

**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**FW****HOW TO USE THIS MANUALS****HU****SPECIFICATIONS****SPC****PRECAUTION****PC****NOTE****NT****IDENTIFICATION****ID****RECOMMENDED MATERIALS****RM****PRE-DELIVERY INSPECTION****PI****PERIODIC MAINTENANCE SERVICES****PM**

FOREWORD

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1. Foreword

A: FOREWORD

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

Applied model: GG***** and GD***** from 2001MY.

The additional manuals below are also available:
AUTOMATIC TRANSMISSION SERVICE MANUAL (Pub. No. G0853ZE)

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. And at the end of each section is an alphabetical index.

3. COMPONENTS

For each component, a composition drawing is included.

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 are provided for each component. When multiple components comprise one process, refer to the instructions for that process for each component.

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.

SPECIFICATIONS

SPC

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IMPREZA

SPECIFICATIONS

1. Impreza

A: DIMENSIONS

Model			Sedan	Wagon	OUTBACK
Overall length		mm (in)	4,405 (173.4)		
Overall width		mm (in)	1,730 (68.1)	1,695 (66.7)	1,710 (67.3)
Overall height (at CW)		mm (in)	1,440 (56.7)	1,465 (57.7), 1,485 (58.5)★4	1,475 (58.1), 1,495 (58.9)★4
Compartment	Length	mm (in)	1,890 (74.4)	1,845 (72.6)	
	Width	mm (in)	1,380 (54.3)		
	Height	mm (in)	1,180 (46.5)	1,200 (47.2), 1,150 (45.3)★5	1,200 (47.2), 1,150 (45.3)★5
Wheelbase		mm (in)	2,525 (99.4)		
Tread	Front	mm (in)	1,485 (58.5)	1,460 (57.5)★1, 1,465 (57.7)	1,460 (57.5)
	Rear	mm (in)	1,475 (58.1), 1,480 (58.3)★3	1,450 (57.1)★1, 1,455 (57.3)	1,455 (57.3)
Minimum road clearance	Without catalytic converter	mm (in)	150 (5.9), 155 (6.1)★2	150 (5.9), 155 (6.1)★2	160 (6.3)
	With catalytic converter	mm (in)	150 (5.9), 155 (6.1)★3	150 (5.9), 155 (6.1)★3	160 (6.3)

★1: 1.6 L

★2: GX

★3: WRX

★4: With roof rail

★5: With sun roof

B: ENGINE

Model		1.6 L	Non Turbo 2.0 L	Turbo 2.0 L
Engine type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
Valve arrangement		Overhead camshaft type		
Bore × Stroke		mm (in)	87.9 × 65.8 (3.461 × 2.591)	92 × 75 (3.62 × 2.95)
Displacement		cm ³ (cu in)	1,597 (97.45)	1,994 (121.67)
Compression ratio		10.0		8.0
Firing order		1 — 3 — 2 — 4		
Idle speed at Park/Neutral position		rpm	700±100	750±100
Maximum output		kW (HP)/rpm	75 (100)/5,200	92 (123)/5,600
Maximum torque		N·m (kgf-m, ft-lb)/rpm	143 (14.6, 105.5)/3,600	184 (18.8, 136.0)/3,600
				292 (29.8, 215.4)/3,600

C: ELECTRICAL

Model			1.6 L		Non Turbo 2.0 L		Turbo 2.0 L	
Ignition timing at idling speed			BTDC/rpm		5°±10°/700		10°±10°/700	
Spark plug	Type and manu- facturer	Without OBD	NGK: BKR6E (without catalyst) CHAMPION: RC10YC4 (with catalyst) NGK: BKR5E-11 (with catalyst)				—	
			RC10YC4 CHAMPION				NGK: PFR6G	
		With OBD	Alternate	RC8YC4 CHAMPION BKR6E-11 NGK K20PR-U11 NIPPONDENSO				
Generator			12V — 75A					
Battery	Type and capac- ity (5HR)	For Europe and South America	MT: 12V — 48AH (55D23L) AT: 12V — 52AH (75D23L)		MT: 12V — 48AH (55D23L) AT: 12V — 52AH (65D23L)			
			Others		12V — 27AH (34B19L)			

D: TRANSMISSION

FWD

Model			1.6 L	
Transmission type			5MT★1	4AT★2
Clutch type			DSPD	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
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	4.444
Reduction gear (Rear drive)	Transfer reduction	Type of gear	—	—
		Gear ratio	—	—
	Final reduction	Type of gear	—	—
		Gear ratio	—	—

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

4AT★2: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse

DSPD: Dry Single Plate Diaphragm

TCC: Torque Converter Clutch

IMPREZA

SPECIFICATIONS

AWD

Model			1.6 L	Non Turbo 2.0 L		Turbo 2.0 L
Transmission type			5MT★1	5MT★1	4AT★2	5MT★1
Clutch type			DSPD	DSPD	TCC	DSPD
Gear ratio		1st	3.454	3.454	2.785	3.454
		2nd	2.062	2.062	1.545	1.947
		3rd	1.448	1.448	1.000	1.336
		4th	1.088	1.088	0.694	0.972
		5th	0.825	0.825	—	0.738
		Reverse	3.333	3.333	2.272	3.333
		Dual range	1.447	1.447	—	1.447
Reduction gear (Front drive)	1st reduction	Type of gear	—	—	Helical	
		Gear ratio	—	—	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	3.900	4.111	3.900
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	Helical	—	Helical
		Gear ratio	1.000	1.000	—	1
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	3.900	4.111	3.545

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

4AT★2: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse

DSPD: Dry Single Plate Diaphragm

TCC: Torque Converter Clutch

E: STEERING

Model			WRX	OUTBACK	OTHERS
Type			Rack and Pinion		
Turns, lock to lock			1.6	1.5	1.6
Minimum turning circle	m (ft)	Curb to curb	11.0 (36.1)	10.8 (35.4)	10.4 (34.1)
		Wall to wall	12.0 (39.4)	11.6 (38.1)	11.2 (36.7)

F: SUSPENSION

Front	Macpherson strut type, Independent, Coil spring
Rear	Dual-link type, Independent, Coil spring

G: BRAKE

Model	1.6 L	2.0 L
Service brake system	Dual circuit hydraulic with vacuum suspended power unit	
Front	Ventilated disc brake	
Rear	Drum brake	Disc brake
Parking brake	Mechanical on rear brakes	

H: TIRE

Rim size	14 × 5½JJ		15 × 6JJ	16 × 6½JJ	17 × 7JJ
Tire size	175/70R14 84T	185/70R14 88H	195/60R15 88H	P205/55R16 89V	215/45R17 87W
Type	Steel belted radial, Tubeless				

I: CAPACITY

FWD

Model		1.6 L	
		5MT	4AT
Fuel tank	ℓ (US gal, Imp gal)	50 (13.2, 11.0)	
Engine oil	Upper level	ℓ (US qt, Imp qt)	4.0 (4.2, 3.5)
	Lower level	ℓ (US qt, Imp qt)	3.0 (3.2, 2.6)
Transmission gear oil	ℓ (US qt, Imp qt)	3.3 (3.5, 2.9)	—
Automatic transmission fluid	ℓ (US qt, Imp qt)	—	8.0 (8.5, 7.0)
AT differential gear oil	ℓ (US qt, Imp qt)	—	1.2 (1.3, 1.1)
AWD rear differential gear oil	ℓ (US qt, Imp qt)	—	
Power steering fluid	ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)	
Engine coolant	ℓ (US qt, Imp qt)	7.4 (7.8, 6.5)	7.3 (7.7, 6.4)

AWD

Model		1.6 L		Non Turbo 2.0 L		Turbo 2.0 L
		5MT	4AT	5MT	4AT	5MT
Fuel tank ℓ (US gal, Imp gal)		50 (13.2, 11.0)		50 (13.2, 11.0)		60 (15.9, 13.2)
Engine oil	Upper level ℓ (US qt, Imp qt)	4.0 (4.2, 3.5)				
	Lower level ℓ (US qt, Imp qt)	3.0 (3.2, 2.6)				3.5 (3.7, 3.1)
Transmission gear oil ℓ (US qt, Imp qt)		3.5 (3.7, 3.1) 4.0 (4.2, 3.5)★1	—	3.5 (3.7, 3.1) 4.0 (4.2, 3.5)★1	—	3.5 (3.7, 3.1)
Automatic transmission fluid ℓ (US qt, Imp qt)		—	8.4 (8.9, 7.4)	—	8.4 (8.9, 7.4)	—
AT differential gear oil ℓ (US qt, Imp qt)		—	1.2 (1.3, 1.1)	—	1.2 (1.3, 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)		7.4 (7.8, 6.5)	7.3 (7.7, 6.4)	7.0 (7.4, 6.2)	6.9 (7.3, 6.1)	7.7 (8.1, 6.8)

★1: Dual range

IMPREZA

SPECIFICATIONS

J: WEIGHT

1. EUROPE SPEC. VEHICLE

Sedan

Model			FWD			
			1.6 L			
			LHD		RHD	
			BASE			
			5MT★1	4AT★1	5MT★1	4AT★1
Curb weight (C.W.)	Front	kgf (lb)	715 (1,576)	760 (1,676)	715 (1,576)	760 (1,676)
	Rear	kgf (lb)	470 (1,036)	470 (1,036)	470 (1,036)	470 (1,036)
	Total	kgf (lb)	1,185 (2,612)	1,230 (2,712)	1,185 (2,612)	1,230 (2,712)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	890 (1,962)	890 (1,962)	890 (1,962)	890 (1,962)
	Rear	kgf (lb)	890 (1,962)	890 (1,962)	890 (1,962)	890 (1,962)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,660 (3,660)	1,660 (3,660)	1,660 (3,660)	1,660 (3,660)

Model			AWD			
			1.6 L		2.0 L	
			LHD	RHD	LHD	RHD
			TS		WRX	
			5MT	5MT★2	5MT★2	5MT★3
Curb weight (C.W.)	Front	kgf (lb)	730 (1,609)	735 (1,620)	810 (1,786)	830 (1,830)
	Rear	kgf (lb)	520 (1,146)	520 (1,146)	555 (1,224)	555 (1,224)
	Total	kgf (lb)	1,250 (2,756)	1,255 (2,767)	1,365 (3,009)	1,385 (3,053)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	890 (1,962)	890 (1,962)	960 (2,116)	960 (2,116)
	Rear	kgf (lb)	890 (1,962)	890 (1,962)	920 (2,028)	920 (2,028)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,690 (3,726)	1,690 (3,726)	1,820 (4,012)	1,820 (4,012)

Model			AWD			
			2.0 L			
			LHD		RHD	
			GX			
			5MT	4AT	5MT★4	4AT★4
Curb weight (C.W.)	Front	kgf (lb)	745 (1,642)	770 (1,698)	535 (1,179)	790 (1,742)
	Rear	kgf (lb)	535 (1,179)	530 (1,168)	765 (1,687)	530 (1,168)
	Total	kgf (lb)	1,280 (2,822)	1,300 (2,866)	1,300 (2,866)	1,320 (2,910)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	920 (2,028)	920 (2,028)	920 (2,028)	920 (2,028)
	Rear	kgf (lb)	910 (2,006)	910 (2,006)	910 (2,006)	910 (2,006)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,760 (3,880)	1,760 (3,880)	1,760 (3,880)	1,760 (3,880)

★1: Includes weight of air conditioner

★2: Includes weight of ABS

★3: Includes weight of ABS, air conditioner

★4: Includes weight of ABS, air conditioner, rear spoiler

Wagon

Model			FWD			
			1.6 L			
			LHD		RHD	
			BASE			
			5MT★1	4AT★4	5MT★1	4AT★1
Curb weight (C.W.)	Front	kgf (lb)	710 (1,565)	765 (1,687)	710 (1,565)	760 (1,676)
	Rear	kgf (lb)	490 (1,080)	495 (1,091)	490 (1,080)	490 (1,080)
	Total	kgf (lb)	1,200 (2,646)	1,260 (2,778)	1,200 (2,646)	1,250 (2,756)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	890 (1,962)	890 (1,962)	890 (1,962)	890 (1,962)
	Rear	kgf (lb)	900 (1,984)	900 (1,984)	900 (1,984)	900 (1,984)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,690 (3,726)	1,690 (3,726)	1,690 (3,726)	1,690 (3,726)

Model			AWD			
			1.6 L		2.0 L	
			LHD	RHD	LHD	RHD
			TS		GX	
			Dual range★2	Dual range★3	Dual range★2	Dual range★6
Curb weight (C.W.)	Front	kgf (lb)	735 (1,620)	740 (1,631)	745 (1,642)	765 (1,687)
	Rear	kgf (lb)	545 (1,202)	545 (1,202)	570 (1,257)	570 (1,257)
	Total	kgf (lb)	1,280 (2,822)	1,285 (2,833)	1,315 (2,899)	1,335 (2,943)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	900 (1,984)	900 (1,984)	920 (2,028)	920 (2,028)
	Rear	kgf (lb)	910 (2,006)	910 (2,006)	960 (2,116)	960 (2,116)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,730 (3,814)	1,730 (3,814)	1,800 (3,968)	1,800 (3,968)

Model			AWD			
			2.0 L			
			LHD	RHD	RHD	
			GX		OUTBACK	
			4AT★2	4AT★6	Dual range★5	4AT★5
Curb weight (C.W.)	Front	kgf (lb)	770 (1,698)	790 (1,742)	750 (1,653)	765 (1,687)
	Rear	kgf (lb)	565 (1,246)	565 (1,246)	570 (1,257)	570 (1,257)
	Total	kgf (lb)	1,335 (2,943)	1,355 (2,987)	1,320 (2,910)	1,335 (2,943)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	920 (2,028)	920 (2,028)	920 (2,028)	920 (2,028)
	Rear	kgf (lb)	960 (2,116)	960 (2,116)	960 (2,116)	960 (2,116)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,800 (3,968)	1,800 (3,968)	1,800 (3,968)	1,800 (3,968)

★1: Includes weight of air conditioner

★2: Includes weight of roof rail

★3: Includes weight of ABS, roof rail

★4: Includes weight of ABS, air conditioner, roof rail

★5: Includes weight of cruise control, ABS, roof rail

★6: Includes weight of ABS, roof rail, air conditioner, rear spoiler

IMPREZA

SPECIFICATIONS

Model			AWD	
			2.0 L	
			LHD	RHD
			WRX	
			5MT★3	5MT★4
Curb weight (C.W.)	Front	kgf (lb)	805 (1,775)	765 (1,687)
	Rear	kgf (lb)	585 (1,290)	570 (1,257)
	Total	kgf (lb)	1,390 (3,064)	1,335 (2,943)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	970 (2,138)	970 (2,138)
	Rear	kgf (lb)	950 (2,094)	950 (2,094)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,860 (4,100)	1,860 (4,100)

★3: Includes weight of ABS, roof rail

★4: Includes weight of ABS, air conditioner, roof rail

2. AUSTRALIA SPEC. VEHICLE

Sedan

Model			AWD		
			2.0 L		
			GX		WRX
			5MT	4AT	5MT★2
Curb weight (C.W.)	Front	kgf (lb)	750 (1,653)	775 (1,709)	830 (1,830)
	Rear	kgf (lb)	535 (1,179)	530 (1,168)	560 (1,235)
	Total	kgf (lb)	1,285 (2,833)	1,305 (2,877)	1,390 (3,064)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	920 (2,028)	920 (2,028)	960 (2,116)
	Rear	kgf (lb)	910 (2,006)	910 (2,006)	920 (2,028)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,760 (3,880)	1,760 (3,880)	1,820 (4,012)

Wagon

Model			AWD				
			2.0 L				
			GX		OUTBACK		WRX
			Dual range	4AT	Dual range	4AT	5MT★1
Curb weight (C.W.)	Front	kgf (lb)	750 (1,653)	775 (1,709)	750 (1,653)	765 (1,687)	825 (1,819)
	Rear	kgf (lb)	570 (1,257)	565 (1,246)	570 (1,257)	570 (1,257)	585 (1,290)
	Total	kgf (lb)	1,320 (2,910)	1,340 (2,954)	1,320 (2,910)	1,335 (2,943)	1,410 (3,109)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	920 (2,028)	920 (2,028)	920 (2,028)	920 (2,028)	970 (2,138)
	Rear	kgf (lb)	960 (2,116)	960 (2,116)	960 (2,116)	960 (2,116)	950 (2,094)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,800 (3,968)	1,800 (3,968)	1,800 (3,968)	1,800 (3,968)	1,860 (4,100)

★1: Includes weight of air conditioner

★2: Includes weight of air conditioner, rear spoiler

IMPREZA

SPECIFICATIONS

3. OTHERS

Sedan

Model			FWD		AWD		
			1.6 L			2.0 L	
			BASE		TS	GX	
			5MT	4AT	5MT	5MT	4AT★1
Curb weight (C.W.)	Front	kgf (lb)	705 (1,554)	750 (1,653)	740 (1,631)	750 (1,653)	780 (1,720)
	Rear	kgf (lb)	485 (1,069)	485 (1,069)	535 (1,179)	545 (1,202)	540 (1,191)
	Total	kgf (lb)	1,190 (2,624)	1,235 (2,723)	1,275 (2,811)	1,295 (2,855)	1,320 (2,910)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	890 (1,962)	890 (1,962)	890 (1,962)	920 (2,028)	920 (2,028)
	Rear	kgf (lb)	890 (1,962)	890 (1,962)	890 (1,962)	910 (2,006)	910 (2,006)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,660 (3,660)	1,660 (3,660)	1,690 (3,726)	1,760 (3,880)	1,760 (3,880)

Wagon

Model			FWD		AWD	
			1.6 L			2.0 L
			BASE		TS	GX
			5MT	Dual range★2	Dual range★2	4AT★3
Curb weight (C.W.)	Front	kgf (lb)	700 (1,543)	745 (1,642)	750 (1,653)	780 (1,720)
	Rear	kgf (lb)	505 (1,113)	560 (1,235)	580 (1,279)	575 (1,268)
	Total	kgf (lb)	1,205 (2,657)	1,305 (2,877)	1,330 (2,932)	1,355 (2,987)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	890 (1,962)	900 (1,984)	920 (2,028)	920 (2,028)
	Rear	kgf (lb)	900 (1,984)	910 (2,006)	960 (2,116)	960 (2,116)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,690 (3,726)	1,730 (3,814)	1,800 (3,968)	1,800 (3,968)

★1: Includes weight of ABS

★2: Includes weight of roof rail

★3: Includes weight of ABS, roof rail

PRECAUTION

PC

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1. Precaution	2



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 the special instructions for disposal in this manual. 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

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1. Note.....	2



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.

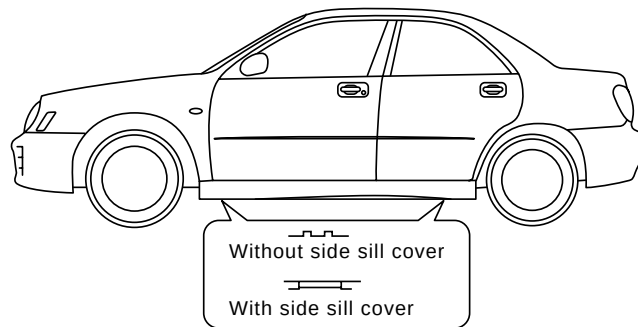
4. SERVICE PARTS

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.

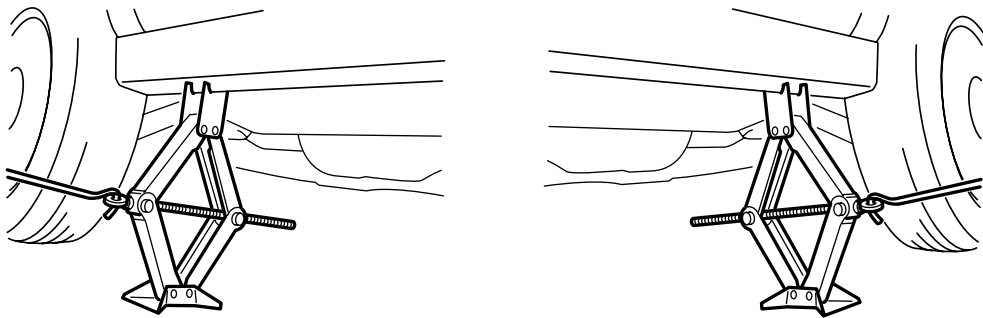
5. LIFTS AND JACKS

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.

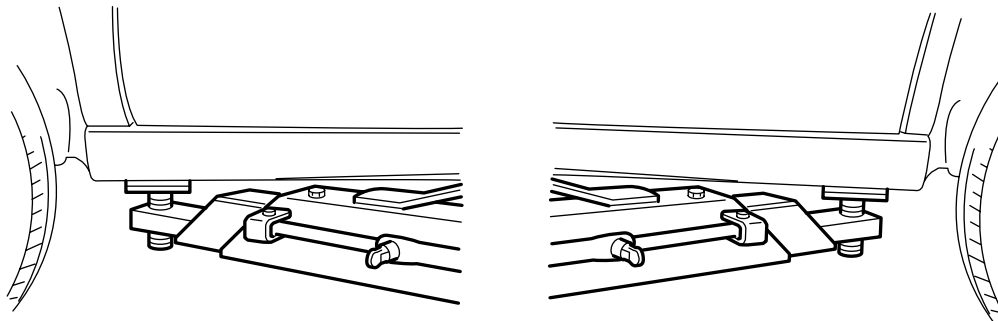
Support locations



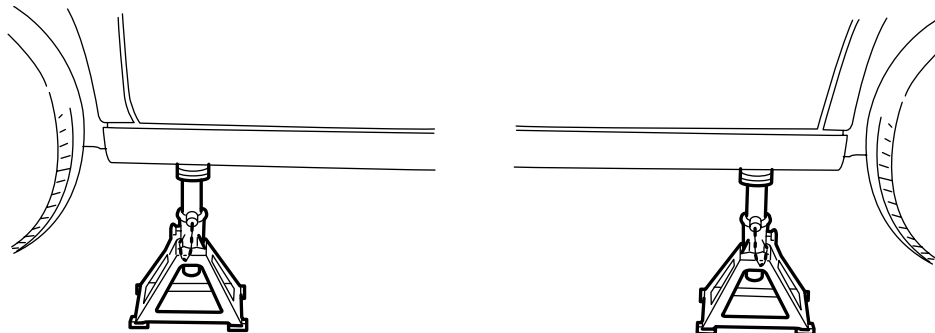
Pantograph jack



Lift



Safety stand

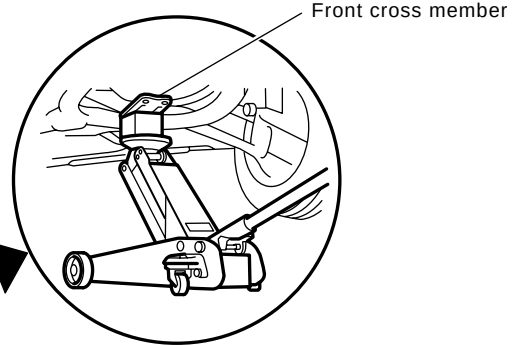
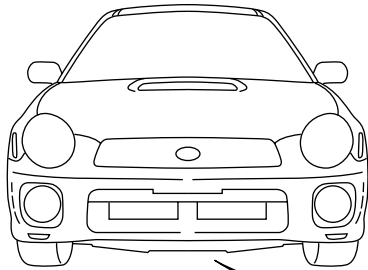


GI0120

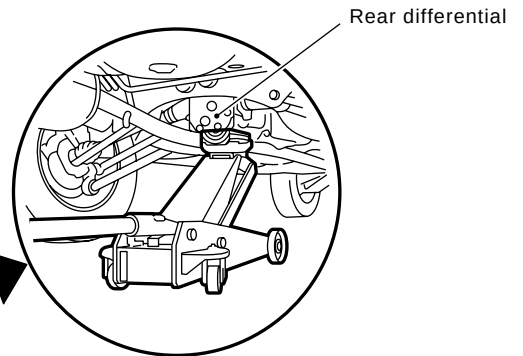
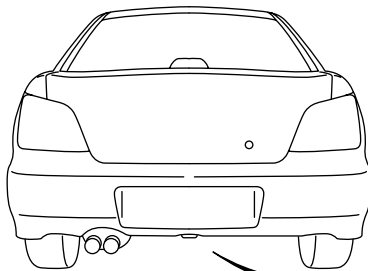
NOTE

NOTE

Front



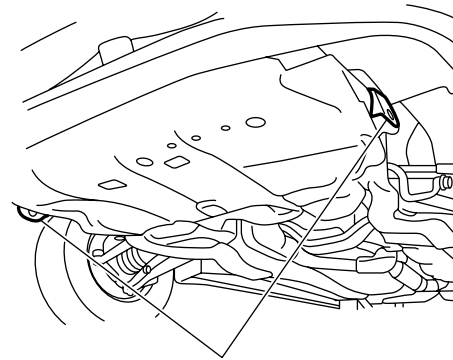
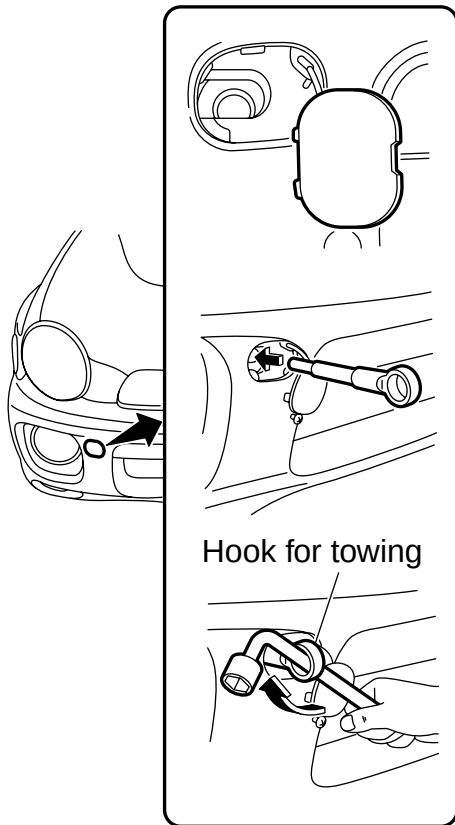
Rear



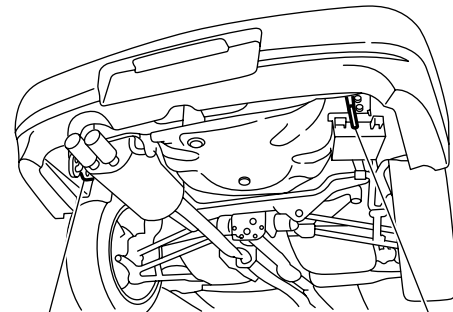
GI0121

6. TIE DOWNS

Tie downs are used when transporting vehicles and when using the chassis dynamo. Attach tie downs only to the specified points on the vehicle.



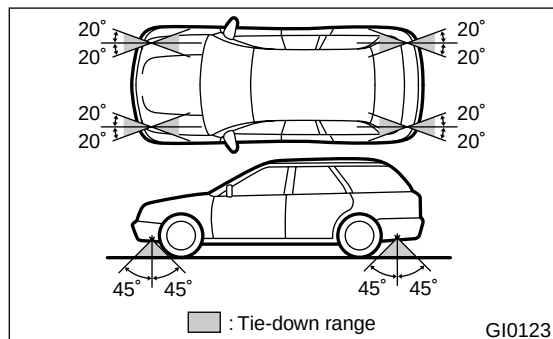
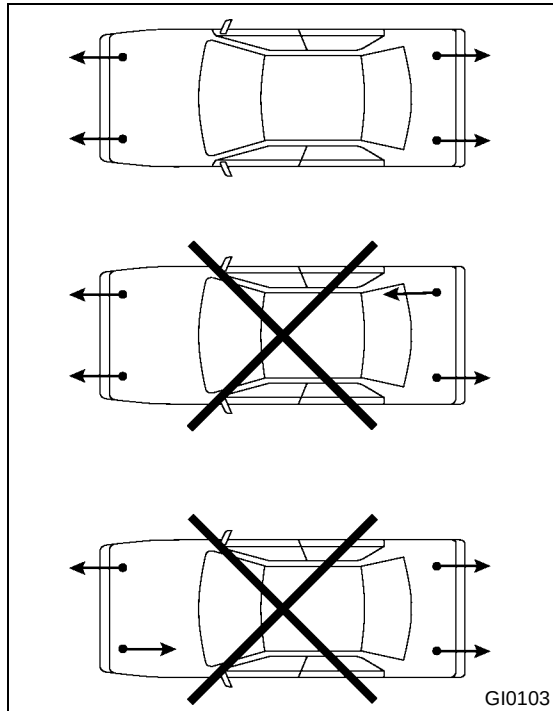
Hook for tie-down



Hook for tie-down

Hook for towing
and tie-down

GI0122



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. TRAINING

For information about training, contact a dealer or agent.

9. 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.

IDENTIFICATION

ID

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1. Identification	2



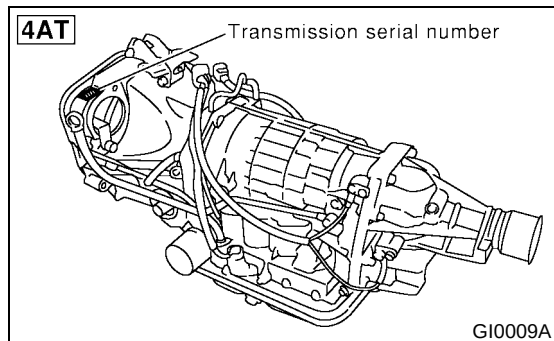
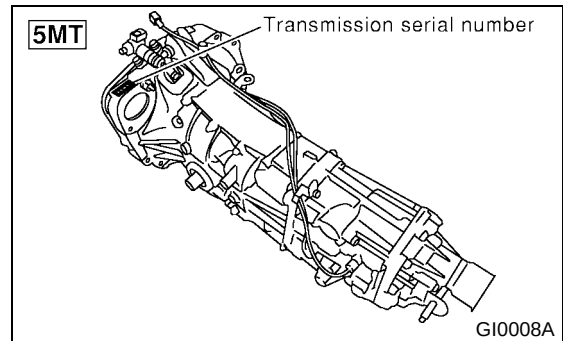
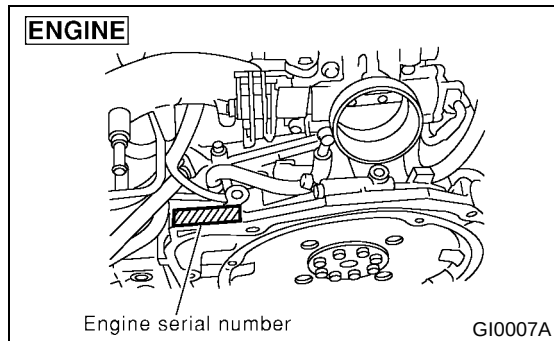
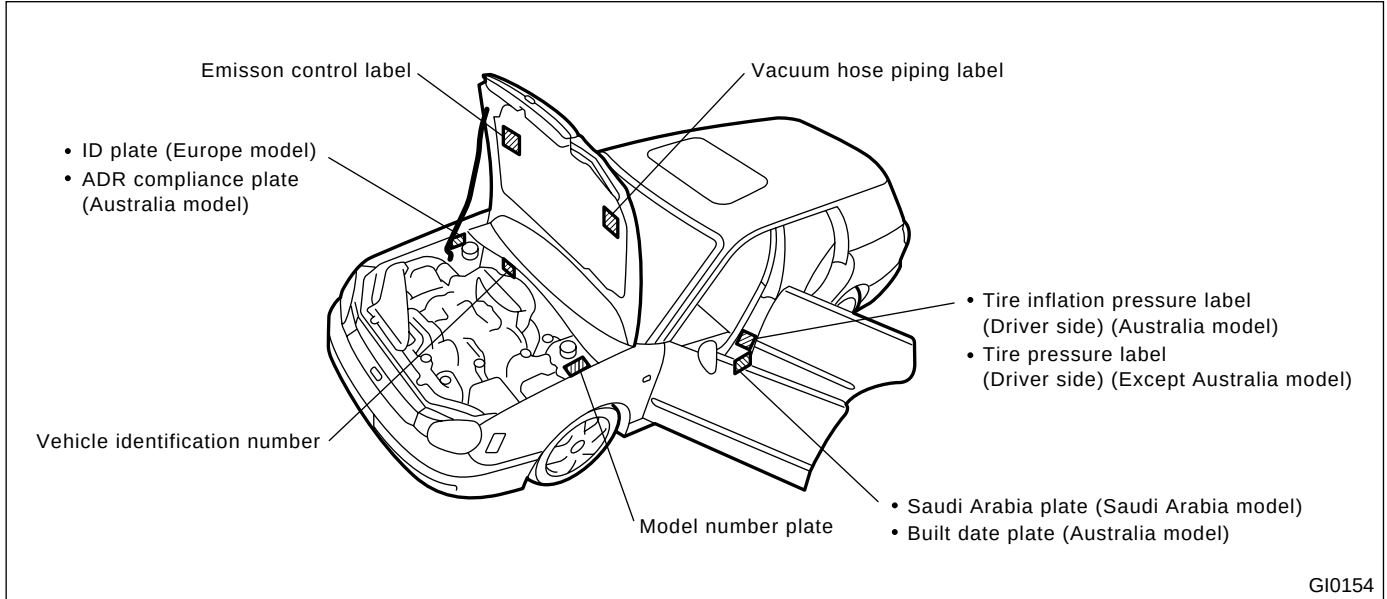
1. Identification

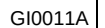
A: IDENTIFICATION

1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

The VIN (Vehicle Identification Numbers) is used to classify the vehicle.

Positioning of the plate label for identification





IDENTIFICATION

IDENTIFICATION

2. MEANING OF V.I.N.

The meaning of the VIN is as follows:

• Europe, Australia and General (Except GCC)

JJF1GD5LJ31G002001

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	G	Car line	IMPREZA
5	D	Body type	D: 4 Door Sedan G: Wagon
6	5	Displacement	4: 1.6 L FWD 5: 1.6 L AWD 9: 2.0 L AWD A: 2.0 L AWD Turbo
7	L	Steering position	K: RHD (Right-hand drive) L: LHD (Left-hand drive)
8	J	Engine & transmission	G: SOHC MPI 5-speed MT R: SOHC MPI 4-speed AT J: SOHC MPI Full-time AWD 5-speed MT K: SOHC MPI Full-time AWD 5-speed MT Dual range D: DOHC Turbo Full-time AWD 5-speed MT
9	3	Drive type	3: Full-time AWD Single range 4: Full-time AWD Dual range 5: AWD AT 9: FWD
10	1	Model year	1: 2001MY 2: 2002MY
11	G	Factory location	G: FHI (Gunma)
12 to 17	002001	Serial number	

• GCC countries (Saudi Arabia, etc.)

JJF1GD33MX1G002001

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	G	Car line	IMPREZA
5	D	Body type	D: 4 Door Sedan G: Wagon
6	3	Displacement	3: 1.6 L FWD 4: 1.6 L AWD 8: 2.0 L AWD
7	3	Grade	3: BASE 5: TS 7: GX
8	M	Restraint	M: Manual belts, dual airbag
9	X	Check digit	
10	1	Model year	1: 2001MY 2: 2002MY 3: 2003MY
11	G	Transmission type	B: FWD 5 MT K: FWD 4 AT 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.

GD9AL7R

Digits	Code	Meaning	Details
1	G	Series	IMPREZA
2	D	Body style	D: 4 Door Sedan G: Wagon
3	9	Engine displacement Drive system Suspension system	4: 1.6 L FWD 5: 1.6 L AWD 9: 2.0 L AWD
4	A	Minor change	2001MY
5	L	Destination	K: Right-hand drive for general market L: Left-hand drive for general market Y: Left-hand drive for United States, Canada, and Taiwan
6	7	Grade	3: Base 4: TS 5: GX 7: OUTBACK 8: WRX
7	R	Transmission, fuel feed system	G: SOHC MPI 5-speed MT K: SOHC MPI 5-speed MT R: SOHC MPI 4-speed AT P: DOHC B MPI 4-speed AT J: SOHC MPI 5-speed MT AWD D: DOHC B MPI 5-speed MT AWD

The engine and transmission type are as follows:

• Engine

EJ161RX3AA

Digits	Code	Meaning	Details
1 and 2	EJ	Engine type	EJ: 4 cylinders
3 and 4	16	Displacement	16: 1.6 L 20: 2.0 L
5	1	Fuel feed system	1: D-MPI SOHC-A 5: MPI Turbo
6	R	Detailed specifications	Used when ordering parts. See the parts catalog for details.
7	X	Transmission	W: MT X: AT
8 to 10	3AA	Detailed specifications	Used when ordering parts. See the parts catalog for details.

IDENTIFICATION

IDENTIFICATION

• Transmission

TV1B4A1AA

Digits	Code	Meaning	Details	
1	T	Transmission	T: Transmission	
2	V	Transmission type	A: FWD AT M: FWD MT Y: Full-time AWD MT center differential V: Full-time AWD AT center differential Z: Full-time AWD AT MPT	
3 and 4	1B	Classification	75: MT 1B: AT	
5	4	Series	MT	4: 5 MT
			AT	4: New AT
6	A	Transmission specifications	R: FWD MT S: Part-time AWD 5-speed MT Single range D: Part-time AWD 5-speed MT Dual range A: FWD AT 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 to 10	AAA	Detailed specifications	Used when ordering parts. See the parts catalog for details.	

• Rear differential 1

VA1REJ

Digits	Code	Meaning	Details
1	V	For AWD	V: AED
2	A	Type	A: A type
3	1	Hypoid gear diameter	1: 152 dia. 2: 160 dia.
4	R	Installation position	R: Rear
5	E	Reduction gear ratio	B: 3.900 E: 4.111 F: 4.444
6	J	Specification differences	J: Case B

• Rear differential 2

T1

Code	Reduction gear ratio	LSD
T1	3.900	No
T2	4.111	No
TP	4.444	No
BK	4.111	Viscous
BP	4.111	Viscous strengthened type
BL	4.444	Viscous strengthened type
CD	4.444	Viscous
VB	3.700	No

RECOMMENDED MATERIALS

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1. Recommended Materials

A: RECOMMENDED MATERIALS

1. GENERAL

To insure the best performance, always use the specified oil, gasoline, adhesive, sealant, etc. or that 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.

• 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.

• Leaded gasoline

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

RECOMMENDED MATERIALS

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

SAE viscosity	SAE viscosity No. and applicable temperature SAE J300								
Engine oil	(°C)	-30	-20	-10	0	10	20	30	40
	(°F)	-22	-4	14	32	50	68	86	104
			10W-30 or 10W-40						
			5W-30 Recommend						

GI0003A

RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

SAE viscosity	SAE viscosity No. and applicable temperature SAE J300
Manual transmission oil	(°C) -30 -20 -10 0 10 20 30 40 (°F) -22 -4 14 32 50 68 86 104
Rear differential	(°C) -30 -20 -10 0 10 20 30 40 (°F) -22 -4 14 32 50 68 86 104
Front differential	(°C) -30 -20 -10 0 10 20 30 40 (°F) -22 -4 14 32 50 68 86 104

GI0004A

GI0005A

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. The table below shows the ratio of coolant to distilled water.

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 and DENSO OIL 9.

Air conditioner	Recommended	Item number	Alternative
Refrigerant	HFC134a	—	None
Compressor oil	LHD: ZXL200PG RHD: DENSO OIL 9	—	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	- O2 sensor - Bolts, etc.	SUBARU CRC	004301003	—
Grease	MT main shaft	FX clutch grease	000040901	—
	Clutch master cylinder push rod	Slicolube G-40M	004404003	—
	- Steering shaft bearing - Gear shift bush	SUNLIGHT2	003602010	—
	Steering gear box	Valiant grease M-2	003608001	—
	Disc brake	Niglube RX-2	003606000 or 725191040	—
	Drum brake	Molykote No. 7439	72519460	—
	- Brake pad - Brake shoe	Molykote AS-880N	26298AC000	—
	Front axle SFJ	SSG-6003	28093TA000	—
	Front EBJ	NIG 2218	28093AA000	—
	Rear axle BJ	Molykote No. 2	723223010	—
	Rear axle DOJ	VU-3A702	23223GA050	—
	- Control cable - Throttle linkage - Water pump - 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
	Weatherstrip, rubber parts	Cemedine 5430L	—	3M's EC-1770 EC-1368
	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
	Engine case	Three Bond 1215	004403007	Dow Corning's No. 7038
	Transmission	Three Bond 1217B	K0877YA020	—
	Rear differential	Three Bond 1324	004403042	—
	Rear differential	Three Bond 1105	004403010	Dow Corning's No. 7038
	Weatherstrip	Starcalking B-33A	000018901	Butyl Rubber sealant
	Steering adjusting screw	Three Bond 1102	004403006	—
	SOHC cam cap	Three Bond 1280B	K0877YA018	—

RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

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 coating, visually check the vehicle body for damage and dents. If the protective coating has been removed, visually check the body paints for small areas of damage or stains. (2) Visually check the glass and light lenses for any damage and cracks or excessive gaps to the body sheet metal. (3) Visually check the plated parts for any damage.
2. Tire check	(4) Check the tires for damage, abnormal conditions, and dents on the wheels. (5) Check the tire air pressure.
3. Fuse installation	(6) If the vehicle is about to be delivered to the customer, attach a room lamp fuse.
4. Check the doors for lock/unlock and open/close operations.	(7) Using the key, check if the door can be locked and unlocked normally. (8) Open and close the all doors to see that there are no abnormal conditions.
5. Power window operation check	(9) Check the power window for correct operations.
6. Operation check of trunk lock release lever	(10) Operate the trunk lock release lever to check that the trunk opens normally.
7. Operation check of rear gate lock release lever	(11) Operate the rear gate lock release lever to check that the rear gate is unlocked normally.
8. Operation check of fuel lid opener lock release lever	(12) Operate the fuel lid opener to check that the fuel lid is unlocked normally.
9. Accessory check	Check the following accessories are provided: • Owner's manual • Warranty booklet • Service booklet • Spare key • Jack • Tool set • Spare tire
10. Operation check of hood lock release system	(1) Operate the hood lock release lever to check that the hood opens normally.
11. Connection of air conditioner harness	(2) If the vehicle is about to be delivered to the customer, connect the air conditioner harness.
12. Battery	(3) Check the battery for any abnormal conditions such as rust and trace of battery fluid leaks.
13. Brake fluid	(4) Check the fluid amount.
14. Engine oil	(5) Check the oil amount.
15. Transmission fluid	(6) Check the fluid amount. (7) For AT, check the front differential oil.
16. AT front differential oil	(8) Check the AT front differential oil amount.
17. Coolant	(9) Check the coolant amount.
18. Clutch fluid	(10) Check the clutch fluid amount.
19. Window washer fluid	(11) Check the window washer fluid amount.
20. Hood latch check	(12) Check that the hood is closed and latched securely.
21. Keyless entry system	(13) Check that the keyless entry system operates normally.
22. Seat	(14) Check the seat surfaces for smears or dirt. (15) Check the seat installation conditions and functionality.
23. Seat belt	(16) Check the seat belt installation conditions and functionality.
24. Wheel alignment	(17) Check that the wheel alignments are properly adjusted.

PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

Checks with the Engine Running

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

Dynamic Test with the Vehicle Running

Step	Check point
1. Brake test	(1) Check that the foot brake operates normally.
2. Parking brake	(2) Check that the parking brake operates normally.
3. AT shift control	(3) Check the AT shift patterns are correct.
4. Heater & ventilation	(4) Check that the heater & ventilation system operates normally.
5. Air conditioner	(5) Check that the air conditioner operates normally.
6. Cruise control	(6) 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	(2) Check that the power steering fluid level is normal.
3. Fluid leak check	(3) Check for fluid/oil leaks.
4. Water leak check	(4) Spray the vehicle with water and check for water leaks.
5. Appearance check 2	(5) Remove the protective coating (if any). (6) Check the body paints for damage and smears. (7) Check the plated parts for damage and rust.

1. APPEARANCE CHECK

- If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents.
- If there is no protective coating, check the body paints for small areas of damage or stains and repair as necessary.
- Check the window glass, door glass, and lights for any cracks or damage and repair or replace the parts as necessary.
- 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.

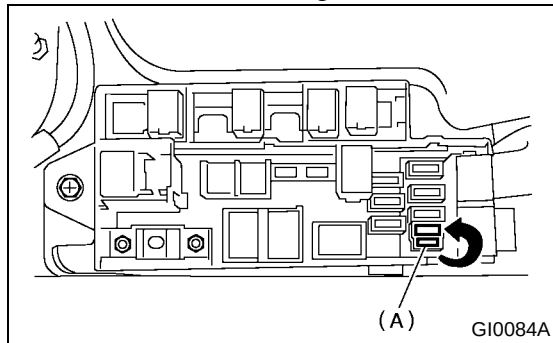
2. TIRE CHECK

- 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
175/70R14	220 (2.2, 32)	220 (2.2, 32)
185/70R14	220 (2.2, 32)	220 (2.2, 32)
195/60R15	220 (2.2, 32)	220 (2.2, 32)
215/45R17	230 (2.3, 33)	220 (2.2, 32)

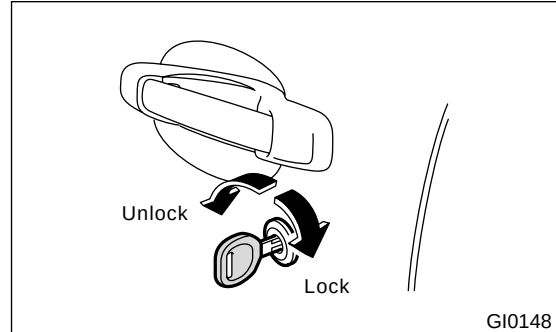
3. FUSE INSTALLATION

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. 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.



