT), REMOVAL, Front Seat Belt.>
- 5) Remove bracket (A), and then remove cap (B).



- 6) Using E12 TORX®, remove two TORX® nuts, and then detach side airbag sensor (A).



B: INSTALLATION

CAUTION:

Use new TORX® nuts during re-assembly.
Install in the reverse order of removal.

C: INSPECTION

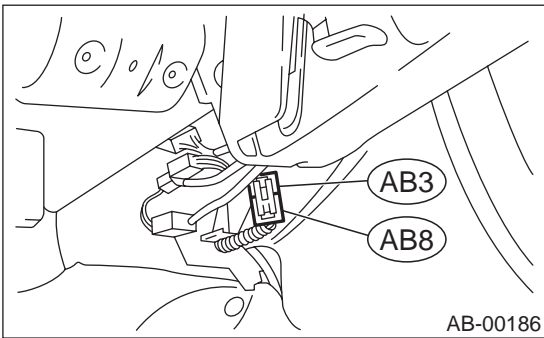
Check for the following, and replace damaged parts with new parts.

- Bracket connector for side airbag sensor is damaged.

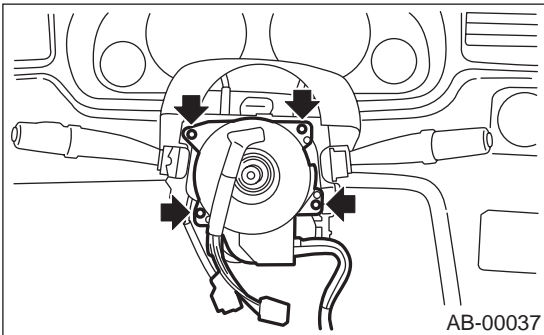
11.Roll Connector

A: REMOVAL

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove instrument panel lower cover.
- 4) Disconnect airbag connector (AB3) and (AB8) below steering column.



- 5) Remove driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- 6) Remove steering wheel. <Ref. to PS-24, REMOVAL, Steering Wheel.>
- 7) Remove steering column cover.
- 8) Remove screws, and then remove roll connector.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

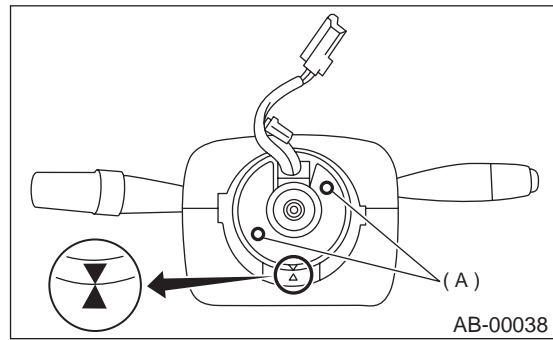
Check for the following, and replace damaged parts with new parts.

- Combination switch and roll connector is cracked or deformed.

D: ADJUSTMENT

- 1) Check that front wheels are positioned in straight ahead direction.
- 2) Turn roll connector pin (A) clockwise until it stops.

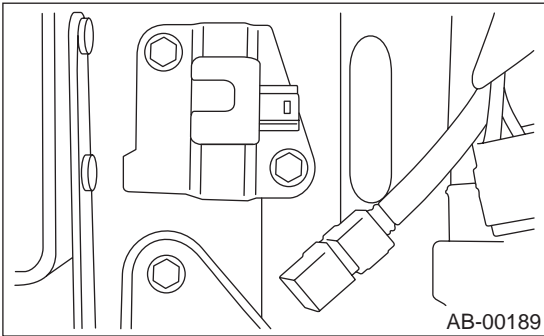
- 3) Turn roll connector pin (A) counterclockwise approximately 2.65 turns until "▲" marks are aligned.



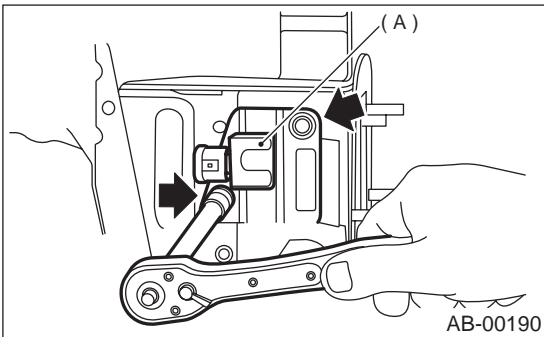
12. Front Sub Sensor

A: REMOVAL

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove front bumper. <Ref. to EI-14, REMOVAL, Front Bumper.>
- 4) Disconnect connector from front sub sensor.



- 5) Remove front sub sensor (A).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

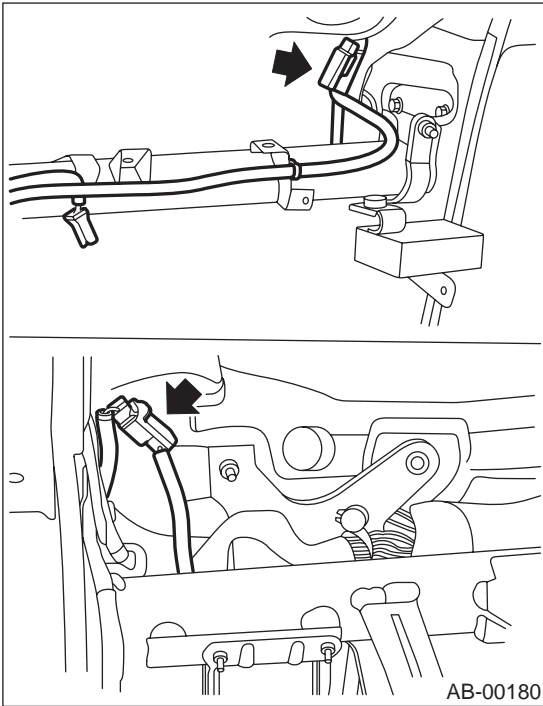
Check for the following, and replace damaged parts with new parts.

- Front sub sensor, mounting bracket, and connector are damaged.

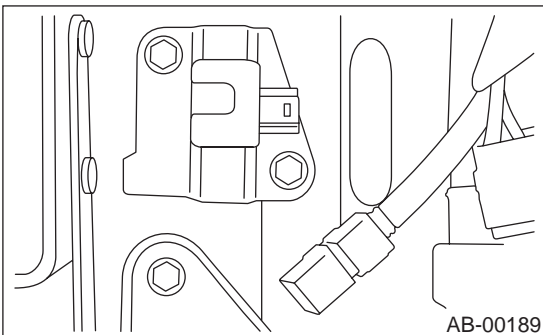
13. Front Sub Sensor Harness

A: REMOVAL

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove instrument panel. <Ref. to EI-35, REMOVAL, Instrument Panel Assembly.>
- 4) Disconnect front sub sensor connector (blue) from airbag main harness.

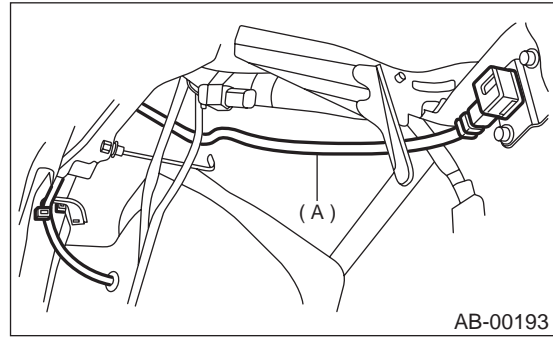


- 5) Remove front bumper. <Ref. to EI-14, REMOVAL, Front Bumper.>
- 6) Disconnect connector from front sub sensor.



- 7) Remove wiring harness clips.

- 8) Remove grommet, and then detach front sub sensor harness (A).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check for the following, and replace damaged parts.

- Harness and/or connector is damaged.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

14. Disposal of Airbag Module (Deploying While Installed in Vehicle)

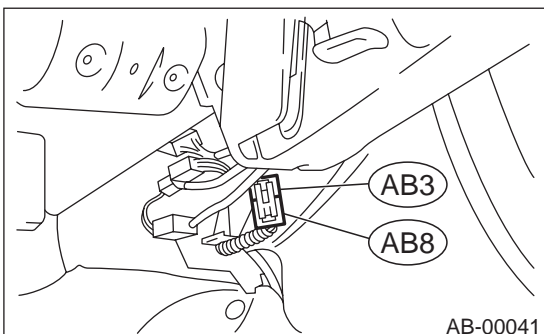
A: OPERATION

CAUTION:

- Do not discard undeployed airbag module because it may cause serious personal injury when accidentally deployed.
- As a rule, the airbag module should be deployed while still installed in the vehicle. Do not remove it unless necessary.
- Deployment of the airbag module should be done on a flat place free from any possible danger. Avoid deploying outdoors during rainy or windy weather.
- Because deploying the airbag module causes a high explosive noise, be sure to warn people in the area, and do not allow anyone within a 5 m (16 ft) radius of the disposal site.
- Some smoke will be emitted from deployment of the airbag module. Therefore, it must be deployed in a well-ventilated place with no fire alarms nearby.
- Wear gloves, goggles, and earplugs during this operation. Wash your hands afterwards.
- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.
- Wrap the deployed airbag module in an air-tight vinyl bag, and discard it.
- If circumstances do not permit airbag module deployment, contact a Subaru dealer.

1. AIRBAG MODULE (DRIVER)

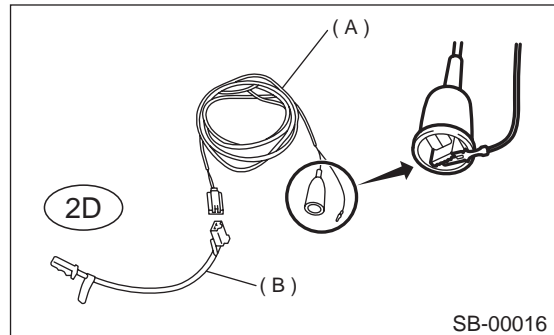
- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove lower cover.
- 4) Disconnect airbag connector (AB3) and (AB8) below steering column.



- 5) Short terminal to alligator clip furnished as deployment tool.
- 6) Connect the deployment tool and adapter A (deployment).

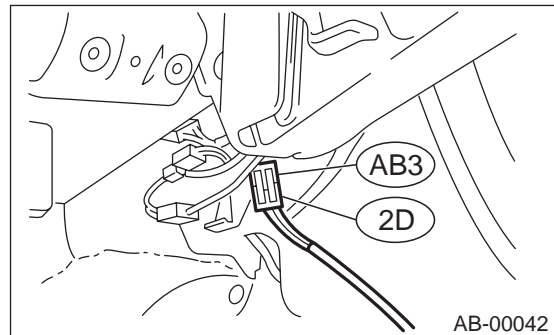
CAUTION:

The deployment tool should be kept shorted until just before deployment of the airbag module.

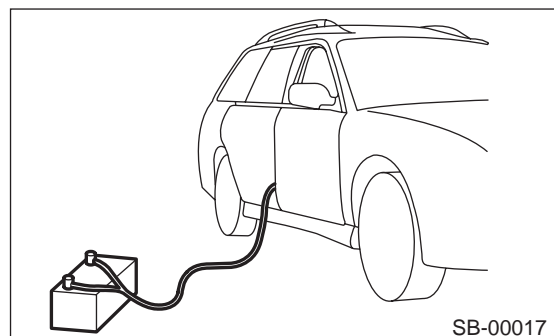


- (A) Deployment tool: (Part No. 98299PA030)
(B) Adapter A (deployment): (Part No. 98299FC030)

- 7) Connect adapter A (deployment) connector (2D) to airbag connector (AB3).



- 8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.

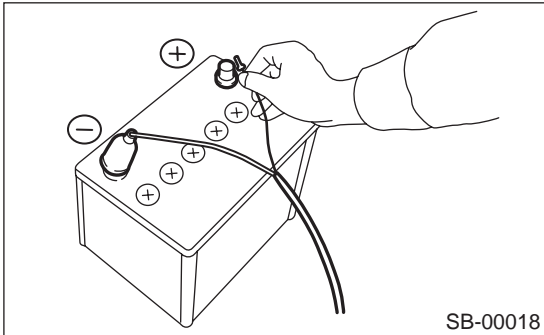


- 9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

10) Connect the other terminal of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.

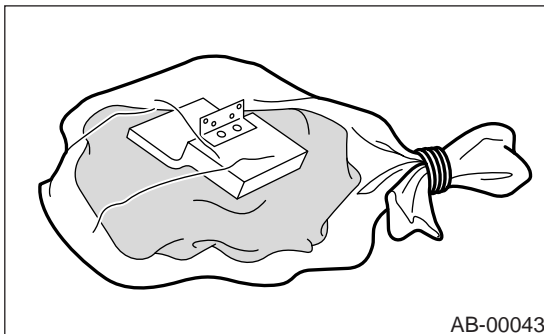


CAUTION:

- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

11) Remove airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.

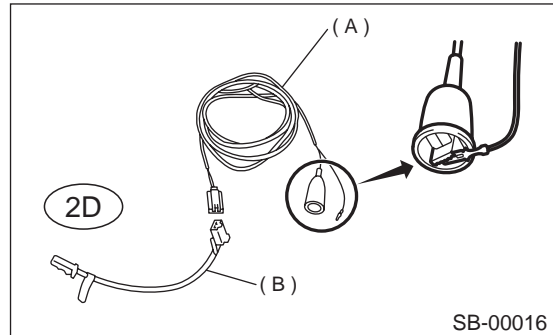


2. AIRBAG MODULE (PASSENGER)

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Pull out the two stopper pins and lower the glove box.
- 4) Disconnect airbag connectors (AB9) and (AB10).
- 5) Short terminal to alligator clip furnished as deployment tool.
- 6) Connect the deployment tool and adapter A (deployment).

CAUTION:

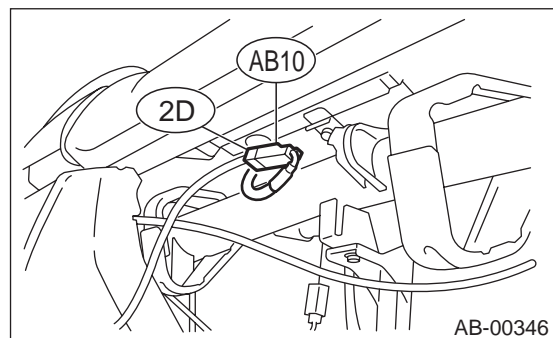
The deployment tool should be kept shorted until just before deployment of the airbag module.



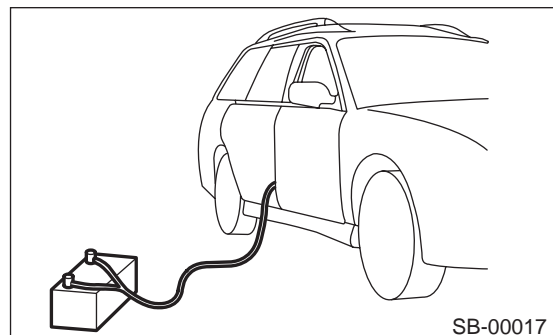
(A) Deployment tool: (Part No. 98299PA030)

(B) Adapter A (deployment): (Part No. 98299FC030)

7) Connect adapter A (deployment) connector (2D) to airbag connector (AB10).



8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.

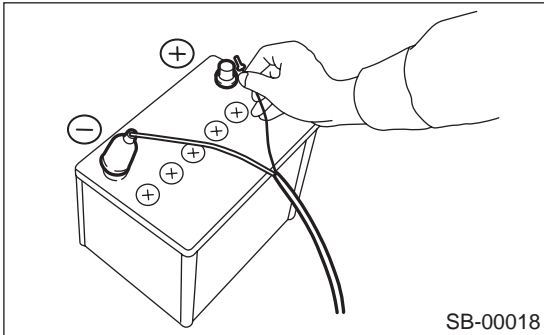


9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

10) Connect the other terminal of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.

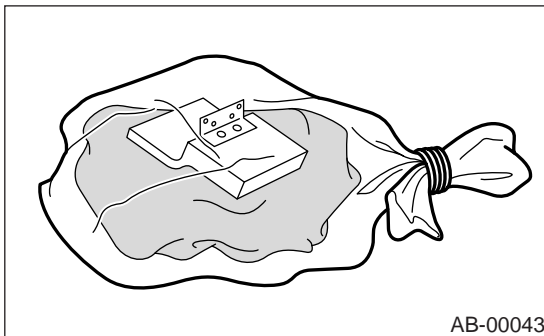


CAUTION:

- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

11) Remove airbag module. <Ref. to AB-13, REMOVAL, Passenger's Airbag Module.>

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



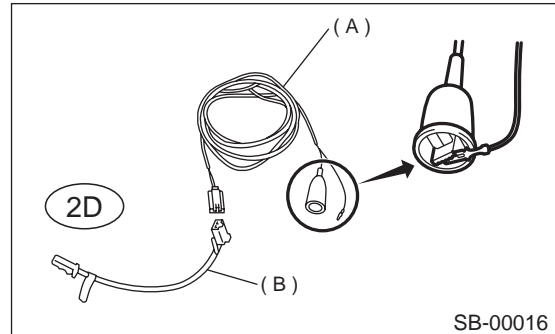
3. AIRBAG MODULE (SIDE)

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Disconnect the side airbag module connector (yellow) under the front seat cushion.
- 4) Adjust both the front seat and front seat backrest to center positions.
- 5) Short terminal to alligator clip furnished as deployment tool.

6) Connect the deployment tool and adapter A (deployment).

CAUTION:

The deployment tool should be kept shorted until just before deployment of the airbag module.



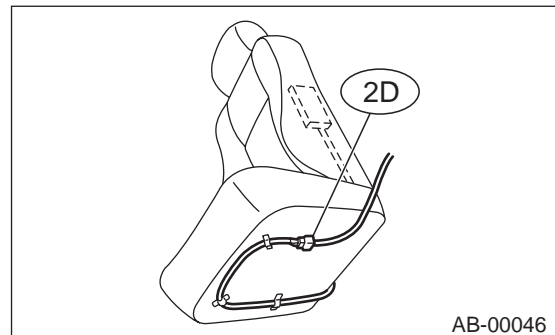
(A) Deployment tool: (Part No. 98299PA030)

(B) Adapter A (deployment): (Part No. 98299FC030)

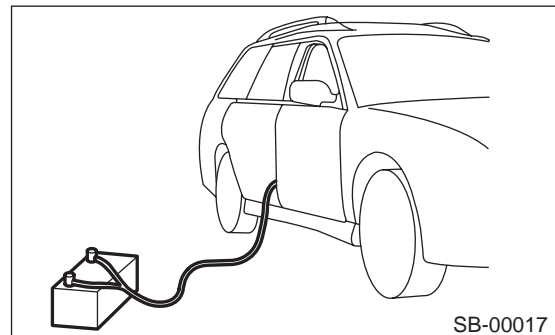
7) Connect adapter A (deployment) connector (2D) to side airbag module connector (yellow).

CAUTION:

- Do not put any objects on the front seat.
- Side airbag shall be deployed and disposed of one by one.



8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.

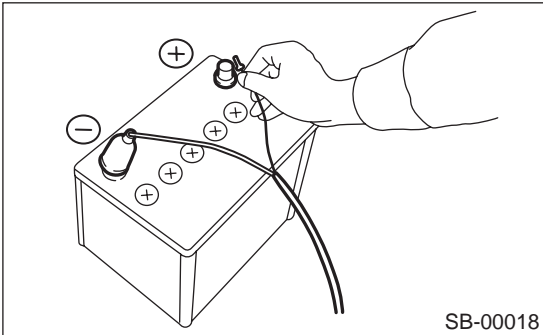


9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

10) Connect the other terminal of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.

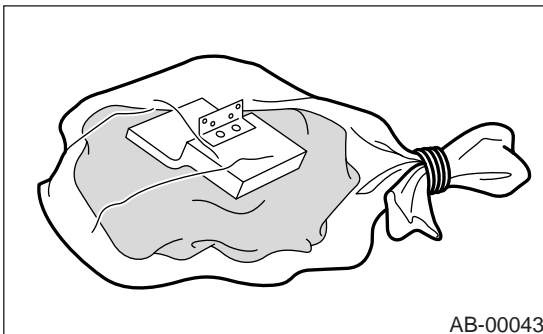


CAUTION:

- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

11) Remove side airbag module. <Ref. to SE-9, DISASSEMBLY, Front Seat.>

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

15. Disposal of Airbag Module (Deploying After Removal from Vehicle)

A: OPERATION

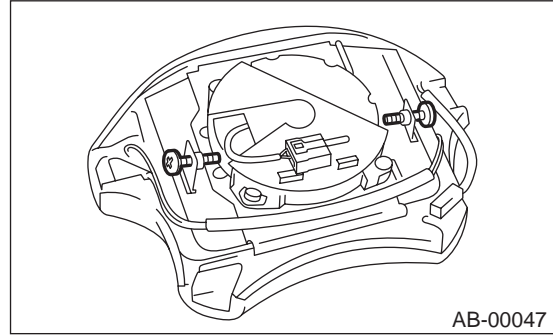
CAUTION:

- Do not discard undeployed airbag module because it may cause serious personal injury when accidentally deployed.
- As a rule, the airbag module should be deployed while still installed in the vehicle. Do not remove it unless necessary.
- Deployment of the airbag module should be done on a flat place free from any possible danger. Avoid deploying outdoors during rainy or windy weather.
- Do not damage the airbag module or drop it.
- Because deploying the airbag module causes a high explosive noise, be sure to warn people in the area, and do not allow anyone within a 5 m (16 ft) radius of the disposal site.
- Some smoke will be emitted from deployment of the airbag module. Therefore, it must be deployed in a well-ventilated place with no fire alarms nearby.
- Wear gloves, goggles, and earplugs during this operation. Wash your hands afterwards.
- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.
- Wrap the deployed airbag module in an airtight vinyl bag, and discard it.
- If circumstances do not permit airbag module deployment, contact a Subaru dealer.

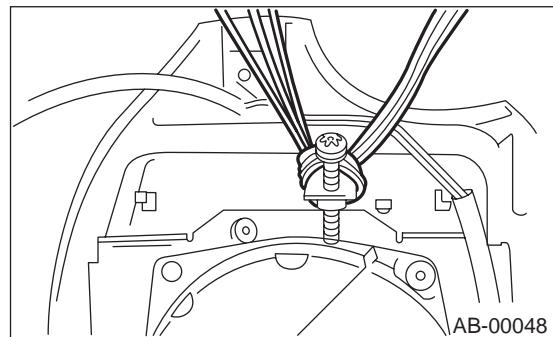
1. AIRBAG MODULE (DRIVER)

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

- 4) Install the removed bolts to airbag module.



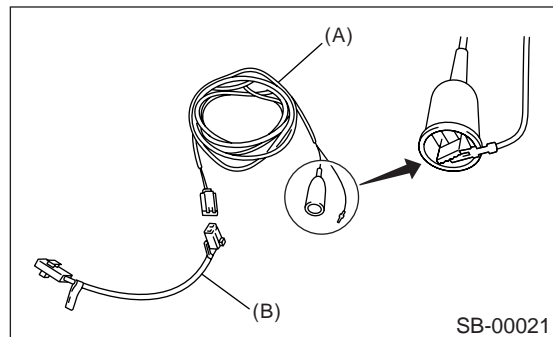
- 5) Bundle three wire automotive harnesses [each with a sectional area of 1.25 mm² (0.00194 sq in) or more], and bind them twofold around the airbag module stay.



- 6) Short terminal to alligator clip furnished as deployment tool.
- 7) Connect the deployment tool and adapter D (deployment).

CAUTION:

The deployment tool should be kept shorted until just before deployment of the airbag module.



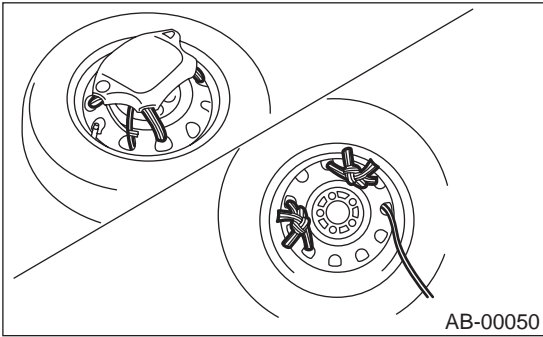
- (A) Deployment tool: (Part No. 98299PA030)
(B) Adapter D (deployment): (Part No. 98299SA010)

- 8) Connect adapter D (deployment) connector (2D) to airbag module.

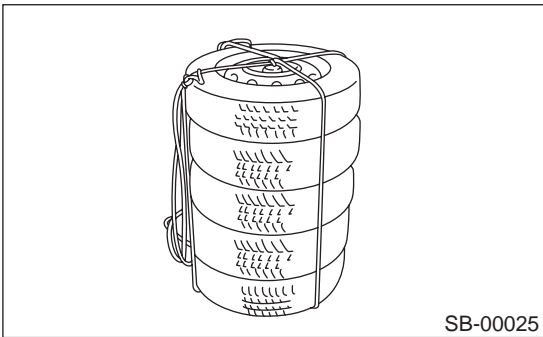
DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

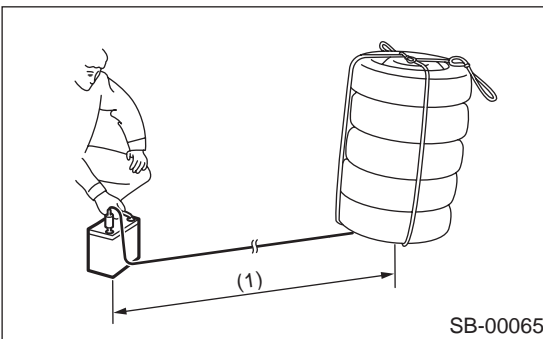
9) Install airbag module with pad side facing upward on the wheel with the tire.



10) Put three tires without the wheel on the tire installed with the airbag module. Put on an additional tire with the wheel, and then fasten them tight with rope.

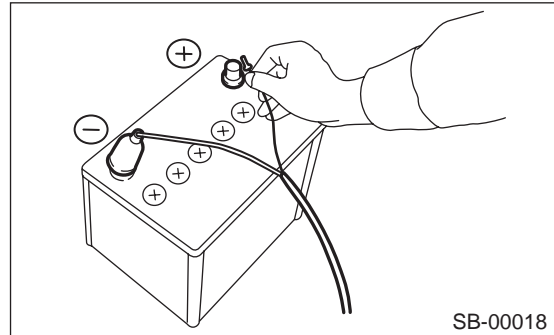


11) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.



(1) 5 m (16 ft) or more

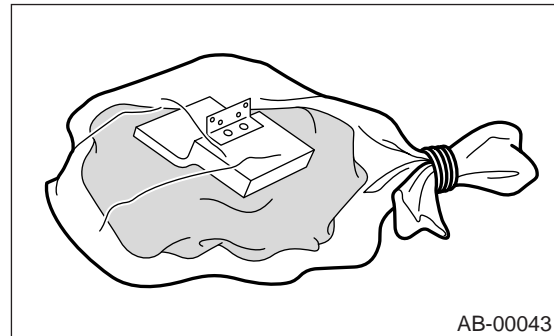
12) Connect the other terminal of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.



CAUTION:

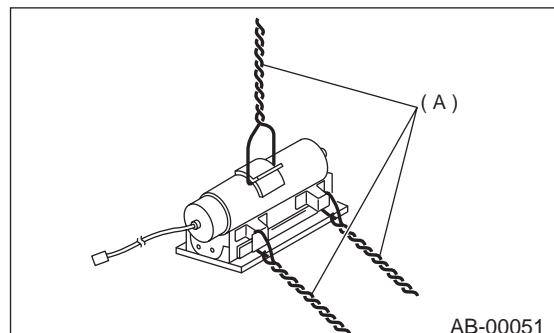
- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

13) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



2. AIRBAG MODULE (PASSENGER)

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove airbag module. <Ref. to AB-13, REMOVAL, Passenger's Airbag Module.>
- 4) Bundle three wire automotive harnesses [each with a sectional area of 1.25 mm² (0.00194 sq in) or more], and route them through the airbag module bracket (A). Then, twist them for added strength.



DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

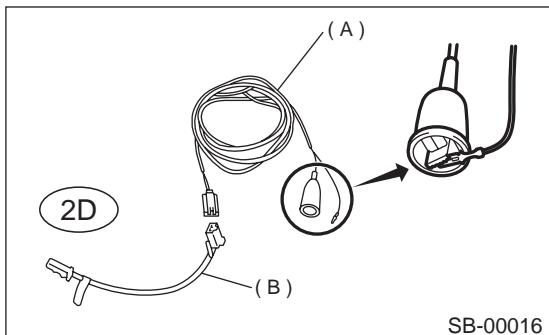
AIRBAG SYSTEM

5) Short terminal to alligator clip furnished as deployment tool.

6) Connect the deployment tool and adapter A (deployment).

CAUTION:

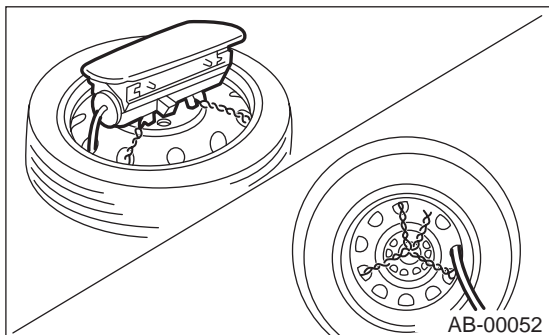
The deployment tool should be kept shorted until just before deployment of the airbag module.



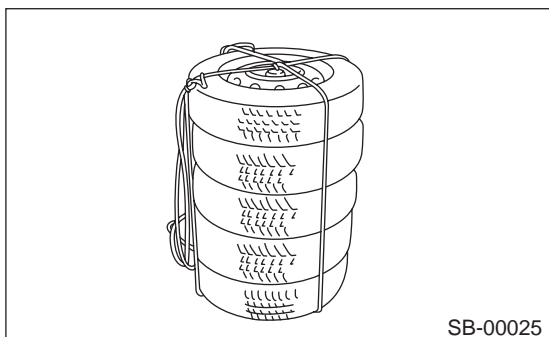
- (A) Deployment tool: (Part No. 98299PA030)
- (B) Adapter A (deployment): (Part No. 98299FC030)

7) Connect adapter A (deployment) connector (2D) to airbag module.

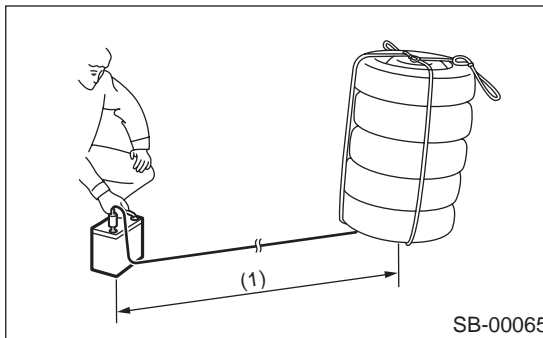
8) Install airbag module with pad side facing upward on 14 inch or greater size wheel with the tire.



9) Put three tires without the wheel on the tire installed with the airbag module. Put on an additional tire with the wheel on top, and then fasten them tight with rope.

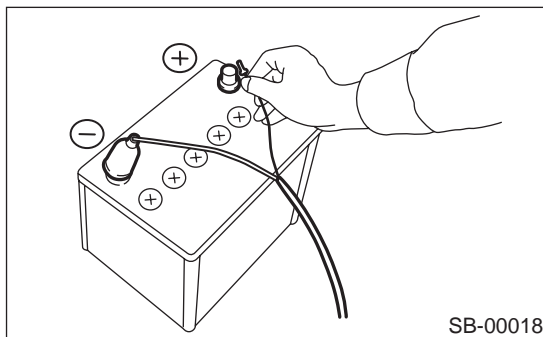


10) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.



(1) 5 m (16 ft) or more

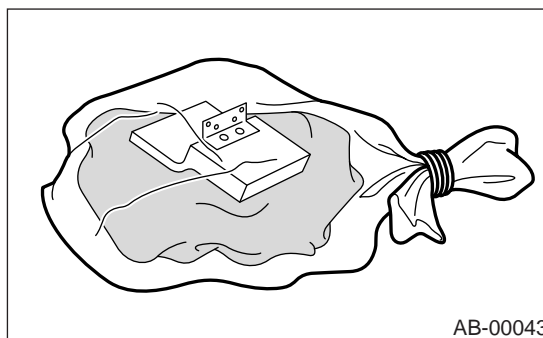
11) Connect the other terminal of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.



CAUTION:

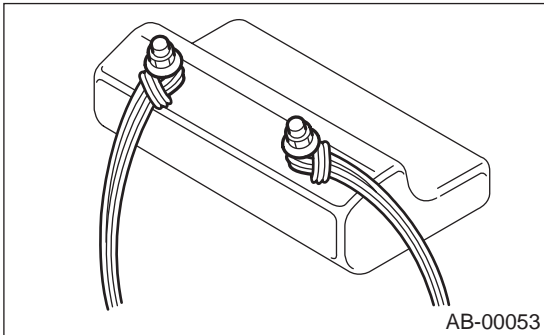
- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



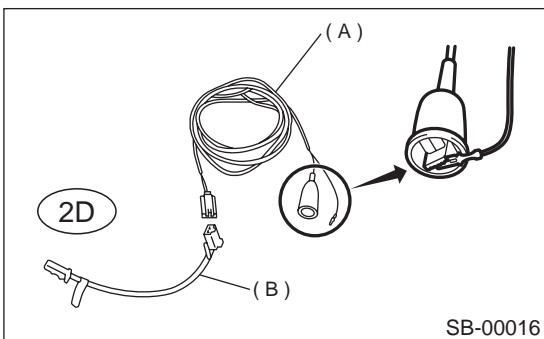
3. AIRBAG MODULE (SIDE)

- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove front seat. <Ref. to SE-7, REMOVAL, Front Seat.>>
- 4) Remove side airbag module. <Ref. to SE-9, DISASSEMBLY, Front Seat.>
- 5) Install nuts to side airbag module.
- 6) Bundle three wire automotive harnesses [each with a sectional area of 1.25 mm² (0.00194 sq in) or more], and bind them twofold around the airbag module stay.



- 7) Short terminal to alligator clip furnished as deployment tool.
- 8) Connect the deployment tool and adapter A (deployment).

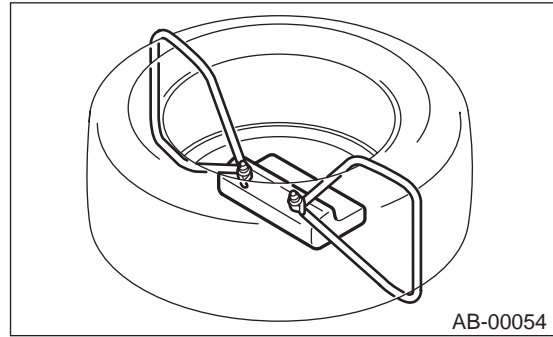
CAUTION:
The deployment tool should be kept shorted until just before deployment of the airbag module.



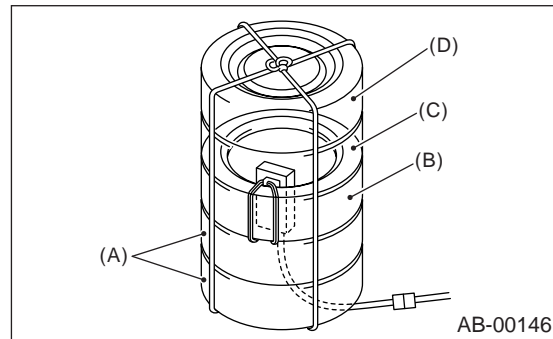
- (A) Deployment tool: (Part No. 98299PA030)
- (B) Adapter A (deployment): (Part No. 98299FC030)

- 9) Connect adapter A (deployment) connector (2D) to airbag module.

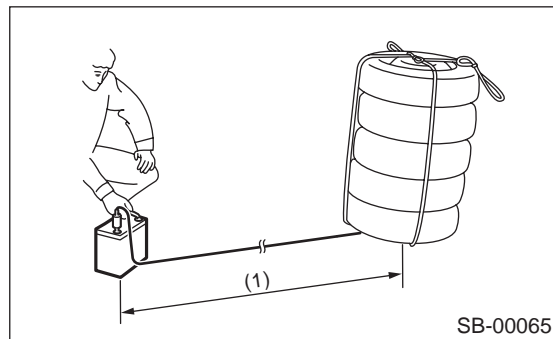
- 10) Install side airbag module on 14 inch or greater size tire without disk wheel.



Put two tires without the wheel (A) under the tire installed with the side airbag module (B). Put on an additional tire without disk wheel (C), and then put a tire with the wheel (D) on top. Fasten them tight with rope.



- 11) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.

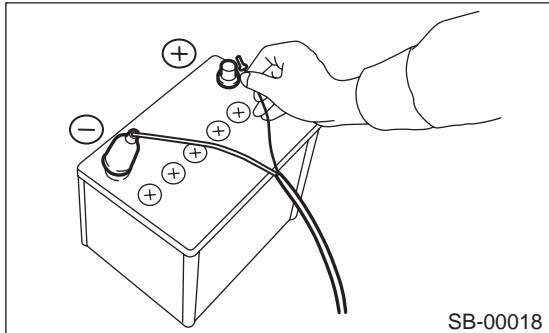


- (1) 5 m (16 ft) or more

DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

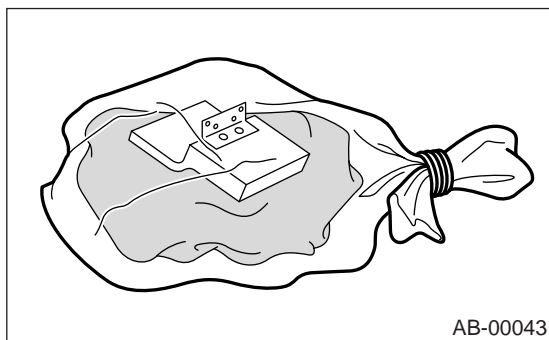
12) Connect the other terminal of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.



CAUTION:

- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

13) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



AIRBAG SYSTEM (DIAGNOSTICS)

AB

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2. Check List for Interview	3
3. General Description	4
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6. Airbag Warning Light Illumination Pattern	19
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8. Inspection Mode.....	21
9. Clear Memory Mode.....	22
10. Airbag Warning Light Failure.....	24
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12. Diagnostic Chart with Diagnostic Trouble Code (DTC).....	30

BASIC DIAGNOSTIC PROCEDURE

AIRBAG SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Value	Yes	No
1	Read DTC. <Ref. to AB-20, Read Diagnostic Trouble Code (DTC).>	Is the normal code being detected?	Finish the diagnosis.	Go to step 2.
2	Read DTC. <Ref. to AB-20, Read Diagnostic Trouble Code (DTC).>	Is the DTC being detected?	Go to step 3.	Go to "Airbag Warning Light Failure".<Ref. to AB-24, Airbag Warning Light Failure.>
3	Perform the diagnosis. 1) Judge the possible cause from "List of Diagnostic Trouble Code (DTC)" <Ref. to AB-28, List of Diagnostic Trouble Code (DTC).> . 2) Inspect using "Diagnostic Chart with Diagnostic Trouble Code (DTC)". 3) Repair the cause of the trouble. 4) Perform the clear memory mode. <Ref. to AB-22, Clear Memory Mode.> 5) Perform the inspection mode. <Ref. to AB-21, Inspection Mode.> 6) Read DTC.	Is the DTC being detected?	Perform the procedure 1) to 5) in step 3.	Finish the diagnosis.

CHECK LIST FOR INTERVIEW

AIRBAG SYSTEM (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Customer's Name		Inspector's Name	
Date Vehicle Brought In	/ /	Registration No.	
Odometer Reading	km Miles	Vin No.	
Date Problem Occurred	/ /	Registration Year	/ /
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Other:		
Temperature	°C (°F)		
Road Condition	<input type="checkbox"/> Level road <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Vehicle Operation	<input type="checkbox"/> Starting <input type="checkbox"/> Idling <input type="checkbox"/> Driving (<input type="checkbox"/> Constant Speed <input type="checkbox"/> Acceleration <input type="checkbox"/> Deceleration) <input type="checkbox"/> Steering wheel turn <input type="checkbox"/> Other:		
Details of Problem			
Check Airbag Warning Light	<input type="checkbox"/> Remains ON <input type="checkbox"/> Remains OFF		
Check DTC	<input type="checkbox"/> Normal Code <input type="checkbox"/> Trouble Code: (Code:)		

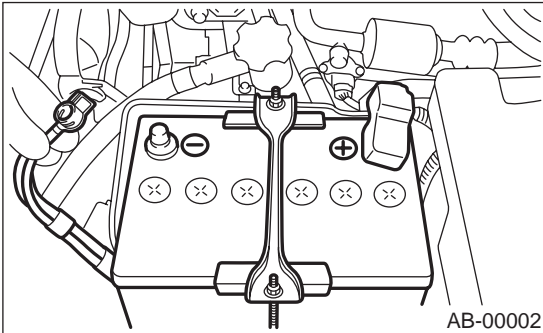
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

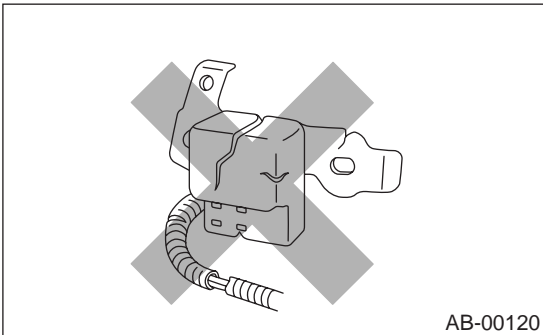
3. General Description

A: CAUTION

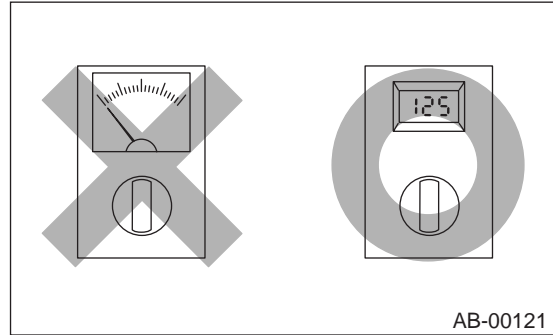
- When servicing a vehicle, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait for more than 20 seconds before starting work.
- The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.



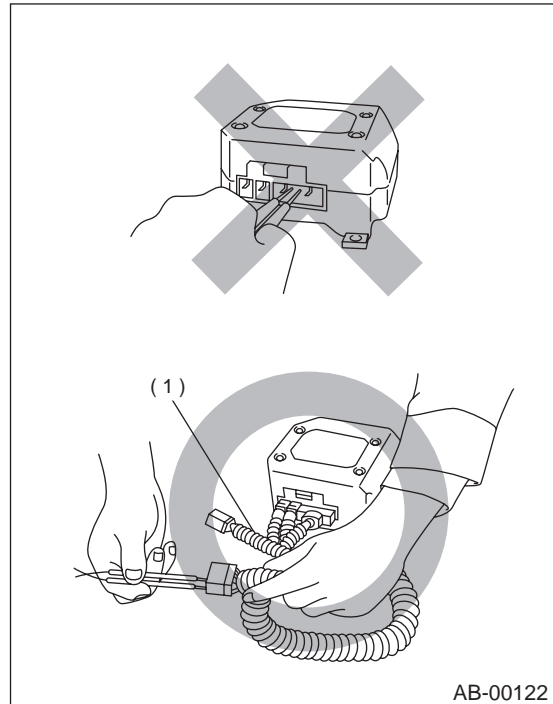
- If the airbag warning light illuminates, repair the vehicle immediately. Airbag or pretensioner may inflate incorrectly, or not inflate in collision.
- If sensors, airbag module, airbag control module pretensioner, and harness are deformed or damaged, replace them with new genuine parts.
- Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.



- When checking the system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously.



- When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.

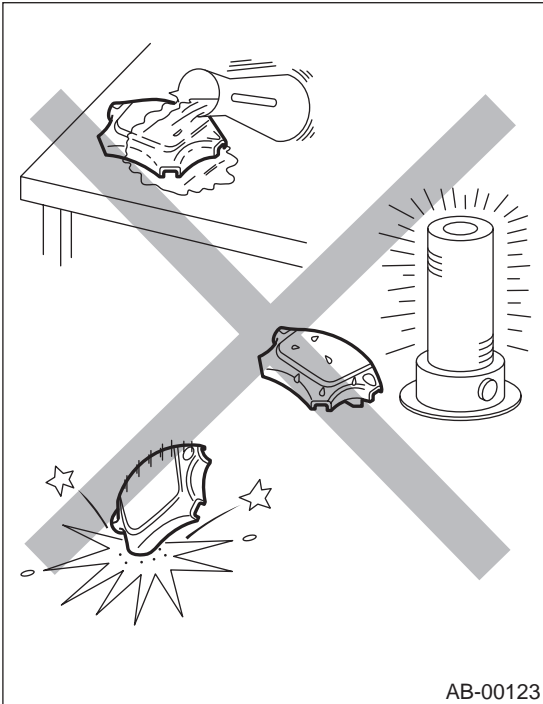


(1) Test harness

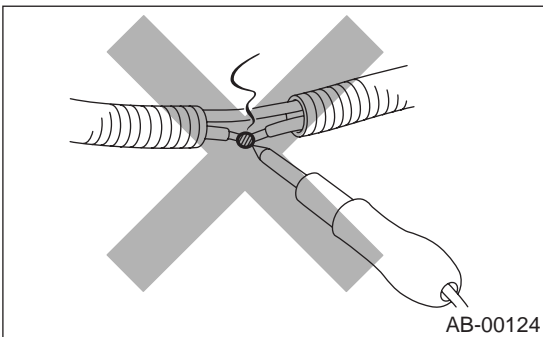
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

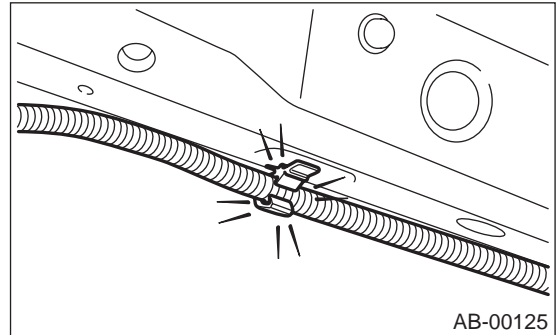
- Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



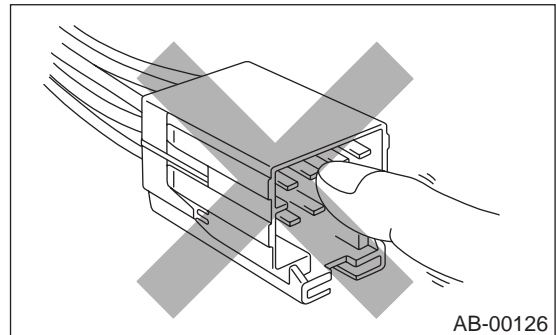
- If any damage, opening or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



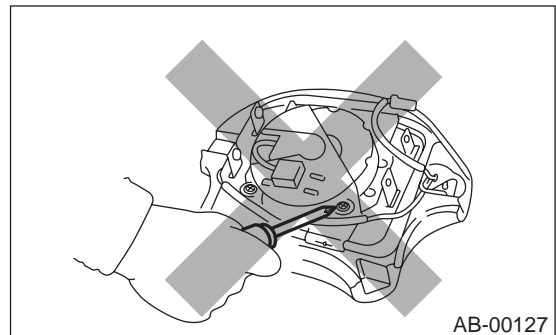
- Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



- Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



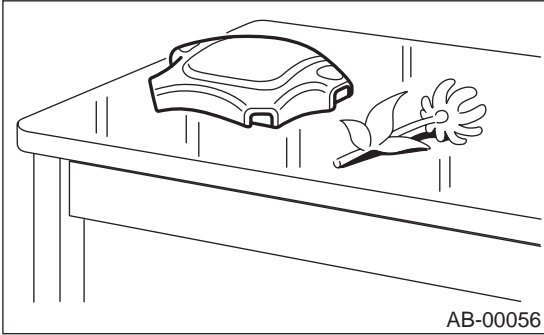
- The airbag module (driver, passenger, and side, pretensioner) must not be disassembled.
- The airbag module cannot be used again once inflated.



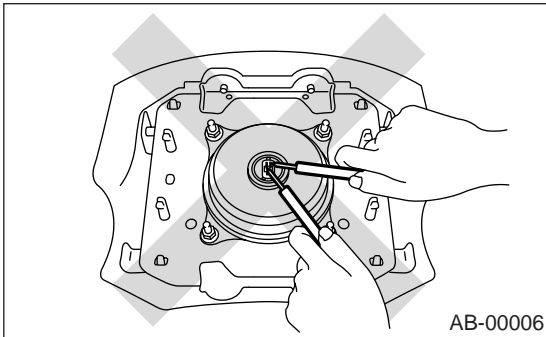
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

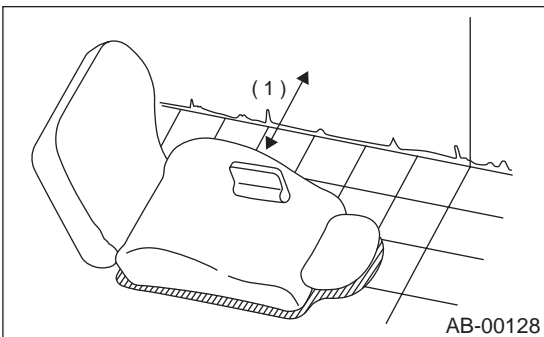
- After removal, keep the airbag module with the pad facing upward on a dry, clean, and flat surface away from heat and light sources, and moisture and dust.



- Do not check continuity of the airbag module (driver, passenger, and side, pretensioner).

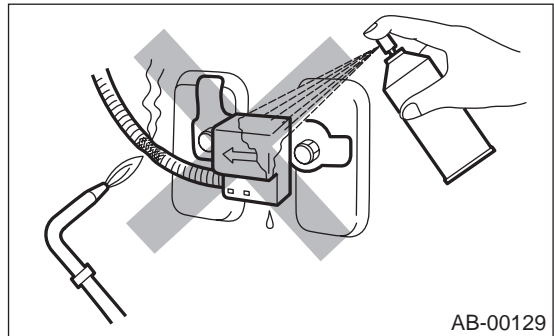


- The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



(1) More than 200 mm (8 in)

- When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.
- When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.



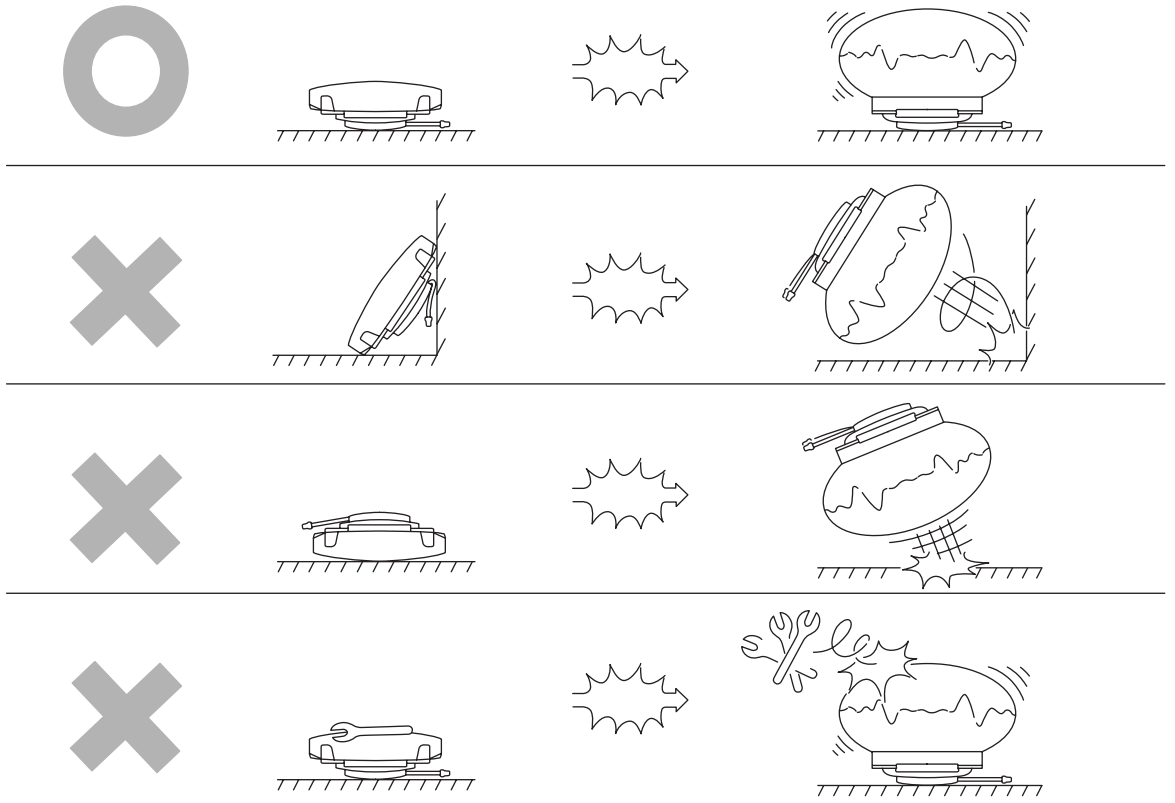
- Do not discard undeployed airbag modules. They could easily cause a serious accident if accidentally deployed.
- Do not damage the airbag module or drop it.

GENERAL DESCRIPTION

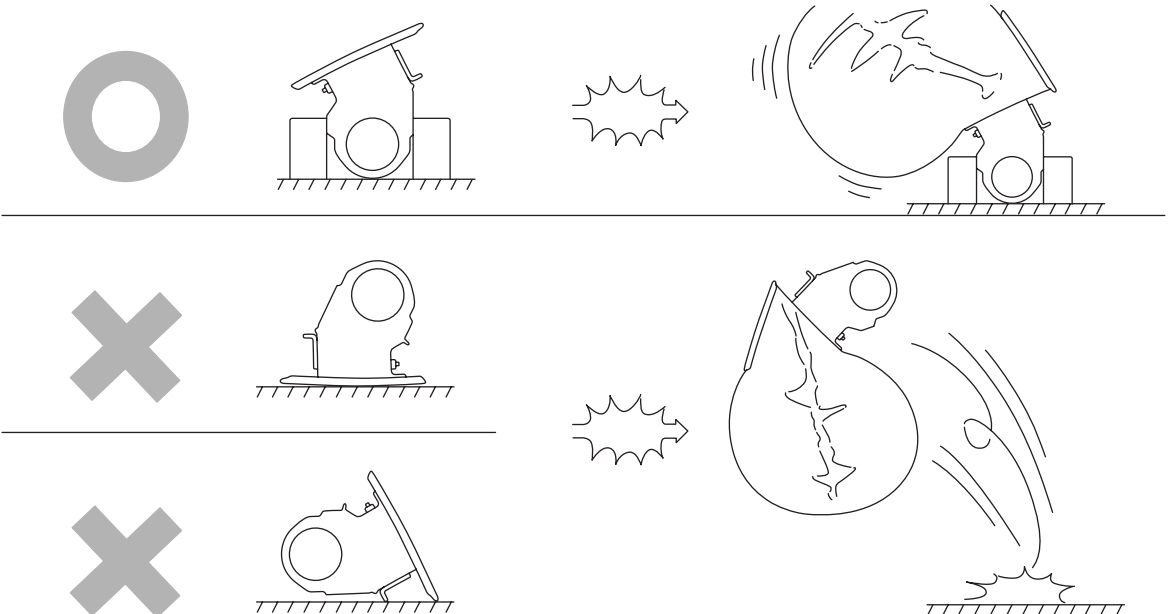
AIRBAG SYSTEM (DIAGNOSTICS)

- When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.

(1)



(2)



AB-00130

(1) Driver side

(2) Passenger side

GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

B: INSPECTION

Before diagnosing, check the following items that might be related to the engine problem:

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V

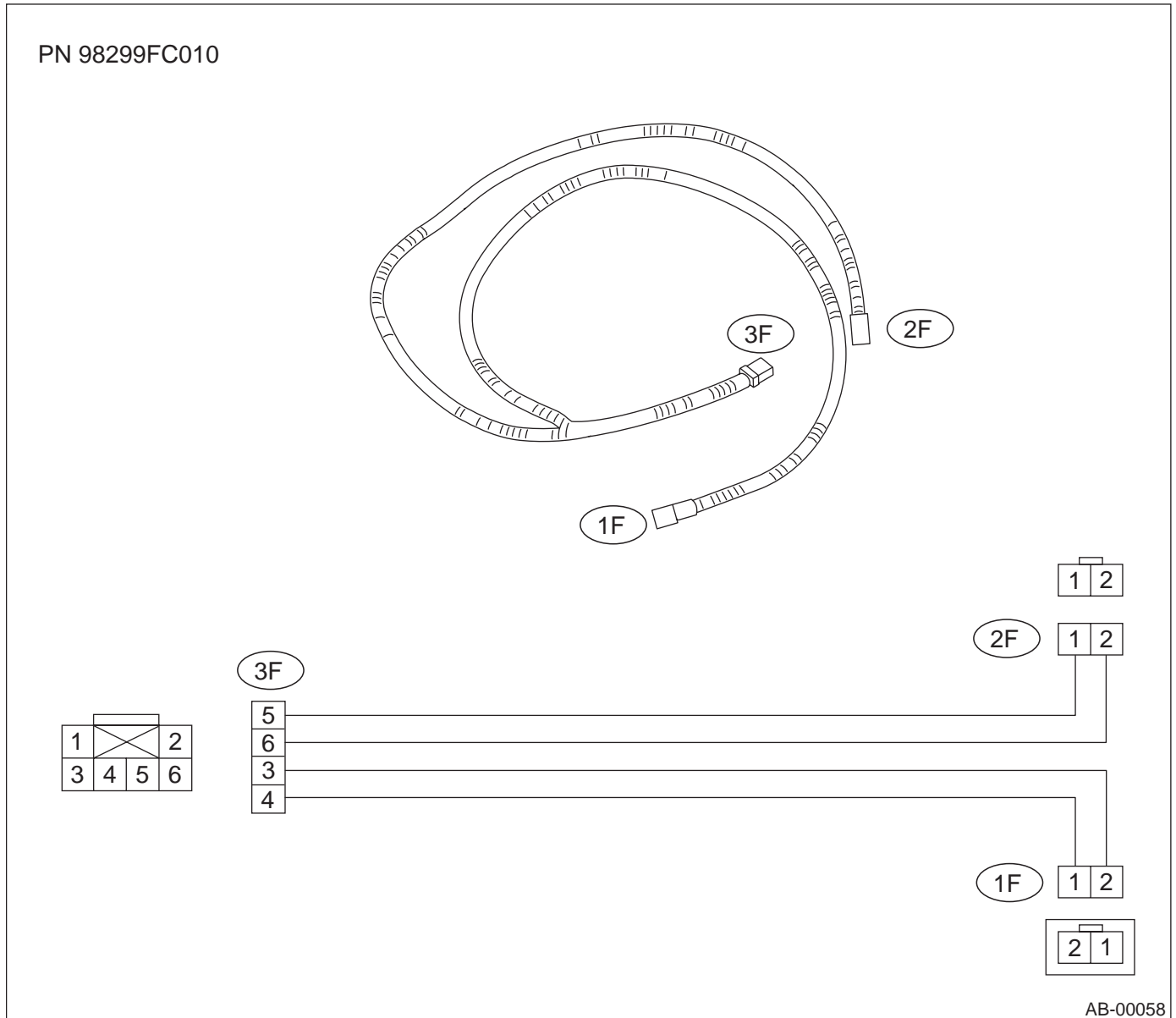
Specific gravity: Above 1.260

C: PREPARATION TOOL

CAUTION:

Be sure to use specified test harness F, G, H, K and I or I2 when measuring voltage, resistance, etc. of AIRBAG system component parts.

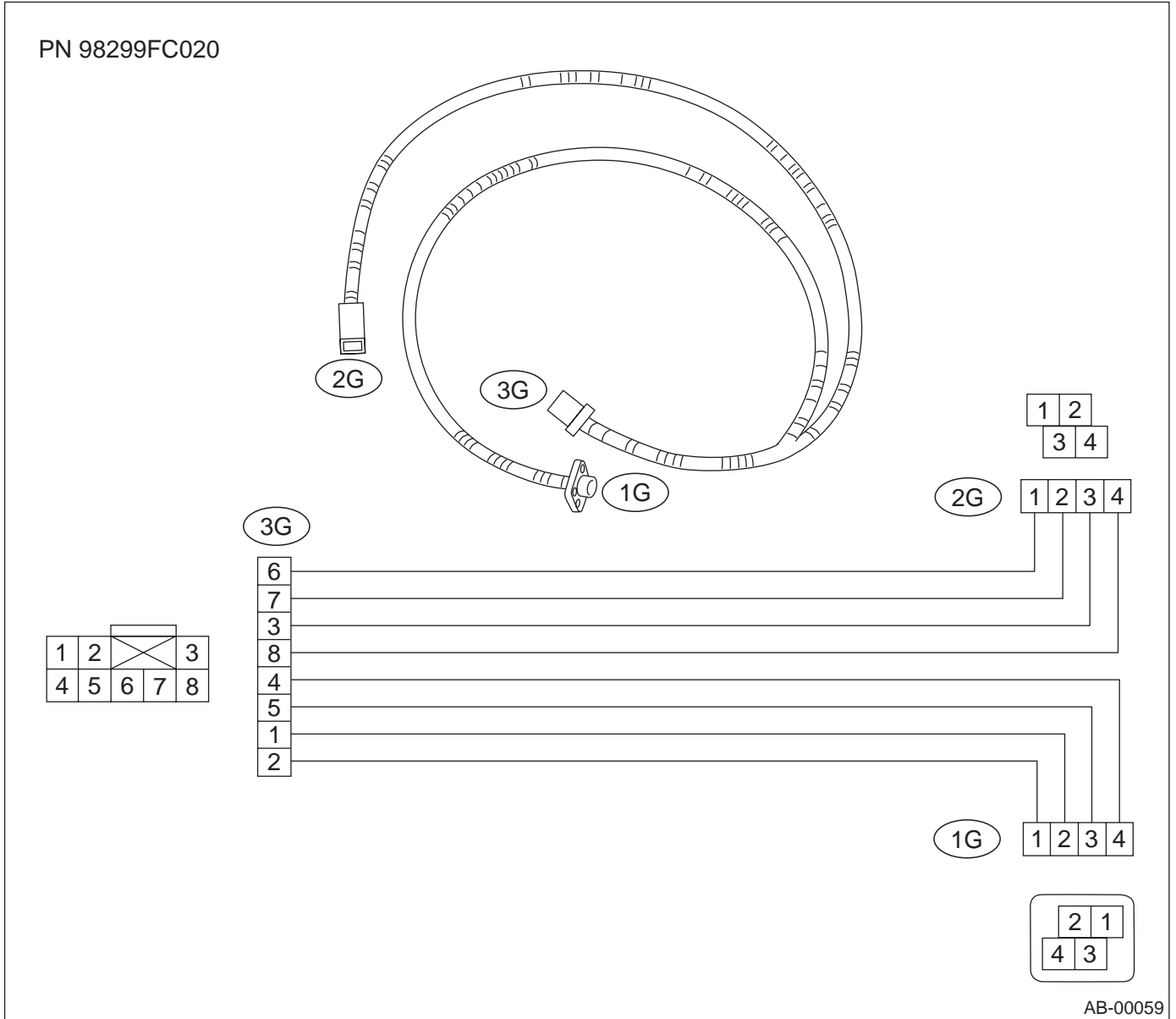
1. TEST HARNESS F



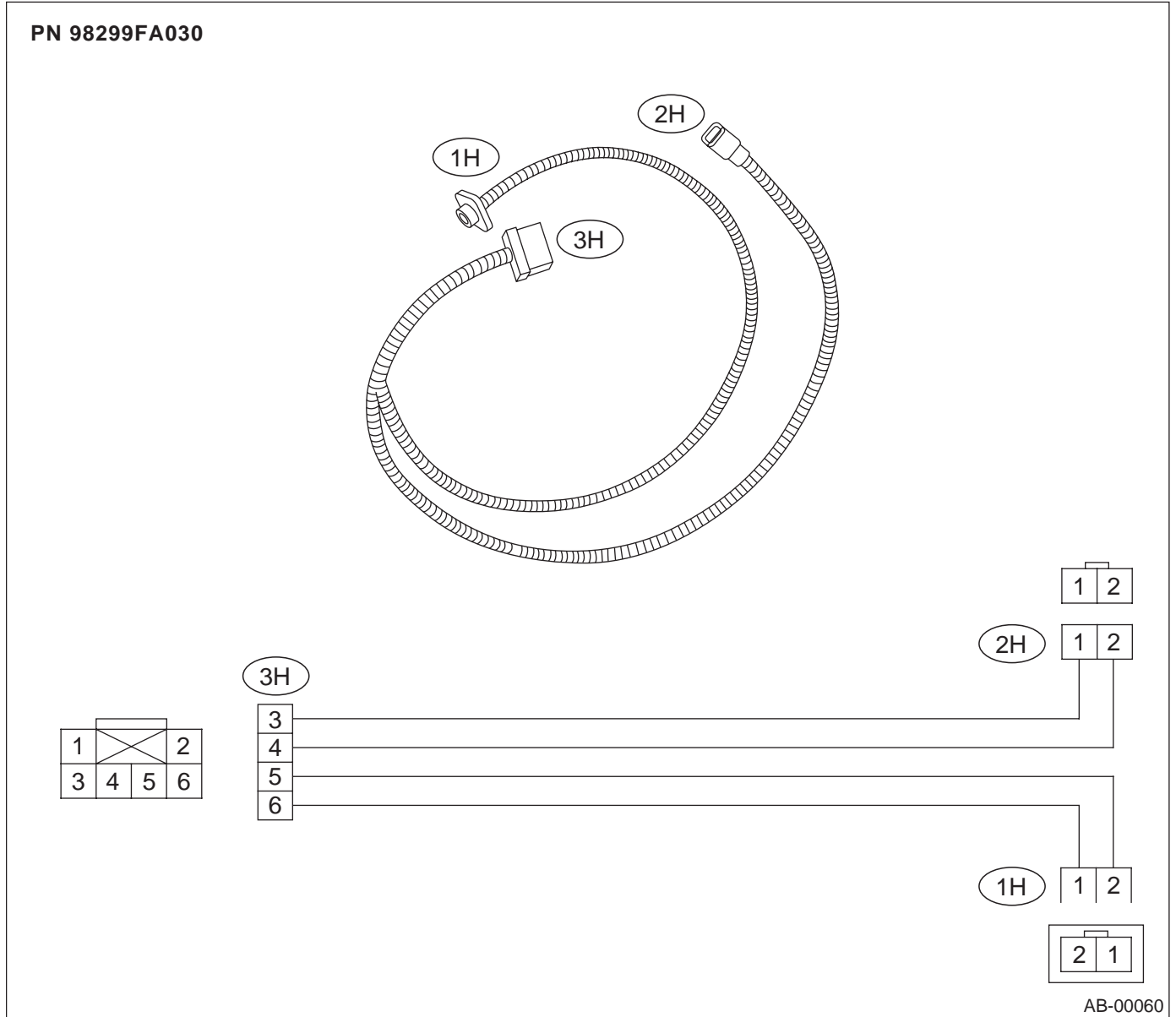
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

2. TEST HARNESS G



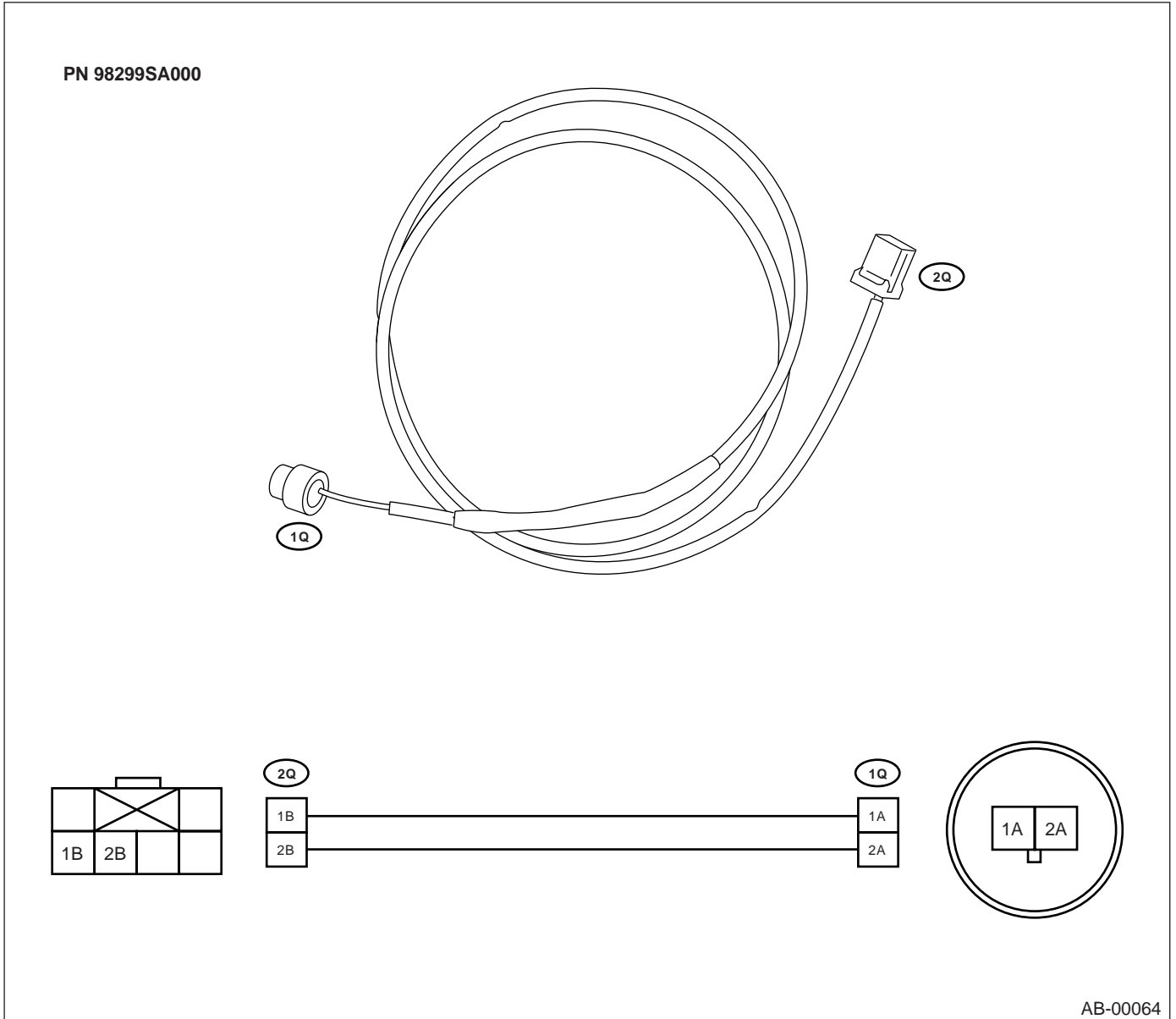
3. TEST HARNESS H



GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

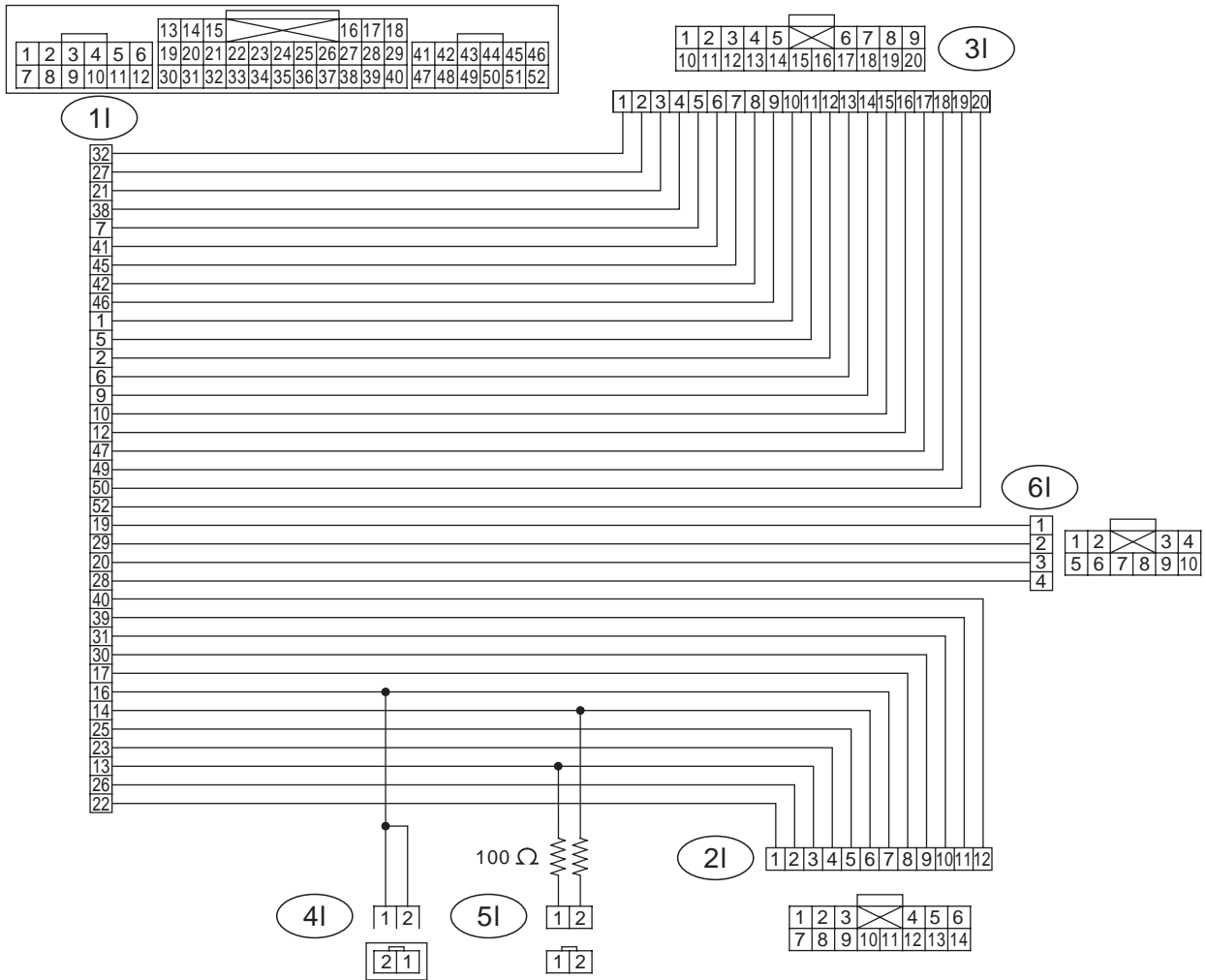
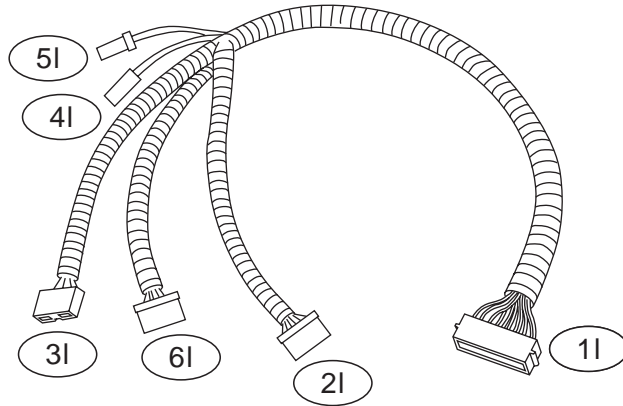
4. TEST HARNESS N



GENERAL DESCRIPTION

5. TEST HARNESS I2

PN 98299FC041



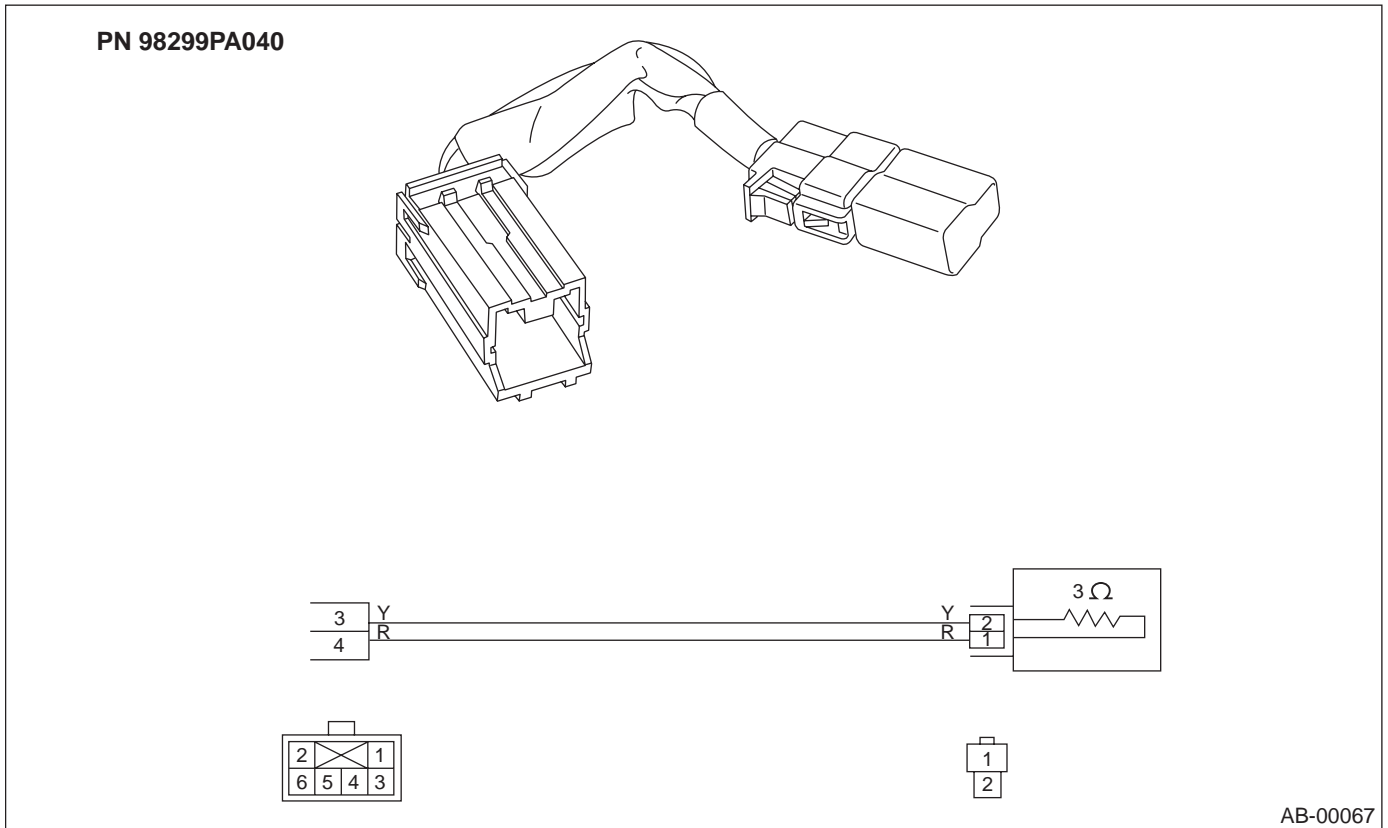
AB-00282

GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

6. AIRBAG RESISTOR

The airbag resistor is used during diagnostics. The airbag resistor has the same resistance as the airbag module and thus provides safety when used instead of the airbag module. It also makes it possible to finish diagnostics in less time.



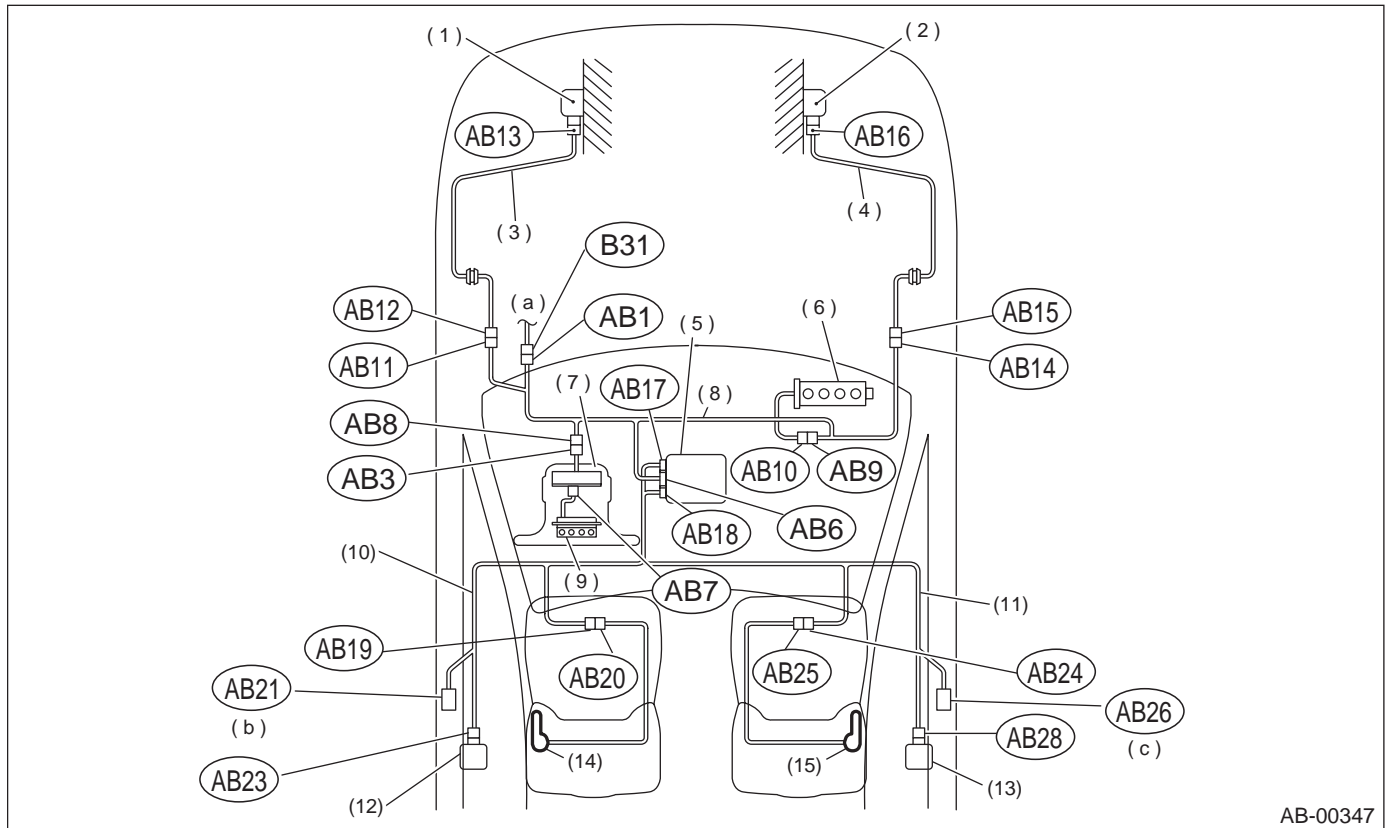
ELECTRICAL COMPONENTS LOCATION

AIRBAG SYSTEM (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

1. LHD MODEL



AB-00347

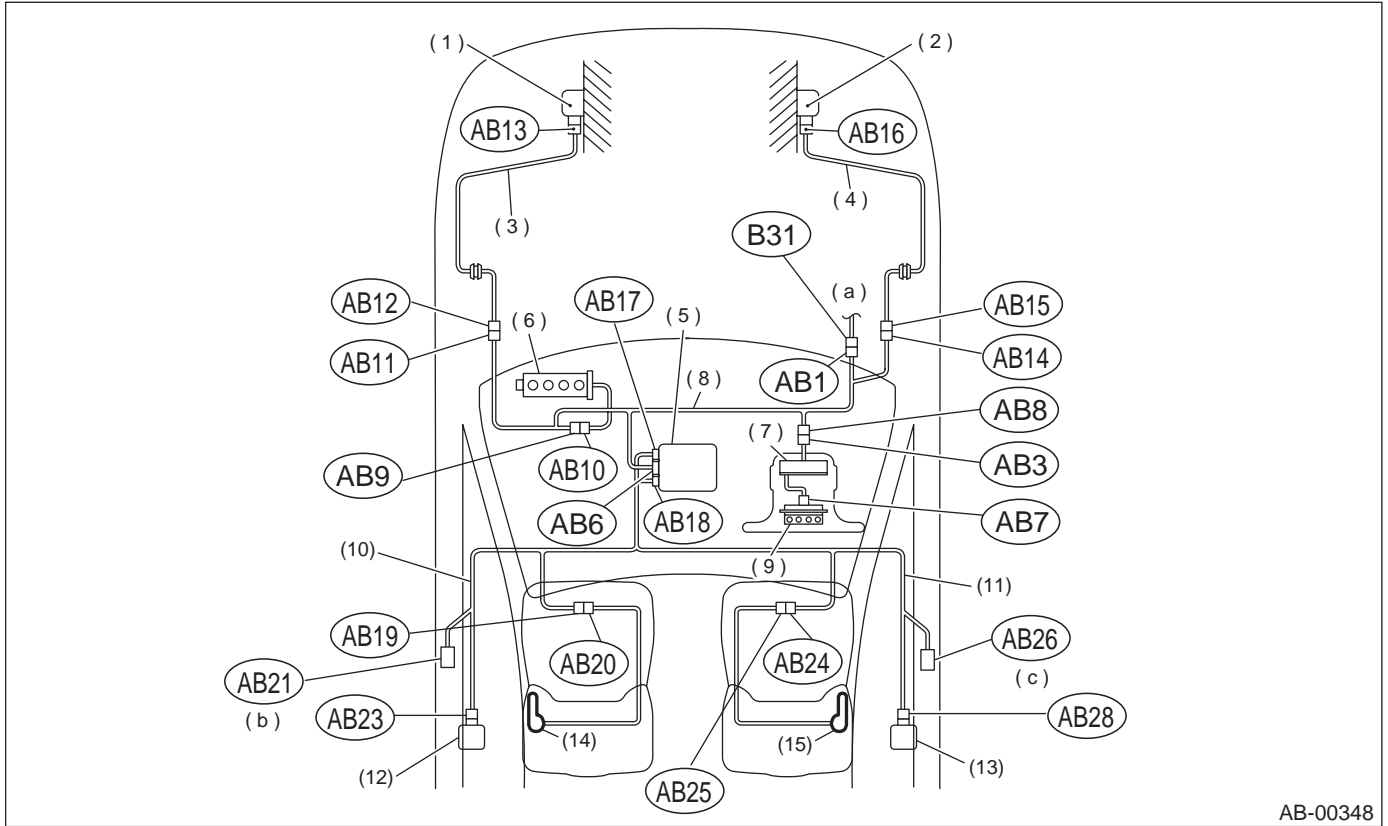
- | | | |
|--|-------------------------------|------------------------------------|
| (1) Front sub sensor (LH) | (7) Roll connector | (13) Side airbag sensor (RH) |
| (2) Front sub sensor (RH) | (8) Airbag main harness | (14) Side airbag inflator (LH) |
| (3) Front sub sensor harness (LH) | (9) Inflator (Driver) | (15) Side airbag inflator (RH) |
| (4) Front sub sensor harness (RH) | (10) Side airbag harness (LH) | (a) To body harness |
| (5) Airbag control module with safety sensor and electric sensor | (11) Side airbag harness (RH) | (b) To seal belt pretensioner (LH) |
| (6) Inflator (Passenger) | (12) Side airbag sensor (LH) | (c) To seal belt pretensioner (RH) |

Connector No.	(AB1)	(AB2)	(AB3)	(AB6)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	12	2	2	28	2	2	2	2	2	2	2	2
Color	Yellow	Yellow	Yellow	Yellow	Black	Yellow	Yellow	Yellow	Blue	Blue	Yellow	Blue
Male/Female	Male	Male	Male	Female	Female	Female	Female	Male	Male	Female	Female	Male
Connector No.	(AB15)	(AB16)	(AB17)	(AB18)	(AB19)	(AB20)	(AB21)	(AB23)	(AB24)	(AB25)	(AB26)	(AB28)
Pole	2	2	12	12	2	2	2	4	2	2	2	4
Color	Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Female	Female	Female	Female	Female	Male	Female	Female	Female	Male	Female	Female

ELECTRICAL COMPONENTS LOCATION

AIRBAG SYSTEM (DIAGNOSTICS)

2. RHD MODEL



- | | | |
|--|-------------------------------|------------------------------------|
| (1) Front sub sensor (LH) | (7) Roll connector | (13) Side airbag sensor (RH) |
| (2) Front sub sensor (RH) | (8) Airbag main harness | (14) Side airbag inflator (LH) |
| (3) Front sub sensor harness (LH) | (9) Inflator (Driver) | (15) Side airbag inflator (RH) |
| (4) Front sub sensor harness (RH) | (10) Side airbag harness (LH) | (a) To body harness |
| (5) Airbag control module with safety sensor and electric sensor | (11) Side airbag harness (RH) | (b) To seat belt pretensioner (LH) |
| (6) Inflator (Passenger) | (12) Side airbag sensor (LH) | (c) To seat belt pretensioner (RH) |

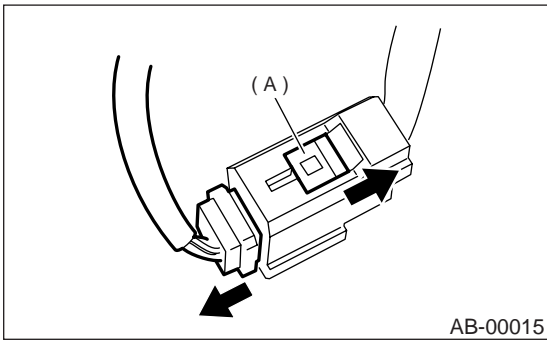
Connector No.	(AB1)	(AB2)	(AB3)	(AB6)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	12	2	2	28	2	2	2	2	2	2	2	2
Color	Yellow	Yellow	Yellow	Yellow	Black	Yellow	Yellow	Yellow	Blue	Blue	Yellow	Blue
Male/Female	Male	Male	Male	Female	Female	Female	Female	Male	Male	Female	Female	Male
Connector No.	(AB15)	(AB16)	(AB17)	(AB18)	(AB19)	(AB20)	(AB21)	(AB23)	(AB24)	(AB25)	(AB26)	(AB28)
Pole	2	2	12	12	2	2	2	4	2	2	2	4
Color	Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Female	Female	Female	Female	Female	Male	Female	Female	Female	Male	Female	Female

5. Airbag Connector

A: OPERATION

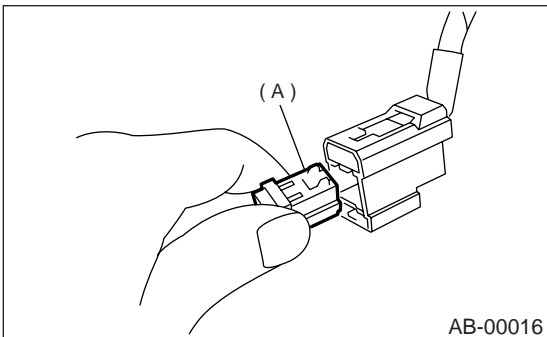
1. POWER SUPPLY

- 1) How to disconnect:
 - (1) Move the slide lock (A) in the direction of the arrow.
 - (2) Pull the female connector in the direction of the arrow with slide lock (A) moved.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

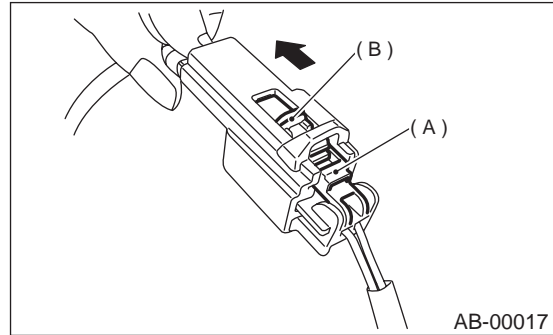
- 2) How to connect:
Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

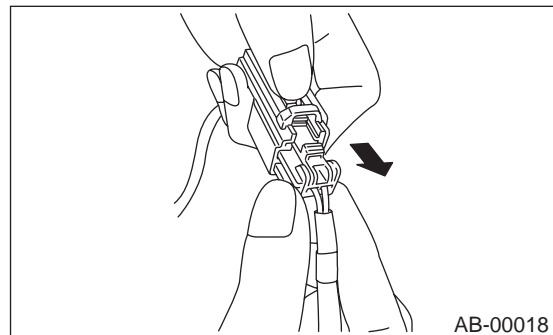
2. DRIVER'S AIRBAG, PASSENGER'S AIRBAG, SIDE AIRBAG, FRONT SUB SENSOR HARNESS TO AIRBAG MAIN HARNESS AND PRETENSIONER

- 1) How to disconnect:
 - (1) Push lock arm (A).
 - (2) With lock arm (A) pushed in, move slide lock (B) in the direction of the arrow.



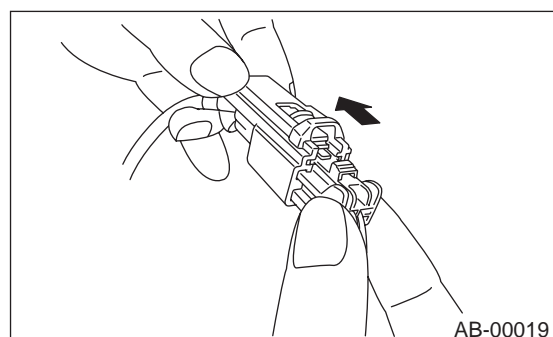
- (3) With slide lock (B) pulled, remove lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



- 2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



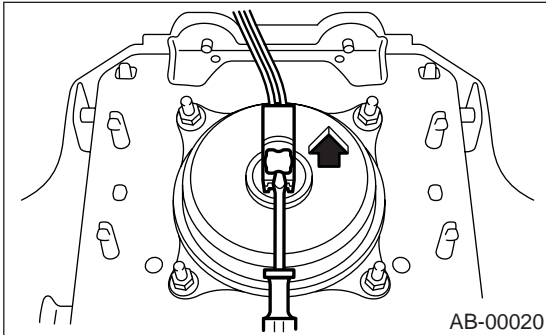
AIRBAG CONNECTOR

AIRBAG SYSTEM (DIAGNOSTICS)

3. DRIVER'S AIRBAG (ROLL CONNECTOR AND AIRBAG MODULE)

1) How to disconnect:

- (1) Using a flat tip screwdriver, pry the push lock upward to unlock.



- (2) Pull the connector to disconnect from driver's side airbag module assembly.

2) How to connect:

Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

CAUTION:

Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

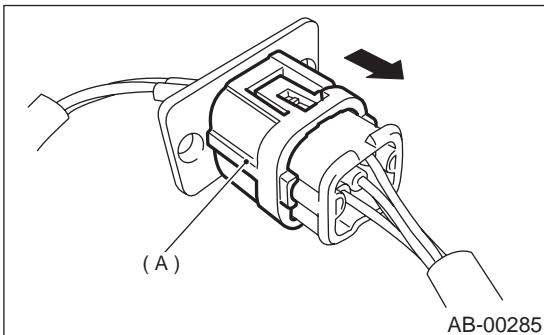
4. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR

1) How to disconnect:

- (1) Holding outer part (A), pull it in the direction of the arrow.

CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

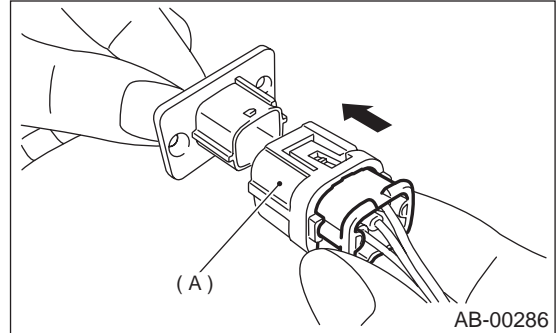


2) How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:

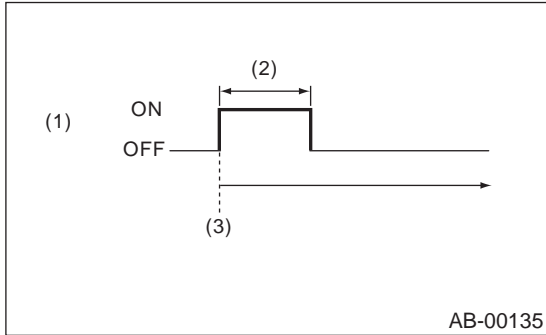
- Outer (A) moves back, and so do not put your hand on the outer part.
- Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



6. Airbag Warning Light Illumination Pattern

A: INSPECTION

Keep the ignition switch ON, and confirm that the airbag warning light remains off approximately 6 seconds after being turned on.



- (1) Airbag warning light
- (2) Approx. 6 seconds
- (3) Ignition switch ON

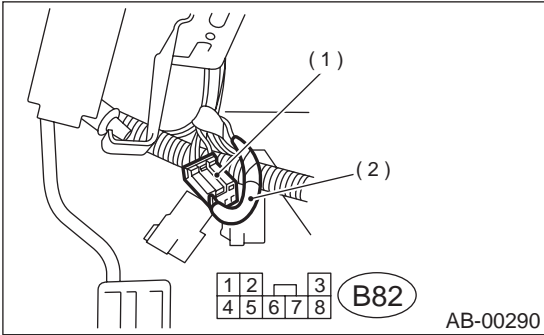
READ DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

- 1) Turn the ignition switch ON.
- 2) Connect the diagnosis terminal to diagnosis connector terminal No. 2 in the driver's seat lower cover area.



- (1) Diagnosis connector
- (2) Diagnosis terminal

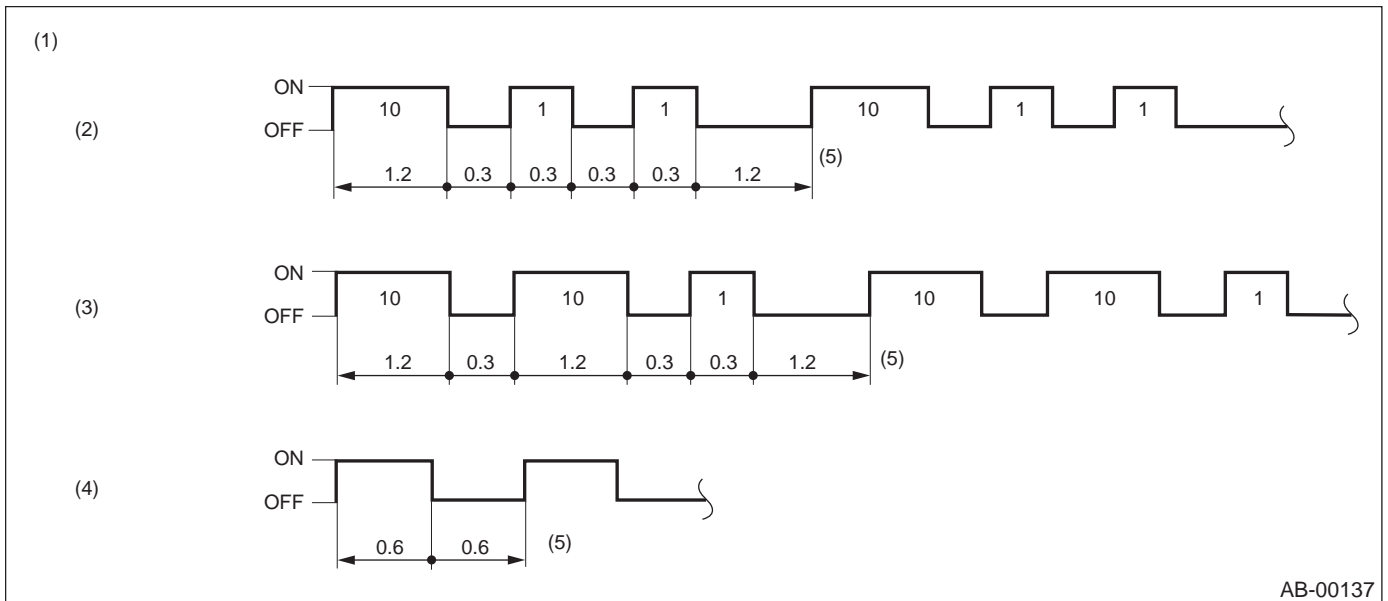
3) Read DTC by identifying the way the air bag warning light flashes.

The airbag warning light flashes a DTC corresponding to the faulty parts.

The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.3 sec on) indicates a “one”.

NOTE:

- “List of Diagnostic Trouble Code (DTC)” <Ref. to AB-28, List of Diagnostic Trouble Code (DTC).>
- “Airbag Warning Light Failure” <Ref. to AB-24, Airbag Warning Light Failure.>



AB-00137

- (1) Example
- (2) Flashing code 12
- (3) Flashing code 21
- (4) Flashing normal code
- (5) Sec.

4) Turn the ignition switch OFF, and disconnect the diagnosis terminal from the diagnosis connector terminal No. 2.

5) Wind tape around the diagnosis terminal and return it to its original position.

8. Inspection Mode

A: OPERATION

Recreate the circumstance by referring to the conditions described in the checklist.

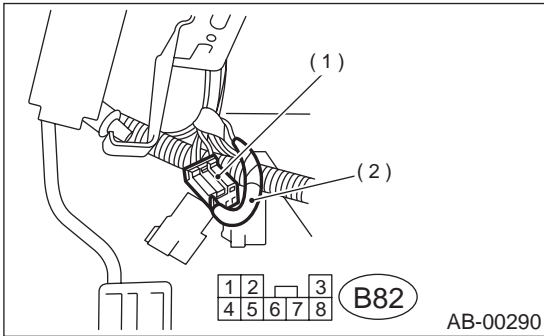
CLEAR MEMORY MODE

AIRBAG SYSTEM (DIAGNOSTICS)

9. Clear Memory Mode

A: OPERATION

- 1) Turn the ignition switch ON.
- 2) Connect the diagnosis terminal to diagnosis connector terminal No. 2 in the driver's seat lower cover area.



- (1) Diagnosis connector
- (2) DIAG. terminal

- 3) While the warning light flashes, connect another diagnosis terminal to diagnosis connector terminal No. 3.
- 4) Once the memory is erased, the warning light returns to the normal flash rate (0.6 sec on). The failure to recover the normal flash rate indicates that trouble parts still remain. Having repaired such parts, erase the memory again and confirm that the normal flash rate has returned.
- 5) When the memory has been cleared, disconnect the diagnosis terminal from the diagnosis connector.
- 6) Wind tape around the diagnosis terminal and return it to its original position.

MEMO:

AIRBAG WARNING LIGHT FAILURE

AIRBAG SYSTEM (DIAGNOSTICS)

10. Airbag Warning Light Failure

A: AIRBAG WARNING LIGHT REMAINS ON.

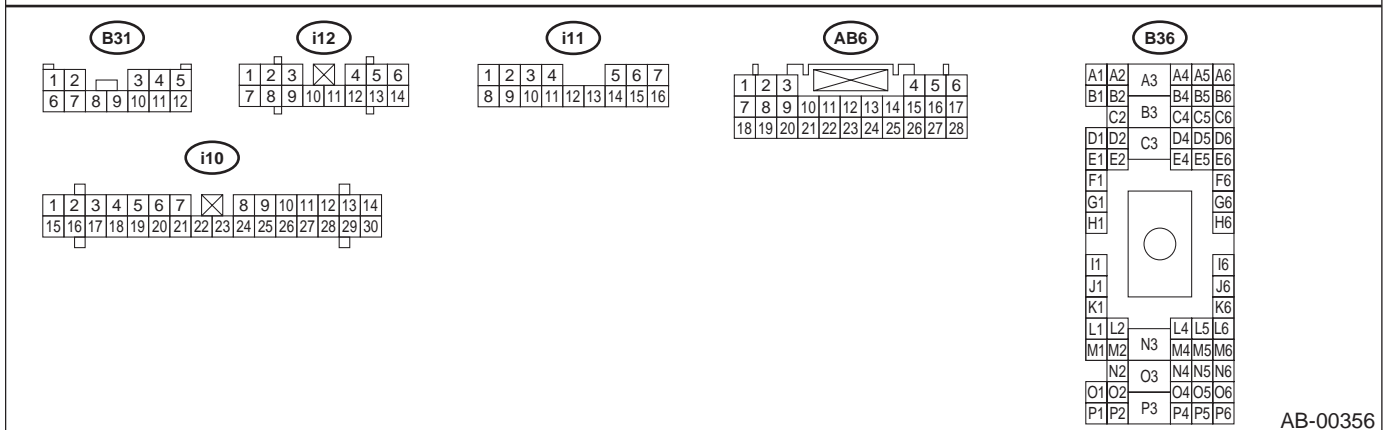
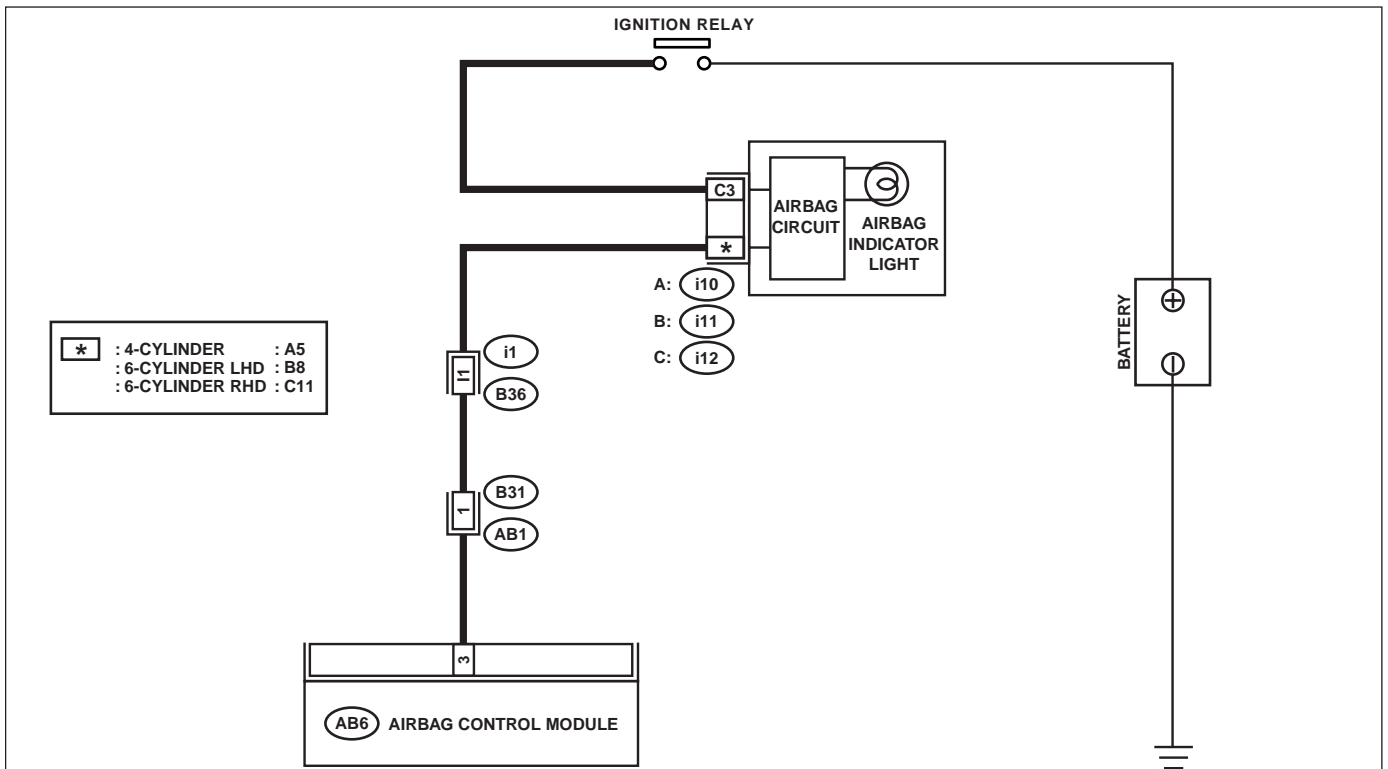
DIAGNOSIS:

- Airbag warning light is faulty.
- Airbag control module to airbag warning light circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- (AB1) and (B31) are not connected properly.
- (AB6) is not connected properly to airbag control module.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



AB-00356

AIRBAG WARNING LIGHT FAILURE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).</p> <p>1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Remove side sill cover. (Driver's side)</p> <p>3) Confirm that firm contact is secured between connectors (AB1) and (B31). Is the poor contact in connectors (AB1) and (B31)?</p>	There is no poor contact.	Go to step 2.	Repair the body harness or replace airbag main harness. <Ref. to AB-15, Main Harness.>
<p>2 CHECK POOR CONTACT.</p> <p>Confirm that firm contact is secured between the air bag control module and the connector (AB6). <Ref. to AB-17, REMOVAL, Airbag Control Module.> Is the poor contact in connector (AB6)?</p>	There is no poor contact.	Go to step 3.	Replace airbag main harness. <Ref. to AB-15, Main Harness.> Or replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>
<p>3 CHECK AIRBAG MAIN HARNESS.</p> <p>1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Connect the connector (AB1) to (B31).</p> <p>3) Disconnect connectors (AB3) and (AB8).</p> <p>4) Pull out the two stopper pins and lower the glove box and disconnect connectors (AB10) and (AB9).</p> <p>5) Disconnect the connector (AB6) from the airbag control module, and connect the connector (11) in test harness I2. <Ref. to AB-17, Airbag Control Module.></p> <p>6) Connect the battery ground cable and turn the ignition switch ON.</p> <p>7) Connect connectors (41) and (51) in test harness I2.</p> <p>NOTE: After problem has been eliminated, disconnect connectors (41) and (51). Is the airbag warning light turned off?</p>	Airbag warning light turns OFF.	Go to step 4.	Replace airbag main harness. <Ref. to AB-15, Main Harness.> Or replace combination meter printed circuit. <Ref. to IDI-14, Combination Meter Assembly.> Or repair the body harness.
<p>4 CHECK AIRBAG MAIN HARNESS.</p> <p>1) Connect the connector (AB1) to (B31).</p> <p>2) Disconnect the connector (AB6) from the airbag control module, and connect the connector (11) in test harness I2. <Ref. to AB-17, Airbag Control Module.></p> <p>3) Measure the resistance between connector (21) in test harness I2 and the chassis ground.</p> <p>Connector & terminal (21) No. 9 — Chassis ground: (21) No. 10 — Chassis ground: Is the measured value less than the specified value?</p>	10 Ω	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-15, Main Harness.> Or repair the body harness.

AIRBAG WARNING LIGHT FAILURE

AIRBAG SYSTEM (DIAGNOSTICS)

B: AIRBAG WARNING LIGHT REMAINS OFF.

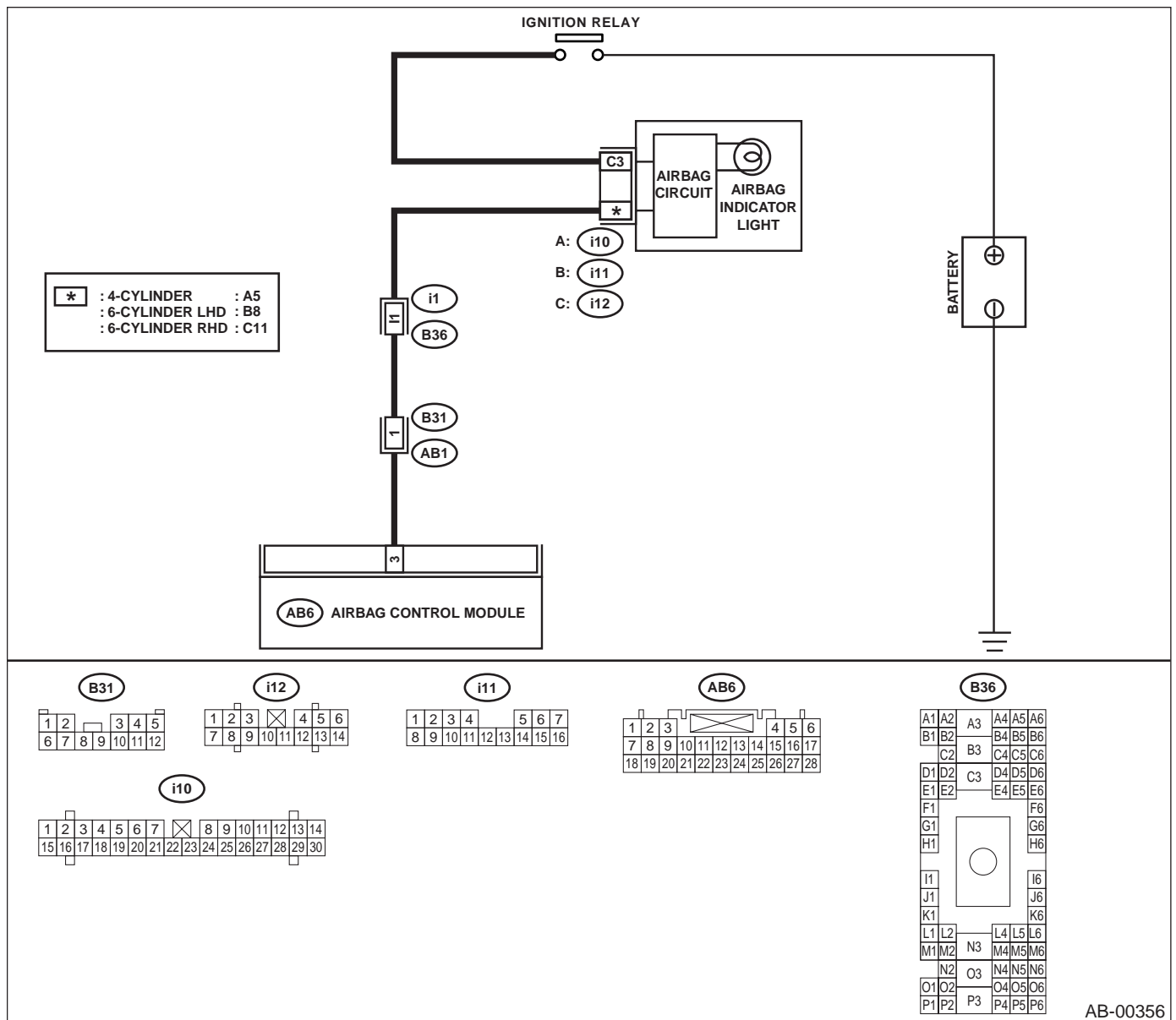
DIAGNOSIS:

- Fuse No. 5 (in fuse box) is blown.
- Body harness circuit is open.
- Airbag warning light is faulty.
- Airbag main harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



AIRBAG WARNING LIGHT FAILURE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK COMBINATION METER. Turn the ignition switch ON, and confirm that warning lights equipped in the combination meter are turned on. Do warning lights not for the airbag turn on?	Warning lights not for the airbag turn ON.	Go to step 2.	Repair combination meter power supply. <Ref. to IDI-4, Combination Meter System.>
2 CHECK FUSE NO. 5 (IN MAIN FUSE BOX). Remove fuse No. 5 and perform visual inspection. Is fuse No. 5 (in main fuse box) blown?	Fuse No. 5 is not blown.	Go to step 3.	Replace fuse No. 5. If fuse No. 5 blows again, go to step 3.
3 CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER). 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB1) from (B31). 3) Connect the battery ground cable and turn the ignition switch ON. Is the airbag warning light turned on?	Airbag warning light turns ON.	Go to step 4.	Replace airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-14, Combination Meter Assembly.> Or repair the body harness.
4 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect the connector (AB6) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> 4) Connect the battery ground cable and turn the ignition switch ON. Is the airbag warning light turned on?	Airbag warning light turns ON.	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-17, Airbag Control Module.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

11. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Memory function	Contents of diagnosis	Index No.
11	Provided.	<ul style="list-style-type: none"> • Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (driver) circuit is open, shorted or shorted to ground. • Roll connector circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Driver's airbag module is faulty. 	<Ref. to AB-30, DTC 11, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
12	Provided.	<ul style="list-style-type: none"> • Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (passenger) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty. 	<Ref. to AB-34, DTC 12, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
15	Provided.	<ul style="list-style-type: none"> • Airbag main harness circuit (driver) is shorted to power supply. • Airbag module harness (driver) is shorted to power supply. • Roll connector is shorted to power supply. • Airbag control module is faulty. • Driver's airbag module is faulty. 	<Ref. to AB-36, DTC 15, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
16	Provided.	<ul style="list-style-type: none"> • Airbag main harness circuit (passenger) is shorted to power supply. • Airbag module harness (passenger) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty. 	<Ref. to AB-38, DTC 16, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
21	Provided.	Airbag control module is faulty.	<Ref. to AB-40, DTC 21, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
22	Provided.	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB-41, DTC 22, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
23	Not provided.	(AB6), (AB17) and (AB18) are not connected properly to airbag control module.	<Ref. to AB-42, DTC 23, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
24	Not provided.	<ul style="list-style-type: none"> • Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 11 (in joint box) is blown. • Body harness circuit is open. 	<Ref. to AB-44, DTC 24, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
25	Provided.	<ul style="list-style-type: none"> • Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 6 (in joint box) is blown. • Body harness circuit is open. 	<Ref. to AB-46, DTC 25, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
31	Provided.	<ul style="list-style-type: none"> • Front sub-sensor harness (RH) circuit is shorted. • Front sub-sensor harness (RH) circuit is open. • Front sub-sensor (RH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-48, DTC 31, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
32	Provided.	<ul style="list-style-type: none"> • Front sub-sensor harness (LH) circuit is shorted. • Front sub-sensor harness (LH) circuit is open. • Front sub-sensor (LH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-52, DTC 32, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
41	Provided.	<ul style="list-style-type: none"> • Side airbag harness (RH) is faulty. • Side airbag module (RH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-56, DTC 41, Diagnostic Chart with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

DTC	Memory function	Contents of diagnosis	Index No.
42	Provided.	<ul style="list-style-type: none"> • Side airbag harness (LH) is faulty. • Side airbag module (LH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-58, DTC 42, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
45	Provided.	<ul style="list-style-type: none"> • Side airbag harness (RH) is shorted to power supply. • Airbag control module is faulty. 	<Ref. to AB-60, DTC 45, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
46	Provided.	<ul style="list-style-type: none"> • Side airbag harness (LH) is shorted to power supply. • Airbag control module is faulty. 	<Ref. to AB-62, DTC 46, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
51	Provided.	<ul style="list-style-type: none"> • Side airbag sensor (RH) is faulty. • Side airbag harness (RH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-64, DTC 51, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
52	Provided.	<ul style="list-style-type: none"> • Side airbag sensor (LH) is faulty. • Side airbag harness (LH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-66, DTC 52, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
53	Provided.	Side airbag sensor (RH) is faulty.	<Ref. to AB-68, DTC 53, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
54	Provided.	Side airbag sensor (LH) is faulty.	<Ref. to AB-68, DTC 54, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
55	Provided.	Side airbag module is inflated.	<Ref. to AB-68, DTC 55, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
61	Provided.	<ul style="list-style-type: none"> • Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty. 	<Ref. to AB-70, DTC 61, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
62	Provided.	<ul style="list-style-type: none"> • Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty. 	<Ref. to AB-72, DTC 62, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
65	Provided.	<ul style="list-style-type: none"> • Seat belt pretensioner (RH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty. 	<Ref. to AB-74, DTC 65, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
66	Provided.	<ul style="list-style-type: none"> • Seat belt pretensioner (LH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty. 	<Ref. to AB-76, DTC 66, Diagnostic Chart with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

12.Diagnostic Chart with Diagnostic Trouble Code (DTC)

A: DTC 11

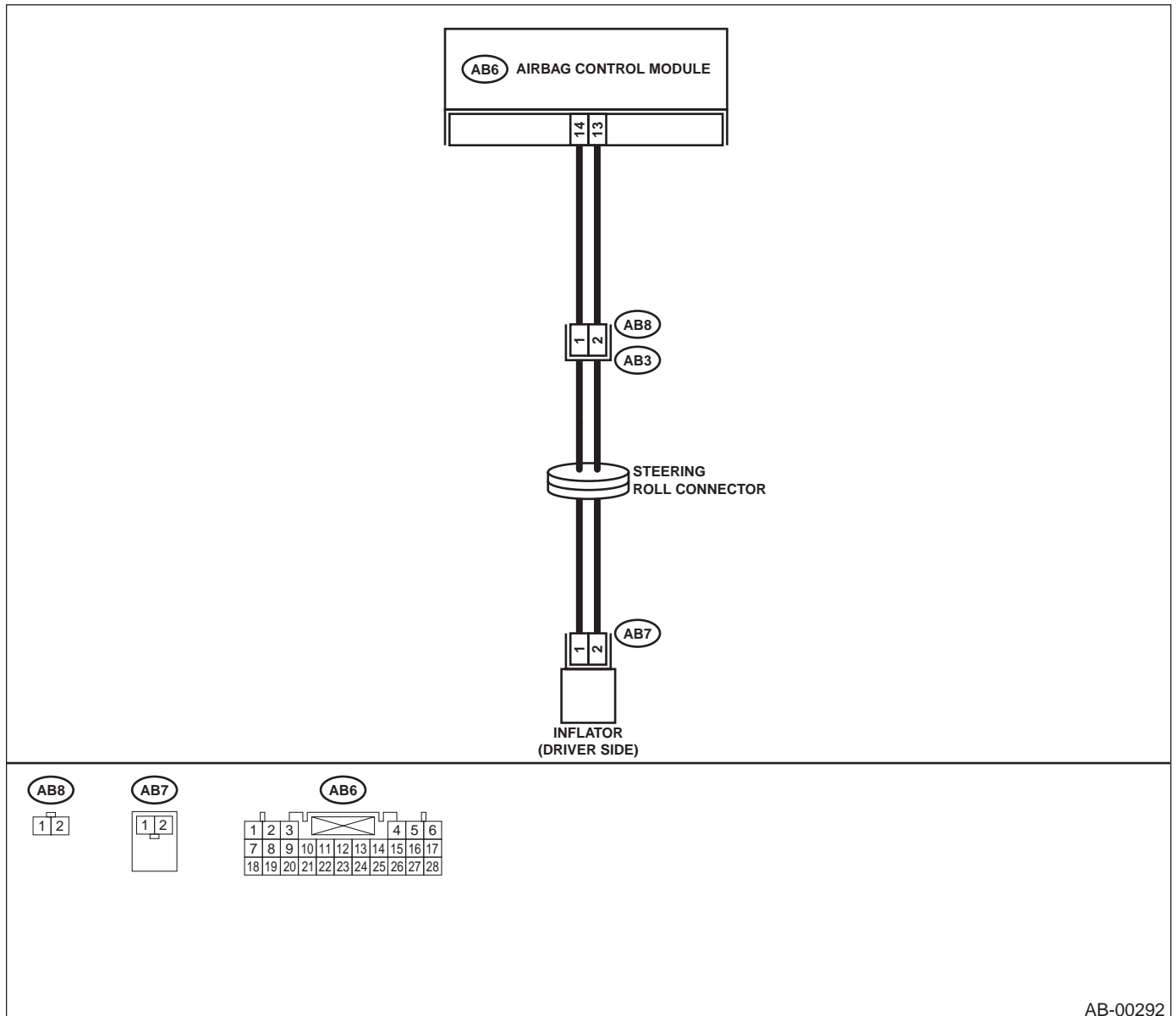
DIAGNOSIS:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Driver) circuit is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll controller, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



AB-00292

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DRIVER'S AIRBAG MODULE. 1) Turn the ignition switch OFF, disconnect battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.> 3) Connect the connector (1F) in test harness F to connector (AB7). 4) Connect airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON. Does the airbag warning light operate properly?	Operates properly.	Replace the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>	Go to step 2.
2 CHECK ROLL CONNECTOR. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 second. 2) Disconnect the test harness from the connector (AB7). 3) Remove the lower cover panel, disconnect the connector (AB3) from (AB8) and connect the connector (1F) in test harness F to connector (AB8). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON. Does the airbag warning light operate properly?	Operates properly.	Replace the roll connector. <Ref. to AB-19, Roll Connector.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch OFF, disconnect the ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Remove the glove box, <Ref. to AB-13, Passenger's Airbag Module.>, REMOVAL, Passenger's Airbag Module.> and disconnect connectors (AB10) and (AB9). 4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-17, Airbag Control Module.> 5) Measure the resistance between connector (2I) in test harness I2 and the connector (3F) in test harness F. Connector & terminal (2I) No. 1 — (3F) No. 4: (2I) No. 4 — (3F) No. 3: Is the measured value less than the specified value?	10 Ω	Go to step 4.	Replace airbag main harness. <Ref. to AB-15, Main Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>4 CHECK AIRBAG MAIN HARNESS. Measure the resistance of the connector (2I) in test harness I2. Connector & terminal (2I) No. 1 — No. 4: (2I) No. 4 — Chassis ground: (2I) No. 1 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-15, Main Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

MEMO:

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

B: DTC 12

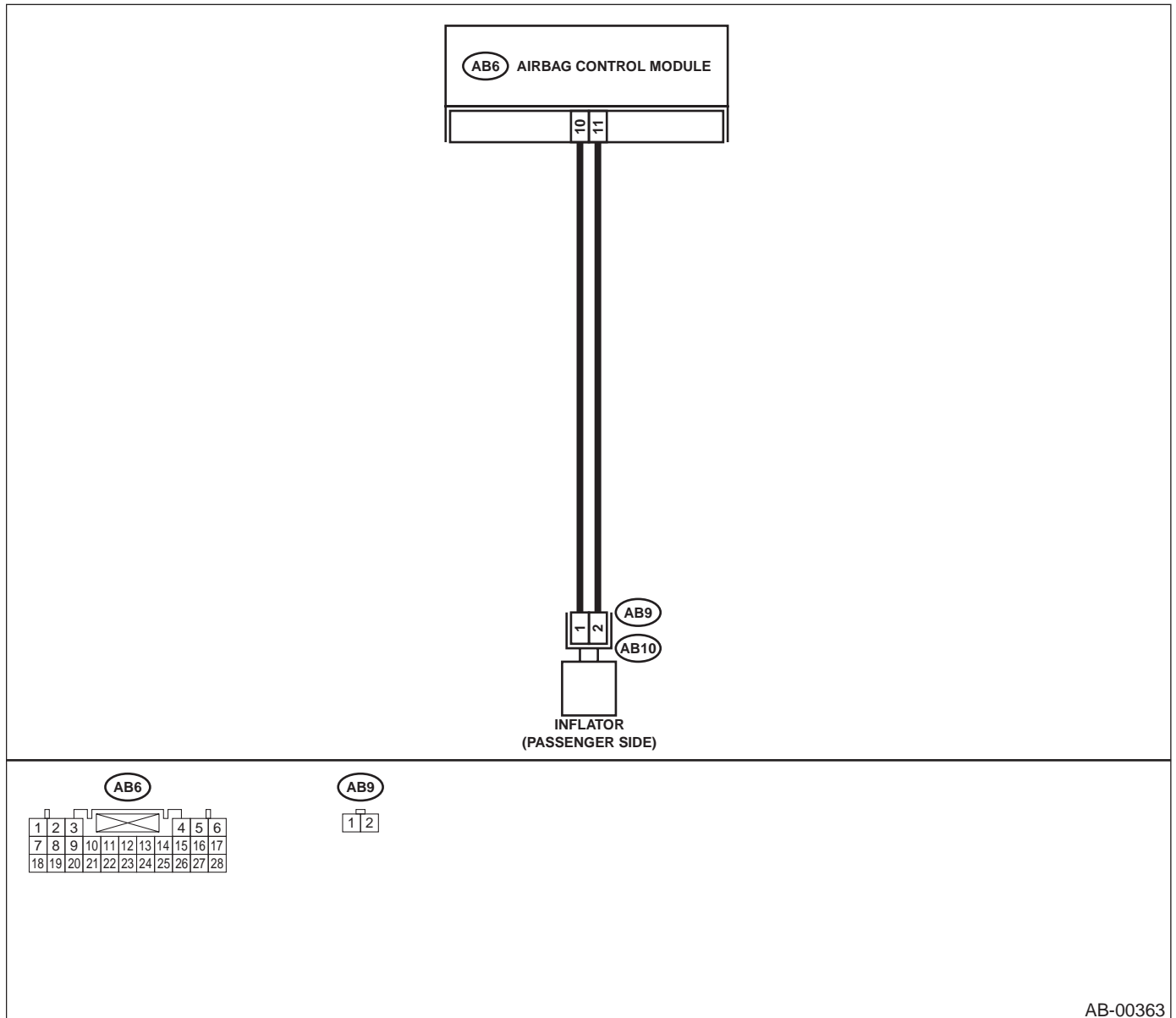
DIAGNOSIS:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Passenger) circuit is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



AB-00363

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK PASSENGER'S AIRBAG MODULE. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Pull out the two stopper pins and lower the glove box. 3) Disconnect the connector (AB10) from (AB9). 4) Connect the connector (1K) in test harness K to connector (AB9). 5) Connect two airbag resistors to connectors (3K) and (4K) in test harness K. 6) Connect the battery ground cable and turn the ignition switch ON. Does the airbag warning light operate properly?	Operates properly.	Replace the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect two airbag resistors from the connectors (3K) and (4K) in test harness K. 3) Remove lower cover and disconnect the connector (AB3) from (AB8). 4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-17, Airbag Control Module.> 5) Measure the resistance between connector (2I) in test harness I2 and the connector (3K) in test harness K. Connector & terminal (2I) No. 2 — (3K) No. 4: (2I) No. 5 — (3K) No. 3: Is the measured value less than the specified value?	10 Ω	Go to step 3.	Replace airbag main harness. <Ref. to AB-15, Main Harness.>
3 CHECK AIRBAG MAIN HARNESS. Measure the resistance of the connector (2I) in test harness I2. Connector & terminal (2I) No. 2 — No. 5: (2I) No. 2 — Chassis ground: (2I) No. 5 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Replace airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-15, Main Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

C: DTC 15

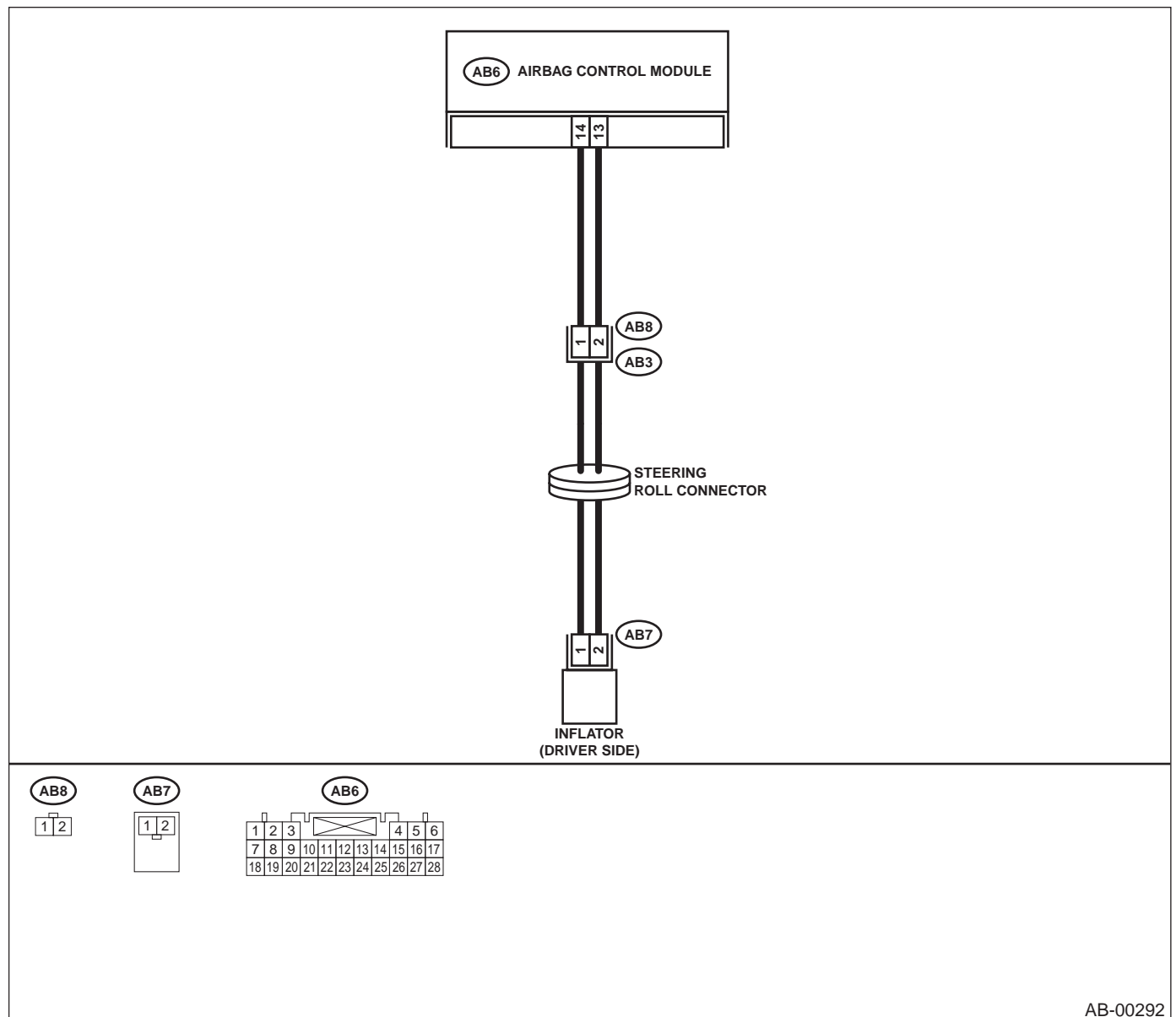
DIAGNOSIS:

- Airbag main harness circuit (Driver) is shorted to the power supply.
- Airbag module harness (Driver) is shorted to the power supply.
- Roll connector is shorted to the power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK DRIVER'S AIRBAG MODULE. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.> 3) Connect the connector (AB7) to connector (1F) in test harness F. 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON. Does the airbag warning light operate properly?	Operates properly.	Replace the driver's airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>	Go to step 2.
2 CHECK ROLL CONNECTOR. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness from the connector (AB7). 3) Remove the lower cover panel and disconnect the connector (AB3) from (AB8). 4) Connect the connector (1F) in test harness F to connector (AB8). 5) Connect the airbag resistor to connector (3F) in test harness F. 6) Connect the battery ground cable and turn the ignition switch ON. Does the airbag warning light operate properly?	Operates properly.	Replace the roll connector. <Ref. to AB-19, REMOVAL, Roll Connector.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Pull out the two stopper pins and lower the glove box, and disconnect connectors (AB10) and (AB9). 4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-17, REMOVAL, Airbag Control Module.> 5) Connect the battery ground cable and turn the ignition switch ON. (Engine OFF) 6) Measure the voltage between connector (2I) in test harness I2 and the chassis ground. Connector & terminal (2I) No. 4 (+) — Chassis ground (-): (2I) No. 1 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Replace the airbag control module. <Ref. to AB-17, REMOVAL, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-15, REMOVAL, Main Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

D: DTC 16

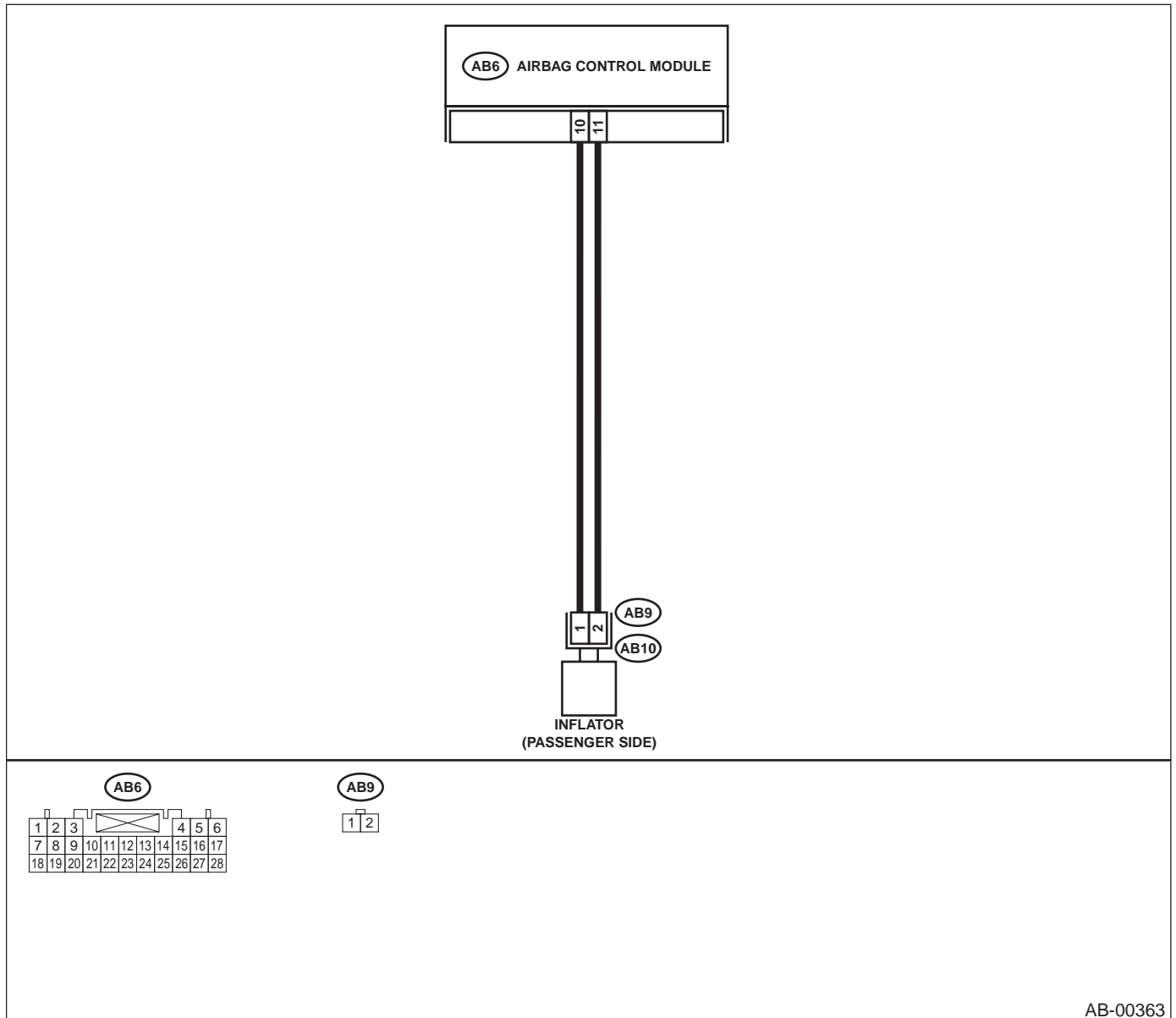
DIAGNOSIS:

- Airbag main harness circuit (Passenger) is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



AB-00363

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK PASSENGER'S AIRBAG MODULE. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Pull out the two stopper pins and lower the glove box. 3) Disconnect the connector (AB10) from (AB9) 4) Connect the connector (1K) in test harness K to connector (AB9). 5) Connect two airbag resistors to connectors (3K) and (4K) in test harness K. 6) Connect the battery ground cable and turn the ignition switch ON. Does the airbag warning light operate properly?	Operates properly.	Replace the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect two airbag resistors from the connectors (3K) and (4K) in test harness K. 3) Remove the lower cover and disconnect the connector (AB3) from (AB8). 4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-17, Airbag Control Module.> 5) Measure the voltage between connector (2I) in test harness I2 and the chassis ground. Connector & terminal (2I) No. 2 — Chassis ground: (2I) No. 5 — Chassis ground: Is the measured value less than the specified value?	1 V	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-15, Main Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

E: DTC 21

DIAGNOSIS:

- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

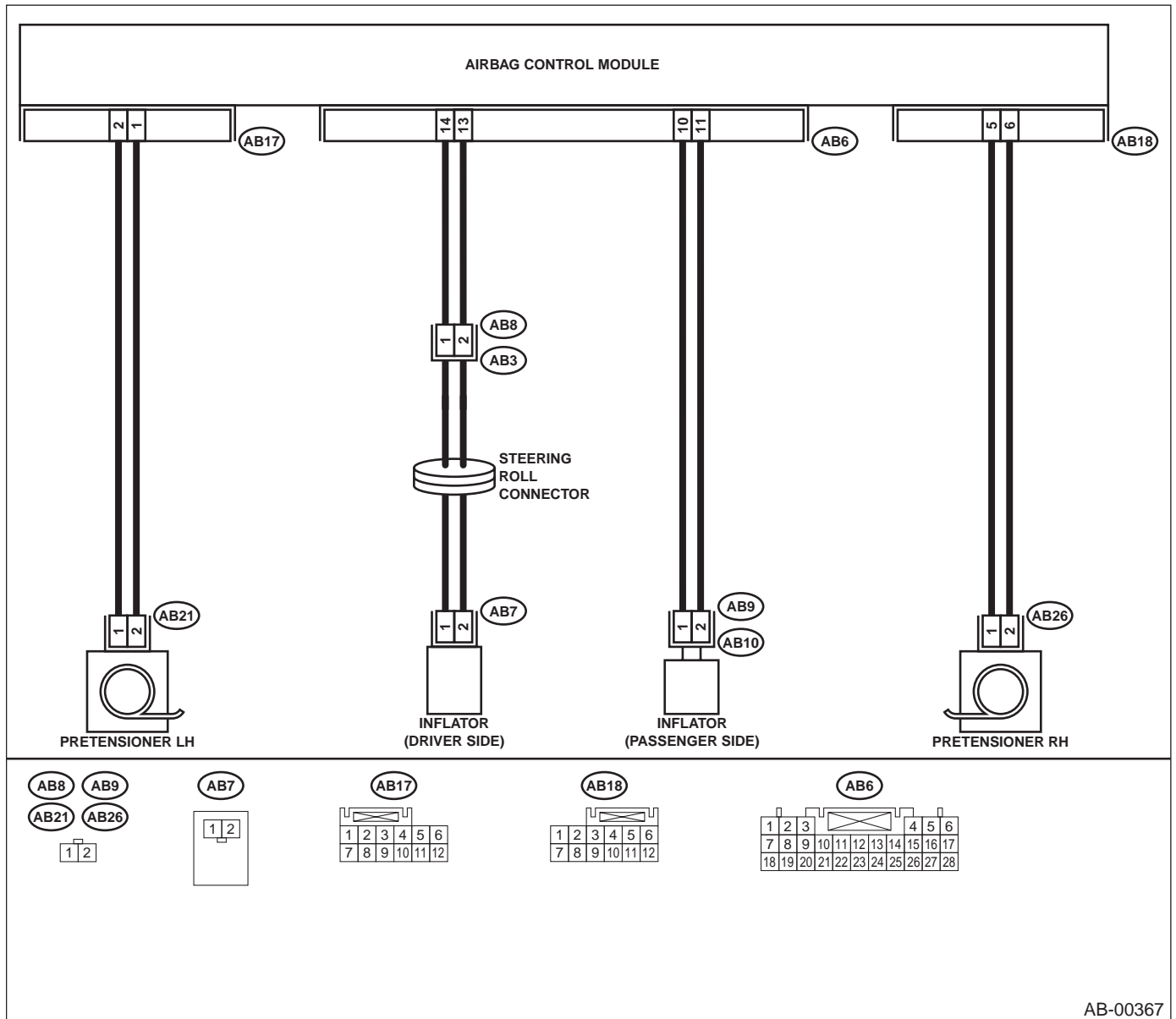
	Step	Value	Yes	No
1	CHECK IF DTC 21 IS INDICATED. Read Diagnostic Trouble Code. <Ref. to AB-20, Read Diagnostic Trouble Code (DTC).> Is airbag warning light trouble code 21 indicated?	DTC 21 is not indicated.	Perform clear memory. <Ref. to AB-22, Clear Memory Mode.>	Replace the airbag control module. <Ref. to AB-17, REMOVAL, Airbag Control Module.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

F: DTC 22

WIRING DIAGRAM:



AB-00367

This code is indicated when the front airbag and the pretensioner are in operation.

Once this code is indicated, memory is not erasable; therefore change the following parts.

- Airbag control module. <Ref. to AB-17, REMOVAL, Airbag Control Module.>
- Driver's airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>
- Passenger's airbag module. <Ref. to AB-13, REMOVAL, Passenger's Airbag Module.>
- Front sub-sensor of both sides. <Ref. to AB-20, REMOVAL, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides. <Ref. to SB-7, REMOVAL, Front Seat Belt.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

G: DTC 23

DIAGNOSIS:

(AB6), (AB17) and (AB18) are not connected properly to airbag control module.

CAUTION:

Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

Step	Value	Yes	No
1 CHECK POOR CONTACT IN CONNECTORS (AB6), (AB17) and (AB18). 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB6), (AB17) and (AB18) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> Check if rust or damage appear on the harness connector and the control module connector.	Rust or damage on the harness connector and the control module are not found.	Go to step 2.	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.> Replace airbag main harness. <Ref. to AB-15, Main Harness.> Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
2 CHECK POOR CONTACT IN CONNECTORS (AB6), (AB17) and (AB18). 1) Ensure that connectors are firmly reconnected. 2) Connect the battery ground cable and turn the ignition switch ON. Does the air bag warning light operate properly?	Operates properly.	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

MEMO:

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

H: DTC 24

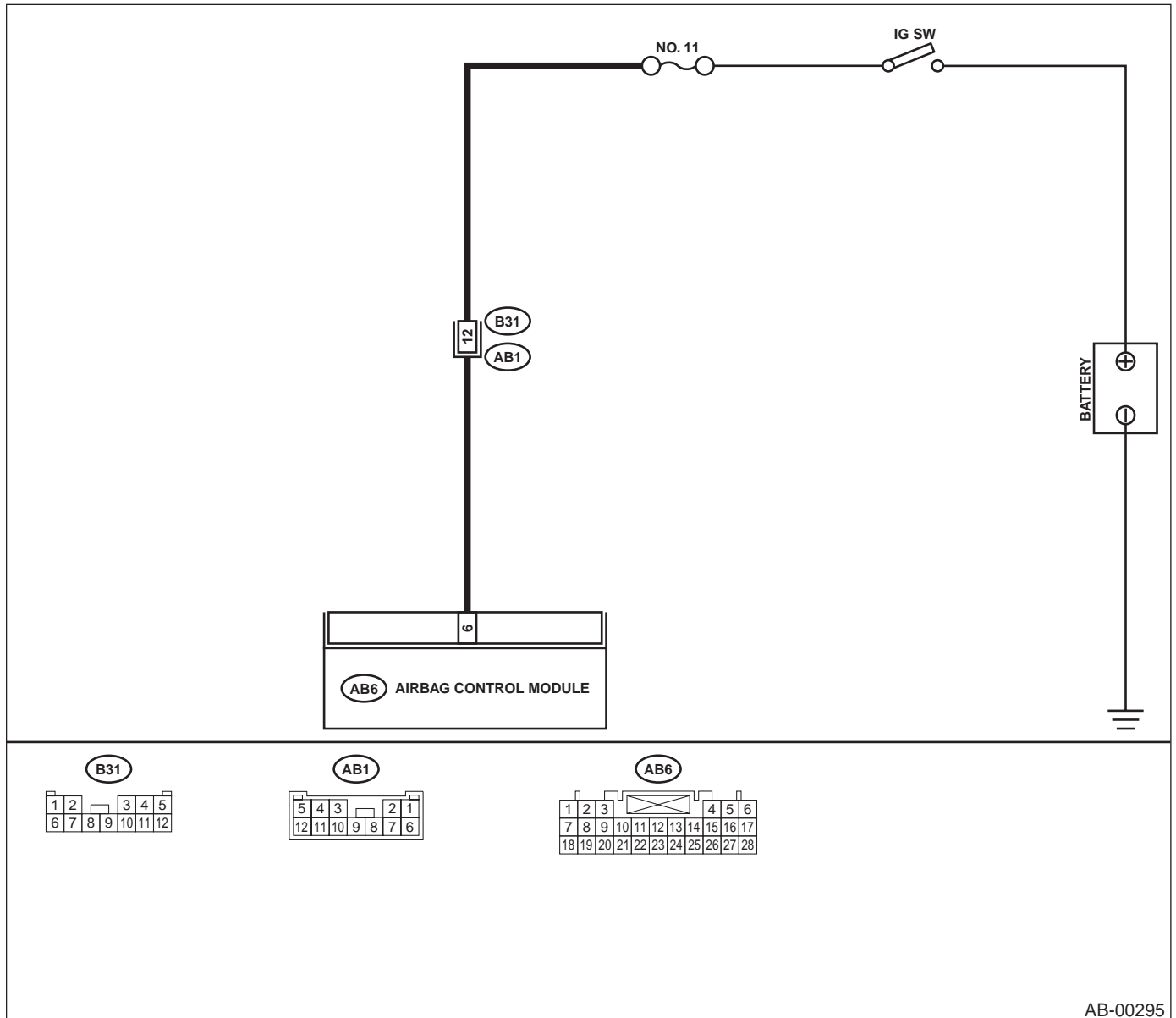
DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No, 11 (in joint box) is blown.
- Body harness circuit is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



AB-00295

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FUSE No. 11 (IN JOINT BOX). 1) Confirm that the ignition switch is turned OFF. 2) Remove fuse No. 11 (in joint box) and perform visual inspection. Is fuse No.11 blown?	Fuse No. 11 is not blown.	Go to step 2.	Replace fuse No. 11. If fuse No. 11 blows again, repair the body harness.
2 CHECK AIRBAG CONTROL MODULE. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB6) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> 3) Connect the connector (11) in test harness I2 to connector (AB6). 4) Connect the battery ground cable and turn the ignition switch ON. 5) Measure the voltage between connector (21) in test harness I2 and chassis ground. Connector & terminal (21) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Go to step 3.
3 CHECK BODY MAIN HARNESS. 1) While checking control module, turn the ignition switch OFF and disconnect the battery ground cable. Wait more than 20 seconds before operation. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Measure the voltage between the connector (B31) and the chassis ground. Connector & terminal (B31) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Replace airbag main harness. <Ref. to AB-15, Main Harness.>	Repair the body harness.

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

I: DTC 25

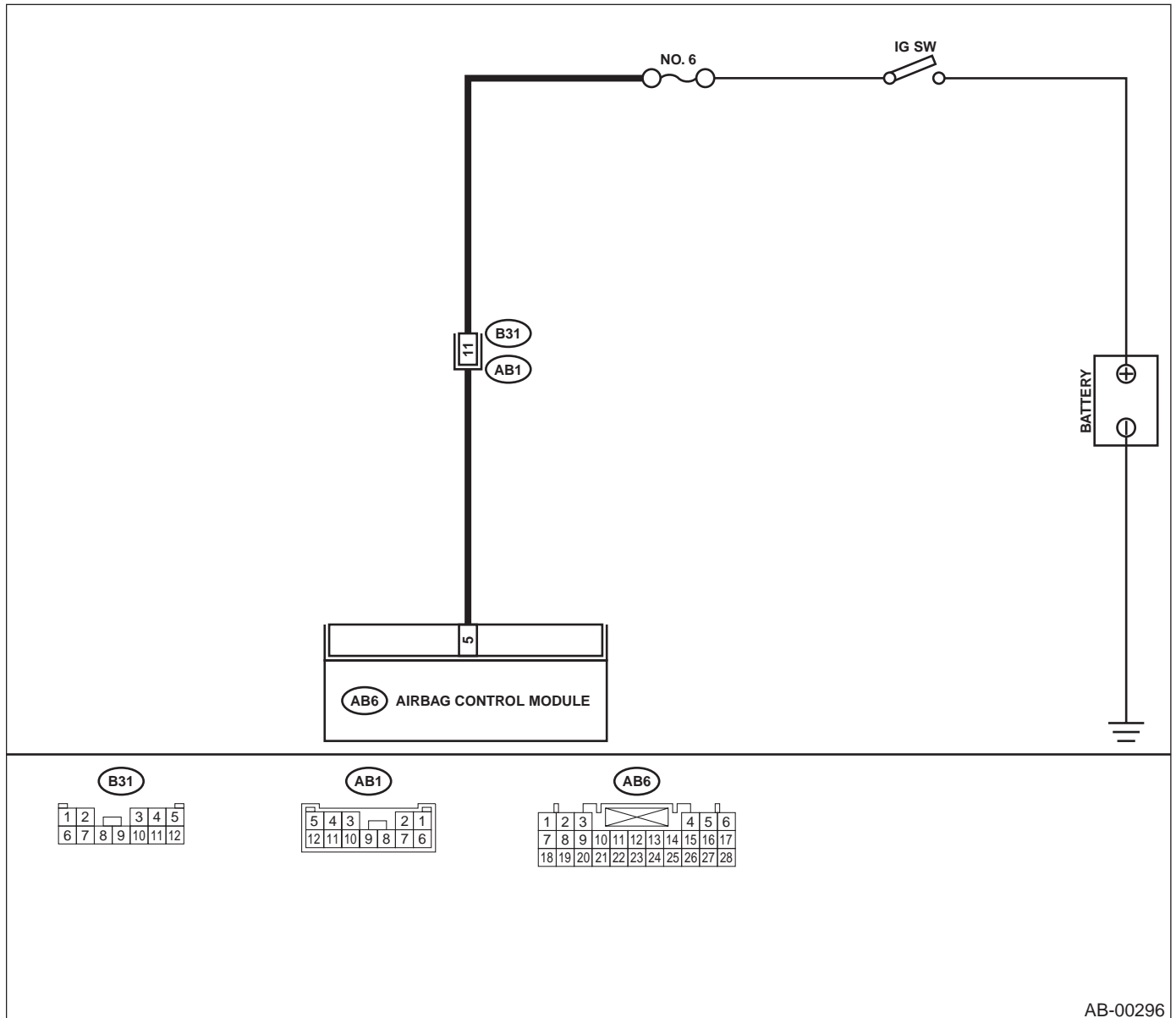
DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 6 (in joint box) is blown.
- Body harness circuit is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



AB-00296

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK FUSE NO. 6 (IN JOINT BOX). 1) Confirm that the ignition switch is turned OFF. 2) Remove No. 6 fuse (in joint box) and perform visual inspection. Is fuse No. 6 blown?	Fuse No. 6 is not blown.	Go to step 2.	Replace fuse No. 6. If fuse No. 6 is blown again, repair the body harness.
2 CHECK AIRBAG CONTROL MODULE. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB6) from airbag control module. <Ref. to AB-17, Airbag Control Module.> 3) Connect the connector (1I) in test harness I2 to connector (AB6). 4) Connect the battery ground cable, and turn the ignition switch ON. 5) Measure the voltage between the connector (2I) in test harness I2 and the chassis ground. Connector & terminal (2I) No. 6 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS. 1) While checking control module, turn the ignition switch OFF and disconnect the battery ground cable. Wait more than 20 seconds before operation. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Measure the voltage between the connector (B31) and the chassis ground. Connector & terminal (B31) No. 11 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Replace the airbag main harness. <Ref. to AB-15, Main Harness.>	Repair the body harness.

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

J: DTC 31

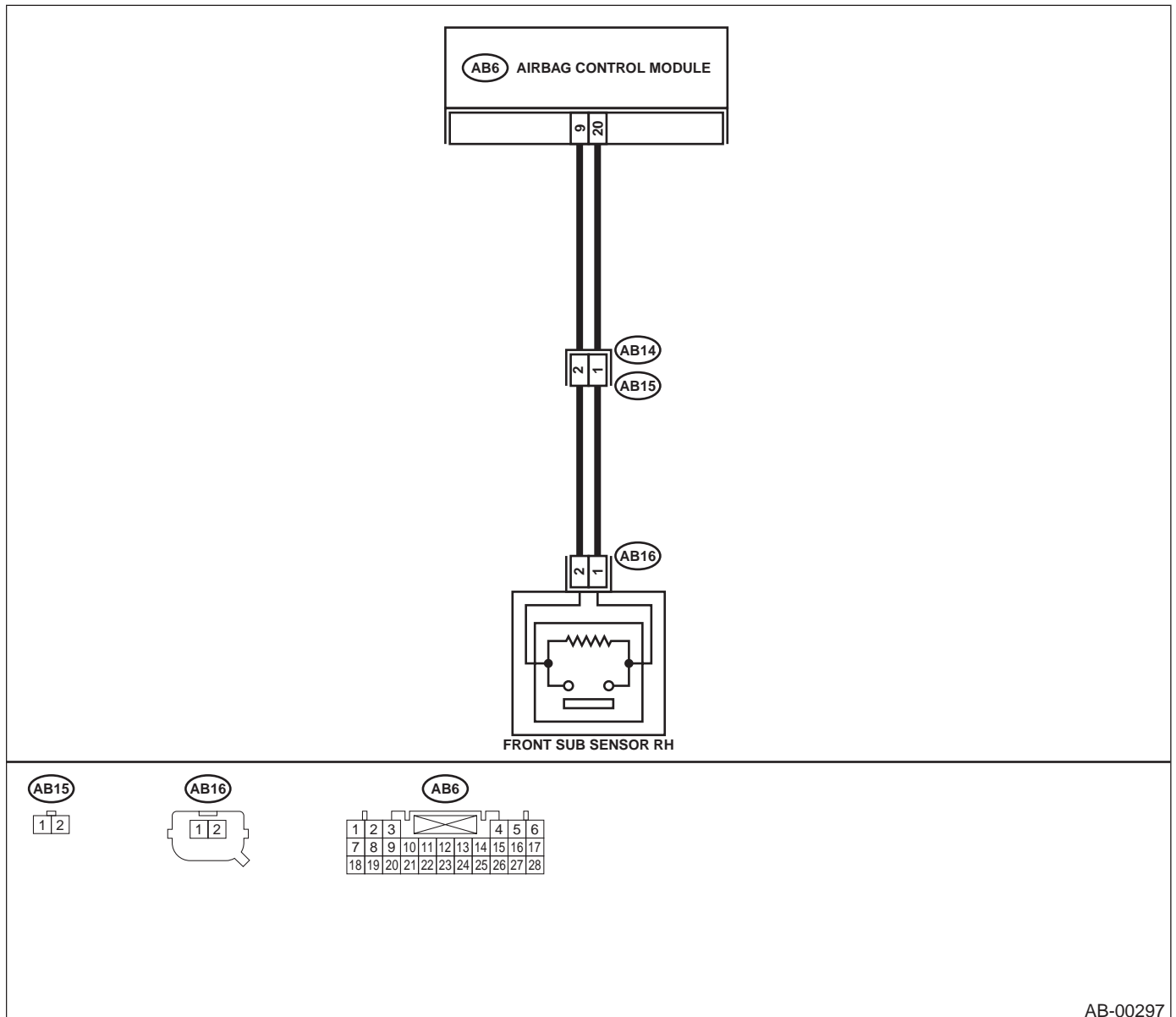
DIAGNOSIS:

- Front sub-sensor harness (RH) circuit is shorted.
- Front sub-sensor harness (RH) circuit is open.
- Front sub-sensor (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



AB-00297

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH).</p> <p>1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-17, Airbag Control Module.></p> <p>3) Measure the resistance of the connector (3I) in test harness I2.</p> <p>Connector & terminal (3I) No. 2 — No. 4:</p> <p>Is the measured value within the specified range?</p>	750 Ω — 1 KΩ	Go to step 2.	Go to step 3.
<p>2</p> <p>CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH).</p> <p>Measure the resistance between connector (3I) in test harness I2 and the chassis ground.</p> <p>Connector & terminal (3I) No. 2 — Chassis ground: (3I) No. 4 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Go to step 3.
<p>3</p> <p>CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).</p> <p>1) Disconnect connector (AB16) from the front sub-sensor. <Ref. to AB-20, Front Sub Sensor.></p> <p>2) Connect connector (1H) in test harness H to connector (AB16).</p> <p>3) Measure the resistance between connector (3I) in test harness I2 and connector (3H) in test harness H.</p> <p>Connector & terminal (3I) No. 2 — (3H) No. 5: (3I) No. 4 — (3H) No. 6:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 4.	Go to step 5.
<p>4</p> <p>CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).</p> <p>Measure the resistance between connector (3I) in test harness I2 and the chassis ground.</p> <p>Connector & terminal (3I) No. 2 — Chassis ground: (3I) No. 4 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9.	Go to step 5.

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
5 CHECK AIRBAG MAIN HARNESS 1) Remove the instrument panel. <Ref. to EI-35, Instrument Panel Assembly.> 2) Disconnect connector (AB15) from (AB14), and connect connector (2F) in test harness F to connector (AB14). 3) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F. Connector & terminal (3I) No. 2 — (3F) No. 6: (3I) No. 4 — (3F) No. 5: Is the measured value less than the specified value?	10 Ω	Go to step 6.	Replace airbag main harness. <Ref. to AB-15, Main Harness.>
6 CHECK AIRBAG MAIN HARNESS Measure the resistance between connector (3I) in test harness I2 and the chassis ground. Connector & terminal (3I) No. 2 — Chassis ground: (3I) No. 4 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 7.	Replace airbag main harness. <Ref. to AB-15, Main Harness.>
7 CHECK FRONT SUB-SENSOR HARNESS (RH). 1) Connect connector (1F) in test harness F to the connector (AB15). 2) Measure the resistance between connector (3H) in test harness H and connector (3F) in the test harness F. Connector & terminal (3F) No. 3 — (3H) No. 5: (3F) No. 4 — (3H) No. 6: Is the measured value less than the specified value?	10 Ω	Go to step 8.	Replace the front sub-sensor harness (RH) <Ref. to AB-21, Front Sub Sensor Harness.>
8 CHECK FRONT SUB-SENSOR HARNESS (RH). Measure the resistance between connector (3F) in test harness F and the chassis ground. Connector & terminal (3F) No. 3 — Chassis ground: (3F) No. 4 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Go to step 9.	Replace the front sub-sensor harness (RH) <Ref. to AB-21, Front Sub Sensor Harness.>
9 CHECK FRONT SUB-SENSOR (RH). 1) Connect connector (2H) in test harness H to front sub-sensor (RH). 2) Measure the resistance of the connector (3H) in test harness H. Connector & terminal (3H) No. 3 — No. 4: Is the measured value within the specified range?	750 Ω — 1 KΩ	Go to step 10.	Replace the front sub-sensor (RH) <Ref. to AB-20, Front Sub Sensor.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
10 CHECK FRONT SUB-SENSOR (RH). Measure the resistance between connector (3H) in test harness H and the chassis ground. Connector & terminal (3H) No. 3 — Chassis ground: (3H) No. 4 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Finish the diagnosis.	Replace the front sub-sensor (RH) <Ref. to AB-20, Front Sub Sensor.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

K: DTC 32

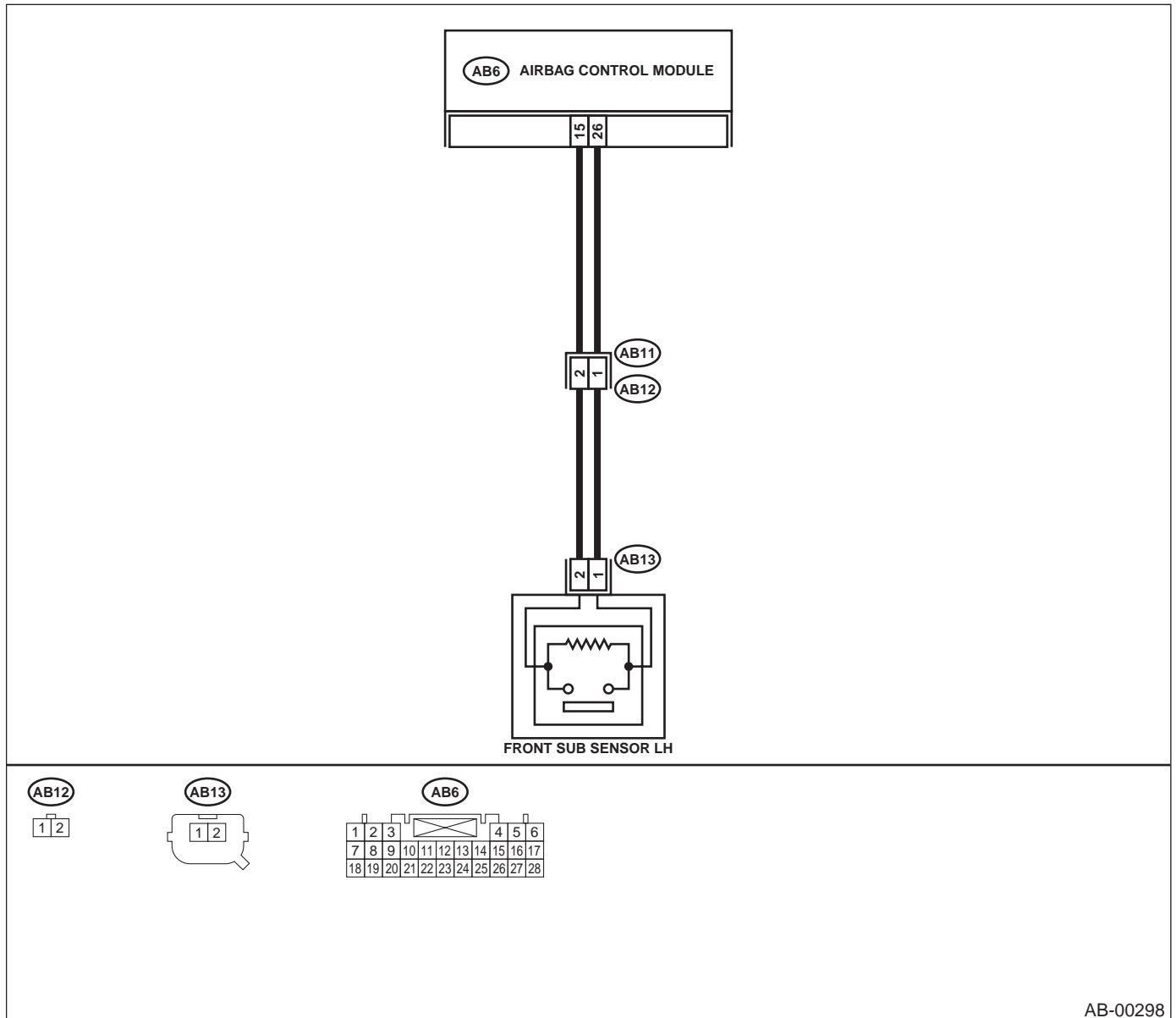
DIAGNOSIS:

- Front sub-sensor harness (LH) circuit is shorted.
- Front sub-sensor harness (LH) circuit is open.
- Front sub-sensor (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



AB-00298

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (RH).</p> <p>1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Disconnect connector (AB6) from the airbag control module, and connect connector (1I) in the test harness I2 to connector (AB6). <Ref. to AB-17, Airbag Control Module.></p> <p>3) Measure the resistance of the connector (3I) in the test harness I2.</p> <p>Connector & terminal (3I) No. 1 — No. 3: Is the measured value within the specified range?</p>	750 Ω — 1 KΩ	Go to step 2.	Go to step 3.
<p>2 CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (RH).</p> <p>Measure the resistance between connector (3I) in test harness I2 and the chassis ground.</p> <p>Connector & terminal (3I) No. 1 — Chassis ground: (3I) No. 3 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Go to step 3.
<p>3 CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).</p> <p>1) Disconnect the connector (AB13) from the front sub-sensor. <Ref. to AB-20, Front Sub Sensor.></p> <p>2) Connect connector (1H) in test harness H to connector (AB13).</p> <p>3) Measure the resistance between connector (3I) in test harness I2 and connector (3H) in test harness H.</p> <p>Connector & terminal (3I) No. 3 — (3H) No. 5: (3I) No. 1 — (3H) No. 6: Is the measured value less than the specified value?</p>	10 Ω	Go to step 4.	Go to step 5.
<p>4 CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).</p> <p>Measure the resistance between connector (3I) in test harness I2 and the chassis ground.</p> <p>Connector & terminal (3I) No. 3 — Chassis ground: (3I) No. 1 — Chassis ground: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9.	Go to step 5.

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK AIRBAG MAIN HARNESS.</p> <p>1) Remove the instrument panel. <Ref. to EI-35, Instrument Panel Assembly.></p> <p>2) Disconnect connector (AB11) from (AB12), and connect connector (2F) in test harness F to (AB11).</p> <p>3) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F.</p> <p>Connector & terminal (3I) No. 3 — (3F) No. 6: (3I) No. 1 — (3F) No. 5:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 6.	Replace the airbag main harness. <Ref. to AB-15, Main Harness.>
<p>6 CHECK AIRBAG MAIN HARNESS.</p> <p>Measure the resistance between connector (3I) in the test harness I2 and the chassis ground.</p> <p>Connector & terminal (3I) No. 3 — Chassis ground: (3I) No. 1 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 7.	Replace the airbag main harness. <Ref. to AB-15, Main Harness.>
<p>7 CHECK FRONT SUB-SENSOR HARNESS (LH).</p> <p>1) Connect connector (1F) in test harness F to connector (AB12).</p> <p>2) Measure the resistance between connector (3H) in test harness H and connector (3F) in test harness F.</p> <p>Connector & terminal (3F) No. 3 — (3H) No. 5: (3F) No. 4 — (3H) No. 6:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 8.	Replace the front sub-sensor harness (LH). <Ref. to AB-15, Main Harness.>
<p>8 CHECK FRONT SUB-SENSOR HARNESS (LH).</p> <p>Measure the resistance between connector (3F) in test harness F and the chassis ground.</p> <p>Connector & terminal (3F) No. 3 — Chassis ground: (3F) No. 4 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 9.	Replace the front sub-sensor harness (LH). <Ref. to AB-15, Main Harness.>
<p>9 CHECK FRONT SUB-SENSOR (LH).</p> <p>1) Connect connector (2H) in test harness H to front sub-sensor (LH).</p> <p>2) Measure the resistance of the connector (3H) in test harness H.</p> <p>Connector & terminal (3H) No. 3 — No. 4:</p> <p>Is the measured value within the specified range?</p>	750 Ω — 1 KΩ	Go to step 10.	Replace the front sub-sensor (LH). <Ref. to AB-20, Front Sub Sensor.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

	Step	Value	Yes	No
10	CHECK FRONT SUB-SENSOR (LH). Measure the resistance between connector (3H) in test harness H and the chassis ground. Connector & terminal (3H) No. 3 — Chassis ground: (3H) No. 4 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Finish the diagnosis.	Replace the front sub-sensor (LH). <Ref. to AB-20, Front Sub Sensor.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

L: DTC 41

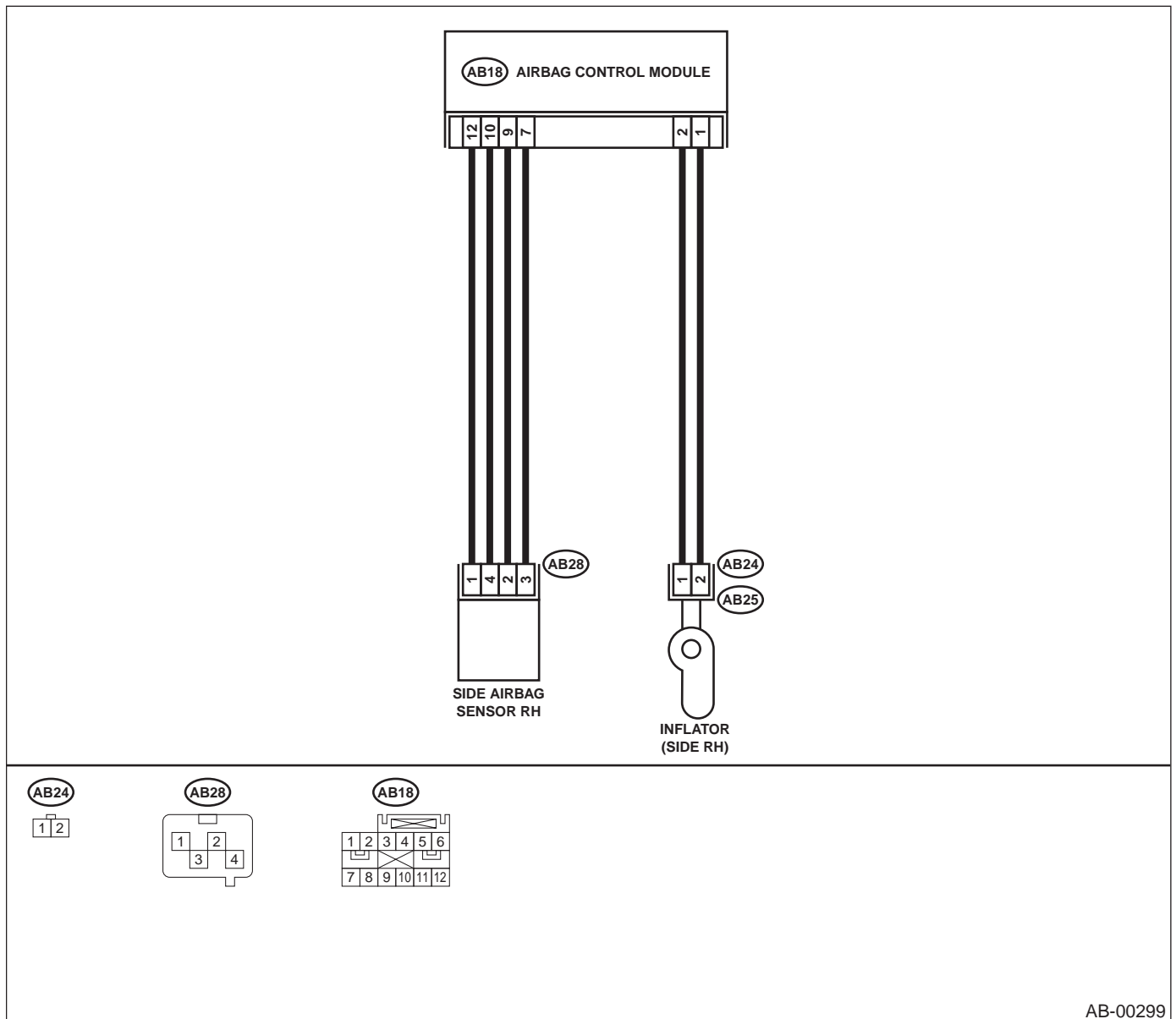
DIAGNOSIS:

- Side airbag harness (RH) is faulty.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00299

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK SIDE AIRBAG MODULE.</p> <p>1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to AB-17, REMOVAL, Airbag Control Module.></p> <p>3) Disconnect connector (AB25) from (AB24), and connect connector (1F) in test harness F to (AB24).</p> <p>4) Connect air bag resistor to connector (3F) in test harness F.</p> <p>5) Connect the battery ground cable, and turn the ignition switch ON.</p> <p>Does the airbag warning light operate properly?</p>	Operates properly.	Replace front seat with side airbag module (RH). <Ref. to SB-7, Front Seat Belt.>	Go to step 2.
<p>2 CHECK SIDE AIRBAG HARNESS (RH).</p> <p>1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Disconnect airbag resistor from test harness.</p> <p>3) Disconnect the connector (AB18) from air bag control module. <Ref. to AB-17, REMOVAL, Airbag Control Module.></p> <p>4) Connect connector (1I) in test harness I2 to connector (AB18).</p> <p>5) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F.</p> <p>Connector & terminal (3I) No. 7 — (3F) No. 4: (3I) No. 9 — (3F) No. 3:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 3.	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
<p>3 CHECK SIDE AIRBAG HARNESS (RH).</p> <p>Measure the resistance of the connector (3F) in test harness F.</p> <p>Connector & terminal (3F) No. 3 — No. 4:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
<p>4 CHECK SIDE AIRBAG HARNESS (RH).</p> <p>Measure the resistance between connector (3F) in test harness F and the chassis ground.</p> <p>Connector & terminal (3F) No. 3 — Chassis ground: (3F) No. 4 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

M: DTC 42

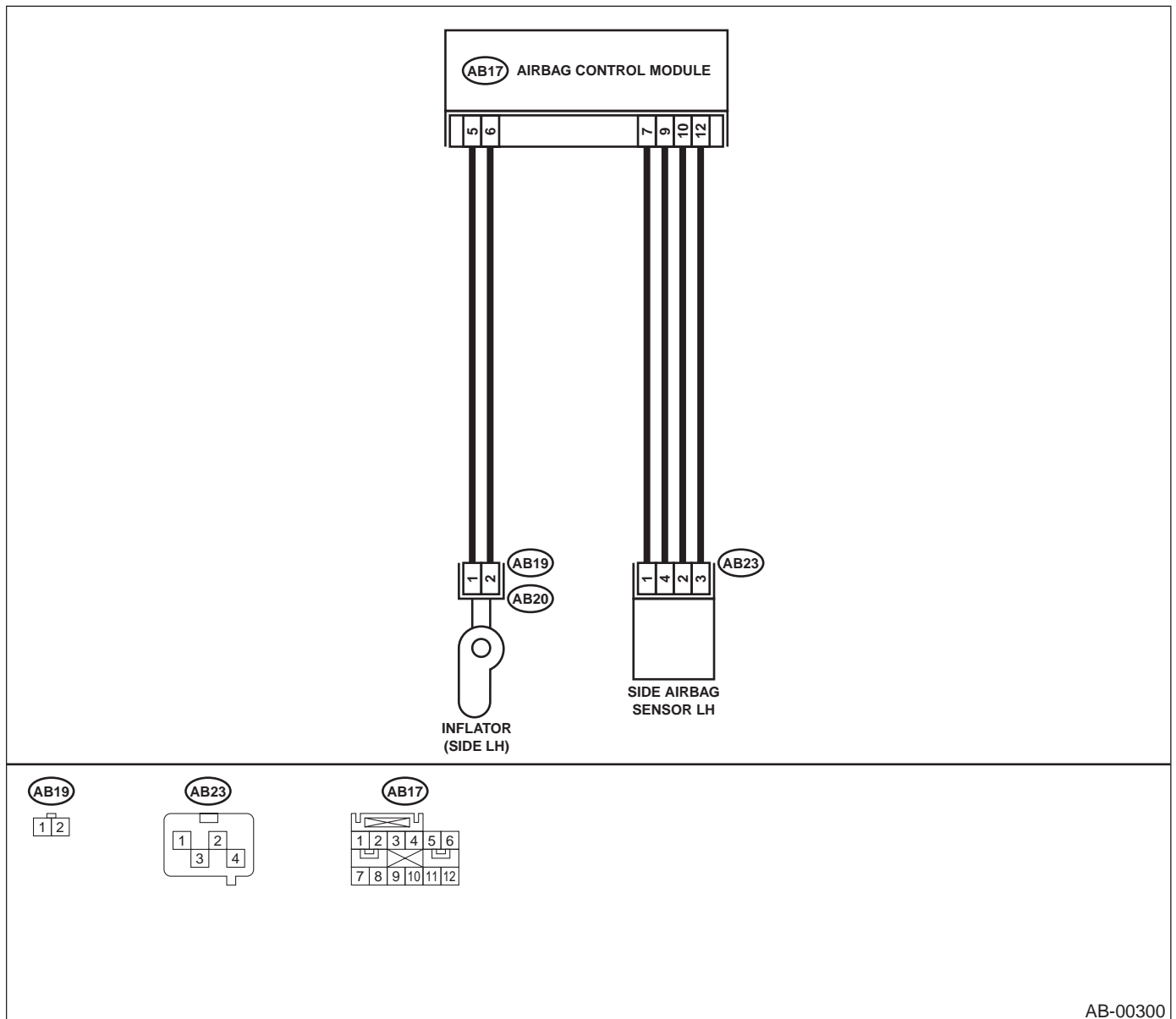
DIAGNOSIS:

- Side airbag harness (LH) is faulty.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00300

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SIDE AIRBAG MODULE. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to AB-17, REMOVAL, Airbag Control Module.> 3) Disconnect connector (AB20) from (AB19), and connect connector (1F) in test harness F to (AB19). 4) Connect airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch ON. Does the air bag warning light operate properly?	Operates properly.	Replace front seat with side airbag module (LH). <Ref. to SB-7, Front Seat Belt.>	Go to step 2.
2 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect airbag resistor from the test harness. 3) Disconnect the connector (AB17) from the airbag control module. <Ref. to AB-17, REMOVAL, Airbag Control Module.> 4) Connect connector (1I) in test harness I2 to connector (AB17). 5) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F. Connector & terminal (3I) No. 10 — (3F) No. 3: (3I) No. 12 — (3F) No. 4: Is the measured value less than the specified value?	10 Ω	Go to step 3.	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
3 CHECK SIDE AIRBAG HARNESS (LH). Measure the resistance of the connector (3F) in test harness F. Connector & terminal (3F) No. 3 — No. 4: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
4 CHECK SIDE AIRBAG HARNESS (LH). Measure the resistance between connector (3F) in test harness F and the chassis ground. Connector & terminal (3F) No. 3 — Chassis ground: (3F) No. 4 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

N: DTC 45

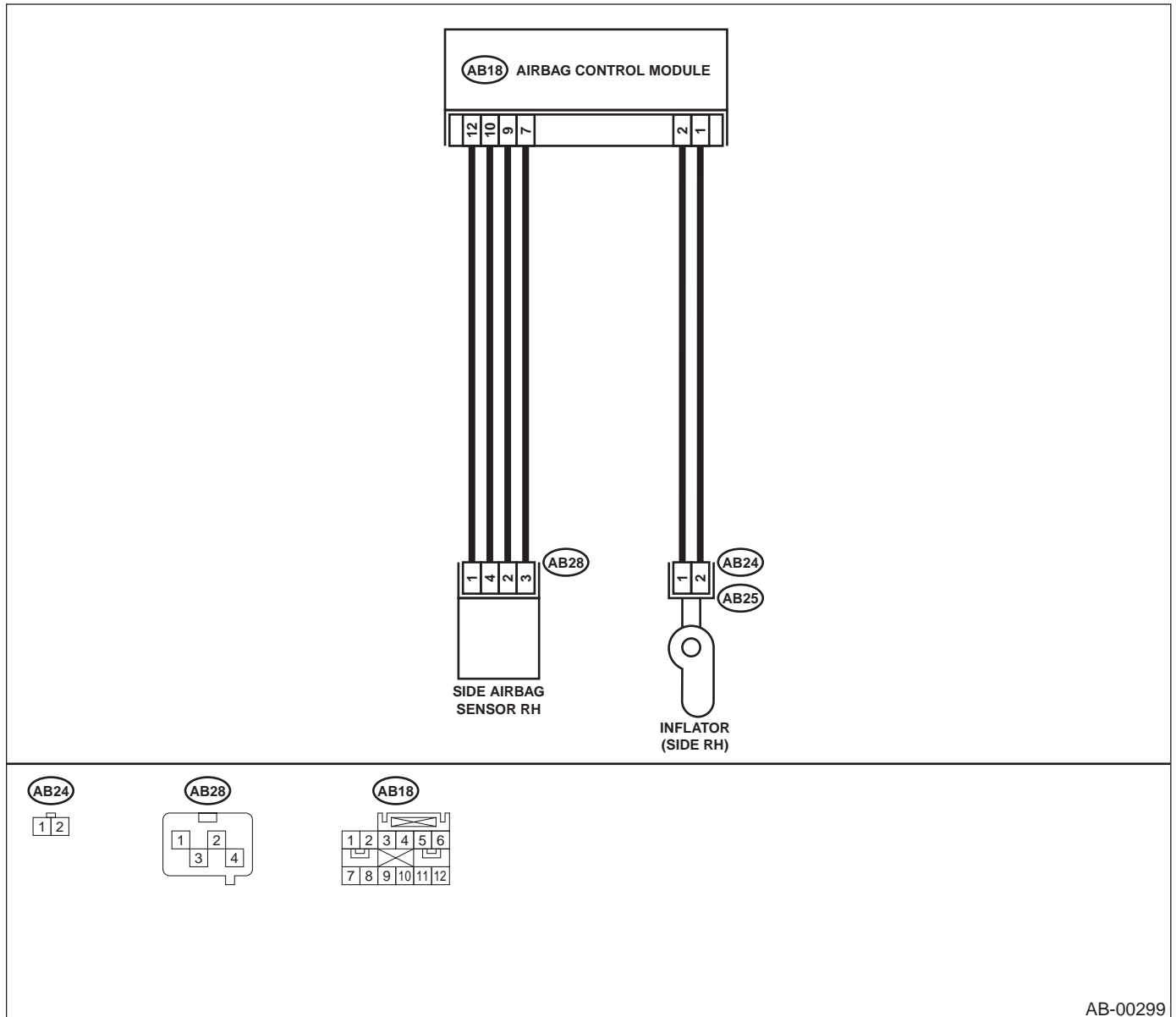
DIAGNOSIS:

- Side airbag harness (RH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00299

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK SIDE AIRBAG MODULE.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SE-7, Front Seat.> 3) Disconnect the connector (AB25) from (AB24), and connect connector (1F) in test harness F to (AB24). 4) Connect airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch ON. <p>Does air bag warning light operate properly?</p>	Operates properly.	Replace front seat with side airbag module (RH). <Ref. to SE-7, Front Seat.>	Go to step 2.
<p>2 CHECK SIDE AIRBAG HARNESS (RH).</p> <ol style="list-style-type: none"> 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect airbag resistor from the test harness. 3) Disconnect the connector (AB18) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> 4) Connect connector (1I) in test harness I2 to connector (AB18). 5) Connect the battery ground cable, and turn the ignition switch ON. 6) Measure the voltage between connector (3I) in test harness I2 and the chassis ground. <p>Connector & terminal (3I) No. 7 (+) — Chassis ground (-): (3I) No. 9 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

O: DTC 46

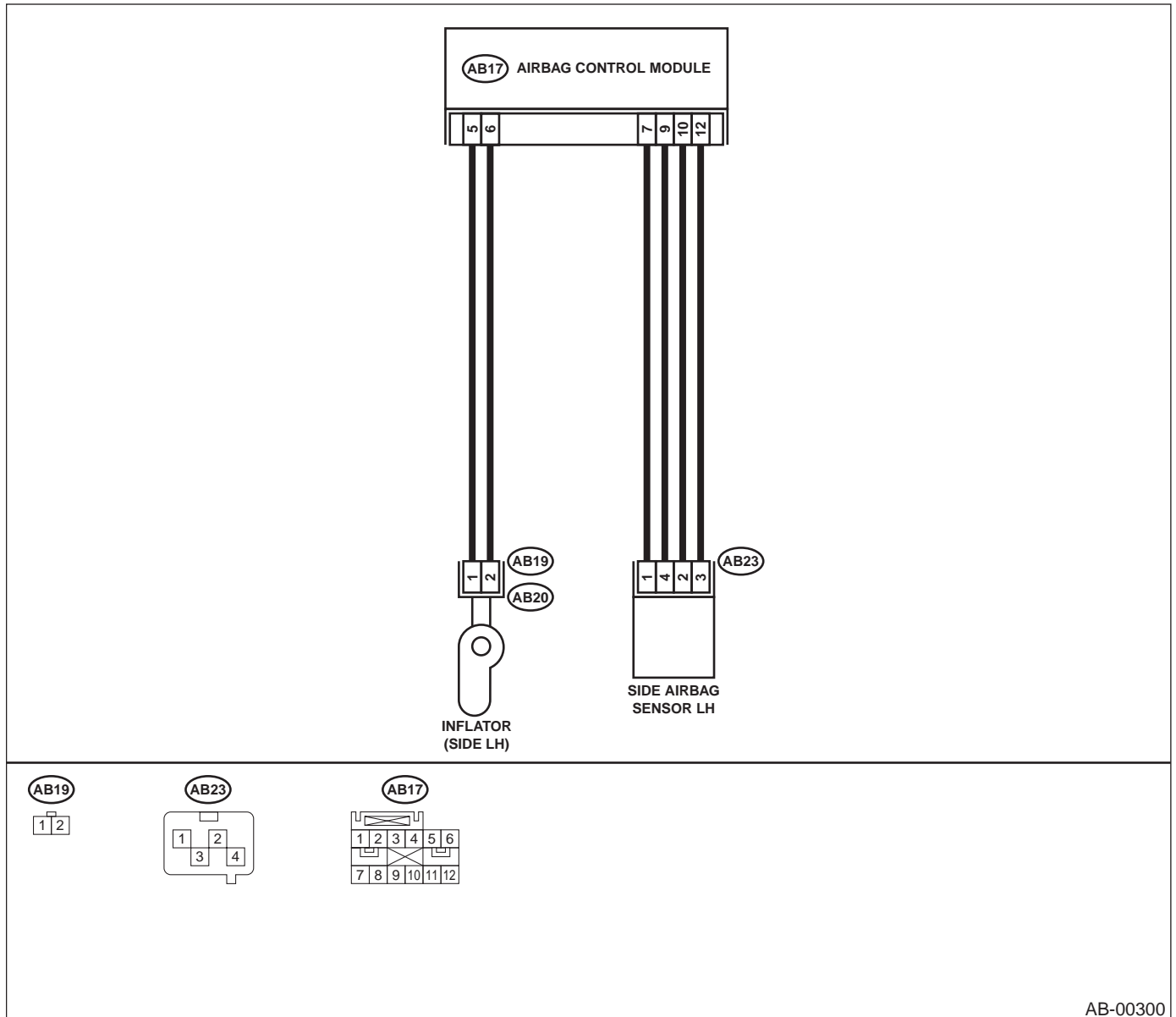
DIAGNOSIS:

- Side airbag harness (LH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00300

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SIDE AIRBAG MODULE. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB21) from the seat belt pretensioner (LH). <Ref. to SE-7, Front Seat.> 3) Disconnect connector (AB20) from (AB19), and connect connector (1F) in test harness F to (AB19). 4) Connect airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON. Does air bag warning light operate properly?	Operates properly.	Replace front seat with side airbag module (LH). <Ref. to SE-7, Front Seat.>	Go to step 2.
2 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect airbag resistor from the test harness. 3) Disconnect the connector (AB17) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> 4) Connect connector (1I) in test harness I2 to connector (AB17). 5) Connect the battery ground cable, and turn the ignition switch ON. 6) Measure the voltage between connector (3I) in test harness I2 and the chassis ground. Connector & terminal (3I) No. 10 (+) — Chassis ground (-): (3I) No. 12 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

P: DTC 51

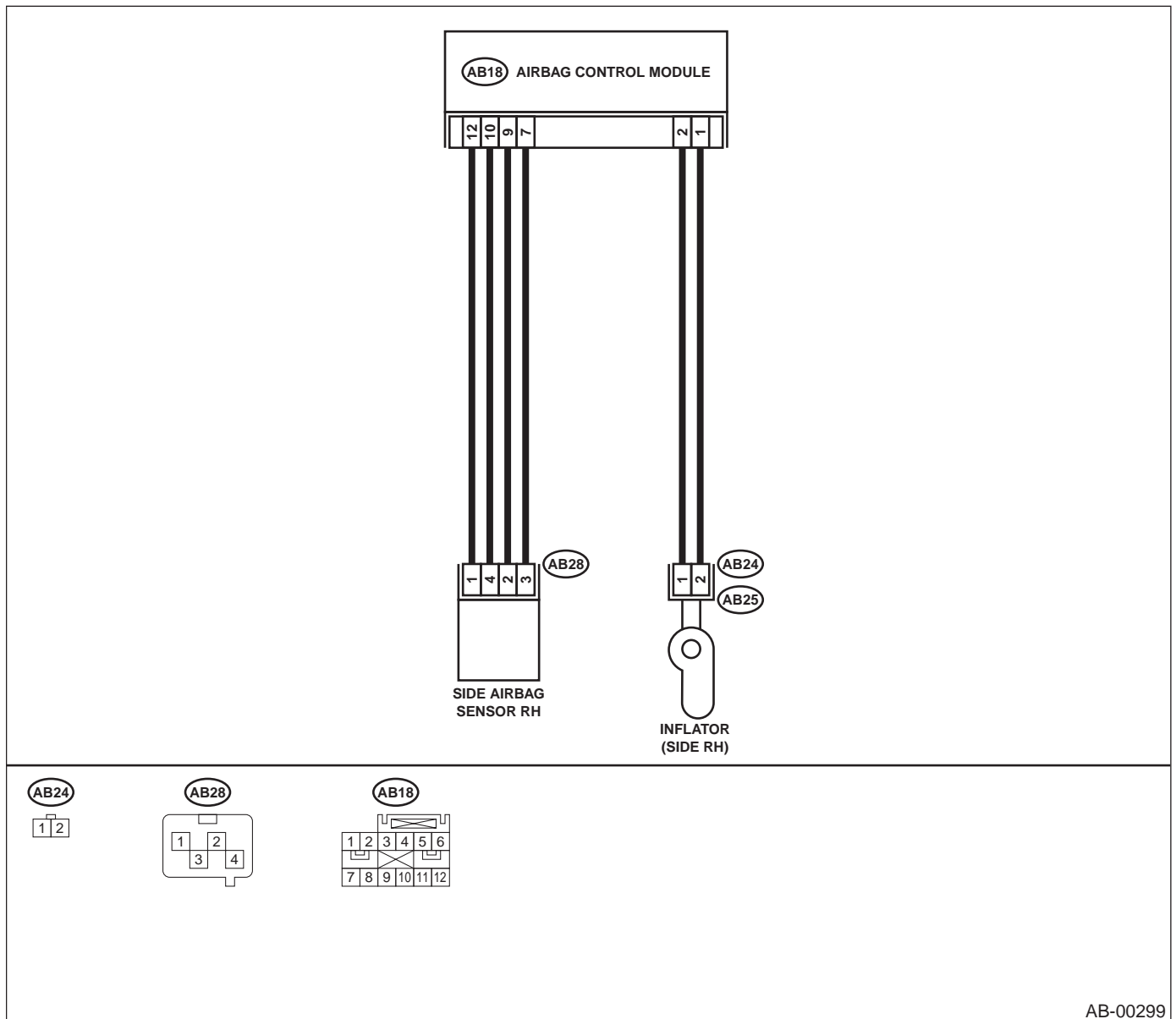
DIAGNOSIS:

- Side airbag sensor (RH) is faulty.
- Side airbag harness (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00299

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK SIDE AIRBAG HARNESS (RH).</p> <ol style="list-style-type: none"> 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.> 3) Disconnect connector (AB25) from (AB24). 4) Disconnect connector (AB18) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> 5) Connect connector (1I) in test harness I2 to the connector (AB18). 6) Disconnect connector (AB28) from the side airbag sensor (RH), and connect connector (1G) in test harness G to connector (AB28). 7) Measure the resistance between connector (3I) in test harness I2 and connector (3G) in test harness G. <p>Connector & terminal</p> <p>(3I) No. 17 — (3G) No. 2:</p> <p>(3I) No. 18 — (3G) No. 4:</p> <p>(3I) No. 19 — (3G) No. 1:</p> <p>(3I) No. 20 — (3G) No. 5:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 2.	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
<p>2</p> <p>CHECK SIDE AIRBAG HARNESS (RH).</p> <p>Measure the resistance between connector (3I) in test harness I2 and the chassis ground.</p> <p>Connector & terminal</p> <p>(3I) No. 17 — Chassis ground:</p> <p>(3I) No. 18 — Chassis ground:</p> <p>(3I) No. 19 — Chassis ground:</p> <p>(3I) No. 20 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Replace side airbag sensor (RH). <Ref. to AB-18, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Q: DTC 52

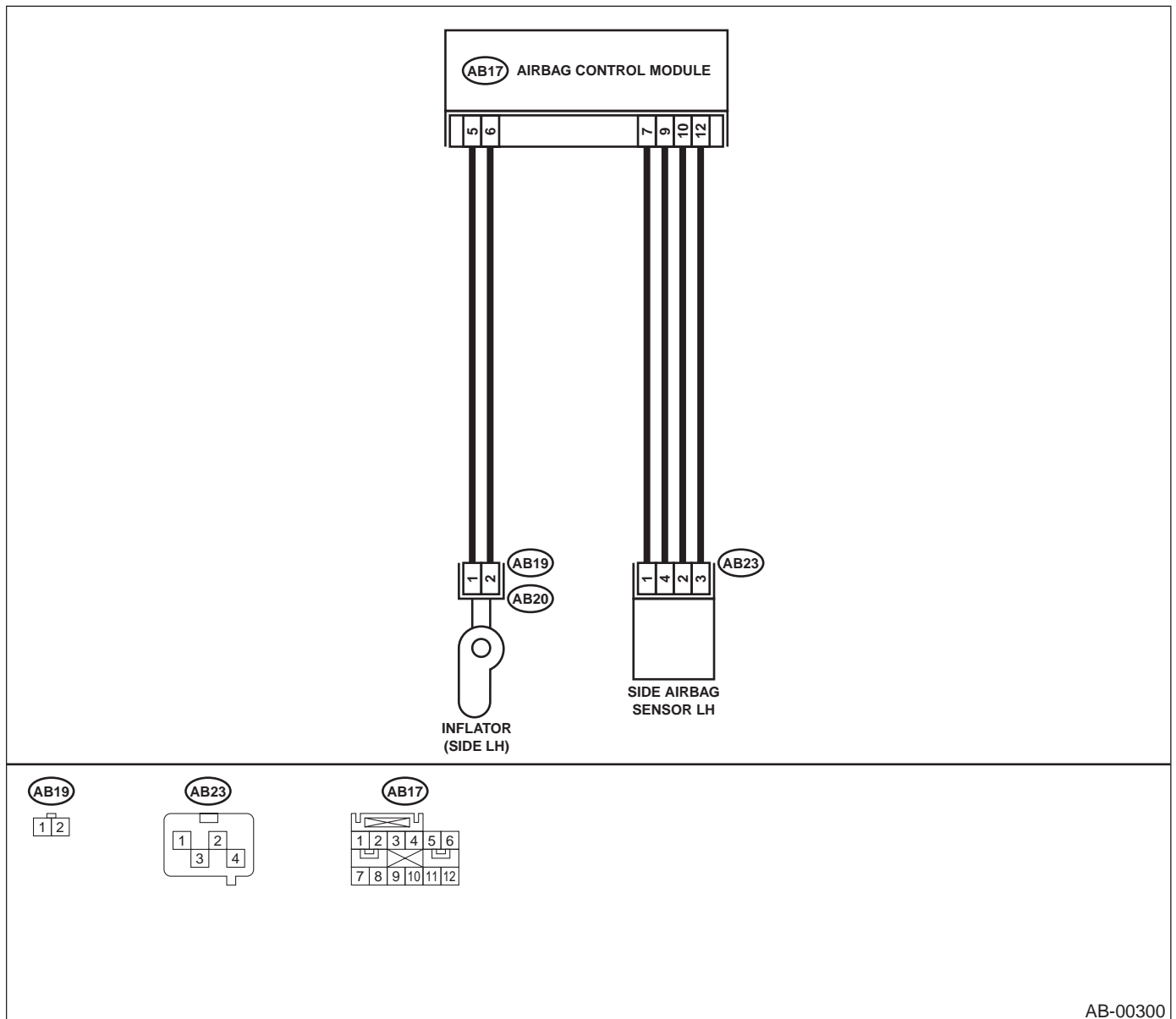
DIAGNOSIS:

- Side airbag sensor (LH) is faulty.
- Side airbag harness (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00300

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK SIDE AIRBAG HARNESS (LH).</p> <ol style="list-style-type: none"> 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.> 3) Disconnect connector (AB20) from (AB19). 4) Disconnect connector (AB17) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> 5) Connect connector (1I) in test harness I2 to connector (AB17). 6) Disconnect connector (AB23) from the side airbag sensor (LH), and connect connector (1G) in test harness G to connector (AB23). 7) Measure the resistance between connector (3I) in test harness I2 and connector (3G) in test harness G. <p>Connector & terminal (3I) No. 5 — (3G) No. 5: (3I) No. 14 — (3G) No. 1: (3I) No. 15 — (3G) No. 4: (3I) No. 16 — (3G) No. 2:</p> <p>Is the measured value less than the specified value?</p>	<p>10 Ω</p>	<p>Go to step 2.</p>	<p>Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.></p>
<p>2 CHECK SIDE AIRBAG HARNESS (RH).</p> <p>Measure the resistance between connector (3I) in test harness I2 and the chassis ground.</p> <p>Connector & terminal (3I) No. 5 — Chassis ground: (3I) No. 14 — Chassis ground: (3I) No. 15 — Chassis ground: (3I) No. 16 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	<p>1 MΩ</p>	<p>Replace side airbag sensor (LH). <Ref. to AB-18, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-17, Airbag Control Module.></p>	<p>Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.></p>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

R: DTC 53

DIAGNOSIS:

- Side airbag sensor (RH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (RH) is faulty. Replace the side airbag sensor (RH).

<Ref. to AB-18, Side Airbag Sensor.>

S: DTC 54

DIAGNOSIS:

- Side airbag sensor (LH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).

<Ref. to AB-18, Side Airbag Sensor.>

T: DTC 55

This code is displayed when the side airbag is deployed.

When this code is displayed, the memory cannot be erased. Replace the following parts.

- Airbag control module. <Ref. to AB-17, Airbag Control Module.>
- Front seat with side airbag module. (Operating side) <Ref. to SE-7, Front Seat.>
- Side airbag sensor. (Operating side) <Ref. to AB-18, Side Airbag Sensor.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

MEMO:

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

U: DTC 61

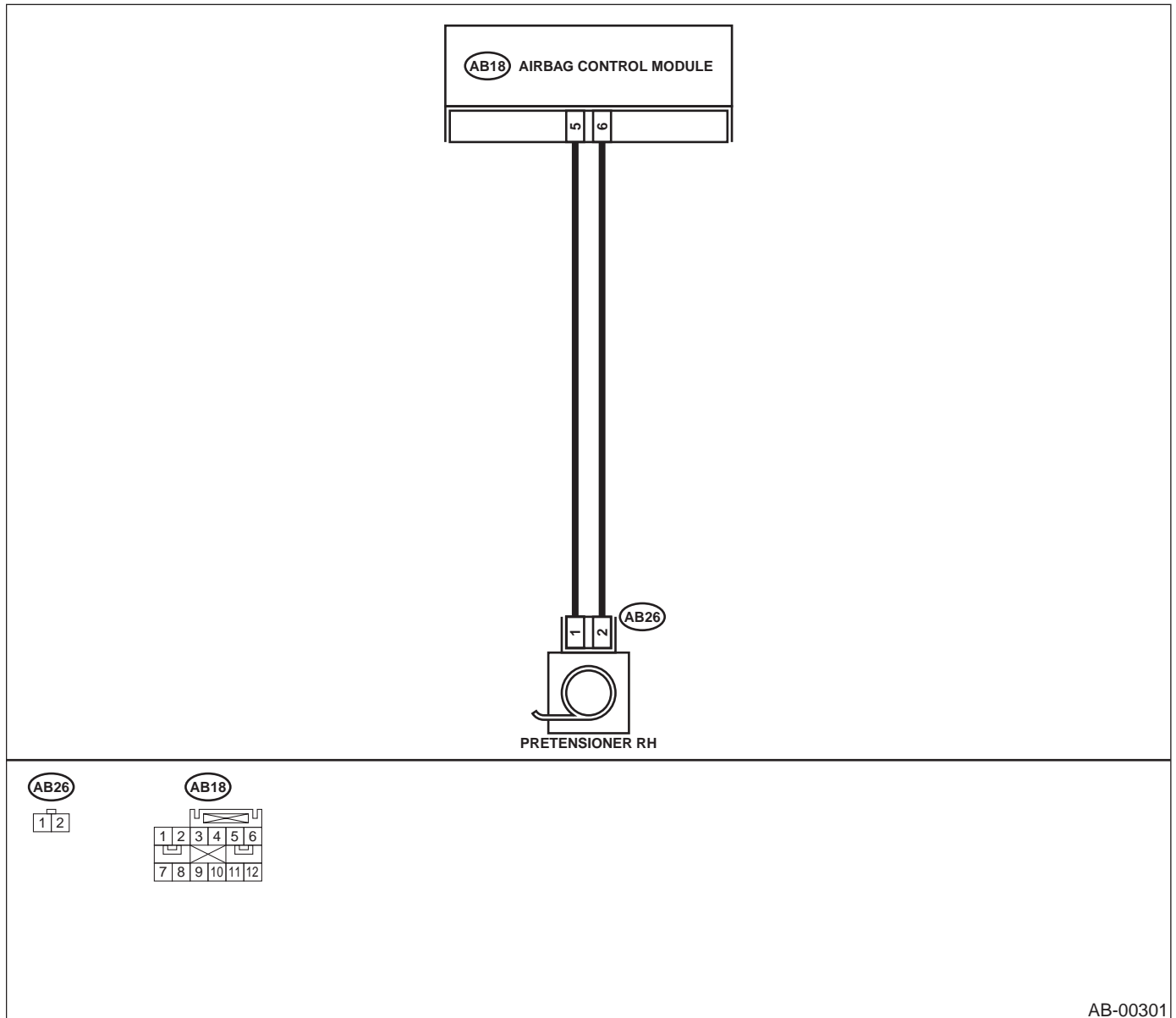
DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00301

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK SEAT BELT PRETENSIONER.</p> <p>1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.></p> <p>3) Connect the connector (1F) in test harness F to (AB26).</p> <p>4) Connect the airbag resistor to connector (3F) in test harness F.</p> <p>5) Connect the battery ground cable and turn the ignition switch ON.</p> <p>Does the airbag warning light operate properly?</p>	Operates properly.	Replace seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.>	Go to step 2.
<p>2 CHECK SIDE AIRBAG HARNESS (RH).</p> <p>1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Disconnect the airbag resistor from the test harness.</p> <p>3) Disconnect the connector (AB25) from (AB24).</p> <p>4) Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-17, Airbag Control Module.></p> <p>5) Connect the connector (1I) in test harness I2 to connector (AB18).</p> <p>6) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F.</p> <p>Connector & terminal (3I) No. 8 — (3F) No. 4: (3I) No. 6 — (3F) No. 3:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 3.	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
<p>3 CHECK SIDE AIRBAG HARNESS (RH).</p> <p>Measure the resistance of the connector (3I) in test harness I2.</p> <p>Connector & terminal (3I) No. 6 — No. 8:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
<p>4 CHECK SIDE AIRBAG HARNESS (RH).</p> <p>Measure the resistance between connector (3I) in test harness I2 and the chassis ground.</p> <p>Connector & terminal (3I) No. 6 — Chassis ground: (3I) No. 8 — Chassis ground:</p> <p>Does the measured value exceed the specified value?</p>	1 MΩ	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

V: DTC 62

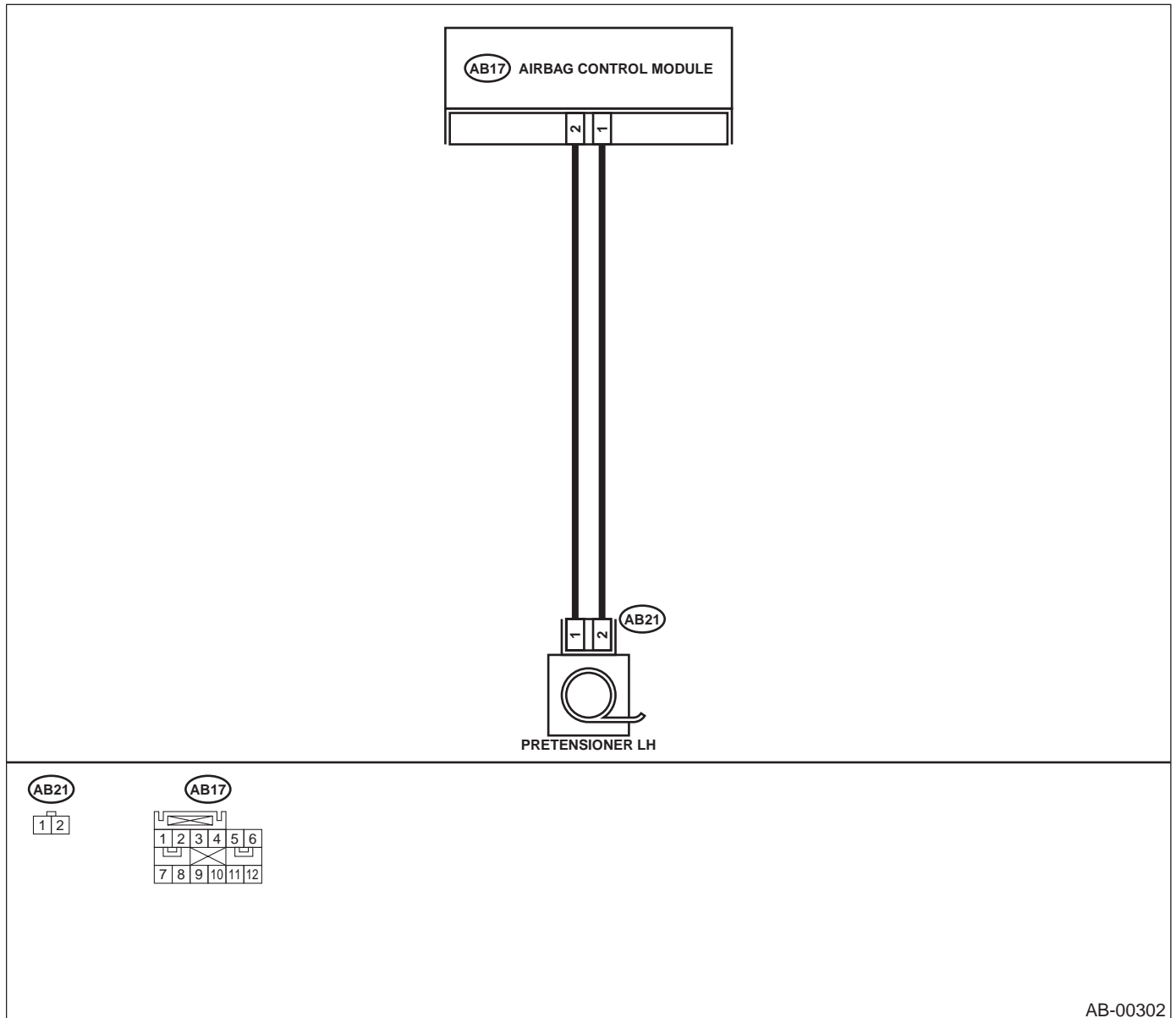
DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00302

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SEAT BELT PRETENSIONER. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB21) from the seatbelt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB21). 4) Connect the airbag resistor to the connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON. Does the airbag warning light operate properly?	Operates properly.	Replace seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.>	Go to step 2.
2 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB20) from (AB19). 4) Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> 5) Connect the connector (1I) in test harness I2 to the connector (AB17). 6) Measure the resistance between connector (3I) in test harness I2 and the connector (3F) in test harness F. Connector & terminal (3I) No. 11 — (3F) No. 4: (3I) No. 13 — (3F) No. 3: Is the measured value less than the specified value?	10 Ω	Go to step 3.	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
3 CHECK SIDE AIRBAG HARNESS (LH). Measure the resistance of the connector (3I) in test harness I2. Connector & terminal (3I) No. 11 — No. 13: Does the measured value exceed the specified value?	1 MΩ	Go to step 4.	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>
4 CHECK SIDE AIRBAG HARNESS (LH). Measure the resistance between the connector (3I) in test harness I2 and the chassis ground. Connector & terminal (3I) No. 11 — Chassis ground: (3I) No. 13 — Chassis ground: Does the measured value exceed the specified value?	1 MΩ	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

W: DTC 65

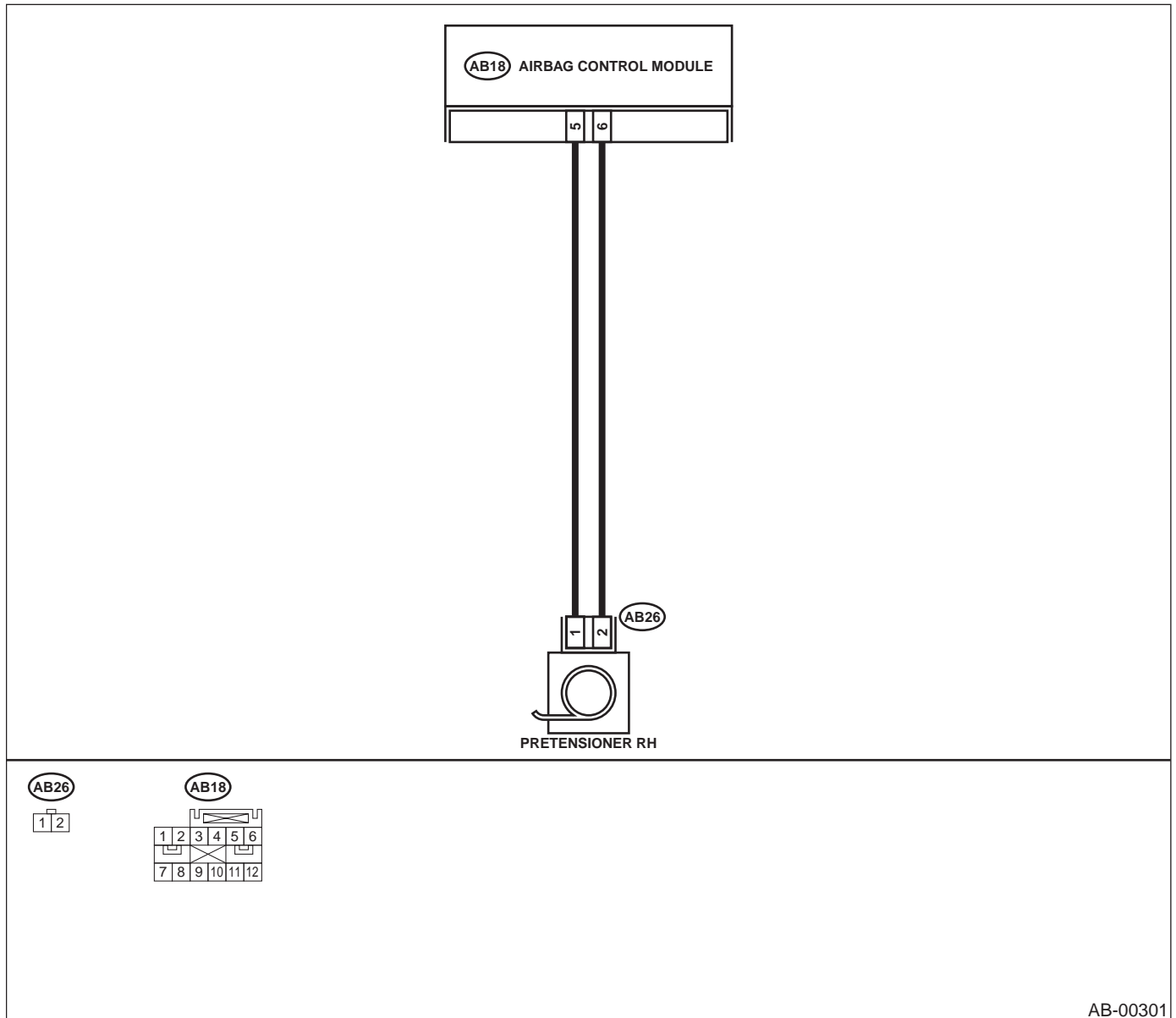
DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00301

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK SEAT BELT PRETENSIONER. 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB26). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch ON. Does the airbag warning light operate properly?	Operates properly.	Replace seat belt pretensioner (RH). <Ref. to SB-7, Front Seat Belt.>	Go to step 2.
2 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB25) from (AB24). 4) Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> 5) Connect the connector (1I) in test harness I2 to the connector (AB18). 6) Connect the battery ground cable and turn the ignition switch ON. 7) Measure the voltage between connector (3I) in test harness I2 and the chassis ground. Connector & terminal (3I) No. 6 (+) — Chassis ground (-): (3I) No. 8 (+) — Chassis ground (-): Is the measured value less than the specified value?	1 V	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

X: DTC 66

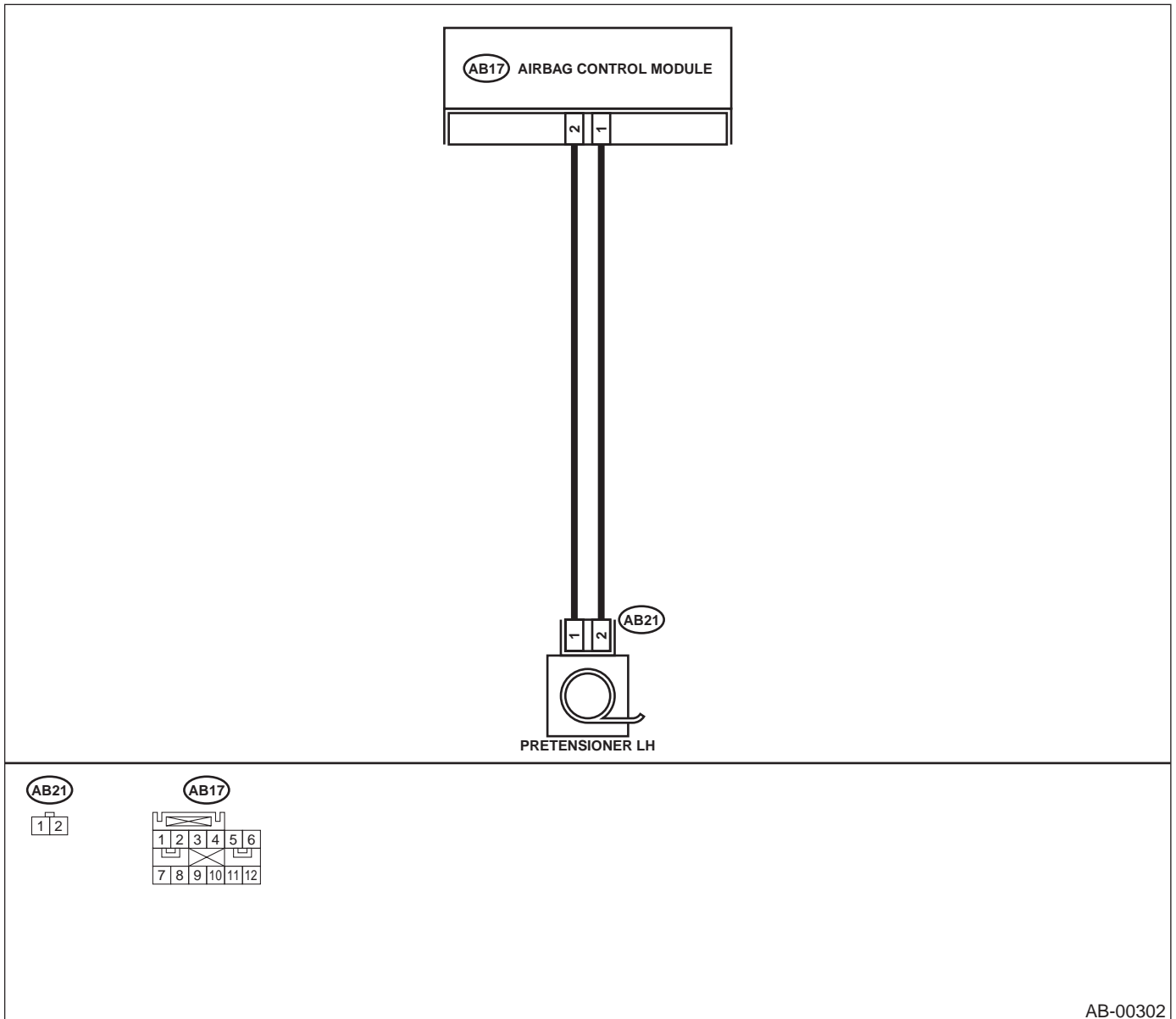
DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, roll connector, control module and the sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



AB-00302

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1</p> <p>CHECK SEAT BELT PRETENSIONER.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-7, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB21). 4) Connect the airbag resistor to the connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON. <p>Does the airbag warning light operate properly?</p>	Operates properly.	Replace seat belt pre-tensioner (LH). <Ref. to SB-7, Front Seat Belt.>	Go to step 2.
<p>2</p> <p>CHECK SIDE AIRBAG HARNESS (LH).</p> <ol style="list-style-type: none"> 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB20) from (AB19). 4) Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-17, Airbag Control Module.> 5) Connect the connector (1I) in test harness I2 to the connector (AB17). 6) Connect the battery ground cable and turn the ignition switch ON. 7) Measure the voltage between connector (3I) in test harness I2 and the chassis ground. <p>Connector & terminal</p> <p>(3I) No. 11 (+) — Chassis ground (-): (3I) No. 13 (+) — Chassis ground (-):</p> <p>Is the measured value less than the specified value?</p>	1 V	Replace the airbag control module. <Ref. to AB-17, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-16, Side Airbag Harness.>

DIAGNOSTIC CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

MEMO:

SEAT BELT SYSTEM

SB

	Page
1. General Description	2
2. Inspection Locations After a Collision	6
3. Front Seat Belt	7
4. Rear Seat Belt	9
5. Disposal of Pretensioner	12



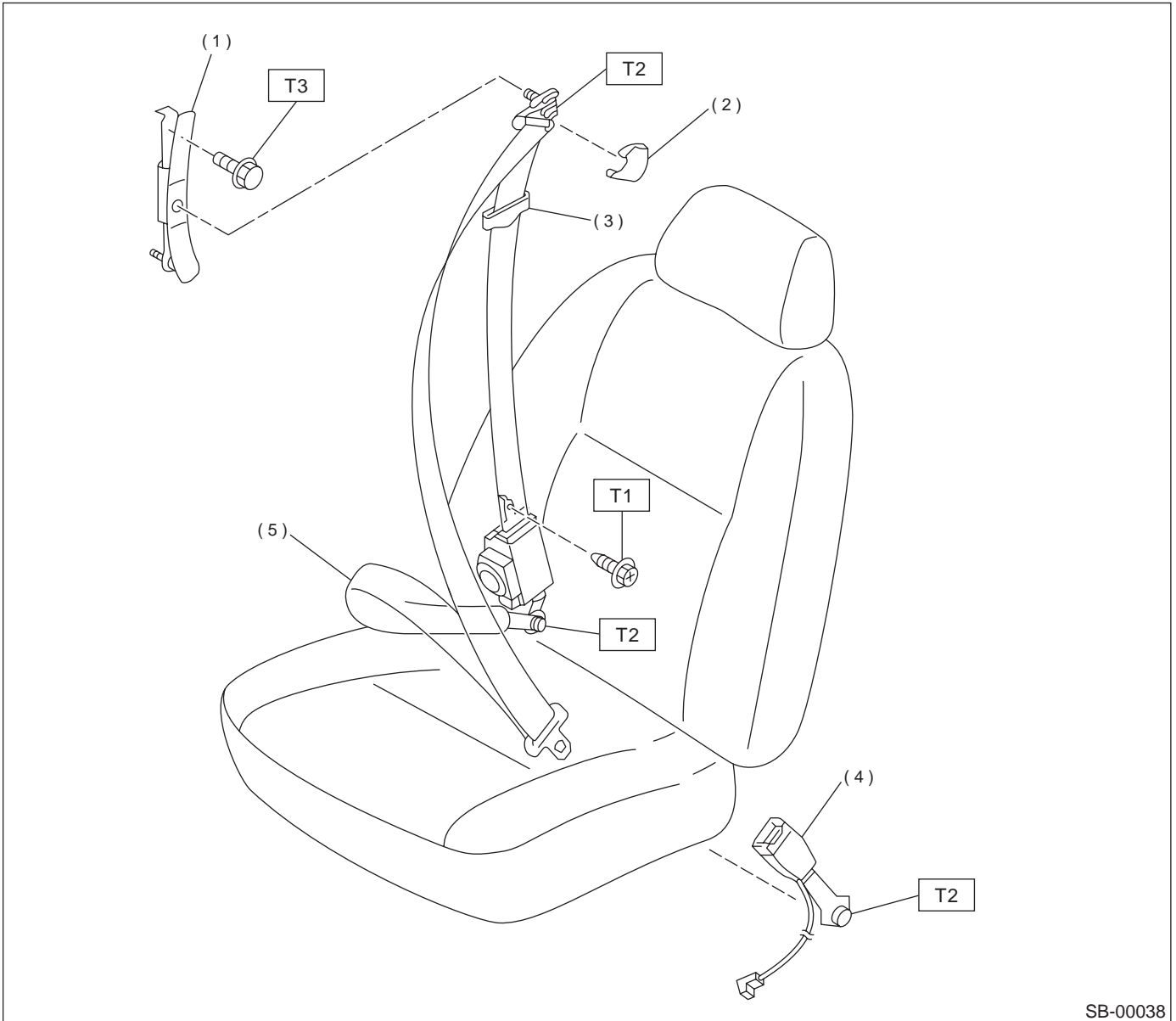
GENERAL DESCRIPTION

SEAT BELT SYSTEM

1. General Description

A: COMPONENT

1. FRONT SEAT BELT



SB-00038

(1) Adjuster anchor ASSY

(5) Outer belt ASSY

(2) Anchor cover

(3) Webbing guide

(4) Inner belt ASSY

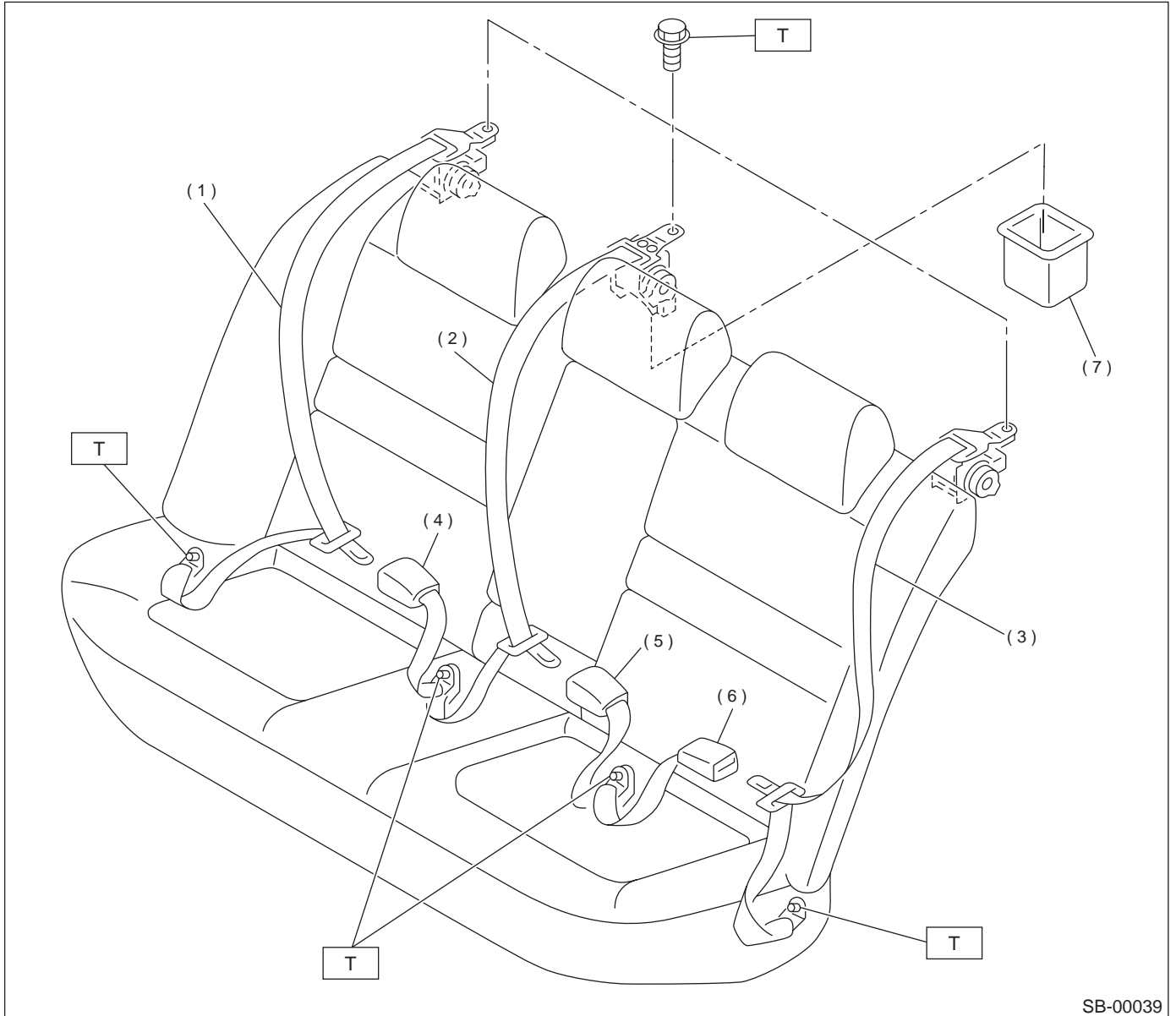
Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 30 (3.1, 22)

T3: 53 (5.4, 39)

2. REAR SEAT BELT (SEDAN BODY)



- | | |
|----------------------------|----------------------------|
| (1) Outer seat belt RH | (5) Inner seat belt CENTER |
| (2) Outer seat belt CENTER | (6) Inner seat belt LH |
| (3) Outer seat belt LH | (7) Case center ELR |
| (4) Inner seat belt RH | |

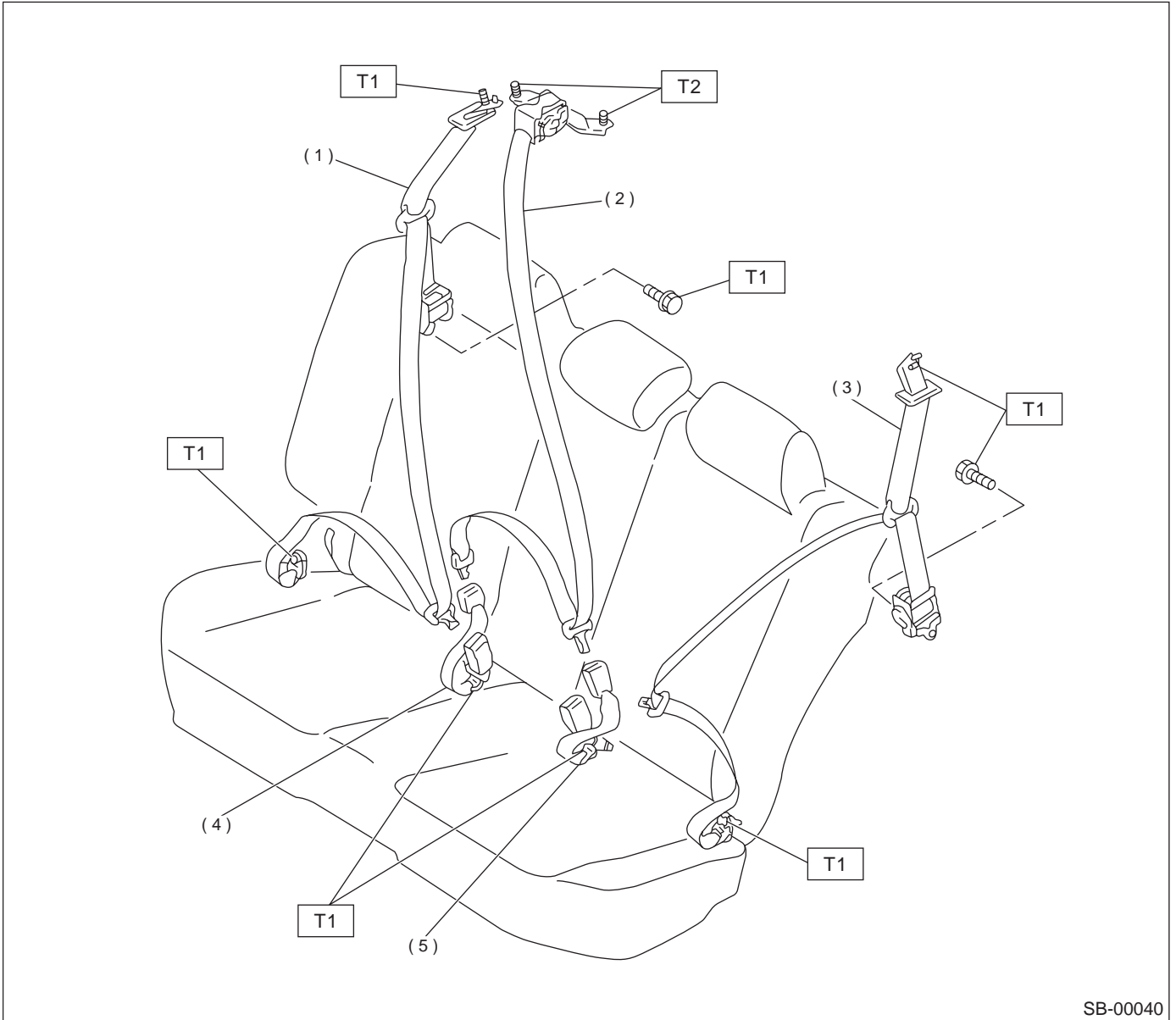
Tightening torque: N·m (kgf-m, ft-lb)

T: 30 (3.1, 22)

GENERAL DESCRIPTION

SEAT BELT SYSTEM

3. REAR SEAT BELT (WAGON BODY)



- (1) Outer seat belt RH
- (2) Outer seat belt CENTER
- (3) Outer seat belt LH

- (4) Inner seat belt RH
- (5) Inner seat belt LH

Tightening torque: N·m (kgf·m, ft·lb)

T1: 30 (3.1, 22)

T2: 53 (5.4, 39)

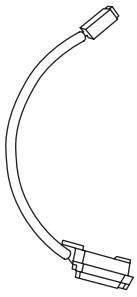

B: CAUTION

- Before starting, turn the ignition switch OFF, disconnect the battery ground cable and wait for 20 seconds or more.
- The pretensioner system has a backup power source. The pretensioner might deploy if you do not wait for 20 seconds or more before starting
- Do not drop or apply any impact to the pretensioner.
- If oil, grease, or water gets on the pretensioner, wipe it off immediately with a dry cloth.
- Do not expose the pretensioner to high temperature or flame.
- Do not allow current to flow through or voltage to reach the pretensioner. Do not use a circuit tester to check resistance of the pretensioner.

- Do not disassemble or attempt to repair the pretensioner. If it is dented, cracked, or deformed, replace it with a new one.
- Do not use the airbag or pretensioner parts from other vehicles. Always replace parts with new parts
- When handling a seat belt with a deployed pretensioner, wear gloves and goggles. Wash your hands afterwards.
- Do not re-use a seat belt with a deployed pretensioner again.
- Be sure to deploy pretensioner before disposal. <Ref. to SB-12, OPERATION, Disposal of Pretensioner.>
- If the material gets in your eyes or on your skin during deployment, wash it away with clean water, and then consult a doctor.

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST98299FC030</p>	98299FC030	ADAPTER A (DEPLOYMENT)	<ul style="list-style-type: none"> • Used for activating the pretensioner. • Used with DEPLOYMENT TOOL (98299PA030).
 <p style="text-align: center;">ST98299PA030</p>	98299PA030	DEPLOYMENT TOOL	<ul style="list-style-type: none"> • Used for activating the pretensioner. • Used with ADAPTER A (DEPLOYMENT) (98299FC030).

INSPECTION LOCATIONS AFTER A COLLISION

SEAT BELT SYSTEM

2. Inspection Locations After a Collision

A: INSPECTION

Check for the following, and then replace with new parts if necessary.

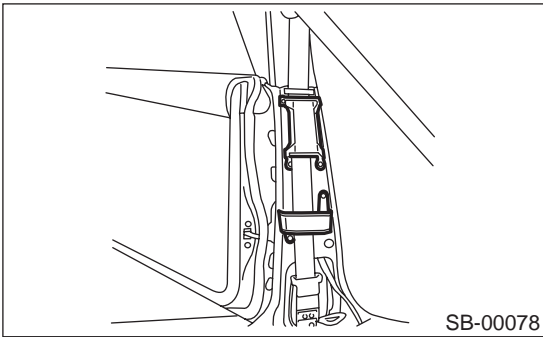
- Center pillar lower garnish is discolored or cracked.
- Wire harness and/or connector is damaged.

3. Front Seat Belt

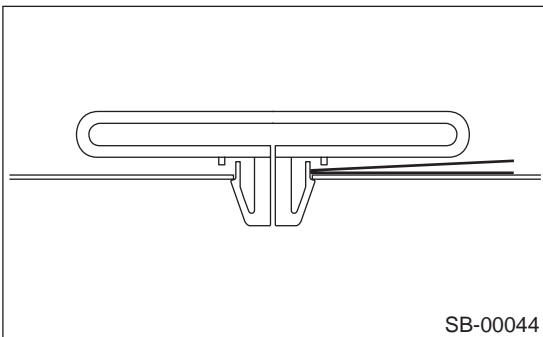
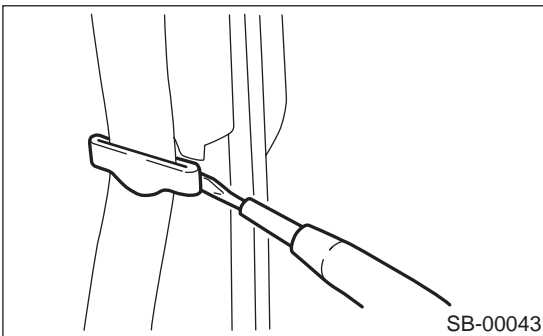
A: REMOVAL

1. OUTER BELT (FRONT)

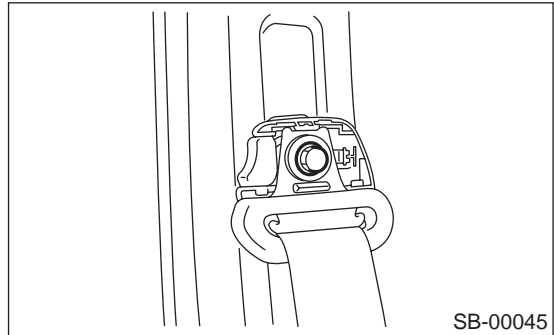
- 1) Fold backrest all the way forward, and then move front seat all the way forward.
- 2) Turn ignition switch OFF, disconnect ground cable from battery, and wait for more than 20 seconds before starting work.
- 3) Remove center pillar lower trim. <Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 4) Remove bracket.



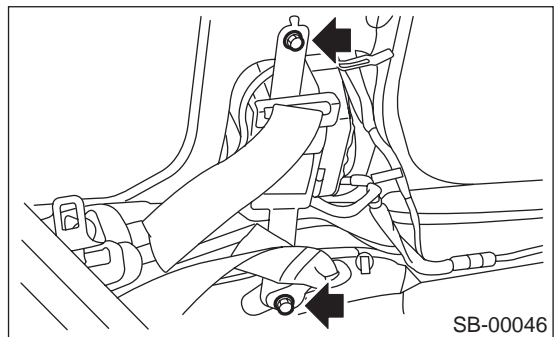
- 5) Remove webbing guide.



- 6) Remove anchor cover. Loosen shoulder anchor bolt, and then detach shoulder anchor from center pillar.



- 7) Turn over the floor mat to remove bolt.



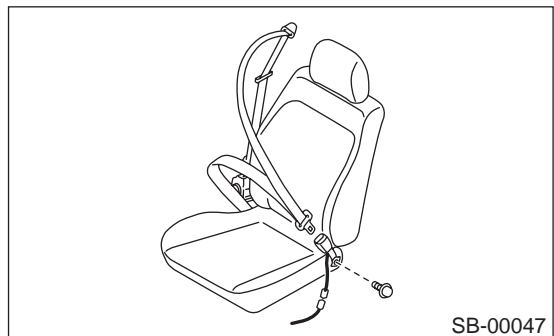
- 8) Disconnect yellow connector of pretensioner harness, and remove outer belt (front).

CAUTION:

- Do not drop or apply any impact to pretensioner.
- Pretensioner and bracket should be treated as an assembly. Do not attempt to disassemble it.

2. INNER BELT (FRONT)

- 1) Disconnect connector.
- 2) Remove anchor bolt, and then detach inner belt.



FRONT SEAT BELT

SEAT BELT SYSTEM

B: INSTALLATION

1. OUTER BELT (FRONT)

Install in the reverse order of removal.

CAUTION:

- The parts on left and right are not identical. Before installation, make sure that the correct part is used.
- Be careful not to twist belts during installation.

2. INNER BELT (FRONT)

Install in the reverse order of removal.

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

C: INSPECTION

1. OUTER BELT (FRONT)

Check for the following, and replace with new parts if necessary.

- Pretensioner is cracked or deformed.
- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. INNER BELT (FRONT)

Check for the following, and replace with new parts if necessary.

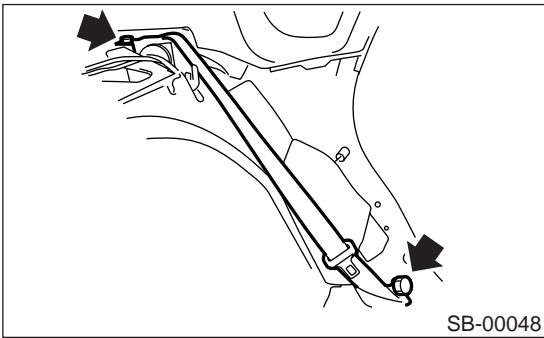
- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

4. Rear Seat Belt

A: REMOVAL

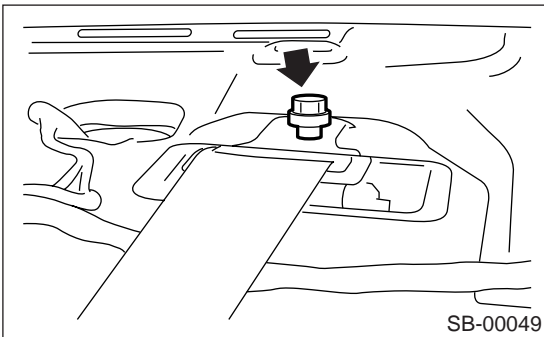
1. OUTER BELT SIDE (SEDAN BODY)

- 1) Remove rear shelf trim. <Ref. to EI-45, REMOVAL, Rear Shelf Trim.>
- 2) Remove side sill rear upper cover. <Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 3) Remove bolts, then detach outer belt side.



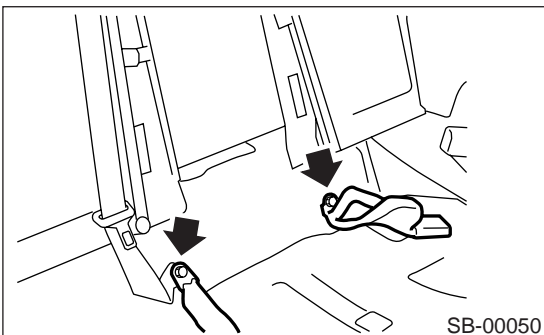
2. OUTER BELT CENTER (SEDAN BODY)

- 1) Remove rear shelf trim. <Ref. to EI-45, REMOVAL, Rear Shelf Trim.>
- 2) Remove bolt, and then detach outer belt center.



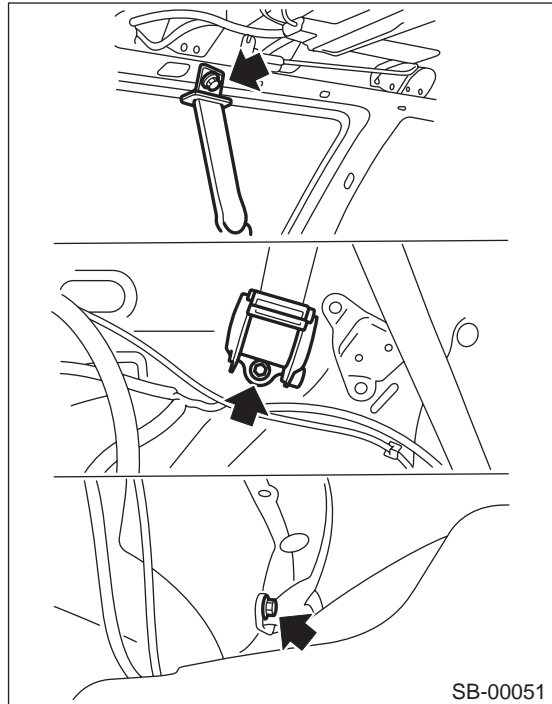
3. INNER BELT (SEDAN BODY)

- 1) Remove the rear seat cushion. <Ref. to SE-17, SEDAN, REMOVAL, Rear Seat.>
- 2) Remove bolts, and then detach inner belt.



4. OUTER BELT SIDE (WAGON BODY)

- 1) Remove rear quarter trim. <Ref. to EI-40, WAGON, REMOVAL, Rear Quarter Trim.>
- 2) Remove bolt and nut, and then detach outer belt side.



5. OUTER BELT CENTER (WAGON BODY)

NOTE:

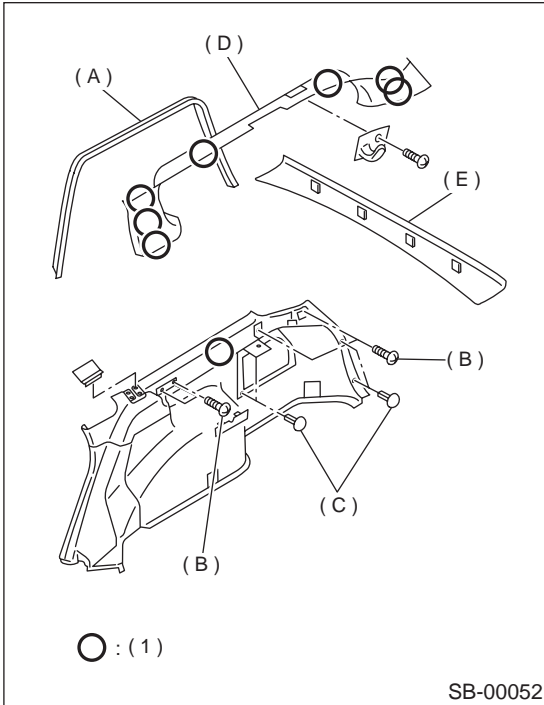
When removing clip, do not to damage the roof trim.

- 1) Remove luggage room light. <Ref. to LI-33, REMOVAL, Luggage Room Light.>
- 2) Remove rear mole (A) of right side.
- 3) Remove screws (B) and clips (C) of rear quarter lower trim shown in the figure.
- 4) Remove rear quarter upper trim (D) of right side.

REAR SEAT BELT

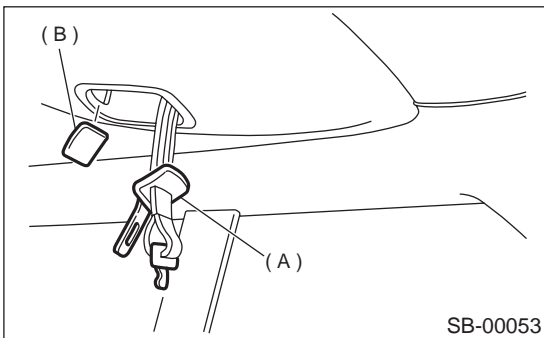
SEAT BELT SYSTEM

5) Remove rear rail trim (E).



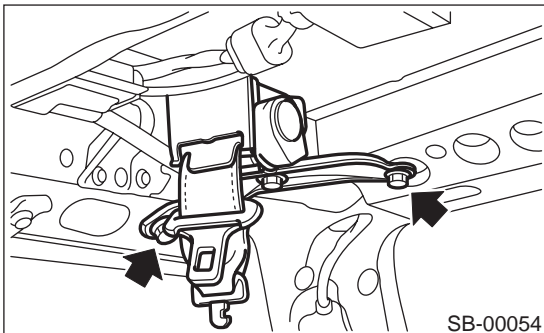
(1) Hook

6) Remove cover (B) while detaching snap lock carefully. Put the outer belt center tongue (A) out to the other side of the trim through the hole.



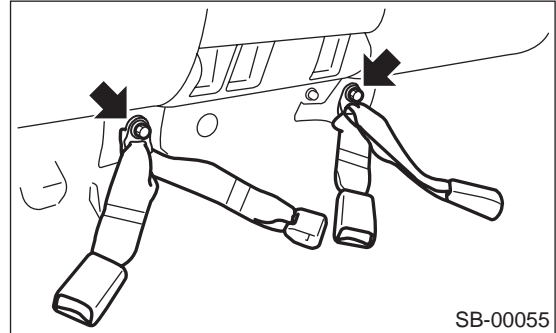
7) Remove clips and hang down rear end of roof trim.

8) Disconnect harness and connector, and then remove outer belt center assembly.



6. INNER BELT (WAGON BODY)

- 1) Raise the rear seat cushion.
- 2) Remove bolt, and then detach inner belt.



B: INSTALLATION

1. OUTER BELT SIDE (SEDAN BODY)

Install in the reverse order of removal.

CAUTION:

- During installation, make sure that seat belts are not twisted.
- After installation, make sure that seat belts can be smoothly extended and wound.

2. OUTER BELT CENTER (SEDAN BODY)

Install in the reverse order of removal.

CAUTION:

- During installation, make sure that seat belts are not twisted.
- After installation, make sure that seat belts can be smoothly extended and wound.

3. INNER BELT (SEDAN BODY)

Install in the reverse order of removal.

CAUTION:

During installation, make sure that seat belts are not twisted.

4. OUTER BELT SIDE (WAGON BODY)

Install in the reverse order of removal.

CAUTION:

- During installation, make sure that seat belts are not twisted.
- After installation, make sure that seat belts can be smoothly extended and wound.

5. OUTER BELT CENTER (WAGON BODY)

Install in the reverse order of removal.

CAUTION:

- During installation, make sure that seat belts are not twisted.
- After installation, make sure that seat belts are smoothly extended and wound.

6. INNER BELT (WAGON BODY)

Install in the reverse order of removal.

CAUTION:

During installation, make sure that seat belts are not twisted.

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to SB-3, REAR SEAT BELT (SEDAN BODY), COMPONENT, General Description.> or <Ref. to SB-4, REAR SEAT BELT (WAGON BODY), COMPONENT, General Description.>

C: INSPECTION

1. OUTER BELT SIDE (SEDAN BODY)

Check for the following, and replace with new parts if necessary.

- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. OUTER BELT CENTER (SEDAN BODY)

Check for the following, and replace with new parts if necessary.

- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

3. INNER BELT (SEDAN BODY)

Check for the following, and replace with new parts if necessary.

- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

4. OUTER BELT SIDE (WAGON BODY)

Check for the following, and replace with new parts if necessary.

- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

5. OUTER BELT CENTER (WAGON BODY)

Check for the following, and replace with new parts if necessary.

- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

6. INNER BELT (WAGON BODY)

Check for the following, and replace with new parts if necessary.

- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

DISPOSAL OF PRETENSIONER

SEAT BELT SYSTEM

5. Disposal of Pretensioner

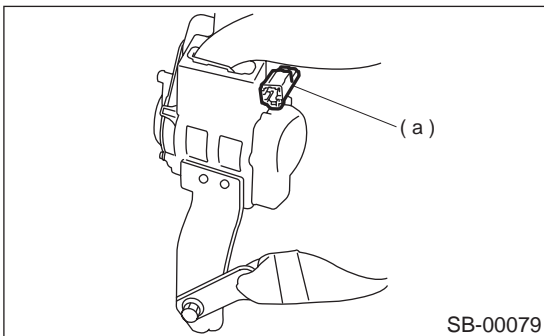
A: CAUTION

- Do not discard undeployed pretensioners, because they may cause serious personal injury when accidentally deployed.
- Deployment of the pretensioners should be done on a flat place free from any possible danger. Avoid deploying outdoors during rainy or windy weather.
- Do not drop or damage pretensioner.
- Because deploying the pretensioners causes a high-explosive noise, be sure to warn people in the area, and do not allow anyone within a 5-meter (16 ft) radius of the disposal site.
- Some smoke will be emitted after deployment of the pretensioners. Therefore, it must be deployed in a well-ventilated area with no smoke alarms nearby.
- Wear gloves, goggles, and earplugs during this operation. Wash your hands afterwards.
- After deployment, the pretensioner is especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed pretensioner.
- Wrap the deployed the pretensioner in an airtight vinyl bag, and then discard it.

B: OPERATION

1. DEPLOYING WHILE INSTALLED IN VEHICLE

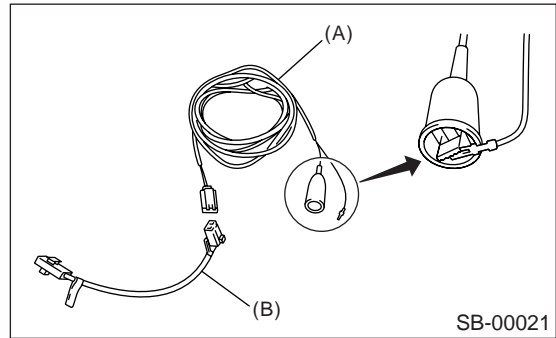
- 1) Fold backrest all the way forward, and then move front seat all the way forward.
- 2) Turn ignition switch OFF, disconnect the ground cable from the battery, and wait for more than 20 seconds before starting work.
- 3) Remove center pillar lower trim. <Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 4) Disconnect yellow connector from pretensioner.



- 5) Short terminal to alligator clip furnished as deployment tool.
- 6) Connect the deployment tool and adapter A (deployment).

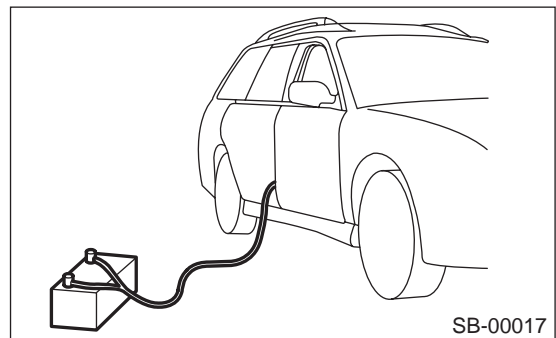
CAUTION:

The deployment tool should be kept shorted until just before deployment of the pretensioner.



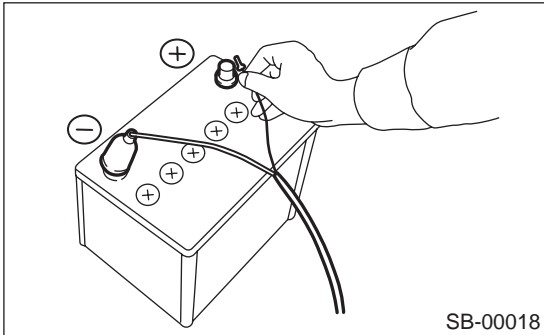
- (A) Deployment tool: (Part No. 98299PA030)
(B) Adapter A (deployment) : (Part No. 98299FC030)

- 7) Connect adapter A (deployment) connector (2D) and pretensioner yellow connector.
- 8) Extend the deployment tool to the limit, and make sure that vehicle is empty. Close all windows, sunroof, and rear gate completely.



- 9) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.

10) Connect the other terminal of deployment tool to the battery plus terminal. Then deploy the pretensioner.

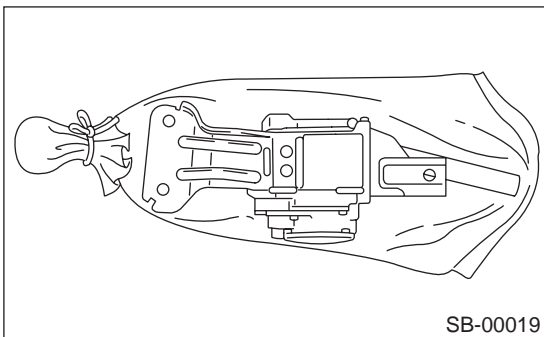


CAUTION:

- After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes.
- Do not let water get on the deployed pretensioner.

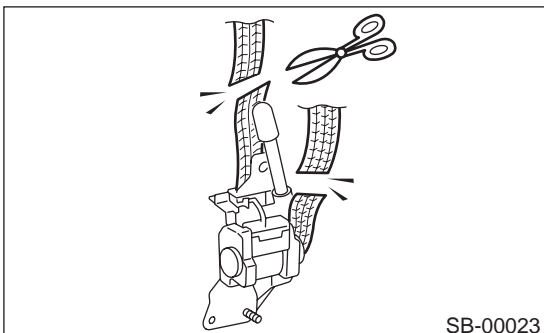
11) Remove outer belt (front). <Ref. to SB-7, REMOVAL, Front Seat Belt.>

12) Wrap the deployed pretensioner in an airtight vinyl bag, and then discard it.



2. DEPLOYING AFTER REMOVAL FROM VEHICLE

- 1) Fold backrest all the way forward, then move front seat all the way forward.
- 2) Turn ignition switch OFF, disconnect the ground cable from the battery, and wait for more than 20 seconds before starting work.
- 3) Remove outer belt (front). <Ref. to SB-7, REMOVAL, Front Seat Belt.>
- 4) Cut off seat belt as close to retractor as possible.

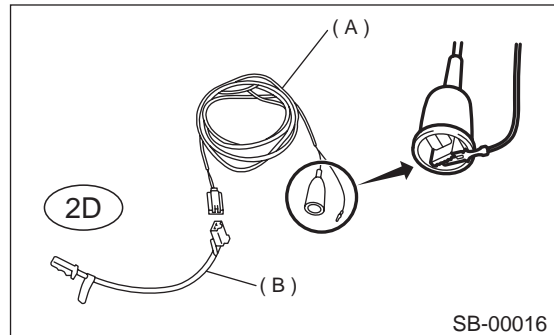


5) Short terminal to alligator clip furnished as a deployment tool.

6) Connect the deployment tool and adapter A (deployment).

CAUTION:

The deployment tool should be kept shorted until just before deployment of the pretensioner.

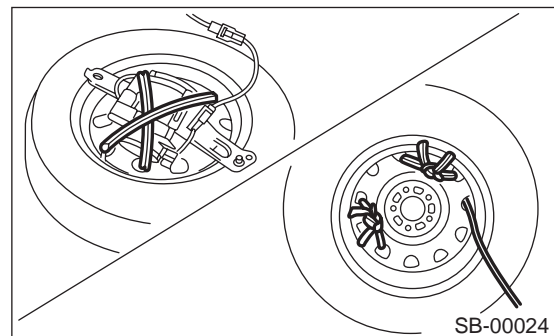


(A) Deployment tool: (Part No. 98299PA030)

(B) Adapter A (deployment) : (Part No. 98299FAC030)

7) Connect adapter A (deployment) connector (2D) and pretensioner yellow connector.

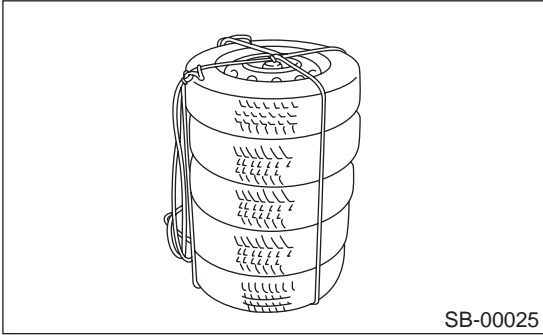
8) Install pretensioner on the wheel with the tire. Then, bundle three wire automotive harness [each with a sectional area of 1.25 mm² (0.00194 sq in) or more], and bind them twofold around the pretensioner bracket and the wheel.



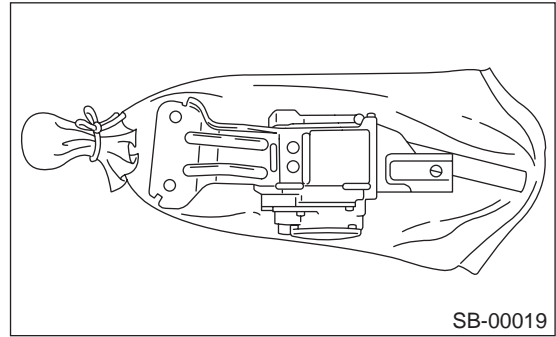
DISPOSAL OF PRETENSIONER

SEAT BELT SYSTEM

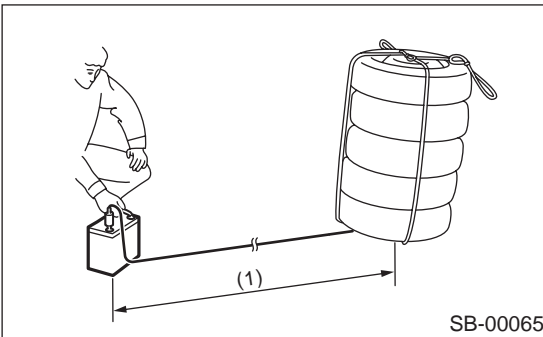
9) Put three tires without the wheel on the tire installed with pretensioner. Put on an additional tire with the wheel on top, and then fasten them tight with rope.



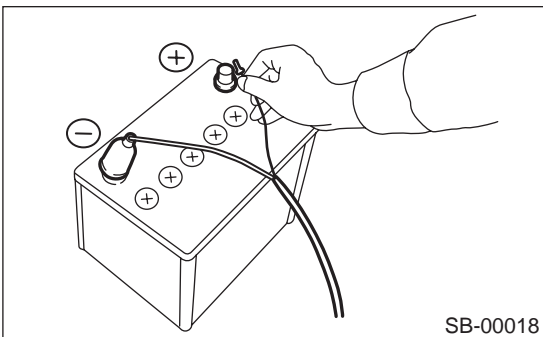
12) Wrap the deployed pretensioner in an airtight vinyl bag, and discard it.



10) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.



11) Connect the other terminal of deployment tool to the battery plus terminal. Then deploy pretensioner.



CAUTION:

- After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes.
- Do not let water get on the deployed pretensioner.

LIGHTING SYSTEM



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GENERAL DESCRIPTION

LIGHTING SYSTEM

1. General Description

A: SPECIFICATIONS

Headlight		12 V — 55 W/55 W (Halogen)
Front turn signal light		12 V — 21 W
Side turn signal light		12 V — 5 W
Parking light		12 V — 5 W
Front fog light		12 V — 55 W
Rear fog light		12 V — 21 W
Rear combination light	Tail/Stop light	12 V — 5/21 W
	Turn signal light	12 V — 21 W
	Back-up light	12 V — 21 W
License plate light		12 V — 5 W
High-mounted stop light	Sedan	12 V — 21 W
	Wagon	12 V — 10 W
Room light		12 V — 8 W
Spot light		12 V — 8 W
Door step light		12 V — 3.4 W
Luggage room light		12 V — 13 W
Trunk room light		12 V — 5 W
Glove box light		12 V — 1.4 W

B: PRECAUTIONS

- Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

WARNING:

- **Airbag system wiring harness is routed near electrical parts and switches. All airbag system wiring harnesses and connectors are yellow. Do not use electric test equipment on these circuits.**
- **Be careful not to damage the airbag system wiring harness when servicing electrical parts and switches.**

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Headlight and Tail Light System

A: SCHEMATIC

1. HEADLIGHT LHD MODEL

<Ref. to WI-264, LHD MODEL, SCHEMATIC, Headlight System.>

2. HEADLIGHT RHD MODEL

<Ref. to WI-265, RHD MODEL, SCHEMATIC, Headlight System.>

3. CLEARANCE LIGHT AND ILLUMINATION LIGHT LHD MODEL

<Ref. to WI-248, LHD 4-CYLINDER ENGINE MODEL, SCHEMATIC, Clearance Light and Illumination Light System.>

<Ref. to WI-251, LHD 6-CYLINDER ENGINE MODEL, SCHEMATIC, Clearance Light and Illumination Light System.>

4. CLEARANCE LIGHT AND ILLUMINATION LIGHT RHD MODEL

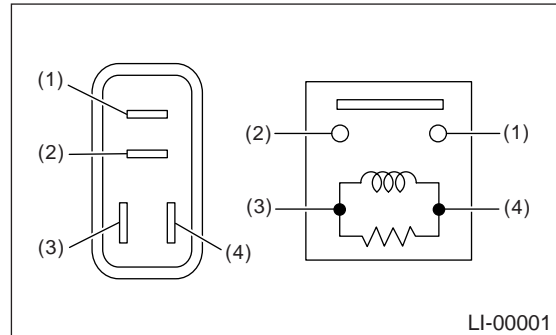
<Ref. to WI-254, RHD 4-CYLINDER NON-TURBO ENGINE MODEL, SCHEMATIC, Clearance Light and Illumination Light System.>

<Ref. to WI-257, RHD 6-CYLINDER ENGINE AND TURBO ENGINE MODEL, SCHEMATIC, Clearance Light and Illumination Light System.>

B: INSPECTION

1. HEADLIGHT RELAY

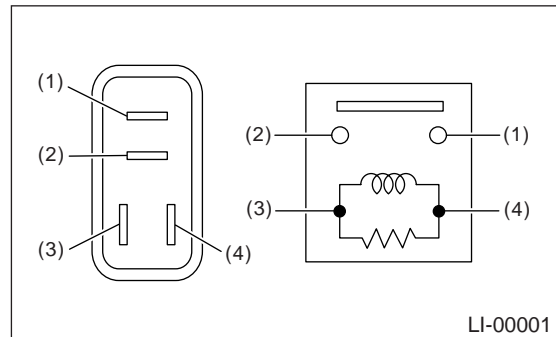
Measure headlight relay resistance between terminals while connecting terminal No. 4 to battery positive terminal No. 3 to battery ground terminal.



Current Flow	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

2. TAIL AND ILLUMINATION RELAY

Measure tail and illumination relay resistance between terminals while connecting terminal No. 4 to battery positive terminal No. 3 to battery ground terminal.



Current Flow	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

FRONT FOG LIGHT SYSTEM

LIGHTING SYSTEM

3. Front Fog Light System

A: SCHEMATIC

1. FRONT FOG LIGHT 4 CYLINDER ENGINE MODEL

<Ref. to WI-260, 4-CYLINDER ENGINE MODEL, SCHEMATIC, Front Fog Light System.>

2. FRONT FOG LIGHT LHD 6 CYLINDER ENGINE MODEL

<Ref. to WI-261, LHD 6-CYLINDER ENGINE MODEL, SCHEMATIC, Front Fog Light System.>

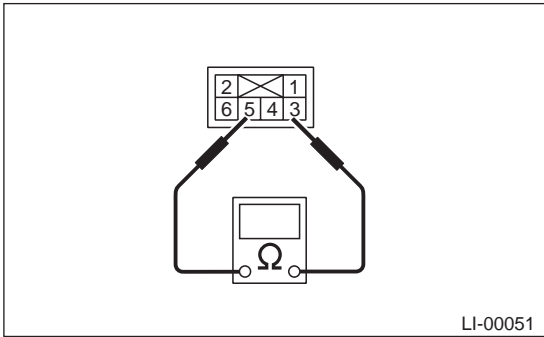
3. FRONT FOG LIGHT RHD 6 CYLINDER ENGINE MODEL

<Ref. to WI-262, RHD 6-CYLINDER ENGINE MODEL, SCHEMATIC, Front Fog Light System.>

B: INSPECTION

1. FRONT FOG LIGHT SWITCH

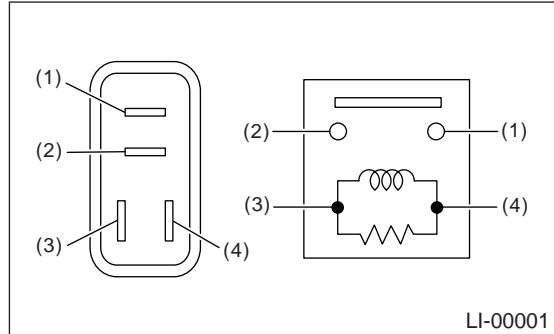
Measure front fog light switch resistance.



Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	3 and 5	Less than 1 Ω

2. FRONT FOG LIGHT RELAY

Measure front fog light relay resistance between terminals while connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

4. Rear Fog Light System

A: SCHEMATIC

1. REAR FOG LIGHT

<Ref. to WI-294, SCHEMATIC, Rear Fog Light System.>

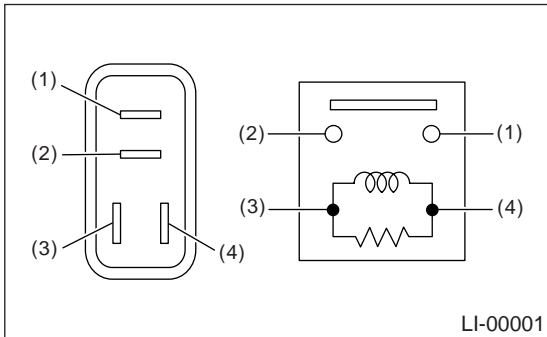
B: INSPECTION

1. REAR FOG LIGHT SWITCH

- 1) Turn ignition switch ON.
- 2) Turn on the headlight or front fog light.
- 3) Push the rear fog light switch and check if the rear fog light turns on.

2. REAR FOG LIGHT RELAY

Measure rear fog light relay resistance between terminals while connecting terminal No. 4 to battery positive terminal and No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 M Ω

TURN SIGNAL AND HAZARD LIGHT SYSTEM

LIGHTING SYSTEM

5. Turn Signal and Hazard Light System

A: SCHEMATIC

1. TURN SIGNAL LIGHT AND HAZARD LIGHT LHD MODEL

<Ref. to WI-274, LHD MODEL, SCHEMATIC, Turn Signal Light and Hazard Light System.>

2. TURN SIGNAL LIGHT AND HAZARD LIGHT RHD MODEL

<Ref. to WI-276, RHD MODEL, Turn Signal Light and Hazard Light System.>

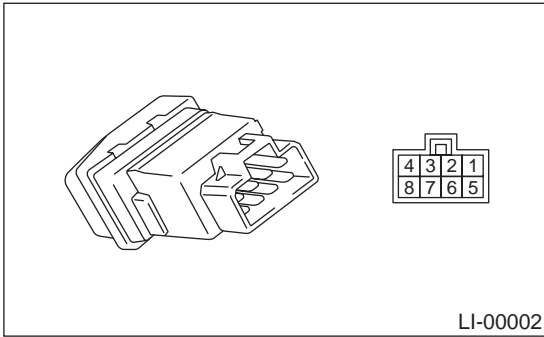
B: INSPECTION

1. TURN SIGNAL SWITCH

<Ref. to LI-11, INSPECTION, Combination Switch (Light).>

2. HAZARD SWITCH

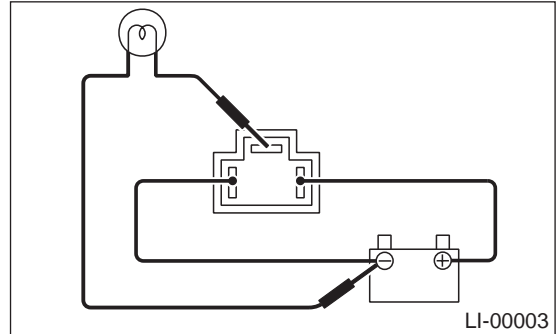
Measure hazard switch resistance.



Switch position	Terminal No.	Standard
OFF	6 and 7	Less than 1 Ω
ON	1, 3 and 4	Less than 1 Ω
	7 and 8	Less than 1 Ω

3. TURN SIGNAL & HAZARD MODULE

Connect battery and turn signal light bulb to the module, as shown in the figure. The module is properly functioning if it blinks when power is supplied to the circuit.



6. Back-up Light System

A: SCHEMATIC

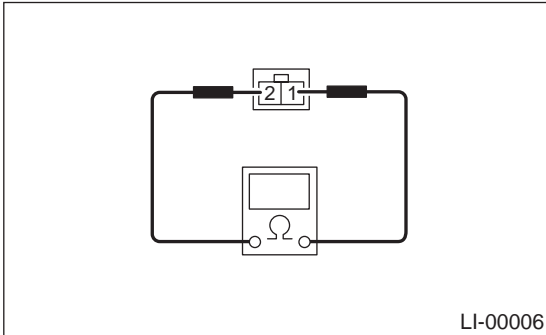
1. BACK-UP LIGHT

<Ref. to WI-247, SCHEMATIC, Back-up Light System.>

B: INSPECTION

1. BACK-UP LIGHT SWITCH (M/T)

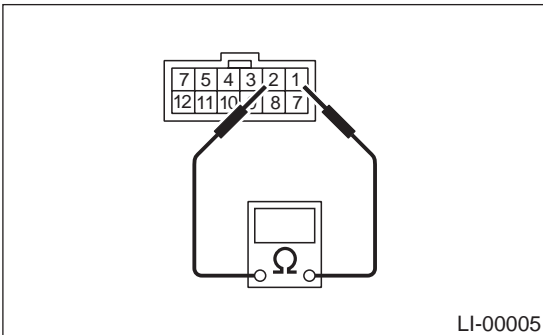
Measure back-up light switch resistance.



Switch position	Terminal No.	Standard
When shift lever is set in reverse position	1 and 2	Less than 1 Ω
Other positions		More than 1 M Ω

2. INHIBITOR SWITCH (A/T)

Measure inhibitor switch resistance.



Switch position	Terminal No.	Standard
When select lever is set in "R" position	1 and 2	Less than 1 Ω
Other positions		More than 1 M Ω

7. Stop Light System

A: SCHEMATIC

1. STOP LIGHT SEDAN MODEL

<Ref. to WI-272, SEDAN MODEL, SCHEMATIC, Stop Light System.>

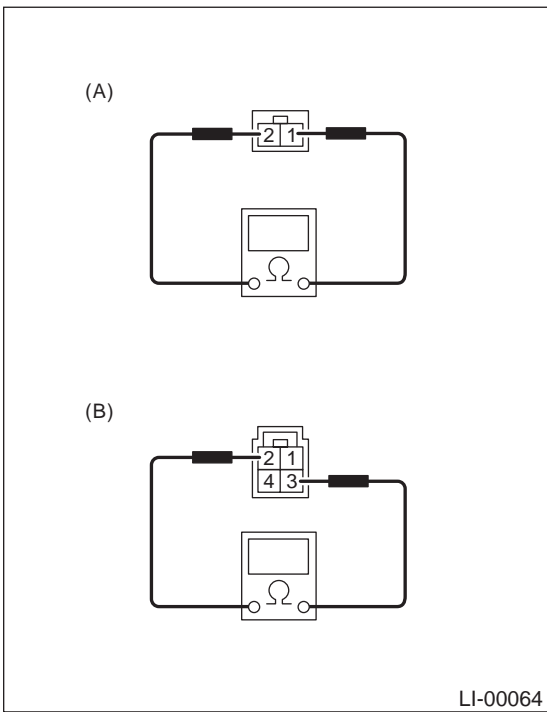
2. STOP LIGHT WAGON MODEL

<Ref. to WI-273, WAGON MODEL, SCHEMATIC, Stop Light System.>

B: INSPECTION

1. STOP LIGHT SWITCH

Measure stop light switch resistance.



(A) Without cruise control

(B) With cruise control

Switch position	Terminal No.	Standard
When brake pedal is depressed	1 and 2: Without cruise control	Less than 1 Ω
When brake pedal is released	2 and 3: With cruise control	More than 1 M Ω

8. Interior Light System

A: SCHEMATIC

1. INTERIOR LIGHT LHD MODEL

<Ref. to WI-266, LHD MODEL, SCHEMATIC, In Compartment Light System.>

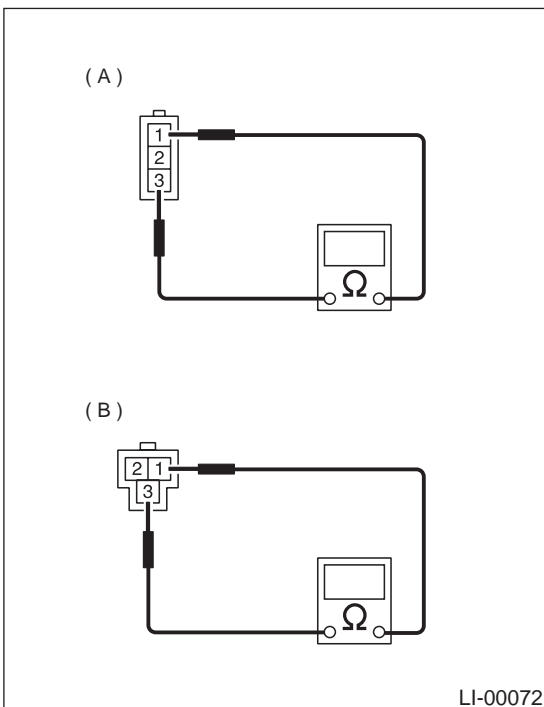
2. INTERIOR LIGHT RHD MODEL

<Ref. to WI-269, RHD MODEL, SCHEMATIC, In Compartment Light System.>

B: INSPECTION

1. DOOR SWITCH

Measure door switch resistance.



(A) Front door switch

(B) Rear door switch

Switch position	Terminal No.	Standard
When door is open	1 and 3	Less than 1 Ω
When door is closed		More than 1 MΩ

2. REAR GATE LATCH SWITCH

Measure rear gate latch switch.

Switch position	Terminal No.	Standard
When rear gate is open	1 and 2	Less than 1 Ω
When rear gate is closed		More than 1 MΩ

3. TRUNK ROOM LIGHT SWITCH

Measure trunk room light switch.

Switch position	Terminal No.	Standard
When trunk lid is open	1 and 2	Less than 1 Ω
When trunk lid is closed		More than 1 MΩ

HEADLIGHT BEAM LEVELER SYSTEM

LIGHTING SYSTEM

9. Headlight Beam Leveler System

A: SCHEMATIC

1. HEADLIGHT BEAM LEVELER

<Ref. to WI-234, SCHEMATIC, Headlight Beam Leveler System.>

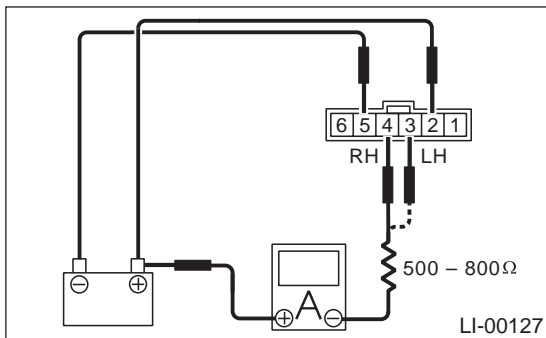
B: INSPECTION

1. HEADLIGHT BEAM LEVELER ACTUATOR

- 1) Turn on the headlights.
- 2) Confirm the headlight beam level is lowered by changing the switch position to 0 - 1 - 2 - 3 - 4 - 5.

2. HEADLIGHT BEAM LEVELER SWITCH

Connect battery, headlight beam leveler switch connector, circuit tester and resistor (500 to 800 Ω) as shown in the figure. Measure the current at each switch position.

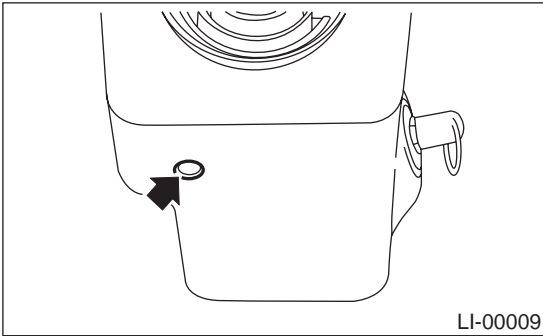


Switch position	Current (mA)
0	8.0
1	7.2
2	6.39
3	5.59
4	4.78
5	3.98

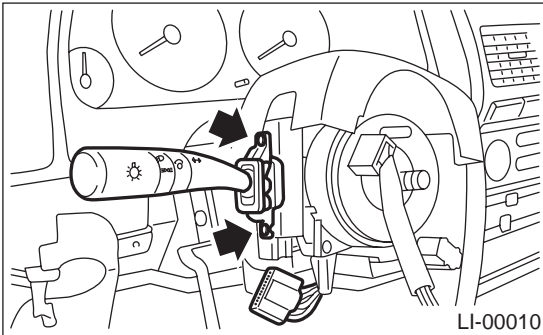
10. Combination Switch (Light)

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove instrument panel lower cover. <Ref. to EI-35, REMOVAL, Instrument Panel Assembly.>
- 3) Remove screws which secure upper column cover to lower column cover.



- 4) Disconnect connector from combination switch.
- 5) Remove screws which secure switch and remove switch.

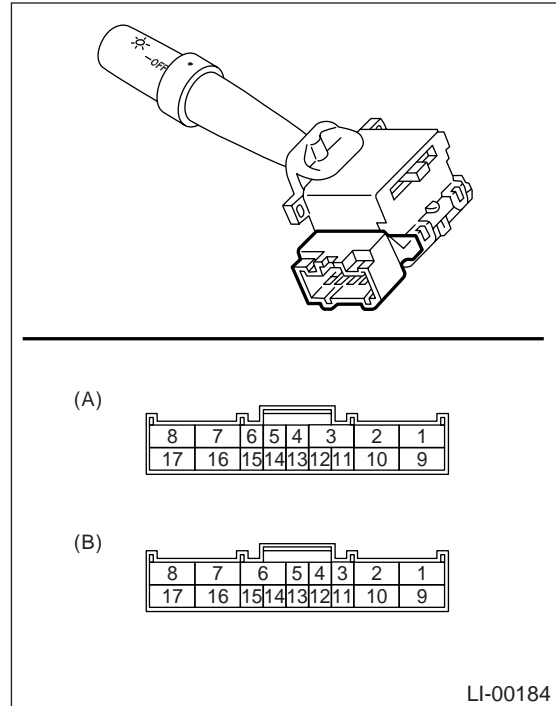


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure combination switch resistance.



- (A) LHD model and RHD model with rear fog light
 (B) RHD model without rear fog light

1. LIGHTING SWITCH

LHD model and RHD model with rear fog light:

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
Tail	14 and 16	Less than 1 Ω
Head	13, 14 and 16	Less than 1 Ω

RHD model without rear fog light:

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
Tail	9 and 15	Less than 1 Ω
Head	9, 14 and 15	Less than 1 Ω

2. DIMMER AND PASSING SWITCH

LHD model and RHD model with rear fog light:

Switch position	Terminal No.	Standard
Passing	7, 8 and 16	Less than 1 Ω
Low beam	16 and 17	Less than 1 Ω
High beam	7 and 16	Less than 1 Ω

RHD model without rear fog light:

Switch position	Terminal No.	Standard
Passing	1, 2 and 9	Less than 1 Ω
Low beam	9 and 10	Less than 1 Ω
High beam	2 and 9	Less than 1 Ω

COMBINATION SWITCH (LIGHT)

LIGHTING SYSTEM

3. TURN SIGNAL SWITCH

LHD model and RHD model with rear fog light:

Switch position	Terminal No.	Standard
Left	1 and 2	Less than 1 Ω
Neutral	—	More than 1 M Ω
Right	2 and 3	Less than 1 Ω

RHD model without rear fog light:

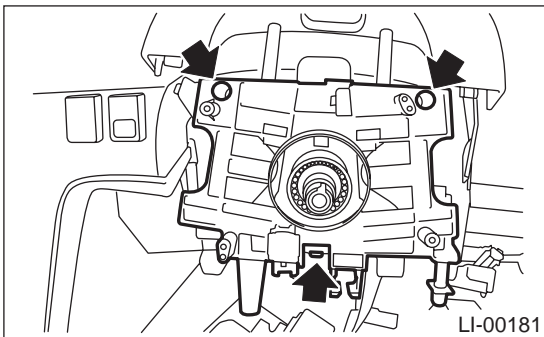
Switch position	Terminal No.	Standard
Left	6 and 7	Less than 1 Ω
Neutral	—	More than 1 M Ω
Right	7 and 8	Less than 1 Ω

11. Combination Base Switch Assembly

A: REMOVAL

1. WITHOUT VDC MODEL

- 1) Remove driver's airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>
- 2) Remove steering wheel. <Ref. to PS-24, REMOVAL, Steering Wheel.>
- 3) Remove steering column cover.
- 4) Remove combination switch. <Ref. to LI-11, REMOVAL, Combination Switch (Light).> <Ref. to WW-8, REMOVAL, Combination Switch (Wiper).>
- 5) Loosen 4 screws and remove roll connector.
- 6) Loosen 3 screws.

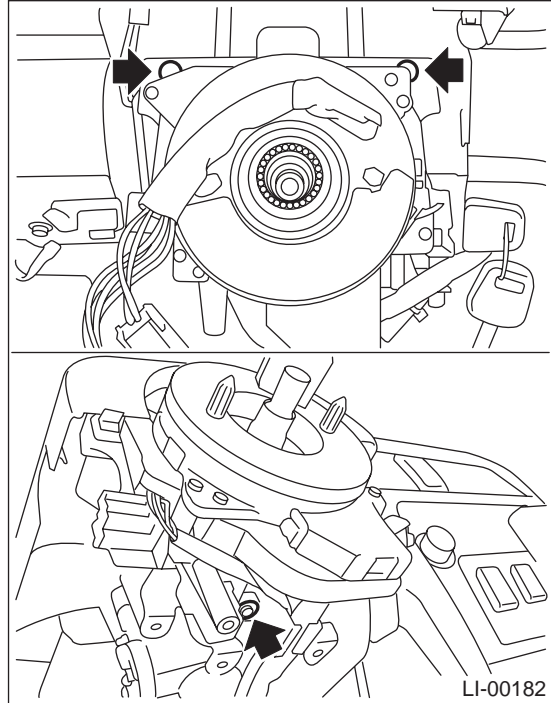


- 7) Disconnect connector and remove combination base switch assembly.

2. WITH VDC MODEL

- 1) Remove driver's airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>
- 2) Remove steering wheel. <Ref. to PS-24, REMOVAL, Steering Wheel.>
- 3) Remove steering column cover.
- 4) Remove combination switch. <Ref. to LI-11, REMOVAL, Combination Switch (Light).> <Ref. to WW-8, REMOVAL, Combination Switch (Wiper).>

- 5) Loosen 3 screws.



- 6) Disconnect connector and remove combination base switch assembly.

CAUTION:

In case of model with VDC, do not separate roll connector from combination base switch.

B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Align the attaching direction of roll connector with steering wheel, before installation of steering wheel.<Ref. to AB-19, ADJUSTMENT, Roll Connector.>

C: INSPECTION

1. COMBINATION BASE SWITCH ASSEMBLY

Perform inspection for the following items and replace with a new one, if any damage is found.

- Crack or deformation of combination base switch assembly or roll connector

CAUTION:

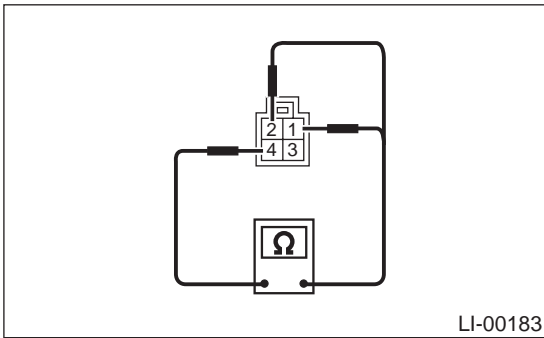
In case of model with VDC, do not separate roll connector from combination base switch.

COMBINATION BASE SWITCH ASSEMBLY

LIGHTING SYSTEM

2. PARKING SWITCH

Measure parking switch resistance.

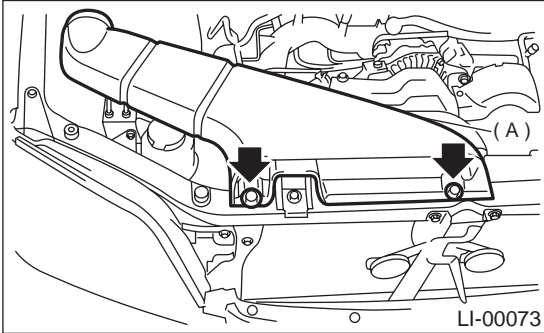


Switch position	Terminal No.	Standard
OFF	2 and 4	Less than 1 Ω
ON	1 and 4	Less than 1 Ω

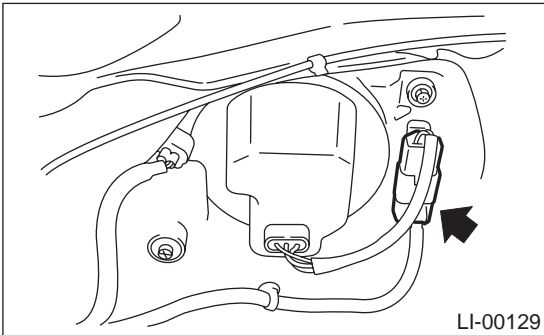
12. Headlight Assembly

A: REMOVAL

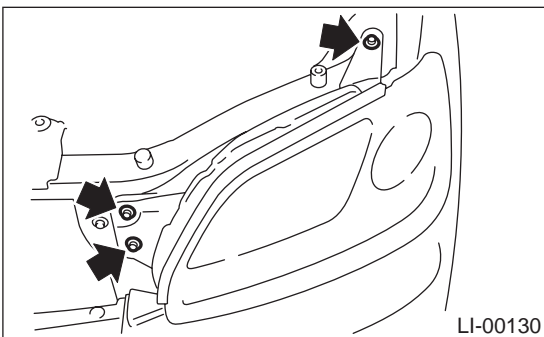
- 1) Disconnect ground cable from battery.
- 2) Remove duct (A) (when right side headlight is removed).



- 3) Disconnect headlight bulb connector.



- 4) Remove three bolts and disconnect connectors, and then detach headlight assembly.



B: INSTALLATION

Install in the reverse order of removal.

HEADLIGHT ASSEMBLY

LIGHTING SYSTEM

C: ADJUSTMENT

1. HEADLIGHT AIMING

CAUTION:

Turn off the light before adjusting headlight aiming. If the light is necessary to check aiming, do not turn on for more than two minutes.

NOTE:

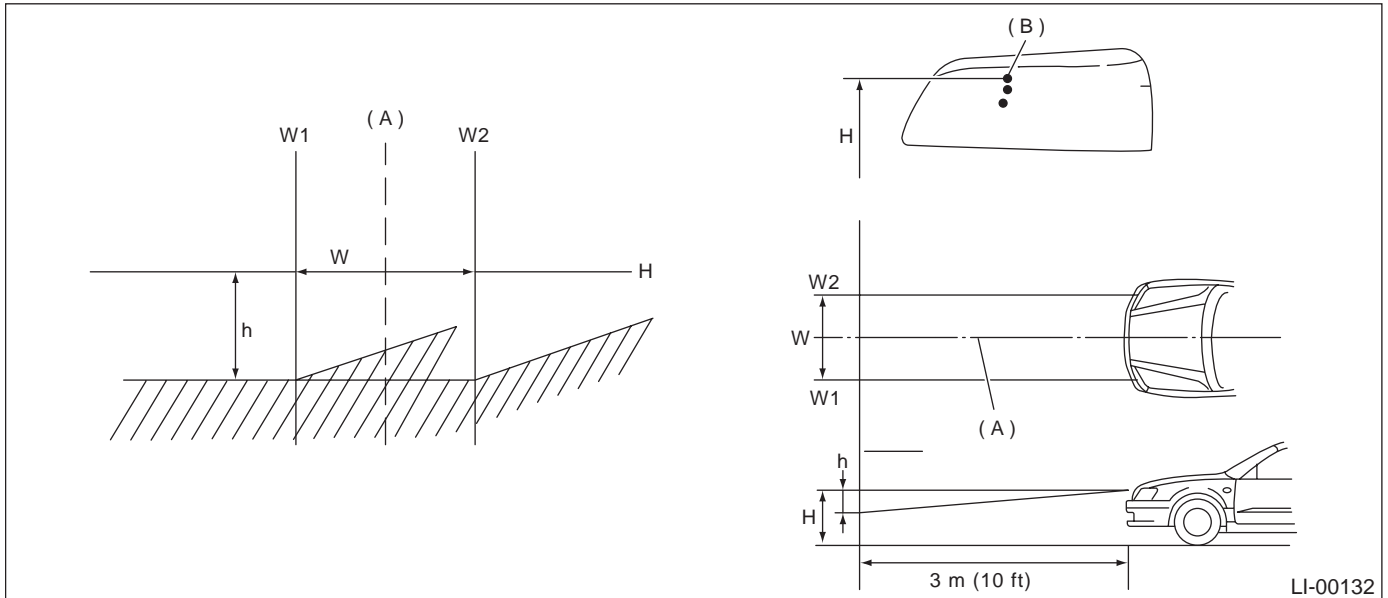
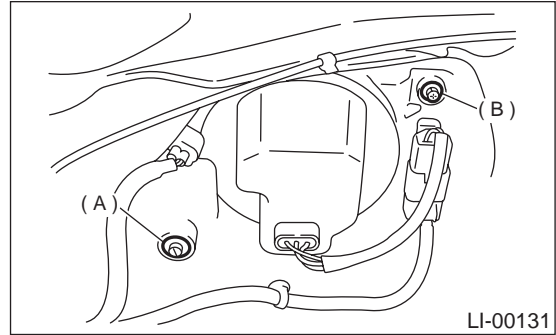
Before checking the headlight aiming, be sure of the following:

- The area around the headlight has not sustained any accident, damage or other type of deformation.
- Vehicle is parked on level ground.
- The inflation pressure of tires is correct.
- Vehicle's gas tank is fully charged.
- Bounce the vehicle several times to normalize the suspension.
- Make certain that someone is seated in the driver's seat.

Turn the headlights on and then adjust the low beam pattern to the following positions on the screen.

NOTE:

- Set the headlight leveler switch to "0" position.
- Adjust vertical aim (A) first, then horizontal aim (B).



- (A) Vehicle center
- (B) Bulb center

This illustration is for LHD model.

The pattern for RHD model is symmetrically opposite.

W mm (in)	H mm (in)				h mm (in) at 3 m (10 ft)
	Sedan	Wagon		Outback	
		Conventional suspension	Air suspension		
1,130 (44.69)	665 (26.18)	660 (25.98)	650 (25.59)	725 (28.54)	30 (1.18)

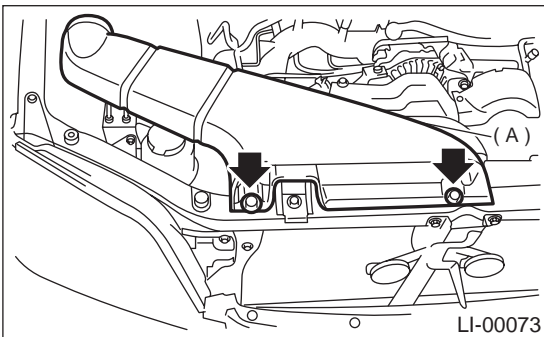
13. Headlight Bulb

A: REMOVAL

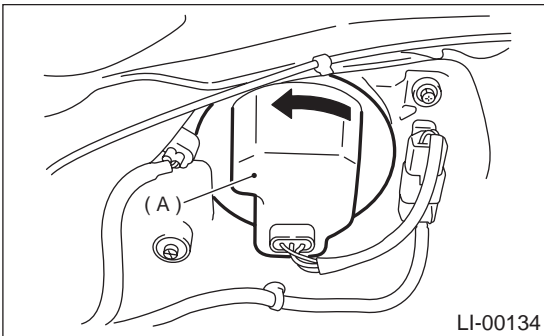
CAUTION:

- Because the tungsten halogen bulb operates at a high temperature, dirt and oil on the bulb surface reduces the bulb's service life. Hold the flange portion when replacing the bulb. Never touch the glass portion.
- Do not leave the headlight without a bulb for a long time. Dust, moisture, etc. entering the headlight may affect its the performance.

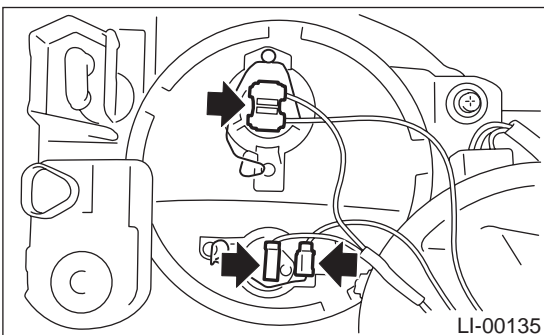
- 1) Disconnect ground cable from battery.
- 2) Remove duct (A) (when right side headlight is removed).



- 3) Remove back cover (A).



- 4) Disconnect harness connector.



- 5) Push to remove spring retainer and then detach headlight bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

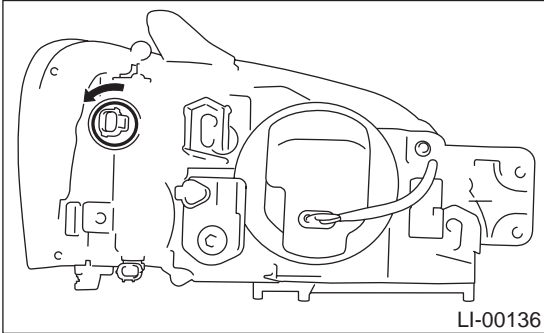
FRONT TURN SIGNAL LIGHT BULB

LIGHTING SYSTEM

14. Front Turn Signal Light Bulb

A: REMOVAL

- 1) Remove headlight assembly. <Ref. to LI-15, REMOVAL, Headlight Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

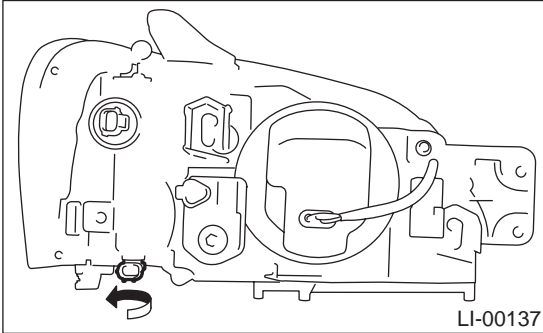
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

15. Parking Light Bulb

A: REMOVAL

- 1) Remove headlight assembly. <Ref. to LI-15, REMOVAL, Headlight Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

FRONT FOG LIGHT ASSEMBLY

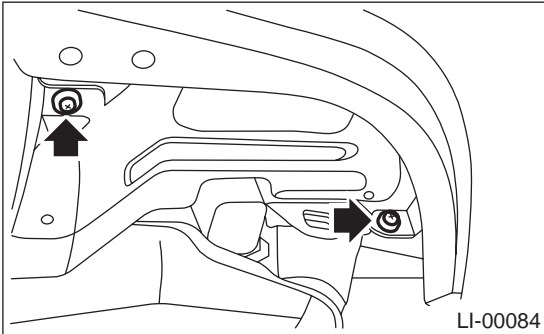
LIGHTING SYSTEM

16. Front Fog Light Assembly

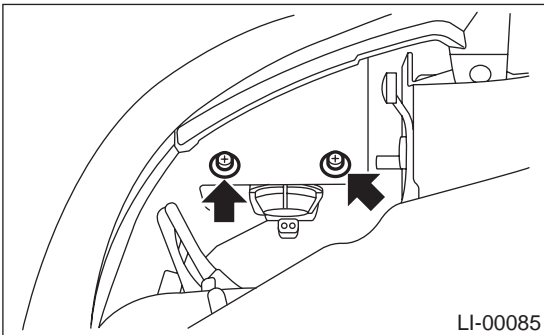
A: REMOVAL

1. EXCEPT OUTBACK

- 1) Disconnect ground cable from battery.
- 2) Remove two clips and lower the mudguard.

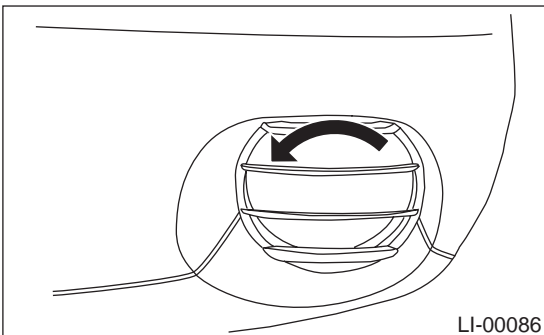


- 3) Disconnect harness connector.
- 4) Remove mounting bolts, and then detach fog light assembly.

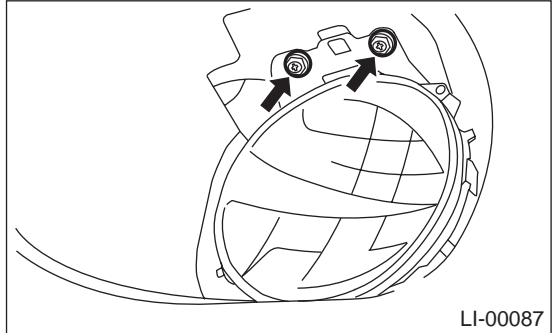


2. OUTBACK

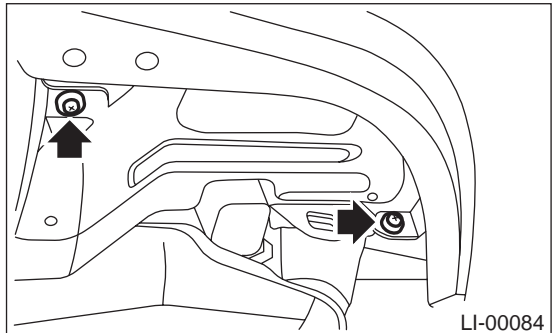
- 1) Disconnect ground cable from battery.
- 2) Turn stone guard counterclockwise, and then remove it.



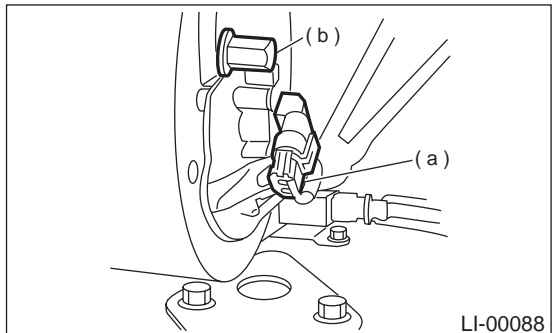
- 3) Remove mounting bolts.



- 4) Remove two clips and lower the mudguard.



- 5) Disconnect harness connector (a).
- 6) Remove nut (b) then detach fog light assembly.



B: INSTALLATION

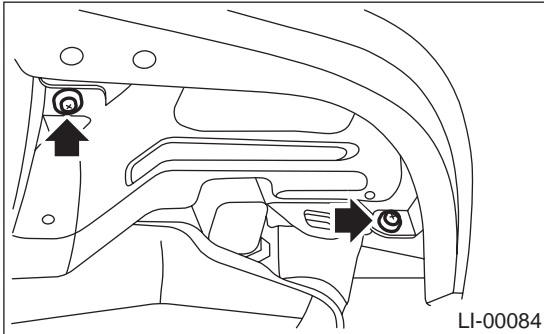
Install in the reverse order of removal.

17. Front Fog Light Bulb

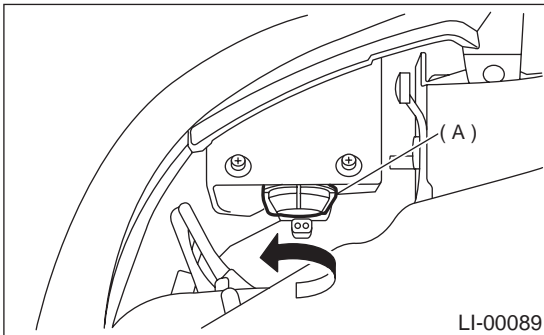
A: REMOVAL

1. EXCEPT OUTBACK

- 1) Disconnect ground cable from battery.
- 2) Remove the two clips and lower the mudguard.



- 3) Disconnect harness connector.
- 4) Remove back cover (A).



- 5) Remove spring retainer then detach fog light bulb.

2. OUTBACK

- 1) Remove fog light assembly. <Ref. to LI-20, OUTBACK, REMOVAL, Front Fog Light Assembly.>
- 2) Disconnect harness connector.
- 3) Loosen screws and turn the bulb assembly counterclockwise, and then detach the bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, PRE-CAUTIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

REAR COMBINATION LIGHT ASSEMBLY

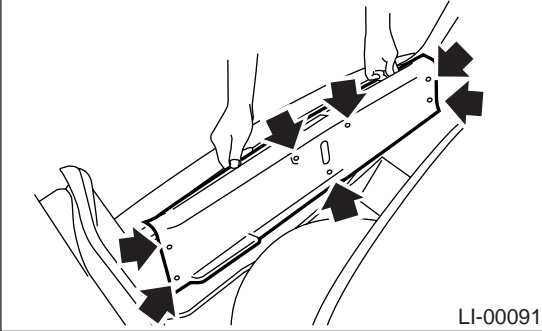
LIGHTING SYSTEM

18. Rear Combination Light Assembly

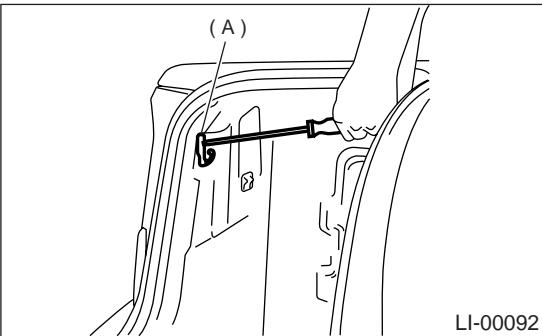
A: REMOVAL

1. SEDAN

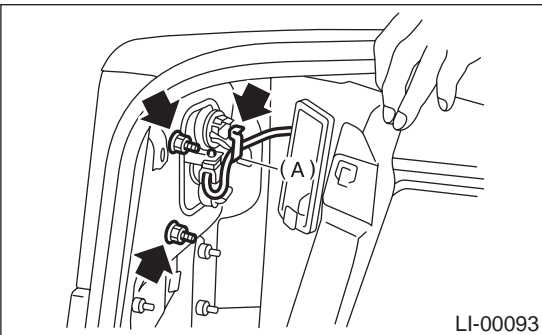
- 1) Disconnect ground cable from battery.
- 2) Remove clips and then detach trunk rear trim.



- 3) Remove hook (A) and then turn over the trunk side trim of rear portion.



- 4) Remove harness clip (A).
- 5) Remove three nuts and then detach rear combination light while disconnecting connector.

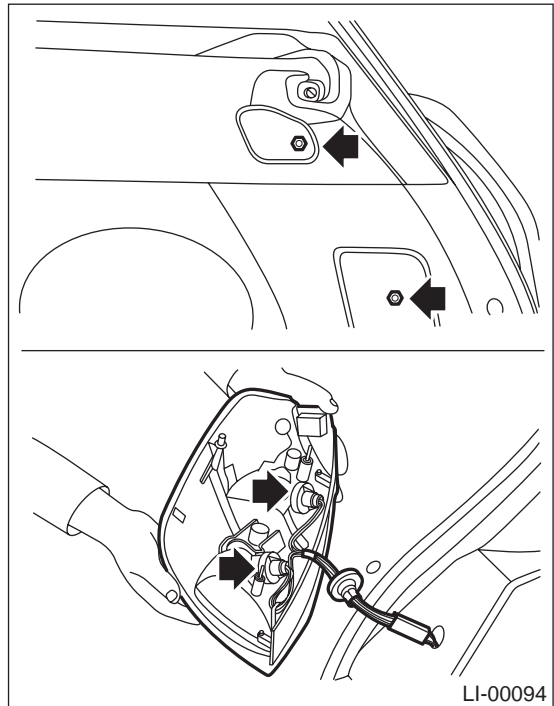


2. WAGON

- 1) Disconnect ground cable from battery.
- 2) Remove two rear quarter trim covers.
- 3) Remove two nuts and then remove rear combination light while disconnecting connector.

NOTE:

Before removing the nuts, apply a few turns of butyl tape to the tip of the service tool. This prevents the nuts from falling during removal.



B: INSTALLATION

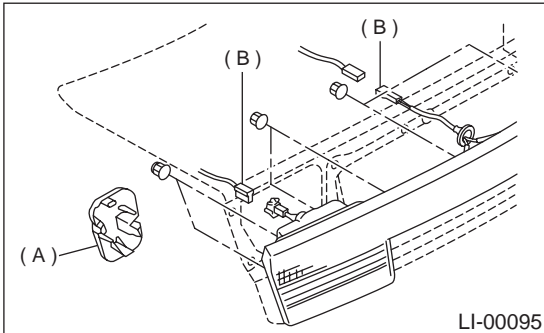
Install in the reverse order of removal.

19. Rear Finisher Light Assembly

A: REMOVAL

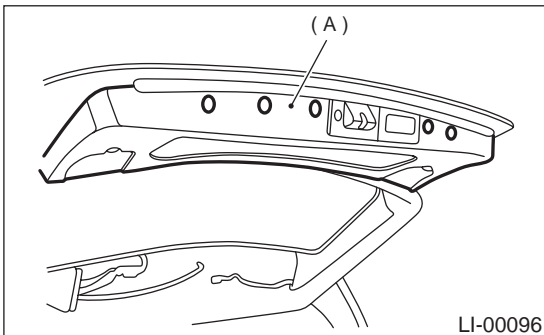
1. SEDAN

- 1) Disconnect ground cable from battery.
- 2) Open the trunk lid.
- 3) Remove cover (A).
- 4) Disconnect connector (B) from rear finisher light.
- 5) Remove ten nuts and then detach rear finisher light from trunk lid.

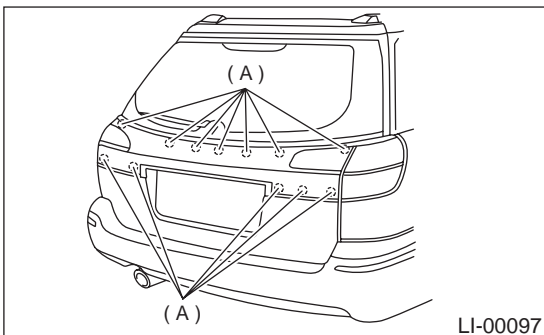


2. WAGON

- 1) Disconnect ground cable from battery.
- 2) Remove rear gate trim (A). <Ref. to EI-44, REMOVAL, Rear Gate Trim.>



- 3) Disconnect connector from rear finisher light.
- 4) Remove nuts (A) and then remove rear finisher light from rear gate.



B: INSTALLATION

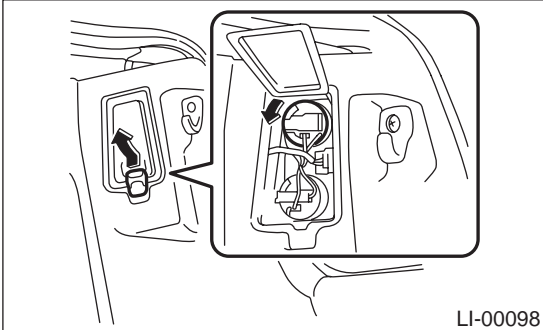
Install in the reverse order of removal.

20.Brake/Tail Light Bulb

A: REMOVAL

1. SEDAN

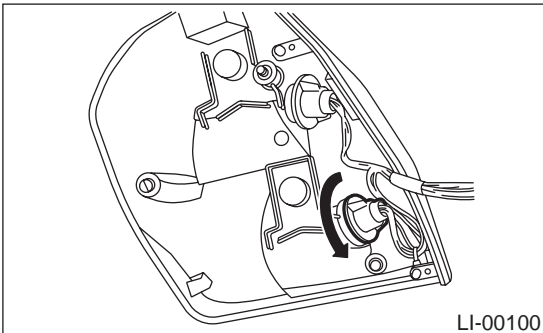
- 1) Open trunk lid and remove cover.



- 2) Turn the socket and remove the bulb.

2. WAGON

- 1) Remove rear combination light assembly. <Ref. to LI-22, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

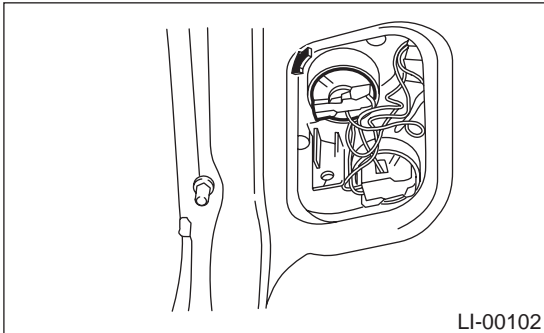
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

21. Back-up Light Bulb

A: REMOVAL

1. SEDAN

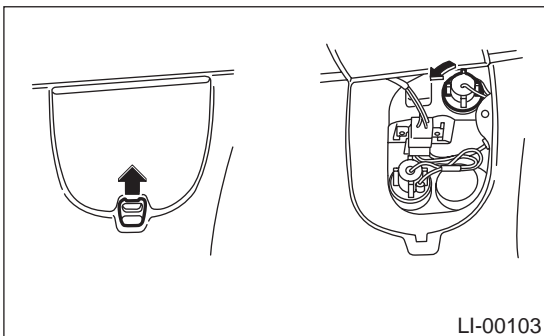
- 1) Open trunk lid and remove cover.



- 2) Turn the socket and remove the bulb.

2. WAGON

- 1) Open rear gate lower trim cover.



- 2) Turn the socket and remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

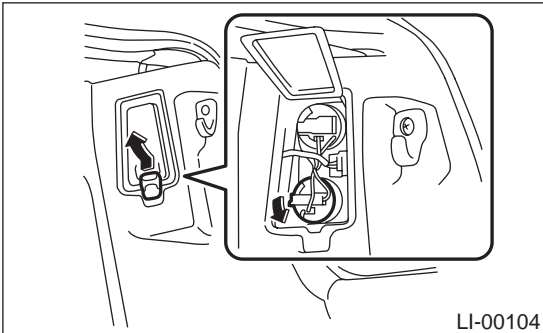
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

22.Rear Turn Signal Light Bulb

A: REMOVAL

1. SEDAN

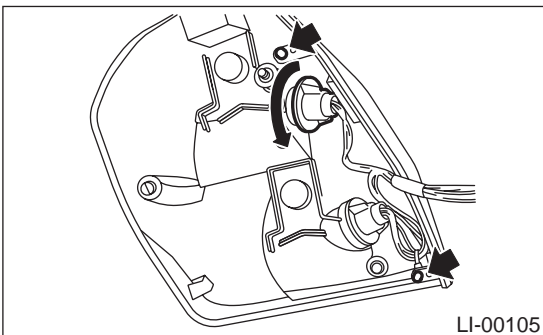
- 1) Open trunk lid and remove cover.



- 2) Turn the socket and remove the bulb.

2. WAGON

- 1) Remove rear combination light assembly. <Ref. to LI-22, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Remove the light cover mounting screws then detach the cover.
- 3) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

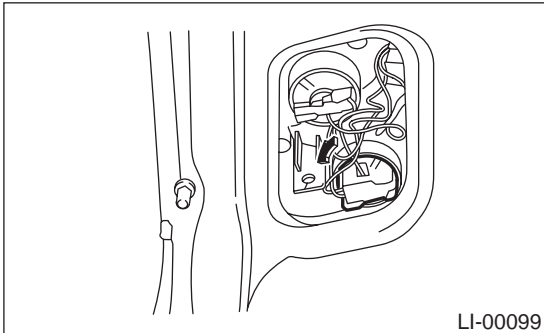
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

23. Rear Fog Light Bulb

A: REMOVAL

1. SEDAN

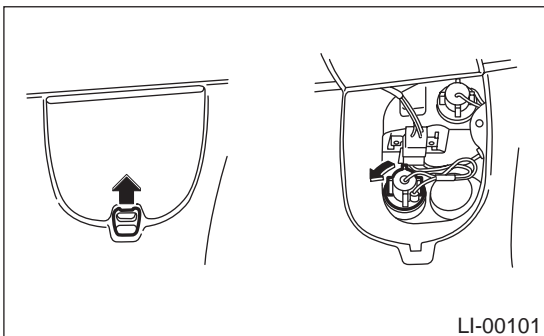
- 1) Open trunk lid and remove cover.



- 2) Turn the socket and remove the bulb.

2. WAGON

- 1) Open rear gate lower trim cover.



- 2) Turn the socket and remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

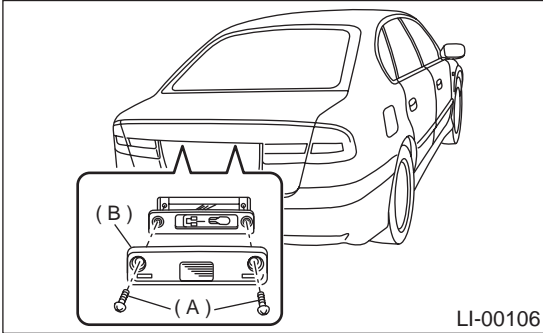
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, Specifications.>
- 3) If NG, replace the bulb with a new one.

24. License Plate Light

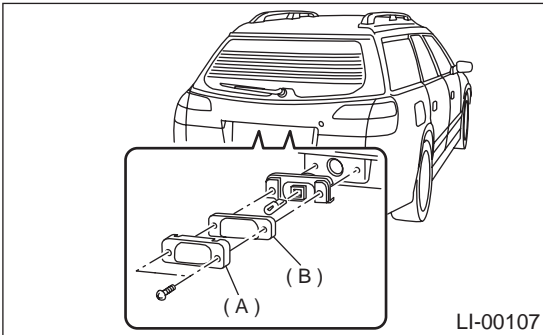
A: REMOVAL

- 1) Remove license plate light mounting screw (A) and then remove the lens (B)

SEDAN



WAGON



- 2) Remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

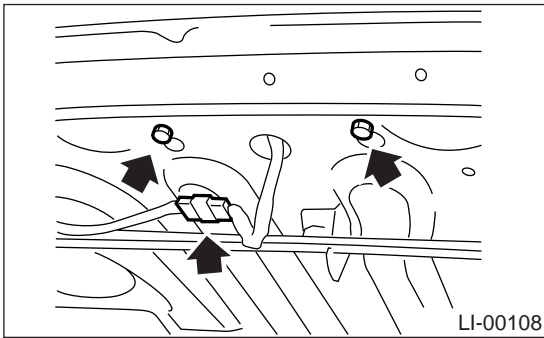
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

25.High-mounted Stop Light

A: REMOVAL

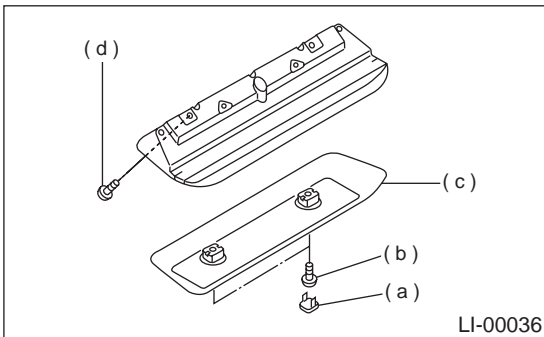
1. SEDAN

- 1) Disconnect ground cable from battery.
- 2) Disconnect connector of high-mounted stop light from body harness.
- 3) Remove bolts, then detach high-mounted stop light assembly.