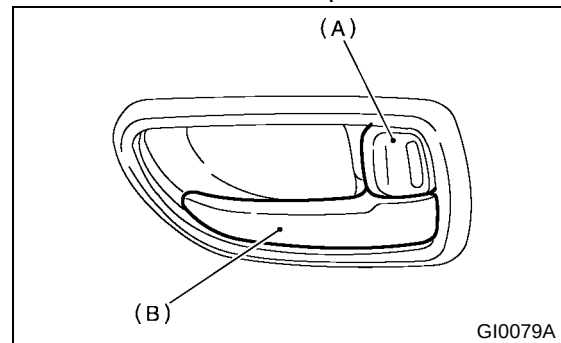
• Vehicles with manual door locks:

Sit in the driver seat, 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.

• Vehicles with power door locks:

Sit in the driver seat, close the driver's door completely, and place the door lock knob (A) to the lock position. Then pull the all inside door handles (B) 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.



5. 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.

6. OPERATION CHECK OF TRUNK LOCK RELEASE LEVER

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

PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

7. OPERATION CHECK OF REAR GATE LOCK RELEASE LEVER

Operate the rear gate lock release lever and verify that the rear gate is unlocked and opened smoothly.

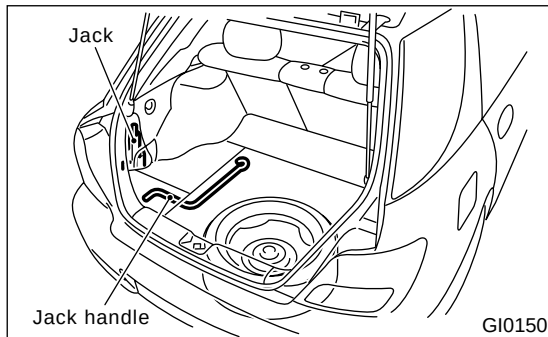
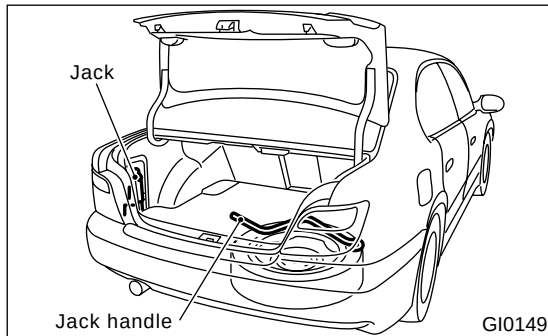
8. OPERATION CHECK OF FUEL LID OPENER LOCK RELEASE LEVER

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

9. ACCESSORY CHECK

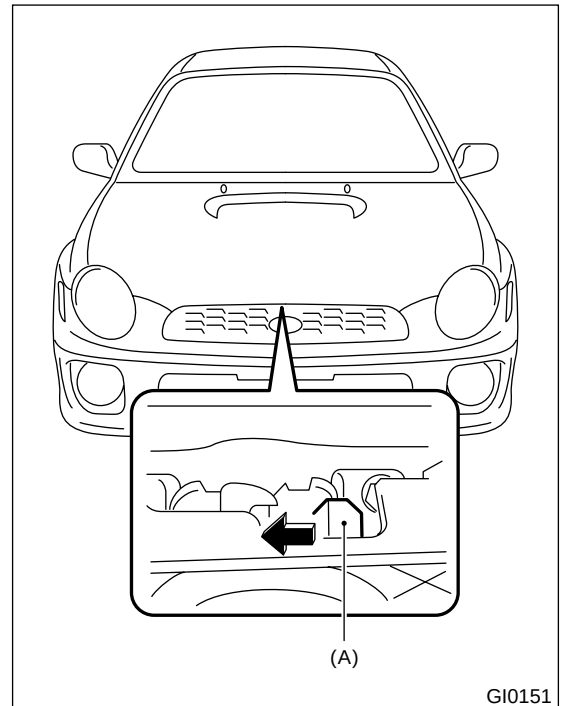
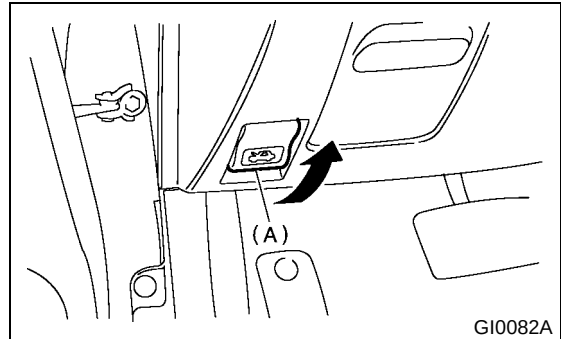
Check that the following accessories are provided in the luggage compartment or cargo area.

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



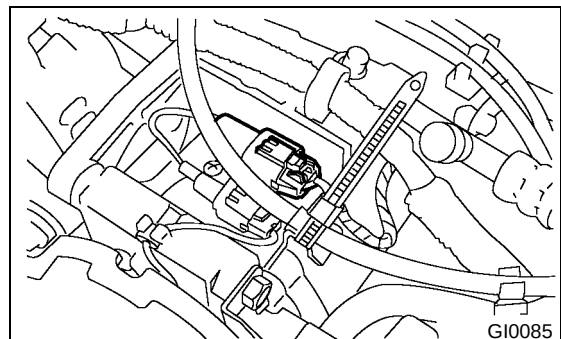
10. OPERATION CHECK OF HOOD LOCK RELEASE SYSTEM

Unlatch and open the hood while checking that no abnormal conditions are found. Then, support the hood with the hood stay.



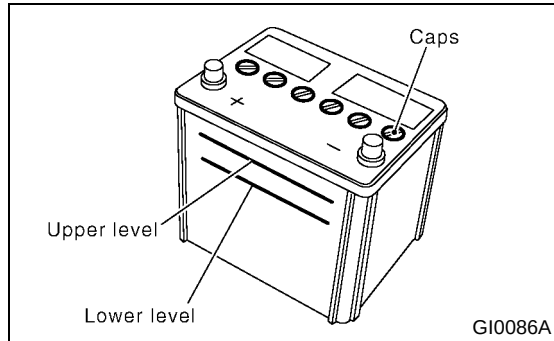
11. CONNECTION OF AIR CONDITIONER HARNESS

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



12.BATTERY

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

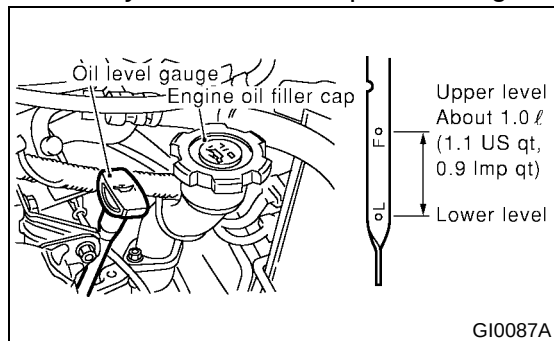


13.BRAKE FLUID

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.

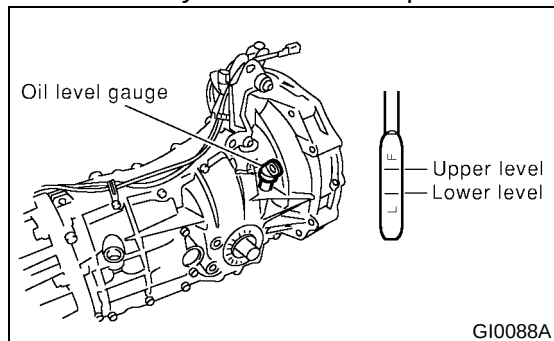
14.ENGINE OIL

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.



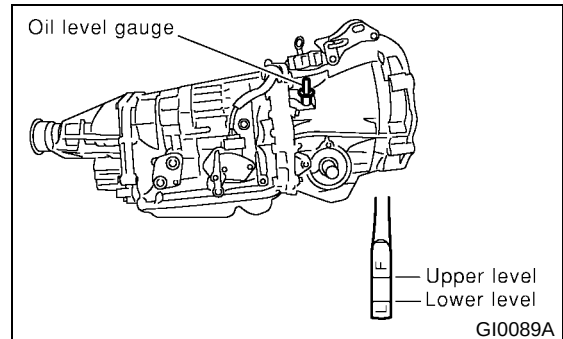
15.TRANSMISSION FLUID

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.



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.

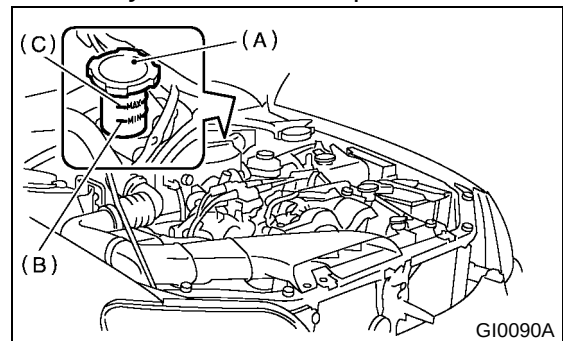


17.COOLANT

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.



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.HOOD LATCH CHECK

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

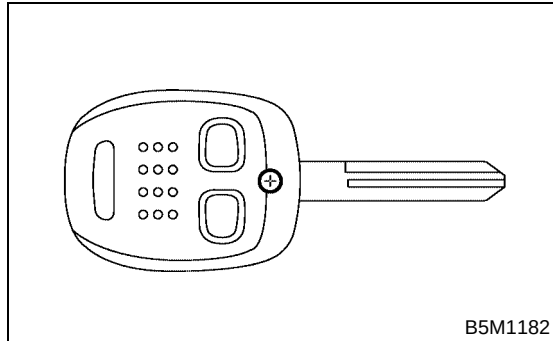
PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

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 once.



- Press the "OPEN" button on the transmitter momentarily once and check if the all doors 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.

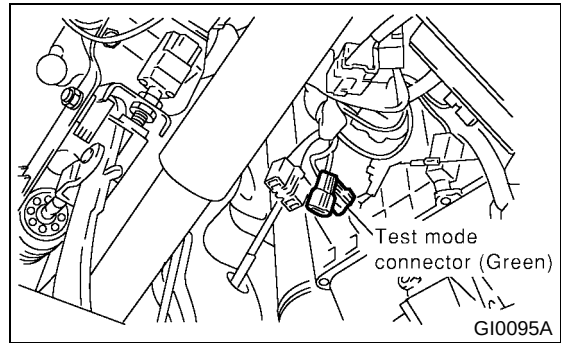
24.WHEEL ALIGNMENT

Check the wheel alignments. <Ref. to FS-8, Wheel Alignment.> and <Ref. to RS-10, Wheel Alignment, .>

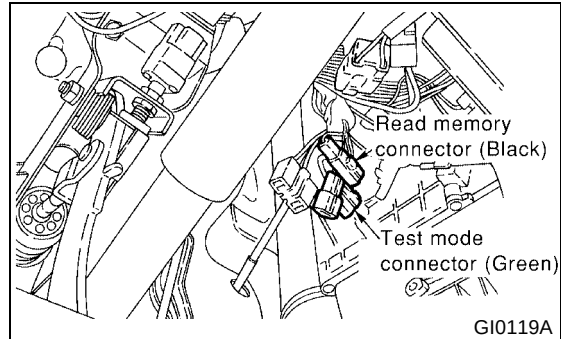
25.READ MEMORY AND TEST MODE CONNECTORS

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



Without OBD model



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

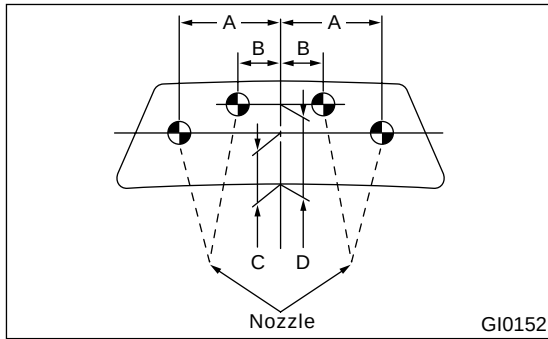
- Check the headlight operations.
- Check the brake light operations.
- Check the other lights for normal operations.

33.WINDOW WASHER

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

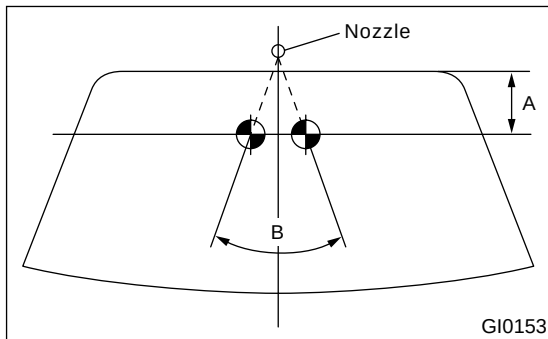
Front Injection position:

- A: 350mm (13.78 in)N·m
- B: 162mm (5.91 in)N·m
- C: 300mm (11.81 in)N·m
- D: 500mm (23.62 in)N·m



Rear Injection position:

- A: 39 mm (2.36 in)N·m
- B: 72°



34.WIPER

Check the front and rear wipers for normal operations.

35.BRAKE TEST

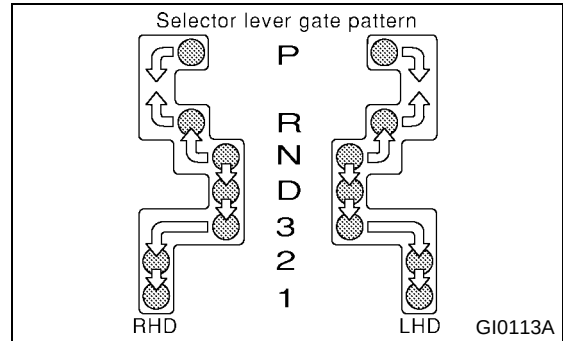
Check the foot brake for normal operations.

36.PARKING BRAKE

Check the parking brake for normal operations.

37.AT SHIFT CONTROL

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



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

38.HEATER & VENTILATION

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

39.AIR CONDITIONER

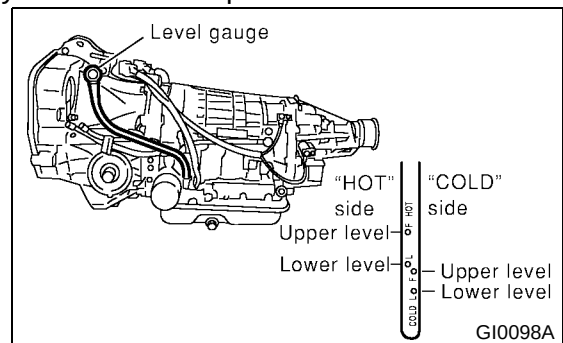
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

40.CRUISE CONTROL

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

41.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.

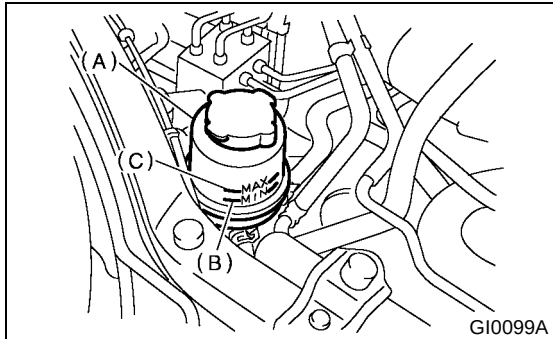


PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

42. 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.



43. FLUID LEAK CHECK

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

44. 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.

45. APPEARANCE CHECK 2

Check the vehicle body paints, plated faces, glass, and lenses for any dirt or damage.

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. MAINTENANCE SCHEDULE 1 – (1)

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		R	R	R	R	
2	Engine oil filter		R	R	R	R	

2. MAINTENANCE SCHEDULE 1 – (2)

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				R	
		Others		R		R	
4	Drive belt(s)		I	I	I	I	
5	Camshaft drive belt					R	
6	Valve clearance	Use in Europe countries					Inspect every 100,000 km (60,000 miles)
		Use in others					Inspect every 160,000 km (100,000 miles)
7	Fuel line			I		I	
8	Fuel filter					R	
9	Air cleaner element		I	R	I	R	
10	Cooling system			I		I	
11	Coolant			R		R	
12	Idle mixture		I	I	I	I	For models without catalyst converter
13	Clutch system		I	I	I	I	
14	Hill-holder system		I	I	I	I	
15	Transmission oil			R		R	
16	ATF			R		R	
17	Front & rear differential oil			R		R	
18	Brake line			I		I	
19	Brake fluid			R		R	
20	Disc brake pads & discs		I	I	I	I	
21	Brake linings and drums			I		I	
22	Parking brake		I	I	I	I	

SCHEDULE

PERIODIC MAINTENANCE SERVICES

			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	
23	Suspension			I	I	I	I	
24	Wheel bearing						(I)	
25	Axle boots & joints			I	I	I	I	
26	Steering system (Power steering)			I	I	I	I	

Symbols used:

R: Replace

I: Inspection

(R) or (I): Recommended service for safe vehicle operation.

NOTE:

- (1) Periodic inspection and replacement of the camshaft drive chains on the 3.0 liter models are not required.
- (2) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.
- (3) ATF filter is maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.

SCHEDULE

PERIODIC MAINTENANCE SERVICES

B: MAINTENANCE SCHEDULE 2

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				I		
	12,500 km						
	7,500 miles						
Transmission oil							Replace more frequently
ATF							Replace more frequently
Front & rear differential oil							Replace more frequently
Brake line	6 months	I	I		I		I
	12,500 km						
	7,500 miles						
Brake fluid	12 months					R	
	25,000 km						
	15,000 miles						
Brake pads	6 months	I	I		I		I
	12,500 km						
	7,500 miles						
Brake linings and drums	6 months	I	I		I		I
	12,500 km						
	7,500 miles						
Parking brake	6 months	I	I		I		I
	12,500 km						
	7,500 miles						
Suspension	6 months		I	I	I		I
	12,500 km						
	7,500 miles						
Axle boots & joints	6 months	I	I	I	I		I
	12,500 km						
	7,500 miles						
Steering system (Power steering)	6 months	I	I	I	I		I
	12,500 km						
	7,500 miles						

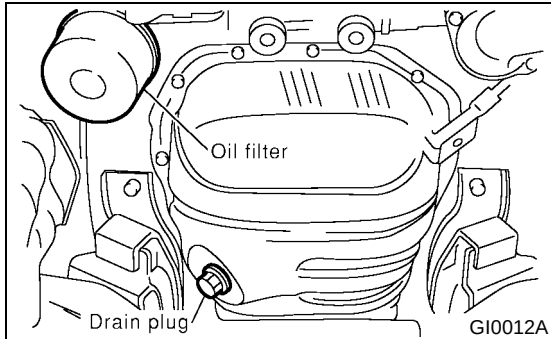
ENGINE OIL

PERIODIC MAINTENANCE SERVICES

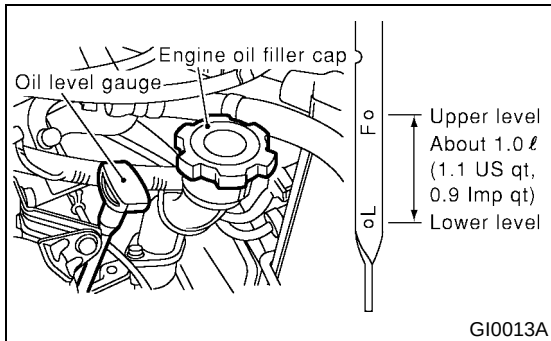
3. Engine Oil

A: REPLACEMENT

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



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

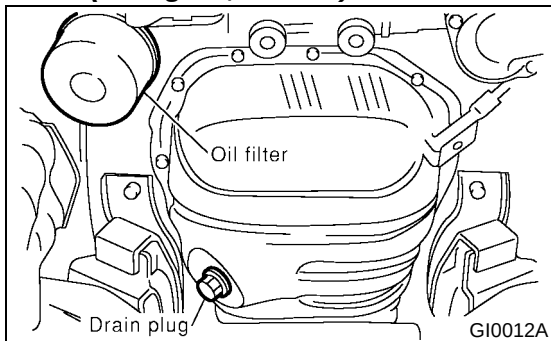


3) Replace drain plug gasket.

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 capacity (Non-TURBO model):

Upper level

4.0 l (4.2 US qt, 3.5 Imp qt)

Lower level

3.0 l (3.2 US qt, 2.6 Imp qt)

Engine oil capacity (TURBO model):

Upper level

4.5 l (4.8 US qt, 4.0 Imp qt)

Lower level

3.5 l (3.7 US qt, 3.1 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							

GI0015A

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: SJ or SH

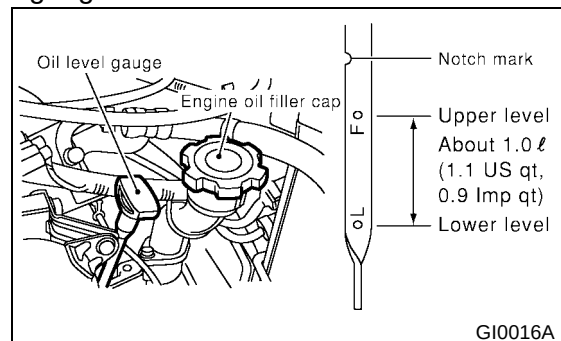
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

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.



B: INSPECTION

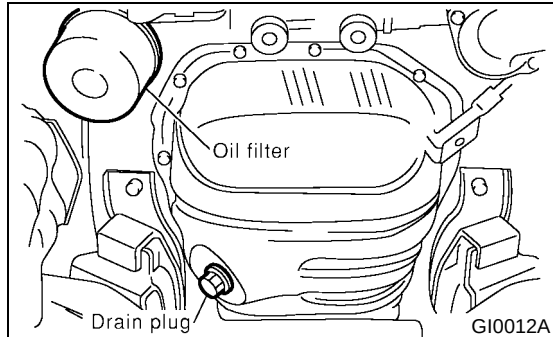
- 1) Park vehicle on a level surface.
- 2) Remove oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the engine oil level is below the "L" line, add 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) Remove oil filter with ST.

ST 498547000 OIL FILTER WRENCH



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 oil pump case. 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:

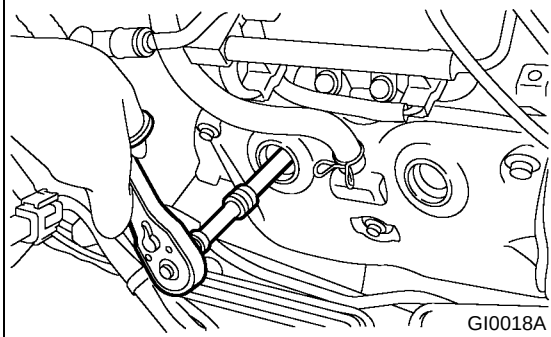
The filter element and filter case are permanently joined; therefore, interior cleaning is not necessary.

6) Check the engine oil level. <Ref. to PI-3, PDI PROCEDURE, Pre-delivery Inspection.>

5. Spark Plugs

A: REPLACEMENT

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



- 5) Set new spark plug.

Recommended spark plug :

SOHC

CHAMPION RC10YC4

CHAMPION RC8YC4

NGK BKR6E-11

NIPPONDENSO K20PR-U11

Spark plug gap

1.0 — 1.1 mm (0.039 — 0.043 in)

SOHC 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)

DOHC Turbo

NGK PFR6B

Spark plug gap

0.7— 0.8 mm (0.028 — 0.031 in)

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

Tightening torque:

20.6 N·m (2.10 kgf·m, 15.19 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.

6. Drive Belt(s)

A: INSPECTION

- 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 — 9 mm (0.276 — 0.354 in)

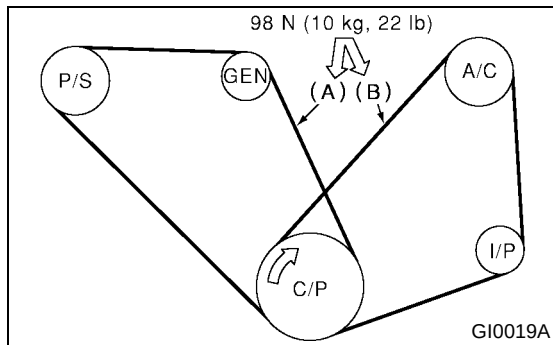
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

(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.

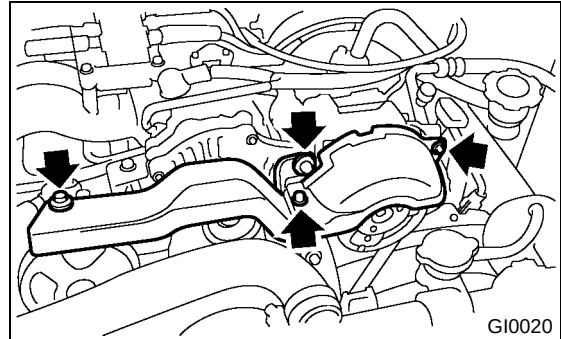


C/P	Crankshaft pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

B: REPLACEMENT

1. V-BELT COVER

- 1) Remove V-belt cover.



2. FRONT SIDE BELT (DRIVING POWER STEERING OIL PUMP AND GENERATOR)

NOTE:

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

- 1) Loosen the lock bolt (A).
- 2) Loosen the slider bolt (B).
- 3) Remove the front side belt (C).
- 4) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
- 5) Tighten the slider bolt (B).
- 6) Tighten the lock bolt (A).

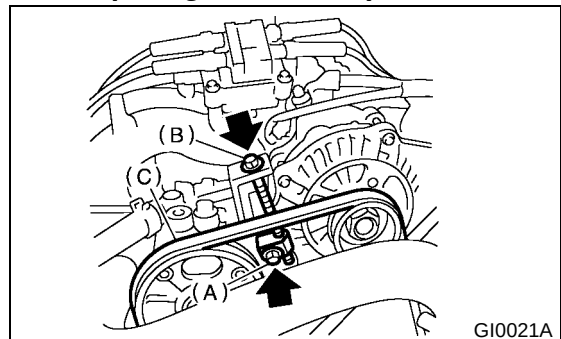
Tightening torque:

Lock bolt, through bolt:

25 N·m (2.5 kgf·m, 18 ft·lb)

Slider bolt:

8 N·m (0.8 kgf·m, 5.8 ft·lb)



3. REAR SIDE BELT (DRIVING AIR CONDITIONER)

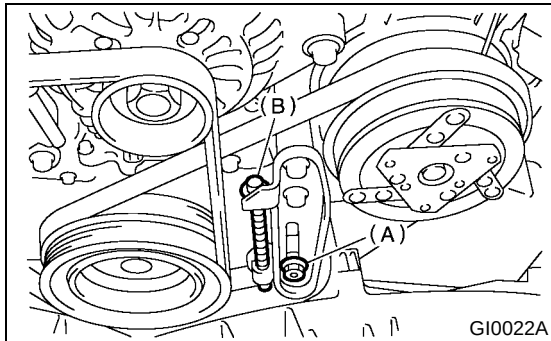
NOTE:

- Wipe off any oil or water on the belt and pulley.
- Before removing the rear side belt, remove the front side belt.

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).
- 3) Remove the rear side belt.
- 4) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
- 5) Tighten the slider bolt (B).
- 6) Tighten the lock nut (A).

Tightening torque:

22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



CAMSHAFT DRIVE BELT

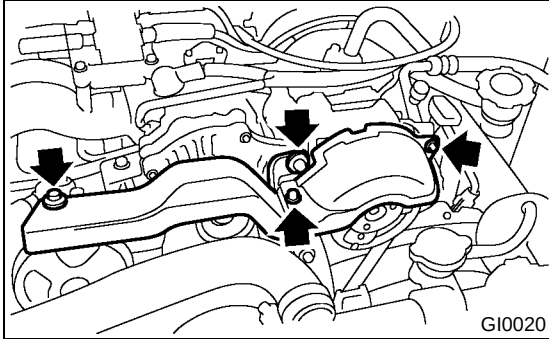
PERIODIC MAINTENANCE SERVICES

7. Camshaft Drive Belt

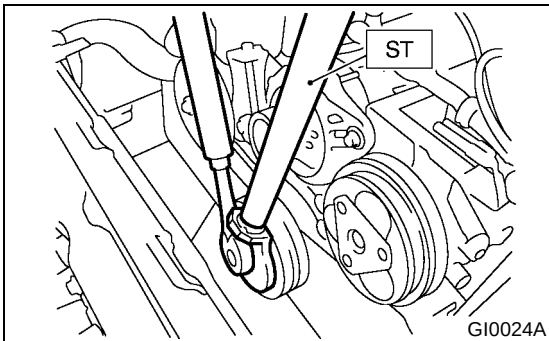
A: REPLACEMENT

1. SOHC MODEL

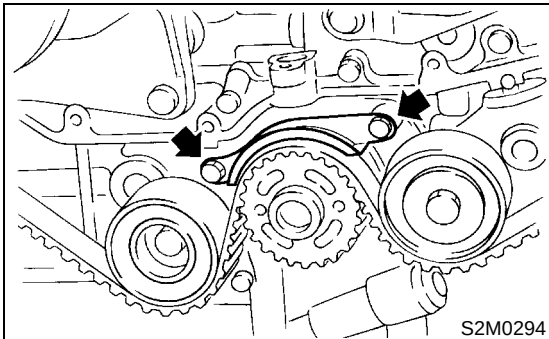
- 1) Remove radiator fan <Ref. to CO-9, Radiator Main Fan System.> and air conditioner fan. <Ref. to CO-17, Radiator Sub Fan System.>
- 2) Remove V-belt cover.



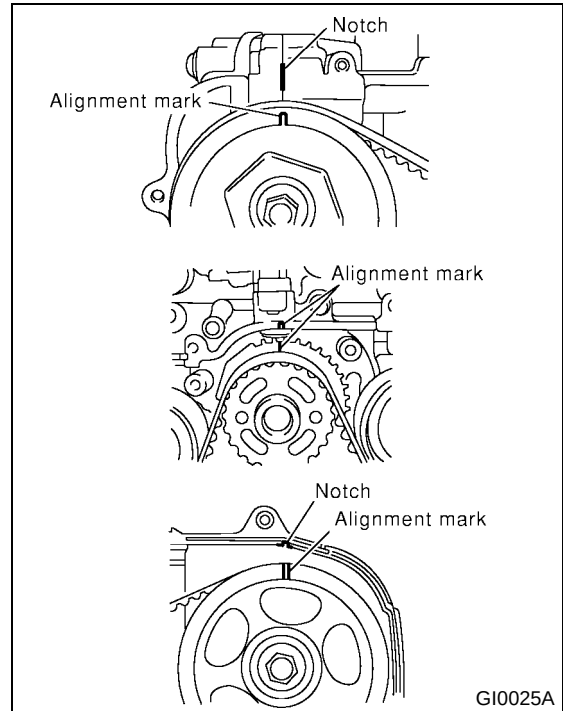
- 3) Remove V-belts. <Ref. to ME(SOHC)-42, V-belt.>
- 4) Remove air conditioning compressor drive belt tensioner.
- 5) Remove pulley bolt. To lock crankshaft use ST. ST 499977100 CRANKSHAFT PULLEY WRENCH



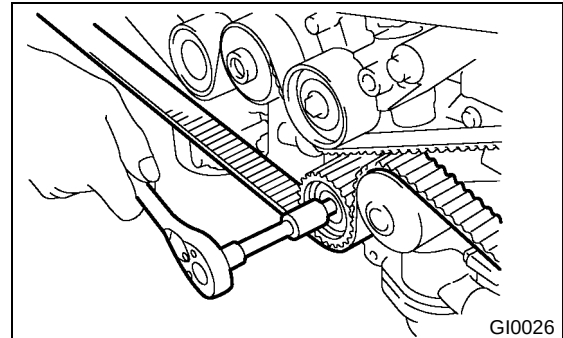
- 6) Remove crankshaft pulley.
- 7) Remove left side belt cover.
- 8) Remove front belt cover.
- 9) Remove timing belt guide. (MT vehicle only)



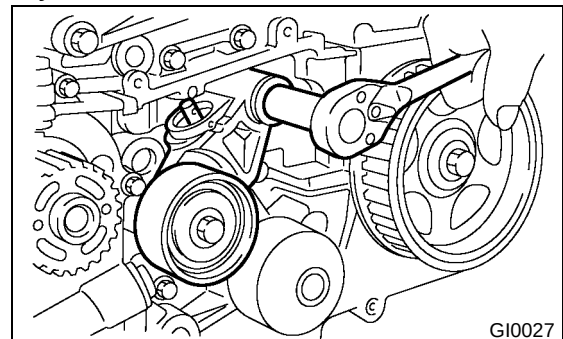
- 10) Turn crankshaft and align alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block:
ST 499987500 CRANKSHAFT SOCKET



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



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

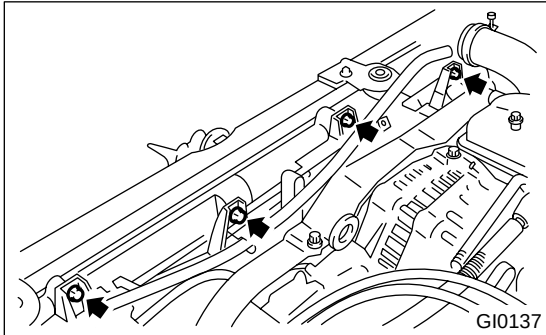


CAMSHAFT DRIVE BELT

PERIODIC MAINTENANCE SERVICES

2. DOHC MODEL

1) Remove radiator fan and air conditioner fan.

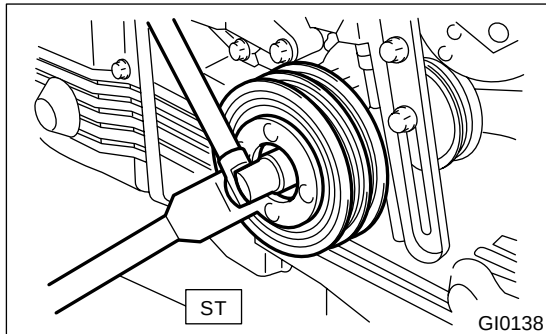


2) Remove V-belts. <Ref. to ME(DOHC TURBO)-43, V-belt.>

3) Remove air conditioning compressor drive belt tensioner.

4) Remove pulley bolt. To lock crankshaft use ST.

ST 499977300 CRANKSHAFT PULLEY WRENCH



5) Remove crankshaft pulley.

6) Remove air conditioning compressor drive belt tensioner.

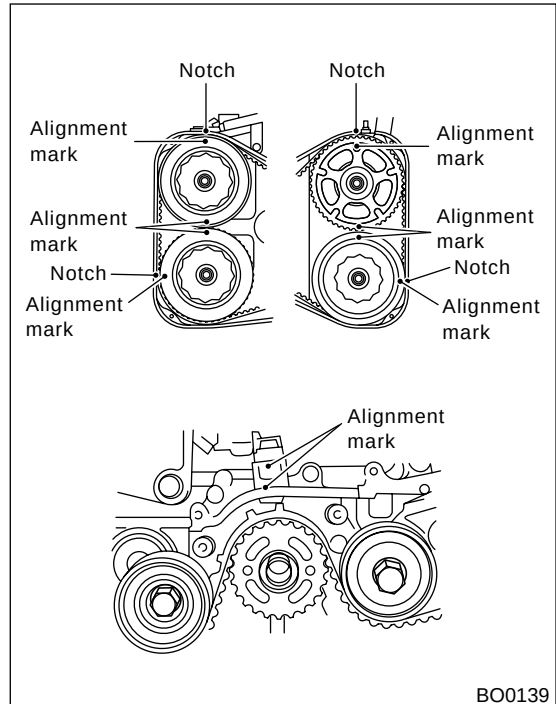
7) Remove left side belt cover.

8) Remove right side belt cover.

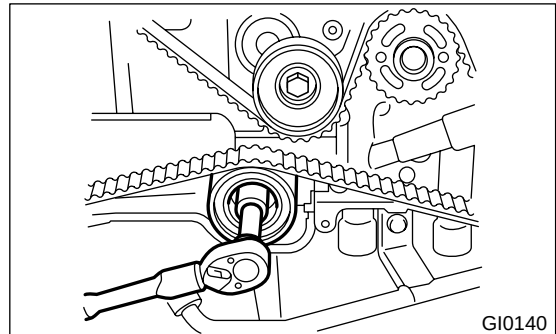
9) Remove front belt cover.

10) Turn crankshaft and align alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block. To turn crankshaft, use ST:

ST 499987500 CRANKSHAFT SOCKET

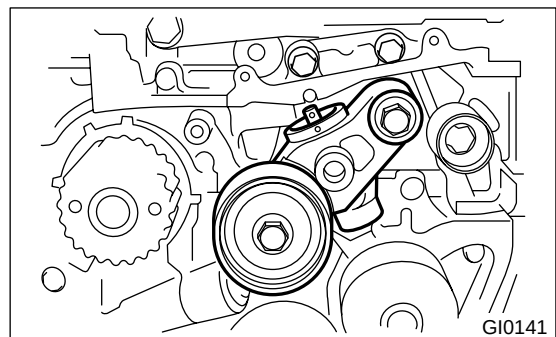


11) Remove belt idler.



12) Remove timing belt.

13) Remove automatic belt tension adjuster assembly.



CAMSHAFT DRIVE BELT

PERIODIC MAINTENANCE SERVICES

B: INSTALLATION

1. SOHC MODEL

To install, reverse order of removal procedures.
<Ref. to ME(SOHC)-46, Timing Belt Assembly.>

2. DOHC MODEL

To install, reverse order of removal procedures.
<Ref. to ME(DOHC TURBO)-47, Timing Belt Assembly.>

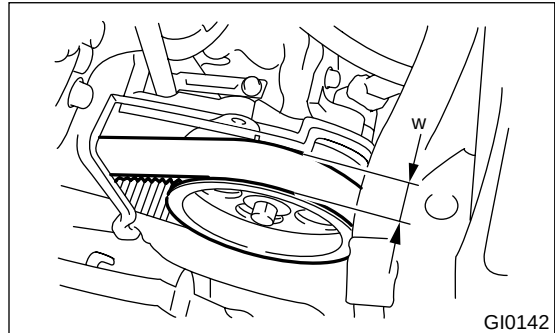
CAUTION:

When installing the timing belt, be sure to align all alignment marks on the belt with corresponding marks on the sprockets. If incorrectly installed, interference between pistons and valves may occur.

C: INSPECTION

1. SOHC MODEL

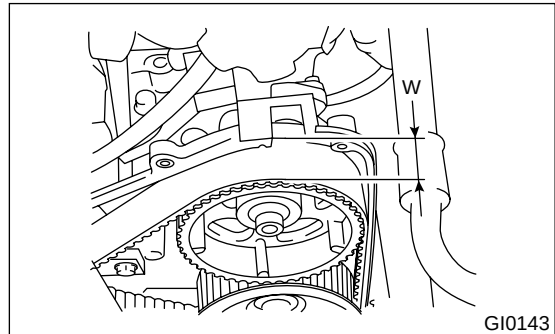
- 1) Remove left and right timing belt covers.
- 2) While cranking engine at least four rotations, check timing belt back surface for cracks or damage. Replace faulty timing belt as needed.
- 3) Measure timing belt width W. If it is less than 27 mm (1.06 in), check idlers, tensioner, water pump pulley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



- 4) Install left and right timing belt covers.

2. DOHC MODEL

- 1) Remove left and right timing belt covers.
- 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 30 mm (1.18 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace worn timing belt.
- 4) Install left and right timing belt covers.



8. Valve Clearance

A: INSPECTION

For the inspection procedures of the valve clearance: <Ref. to ME(SOHC)-29, Valve Clearance.>
or <Ref. to ME(DOHC TURBO)-28, Valve Clearance.>

9. 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. <Ref. to FU(SOHC)-64, Fuel Delivery, Return and Evaporation Lines.> or <Ref. to FU(SOHCw/oOBD)-60, Fuel Delivery, Return and Evaporation Lines.> or <Ref. to FU(DOHC TURBO)-64, Fuel Delivery, Return and Evaporation Lines.>

10.Fuel Filter

A: REPLACEMENT

For fuel filter replacement procedures, refer to “FU” section.

<Ref. to FU(SOHC)-61, Fuel Filter.> or <Ref. to FU(SOHCw/oOBD)-57, Fuel Filter.> or <Ref. to FU(DOHC TURBO)-61, Fuel Filter.>

AIR CLEANER ELEMENT

PERIODIC MAINTENANCE SERVICES

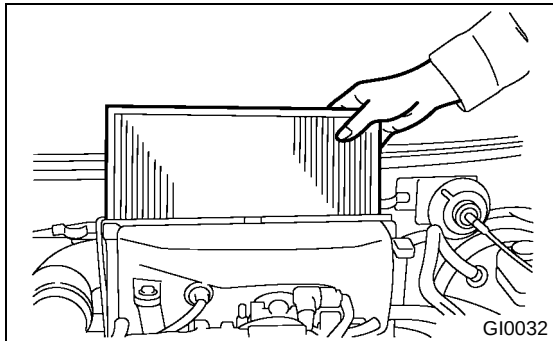
11. Air Cleaner Element

A: REPLACEMENT

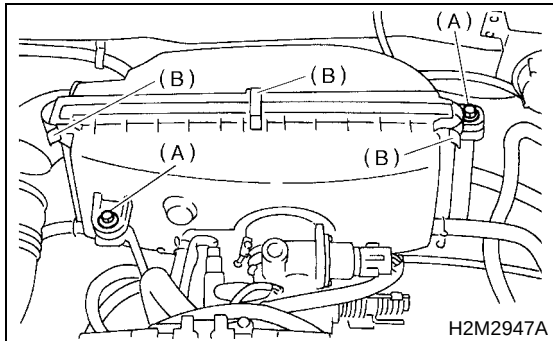
NOTE:

Do not attempt to clean the air cleaner element. The filter paper of the element is wetted with a special non-inflammable slow-evaporating viscous liquid. It is resistant to cold weather and has a long service life. Dirt adhering to this filter paper forms porous laminations with the viscous liquid, which function as a filtration layer to reduce dust penetration into the filter paper. If this filter paper is cleaned, the filtration layer thus formed will be lost along with the viscous liquid.

1. NON-TURBO MODEL



- 1) Remove bolt (A) which install air cleaner case to stays.
- 2) Remove the clip (B) above the air cleaner case.

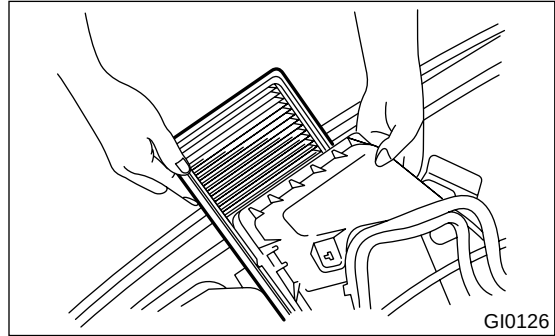


- 3) Remove air cleaner.
- 4) Install in the reverse order of removal.

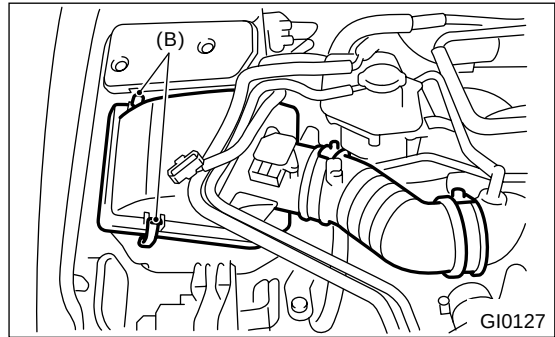
CAUTION:

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

2. TURBO MODEL



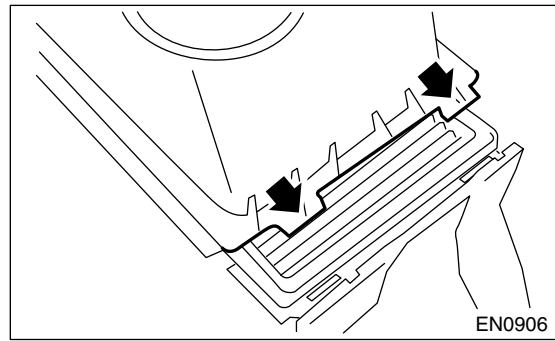
- 1) Remove the clip (B) above the air cleaner case.



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

CAUTION:

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



12. Cooling System

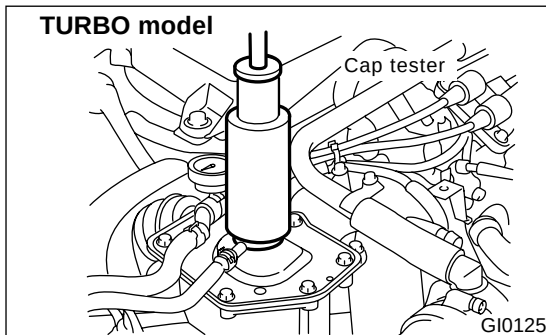
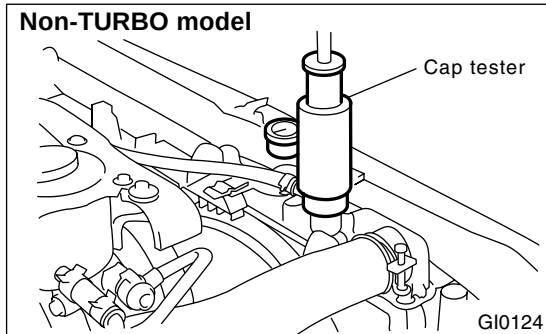
A: INSPECTION

1) Check radiator for leakage, filling it with coolant and attach radiator cap tester 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.



- 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.

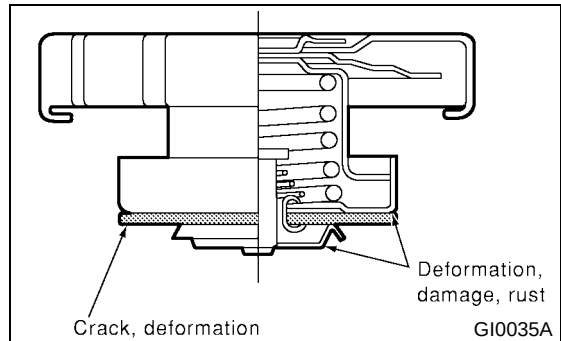
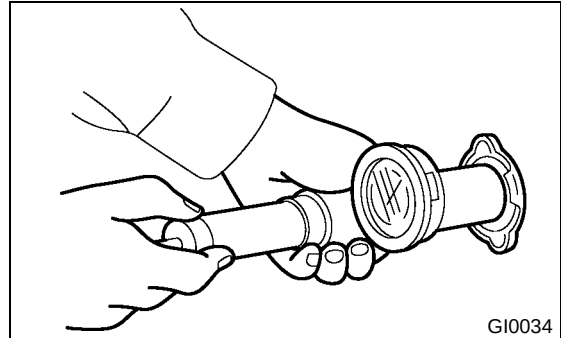
Radiator cap valve open pressure

Standard value:

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

Service limit:

83 kPa (0.85 kg/cm², 12 psi)



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 90 to 94°C (194 to 201°F), check thermostitch or fan motor.

13. Coolant

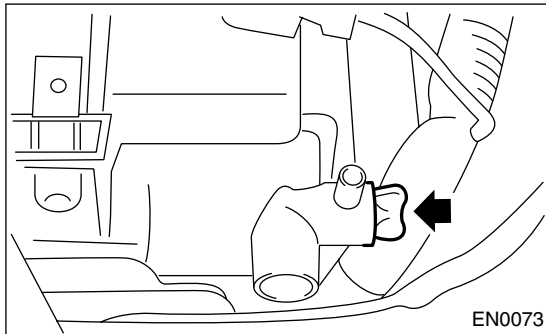
A: REPLACEMENT

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 (A) to drain engine coolant into container.



- 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 capacity (fill up to "FULL" level)

1.6 L AT model:

Approx. 7.3 L (7.7 US qt, 6.4 Imp qt)

1.6 L MT model:

Approx. 7.4 L (7.8 US qt, 6.5 Imp qt)

Non-turbo 2.0 L AT model:

Approx. 6.9 L (7.3 US qt, 6.1 Imp qt)

Non-turbo 2.0 L MT model:

Approx. 7.0 L (7.4 US qt, 6.2 Imp qt)

Turbo model:

Approx. 7.7 L (8.1 US qt, 6.8 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.

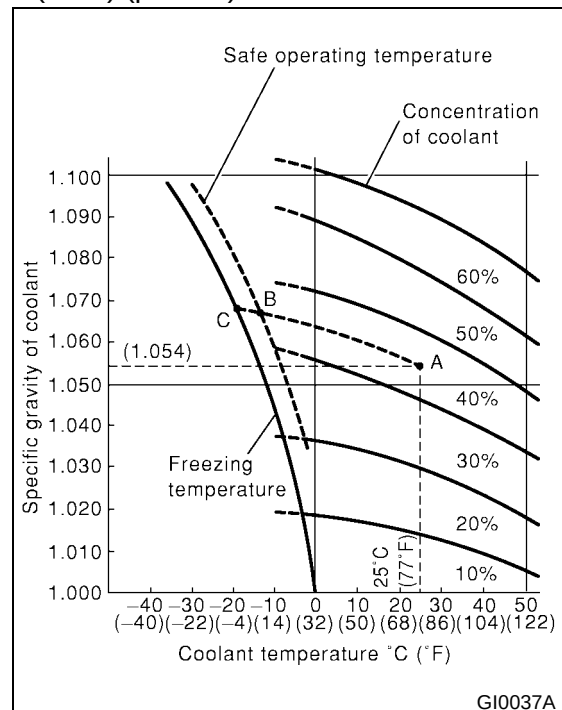
12) After adding coolant, securely install radiator and reservoir tank caps.

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

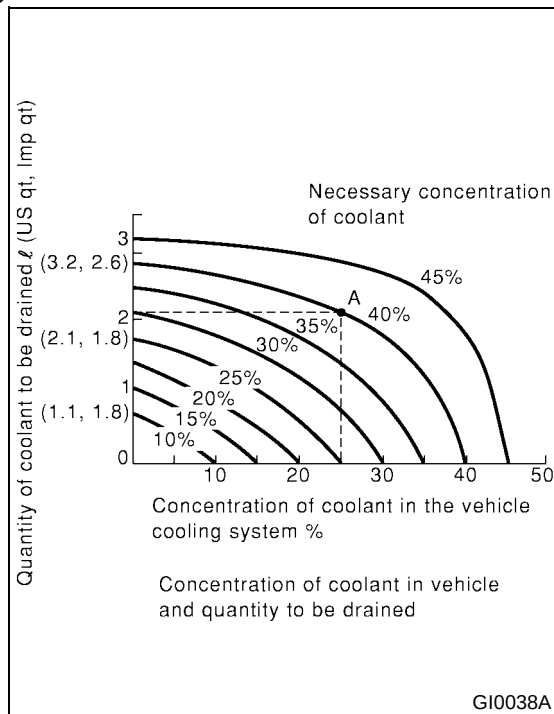
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).

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.



14.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.

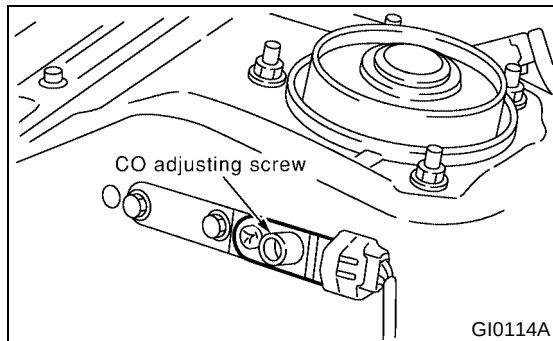
5) After adjusting the CO value, check and adjust increment coefficient of CO resistor by using Select Monitor.

(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.

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.

15. Clutch System

A: INSPECTION AND ADJUSTMENT

1. MECHANICAL CLUTCH TYPE

1) Inspect free play of clutch pedal by operating pedal by hand.

If it is out of the specified value, adjust it by turning wing nut on engine side of clutch cable at release fork.

Tightening torque

(Adjusting nut on release fork):

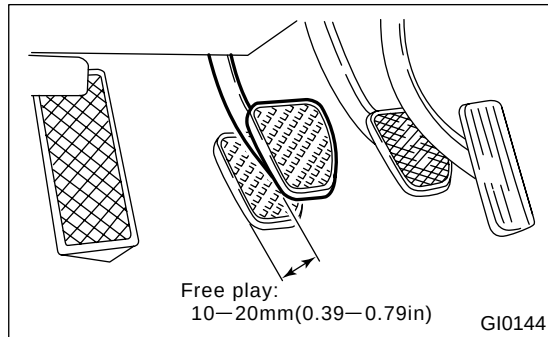
4.4 — 7.4 N·m

(0.45 — 0.75 kgf-m, 3.3 — 5.4 ft-lb)

Standard free play:

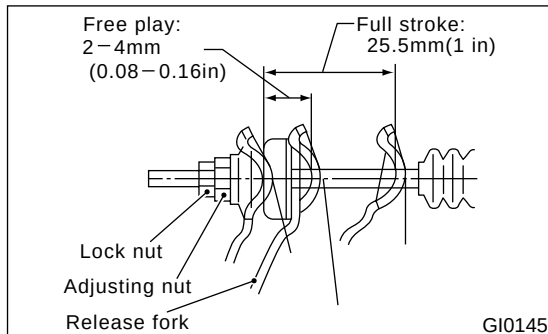
AT clutch pedal

10 — 20 mm (0.39 — 0.79 in)



Fork lever free play allowance:

2 — 4 mm (0.08 — 0.16 in)



2) Pedal-to-floor plate gap in disengaged position.

(1) With the engine idling, pull parking brake lever completely.

(2) Slowly depress clutch pedal while moving shift lever into reverse.

(3) Stop depressing clutch pedal when gear-shifting is complete. With clutch pedal in this position, measure the distance between the upper side of pedal pad and the lower end of front panel (intersection of front panel with floor). Check that the measured value is within the specified standard.

Standard:

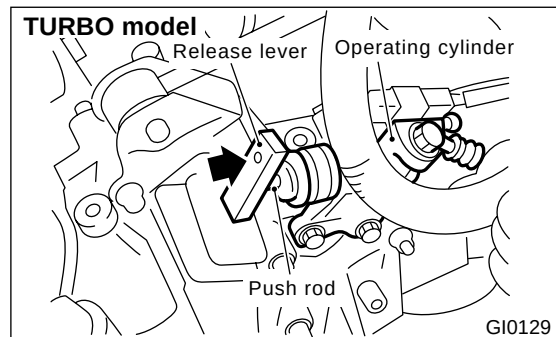
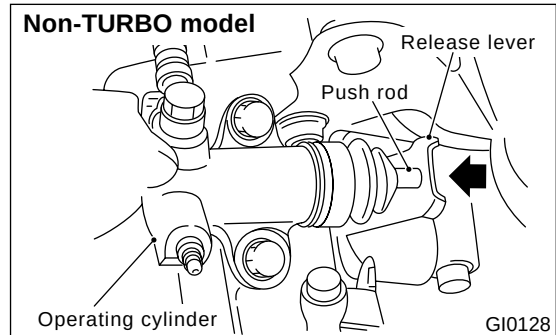
80 mm (3.15 in) or more

3) Pedal height

Check that the clutch pedal pad surface is level with or higher than brake pedal pad surface.

2. HYDRAULIC CLUTCH TYPE

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.



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-32, 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

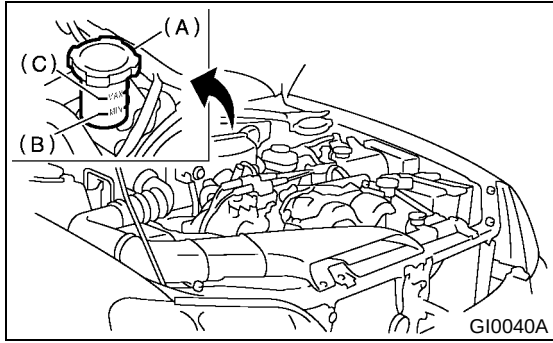
NOTE:

- Avoid mixing different brands of brake fluid to prevent degradation of the fluid.

CLUTCH SYSTEM

PERIODIC MAINTENANCE SERVICES

- Be careful not to allow dirt or dust to get into the reservoir tank.



16. 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.

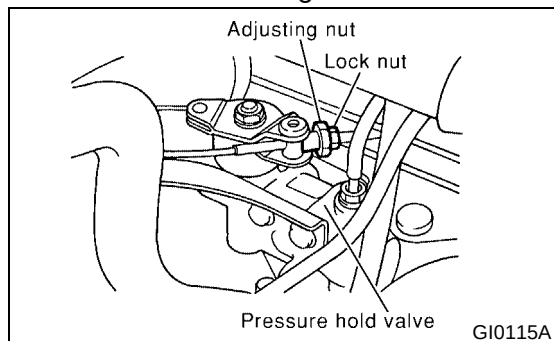
(1) When vehicle does not stop;
Tighten adjusting nut of PHV cable.

(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.



17. Transmission Oil

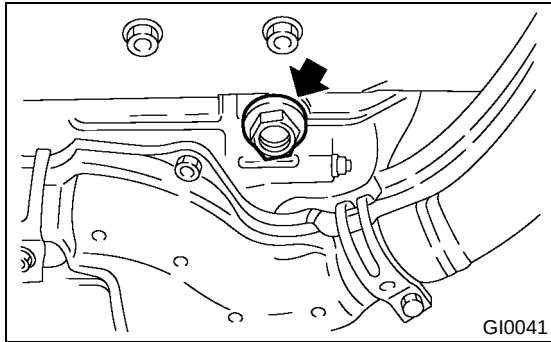
A: REPLACEMENT

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.



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:

- 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 transmission gear oil through the oil level gauge hole up to the upper point of level gauge.

Gear oil capacity:

FWD model

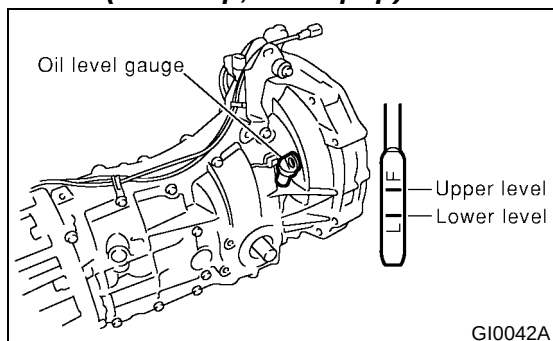
3.3 ℓ (3.5 US qt, 2.9 Imp qt)

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)



18.ATF

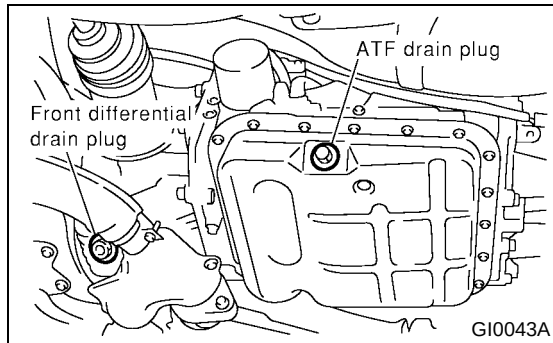
A: REPLACEMENT

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.



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

Tightening torque:

24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole.

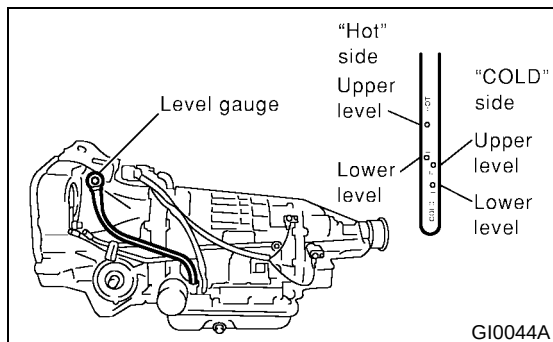
Recommended fluid:

Dexron III type automatic transmission fluid

Fluid capacity:

Fill the same amount drained from ATF drain plug hole.

4) Run the vehicle until the ATF temperature rises to 60 to 80°C (140 to 176°F) and check the ATF level.



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-43, ATF Filter.>

FRONT & REAR DIFFERENTIAL OIL

PERIODIC MAINTENANCE SERVICES

19. Front & Rear Differential Oil

A: REPLACEMENT

1. FRONT DIFFERENTIAL (MANUAL TRANSMISSION)

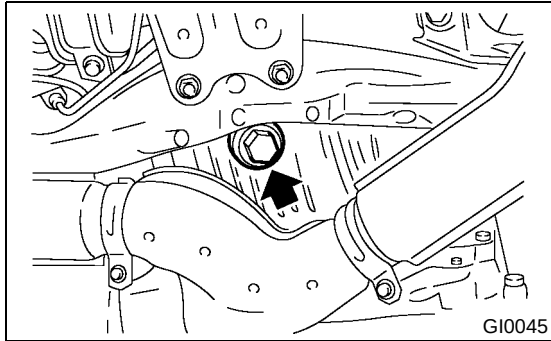
For M/T vehicle, manual transmission oil works as differential oil to lubricate differential. Refer to "Transmission Oil". <Ref. to PM-26, Transmission Oil.>

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.



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)

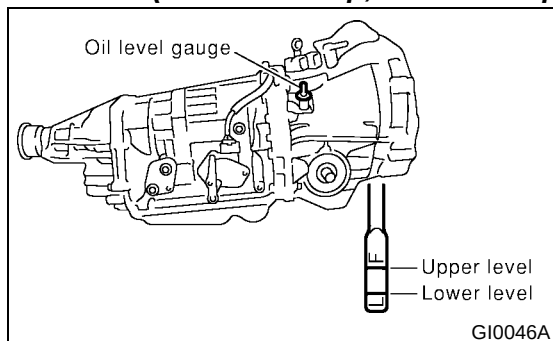
NOTE:

- 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)



3. REAR DIFFERENTIAL

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

NOTE:

- Apply fluid packing to drain plug threads before installation in Except Non-TURBO AT model.
- Non-TURBO AT model uses a new aluminum gasket.

Fluid packing:

Three Bond 1105

Tightening torque:

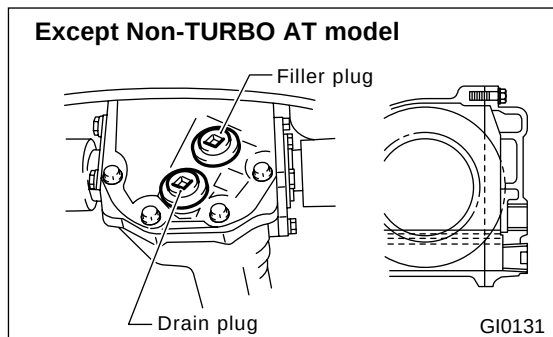
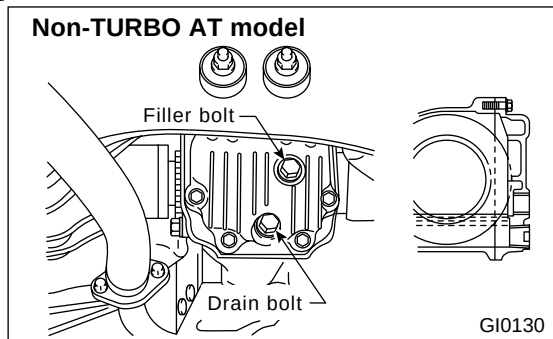
Except Non-TURBO AT model:

49.0 N·m (5.0 kgf·m, 36.2 ft·lb)

Non-TURBO AT model:

34 N·m (3.5 kgf·m, 25.3 ft·lb)

4) After installing drain plug onto rear differential gear case firmly, fill oil up fully to the mouth of filler 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 in Except Non-TURBO AT model.
- Non-TURBO AT model uses a new aluminum gasket.

Fluid packing:

Three Bond 1105

Tightening torque:

Except Non-TURBO AT model:

49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

Non-TURBO AT model:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

20.Brake Line

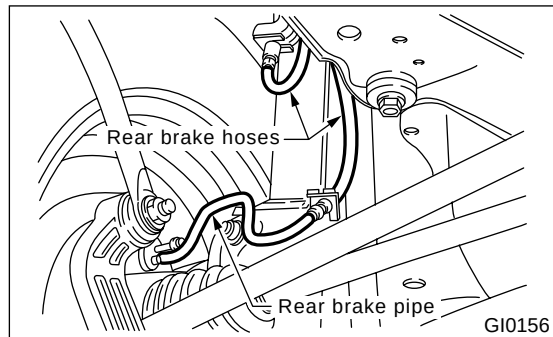
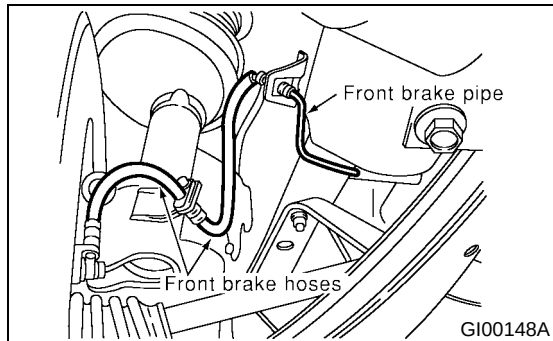
A: INSPECTION

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.



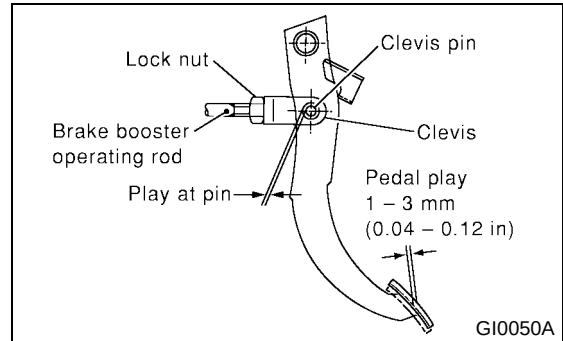
B: CHECKING

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)



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

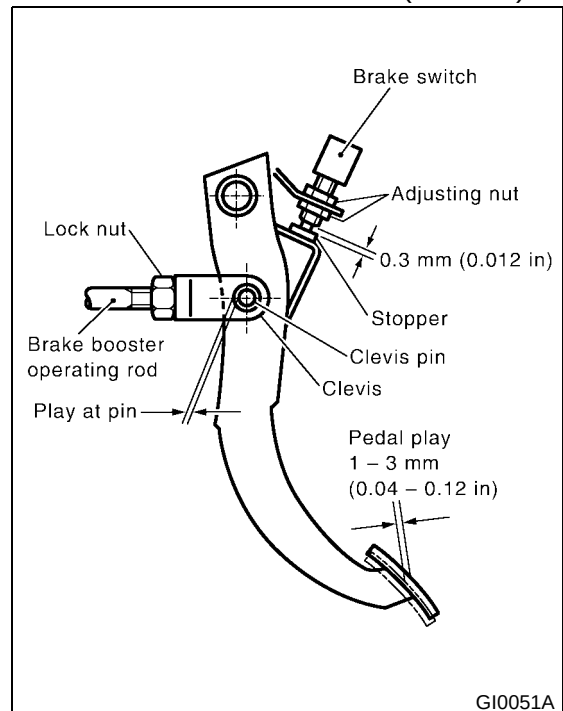
(1) Be sure engine is off. (No vacuum is applied to brake booster.)

(2) There should be play between brake booster clevis and pin at brake pedal installing portion.

[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).]

(3) Depress the surface of brake pad by hand.

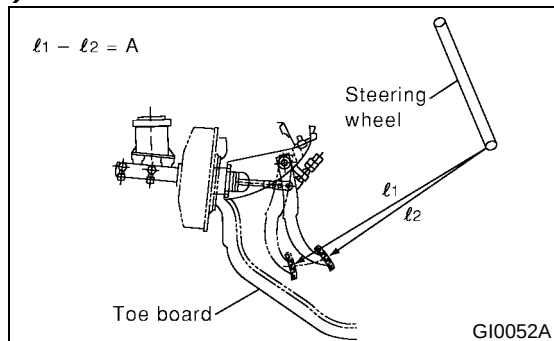
(4) If there is no free play between clevis pin and clevis, turn brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).



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)



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.

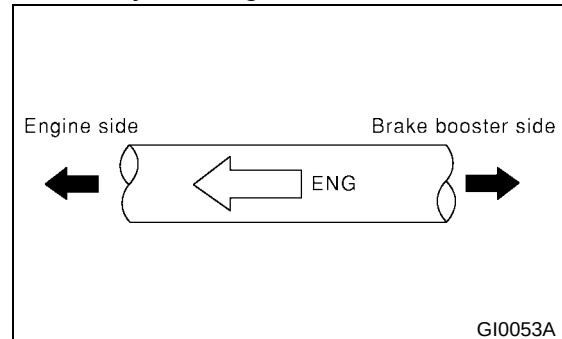
2) With the brake pedal depressed, start the engine: Make sure the pedal should move slightly toward the floor.

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 "ENGINE" as shown.



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.

21.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.

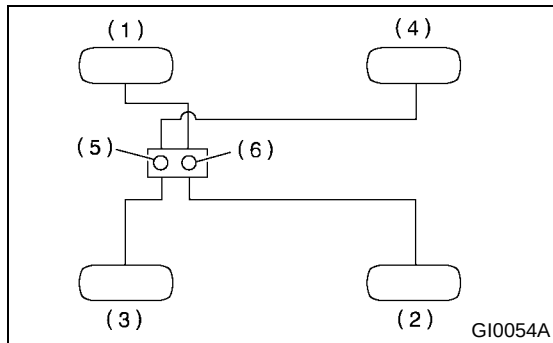
Recommended brake fluid:

FMVSS No. 116, fresh DOT3 or 4 brake fluid

NOTE:

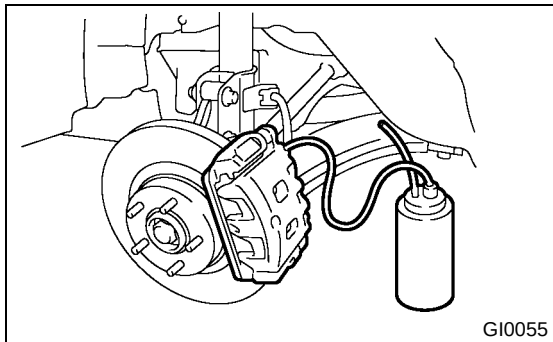
- Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

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 reserve 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 mℓ (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.

22.Disc Brake Pads and Discs

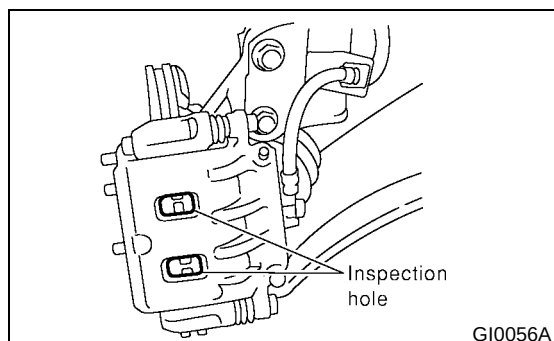
A: INSPECTION

1. DISC BRAKE PAD AND DISC

1) Jack up vehicle and support with rigid racks. Then remove wheels.

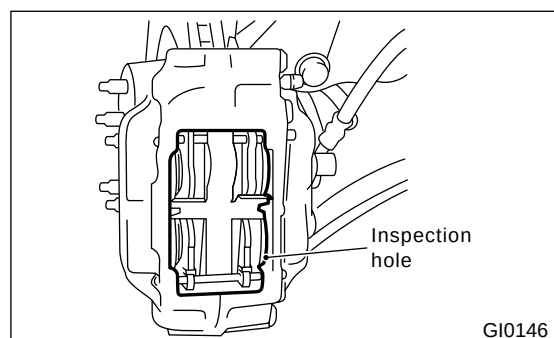
2) Visually check pad thickness through inspection hole of disc brake assembly. Replace pad if necessary.

Non Turbo Model

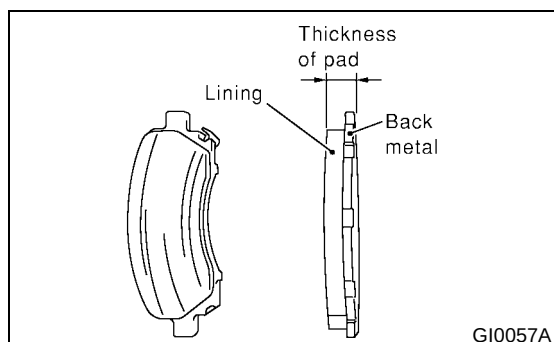


Pad thickness including back metal mm (in)		
	Front	Rear
Standard	17 (0.67)	14 (0.55)
Service limit	7.5 (0.295)	6.5 (0.256)

Turbo Model



Pad thickness including back metal mm (in)		
	Front	Rear
Standard	14.5 (0.570)	16 (0.629)
Service limit	6.0 (0.236)	6.0 (0.236)



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 5 mm (0.20 in) from the outer periphery of the rotor.

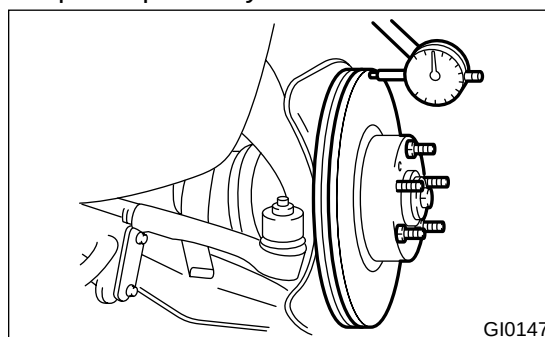
Disc rotor runout limit:

Front: 0.075 mm (0.0030 in)

Rear: 0.075 mm (0.0030 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.



BRAKE LININGS AND DRUMS

PERIODIC MAINTENANCE SERVICES

23.Brake Linings and Drums

A: INSPECTION

1. REAR DRUM BRAKE

1) Remove brake drum, and check that there is no fluid leakage from wheel cylinder.

If there is fluid leakage from wheel cylinder, replace it.

2) Inspect brake shoes for damage or deformities and check brake linings for wear.

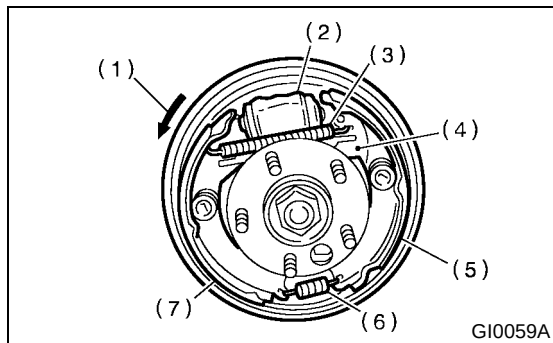
NOTE:

- Always replace both leading and trailing brake shoes for the left and right wheels at the same time.
- When either the left or the right brake assembly is replaced, always replace the leading shoe and trailing shoe of the other.
- The cotter pin, once removed, cannot be reused.

Thickness of lining (except back metal)

Standard value: 4.1 mm (0.161 in)

Service limit: 1.5 mm (0.059 in)



- (1) Rotational direction of drum (Forward)
- (2) Wheel cylinder
- (3) Upper shoe return spring
- (4) Adjusting lever
- (5) Trailing shoe
- (6) Lower shoe return spring
- (7) Leading shoe

To replace trailing shoe, remove cotter pin. Clevis pin should also be replaced if worn.

3) Check brake drum for wear, dents or other damage.

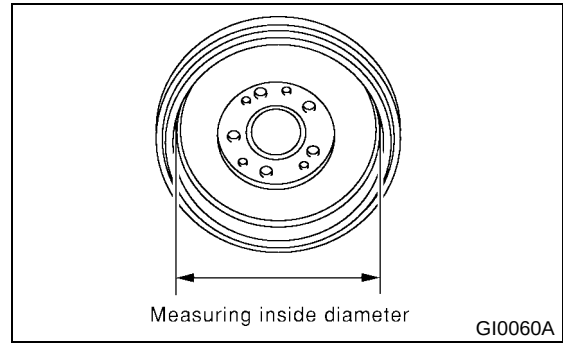
If the inside surface of brake drum is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn, tapered, or the outside surface of brake drum is damaged, correct or replace it.

Brake drum inner diameter

Standard value: 228.6 mm (9.000 in)

Service limit: 230.6 mm (9.079 in)

If deformation or wear of back plate, shoe, etc. is noticeable, replace the affected parts.



2. PARKING BRAKE (REAR DISC BRAKE)

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.

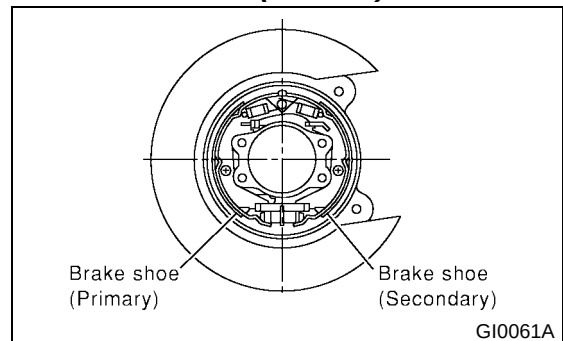
NOTE:

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)

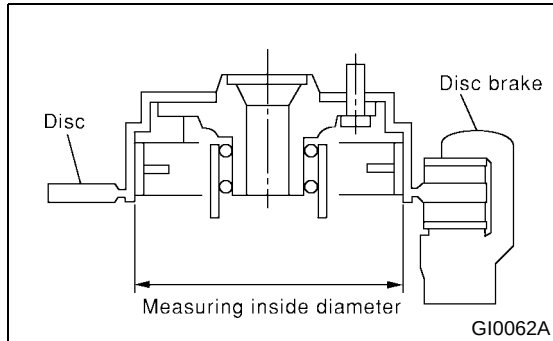


2) Check brake drum for wear, dents or other damage. If the inside surface of brake drum is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn, tapered, or the outside surface of brake drum is damaged, correct or replace it.

Brake drum inside diameter

Standard value: 170 mm (6.69 in)

Wear limit: 171 mm (6.73 in)



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. REAR DRUM BRAKE

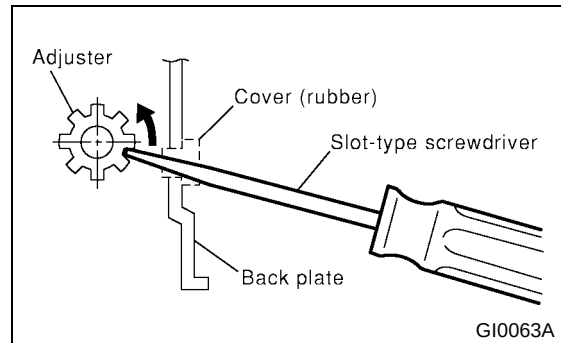
The main brake is adjusted automatically, and so there is no need to adjust it.

2. PARKING BRAKE (REAR DISC BRAKE)

For rear disc brake, adjust parking brake after bleeding the air.

1) Remove rear cover (rubber) installed at back plate.

2) Turn adjuster toward arrow mark (upward) until it is locked slightly, by using slot-type screwdriver as shown in illustration.



3) Turn back (downward) adjuster 3 to 4 notches.

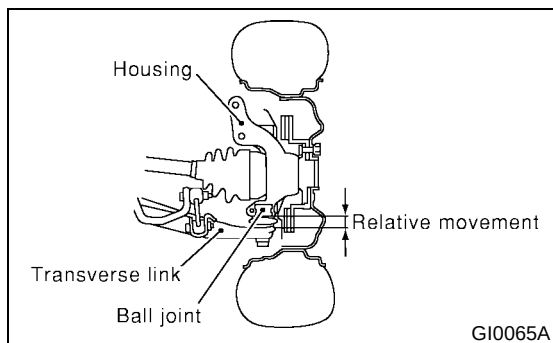
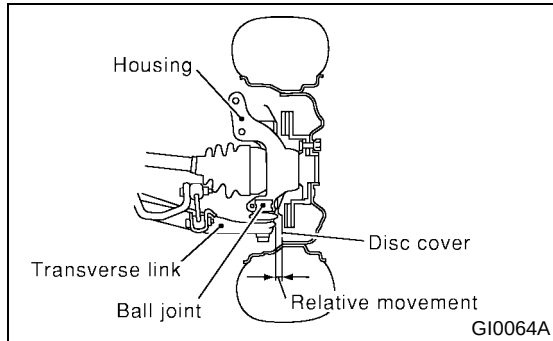
4) Install cover (rubber) at original position correctly.

24. 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-18, Front Ball Joint.>

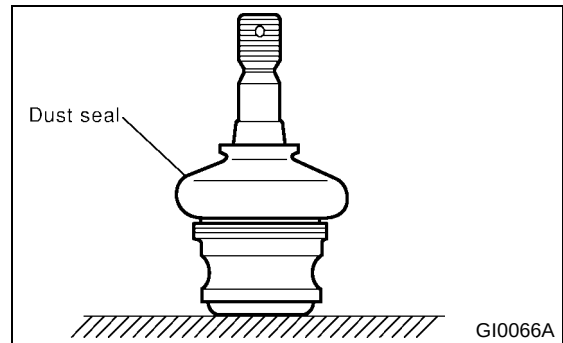


- 5) Damage of dust seal
Visually inspect ball joint dust seal. If it is damaged, remove transverse link. <Ref. to FS-16, Front Transverse Link.> And measure free play of ball joint. <Ref. to FS-18, Front Ball Joint.>

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

NOTE:

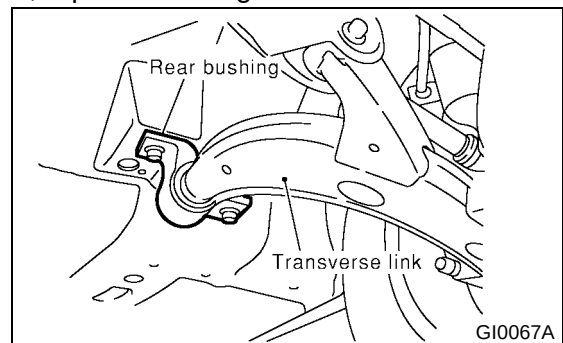
When transverse link ball joint has been removed or replaced, check toe-in of front wheel. If front



wheel toe-in is not at specified value, adjust toe-in. <Ref. to FS-8, Wheel Alignment.>

2. TRANSVERSE LINK'S REAR BUSHING

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



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-8, Wheel Alignment.> <Ref. to RS-10, 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-8, 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-10, 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-2, General Description.>

Rear suspension: <Ref. to RS-2, 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
 - Crossmember
 - Lateral links
 - Trailing link
 - Strut

- In the district where salt is sprayed to melt snow on a road in winter, check suspension parts for damage caused by rust every 12 months after lapse of 60 months. Take rust prevention measure as required.

25.Wheel Bearing

A: INSPECTION

1. FRONT WHEEL BEARING

NOTE:

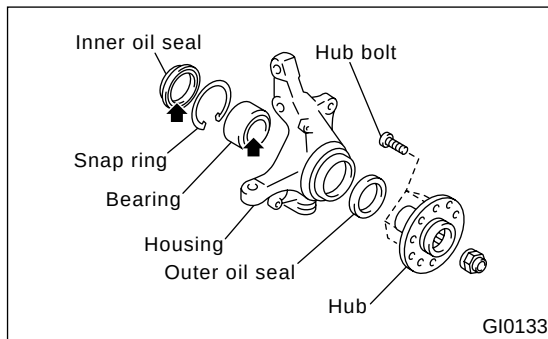
Inspect the condition of front wheel bearing grease.

- 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 S.F.J. to transmission spindle, remove it.
 - 7) Extract S.F.J. from transmission spindle. <Ref. to DS-19, 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.



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 COMPL and measure axial displacement in axial direction.

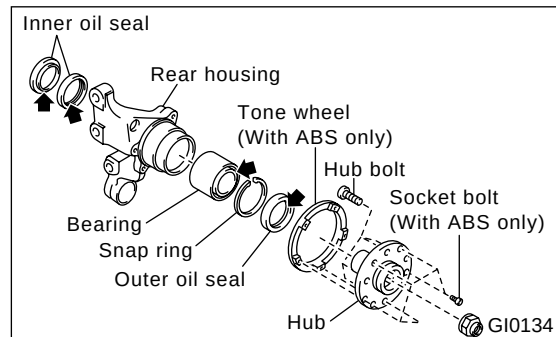
Service limit:

**Straight-ahead position within 0.05 mm
(0.0020 in)**

- 5) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DS-37, Rear Drive Shaft.>

- 6) While supporting rear drive shaft horizontally with one hand, turn hub COMPL with the other to check for noise or binding.

If hub COMPL is noisy or binds, disassemble rear axle and check condition of oil seals, bearings, etc.

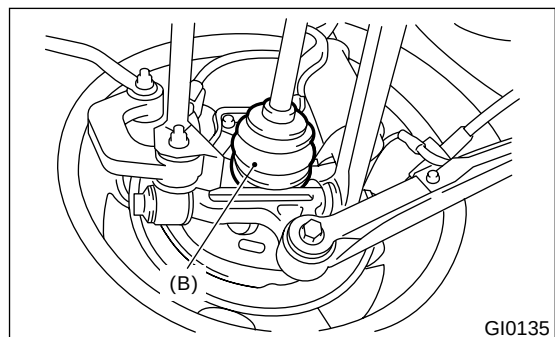
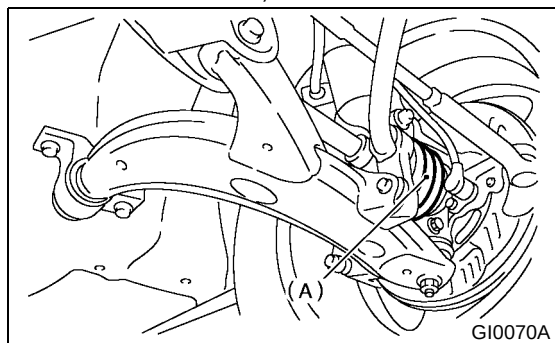


26. Axle Boots & Joints

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-32, Front Drive Shaft.> <Ref. to DS-37, Rear Drive Shaft.>



2. PROPELLER SHAFT

Inspect propeller shaft for damage or failure. If faulty, replace with new one. <Ref. to DS-16, Propeller Shaft.>

STEERING SYSTEM (POWER STEERING)

PERIODIC MAINTENANCE SERVICES

27. Steering System (Power Steering)

A: INSPECTION

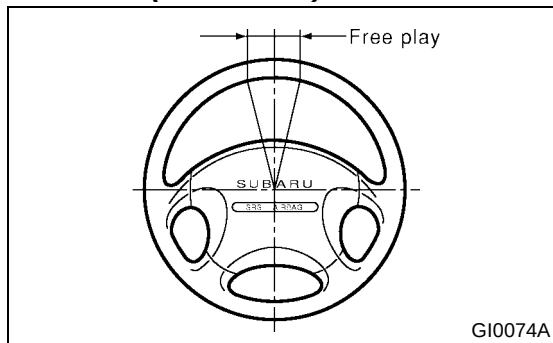
1. STEERING WHEEL

- 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)



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.

Maximum permissible play:

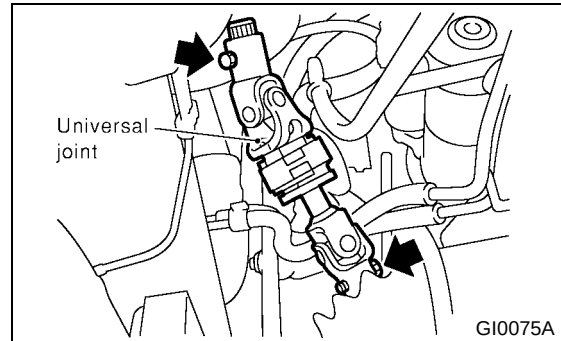
0.5 mm (0.020 in)

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)



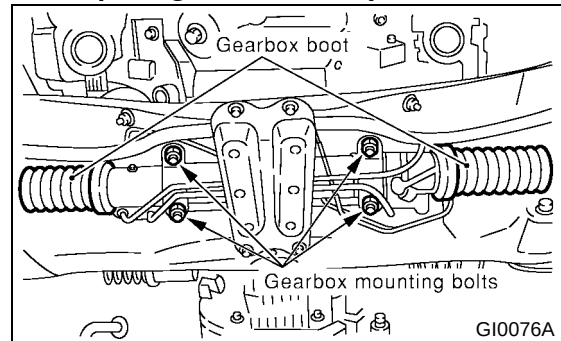
3. GEARBOX

- 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)



- 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.

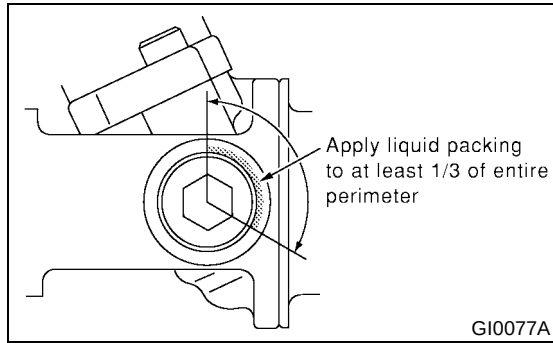
- (1) Tighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and then loosen. Repeat this operation twice.

- (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.