2. WAGON

- 1) Disconnect ground cable from battery.
- 2) Remove cap (a) by prying on the edge with a screwdriver.
- 3) Remove screws (b) and then detach cover (c).
- 4) Remove screws (d) and then detach high-mounted stop light while disconnecting connector.



B: INSTALLATION

Install in the reverse order of removal.

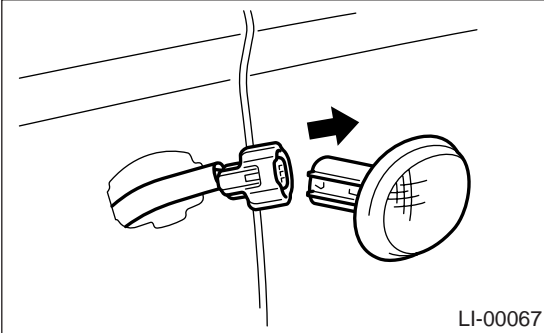
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

26.Side Turn Signal Light

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Pull out the light from body while pushing it in direction of vehicle front.
- 3) Disconnect harness connector and remove the light.



B: INSTALLATION

Install in the reverse order of removal.

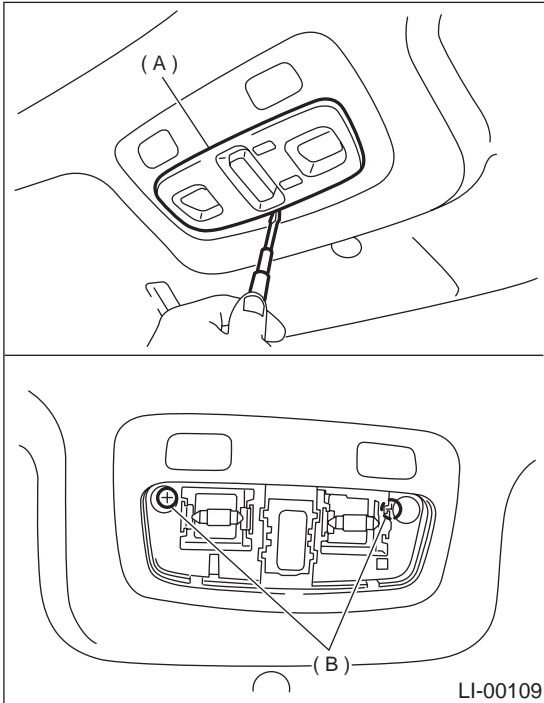
C: INSPECTION

- 1) Check the bulb for blow out using a tester.
- 2) If NG, replace the side turn signal light assembly with a new one.

27. Spot Light

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove lens (A) and spot light mounting screw (B).



- 3) Disconnect harness connectors and remove spot light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SPOT LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

2. SPOT LIGHT SWITCH

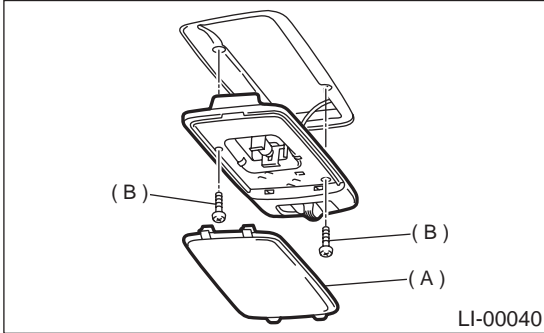
Measure spot light resistance.

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 2	18±5.4 Ω

28. Room Light

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove lens (A) and room light mounting screws (B).



- 3) Disconnect harness connectors and remove the light.

B: INSTALLATION

Install in the reverse order of removal.

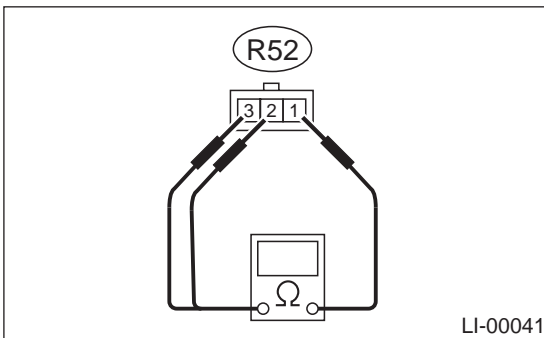
C: INSPECTION

1. ROOM LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

2. ROOM LIGHT SWITCH

Measure room light switch resistance.

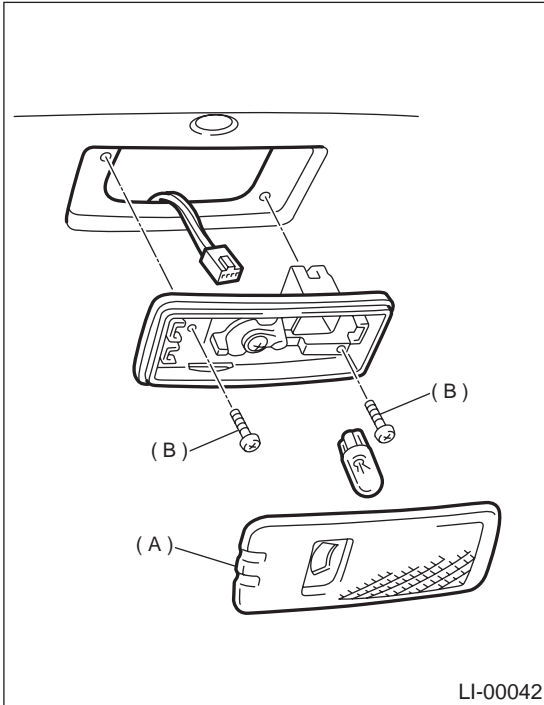


Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

29. Luggage Room Light

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove lens (A) and luggage room light mounting screws (B).



- 3) Disconnect harness connectors and remove luggage room light.

B: INSTALLATION

Install in the reverse order of removal.

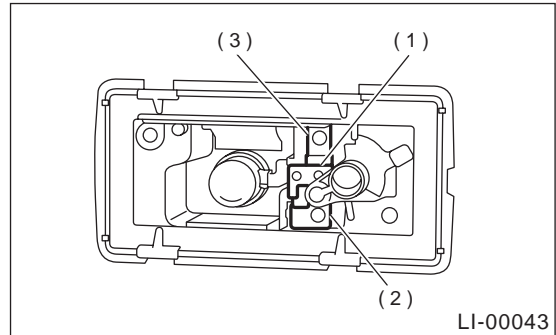
C: INSPECTION

1. LUGGAGE ROOM LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

2. LUGGAGE ROOM LIGHT SWITCH

Measure luggage room light resistance.

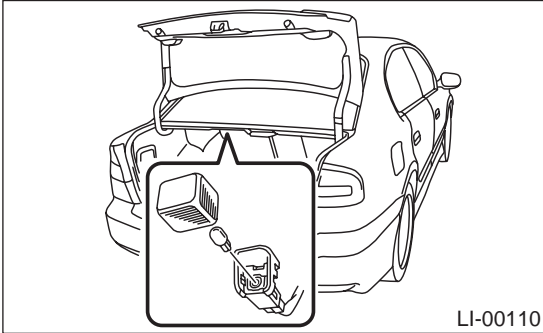


Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

30.Trunk Room Light

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Disconnect harness connectors and remove trunk room light.



B: INSTALLATION

Install in the reverse order of removal.

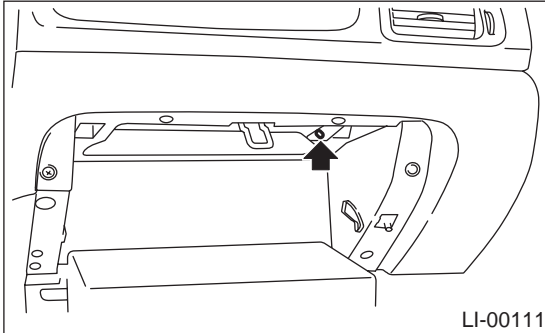
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

31. Glove Box Light

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove glove box. <Ref. to EI-32, REMOVAL, Glove Box.>
- 3) Disconnect harness connector.
- 4) Remove glove box light.



B: INSTALLATION

Install in the reverse order of removal.

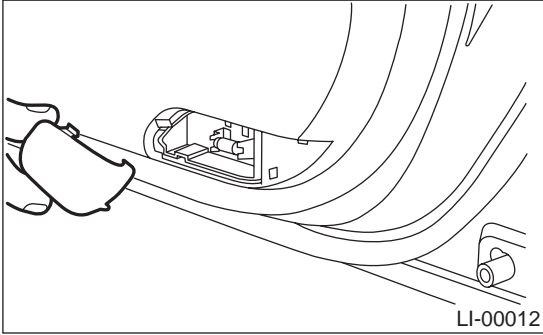
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

32. Door Step Light

A: REMOVAL

Remove the lens then detach the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

WIPER AND WASHER SYSTEMS



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6. Front Wiper Arm.....	12
7. Front Wiper Motor and Link.....	13
8. Front Washer Nozzle	14
9. Rear Wiper Arm	15
10. Rear Wiper Motor.....	16
11. Rear Washer Nozzle	17
12. Wiper Control Relay	18

GENERAL DESCRIPTION

WIPER AND WASHER SYSTEMS

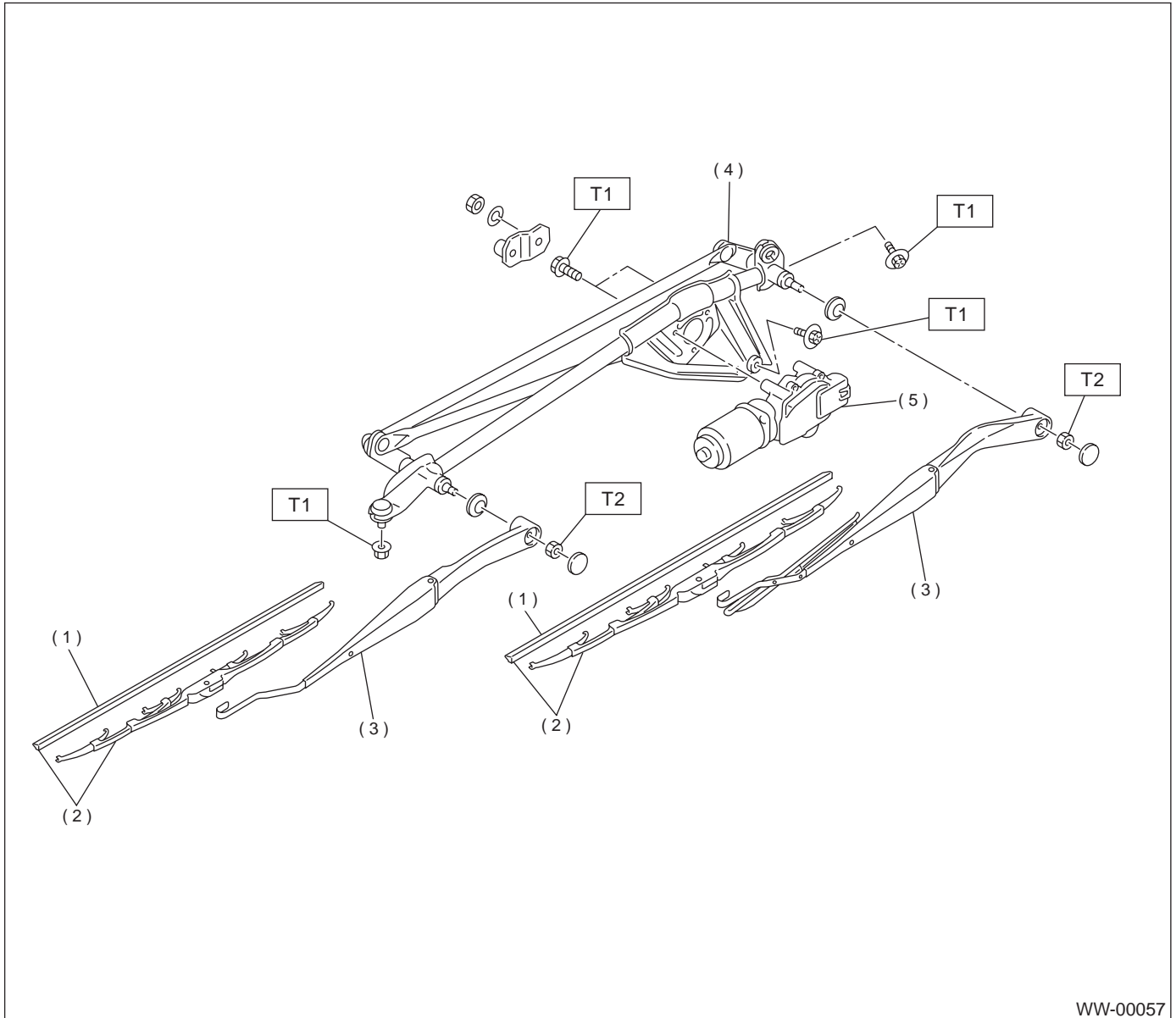
1. General Description

A: SPECIFICATIONS

Front wiper motor	Input	12 V — 72 W or less
Rear wiper motor	Input	12 V — 36 W or less
Front washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less
Rear washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less

B: COMPONENT

1. FRONT WIPER



WW-00057

- (1) Wiper rubber
- (2) Wiper blade ASSY
- (3) Wiper arm

- (4) Wiper link
- (5) Wiper motor

Tightening torque: N-m (kgf-m, ft-lb)

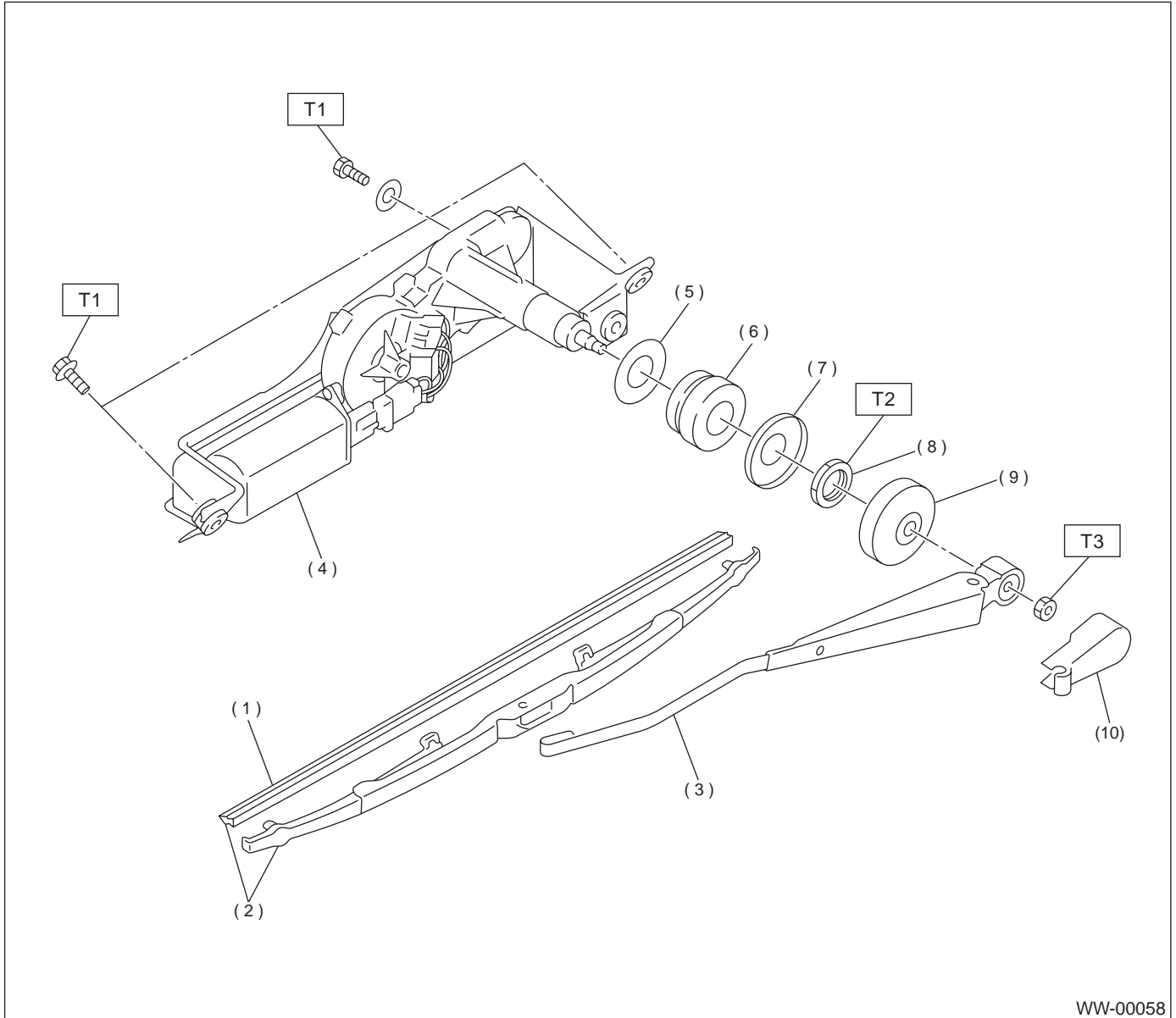
T1: 6.0 (0.61, 4.4)

T2: 20 (2.0, 14.5)

GENERAL DESCRIPTION

WIPER AND WASHER SYSTEMS

2. REAR WIPER



- | | |
|----------------------|----------------------|
| (1) Wiper rubber | (6) Cushion |
| (2) Wiper blade ASSY | (7) Spacer B |
| (3) Wiper arm | (8) Nut |
| (4) Wiper motor | (9) Cap |
| (5) Spacer A | (10) Wiper arm cover |

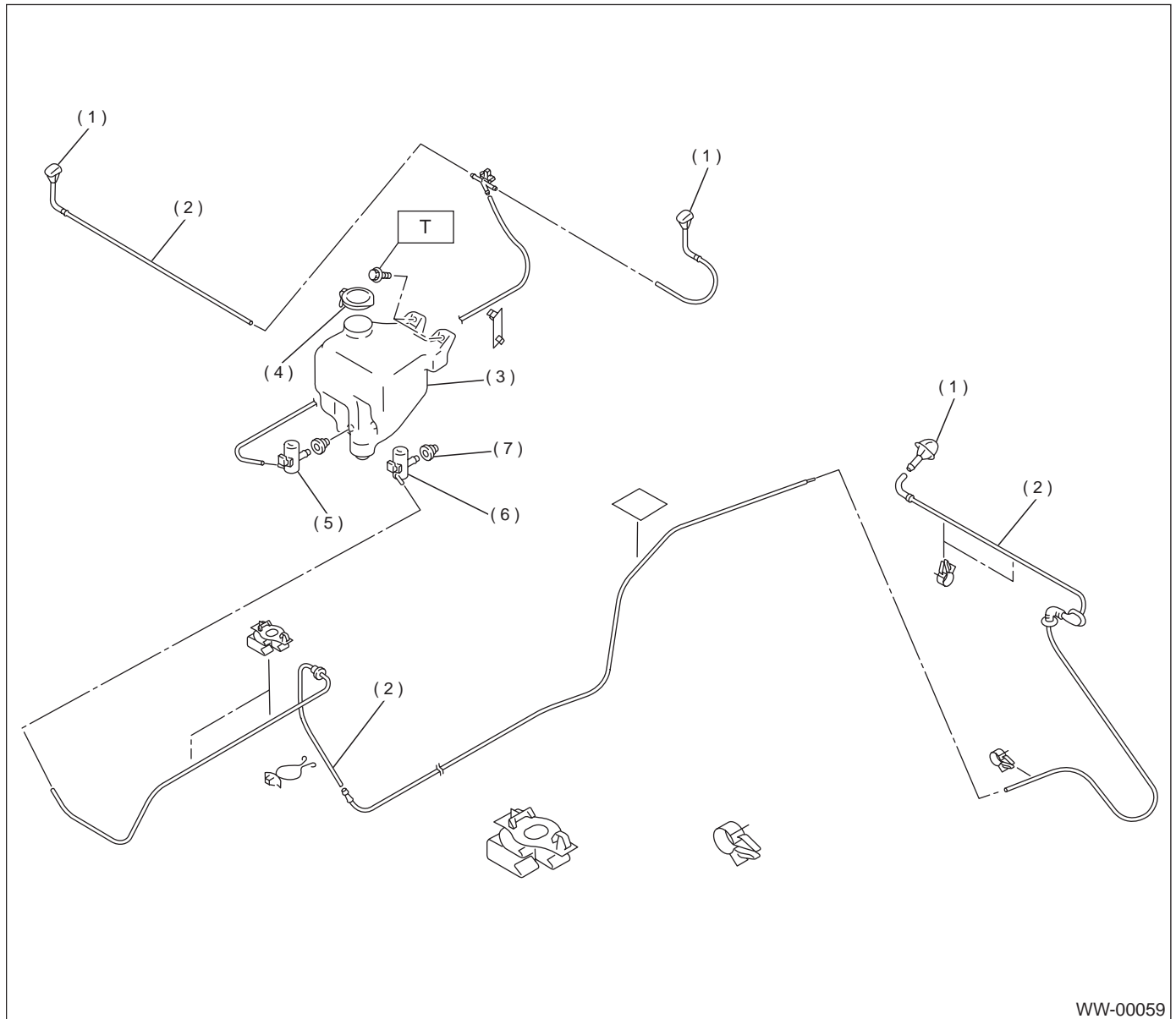
Tightening torque: N·m (kgf·m, ft·lb)

T1: 5.9 (0.6, 4.3)

T2: 7.4 (0.75, 5.4)

T3: 7.8 (0.8, 5.8)

3. WASHER TANK



WW-00059

- | | |
|---------------------|------------------------|
| (1) Washer nozzle | (5) Front washer motor |
| (2) Washer hose | (6) Rear washer motor |
| (3) Washer tank | (7) Grommet |
| (4) Washer tank cap | |

Tightening torque: N·m (kgf-m, ft-lb)

T: 6.0 (0.61, 4.4)

GENERAL DESCRIPTION

WIPER AND WASHER SYSTEMS

C: CAUTION

- Reconnect connectors and hoses securely. After reconnecting, confirm that each function operates normally.
- Be careful that wire harnesses of airbag system pass near electrical parts and switches.
- Wire harnesses and connectors of all airbag system are yellow color. Do not use a tester on these circuits.
- Care must be taken when installing the piping hose so that no bending, jamming, etc. are caused.
- If even a little oil or grease such as silicon oil gets in the tank and washer passages, an oil film easily forms on the glass, causing the wiper to chatter and judder. Therefore, be careful not to let this happen.

2. Wiper and Washer System

A: SCHEMATIC

1. WIPER AND WASHER (FRONT) LHD MODEL

<Ref. to WI-324, LHD MODEL, SCHEMATIC, Wiper and Washer System (Front).>

2. WIPER AND WASHER (FRONT) RHD MODEL

<Ref. to WI-325, RHD MODEL, SCHEMATIC, Wiper and Washer System (Front).>

3. WIPER AND WASHER (REAR) LHD MODEL

<Ref. to WI-326, LHD MODEL, SCHEMATIC, Wiper and Washer System (Rear).>

4. WIPER AND WASHER (REAR) RHD MODEL

<Ref. to WI-327, RHD MODEL, SCHEMATIC, Wiper and Washer System (Rear).>

B: INSPECTION

Symptom	Repair order
Wiper and washers do not operate.	(1) Wiper fuse (F/B No. 14, 15) (2) Combination switch (3) Wiper motor (4) Wire harness
Wipers do not operate in LO or HI.	(1) Combination switch (2) Wiper motor (3) Wire harness
Wipers do not operate in INT.	(1) Combination switch (2) Wiper motor (3) Wire harness
Washer motor does not operate.	(1) Washer switch (2) Washer motor (3) Wire harness
Wipers do not operate when washer switch is ON.	(1) Washer motor (2) Wire harness
Washer fluid spray does not operate.	(1) Washer motor (2) Washer hose and nozzle

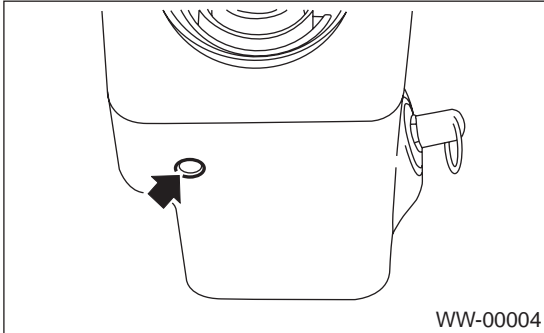
COMBINATION SWITCH (WIPER)

WIPER AND WASHER SYSTEMS

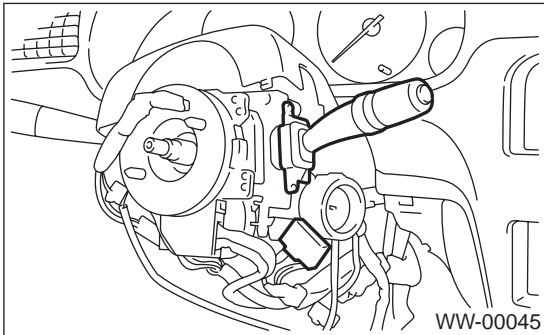
3. Combination Switch (Wiper)

A: REMOVAL

- 1) Loosen screw to remove a steering column cover.



- 2) Disconnect connectors from combination switches.
- 3) Loosen screw to remove combination switch.

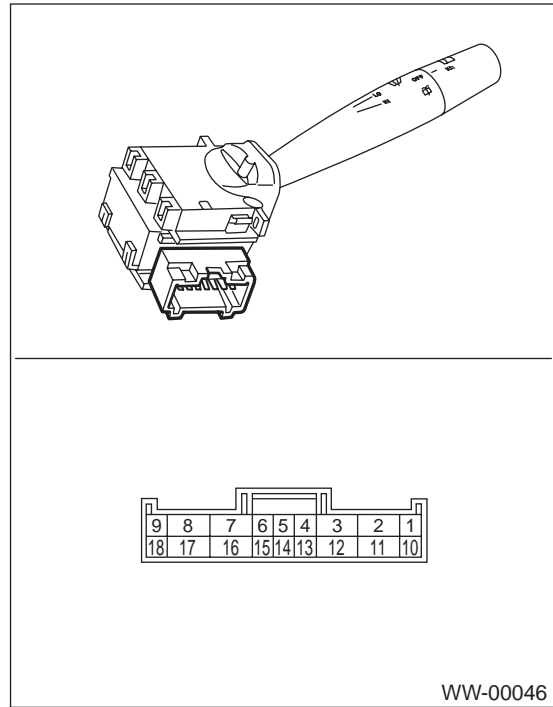


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- Inspect the continuity between each connector terminal.



LHD model and RHD model with rear fog light:

	Switch position	Terminal No.	Standard
FRONT	OFF	7 and 16	Less than 1 Ω
	INT	7 and 16	Less than 1 Ω
	LO	7 and 17	Less than 1 Ω
	HI	8 and 17	Less than 1 Ω
	Washer ON	2 and 11	Less than 1 Ω
REAR	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1 Ω
	OFF	—	More than 1 MΩ
	ON	2 and 10	Less than 1 Ω
	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1 Ω

If continuity is not as specified, replace the switch.

COMBINATION SWITCH (WIPER)

WIPER AND WASHER SYSTEMS

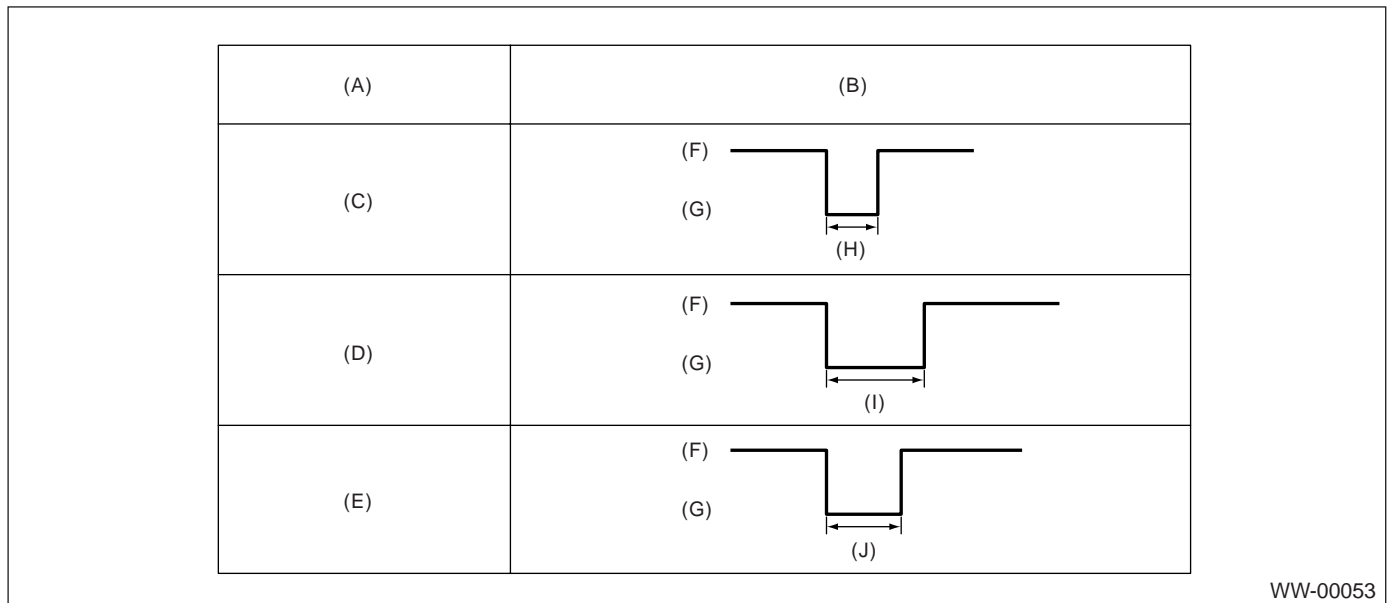
RHD model without rear fog light:

	Switch position	Terminal No.	Standard
FRONT	OFF	3 and 12	Less than 1 Ω
	INT	3 and 12	Less than 1 Ω
	LO	3 and 11	Less than 1 Ω
	HI	2 and 11	Less than 1 Ω
	Washer ON	8 and 17	Less than 1 Ω
REAR	Washer ON	8 and 16 16 and 18 8 and 18	Less than 1 Ω
	OFF	—	More than 1 $M\Omega$
	ON	8 and 18	Less than 1 Ω
	Washer ON	8 and 16 16 and 18 8 and 18	Less than 1 Ω

If continuity is not as specified, replace the switch.

• Intermittent operation inspection

- 1) Turn the wiper switch to INT.
- 2) Adjust the intermittent control switch to MAX.
- 3) Apply battery voltage to switch terminals 16 and 2, and inspect the voltage of terminals 7 and 2. (Measure the voltage from after the second time the wiper stops.)



WW-00053

- | | | |
|---------------------|--------------------|---------------------|
| (A) Switch position | (E) Non-variable | (I) 16 ± 6 sec. |
| (B) Voltage | (F) 12 V | (J) 3 ± 1 sec. |
| (C) MIN. | (G) 0 V | |
| (D) MAX. | (H) Approx. 2 sec. | |

If operation is not as specified, replace the switch.

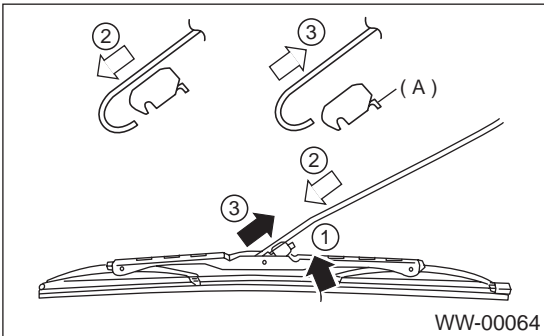
WIPER BLADE

WIPER AND WASHER SYSTEMS

4. Wiper Blade

A: REMOVAL

While pushing locking clip (A) up, pull out blade from arm to arrow direction.

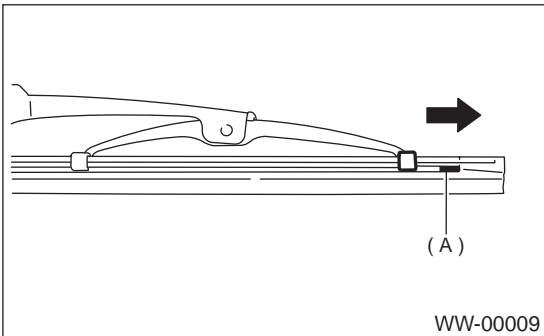


B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Confirm that clip was locked securely.

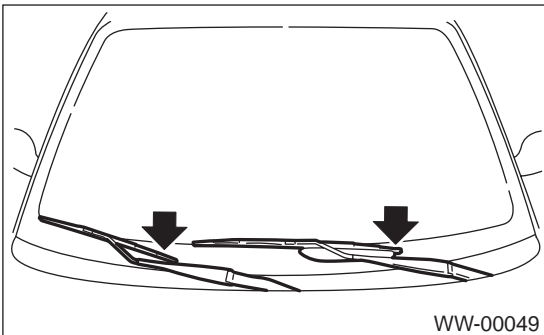
C: DISASSEMBLY

Pull on side (A) of the wiper rubber stopper and remove the rubber from the blade assembly.

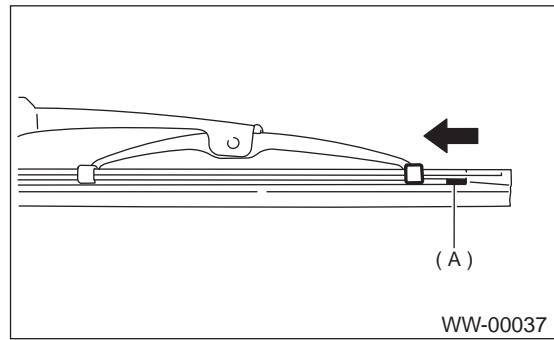


D: ASSEMBLY

1) Insert the wiper rubber onto the blade so that the stopper is in the position shown (at the bottom of the wiper arm).



2) Make sure the wiper rubber is securely fastened to the pull stopper (A).



E: INSPECTION

1) When the wiper does not perform well, inspect the following:

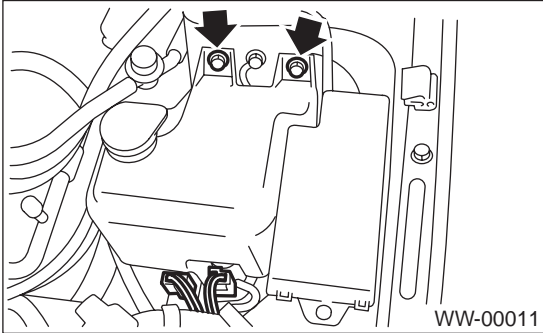
- Make sure the movable part of the blade assembly moves smoothly.
- Make sure the wiper rubber is not deformed or damaged.

2) Replace with a new part if damage is found.

5. Washer Tank and Motor

A: REMOVAL

- 1) Open hood.
- 2) Remove the 2 bolts, hose and connector and then remove the tank.

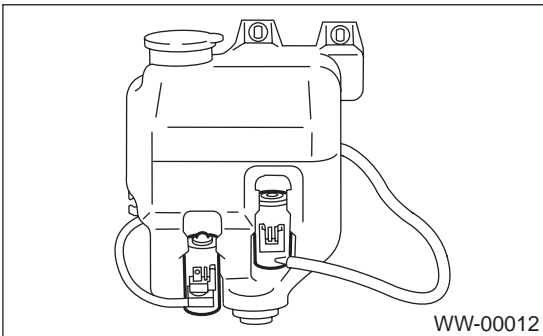


B: INSTALLATION

Install in the reverse order of removal.

C: DISASSEMBLY

Remove washer motor from tank.

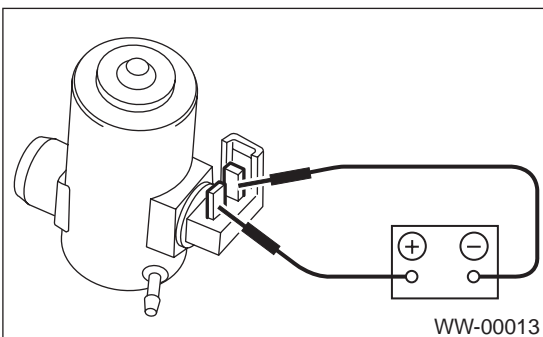


D: ASSEMBLY

- 1) Assemble in the reverse order of disassembly.
- 2) Confirm that water does not leak from installation area of motor.

E: INSPECTION

Apply battery voltage to the connector terminal of the washer motor and make sure the motor operates.



FRONT WIPER ARM

WIPER AND WASHER SYSTEMS

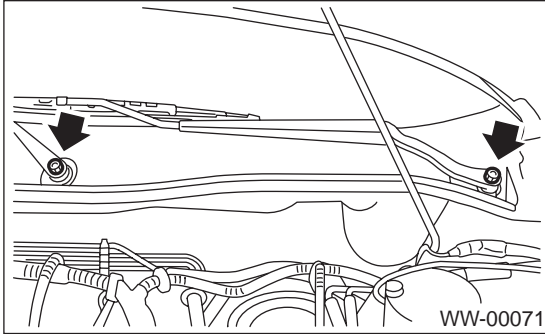
6. Front Wiper Arm

A: REMOVAL

NOTE:

The positions for RHD model are symmetrically opposite.

- 1) Open hood.
- 2) Remove cap.
- 3) Loosen nut to remove arm.

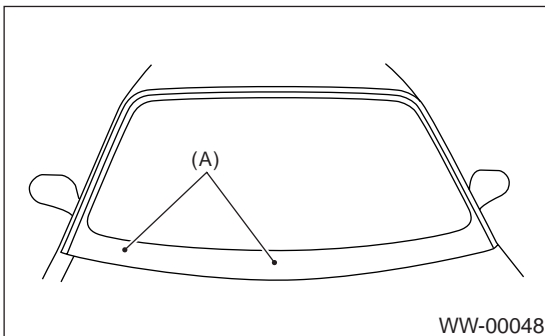


B: INSTALLATION

NOTE:

The positions for RHD model are symmetrically opposite.

- 1) Install in the reverse order of removal.
- 2) Operate wiper once.
- 3) Align wiper blade to ceramic print point mark (A) of front window pane.



Tightening torque:

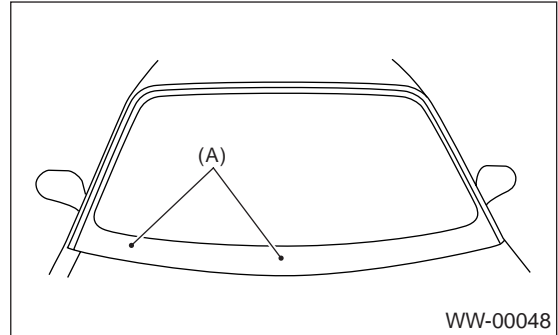
Refer to **COMPONENT** in *General Description*. <Ref. to **WW-3, FRONT WIPER, COMPONENT, General Description.**>

C: ADJUSTMENT

NOTE:

The positions for RHD model are symmetrically opposite.

Operate wiper once. Align wiper blade to ceramic print point mark (A) of front window pane.



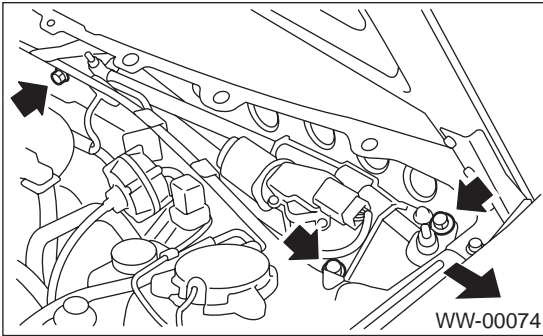
7. Front Wiper Motor and Link

A: REMOVAL

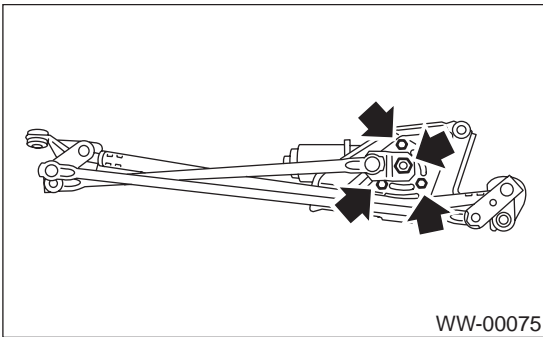
NOTE:

The positions for RHD model are symmetrically opposite.

- 1) Remove cowl panel. <Ref. to EI-27, REMOVAL, Cowl Panel.>
- 2) Disconnect connector of motor.
- 3) Loosen bolts and nuts to remove wiper link.



- 4) Loosen bolts and nuts to remove motor.



B: INSTALLATION

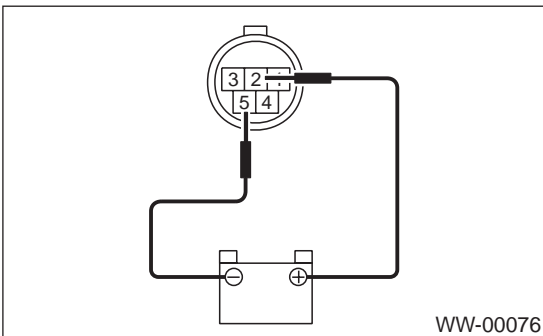
Install in the reverse order of removal.

Tightening torque:

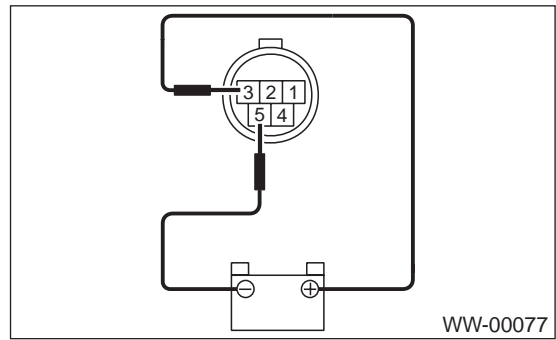
Refer to **COMPONENT** in **General Description**. <Ref. to WW-3, **FRONT WIPER, COMPONENT, General Description**.>

C: INSPECTION

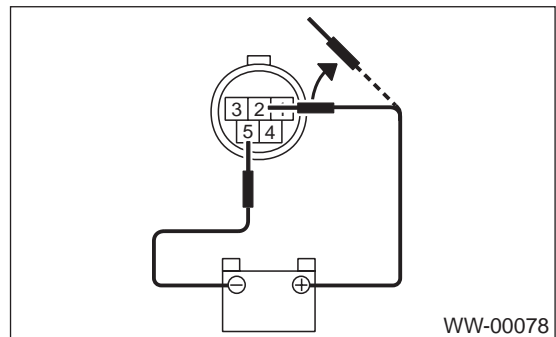
- 1) When battery is connected to terminal of connectors, confirm that motor operates at low speed.



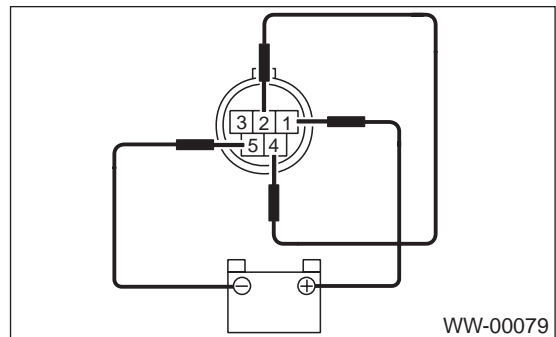
- 2) When battery is connected to terminal of connectors, confirm that motor operates at high speed.



- 3) Connect battery to terminals of connector, and remove terminal connection with motor rotated at low speed, and stop wiper motor through operation.



- 4) Connect battery and confirm that motor stops at automatic stop position after motor operates at low speed again.



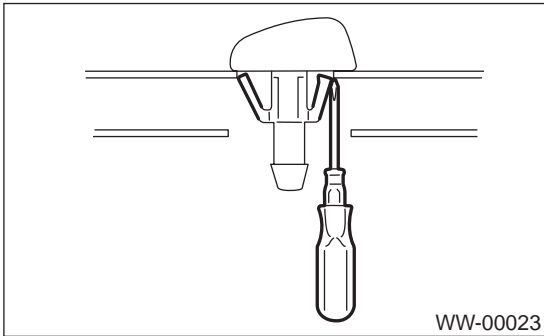
FRONT WASHER NOZZLE

WIPER AND WASHER SYSTEMS

8. Front Washer Nozzle

A: REMOVAL

- 1) Remove the washer hose from the washer nozzle.
- 2) Open the clips on the underside of the hood with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the position of the washer liquid sprayer. <Ref. to WW-14, ADJUSTMENT, Front Washer Nozzle.>

C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

D: ADJUSTMENT

NOTE:

Adjustment positions for left-handed vehicle. Carry out left-right symmetry for adjustment positions for right-handed vehicle.

- 1) Turn wiper switch to OFF position.
- 2) When vehicle stops, adjust washer injection position as shown in the figure.

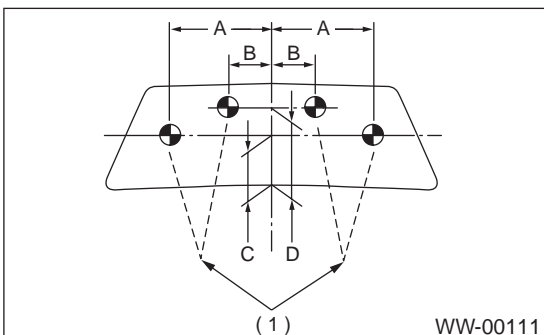
Injection position:

A: 350 mm (13.78 in)

B: 150 mm (5.91 in)

C: 300 mm (11.81 in)

D: 600 mm (23.62 in)

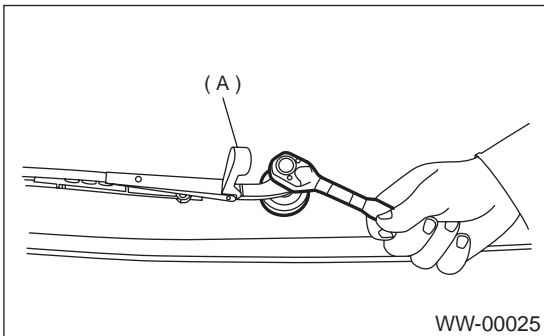


(1) Nozzle

9. Rear Wiper Arm

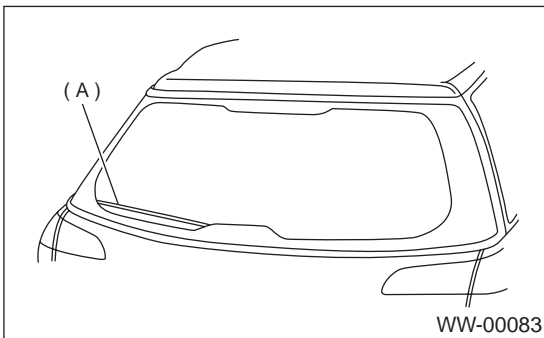
A: REMOVAL

- 1) Raise wiper arm cover (A).
- 2) Loosen nut to remove wiper arm.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Operate rear wiper once.
- 3) Align blade to rear defogger heat wire (A).

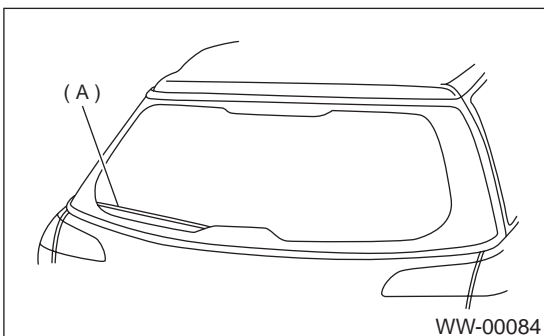


Tightening torque:

Refer to COMPONENT in General Description. <Ref. to WW-4, REAR WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

- 1) Operate rear wiper once.
- 2) Align blade to rear defogger heat wire (A).



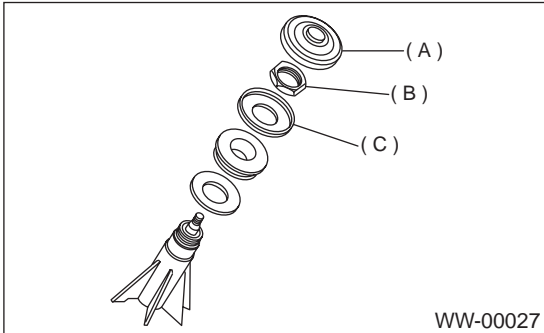
REAR WIPER MOTOR

WIPER AND WASHER SYSTEMS

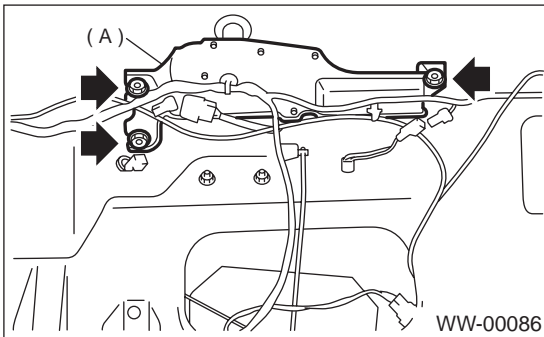
10. Rear Wiper Motor

A: REMOVAL

- 1) Remove rear wiper arm.
- 2) Remove cap (A), nut (B), and spacer (C) from rear wiper shaft.

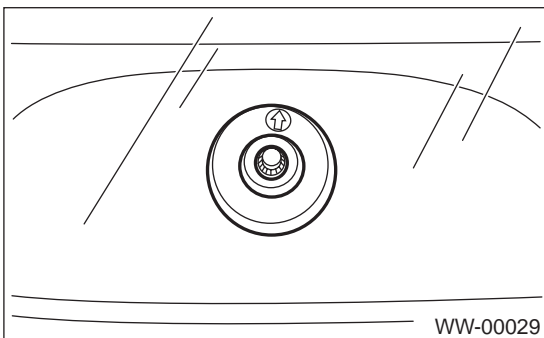


- 3) Remove rear gate lower trim. <Ref. to EI-44, REMOVAL, Rear Gate Trim.>
- 4) Unclip clip of harness and disconnect connector of wiper motor.
- 5) Loosen bolts to remove wiper motor assembly (A).



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Install rear wiper cushion with the arrow mark facing up, as shown in the figure.

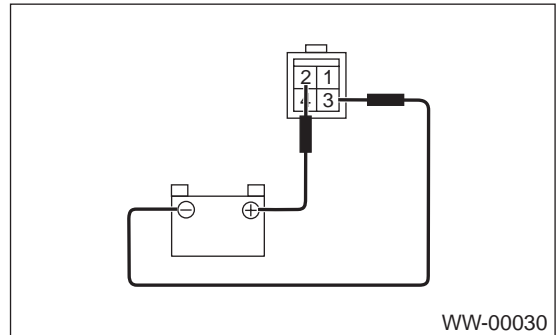


Tightening torque:

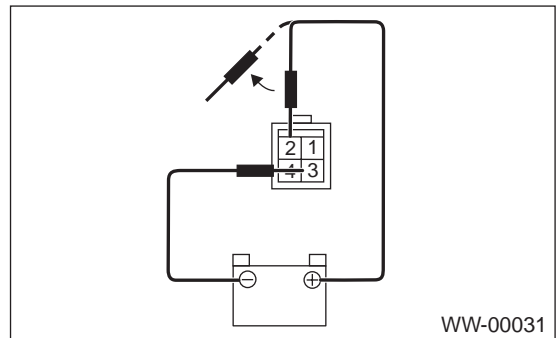
Refer to **COMPONENT** in *General Description*. <Ref. to WW-4, REAR WIPER, COMPONENT, General Description.>

C: INSPECTION

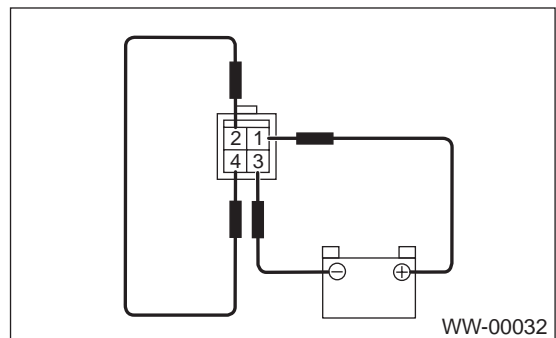
- 1) Connect battery to wiper motor connector and confirm that wiper motor operates.



- 2) Connect battery to terminal of connector and remove terminal connections with motor rotated, and stop wiper motor through operation.



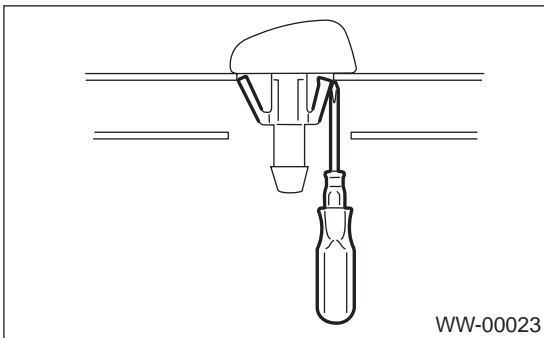
- 3) Connect battery and confirm that motor stops at automatic stop position after motor operates at low speed again.



11.Rear Washer Nozzle

A: REMOVAL

- 1) Remove the high-mount stop light. <Ref. to LI-29, REMOVAL, High-mounted Stop Light.>
- 2) Remove the washer hose from the washer nozzle.
- 3) Open the clips on the underside of the rear gate panel with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the position of the washer liquid sprayer. <Ref. to WW-17, ADJUSTMENT, Rear Washer Nozzle.>

C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

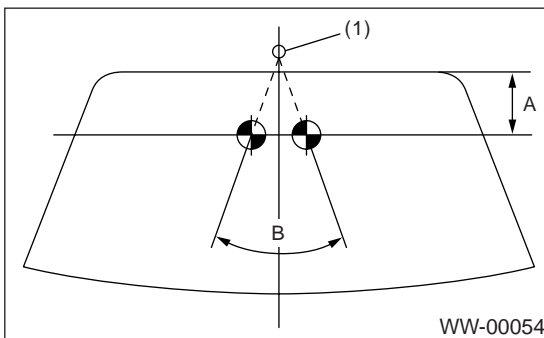
D: ADJUSTMENT

- 1) Turn wiper switch to OFF position.
- 2) When vehicle stops, adjust washer injection position as shown in the figure.

Injection position:

A: 60 mm (2.36 in)

B: 42°



(1) Nozzle

WIPER CONTROL RELAY

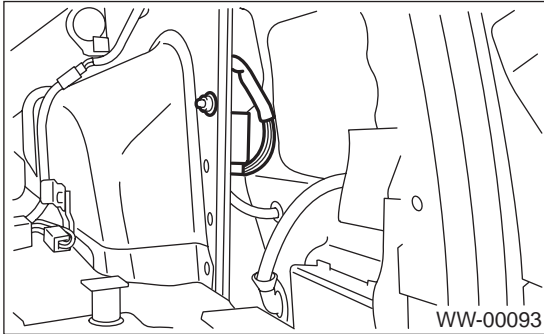
WIPER AND WASHER SYSTEMS

12. Wiper Control Relay

A: REMOVAL

1. WAGON

- 1) Remove right quarter lower trim. <Ref. to EI-40, REMOVAL, Rear Quarter Trim.>
- 2) Remove quarter pocket.
- 3) Loosen nut to remove control unit.



B: INSTALLATION

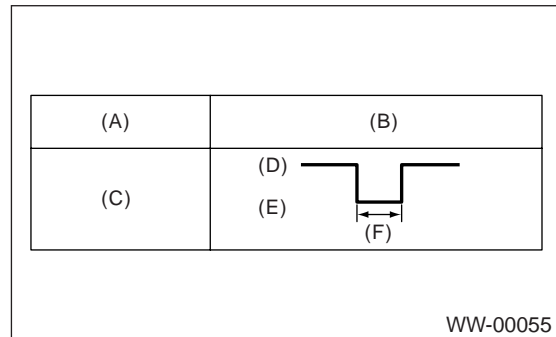
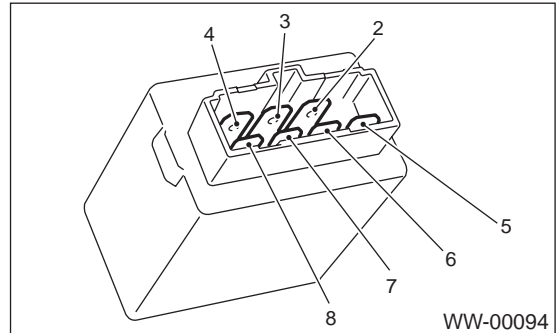
1. WAGON

Install in the reverse order of removal.

C: INSPECTION

1. WAGON

- 1) Turn the rear wiper switch to ON.
- 2) Apply battery voltage to the rear terminals 8 and 2, and then inspect the voltage of 6 and 2. (Measure the voltage from after the second time the wiper stops.)



- (A) Switch position
- (B) Voltage
- (C) ON
- (D) 12 V
- (E) 0 V
- (F) 9 ± 2 sec.

If operation is not as specified, replace the switch.

ENTERTAINMENT

ET

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9. Speaker Amplifier	10
10. Antenna.....	11
11. Antenna Amplifier	12
12. Cigarette Lighter.....	14



GENERAL DESCRIPTION

ENTERTAINMENT

1. General Description

A: CAUTION

- Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
Conductive Silver Composition (DUPONT NO. 4817 or equivalent)	Used for repairing antenna wire.

2. Radio System

A: SCHEMATIC

1. AUDIO SYSTEM

<Ref. to WI-118, SCHEMATIC, Audio System.>

B: INSPECTION

Symptom	Repair order
No power coming in (No display and no sound from speakers)	(1) Check fuse and power supply for radio. (2) Check radio ground. (3) Remove radio for repair.
A specific speaker does not operate.	(1) Check speaker. (2) Check output circuit between radio and speaker.
Radio generates noise with engine running.	(1) Check radio ground. (2) Check generator. (3) Check ignition coil. (4) Remove radio for repair.
AM and FM modes are weak or noisy.	(1) Check antenna. (2) Check antenna amplifier. (3) Check radio ground. (4) Remove radio for repair.

3. Cigarette Lighter System

A: SCHEMATIC

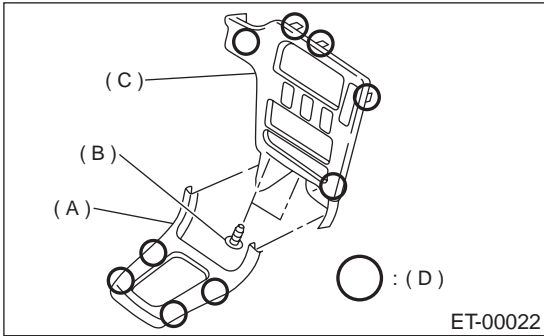
1. CIGARETTE LIGHTER

<Ref. to WI-233, SCHEMATIC, Front Accessory
Power Supply System.>

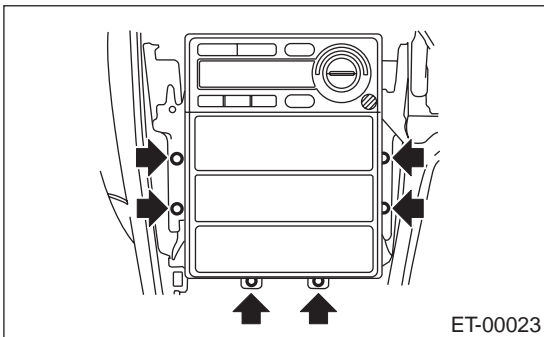
4. Radio Body

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove hook (D) and then remove front cover (A).
- 3) Remove two screws (B) and hook (D), then remove center panel (C) while disconnecting connector.



- 4) Remove fitting screws, and slightly pull radio out from center console.



- 5) Disconnect electric connectors and antenna feeder cord and then disconnect heater control unit.

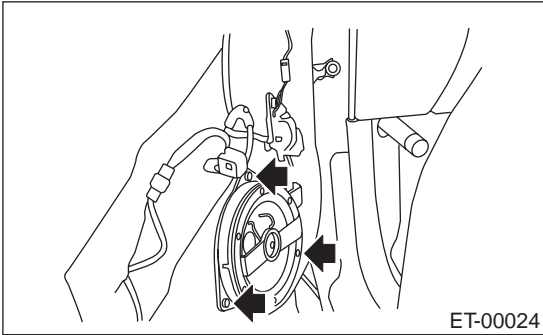
B: INSTALLATION

Install in the reverse order of removal.

5. Front Speaker

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove front door trim. <Ref. to EI-30, REMOVAL, Front Door Trim.>
- 3) Remove front speaker mounting screws.



- 4) Disconnect harness connector and remove front speaker.

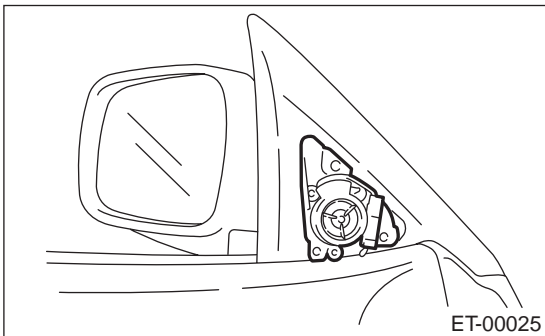
B: INSTALLATION

Install in the reverse order of removal.

6. Front Tweeter

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove gusset cover.



- 3) Disconnect harness connector and remove tweeter.

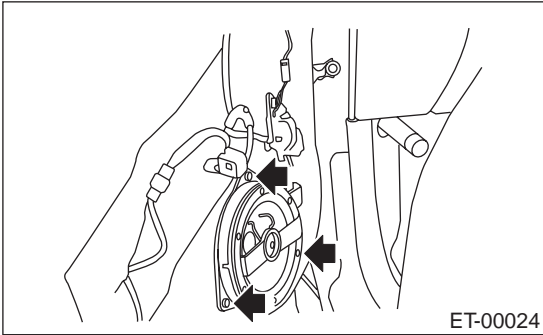
B: INSTALLATION

Install in the reverse order of removal.

7. Rear Speaker

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove rear door trim. <Ref. to EI-31, REMOVAL, Rear Door Trim.>
- 3) Remove rear speaker mounting screws.



- 4) Disconnect harness connector and remove rear speaker.

B: INSTALLATION

Install in the reverse order of removal.

8. Woofer

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove rear shelf trim. <Ref. to EI-45, Removal, Rear Shelf Trim.>
- 3) Remove woofer mounting screws.
- 4) Disconnect harness connector, and then remove woofer.

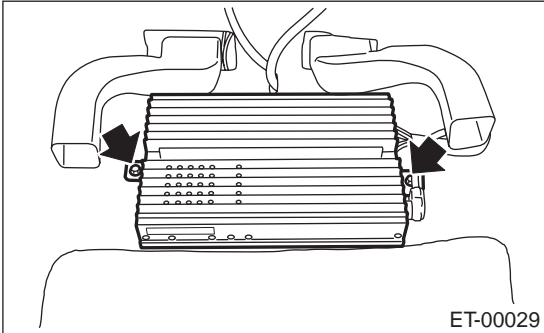
B: INSTALLATION

Install in the reverse order of removal.

9. Speaker Amplifier

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove passenger's seat. <Ref. to SE-7, REMOVAL, Front Seat.>
- 3) Disconnect harness connector.
- 4) Remove mounting nuts, and then detach speaker amplifier.



B: INSTALLATION

Install in the reverse order of removal.

10. Antenna

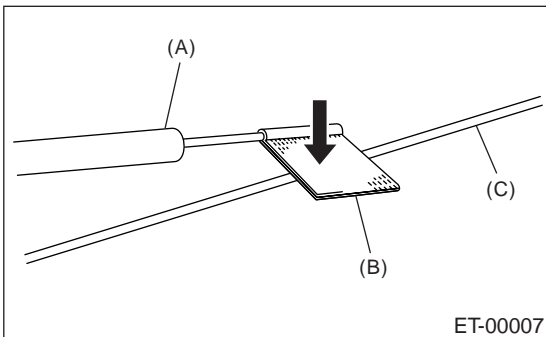
A: INSPECTION

Measure resistance between antenna terminal and each antenna wire.

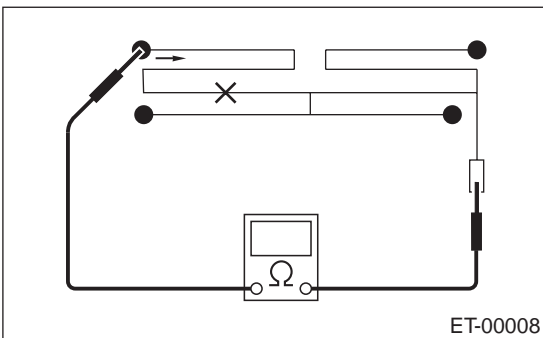
If an antenna wire is OK, resistance will be less than $1\ \Omega$. If an antenna wire is broken, resistance will be more than $1\ M\Omega$.

NOTE:

When checking continuity, wind a piece of tin foil around the tip of the tester probe (A) and press the foil (B) against the wire (C) with your finger.



To locate the broken point, move the probe along the antenna wire.

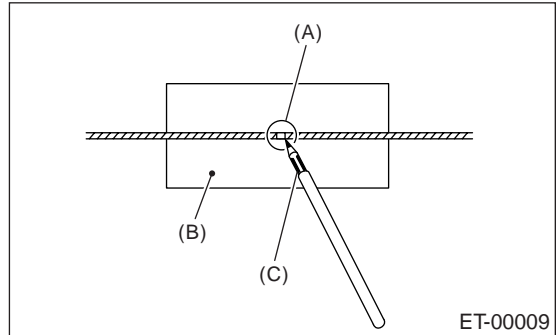


B: REPAIR

1) Clean antenna wire and the surrounding area with a cloth dampened by alcohol.

2) Paste a thin masking film (B) on glass along the broken wire.

3) Deposit conductive silver composition (C) (DU-PONT NO. 4817) on the broken portion (A) with a drawing pen.



4) Dry out the deposited portion.

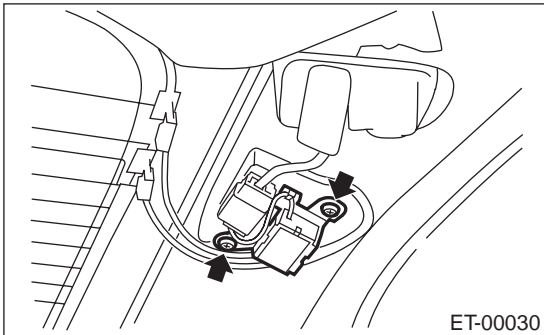
5) After repair has been completed, measure resistance in the repaired wire.

11. Antenna Amplifier

A: REMOVAL

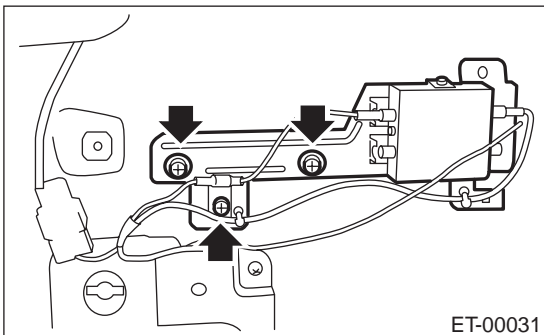
1. SEDAN

- 1) Disconnect ground cable from battery.
- 2) Remove rear pillar upper trim. <Ref. to EI-40, SEDAN, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect harness connector and terminal.
- 4) Remove mounting screw and detach antenna amplifier.



2. WAGON

- 1) Disconnect ground cable from battery.
- 2) Remove rear quarter lower trim. <Ref. to EI-40, WAGON, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect harness connector and terminal.
- 4) Remove mounting screw and detach antenna amplifier.



B: INSTALLATION

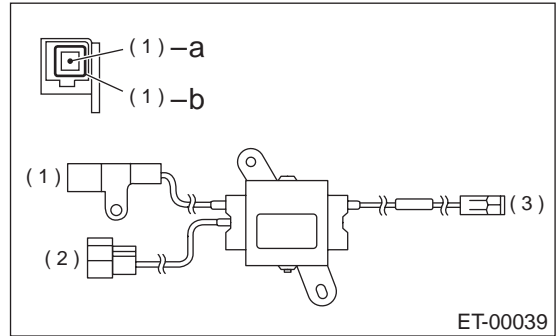
Install in the reverse order of removal.

C: INSPECTION

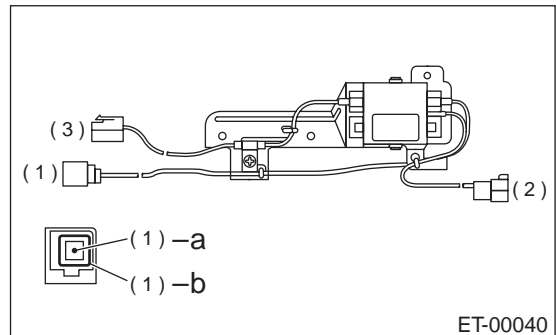
1. FOR EUROPE

Measure antenna amplifier resistance.

SEDAN:



WAGON:

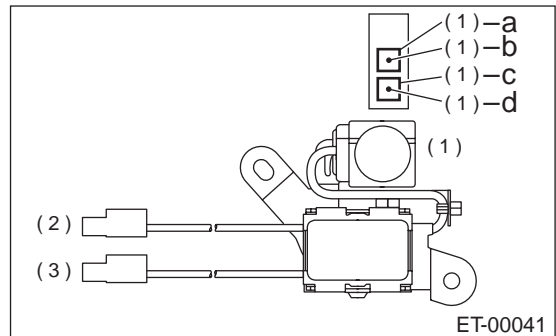


Terminal No.	Standard
1-a and Amplifier	More than 100 k Ω
1-b and Amplifier	Less than 1 Ω
2 and Amplifier	More than 100 k Ω
3 and Amplifier	More than 100 k Ω

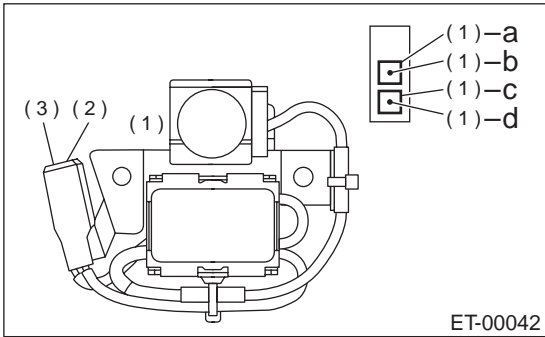
2. EXCEPT FOR EUROPE

Measure antenna amplifier resistance.

SEDAN:



WAGON:

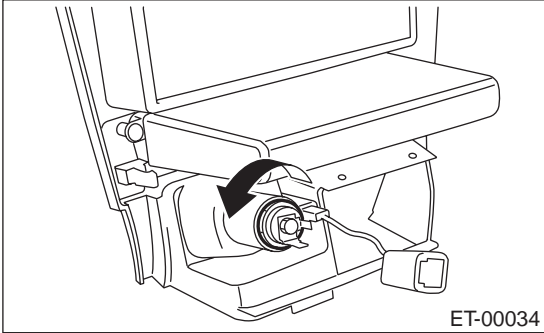


Terminal No.	Standard
1-a and Amplifier	Less than 1 Ω
1-b and Amplifier	More than 100 k Ω
1-c and Amplifier	Less than 1 Ω
1-d and Amplifier	More than 100 k Ω
2 and Amplifier	More than 100 k Ω
3 and Amplifier	More than 100 k Ω
1-b, d and 2, 3	0 – 100 Ω

12.Cigarette Lighter

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove center panel. <Ref. to ET-5, REMOVAL, Radio Body.>
- 3) Disconnect harness connectors and remove cigarette lighter.



B: INSTALLATION

Install in the reverse order of removal.

COMMUNICATION SYSTEM

COM

	Page
1. General Description	2
2. Horn System	3
3. Horn	4
4. Horn Switch.....	5



GENERAL DESCRIPTION

COMMUNICATION SYSTEM

1. General Description

A: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Horn System

A: SCHEMATIC

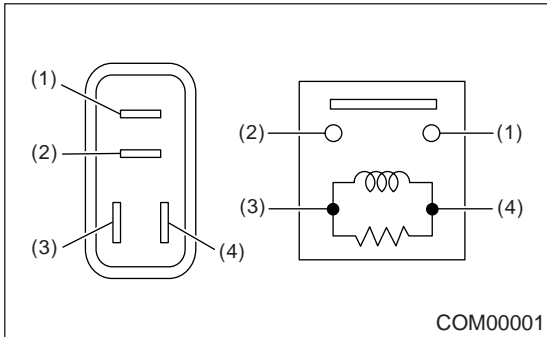
1. HORN

<Ref. to WI-235, SCHEMATIC, Horn System.>

B: INSPECTION

1. HORN RELAY

Measure horn relay resistance between terminals (indicated in table below) while connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.

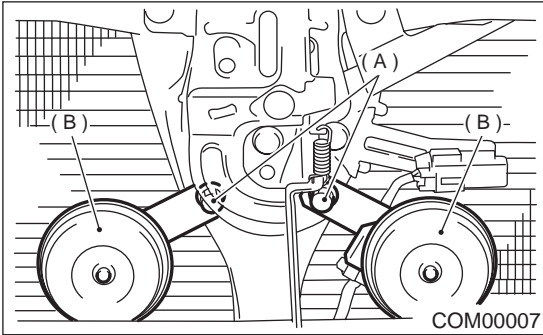


Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 M Ω

3. Horn

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove horn bracket mounting bolt (A).
- 3) Disconnect harness connector and remove horn assembly (B).

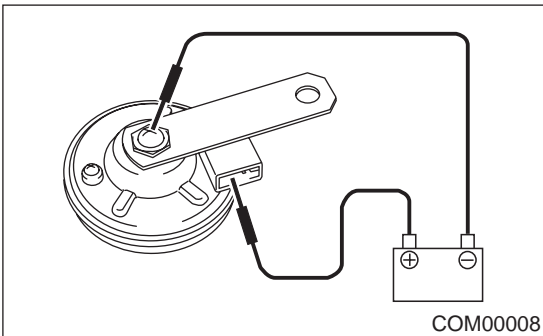


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

With 12 V direct current supply between horn terminal and case ground, check that the horn sounds properly.



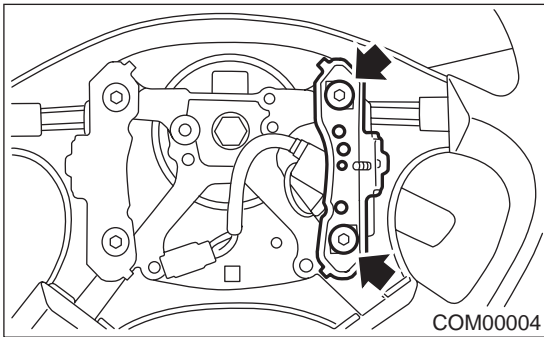
4. Horn Switch

A: REMOVAL

WARNING:

Before servicing, be sure to read the notes in the AB section for proper handling of the driver airbag module. <Ref. to AB-3, CAUTION, General Description.>

- 1) Disconnect ground cable from battery.
- 2) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- 3) Remove horn switch from steering wheel as shown.

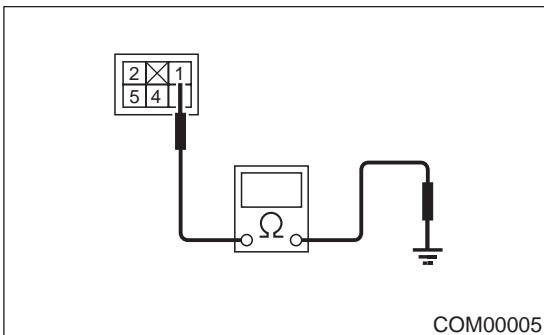


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure horn switch resistance.



Switch position	Terminal No.	Standard
When horn switch is pushed.	1 and Body ground	Less than 1 Ω
When horn switch is not pushed.		More than 1 MΩ

HORN SWITCH

COMMUNICATION SYSTEM

MEMO:

GLASS/WINDOWS/MIRRORS

GW

	Page
1. General Description	2
2. Power Window System	8
3. Rear Window Defogger System	9
4. Windshield Wiper Deicer System	10
5. Remote Control Mirror System	11
6. Front Door Glass	12
7. Front Regulator and Motor Assembly	16
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9. Rear Regulator and Motor Assembly	18
10. Windshield Glass	19
11. Rear Gate Glass	22
12. Rear Quarter Glass	24
13. Rear Window Glass	26
14. Roof Window Glass	27
15. Inner Rearview Mirror	28
16. Power Window Control Switch	29
17. Rear Window Defogger Switch	31
18. Rear Window Defogger	32
19. Outer Mirror Assembly	33
20. Outer Mirror	35
21. Remote Control Mirror Switch	36
22. Wiper Deicer	38
23. Wiper Deicer Switch	39

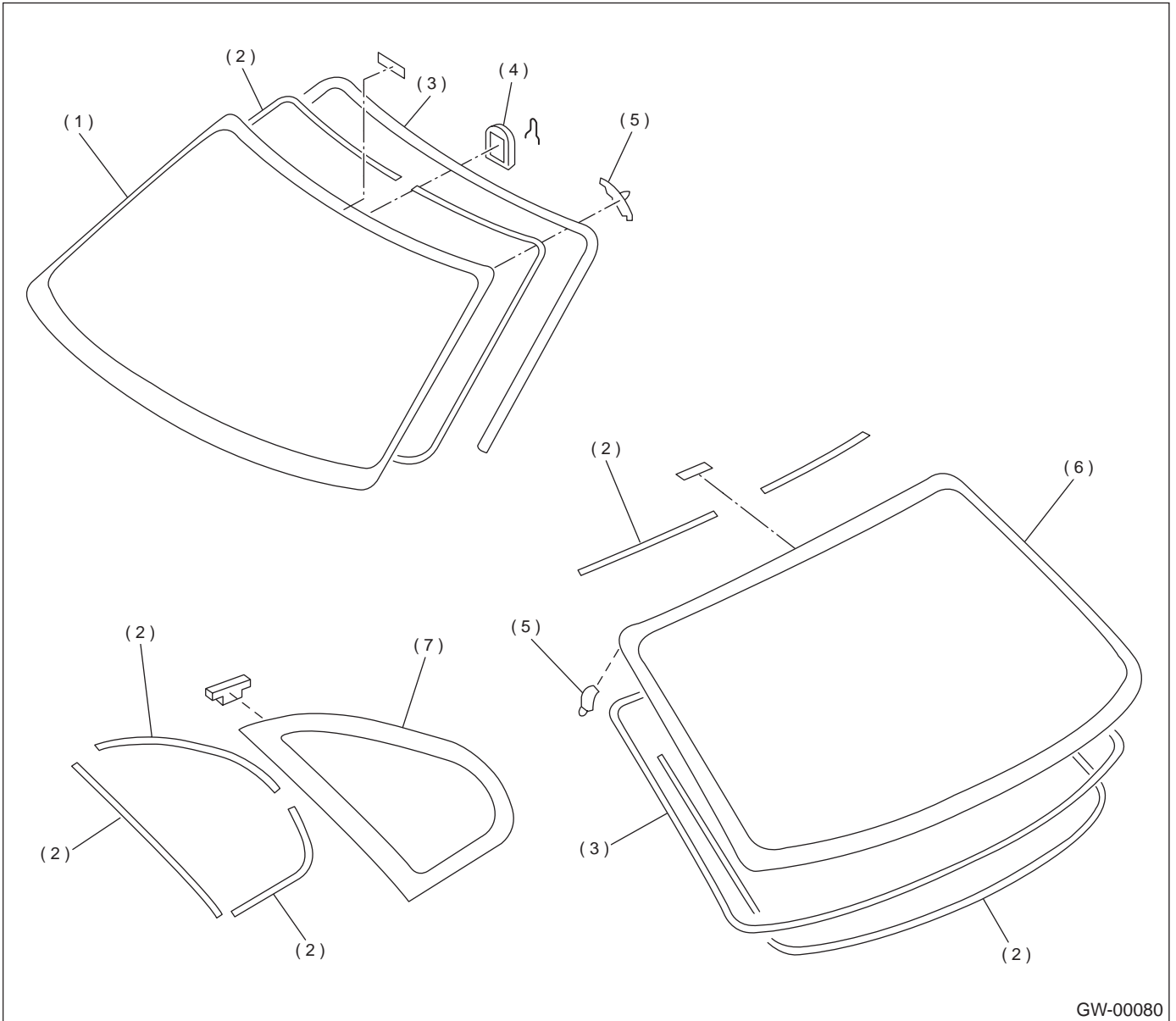
GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

1. General Description

A: COMPONENT

1. FIXED GLASS (SEDAN)



GW-00080

(1) Windshield glass

(2) Dam rubber

(3) Molding

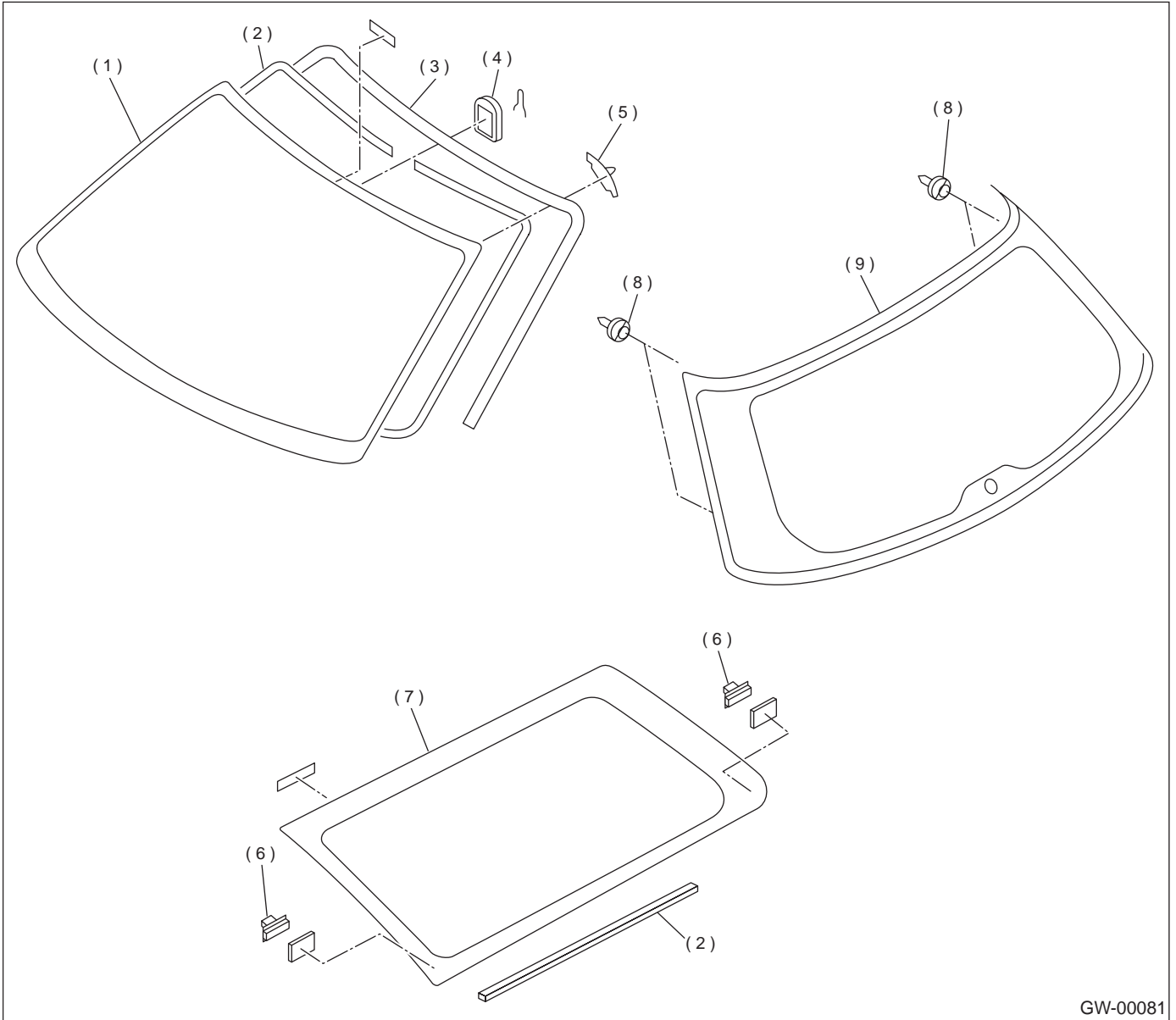
(4) Rearview mirror mount

(5) Locate pin

(6) Rear window glass

(7) 6 light glass

2. FIXED GLASS (WAGON)



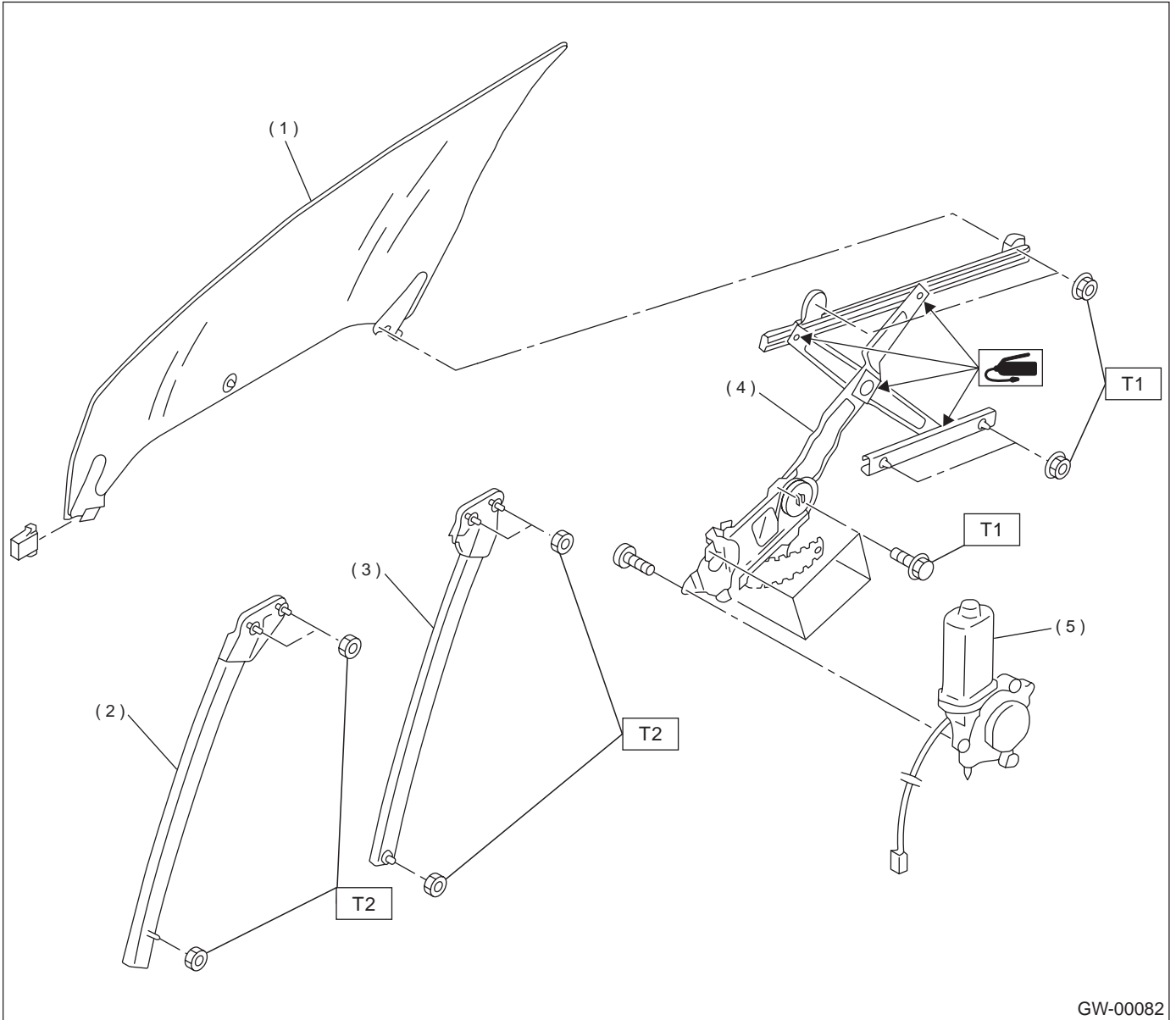
GW-00081

- | | | | | | |
|-----|------------------|-----|-----------------------|-----|--------------------|
| (1) | Windshield glass | (4) | Rearview mirror mount | (7) | Rear quarter glass |
| (2) | Dam rubber | (5) | Locate pin | (8) | Locate pin |
| (3) | Molding | (6) | Fastener | (9) | Rear gate glass |

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

3. FRONT DOOR GLASS



- (1) Glass
- (2) Door sash (Front)
- (3) Door sash (Rear)

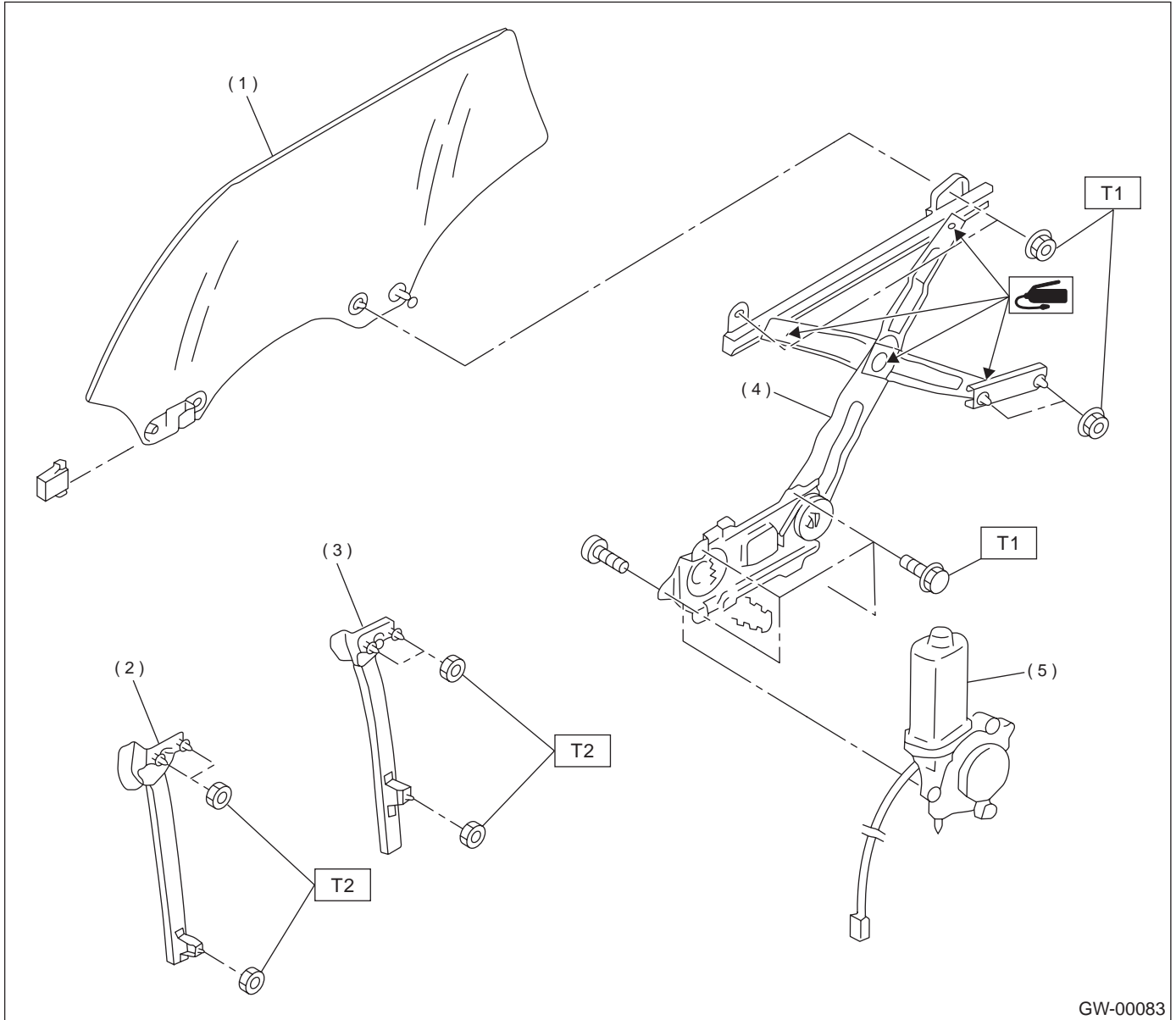
- (4) Regulator ASSY
- (5) Motor ASSY

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.35 (0.75, 5.4)

T2: 14 (1.4, 10.1)

4. REAR DOOR GLASS



- | | | | |
|-----|-------------------|-----|----------------|
| (1) | Glass | (4) | Regulator ASSY |
| (2) | Door sash (Front) | (5) | Motor ASSY |
| (3) | Door sash (Rear) | | |

Tightening torque: N·m (kgf·m, ft·lb)

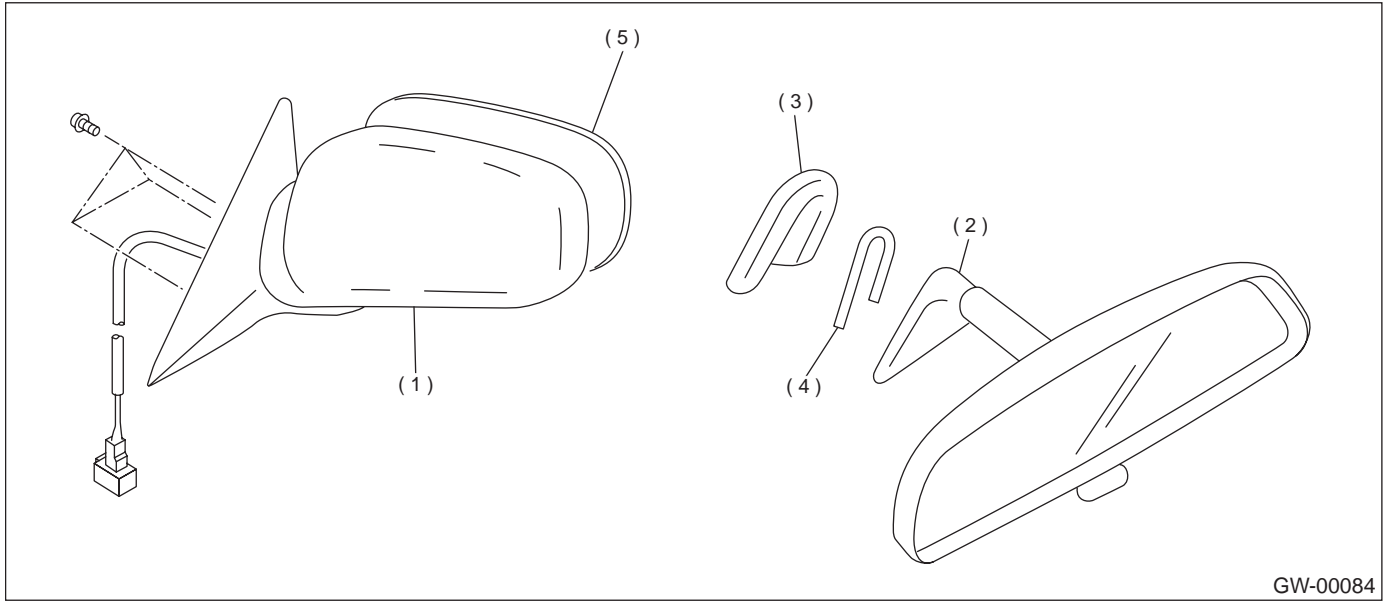
T1: 7.35 (0.75, 5.4)

T2: 14 (1.4, 10.1)

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

5. MIRRORS



GW-00084

- (1) Outer mirror
- (2) Rearview mirror

- (3) Mount
- (4) Spring

- (5) Mirror

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

B: CAUTION

- When electrical connectors are disconnected, always conduct an operational check after connecting them again.
- Avoid impact and damage to the glass.

C: PREPARATION TOOL

TOOL NAME	REMARKS
Circuit Tester	Used for checking voltage and continuity.
Piano Wire	Used for window glass removal.
Windshield Knife	Used for window glass removal.

POWER WINDOW SYSTEM

GLASS/WINDOWS/MIRRORS

2. Power Window System

A: SCHEMATIC

1. POWER WINDOW LHD MODEL

<Ref. to WI-282, LHD MODEL, SCHEMATIC, Power Window System.>

2. POWER WINDOW RHD MODEL

<Ref. to WI-286, RHD MODEL, SCHEMATIC, Power Window System.>

B: INSPECTION

Symptom	Repair order
All power windows does not operate.	(1) Fuse (SBF-6) (F/B No. 18) (2) Power window circuit breaker (3) Power window relay (4) Wire harness
One window does not operate.	(1) Power window main switch (2) Power window sub switch (3) Power window motor (4) Wire harness
"Window Lock" does not operate.	(1) Power window main switch

REAR WINDOW DEFOGGER SYSTEM

GLASS/WINDOWS/MIRRORS

3. Rear Window Defogger System

A: SCHEMATIC

<Ref. to WI-296, SCHEMATIC, Rear Window Defogger System.>

B: INSPECTION

Symptom	Repair order
Rear window defogger does not operate.	(1) Fuse (M/B No. 1) (2) Rear defogger relay (3) Defogger switch (4) Rear defogger condenser (5) Defogger wire (6) Wire harness

WINDSHIELD WIPER DEICER SYSTEM

GLASS/WINDOWS/MIRRORS

4. Windshield Wiper Deicer System

A: SCHEMATIC

<Ref. to WI-328, SCHEMATIC, Wiper Deicer System.>

B: INSPECTION

Symptom	Repair order
Wiper deicer does not operate.	(1) Fuse (F/B No. 18, 19) (2) Wiper deicer relay (3) Wiper deicer switch (4) Wire harness

5. Remote Control Mirror System

A: SCHEMATIC

1. REMOTE CONTROL MIRROR LHD MODEL

<Ref. to WI-298, LHD MODEL, SCHEMATIC, Remote Controlled Rearview Mirror System.>

2. REMOTE CONTROL MIRROR RHD MODEL

<Ref. to WI-299, RHD MODEL, SCHEMATIC, Remote Controlled Rearview Mirror System.>

B: INSPECTION

Symptom	Repair order
All function does not operate.	(1) Fuse (F/B No. 4) (2) Mirror switch (3) Wire harness
One side of the mirror motor does not operate.	(1) Mirror switch (2) Mirror motor (3) Wire harness
Mirror heater does not operate.	(1) Mirror switch (2) Mirror heater (3) Wire harness

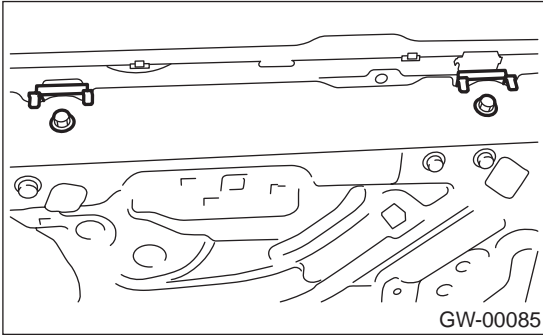
FRONT DOOR GLASS

GLASS/WINDOWS/MIRRORS

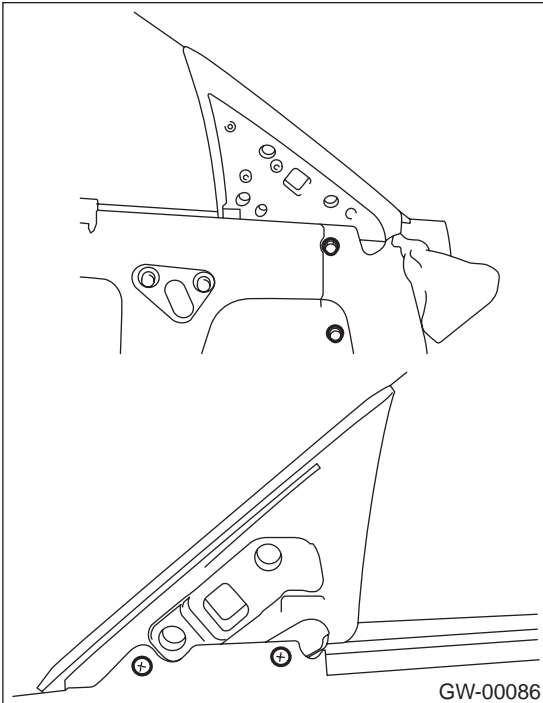
6. Front Door Glass

A: REMOVAL

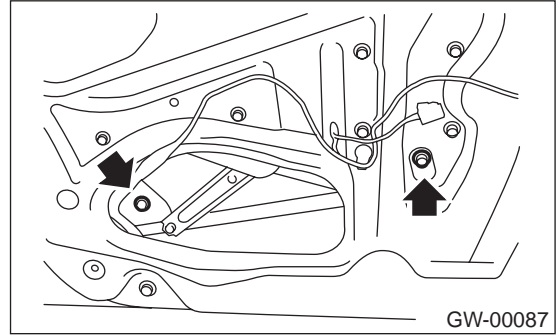
- 1) Remove door trim. <Ref. to EI-30, REMOVAL, Front Door Trim.>
- 2) Remove sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 3) Remove inner remote. <Ref. to SL-19, REMOVAL, Front Inner Remote.>
- 4) Remove outer weatherstrip.
- 5) Remove inner stabilizer.



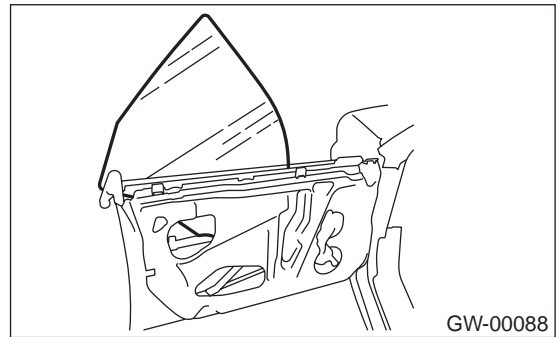
- 6) Remove outer mirror. <Ref. to GW-33, REMOVAL, Outer Mirror Assembly.>
- 7) Remove gusset.



- 8) Operate the power window switch to move glass to the position shown in the figure, and then remove the two nuts from service holes.



- 9) Take out door glass upward.



NOTE:

Do not turn regulator in the closing direction after removal of the glass. Otherwise gear may be disengaged.

B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

Make sure that glass stay is placed securely in sash.

- 2) Adjust front door glass. <Ref. to GW-13, ADJUSTMENT, Front Door Glass.>

C: ADJUSTMENT

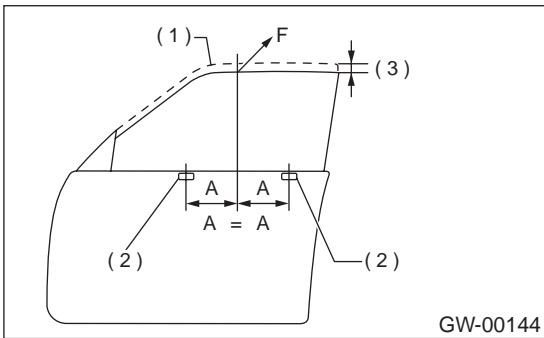
NOTE:

Before adjustment, ensure that all adjusting bolts of stabilizer, upper stopper, and sash are loose and door glass is raised so that it is in contact with weatherstrip.

1) Temporarily tighten one adjusting bolt on one side of rear sash at the midpoint of slotted hole in the inner panel.

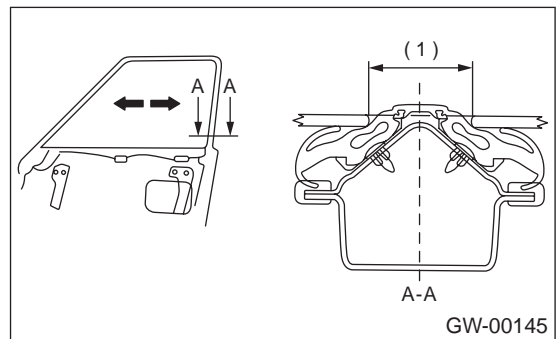
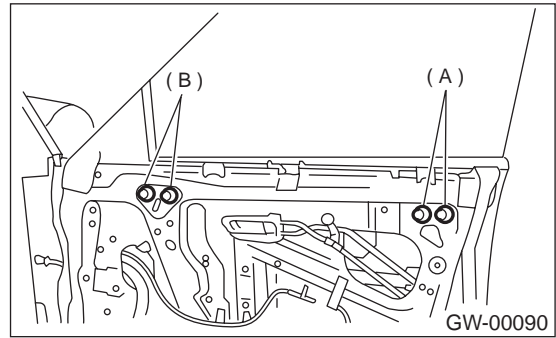
2) Temporarily tighten regulator B-channel in a position slightly lower than midpoint of slotted hole.

3) Lower door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure of 45 ± 5 N (4.59 ± 0.51 kgf, 10.1 ± 1.1 lb) (F) to upper edge of glass above midpoint of two outer stabilizers, press inner stabilizer at 10 ± 5 N (1.02 ± 0.51 kgf, 2.2 ± 1.1 lb) until it just touches the glass, then secure it.



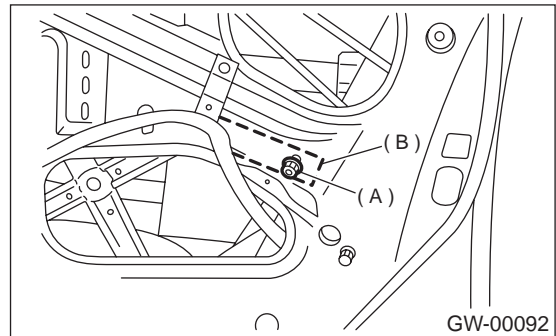
- (1) Full close
- (2) Stabilizer
- (3) 10 – 15 mm (0.39 – 0.59 in)

4) For adjustment of clearance between front and rear glasses, loosen nuts (A) and (B), and move glass sash back and forth until clearance becomes the value shown.



- (1) 38 mm (1.50 in)

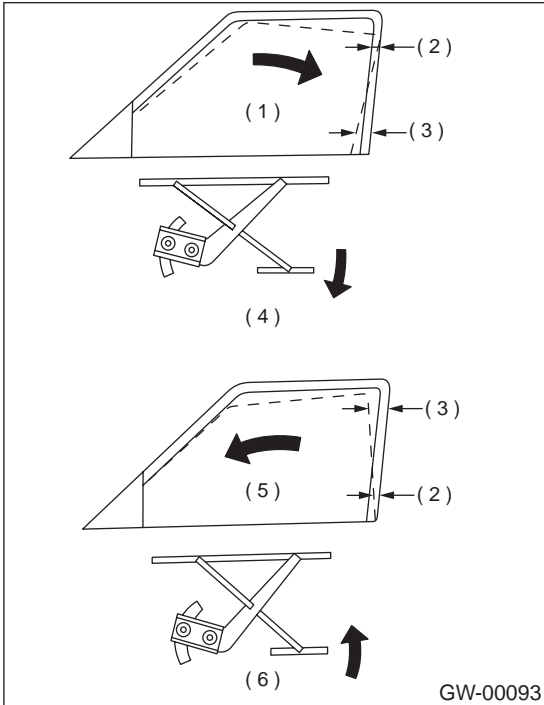
5) For adjustment of upper and lower ends of center pillar, loosen adjusting nut (A) of B-channel (B).



FRONT DOOR GLASS

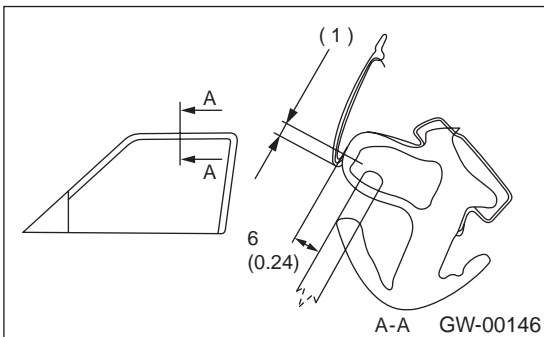
GLASS/WINDOWS/MIRRORS

6) Adjust so that upper and lower ends of center pillar are the same size.



- (1) Glass tilts too far rearward
- (2) Narrow
- (3) Wide
- (4) Lower B channel
- (5) Glass tilts too far forward
- (6) Raise B channel

7) For glass stroke adjustment, close door, raise glass until positional relationship between glass and weatherstrip becomes as shown. And secure the glass so that upper stopper lightly touches the glass holder.



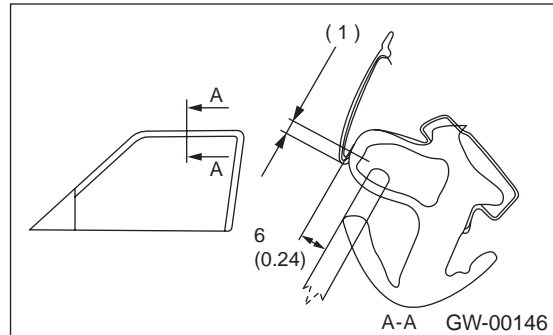
- (1) 2.5 ± 0.5 mm (0.098 \pm 0.020 in)
- (2) 6 mm (0.24 in)

8) After stabilizer adjustment, carry out glass crimp adjustment. First, visually ensure positional relationship between retainer & molding and glass of the roof side, and then begin with rear sash adjustment. Adjust two adjusting bolts alternately step by step to obtain dimensions shown below (cross-section A).

NOTE:

If two nuts are loosened at the same time, sash moves back and forth. Therefore, when one nut is adjusted, secure the other.

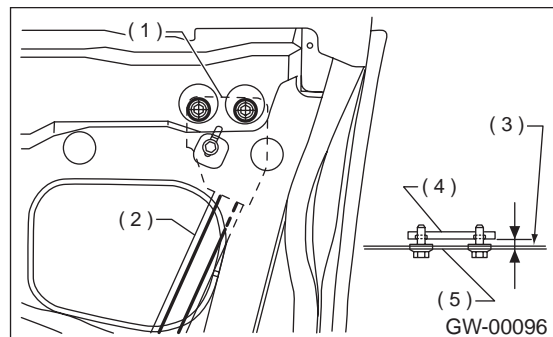
9) Make the same adjustment of two adjusting bolts of rear sash.



- (1) 2.5 ± 0.5 mm (0.098 \pm 0.020 in)
- (2) 6 mm (0.24 in)

NOTE:

Do not tilt sash bracket to inner panel during adjustment. Otherwise smooth regulator operation cannot be achieved.



- (1) Sash bracket
- (2) Rear sash
- (3) Adjust a line parallel
- (4) Sash
- (5) Inner panel

10) Make adjustment of front sash in the same manner as that of rear sash.

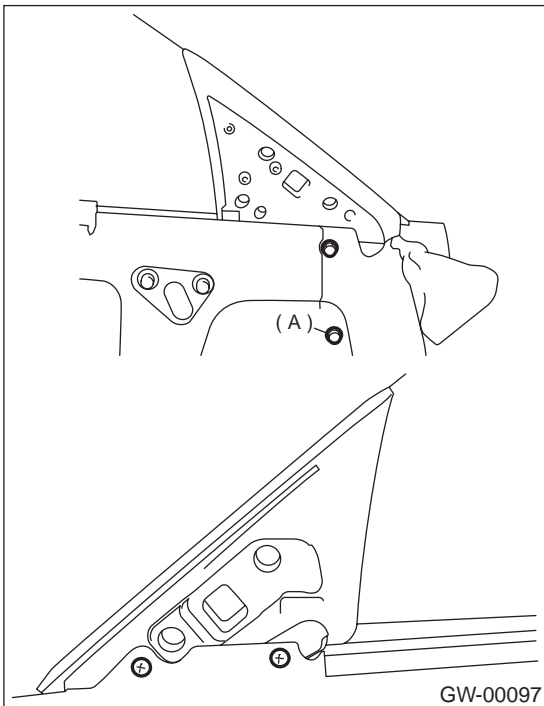
CAUTION:

Although front and rear sashes must, as a rule, be adjusted in the same manner, in some door installation, the adjustment in a different manner may be required. However, adjustment of one sash to the maximum amount and the other to the minimum amount is not permitted. Such adjustment may result in application of excessive load to regulator.

11) After adjustments, tighten nuts.

12) After adjustment of glass, if there is a gap between outer lip of gusset and glass surface, adjust the gap with adjusting bolt (A) in lower fitting part of gusset to prevent generation of wind noise.

13) During adjustments, loosen other three clamping bolts.



14) After adjustment, tighten bolts and nuts.

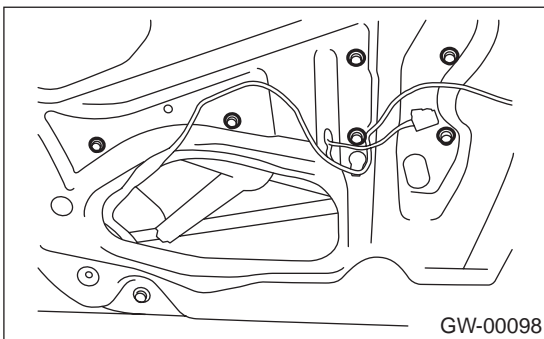
FRONT REGULATOR AND MOTOR ASSEMBLY

GLASS/WINDOWS/MIRRORS

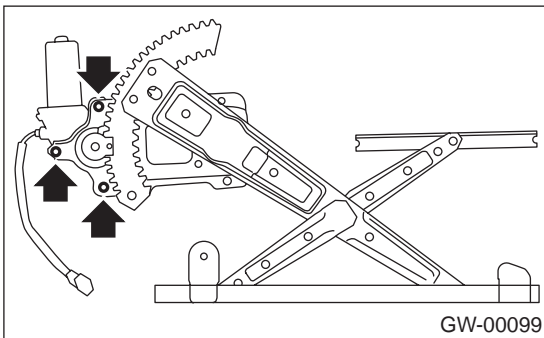
7. Front Regulator and Motor Assembly

A: REMOVAL

- 1) Remove door trim. <Ref. to EI-30, REMOVAL, Front Door Trim.>
- 2) Remove sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 3) Remove inner remote. <Ref. to SL-19, REMOVAL, Front Inner Remote.>
- 4) Remove door glass. <Ref. to GW-12, REMOVAL, Front Door Glass.>
- 5) Disconnect motor connector.
- 6) Loosen four bolts and two nuts to pull out regulator assembly.



- 7) Loosen screws to remove motor assembly.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust front door glass. <Ref. to GW-13, ADJUSTMENT, Front Door Glass.>

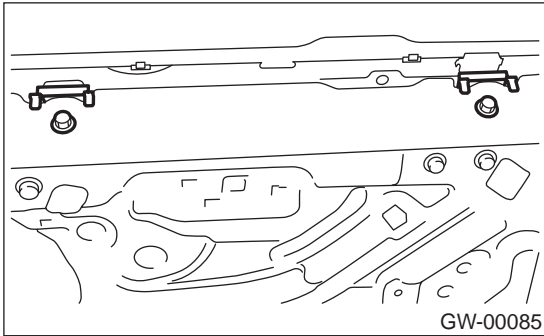
C: INSPECTION

- 1) Make sure that power window motor rotates properly when battery voltage is applied to terminals of motor connector.
- 2) Change polarity of battery connections to terminals to ensure that motor rotates in reverse direction.

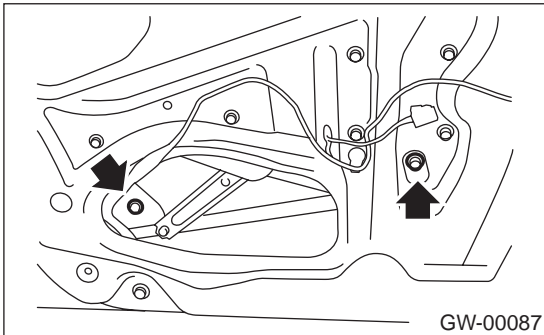
8. Rear Door Glass

A: REMOVAL

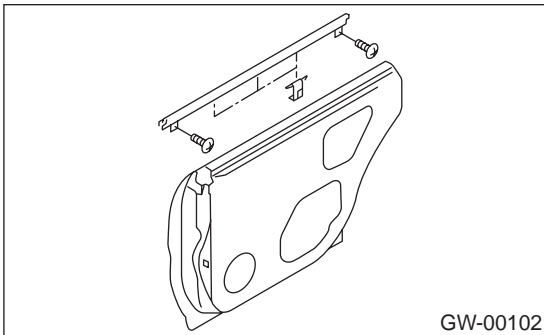
- 1) Remove door trim. <Ref. to EI-31, REMOVAL, Rear Door Trim.>
- 2) Remove sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 3) Remove stabilizer.



- 4) Operate power window switch to move glass as shown in the figure, and remove two nuts.



- 5) Loosen two screws to remove weatherstrip.



- 6) Pull out glass.

B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

Make sure that glass stay is placed securely in sash.

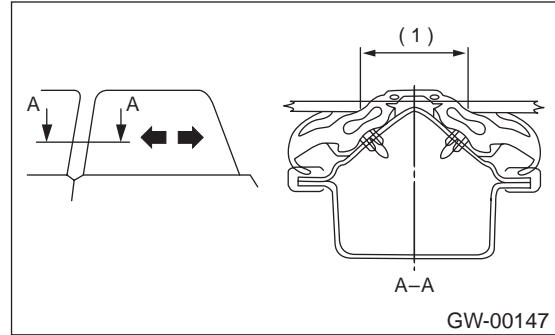
- 2) Adjust rear door glass. <Ref. to GW-17, ADJUSTMENT, Rear Door Glass.>

C: ADJUSTMENT

NOTE:

Rear door glass, as a rule, should be adjusted in the same manner as front glass, although they are different in dimension. Special notes for rear glass are given below.

- 1) Adjust glass position using the following dimensions as a guide line.

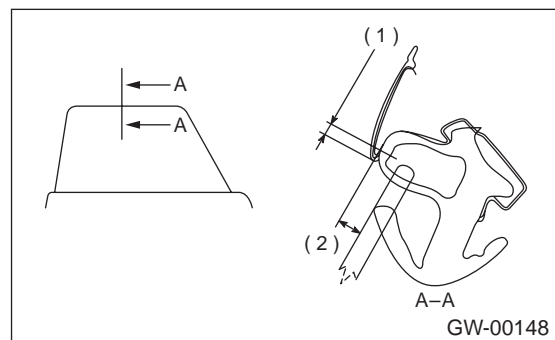


- (1) 38 mm (1.50 in)

NOTE:

- If dimensions are smaller than the given dimensions, glass may get caught in weatherstrip during lifting/lowering operation. In the worst case, it may cause glass not to be opened fully.
- After adjustment, move glass up and down to check whether it is caught.

- 2) Adjust crimp of glass using the following dimensions as a guide line.



- (1) 2.5 ± 0.5 mm (0.098 \pm 0.020 in)

- (2) 6 mm (0.24 in)

CAUTION:

- If crimp of rear glass is higher than necessary, glass may get caught in weatherstrip of center pillar corner, resulting in early wear of weatherstrip. Be careful when adjusting.
- After adjustment, move glass up and down to check whether it is caught.

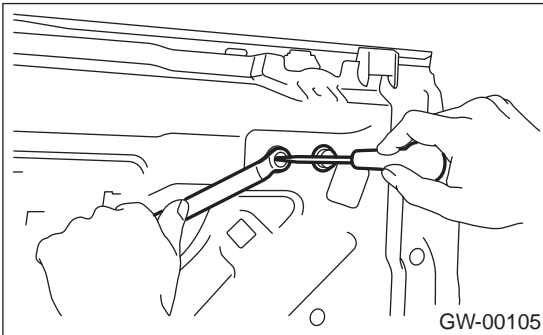
REAR REGULATOR AND MOTOR ASSEMBLY

GLASS/WINDOWS/MIRRORS

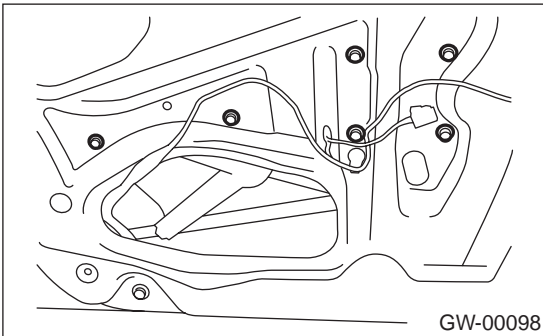
9. Rear Regulator and Motor Assembly

A: REMOVAL

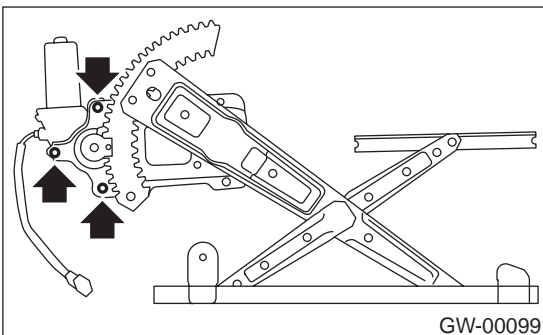
- 1) Remove door trim. <Ref. to EI-30, REMOVAL, Front Door Trim.>
- 2) Remove sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 3) Remove door glass. <Ref. to GW-17, REMOVAL, Rear Door Glass.>
- 4) Secure bolts using screwdriver to remove front sash adjusting nut.



- 5) Remove front sash.
- 6) Disconnect motor connector.
- 7) Loosen four bolts and two nuts to remove regulator assembly.



- 8) Loosen screws to remove motor assembly.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust rear door glass. <Ref. to GW-17, ADJUSTMENT, Rear Door Glass.>

C: INSPECTION

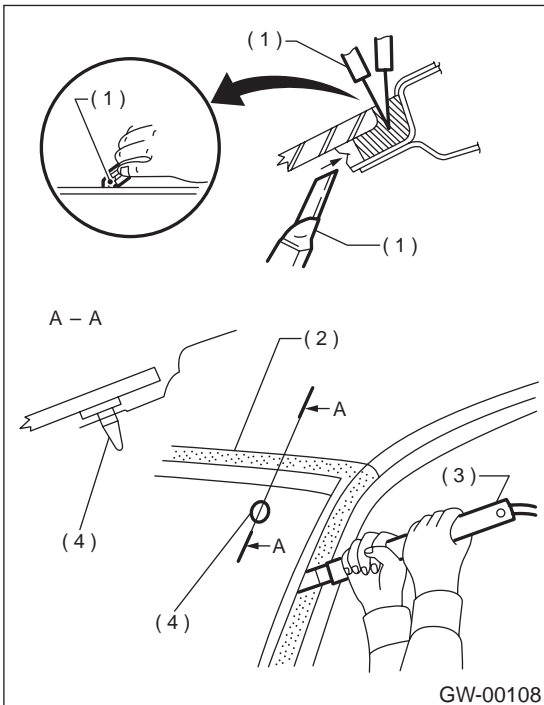
- 1) Make sure that power window motor rotates properly when battery voltage is applied to terminals of motor connector.
- 2) Change polarity of battery connections to terminals to ensure that motor rotates in reverse direction.

10. Windshield Glass

A: REMOVAL

1. USING WINDSHIELD KNIFE

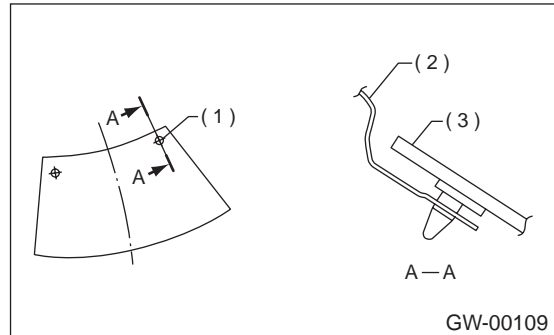
- 1) Remove cowl panel. <Ref. to EI-27, REMOVAL, Cowl Panel.>
- 2) Remove front side molding and upper front molding.
- 3) Tape body side of the circumference of windshield glass for protection.
- 4) Apply sufficient amount of soapy water to adhesive layer.
- 5) Insert windshield knife into the adhesive layer.
- 6) While holding the knife edge and windshield glass edge at a right angle, move windshield knife in parallel to windshield glass edge along face and edge of windshield glass to cut the adhesive layer.



- (1) Putty knife
- (2) Protective tape
- (3) Windshield knife
- (4) Matching pin

NOTE:

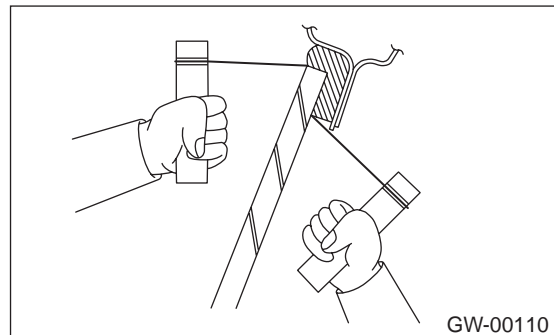
Because matching pins are bonded to the corners of glass, use piano wire to cut the pin.



- (1) Matching pin
- (2) Body panel
- (3) Glass

2. USING PIANO WIRE

- 1) Remove cowl panel. <Ref. to EI-27, REMOVAL, Cowl Panel.>
- 2) Remove roof molding and upper front molding.
- 3) Tape the body side of the circumference of windshield glass for protection.
- 4) Make a hole in adhesive layer using drill or knife.
- 5) Pass piano wire through the hole, and attach securely both the wire ends to pieces of wood.



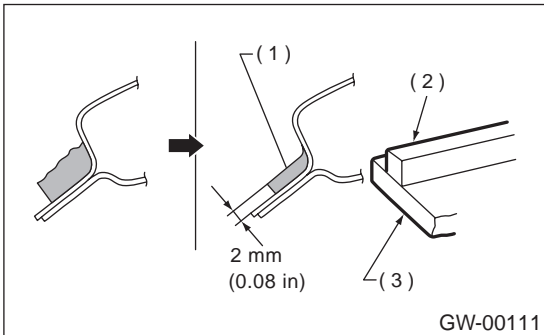
- 6) Pull the wire ends alternately to cut off the adhesive layer.

WINDSHIELD GLASS

GLASS/WINDOWS/MIRRORS

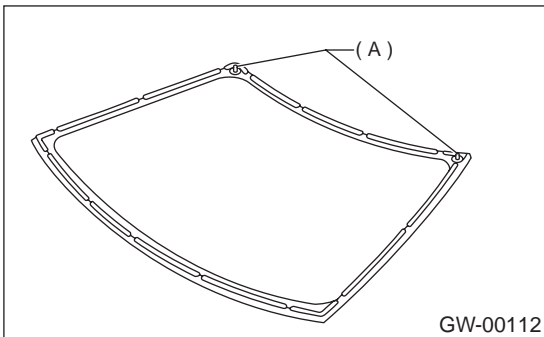
B: INSTALLATION

- 1) Clean external circumference of windshield glass with alcohol or white gasoline.
- 2) Remove adhesive layer on the body using cutter knife to obtain smooth face 2 mm (0.08 in) thick.



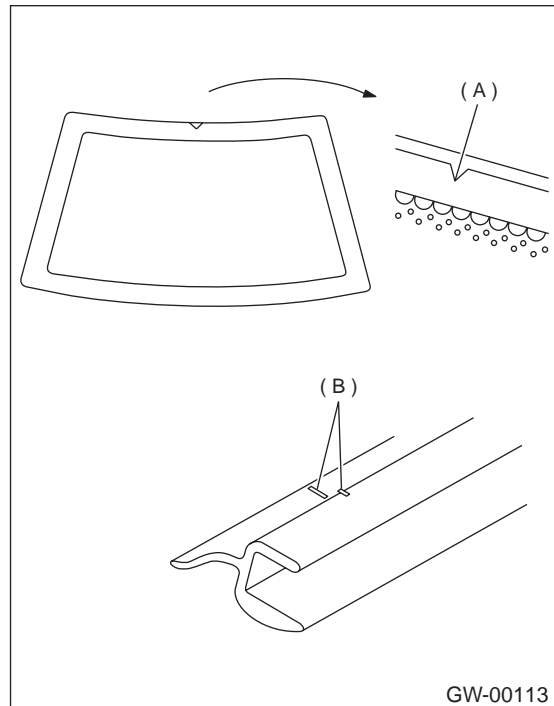
- (1) Adhesive
- (2) Dam rubber
- (3) Glass

- 3) Clean body with alcohol or white gasoline to remove thoroughly chips, dusts, and dirt from body face.
- 4) Place glass on body.
- 5) Adjust glass position to make uniform clearance between body and glass in four corners.
- 6) Place locating pins (A) and body on glass.



- 7) Remove glass from body.

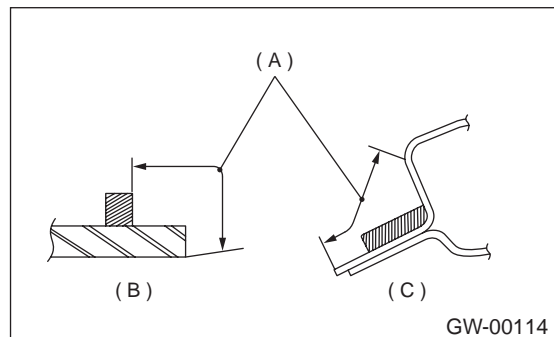
- 8) Fit molding mark (B) to notch (A) of ceramic print.



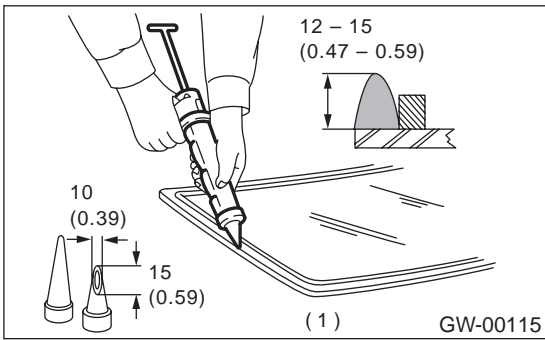
- 9) Apply primer to adhesive layer (A) of glass (B) using sponge.
- 10) Apply primer to adhesive layer (A) of body (C).

NOTE:

- Primer once attached to the painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such areas.
- Let primer dry for about ten minutes before installing the glass.



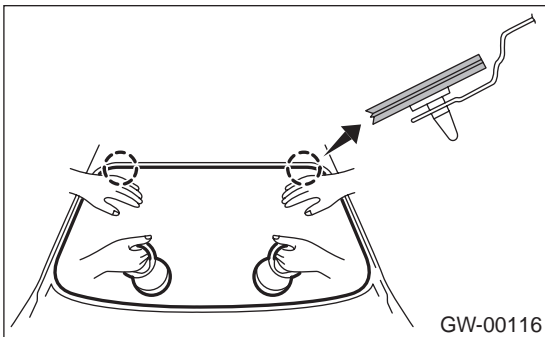
11) Cut off cartridge nozzle tip and set it in sealant gun as shown.



(1) Unit: mm (in)

12) Apply adhesive to glass end surface as shown.

13) Fit matching pins using suction rubber cup to install windshield glass.



14) Lightly press windshield glass for tight fit.

15) Make adhesive surface flush using spatula.

16) After completion of all work, allow vehicle to stand for about 24 hours.

NOTE:

For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

17) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:

When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

18) Install cowl panel. <Ref. to EI-27, INSTALLATION, Cowl Panel.>

REAR GATE GLASS

GLASS/WINDOWS/MIRRORS

11. Rear Gate Glass

A: REMOVAL

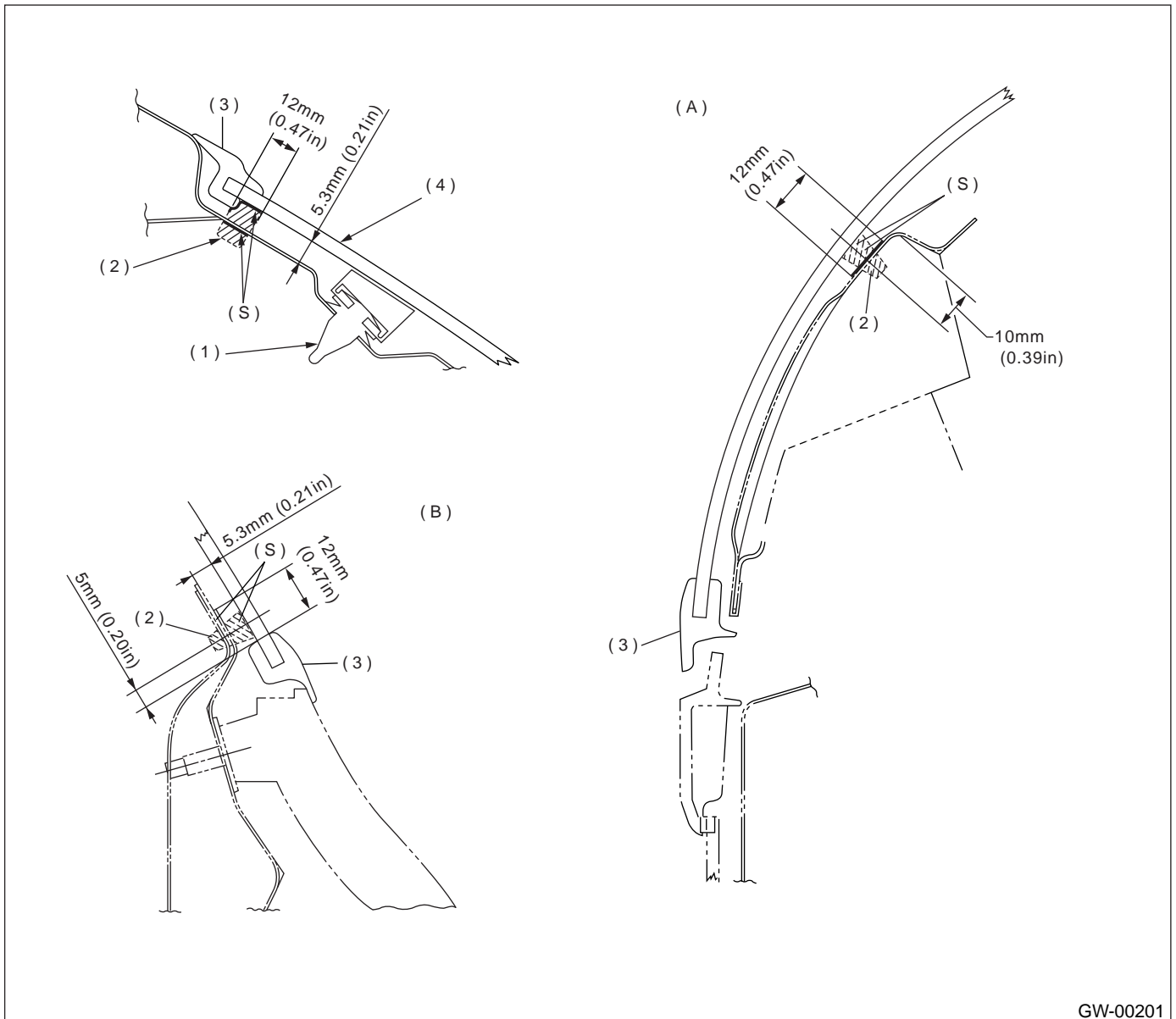
- 1) Remove rear wiper motor. <Ref. to WW-16, REMOVAL, Rear Wiper Motor.>
- 2) Remove connector from rear defogger terminal.
- 3) Remove glass in the same procedure as for windshield glass. <Ref. to GW-19, REMOVAL, Windshield Glass.>

NOTE:

Rear gate glass is a single unit of both glass and molding. Replacing only molding or glass is not allowed.

B: INSTALLATION

- 1) Apply adhesive evenly to the glass attachment area.
- 2) Insert the glass clip pin into the rear gate hole, and after pushing on the area around the clip pin to secure it, push lightly all around the area to seal it.
- 3) About one hour after installation, conduct a leak test.



GW-00201

- (1) Clip
- (2) Adhesive
- (3) Molding

- (4) Glass
- (5) Primer

- (A) Primer application location (left and right)
- (B) Primer application location (lower)

4) After completion of all work, allow vehicle to stand for about 24 hours.

NOTE:

For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

- When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

5) Connect rear defogger terminals.

6) Install rear wiper. <Ref. to WW-16, INSTALLATION, Rear Wiper Motor.>

REAR QUARTER GLASS

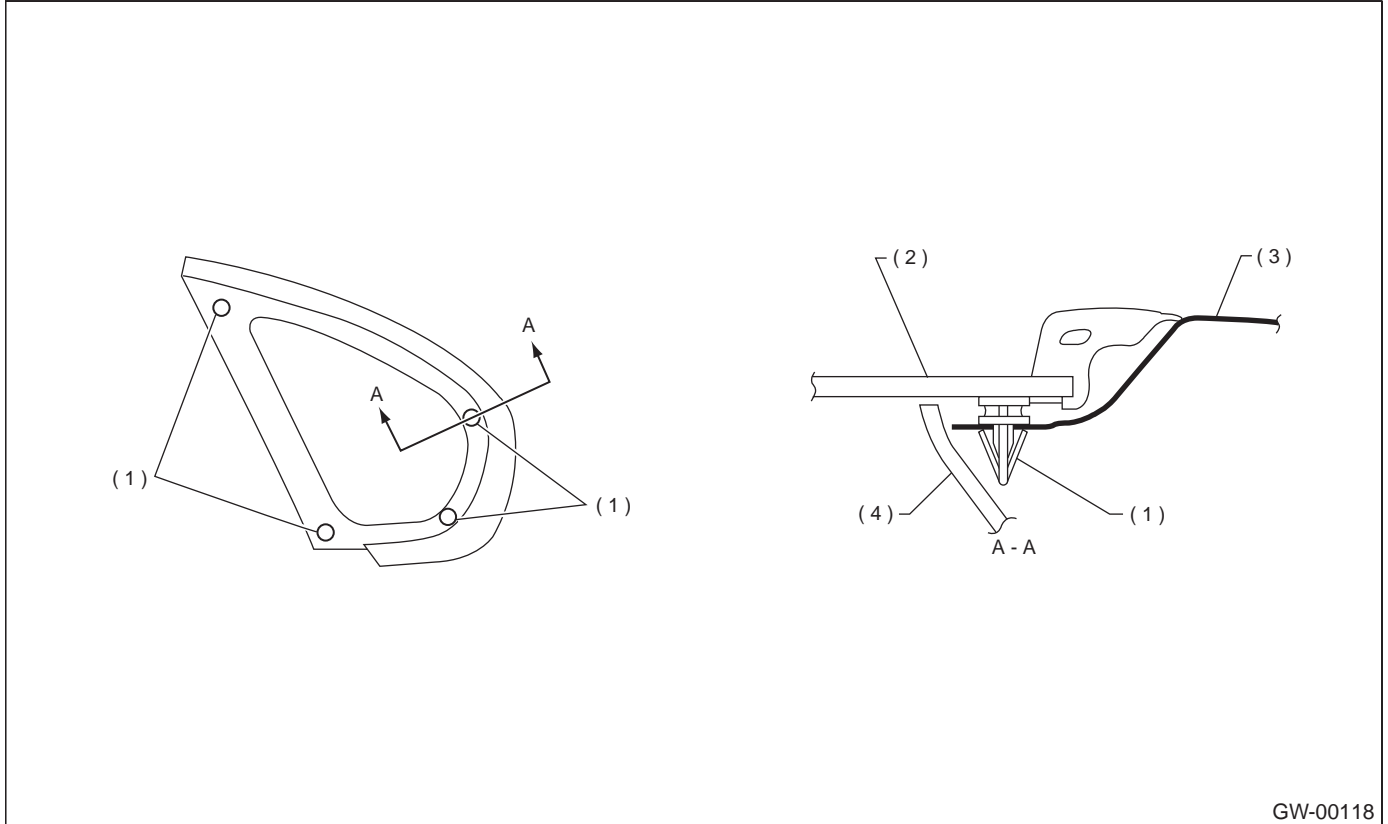
GLASS/WINDOWS/MIRRORS

12.Rear Quarter Glass

A: REMOVAL

1. SEDAN

Remove glass in the same procedure as for windshield glass. <Ref. to GW-19, REMOVAL, Windshield Glass.>



- (1) Locating pin
- (2) Rear quarter glass

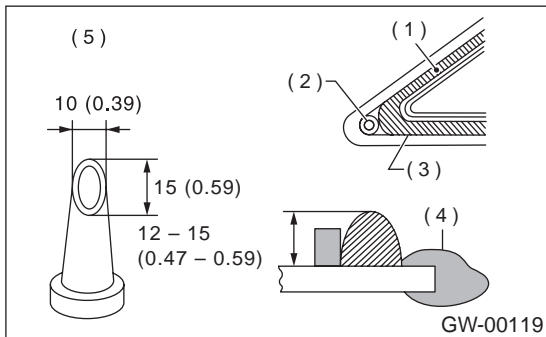
- (3) Body panel
- (4) Trim panel

2. WAGON

Remove glass in the same procedure as for windshield glass. <Ref. to GW-19, REMOVAL, Windshield Glass.>

B: INSTALLATION

1) Cut off nozzle tip as shown in the figure.



- (1) Dam rubber
- (2) Locating pin
- (3) Adhesive
- (4) Molding
- (5) Unit: mm (in)

2) Install glass in the same procedure as for windshield glass. <Ref. to GW-18, INSTALLATION, Rear Regulator and Motor Assembly.>

3) After completion of all work, allow vehicle to stand for about 24 hours.

NOTE:

For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

4) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:

When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

REAR WINDOW GLASS

GLASS/WINDOWS/MIRRORS

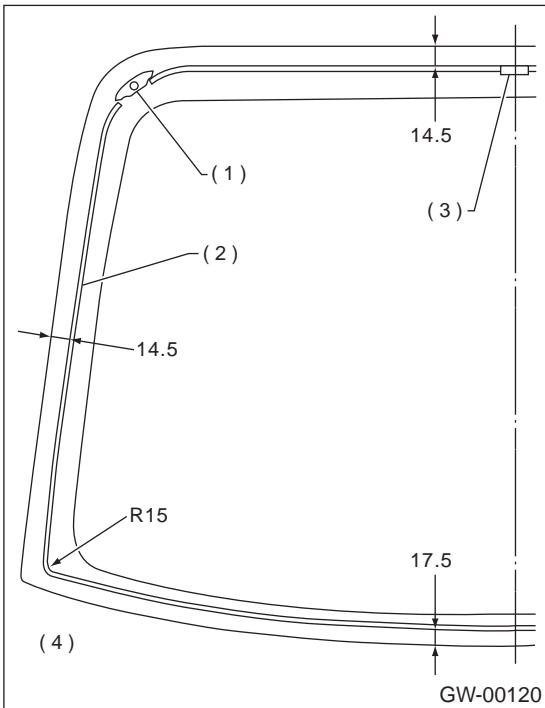
13. Rear Window Glass

A: REMOVAL

- 1) Disconnect connectors from rear defogger terminals.
- 2) Remove glass in the same procedure as for windshield glass. <Ref. to GW-19, REMOVAL, Windshield Glass.>

B: INSTALLATION

- 1) Bond dam rubber and matching pin.



- (1) Locating pin
- (2) Dam rubber
- (3) Fastener
- (4) Unit: mm (in)

- 2) Install glass in the same procedure as for windshield glass. <Ref. to GW-18, INSTALLATION, Rear Regulator and Motor Assembly.>
- 3) Connect rear defogger terminals.
- 4) After completion of all work, allow vehicle to stand for about 24 hours.

NOTE:

For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

- 5) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:

When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

14. Roof Window Glass

A: REMOVAL

<Ref. to SR-6, REMOVAL, Sunroof Lid.>

B: INSTALLATION

<Ref. to SR-6, INSTALLATION, Sunroof Lid.>

C: ADJUSTMENT

<Ref. to SR-6, ADJUSTMENT, Sunroof Lid.>

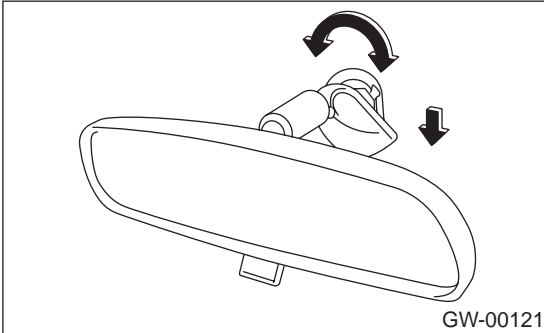
INNER REARVIEW MIRROR

GLASS/WINDOWS/MIRRORS

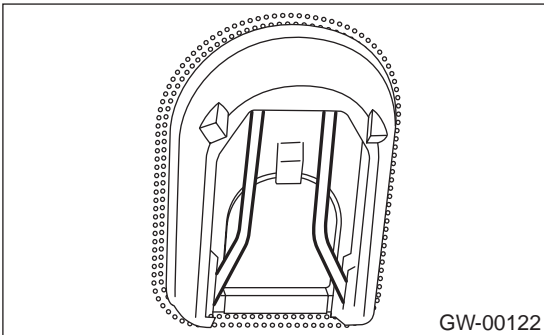
15.Inner Rearview Mirror

A: REMOVAL

1) Turn mirror base 90 degrees clockwise or counterclockwise to remove it.



2) Remove spring from mirror base.



CAUTION:

Be careful not to damage the mirror surface.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Do not let mirror be damaged.

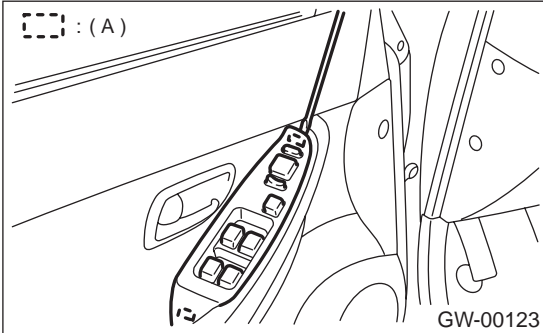
Do not let spring deteriorate.

16. Power Window Control Switch

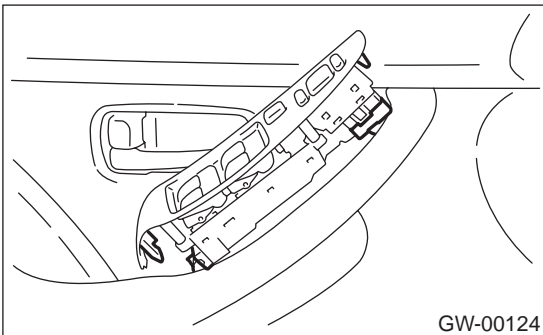
A: REMOVAL

1. MAIN SWITCH

1) Remove two hooks (A) of switch panel to remove power window main switch.

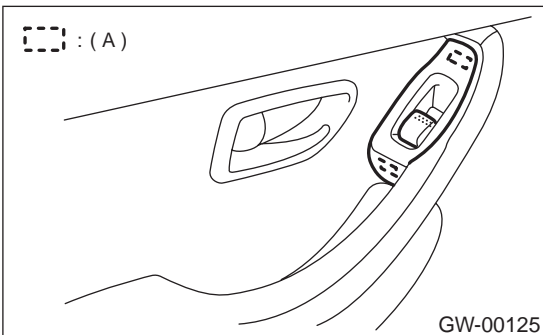


2) Disconnect connectors from power window main switch and mirror switch.



2. SUB-SWITCH

Remove two hooks (A) of switch panel to remove power window sub-switch and disconnect connector.



B: INSTALLATION

1. MAIN SWITCH

Install in the reverse order of removal.

2. SUB-SWITCH

Install in the reverse order of removal.

POWER WINDOW CONTROL SWITCH

GLASS/WINDOWS/MIRRORS

C: INSPECTION

1. MAIN SWITCH

Measure switch resistance.

Driver's switch:

Switch position	Terminal No.	Standard
AUTO UP	3 and 9, 7 and 1	Continuity
UP	3 and 9, 7 and 1	Less than 1 Ω
OFF	3 and 7 and 1	Less than 1 Ω
DOWN	7 and 9, 3 and 1	Less than 1 Ω
AUTO DOWN	7 and 9, 3 and 1	Less than 1 Ω

Front passenger's switch:

Switch position	Terminal No.	Standard
UP	9 and 5, 1 and 4	Less than 1 Ω
OFF	1 and 5 and 4	Less than 1 Ω
DOWN	9 and 4, 1 and 5	Less than 1 Ω

Rear left switch:

Switch position	Terminal No.	Standard
UP	9 and 13, 1 and 8	Less than 1 Ω
OFF	1 and 13 and 8	Less than 1 Ω
DOWN	9 and 8, 1 and 13	Less than 1 Ω

Rear right switch:

Switch position	Terminal No.	Standard
UP	9 and 16, 1 and 14	Less than 1 Ω
OFF	1 and 16 and 14	Less than 1 Ω
DOWN	9 and 14, 1 and 16	Less than 1 Ω

If NG, replace the main switch.

2. SUB-SWITCH

Measure switch resistance.

Front passenger's door switch and rear door switch:

Switch position	Terminal No.	Standard
UP	5 and 1, 6 and 2	Less than 1 Ω
OFF	4 and 1, 6 and 2	Less than 1 Ω
DOWN	5 and 2, 4 and 1	Less than 1 Ω

If NG, replace the sub-switch.

REAR WINDOW DEFOGGER SWITCH

GLASS/WINDOWS/MIRRORS

17. Rear Window Defogger Switch

A: REMOVAL

<Ref. to AC-34, REMOVAL, Control Unit.>

B: INSTALLATION

<Ref. to AC-34, INSTALLATION, Control Unit.>

C: INSPECTION

Check continuity between connectors at the back of heater control unit.

1. AUTO A/C

LHD:

Switch position	Terminal No.	Standard
OFF	—	More than 1 M Ω
ON	(i48) 13 and (i49) 12	Less than 1 Ω

RHD:

Switch position	Terminal No.	Standard
OFF	—	More than 1 M Ω
ON	(i49) 13 and (i48) 9	Less than 1 Ω

2. MANUAL A/C

LHD:

Switch position	Terminal No.	Standard
OFF	—	More than 1 M Ω
OFF	(i17) 14 and (i17) 10	Less than 1 Ω

RHD:

Switch position	Terminal No.	Standard
OFF	—	More than 1 M Ω
ON	(i17) 11 and (i17) 13	Less than 1 Ω

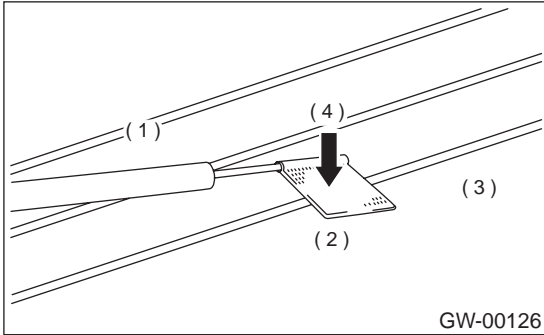
REAR WINDOW DEFOGGER

GLASS/WINDOWS/MIRRORS

18.Rear Window Defogger

A: INSPECTION

- 1) Turn ignition switch to ON.
- 2) Turn defogger switch to ON.
- 3) Wrap tips of tester pins with aluminum foil to avoid damage to heat wire.

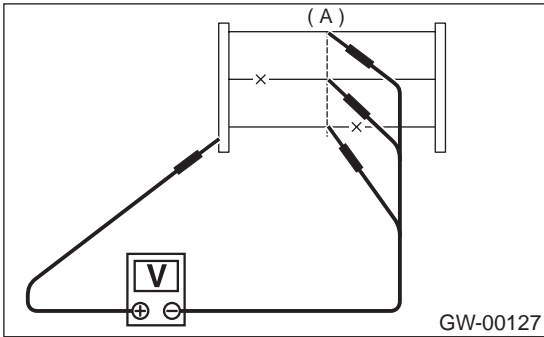


- (1) Tester probe
- (2) Tin foil
- (3) Heat wire
- (4) PRESS

- 4) Measure voltage at wire center (A) with DC voltmeter.

Standard voltage:

Approx. 6 volts



Voltage	Criteria
Approx. 6 V	OK
Approx. 12 V or 0 V	Broken

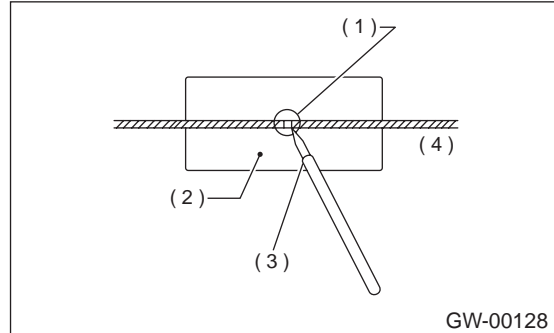
NOTE:

- If the measured value is 12 volts, heat wire is open between wire center and positive (+) end.
- If zero volt, heat wire is open between wire center and ground.

- 5) Apply positive lead of voltmeter to positive terminal of voltmeter, and then move negative lead along the wire up to the negative terminal end. If voltage changes from zero to several volts during movement of lead, heat wire is open at the voltage change point.

B: REPAIR

- 1) Clean broken portion with alcohol or white gasoline.
- 2) Mask both side of wire with thin film.
- 3) Apply conductive silver composition (DUPONT No. 4817) to broken portion.



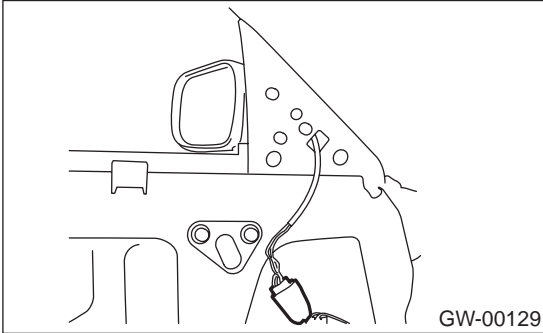
- (1) Broken portion
- (2) Masking thin film
- (3) Conductive silver composition
- (4) Broken wire

- 4) After repair, check wire.

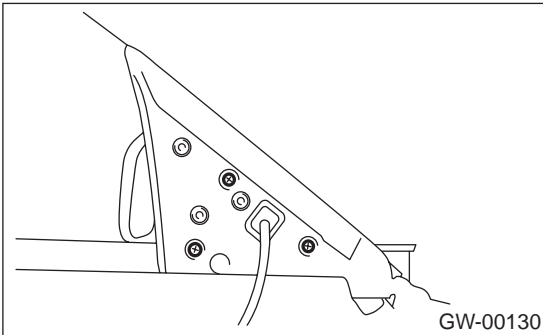
19. Outer Mirror Assembly

A: REMOVAL

- 1) Remove door trim. <Ref. to EI-30, REMOVAL, Front Door Trim.>
- 2) Remove sealing cover to disconnect mirror connector.



- 3) Loosen screws to remove mirror assembly.



B: INSTALLATION

Install in the reverse order of removal.

OUTER MIRROR ASSEMBLY

GLASS/WINDOWS/MIRRORS

C: INSPECTION

Check to ensure that outer mirror moves properly when battery voltage is applied to terminals.

Mirror heater not-equipped model:

Switch position	Terminal No.
OFF	—
UP	1 (+) and 3 (-)
DOWN	3 (+) and 1 (-)
LEFT	2 (+) and 3 (-)
RIGHT	3 (+) and 2 (-)

If NG, replace the mirror.

Mirror heater equipped model:

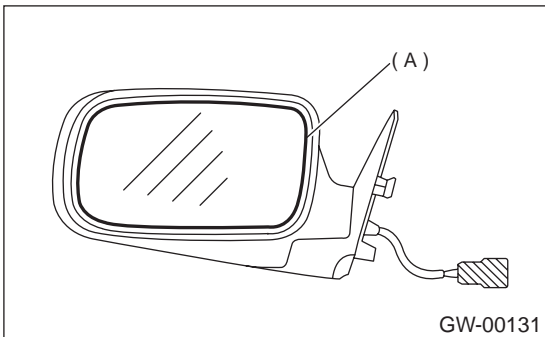
Switch position	Terminal No.
OFF	—
UP	2 (+) and 4 (-)
DOWN	4 (+) and 2 (-)
LEFT	3 (+) and 4 (-)
RIGHT	4 (+) and 3 (-)

If NG, replace the mirror.

20. Outer Mirror

A: REPLACEMENT

- 1) Remove the door mirror assembly. <Ref. to GW-33, REMOVAL, Outer Mirror Assembly.>
- 2) Warm the area around the mirror holder (A) with a hair drier until the edges of the mirror holder become soft (about 2 or 3 minutes with a 1,000 W drier.)
- 3) Use a flat-bladed screwdriver without sharp edges to lift the mirror out of the mirror holder (A). (Also remove the connector from the back of mirrors with heaters.)



- 4) Warm the area around the mirror holder (A) with a hair drier until the edges of the mirror holder (A) become soft (about 2 or 3 minutes with a 1,000 W drier.)
- 5) Remove the backing of the new two-sided tape, and push the mirror in to install it.

NOTE:

Unless the mirror holder is warmed sufficiently, the mirror holder edges may be damaged or the mirror cracked.

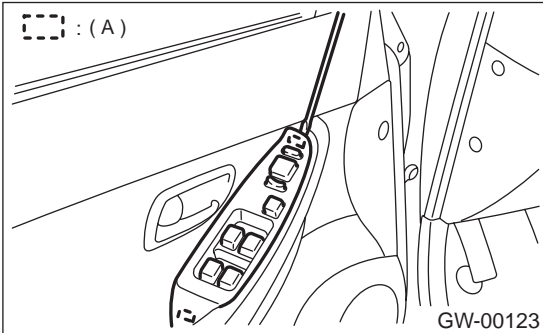
REMOTE CONTROL MIRROR SWITCH

GLASS/WINDOWS/MIRRORS

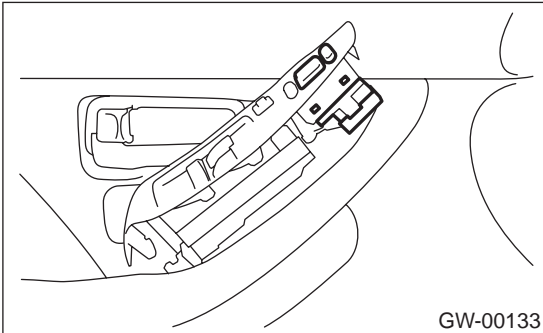
21. Remote Control Mirror Switch

A: REMOVAL

1) Remove power window main switch panel.



2) Remove four hook to remove remote control mirror switch.



B: INSTALLATION

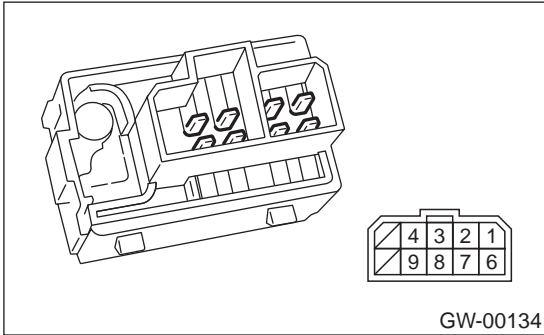
Install in the reverse order of removal.

REMOTE CONTROL MIRROR SWITCH

GLASS/WINDOWS/MIRRORS

C: INSPECTION

Move rearview mirror switch to each position and check continuity between terminals.



Change over switch left position:

Switch position	Terminal No.	Standard
OFF	—	More than 1 M Ω
UP	7 and 4, 2 and 1	Less than 1 Ω
DOWN	7 and 2, 4 and 1	Less than 1 Ω
LEFT	9 and 4, 2 and 1	Less than 1 Ω
RIGHT	9 and 2, 4 and 1	Less than 1 Ω

Change over switch right position:

Switch position	Terminal No.	Standard
OFF	—	More than 1 M Ω
UP	6 and 4, 2 and 1	Less than 1 Ω
DOWN	6 and 2, 4 and 1	Less than 1 Ω
LEFT	8 and 4, 2 and 1	Less than 1 Ω
RIGHT	8 and 2, 4 and 1	Less than 1 Ω

If NG, replace the switch.

22.Wiper Deicer

A: INSPECTION

Refer to INSPECTION under Rear Window Defogger. <Ref. to GW-32, INSPECTION, Rear Window Defogger.>

B: REPAIR

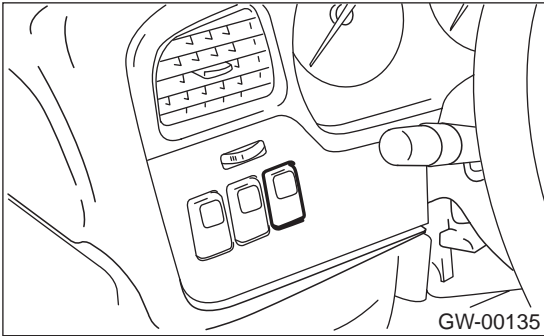
Refer to REPAIR under Rear Window Defogger. <Ref. to GW-32, REPAIR, Rear Window Defogger.>

23. Wiper Deicer Switch

A: REMOVAL

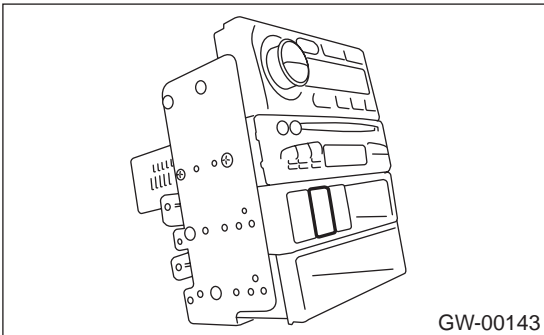
1. RHD MODEL

Remove driver side switch panel, and then remove wiper deicer switch.



2. LHD MODEL

Remove radio bracket, and then remove wiper deicer switch. <Ref. to ET-5, REMOVAL, Radio Body.>



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Move wiper deicer switch to each position and check continuity between terminals.

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	3 and 5	Less than 1 Ω

If NG, replace the switch.

WIPER DEICER SWITCH

GLASS/WINDOWS/MIRRORS

MEMO

BODY STRUCTURE

BS

	Page
1. General Description	2
2. Datum Points.....	3
3. Datum Dimensions.....	10



GENERAL DESCRIPTION

BODY STRUCTURE

1. General Description

A: PREPARATION TOOL

TOOL NAME	REMARKS
Tram tracking gauge	Used for measuring dimension.
Tape measure	Used for measuring dimension

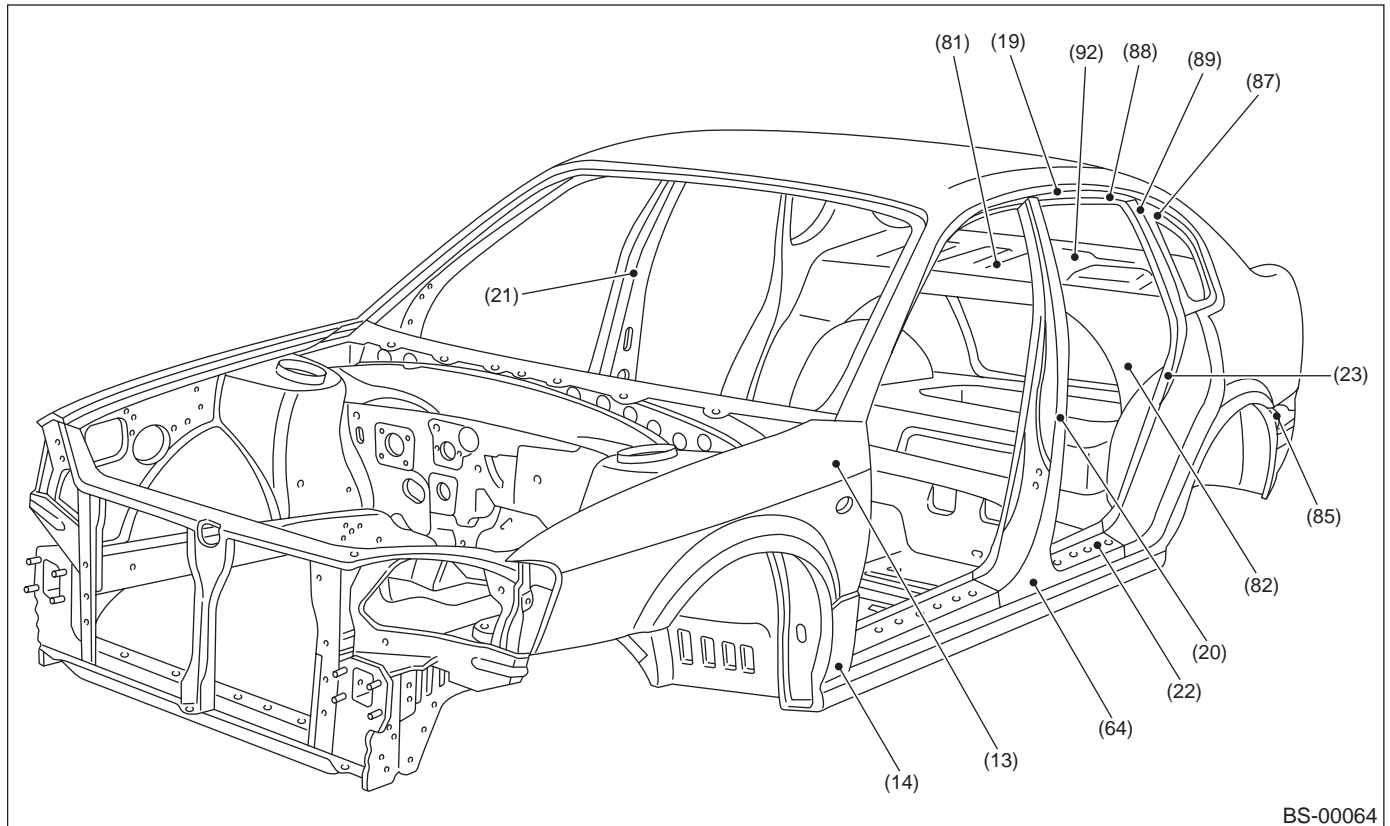
2. Datum Points

A: LOCATION

NOTE:

- Datum points are specified for body repair.
- Guide holes, locators, and indents are provided to facilitate panel replacement and to increase alignment accuracy.
- Both right and left reference points are symmetrical.

1. ROOM SECTION

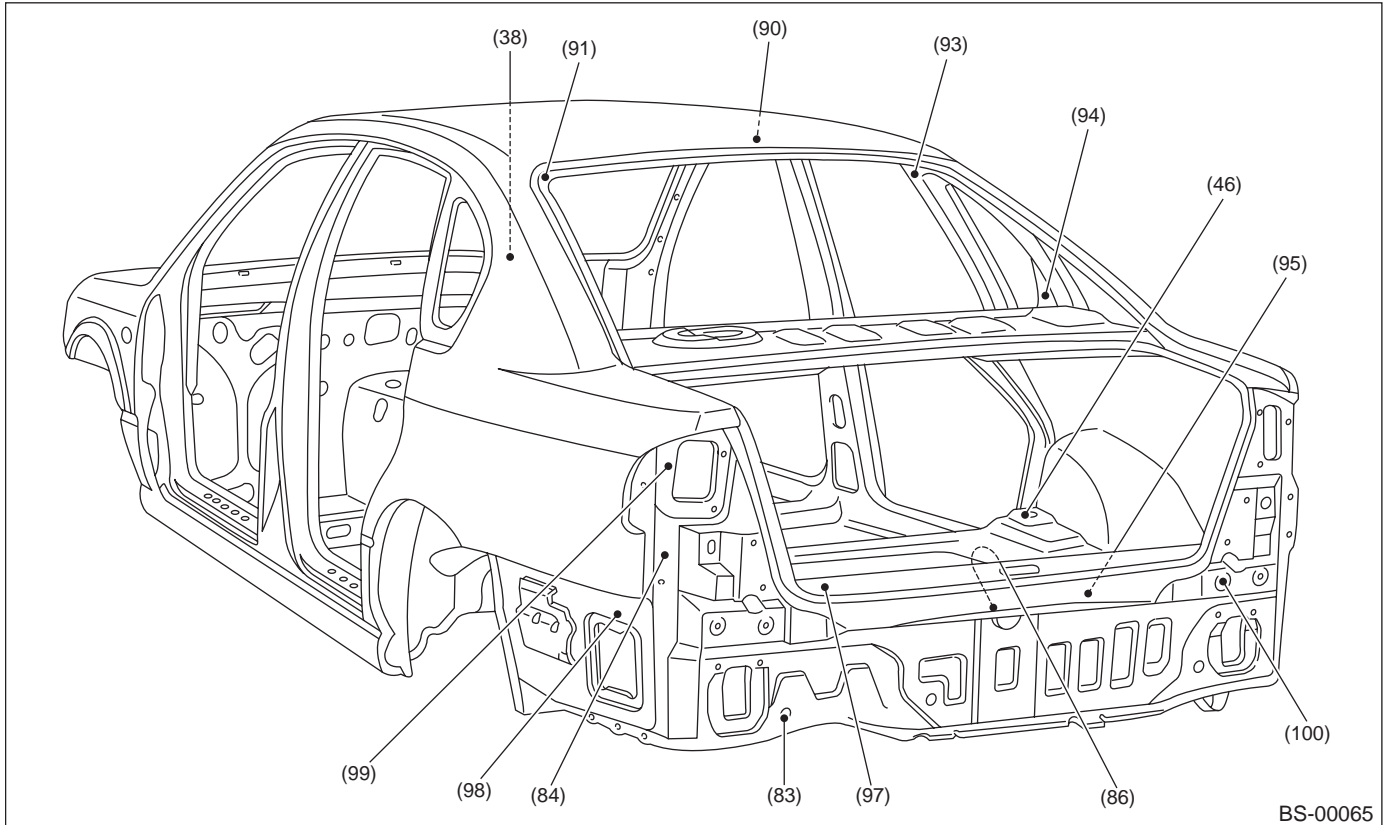


- | | | |
|--|---|---|
| (13) Front fender attaching hole at front pillar center portion M6 | (23) Rear quarter outer door switch attaching hole 20 mm (0.79 in) dia. | (87) Six light glass attaching hole 6.2 mm (0.244 in) dia. |
| (14) Front fender attaching hole at front pillar lower portion M6 | (64) Center pillar (LWR) gauge hole 16 mm (0.63 in) dia. | (88) Retainer attaching square hole at side rail outer 8 × 8 mm (0.31 × 0.31 in) |
| (19) Retainer attaching hole at side rail outer 3.2 mm (0.126 in) dia. | (81) Panel rear center (UPR) gauge hole 8 mm (0.31 in) dia. | (89) Retainer attaching square hole at rear quarter outer 8 × 8 mm (0.31 × 0.31 in) |
| (20) Center pillar outer hole 14 mm (0.55 in) dia. | (82) Bulk head rear trim clip hole 7 mm (0.28 in) dia. | (92) Rear panel center hole (UPR) 6 mm (0.24 in) dia. |
| (21) Front seat belt adjust plate attaching hole M10 | (85) Rear quarter outer gauge hole 20 mm (0.79 in) dia. | |
| (22) Side sill outer hole 20 mm (0.79 in) dia. | | |

DATUM POINTS

BODY STRUCTURE

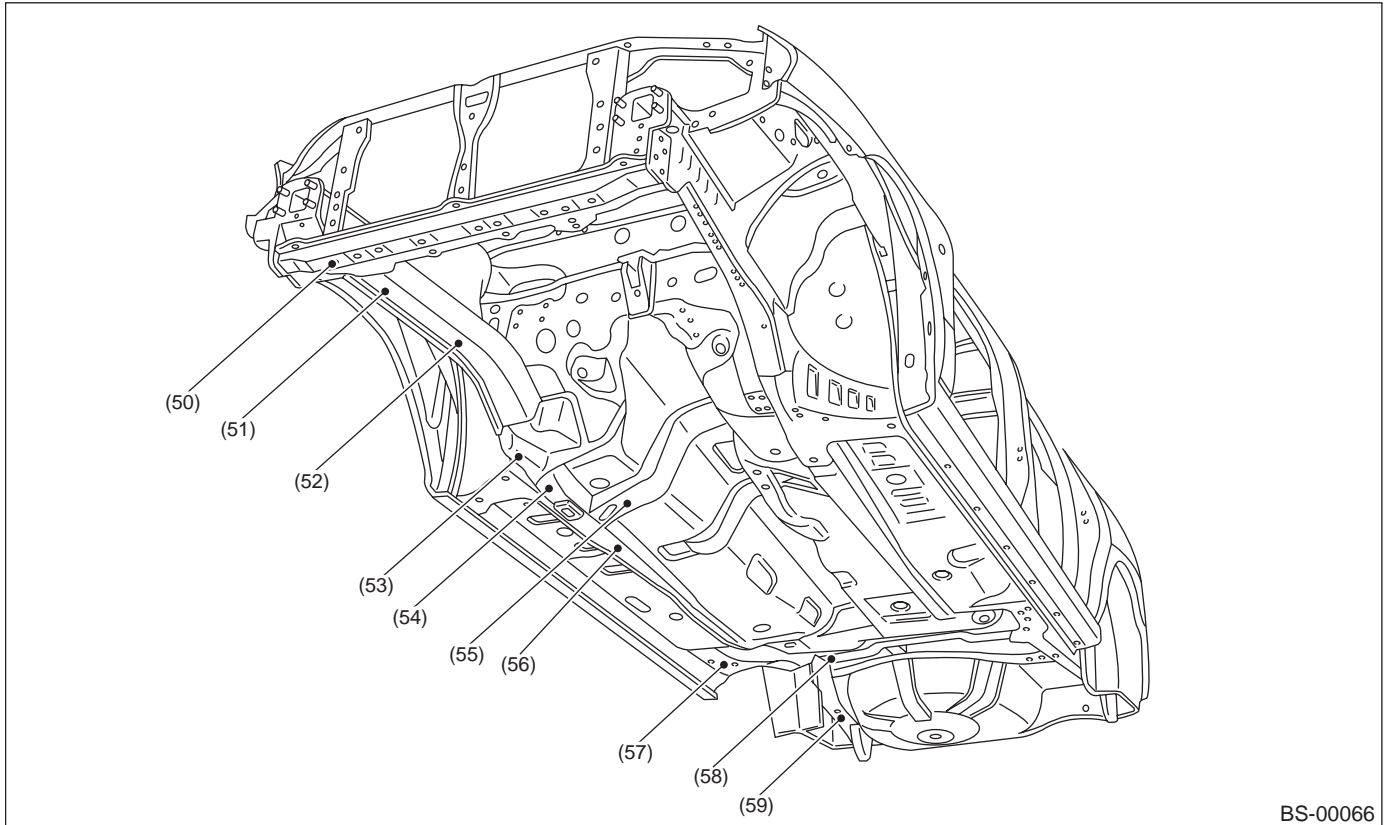
2. REAR SECTION



BS-00065

- | | | |
|---|--|--|
| (38) Front panel instrument panel attaching hole 18 × 36 mm (0.71 × 1.42 in) dia. oblong hole | (90) Rear rear roof trim attaching hole 8 mm (0.31 in) dia. | (97) Trunk trim attaching hole at rear skirt 7 mm (0.28 in) dia. |
| (46) Rear/front shock absorber floor side attaching hole 13 mm (0.51 in) dia. | (91) Rear glass attaching hole
RH: 6.5 mm (0.256 in) dia.
LH: (6.5 × 10 mm (0.256 × 0.394 in) oval | (98) Rear bumper slider attaching hole 6.2 mm (0.244 in) dia. |
| (83) Rear skirt outer burring hole 20 mm (0.79 in) dia. | (93) Rear panel inner trim attaching hole (UPR) 8 mm (0.31 in) dia. | (99) Rear combination light mounting hole 8 mm (0.31 in) dia. |
| (84) Rear extension attaching hole 6.2 mm (0.244 in) dia. | (94) Rear panel inner trim attaching hole (LWR) 8 mm (0.31 in) dia. | (100) Rear bumper beam attaching hole 8.2 mm (0.323 in) dia.
RH: 8.2 mm (0.323 in)
LH: 8.2 × 12 mm (0.323 × 0.472 in) oval |
| (86) Reinforce striker trim attaching hole 7 mm (0.28 in) dia. | (95) Rear bumper attaching hole 12.5 × 17 mm (0.492 × 0.669 in) dia. oblong hole | |

3. UNDERBODY SECTION

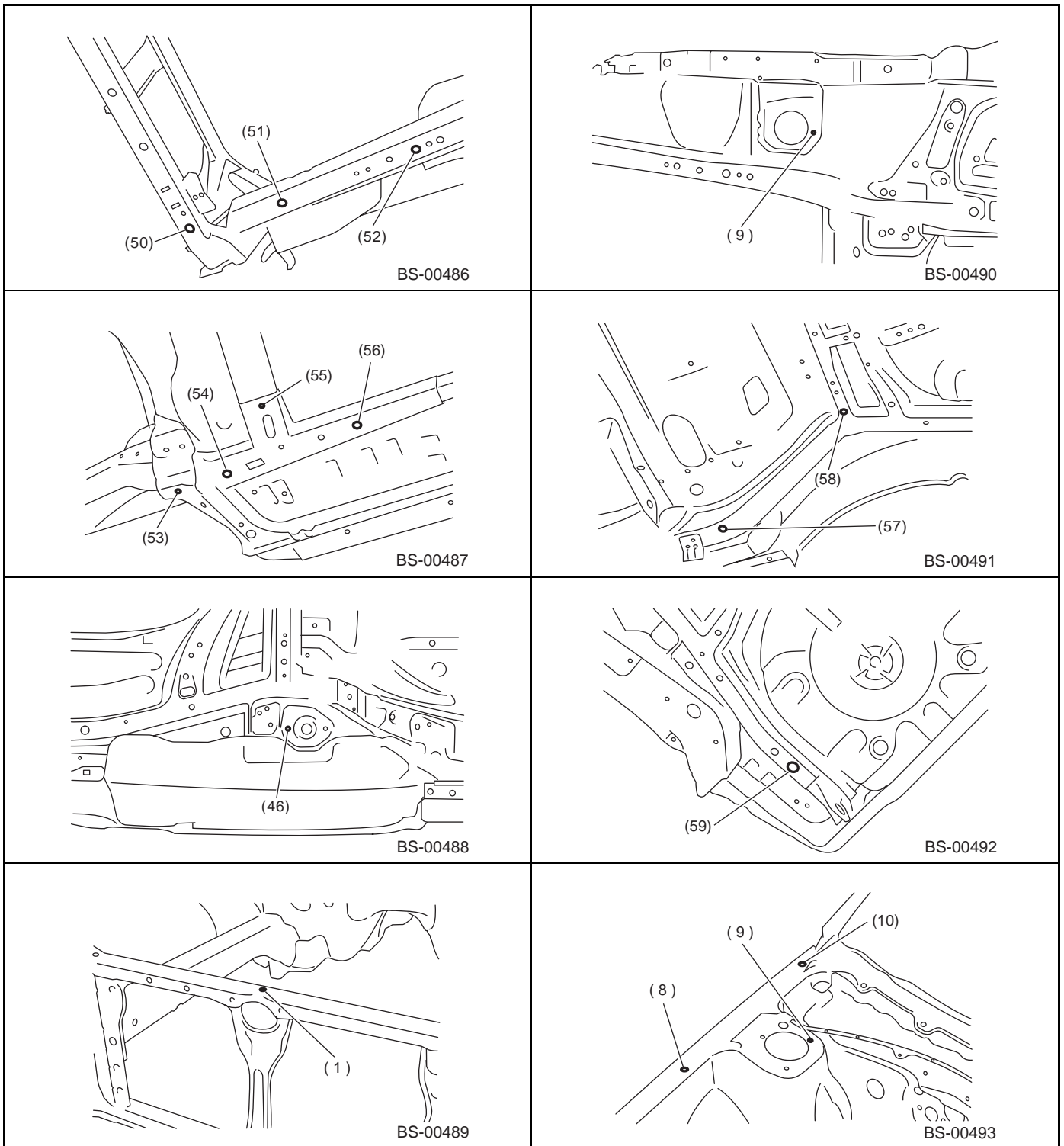


BS-00066

- | | | |
|---|--|--|
| (50) Radiator panel (LWR) frame gauge hole 15 mm (0.59 in) dia. | (54) Front side frame (Rr) gauge hole 20 mm (0.79 in) dia. | (58) Reinforcement crossmember B hole RH: 15 mm (0.59 in) dia., LH: 12 mm (0.47 in) dia. |
| (51) Front side frame (Ft) gauge hole 20 mm (0.79 in) dia. | (55) Crossmember front floor gauge hole M10 | (59) Frame rear floor side gauge hole 30 mm (1.18 in) dia. |
| (52) Front side frame (Ft) gauge hole 20 mm (0.79 in) dia. | (56) Front side frame (Rr) gauge hole 18 mm (0.71 in) dia. | |
| (53) Front suspension bracket COMPL securing nut (M14) | (57) Frame rear floor side gauge hole 25 mm (0.98 in) dia. | |

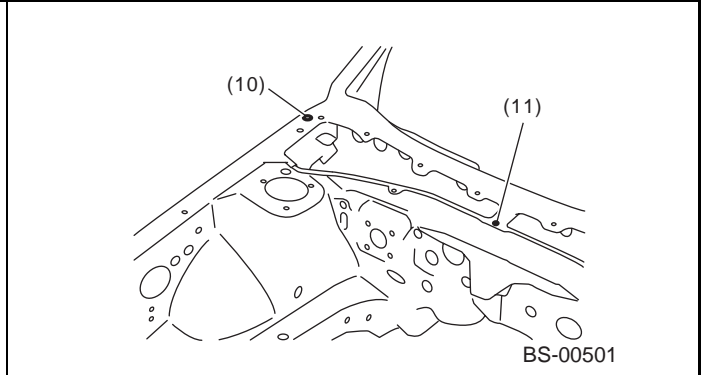
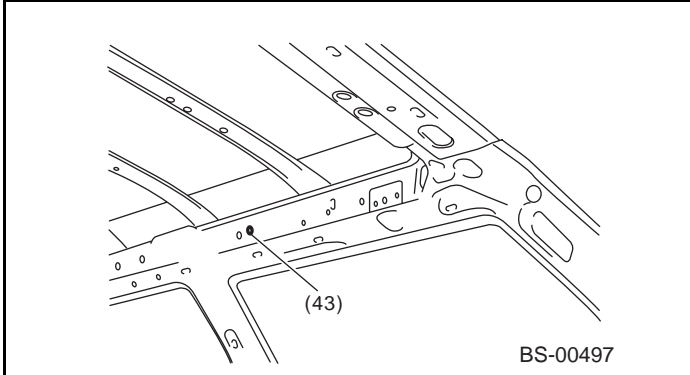
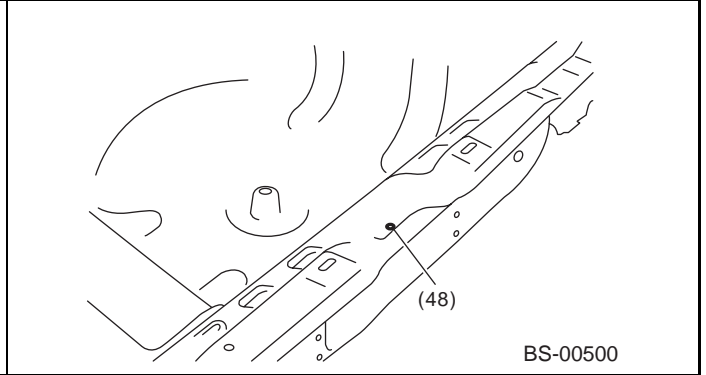
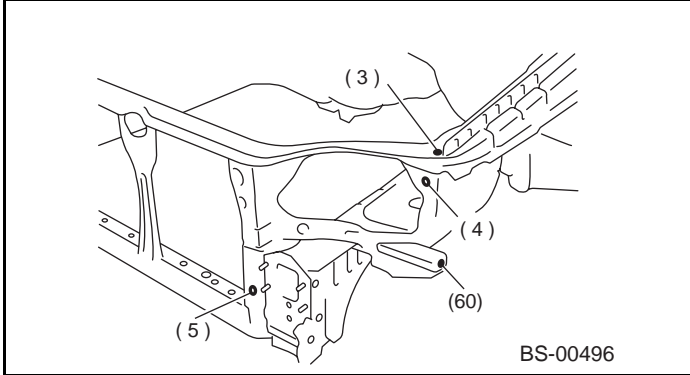
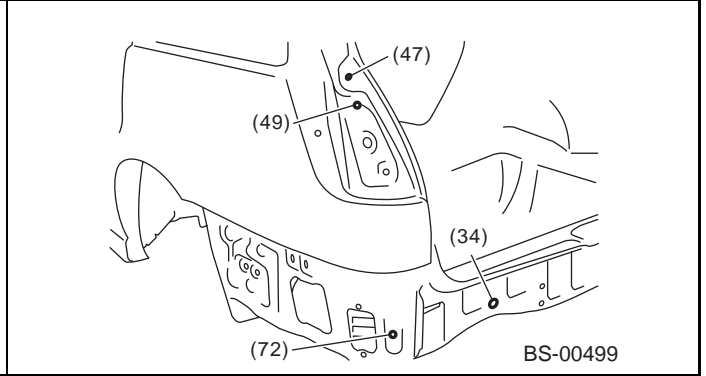
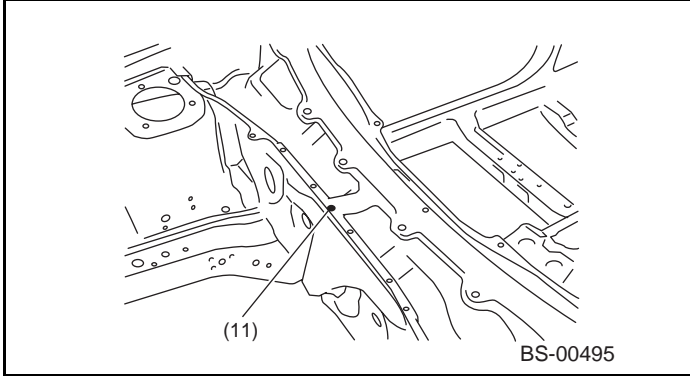
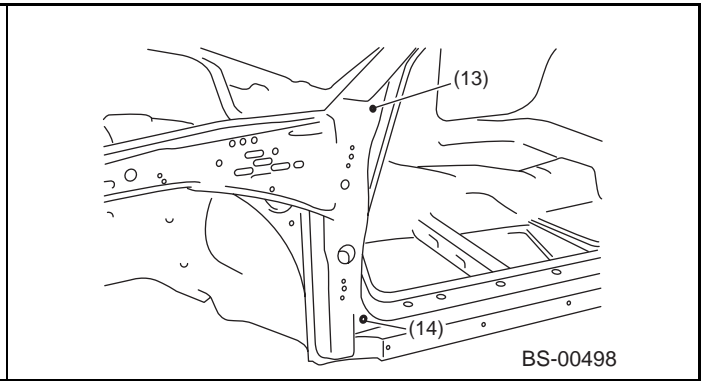
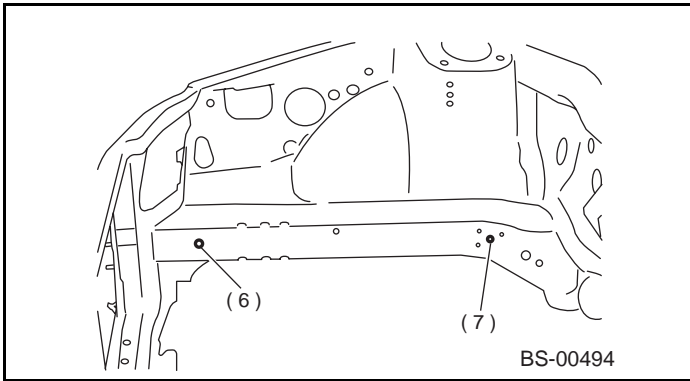
DATUM POINTS

BODY STRUCTURE



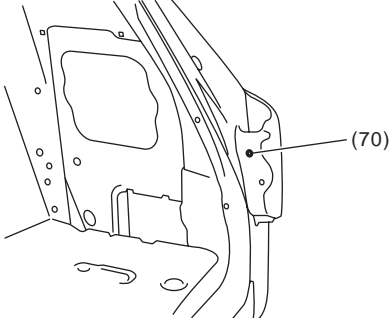
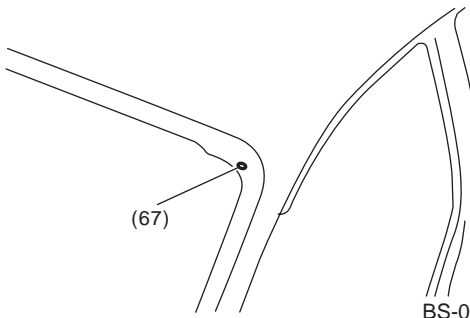
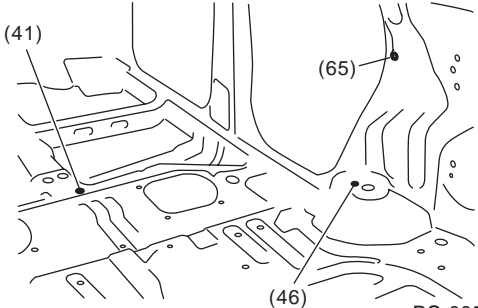
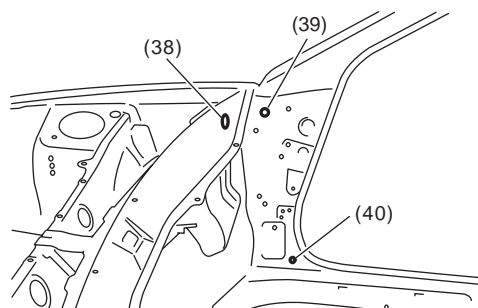
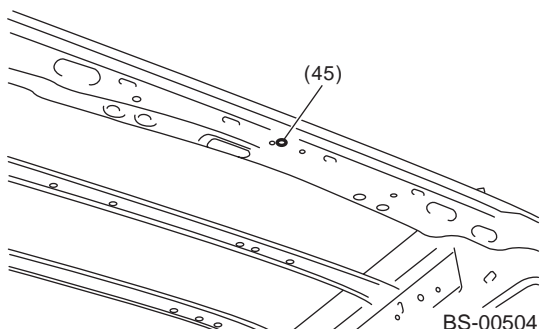
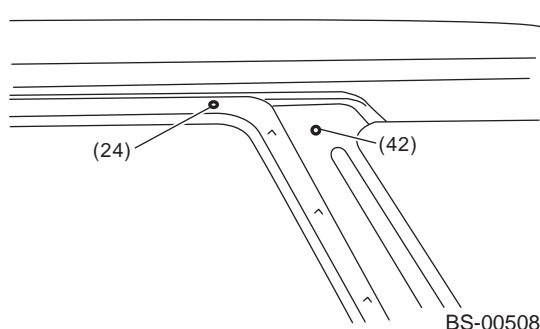
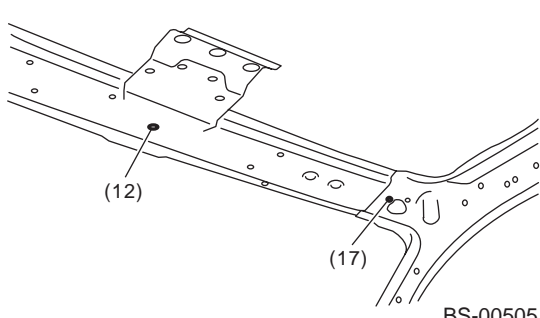
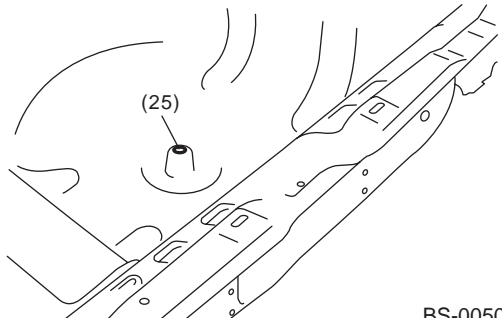
DATUM POINTS

BODY STRUCTURE



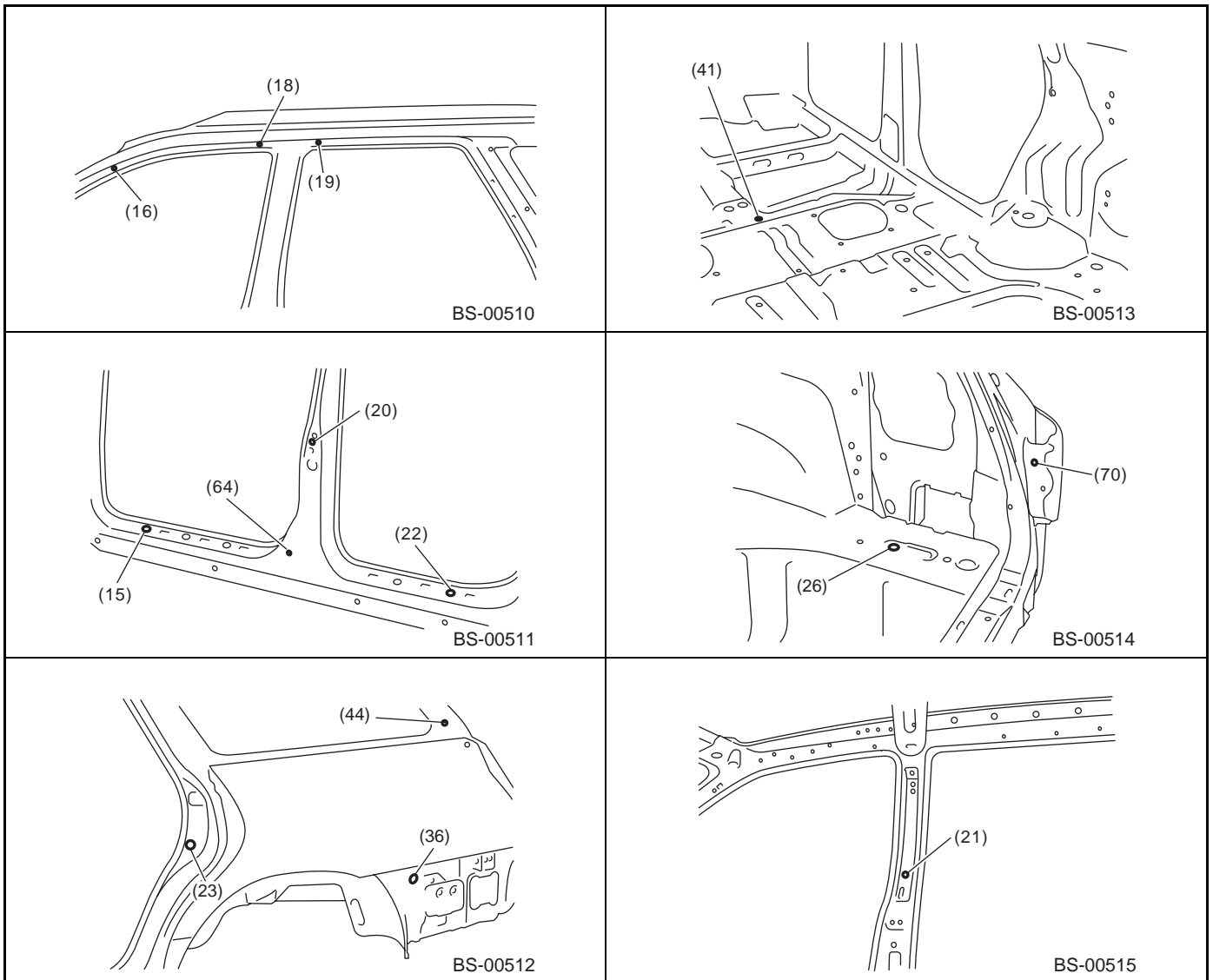
DATUM POINTS

BODY STRUCTURE

 <p>(70)</p> <p>BS-00502</p>	 <p>(67)</p> <p>BS-00506</p>
 <p>(41)</p> <p>(65)</p> <p>(46)</p> <p>BS-00503</p>	 <p>(38)</p> <p>(39)</p> <p>(40)</p> <p>BS-00507</p>
 <p>(45)</p> <p>BS-00504</p>	 <p>(24)</p> <p>(42)</p> <p>BS-00508</p>
 <p>(12)</p> <p>(17)</p> <p>BS-00505</p>	 <p>(25)</p> <p>BS-00509</p>

DATUM POINTS

BODY STRUCTURE



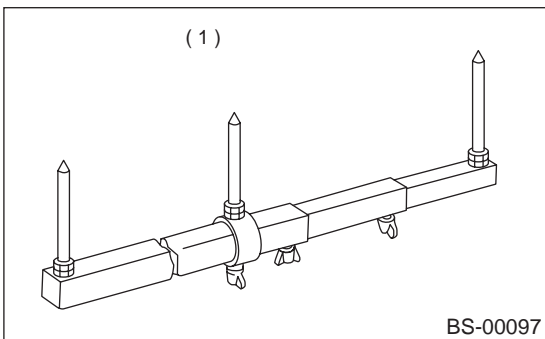
3. Datum Dimensions

A: MEASUREMENT

Refer to LOCATION for details on measurement points. <Ref. to BS-3, LOCATION, Datum Points.>

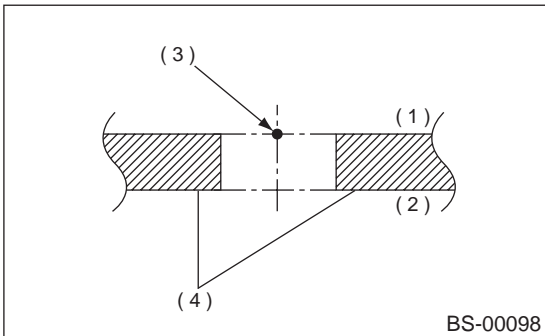
NOTE:

- Using a tram tracking gauge, measure all the dimensions.
- When using a tape measure, carefully measure dimensions without letting the tape measure sag or twist.
- Measure the linear dimensions between cores of holes.
- Suffixes "RH" and "LH" indicate right-hand and left-hand.



(1) Tram tracking gauge

- Measure at the center of the circle around the outside of the body panel.

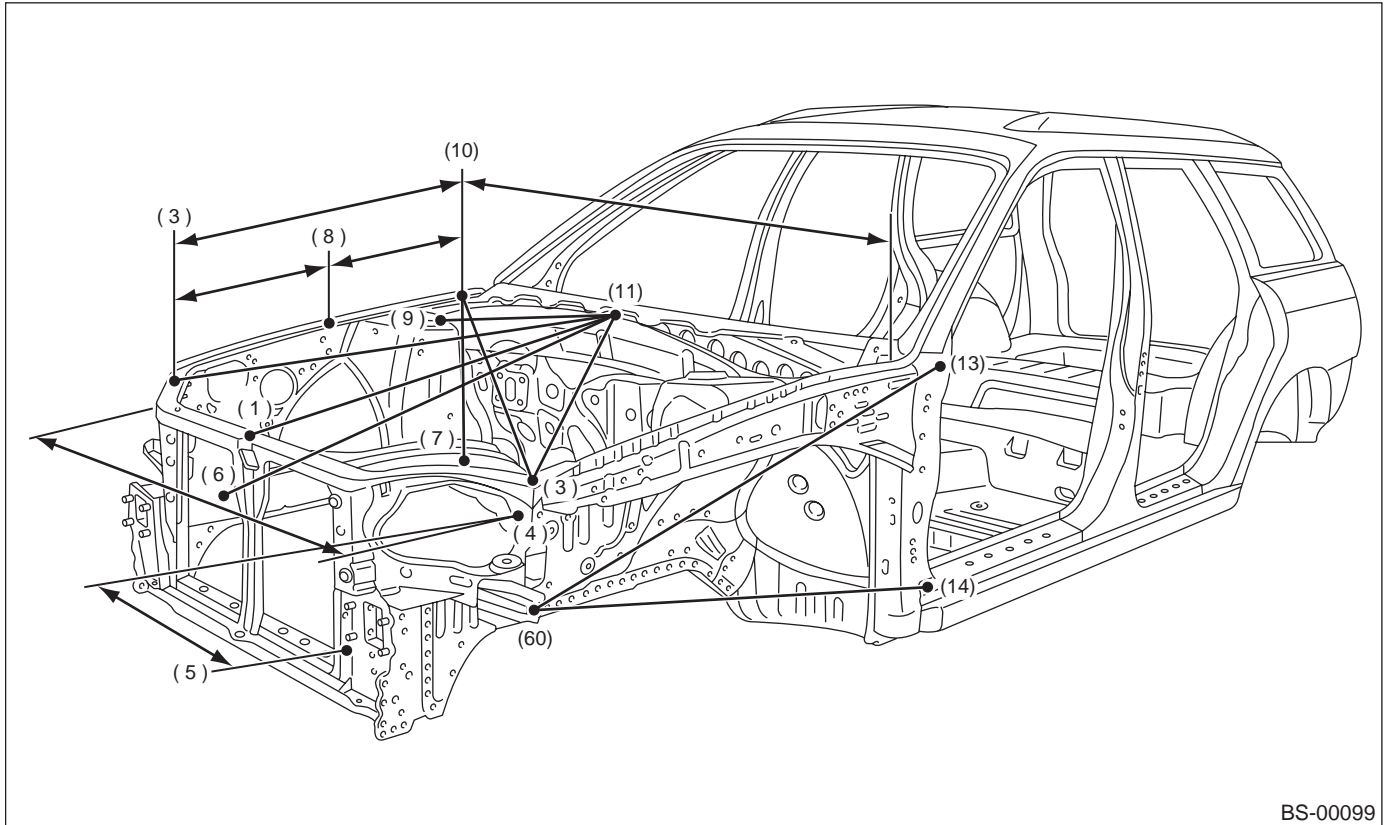


- (1) Outside
- (2) Inside
- (3) Datum point
- (4) Body panel

DATUM DIMENSIONS

BODY STRUCTURE

1. FRONT STRUCTURE



BS-00099

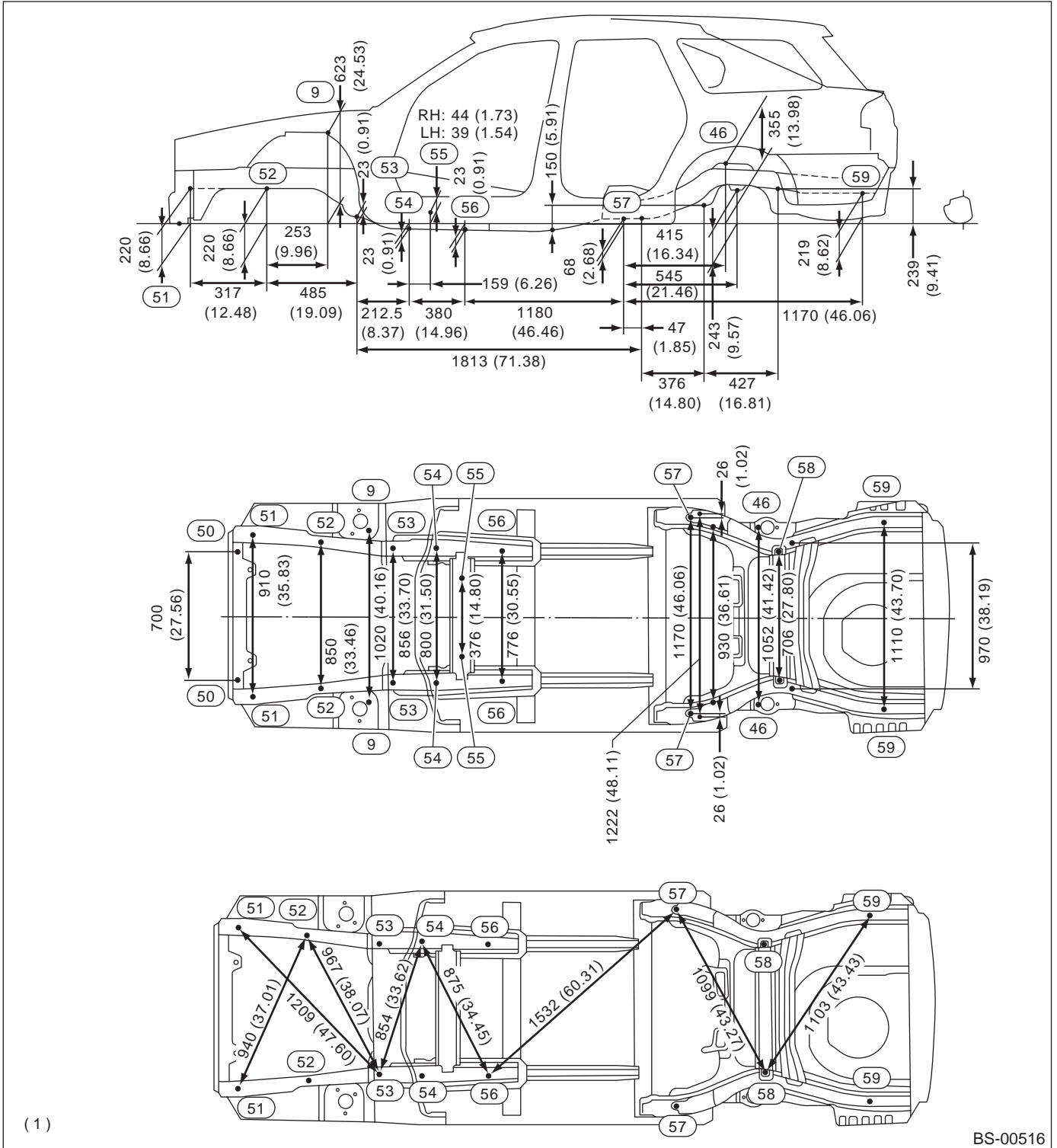
Point to point	Dimension	Point to point	Dimension
(11) to (1)	888 (34.96)	(4) RH to (4) LH	1,320 (51.97)
(11) to (9) RH	519 (20.43)	(5) RH to (4) LH	1,073 (42.24)
(11) to (9) LH	519 (20.43)	(5) LH to (4) RH	1,073 (42.24)
(11) to (6) RH	950 (37.40)	(60) RH to (13) RH	1,179 (46.42)
(11) to (6) LH	950 (37.40)	(60) LH to (13) LH	1,179 (46.42)
(11) to (3) RH	1,008 (39.68)	(60) RH to (14) RH	1,135 (44.68)
(11) to (3) LH	1,008 (39.68)	(60) LH to (14) LH	1,135 (44.68)
(10) RH to (3) RH	897 (35.31)	(10) RH to (3) LH	1,679 (66.10)
(10) RH to (8) RH	504 (19.84)	(10) LH to (3) RH	1,679 (66.10)
(10) LH to (8) LH	504 (19.84)	(8) RH to (8) LH	1,398 (55.04)
(9) RH to (9) LH	1,020 (40.16)	(8) RH to (10) LH	1,519 (59.80)
(6) RH to (6) LH	740 (29.13)	(8) LH to (10) RH	1,519 (59.80)
(6) RH to (10) LH	1,522 (59.92)	(3) RH to (8) LH	1,439 (56.65)
(6) LH to (10) RH	1,522 (59.92)	(3) LH to (8) RH	1,439 (56.65)
(8) RH to (3) RH	395 (15.55)	(7) RH to (7) LH	870 (34.25)
(8) LH to (3) LH	395 (15.55)	(7) RH to (6) LH	943 (37.13)
(10) RH to (10) LH	1,470 (57.87)	(7) LH to (6) RH	943 (37.13)
(3) RH to (3) LH	1,370 (53.94)	(7) RH to (10) LH	1,322 (52.05)
(5) RH to (5) LH	720 (28.35)	(7) LH to (10) RH	1,322 (52.05)

Unit: mm (in)

DATUM DIMENSIONS

BODY STRUCTURE

2. CENTER STRUCTURE



(1)

BS-00516

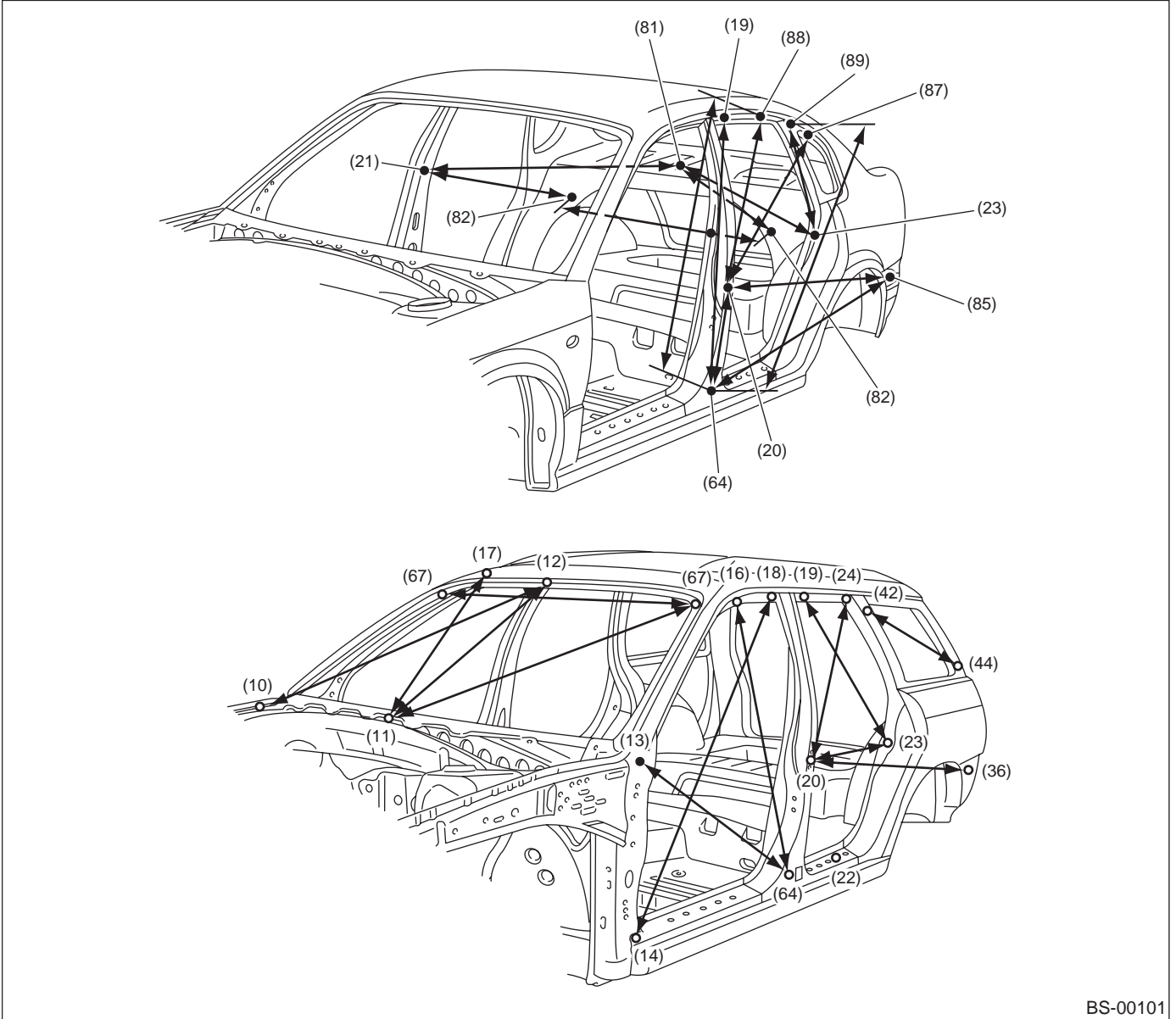
(1) Unit: mm (in)

MEMO:

DATUM DIMENSIONS

BODY STRUCTURE

3. WINDSHIELD AND DOORS



BS-00101

DATUM DIMENSIONS

BODY STRUCTURE

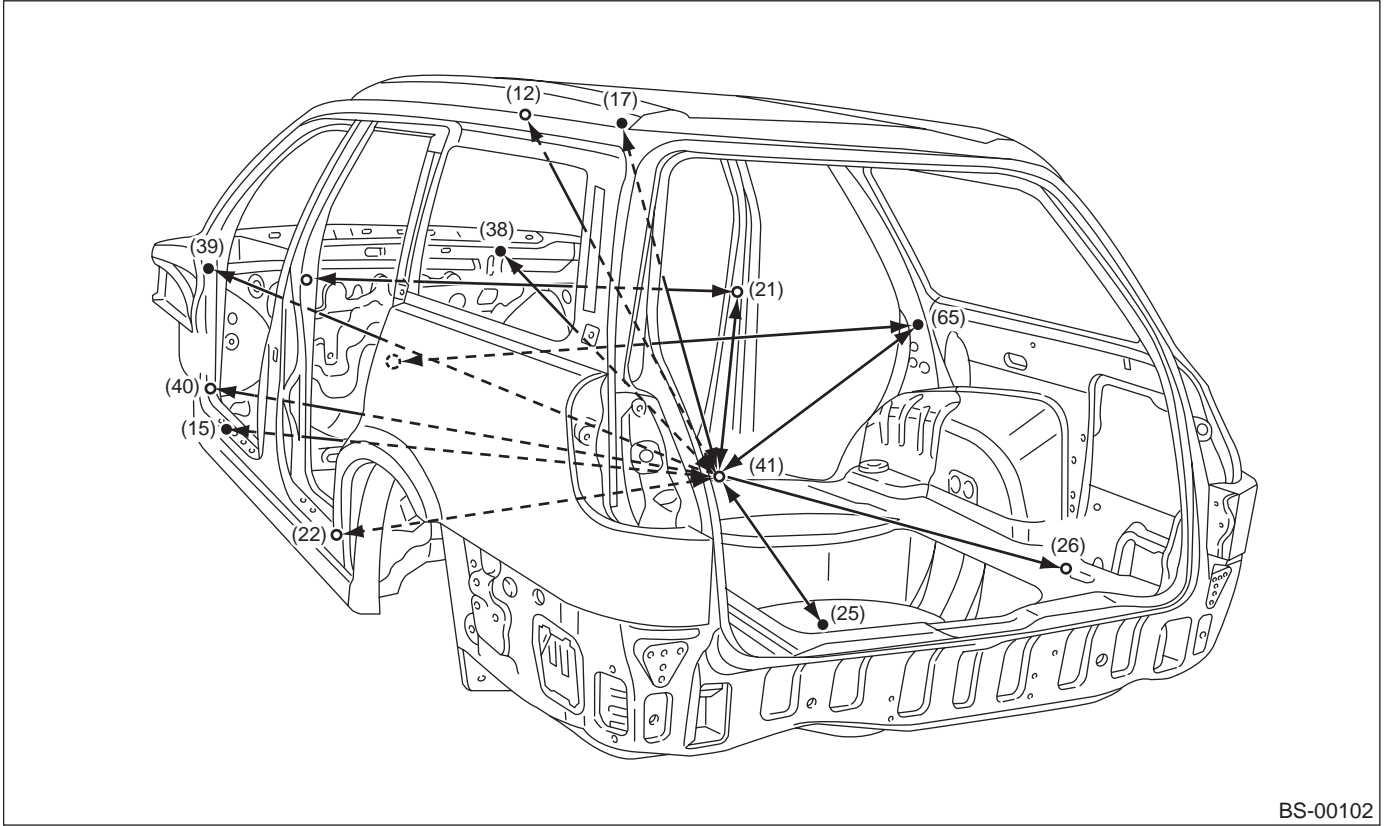
Point to point	Dimension	Point to point	Dimension
(14) RH to (18) RH	1,425 (56.10)	(12) to (10) RH	1,136 (44.72)
(14) LH to (18) LH	1,425 (56.10)	(12) to (10) LH	1,136 (44.72)
(13) RH to (64) RH	1,030 (40.55)	(11) to (17) RH	1,130 (44.49)
(13) LH to (64) LH	1,030 (40.55)	(11) to (17) LH	1,130 (44.49)
(16) RH to (64) RH	966 (38.03)	(81) to (82) RH	611 (24.06)
(16) LH to (64) LH	966 (38.03)	(81) to (82) LH	611 (24.06)
(20) RH to (23) RH	864 (34.02)	(81) to (21) RH	1,309 (51.54)
(20) LH to (23) LH	864 (34.02)	(81) to (21) LH	1,309 (51.54)
(20) RH to (24) RH	860 (33.86)	(81) to (23) RH	812 (31.97)
(20) LH to (24) LH	860 (33.86)	(81) to (23) LH	812 (31.97)
(19) RH to (23) RH	899 (35.39)	(82) LH to (21) LH	1,019 (40.12)
(19) LH to (23) LH	899 (35.39)	(82) RH to (21) LH	1,606 (63.23)
(20) RH to (36) RH	1,548 (60.94)	(82) RH to (82) LH	1,140 (44.88)
(20) LH to (36) LH	1,548 (60.94)	(85) LH to (20) LH	1,548 (60.94)
(42) RH to (44) RH	1,037 (40.83)	(85) LH to (64) LH	1,650 (64.96)
(42) LH to (44) LH	1,037 (40.83)	(19) LH to (64) LH	1,029 (40.51)
(11) to (12)	989 (38.94)	(20) LH to (87) LH	911 (35.87)
(67) RH to (67) LH	1,100 (43.31)	(20) LH to (88) LH	842 (33.15)
(11) to (67) RH	1,119 (44.06)	(20) LH to (64) LH	399 (15.71)
(11) to (67) LH	1,119 (44.06)	(23) LH to (89) LH	552 (21.73)
(12) to (67) RH	551 (21.69)	(88) LH to (64) LH	1,192 (46.93)
(12) to (67) LH	551 (21.69)	(89) LH to (64) LH	1,204 (47.40)

Unit: mm (in)

DATUM DIMENSIONS

BODY STRUCTURE

4. COMPARTMENT



BS-00102

Point to point	Dimension	Point to point	Dimension
(21) RH to (21) LH	1,351 (53.19)	(41) to (22) LH	738 (29.06)
(15) RH to (15) LH	1,455 (57.28)	(41) to (26) RH	1,459 (57.44)
(22) RH to (22) LH	1,455 (57.28)	(41) to (26) LH	1,459 (57.44)
(39) RH to (39) LH	1,385 (54.53)	(41) to (25)	1,290 (50.79)
(40) RH to (40) LH	1,392 (54.80)	(41) to (12)	1,228 (48.35)
(41) to (38)	1,639 (64.53)	(41) to (21) RH	940 (37.01)
(41) to (39) RH	1,642 (64.65)	(41) to (21) LH	940 (37.01)
(41) to (39) LH	1,642 (64.65)	(41) to (17) RH	1,261 (49.65)
(41) to (40) RH	1,531 (60.28)	(41) to (17) LH	1,261 (49.65)
(41) to (40) LH	1,531 (60.28)	(65) RH to (65) LH	1,307 (51.46)
(41) to (15) RH	1,342 (52.83)	(41) to (65) RH	969 (38.15)
(41) to (15) LH	1,342 (52.83)	(41) to (65) LH	969 (38.15)
(41) to (22) RH	738 (29.06)		

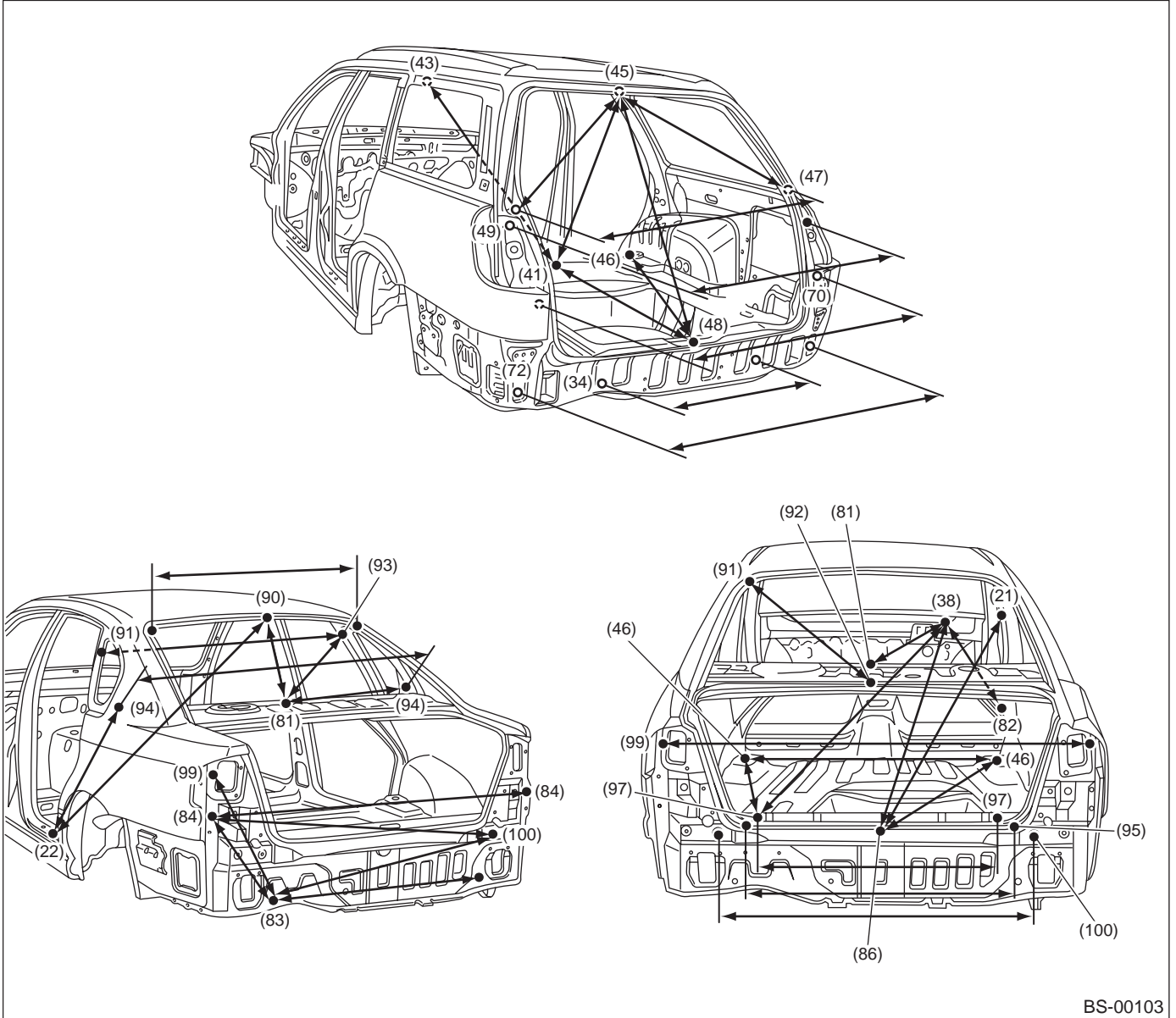
Unit: mm (in)

MEMO:

DATUM DIMENSIONS

BODY STRUCTURE

5. TRUNK LID AND REAR GATE



BS-00103

DATUM DIMENSIONS

BODY STRUCTURE

Point to point	Dimension	Point to point	Dimension
(45) to (48)	974 (38.35)	(84) RH to (84) LH	1,410 (55.51)
(45) to (47) RH	797 (31.38)	(100) RH to (84) LH	1,226 (48.27)
(45) to (47) LH	797 (31.38)	(86) to (21) RH	2,073 (81.61)
(47) RH to (47) LH	1,289 (50.75)	(86) to (21) LH	2,086 (82.13)
(49) RH to (49) LH	1,313 (51.69)	(86) to (38)	3,143 (123.74)
(34) RH to (34) LH	700 (27.56)	(86) to (46) RH	1,121 (44.13)
(41) to (45)	1,482 (58.35)	(86) to (46) LH	1,140 (44.88)
(41) to (43) RH	1,206 (47.48)	(86) to (96)	558 (21.97)
(41) to (43) LH	1,199 (47.20)	(90) to (22) RH	1,319 (51.93)
(41) to (48)	1,663 (65.47)	(90) to (22) LH	1,319 (51.93)
(48) to (46) RH	1,191 (46.89)	(22) RH to (94) LH	1,710 (67.32)
(48) to (46) LH	1,191 (46.89)	(22) LH to (94) RH	1,710 (67.32)
(70) RH to (70) LH	1,215 (47.83)	(38) to (97) RH	3,100 (122.05)
(72) RH to (72) LH	1,320 (51.97)	(38) to (97) LH	3,227 (127.05)
(81) to (38)	2,351 (92.56)	(92) to (91) RH	776 (30.55)
(81) to (90)	444 (17.48)	(92) to (91) LH	776 (30.55)
(81) to (93) RH	719 (28.31)	(91) RH to (91) LH	976 (38.43)
(81) to (93) LH	719 (28.31)	(46) LH to (97) LH	1,008 (39.68)
(81) to (94) RH	632 (24.88)	(46) LH to (97) RH	1,374 (54.09)
(81) to (94) LH	632 (24.88)	(46) LH to (46) RH	1,052 (41.42)
(38) to (82) RH	2,178 (85.75)	(93) RH to (93) LH	1,099 (43.27)
(38) to (82) LH	2,419 (95.24)	(94) RH to (94) LH	1,257 (49.49)
(83) RH to (83) LH	930 (36.61)	(95) RH to (95) LH	1,115 (43.90)
(84) RH to (83) LH	1,216 (47.87)	(97) RH to (97) LH	830 (32.68)
(99) RH to (83) LH	1,246 (49.06)	(99) RH to (99) LH	1,370 (53.94)
(100) RH to (83) LH	991 (39.02)	(100) RH to (100) LH	1,020 (40.16)
Unit: mm (in)			

DATUM DIMENSIONS

BODY STRUCTURE

MEMO:

INSTRUMENTATION/DRIVER INFO



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5. Tachometer	19
6. Fuel Gauge	20
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GENERAL DESCRIPTION

INSTRUMENTATION/DRIVER INFO

1. General Description

A: SPECIFICATIONS

1. STANDARD METER

Combination meter	Speedometer	Electric pulse type
	Temperature gauge	Cross coil type
	Fuel gauge	Cross coil type
	Tachometer	Electric pulse type
	Turn signal indicator light	12 V — 1.4 W
	Charge indicator light	12 V — 1.4 W
	Oil pressure indicator light	12 V — 1.4 W
	ABS warning light	12 V — 1.4 W
	CHECK ENGINE warning light (Malfunction indicator light)	12 V — 1.4 W
	HI-beam indicator light	12 V — 1.4 W
	Door open warning light	LED
	Seat belt warning light	LED
	Brake fluid and parking brake warning light	12 V — 1.4 W
	FWD indicator light	12 V — 1.4 W
	AIRBAG warning light	12 V — 1.4 W
	Meter illumination light	12 V — 3.4 W
	AT OIL TEMP. warning light	12 V — 1.4 W
	LO indicator light	12 V — 1.4 W
	HOLD indicator light	12 V — 1.4 W
	Immobiliser indicator light	LED
	VDC warning light	12 V — 1.4 W
	VDC function indicator light	12 V — 3 W
	POWER indicator light	12 V — 1.4 W
	VDC OFF indicator light	12 V — 1.4 W
	Low fuel warning light	12 V — 1.4 W
	AT select lever position indicator light	12 V — 100 mA
LCD back light	12 V — 1.4 W	

GENERAL DESCRIPTION

INSTRUMENTATION/DRIVER INFO

2. LUMINESCENT METER

Combination meter	Speedometer	Electric pulse type
	Water temperature gauge	Thermistor cross-coil type
	Fuel gauge	Resistance cross-coil type
	Tachometer	Electric pulse type
	Turn signal indicator light	12 V — 1.4 W
	Charge indicator light	12 V — 1.4 W
	Oil pressure warning light	12 V — 1.4 W
	ABS warning light	12 V — 1.4 W
	Check engine warning light (Malfunction indicator light)	12 V — 1.4 W
	HI-beam indicator light	12 V — 1.4 W
	Door open warning light	12 V — 2.0 W (LCD back light)
	Seat belt warning light	LED
	Brake fluid and parking brake warning light	12 V — 1.4 W
	FWD indicator light	12 V — 1.4 W
	AIRBAG warning light	12 V — 1.4 W
	Meter illumination light	CFL (Cold cathode fluorescent light)
	Meter ring light	12 V — 3.0 W, 2.0 W
	AT OIL TEMP. warning light	12 V — 1.4 W
	HOLD indicator light	12 V — 1.4 W
	Immobilizer indicator light	LED
	VDC warning light	12 V — 1.4 W
	VDC function indicator light	12 V — 3 W
	POWER indicator light	12 V — 1.4 W
	VDC OFF indicator light	12 V — 1.4 W
	Low fuel warning light	12 V — 1.4 W
	AT select lever position indicator light	12 V — 150 mA
Lighting switch indicator light	12 V — 1.4 W	
SPORT shift indicator	12 V - 3.0 W (LCD back light)	
LCD back light	CFL (Cold cathode fluorescent light)	

B: CAUTION

- Be careful not to damage meters and instrument panel.
- Be careful not to damage meter glasses.
- Make sure that electrical connector is connected securely.
- After installation, make sure that each meter operates normally.
- Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
- Do not apply excessive force to printed circuit.
- Do not drop or otherwise apply impact.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

2. Combination Meter System

A: SCHEMATIC

1. COMBINATION METER

<Ref. to WI-126, SCHEMATIC, Combination Meter.>

2. OUTSIDE TEMPERATURE INDICATOR

<Ref. to WI-279, SCHEMATIC, Outside Temperature Display System.>

B: INSPECTION

CAUTION:

- When measuring voltage and resistance of the ECM, TCM, or each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 2 mm (0.08 in).
- Luminescent meter has a CFL (Cold cathode fluorescent light) inverter that generates a high-tension current. Do not touch the inverter terminal when checking combination meter with ignition switch turned ON.

1. SYMPTOM CHART

Symptom	Repair order	Reference
Combination meter assembly does not operate.	(1) Power supply (2) Ground circuit	<Ref. to IDI-5, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Combination Meter System.>
Speedometer does not operate.	(1) (MT) Vehicle speed sensor (AT) Transmission control module (2) Harness (3) Speedometer	MT: <Ref. to IDI-6, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>
		AT: <Ref. to IDI-7, CHECK TRANSMISSION CONTROL MODULE, INSPECTION, Combination Meter System.>
Tachometer does not operate.	(1) Engine control module (2) Harness (3) Tachometer	<Ref. to IDI-8, CHECK ENGINE CONTROL MODULE, INSPECTION, Combination Meter System.>
Fuel gauge does not operate.	(1) Fuel level sensor (2) Harness (3) Fuel gauge	<Ref. to IDI-9, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>
Water temperature gauge does not operate.	(1) Engine coolant temperature sensor (2) Harness (3) Water temperature gauge	<Ref. to IDI-11, CHECK ENGINE COOLANT TEMPERATURE SENSOR, INSPECTION, Combination Meter System.>
Outside temperature indicator does not operate.	(1) Ambient sensor (2) Harness (3) Combination meter	<Ref. to IDI-12, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>
Indicator and warning lights illuminate normally, but meter characters are not displayed when turning ignition switch ON (Luminescent meter).	Combination meter printed circuit	<Ref. to IDI-13, CHECK COMBINATION METER PRINTED CIRCUIT, INSPECTION, Combination Meter System.>

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY FOR COMBINATION METER. 1) Remove combination meter. <Ref. to IDI-14, REMOVAL, Combination Meter Assembly.> 2) Disconnect combination meter harness connector. 3) Turn ignition switch to ON. 4) Measure voltage between combination meter connector and chassis ground.</p> <p>Connector & terminal Standard meter: <i>(i12) No. 3 (+) — Chassis ground (-):</i> Luminiscent meter: <i>(i10) No. 8 (+) — Chassis ground (-):</i> <i>(i11) No. 5 (+) — Chassis ground (-):</i> Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Check harness for open or short between ignition relay and combination meter.
<p>2 CHECK POWER SUPPLY FOR COMBINATION METER. Measure voltage between combination meter connector and chassis ground.</p> <p>Connector & terminal Standard meter: <i>(i12) No. 7 (+) — Chassis ground (-):</i> Luminiscent meter: <i>(i10) No. 9 (+) — Chassis ground (-):</i> <i>(i12) No. 1 (+) — Chassis ground (-):</i> Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Check harness for open or short between fuse and combination meter.
<p>3 CHECK GROUND CIRCUIT OF COMBINATION METER. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between combination meter connector and chassis ground.</p> <p>Connector & terminal Standard meter: <i>(i10) No. 20 — Chassis ground :</i> Luminiscent meter: <i>(i11) No. 7 — Chassis ground:</i> Is the measured value less than the specified value?</p>	10 Ω	Go to step 4.	Repair wiring harness.
<p>4 CHECK GROUND CIRCUIT OF COMBINATION METER. Measure resistance of harness between combination meter connector and chassis ground.</p> <p>Connector & terminal Standard meter: <i>(i11) No. 16 — Chassis ground :</i> Luminiscent meter: <i>(i10) No. 18— Chassis ground:</i> Is the measured value less than the specified value?</p>	10 Ω	Replace combination meter.	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

3. CHECK VEHICLE SPEED SENSOR

Step	Value	Yes	No
<p>1 CHECK VEHICLE SPEED SENSOR.</p> <p>1) Lift-up the vehicle and support it with safety stands.</p> <p>2) Remove the combination meter with harness connector.</p> <p>3) Drive the vehicle at a speed greater than 20 km/h (12 MPH).</p> <p>Warning: Be careful not to get caught in the running wheels.</p> <p>4) Measure voltage between combination meter connector and chassis ground.</p> <p>Connector & terminal Standard meter: <i>(i10) No. 13 (+) — Chassis ground (-):</i> Luminiscent meter: <i>(i10) No. 11 (+) — Chassis ground (-):</i></p> <p>Is the measured value same as the specified value?</p>	0 V ↔ 5 V	Check speedometer. <Ref. to IDI-18, REMOVAL, Speedometer.>	Go to step 2.
<p>2 CHECK VEHICLE SPEED SENSOR POWER SUPPLY.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect vehicle speed sensor harness connector.</p> <p>3) Turn ignition switch to ON.</p> <p>4) Measure voltage between vehicle speed sensor connector and engine ground.</p> <p>Connector & terminal <i>(B17) No. 3 (+) — Engine ground (-):</i></p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Check harness for open or short between ignition relay and vehicle speed sensor.
<p>3 CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Measure resistance between vehicle speed sensor connector and engine ground.</p> <p>Connector & terminal <i>(B17) No. 2 — Engine ground:</i></p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 4.	Repair wiring harness.
<p>4 CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND COMBINATION METER.</p> <p>1) Disconnect connector from combination meter.</p> <p>2) Measure resistance between vehicle speed sensor harness connector and combination meter harness connector.</p> <p>Connector & terminal Standard meter: <i>(B17) No. 1 — (i10) No. 13:</i> Luminiscent meter: <i>(B17) No. 1 — (i10) No. 11:</i></p> <p>Is the measured value less than the specified value?</p>	10 Ω	Replace vehicle speed sensor.	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

4. CHECK TRANSMISSION CONTROL MODULE

Step	Value	Yes	No
<p>1</p> <p>CHECK TRANSMISSION CONTROL MODULE SIGNAL.</p> <p>1) Lift-up the vehicle and support it with safety stands.</p> <p>2) Drive the vehicle faster than 10 km/h (6 MPH).</p> <p>Warning: Be careful not to get caught in the running wheels.</p> <p>3) Measure voltage between transmission control module connector and chassis ground.</p> <p>Connector & terminal (B56) No. 17 (+) — Chassis ground (-): Is the measured value same as the specified value?</p>	<p>0 V ↔ 5 V</p>	<p>Go to step 2.</p>	<p>Check transmission control module. <Ref. to AT-2, Basic Diagnostic Procedure.></p>
<p>2</p> <p>CHECK HARNESS BETWEEN TRANSMISSION CONTROL MODULE AND COMBINATION METER.</p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from transmission control module and combination meter.</p> <p>3) Measure resistance between transmission control module harness connector and combination meter harness connector.</p> <p>Connector & terminal Standard meter: (B56) No. 17 — (i10) No. 13: Luminiscent meter: (B56) No. 17 — (i10) No. 11: Is the measured value less than the specified value?</p>	<p>10 Ω</p>	<p>Check speed meter. <Ref. to IDI-18, REMOVAL, Speedometer.></p>	<p>Repair wiring harness.</p>

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

5. CHECK ENGINE CONTROL MODULE

Step	Value	Yes	No
<p>1 CHECK ENGINE CONTROL MODULE SIGNAL.</p> <p>1) Start the engine. 2) Measure voltage between engine control module connector and chassis ground.</p> <p>Connector & terminal Standard meter (Without OBD): (B134) No. 30 (+) — Chassis ground (-): Standard meter (With OBD): (B134) No. 10 (+) — Chassis ground (-): Luminiscent meter: (B136) No. 9 (+) — Chassis ground (-):</p> <p>Is the measured value same as the specified value?</p>	0 ↔ 14 V	Go to step 2.	Check engine control module. <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>or <Ref. to EN(H4SOw/oOBD)-2, Basic Diagnostic Procedure.>or <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.>or<Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>
<p>2 CHECK HARNESS BETWEEN COMBINATION METER AND ENGINE CONTROL MODULE.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from engine control module and combination meter. 3) Measure resistance between engine control module harness connector and combination meter harness connector.</p> <p>Connector & terminal Standard meter (Without OBD): (B134) No. 30 — (i11) No. 7: Standard meter (With OBD): (B134) No. 10 — (i11) No. 7: Luminiscent meter: (B136) No. 9 — (i11) No. 6:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Check tachometer. <Ref. to IDI-19, REMOVAL, Tachometer.>	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

6. CHECK FUEL LEVEL SENSOR

Step	Value	Yes	No
<p>1 CHECK FUEL LEVEL SENSOR.</p> <p>1) Remove the fuel level sensor. <Ref. to FU(H4SO)-64, REMOVAL, Fuel Level Sensor.> or <Ref. to FU(H4SOw/oOBD)-61, REMOVAL, Fuel Level Sensor.><Ref. to FU(H4DOSTC)-61, REMOVAL, Fuel Level Sensor.>or <Ref. to FU(H6DO)-67, REMOVAL, Fuel Level Sensor.></p> <p>2) Measure the resistance between the fuel level sensor terminals when setting the float to FULL and EMPTY position.</p> <p>Terminals No. 3 — No. 6</p> <p>Is the measured value within the specified range?</p>	<p>FULL: 0.5 — 2.5 Ω, EMPTY: 52.5 — 54.5 Ω</p>	Go to step 2.	Replace the fuel level sensor.
<p>2 CHECK FUEL SUB LEVEL SENSOR.</p> <p>1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-65, REMOVAL, Fuel Sub Level Sensor.> or <Ref. to FU(H4SOw/oOBD)-62, REMOVAL, Fuel Sub Level Sensor.> or <Ref. to FU(H4DOSTC)-62, REMOVAL, Fuel Sub Level Sensor.> or <Ref. to FU(H6DO)-68, REMOVAL, Fuel Sub Level Sensor.></p> <p>2) Measure the resistance between the fuel sub level sensor terminals when setting the float to FULL and EMPTY position.</p> <p>Terminals No. 1 — No. 2</p> <p>Is the measured value within the specified range?</p>	<p>FULL: 0.5 — 2.5 Ω, EMPTY: 39.5 — 41.5 Ω</p>	Go to step 3.	Replace the fuel sub level sensor.
<p>3 CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER.</p> <p>1) Disconnect the connector from the combination meter.</p> <p>2) Measure the resistance between the fuel sub level sensor harness connector terminal and combination meter harness connector terminal.</p> <p>Connector & terminal Standard meter: (R59) No. 1 — (i10) No. 3: Luminiscent (LHD): (R59) No. 1 — (i11) No. 15: Luminiscent (RHD): (R59) No. 1 — (i10) No. 17:</p> <p>Is the measured value less than the specified value?</p>	<p>10 Ω</p>	Go to step 4.	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

Step	Value	Yes	No
<p>4 CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR. Measure the resistance between the fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal.</p> <p style="padding-left: 20px;">Connector & terminal (R58) No. 6 — (R59) No. 2:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 5.	Repair wiring harness.
<p>5 CHECK FUEL LEVEL SENSOR GROUND CIRCUIT. Measure the resistance between the fuel level sensor harness connector terminal and chassis ground.</p> <p style="padding-left: 20px;">Connector & terminal (R58) No. 3 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Check the fuel gauge. <Ref. to IDI-20, REMOVAL, Fuel Gauge.>	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Step	Value	Yes	No
<p>1 CHECK ENGINE COOLANT TEMPERATURE SENSOR. Check engine coolant temperature sensor. <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>, or <Ref. to EN(H4SOw/oOBD)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H4DOSTC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.> Is engine coolant temperature sensor OK?</p>	Engine coolant temperature sensor is OK.	Go to step 2.	Replace engine coolant temperature sensor.
<p>2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND COMBINATION METER. 1) Turn ignition switch to OFF. 2) Disconnect connector from engine coolant temperature sensor and combination meter. 3) Measure resistance between engine coolant temperature sensor harness connector and combination meter harness connector. Connector & terminal Standard meter: (E8) No. 3 — (i12) No. 8: Luminiscent meter (LHD): (E8) No. 3 — (i12) No. 5: Luminiscent meter (RHD): (E8) No. 3 — (i11) No. 15: Is the measured value less than the specified value?</p>	10 Ω	Go to step 3.	Repair wiring harness.
<p>3 CHECK WATER TEMPERATURE GAUGE GROUND CIRCUIT. Measure resistance between combination meter harness connector terminal and chassis ground. Connector & terminal Standard meter: (i12) No. 9 — Chassis ground: Luminiscent meter (LHD): (i12) No. 6 — Chassis ground: Luminiscent meter (RHD): (i11) No. 16 — Chassis ground: Is the measured value less than the specified value?</p>	10 Ω	Check water temperature gauge. <Ref. to IDI-21, REMOVAL, Water Temperature Gauge.>	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

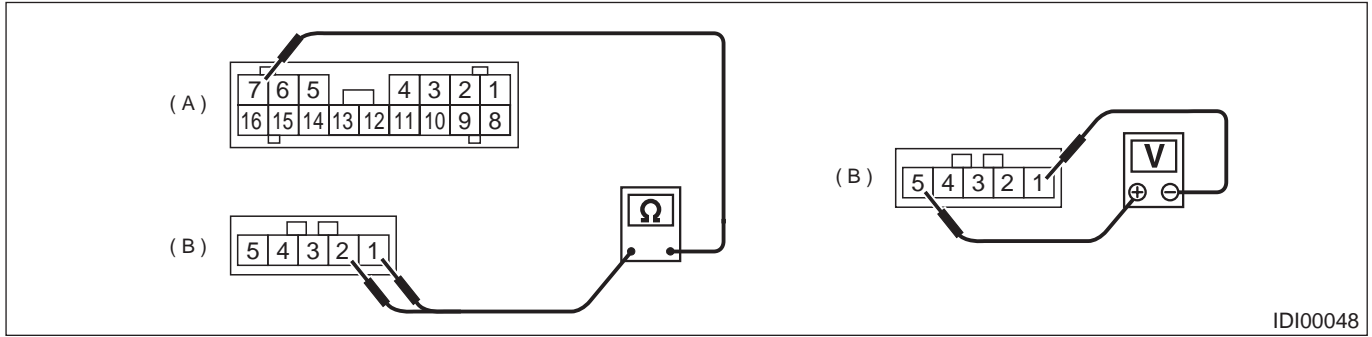
8. CHECK OUTSIDE TEMPERATURE INDICATOR

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY FOR AMBIENT SENSOR.</p> <p>1) Turn ignition switch OFF. 2) Disconnect connector from ambient sensor. 3) Turn ignition switch ON. 4) Measure voltage between ambient sensor harness connector terminal and chassis ground.</p> <p>Connector & terminal (F78) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	4 V	Go to step 2.	Check harness for open or short between ambient sensor and combination meter.
<p>2 CHECK AMBIENT SENSOR.</p> <p>1) Turn ignition switch OFF. 2) Remove ambient sensor. 3) Check ambient sensor. <Ref. to IDI-22, INSPECTION, Ambient Sensor.> Is the ambient sensor OK?</p>	Ambient sensor is OK.	Go to step 3.	Replace the ambient sensor.
<p>3 CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.</p> <p>1) Disconnect connector from combination meter. 2) Measure resistance between ambient sensor harness connector terminal and combination meter harness connector terminal.</p> <p>Connector & terminal (F78) No. 1 — (i10) No. 22: Is the measured value less than the specified value?</p>	10 Ω	Go to step 4.	Repair wiring harness.
<p>4 CHECK OUTSIDE TEMPERATURE INDICATOR.</p> <p>1) Connect combination meter harness connector. 2) Connect a resistor (1.7 kΩ) between terminals of ambient sensor harness connector. 3) Turn ignition switch ON and check the outside temperature indicator display. Is the outside temperature indicator indicating the specified value?</p>	25°C (77°F)	Outside temperature indicator is OK.	Replace combination meter printed circuit.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

9. CHECK COMBINATION METER PRINTED CIRCUIT



IDI00048

- (A) Combination meter connector (16-poles): To B: (i11)
 (B) Combination meter printed circuit connector (5-poles): To CFL inverter harness

Step	Value	Yes	No
<p>1</p> <p>CHECK COMBINATION METER PRINTED CIRCUIT.</p> <ol style="list-style-type: none"> 1) Turn ignition switch OFF. 2) Remove combination meter. <Ref. to IDI-14, Removal.> 3) Disconnect connector from combination meter. 4) Disconnect CFL inverter harness connector (5-poles) from behind the meter. 5) Remove CFL inverter from combination meter. <Ref. to IDI-16, LUMINESCENT METER.> 6) Measure resistance between printed circuit connector (B) and combination meter connector (A). <p>Connector & terminal</p> <p>Printed circuit connector (B) No. 1 — Combination meter connector (A) No. 7:</p> <p>Printed circuit connector (B) No. 2 — Combination meter connector (A) No. 7:</p> <p>Is the measured value less than the specified value?</p>	1 Ω	Go to step 2.	Replace combination meter printed circuit.
<p>2</p> <p>CHECK COMBINATION METER PRINTED CIRCUIT.</p> <ol style="list-style-type: none"> 1) Connect combination meter connectors to instrument panel harness. (With CFL inverter removed.) 2) Turn ignition switch ON. 3) Measure voltage between printed circuit connector (B) terminals. <p>Connector & terminal</p> <p>Printed circuit connector (B) No. 1— No. 5:</p> <p>Does the measured value exceed the specified value?</p>	10 V	Replace CFL assembly (light, harness and inverter).	Replace combination meter printed circuit.

COMBINATION METER ASSEMBLY

INSTRUMENTATION/DRIVER INFO

3. Combination Meter Assembly

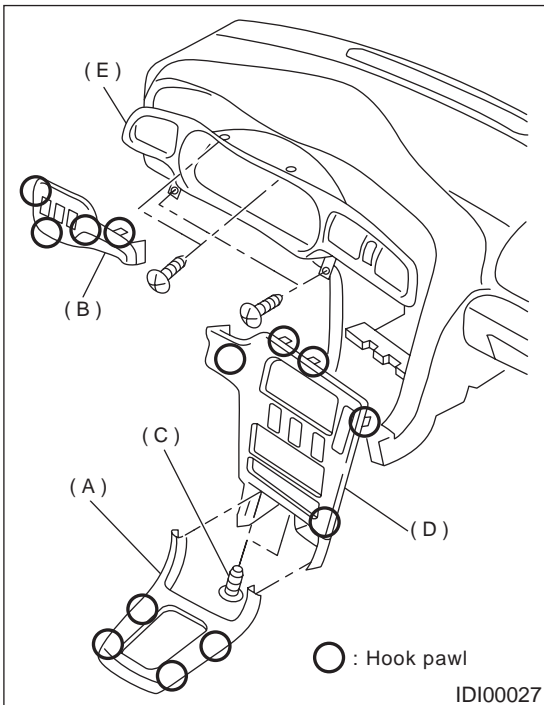
- Pay particular attention to avoid damaging the meter glass.

A: REMOVAL

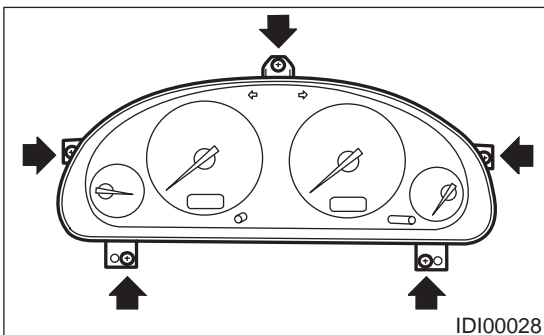
- 1) Disconnect ground cable from battery.
- 2) Set tilt steering at the lowest position.
- 3) Disconnect each electrical connector to remove front cover (A) and switch panel (B).
- 4) Loosen screws (C) to remove center panel (D).
- 5) Remove meter visor (E).

NOTE:

The following illustration is for LHD model. The layout for RHD model is symmetrically opposite.



- 6) Remove screws of combination meter to pull out the meter toward you.
- 7) Remove connector in the upper area of combination meter to remove meter.



CAUTION:

- Be careful not to damage meter or instrument panel.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

- Make sure that electrical connector is connected securely.
- Make sure that each meter operates normally.

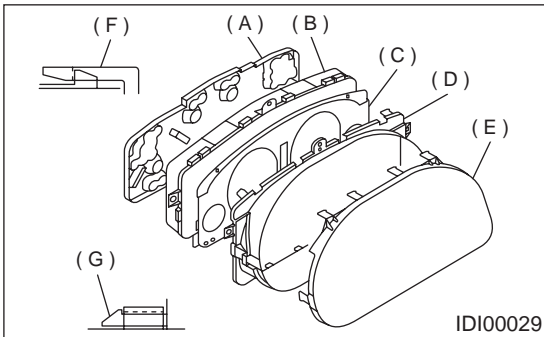
C: DISASSEMBLY

CAUTION:

Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

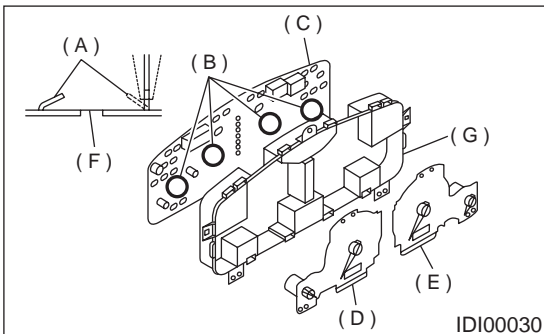
1. STANDARD METER

- 1) Disengage claw (F) to remove case (B) from back cover (A).
- 2) Disengage claw (G) to remove meter glass (E), reflector (D), and window plate (C) from inner case.



- 3) Pull up claw (A) in portion (B) of printed circuit (C) with combination pliers. Push out speedometer assembly (D) and tachometer assembly (E) using hole (F).

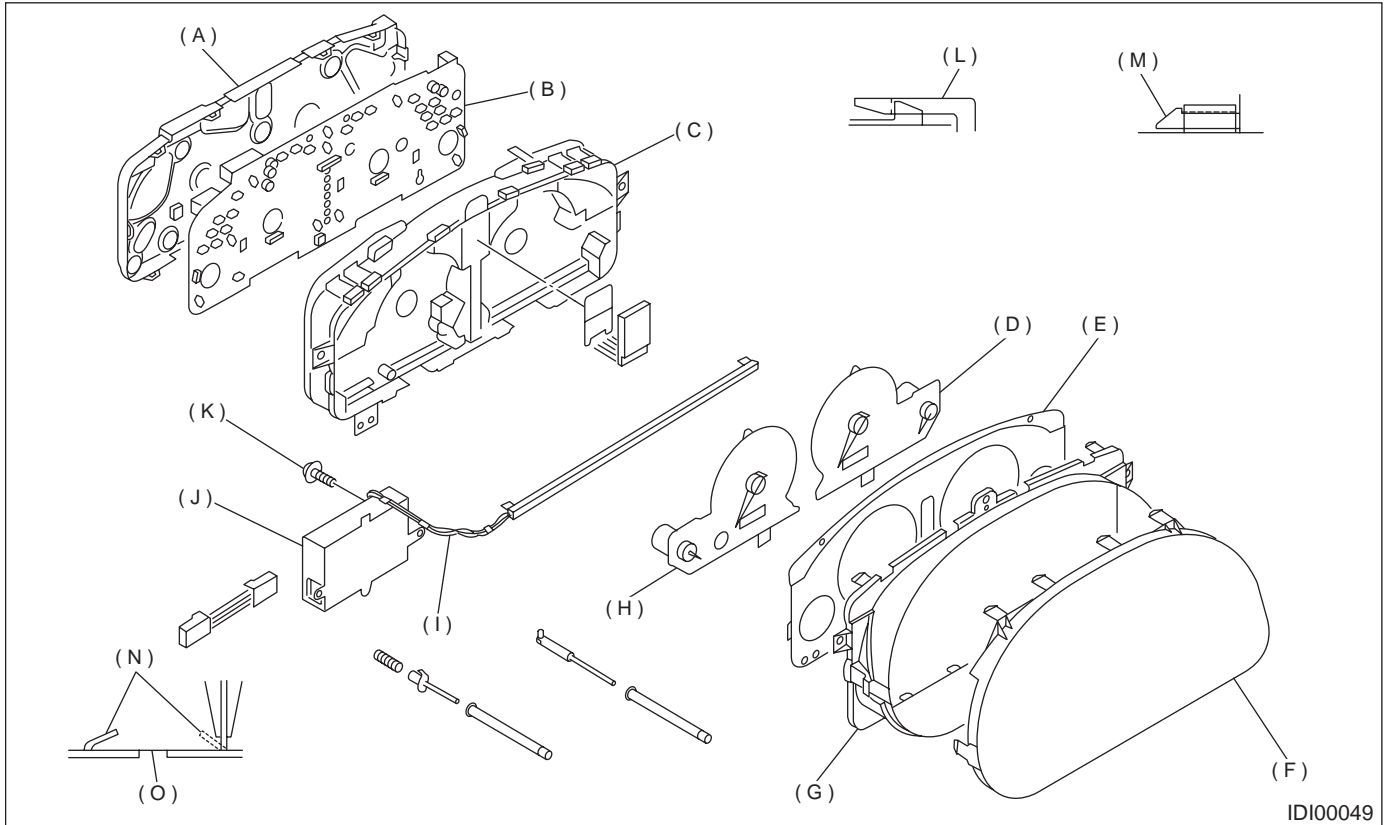
- 4) Pull up claw in the center of printed circuit (C), and remove printed circuit from case (G).



COMBINATION METER ASSEMBLY

INSTRUMENTATION/DRIVER INFO

2. LUMINESCENT METER



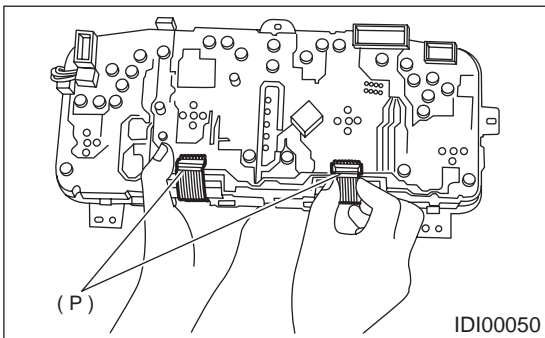
1) Remove screw (K) and disconnect connectors, detach CFL (Cold Cathode Fluorescent Light) inverter (J).

2) Unfasten CFL harness (I) from back cover groove.

3) Disengage claw (M) to remove meter glass (F), reflector (G), and window plate (E) from case (C).

4) Remove connector cover and release connector lock by pulling both end of it, disconnect FPC (Flexible Printed Circuit) connector (P).

8) Pull up claw in center of printed circuit (B), remove printed circuit from case (C).



5) Pull up claw (N) on back cover (A) with combination pliers.

6) Push out speedometer assembly (H) and tachometer assembly (D) using hole (O).

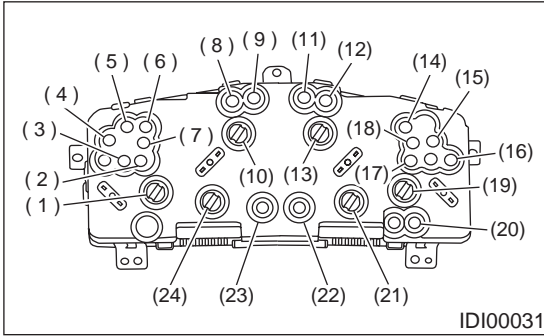
7) Disengage claw (L) to remove case (C) from back cover (A).

COMBINATION METER ASSEMBLY

INSTRUMENTATION/DRIVER INFO

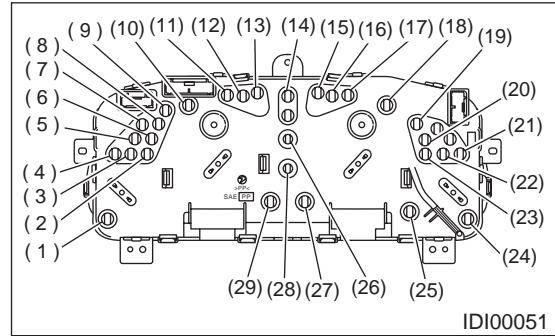
3. BULB REPLACEMENT

• Standard meter:



- (1) Tachometer and water temperature gauge
- (2) ABS
- (3) VDC
- (4) Oil pressure
- (5) Charge
- (6) AT oil temp.
- (7) Check engine
- (8) HI-beam
- (9) Turn RH
- (10) Tachometer
- (11) Turn LH
- (12) Brake
- (13) Speedometer
- (14) VDC function
- (15) 4WD LO
- (16) FWD
- (17) VDC OFF
- (18) Airbag
- (19) Speedometer and fuel gauge
- (20) Low fuel
- (21) LCD
- (22) POWER
- (23) HOLD
- (24) LCD

• Luminescent meter:



- (1) Water temperature gauge ring
- (2) Tachometer and water temperature gauge ring
- (3) ABS
- (4) VDC
- (5) Oil pressure
- (6) Check engine
- (7) Charge
- (8) AT oil temp.
- (9) Lighting switch
- (10) Tachometer ring
- (11) HI-beam
- (12) Turn RH
- (13) HOLD
- (14) LCD
- (15) POWER
- (16) Turn LH
- (17) Brake
- (18) Speedometer ring
- (19) VDC function
- (20) AIRBAG
- (21) FWD
- (22) VDC OFF
- (23) Speedometer and fuel gauge ring
- (24) Fuel gauge ring
- (25) Low fuel
- (26) AT select lever position (P)
- (27) Speedometer ring
- (28) AT select lever position (D)
- (29) Tachometer ring

D: ASSEMBLY

Assemble in the reverse order of disassembly.

SPEEDOMETER

INSTRUMENTATION/DRIVER INFO

4. Speedometer

A: REMOVAL

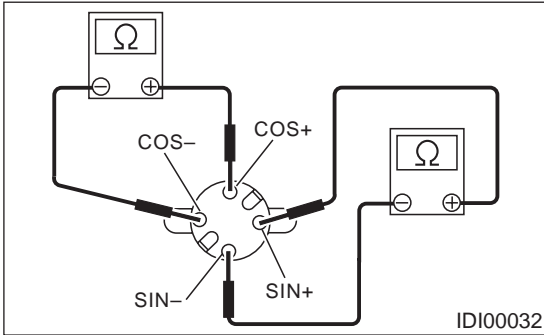
Disassemble combination meter, and then remove speedometer and fuel gauge assembly. <Ref. to IDI-15, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure speedometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN-	200±8 Ω
Terminals COS+ and COS-	200±8 Ω

If NG, replace speedometer and fuel gauge assembly.

If OK, replace combination meter printed circuit.

5. Tachometer

A: REMOVAL

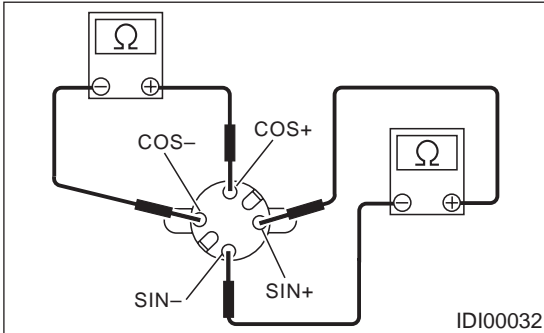
Disassemble combination meter, and then remove tachometer and water temperature gauge assembly. <Ref. to IDI-15, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure tachometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN-	200±8 Ω
Terminals COS+ and COS-	200±8 Ω

If NG, replace tachometer and water temperature gauge assembly.

If OK, replace combination meter printed circuit.

6. Fuel Gauge

A: REMOVAL

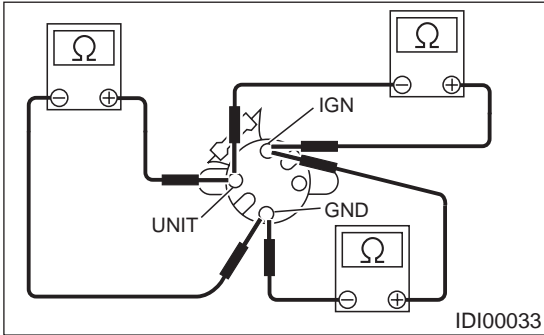
Disassemble combination meter, and then remove speedometer and fuel gauge assembly. <Ref. to IDI-15, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure fuel gauge resistance.



Terminal	Resistance
Terminals IGN and GND	170±10 Ω
Terminals IGN and UNIT	35±10 Ω
Terminals UNIT and GND	136±10 Ω

If NG, replace speedometer and fuel gauge assembly.

If OK, replace combination meter printed circuit.

7. Water Temperature Gauge

A: REMOVAL

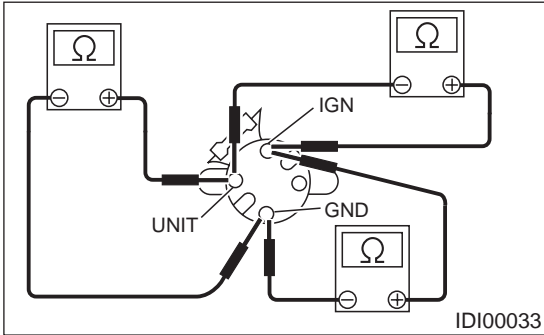
Disassemble combination meter, and then remove tachometer and water temperature gauge assembly. <Ref. to IDI-15, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure water temperature gauge resistance.



Terminal	Resistance
Terminals IGN and GND	208±10 Ω
Terminals IGN and UNIT	56±10 Ω
Terminals UNIT and GND	264±10 Ω

If NG, replace tachometer and water temperature gauge assembly.

If OK, replace combination meter printed circuit.

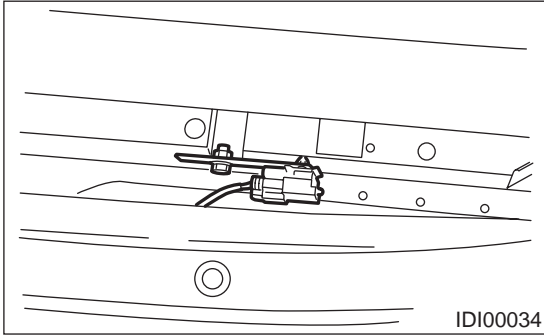
AMBIENT SENSOR

INSTRUMENTATION/DRIVER INFO

8. Ambient Sensor

A: REMOVAL

- 1) Open front hood.
- 2) Disconnect ground cable from battery.
- 3) Disconnect ambient sensor connector.
- 4) Remove ambient sensor from radiator lower panel.

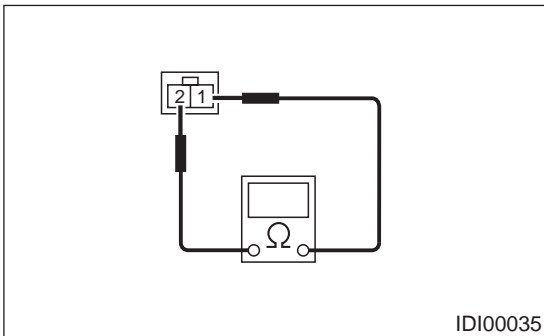


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure ambient sensor resistance.



Terminal No.	Resistance
1 and 2	1.7 kΩ/25°C (77°F)

If NG, replace the ambient sensor.

SEATS

SE

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3. Rear Seat	17



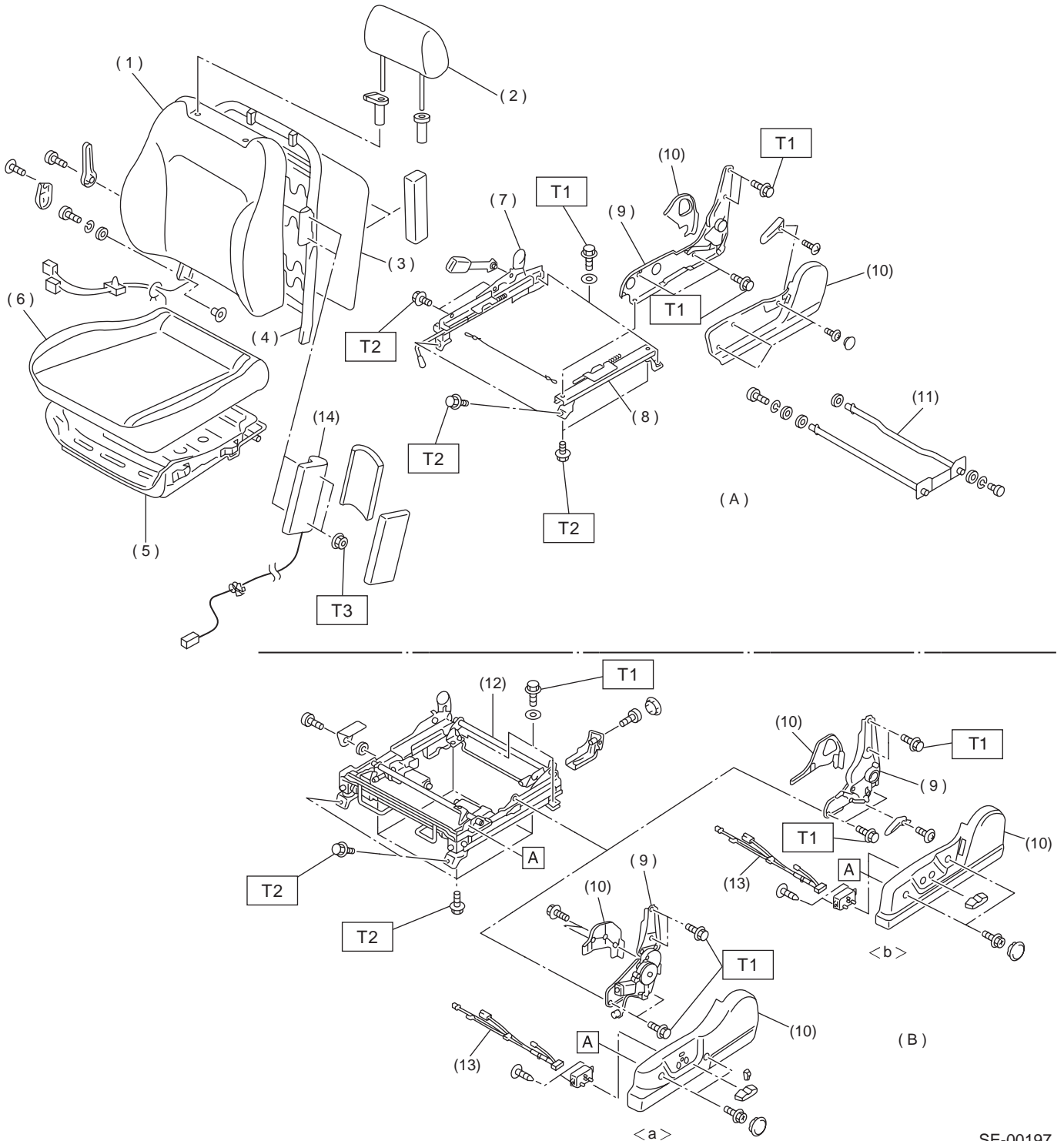
GENERAL DESCRIPTION

SEATS

1. General Description

A: COMPONENT

1. FRONT SEAT



SE-00197

GENERAL DESCRIPTION

SEATS

- | | |
|-----------------------------|---------------------------|
| (A) Standard seat | (6) Seat cushion pad |
| (B) Power seat | (7) Slide rail inner ASSY |
| (a) 8-way power seat | (8) Slide rail outer ASSY |
| (b) 6-way power seat | (9) Hinge ASSY |
| (1) Seat back pad | (10) Hinge cover |
| (2) Headrest | (11) Rod |
| (3) Seat back board | (12) Slide and unit ASSY |
| (4) Seat back frame ASSY | (13) Power seat harness |
| (5) Seat cushion frame ASSY | (14) Side airbag module |

Tightening troque: N-m (kgf-m, ft-lb)

T1: 30 (3.1, 22)

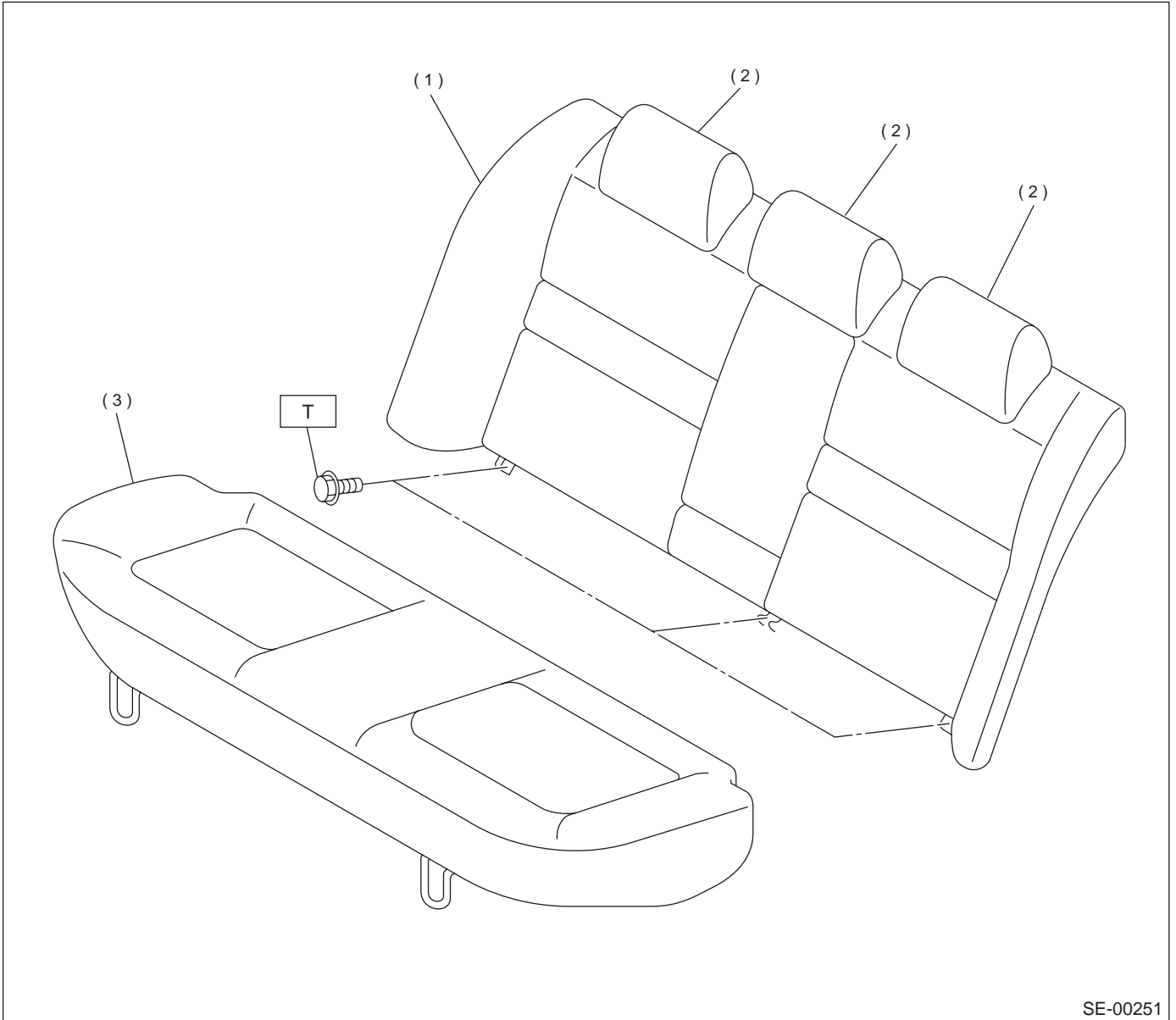
T2: 53 (5.4, 39)

T3: 10 (1.0, 7)

GENERAL DESCRIPTION

SEATS

2. REAR SEAT (SEDAN)



SE-00251

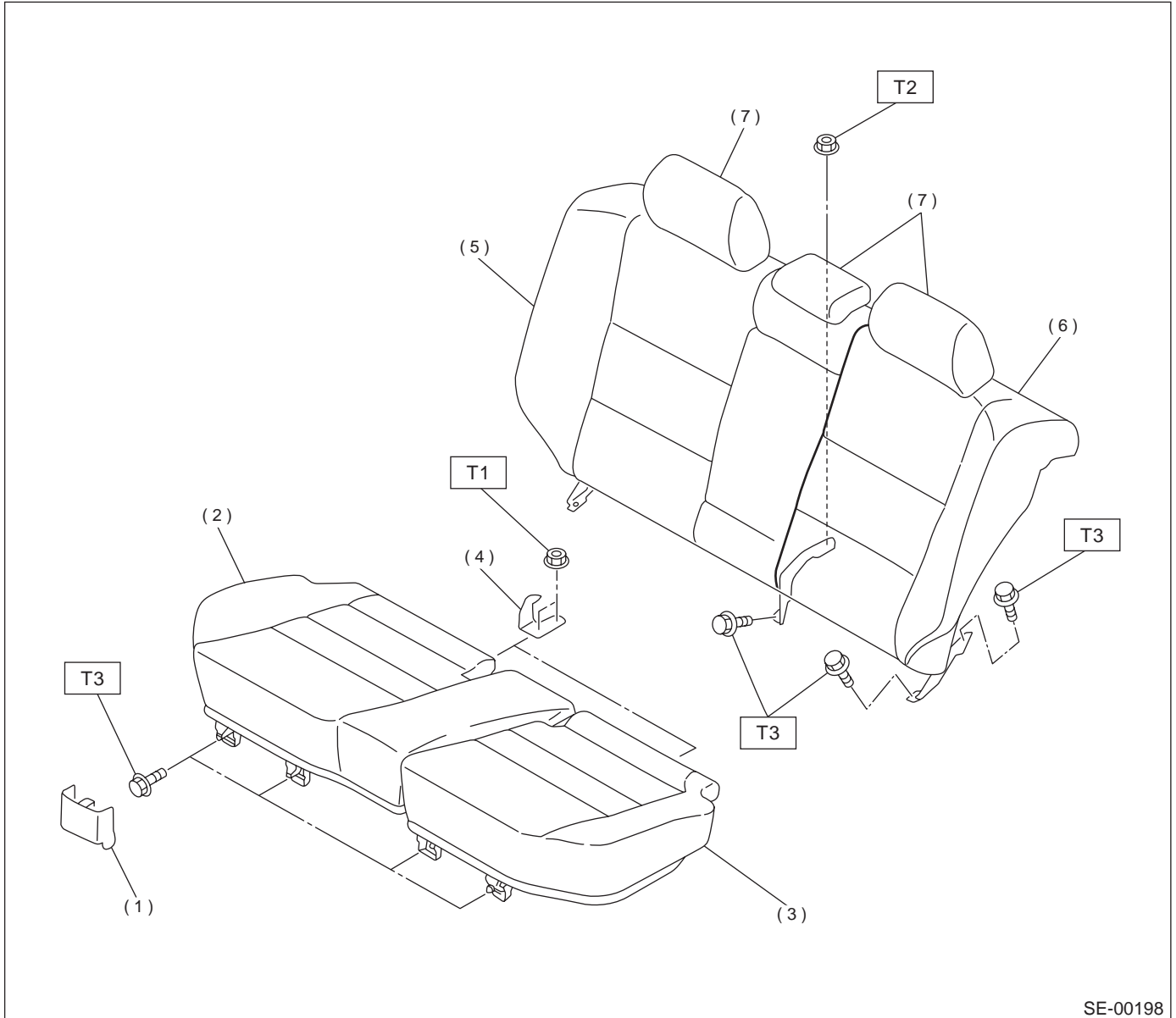
- (1) Backrest
- (2) Head restraint

- (3) Cushion

Tightening torque: N·m (kgf·m, ft·lb)

T: 24.5 (2.50, 18.1)

3. REAR SEAT (WAGON)



SE-00198

- | | |
|----------------|--------------------|
| (1) Cover | (5) Backrest RH |
| (2) Cushion RH | (6) Backrest LH |
| (3) Cushion LH | (7) Head restraint |
| (4) Hook | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 10 (1.0, 7.2)

T2: 24.5 (2.50, 18.1)

T3: 33 (3.40, 24.1)

GENERAL DESCRIPTION

SEATS

B: CAUTION

When removing front seat from a side airbag loaded vehicle, follow cautions given in the airbag section.

C: PREPARATION TOOL

1. GENERAL TOOL

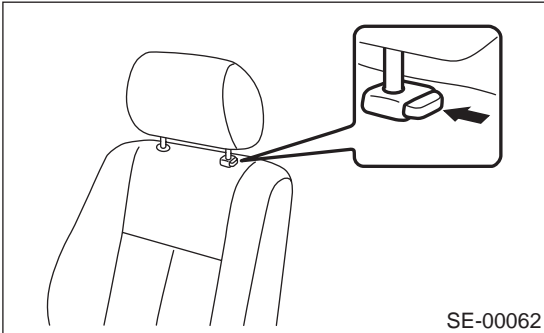
TOOL NAME	REMARKS
Long Nose Pliers	Used for removing and installing hog ring

2. Front Seat

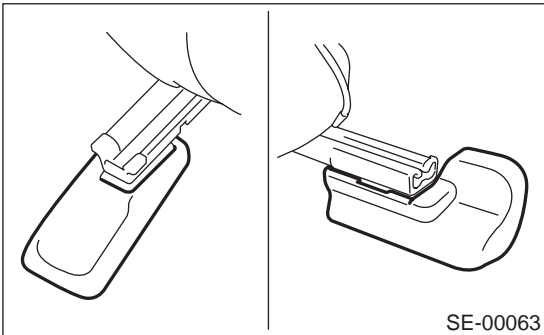
A: REMOVAL

1. STANDARD SEAT

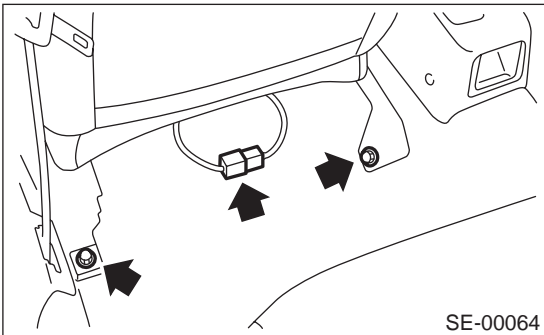
- 1) Disconnect ground cable from battery.
- 2) While pressing headrest lock button, remove headrest.



- 3) Tilt forward backrest.
- 4) Move seat to full front end.
- 5) Remove bolt cover at rear end of slide rail.

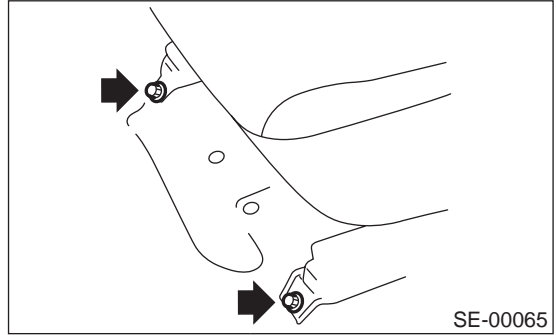


- 6) Disconnect side airbag connector under the seat. (Side airbag equipped seat)
- 7) Disconnect connectors of seat heater and seat belt warning. (Seat heater equipped seat)
- 8) Remove two bolts at rear side of seat rail.



- 9) Move seat to full rear end.

- 10) Remove two bolts at front side of seat rail.



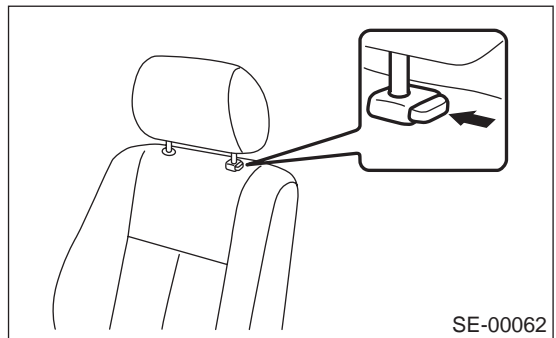
- 11) Remove front seat from vehicle.

CAUTION:

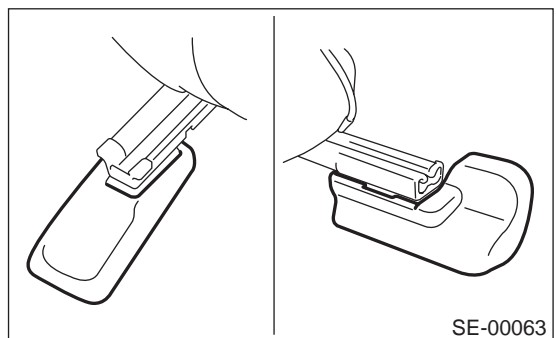
When removing seat from vehicle, take care not to damage body, seat, or trim.

2. POWER SEAT

- 1) While pressing headrest lock button, remove headrest.



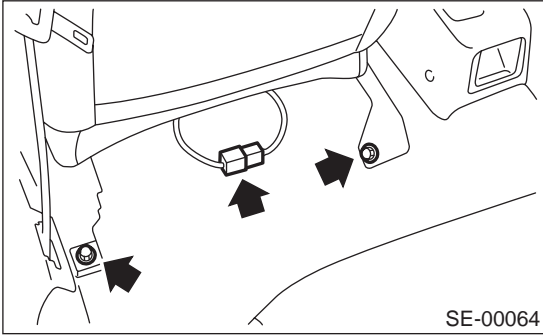
- 2) Tilt forward backrest.
- 3) Move seat to full front end.
- 4) Remove bolt cover at rear end of slide rail.



FRONT SEAT

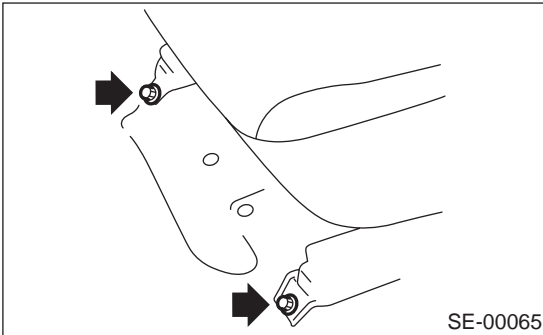
SEATS

5) Remove two bolts at rear side of seat rail.



6) Move seat to full rear end.

7) Remove two bolts at front side of seat rail.



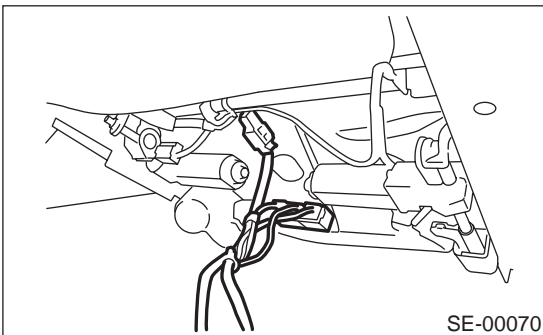
8) Disconnect ground cable from battery.

CAUTION:

- Wait for 20 seconds or more after disconnecting the battery.
- The airbag system has a backup power source. The airbag might deploy if you do not wait for 20 seconds or more before starting.

9) Disconnect side airbag connector under the seat. (Side airbag equipped seat)

10) Disconnect connectors of seat heater and seat belt warning. (Seat heater equipped seat)

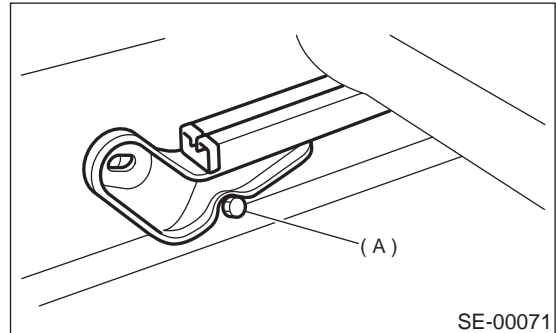


11) Remove front seat from vehicle.

B: INSTALLATION

1. STANDARD SEAT

- 1) Install in the reverse order of removal.
- 2) Place slide rail rear inner on location bolts (A).



3) Tighten the four bolts of slide rail.

NOTE:

Confirm that seat can move smoothly and be locked securely at any position.

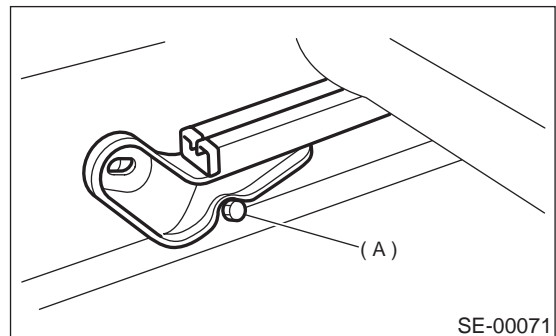
Tightening torque:

Refer to **COMPONENT** in **General Description**.

<Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

2. POWER SEAT

- 1) Install in the reverse order of removal.
- 2) Place slide rail rear inner on location bolts (A).



3) Tighten the four bolts of slide rail.

NOTE:

Confirm that seat can move smoothly.

Tightening torque:

Refer to **COMPONENT** in **General Description**.

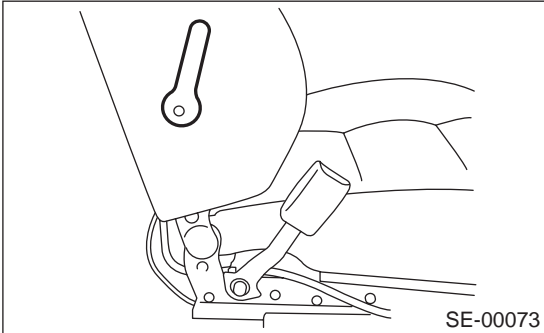
<Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

C: DISASSEMBLY

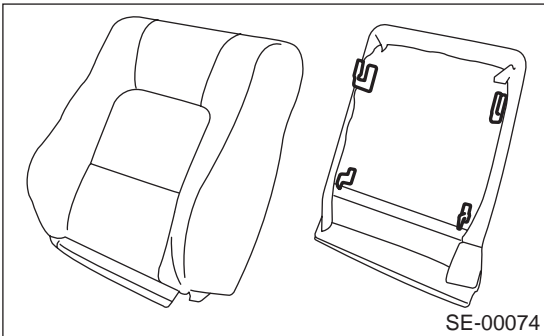
1. STANDARD SEAT

1) Remove seats from vehicle. <Ref. to SE-7, REMOVAL, Front Seat.>

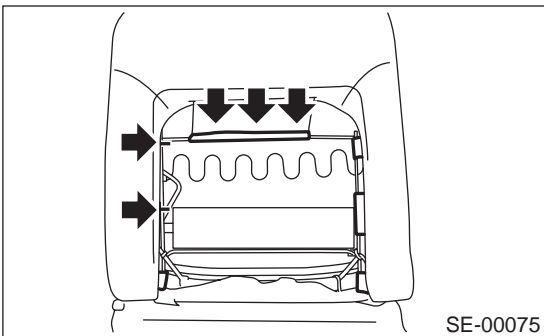
2) Remove lumbar lever cover.



3) Remove hook at bottom, and then remove seat back board.

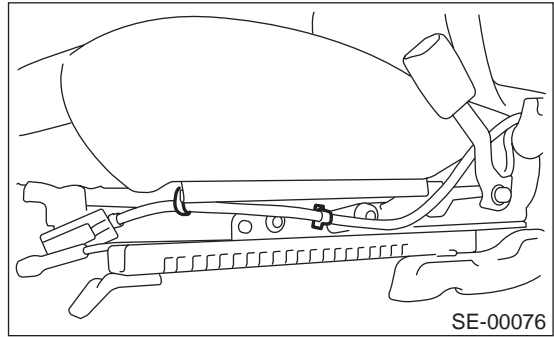


4) Remove hook on back side of seat, and remove hog rings using a plier.

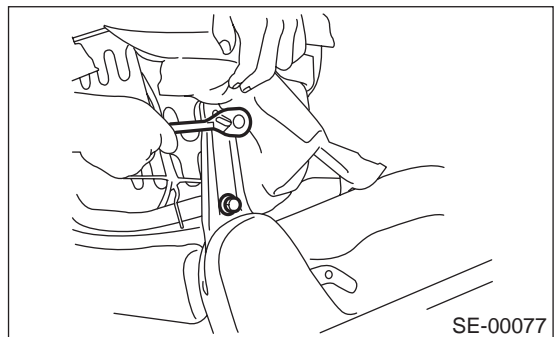


5) Remove clamp of side airbag wire harness. (Side airbag equipped seat)

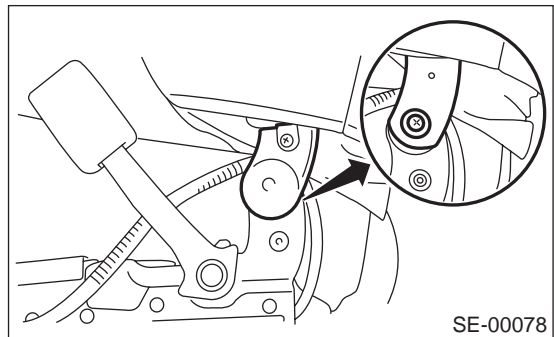
6) Remove clamp of seat heater wire harness. (Seat heater equipped seat)



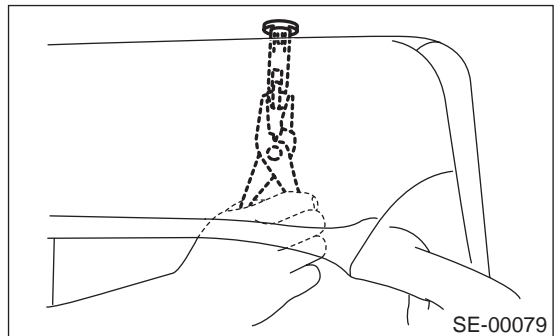
7) Turn cover and cushion, and remove the two bolts from hinge.



8) Remove hinge screw cover and screws, and remove seat back from hinge.



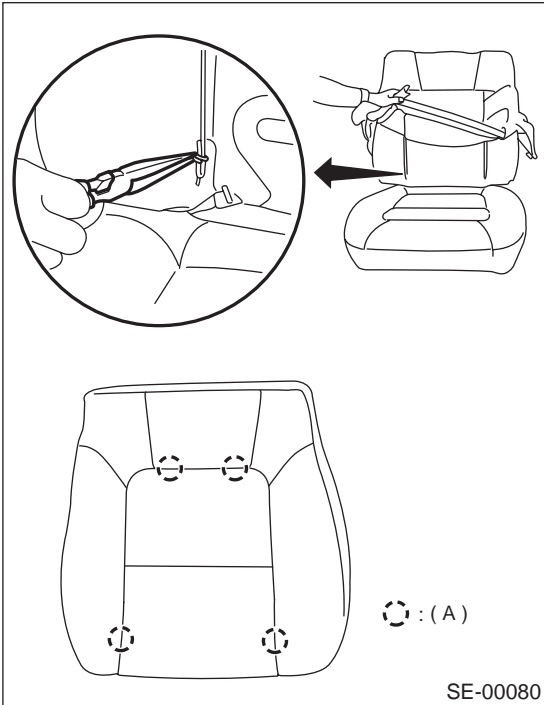
9) While picking up tip with a plier, remove head-rest lock bushing.



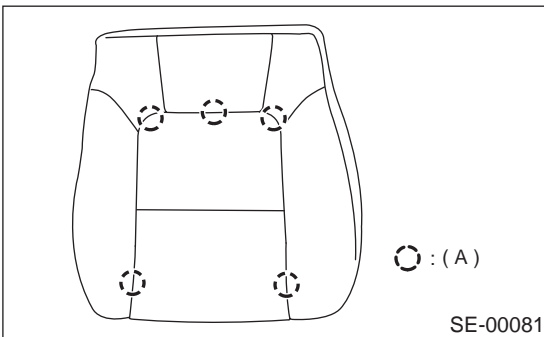
FRONT SEAT

SEATS

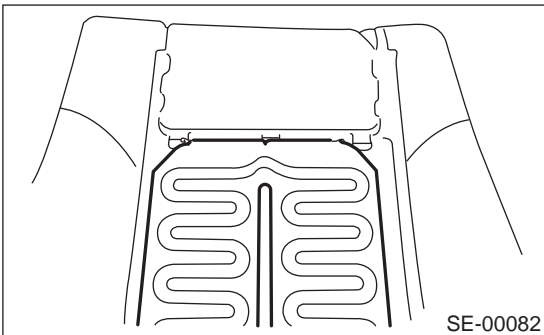
10) Remove hog ring (A) on front face of seat.



Side airbag equipped seat:



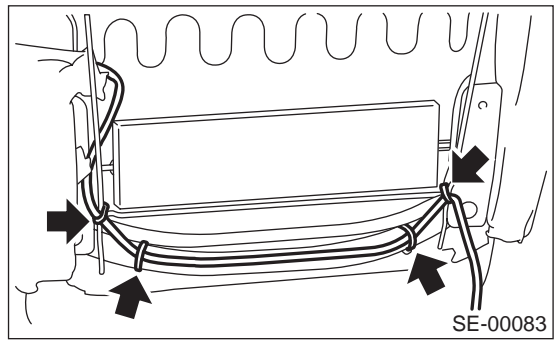
11) Remove hog rings (A), and then remove seat heater. (Seat heater equipped seat)



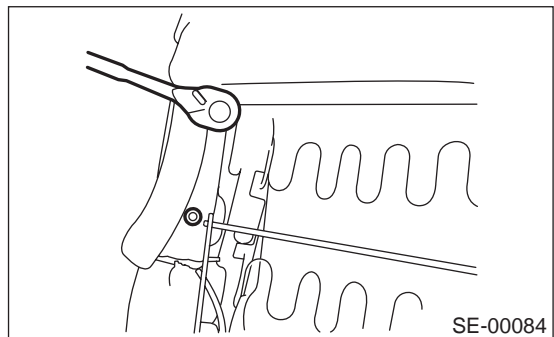
12) Remove seat cover.

13) Remove backrest pad.

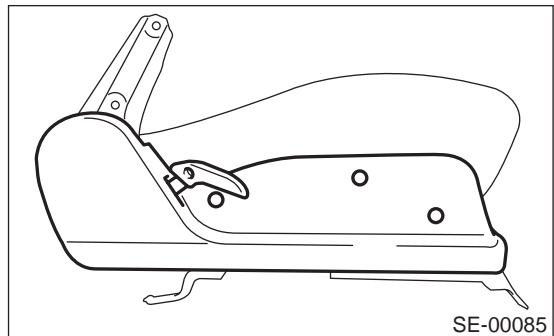
14) Remove clamp of airbag wire harness on back side of seat. (Side airbag equipped seat)



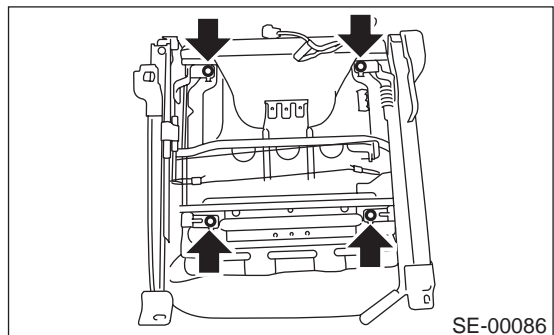
15) Remove the two cap nuts, and then remove side airbag module assembly. (Side airbag equipped seat)



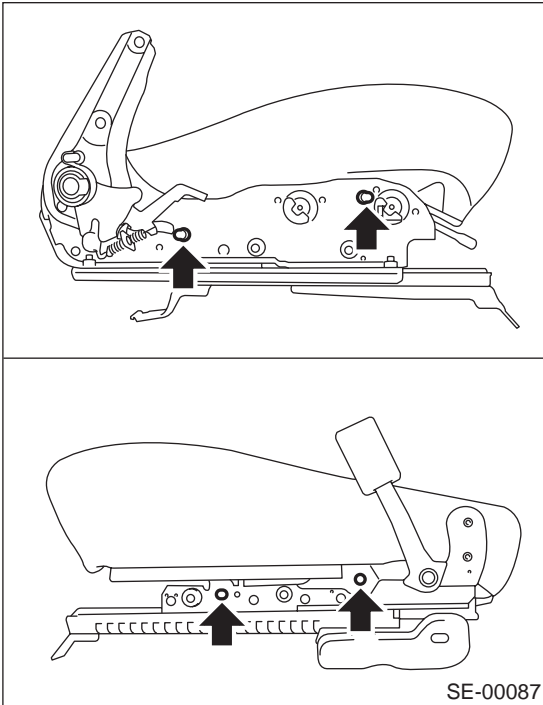
16) Remove reclining cover and hinge cover. (Non-tilt type seat)



17) Remove the 4 bolts of seat hinge assembly, and then remove seat cushion. Tilt type seat:

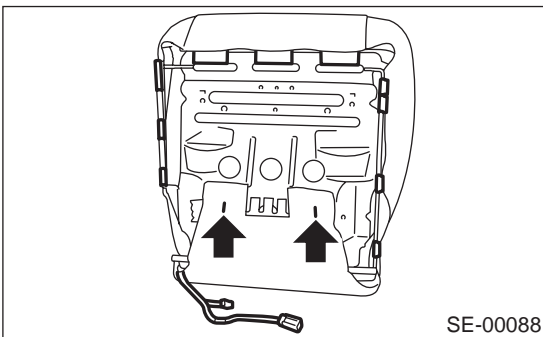


Non-tilt type seat:



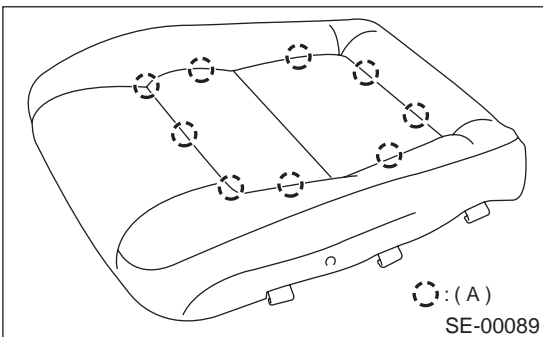
18) Remove hook clips on back side of seat cushion, and remove wire rings.

19) Remove clamp of seat heater wire harness. (Seat heater equipped seat)



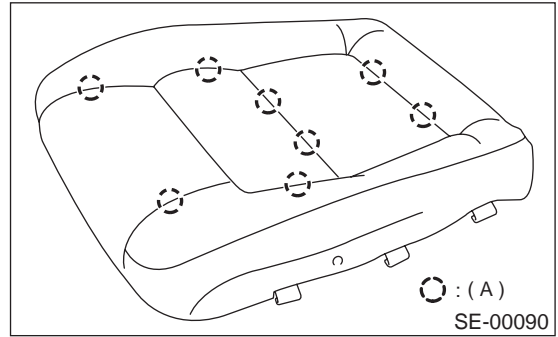
20) Remove hog rings (A).

Tilt type seat:



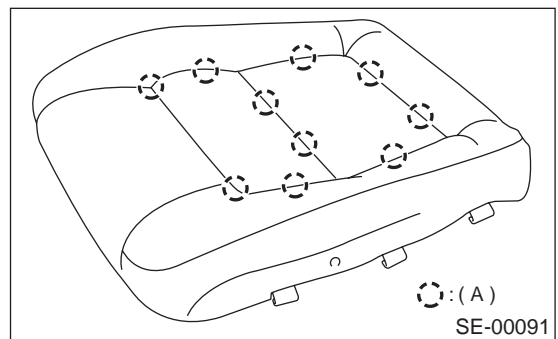
(A) Hog ring

Non-tilt type seat:



(A) Hog ring

Leather type seat:

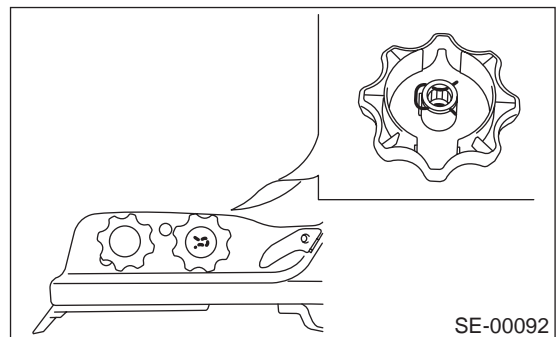


(A) Hog ring

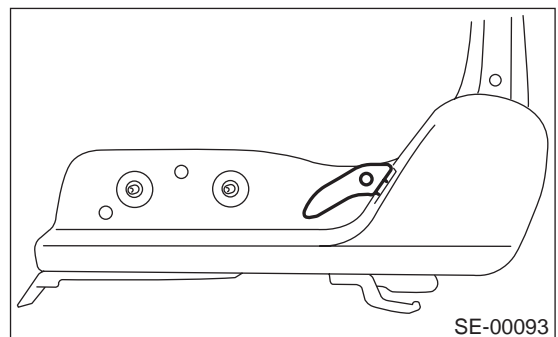
21) Remove cushion cover.

22) Remove cushion pad.

23) Remove clip pins, and remove seat lifter lever.



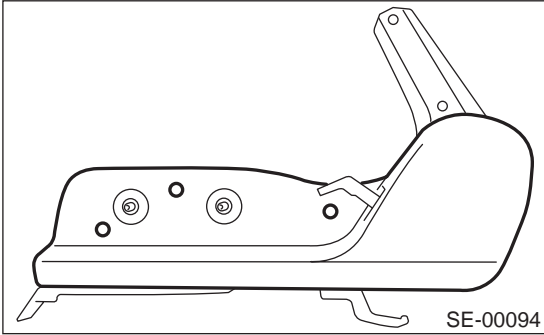
24) Remove reclining lever cover.



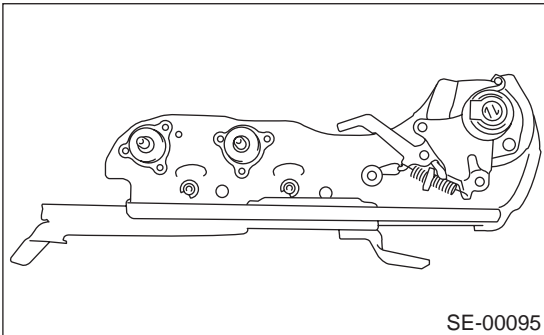
FRONT SEAT

SEATS

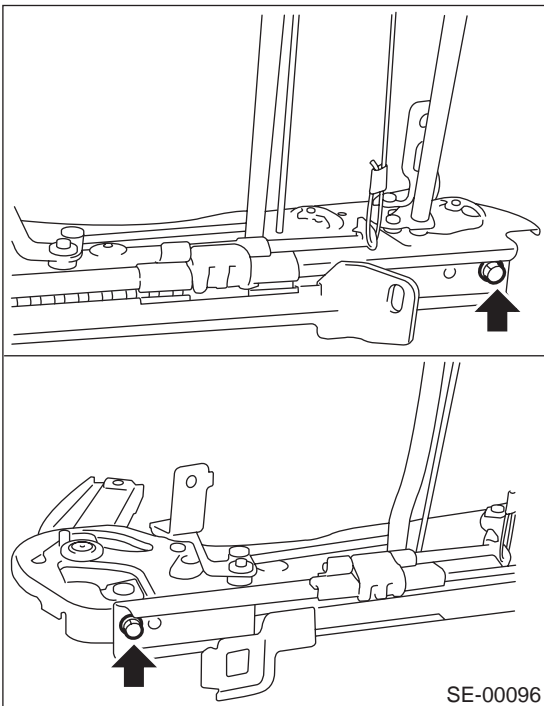
25) Remove hinge cover cap and screws.



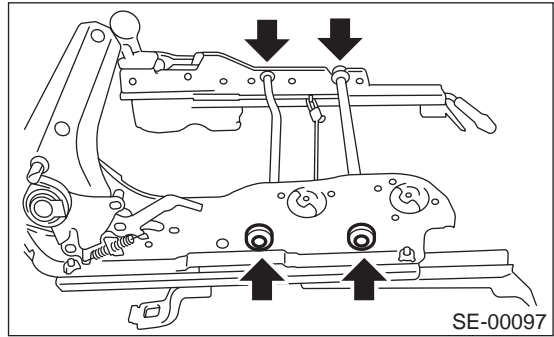
26) Remove seat hinge cover and hinge spring cover.



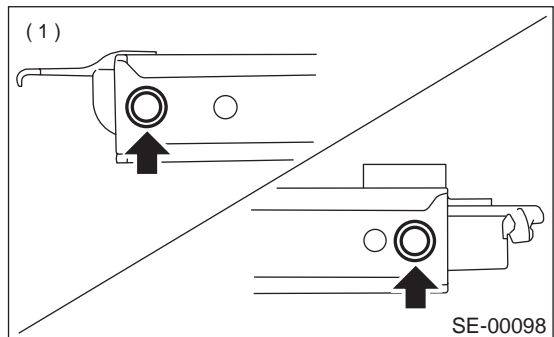
27) Remove 2 bolts, and then remove slide rail.



28) Remove 4 screws, and then remove hinge. (Non-tilt type seat)



29) Remove 2 bolts, and then remove slide rail. (Non-tilt type seat)



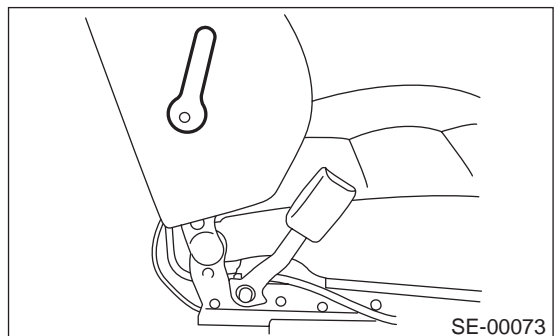
(1) Lower side of seat rail

30) Remove connecting wire.

2. POWER SEAT

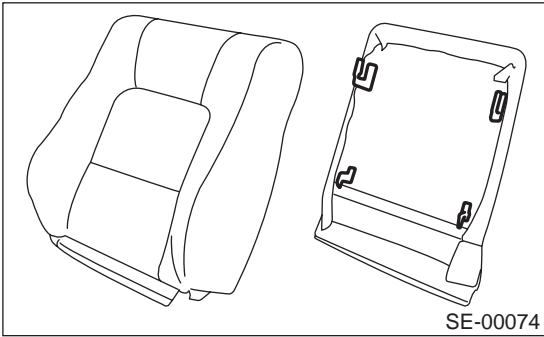
1) Remove seats from vehicle. <Ref. to SE-7, REMOVAL, Front Seat.>

2) Remove lumbar lever cover.

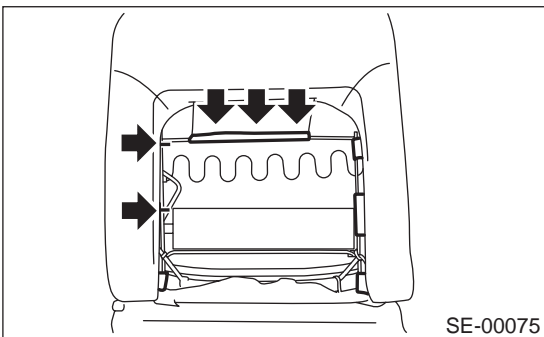


FRONT SEAT

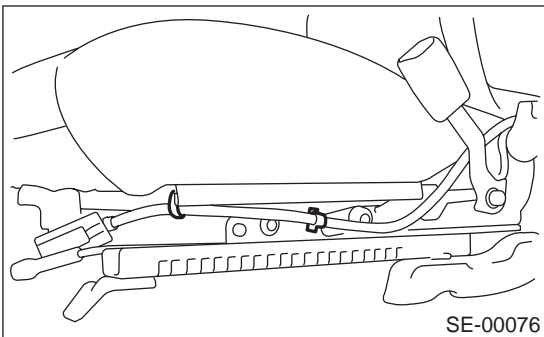
3) Remove hook at bottom, and then remove seat back board.



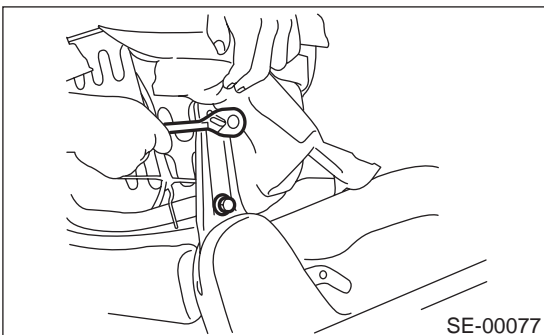
4) Remove hook on back side of seat, and remove wire rings using a plier.



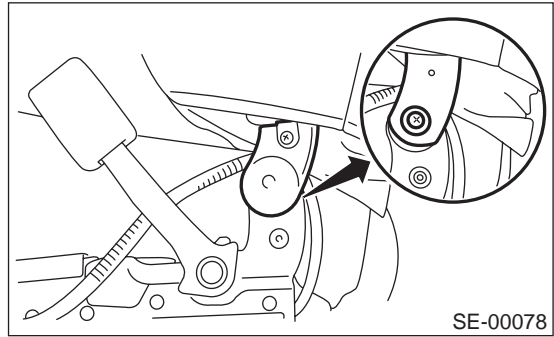
5) Remove clamp of side airbag wire harness.
(Side airbag equipped seat)
6) Remove clamp of seat heater wire harness.
(Seat heater equipped seat)



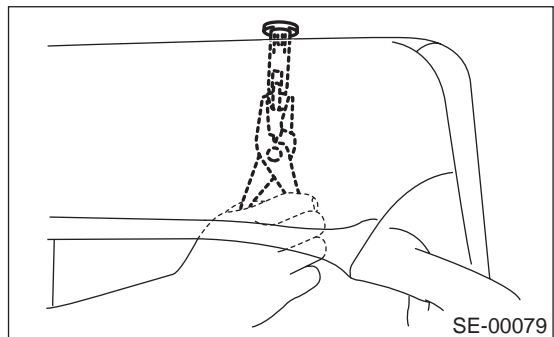
7) Turn cover and cushion, and remove the two bolts from hinge.



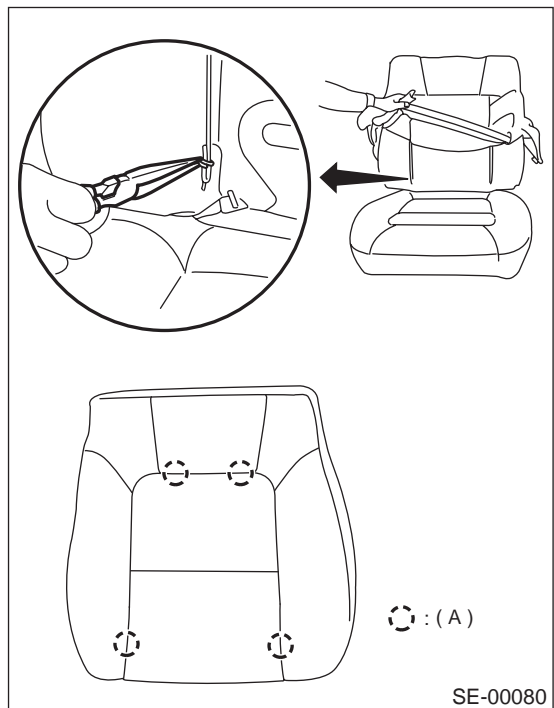
8) Remove hinge screw cover and screws, and remove seat back from hinge.



9) While picking up tip with a plier, remove head-rest lock bushing.



10) Remove hog ring (A) on front face of seat.

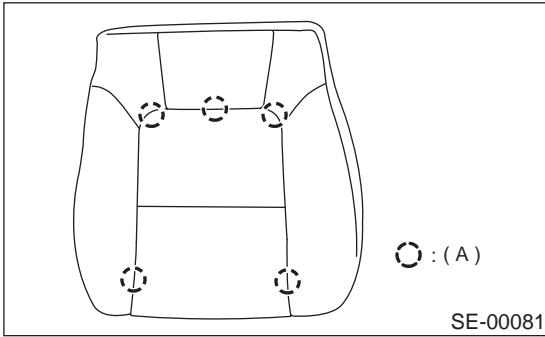


(A) Hog ring

FRONT SEAT

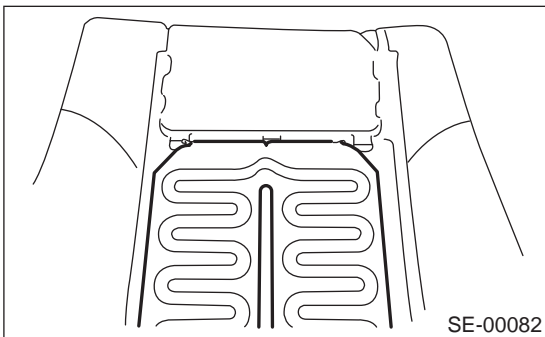
SEATS

Side airbag equipped seat:



(A) Hog ring

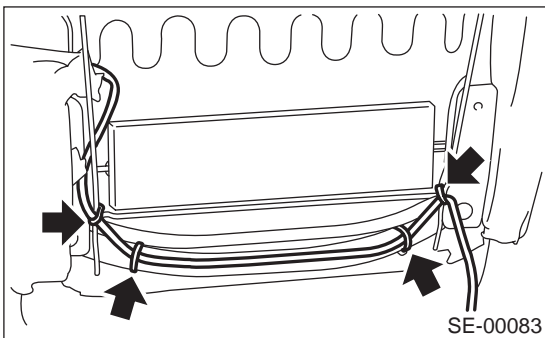
11) Remove hog rings (A), and then remove seat heater. (Seat heater equipped seat)



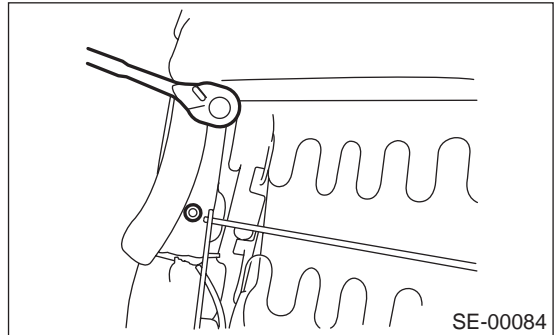
12) Remove seat cover.

13) Remove backrest pad.

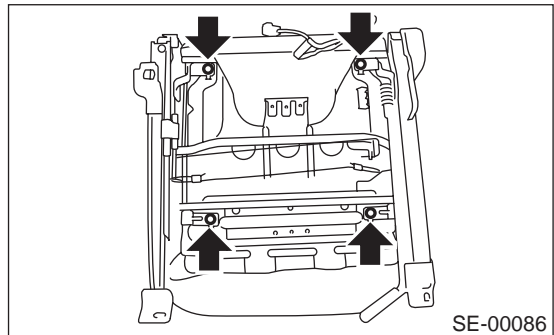
14) Remove clamp of airbag wire harness on back side of seat. (Side airbag equipped seat)



15) Remove the two cap nuts, and then remove side airbag module assembly. (Side airbag equipped seat)

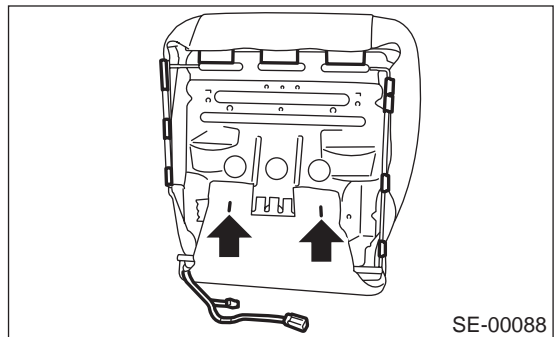


16) Remove the 4 bolts of seat hinge assembly, and then remove seat cushion.

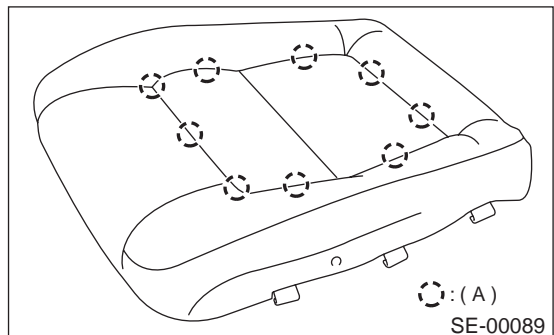


17) Remove hook clips on back side of seat cushion, and remove hog rings (A).

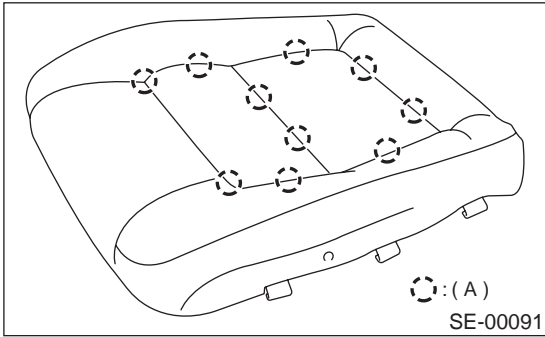
18) Remove clamp of seat heater wire harness. (Seat heater equipped seat)



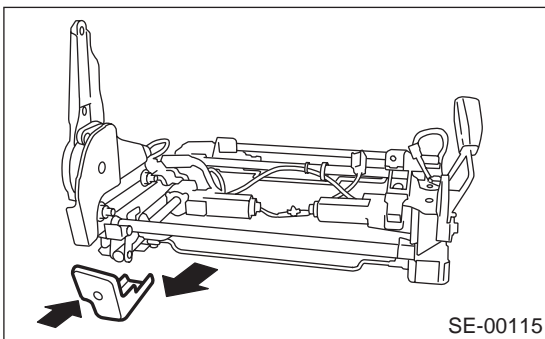
19) Remove hog rings (A).