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

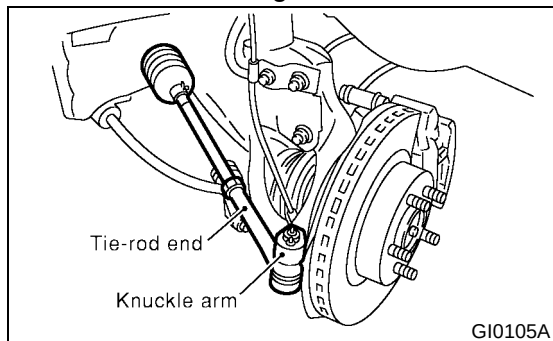
Tightening torque (Lock nut):

39±10 N·m (4.0±1.0 kgf-m, 29±7 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.



- 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:

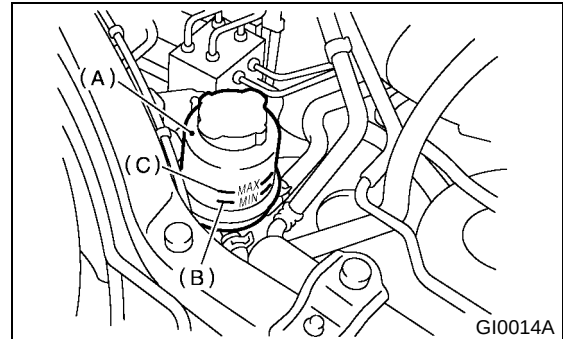
83 N·m (8.5 kgf-m, 61.5 ft-lb)

5. POWER STEERING FLUID LEVEL

NOTE:

The fluid level must be checked when the temperature of the reservoir tank surface is approximately 20°C (68°F).

- 1) Place vehicle with engine "off" on the flat and level surface.
- 2) Check the fluid level using the scale on the outside of the reservoir tank (A). If the level is below "MIN" (B), add fluid to bring it up to "MAX" (C).



NOTE:

If fluid level is at MAX level or above, drain fluid to keep the level in the specified range of indicator by using a syringe or the like.

Recommended fluid:

Dexron IIE or III

Fluid capacity:

0.7 ㉓ (0.7 US qt, 0.6 Imp qt)

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.

STEERING SYSTEM (POWER STEERING)

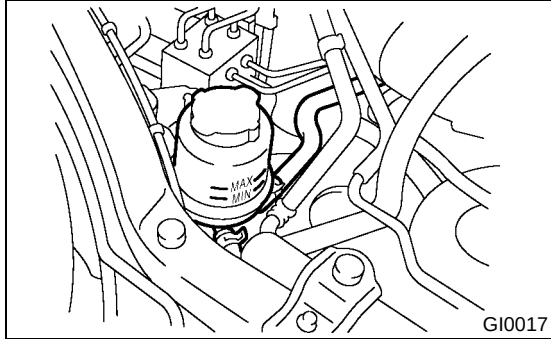
PERIODIC MAINTENANCE SERVICES

7. HOSES OF OIL PUMP FOR DAMAGES

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

9. GEARBOX BOOTS

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

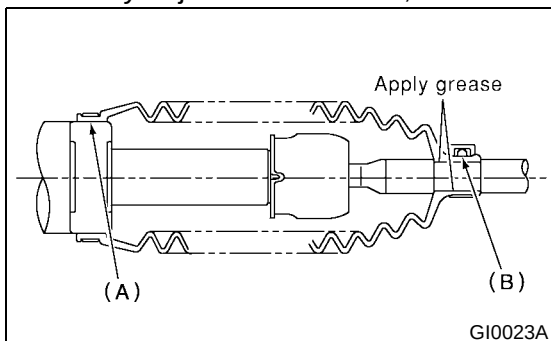
1) (A) and (B) positions of gearbox boot are fitted correspondingly in (A) and (B) grooves of gearbox and the rod.

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.



10. FITTING BOLTS AND NUTS

Inspect fitting bolts and nuts of oil pump and bracket for looseness, and retighten them if necessary.

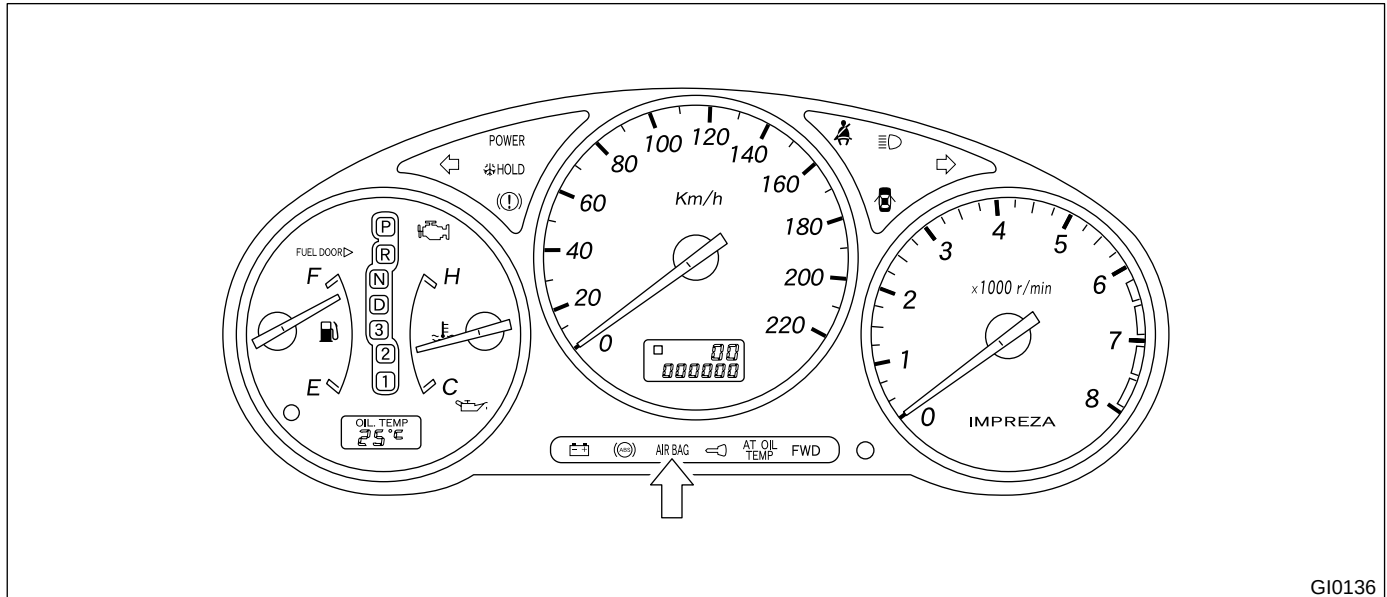
Inspect and/or retighten them when engine is cold.

28. Supplemental Restraint System

A: INSPECTION

Check the airbag system in accordance with the result of the self-diagnosis. <Ref. to AB-2, Basic Diagnostic Procedure.>

1) Ensure that airbag connectors are connected. If not, properly connect (also double lock the connector). When the ignition switch is turned ON with the connector(s) disconnected, the airbag warning light blinks to identify the fault.



GI0136

2) Turn the ignition switch ON, and connect the airbag diagnosis terminal of the service connector (located below lower cover) to the ground terminal.

3) The warning light blinks to indicate a trouble code (a fault is identified). When the airbag system is in good order (no trouble codes are stored in the memory), the warning light blinks on and off at 0.6 second intervals (as long as the diagnosis terminal is connected to the ground terminal).

4) When the warning light indicates a trouble code, check the airbag system in accordance with the trouble-shooting procedure. <Ref. to AB-2, Basic Diagnostic Procedure.>

SUPPLEMENTAL RESTRAINT SYSTEM

PERIODIC MAINTENANCE SERVICES

ENGINE 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

FUEL INJECTION (FUEL SYSTEMS)

FU(SOHC)

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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

Model		
Fuel tank	Capacity	50 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)

FUEL INJECTION (FUEL SYSTEMS)

1. INTAKE MANIFOLD



FU(SOHC)-4

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

(1) Intake manifold gasket RH	(15) O-ring	(28) Accelerator cable bracket
(2) Fuel injector pipe	(16) Plug cord holder LH	
(3) Fuel injector	(17) Fuel pipe protector RH	
(4) O-ring	(18) Fuel pipe ASSY	
(5) O-ring	(19) Fuel hose	
(6) O-ring	(20) Clip	
(7) Plug	(21) Clip	
(8) PCV valve	(22) Air assist injector solenoid valve	
(9) Purge control solenoid valve	(23) Air assist injector solenoid valve bracket	
(10) Nipple		
(11) Intake manifold	(24) Guide pin	
(12) Intake manifold gasket LH	(25) Atmospheric pressure sensor bracket	
(13) Fuel pipe protector LH	(26) Atmospheric pressure sensor	
(14) Intake air temperature and pressure sensor	(27) Plug cord holder RH	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 3.4 (0.35, 2.5)

T2: 5.0 (0.51, 3.7)

T3: 6.4 (0.65, 4.7)

T4: 19 (0.19, 1.4)

T5: 22.5 (2.29, 16.6)

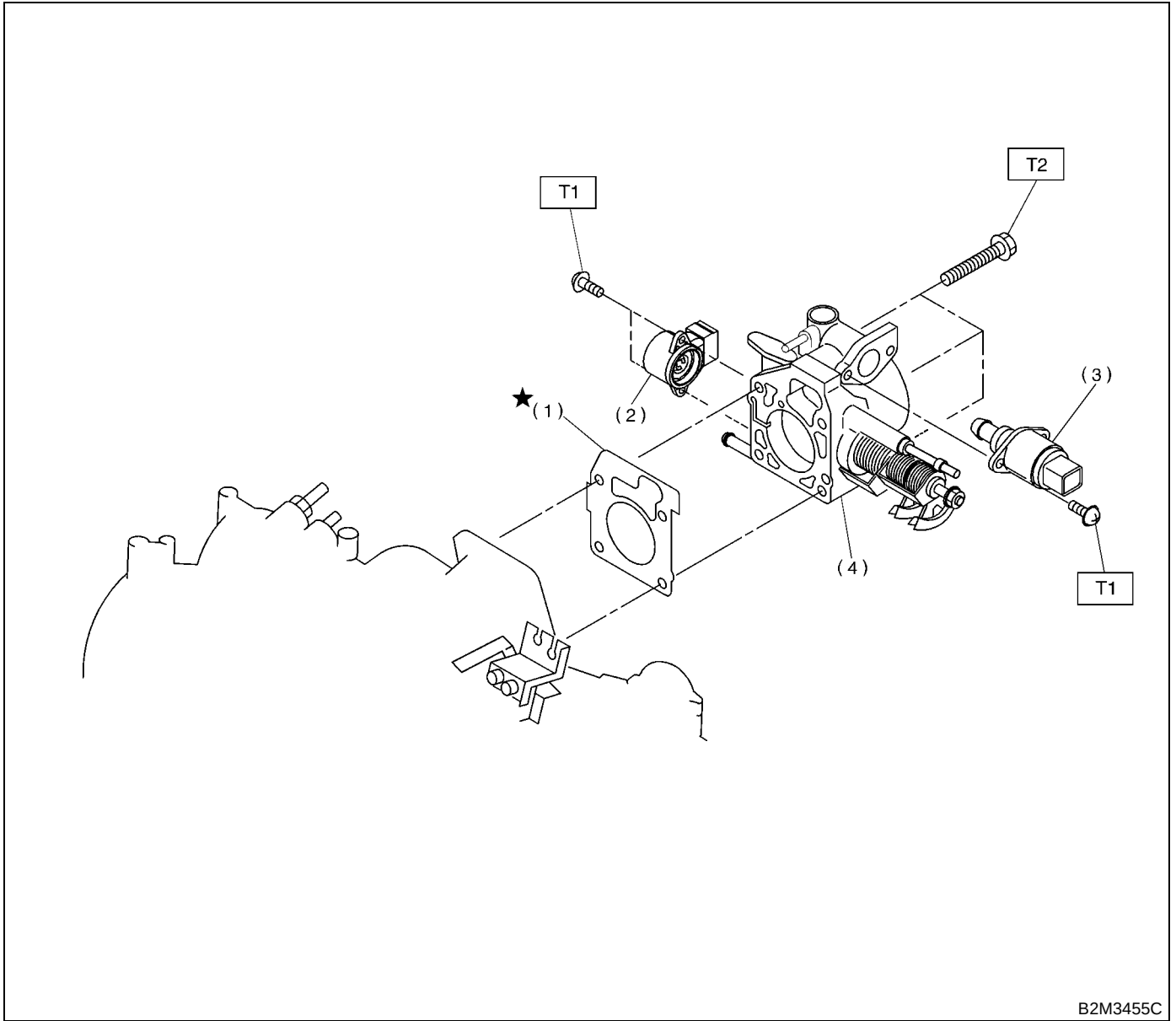
T6: 25 (2.6, 18.8)

T7: 7.35 (0.75, 5.421)

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)

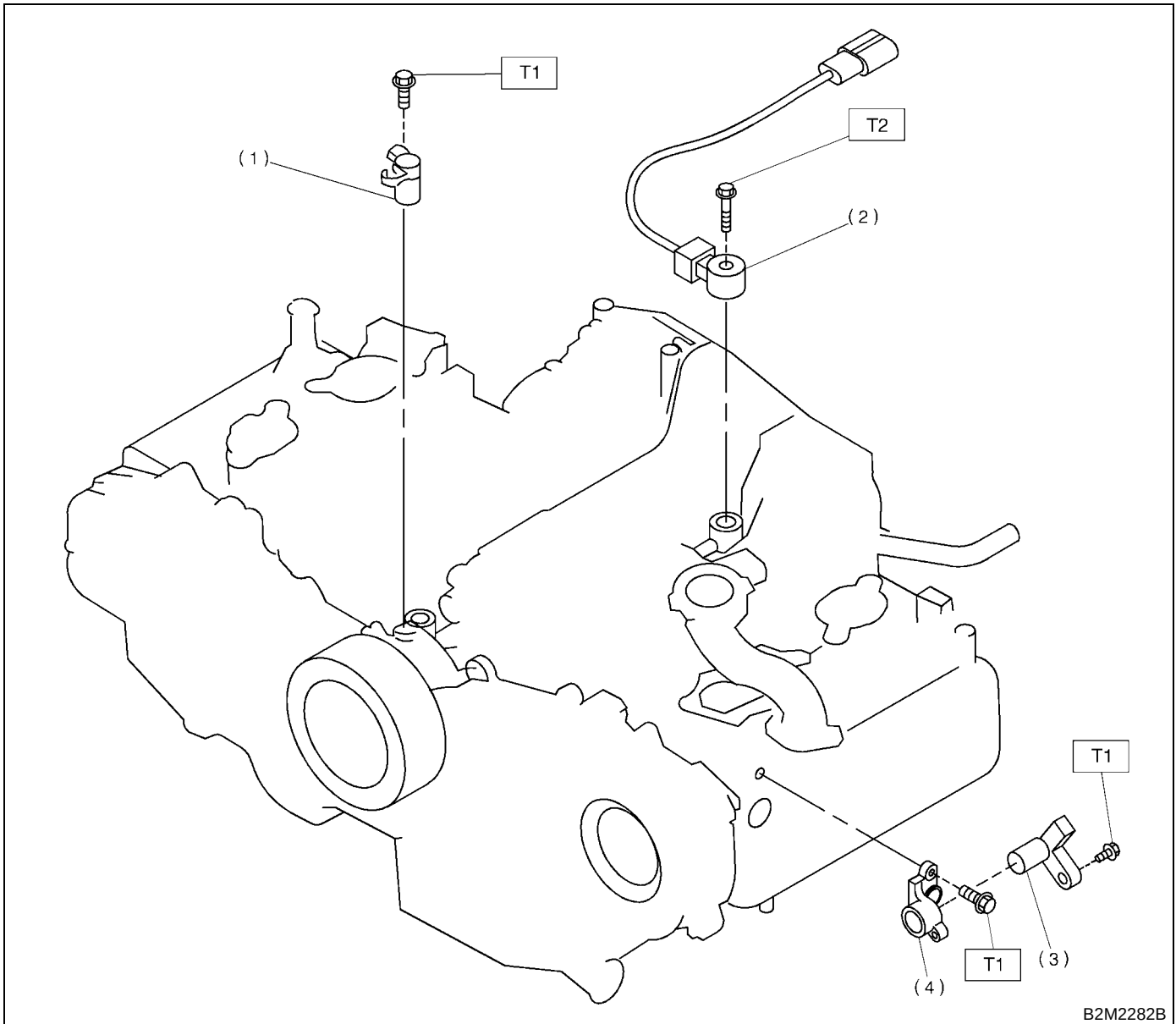
T1: 1.6 (0.16, 1.2)

T2: 22 (2.2, 16)

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)

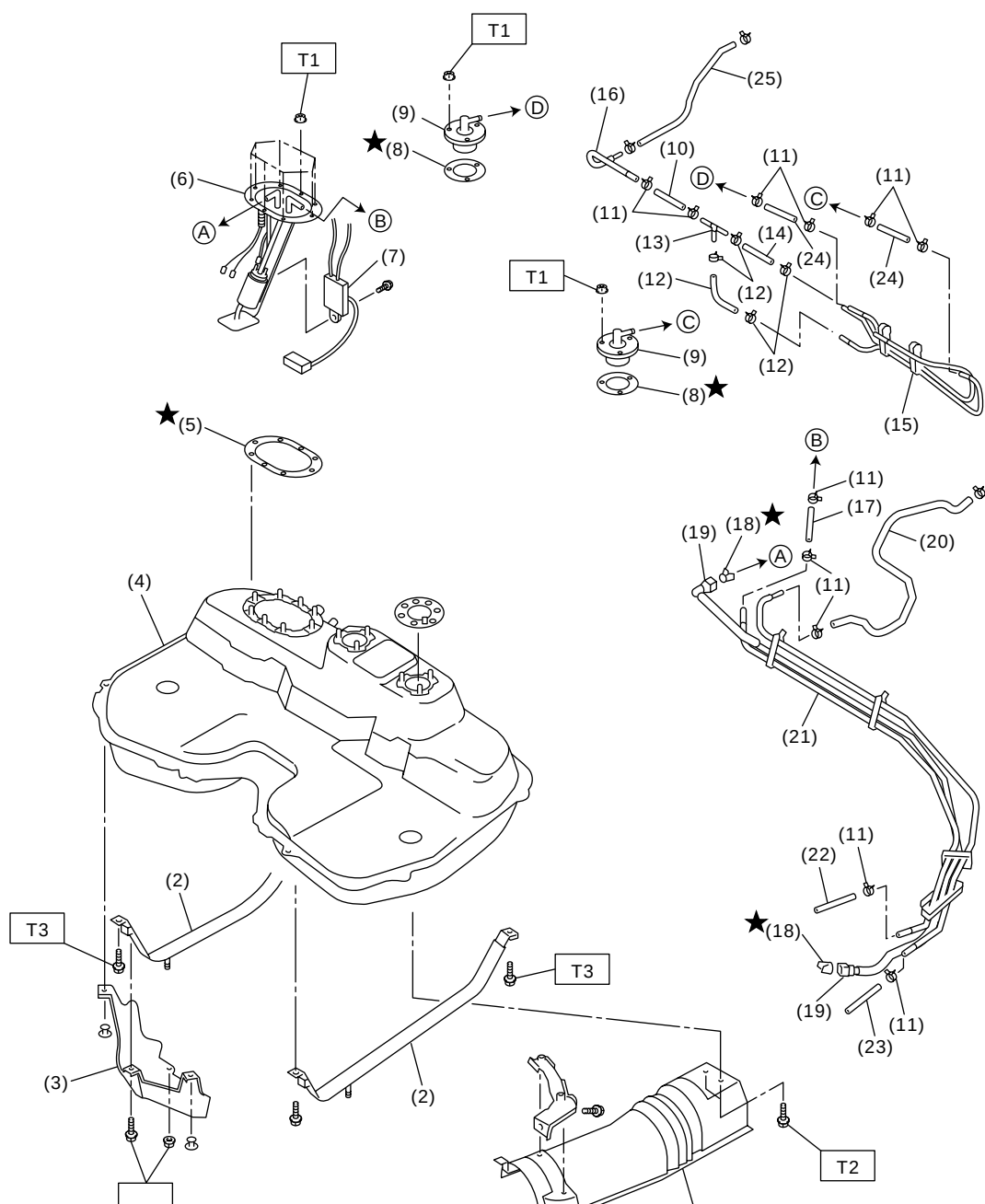
T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK



GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

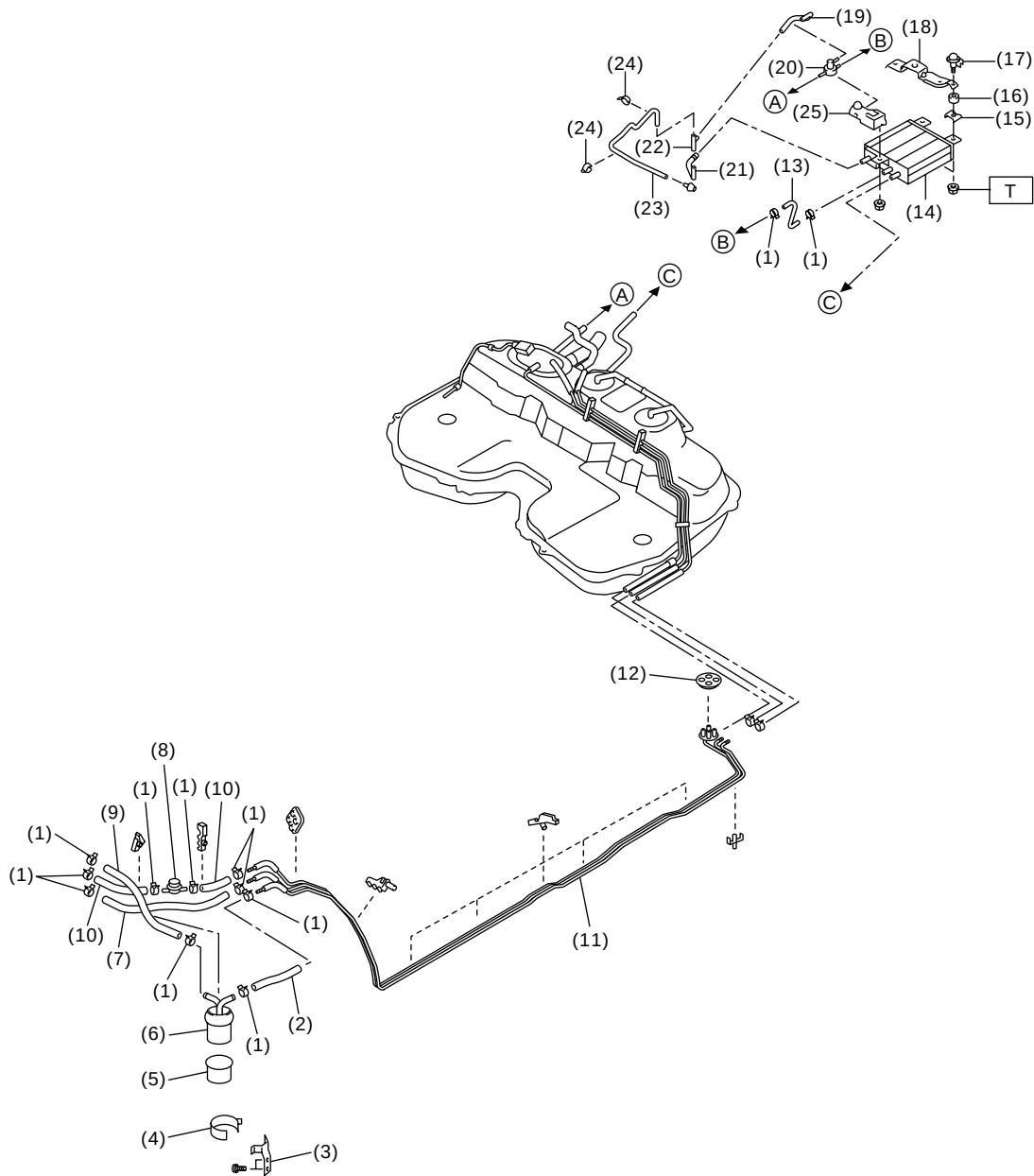
(1) Heat sealed cover	(11) Clip	(21) Fuel pipe ASSY
(2) Fuel tank band	(12) Evaporation hose B	(22) Evaporation hose F
(3) Protector RH	(13) Joint pipe	(23) Fuel return hose B
(4) Fuel tank	(14) Evaporation hose C	(24) Evaporation hose G
(5) Fuel pump gasket	(15) Evaporation pipe ASSY	(25) Evaporation hose H
(6) Fuel pump ASSY	(16) Evaporation pipe	
(7) Fuel meter unit	(17) Evaporation hose D	
(8) Fuel cut valve gasket	(18) Retainer	
(9) Fuel cut valve	(19) Quick connector	
(10) Evaporation hose A	(20) Evaporation hose E	

Tightening torque: N·m (kgf-m, ft-lb)***T1: 4.4 (0.45, 3.3)******T2: 7.4 (0.75, 5.4)******T3: 33 (3.4, 25)***

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

5. FUEL LINE



EN0440

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

(1) Clip	(11) Fuel pipe ASSY	(21) Two-way valve drain hose A
(2) Fuel delivery hose A	(12) Grommet	(22) Connector
(3) Fuel filter bracket	(13) Canister hose A	(23) Two-way valve drain hose B
(4) Fuel filter holder	(14) Canister	(24) Clamp
(5) Fuel filter cup	(15) Canister bracket plate	(25) Front canister bracket
(6) Fuel filter	(16) Cushion	
(7) Evaporation hose	(17) Canister bracket spacer	
(8) Fuel damper	(18) Rear canister bracket	
(9) Fuel delivery hose B	(19) Two-way valve return hose	
(10) Fuel return hose	(20) Two-way valve	

Tightening torque: N·m (kgf-m, ft-lb)

T: 23 (2.34, 17.0)

FUEL INJECTION (FUEL SYSTEMS)

This technical drawing is an exploded view of a mechanical assembly. It features the following components and callouts:

- Part (1):** A long, curved main shaft or tube.
- Part (2):** A small, knurled adjustment knob.
- Part (3):** Multiple small O-rings or seals used at various connection points.
- Part (4):** A circular end cap or flange.
- Part (5):** A vertical support or guide tube.
- Part (6):** A curved bracket or arm.
- Part (7):** A small cylindrical component, possibly a pin or bush.
- Part (8):** A circular flange or plate.
- Part (9):** A small bolt or screw.
- Part (10):** A larger bolt or screw.
- Part (11):** A large, complex mounting bracket or housing.

Callouts include the letter **T** in a box, which points to several bolts and screws, and the letter **C** in a box, which points to specific features on parts (1), (6), and (11). Dashed lines indicate the assembly path for each component.

- Tightening torque: N·m (kgf-m, ft-lb)**
T: 7.5 (0.76, 5.53)

GENERAL DESCRIPTION

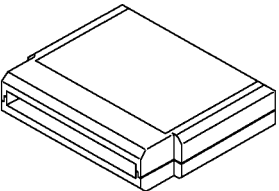
FUEL INJECTION (FUEL SYSTEMS)

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
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

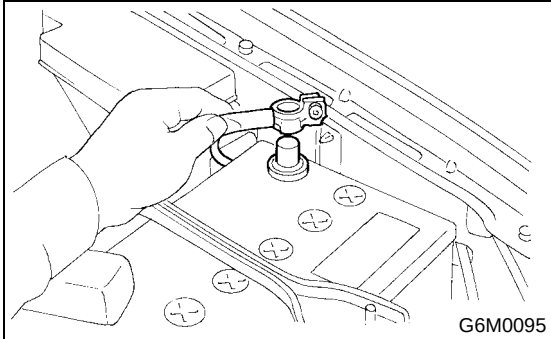
THROTTLE BODY

FUEL INJECTION (FUEL SYSTEMS)

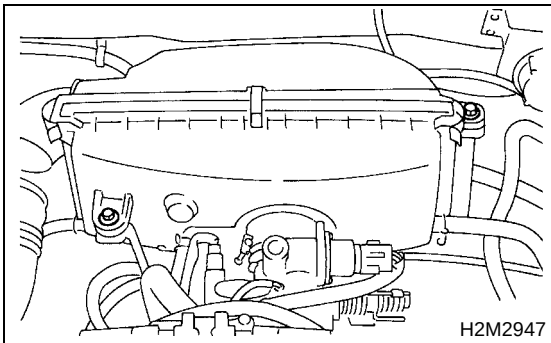
2. Throttle Body

A: REMOVAL

1) Disconnect battery ground cable.

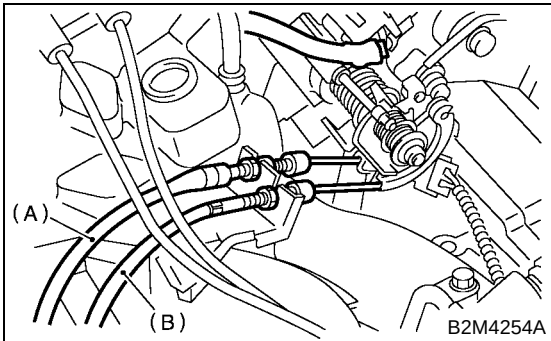


2) Remove air cleaner case.



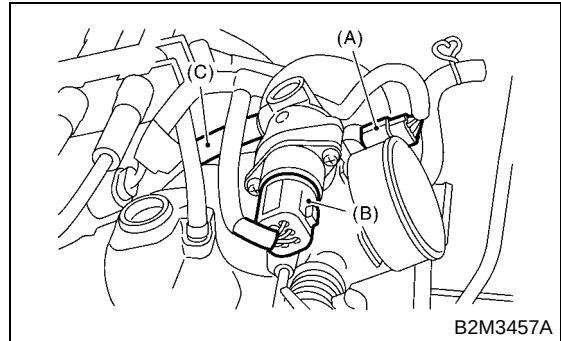
3) Disconnect accelerator cable (A).

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 air assist injector solenoid valve.

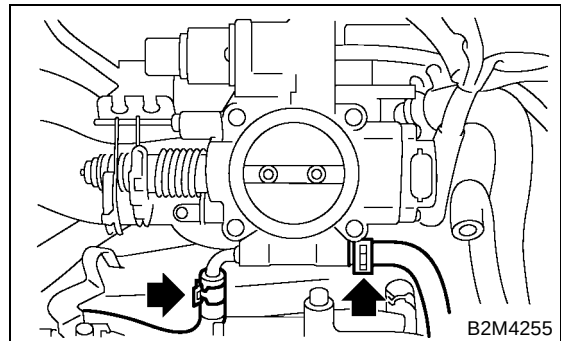


(A) Throttle position sensor

(B) Idle air control solenoid valve

(C) Air by-pass hose from air assist injector solenoid valve

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.

CAUTION:

Always use a new gasket.

Tightening torque:

Throttle body;

22 N·m (2.2 kgf-m, 15.9 ft-lb)

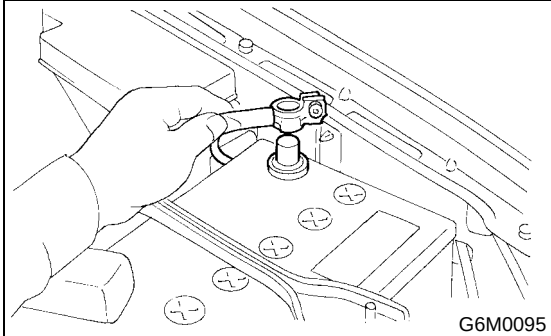
Air cleaner case;

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

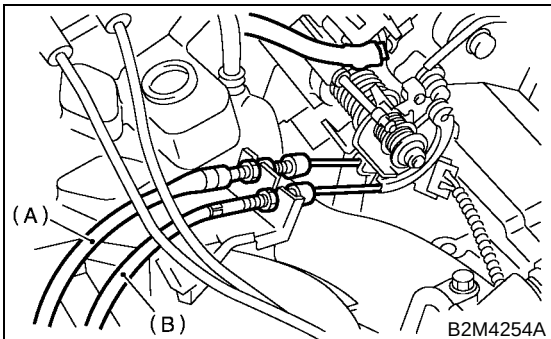
3. Intake Manifold

A: REMOVAL

- 1) Release fuel pressure. <Ref. to FU(SOHC)-51, 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(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
- 5) Disconnect accelerator cable (A).
- 6) Disconnect cruise control cable (B). (With cruise control model)

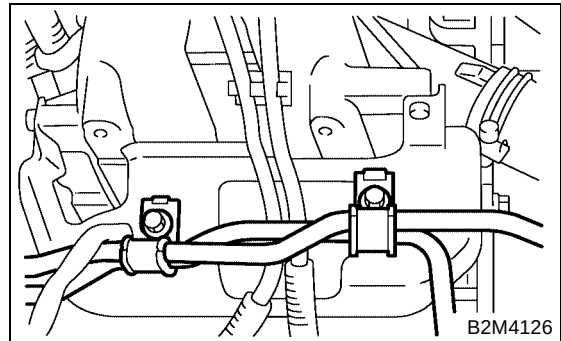


- 7) Remove power steering pump and tank from brackets.

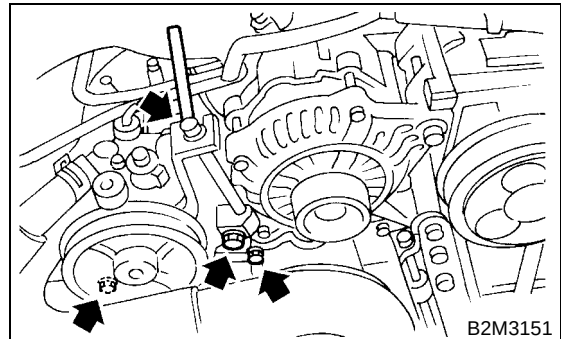
- (1) Remove resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
- (2) Remove front side V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- (3) Remove bolts which hold power steering pipes onto intake manifold protector.

NOTE:

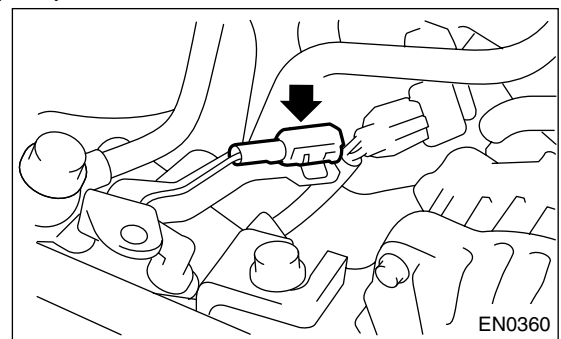
Do not disconnect power steering hose.



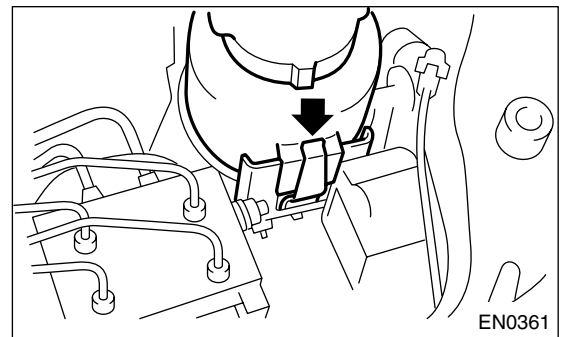
- (4) Remove bolts which install power steering pump bracket.



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



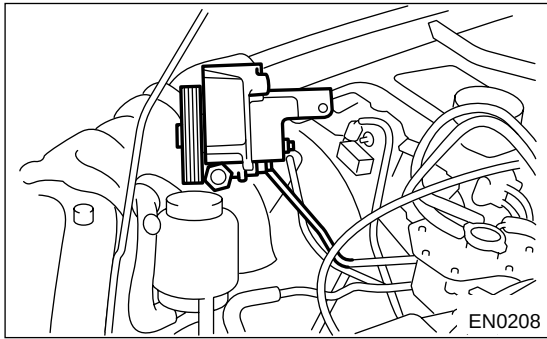
- (6) Remove power steering tank from the bracket by pulling it upwards.



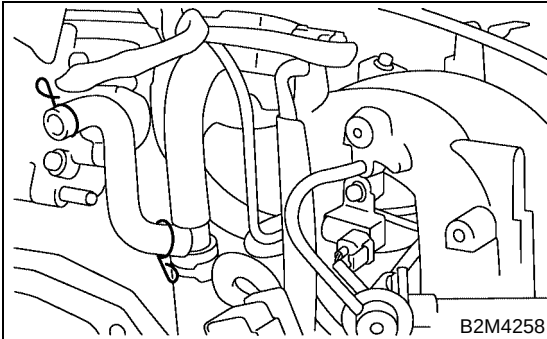
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

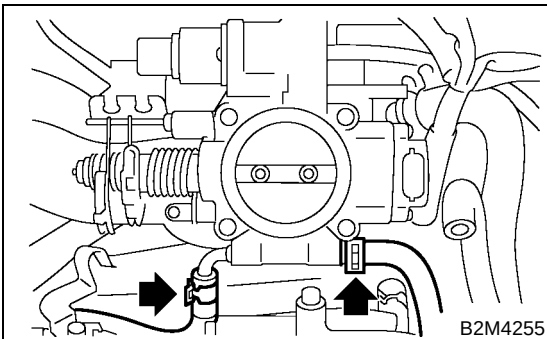
- (7) Place power steering pump and tank on the right side wheel apron.



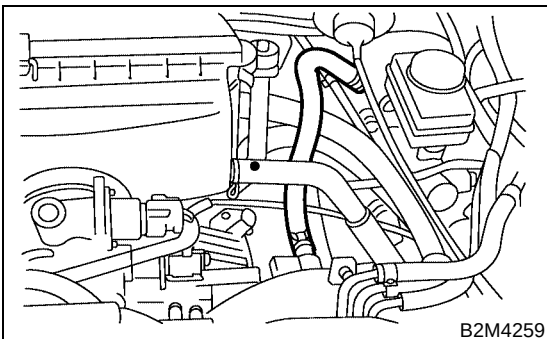
- 8) Disconnect spark plug cords from spark plugs.
9) Disconnect PCV hose from intake manifold.



- 10) Disconnect engine coolant hose from throttle body.



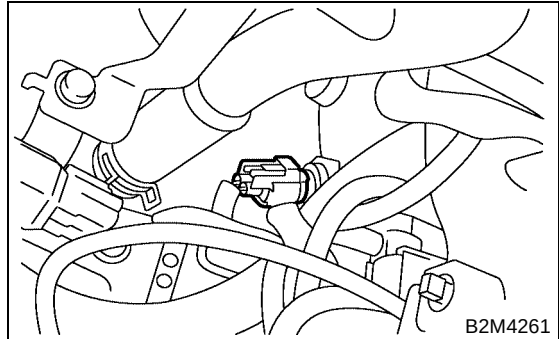
- 11) Disconnect brake booster hose.



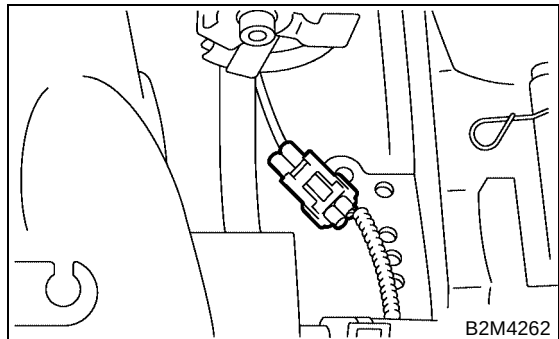
- 12) Remove air cleaner case stay RH and engine harness bracket, and disconnect engine harness connectors from bulkhead harness connectors.



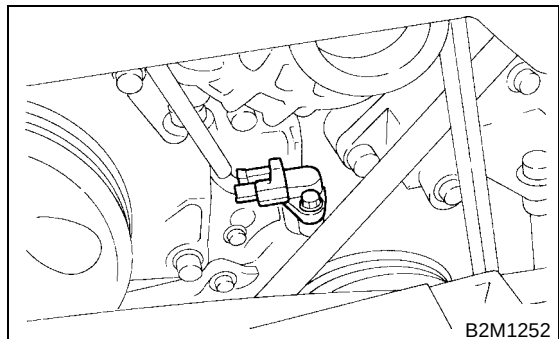
- 13) Disconnect connectors from engine coolant temperature sensor.



- 14) Disconnect knock sensor connector.



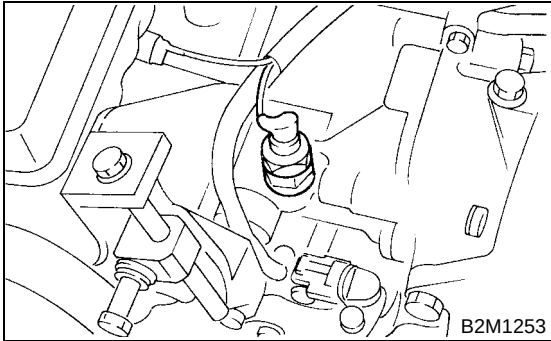
- 15) Disconnect connector from crankshaft position sensor.



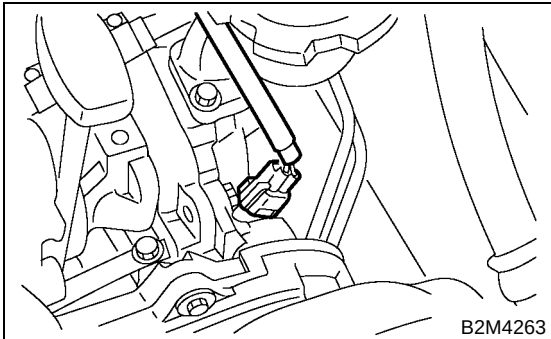
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

16) Disconnect connector from oil pressure switch.



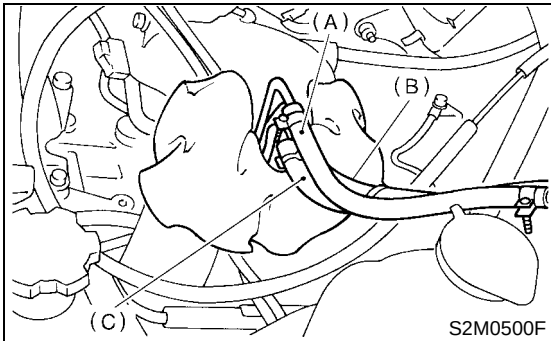
17) Disconnect connector from camshaft position sensor.



18) Disconnect fuel hoses from fuel pipes.

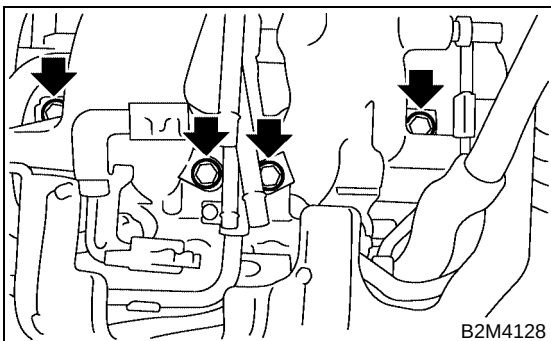
WARNING:

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

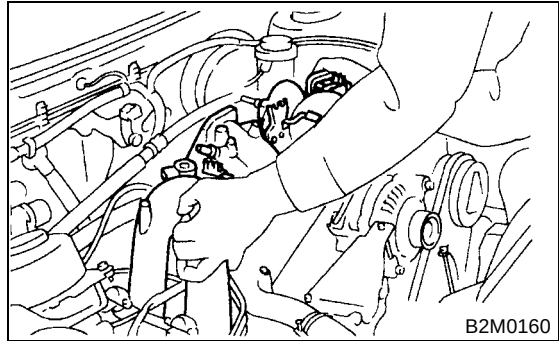


- (A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

19) Remove bolts which hold intake manifold onto cylinder heads.



20) Remove intake manifold.



B: INSTALLATION

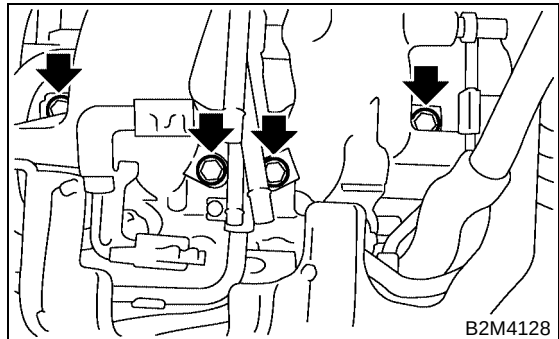
1) Install intake manifold onto cylinder heads.

CAUTION:

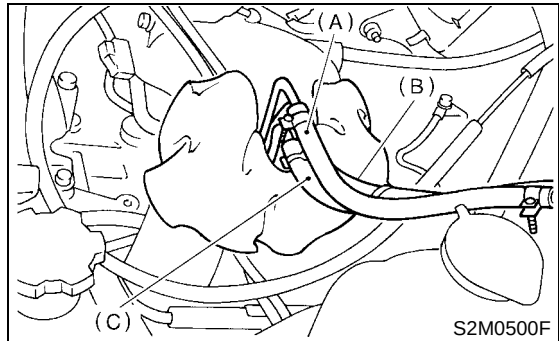
Always use new gaskets.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



2) Connect fuel hoses.

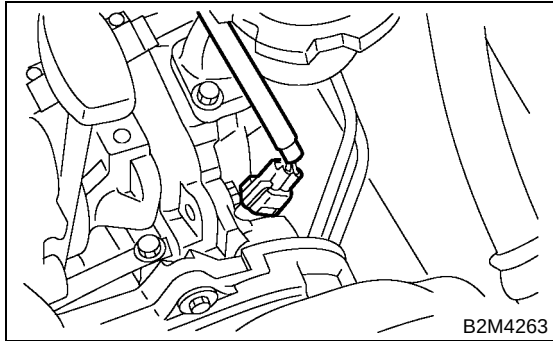


- (A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

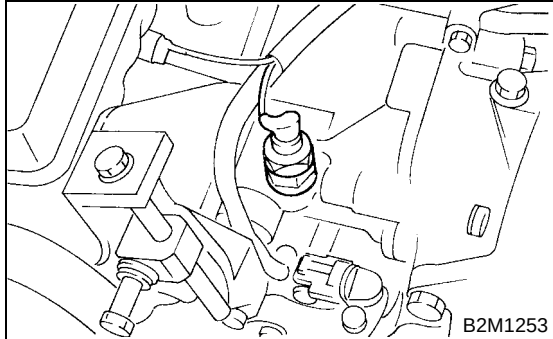
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

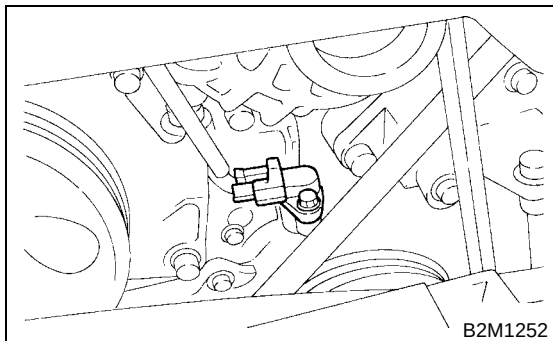
3) Connect connector to camshaft position sensor.



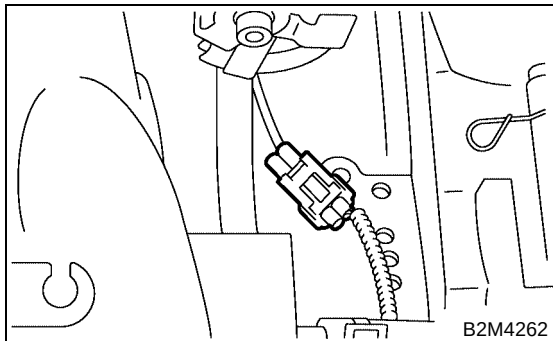
4) Connect connector to oil pressure switch.



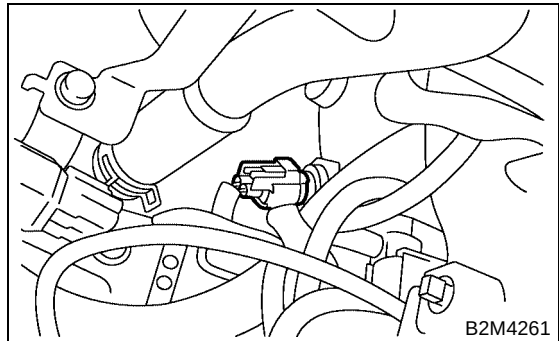
5) Connect connector to crankshaft position sensor.



6) Connect knock sensor connector.



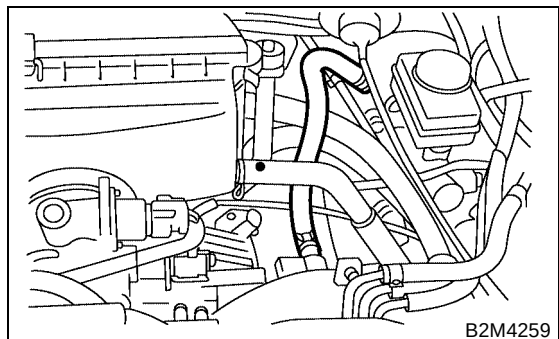
7) Connect connectors to engine coolant temperature sensor.



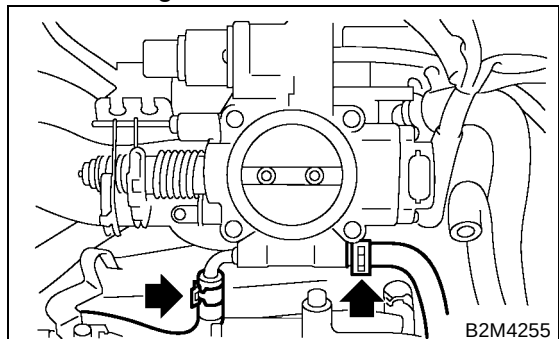
8) Install air cleaner case stay RH and engine harness bracket, and connect engine harness connectors to bulkhead connectors.



9) Connect brake booster hose.



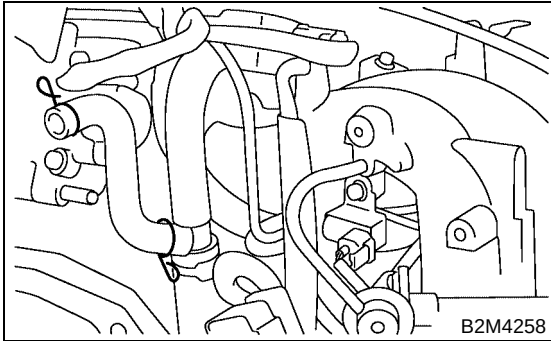
10) Connect engine coolant hose to throttle body.



INTAKE MANIFOLD

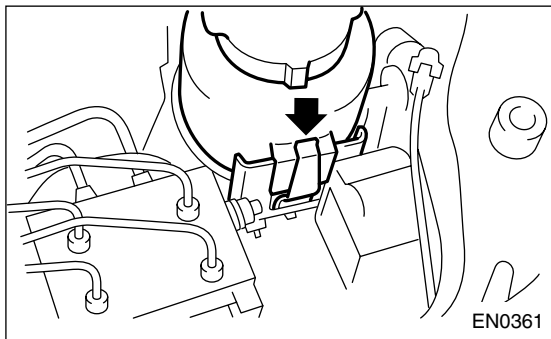
FUEL INJECTION (FUEL SYSTEMS)

- 11) Connect PCV hose to intake manifold.

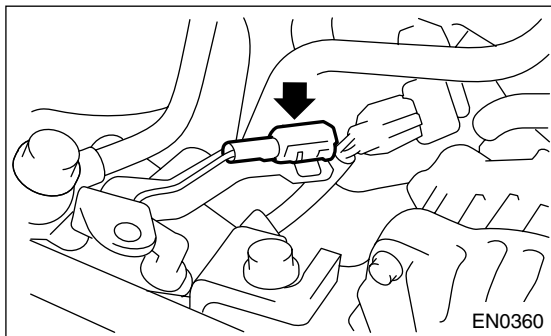


- 12) Connect spark plug cords to spark plugs.
13) Install power steering pump and tank on brackets.

- (1) Install power steering tank on bracket.



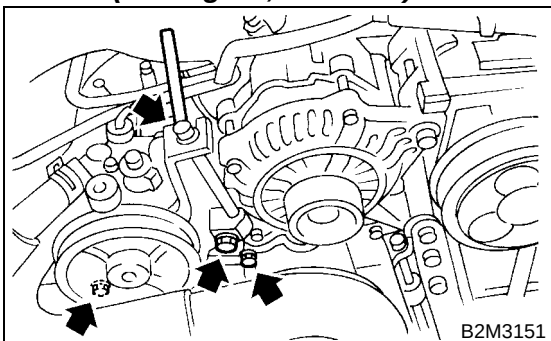
- (2) Connect connector to power steering pump switch.



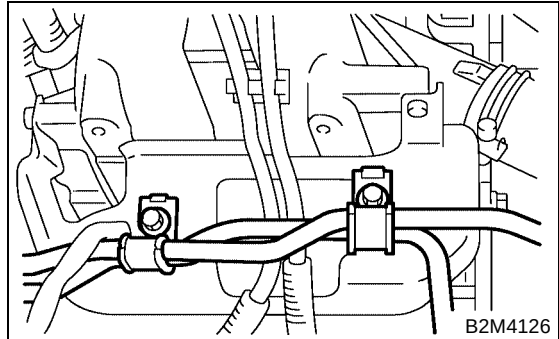
- (3) Tighten bolts which install power steering pump on bracket.

Tightening torque:

20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



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

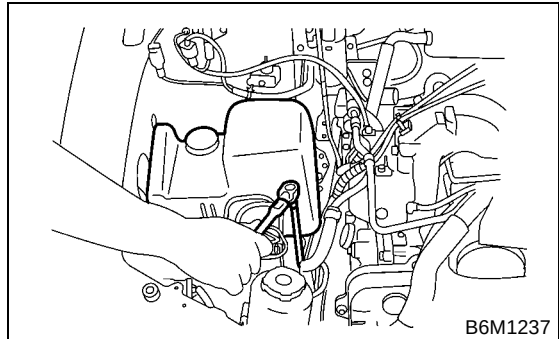


- (5) Install front side V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

- (6) Install resonator chamber.

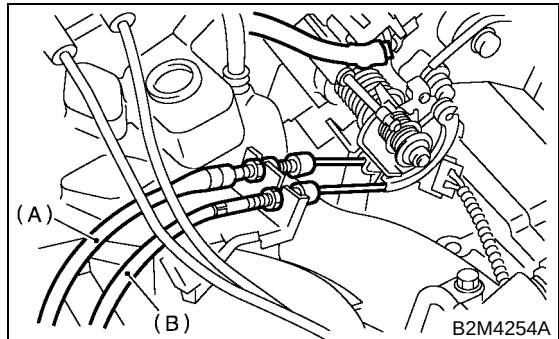
Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



- 14) Connect accelerator cable (A).

- 15) Connect cruise control cable (B). (With cruise control models)



- 16) Install air intake duct and air cleaner assembly. <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>

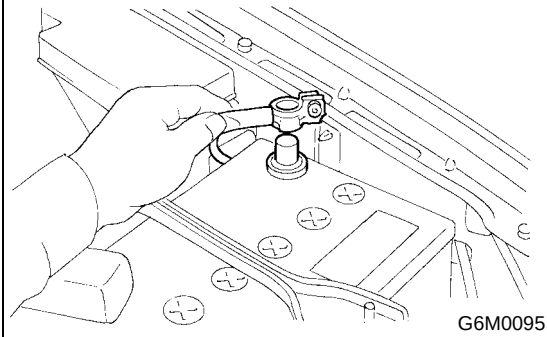
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

17) Connect connector to fuel pump relay.

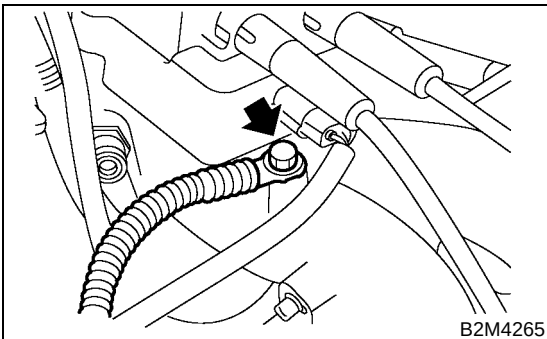


18) Connect battery ground cable.

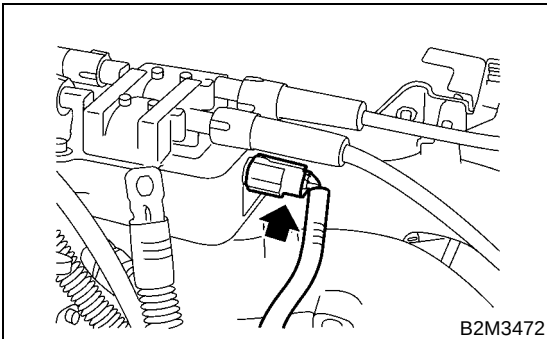


C: DISASSEMBLY

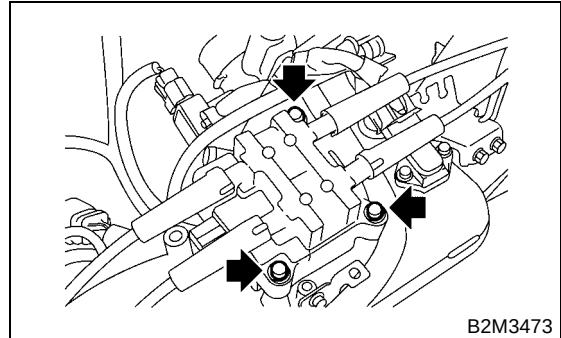
1) Disconnect engine ground terminal from intake manifold.



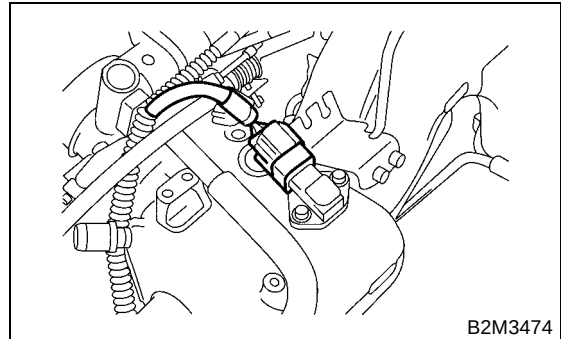
2) Disconnect connector from ignition coil and ignitor assembly.



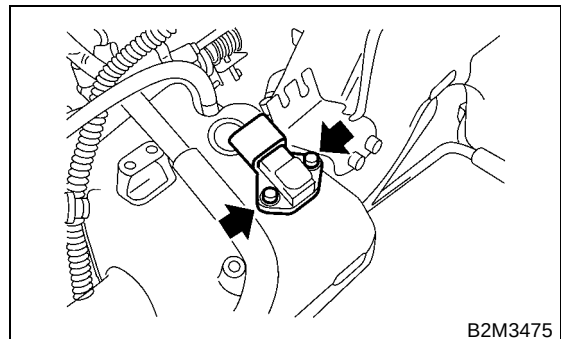
3) Remove ignition coil and ignitor assembly.



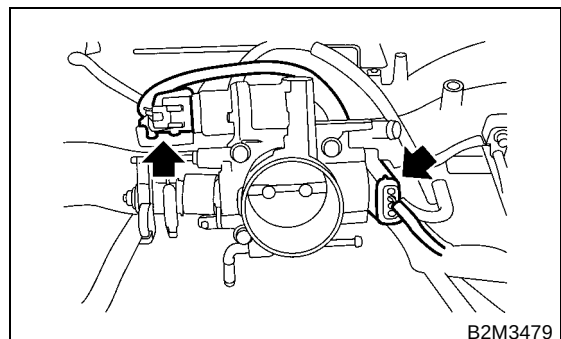
4) Disconnect connector from intake air temperature and pressure sensor.



5) Remove intake air temperature and pressure sensor from intake manifold.



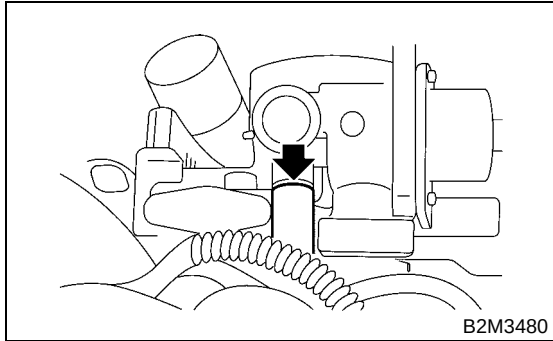
6) Disconnect connectors from throttle position sensor and idle air control solenoid valve.



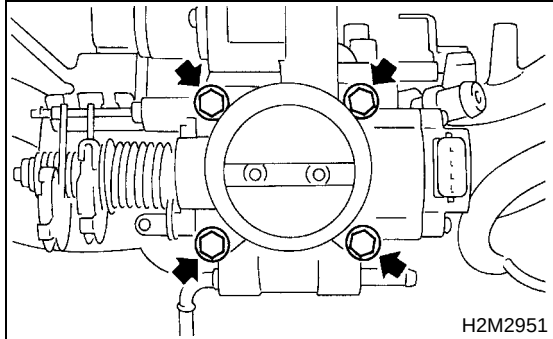
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

7) Disconnect air by-pass hose from throttle body.

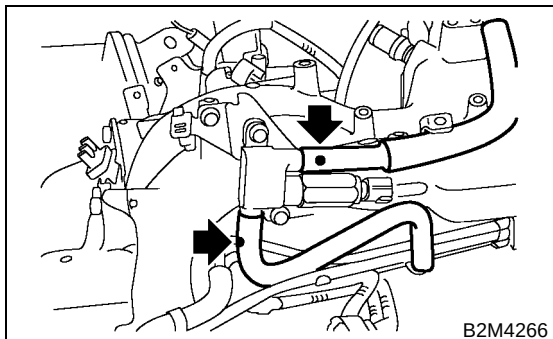


8) Remove throttle body.

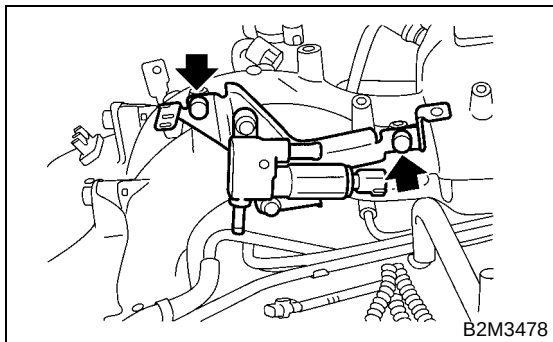


9) Disconnect connector from air assist injector solenoid valve.

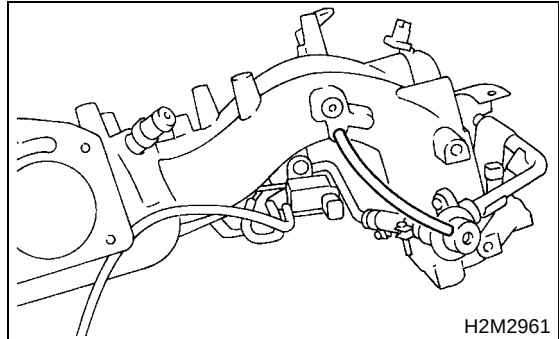
10) Disconnect air by-pass hoses from air assist solenoid valve.



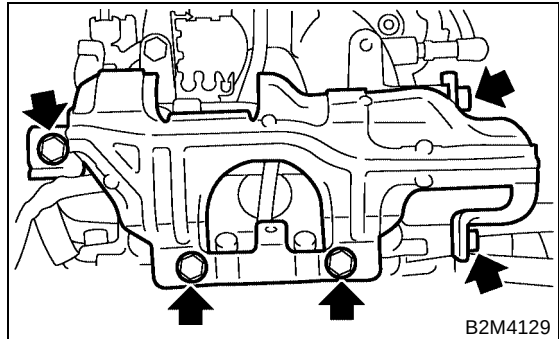
11) Remove air assist injector solenoid valve from intake manifold.



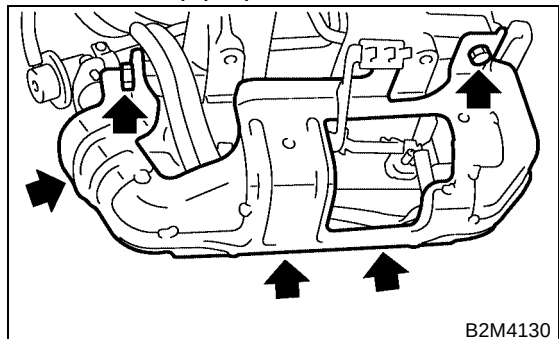
12) Disconnect pressure regulator vacuum hose from intake manifold.



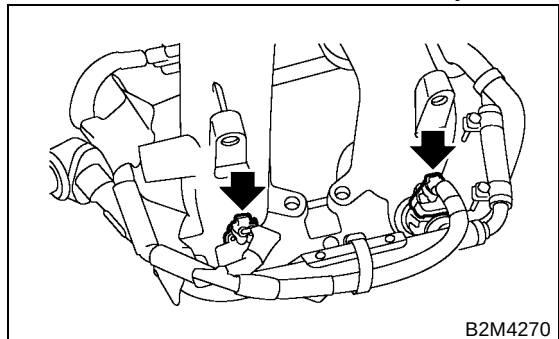
13) Remove fuel pipe protector LH.



14) Remove fuel pipe protector RH.



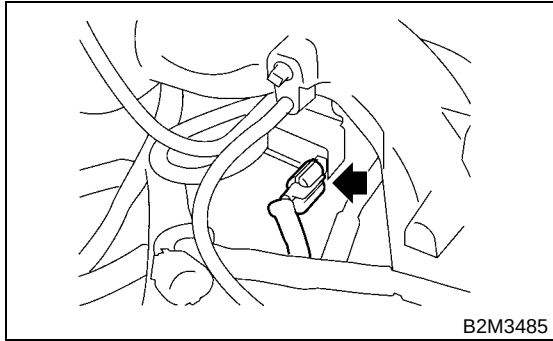
15) Disconnect connectors from fuel injectors.



INTAKE MANIFOLD

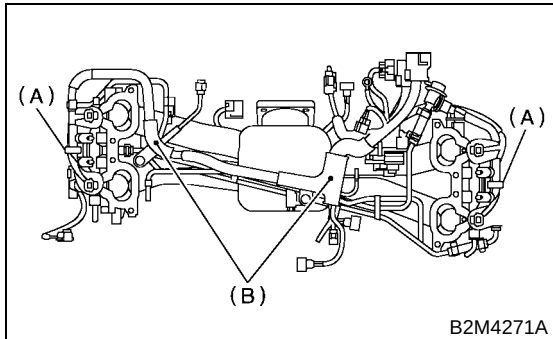
FUEL INJECTION (FUEL SYSTEMS)

16) Disconnect connector from purge control solenoid valve.



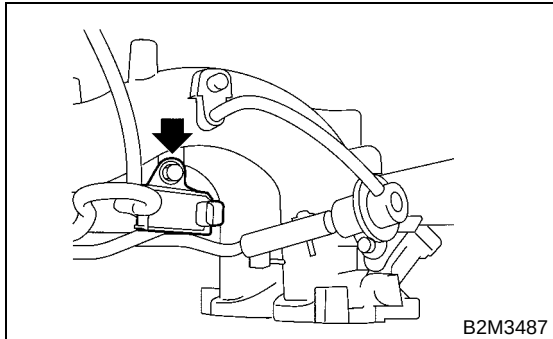
17) Disconnect air by-pass hose from purge control solenoid valve.

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

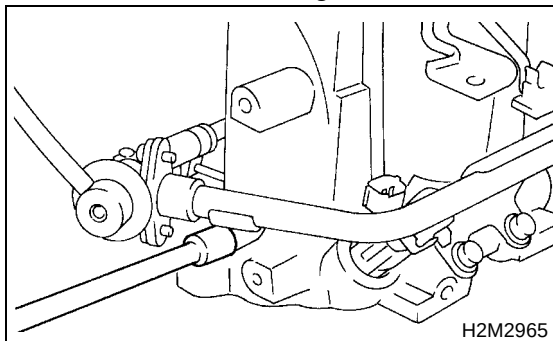


19) Remove engine harness from intake manifold.

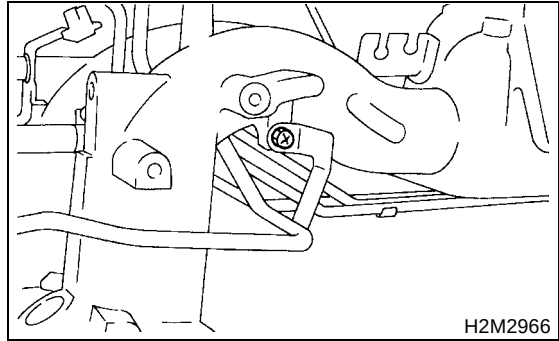
20) Remove purge control solenoid valve.



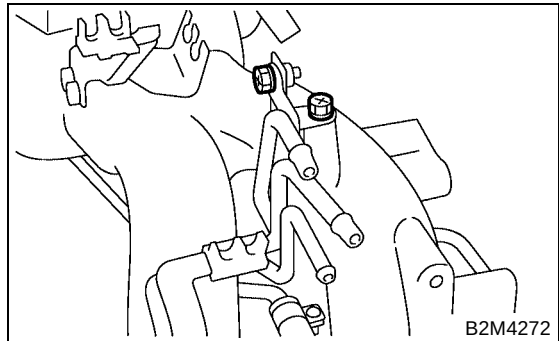
21) Remove bolt which installs injector pipe on intake manifold as shown in figure.



22) Remove bolt which installs injector pipe on intake manifold.

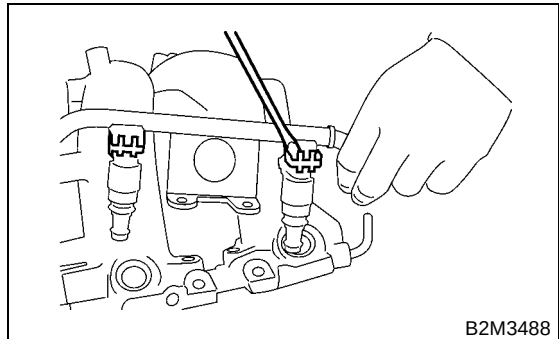


23) Remove two bolts which hold fuel pipes on the left side of intake manifold.

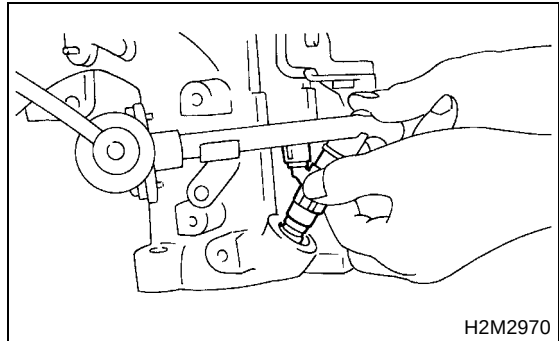


24) Remove fuel injectors.

(1) Remove fuel injector securing clip.



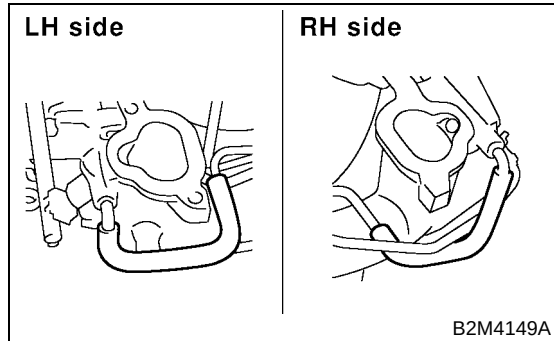
(2) Remove fuel injector while lifting up fuel injector pipe.



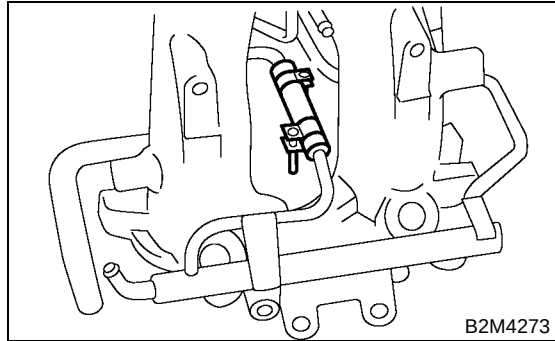
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

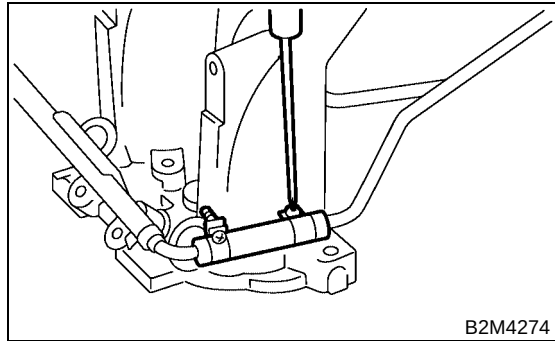
25) Disconnect air by-pass hoses from intake manifold.



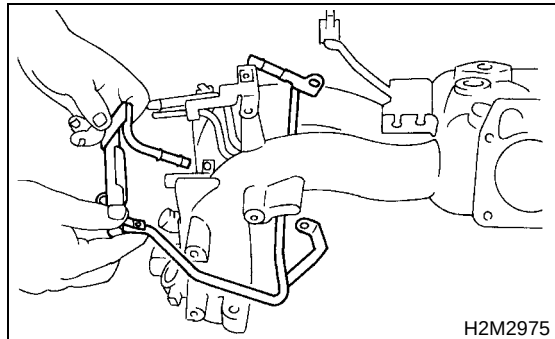
26) Loosen clamp which holds front left side fuel hose to injector pipe and remove the pipe from clamp.



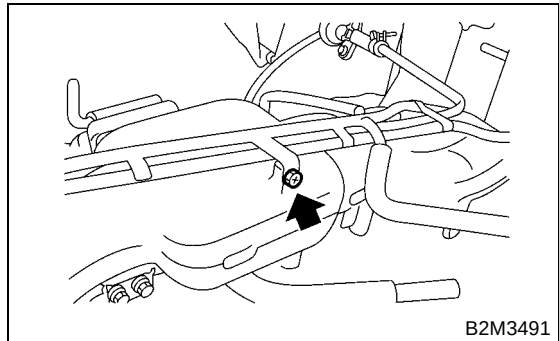
27) Loosen clamp which holds front right side fuel hose to injector pipe and remove the pipe from clamp.



28) Remove fuel injector pipe.



29) Remove bolt which installs fuel pipes on intake manifold.



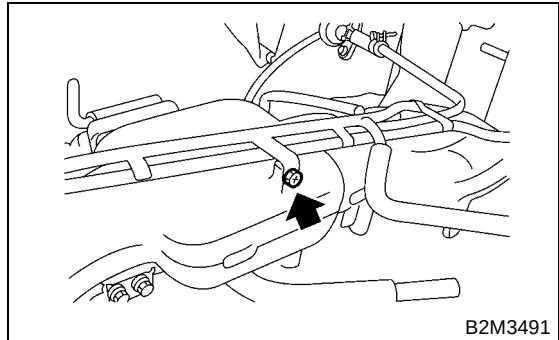
30) Remove fuel pipe assembly and pressure regulator, from intake manifold.

D: ASSEMBLY

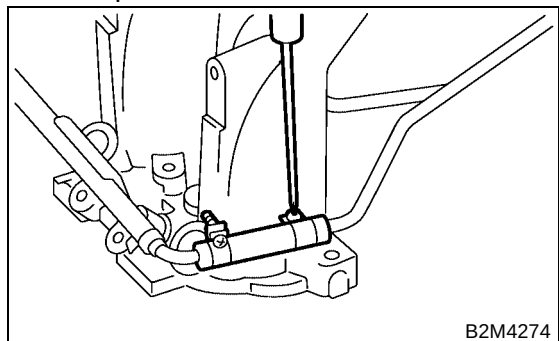
- 1) Install fuel pipe assembly and pressure regulator, etc. to intake manifold.
- 2) Tighten bolt which installs fuel pipes on intake manifold.

Tightening torque:

4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



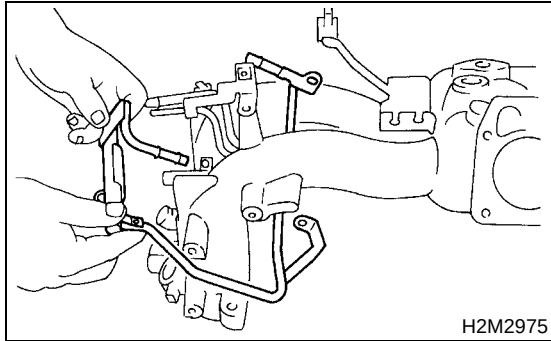
3) Connect right side fuel hose to injector pipe, and tighten clamp screw.



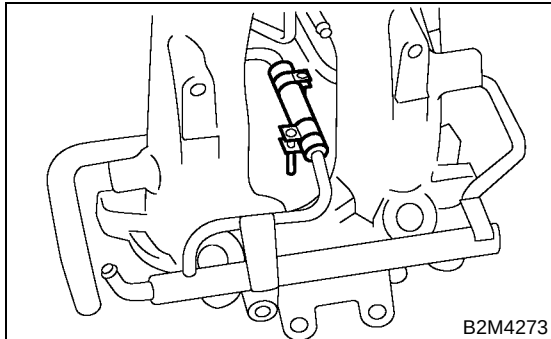
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

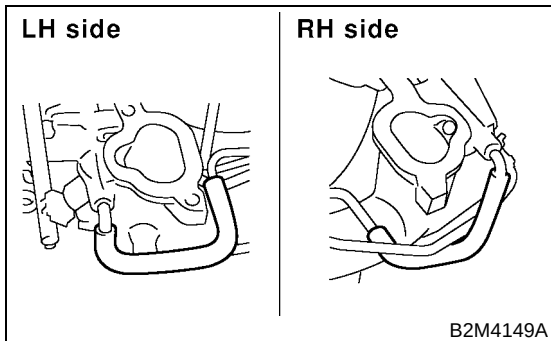
4) Install fuel injector pipe.



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

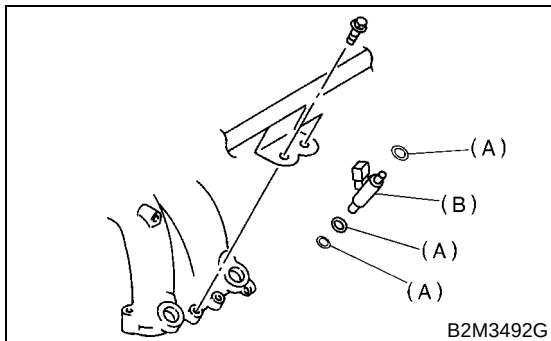


6) Connect air assist hoses.



7) Install fuel injectors.

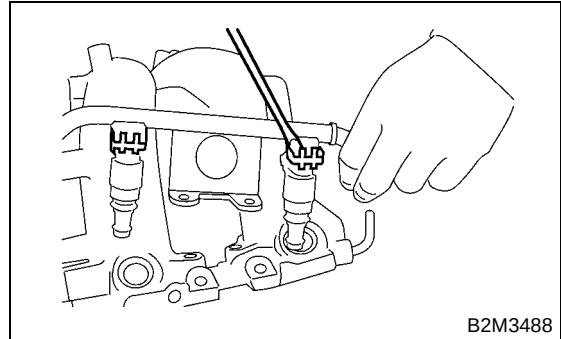
CAUTION:
Always use new o-rings.



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

NOTE:

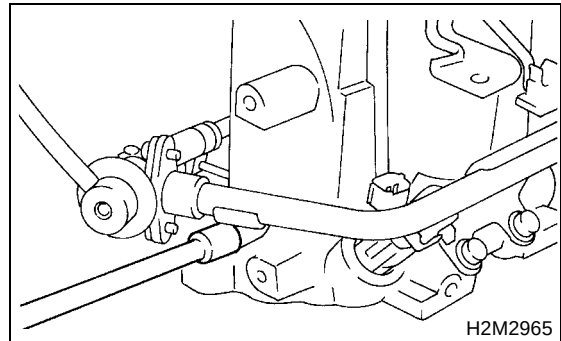
Do not forget to install the fuel injector securing clip.



8) Tighten bolt which installs injector pipe on intake manifold.

Tightening torque:

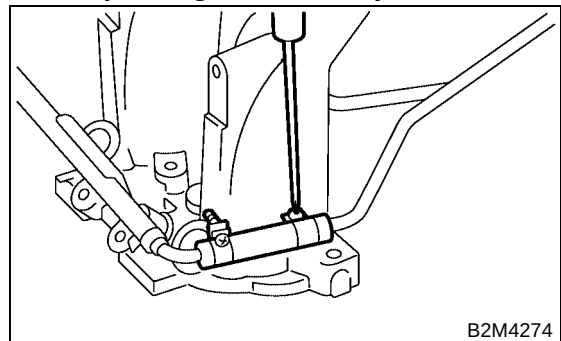
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



9) 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)



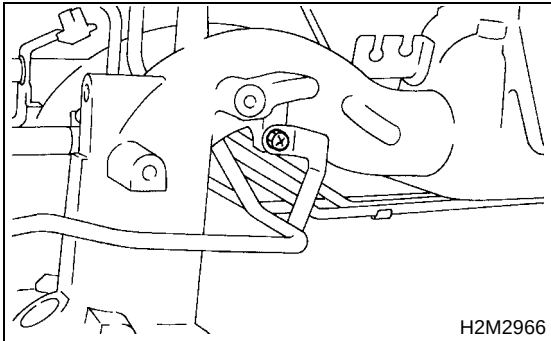
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

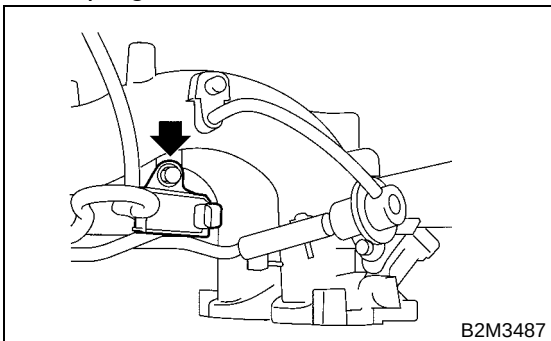
10) Tighten bolt which install injector pipe on intake manifold.

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



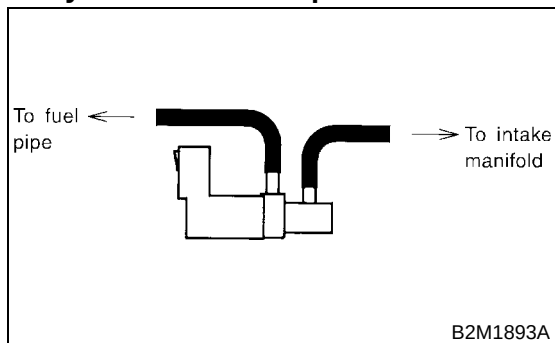
11) Install purge control solenoid valve.



12) Connect hoses to purge control solenoid valve.

CAUTION:

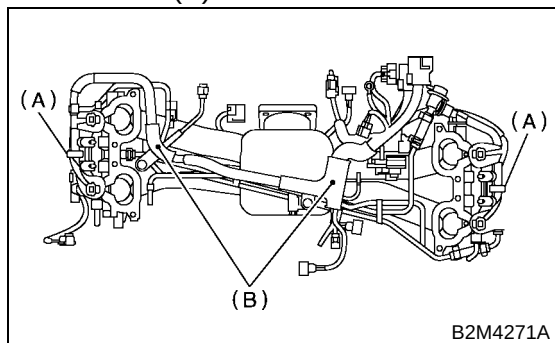
Carefully connect the evaporation hoses.



13) Install engine harness onto intake manifold.

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

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



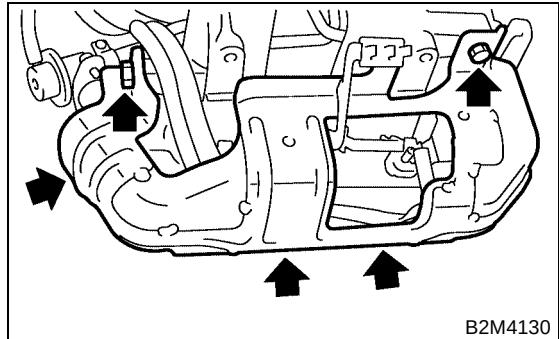
NOTE:

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

16) Install fuel pipe protector RH.

Tightening torque:

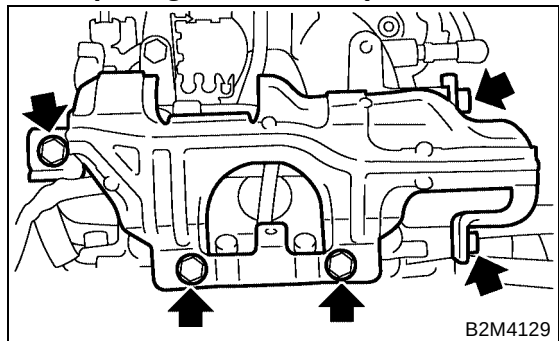
19 N·m (1.9 kgf-m, 13.7 ft-lb)



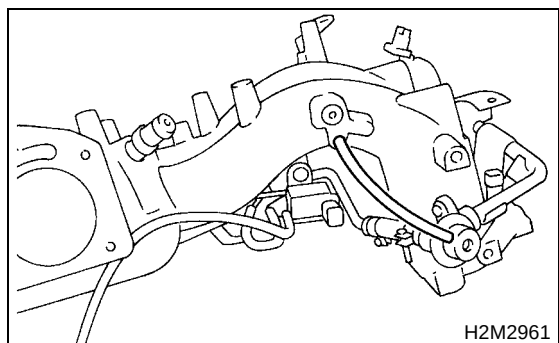
17) Install fuel pipe protector LH.

Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



18) Connect pressure regulator vacuum hose to intake manifold.



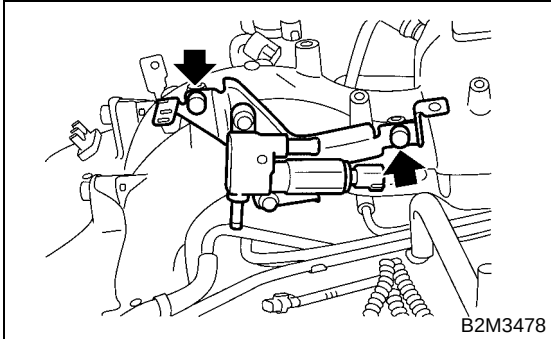
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

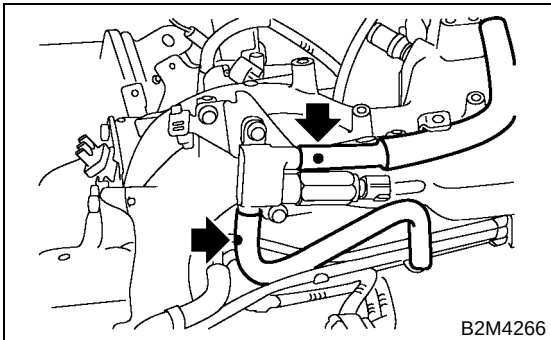
19) Install air assist injector solenoid valve to bracket.

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



20) Connect air by-pass hoses to air assist solenoid valve.



21) Connect connector to air assist solenoid valve.

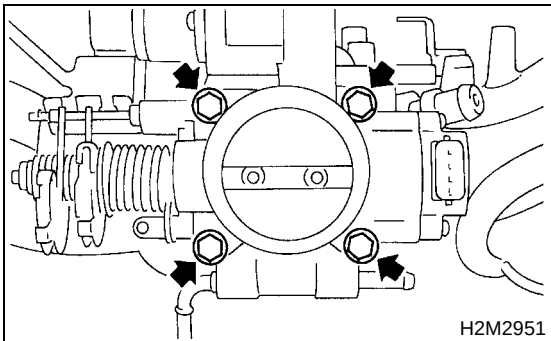
22) Install throttle body to intake manifold.

CAUTION:

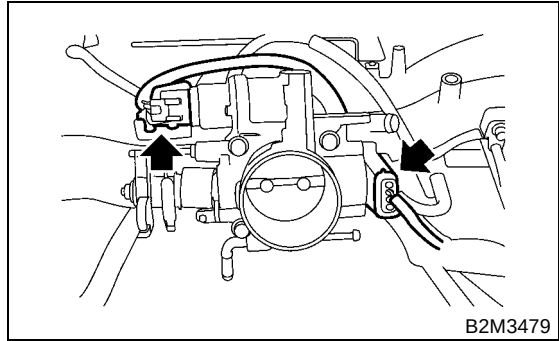
Replace gasket with a new one.

Tightening torque:

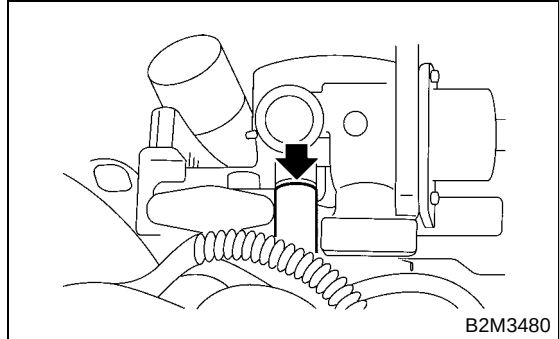
22 N·m (2.2 kgf-m, 15.9 ft-lb)



23) Connect connector to throttle position sensor and idle air control solenoid valve.



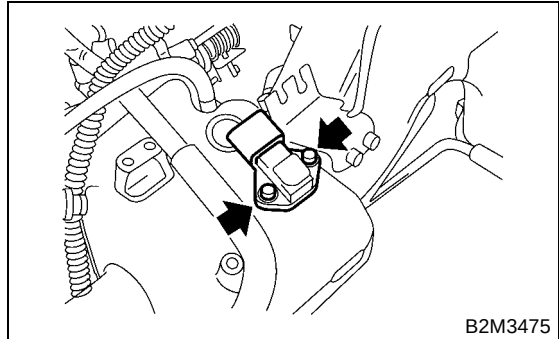
24) Connect air by-pass hose to throttle body.