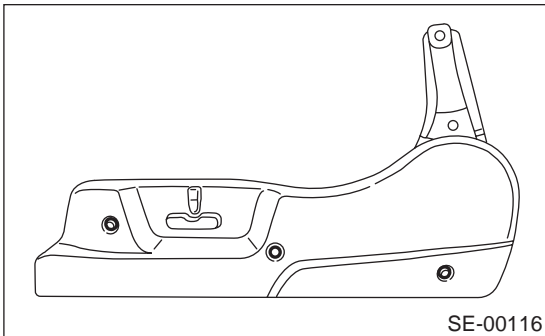
Leather type seat:



- 20) Remove cushion cover.
- 21) Remove cushion pad.
- 22) Remove the screw and then remove the cover.

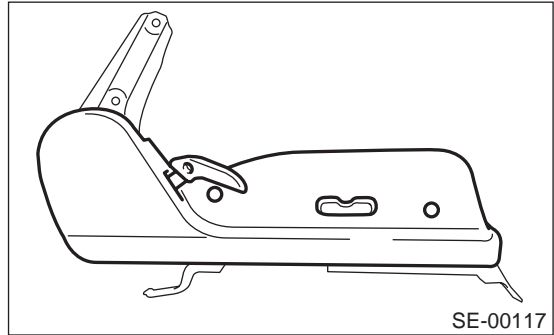


- 23) 8-way power seat:
- Remove the screw, disconnect the power seat switch connector on the underside of the cover, and remove the hinge cover.

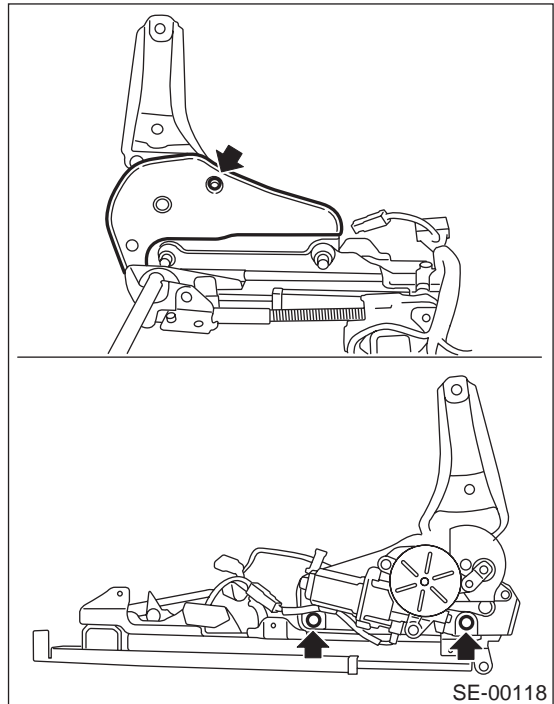


6-way power seat:

Remove the reclining lever cover and screw, disconnect the power seat switch connector on the underside of the cover, and remove the hinge cover.



- 24) Remove the cover on the underside of the seat hinge, remove the two bolts, and remove the seat hinge.



D: ASSEMBLY

1. STANDARD SEAT

1) Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.

2) Attach seat cover end hole to hinge inner. (Only non-tilt type standard seat)

2. POWER SEAT

1) Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.
- Make sure the connector is firmly connected.
- Make sure the wire harness is not pinched.

2) Attach seat cover end hole to hinge inner. (Only non-tilt type standard seat)

Tightening torque:

Refer to COMPONENT in General Description.

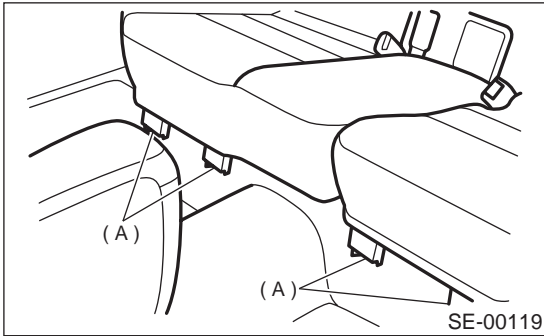
<Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

3. Rear Seat

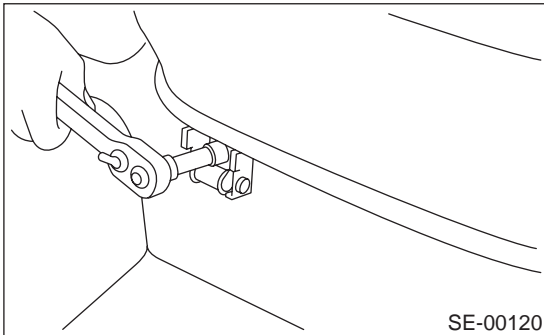
A: REMOVAL

1. WAGON

1) Raise the cushion, and then remove bolt covers (A).

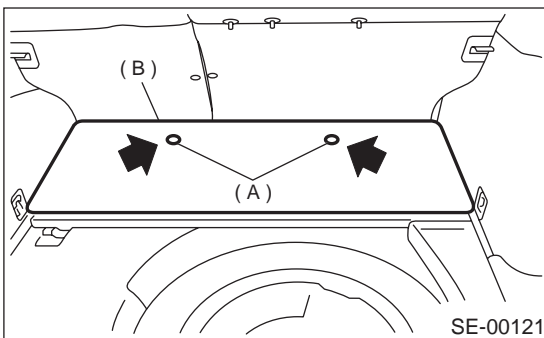


2) Remove bolts, and then remove rear seat cushion.

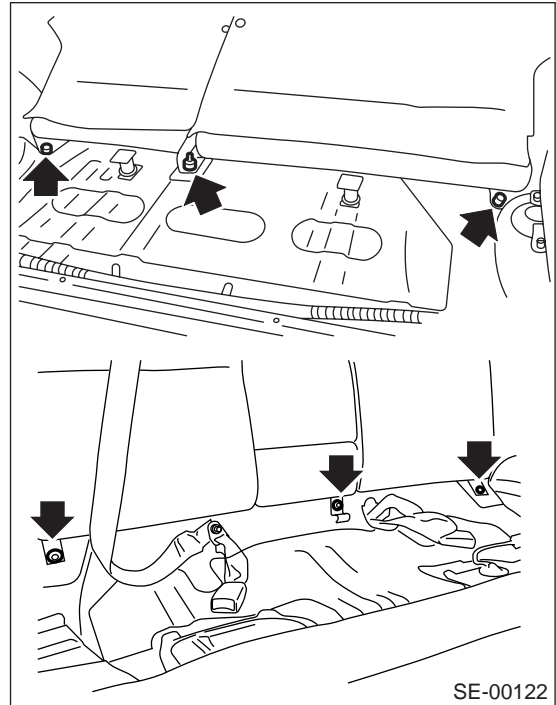


3) Remove headrest.

4) Remove clips, and then remove rear floor front mat.



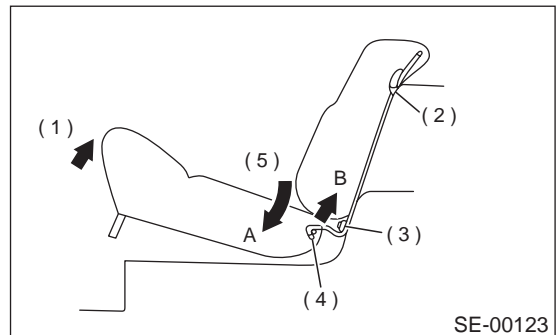
5) Remove bolts and nuts of bracket hinge.



6) Remove rear seat backrest.

2. SEDAN

1) Slightly raise front of cushion while pushing down on cushion in the direction of "A". With cushion held in that position, move it forward until it is unhooked.

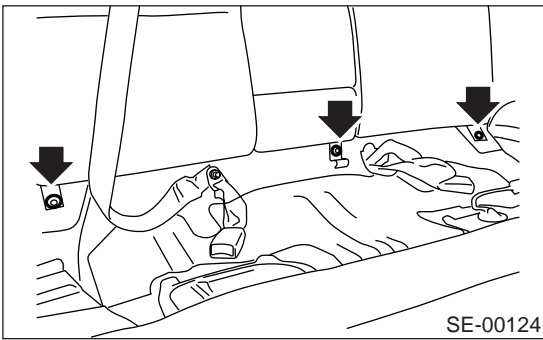


- (1) Raise
- (2) Hook
- (3) Attaching bolt
- (4) Hook
- (5) Push

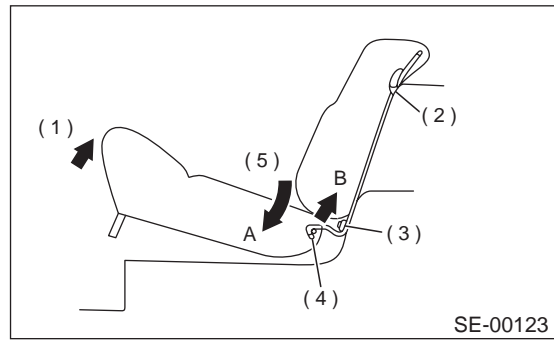
REAR SEAT

SEATS

2) Remove bolts securing lower portion of backrest and then open the center trunk through lid.



3) Hook and fasten the seat cushion to the hook on the lower part of the rear seat backrest.



3) Lift rear seat backrest and then remove it.

B: INSTALLATION

1. WAGON

1) Install in the reverse order of removal.

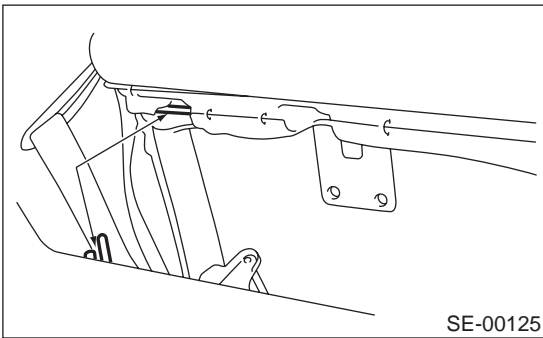
Tightening torque:

Refer to **COMPONENT** in *General Description*.

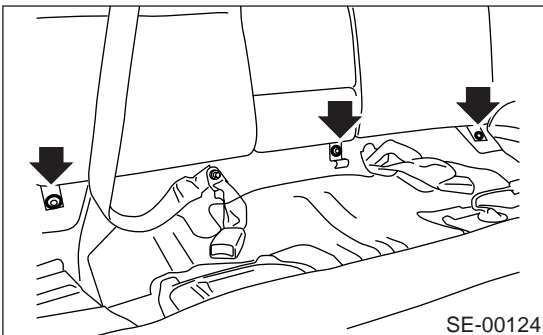
<Ref. to SE-5, REAR SEAT (WAGON), COMPONENT, GENERAL DESCRIPTION.>

2. SEDAN

1) Hook and fasten the upper-back side of the rear seat backrest to the body hook.



2) Tighten the bolt and install the backrest.



- (1) Raise
- (2) Hook
- (3) Attaching bolt
- (4) Hook
- (5) Push

Tightening torque:

Refer to **COMPONENT** in *General Description*.

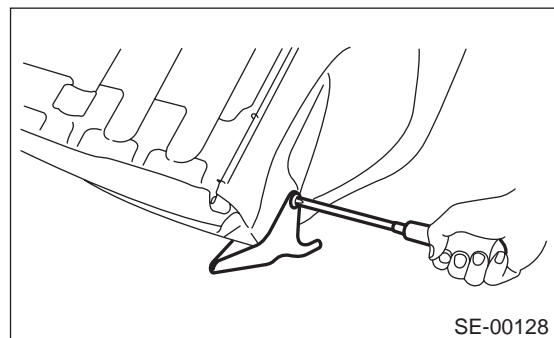
<Ref. to SE-4, REAR SEAT (SEDAN), COMPONENT, General Description.>

C: DISASSEMBLY

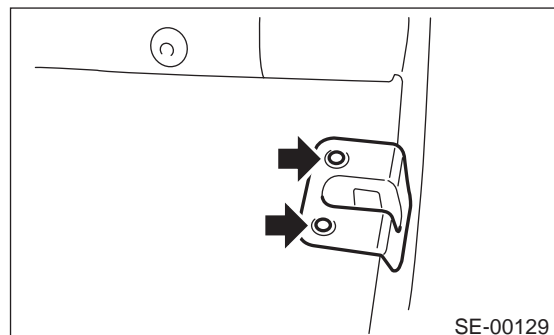
1. WAGON

1) Remove rear seat. <Ref. to SE-17, REMOVAL, Rear Seat.>

2) Remove bolts, and then remove bracket hinge.

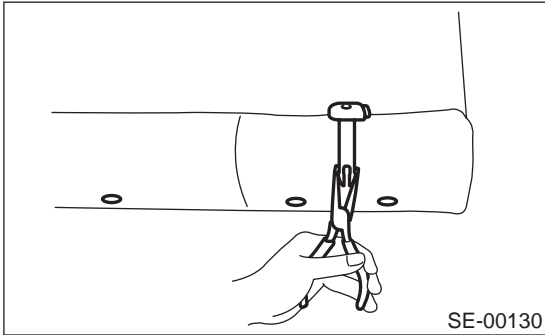


3) Remove rear backrest lock cover.

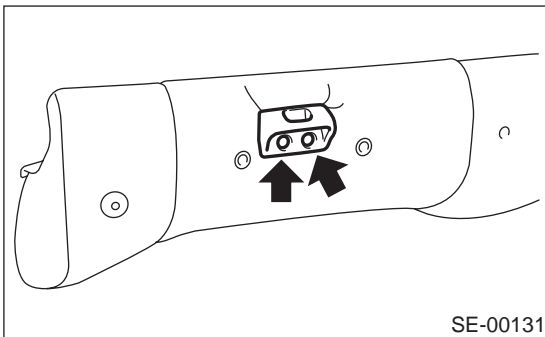


4) While turning counterclockwise rear backrest knob, remove it.

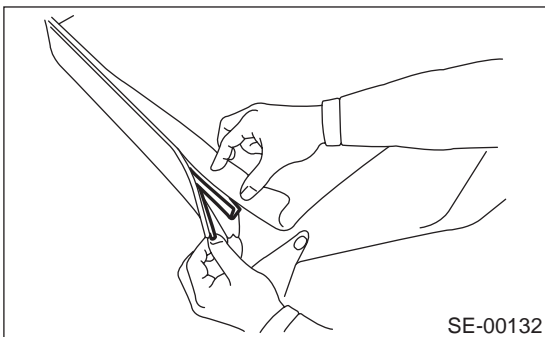
5) While picking up tip with pliers, remove headrest lock bushings.



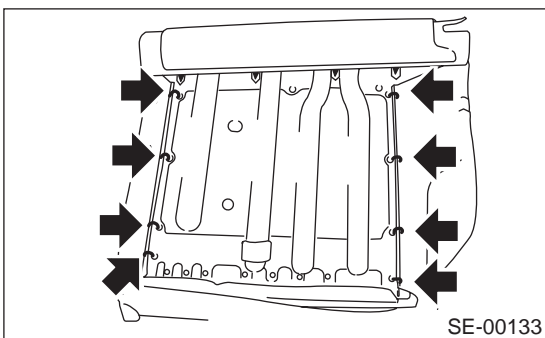
6) Remove backrest hook.



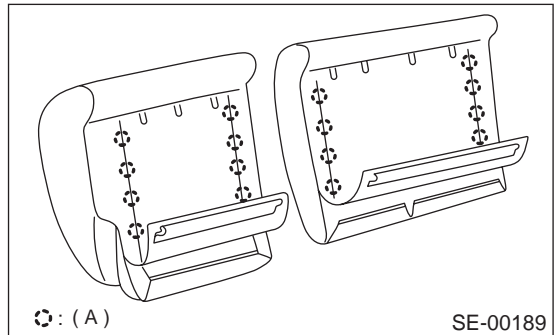
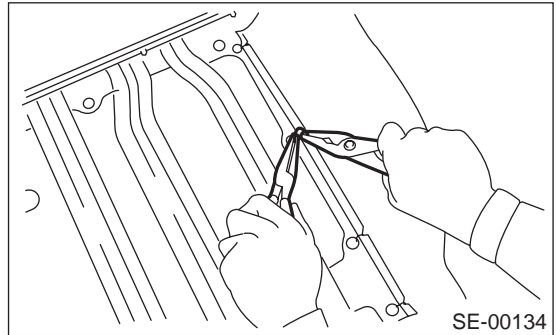
7) Remove hook at bottom.



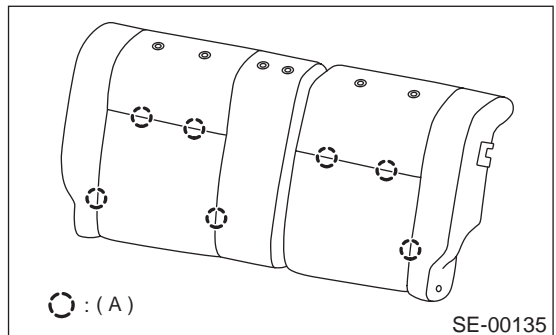
8) Remove 4 pawls.



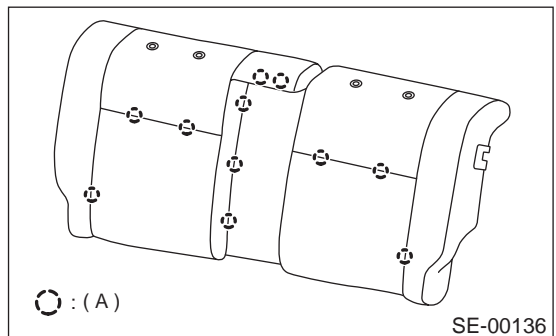
9) Remove 8 hog rings (A).



10) Remove the hog rings (A) on front side of cushion pad.



Armrest-equipped seat:

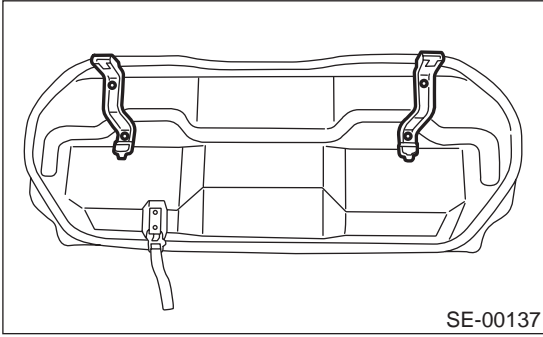


11) Remove cover. When disassembly of rear seat cushion is required, proceed to the following steps.

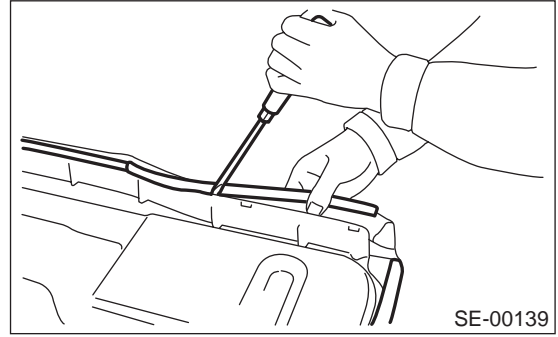
REAR SEAT

SEATS

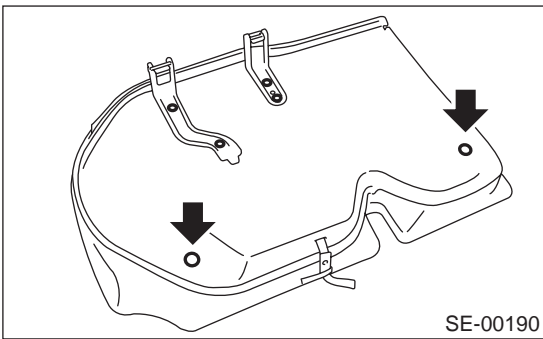
12) Remove bolts, and then remove cushion hinge.



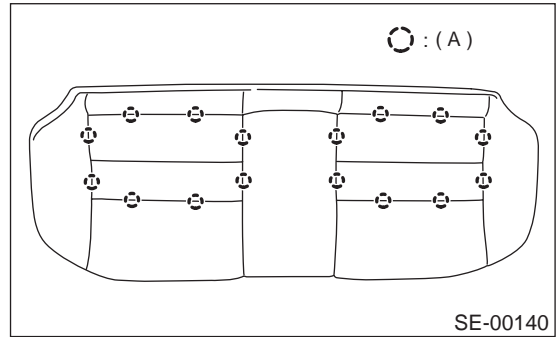
15) Remove hook, and then remove frame.



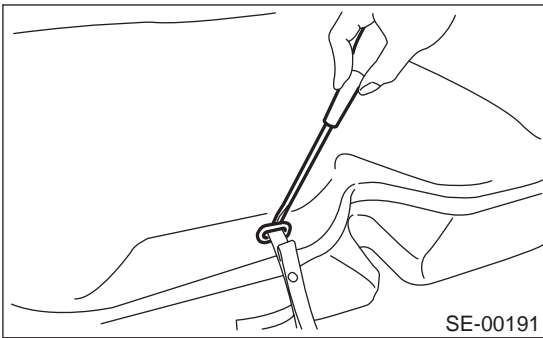
Separated-type seat:
Remove clips. Remove bolts, and then remove cushion hinge.



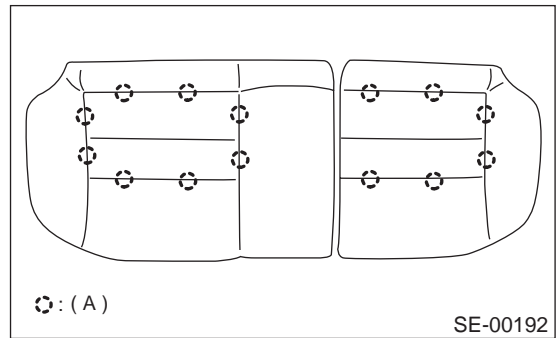
16) Remove hog rings (A), and then remove cover.



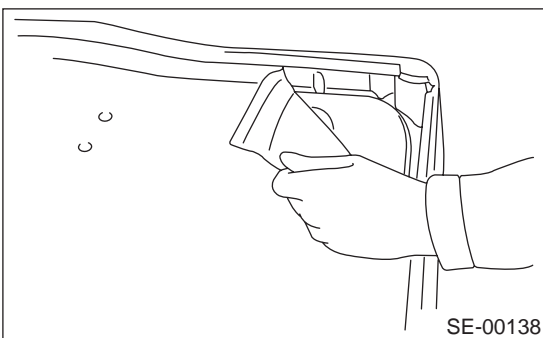
13) Remove bezel.



Separated-type seat:

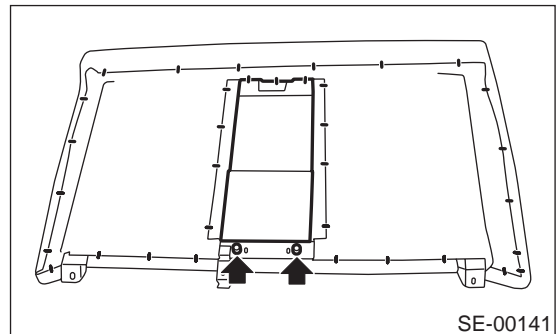


14) Remove rear cushion mat.



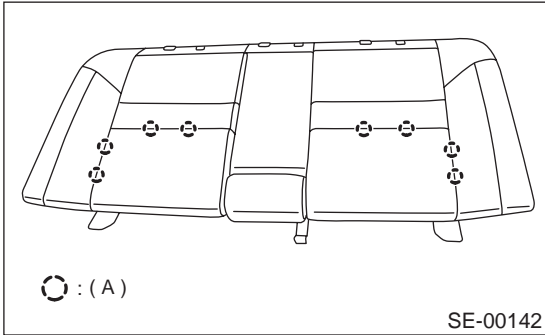
2. SEDAN

- 1) Remove the rear seat from the vehicle. <Ref. to SE-17, REMOVAL, Rear Seat.>
- 2) Remove the hog rings from around the seat backrest.
- 3) Remove the two nuts and remove the armrest assembly.

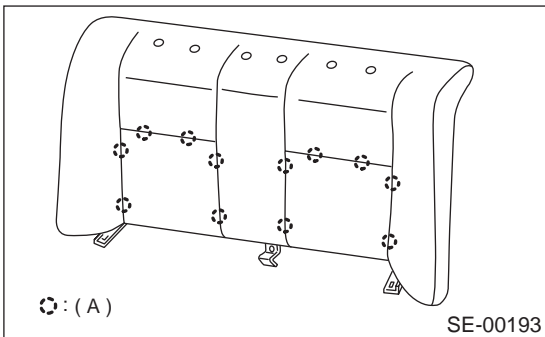


4) Remove the hog rings (A), and then remove the seat cover.

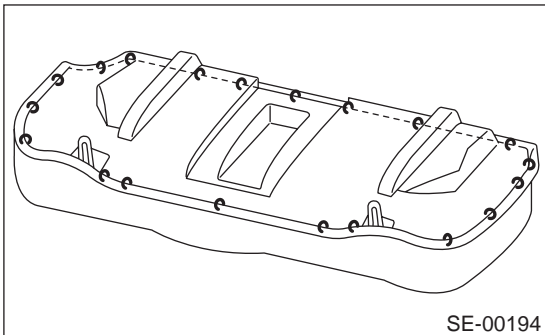
Armrest through-equipped seat:



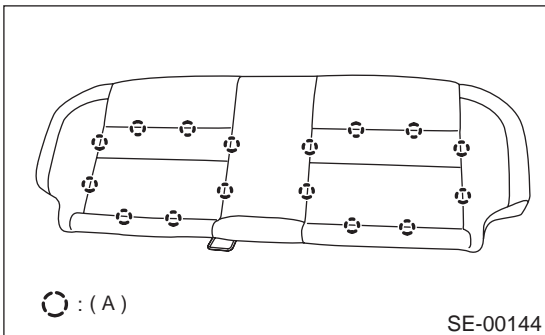
Unified-type seat:



5) Remove the hog rings around the seat cushion.



6) Remove the hog rings (A), and then remove the seat cover



D: ASSEMBLY

1. WAGON

1) Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage cover.
- While installing wire rings, prevent seat from getting wrinkled.

2. SEDAN

1) Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage cover.
- While installing wire rings, prevent seat from getting wrinkled.

REAR SEAT

SEATS

MEMO:

SECURITY AND LOCKS

SL

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GENERAL DESCRIPTION

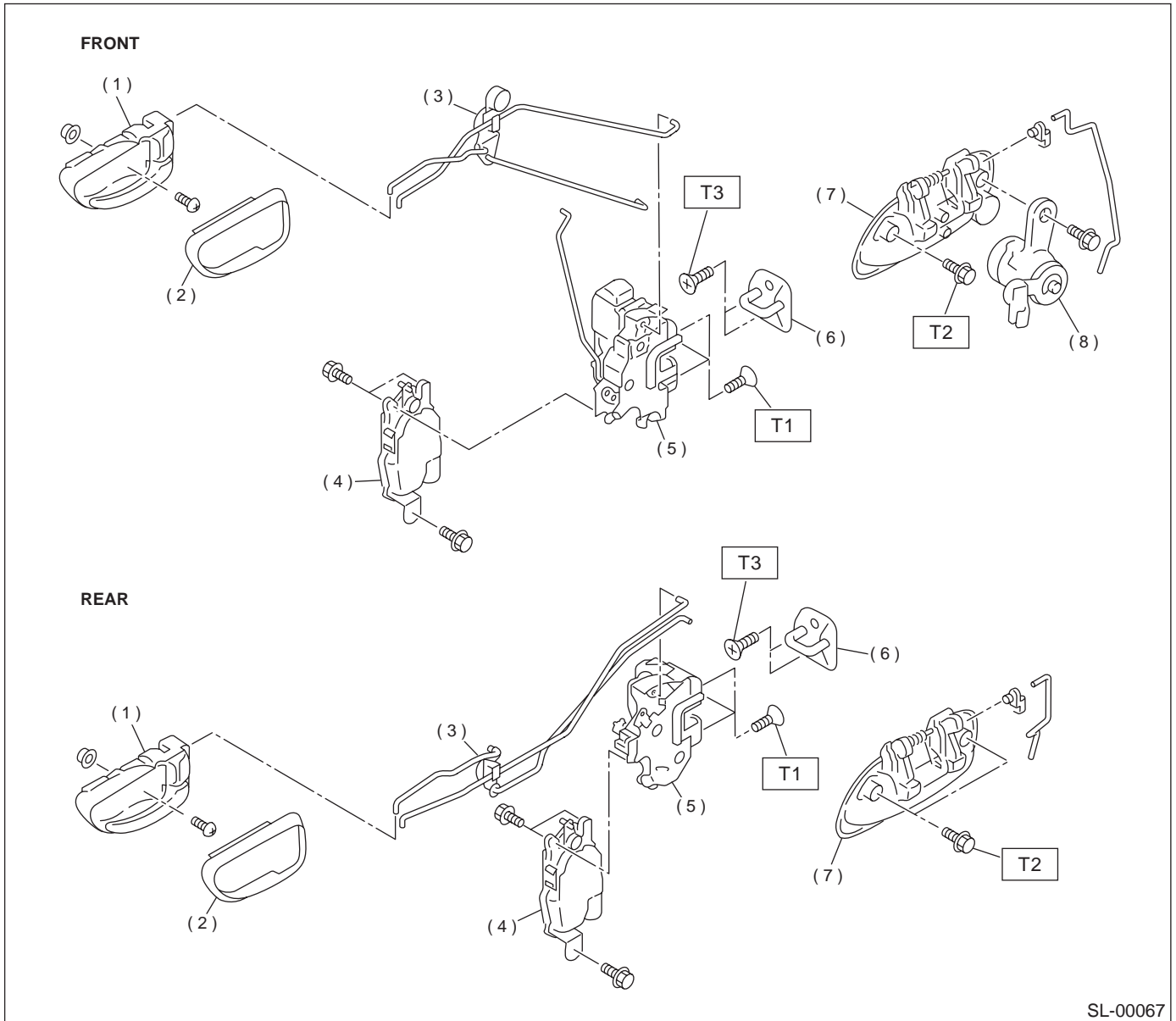
SECURITY AND LOCKS

1. General Description

A: SPECIFICATIONS

B: COMPONENT

1. DOOR LOCK ASSEMBLY



SL-00067

- | | |
|-----------------------------|-----------------------|
| (1) Inner remote ASSY | (6) Striker |
| (2) Inner remote cover | (7) Door outer handle |
| (3) Bell crank | (8) Key cylinder |
| (4) Auto-door lock actuator | |
| (5) Door latch | |

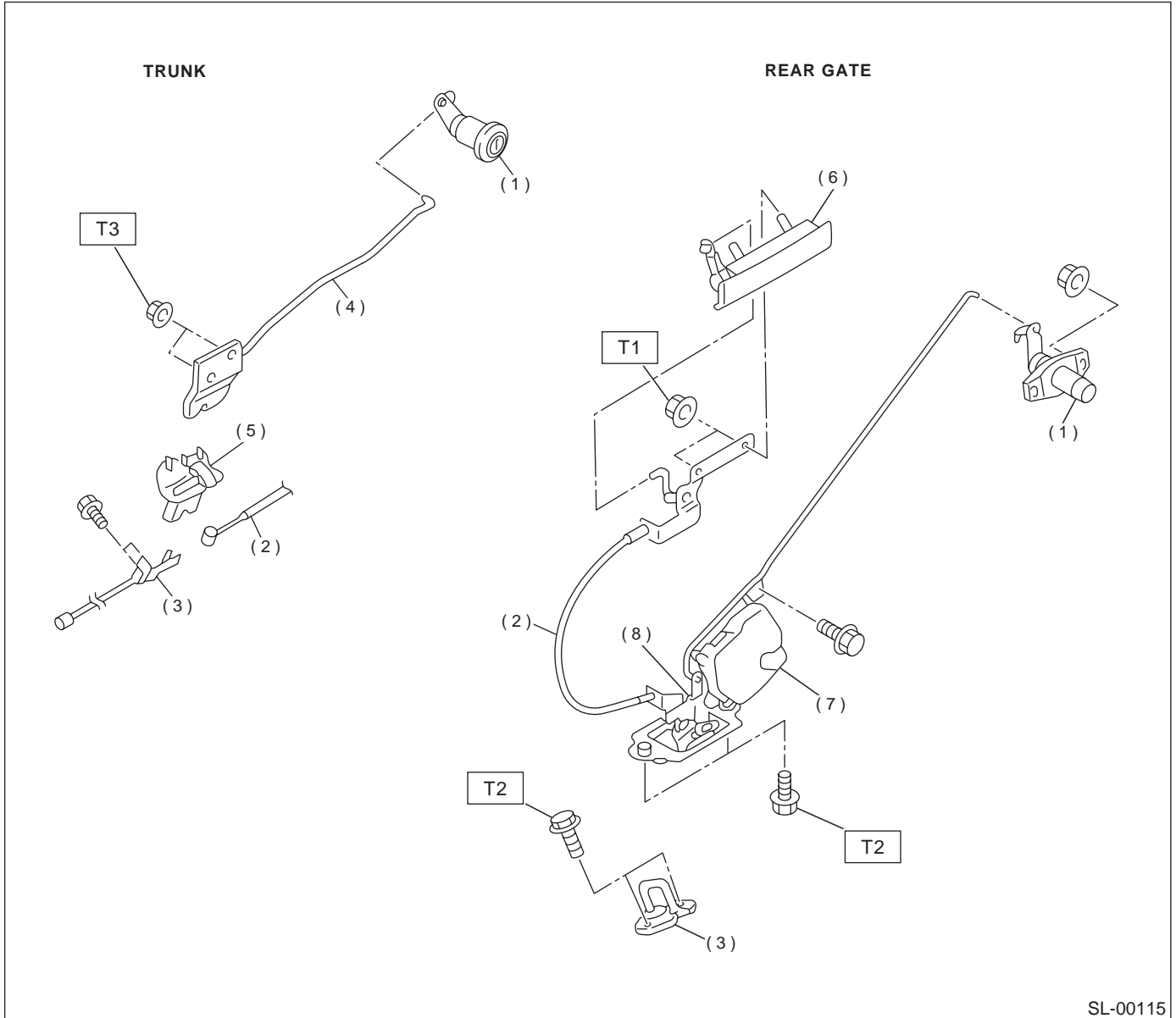
Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.4 (0.65, 4.7)

T2: 7.35 (0.75, 5.4)

T3: 18.0 (1.8, 13.0)

2. TRUNK LID AND REAR GATE LOCK



- (1) Key cylinder
- (2) Cable
- (3) Striker
- (4) Trunk lid lock ASSY
- (5) Trunk lid lock cover

- (6) Rear gate outer handle
- (7) Rear gate actuator
- (8) Rear gate latch

Tightening torque: N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

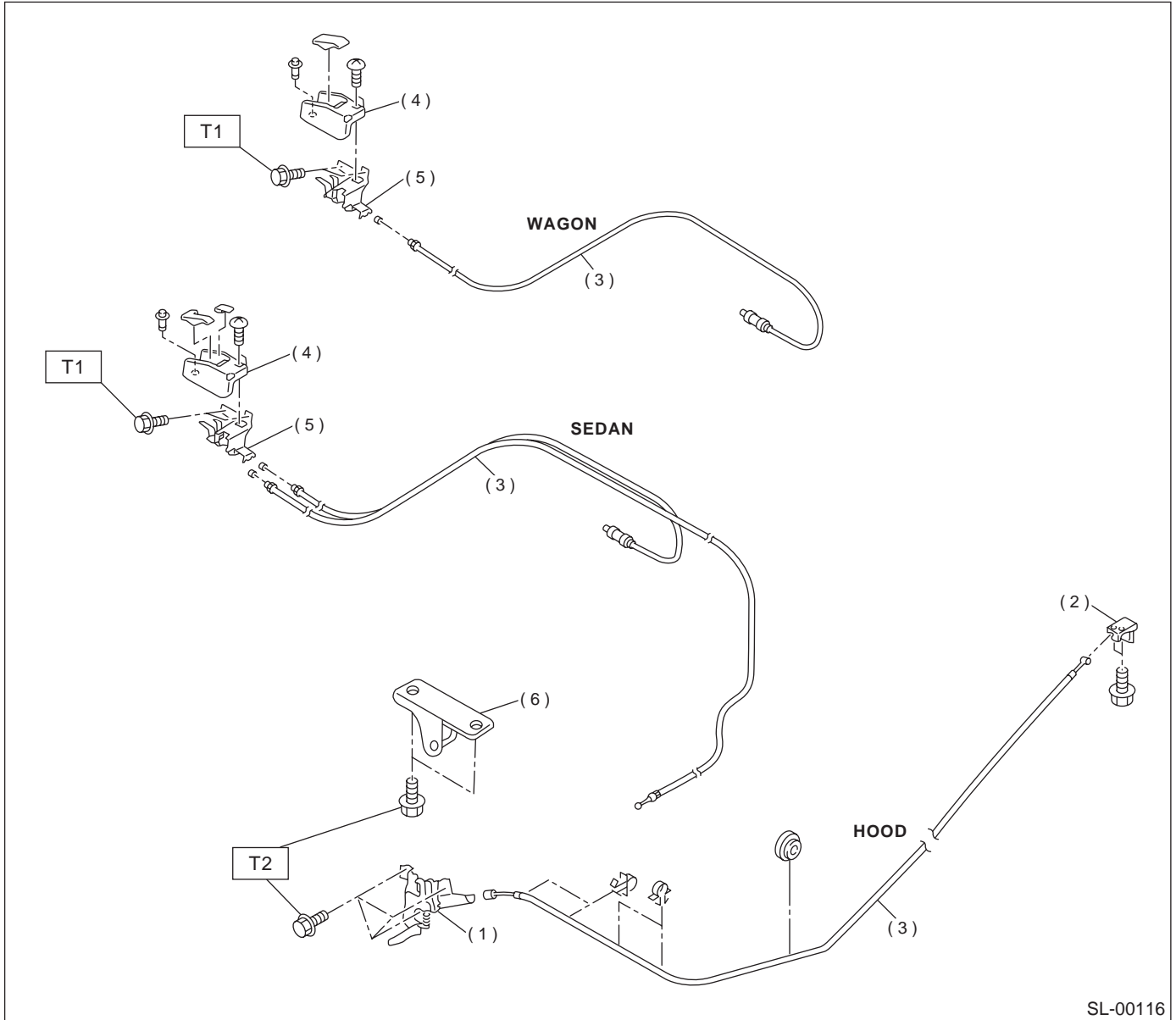
T2: 25 (2.5, 18.1)

T3: 18 (1.8, 13.0)

GENERAL DESCRIPTION

SECURITY AND LOCKS

3. HOOD LOCK AND REMOTE OPENERS



SL-00116

- (1) Hood lock ASSY
- (2) Lever ASSY
- (3) Cable

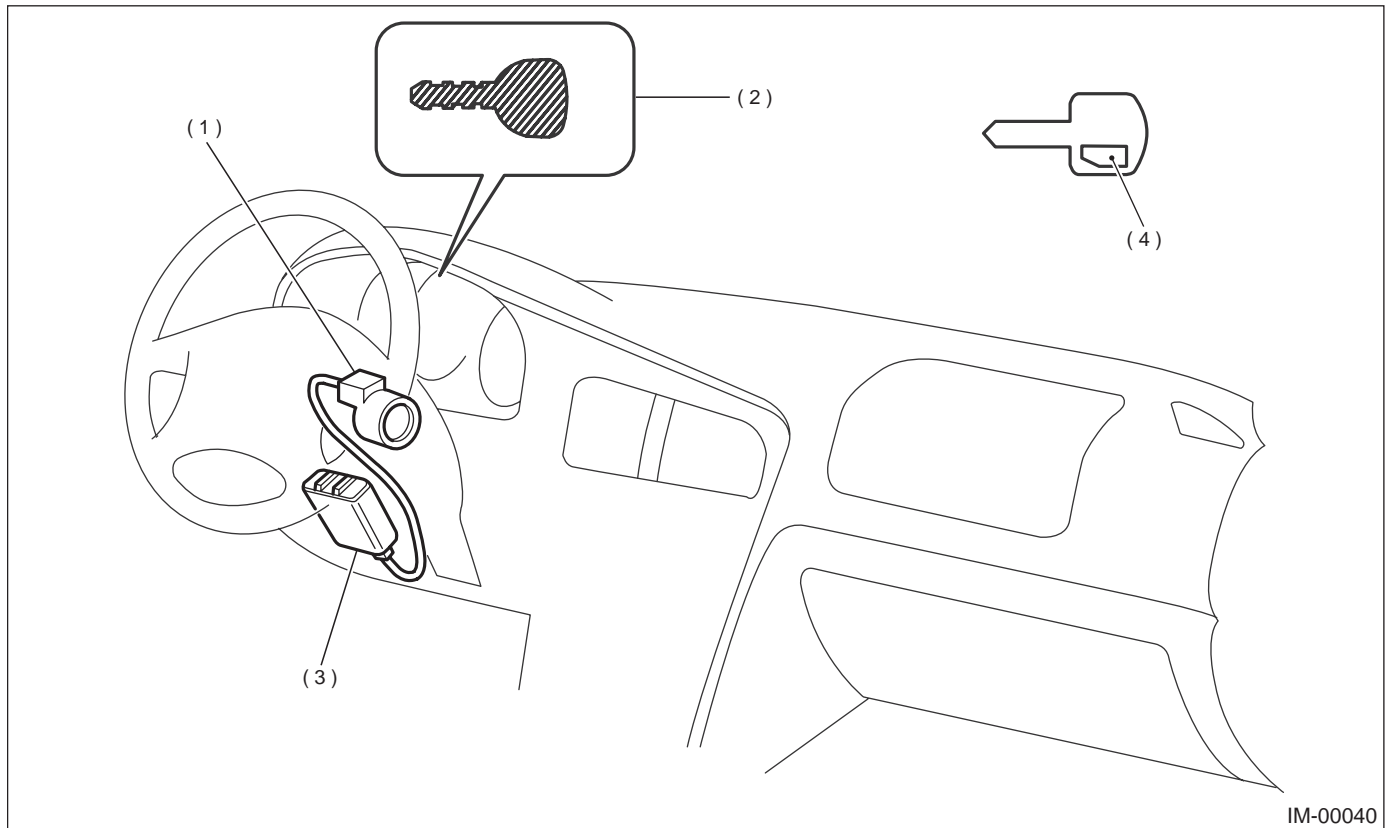
- (4) Cover
- (5) Pull handle ASSY
- (6) Striker

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.4 (0.65, 4.7)

T2: 32 (3.3, 23.9)

4. IMMOBILIZER SYSTEM



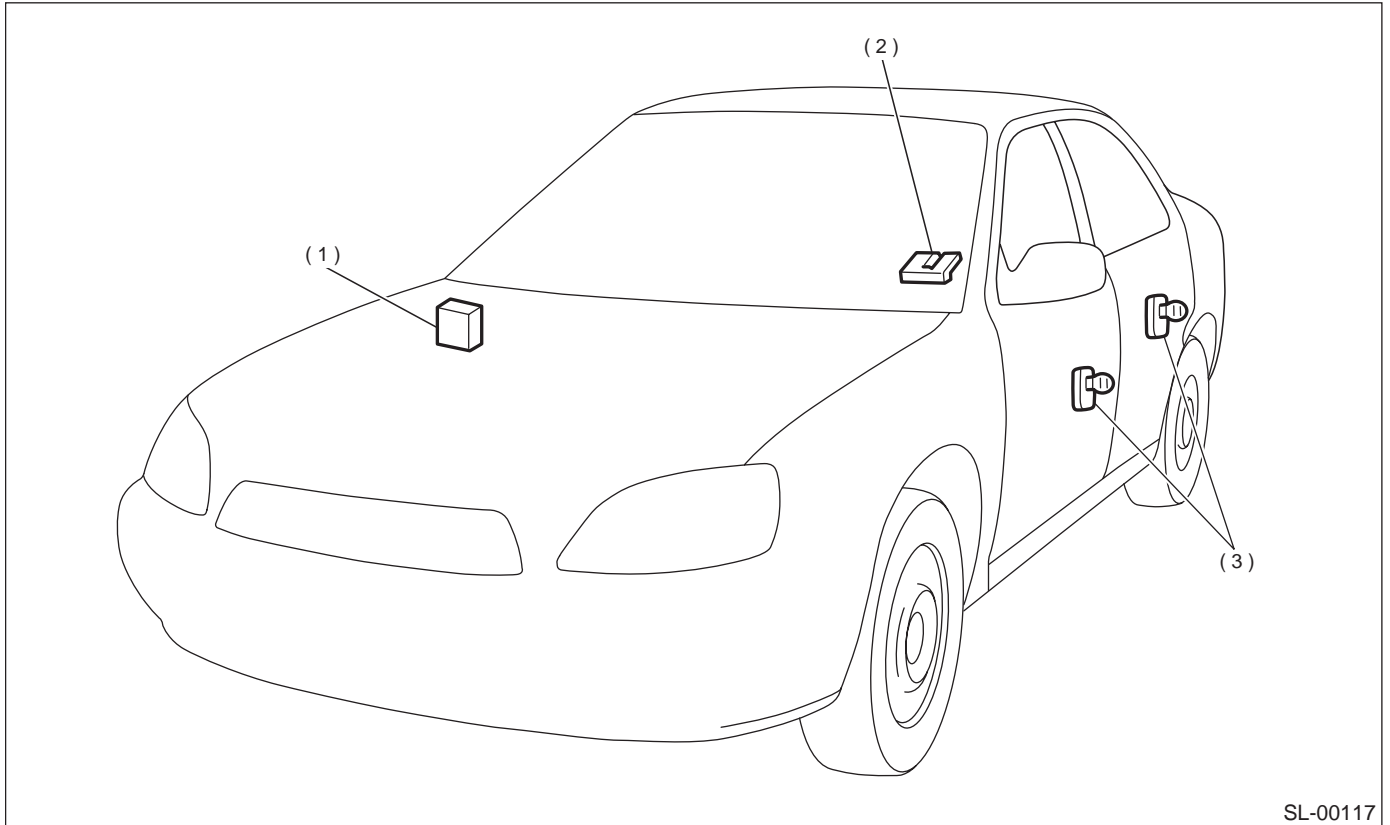
- (1) Antenna
- (2) Immobilizer indicator light (LED bulb)
- (3) Immobilizer control module (IMM ECM)
- (4) Transponder

NOTE:
IMM ECM location for RHD model is symmetrically opposite.

GENERAL DESCRIPTION

SECURITY AND LOCKS

5. KEYLESS ENTRY SYSTEM



SL-00117

(1) Keyless entry control module

(2) Rear gate latch switch (Wagon)

(3) Door switch

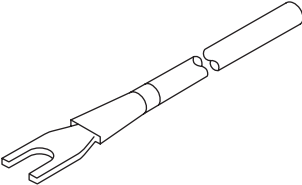
C: CAUTION

- Before disassembling or reassembling parts, always disconnect battery ground cable. When repairing radio, control module, etc. which are provided with memory functions, record memory contents before disconnecting battery ground cable. This is to prevent from memory loss caused by disconnection of ground cable.
- Reassemble parts in reverse order of disassembly procedure unless otherwise indicated.
- Adjust parts to specifications contained in this manual if so designated.

- Connect connectors and hoses securely during reassembly.
- After reassembly, ensure all functional parts operate smoothly.
- Airbag system wiring harness is routed near the electrical parts and switch.
- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage airbag system wiring harness when servicing the ignition key cylinder.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925580000	925580000	PULLER	Used for removing trim clip.

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
Drill	Used for replacing ignition key lock.

DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

2. Door Lock Control System

A: SCHEMATIC

<Ref. to WI-240, SCHEMATIC, Keyless Entry System.>

B: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
Door lock control system does not operate.	1. Check the fuse.	<Ref. to SL-8, CHECK FUSE, INSPECTION, Door Lock Control System.>
	2. Check the power supply and ground circuit for keyless entry control module.	<Ref. to SL-9, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the door lock switch and the circuit.	<Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
	4. Check the door lock actuator and the circuit.	<Ref. to SL-10, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
Door lock switch (knob) does not operate.	Check the door lock switch and the circuit.	<Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
A specific door lock actuator does not operate.	Check the door lock actuator and the circuit.	<Ref. to SL-10, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>

2. CHECK FUSE

Step	Value	Yes	No
1 CHECK FUSE. Remove and visually check fuse No. 2 (in the main fuse box) and No. 3 (in the fuse and relay box). Is the fuse blown?	The fuse is not blown.	Check power supply and ground circuit. <Ref. to SL-9, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>	Replace the fuse with a new one.

DOOR LOCK CONTROL SYSTEM

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Value	Yes	No
1 CHECK POWER SUPPLY. 1) Disconnect the keyless entry control module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. Connector & terminal (B176) No. 5 (+) — Chassis ground (-): (B176) No. 16 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 2.	Check the harness for open circuits or shorts between the keyless entry control module and the fuse.
2 CHECK GROUND CIRCUIT. Measure the resistance between the harness connector terminal and chassis ground. Connector & terminal (B176) No. 6 — Chassis ground: (B176) No. 14 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Power supply and ground circuit are OK.	Repair harness.

4. CHECK DOOR LOCK SWITCH AND CIRCUIT

Step	Value	Yes	No
1 CHECK DOOR LOCK SWITCH CIRCUIT. 1) Disconnect the keyless entry control module harness connector. 2) Measure the resistance between the harness connector terminal and chassis ground when moving the driver's door lock knob to UNLOCK. Connector & terminal (B176) No. 7 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Go to step 2.	Go to step 3.
2 CHECK DOOR LOCK SWITCH CIRCUIT. Measure the resistance between the harness connector terminal and chassis ground when the driver's door lock knob is moved to LOCK. Connector & terminal (B176) No. 7 — Chassis ground: Does the measured value exceed the specified value?	1 M Ω	The door lock switch is OK.	Go to step 3.
3 CHECK DOOR LOCK SWITCH. 1) Disconnect the driver's door lock switch (actuator) harness connector. 2) Measure the resistance between the door lock switch terminals when moving the door lock knob to UNLOCK. Terminal No. 1 — No. 3: Is the measured value less than the specified value?	1 Ω	Go to step 4.	Replace the door lock switch (actuator).

DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

Step	Value	Yes	No
4 CHECK DOOR LOCK SWITCH. Measure the resistance between the door lock switch terminals when moving the door lock knob to LOCK. Terminal No. 1 — No. 3: Does the measured value exceed the specified value?	1 MΩ	Check the harness for open circuits or shorts between the keyless entry control module and the door lock switch.	Replace the door lock switch (actuator).

5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

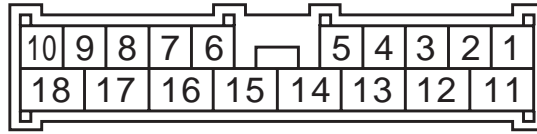
Step	Value	Yes	No
1 CHECK OUTPUT SIGNAL. Measure the voltage between the harness connector terminal of keyless entry control module and chassis ground when moving the door lock knob to LOCK. Connector & terminal (B176) No. 18 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 2.	Replace the keyless entry control module.
2 CHECK OUTPUT SIGNAL. Measure the voltage between the harness connector terminal of keyless entry control module and chassis ground when moving the door lock knob to UNLOCK. Connector & terminal (B176) No. 17 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Replace the keyless entry control module.
3 CHECK DOOR LOCK ACTUATOR. Check the door lock actuator. Front door lock actuator: <Ref. to SL-22, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-26, Rear Door Lock Actuator.> Rear gate latch lock actuator: <Ref. to SL-29, Rear Gate Latch Lock Actuator.> Is the door lock actuator OK?	The door lock actuator is OK.	Check the harness for open circuits or shorts between the keyless entry control module and the door lock actuator.	Replace the door lock actuator.

3. Keyless Entry System

A: SCHEMATIC

<Ref. to WI-240, SCHEMATIC, Keyless Entry System.>

B: ELECTRICAL SPECIFICATION



SL-00118

Content	Terminal No.	Measuring condition
Key warning switch	1 (INPUT)	Battery voltage is present when inserting the key into the ignition switch.
Registration connector	2 (INPUT)	0 V is detected when connecting the registration connector.
Door switch	3 (INPUT)	0 V is detected when any door is open.
Rear gate switch	4 (INPUT)	0 V is detected when opening the rear gate.
Power supply	5	Battery voltage is constantly detected.
Ground	6	0 V is constantly detected.
Door lock switch	7 (INPUT)	0 V is detected when driver's door is unlocked.
Empty	8	—
Empty	9	—
Empty	10	—
Room light/Ignition switch illumination	11 (OUTPUT)	<ul style="list-style-type: none"> • 0 V is detected when pressing the transmitter OPEN button. • 0 V is detected when any door is open.
Turn signal light (Right)	12 (OUTPUT)	Battery voltage is detected when pressing the transmitter OPEN or LOCK button.
Turn signal light (Left)	13 (OUTPUT)	Battery voltage is detected when pressing the transmitter OPEN or LOCK button.
Ground	14	0 V is constantly detected.
Power supply (Hazard light)	15	Battery voltage is constantly detected.
Power supply	16	Battery voltage is constantly detected.
Door and rear gate lock actuator (Unlock)	17 (OUTPUT)	Battery voltage is detected when pressing the transmitter OPEN button.
Door and rear gate lock actuator (Lock)	18 (OUTPUT)	Battery voltage is detected when pressing the transmitter LOCK button.

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

C: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
None of the functions of the keyless entry system operate.	1. Check the transmitter battery.	<Ref. to SL-13, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the fuse.	<Ref. to SL-13, CHECK FUSE, INSPECTION, Keyless Entry System.>
	3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-13, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-38, Keyless Entry Control Module.>
Transmitter cannot be registered.	1. Check the transmitter battery.	<Ref. to SL-13, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the registration connector circuit.	<Ref. to SL-14, CHECK REGISTRATION CONNECTOR CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.	<Ref. to SL-38, Keyless Entry Control Module.>
Door lock or unlock does not operate. NOTE: If the door lock control system does not operate when using the door lock switch, check the door lock control system. <Ref. to SL-8, INSPECTION, Door Lock Control System.>	1. Check the transmitter battery.	<Ref. to SL-13, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-16, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-15, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-38, Keyless Entry Control Module.>
Hazard light does not operate.	1. Check the hazard light operation.	<Ref. to SL-17, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Replace the keyless entry control module.	<Ref. to SL-38, Keyless Entry Control Module.>
Room light and ignition switch illumination operation does not activate.	1. Check the room light operation.	<Ref. to SL-17, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Check the ignition switch illumination circuit.	<Ref. to SL-18, CHECK IGNITION SWITCH ILLUMINATION CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.	<Ref. to SL-38, Keyless Entry Control Module.>

2. CHECK TRANSMITTER BATTERY

Step	Value	Yes	No
1 CHECK TRANSMITTER BATTERY. 1) Remove the battery from the transmitter. <Ref. to SL-39, REMOVAL, Keyless Transmitter.> 2) Check the battery voltage. <Ref. to SL-39, INSPECTION, Keyless Transmitter.> Does the measured value exceed the specified value?	2 V	The transmitter battery is OK. Further inspection is necessary, refer to "SYMPTOM CHART". <Ref. to SL-12, SYMPTOM CHART, INSPECTION, Keyless Entry System.>	Replace the transmitter battery.

3. CHECK FUSE

Step	Value	Yes	No
1 CHECK FUSE. Remove and visually check fuse No. 2 (in the main fuse box), No. 3 (in the fuse and relay box) and SBF-6 (in the main fuse box) Is the fuse blown?	The fuse is not blown.	Check power supply and ground circuit. <Ref. to SL-13, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>	Replace the fuse with a new one.

4. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Value	Yes	No
1 CHECK POWER SUPPLY. 1) Disconnect the keyless entry control module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. Connector & terminal (B176) No. 5, No. 16 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 2.	Check the harness for open circuits or shorts between the keyless entry control module and fuse.
2 CHECK GROUND CIRCUIT. Measure the resistance between the harness connector terminal and chassis ground. Connector & terminal (B176) No. 6, No. 14 — Chassis ground: Is the measured value less than the specified value?	10 Ω	The power supply and ground circuit are OK.	Repair the harness.

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

5. CHECK REGISTRATION CONNECTOR CIRCUIT

Step	Value	Yes	No
1 REGISTRATION CONNECTOR INPUT VOLTAGE INSPECTION 1) Turn ignition switch ON. 2) Disconnect registration connector. 3) Measure voltage between keyless entry control module harness connector and chassis ground. Connector & terminal (B176) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 2.	Repair harness, and (or) connector.
2 REGISTRATION CONNECTOR INPUT VOLTAGE INSPECTION 1) Connect registration connector. 2) Measure voltage between keyless entry control module harness connector and chassis ground. Connector & terminal (B176) No. 2 (+) — Chassis ground (-): Is the measured value same as the specified value?	0 V	Registration connector circuit is OK.	Repair harness, and (or) connector.

6. CHECK DOOR SWITCH

Step	Value	Yes	No
<p>1 CHECK DOOR SWITCH CIRCUIT. Measure the voltage between the keyless entry control module harness connector terminal and chassis ground.</p> <p>Connector & terminal Front and rear door: (B176) No. 3 (+) — Chassis ground (-): Rear gate: (B176) No. 4 (+) — Chassis ground (-):</p> <p>Is the measured value same as the specified value when opening either door or rear gate?</p>	0 V	Go to step 2.	Go to step 3.
<p>2 CHECK DOOR SWITCH CIRCUIT. Measure the voltage between the keyless entry control module harness connector terminal and chassis ground.</p> <p>Connector & terminal Front and rear door: (B176) No. 3 (+) — chassis ground (-): Rear gate: (B176) No. 4 (+) — chassis ground (-):</p> <p>Is the measured value less than the specified value when all doors and rear gate are closed?</p>	10 V	The door switch is OK.	Go to step 3.
<p>3 CHECK DOOR SWITCH. 1) Disconnect the door switch harness connector. 2) Measure the resistance between the door switch terminals.</p> <p>Terminal Door switch No. 1 — No. 3: Rear gate latch switch No. 1 — No. 2:</p> <p>Does the measured value exceed the specified value when door switch is pressed?</p>	1 M Ω	Go to step 4.	Replace the door switch.
<p>4 CHECK DOOR SWITCH. Measure the resistance between the door switch terminals.</p> <p>Terminal Door switch No. 1 — No. 3: Rear gate latch switch No. 1 — No. 2:</p> <p>Is the measured value less than the specified value when door switch is released?</p>	1 Ω	Check the harness for open circuits or shorts between the keyless entry control module and door switch.	Replace the door switch.

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

7. CHECK KEY WARNING SWITCH

Step	Value	Yes	No
1 CHECK FUSE. Remove and visually check fuse No. 6 (in the main fuse box). Is the fuse blown?	The fuse is not blown.	Go to step 2.	Replace the fuse with a new one.
2 CHECK KEY WARNING SWITCH CIRCUIT. 1) Disconnect the keyless entry control module harness connector. 2) Insert the key into the ignition switch. (LOCK position) 3) Measure the voltage between the harness connector terminal and chassis ground. Connector & terminal (B176) No. 1 (+) — chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Go to step 4.
3 CHECK KEY WARNING SWITCH CIRCUIT. 1) Remove the key from the ignition switch. 2) Measure the voltage between the harness connector terminal and chassis ground. Connector & terminal (B176) No. 1 (+) — chassis ground (-): Is the measured value same as the specified value?	0 V	The key warning switch is OK.	Go to step 4.
4 CHECK KEY WARNING SWITCH. 1) Disconnect the key warning switch harness connector. 2) Insert the key into the ignition switch. (LOCK position) 3) Measure the resistance between the key warning switch terminals. Terminal No. 1 — No. 2: Is the measured value less than the specified value?	1 Ω	Go to step 5.	Replace key warning switch.
5 CHECK KEY WARNING SWITCH. 1) Remove the key from the ignition switch. 2) Measure the resistance between the key warning switch terminals. Terminal No. 1 — No. 2: Does the measured value exceed the specified value?	1 M Ω	Check the following: • Harness for open circuits or shorts between the key warning switch and fuse • Harness for open circuits or shorts between the keyless entry control module and key warning switch	Replace key warning switch.

8. CHECK HAZARD LIGHT OPERATION

Step	Value	Yes	No
1 CHECK HAZARD LIGHT OPERATION. Make sure the hazard light blinks when hazard switch is turned ON. Does hazard light blink?	Hazard light blinks.	Go to step 2.	Check hazard light circuit.
2 CHECK OUTPUT SIGNAL. 1) Remove the key from ignition switch. 2) Close all doors and rear gate. 3) Measure voltage between keyless entry control module harness connector terminal and chassis ground when LOCK or OPEN button of transmitter is pressed. Connector & terminal (B176) No. 12, No. 13 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Check harness for open or short between keyless entry control module and turn signal lights.	Replace the keyless entry control module.

9. CHECK ROOM LIGHT OPERATION

Step	Value	Yes	No
1 CHECK ROOM LIGHT OPERATION. Make sure the room light illuminates when the room light switch is turned ON. Does the room light illuminate?	Room light illuminates.	Go to step 2.	Check the room light circuit.
2 CHECK HARNESS BETWEEN ROOM LIGHT AND KEYLESS ENTRY CONTROL MODULE. 1) Disconnect the keyless entry control module harness connector and room light harness connector. 2) Measure the resistance between the keyless entry control module harness connector terminal and the room light harness connector terminal. Connector & terminal (B176) No. 11 — (R52) No. 2: Is the measured value less than the specified value?	10 Ω	The room light operation circuit is OK.	Check the harness for open circuits or shorts between the keyless entry control module and room light.

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

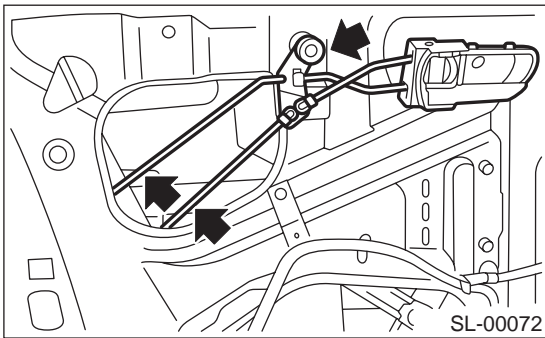
10.CHECK IGNITION SWITCH ILLUMINATION CIRCUIT

Step	Value	Yes	No
<p>1 CHECK IGNITION SWITCH ILLUMINATION POWER SUPPLY.</p> <p>1) Disconnect the ignition switch illumination harness connector.</p> <p>2) Measure voltage between the ignition switch illumination harness connector terminal and chassis ground.</p> <p>Connector & terminal (B224) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Check harness for open circuit or shorts between the ignition switch illumination and fuse.
<p>2 CHECK HARNESS BETWEEN IGNITION SWITCH ILLUMINATION AND KEYLESS ENTRY CONTROL MODULE.</p> <p>1) Disconnect the keyless entry control module harness connector.</p> <p>2) Measure the resistance between the keyless entry harness connector terminal and the ignition switch illumination harness connector.</p> <p>Connector & terminal (B176) No. 11 — (B224) No. 1: Is the measured value less than the specified value?</p>	10 Ω	Check the ignition switch illumination. If NG, replace the ignition switch illumination.	Repair the harness.

4. Front Inner Remote

A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-30, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 3) Remove the two rod joints.
- 4) Remove the screw, and detach the front inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the inner remote works properly after installation.

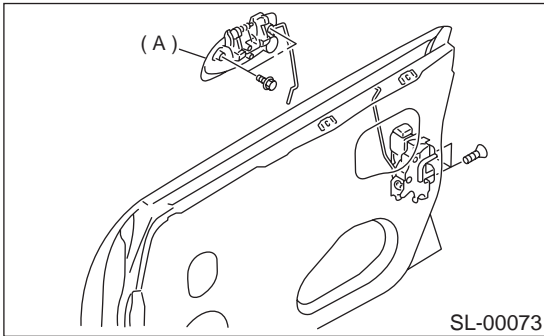
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

5. Front Outer Handle

A: REMOVAL

- 1) Remove the front door latch assembly. <Ref. to SL-21, REMOVAL, Front Door Latch Assembly.>
- 2) Remove the two bolts. Remove the front outer handle (A).



CAUTION:

Do not use excessive force to remove the door panel. This will deform it.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the outer handle works properly after installation.

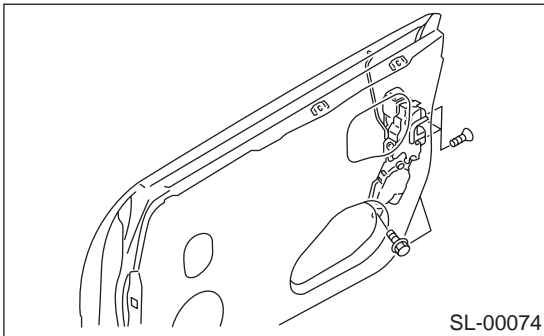
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

6. Front Door Latch Assembly

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-30, REMOVAL, Front Door Trim.>
- 3) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 4) Remove the front inner remote. <Ref. to SL-19, REMOVAL, Front Inner Remote.>
- 5) Remove the front door glass. <Ref. to GW-12, REMOVAL, Front Door Glass.>
- 6) Remove three nuts, and detach the front door sash (Rear).
- 7) Remove the three screws and bolt.



- 8) Disconnect the connector. Remove the front door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

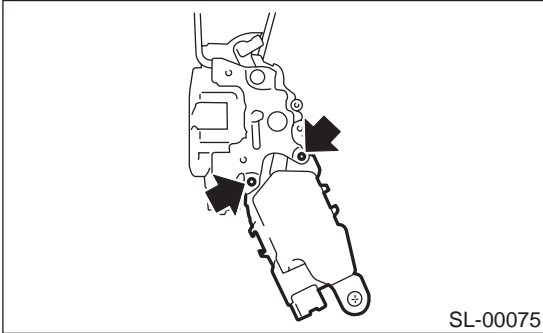
FRONT DOOR LOCK ACTUATOR

SECURITY AND LOCKS

7. Front Door Lock Actuator

A: REMOVAL

- 1) Remove the front door latch assembly. <Ref. to SL-21, REMOVAL, Front Door Latch Assembly.>
- 2) Remove the bolt. Remove the front door lock actuator.



B: INSTALLATION

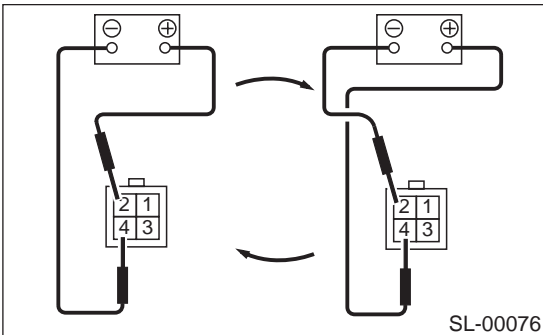
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to the door lock actuator terminals.



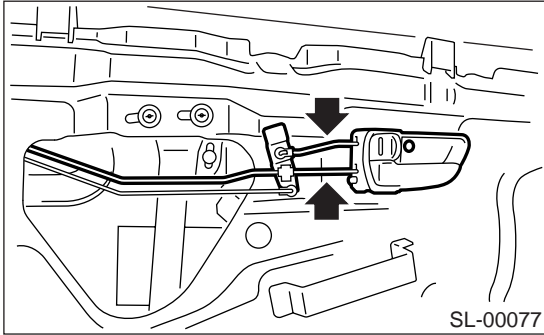
Terminal No.	Actuator operation
No. 2 (+) and No. 4 (-)	Unlocked → Locked
No. 4 (+) and No. 2 (-)	Locked → Unlocked

If NG, replace the door lock actuator.

8. Rear Inner Remote

A: REMOVAL

- 1) Remove the rear door trim. <Ref. to EI-31, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 3) Remove the two rod joints.
- 4) Remove the screw, and detach the inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the inner remote works properly after installation.

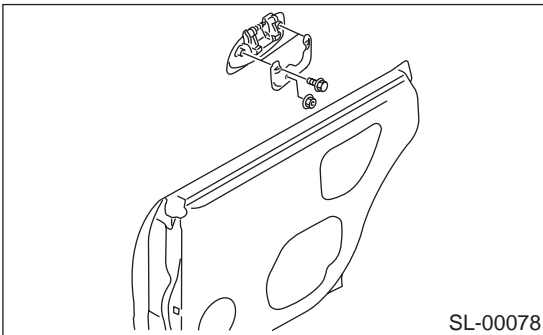
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.
- 3) Make sure the child safety lock on rear doors work properly, when applicable.

9. Rear Outer Handle

A: REMOVAL

- 1) Remove the rear door trim. <Ref. to EI-31, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 3) Remove the rear inner remote. <Ref. to SL-23, REMOVAL, Rear Inner Remote.>
- 4) Remove the rear door latch assembly. <Ref. to SL-25, REMOVAL, Rear Door Latch Assembly.>
- 5) Remove the two bolts and nut. Remove the rear outer handle.



CAUTION:

Do not use excessive force to remove the door panel. This will deform it.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the outer handle works properly after installation.

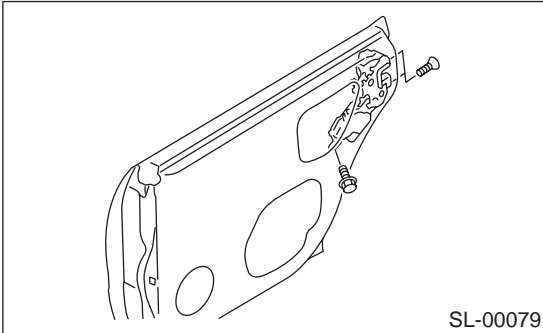
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

10. Rear Door Latch Assembly

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove the rear door trim. <Ref. to EI-31, REMOVAL, Rear Door Trim.>
- 3) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 4) Remove the rear inner remote. <Ref. to SL-23, REMOVAL, Rear Inner Remote.>
- 5) Remove the three screws and bolt.



- 6) Disconnect the connector. Remove the rear door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

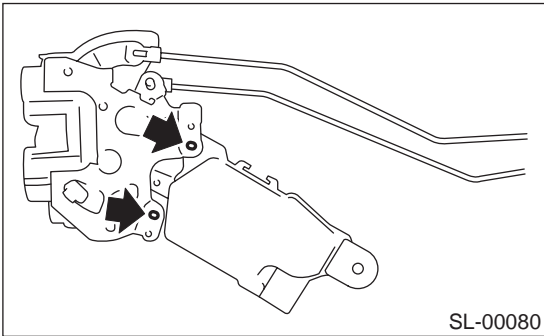
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

11.Rear Door Lock Actuator

A: REMOVAL

- 1) Remove the rear door latch assembly. <Ref. to SL-25, REMOVAL, Rear Door Latch Assembly.>
- 2) Remove the bolt. Remove the rear door lock actuator.



B: INSTALLATION

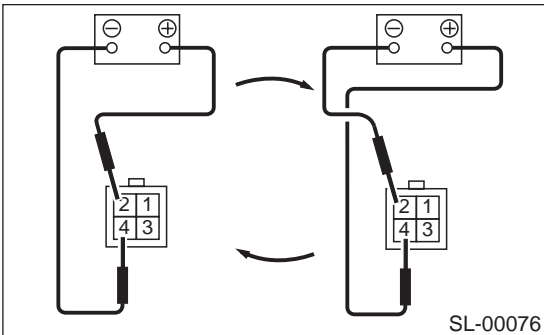
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to the door lock actuator terminals.



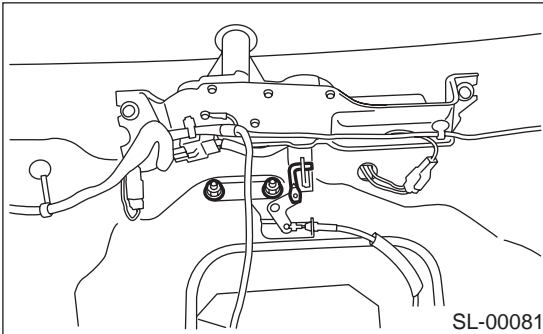
Terminal No.	Actuator operation
No. 2 (+) and No. 4 (-)	Unlocked → Locked
No. 4 (+) and No. 2 (-)	Locked → Unlocked

If NG, replace the door lock actuator.

12.Rear Gate Outer Handle

A: REMOVAL

- 1) Remove the rear gate lower trim. <Ref. to EI-44, REMOVAL, Rear Gate Trim.>
- 2) Remove the rear gate latch rod.
- 3) Remove the nut holding the rear gate outer handle, and then remove the rear gate outer handle.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the outer handle works properly after installation.

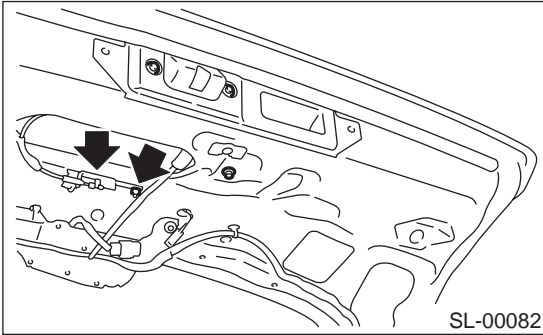
C: INSPECTION

- 1) Inspect the rod for deformation.
- 2) Make sure the lever and rod move smoothly.

13.Rear Gate Latch Assembly

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove the rear gate lower trim. <Ref. to EI-44, REMOVAL, Rear Gate Trim.>
- 3) Remove the rear gate key cylinder rod.
- 4) Remove the rear gate outer handle. <Ref. to SL-27, REMOVAL, Rear Gate Outer Handle.>
- 5) Remove the three bolts.



- 6) Remove the two connectors and pull out the latch.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

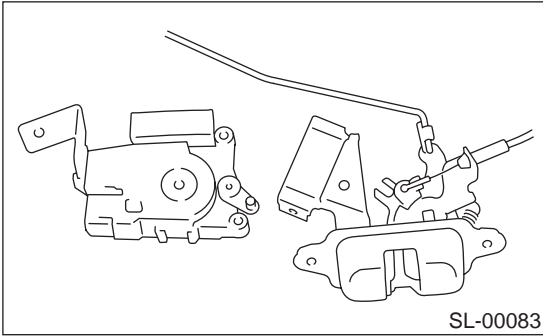
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

14. Rear Gate Latch Lock Actuator

A: REMOVAL

- 1) Remove the rear gate latch assembly. <Ref. to SL-28, REMOVAL, Rear Gate Latch Assembly.>
- 2) Remove the rear gate lock actuator.



B: INSTALLATION

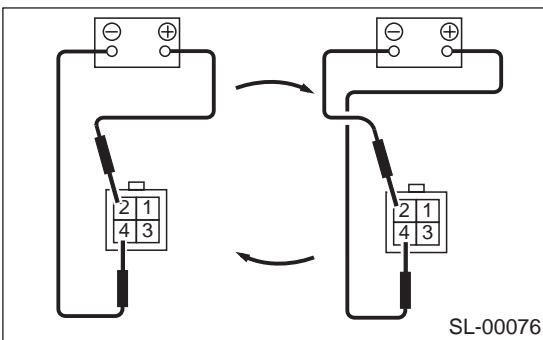
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to the door lock actuator terminals.



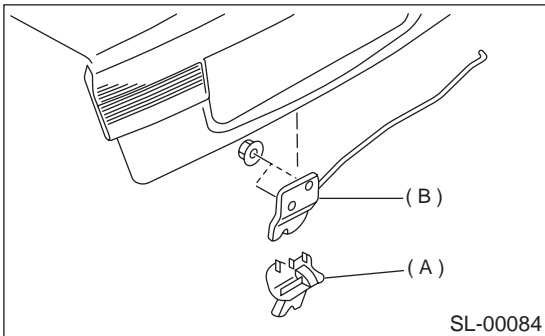
Terminal No.	Actuator operation
No. 2 (+) and No. 4 (-)	Unlocked → Locked
No. 4 (+) and No. 2 (-)	Locked → Unlocked

If NG, replace the rear gate latch lock actuator.

15. Trunk Lid Lock Assembly

A: REMOVAL

- 1) Remove the trunk lid key cylinder rod.
- 2) Remove the lock assembly cover (A).
- 3) Remove the nut while holding the lock assembly.
Remove the lock assembly (B).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

- Apply grease to parts that rub.
- Make sure the lock works properly after installation.

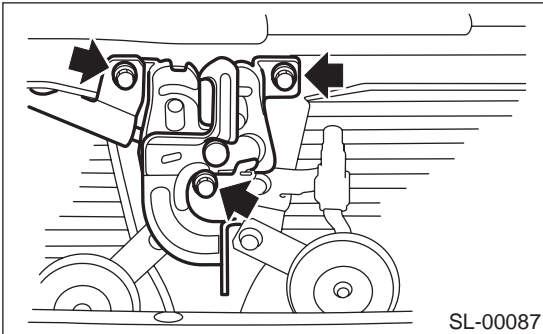
C: INSPECTION

- 1) Check the striker for bending or abnormal wear.
- 2) Check the safety lever for improper movement.
- 3) Check other levers and the spring for rust formation and unsmooth movement.

16. Front Hood Lock Assembly

A: REMOVAL

- 1) Open the hood.
- 2) Remove the bolt. Remove the hood lock assembly.
- 3) Remove the release cable from the lock assembly.



B: INSTALLATION

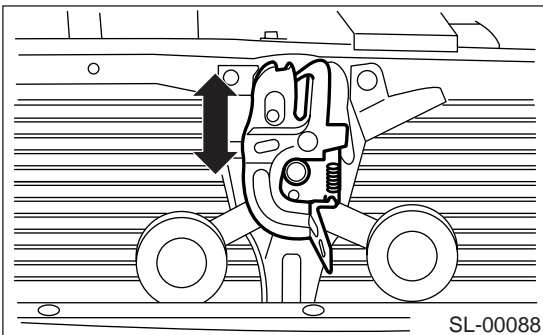
Install in the reverse order of removal.

NOTE:

- Apply grease to parts that rub.
- Make sure the release cable works properly after installation.

C: ADJUSTMENT

Loosen the bolt. Adjust the lock assembly while moving it up and down.



D: INSPECTION

- 1) Check the striker for bending or abnormal wear.
- 2) Check the safety lever for improper movement.
- 3) Check other levers and the spring for rust formation and unsmooth movement.

REMOTE OPENERS

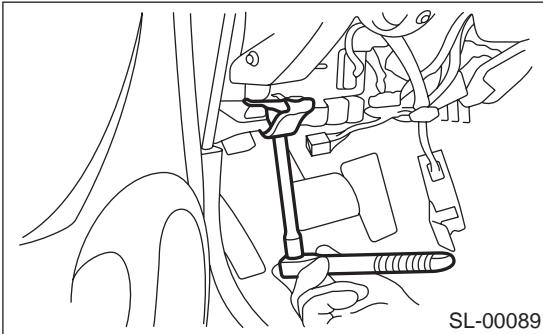
SECURITY AND LOCKS

17. Remote Openers

A: REMOVAL

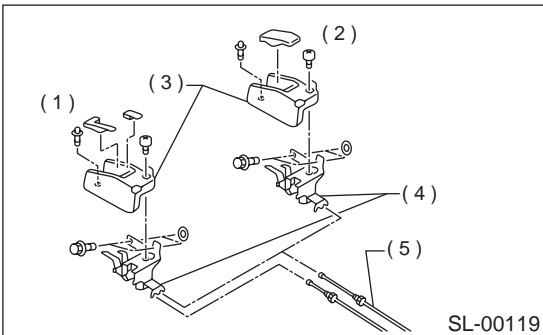
1. HOOD OPENER

- 1) Remove the release cable from the hood lock.
- 2) Remove the bolt. Remove the opener lever.



2. TRUNK LID OPENER

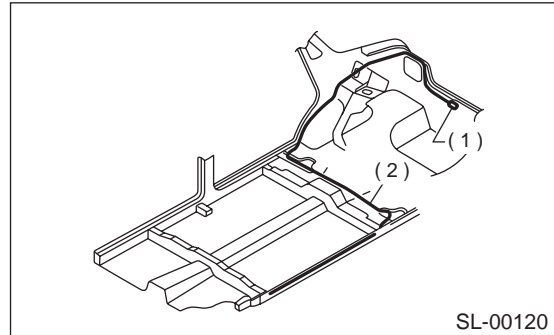
- 1) Remove the rear seat. <Ref. to SE-17, REMOVAL, Rear Seat.>
- 2) Remove the center pillar lower trim and side sill cover on the passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
- 3) Remove the bolt. Remove the opener pull handle.



- (1) Sedan
- (2) Wagon
- (3) Cover
- (4) Pull handle Assy
- (5) Cable

- 4) Remove the cable from the opener pull handle.
- 5) Remove the striker from the trunk lid.

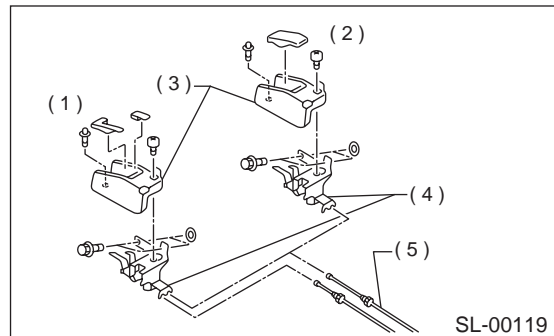
- 6) Remove the cable from the striker.



- (1) Striker
- (2) Cable

3. FUEL FLAP OPENER

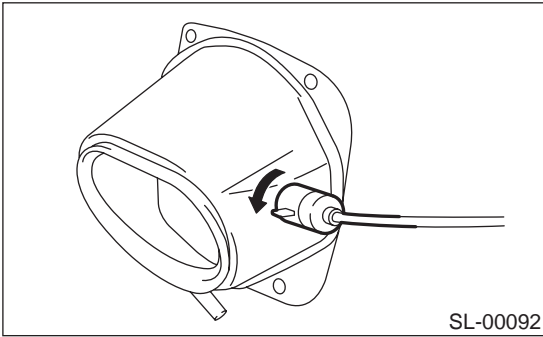
- 1) Remove the rear seat. <Ref. to SE-17, REMOVAL, Rear Seat.>
- 2) Remove the center pillar lower trim and side sill cover on the passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
- 3) Remove the bolt. Remove the opener pull handle.



- (1) Sedan
- (2) Wagon
- (3) Cover
- (4) Pull handle Assy
- (5) Cable

- 4) Remove the cable from the opener pull handle.
- 5) Remove the right rear quarter trim. <Ref. to EI-40, REMOVAL, Rear Quarter Trim.>

6) Rotate the fuel lock inside the quarter panel to left and remove.



B: INSTALLATION

1. HOOD OPENER

Install in the reverse order of removal.

2. TRUNK LID OPENER

Install in the reverse order of removal.

3. FUEL FLAP OPENER

Install in the reverse order of removal.

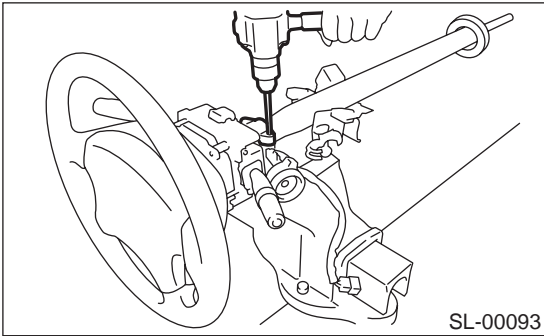
C: INSPECTION

Make sure the fuel flap opens and closes smoothly.

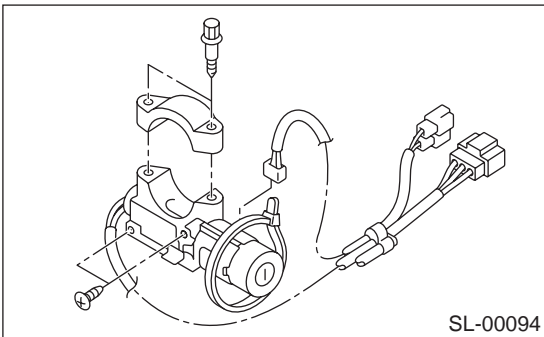
18. Ignition Key Lock

A: REPLACEMENT

- 1) Disconnect ground cable from battery.
- 2) Remove the steering column. <Ref. to PS-28, REMOVAL, Tilt Steering Column.>
- 3) Secure the steering column in a vise. Remove the bolt with a drill.



- 4) Remove the ignition key lock.
- 5) Use a new torn bolt. Tighten the torn bolt to the end of the thread.



B: INSPECTION

- 1) Remove the instrument panel lower cover.
- 2) Remove the lower column cover.
- 3) Unfasten the hold-down clip which secures the harness and disconnect the connector of the ignition switch from the body harness.
- 4) Turn the ignition key plate to each position and check the continuity between the terminals of the ignition connector.

Switch position	Terminal No.	Standard
LOCK	—	—
ACC	No. 1 and No. 2	Less than 1 Ω
ON	No. 1 and No. 2 No. 1 and No. 4 No. 2 and No. 4	Less than 1 Ω
ST	No. 1 and No. 3 No. 1 and No. 4 No. 3 and No. 4	Less than 1 Ω

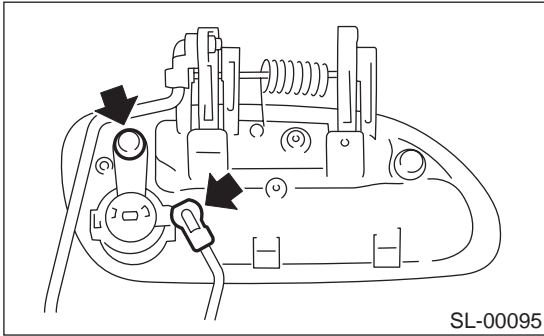
If NG, replace the ignition switch.

19. Key Lock Cylinders

A: REPLACEMENT

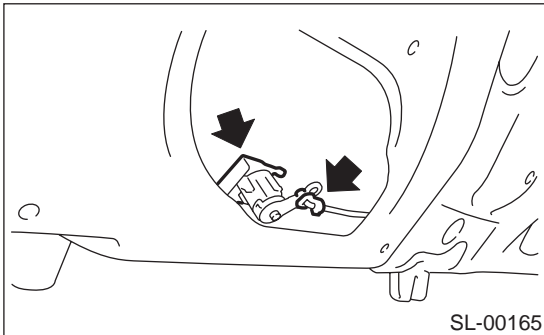
1. FRONT DOOR

- 1) Remove the front outer handle. <Ref. to SL-20, REMOVAL, Front Outer Handle.>
- 2) Remove the rod clamp. Replace the key cylinder.



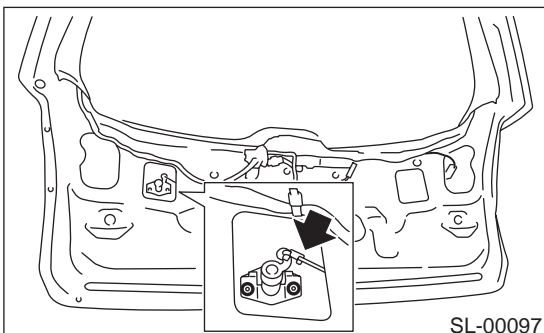
2. TRUNK LID

- 1) Remove the trunk trim. <Ref. to EI-47, REMOVAL, Trunk Lid Trim.>
- 2) Remove the rod clamp. Remove the lock plate. Replace the key cylinder.



3. REAR GATE

- 1) Remove the rear gate lower trim. <Ref. to EI-44, REMOVAL, Rear Gate Trim.>
- 2) Remove the rod clamp. Remove the nut. Replace the key cylinder.



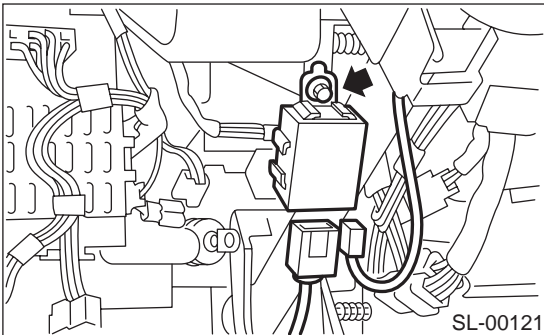
20. Immobilizer Control Module

A: REMOVAL

NOTE:

The following positions for removal and installation are for LHD models. The positions for RHD models are symmetrically opposite.

- 1) Disconnect ground cable from battery.
- 2) Remove instrument panel lower cover. <Ref. to EI-35, REMOVAL, Instrument Panel Assembly.>
- 3) Disconnect connector from immobilizer control module.
- 4) Remove immobilizer control module.



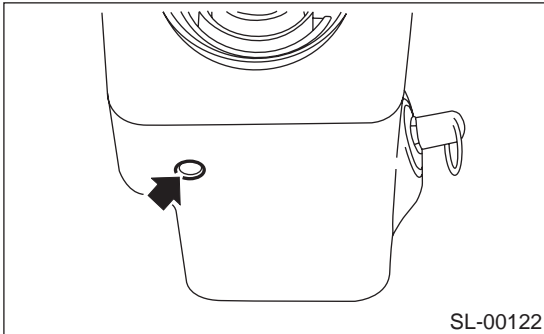
B: INSTALLATION

Install in the reverse order of removal.

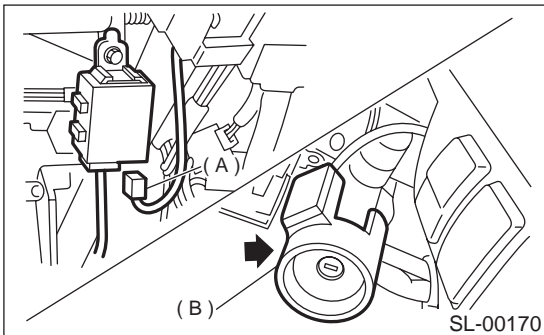
21. Immobilizer Antenna

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove instrument panel lower cover. <Ref. to EI-35, REMOVAL, Instrument Panel Assembly.>
- 3) Remove screws, separate upper column cover and lower column cover.



- 4) Disconnect immobilizer antenna connector (A) from immobilizer control module.
- 5) Remove immobilizer antenna (B).



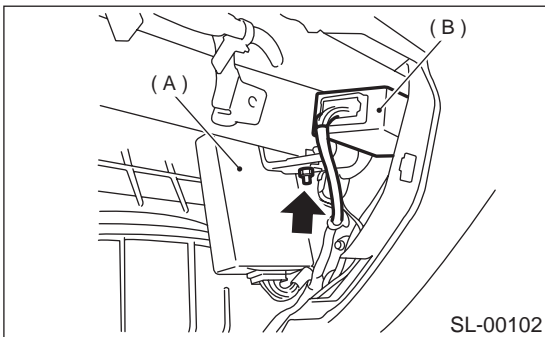
B: INSTALLATION

Install in the reverse order of removal.

22. Keyless Entry Control Module

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove glove box. <Ref. to EI-32, REMOVAL, Glove Box.>
- 3) Remove nut, then remove keyless entry control module (B) and the other electrical control module (A) while disconnecting connector.



- 4) Disconnect keyless entry control module and the other electrical control module.

B: INSTALLATION

Install in the reverse order of removal.

23. Keyless Transmitter

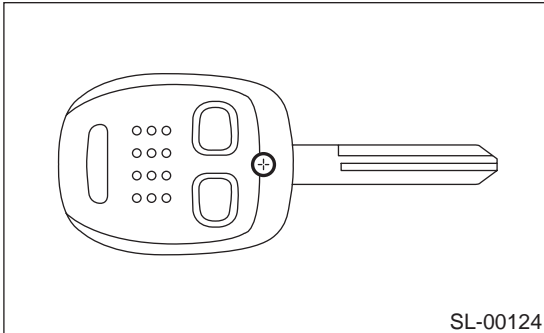
A: REMOVAL

1. TRANSMITTER BATTERY

Remove battery from transmitter.

NOTE:

To prevent static electricity damage to transmitter printed circuit board, touch steel area of building with hand to discharge static electricity carried on body or clothes before disassembling transmitter.



B: INSTALLATION

1. TRANSMITTER BATTERY

Install in the reverse order of removal.

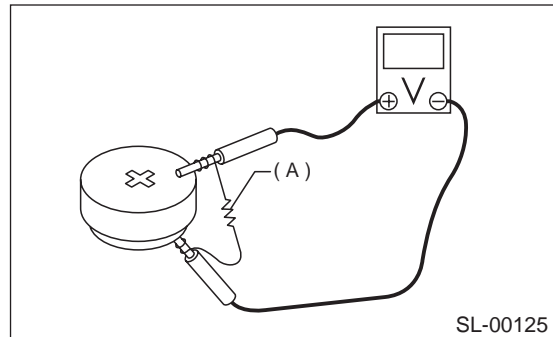
C: INSPECTION

1. TRANSMITTER BATTERY

1) Measure voltage between battery (+) terminal and (-) terminal.

NOTE:

- Battery discharge occurs during measurement. Complete measurement within 5 seconds.
- During battery voltage measurement, voltage falls more than 1.8 volts in 3 seconds period.



(A) Resistance 47Ω

Tester connection		Standard
(+)	(-)	
Battery (+) terminal	Battery (-) terminal	More than 2V

If NG, replace the battery. (Use CR1620 or equivalent.)

D: REPLACEMENT

1. TRANSMITTER REGISTRATION

NOTE:

A maximum of 3 transmitters can be registered for each individual vehicle.

- 1) Remove the side sill cover at the driver's side, then connect the registration connectors at the front pillar lower section.
- 2) Unlock the door lock.
- 3) Press any button of the transmitter twice to be registered.
- 4) The door lock will automatically lock and unlock in sequence. This indicates the completion of transmitter registration for the first transmitter.
- 5) If registration of another transmitter is now to be carried out, repeat procedure 3) and 4).
- 6) Disconnect the registration connectors after the completion of all registration operations. After confirming the operation of the door lock using the newly registered transmitter(s), reinstall the side sill cover at the driver's side.

KEYLESS TRANSMITTER

SECURITY AND LOCKS

MEMO:

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

SR

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1. General Description	2
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3. Sunroof Lid.....	6
4. Sunroof Assembly	7
5. Sunroof Motor	11
6. Sunroof Switch	14



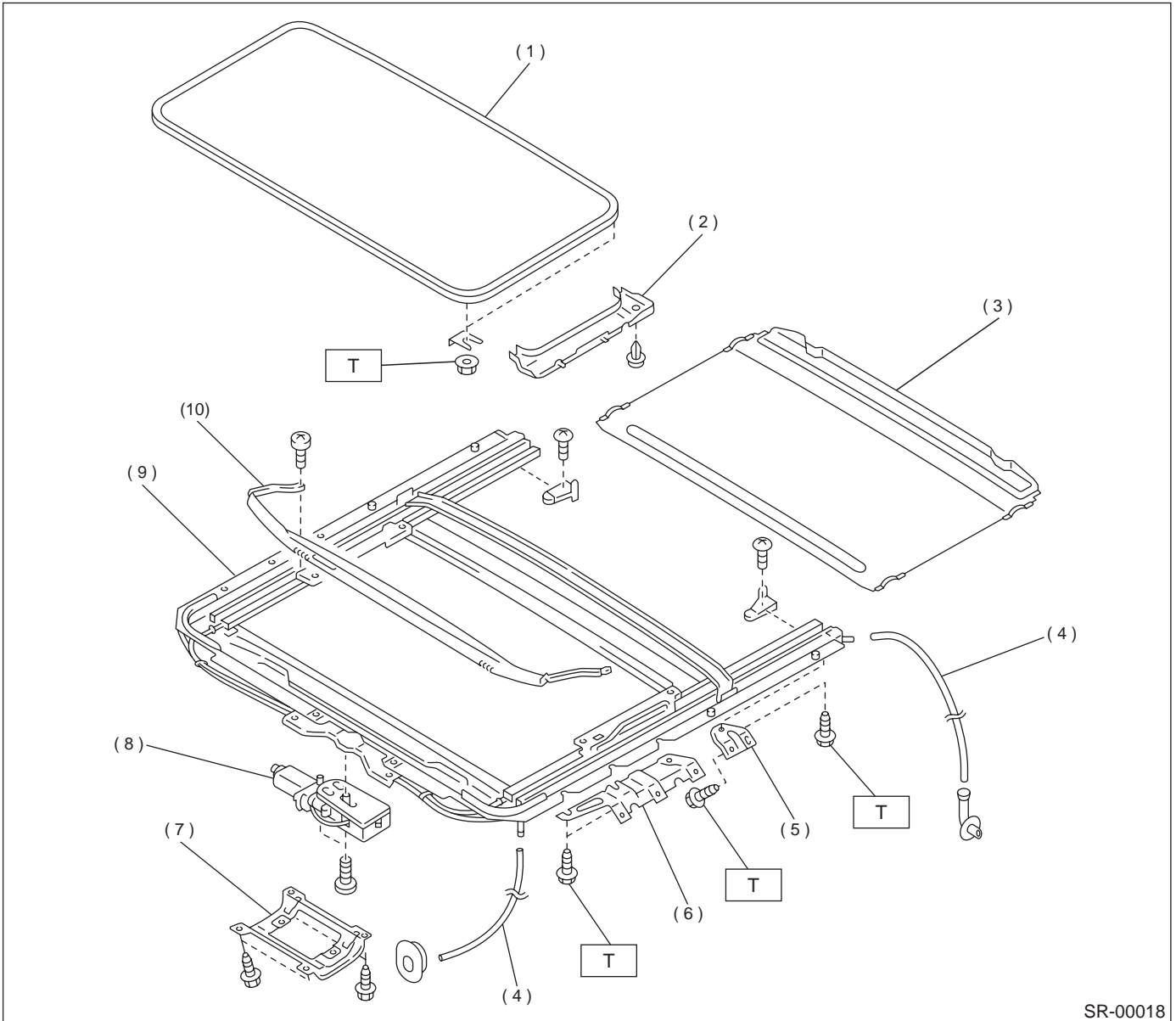
GENERAL DESCRIPTION

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

1. General Description

A: COMPONENT

1. SEDAN



SR-00018

- | | |
|----------------------------|-----------------------------|
| (1) Glass lid | (6) Sunroof bracket (Front) |
| (2) Guide rail cover | (7) Motor cover |
| (3) Sunshade | (8) Motor ASSY |
| (4) Drain tube | (9) Frame ASSY |
| (5) Sunroof bracket (Rear) | (10) Deflector |

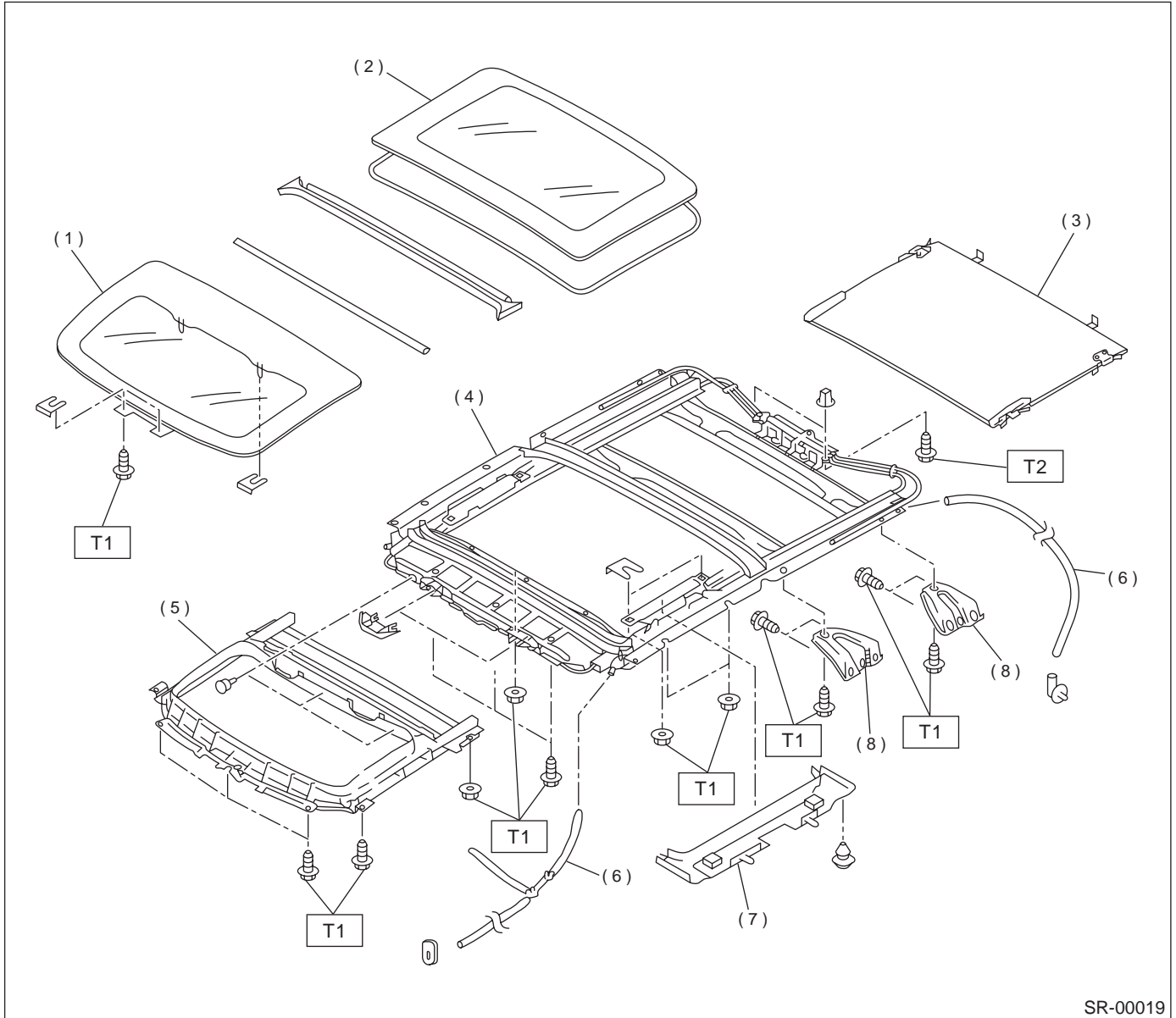
Tightening torque: N·m (kgf·m, ft·lb)

T: 7.4 (0.75, 5.4)

GENERAL DESCRIPTION

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

2. WAGON



SR-00019

- | | |
|-----------------------|------------------------|
| (1) Glass lid (Front) | (5) Frame ASSY (Front) |
| (2) Glass lid (Rear) | (6) Drain tube |
| (3) Sunshade | (7) Cover |
| (4) Frame ASSY (Rear) | (8) Frame bracket |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 7.4 (0.75, 5.4)

T2: 1.5 (0.15, 1.1)

GENERAL DESCRIPTION

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

B: CAUTION

- Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect connectors and hoses securely during reassembly.
- After reassembly, make sure all functional parts operate smoothly.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

SUNROOF CONTROL SYSTEM

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

2. Sunroof Control System

A: SCHEMATIC

1. SUNROOF

<Ref. to WI-306, SCHEMATIC, Sunroof System.>

B: INSPECTION

Symptom	Checking order
Water leaks.	(1) Check roof panel and sunroof lid for improper or poor sealing. (2) Check drain tube for clogging. (3) Check sunroof frame seal and body for improper fit.
Booming noise	(1) Check sunroof lid and roof panel for improper clearance. (2) Check sunshade and roof trim for improper clearance.
Abnormal motor noise	(1) Check motor for looseness. (2) Check gears and bearings for wear. (3) Check cables for wear. (4) Check cable pipe for deformities.
Failure of sunroof (Motor operates properly.)	(1) Check guide rail for foreign particles. (2) Check guide rail for improper installation. (3) Check parts for mutual interference. (4) Check cable slider for improper clinching. (5) Check cable for improper installation. (6) Check clutch adjustment nut for improper tightness.
Motor does not rotate or rotates improperly.	(1) Check fuse for blow-out. (2) Check switch for improper function. (3) Check motor for incorrect terminal voltage. (4) Check relay for improper operation. (5) Check poor grounding system. (6) Check harness for open or short and terminals for poor connections. (7) Check limit switch for improper operation.

SUNROOF LID

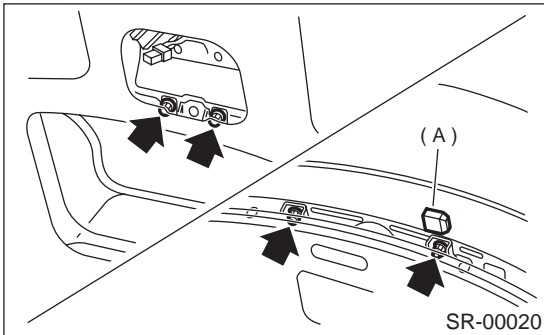
SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

3. Sunroof Lid

A: REMOVAL

1. WAGON (FRONT)

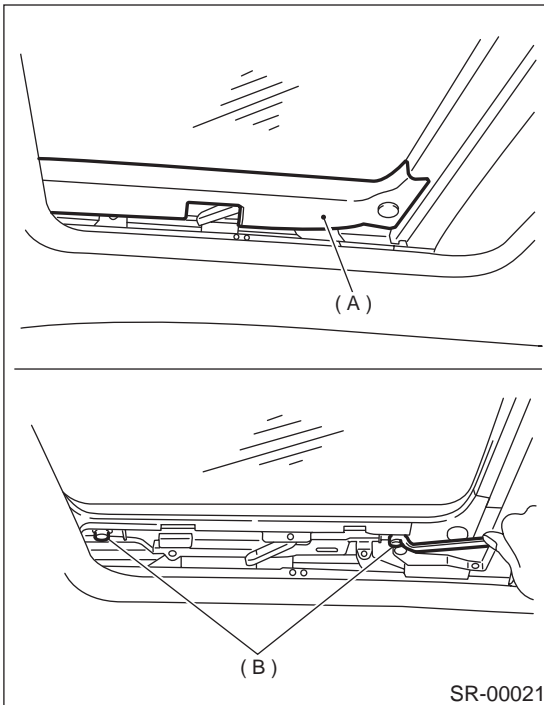
- 1) Tilt-up the front sunroof (most upper position).
- 2) Remove sunroof switch. <Ref. to SR-14, REMOVAL, Sunroof Switch.>
- 3) Remove two mounting bolts.
- 4) Detach covers (A) then remove two nuts from tilt-up assembly.



- 5) Remove the sunroof lid carefully.

2. SEDAN AND WAGON (REAR)

- 1) Completely close rear sunroof lid and open sunshade.
- 2) Remove covers (A) then remove nuts (B).



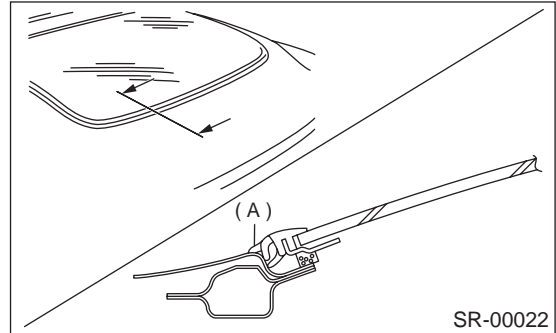
- 3) Remove the sunroof lid carefully.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

When installing sunroof lid, be careful not to pinch the lip (A) of lid.



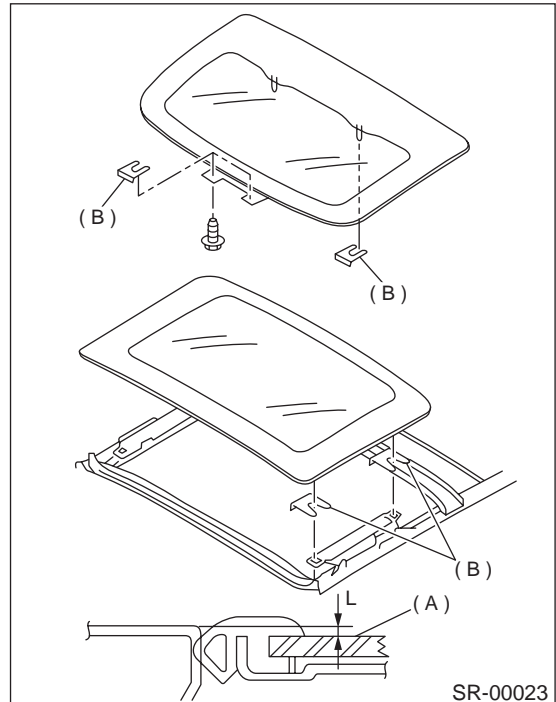
C: ADJUSTMENT

1. ALIGNMENT OF HEIGHT BETWEEN SUNROOF LID AND ROOF PANEL

Loosen sunroof lid installation nuts and then adjust height by adding (max: two pieces) or extracting (max: one piece) shims (B) (standard: one piece) between sunroof lid (A) and body.

Difference in height between sunroof lid and roof panel: L

L: 2.0 ± 0.5 mm (0.079 \pm 0.020 in)



SUNROOF ASSEMBLY

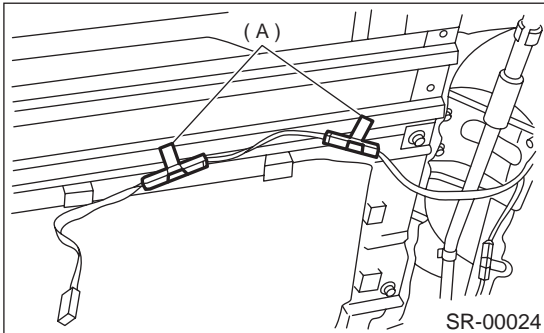
SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

4. Sunroof Assembly

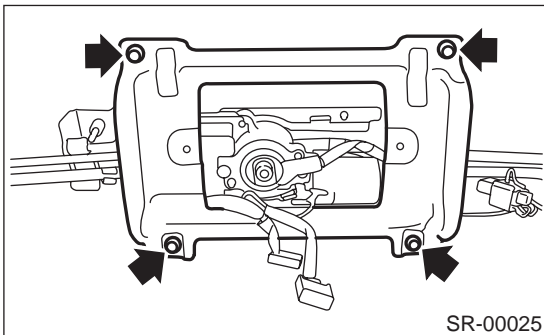
A: REMOVAL

1. SEDAN

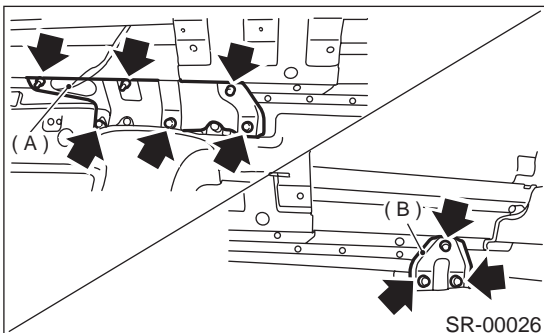
- 1) Disconnect ground cable from battery.
- 2) Remove roof trim. <Ref. to EI-42, SEDAN, REMOVAL, Roof Trim.>
- 3) Remove sunroof lid. <Ref. to SR-6, SEDAN AND WAGON (REAR), REMOVAL, Sunroof Lid.>
- 4) Disconnect drain tubes from sunroof frame.
- 5) Remove room lamp harness clip (A).



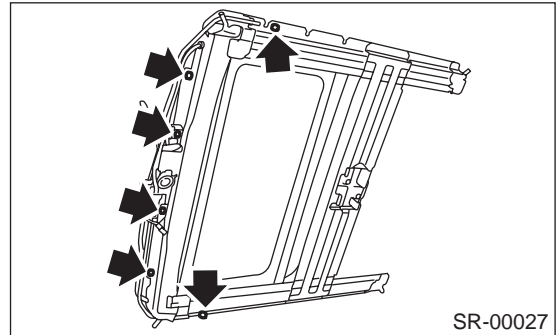
- 6) Disconnect sunroof harness connector.
- 7) Remove motor cover.



- 8) Remove sunroof brackets front (A) and rear (B).

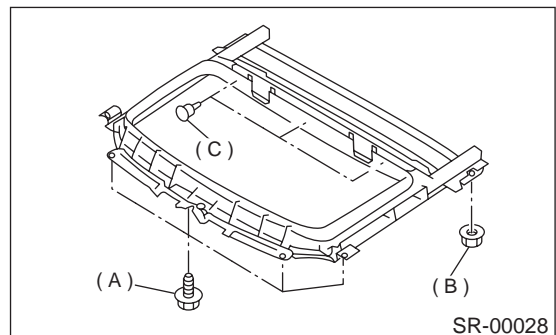


- 9) Remove nuts then detach the sunroof frame.



2. WAGON (FRONT)

- 1) Disconnect ground cable from battery.
- 2) Remove roof trim. <Ref. to EI-42, WAGON, REMOVAL, Roof Trim.>
- 3) Remove front sunroof lid. <Ref. to SR-6, WAGON (FRONT), REMOVAL, Sunroof Lid.>
- 4) Remove room lamp harness clip.
- 5) Remove bolts (A), nuts (B) and clips (C) then detach the sunroof frame.

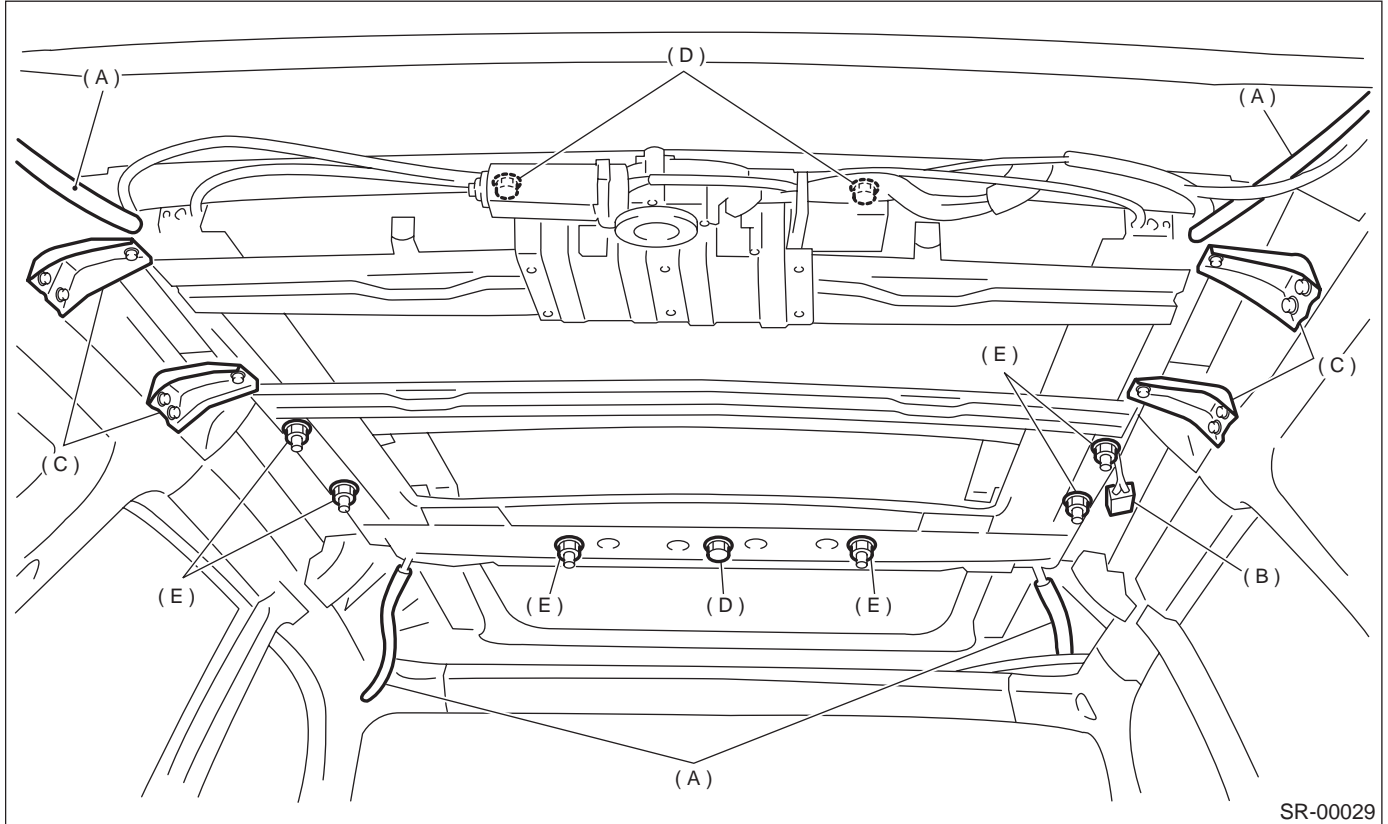


SUNROOF ASSEMBLY

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

3. WAGON (REAR)

- 1) Disconnect ground cable from battery.
- 2) Remove roof trim. <Ref. to EI-42, WAGON, REMOVAL, Roof Trim.>
- 3) Remove rear sunroof lid. <Ref. to SR-6, SEDAN AND WAGON (REAR), REMOVAL, Sunroof Lid.>
- 4) Disconnect drain tubes (A) from rear sunroof frame.
- 5) Disconnect sunroof harness connector (B).
- 6) Remove sunroof brackets (C).
- 7) Remove bolts (D) and nuts (E) then detach the sunroof frame.



SR-00029

SUNROOF ASSEMBLY

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

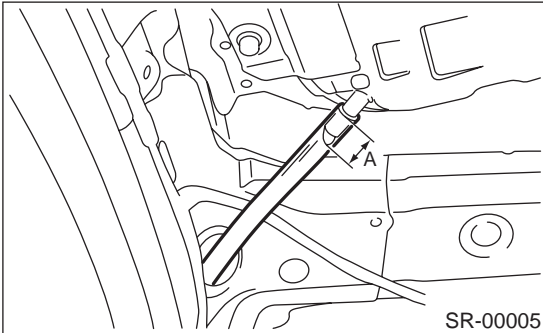
Be careful not to snag the harness.

NOTE:

- Make sure to connect harness connector.
- When installing drain tube, insert it securely onto drain pipe.

Length A:

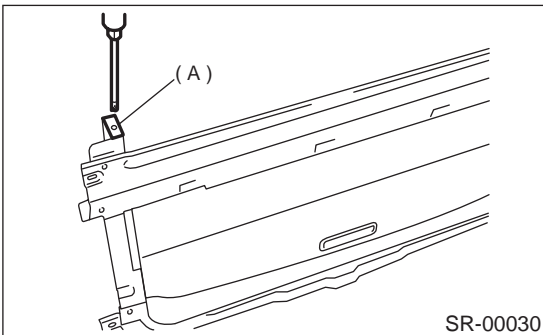
15 mm (0.59 in) or more



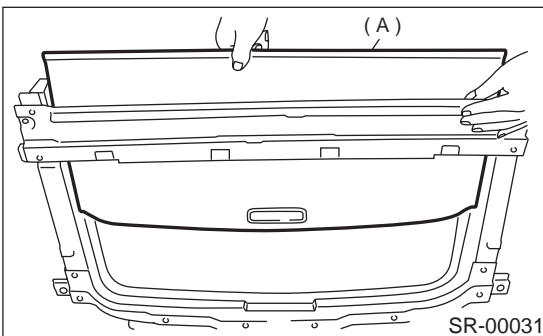
C: DISASSEMBLY

1. SEDAN AND WAGON (FRONT)

- 1) Remove sunroof frame.
- 2) Remove rail stoppers (A).

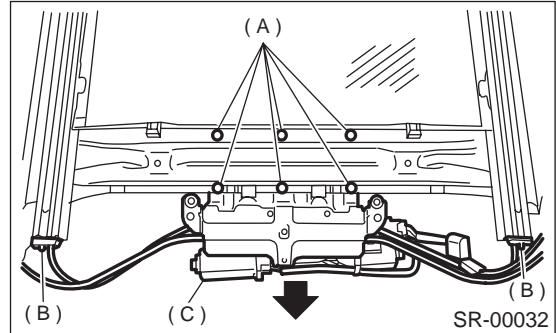


- 3) Pull out the sunshade (A) from sunroof frame.

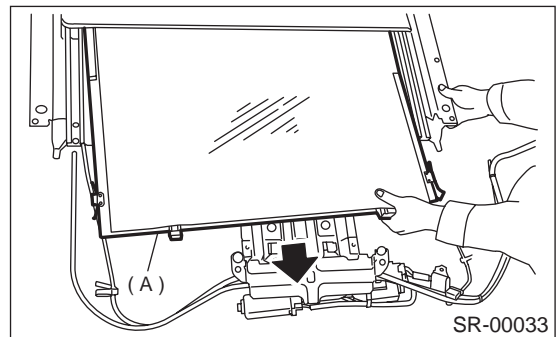


2. WAGON (REAR)

- 1) Remove rear sunroof frame.
- 2) Remove sunroof motor bracket mounting screws (A).
- 3) Remove rail stoppers (B) then pull the motor assembly (C) in the direction shown in the figure.



- 4) Pull out the sunshade (A) from sunroof frame.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

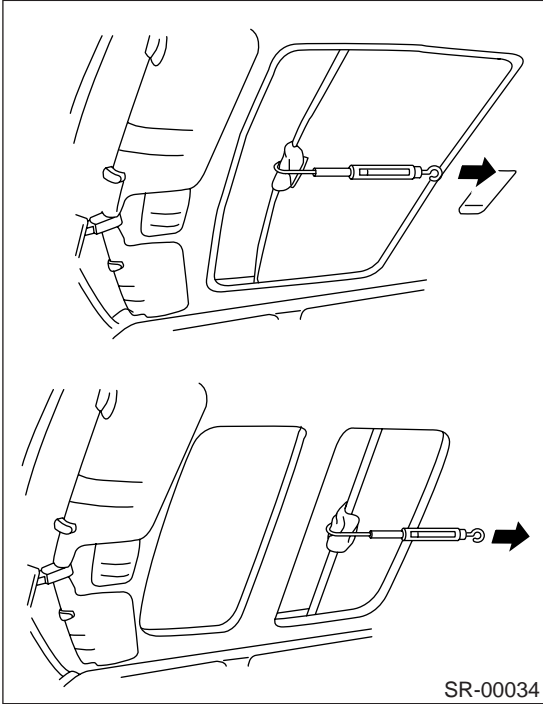
SUNROOF ASSEMBLY

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

E: INSPECTION

1. CHECK FOR MOVEMENT OF SUNSHADE

1) Place a cloth on sunshade, and attach a spring scale to sunshade edge using a cloth.



2) Pull spring scale to measure force required to move the sunshade.

Force required to move rear sunshade:

Less than 24.5 ± 4.9 N (2.5 ± 0.5 kgf, 5.5 ± 1.1 lb)

NOTE:

Considerable force is required to start sunshade moving, so take a scale reading when it begins to move smoothly.

3) If the force required exceeds specifications, check the following points:
Sunroof lid, sunshade and guide rail assembly for improper installation

SUNROOF MOTOR

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

5. Sunroof Motor

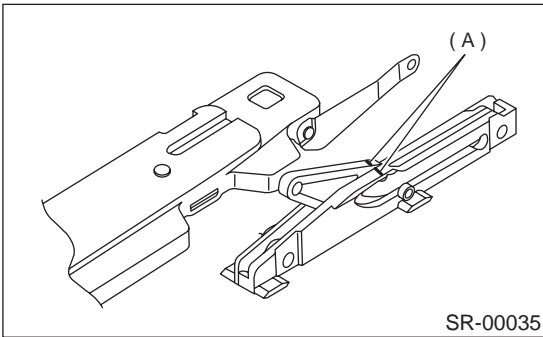
A: REMOVAL

CAUTION:

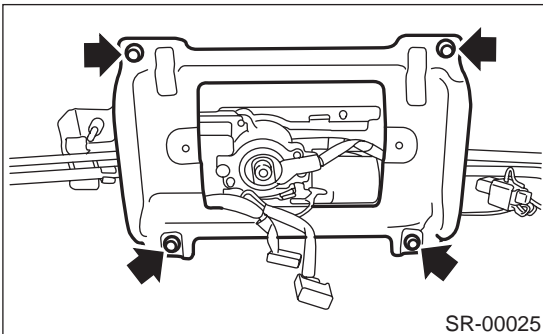
When removing clip, use great care not to damage the roof trim.

1. SEDAN

- 1) Completely close the sunroof.
- 2) Disconnect ground cable from battery.
- 3) Remove sunroof lid. <Ref. to SR-6, SEDAN AND WAGON (REAR), REMOVAL, Sunroof Lid.>
- 4) Confirm the matching mark (A) of sunroof bracket link and the guide from sunroof opening. (If the mark does not match, adjust to match the mark.)



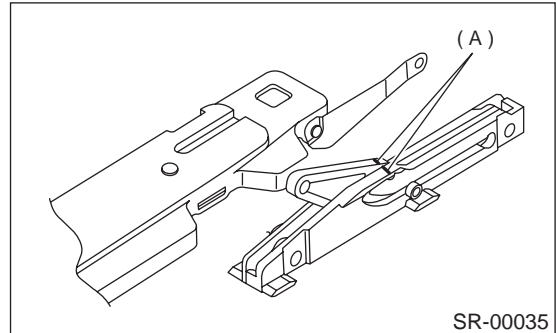
- 5) Remove roof trim. <Ref. to EI-42, SEDAN, REMOVAL, Roof Trim.>
- 6) Remove motor cover.



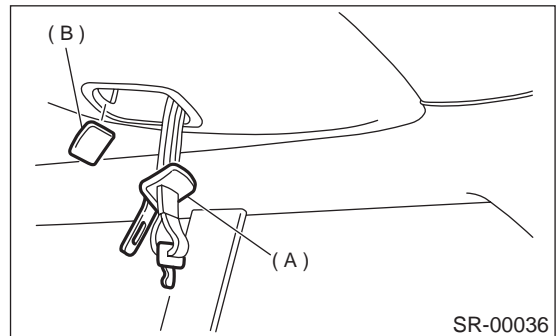
- 7) Disconnect harness connector and remove sunroof motor mounting screw.

2. WAGON

- 1) Completely close the front and rear sunroof, then tilt-up the front sunroof to the most upper position.
- 2) Disconnect ground cable from battery.
- 3) Remove rear sunroof lid. <Ref. to SR-6, SEDAN AND WAGON (REAR), REMOVAL, Sunroof Lid.>
- 4) Confirm the matching mark (A) of rear sunroof bracket link and the guide from sunroof opening. (If the mark does not match, adjust to match the mark.)



- 5) Remove luggage room light. <Ref. to LI-33, REMOVAL, Luggage Room Light.>
- 6) Remove rear assist grips.
- 7) Remove rear quarter trim. <Ref. to EI-40, WAGON, REMOVAL, Rear Quarter Trim.>
- 8) Remove cover (B) while detaching snap lock carefully. Put the rear center seat belt tongue (A) out to the other side of the trim through the hole.

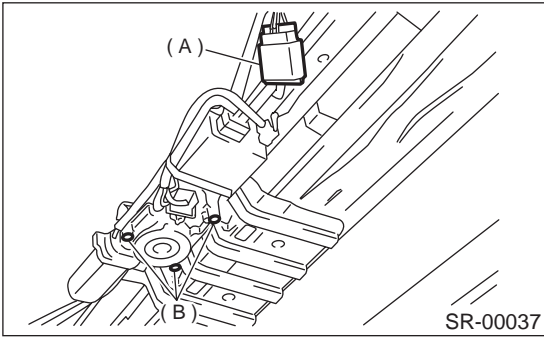


- 9) Remove clips and hang down rear end of roof trim.

SUNROOF MOTOR

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

- 10) Disconnect harness connector (A) and remove sunroof motor mounting screw (B).

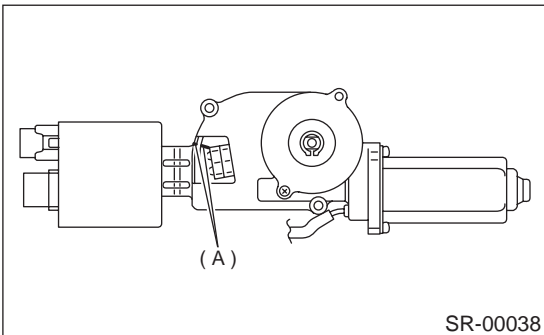


B: INSTALLATION

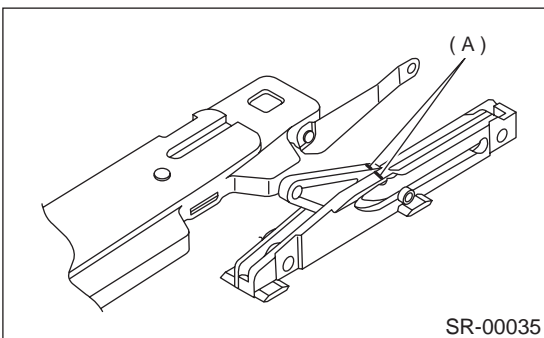
CAUTION:

- Never rotate the sunroof motor while removed.
- Be careful not to move the sunroof cable when installing sunroof motor.

- 1) Check the matching mark (A) of sunroof motor.



- 2) Confirm the matching mark (A) of sunroof bracket link.



- 3) Install sunroof motor.
- 4) After installing the motor, reconfirm the matching marks of motor side and sunroof bracket link side.
- 5) Connect sunroof motor harness connector and then connect battery ground cable.
- 6) Check the sunroof operation with the procedure as shown in the table.

SUNROOF MOTOR

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

SEDAN

Operation	Switch position
(1) Completely close sunroof.	Closed
(2) Tilt-up sunroof to most upper position.	Tilt-up
(3) Lower sunroof completely.	Tilt-down
(4) Open sunroof to near the completely open position.	Open
(5) Completely open sunroof.	Open
(6) Close sunroof 150 mm (5.91 in) away from completely closed position.	Closed
(7) Completely close sunroof.	Closed

WAGON

Operation	Switch position
(1) Completely close front and rear sunroof.	Closed
(2) Tilt-up front sunroof to most upper position.	Open
(3) Open rear sunroof to near the completely open position.	Open
(4) Completely open front and rear sunroof.	Open
(5) Close rear sunroof 150 mm (5.91 in) away from completely closed position.	Closed
(6) Completely close rear sunroof.	Closed
(7) Lower front sunroof and completely close front and rear sunroof.	Closed

7) Install trims in the reverse order of removal.

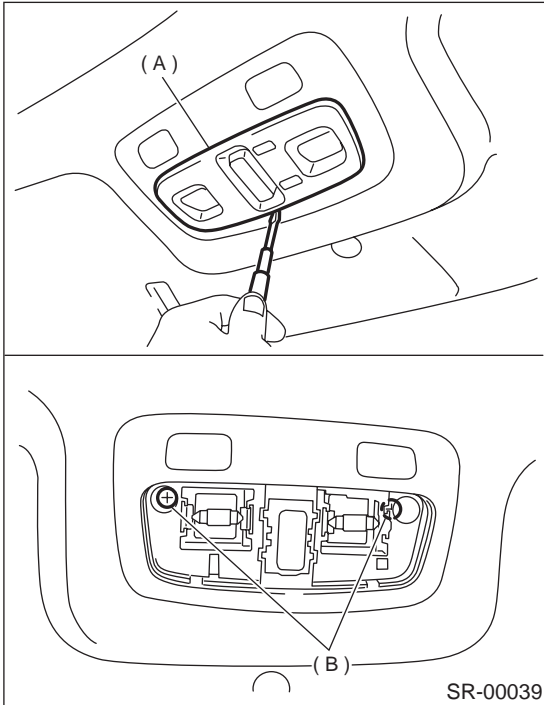
SUNROOF SWITCH

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

6. Sunroof Switch

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove spot light lens (A) and sunroof switch mounting screw (B).



SR-00039

- 3) Disconnect harness connectors and remove sunroof switch.

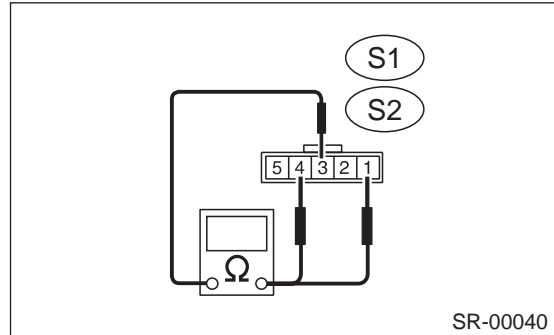
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SEDAN

Measure sunroof switch resistance.

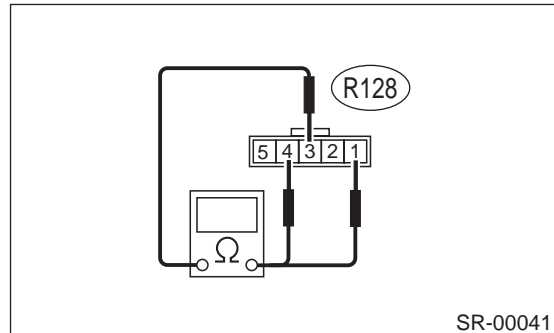


SR-00040

Switch position	Terminal No.	Standard
Open	S1: 3 and 4	Less than 1 Ω
Close	S1: 1 and 3	Less than 1 Ω
Tilt-up	S2: 3 and 4	Less than 1 Ω
Tilt-down	S2: 1 and 3	Less than 1 Ω

2. WAGON

Measure sunroof switch resistance.



SR-00041

Switch position	Terminal No.	Standard
Open	3 and 4	Less than 1 Ω
Close	1 and 3	Less than 1 Ω

EXTERIOR/INTERIOR TRIM



	Page
1. General Description	2
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3. Front Under Cover	13
4. Front Bumper	14
5. Rear Bumper	20
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22. Rear Gate Trim	44
23. Rear Shelf Trim	45
24. Trunk Trim	46
25. Trunk Lid Trim	47
26. Floor Mat	48
27. Luggage Floor Mat	49
28. Trunk Room Mat	50



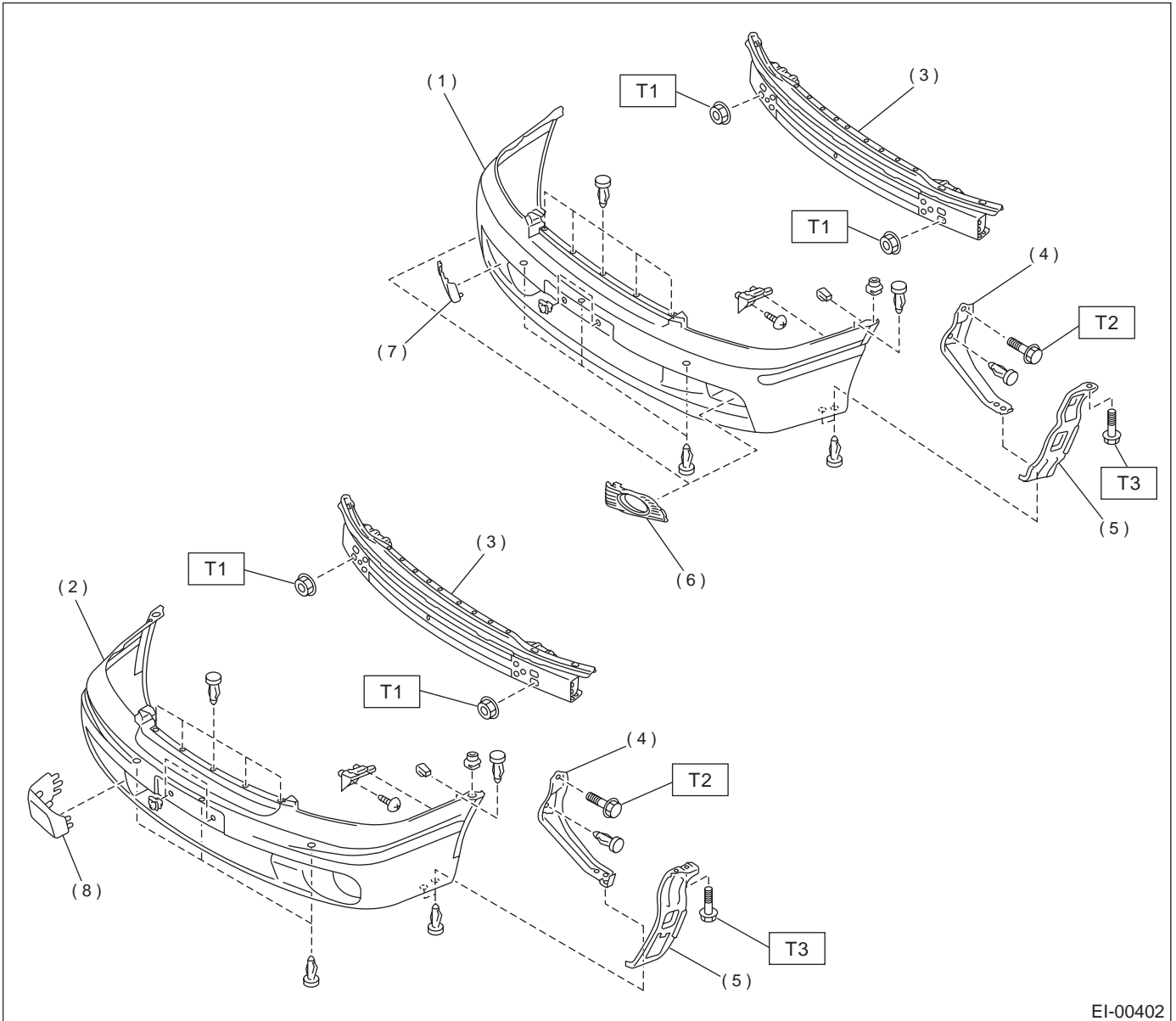
GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

1. General Description

A: COMPONENT

1. FRONT BUMPER



EI-00402

- | | |
|----------------------------------|--|
| (1) Bumper face (Except OUTBACK) | (6) Cover |
| (2) Bumper face (OUTBACK) | (7) Toeing hook cover (Except OUTBACK) |
| (3) Bumper beam | (8) Toeing hook cover (OUTBACK) |
| (4) Side stay | |
| (5) Side bracket | |

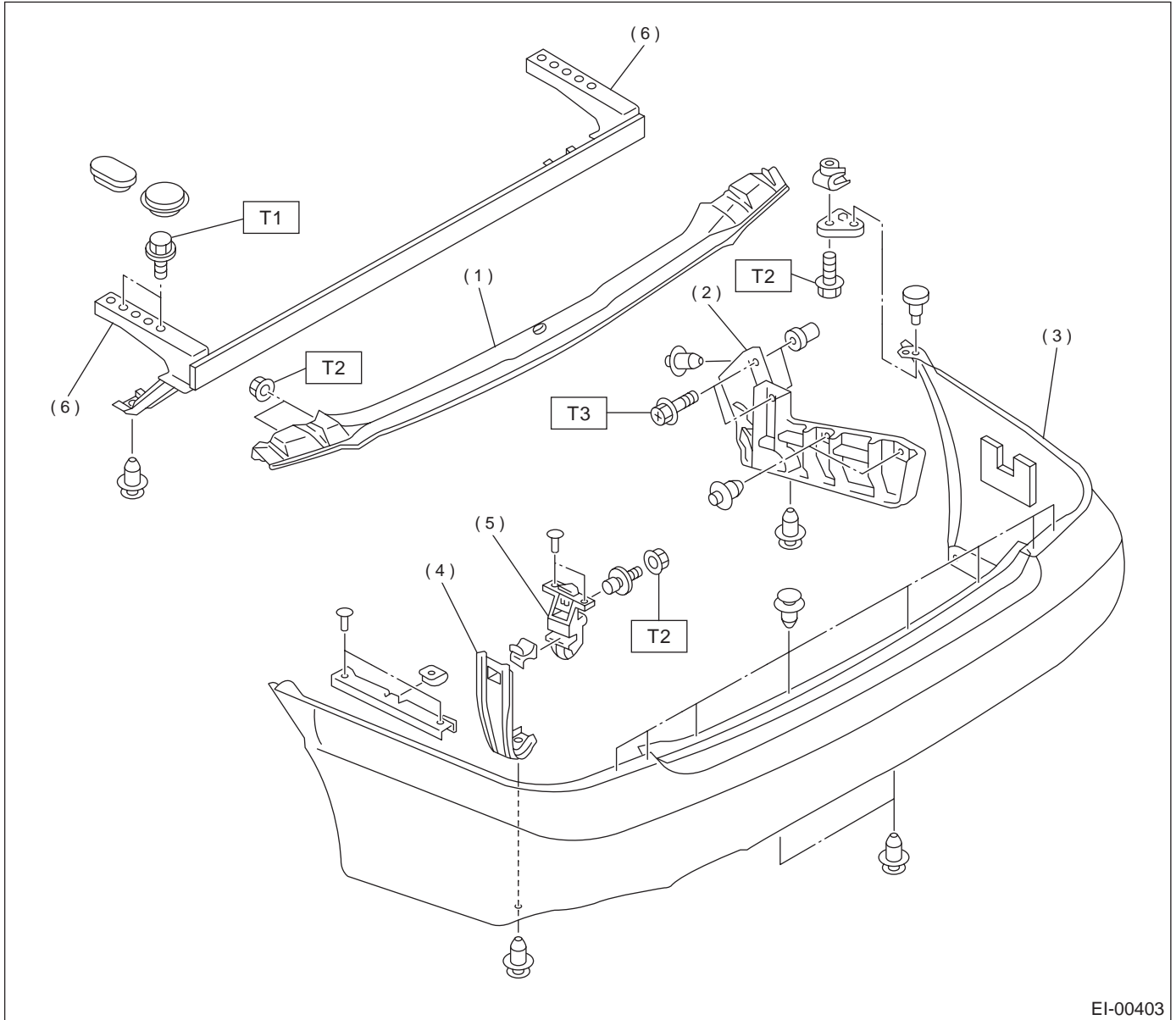
Tightening torque: N-m (kgf-m, ft-lb)

T1: 30 (3.1, 22)

T2: 17.7 (1.8, 13.0)

T3: 7.4 (0.75, 5.4)

2. REAR BUMPER (SEDAN)



- (1) Bumper beam
- (2) Side bracket
- (3) Bumper face

- (4) Side stay
- (5) Hook
- (6) Bracket

Tightening torque: N·m (kgf·m, ft·lb)

T1: 93 (9.5, 69)

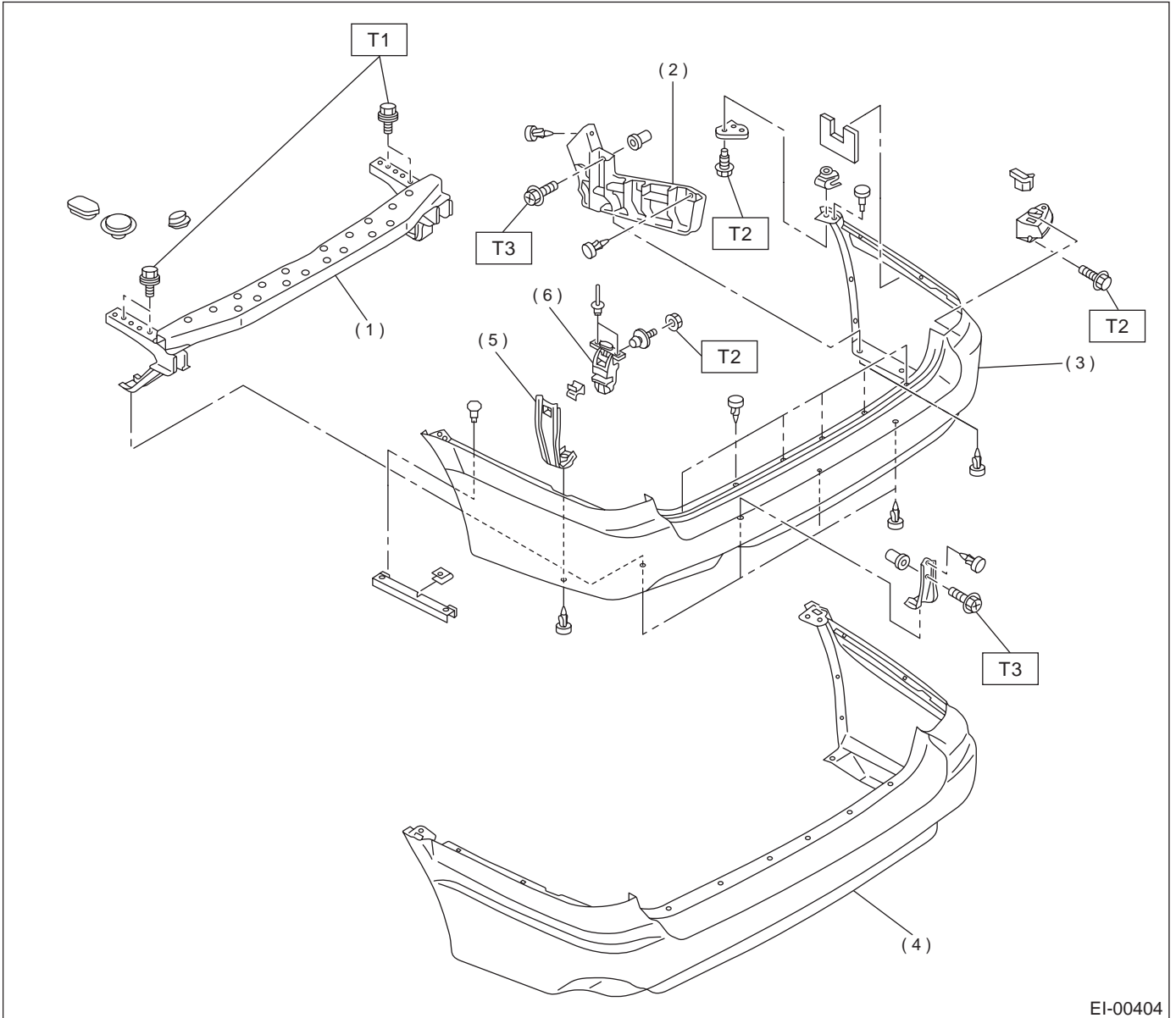
T2: 7.4 (0.75, 5.4)

T3: 2 (0.2, 1.4)

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

3. REAR BUMPER (WAGON)



EI-00404

- | | |
|----------------------------------|---------------------------|
| (1) Bumper beam | (4) Bumper face (OUTBACK) |
| (2) Side bracket | (5) Side stay |
| (3) Bumper face (Except OUTBACK) | (6) Hook |

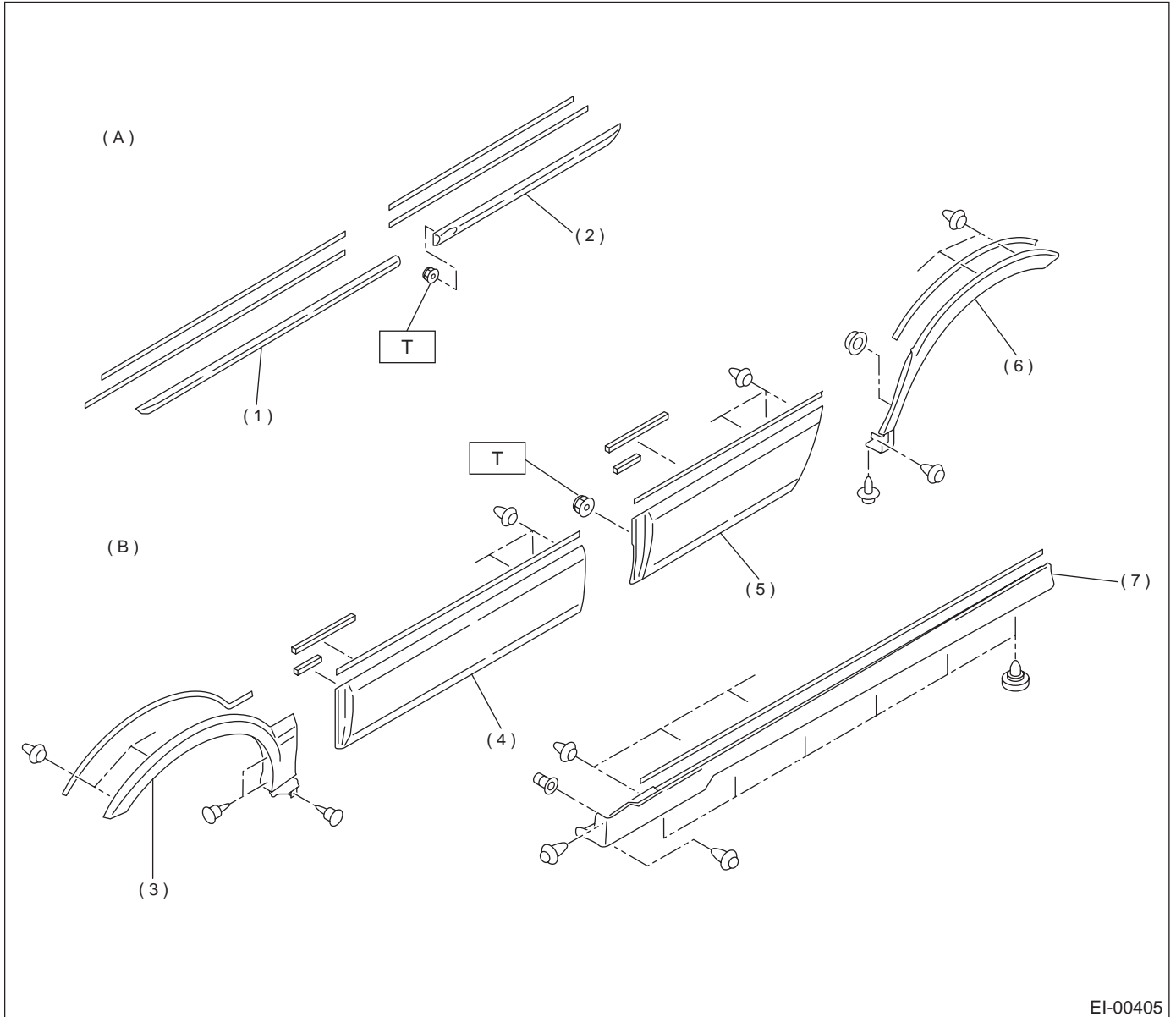
Tightening torque: N·m (kgf·m, ft·lb)

T1: 93 (9.5, 96)

T2: 7.4 (0.75, 5.4)

T3: 2 (0.2, 1.4)

4. SIDE PROTECTOR



- (A) Except OUTBACK
- (B) OUTBACK
- (1) Front side protector
- (2) Rear side protector

- (3) Side protector (Front fender)
- (4) Side protector (Front door)
- (5) Side protector (Rear door)
- (6) Side protector (Rear quarter)

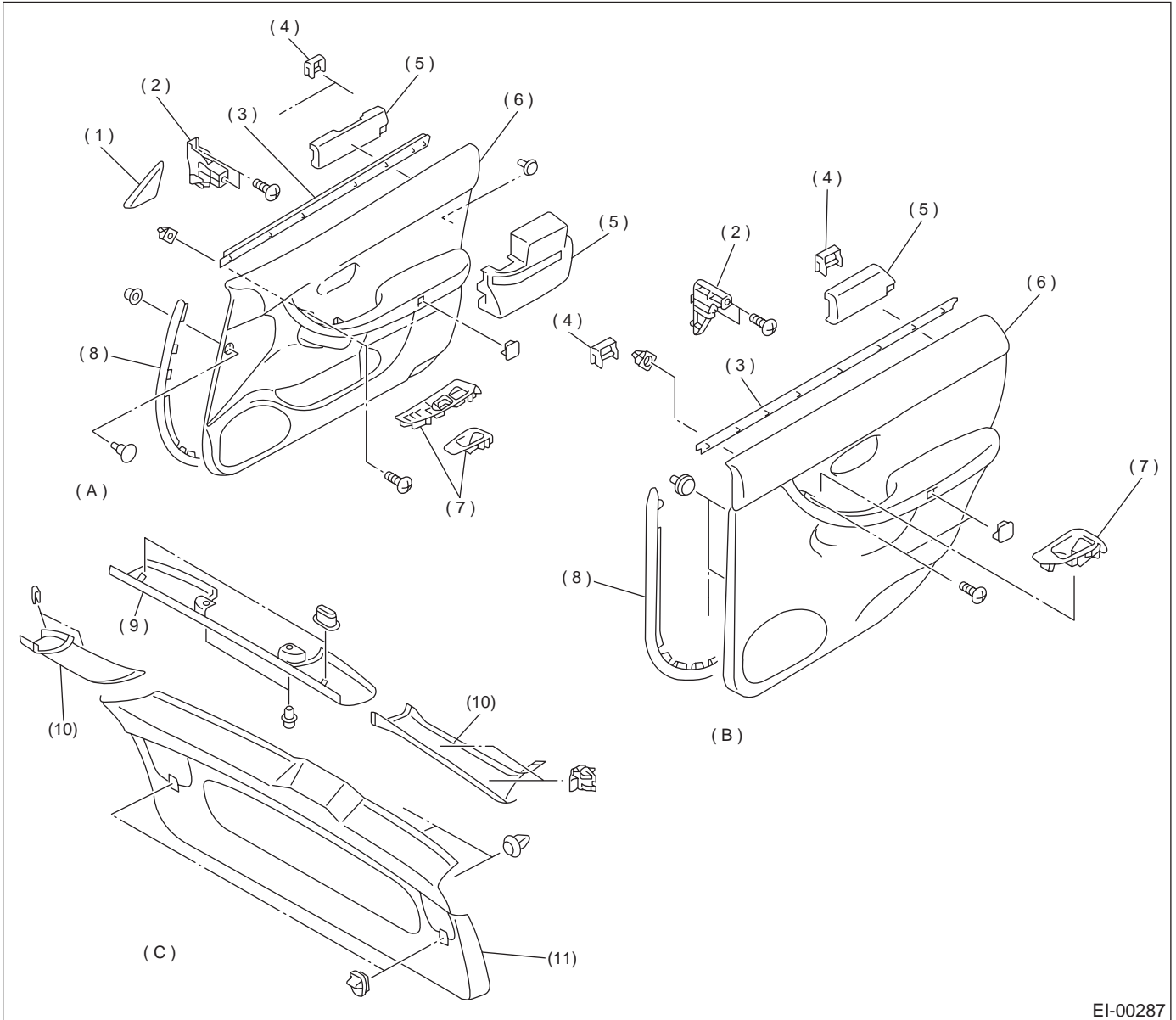
- (7) Side protector (Side sill)

Tightening torque: N·m (kgf·m, ft·lb)
T: 4.3 (0.44, 3.2)

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

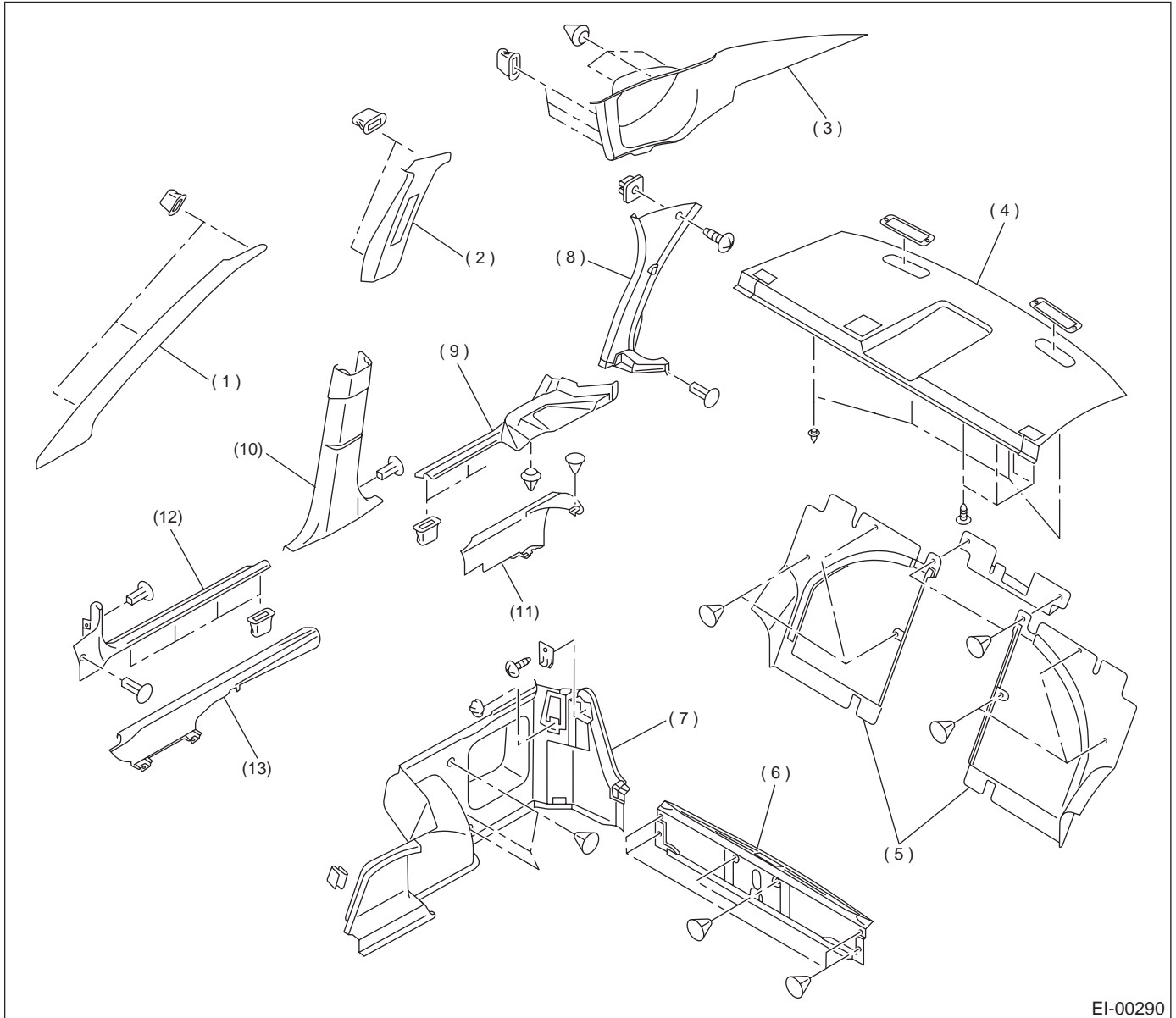
5. DOOR TRIM



EI-00287

- | | | |
|------------------|-------------------------------|------------------------|
| (A) Front door | (3) Weatherstrip upper | (8) Weatherstrip lower |
| (B) Rear door | (4) Clip | (9) Upper trim |
| (C) Rear gate | (5) Pad | (10) Side trim |
| (1) Gusset cover | (6) Trim panel | (11) Lower trim |
| (2) Bracket | (7) Power window switch cover | |

6. INNER TRIM (SEDAN)



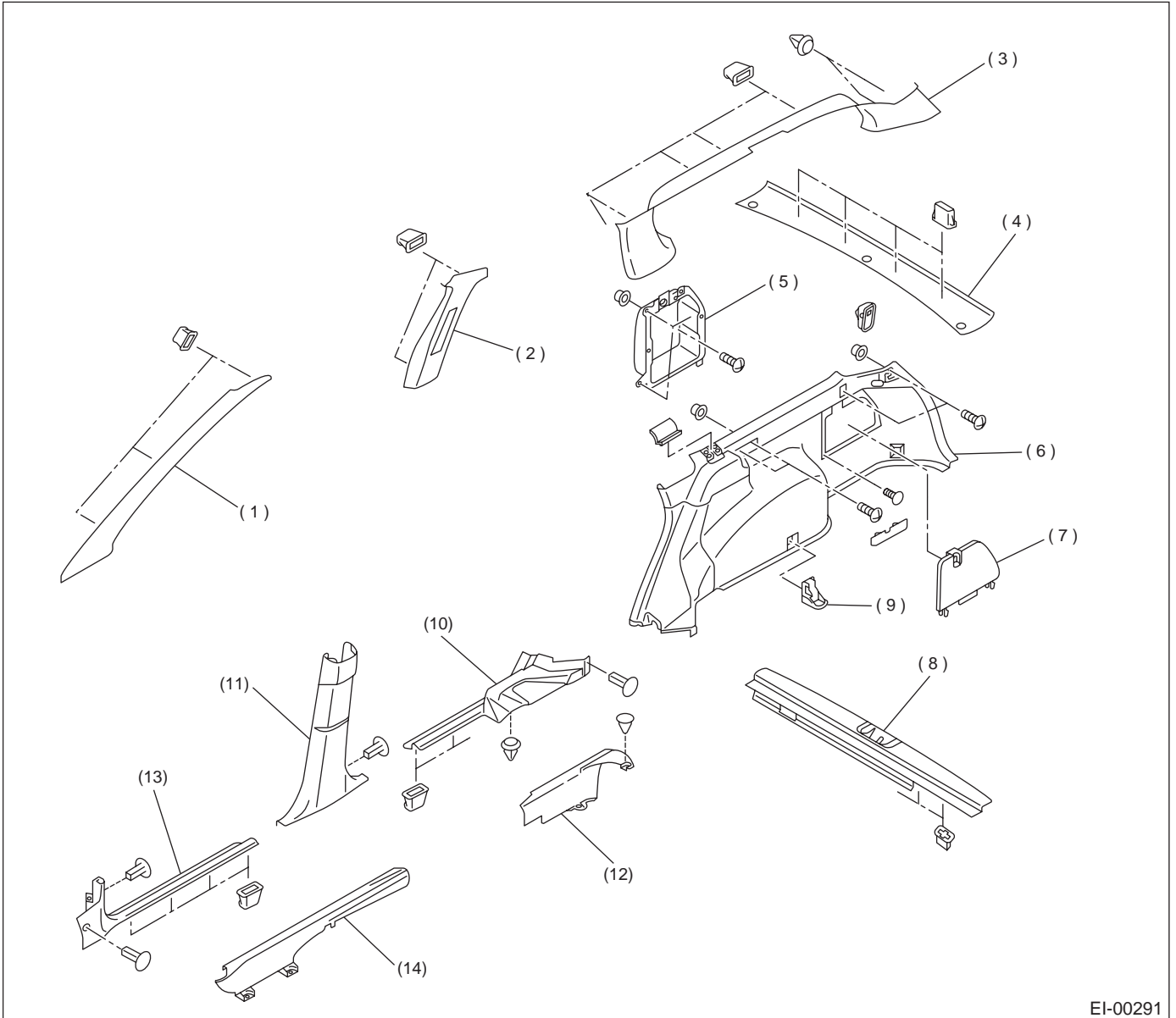
EI-00290

- | | | |
|------------------------------|--------------------------------|----------------------------------|
| (1) Front pillar upper trim | (6) Trunk rear trim | (11) Side sill rear lower cover |
| (2) Center pillar upper trim | (7) Trunk side trim | (12) Front pillar lower trim |
| (3) Rear pillar upper trim | (8) Rear pillar lower trim | (13) Side sill front lower cover |
| (4) Rear shelf trim | (9) Side sill rear upper cover | |
| (5) Rear bulk trim | (10) Center pillar lower trim | |

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

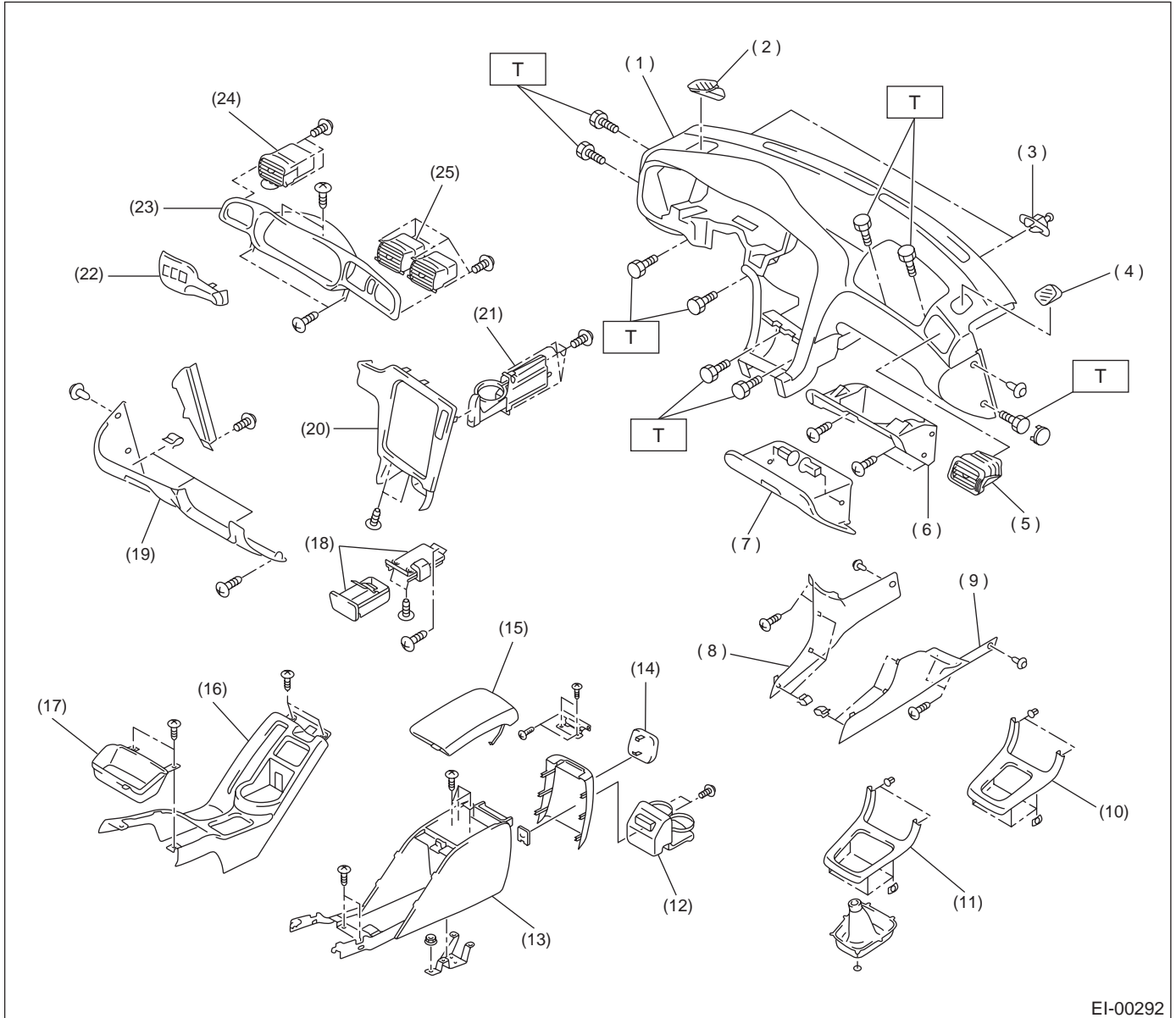
7. INNER TRIM (WAGON)



EI-00291

- | | | |
|------------------------------|---------------------------------|----------------------------------|
| (1) Front pillar upper trim | (6) Rear quarter lower trim | (11) Center pillar lower trim |
| (2) Center pillar upper trim | (7) Lid | (12) Side sill rear lower cover |
| (3) Rear pillar upper trim | (8) Rear skirt trim | (13) Front pillar lower trim |
| (4) Rear rail trim | (9) Hook | (14) Side sill front lower cover |
| (5) Pocket | (10) Side sill rear upper cover | |

8. INSTRUMENT PANEL



EI-00292

- | | | |
|---------------------------|-----------------------|-----------------------|
| (1) Pad & frame | (11) Front cover (MT) | (21) Front cup holder |
| (2) Grille side (D) | (12) Rear cup holder | (22) Switch panel |
| (3) Hook | (13) Console box | (23) Meter visor |
| (4) Grille side (P) | (14) Rear ash tray | (24) Grille vent (D) |
| (5) Grille vent (P) | (15) Console lid | (25) Grille center |
| (6) Glove box panel | (16) Console cover | |
| (7) Glove box lid | (17) Tray | |
| (8) Center panel side (D) | (18) Ash tray | |
| (9) Center panel side (P) | (19) Lower cover | |
| (10) Front cover (AT) | (20) Center panel | |

Tightening torque: N·m (kgf·m, ft·lb)

T: 7±1 (0.7±0.1, 5.1±0.7)

NOTE:

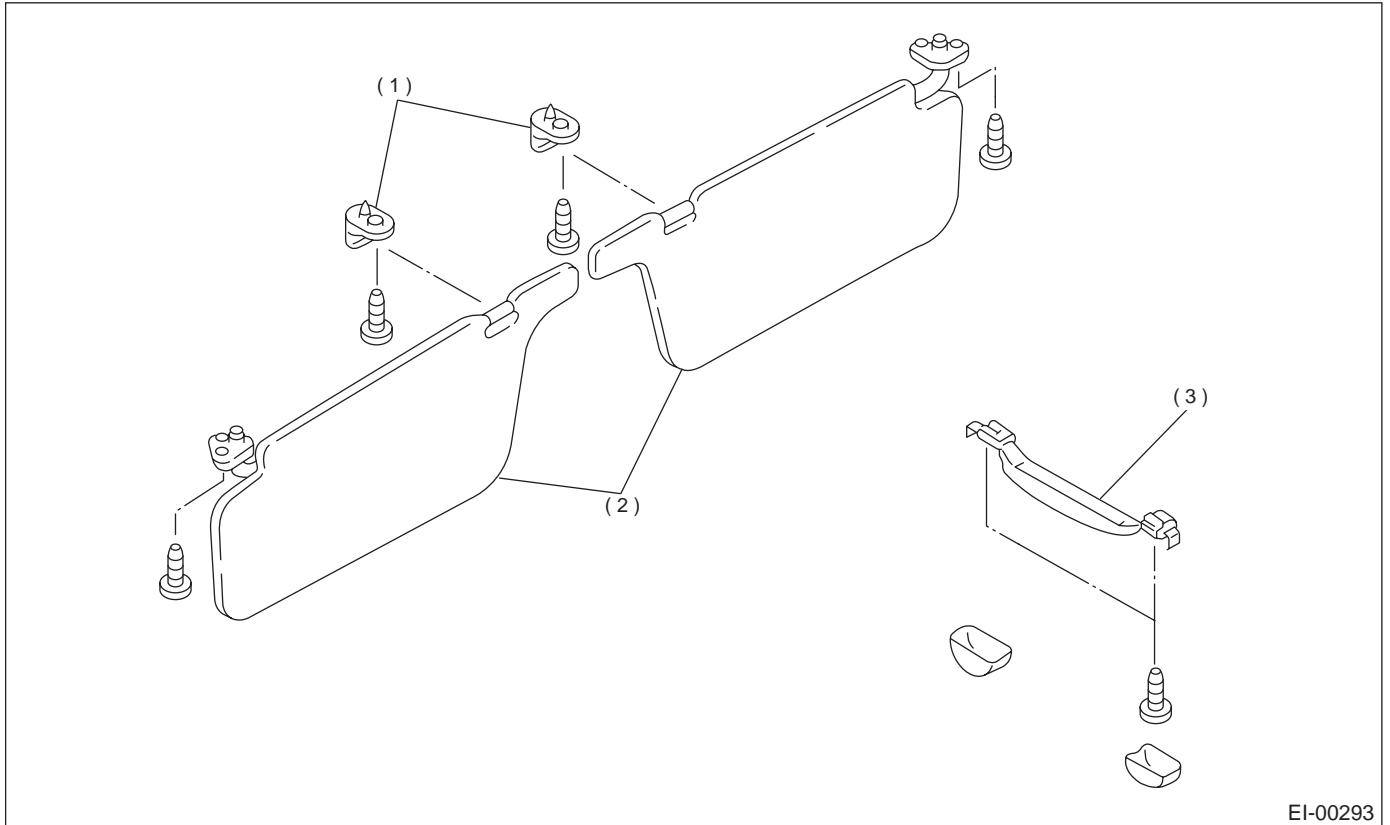
This illustration is for LHD model.

The location for RHD model is symmetrically opposite.

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

9. INNER ACCESSORIES



EI-00293

(1) Hook

(2) Sun visor

(3) Assist grip

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

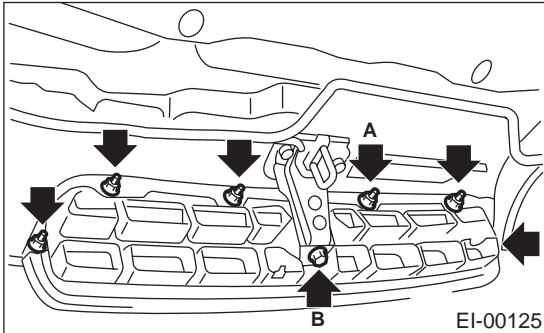
B: PREPARATION TOOL

TOOL NAME	REMARKS
Clip remover	Used for removal of trim.
Adhesive remover	Used for removal of side protector.
Primer	Used for installation of side protector.
Infrared lamp	Used for disassembly/assembly of side protector.
Tow-sided tape	Used for installation of side protector.
TORX® T30	Used for disassembly/assembly of crossbar.

2. Front Grille

A: REMOVAL

- 1) Open hood.
- 2) Loosen bolts and nuts to remove front grill.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

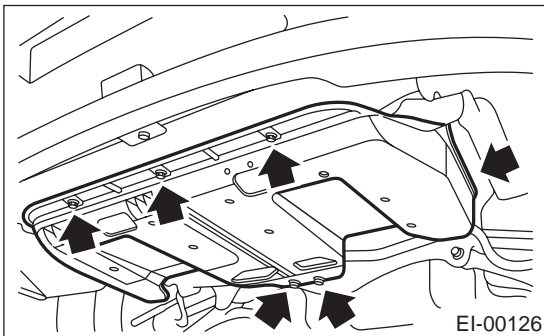
A (Nut): 4.4 ± 1.5 N·m (0.45 ± 0.15 kgf·m,
 3.3 ± 1.1 ft·lb)

B (Bolt): 0.9 ± 2.0 N·m (0.7 ± 0.2 kgf·m,
 5.1 ± 1.4 ft·lb)

3. Front Under Cover

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen bolts and clips to remove under cover.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18.4 N·m (1.88 kgf-m, 13.6 ft-lb)

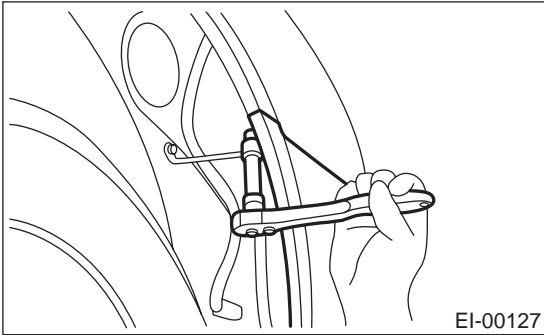
FRONT BUMPER

EXTERIOR/INTERIOR TRIM

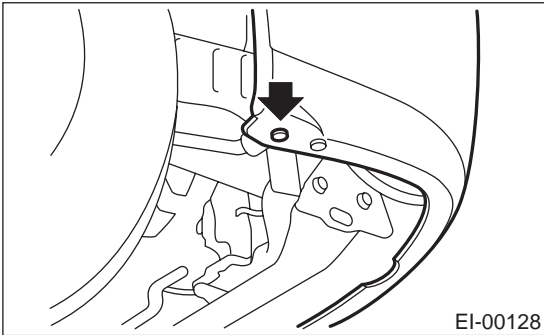
4. Front Bumper

A: REMOVAL

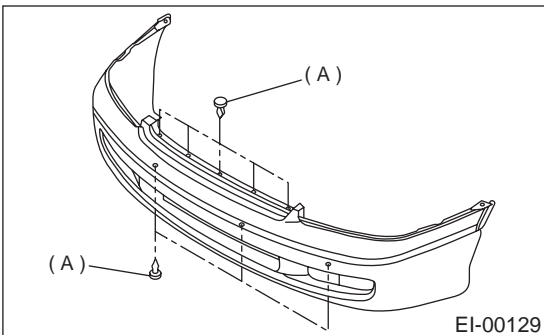
- 1) Open hood.
- 2) Disconnect ground cable from battery.
- 3) Pull off front side of front mud guard, then remove bolts from inside the mud guard.



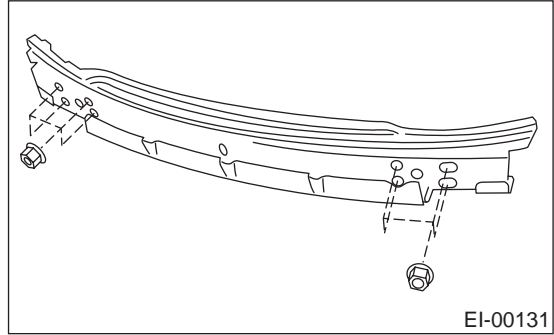
- 4) Remove clip at bottom of bumper.



- 5) Remove clip (A), and pull out bumper slightly.
- 6) Disconnect electrical connector of fog light to remove bumper.



- 7) Remove bumper beam.



B: INSTALLATION

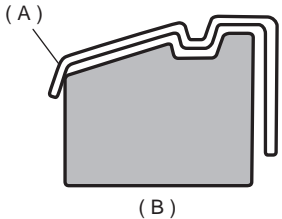
Install in the reverse order of removal.

Tightening torque:

Refer to **COMPONENT** in *General Description*. <Ref. to EI-2, **FRONT BUMPER, COMPONENT, General Description**.>

C: REPAIR

1. COATING METHOD FOR PP BUMPER

Process No.	Process name	Job contents	
1	Bumper mounting	Set bumper (A) on paint worktable (B) if required. Use paint worktable conforming to inner shape of bumper when possible.	 <p style="text-align: right;">EI-00132</p>
2	Masking	Mask specified part (black base) with masking tape. Use masking tape for PP (example, Nichiban No. 533, etc.).	
3	Degreasing, cleaning	Clean all parts to be painted with white gasoline, normal alcohol, etc. to remove dirt, oil, fat, etc.	
4	Primer paint	Apply primer one to all parts to be painted, using air gun. Use primer (clear).	
5	Drying	Dry at normal temperature [10 to 15 min. at 20°C (68°F)]. In half-dried condition, PP primer paint is dissolved by solvent, e.g. thinner, etc. Therefore, if dust or dirt must be removed, use ordinary alcohol, etc.	
6	Top coat paint (I)	Solid color	Metallic color
		Use section (block) paint for top coat. • Paint in use (for each color): Solid paint Hardener PB Thinner T-301 • Mixing ratio: Main agent vs. hardener = 4:1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 35 — 45μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm ² , 36 — 50 psi)	Use section (block) paint for top coat. • Paint in use (for each color): Metallic paint Hardener PB Thinner T-306 • Mixing ratio: Main agent vs. hardener = 10 : 1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 15 — 20μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm ² , 36 — 50 psi)
7	Drying	Not required.	Dry at normal temperature [10 min. or more at 20°C (68°F)]. In half-dried condition, avoid dust, dirt.
8	Top coat paint (II)	Not required.	Apply a clear coat to parts with top coat paint (I), three times, at 5 — 7 minutes intervals. • Paint in use: Metallic paint Hardener PB Thinner T-301 • Mixing ratio: Clear vs. hardener = 6 : 1 • Viscosity: 14 — 16 sec/20°C (68°F) • Film thickness: 25 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm ² , 36 — 50 psi)
9	Drying	60°C (140°F), 60 min. or 80°C (176°F), 30 min. If higher than 80°C (176°F), PP may be deformed. Keep maximum temperature of 80°C (176°F).	
10	Inspection	Paint check.	
11	Masking removal	Remove masking in process No. 2.	

FRONT BUMPER

EXTERIOR/INTERIOR TRIM

2. REPAIR INSTRUCTIONS FOR COLORED PP BUMPER

NOTE:

All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damage limited to shallow scratches that cause only a change in the lustre of the base material or coating, can be almost fully restored. Before repairing a damaged area, explain this point to the customer and get an understanding about the matter. Repair methods are outlined below, based on a classification of the extent of damage.

• **Minor damage causing only a change in the lustre of the bumper due to a light touch**

Almost restorable.

Process No.	Process name	Job contents	
1	Cleaning	Clean the area to be repaired using water.	
2	Sanding	Grind the repairing area with #500 sand paper in a "feathering" motion.	
3	Finish	Resin section	Coated section
		Repeatedly apply wax to the affected area using a soft cloth (such as flannel). Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent.	Perform either the same operation as for the resin section or process No. 18 and subsequent operations in the "(3)" section, depending on the degree and nature of damage.
		Polish the waxed area with a clean cloth after 5 to 10 minutes.	

• **Deep damage caused by scratching fences, etc.**

A dent cannot be repaired but a whitened or swelled part can be removed.

Process No.	Process name	Job contents	
1	Cleaning	Clean damaged area with water.	
2	Removal of damaged area	Cut off protruding area, if any, due to collision, using a putty knife.	
3	Sanding	Grind the affected area with #100 to #500 sand paper.	
4	Finish	Resin section	Coated section
		Same as Process No. 3 in the "(1)" section.	Perform Process No. 12 and subsequent operations in the "(3)" section.

• **Deep damage such as a break or hole that requires filling**

Much of the peripheral grained surface must be sacrificed for repair, and the degree of restoration is not really worth the expense. (The surface, however, will become almost flush with adjacent areas.)

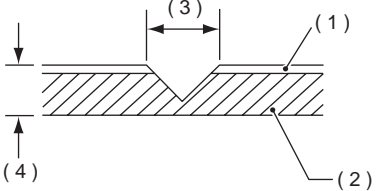
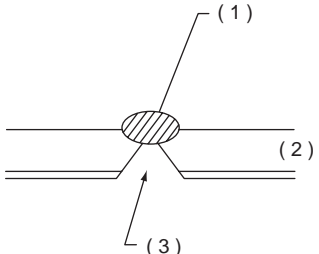
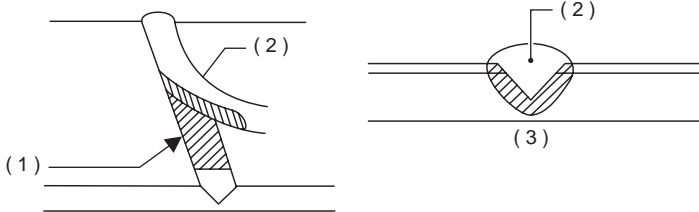
Recommended repair kit: PP Part Repair Kit (NRM)

Process No.	Process name	Job contents	
1	Bumper removal	Remove bumper as required.	
2	Part removal	Remove parts built into bumper as required.	
3	Bumper placement	Place bumper (A) on a paint worktable (B) as required. It is recommended that contour of worktable accommodate internal shape of bumper.	<p>The diagram shows a bumper, labeled (A), which has a complex, multi-layered profile. It is being placed on a rectangular surface, labeled (B), which represents a paint worktable. The bumper's shape is designed to fit into a specific contour on the worktable.</p>

EI-00132


FRONT BUMPER

EXTERIOR/INTERIOR TRIM

Process No.	Process name	Job contents	
4	Surface preparation	Remove dust, oil, etc. from areas to be repaired and surrounding areas, using a suitable solvent (NRM No. 900 Precleno, white gasoline, or alcohol).	
5	Cutting	<p>If nature of damage are cracks or holes, cut a guide slit of 20 to 30 mm (0.79 to 1.18 in) in length along the crack or hole up to the bumper's base surface. Then, bevel or "vee-out" the affected area using a knife or grinder.</p>	 <p style="text-align: right;">EI-00294</p> <p>(1) Paint surface (2) PP base surface (3) 20 — 30 mm (0.79 — 1.18 in) (4) 3 mm (0.12 in)</p>
6	Sanding (I)	Grind beveled surface with sand paper (#40 to #60) to smooth finish.	
7	Cleaning	Clean the sanded surface with the same solvent as used in Process No. 4.	
8	Temporary welding	<p>Grind the side just opposite the beveled area with sand paper (#40 to #60) and clean using a solvent. Temporarily spot-weld the side, using a PP welding rod and heater gun.</p>	 <p style="text-align: right;">EI-00135</p> <p>(1) Welded spot (Use heater gun and PP welding rod) (2) PP base surface (3) Beveled section</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Do not melt welding rod until it flows out. This results in reduced strength. • Leave the welded spot unattended until it cools completely.
9	Welding	<p>Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.</p>	 <p style="text-align: right;">EI-00136</p> <p>(1) Melt hatched area (2) Welding rod (3) Section</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Melt the sections indicated by hatched area. • Do not melt welding rod until it flows out, in order to provide strength. • Always keep the heater gun 1 to 2 cm (0.4 to 0.8 in) away from the welding spot. • Leave the welded spot unattended until it cools completely.

FRONT BUMPER

EXTERIOR/INTERIOR TRIM

Process No.	Process name	Job contents	
10	Sanding (II)	Remove excess part of weld with a putty knife. If a drill or disc wheel is used instead of the knife, operate it at a rate lower than 1,500 rpm and grind the excess part little by little. A higher rpm will cause the PP substrate to melt from the heat.	
		 <p style="text-align: right;">EI-00042</p>	
		Sand the welded spot smooth with #240 sand paper.	
11	Masking	Mask the black substrate section using masking tape. Recommended masking tape: Nichiban No. 533 or equivalent	
12	Cleaning/ degreasing	Completely clean the entire coated area, using solvent similar to that used in Process No. 4.	
13	Primer coating	Apply a coat of primer to the repaired surface and its surrounding areas. Mask these areas, if necessary. Recommended primer: Mp/ 364 PP Primer NOTE: Be sure to apply one coat of primer at a spraying pressure of 245 to 343 kPa (2.5 to 3.5 kg/cm ² , 36 to 50 psi) with a spray gun.	
14	Leave unattended.	Leave the repaired area unattended at 20°C (68°F) for 10 to 15 minutes until primer is half-dry. NOTE: If dirt or dust comes in contact with the coated area, wipe it off with a cloth dampened with alcohol. (Do not use thinner since the coated area tends to melt.)	
15	Primer surfacer coating	Apply a coat of primer surfacer to the repaired area two or three times at an interval of 3 to 5 minutes. Recommended surfacer: <ul style="list-style-type: none"> • UPS 300 Flex Primer • No. 303 UPS 300 Exclusive hardener • NPS 725 Exclusive Reducer (thinner) • Mixing ratio: 2 : 1 (UPS 300: No. 303) • Viscosity: 12 — 14 sec/20°C (68°F) • Coated film thickness: 40 — 50μ 	
16	Drying	Allow the coated surface to dry for 60 minutes at 20°C (68°F) [or 30 minutes at 60°C (140°F)].	
17	Sanding (III)	Sand the coated surface and its surrounding areas using #400 sand paper and water.	
18	Cleaning/ degreasing	Same as Process No. 12.	
19	Top coat (I)	Solid color	Metallic color
		Use a "block" coating method. <ul style="list-style-type: none"> • Recommended paint: Suncryl (SC) • No. 307 Flex Hardener • SC Reducer (thinner) • Mixing ratio: 3 : 1 • Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 40 — 50μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm², 36 — 50 psi) 	Use a "block" coating method. <ul style="list-style-type: none"> • Recommended paint: Suncryl (SC) • No. 307 Flex Hardener • SC Reducer (thinner) • Mixing ratio: 3 : 1 • Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm², 36 — 50 psi)
20	Leave unattended.	Not required.	Leave unattended at 20°C (68°F) for at least 10 minutes until the topcoated area is half-dry. NOTE: Be careful to keep dust or dirt from coming in contact with the affected area.

FRONT BUMPER

EXTERIOR/INTERIOR TRIM

Process No.	Process name	Job contents
21	Top coat (II)	<p>Not required.</p> <p>Apply a clear coat three times at an interval of 3 to 5 minutes.</p> <ul style="list-style-type: none"> • Recommended paint: SC710 Overlay Clear No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 10 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm², 36 — 50 psi)
22	Drying	<p>Allow the coated surface to dry at 20°C (68°F) for two hours or 60°C (140°F) for 30 minutes.</p> <p>NOTE: Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate.</p>
23	Inspection	Carefully check the condition of the repaired area.
24	Masking removal	Remove masking tape applied in Process No. 11 and 13.
25	Parts installation	Install parts on bumper in reverse order of removal.
26	Bumper installation	Install bumper.

REAR BUMPER

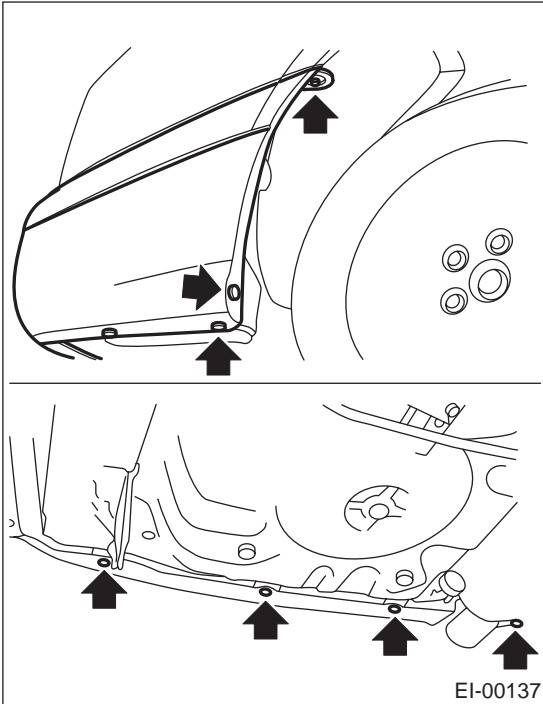
EXTERIOR/INTERIOR TRIM

5. Rear Bumper

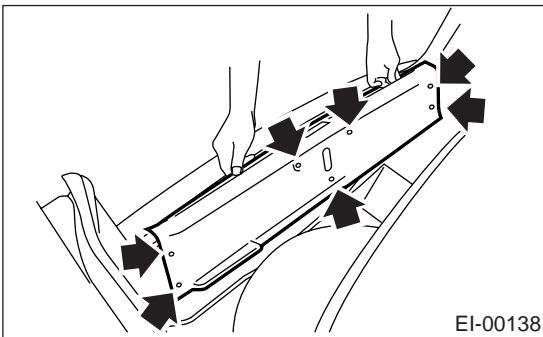
A: REMOVAL

1. SEDAN

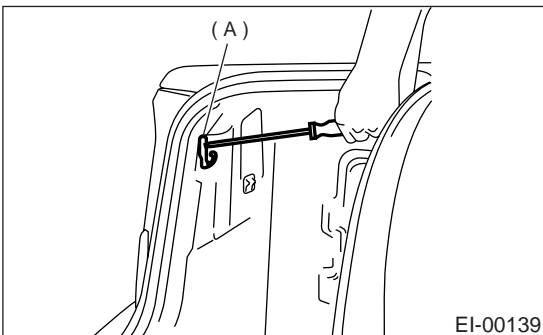
- 1) Lift-up the vehicle.
- 2) Remove bolts and clips.



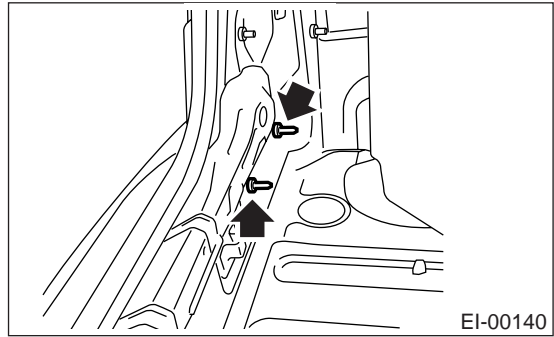
- 3) Loosen clips to remove trunk rear trim.



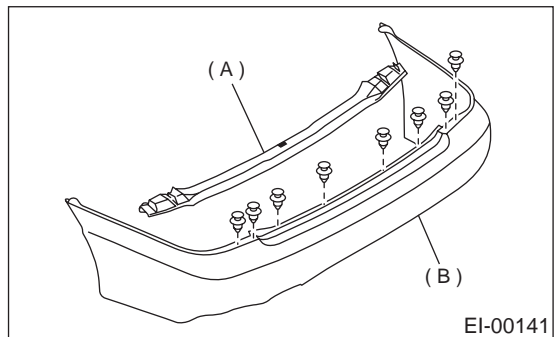
- 4) Remove hook (A) to pull off rear side of trunk side trim.



- 5) Remove two nuts from each side to remove rear bumper.

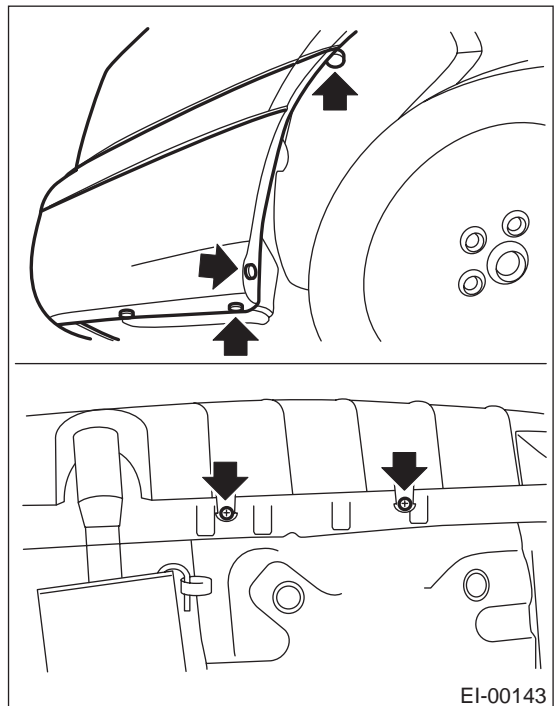


- 6) Loosen clips to remove upper beam (A) from bumper face.



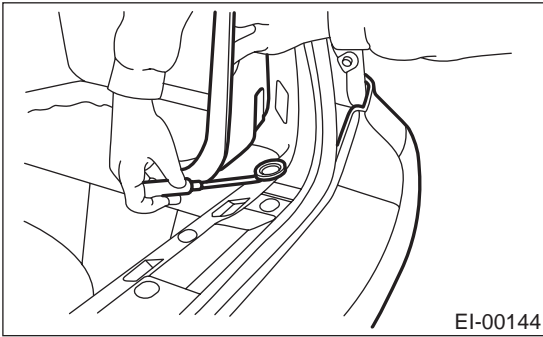
2. WAGON

- 1) Lift-up the vehicle.
- 2) Remove bolts and clips.

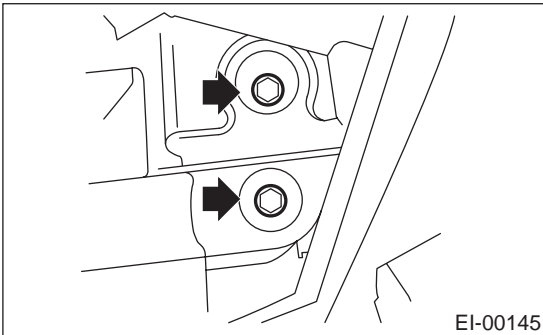


- 3) Remove rear floor box. <Ref. to EI-40, Removal.>

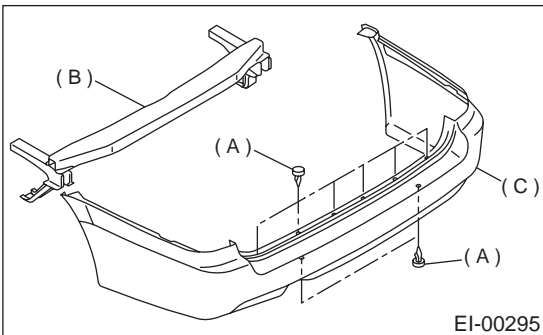
4) Pull off rear end of rear quarter lower trim to remove cap.



5) Loosen bolts to remove rear bumper.



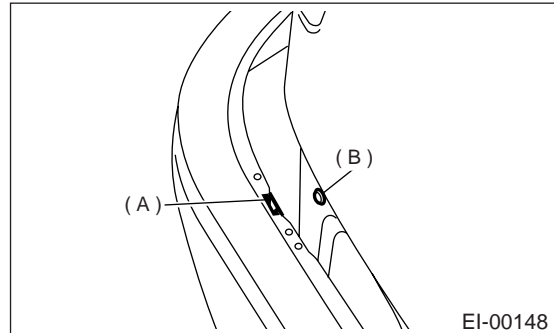
6) Loosen clip (A) to remove bumper beam (B) from rear bumper face (C).



B: INSTALLATION

1. SEDAN

- 1) Install in the reverse order of removal.
- 2) Fit slider (A) to guide pin (B) securely.

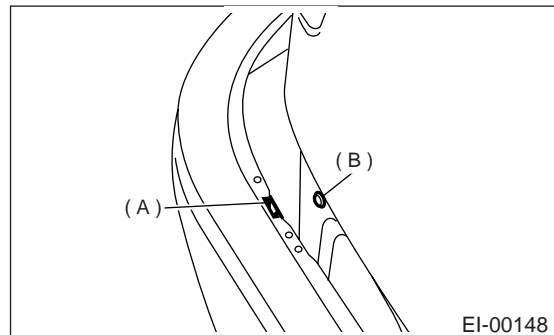


Tightening torque:

Refer to COMPONENT in General Description. <Ref. to EI-3, REAR BUMPER (SEDAN), COMPONENT, General Description.>

2. WAGON

- 1) Install in the reverse order of removal.
- 2) Fit slider (A) to guide pin (B) securely.



Tightening torque:

Refer to COMPONENT in General Description. <Ref. to EI-4, REAR BUMPER (WAGON), COMPONENT, General Description.>

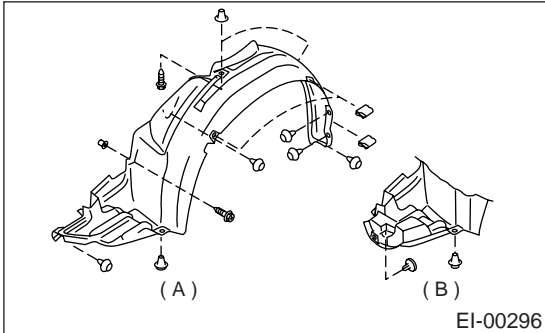
C: REPAIR

Refer to front bumper repair. <Ref. to EI-14, REMOVAL, Front Bumper.>

6. Mud Guard

A: REMOVAL

- 1) Jack-up the vehicle.
- 2) Remove screws and clips to remove mud guard.



- (A) Except OUTBACK
(B) OUTBACK

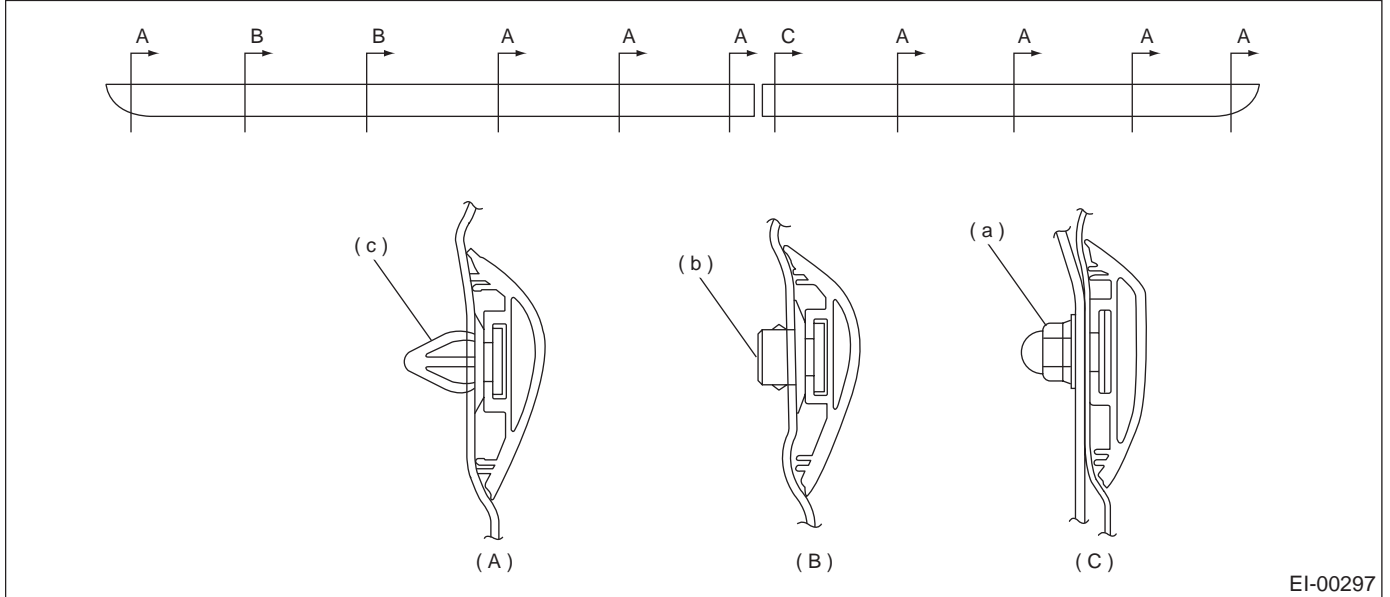
B: INSTALLATION

Insert hook into body, and tighten it with screw and clip.

7. Protector

A: REMOVAL

1) Except OUTBACK:



EI-00297

(A) Section A

(B) Section B

(C) Section C

NOTE:

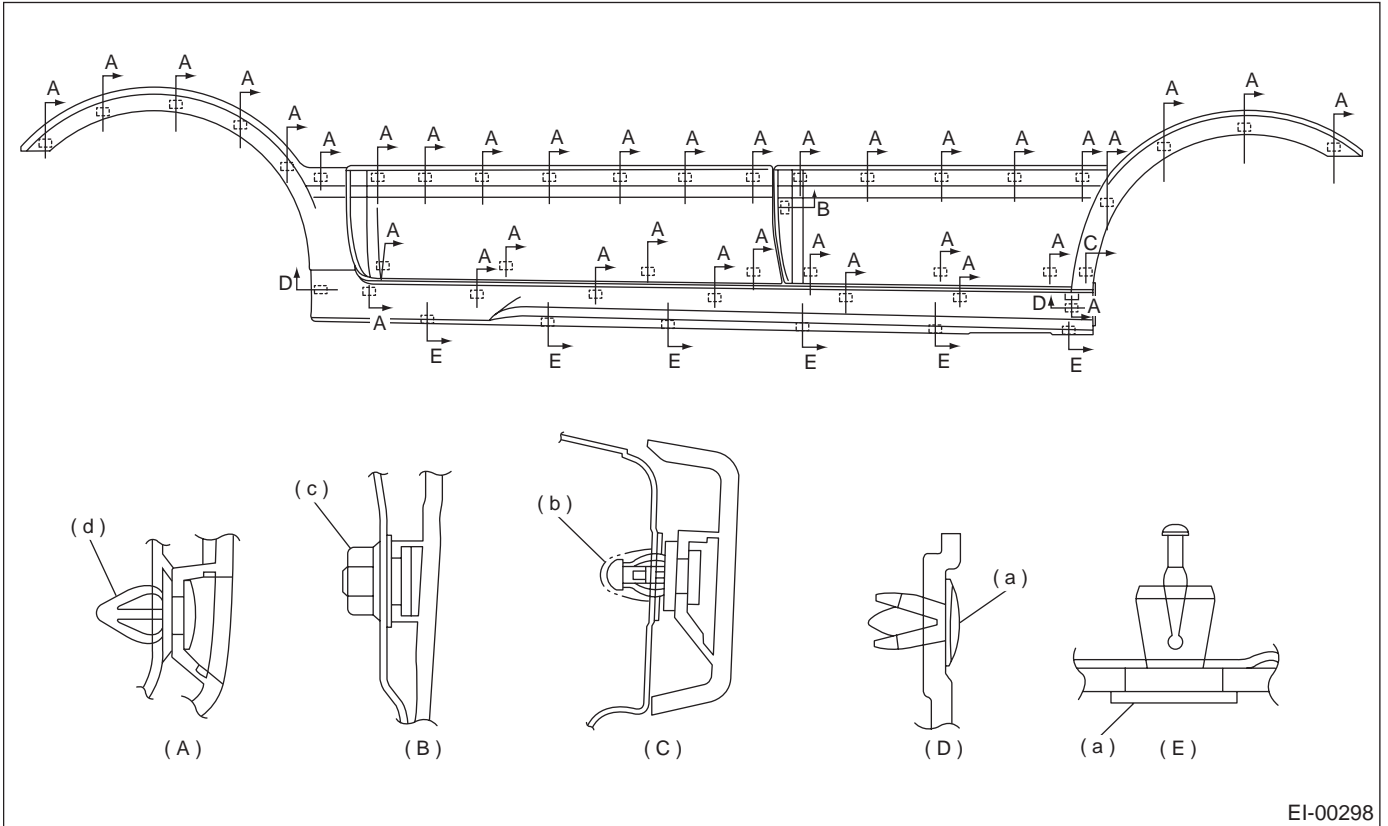
Pay attention to the position of clips (a), (c).

PROTECTOR

EXTERIOR/INTERIOR TRIM

OUTBACK:

Remove clip (a) and bolt (b).



(A) Section A
(B) Section B

(C) Section C
(D) Section D

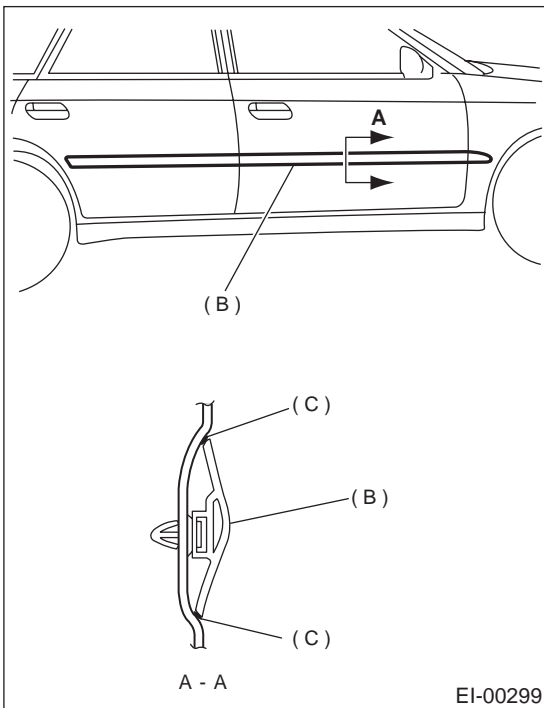
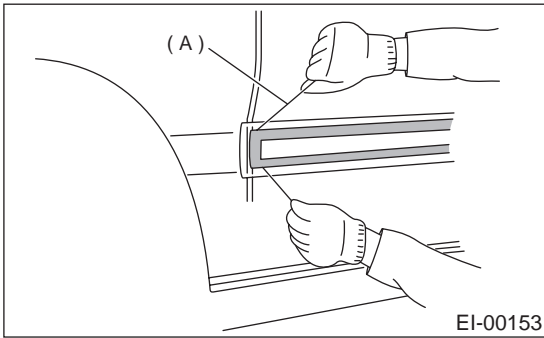
(E) Section E

NOTE:

Pay attention to the position of clip (C).

2) Attach masking tape to outer perimeter of side protector. (If original side protector is re-installed, tape the entire protector.)

3) Insert fishing line [0.8 mm (0.031 in) dia.] (A) between side protector (B) and vehicle body. Cut (pull the line) through two-sided tape (C) along side protector (B) on the body. Using a puller, remove clips from vehicle body while pulling side protector towards yourself as required.



NOTE:

- To increase adhesive remover strength, leave two-sided tape on body and side protector.
- If two-sided tape is too thick, use a putty knife to cut it thin so that adhesive remover is ready for use.
- If two-sided tape is hard to remove, heat to approximately 40°C (104°F).

4) Apply an even coat of adhesive remover to the two-sided tape.

Recommended adhesive remover:
SUMITOMO 3M4000 or equivalent

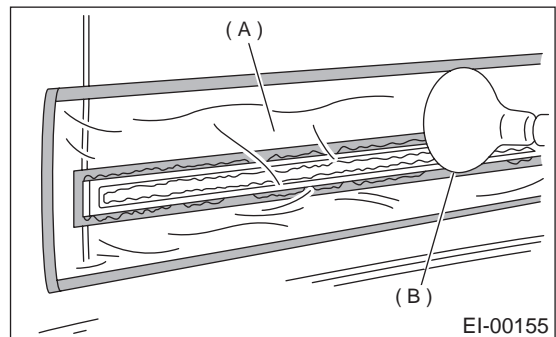
CAUTION:

Do not apply adhesive remover to lacquer base coated body panels.

5) Attach plastic wrap (A) to adhesive remover coated areas and heat to 40 to 60°C (104 to 140°F) for 5 to 10 minutes using an infrared lamp (B).

NOTE:

Do not overheat unit plastic wrap is somewhat white.



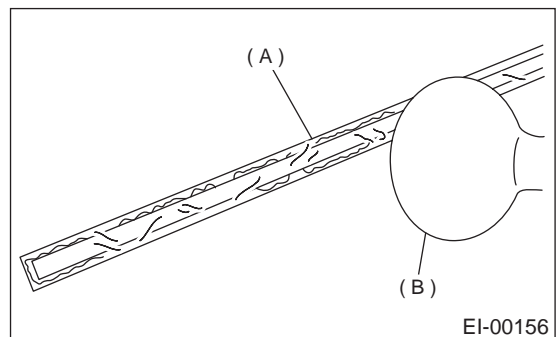
6) Using a plastic spatula, remove traces of two-sided tape from body panel.

7) Remove masking tape and clean traces of two-sided tape using a cloth dampened with white gasoline.

8) Similarly, clean traces of adhesive from two-sided tape on side protector.

NOTE:

Make sure side protector is clean and free of adhesive remover. Clean if necessary.



PROTECTOR

EXTERIOR/INTERIOR TRIM

B: INSTALLATION

1) Apply primer to original side protector (if used), and attach two-sided tape to side protectors as shown.

Two-sided tape:

Thickness; 1.2 mm (0.047 in)

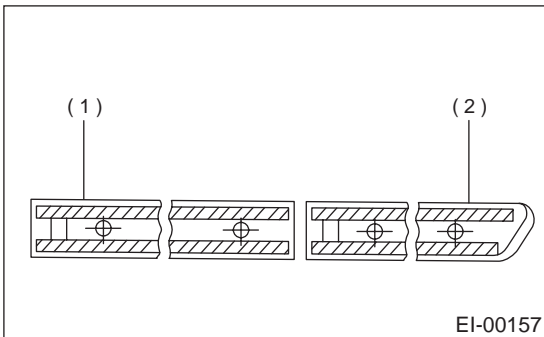
Width; 5 mm (0.20 in)

Recommended primer:

SUMITOMO 3MK-500 or equivalent

Recommended two-sided tape:

SUMITOMO 3M5305 or equivalent



(1) Front door part

(2) Rear door part

2) Using an infrared lamp, heat body panel to 40 to 60°C (104 to 140°F) and rear surface of side protector to 20 to 30°C (68 to 86°F).

3) Remove tack paper from two-sided paper. While aligning clips with holes in body panel, attach two-sided tape to side protector and body panel with a force of more than 49 N (5 kgf, 11 lb) with roller. Do not allow air to enter mating surface of the two.

CAUTION:

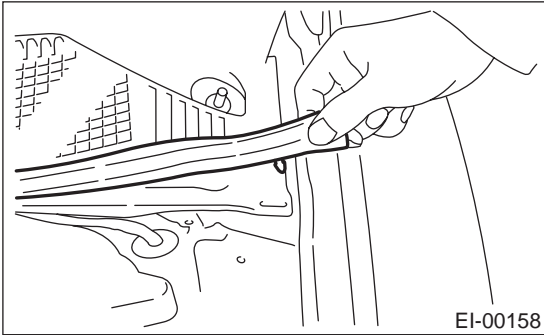
- To maintain adhesive power, do not wash the vehicle for 24 hours after tape application.
- Push clip in securely using hands.

(To prevent deformation, do not use excessive force.)

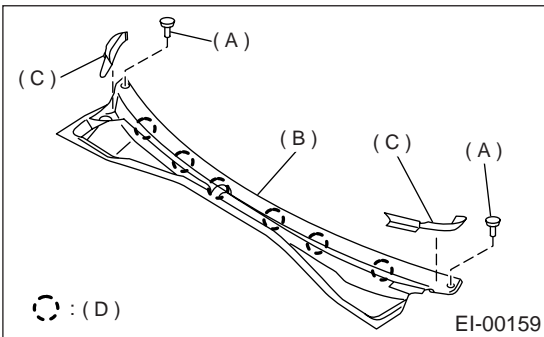
8. Cowl Panel

A: REMOVAL

- 1) Open hood.
- 2) Remove wiper arm. <Ref. to WW-12, REMOVAL, Front Wiper Arm.>
- 3) Remove front panel seal.



- 4) Remove clips (A) and cowl side panel (C). Loosen clips (D) on six positions, and remove cowl side panel.



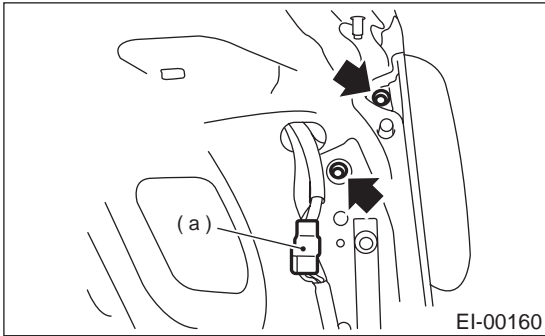
B: INSTALLATION

Install in the reverse order of removal.

9. Spoiler

A: REMOVAL

- 1) Open trunk lid.
- 2) Disconnect connector (a) of high-mounted stop light.
- 3) Remove mounting nut of rear spoiler to remove rear spoiler.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Clean mounting surfaces of trunk lid and spoiler before installation.

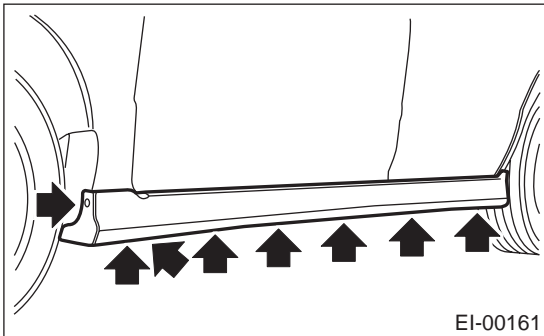
Tightening torque:

7.4 N·m (0.75 kgf·m, 5.46 ft·lb)

10.Side Sill Spoiler

A: REMOVAL

Remove clips (1 on front, 6 on lower, 1 on side), remove side spoiler.



B: INSTALLATION

Install in the reverse order of removal.

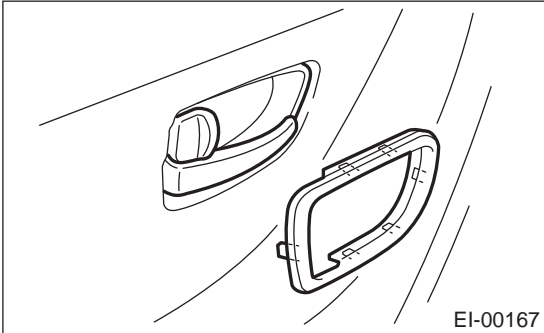
FRONT DOOR TRIM

EXTERIOR/INTERIOR TRIM

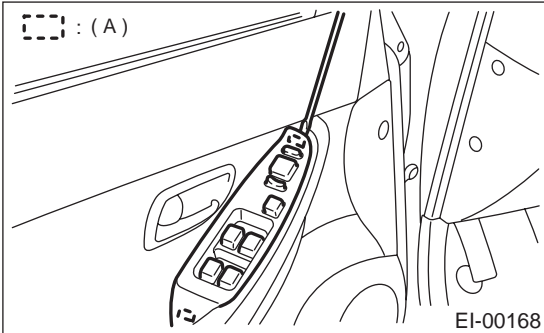
11. Front Door Trim

A: REMOVAL

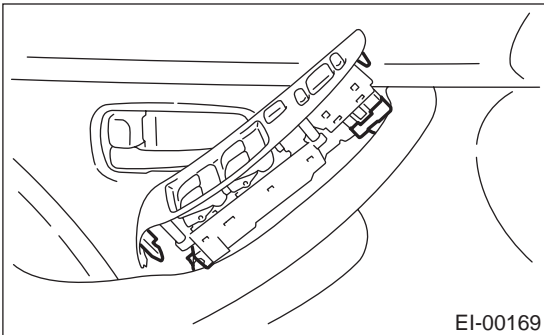
1) Pull up inner remote cover toward you to remove upper hook. Pull down it to remove lower claw. Remove inner remote cover.



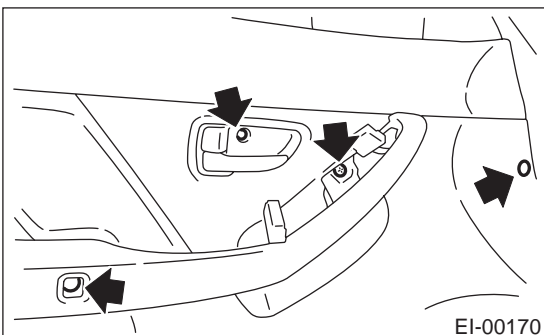
2) Remove two hook (A) of switch panel to remove power window main switch.



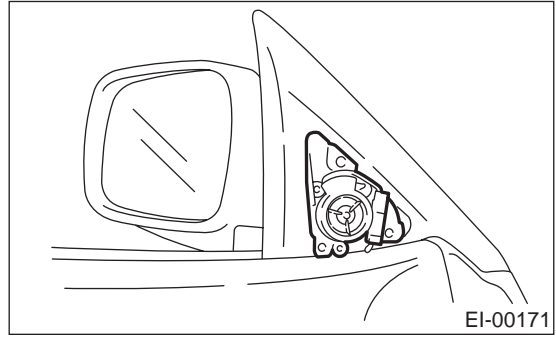
3) Disconnect electrical connectors from power window main switch and mirror switch.



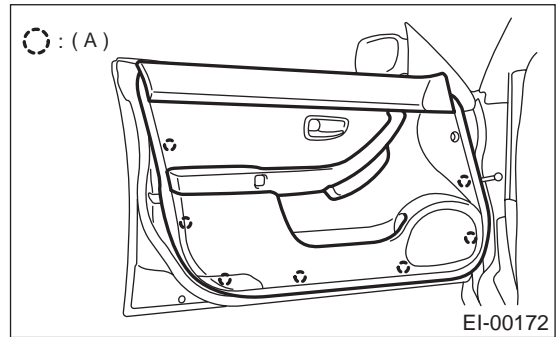
4) Remove three screws and clips.



5) Remove gusset cover. Disconnect electrical connectors to remove speaker.



6) Remove seven clips (A) of trim panel using clip remover to remove trim panel.



B: INSTALLATION

Install in the reverse order of removal.

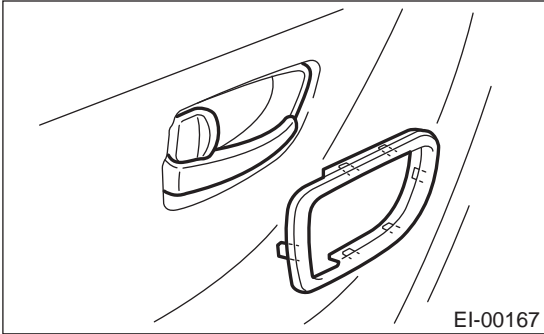
12.Rear Door Trim

A: REMOVAL

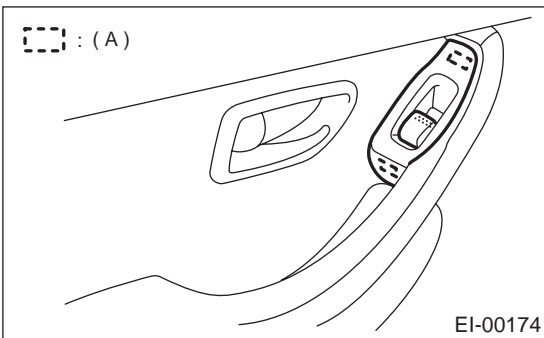
CAUTION:

Do not apply excessive force to clip. Otherwise the clip may be broken.

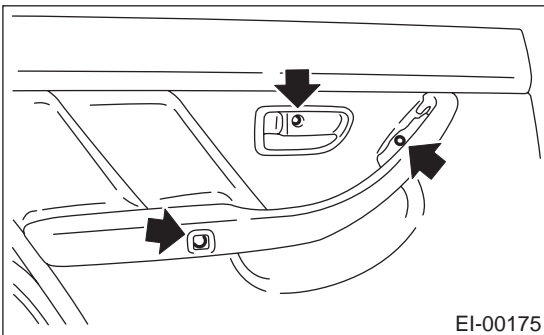
1) Pull up inner remote cover toward you to remove upper hook. Pull down it to remove lower claw. Remove inner remote cover.



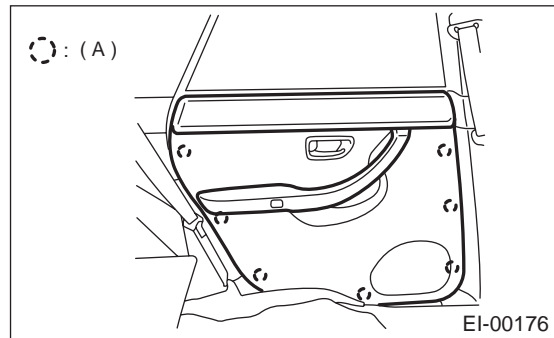
2) Remove two hook (A) of switch panel to remove power window sub switch and disconnect electrical connector.



3) Remove three screws and clips.



4) Remove seven clips (A) of trim panel using clip remover to remove trim panel.



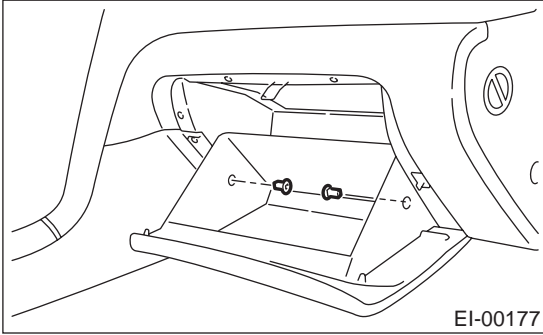
B: INSTALLATION

Install in the reverse order of removal.

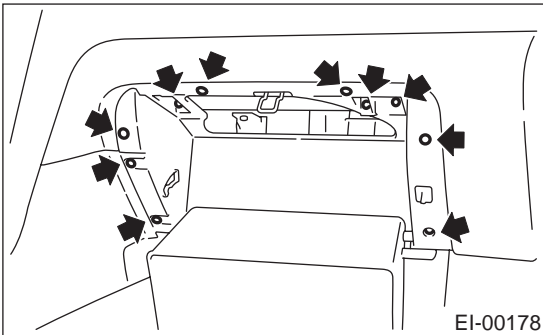
13. Glove Box

A: REMOVAL

1) Remove stoppers.



2) Loosen screws to remove glove box.



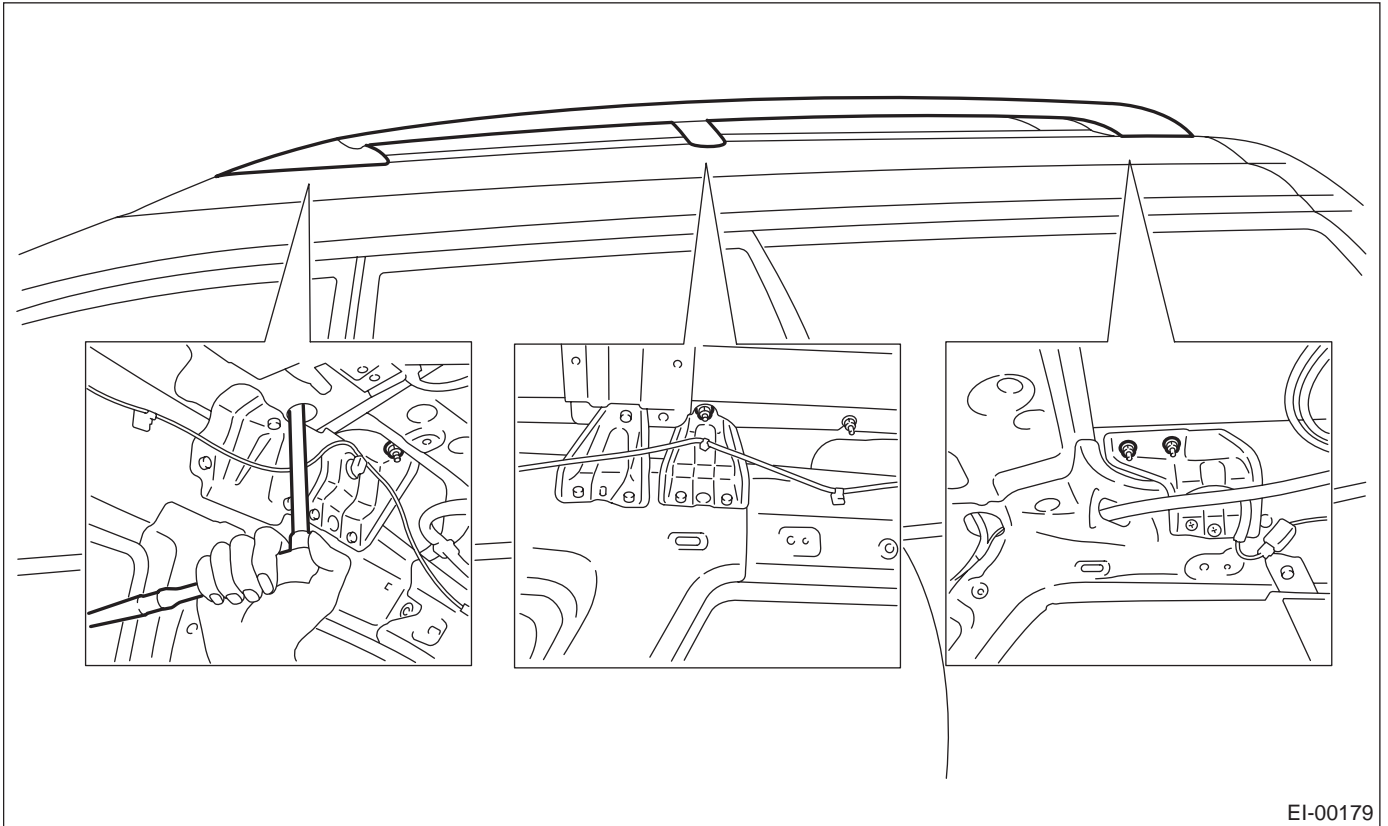
B: INSTALLATION

Install in the reverse order of removal.

14. Roof Rail

A: REMOVAL

- 1) Remove roof trim. <Ref. to EI-42, REMOVAL, Roof Trim.>
- 2) Remove five mounting nuts and then detach roof rail carefully.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.4 N·m (0.75 kgf·m, 5.46 ft·lb)

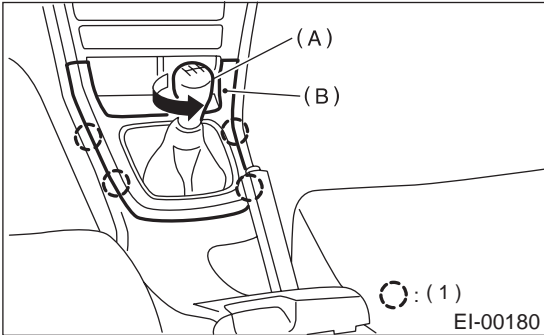
CONSOLE BOX

EXTERIOR/INTERIOR TRIM

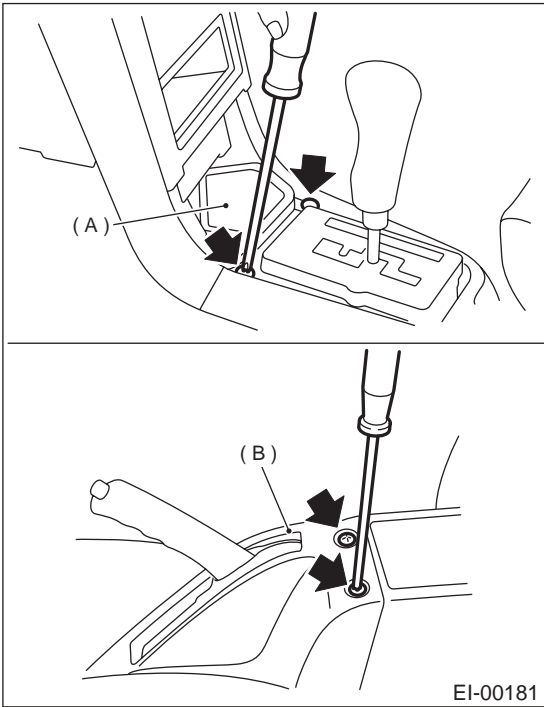
15. Console Box

A: REMOVAL

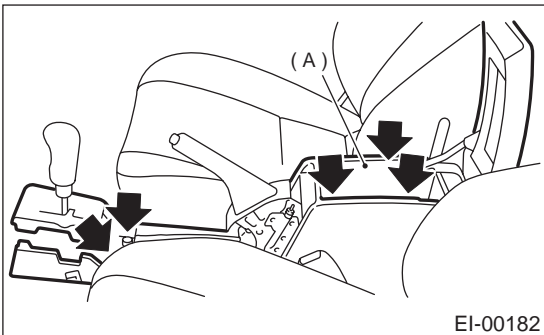
1) Remove shift knob (A) (MT model) and front cover (B).



2) Remove tray (A) and console cover (B).



3) Remove console box (A).



B: INSTALLATION

Install in the reverse order of removal.

16. Instrument Panel Assembly

A: REMOVAL

Airbag system wiring harness is routed near the combination meter.

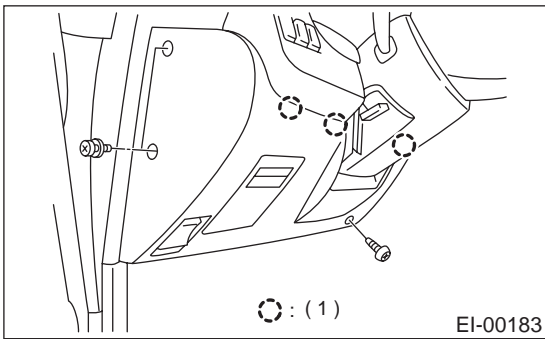
CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage airbag system harness when servicing the instrument panel.

NOTE:

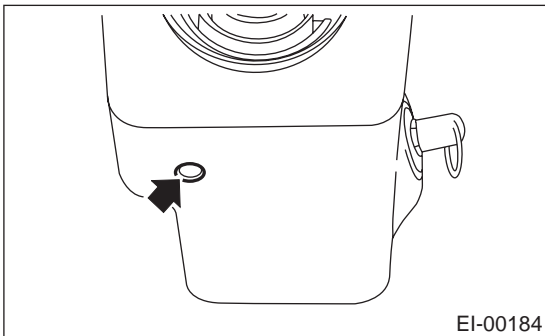
The following location are for LHD model.
The locations for RHD model are symmetrically opposite.

- 1) Disconnect ground cable from battery.
- 2) Remove lower cover.



(1) Hool pawl

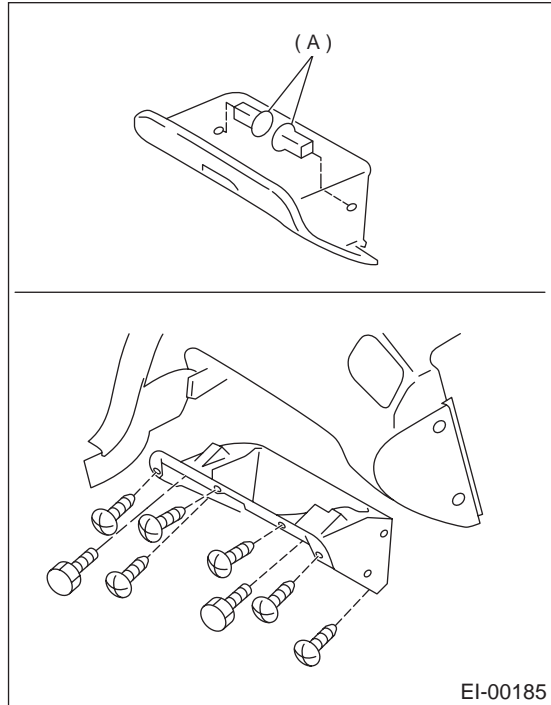
- 3) Remove lower column cover and disconnect harness connectors to steering column.



EI-00184

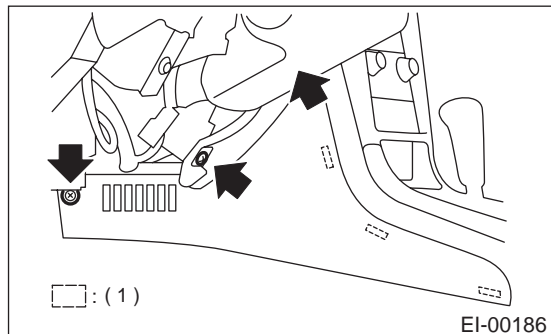
- 4) Remove steering column assembly (with steering wheel). <Ref. to PS-28, REMOVAL, Tilt Steering Column.>

- 5) Remove stopper (A) then remove glove box.



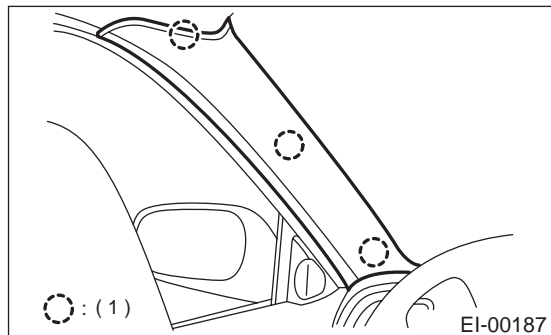
EI-00185

- 6) Remove side panel of both sides.



(1) Hool pawl

- 7) Remove passenger's airbag module. <Ref. to AB-13, REMOVAL, Passenger's Airbag Module.>
- 8) Remove console box. <Ref. to EI-34, REMOVAL, Console Box.>
- 9) Remove front pillar upper trim of both sides.

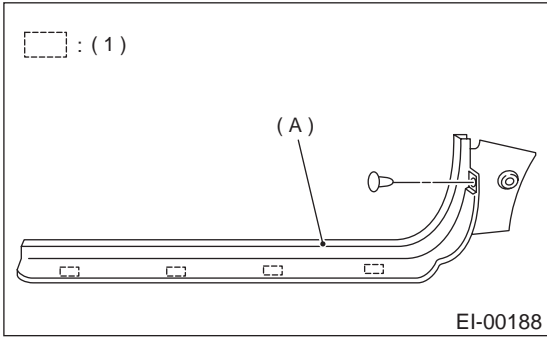


(1) Hool pawl

INSTRUMENT PANEL ASSEMBLY

EXTERIOR/INTERIOR TRIM

10) Remove front pillar lower trim of passenger side.

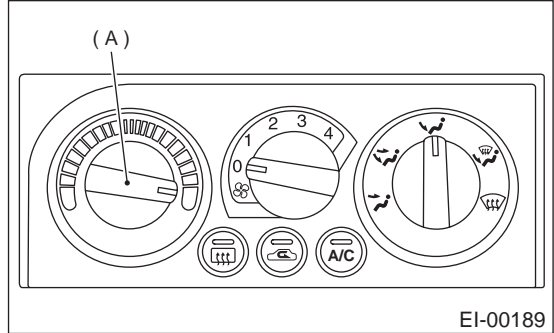


(1) Hool pawl

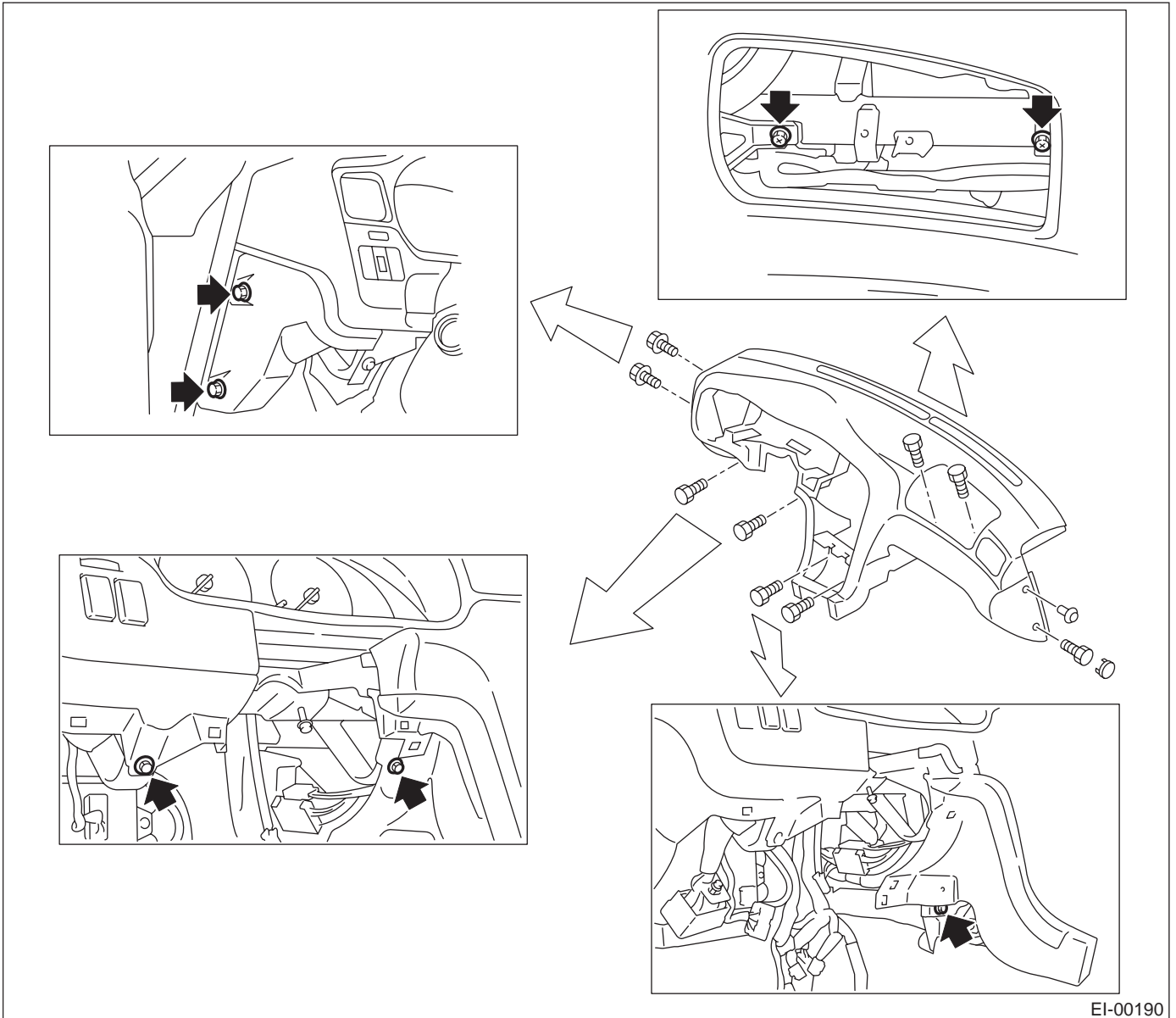
11) Set temperature control switch (A) to "FULL HOT" and then disconnect temperature control cable from bottom of heater unit. (Manual A/C equipped model)

NOTE:

Do not move the switch and link when installing.



12) Remove instrument panel mounting bolts.



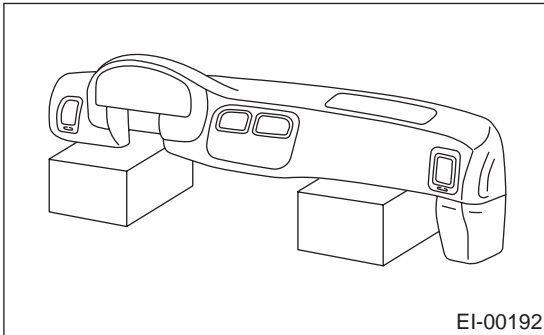
13) Disconnect harness connectors and remove instrument panel carefully.

CAUTION:

Do not pull the harness when disconnecting the connector.

NOTE:

- If necessary, make matching marks for easy re-assembly.
- When storing the removed instrument panel, place it standing up on the floor.



B: INSTALLATION

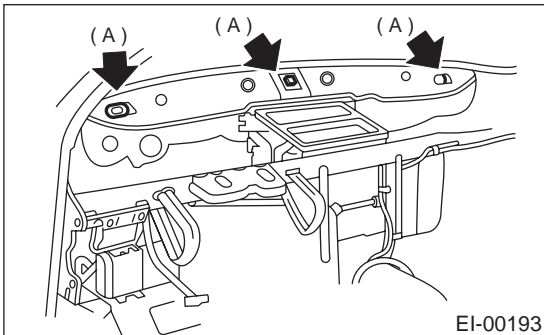
Install in the reverse order of removal.

CAUTION:

Be careful not to snag the harness.

NOTE:

When setting the instrument panel into position, push the three hooks into grommet (A) on the body panel.



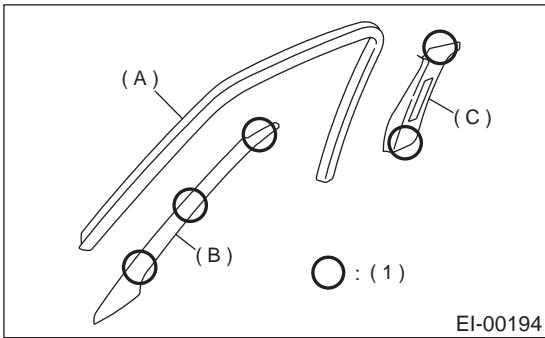
Tightening torque:

Refer to COMPONENT in General Description. <Ref. to EI-9, INSTRUMENT PANEL, COMPONENT, General Description.>

17.Upper Inner Trim

A: REMOVAL

- 1) Remove front mole (A).
- 2) Remove front pillar upper trim (B).
- 3) Detach front seat belt shoulder anchor, then remove center pillar upper trim (C).



- (1) Hook pawl

B: INSTALLATION

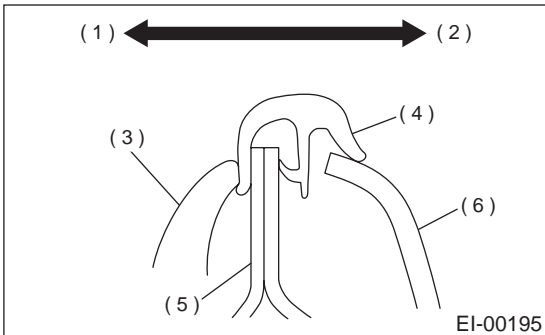
Install in the reverse order of removal.

CAUTION:

Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:

When installing center pillar upper trim and front pillar upper trim, be sure to set front mole as shown in figure.

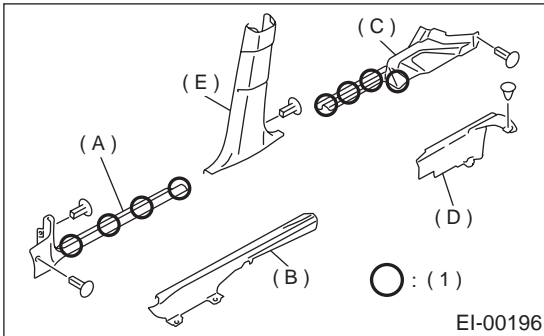


- (1) Outside
- (2) Inside
- (3) Weatherstrip
- (4) Molding
- (5) Body
- (6) Trim

18.Lower Inner Trim

A: REMOVAL

- 1) Remove front pillar lower trim (A).
 - 2) Remove side sill front lower cover (B).
 - 3) For sedan: Remove rear seat cushion <Ref. to SE-17, REMOVAL, Rear Seat.>, then remove side sill rear upper cover (C).
- For wagon: Rise rear seat cushion, then remove side sill rear upper cover (C).
- 4) Remove side sill rear lower cover (D).
 - 5) Remove center pillar lower trim (E).



(1) Hook pawl

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Be sure to securely hook pawls of inner trim panel to body flange.

REAR QUARTER TRIM

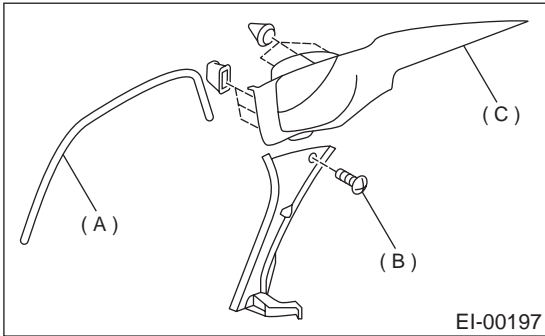
EXTERIOR/INTERIOR TRIM

19. Rear Quarter Trim

A: REMOVAL

1. SEDAN

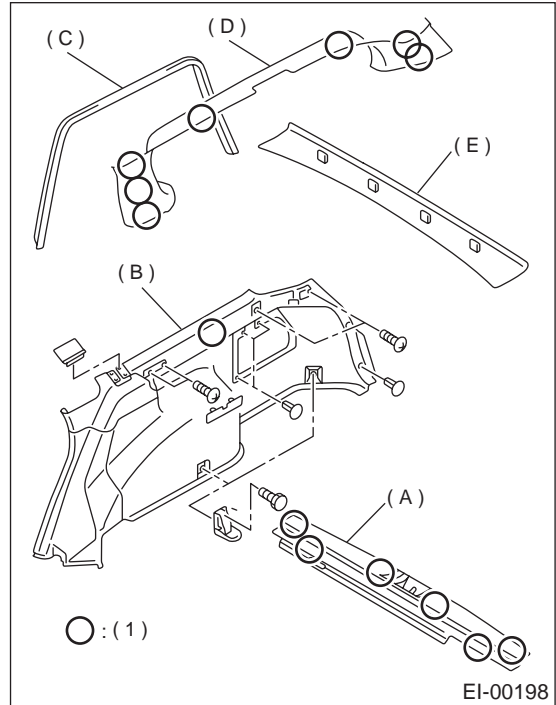
- 1) Remove rear mole (A).
- 2) Remove rear shelf trim. <Ref. to EI-45, REMOVAL, Rear Shelf Trim.>
- 3) Remove side sill rear upper cover. <Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 4) Remove rear pillar lower trim (B).
- 5) Remove rear pillar upper trim (C).



2. WAGON

- 1) Remove side sill rear upper cover. <Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 2) Remove luggage floor mat. <Ref. to EI-49, REMOVAL, Luggage Floor Mat.>
- 3) Remove rear skirt trim (A).
- 4) Remove rear quarter lower trim mounting volts, screws and clips, then remove the trim (B).
- 5) Remove rear mole (C).
- 6) Remove rear quarter upper trim mounting screw, then remove the trim (D).

- 7) Remove rear rail trim (E).



- (1) Hook pawl

B: INSTALLATION

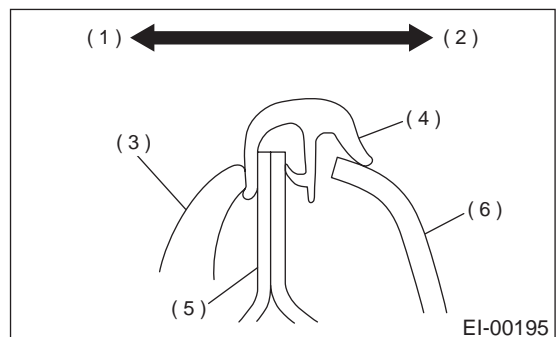
Install in the reverse order of removal.

CAUTION:

Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:

When installing rear quarter upper trim, be sure to set rear mole as shown in the figure.

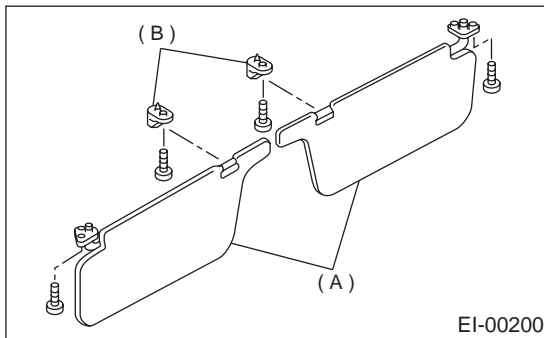


- (1) Outside
- (2) Inside
- (3) Weatherstrip
- (4) Molding
- (5) Body
- (6) Trim

20.Sun Visor

A: REMOVAL

Remove mounting screws then detach sun visor (A) and hook (B).



B: INSTALLATION

Install in the reverse order of removal.

ROOF TRIM

EXTERIOR/INTERIOR TRIM

21. Roof Trim

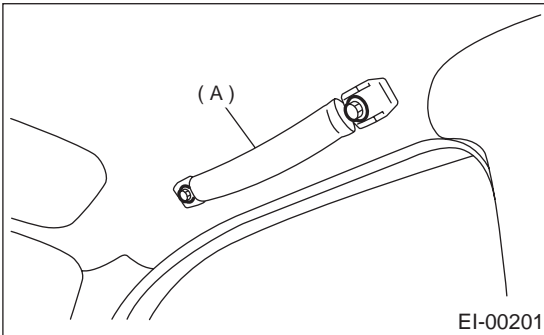
A: REMOVAL

CAUTION:

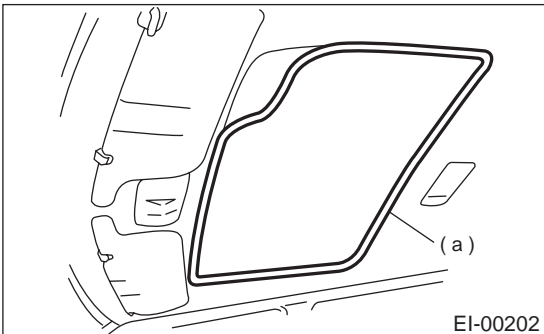
When removing clip, use great care not to damage the roof trim.

1. SEDAN

- 1) Disconnect ground cable from battery.
- 2) Remove sunroof switch. (Sunroof equipped model) <Ref. to SR-14, REMOVAL, Sunroof Switch.>
- 3) Remove room light. <Ref. to LI-32, REMOVAL, Room Light.>
- 4) Remove sun visor and hook of both sides. <Ref. to EI-41, REMOVAL, Sun Visor.>
- 5) Remove assist grips (A).

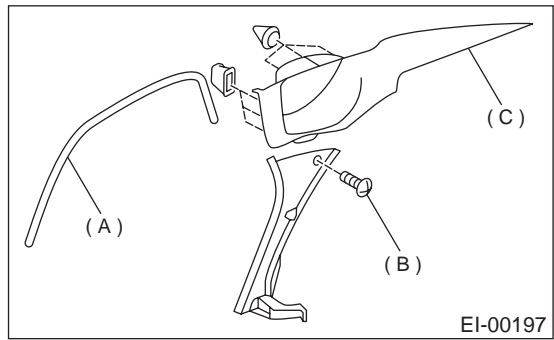


- 6) Remove sunroof garnish (A).

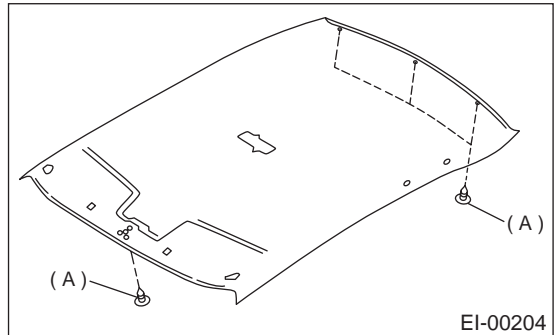


- 7) Remove upper inner trim. <Ref. to EI-38, REMOVAL, Upper Inner Trim.>
- 8) Remove rear window mole (A) of both sides.
- 9) Remove screw (B) of rear quarter lower trim shown in the figure.

- 10) Remove rear quarter upper trim (C) of both sides.

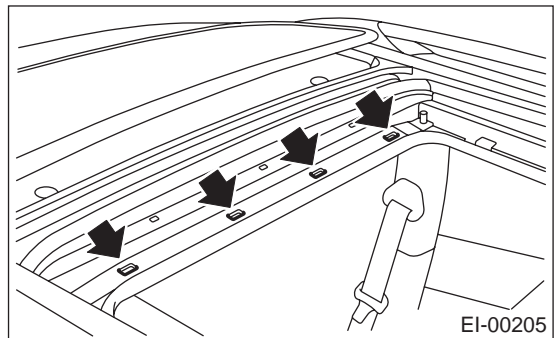


- 11) Remove clips, and then remove roof trim.



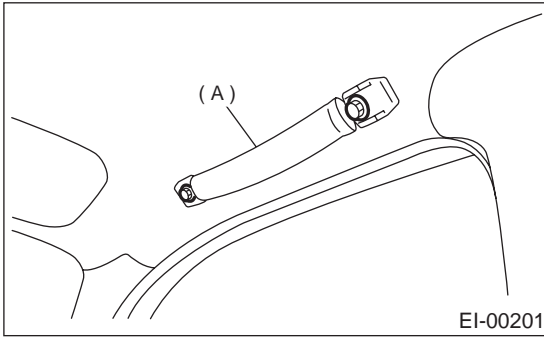
2. WAGON

- 1) Open the rear sunroof, and then remove four clips. (Sunroof equipped model)



- 2) Disconnect ground cable from battery.
- 3) Remove sunroof switch. (Sunroof equipped model) <Ref. to SR-14, REMOVAL, Sunroof Switch.>
- 4) Remove room light and luggage room light. <Ref. to LI-32, REMOVAL, Room Light.> and <Ref. to LI-33, REMOVAL, Luggage Room Light.>
- 5) Remove sun visor and hook of both sides. <Ref. to EI-41, REMOVAL, Sun Visor.>

6) Remove assist grips (A).



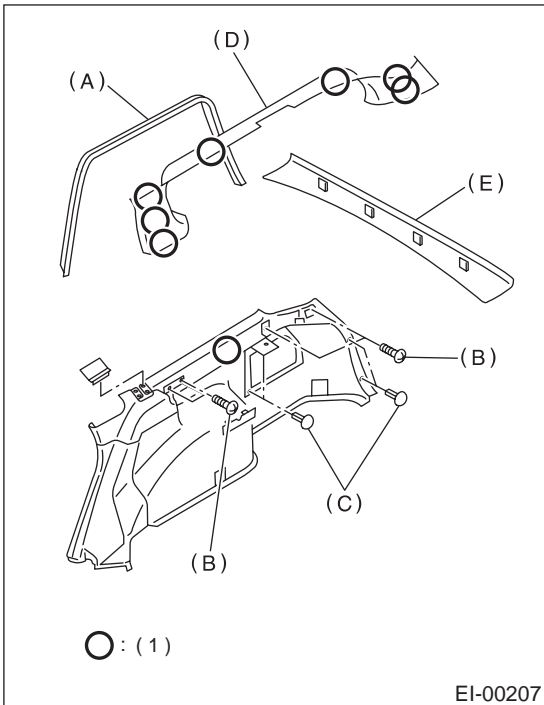
7) Remove upper inner trim. <Ref. to EI-38, REMOVAL, Upper Inner Trim.>

8) Remove rear window mole of both sides (A).

9) Remove screws (B) and clips (C) of rear quarter lower trim shown in the figure.

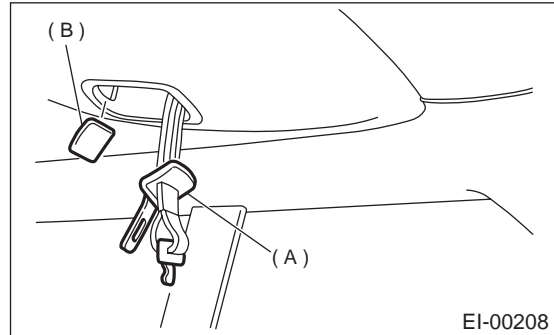
10) Remove rear quarter upper trim (D) of both sides.

11) Remove rear rail trim (E).

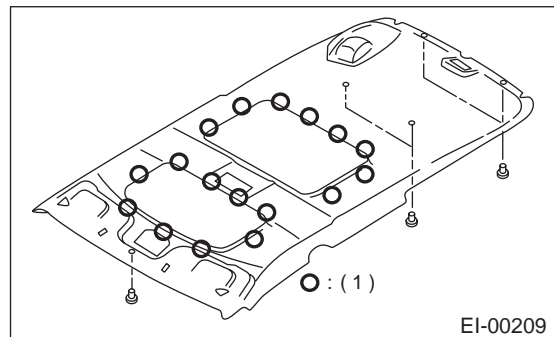


(1) Hook pawl

12) Remove cover (B) while detaching snap lock carefully. Put the rear center seat belt tongue (A) out to the other side of the trim through the hole.



13) Remove clips and then remove roof trim.



(1) Snap lock

B: INSTALLATION

Install in the reverse order of removal.

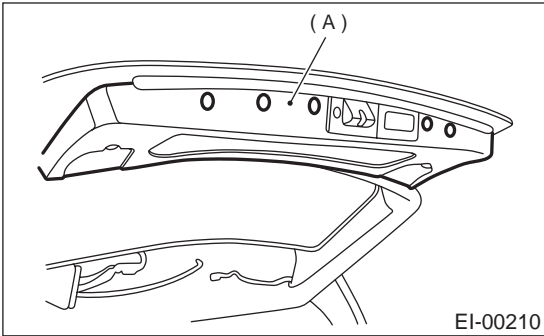
22.Rear Gate Trim

A: REMOVAL

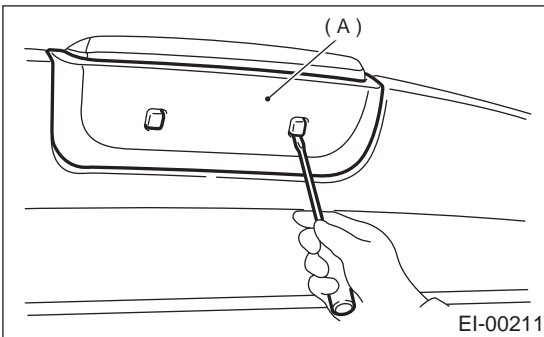
CAUTION:

Be careful not to damage clips or their holes.

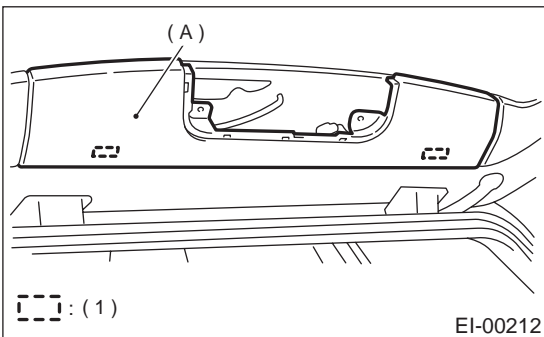
- 1) Remove clips and detach rear gate lower trim (A).



- 2) Remove caps and screws, and then detach high-mounted stop light cover (A).



- 3) Remove rear gate upper trim (A).



(1) Hook pawl

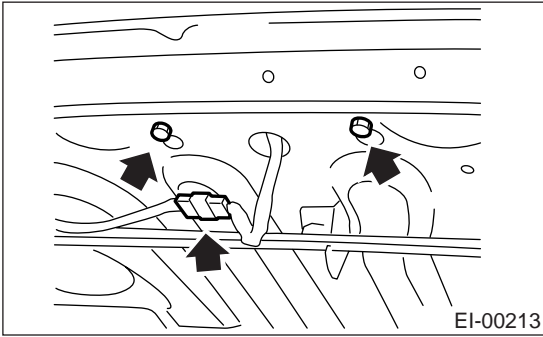
B: INSTALLATION

Install in the reverse order of removal.

23.Rear Shelf Trim

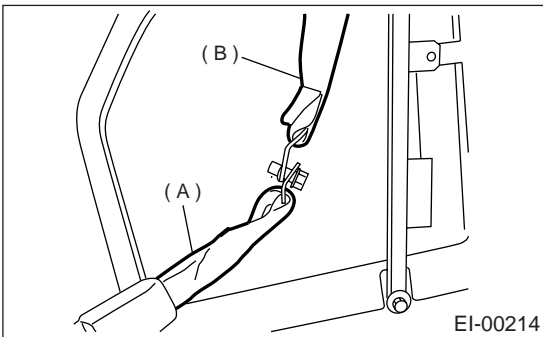
A: REMOVAL

1) Remove high-mounted stop light.

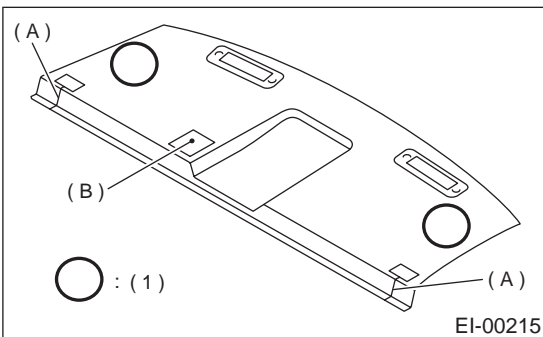


2) Remove rear seat backrest. <Ref. to SE-17, SEDAN, REMOVAL, Rear Seat.>

3) Remove inner seat belt RH, then disconnect inner seat belt RH (A) and outer seat belt center (B).



4) Detach rear shelf trim through each rear outer seat belt from slits (A) and hole (B) of rear shelf trim.



(1) Clip

B: INSTALLATION

Install in the reverse order of removal.

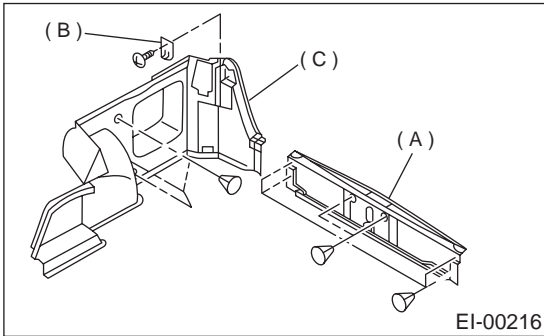
TRUNK TRIM

EXTERIOR/INTERIOR TRIM

24. Trunk Trim

A: REMOVAL

- 1) Remove clips, and then detach trunk rear trim (A).
- 2) Remove luggage hook (B) and clips, then detach trunk side trim (C).



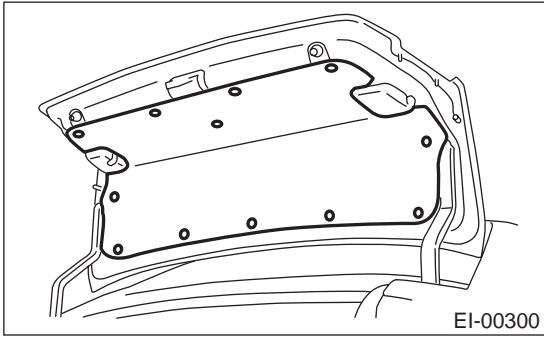
B: INSTALLATION

Install in the reverse order of removal.

25. Trunk Lid Trim

A: REMOVAL

Remove clips and detach trunk lid trim (A).



B: INSTALLATION

Install in the reverse order of removal.

26.Floor Mat

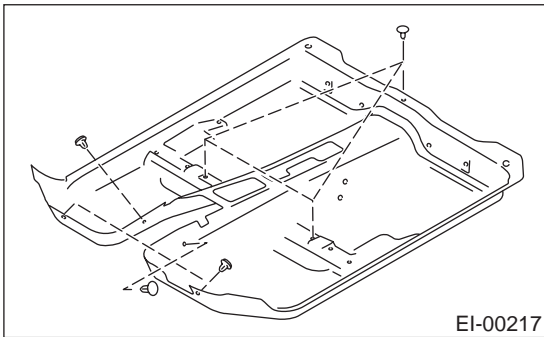
A: REMOVAL

- 1) Remove front seats. <Ref. to SE-7, REMOVAL, Front Seat.>
- 2) Remove rear seat cushion. <Ref. to SE-17, REMOVAL, Rear Seat.>
- 3) Remove console box. <Ref. to EI-34, Console Box.>
- 4) Remove front pillar lower trim, side sill rear upper cover and center pillar lower trim. <Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 5) Remove clips from floor mat.

NOTE:

When pulling out edge, do not pull mat alone; pull mat together with edge. Ply off two steel clips on side sill front cover and one on side sill rear cover using screwdriver.

- 6) Remove mat hook.
- 7) Remove mat from foot rest area.
- 8) Remove mat from rear heater duct.
- 9) Roll mat, and then take it out of opened rear door.



B: INSTALLATION

Install in the reverse order of removal.

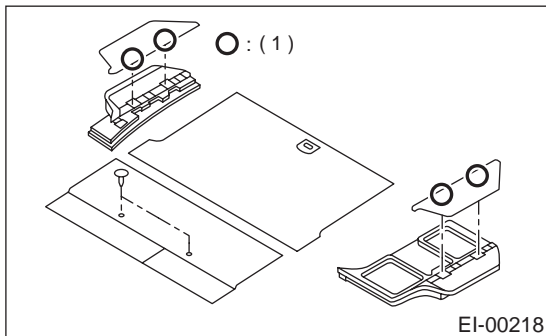
NOTE:

- Secure mat firmly with hook and Velcro tape.
- Insert mat edge firmly into the groove of side sill cover.

27. Luggage Floor Mat

A: REMOVAL

Remove clips, then detach rear floor mats and boxes.



(1) Clips

B: INSTALLATION

Install in the reverse order of removal.

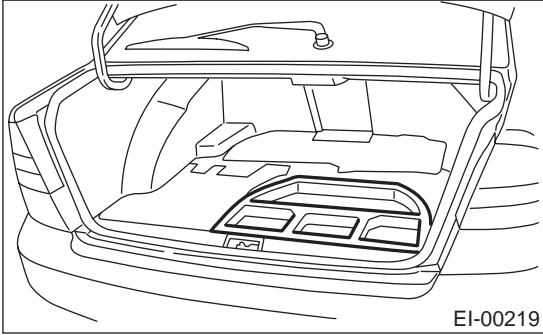
TRUNK ROOM MAT

EXTERIOR/INTERIOR TRIM

28.Trunk Room Mat

A: REMOVAL

Draw out trunk room mat.



EI-00219

B: INSTALLATION

Install in the reverse order of removal.

EXTERIOR BODY PANELS



	Page
1. General Description	2
2. Front Hood	9
3. Fender Panel.....	10
4. Front Door Panel.....	11
5. Front Sealing Cover	13
6. Rear Door Panel	14
7. Rear Sealing Cover.....	16
8. Trunk Lid Panel	17
9. Rear Gate Panel	18

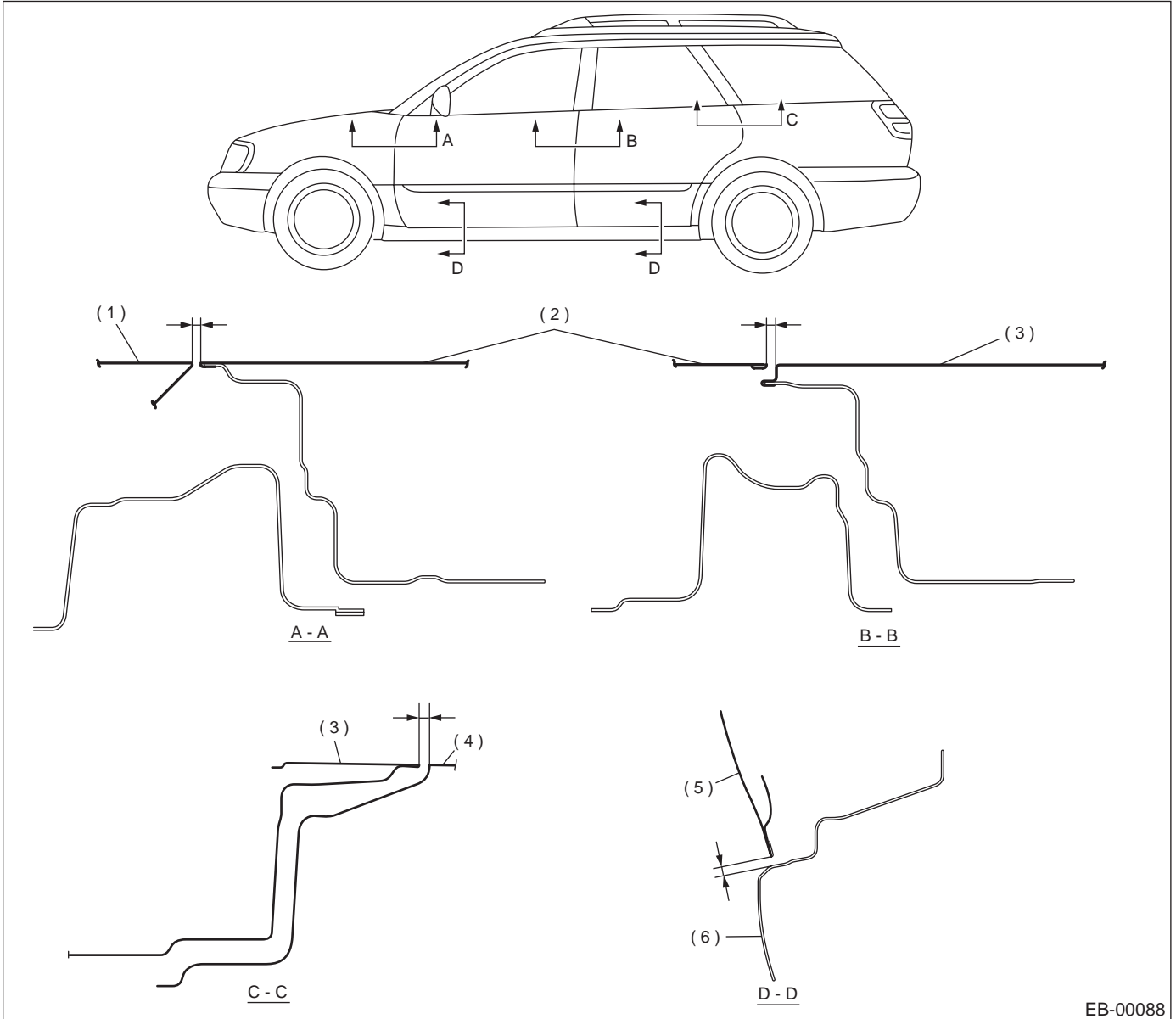


GENERAL DESCRIPTION

EXTERIOR BODY PANELS

1. General Description

A: SPECIFICATIONS

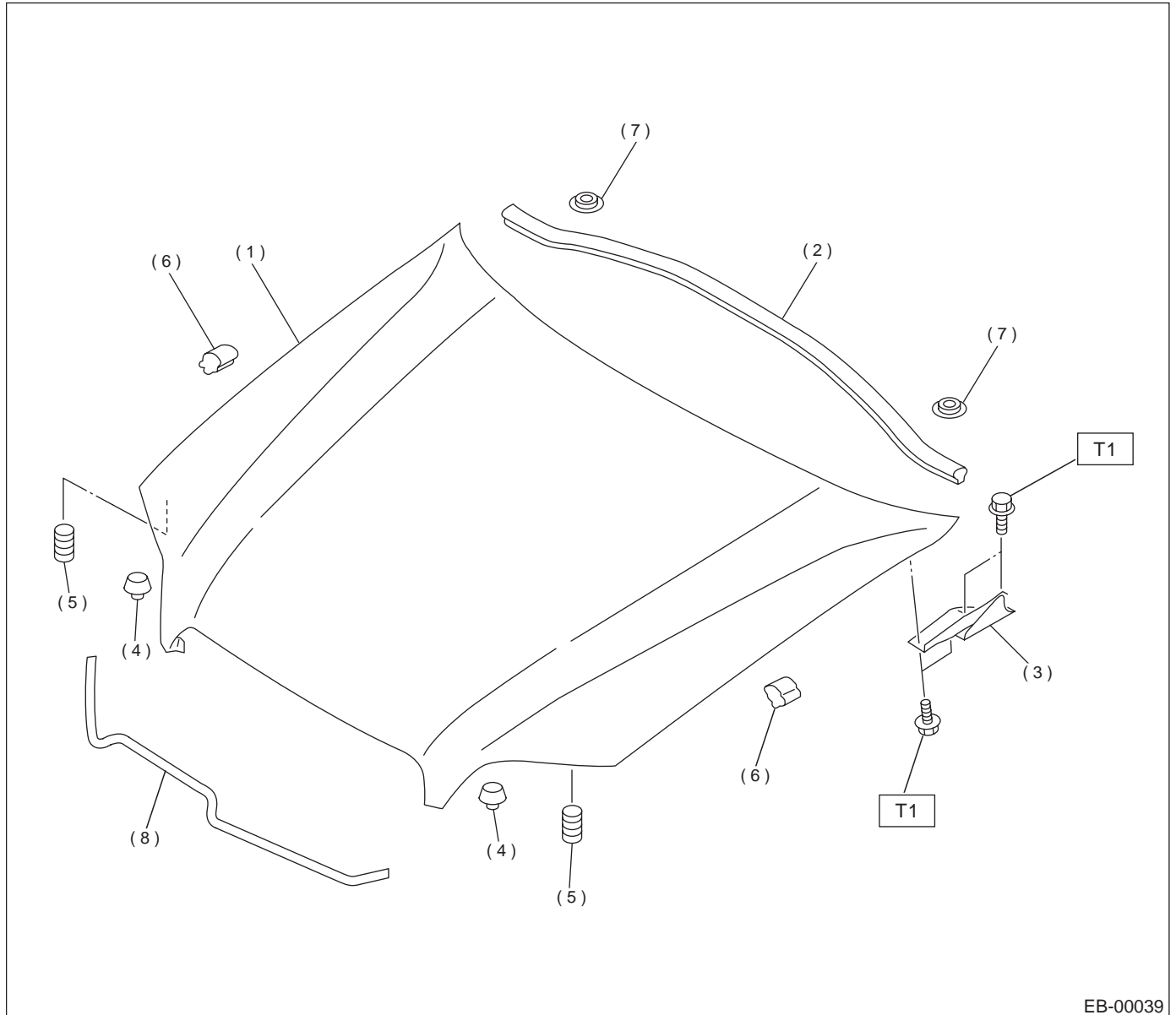


EB-00088

Section	Part	Specification
A - A	(1) Front fender and (2) front door	$4.6 \pm 1.0 \text{ mm}$ ($0.181 \pm 0.039 \text{ in}$)
B - B	(2) Front door and (3) rear door	$5.1 \pm 1.0 \text{ mm}$ ($0.201 \pm 0.039 \text{ in}$)
C - C	(3) Rear door and (4) rear quarter	$4.6 \pm 1.0 \text{ mm}$ ($0.181 \pm 0.039 \text{ in}$)
D - D	(5) Door panel and (6) side sill	$4.8 \pm 1.0 \text{ mm}$ ($0.189 \pm 0.039 \text{ in}$)

B: COMPONENT

1. FRONT HOOD



EB-00039

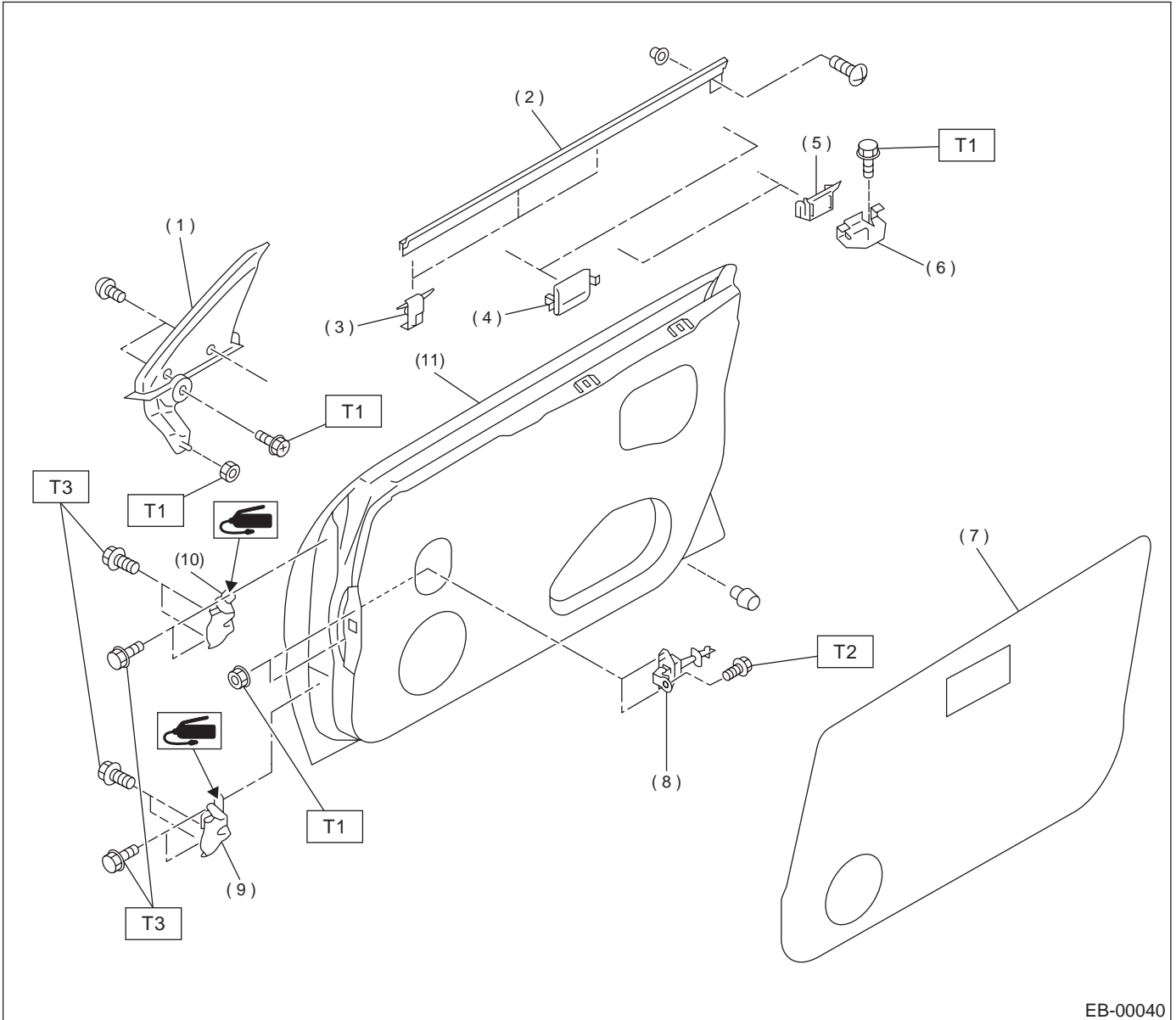
- | | |
|-----------------------|---------------|
| (1) Front hood | (5) Buffer A |
| (2) Seal (Front hood) | (6) Buffer B |
| (3) Hinge | (7) Plug |
| (4) Buffer C | (8) Seal ASSY |

Tightening torque: N-m (kgf-m, ft-lb)
T1: 24.5 (2.5, 18.1)

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

2. FRONT DOOR PANEL



- | | |
|--------------------------------|-------------------|
| (1) Gusset | (7) Sealing cover |
| (2) Weatherstrip (Outer) | (8) Door checker |
| (3) Clip (Weatherstrip, outer) | (9) Lower hinge |
| (4) Stabilizer (Lifter) | (10) Upper hinge |
| (5) Stabilizer (Outer) | (11) Door panel |
| (6) Stabilizer (Inner) | |

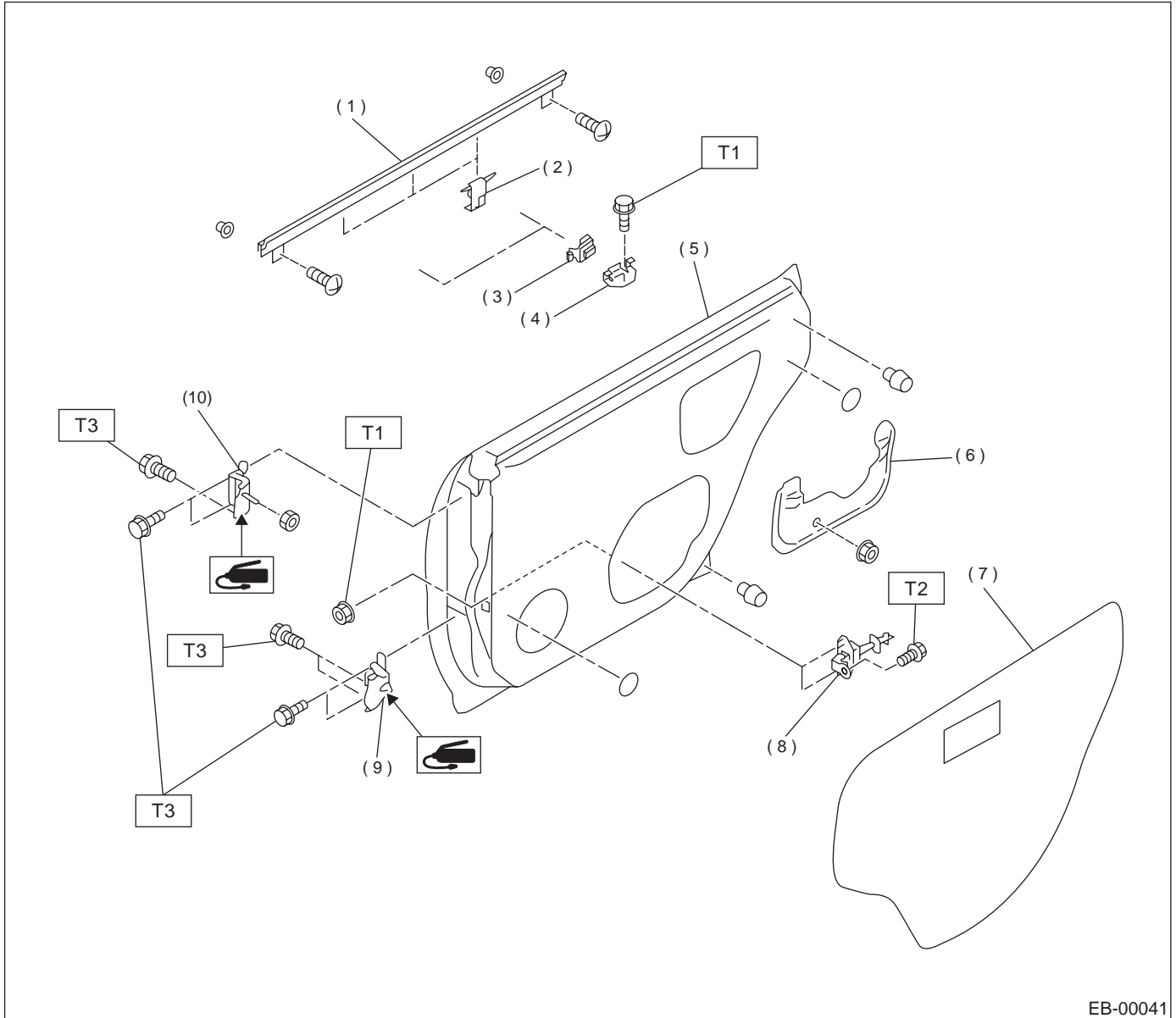
Tightening torque: N-m (kgf-m, ft-lb)

T1: 7.35 (0.75, 5.4)

T2: 18 (1.8, 13)

T3: 30 (3.1, 22)

3. REAR DOOR PANEL



EB-00041

- | | |
|--------------------------------|-------------------|
| (1) Weatherstrip (Outer) | (6) Bracket |
| (2) Clip (Weatherstrip, outer) | (7) Sealing cover |
| (3) Stabilizer (Outer) | (8) Door checker |
| (4) Stabilizer (Inner) | (9) Lower hinge |
| (5) Door panel | (10) Upper hinge |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.35 (0.75, 5.4)

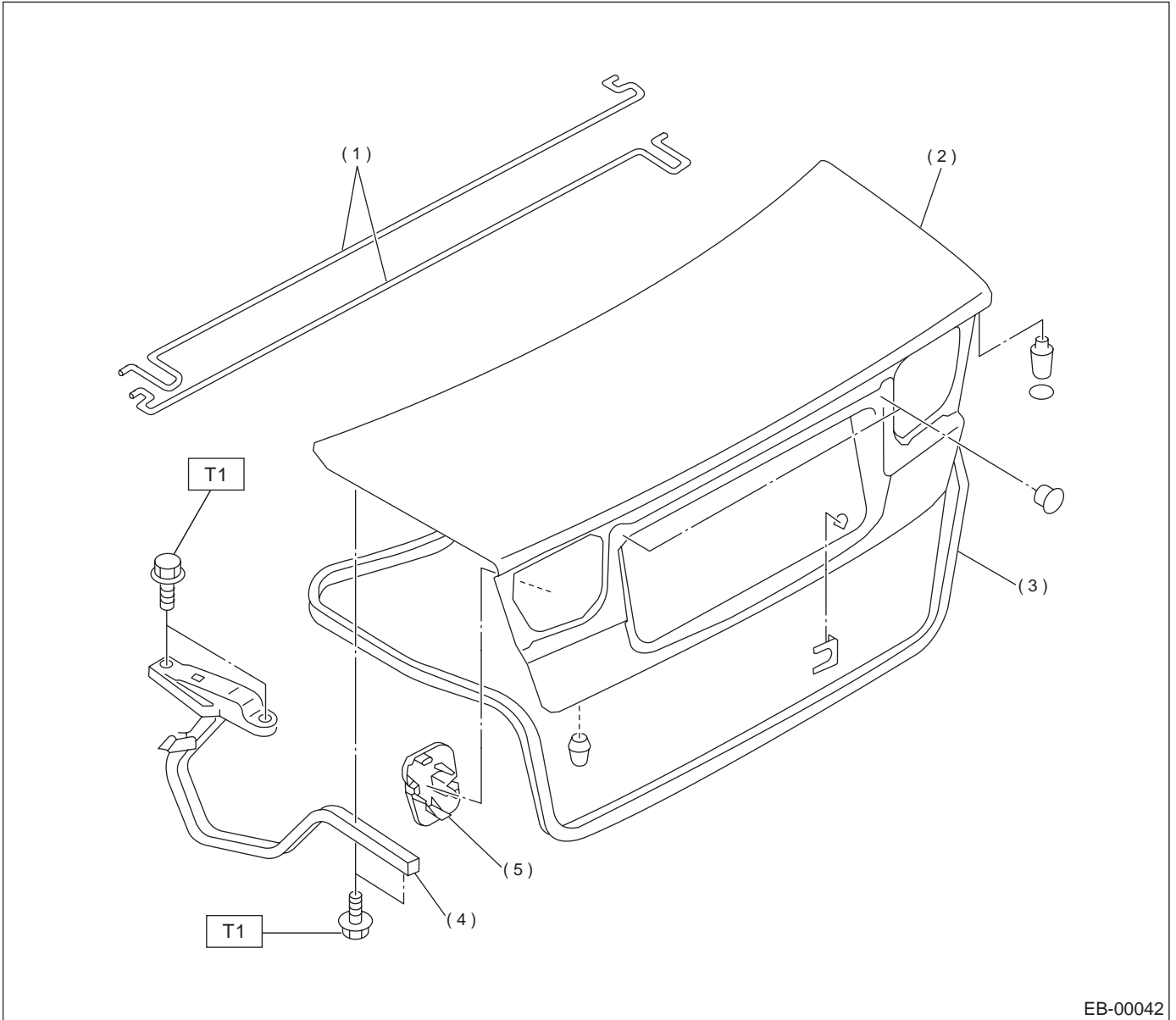
T2: 18 (1.8, 13)

T3: 30 (3.1, 22)

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

4. TRUNK LID PANEL



- (1) Torsion bar
- (2) Trunk lid
- (3) Weatherstrip

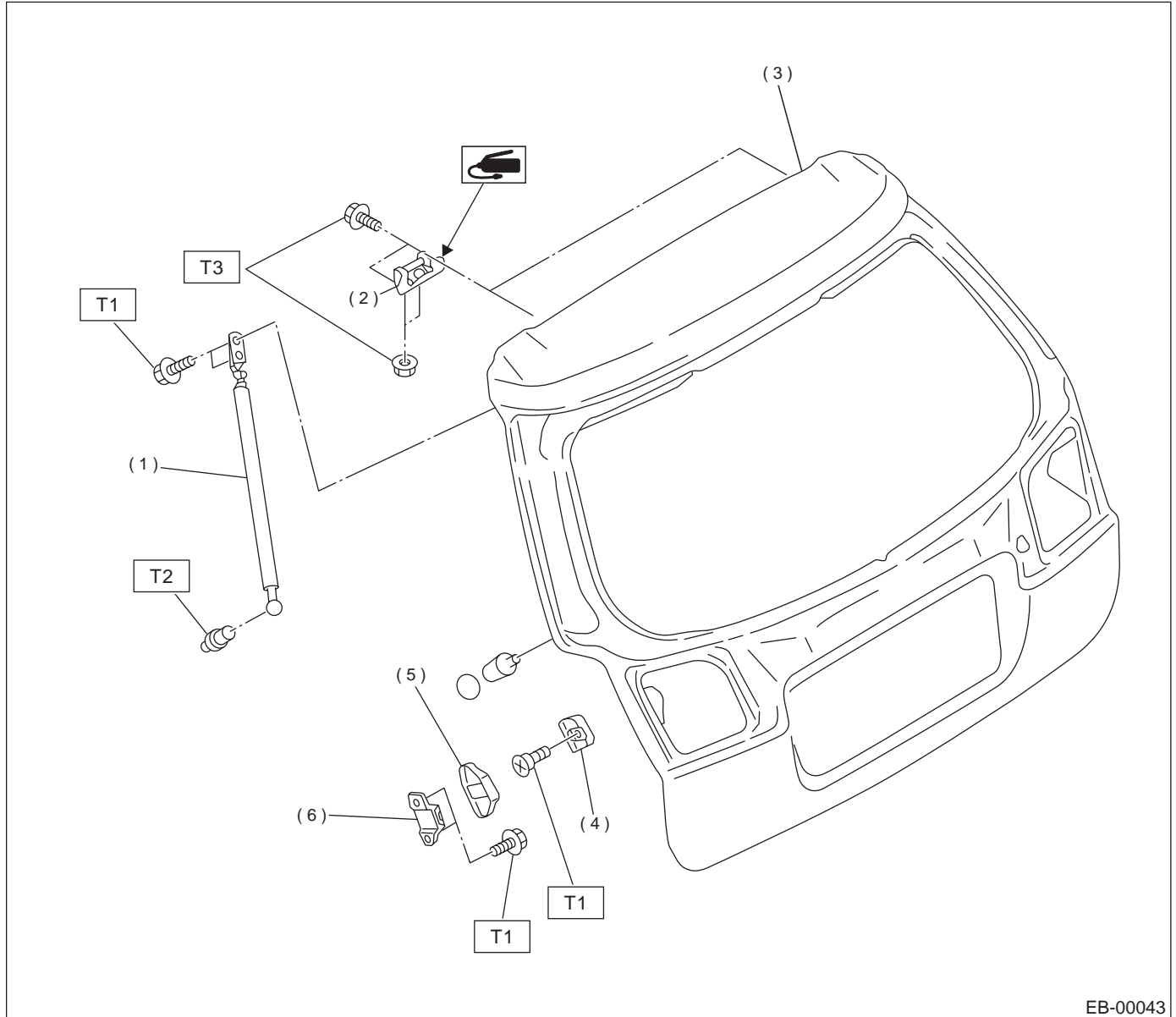
- (4) Hinge ASSY
- (5) Cover

Tightening torque: N·m (kgf·m, ft·lb)

T1: 18 (1.8, 13)

T2: 14 (1.4, 10)

5. REAR GATE PANEL



EB-00043

- | | |
|---------------|------------------------|
| (1) Gas stay | (4) Buffer (Rear gate) |
| (2) Hinge | (5) Buffer cover |
| (3) Rear gate | (6) Buffer (Back door) |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 14 (1.4, 10.1)

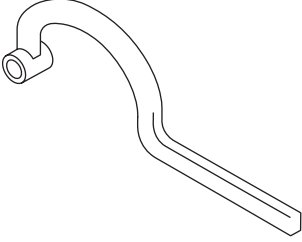
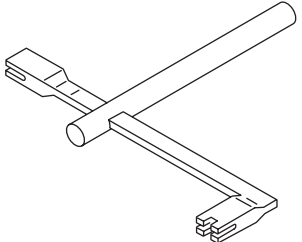
T3: 25 (2.5, 18.1)

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925610000	925610000	WRENCH	Used for removing and installing door hinge.
 ST-927780000	927780000	REMOVER	Used for removing and installing trunk torsion bar.

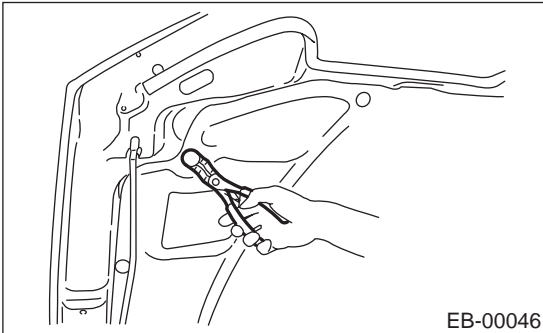
2. GENERAL TOOL

TOOL NAME	REMARKS
Support Jack	Used for supporting door panel.

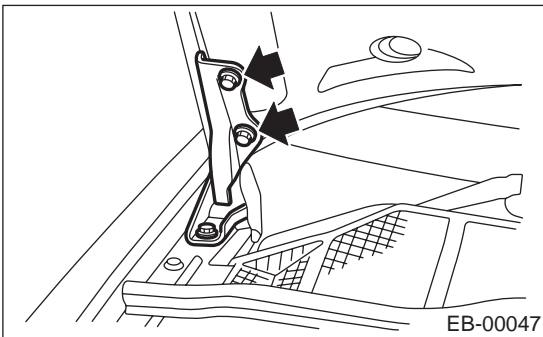
2. Front Hood

A: REMOVAL

- 1) Open front hood to remove washer nozzles.
- 2) Remove clips to remove hood insulator.



- 3) Remove bolts to disconnect hood from hinges.



B: INSTALLATION

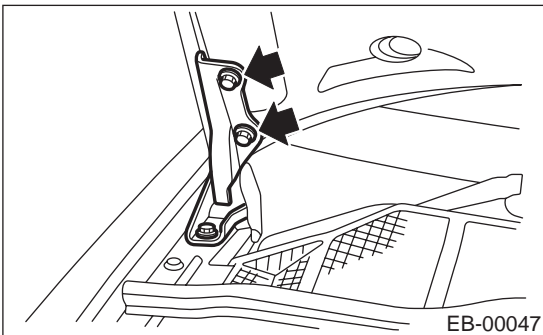
- 1) Install in the reverse order of removal.
- 2) Adjust clearance between hood and fender. Clearance must be equal at both sides.

Tightening torque:

24.5 N·m (2.5 kgf·m, 18 ft·lb)

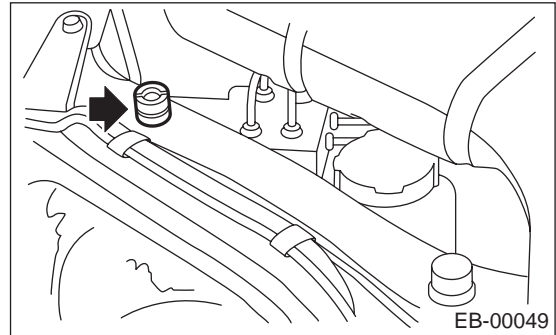
C: ADJUSTMENT

- 1) Use hinge mounting holes to align front hood longitudinally and laterally.



- 2) Adjust height at front end of hood. <Ref. to SL-31, REMOVAL, Front Hood Lock Assembly.>

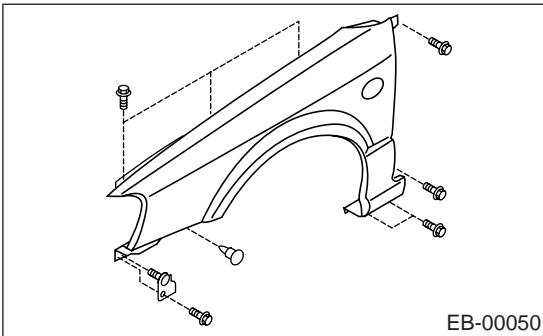
- 3) Rotate front hood buffer to adjust lateral height.



3. Fender Panel

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove side sill spoilers. <Ref. to EI-29, REMOVAL, Side Sill Spoiler.>(If fitted)
- 3) Remove side protectors and fender protectors. (OUTBACK)
- 4) Remove front bumper face. <Ref. to EI-14, REMOVAL, Front Bumper.>
- 5) Remove headlights. <Ref. to LI-15, REMOVAL, Headlight Assembly.>
- 6) Remove mud guard. <Ref. to EI-22, REMOVAL, Mud Guard.>
- 7) Remove bolts and clips to remove front fender.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When fender panel is installed, clearance between fender panel and hood or front fender must be equal.

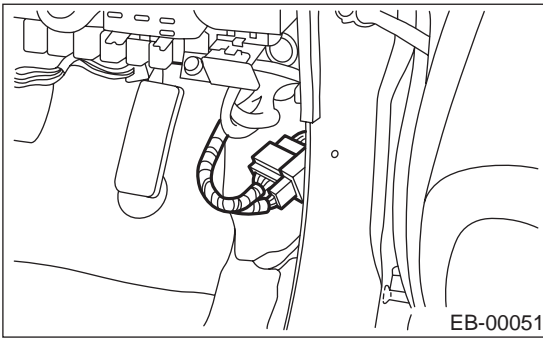
Tightening torque:

7.35 N·m (0.75 kgf-m, 5.4 ft-lb)

4. Front Door Panel

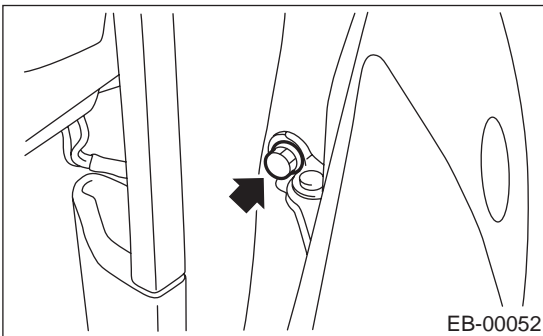
A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove front door trim. <Ref. to EI-30, REMOVAL, Front Door Trim.>
- 3) Remove outer mirror assembly. <Ref. to GW-33, REMOVAL, Outer Mirror Assembly.>
- 4) Remove front door regulator and motor. <Ref. to GW-16, REMOVAL, Front Regulator and Motor Assembly.>
- 5) Remove front door latch assembly. <Ref. to SL-21, REMOVAL, Front Door Latch Assembly.>
- 6) Remove front outer handle. <Ref. to SL-20, REMOVAL, Front Outer Handle.>
- 7) Remove front pillar lower trim to disconnect connector from body harness.

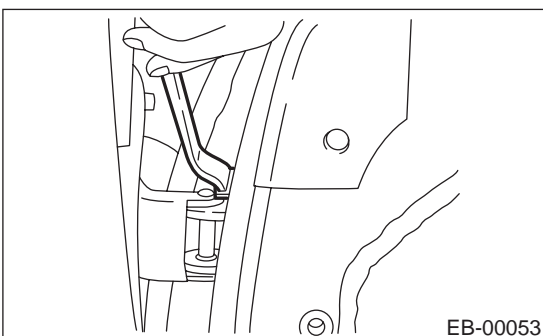


- 8) Put wooden block on jack and place jack under door. Support door with a jack to protect it from damage.

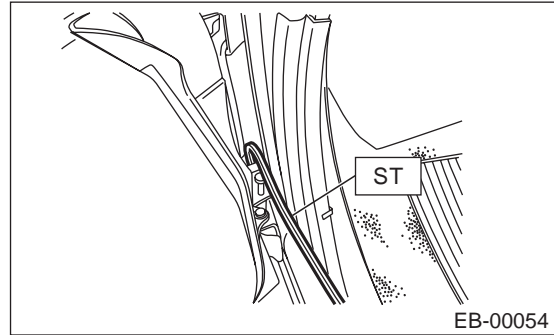
- 9) Remove checker bolts.



- 10) Remove door-side bolts for upper and lower hinges to remove door.



- 11) Using special tool, remove body-side bolts for upper and lower hinges, and remove door hinges.
ST 925610000 DOOR HINGE WRENCH



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Apply grease to sliding area of door hinges.

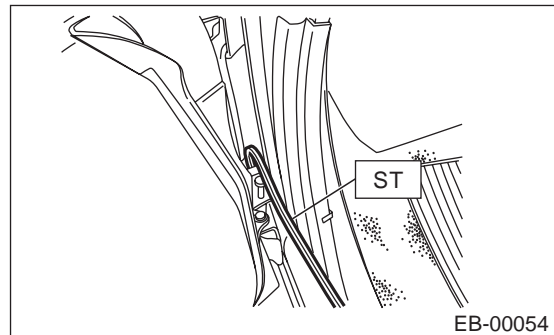
Tightening torque:

Refer to **COMPONENT** in *General Description*. <Ref. to EB-4, FRONT DOOR PANEL, COMPONENT, General Description.>

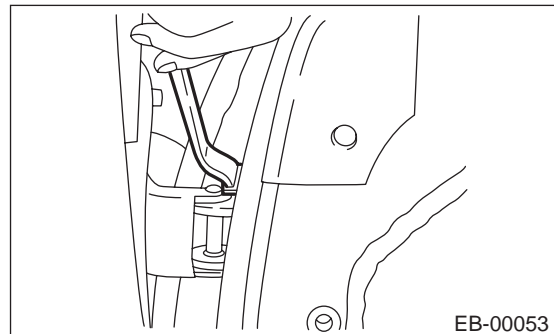
C: ADJUSTMENT

- 1) Using special tool, loosen body-side bolts of upper and lower hinges to align the position of front door panel longitudinally and vertically.

ST 925610000 DOOR HINGE WRENCH



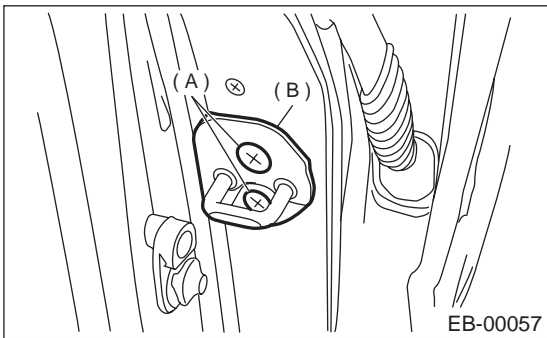
- 2) Loosen door-side bolts of upper and lower hinges to align the position of front door panel vertically and laterally at the front end.



FRONT DOOR PANEL

EXTERIOR BODY PANELS

3) Loosen screw (A) and tap striker (B) using plastic hammer to adjust striker.



CAUTION:
Do not use impact wrench. Welding area on striker nut plate is easily broken.

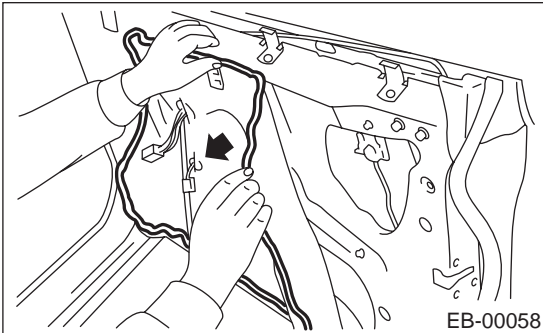
5. Front Sealing Cover

A: REMOVAL

- 1) Remove front door trim. <Ref. to EI-30, REMOVAL, Front Door Trim.>
- 2) Remove front speaker. <Ref. to ET-6, REMOVAL, Front Speaker.>

NOTE:

- Carefully remove butyl tape. Excessive force will easily break the cover.
- If cover gets broken, replace it with a new one.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When replacing sealing cover, use butyl tape.
- 3) Press sealer-applied area firmly to prevent any floating on surface.

Butyl tape:

3M8626 or equivalent

NOTE:

- Apply a uniform bead of butyl tape.
- Attach sealing cover, keeping it from becoming wrinkled.
- Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

If sealing cover is damaged, replace it with a new one.

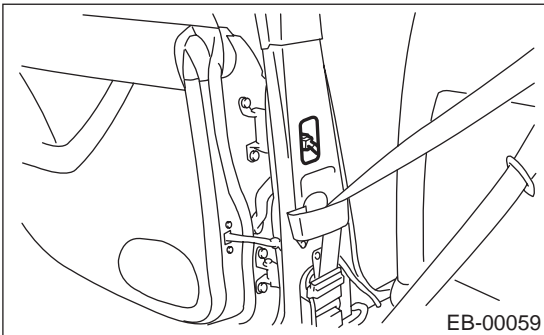
REAR DOOR PANEL

EXTERIOR BODY PANELS

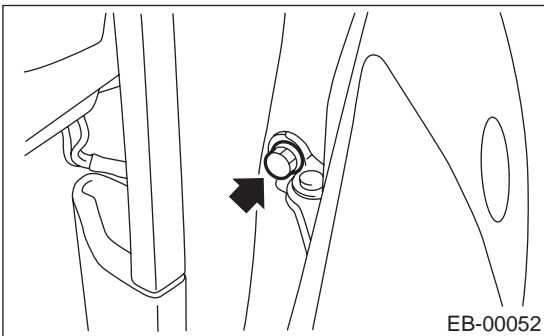
6. Rear Door Panel

A: REMOVAL

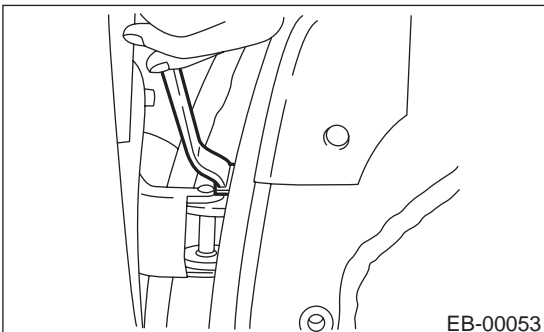
- 1) Disconnect ground cable from battery.
- 2) Remove rear door trim. <Ref. to EI-31, REMOVAL, Rear Door Trim.>
- 3) Remove rear door regulator and motor assembly. <Ref. to GW-18, REMOVAL, Rear Regulator and Motor Assembly.>
- 4) Remove rear outer handle. <Ref. to SL-24, REMOVAL, Rear Outer Handle.>
- 5) Remove center pillar lower trim. <Ref. to EI-39, REMOVAL, Lower Inner Trim.>
- 6) Remove seatbelt bracket and blind plug.
Disconnect connector of door harness and remove door hinge nut.



- 7) Put a wooden block on the jack and place the jack under the door. Support the door with the jack to protect it.
- 8) Remove checker bolts.



- 9) Remove door-side bolts for upper and lower hinges to remove door.



- 10) Using special tool, remove body-side bolts for upper and lower hinges, and remove door hinges.

B: INSTALLATION

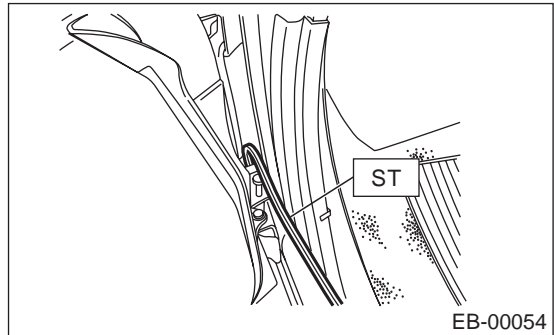
- 1) Install in the reverse order of removal.
- 2) Apply grease to sliding area of door hinges.

Tightening torque:

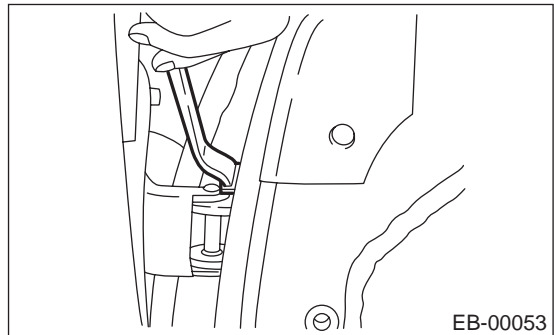
Refer to COMPONENT in General Description. <Ref. to EB-5, REAR DOOR PANEL, COMPONENT, General Description.>

C: ADJUSTMENT

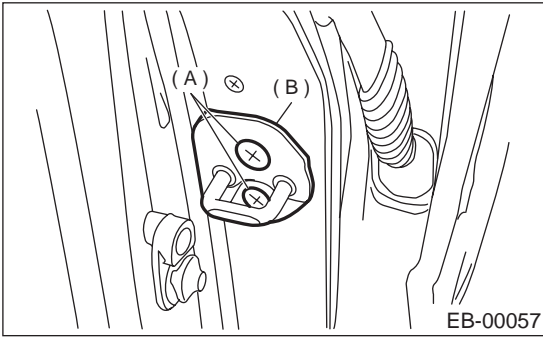
- 1) Using special tool, loosen body-side bolts of upper and lower hinges to align the position of rear door panel longitudinally and vertically.



- 2) Loosen door-side bolts of upper and lower hinges to align the position of rear door panel vertically and laterally at front-end.



3) Loosen screw (A) and tap striker (B) using plastic hammer to adjust striker.



CAUTION:
Do not use an impact wrench. The welding area on the striker nut plate is easily broken.

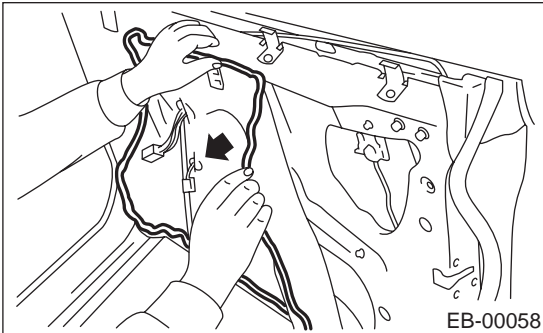
7. Rear Sealing Cover

A: REMOVAL

- 1) Remove rear door trim. <Ref. to EI-31, REMOVAL, Rear Door Trim.>
- 2) Remove rear speaker. <Ref. to ET-8, REMOVAL, Rear Speaker.>

NOTE:

- Carefully remove butyl tape. Excessive force will easily break the cover.
- If cover gets broken, replace it with a new one.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When replacing sealing cover, use butyl tape.
- 3) Press sealer-applied area firmly to prevent any floating on surface.

Butyl tape:

3M8626 or equivalent

NOTE:

- Apply a uniform bead of butyl tape.
- Attach sealing cover, keeping it from becoming wrinkled.
- Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

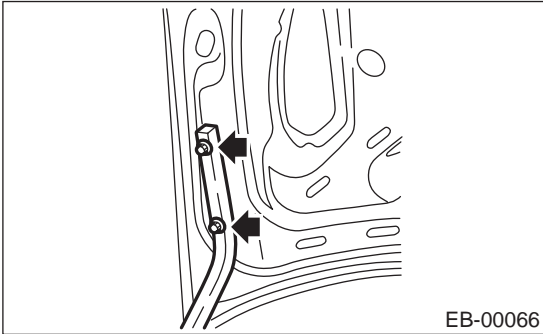
If sealing cover gets damaged, replace it with a new one.

8. Trunk Lid Panel

A: REMOVAL

1. TRUNK LID

- 1) Open trunk lid.
- 2) Disconnect trunk lid connector.
- 3) Loosen trunk lid mounting bolts to remove trunk lid from hinges.



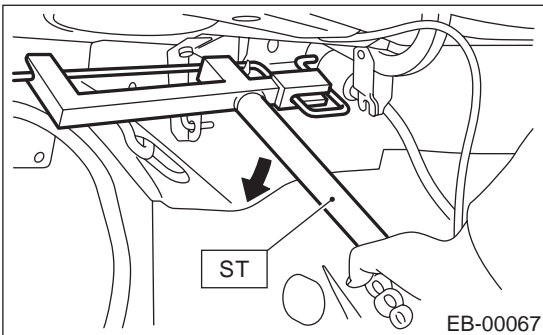
2. TORSION BAR

- 1) Open trunk lid.
- 2) Using special tool, remove torsion bar from hinge link.

ST 927780000 REMOVER

CAUTION:

During removal and installation, carefully handle torsion bar. It will generate reactive force.



- 3) Remove right/left torsion bars.

B: INSTALLATION

1. TRUNK LID

- 1) Install in the reverse order of removal.
- 2) Install trunk lid with uniform clearance.

2. TORSION BAR

- 1) Install in the reverse order of removal.
- 2) Apply grease to rotating area of hinges and mating surface of torsion bar.

Tightening torque:

14 N·m (1.4 kgf-m, 10 ft-lb)

REAR GATE PANEL

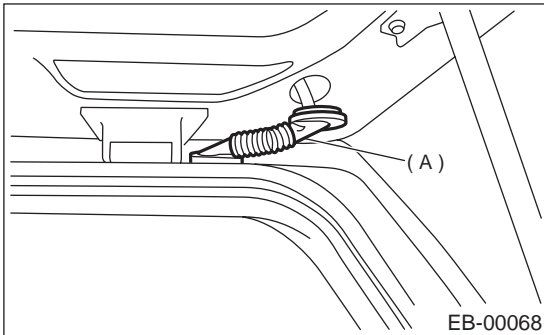
EXTERIOR BODY PANELS

9. Rear Gate Panel

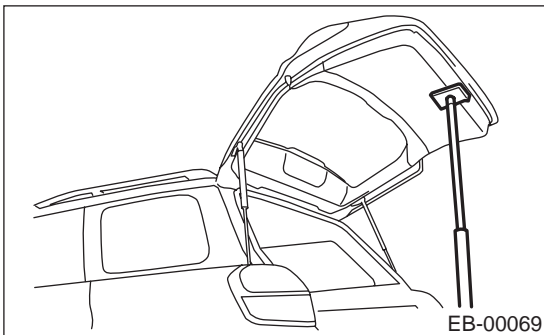
A: REMOVAL

1. REAR GATE PANEL

- 1) Open rear gate.
- 2) Remove rear gate outer handle. <Ref. to SL-27, REMOVAL, Rear Gate Outer Handle.>
- 3) Remove rear gate latch assembly. <Ref. to SL-28, REMOVAL, Rear Gate Latch Assembly.>
- 4) Remove rear gate trim. <Ref. to EI-44, REMOVAL, Rear Gate Trim.>
- 5) Remove rear gate key lock cylinders. <Ref. to SL-35, REAR GATE, REPLACEMENT, Key Lock Cylinders.>
- 6) Remove rear finisher light assembly. <Ref. to LI-23, REMOVAL, Rear Finisher Light Assembly.>
- 7) Remove rear wiper. <Ref. to WW-16, REMOVAL, Rear Wiper Motor.>
- 8) Disconnect connectors of rear wiper, rear defogger, and other lighting devices.
- 9) Disconnect washer hose.
- 10) Remove rubber duct (A) connection, and pull out harness and washer hose from rear gate.



- 11) Using a support, support the rear gate while removing gas stay mounting bolts.



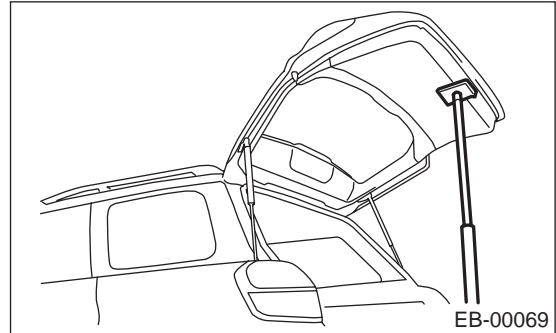
NOTE:

When the rear gate is released, it may hit and damage the body. To prevent this, place a shop cloth between body and gate.

- 12) Loosen rear gate bolts to remove rear gate.

2. GAS STAY

- 1) Open rear gate. Using a jack to support the rear gate.



CAUTION:

- After gas stay is removed, rear gate cannot stay open. Supporting the rear gate with a jack, remove the bolts.
 - Do not damage piston rods and oil seals.
 - Never disassemble cylinders: They contain gas.
- 2) Loosen bolts to remove gas stay from rear gate.

B: INSTALLATION

1. REAR GATE PANEL

- 1) Install in the reverse order of removal.
- 2) Install rear gate panel with uniform clearance to body.

2. GAS STAY

Install in the reverse order of removal.

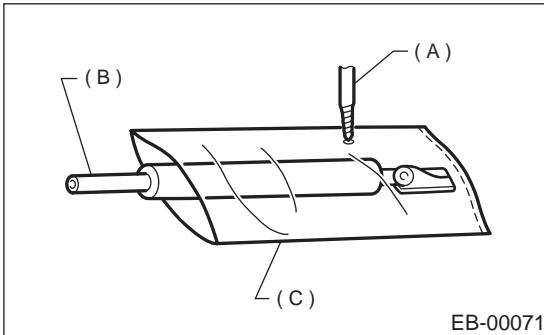
Tightening torque:

Refer to COMPONENT in General Description. <Ref. to EB-7, REAR GATE PANEL, COMPONENT, General Description.>

C: DISPOSAL

1. GAS STAY

1) Before opening a hole with a drill (A), put gas stay (B) into a vinyl sack (C).



CAUTION:

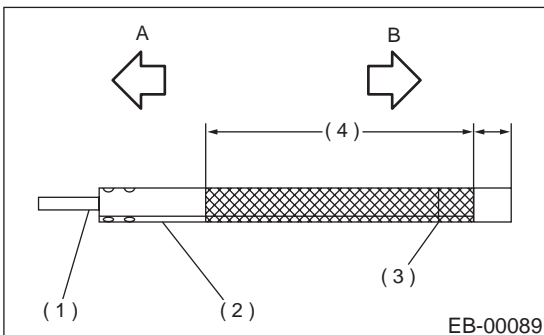
Prevent the vinyl case from being caught by drill cutting edge

2) Lift body side slightly with piston rods fully extended, and secure body side on vise stand.

Drill a hole in 2 to 3 mm (0.08 to 0.12 in) diameter at a point 10 to 200 mm (0.39 to 7.87 in) from door side, and bleed gas stay completely.

CAUTION:

Gas is colorless, odorless, and harmless. However, gas pressure may spray cutting powder or oil. Be sure to wear dust-resistant goggles.