25) Install intake air temperature and pressure sensor.

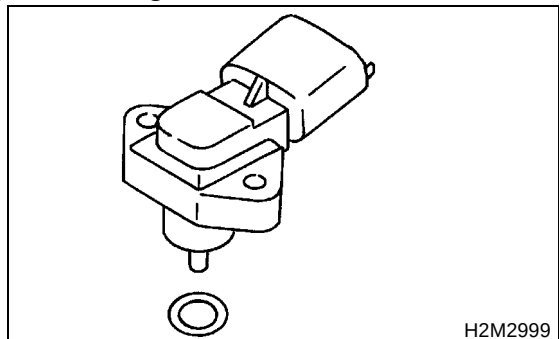
Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



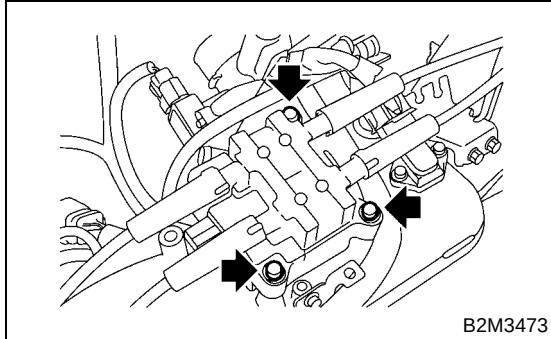
CAUTION:

Replace O-ring with new one.



26) Connect connector to intake air temperature and pressure sensor.

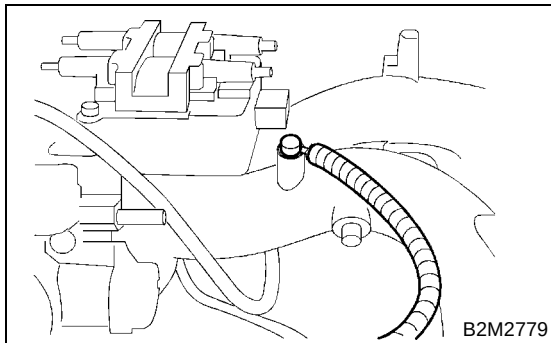
27) Install ignition coil and ignitor assembly.



B2M3473

28) Connect connector to ignition coil and ignitor assembly.

29) Install engine ground terminal to intake manifold.



B2M2779

E: INSPECTION

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

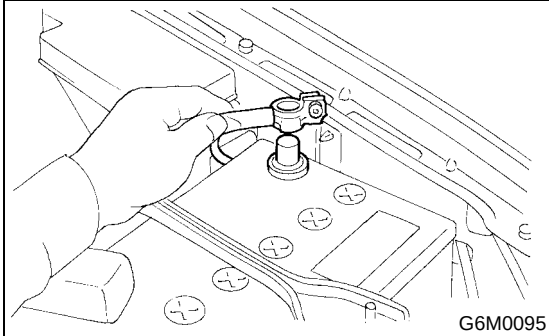
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

4. Engine Coolant Temperature Sensor

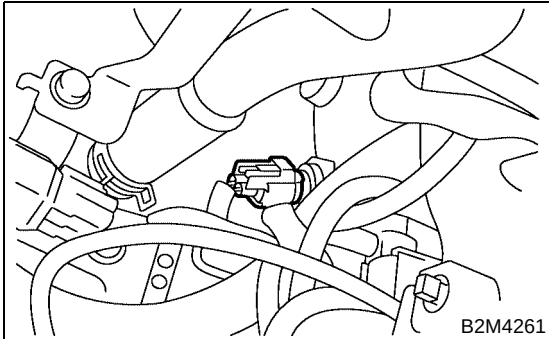
A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Remove air intake duct and air cleaner assembly. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>

- 3) Disconnect connector from engine coolant temperature sensor.



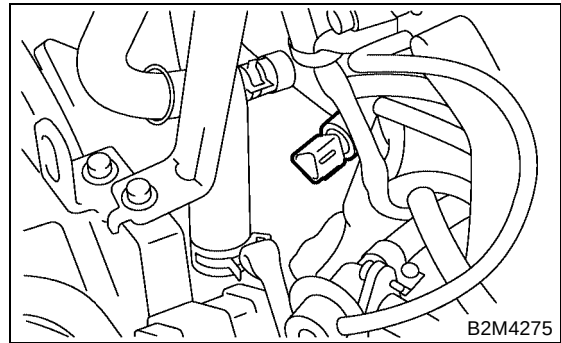
- 4) Remove engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (0.16 kgf-m, 1.2 ft-lb)



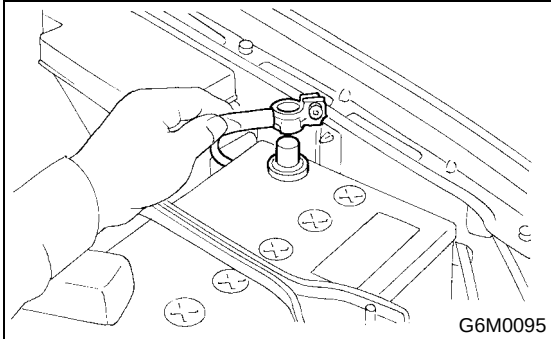
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

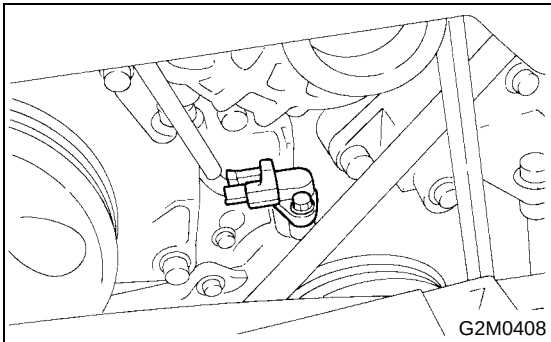
5. Crankshaft Position Sensor

A: REMOVAL

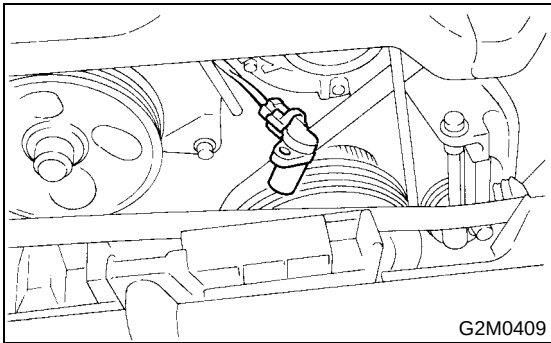
1) Disconnect battery ground cable.



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



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

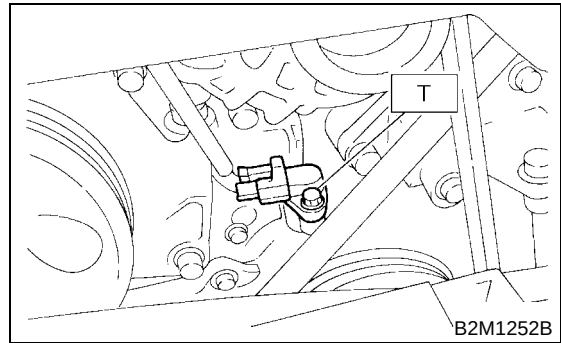


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



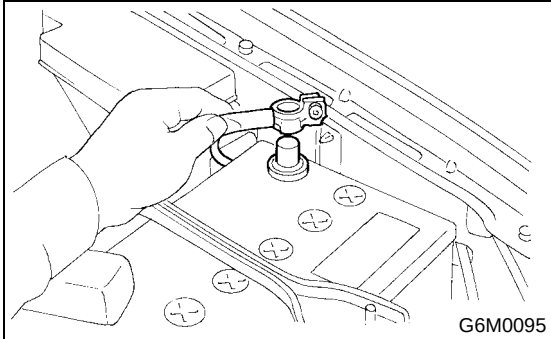
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

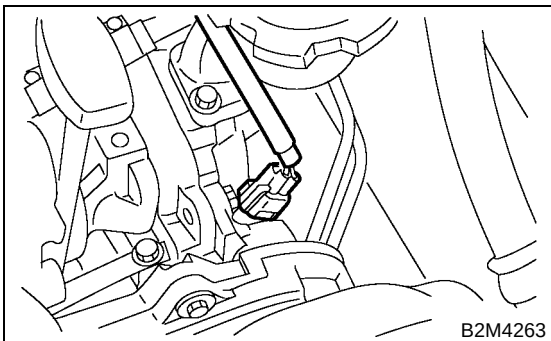
6. Camshaft Position Sensor

A: REMOVAL

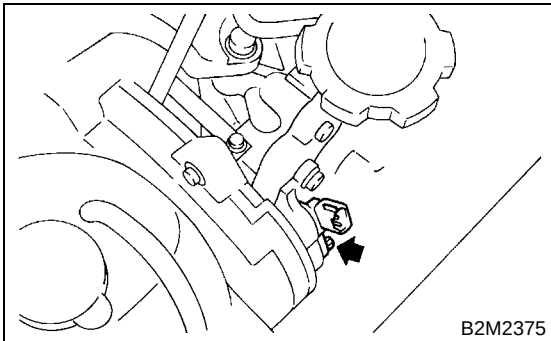
1) Disconnect battery ground cable.



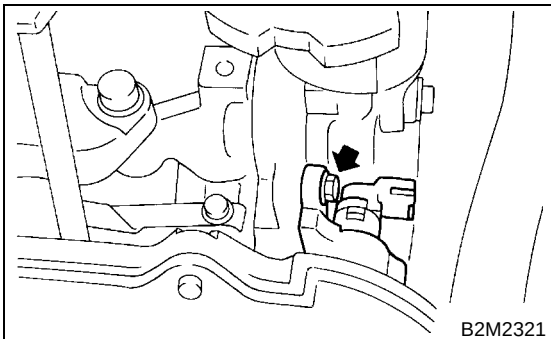
2) Disconnect connector from camshaft position sensor.



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

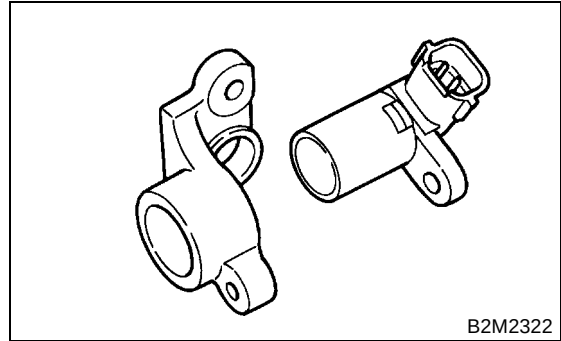


4) Remove bolt which installs camshaft position sensor support to camshaft cap LH.



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.

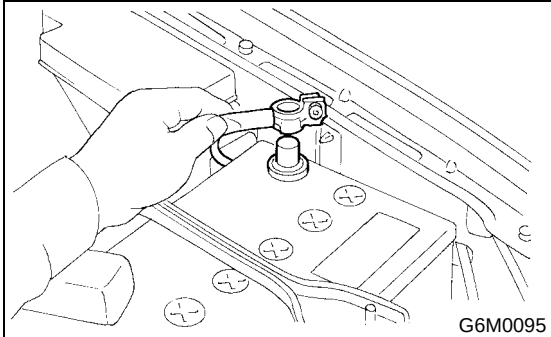
Tightening torque:

- 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)

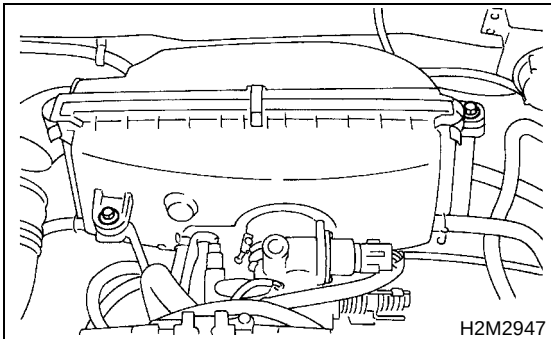
7. Knock Sensor

A: REMOVAL

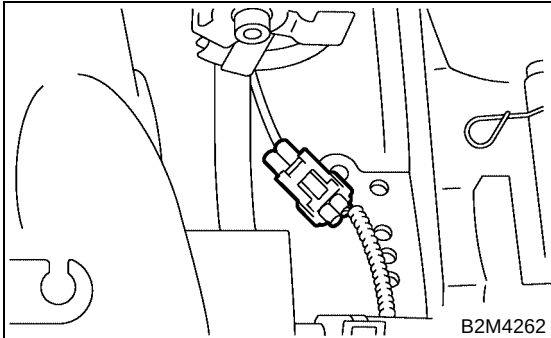
- 1) Disconnect battery ground cable from battery ground terminal.



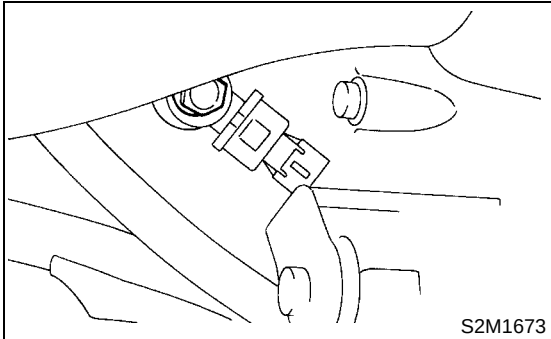
- 2) Remove air cleaner case.



- 3) Disconnect knock sensor connector.



- 4) Remove knock sensor from cylinder block.



B: INSTALLATION

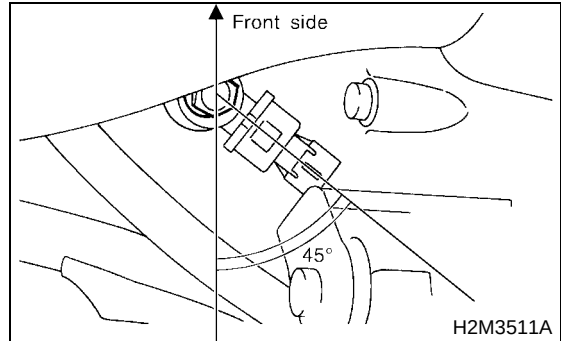
- 1) Install knock sensor to cylinder block.

Tightening torque:

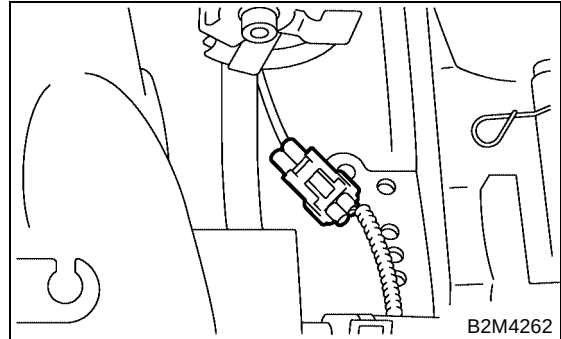
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:

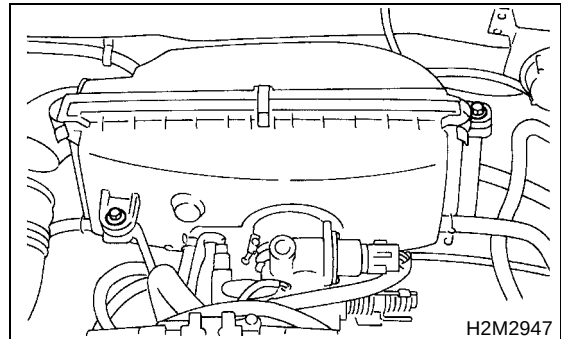
The extraction area of the knock sensor cord must be positioned at a 45° angle relative to the engine rear.



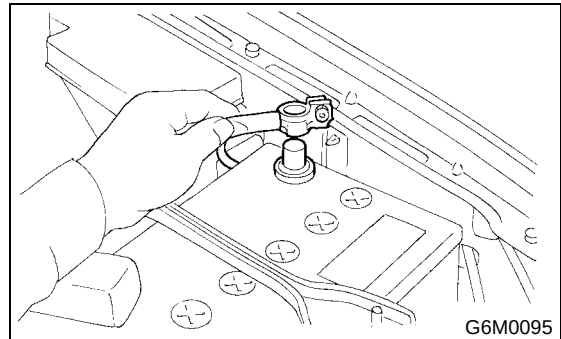
- 2) Connect knock sensor connector.



- 3) Install air cleaner case.



- 4) Connect battery ground cable.



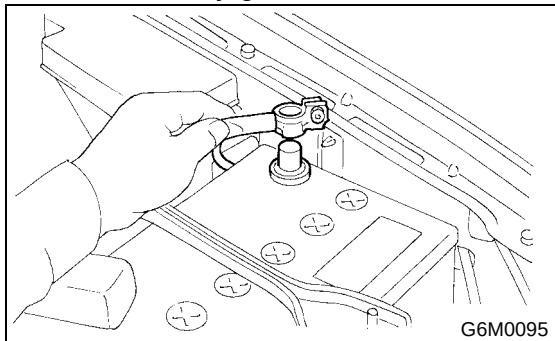
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

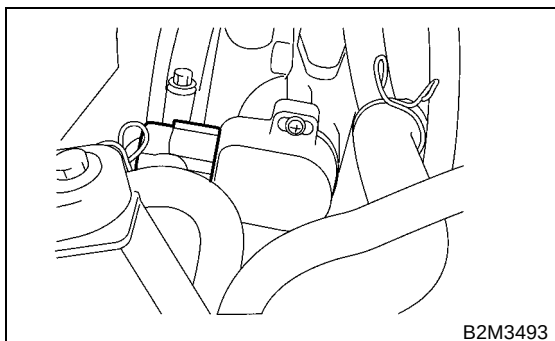
8. Throttle Position Sensor

A: REMOVAL

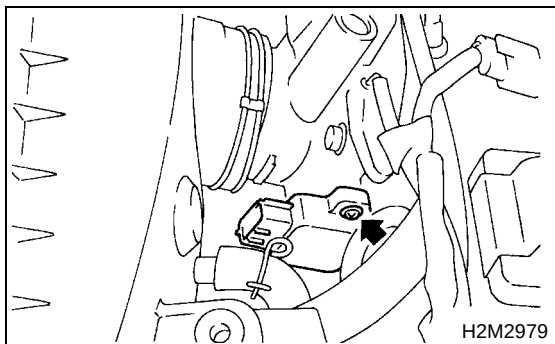
- 1) Disconnect battery ground cable.



- 2) Disconnect connector from throttle position sensor.



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



B: INSTALLATION

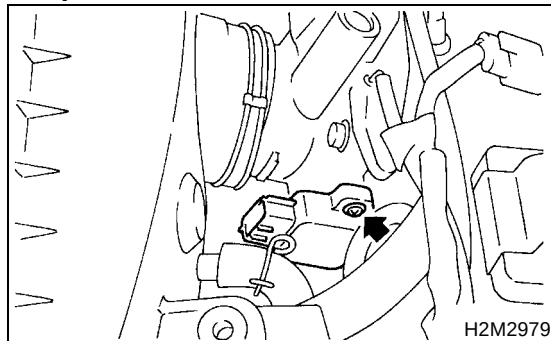
Install in the reverse order of removal.

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.

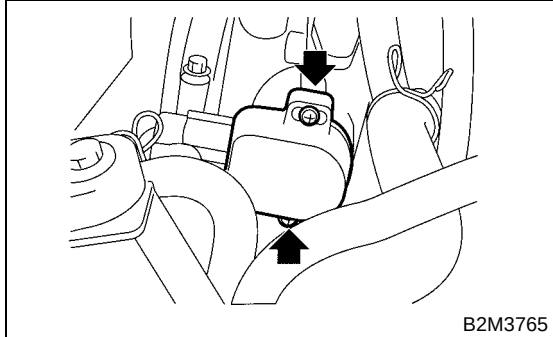


THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

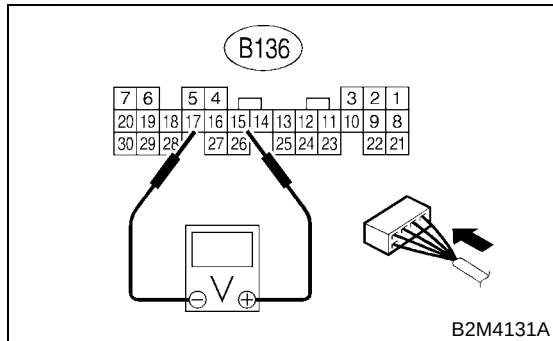
C: ADJUSTMENT

- 1) Turn ignition switch to OFF.
- 2) Loosen throttle position sensor holding screws.



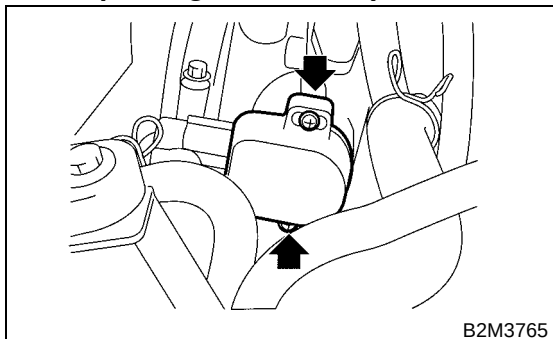
- 3) When using voltage meter;
 - (1) Take out ECM.
 - (2) Turn ignition switch to ON.
 - (3) Adjust throttle position sensor to the proper position to allow the voltage signal to ECM to be in specification.

Connector & terminal / Specified voltage
(B136) No. 15 — (B136) No. 17 / 0.45 — 0.55 V
[Fully closed.]



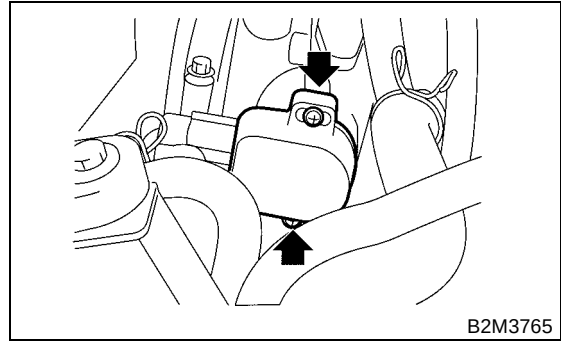
- (4) Tighten throttle position sensor holding screws.

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.

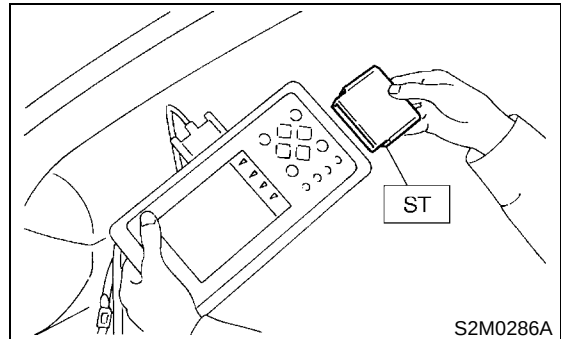
- (2) Loosen throttle position sensor holding screws.



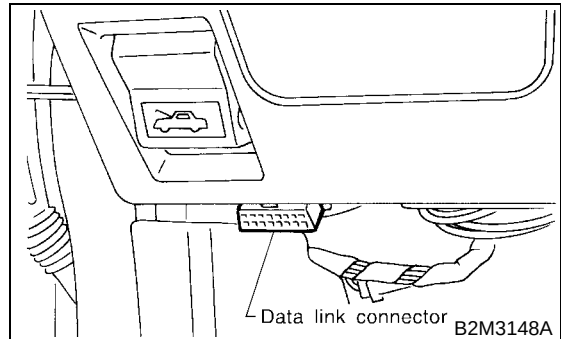
NOTE:

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

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



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



- 5) Turn ignition switch to ON, and Subaru Select Monitor switch to ON.
- 6) Select {2. Each System Check} in Main Menu.
- 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.

THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

10) Adjust throttle position sensor to the proper position to match with the following specifications.

Condition: Throttle fully closed

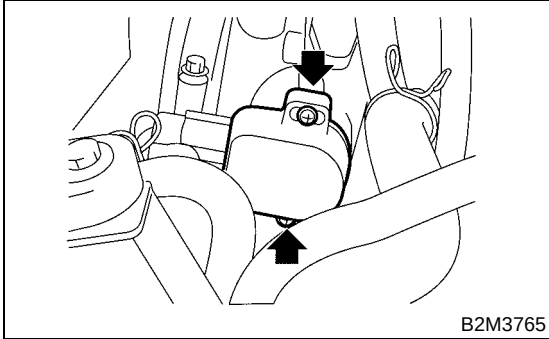
Throttle opening angle 0.00%

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)



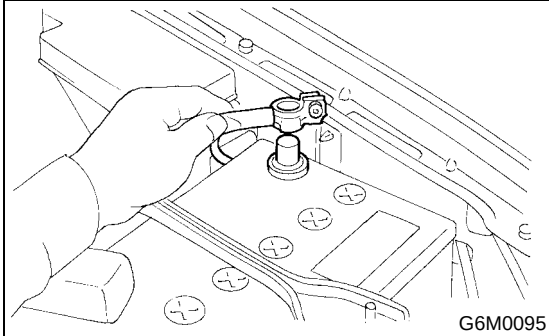
INTAKE AIR TEMPERATURE AND PRESSURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

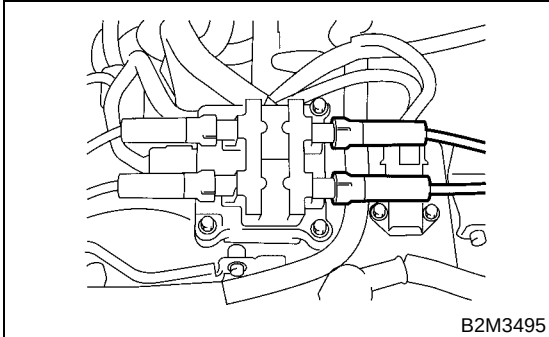
9. Intake Air Temperature and Pressure Sensor

A: REMOVAL

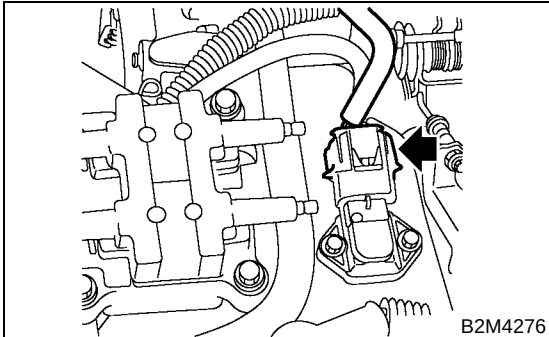
- 1) Disconnect battery ground cable.



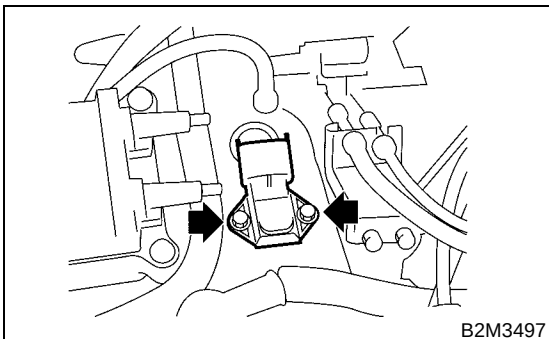
- 2) Disconnect spark plug cord from ignition coil and ignitor assembly.



- 3) Disconnect connector from intake air temperature and pressure sensor.



- 4) Remove intake air temperature and pressure sensor.

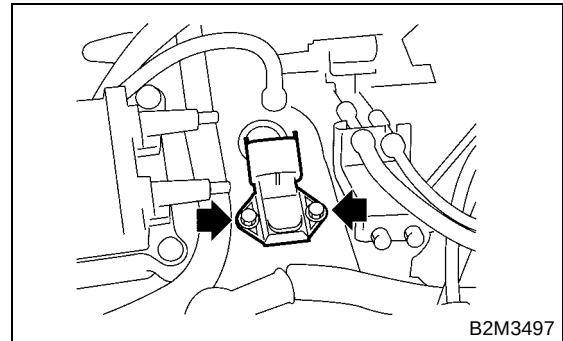


B: INSTALLATION

Install in the reverse order of removal.

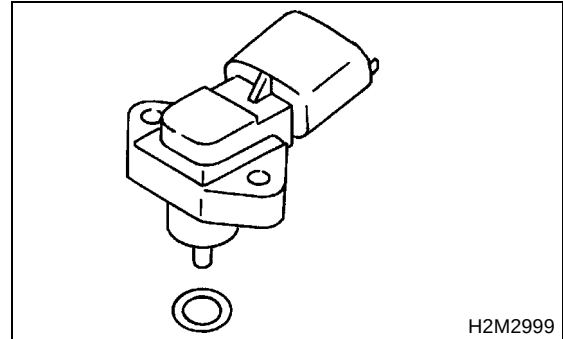
Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



CAUTION:

Replace O-ring with new one.



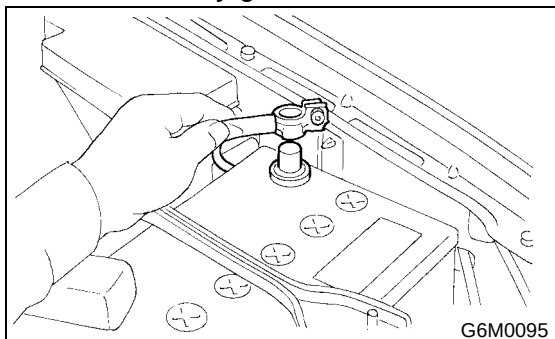
ATMOSPHERIC PRESSURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

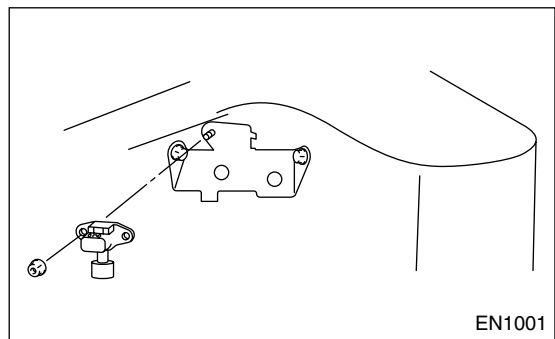
10. Atmospheric Pressure Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from atmospheric pressure sensor.
- 3) Remove atmospheric pressure sensor from bracket.

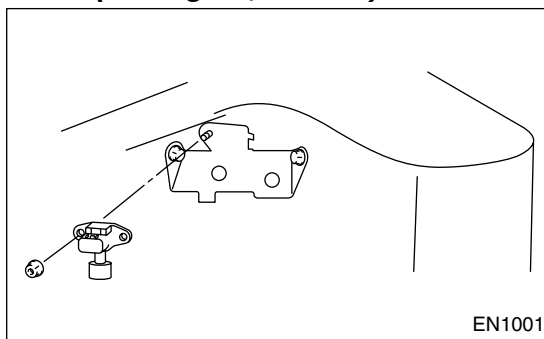


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



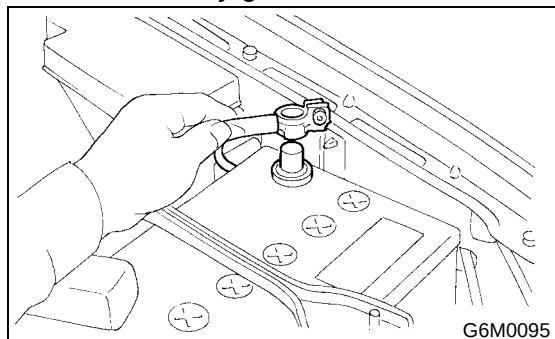
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

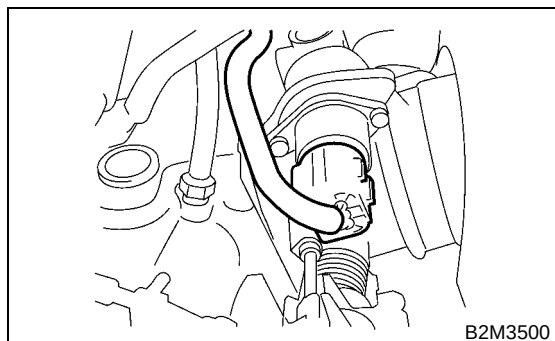
11.Idle Air Control Solenoid Valve

A: REMOVAL

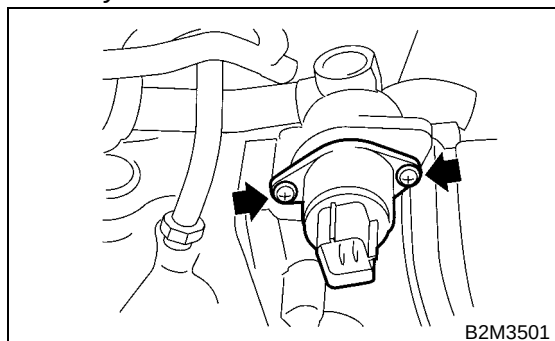
- 1) Disconnect battery ground cable.



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



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



B: INSTALLATION

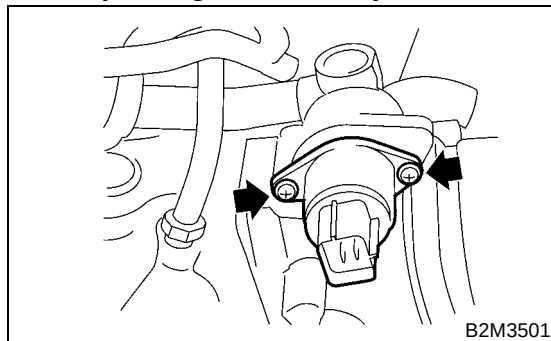
Install in the reverse order of removal.

CAUTION:

Always use new gasket.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



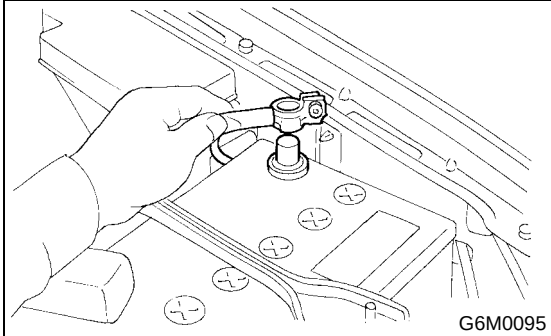
AIR ASSIST INJECTOR SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

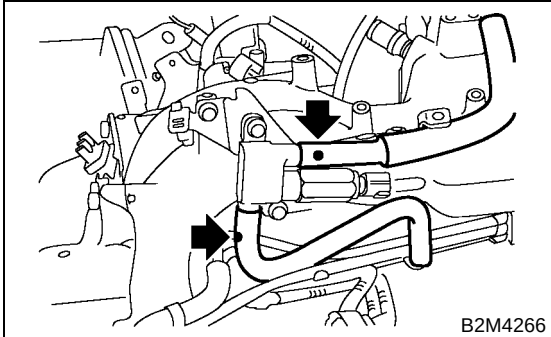
12. Air Assist Injector Solenoid Valve

A: REMOVAL

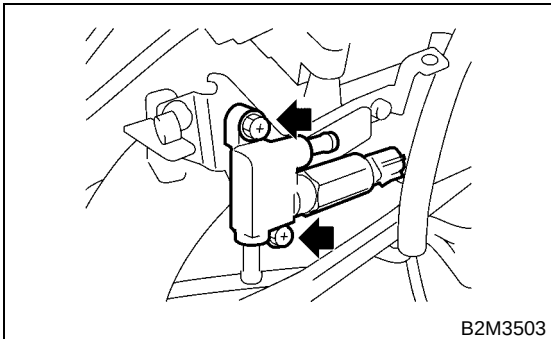
- 1) Disconnect battery ground cable.



- 2) Disconnect connector from air assist injector solenoid valve and disconnect air by-pass hoses.



- 3) Remove air assist injector solenoid valve from intake manifold.

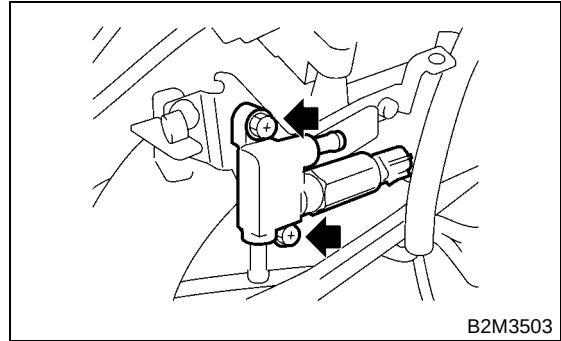


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

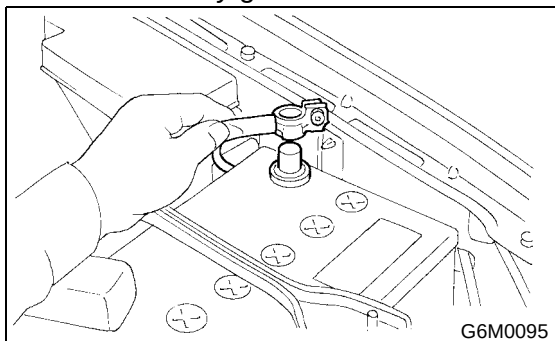


13. Fuel Injector

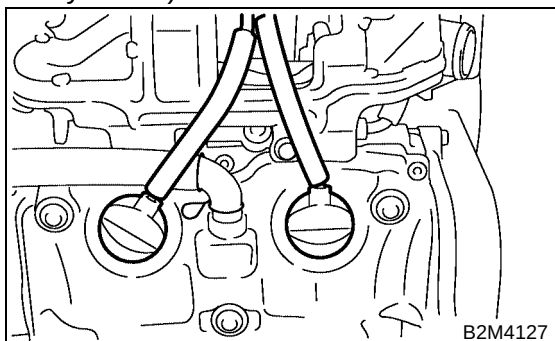
A: REMOVAL

1. RH SIDE

- 1) Release fuel pressure.
<Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.
- 3) Disconnect battery ground cable.

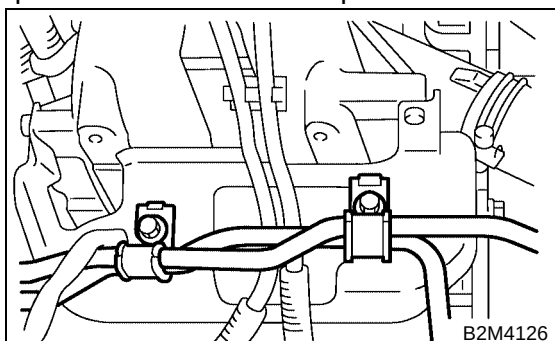


- 4) Remove resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
- 5) Remove spark plug cords from spark plugs (#1 and #3 cylinders).

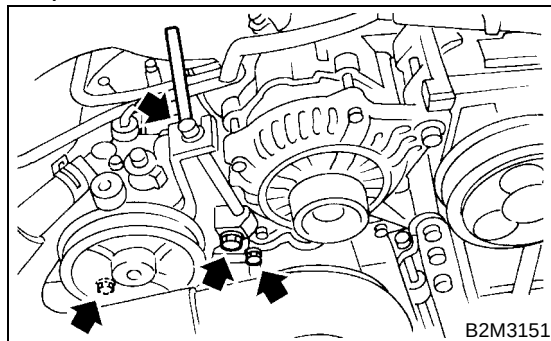


- 6) Remove power steering pump and tank from brackets.

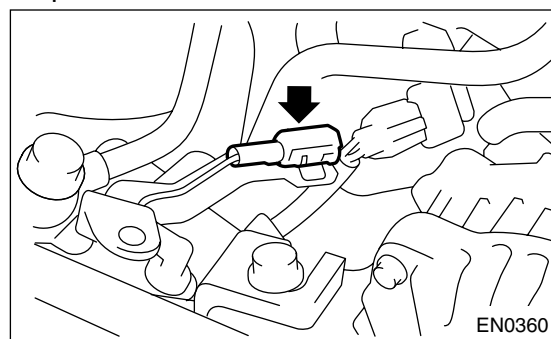
- (1) Remove front side V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- (2) Remove bolts which hold power steering pipes onto intake manifold protector.



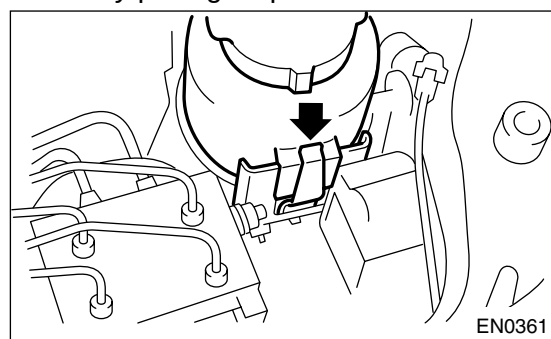
- (3) Remove bolts which install power steering pump to bracket.



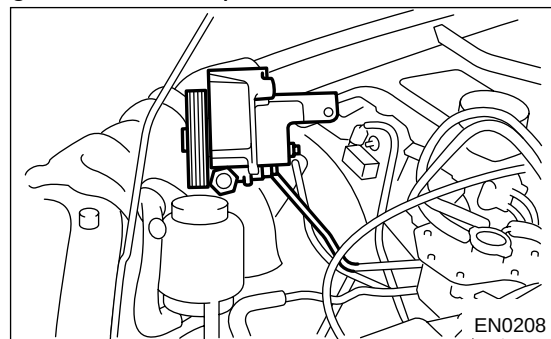
- (4) Disconnect connector from power steering pump switch.



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



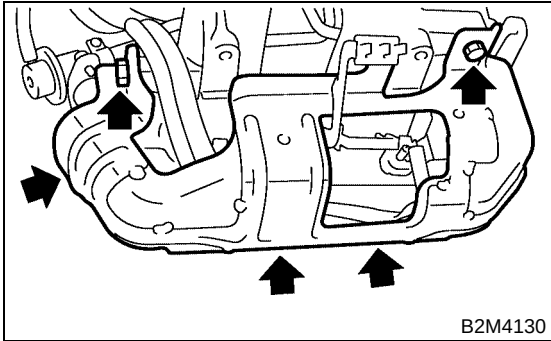
- (6) Place power steering pump and tank on the right side wheel apron.



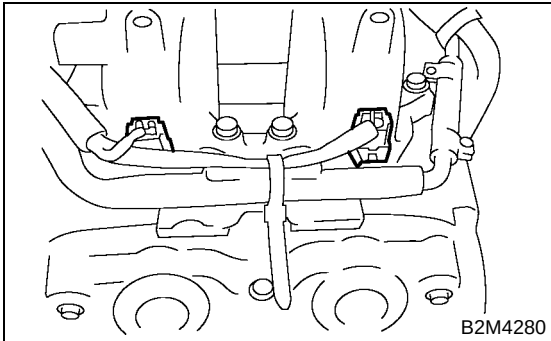
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

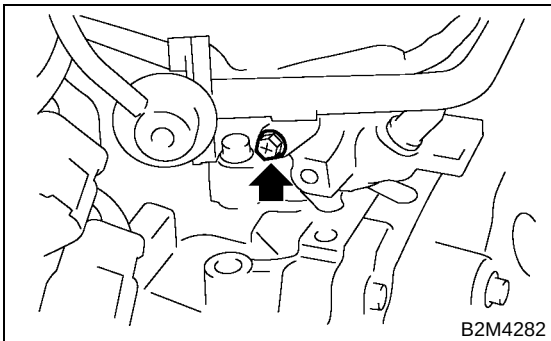
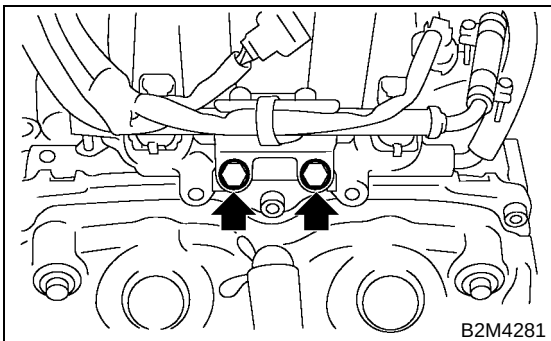
7) Remove fuel pipe protector RH.



8) Disconnect connector from fuel injector.

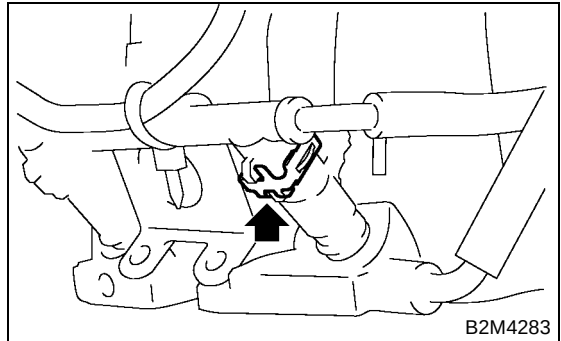


9) Remove bolt which holds injector pipe to intake manifold.

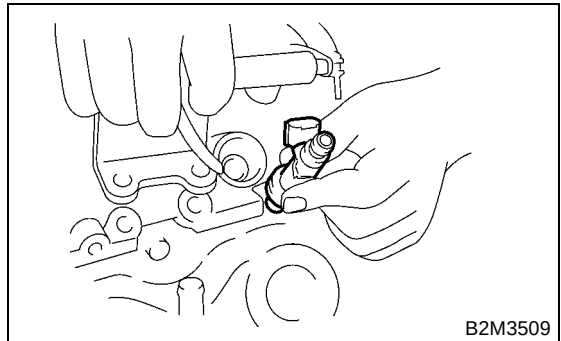


10) Remove fuel injector from intake manifold.

(1) Remove fuel injector securing clip.



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

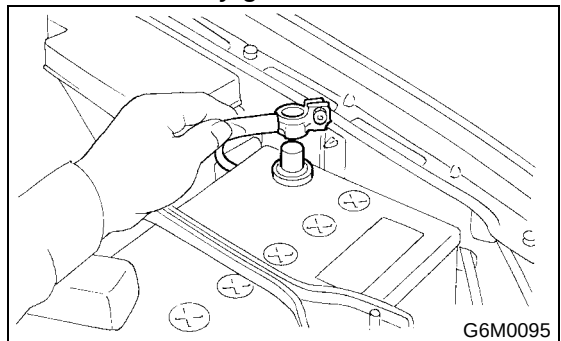


2. LH SIDE

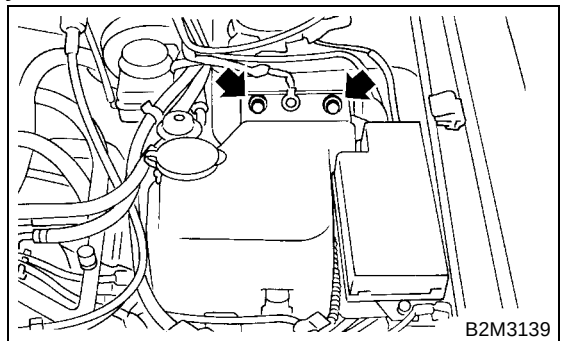
1) Release fuel pressure. <Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

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.

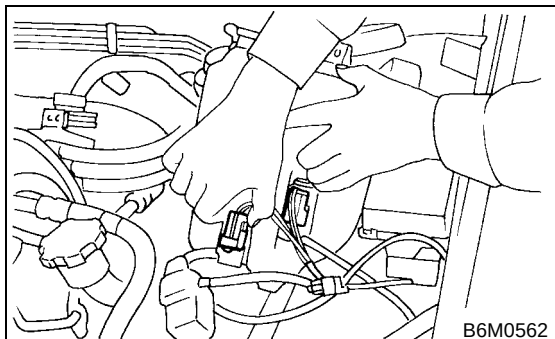


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

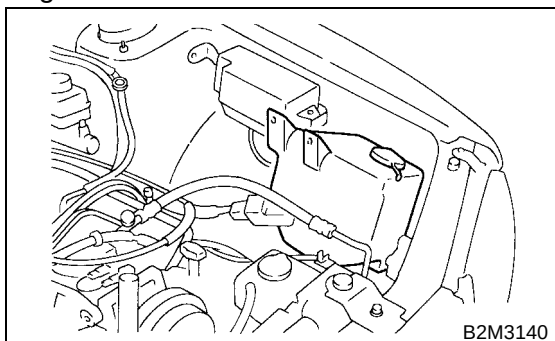
5) Disconnect connector from front window washer motor.

6) Disconnect connector from rear gate glass washer motor.

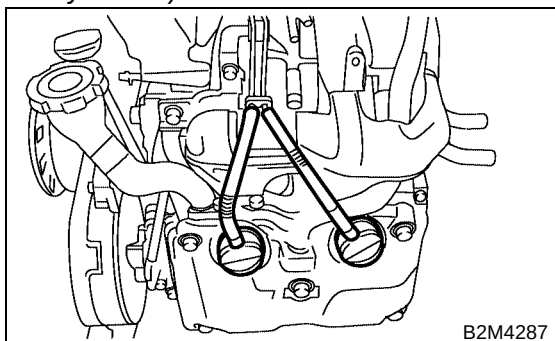


7) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

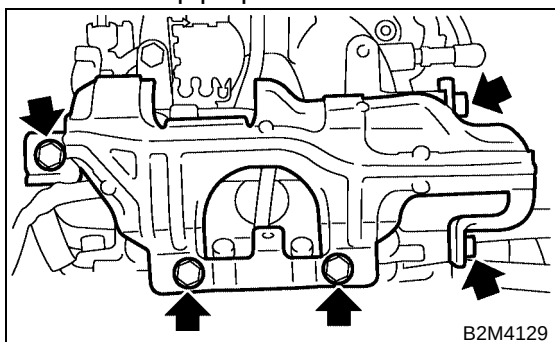
8) Move washer tank, and secure it away from working area.



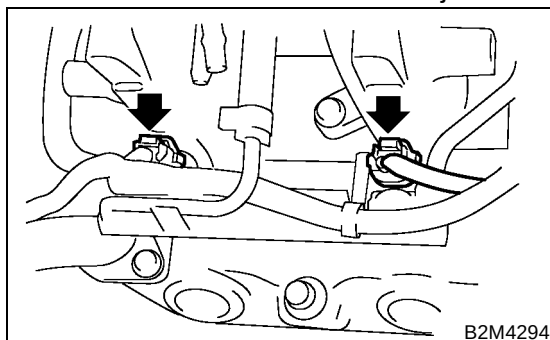
9) Remove spark plug cords from spark plugs (#2 and #4 cylinders).



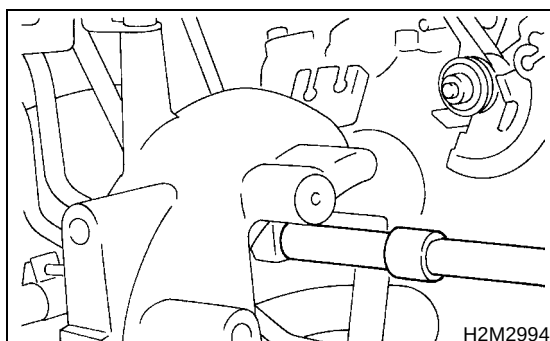
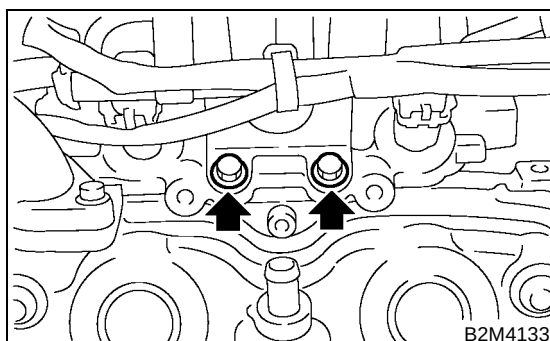
10) Remove fuel pipe protector LH.



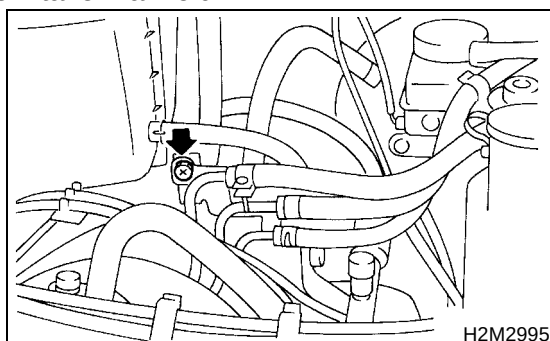
11) Disconnect connector from fuel injector.



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



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

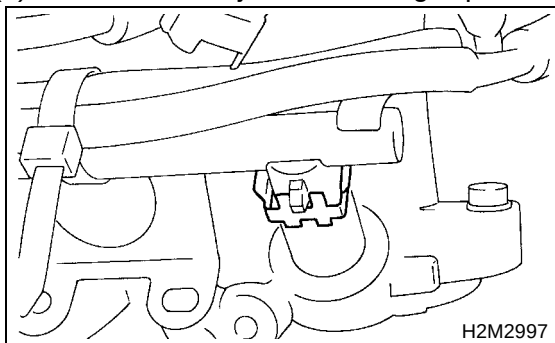


FUEL INJECTOR

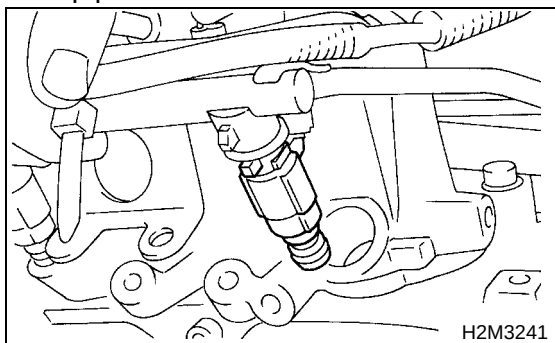
FUEL INJECTION (FUEL SYSTEMS)

14) Remove fuel injector from intake manifold.

(1) Remove fuel injector securing clip.



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



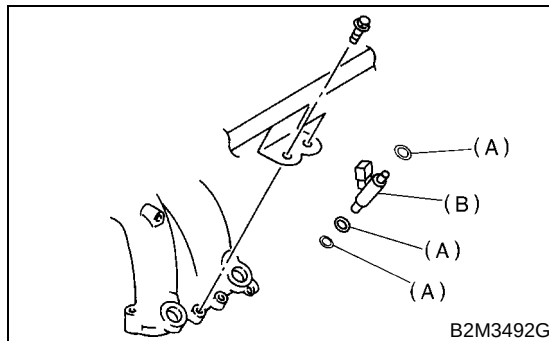
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

CAUTION:

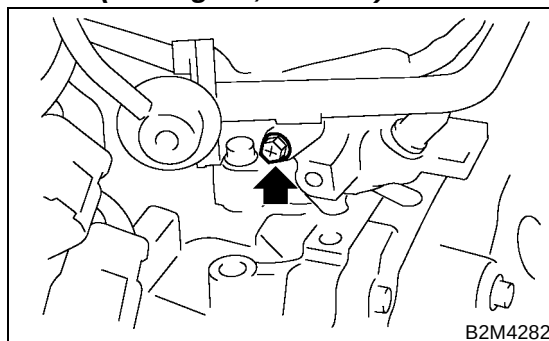
Replace O-rings and insulators with new ones.



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

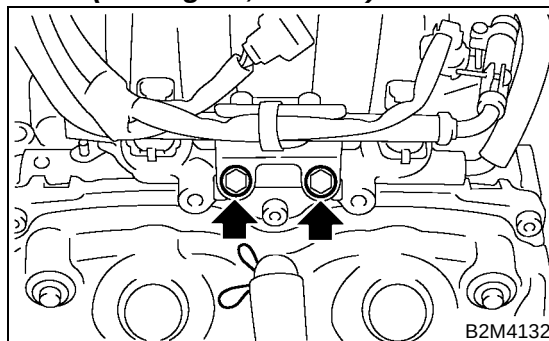
Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



Tightening torque:

19 N·m (0.19 kgf-m, 1.4 ft-lb)

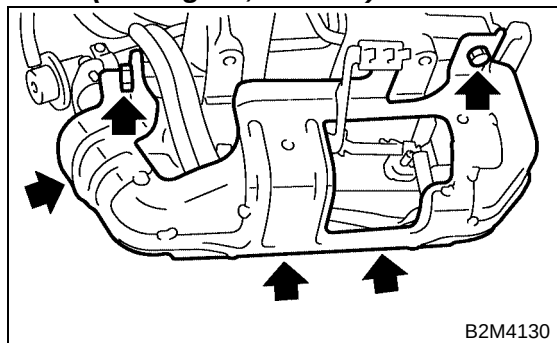


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

Tightening torque:

19 N·m (0.19 kgf-m, 1.4 ft-lb)

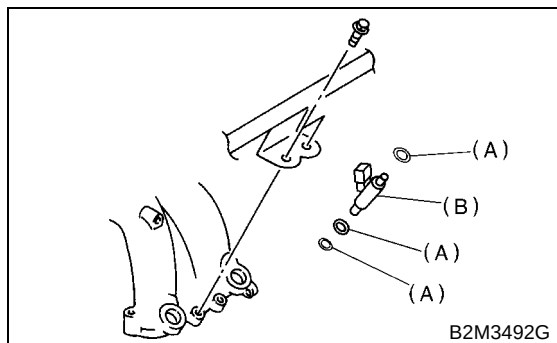


2. LH SIDE

Install in the reverse order of removal.

CAUTION:

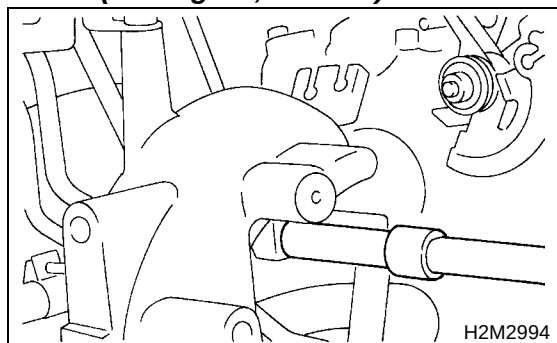
Replace O-rings and insulators with new ones.



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

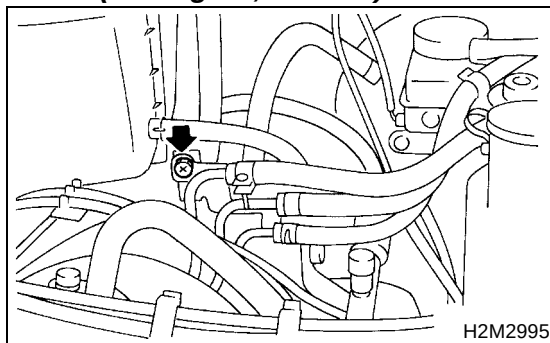
Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



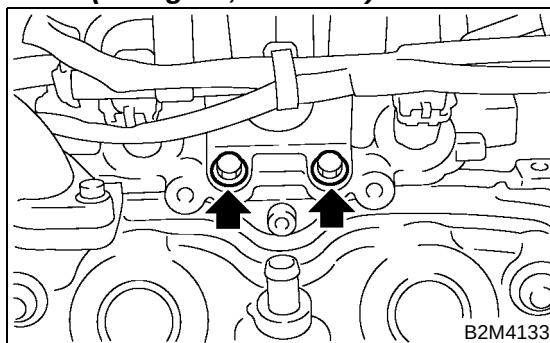
Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



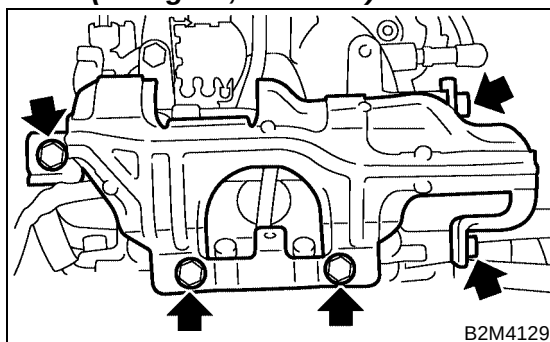
Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



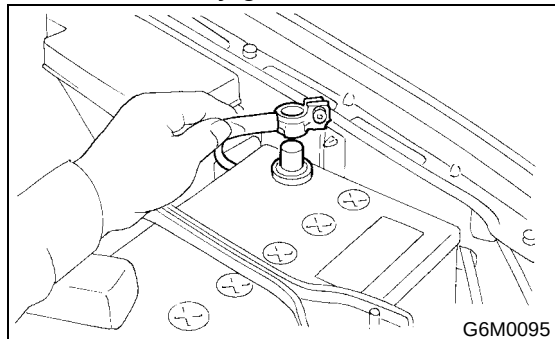
FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

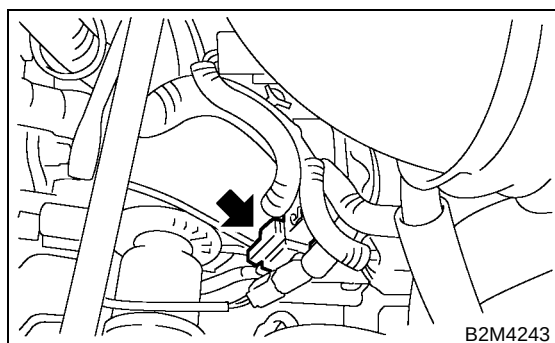
14.Front Oxygen (A/F) Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from front oxygen (A/F) sensor.



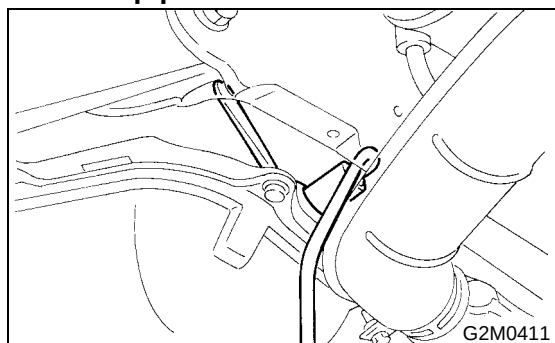
- 3) Lift-up the vehicle.
- 4) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove 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

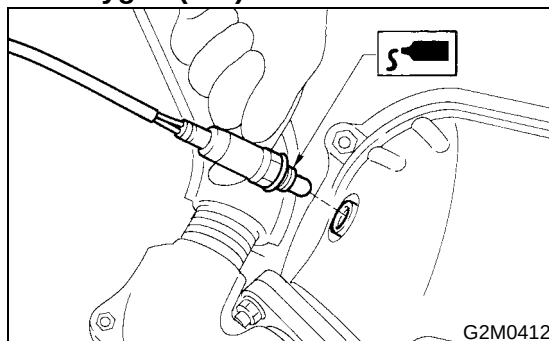
- 1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:

SS-30 by JET LUBE

CAUTION:

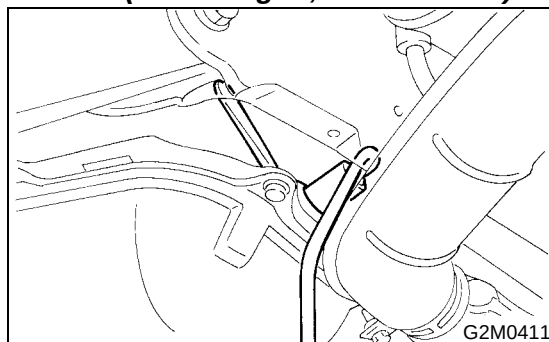
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.



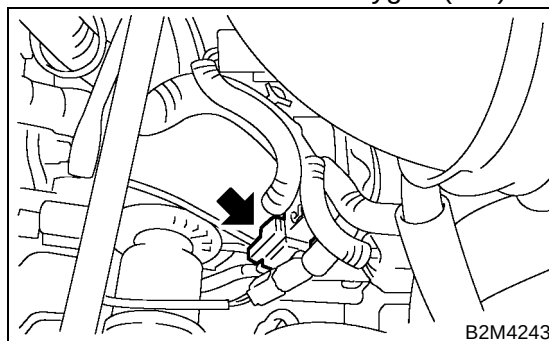
- 2) Install front oxygen (A/F) sensor.

Tightening torque:

21 ± 3 N·m (2.1 ± 0.3 kg·m, 15.2 ± 2.2 ft·lb)



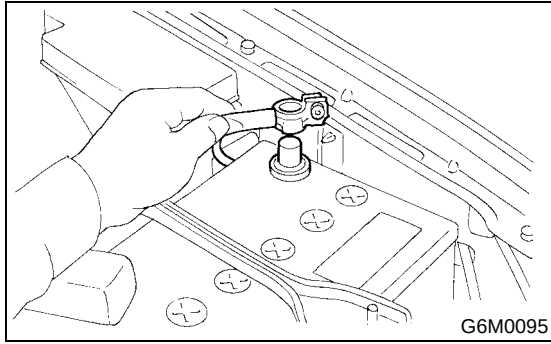
- 3) Lower the vehicle.
- 4) Connect connector of front oxygen (A/F) sensor.



FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

5) Connect battery ground cable.



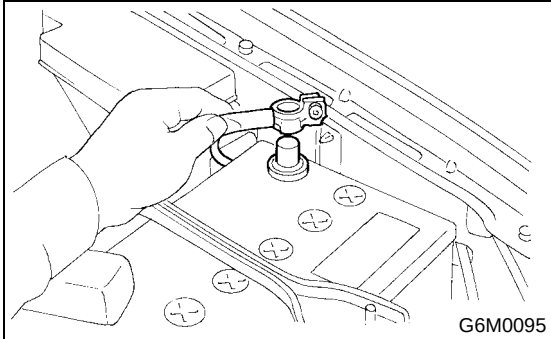
REAR OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

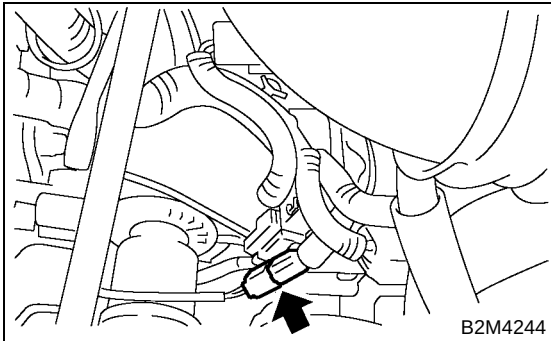
15.Rear Oxygen Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from rear oxygen sensor.



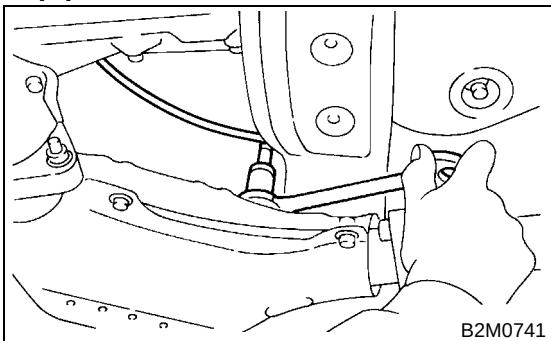
- 3) Lift-up the vehicle.
- 4) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove rear oxygen sensor.

CAUTION:

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



B: INSTALLATION

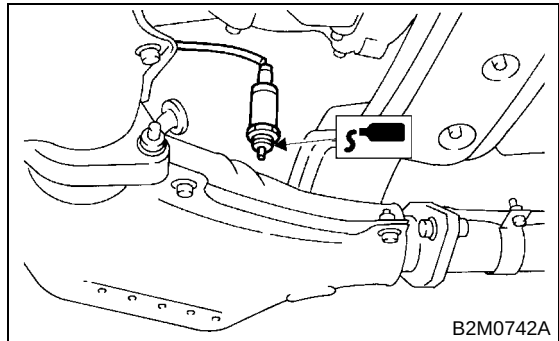
- 1) Before installing rear oxygen sensor, apply anti-seize compound only to threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:

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

Anti-seize compound:

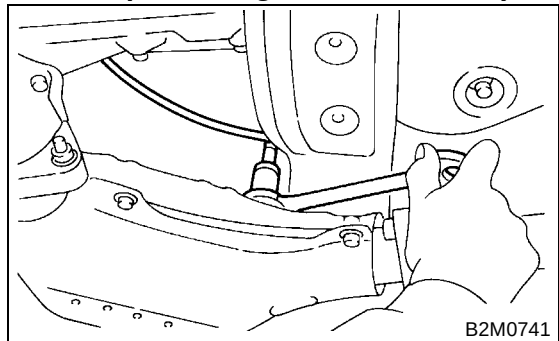
SS-30 by JET LUBE



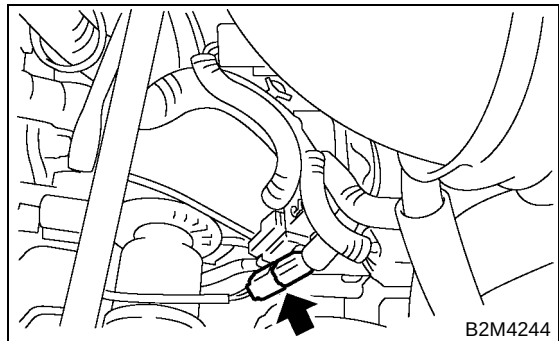
- 2) Install rear oxygen sensor.

Tightening torque:

21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)



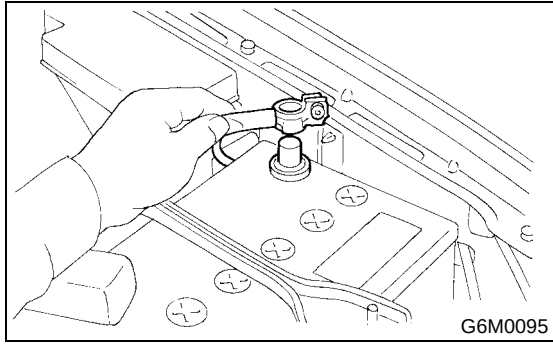
- 3) Lower the vehicle.
- 4) Connect connector to rear oxygen sensor.



REAR OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

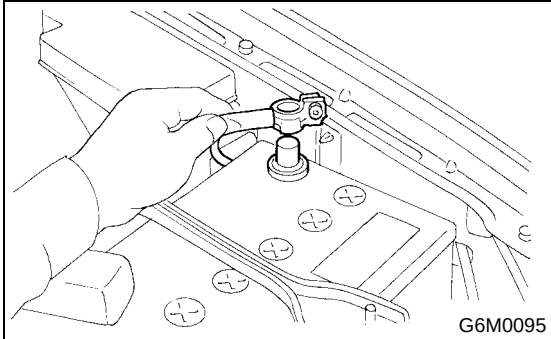
5) Connect battery ground cable.



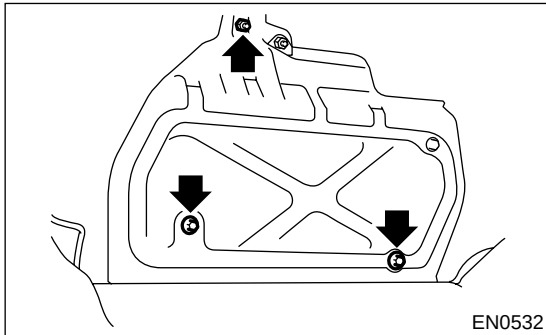
16.Engine Control Module

A: REMOVAL

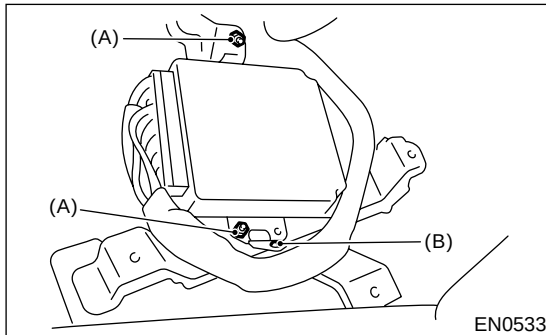
- 1) Disconnect battery ground cable.



- 2) Remove lower inner trim of passenger side.
<Ref. to EI-29, REMOVAL, Lower Inner Trim.>
3) Detach floor mat of front 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.

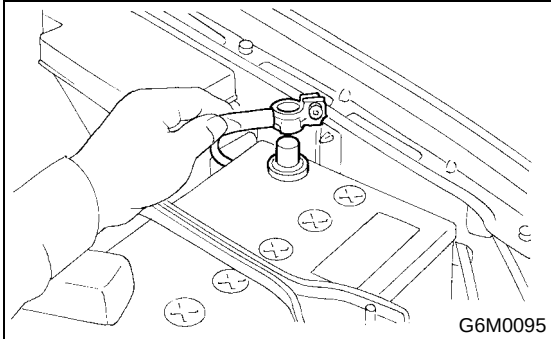
CAUTION:

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

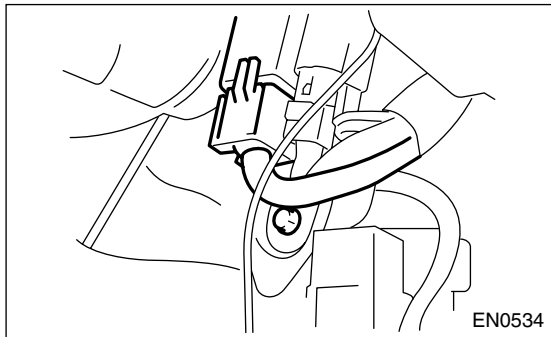
17.Main Relay

A: REMOVAL

- 1) Disconnect battery ground cable.



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



B: INSTALLATION

Install in the reverse order of removal.

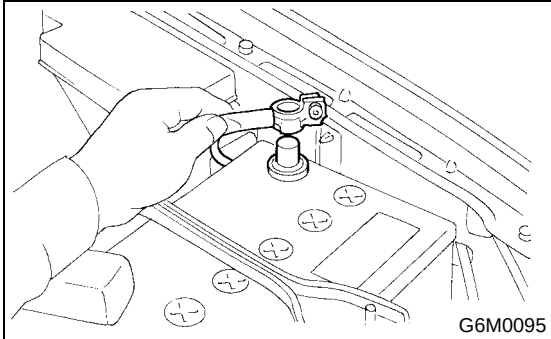
FUEL PUMP RELAY

FUEL INJECTION (FUEL SYSTEMS)

18. Fuel Pump Relay

A: REMOVAL

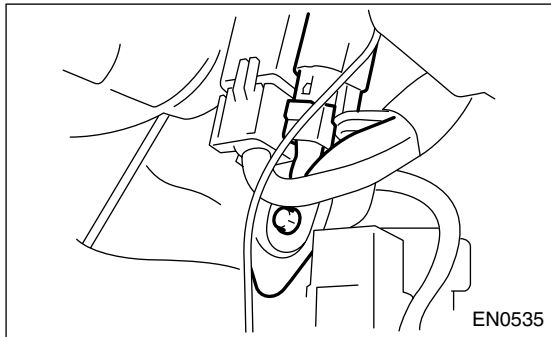
1) Disconnect battery ground cable.



2) Remove passenger's side front side sill cover.

3) Remove bolt which holds fuel pump relay bracket on body.

4) Disconnect connector from fuel pump.



5) Remove fuel pump relay from mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

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 connector from fuel pump relay.



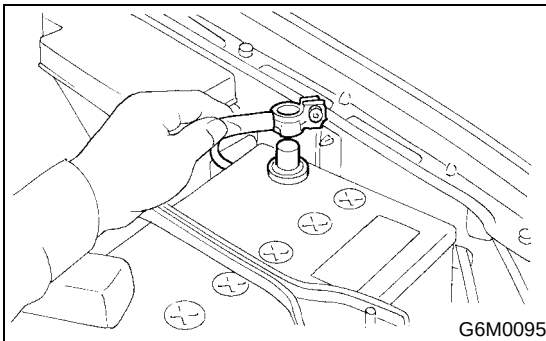
- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn ignition switch to OFF.

2. DRAINING FUEL

WARNING:

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

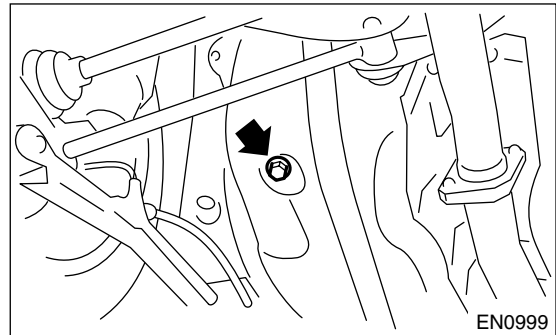
- 1) Set vehicle on the lift.
- 2) Disconnect battery ground cable.



- 3) Lift-up the vehicle.

- 4) Drain fuel from fuel tank.

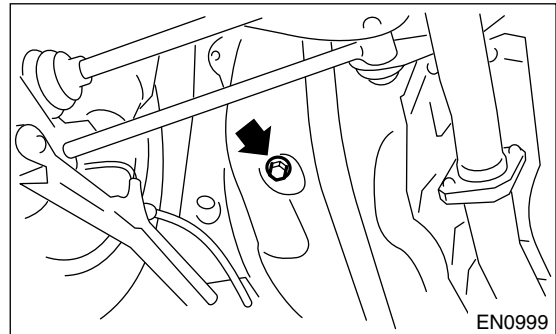
Set a container under the vehicle and remove drain plug from fuel tank.



- 5) Tighten fuel drain plug.

Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



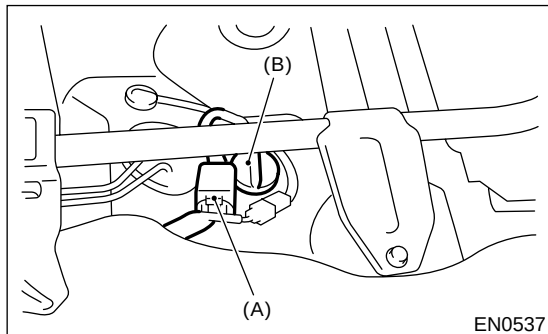
20. Fuel Tank

A: REMOVAL

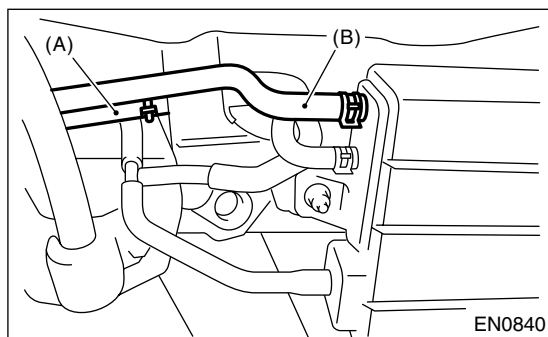
WARNING:

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

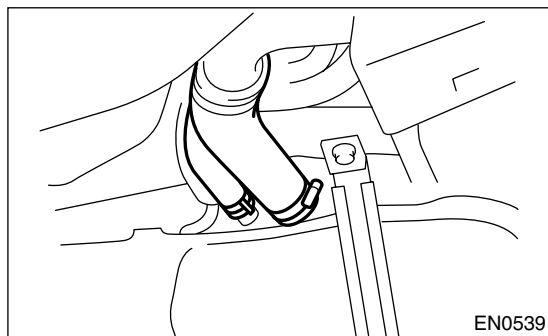
- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, Fuel.>
- 3) Drain fuel from fuel tank. <Ref. to FU(SOHC)-51, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove rear seat.
- 5) Disconnect connector (A) of fuel tank cord to rear harness.
- 6) Push grommet (B) which holds fuel tank cond on floor panel into under the body.



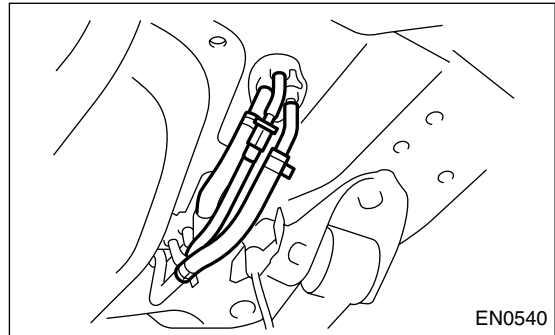
- 7) Remove rear crossmember. <Ref. to RS-22, REMOVAL, Rear Crossmember.>
- 8) Disconnect two-way valve hose (A) from two-way valve and disconnect canister hose (B) from canister.



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



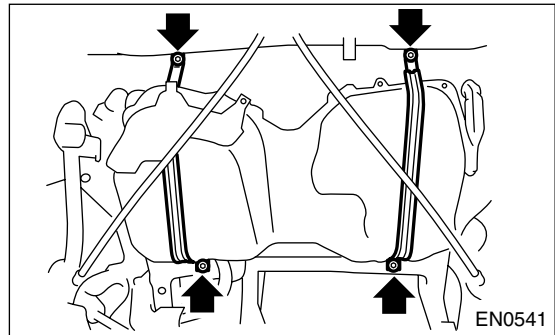
- 10) Move clips, and disconnect quick connector. <Ref. to FU(SOHC)-64, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 11) Disconnect fuel hoses.



- 12) 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.

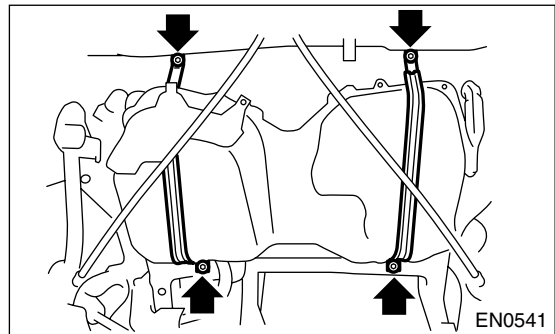


B: INSTALLATION

- 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:

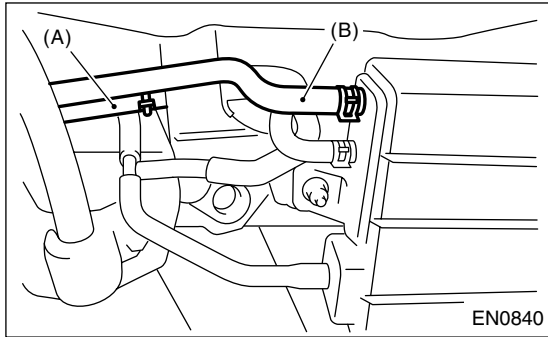
A helper is required to perform this work.



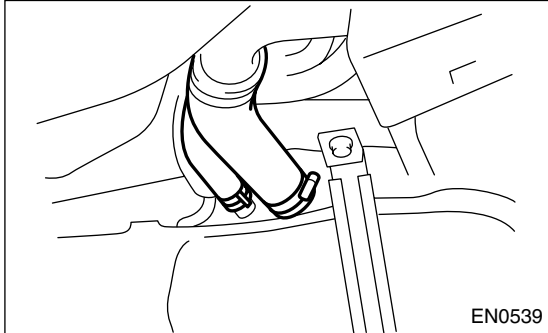
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

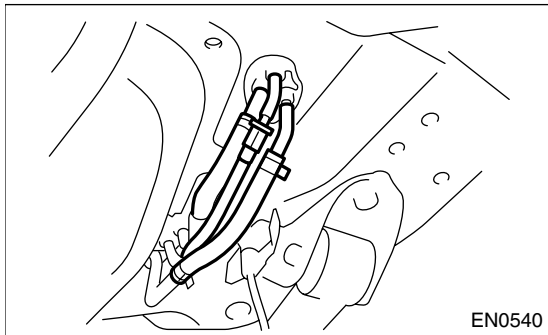
- 3) Connect two-way valve hose (A) to two-way valve and connect canister hose (B) to canister.



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



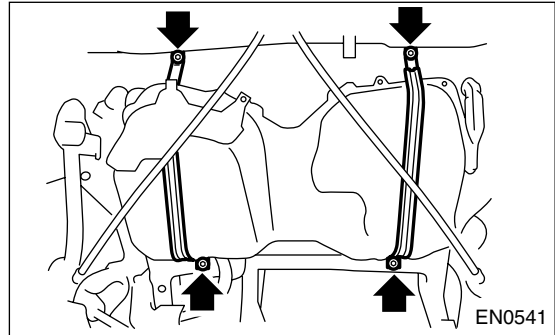
- 5) Connect fuel hoses, and hold then with clips and quick connector. <Ref. to FU(SOHC)-64, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



- 6) Tighten band mounting bolts.

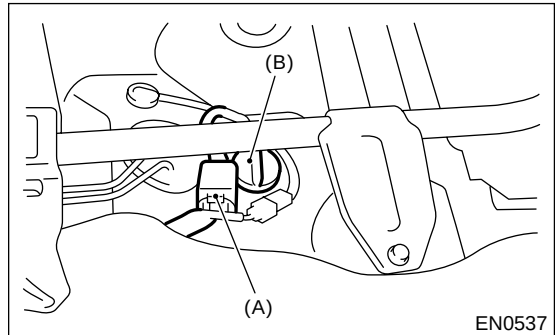
Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



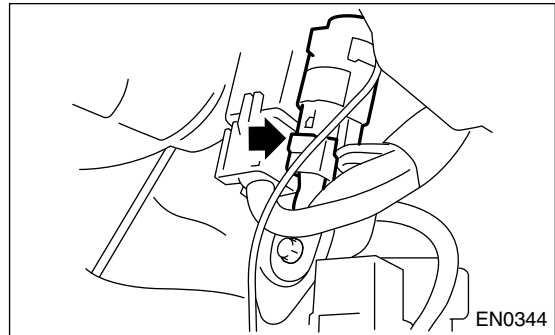
- 7) Install rear crossmember. <Ref. to RS-23, INSTALLATION, Rear Crossmember.>

- 8) Connect connectors to fuel tank cord and plug service hole with grommet



- 9) Set rear seat and floor mat.

- 10) Connect connector to fuel pump relay.



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.

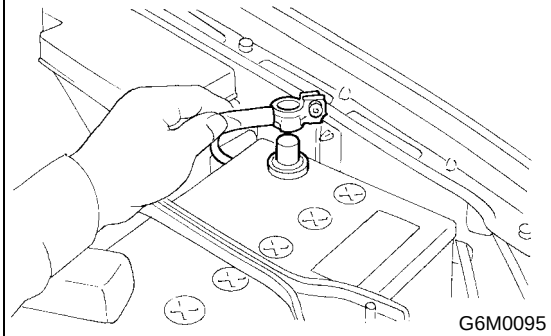
21. Fuel Filler Pipe

A: REMOVAL

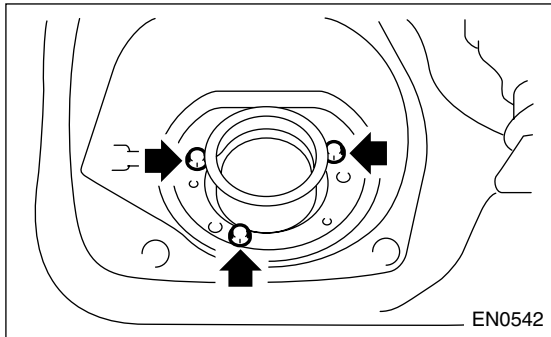
WARNING:

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

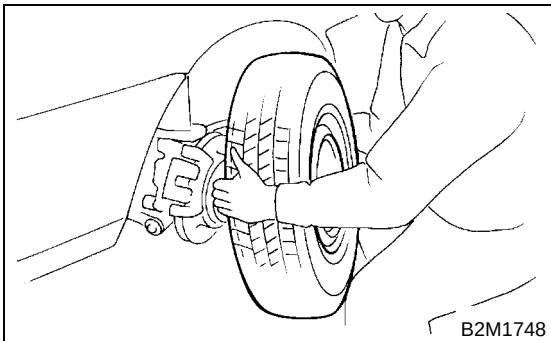
- 1) Release fuel pressure. <Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel filler flap lid and remove filler cap.
- 3) Disconnect battery ground cable.



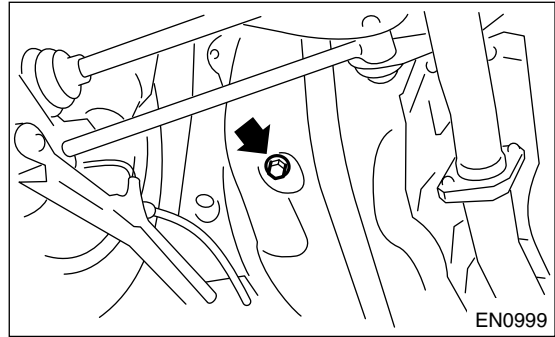
- 4) Remove screws holding packing in place.



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



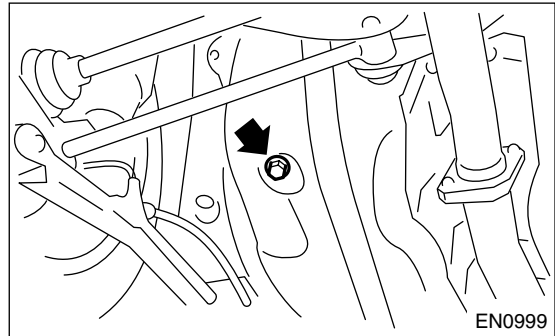
- 8) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



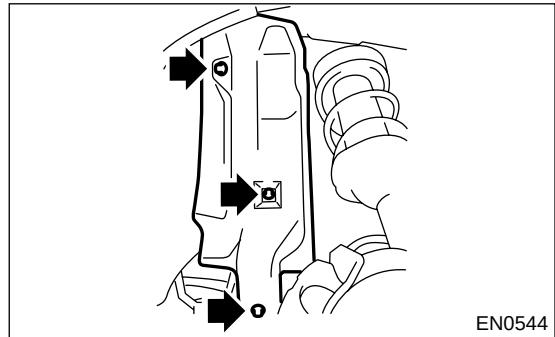
- 9) Tighten fuel drain plug and then install front right side tank cover.