- (A) Body side
- (B) Door side
- (1) Piston rod
- (2) Cylinder
- (3) Portion to be drilled
- (4) 190 mm (7.48 in)

REAR GATE PANEL

EXTERIOR BODY PANELS

MEMO:

CRUISE CONTROL SYSTEM



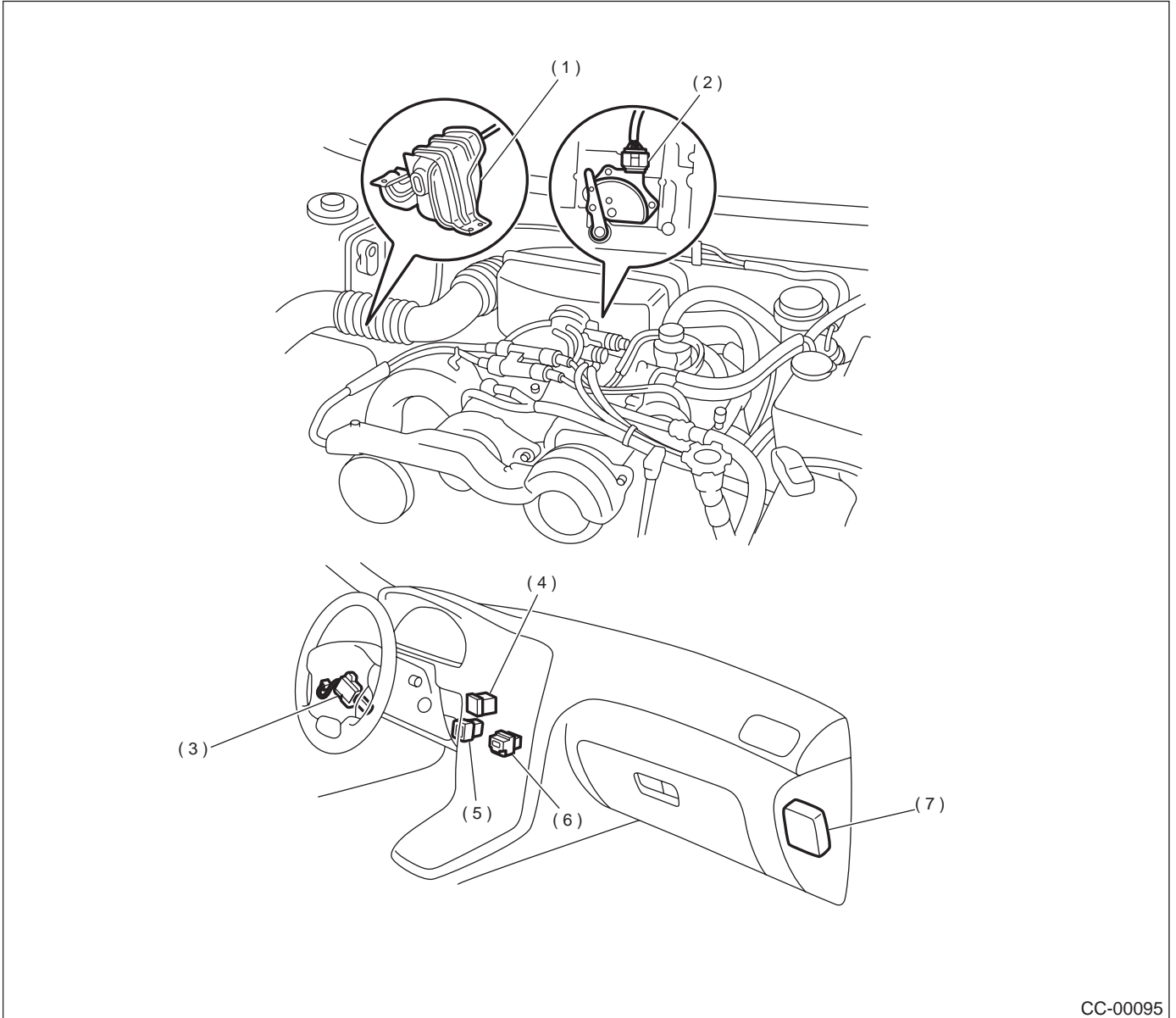
	Page
1. General Description	2
2. Actuator.....	4
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6. Stop and Brake Switch.....	9
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8. Inhibitor Switch.....	11

GENERAL DESCRIPTION

CRUISE CONTROL SYSTEM

1. General Description

A: COMPONENT



CC-00095

- | | | |
|-----------------------------------|--------------------------------|---------------------------|
| (1) Actuator | (4) Cruise control main switch | (7) Cruise control module |
| (2) Inhibitor switch (AT) | (5) Clutch switch (MT) | |
| (3) Cruise control command switch | (6) Stop and brake switch | |

NOTE:

Electrical component location are for LHD vehicles. Cruise control actuator and cruise control module location for RHD vehicles are symmetrically opposite.

B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable. When repairing the radio, control module and other parts with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise the memory will be erased.
- Reassemble parts in the reverse order of disassembly unless otherwise indicated.
- Adjust parts to specifications specified in this manual.
- Connect connectors and hoses securely during reassembly.
- After reassembly, ensure functional parts operate properly.

C: PREPARATION TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

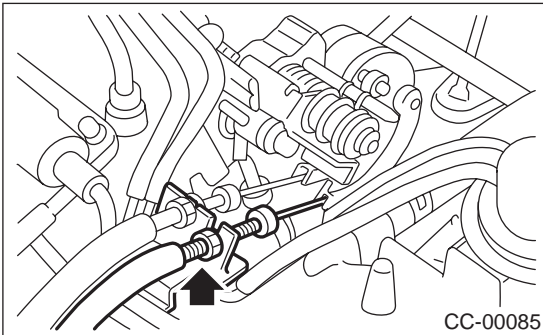
2. Actuator

A: REMOVAL

CAUTION:

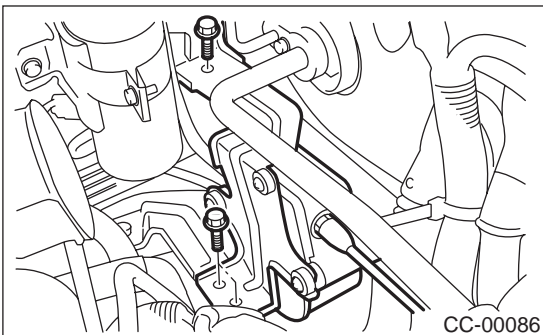
- Be careful not to apply excessive load to the wire cable when adjusting and/or installing; otherwise, the actuator may be deformed or damaged.
- Do not bend cable sharply with a radius less than 100 mm (3.94 in); otherwise, cable may bend permanently, resulting in poor performance.
- When installing cable, be careful not to sharply bend or pinch the inner cable; otherwise, the cable may break.

- 1) Disconnect ground cable from battery.
- 2) Remove clip bands from cruise control cable.
- 3) Loosen nut which secures cruise control cable end to throttle cam and then remove cable from throttle cam.

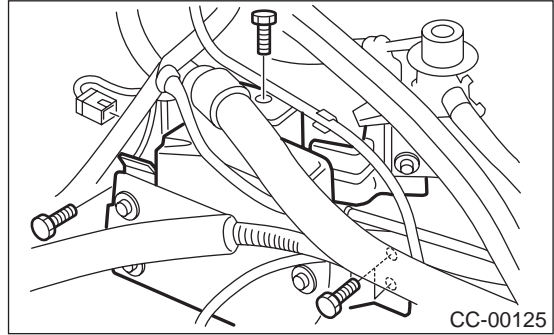


- 4) Remove actuator attaching bolts.
- 5) Remove actuator while disconnecting connector.

LHD



RHD



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Actuator

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

Cable end nut

12 N·m (1,2 kgf-m, 8.7 ft-lb)

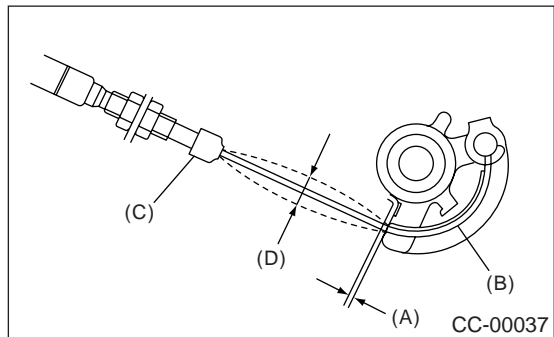
NOTE:

Must be adjusted when cable end outer is fixed in place, so that gap (A) between throttle cam and lever is 0 — 1 mm (0 — 0.04 in), or inner cable deflection (D) is 1 — 8 mm (0.039 — 0.315 in) with specified range of throttle cable play.

(Must be attached while throttle cam is being pulled by wire cable.)

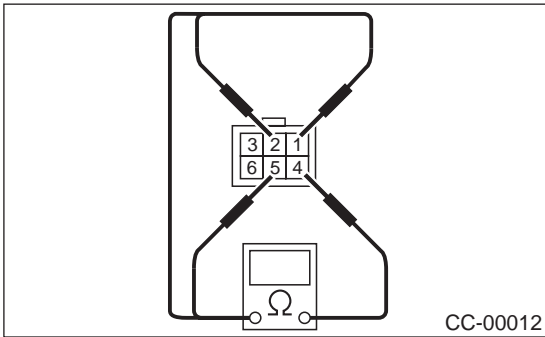
Must be coated evenly on cam end inner (B) connection.

Cover (C) must be inserted securely, until tip of cable touches cover stopper.



C: INSPECTION

Measure cruise control actuator resistance.



Terminal No.	Standard
4 and 1	Approx. 5Ω
4 and 2	Approx. 5Ω
4 and 5	Approx. 5Ω
3 and 6	Approx. 39Ω

If NG, replace cruise control actuator.

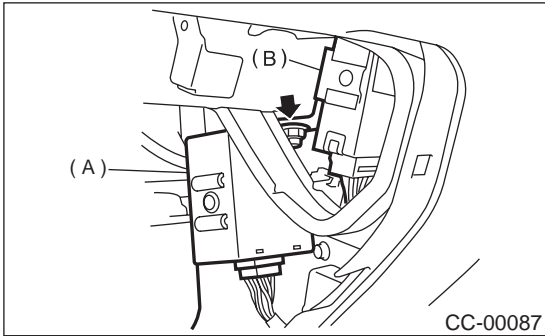
CRUISE CONTROL MODULE

CRUISE CONTROL SYSTEM

3. Cruise Control Module

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove glove box. <Ref. to EI-32, REMOVAL, Glove Box.>
- 3) Remove nut, then remove cruise control module (A) and the other electrical control module (B) while disconnecting connector.



- 4) Disconnect cruise control module and the other electrical control module.

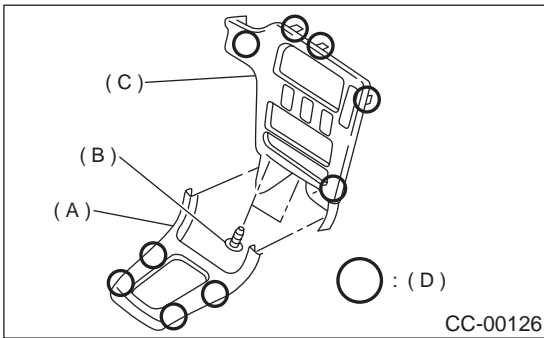
B: INSTALLATION

Install is in the reverse order of removal.

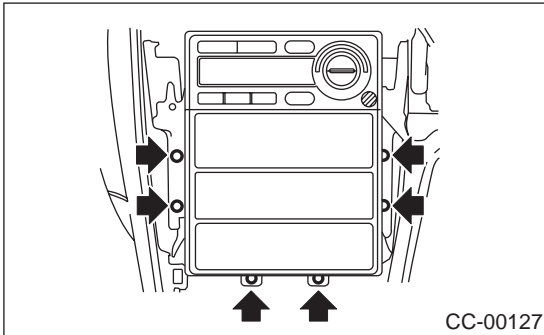
4. Cruise Control Main Switch

A: REMOVAL

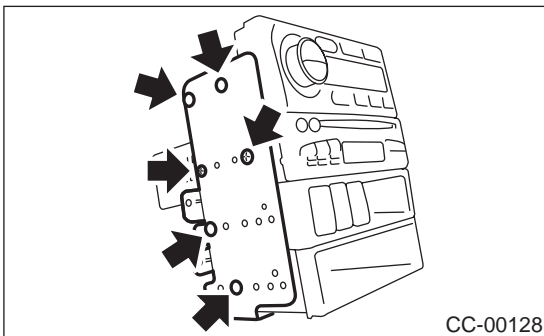
- 1) Disconnect ground cable from battery.
- 2) Remove screws and clip from instrument panel lower cover.
- 3) Remove hook (D) and front cover (A) while disconnecting connector.
- 4) Remove two screws (B) and hook (D), and then remove center panel (C) while disconnecting connector.



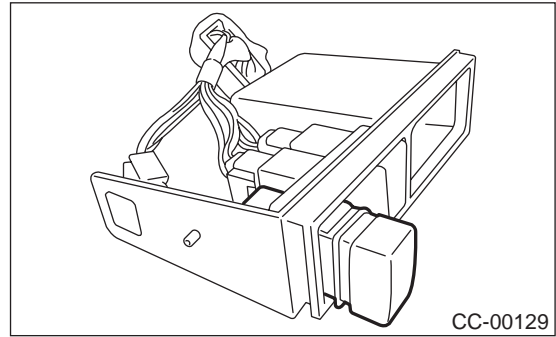
- 5) Disconnect fitting screws, and slightly pull radio and switch assembly out from center console.



- 6) Disconnect electric connectors and antenna-feeder cord and then disconnect heater control unit.
- 7) Remove screw and detach the bracket and then remove switch panel.



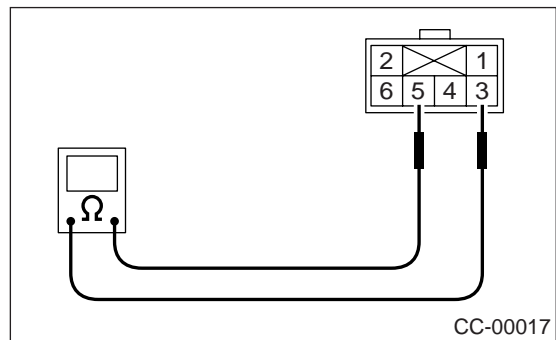
- 8) Remove main switch by pushing it outward.



B: INSTALLATION

Install is in the reverse order of removal.

C: INSPECTION



Switch position	Terminal No.	Standard
OFF (Released)	3 and 5	More than 1 MΩ
ON (Pushed)	3 and 5	Less than 1 Ω

If NG, replace cruise control main switch.

CRUISE CONTROL COMMAND SWITCH

CRUISE CONTROL SYSTEM

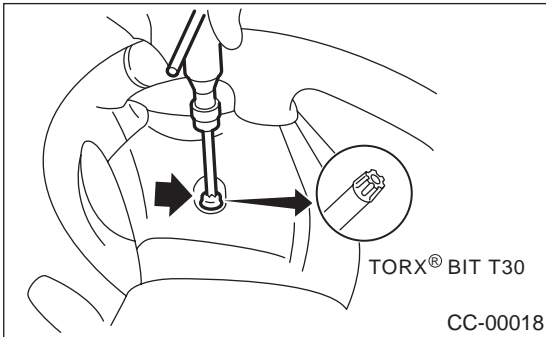
5. Cruise Control Command Switch

A: REMOVAL

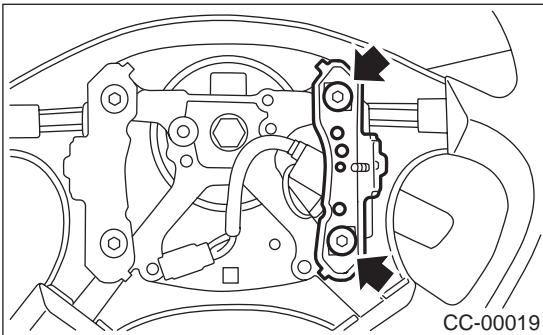
WARNING:

Before servicing, be sure to read the notes in the AB section for proper handling of the driver's airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

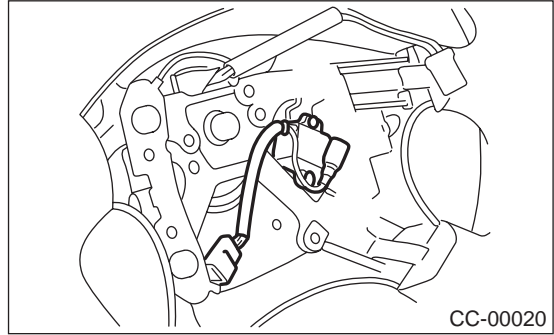
- 1) Set front wheels in straight ahead position.
- 2) Turn ignition switch OFF.
- 3) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.
- 4) Using TORX® BIT T30 (Tamper resistant type), loosen two TORX® bolts which secure driver's airbag module.



- 5) Disconnect airbag module connector on back of airbag module.
- 6) Remove horn switch from steering wheel as shown.



- 7) Disconnect horn and cruise control command switch connector, then remove cruise control command switch.

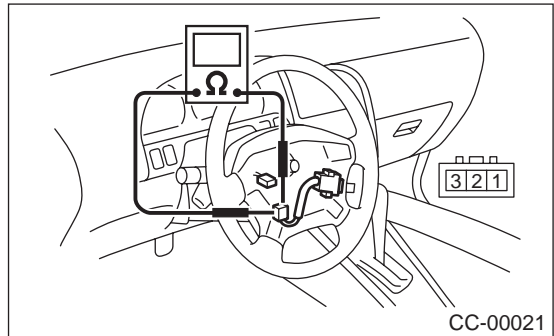


B: INSTALLATION

Install is in the reverse order of removal.

C: INSPECTION

Measure cruise control command switch resistance.



Check continuity between cruise control command switch terminals.

Switch	Position	Terminal No.	Standard
CANCEL	ON	1 (+) and 2 (-)	Less than 1 Ω
	ON	1 (+) and 3 (-)	Less than 1 Ω
SET/ COAST	OFF	1 and 2	More than 1 M Ω
	ON	1 and 2	Less than 1 Ω
RESUME/ ACCEL	OFF	1 and 3	More than 1 M Ω
	ON	1 and 3	Less than 1 Ω

If NG, replace cruise control command switch.

6. Stop and Brake Switch

A: REMOVAL

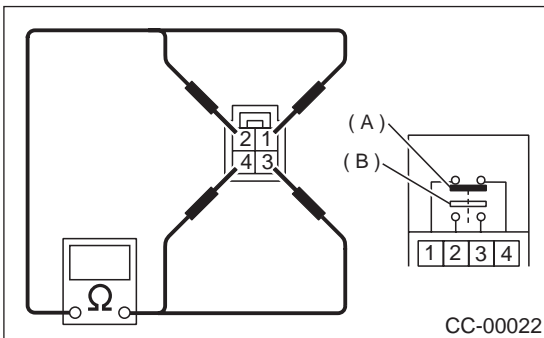
- 1) Disconnect ground cable from battery.
- 2) Disconnect connector from stop and brake switch, and then remove the switch. <Ref. to BR-55, REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the brake switch (A) and stop light switch (B) resistance.



Switch	Pedal	Terminal No.	Standard
Brake	Released	1 and 4	Less than 1 Ω
	Depressed	1 and 4	More than 1 MΩ
Stop light	Released	2 and 3	More than 1 MΩ
	Depressed	2 and 3	Less than 1 Ω

If NG, replace stop and brake switch.

7. Clutch Switch

A: REMOVAL

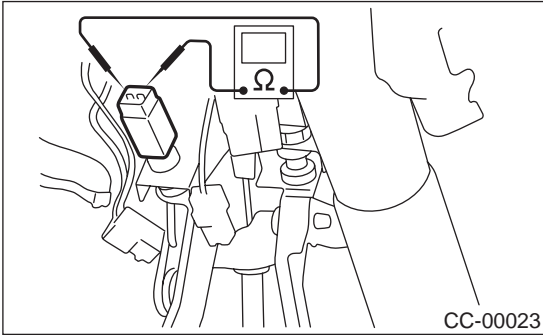
- 1) Disconnect ground cable from battery.
- 2) Disconnect the connector from the clutch switch, and then remove the switch. <Ref. to CL-40, REMOVAL, Clutch Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure clutch switch resistance.



Switch	Pedal	Terminal No.	Standard
Clutch	Released	1 and 2	Less than 1 Ω
	Depressed	1 and 2	More than 1 M Ω

If NG, replace the clutch switch.

8. Inhibitor Switch

A: REMOVAL

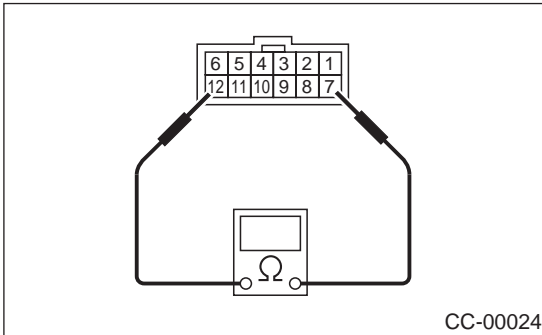
- 1) Disconnect ground cable from battery.
- 2) Disconnect connector from inhibitor switch, and then remove the switch. <Ref. to AT-50, REMOVAL, Inhibitor Switch.>

B: INSTALLATION

Installation is in the reverse order of removal.

C: INSPECTION

Measure inhibitor switch resistance.



Selector lever position	Terminal No.	Standard
P	7 and 12	Less than 1 Ω
N		Less than 1 Ω
Except P and N		More than 1 MΩ

If NG, replace inhibitor switch.

INHIBITOR SWITCH

CRUISE CONTROL SYSTEM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC

	Page
1. Basic Diagnostic Procedure	2
2. General Description	4
3. Electrical Components Location.....	7
4. Cruise Control Module I/O Signal.....	8
5. Subaru Select Monitor.....	10
6. Diagnostics Chart with Symptom	12
7. List of Diagnostic Trouble Code (DTC)	26
8. Diagnostics Chart with Trouble Code.....	27

BASIC DIAGNOSTIC PROCEDURE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Value	Yes	No
1 START DIAGNOSIS. 1) Perform pre-inspection. <Ref. to CC-6, INSPECTION, General Description.> 2) Check cruise control main switch operation. Is cruise control main switch turned ON?	Cruise main switch is turned ON.	Go to step 2.	Go to symptom 1. <Ref. to CC-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
2 PREPARE SUBARU SELECT MONITOR. Is the Subaru select monitor available?	Subaru select monitor is available.	Go to step 3.	Go to step 4.
3 PERFORM CRUISE CANCEL CONDITIONS DIAGNOSIS. Perform cruise cancel conditions diagnosis. <Ref. to CC-10, Subaru Select Monitor.> Is trouble code indicated?	Trouble code is not indicated.	Go to step 4.	Go to "List of Diagnostic Trouble Code (DTC)". <Ref. to CC-26, List of Diagnostic Trouble Code (DTC).>
4 CHECK CRUISE CONTROL SET OPERATION. Check cruise control set operation. Can cruise control be set while driving at 40 km/h (25 MPH)?	Cruise control can be set.	Go to step 5.	Go to symptom 2. <Ref. to CC-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
5 CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED. Make sure vehicle speed is held within set speed. Is vehicle speed held within set speed ± 3 km/h (± 2 MPH) ?	Vehicle speed is held within set speed.	Go to step 6.	Go to symptom 3. <Ref. to CC-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
6 CHECK RESUME/ACCEL OPERATION. Check RESUME/ACCEL operation. Does vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Vehicle speed increases or returns to set speed.	Go to step 7.	Go to symptom 4. <Ref. to CC-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
7 CHECK SET/COAST OPERATION. Check SET/COAST operation. Does vehicle speed decrease after SET/COAST switch has been pressed?	Vehicle speed decreases.	Go to step 8.	Go to symptom 5. <Ref. to CC-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
8 CHECK CANCEL OPERATION. Check CANCEL operation. Is cruise control released after CANCEL switch has been pressed?	Cruise control is released.	Go to step 9.	Go to symptom 6. <Ref. to CC-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
9 CHECK CRUISE CONTROL RELEASE OPERATION. Check cruise control release operation. Is cruise control released after brake pedal has been depressed?	Cruise control is released.	Go to step 10.	Go to symptom 7. <Ref. to CC-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>

BASIC DIAGNOSTIC PROCEDURE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

	Step	Value	Yes	No
10	CHECK CRUISE CONTROL RELEASE OPERATION. Check cruise control release operation. Is cruise control released after clutch pedal has been depressed? (MT)	Cruise control is released.	Finish the diagnostics.	Go to symptom 8. <Ref. to CC-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>

GENERAL DESCRIPTION

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

2. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

Airbag system wiring harness is routed near the cruise control module and cruise control command switch.

CAUTION:

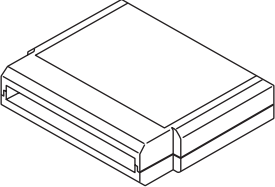

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage airbag system wiring harness when servicing the cruise control module and cruise control command switch.

GENERAL DESCRIPTION

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

B: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none">• English: 22771AA030 (Without printer)• German: 22771AA070 (Without printer)• French: 22771AA080 (Without printer)• Spanish: 22771AA090 (Without printer)

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

GENERAL DESCRIPTION

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

C: INSPECTION

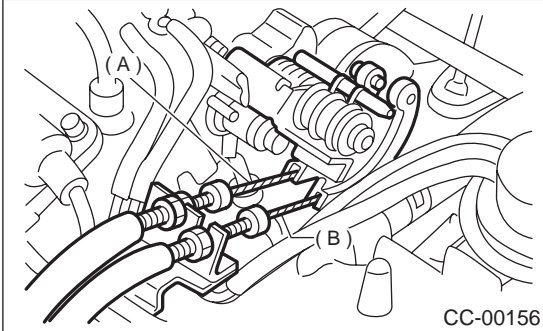
1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V, or more

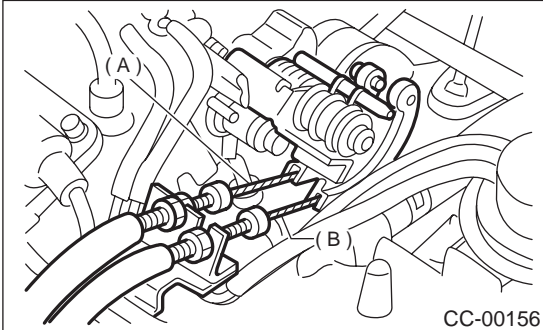
Specific gravity:
Above 1.260

2. CRUISE CONTROL CABLE



Check the cruise control cable (B) installation. If NG, install the cable securely.

3. ACCELERATOR CABLE

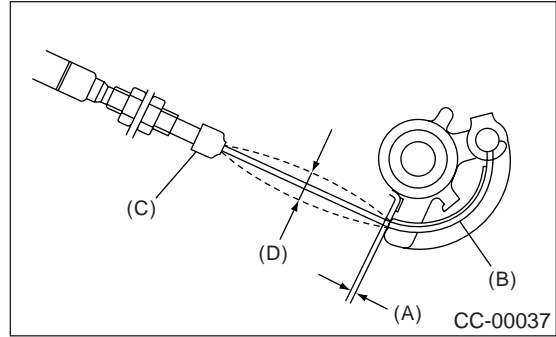


Check movement of the accelerator cable (A) when the cruise control throttle is moved by hand. If NG, check throttle cam.

4. THROTTLE CAM

Check that the throttle cam moves smoothly. If NG, repair throttle cam.

5. CABLE FREE PLAY



Check that the clearance (A) between throttle cam (B) and lever or cable deflection (D) is within specifications.

Throttle cam-to-lever clearance:
0 — 1 mm (0 — 0.04 in)

Inner cable deflection:
1 — 8 mm (0.04 — 0.31 in)

If NG, adjust the clearance or the deflection with the adjust nut.

NOTE:

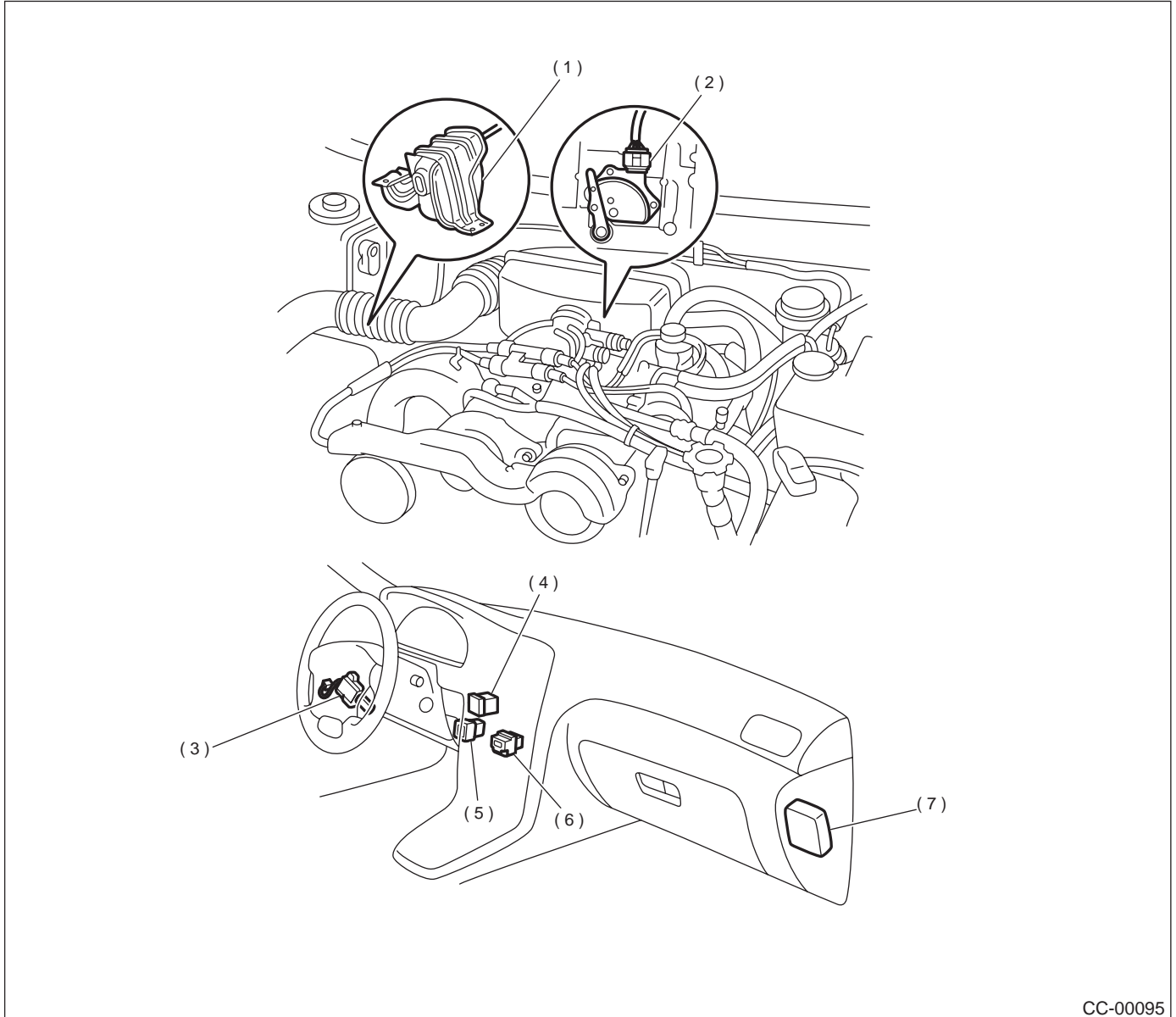
Check that the cap (C) is positioned in the groove.

ELECTRICAL COMPONENTS LOCATION

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

3. Electrical Components Location

A: LOCATION



CC-00095

- | | | |
|-----------------------------------|--------------------------------|---------------------------|
| (1) Actuator | (4) Cruise control main switch | (7) Cruise control module |
| (2) Inhibitor switch (AT) | (5) Clutch switch (MT) | |
| (3) Cruise control command switch | (6) Stop and brake switch | |

NOTE:

Electrical component locations are for LHD vehicles.

Cruise control actuator and cruise control module locations for RHD vehicles are symmetrically opposite.

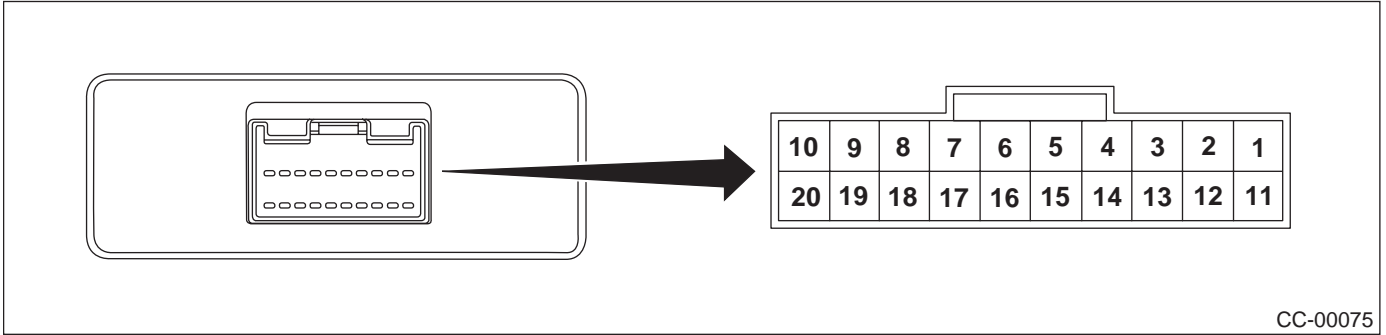
Cruise control main switch location is different depending on destination.

CRUISE CONTROL MODULE I/O SIGNAL

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

4. Cruise Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



CC-00075

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Main light	1	<ul style="list-style-type: none"> Battery voltage is present when main switch is turned OFF. "0" volt is present when main switch is turned ON.
Inhibitor switch (AT)	4	<ul style="list-style-type: none"> Battery voltage is present when selector lever is other than "P" or "N" position. "0" volt is present when selector lever is set to "P" or "N" position.
Motor B	5	<ul style="list-style-type: none"> ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. "0" volt is present when main switch is turned OFF.
Ground	6	—
Motor A	7	<ul style="list-style-type: none"> ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. "0" volt is present when main switch is turned OFF.
RESUME/ACCEL switch	9	<ul style="list-style-type: none"> Battery voltage is present when command switch is turned to RESUME/ACCEL position. "0" volt is present when command switch is released.
SET/COAST switch	10	<ul style="list-style-type: none"> Battery voltage is present when command switch is turned to SET/COAST position. "0" volt is present when command switch is released.
Main power supply	11	<ul style="list-style-type: none"> Battery voltage is present when main switch is turned ON. "0" volt is present when main switch is turned OFF.
Ignition switch	12	<ul style="list-style-type: none"> Battery voltage is present when ignition switch is turned ON. "0" volt is present when ignition switch is turned OFF.
Motor C	13	<ul style="list-style-type: none"> ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. "0" volt is present when main switch is turned OFF.
Motor clutch	14	<ul style="list-style-type: none"> ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. "0" volt is present when vehicle is stopped.
Cruise control main switch	15	<ul style="list-style-type: none"> Battery voltage is present during pressing the main switch. "0" volt is present when main switch is released.
Brake switch	16	<p>Leave clutch pedal released (MT), while cruise control main switch is turned ON. Then check that;</p> <ul style="list-style-type: none"> Battery voltage is present when brake pedal is released. "0" volt is present when brake pedal is depressed. <p>Additionally only in MT vehicle, keep the cruise control main switch to ON and leave brake pedal released. Then check that;</p> <ul style="list-style-type: none"> Battery voltage is present when clutch pedal is released. "0" volt is present when clutch pedal is depressed.
Data link connector	17	—
Data link connector	18	—

CRUISE CONTROL MODULE I/O SIGNAL

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Vehicle speed sensor (MT) TCM (AT)	19	Lift-up the vehicle until all four wheels are raised off ground, and then rotate any wheel manually. Approx. "5" and "0" volt pulse signals are alternately input to cruise control module.
Stop light switch	20	Turn ignition switch to OFF. Then check that; <ul style="list-style-type: none">• Battery voltage is present when brake pedal is depressed.• "0" volt is present when brake pedal is released.

NOTE:
Voltage at terminals 5, 7, 13 and 14 cannot be checked unless vehicle is driving by cruise control operation.

B: SCHEMATIC

<Ref. to WI-142, SCHEMATIC, Cruise Control System.>

SUBARU SELECT MONITOR

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

The on-board diagnosis function of the cruise control system uses an external Subaru Select Monitor.

The on-board diagnosis function operates in two categories, which are used depending on the type of problems;

1) Cruise cancel conditions diagnosis

(1) This category of diagnosis requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).

(2) Cruise control module memory stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:

- The cruise control memory stores not only the cruise "cancel" which occurred (although "cancel" operation is not entered by the driver), but also the "cancel" condition input by the driver.
- The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

2) Real-time diagnosis

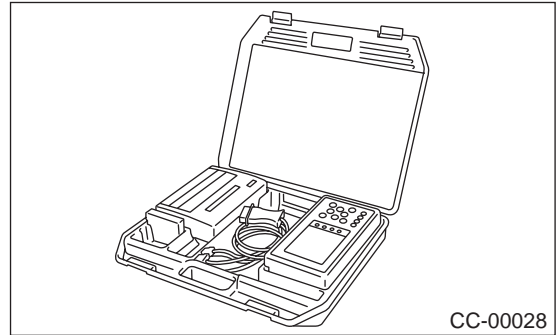
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.

(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.

(2) Monitor the signal conditions from switches and sensors.

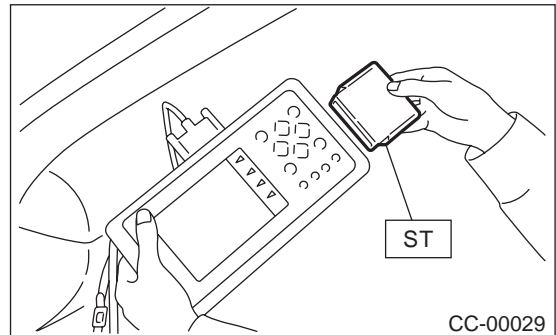
2. CRUISE CANCEL CONDITIONS DIAGNOSIS

1) Prepare Subaru Select Monitor kit.



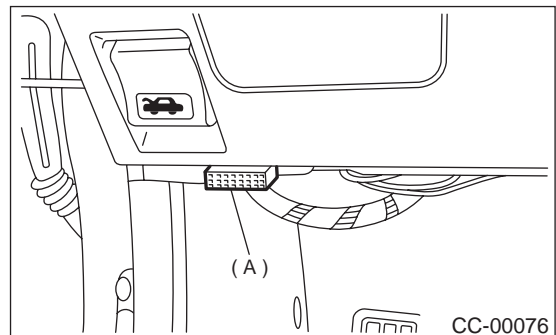
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to CC-5, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

(1) Data link connector (A) is located in the lower portion of the instrument panel (on the driver's side).



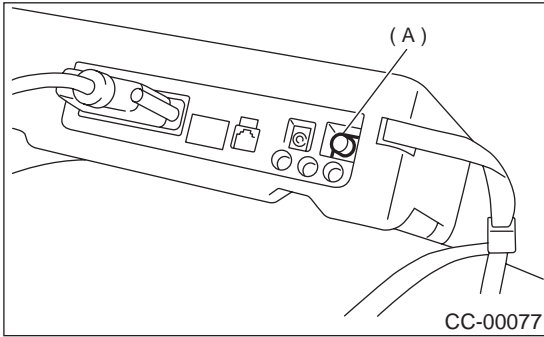
(2) Connect diagnosis cable to data link connector.

5) Start engine and turn cruise control main switch to ON.

SUBARU SELECT MONITOR

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

6) Turn Subaru Select Monitor switch (A) to ON.



7) On the «Main Menu» display screen, select the {All System Diagnosis} and press the [YES] key.

NOTE:

The diagnostic trouble code (DTC) is also shown in the {Each System Check} mode. This mode is called up on the «Cruise Control Diagnosis» display screen by selecting the item {Cancel Code(s) Display}.

8) Drive vehicle at least 30 km/h (19 MPH) with cruise speed set.

9) If cruise speed is canceled itself (without doing any cancel operations), a diagnostic trouble code (DTC) will appear on select monitor display.

CAUTION:

- A diagnostic trouble code (DTC) will also appear when cruise cancel is effected by driver. Do not confuse.
- Have a co-worker ride in vehicle to assist in diagnosis during driving.

NOTE:

Diagnostic trouble code (DTC) will be cleared by turning ignition switch or cruise control main switch to OFF.

3. REAL-TIME DIAGNOSIS

- 1) Connect select monitor.
- 2) Turn ignition switch and cruise control main switch to ON.
- 3) Turn Subaru Select Monitor switch to ON.
- 4) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 5) On the «System Selection Menu» display screen, select the {Cruise Control} and press the [YES] key.
- 6) Press the [YES] key after displayed the information of engine type.
- 7) On the «Cruise Control Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
- 8) Make sure that normal indication is displayed when controls are operated as indicated below:
 - Depress/release the brake pedal. (Stop light switch and brake switch turn ON or OFF.)
 - Turn ON/OFF the “SET/COAST” switch.
 - Turn ON/OFF the “RESUME/ACCEL” switch.
 - Depress/release the clutch pedal. (MT)
 - Set the selector lever to P or N. (AT)

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to CC-26, List of Diagnostic Trouble Code (DTC).>

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

6. Diagnostics Chart with Symptom

A: SYMPTOM CHART

Symptom		Repair area	Reference
1	Cruise control main switch is not turned ON.	(1) Check power supply.	<Ref. to CC-14, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>
		(2) Check cruise control main switch.	<Ref. to CC-16, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics Chart with Symptom.>
2	Cruise control cannot be set.	(1) Check SET/COAST switch.	<Ref. to CC-18, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check stop light switch and brake switch.	<Ref. to CC-20, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(3) Check clutch switch (MT).	<Ref. to CC-22, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(4) Check inhibitor switch (AT).	<Ref. to CC-24, CHECK INHIBITOR SWITCH (AT), Diagnostics Chart with Symptom.>
		(5) Check vehicle speed sensor.	<Ref. to CC-28, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
		(6) Check motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(7) Check motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
3	Vehicle speed is not held within set speed ± 3 km/h (± 2 MPH).	(1) Check vehicle speed sensor.	<Ref. to CC-28, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
		(2) Check motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
4	Vehicle speed does not increase or does not return to set speed after RESUME/ACCEL switch has been pressed.	(1) Check RESUME/ACCEL switch.	<Ref. to CC-18, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
5	Vehicle speed does not decrease after SET/COAST switch has been pressed.	(1) Check SET/COAST switch.	<Ref. to CC-18, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
6	Cruise control is not released after CANCEL switch has been pressed.	(1) Check CANCEL switch.	<Ref. to CC-18, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
7	Cruise control is not released after brake pedal has been depressed.	(1) Check stop light switch and brake switch.	<Ref. to CC-20, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Symptom		Repair area	Reference
8	Cruise control is not released after clutch pedal has been depressed (MT).	(1) Check clutch switch.	<Ref. to CC-22, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>

DIAGNOSTICS CHART WITH SYMPTOM

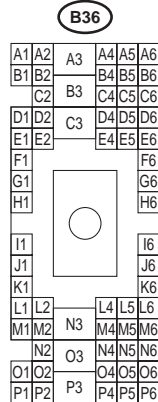
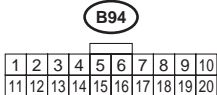
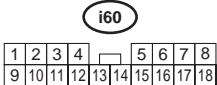
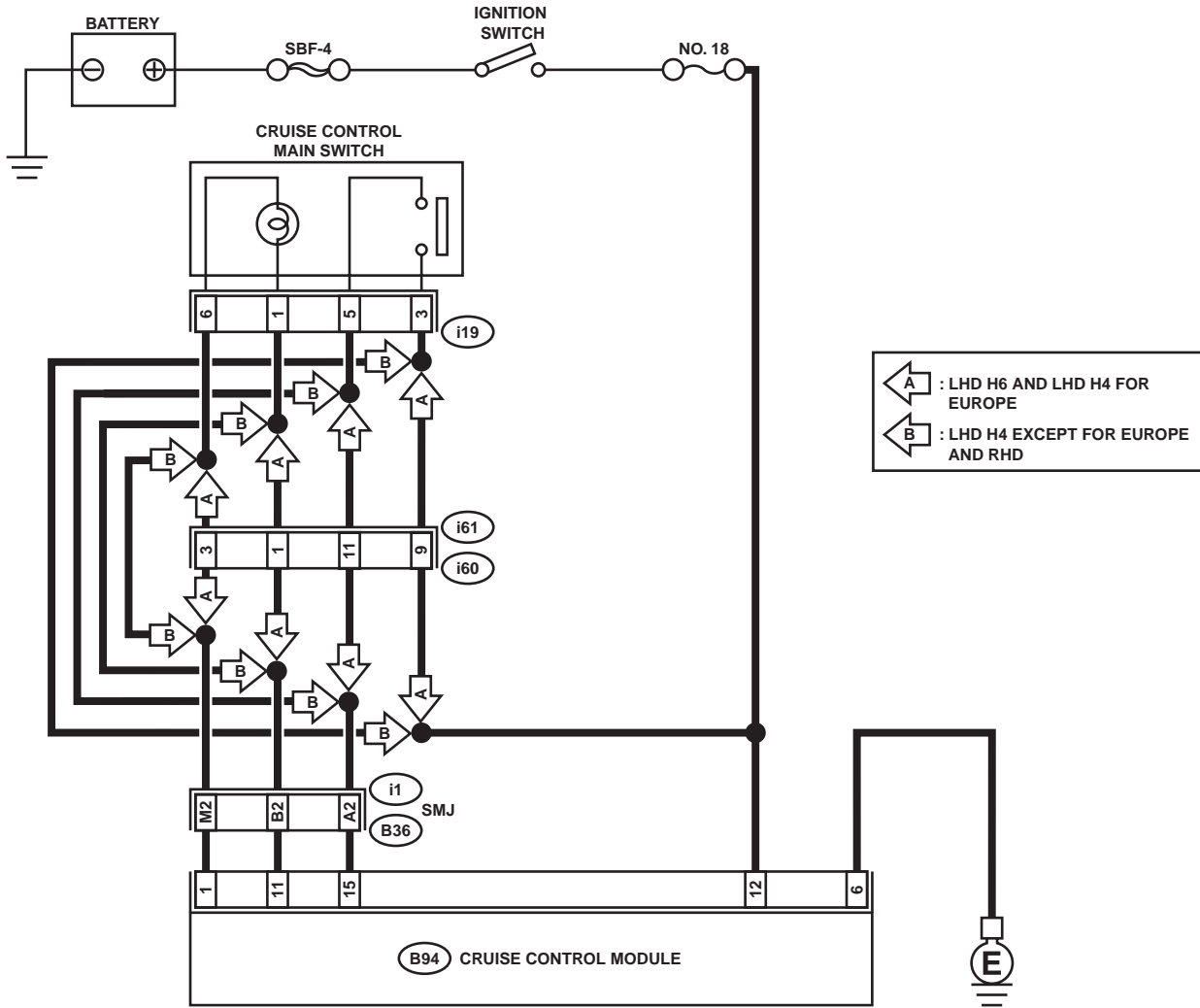
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

B: CHECK POWER SUPPLY

TROUBLE SYMPTOM:

Cruise control cannot be set, and indicator does not come on. (When main switch is pressed.)

WIRING DIAGRAM:



CC-00096

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK POWER SUPPLY. 1) Turn ignition switch OFF. 2) Disconnect cruise control module harness connector. 3) Turn ignition switch ON. 4) Measure voltage between harness connector terminal and chassis ground. Connector & terminal (B94) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 2.	<ul style="list-style-type: none"> • Check fuse No. 18 (in fuse & relay box). • Check harness for open or short between cruise control module and fuse & relay box.
2 CHECK GROUND CIRCUIT. 1) Turn ignition switch OFF. 2) Measure resistance between harness connector terminal and chassis ground. Connector & terminal (B94) No. 6 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Power supply and ground circuit are OK.	Repair harness.

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

C: CHECK CRUISE CONTROL MAIN SWITCH

TROUBLE SYMPTOM:

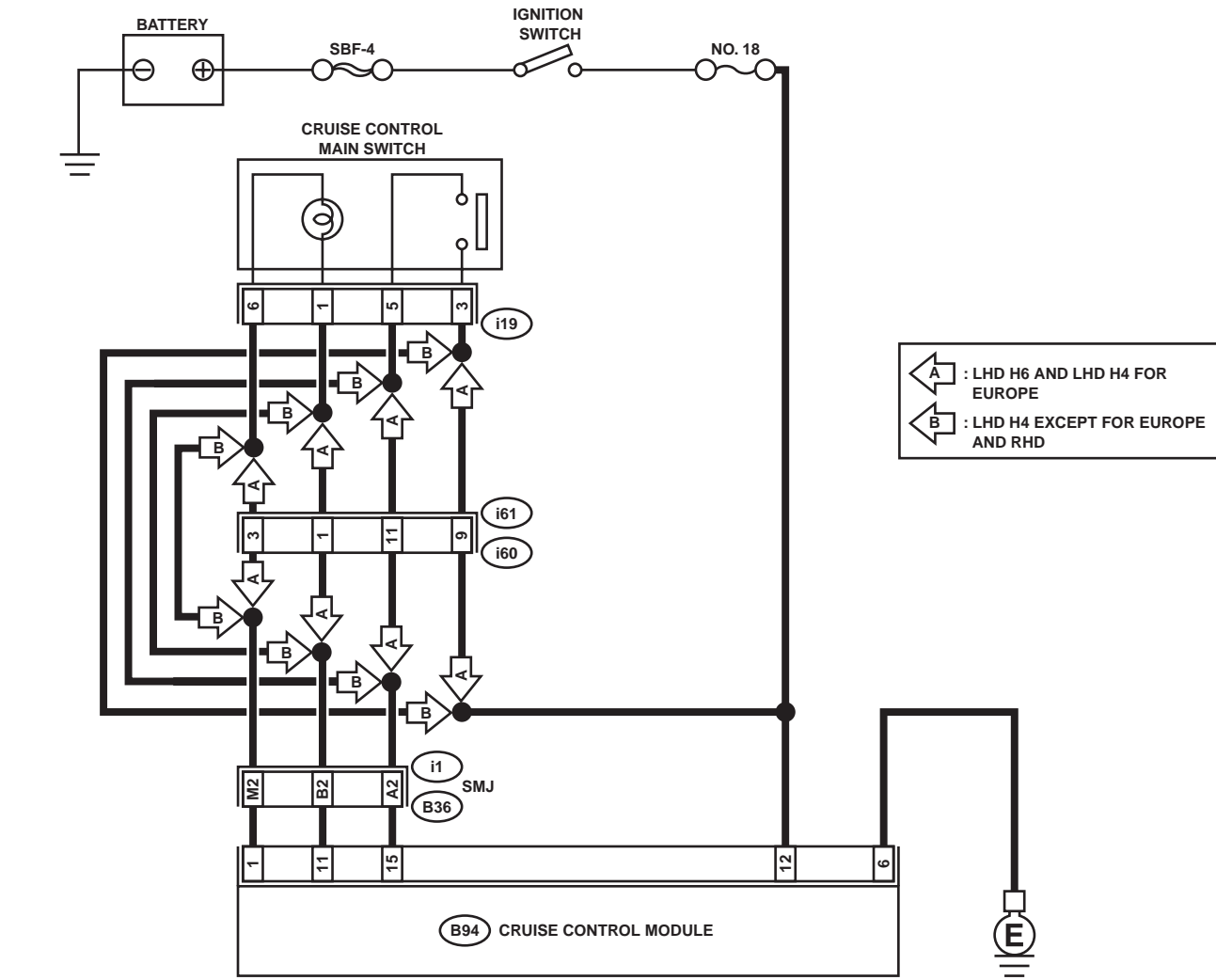
Cruise control main switch is not turned ON and cruise control cannot be set.

NOTE:

When the main relay (built-in cruise control module) operates, the main switch circuit is in normal condition. The main relay operation can be checked by hearing the operation sounds.

This operation sounds will be heard when ignition switch and cruise control main switch is turned to ON.

WIRING DIAGRAM:



i19

1	2
3	4
5	6

i60

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18						

B94

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

B36

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C2	C3	C4	C5	C6	
D1	D2	D3	D4	D5	D6
E1	E2	E3	E4	E5	E6
F1					F6
G1					G6
H1					H6
I1					I6
J1					J6
K1					K6
L1	L2	L3	L4	L5	L6
M1	M2	M3	M4	M5	M6
N2			N4	N5	N6
O1	O2	O3	O4	O5	O6
P1	P2	P3	P4	P5	P6

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.</p> <p>1) Turn ignition switch OFF. 2) Disconnect cruise control main switch harness connector. 3) Turn ignition switch ON. 4) Measure voltage between harness connector terminal and chassis ground.</p> <p>Connector & terminal <i>(i19) No. 3 (+) — Chassis ground (-):</i> Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	<ul style="list-style-type: none"> • Check fuse No. 18 (in fuse & relay box). • Check harness for open or short between cruise control main switch and fuse & relay box.
<p>2 CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.</p> <p>1) Turn ignition switch OFF. 2) Disconnect cruise control module harness connector. 3) Measure resistance between cruise control module harness connector terminal and cruise control main switch harness connector terminal.</p> <p>Connector & terminal <i>(B94) No. 15 — (i19) No. 5:</i> <i>(B94) No. 1 — (i19) No. 6:</i> <i>(B94) No. 11 — (i19) No. 1:</i> Is the measured value less than the specified value?</p>	10 Ω	Go to step 3.	Repair harness.
<p>3 CHECK CRUISE CONTROL MAIN SWITCH. Remove and check cruise control main switch. <Ref. to CC-7, Cruise Control Main Switch.> Is cruise control main switch OK?</p>	Cruise control main switch is OK.	Replace cruise control module.	Replace cruise control main switch.

DIAGNOSTICS CHART WITH SYMPTOM

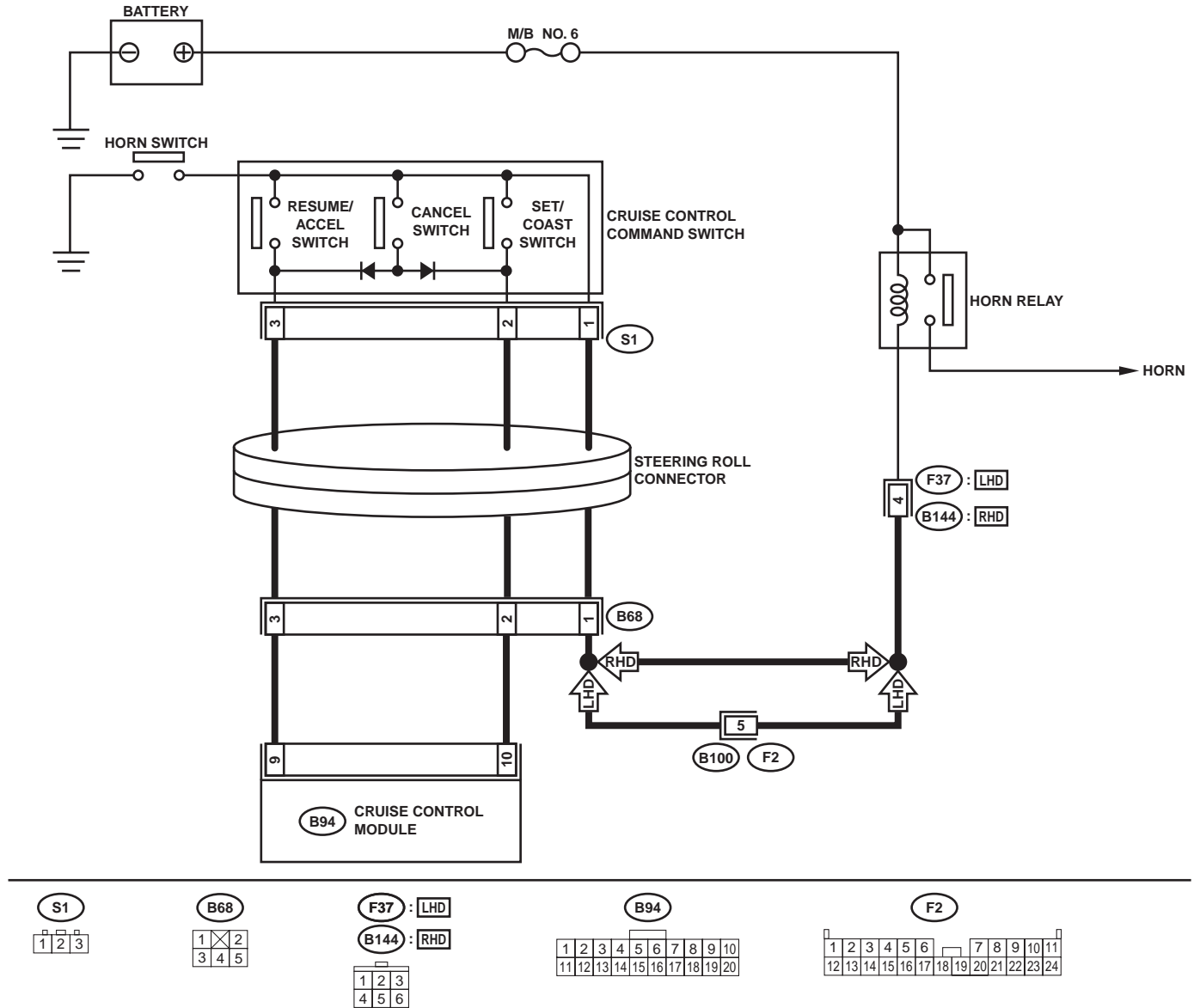
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

D: CHECK CRUISE CONTROL COMMAND SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK SET/COAST SWITCH CIRCUIT. 1) Turn ignition switch OFF. 2) Disconnect cruise control module harness connector. 3) Measure voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed.</p> <p>Connector & terminal (B94) No. 10 (+) — Chassis ground (-): Is the measured value less than the specified value, when SET/COAST switch is not pressed? Does the measured value exceed the specified value, when SET/COAST switch is pressed?</p>	When SET/COAST switch is not pressed: 0 V, and when SET/COAST switch is pressed: 10 V	Go to step 2.	Go to step 4.
<p>2 CHECK RESUME/ACCEL SWITCH CIRCUIT. Measure voltage between harness connector terminal and chassis ground when RESUME/ACCEL switch is pressed and not pressed.</p> <p>Connector & terminal (B94) No. 9 (+) — Chassis ground (-): Is the measured value less than the specified value, when RESUME/ACCEL switch is not pressed? Does the measured value exceed the specified value, when RESUME/ACCEL switch is pressed?</p>	When RESUME/ACCEL switch is not pressed: 0 V, and when RESUME/ACCEL switch is pressed: 10 V	Go to step 3.	Go to step 4.
<p>3 CHECK CANCEL SWITCH CIRCUIT. Measure voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed.</p> <p>Connector & terminal (B94) No. 9 (+) — Chassis ground (-): (B94) No. 10 (+) — Chassis ground (-): Is the measured value less than the specified value, when CANCEL switch is not pressed? Does the measured value exceed the specified value, when CANCEL switch is pressed?</p>	When CANCEL switch is not pressed: 0 V, and when CANCEL switch is pressed: 10 V	Cruise control command switch circuit is OK.	Go to step 4.
<p>4 CHECK POWER SUPPLY FOR COMMAND SWITCH. Check horn operation. Does horn sound?</p>	Horn sounds.	Go to step 5.	<ul style="list-style-type: none"> • Check fuse No. 6 (in main fuse box). • Check horn relay. <Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.> • Check harness for open or short between cruise control command switch and fuse & relay box.
<p>5 CHECK CRUISE CONTROL COMMAND SWITCH. Remove and check cruise control command switch. <Ref. to CC-8, Cruise Control Command Switch.> Is cruise control command switch OK?</p>	Cruise control command switch is OK.	Check harness between cruise control command switch and cruise control module.	Replace cruise control command switch.

DIAGNOSTICS CHART WITH SYMPTOM

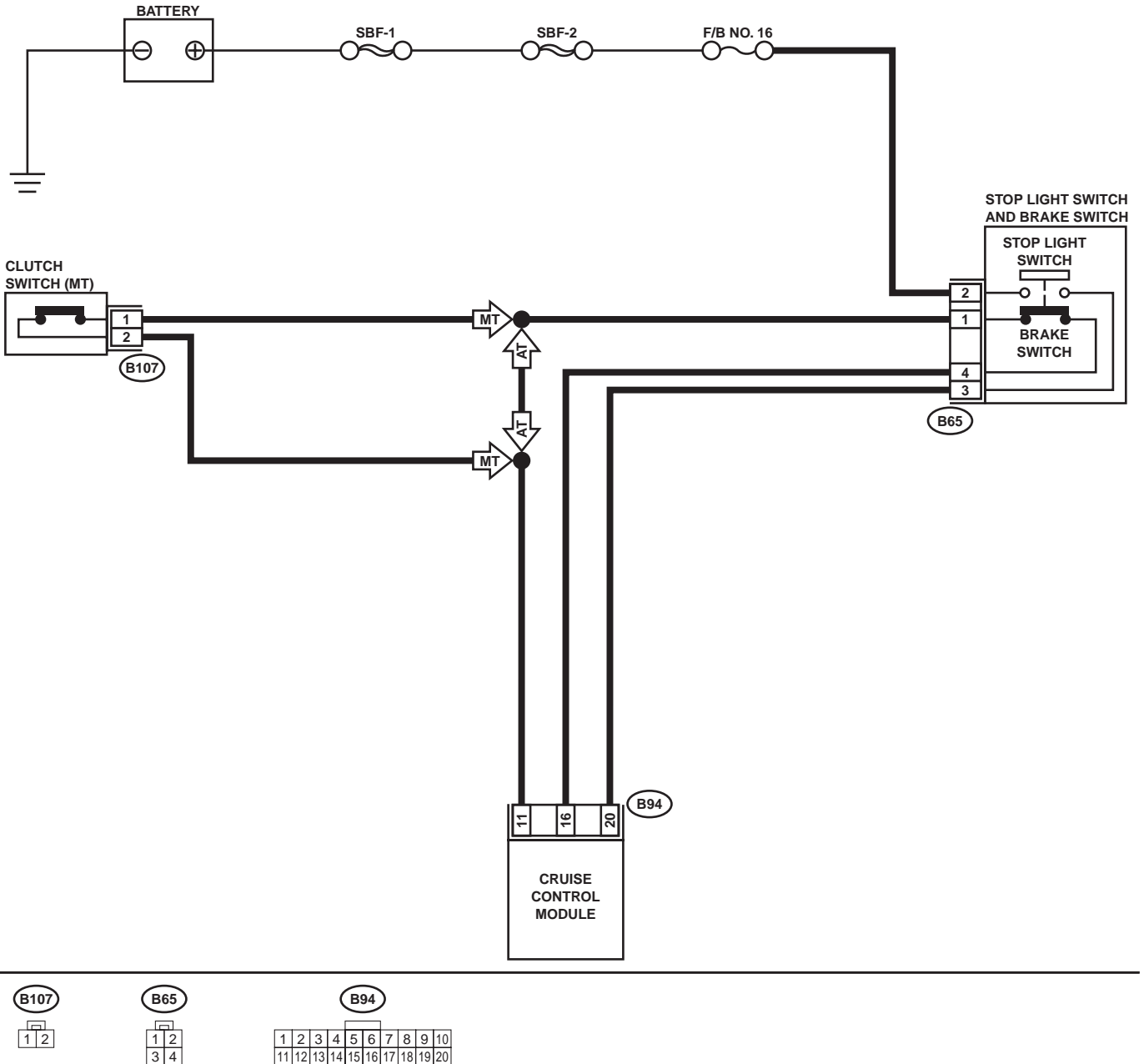
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

E: CHECK STOP LIGHT SWITCH AND BRAKE SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



CC-00080

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. 1) Turn ignition switch OFF. 2) Disconnect stop light switch and brake switch harness connector. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between harness connector terminal and chassis ground.</p> <p>Connector & terminal (B65) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	<ul style="list-style-type: none"> • Check fuse No. 16 (in fuse & relay box). • Check harness for open or short between stop light/brake switch and fuse & relay box.
<p>2 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. Measure voltage between harness connector terminal and chassis ground.</p> <p>Connector & terminal (B65) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	<ul style="list-style-type: none"> • Check harness for open or short between stop light/brake switch and cruise control module (AT). • Check clutch switch and the circuit (MT).
<p>3 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. 1) Turn cruise control main switch and ignition switch OFF. 2) Disconnect cruise control module harness connector. 3) Measure resistance between cruise control module harness connector terminal and stop light switch and brake switch harness connector terminal.</p> <p>Connector & terminal (B94) No. 20 — (B65) No. 3: (B94) No. 16 — (B65) No. 4: Is the measured value less than the specified value?</p>	10 Ω	Go to step 4.	Repair harness.
<p>4 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH. Remove and check stop light switch and brake switch. <Ref. to CC-9, Stop and Brake Switch.> Are stop light switch and brake switch OK?</p>	Stop light switch and brake switch are OK.	Stop light switch and brake switch circuit are OK.	Replace stop light switch and brake switch.

DIAGNOSTICS CHART WITH SYMPTOM

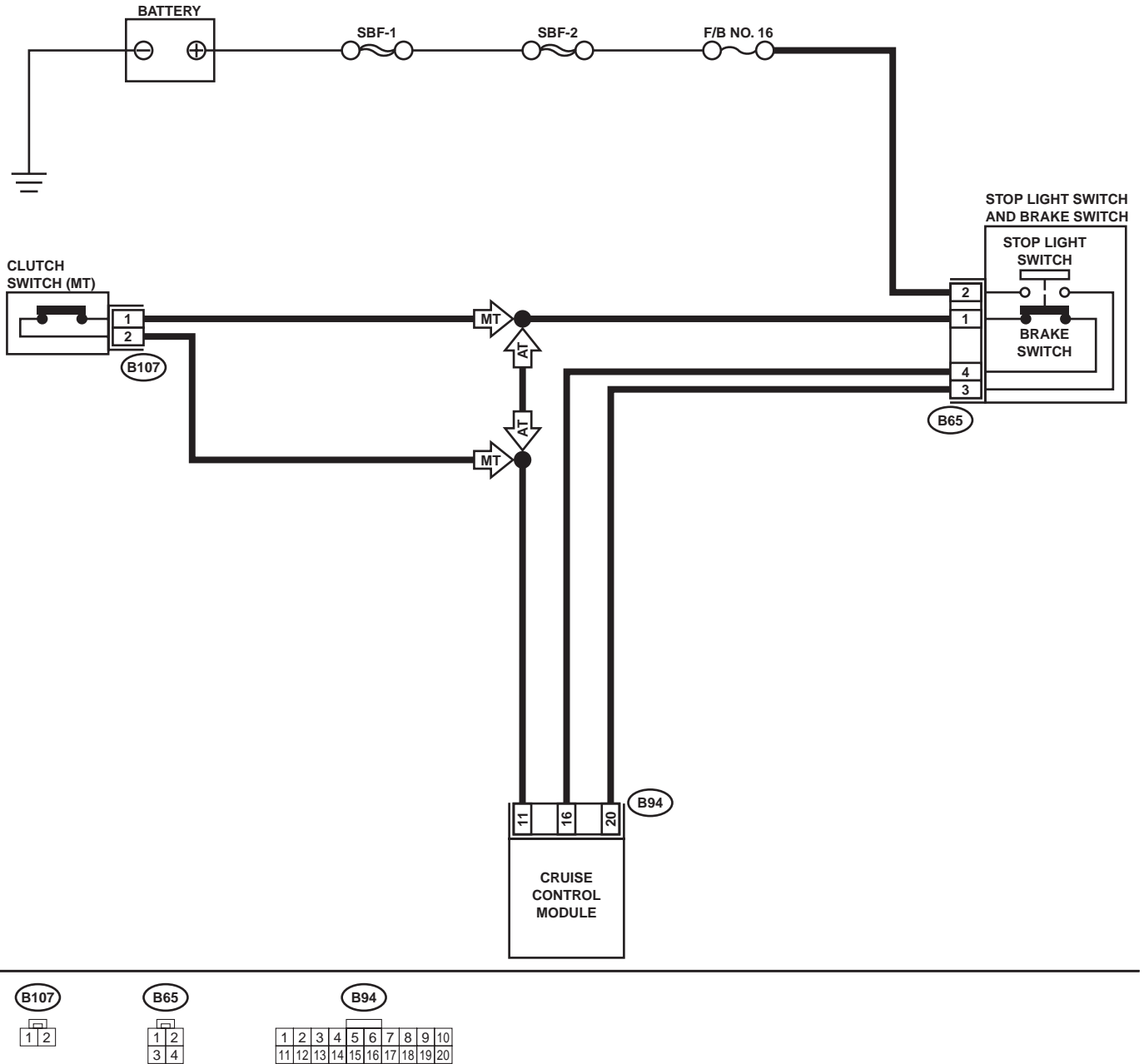
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

F: CHECK CLUTCH SWITCH (MT)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



CC-00080

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK CLUTCH SWITCH CIRCUIT. 1) Turn ignition switch OFF. 2) Disconnect clutch switch harness connector. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between harness connector terminal and chassis ground. Connector & terminal (B107) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 2.	Check harness for open or short between clutch switch and cruise control module.
2 CHECK CLUTCH SWITCH CIRCUIT. 1) Turn cruise control main switch and ignition switch OFF. 2) Disconnect stop light switch and brake switch harness connector. 3) Measure resistance between clutch switch harness connector terminal and stop light switch and brake switch harness connector terminal. Connector & terminal (B107) No. 1 — (B65) No. 1: Is the measured value less than the specified value?	10 Ω	Go to step 3.	Repair harness.
3 CHECK CLUTCH SWITCH. Remove and check clutch switch. <Ref. to CC-10, Clutch Switch.> Is clutch switch OK?	Clutch switch is OK.	Clutch switch circuit is OK.	Replace clutch switch.

DIAGNOSTICS CHART WITH SYMPTOM

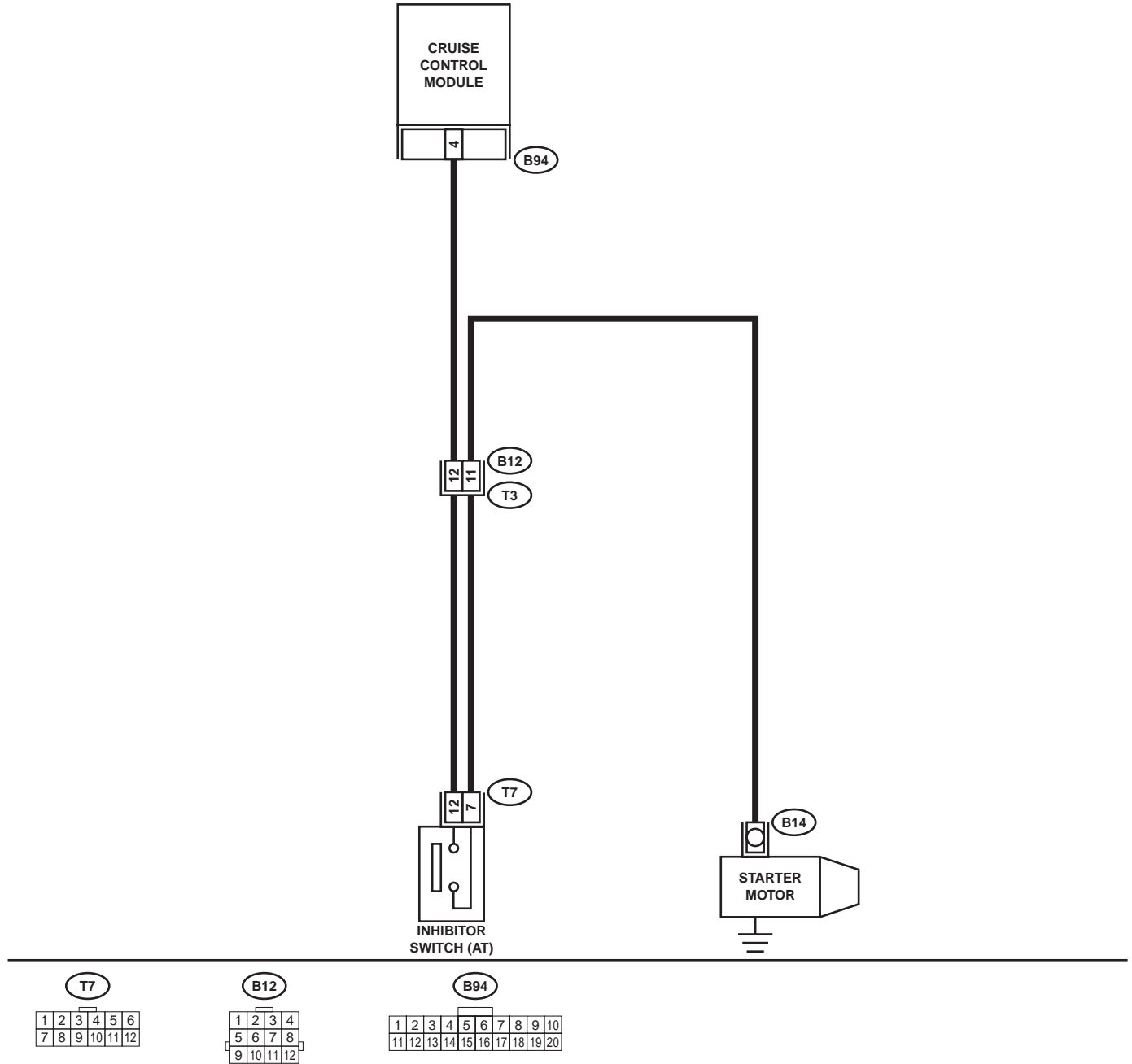
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

G: CHECK INHIBITOR SWITCH (AT)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



CC-00098

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK INHIBITOR SWITCH CIRCUIT. 1) Turn ignition switch OFF. 2) Disconnect inhibitor switch harness connector. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between harness connector terminal and chassis ground. Connector & terminal (T7) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 2.	Check harness for open or short between inhibitor switch and cruise control module.
2 CHECK INHIBITOR SWITCH CIRCUIT. 1) Turn cruise control main switch and ignition switch OFF. 2) Disconnect starter motor harness connector. 3) Measure resistance between inhibitor switch harness connector terminal and chassis ground. Connector & terminal (T7) No. 7 — (B14) No. 1: Is the measured value less than the specified value?	10 Ω	Go to step 3.	Repair harness.
3 CHECK INHIBITOR SWITCH. Remove and check inhibitor switch. <Ref. to CC-11, Inhibitor Switch.> Is inhibitor switch OK?	Inhibitor switch is OK.	Inhibitor switch circuit is OK.	Replace inhibitor switch.

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

7. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnosis	Reference
21	Inner relay is seized.	Cruise control module inner relay is seized when main switch is OFF.	<Ref. to CC-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
22	Vehicle speed sensor	Vehicle speed signal changes more than 10 km/h (6 MPH) within 350 ms.	<Ref. to CC-28, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
24	Cruise control module is abnormal.	Two vehicle speed values stored in cruise control module memory are not the same.	<Ref. to CC-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
25	Cruise control module is abnormal.	Two output values stored in cruise control module memory are not the same.	<Ref. to CC-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
28	Wiring harness opened.	Open wiring harness circuit is detected via control module relay when main switch is ON.	<Ref. to CC-31, DTC 28 WIRING HARNESS OPENED., Diagnostics Chart with Trouble Code.>
35	Motor drive system is abnormal.	<ul style="list-style-type: none"> • Motor output circuit is open or shorted. • Motor drive circuit is open or shorted. 	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
36	Trouble of motor turning speed	Motor turning speed is low.	<Ref. to CC-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
37	Motor clutch drive system is abnormal.	<ul style="list-style-type: none"> • Motor clutch output circuit is open or shorted. • Motor clutch drive circuit is open or shorted. 	<Ref. to CC-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
38	Motor drive shaft does not engage properly.	Motor drive gear engagement is not properly adjusted.	<Ref. to CC-36, DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY., Diagnostics Chart with Trouble Code.>
39	Motor is overloaded.	Current flows through motor more frequently than under normal conditions.	<Ref. to CC-36, DTC 39 MOTOR IS OVERLOADED., Diagnostics Chart with Trouble Code.>
2A	Cruise control module is abnormal.	Cruise control module self-diagnosis function senses abnormality.	<Ref. to CC-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>

8. Diagnostics Chart with Trouble Code

A: DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM

DIAGNOSIS:

- Poor welding of built-in relay of cruise control module.
- Failure of built-in CPU RAM of cruise control module.

TROUBLE SYMPTOM:

- Cruise control is canceled and memorized cruise speed is also canceled.
- Once cruise control is canceled, cruise control cannot be set until the ignition switch and cruise control main switch turns OFF, and then turns ON again.

NOTE:

Check input/output signal and vehicle speed signal with select monitor. When signals are in good condition, failure is in cruise control module. (Check power supply and ground conditions of cruise control module.)

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

B: DTC 22 VEHICLE SPEED SENSOR

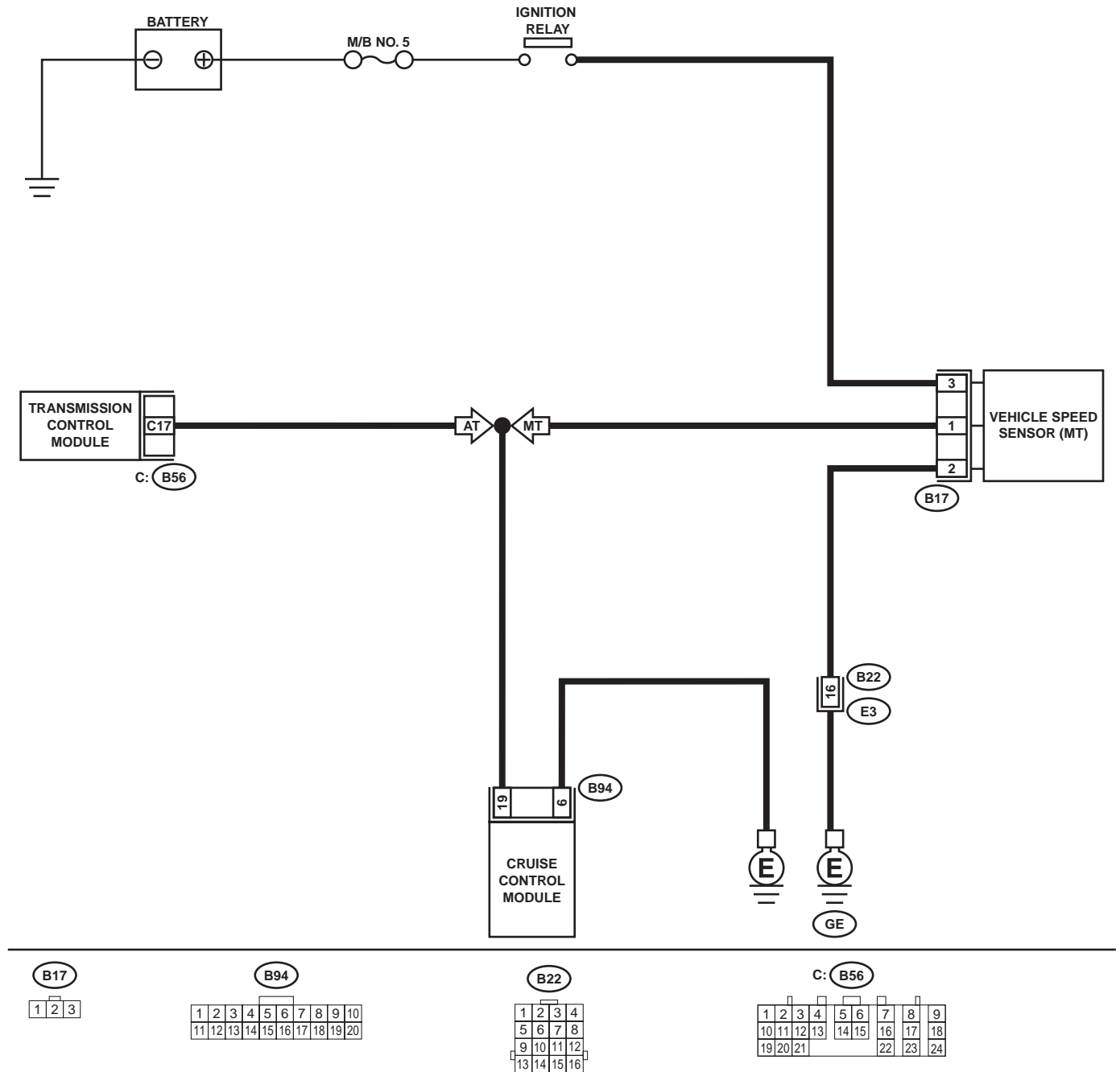
DIAGNOSIS:

Disconnection or short circuit of vehicle speed sensor system.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK TRANSMISSION TYPE. Is the transmission type MT?	Transmission type is MT.	Go to step 2.	Go to step 6.
2 CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect harness connector from vehicle speed sensor. 3) Turn ignition switch to ON. 4) Measure voltage between vehicle speed sensor harness connector terminal and chassis ground. Connector & terminal (B17) No. 3 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 3.	Check harness for open or short between ignition relay and vehicle speed sensor.
3 CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND VEHICLE SPEED SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect harness connector from cruise control module. 3) Measure resistance between vehicle speed sensor harness connector terminal and cruise control module harness connector terminal. Connector & terminal (B17) No. 1 — (B94) No. 19: Is the measured value less than the specified value?	10 Ω	Go to step 4.	Repair harness.
4 CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND. Measure resistance between vehicle speed sensor harness connector terminal and engine ground. Connector & terminal (B17) No. 2 (+) — Engine ground (-): Is the measured value less than the specified value?	10 Ω	Go to step 5.	Repair harness.
5 CHECK VEHICLE SPEED SENSOR. 1) Connect harness connector to vehicle speed sensor. 2) Lift-up the vehicle and support with safety stands. 3) Drive the vehicle at speed greater than 20 km/h (12 MPH). Warning: Be careful not to be caught up by the running wheels. 4) Measure voltage between cruise control module harness connector terminal and chassis ground. Connector & terminal (B94) No. 19 (+) — Chassis ground (-): Is the measured value same as the specified value?	0 ↔ 5 V	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Replace vehicle speed sensor.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>6 CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND TRANSMISSION CONTROL MODULE.</p> <p>1) Turn ignition switch to OFF. 2) Disconnect harness connector from transmission control module and cruise control module. 3) Measure resistance between cruise control module harness connector terminal and transmission control module harness connector terminal.</p> <p>Connector & terminal (B94) No. 19 — (B56) No. 17: Is the measured value less than the specified value?</p>	10 Ω?	Go to step 7.	Repair harness.
<p>7 CHECK TRANSMISSION CONTROL MODULE.</p> <p>1) Connect harness connector to transmission control module. 2) Lift-up the vehicle and support with safety stands. 3) Drive the vehicle faster than 10 km/h (6 MPH).</p> <p>Warning: Be careful not to be caught by the running wheels.</p> <p>4) Measure voltage between transmission control module harness connector terminal and chassis ground.</p> <p>Connector & terminal (B56) No. 17 (+) — Chassis ground (-): Is the measured value same as the specified value?</p>	0 ↔ 5 V	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Replace transmission control module. <Ref. to AT-76, Transmission Control Module (TCM).>

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

C: DTC 28 WIRING HARNESS OPENED.

Step	Value	Yes	No
1 CHECK BATTERY. Measure battery specific gravity of electrolyte. Does the measured value exceed the specified value?	1.250	Go to step 2.	Charge or replace battery. Go to step 2.
2 CHECK FUSES, CONNECTORS AND HAR- NESSES. Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding. Is there anything unusual about the appearance of main fuse, fuse, harness, connector and grounding?	Fuse, harness, connector and grounding are OK.	End of inspection.	Repair or replace faulty parts.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

D: DTC 35 AND 36 ACTUATOR MOTOR

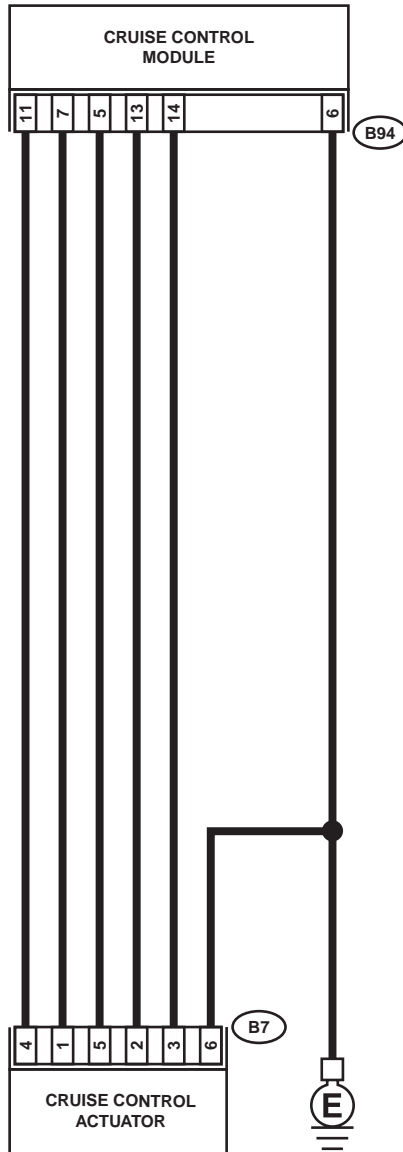
DIAGNOSIS:

Open or poor contact of cruise control actuator motor.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



B7

1	2	3
4	5	6

B94

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY. 1) Turn ignition switch OFF. 2) Disconnect harness connector from cruise control actuator. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between cruise control actuator harness connector terminal and chassis ground.</p> <p>Terminals (B7) No. 4 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Check harness for open or short between cruise control module and cruise control actuator.
<p>2 CHECK GROUND CIRCUIT OF ACTUATOR. 1) Turn ignition switch and cruise control main switch OFF. 2) Measure resistance between cruise control actuator harness connector terminal and chassis ground.</p> <p>Terminals (B7) No. 6 — Chassis ground: Is the measured value less than the specified value?</p>	10 Ω	Go to step 3.	Repair harness.
<p>3 MEASURE RESISTANCE OF ACTUATOR. Measure resistance of cruise control actuator motor.</p> <p>Terminals No. 4 — No. 1: No. 4 — No. 2: No. 4 — No. 5: Is the measured value same as the specified value?</p>	Approximately 5 Ω	Go to step 4.	Replace cruise control actuator. <Ref. to CC-4, Actuator.>
<p>4 CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE. 1) Disconnect harness connector from cruise control module. 2) Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal.</p> <p>Connector & terminal (B7) No. 1 — (B94) No. 7: Is the measured value less than the specified value?</p>	10 Ω	Go to step 5.	Repair harness.
<p>5 CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE. Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal.</p> <p>Connector & terminal (B7) No. 5 — (B94) No. 5: Is the measured value less than the specified value?</p>	10 Ω	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Repair harness.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

E: DTC 37 ACTUATOR MOTOR CLUTCH

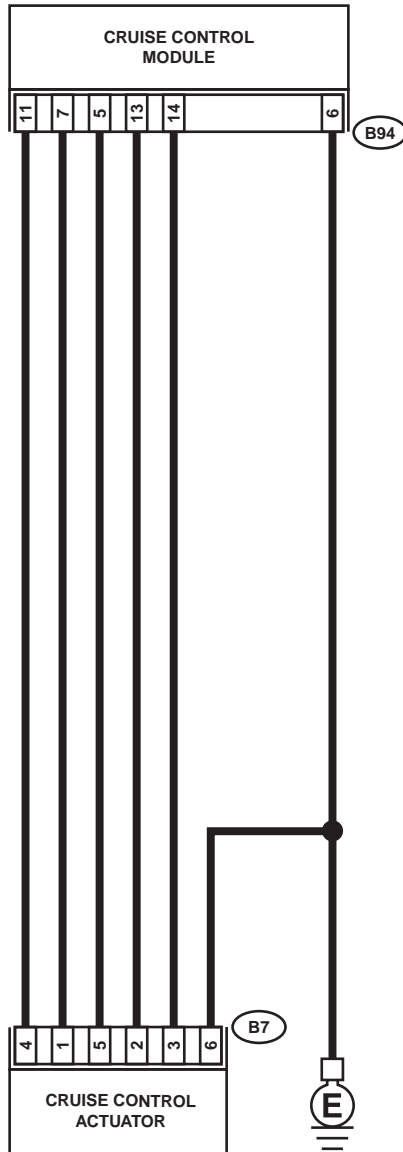
DIAGNOSIS:

Open or poor contact of cruise control actuator motor clutch.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



B7

1	2	3
4	5	6

B94

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY. 1) Turn ignition switch OFF. 2) Disconnect harness connector from cruise control actuator. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between cruise control actuator harness connector terminal and chassis ground.</p> <p>Terminals (B7) No. 4 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Check harness for open or short between cruise control module and cruise control actuator.
<p>2 CHECK GROUND CIRCUIT OF ACTUATOR. 1) Turn ignition switch and cruise control main switch OFF. 2) Measure resistance between cruise control actuator harness connector terminal and chassis ground.</p> <p>Terminals (B7) No. 6 — Chassis ground: Is the measured value less than the specified value?</p>	10 Ω	Go to step 3.	Repair harness.
<p>3 MEASURE RESISTANCE OF ACTUATOR CLUTCH. Measure resistance of cruise control actuator clutch.</p> <p>Terminals No. 3 — No. 6: Is the measured value same as the specified value?</p>	Approximately 39 Ω	Go to step 4.	Replace cruise control actuator. <Ref. to CC-4, Actuator.>
<p>4 CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE. 1) Disconnect harness connector from cruise control module. 2) Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal.</p> <p>Connector & terminal (B7) No. 2 — (B94) No. 13: Is the measured value less than the specified value?</p>	10 Ω	Go to step 5.	Repair harness.
<p>5 CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE. Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal.</p> <p>Connector & terminal (B7) No. 3 — (B94) No. 14: Is the measured value less than the specified value?</p>	10 Ω	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Repair harness.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

F: DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY.

Step	Value	Yes	No
1 CHECK ACTUATOR MOTOR. 1) Turn ignition switch to OFF. 2) Disconnect harness connector from cruise control actuator. 3) Remove cruise control actuator from mounting bracket. 4) Pull cable by hand to check for looseness or status of inner gear engagement. Are foreign particles caught in inner gear or does inner gear engage and disengage improperly?	Cable and inner gear are OK.	Replace cruise control actuator. <Ref. to CC-4, Actuator.>	Check the cruise control cable adjustment.<Ref. to CC-6, CABLE FREE PLAY, INSPECTION, General Description.>

G: DTC 39 MOTOR IS OVERLOADED.

Step	Value	Yes	No
1 CHECK THE OPERATING CURRENT TO ACTUATOR MOTOR. 1) Connect Subaru Select Monitor to data link connector. 2) Try to drive the vehicle while operating the cruise control system. 3) Measure the operation current to the cruise control actuator motor. Is the measured value less than the specified value?	10 A	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Check the power supply circuit. <Ref. to CC-14, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>

IMMOBILIZER (DIAGNOSTICS)



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BASIC DIAGNOSTIC PROCEDURE

IMMOBILIZER (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

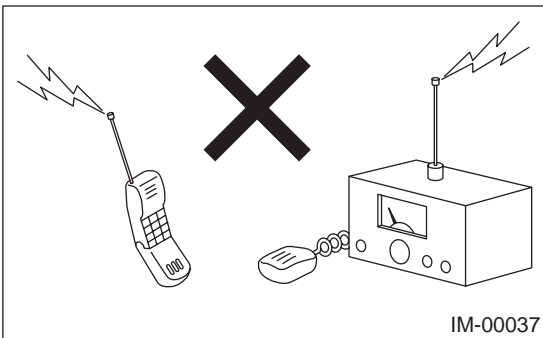
Step	Value	Yes	No
1 CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT. 1) Turn ignition switch to OFF or ACC position. 2) Wait at least 60 seconds. Does immobilizer indicator light blink?	Immobilizer indicator light blinks.	Go to step 2.	Check immobilizer indicator light circuit. <Ref. to IM-10, CHECK IMMOBILIZER INDICATOR CIRCUIT, INSPECTION, Diagnostic Procedure for Immobilizer Indicator Light.>
2 CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT. Remove key from ignition switch. Does immobilizer indicator light begin to blink 1 second after the key is removed?	Immobilizer indicator light begins to blink.	Go to step 3.	Check key switch circuit. <Ref. to IM-14, CHECK KEY SWITCH CIRCUIT, INSPECTION, Diagnostic Procedure for Immobilizer Indicator Light.>
3 CHECK ENGINE START. Turn ignition switch to START position. Is the engine hard to start?	The engine starts.	Go to step 4.	Go to step 5.
4 CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT. Turn ignition switch ON. Does immobilizer indicator light illuminate?	Immobilizer indicator light illuminates.	Check immobilizer indicator light circuit. <Ref. to IM-10, CHECK IMMOBILIZER INDICATOR CIRCUIT, INSPECTION, Diagnostic Procedure for Immobilizer Indicator Light.>	Immobilizer system is normal.
5 CHECK INDICATION OF DTC ON DISPLAY. 1) Turn ignition switch OFF. 2) Connect the Subaru Select Monitor to data link connector. <Ref. to IM-7, HOW TO USE SUBARU SELECT MONITOR, OPERATION, Subaru Select Monitor.> 3) Turn ignition switch and Subaru Select Monitor switch ON. 4) Read DTC on the display. Is DTC indicated on display?	DTC is indicated on display.	Check DTC. <Ref. to IM-16, List of Diagnostic Trouble Code (DTC).> Go to step 6.	Check engine starting failure.
6 PERFORM THE DIAGNOSIS. 1) Inspect using "Diagnostic Procedure with Trouble Code (DTC)". <Ref. to IM-17, Diagnostic Procedure with Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform clear memory mode. 4) Read DTC again. Is DTC indicated on display?	DTC is indicated on display.	Inspect using "Diagnostic Procedure with Trouble Code". <Ref. to IM-17, Diagnostic Procedure with Trouble Code (DTC).>	Finish the diagnostics.

2. General Description

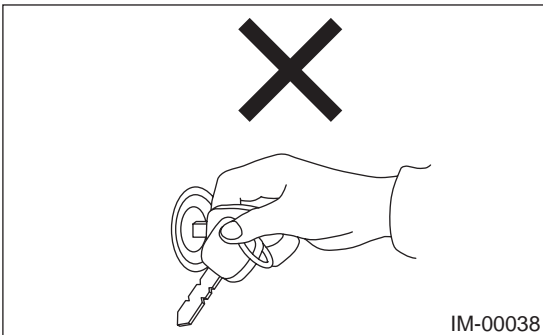
A: CAUTION

CAUTION:

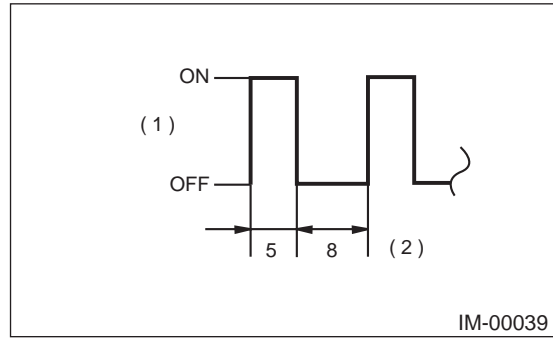
- Airbag system wiring harness is routed near the immobilizer control module. All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage airbag system wiring harness when servicing the immobilizer control module.
- While diagnostic items are being checked, do not operate radios, portable telephones, etc. which emit electromagnetic waves near or inside the vehicle.



- When ignition switch is being turned ON or OFF while diagnostic items are being checked, do not allow keys with different ID codes close to the ignition switch. If ignition key is in a key holder, remove it from holder before carrying out diagnoses.



- When repeatedly turning ignition ON or OFF while diagnostic items are being checked, it should be switched in cycles of "ON" for at least 5 seconds → "OFF" for at least 8 seconds.



- (1) Ignition switch position
- (2) SEC.

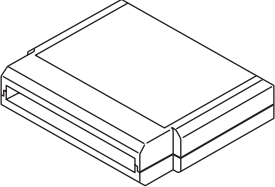

- If engine fails to start with a registered ignition key, detach ignition key from ignition switch and wait for approximately 1 second until immobilizer indicator light begins to flash. Start engine again.
- Before checking diagnostic items, obtain all keys for vehicle to be checked possessed by owner.

GENERAL DESCRIPTION

IMMOBILIZER (DIAGNOSTICS)

B: PREPARATION TOOL

1. SPECIAL TOOLS

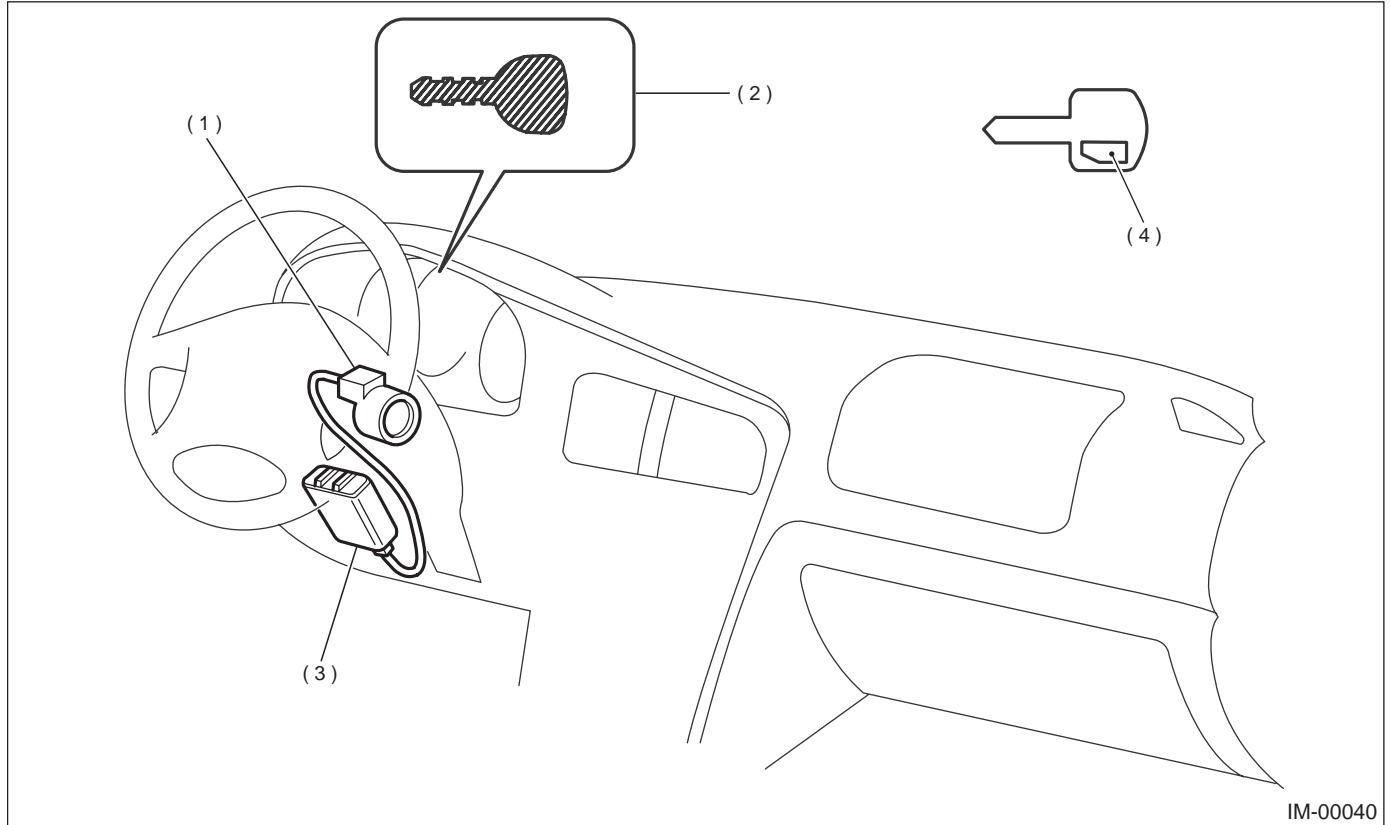
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

3. Electrical Components Location

A: LOCATION



IM-00040

- (1) Antenna
- (2) Immobilizer indicator light (LED bulb)
- (3) Immobilizer control module (IMM ECM)
- (4) Transponder

NOTE:
IMM ECM location for RHD model is symmetrically opposite.

IMMOBILIZER CONTROL MODULE I/O SIGNAL

IMMOBILIZER (DIAGNOSTICS)

4. Immobilizer Control Module I/O Signal

A: SCHEMATIC

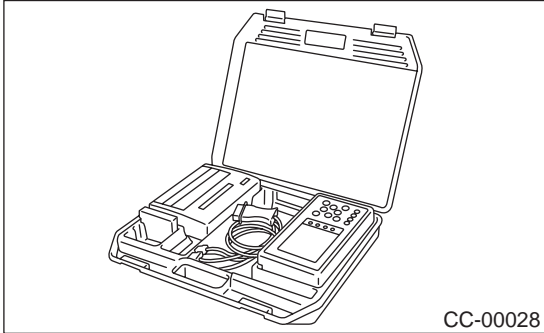
<Ref. to WI-236, SCHEMATIC, Immobilizer System.>

5. Subaru Select Monitor

A: OPERATION

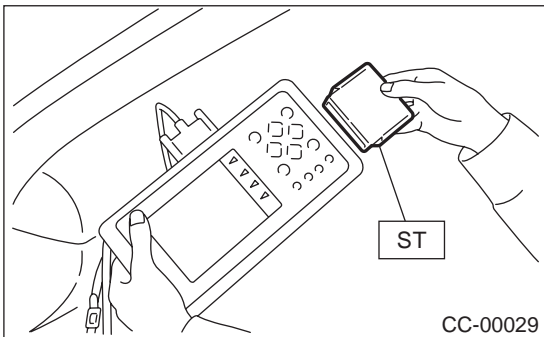
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit.



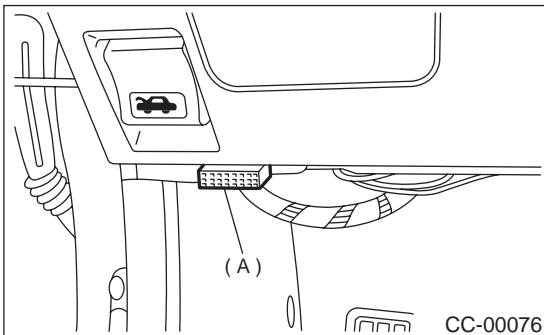
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor.



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector (A) located in the lower portion of the instrument panel (on driver's side).

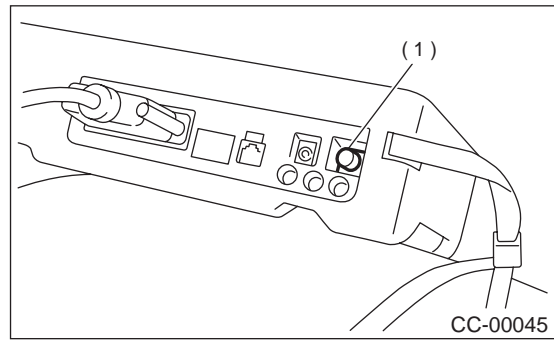


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF), and then Subaru Select Monitor switch to ON.



(1) Power switch

6) Using the Subaru Select Monitor, call up any DTCs and various data, and then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE.

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to IM-8, Read Diagnostic Trouble Code (DTC).>

3. INTERFACE CHECK

NOTE:

The communication line between ECM and IMM ECM can be checked in «System Operation Check Mode». This is referred to as «interface check».

1) Connect the Subaru Select Monitor.

2) Set the «System Operation Check Mode» menu display screen, and then select «Immobilizer System».

3) Start the interface check.

4) Does «Communication Line not Shorted» appear on screen?

If «YES». Go to step 5).

If «NO». Go to step 6).

5) After diagnostic results, it is determined that the short circuit is not a diagnostic item. This completes interface check.

6) If a problem is detected, repair. <Ref. to IM-18, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Trouble Code (DTC).>

READ DIAGNOSTIC TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

- 1) On the «Main Menu» display screen, select the {Each System Check}, and then press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}, and then press the [YES] key.
- 3) Press the [YES] key after displayed information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display}, and then press the [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to IM-16, List of Diagnostic Trouble Code (DTC).>

7. Clear Memory Mode

A: OPERATION

- 1) On the «Main Menu» display screen, select the {2. Each System Check}, and then press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}, and then press the [YES] key.
- 3) Press the [YES] key after displayed information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory}, and then press the [YES] key.
- 5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- After the memory has been cleared, the ISC must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

DIAGNOSTIC PROCEDURE FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

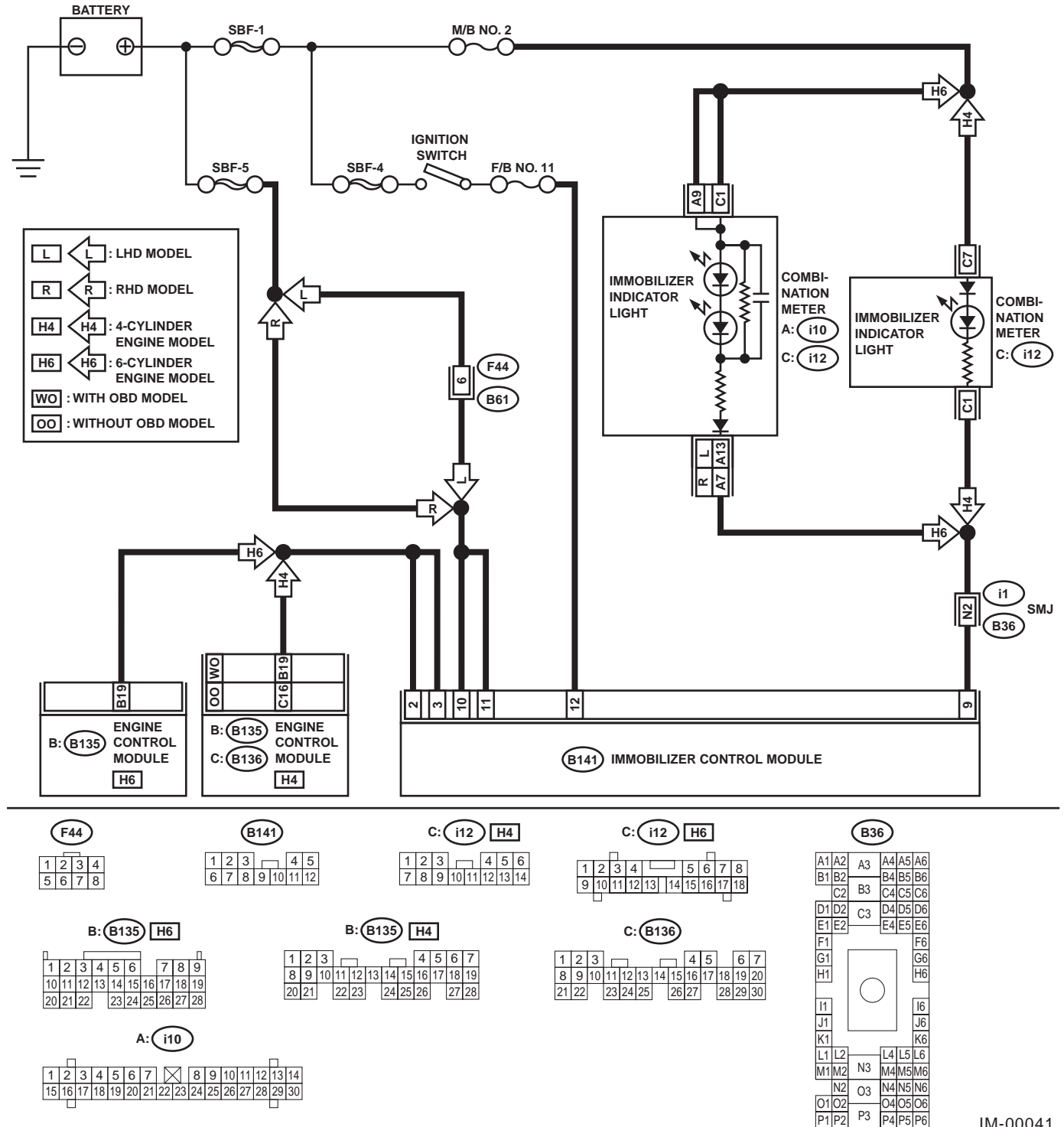
8. Diagnostic Procedure for Immobilizer Indicator Light

A: INSPECTION

1. CHECK IMMOBILIZER INDICATOR CIRCUIT

WIRING DIAGRAM:

- Non-TURBO model

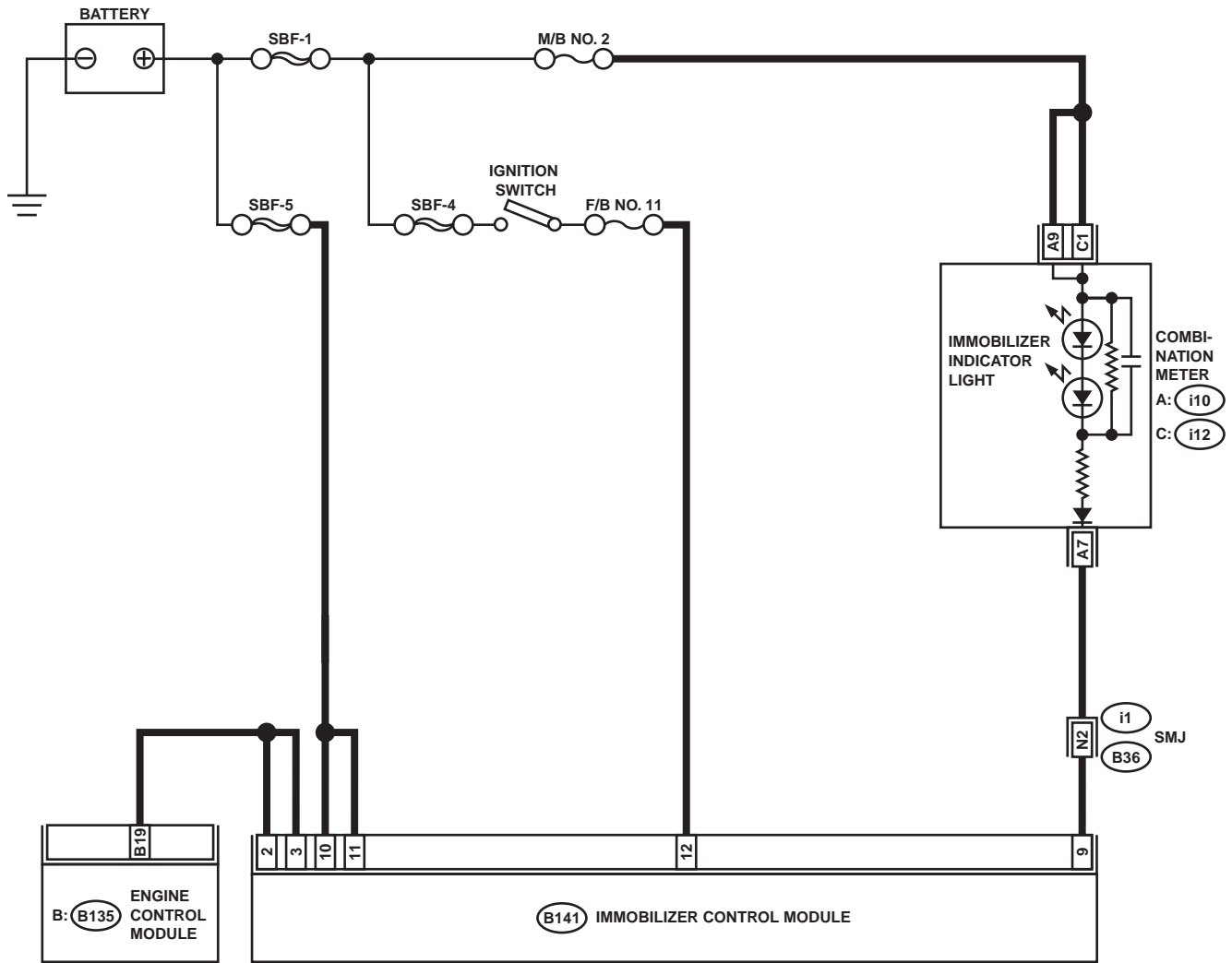


IM-00041

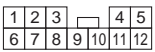
DIAGNOSTIC PROCEDURE FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

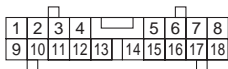
- TURBO model



B141



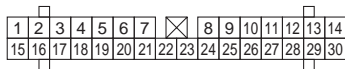
C: i12



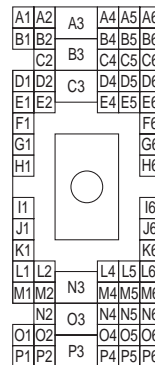
B: B135



A: i10



B36



IM-00046

DIAGNOSTIC PROCEDURE FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK IMMOBILIZER INDICATOR LIGHT COMES ON. 1) Turn ignition switch OFF. 2) Disconnect harness connector from IMM ECM. 3) Connect a resistor (750 Ω) between IMM ECM harness connector terminal No. 9 and chassis ground. Does indicator light comes on?	Indicator light comes on.	Go to step 2.	Go to step 5.
2 CHECK IMM ECM GROUND CIRCUIT. Measure resistance between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 2, No. 3 — Chassis ground: Is the measured value less than the specified value?	10 Ω	Go to step 3.	Repair open circuit of IMM ECM ground circuit.
3 CHECK IMM ECM IGNITION CIRCUIT. 1) Turn ignition switch ON. (Engine OFF.) 2) Measure voltage between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 12 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 4.	Check harness for open or short between IMM ECM and ignition switch.
4 CHECK IMM ECM POWER SUPPLY CIRCUIT. 1) Turn ignition switch OFF. 2) Measure voltage between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 10, No. 11 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Replace IMM ECM <Ref. to SL-36, Immobilizer Control Module.>and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Check harness for open or short between IMM ECM and fuse.
5 CHECK COMBINATION METER CIRCUIT. 1) Remove combination meter. <Ref. to IDI-14, REMOVAL, Combination Meter Assembly.> 2) Measure voltage between combination meter harness connector terminal and chassis ground. Connector & terminal H4 non-TURBO model (i12) No. 7 (+) — Chassis ground (-): H6 and H4 TURBO model (i10) No. 9 (+) — Chassis ground (-): (i12) No. 1 (+) — Chassis ground (-): Does the measured value exceed the specified value?	10 V	Go to step 6.	Check harness for open or short between combination meter and fuse.

DIAGNOSTIC PROCEDURE FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

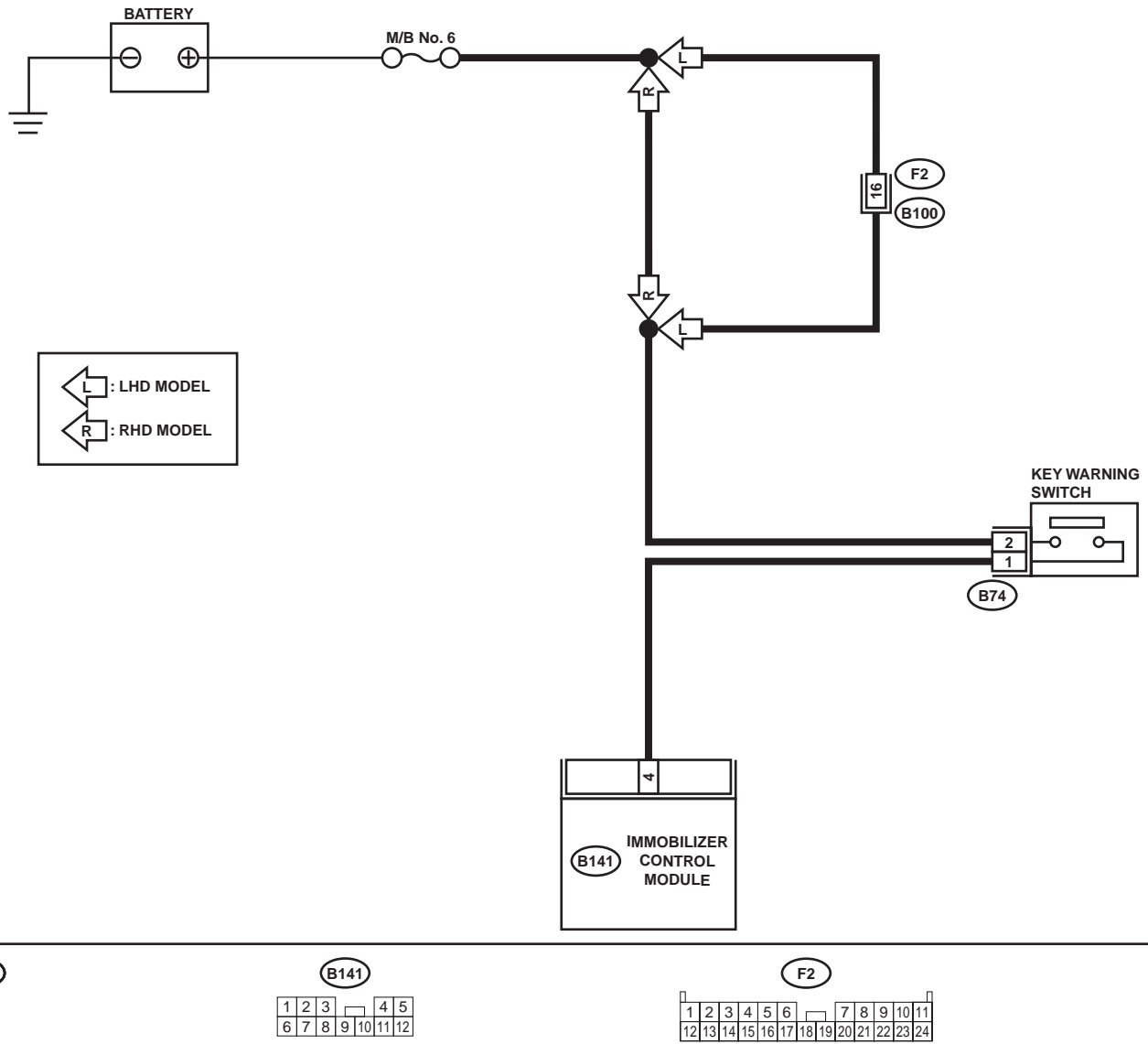
Step	Value	Yes	No
<p>6 CHECK COMBINATION METER CIRCUIT. Measure resistance between IMM ECM harness connector terminal and combination meter harness connector terminal.</p> <p>Connector & terminal H4 non-TURBO model (B141) No. 9 — (i12) No. 1: LHD H6 model (B141) No. 9 — (i10) No. 13: RHD H6 and H4 TURBO models (B141) No. 9 — (i10) No. 7:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Faulty LED bulb. Replace combination meter printed circuit. <Ref. to IDI-15, DISASSEMBLY, Combination Meter Assembly.>	Repair harness or connector.

DIAGNOSTIC PROCEDURE FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

2. CHECK KEY SWITCH CIRCUIT

WIRING DIAGRAM:



IM-00051

DIAGNOSTIC PROCEDURE FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY CIRCUIT. 1) Disconnect harness connector from key warning switch. 2) Measure voltage between key warning switch harness connector terminal and chassis ground. Connector & terminal (B74) No. 2 (+) — Chassis ground (-): Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Check harness for open or short between key warning switch and fuse.
<p>2 CHECK KEY SWITCH. 1) Insert the ignition key to the ignition switch. (OFF or ACC position) 2) Measure the resistance between key warning switch connector terminals. Terminal No. 1 — No. 2: Is the measured value less than the specified value?</p>	1 Ω	Go to step 3.	Replace key warning switch.
<p>3 CHECK KEY SWITCH. 1) Remove the ignition key from the ignition switch. 2) Measure the resistance between key warning switch connector terminals. Terminal No. 1 — No. 2: Does the measured value exceed the specified value?</p>	1 MΩ	Go to step 4.	Replace key warning switch.
<p>4 CHECK HARNESS BETWEEN KEY SWITCH AND IMM ECM. 1) Disconnect harness connector from key warning switch. 2) Disconnect harness connector from IMM ECM. 3) Measure resistance between key warning switch harness connector terminal and IMM ECM harness connector terminal. Connector & terminal (B74) No. 1 — (B141) No. 4: Is the measured value less than the specified value?</p>	10 Ω	Replace IMM ECM <Ref. to SL-36, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Repair harness between key warning switch and IMM ECM.

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

9. List of Diagnostic Trouble Code (DTC)

A: LIST

Item appearing on select monitor screen		Item	Contents of diagnosis	Index No.
DTC				
Without OBD	With OBD			
53	P1571	Reference Code Incompatibility	Reference code incompatibility between IMM ECM and ECM	<Ref. to IM-17, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Trouble Code (DTC).>
	P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between IMM ECM and ECM	<Ref. to IM-18, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Trouble Code (DTC).>
	P1574	Key Communication Failure	Failure of IMM ECM to verify key (transponder) ID code	<Ref. to IM-23, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Trouble Code (DTC).>
	P0153	Use of Unregistered Key	Incorrect immobilizer key (Use of unregistered key in IMM ECM)	<Ref. to IM-24, DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY), Diagnostic Procedure with Trouble Code (DTC).>
	P1576	EGI Control Module EEPROM	ECM malfunctioning	<Ref. to IM-25, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Trouble Code (DTC).>
	P1577	IMM Control Module EEPROM	IMM ECM malfunctioning	<Ref. to IM-25, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Trouble Code (DTC).>
	P1570	ANTENNA	Faulty antenna	<Ref. to IM-26, DTC P1570 ANTENNA, Diagnostic Procedure with Trouble Code (DTC).>

NOTE:

When a DTC except for the above immobilizer trouble code has been output, carry out diagnosis for the engine trouble code. <Ref. to EN(H4SO)-83, List of Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4SOw/oOBD)-57, List of Diagnostic Trouble Code (DTC).> or <Ref. to EN(H6DO)-89, List of Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOSTC)-62, List of Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

10. Diagnostic Procedure with Trouble Code (DTC)

A: DTC P1571 REFERENCE CODE INCOMPATIBILITY

DIAGNOSIS:

- Reference code incompatibility between IMM ECM and ECM

Step	Value	Yes	No
1 PERFORM TEACHING OPERATION ON IGNITION KEY. Perform teaching operation on all keys of the vehicle. Refer to teaching operation manual. Is teaching operation for all keys completed?	Teaching operation for all keys is completed.	END	Replace ECM <Ref. to FU(H4SO)-45, Engine Control Module.> or <Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.> or <Ref. to FU(H6DO)-46, Engine Control Module.> or <Ref. to FU(H4DOSTC)-40, Engine Control Module.> and IMM ECM <Ref. to SL-36, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

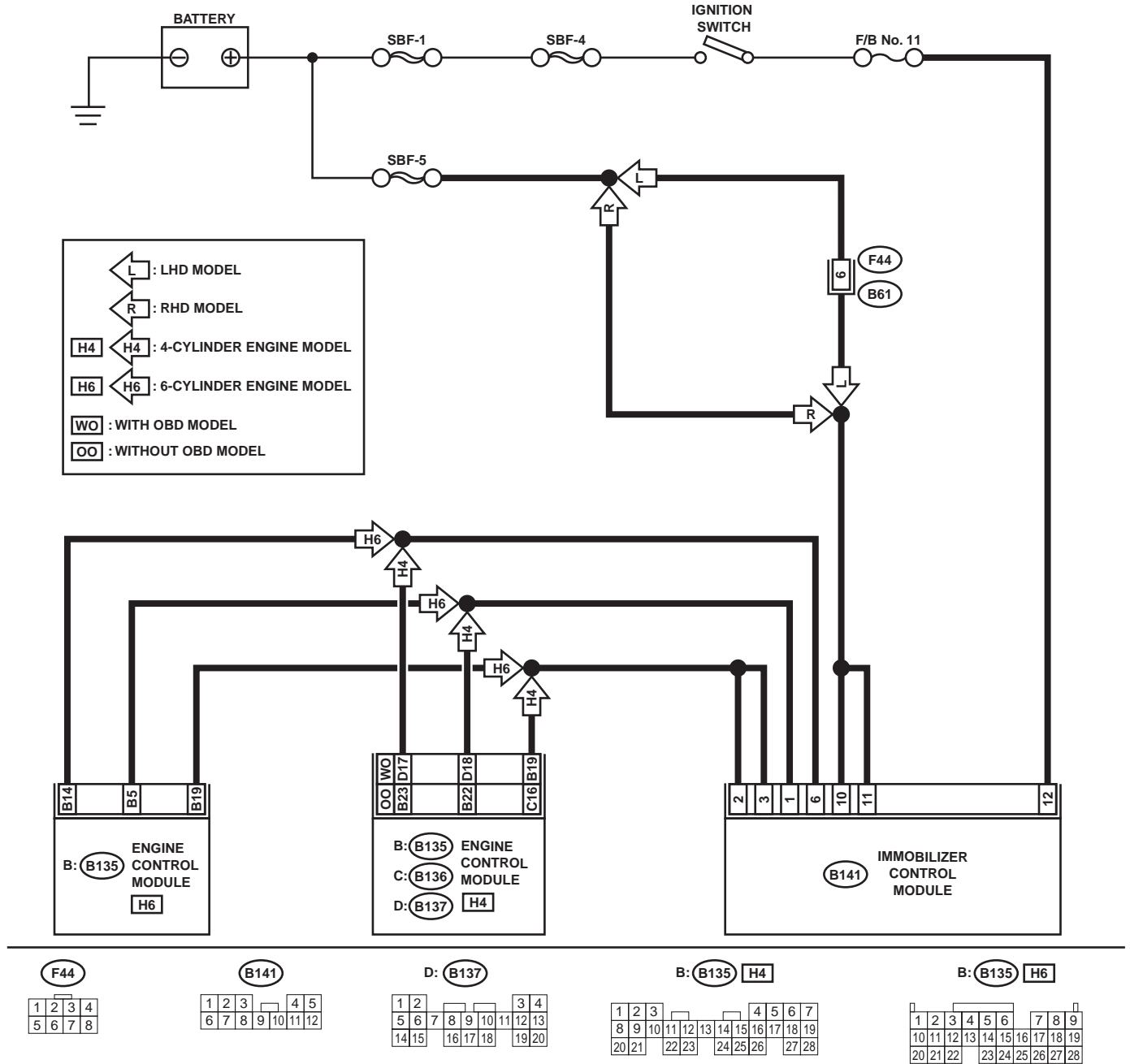
B: DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

DIAGNOSIS:

- Communication failure between IMM ECM and ECM

WIRING DIAGRAM:

- Non-TURBO

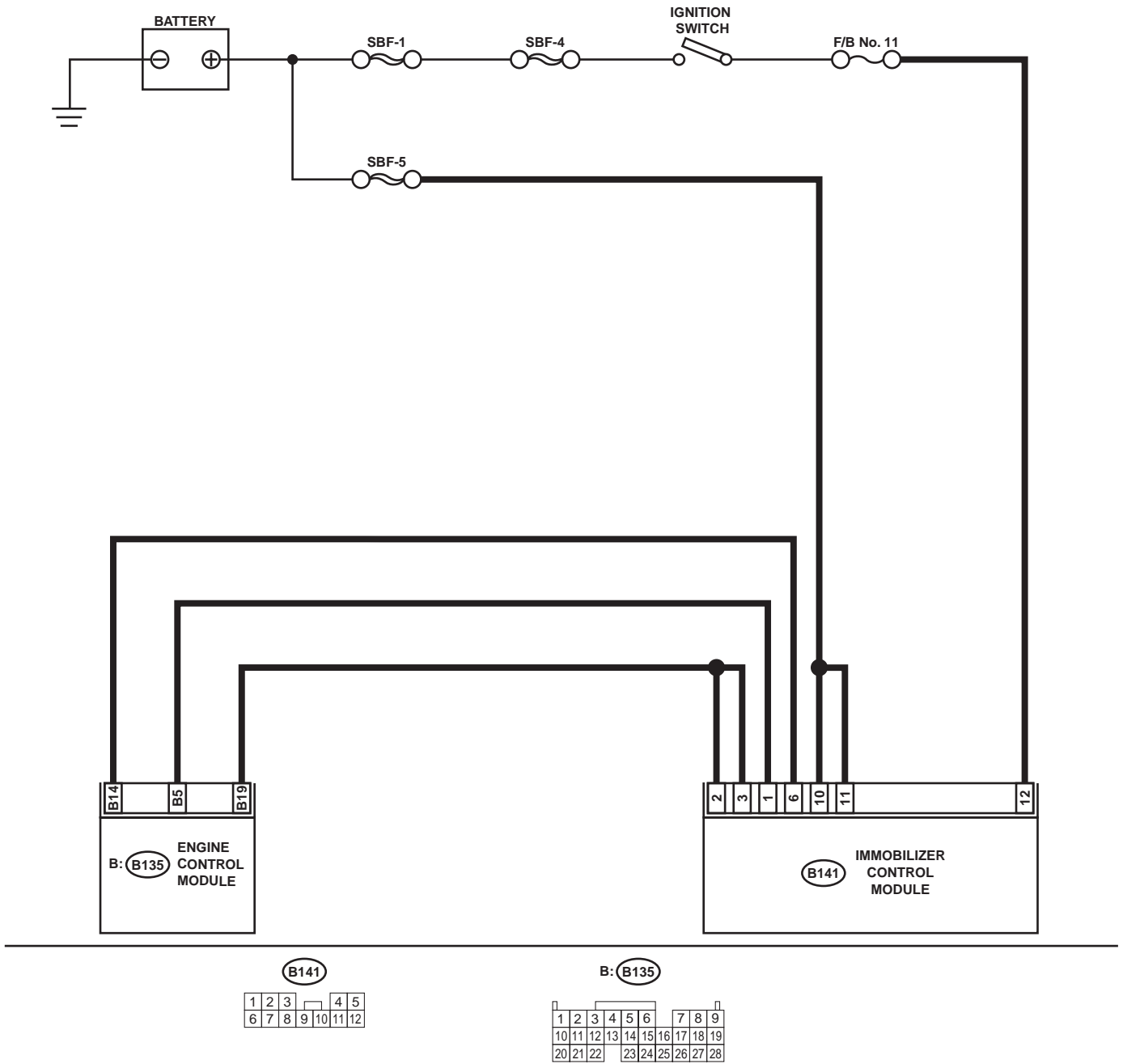


IM-00056

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

- TURBO model



IM-00061

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Value	Yes	No
<p>1 CHECK POWER SUPPLY CIRCUIT OF IMM ECM.</p> <p>1) Turn ignition switch OFF. 2) Disconnect harness connector from IMM ECM. 3) Measure voltage between IMM ECM harness connector terminal and chassis ground.</p> <p>Connector & terminal (B141) No. 10, No.11 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 2.	Check harness for open or short between IMM ECM and fuse.
<p>2 CHECK POWER SUPPLY CIRCUIT OF IMM ECM.</p> <p>1) Turn ignition switch ON. (Engine OFF.) 2) Measure voltage between IMM ECM harness connector terminal and chassis ground.</p> <p>Connector & terminal (B141) No. 12 (+) — Chassis ground (-):</p> <p>Does the measured value exceed the specified value?</p>	10 V	Go to step 3.	Check harness for open or short between IMM ECM and ignition switch.
<p>3 CHECK GROUND CIRCUIT OF IMM ECM.</p> <p>1) Turn ignition switch OFF. 2) Measure resistance between IMM ECM harness connector terminal and chassis ground.</p> <p>Connector & terminal (B141) No. 2, No.3 — Chassis ground:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 4.	Repair open circuit of IMM ECM ground circuit.
<p>4 CHECK HARNESS BETWEEN IMM ECM AND ECM.</p> <p>1) Disconnect harness connector from ECM and IMM ECM. 2) Measure resistance between IMM ECM harness connector terminal and ECM harness connector terminal.</p> <p>Connector & terminal H4 non-TURBO without OBD model (B141) No. 1 — (B135) No. 22: H4 Non-TURBO with OBD model (B141) No. 1 — (B137) No. 18: H6 and H4 TURBO models (B141) No. 1 — (B135) No. 5:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 5.	Repair open circuit of harness between IMM ECM and ECM.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Value	Yes	No
<p>5 CHECK HARNESS BETWEEN IMM ECM AND ECM. Measure resistance between IMM ECM harness connector terminal and ECM harness connector terminal.</p> <p>Connector & terminal <i>H4 non-TURBO without OBD model</i> (B141) No. 6 — (B135) No. 23: <i>H4 non-TURBO with OBD model</i> (B141) No. 6 — (B137) No. 17: <i>H6 and H4 TURBO models</i> (B141) No. 6 — (B135) No. 14:</p> <p>Is the measured value less than the specified value?</p>	10 Ω	Go to step 6.	Repair open circuit of harness between IMM ECM and ECM.
<p>6 CHECK HARNESS OF COMMUNICATION LINE. 1) Turn ignition switch ON. (Engine OFF.) 2) Measure voltage between IMM ECM harness connector terminal and chassis ground.</p> <p>Connector & terminal (B141) No. 1, No.6 (+) — Chassis ground (-):</p> <p>Is the measured value same as the specified value?</p>	0 V	Go to step 7.	Repair harness between IMM ECM and ECM, because there is short circuit in battery voltage line or ignition switch "ON" line.
<p>7 CHECK HARNESS OF COMMUNICATION LINE. Measure voltage between ECM harness connector terminal and chassis ground.</p> <p>Connector & terminal <i>H4 non-TURBO without OBD model</i> (B135) No. 22, No.23 (+) — Chassis ground (-): <i>H4 non-TURBO with OBD model</i> (B137) No. 17, No.18 (+) — Chassis ground (-): <i>H6 and H4 TURBO models</i> (B135) No. 5, No.14 (+) — Chassis ground (-):</p> <p>Is the measured value same as the specified value?</p>	0 V	Go to step 8.	Repair harness between IMM ECM and ECM, because there is short circuit in battery voltage line or ignition switch "ON" line.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Value	Yes	No
8 CHECK ECM BY INTERFACE CHECK. 1) Connect harness connector to ECM. 2) Disconnect harness connector from IMM ECM. 3) Perform interface check. <Ref. to IM-7, INTERFACE CHECK, OPERATION, Subaru Select Monitor.> Does "Commun. Line Shorted to Ground" appear on screen?	"Commun. Line Shorted to Ground" appears on screen.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.> or <Ref. to FU(H4SOW/oOBD)-42, Engine Control Module.> or <Ref. to FU(H6DO)-46, Engine Control Module.> or <Ref. to FU(H4DOSTC)-40, Engine Control Module.> Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Go to step 9 .
9 CHECK ECM BY INTERFACE CHECK. Perform interface check. Does "Commun. Line Shorted to Battery" appear on screen?	"Commun. Line Shorted to Battery" appears on screen.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.> or <Ref. to FU(H4SOW/oOBD)-42, Engine Control Module.> or <Ref. to FU(H6DO)-46, Engine Control Module.> or <Ref. to FU(H4DOSTC)-40, Engine Control Module.> Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Go to step 10 .
10 CHECK ECM BY INTERFACE CHECK. Perform interface check. Does "Communication Line not Shorted" appear on screen?	"Communication Line not Shorted" appears on screen.	Replace IMM ECM <Ref. to SL-36, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	When " Check (Time Out) " appears on screen, perform interface check again.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

C: DTC P1574 KEY COMMUNICATION FAILURE

DIAGNOSIS:

- Failure of IMM ECM to verify key (transponder) ID code

Step	Value	Yes	No
<p>1</p> <p>CHECK IMM ECM FUNCTION. Insert the key to ignition switch (LOCK position), measure changes in voltage between antenna connector terminals.</p> <p>Connector & terminal (B142) No. 1 (+) — No. 2 (-):</p> <p>Is the measured value same as the specified value?</p>	<p>-30 to 30 V (Approximately 0.1 second after inserting the key.) 0 V (Approximately 1 second after inserting the key.)</p>	Go to step 2.	Replace IMM ECM <Ref. to SL-36, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).
<p>2</p> <p>CHECK IGNITION KEY (TRANSPONDER). 1) Remove the key from ignition switch. 2) Start engine using other keys that have undergone the teaching operation, furnished with vehicle. Does engine start?</p>	Engine starts.	Replace ignition key (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Replace IMM ECM <Ref. to SL-36, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

D: DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY)

DIAGNOSIS:

- Use of unregistered key in IMM ECM

	Step	Value	Yes	No
1	PERFORM TEACHING OPERATION ON IGNITION KEY. Perform teaching operation on all keys of the vehicle. Refer to teaching operation manual (Pub. No. S0820GZ). Is teaching operation for all keys completed?	Teaching operation for all keys is completed.	END	Replace all ignition keys (including the transponder). Go to step 2.
2	PERFORM TEACHING OPERATION ON IGNITION KEY. Perform teaching operation on all keys with vehicle. Refer to teaching operation manual (Pub. No. S0820GZ). Is teaching operation for all keys completed?	Teaching operation for all keys is completed.	END	Replace IMM ECM <Ref. to SL-36, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

E: DTC P1576 EGI CONTROL MODULE EEPROM

DIAGNOSIS:

- ECM malfunctioning

1. REPLACE ECM.

Replace ECM.

<Ref. to FU(H4SO)-45, Engine Control Module.>

<Ref. to FU(H4SOw/oOBD)-42, Engine Control Module.>

<Ref. to FU(H6DO)-46, Engine Control Module.>

<Ref. to FU(H4DOSTC)-40, Engine Control Module.>

Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

F: DTC P1577 IMM CONTROL MODULE EEPROM

DIAGNOSIS:

- IMM ECM malfunctioning

1. REPLACE IMM ECM.

Replace IMM ECM <Ref. to SL-36, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

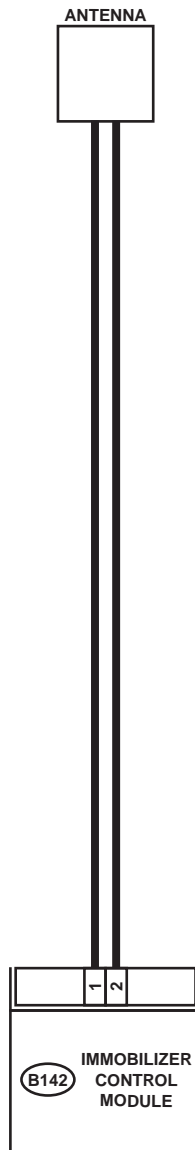
IMMOBILIZER (DIAGNOSTICS)

G: DTC P1570 ANTENNA

DIAGNOSIS:

- Faulty antenna

WIRING DIAGRAM:



B142

1 2

IM-00066

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Value	Yes	No
1 CHECK ANTENNA CIRCUIT. 1) Turn ignition switch OFF. 2) Disconnect harness antenna connector from IMM ECM. <Ref. to SL-37, Immobilizer Antenna.> 3) Measure resistance of antenna circuit. Connector & terminal (B142) No. 1 — No. 2: Is the measured value less than the specified value?	10 Ω	Go to step 2.	Replace antenna. <Ref. to SL-37, Immobilizer Antenna.>
2 CHECK ANTENNA CIRCUIT. Measure resistance between antenna harness connector and chassis ground. Connector & terminal (B142) No. 1 — Chassis ground Is the measured value less than the specified value?	10 Ω	Replace antenna. <Ref. to SL-37, Immobilizer Antenna.>	Go to step 3.
3 CHECK ANTENNA CIRCUIT. Measure resistance between antenna harness connector and chassis ground. Connector & terminal (B142) No. 2 — Chassis ground Is the measured value less than the specified value?	10 Ω	Replace antenna. <Ref. to SL-37, Immobilizer Antenna.>	Go to step 4.
4 CHECK ANTENNA CIRCUIT. 1) Turn ignition switch ON. (Engine OFF.) 2) Measure voltage between antenna harness connector and chassis ground. Connector & terminal (B142) No. 1 (+) — Chassis ground (-): Is the measured value same as the specified value?	0 V	Go to step 5.	Replace antenna. <Ref. to SL-37, Immobilizer Antenna.>
5 CHECK ANTENNA CIRCUIT. Measure voltage between antenna harness connector and chassis ground. Connector & terminal (B142) No. 2 (+) — Chassis ground (-): Is the measured value same as the specified value?	0 V	Go to step 6.	Replace antenna. <Ref. to SL-37, Immobilizer Antenna.>
6 CHECK IMM ECM FUNCTION. 1) Turn ignition switch OFF. 2) Connect antenna harness connector to IMM ECM. 3) Insert the key to ignition switch, measure changes in voltage between antenna harness connector terminals. Connector & terminal (B142) No. 1 (+) — No. 2 (-): Is the measured value same as the specified value?	-30 to 30 V (Approximately 0.1 second after inserting the key.) 0 V (Approximately 1 second after inserting the key.)	Go to step 7.	Replace IMM ECM <Ref. to SL-36, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Value	Yes	No
7 CHECK IGNITION KEY (TRANSPONDER). 1) Remove key from ignition switch. 2) Start engine using other keys that have undergone the teaching operation, furnished with vehicle. Does engine start?	Engine starts.	Replace ignition key (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Replace IMMECM <Ref. to SL-36, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

WIRING SYSTEM SECTION

WIRING SYSTEM

WI

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

WIRING SYSTEM



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1. Basic Diagnostics Procedure

A: BASIC PROCEDURES

1. GENERAL

The most important purpose of diagnostics is to determine which part is malfunctioning quickly, to save time and labor.

2. IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on the symptom.

3. PROBABLE CAUSE OF TROUBLE

Look at the wiring diagram and check the system's circuit. Then check the switch, relay, fuse, ground, etc.

4. LOCATION AND REPAIR OF TROUBLE

- 1) Using the diagnostics narrow down the causes.
- 2) If necessary, use a voltmeter, ohmmeter, etc.
- 3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problems are encountered, check the component parts.

5. CONFIRMATION OF SYSTEM OPERATION

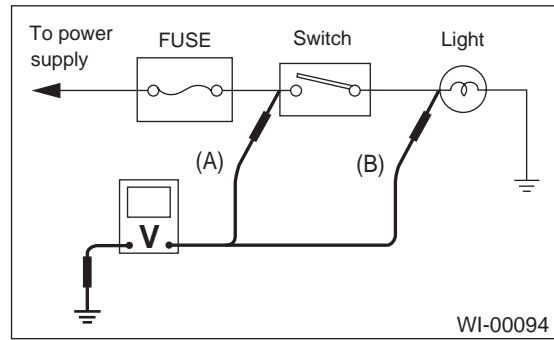
After repairing, ensure that the system operates properly.

B: BASIC INSPECTION

1. VOLTAGE MEASUREMENT

- 1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
 - 2) Contact the positive probe of the voltmeter on connector (A).
- The voltmeter will indicate a voltage.

- 3) Shift the positive probe to connector (B). The voltmeter will indicate no voltage.



- 4) With test set-up held as it is, turn switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.

- 5) The circuit is in good order. If a problem such as a lamp failing to light occurs, use the procedures outlined above to track down the malfunction.

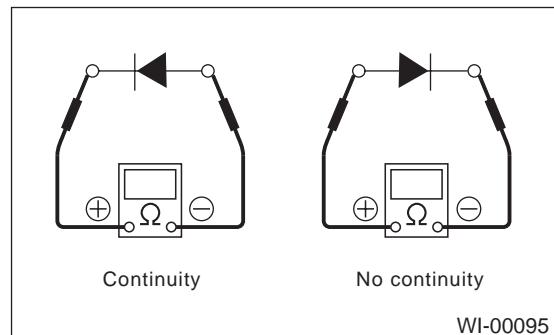
2. CIRCUIT CONTINUITY CHECKS

- 1) Disconnect the battery terminal or connector so there is no voltage between the check points. Contact the two leads of an ohmmeter to each of the check points.

If the circuit has diodes, reverse the two leads and check again.

- 2) Use an ohmmeter to check for diode continuity. When contacting the negative lead to the diode positive side and the positive lead to the negative side, there should be continuity.

When contacting the two leads in reverse, there should be no continuity.



BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

3) Symbol “○—○” indicates that continuity exists between two points or terminals. For example, when a switch position is “3”, continuity exists among terminals 1, 3 and 6, as shown in table below.

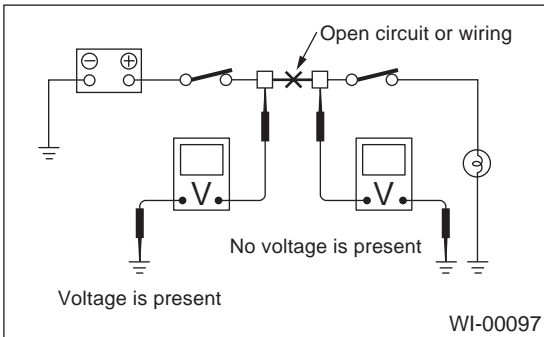
Terminal	1	2	3	4	5	6
Switch Position						
OFF						
1	○—○				○—○	
2	○—○			○—○		○—○
3	○—○		○—○			○—○
4	○—○	○—○				○—○

WI-00096

3. HOW TO DETERMINE AN OPEN CIRCUIT

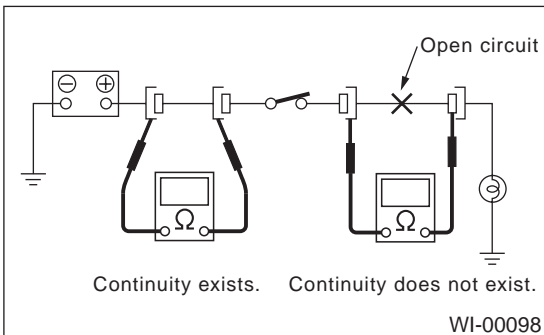
1) Voltmeter Method:

An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to the power supply. The power supply must be turned ON so that current flows in the circuit. If voltage is not present between a particular connector and ground, the circuit between that connector and the previous connector is open.



2) Ohmmeter method:

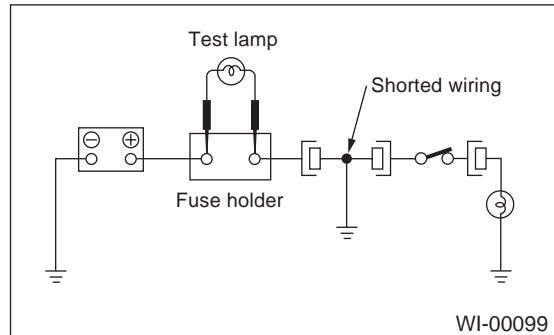
Disconnect all connectors affected, and check continuity in the wiring between adjacent connectors. When the ohmmeter indicates “infinite”, the wiring is open.



4. HOW TO DETERMINE A SHORT CIRCUIT

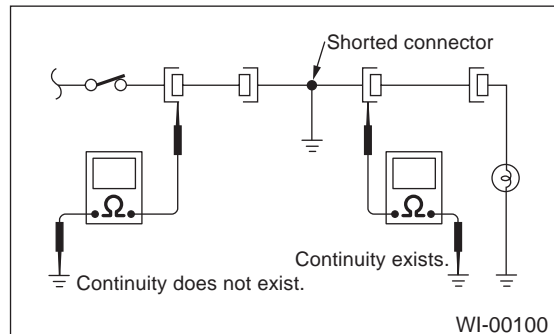
1) Test lamp method:

Connect a test lamp (rated at approximately 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit, starting with the one located farthest from the power supply. If the test lamp goes out when a connector is disconnected, the wiring between that connection and the next connector (farther from the power supply) is shorted.



2) Ohmmeter method:

Disconnect all affected connectors, and check continuity between each connector and ground. When ohmmeter indicates continuity between a particular connector and ground, that connector is shorted.



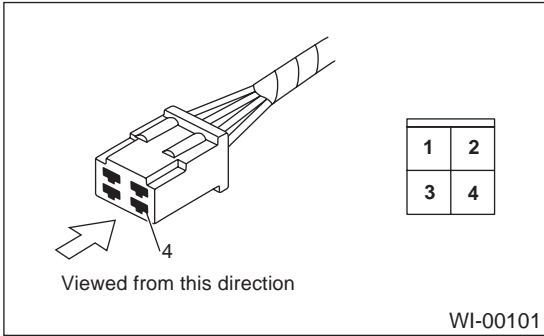
C: HOW TO READ WIRING DIAGRAMS

1. WIRING DIAGRAM

The wiring diagram of each system is illustrated so that you can understand the path through which the electric current flows from the battery.

Sketches and codes are used in the diagrams. They should read as follows:

- Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from the front.



- The number of poles or pins, presence of a lock, and pin number of each terminal are indicated in the sketch of each connector. In the sketch, the highest pole number refers to the number of poles which the connector has. For example, the sketch of the connector shown in figure indicates the connector has 9 poles.

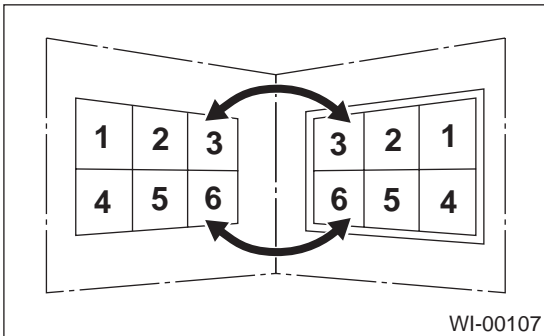
Connector used in vehicle	Connector shown in wiring diagram		
	Sketch	Symbol	Number of poles
	<p>Double frames</p> <p>Indicates a lock is included.</p> <p>Indicates the number of poles.</p>		<p>Numbered in order from upper right to lower left.</p>
	<p>Indicates a lock is included.</p> <p>Single frame</p>		<p>Numbered in order from upper left to lower right</p>

WI-00102

BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

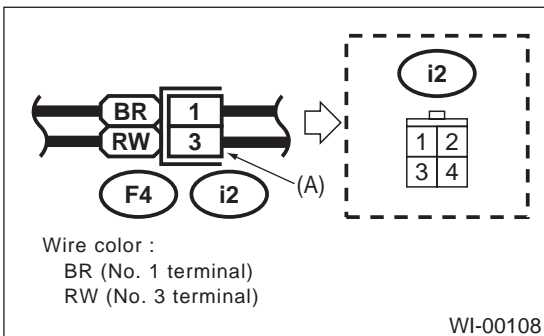
- When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of the other. When these two connectors are connected as a unit, the poles which have the same number are joined.



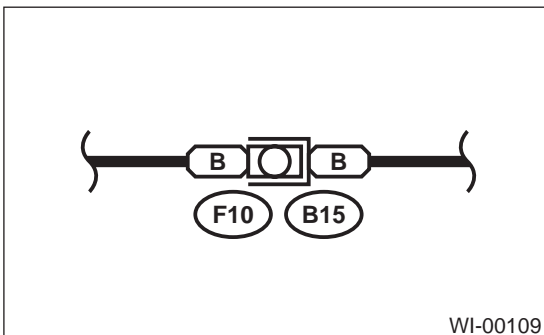
- Electrical wiring harness:**
The connectors are numbered along with the number of poles, external colors, and mating connections in the accompanying list.
- The sketch of each connector in the wiring diagram usually shows the (A) side of the connector. The relationship between the wire color, terminal number and connector is described in figure.

NOTE:

A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

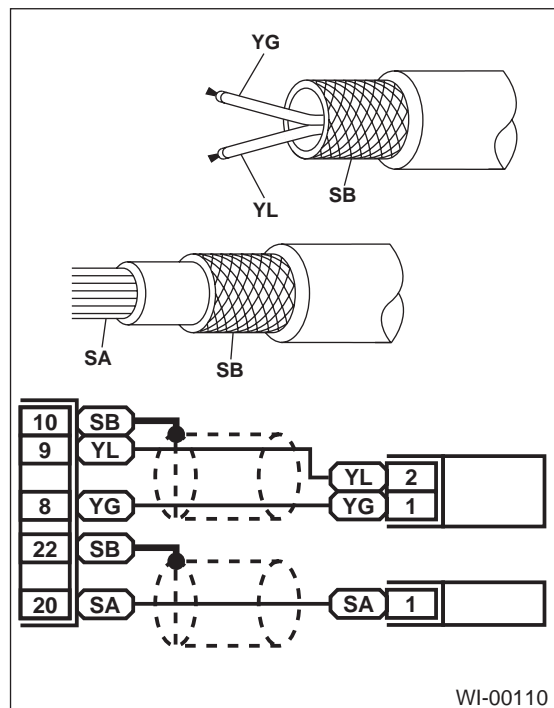


- In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.

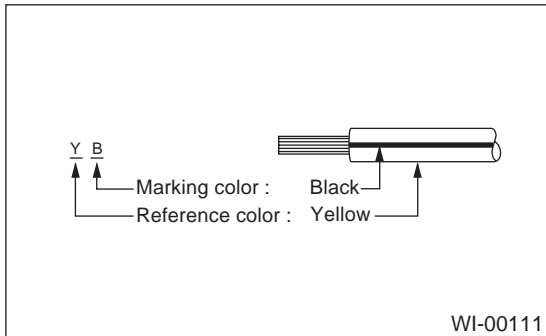


- The following color codes are used to indicate the colors of the wires used.

Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



- The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and the stripe marking by its second letter.



- The table lists the nominal sectional areas and allowable currents of the wires.

CAUTION:

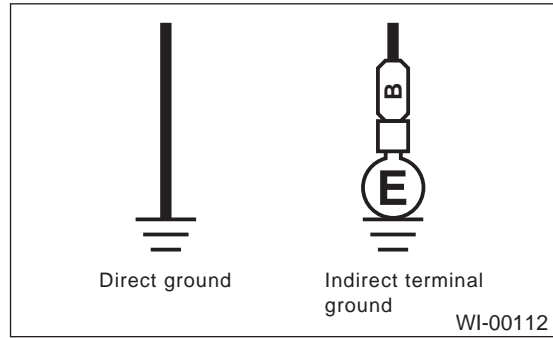
When replacing or repairing a wire, be sure to use the same size and type of the wire which was originally used.

NOTE:

- The allowable current in the table indicates the tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
- The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.

Nominal sectional area mm ²	No. of strands/ strand diameter	Outside diameter of finished wiring mm	Allowable current Amps/ 40°C (104°F)
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

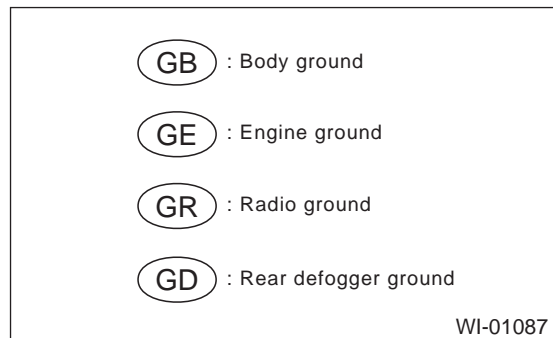
- Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.



- The ground points shown in the wiring diagram refer to the following:

NOTE:

All wiring harnesses are provided with a ground point which should be securely connected.

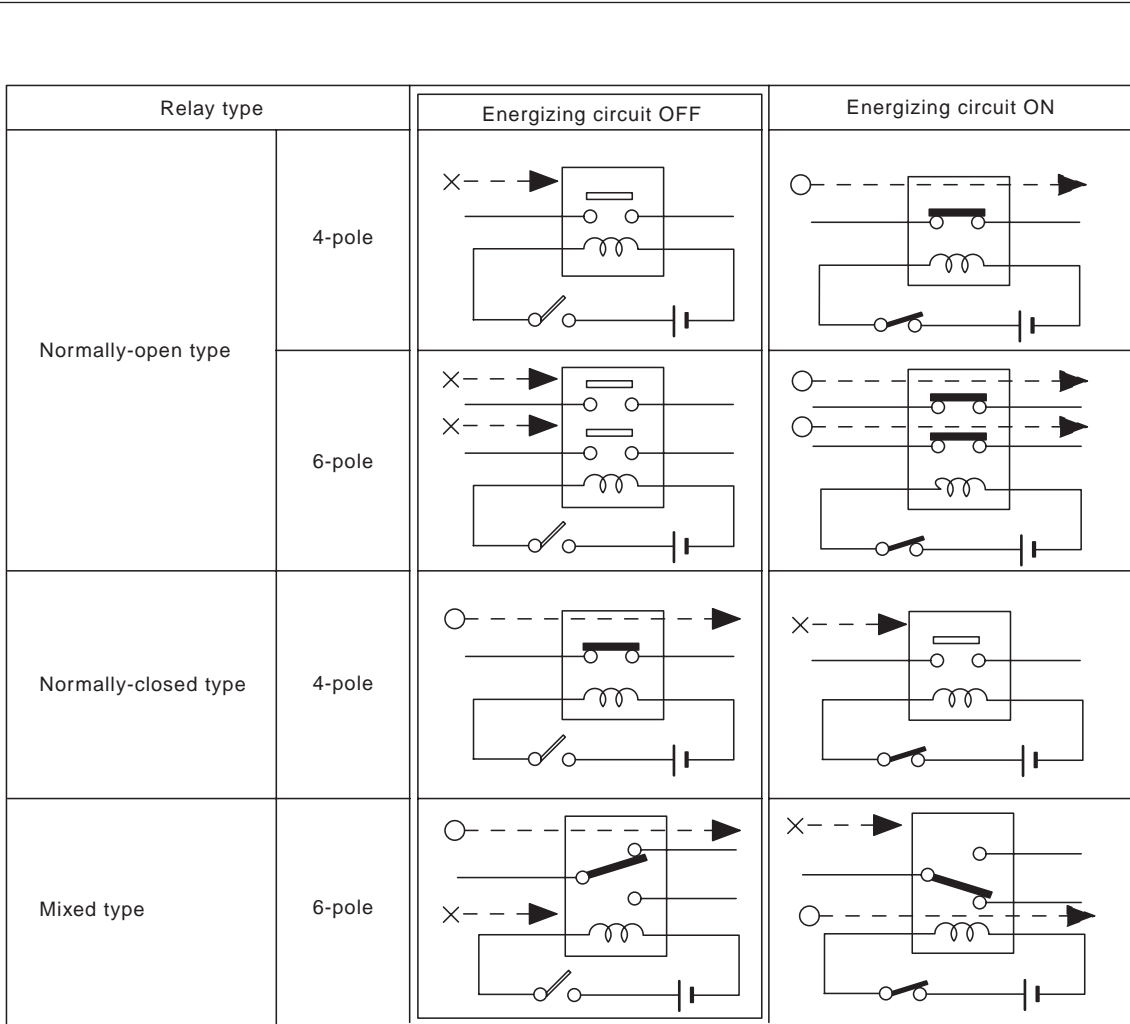


BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

- Relays are classified as normally-open or normally-closed. The normally-closed relay has one or more contacts.

The wiring diagram shows the relay mode when the energizing circuit is OFF.



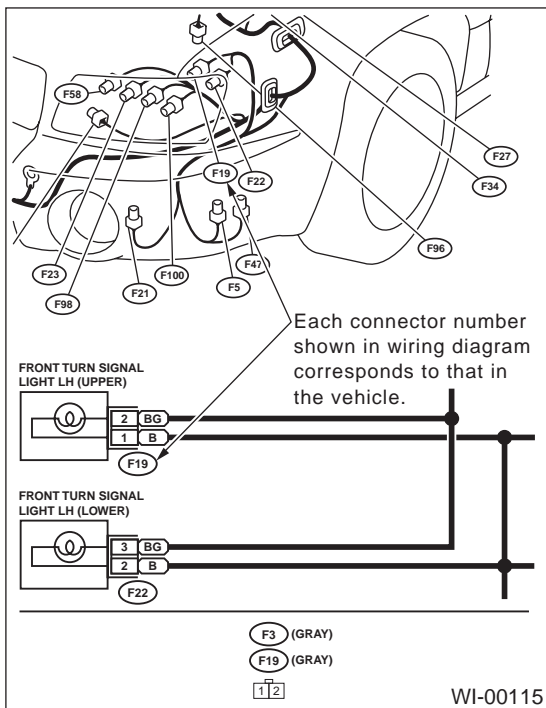
Key to symbols:

- —▶ : Current flows.
- × —▶ : Current does not flow.

WI-00114

- Each connector number shown in the wiring diagram corresponds to that in the wiring harness. The location of each connector in the actual vehicle is determined by reading the first character of the connector (for example, a “F” for F8, “i” for i16, etc.) and the type of wiring harness. The first character of each connector number refers to the area or system of the vehicle.

Symbol	Wiring harness and cord
F	Front wiring harness
B	Bulkhead wiring harness
E	Engine wiring harness
T	Transmission cord, Rear oxygen sensor cord
D	Door cord LH & RH, Rear door cord LH & RH, Rear gate cord
i	Instrument panel wiring harness
R	Rear wiring harness, Fuel tank cord, Roof cord

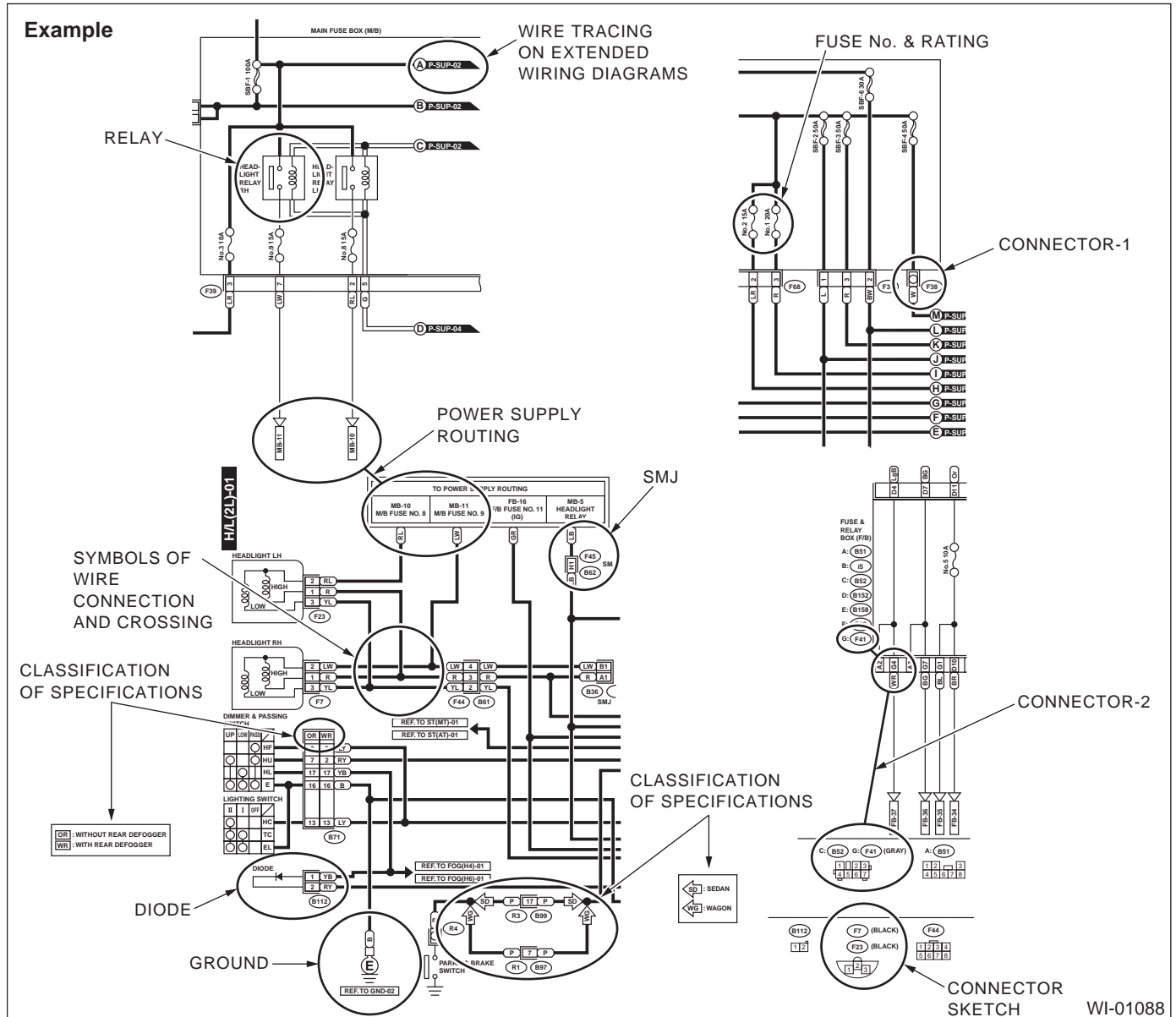


BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

D: SYMBOLS IN WIRING DIAGRAMS

A number of symbols are used in each wiring diagram to easily identify parts or circuits.



6. CONNECTOR SKETCH

- Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
- When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

7. GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

8. DIODE

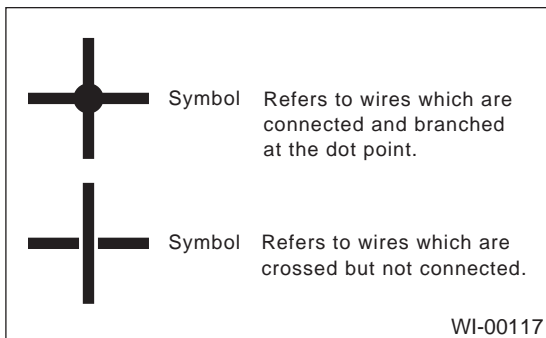
A symbol is used to indicate a diode.

9. WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), facilitates wire tracing from one page to the next.

A \longleftrightarrow A, B \longleftrightarrow B

10. SYMBOLS OF WIRE CONNECTION AND CROSSING



11. POWER SUPPLY ROUTING

A symbol is used to indicate the power supply in each wiring diagram.

“MB-5”, “MB-6”, etc., which are used as power-supply symbols throughout the text, correspond with those shown in the POWER SUPPLY ROUTING in the wiring diagram.

Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

E: ABBREVIATION IN WIRING DIAGRAMS

Abbr.	Full name
ABS	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AD	Auto Down
AT	Automatic Transmission
AU	Auto Up
A/B	Air Bag
A/F	Air Fuel
ATF	Automatic Transmission Fluid
AWD	All Wheel Drive
B	Battery
D	Drive Range
DN	Down
E	Ground
ELR	Emergency Locking Retractor
F/B	Fuse & Joint Box
FL1.5	Fusible Link 1.5 mm ²
H/L	Head Light
I/F	Interface
IG	Ignition
Illumi.	Illumination
INT	Intermittent
L/C	Low Clutch
LCD	Liquid Crystal Display
LH	Left Hand
Lo	Low
M	Motor
M/B	Main Fuse Box
MG	Magnet
Mi	Middle
MT	Manual Transmission
N	Neutral Range
OP	Optional Parts
P	Parking Range
PASS	Passing
R	Reverse Range
RH	Right Hand
SBF	Slow Blow Fuse
ST	Starter
SW	Switch
UP	Up
WASH	Washer

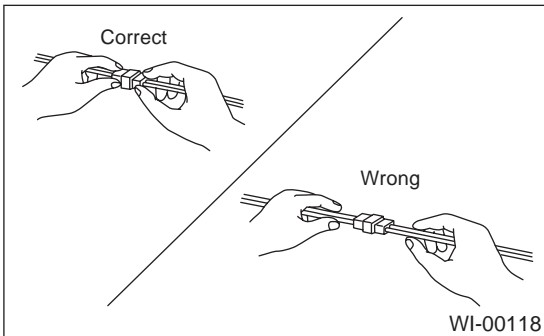
2. Working Precautions

A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

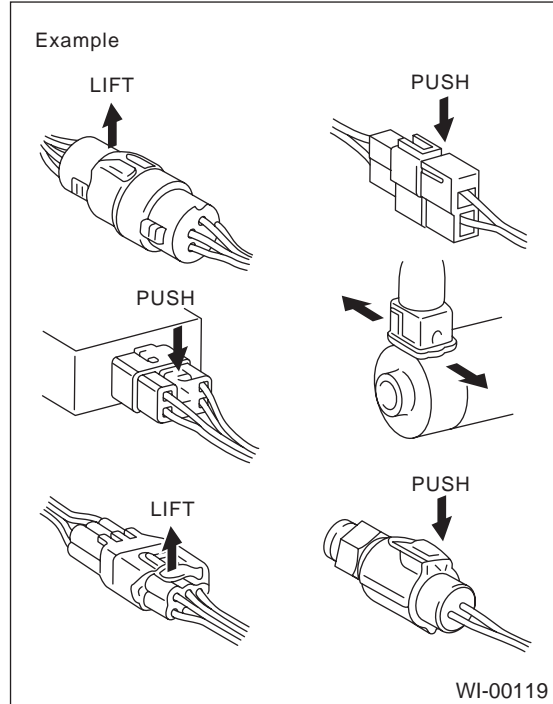
- 1) When working under a vehicle which is jacked up, always be sure to use safety stands.
- 2) The parking brake must always be applied during working. Also, in automatic transmission vehicles, keep the select lever set to the P (Parking) range.
- 3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
- 4) Be careful not to touch hot metal parts, especially the radiator and exhaust system immediately after the engine has been shut off.

B: PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

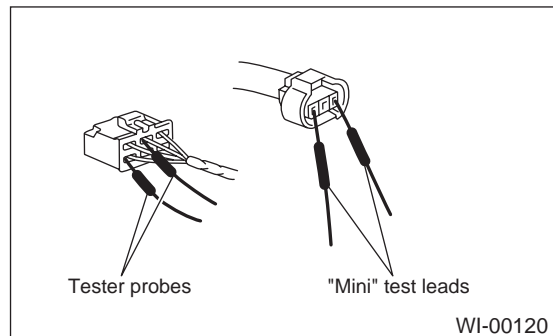
- 1) The battery cable must be disconnected from the battery's (-) terminal, and the ignition switch must be set to the OFF position, unless otherwise required by the diagnostics.
- 2) Securely fasten the wiring harness with clamps and slips so that the harness does not interfere with the body end parts or edges and bolts or screws.
- 3) When installing parts, be careful not to catch them on the wiring harness.
- 4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.



- 5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector. To connect, insert the connector until it snaps and confirm that it is tightly connected.



- 6) When checking continuity between connector terminals, or measuring voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use "mini" test leads. To check water-proof connectors (which are not accessible from the wiring side), contact test probes on the terminal side being careful not to bend or damage the terminals.



- 7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts. Handle them with care so that they are not dropped or mishandled.

3. Super Multiple Junction (SMJ)

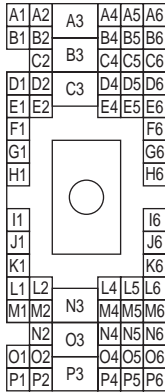
A: HOW TO USE SUPER MULTIPLE JUNCTION (SMJ)

The "SMJ" indicated in wiring diagrams is shown in a simplified form.

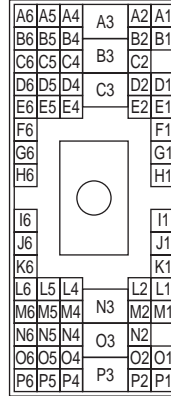
B: TERMINAL ARRANGEMENT

Bulkhead Wiring Harness ←————→ Instrument Panel Wiring Harness

B36 66 Poles



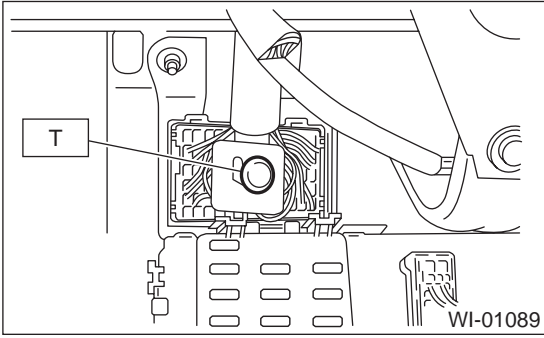
i1 66 Poles



SUPER MULTIPLE JUNCTION (SMJ)

WIRING SYSTEM

C: INSTALLATION



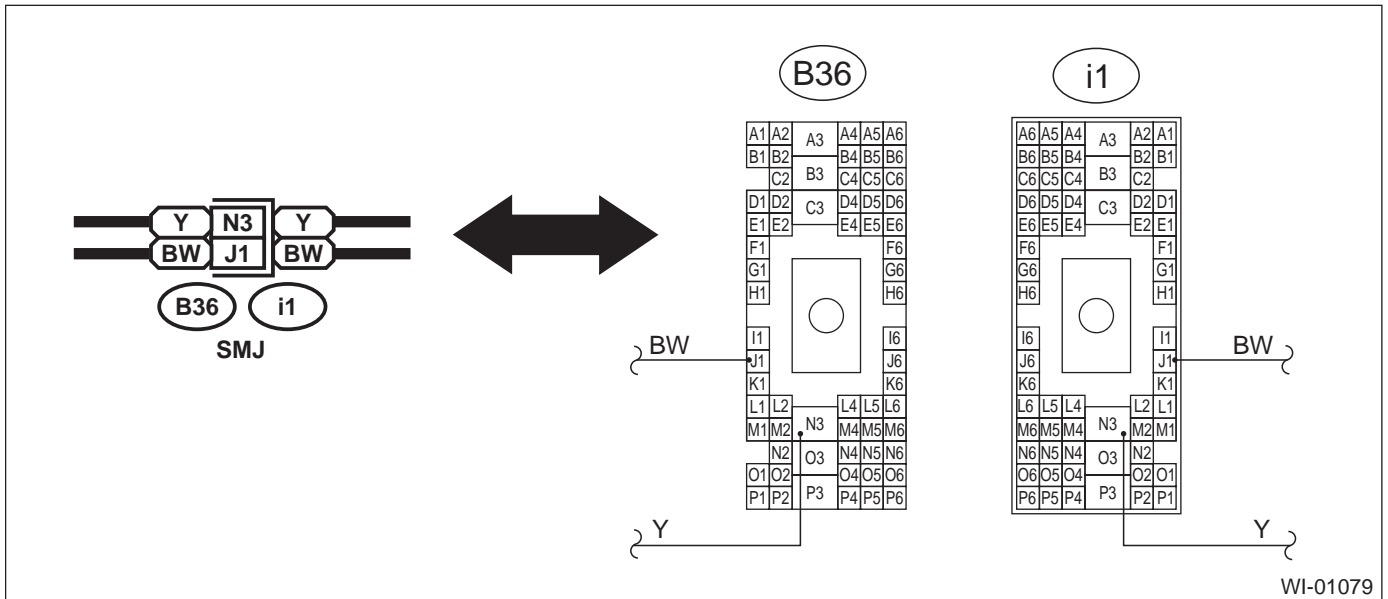
Tightening torque:

T: 4.4 N·m (0.45 kgf·m, 3.3 ft·lb)

NOTE:

- Align the cutout portion of one connector with that of other before tightening the connecting bolt.
- Do not tighten the bolt excessively since this may deform the connectors.

D: EXPLANATION OF SMJ SHOWN IN THE WIRING DIAGRAM



MEMO:

POWER SUPPLY ROUTING

WIRING SYSTEM

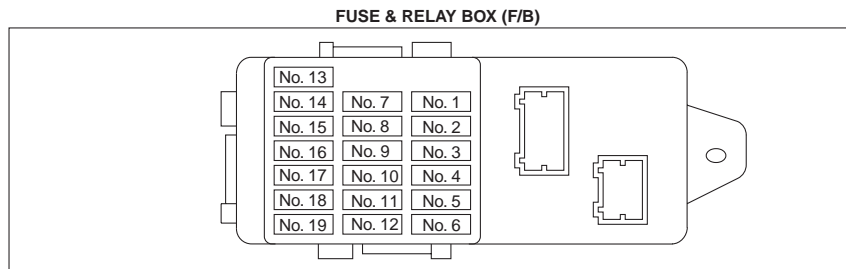
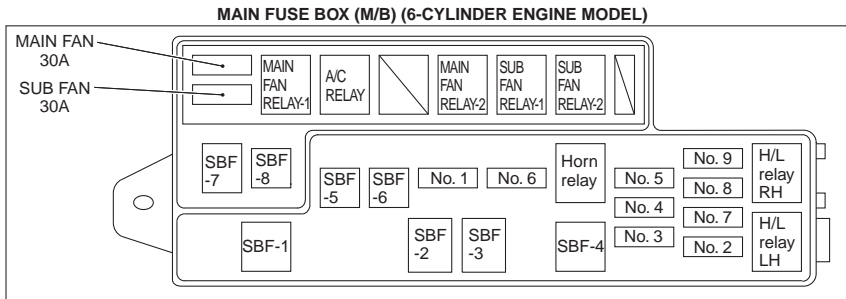
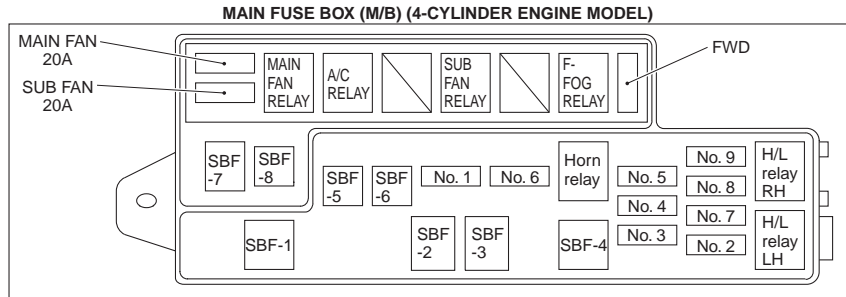
4. Power Supply Routing

A: SCHEMATIC

1. LHD MODEL

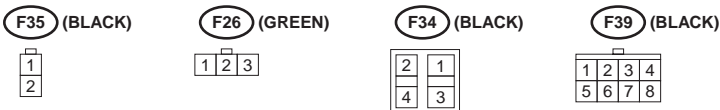
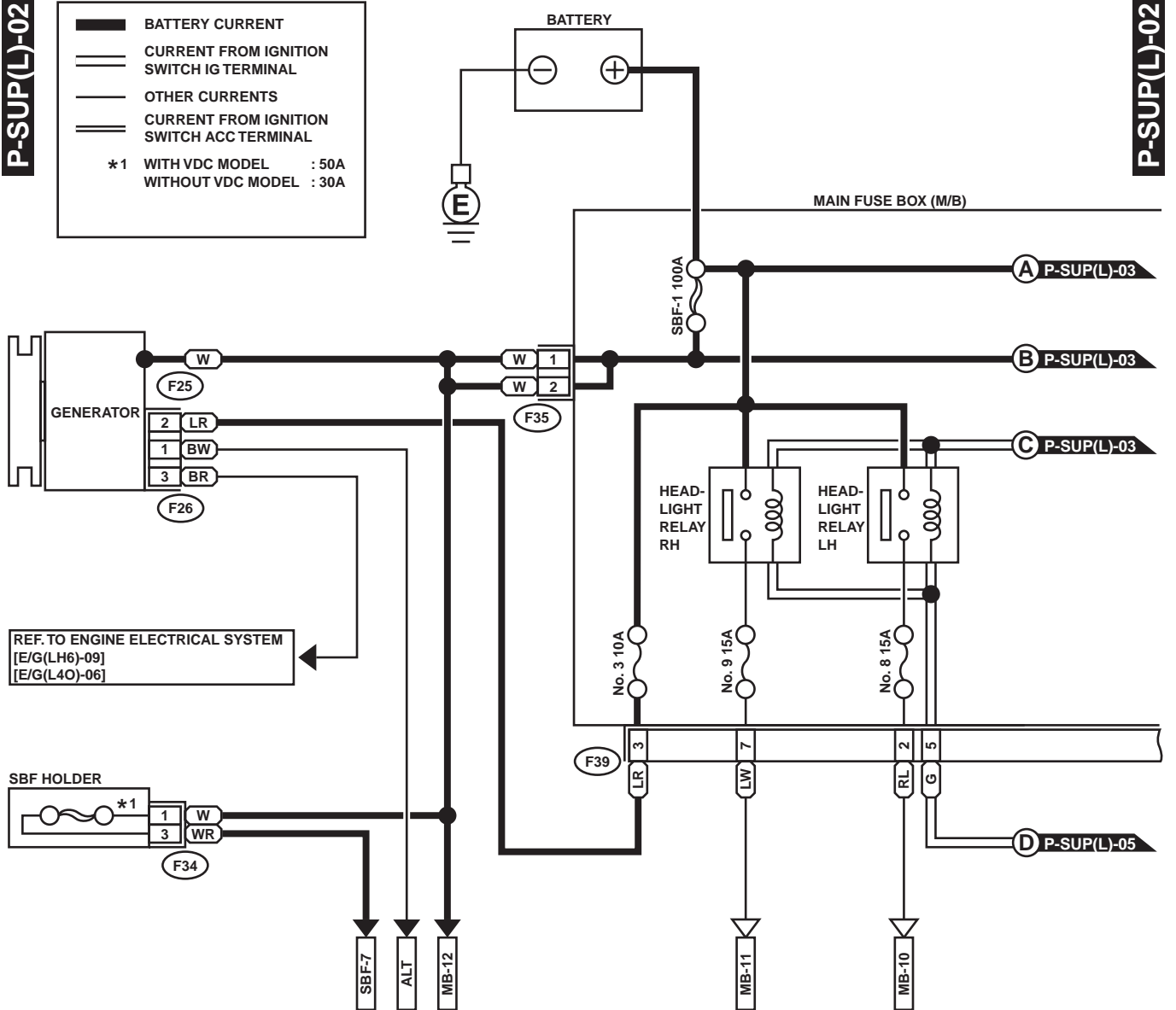
P-SUP(L)-01

P-SUP(L)-01



POWER SUPPLY ROUTING

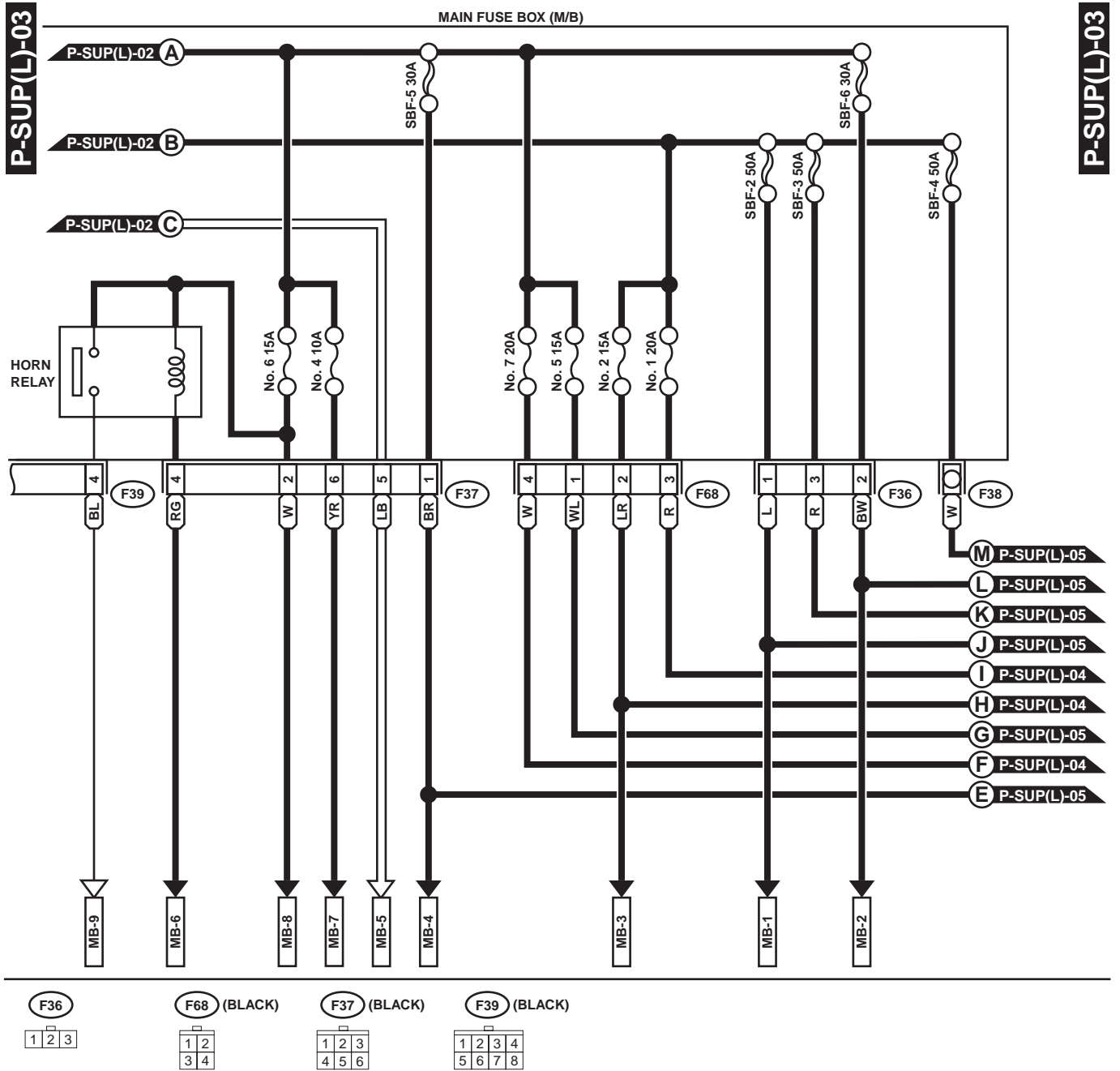
WIRING SYSTEM



WI-00739

POWER SUPPLY ROUTING

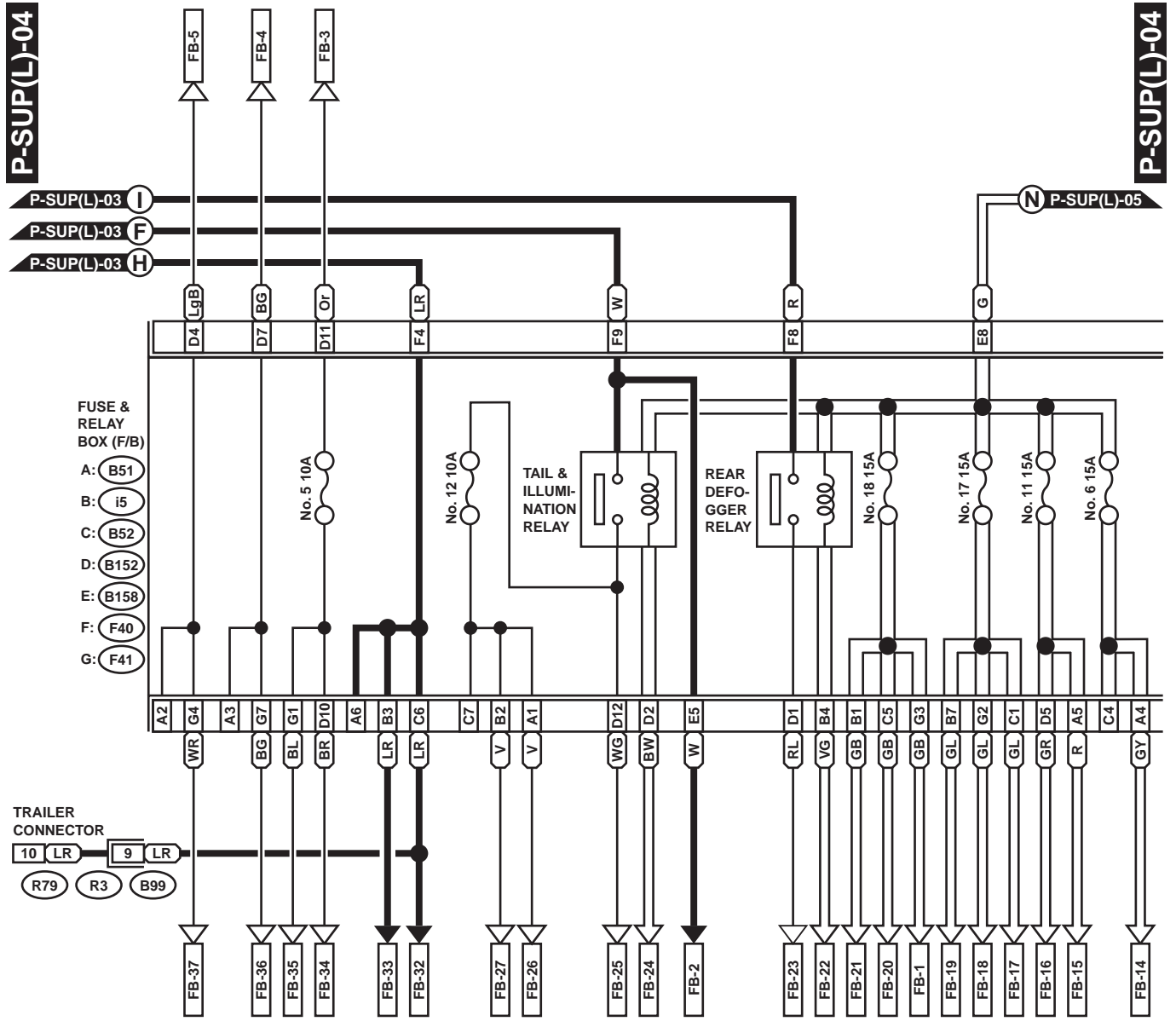
WIRING SYSTEM



WI-00740

POWER SUPPLY ROUTING

WIRING SYSTEM



C: **B52**

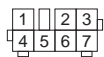
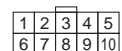
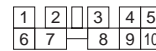
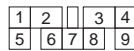
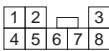
A: **B51**

F: **F40** (BROWN)

E: **B158** (GRAY)

R79

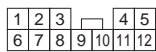
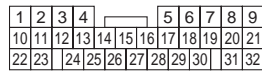
G: **F41** (GRAY)



B: **i5** (BLUE)

B99

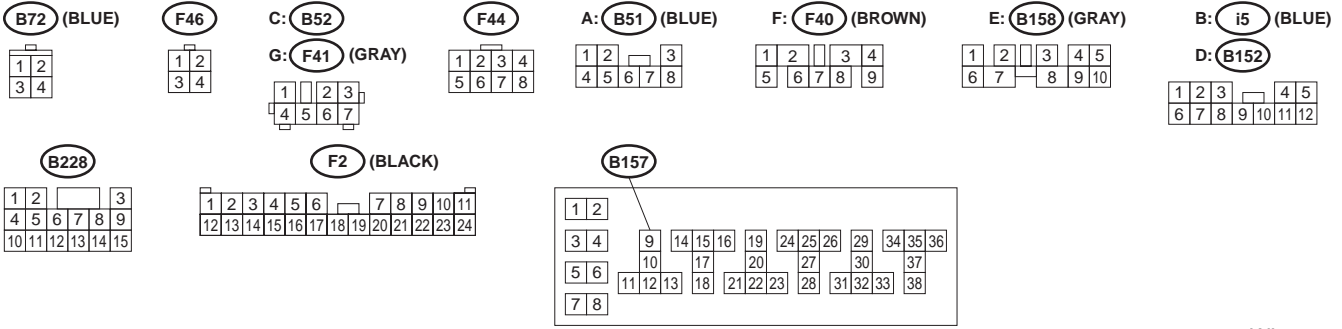
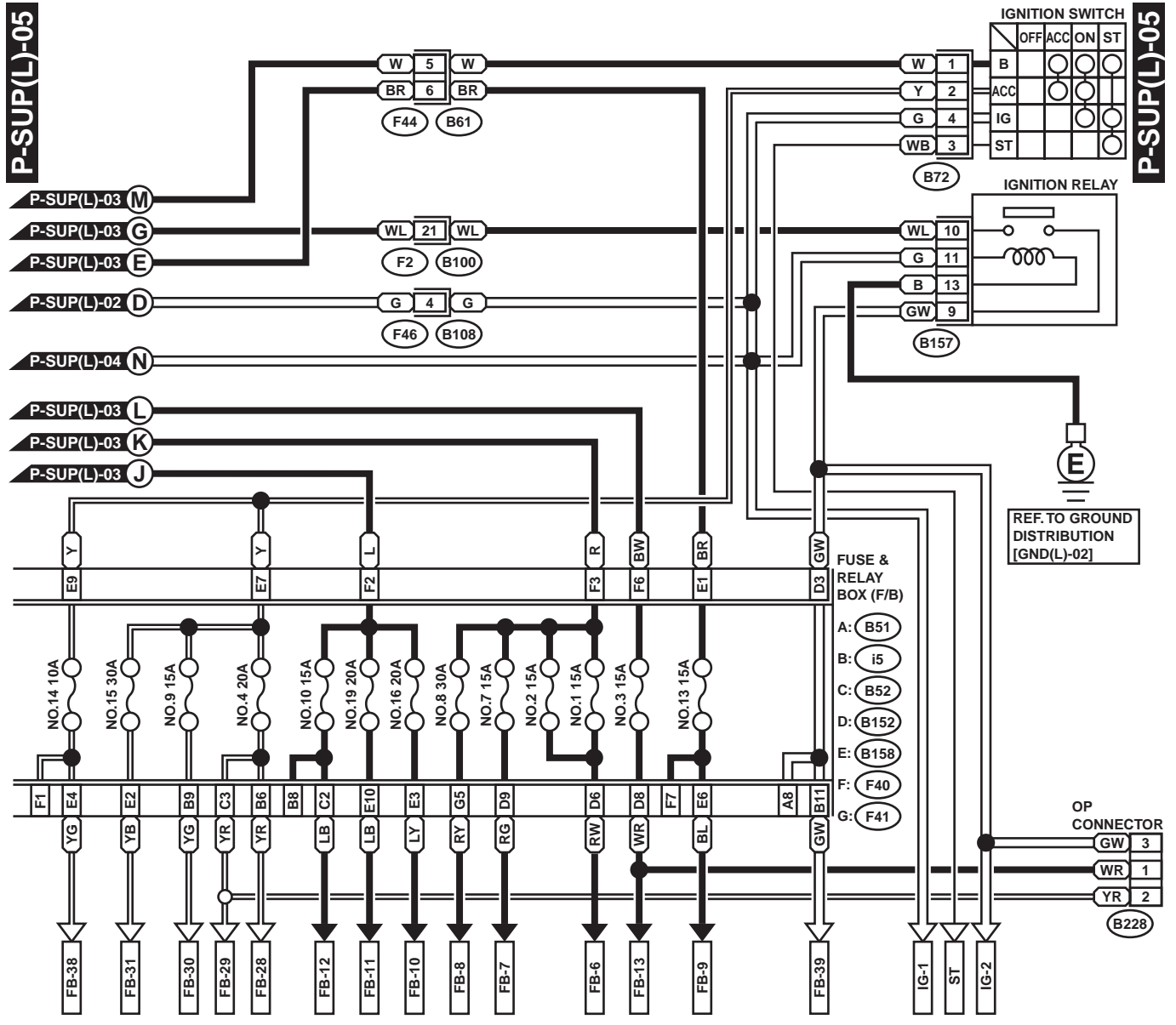
D: **B152**



WI-00741

POWER SUPPLY ROUTING

WIRING SYSTEM



RELAY BLOCK (BLACK)

WI-00742

POWER SUPPLY ROUTING

WIRING SYSTEM

No.	Load
MB-1	Fuse (Relay block)
MB-2	Power window circuit breaker
MB-4	Data link connector Engine control module Immobiliser control module Main relay
MB-5	Diode (With rear fog light) Lighting switch OP connector
MB-6	Cruise control sub switch Horn switch
MB-7	Transmission control module
MB-8	Hazard switch Keyless entry control module Key warning switch
MB-9	Horn
MB-10	Headlight LH
MB-11	Combination meter Headlight RH
MB-12	A/C relay holder
SBF-7	ABS control module VDC hydraulic module
ALT	Combination meter
IG-1	Seat belt timer
IG-2	Check connector Seat belt timer Vehicle speed sensor (MT)
ST	Engine control module Inhibitor switch (AT) Starter motor (MT)
FB-1	ABS control module Main fan relay (4-cylinder engine model) Main fan relay-1 (6-cylinder engine model) Main fan relay-2 (6-cylinder engine model) VDC module
FB-2	Parking switch
FB-3	Parking switch
FB-4	Combination meter Hazard switch Rear turn signal light LH Trailer connector Turn signal switch
FB-5	Combination meter Hazard switch Rear turn signal light RH Trailer connector Turn signal switch
FB-6	Blower motor relay
FB-7	Front fog light relay
FB-8	ABS control module VDC hydraulic module
FB-9	Fuel pump relay
FB-10	Stop light switch
FB-11	Wiper deicer relay
FB-12	Rear fog light relay

No.	Load
FB-13	Keyless entry control module
FB-14	Airbag control module
FB-15	Airbag control module
FB-16	Engine control module Fuel pump relay Ignition coil (6-cylinder engine model) Ignition coil and ignitor (4-cylinder engine model) Immobiliser control module Transmission control module
FB-17	A/C pressure switch Blower motor relay Fan relay (6-cylinder engine model)
FB-18	A/C relay Sub fan relay (4-cylinder engine model) Sub fan relay-1 (6-cylinder engine model) Sub fan relay-2 (6-cylinder engine model)
FB-19	Auto A/C control module Mode control panel (Manual A/C)
FB-20	Back-up light switch (MT) Cruise control module Inhibitor switch (AT) Power window relay Wiper deicer relay Wiper deicer timer
FB-21	Cruise control main switch
FB-22	Engine control module Rear defogger switch
FB-23	Rear defogger Rear defogger condenser
FB-24	Engine control module Lighting switch OP connector
FB-25	Headlight leveler LH Headlight leveler RH Headlight leveling switch Parking switch
FB-26	Front fog light relay Illumination control module Illumination light OP connector Rear fog light relay
FB-27	Combination meter Front fog light switch Headlight leveling switch Illumination light Rear fog light switch
FB-28	Auto A/C control module Front accessory power supply socket
FB-29	Mirror heater LH Mirror heater RH Remote control rearview mirror switch Seat heater/rear accessory power supply relay Vanity mirror illumination light LH Vanity mirror illumination light RH
FB-30	Radio Radio amplifier

POWER SUPPLY ROUTING

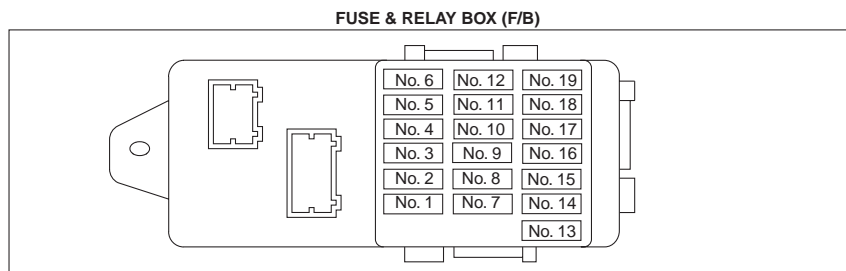
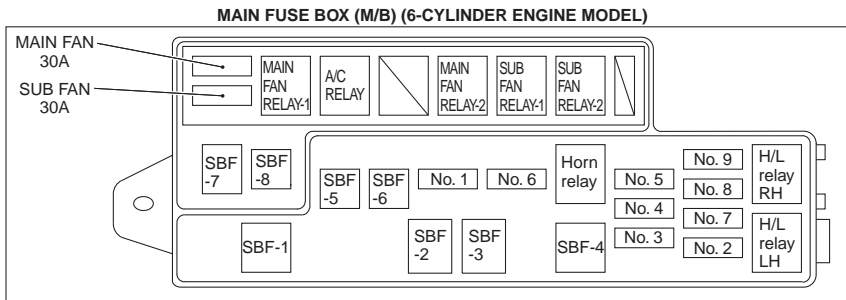
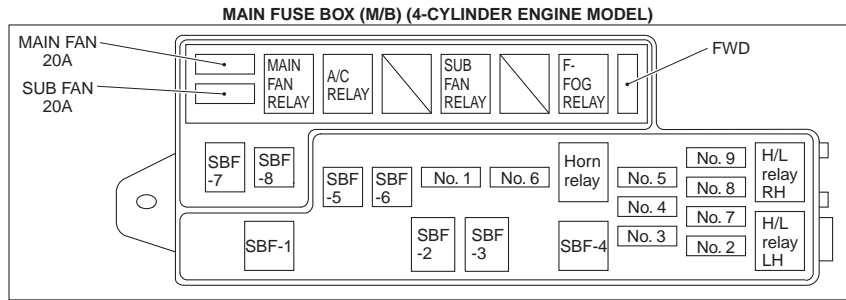
WIRING SYSTEM

No.	Load
FB-31	Front washer motor Front wiper motor Front wiper & washer switch
FB-32	Keyless entry control module Key switch illumination light Luggage room light (Wagon) Trunk room light (Sedan) Room light Spot light Step light LH Step light RH
FB-33	Auto A/C control module Combination meter Radio
FB-34	License plate light LH License plate light RH Tail light LH Tail light RH Trailer connector
FB-35	Front clearance light LH Front clearance light RH
FB-36	Front turn signal light LH Side turn signal light LH
FB-37	Front turn signal light RH Side turn signal light RH
FB-38	Rear washer motor Rear wiper intermittent module Rear wiper motor
FB-39	Combination meter Hazard switch

2. RHD MODEL

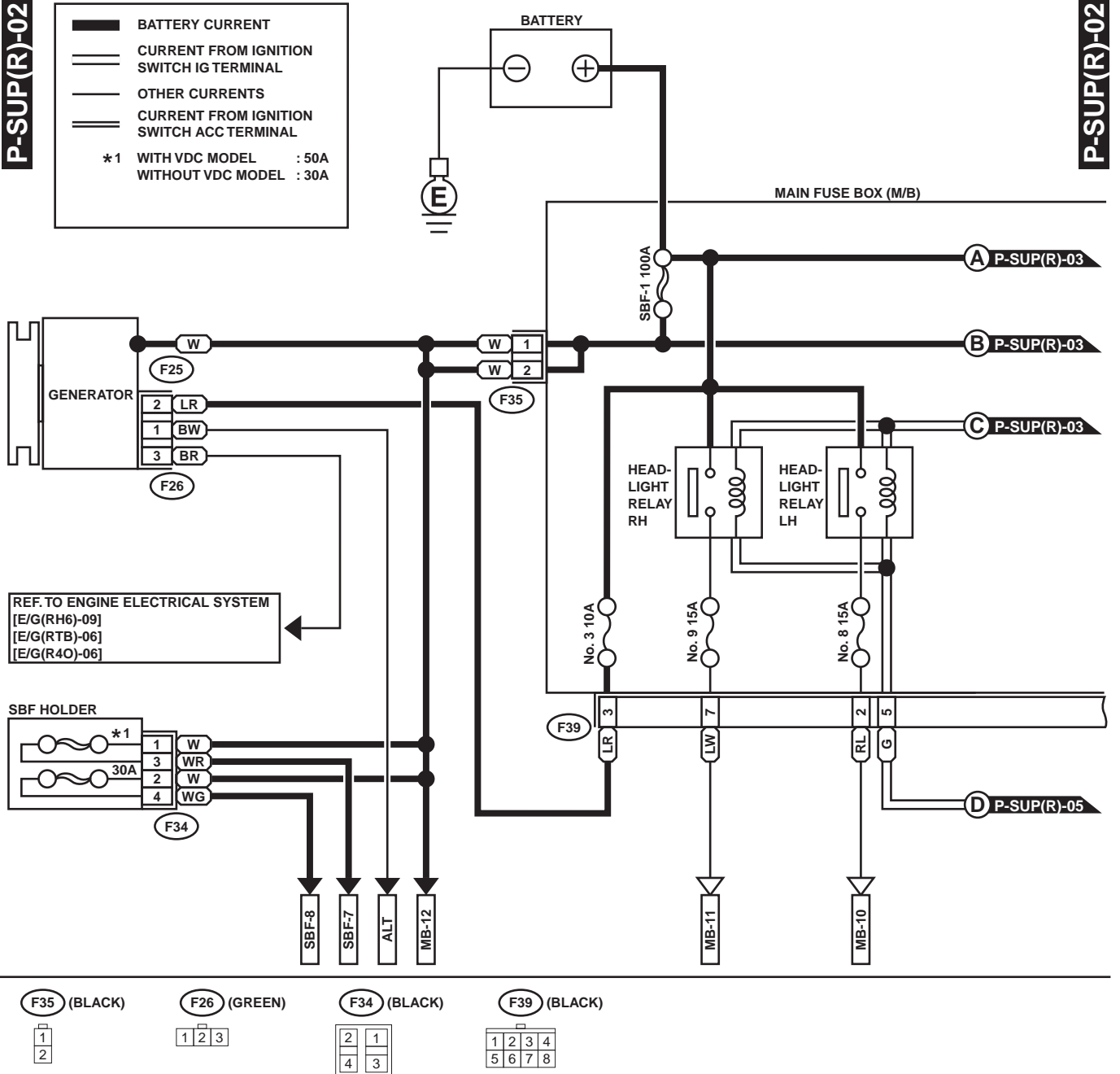
P-SUP(R)-01

P-SUP(R)-01



POWER SUPPLY ROUTING

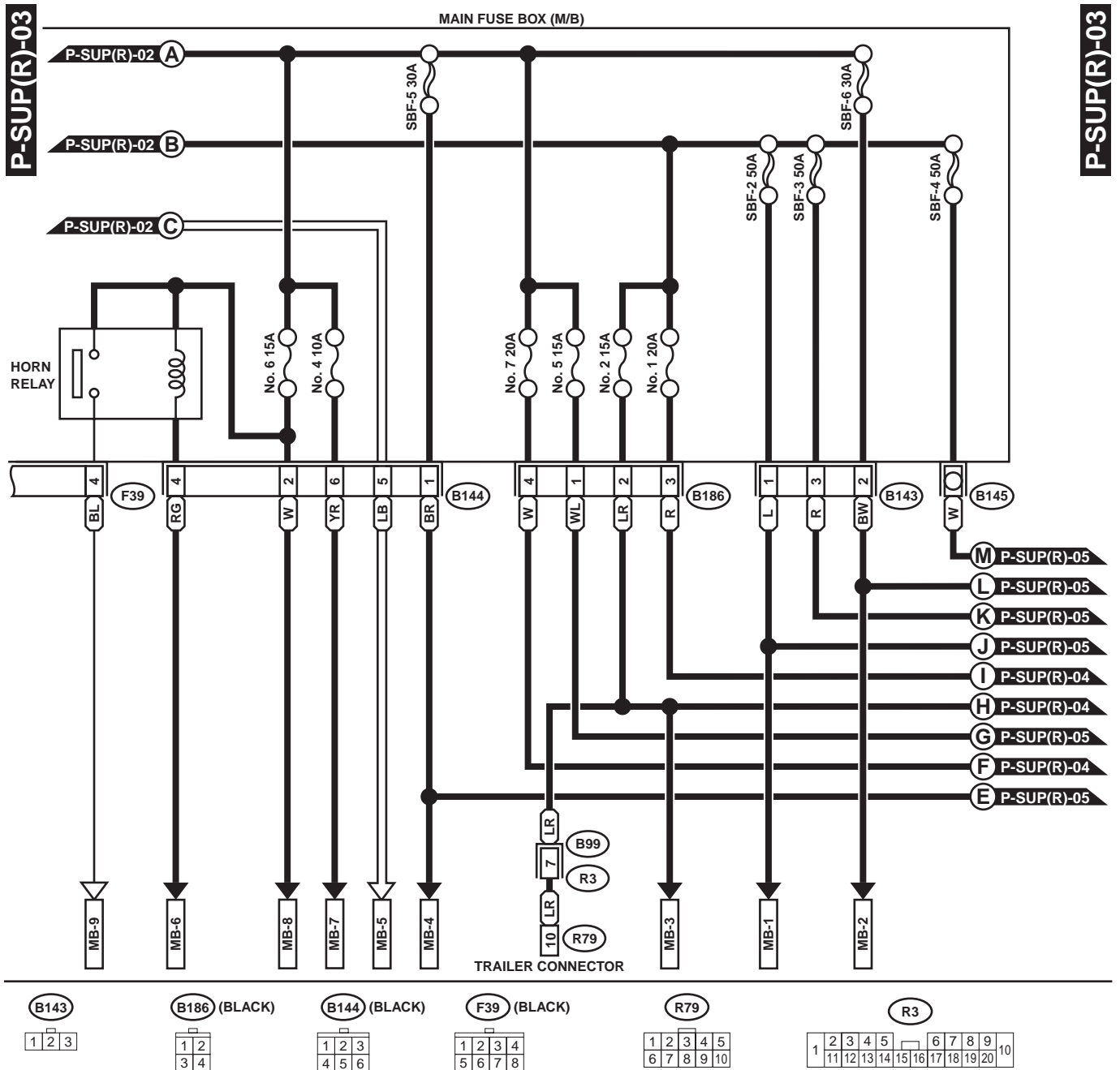
WIRING SYSTEM



WI-00744

POWER SUPPLY ROUTING

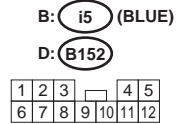
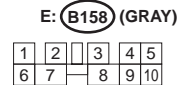
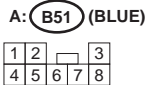
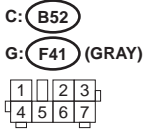
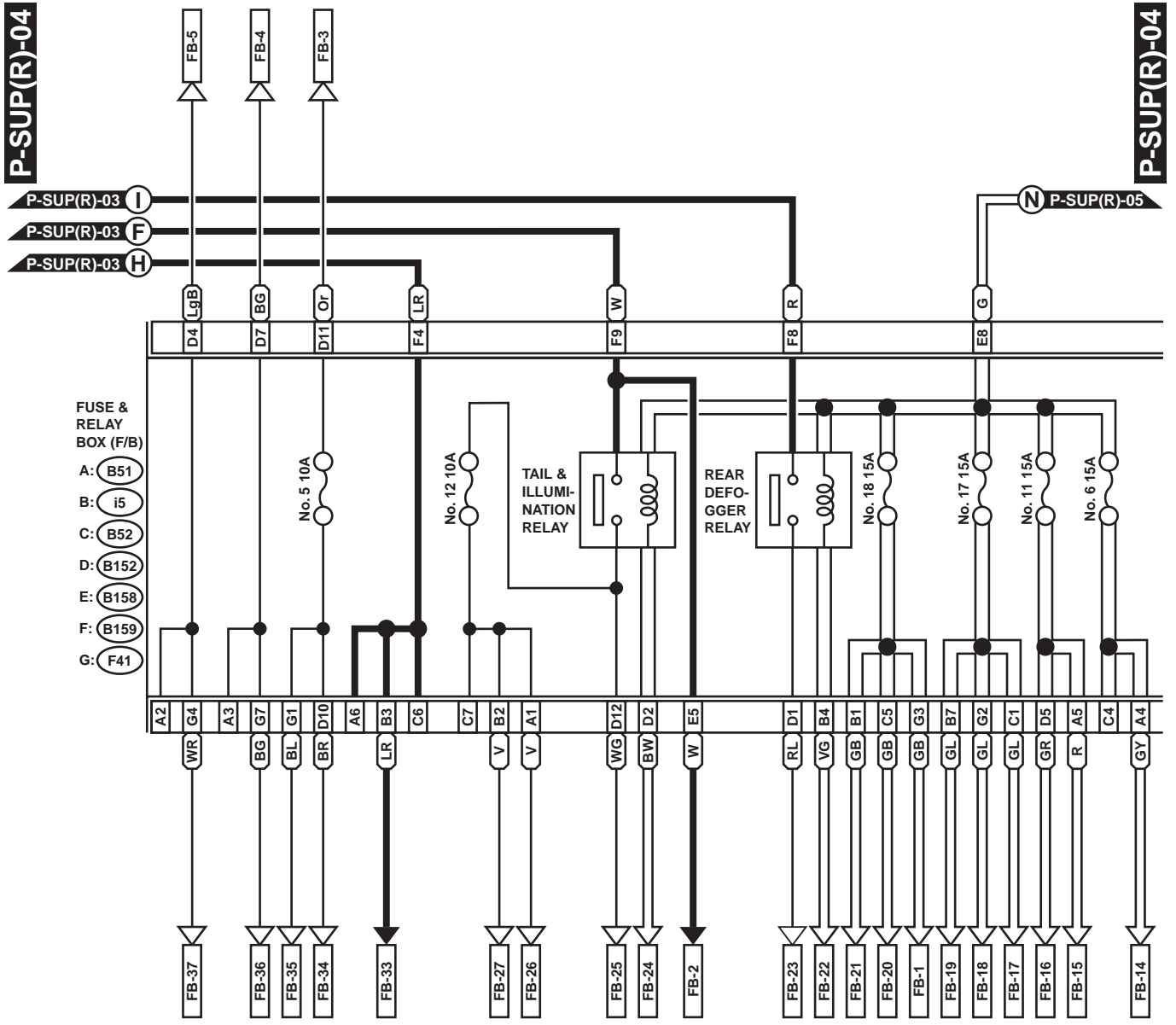
WIRING SYSTEM



WI-00745

POWER SUPPLY ROUTING

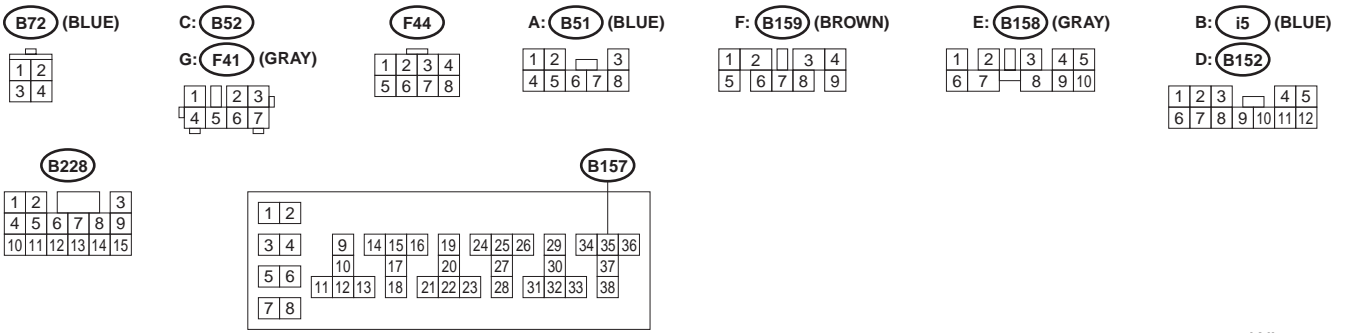
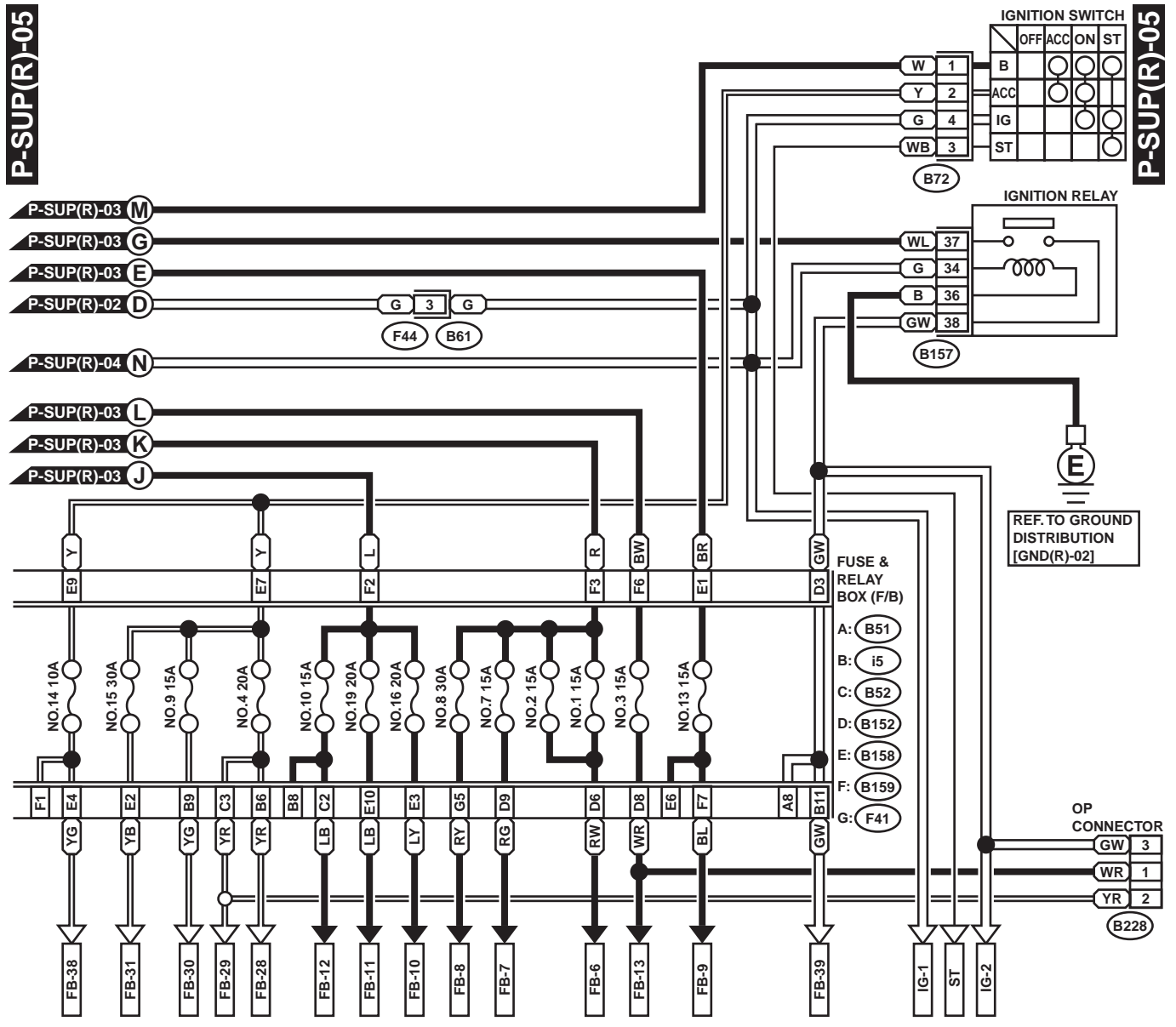
WIRING SYSTEM



WI-00746

POWER SUPPLY ROUTING

WIRING SYSTEM



WI-00747

POWER SUPPLY ROUTING

WIRING SYSTEM

No.	Load
MB-1	Fuse (Relay block)
MB-2	Power window circuit breaker
MB-3	Keyless entry control module Key switch illumination light Luggage room light (Wagon) Trunk room light (Sedan) Room light Spot light Step light LH Step light RH
MB-4	Data link connector Engine control module Immobilizer control module Main relay
MB-5	Diode (With rear fog light) Lighting switch OP connector
MB-6	Cruise control sub switch Horn switch
MB-7	Transmission control module
MB-8	Hazard switch Keyless entry control module Key warning switch
MB-9	Horn
MB-10	Headlight LH
MB-11	Combination meter Headlight RH
MB-12	A/C relay holder
SBF-7	ABS control module VDC hydraulic module
SBF-8	Fuse (Relay block)
ALT	Combination meter
IG-1	Seat belt timer
IG-2	Check connector Vehicle speed sensor (MT)
ST	Engine control module Inhibitor switch (AT) Starter motor (MT)
FB-1	ABS control module Main fan relay (4-cylinder engine model) Main fan relay-1 (6-cylinder engine model) Main fan relay-2 (6-cylinder engine model) VDC module
FB-2	Parking switch
FB-3	Parking switch
FB-4	Combination meter Hazard switch Rear turn signal light LH Side turn signal light LH Trailer connector Turn signal switch
FB-5	Combination meter Hazard switch Rear turn signal light RH Trailer connector Turn signal switch

No.	Load
FB-6	Blower motor relay
FB-7	Front fog light relay
FB-8	ABS control module VDC hydraulic module
FB-9	Fuel pump relay
FB-10	Stop light switch
FB-11	Wiper deicer relay
FB-12	Rear fog light relay
FB-13	Keyless entry control module
FB-14	Airbag control module
FB-15	Airbag control module
FB-16	Engine control module Fuel pump relay Ignition coil (6-cylinder engine and turbo engine model) Ignition coil and ignitor (4-cylinder non-turbo engine model) Immobilizer control module Transmission control module
FB-17	Blower motor relay Fan relay (6-cylinder engine model) FRESH/RECIRC actuator Mode actuator
FB-18	A/C pressure switch A/C relay Sub fan relay (4-cylinder engine model) Sub fan relay-1 (6-cylinder engine model) Sub fan relay-2 (6-cylinder engine model)
FB-19	Auto A/C control module Blower module (Auto A/C) Mode control panel (Manual A/C)
FB-20	Back-up light switch (MT) Cruise control module Inhibitor switch (AT) Muffler actuator control module Power window relay Wiper deicer relay Wiper deicer timer
FB-21	Cruise control main switch
FB-22	Engine control module Rear defogger switch
FB-23	Rear defogger Rear defogger condenser
FB-24	Engine control module Lighting switch OP connector
FB-25	Headlight leveler LH Headlight leveler RH Headlight leveling switch Parking switch
FB-26	Front fog light relay Illumination control module Illumination light OP connector Rear fog light relay

POWER SUPPLY ROUTING

WIRING SYSTEM

No.	Load
FB-27	Combination meter Front fog light switch Headlight leveling switch Illumination light Rear fog light switch
FB-28	Auto A/C control module Front accessory power supply socket
FB-29	Mirror heater LH Mirror heater RH Remote control rearview mirror switch Seat heater/rear accessory power supply relay Vanity mirror illumination light LH Vanity mirror illumination light RH
FB-30	Radio Radio amplifier
FB-31	Front washer motor Front wiper motor Front wiper & washer switch
FB-33	Auto A/C control module Combination meter Radio
FB-34	License plate light LH License plate light RH Tail light LH Tail light RH Trailer connector
FB-35	Front clearance light LH Front clearance light RH
FB-36	Front turn signal light LH
FB-37	Front turn signal light RH Side turn signal light RH
FB-38	Rear washer motor Rear wiper intermittent module Rear wiper motor
FB-39	Combination meter Hazard switch

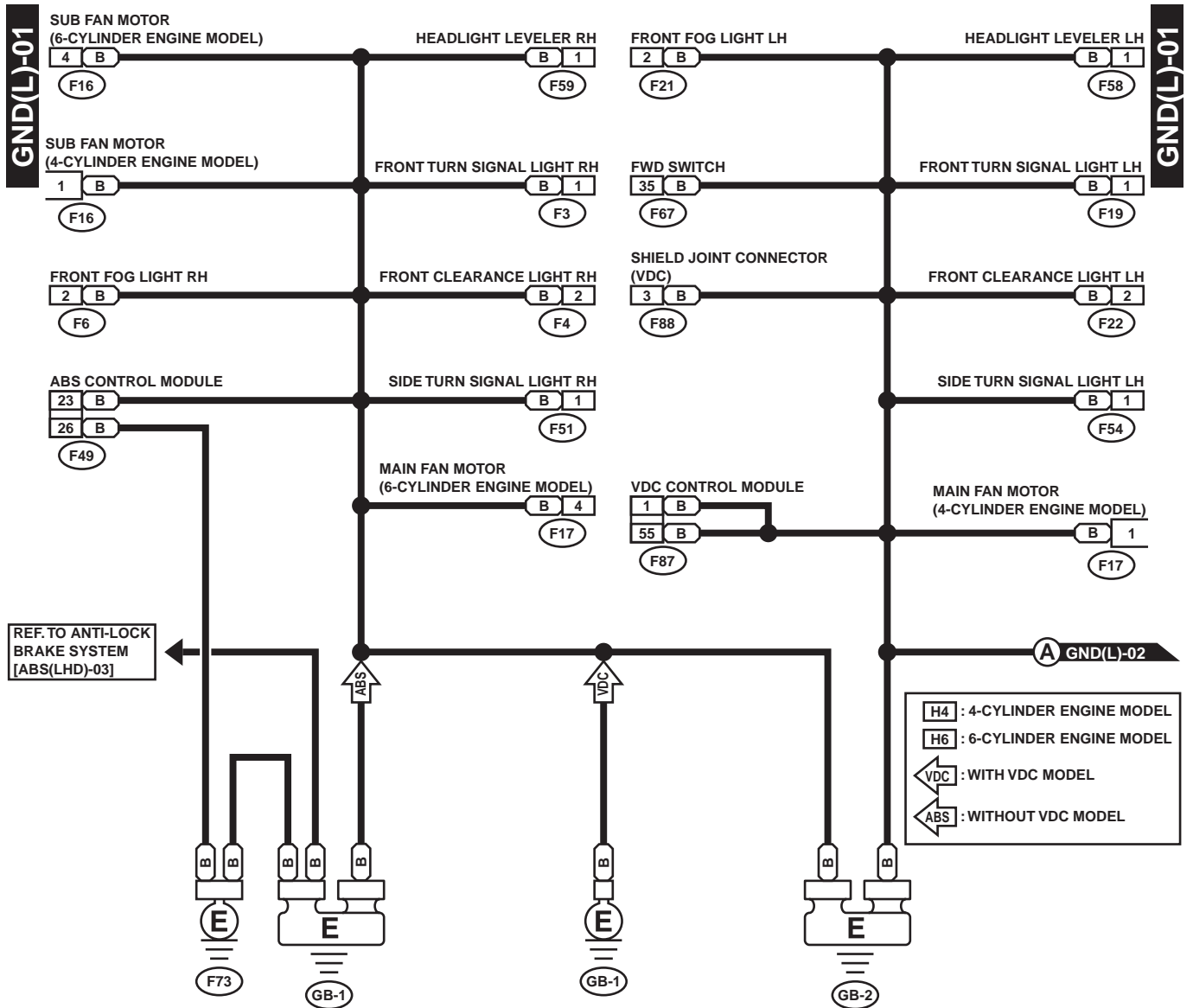
GROUND DISTRIBUTION

WIRING SYSTEM

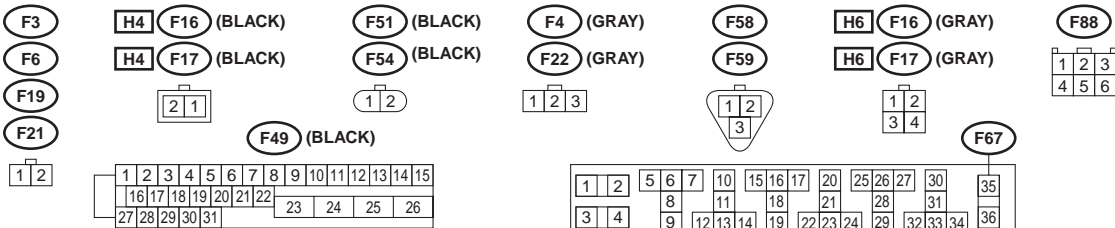
5. Ground Distribution

A: SCHEMATIC

1. LHD MODEL



H4 : 4-CYLINDER ENGINE MODEL
H6 : 6-CYLINDER ENGINE MODEL
VDC : WITH VDC MODEL
ABS : WITHOUT VDC MODEL



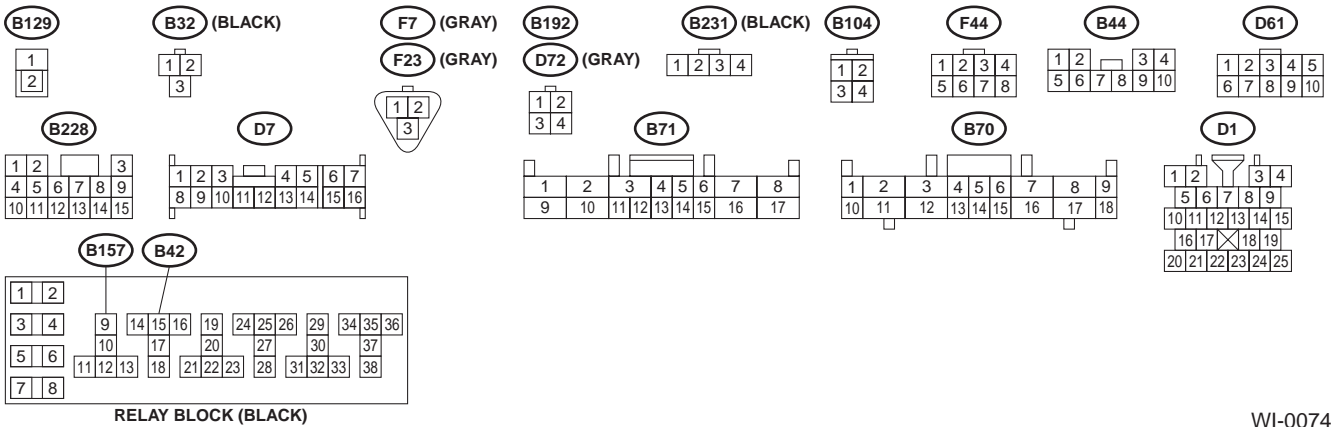
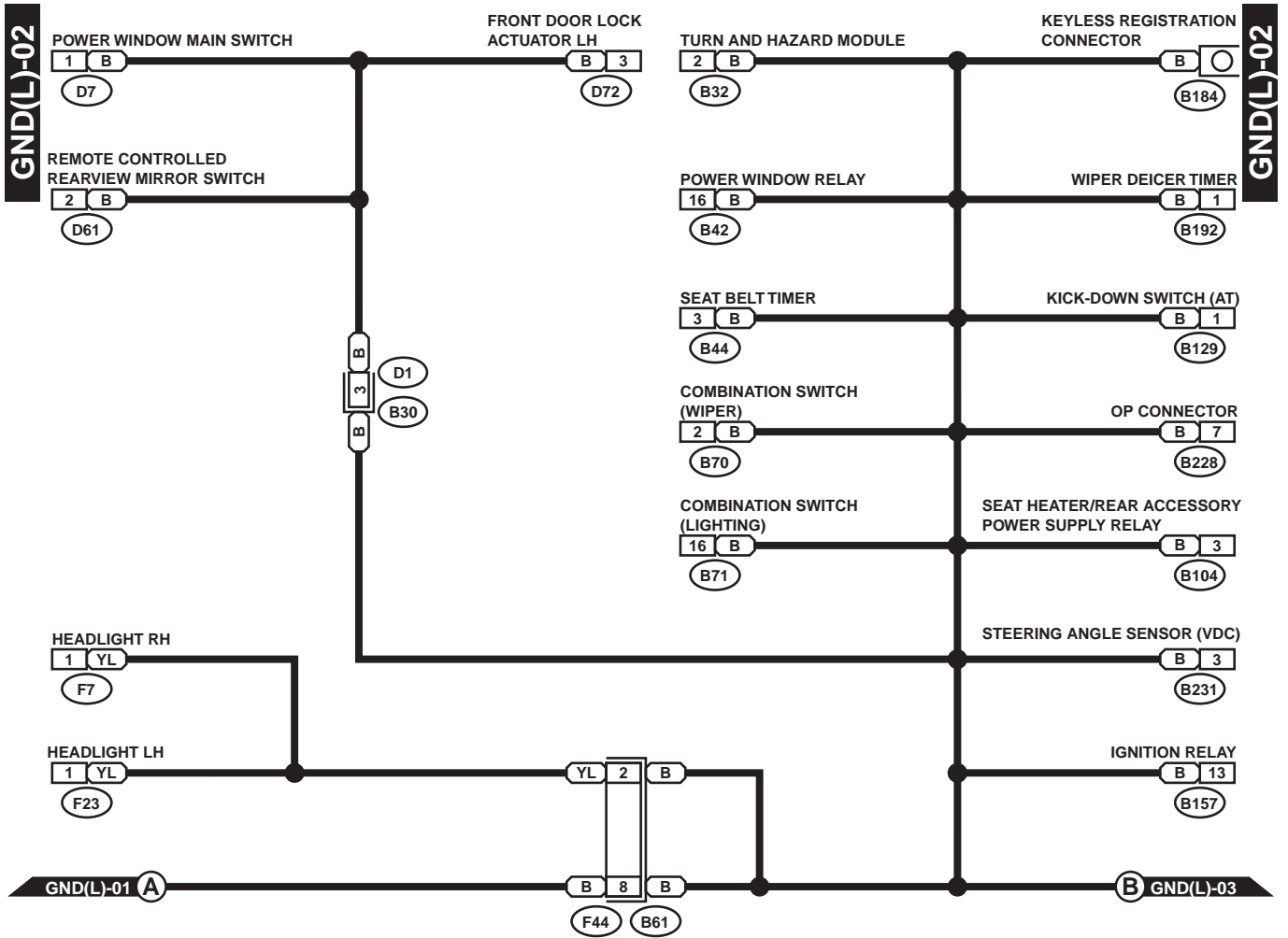
RELAY HOLDER (BLACK)
F87 (BLACK)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

WI-00748

GROUND DISTRIBUTION

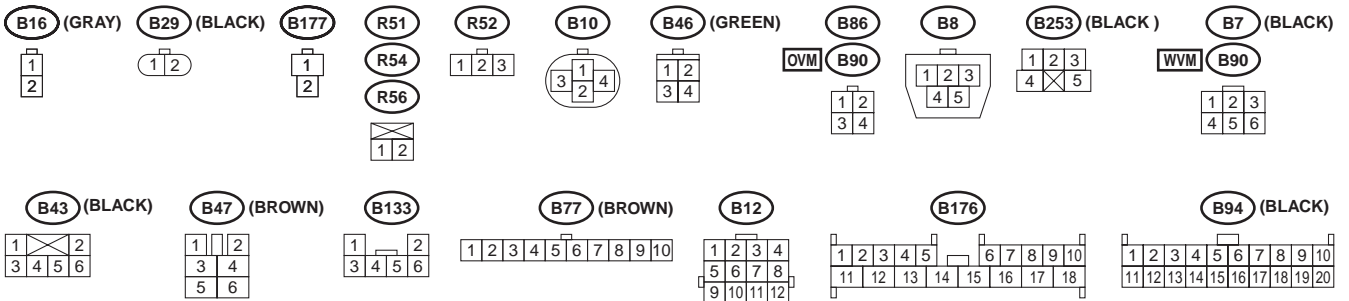
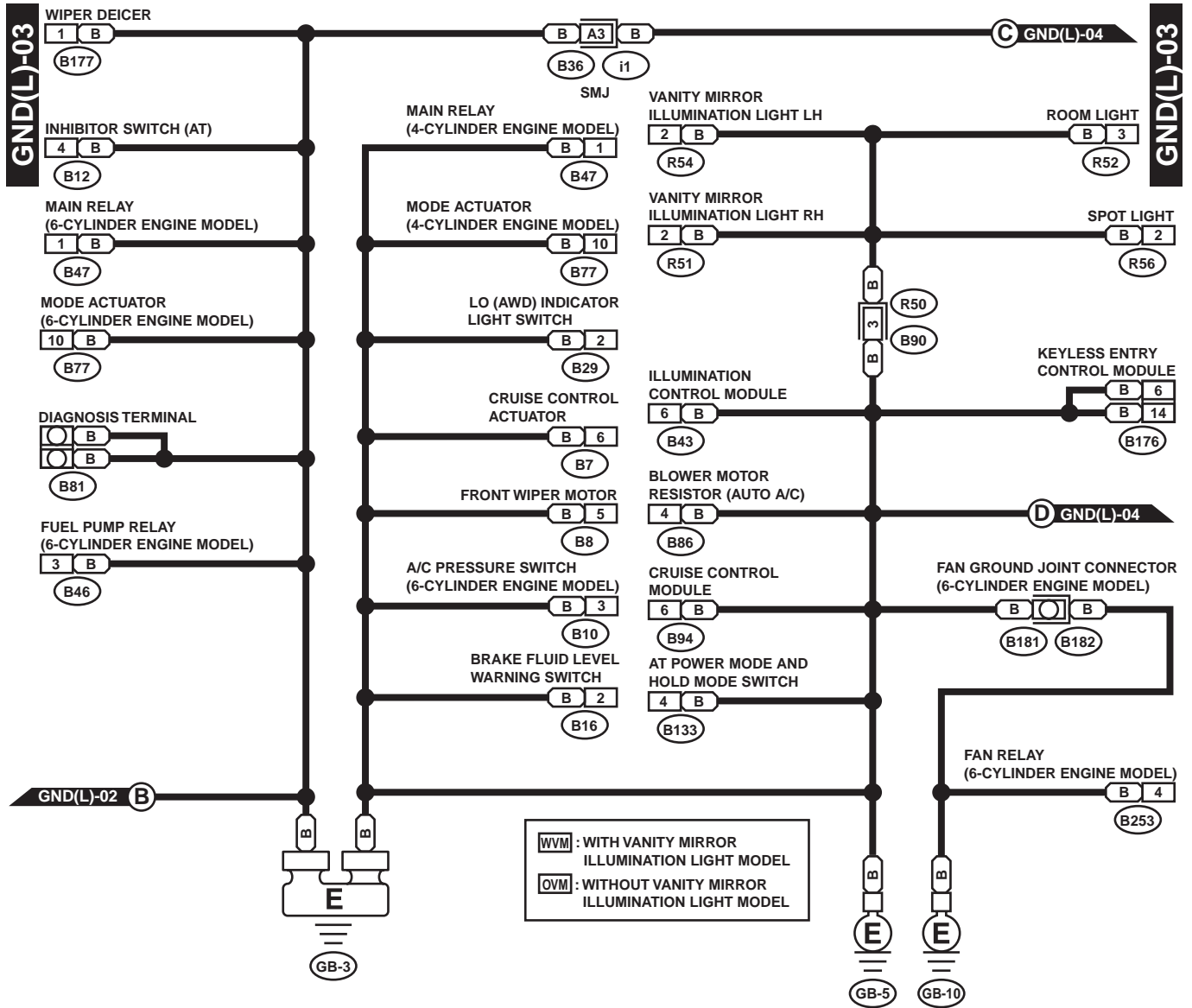
WIRING SYSTEM



WI-00749

GROUND DISTRIBUTION

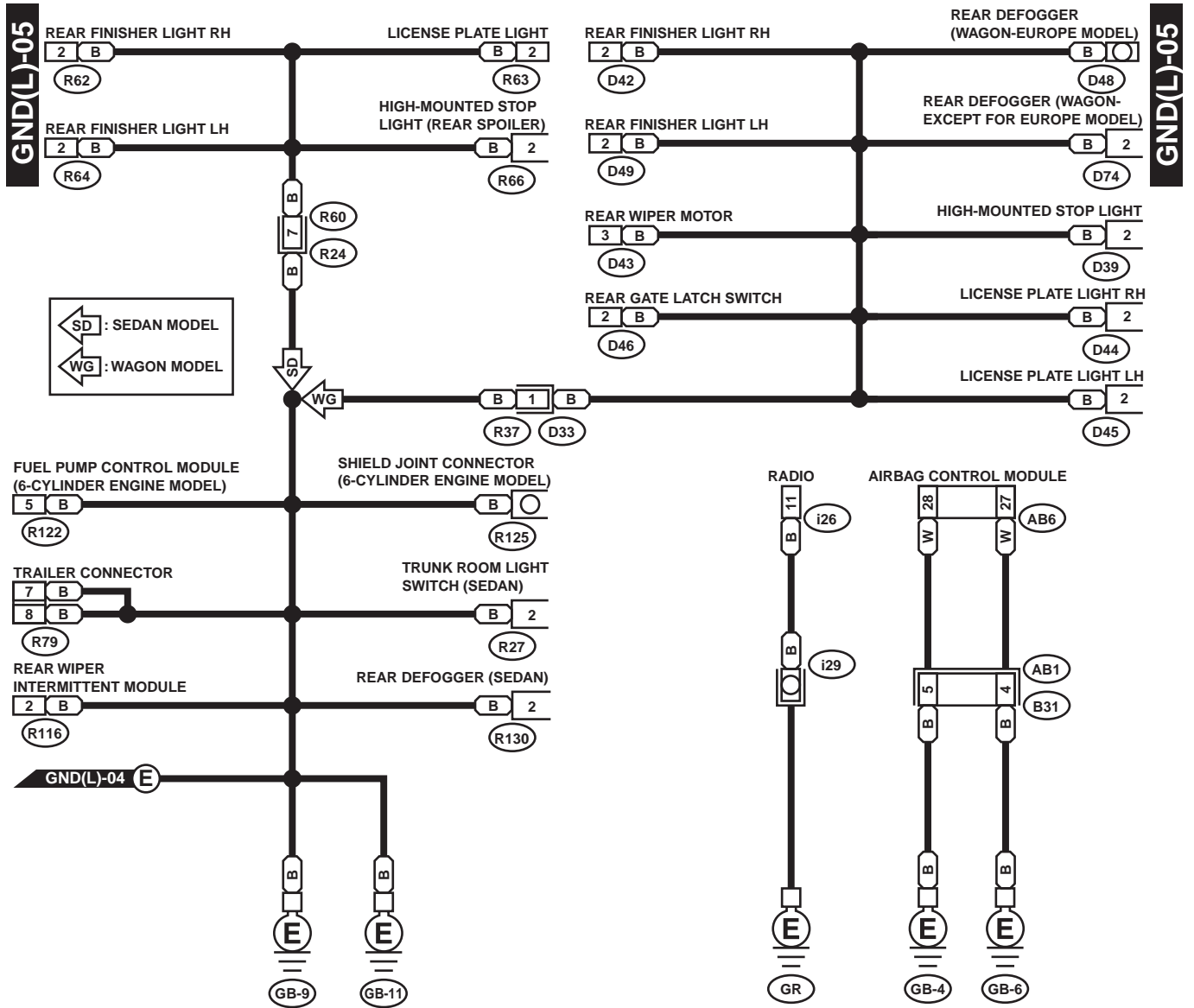
WIRING SYSTEM



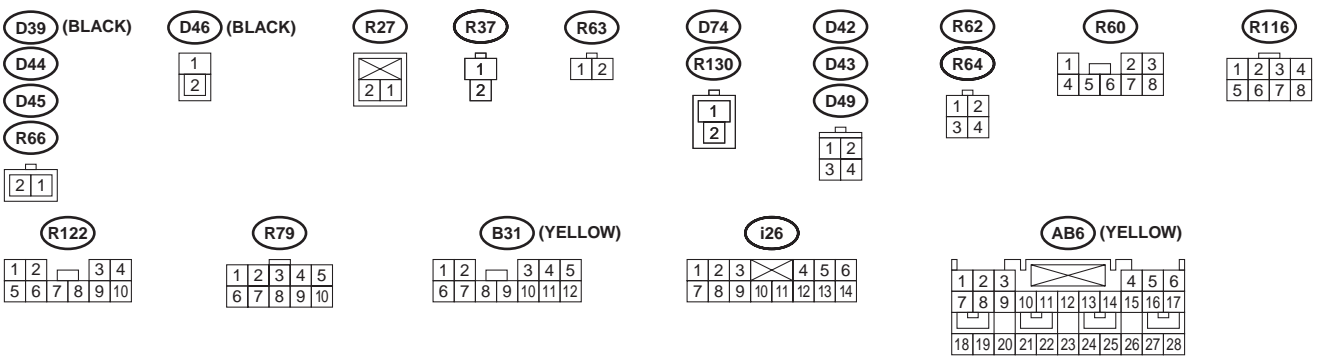
WI-00750

GROUND DISTRIBUTION

WIRING SYSTEM



← SD : SEDAN MODEL
 ← WG : WAGON MODEL



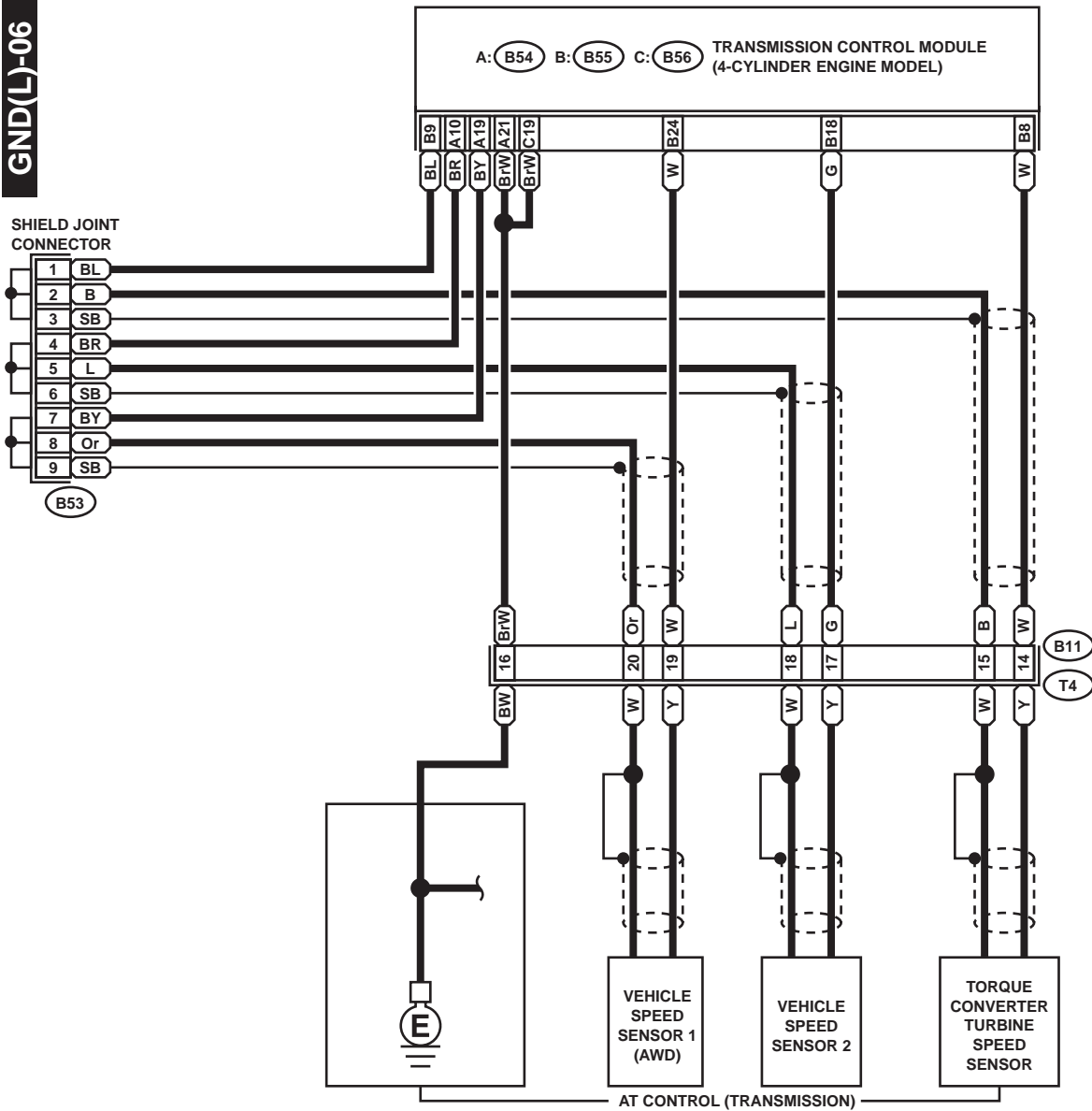
WI-00752

GROUND DISTRIBUTION

WIRING SYSTEM

GND(L)-06

GND(L)-06



B53

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

B11 (BLACK)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

A: B54

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21		22	23	24		

B: B55 (GRAY)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21		22	23	24		

C: B56 (GREEN)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21		22	23	24		

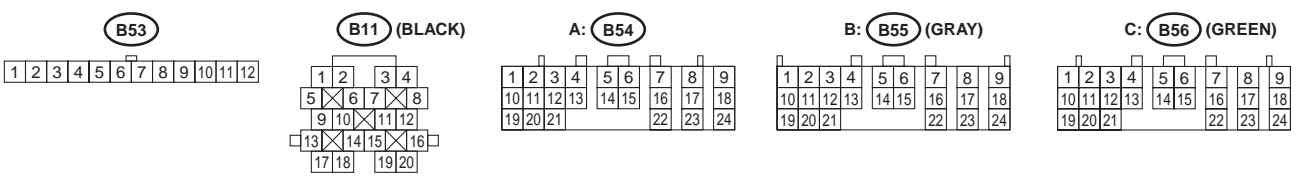
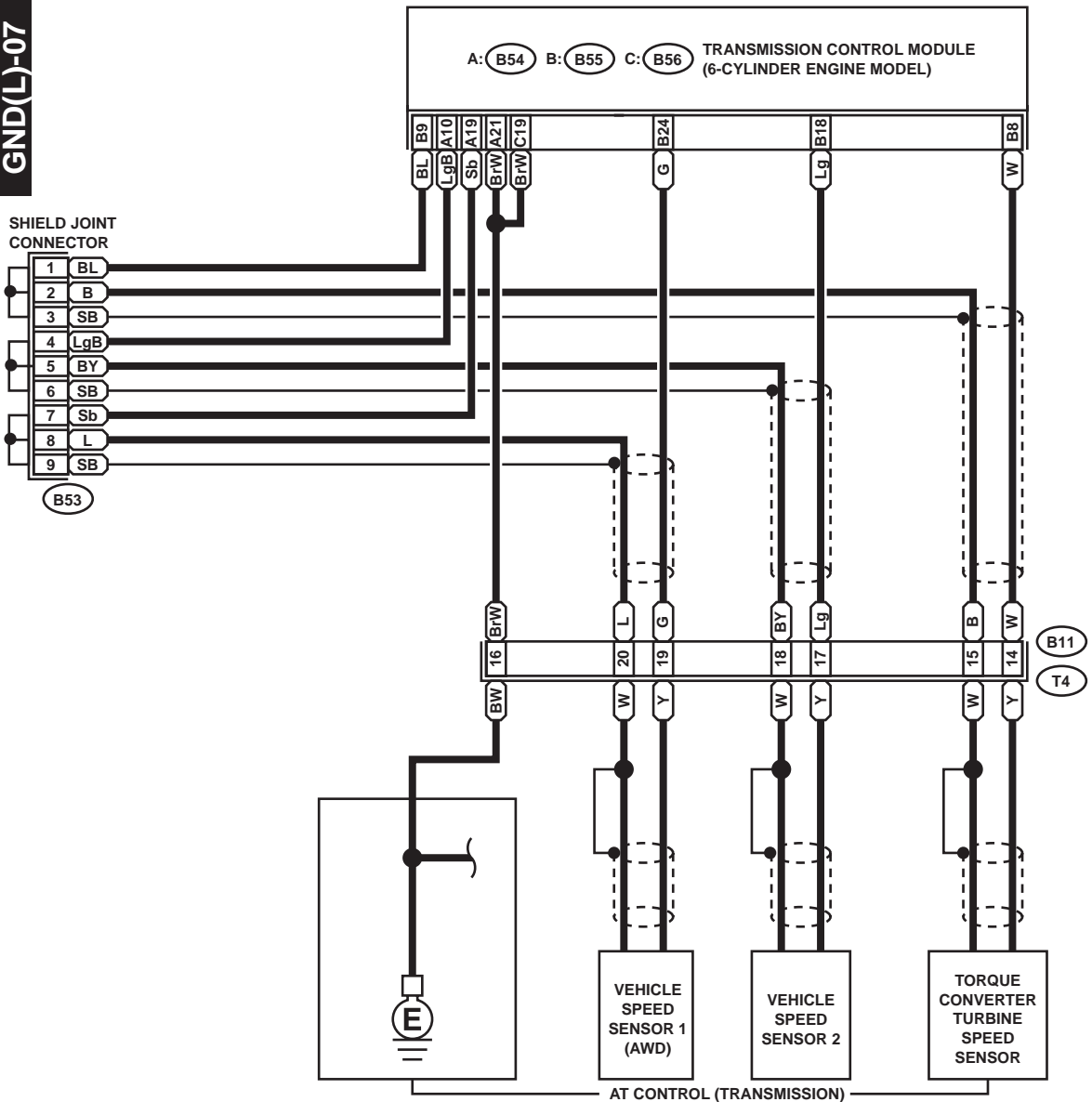
WI-00753

GROUND DISTRIBUTION

WIRING SYSTEM

GND(L)-07

GND(L)-07

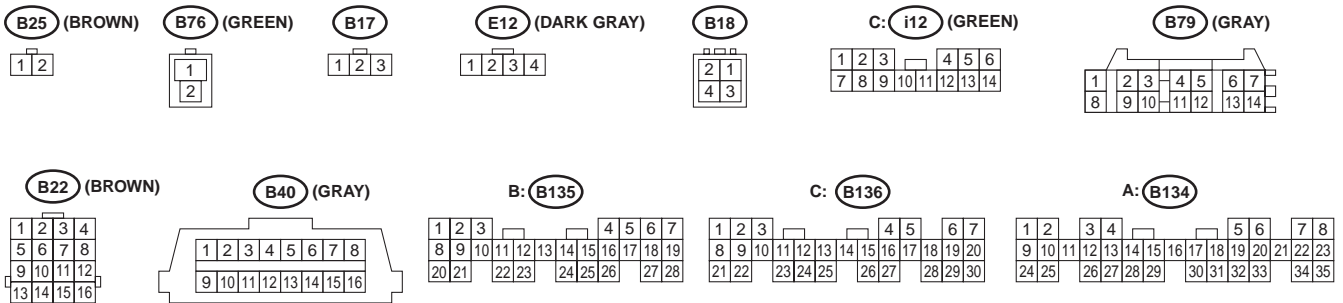
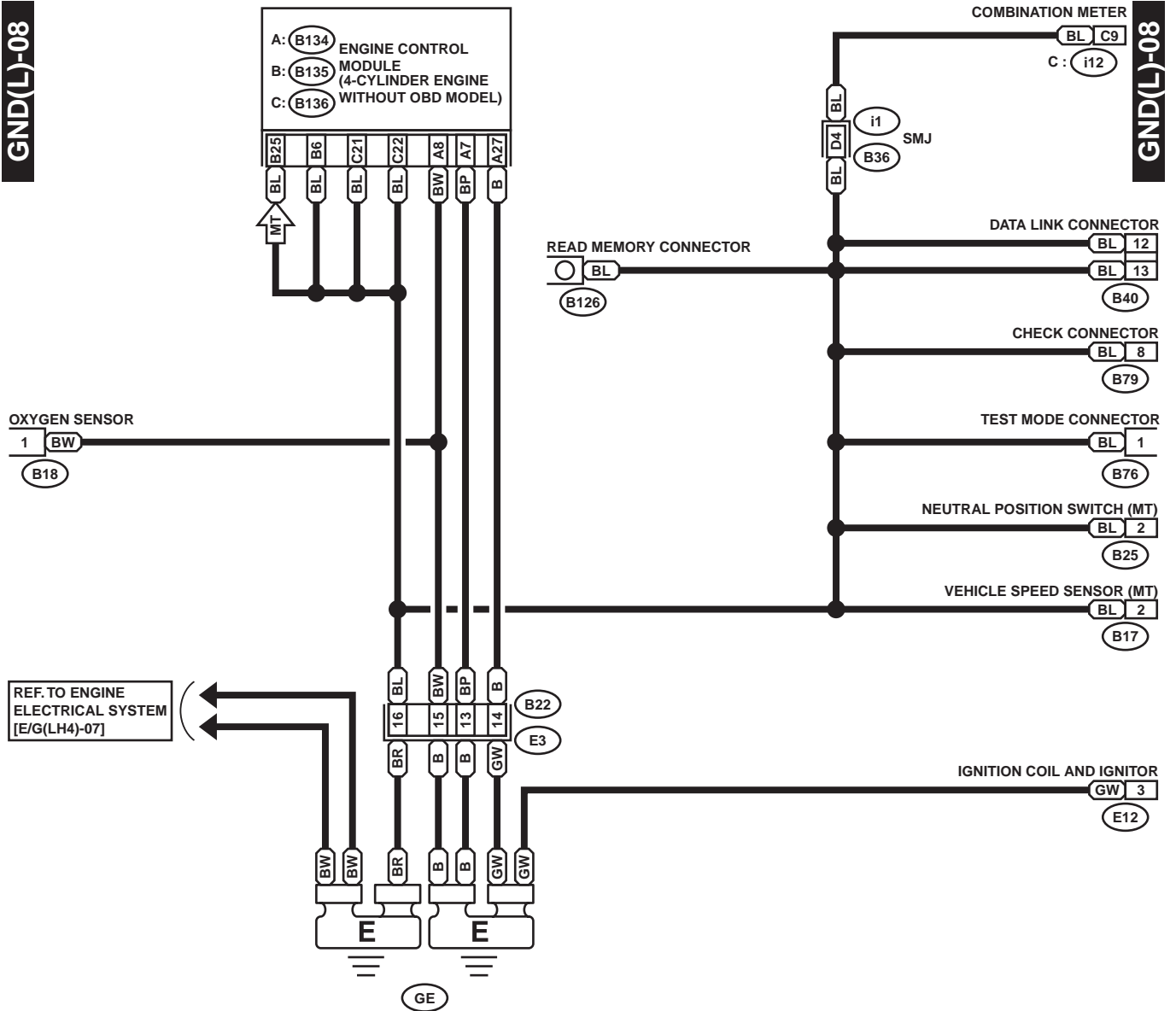


WI-00754

GROUND DISTRIBUTION

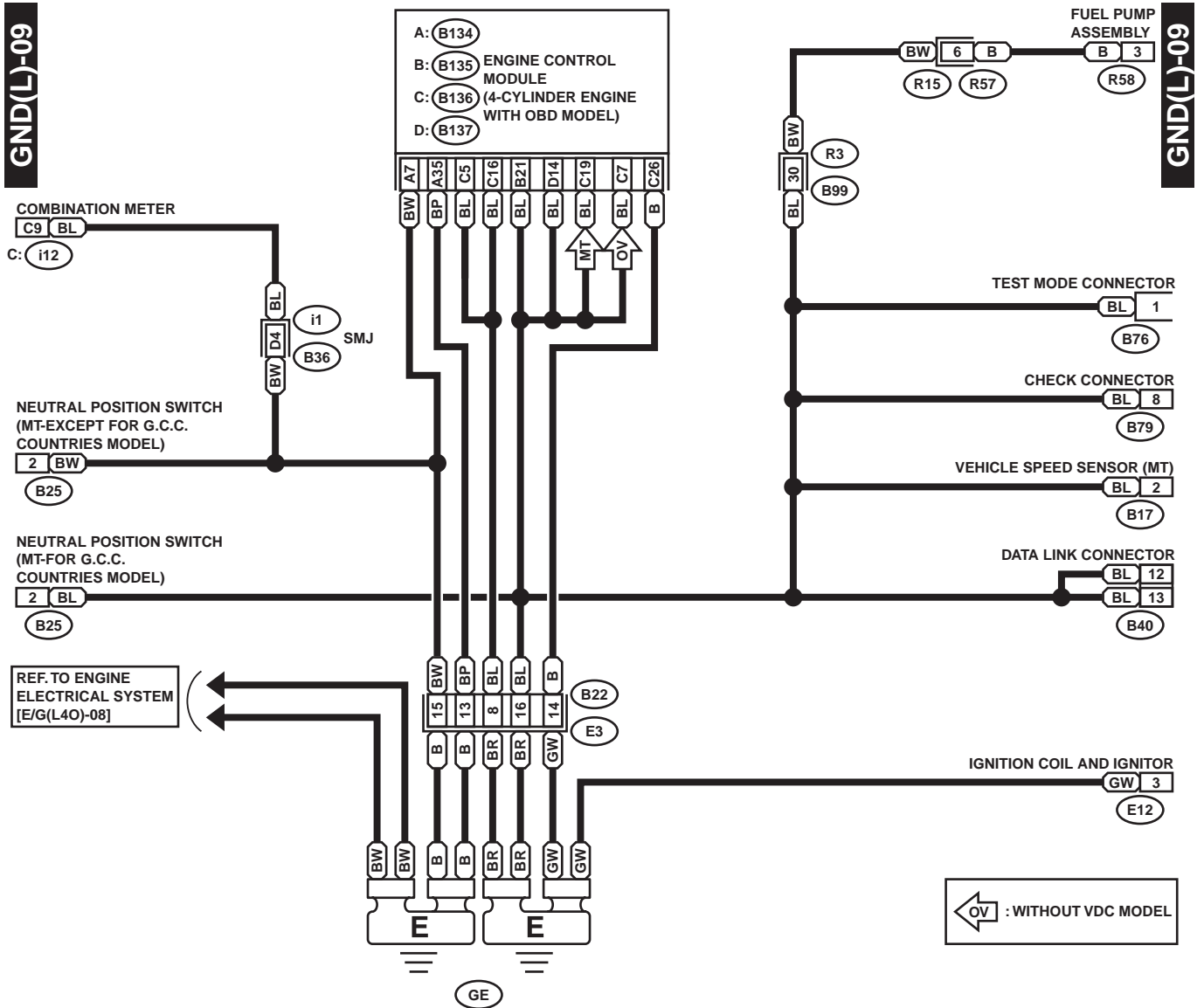
GND(L)-08

GND(L)-08



GROUND DISTRIBUTION

WIRING SYSTEM

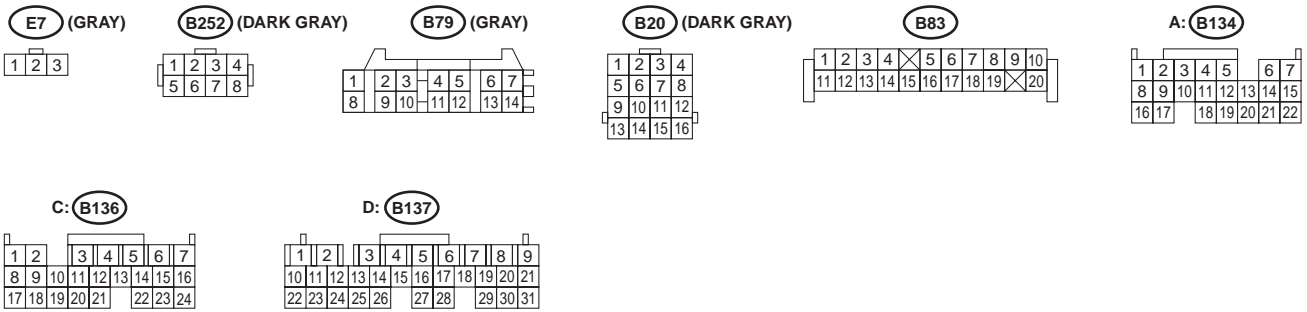
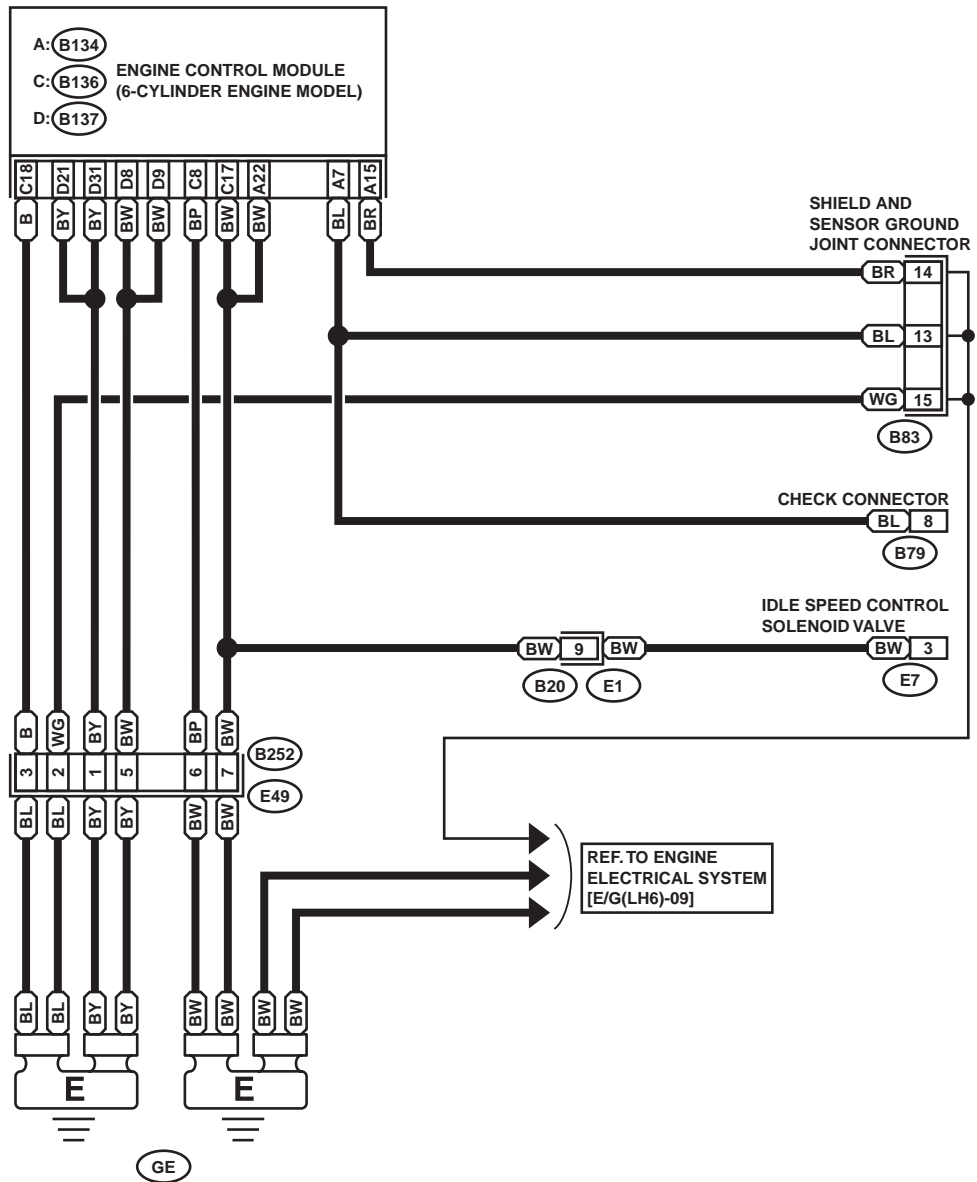


WI-00756

GROUND DISTRIBUTION

GND(L)-10

GND(L)-10

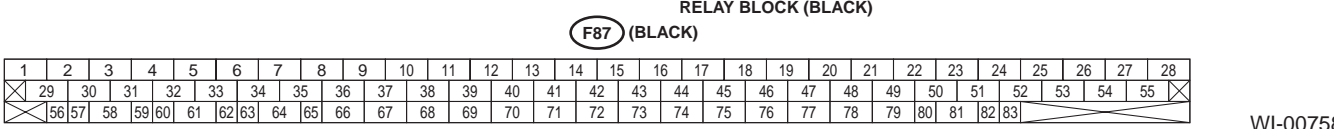
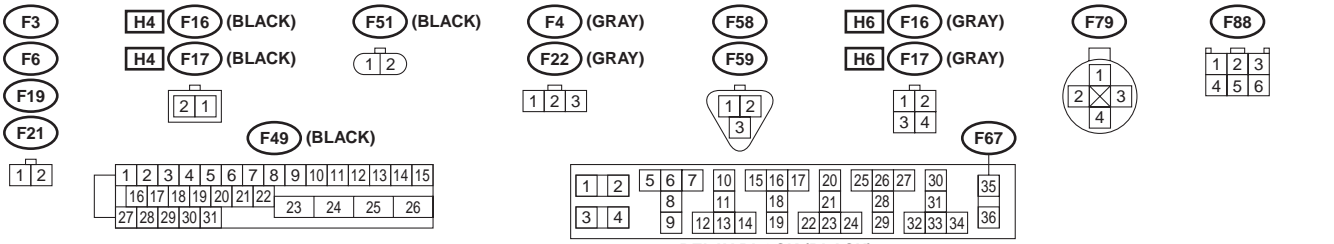
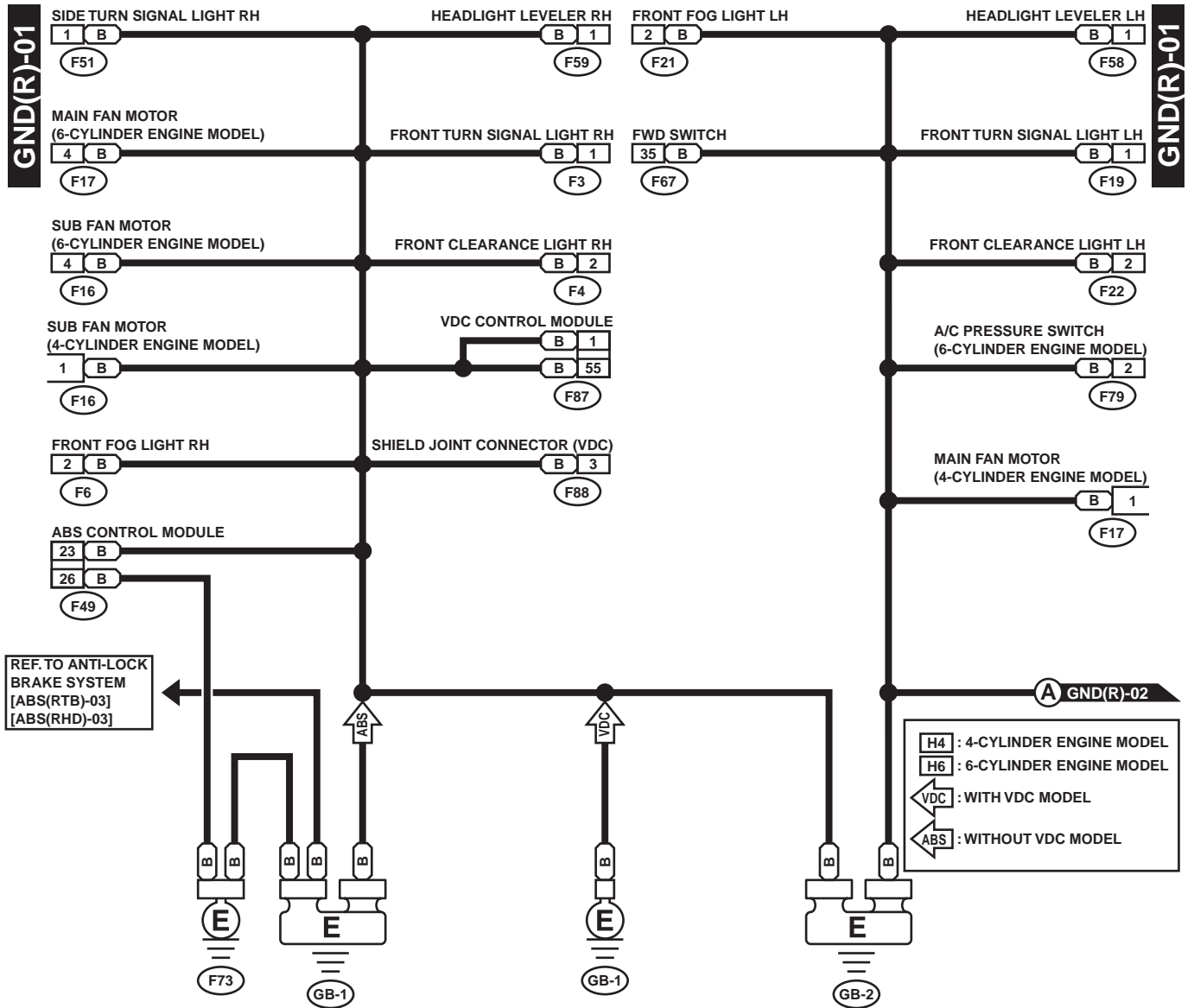


WI-00757

GROUND DISTRIBUTION

WIRING SYSTEM

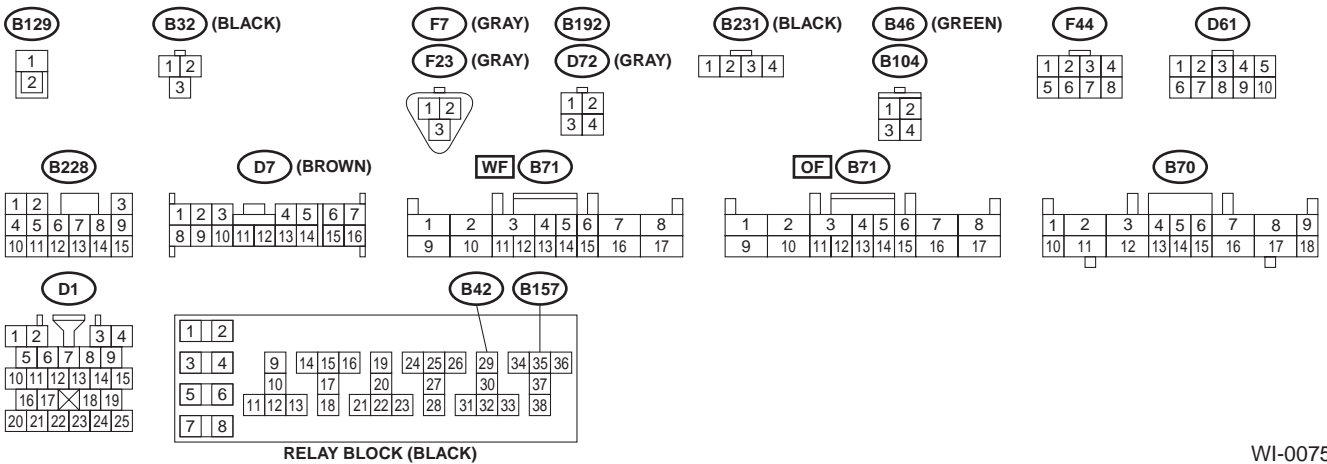
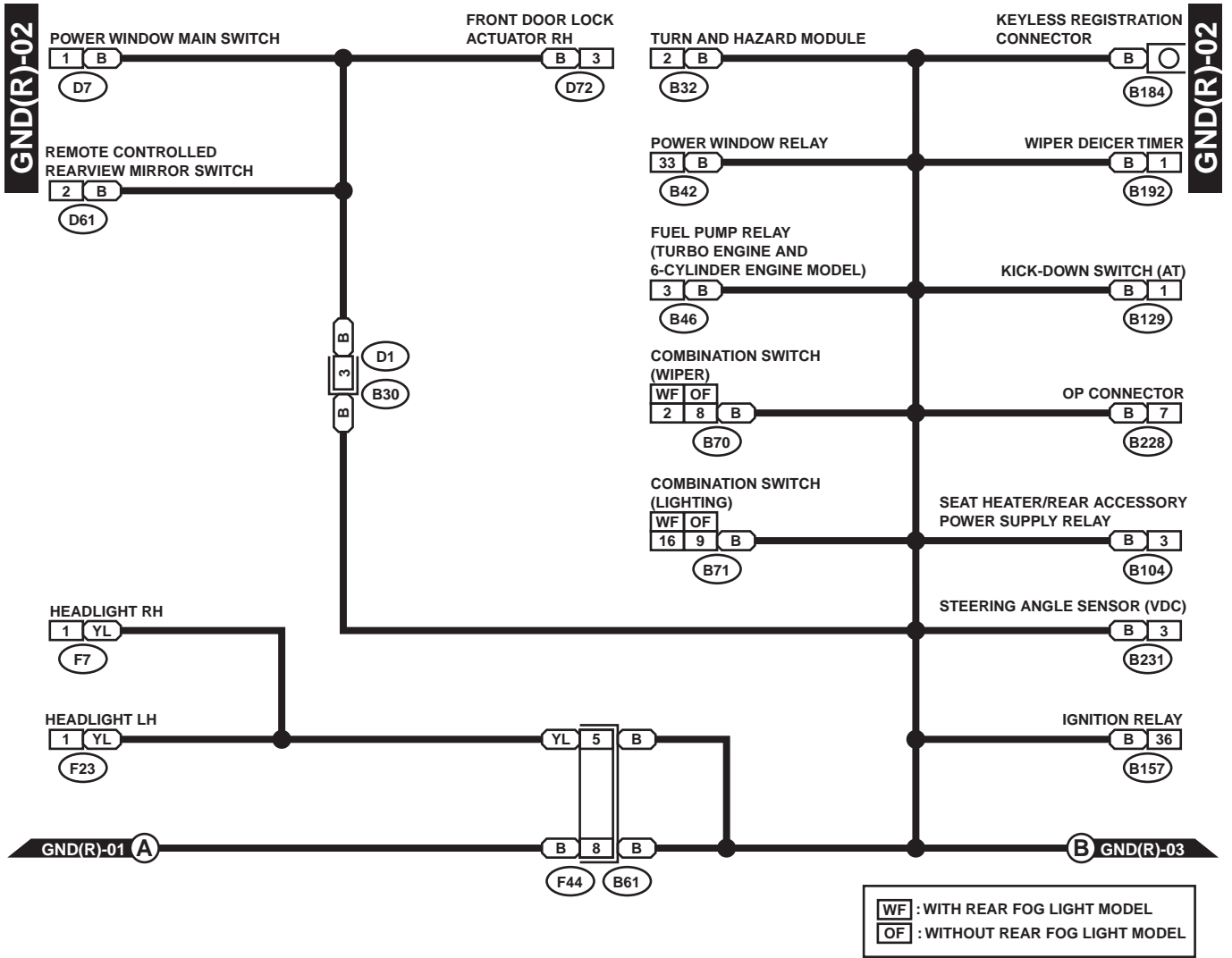
2. RHD MODEL



WI-00758

GROUND DISTRIBUTION

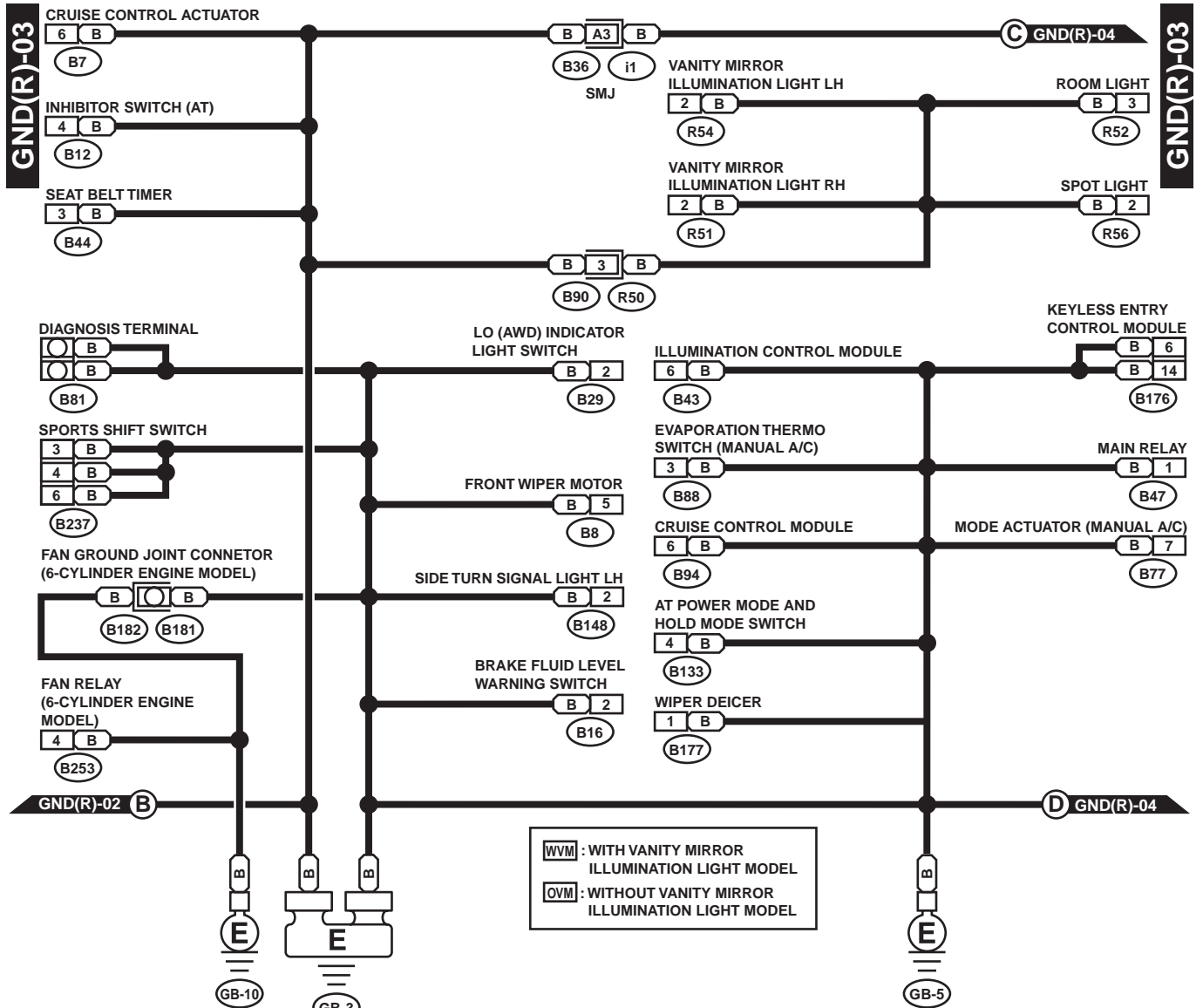
WIRING SYSTEM



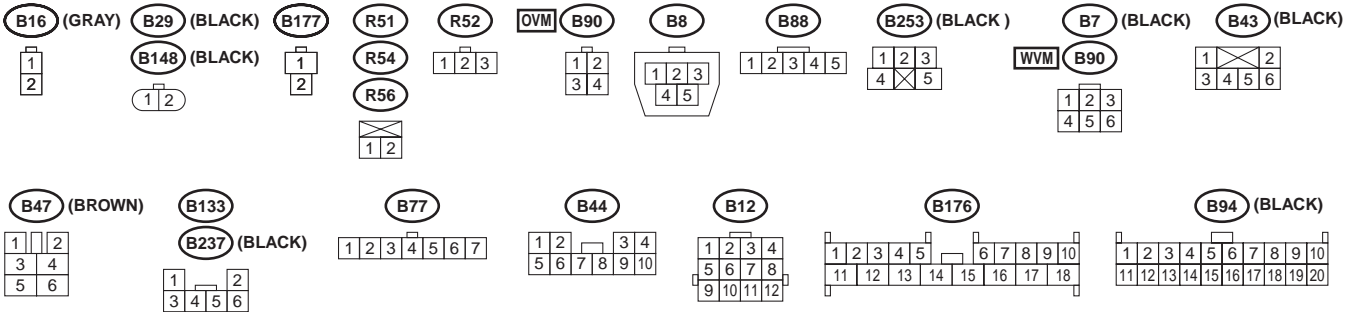
WI-00759

GROUND DISTRIBUTION

WIRING SYSTEM



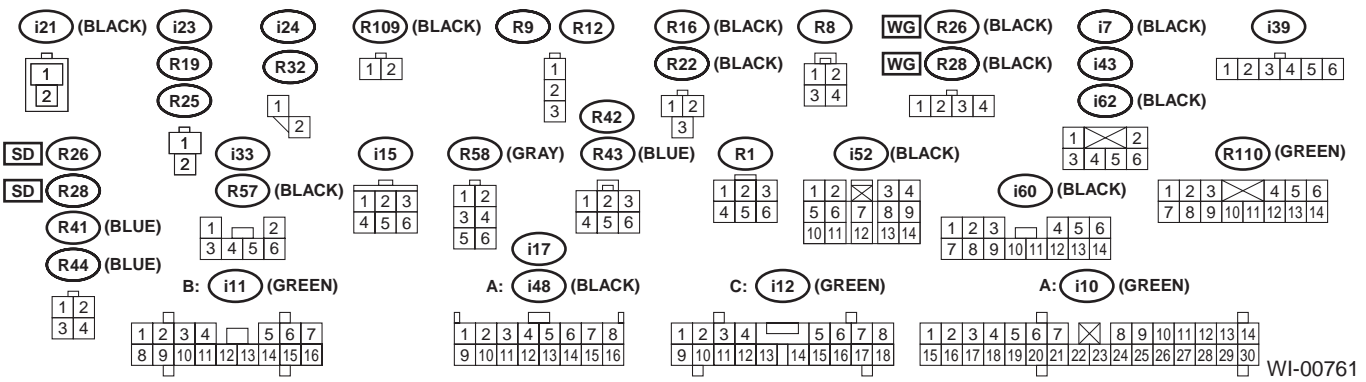
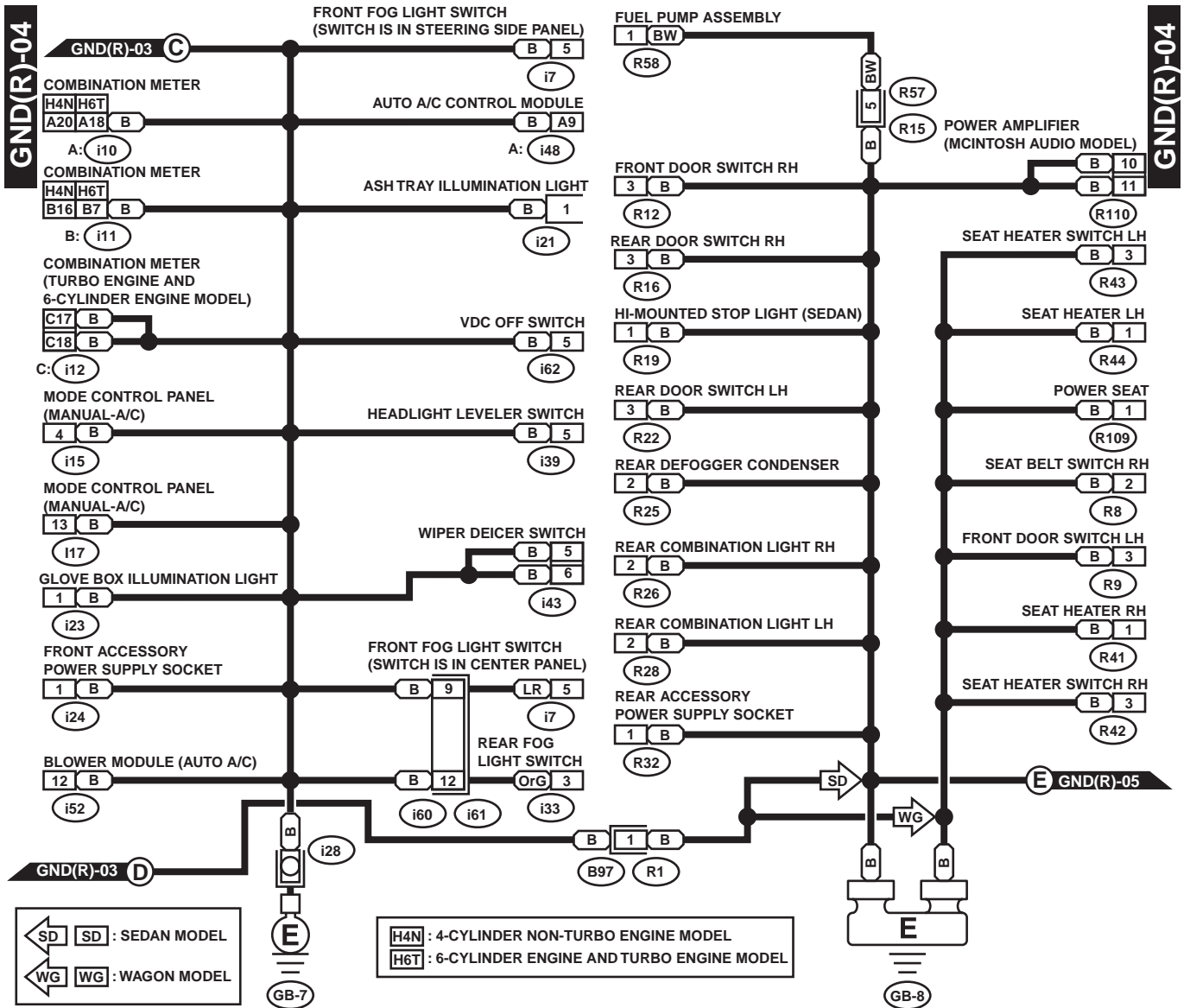
[WVM] : WITH VANITY MIRROR ILLUMINATION LIGHT MODEL
[OVM] : WITHOUT VANITY MIRROR ILLUMINATION LIGHT MODEL



WI-00760

GROUND DISTRIBUTION

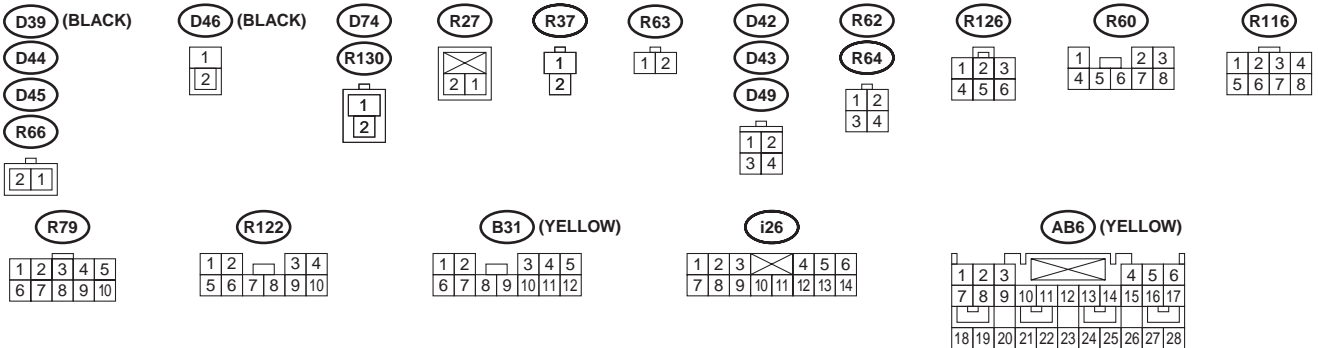
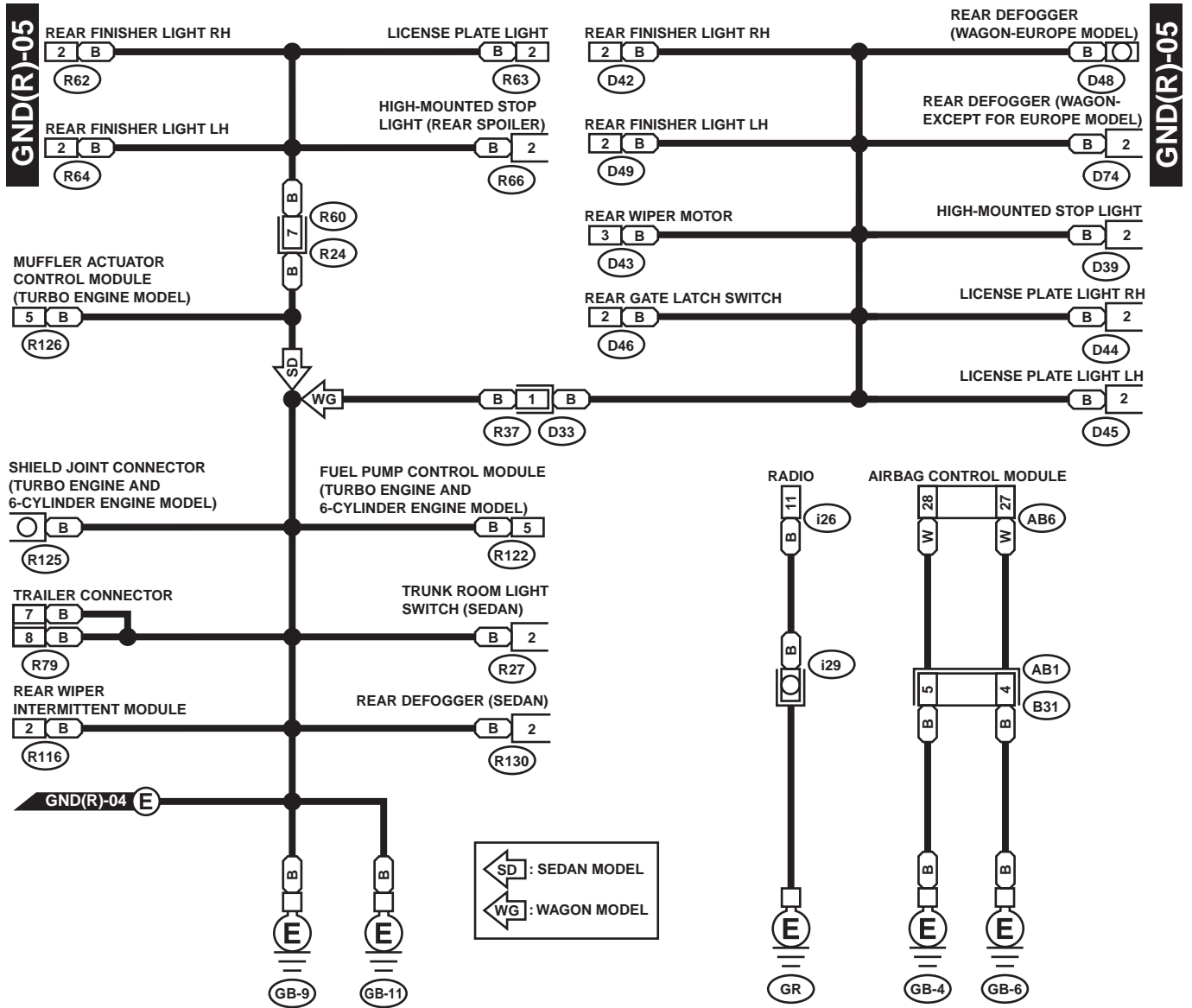
WIRING SYSTEM



WI-00761

GROUND DISTRIBUTION

WIRING SYSTEM



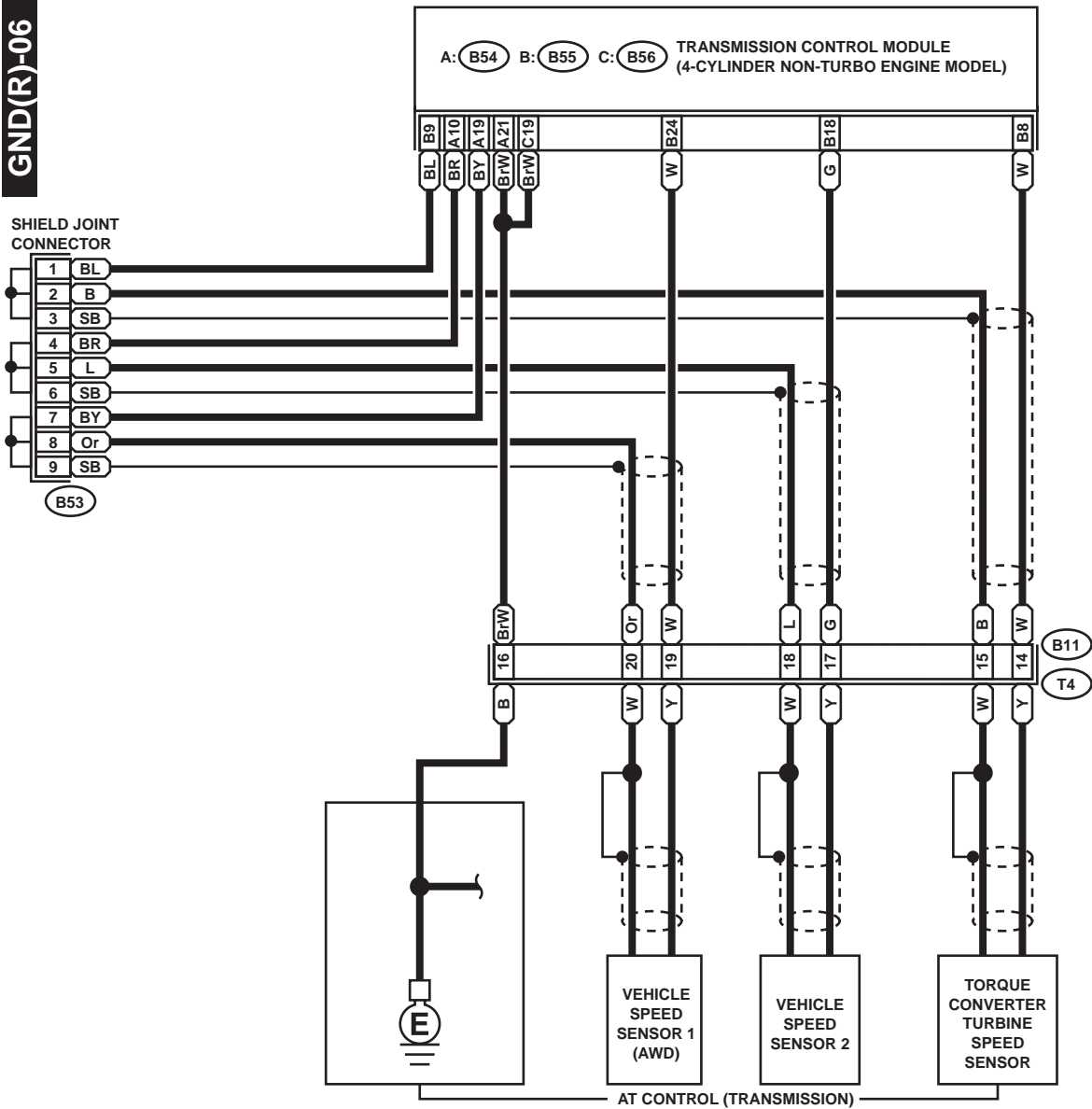
WI-00762

GROUND DISTRIBUTION

WIRING SYSTEM

GND(R)-06

GND(R)-06



B53

1	2	3	4	5	6	7	8	9	10	11	12
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B11 (BLACK)

1	2	3	4			
5	X	6	X	7	X	8
9	10	X	11	12		
13	X	14	X	15	X	16
17	18	19	20			

A: B54

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24			

B: B55 (GRAY)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24			

C: B56 (GREEN)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24			

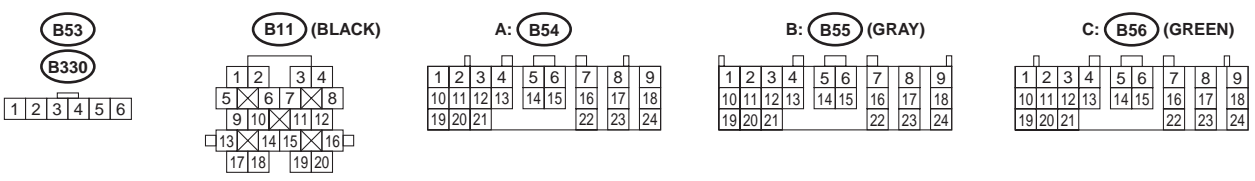
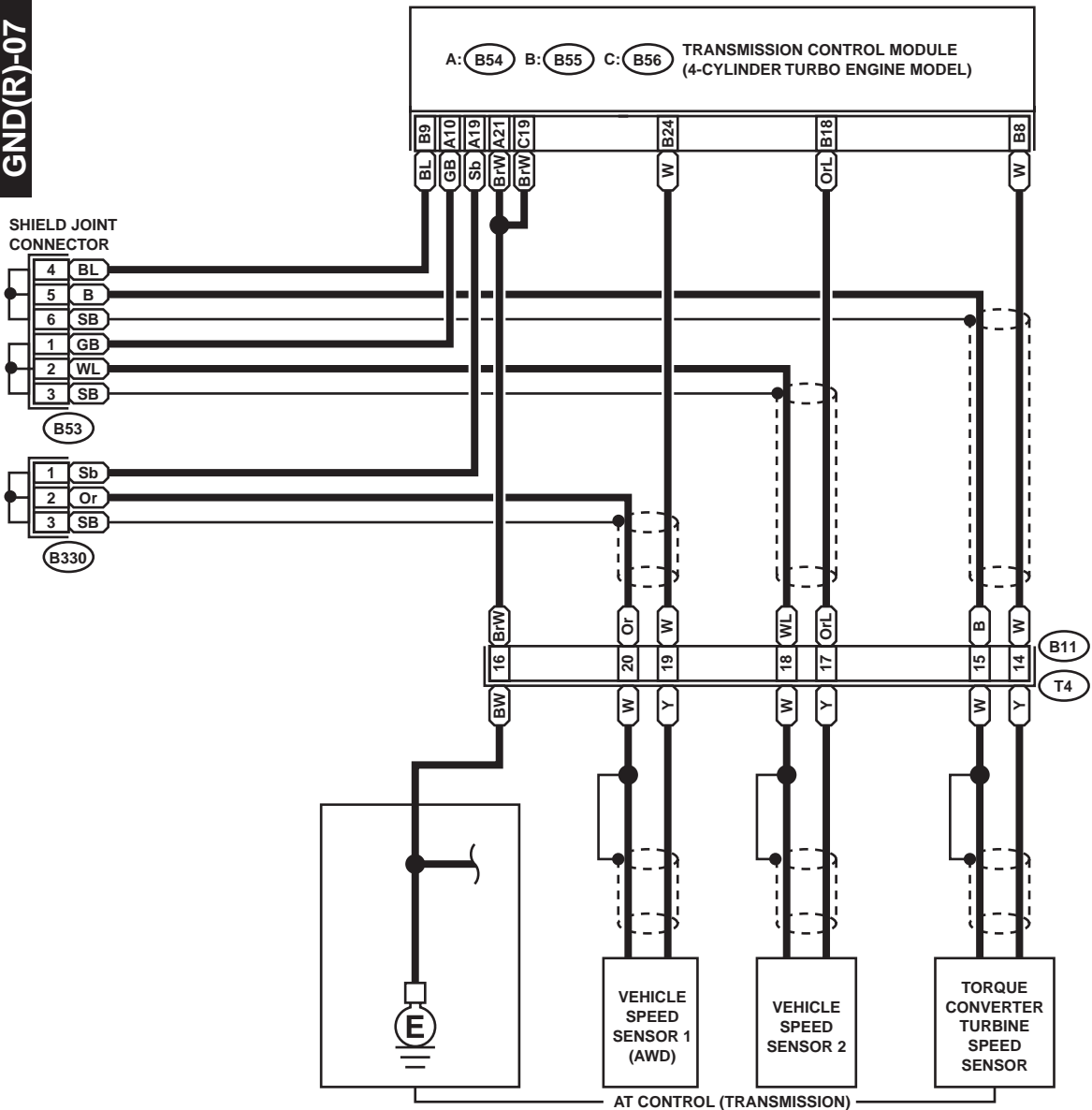
WI-00763

GROUND DISTRIBUTION

WIRING SYSTEM

GND(R)-07

GND(R)-07



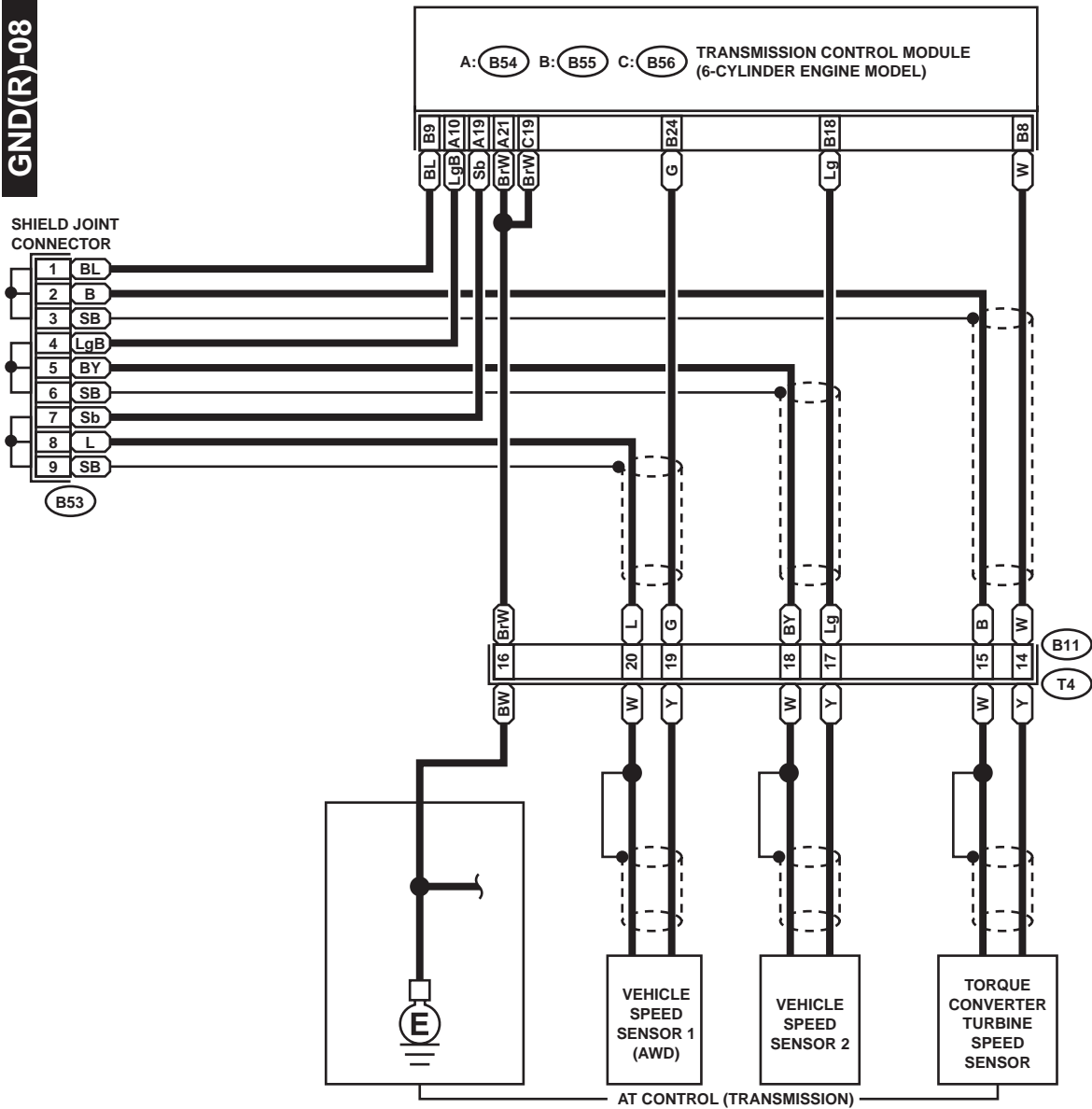
WI-00764

GROUND DISTRIBUTION

WIRING SYSTEM

GND(R)-08

GND(R)-08



B53

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

B11 (BLACK)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

A: B54

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21		22	23	24		

B: B55 (GRAY)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21		22	23	24		

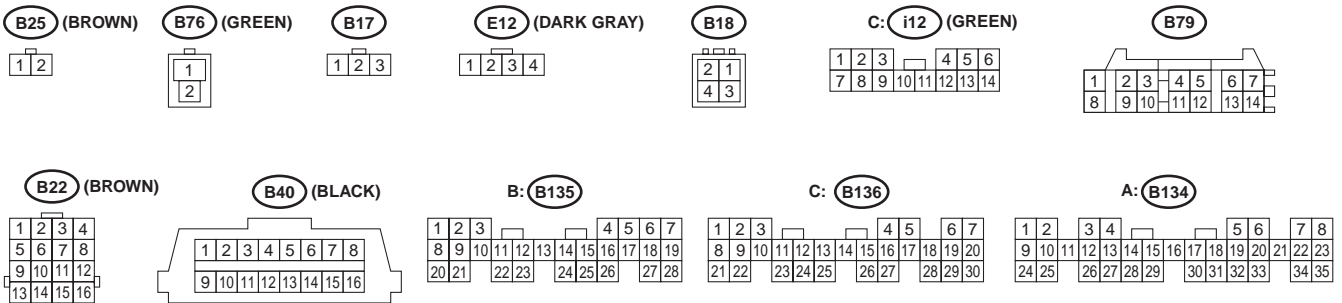
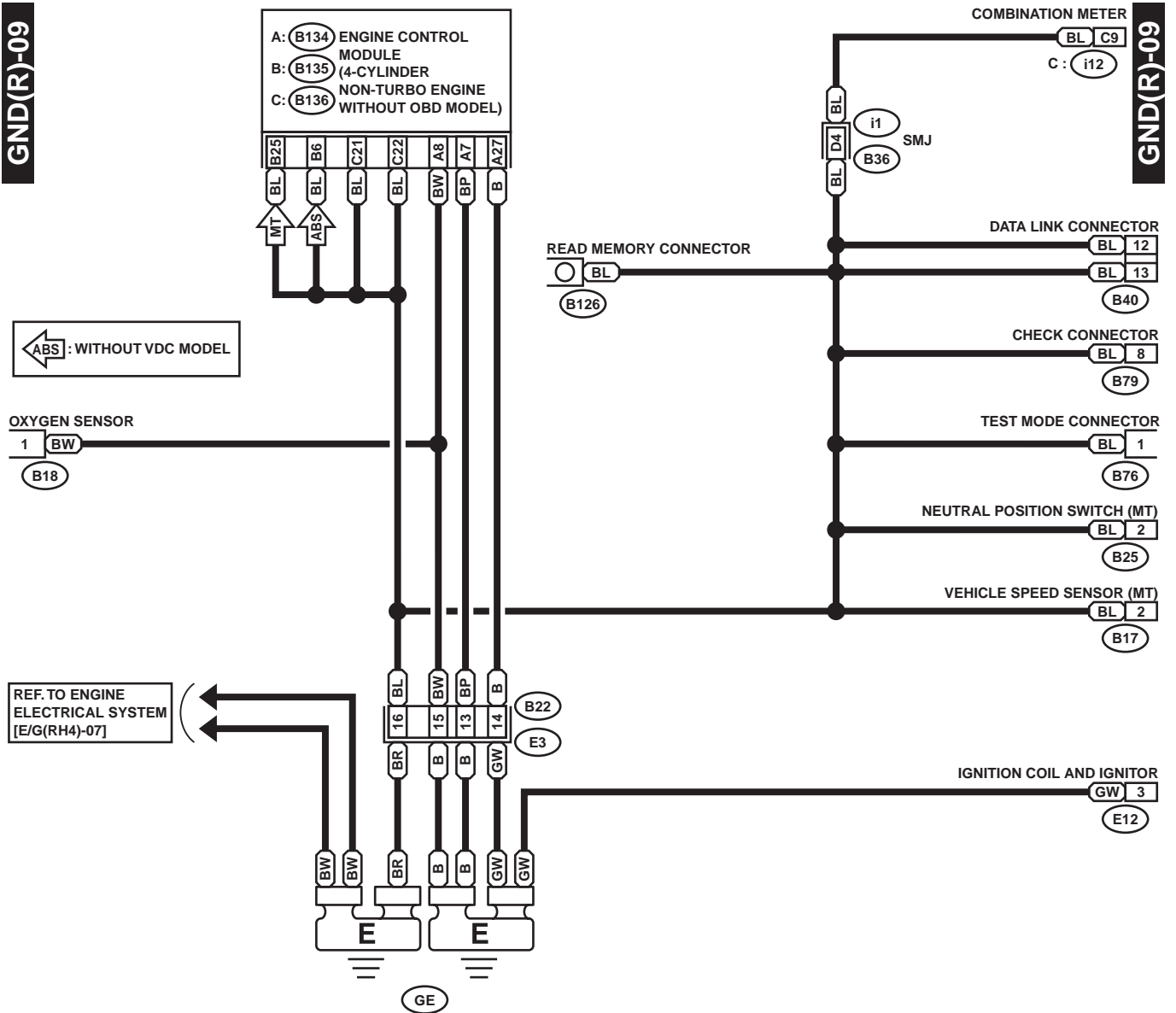
C: B56 (GREEN)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21		22	23	24		

WI-00765

GROUND DISTRIBUTION

WIRING SYSTEM

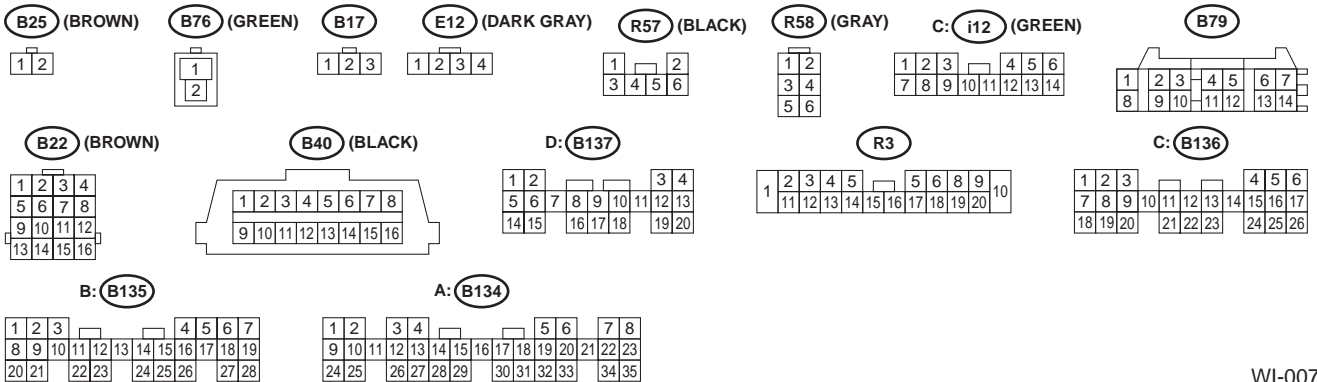
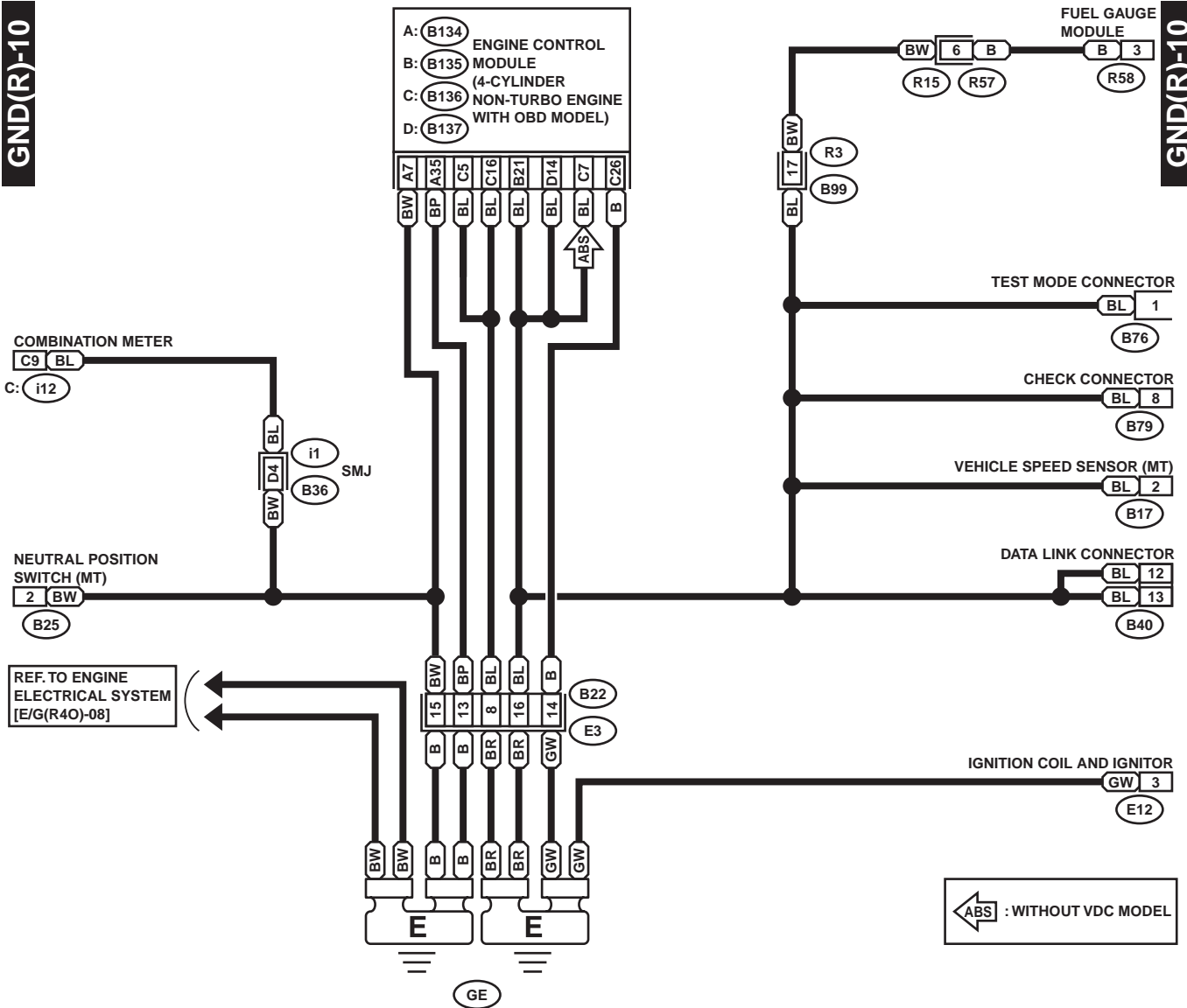


WI-00766

GROUND DISTRIBUTION

GND(R)-10

GND(R)-10



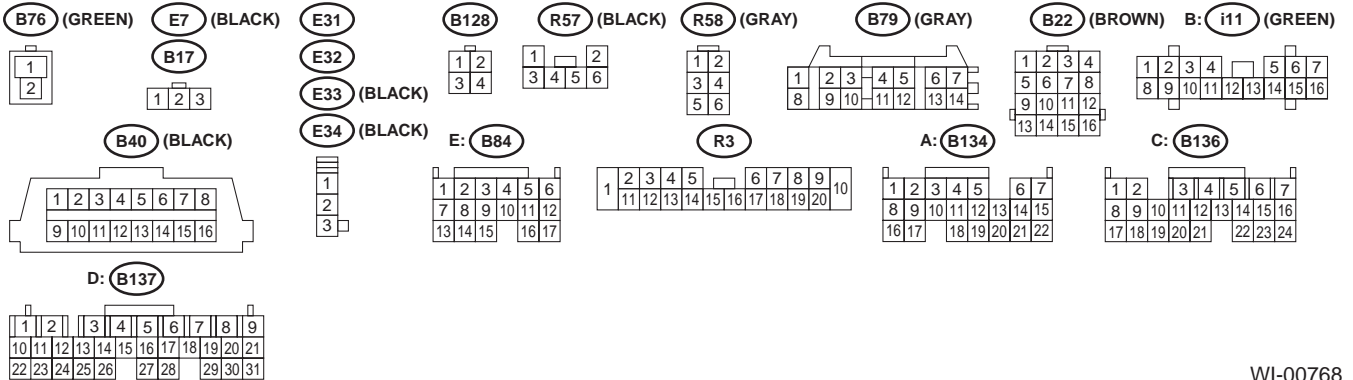
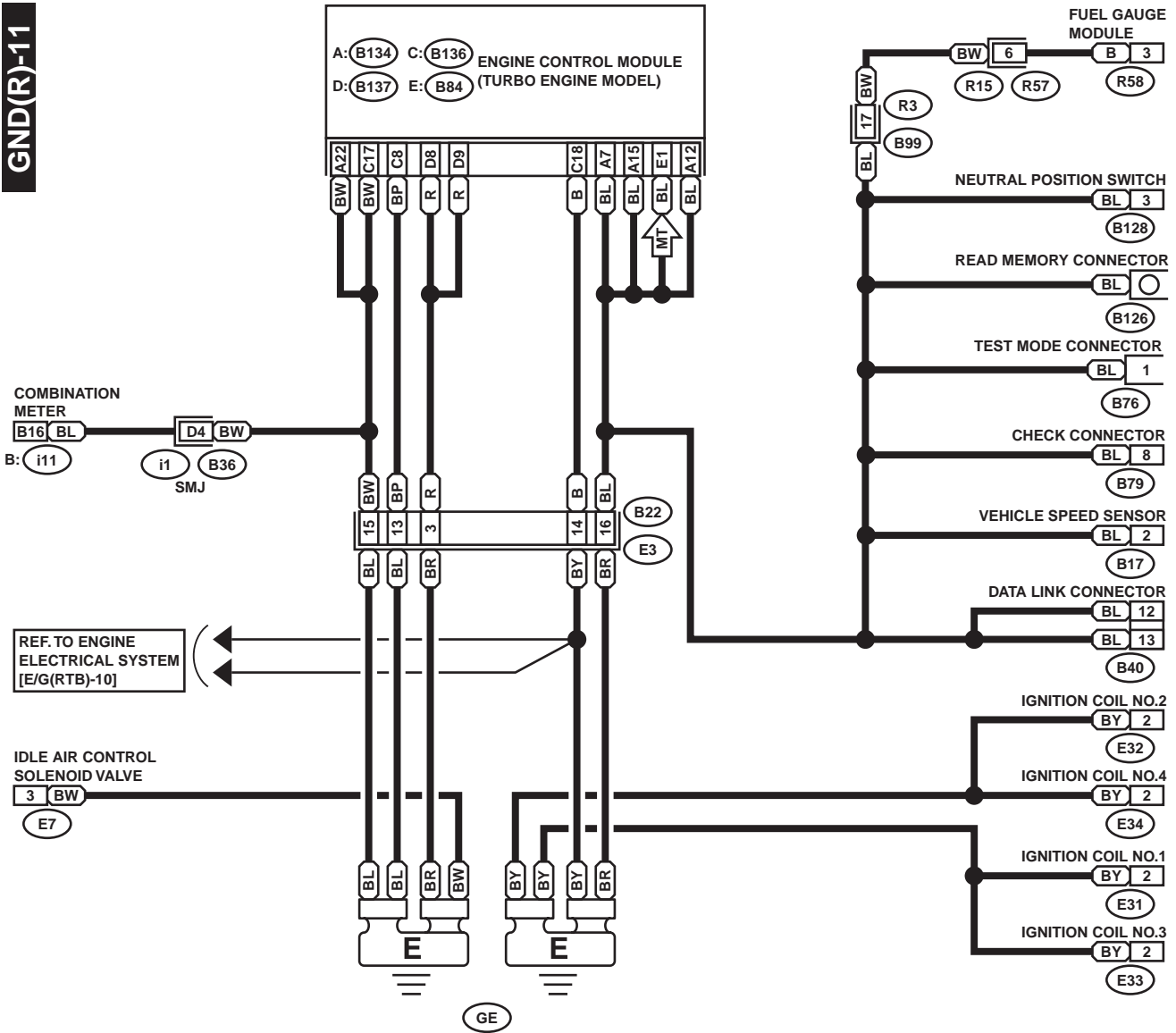
WI-00767

GROUND DISTRIBUTION

WIRING SYSTEM

GND(R)-11

GND(R)-11



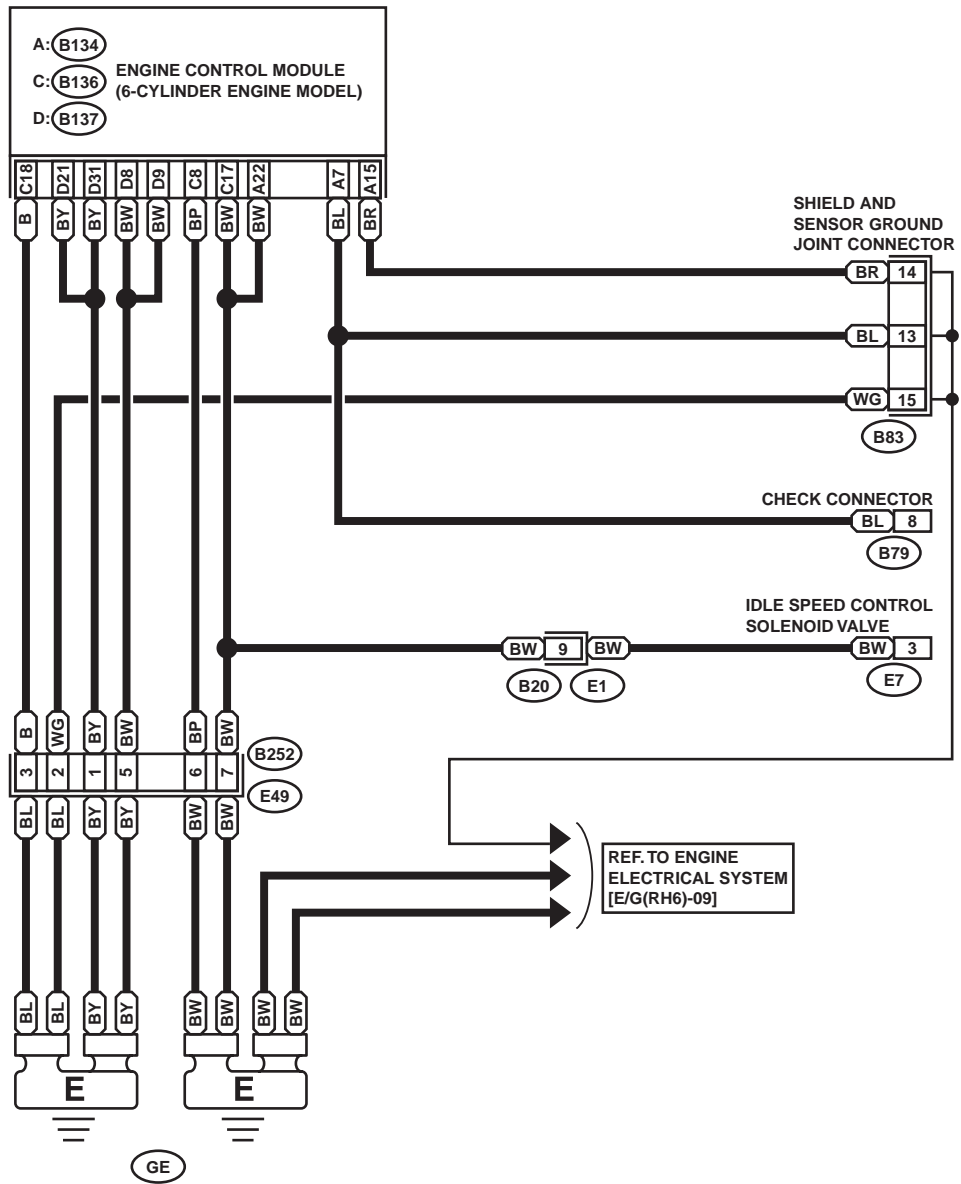
WI-00768

GROUND DISTRIBUTION

WIRING SYSTEM

GND(R)-12

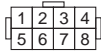
GND(R)-12



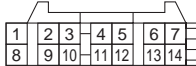
E7 (GRAY)



B252 (DARK GRAY)



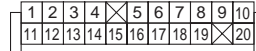
B79 (GRAY)



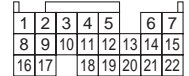
B20 (DARK GRAY)



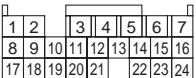
B83



A: B134



C: B136



D: B137



WI-00769

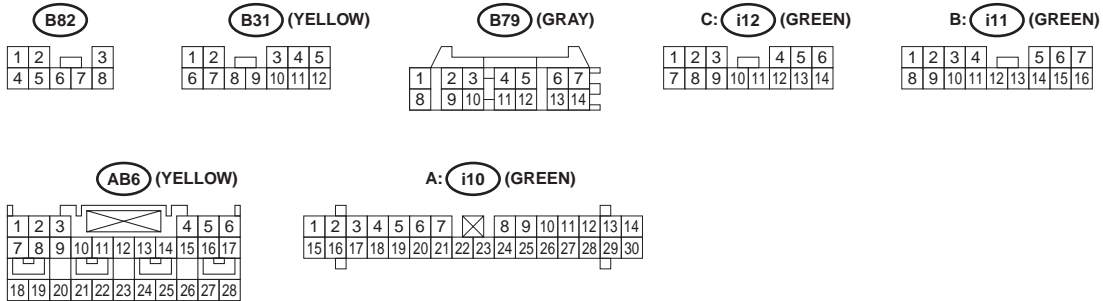
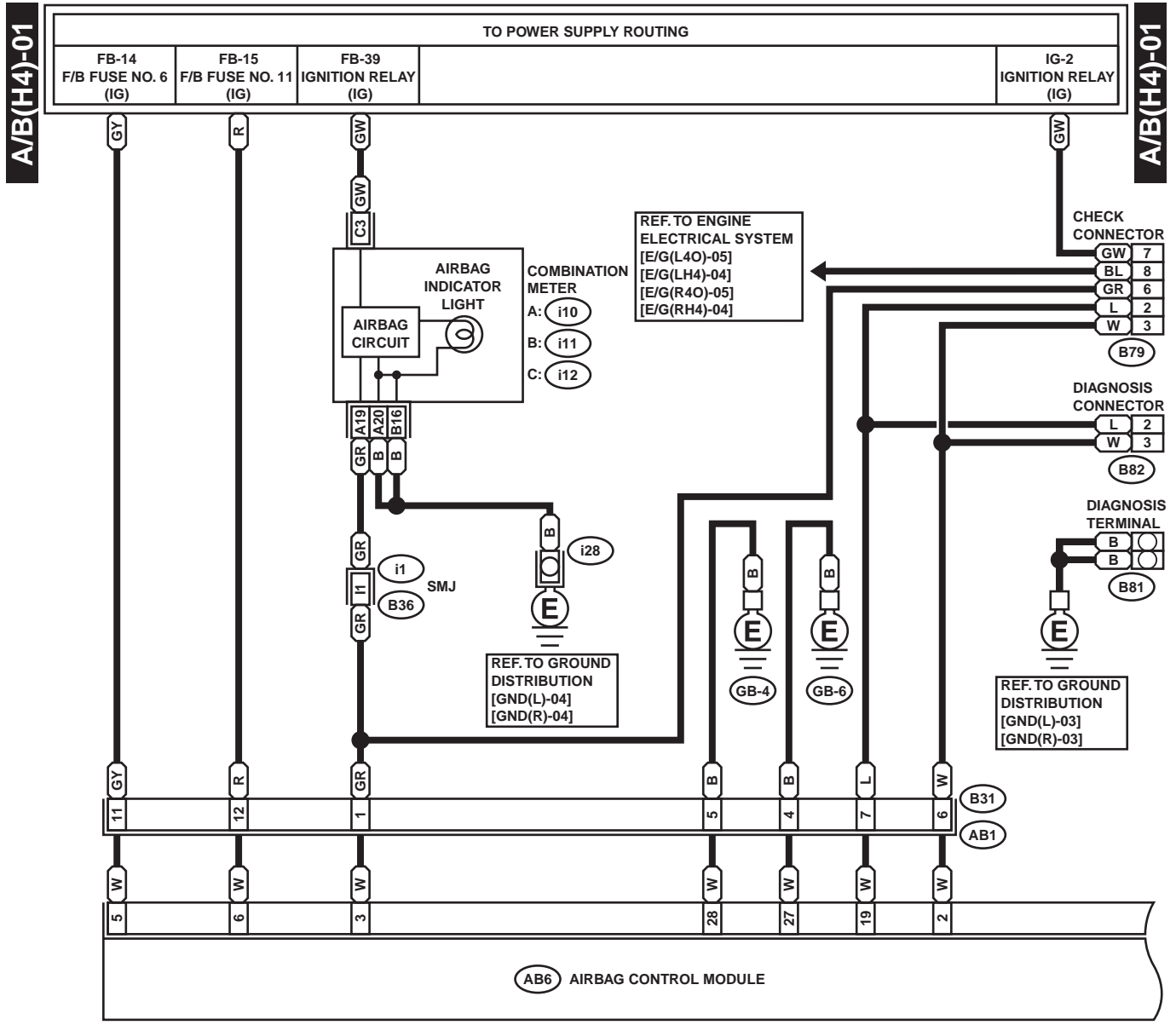
AIRBAG SYSTEM

WIRING SYSTEM

6. Airbag System

A: SCHEMATIC

1. 4-CYLINDER NON-TURBO ENGINE MODEL



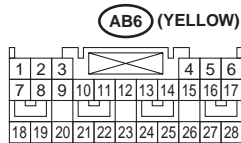
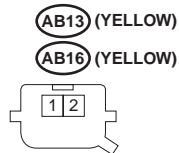
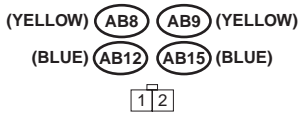
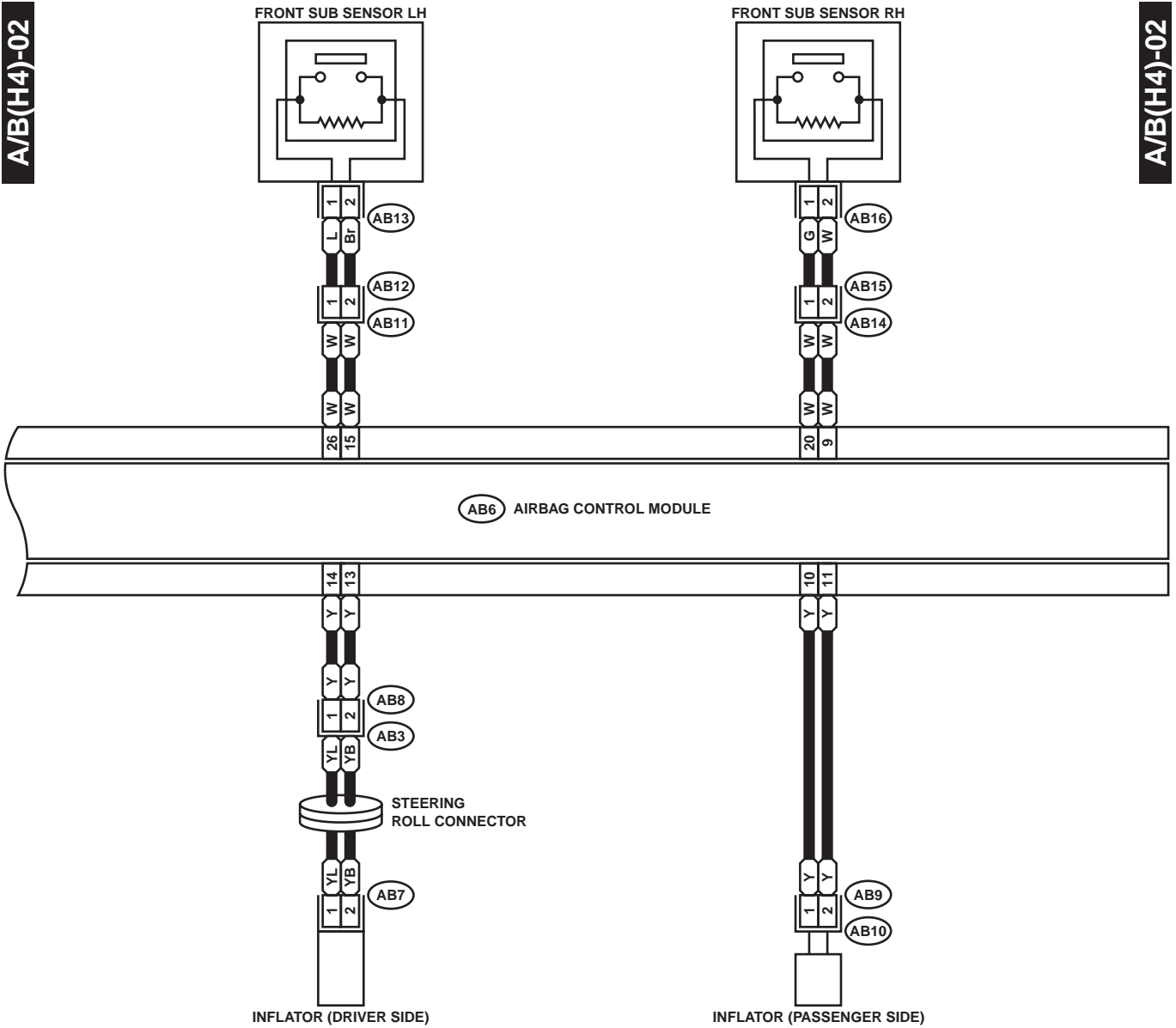
WI-00770

AIRBAG SYSTEM

WIRING SYSTEM

A/B(H4)-02

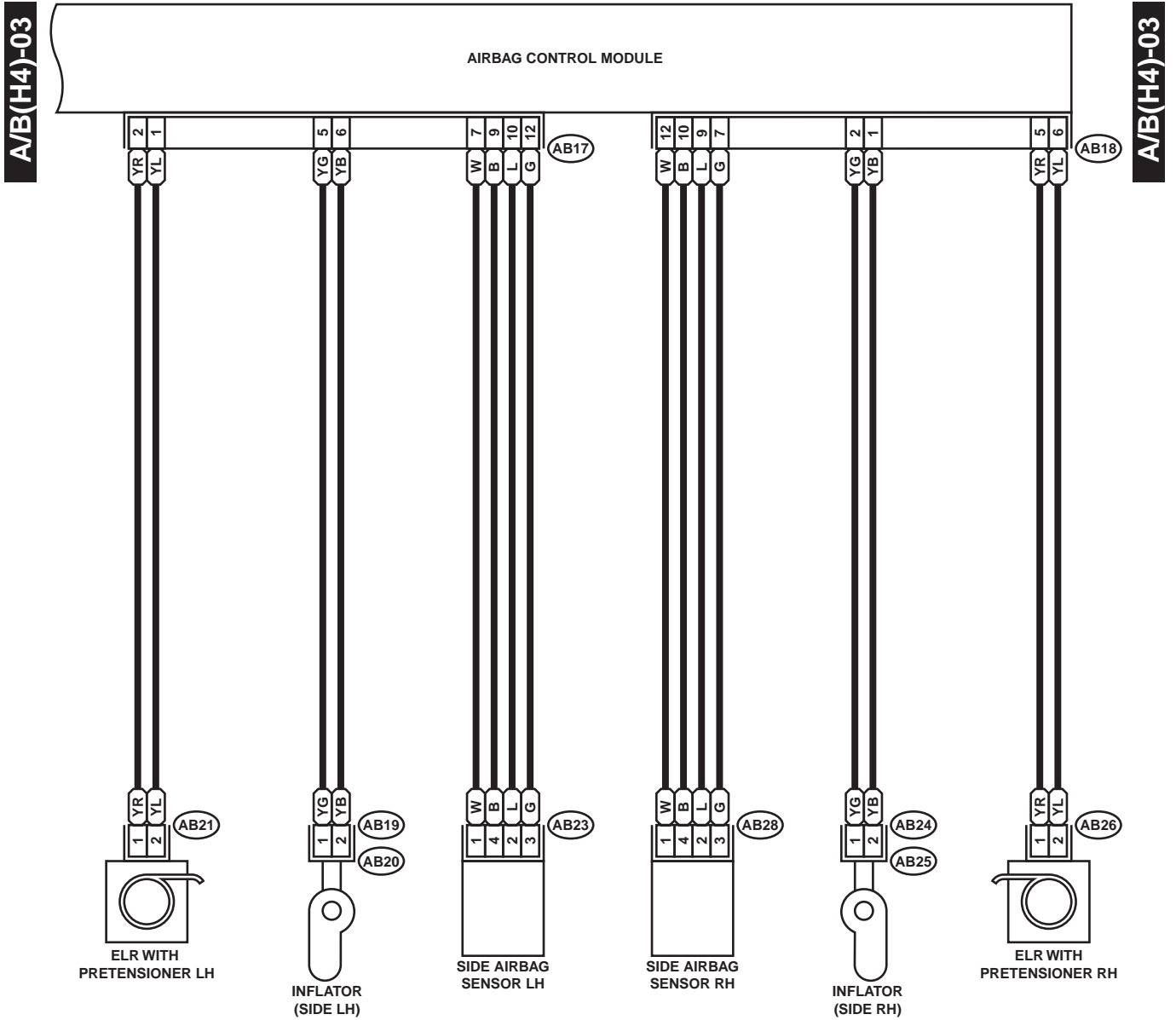
A/B(H4)-02



WI-00771

AIRBAG SYSTEM

WIRING SYSTEM



AB19 (YELLOW)

AB21 (YELLOW)

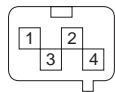
AB24 (YELLOW)

AB26 (YELLOW)

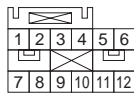


AB23 (YELLOW)

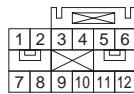
AB28 (YELLOW)



AB17 (YELLOW)



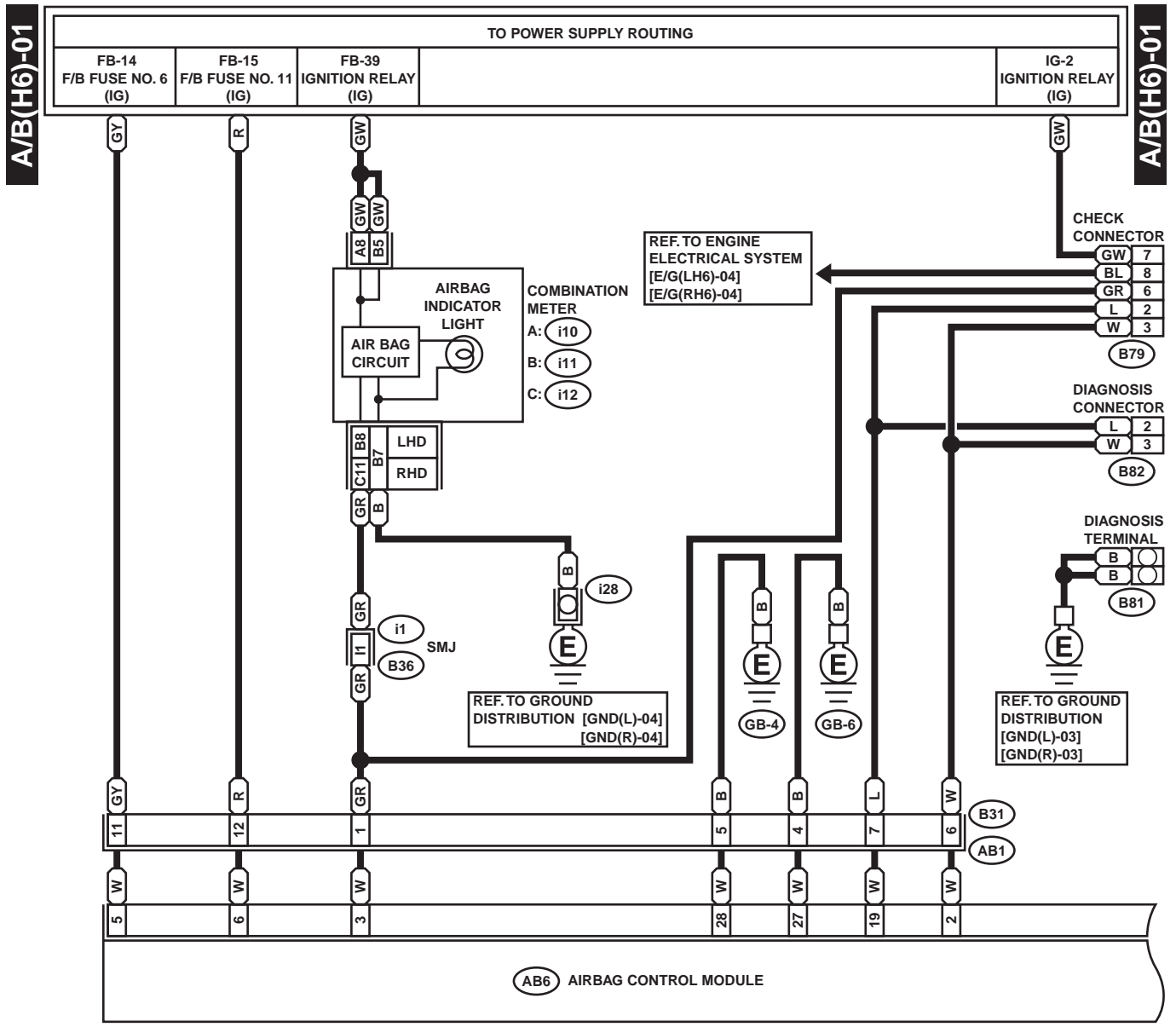
AB18 (YELLOW)



WI-00772

AIRBAG SYSTEM

2. 6-CYLINDER ENGINE MODEL



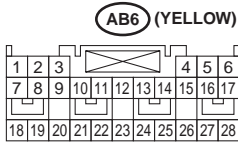
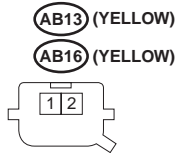
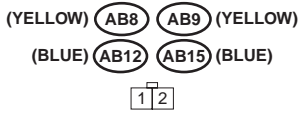
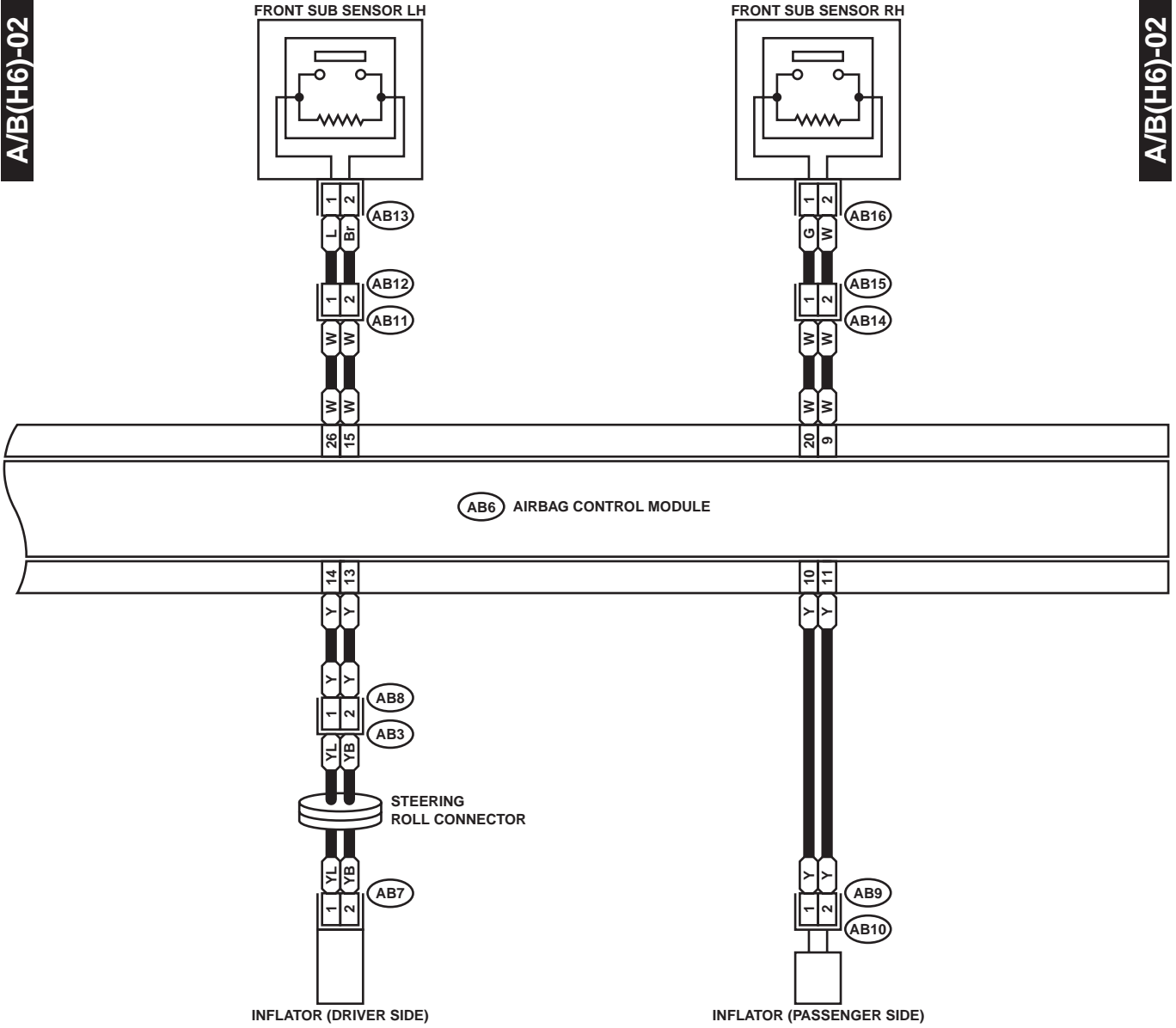
WI-00773

AIRBAG SYSTEM

WIRING SYSTEM

A/B(H6)-02

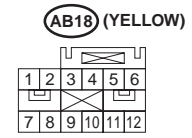
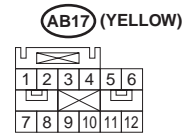
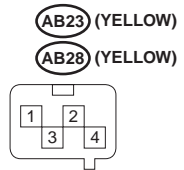
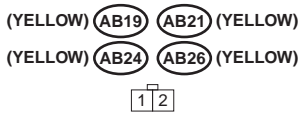
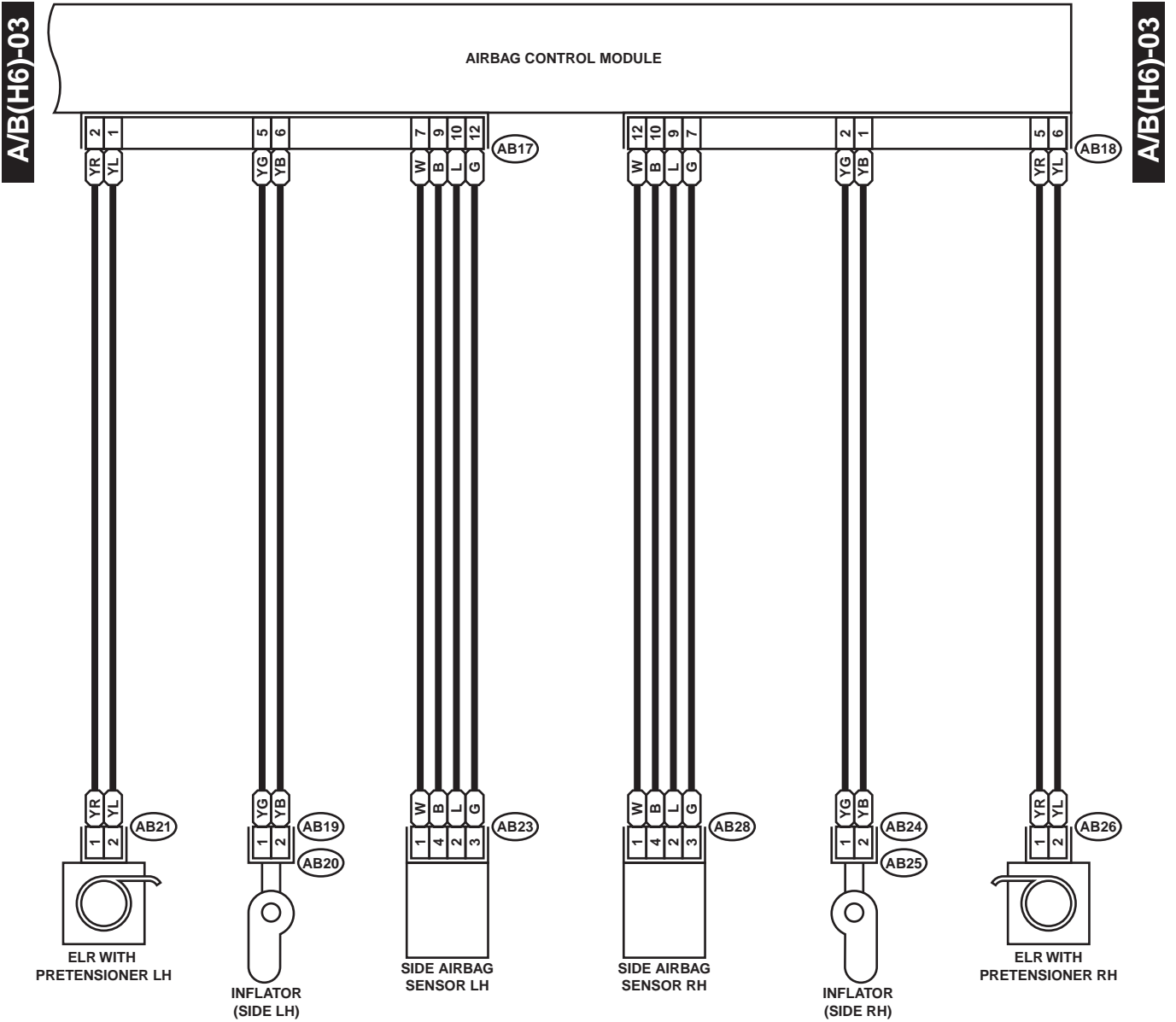
A/B(H6)-02



WI-00774

AIRBAG SYSTEM

WIRING SYSTEM

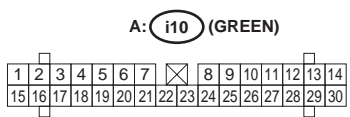
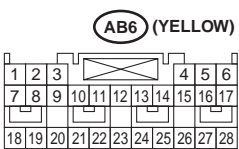
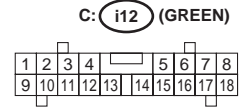
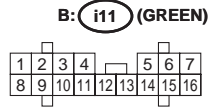
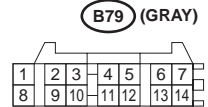
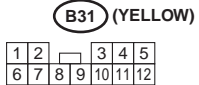
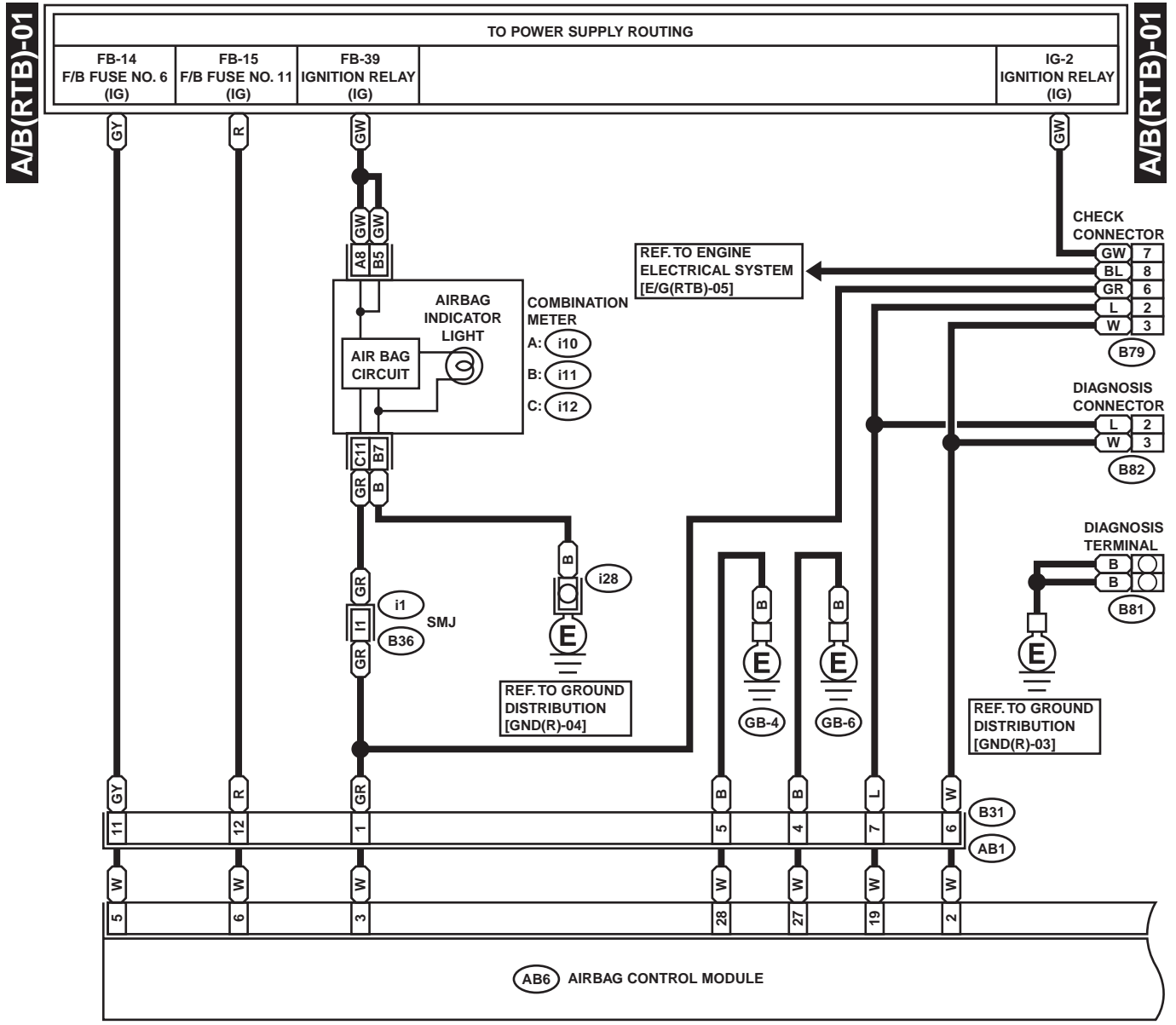


WI-00775

AIRBAG SYSTEM

WIRING SYSTEM

3. TURBO ENGINE MODEL



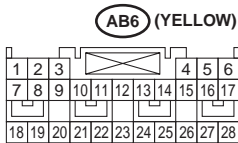
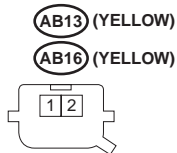
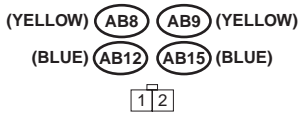
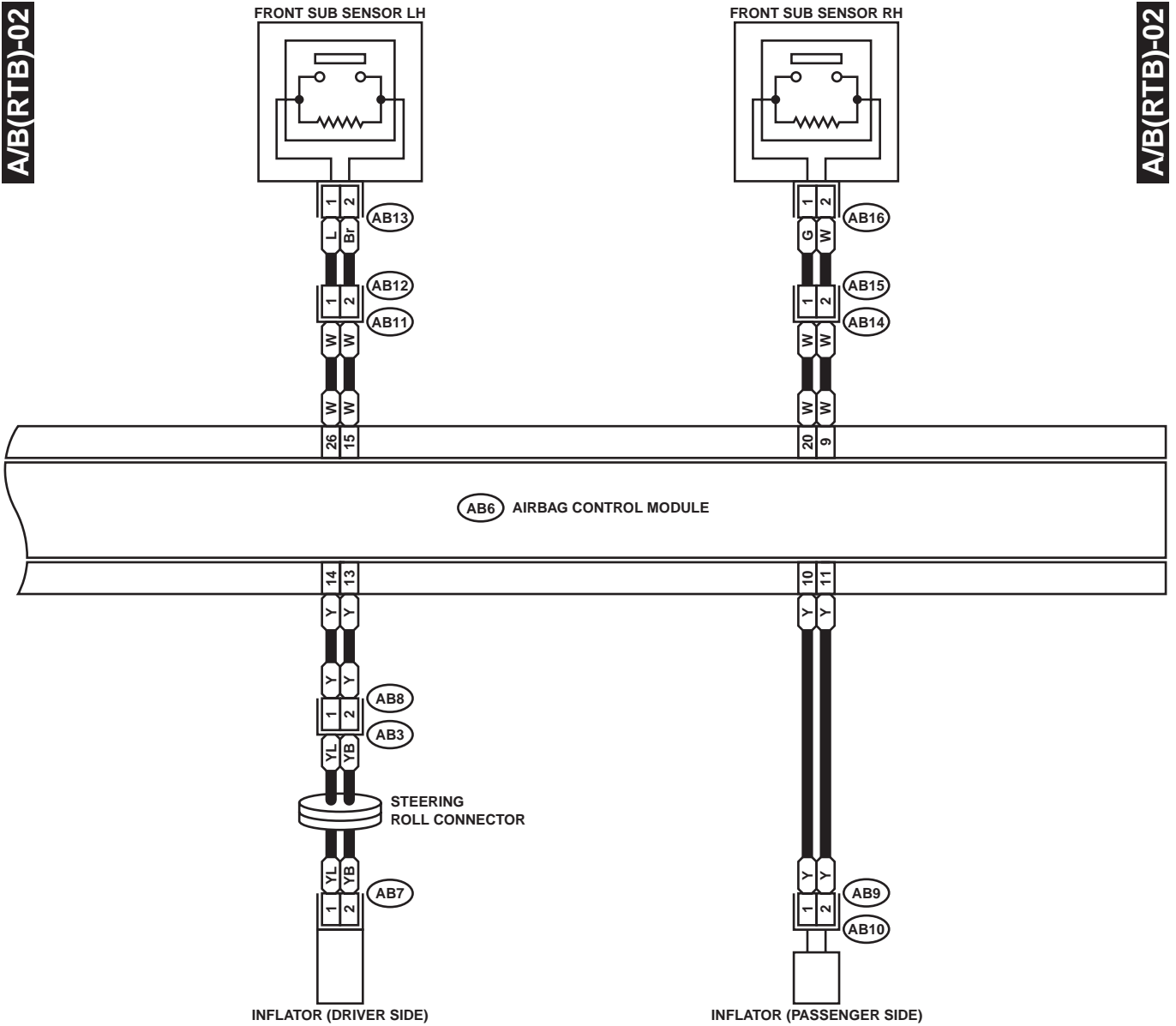
WI-00776

AIRBAG SYSTEM

WIRING SYSTEM

A/B(RTB)-02

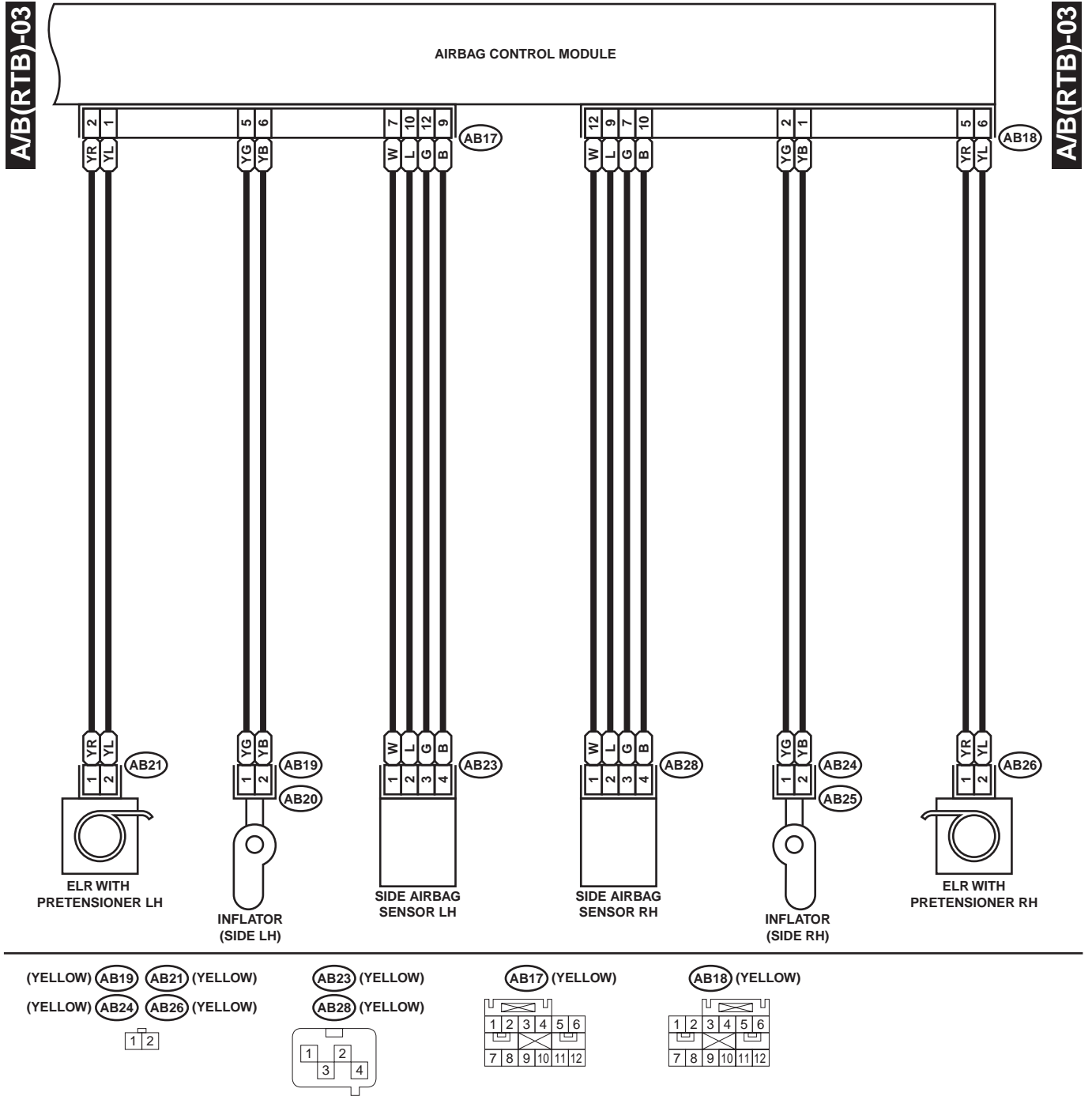
A/B(RTB)-02



WI-00777

AIRBAG SYSTEM

WIRING SYSTEM



WI-00778

MEMO:

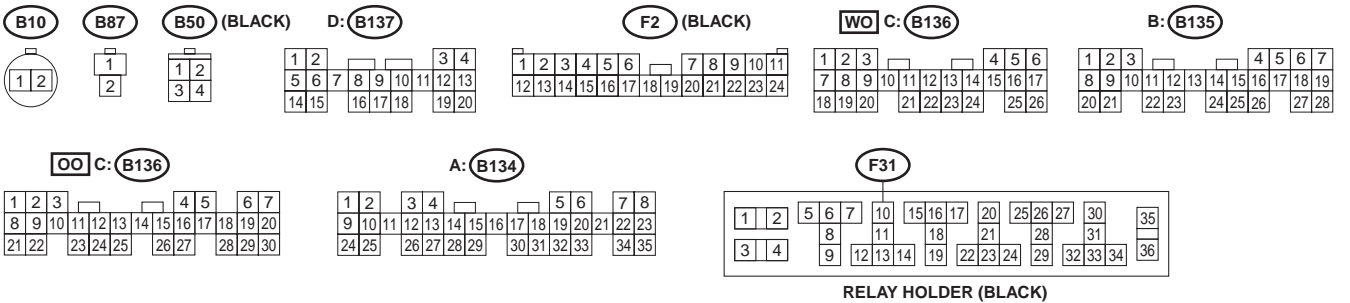
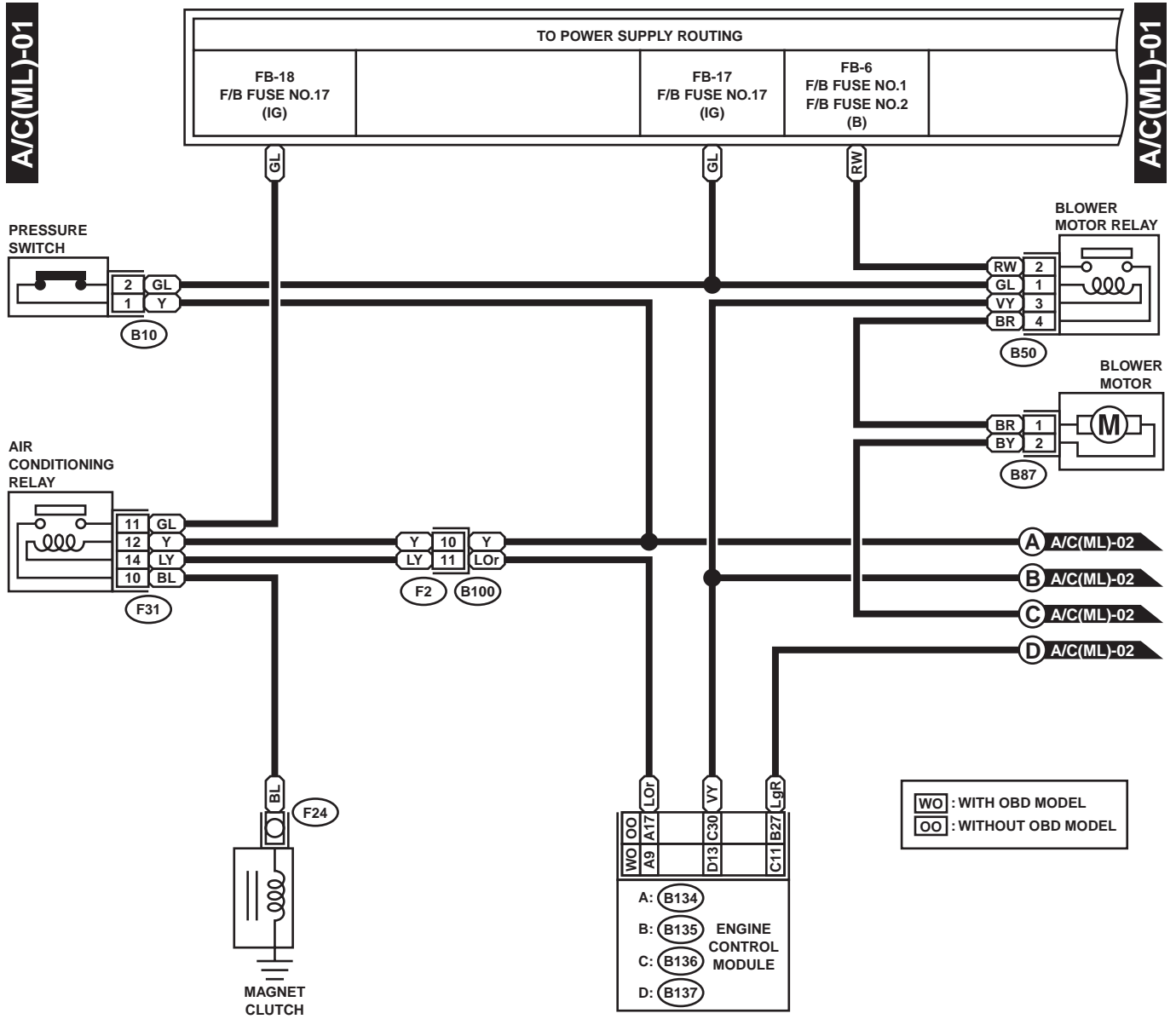
AIR CONDITIONING SYSTEM

WIRING SYSTEM

7. Air Conditioning System

A: SCHEMATIC

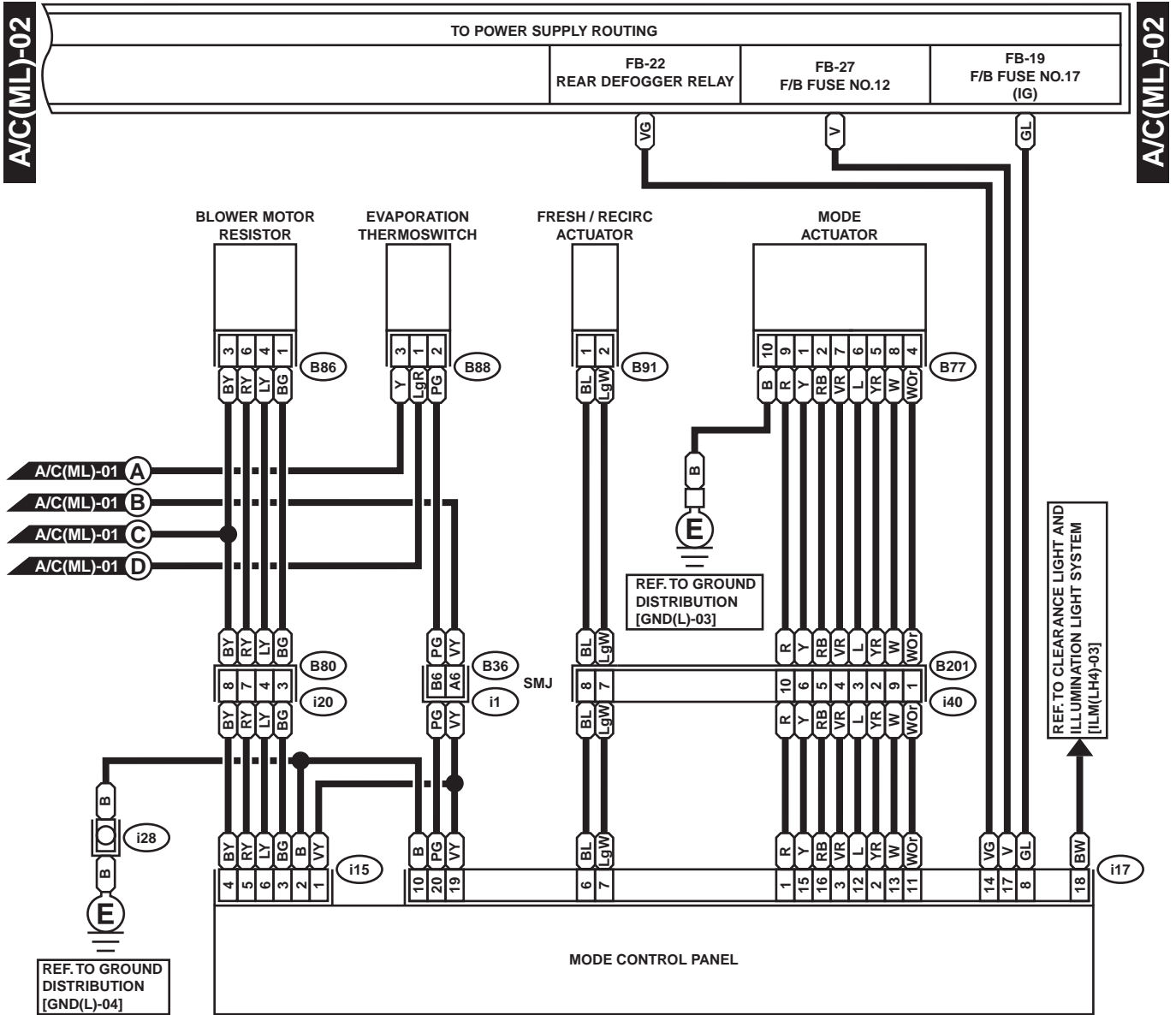
1. MANUAL A/C LHD MODEL



WI-00779

AIR CONDITIONING SYSTEM

WIRING SYSTEM



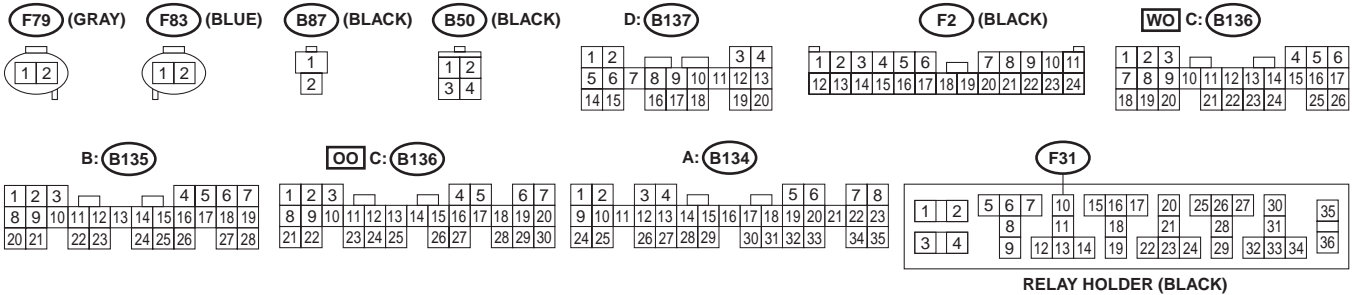
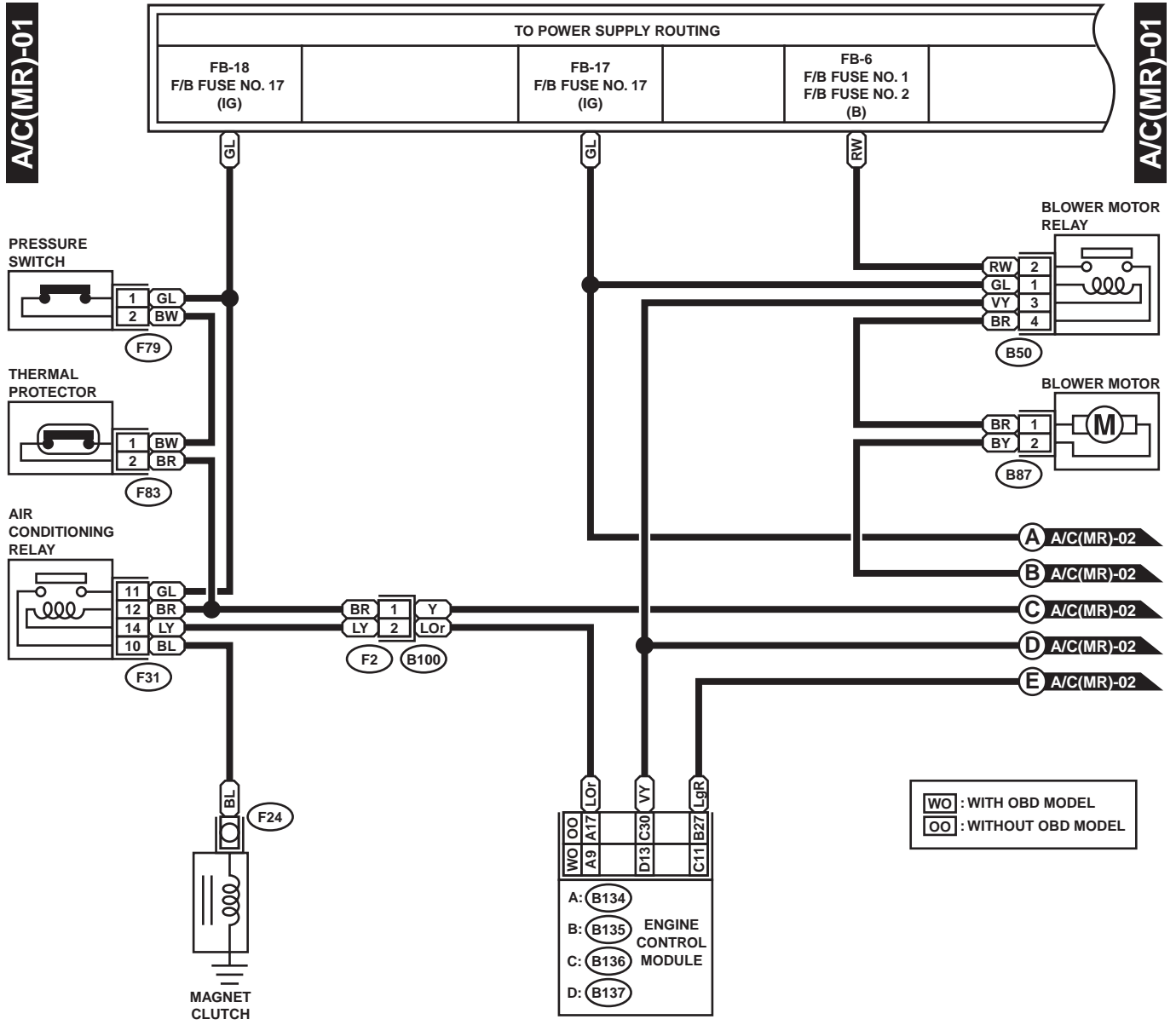
B88 (BLACK)	B86 (BLACK)	B91 (BLACK)	i20 (BLACK)	B77 (BROWN)	i40 (BLACK)	i17 (GRAY)																																																															
<table border="1"><tr><td>1</td><td>2</td><td>3</td></tr></table>	1	2	3	<table border="1"><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>4</td><td>5</td><td>6</td></tr></table>	1	2	3	4	5	6	<table border="1"><tr><td>1</td><td>2</td></tr><tr><td>3</td><td>4</td></tr><tr><td>5</td><td>6</td></tr></table>	1	2	3	4	5	6	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td></tr></table>	1	2	3	4	5	6	7	8	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr></table>	1	2	3	4	5	6	7	8	9	10	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr></table>	1	2	3	4	5	6	7	8	9	10	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr></table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	2	3																																																																			
1	2	3																																																																			
4	5	6																																																																			
1	2																																																																				
3	4																																																																				
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1	2	3	4	5	6	7	8	9	10																																																												
11	12	13	14	15	16	17	18	19	20																																																												

WI-00780

AIR CONDITIONING SYSTEM

WIRING SYSTEM

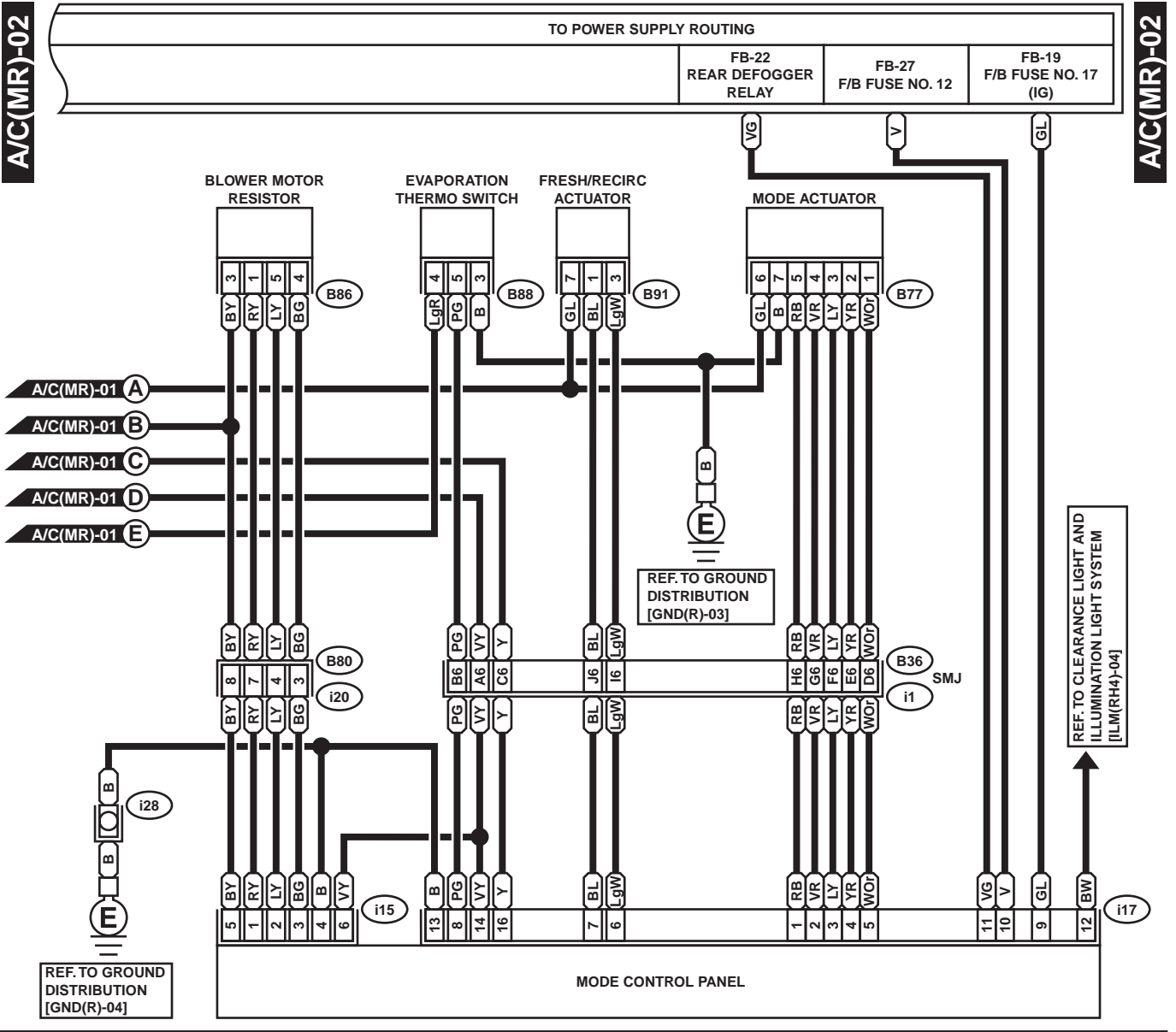
2. MANUAL A/C RHD MODEL



WI-00781

AIR CONDITIONING SYSTEM

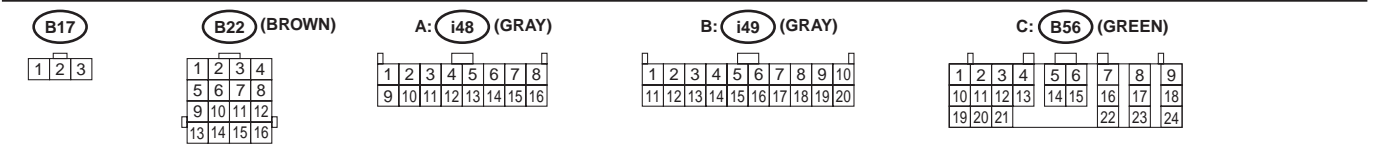
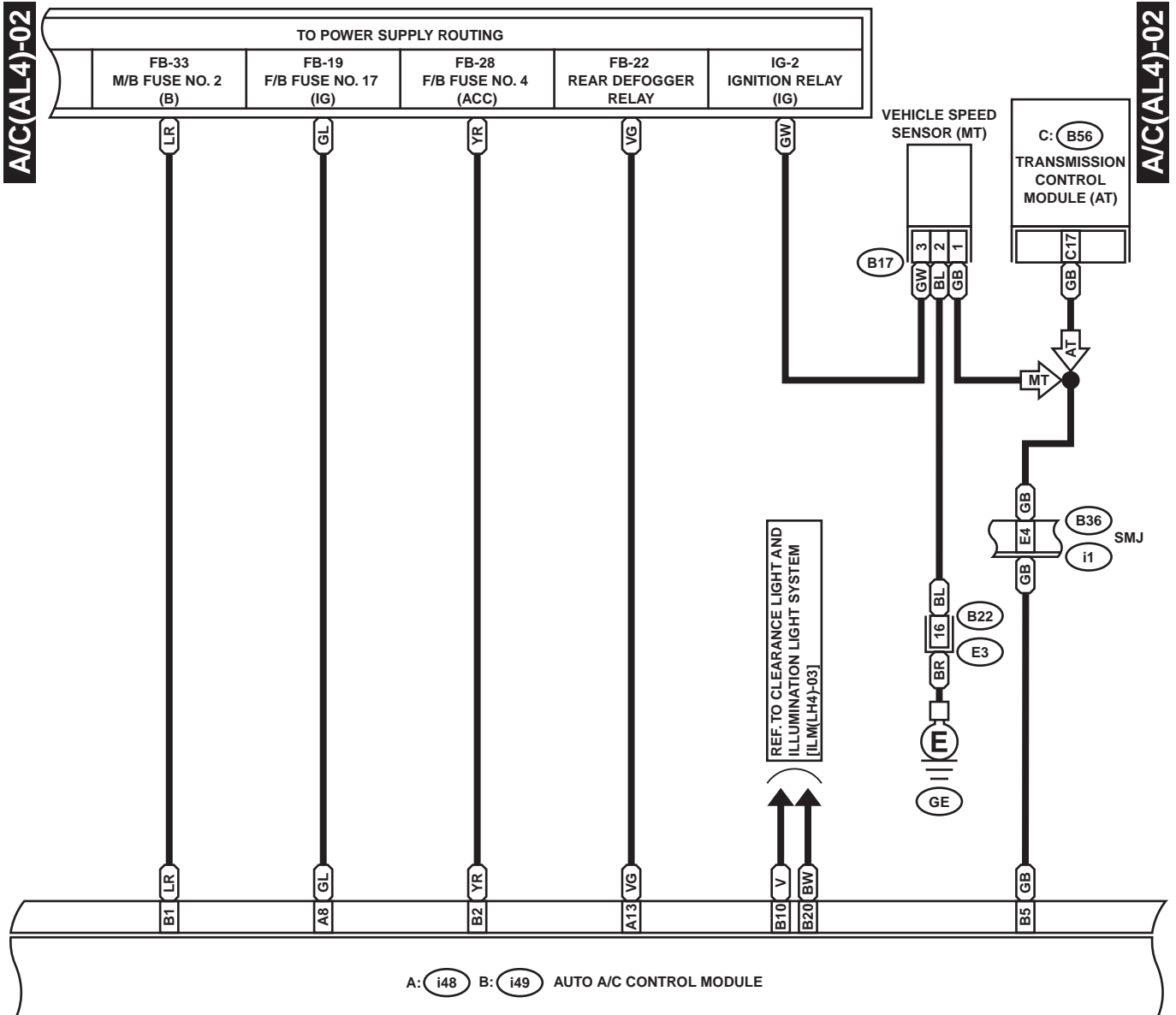
WIRING SYSTEM



WI-00782

AIR CONDITIONING SYSTEM

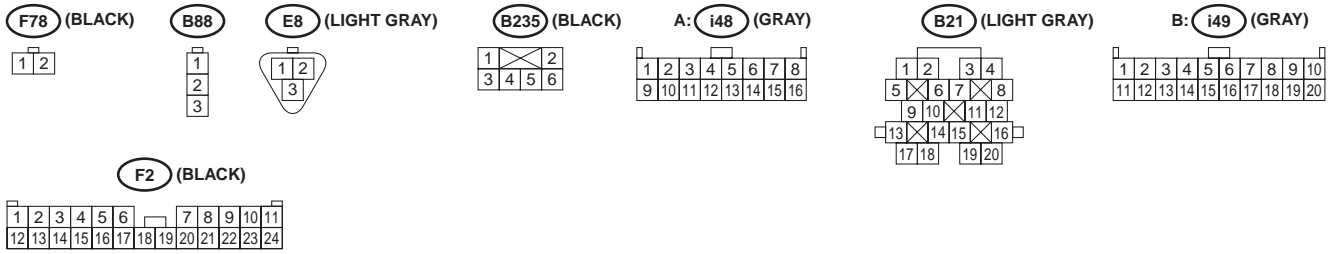
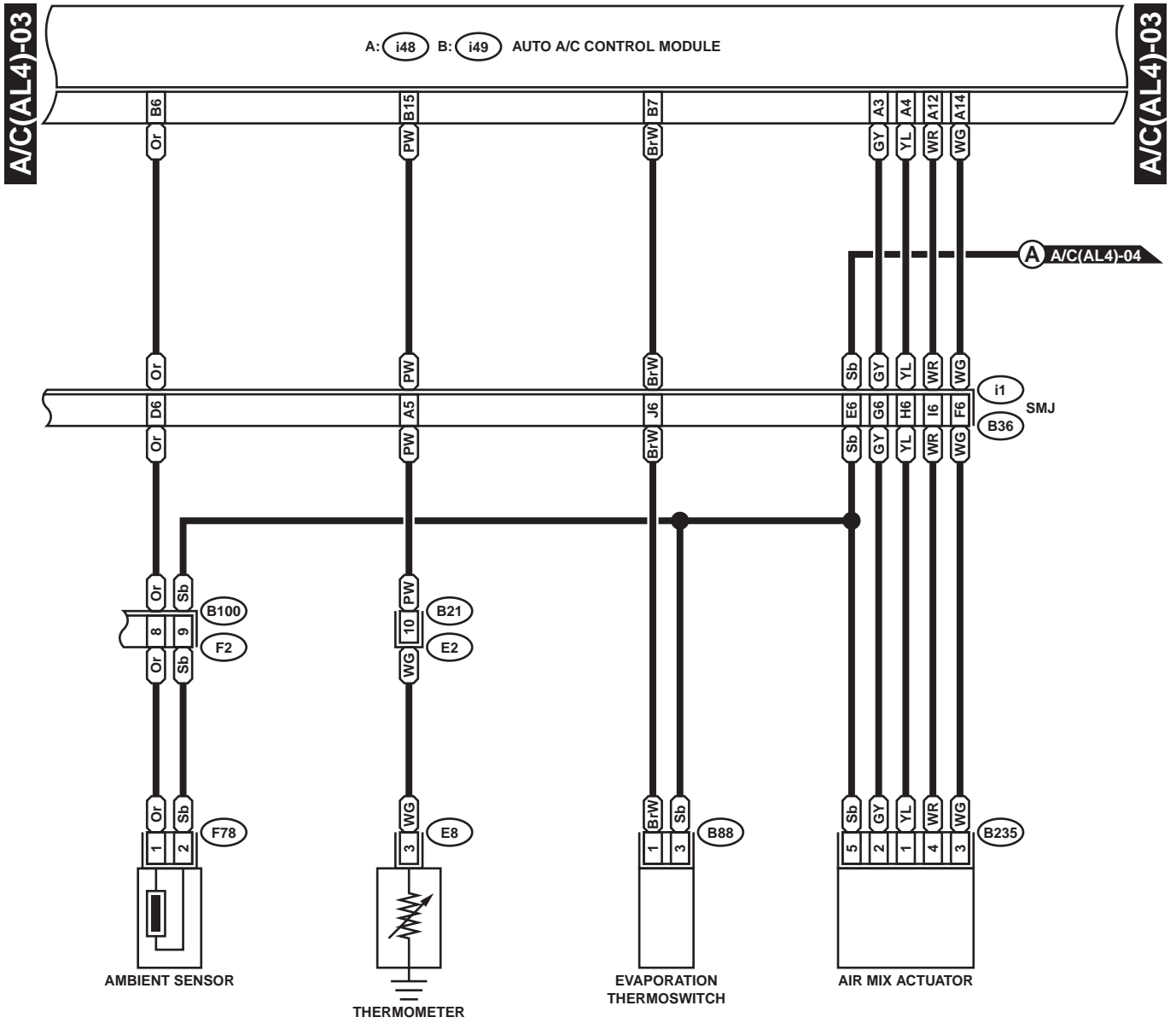
WIRING SYSTEM



WI-00784

AIR CONDITIONING SYSTEM

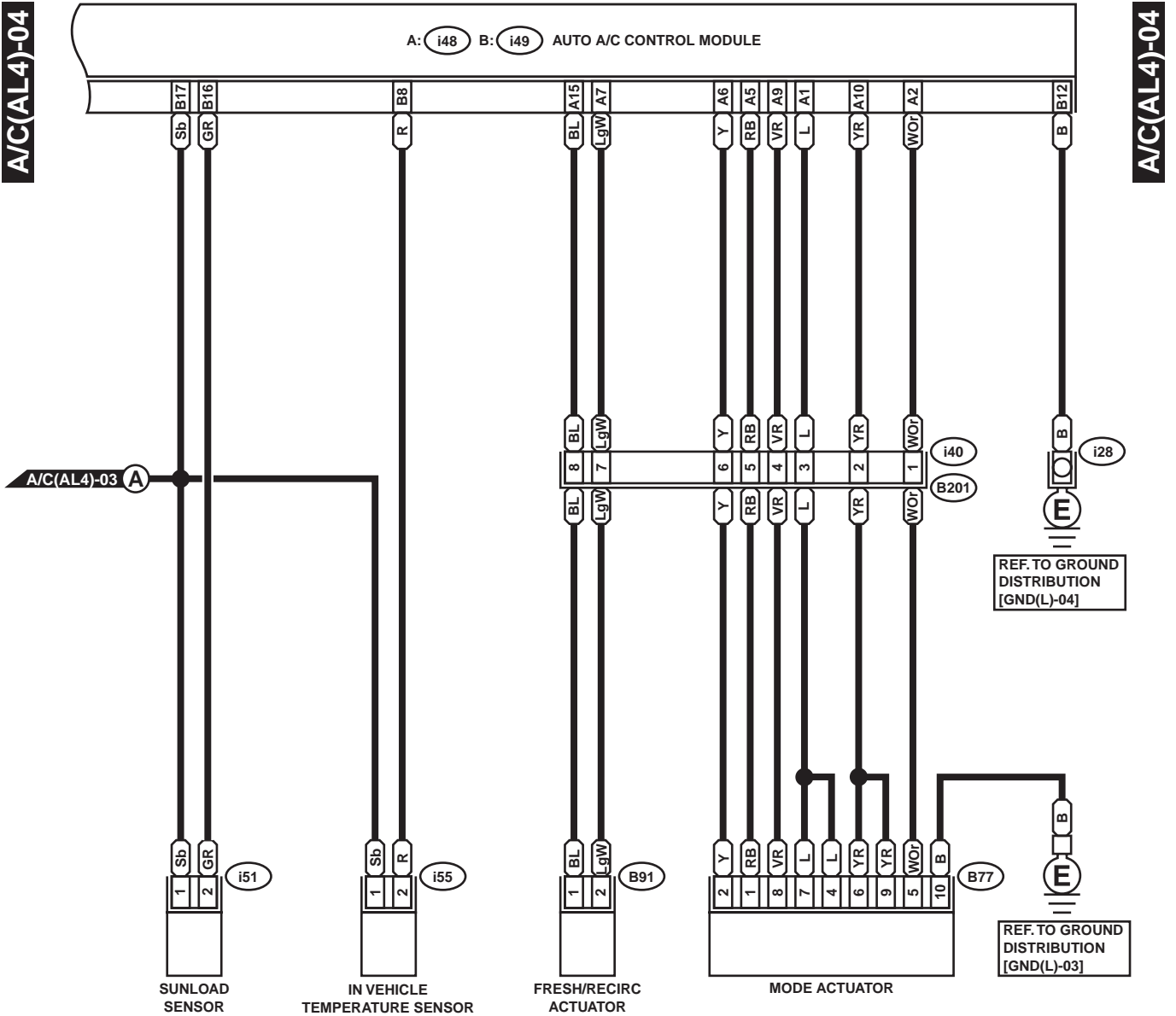
WIRING SYSTEM



WI-00785

AIR CONDITIONING SYSTEM

WIRING SYSTEM



i51 (BLACK)

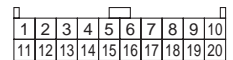
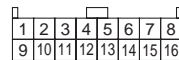
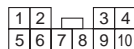
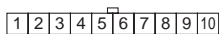
B91 (BLACK)

B77 (BROWN)

i40 (BLACK)

A: i48 (GRAY)

B: i49 (GRAY)

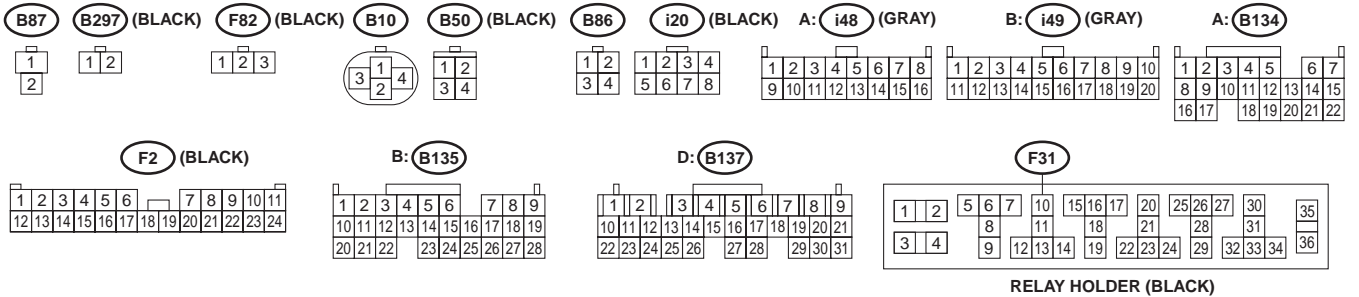
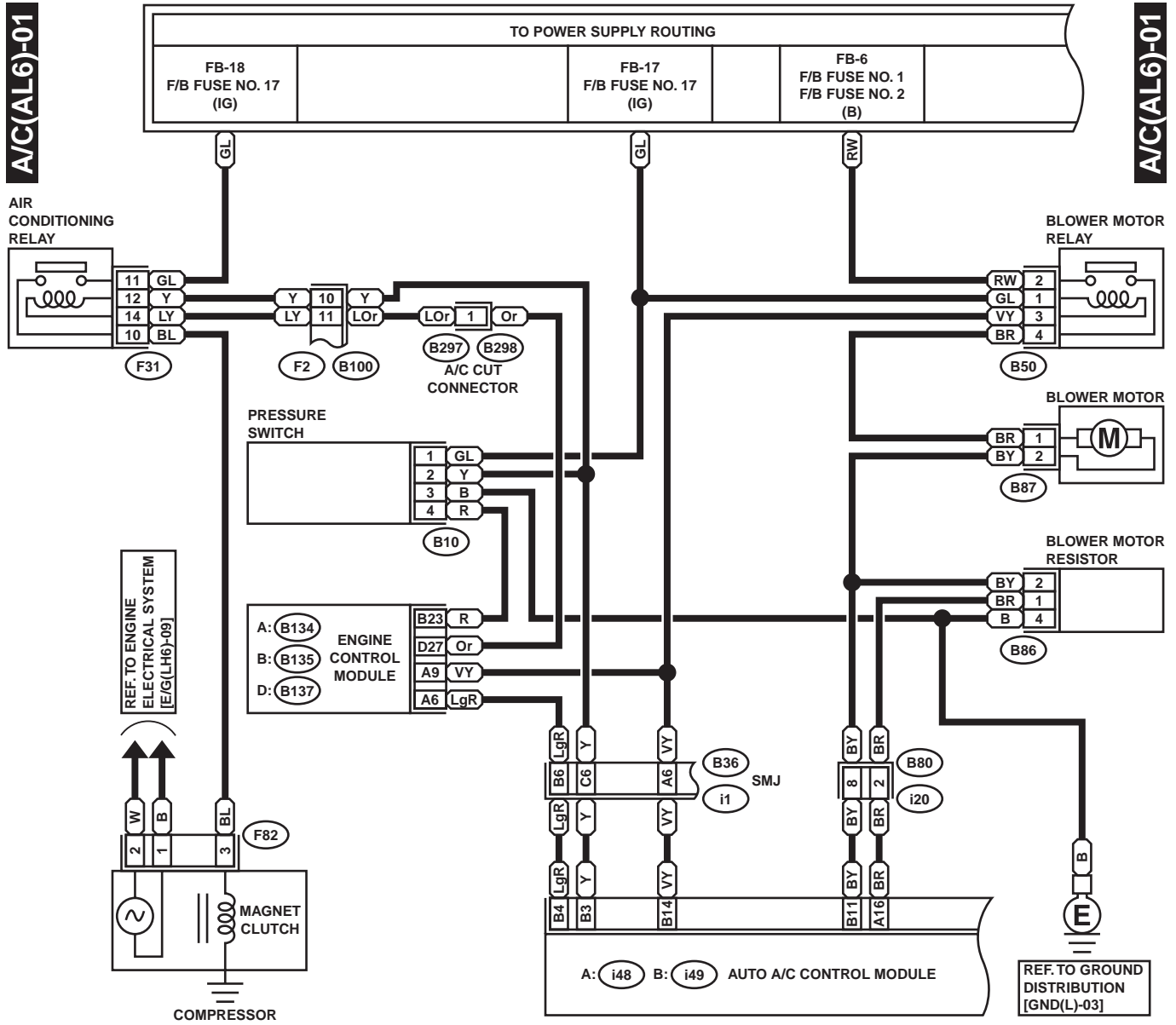


WI-00786

AIR CONDITIONING SYSTEM

WIRING SYSTEM

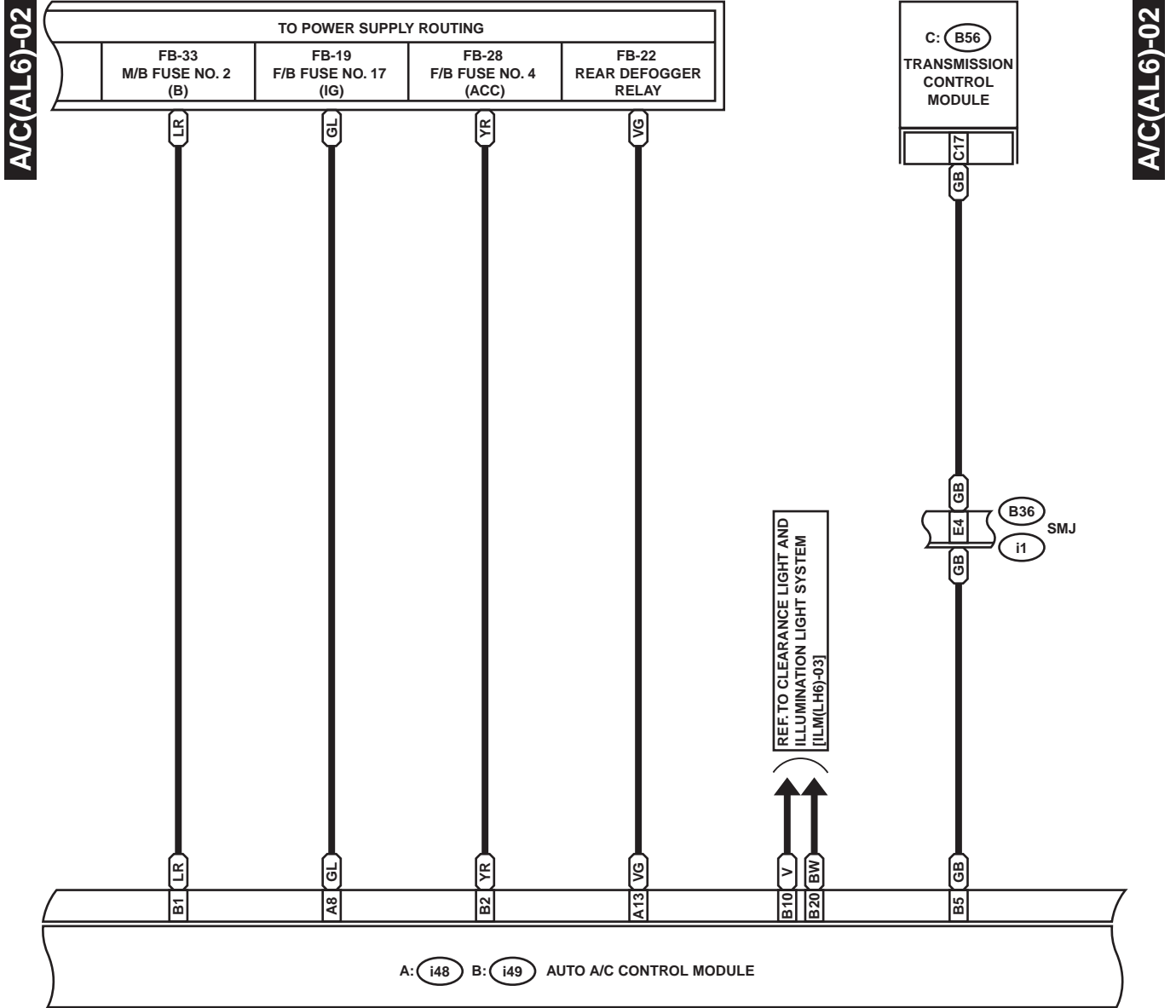
4. AUTO A/C LHD 6-CYLINDER ENGINE MODEL



WI-00787

AIR CONDITIONING SYSTEM

WIRING SYSTEM



A: i48 (GRAY)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

B: i49 (GRAY)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

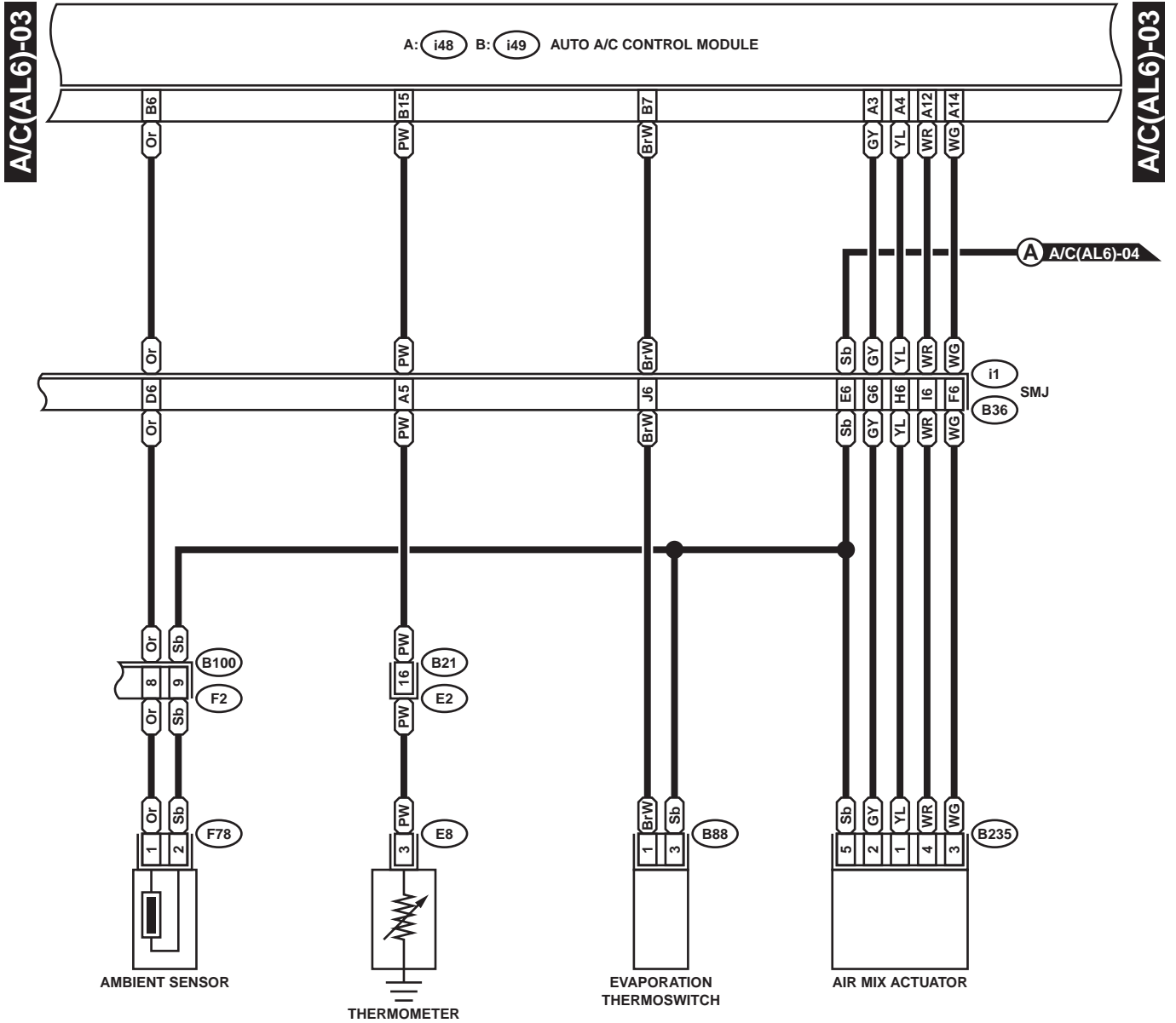
C: B56 (GREEN)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21				22	23	24

WI-00788

AIR CONDITIONING SYSTEM

WIRING SYSTEM



F78 (BLACK)



B88



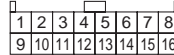
E8 (LIGHT GRAY)



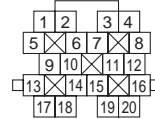
B235 (BLACK)



A: i48 (GRAY)



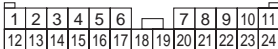
B21



B: i49 (GRAY)



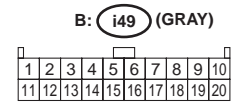
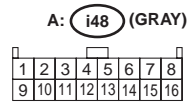
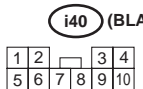
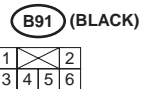
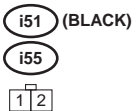
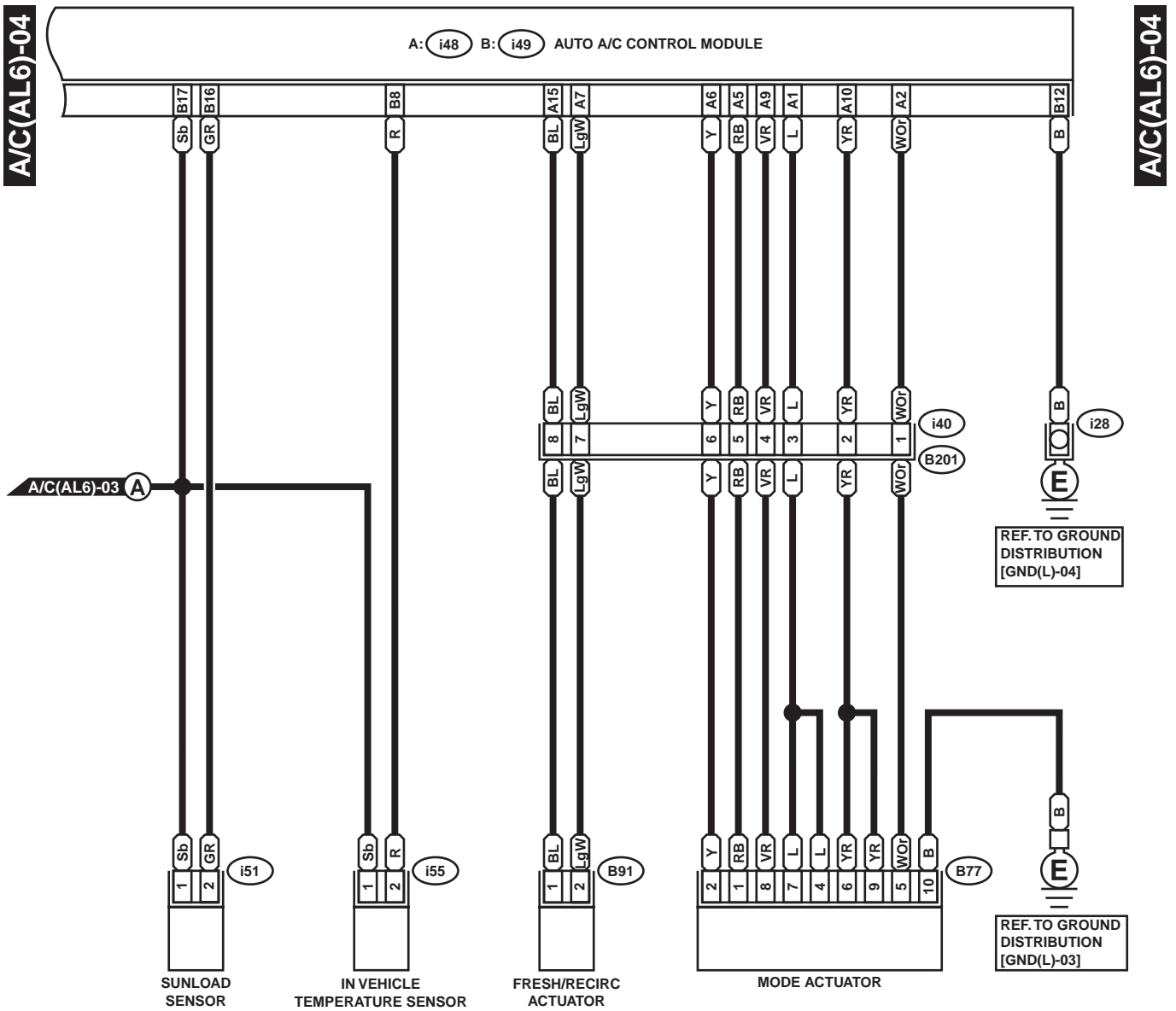
F2 (BLACK)



WI-00789

AIR CONDITIONING SYSTEM

WIRING SYSTEM

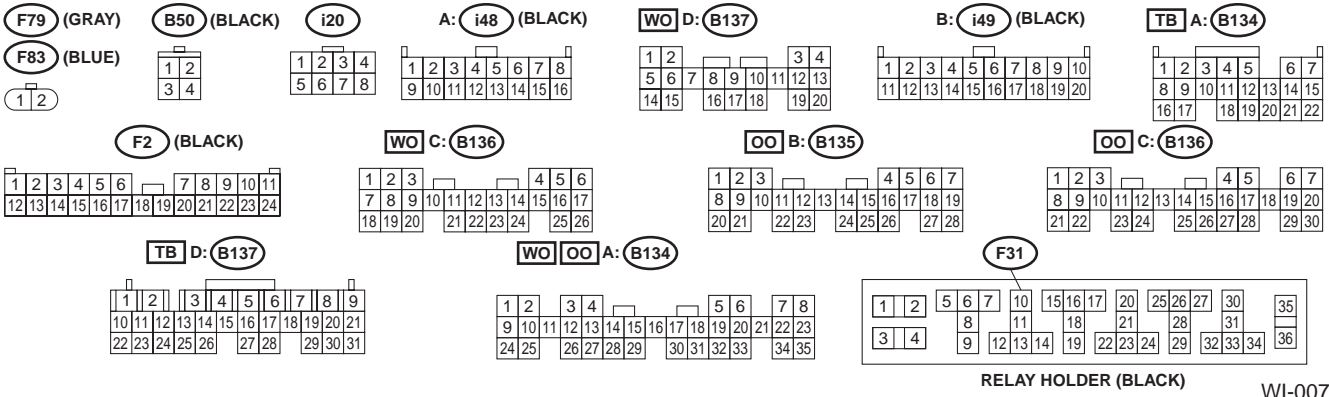
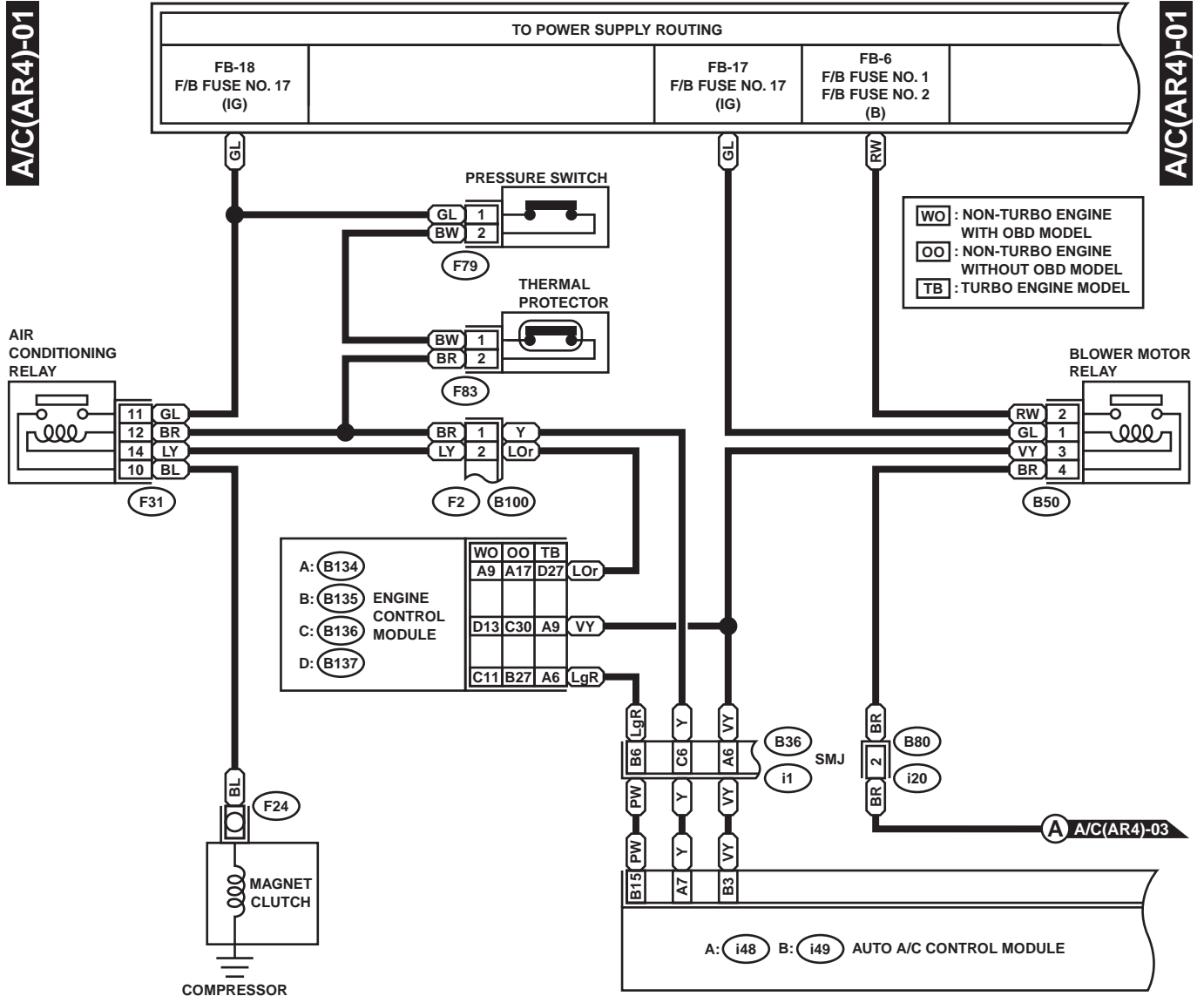


WI-00790

AIR CONDITIONING SYSTEM

WIRING SYSTEM

5. AUTO A/C RHD 4-CYLINDER ENGINE MODEL

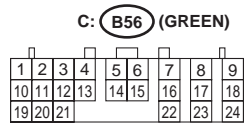
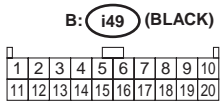
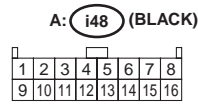
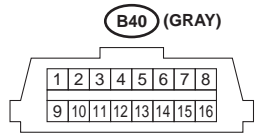
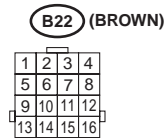
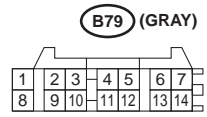
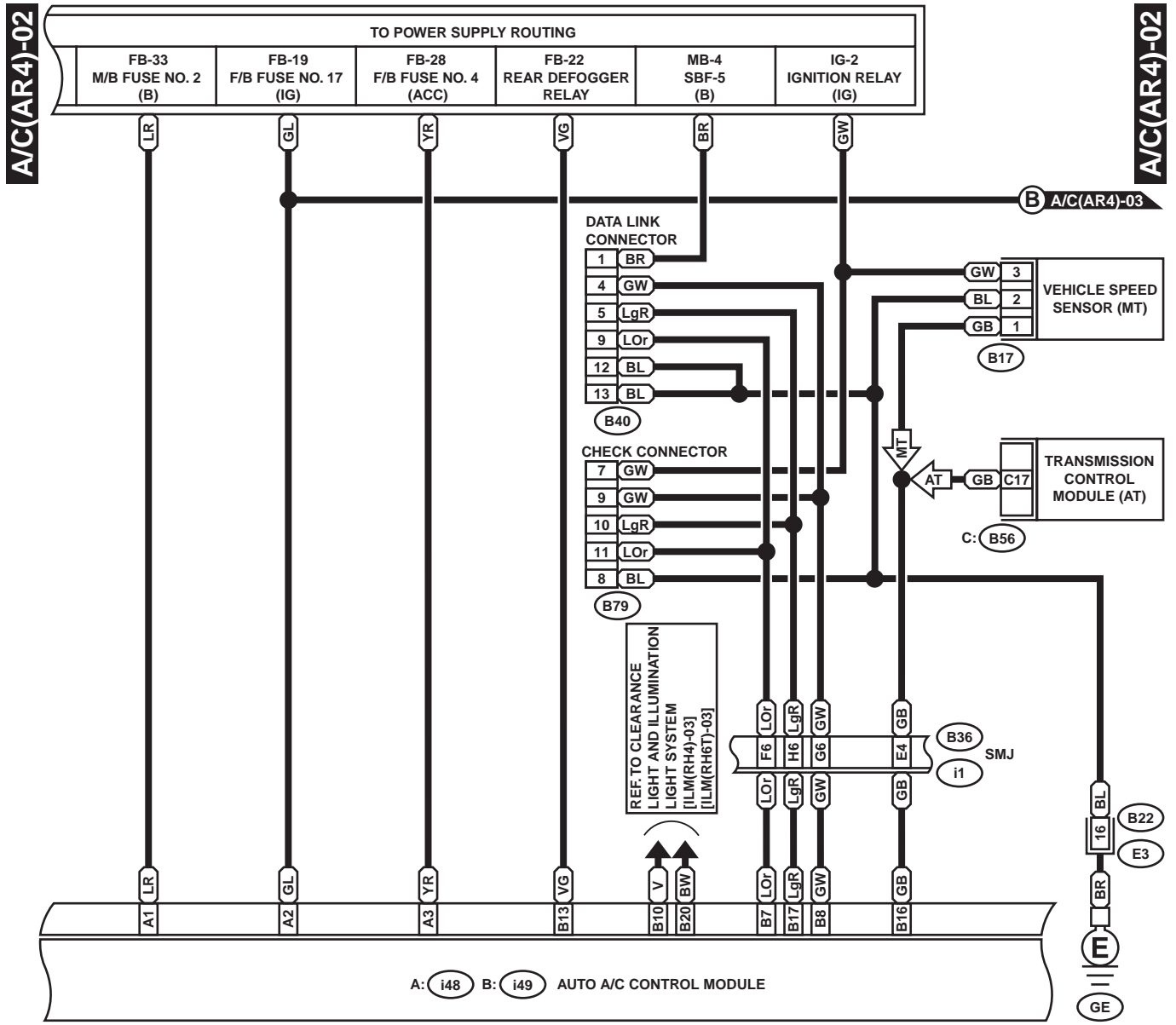


RELAY HOLDER (BLACK)

WI-00791

AIR CONDITIONING SYSTEM

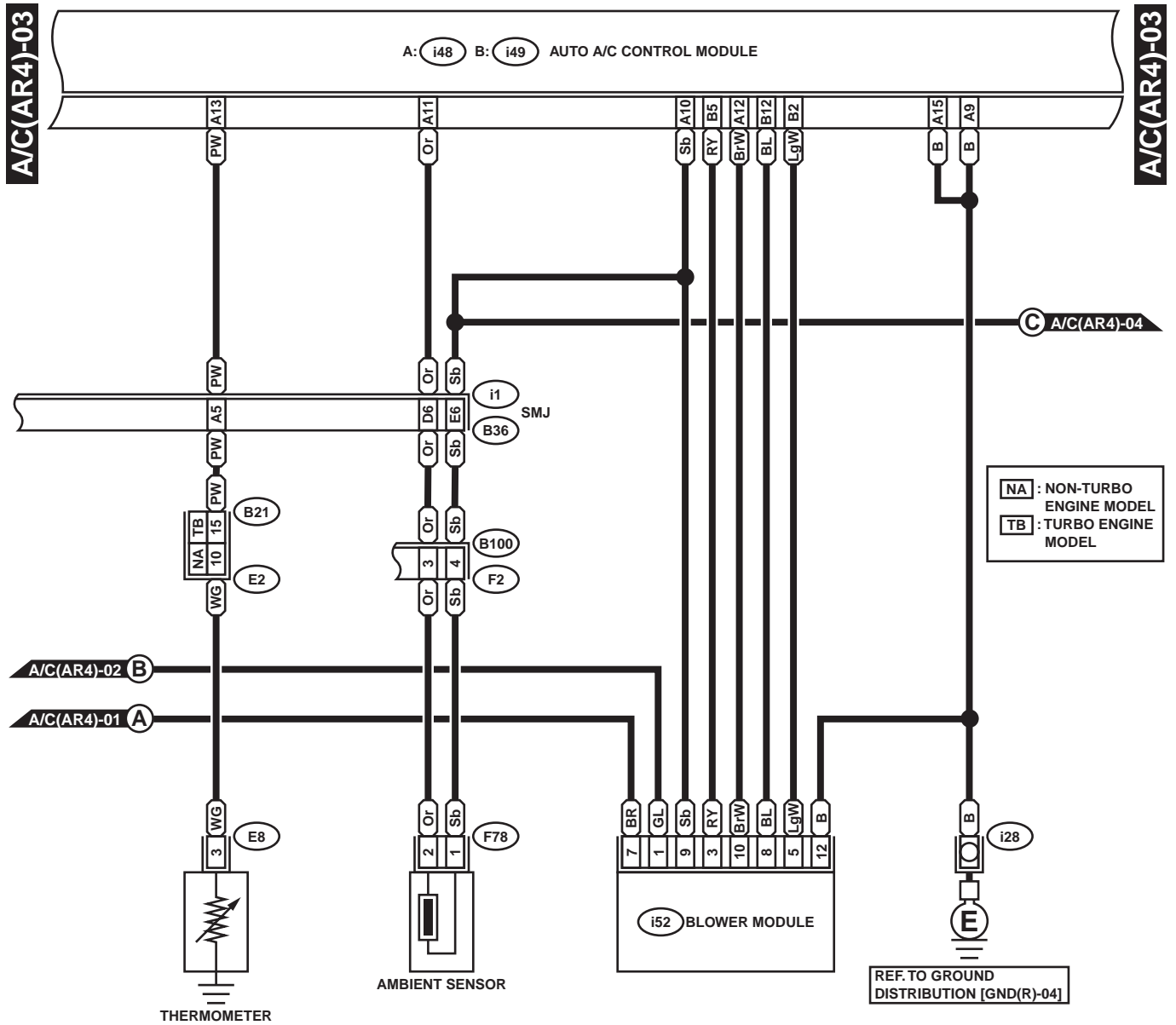
WIRING SYSTEM



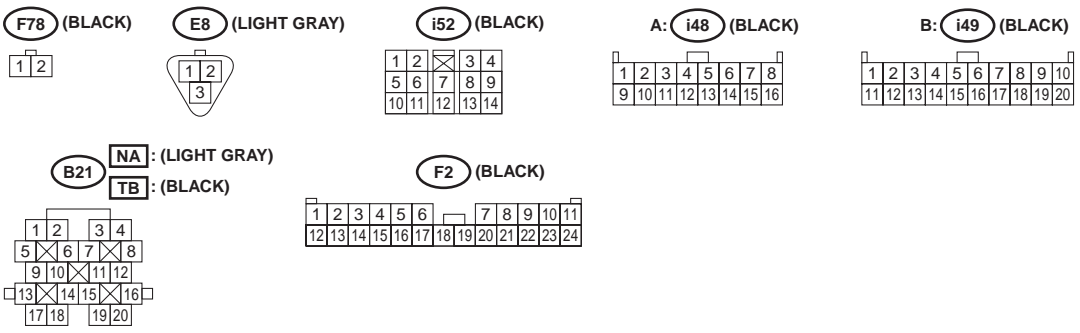
WI-00792

AIR CONDITIONING SYSTEM

WIRING SYSTEM



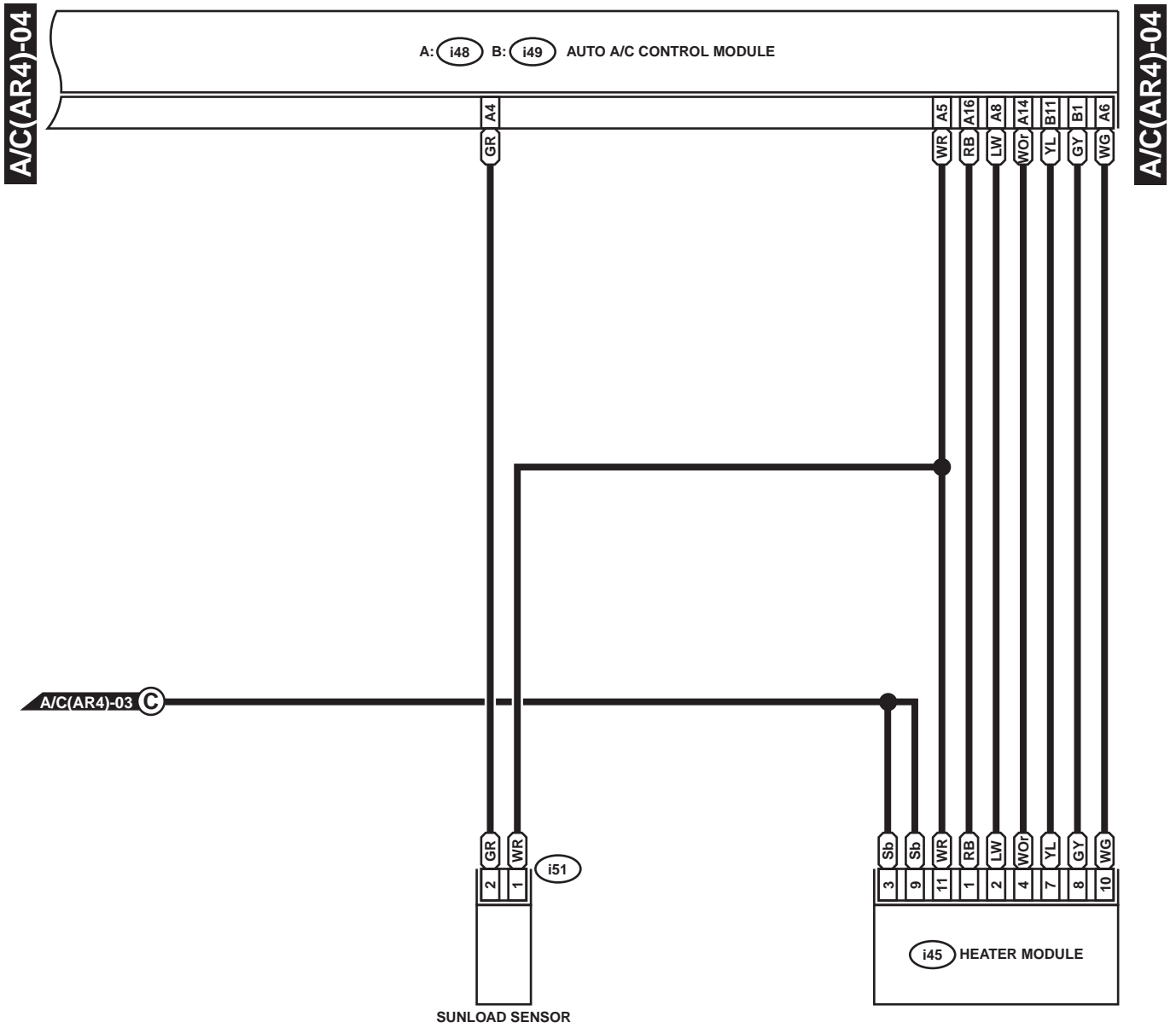
NA : NON-TURBO ENGINE MODEL
TB : TURBO ENGINE MODEL



WI-00793

AIR CONDITIONING SYSTEM

WIRING SYSTEM



i51 (BLACK)

1	2
---	---

i45 (BLACK)

1	2	3		4	5	6	
7	8	9	10	11	12	13	14

A: i48 (BLACK)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

B: i49 (BLACK)

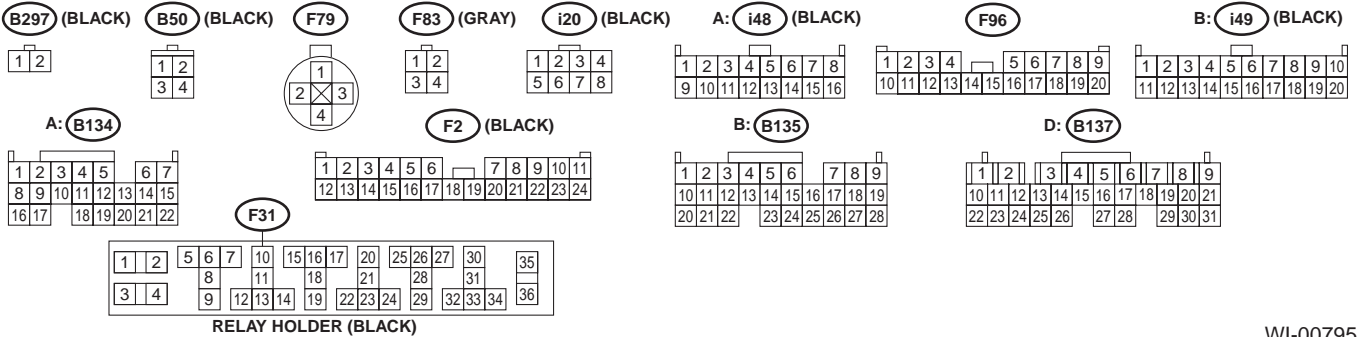
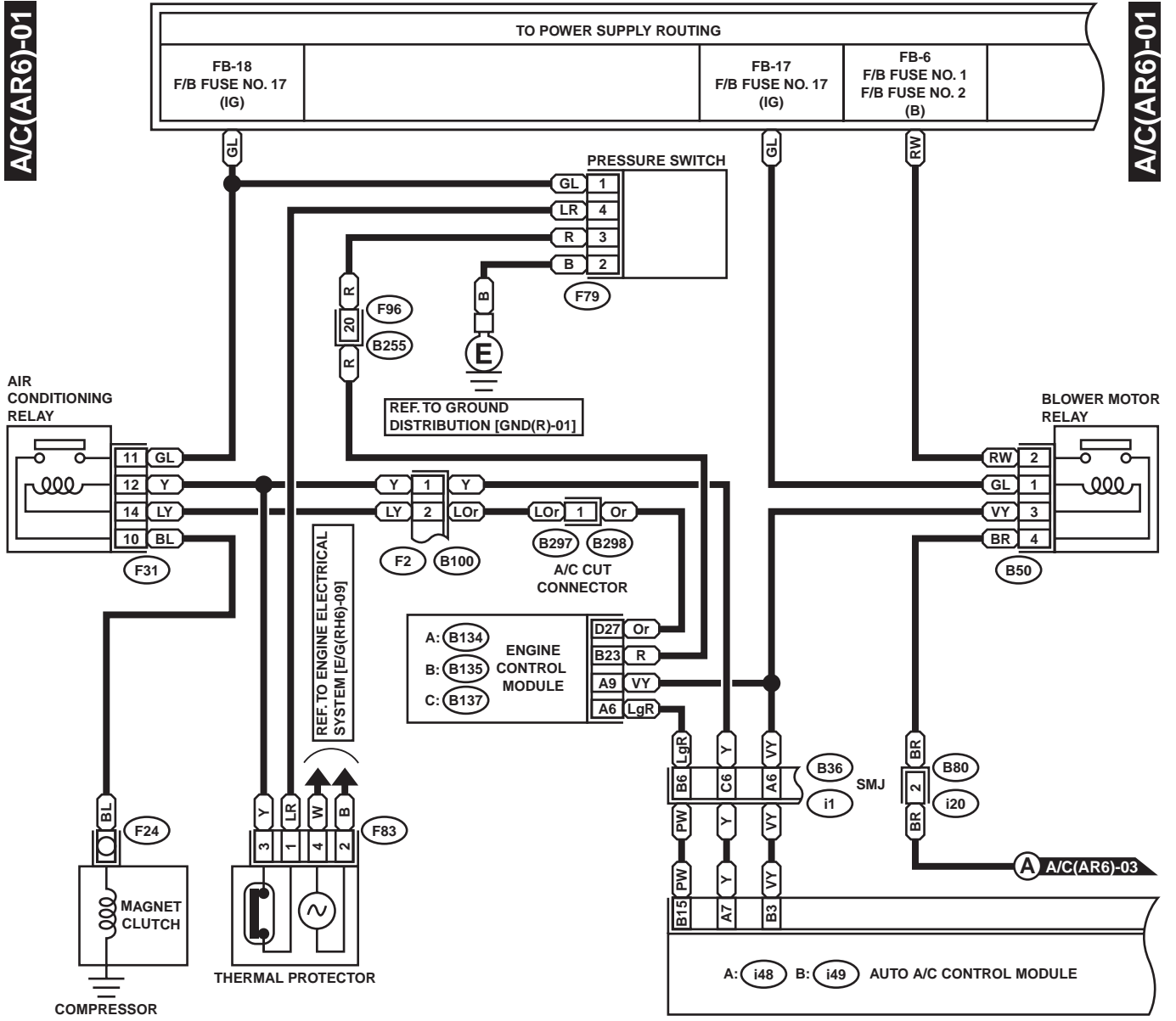
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

WI-00794

AIR CONDITIONING SYSTEM

WIRING SYSTEM

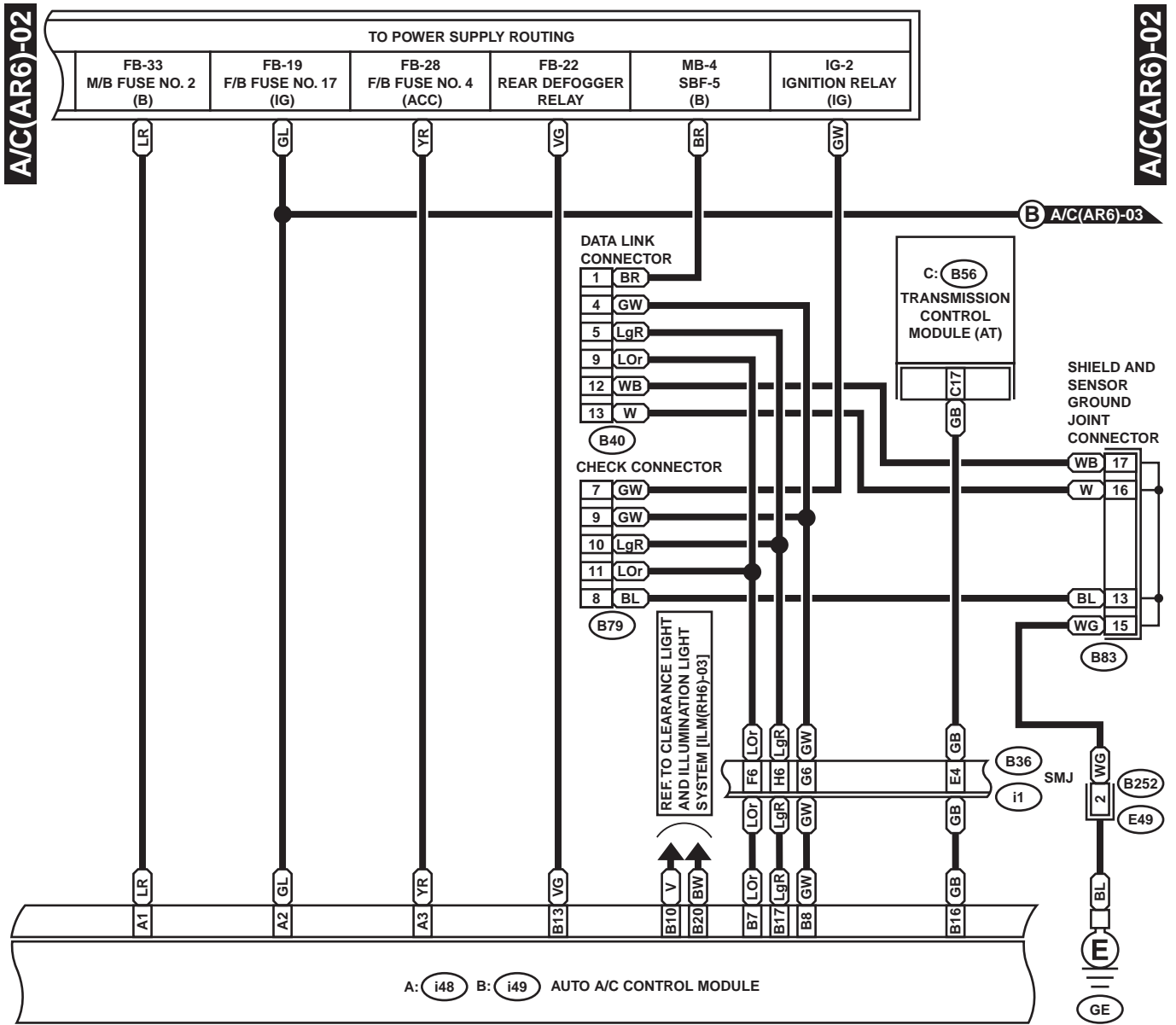
6. AUTO A/C RHD 6-CYLINDER ENGINE MODEL



WI-00795

AIR CONDITIONING SYSTEM

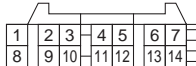
WIRING SYSTEM



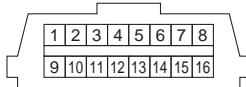
B252 (DARK GRAY)



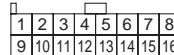
B79 (GRAY)



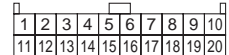
B40 (GRAY)



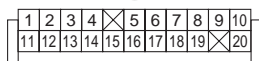
A: i48 (BLACK)



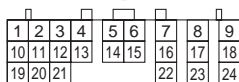
B: i49 (BLACK)



B83



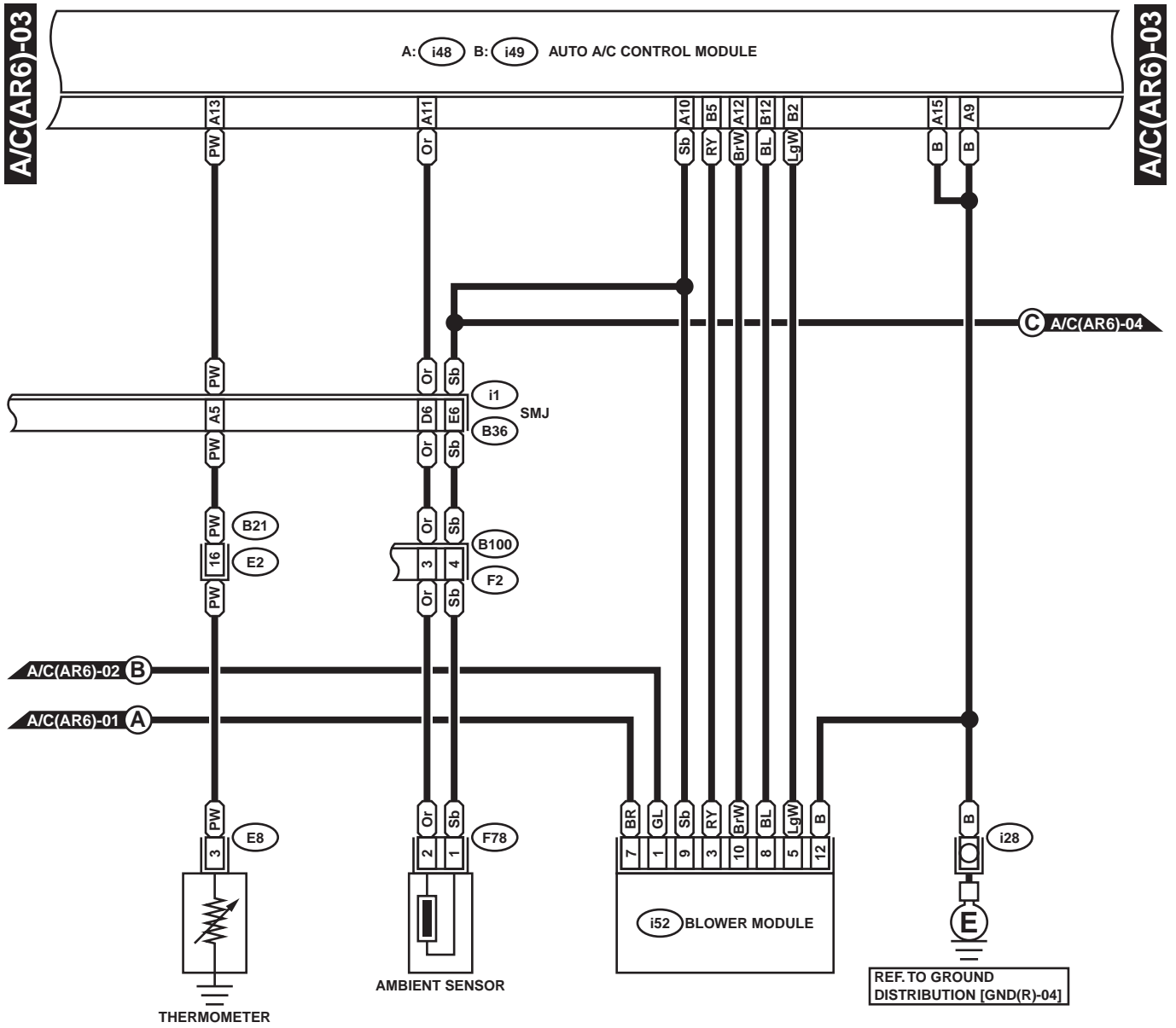
C: B56 (GREEN)



WI-00796

AIR CONDITIONING SYSTEM

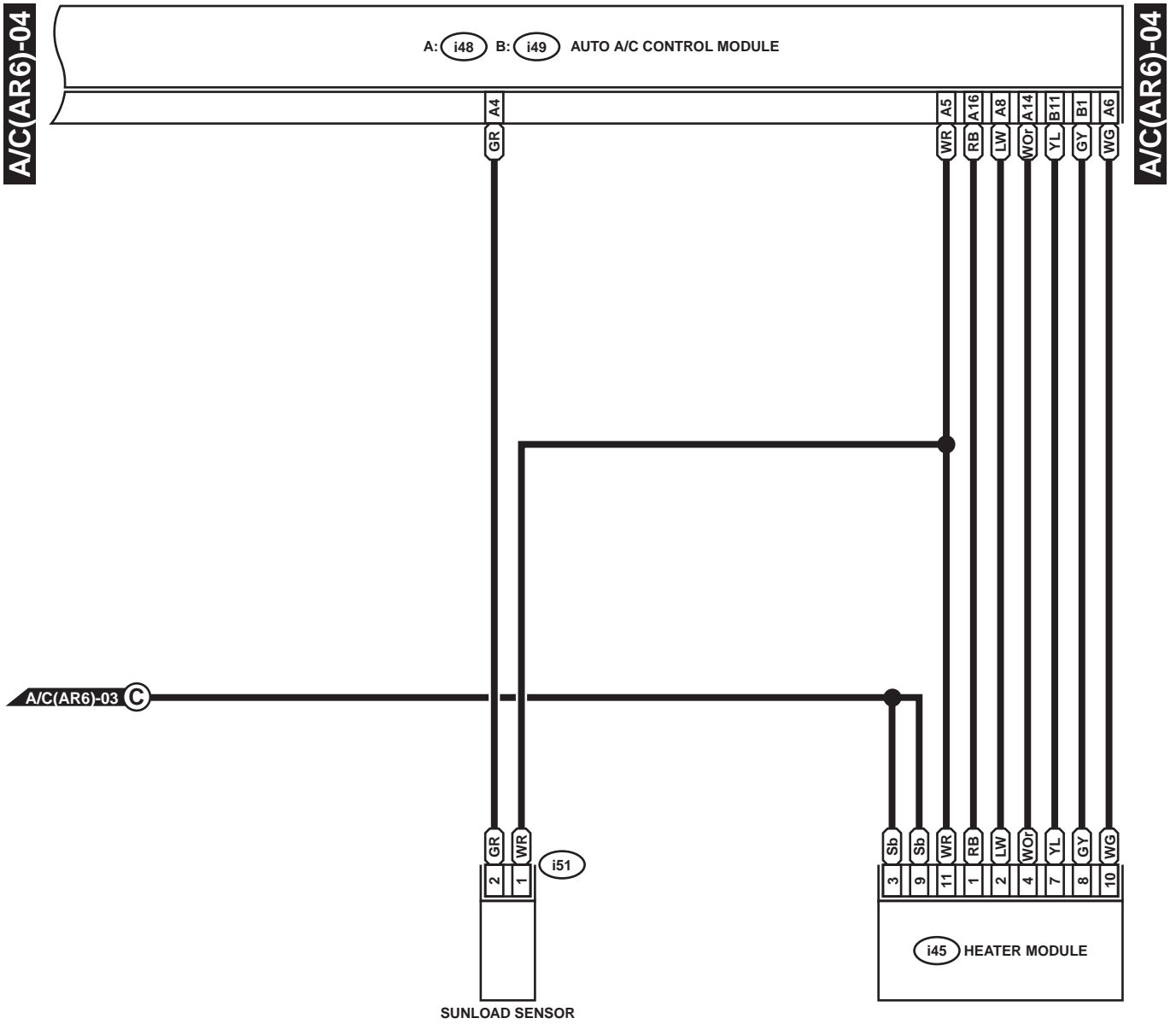
WIRING SYSTEM



WI-00797

AIR CONDITIONING SYSTEM

WIRING SYSTEM



i51 (BLACK)

1	2
---	---

i45 (BLACK)

1	2	3		4	5	6	
7	8	9	10	11	12	13	14

A: i48 (BLACK)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

B: i49 (BLACK)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

WI-00798

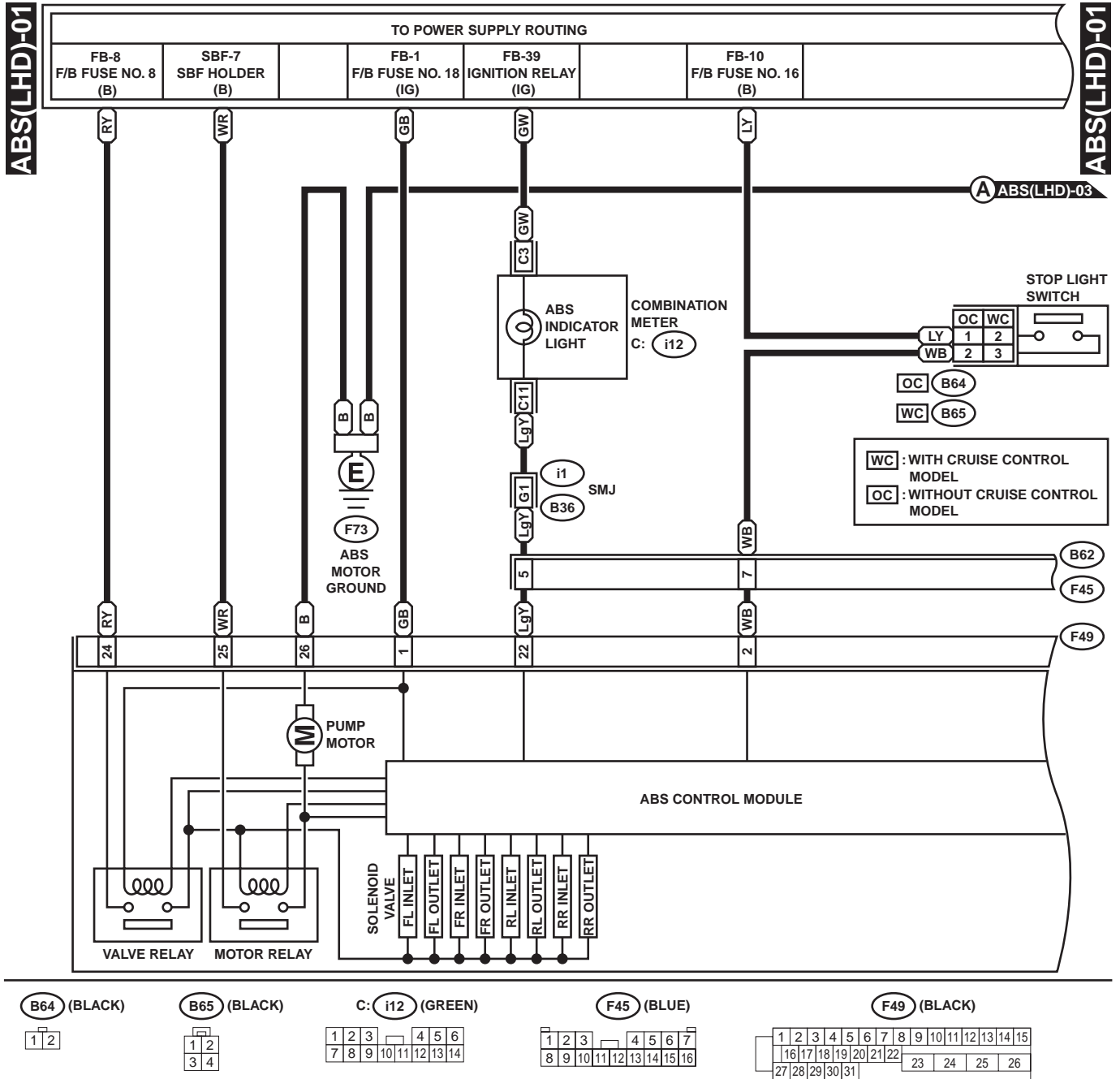
ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM

8. Anti-lock Brake System

A: SCHEMATIC

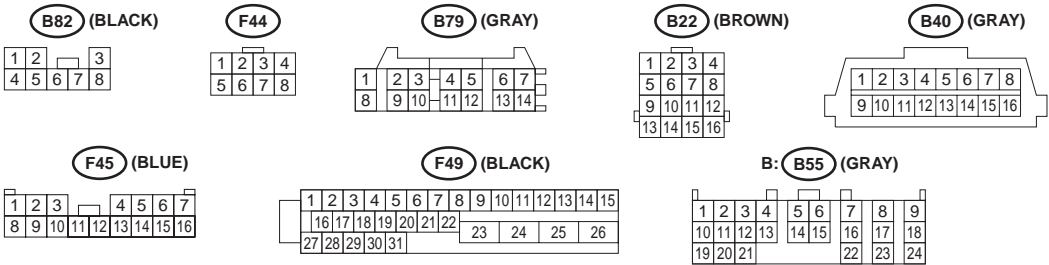
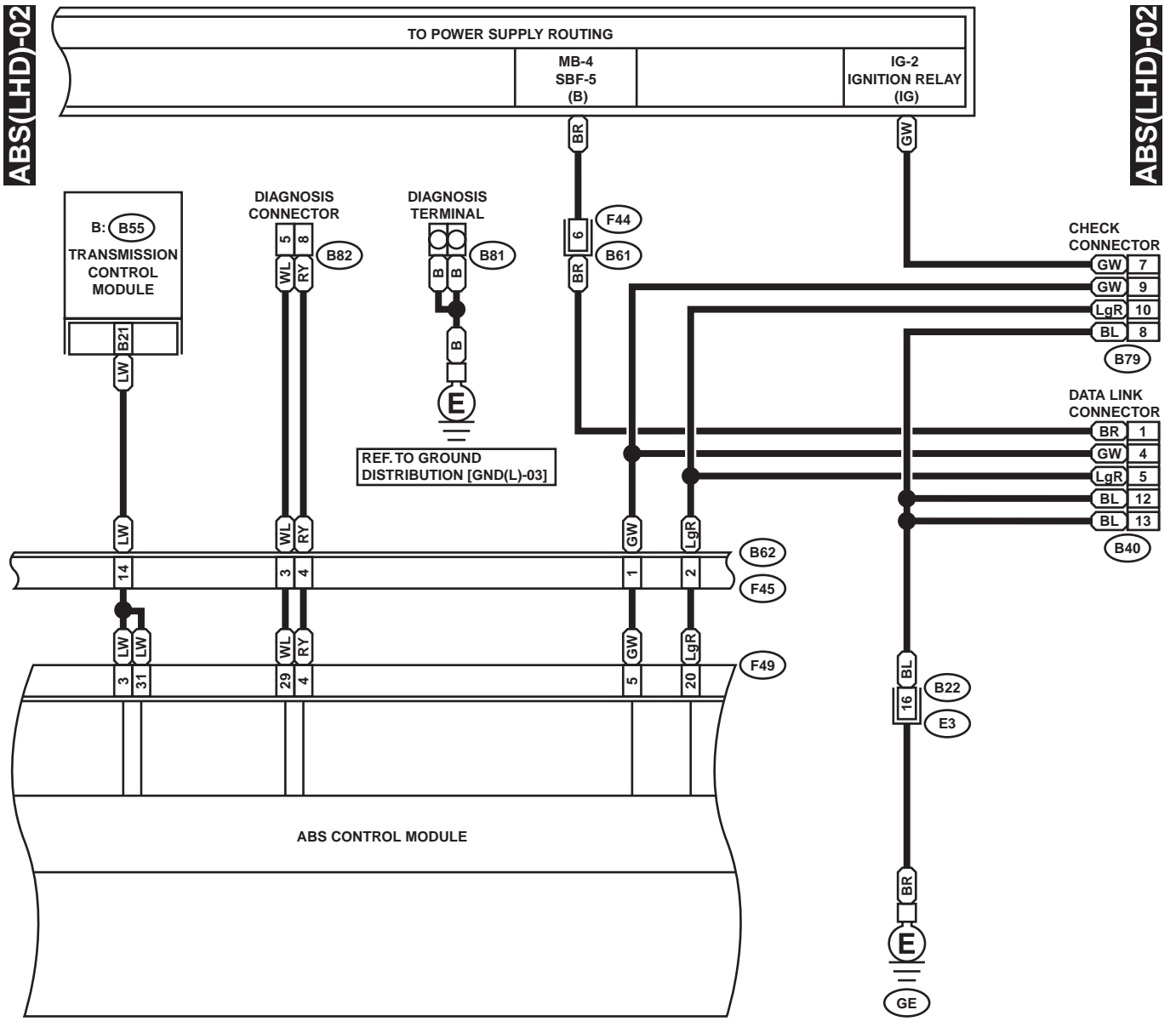
1. LHD MODEL



WI-00799

ANTI-LOCK BRAKE SYSTEM

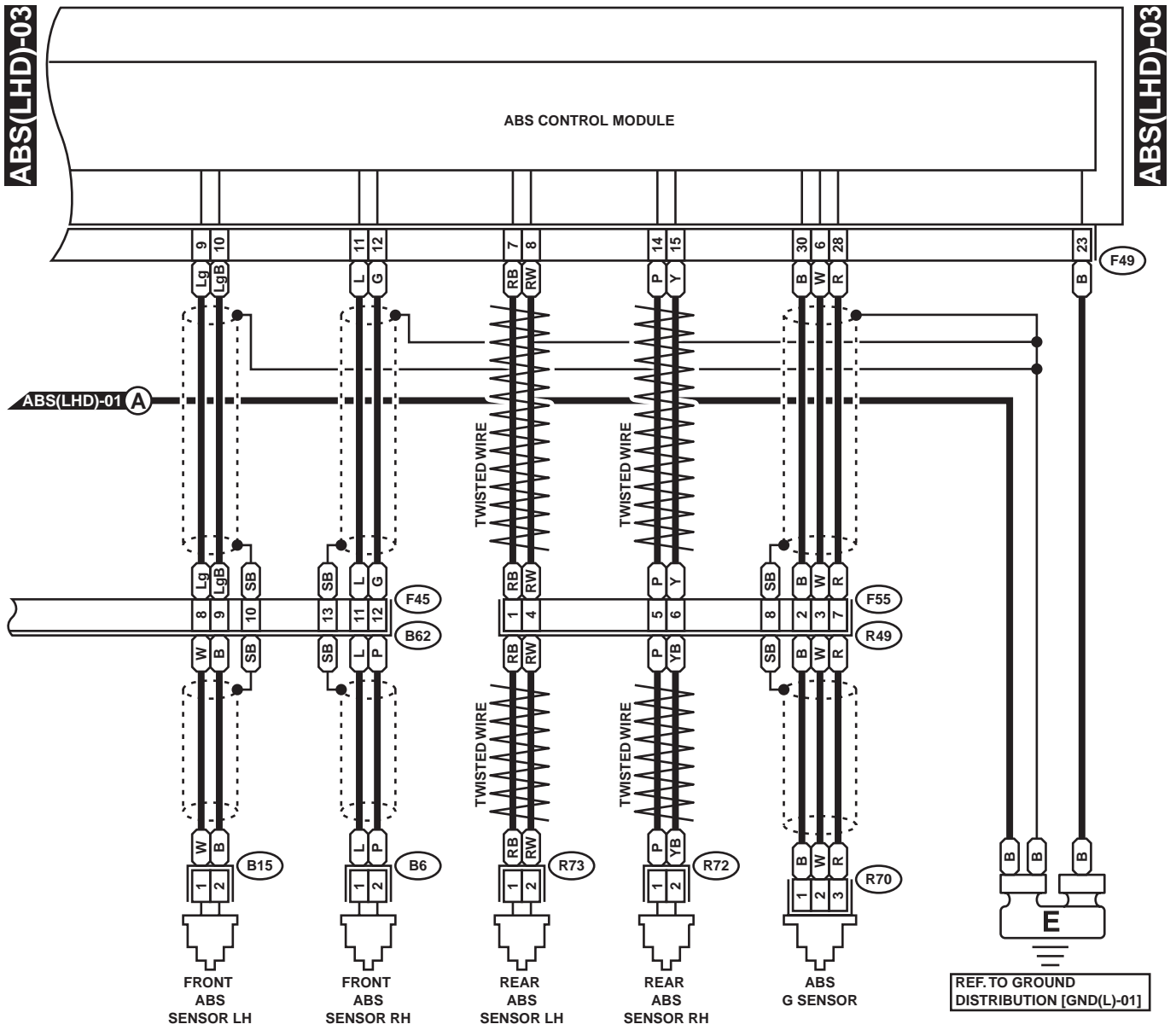
WIRING SYSTEM



WI-00800

ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM



B6 (*1) R72 (GRAY)

R70 (BLACK)

F55

F45 (BLUE)

F49 (BLACK)

B15 (*1) R73 (GRAY)

1	2	3
---	---	---

1	2	3		
4	5	6	7	8

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

2	1
---	---

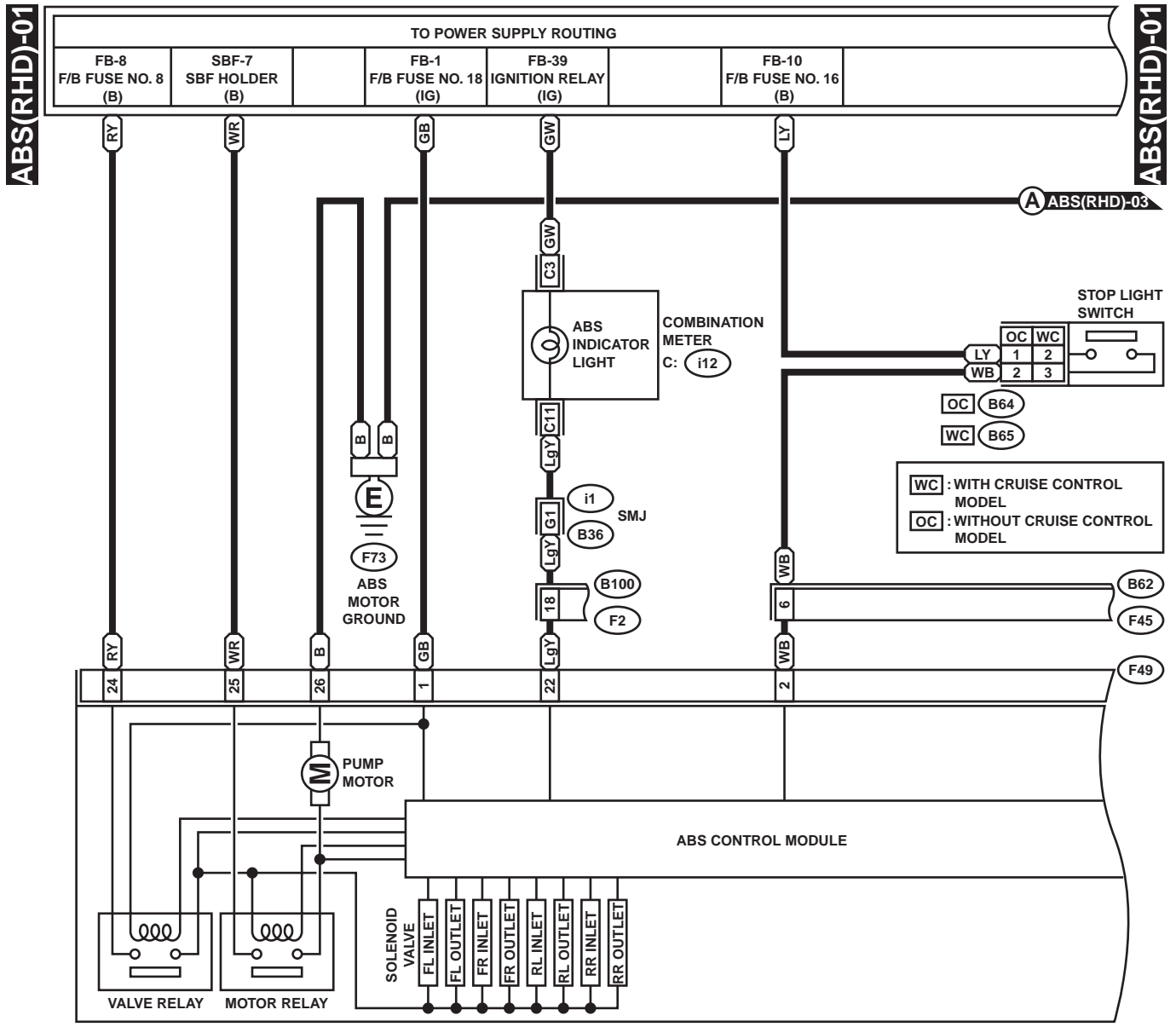
(*1) : OUTBACK: (BROWN)
OTHER MODELS: (GRAY)

WI-00801

ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM

2. RHD NON-TURBO ENGINE MODEL



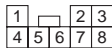
(B64) (BLACK)



(B65) (BLACK)



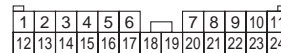
(F45)



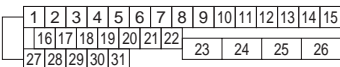
C: i12 (GREEN)



(F2) (BLACK)



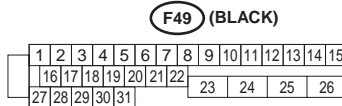
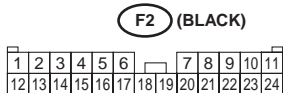
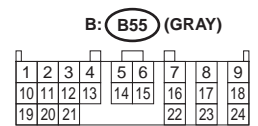
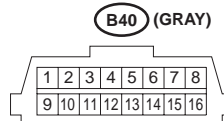
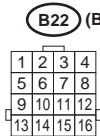
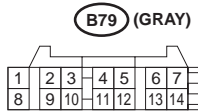
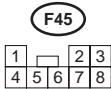
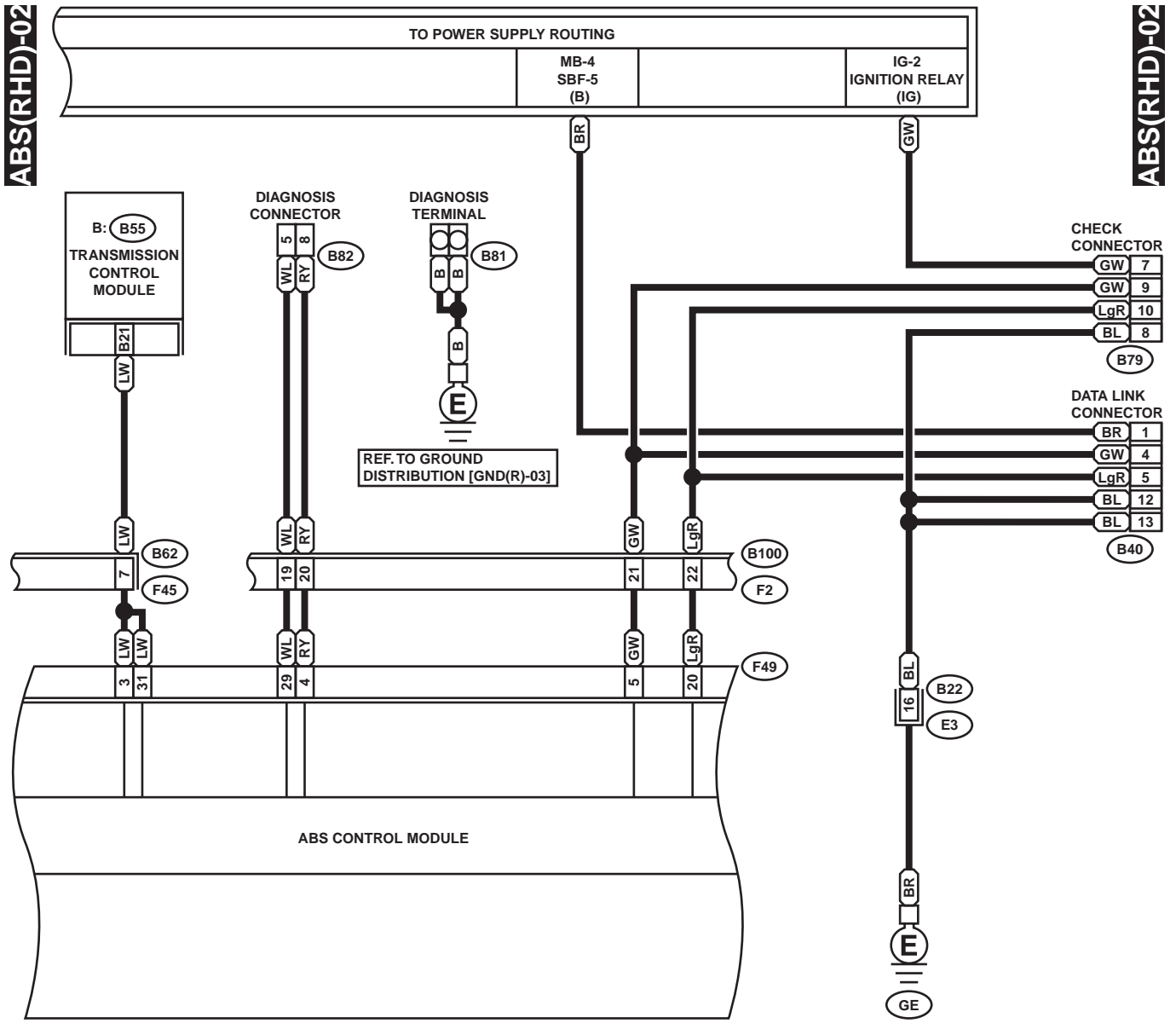
(F49) (BLACK)



WI-00802

ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM

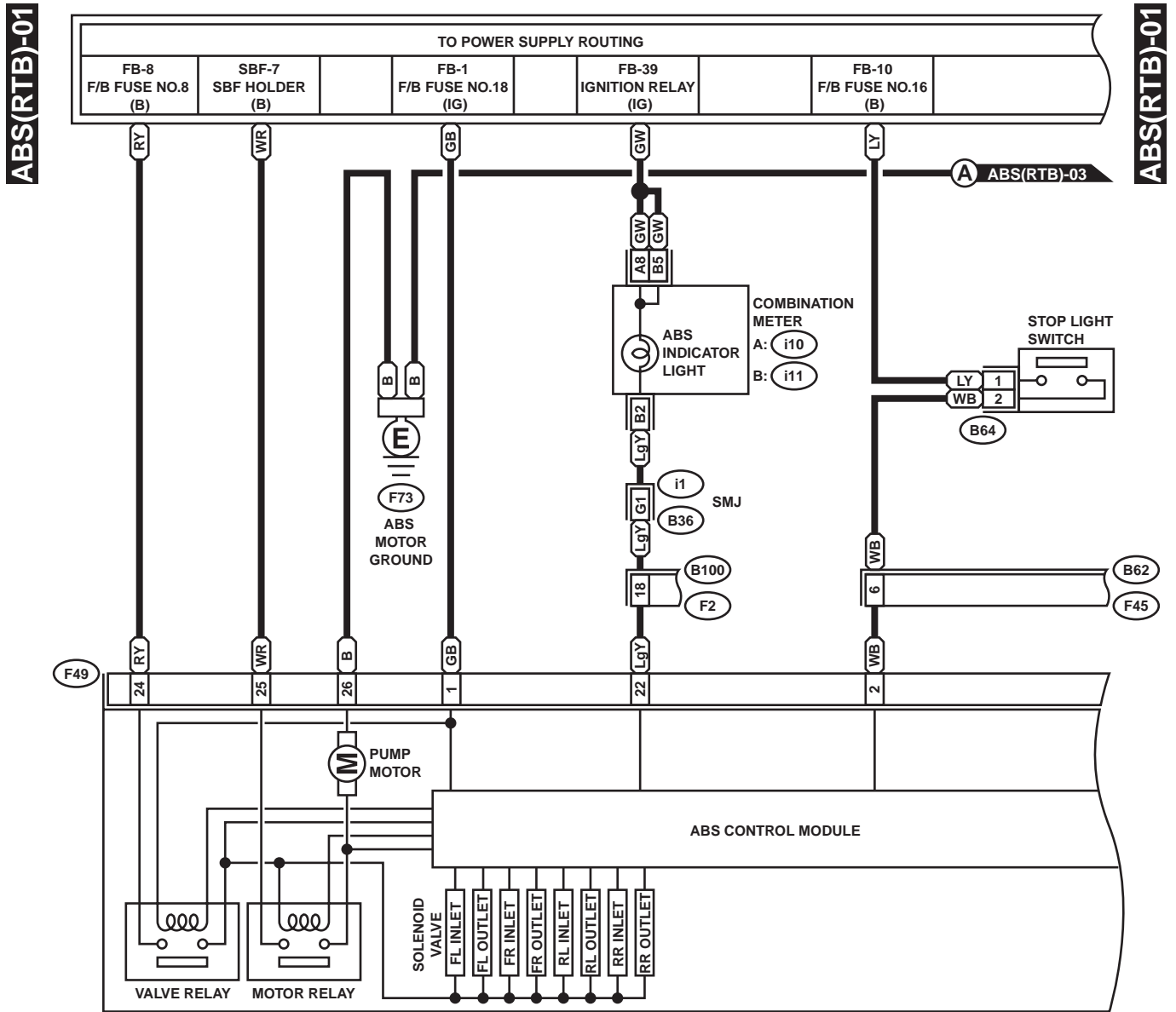


WI-00803

ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM

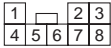
3. RHD TURBO ENGINE MODEL



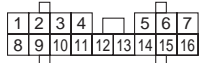
B64 (BLACK)



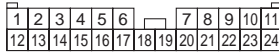
F45



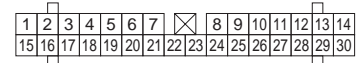
B: i11 (GREEN)



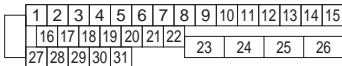
F2 (BLACK)



A: i10 (GREEN)



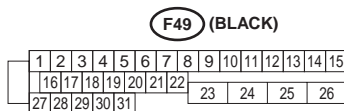
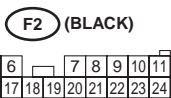
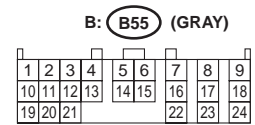
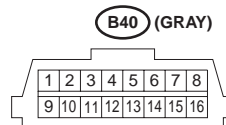
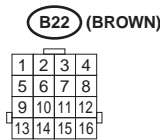
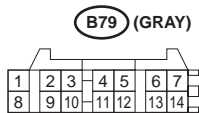
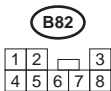
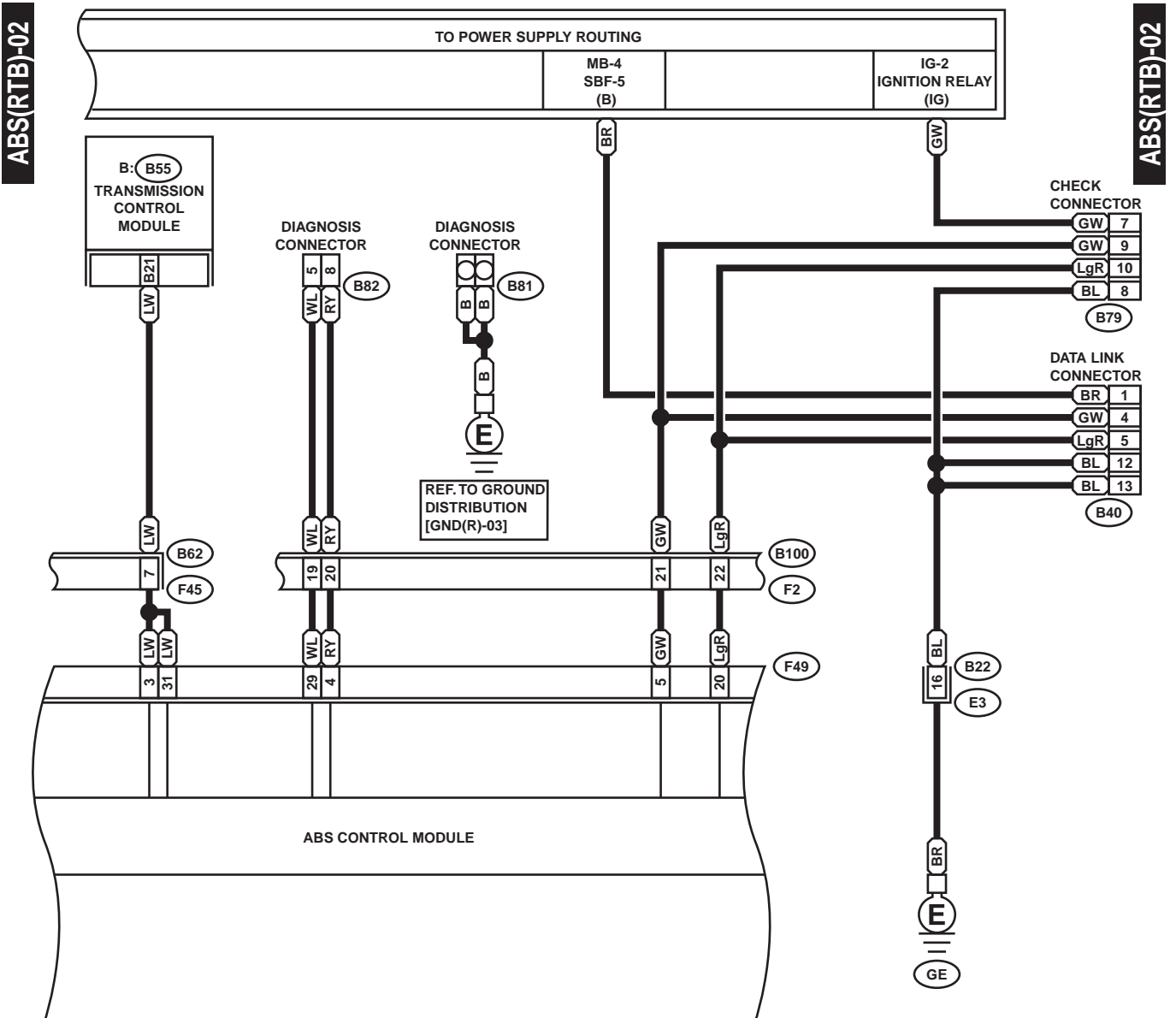
F49 (BLACK)



WI-00805

ANTI-LOCK BRAKE SYSTEM

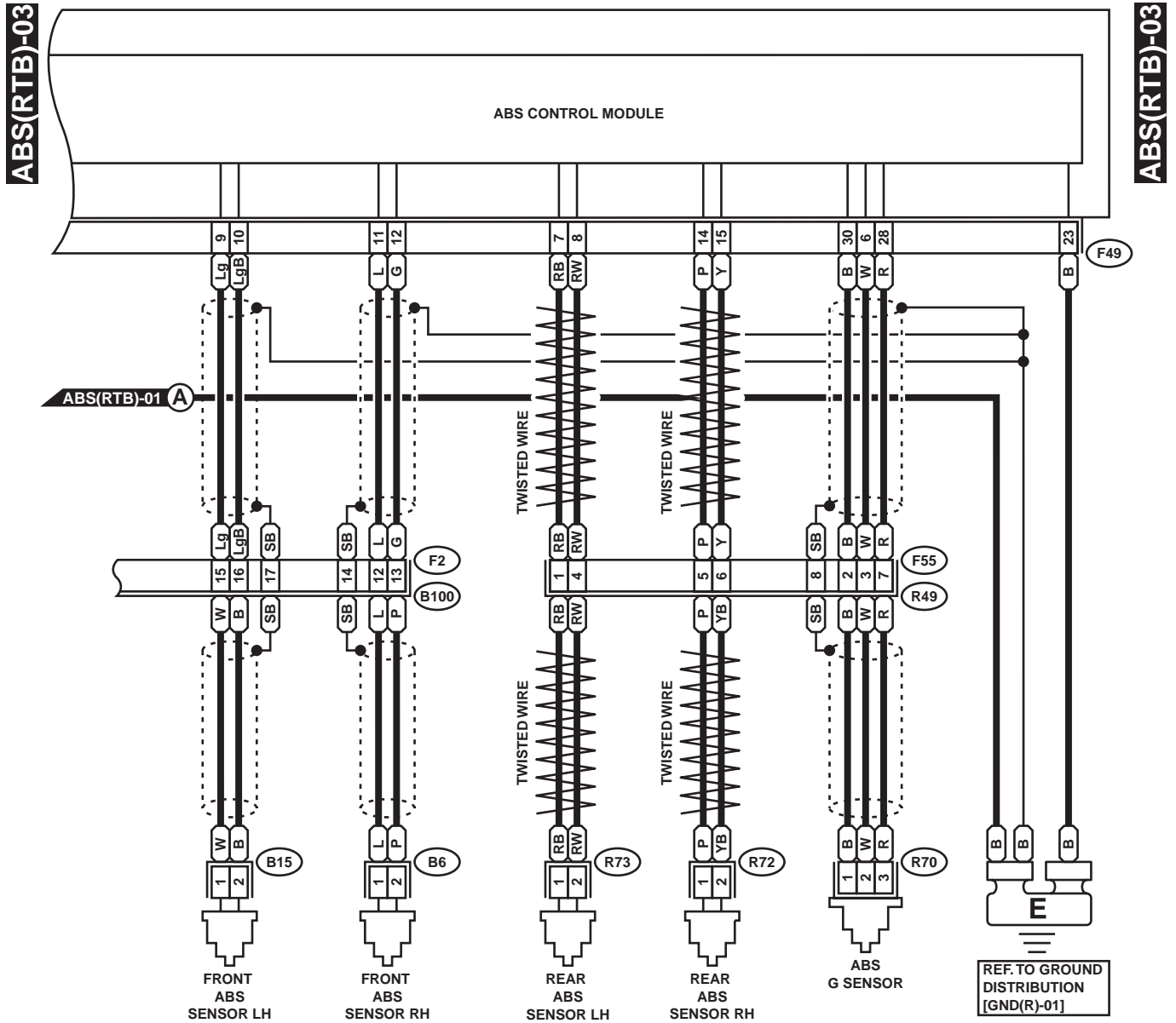
WIRING SYSTEM



WI-00806

ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM



B6 (GRAY)

R70 (BLACK)

F55

F2 (BLACK)

F49 (BLACK)

B15 (GRAY)

1	2	3
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1	2	3
4	5	6
7	8	

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24									

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22								
23	24	25	26											
27	28	29	30	31										

R72 (GRAY)

2	1
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R73 (GRAY)

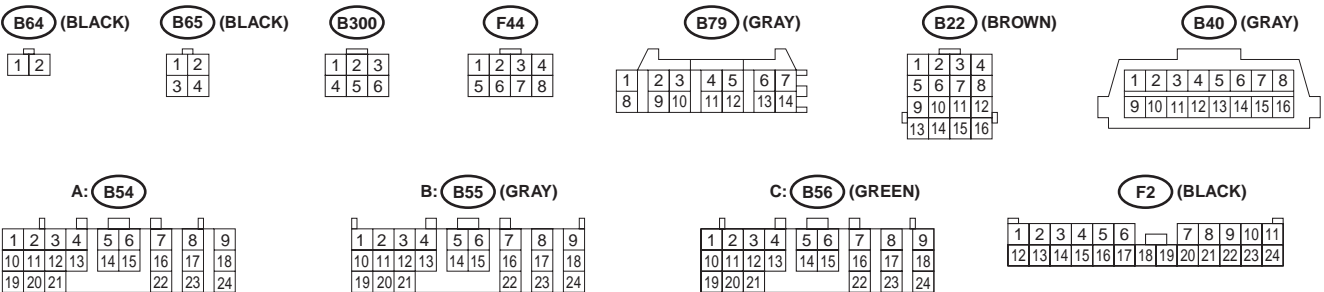
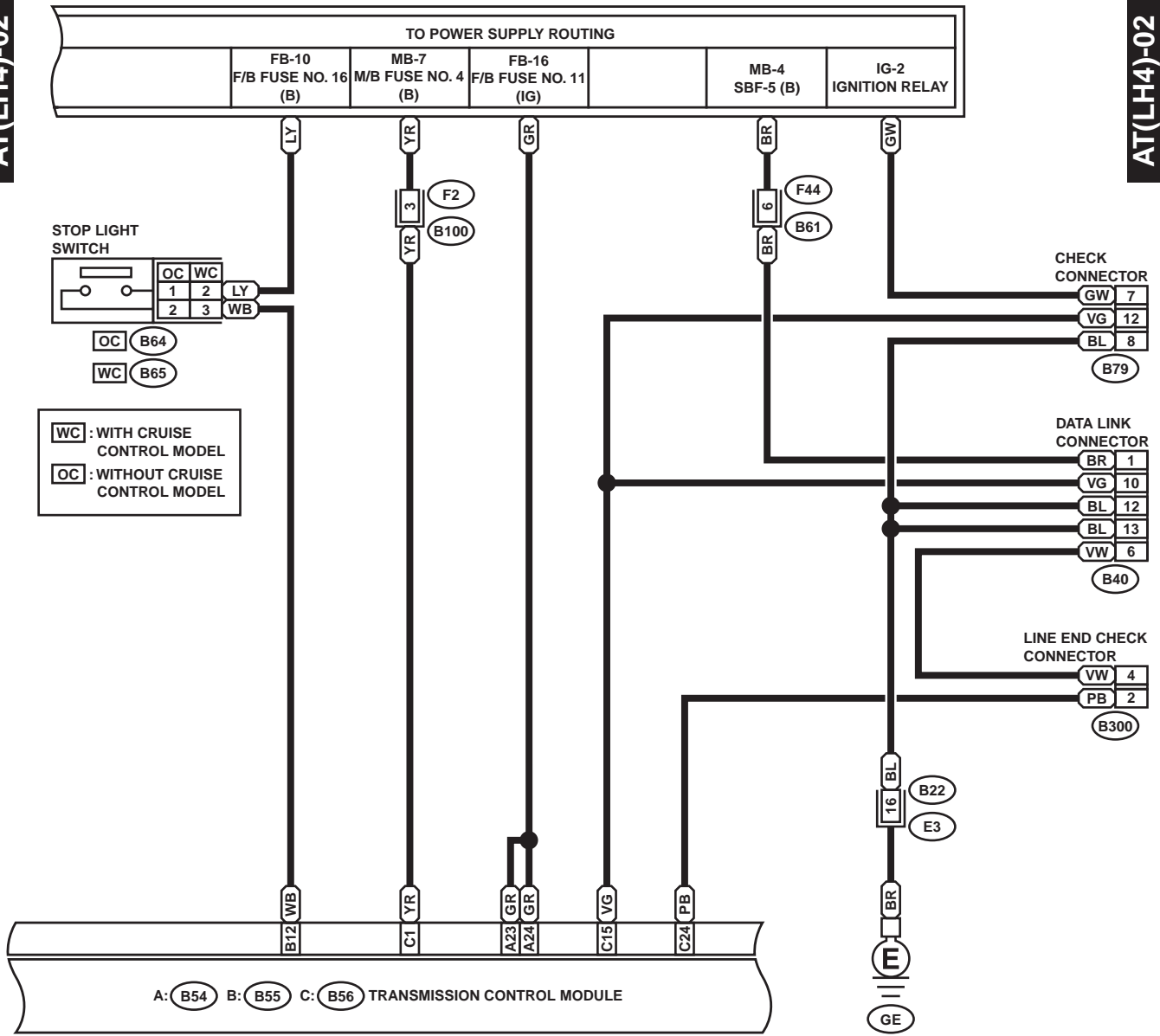
MEMO:

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(LH4)-02

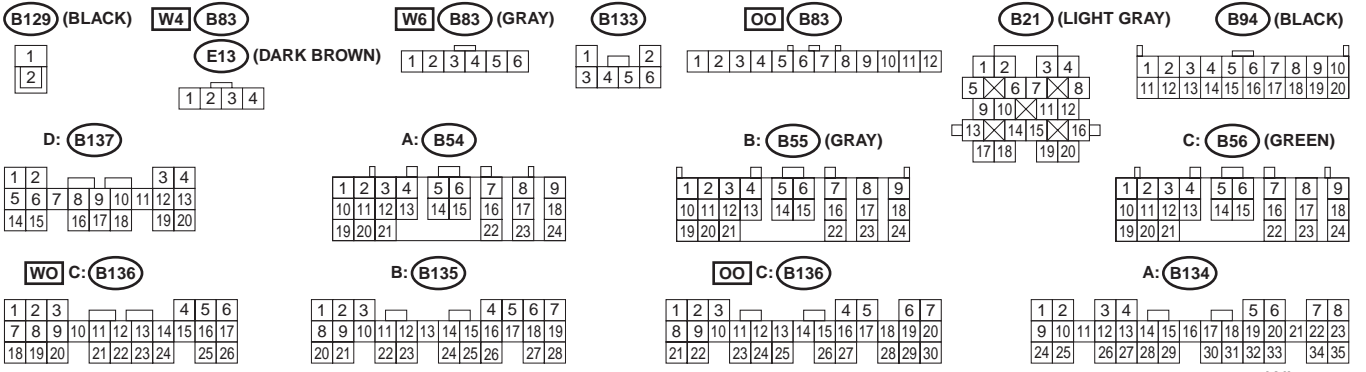
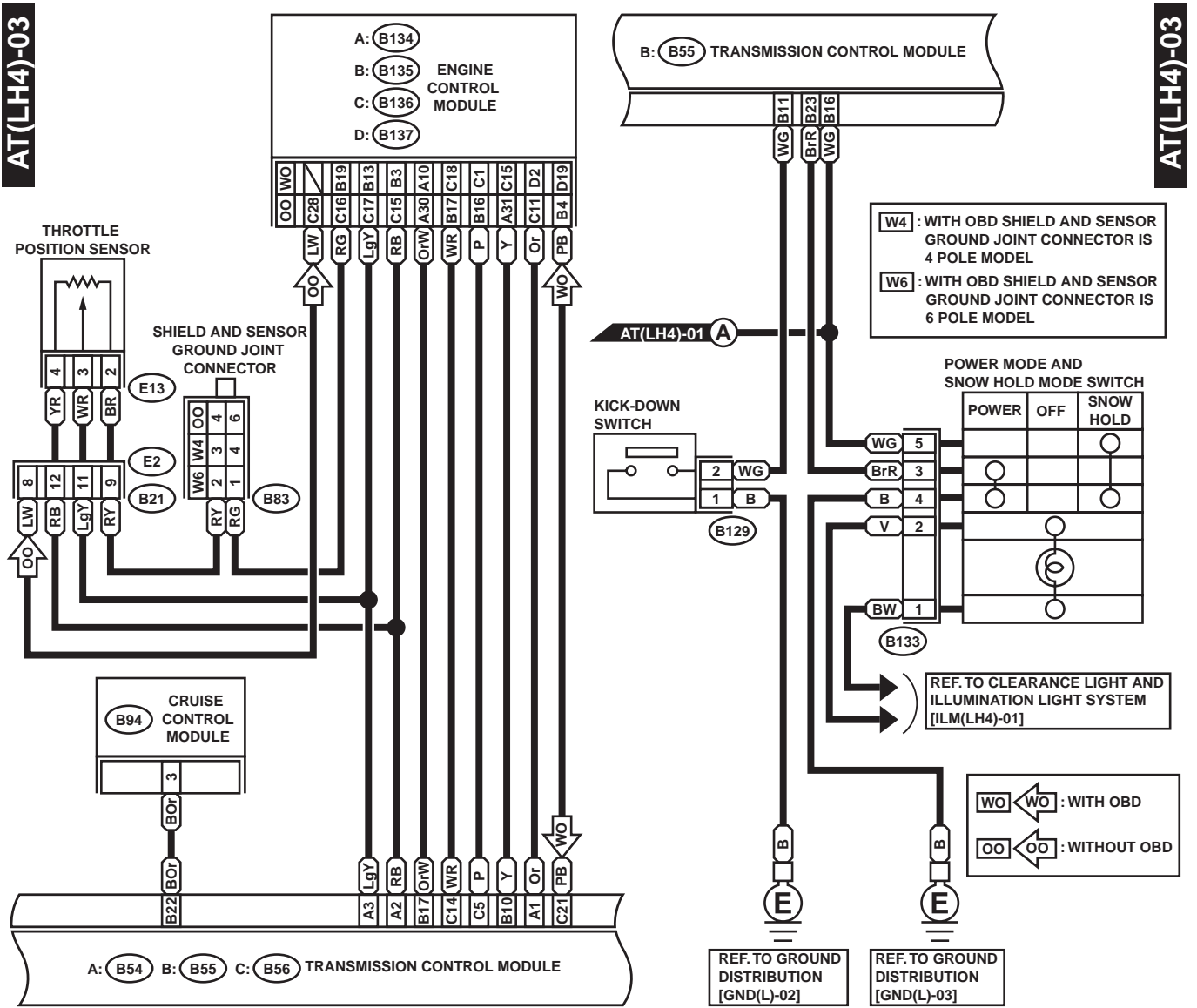
AT(LH4)-02



WI-00809

A/T CONTROL SYSTEM

WIRING SYSTEM



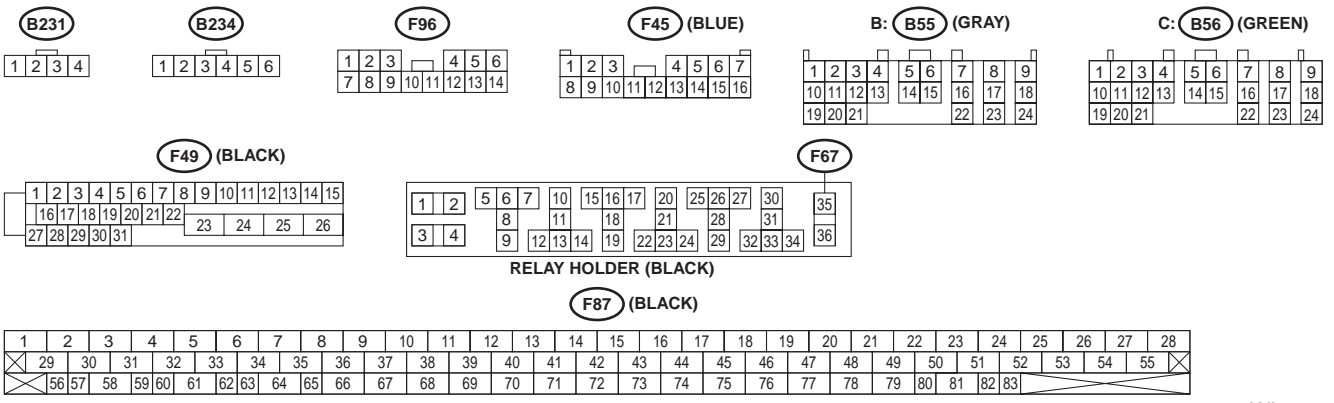
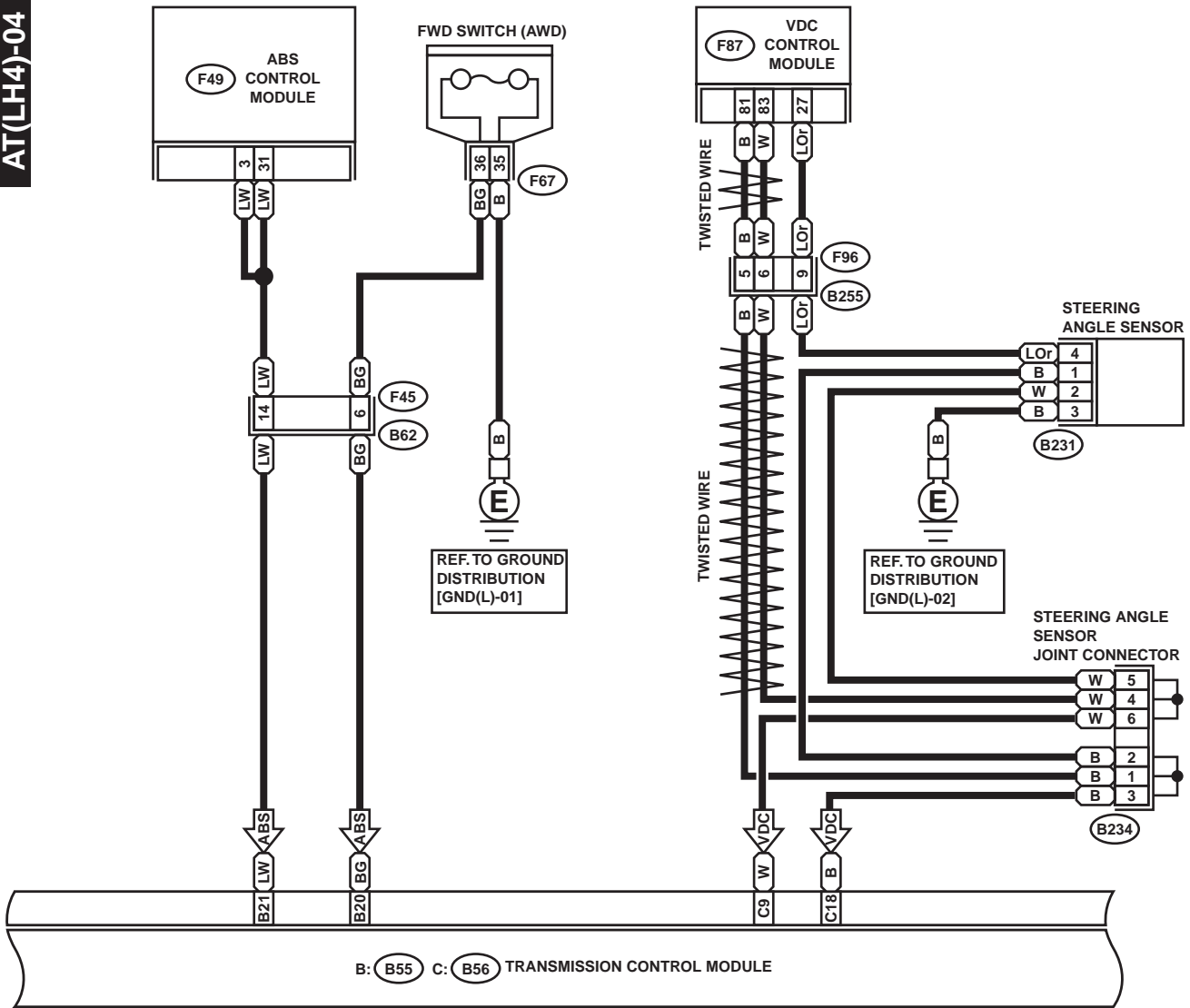
WI-00810

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(LH4)-04

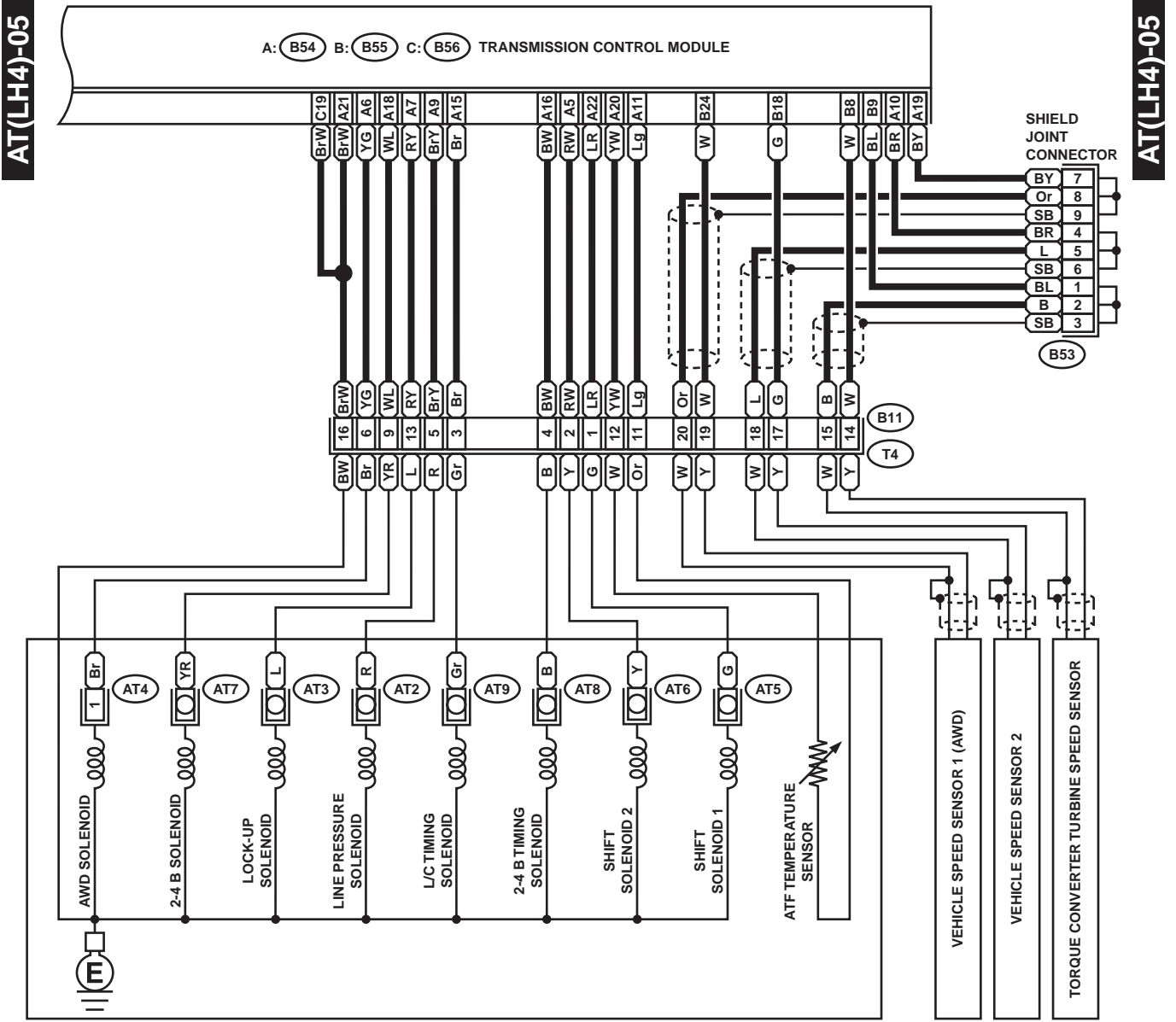
AT(LH4)-04



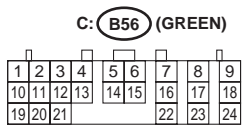
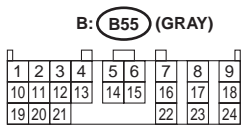
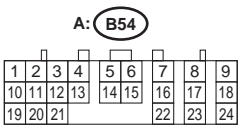
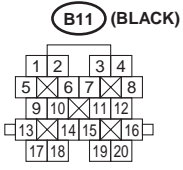
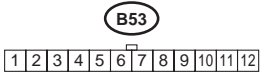
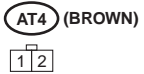
WI-00811

A/T CONTROL SYSTEM

WIRING SYSTEM



AT(LH4)-05



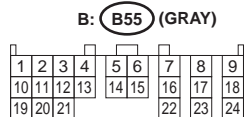
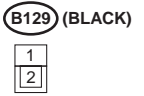
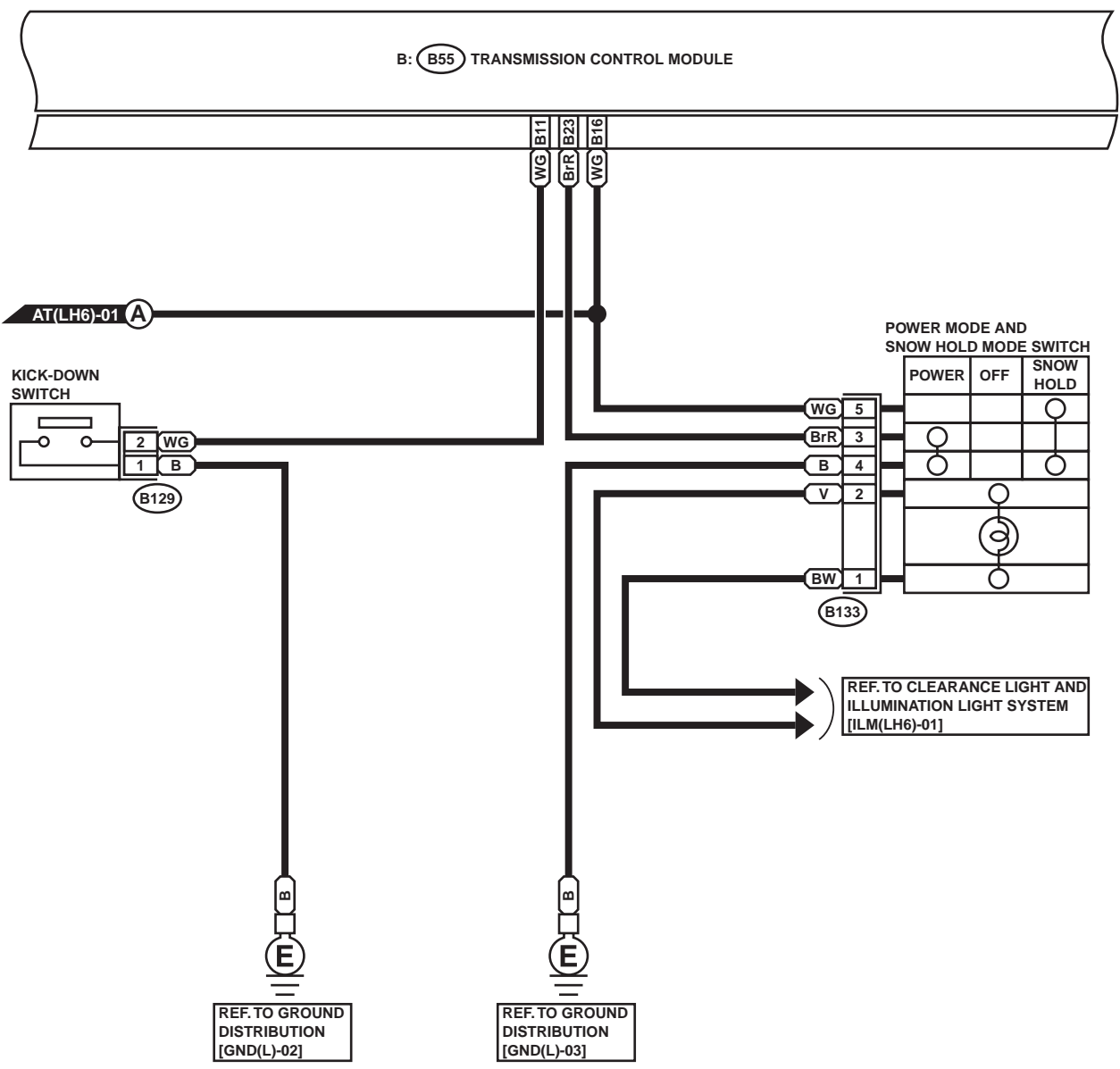
WI-00812

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(LH6)-02

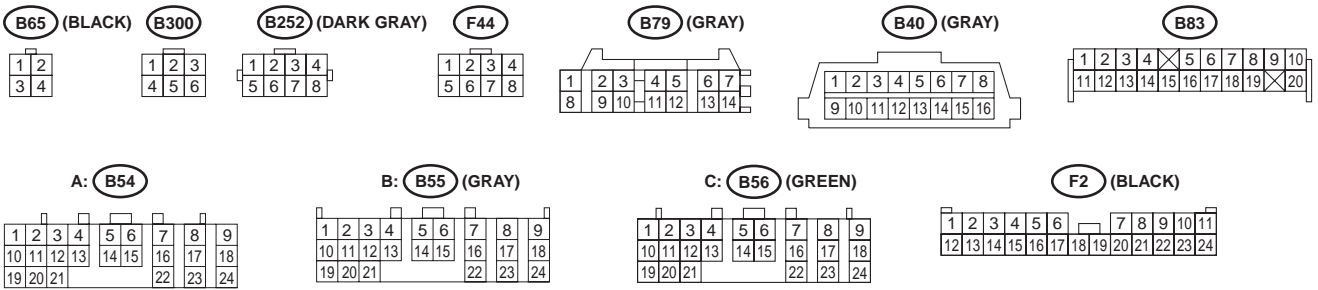
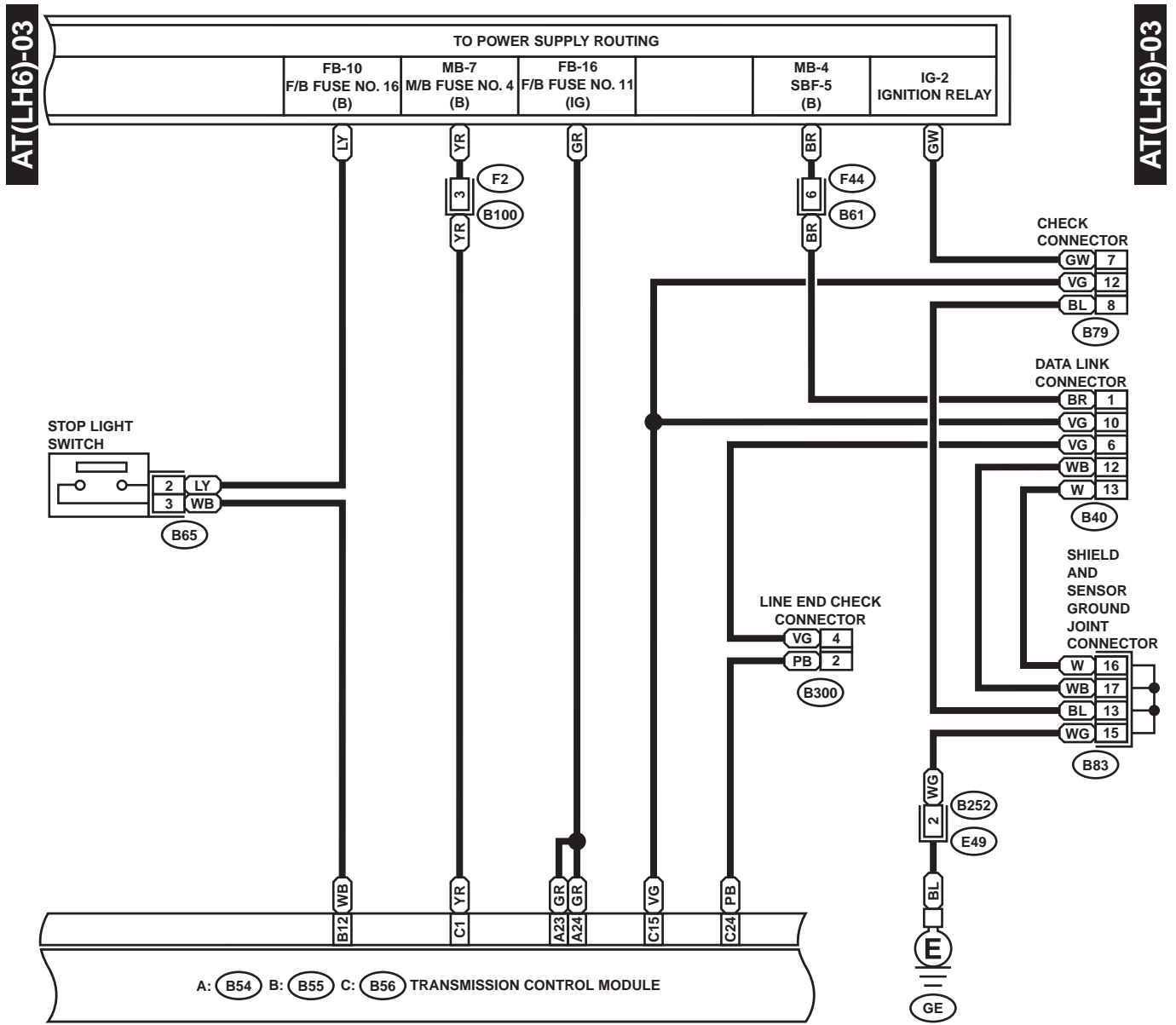
AT(LH6)-02



WI-00814

A/T CONTROL SYSTEM

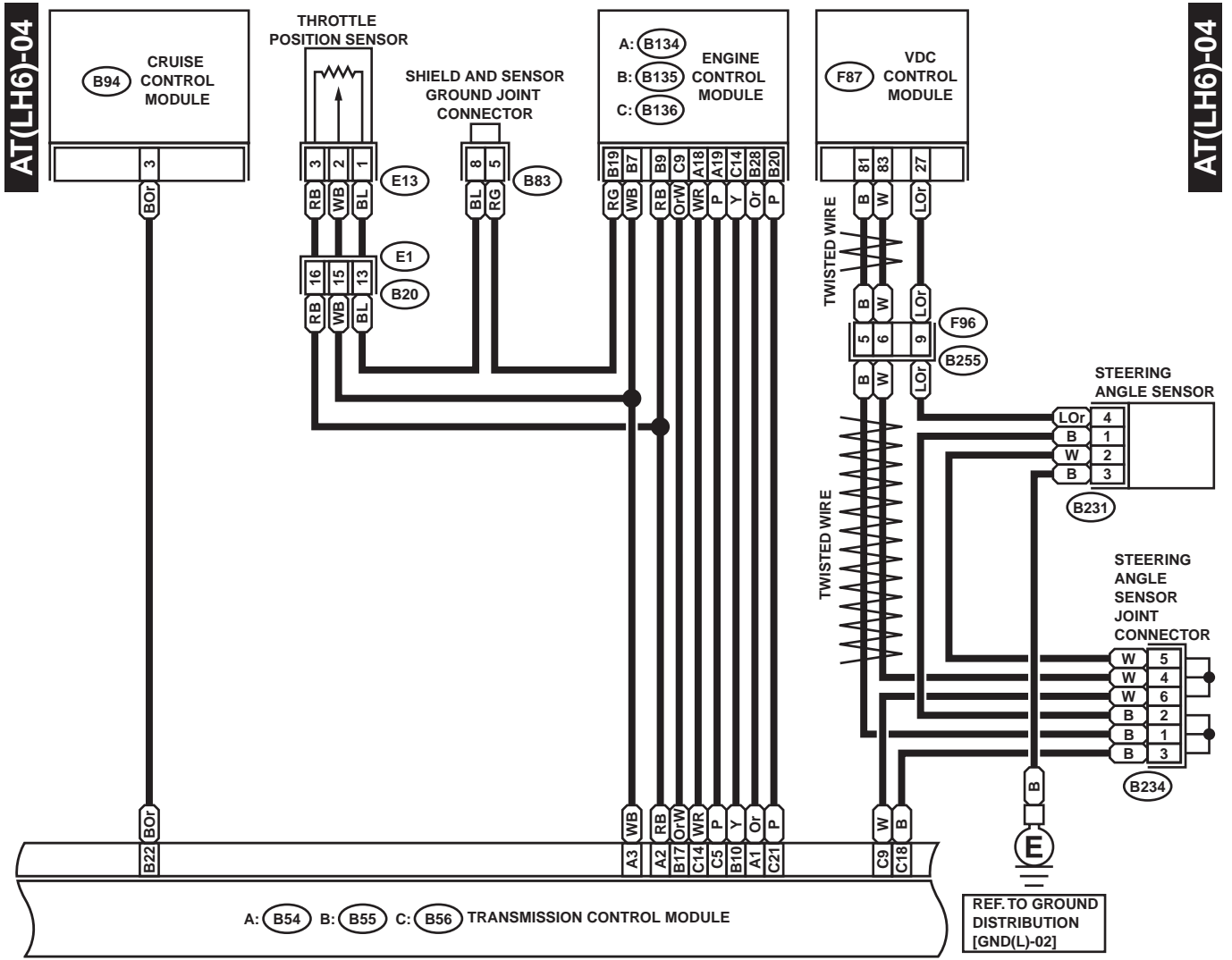
WIRING SYSTEM



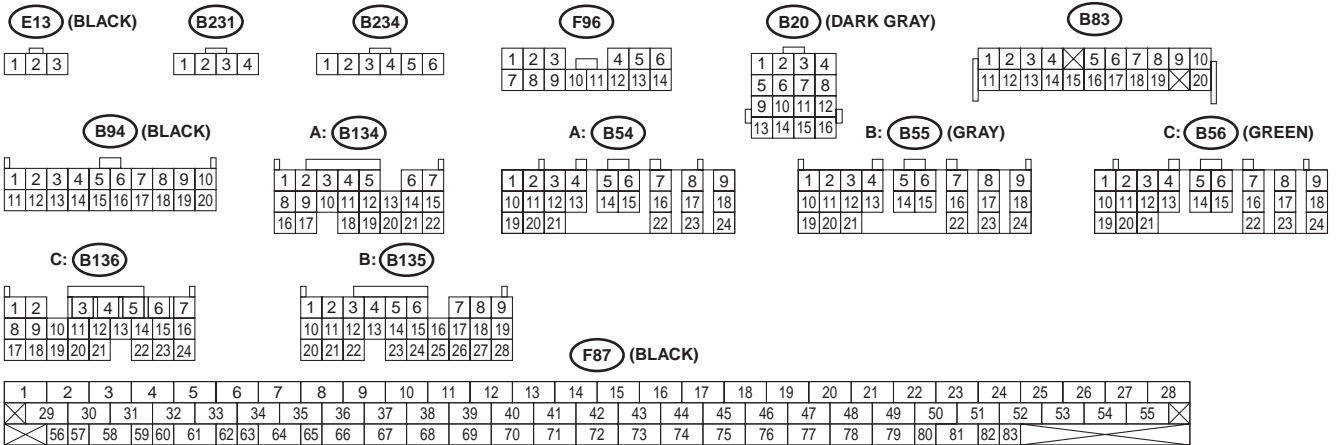
WI-00815

A/T CONTROL SYSTEM

WIRING SYSTEM



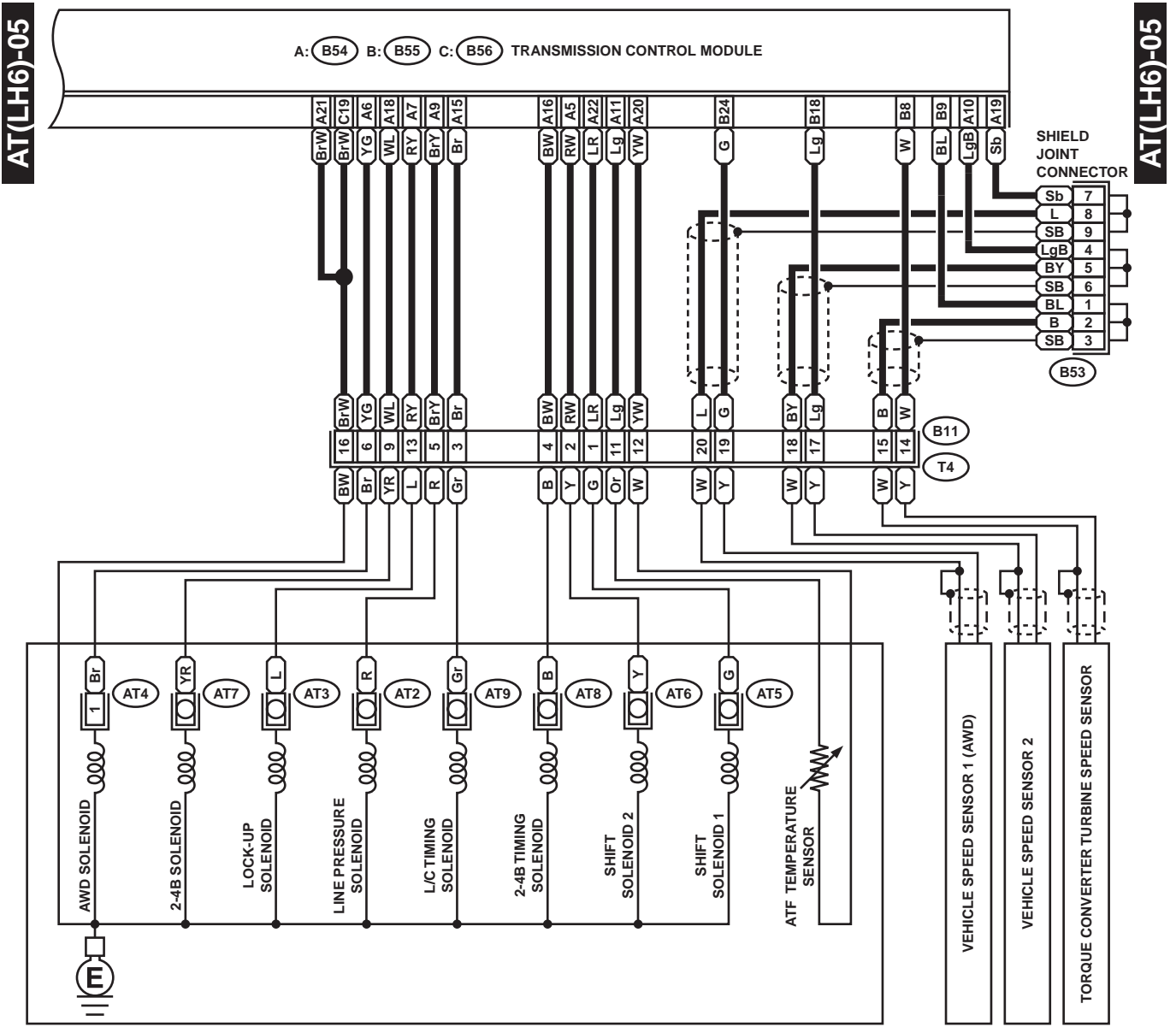
AT(LH6)-04



WI-00816

A/T CONTROL SYSTEM

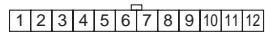
WIRING SYSTEM



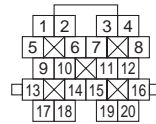
AT4 (BROWN)



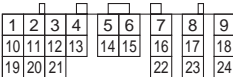
B53



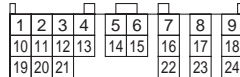
B11 (BLACK)



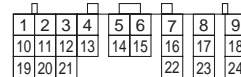
A: B54



B: B55 (GRAY)



C: B56 (GREEN)

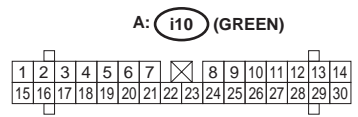
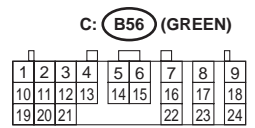
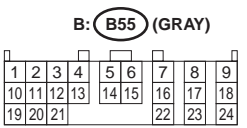
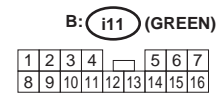
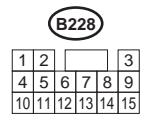
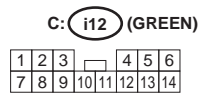
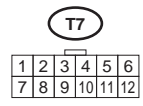
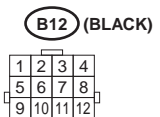
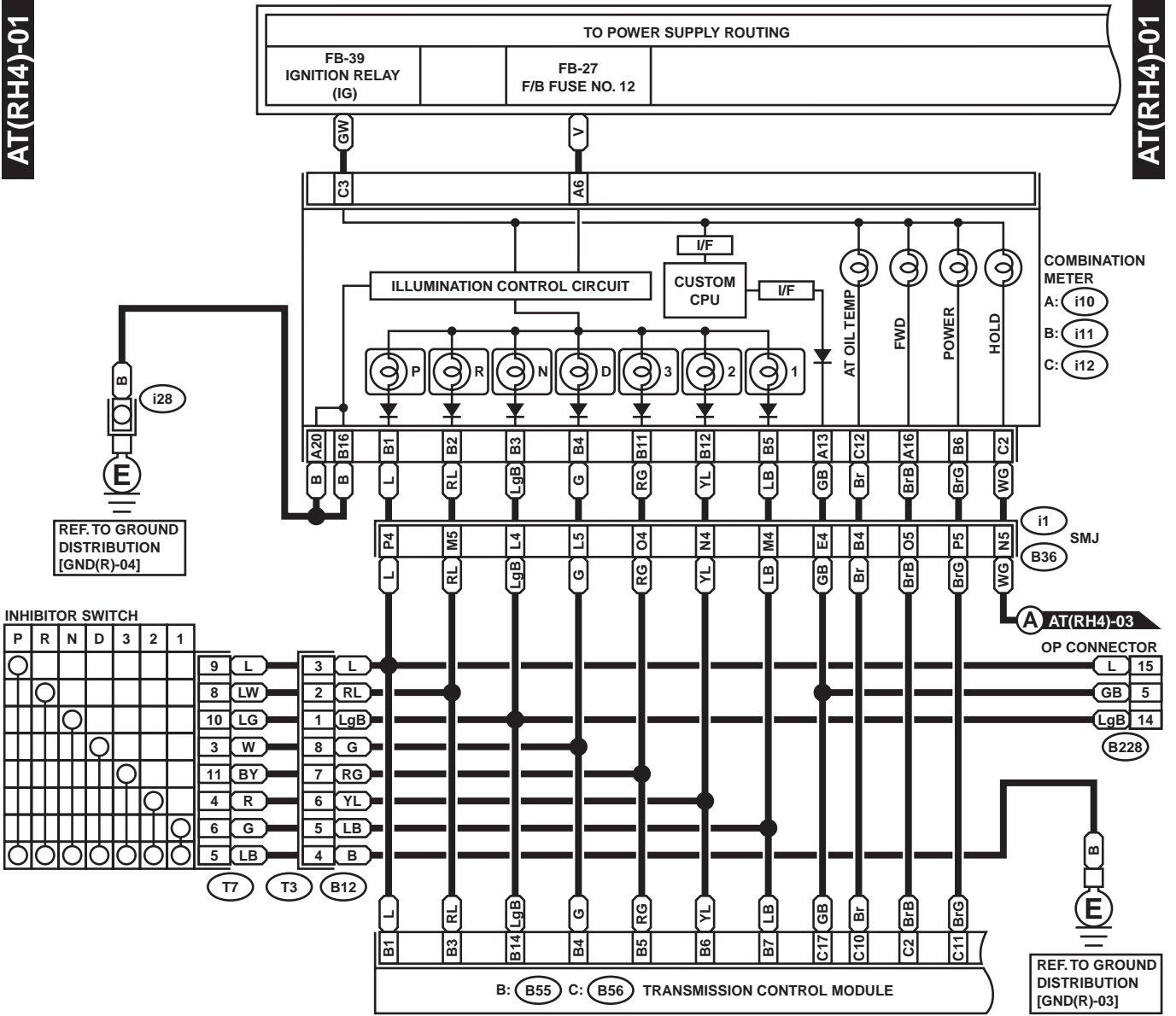


WI-00817

A/T CONTROL SYSTEM

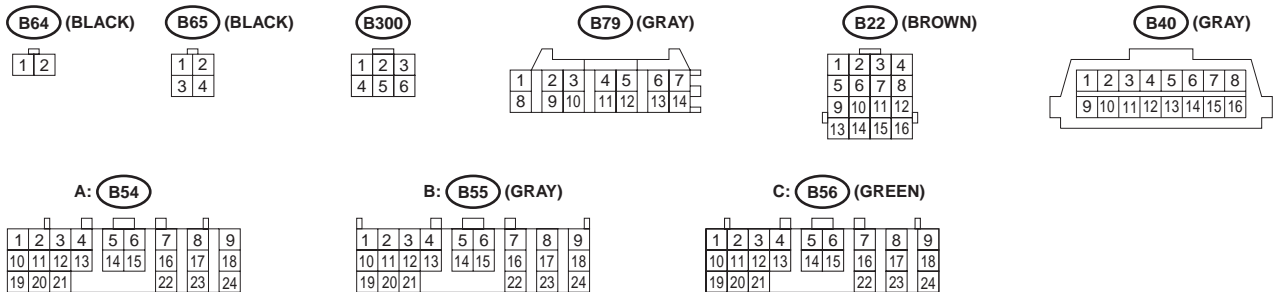
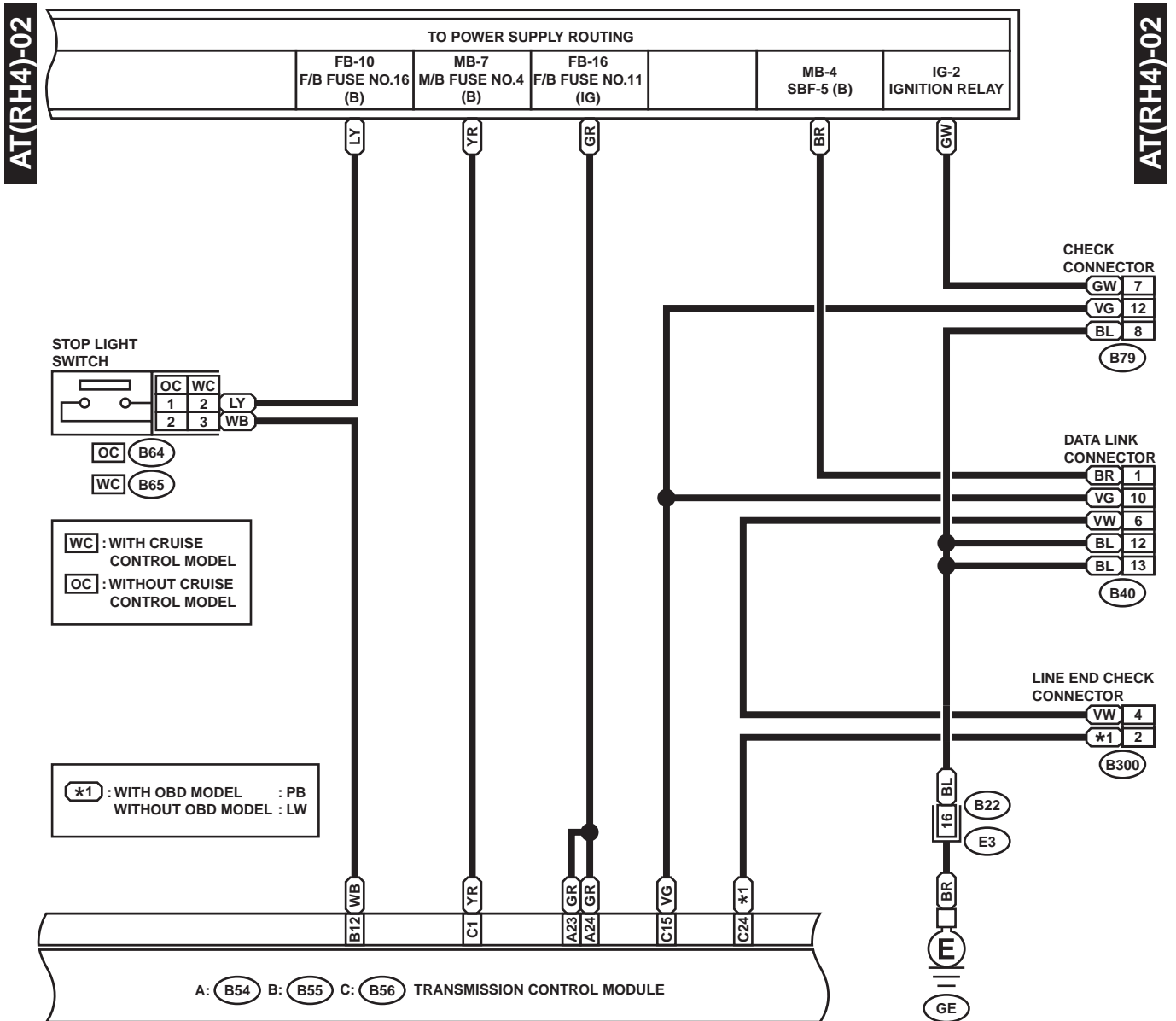
WIRING SYSTEM

3. RHD 4-CYLINDER NON-TURBO ENGINE MODEL



A/T CONTROL SYSTEM

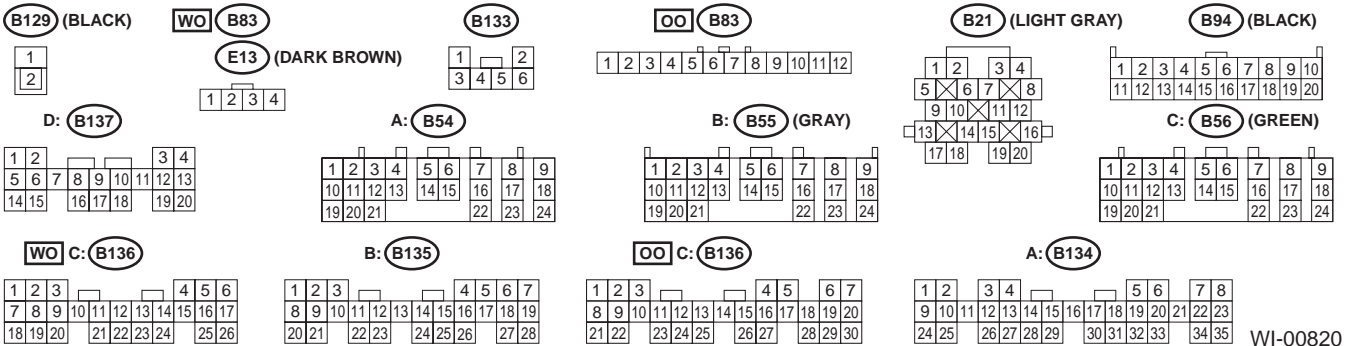
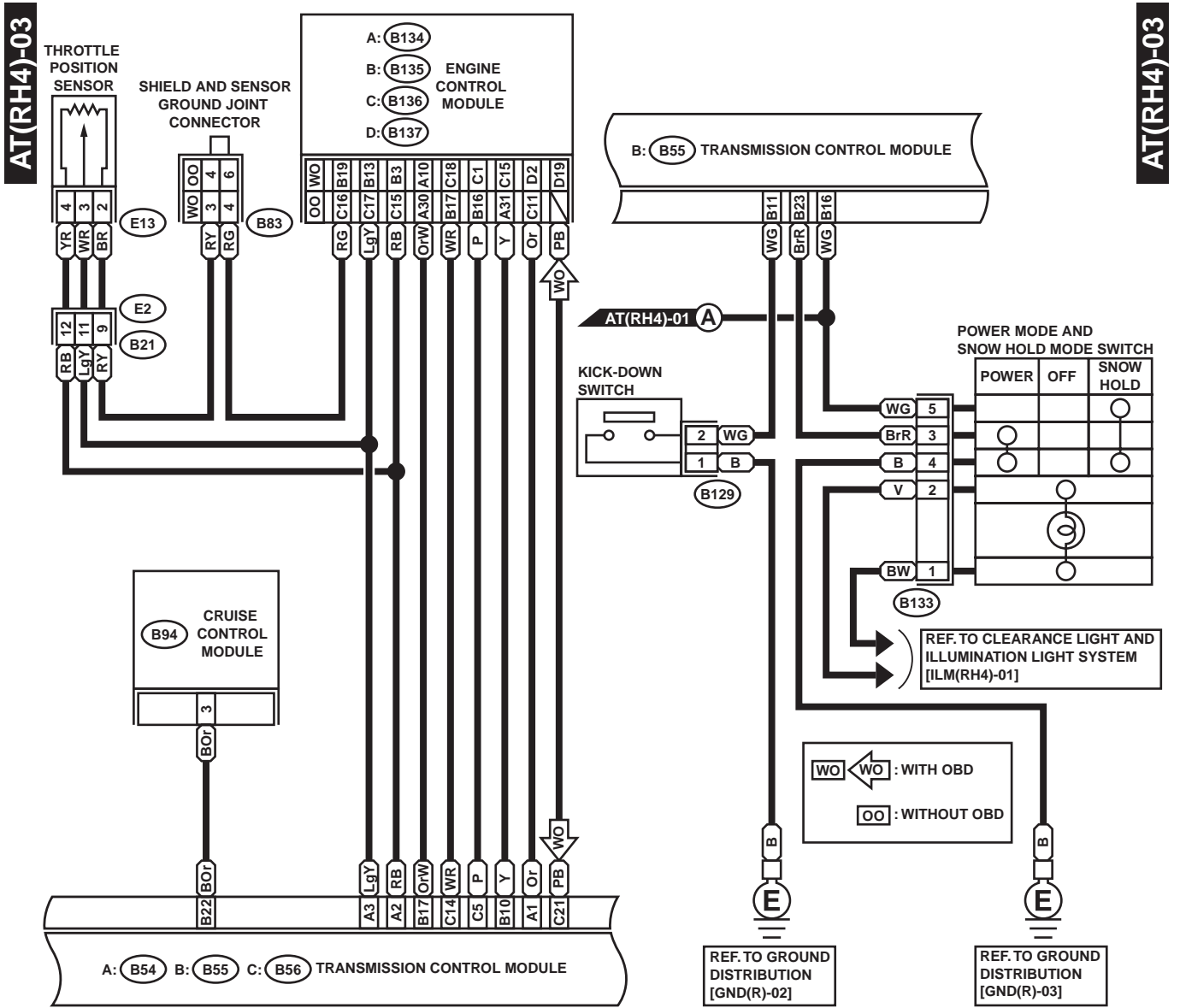
WIRING SYSTEM



WI-00819

A/T CONTROL SYSTEM

WIRING SYSTEM



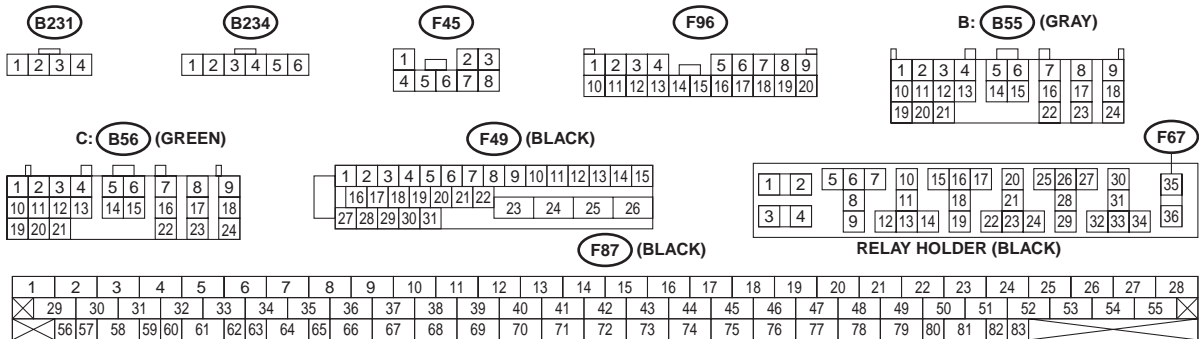
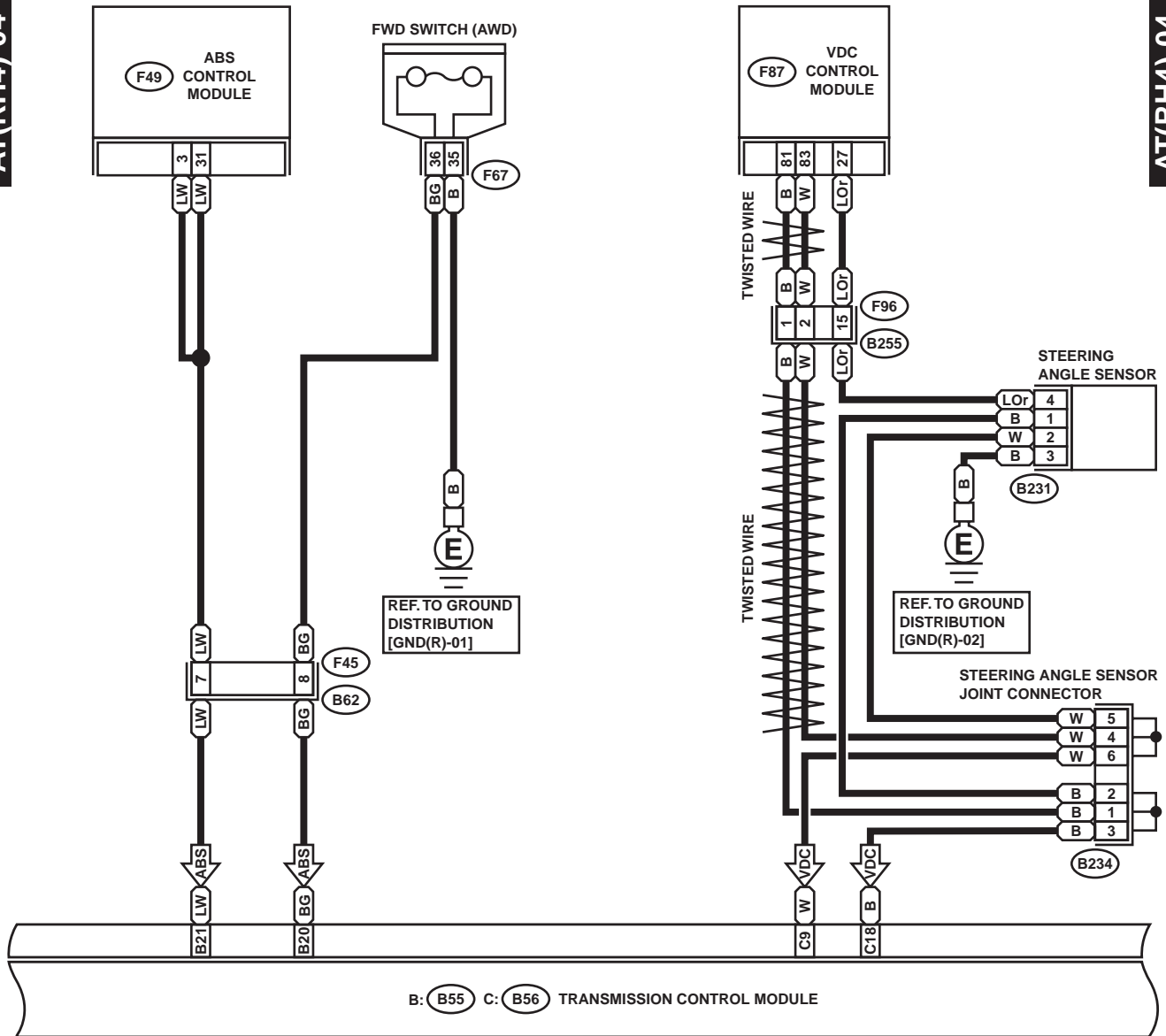
WI-00820

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(RH4)-04

AT(RH4)-04



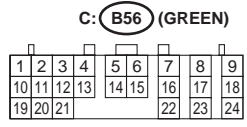
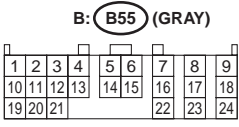
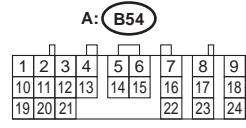
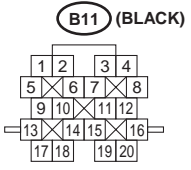
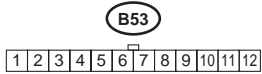
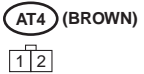
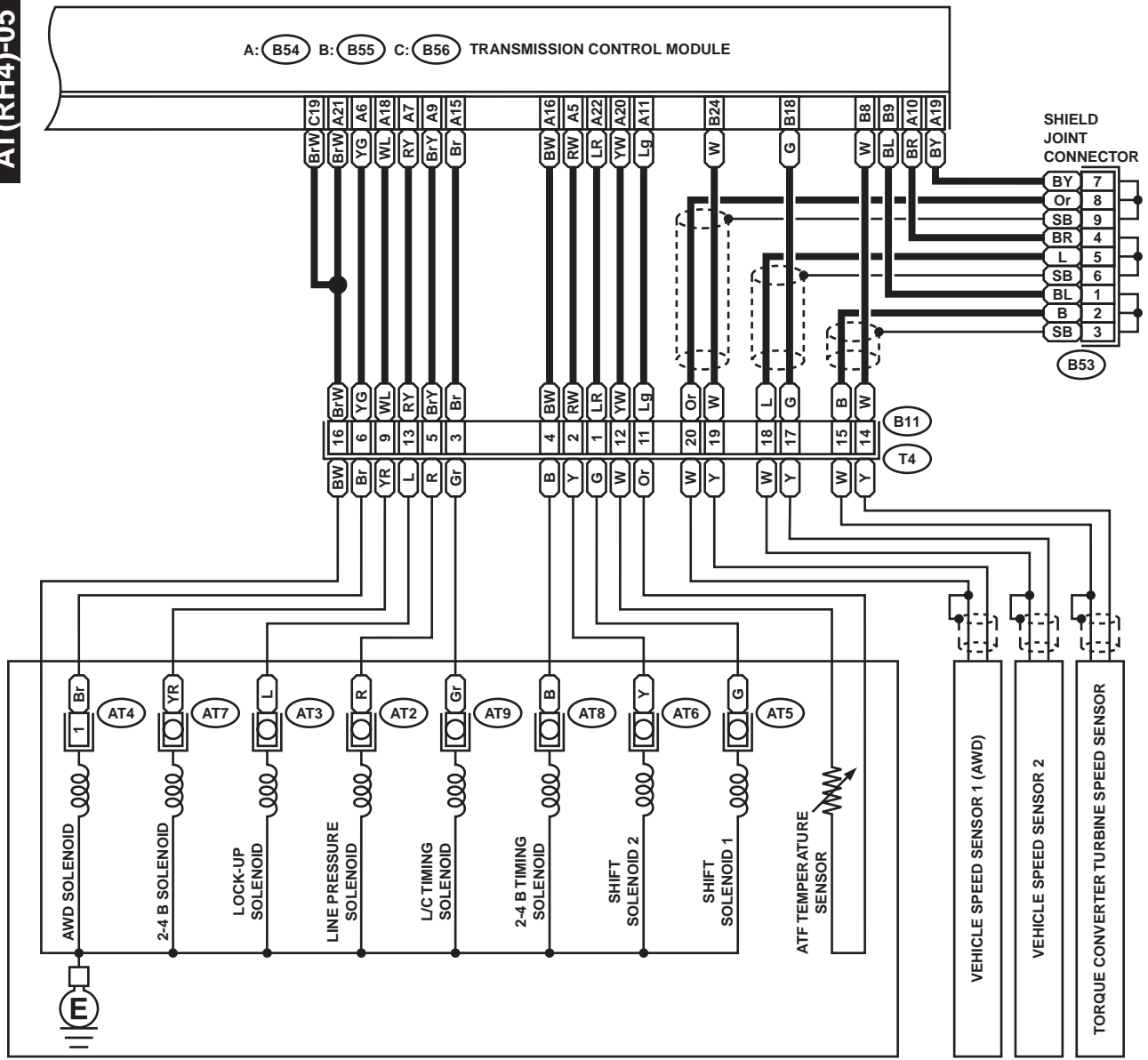
WI-00821

A/T CONTROL SYSTEM

WIRING SYSTEM

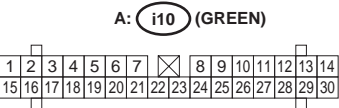
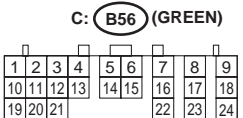
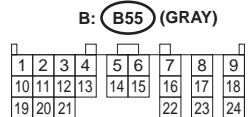
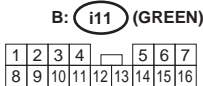
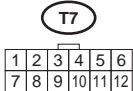
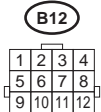
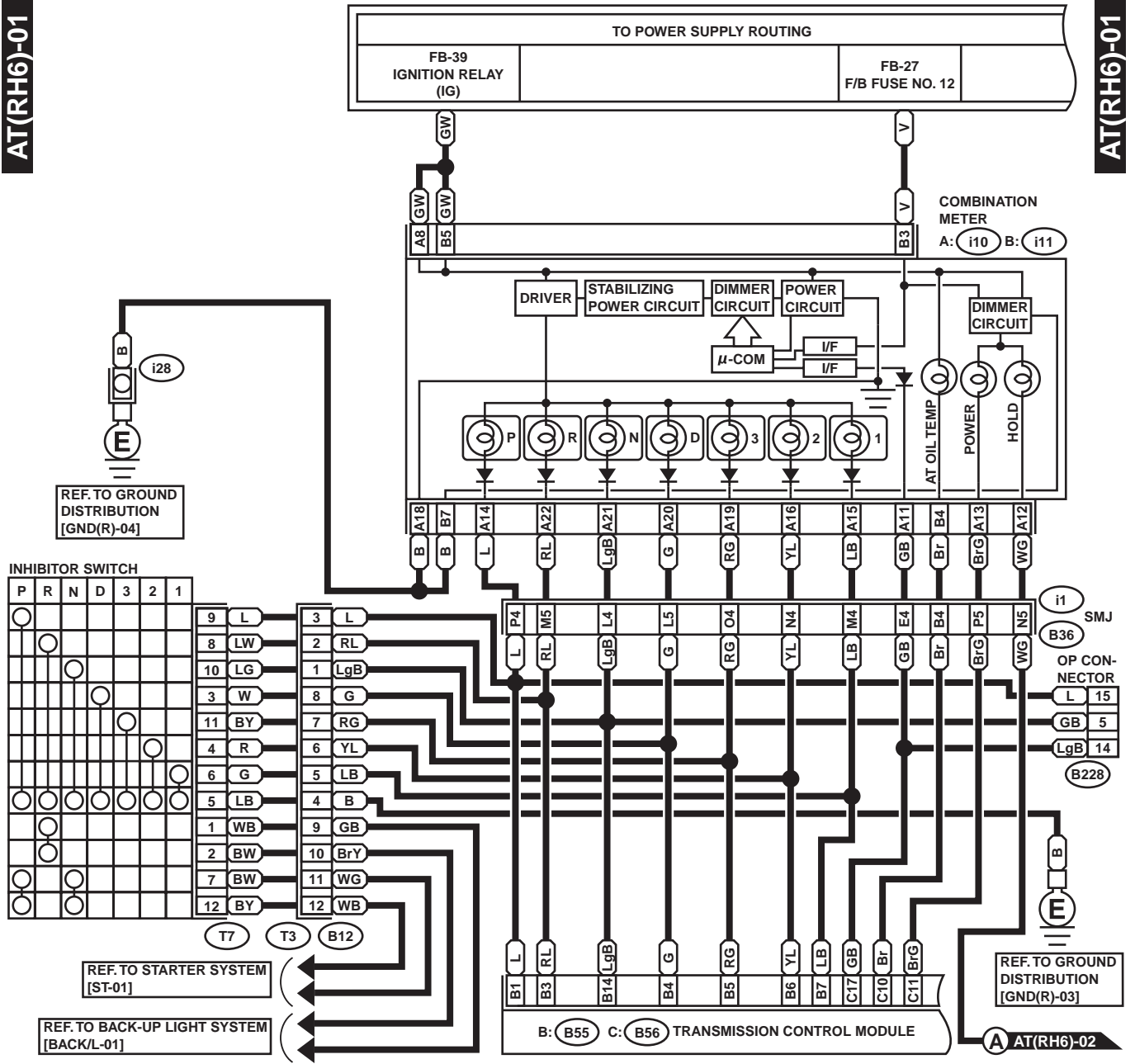
AT(RH4)-05

AT(RH4)-05



WI-00822

4. RHD 6-CYLINDER ENGINE MODEL

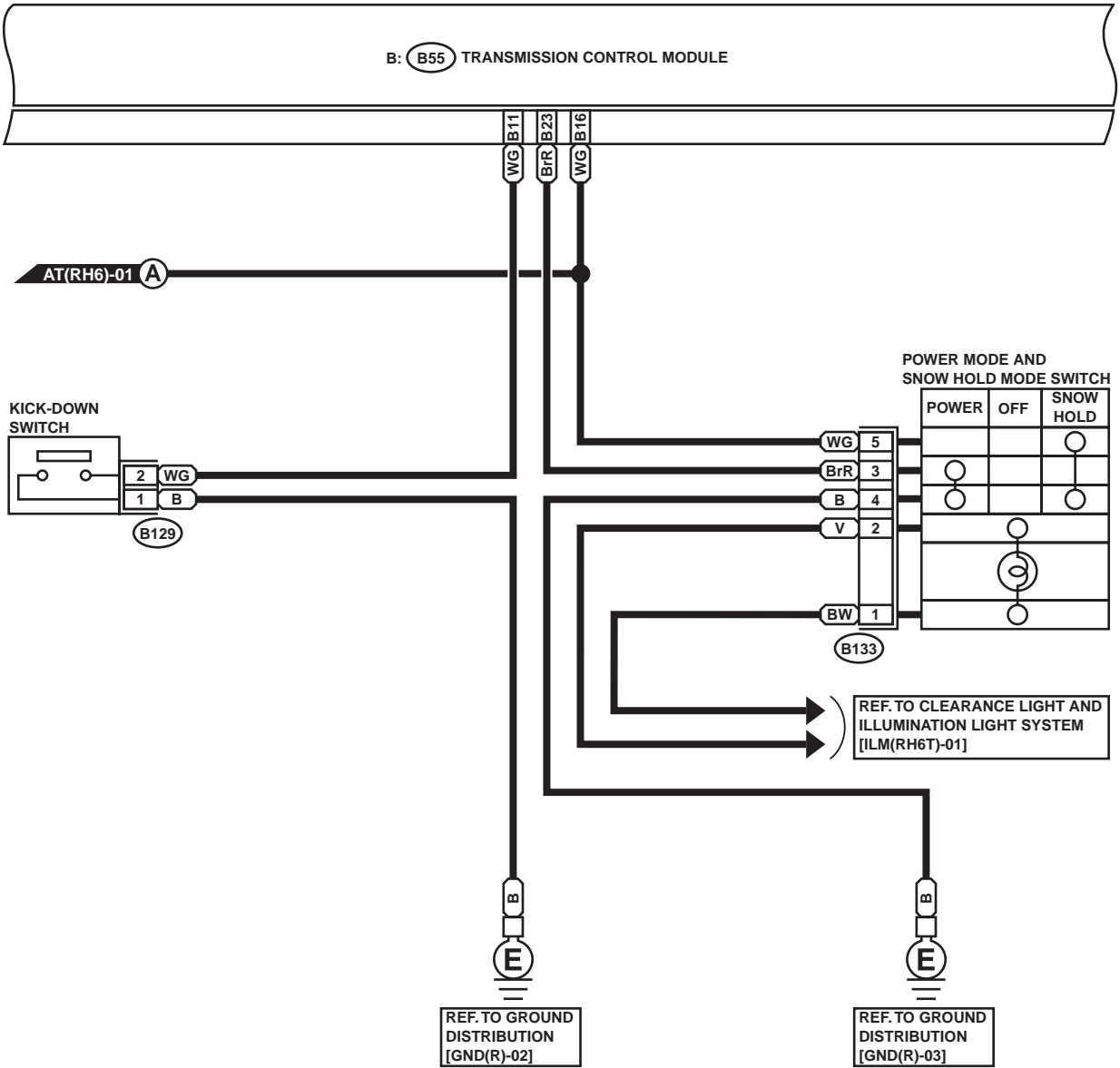


A/T CONTROL SYSTEM

WIRING SYSTEM

AT(RH6)-02

AT(RH6)-02



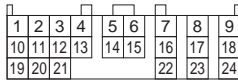
B129 (BLACK)



B133



B: B55 (GRAY)



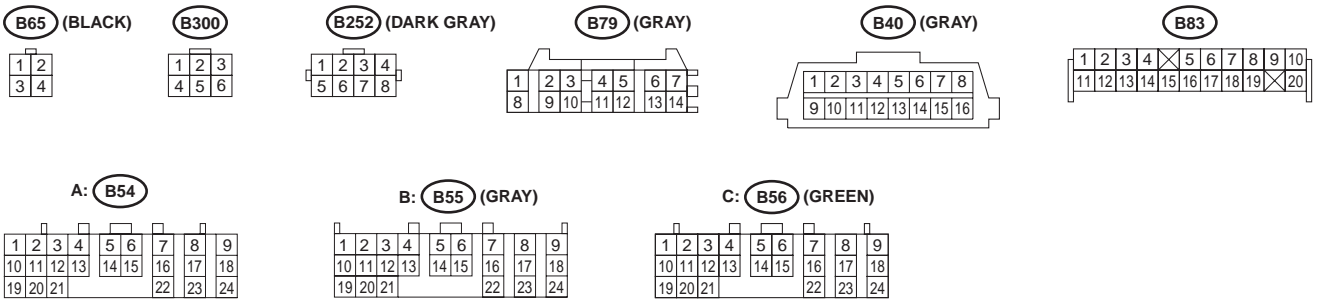
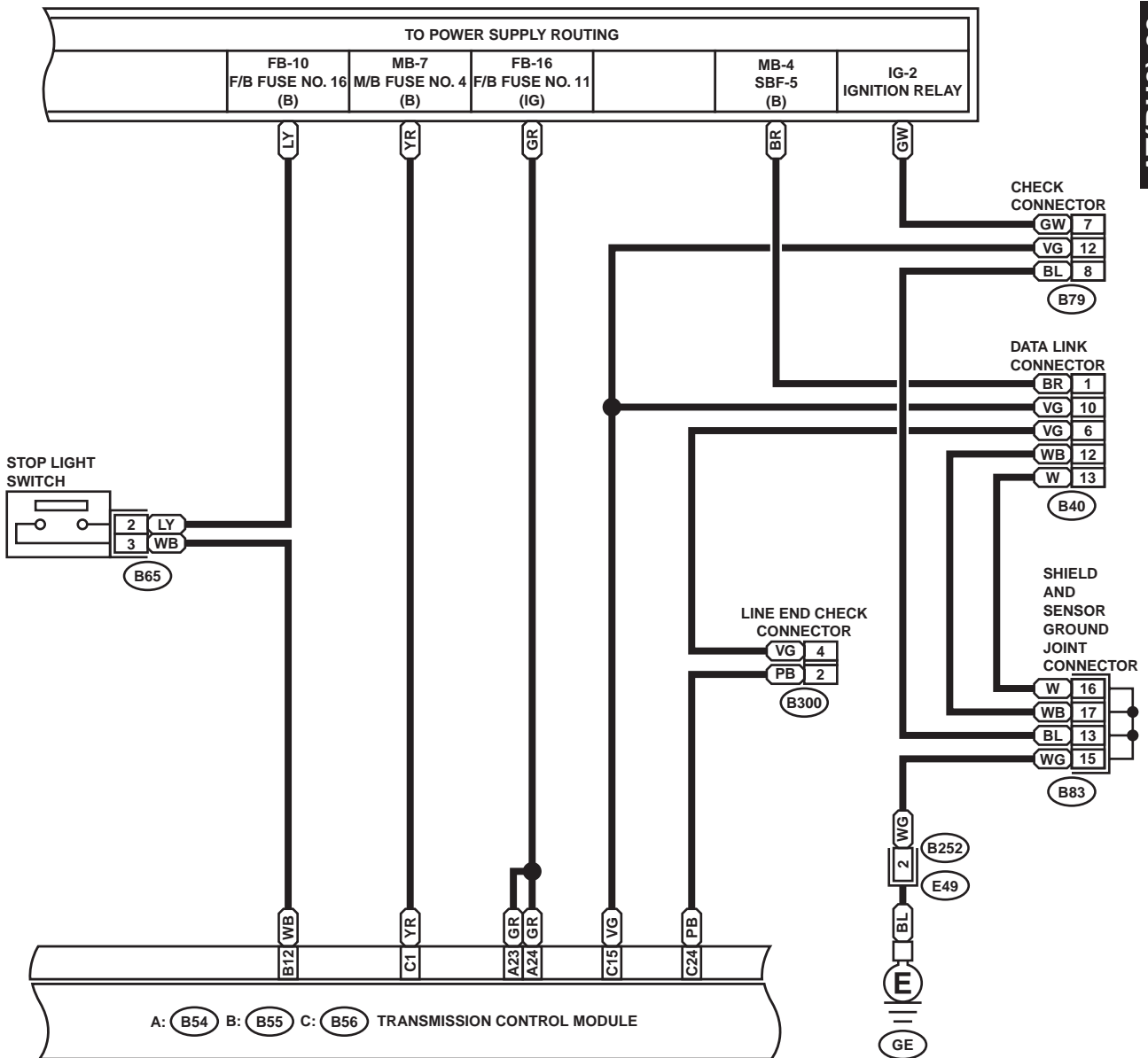
WI-00829

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(RH6)-03

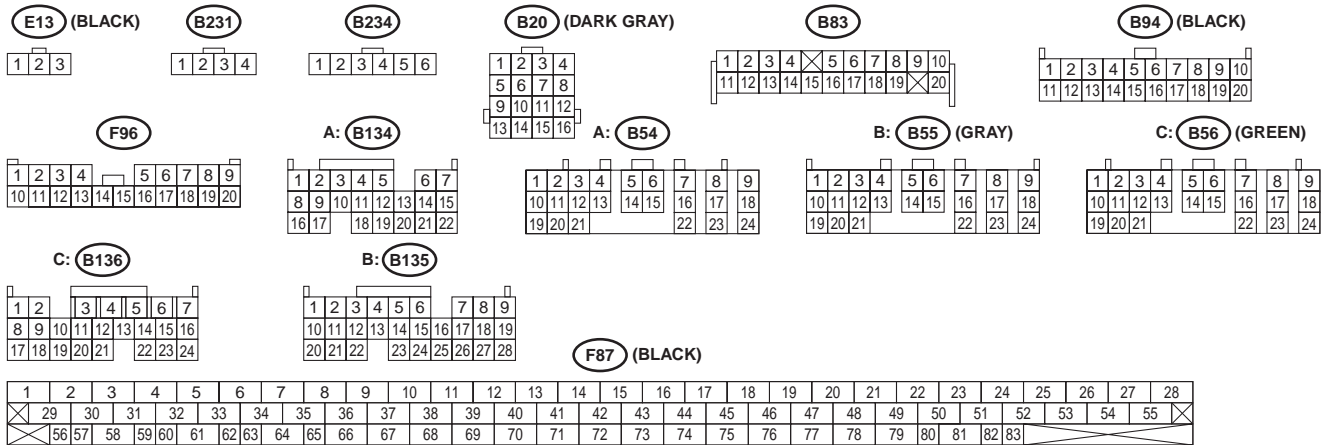
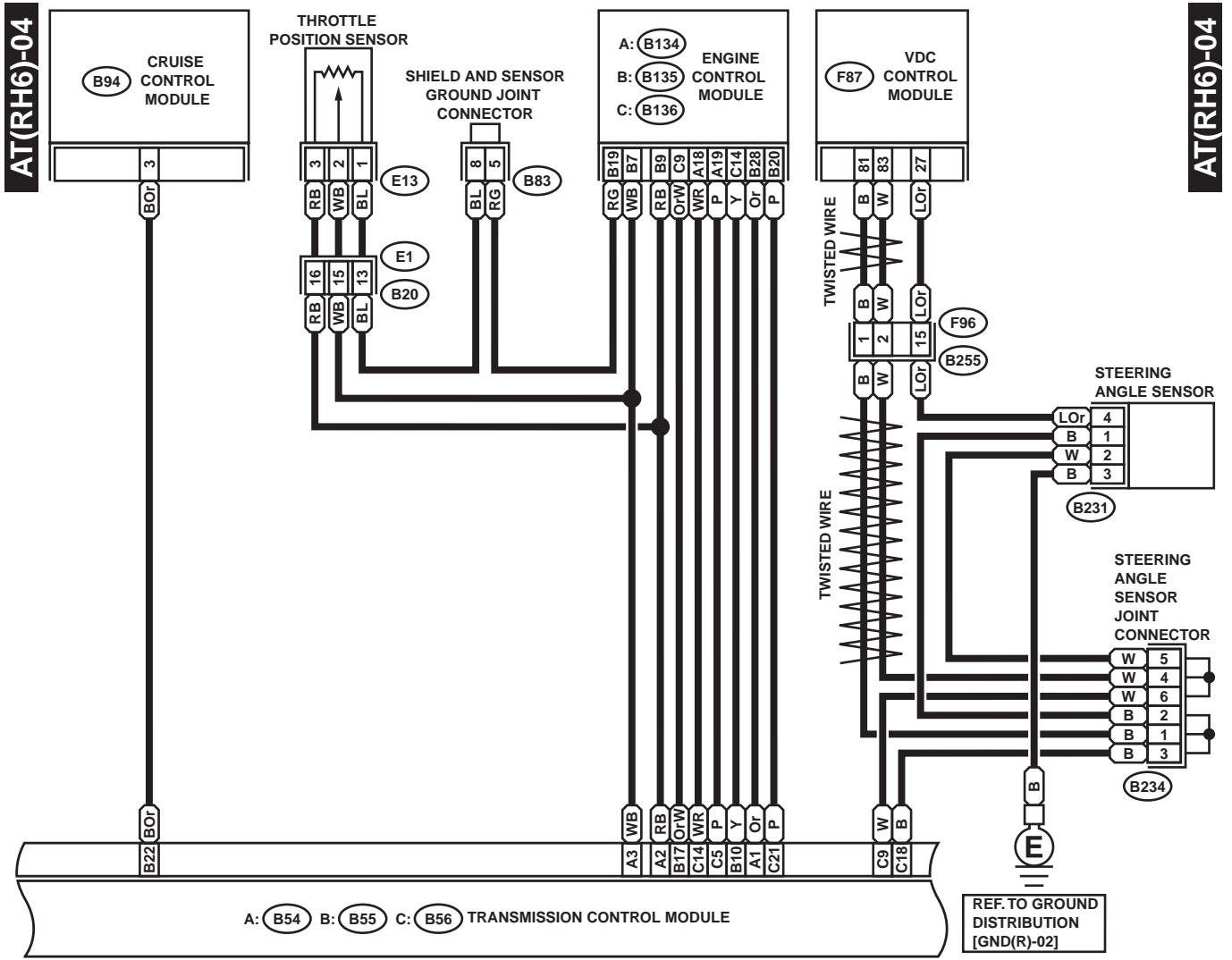
AT(RH6)-03



WI-00830

A/T CONTROL SYSTEM

WIRING SYSTEM



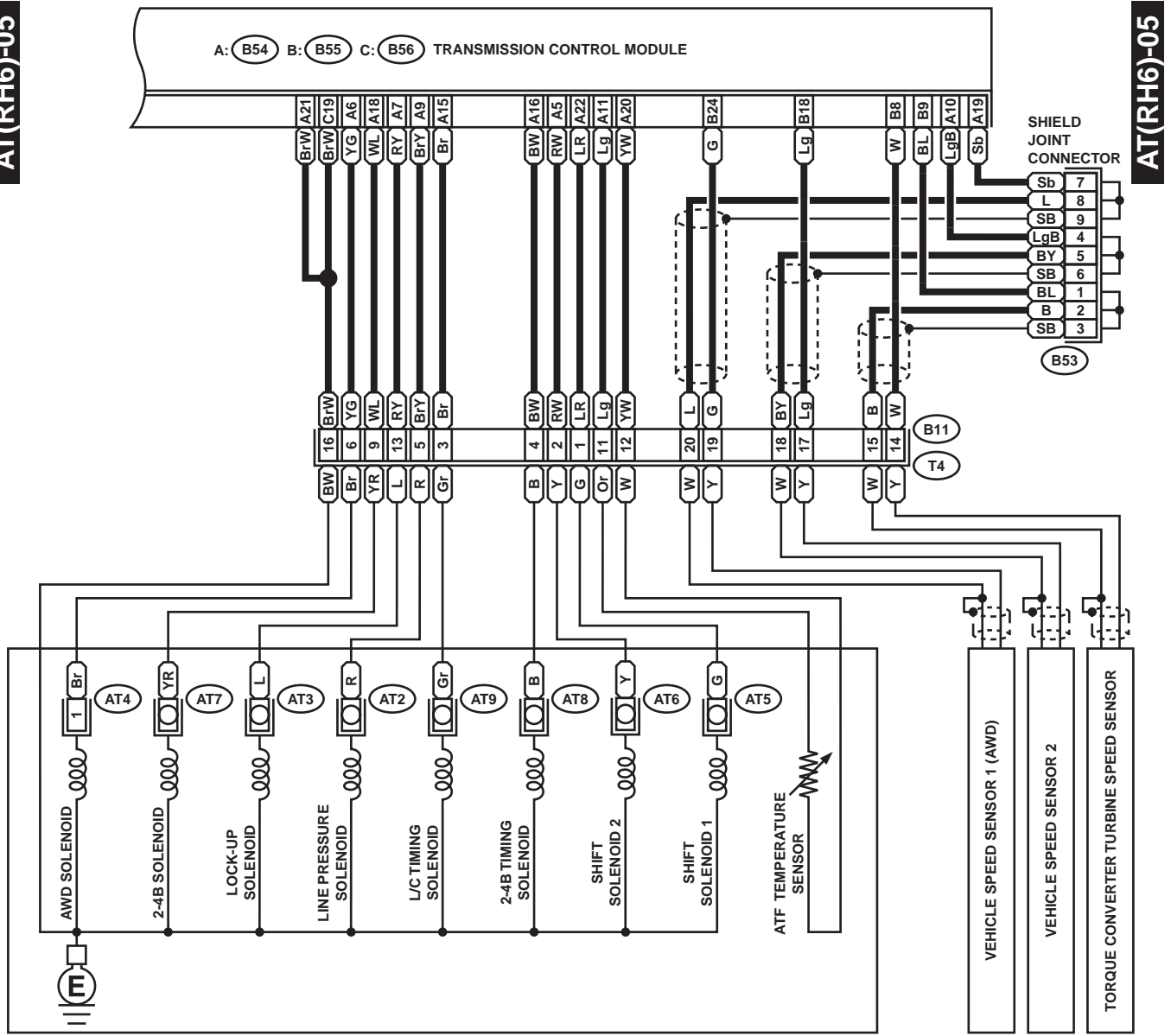
WI-00831

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(RH6)-05

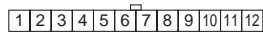
AT(RH6)-05



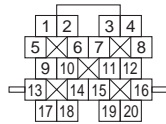
AT4 (BROWN)



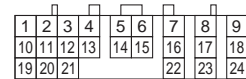
B53



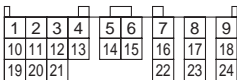
B11 (BLACK)



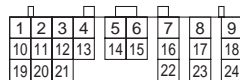
A: B54



B: B55 (GRAY)



C: B56 (GREEN)

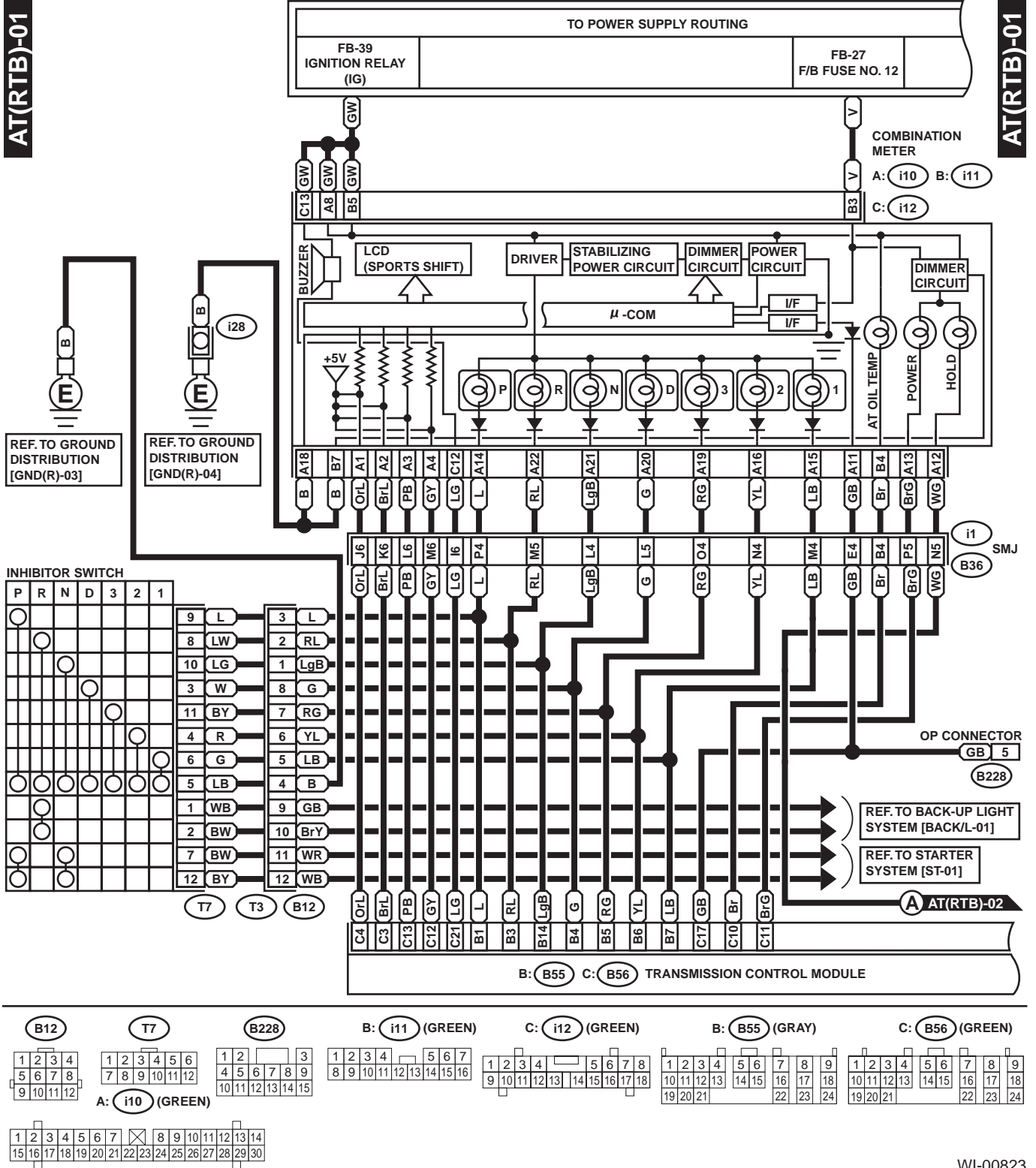


WI-00832

A/T CONTROL SYSTEM

WIRING SYSTEM

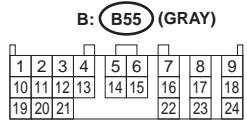
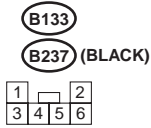
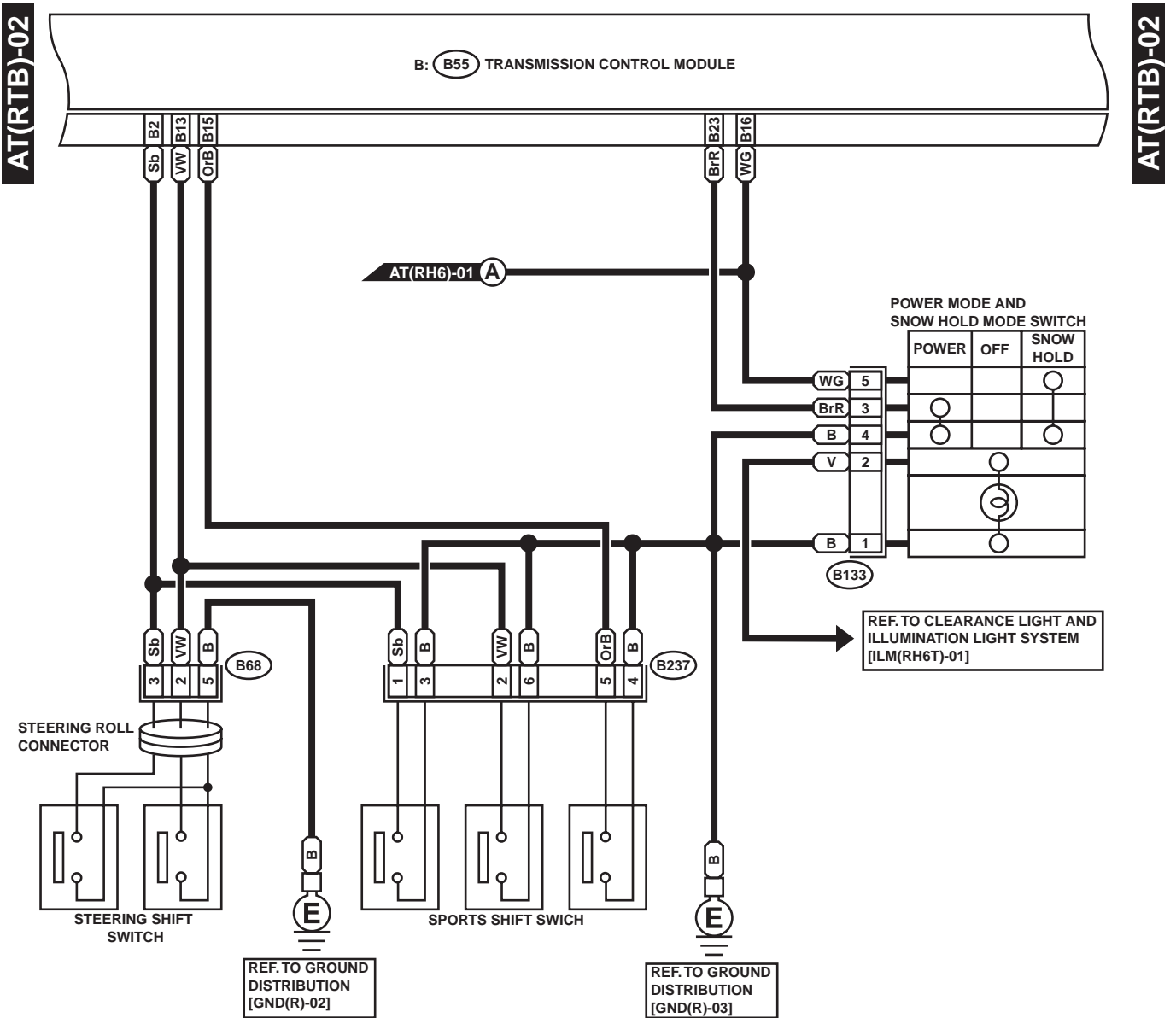
5. RHD TURBO ENGINE MODEL



WI-00823

A/T CONTROL SYSTEM

WIRING SYSTEM



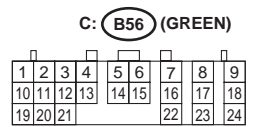
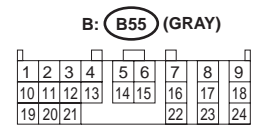
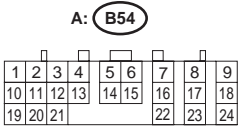
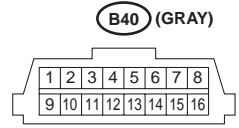
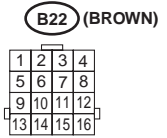
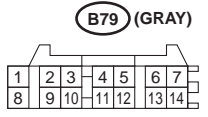
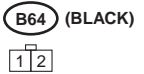
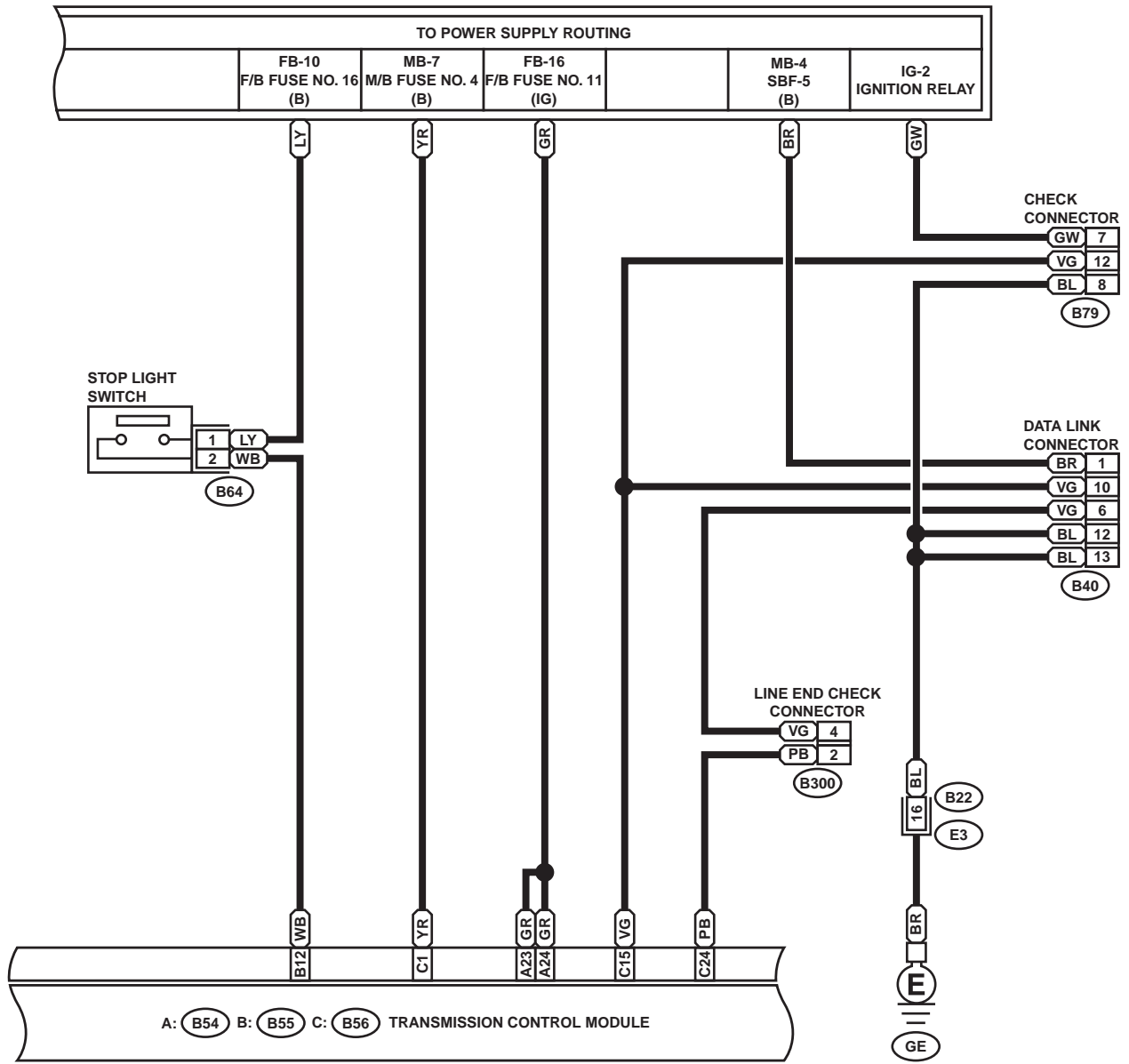
WI-00824

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(RTB)-03

AT(RTB)-03



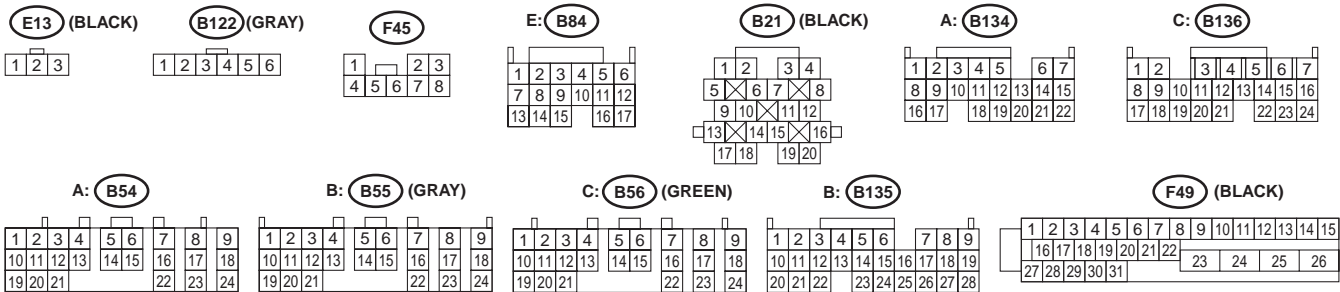
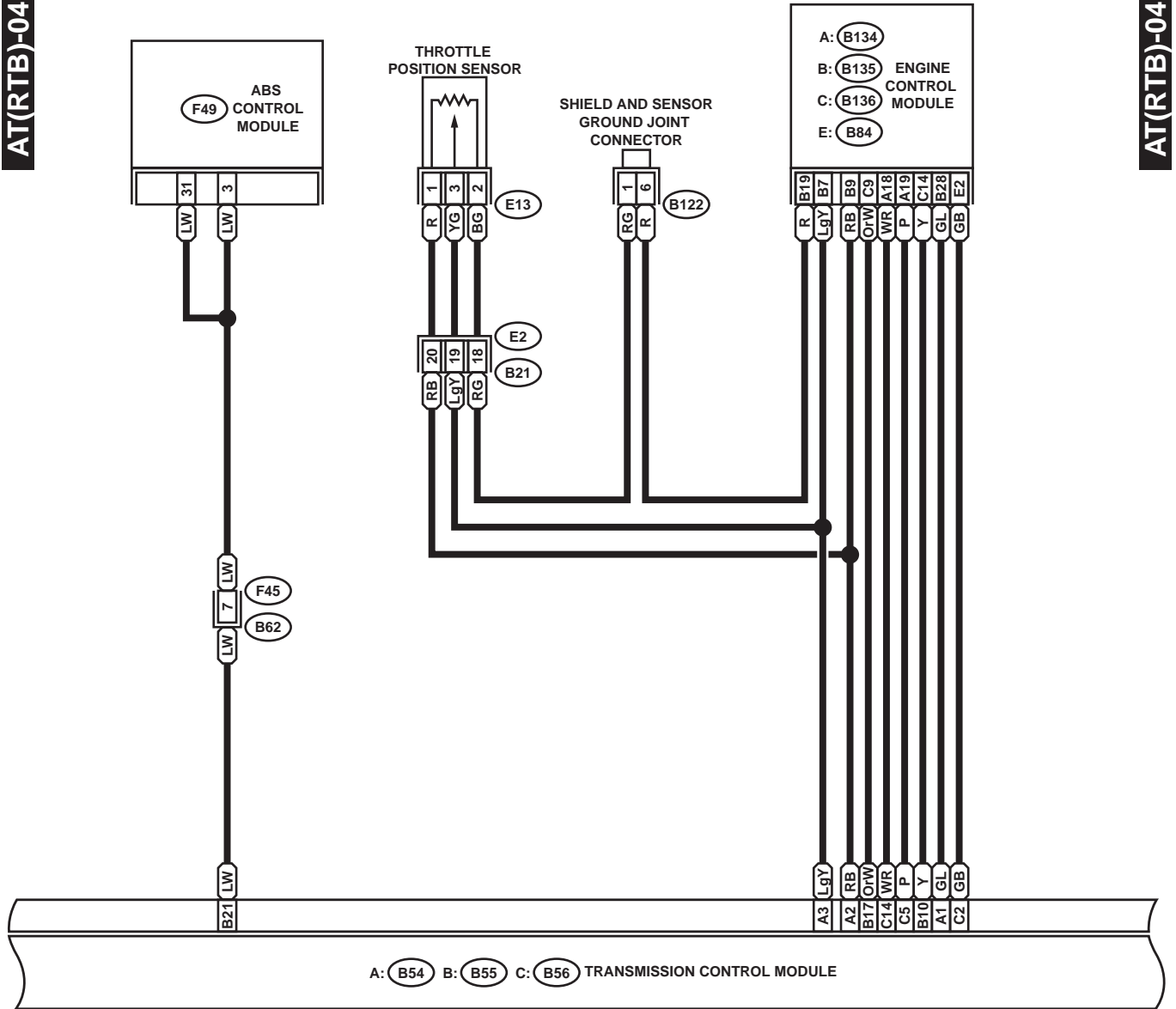
WI-00825

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(RTB)-04

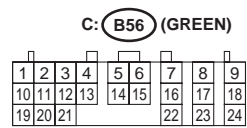
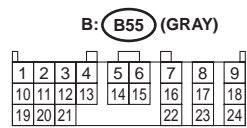
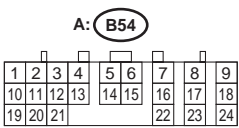
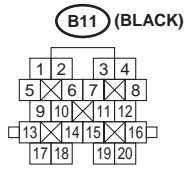
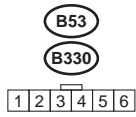
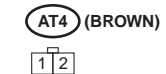
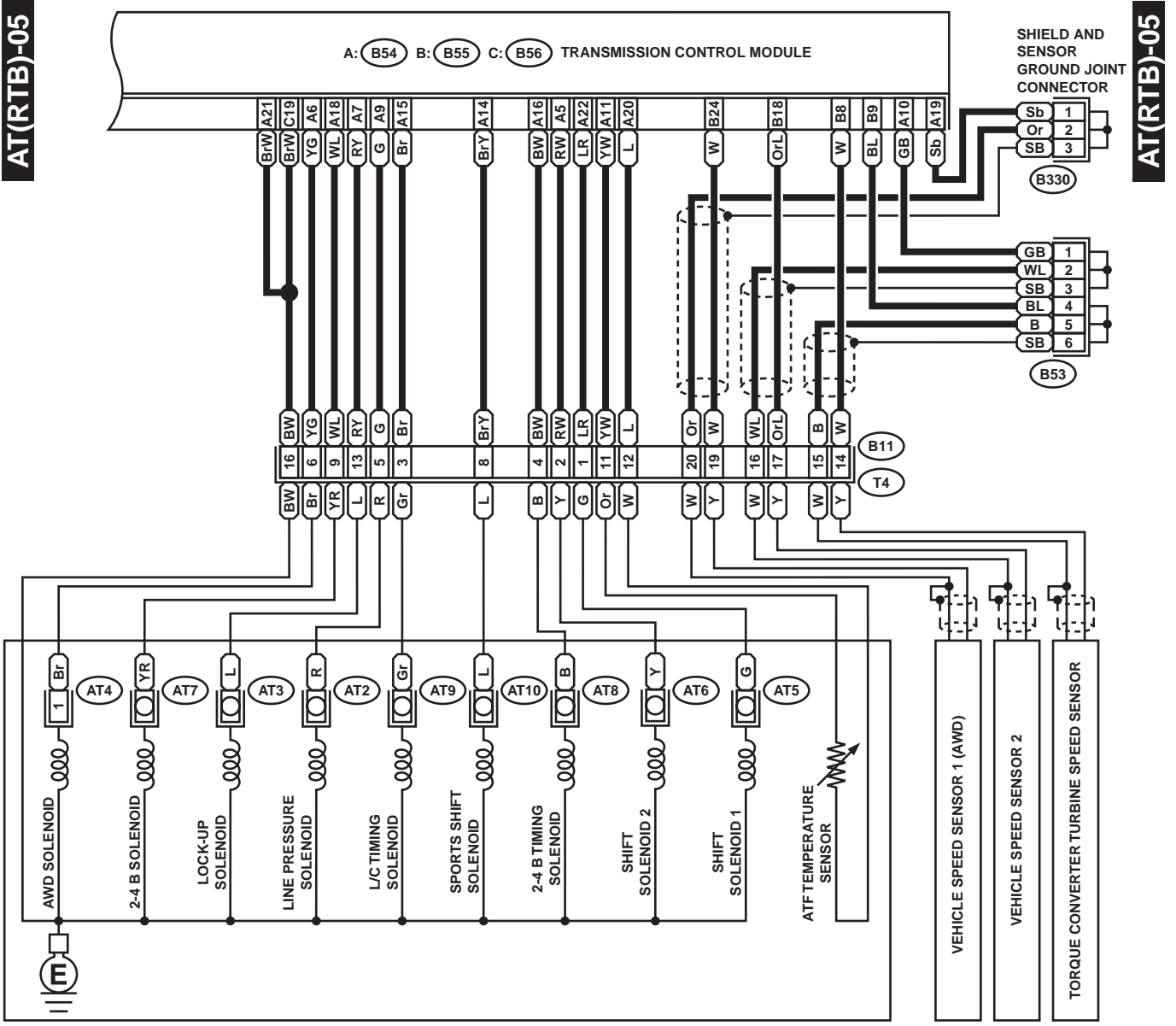
AT(RTB)-04



WI-00826

A/T CONTROL SYSTEM

WIRING SYSTEM



WI-00827

MEMO:

AUDIO SYSTEM

WIRING SYSTEM

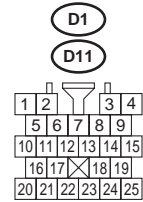
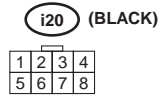
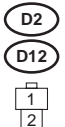
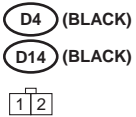
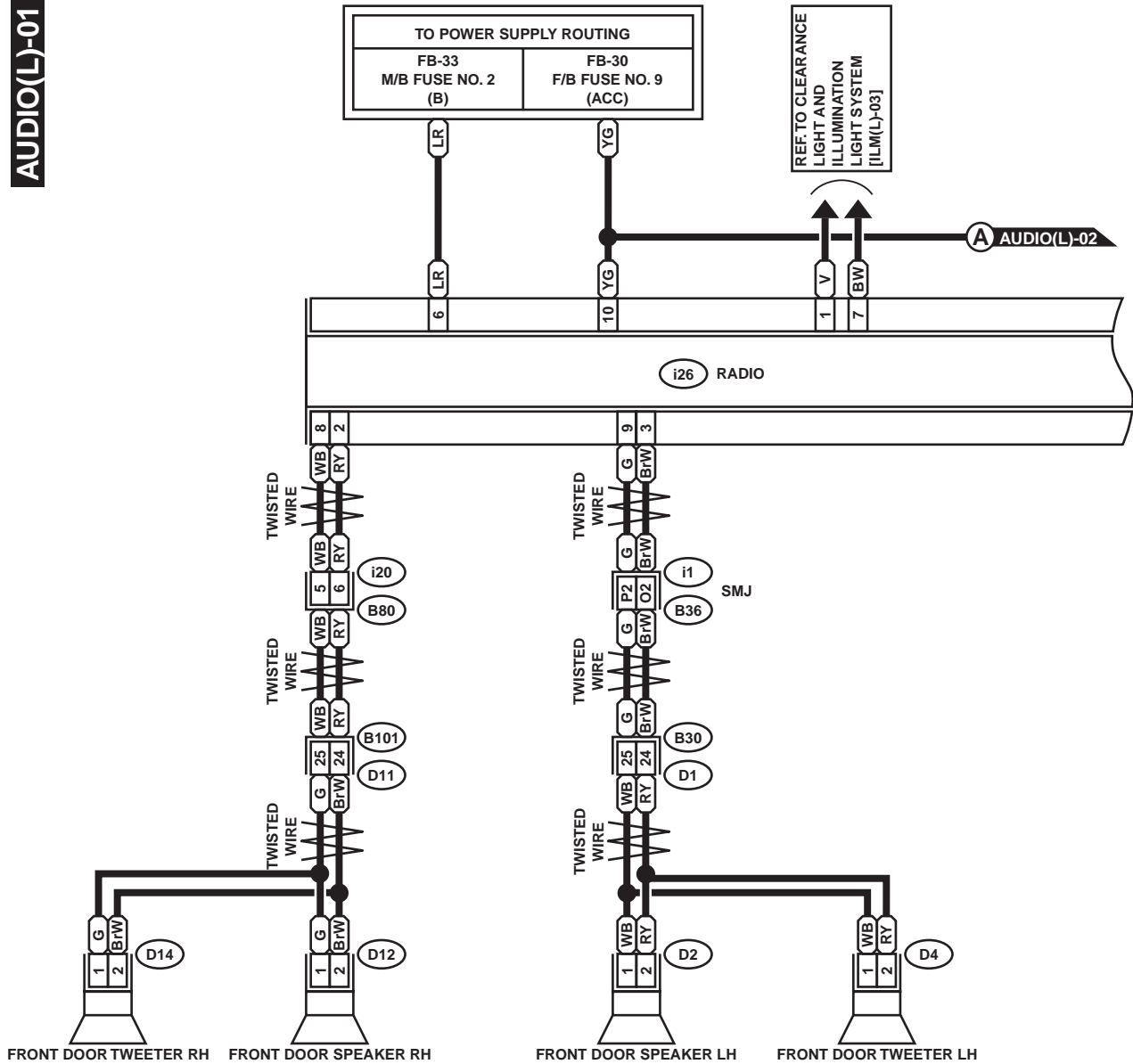
10. Audio System

A: SCHEMATIC

1. LHD MODEL

AUDIO(L)-01

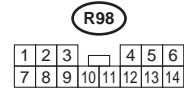
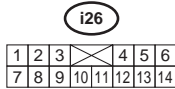
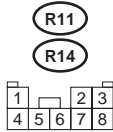
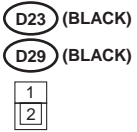
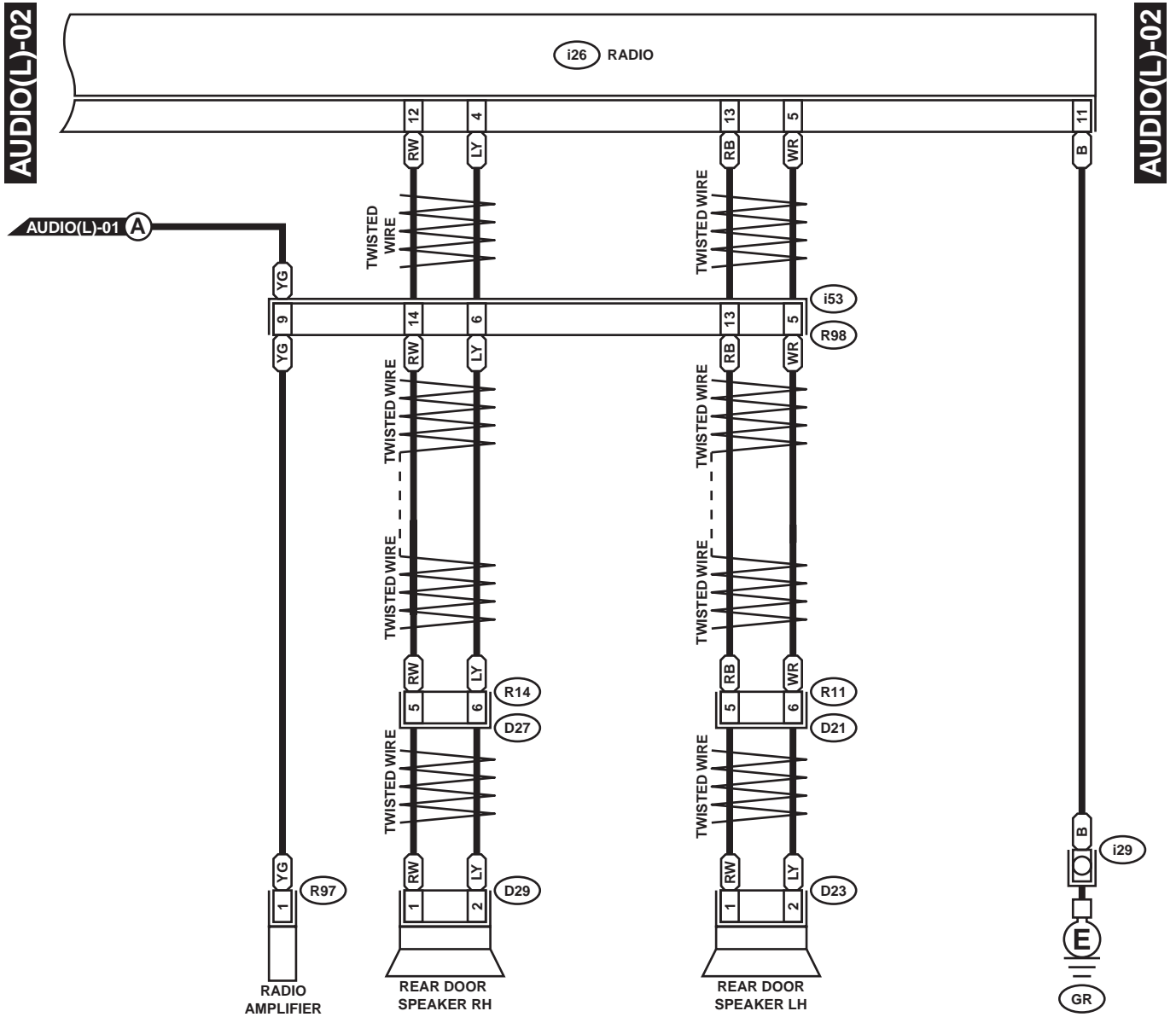
AUDIO(L)-01



WI-00833

AUDIO SYSTEM

WIRING SYSTEM



WI-00834

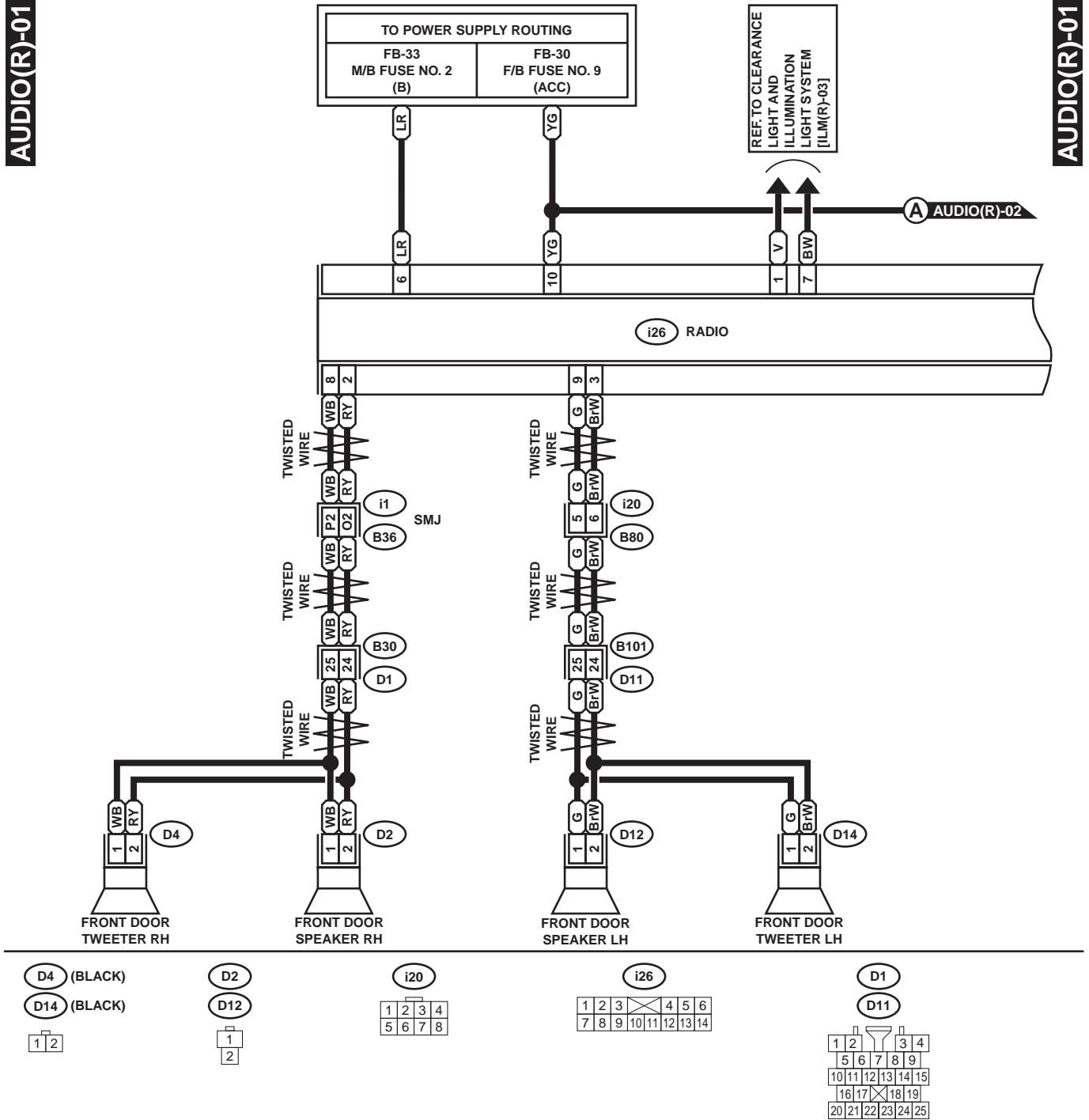
AUDIO SYSTEM

WIRING SYSTEM

2. RHD EXCEPT MCINTOSH AUDIO MODEL

AUDIO(R)-01

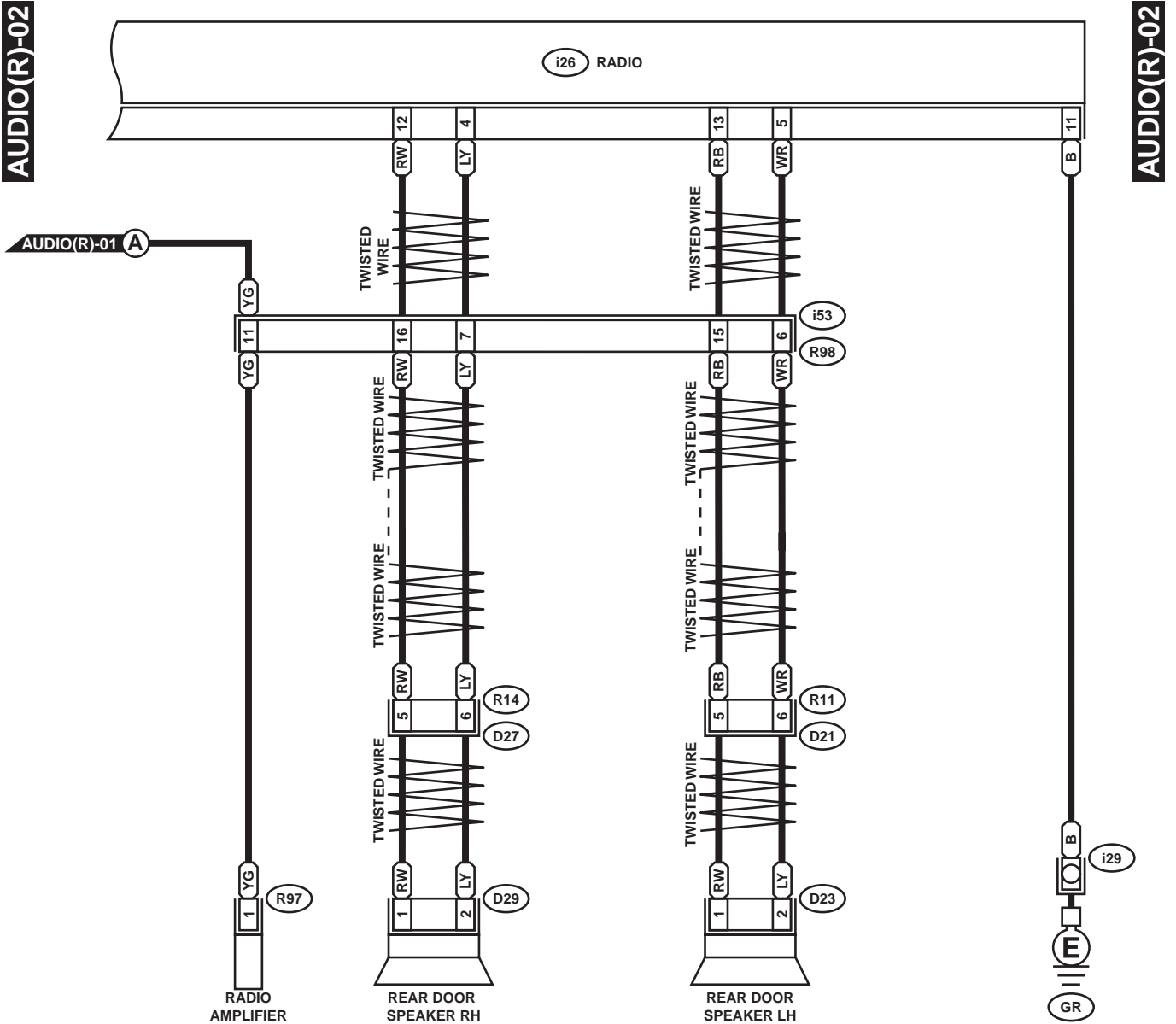
AUDIO(R)-01



WI-00835

AUDIO SYSTEM

WIRING SYSTEM



D23 (BLACK)

D29 (BLACK)

1
2

R97

1
2

R11

R14

1	2	3
4	5	6
7	8	

i26

1	2	3	4	5	6
7	8	9	10	11	12
13	14				

R98

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16					

WI-00836

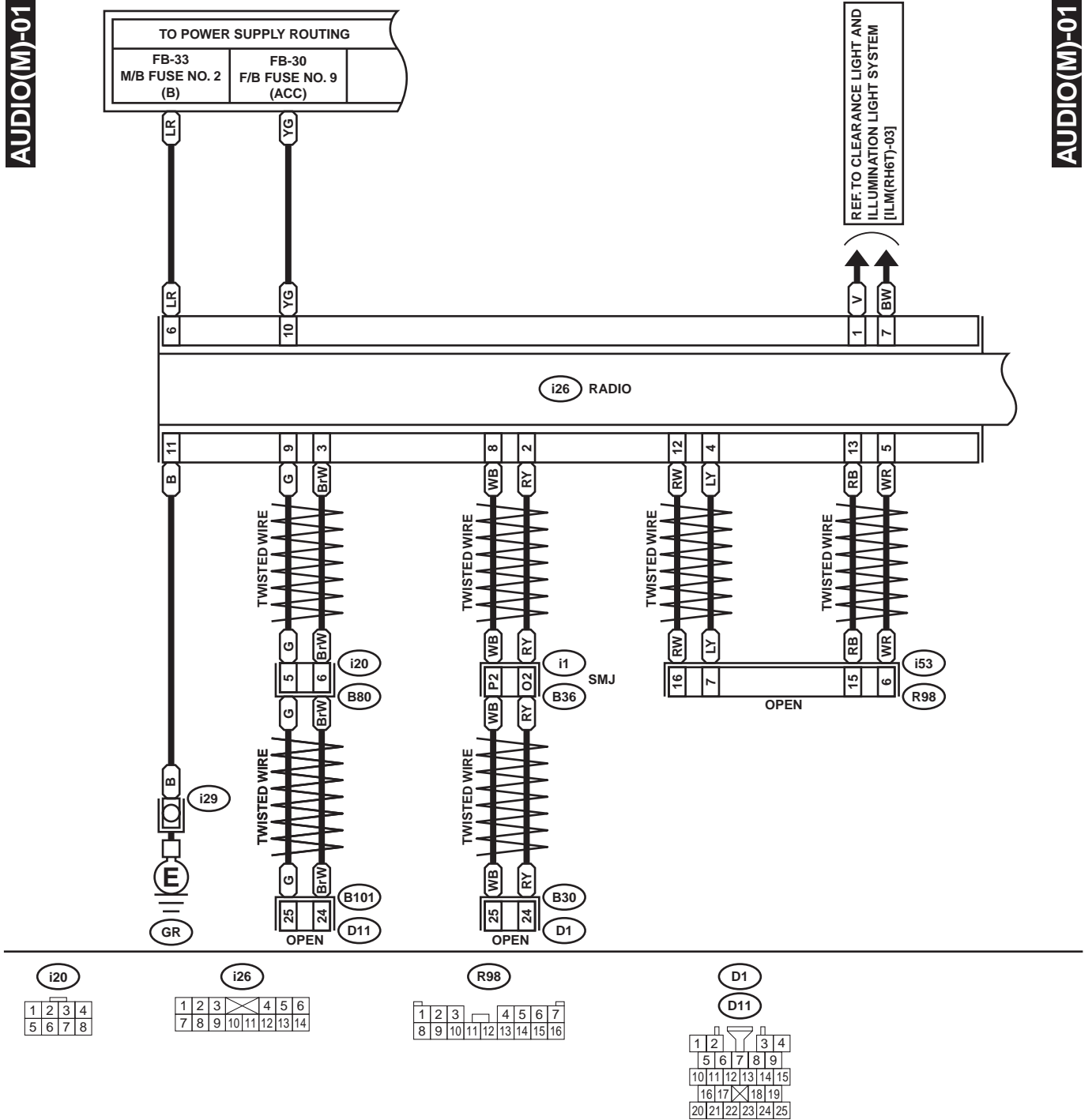
AUDIO SYSTEM

WIRING SYSTEM

3. RHD MCINTOSH AUDIO MODEL

AUDIO(M)-01

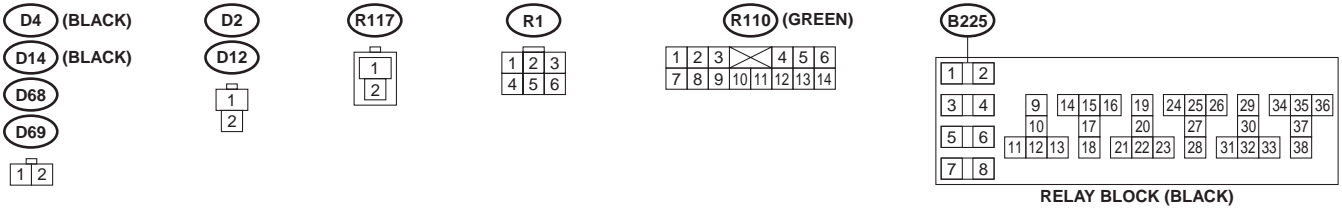
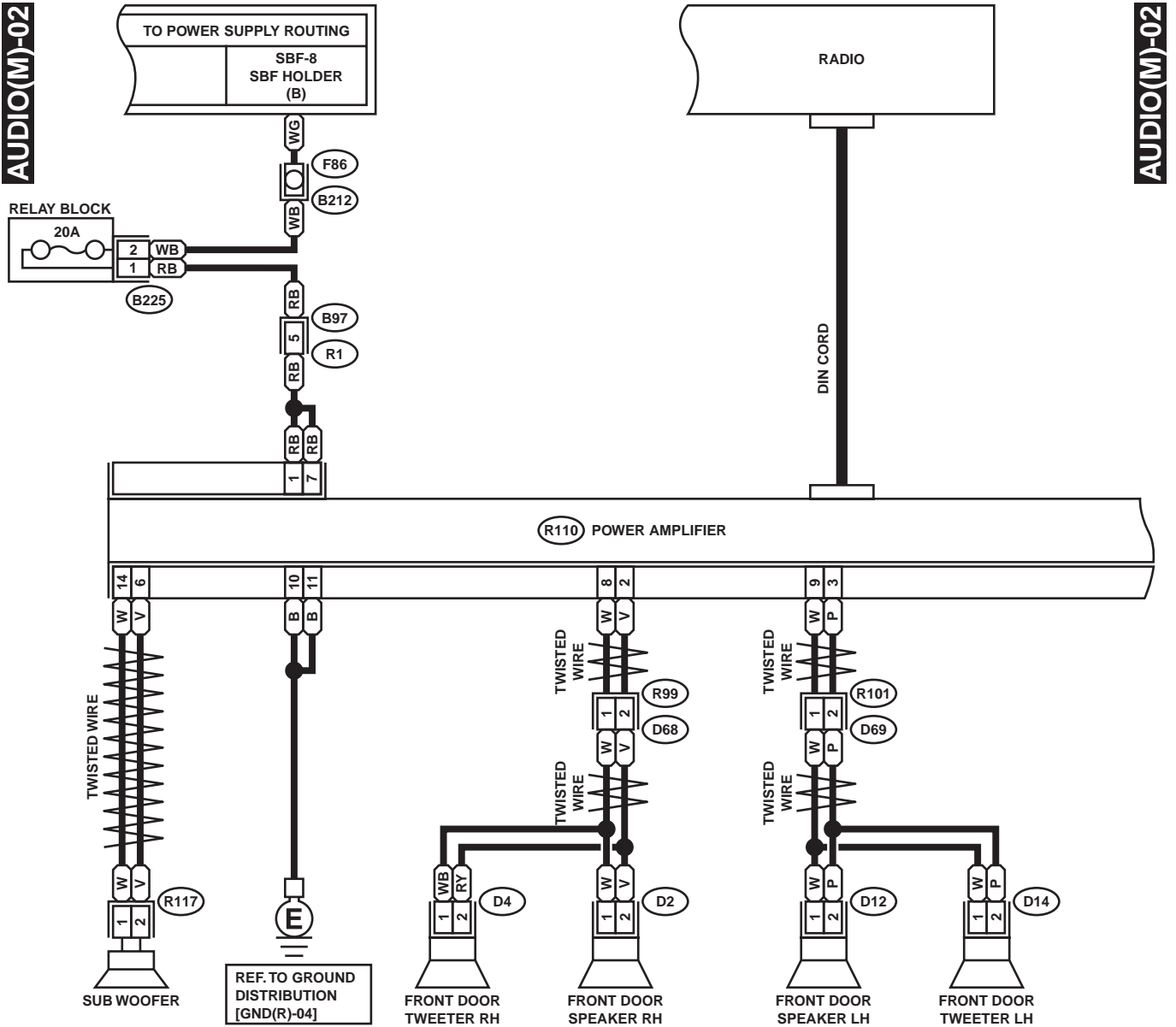
AUDIO(M)-01



WI-00837

AUDIO SYSTEM

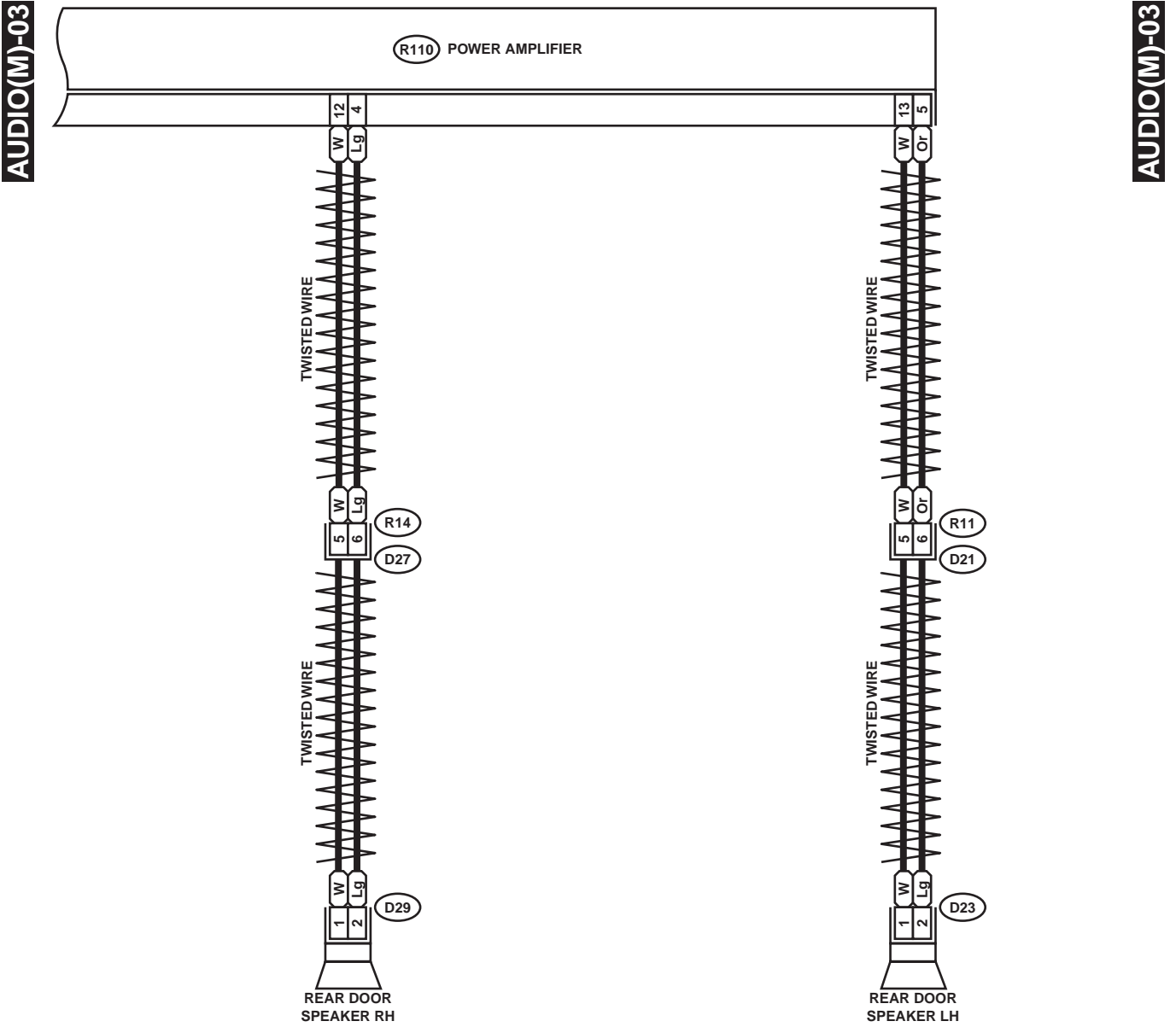
WIRING SYSTEM



WI-00838

AUDIO SYSTEM

WIRING SYSTEM



D23 (BLACK)

D29 (BLACK)

1
2

R11

R14

1	2	3
4	5	6
7	8	8

R110 (GREEN)