Tightening torque:

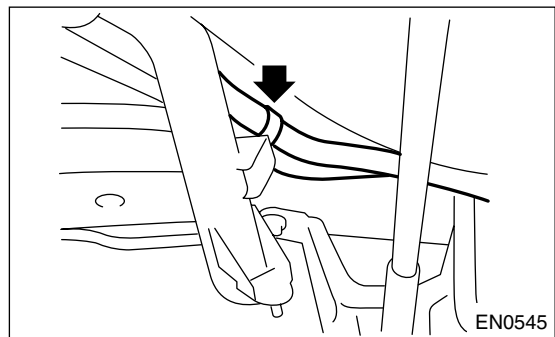
26 N·m (2.65±0.7 kg-m, 19.2±5.1 ft-lb)



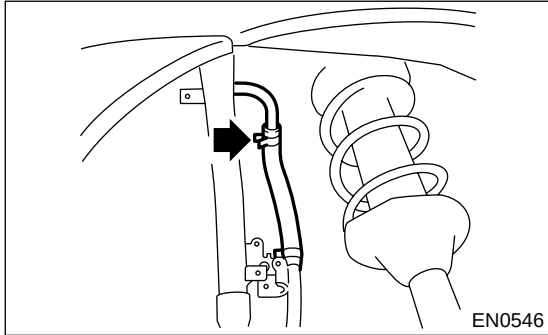
- 10) Remove fuel filler pipe protector.



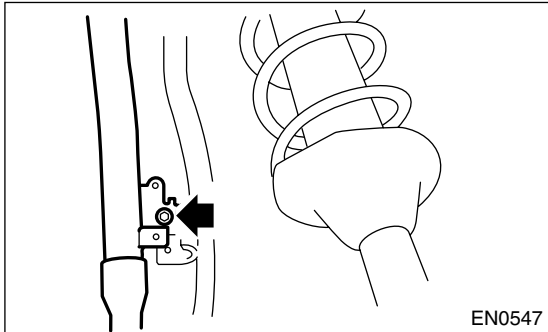
- 11) Separate evaporation hoses from clip of fuel filler pipe.



- 12) Disconnect air vent hose from fuel filler pipe.

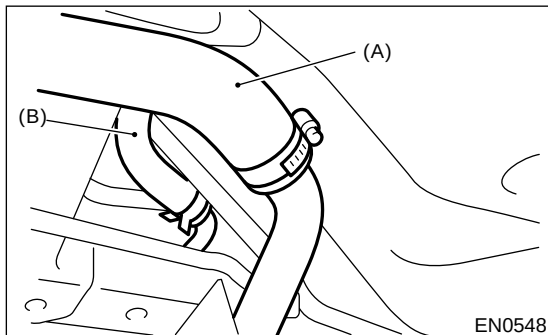


- 13) Remove bolts which hold fuel filler pipe bracket on body.



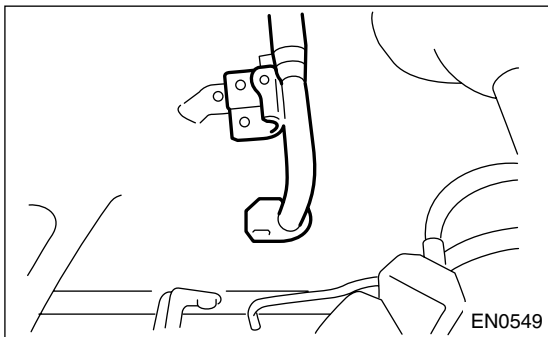
- 14) Loosen clamp and separate fuel filler hose (A) from fuel filler pipe.

- 15) Move clip and separate air vent hose (B).



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

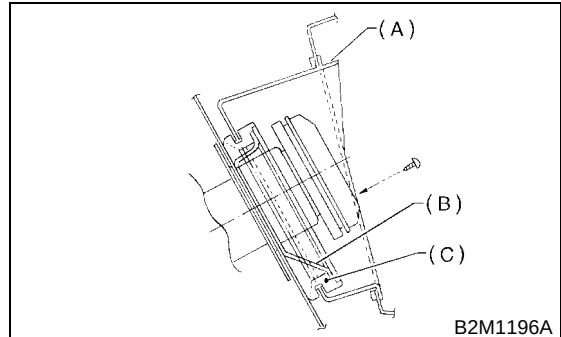
- 17) Remove air vent pipe together with clip from body.



B: INSTALLATION

- 1) Hold fuel filler flap open.

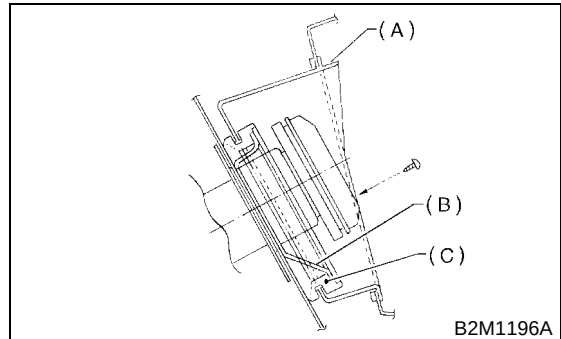
- 2) Set fuel saucer (A) with rubber packing (C) and insert fuel filler pipe into hole from the inner side of apron.



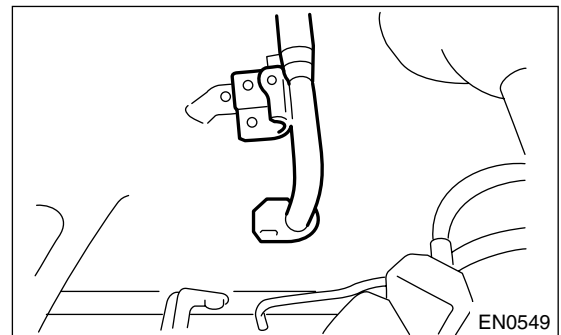
- 3) Align holes in fuel filler pipe neck and set cup (B), and tighten screws.

NOTE:

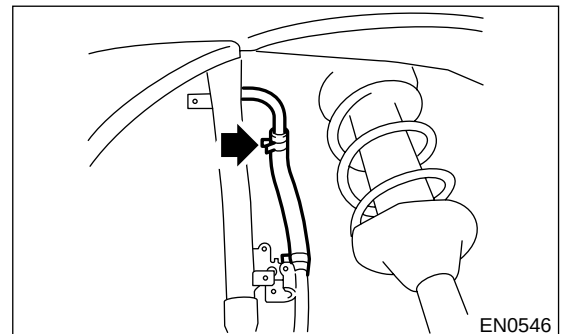
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



- 4) Install air vent pipe.



- 5) Connect air vent hose to fuel filler pipe.



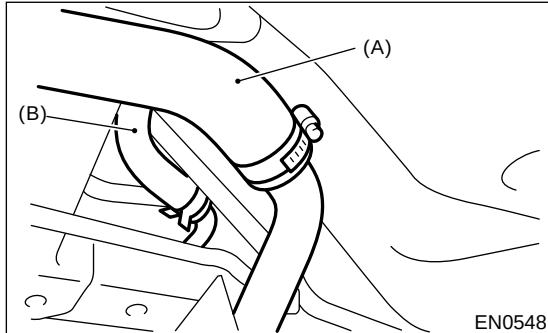
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

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

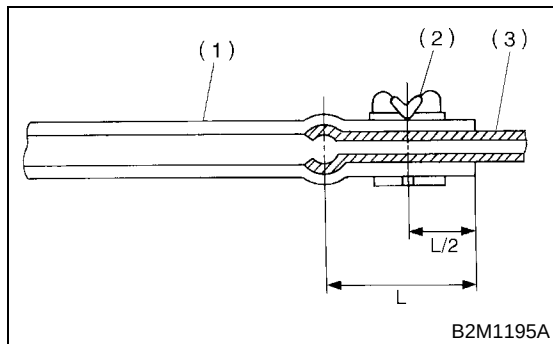
CAUTION:

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



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

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

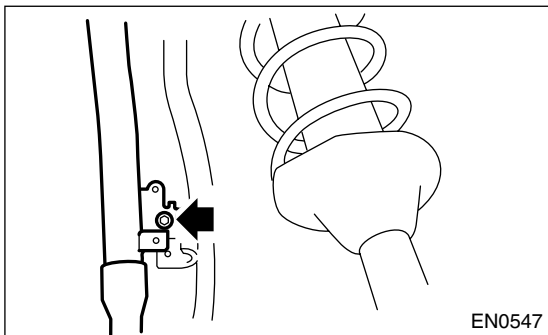


- (1) Hose
- (2) Clip
- (3) Pipe

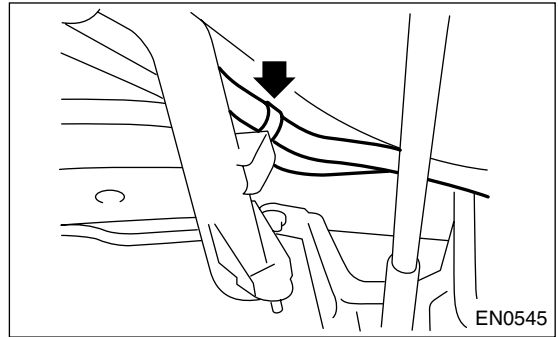
8) Tighten bolt which holds fuel filler pipe bracket on body.

Tightening torque:

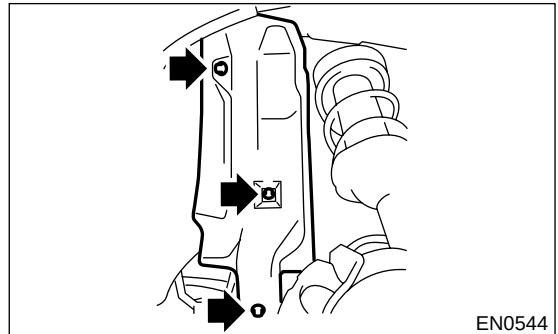
$7.5 \text{ N} \cdot \text{m (0.75 kgf} \cdot \text{m, 5.4 ft} \cdot \text{lb)}$



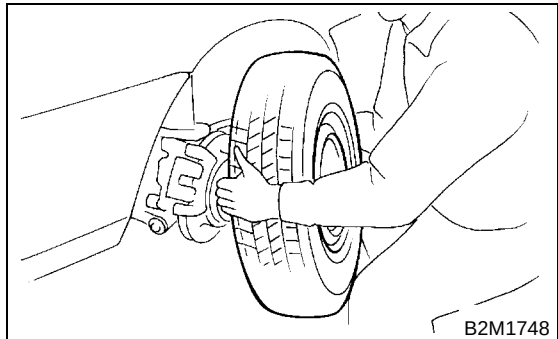
9) Tighten bolts which hold evaporation hoses onto clip of fuel filler pipe.



10) Install fuel filler pipe protector.



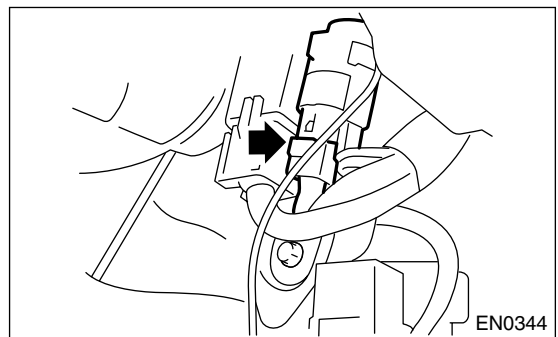
11) Install rear right wheel.



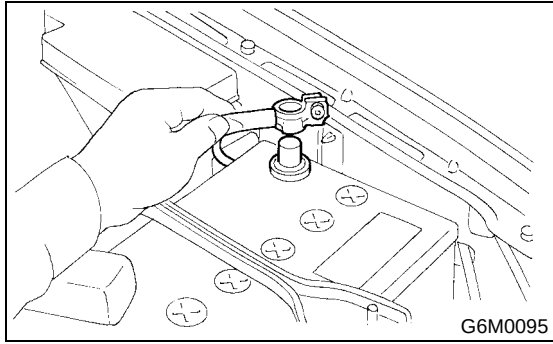
12) Lower the vehicle.

13) Tighten wheel nuts.

14) Connect connector to fuel pump relay.



15) Connect battery ground terminal.



22. Fuel Pump

A: REMOVAL

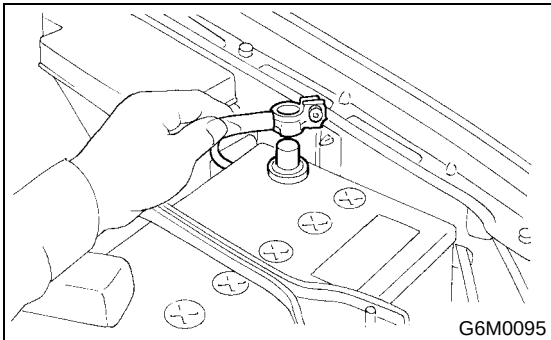
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.
- During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.

NOTE:

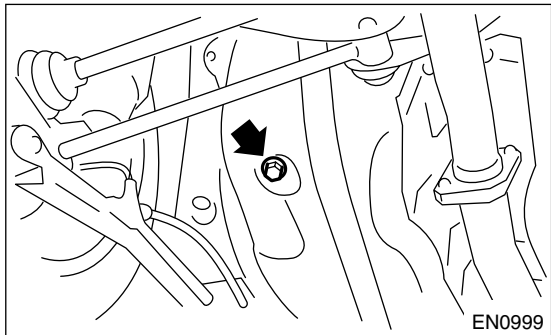
Fuel pump assembly consists of fuel pump and fuel level sensor.

- 1) Release fuel pressure. <Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect battery ground cable.



G6M0095

- 4) Lift-up the vehicle.
- 5) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.

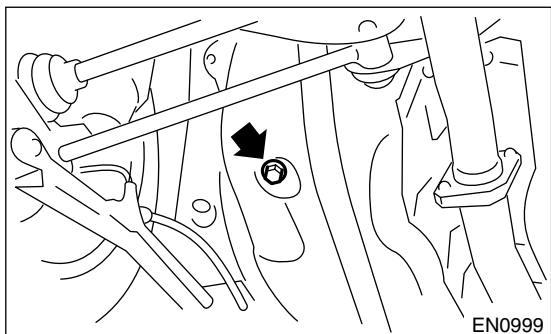


EN0999

- 6) Tighten fuel drain plug.

Tightening torque:

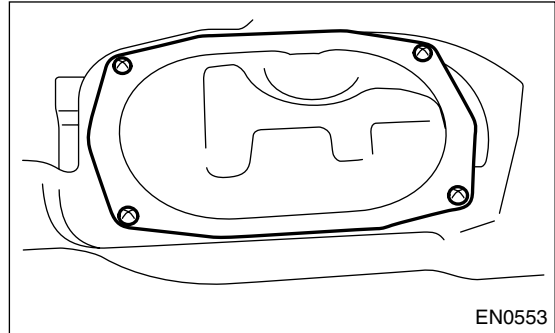
26 N·m (2.65 kgf-m, 19.2 ft-lb)



EN0999

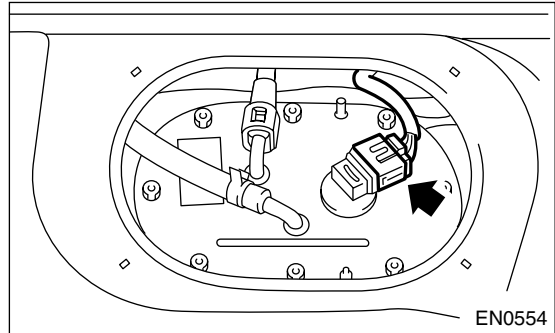
- 7) Raise rear seat and turn floor mat up.

- 8) Remove access hole lid.



EN0553

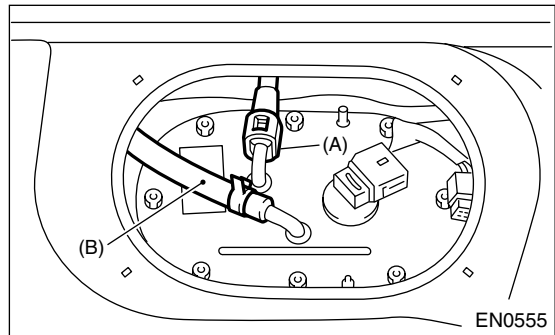
- 9) Disconnect connector from fuel pump.



EN0554

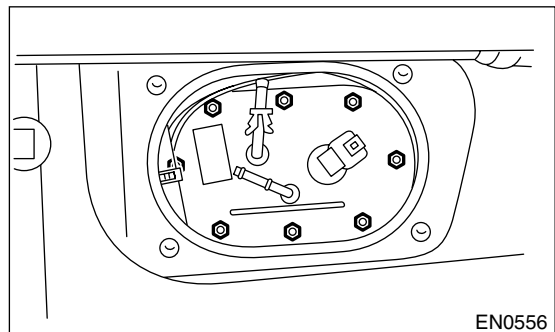
- 10) Disconnect quick connector and then disconnect fuel delivery hose (A). <Ref. to FU(SOHC)-64, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

- 11) Move clip and then disconnect fuel return hose (B).



EN0555

- 12) Remove nuts which install fuel pump assembly onto fuel tank.



EN0556

- 13) Take off fuel pump assembly from fuel tank.

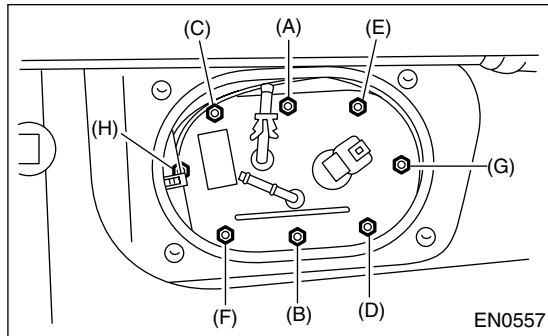
B: INSTALLATION

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

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

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.24 ft-lb)

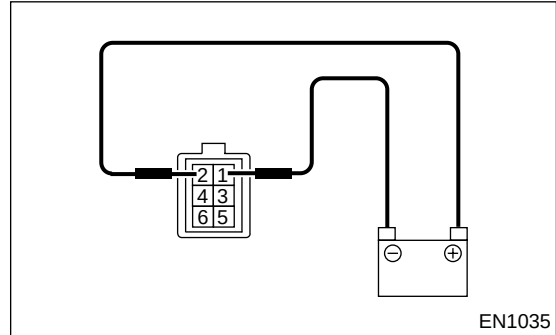


C: INSPECTION

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

WARNING:

- Wipe off the fuel completely.
- Keep 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 fuel pump for a long time under non-load condition.



FUEL LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

23. Fuel Level Sensor

A: REMOVAL

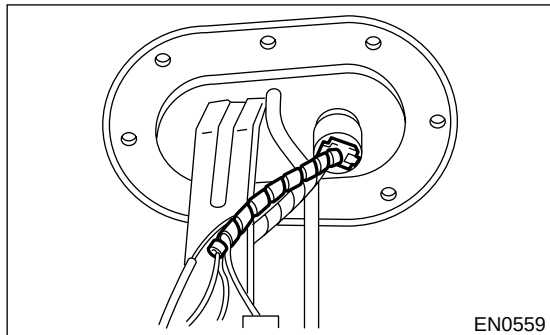
WARNING:

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

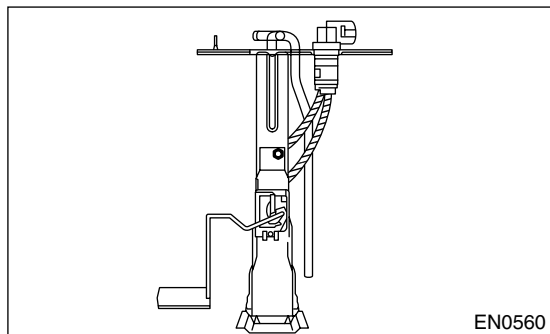
NOTE:

Fuel level sensor is built in fuel pump assembly.

- 1) Remove fuel pump assembly. <Ref. to FU(SOHC)-58, REMOVAL, Fuel Pump.>
- 2) Disconnect connector from fuel pump bracket.



- 3) Remove bolt which installs fuel level sensor on mounting bracket.



B: INSTALLATION

Install in the reverse order of removal.

24. Fuel Filter

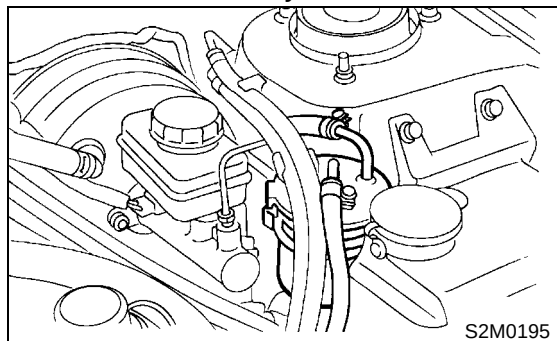
A: REMOVAL

WARNING:

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

1) Release fuel pressure. <Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Disconnect fuel delivery hoses from fuel filter.



3) Remove filter from holder.

B: INSTALLATION

CAUTION:

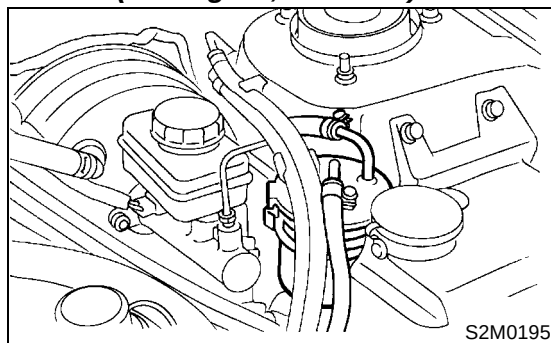
- If fuel hoses are damaged at the connecting portion, replace it with a new one.
- If clamps are badly damaged, replace with new ones.

1) Install in the reverse order of removal.

2) Tighten hose clamp screws.

Tightening torque:

12.5 N·m (1.27 kgf-m, 9.22 ft-lb)



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.

3) If water is found in it, shake and expel the water from inlet port.

FUEL CUT VALVE

FUEL INJECTION (FUEL SYSTEMS)

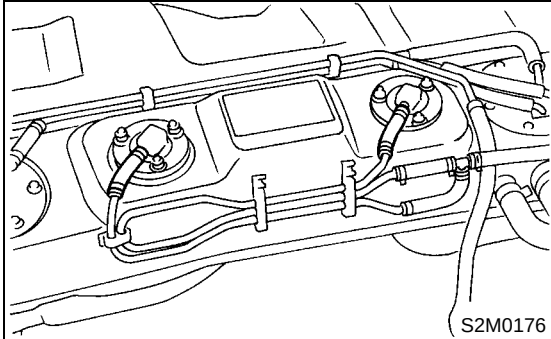
25.Fuel Cut Valve

A: REMOVAL

WARNING:

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

- 1) Remove fuel tank. <Ref. to FU(SOHC)-52, REMOVAL, Fuel Tank.>
- 2) Move clip and disconnect evaporation hose from fuel cut valve.



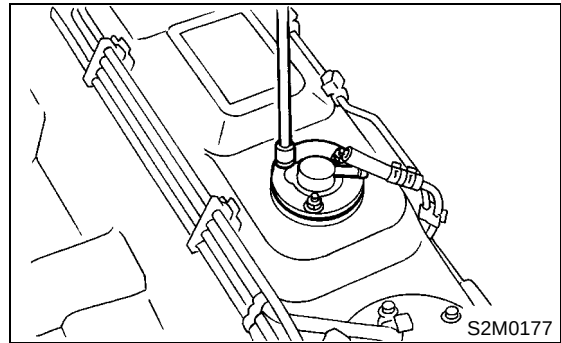
- 3) Remove bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

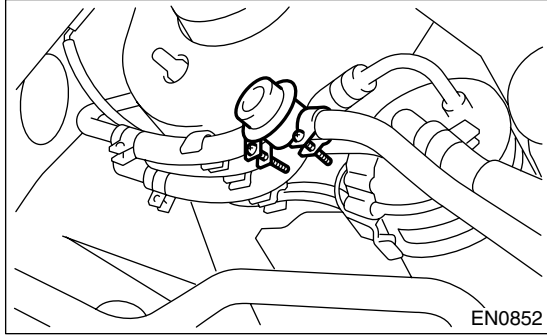
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



26.Fuel Damper Valve

A: REMOVAL

- 1) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Remove fuel damper valve from fuel return line.



B: INSTALLATION

Install in the reverse order of removal.

FUEL DELIVERY, RETURN AND EVAPORATION LINES

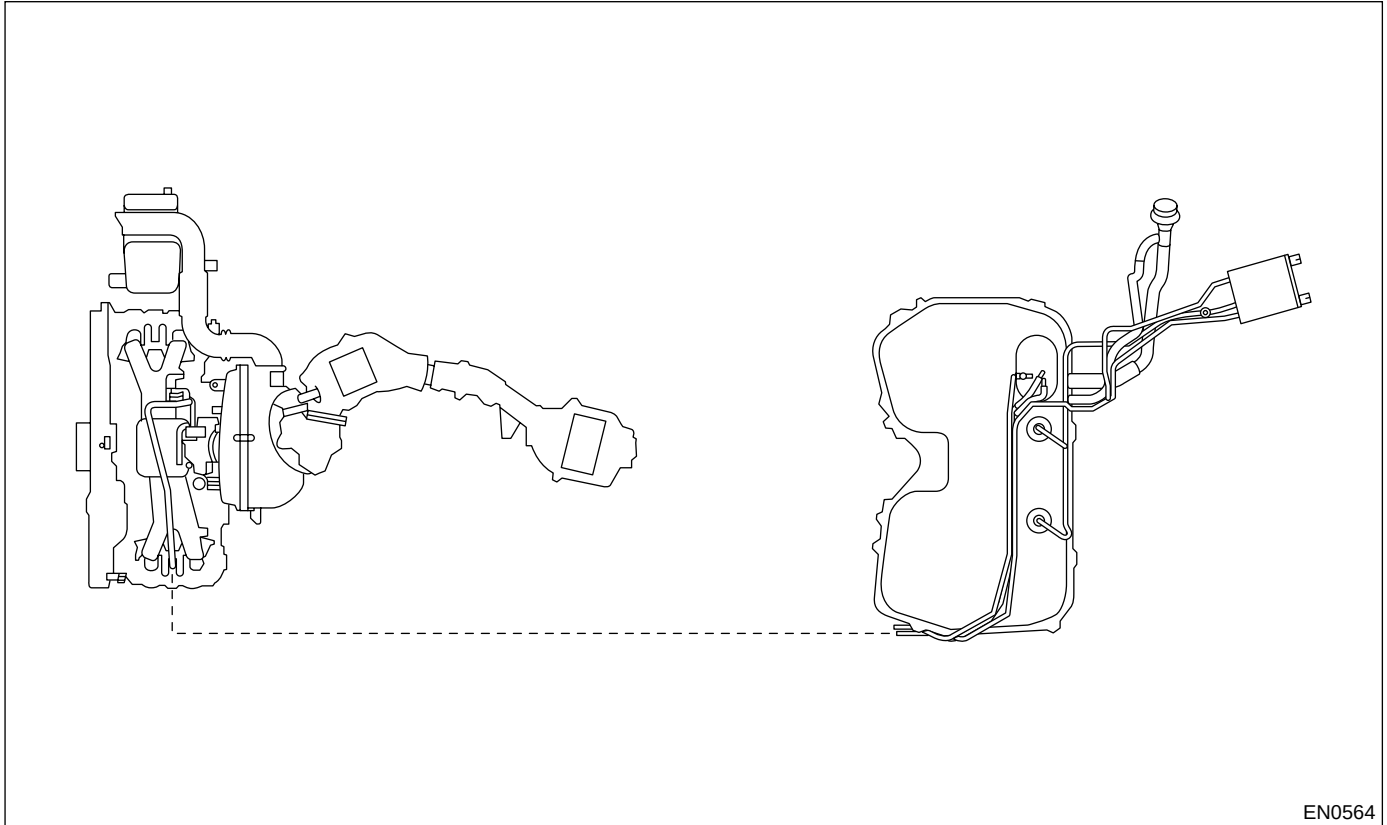
FUEL INJECTION (FUEL SYSTEMS)

27. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

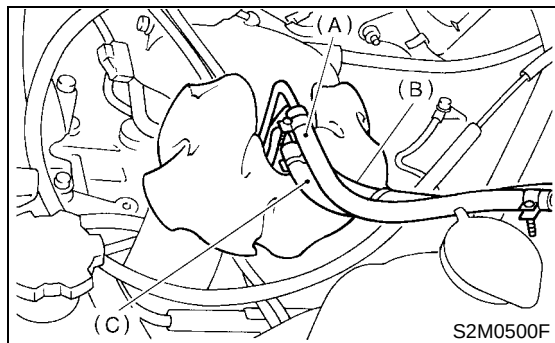
- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

- 3) Open fuel filler flap lid and remove fuel filler cap.
- 4) Remove floor mat. <Ref. to EI-37, REMOVAL, Floor Mat.>
- 5) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



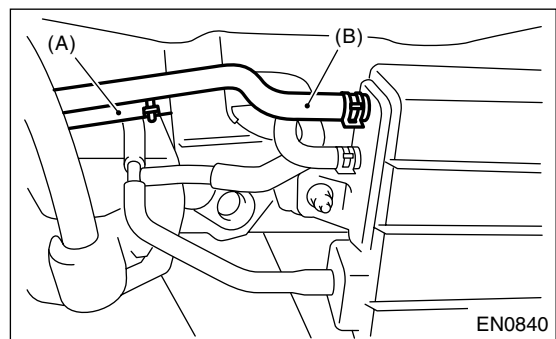
EN0564

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



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

- 8) Disconnect two-way valve hose (A) from two-way valve and disconnect canister hose (B) from canister.



- 7) Lift-up the vehicle.

FUEL DELIVERY, RETURN AND EVAPORATION LINES

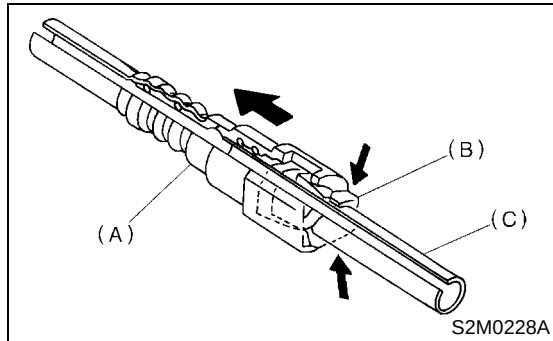
FUEL INJECTION (FUEL SYSTEMS)

9) Separate quick connector on fuel delivery and return line.

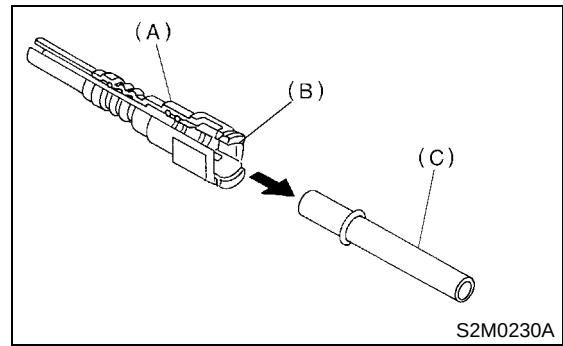
- (1) Clean pipe and connector, if they are covered with dust.
- (2) Hold connector (A) and push retainer (B) down.
- (3) Pull out connector (A) from retainer (B).

CAUTION:

Replace retainer with new ones.



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



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

CAUTION:

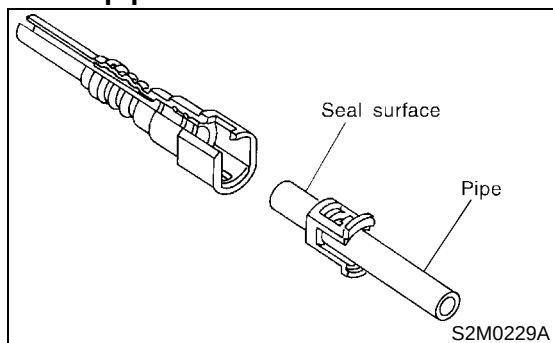
- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.
- Be sure to inspect hoses and their connections for any leakage of fuel.

B: INSTALLATION

1) Connect quick connector on fuel delivery line.

CAUTION:

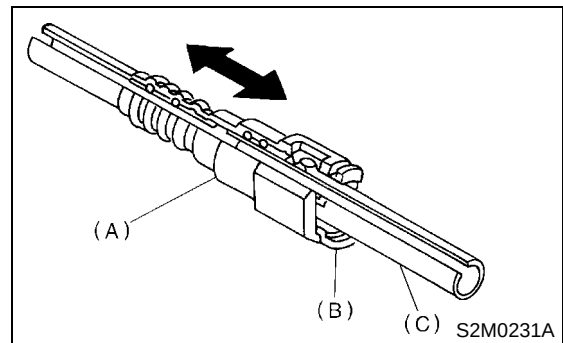
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface of pipe.



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

NOTE:

At this time, two clicking sounds are heard.



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

FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

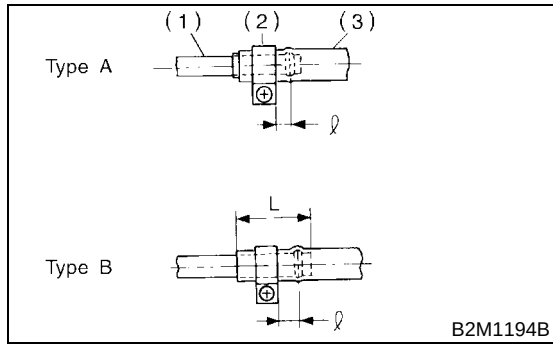
2) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.

Type B: When fitting length is not specified.

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

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



(1) Fitting

(2) Clamp

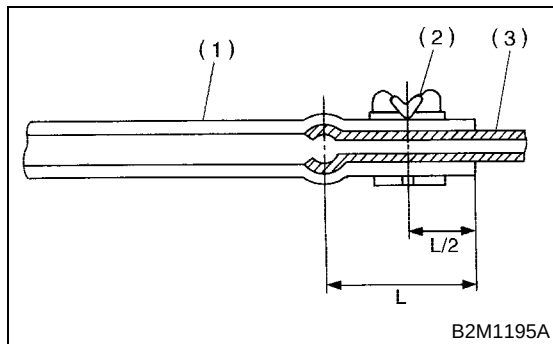
(3) Hose

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

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

CAUTION:

Be sure to inspect 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.

28. 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 fuel pump.
2)	Lowering of fuel pump function.	Replace fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace 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 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 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 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.

(3) 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.

(4) 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)

ENGINE 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) *EC(SOHC)*

	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 negative terminal from battery.

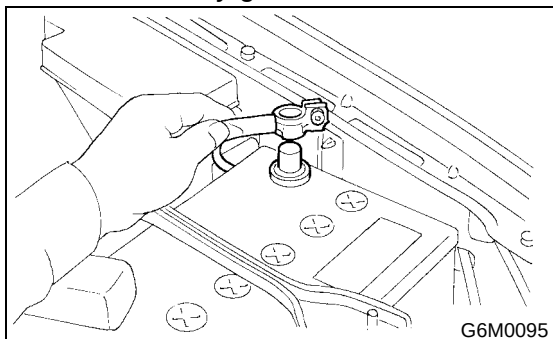
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

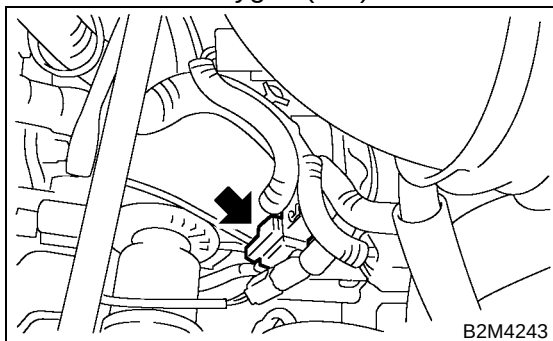
2. Front Catalytic Converter

A: REMOVAL

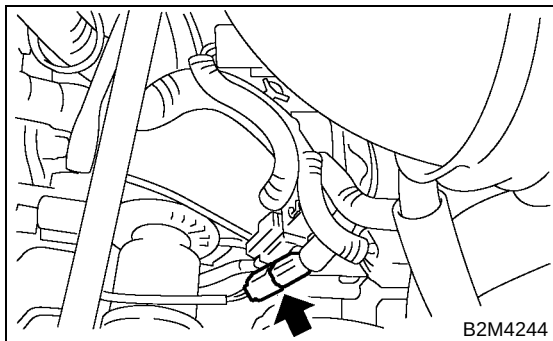
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.



- 3) Disconnect front oxygen (A/F) sensor connector.



- 4) Disconnect connector from rear oxygen sensor connector.

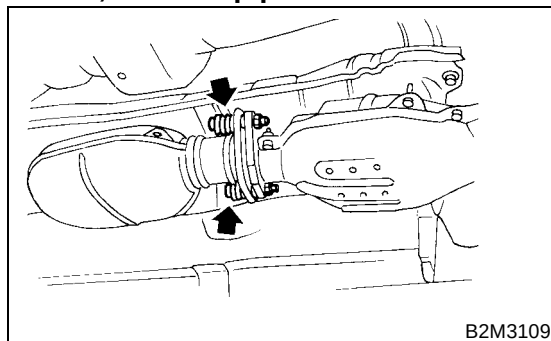


- 5) Lift-up the vehicle.
- 6) Remove under cover.

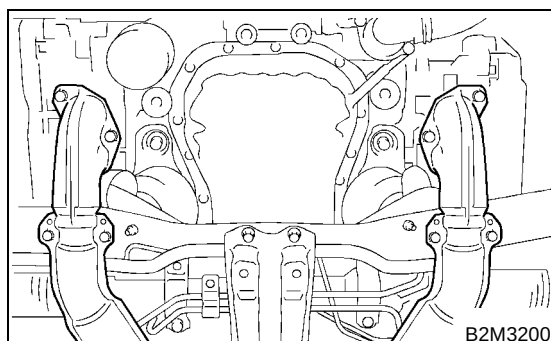
- 7) Separate center exhaust pipe from rear exhaust pipe.

CAUTION:

Be careful, exhaust pipe is hot.



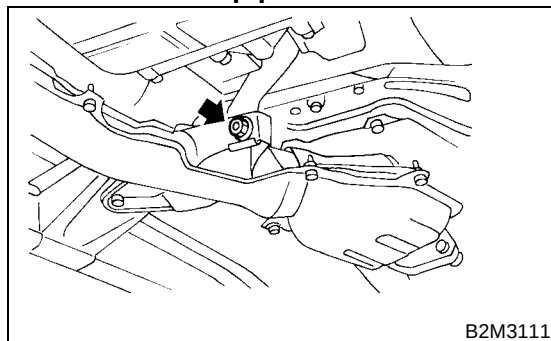
- 8) Remove bolts which hold front exhaust pipe onto cylinder heads.



- 9) Remove front exhaust pipe and center exhaust pipe from hanger bracket.

CAUTION:

Be careful not to pull down front exhaust pipe and center exhaust pipe.



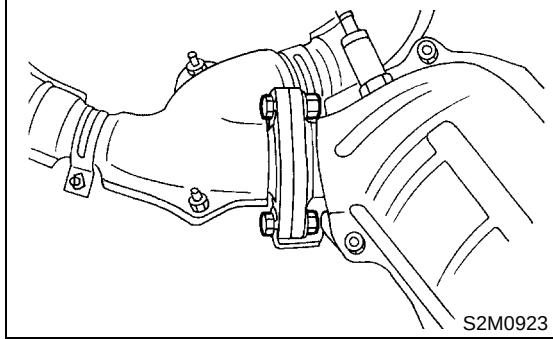
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

10) Separate front catalytic converter from front exhaust pipe.

NOTE:

The rear catalytic converter is integrated with front catalytic converter. Therefore, the procedure for removing rear catalytic converter is the same as the description above.



B: INSTALLATION

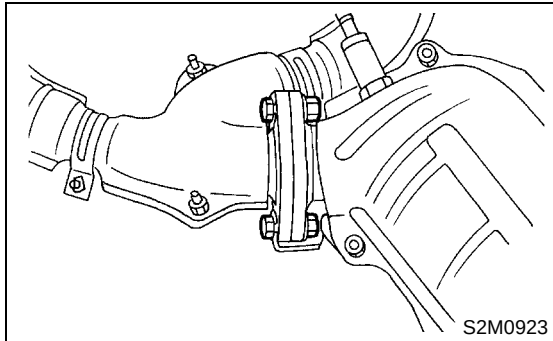
CAUTION:

Replace gaskets with new ones.

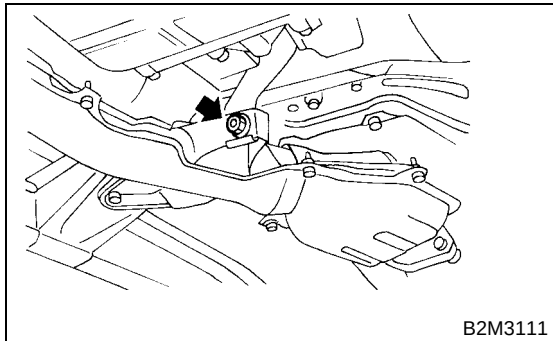
1) Install front catalytic converter to front exhaust pipe.

Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)



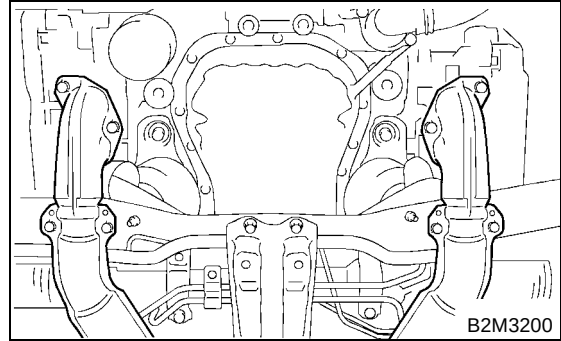
2) Install front exhaust pipe and center exhaust pipe. And temporarily tighten bolt which installs center exhaust pipe to hanger bracket.



3) Tighten bolts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

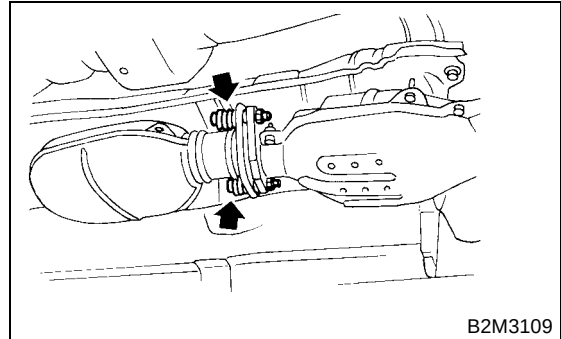
30 N·m (3.1 kgf-m, 22.4 ft-lb)



4) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:

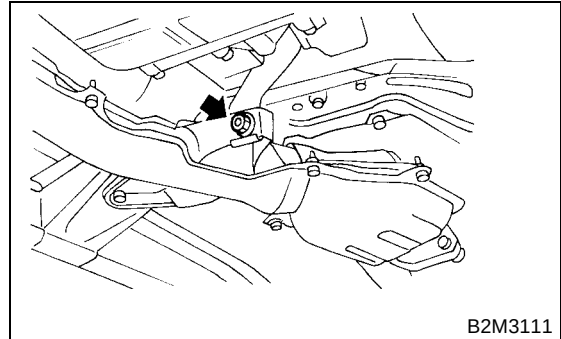
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Tighten bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)



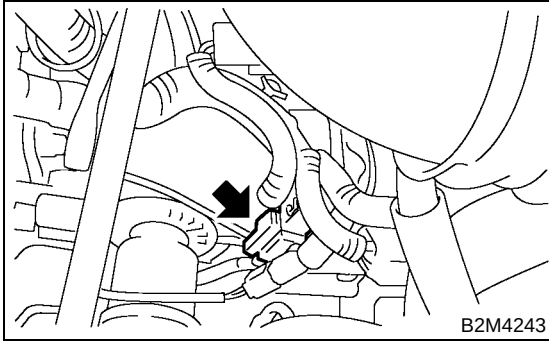
6) Install under cover.

FRONT CATALYTIC CONVERTER

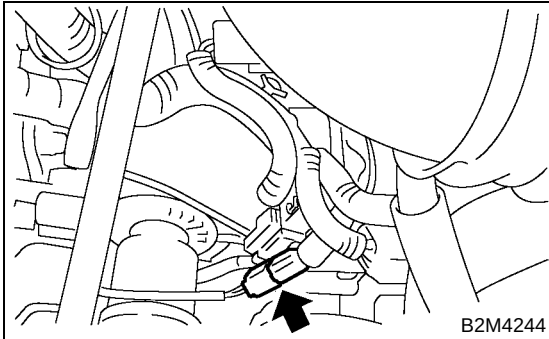
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

7) Lower the vehicle.

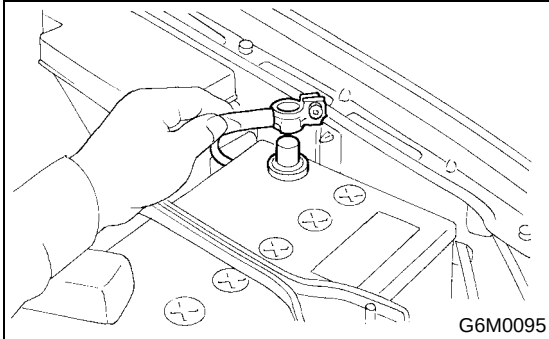
8) Connect front oxygen (A/F) sensor connector.



9) Connect connector to rear oxygen sensor connector.



10) Connect battery ground cable.



NOTE:

The rear catalytic converter is integrated with front catalytic converter. Therefore, the procedure for installing rear catalytic converter is the same as