1	2	3	4	5	6
7	8	9	10	11	12
13	14				

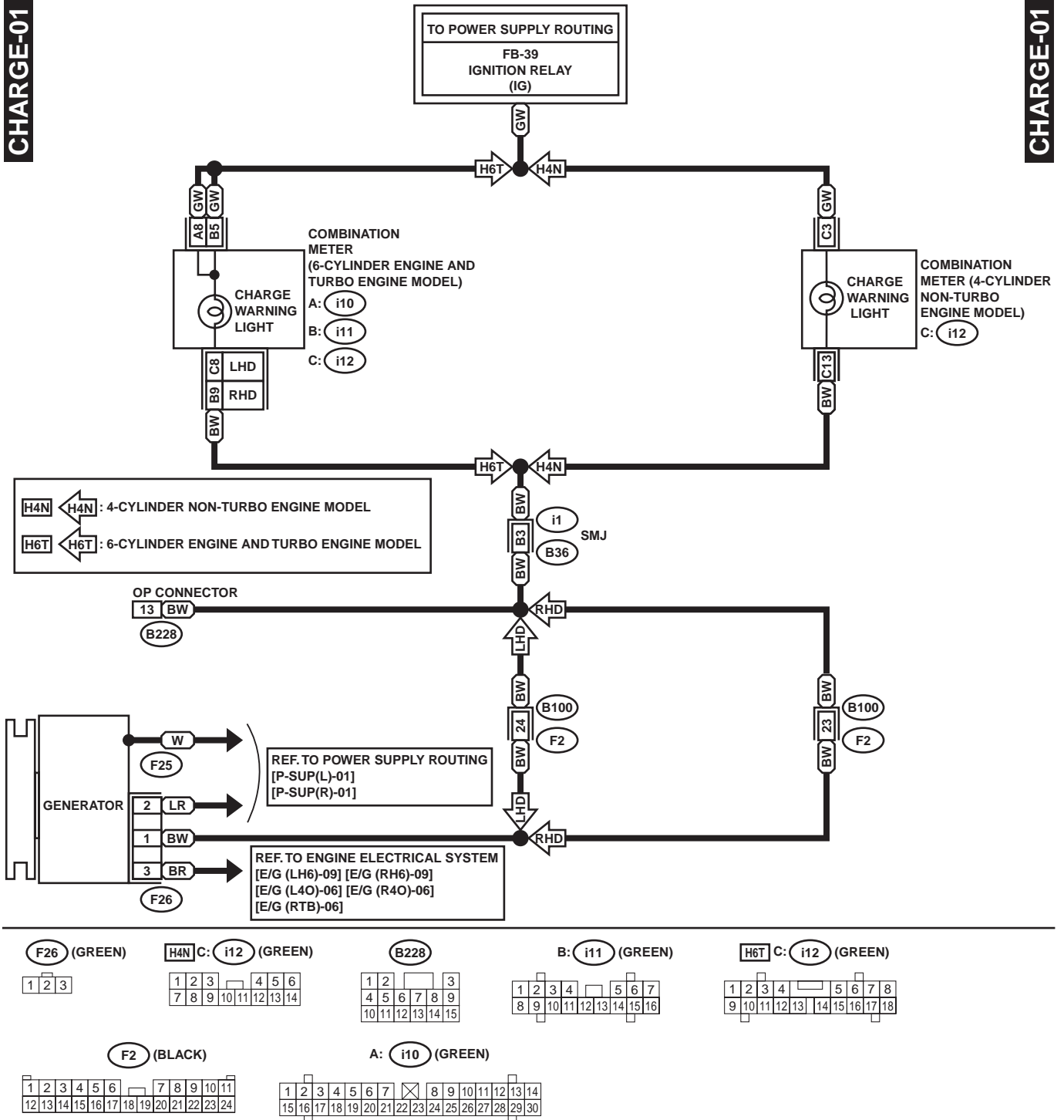
WI-00839

11. Charging System

A: SCHEMATIC

CHARGE-01

CHARGE-01



COMBINATION METER

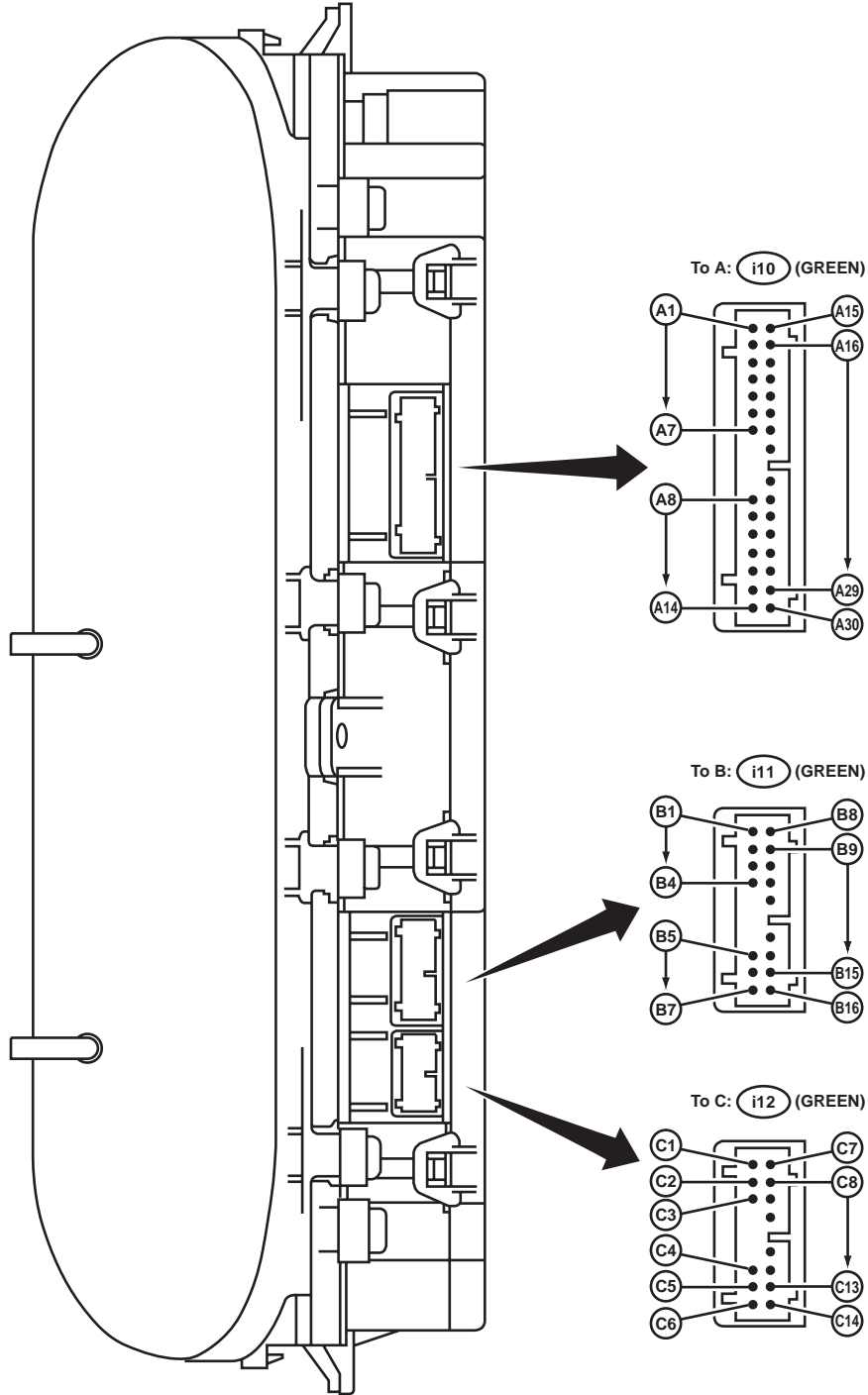
WIRING SYSTEM

12. Combination Meter

A: SCHEMATIC

1. 4-CYLINDER NON-TURBO ENGINE MODEL

M(H4)-01

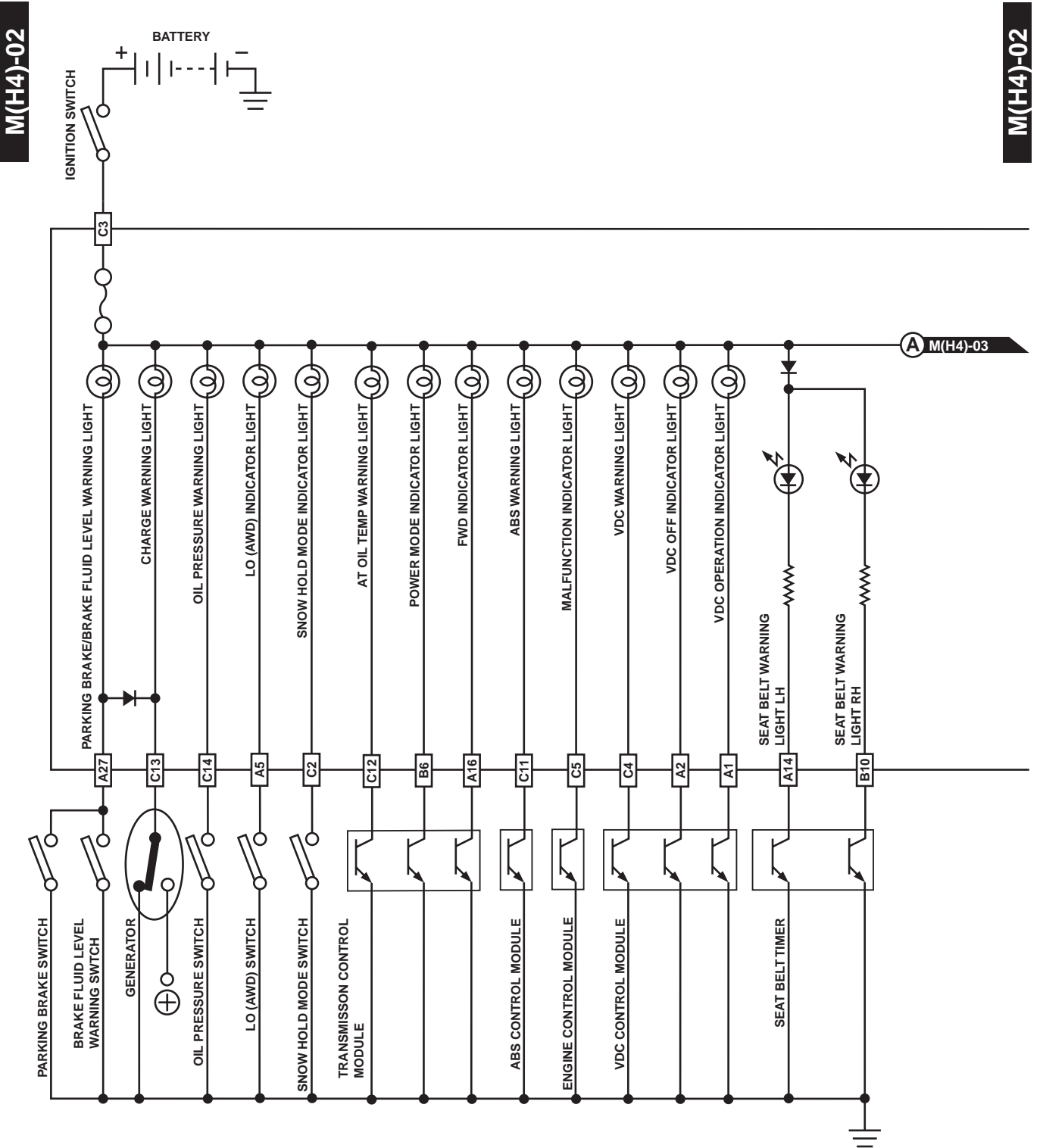


M(H4)-01

WI-00841

COMBINATION METER

WIRING SYSTEM



M(H4)-02

M(H4)-02

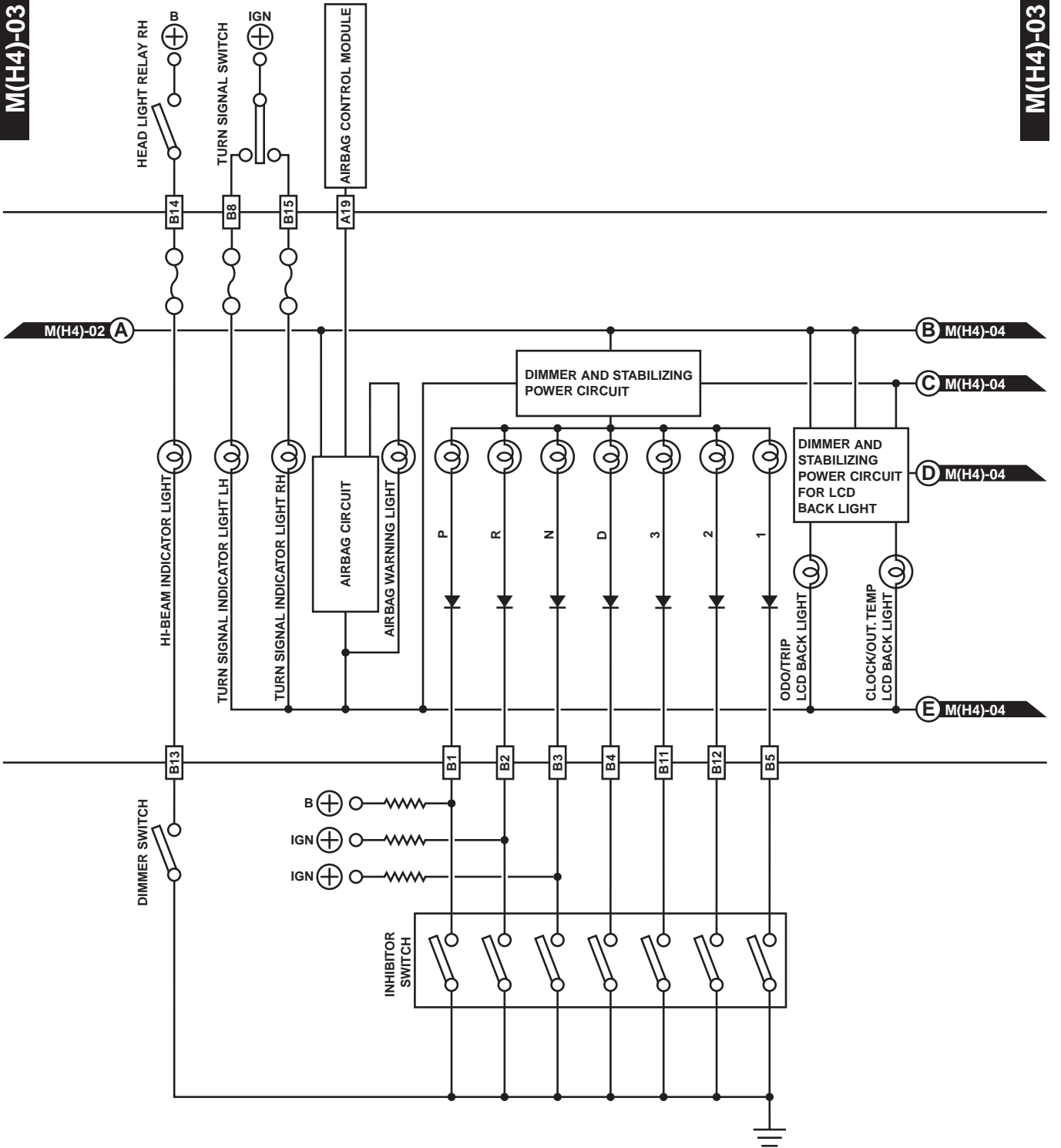
WI-00842

COMBINATION METER

WIRING SYSTEM

M(H4)-03

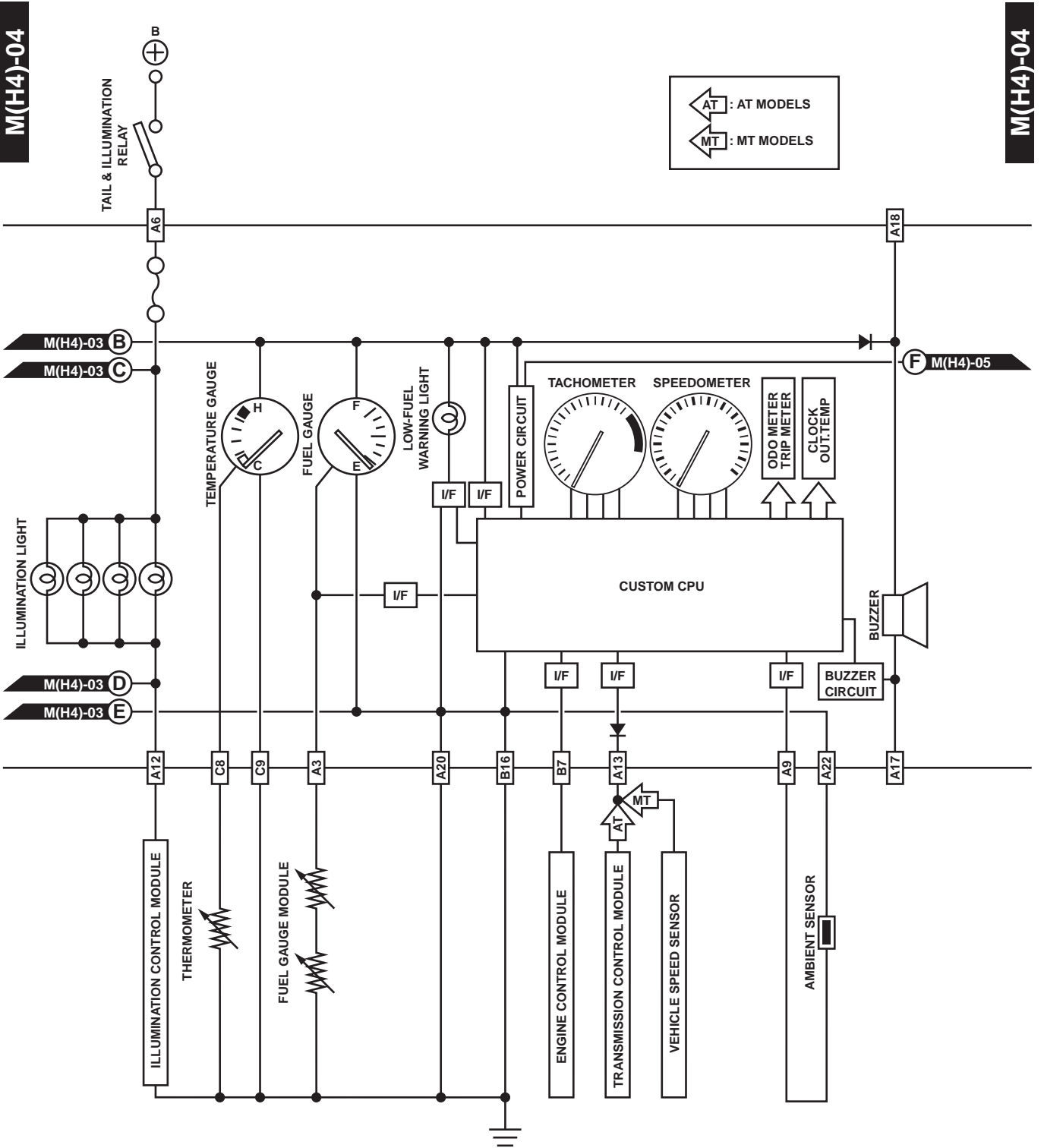
M(H4)-03



WI-00843

COMBINATION METER

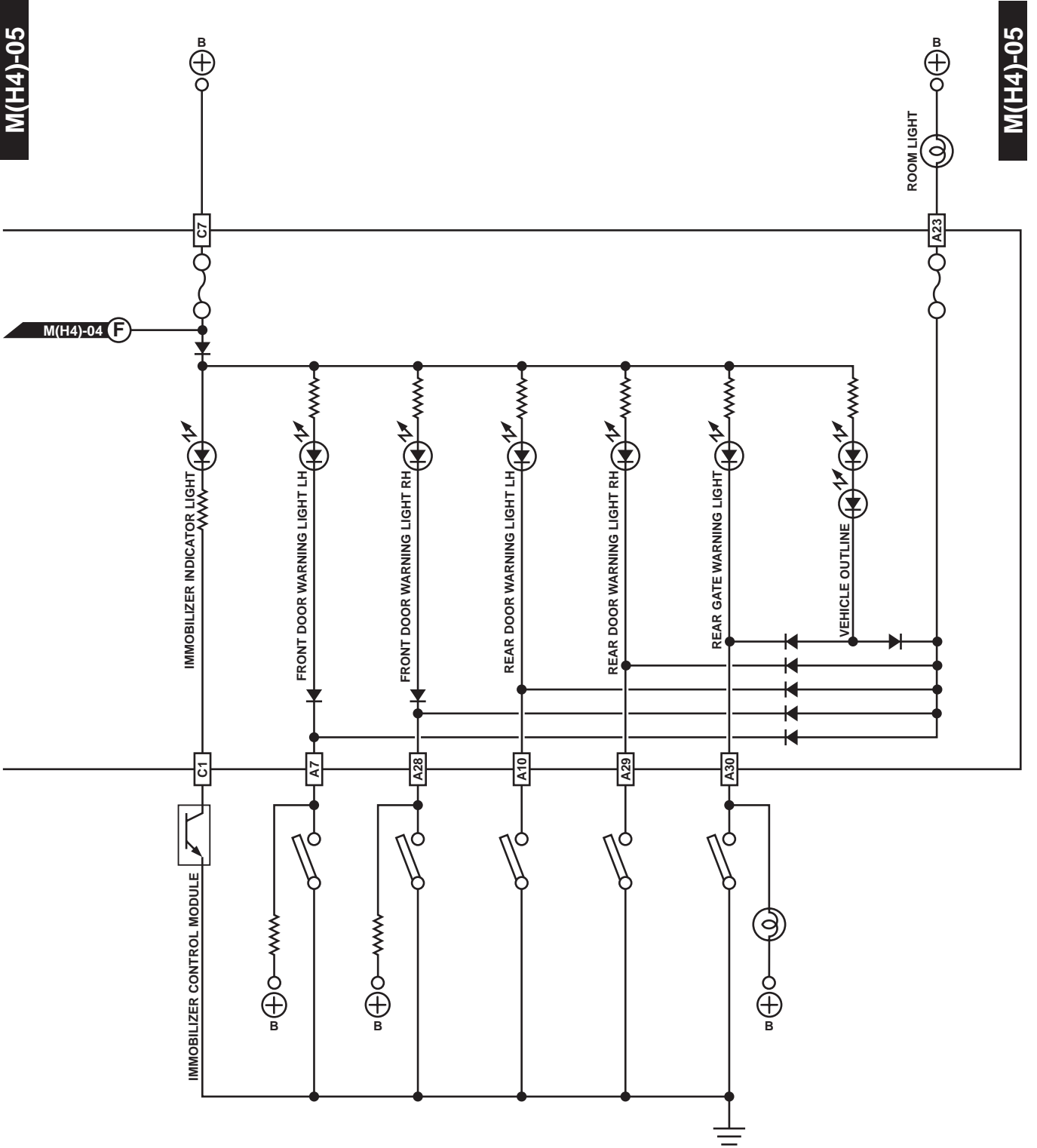
WIRING SYSTEM



WI-00844

COMBINATION METER

WIRING SYSTEM



WI-00845

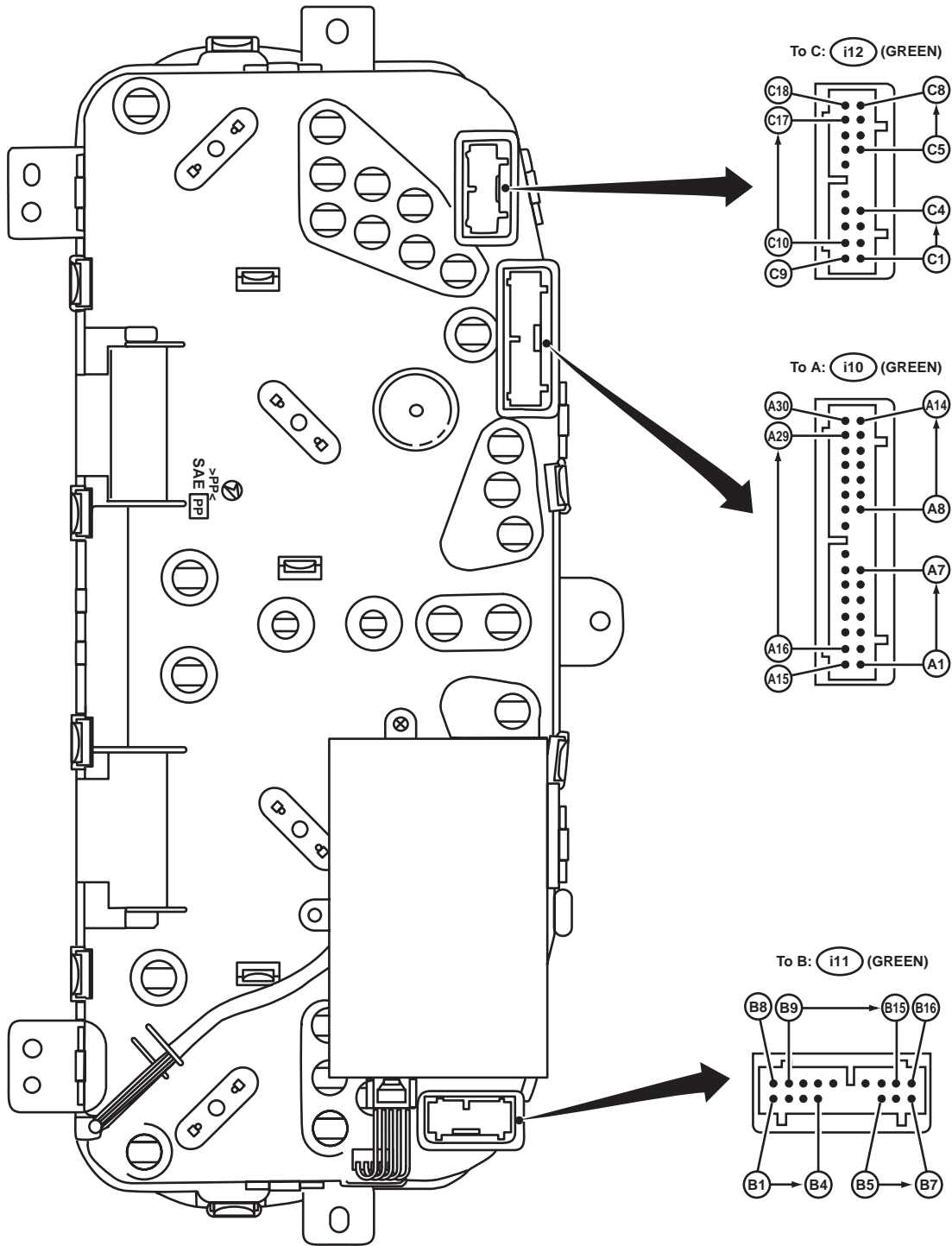
COMBINATION METER

WIRING SYSTEM

2. LHD 6-CYLINDER ENGINE MODEL

M(LH6)-01

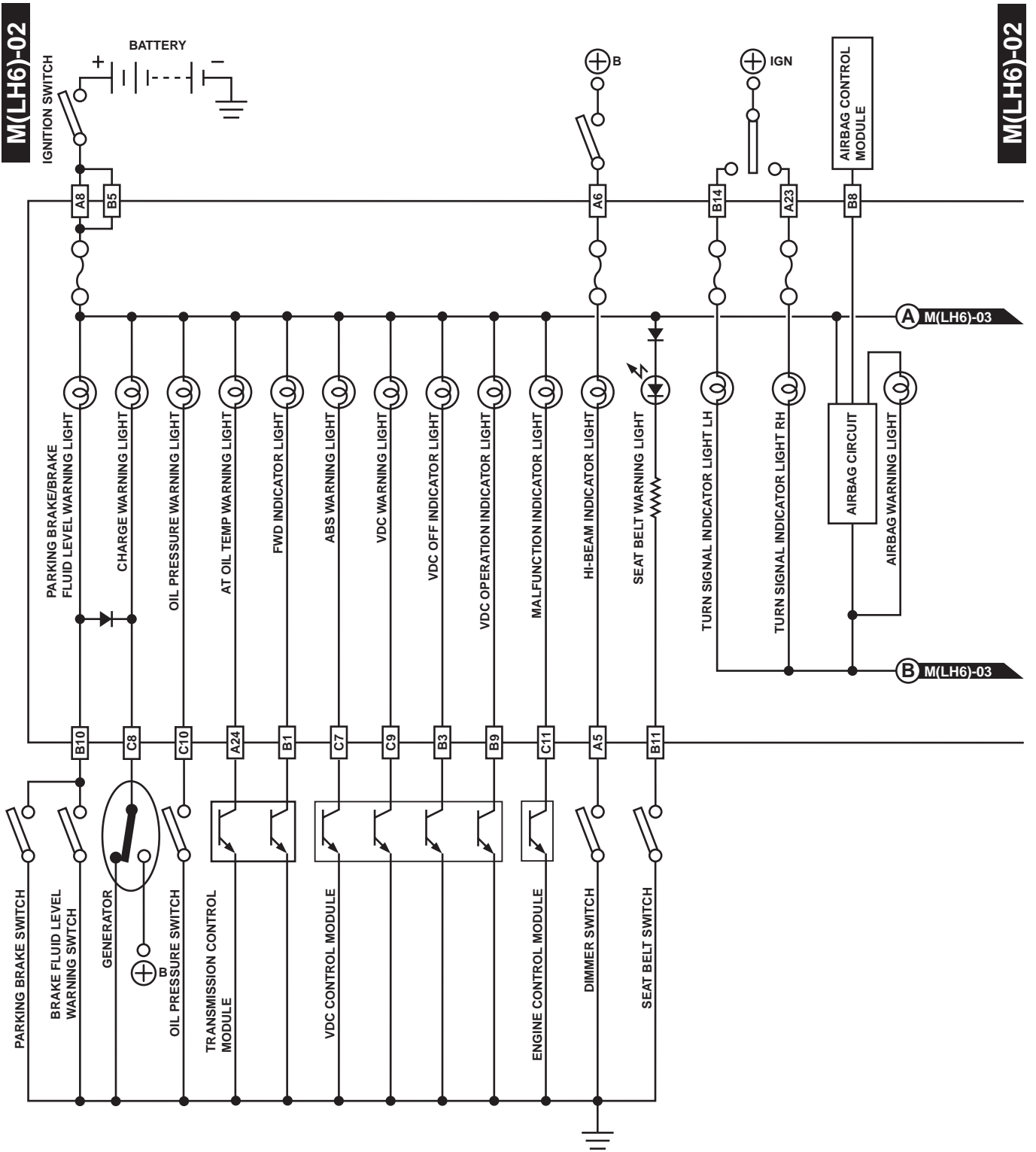
M(LH6)-01



WI-00846

COMBINATION METER

WIRING SYSTEM



M(LH6)-02

M(LH6)-02

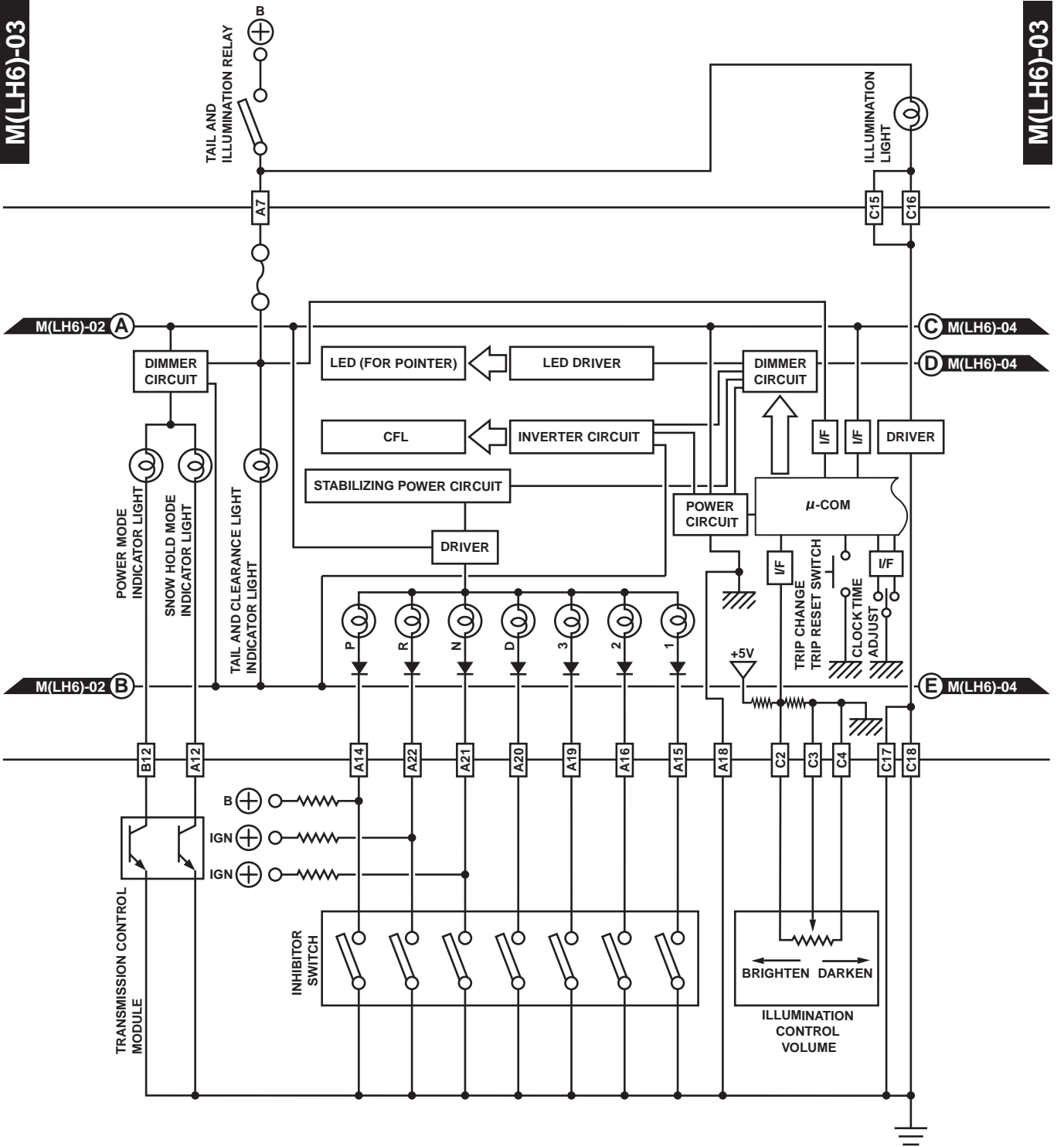
WI-00847

COMBINATION METER

WIRING SYSTEM

M(LH6)-03

M(LH6)-03



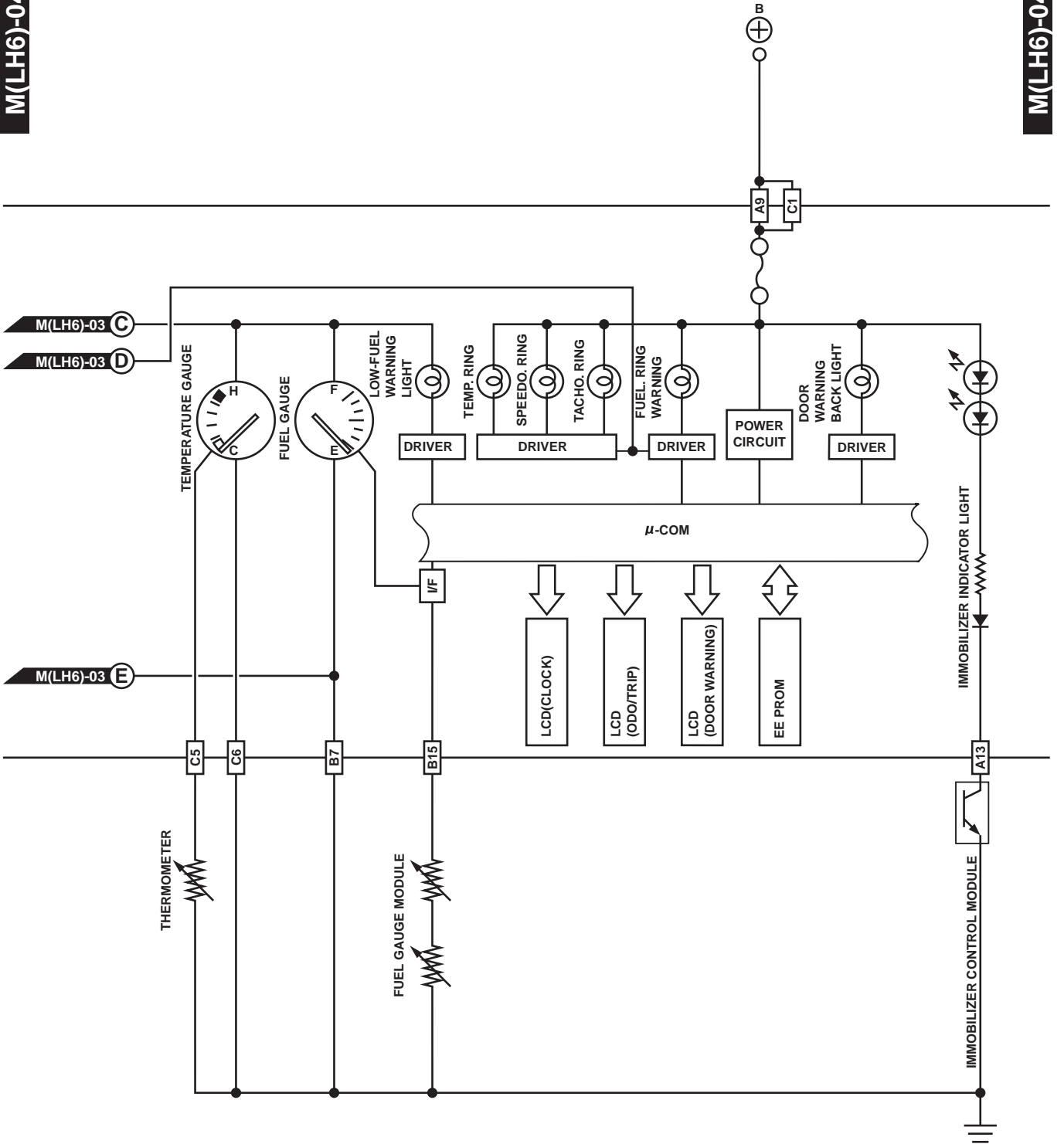
WI-00848

COMBINATION METER

WIRING SYSTEM

M(LH6)-04

M(LH6)-04



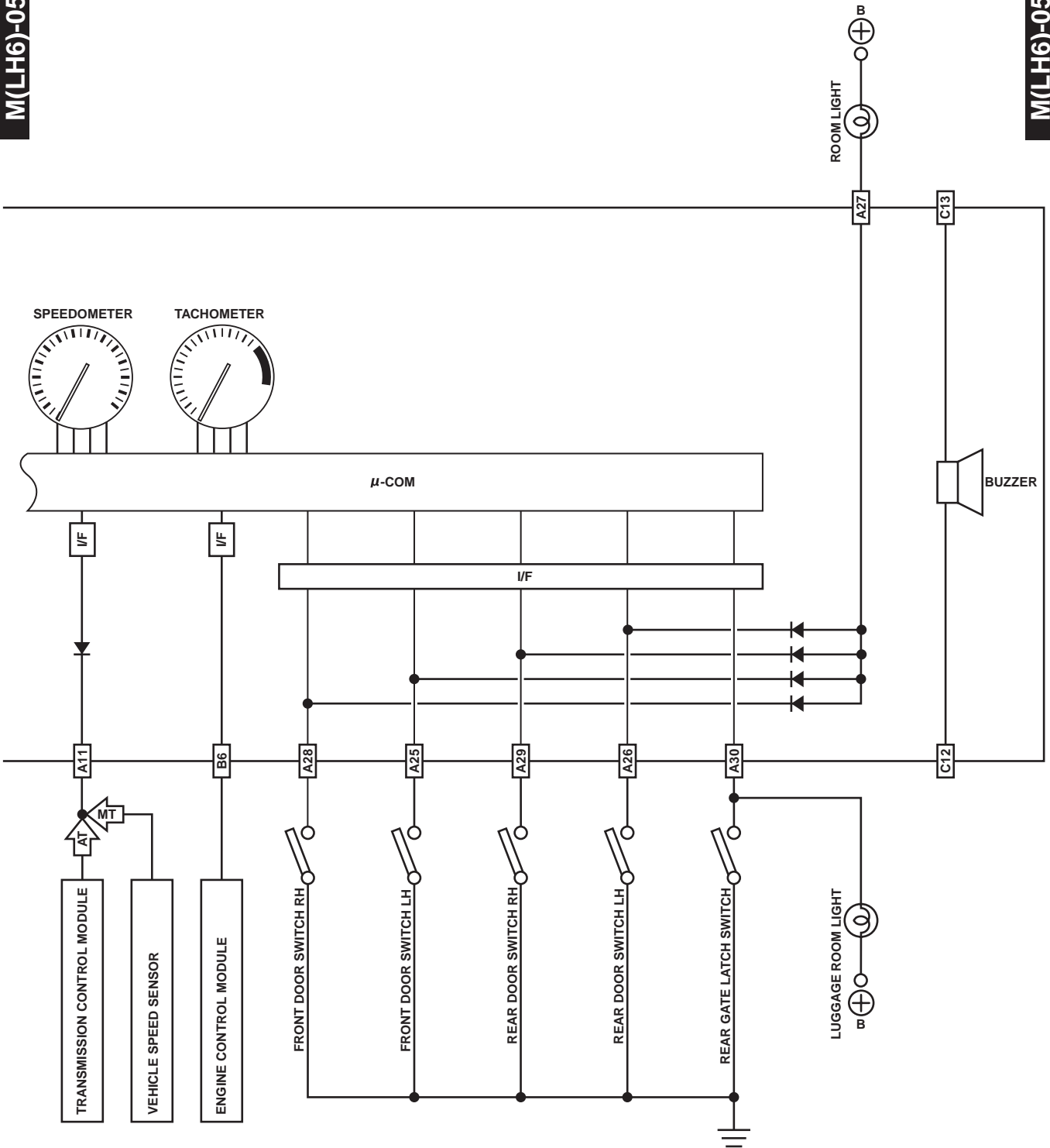
WI-00849

COMBINATION METER

WIRING SYSTEM

M(LH6)-05

M(LH6)-05



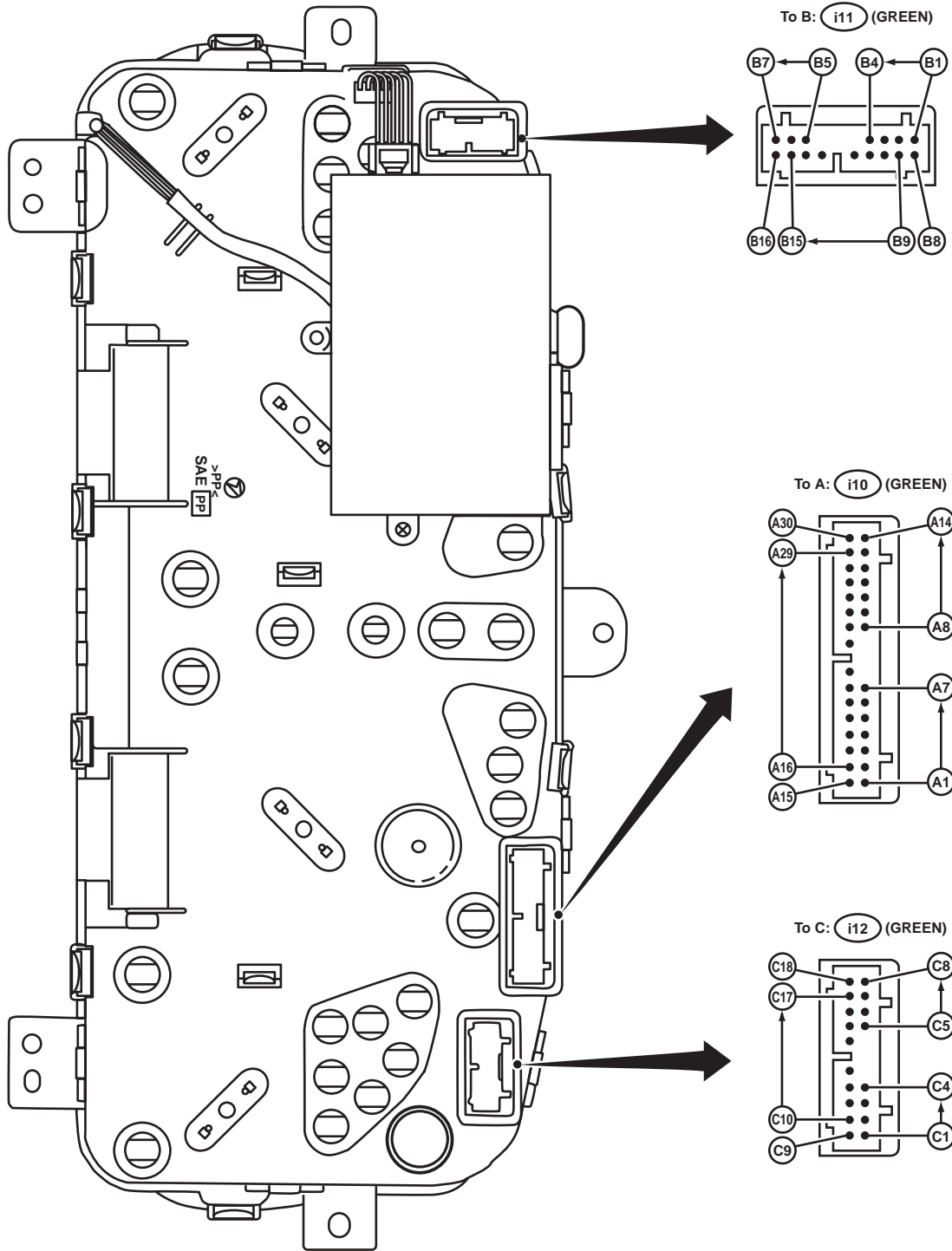
WI-00850

COMBINATION METER

WIRING SYSTEM

3. RHD 6-CYLINDER ENGINE AND TURBO ENGINE MODEL

M(RH6T)-01

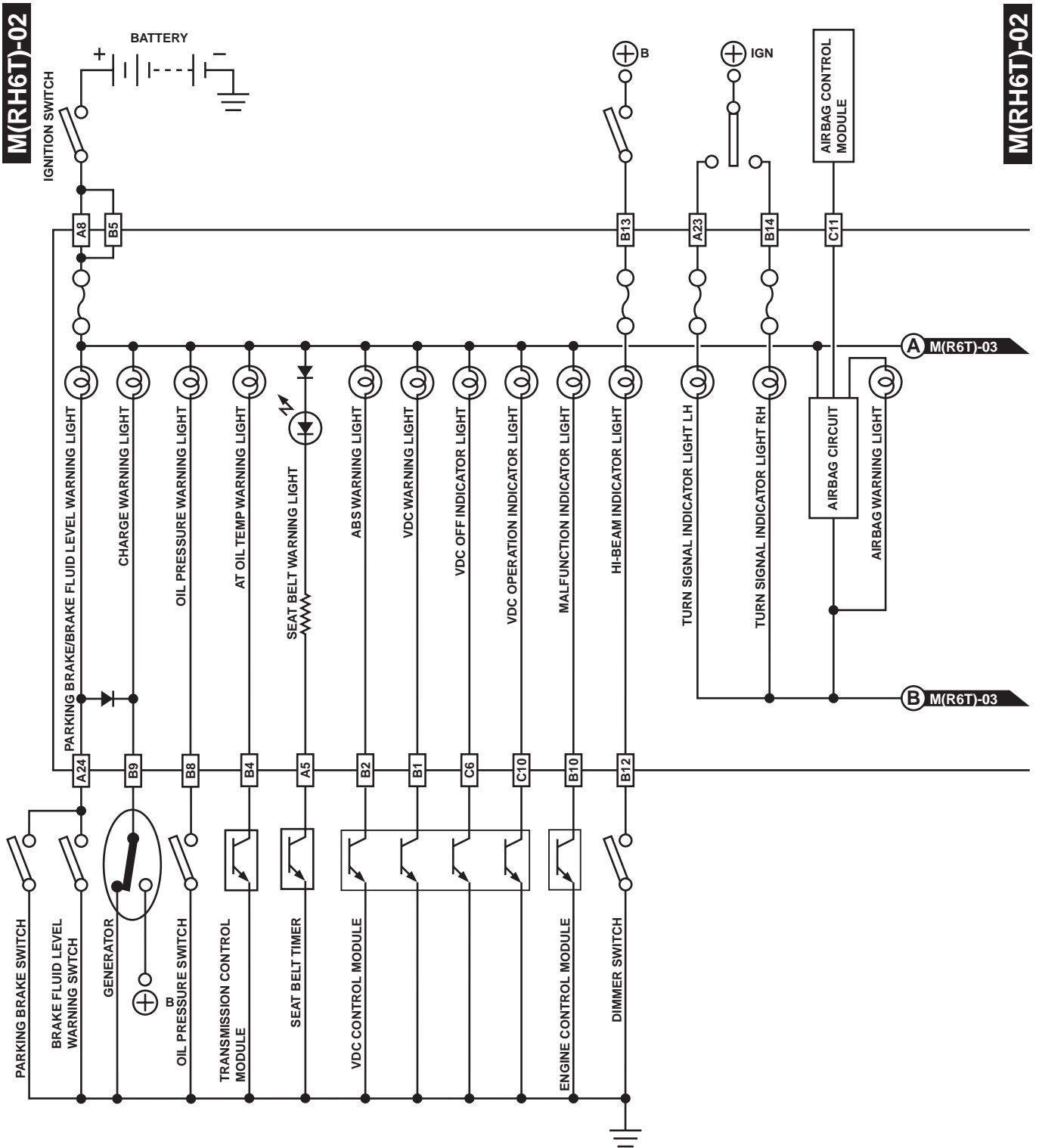


M(RH6T)-01

WI-00851

COMBINATION METER

WIRING SYSTEM



M(RH6T)-02

M(RH6T)-02

A M(R6T)-03

B M(R6T)-03

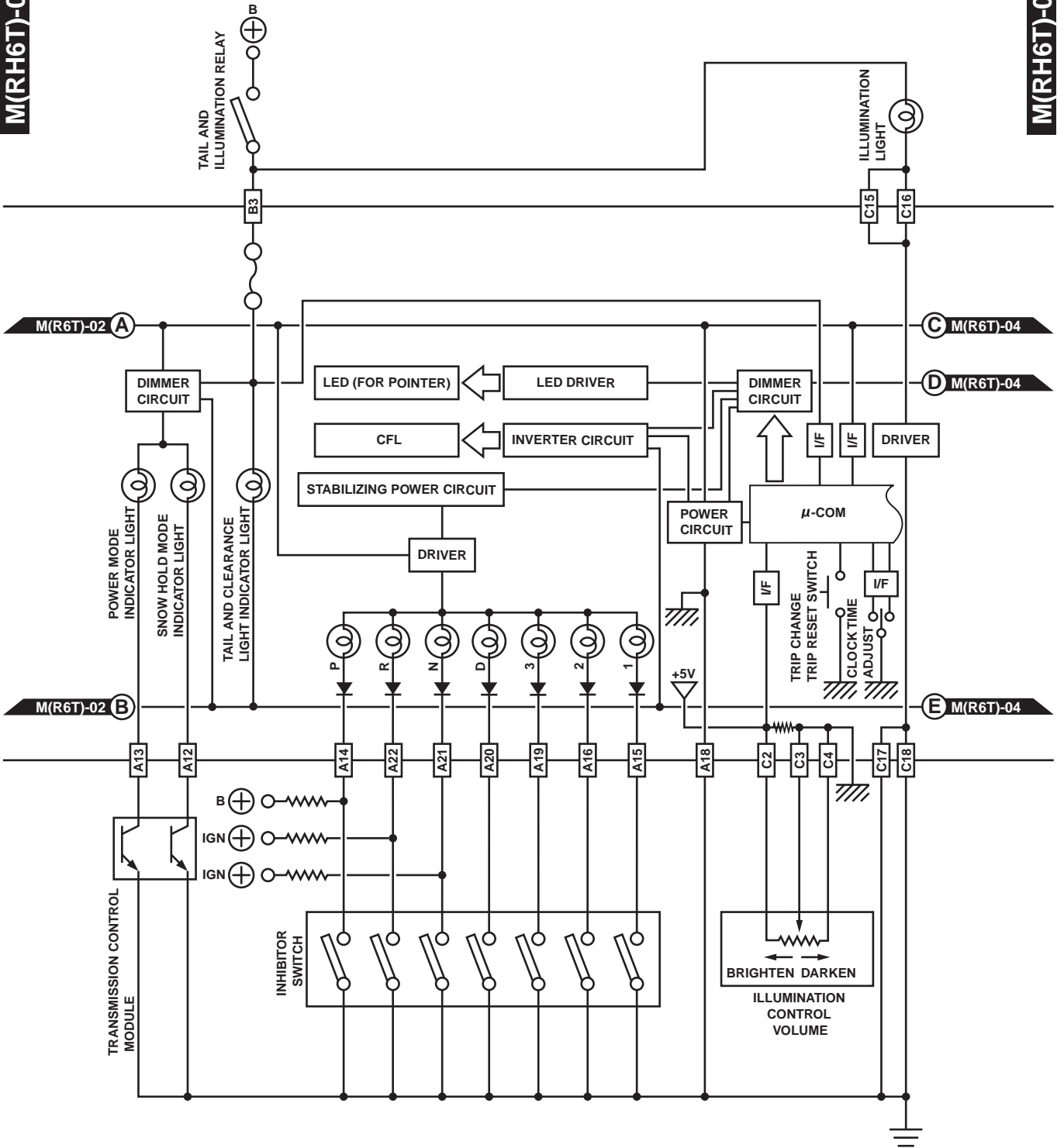
WI-00852

COMBINATION METER

WIRING SYSTEM

M(RH6T)-03

M(RH6T)-03



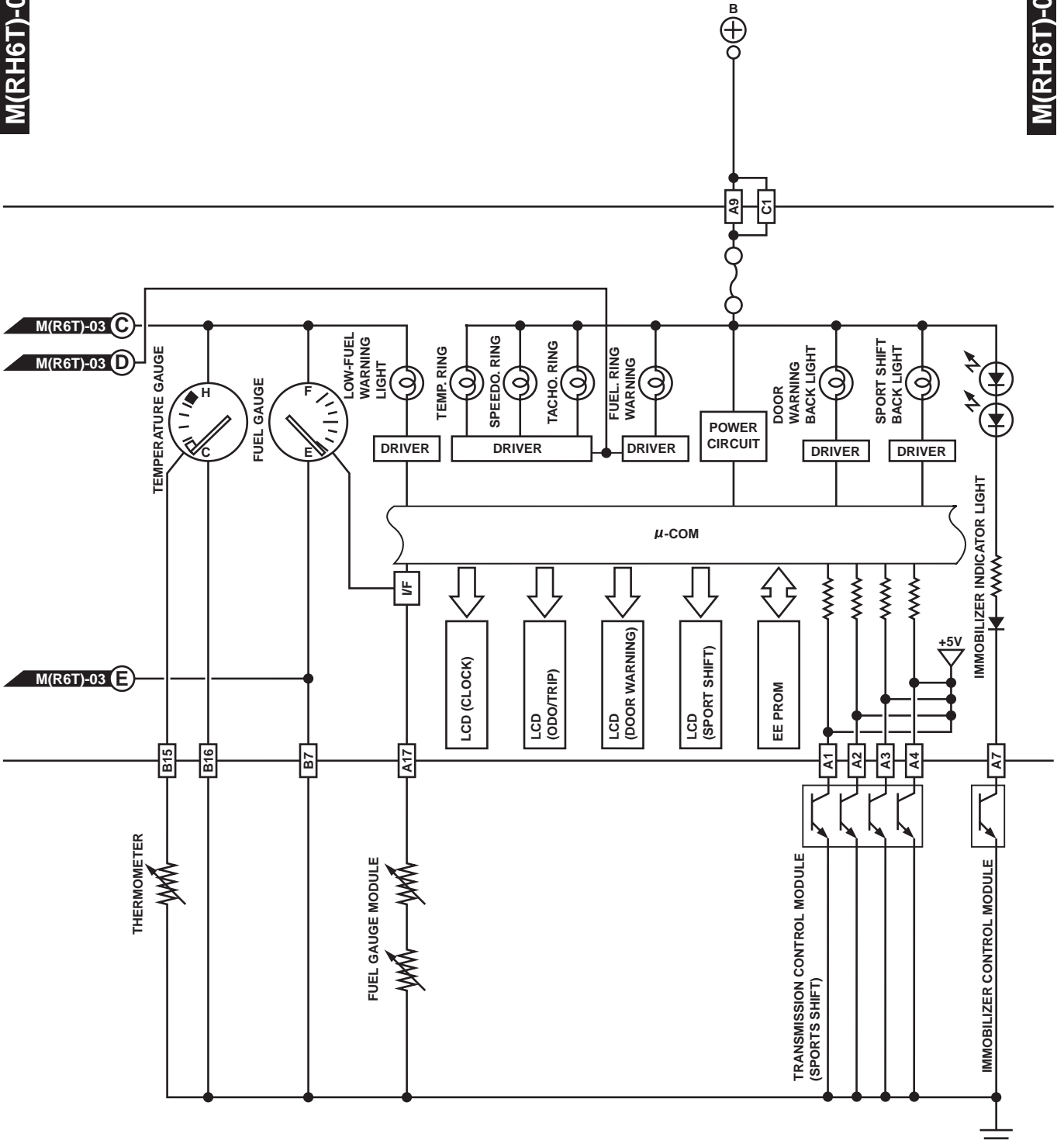
WI-00853

COMBINATION METER

WIRING SYSTEM

M(RH6T)-04

M(RH6T)-04



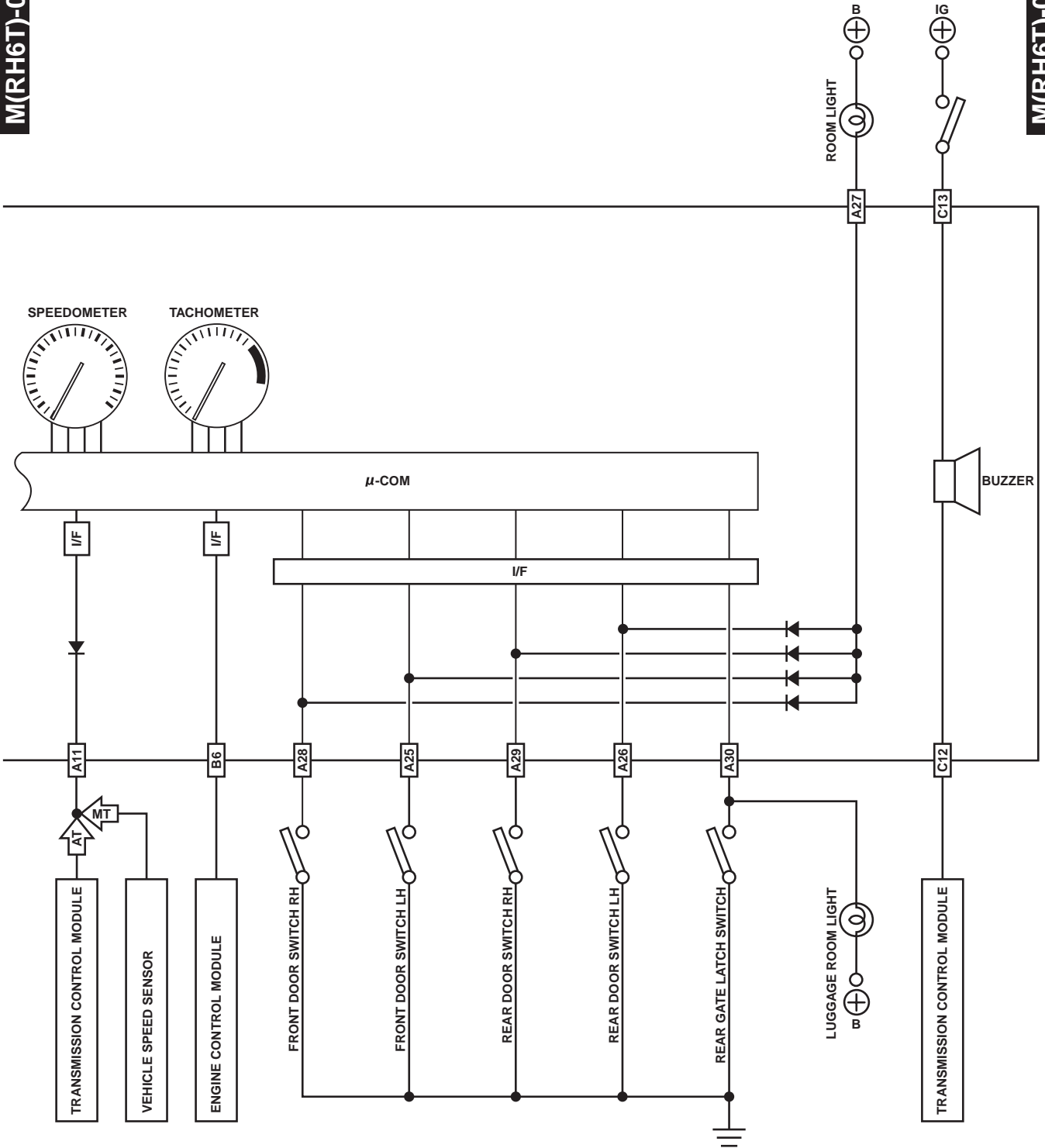
WI-00854

COMBINATION METER

WIRING SYSTEM

M(RH6T)-05

M(RH6T)-05



WI-00855

COMBINATION METER

WIRING SYSTEM

MEMO:

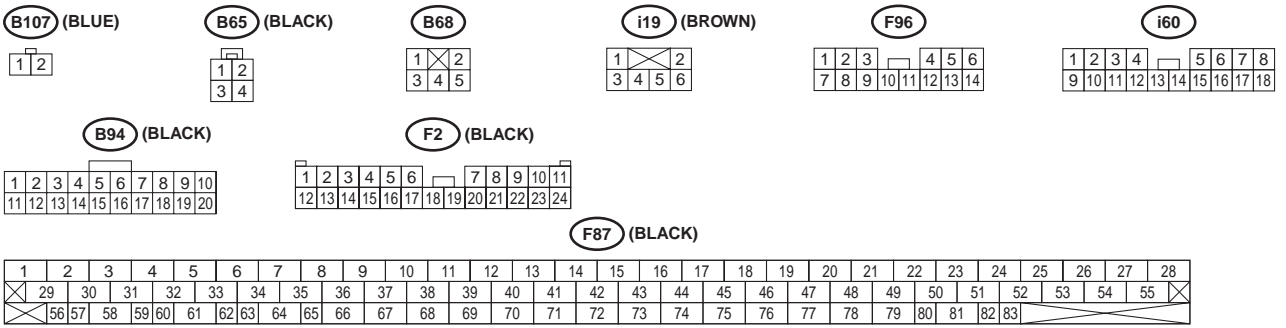
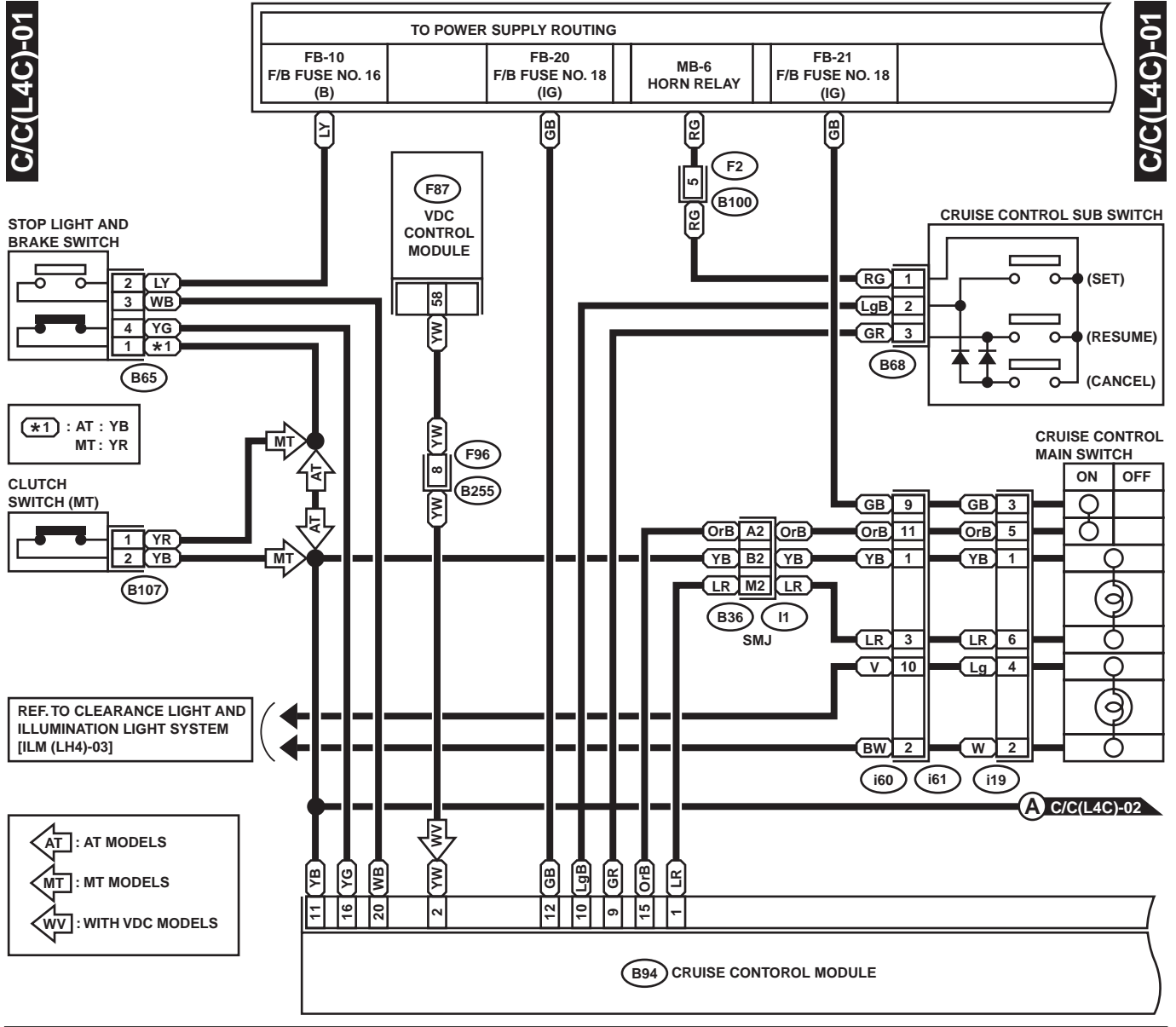
CRUISE CONTROL SYSTEM

WIRING SYSTEM

13. Cruise Control System

A: SCHEMATIC

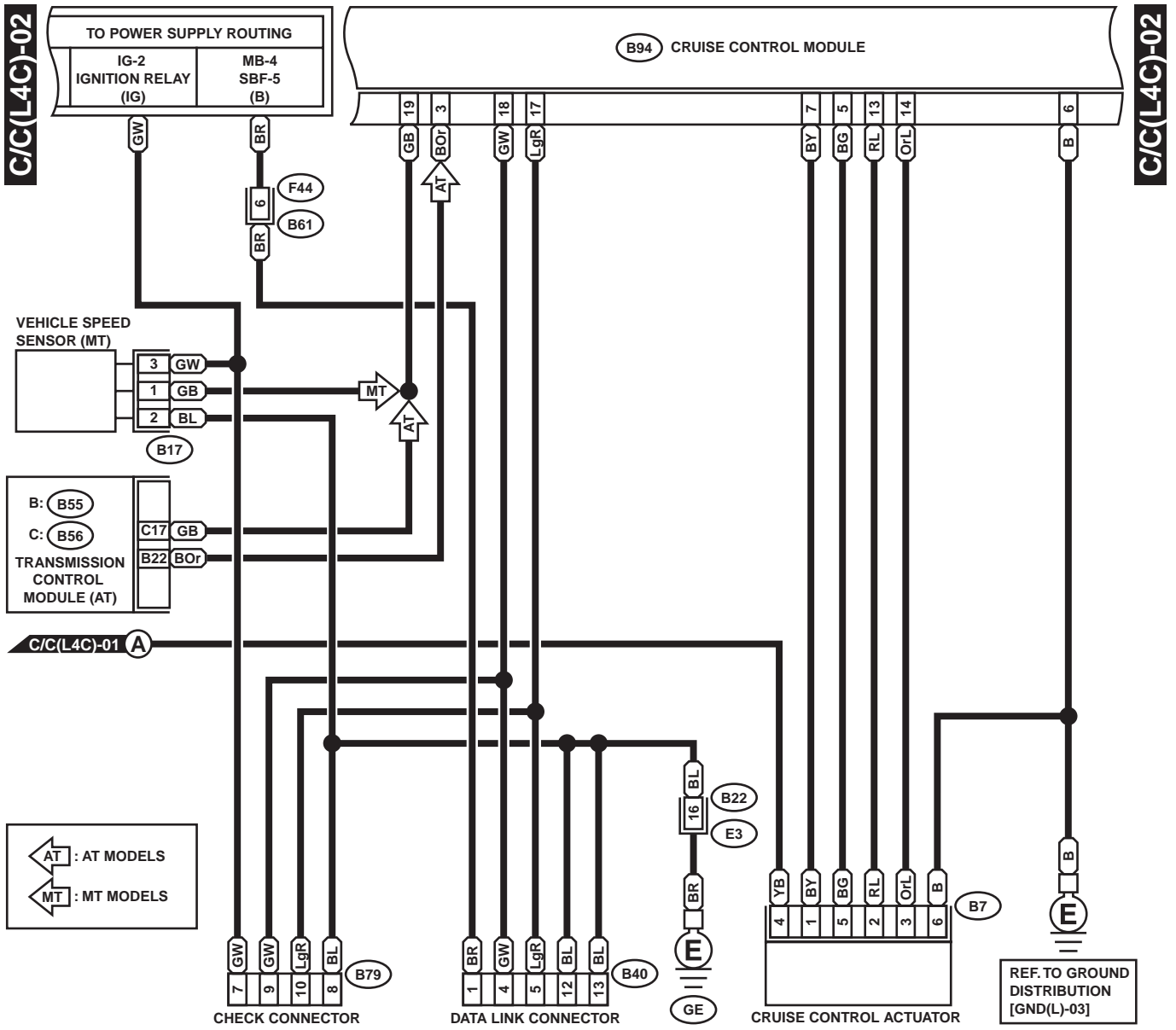
1. LHD 4-CYLINDER ENGINE MODEL (CRUISE CONTROL MAIN SWITCH IS IN CENTER PANEL)



WI-00856

CRUISE CONTROL SYSTEM

WIRING SYSTEM



B17 (BLACK)



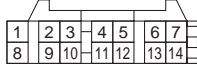
B7 (BLACK)



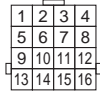
F44



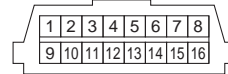
B79 (GRAY)



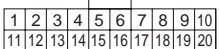
B22 (BROWN)



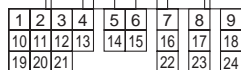
B40 (GRAY)



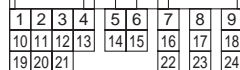
B94 (BLACK)



C: B56 (GREEN)



B: B55 (GRAY)



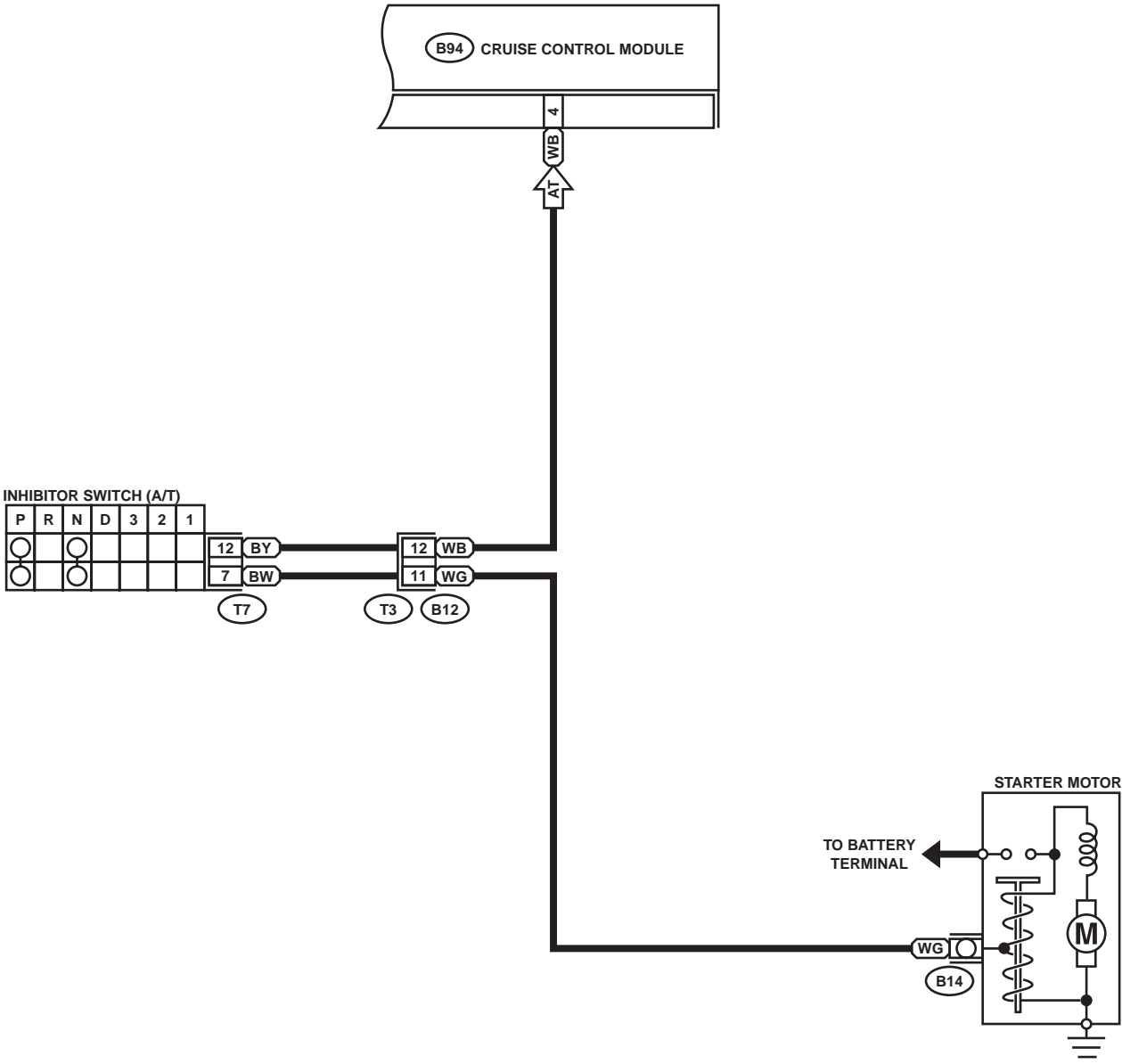
WI-00857

CRUISE CONTROL SYSTEM

WIRING SYSTEM

C/C(L4C)-03

C/C(L4C)-03



T7

1	2	3	4	5	6
7	8	9	10	11	12

B12

1	2	3	4
5	6	7	8
9	10	11	12

B94 (BLACK)

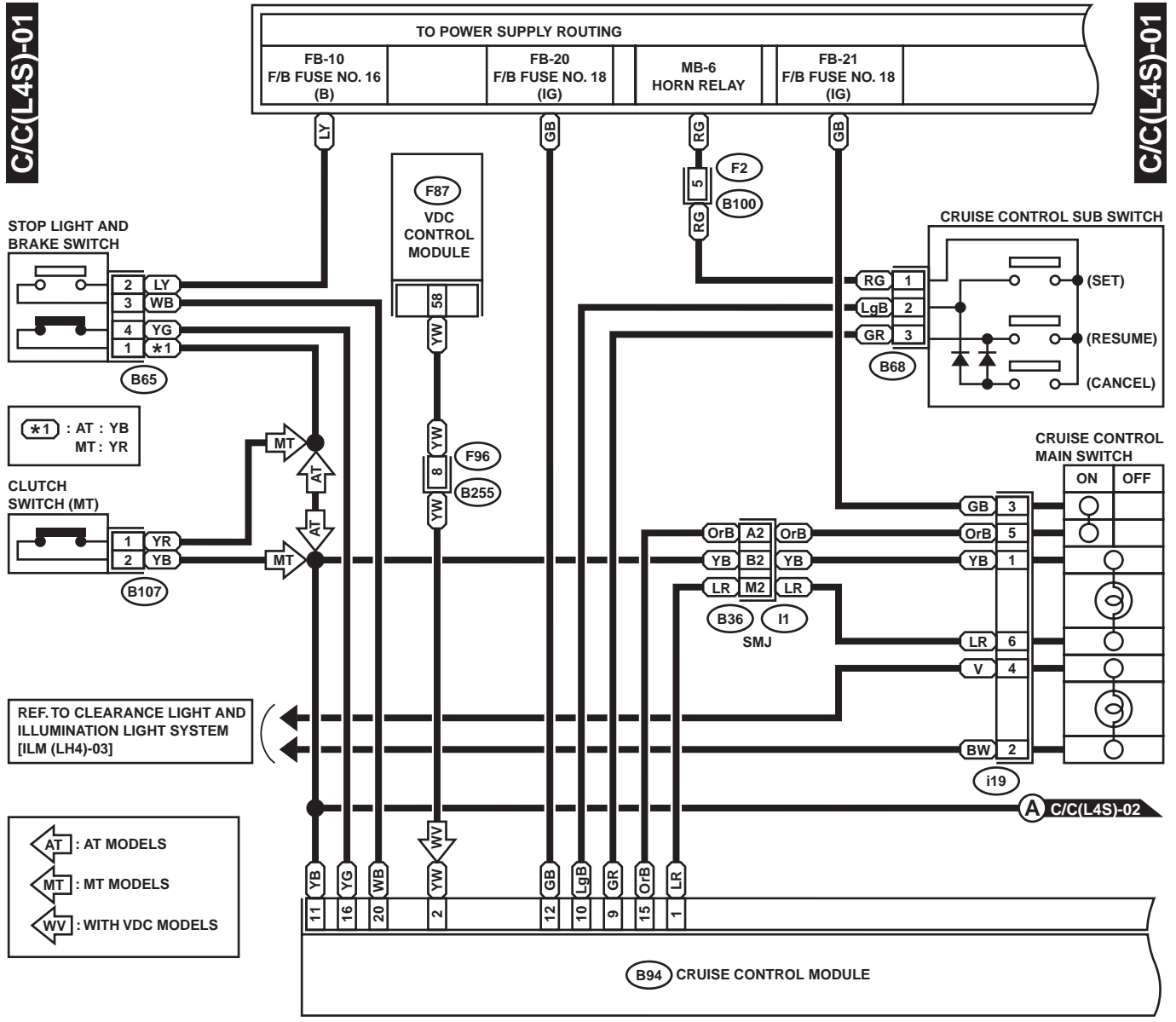
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

WI-00858

CRUISE CONTROL SYSTEM

WIRING SYSTEM

2. LHD 4-CYLINDER ENGINE MODEL (CRUISE CONTROL MAIN SWITCH IS IN STEERING SIDE PANEL)



(B107) (BLUE)



(B65) (BLACK)



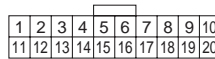
(B68)



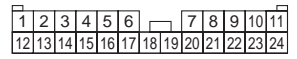
(i19) (BROWN)



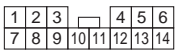
(B94) (BLACK)



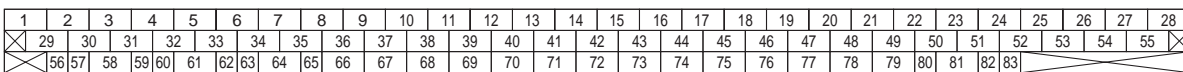
(F2) (BLACK)



(F96)



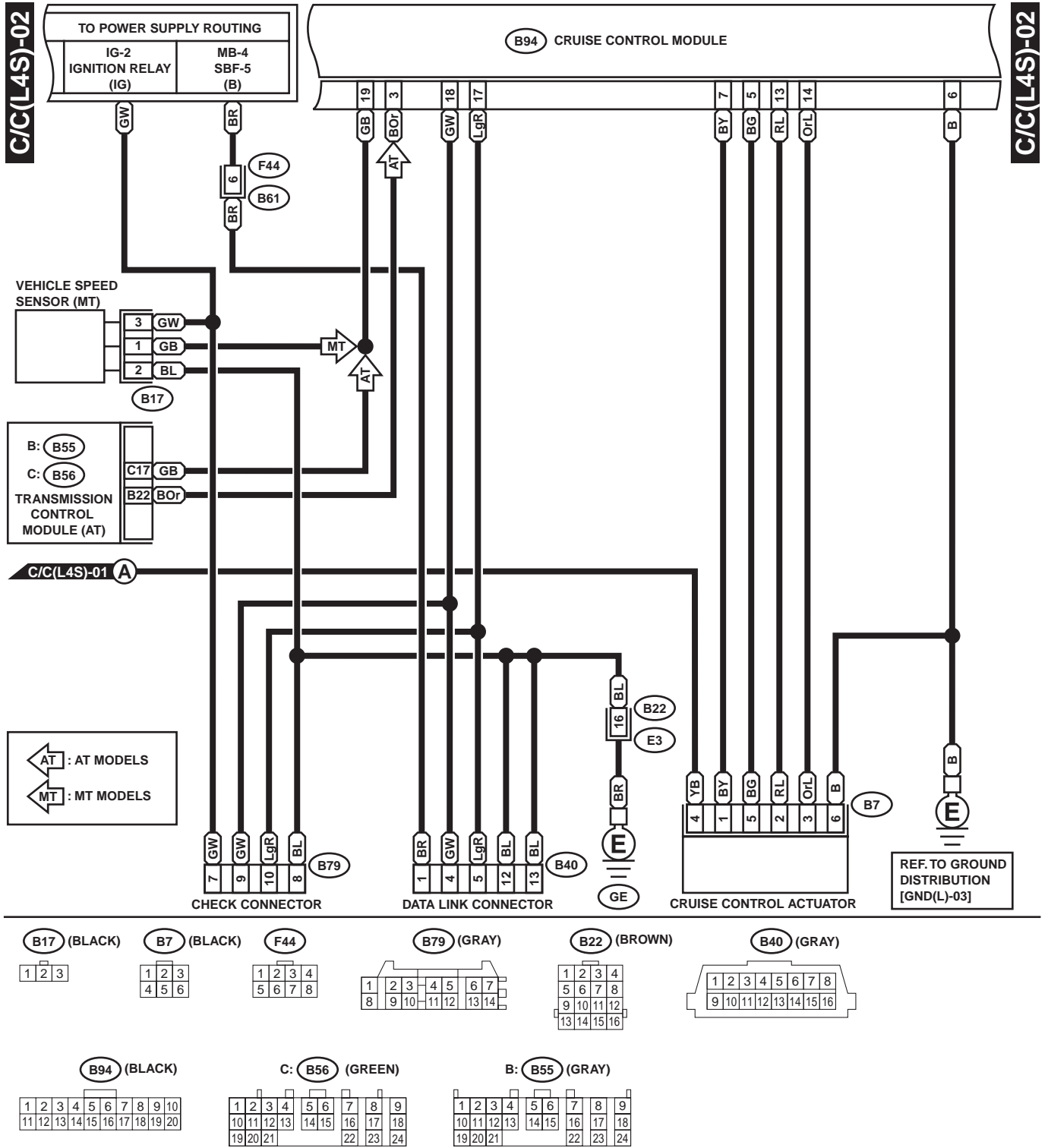
(F87) (BLACK)



WI-00859

CRUISE CONTROL SYSTEM

WIRING SYSTEM



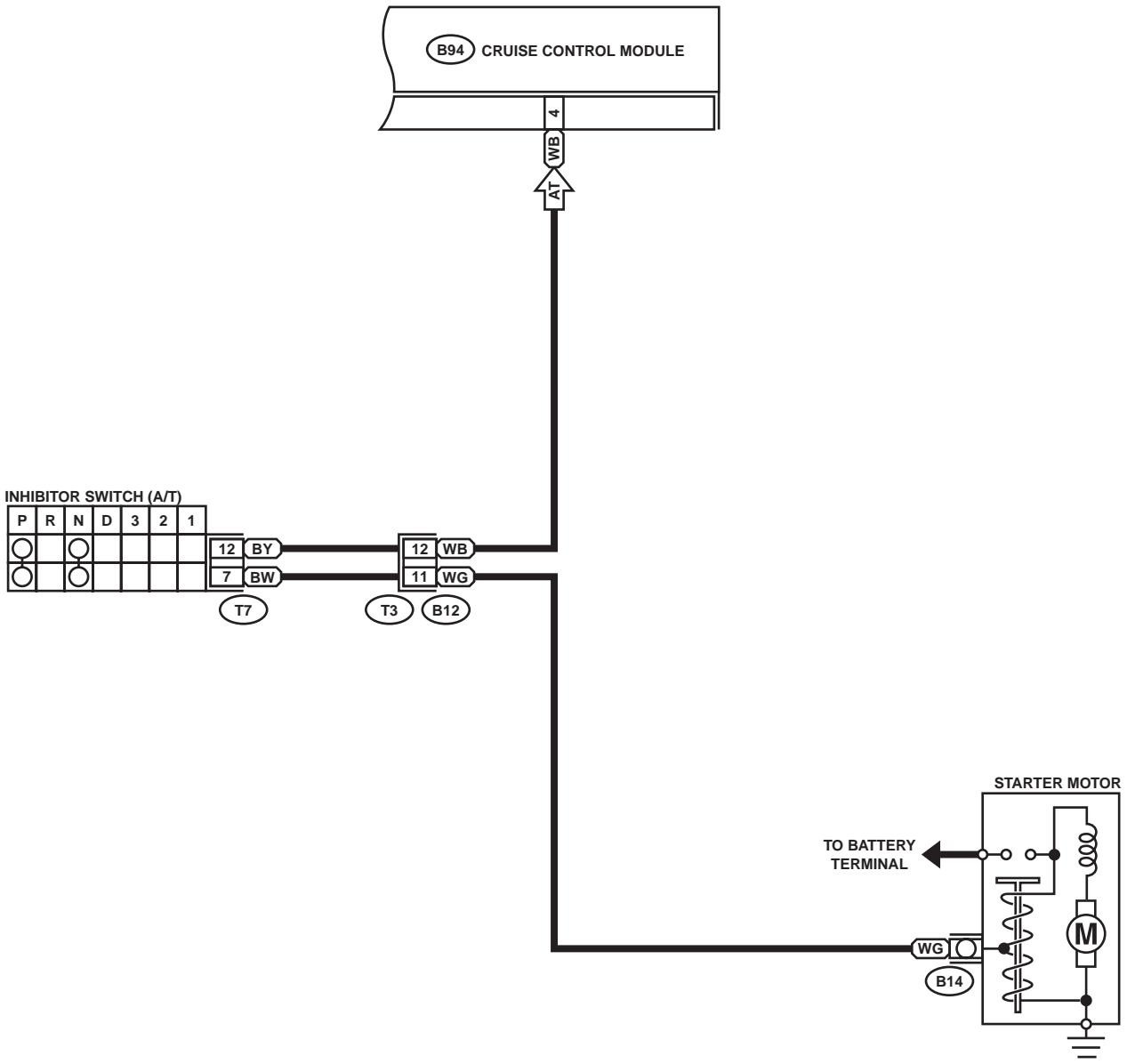
WI-00860

CRUISE CONTROL SYSTEM

WIRING SYSTEM

C/C(L4S)-03

C/C(L4S)-03



T7

B12

B94 (BLACK)

1	2	3	4	5	6
7	8	9	10	11	12

1	2	3	4
5	6	7	8
9	10	11	12

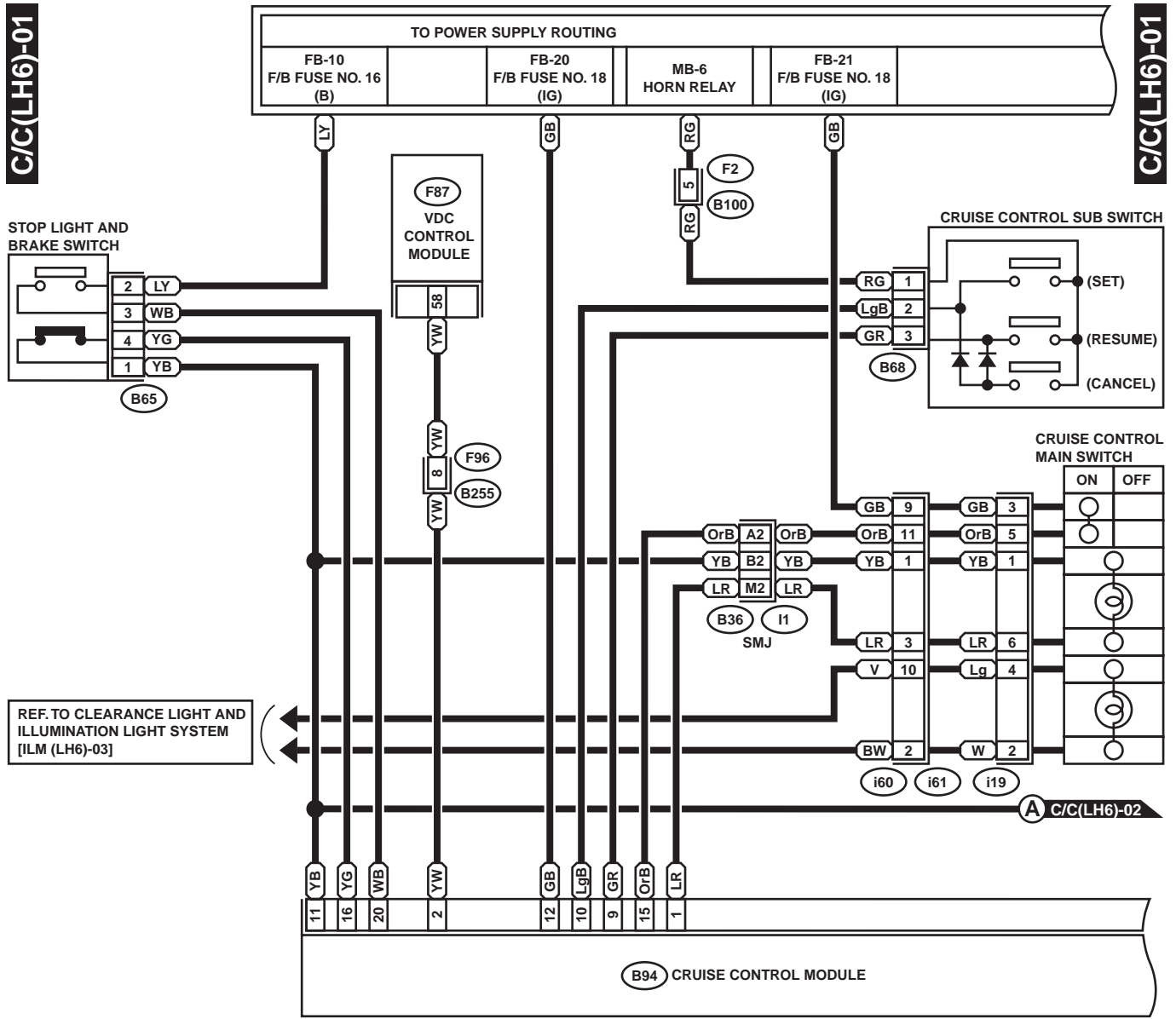
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

WI-00861

CRUISE CONTROL SYSTEM

WIRING SYSTEM

3. LHD 6-CYLINDER ENGINE MODEL



B65 (BLACK)



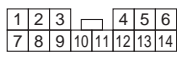
B68



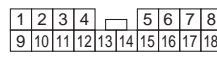
i19 (BROWN)



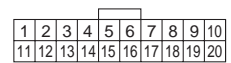
F96



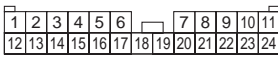
i60



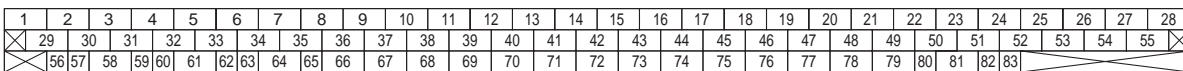
B94 (BLACK)



F2 (BLACK)



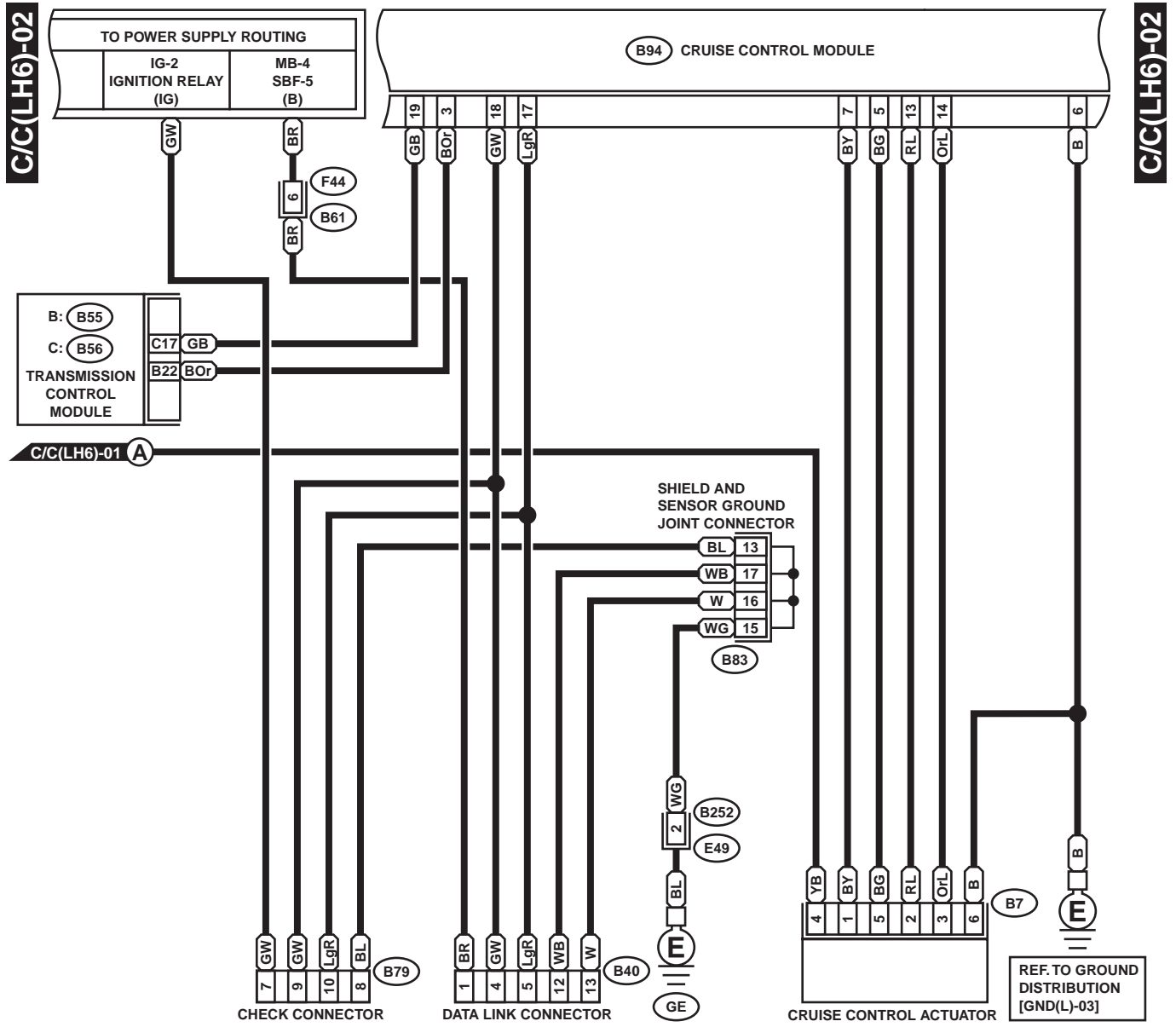
F87 (BLACK)



WI-00862

CRUISE CONTROL SYSTEM

WIRING SYSTEM



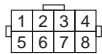
B7 (BLACK)



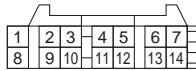
F44



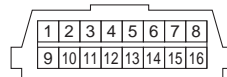
B252 (DARK GRAY)



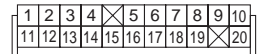
B79 (GRAY)



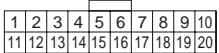
B40 (GRAY)



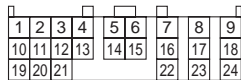
B83



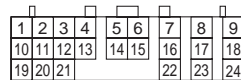
B94 (BLACK)



B: B55 (GRAY)



C: B56 (GREEN)



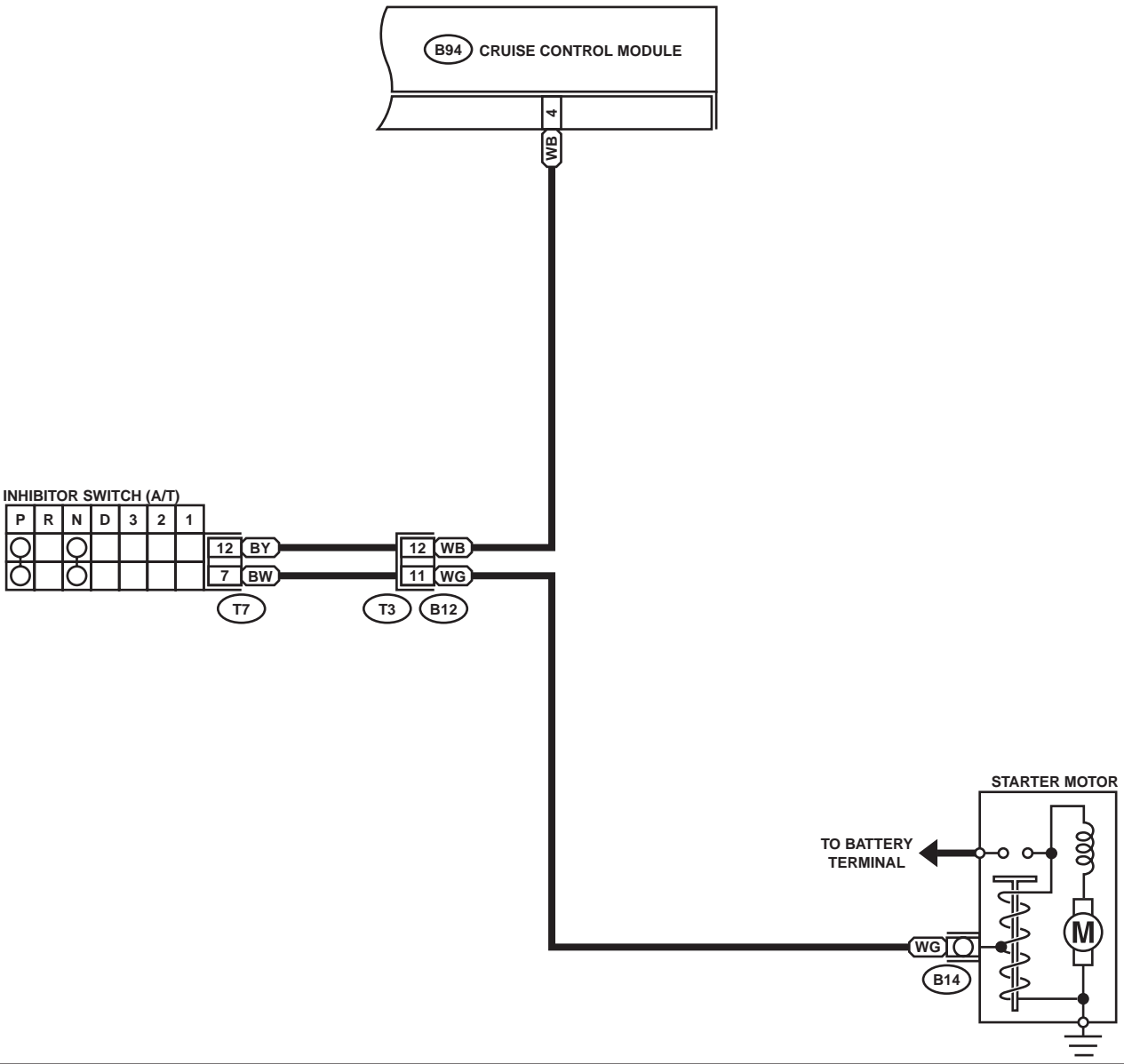
WI-00863

CRUISE CONTROL SYSTEM

WIRING SYSTEM

C/C(LH6)-03

C/C(LH6)-03



T7

B12

B94 (BLACK)

1	2	3	4	5	6
7	8	9	10	11	12

1	2	3	4
5	6	7	8
9	10	11	12

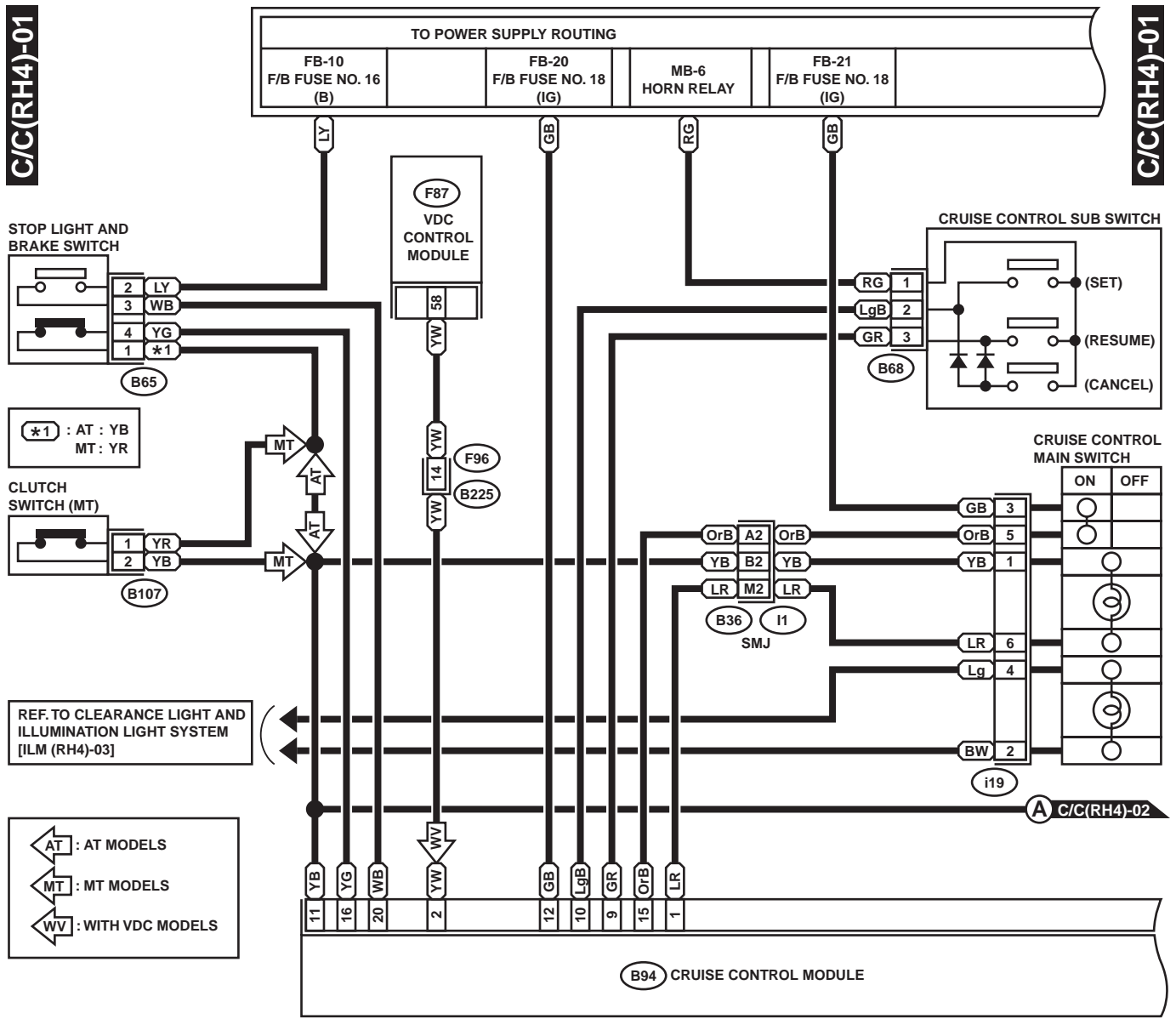
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

WI-00864

CRUISE CONTROL SYSTEM

WIRING SYSTEM

4. RHD 4-CYLINDER ENGINE MODEL



B107 (BLUE)

1	2
---	---

B65 (BLACK)

1	2
3	4

B68

1	2
3	4

i19 (BROWN)

1	2
3	4

B94 (BLACK)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

F96

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20							

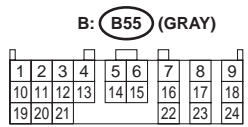
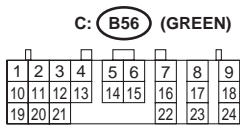
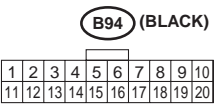
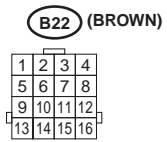
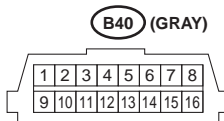
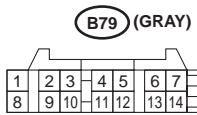
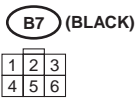
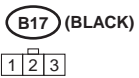
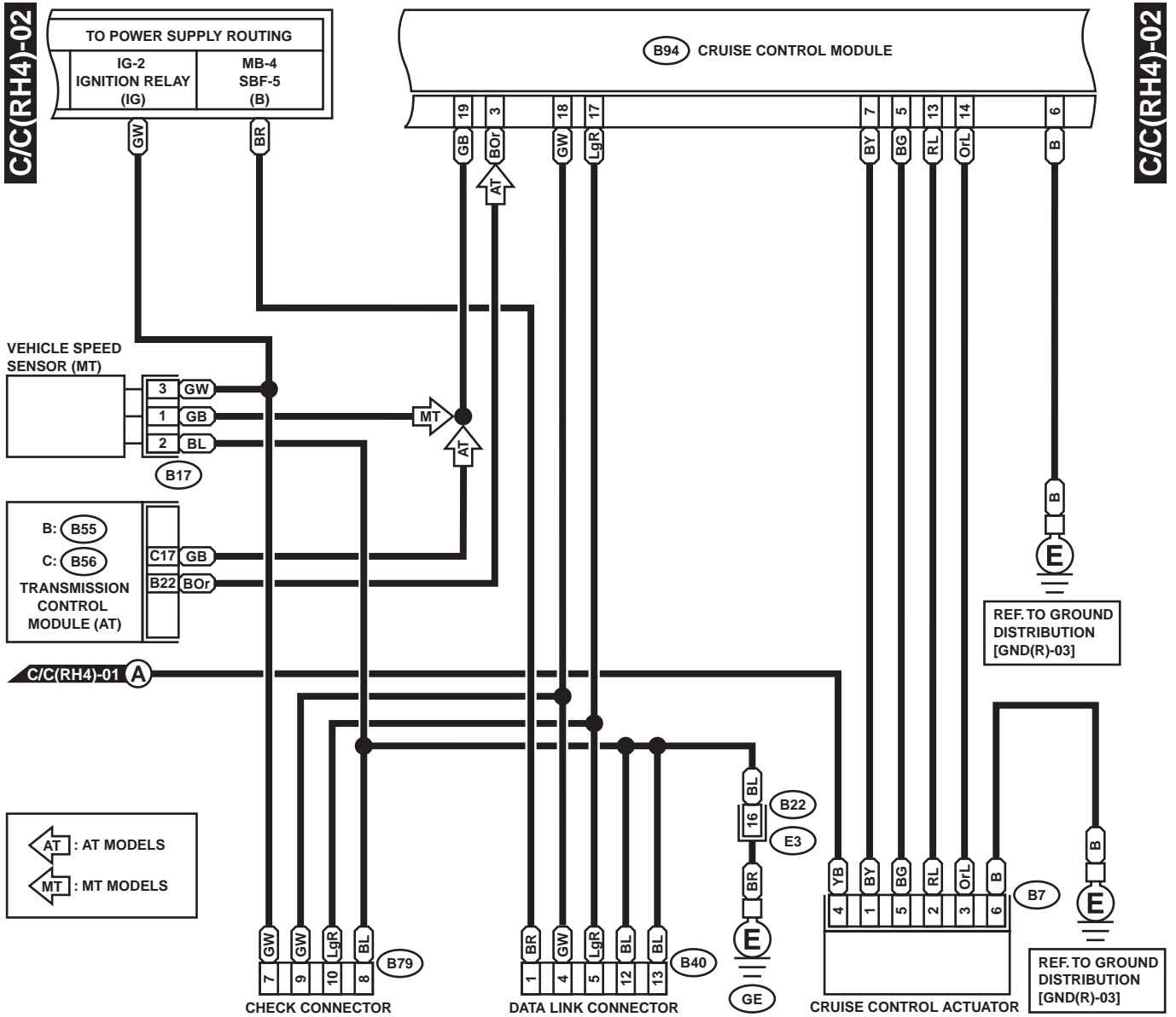
F87 (BLACK)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
X	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	X	
X	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	X

WI-00865

CRUISE CONTROL SYSTEM

WIRING SYSTEM



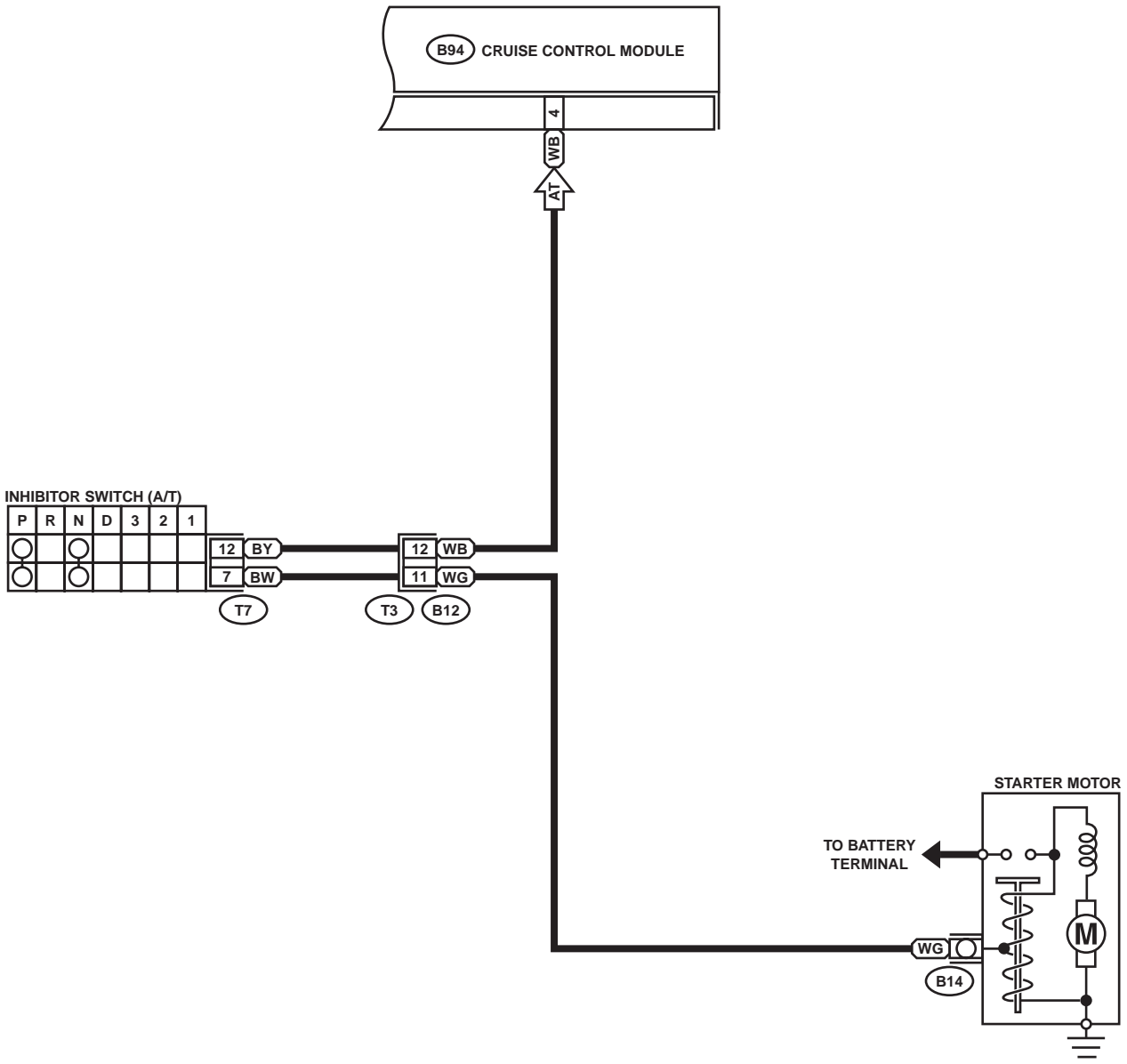
WI-00866

CRUISE CONTROL SYSTEM

WIRING SYSTEM

C/C(RH4)-03

C/C(RH4)-03



T7

B12

B94 (BLACK)

1	2	3	4	5	6
7	8	9	10	11	12

1	2	3	4
5	6	7	8
9	10	11	12

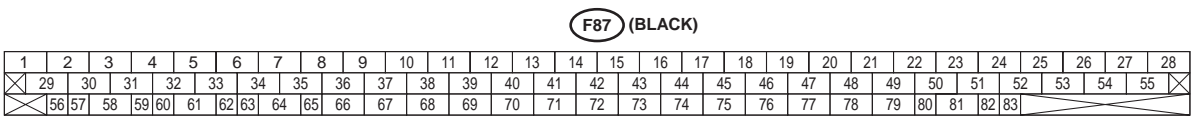
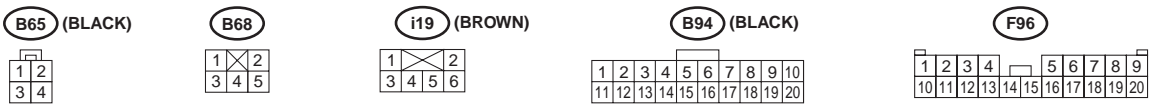
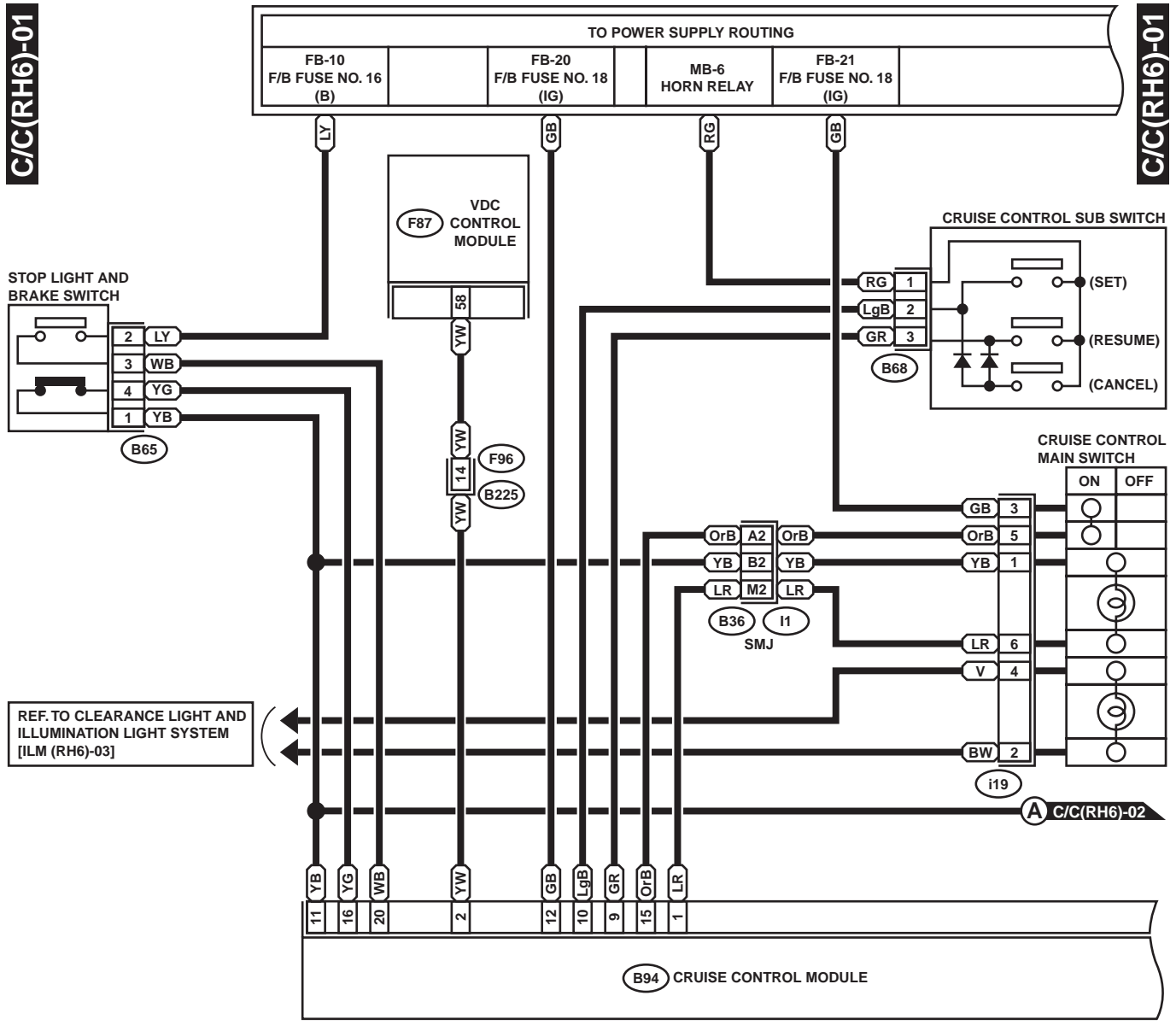
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

WI-00867

CRUISE CONTROL SYSTEM

WIRING SYSTEM

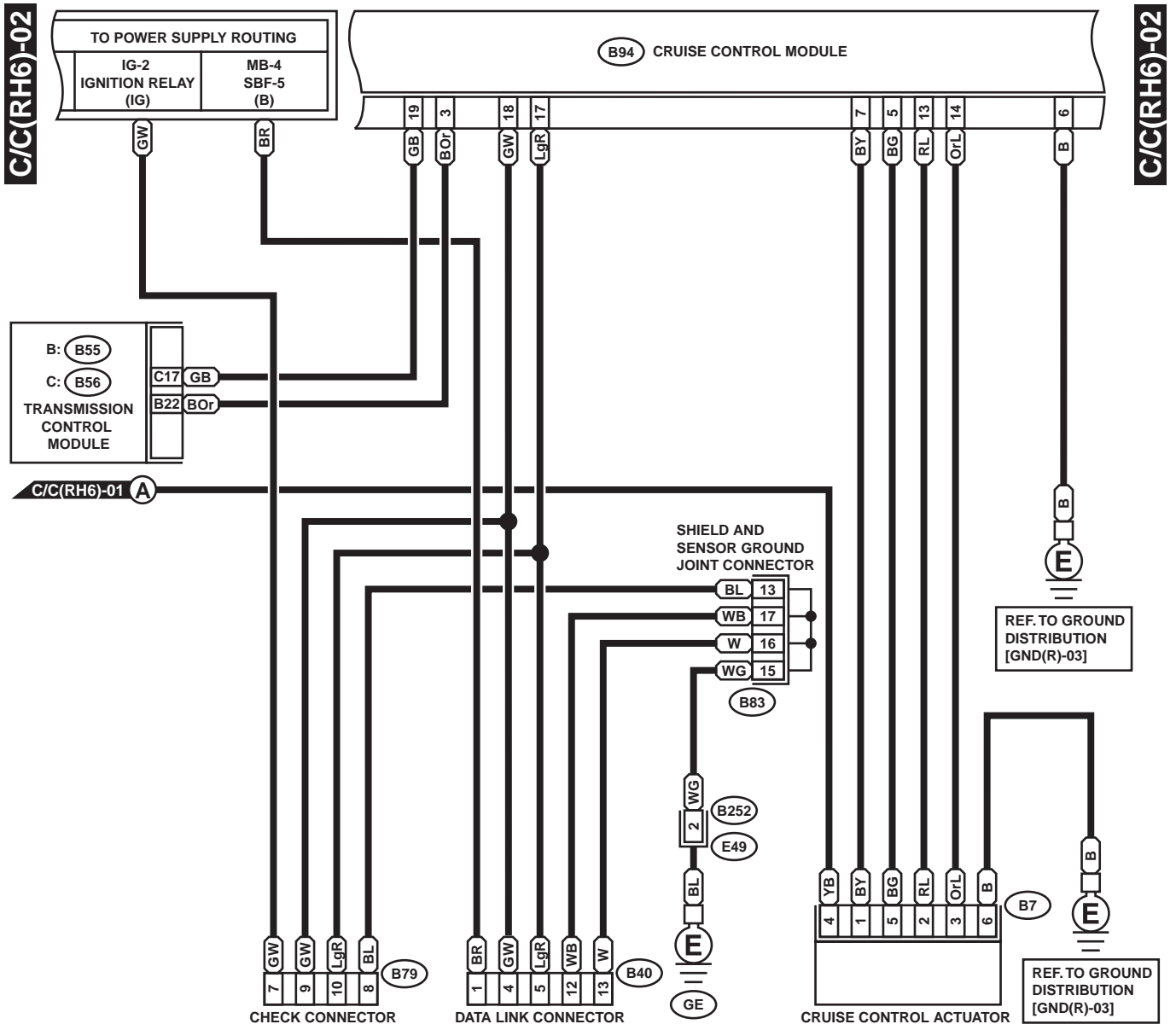
5. RHD 6-CYLINDER ENGINE MODEL



WI-00868

CRUISE CONTROL SYSTEM

WIRING SYSTEM



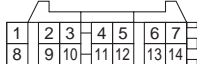
B7 (BLACK)



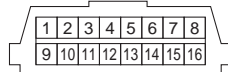
B252 (DARK GRAY)



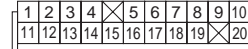
B79 (GRAY)



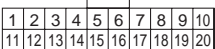
B40 (GRAY)



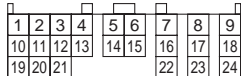
B83



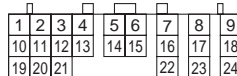
B94 (BLACK)



B: B55 (GRAY)



C: B56 (GREEN)



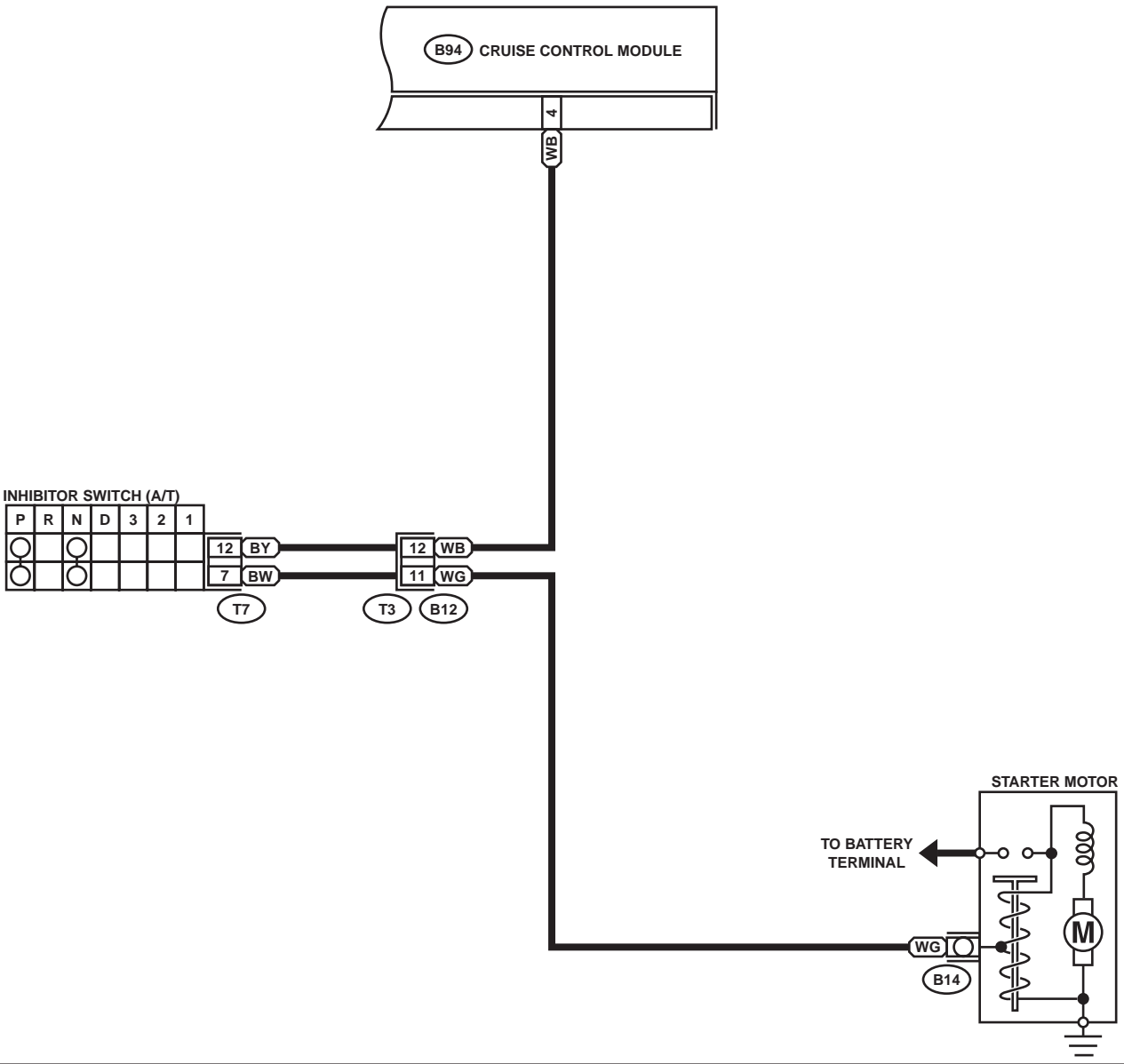
WI-00869

CRUISE CONTROL SYSTEM

WIRING SYSTEM

C/C(RH6)-03

C/C(RH6)-03



T7

1	2	3	4	5	6
7	8	9	10	11	12

B12

1	2	3	4
5	6	7	8
9	10	11	12

B94 (BLACK)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

WI-00870

MEMO:

ENGINE COOLANT TEMPERATURE GAUGE SYSTEM

WIRING SYSTEM

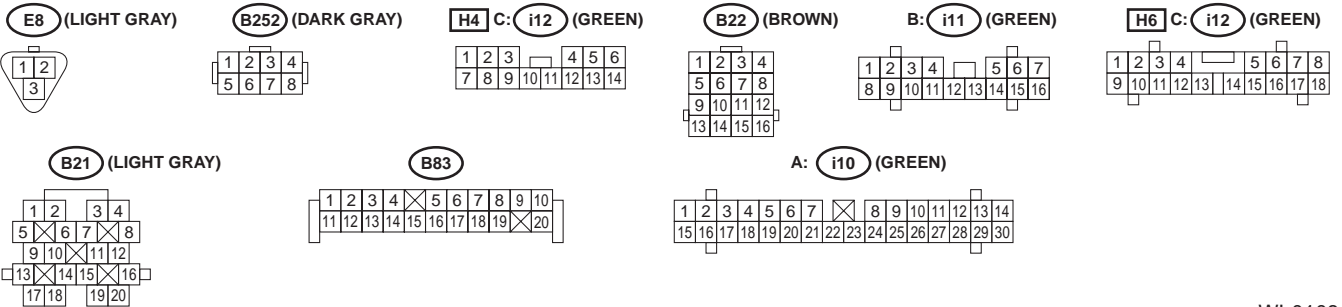
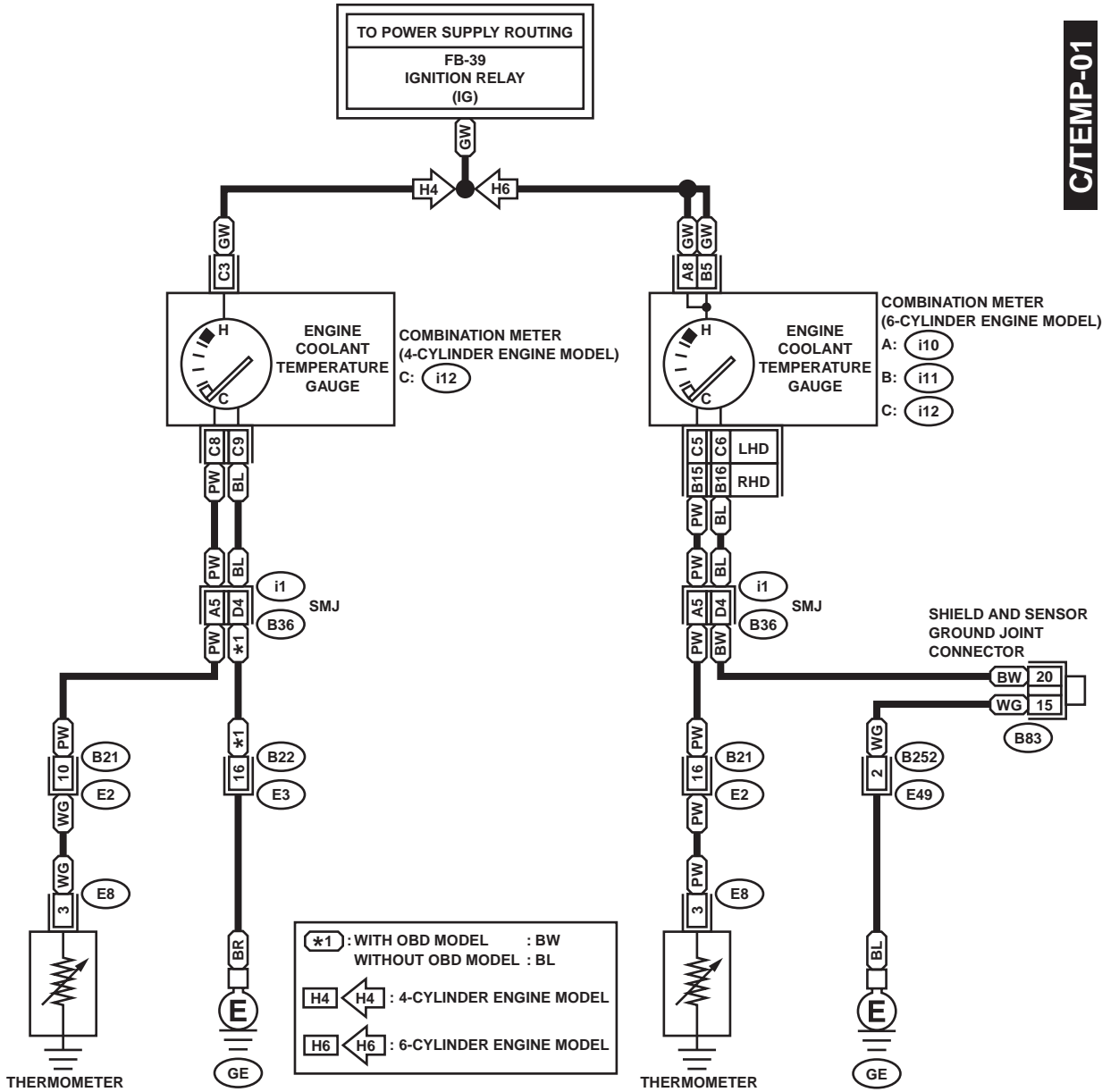
14.Engine Coolant Temperature Gauge System

A: SCHEMATIC

1. NON-TURBO ENGINE MODEL

C/TEMP-01

C/TEMP-01



WI-01081

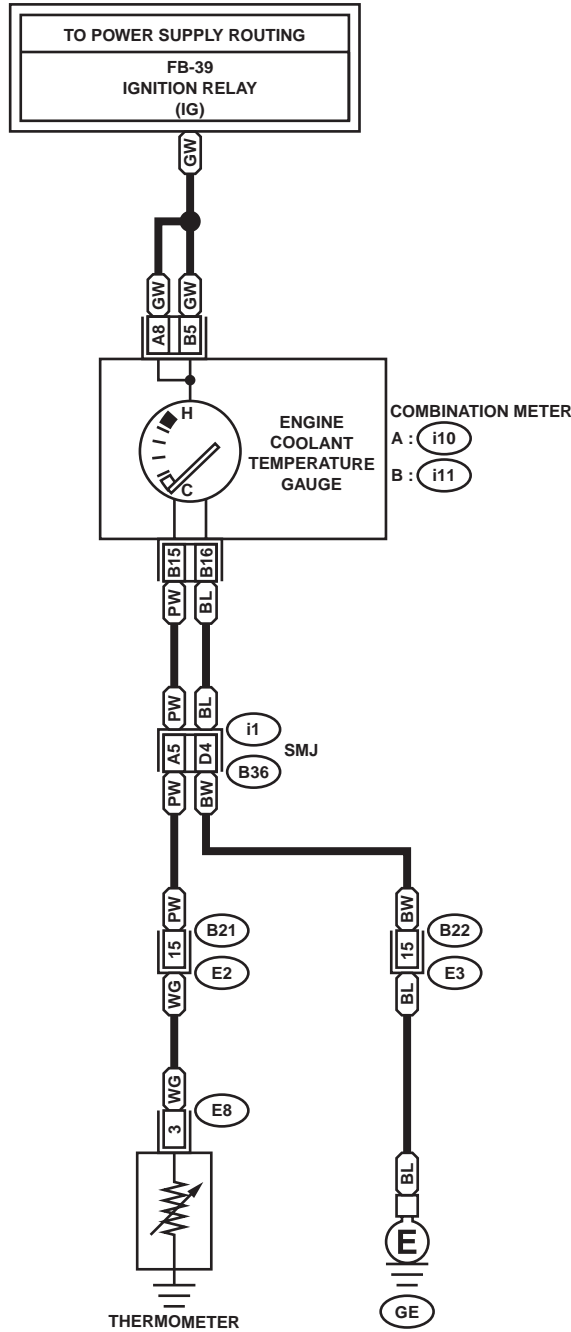
ENGINE COOLANT TEMPERATURE GAUGE SYSTEM

WIRING SYSTEM

2. TURBO ENGINE MODEL

C/T(TB)-01

C/T(TB)-01



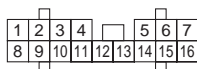
E8 (LIGHT GRAY)



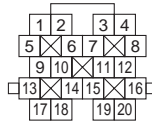
B22 (BROWN)



B: i11 (GREEN)



B21 (BLACK)



A: i10 (GREEN)



WI-01082

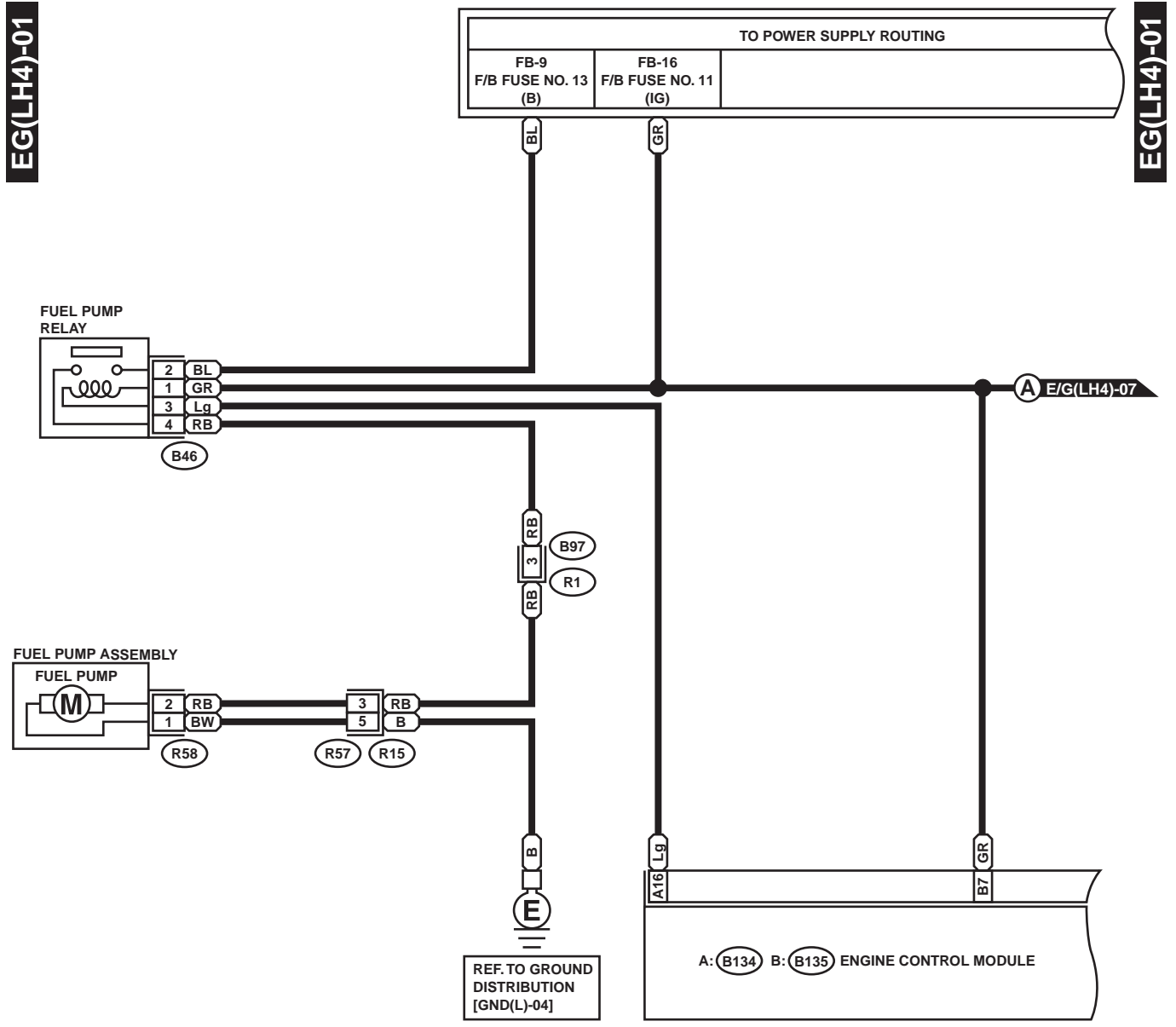
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

15.Engine Electrical System

A: SCHEMATIC

1. LHD 4-CYLINDER ENGINE WITHOUT OBD MODEL

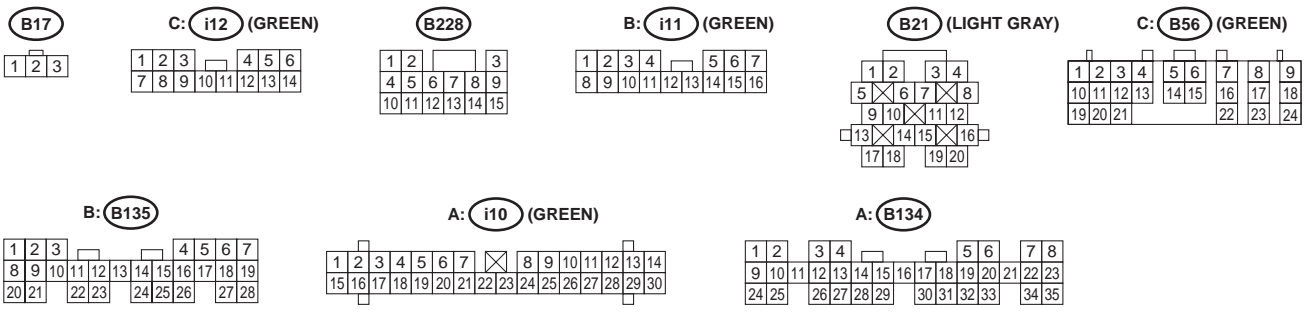
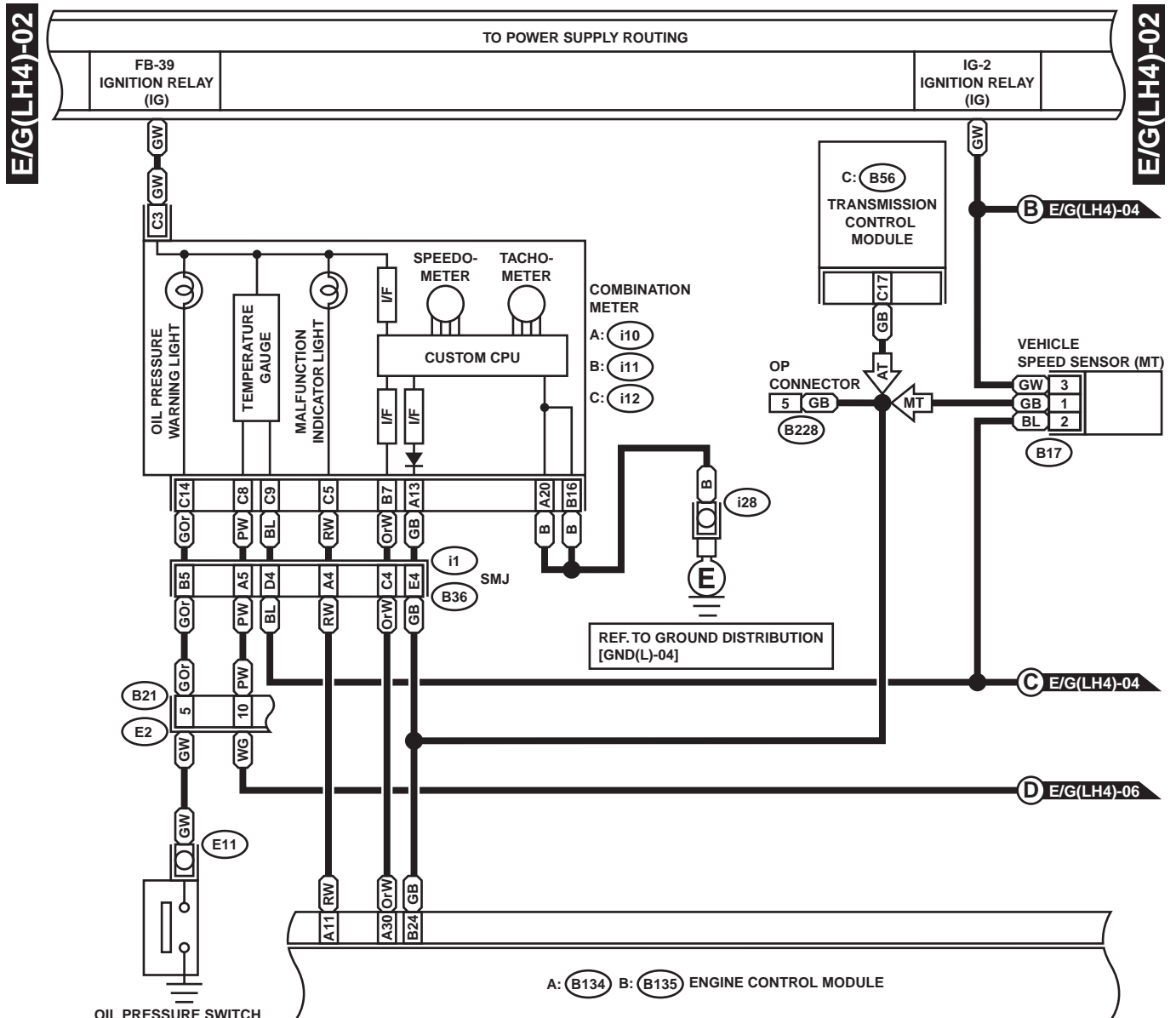


B46 (GREEN)	R57 (BLACK)	R58 (GRAY)	B97	B: B135	A: B134																																																																																												
<table border="1"> <tr><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td></tr> </table>	1	2	3	4	<table border="1"> <tr><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td></tr> </table>	1	2	3	4	5	6	<table border="1"> <tr><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td></tr> </table>	1	2	3	4	5	6	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td></tr> </table>	1	2	3	4	5	6	7	8	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr> <tr><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td></tr> <tr><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td>32</td></tr> <tr><td>33</td><td>34</td><td>35</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35					
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25	26	27	28	29	30	31	32																																																																																										
33	34	35																																																																																															

WI-00873

ENGINE ELECTRICAL SYSTEM

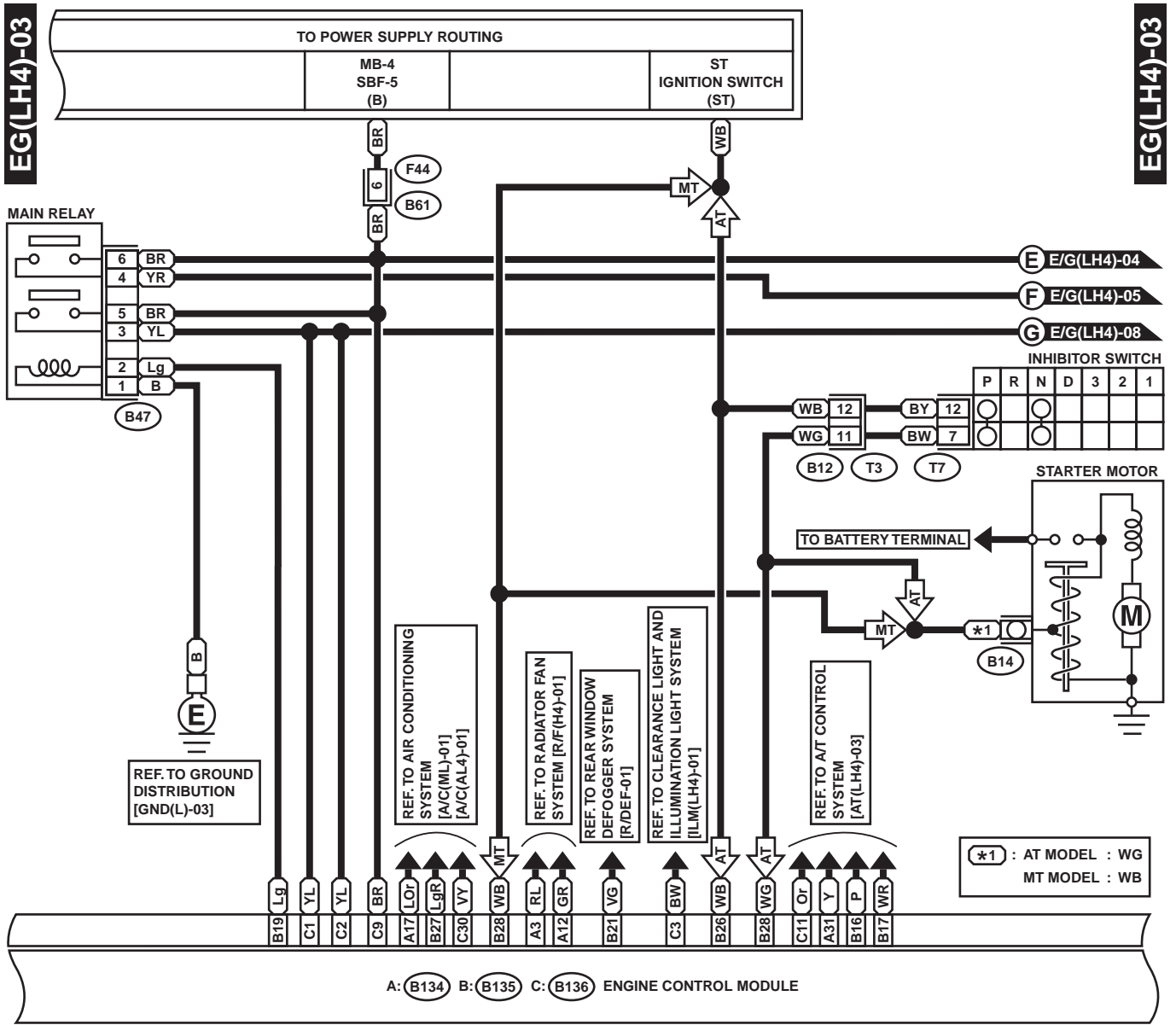
WIRING SYSTEM



WI-00874

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B47 (BROWN)

1	2
3	4
5	6

F44

1	2	3	4
5	6	7	8

B12

1	2	3	4
5	6	7	8
9	10	11	12

T7

1	2	3	4	5	6
7	8	9	10	11	12

B: B135

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

C: B136

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35

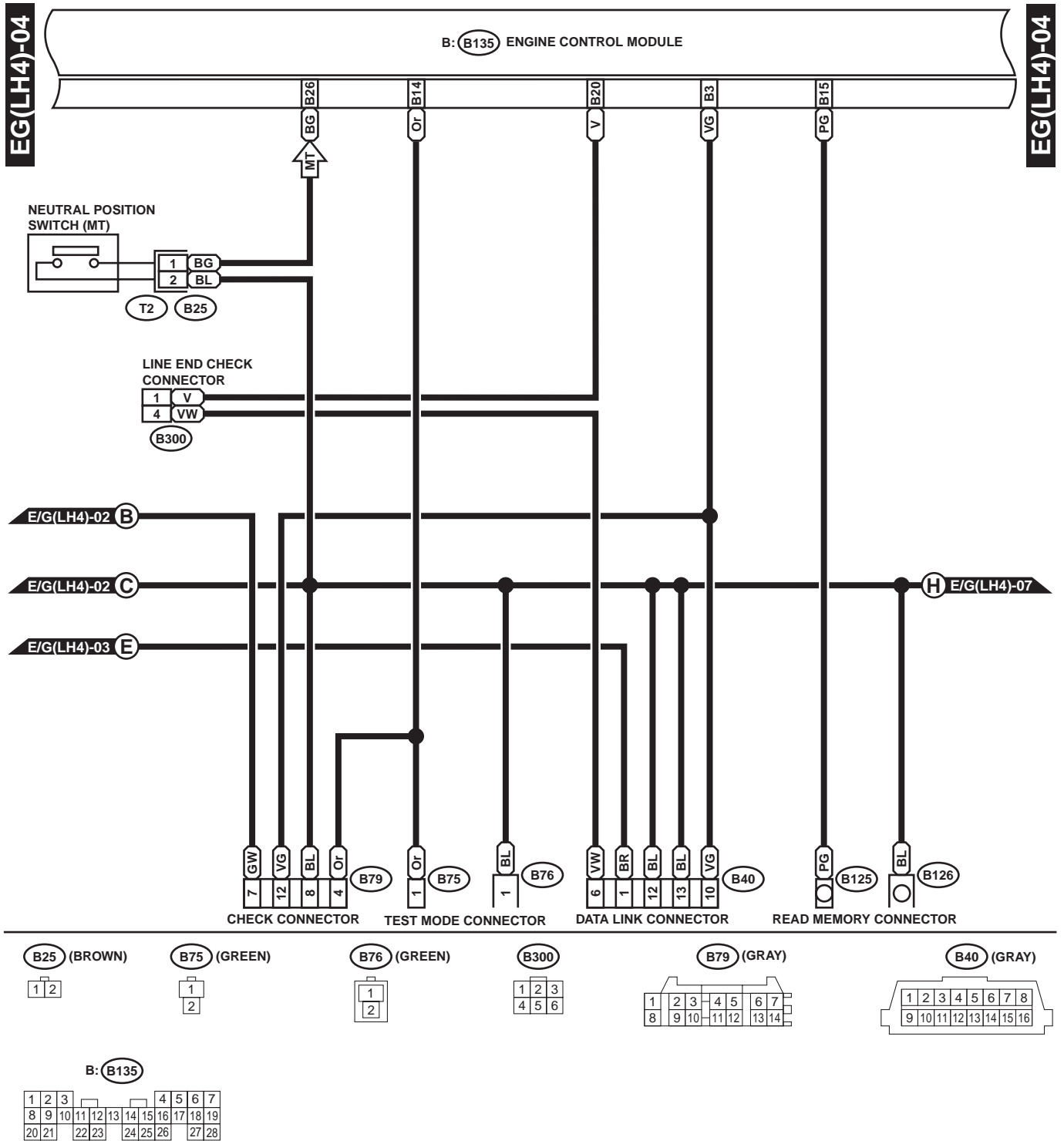
A: B134

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
33	34	35					

WI-00875

ENGINE ELECTRICAL SYSTEM

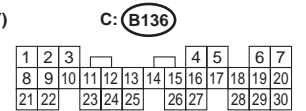
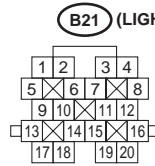
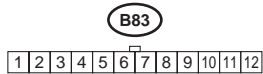
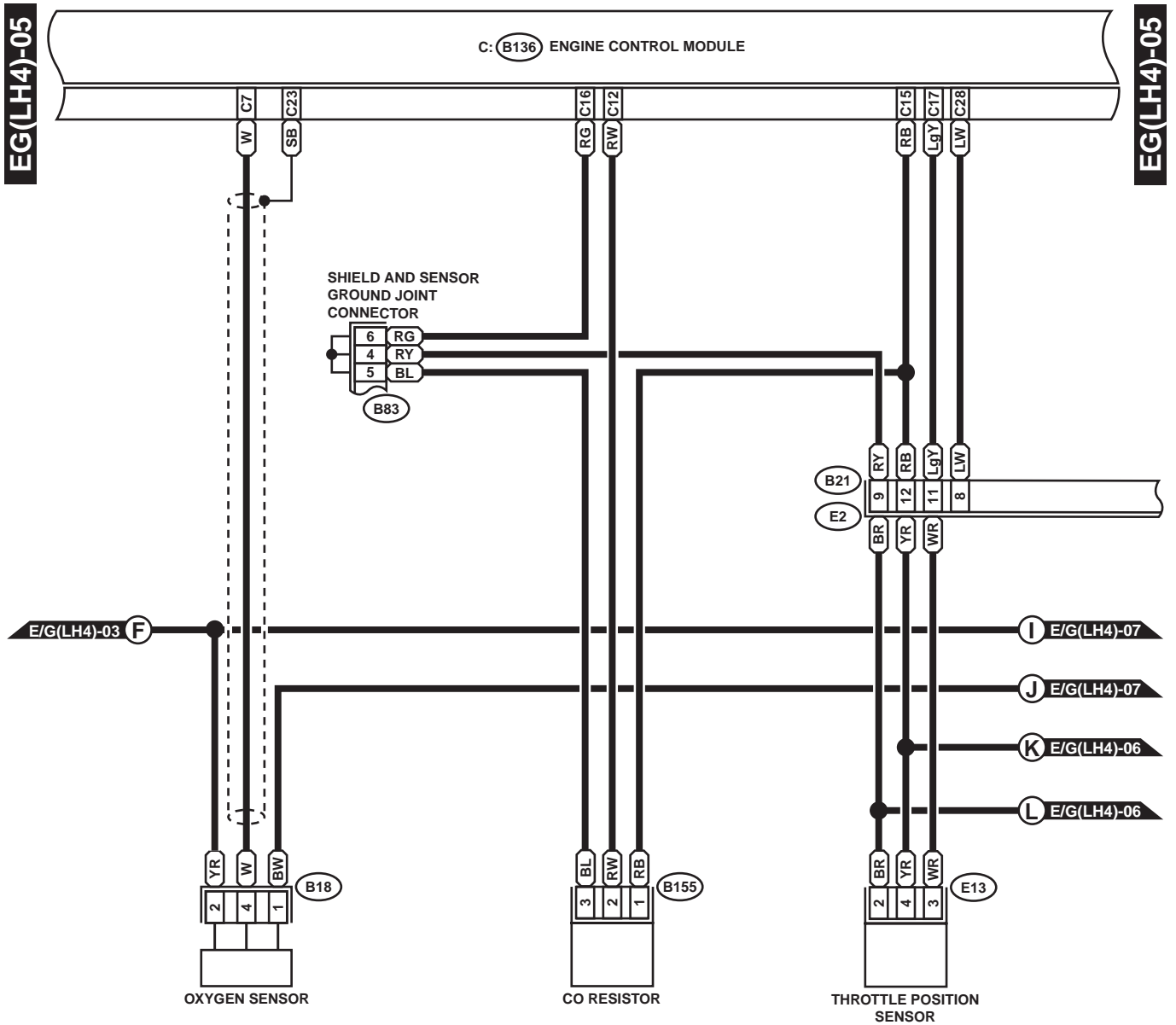
WIRING SYSTEM



WI-00876

ENGINE ELECTRICAL SYSTEM

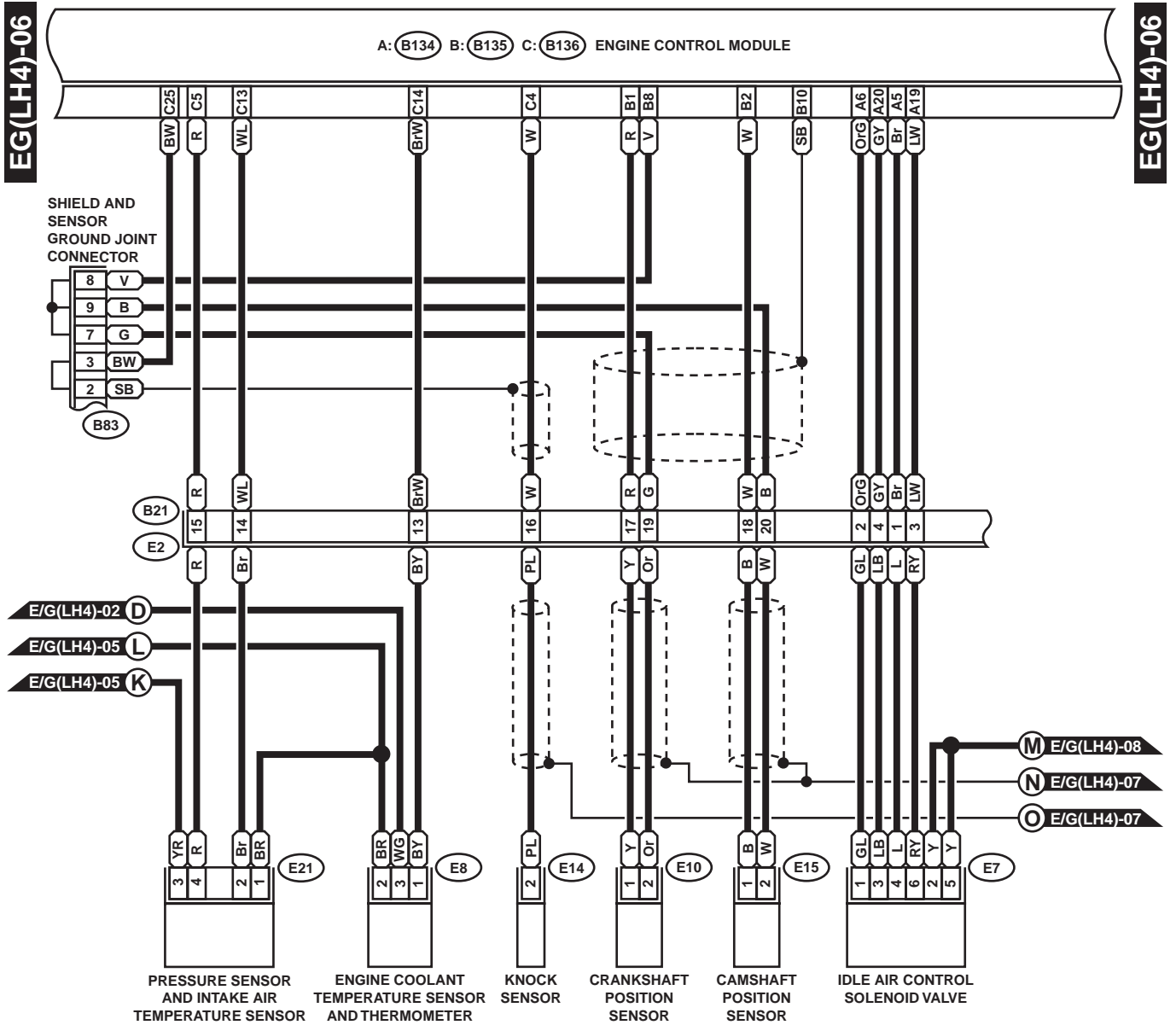
WIRING SYSTEM



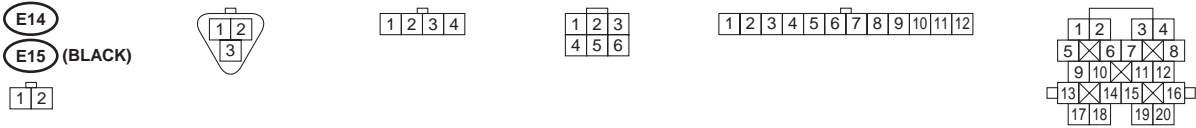
WI-00877

ENGINE ELECTRICAL SYSTEM

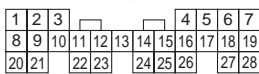
WIRING SYSTEM



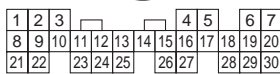
(E10) (LIGHT GRAY) (E8) (LIGHT GRAY) (E21) (BLACK) (E7) (BLACK) (B83) (B21) (LIGHT GRAY)



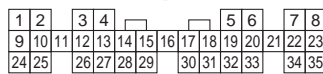
B: (B135)



C: (B136)



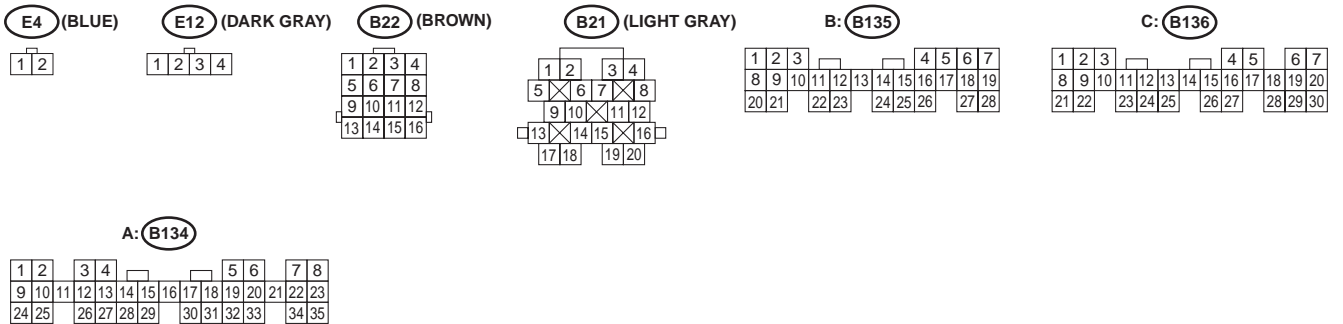
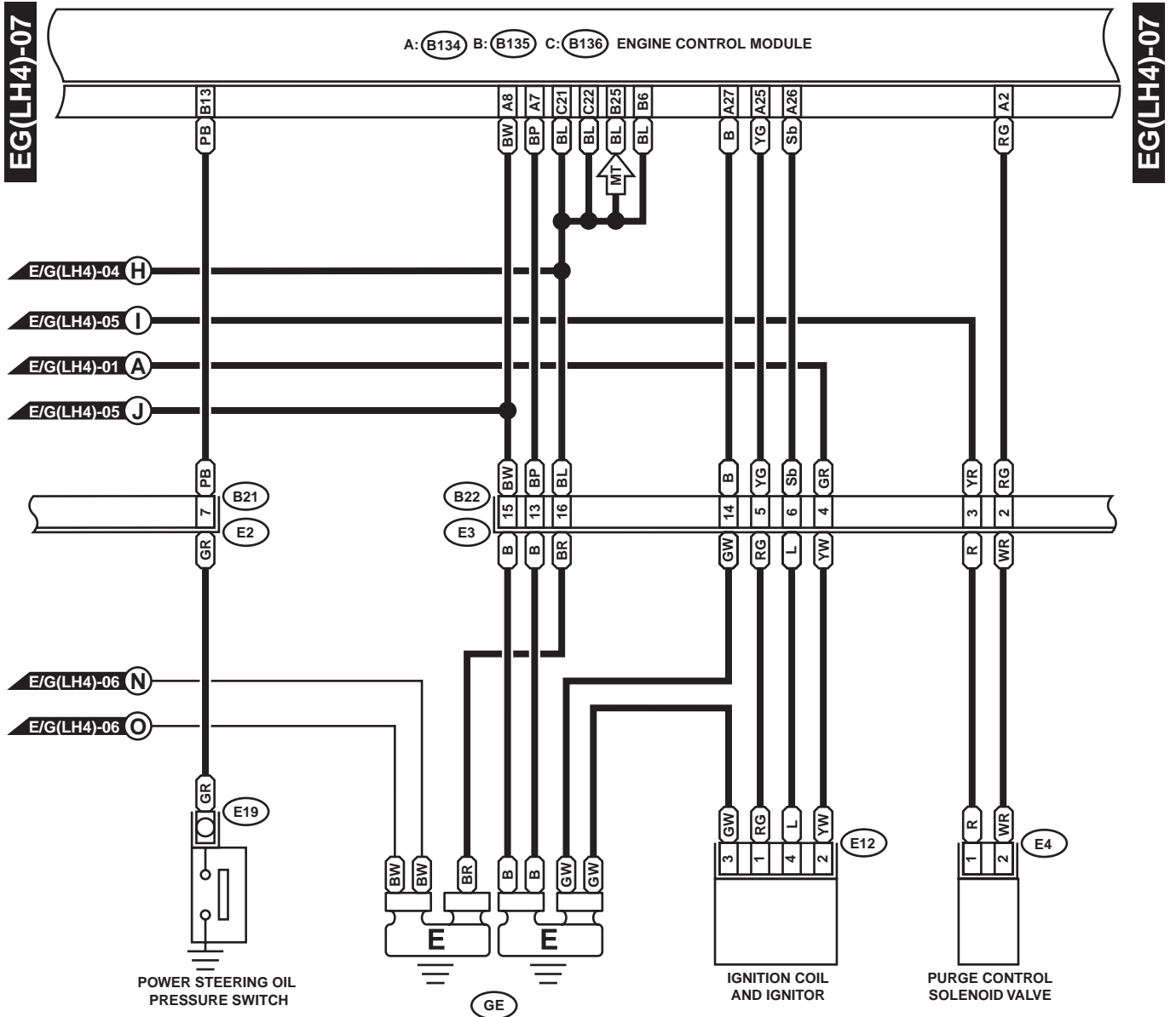
A: (B134)



WI-00878

ENGINE ELECTRICAL SYSTEM

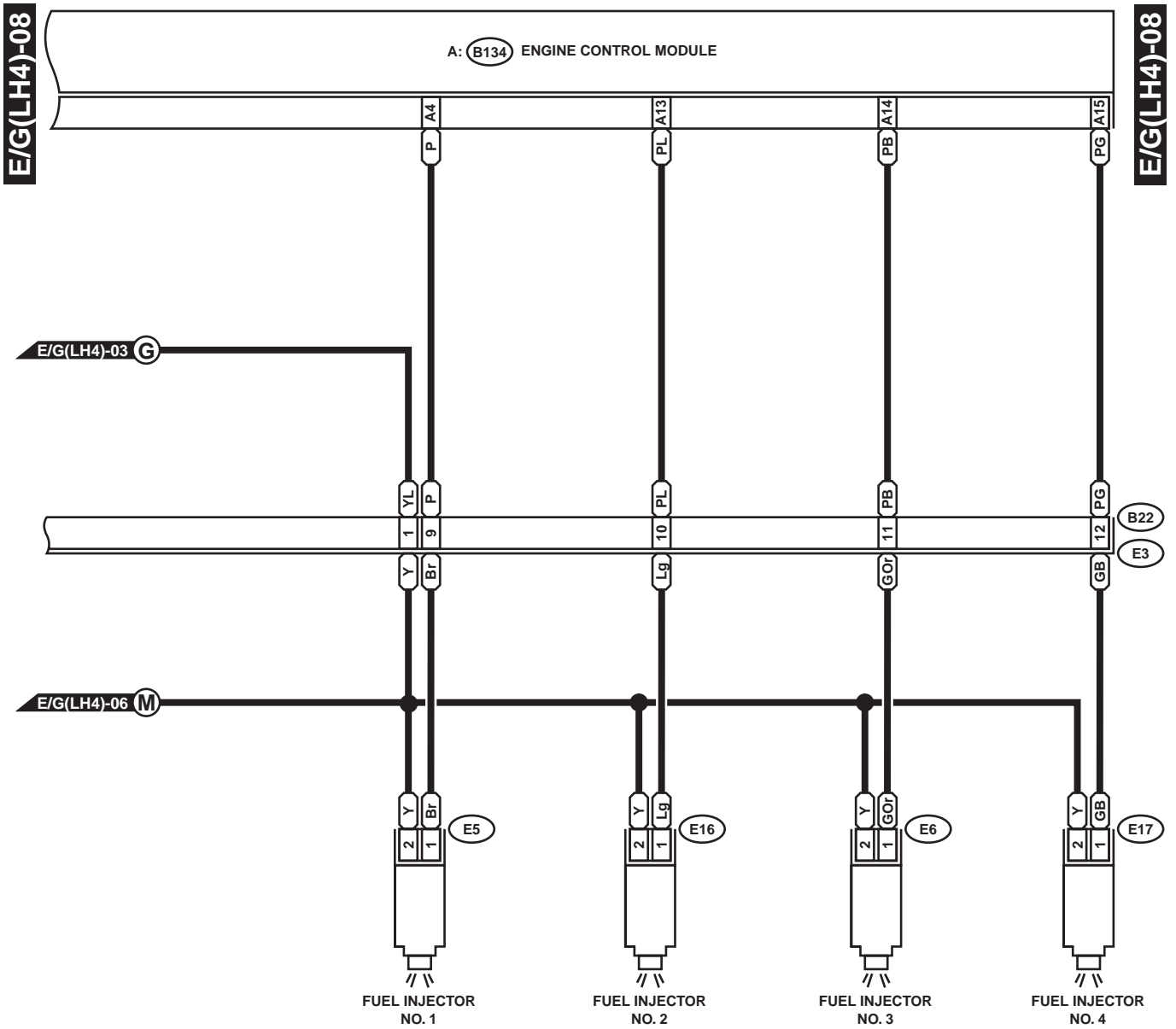
WIRING SYSTEM



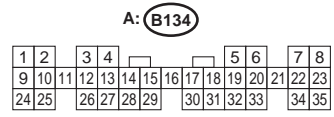
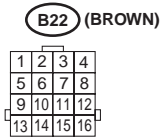
WI-00879

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



- (E5) (LIGHT GRAY)
- (E6) (LIGHT GRAY)
- (E16) (LIGHT GRAY)
- (E17) (LIGHT GRAY)

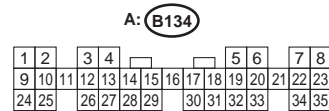
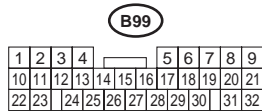
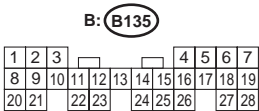
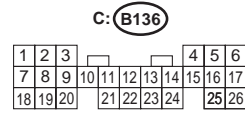
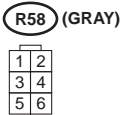
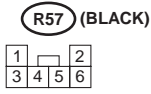
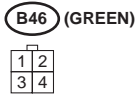
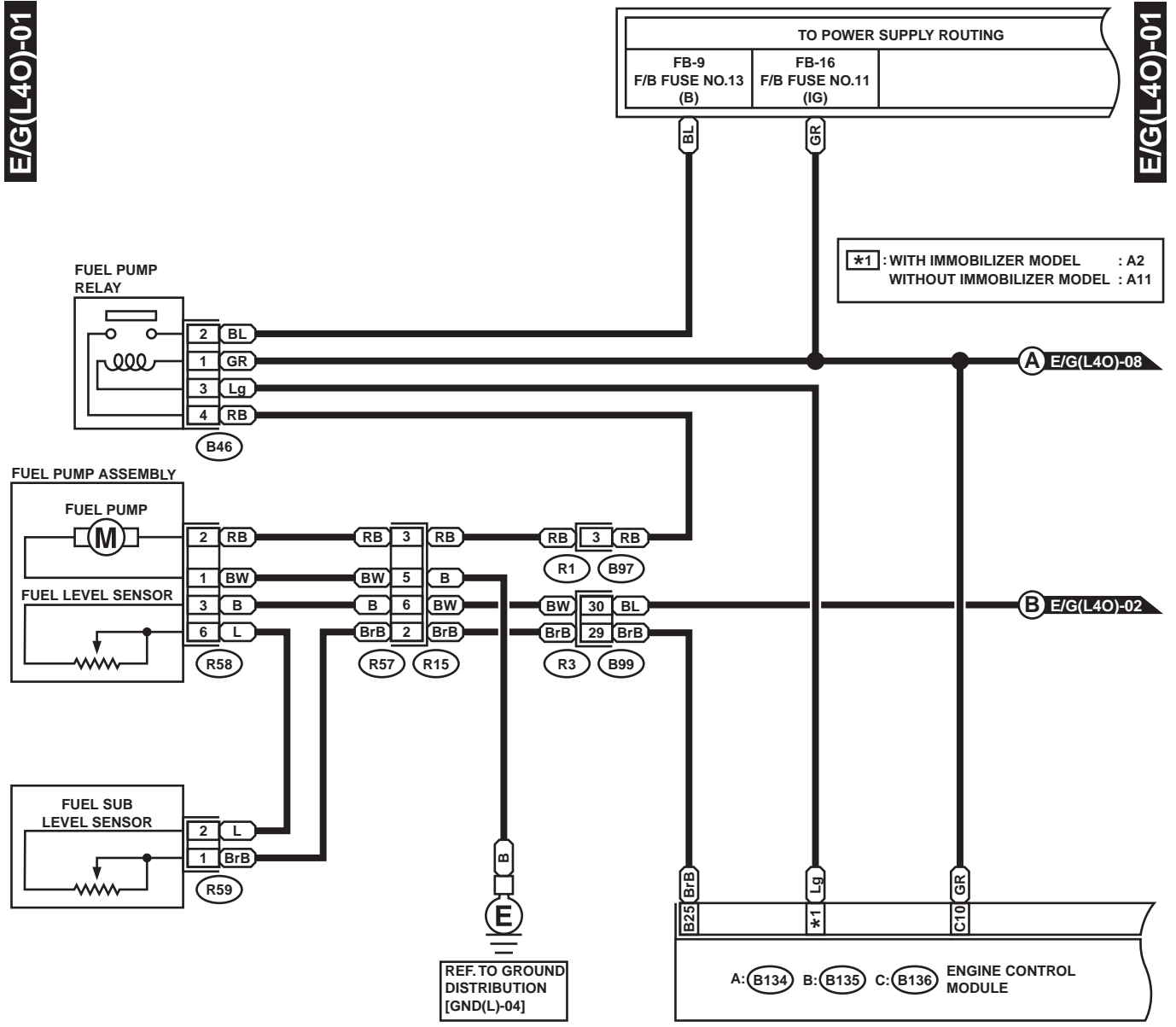


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ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

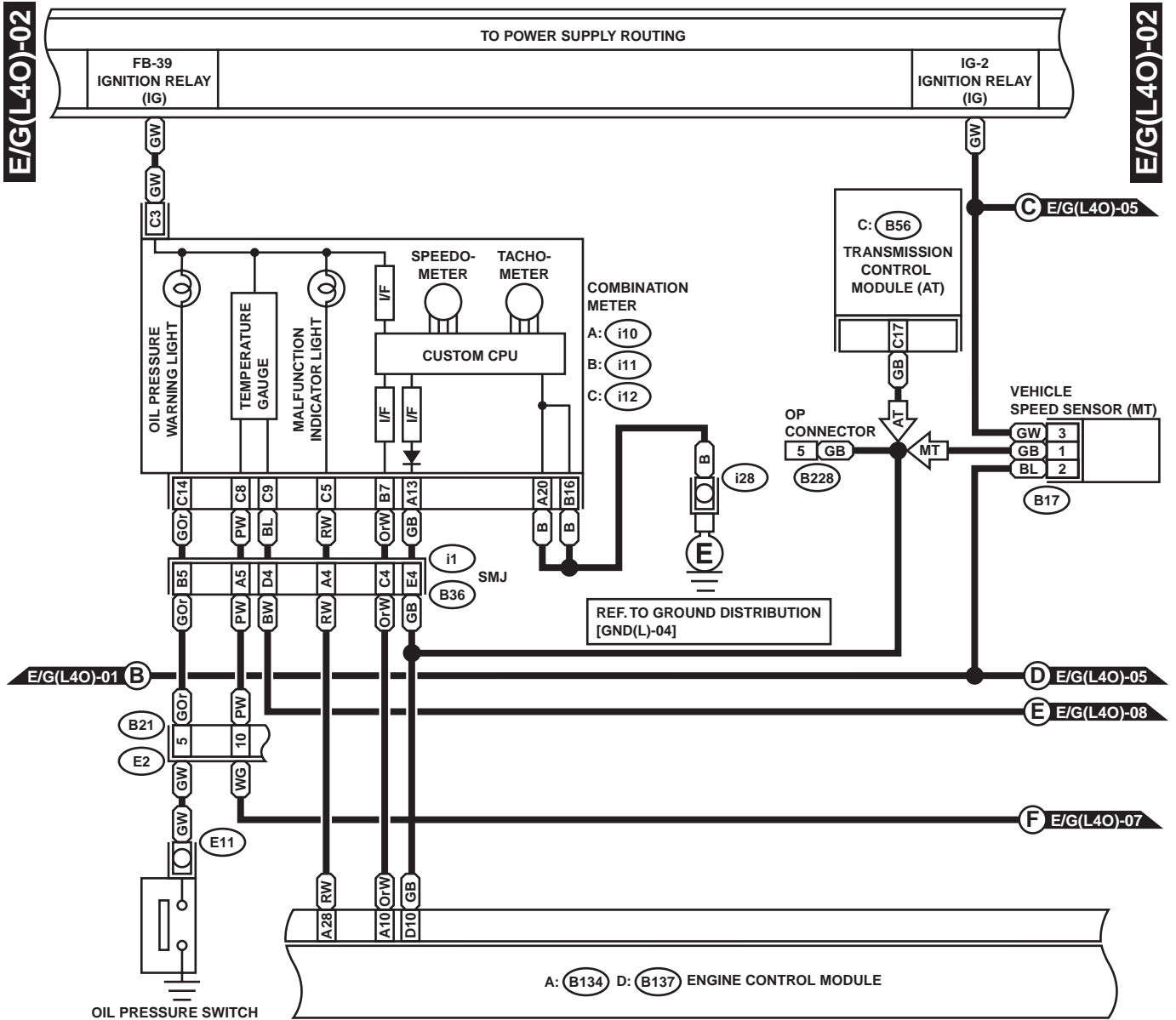
2. LHD 4-CYLINDER ENGINE WITH OBD MODEL



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ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B17

1	2	3
---	---	---

C: i12 (GREEN)

1	2	3	4	5	6		
7	8	9	10	11	12	13	14

B228

1	2	3			
4	5	6	7	8	9
10	11	12	13	14	15

B: i11 (GREEN)

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

B21 (LIGHT GLAY)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

D: B137

1	2	3	4					
5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20		

C: B56 (GREEN)

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24									

A: i10 (GREEN)

1	2	3	4	5	6	7	8	9	10	11	12	13	14		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

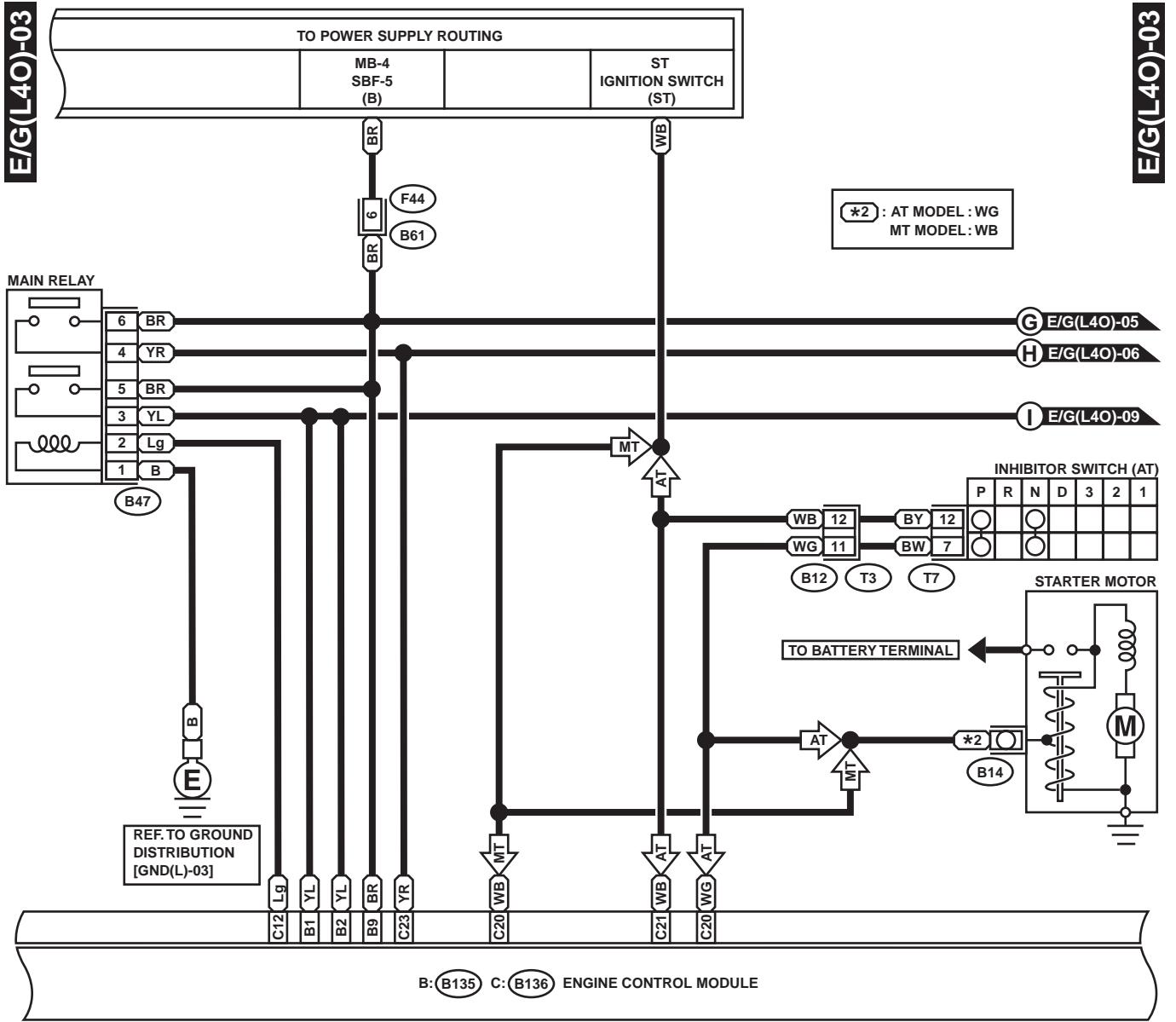
A: B134

1	2	3	4	5	6	7	8							
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31	32	33	34	35			

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ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



(B47) (BROWN)



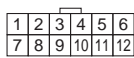
(F44)



(B12) (BLACK)



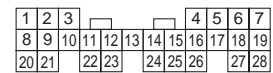
(T7)



C: (B136)



B: (B135)



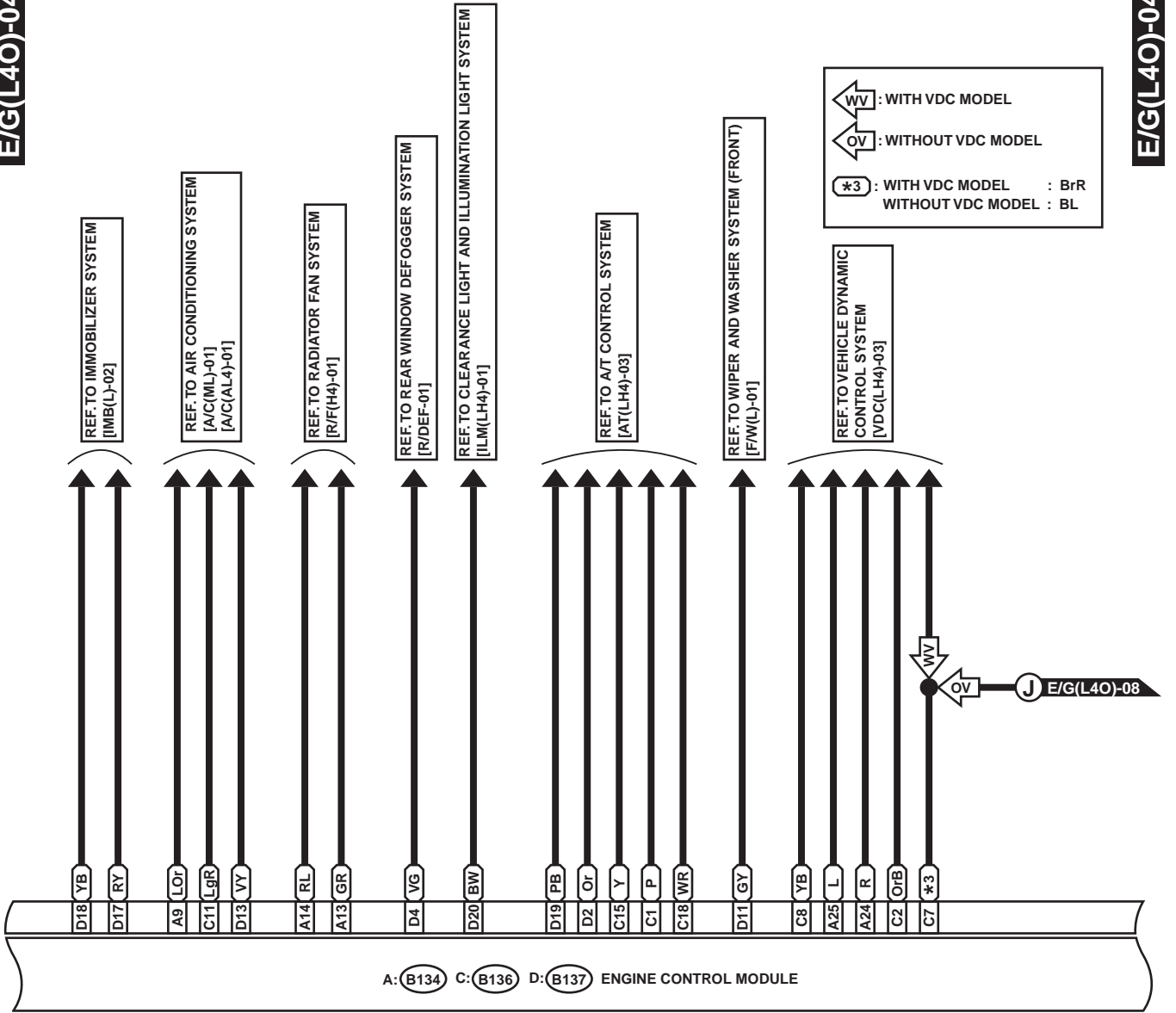
WI-00883

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(L40)-04

E/G(L40)-04



D: (B137)

1	2			3	4
5	6	7	8	9	10
11	12	13	14	15	16
17	18	19	20		

C: (B136)

1	2	3			4	5	6
7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22
23	24	25	26				

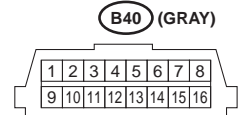
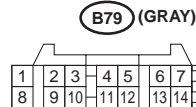
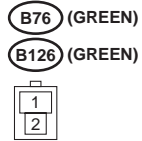
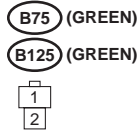
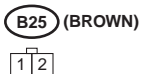
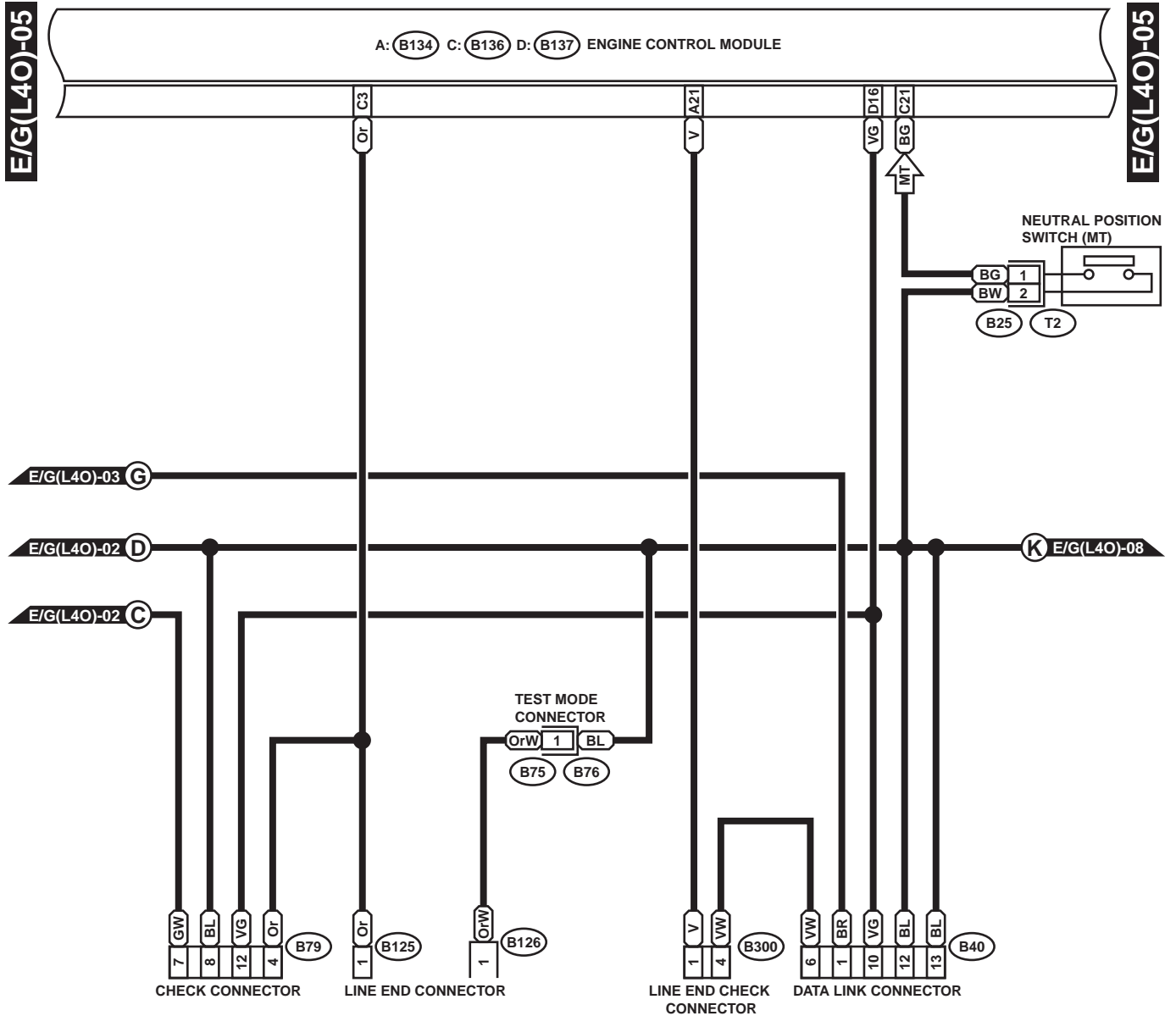
A: (B134)

1	2		3	4			5	6		7	8
9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32
33	34	35									

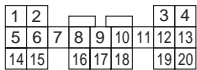
WI-00884

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



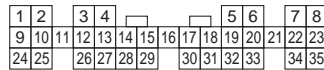
D: (B137)



C: (B136)



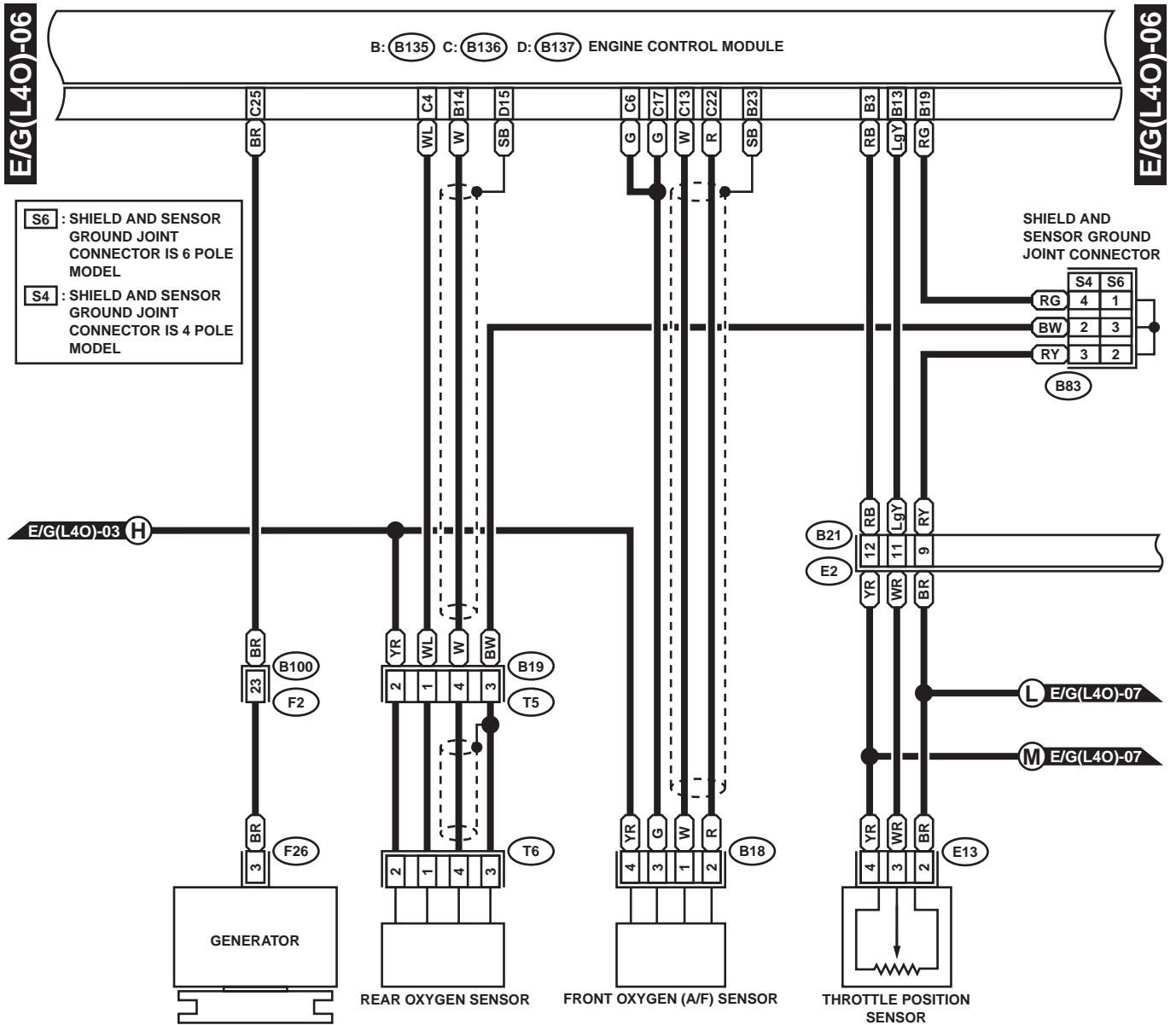
A: (B134)



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ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



(F26) (GREEN)



(S4) (B83)

(E13) (DARK BROWN)



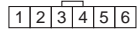
(B18)

(B19)

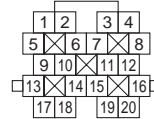
(T6)



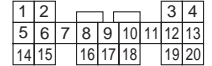
(S6) (B83) (GRAY)



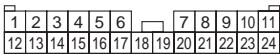
(B21) (LIGHT GRAY)



D: (B137)



(F2) (BLACK)



C: (B136)



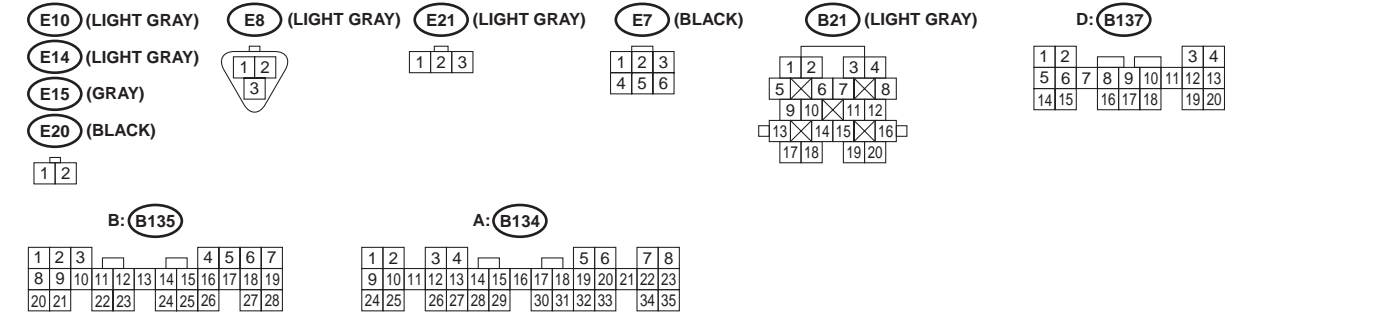
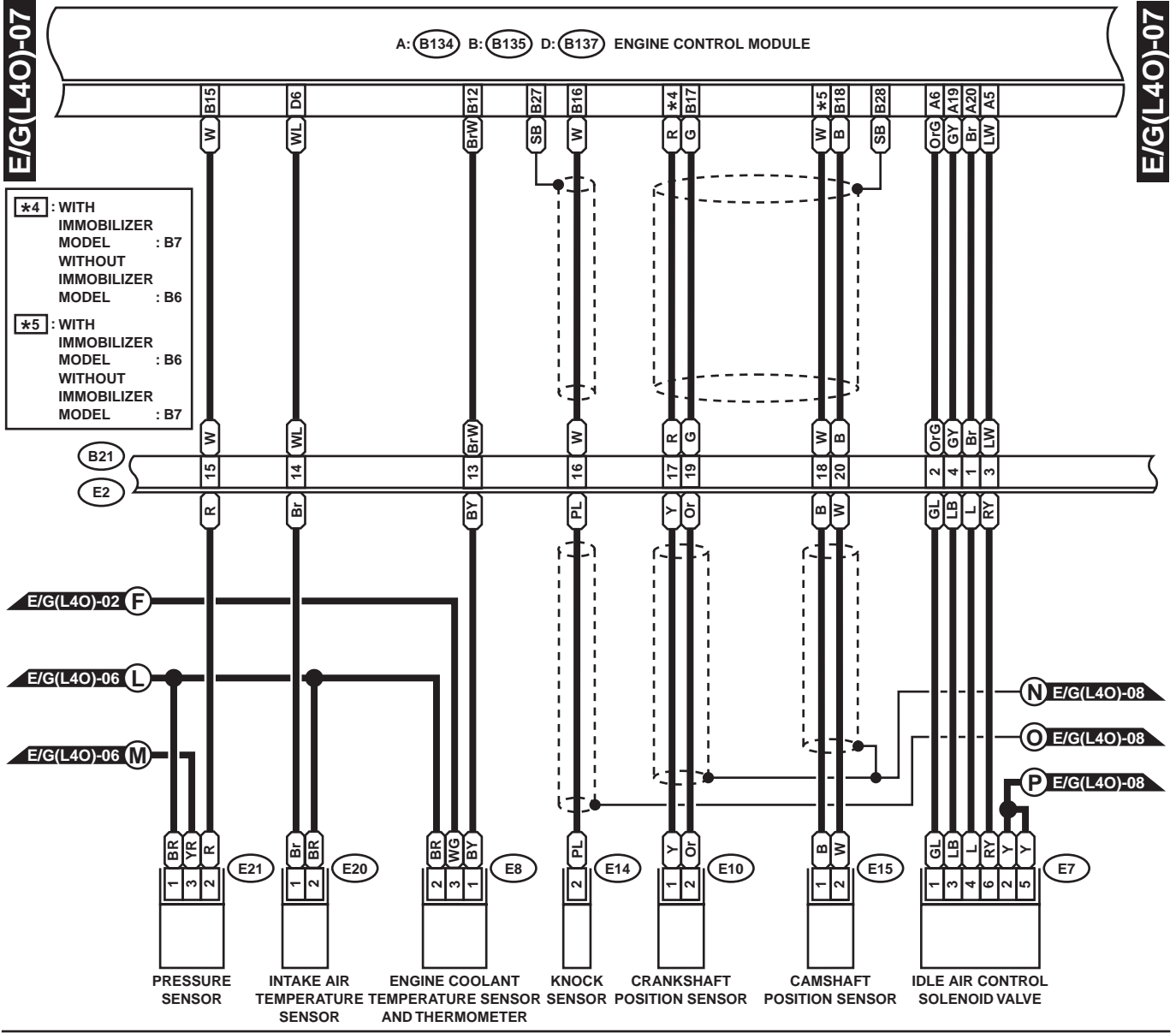
B: (B135)



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ENGINE ELECTRICAL SYSTEM

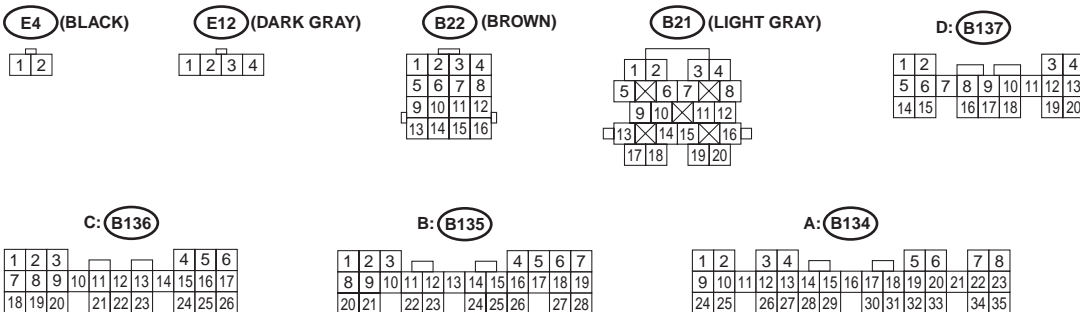
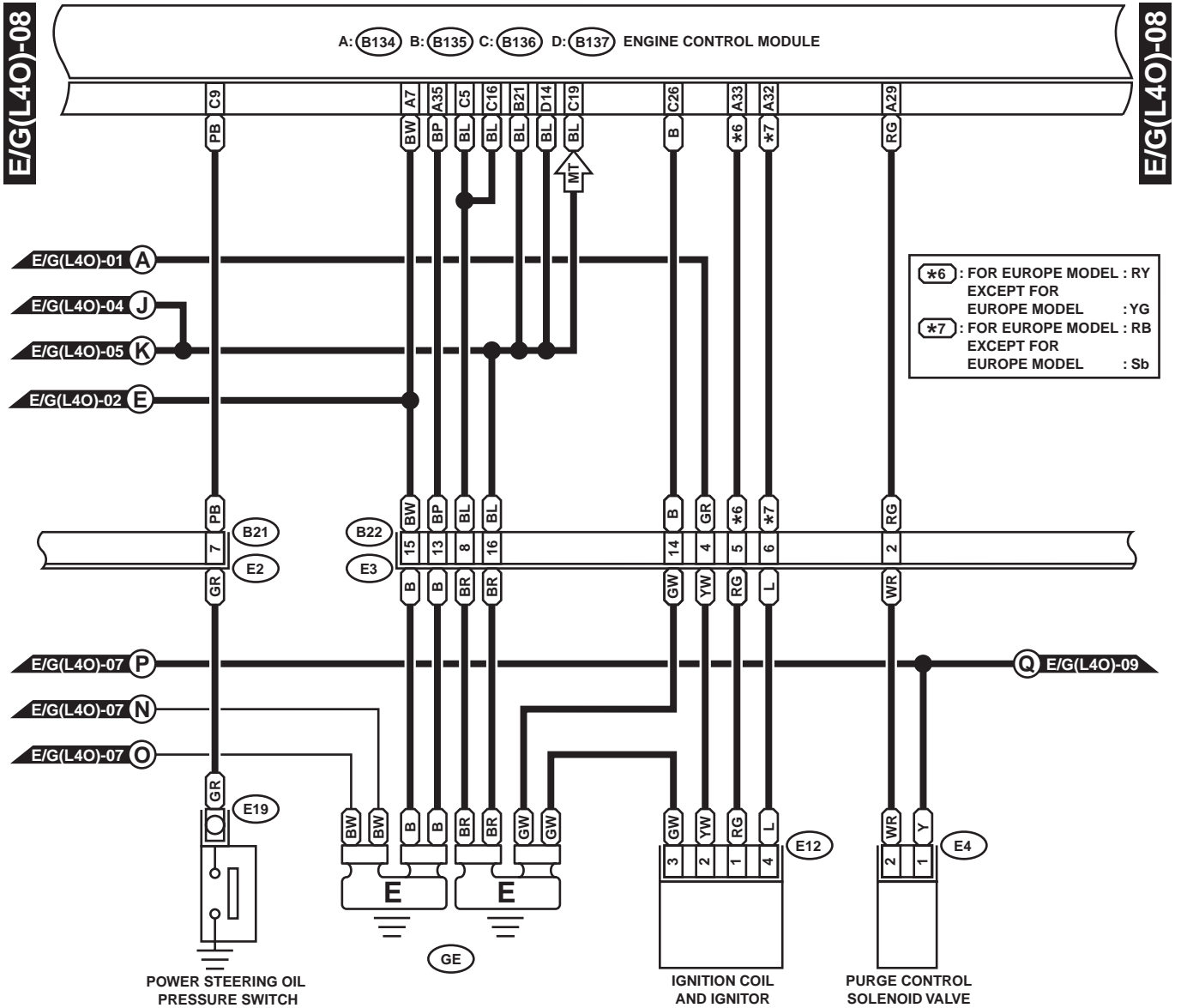
WIRING SYSTEM



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ENGINE ELECTRICAL SYSTEM

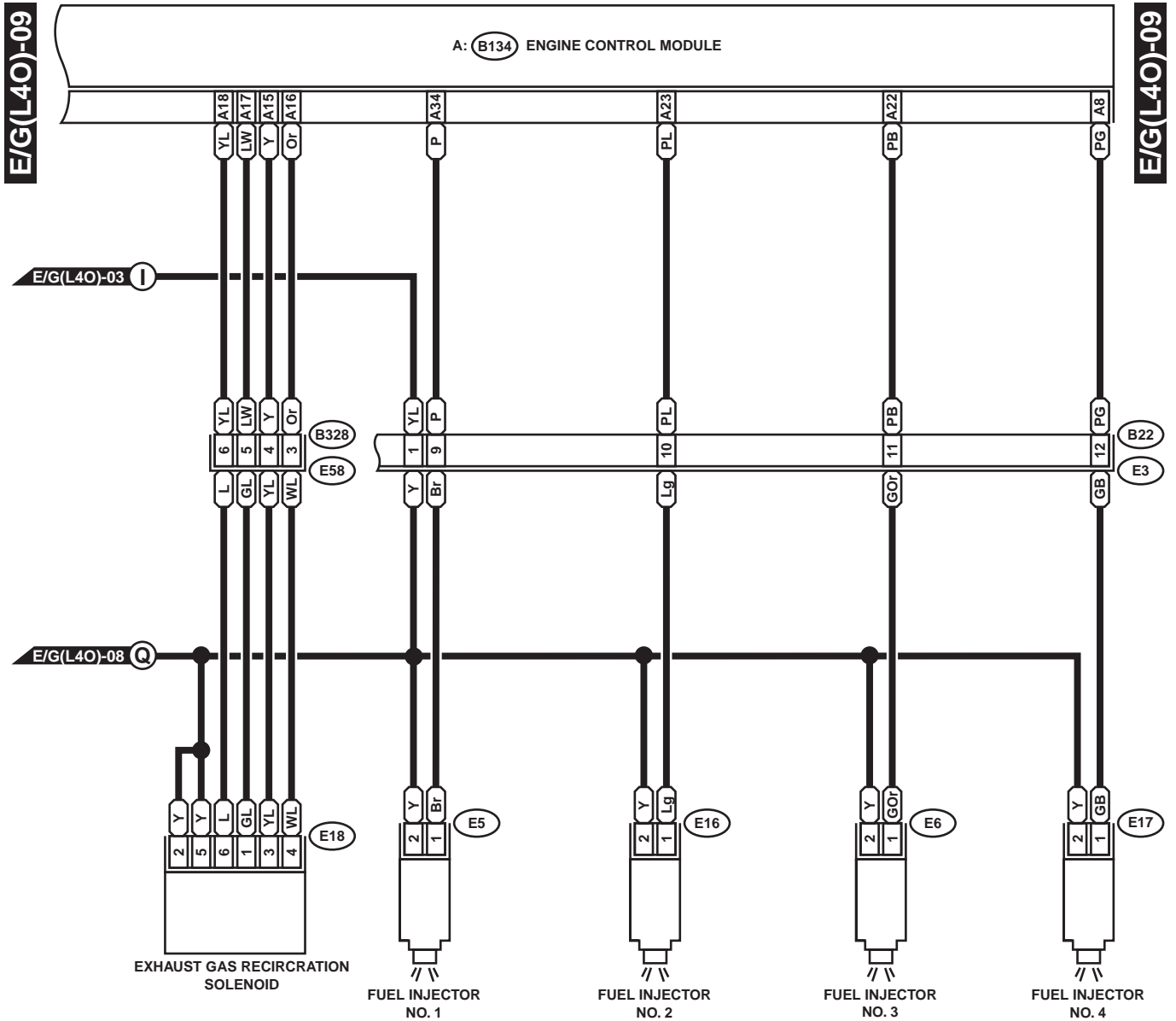
WIRING SYSTEM



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ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



- (E5) (LIGHT GRAY)
- (E6) (LIGHT GRAY)
- (E16) (LIGHT GRAY)
- (E17) (LIGHT GRAY)

- (B328) (BLACK)
 - (E18) (DARK GRAY)
- | | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

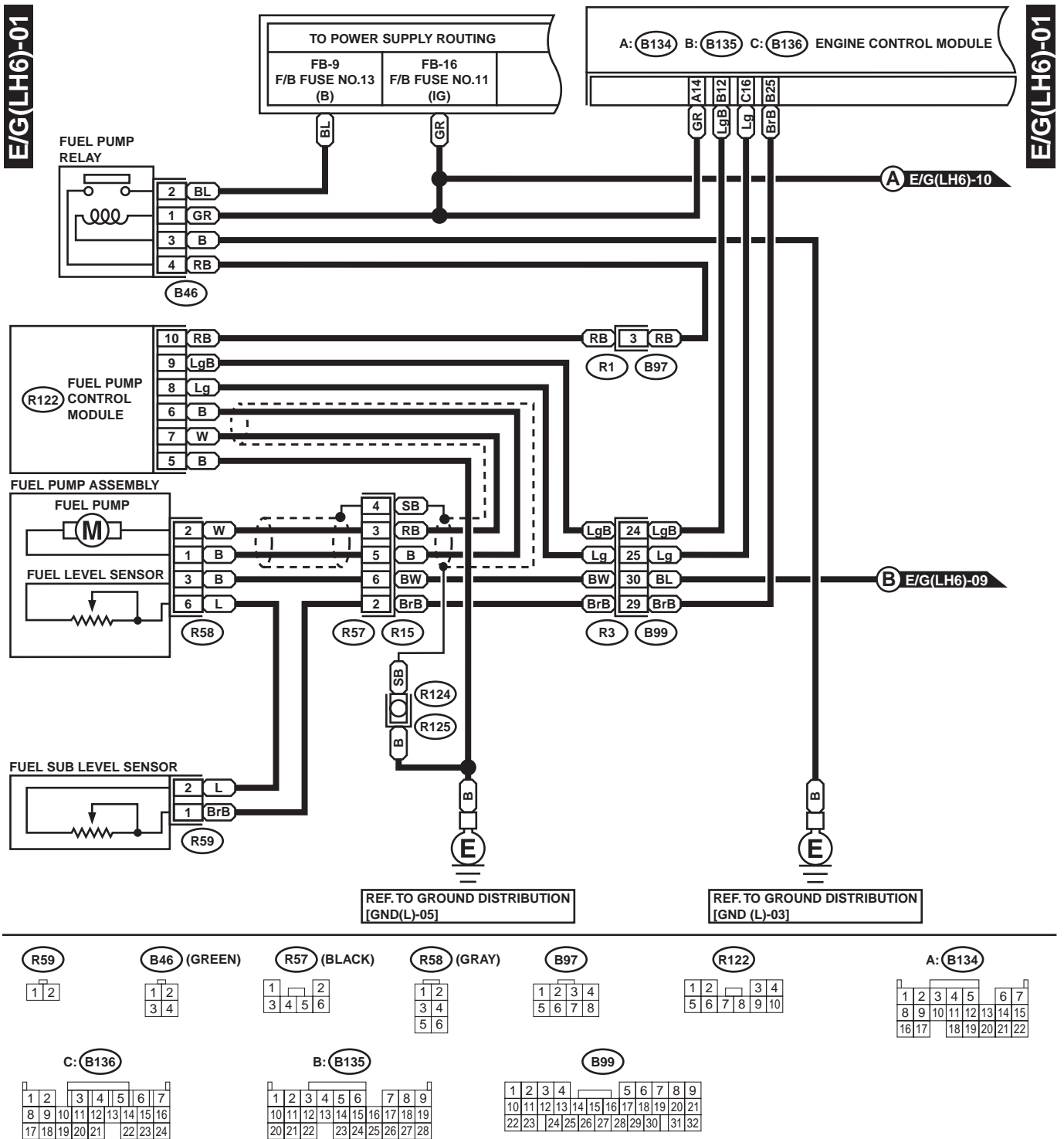
- (B22) (BROWN)
- | | | | |
|----|----|----|----|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

- A: (B134)
- | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | | 5 | 6 | 7 | 8 | | | | | | |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | | | |



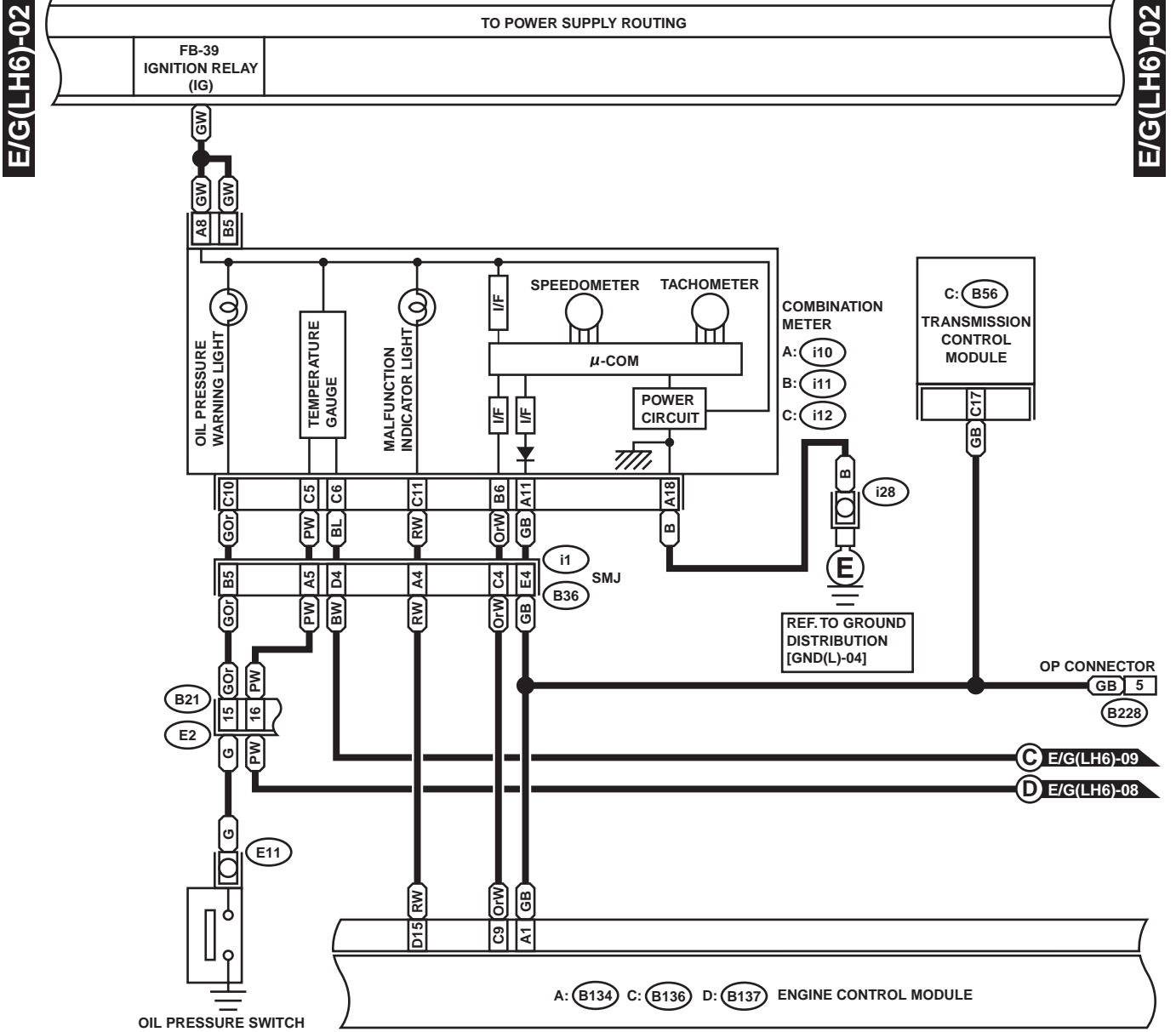
WI-00889

3. LHD 6-CYLINDER ENGINE MODEL



ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B228

1	2		3
4	5	6	7
8	9	10	11
12	13	14	15

B: i11 (GREEN)

1	2	3	4		5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23

C: i12 (GREEN)

1	2	3	4		5	6	7	8
9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26

B21 (LIGHT GRAY)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

A: B134

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

C: B56 (GREEN)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36

C: B136

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

A: i10 (GREEN)

1	2	3	4	5	6	7		8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44

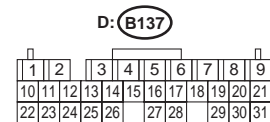
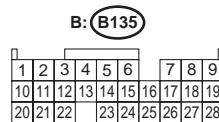
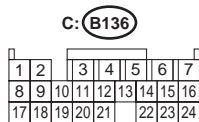
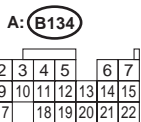
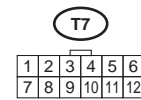
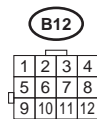
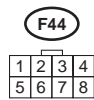
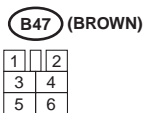
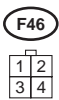
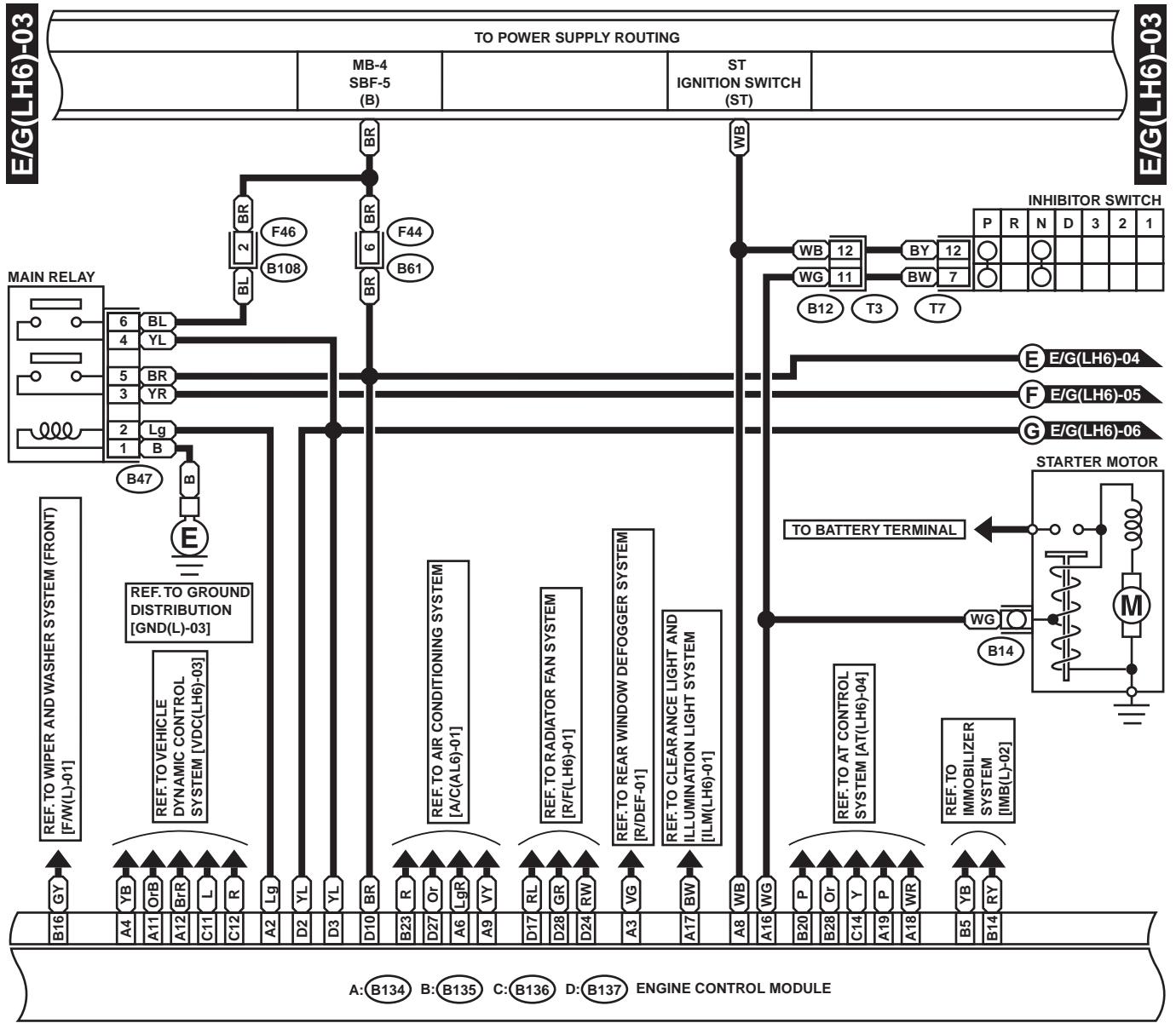
D: B137

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36

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ENGINE ELECTRICAL SYSTEM

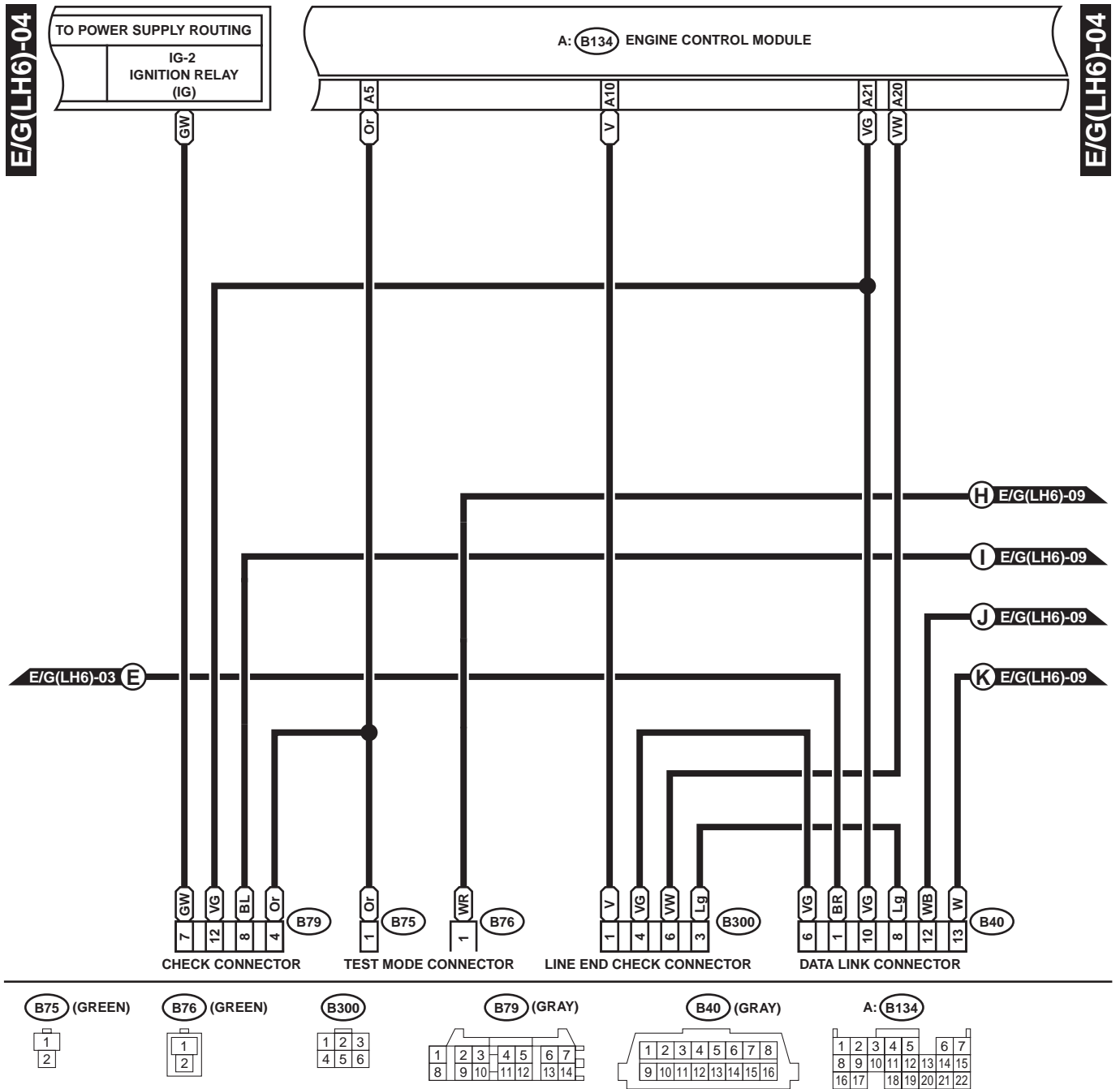
WIRING SYSTEM



WI-00892

ENGINE ELECTRICAL SYSTEM

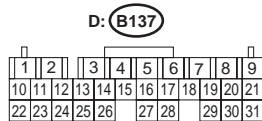
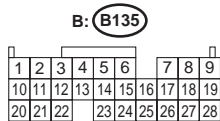
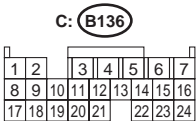
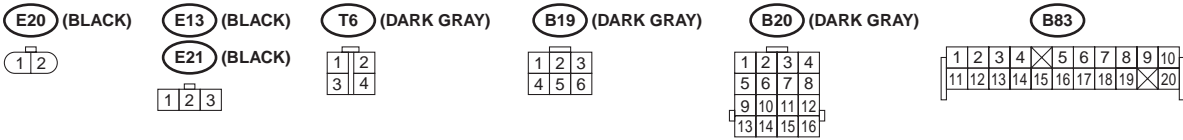
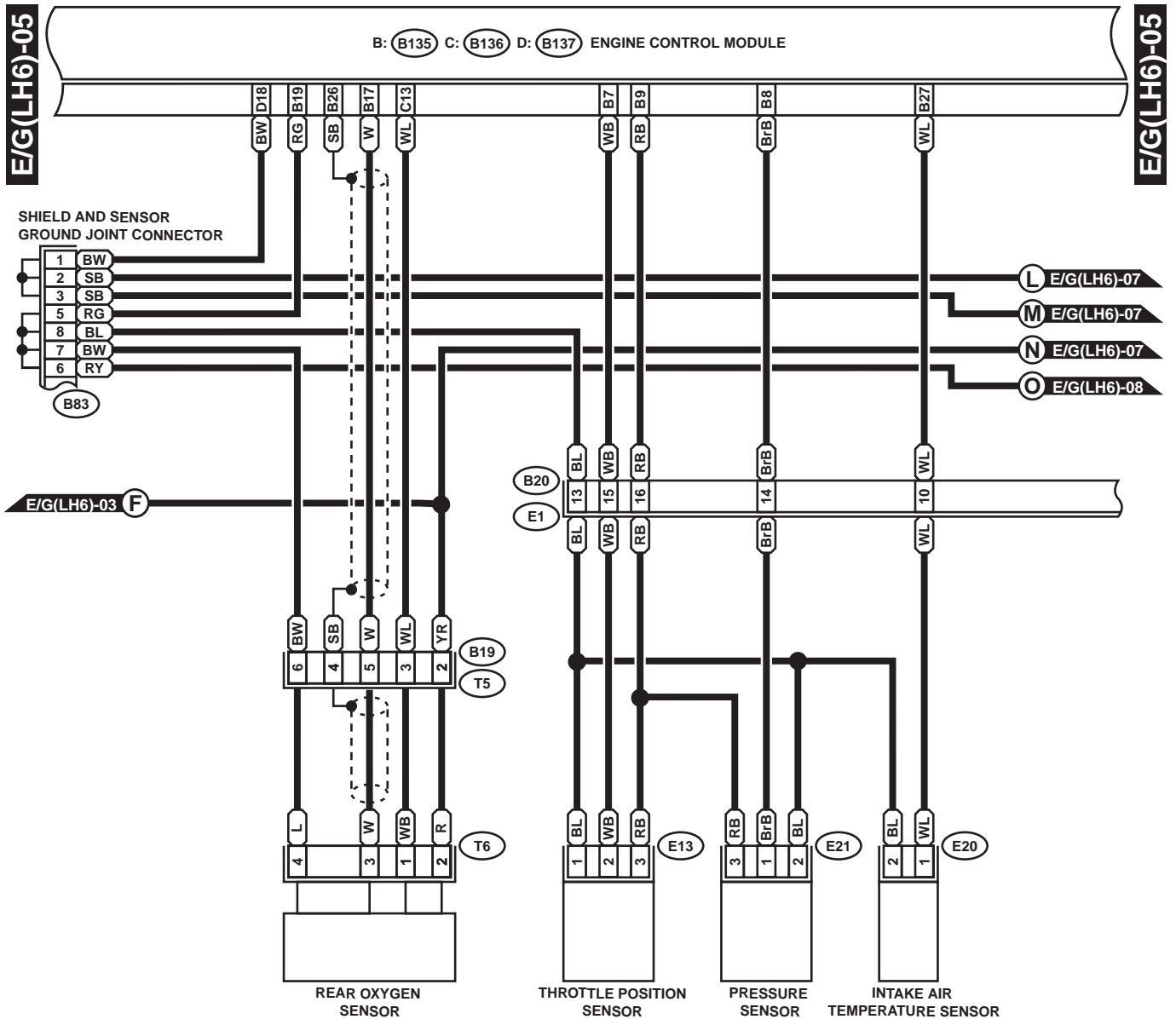
WIRING SYSTEM



WI-00893

ENGINE ELECTRICAL SYSTEM

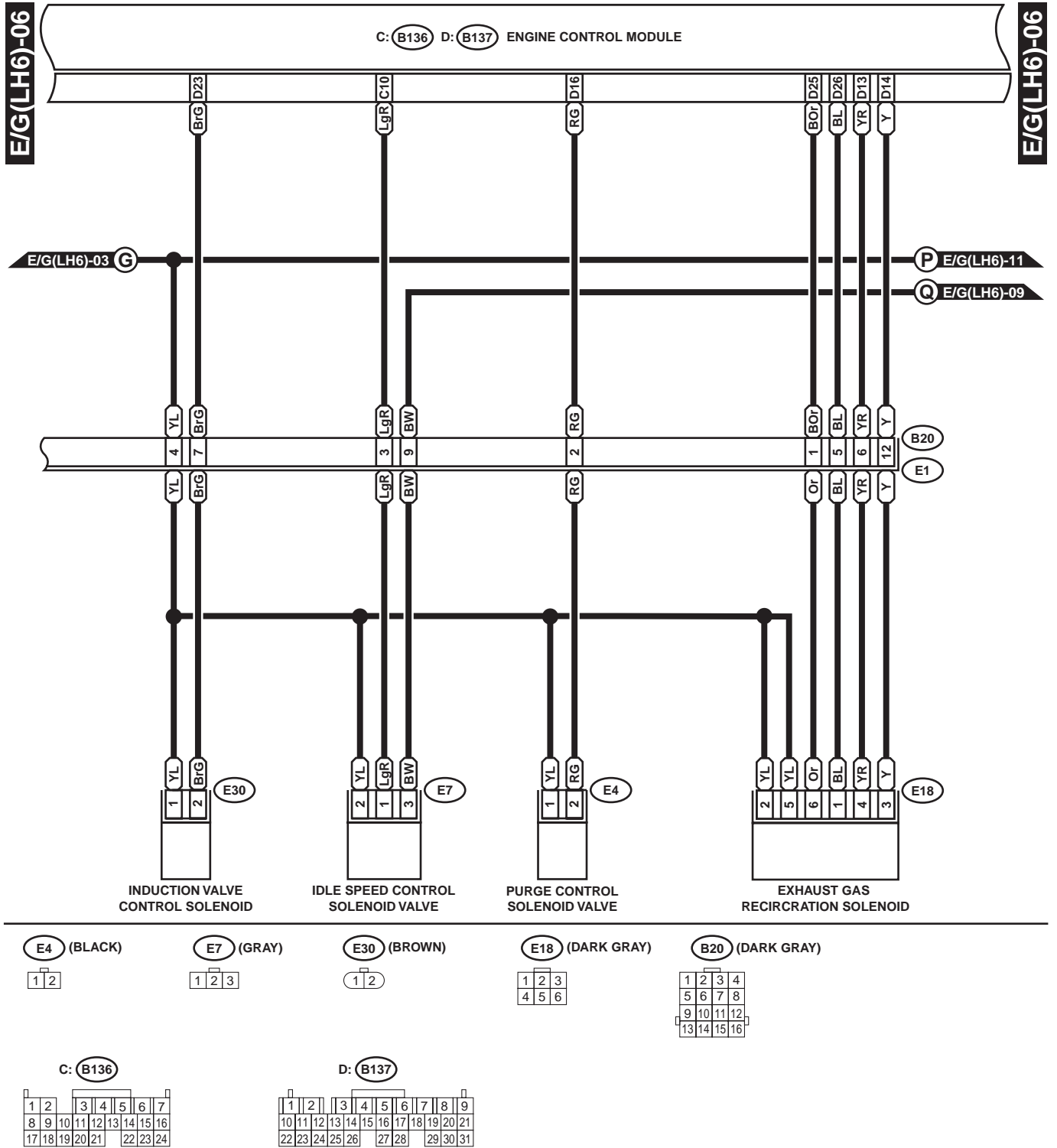
WIRING SYSTEM



WI-00894

ENGINE ELECTRICAL SYSTEM

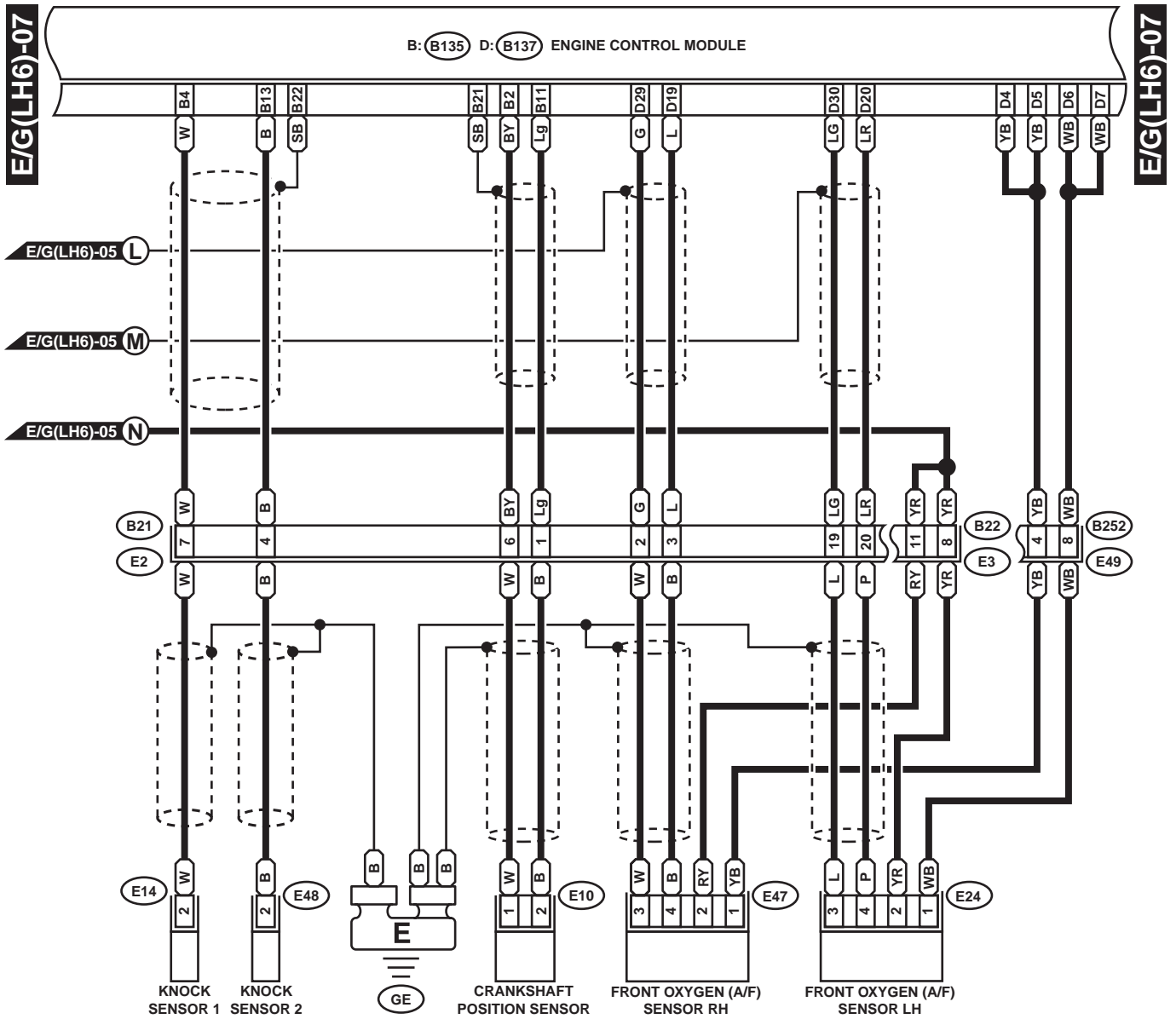
WIRING SYSTEM



WI-00895

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



(E10) (GRAY)

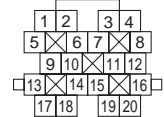
(E14) (BLUE)

(E24) (DARK GRAY)

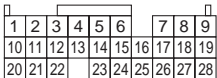
(B252) (DARK GRAY)

(B22) (BROWN)

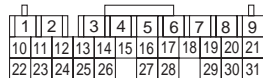
(B21) (LIGHT GRAY)



B: (B135)



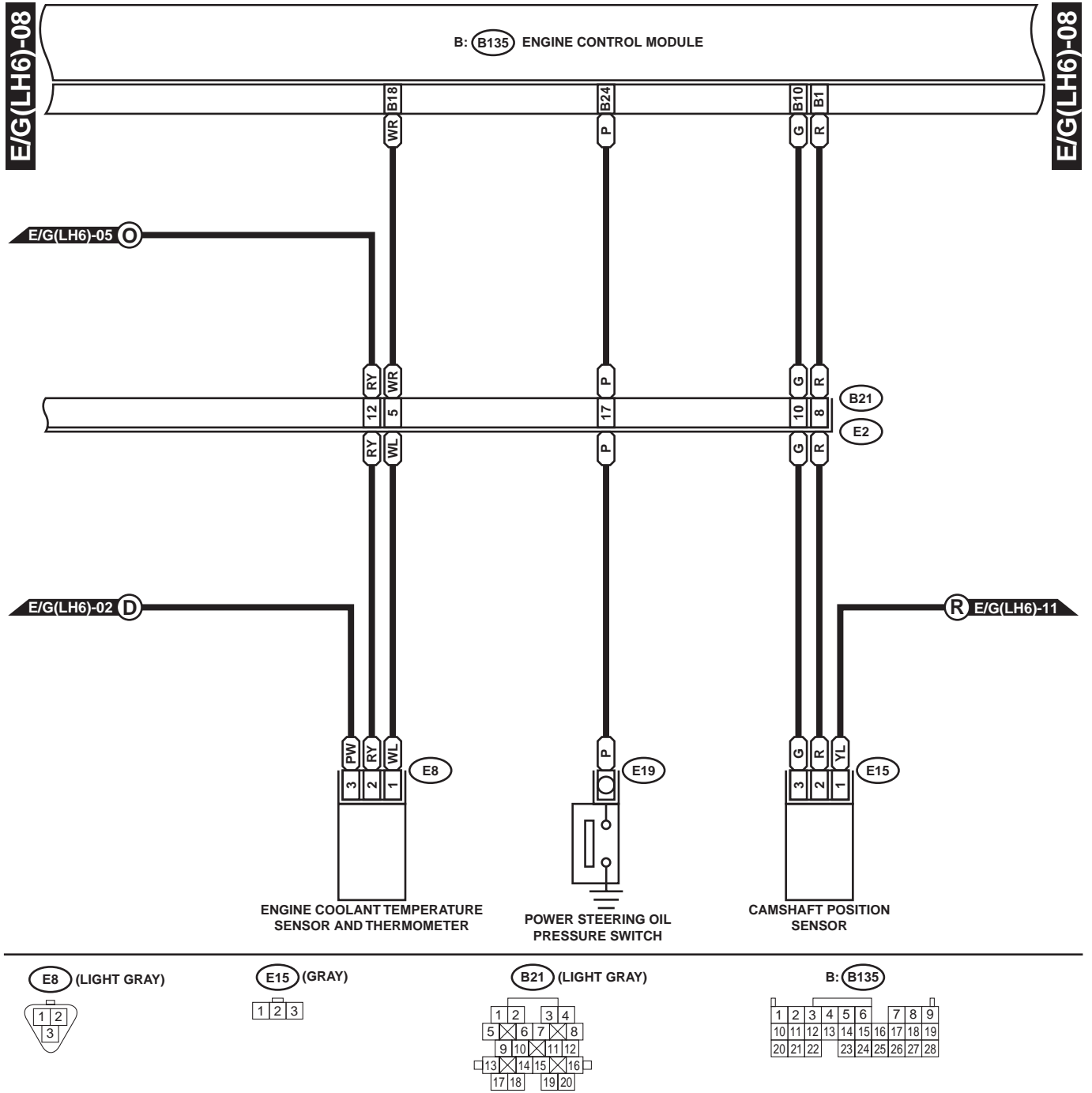
D: (B137)



WI-00896

ENGINE ELECTRICAL SYSTEM

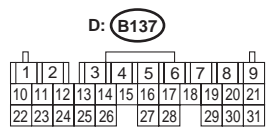
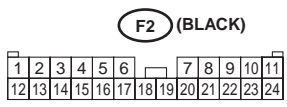
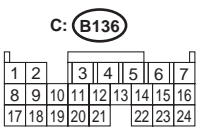
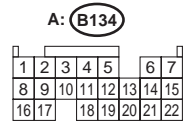
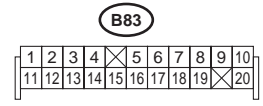
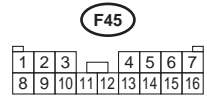
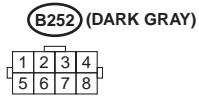
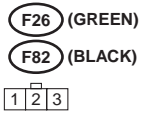
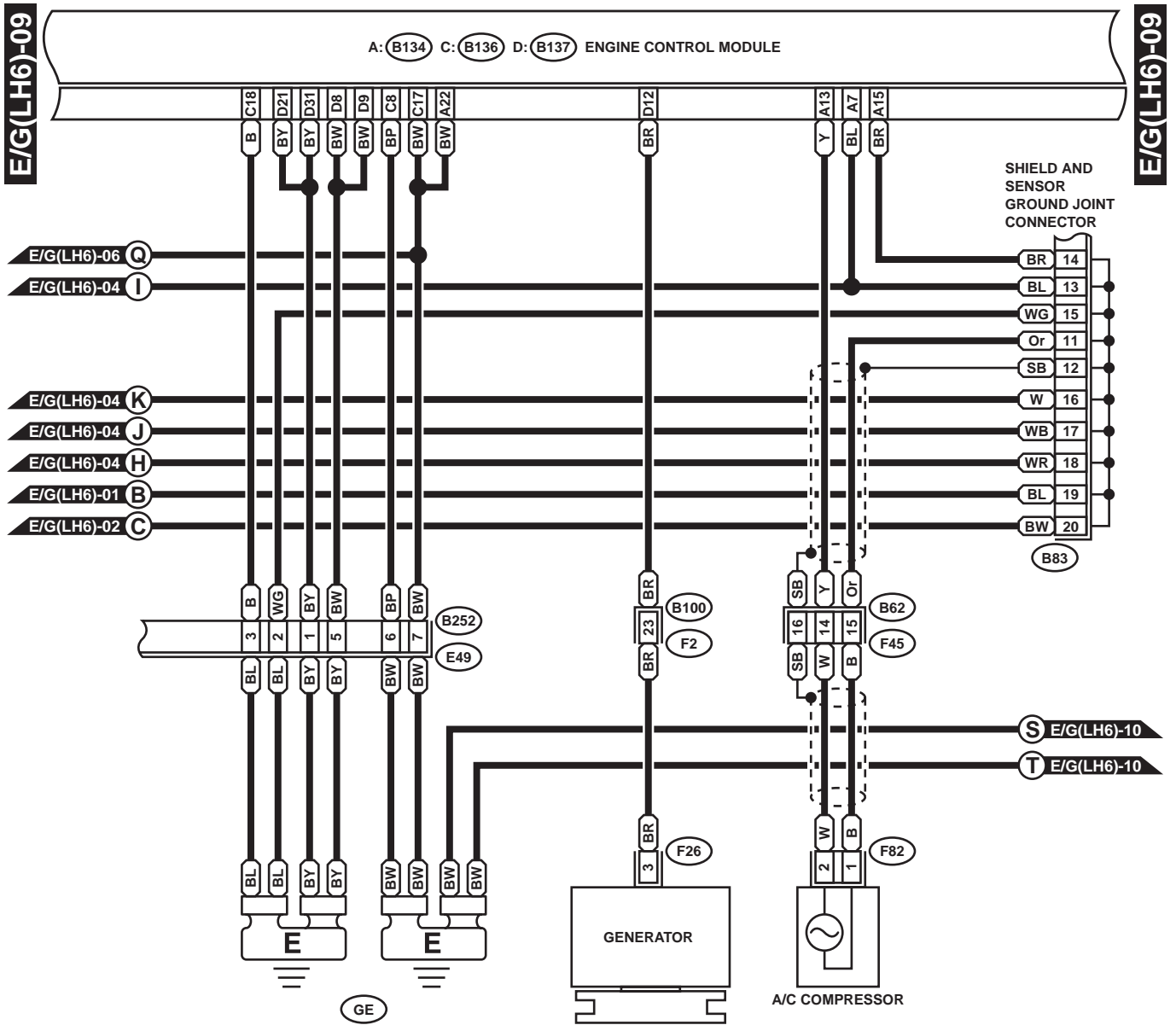
WIRING SYSTEM



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ENGINE ELECTRICAL SYSTEM

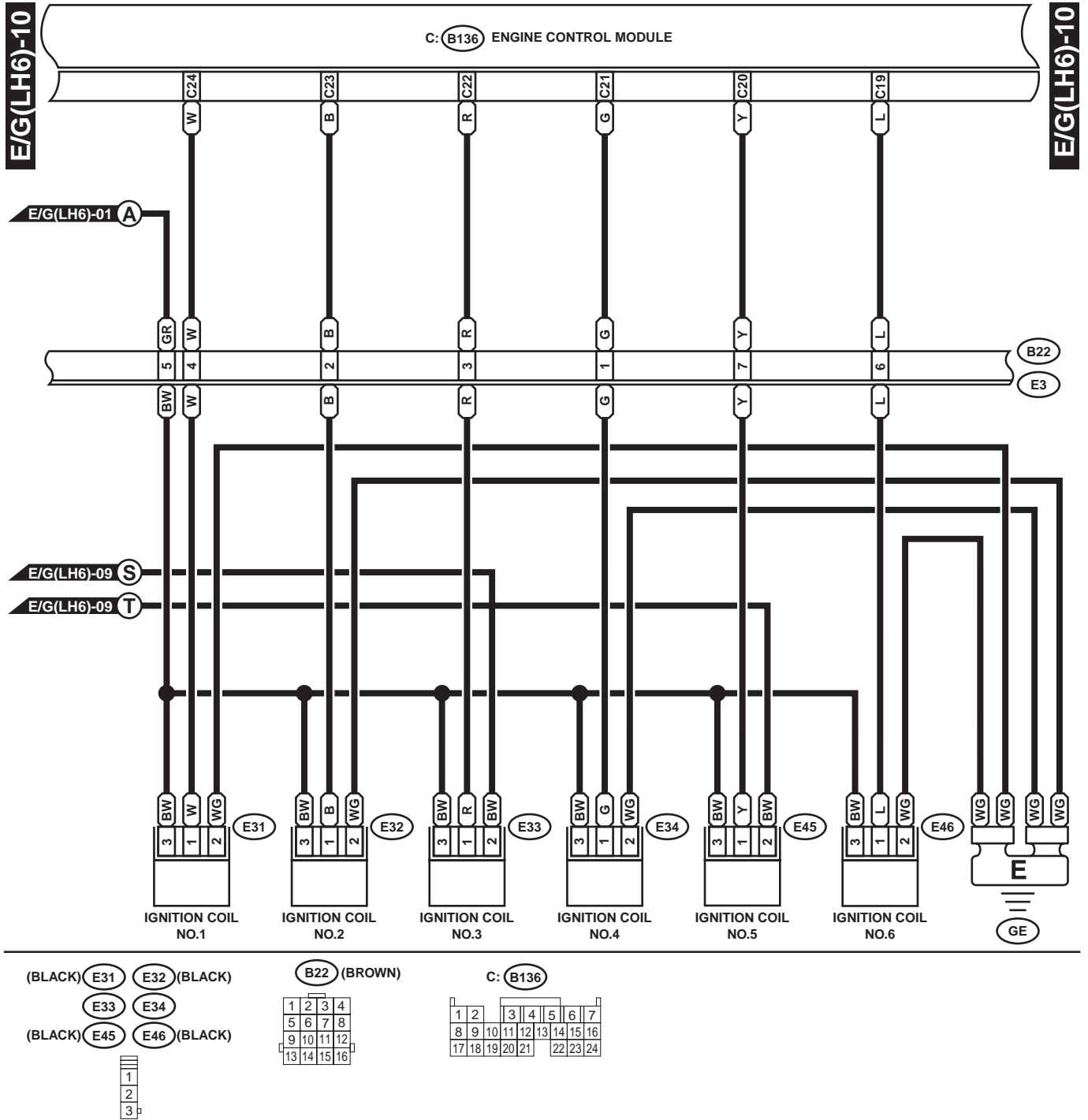
WIRING SYSTEM



WI-00898

ENGINE ELECTRICAL SYSTEM

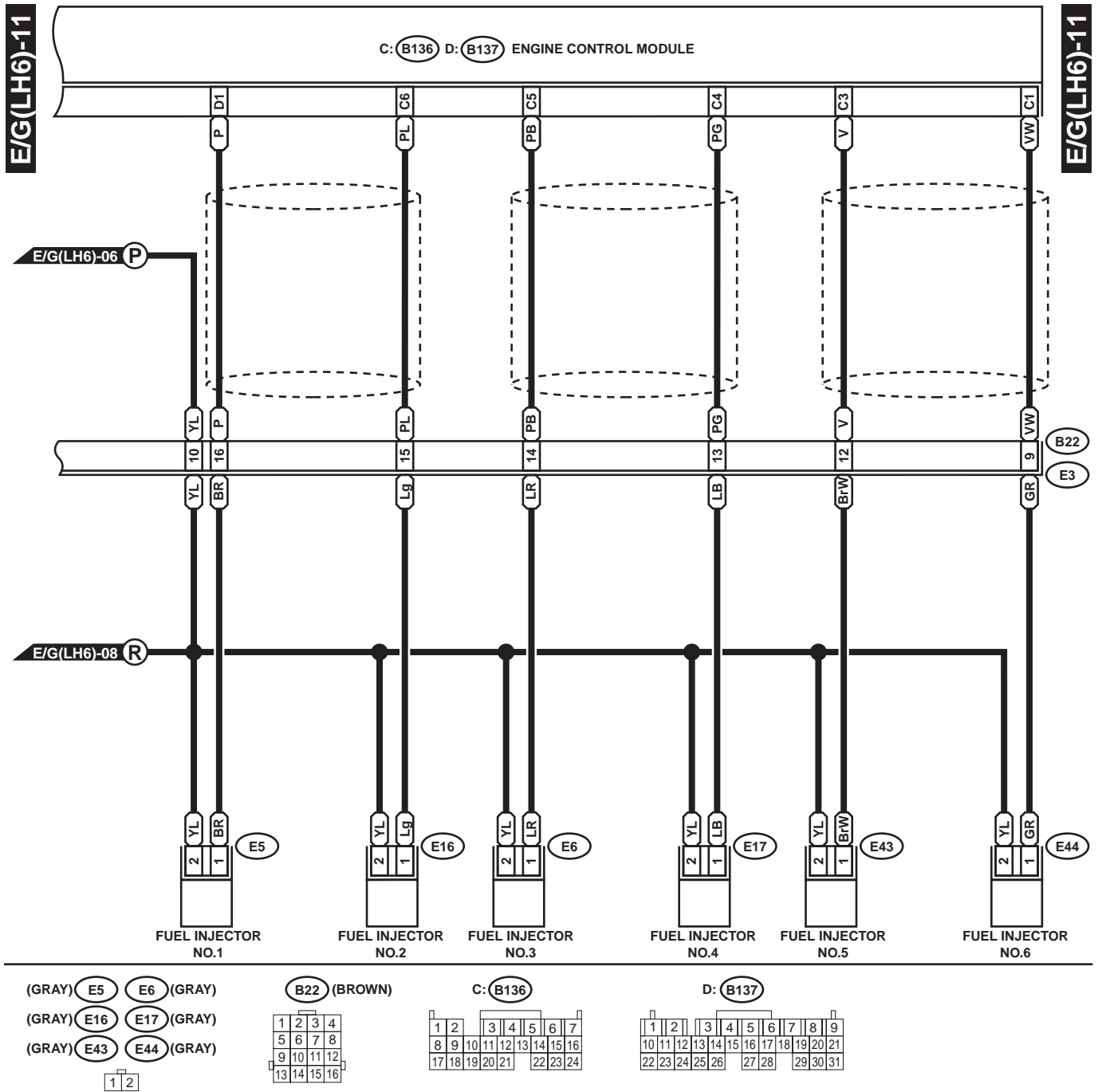
WIRING SYSTEM



WI-00899

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

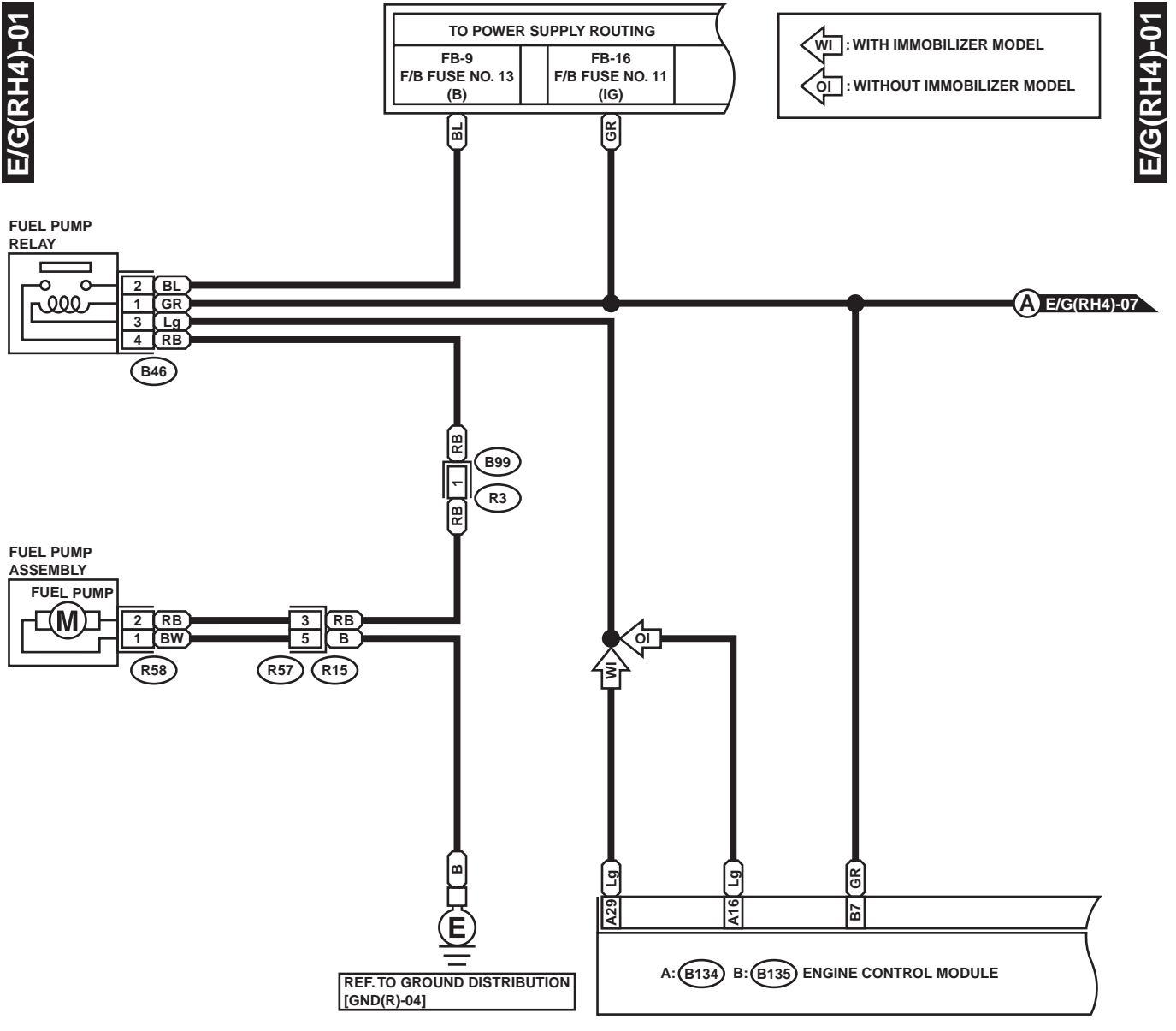


WI-00900

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

4. RHD 4-CYLINDER NON-TURBO ENGINE WITHOUT OBD MODEL



B46 (GREEN)

1	2
3	4

R57 (BLACK)

1	2
3	4
5	6

R58 (GRAY)

1	2
3	4
5	6

R3

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

B: B135

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

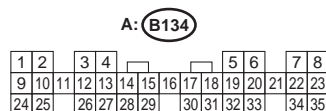
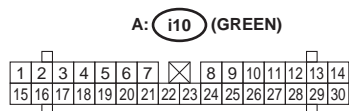
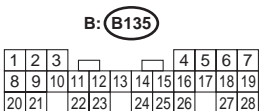
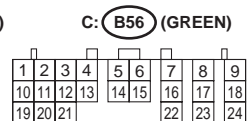
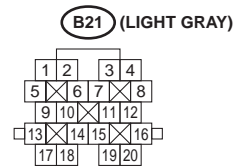
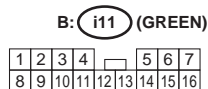
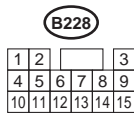
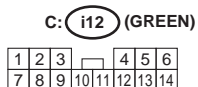
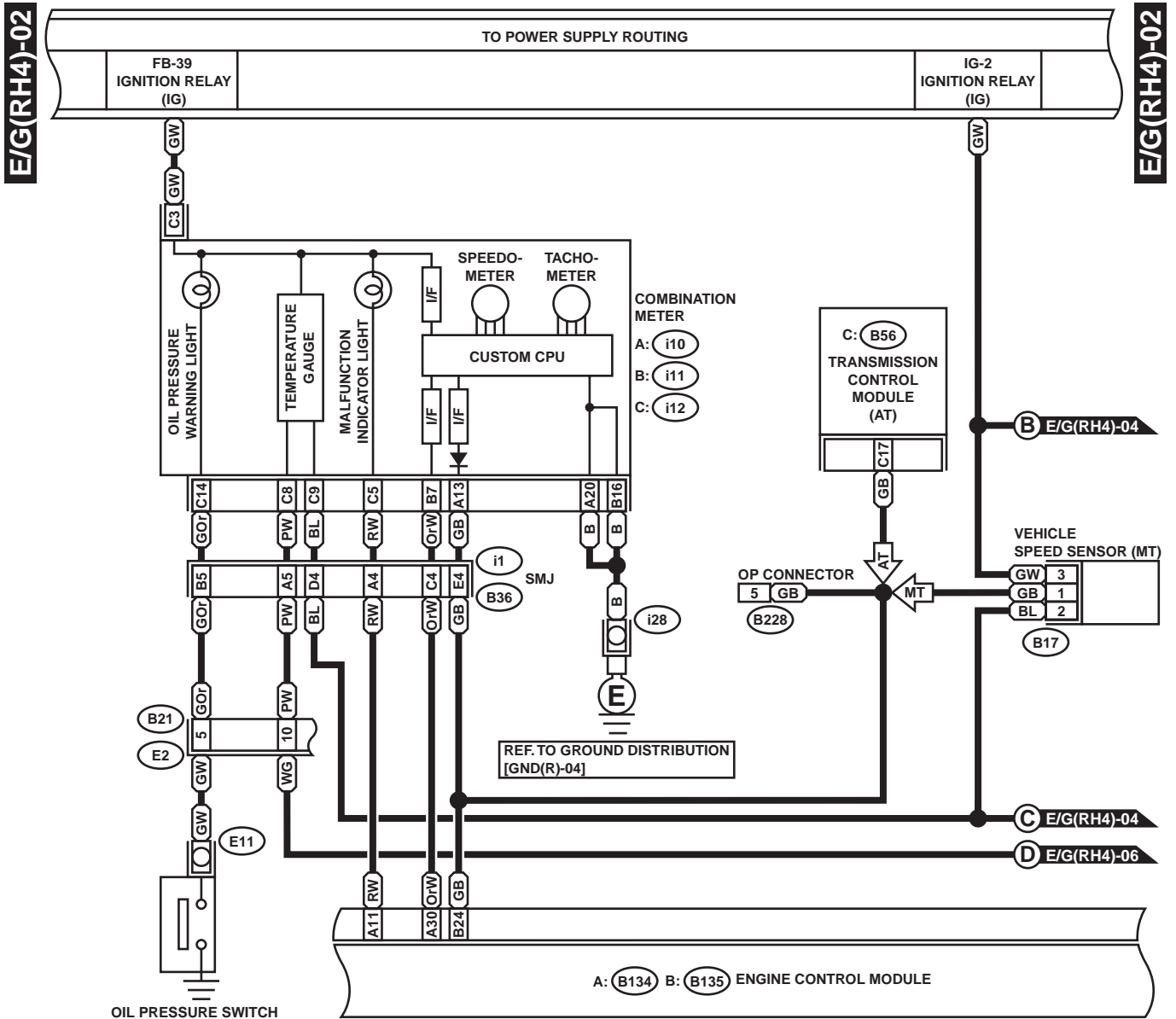
A: B134

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
33	34	35					

WI-00901

ENGINE ELECTRICAL SYSTEM

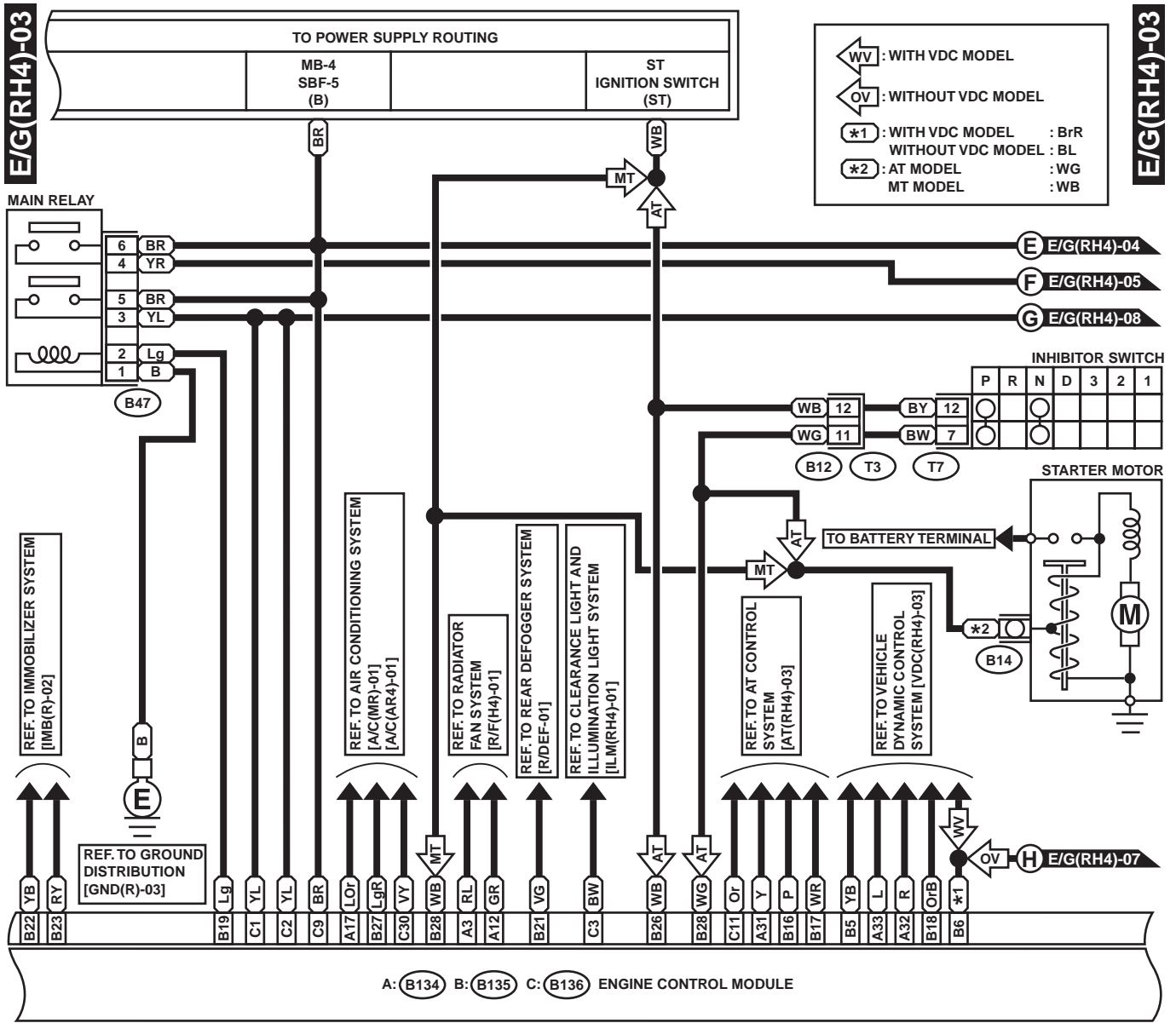
WIRING SYSTEM



WI-00902

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



WV : WITH VDC MODEL
 OV : WITHOUT VDC MODEL
 *1 : WITH VDC MODEL : BrR
 WITHOUT VDC MODEL : BL
 *2 : AT MODEL : WG
 MT MODEL : WB

B47 (BROWN)

1	2
3	4
5	6

B12

1	2	3	4
5	6	7	8
9	10	11	12

T7

1	2	3	4	5	6
7	8	9	10	11	12

B: B135

1	2	3		4	5	6	7				
8	9	10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28			

C: B136

1	2	3		4	5	6	7					
8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30			

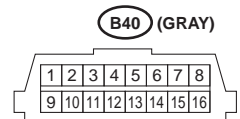
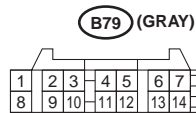
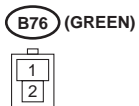
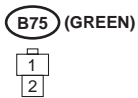
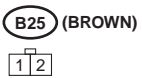
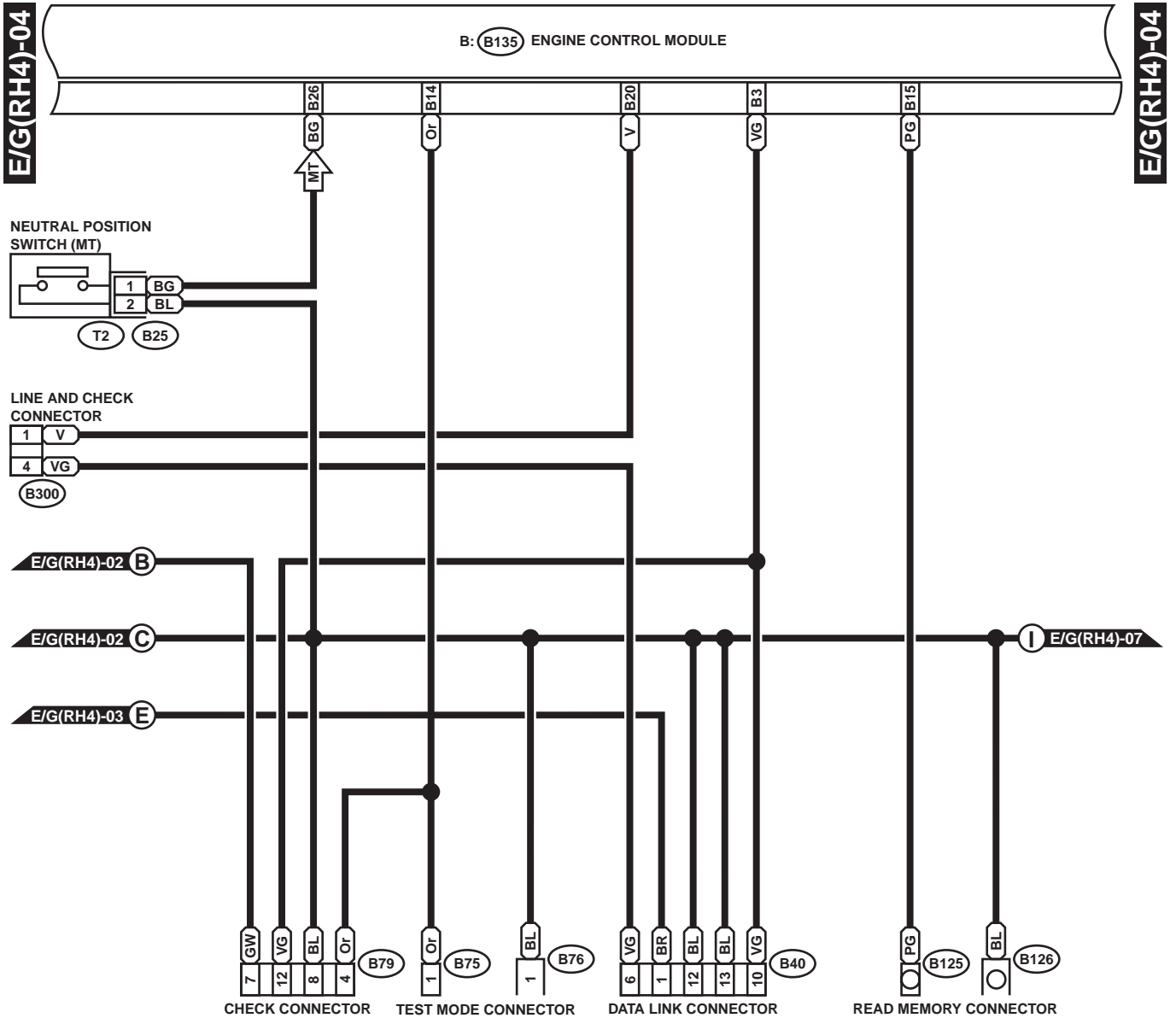
A: B134

1	2	3	4		5	6	7	8						
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31	32	33	34	35			

WI-00903

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



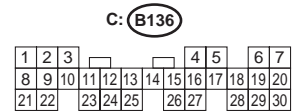
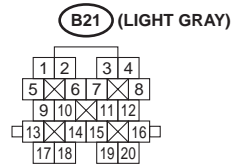
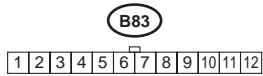
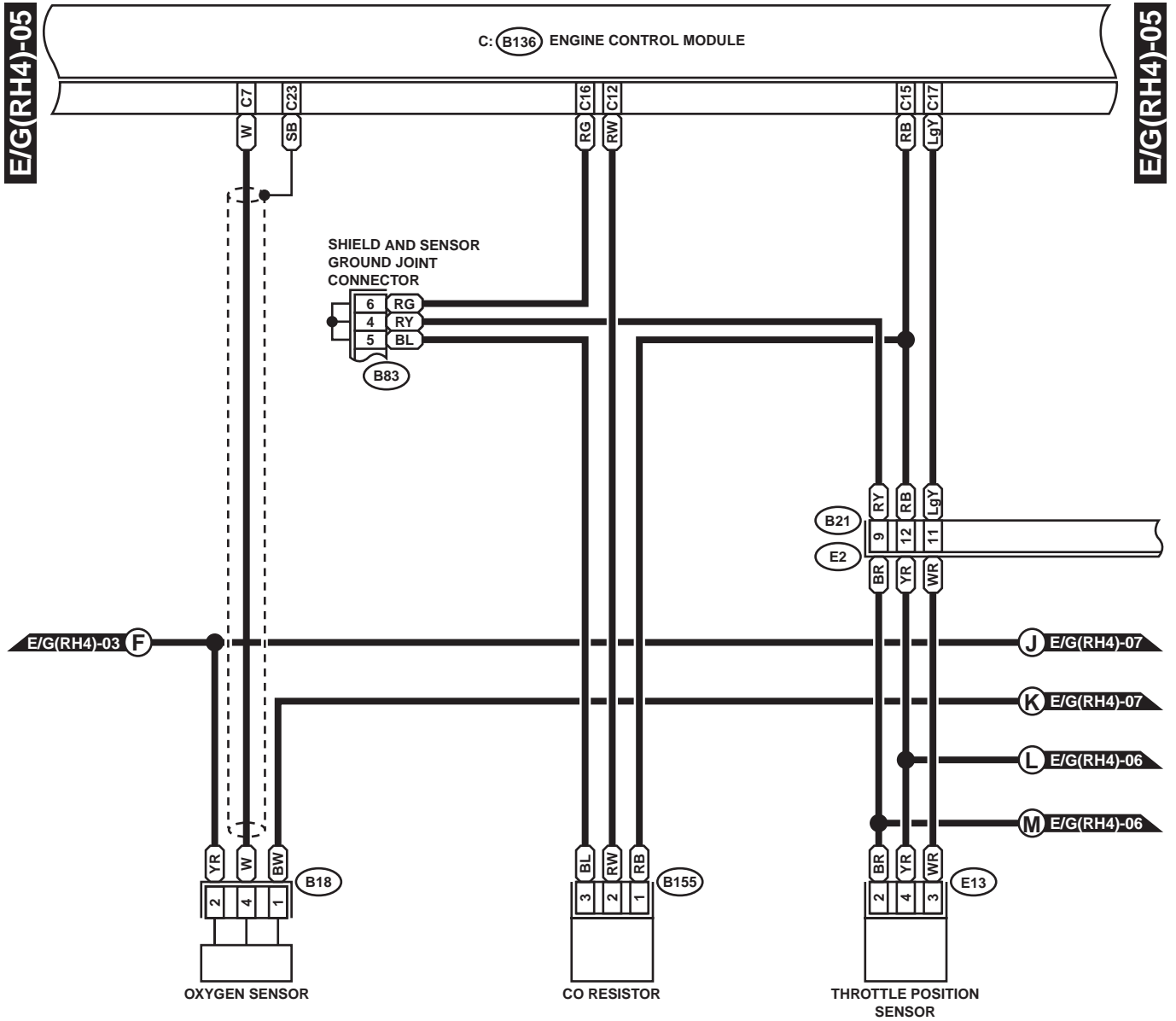
B: (B135)



WI-00904

ENGINE ELECTRICAL SYSTEM

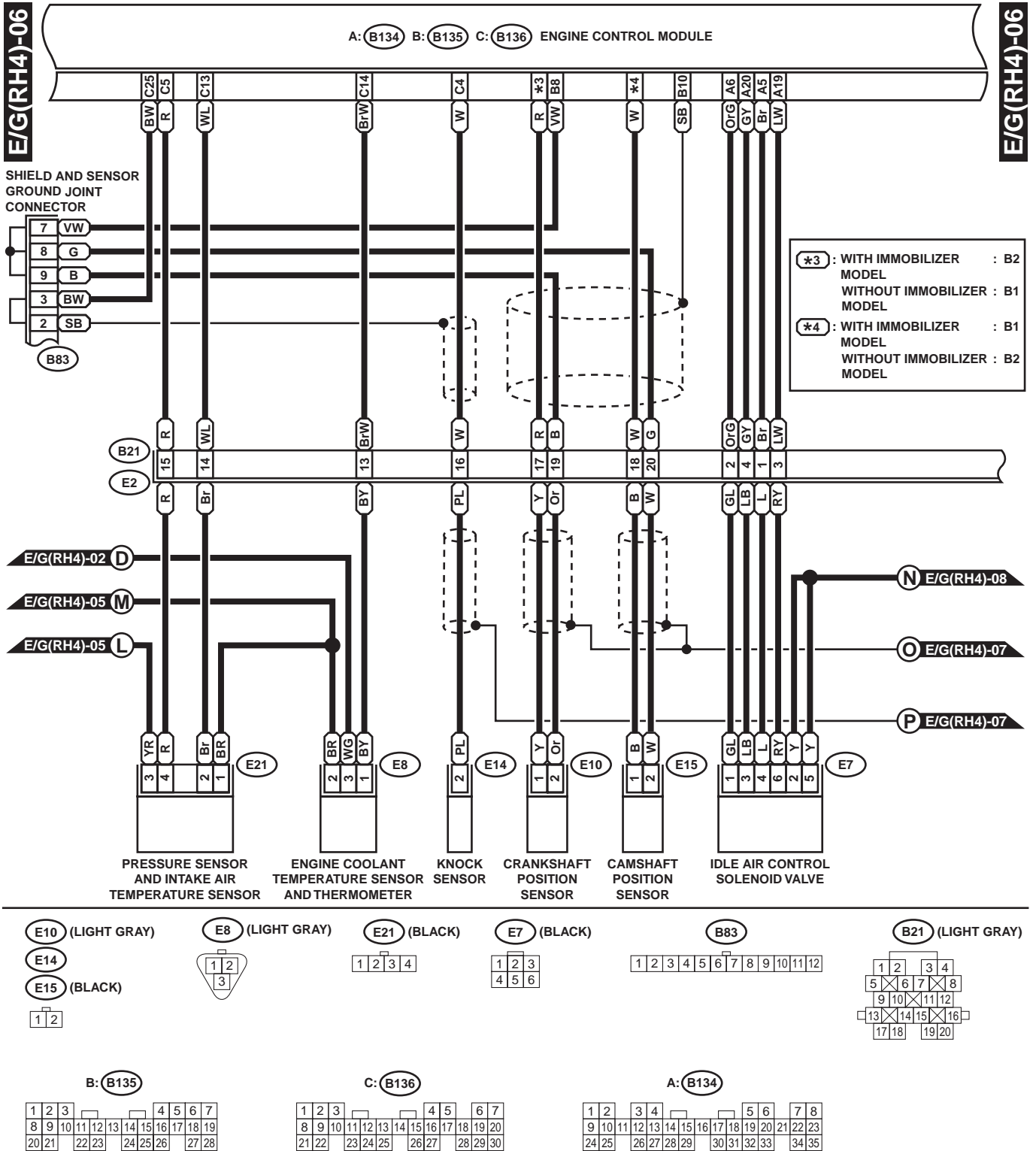
WIRING SYSTEM



WI-00905

ENGINE ELECTRICAL SYSTEM

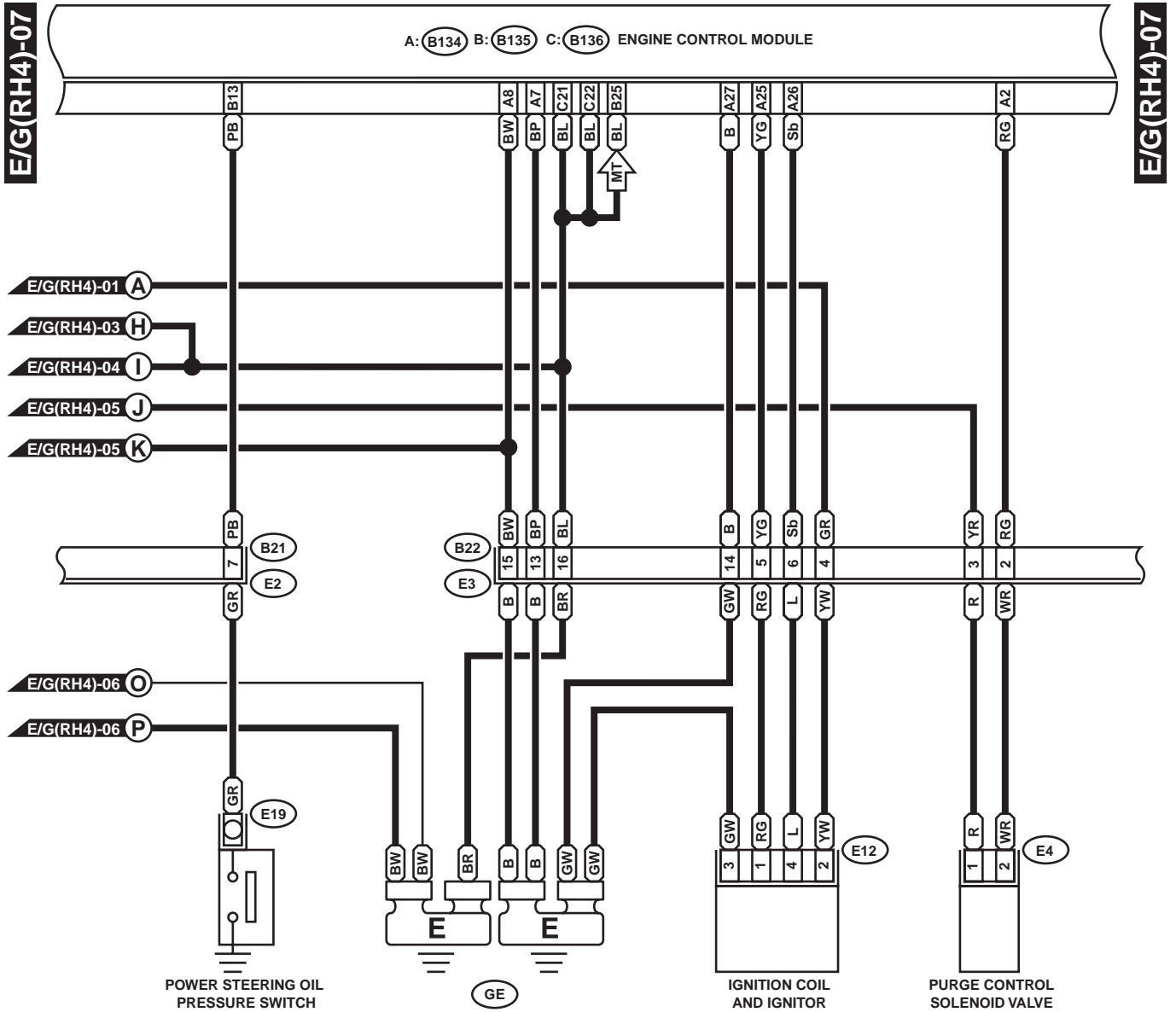
WIRING SYSTEM



WI-00906

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E4 (BLUE)



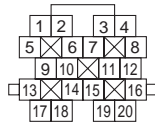
E12 (DARK GRAY)



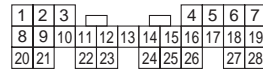
B22 (BROWN)



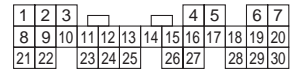
B21 (LIGHT GRAY)



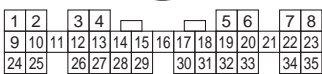
B: (B135)



C: (B136)



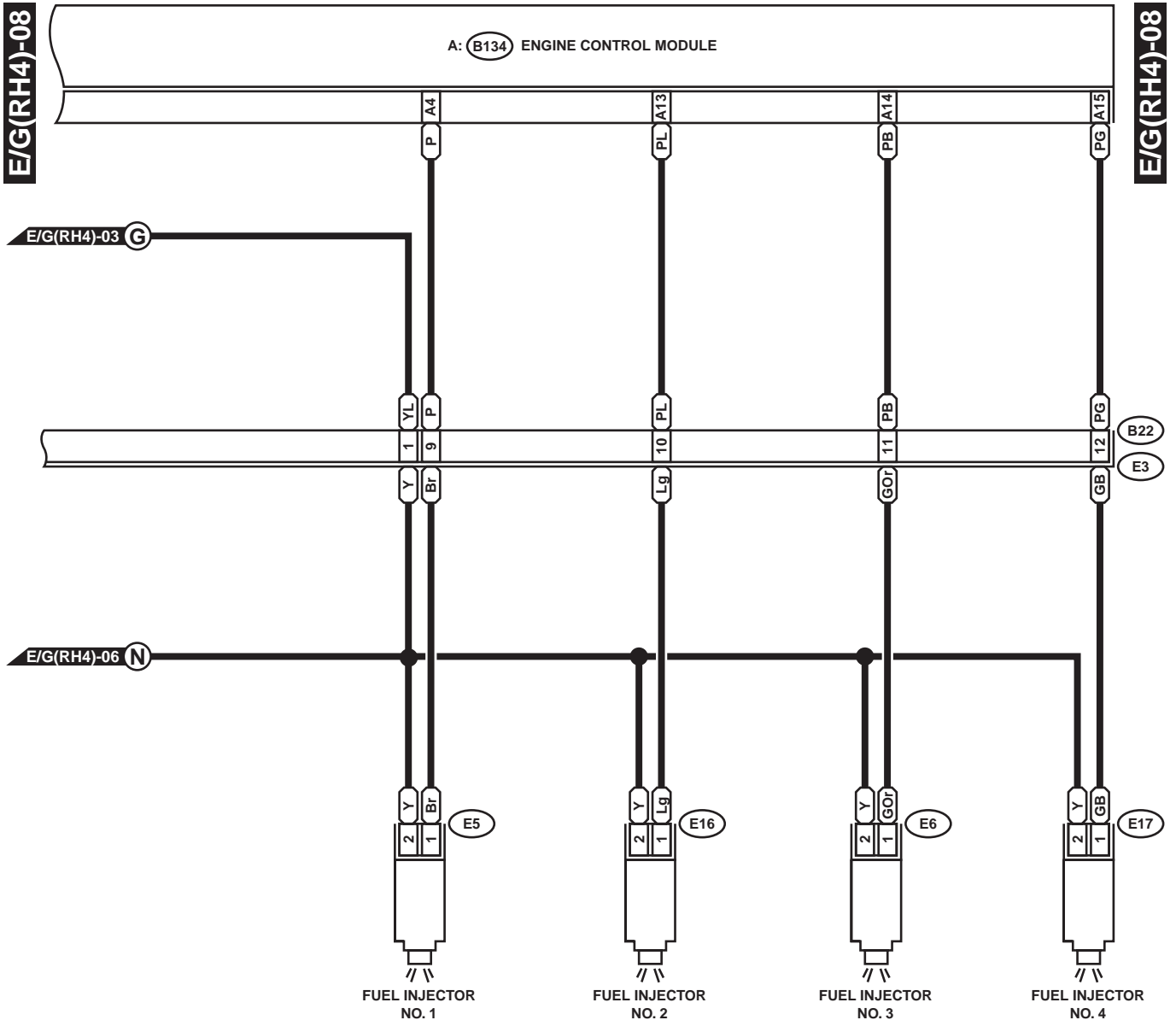
A: (B134)



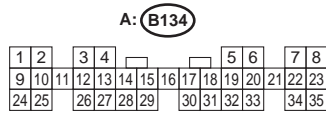
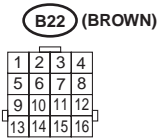
WI-00907

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



- E5 (LIGHT GRAY)
- E6 (LIGHT GRAY)
- E16 (LIGHT GRAY)
- E17 (LIGHT GRAY)

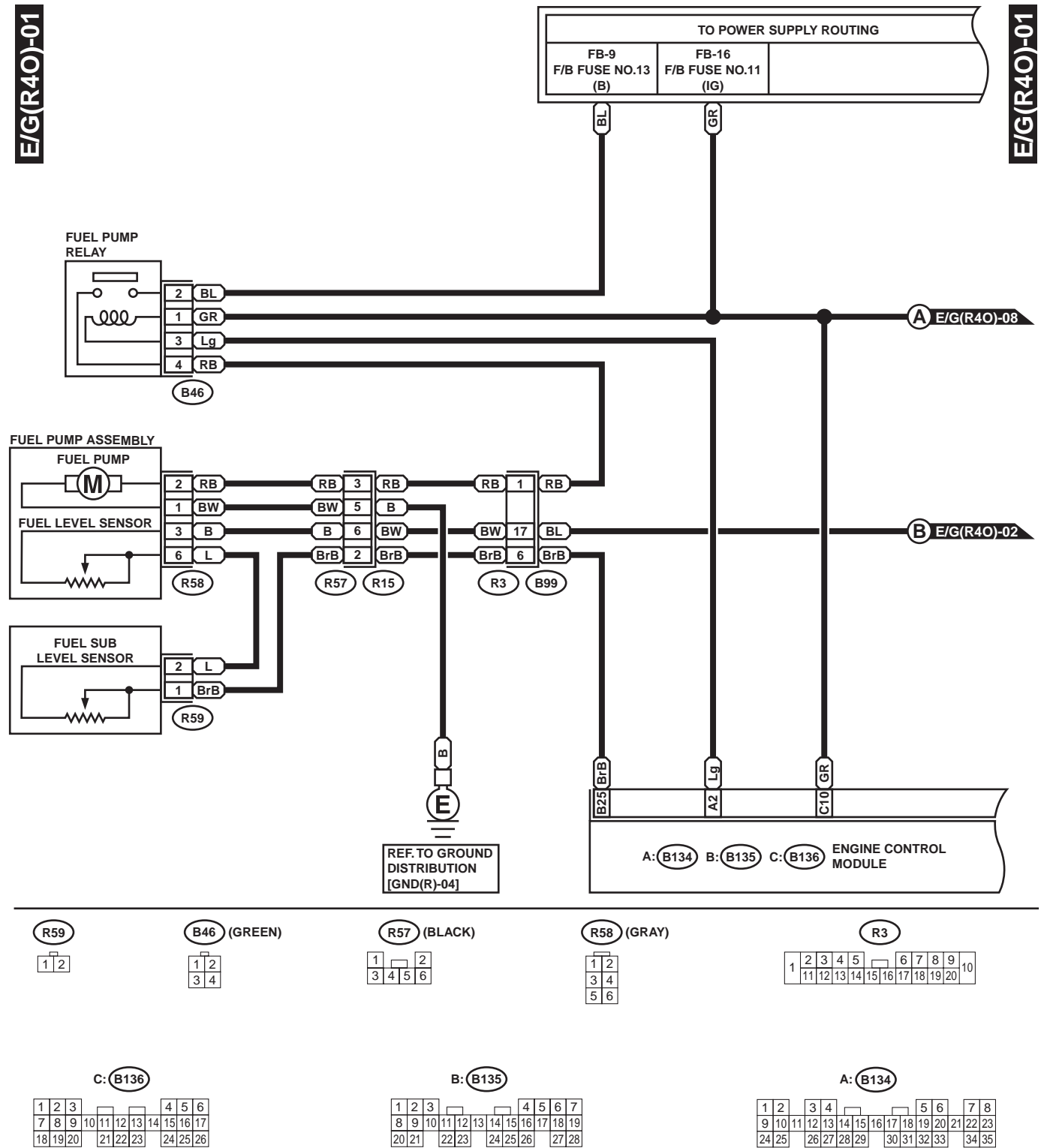


WI-00908

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

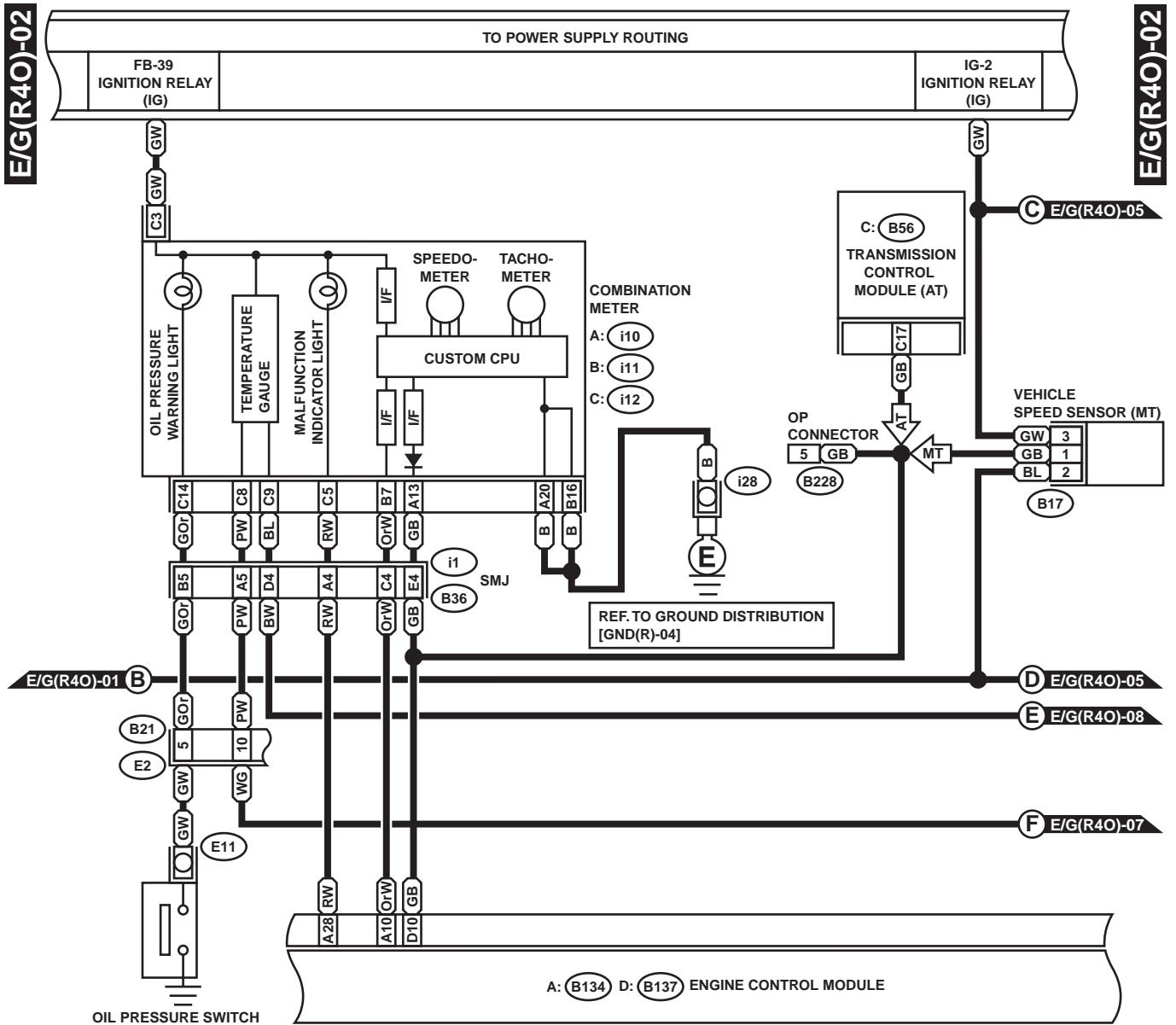
5. RHD 4-CYLINDER NON-TURBO ENGINE WITH OBD MODEL



WI-00909

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B17

1	2	3
---	---	---

C: i12 (GREEN)

1	2	3	4	5	6		
7	8	9	10	11	12	13	14

B228

1	2	3			
4	5	6	7	8	9
10	11	12	13	14	15

B: i11 (GREEN)

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

B21 (LIGHT GRAY)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

D: B137

1	2	3	4					
5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20		

C: B56 (GREEN)

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24									

A: i10 (GREEN)

1	2	3	4	5	6	7	8	9	10	11	12	13	14		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

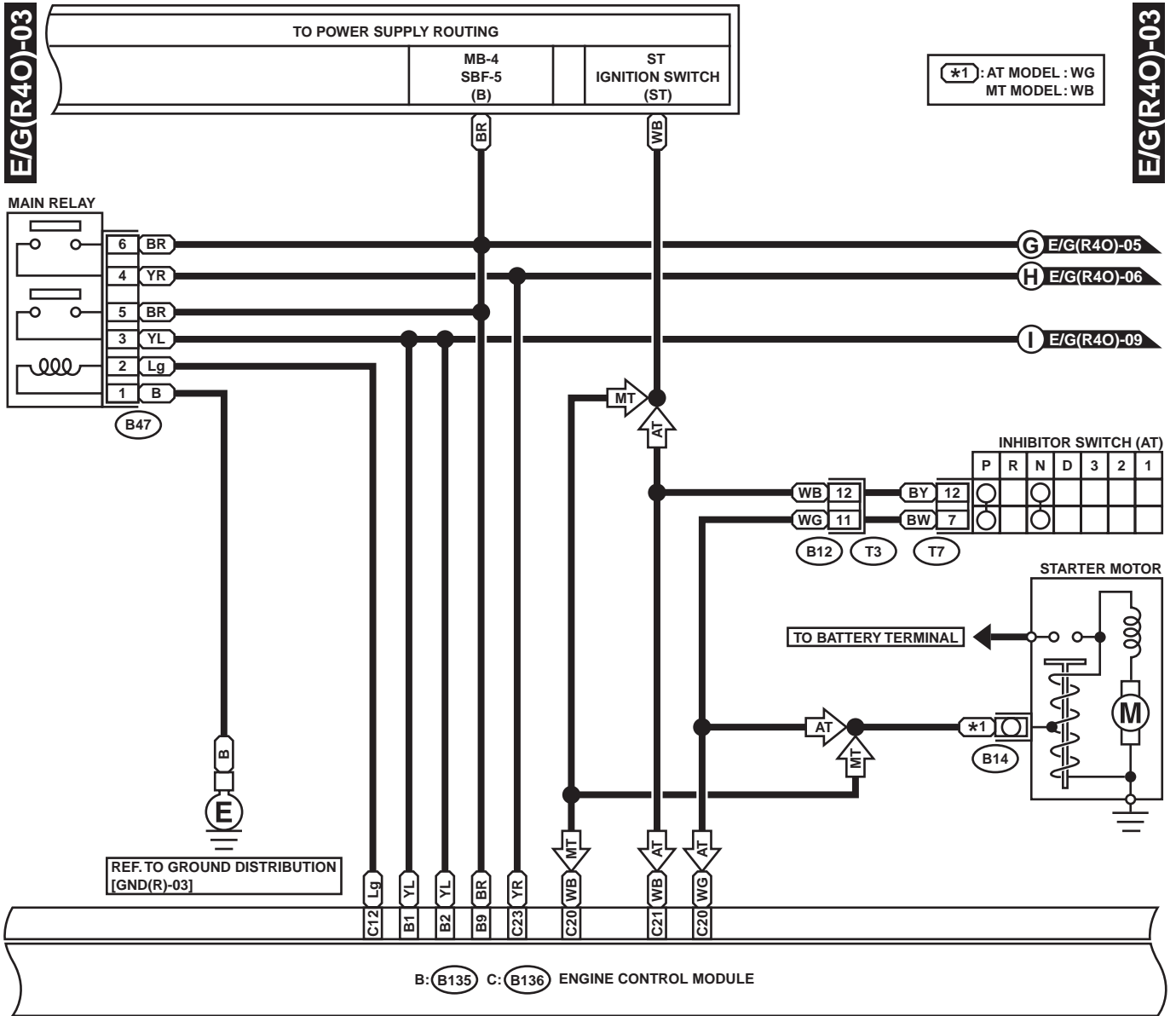
A: B134

1	2	3	4	5	6	7	8							
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31	32	33	34	35			

WI-00910

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B47 (BROWN)

1	2
3	4
5	6

B12

1	2	3	4
5	6	7	8
9	10	11	12

T7

1	2	3	4	5	6
7	8	9	10	11	12

C: (B136)

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26				

B: (B135)

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

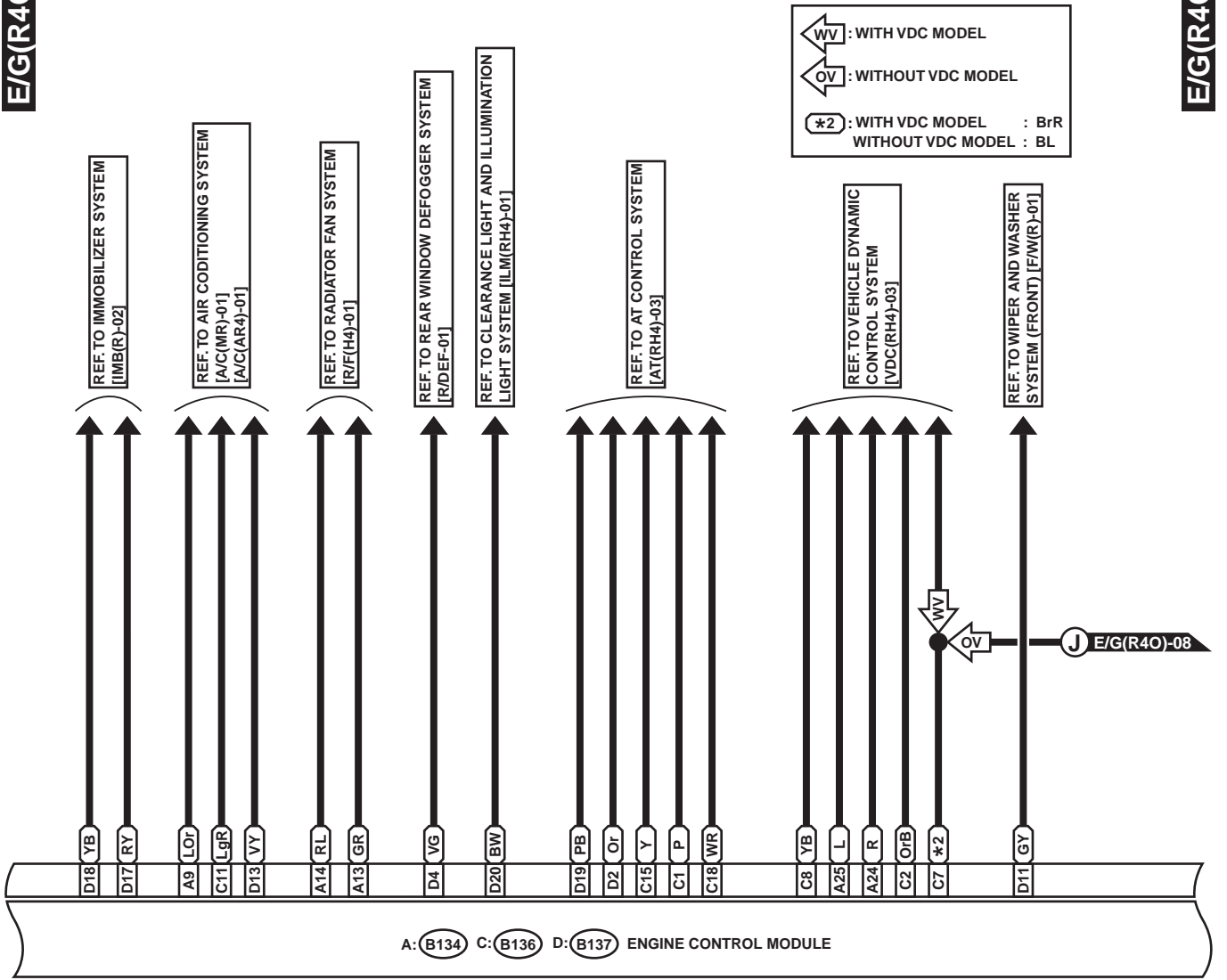
WI-00911

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(R40)-04

E/G(R40)-04



D: B137

1	2			3	4
5	6	8	9	10	11
14	15	16	17	18	19
					20

C: B136

1	2	3		4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	

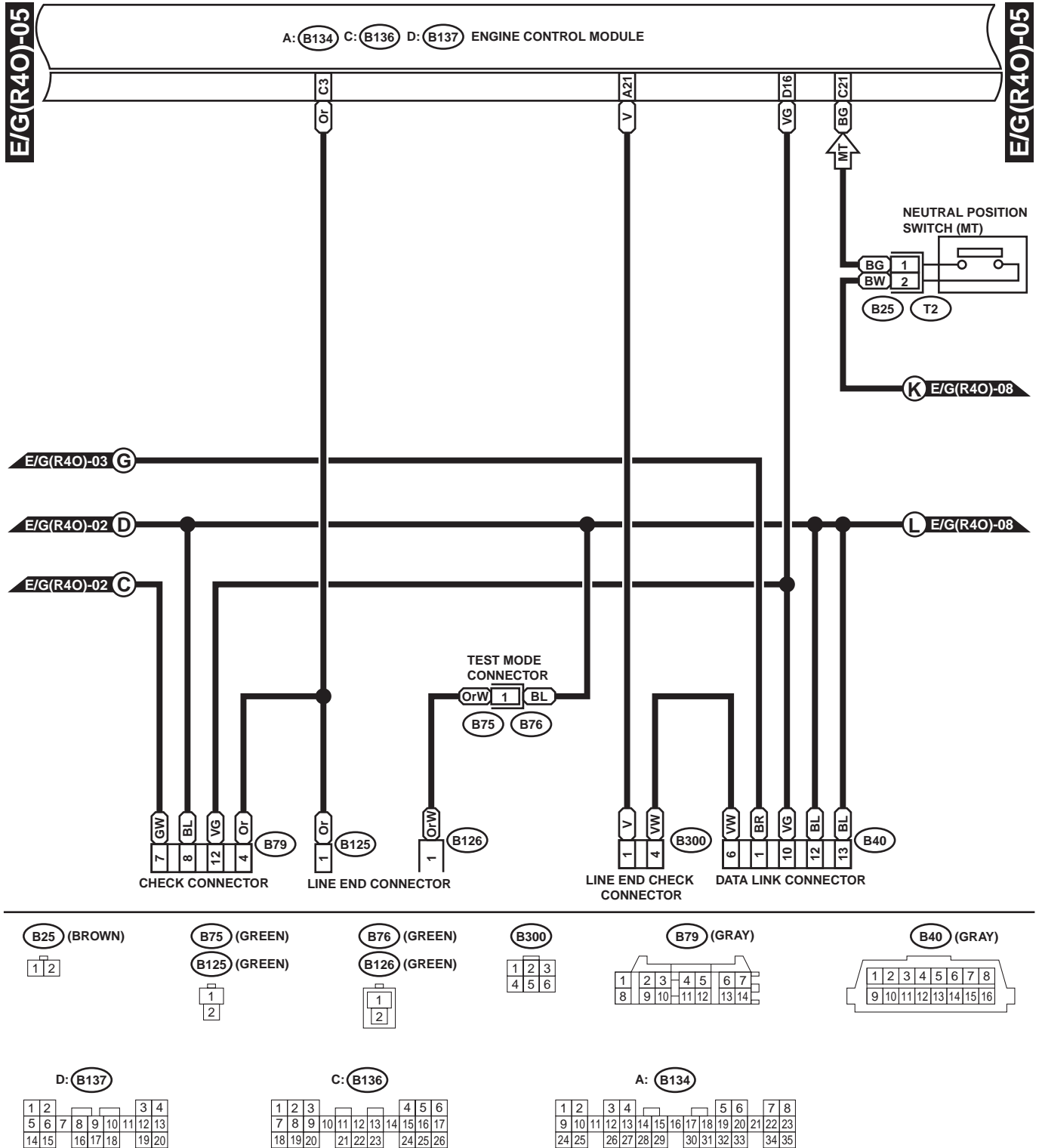
A: B134

1	2	3	4			5	6	7	8
9	10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35			

WI-00912

ENGINE ELECTRICAL SYSTEM

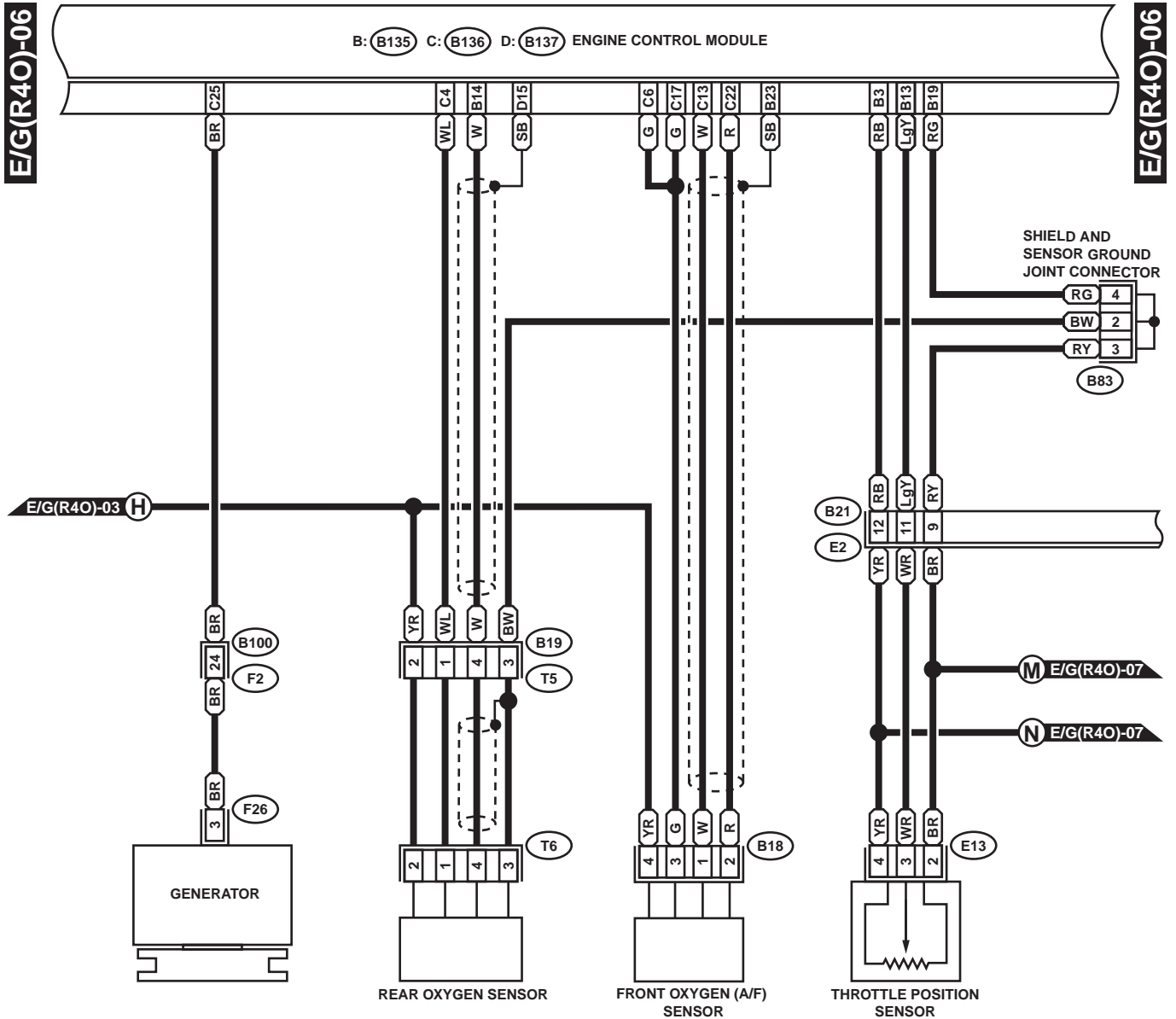
WIRING SYSTEM



WI-00913

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



F26 (GREEN)



B83



E13 (DARK BROWN)

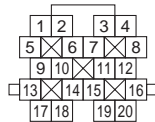
B18



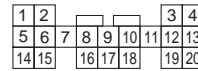
B19

T6

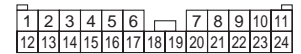
B21 (LIGHT GRAY)



D: B137



F2 (BLACK)



C: B136



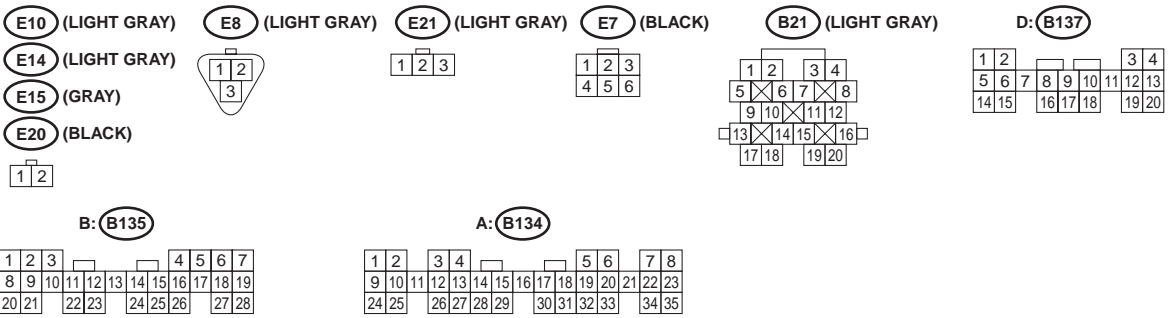
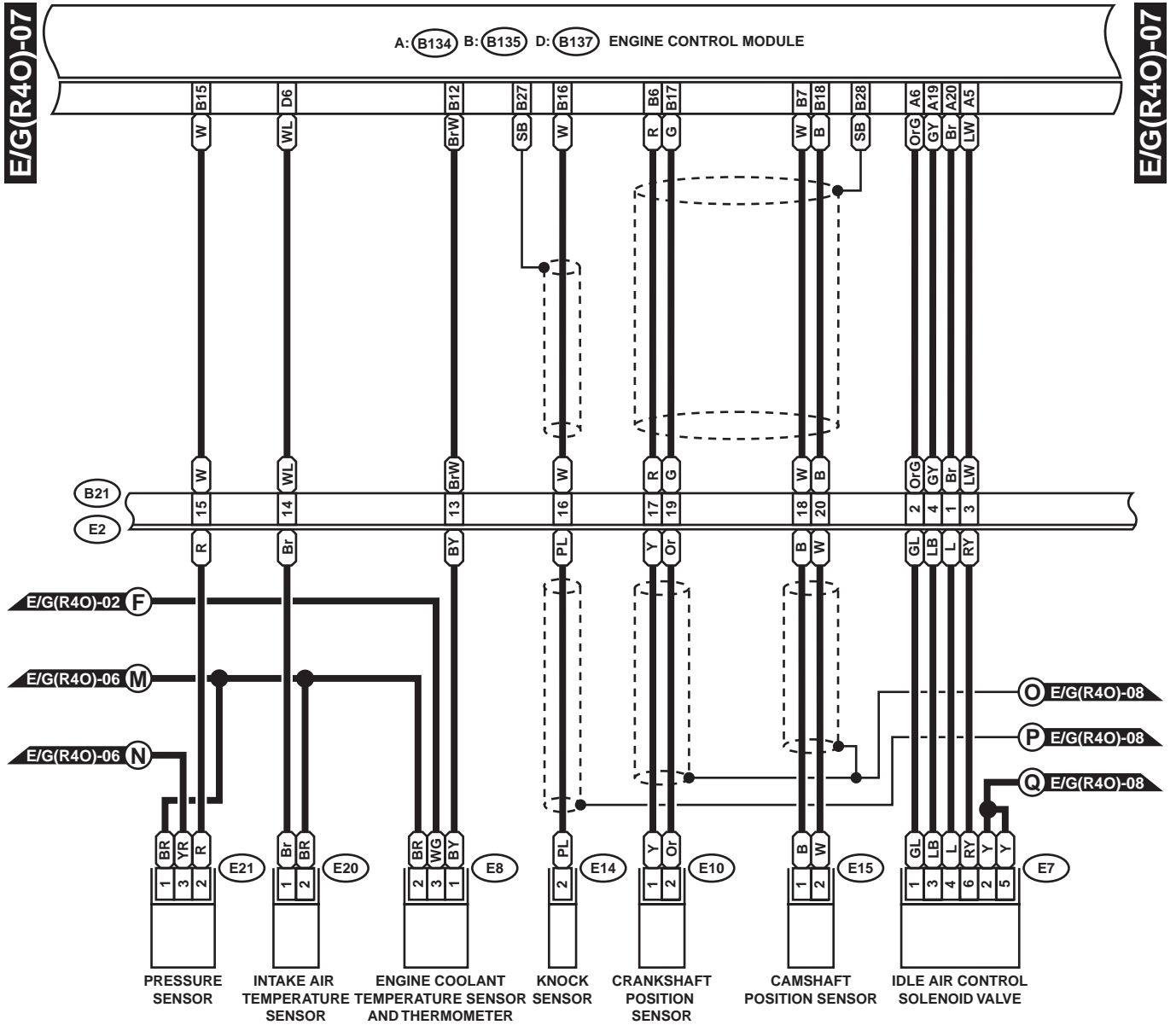
B: B135



WI-00914

ENGINE ELECTRICAL SYSTEM

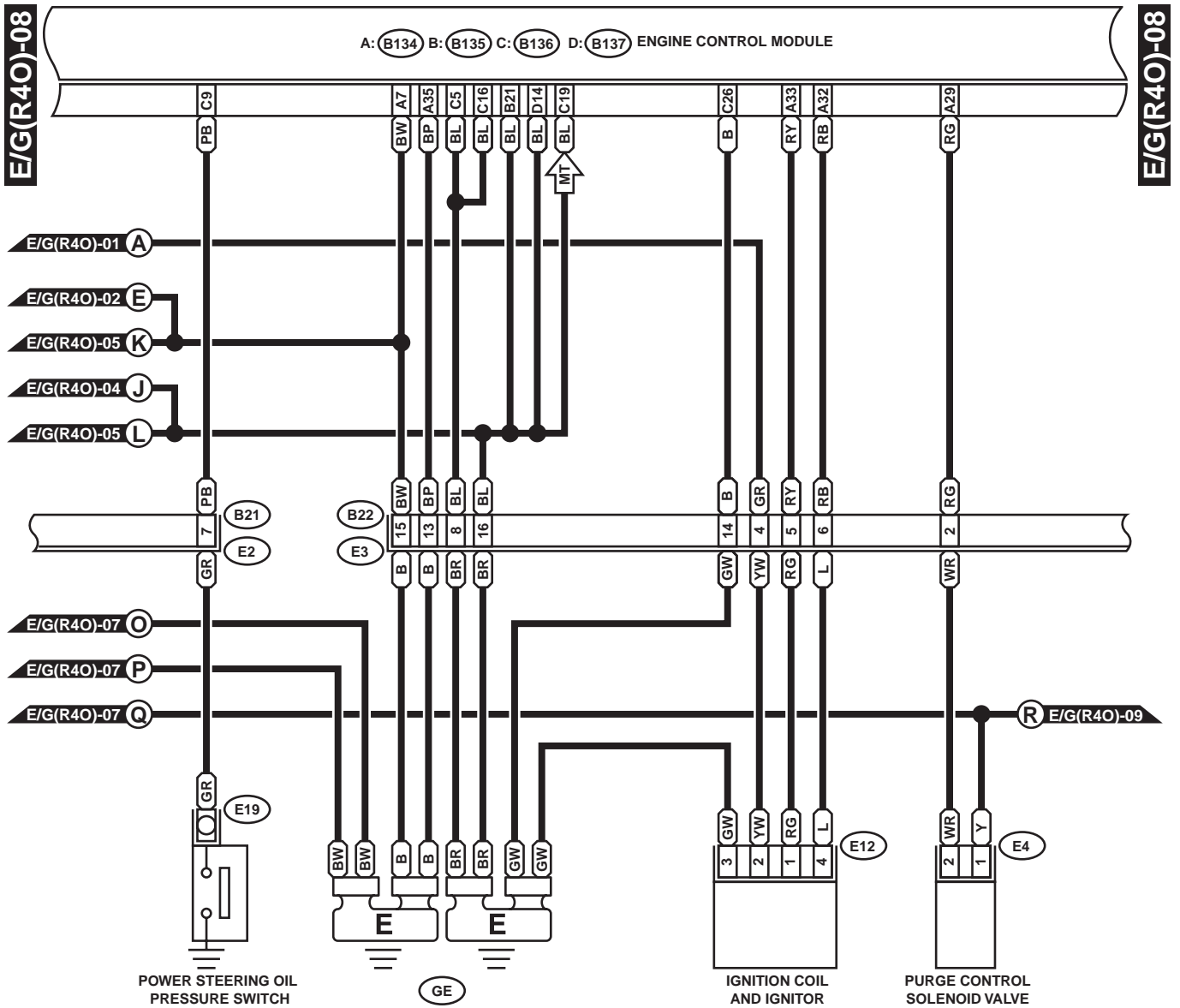
WIRING SYSTEM



WI-00915

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E4 (BLACK)



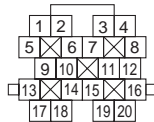
E12 (DARK GRAY)



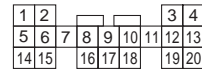
B22 (BROWN)



B21 (LIGHT GRAY)



D: B137



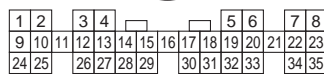
C: B136



B: B135



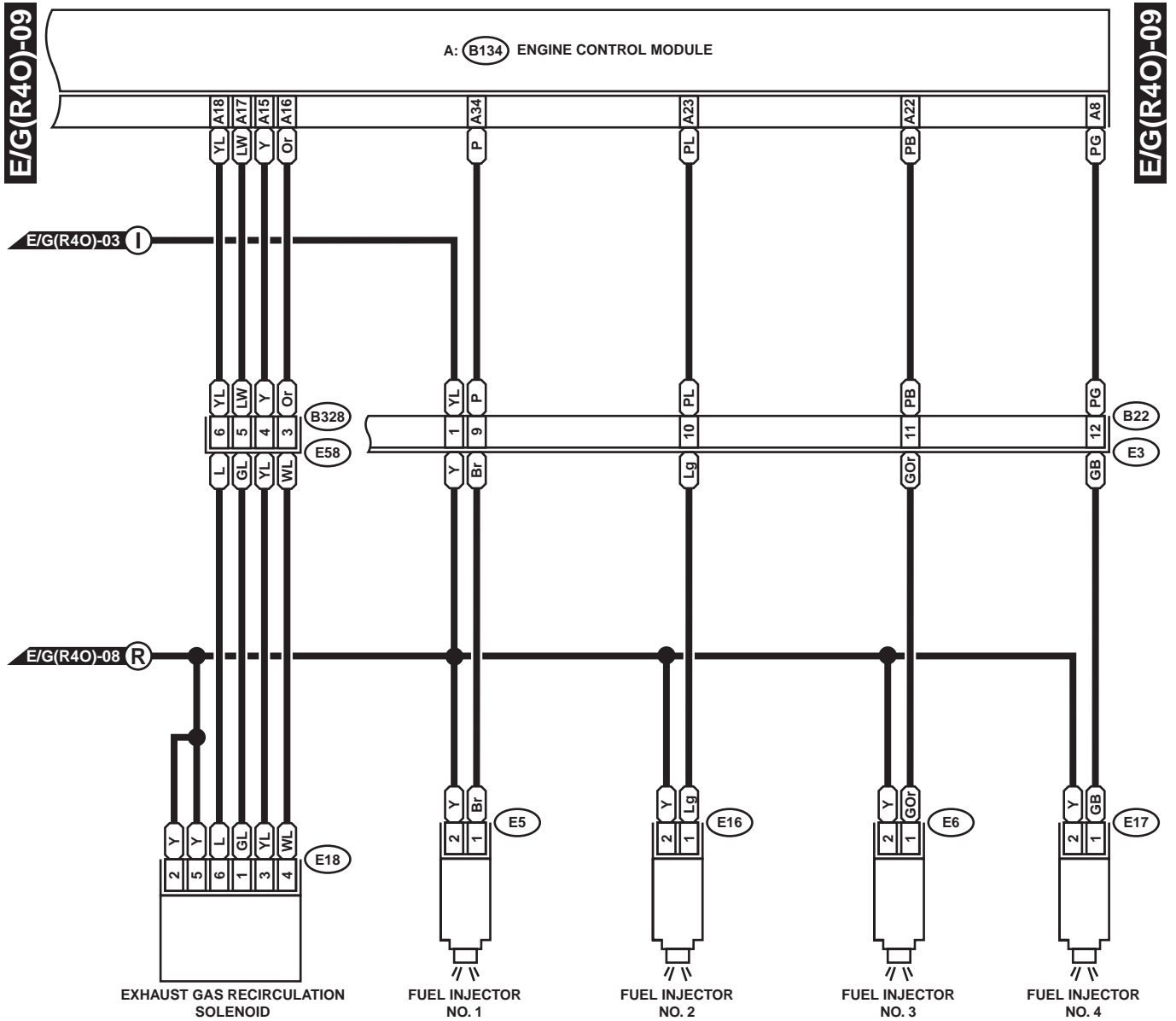
A: B134



WI-00916

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



- (E5) (LIGHT GRAY)
- (E6) (LIGHT GRAY)
- (E16) (LIGHT GRAY)
- (E17) (LIGHT GRAY)

- (B328) (BLACK)
 - (E18) (DARK GRAY)
- | | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

- (B22) (BROWN)
- | | | | |
|----|----|----|----|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

A: (B134)

1	2	3	4			5	6	7	8					
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31	32	33	34	35			

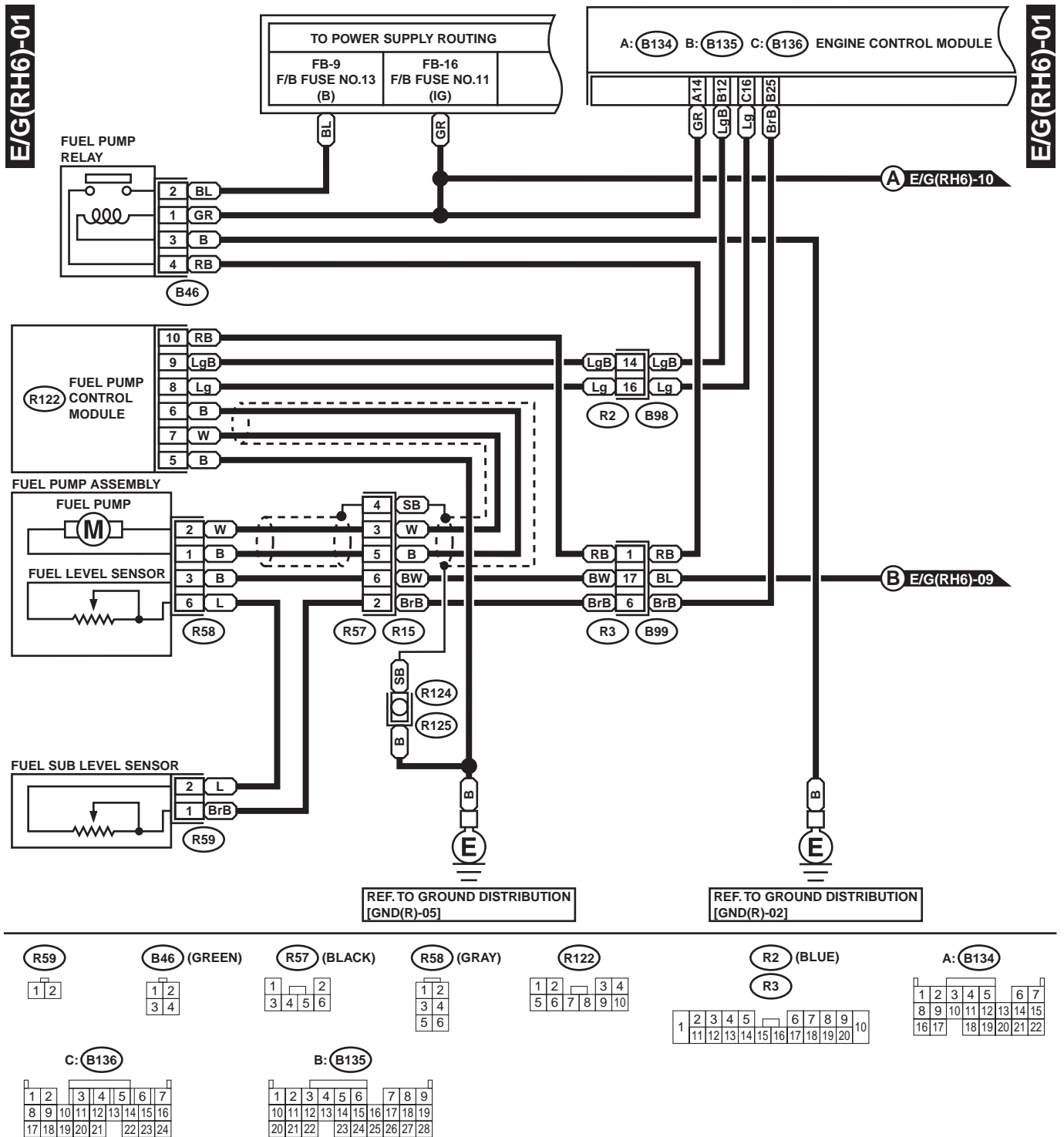


WI-00917

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

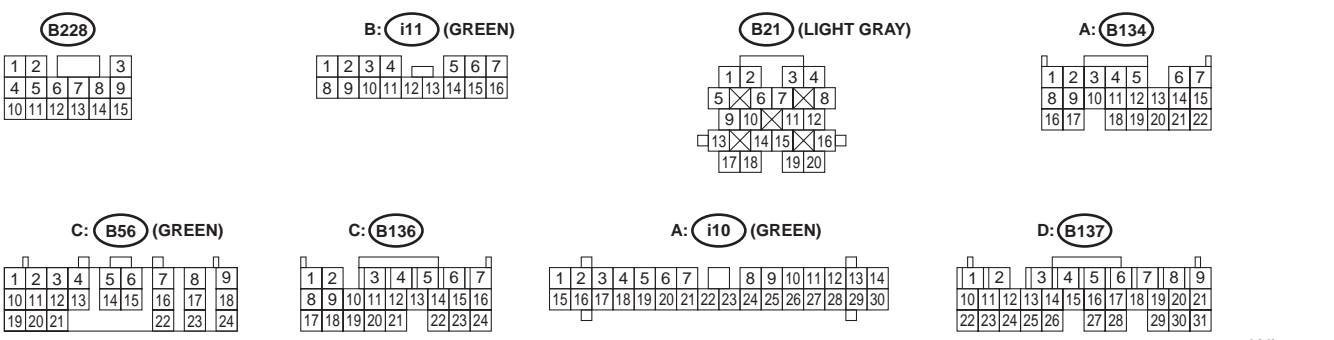
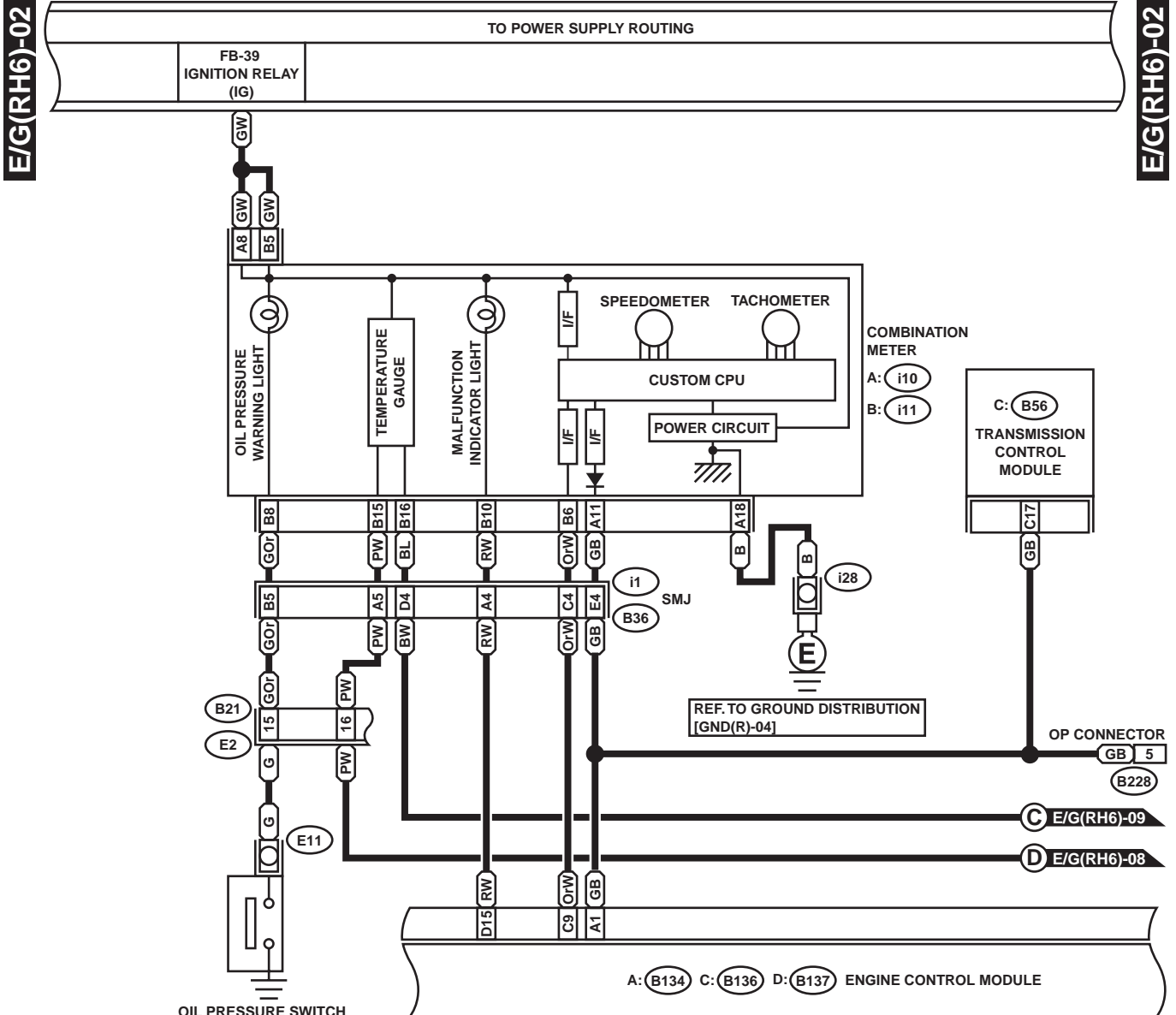
6. RHD 6-CYLINDER ENGINE MODEL



WI-00918

ENGINE ELECTRICAL SYSTEM

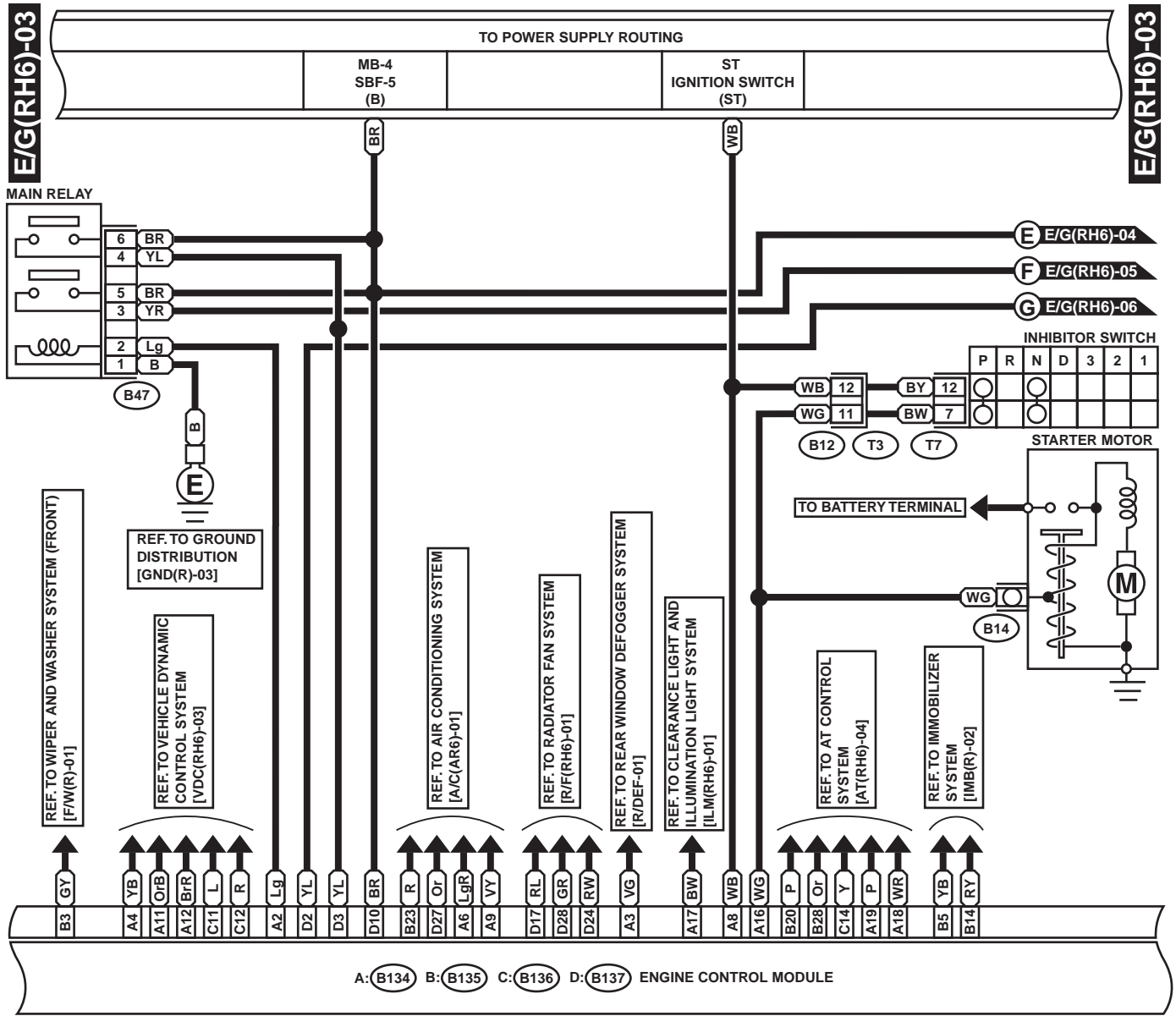
WIRING SYSTEM



WI-00919

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B47 (BROWN)

1	2
3	4
5	6

B12

1	2	3	4
5	6	7	8
9	10	11	12

T7

1	2	3	4	5	6
7	8	9	10	11	12

A: B134

1	2	3	4	5	6	7	
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	

C: B136

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	

B: B135

1	2	3	4	5	6	7	8	9	
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	

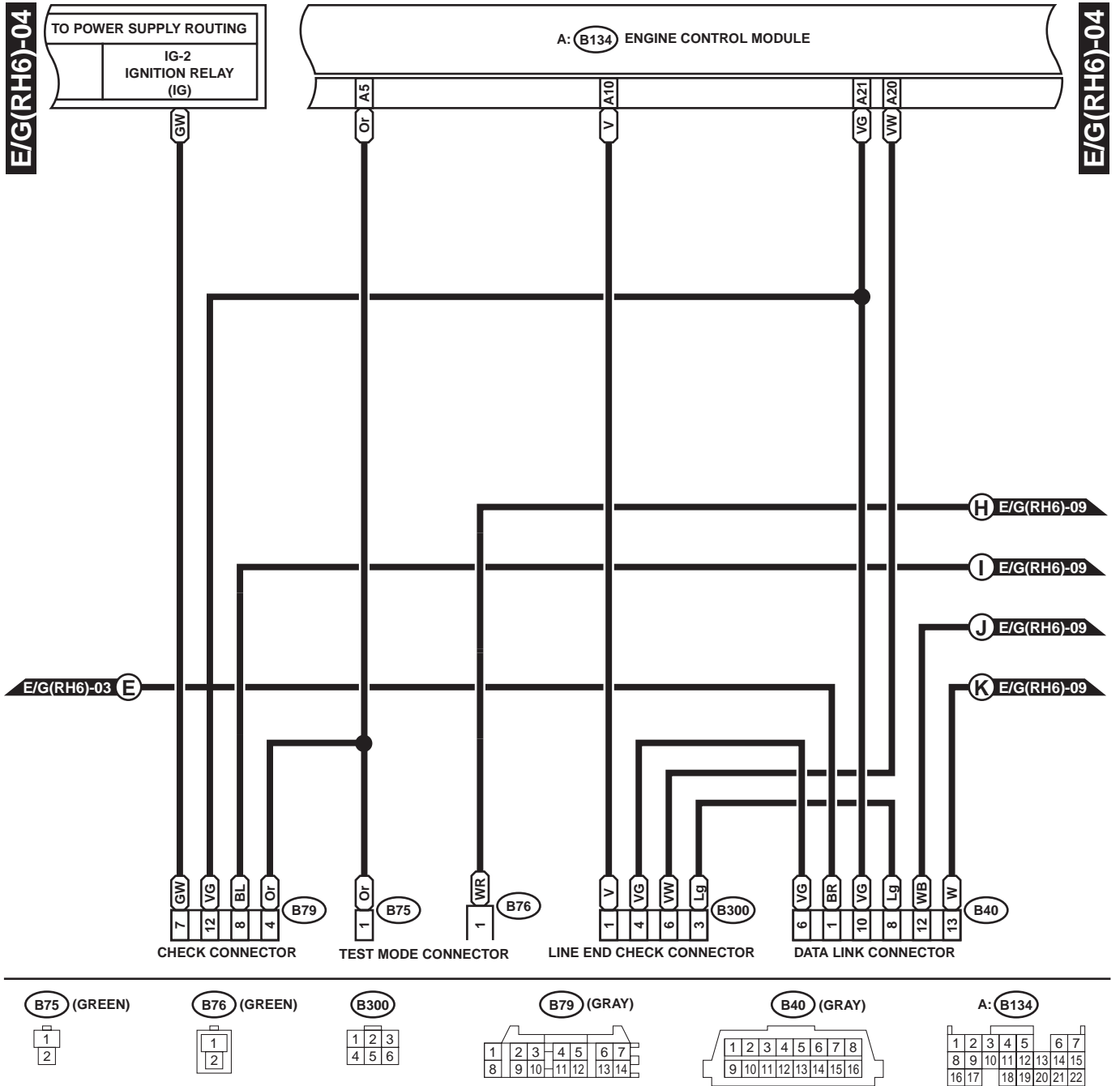
D: B137

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31		

WI-00920

ENGINE ELECTRICAL SYSTEM

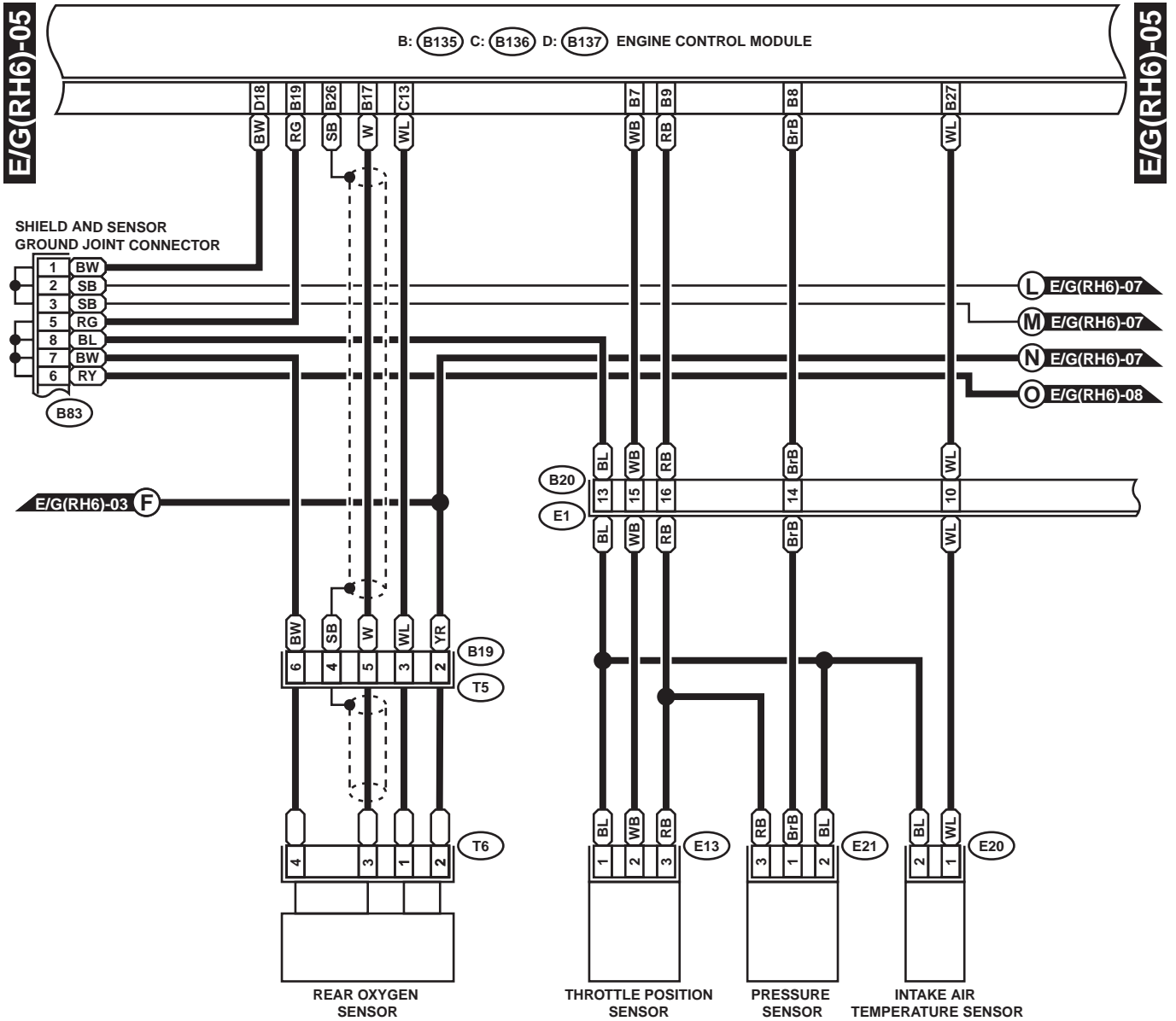
WIRING SYSTEM



WI-00921

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



(E20) (BLACK)



(E13) (BLACK)

(E21) (BLACK)



(T6) (DARK GRAY)



(B19) (DARK GRAY)



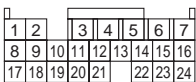
(B20) (GRAY)



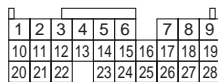
(B83)



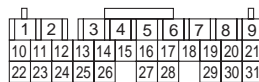
C: (B136)



B: (B135)



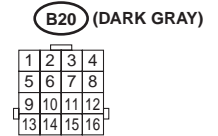
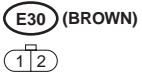
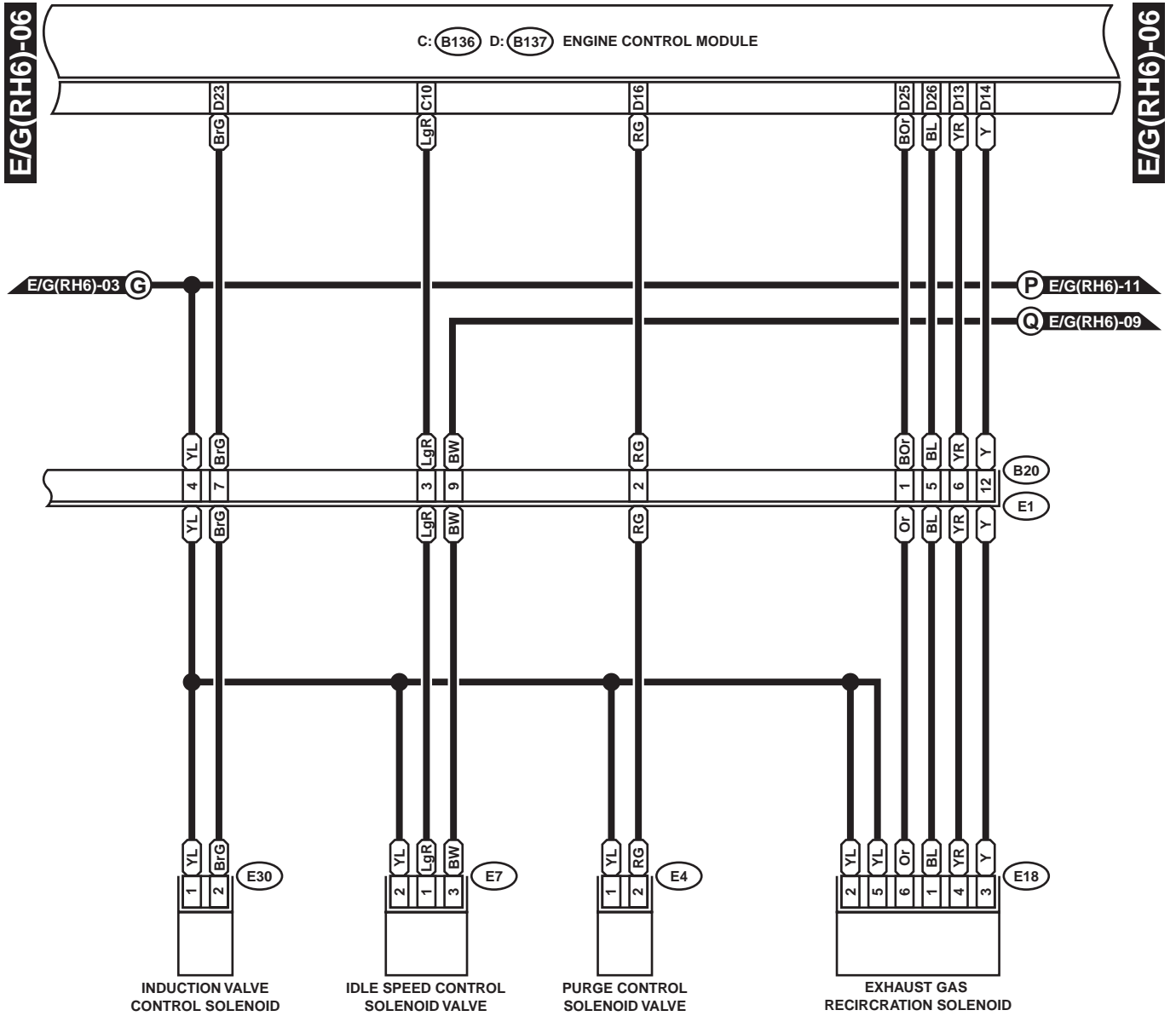
D: (B137)



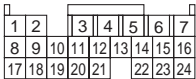
WI-00922

ENGINE ELECTRICAL SYSTEM

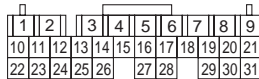
WIRING SYSTEM



C: **B136**



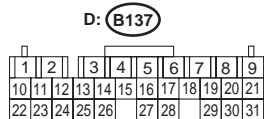
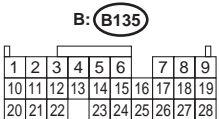
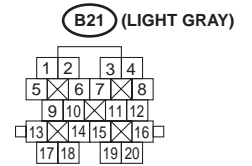
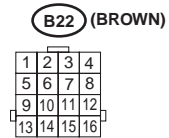
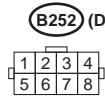
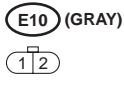
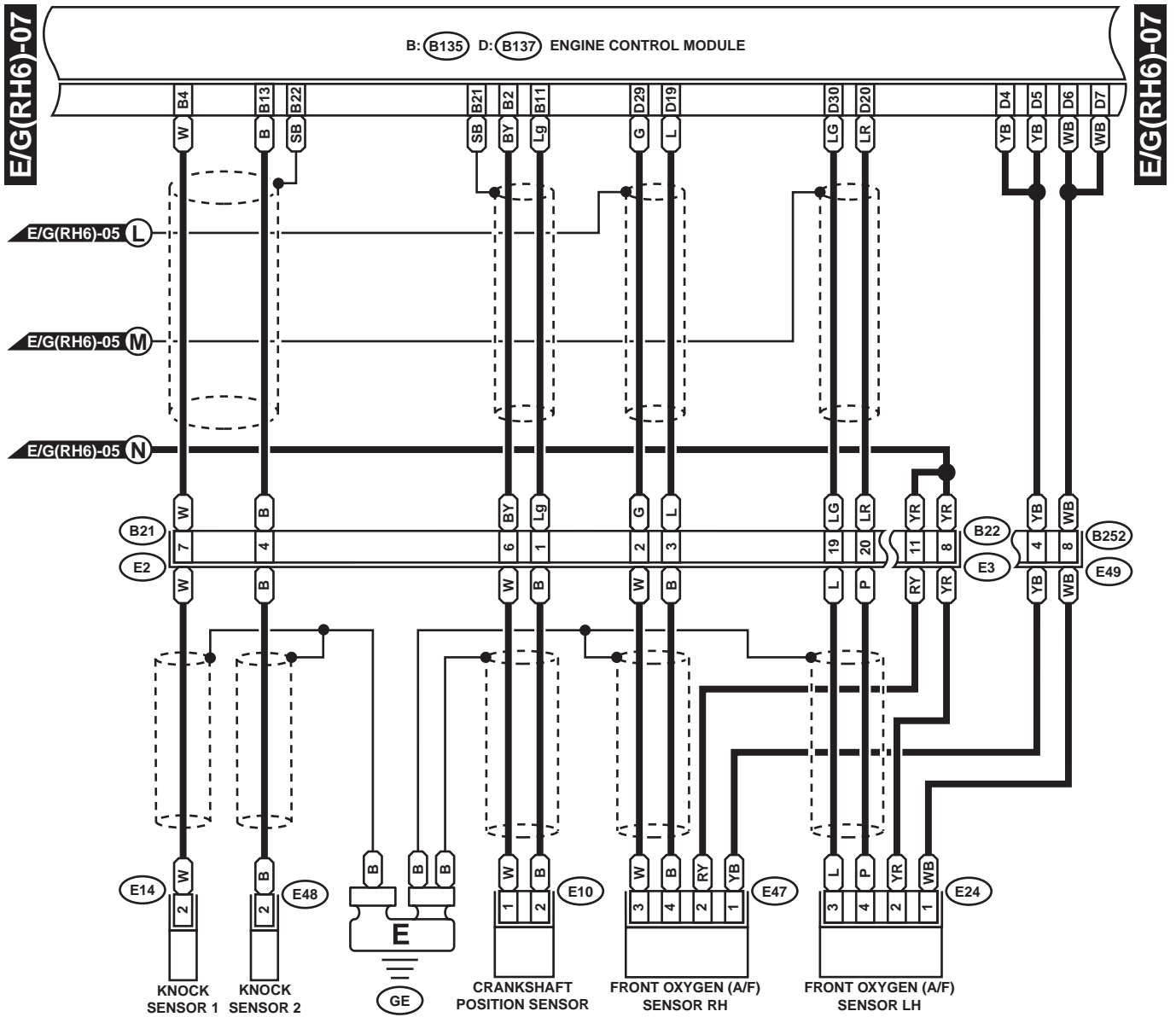
D: **B137**



WI-00923

ENGINE ELECTRICAL SYSTEM

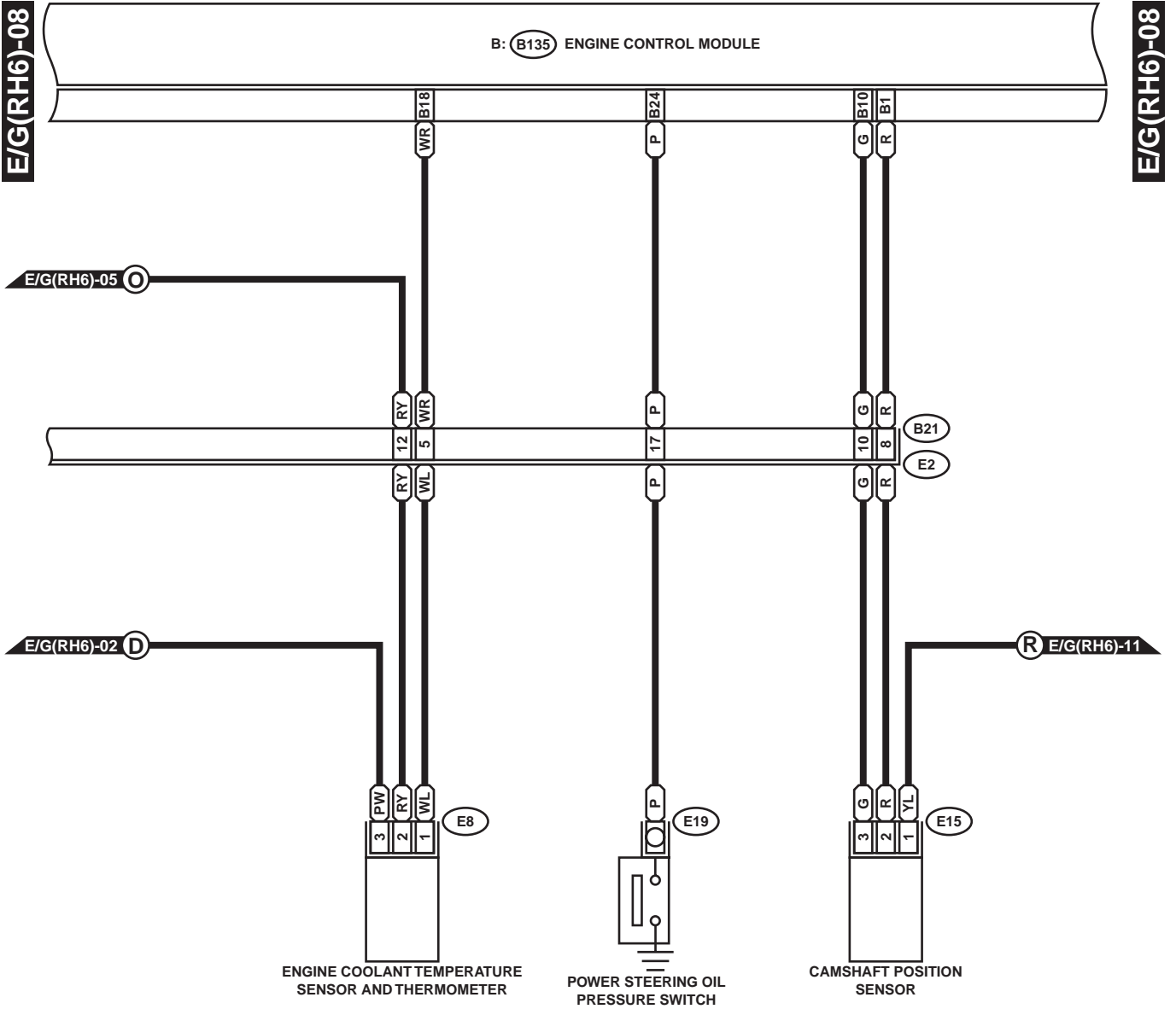
WIRING SYSTEM



WI-00924

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



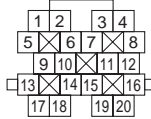
(E15) (GRAY)



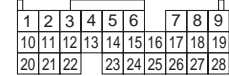
(E8) (LIGHT GRAY)



(B21) (LIGHT GRAY)



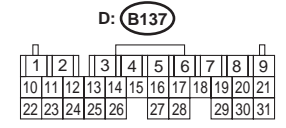
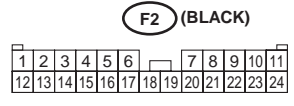
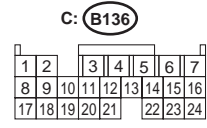
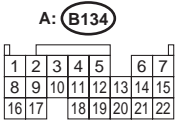
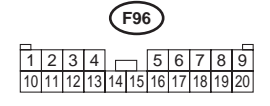
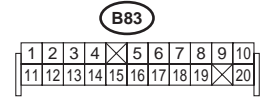
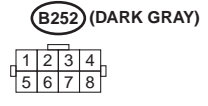
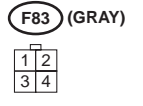
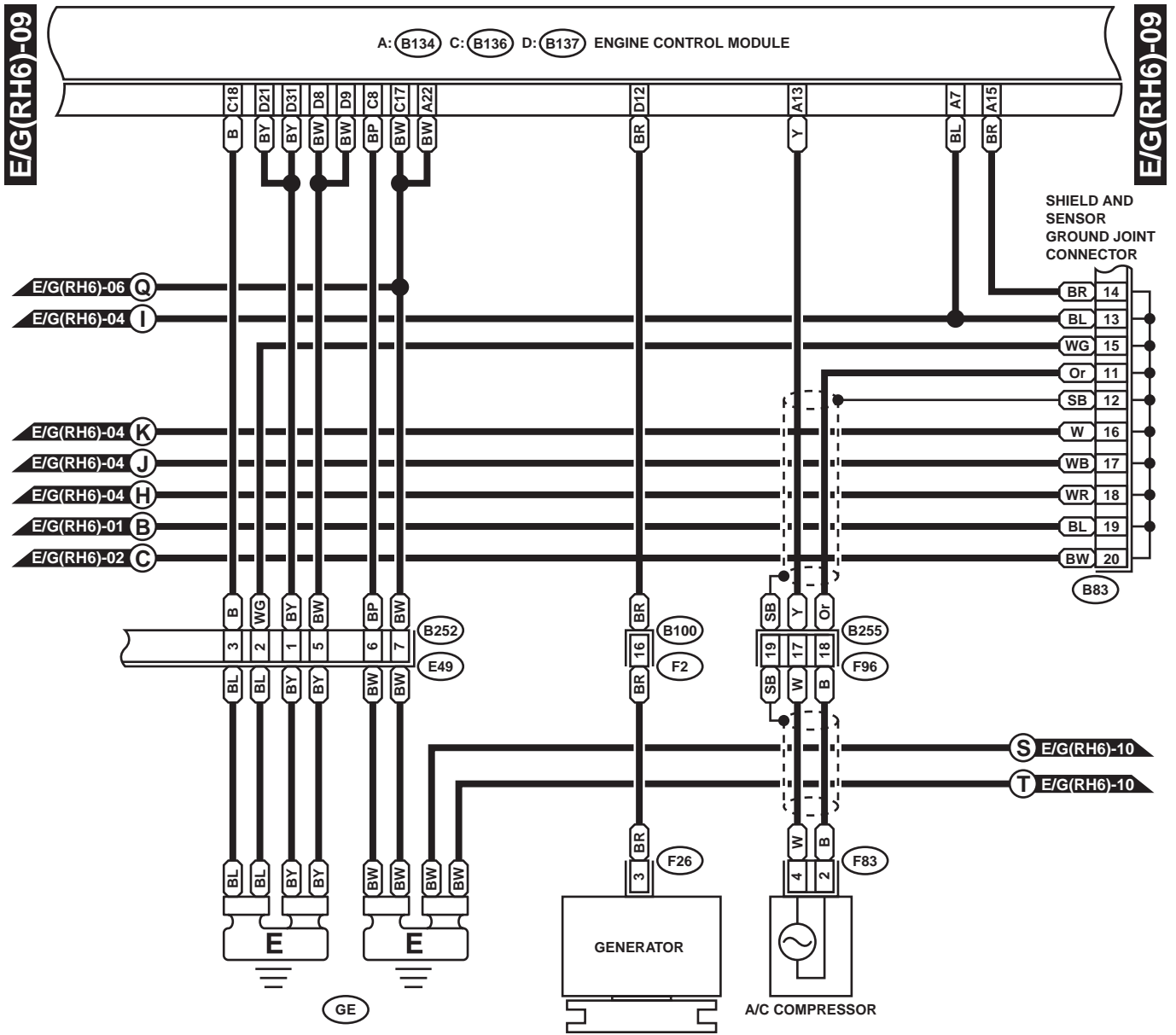
B: (B135)



WI-00925

ENGINE ELECTRICAL SYSTEM

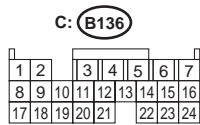
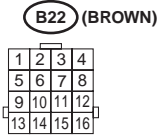
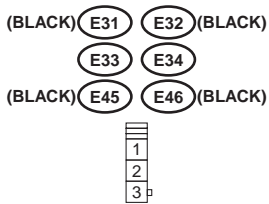
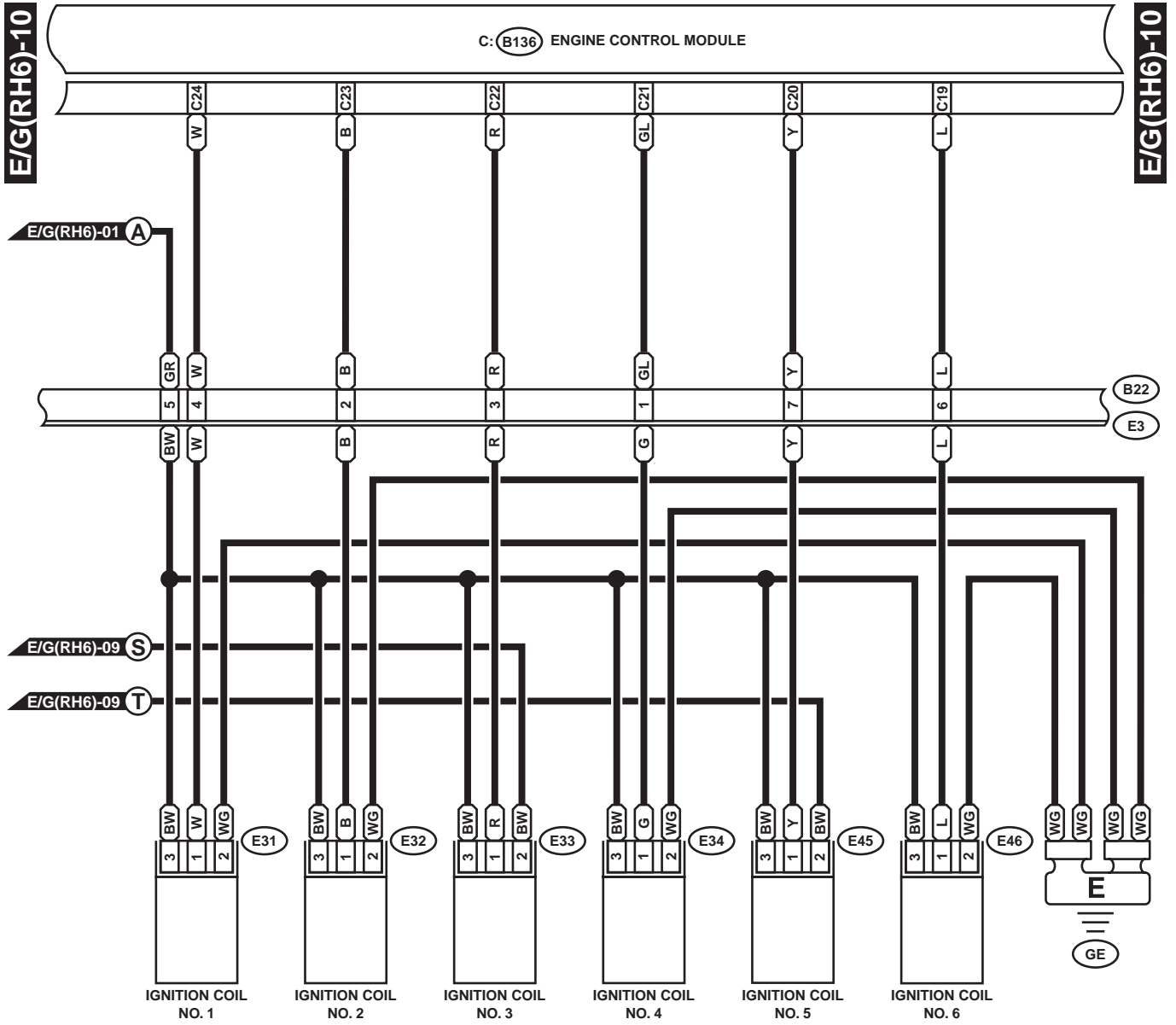
WIRING SYSTEM



WI-00926

ENGINE ELECTRICAL SYSTEM

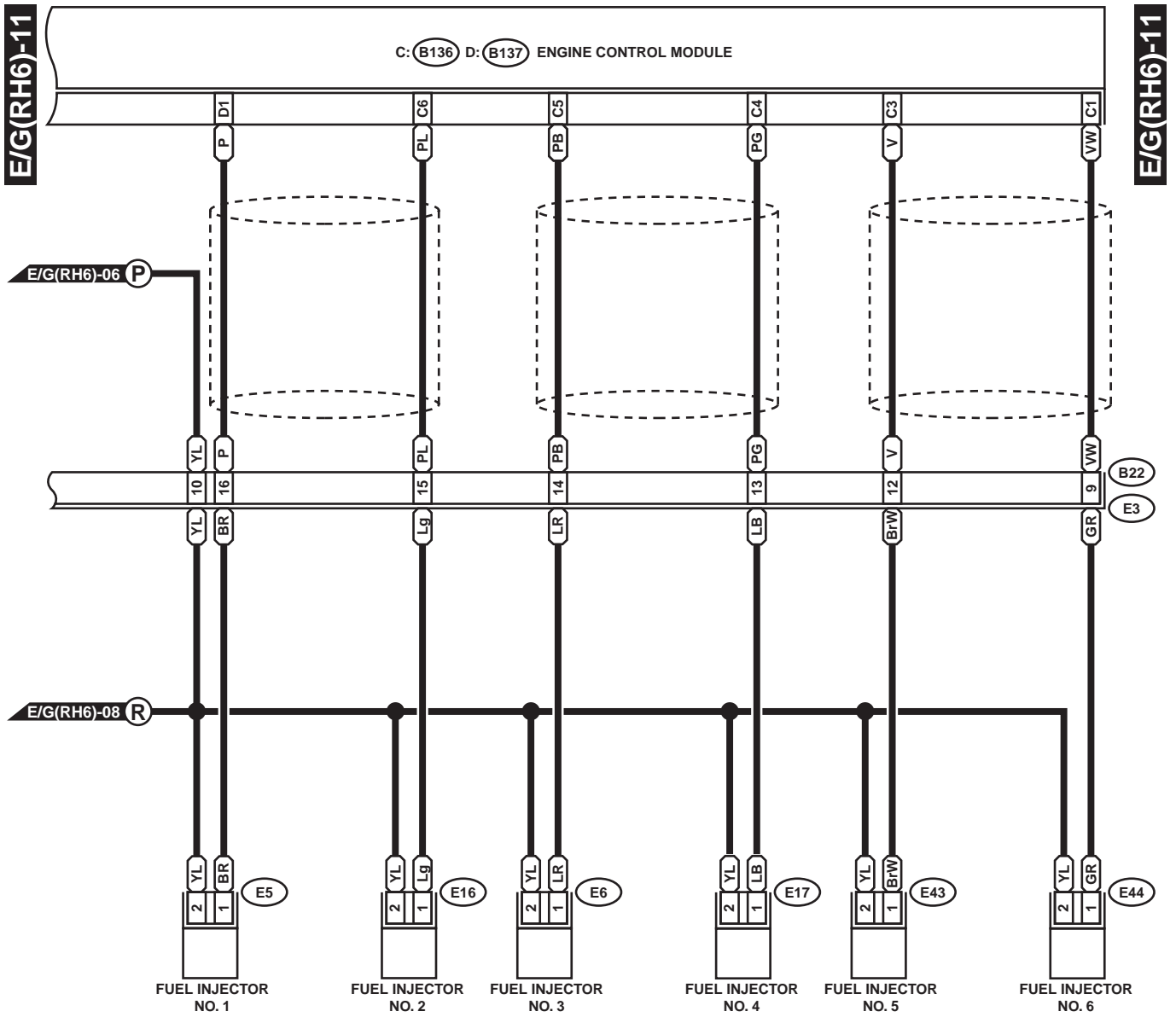
WIRING SYSTEM



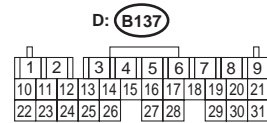
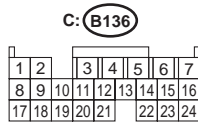
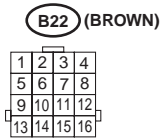
WI-00927

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



- (GRAY) E5 (GRAY) E6 (GRAY)
- (GRAY) E16 (GRAY) E17 (GRAY)
- (GRAY) E43 (GRAY) E44 (GRAY)
- 1 2

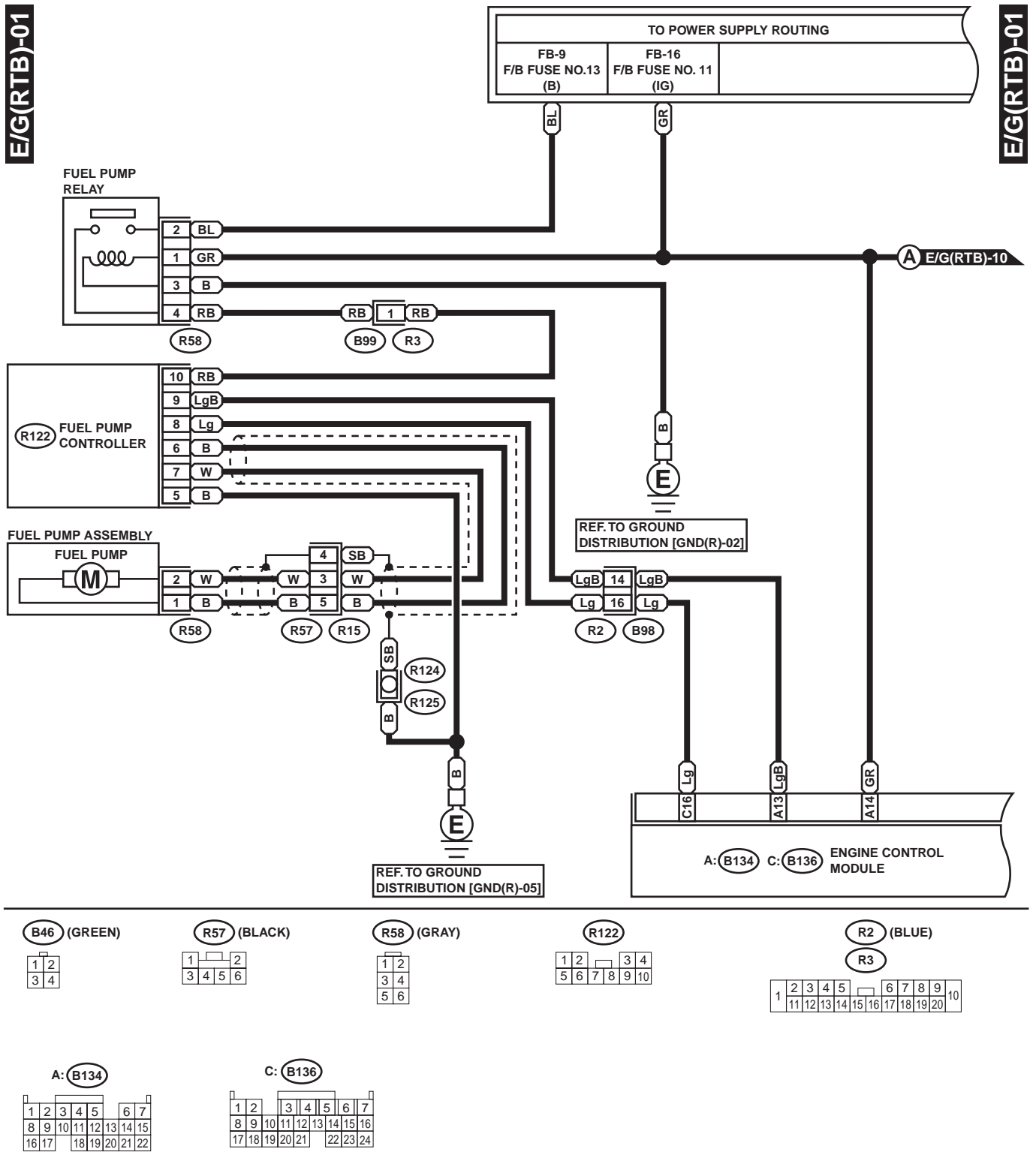


WI-00928

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

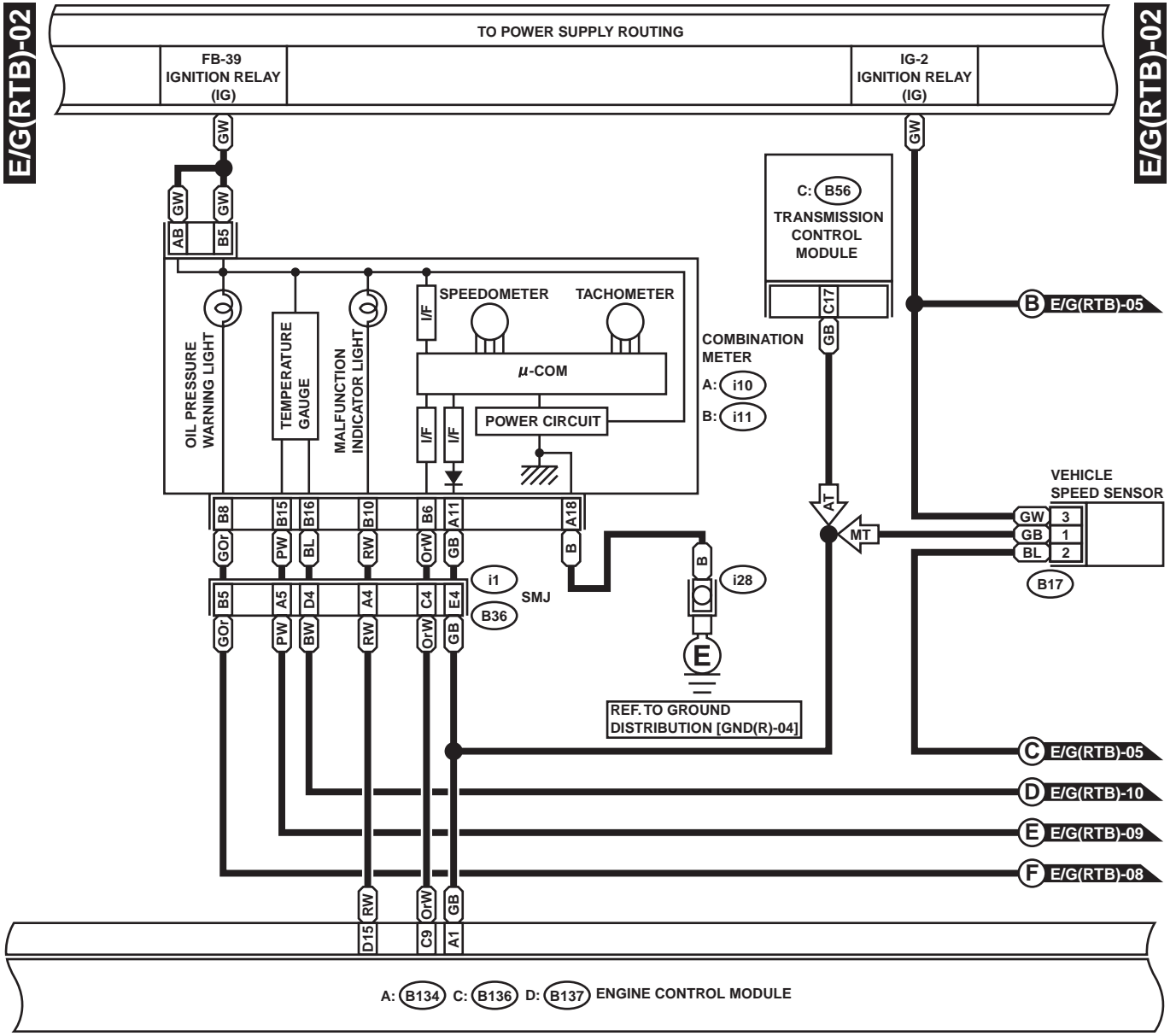
7. RHD TURBO ENGINE MODEL



WI-00929

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B17

1	2	3
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B: i11 (GREEN)

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

A: B134

1	2	3	4	5	6	7	
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	

C: B136

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	

C: B56 (GREEN)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24			

A: i10 (GREEN)

1	2	3	4	5	6	7	8	9	10	11	12	13	14		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

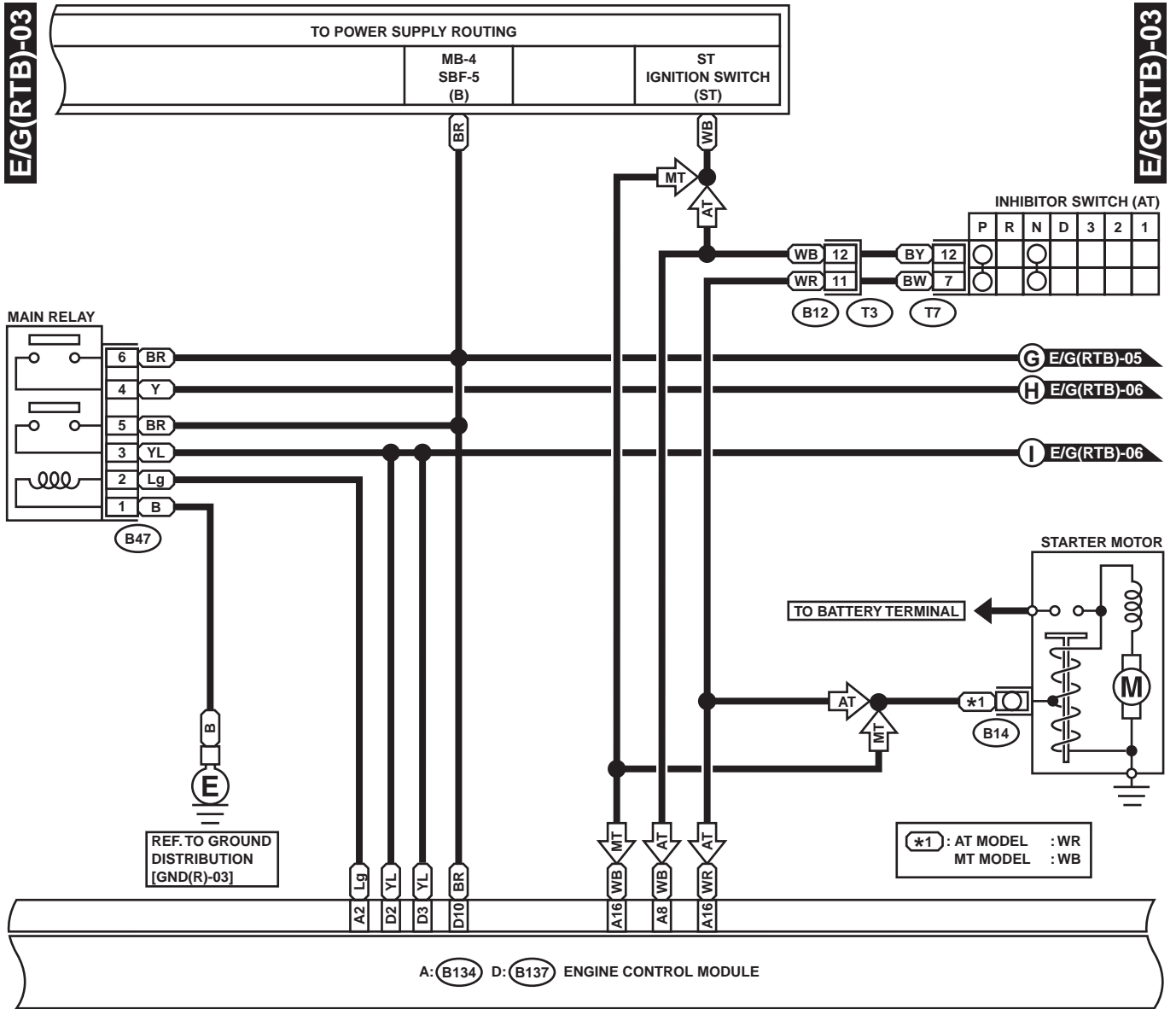
D: B137

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31		

WI-00930

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B47 (BROWN)

1	2
3	4
5	6

B12

1	2	3	4
5	6	7	8
9	10	11	12

T7

1	2	3	4	5	6
7	8	9	10	11	12

A: B134

1	2	3	4	5	6	7	
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	

D: B137

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31		

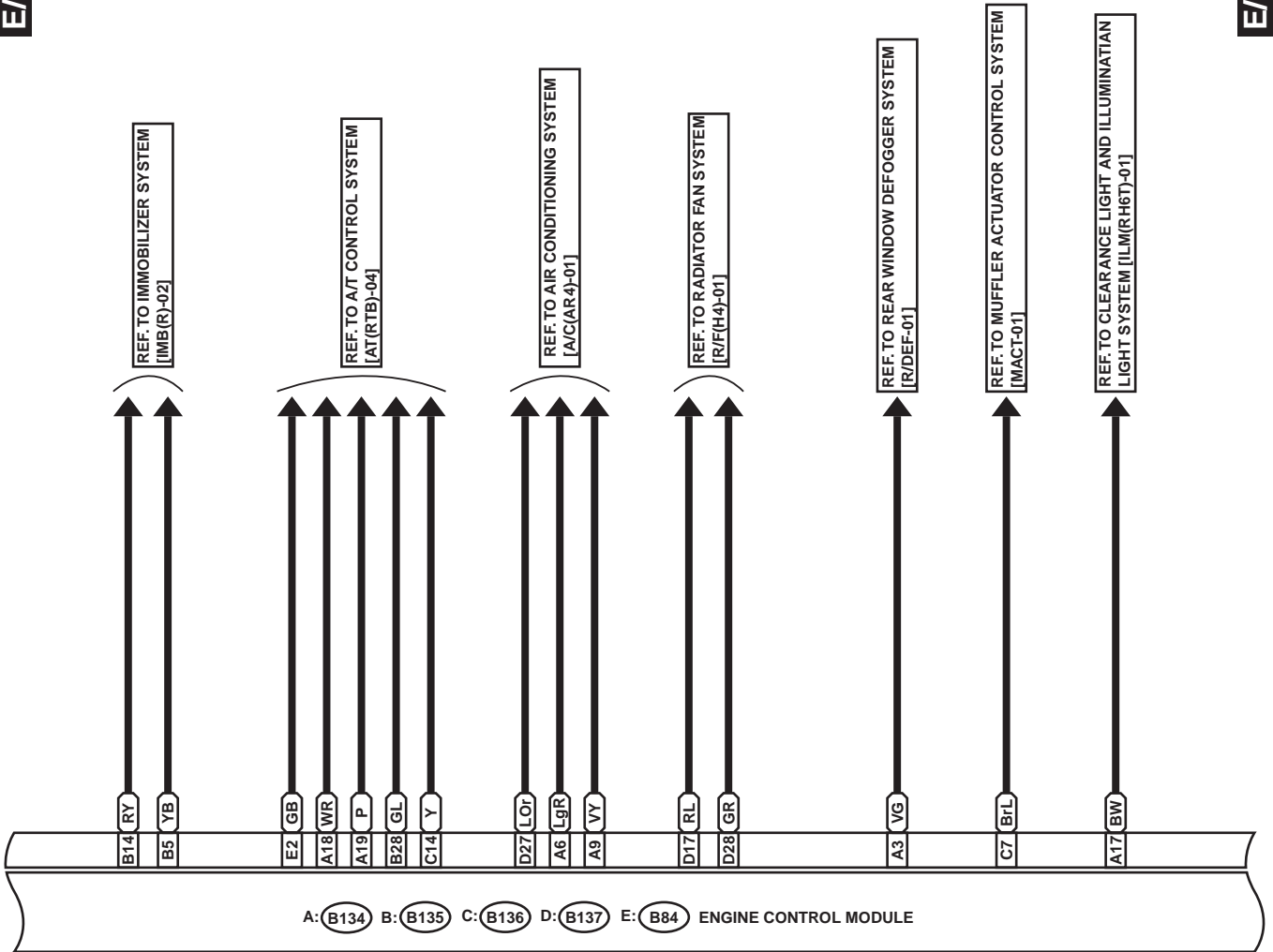
WI-00931

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(RTB)-04

E/G(RTB)-04



E: B84

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	

A: B134

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24				

C: B136

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24				

B: B135

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28								

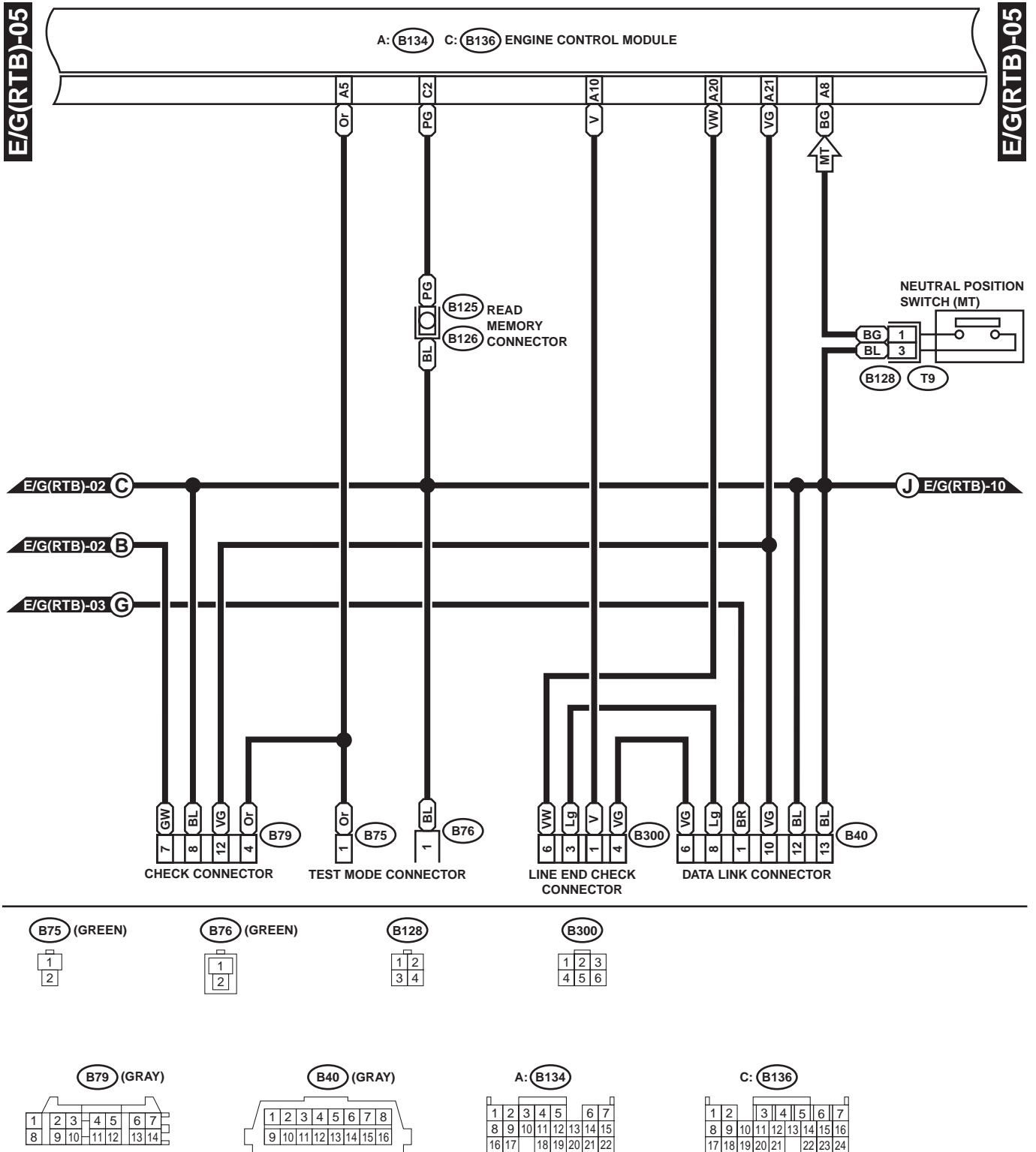
D: B137

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31					

WI-00932

ENGINE ELECTRICAL SYSTEM

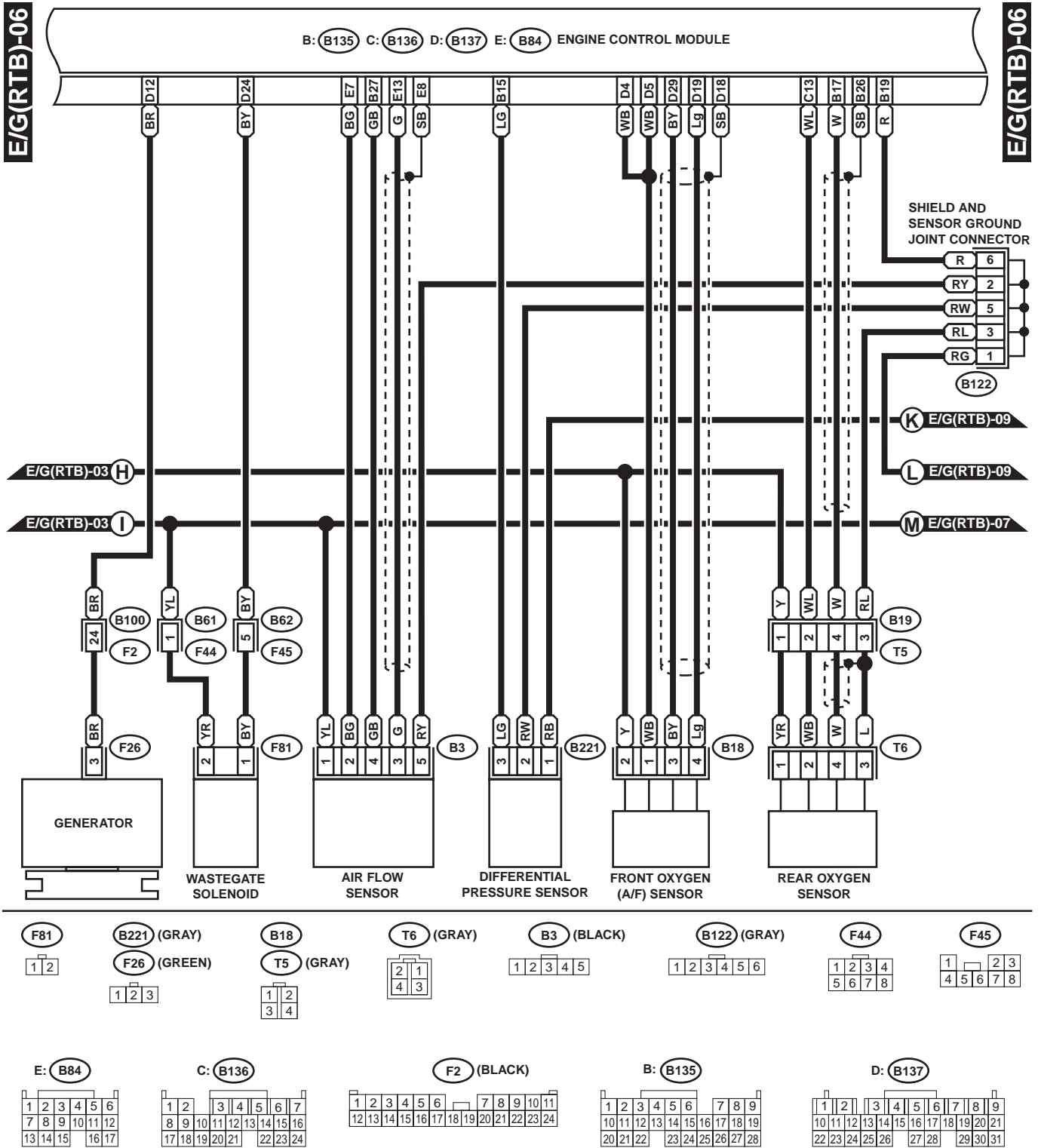
WIRING SYSTEM



WI-00933

ENGINE ELECTRICAL SYSTEM

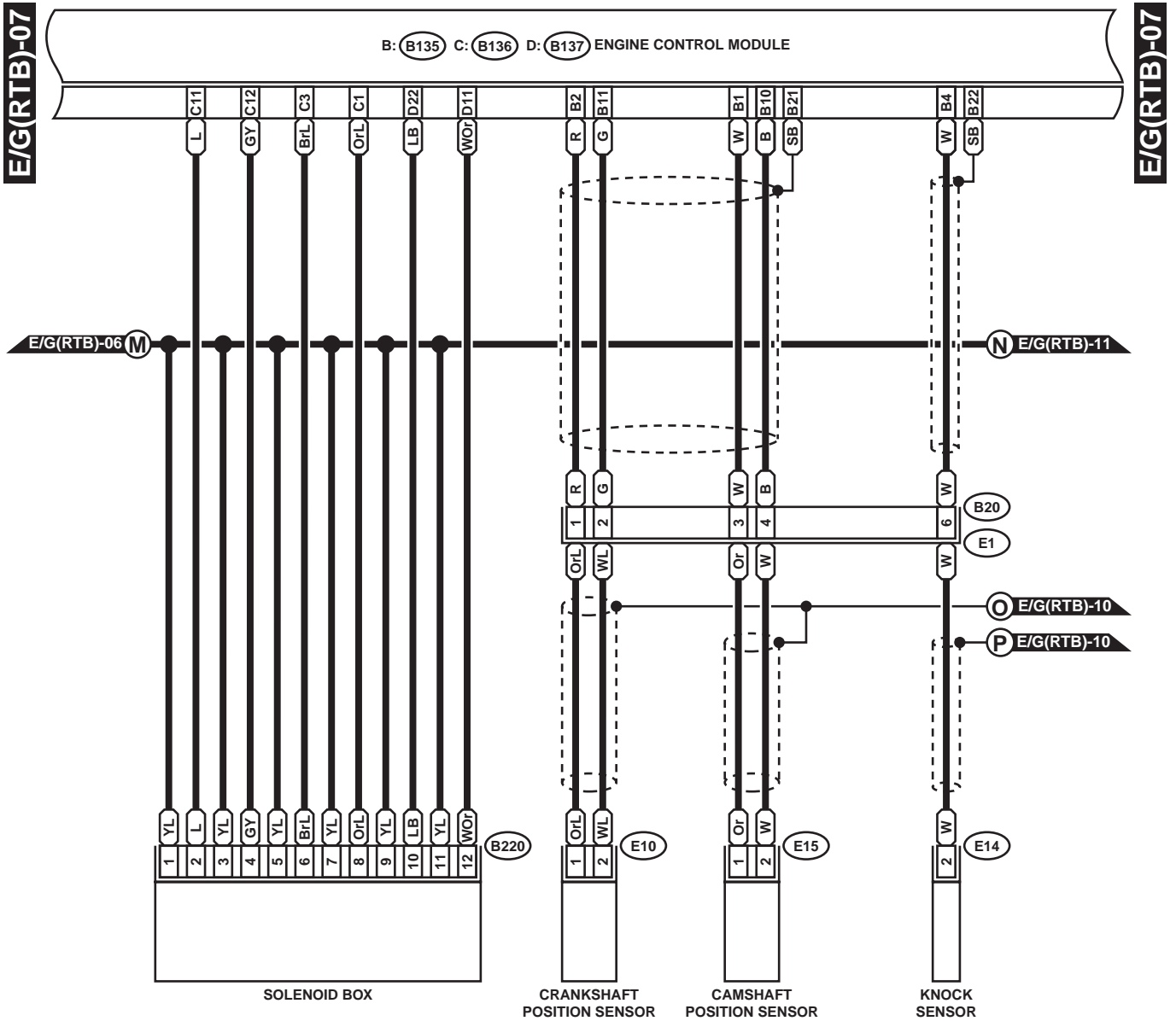
WIRING SYSTEM



WI-00934

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



(E10) (GRAY)

(B20) (LIGHT GRAY)

(B220)

C: (B136)

B: (B135)

D: (B137)

(E14) (GRAY)

1	2	3	4
5	6	7	8
9	10	11	12

1	2	3	4
5	6	7	8
9	10	11	12

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36

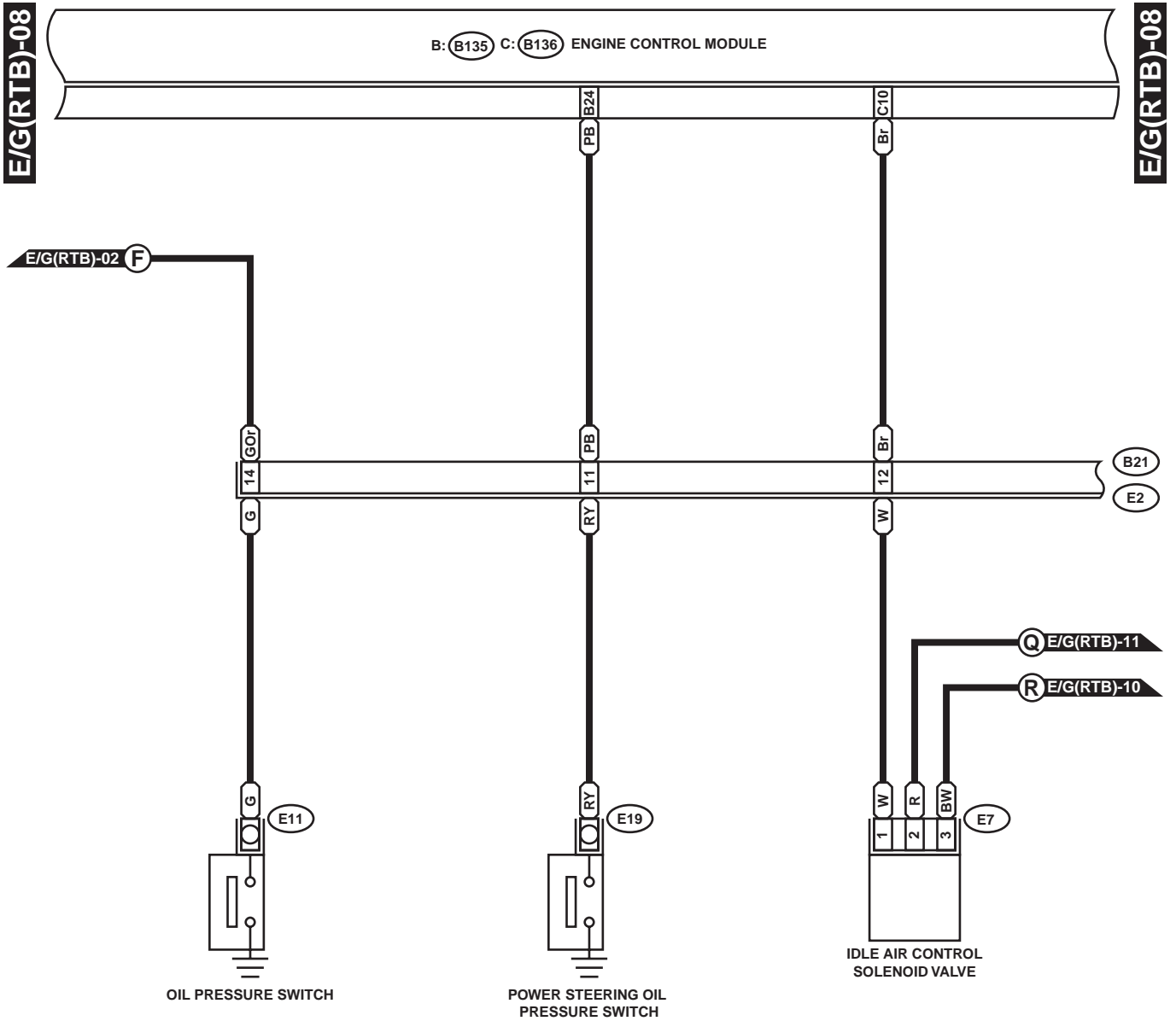
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36

1	2
---	---

WI-00935

ENGINE ELECTRICAL SYSTEM

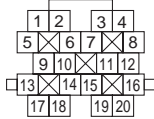
WIRING SYSTEM



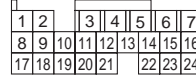
E7 (BLACK)



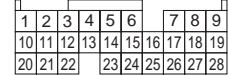
B21 (BLACK)



C: (B136)



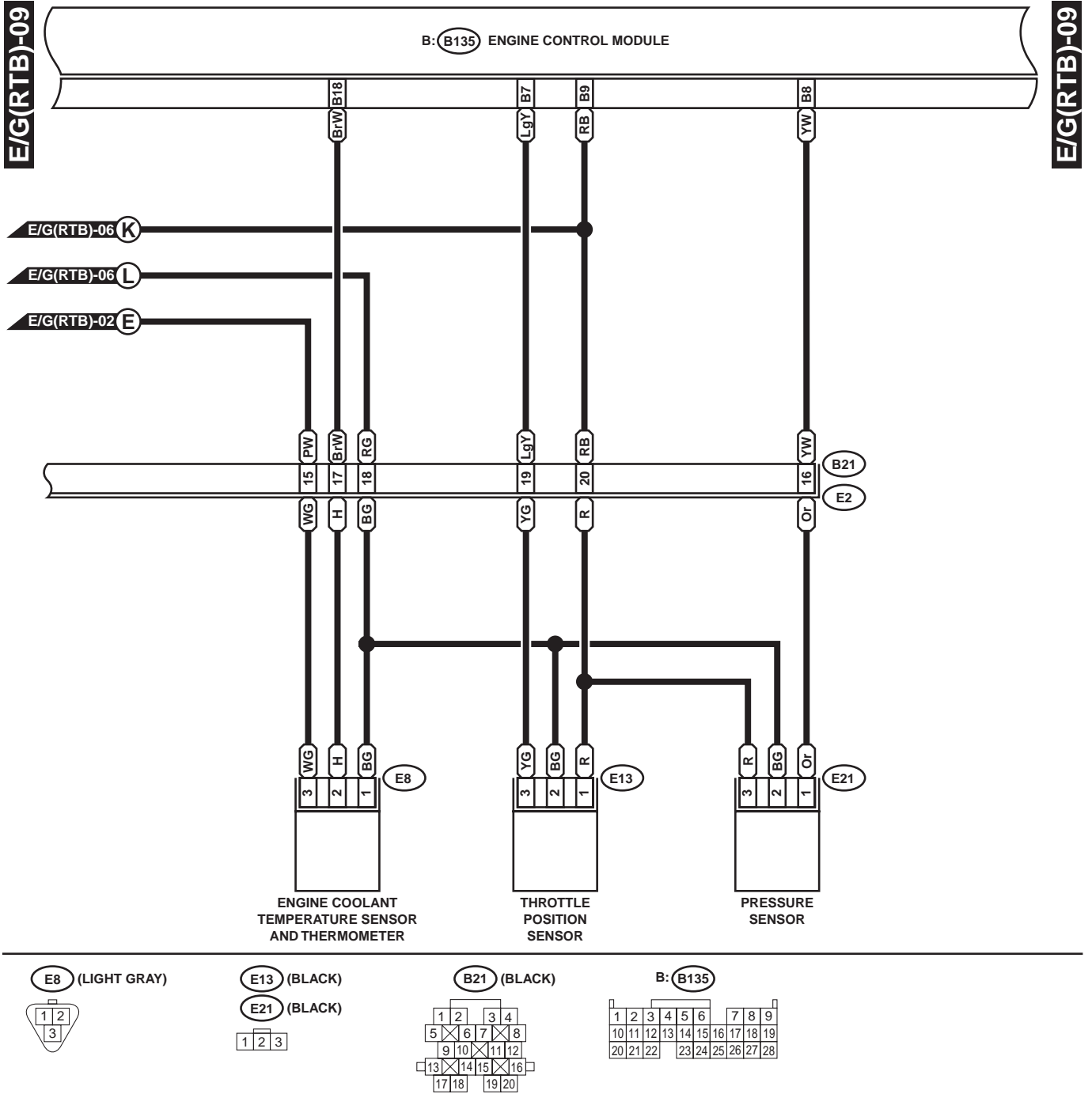
B: (B135)



WI-00936

ENGINE ELECTRICAL SYSTEM

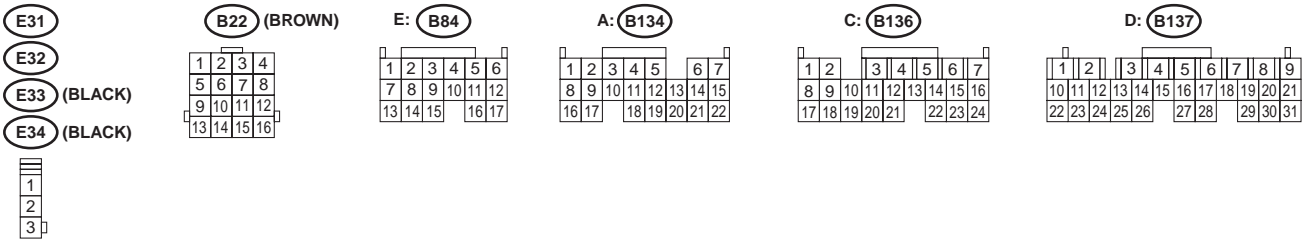
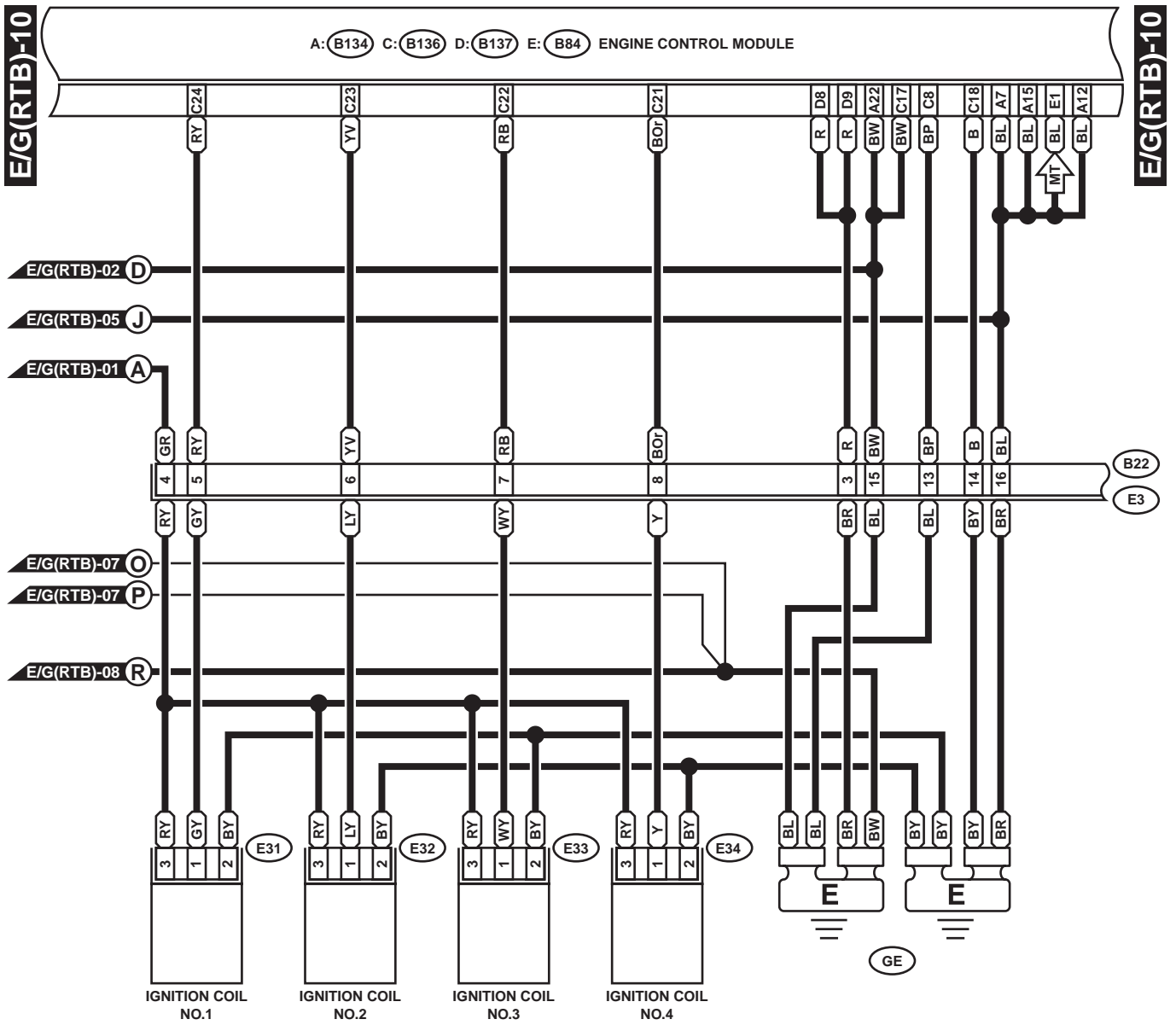
WIRING SYSTEM



WI-00937

ENGINE ELECTRICAL SYSTEM

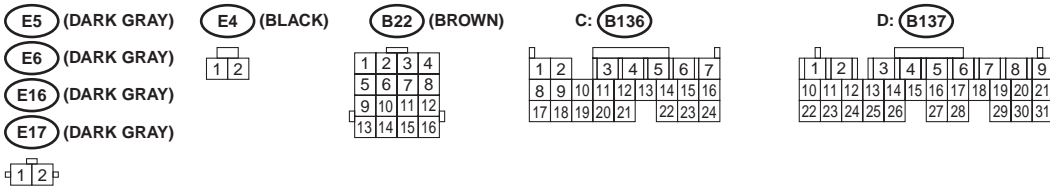
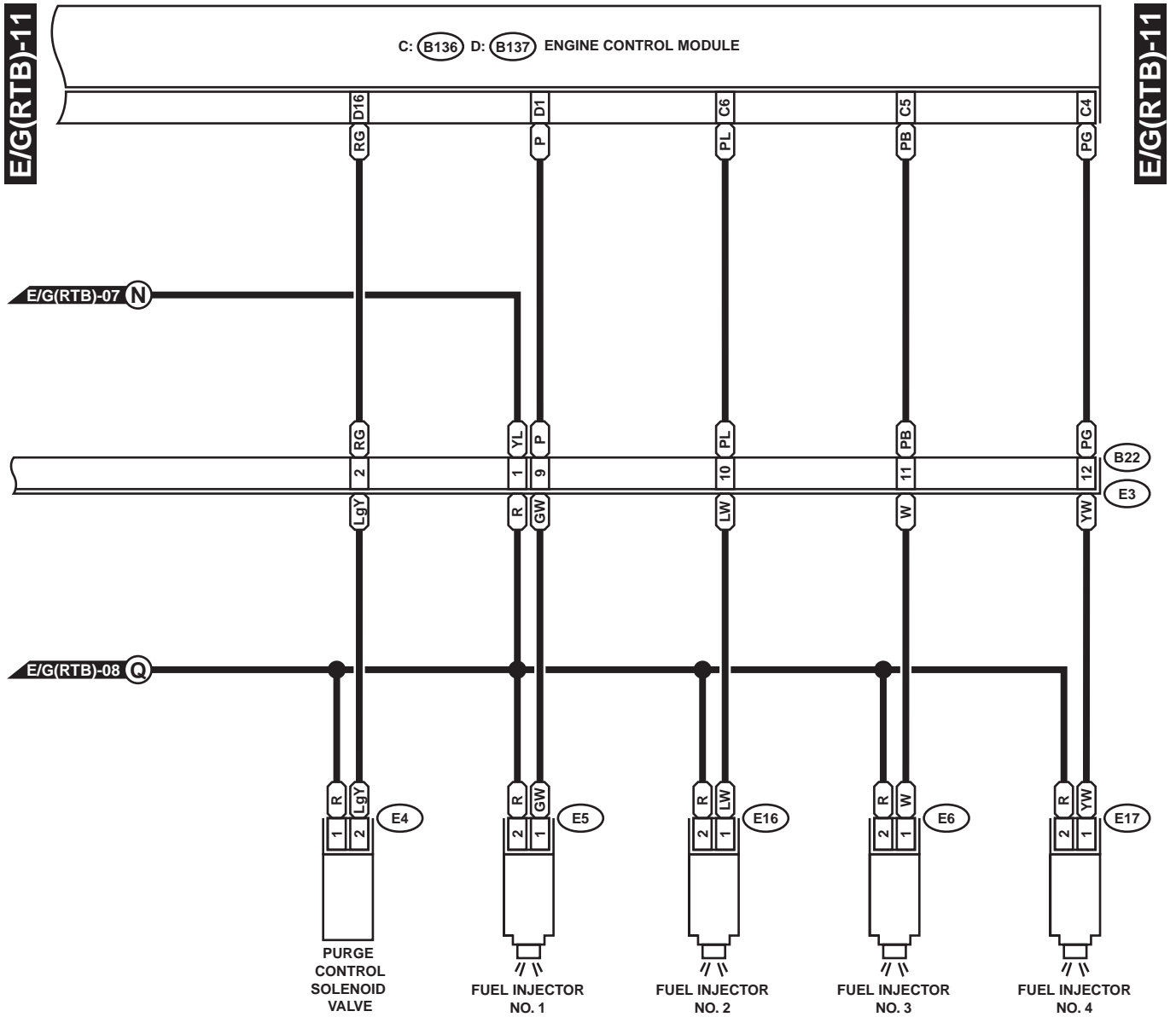
WIRING SYSTEM



WI-00938

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



WI-00939

MEMO:

FUEL GAUGE SYSTEM

WIRING SYSTEM

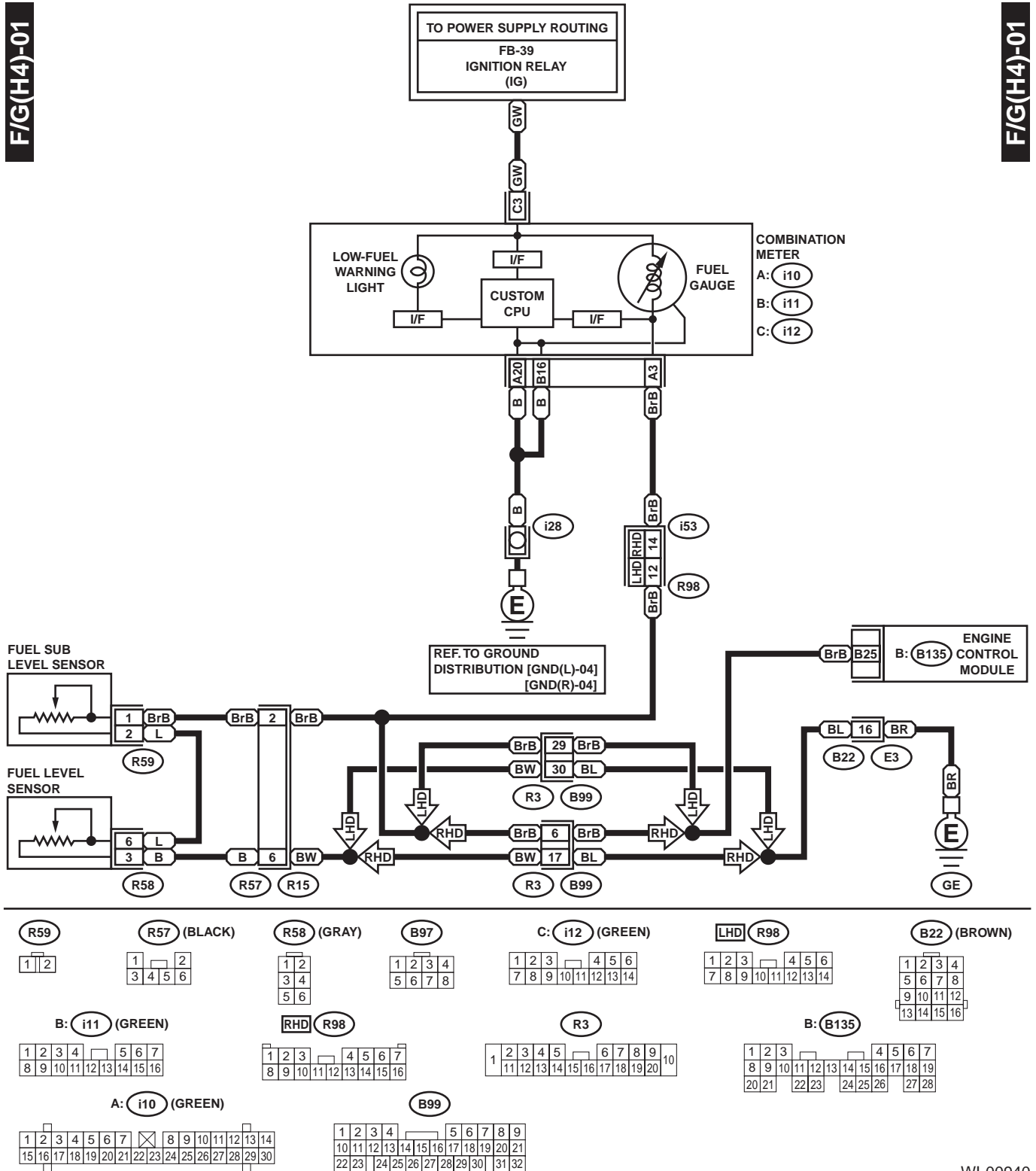
16. Fuel Gauge System

A: SCHEMATIC

1. 4-CYLINDER NON-TURBO ENGINE MODEL

F/G(H4)-01

F/G(H4)-01



WI-00940

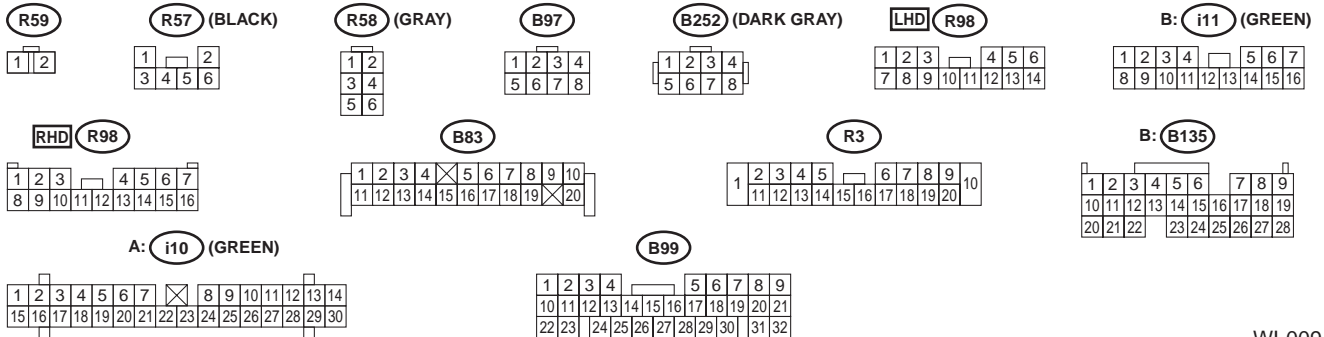
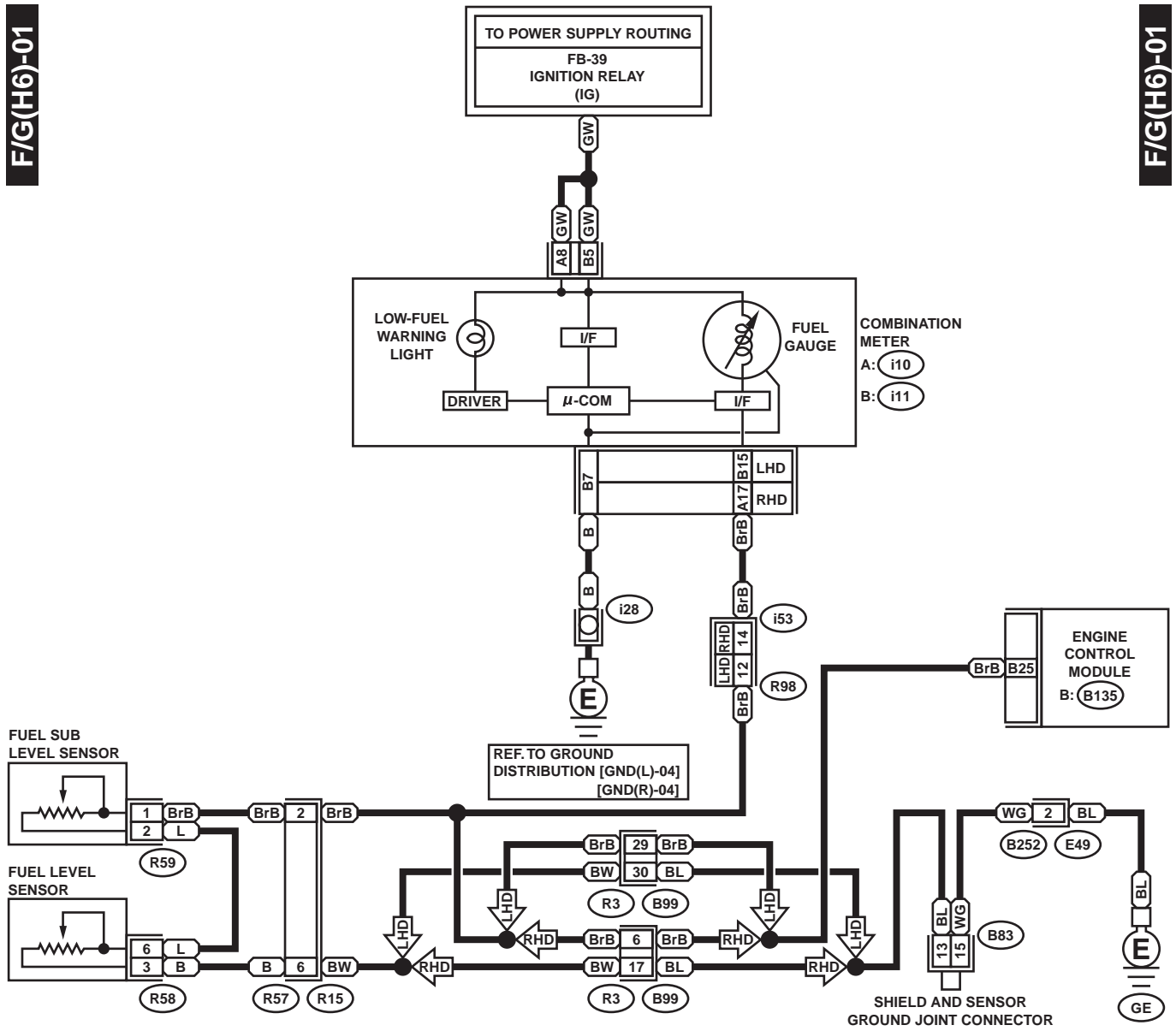
FUEL GAUGE SYSTEM

WIRING SYSTEM

2. 6-CYLINDER ENGINE MODEL

F/G(H6)-01

F/G(H6)-01



WI-00941

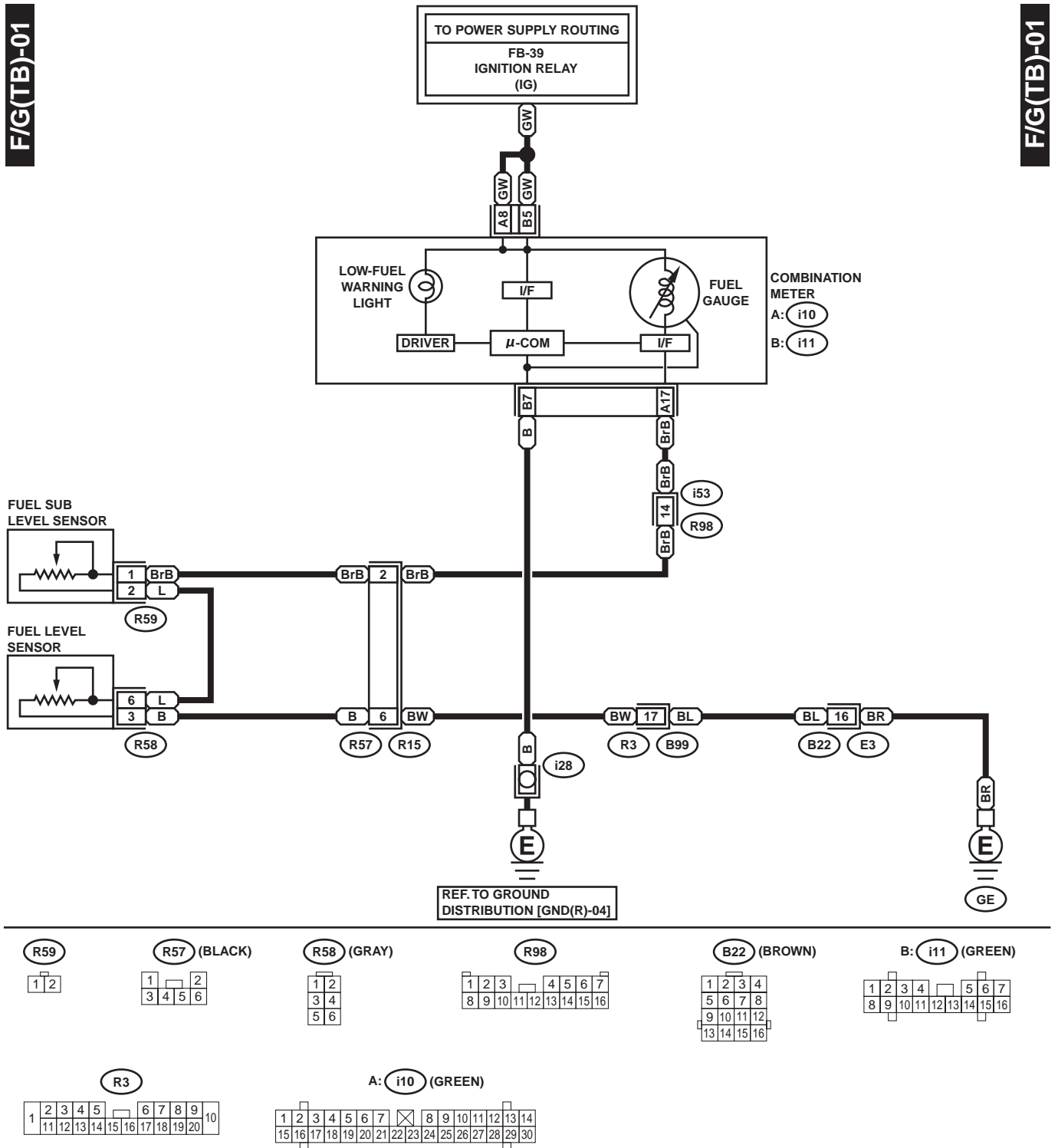
FUEL GAUGE SYSTEM

WIRING SYSTEM

3. TURBO ENGINE MODEL

F/G(TB)-01

F/G(TB)-01



WI-00942

MEMO:

FULL-TIME DUAL-RANGE SYSTEM

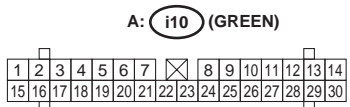
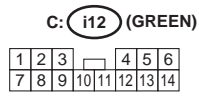
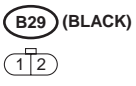
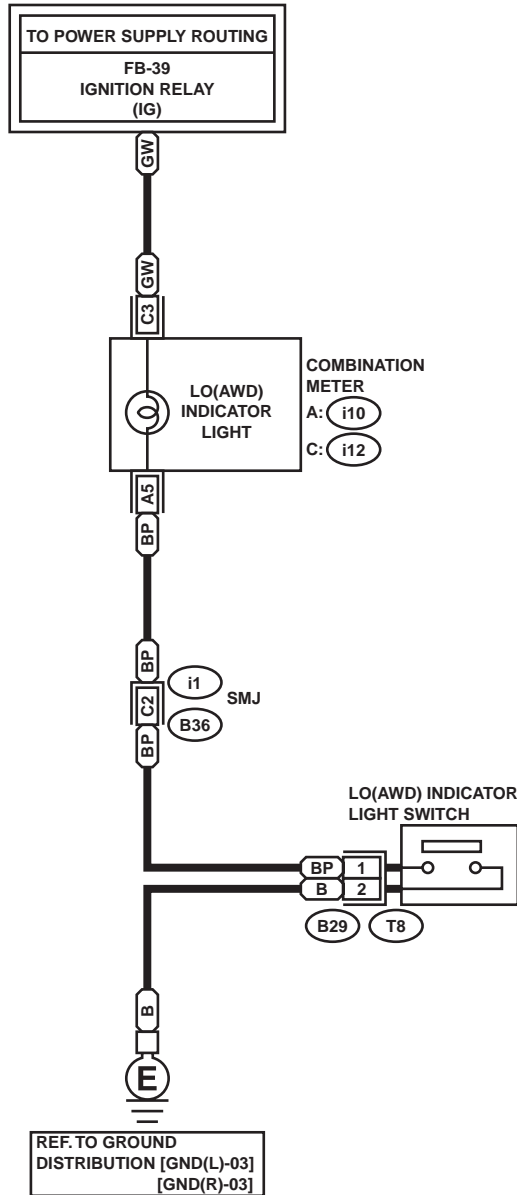
WIRING SYSTEM

17.Full-Time Dual-Range System

A: SCHEMATIC

FTDR-01

FTDR-01



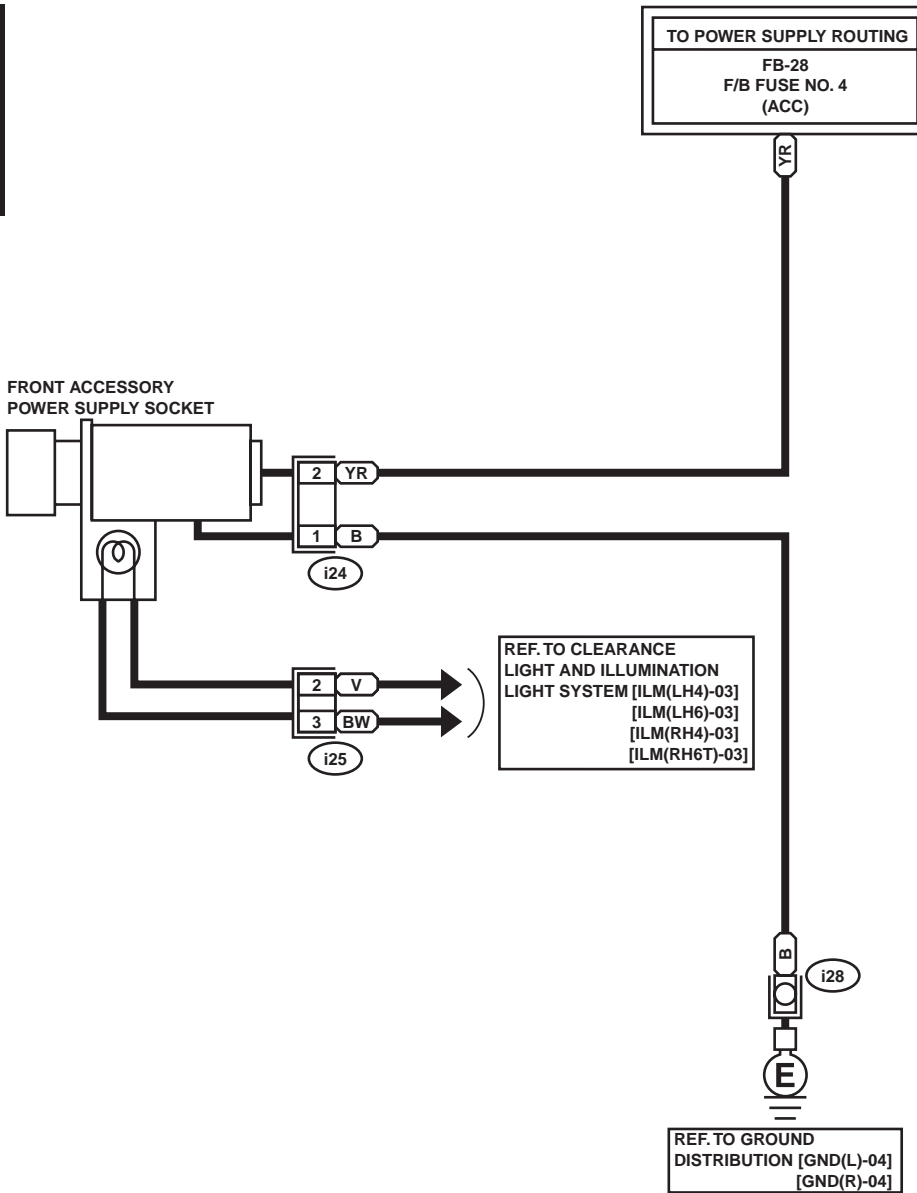
WI-00943

18.Front Accessory Power Supply System

A: SCHEMATIC

FAPS-01

FAPS-01



HEADLIGHT BEAM LEVELER SYSTEM

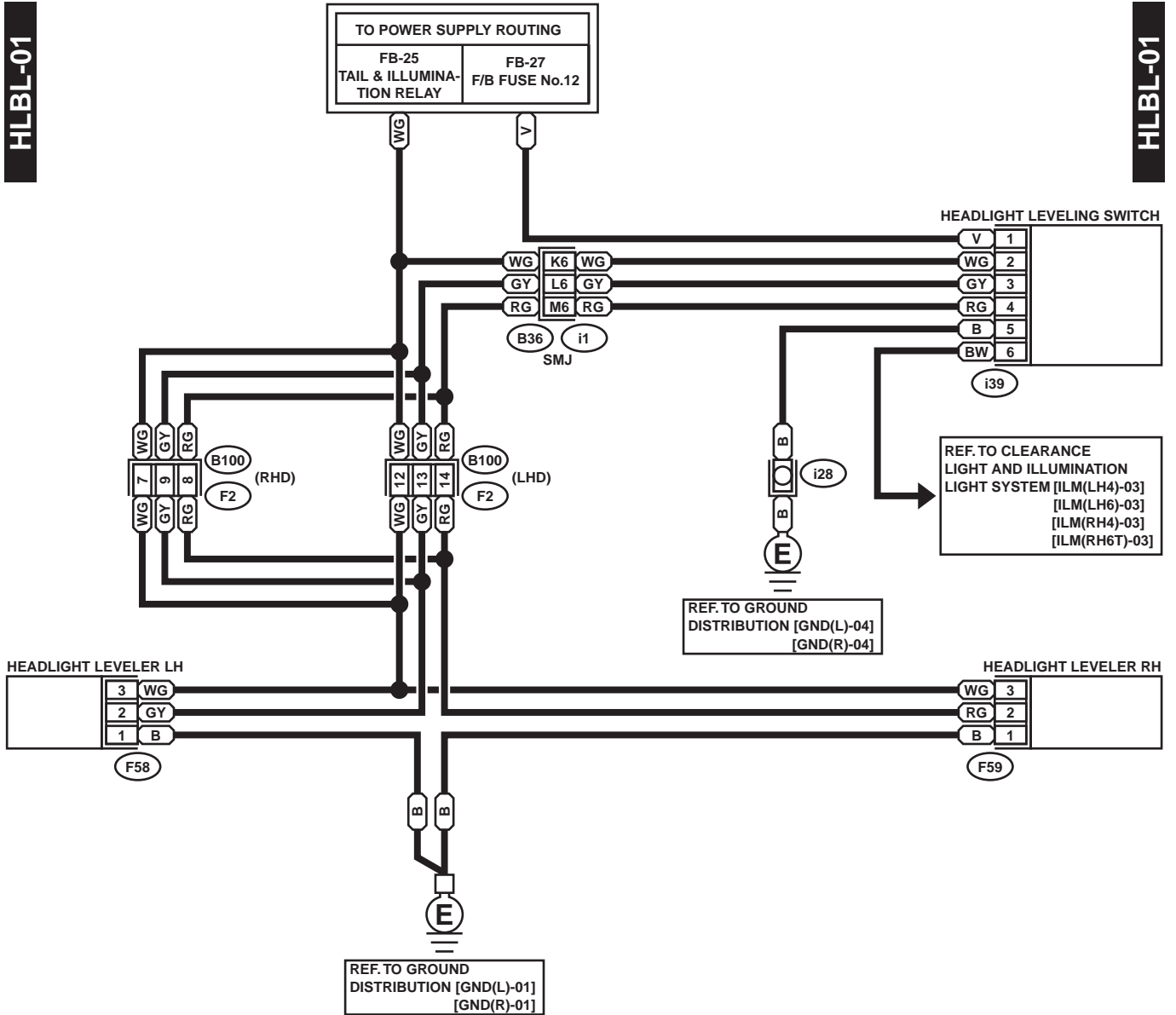
WIRING SYSTEM

19.Headlight Beam Leveler System

A: SCHEMATIC

HLBL-01

HLBL-01



F58 (GRAY)

i39

F2 (BLACK)

F59 (GRAY)

1 2 3 4 5 6

1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24



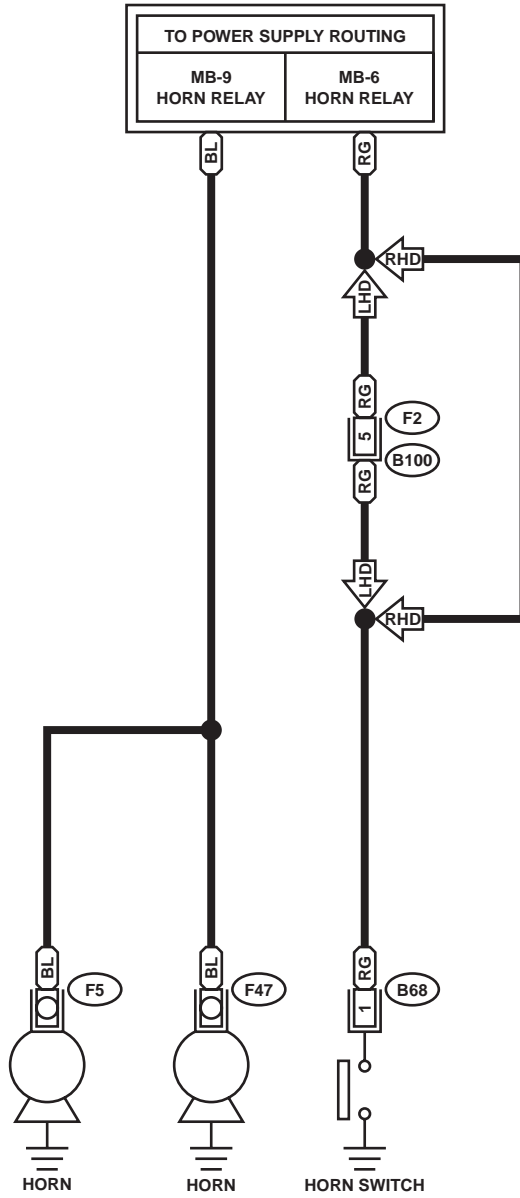
WI-00945

20.Horn System

A: SCHEMATIC

HORN-01

HORN-01



B68

1	2
3	4

F2 (BLACK)

1	2	3	4	5	6	7	8	9	10	11		
12	13	14	15	16	17	18	19	20	21	22	23	24

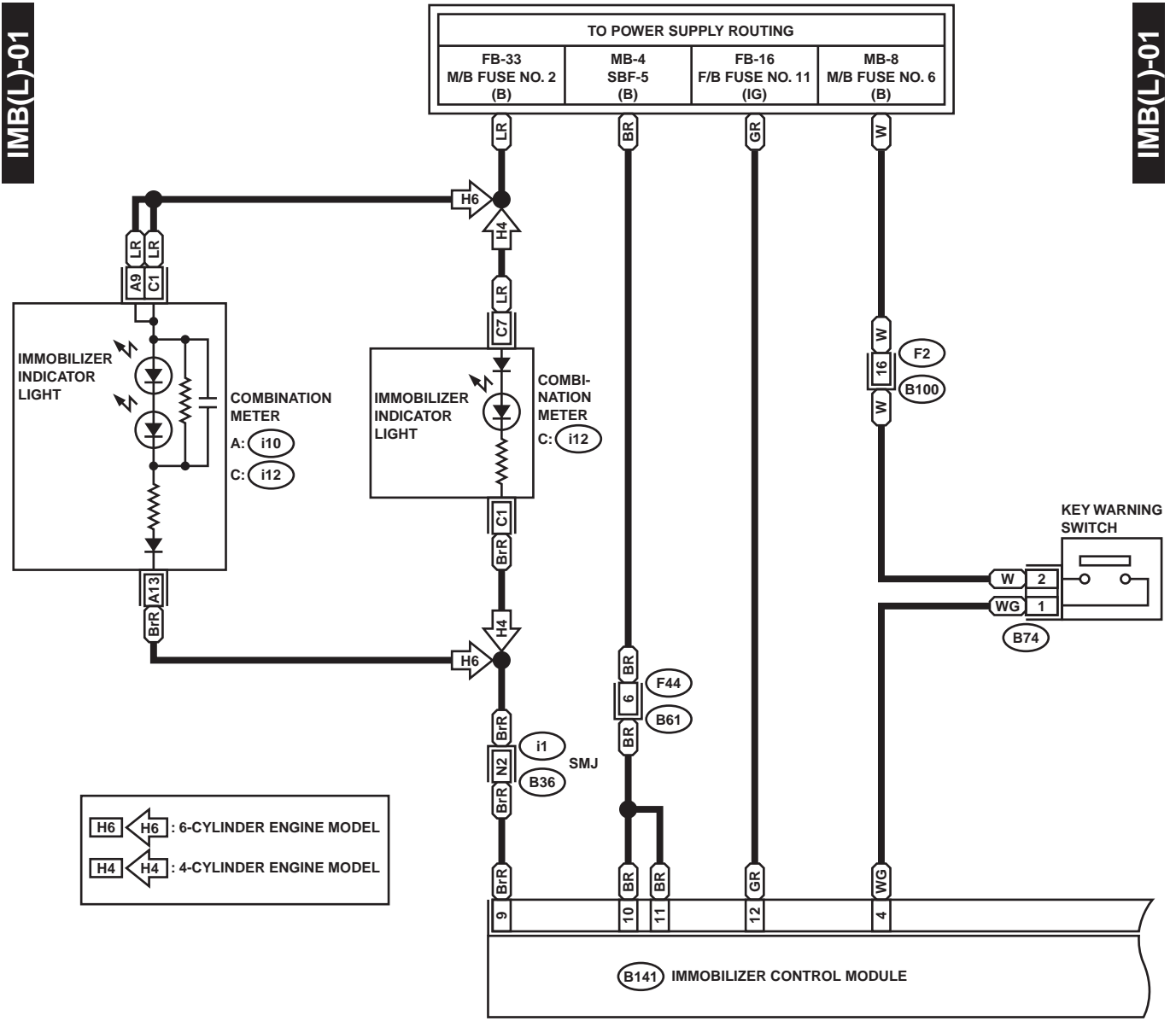
IMMOBILIZER SYSTEM

WIRING SYSTEM

21. Immobilizer System

A: SCHEMATIC

1. LHD MODEL



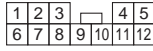
(B74) (BLACK)



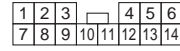
(F44)



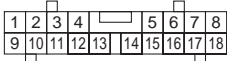
(B141)



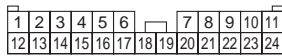
H4 C: i12 (GREEN)



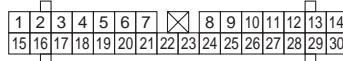
H6 C: i12 (GREEN)



(F2) (BLACK)



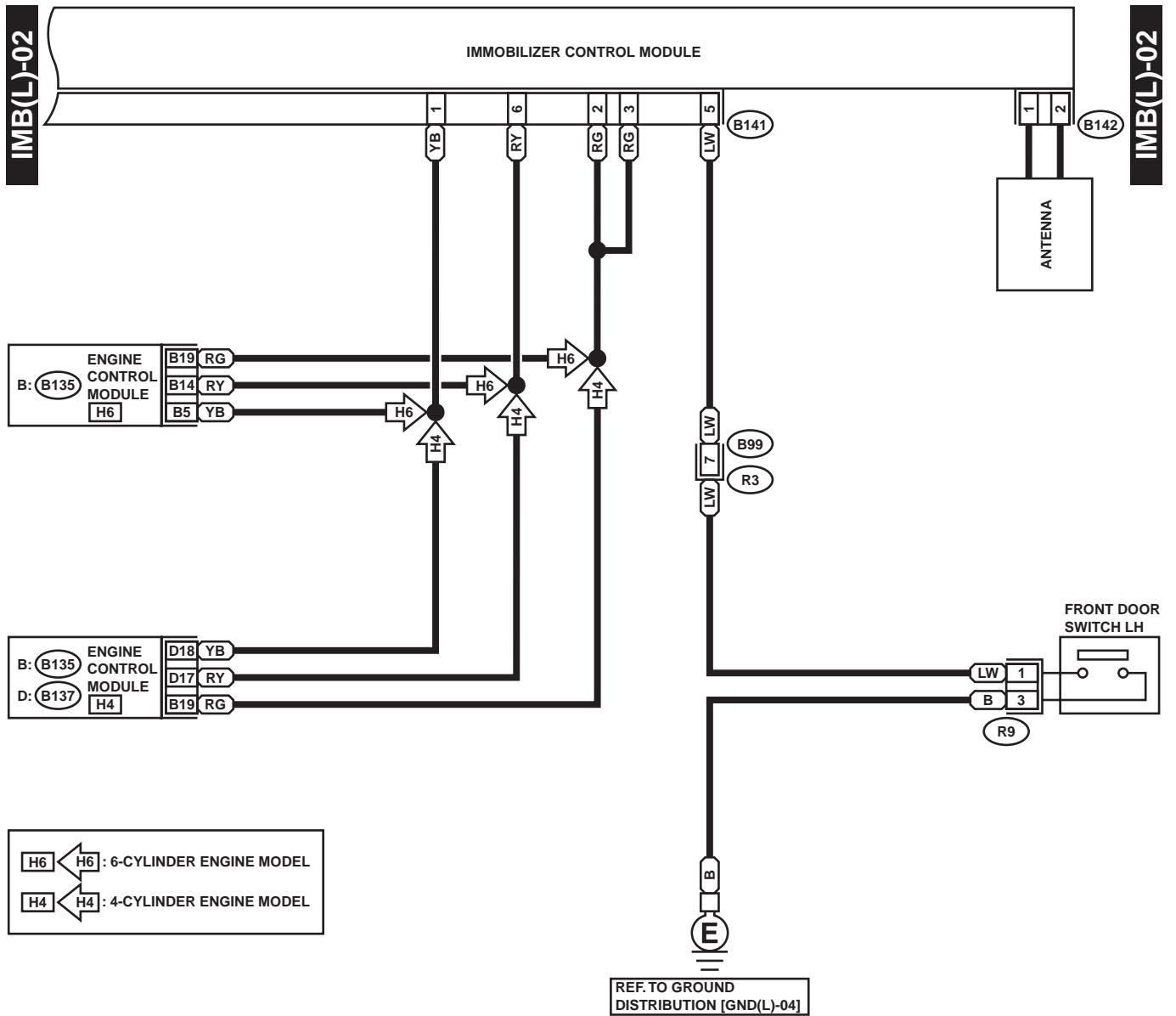
A: i10 (GREEN)



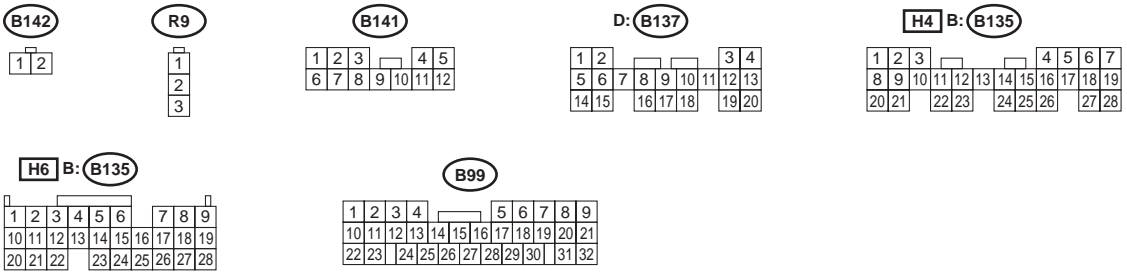
WI-00947

IMMOBILIZER SYSTEM

WIRING SYSTEM



REF. TO GROUND DISTRIBUTION [GND(L)-04]

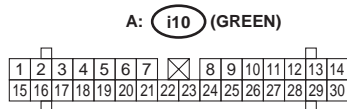
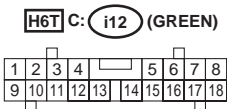
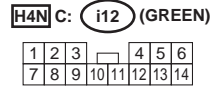
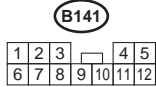
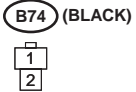
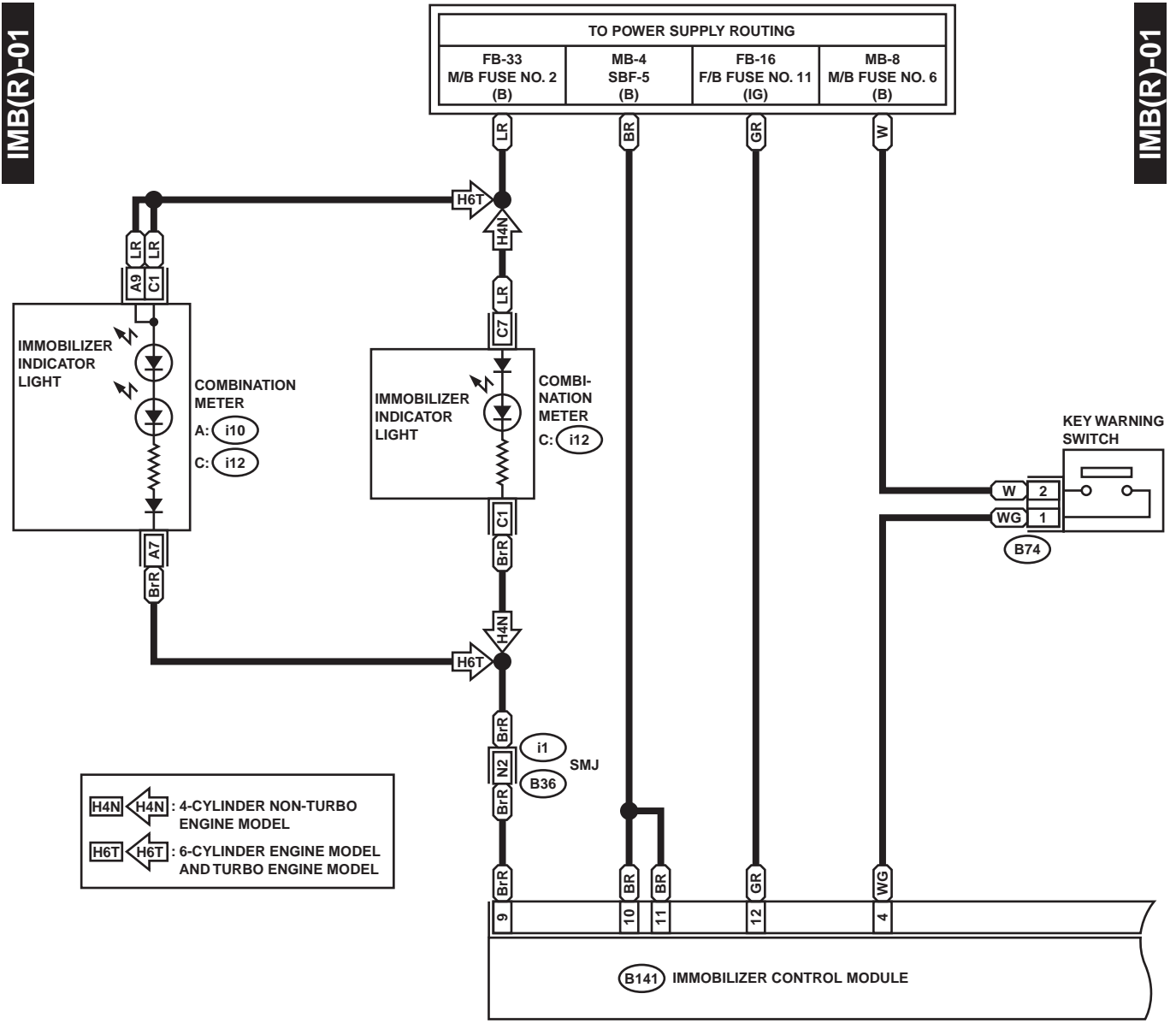


WI-00948

IMMOBILIZER SYSTEM

WIRING SYSTEM

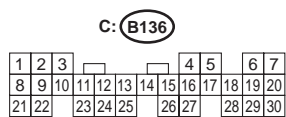
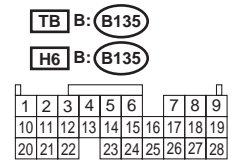
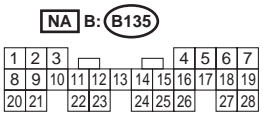
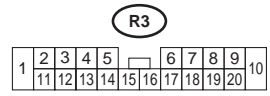
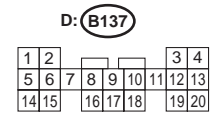
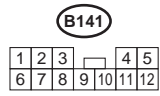
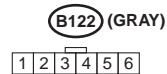
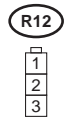
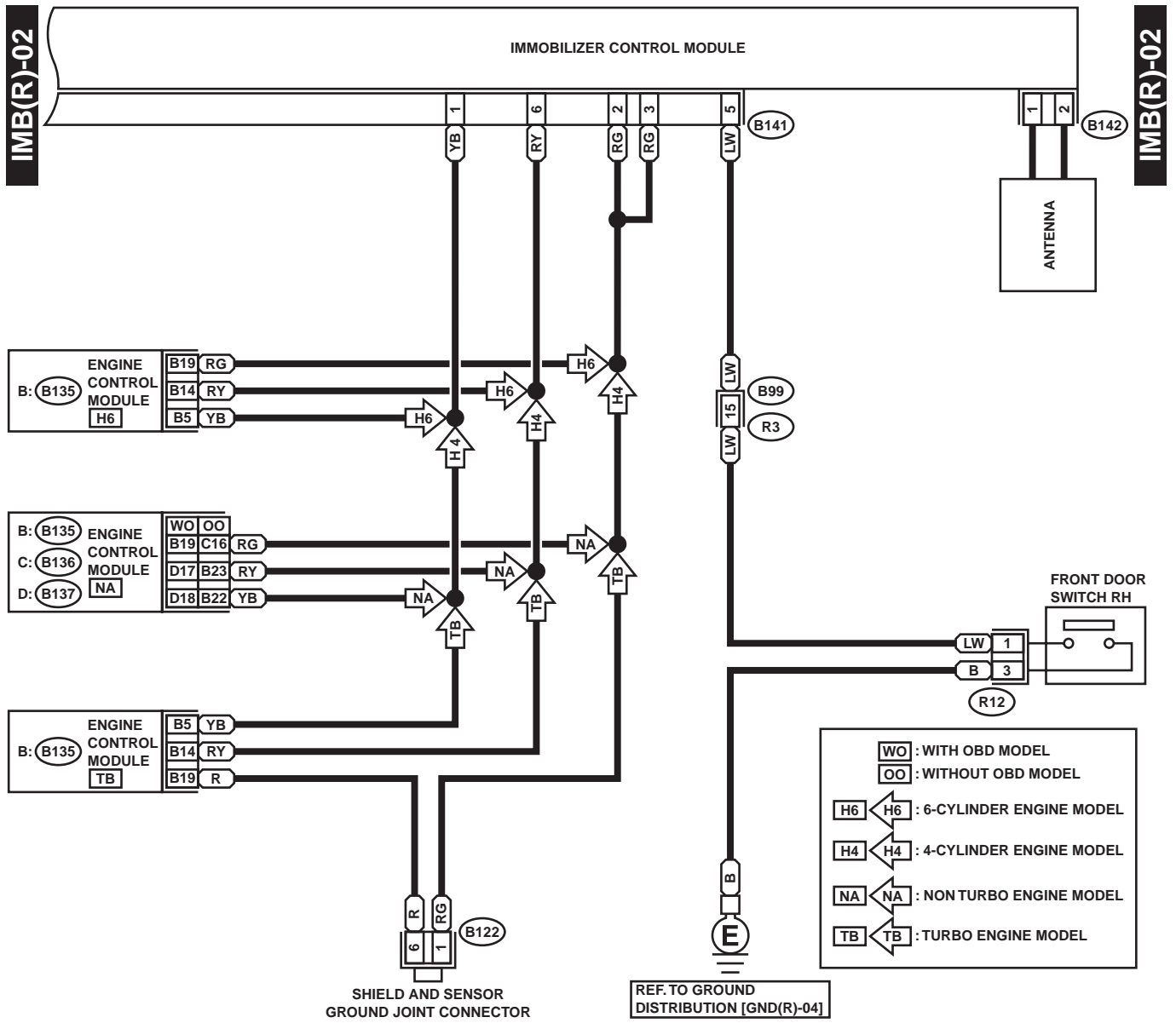
2. RHD MODEL



WI-00949

IMMOBILIZER SYSTEM

WIRING SYSTEM



WI-00950

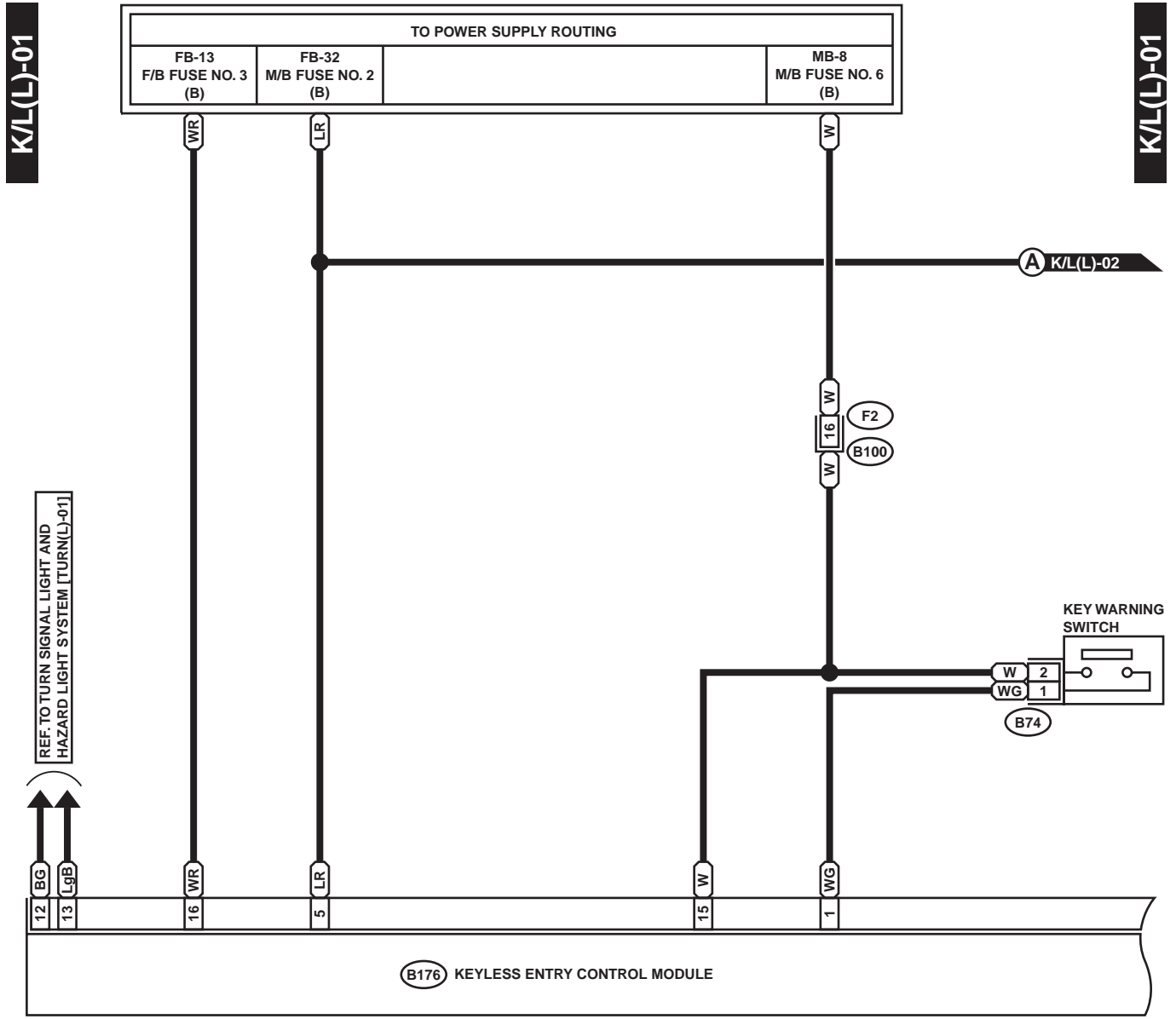
KEYLESS ENTRY SYSTEM

WIRING SYSTEM

22. Keyless Entry System

A: SCHEMATIC

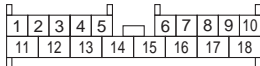
1. LHD MODEL



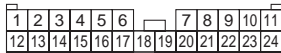
(B74) (BLACK)



(B176)



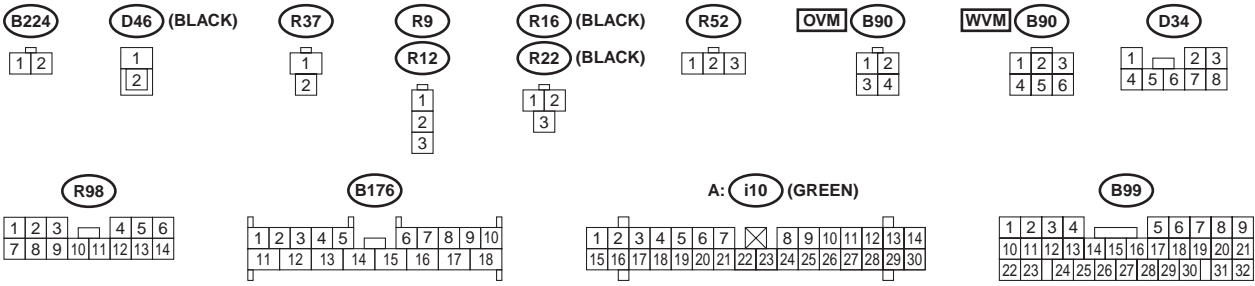
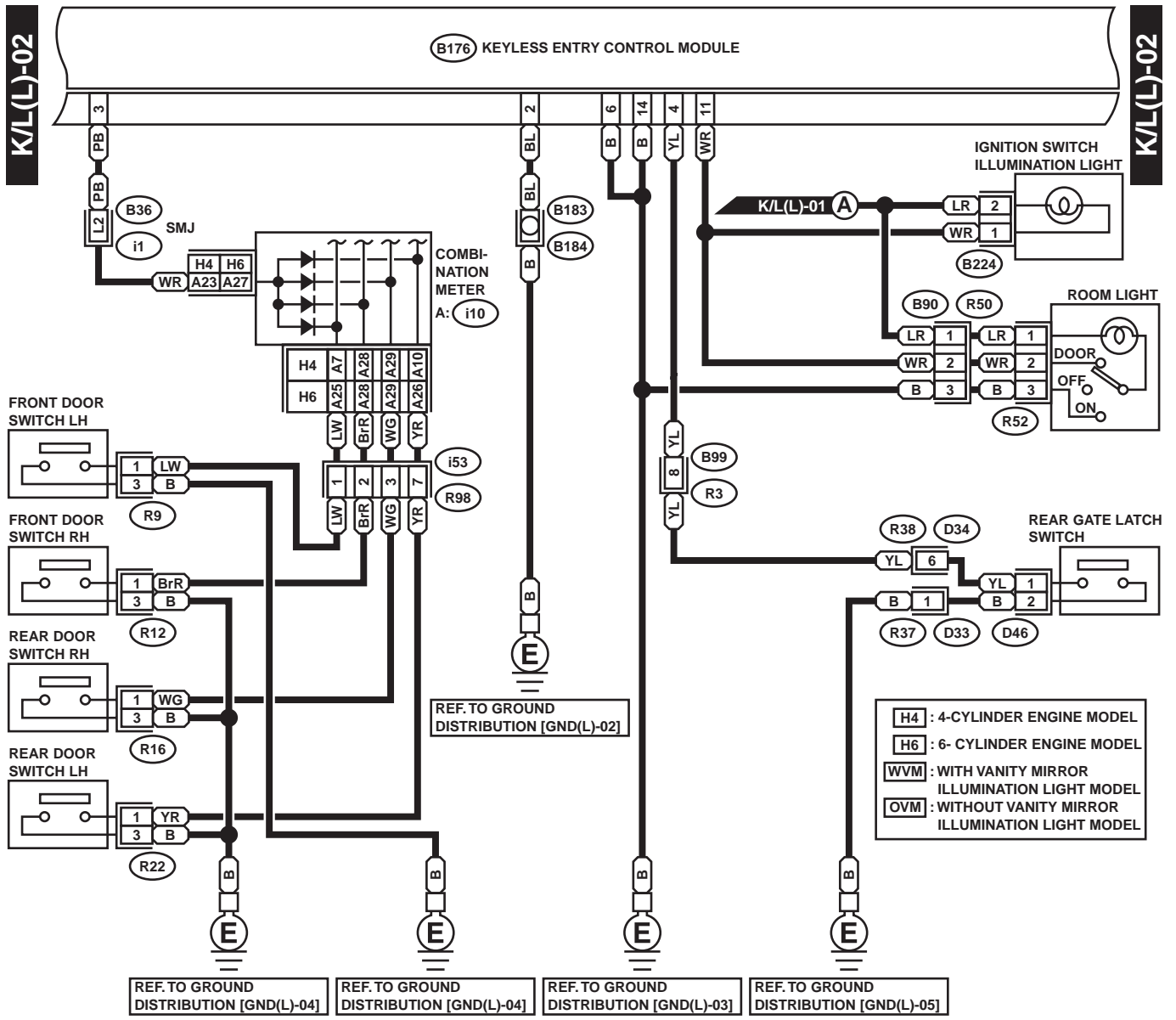
(F2) (BLACK)



WI-00951

KEYLESS ENTRY SYSTEM

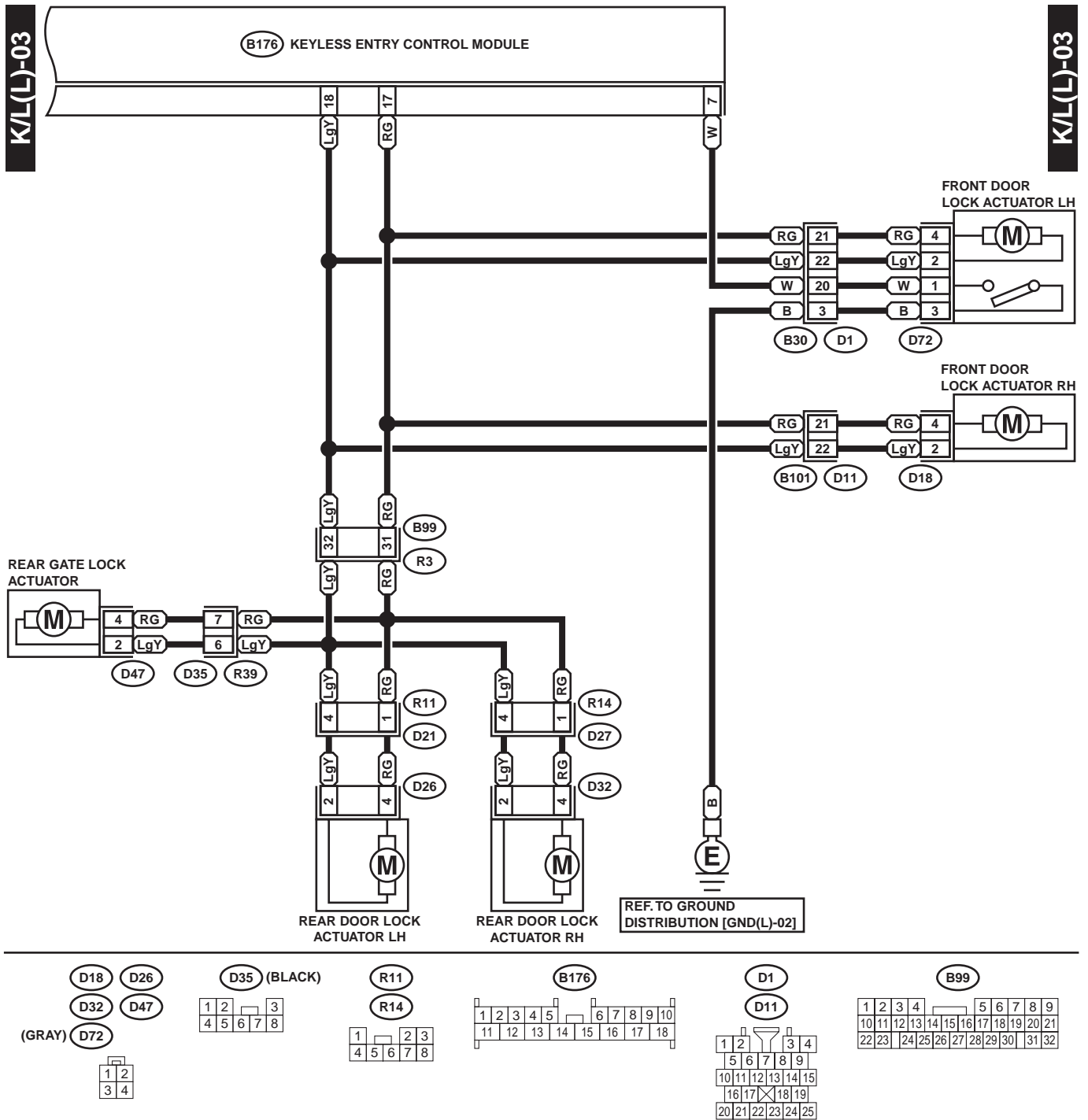
WIRING SYSTEM



WI-00952

KEYLESS ENTRY SYSTEM

WIRING SYSTEM

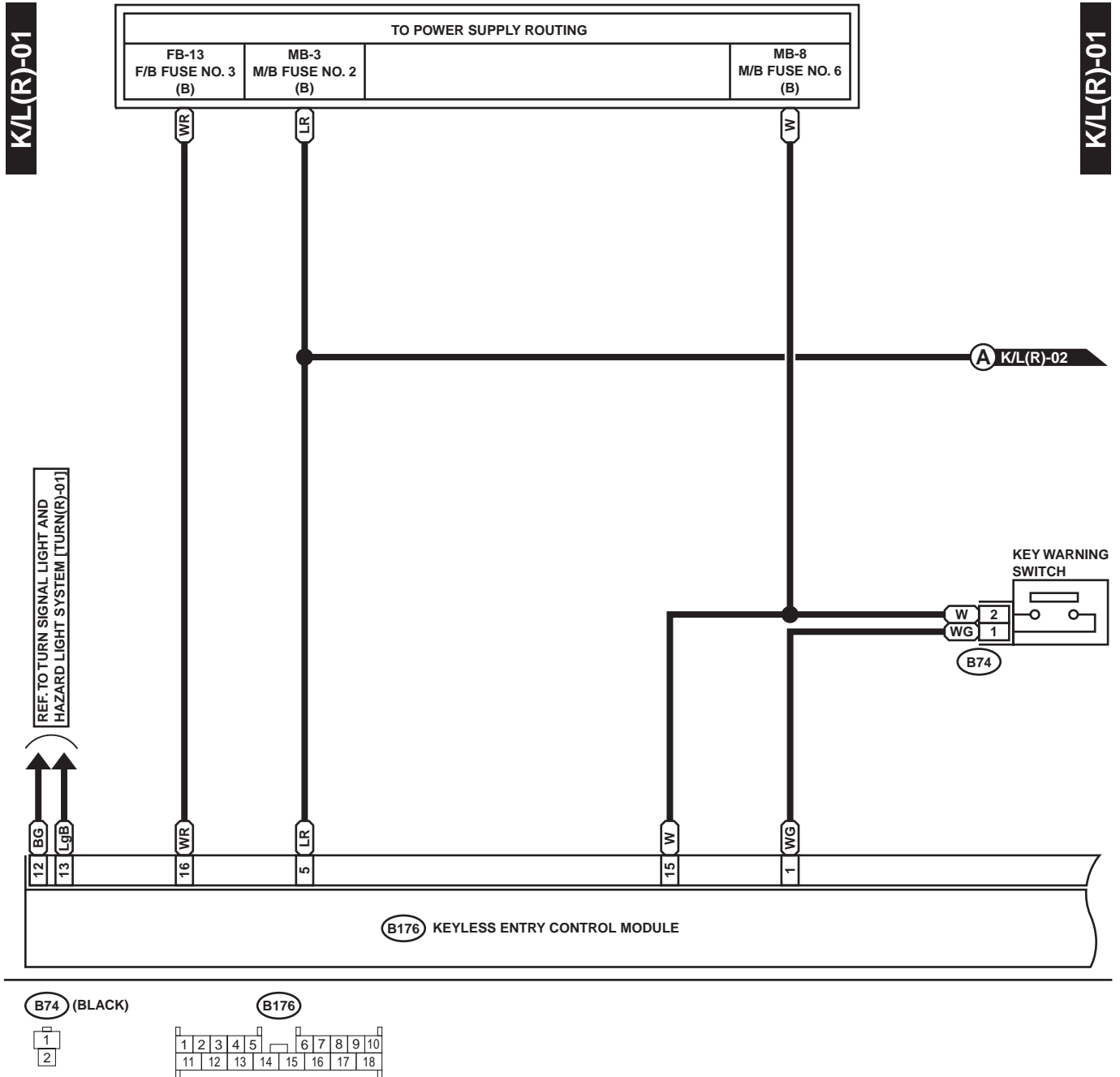


WI-00953

KEYLESS ENTRY SYSTEM

WIRING SYSTEM

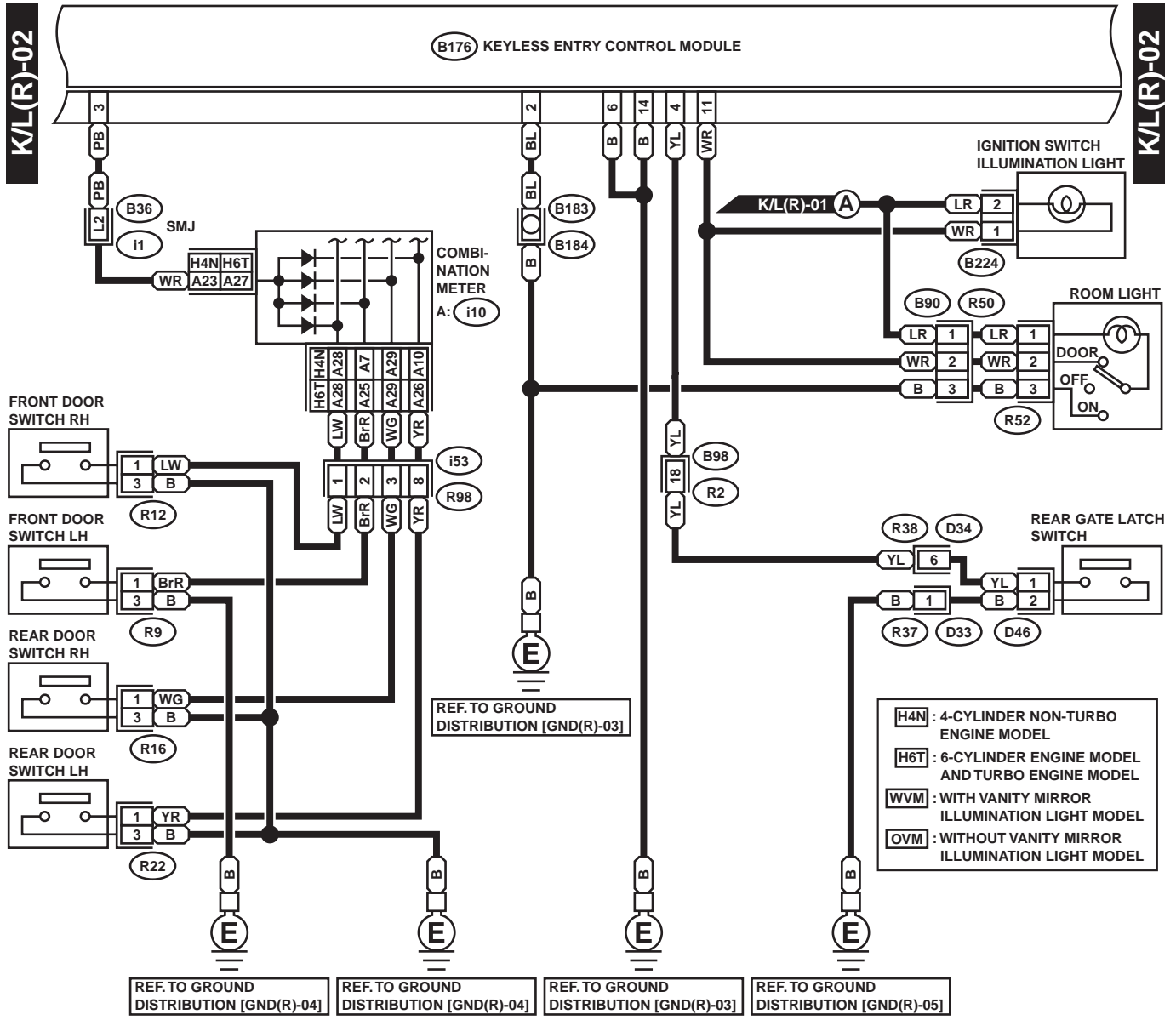
2. RHD MODEL



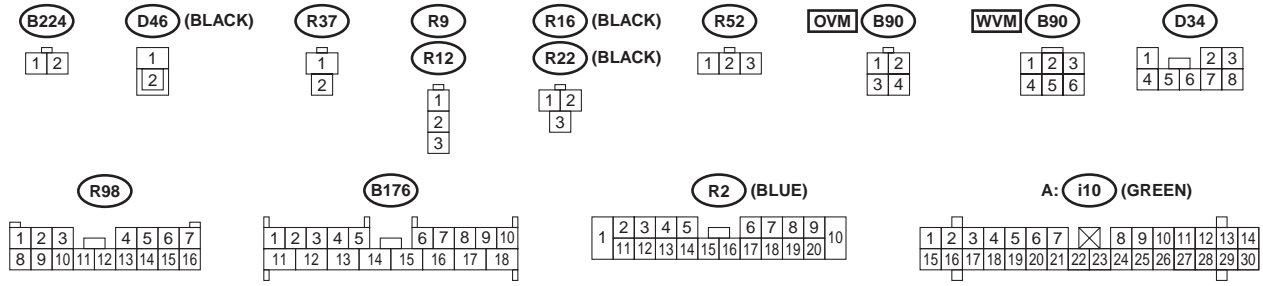
WI-00954

KEYLESS ENTRY SYSTEM

WIRING SYSTEM



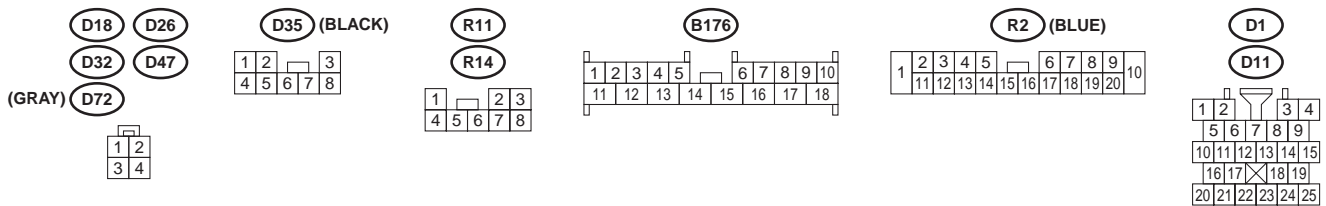
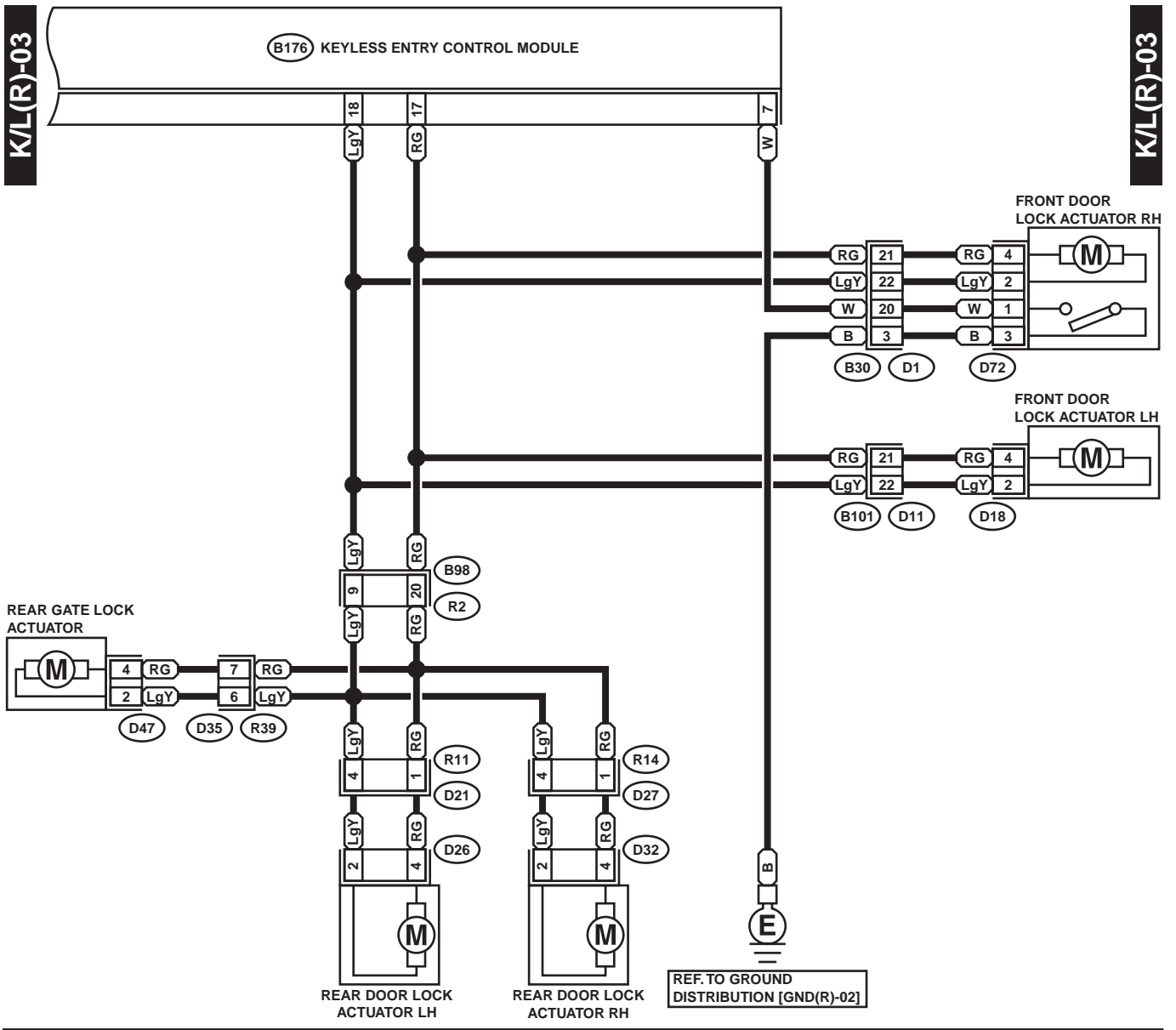
- H4N**: 4-CYLINDER NON-TURBO ENGINE MODEL
- H6T**: 6-CYLINDER ENGINE MODEL AND TURBO ENGINE MODEL
- WVM**: WITH VANITY MIRROR ILLUMINATION LIGHT MODEL
- OVV**: WITHOUT VANITY MIRROR ILLUMINATION LIGHT MODEL



WI-00955

KEYLESS ENTRY SYSTEM

WIRING SYSTEM



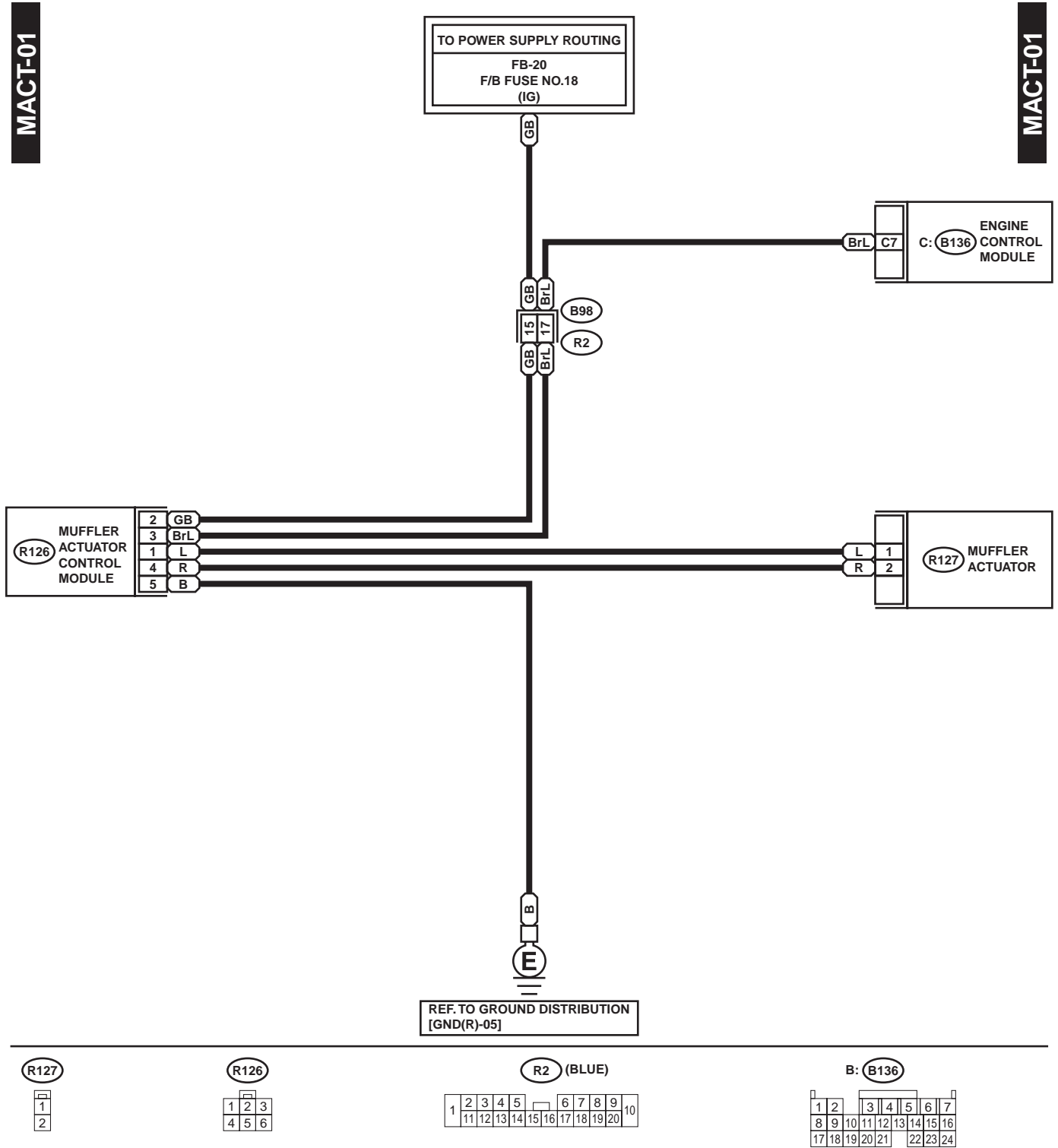
WI-00956

MUFFLER ACTUATOR CONTROL SYSTEM

WIRING SYSTEM

23. Muffler Actuator Control System

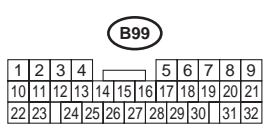
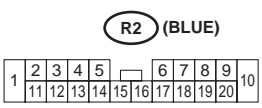
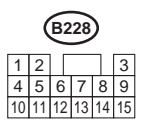
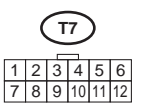
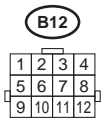
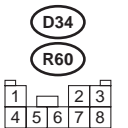
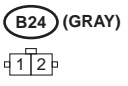
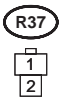
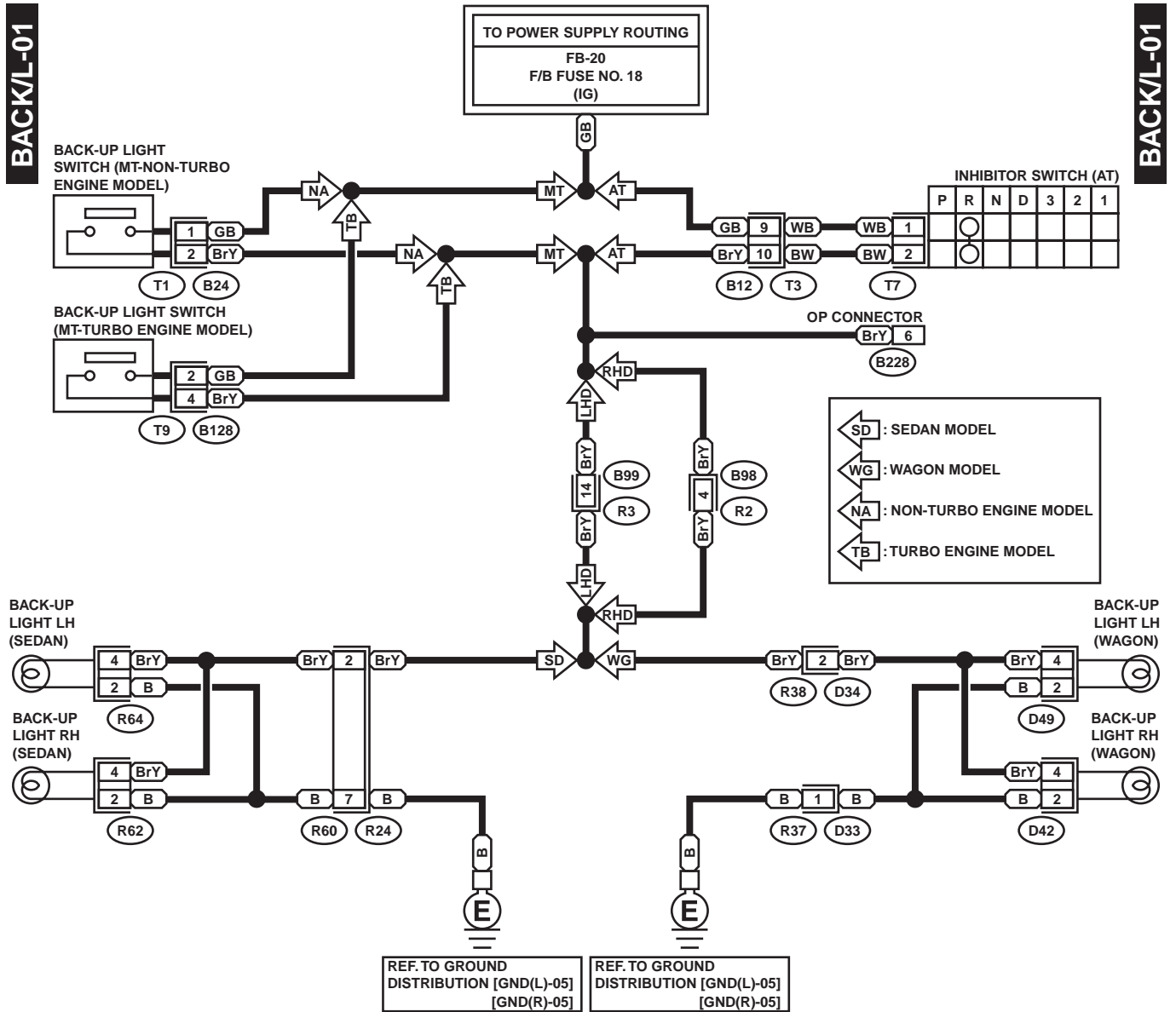
A: SCHEMATIC



WI-01080

24.Back-up Light System

A: SCHEMATIC



WI-00957

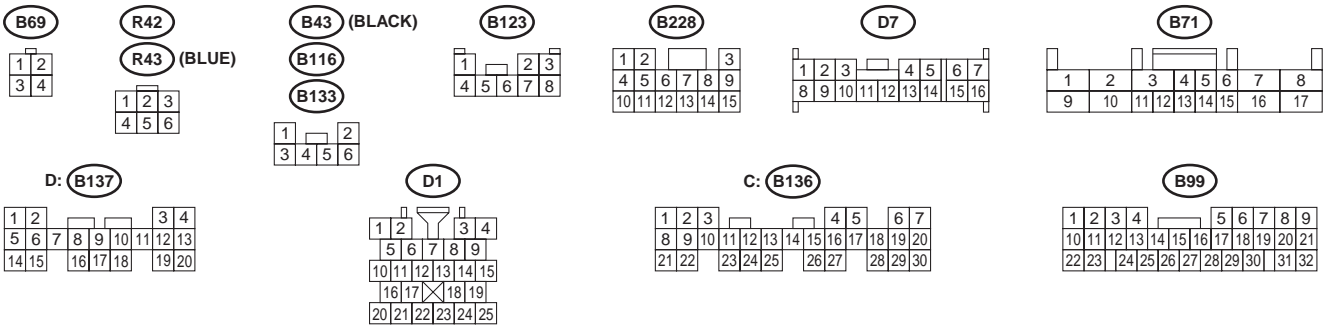
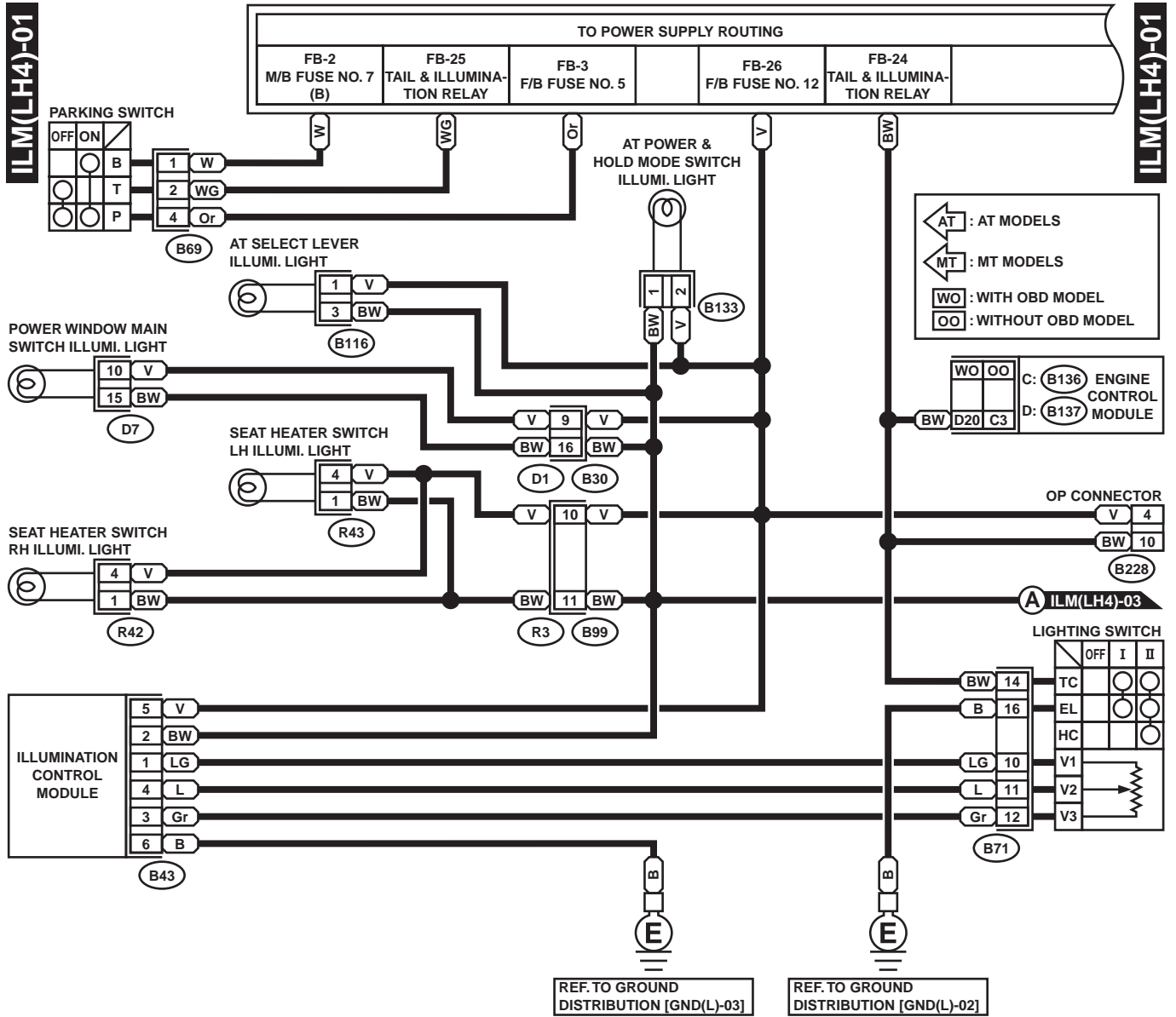
CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

25. Clearance Light and Illumination Light System

A: SCHEMATIC

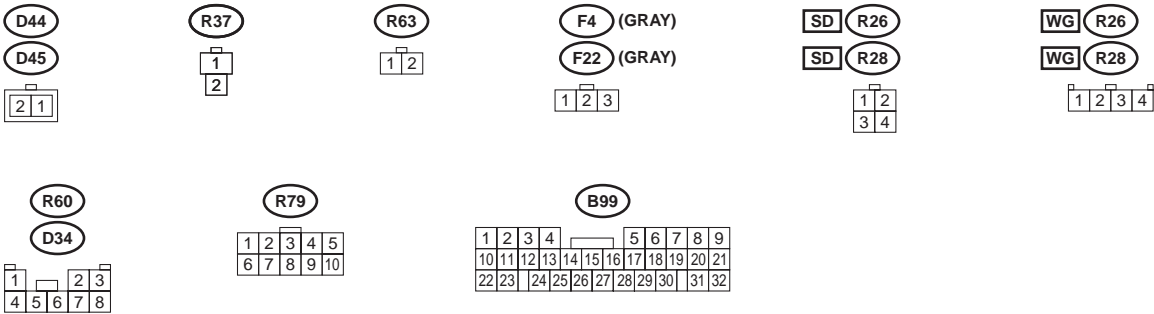
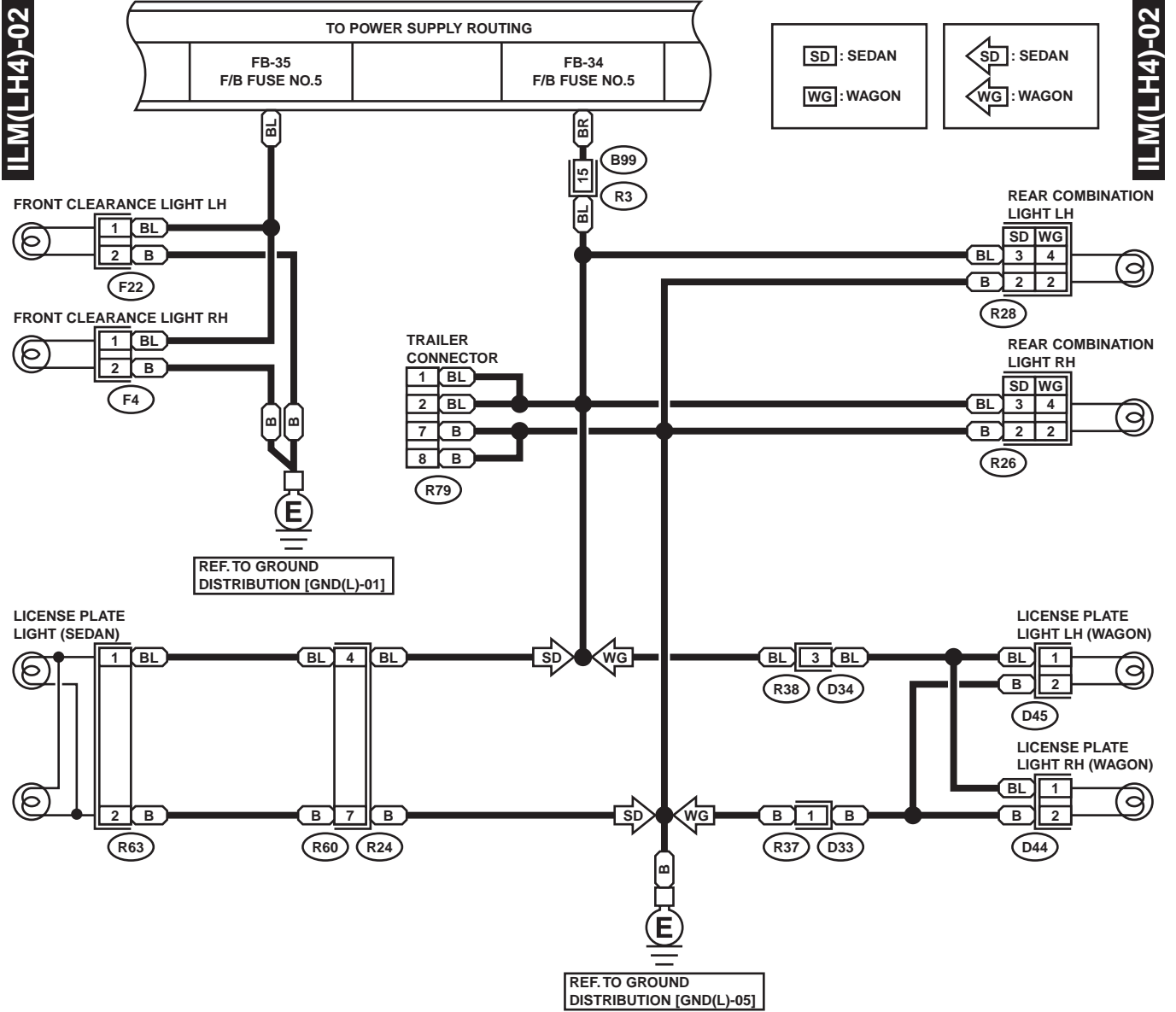
1. LHD 4-CYLINDER ENGINE MODEL



WI-00958

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

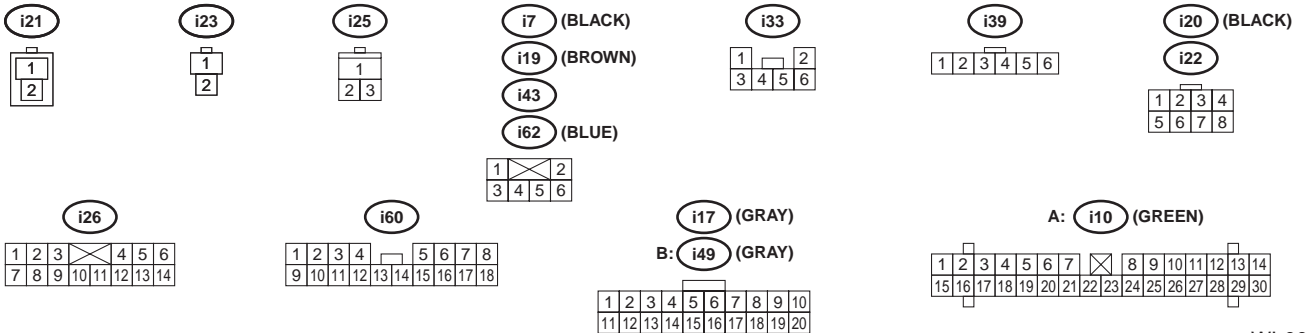
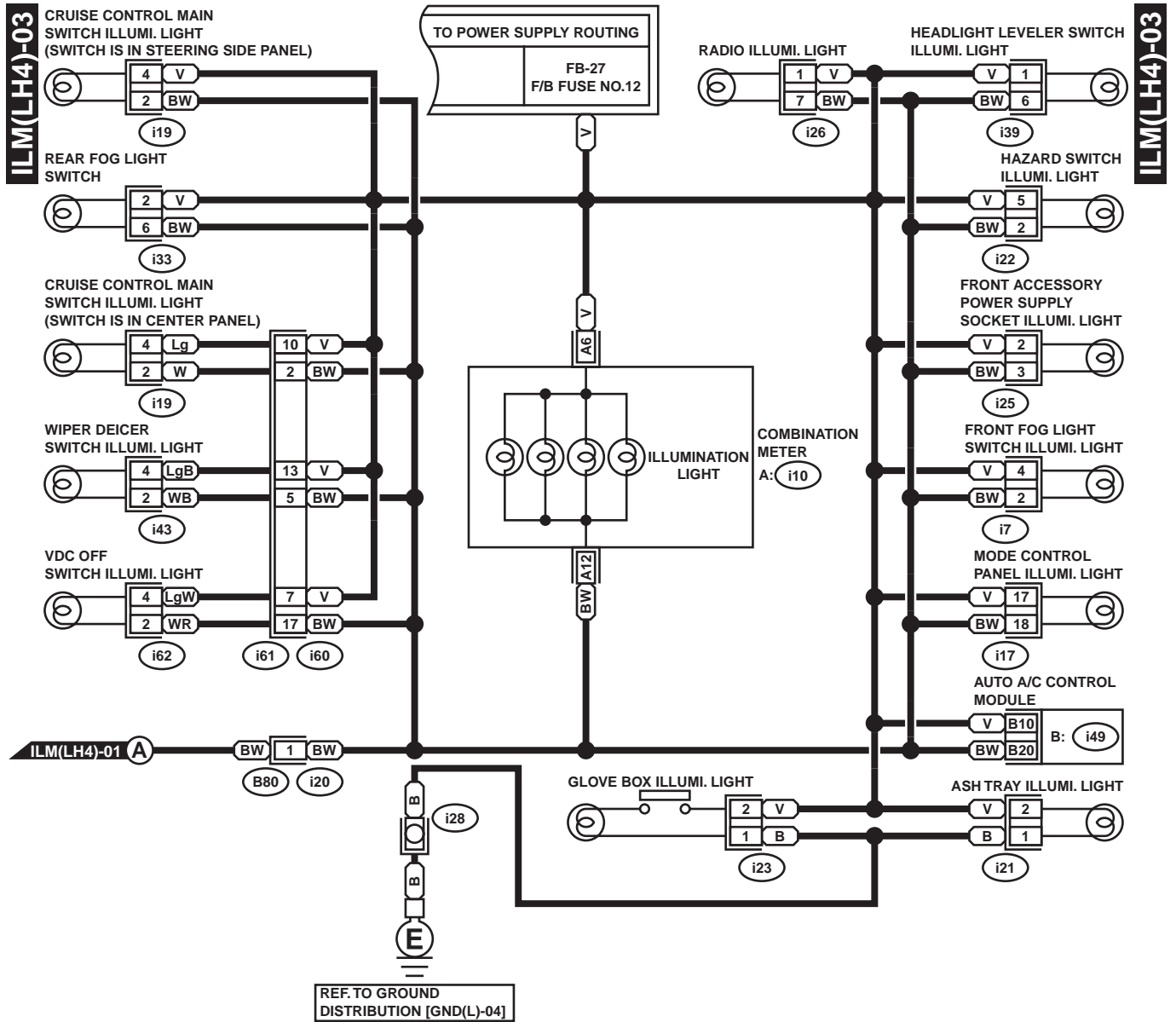
WIRING SYSTEM



WI-00959

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

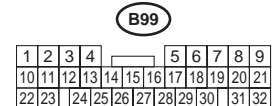
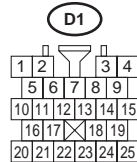
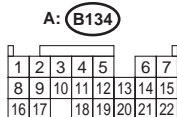
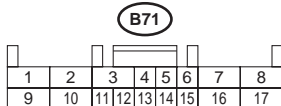
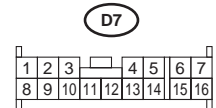
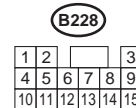
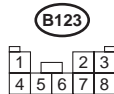
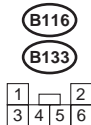
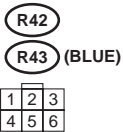
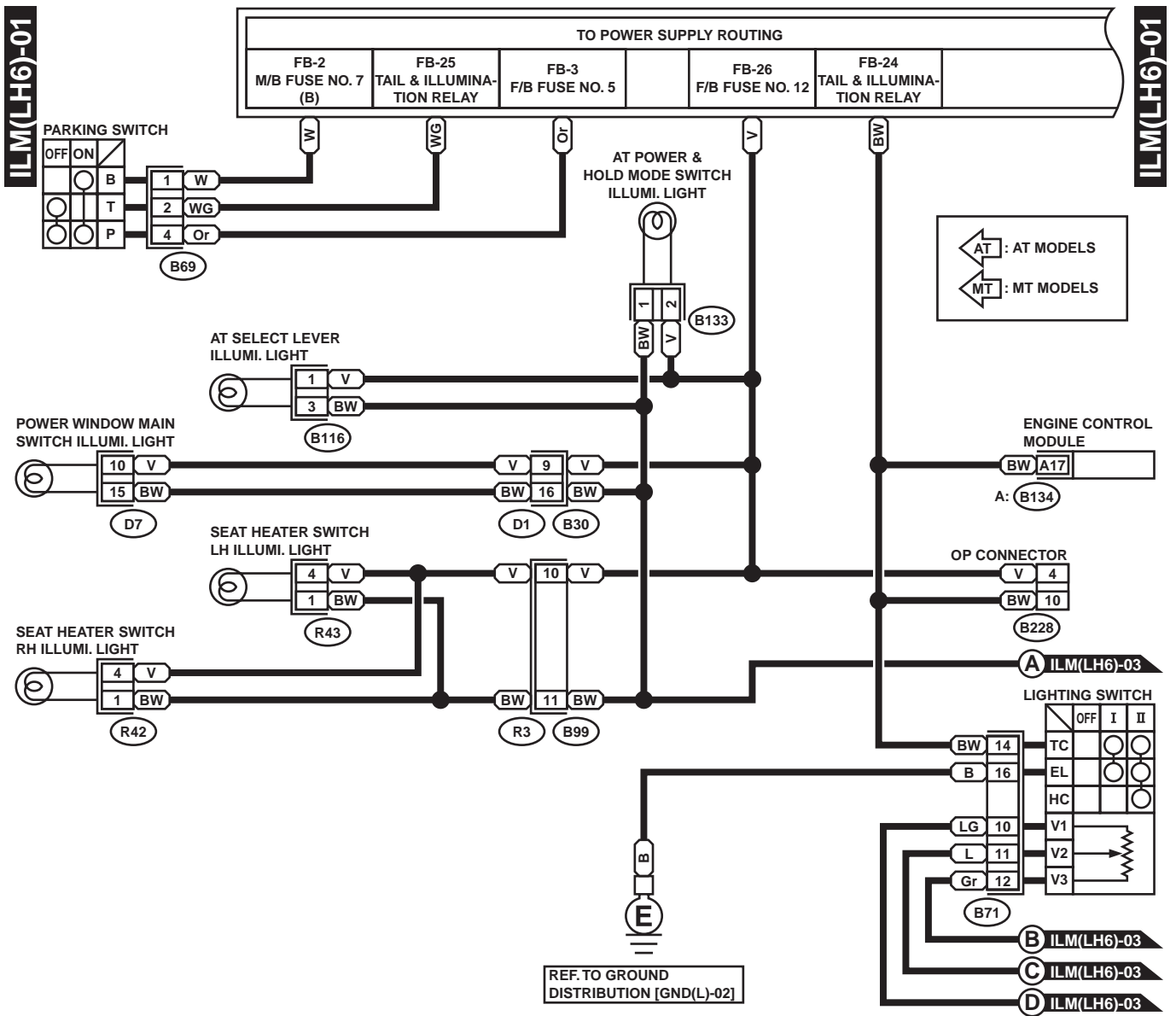


WI-00960

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

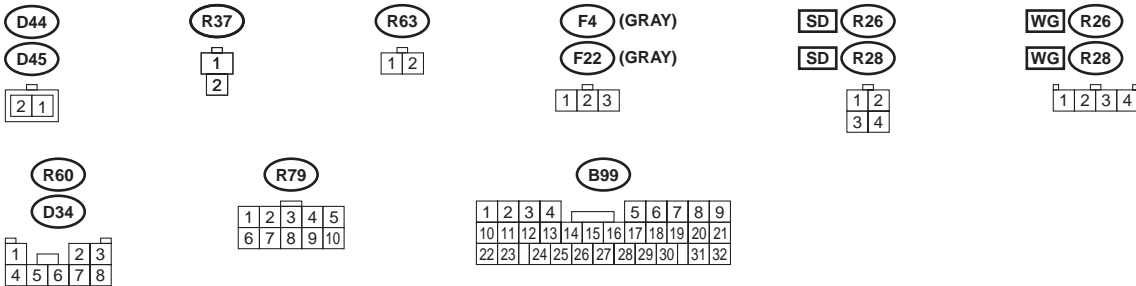
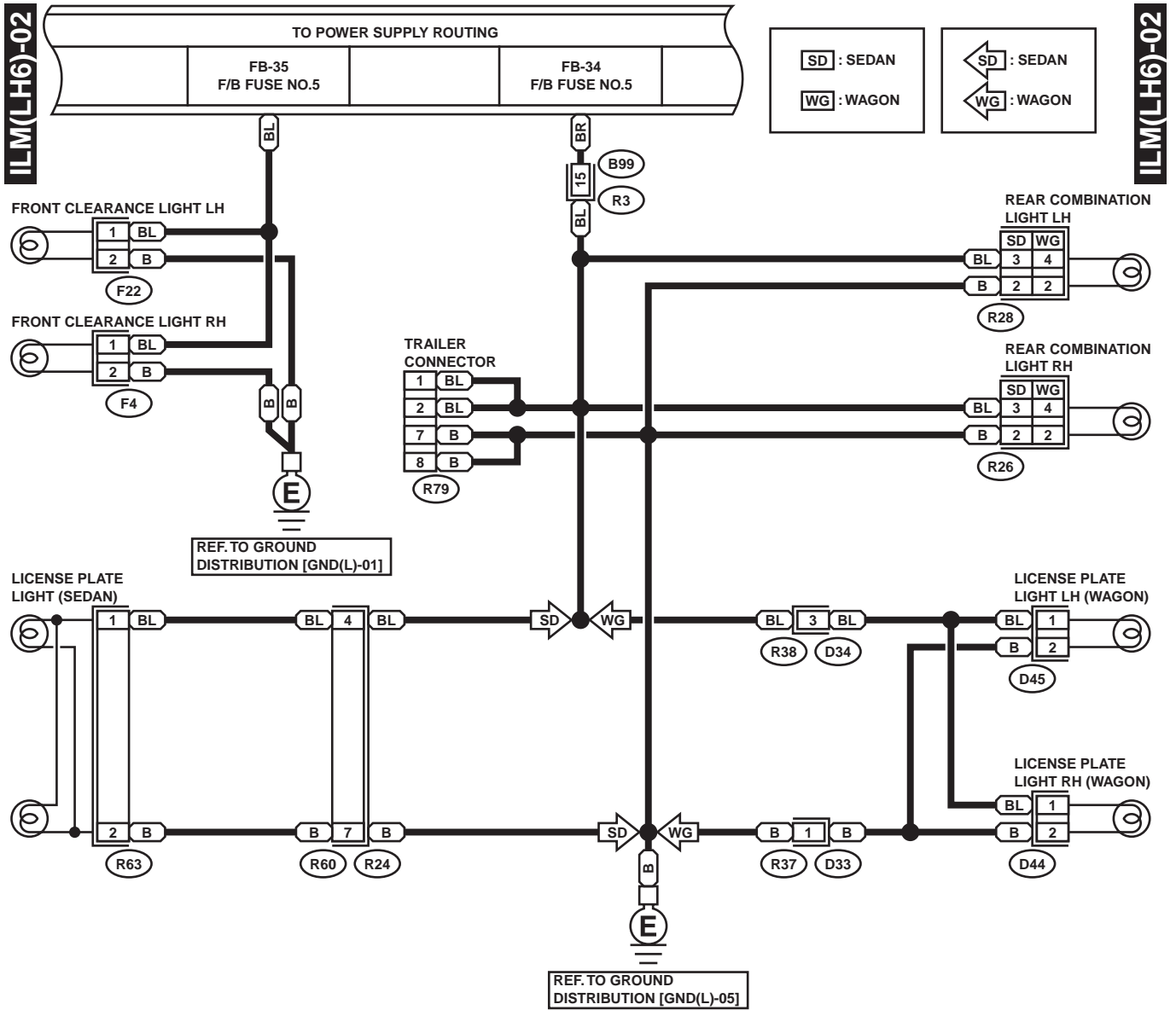
2. LHD 6-CYLINDER ENGINE MODEL



WI-00961

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

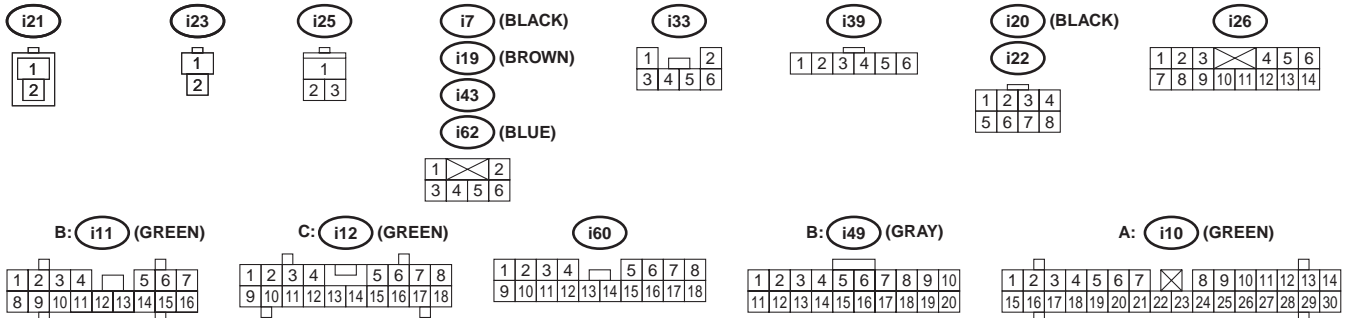
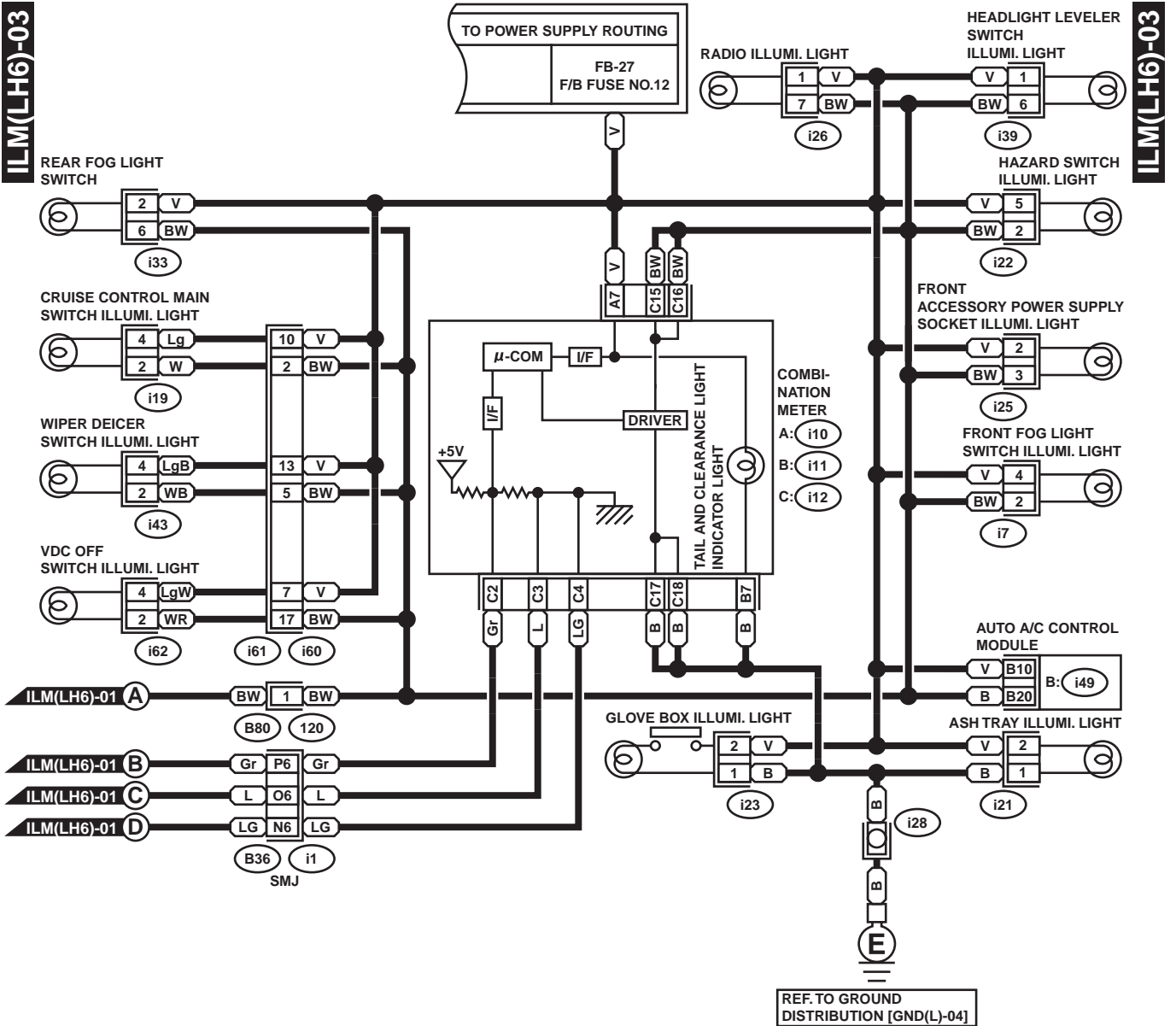
WIRING SYSTEM



WI-00962

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

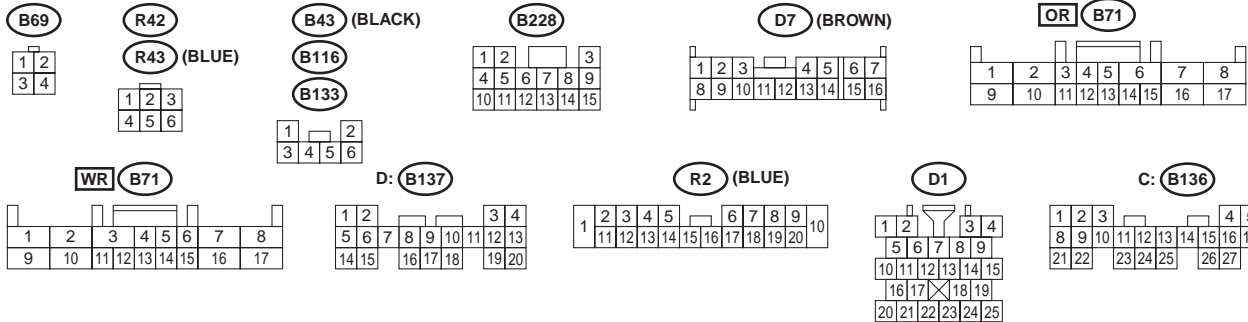
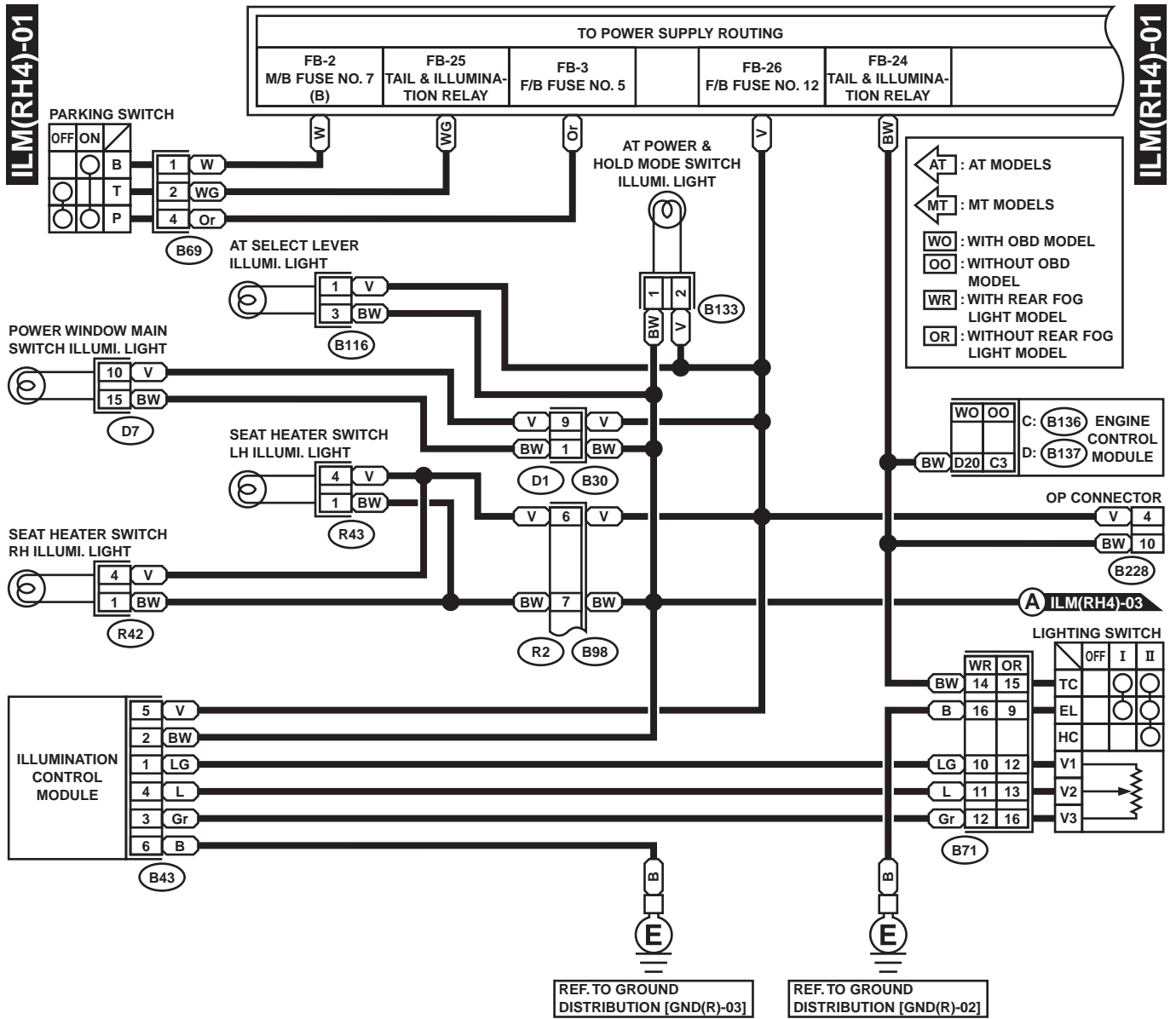


WI-00963

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

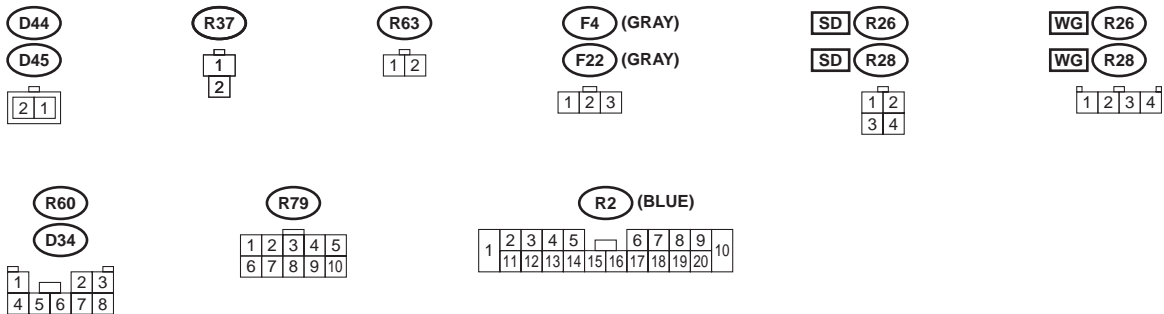
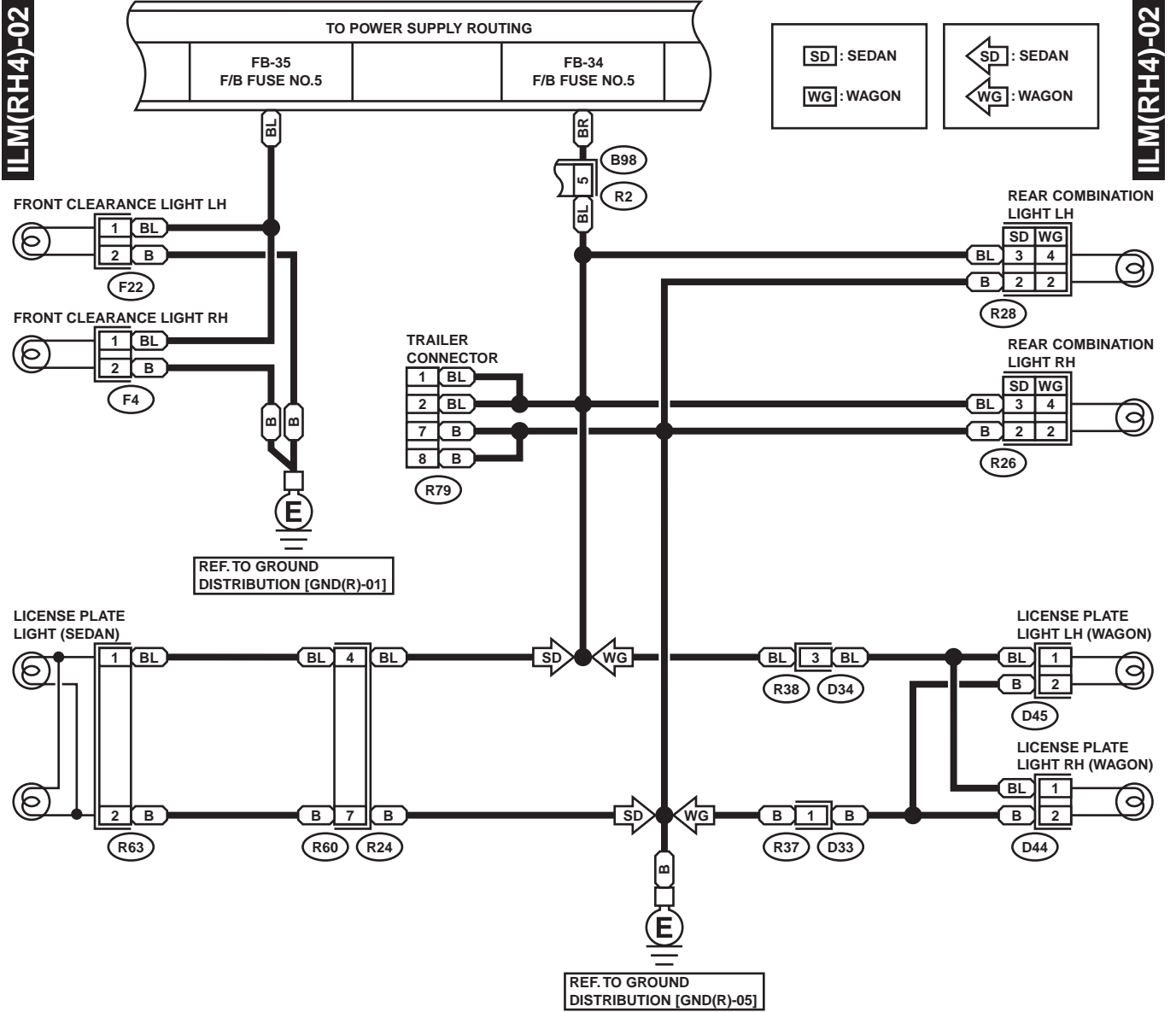
3. RHD 4-CYLINDER NON-TURBO ENGINE MODEL



WI-00964

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

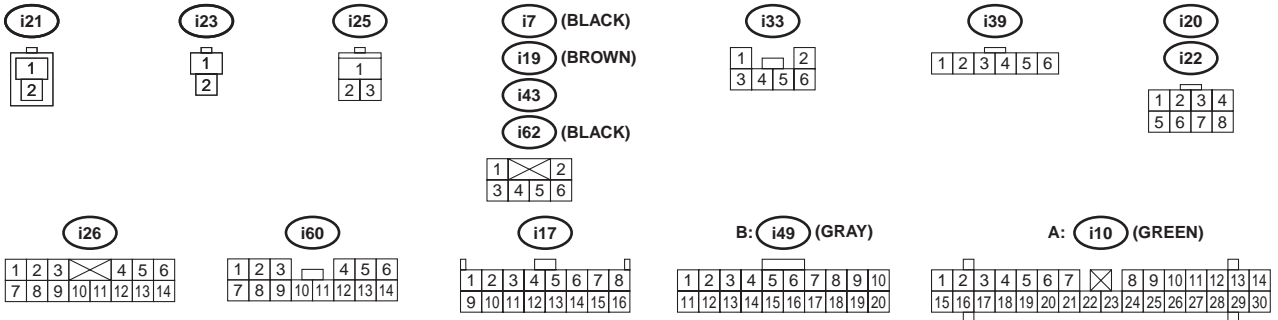
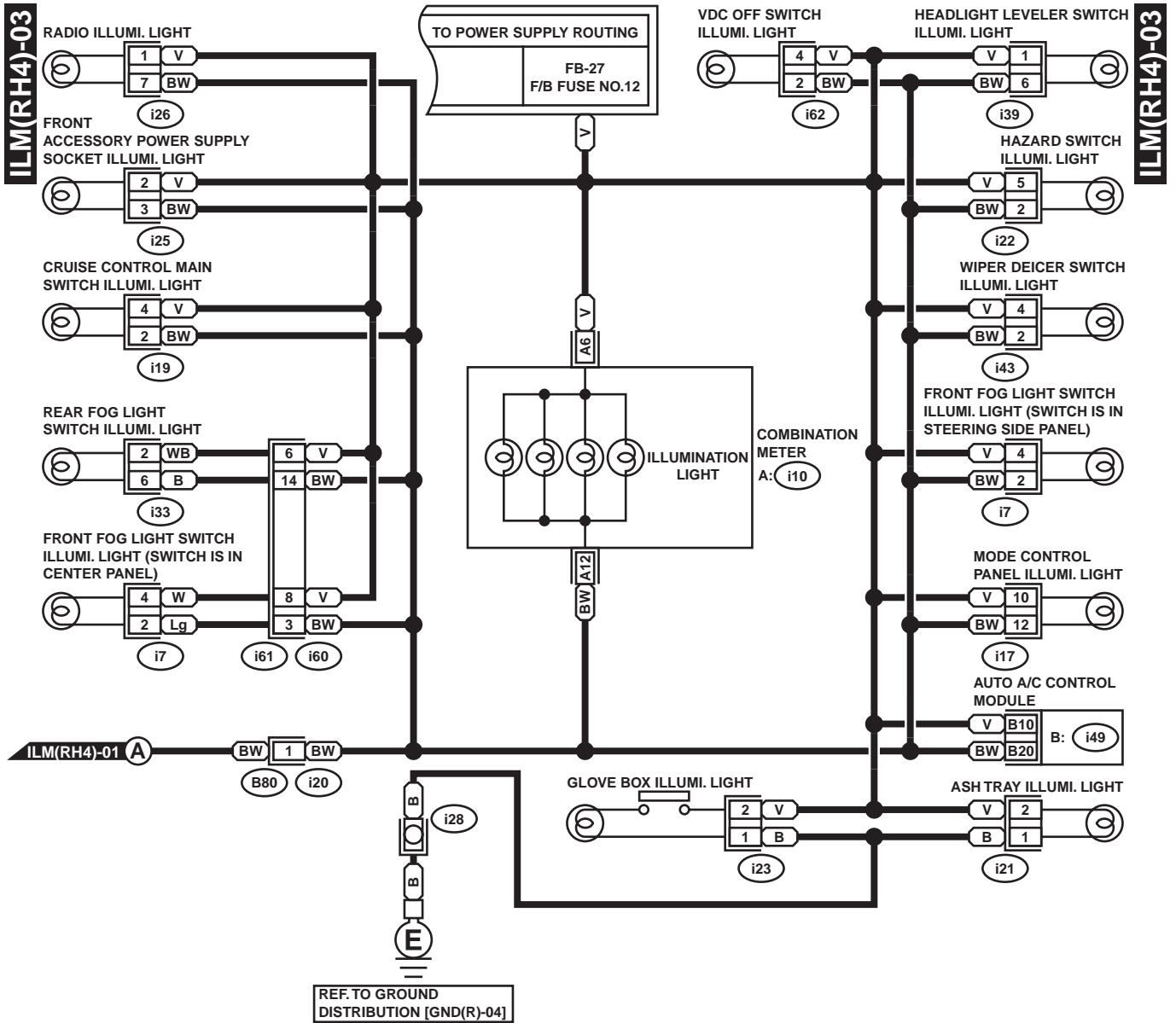
WIRING SYSTEM



WI-00965

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

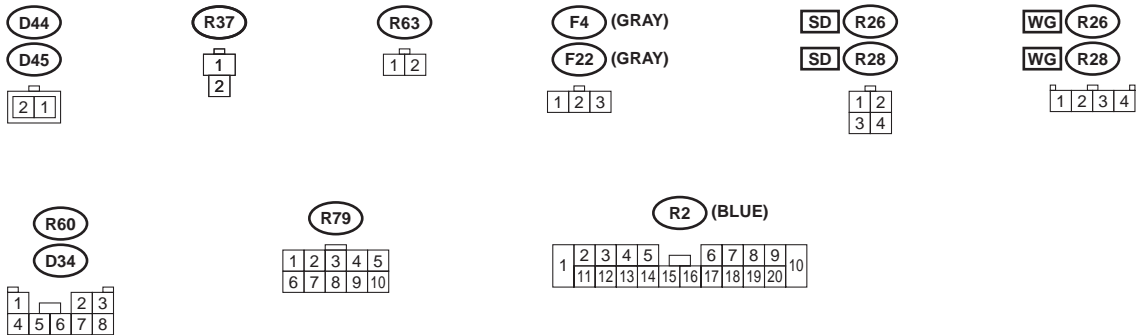
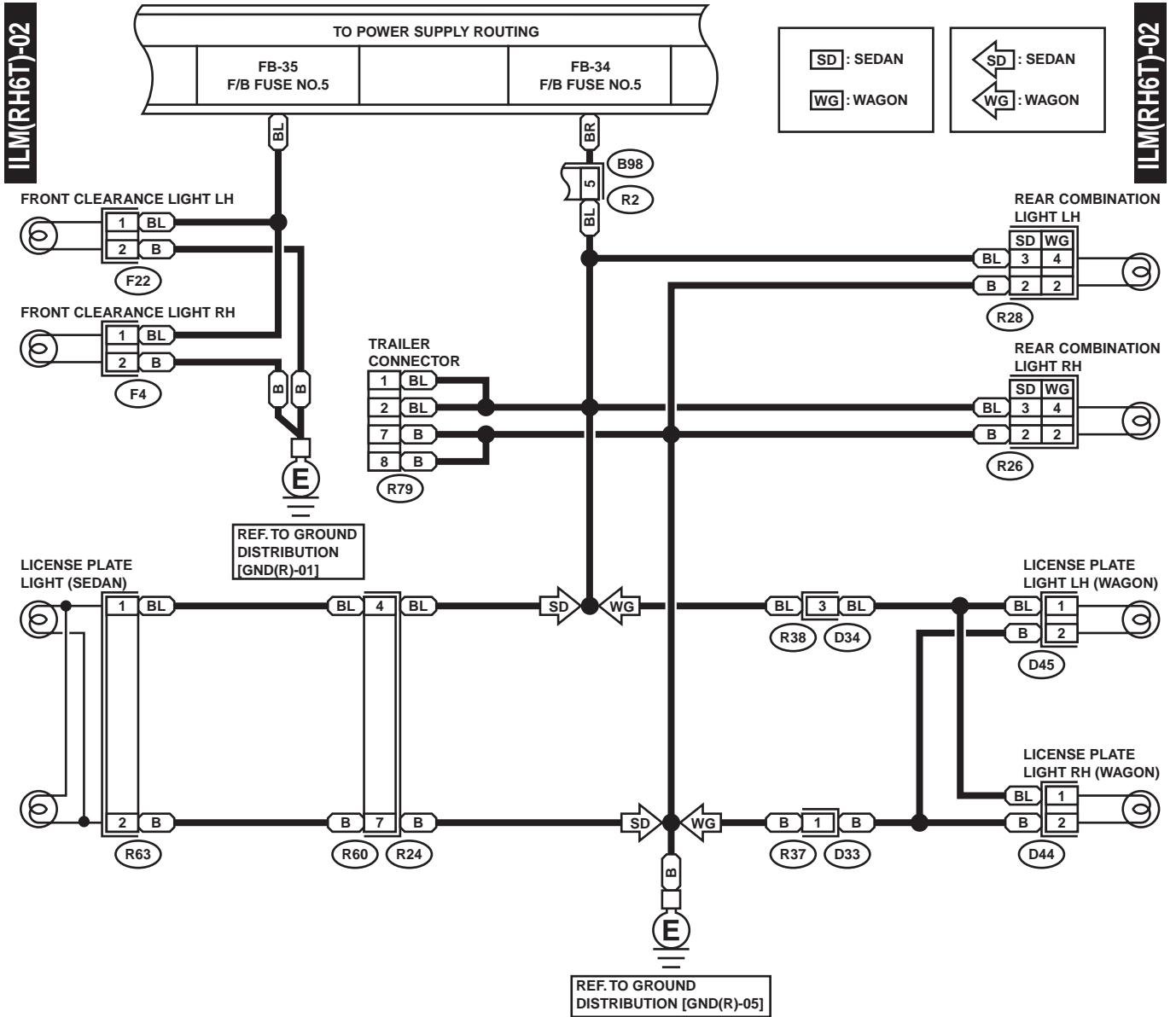
WIRING SYSTEM



WI-00966

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

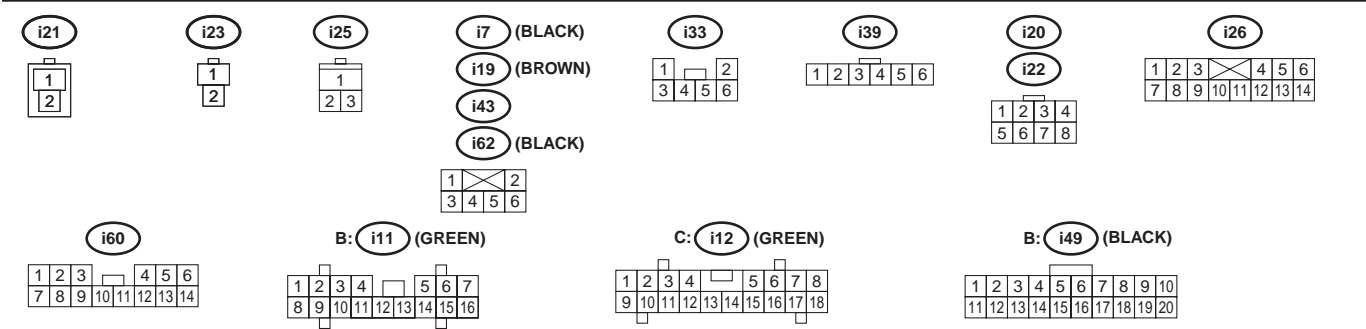
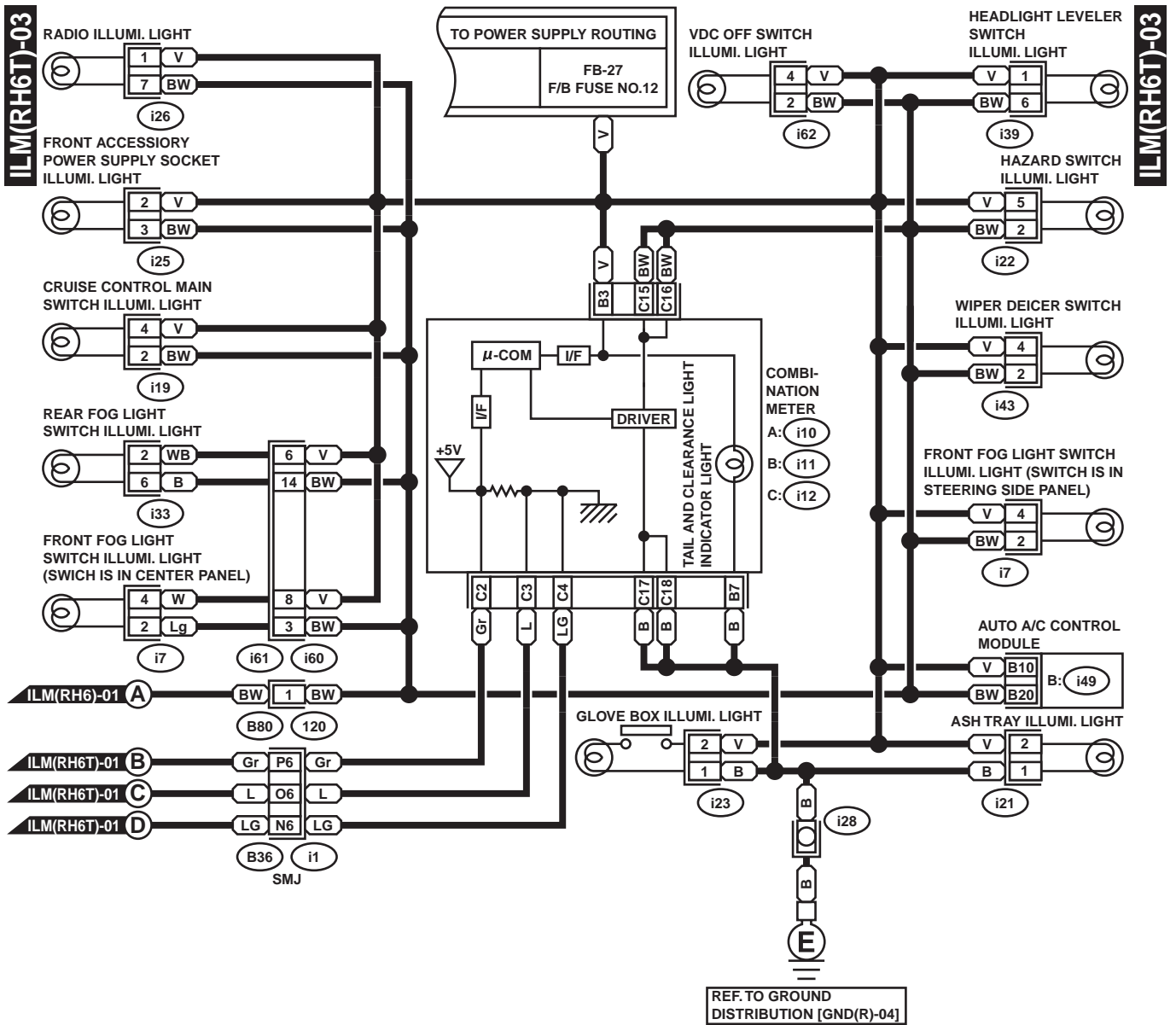
WIRING SYSTEM



WI-00968

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM



WI-00969

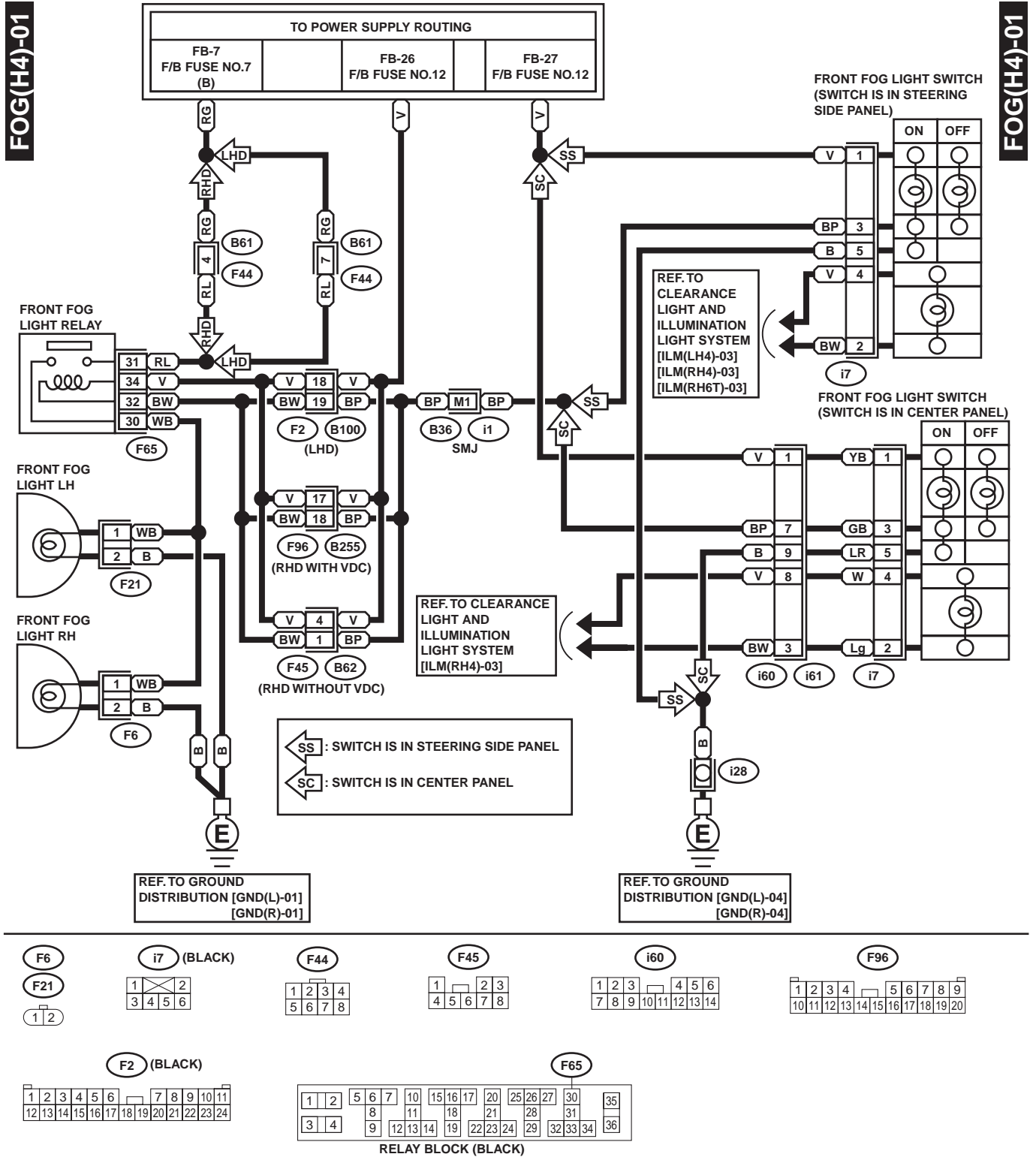
FRONT FOG LIGHT SYSTEM

WIRING SYSTEM

26. Front Fog Light System

A: SCHEMATIC

1. 4-CYLINDER ENGINE MODEL



WI-00970

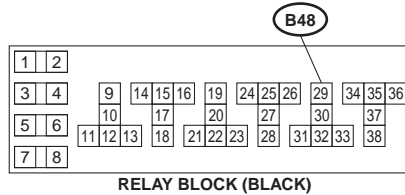
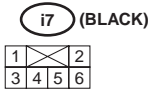
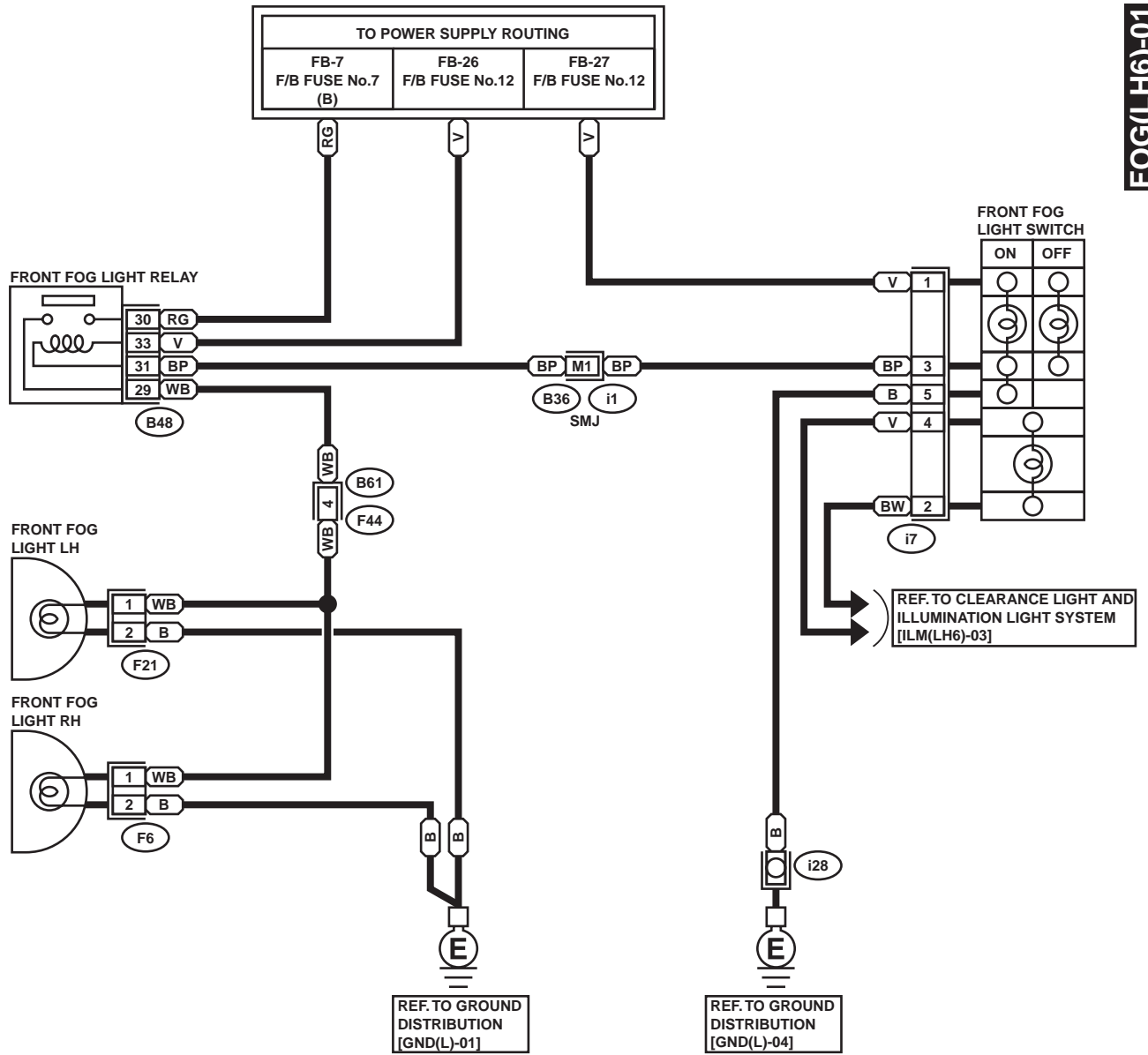
FRONT FOG LIGHT SYSTEM

WIRING SYSTEM

2. LHD 6-CYLINDER ENGINE MODEL

FOGL(H6)-01

FOG(LH6)-01

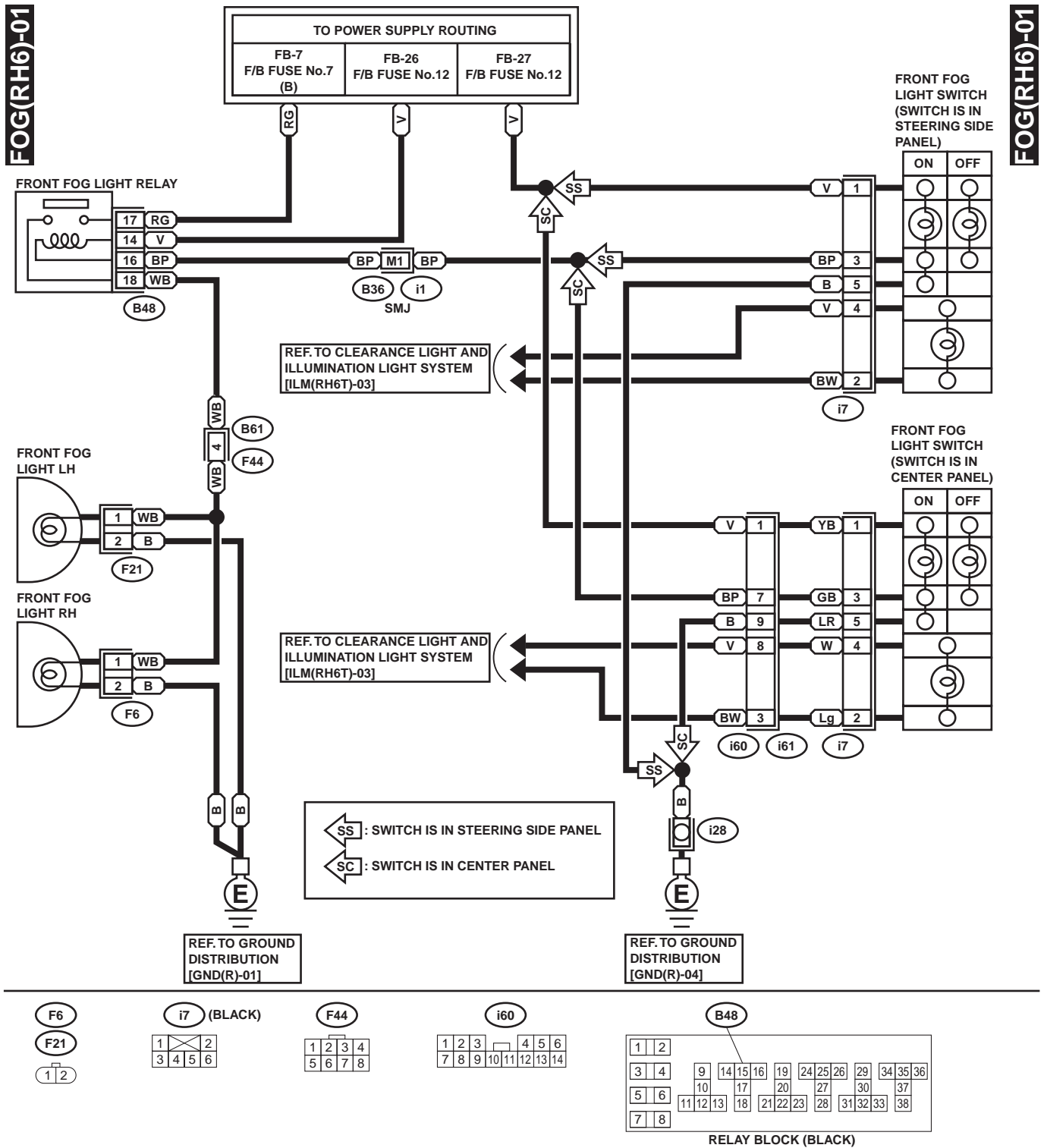


WI-00971

FRONT FOG LIGHT SYSTEM

WIRING SYSTEM

3. RHD 6-CYLINDER ENGINE MODEL



WI-00972

FRONT FOG LIGHT SYSTEM

WIRING SYSTEM

MEMO:

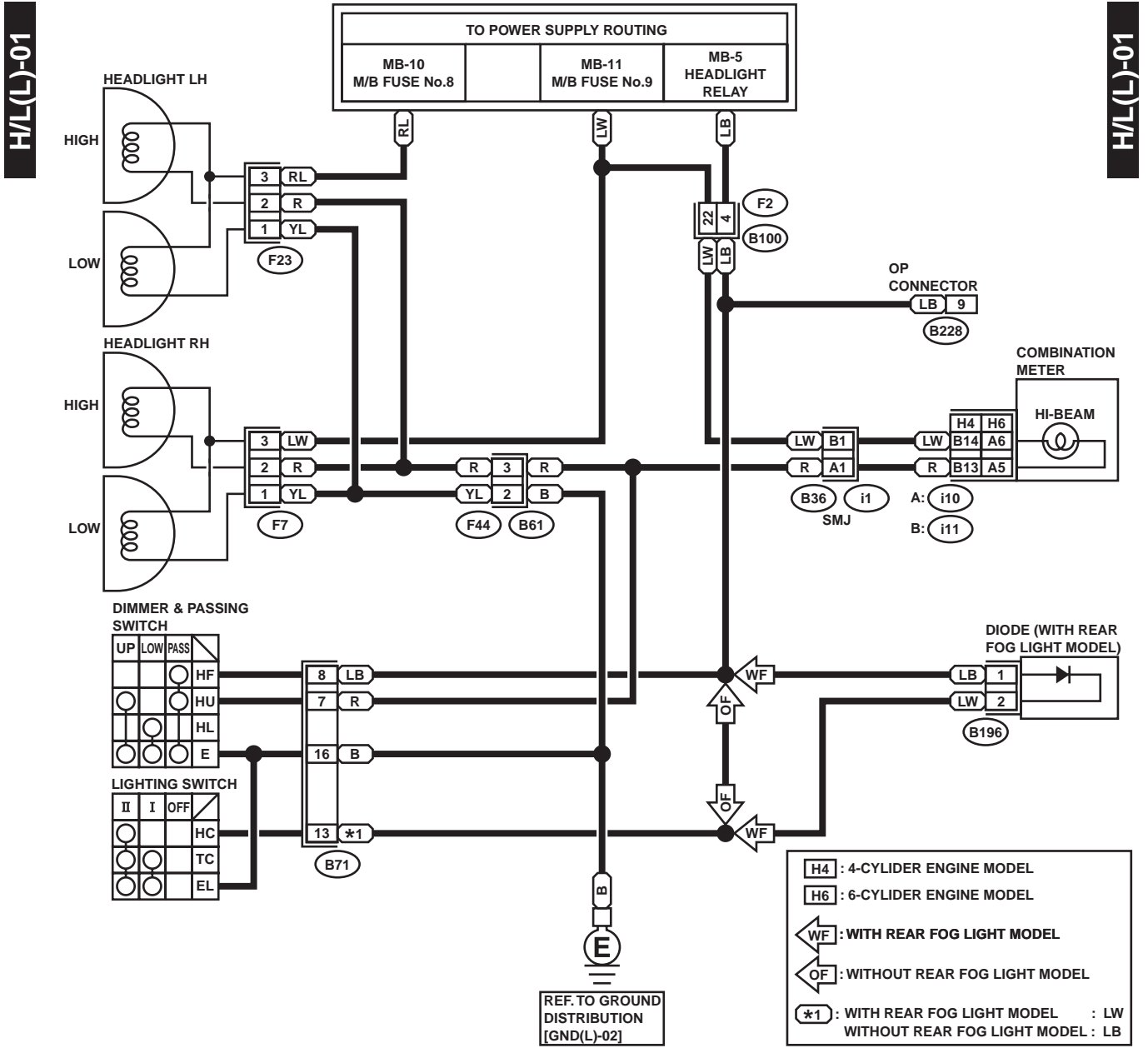
HEADLIGHT SYSTEM

WIRING SYSTEM

27. Headlight System

A: SCHEMATIC

1. LHD MODEL



(B196) (BLACK)



(F7) (GRAY)

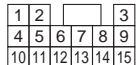
(F23) (GRAY)



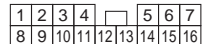
(F44)



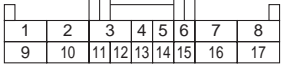
(B228)



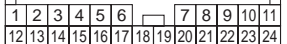
B: i11 (GREEN)



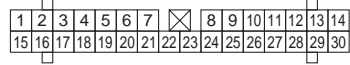
(B71)



(F2) (BLACK)



A: i10 (GREEN)

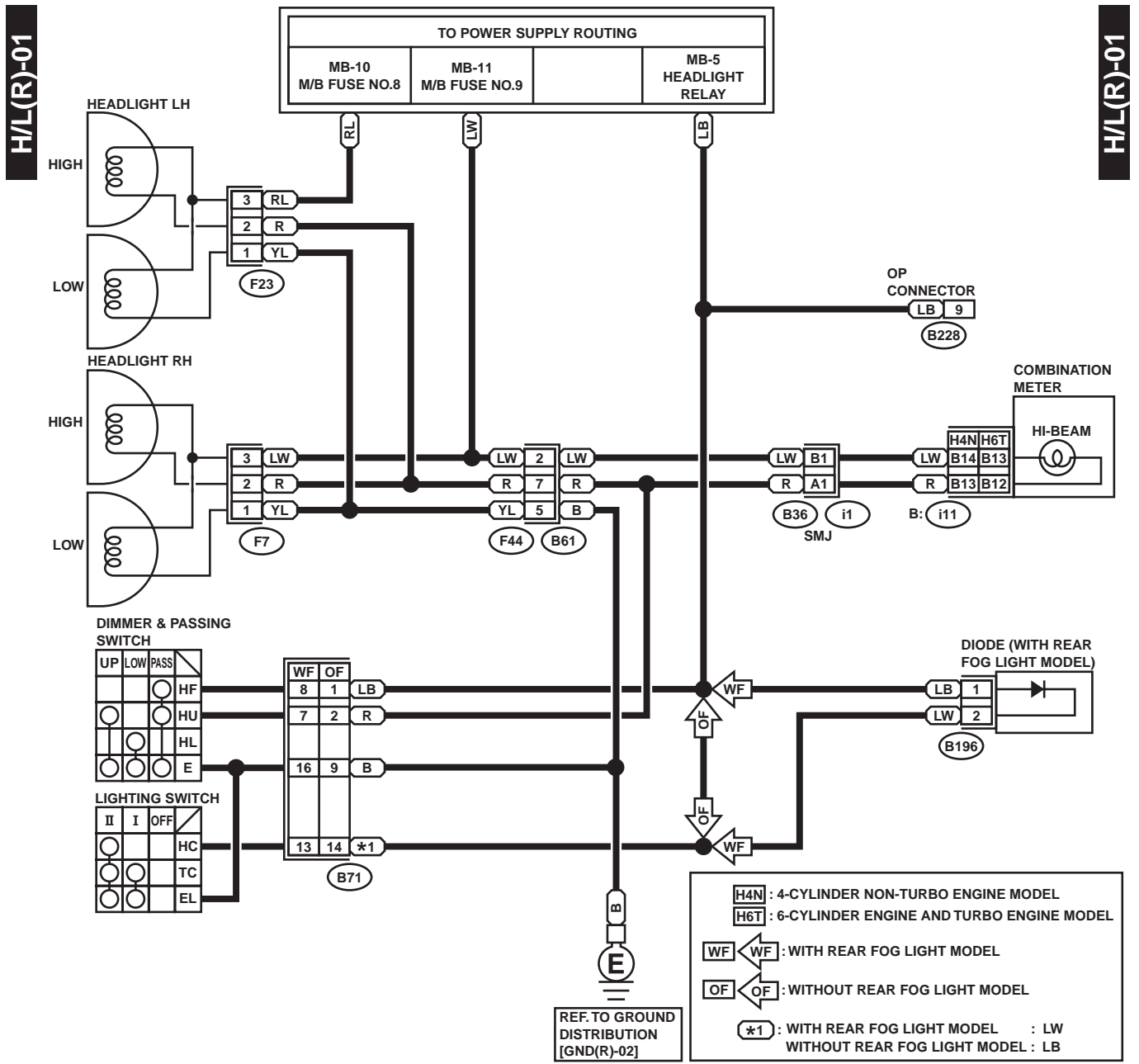


WI-00973

HEADLIGHT SYSTEM

WIRING SYSTEM

2. RHD MODEL



(B196) (BLACK)



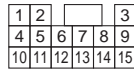
(F7) (GRAY)



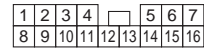
(F44)



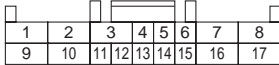
(B228)



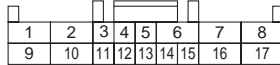
B: i11 (GREEN)



WF (B71)



OF (B71)



WI-00974

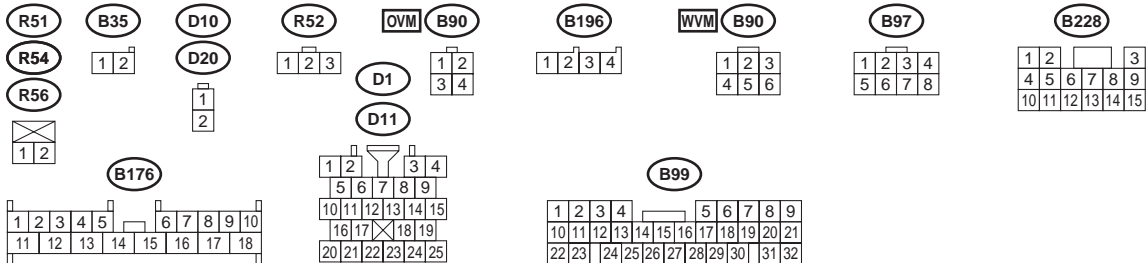
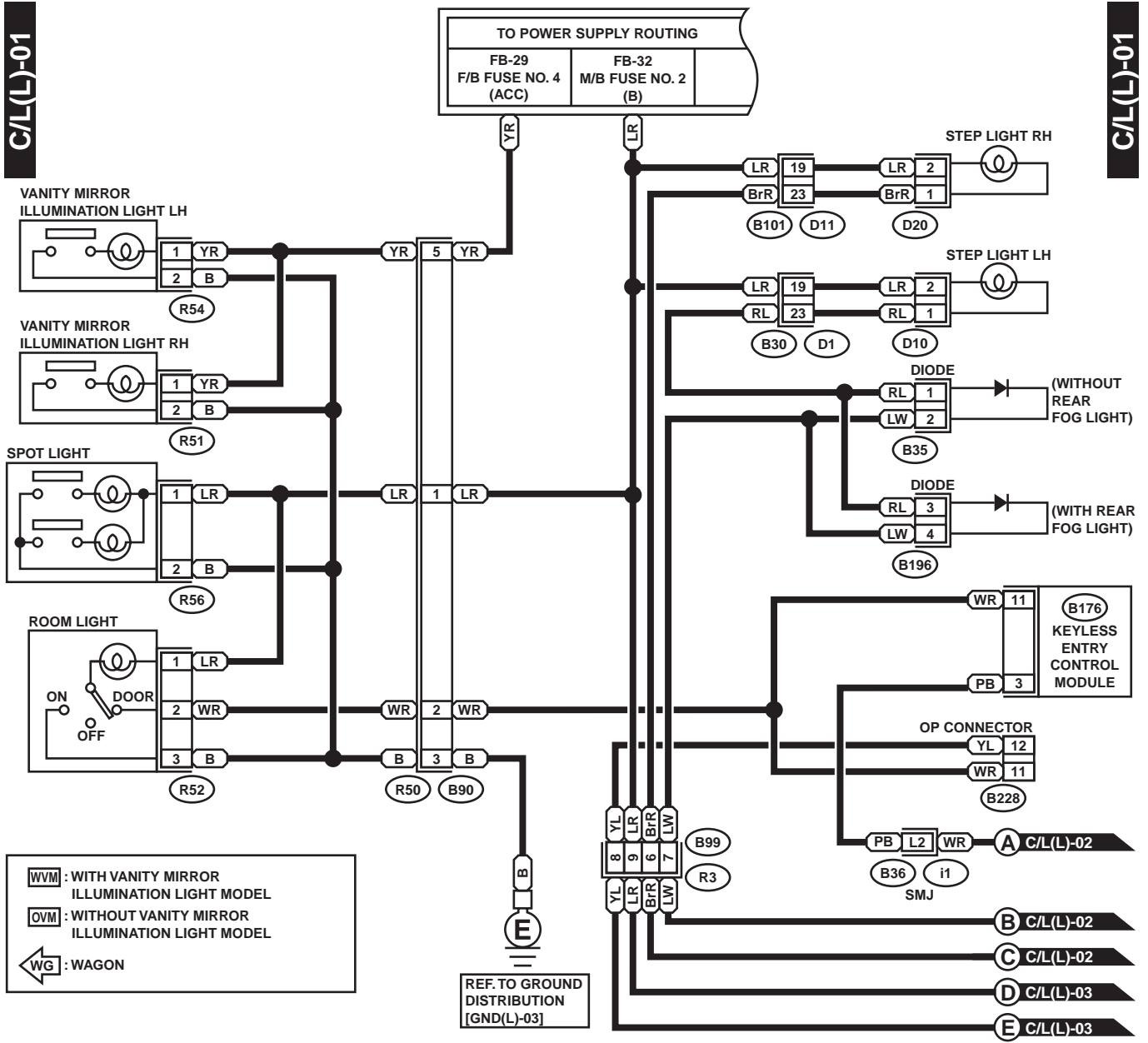
IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM

28.In Compartment Light System

A: SCHEMATIC

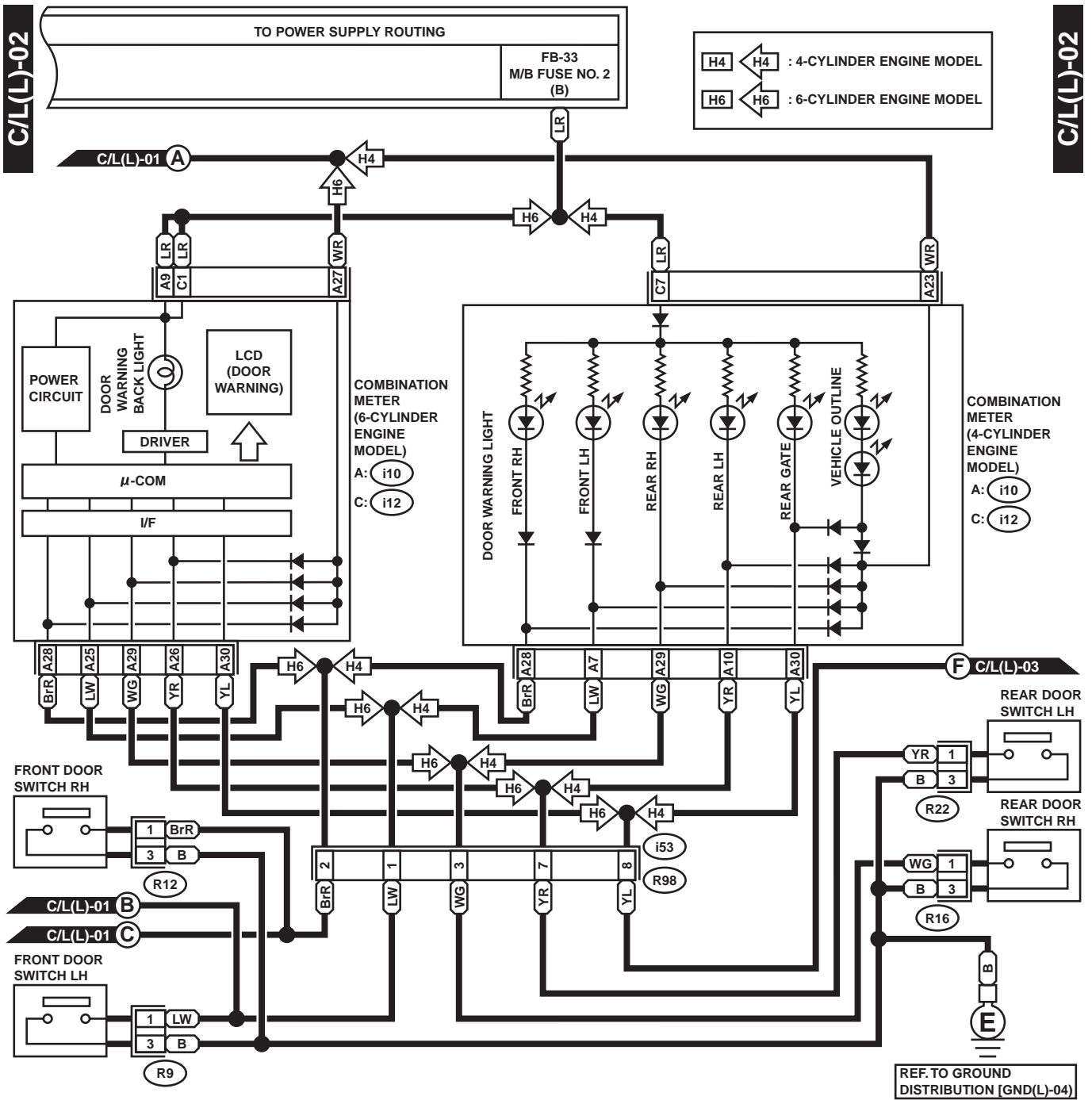
1. LHD MODEL



WI-00975

IN COMPARTMENT LIGHT SYSTEM

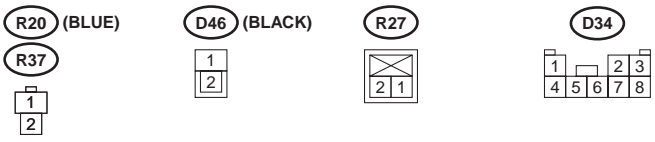
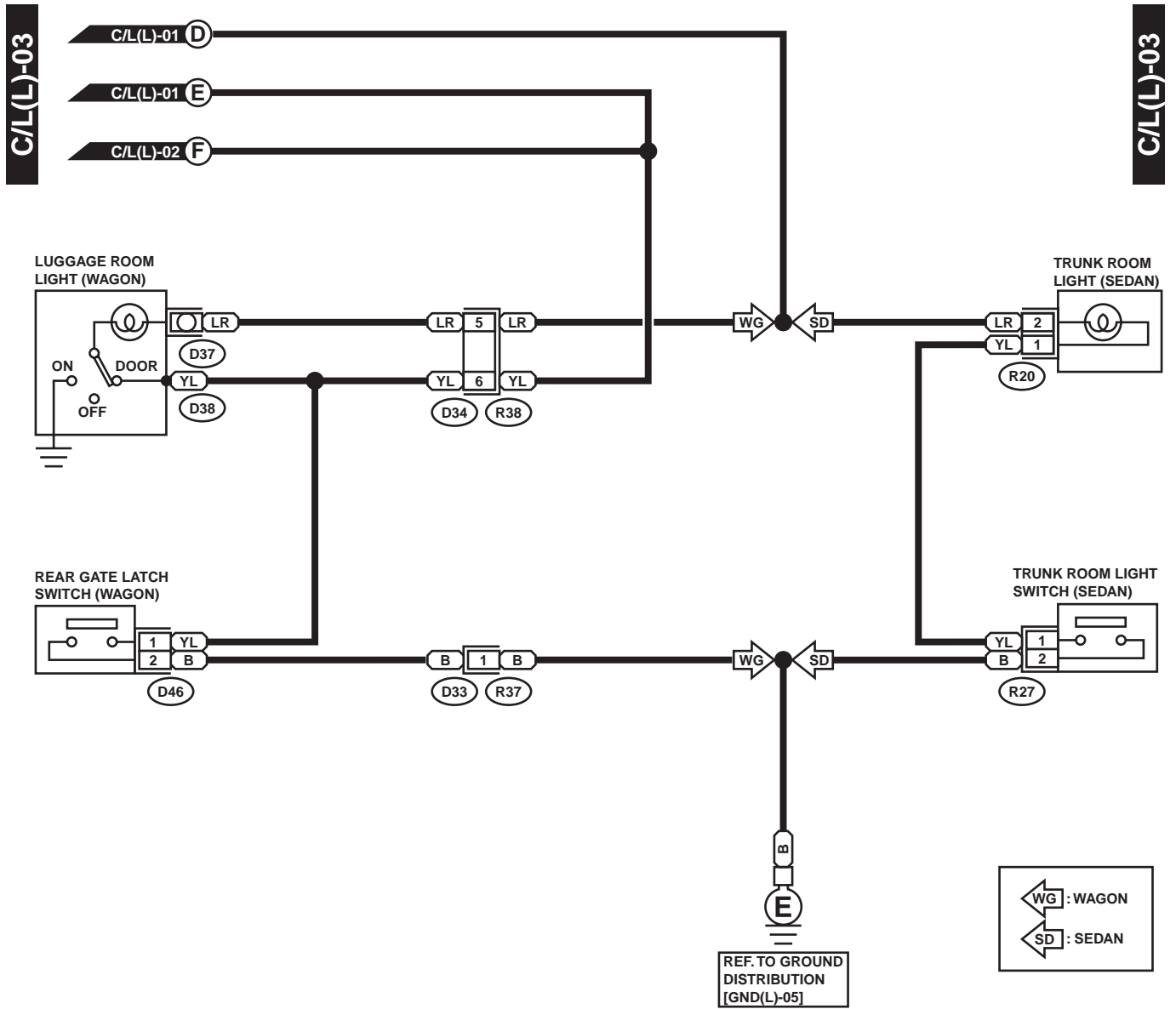
WIRING SYSTEM



WI-00976

IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM

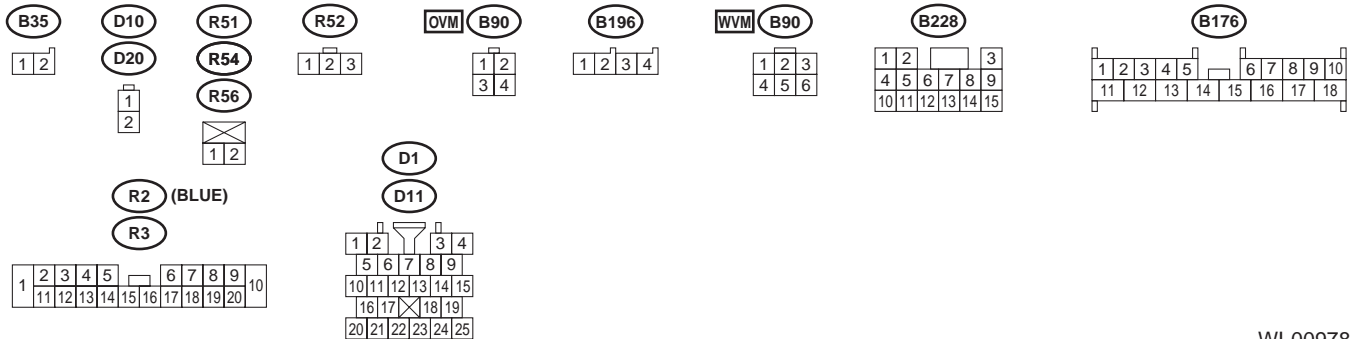
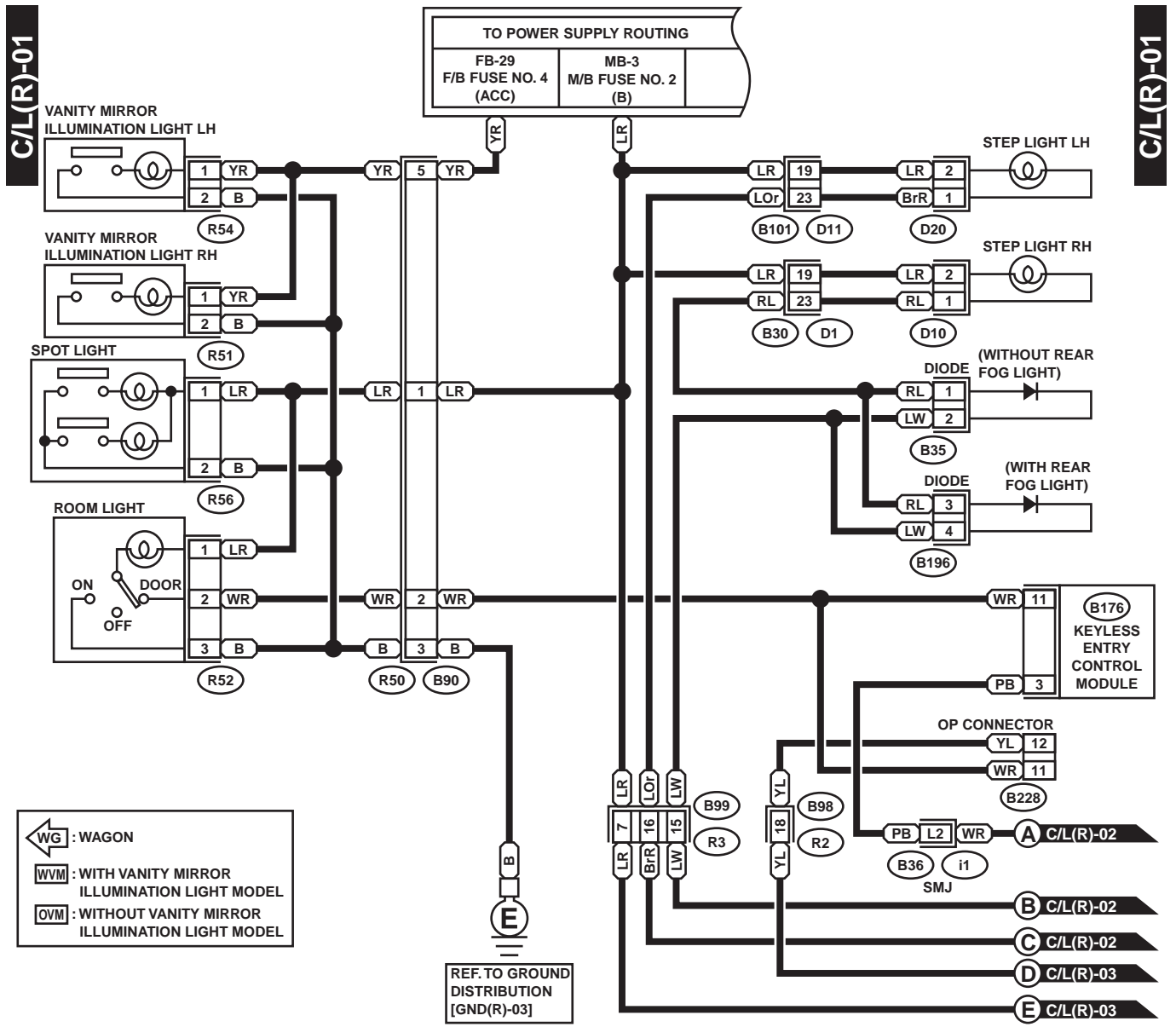


WI-00977

IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM

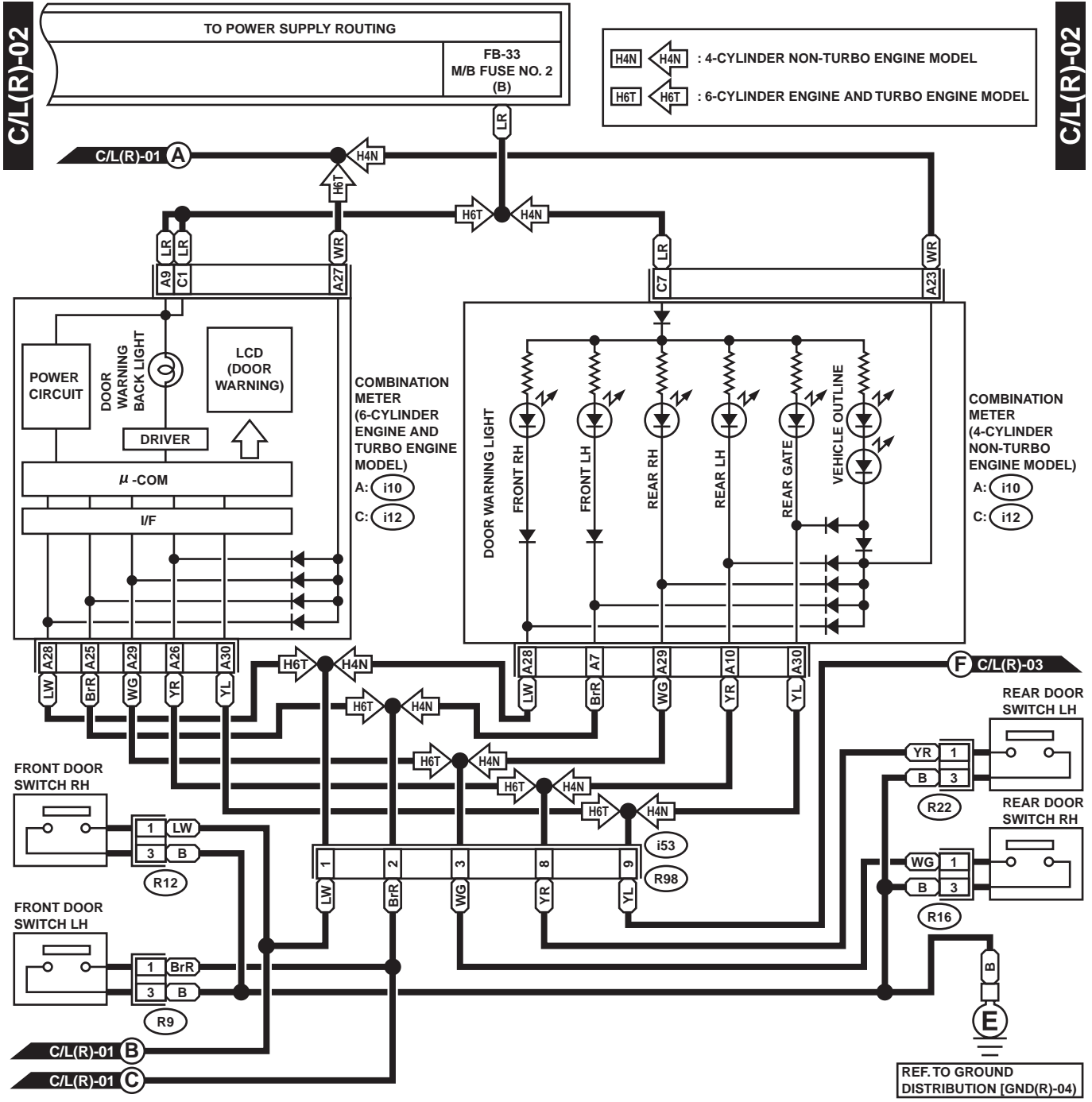
2. RHD MODEL



WI-00978

IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM



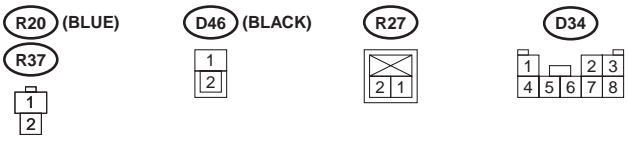
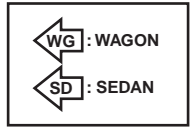
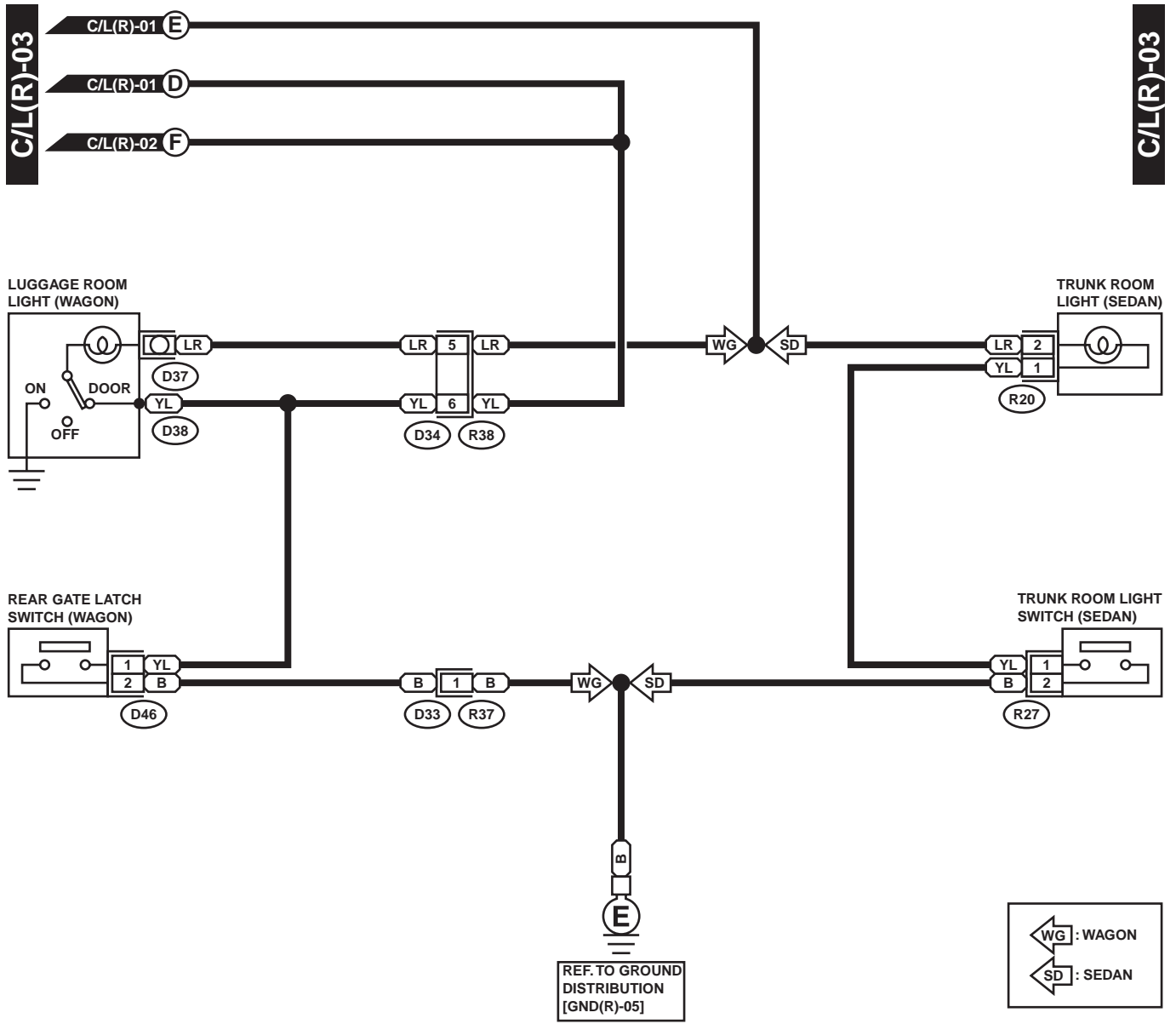
Legend:

- R9, R16 (BLACK)**: 1 2 3
- R12, R22 (BLACK)**: 1 2 3
- H4N C: i12 (GREEN)**: 1 2 3 4 5 6 / 7 8 9 10 11 12 13 14
- R98 (BLUE)**: 1 2 3 4 5 6 7 / 8 9 10 11 12 13 14 15 16
- H6T C: i12 (GREEN)**: 1 2 3 4 5 6 7 8 / 9 10 11 12 13 14 15 16 17 18
- A: i10 (GREEN)**: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 / 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

WI-00979

IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM



WI-00980

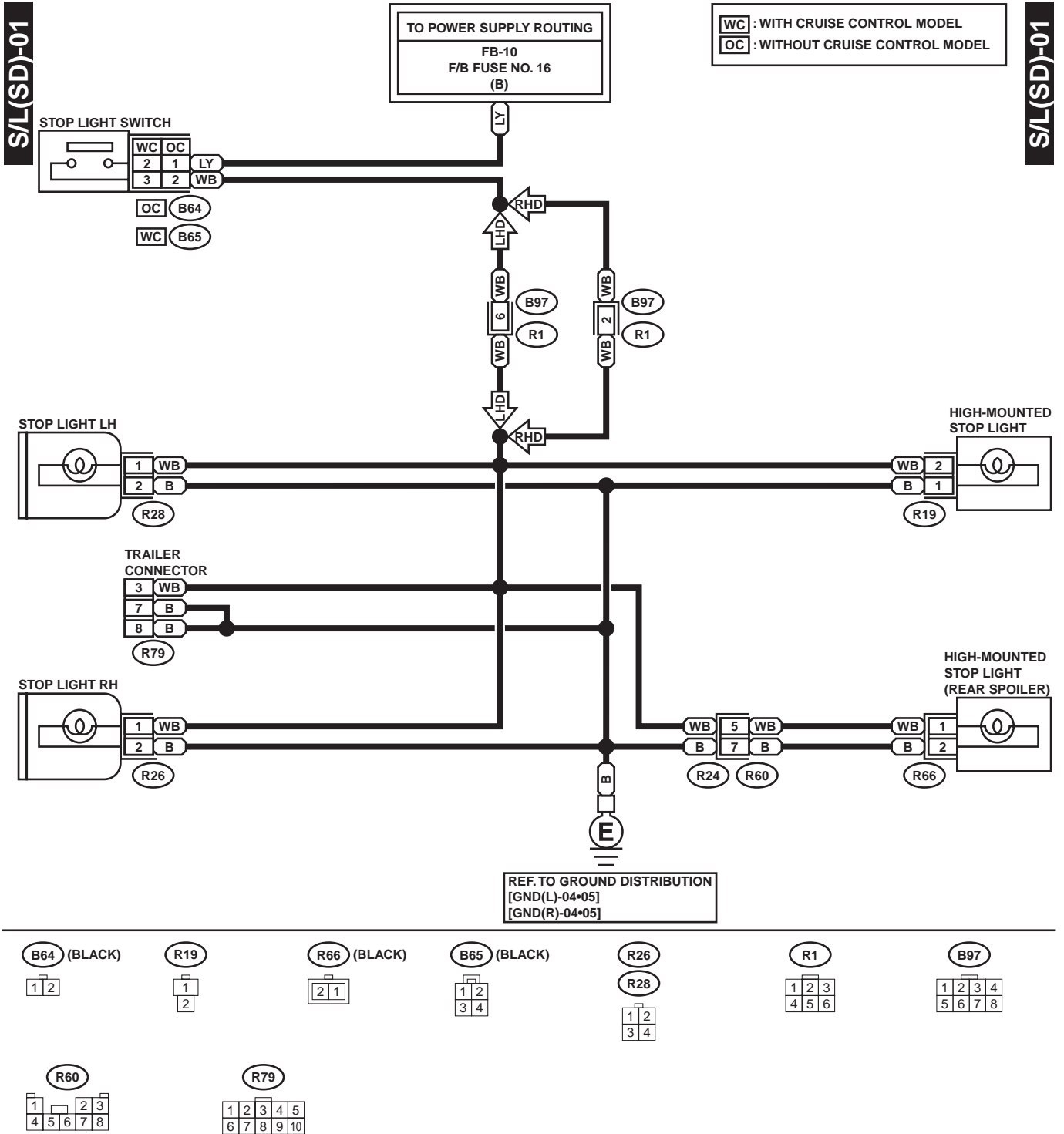
STOP LIGHT SYSTEM

WIRING SYSTEM

29. Stop Light System

A: SCHEMATIC

1. SEDAN MODEL



WI-00981

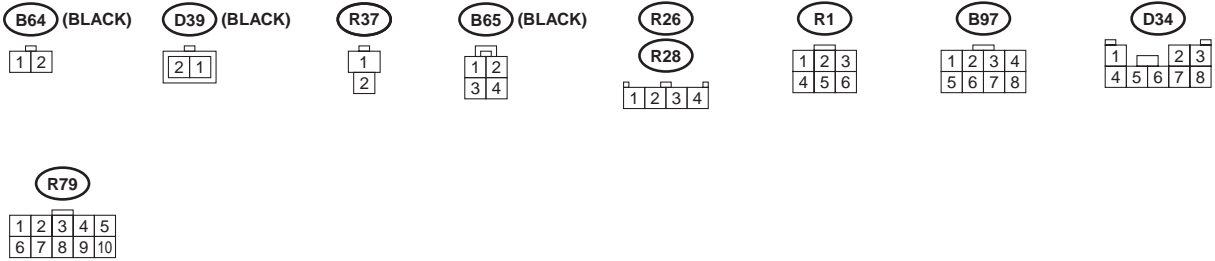
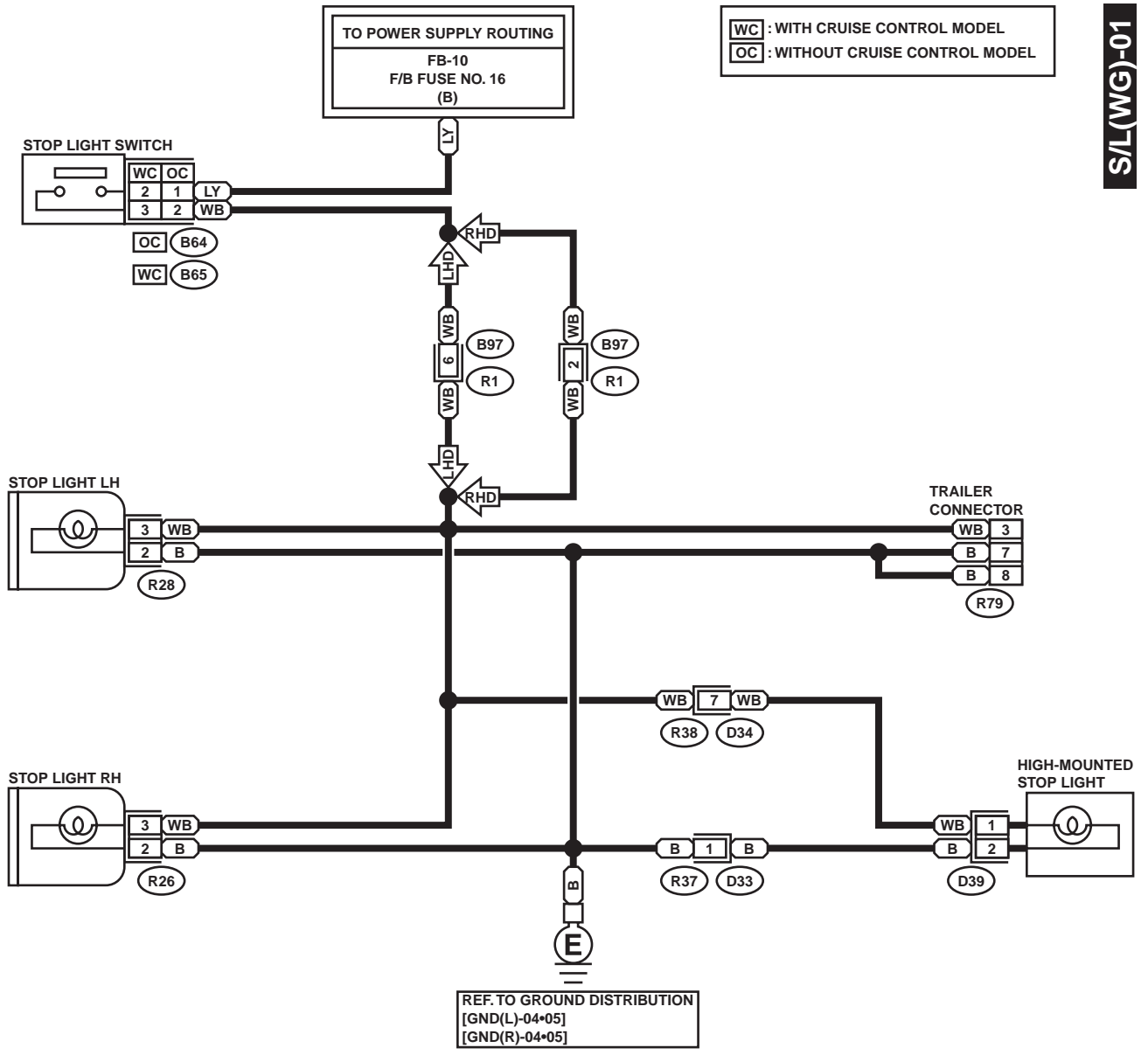
STOP LIGHT SYSTEM

WIRING SYSTEM

2. WAGON MODEL

S/L(WG)-01

S/L(WG)-01



WI-00982

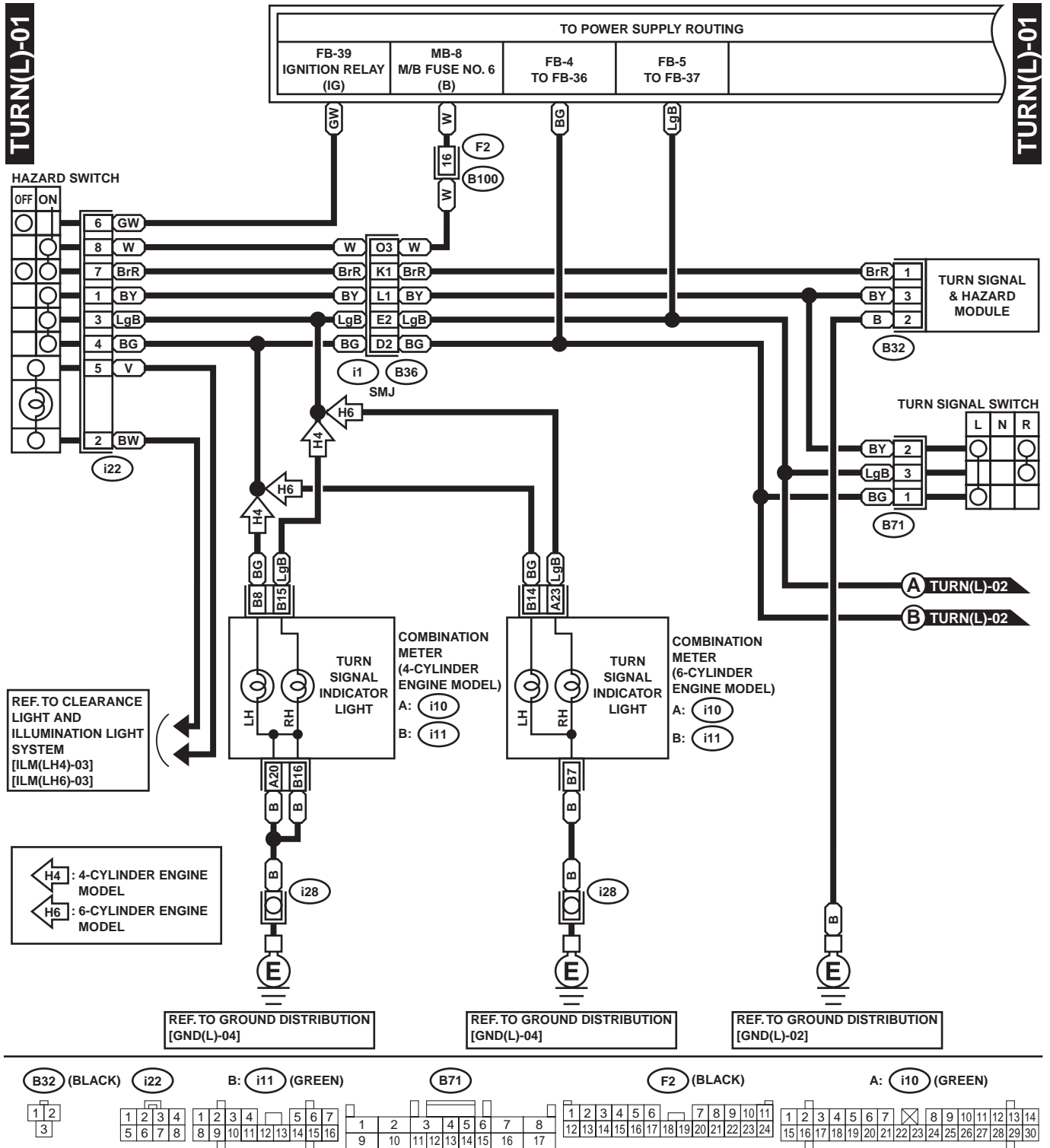
TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

WIRING SYSTEM

30. Turn Signal Light and Hazard Light System

A: SCHEMATIC

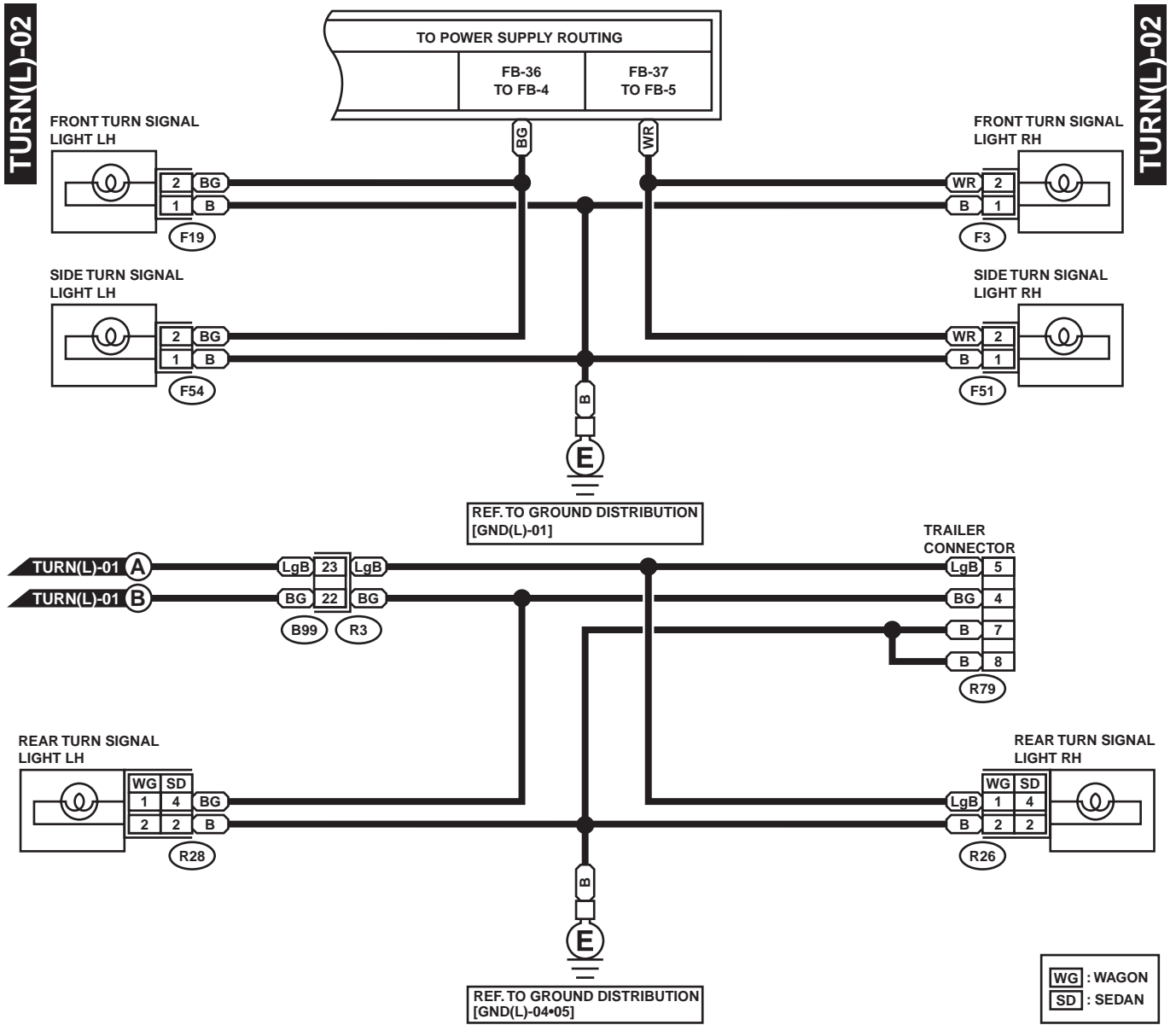
1. LHD MODEL



WI-00983

TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

WIRING SYSTEM



F3

F19

F51 (BLACK)

F54 (BLACK)

1 2

WG R26

WG R28

1	2	3	4
---	---	---	---

SD R26

SD R28

1	2
3	4

R79

1	2	3	4	5
6	7	8	9	10

B99

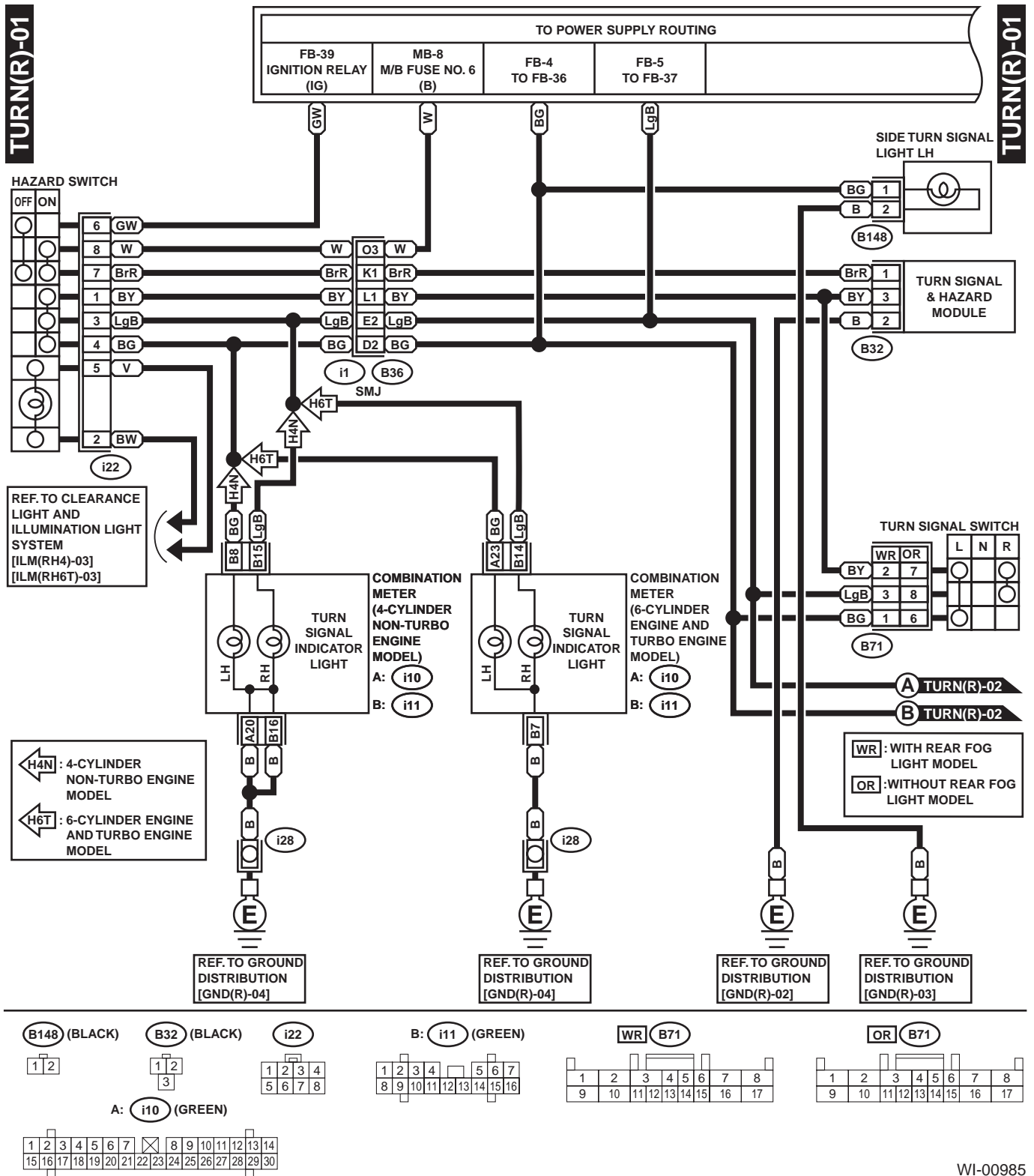
1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32	

WI-00984

TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

WIRING SYSTEM

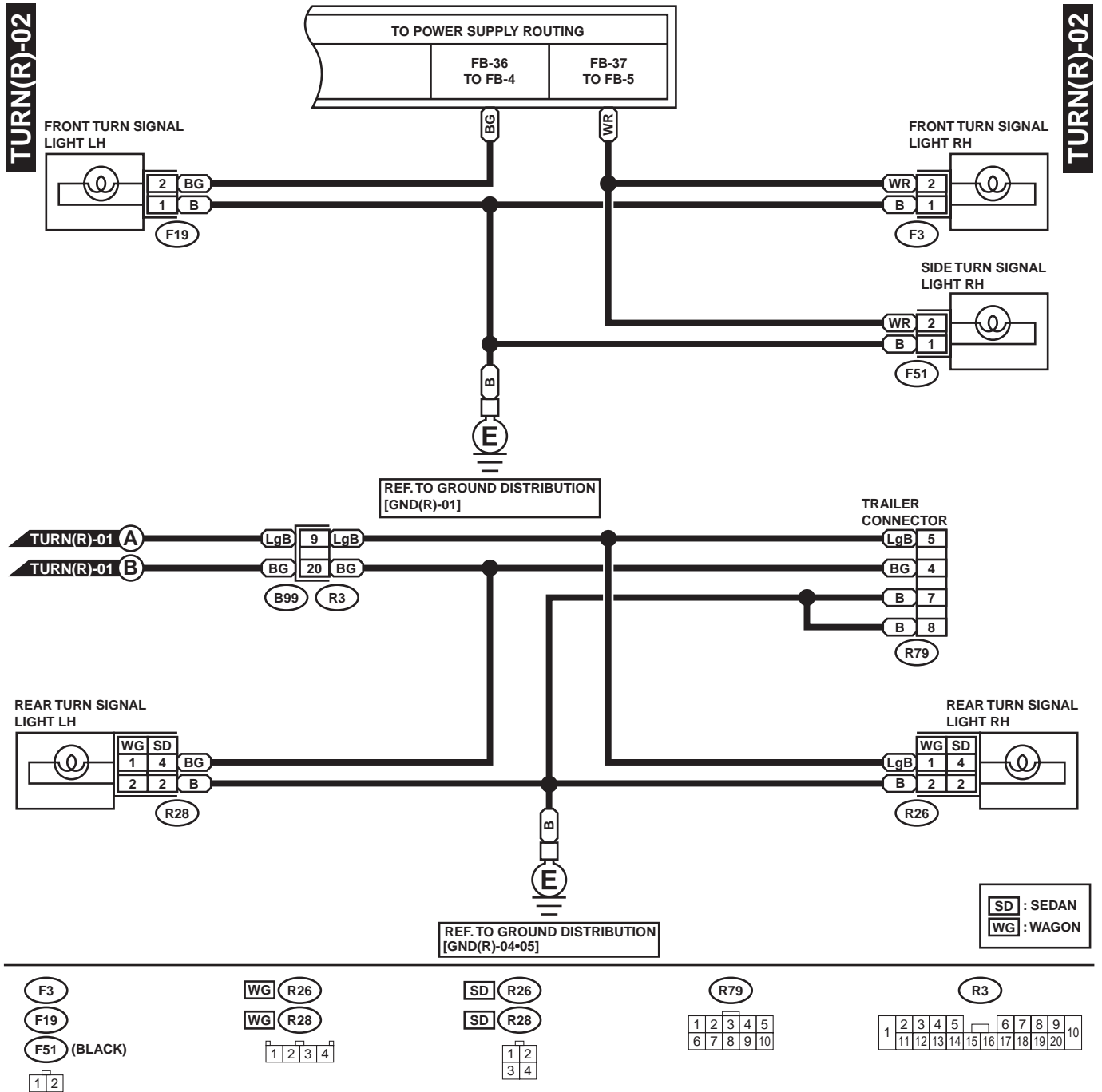
2. RHD MODEL



WI-00985

TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

WIRING SYSTEM



WI-00986

OIL PRESSURE WARNING LIGHT SYSTEM

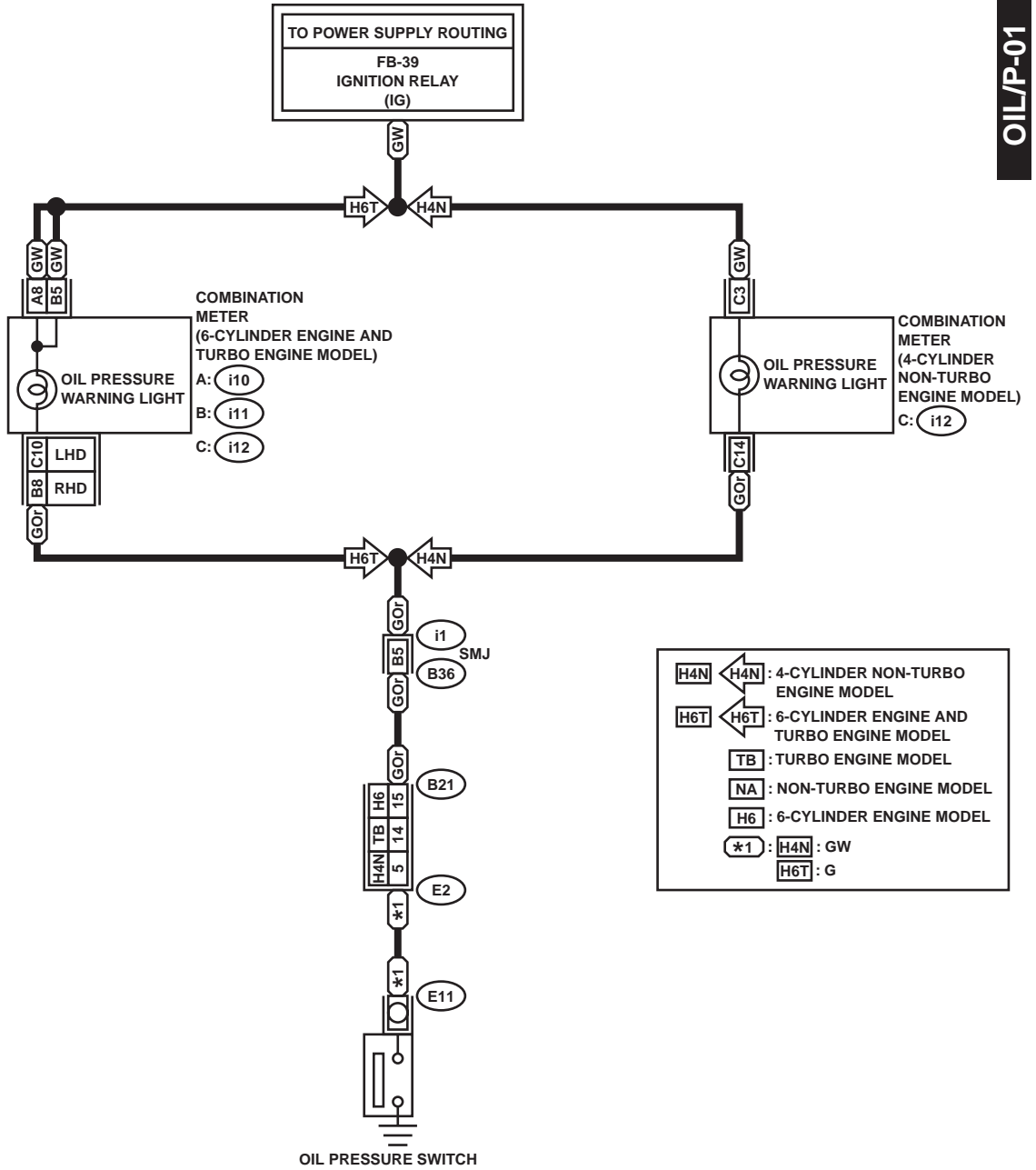
WIRING SYSTEM

31.Oil Pressure Warning Light System

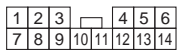
A: SCHEMATIC

OIL/P-01

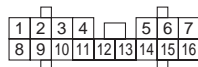
OIL/P-01



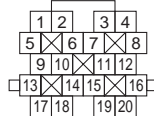
H4N C: i12 (GREEN)



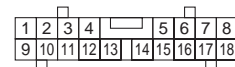
B: i11 (GREEN)



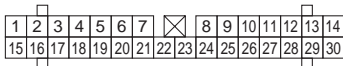
B21 **TB** : (BLACK)
NA : (LIGHT GRAY)



H6T C: i12 (GREEN)



A: i10 (GREEN)



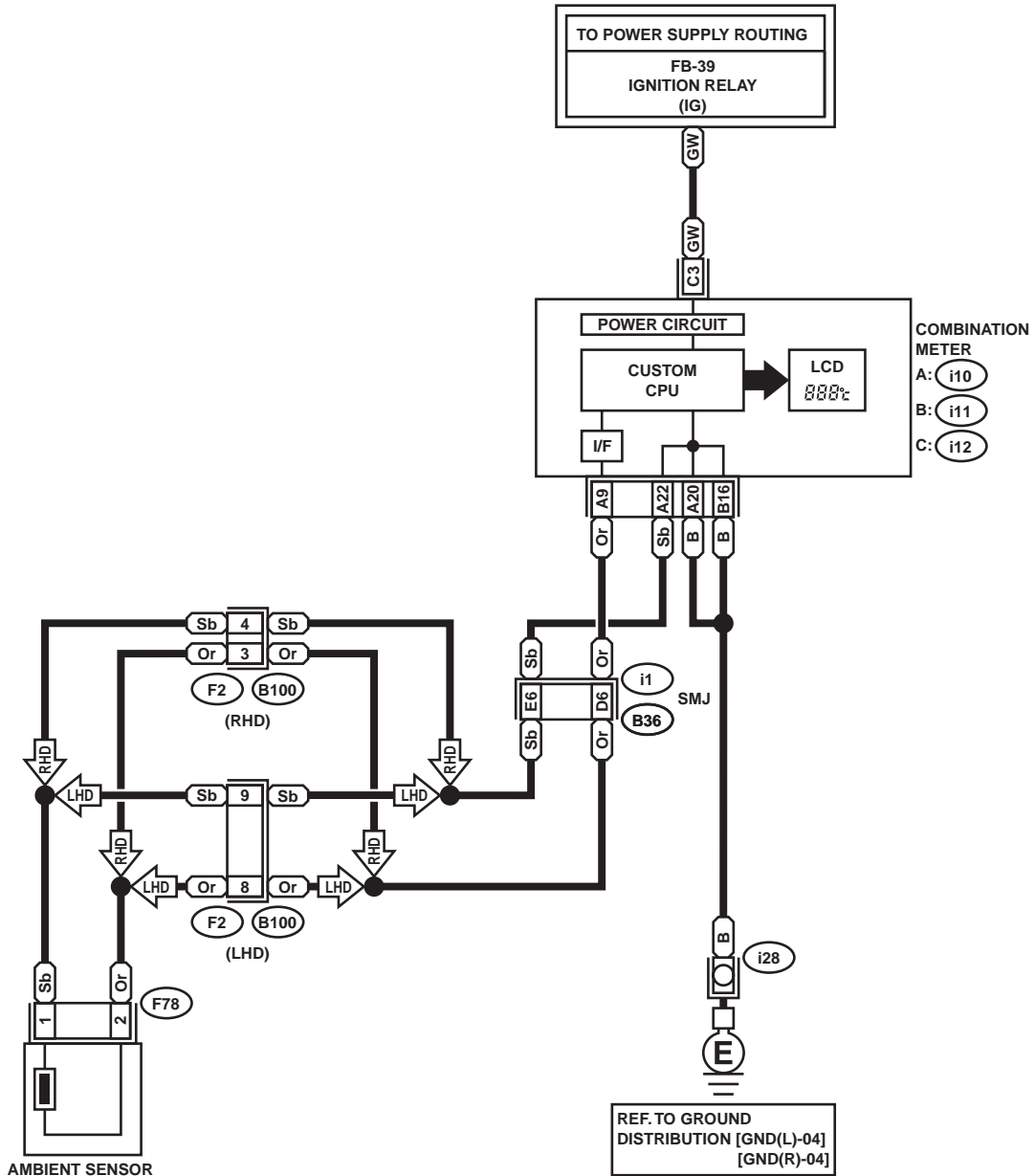
WI-01083

32. Outside Temperature Display System

A: SCHEMATIC

O/TEMP-01

O/TEMP-01



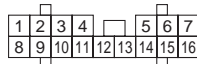
F78 (BLACK)



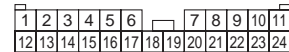
C: i12 (GREEN)



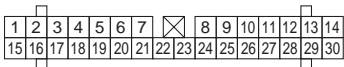
B: i11 (GREEN)



F2 (BLACK)



A: i10 (GREEN)

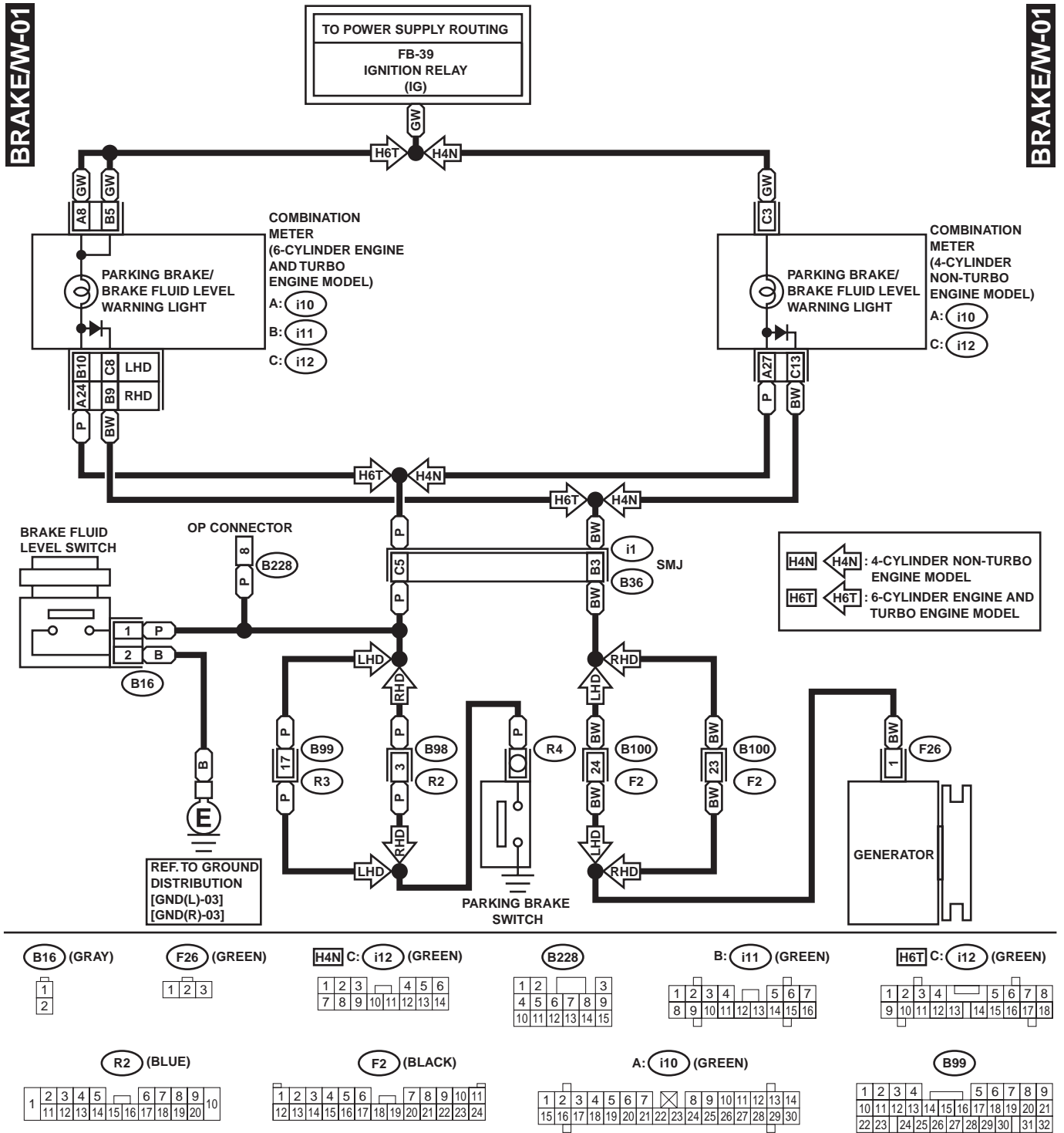


PARKING BRAKE AND BRAKE FLUID LEVEL WARNING SYSTEM

WIRING SYSTEM

33. Parking Brake and Brake Fluid Level Warning System

A: SCHEMATIC



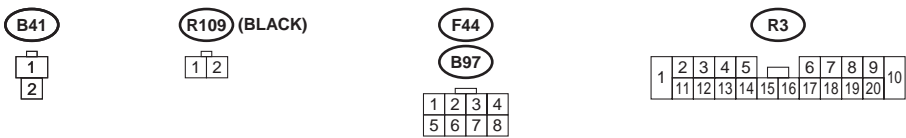
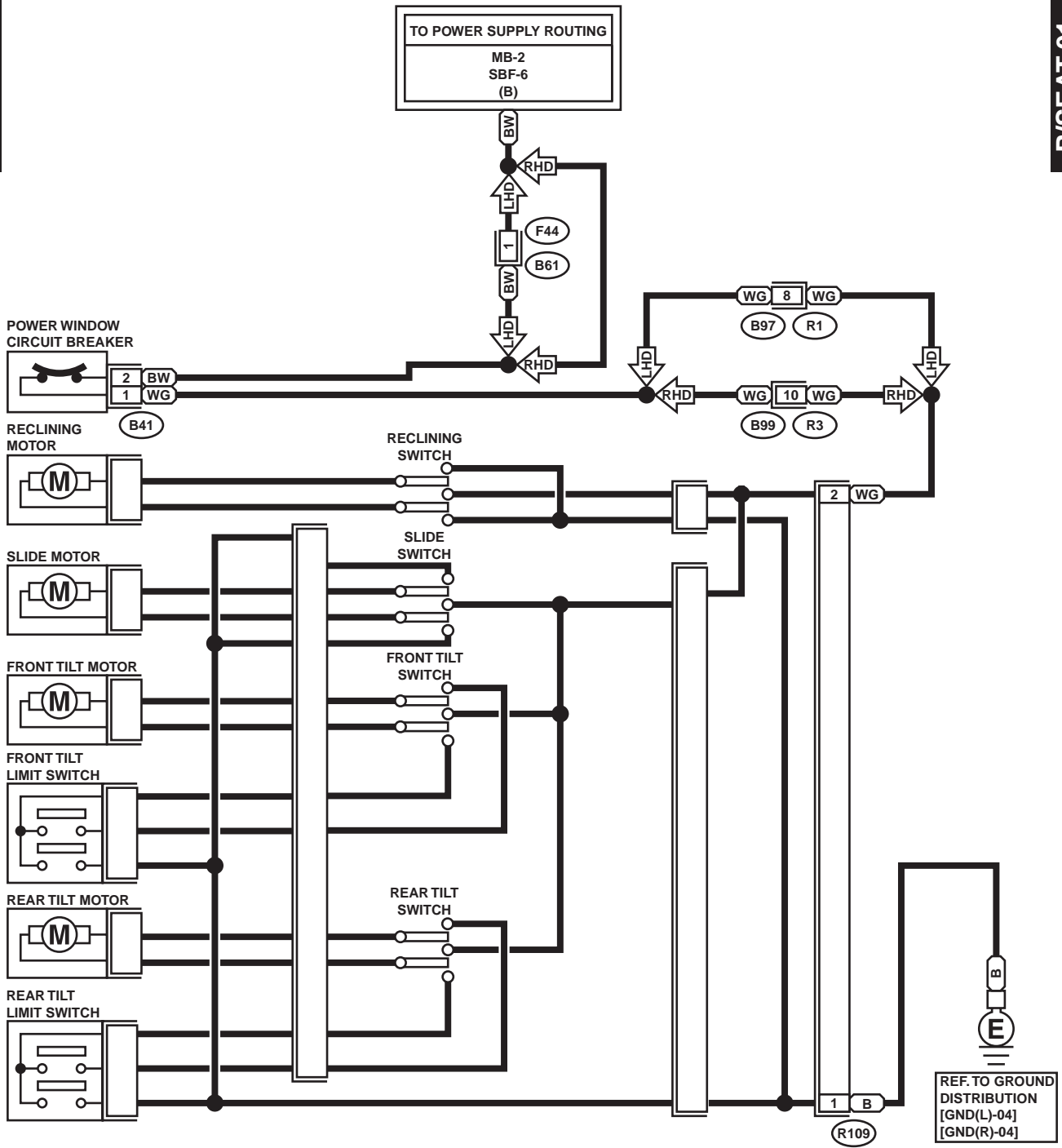
WI-00988

34.Power Seat System

A: SCHEMATIC

P/SEAT-01

P/SEAT-01



WI-01084

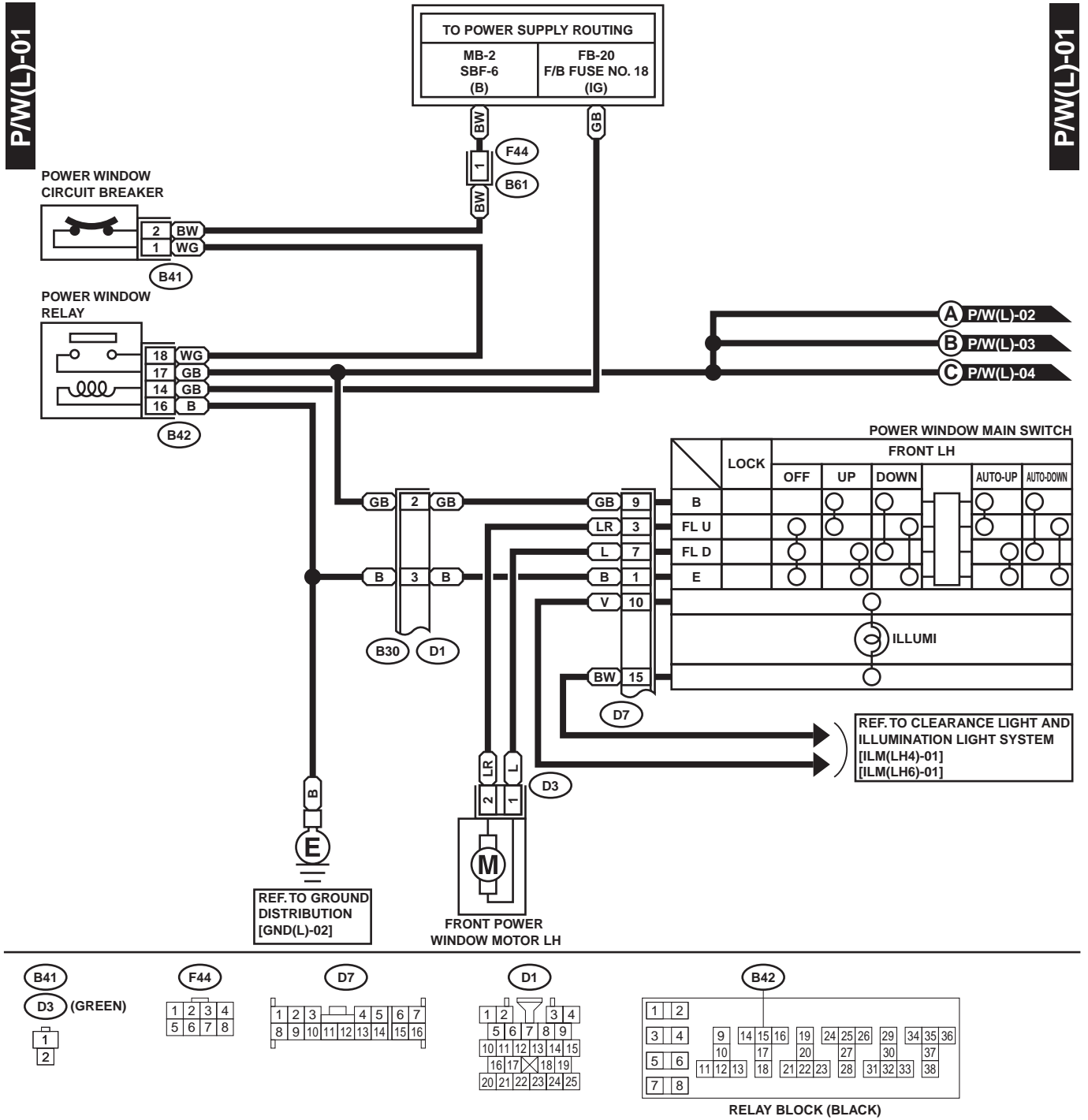
POWER WINDOW SYSTEM

WIRING SYSTEM

35. Power Window System

A: SCHEMATIC

1. LHD MODEL



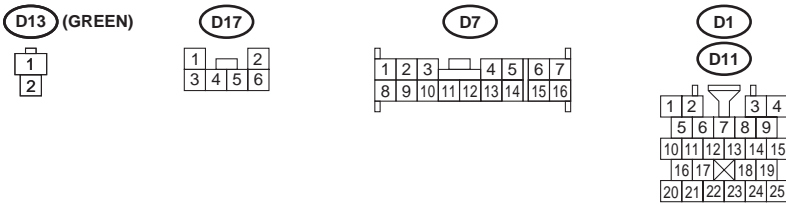
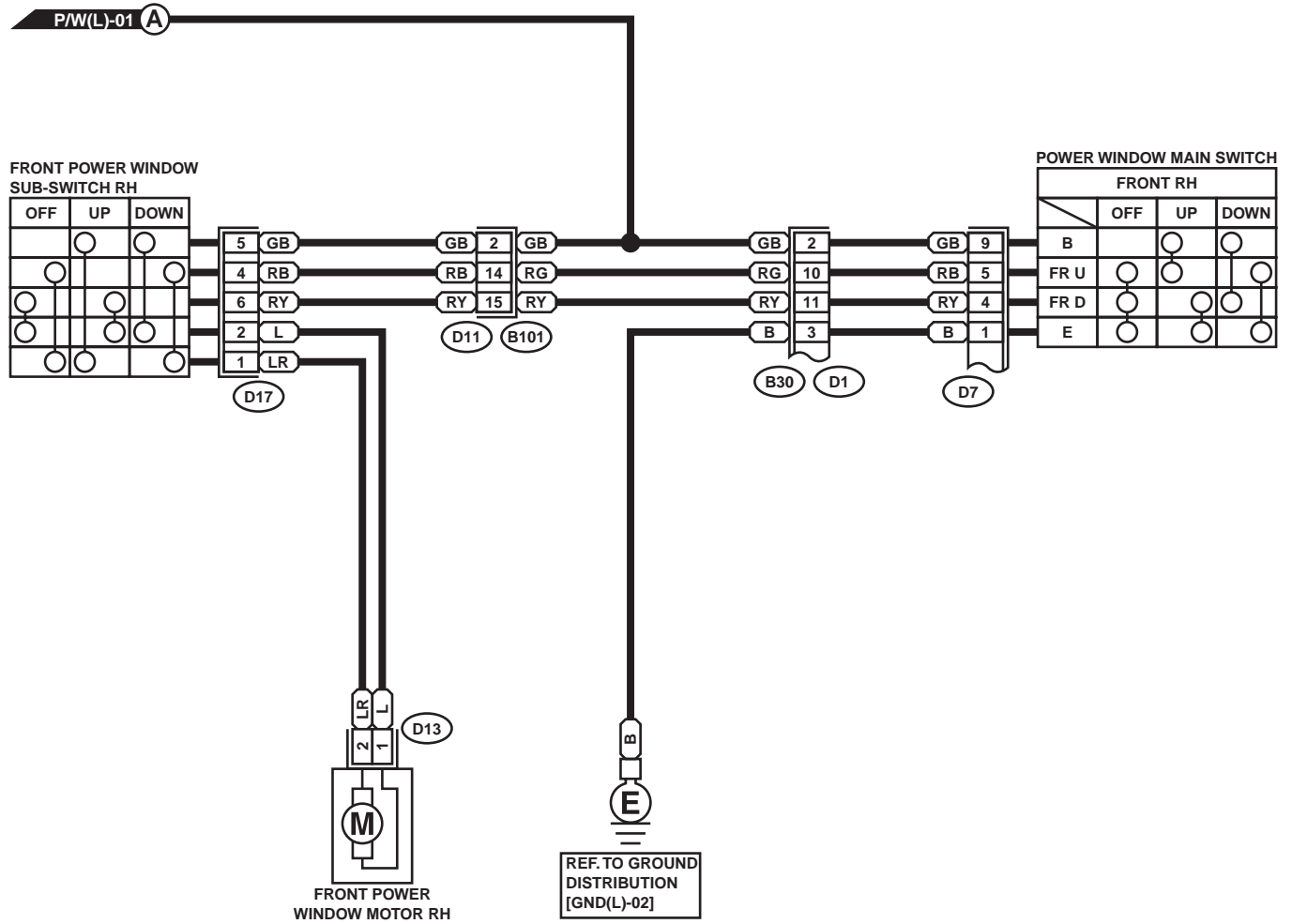
WI-00989

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(L)-02

P/W(L)-02



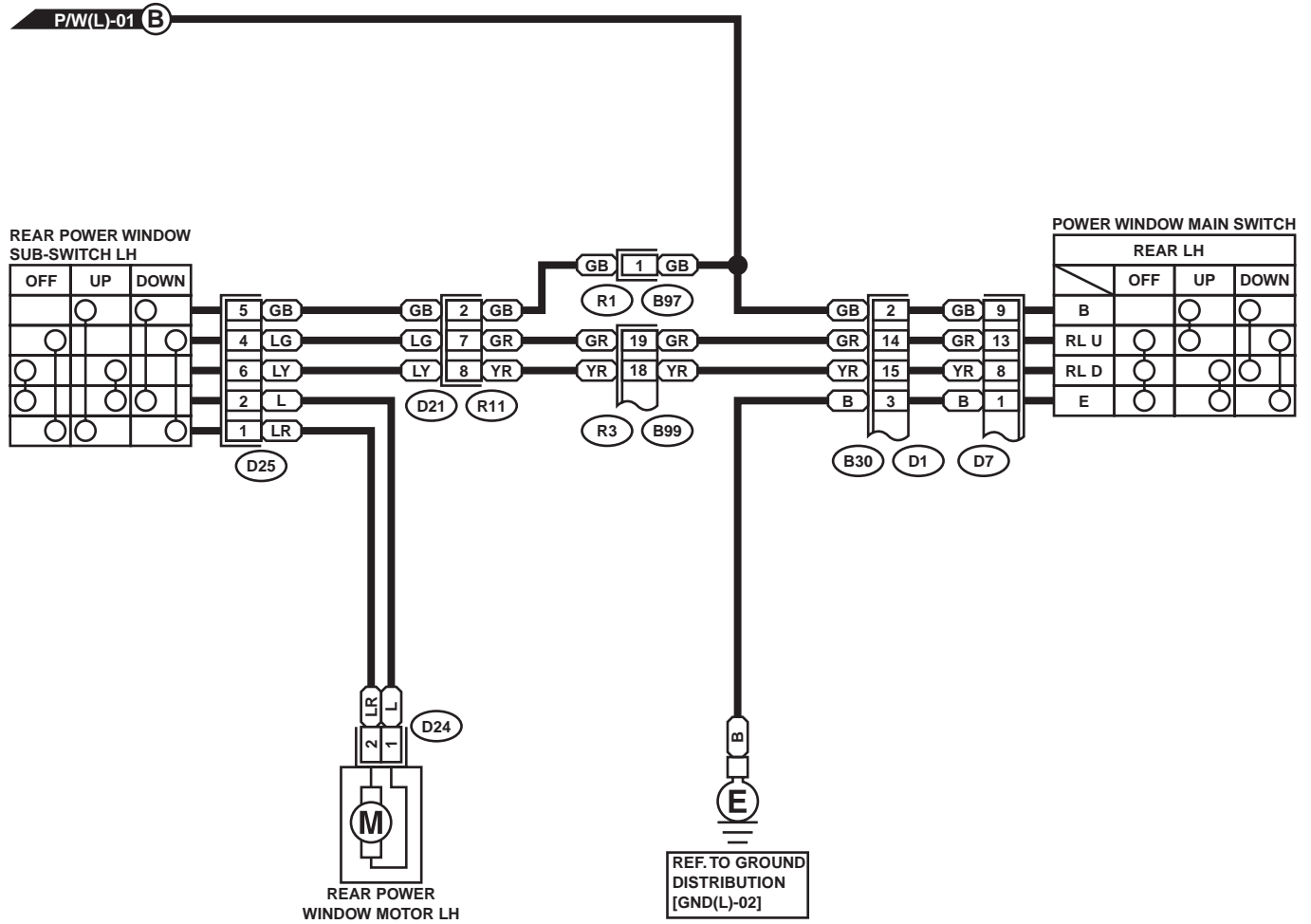
WI-00990

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(L)-03

P/W(L)-03



(D24) (GREEN)



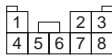
(D25)



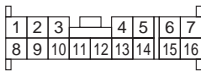
(B97)



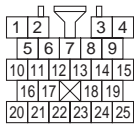
(R11)



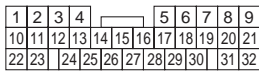
(D7)



(D1)



(B99)



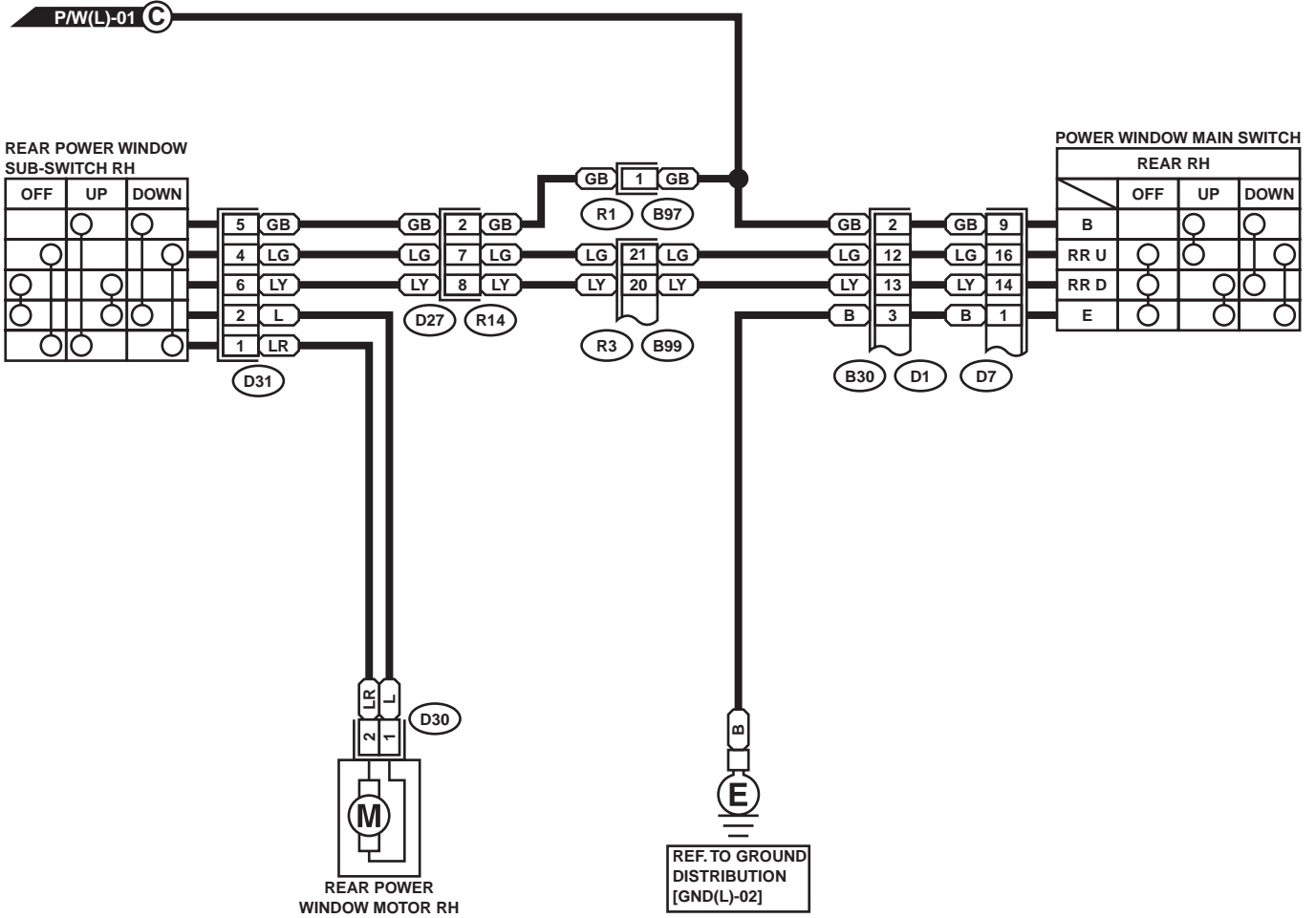
WI-00991

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(L)-04

P/W(L)-04



D30 (GREEN)



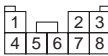
D31



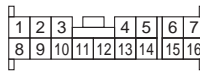
B97



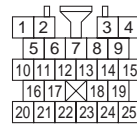
R14



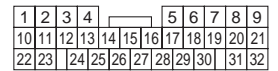
D7



D1



B99

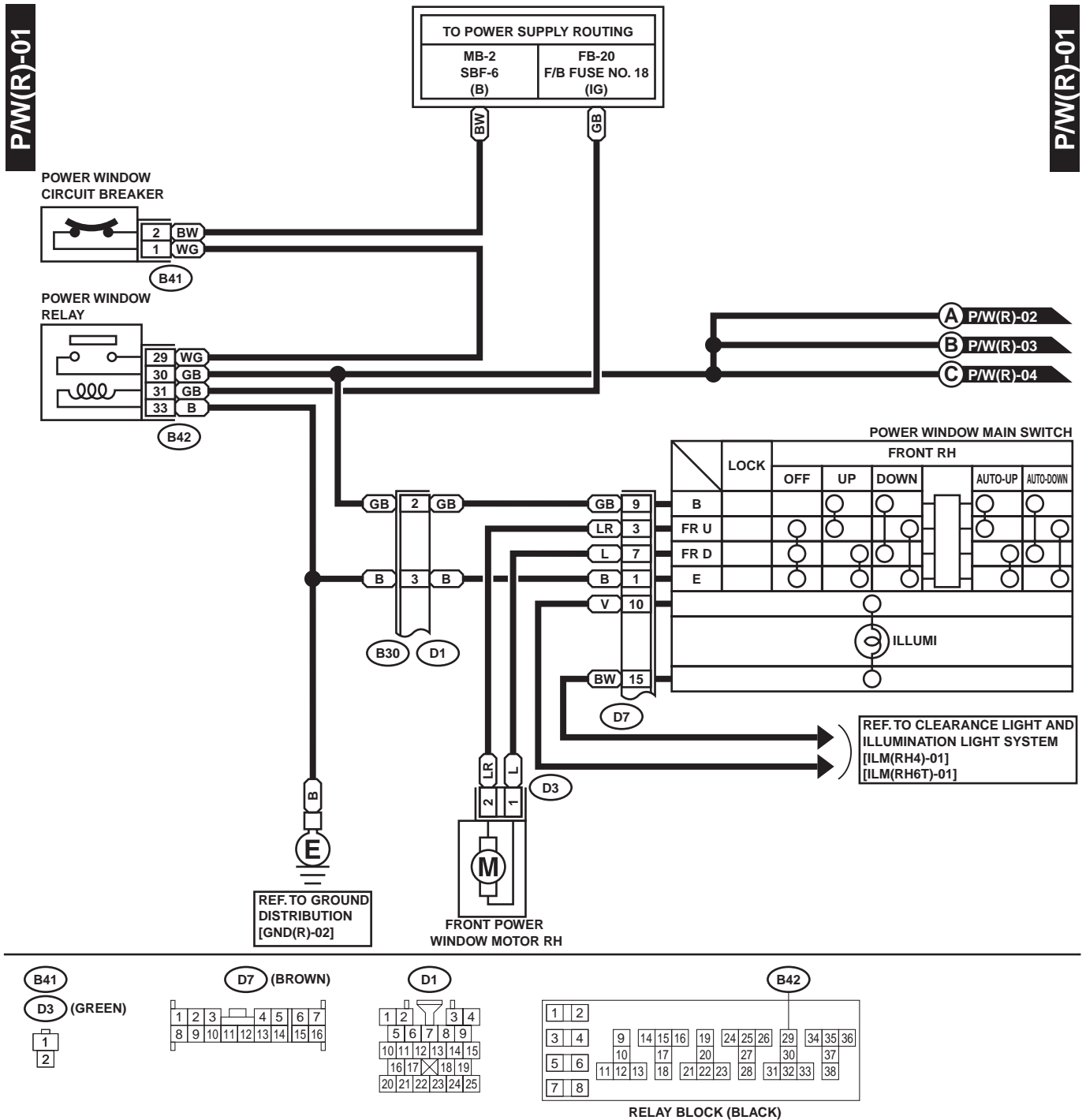


WI-00992

POWER WINDOW SYSTEM

WIRING SYSTEM

2. RHD MODEL



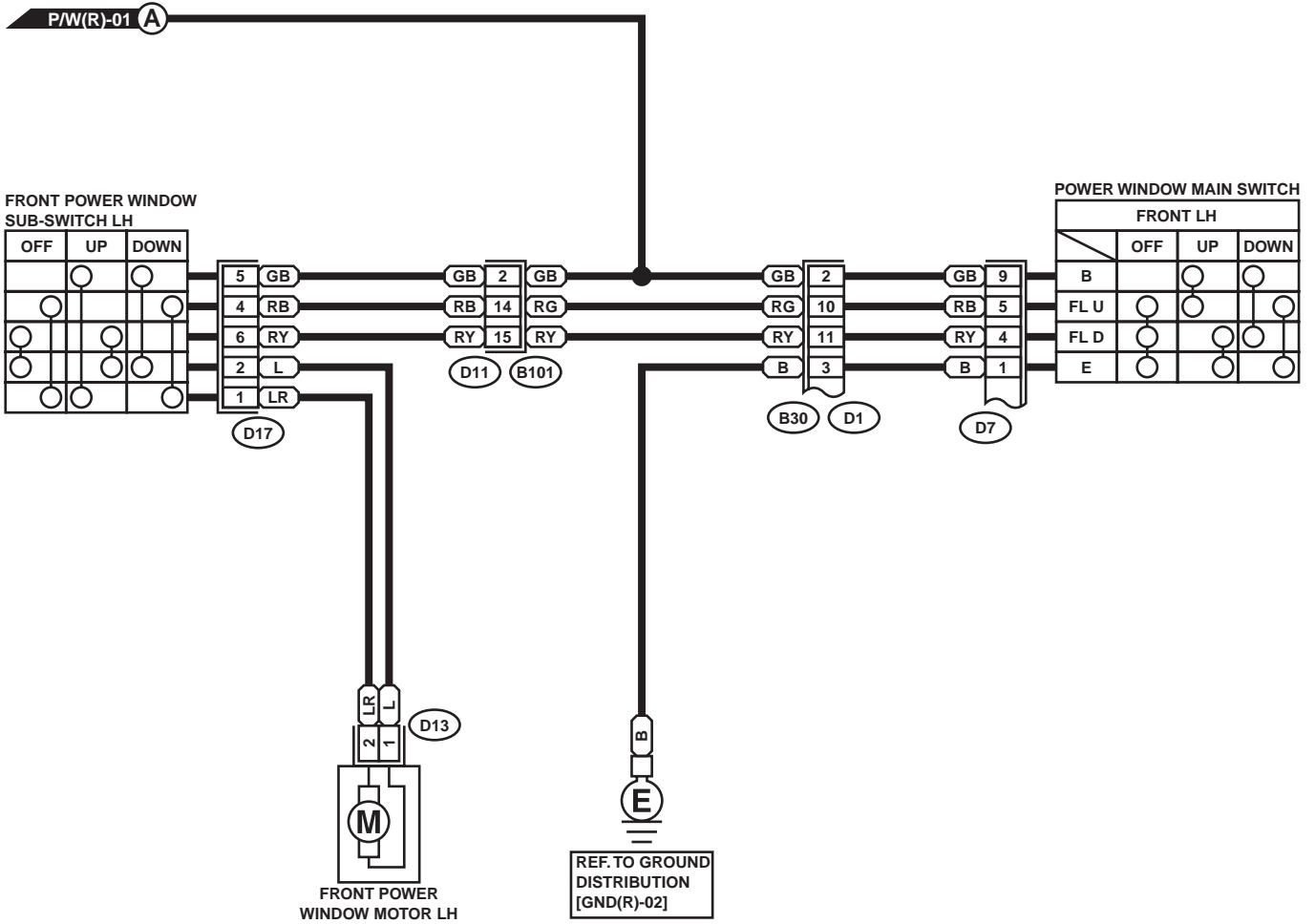
WI-00993

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(R)-02

P/W(R)-02



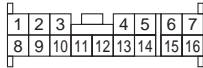
D13 (GREEN)



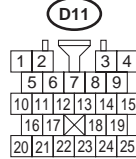
D17



D7 (BROWN)



D1



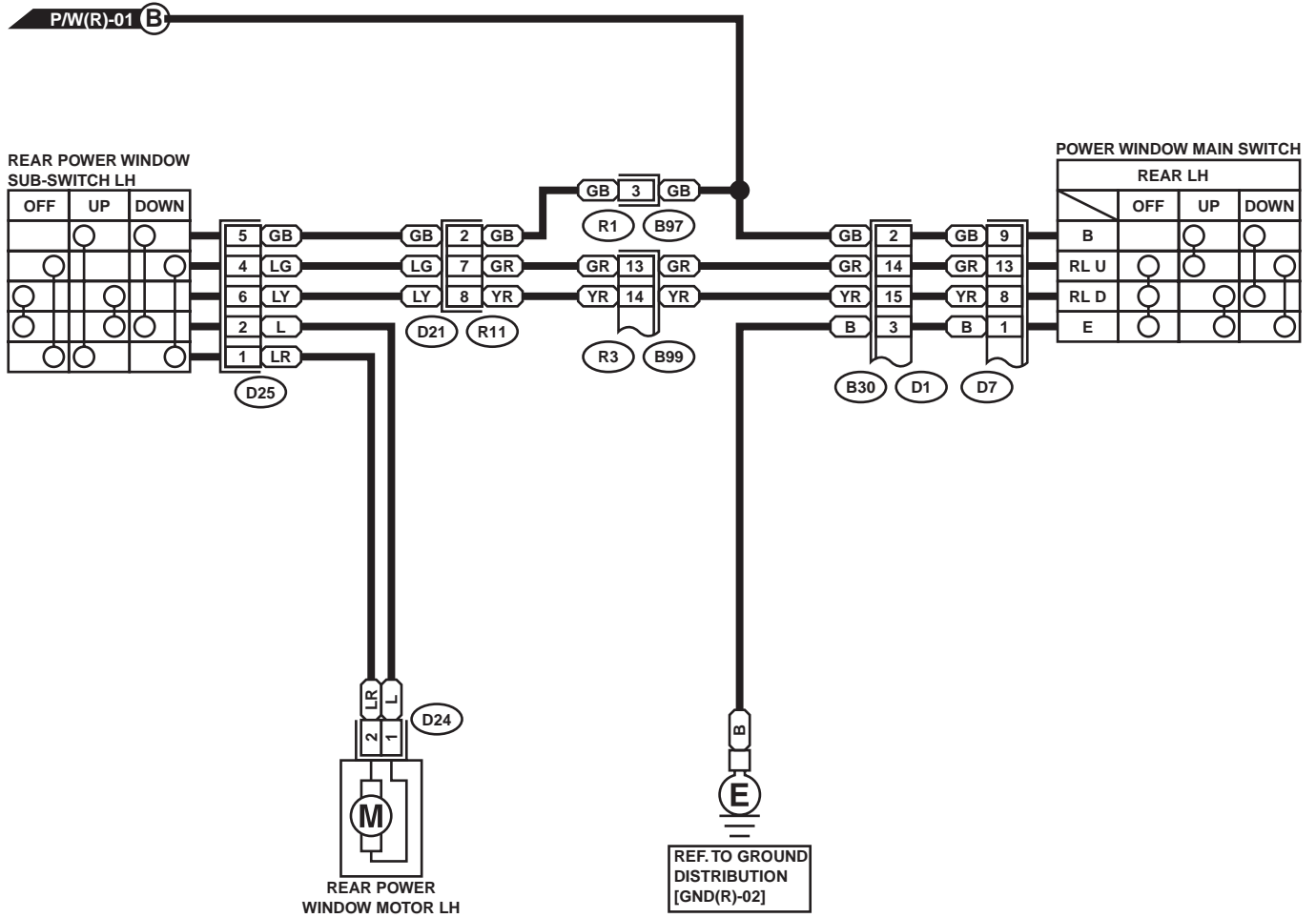
WI-00994

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(R)-03

P/W(R)-03



D24 (GREEN)



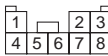
D25



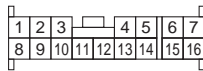
R1



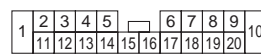
R11



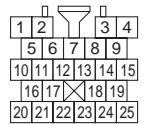
D7 (BROWN)



R3



D1



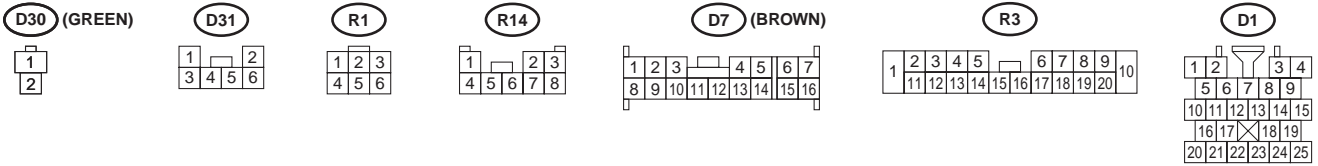
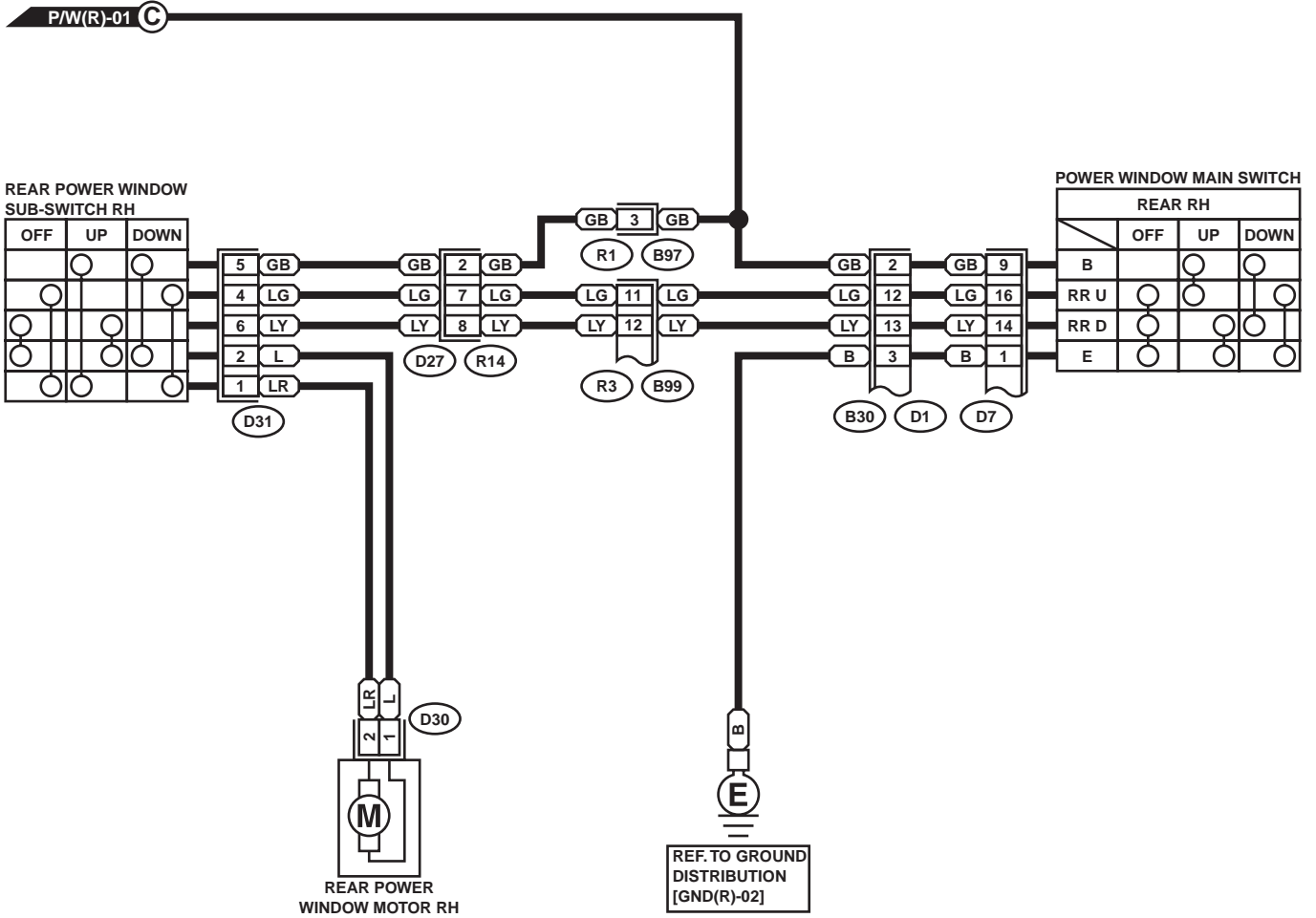
WI-00995

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(R)-04

P/W(R)-04



WI-00996

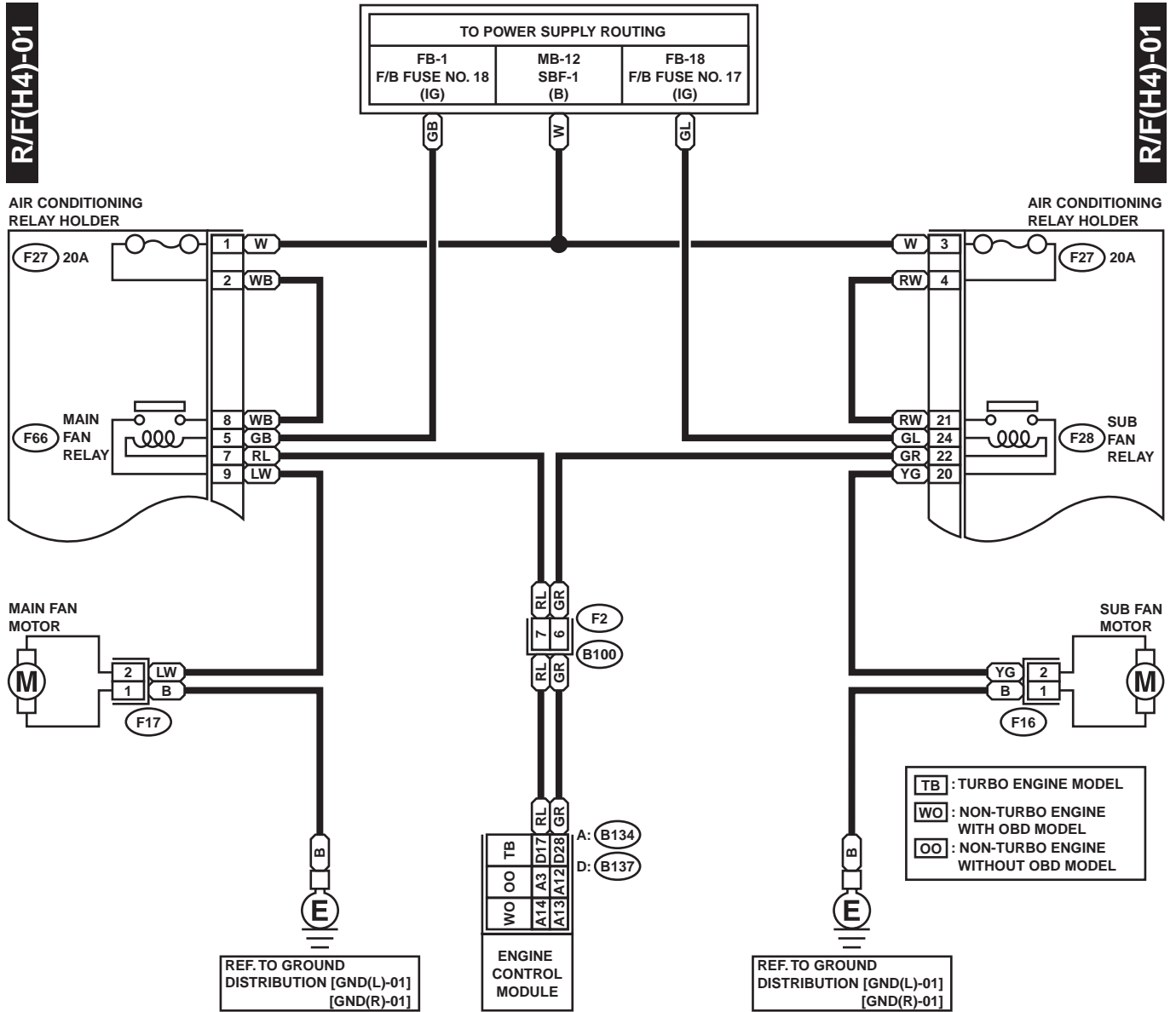
RADIATOR FAN SYSTEM

WIRING SYSTEM

36.Radiator Fan System

A: SCHEMATIC

1. 4-CYLINDER ENGINE MODEL



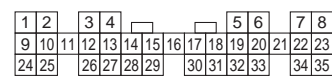
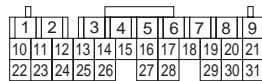
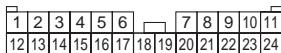
F16 (BLACK)

F2 (BLACK)

D: (B137)

A: (B134)

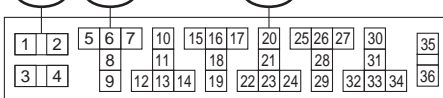
F17 (BLACK)



F27

F66

F28



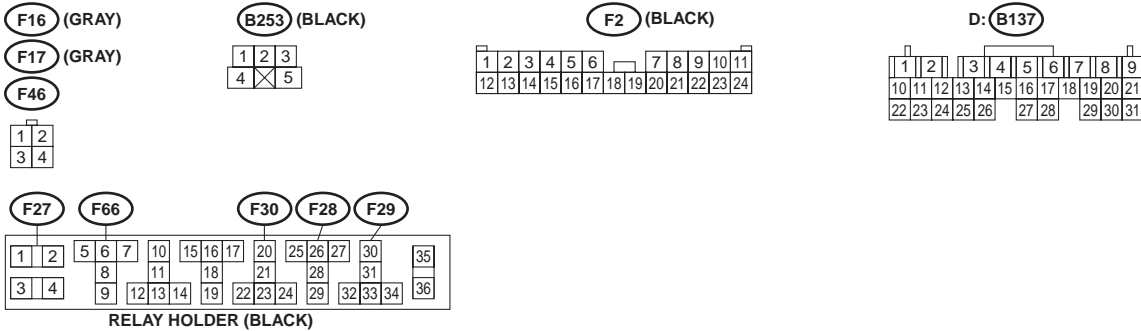
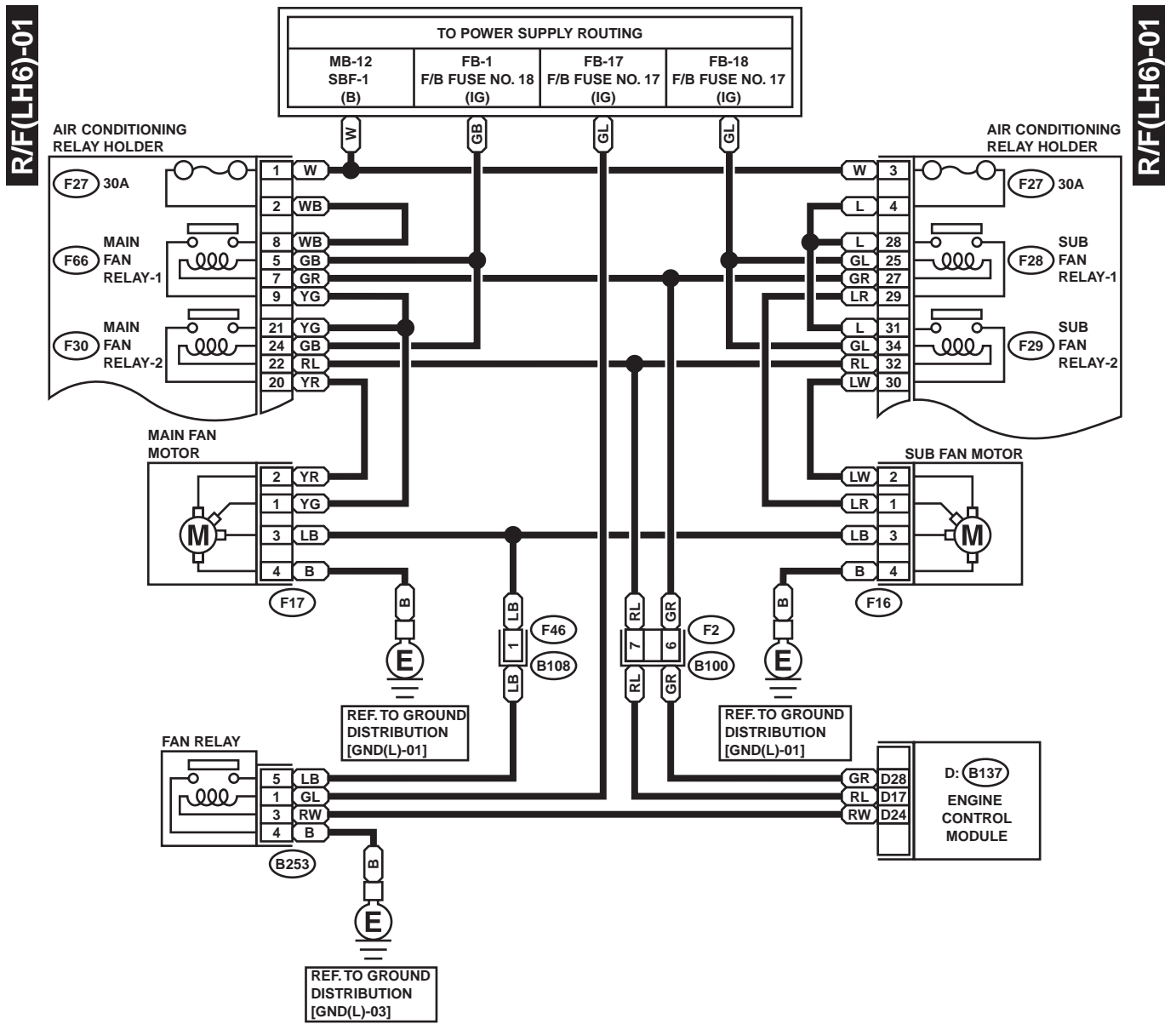
RELAY HOLDER (BLACK)

WI-00997

RADIATOR FAN SYSTEM

WIRING SYSTEM

2. LHD 6-CYLINDER ENGINE MODEL

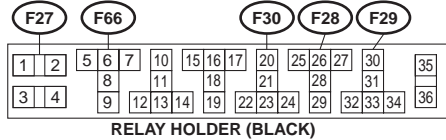
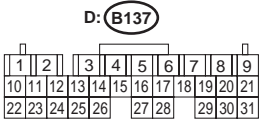
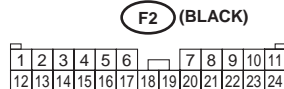
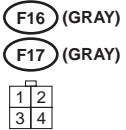
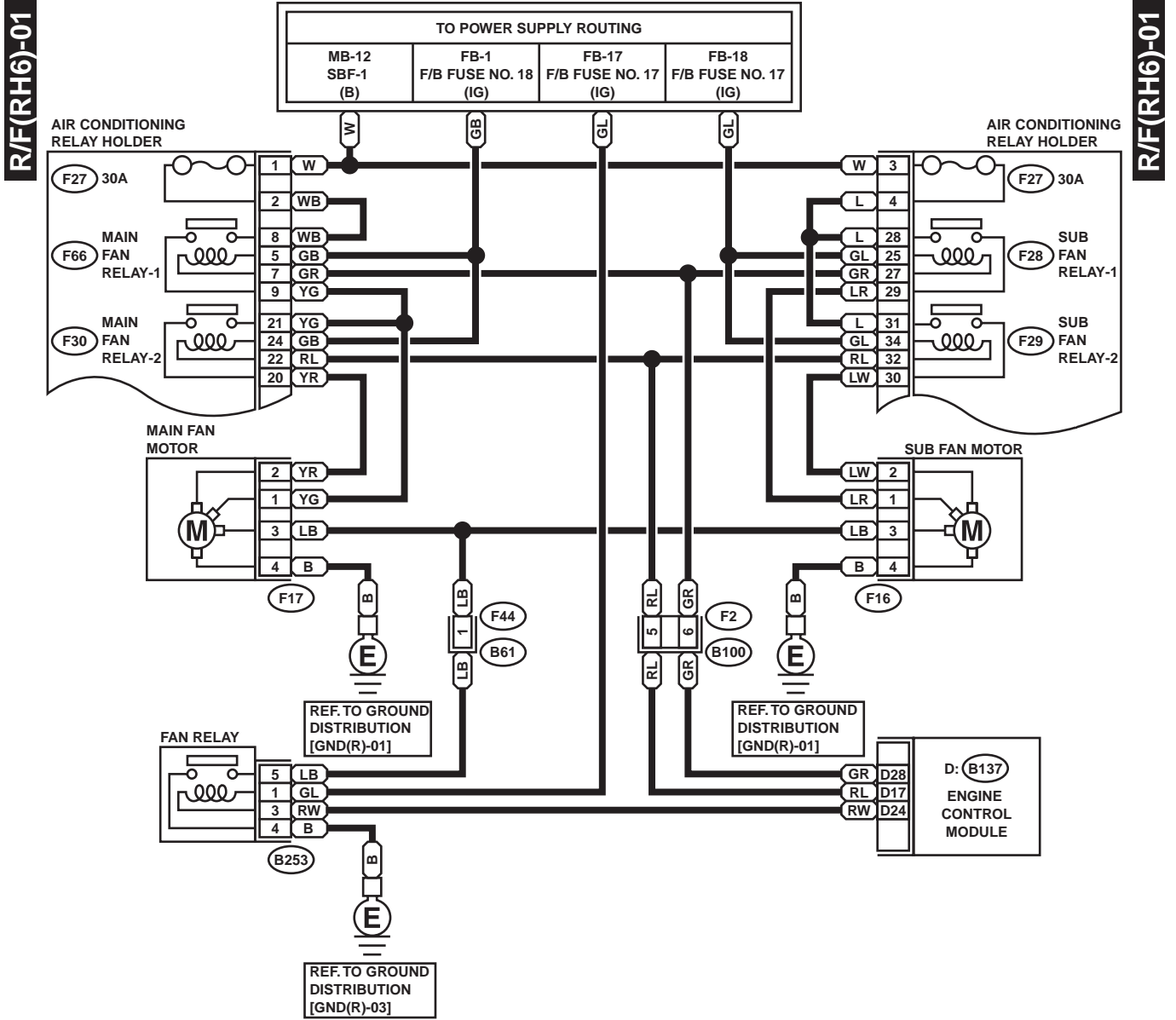


WI-00998

RADIATOR FAN SYSTEM

WIRING SYSTEM

3. RHD 6-CYLINDER ENGINE MODEL



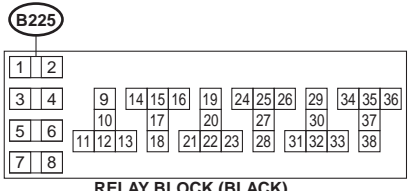
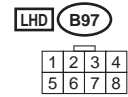
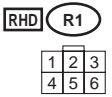
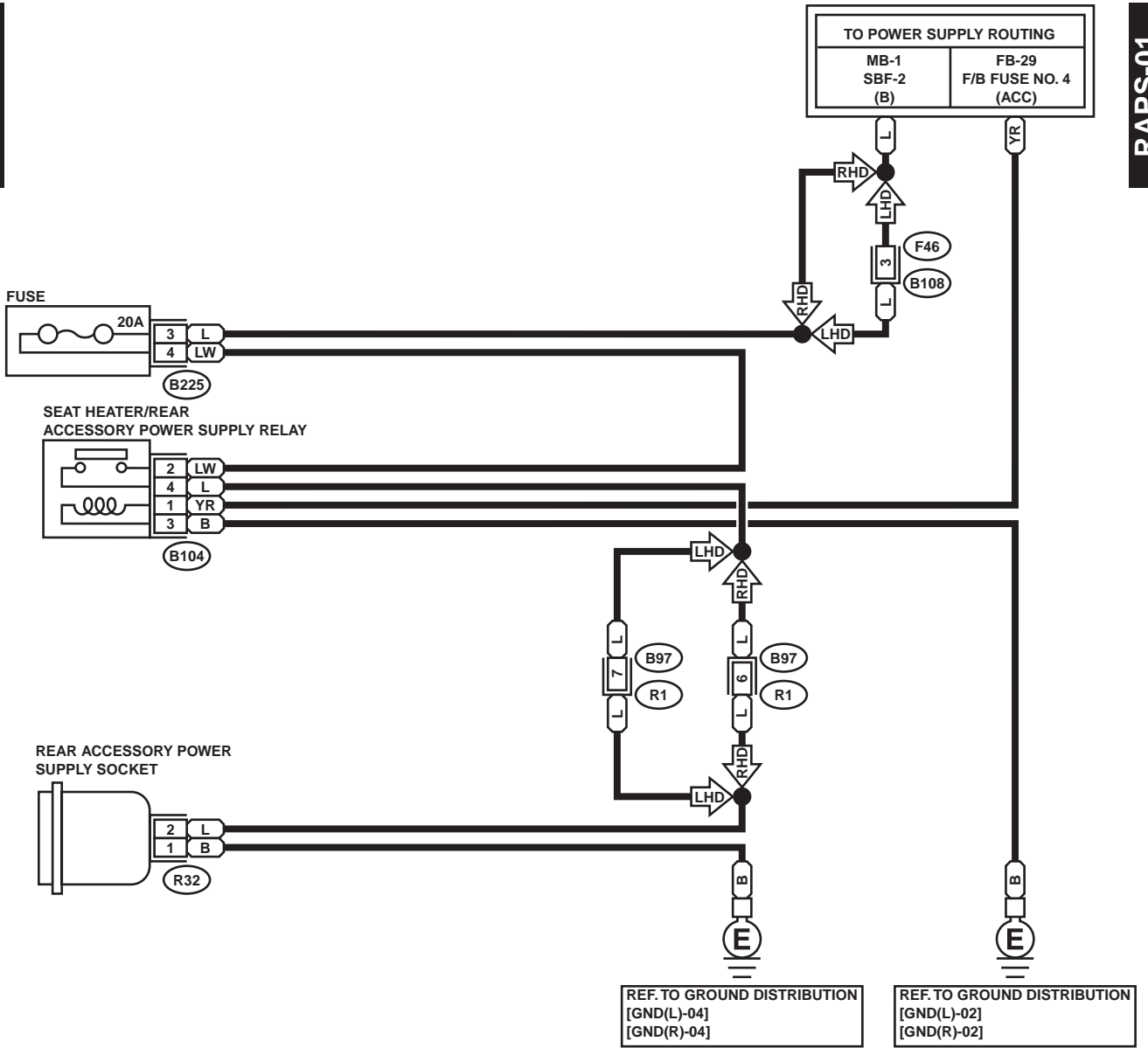
WI-00999

37.Rear Accessory Power Supply System

A: SCHEMATIC

RAPS-01

RAPS-01



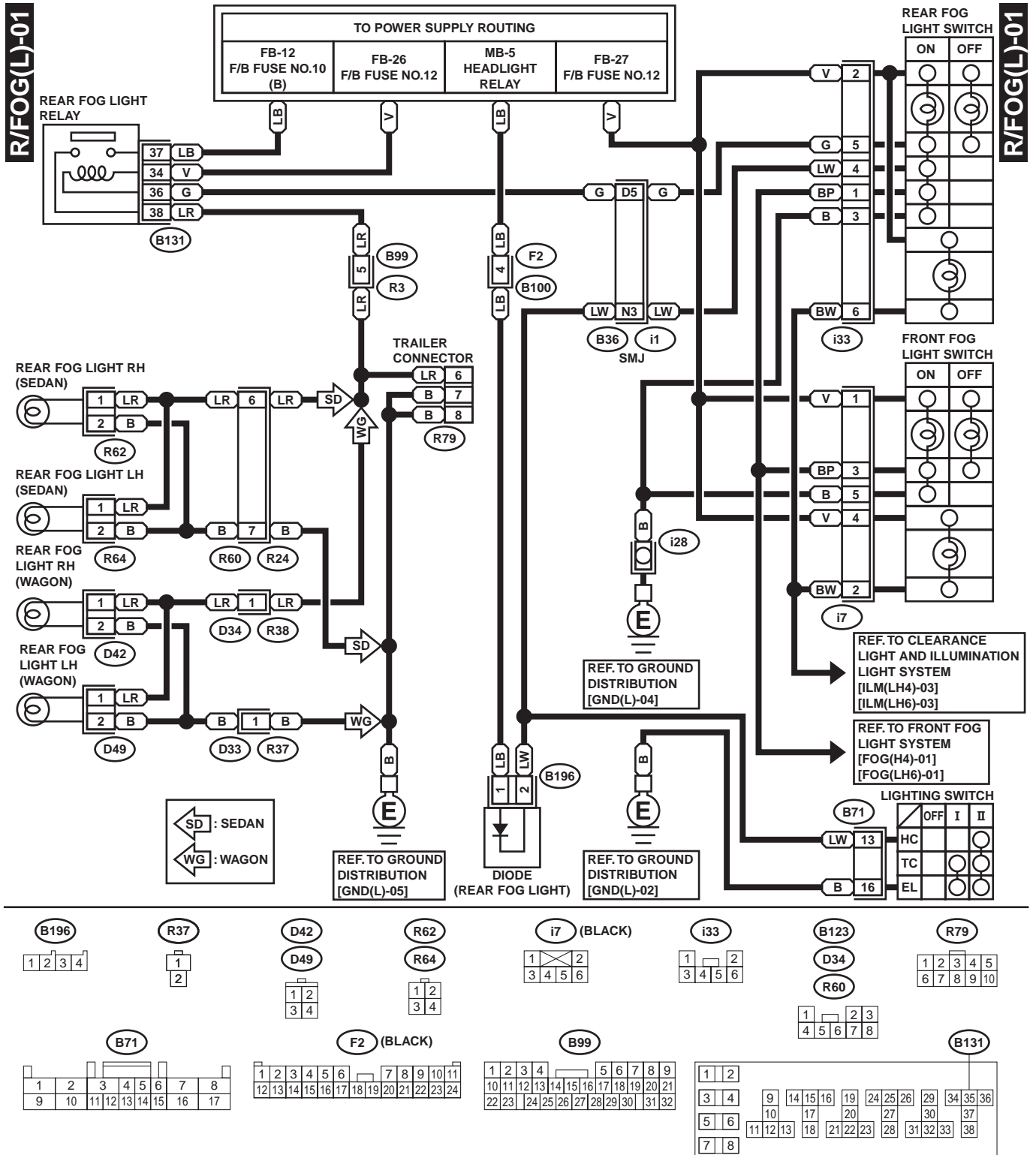
REAR FOG LIGHT SYSTEM

WIRING SYSTEM

38.Rear Fog Light System

A: SCHEMATIC

1. LHD MODEL

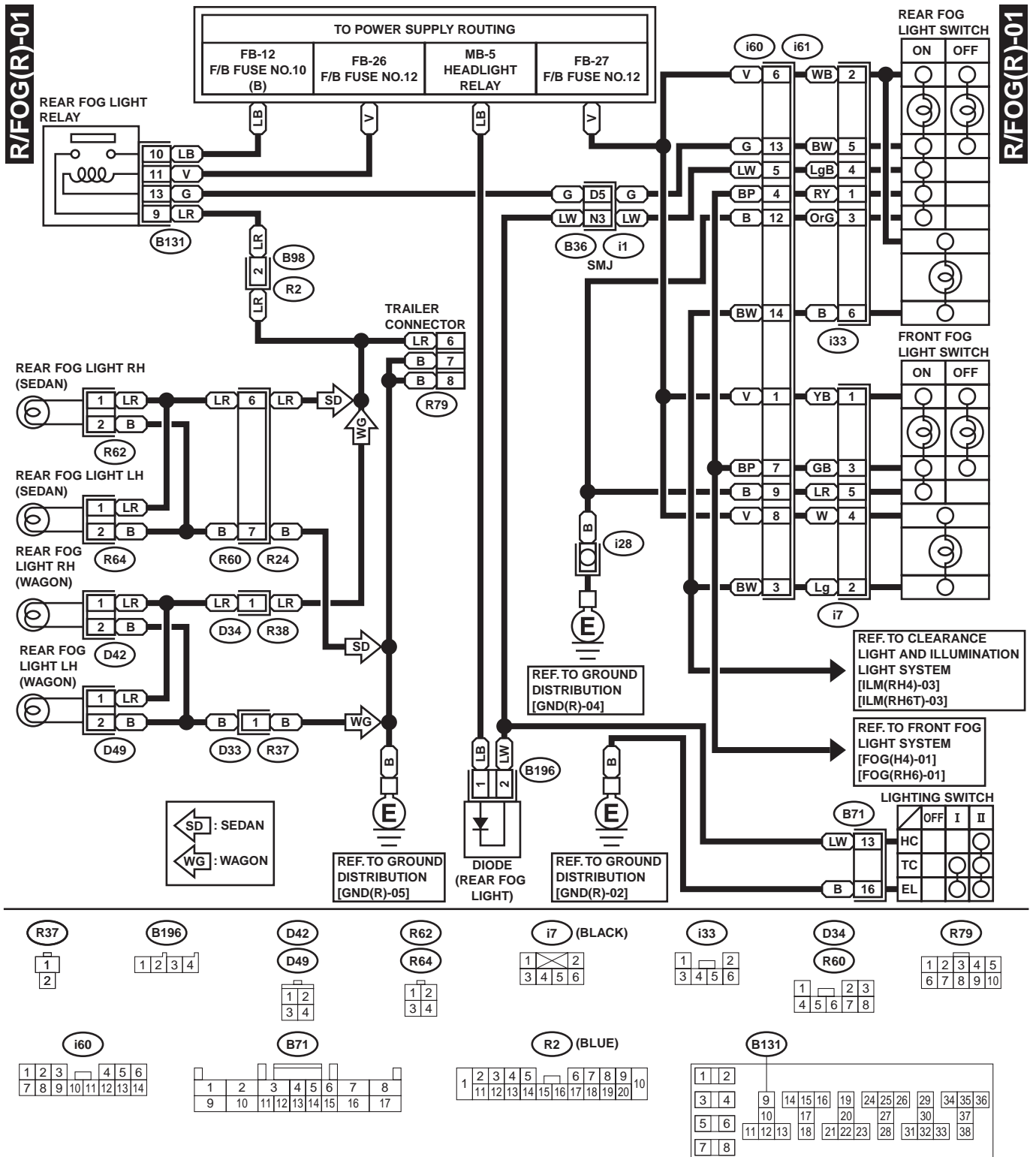


WI-01001

REAR FOG LIGHT SYSTEM

WIRING SYSTEM

2. RHD MODEL



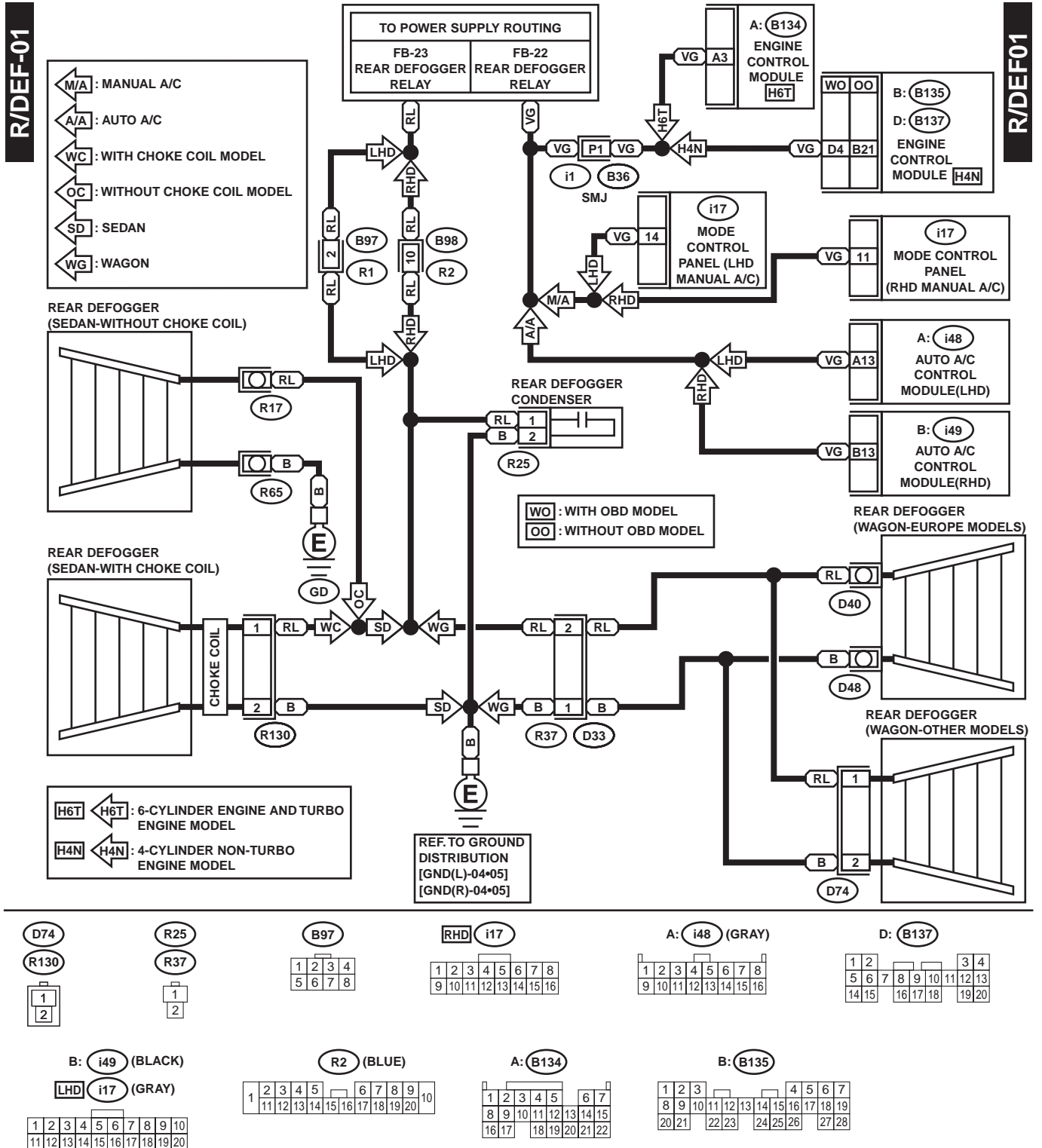
WI-01002

REAR WINDOW DEFOGGER SYSTEM

WIRING SYSTEM

39.Rear Window Defogger System

A: SCHEMATIC



WI-01003

MEMO:

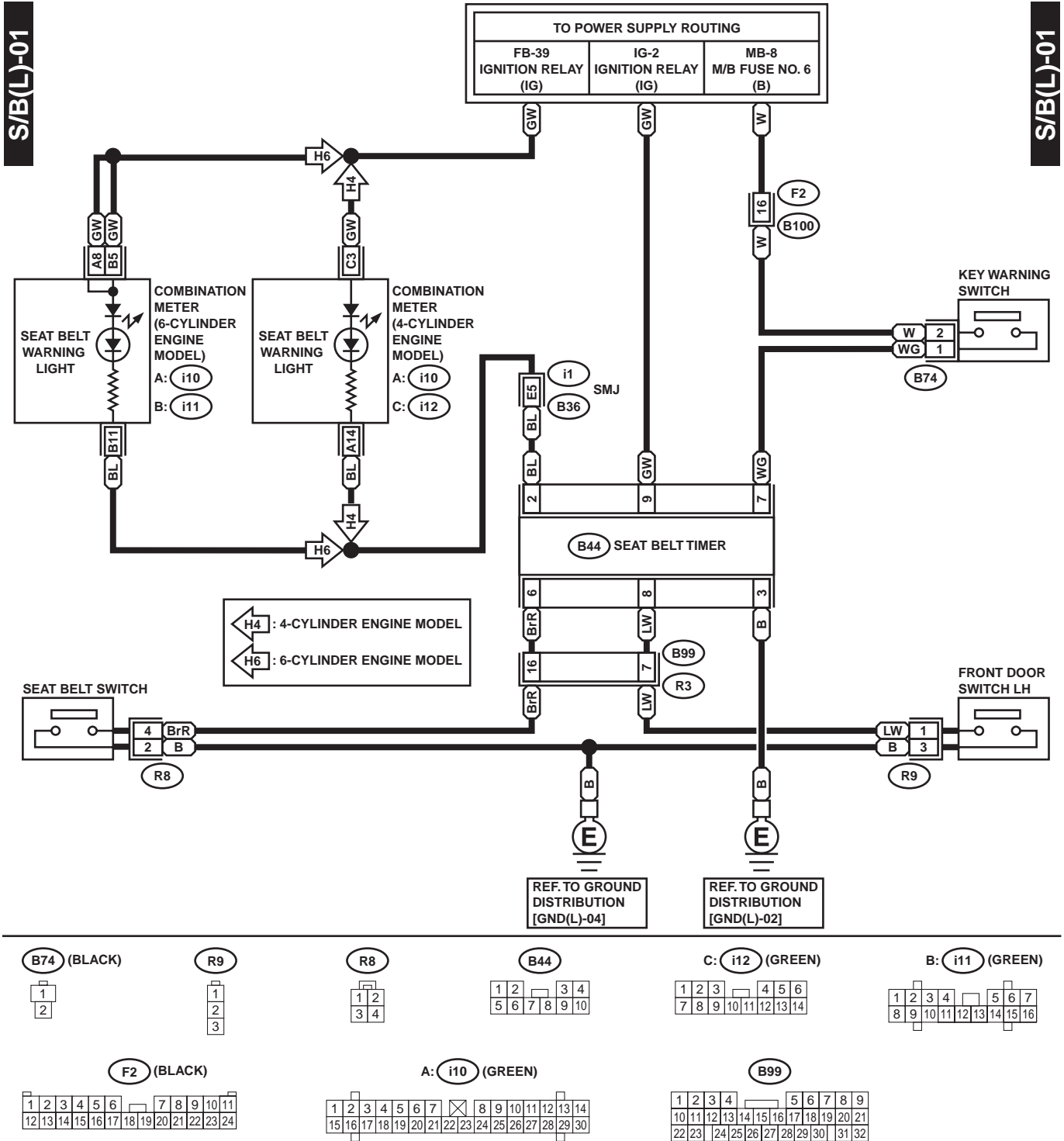
SEAT BELT WARNING SYSTEM

WIRING SYSTEM

41. Seat Belt Warning System

A: SCHEMATIC

1. LHD EXCEPT FOR EUROPE MODEL

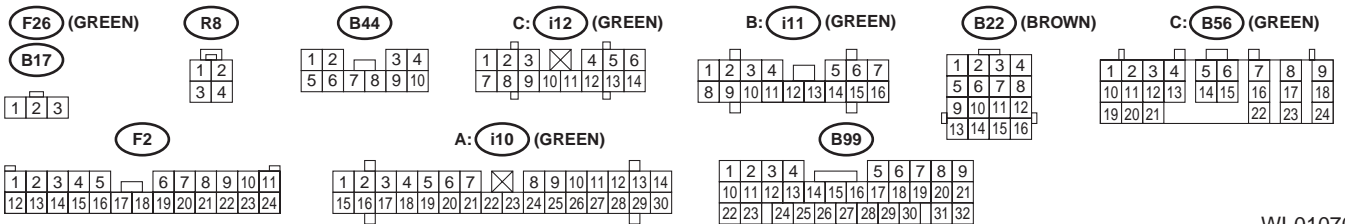
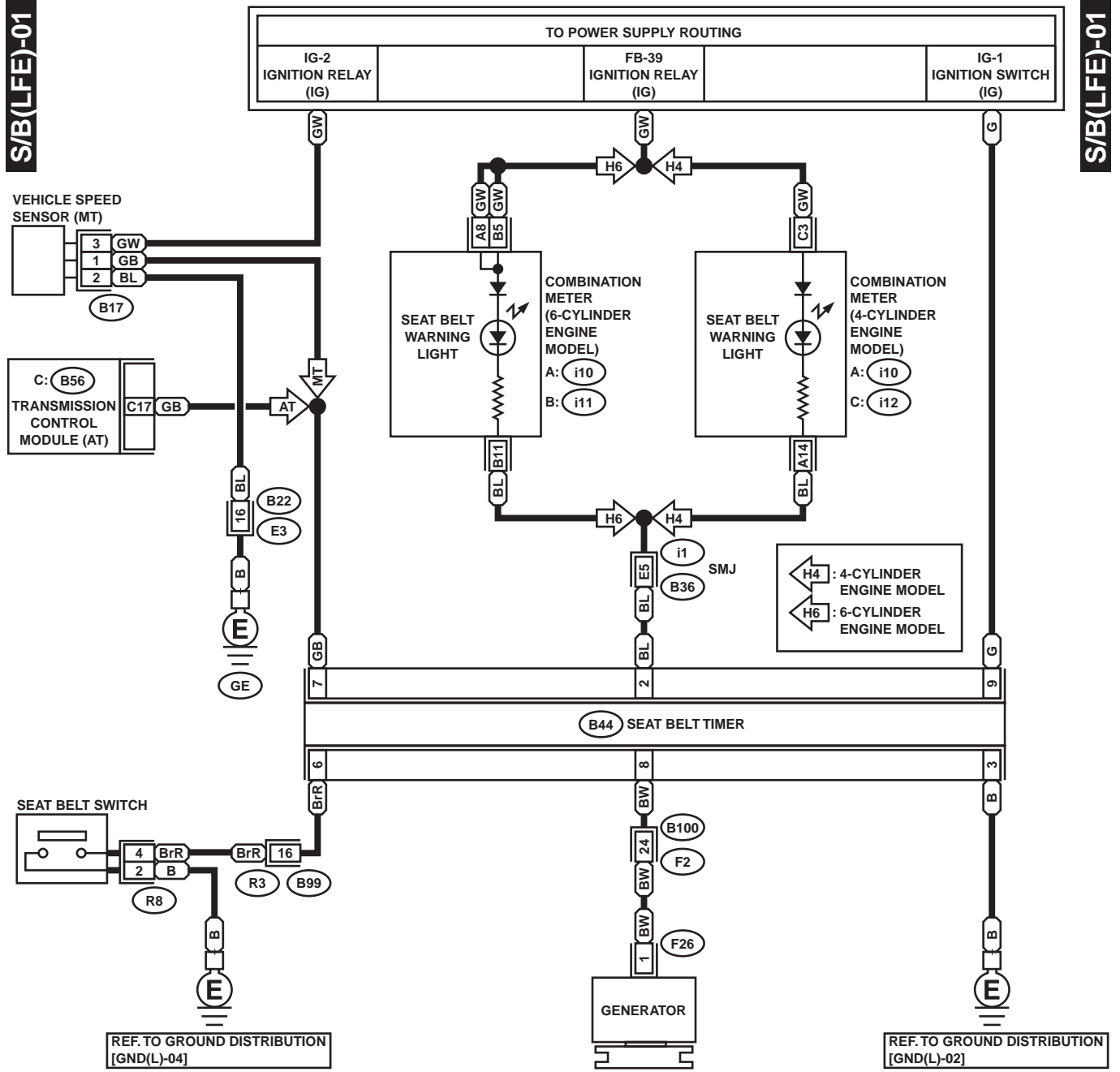


WI-01006

SEAT BELT WARNING SYSTEM

WIRING SYSTEM

2. LHD FOR EUROPE MODEL



WI-01070

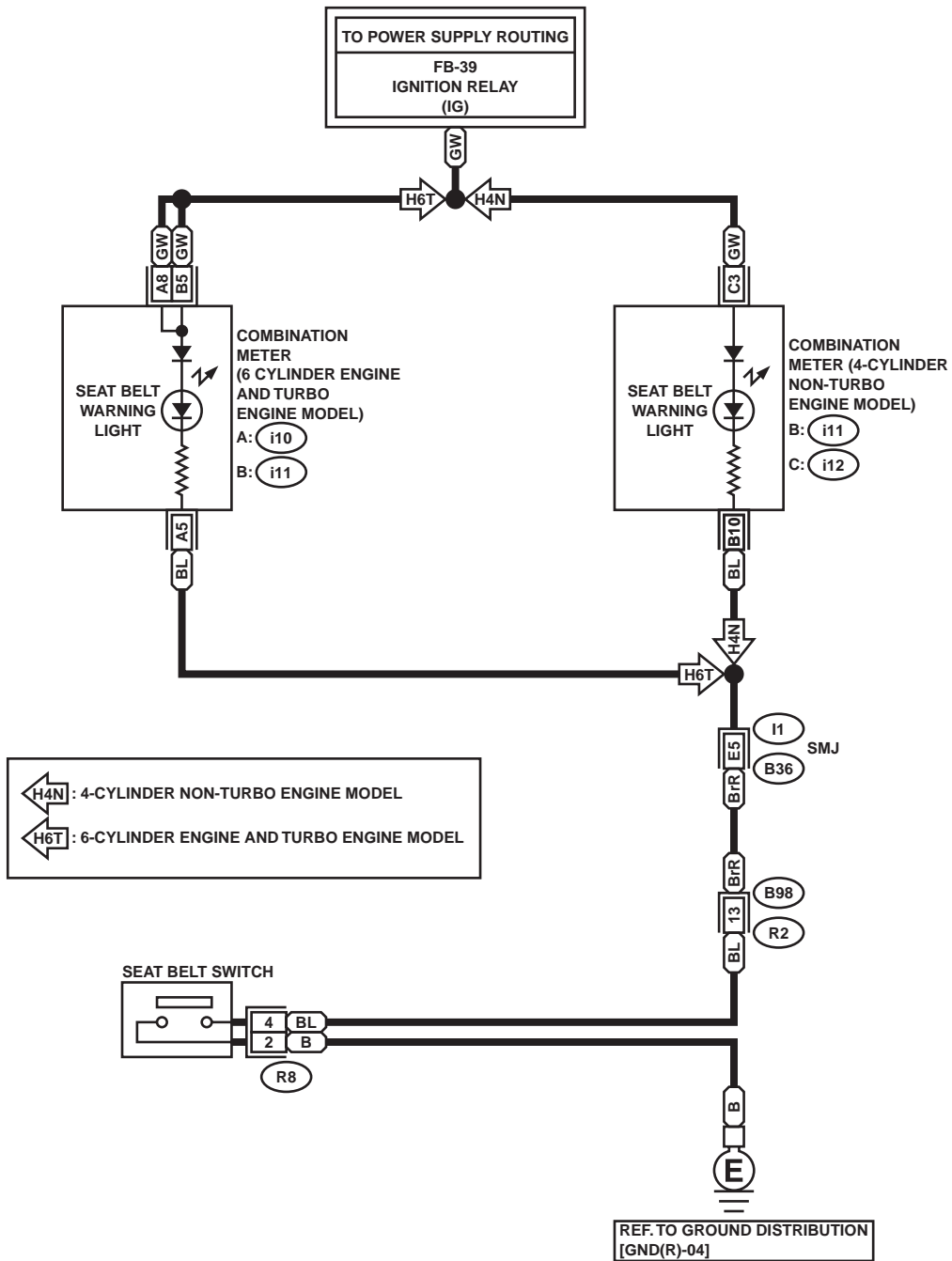
SEAT BELT WARNING SYSTEM

WIRING SYSTEM

3. RHD WITHOUT SEAT BELT TIMER MODEL

S/B(R)-01

S/B(R)-01



R8

C: i12 (GREEN)

B: i11 (GREEN)

R2 (BLUE)

A: i10 (GREEN)

1	2
3	4

1	2	3	4	5	6		
7	8	9	10	11	12	13	14

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

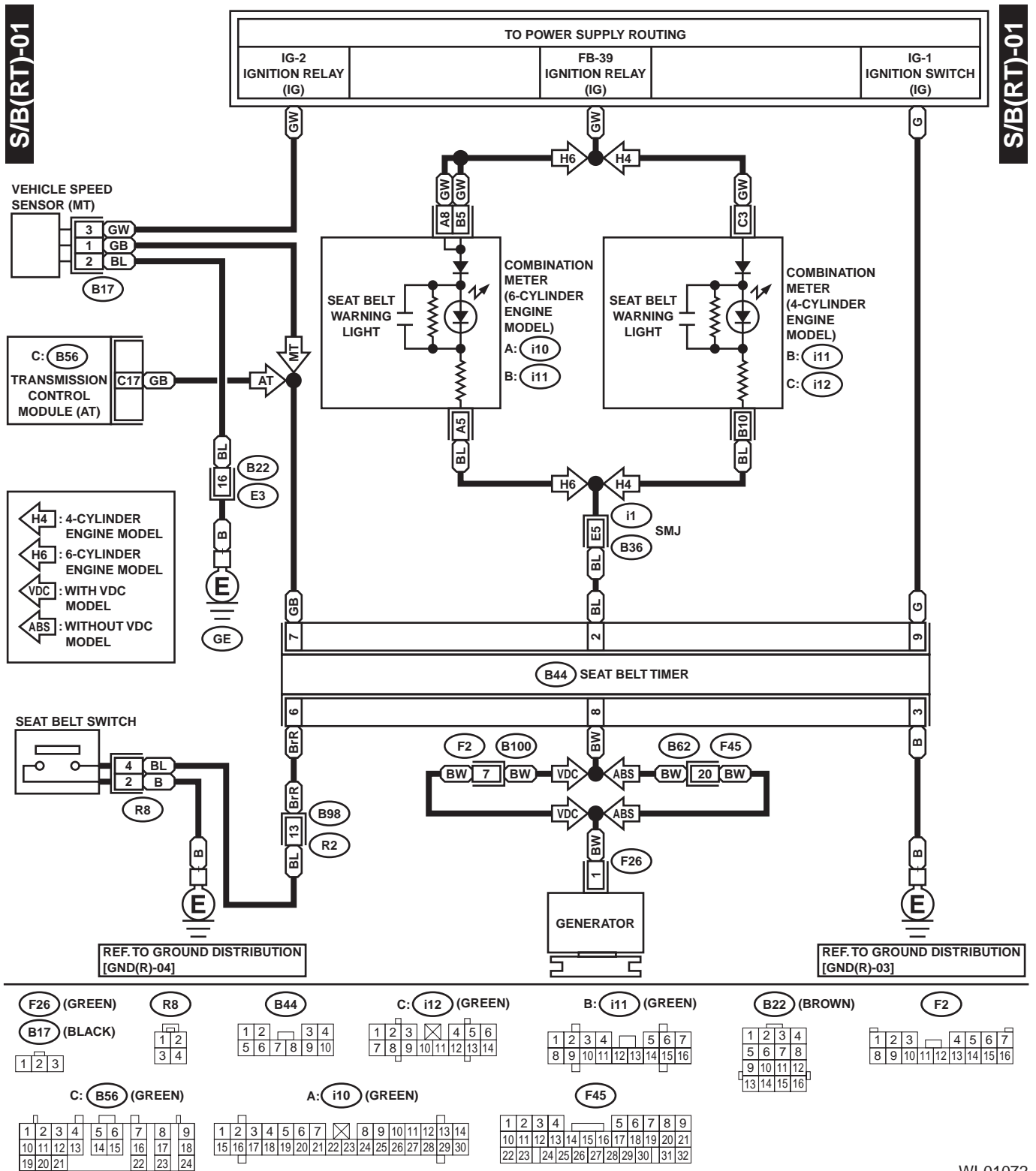
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

WI-01071

SEAT BELT WARNING SYSTEM

WIRING SYSTEM

4. RHD WITH SEAT BELT TIMER MODEL



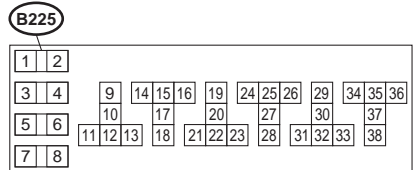
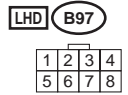
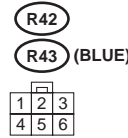
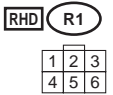
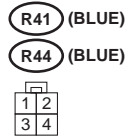
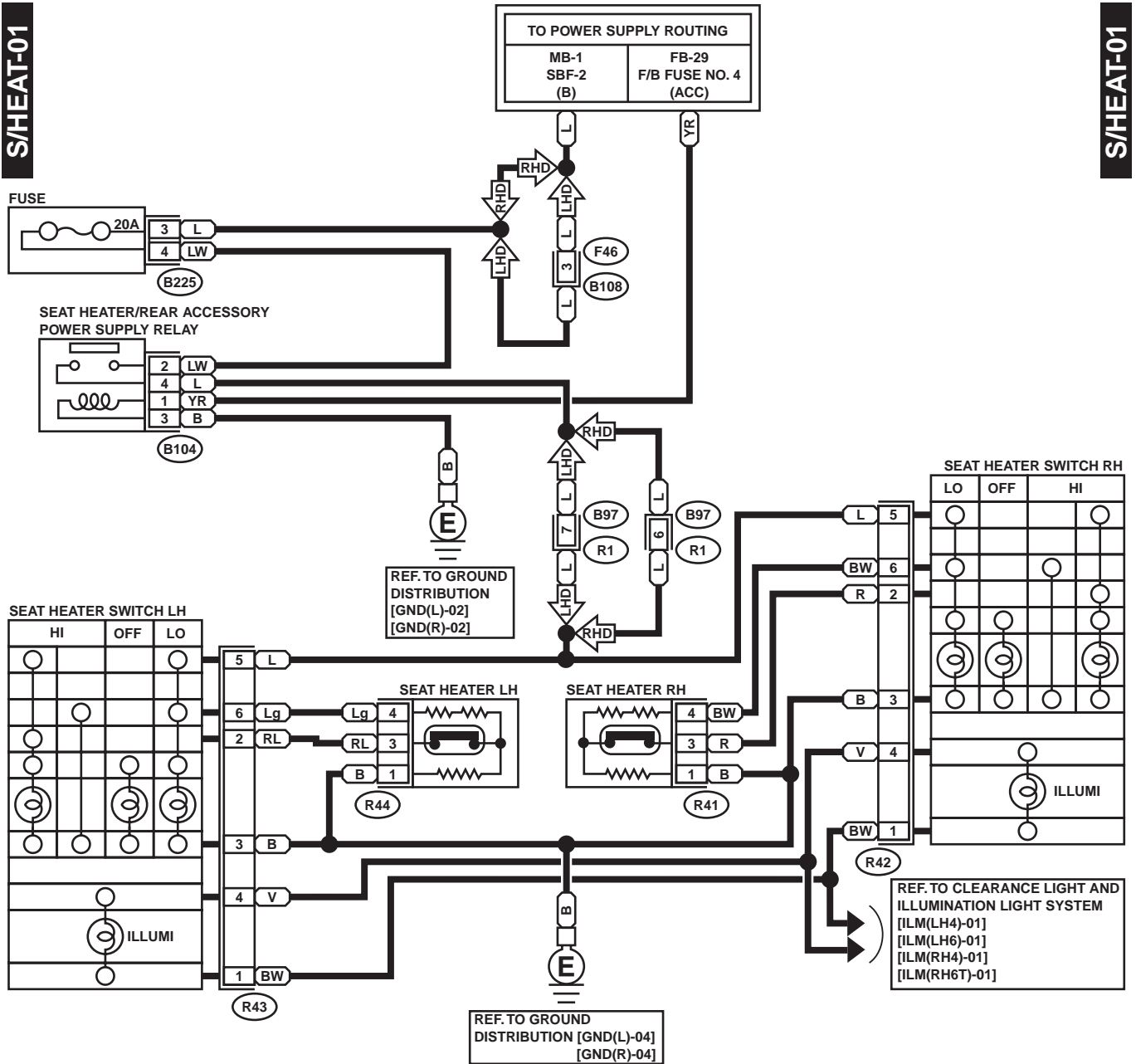
WI-01072

SEAT HEATER SYSTEM

WIRING SYSTEM

42. Seat Heater System

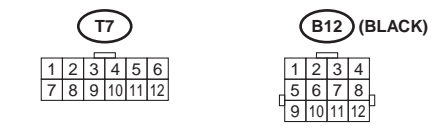
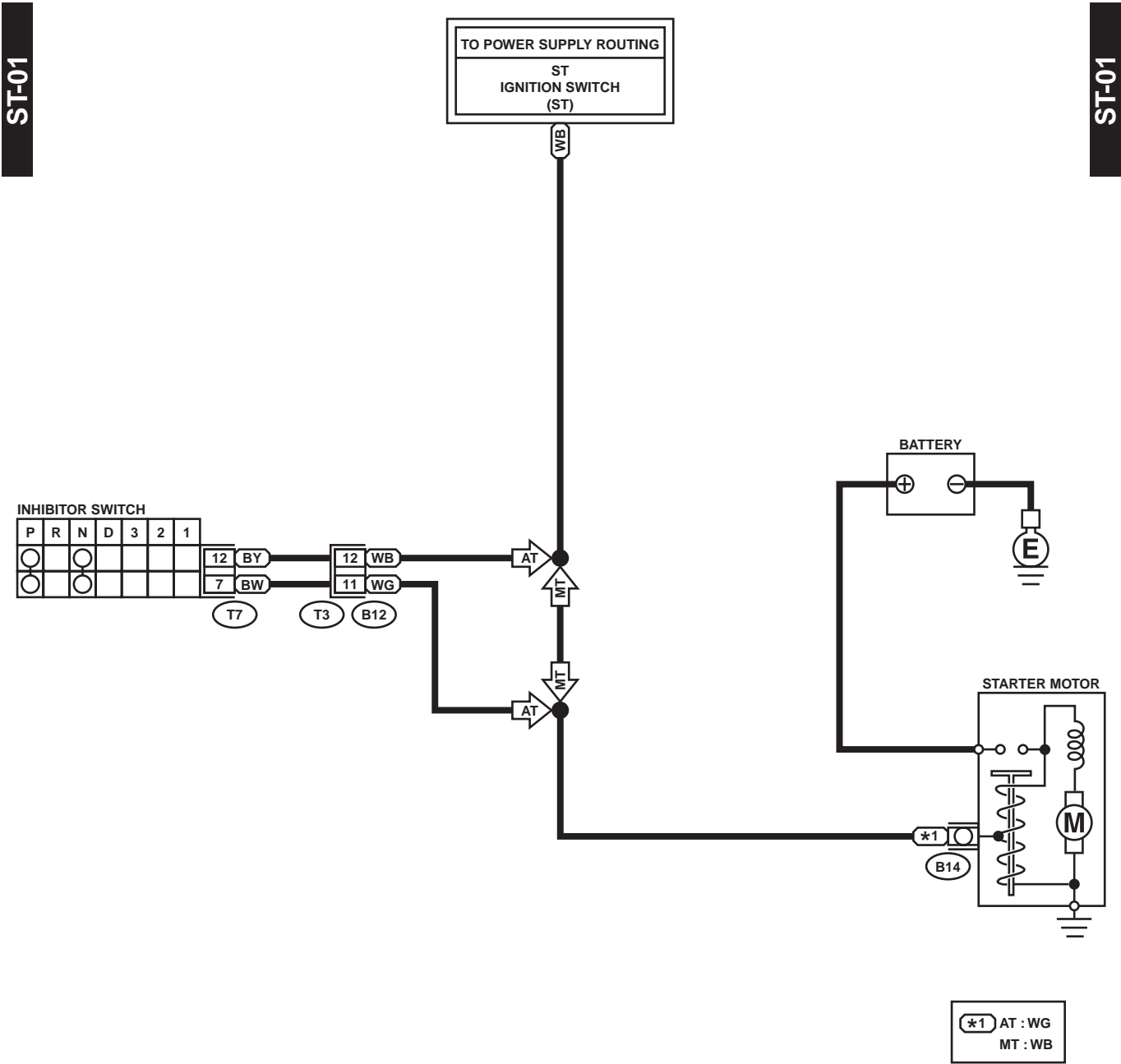
A: SCHEMATIC



WI-01007

43. Starter System

A: SCHEMATIC



SUNROOF SYSTEM

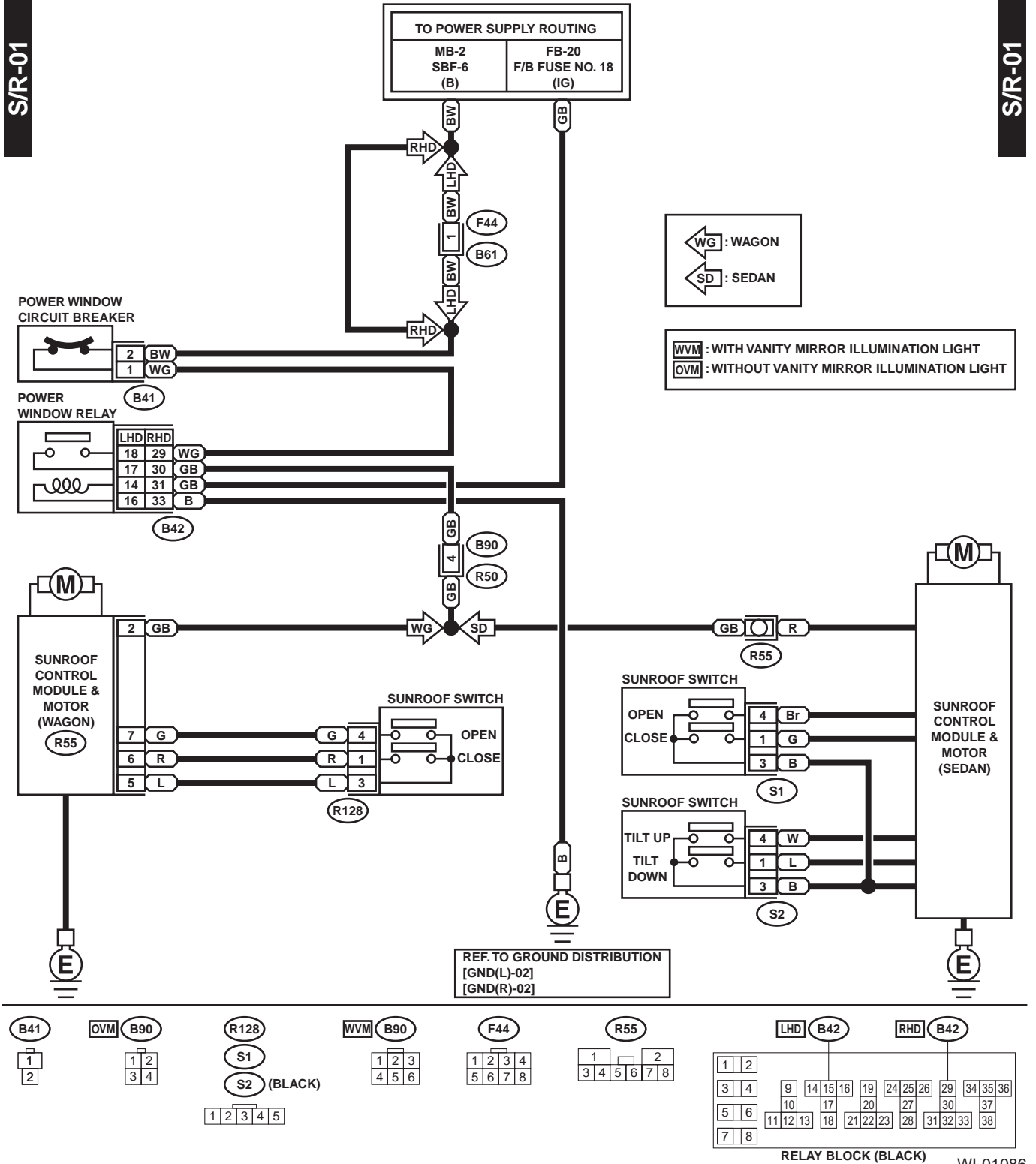
WIRING SYSTEM

44. Sunroof System

A: SCHEMATIC

S/R-01

S/R-01



MEMO:

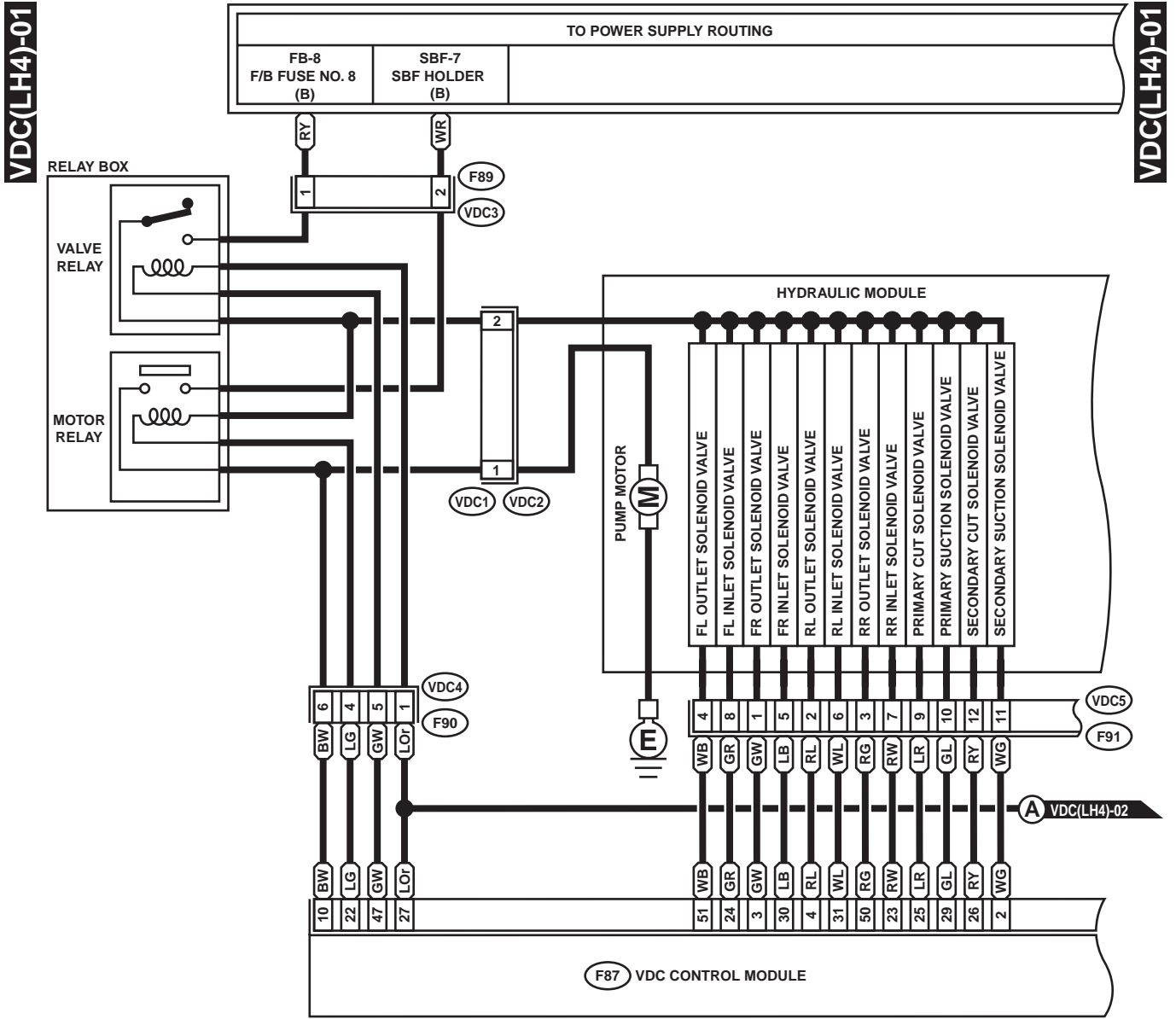
VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM

45. Vehicle Dynamic Control System

A: SCHEMATIC

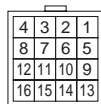
1. LHD 4-CYLINDER ENGINE MODEL



F89 (GRAY)

F90 (BLACK)

F91 (BLACK)



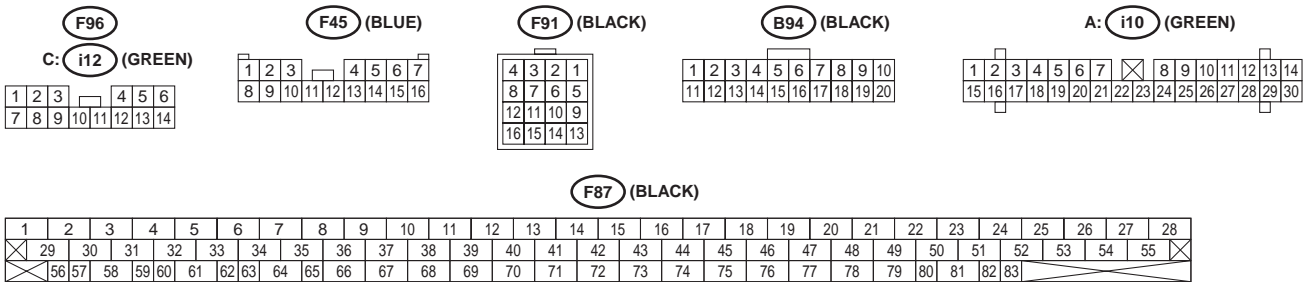
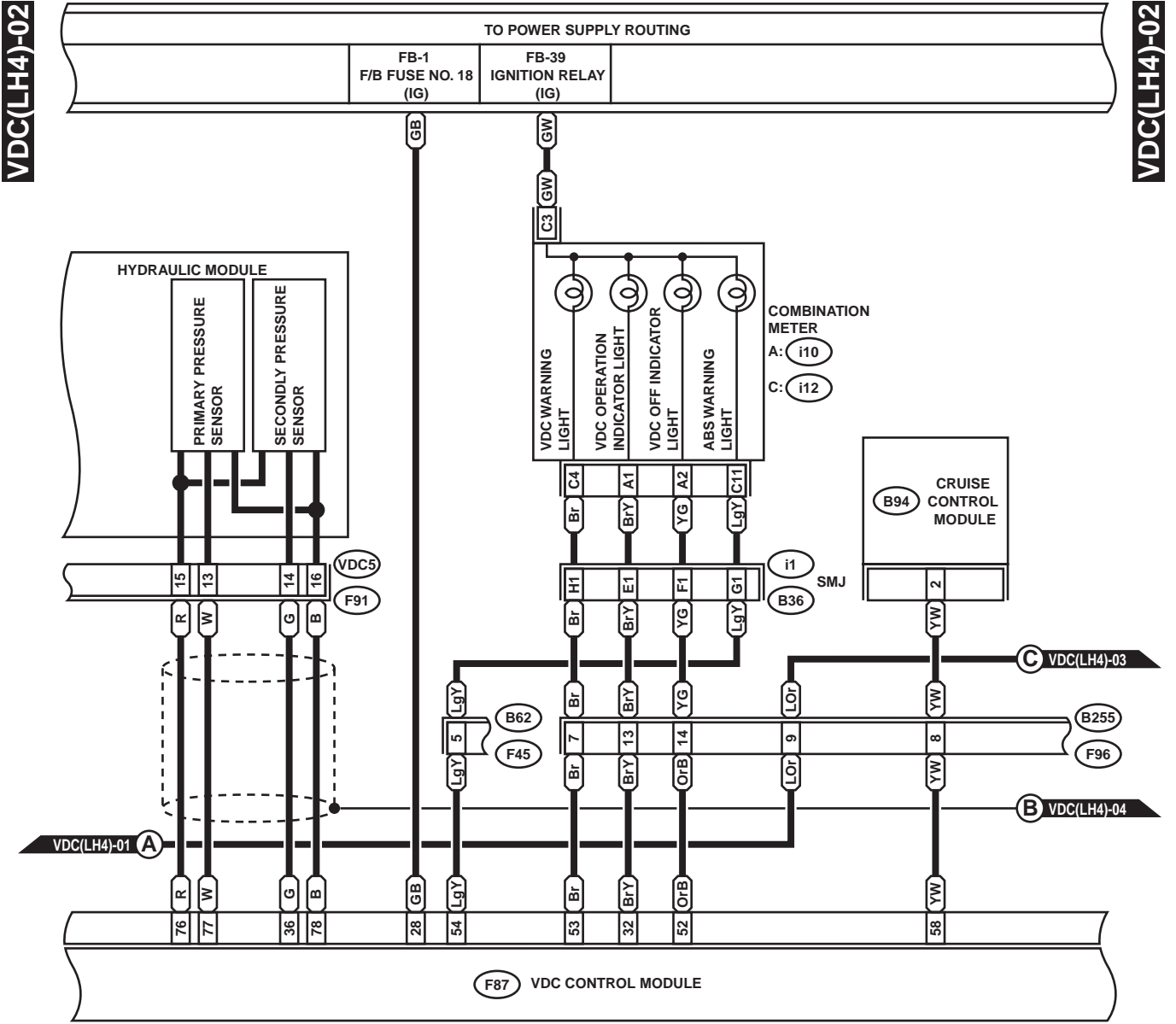
F87 (BLACK)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

WI-01008

VEHICLE DYNAMIC CONTROL SYSTEM

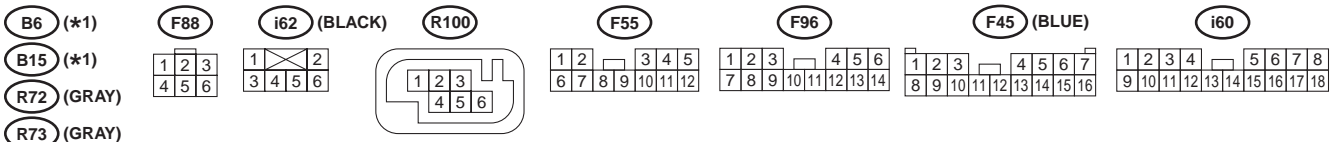
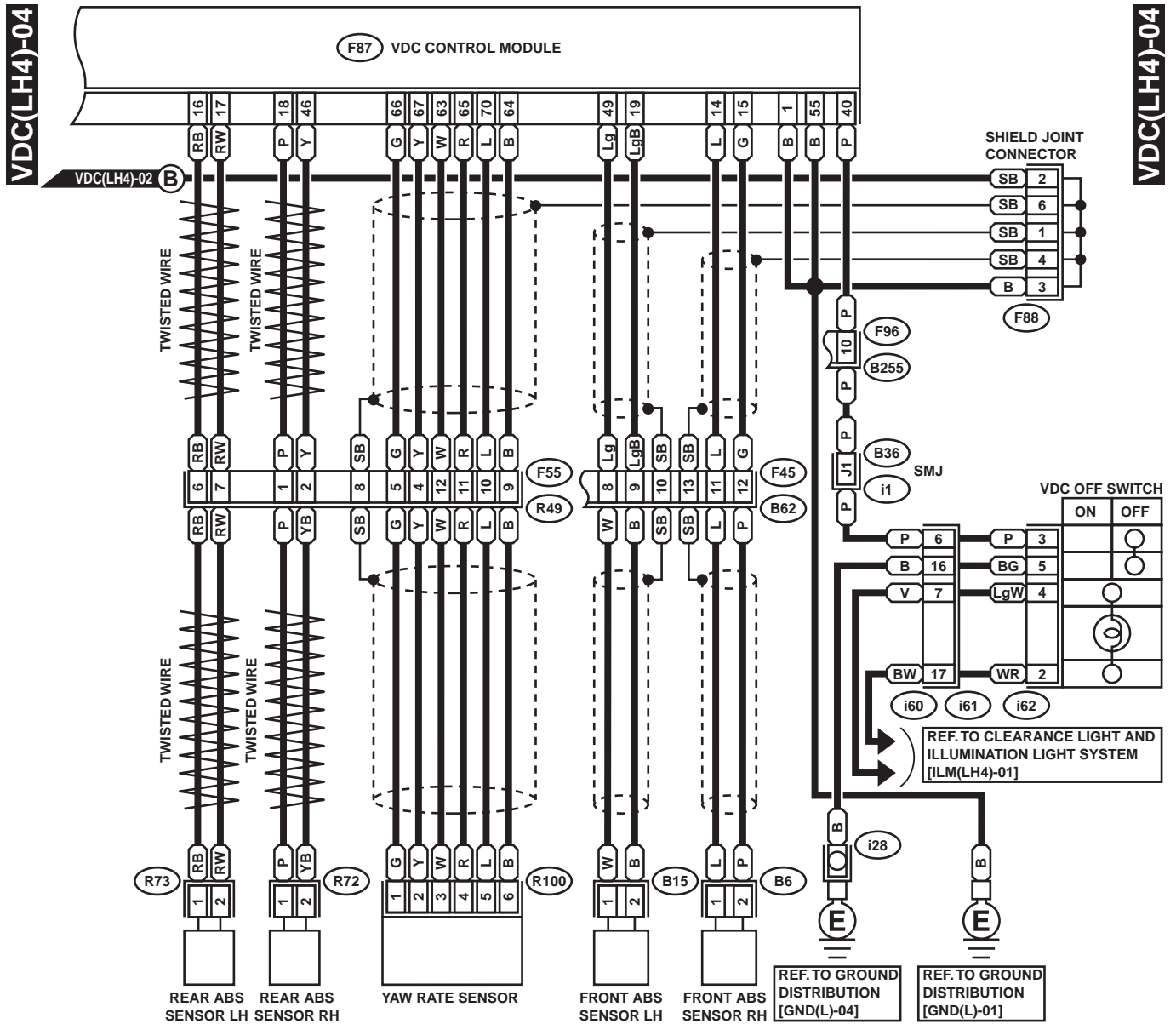
WIRING SYSTEM



WI-01009

VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM



F87 (BLACK)

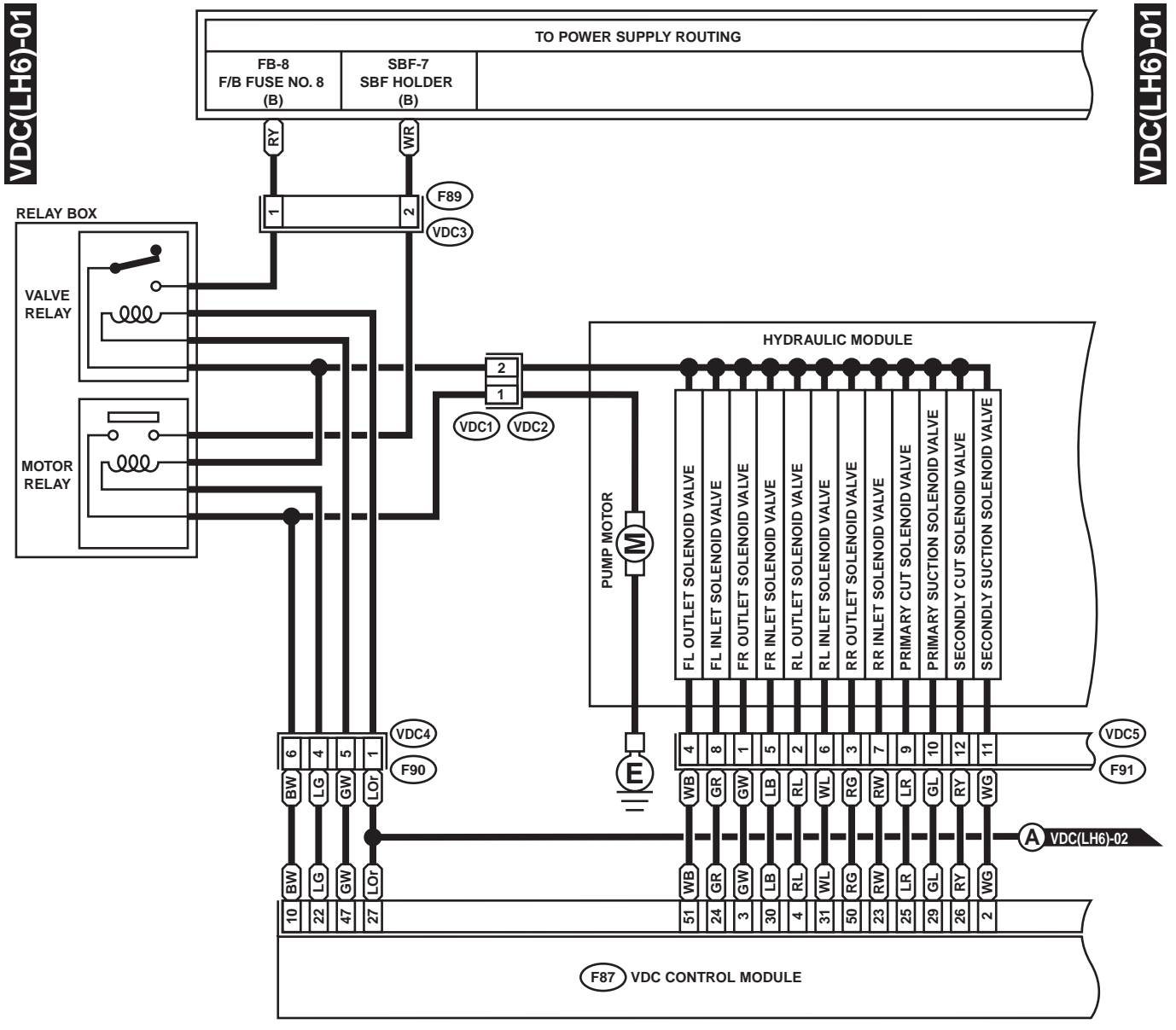
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29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
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WI-01011

VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM

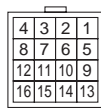
2. LHD 6-CYLINDER ENGINE MODEL



F89 (GRAY)

F90 (BLACK)

F91 (BLACK)



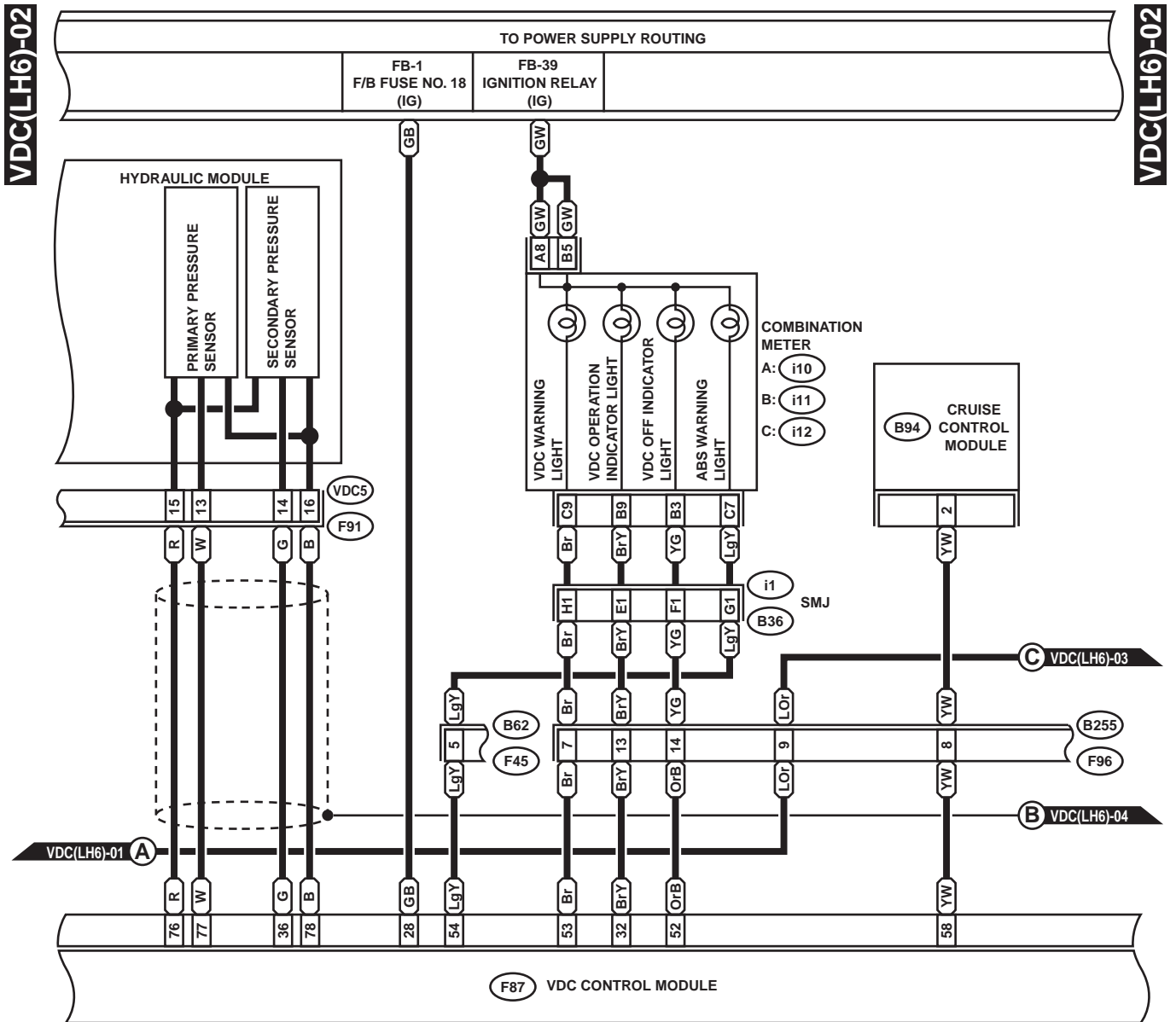
F87 (BLACK)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
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WI-01012

VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM

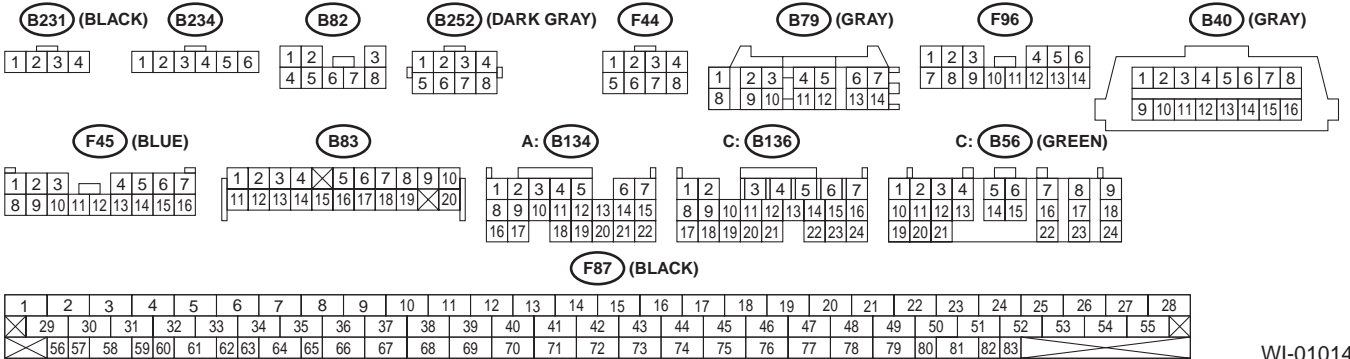
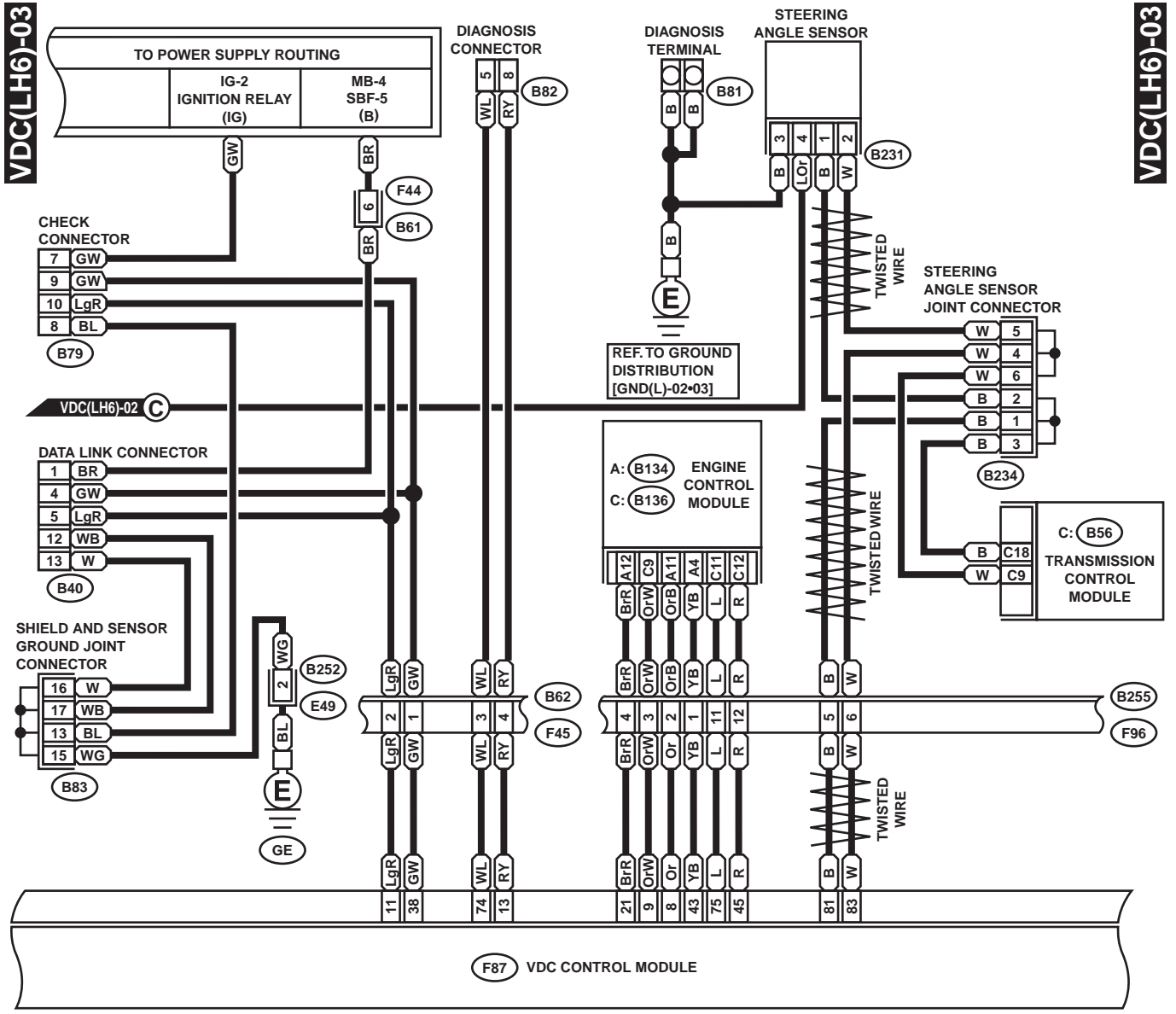


F96	F45 (BLUE)	F91 (BLACK)	B: i11 (GREEN)	C: i12 (GREEN)	B94 (BLACK)																																																																																																																								
<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14					<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>15</td><td>16</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						<table border="1"> <tr><td>4</td><td>3</td><td>2</td><td>1</td></tr> <tr><td>8</td><td>7</td><td>6</td><td>5</td></tr> <tr><td>12</td><td>11</td><td>10</td><td>9</td></tr> <tr><td>16</td><td>15</td><td>14</td><td>13</td></tr> </table>	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>15</td><td>16</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td>17</td><td>18</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18							<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr> <tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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A: i10 (GREEN)																																																																																																																													
<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> <tr><td>29</td><td>30</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																																																																																										
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F87 (BLACK)																																																																																																																													
<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> <tr><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td><td>56</td><td>57</td></tr> <tr><td>58</td><td>59</td><td>60</td><td>61</td><td>62</td><td>63</td><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td><td>71</td><td>72</td><td>73</td><td>74</td><td>75</td><td>76</td><td>77</td><td>78</td><td>79</td><td>80</td><td>81</td><td>82</td><td>83</td><td></td><td></td><td></td></tr> </table>						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83																																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28																																																																																																		
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57																																																																																																	
58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83																																																																																																				

WI-01013

VEHICLE DYNAMIC CONTROL SYSTEM

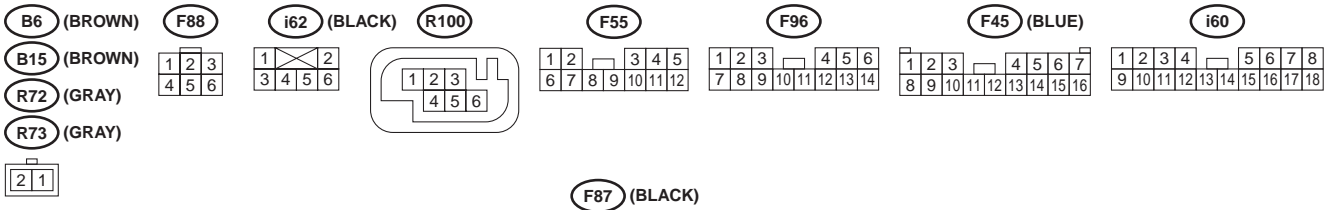
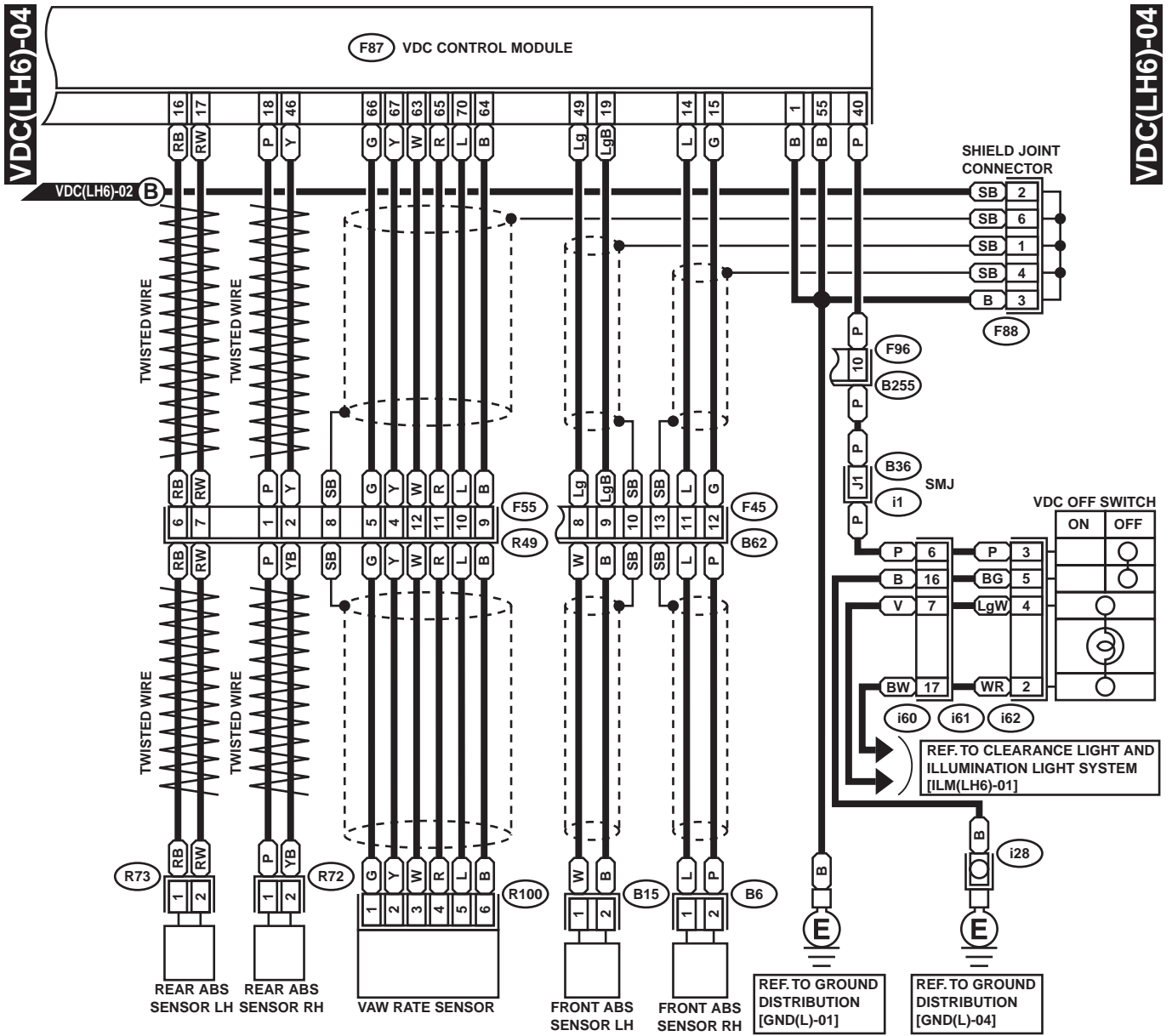
WIRING SYSTEM



WI-01014

VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM



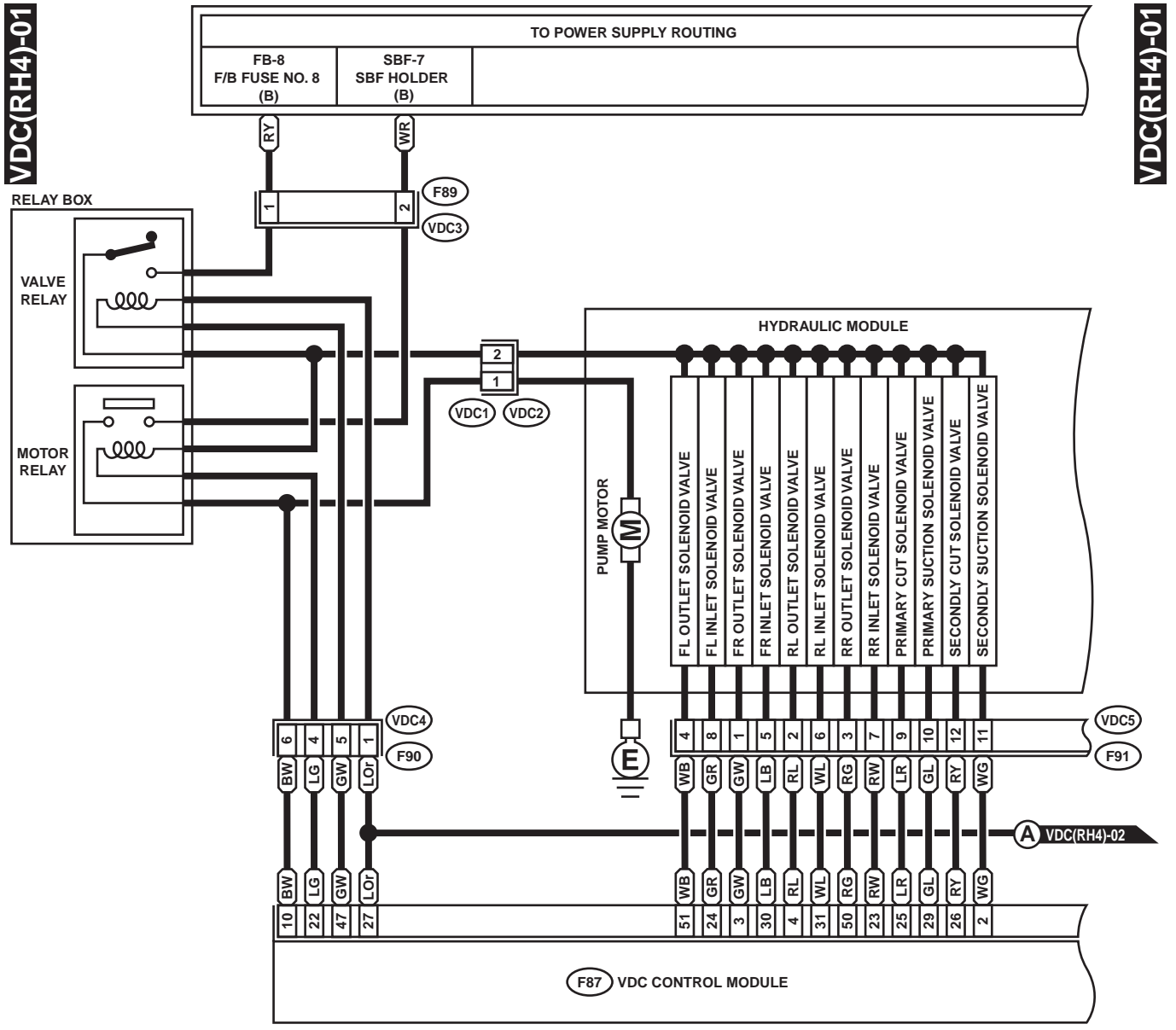
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×	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	×
×	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

WI-01015

VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM

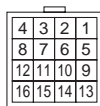
3. RHD 4-CYLINDER ENGINE MODEL



F89 (GRAY)

F90 (BLACK)

F91 (BLACK)



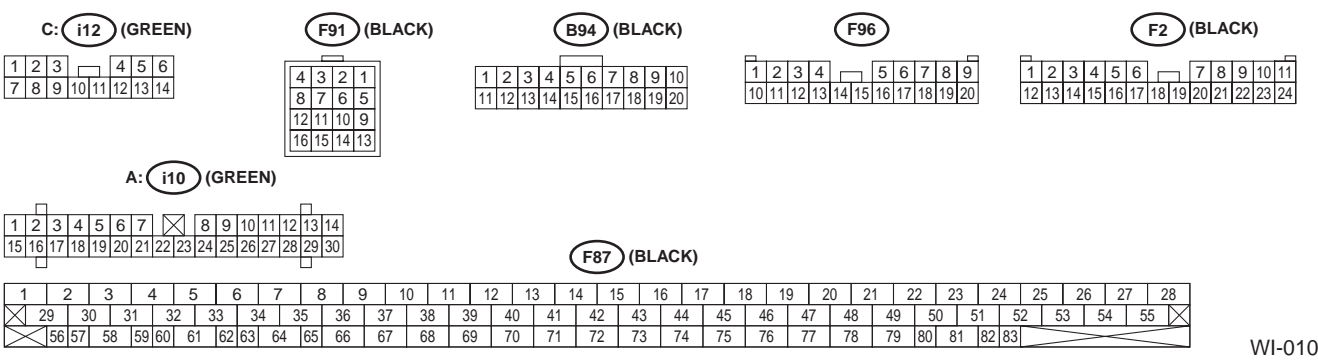
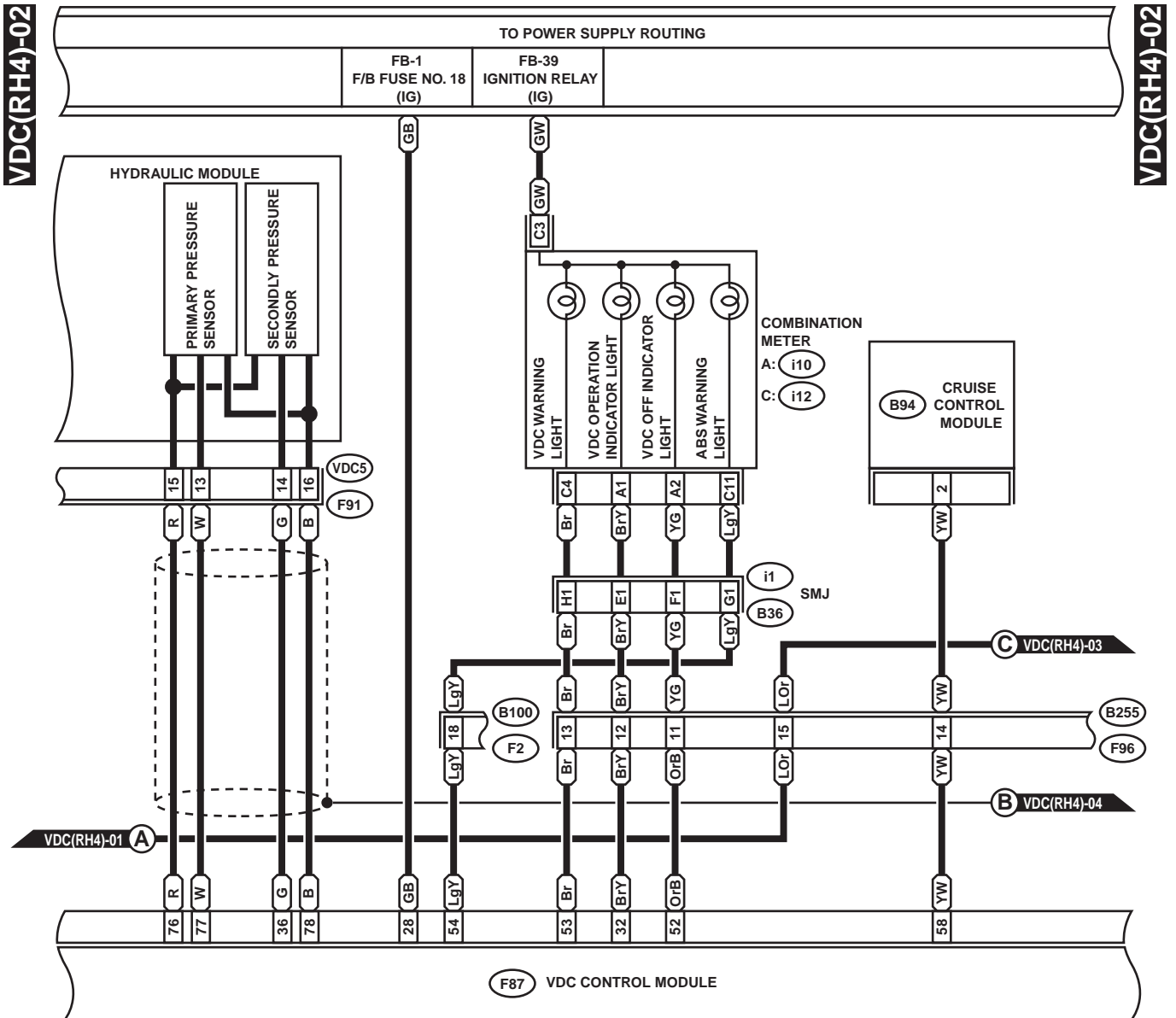
F87 (BLACK)

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29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

WI-01016

VEHICLE DYNAMIC CONTROL SYSTEM

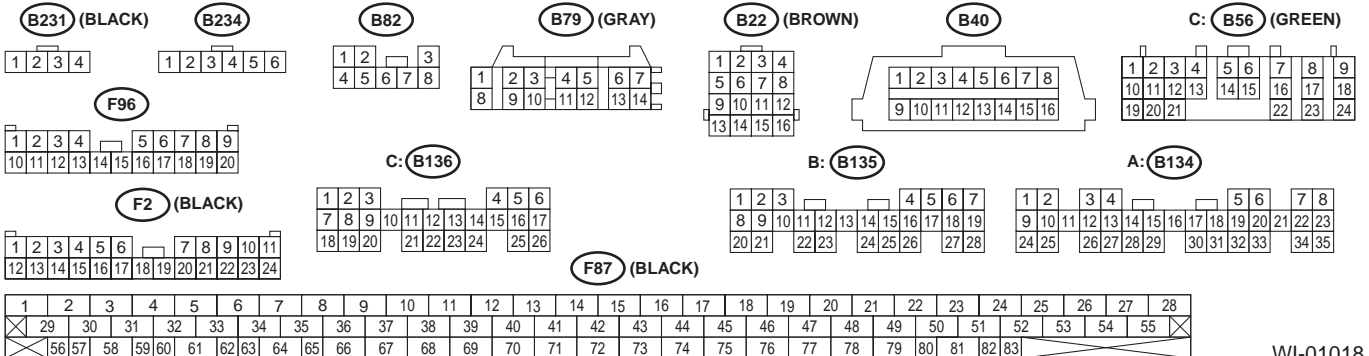
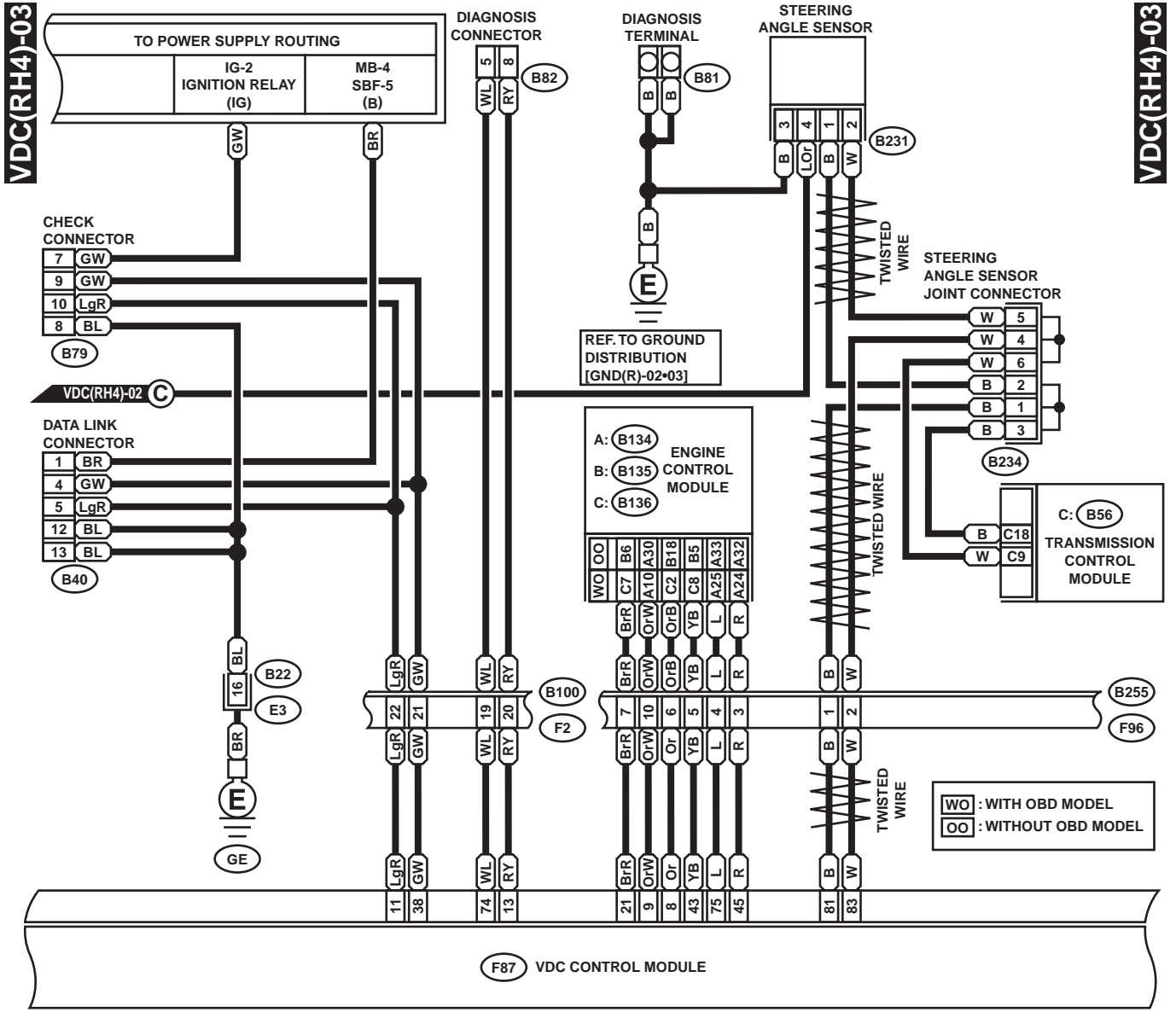
WIRING SYSTEM



WI-01017

VEHICLE DYNAMIC CONTROL SYSTEM

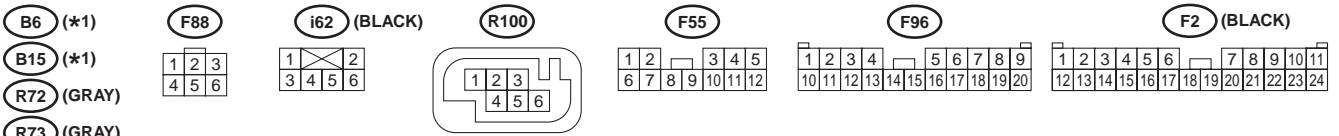
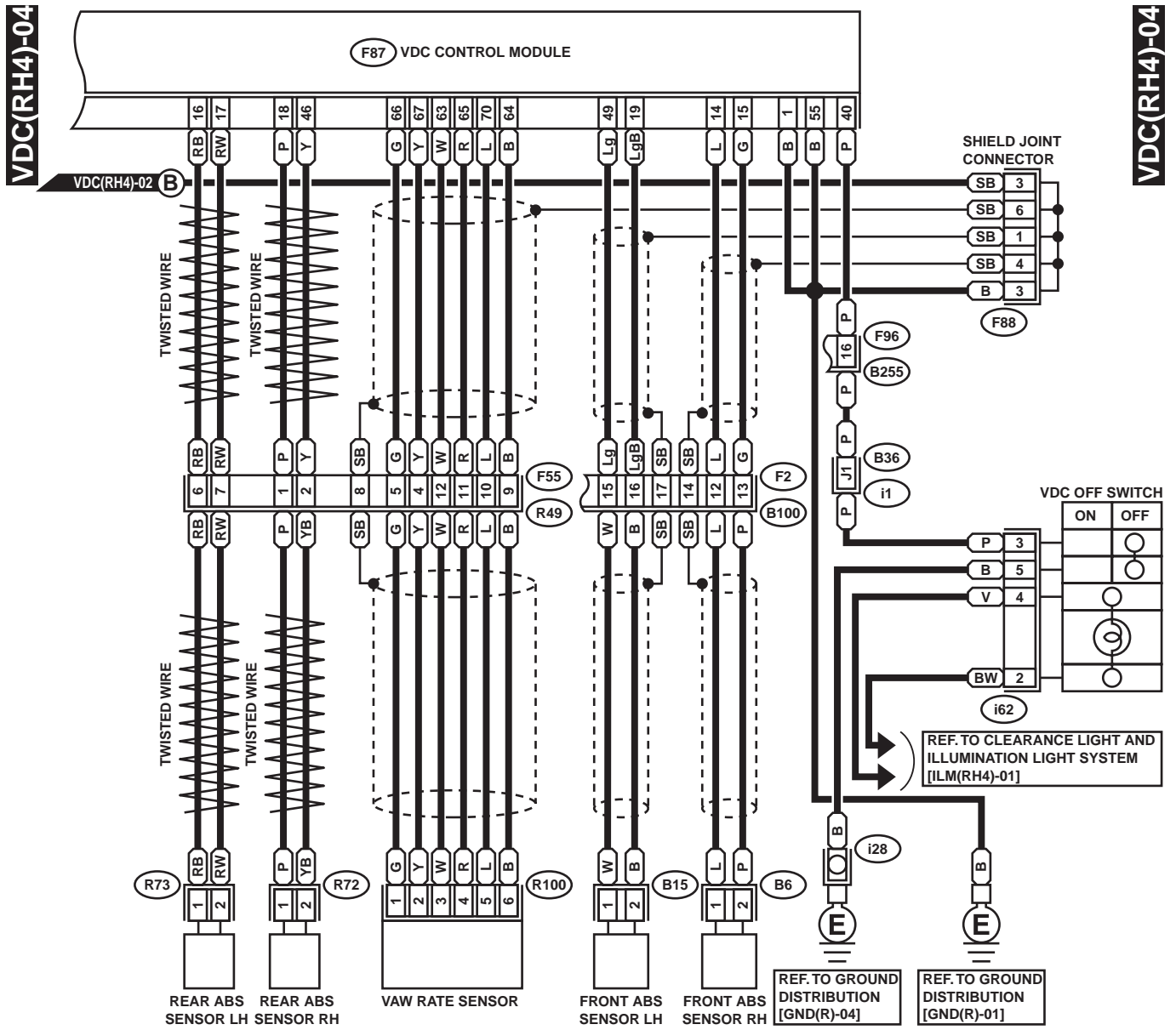
WIRING SYSTEM



WI-01018

VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM



(*1) OUTBACK : (BROWN)
OTHER MODELS : (GRAY)

F87 (BLACK)

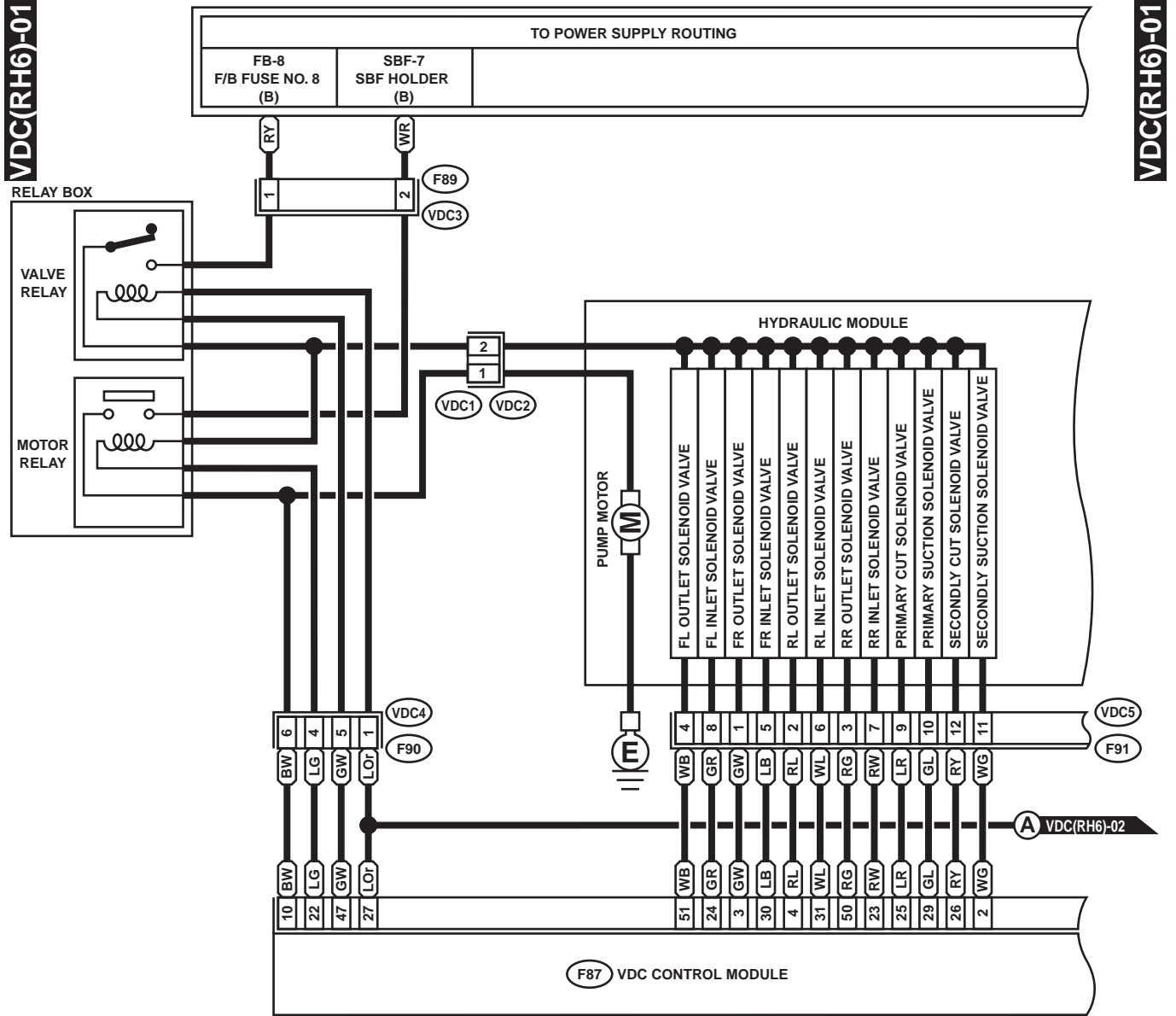
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WI-01019

VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM

4. RHD 6-CYLINDER ENGINE MODEL



F89 (GRAY)

F90 (BLACK)

F91 (BLACK)

VDC1

1	2	3
4	5	6

4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13

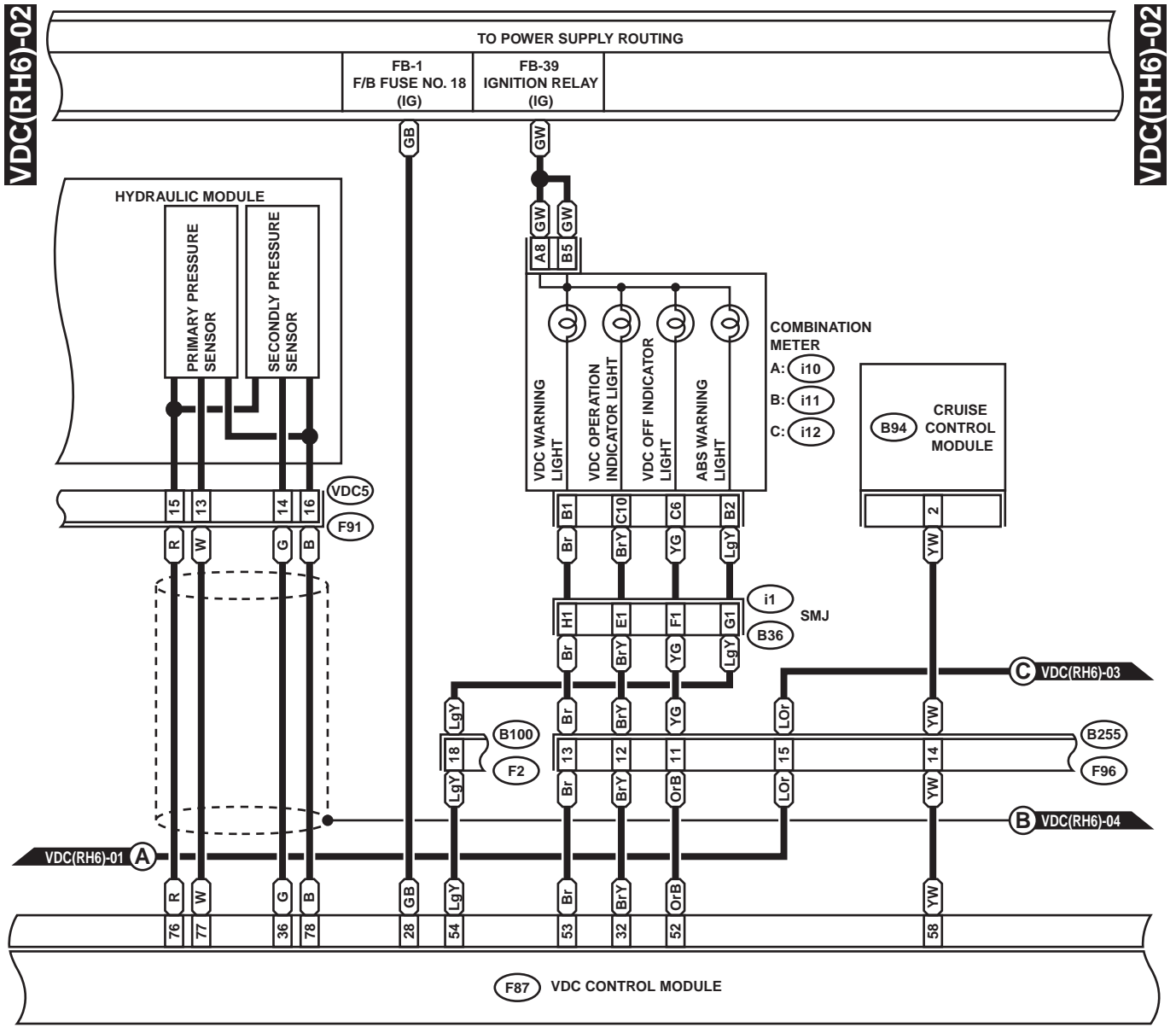
F87 (BLACK)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

WI-01020

VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM

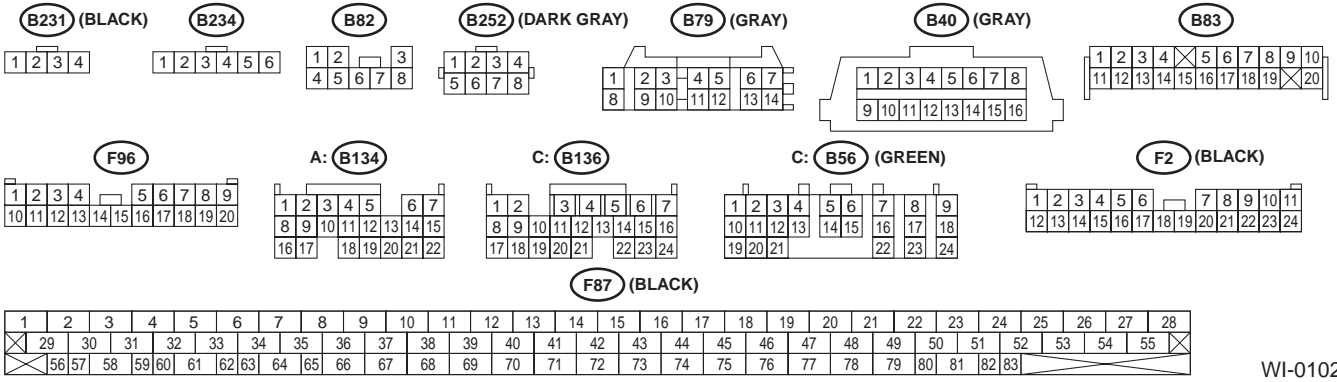
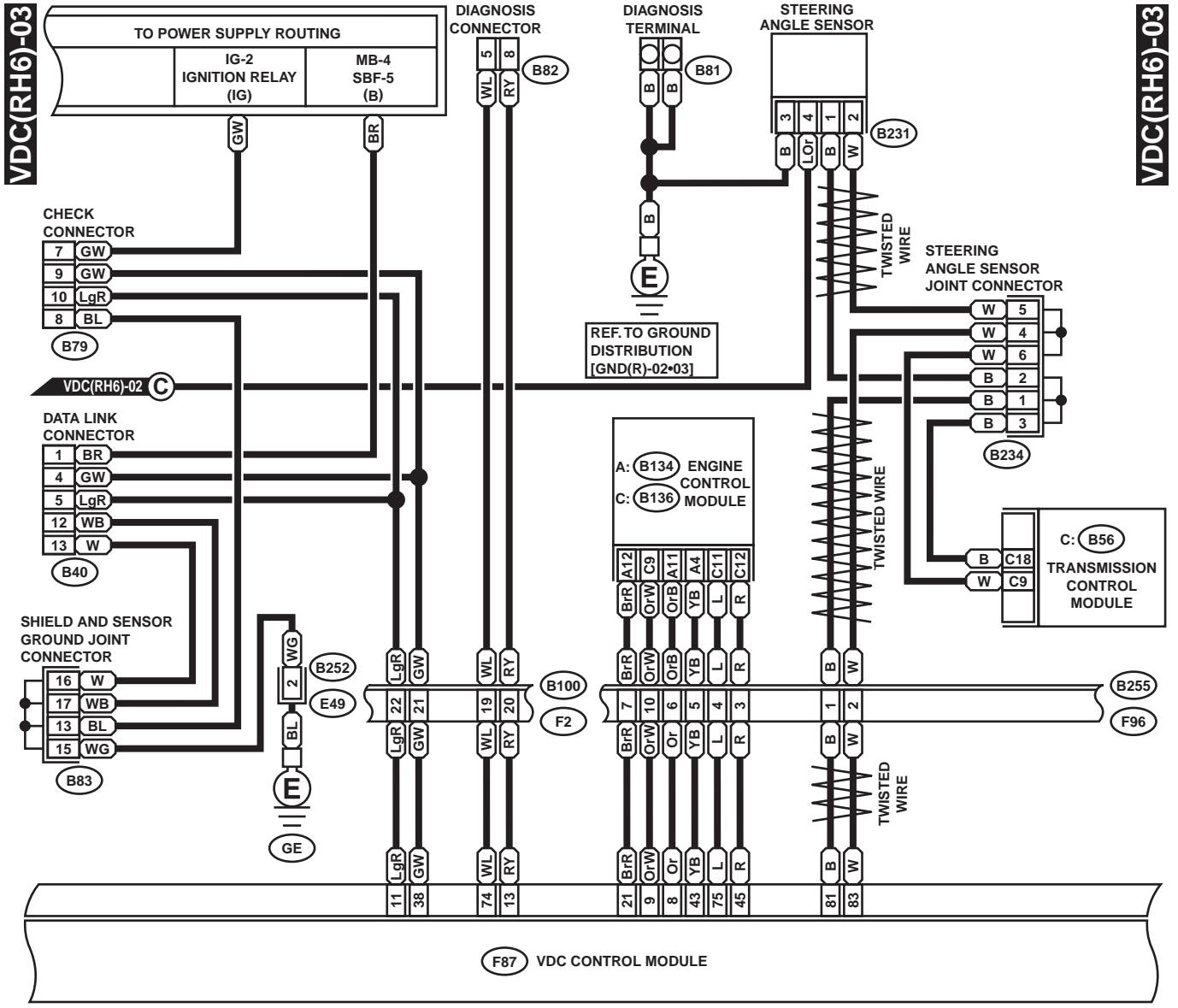


F91 (BLACK)	B: i11 (GREEN)	C: i12 (GREEN)	B94 (BLACK)	F96																																																																																																																																									
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WI-01021

VEHICLE DYNAMIC CONTROL SYSTEM

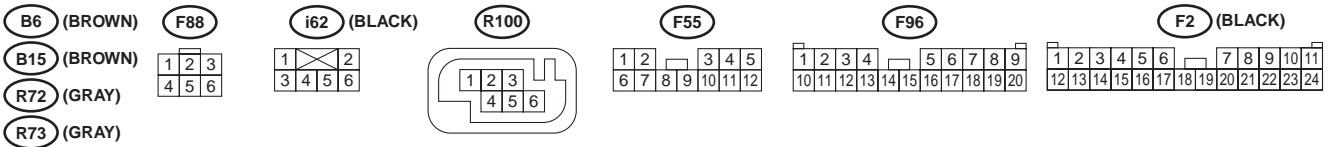
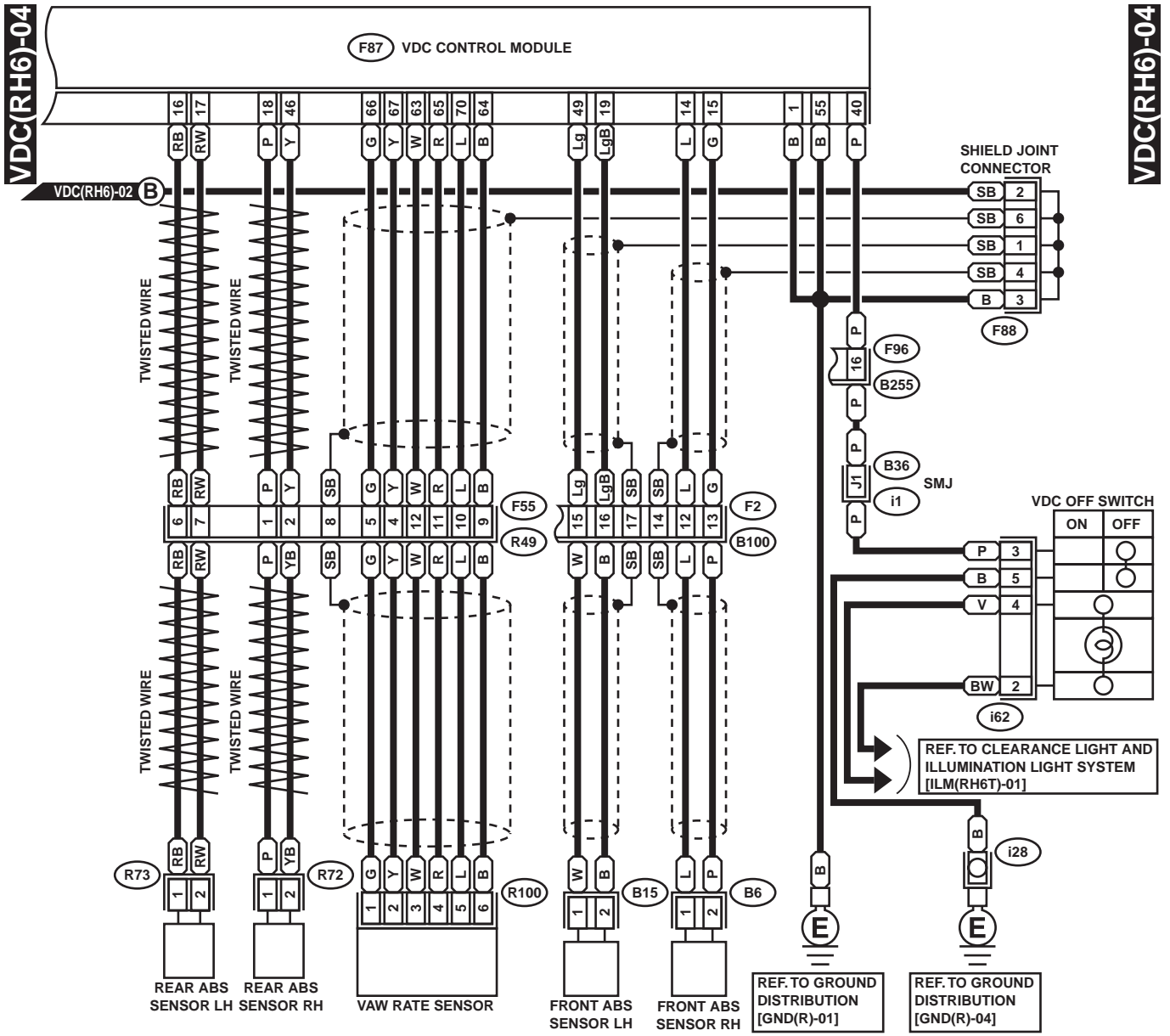
WIRING SYSTEM



WI-01022

VEHICLE DYNAMIC CONTROL SYSTEM

WIRING SYSTEM



(F87) (BLACK)

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WI-01023

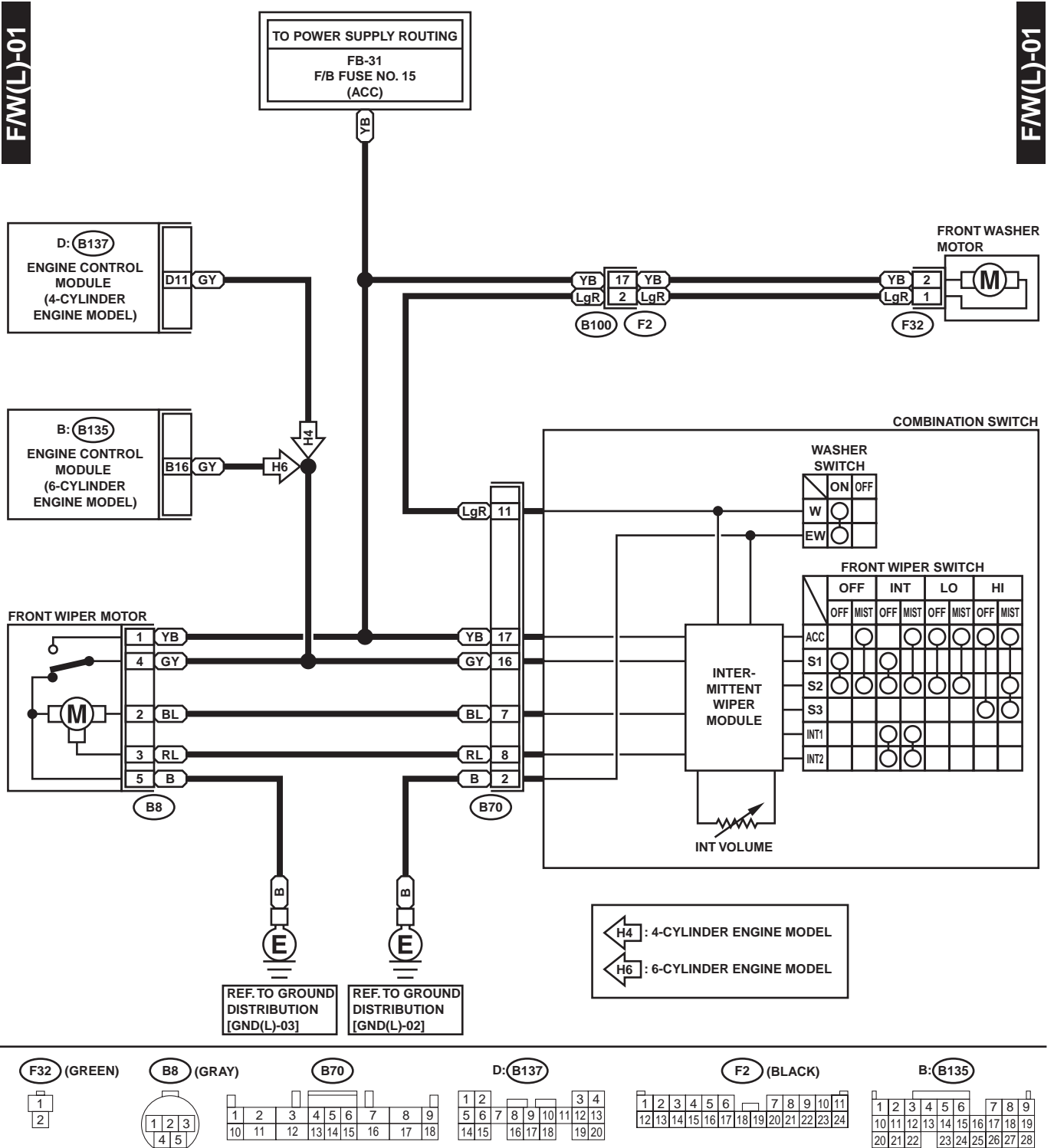
WIPER AND WASHER SYSTEM (FRONT)

WIRING SYSTEM

46. Wiper and Washer System (Front)

A: SCHEMATIC

1. LHD MODEL

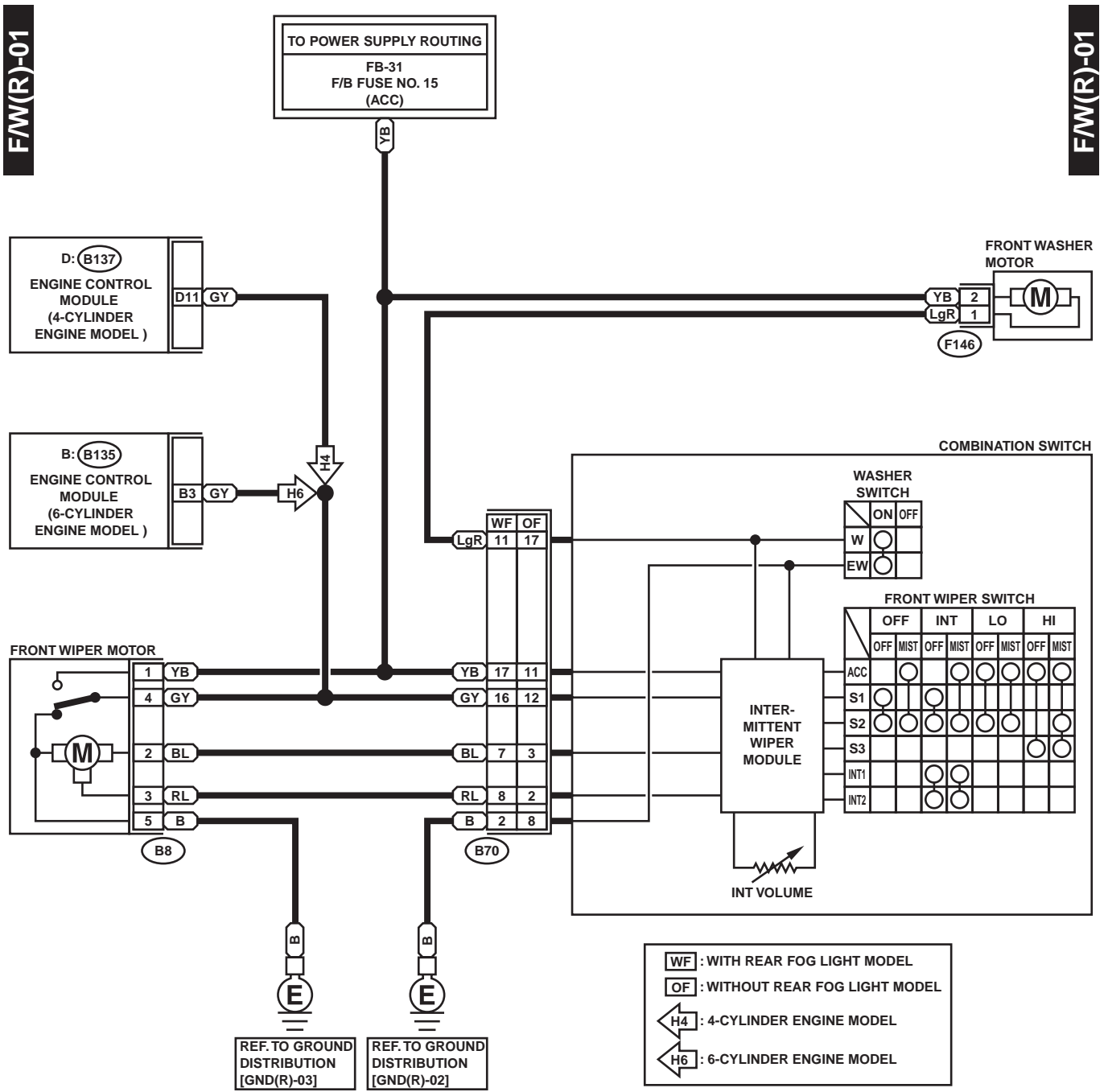


WI-01073

WIPER AND WASHER SYSTEM (FRONT)

WIRING SYSTEM

2. RHD MODEL



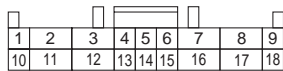
(B146) (GREEN)



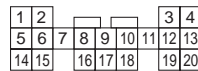
(B8)



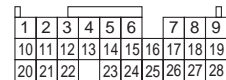
(B70)



D: (B137)



B: (B135)



WI-01074

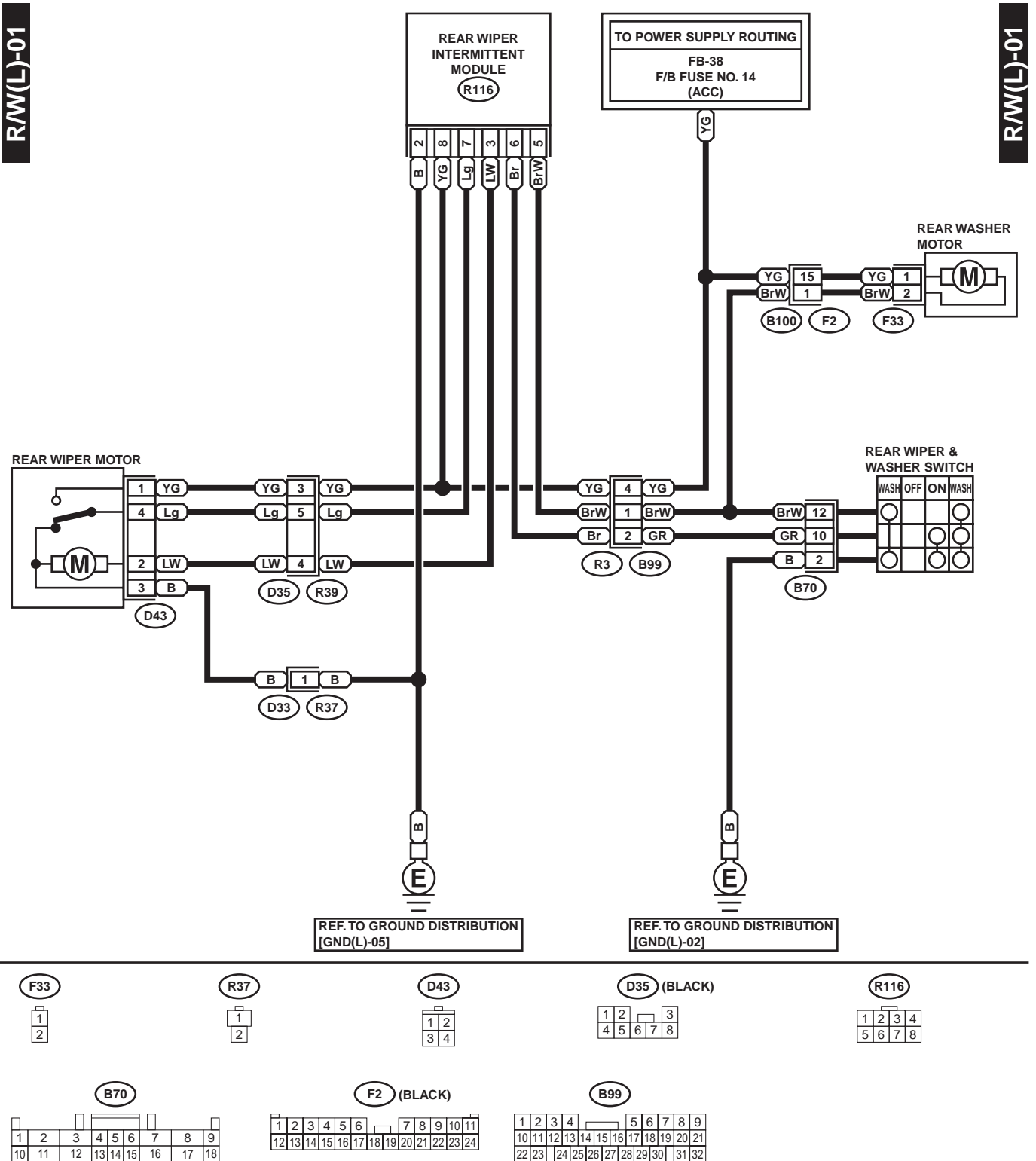
WIPER AND WASHER SYSTEM (REAR)

WIRING SYSTEM

47. Wiper and Washer System (Rear)

A: SCHEMATIC

1. LHD MODEL

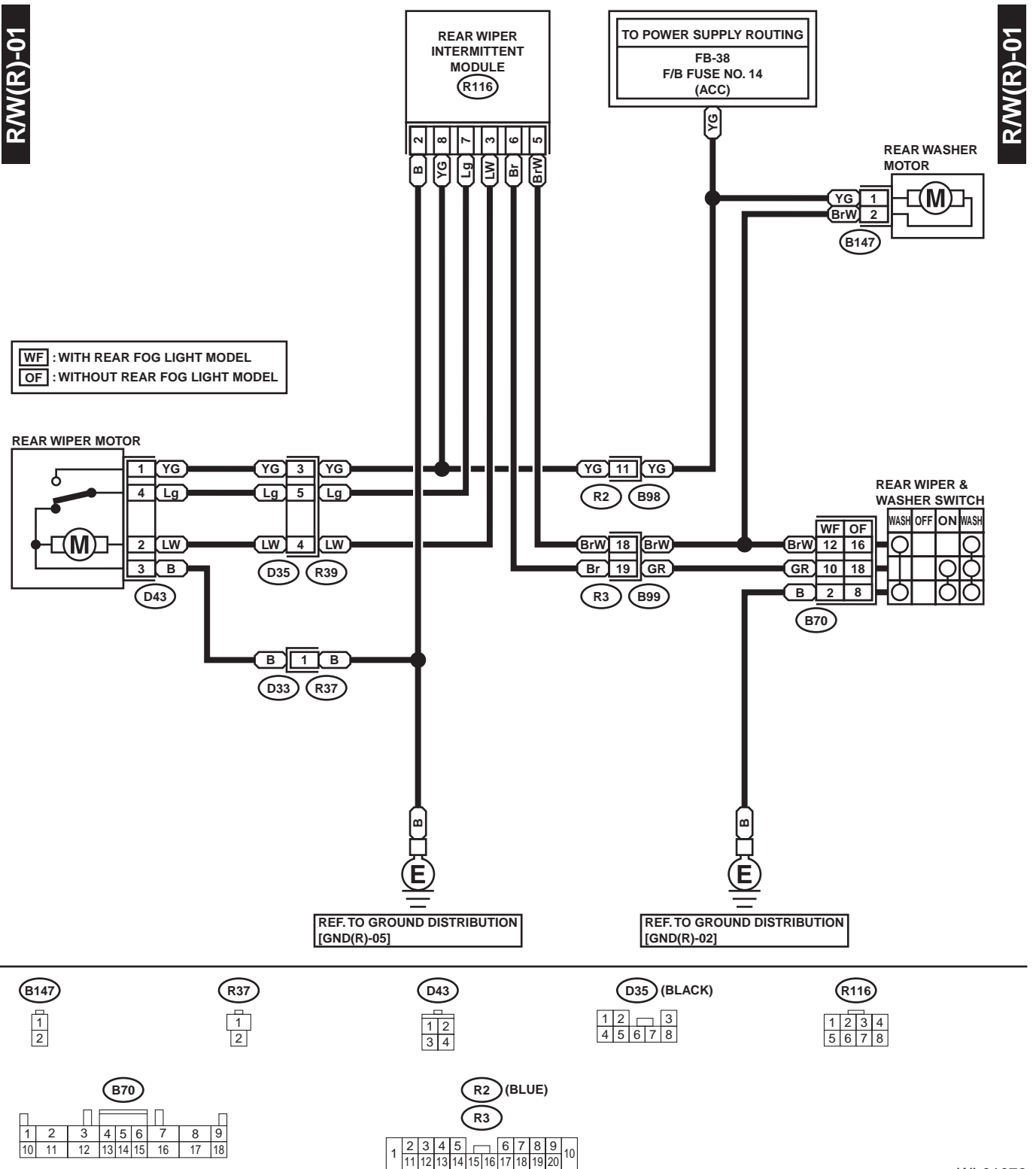


WI-01075

WIPER AND WASHER SYSTEM (REAR)

WIRING SYSTEM

2. RHD MODEL



WI-01076

WIPER DEICER SYSTEM

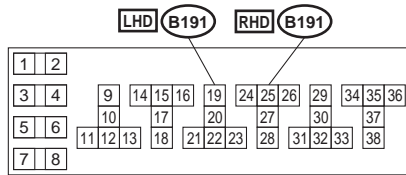
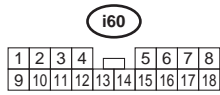
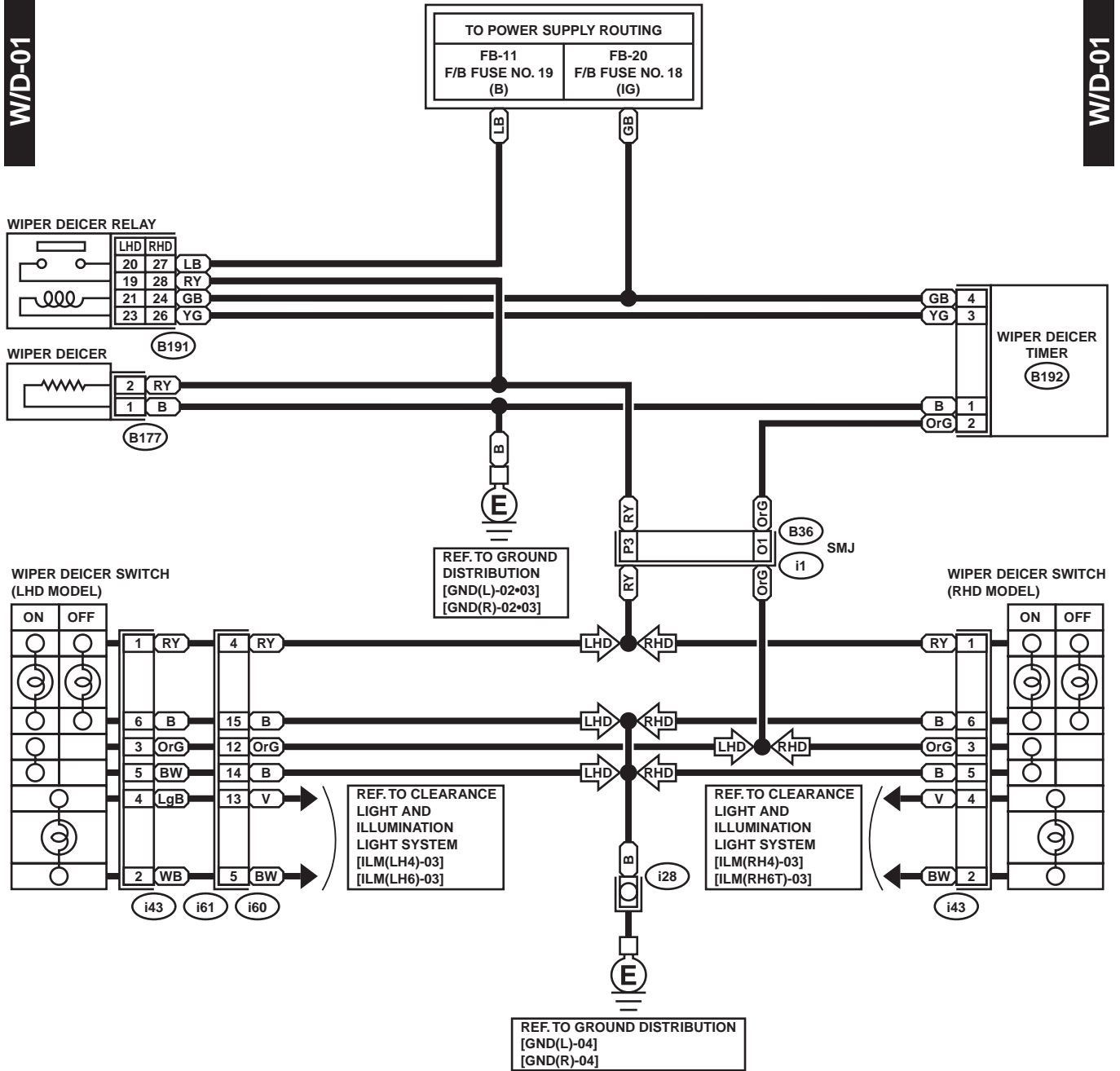
WIRING SYSTEM

48.Wiper Deicer System

A: SCHEMATIC

W/D-01

W/D-01



RELAY BLOCK (BLACK)

WI-01077

MEMO:

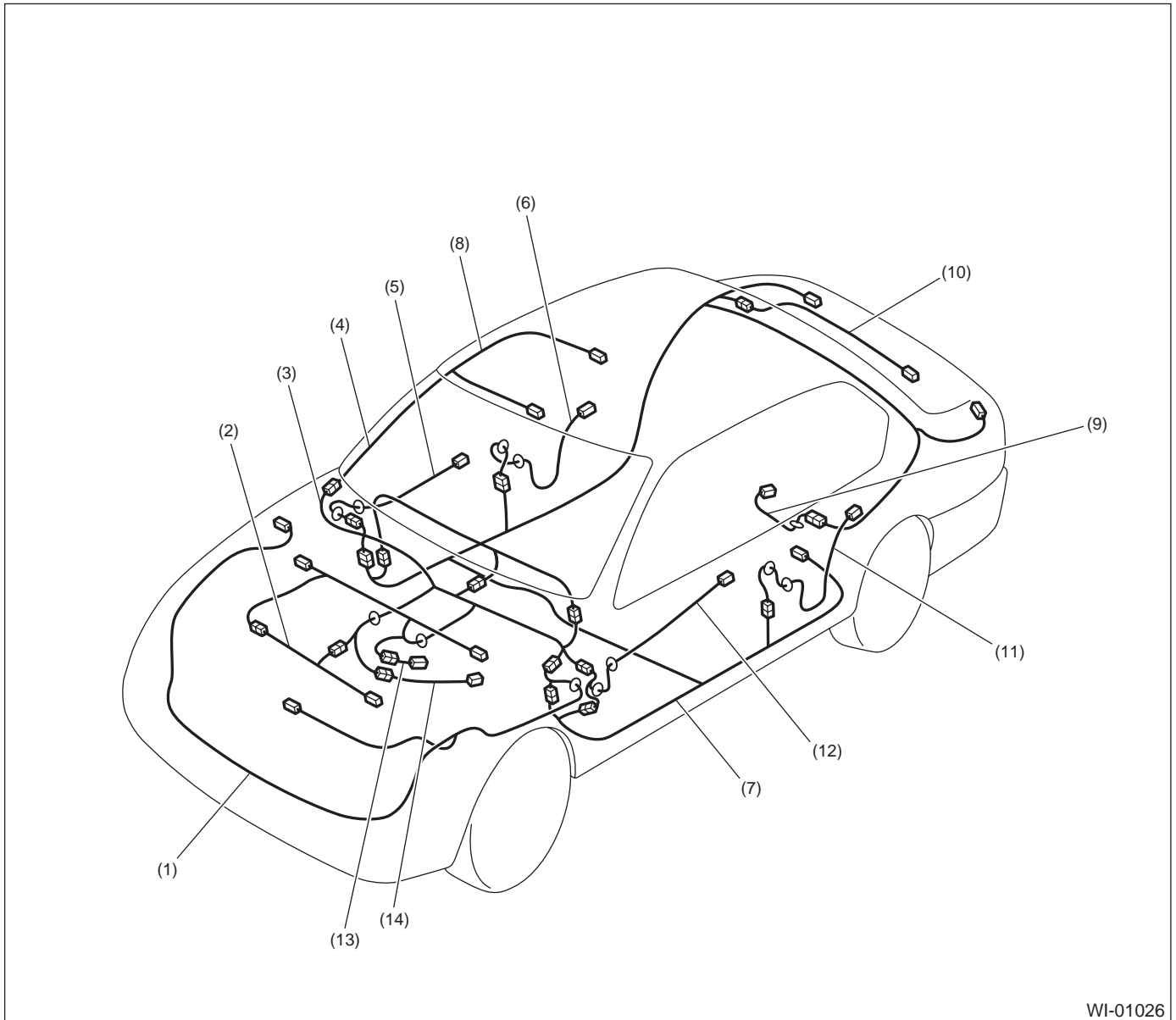
HARNESS COMPONENTS LOCATION

WIRING SYSTEM

49. Harness components location

A: LOCATION

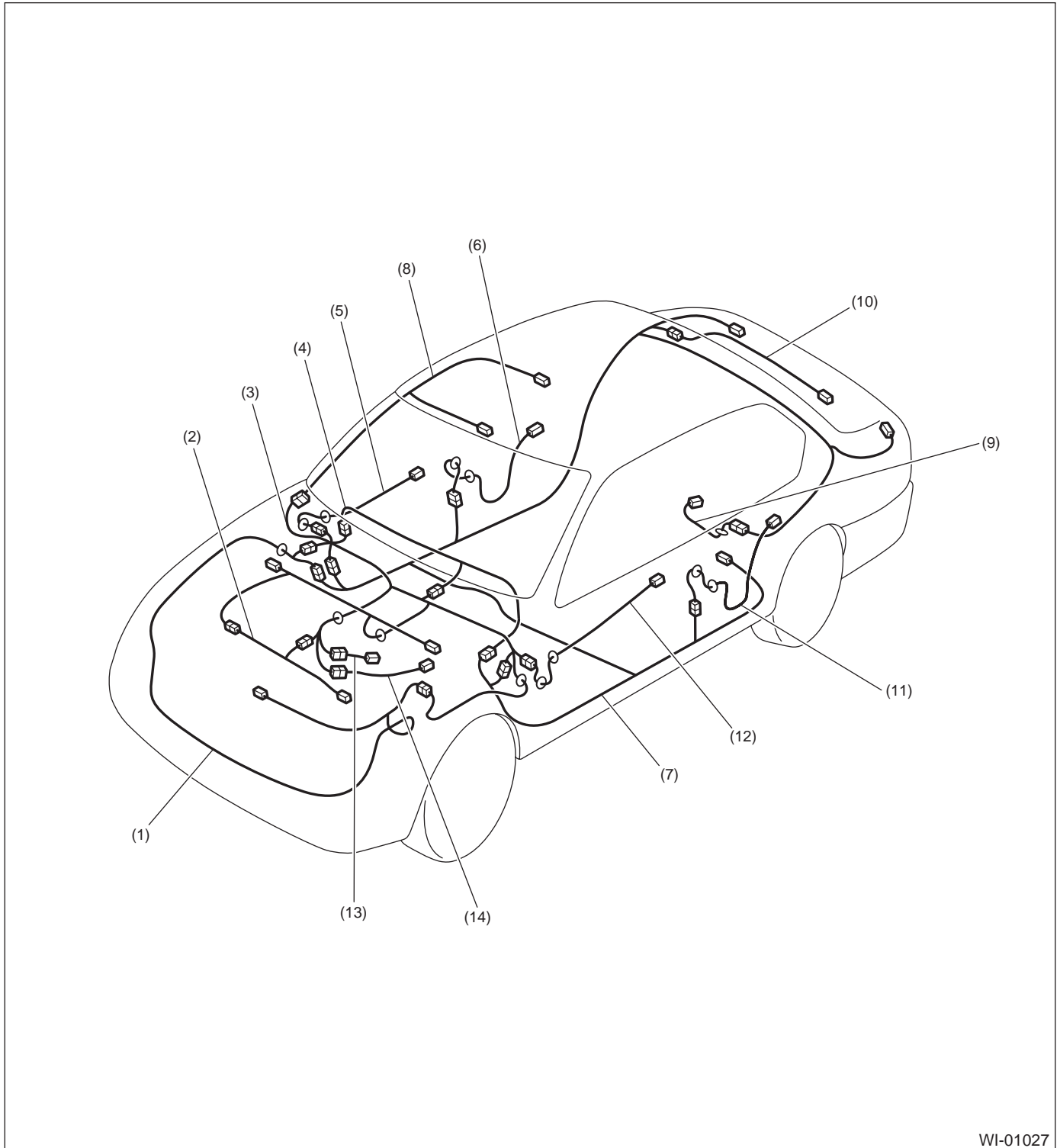
1. LHD SEDAN MODEL



WI-01026

- | | | |
|-------------------------------------|-------------------------|------------------------------|
| (1) Front wiring harness | (6) Rear door cord RH | (11) Rear door cord LH |
| (2) Engine wiring harness | (7) Rear wiring harness | (12) Front door cord LH |
| (3) Bulkhead wiring harness | (8) Roof cord | (13) Transmission cord |
| (4) Instrument panel wiring harness | (9) Fuel tank cord | (14) Rear oxygen sensor cord |
| (5) Front door cord RH | (10) Trunk lid cord | |

2. RHD SEDAN MODEL



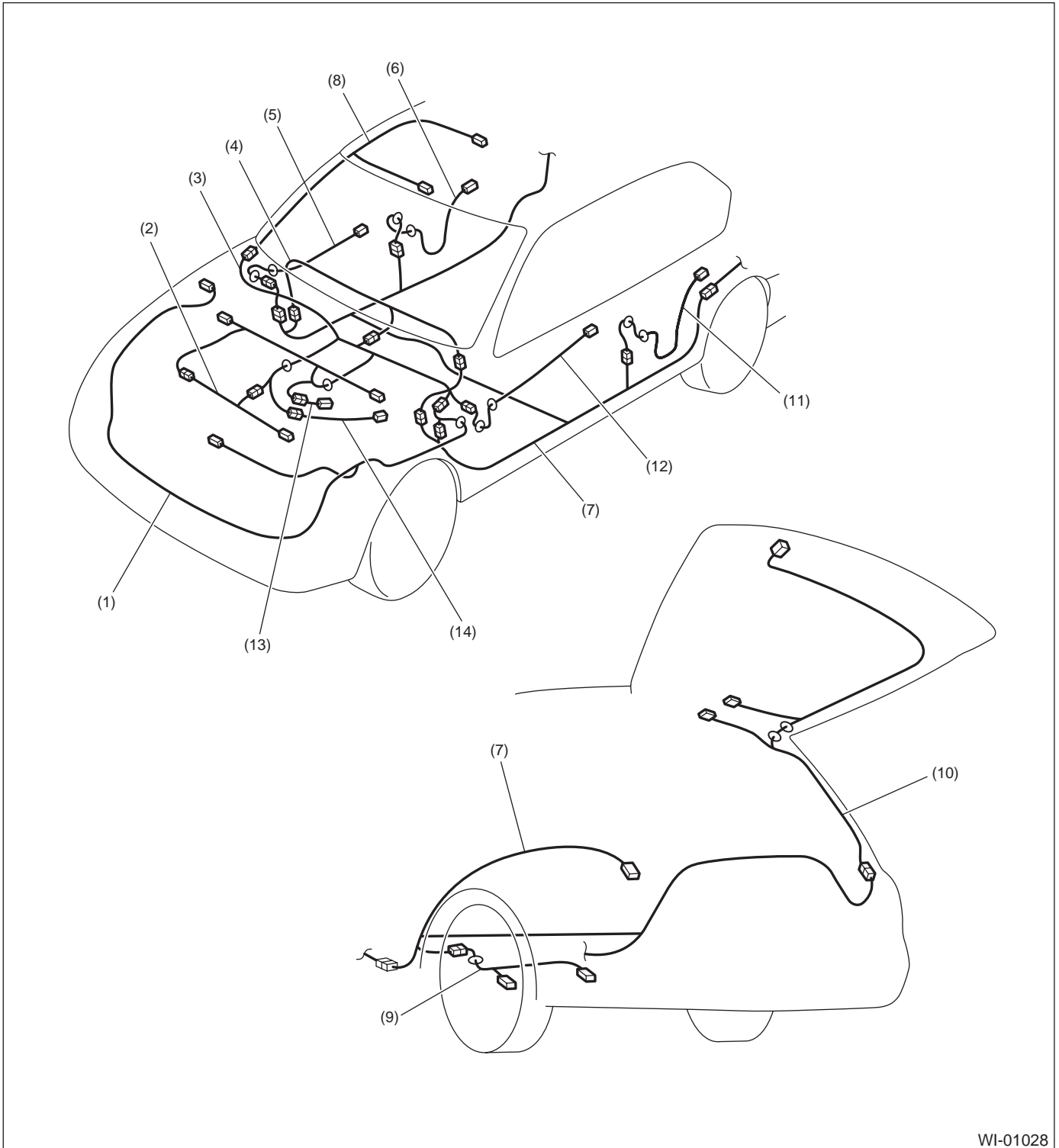
WI-01027

- | | | |
|-------------------------------------|-------------------------|------------------------------|
| (1) Front wiring harness | (6) Rear door cord RH | (11) Rear door cord LH |
| (2) Engine wiring harness | (7) Rear wiring harness | (12) Front door cord LH |
| (3) Bulkhead wiring harness | (8) Roof cord | (13) Transmission cord |
| (4) Instrument panel wiring harness | (9) Fuel tank cord | (14) Rear oxygen sensor cord |
| (5) Front door cord RH | (10) Trunk lid cord | |

HARNESS COMPONENTS LOCATION

WIRING SYSTEM

3. LHD WAGON MODEL



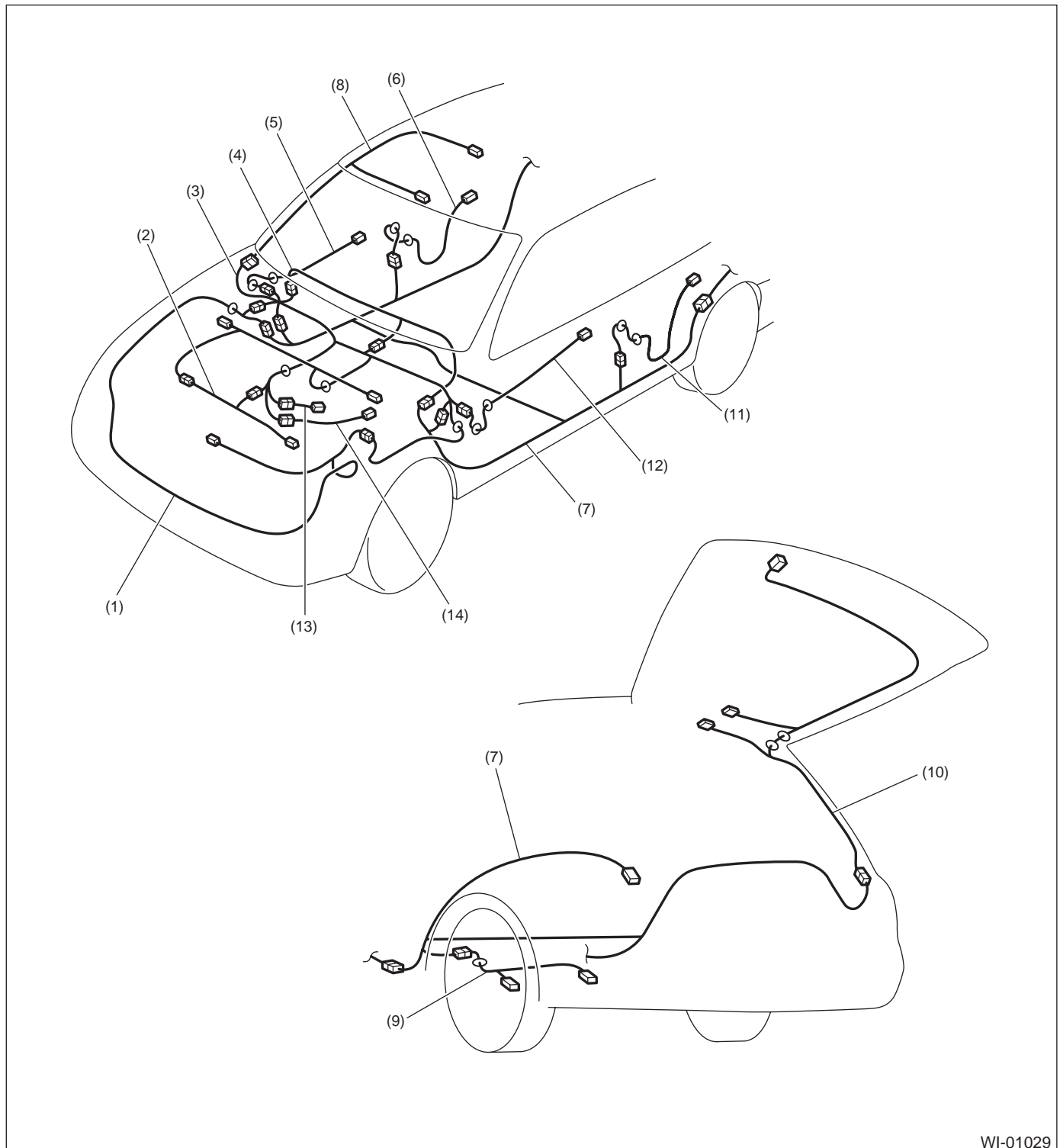
WI-01028

- | | | |
|-------------------------------------|-------------------------|------------------------------|
| (1) Front wiring harness | (6) Rear door cord RH | (11) Rear door cord LH |
| (2) Engine wiring harness | (7) Rear wiring harness | (12) Front door cord LH |
| (3) Bulkhead wiring harness | (8) Roof cord | (13) Transmission cord |
| (4) Instrument panel wiring harness | (9) Fuel tank cord | (14) Rear oxygen sensor cord |
| (5) Front door cord RH | (10) Rear gate cord | |

HARNESS COMPONENTS LOCATION

WIRING SYSTEM

4. RHD WAGON MODEL



WI-01029

- | | | |
|-------------------------------------|-------------------------|------------------------------|
| (1) Front wiring harness | (6) Rear door cord RH | (11) Rear door cord LH |
| (2) Engine wiring harness | (7) Rear wiring harness | (12) Front door cord LH |
| (3) Bulkhead wiring harness | (8) Roof cord | (13) Transmission cord |
| (4) Instrument panel wiring harness | (9) Fuel tank cord | (14) Rear oxygen sensor cord |
| (5) Front door cord RH | (10) Rear gate cord | |

FRONT WIRING HARNESS

WIRING SYSTEM

50. Front Wiring Harness

A: LOCATION

1. LHD MODEL

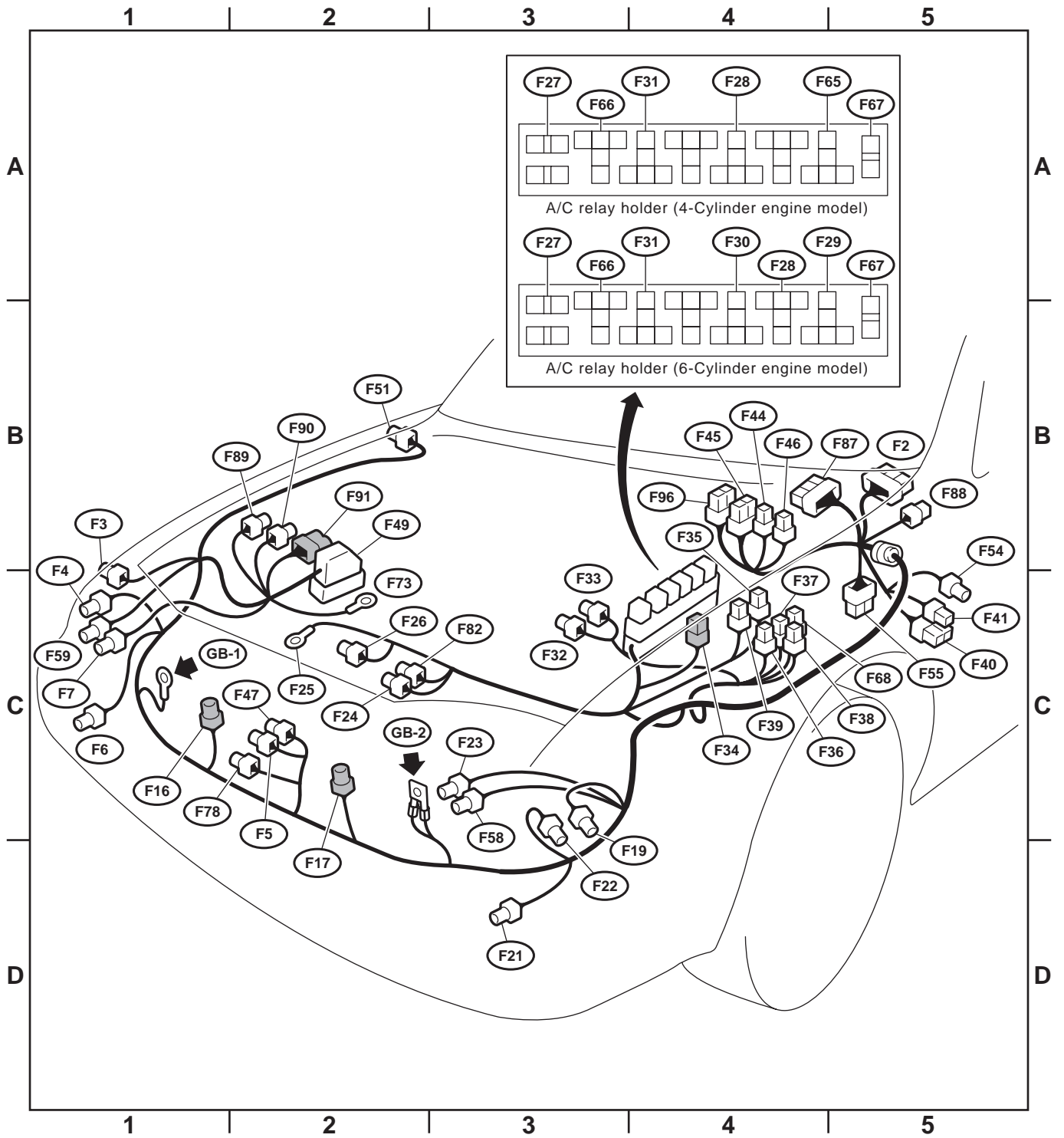
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F2	24	Black	B-4	B100	Bulkhead wiring harness
F3	2	★	B-1		Front turn signal light RH
F4	3	★	B-1		Front clearance light RH
F5	1	Black	C-1		Horn
F6	2	★	C-1		Front fog light RH
F7	3	Gray	C-1		Headlight RH
F16	2	Black	C-1		Sub fan motor (4-cylinder engine model)
	4	Gray	C-1		Sub fan motor (6-cylinder engine model)
F17	2	Black	C-2		Radiator main fan motor (4-cylinder engine model)
	4	Gray	C-2		Radiator main fan motor (6-cylinder engine model)
F19	2	★	C-3		Front turn signal light LH
F21	2	★	D-3		Front fog light LH
F22	3	★	C-3		Front clearance light LH
F23	3	Gray	C-2		Headlight LH
F24	1	Black	C-2		A/C magnet clutch (4-cylinder engine model)
F25	1	★	C-2		Generator
F26	3	Green	C-2		
F27	4	★	A-3		A/C fuse (Relay holder)
F28	5	★	A-3		A/C sub fan relay (Relay holder-4 cylinder engine model)
	5	★	A-4		A/C sub fan relay-1 (Relay holder-6 cylinder engine model)
F29	5	★	A-4		A/C sub fan relay-2 (Relay holder-6 cylinder engine model)
F30	5	★	A-3		Radiator main fan relay-2 (Relay holder-6 cylinder engine model)
F31	5	★	A-3		A/C relay (Relay holder)
F32	2	Green	C-3		Front washer motor
F33	2	★	B-3		Rear washer motor
F34	4	★	C-3		SBF holder

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F35	2	Black	B-4		Main fuse box (M/B)
F36	3	★	C-4		
F37	6	Black	C-4		
F38	1	★	C-4		
F39	8	Black	B-3		Fuse & relay box (F/B)
F40	9	Brown	C-4		
F41	7	Gray	B-4		
F44	8	★	B-4	B61	Bulkhead wiring harness
F45	16	★	B-3	B62	Bulkhead wiring harness
F46	4	★	B-4	B108	Bulkhead wiring harness
F47	1	Black	C-2		Horn
F49	31	★	B-2		ABS control module
F51	2	Black	B-2		Side turn signal light RH
F54	2	Black	B-4		Side turn signal light LH
F55	8	★	B-4	R49	Rear wiring harness (without VDC model)
	12	★			Rear wiring harness (with VDC model)
F58	3	★	D-2		Headlight leveler LH
F59	3	★	C-1		Headlight leveler RH
F65	5	★	A-4		Front fog light relay (Relay holder)
F66	5	★	A-3		Radiator main fan relay (Relay holder-4-cylinder engine model)
	5	★	A-3		Radiator main fan relay-1 (Relay holder-6-cylinder engine model)
F67	2	★	A-4		FWD switch (Relay holder-without VDC model)
F68	4	Black	C-4		Main fuse box (M/B)
F73	1	★	B-2		ABS motor ground
F78	2	Black	C-1		Ambient sensor
F82	3	Black	C-2		A/C magnet clutch (6-cylinder engine model)
F87	83	★	B-4		VDC module
F88	6	★	B-4		Shield joint connector (VDC)
F89	2	Gray	B-1		Hydraulic module (VDC)
F90	6	Black	B-2		
F91	16	★	B-2		Hydraulic module (VDC)
F96	14	★	B-4	B255	Bulkhead wiring harness

★: Non-colored

FRONT WIRING HARNESS

WIRING SYSTEM



WI-01030

FRONT WIRING HARNESS

WIRING SYSTEM

2. RHD MODEL

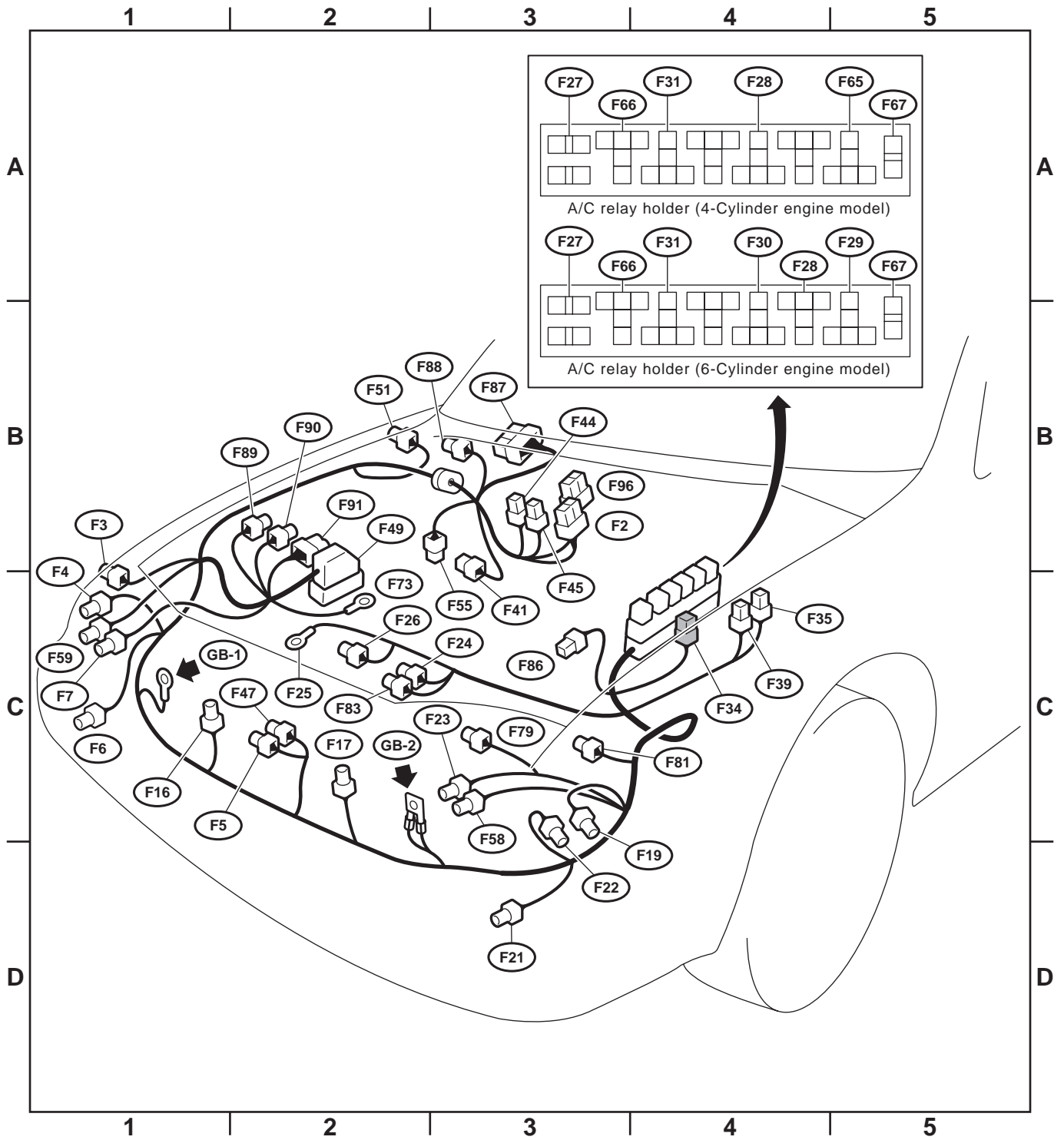
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F2	24	Black	B-3	B100	Bulkhead wiring harness
F3	2	★	B-1		Front turn signal light RH
F4	3	Gray	B-1		Front clearance light RH
F5	1	Black	C-2		Horn
F6	2	★	C-1		Front fog light RH
F7	3	Gray	C-1		Headlight RH
F16	2	Black	C-1		Sub fan motor (4-cylinder engine model)
	4	Gray	C-1		Sub fan motor (6-cylinder engine model)
F17	2	Black	C-2		Radiator main fan motor (4-cylinder engine model)
	4	Gray	C-2		Radiator main fan motor (6-cylinder engine model)
F19	2	★	C-3		Front turn signal light LH
F21	2	★	D-2		Front fog light LH
F22	3	Gray	C-3		Front clearance light LH
F23	3	Gray	C-2		Headlight LH
F24	1	Black	C-2		A/C magnet clutch
F25	1	★	C-2		Generator
F26	3	Green	C-2		
F27	4	★	A-3		A/C fuse (Relay holder)
F28	5	★	A-4		A/C sub fan relay (Relay holder-4-cylinder engine model)
	5	★	A-4		A/C sub fan relay-1 (Relay holder-6-cylinder engine model)
F29	5	★	A-4		A/C sub fan relay-2 (Relay holder-6-cylinder engine model)
F30	5	★	A-4		Radiator main fan relay-2 (Relay holder-6-cylinder engine model)
F31	5	★	A-3		A/C relay (Relay holder)
F34	4	★	C-3		SBF holder
F35	2	Black	B-4		Main fuse box (M/B)
F39	8	Black	B-3		
F41	7	Gray	B-2		Fuse & relay box (F/B)
F44	8	★	B-3	B61	Bulkhead wiring harness
F45	8	★	B-3	B62	Bulkhead wiring harness
F47	1	Black	C-2		Horn
F49	31	★	B-2		ABS control module
F51	2	Black	B-2		Side turn signal light RH
F55	8	★	B-2	R49	Rear wiring harness (without VDC model)
	12				Rear wiring harness (with VDC model)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F58	3	★	C-2		Headlight leveler LH
F59	3	★	C-1		Headlight leveler RH
F65	5	★	A-4		Front fog light relay (Relay holder)
F66	5	★	A-3		Radiator main fan relay (Relay holder-4-cylinder engine model)
	5	★	A-3		Radiator main fan relay-1 (Relay holder-6-cylinder engine model)
F67	2	★	A-4		FWD switch (Relay holder-without VDC model)
F73	1	★	B-2		ABS motor ground
F78	2	Black	C-1		Ambient sensor
F79	2	Gray	C-2		A/C pressure switch (4-cylinder engine model)
	4	★	C-2		A/C pressure switch (6-cylinder engine model)
F83	2	★	C-2		Thermal protector (4-cylinder engine model)
	4	★	C-2		Thermal protector (6-cylinder engine model)
F86	1	Gray	C-3	B212	Bulkhead wiring harness
F87	83	★	B-2		VDC module
F88	6	★	B-2		Shield joint connector (VDC)
F89	2	Gray	B-1		Hydraulic module (VDC)
F90	6	Black	B-1		
F91	16	★	B-2		Hydraulic module (VDC)
F96	20	★	B-3	B255	Bulkhead wiring harness

★: Non-colored

FRONT WIRING HARNESS

WIRING SYSTEM



WI-01031

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM

51. Bulkhead Wiring Harness (In Engine Room)

A: LOCATION

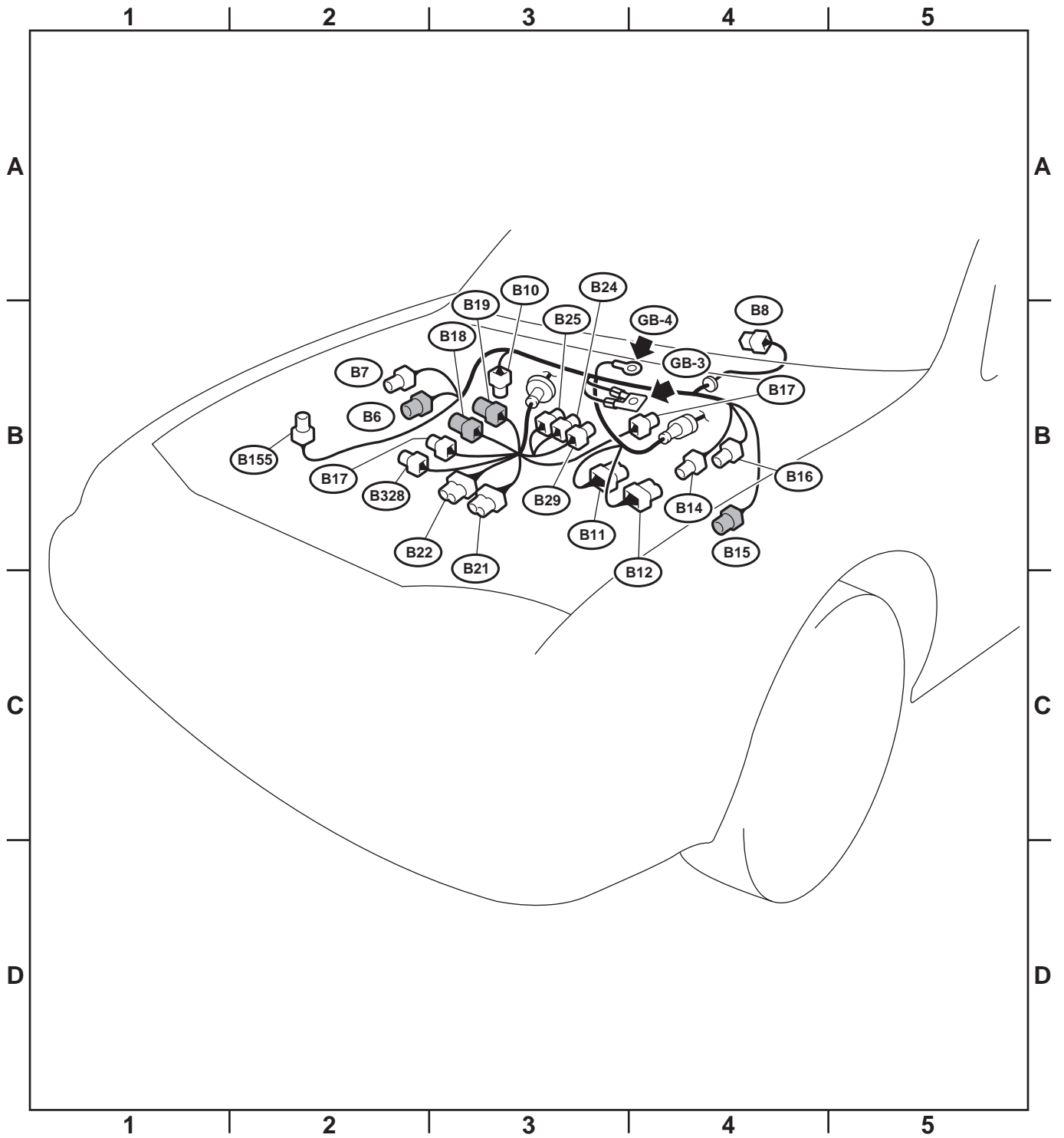
1. LHD 4-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B6	2	Brown	B-2		ABS front sensor RH (Outback model)
	2	★	B-2		ABS front sensor RH (Other models)
B7	6	Black	B-2		Cruise control actuator
B8	5	★	B-3		Front wiper motor
B10	2	★	B-2		A/C pressure switch
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	★	B-3	T3	
B14	1	Black	B-3		Starter (Magnet)
B15	2	Brown	B-3		Front ABS sensor LH (Outback model)
	2	★	B-3		Front ABS sensor LH (Other models)
B16	2	Gray	B-3		Brake fluid level switch
B17	3	★	B-2		Vehicle speed sensor (MT)
B18	4	★	B-2		Oxygen sensor (Without OBD model)
	4	★	B-2		Front oxygen (A/F) sensor (With OBD model)
B19	4	★	B-2	T5	Rear oxygen sensor cord (With OBD model)
B21	20	★	B-2	E2	Engine wiring harness
B22	16	Brown	B-2	E3	
B24	2	Gray	B-3	T1	Back-up light switch (MT)
B25	2	Brown	B-3	T2	Neutral position switch (MT)
B29	2	Black	B-3	T8	Lo (AWD) indicator light switch (MT)
B155	3	★	B-2		CO resistor (Without OBD model)
B328	6	Black	B-2	E58	Engine wiring harness

★: Non-colored

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM



WI-01032

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM

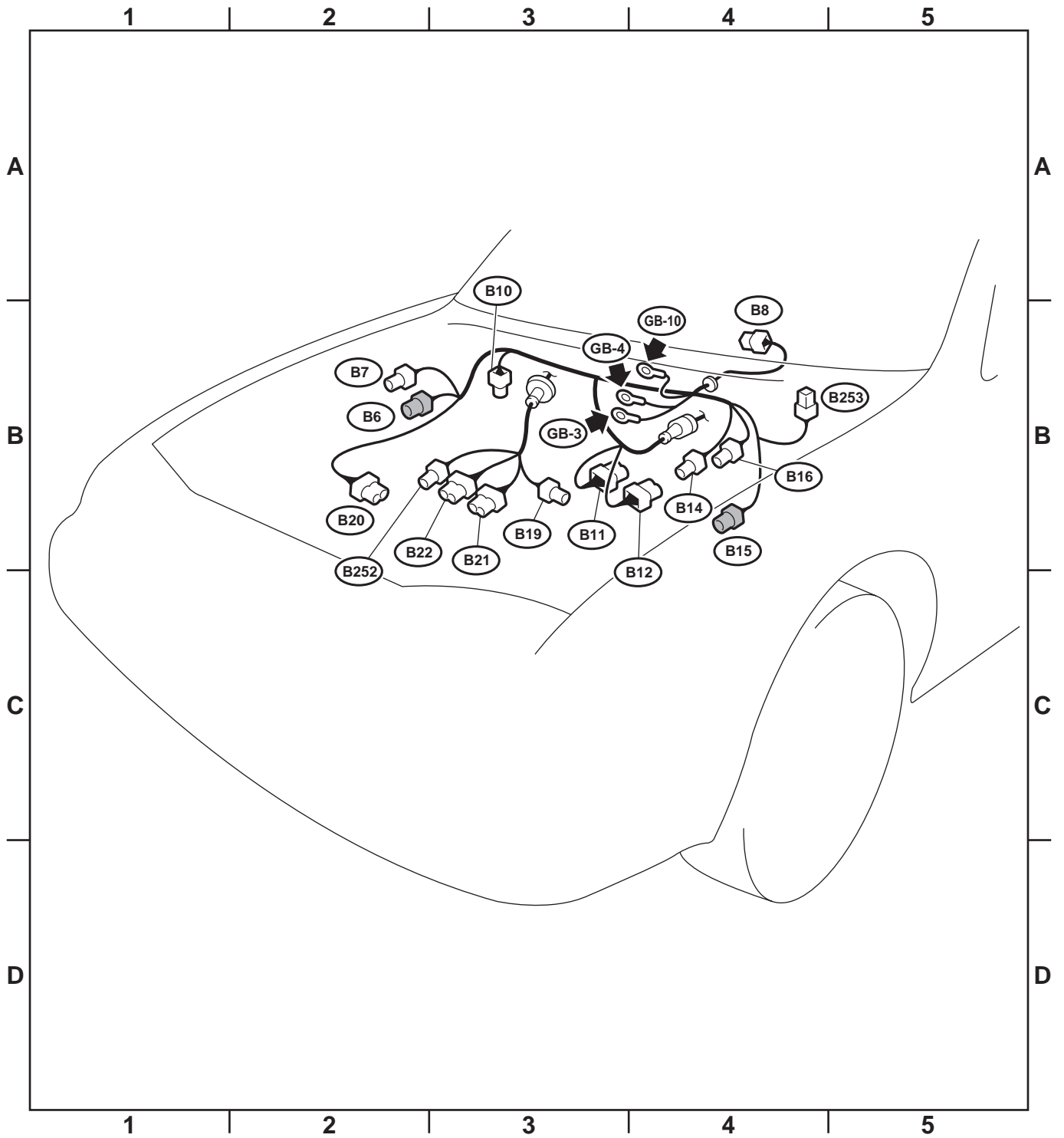
2. LHD 6-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B6	2	Brown	B-2		Front ABS sensor RH
B7	6	Black	B-2		Cruise control actuator
B8	5	★	B-3		Front wiper motor
B10	4	★	B-2		A/C pressure switch
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	★	B-3	T3	
B14	1	Black	B-3		Starter (Magnet)
B15	2	Brown	B-3		Front ABS sensor LH
B16	2	Gray	B-3		Brake fluid level switch
B19	6	★	B-3	T5	Rear oxygen sensor cord
B20	16	★	B-2	E1	Engine wiring harness
B21	20	★	B-2	E2	
B22	16	Brown	B-2	E3	
B252	8	★	B-2	E49	Engine wiring harness
B253	5	★	B-4		Fan relay

★: Non-colored

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM



WI-01033

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM

3. RHD 4-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	★	B-2		Air flow sensor (Turbo engine model)
B6	2	Brown	B-2		Front ABS sensor RH (Outback model)
	2	Gray	B-2		Front ABS sensor RH (Other models)
B7	6	Black	B-3		Cruise control actuator
B8	5	★	B-3		Front wiper motor
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	★	B-3	T3	
		Black	B-3	T3	Transmission (Turbo engine AT model)
B14	1	Black	B-3		Starter (Magnet)
B15	2	Brown	B-3		Front ABS sensor LH (Outback model)
	2	Gray	B-3		Front ABS sensor LH (Other models)
B16	2	Gray	B-2		Brake fluid level switch
B17	3	★	B-2		Vehicle speed sensor (MT)
B18	4	★	B-2		Oxygen sensor
B19	4	★	B-2	T5	Rear oxygen sensor cord (With OBD model)
B20	16	★	B-2	E1	Engine wiring harness (Turbo engine model)
B21	20	★	B-2	E2	Engine wiring harness
B22	16	Brown	B-2	E3	
B24	2	Gray	B-3	T1	Back-up light switch (MT)
B25	2	Brown	B-3	T2	Neutral position switch (MT)
B29	2	Black	B-3	T8	Lo (AWD) indicator light switch (MT)
B128	4	★	B-3	T9	Transmission (MT)
B143	3	★	B-4		Main fuse box (M/B)
B144	6	Black	C-3		
B145	1	★	B-3		
B146	2	Green	C-2		Front washer motor
B147	2	★	B-3		Rear washer motor
B148	2	Black	B-4		Side turn signal light LH
B155	3	★	B-2		CO resistor (Without OBD model)
B186	4	Black	C-4		Main fuse box (M/B)
B212	1	Gray	C-3	F86	Front wiring harness (Turbo engine model)
B220	12	★	B-2		Engine wiring harness (Turbo engine model)
B221	3	★	B-3		Differential pressure sensor
B328	6	Black	B-3	E58	Engine wiring harness

★: Non-colored

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM

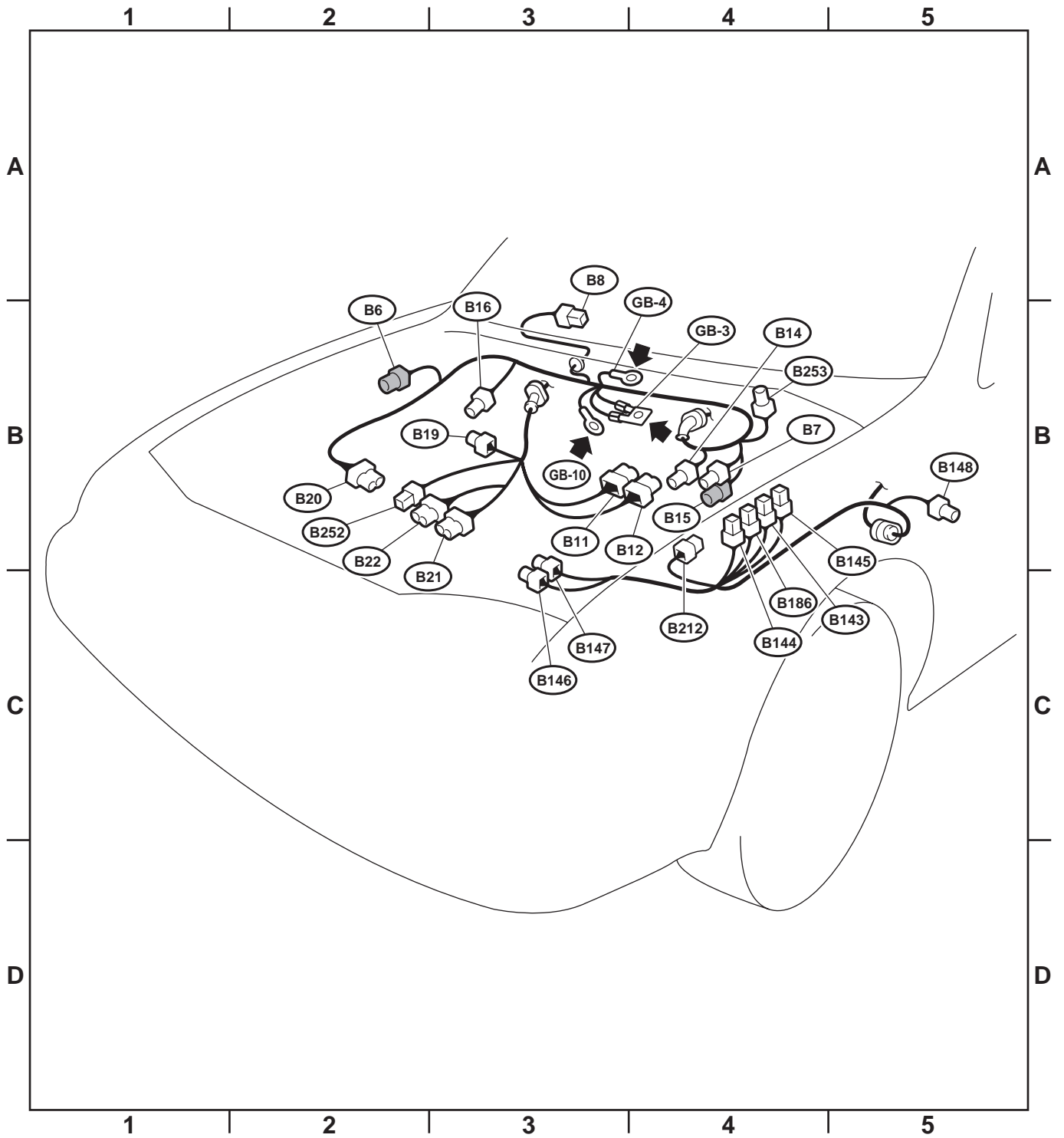
4. RHD 6-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B6	2	Brown	B-2		Front ABS sensor RH
B7	6	Black	B-3		Cruise control actuator
B8	5	★	B-3		Front wiper motor
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	★	B-3	T3	
B14	1	Black	B-3		Starter (Magnet)
B15	2	Brown	B-3		Front ABS sensor LH
B16	2	Gray	B-2		Brake fluid level switch
B19	6	★	B-2	T5	Rear oxygen sensor cord
B20	16	Dark gray	B-2	E1	Engine wiring harness
B21	20	★	B-2	E2	
B22	16	Brown	B-2	E3	
B143	3	★	B-4		Main fuse box (M/B)
B144	6	Black	C-3		
B145	1	★	B-3		
B146	2	Green	C-2		Front washer motor
B147	2	★	B-3		Rear washer motor
B148	2	Black	B-4		Side turn signal light LH
B186	4	Black	C-4		Main fuse box (M/B)
B212	1	Gray	C-3	F86	Front wiring harness
B252	8	★	B-2	E49	Engine wiring harness
B253	5	★	B-4		Fan control relay

★: Non-colored

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM



WI-01035

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM

52. Bulkhead Wiring Harness (In Compartment)

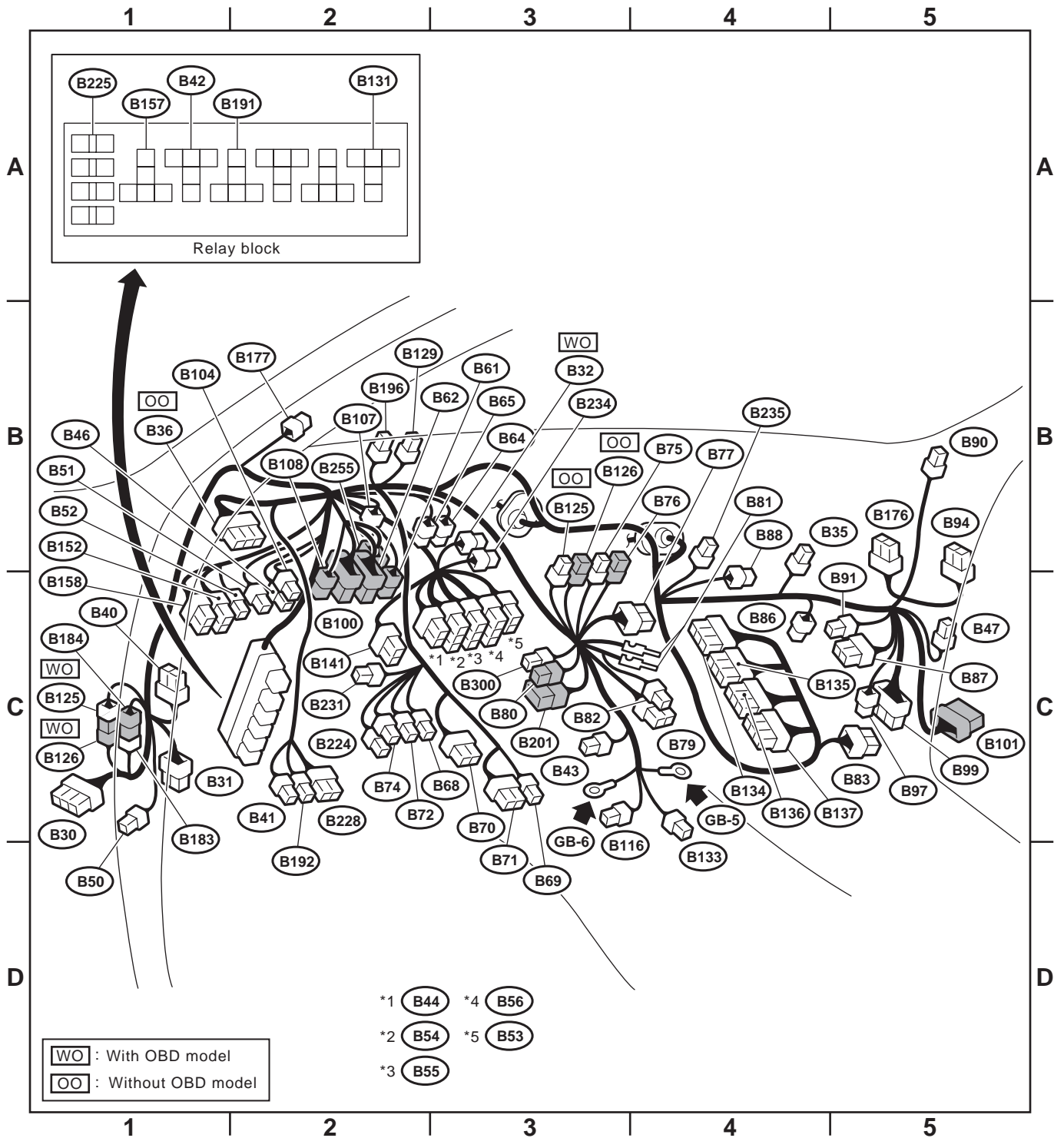
A: LOCATION

1. LHD 4-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	C-1	D1	Front door cord LH
B31	12	Yellow	D-1	AB1	SRS (Airbag) harness
B32	3	Black	B-2		Turn & hazard module
B35	2	★	C-3		Diode (step light)
B36	66	★	B-1	i1	Instrument panel wiring harness (SMJ)
B40	16	★	C-1		Data link connector
B41	2	★	C-1		Power window circuit breaker
B42	5	★	A-1		Power window relay (Relay block)
B43	6	Black	C-3		Illumination control module
B44	10	★	B-2		Seat belt warning module
B46	4	Green	C-1		Fuel pump relay
B47	6	Brown	C-4		Main relay
B50	4	Black	D-1		Blower relay
B51	8	★	C-1		Fuse & relay box (F/B)
B52	7	★	B-1		
B53	12	Black	B-2		Shield joint connector (AT)
B54	24	★	C-2		Transmission control module (AT)
B55	24	Gray	C-2		
B56	24	Green	C-2		
B61	8	★	B-2	F44	Front wiring harness
B62	16	★	B-2	F45	Front wiring harness
B64	2	Black	B-2		Stop light switch
B65	4	Black	B-2		Stop & brake switch (With cruise control)
B68	5	★	C-2		Cruise control sub switch
B69	4	★	D-2		Parking switch
B70	18	★	C-2		Combination switch
B71	17	★	C-2		
B72	4	Blue	C-2		Ignition switch
B74	2	Black	C-2		Key warning switch
B75	2	Green	B-3	B76	Test mode connector
B76	2	Green	B-3	B75	
B77	10	Brown	B-3		Mode actuator
B79	14	Gray	C-3		Check connector
B80	8	Black	C-2	i20	Instrument panel wiring harness
B81	1 × 2	★	C-3		Diagnosis terminal (Ground)
B82	8	★	C-3		Diagnosis connector
B83	12	Black	C-4		Shield & sensor ground joint connector (E/G) (Without OBD model)
	4	★	C-4		Shield & sensor ground joint connector (E/G) (With OBD model)
	6	Gray	C-4		Shield & sensor ground joint connector (E/G) (With OBD model)
B86	4	★	B-4		Blower motor resistor (Auto A/C)
	6	Black	B-4		Blower motor resistor (Manual A/C)
B87	2	★	C-4		Blower motor

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM



WI-01036

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

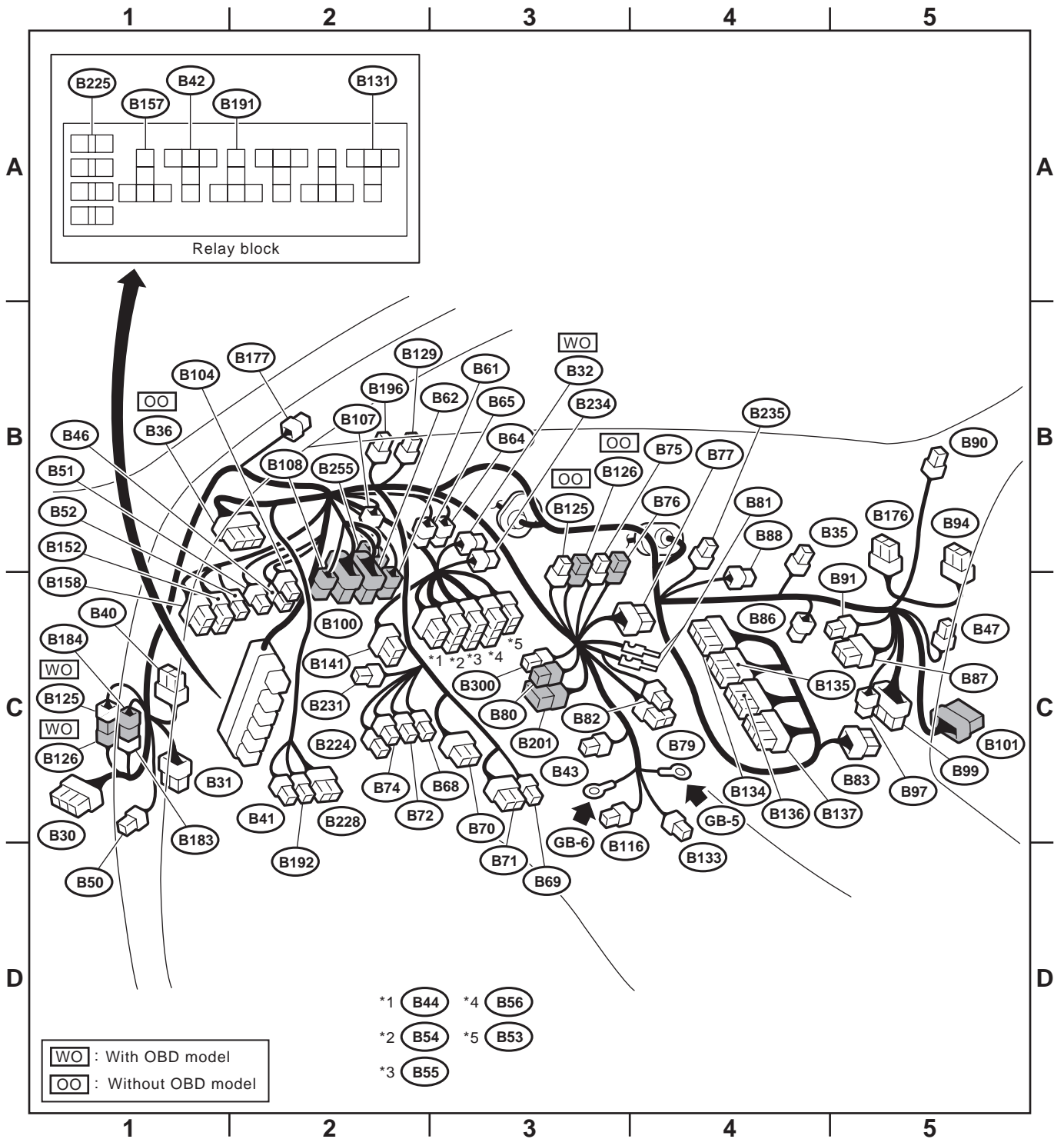
WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B88	3	Black	B-3		Evaporator thermoswitch (Manual A/C)
	3	★	B-3		Evaporator thermoswitch (Auto A/C)
B90	4	★	B-4	R50	Roof cord (Without vanity mirror illumination model)
	6	★	B-4	R50	Roof cord (With vanity mirror illumination model)
B91	6	Black	C-4		FRESH/RECIRC actuator
B94	20	Black	B-4		Cruise control module
B97	8	★	C-4	R1	Rear wiring harness
B99	32	★	C-4	R3	
B100	24	Black	B-2	F2	Front wiring harness
B101	25	★	C-4	D11	Front door cord RH
B104	4	★	B-1		Seat heater/rear accessory power supply relay
B107	2	Blue	B-2		Clutch switch (Cruise control)
B108	4	★	B-2	F46	Front wiring harness
B116	6	★	C-3		Select lever illumination light (AT)
B123	8	★	C-4	R48	Rear wiring harness
B124	8	★	D-1	D53	Front door cord LH
B125	1	Black	B-3	B126	Read memory connector (Without OBD model)
	2	Green	C-1	B126	Line end connector (With OBD model)
B126	1	Black	B-3	B125	Read memory connector (Without OBD model)
	2	Green	C-1	B125	Line end connector (With OBD model)
B129	2	★	B-2		Kick-down switch (AT)
B131	5	★	A-2		Rear fog light relay (Relay block)
B133	6	★	C-3		AT power mode & hold mode switch
B134	35	★	C-3		Engine control module
B135	28	★	C-3		
B136	26	★	C-3		Engine control module (With OBD model)
	30	★			Engine control module (Without OBD model)
B137	20	★	C-3		Engine control module
B141	12	★	A-3/B-2		Immobiliser control module
B152	12	★	B-1		Fuse & relay box (F/B)
B157	5	★	A-1		Ignition relay-2 (Relay block)
B158	10	Gray	C-1		Fuse & relay box (F/B)
B176	18	★	B-4		Keyless entry control module
B177	2	★	B-1		Wiper deicer
B183	1	★	C-1	B184	Keyless registration connector (Keyless entry)
B184	1	★	C-1	B183	
B191	5	★	A-1		Wiper deicer relay (Relay block)
B192	4	★	C-1		Wiper deicer timer
B196	4	★	B-2		Diode (Rear fog light & step light)
B201	10	Black	C-2	i40	Instrument panel wiring harness
B224	2	★	C-2		Key switch illumination light
B225	8	★	A-1		Fuse (Relay block)
B228	15	★	C-2		OP connector
B231	4	Black	C-2		Steering angle sensor (VDC)
B234	6	★	B-2		Joint connector (VDC)
B235	6	Black	B-3		Air mix actuator (Auto A/C)
B255	14	★	B-2	F96	Front wiring harness
B300	6	★	B-3		Line end check connector

★: Non-colored

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM



WI-01036

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

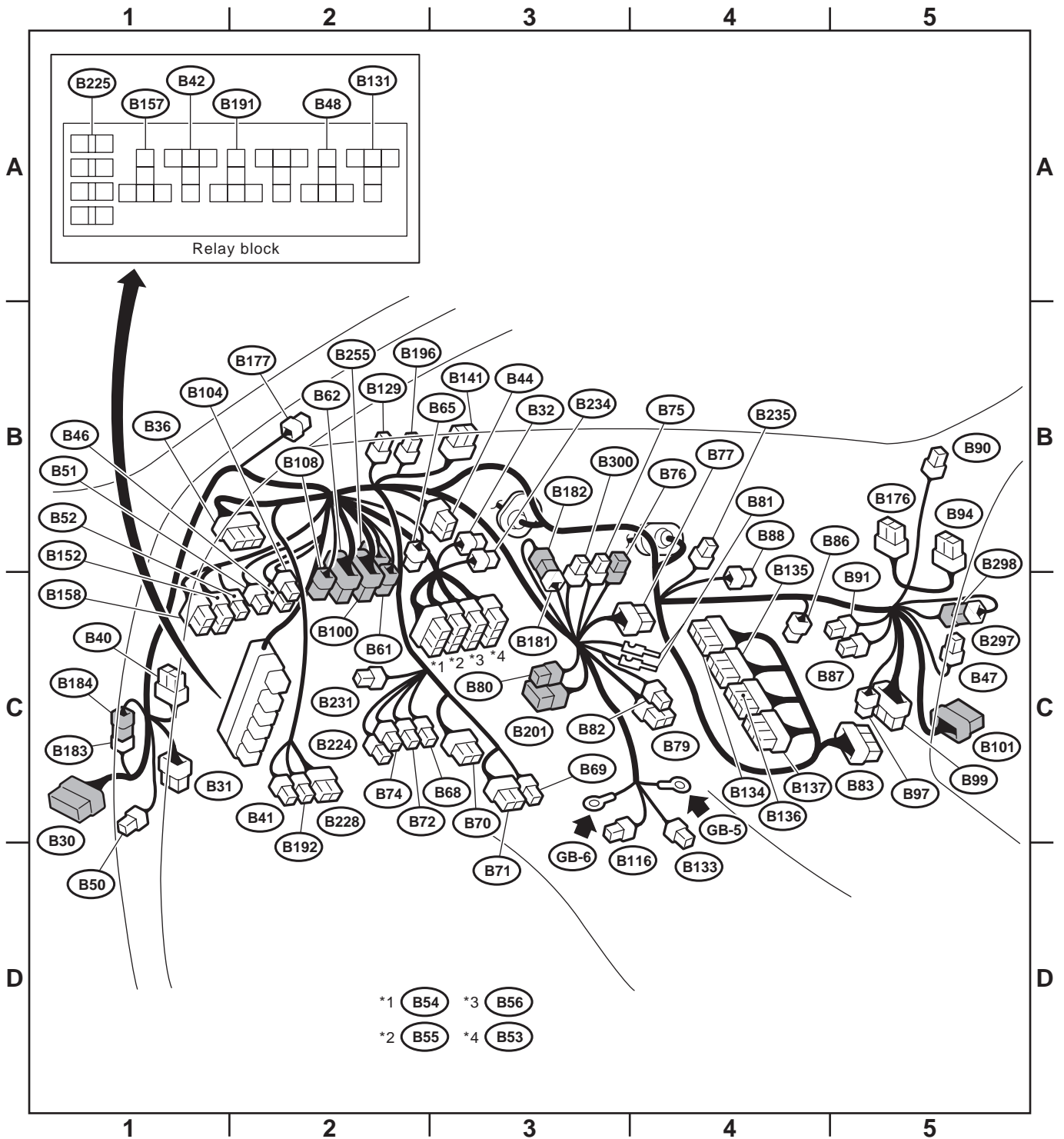
WIRING SYSTEM

2. LHD 6-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	C-1	D1	Front door cord LH
B31	12	Yellow	D-1	AB1	SRS (Airbag) harness
B32	3	Black	B-2		Turn & hazard module
B36	66	★	B-1	i1	Instrument panel wiring harness (SMJ)
B40	16	★	C-1		Data link connector
B41	2	★	C-1		Power window circuit breaker
B42	5	★	A-1		Power window relay (Relay block)
B44	10	★	B-2		Seat belt timer
B46	4	Green	C-1		Fuel pump relay
B47	6	Brown	C-4		Main relay
B48	5	★	A-2		Front fog light relay (Relay block)
B50	4	Black	D-1		Blower relay
B51	8	★	C-1		Fuse & relay box (F/B)
B52	7	★	B-1		
B53	12	Black	B-2		
B54	24	★	C-2		Transmission control module
B55	24	Gray	C-2		
B56	24	Green	C-2		
B61	8	★	B-2	F44	Front wiring harness
B62	16	★	B-2	F45	Front wiring harness
B65	4	Black	B-2		Stop & brake switch
B68	5	★	C-2		Cruise control sub switch
B69	4	★	D-2		Parking switch
B70	18	★	C-2		Combination switch
B71	17	★	C-2		
B72	4	Blue	C-2		Ignition switch
B74	2	Black	C-2		Key warning switch
B75	2	Green	B-3	B76	Test mode connector
B76	2	Green	B-3	B75	
B77	10	Brown	B-3		Mode actuator
B79	14	Gray	C-3		Check connector
B80	8	Black	C-2	i20	Instrument panel wiring harness
B81	1 × 2	★	C-3		Diagnosis terminal (Ground)
B82	8	★	C-3		Diagnosis connector
B83	22	★	C-4		Shield & sensor ground joint connector (E/G)
B86	4	★	B-4		Blower motor resistor
B87	2	★	C-4		Blower motor
B88	3	★	B-3		Evaporator thermostwitch
B90	6	★	B-4	R50	Roof cord
B91	6	Black	C-4		FRESH/RECIRC actuator
B94	20	Black	B-4		Cruise control module
B97	8	★	C-4	R1	Rear wiring harness
B99	32	★	C-4	R3	
B100	24	Black	B-2	F2	Front wiring harness

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM



WI-01037

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

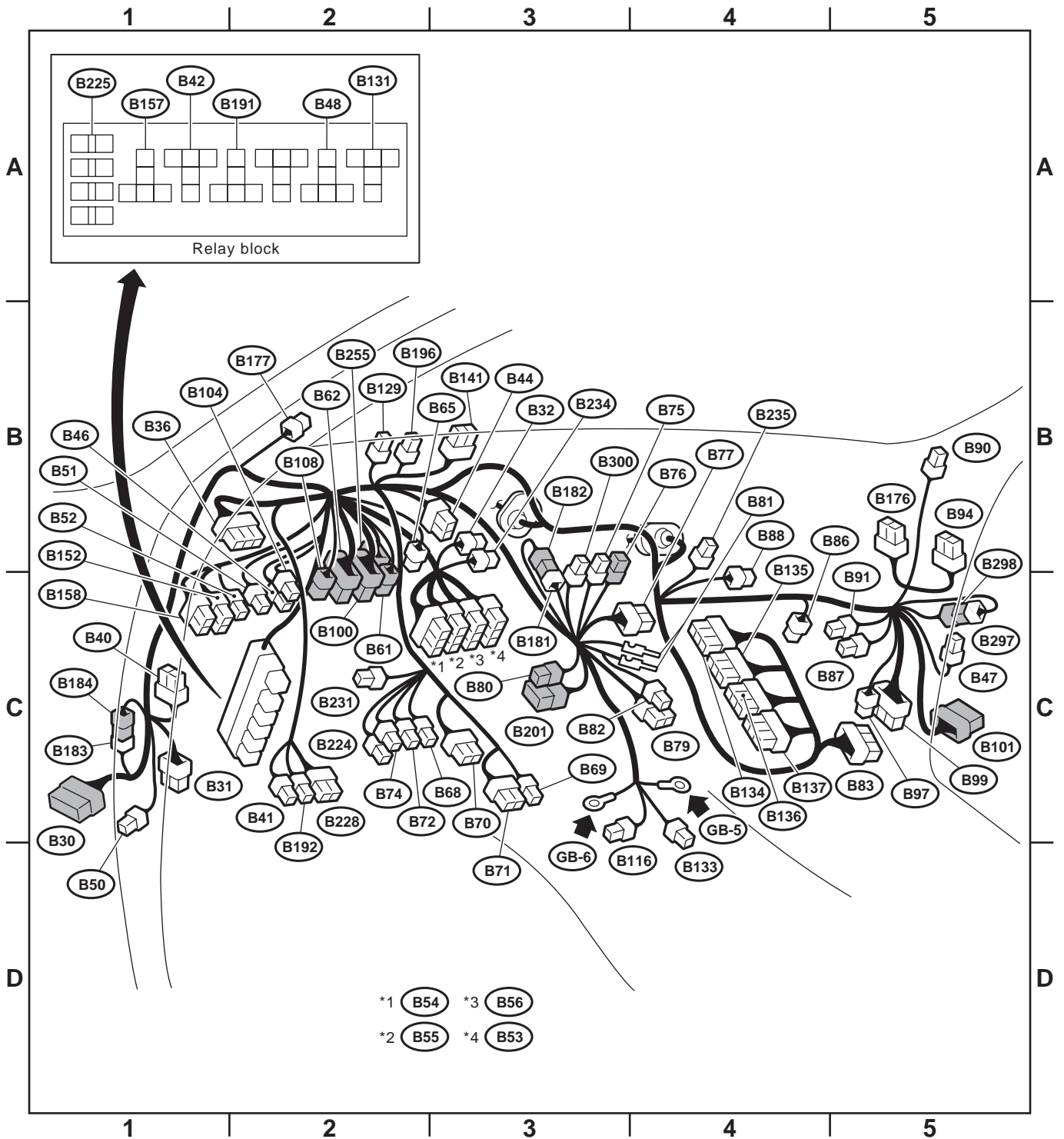
WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B101	25	★	C-4	D11	Front door cord RH
B104	4	★	B-1		Seat heater/rear accessory power supply relay
B108	4	★	B-2	F46	Front wiring harness
B116	6	★	C-3		Select lever illumination light (AT)
B129	2	★	B-2		Kick-down switch (AT)
B131	5	★	A-2		Rear fog light relay (Relay block)
B133	6	★	C-3		AT power mode & hold mode switch
B134	22	★	C-3		Engine control module
B135	28	★	C-3		
B136	24	★	C-3		
B137	31	★	C-4		
B141	12	★	A-3		
B152	12	★	B-1		Fuse & relay box (F/B)
B157	5	★	A-1		Ignition relay-2 (Relay block)
B158	10	Gray	C-1		Fuse & relay box (F/B)
B176	18	★	B-4		Keyless entry control module
B177	2	★	B-1		Wiper deicer
B181	1	★	B-2	B182	Fan ground joint connector
B182	1	★	B-2	B18	Fan ground joint connector
B183	1	★	C-1	B184	Keyless registration connector (Keyless entry)
B184	1	★	C-1	B183	
B191	5	★	A-1		Wiper deicer relay (Relay block)
B192	4	★	C-1		Wiper deicer timer
B196	4	★	B-2		Diode (Rear fog light & step light)
B201	10	Black	C-2	i40	Instrument panel wiring harness
B224	2	★	C-2		Key switch illumination light
B225	8	★	A-1		Fuse (Relay block)
B228	15	★	C-2		OP connector
B231	4	★	C-2		Steering angle sensor (VDC)
B234	6	★	B-2		Joint connector (VDC)
B235	6	Black	B-3		Air mix actuator (Auto A/C)
B255	14	★	B-2	F96	Front wiring harness
B297	2	Black	C-4	B298	A/C cut connector
B298	2	Black	C-4	B297	
B300	6	★	B-3		Line end check connector

★: Non-colored

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM



WI-01037

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM

3. RHD 4-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	C-4	D1	Front door cord RH
B31	12	Yellow	C-4	AB1	SRS (Airbag) harness
B32	3	Black	B-3		Turn & hazard module
B35	2	★	C-3		Diode (Step light)
B36	66	★	B-4	i1	Instrument panel wiring harness (SMJ)
B40	16	★	C-4		Data link connector
B41	2	★	C-4		Power window circuit breaker
B42	5	★	A-4		Power window relay (Relay block)
B43	6	Black	C-2		Illumination control module
B44	10	★	B-3		Seat belt timer
B46	4	Green	C-3		Fuel pump relay
B47	6	Brown	C-1		Main relay
B50	4	Black	C-4		Blower relay
B51	8	★	C-4		Fuse & relay box (F/B)
B52	7	★	C-4		
B53	6	★	C-3		Shield joint connector (AT turbo engine model)
	12	Black	C-3		Shield joint connector (AT non-turbo engine model)
B54	24	★	C-3		Transmission control module
B55	24	Gray	C-3		
B56	24	Green	C-3		
B61	8	★	B-3	F44	Front wiring harness
B62	8	★	B-3	F45	Front wiring harness
B64	2	Black	B-3		Stop light switch
B65	4	Black	B-3		Stop & brake switch (With cruise control)
B68	5	★	C-3		Cruise control sub switch
B69	4	★	C-3		Parking switch
B70	18	★	D-3		Combination switch
B71	17	★	D-3		
B72	4	Blue	C-3		Ignition switch
B74	2	Black	C-3		Key warning switch
B75	2	Green	B-2	B76	Test mode connector
B76	2	Green	B-2	B75	
B77	7	★	B-2		Mode actuator
B79	14	Gray	C-2		Check connector
B80	8	★	C-3	i20	Instrument panel wiring harness
B81	1 × 2	★	B-2		Diagnosis terminal (Ground)
B82	8	★	C-2		Diagnosis connector
B83	12	★	C-1		Shield & sensor ground joint connector (E/G) (Without OBD model)
	4	★	C-1		Shield & sensor ground joint connector (E/G) (With OBD model)
B84	17	★	C-1		Engine control module (TURBO model)
B86	6	Black	B-1		Blower motor resistor
B87	2	Black	C-1		Blower motor
B88	5	★	B-1		Evaporator thermostswitch
B90	4	★	B-4	R50	Roof cord (Without vanity illumi.)
	6	★	B-4	R50	Roof cord (With vanity illumi.)
B91	7	★	C-1		FRESH/RECIRC actuator

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B94	20	Black	C-1		Cruise control module
B97	6	★	B-3	R1	Rear wiring harness
B98	20	Blue	B-3	R2	
B99	20	★	B-3	R3	
B100	24	Black	B-3	F2	Front wiring harness
B101	25	★	C-1	D11	Front door cord LH
B104	4	★	B-3		Seat heater/rear accessory power supply relay
B107	2	Blue	B-3		Clutch switch (Cruise control)
B116	6	★	C-2		Select lever illumination light (AT)
B122	6	Gray	B-3		Shield & sensor ground joint connector (E/G) (Turbo engine model)
B124	8	★	C-4	D53	Front door cord RH
B125	1	Black	B-2	B126	Read memory connector (Without OBD model)
	2	Green	C-4	B126	Line end connector (With OBD model)
B126	1	Black	B-2	B125	Read memory connector (Without OBD model)
	2	Green	C-4	B125	Line end connector (With OBD model)
B129	2	★	B-4		Kick-down switch (AT)
B131	5	★	A-4		Rear fog light relay (Relay block)
B133	6	★	C-2		AT power mode & hold mode switch
B134	22	★	C-2		Engine control module (Turbo engine model)
	35	★			Engine control module (Non-turbo engine model)
B135	28	★	C-2		Engine control module
B136	24	★	C-2		Engine control module (Turbo engine model)
	26	★			Engine control module (with OBD model)
	30	★			Engine control module (without OBD model)
B137	20	★	C-1		Engine control module (with OBD model)
	31	★			Engine control module (Turbo engine model)
B141	12	★	B-3		Immobiliser control module
B152	12	★	B-4		Fuse & relay box (F/B)
B157	5	★	A-4		Ignition relay-2 (Relay block)
B158	10	Gray	B-4		Fuse & relay box (F/B)
B159	9	Brown	B-4		Fuse & relay box (F/B)
B176	18	★	B-1		Keyless entry control module
B177	2	★	B-1		Wiper deicer
B183	1	★	C-4	B184	Keyless registration connector (Keyless entry)
B184	1	★	C-4	B183	
B191	5	★	A-4		Wiper deicer relay (Relay block)
B192	4	★	C-4		Wiper deicer timer
B196	4	Black	C-3		Diode (Rear fog light)
B224	2	★	C-3		Key switch illumination light
B225	8	★	A-4		Fuse (Relay block)
B228	15	★	C-3		OP connector
B231	4	★	C-3		Steering angle sensor (VDC)
B234	6	★	B-3		Joint connector (VDC)
B237	6	Black	C-2		Sports shift switch
B255	20	★	B-4	F96	Front wiring harness
B300	6	★	B-2		Line end check connector
B330	6	★	B-3		Shield joint connector (AT)

★: Non-colored

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM

4. RHD 6-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	C-4	D1	Front door cord RH
B31	12	Yellow	C-4	AB1	SRS (Airbag) harness
B32	3	Black	B-3		Turn & hazard module
B35	2	★	C-3		Diode (step light)
B36	66	★	B-4	i1	Instrument panel wiring harness (SMJ)
B40	16	★	C-4		Data link connector
B41	2	★	C-4		Power window circuit breaker
B42	5	★	A-4		Power window relay (Relay block)
B44	10	★	B-3		Seat belt timer
B46	4	Green	C-3		Fuel pump relay
B47	6	Brown	C-1		Main relay
B48	5	★	A-4		Front fog light relay (Relay block)
B50	4	Black	C-4		Blower relay
B51	8	★	C-4		Fuse & relay box (F/B)
B52	7	★	C-4		
B53	12	Black	C-3		Shield joint connector (AT)
B54	24	★	C-3		Transmission control module
B55	24	Gray	C-3		
B56	24	Green	C-3		
B61	8	★	B-3	F44	Front wiring harness
B62	8	★	B-3	F45	Front wiring harness
B65	4	Black	B-3		Stop & brake switch
B68	5	Black	C-3		Cruise control sub switch
B69	4	★	C-3		Parking switch
B70	18	★	C-3		Combination switch
B71	17	★	C-3		
B72	4	Blue	C-3		Ignition switch
B74	2	Black	C-3		Key warning switch
B75	2	Green	B-2	B76	Test mode connector
B76	2	Green	B-2	B75	
B79	14	Gray	C-2		Check connector
B80	8	★	C-3	i20	Instrument panel wiring harness
B81	1 × 2	★	B-2		Diagnosis terminal (Ground)
B82	8	★	C-2		Diagnosis connector
B83	22	★	C-1		Shield & sensor ground joint connector (E/G)
B90	6	★	B-4	R50	Roof cord
B94	20	Black	C-1		Cruise control module
B97	6	★	B-3	R1	Rear wiring harness
B98	20	Blue	B-3	R2	
B99	20	★	B-3	R3	

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B100	24	Black	B-3	F2	Front wiring harness
B101	25	★	C-1	D11	Front door cord LH
B104	4	★	B-3		Seat heater/rear accessory power supply relay
B116	6	★	C-2		Select lever illumination light (AT)
B129	2	★	B-4		Kick-down switch (AT)
B131	5	★	A-4		Rear fog light relay (Relay block)
B133	6	★	C-2		AT power mode & hold mode switch
B134	22	★	C-2		Engine control module
B135	28	★	C-2		
B136	24	★	C-2		
B137	31	★	C-2		
B141	12	★	B-3		Immobiliser control module
B152	12	★	B-4		Fuse & relay box (F/B)
B157	5	★	A-4		Ignition relay-2 (Relay block)
B158	10	Gray	B-4		Fuse & relay box (F/B)
B159	9	Brown	B-4		Fuse & relay box (F/B)
B176	18	★	B-1		Keyless entry control module
B177	2	★	B-1		Wiper deicer
B181	1	★	B-3	B182	Fan ground joint connector
B182	1	★	B-3	B181	
B183	1	★	C-4	B184	Keyless registration connector (Keyless entry)
B184	1	★	C-4	B183	
B191	5	★	A-4		Wiper deicer relay (Relay block)
B192	4	★	C-4		Wiper deicer timer
B196	2	★	C-3		Diode (Rear fog light)
B224	2	★	C-3		Key switch illumination light
B225	8	★	A-4		Fuse (Relay block)
B228	15	★	C-3		OP connector
B231	4	★	C-3		Steering angle sensor (VDC)
B234	6	★	B-3		Joint connector (VDC)
B255	20	★	B-4	F96	Front wiring harness
B297	2	Black	C-1	B298	A/C cut connector
B298	2	Black	C-1	B297	
B300	6	★	B-2		Line end check connector

★: Non-colored

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM

53.Engine Wiring Harness and Transmission Cord

A: LOCATION

1. 4-CYLINDER NON-TURBO ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E2	20	Light gray	A-2	B21	Bulkhead wiring harness
E3	16	Brown	A-2	B22	Bulkhead wiring harness
E4	2	Blue	A-2		Purge control solenoid valve (Without OBD model)
		Black			Purge control solenoid valve (With OBD model)
E5	2	Light gray	B-1		Injector #1
E6	2	Light gray	A-2		Injector #3
E7	6	Black	A-3		Idle speed control solenoid valve
E8	3	Light gray	B-2		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E12	4	Dark gray	A-2		Ignition coil and ignitor
E13	4	Dark brown	A-3		Throttle position sensor
E14	2	★	B-3		Knock sensor
E15	2	Black	B-3		Camshaft position sensor (Without OBD model)
		Gray			Camshaft position sensor (With OBD model)
E16	2	Light gray	B-3		Injector #2
E17	2	Light gray	B-4		Injector #4
E18	6	Dark gray	B-3		Exhaust gas recirculation solenoid
E19	1	★	B-2		Power steering oil pressure switch
E20	2	Black	A-3		Intake air temperature sensor (With OBD model)
E21	4	Black	A-3		Pressure sensor and intake air temperature sensor (RHD)
	2	Light gray			Pressure sensor (LHD)
E53	2	★	B-2		Idle air control solenoid valve (With OBD model)
E58	6	Black	A-2	B328	Bulkhead wiring harness (With OBD model)

★: Non-colored

<AT>

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T3	12	★	D-3	B12	Bulkhead wiring harness
T4	20	Black	D-3	B11	
T5	4	Gray	C-2	B19	Bulkhead wiring harness
T6	4	Gray	D-4		Rear oxygen sensor
T7	12	★	C-4		Inhibitor switch

★: Non-colored

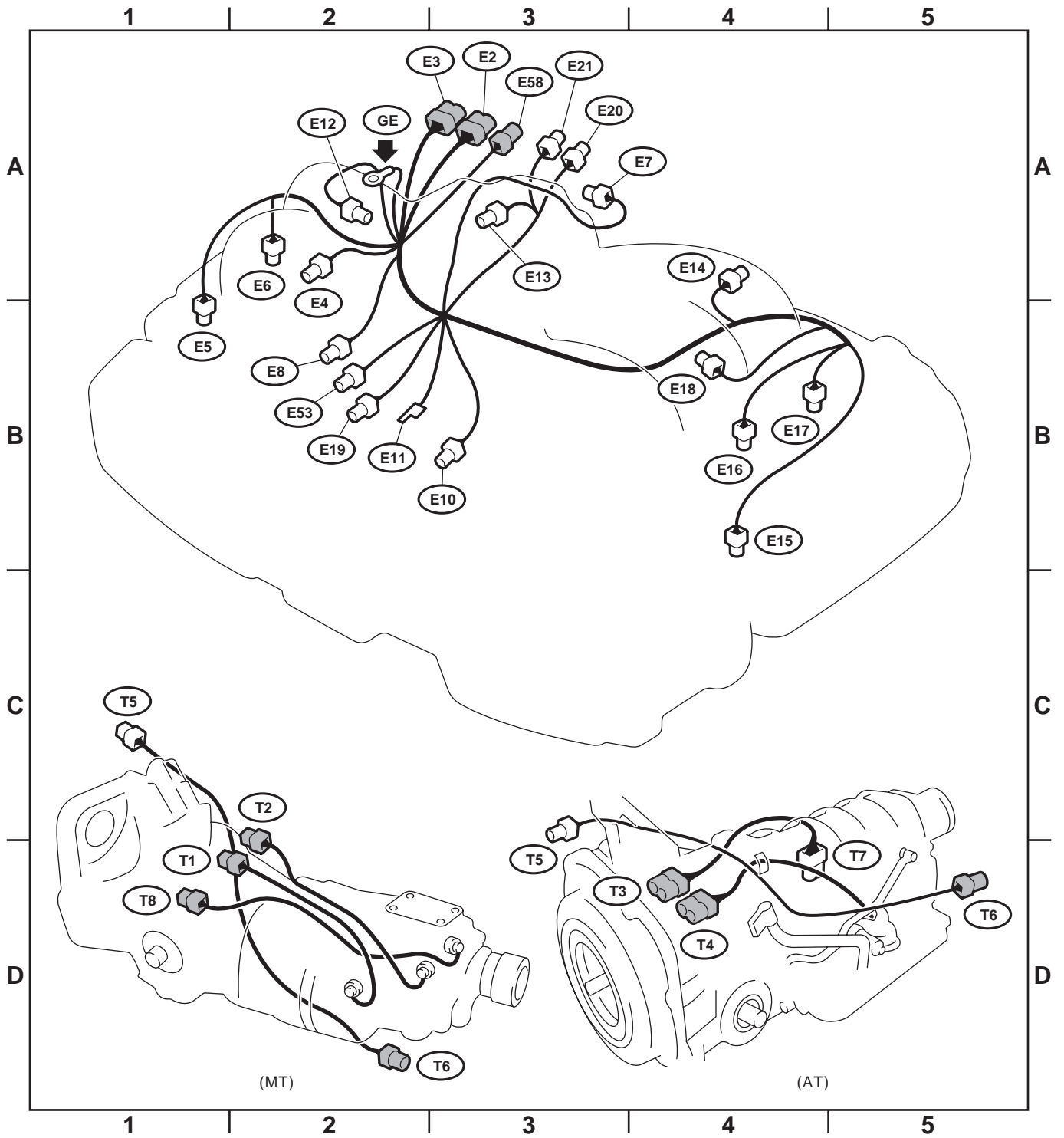
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Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	Gray	D-1	B24	Bulkhead wiring harness
T2	2	Brown	D-1	B25	
T5	4	Gray	C-2	B19	Bulkhead wiring harness (Without OBD RHD model)
T6	4	Gray	D-3		Rear oxygen sensor
T8	2	Black	D-1	B29	Bulkhead wiring harness

★: Non-colored

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM



WI-01040

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM

2. 4-CYLINDER TURBO ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	10	Light gray	A-2	B20	Bulkhead wiring harness
E2	20	Black	A-2	B21	Bulkhead wiring harness
E3	16	Brown	A-2	B22	Bulkhead wiring harness
E4	2	Black	A-2		Purge control solenoid valve
E5	2	Dark gray	B-1		Injector #1
E6	2	Dark gray	A-2		Injector #3
E7	3	Black	A-3		Idle speed control solenoid valve
E8	3	Light gray	B-2		Engine coolant temperature sensor and thermometer
E10	2	Gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E13	3	Black	A-3		Throttle position sensor
E14	2	Gray	B-3		Knock sensor
E15	2	Light gray	B-3		Camshaft position sensor
E16	2	Dark gray	B-3		Injector #2
E17	2	Dark gray	B-4		Injector #4
E19	1	★	B-2		Power steering oil pressure switch
E21	4	Black	A-3		Pressure sensor
E31	3	★	B-1		Ignition coil No. 1
E32	3	★	B-3		Ignition coil No. 2
E33	3	★	A-2		Ignition coil No. 3
E34	3	★	B-3		Ignition coil No. 4
E39	2	Green	A-3		TCS-RRV solenoid

★: Non-colored

<AT>

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T3	12	★	D-3	B12	Bulkhead wiring harness
T4	20	Black	D-3	B11	
T5	4	Gray	C-2	B19	Bulkhead wiring harness
T6	4	Gray	D-4		Rear oxygen sensor
T7	12	★	C-4		Inhibitor switch

★: Non-colored

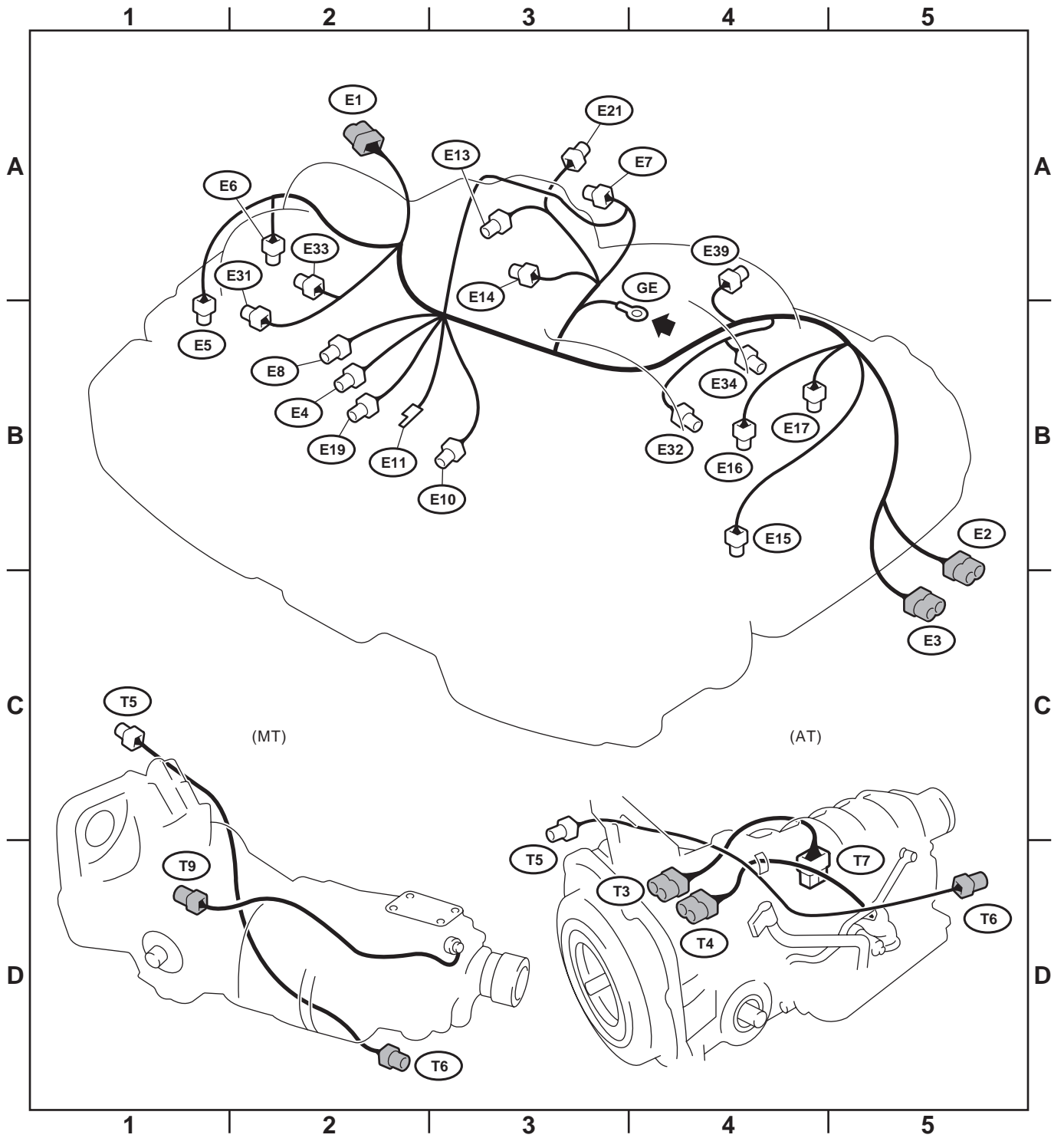
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Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T5	4	Gray	C-2	B19	Bulkhead wiring harness
T6	4	Gray	D-3		Rear oxygen sensor
T9	4	★	D-1	B128	Bulkhead wiring harness

★: Non-colored

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM



WI-01041

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM

3. 6-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	16	Gray	A-2	B20	Bulkhead wiring harness
E2	20	Light gray	B-3	B21	
E3	16	Brown	B-3	B22	
E4	2	Black	A-2		Purge control solenoid valve
E5	2	Gray	B-2		Fuel injector No. 1
E6	2	Gray	B-2		Fuel injector No. 3
E7	3	Gray	A-3		Idle speed control solenoid valve
E8	3	Light gray	C-3		Engine coolant temperature sensor and thermometer
E10	2	Gray	B-3		Crankshaft position sensor
E11	1	★	C-2		Oil pressure switch
E13	3	Black	A-3		Throttle position sensor
E14	2	Blue	B-3		Knock sensor-1
E15	3	Gray	B-2		Camshaft position sensor
E16	2	Gray	B-3		Fuel injector No. 2
E17	2	Gray	B-3		Fuel injector No. 4
E18	6	Dark gray	A-3		Exhaust gas recircration solenoid valve
E19	1	★	C-2		Power steering oil pressure switch
E20	2	Black	A-3		Intake air temperature sensor
E21	3	Black	A-2		Pressure sensor
E24	4	Dark gray	C-3		Front oxygen (A/F) sensor LH
E30	2	Brown	A-2		Induction valve control solenoid
E31	3	Black	B-2		Ignition coil No. 1
E32	3	Black	C-3		Ignition coil No. 2
E33	3	★	C-2		Ignition coil No. 3
E34	3	★	C-4		Ignition coil No. 4
E43	2	Black	B-2		Fuel injector No. 5
E44	2	Black	B-4		Fuel injector No. 6
E45	3	Black	B-2		Ignition coil No. 5
E46	3	Black	C-4		Ignition coil No. 6
E47	4	Dark gray	B-2		Front oxygen (A/F) sensor RH
E48	2	Blue	C-3		Knock sensor-2
E49	8	Dark gray	B-3	B252	Bulkhead wiring harness

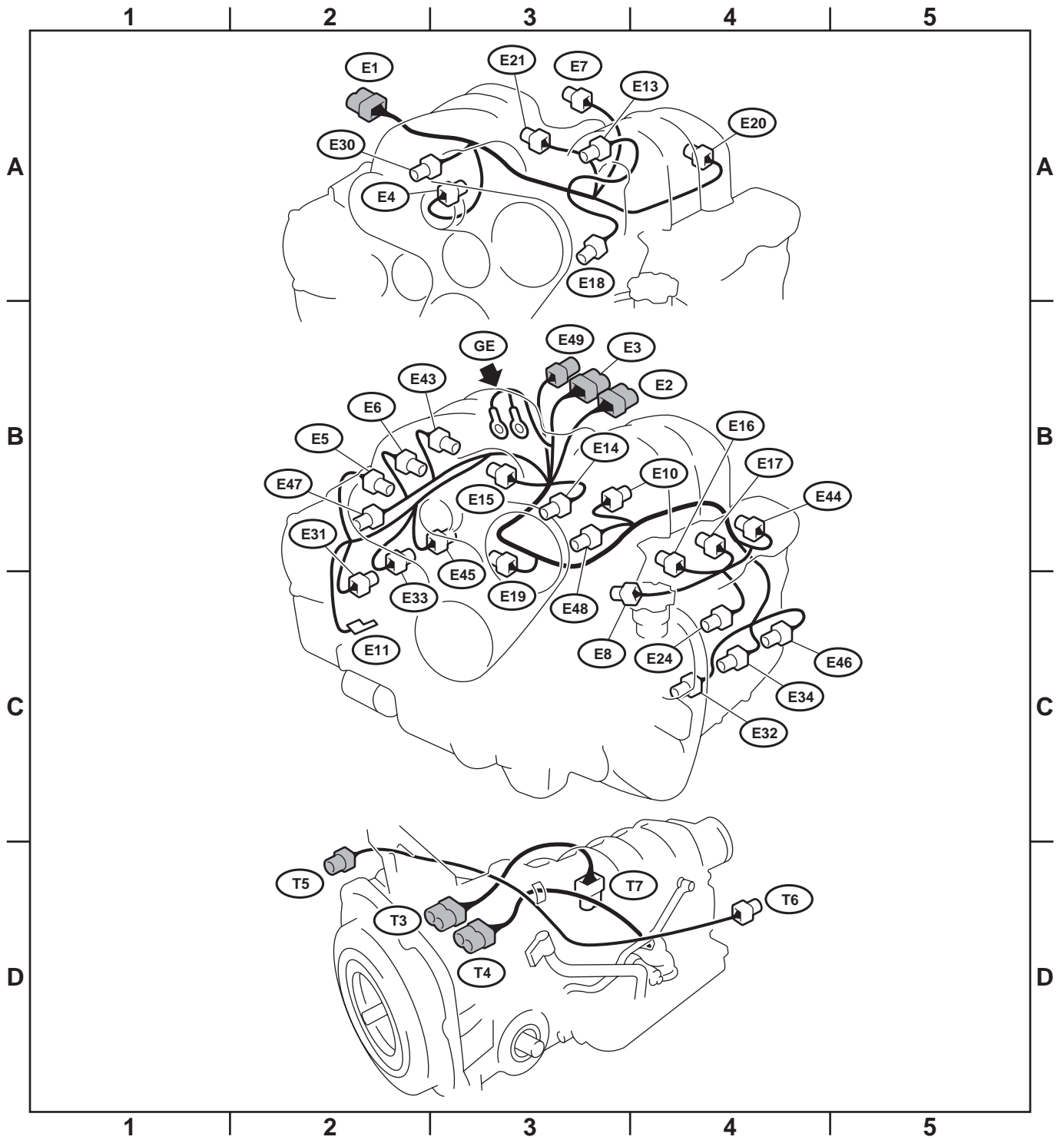
★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T3	12	Black	D-2	B12	Bulkhead wiring harness
T4	20	Black	D-2	B11	
T5	6	★	D-2	B19	Bulkhead wiring harness
T6	4	★	D-3		Rear oxygen sensor
T7	12	★	C-3		Inhibitor switch

★: Non-colored

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM



WI-01042

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM

54. Instrument Panel Wiring Harness

A: LOCATION

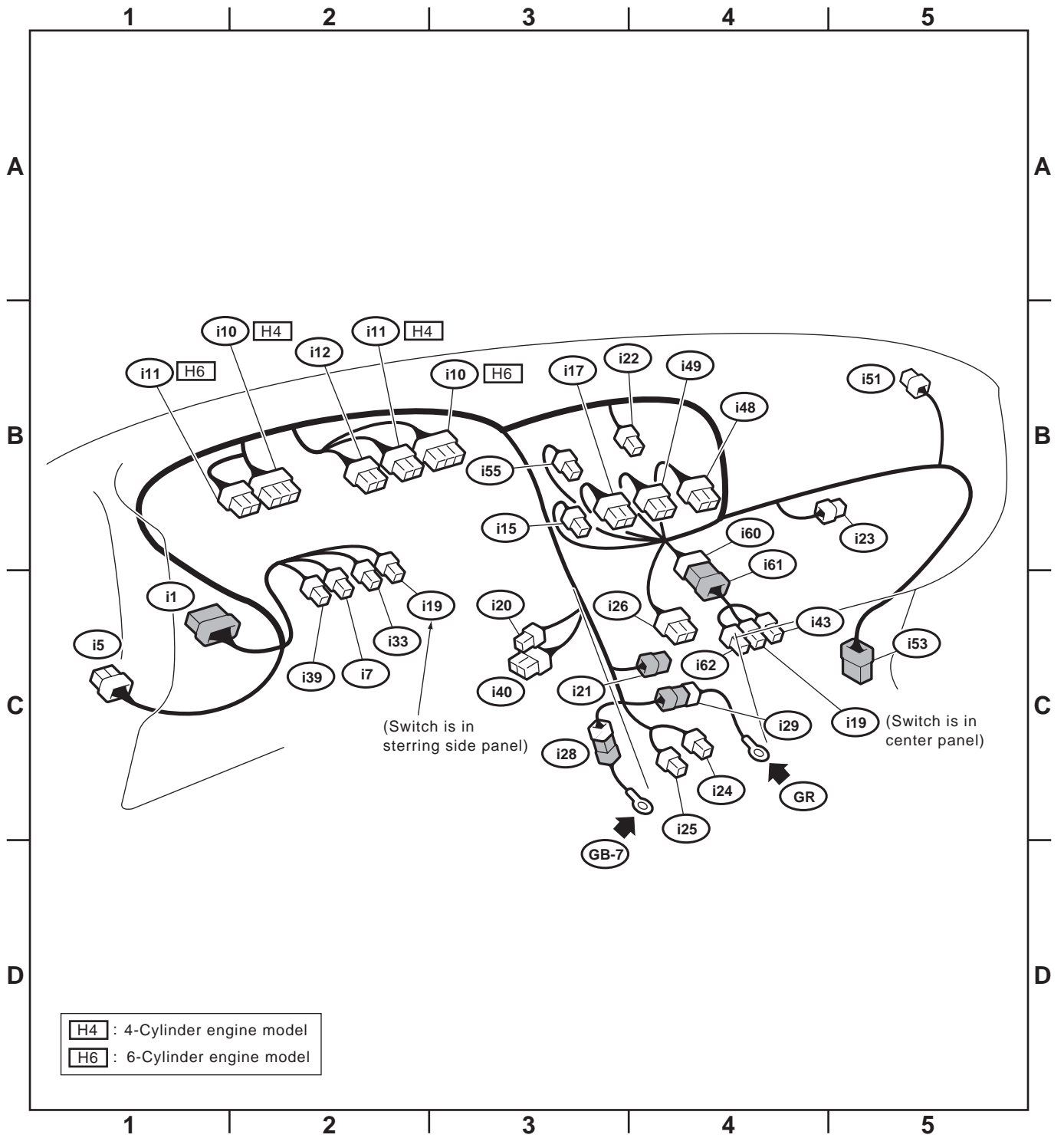
1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i1	66	★	C-1	B36	Bulkhead wiring harness (SMJ)
i5	12	Blue	C-1		Fuse & relay box (F/B)
i7	6	Black	C-2		Front fog light switch
i10	30	Green	B-2		Combination meter
i11	16	Green	B-1/B-2		
i12	14	Green	B-2		Combination meter (4-cylinder engine model)
	18	Green	B-2		Combination meter (6-cylinder engine model)
i15	6	★	B-3		Mode control panel (Manual A/C NA model)
i17	20	Gray	B-3		
i19	6	Brown	C-2/C-3		Cruise control main switch
i20	8	Black	C-2	B80	Bulkhead wiring harness
i21	2	★	C-3		Ash tray illumination light
i22	8	★	B-3		Hazard switch
i23	2	★	B-4		Glove box illumination light
i24	2	★	C-3		Front accessory power supply socket
i25	2	★	C-3		Front accessory power supply illumination light
i26	14	★	C-3		Radio
i28	1	★	C-3		Body ground
i29	1	Black	C-3		Body ground (Radio)
i33	6	★	C-2		Rear fog light switch
i39	6	★	C-2		Headlight leveling switch
i40	10	Black	C-2	B201	Bulkhead wiring harness
i43	6	★	C-3		Wiper deicer switch
i48	16	Gray	B-3		Auto A/C control module
i49	20	Gray	B-3		
i51	2	Black	B-4		Sunload sensor
i53	14	★	C-4	R98	Rear wiring harness
i55	2	★	B-3		In vehicle temperature sensor
i60	18	★	C-3	i61	Switch adaptor cord
i61	18	★	C-3	i60	Instrument panel wiring harness
i62	6	Black	C-4		VDC off switch

★: Non-colored

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM



WI-01043

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM

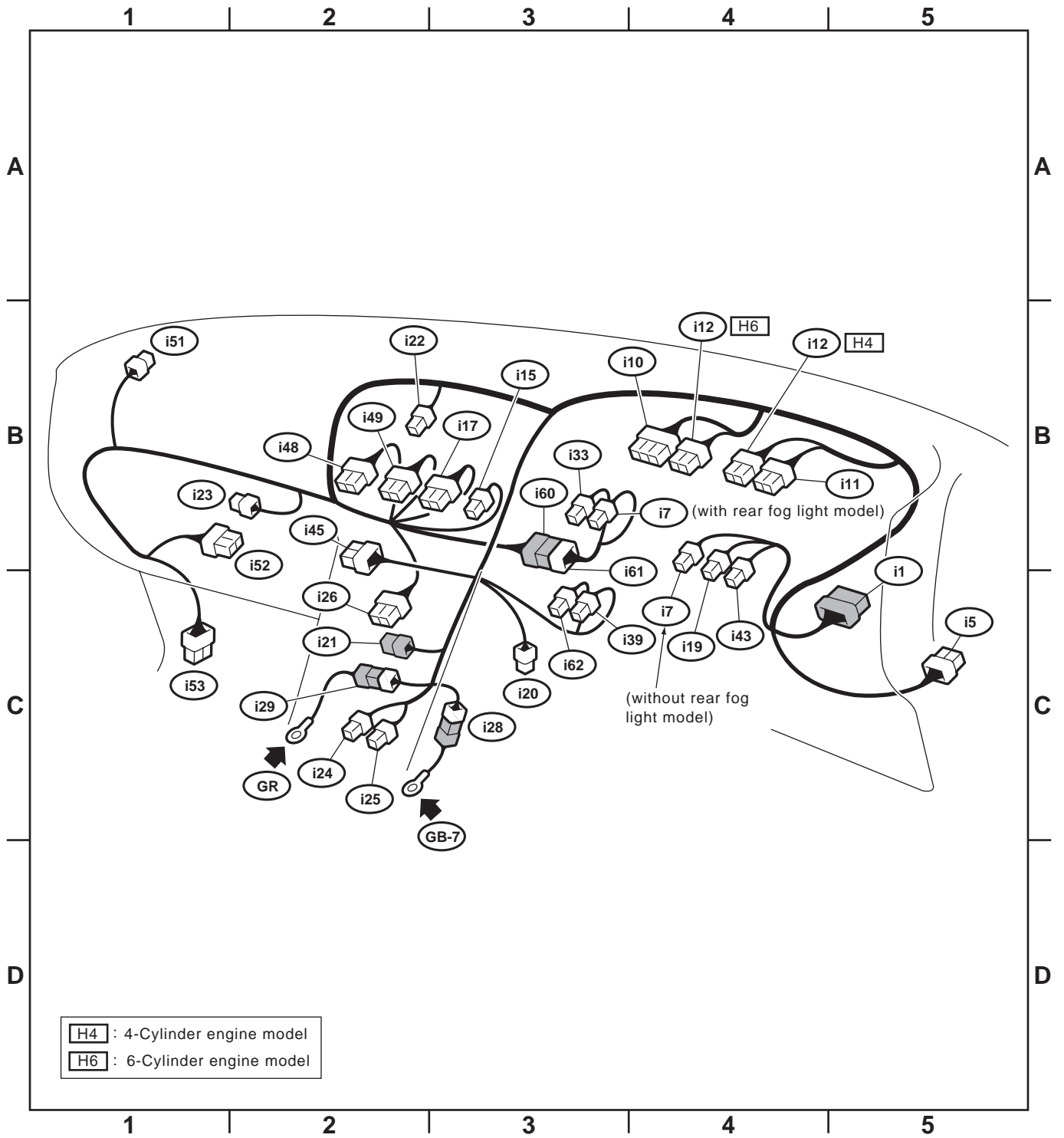
2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i1	66	★	C-4	B36	Bulkhead wiring harness (SMJ)
i5	12	Blue	C-4		Fuse & relay box (F/B)
i7	6	Black	B-3/C-3		Front fog light switch
i10	30	Green	B-3		Combination meter
i11	16	Green	B-3		
i12	14	Green	B-3		Combination meter (4-cylinder engine model)
	18	Green	B-3		Combination meter (6-cylinder engine model)
i15	6	★	B-2		Mode control panel (Manual A/C)
i17	16	★	B-2		
i19	6	Brown	C-3		Cruise control main switch
i20	8	★	C-2	B80	Bulkhead wiring harness
i21	2	★	C-2		Ash tray illumination light
i22	8	★	B-2		Hazard switch
i23	2	★	B-1		Glove box illumination light
i24	2	★	C-2		Front accessory power supply socket
i25	2	★	C-2		Front accessory power supply socket illumination light
i26	14	★	C-2		Radio
i28	1	★	C-2		Body ground
i29	1	Black	C-2		Body ground (Radio)
i33	6	★	B-3		Rear fog light switch
i39	6	★	B-3		Headlight leveling switch
i43	6	★	C-3		Wiper deicer switch
i45	14	Black	C-2		Heater module (Auto A/C)
i48	16	Black	B-2		Auto A/C control module
i49	20	Black	B-2		
i51	2	Black	B-1		Sunload sensor
i52	14	Black	B-1		Blower module (Auto A/C)
i53	16	★	C-1	R98	Rear wiring harness
i60	14	★	B-2	i61	Switch adaptor cord
i61	14	★	B-2	i60	Instrument panel wiring harness
i62	6	Black	C-3		VDC off switch

★: Non-colored

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM



WI-01044

REAR WIRING HARNESS

WIRING SYSTEM

55.Rear Wiring Harness

A: LOCATION

1. LHD SEDAN MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	★	C-2	B97	Bulkhead wiring harness
R3	32	★	B-2	B99	
R4	1	★	C-2		Parking brake switch
R8	4	★	C-3		Seat belt switch
R9	3	★	C-3		Front door switch LH
R11	8	★	C-4	D21	Rear door cord LH
R12	3	★	B-2		Front door switch RH
R14	8	★	B-2	D27	Rear door cord RH
R16	3	Black	B-3		Rear door switch RH
R41	4	Blue	B-3		Seat heater RH
R42	6	★	C-3		Seat heater switch RH
R43	6	Blue	C-3		Seat heater switch LH
R44	4	Blue	C-3		Seat heater LH
R49	8	★	C-3	F55	Front wiring harness
R50	4	★	B-2	B90	Bulkhead wiring harness (Without vanity mirror illumi.)
	6	★	B-2	B90	Bulkhead wiring harness (With vanity mirror illumi.)
R51	2	★	B-2		Vanity mirror illumination light RH
R52	3	★	B-3		Room light
R54	2	★	B-3		Vanity mirror illumination light LH
R55	1	★	B-2		Sunroof switch
R56	2	★	B-2		Spot light
R70	3	★	C-2		ABS G sensor
R72	2	★	B-3		Rear ABS sensor RH
R73	2	★	B-3		Rear ABS sensor LH
R98	14	★	B-1	i53	Instrument panel wiring harness
R109	2	Black	C-3		Power seat motor

★: Non-colored

REAR WIRING HARNESS

WIRING SYSTEM

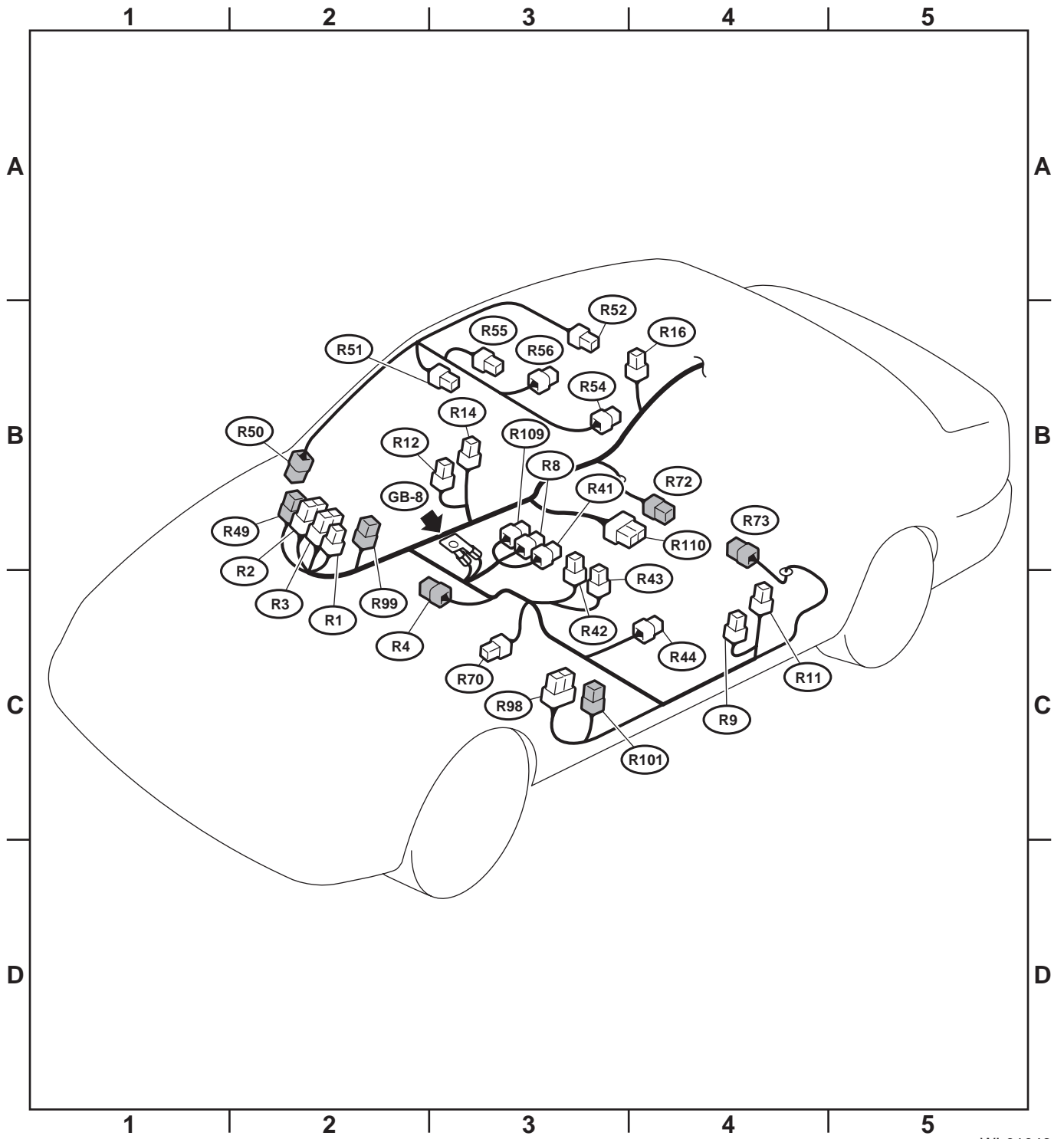
2. RHD SEDAN MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	6	★	B-2	B97	Bulkhead wiring harness
R2	20	Blue	B-2	B98	
R3	20	★	B-2	B99	
R4	1	★	B-2		Parking brake switch
R8	4	★	B-3		Seat belt switch
R9	3	★	C-3		Front door switch LH
R11	8	★	C-4	D21	Rear door cord LH
R12	3	★	B-2		Front door switch RH
R14	8	★	B-2	D27	Rear door cord RH
R16	3	Black	B-3		Rear door switch RH
R41	4	Blue	B-3		Seat heater RH
R42	6	★	B-3		Seat heater switch RH
R43	6	Blue	B-3		Seat heater switch LH
R44	4	Blue	C-3		Seat heater LH
R49	8	★	B-1	F55	Front wiring harness
R50	4	★	B-2	B90	Bulkhead wiring harness (Without vanity mirror illumi.)
	6	★	B-2	B90	Bulkhead wiring harness (With vanity mirror illumi.)
R51	2	★	B-2		Vanity mirror illumination light RH
R52	3	★	B-3		Room light
R54	2	★	B-3		Vanity mirror illumination light LH
R55	1	★	B-2		Sunroof switch
R56	2	★	B-2		Spot light
R70	3	★	C-2		ABS G sensor
R72	2	★	B-3		Rear ABS sensor RH
R73	2	★	B-3		Rear ABS sensor LH
R98	16	★	C-3	i53	Instrument panel wiring harness
R99	2	★	B-2	D68	Front door cord RH (Mcintosh audio)
R101	2	★	C-3	D69	Front door cord LH (Mcintosh audio)
R109	2	Black	B-2		Power seat motor
R110	14	★	B-3		Power amplifier (Mcintosh audio)

★: Non-colored

REAR WIRING HARNESS

WIRING SYSTEM



WI-01046

REAR WIRING HARNESS

WIRING SYSTEM

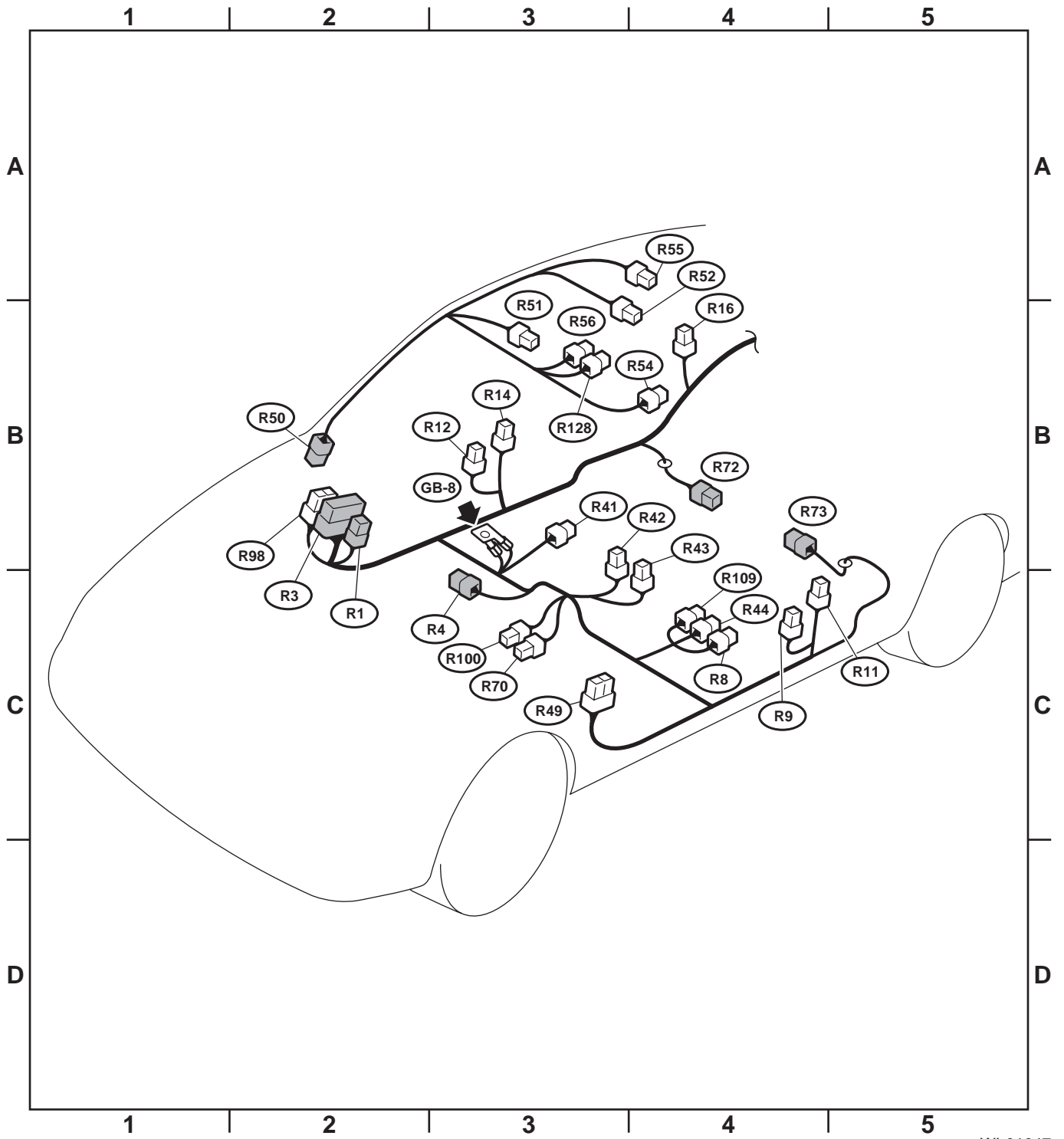
3. LHD WAGON MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	★	B-2	B97	Bulkhead wiring harness
R3	32	★	B-2	B99	
R4	1	★	B-2		Parking brake switch
R8	4	★	C-3		Seat belt switch
R9	3	★	C-4		Front door switch LH
R11	8	★	B-4	D21	Rear door cord LH
R12	3	★	B-2		Front door switch RH
R14	8	★	B-2	D27	Rear door cord RH
R16	3	Black	B-3		Rear door switch RH
R41	4	Blue	B-3		Seat heater RH
R42	6	★	B-3		Seat heater switch RH
R43	6	Blue	B-3		Seat heater switch LH
R44	4	Blue	C-3		Seat heater LH
R49	8	★	C-3	F55	Front wiring harness (without VDC model)
	12	★	C-3		Front wiring harness (with VDC model)
R50	6	★	B-2	B90	Bulkhead wiring harness (With vanity mirror illumi.)
R51	2	★	B-2		Vanity mirror illumination light RH
R52	3	★	B-3		Room light
R54	2	★	B-3		Vanity mirror illumination light LH
R55	8	★	A-3		Sunroof control module
R56	2	★	B-3		Spot light
R70	3	★	C-2		ABS G sensor
R72	2	★	B-3		Rear ABS sensor RH
R73	2	★	B-4		Rear ABS sensor LH
R98	14	★	B-2	i53	Instrument panel wiring harness
R100	6	★	C-2		Yaw rate sensor
R109	2	Black	C-3		Power seat motor
R128	5	★	B-3		Sunroof switch

★: Non-colored

REAR WIRING HARNESS

WIRING SYSTEM



WI-01047

REAR WIRING HARNESS

WIRING SYSTEM

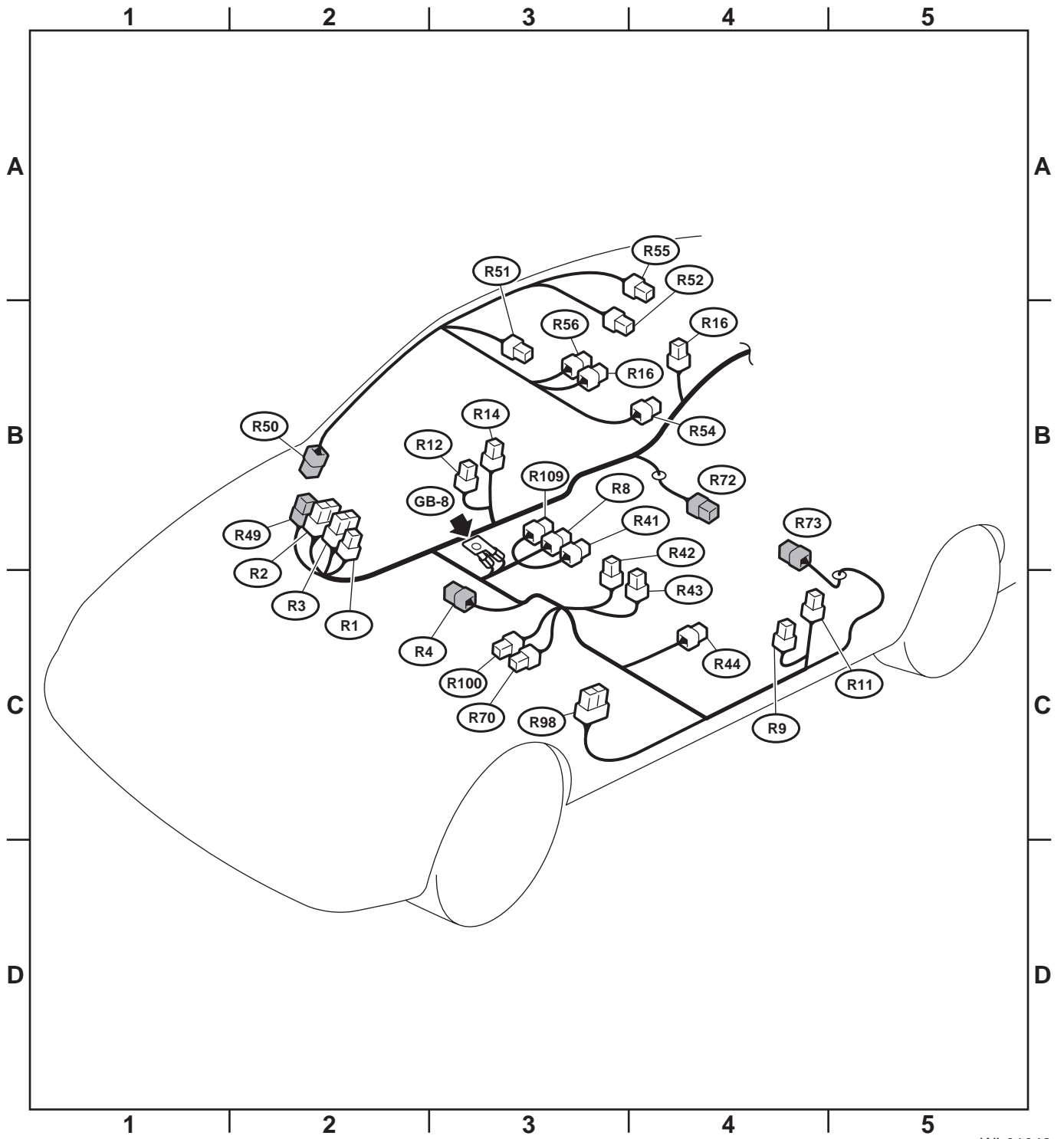
4. RHD WAGON MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	6	★	B-2	B97	Bulkhead wiring harness
R2	20	Blue	B-2	B98	
R3	20	★	B-2	B99	
R4	1	★	C-2		Parking brake switch
R8	4	★	B-3		Seat belt switch
R9	3	★	C-4		Front door switch LH
R11	8	★	C-4	D21	Rear door cord LH
R12	3	★	B-2		Front door switch RH
R14	8	★	B-2	D27	Rear door cord RH
R16	3	Black	B-3		Rear door switch RH
R41	4	Blue	B-3		Seat heater RH
R42	6	★	C-3		Seat heater switch RH
R43	6	Blue	C-3		Seat heater switch LH
R44	4	Blue	C-3		Seat heater LH
R49	8	★	B-2	F55	Front wiring harness (without VDC model)
	12	★	B-2		Front wiring harness (with VDC model)
R50	6	★	B-2	B90	Bulkhead wiring harness
R51	2	★	B-2		Vanity mirror illumination light RH
R52	3	★	B-3		Room light
R54	2	★	B-3		Vanity mirror illumination light LH
R55	8	★	B-3		Sunroof control module
R56	2	★	B-3		Spot light
R70	3	★	C-3		ABS G sensor
R72	2	★	B-3		Rear ABS sensor RH
R73	2	★	B-4		Rear ABS sensor LH
R98	16	★	C-3	i53	Instrument panel wiring harness
R100	6	★	C-2		Yaw rate sensor
R109	2	Black	B-2		Power seat motor
R128	5	★	B-3		Sunroof switch

★: Non-colored

REAR WIRING HARNESS

WIRING SYSTEM



WI-01048

DOOR CORD

WIRING SYSTEM

56. Door Cord

A: LOCATION

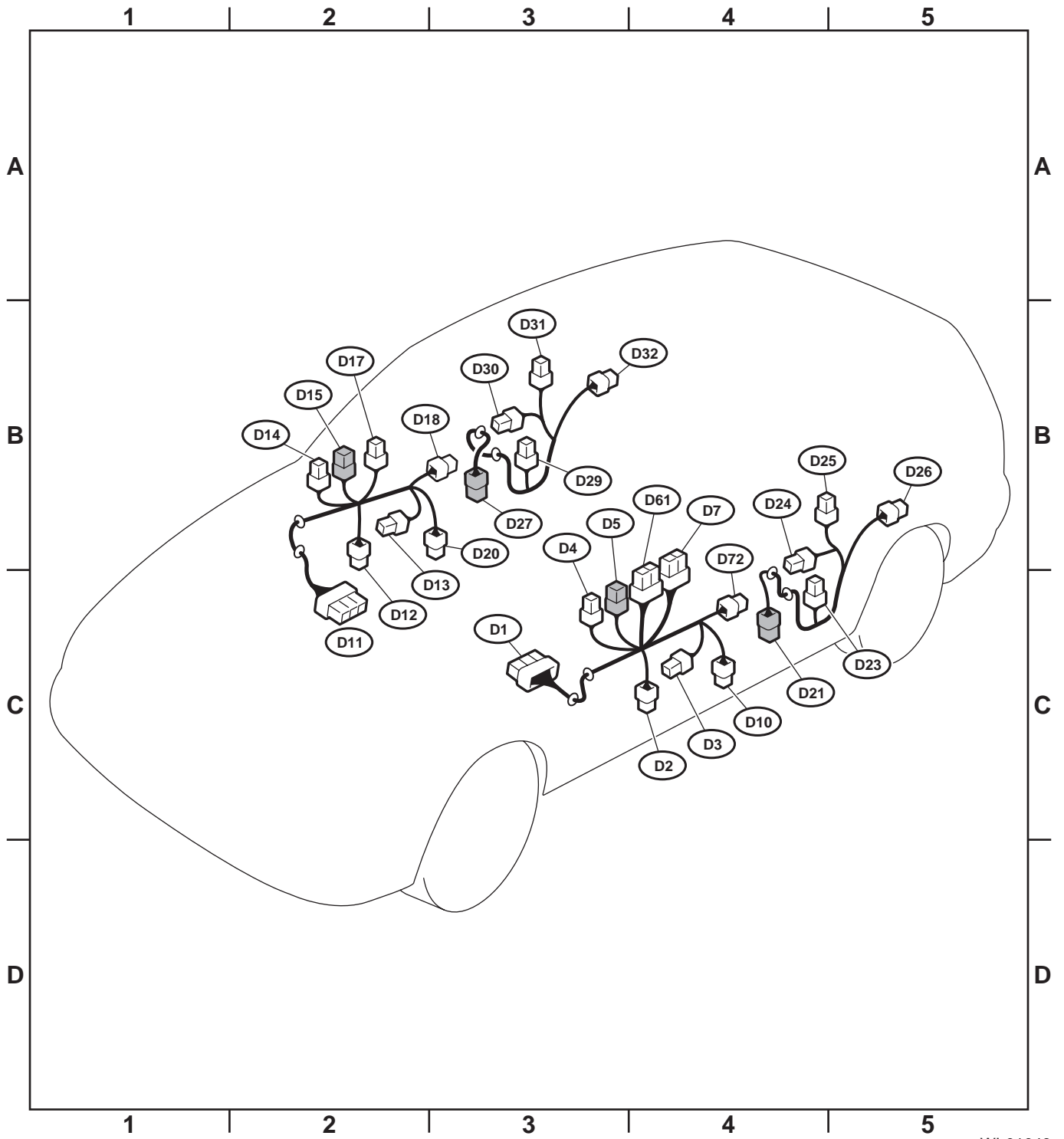
1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D1	25	★	C-2	B30	Bulkhead wiring harness
D2	2	★	C-3		Front door speaker LH
D3	2	Green	C-3		Front power window motor LH
D4	2	Black	C-3		Front door tweeter LH
D5	6	★	C-3		Remote control rearview mirror LH (Without mirror heater)
	8	★	C-3		Remote control rearview mirror LH (With mirror heater)
D7	16	★	C-3		Power window main switch
D10	2	★	C-3		Step light LH
D11	25	★	C-2	B101	Bulkhead wiring harness
D12	2	★	C-2		Front door speaker RH
D13	2	Green	B-2		Front power window motor RH
D14	2	Black	B-2		Front door tweeter RH
D15	6	★	B-2		Remote control rearview mirror RH (Without mirror heater)
	8	★	B-2		Remote control rearview mirror RH (With mirror heater)
D17	6	★	B-2		Front power window sub switch RH
D18	4	★	B-2		Front door lock actuator RH
D20	2	★	B-2		Step light RH
D21	8	★	C-3	R11	Rear wiring harness
D23	2	Black	C-4		Rear door speaker LH
D24	2	Green	C-4		Rear power window motor LH
D25	6	★	B-4		Rear power window sub switch LH
D26	4	★	B-4		Rear door lock actuator LH
D27	8	★	B-2	R14	Rear wiring harness
D29	2	Black	B-2		Rear door speaker RH
D30	2	Green	B-2		Rear power window motor RH
D31	6	★	B-2		Rear power window sub switch RH
D32	4	★	B-3		Rear door lock actuator RH
D61	10	★	C-3		Remote control rearview mirror switch
D72	4	Gray	C-3		Front door lock actuator LH

★: Non-colored

DOOR CORD

WIRING SYSTEM



WI-01049

DOOR CORD

WIRING SYSTEM

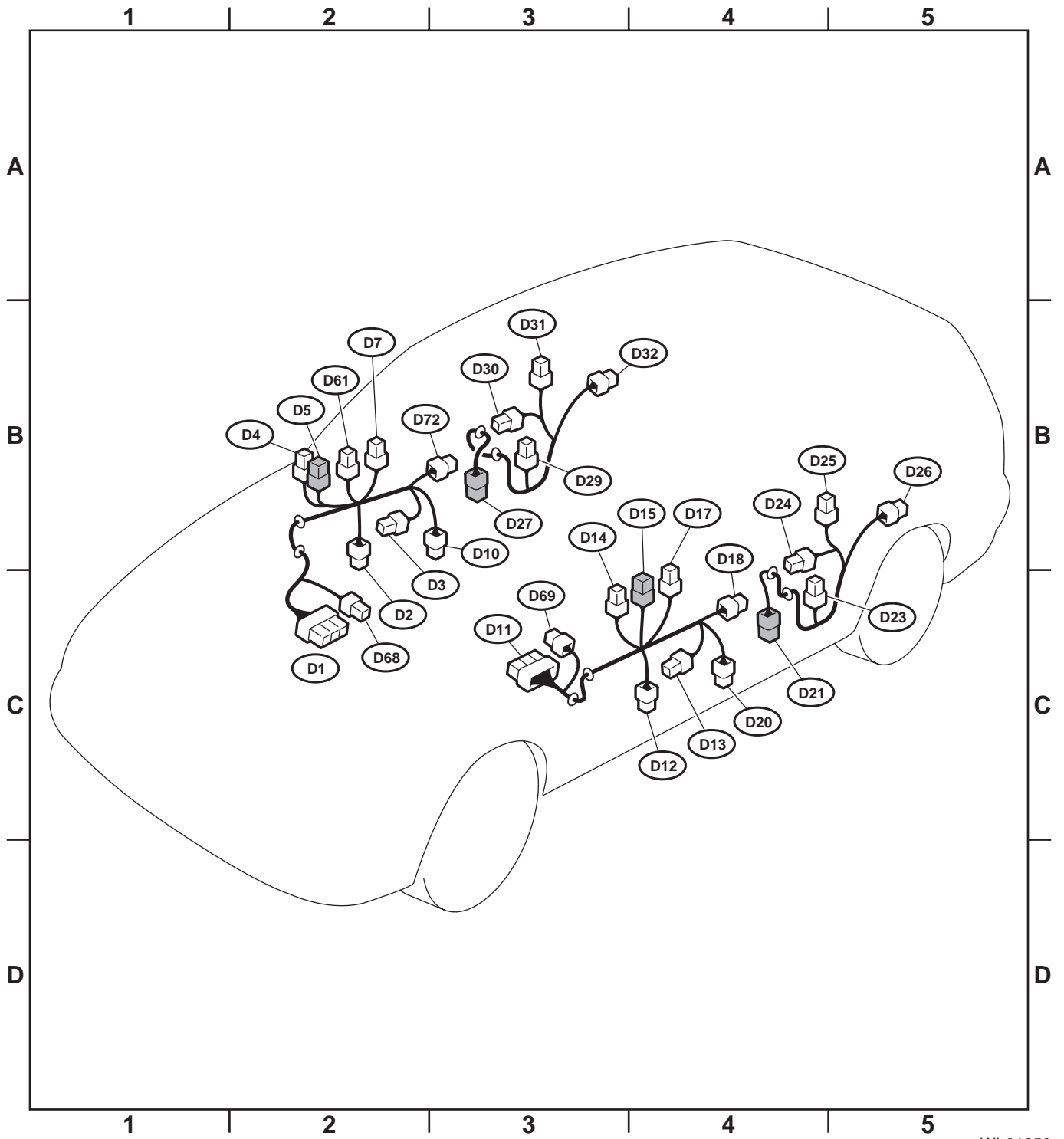
2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D1	25	★	C-2	B30	Bulkhead wiring harness
D2	2	★	B-2		Front door speaker RH
D3	2	Green	B-2		Front power window motor RH
D4	2	Black	B-2		Front door tweeter RH
D5	6	★	B-2		Remote control rearview mirror RH (Without mirror heater)
	8	★	B-2		Remote control rearview mirror RH (With mirror heater)
D7	16	Brown	B-2		Power window main switch
D10	2	★	B-2		Step light RH
D11	25	★	C-2	B101	Bulkhead wiring harness
D12	2	★	C-3		Front door speaker LH
D13	2	Green	C-3		Front power window motor LH
D14	2	Black	C-3		Front door tweeter LH
D15	6	★	C-3		Remote control rearview mirror LH (Without mirror heater)
	8	★	C-3		Remote control rearview mirror LH (With mirror heater)
D17	6	★	B-3		Front power window sub switch LH
D18	4	★	B-3		Front door lock actuator LH
D20	2	★	C-3		Step light LH
D21	8	★	C-3	R11	Rear wiring harness
D23	2	Black	B-4		Rear door speaker LH
D24	2	Green	B-3		Rear power window motor LH
D25	6	★	B-4		Rear power window sub switch LH
D26	4	★	B-4		Rear door lock actuator LH
D27	8	★	B-2	R14	Rear wiring harness
D29	2	Black	B-2		Rear door speaker RH
D30	2	Green	B-2		Rear power window motor RH
D31	6	★	B-2		Rear power window sub switch RH
D32	4	★	B-3		Rear door lock actuator RH
D61	10	★	B-2		Remote control rearview mirror switch
D68	2	★	C-2	R99	Rear wiring harness
D69	2	★	C-3	R101	Rear wiring harness
D72	4	Gray	B-2		Front door lock actuator RH

★: Non-colored

DOOR CORD

WIRING SYSTEM



WI-01050

REAR WIRING HARNESS AND TRUNK LID CORD

WIRING SYSTEM

57.Rear Wiring Harness and Trunk Lid Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R15	6	Black	C-2	R57	Fuel tank cord
R19	2	★	B-2		High-mounted stop light
R20	2	Blue	B-3		Trunk room light
R22	3	Black	B-1		Rear door switch LH
R24	8	★	B-4	R60	Trunk lid cord
R25	2	★	B-3		Rear defogger condenser
R26	4	★	B-4		Rear combination light RH
R27	2	★	C-3		Trunk room light switch
R28	4	★	C-3		Rear combination light LH
R57	6	Black	C-2	R15	Rear wiring harness
R58	6	★	C-2		Fuel gauge module & fuel pump assembly
R59	2	★	C-2		Fuel gauge sub module
R60	8	★	B-4	R24	Rear wiring harness
R62	4	★	C-4		Rear finisher light RH
R63	2	★	C-3		License plate light
R64	4	★	C-3		Rear finisher light LH
R66	2	★	B-4		High-mounted stop light (Rear spoiler)
R79	10	★	C-3		Trailer connector
R97	2	★	B-2		Antenna amplifier
R117	2	★	B-3		Sub woofer (Mcintosh audio) (RHD model)
R122	10	★	C-2		Fuel pump control module
R124	1	★	B-2	R125	Fuel pump control module shield joint connector
R125	1	★	B-2	R124	Fuel pump control module shield joint connector
R126	6	★	C-3		Muffler actuator control module (RHD model)
R127	2	★	C-3		Muffler actuator (RHD model)
R130	2	★	B-3		Rear defogger (choke coil)

★: Non-colored

REAR WIRING HARNESS AND REAR GATE CORD

WIRING SYSTEM

58.Rear Wiring Harness and Rear Gate Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R15	6	Black	D-1	R57	Fuel tank cord
R22	3	Black	C-1		Rear door switch LH
R25	2	★	C-2		Rear defogger condenser
R26	4	★	C-4		Rear combination light RH
R28	4	★	C-2		Rear combination light LH
R32	2	★	C-2		Rear accessory power supply socket
R37	2	★	C-3	D33	Rear gate cord
R38	8	★	C-3	D34	
R39	8	Black	C-4	D35	
R57	6	Black	D-1	R15	Rear wiring harness
R58	6	★	D-2		Fuel gauge module & fuel pump assembly
R59	2	★	D-2		Fuel gauge sub module
R79	10	★	C-2		Trailer connector
R97	2	★	C-1		Antenna amplifier
R116	8	★	C-3		Rear wiper intermittent module
R122	10	★	C-1		Fuel pump control module
R124	1	★	C-1	R125	Fuel pump control module shield joint connector
R125	1	★	C-1	R124	Fuel pump control module shield joint connector

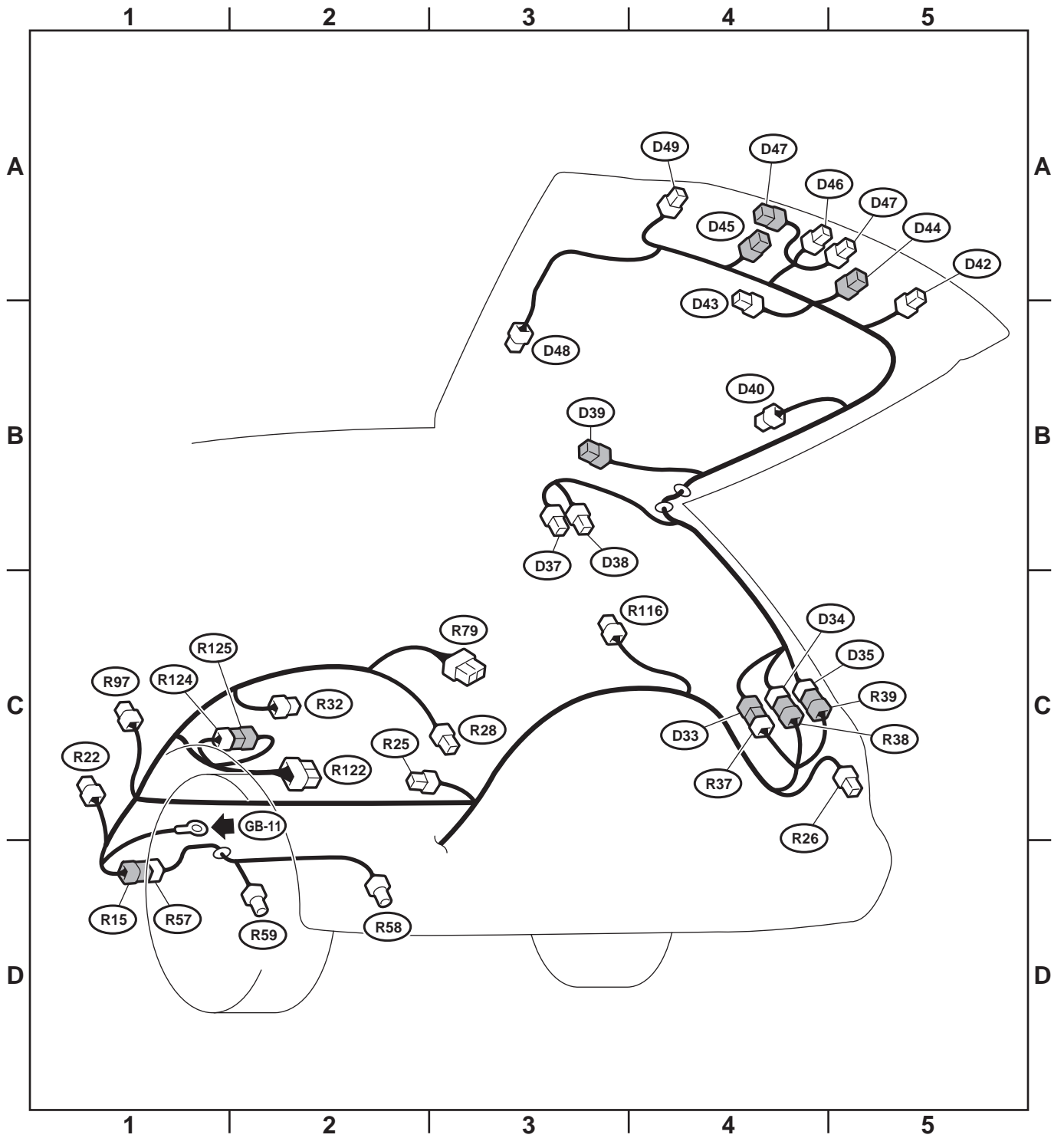
★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D33	2	★	C-3	R37	Rear wiring harness
D34	8	★	C-3	R38	
D35	8	Black	C-4	R39	
D37	1	Black	B-3		Luggage room light (Power)
D38	1	★	B-3		Luggage room light
D39	2	★	B-3		High-mounted stop light
D40	1	Black	B-3		Rear defogger (Power)
D42	4	★	B-4		Rear finisher light RH
D43	4	★	B-3		Rear wiper motor
D44	2	★	B-4		License plate light RH
D45	2	★	A-3		License plate light LH
D46	2	Black	A-4		Rear gate latch switch
D47	4	★	B-4		Rear gate lock actuator
D48	1	Black	B-3		Rear defogger (Ground)
D49	4	★	A-3		Rear finisher light LH
D74	2	★	A-3		Rear defogger (choke coil)

★: Non-colored

REAR WIRING HARNESS AND REAR GATE CORD

WIRING SYSTEM



WI-01052

REAR WIRING HARNESS AND REAR GATE CORD

WIRING SYSTEM

MEMO: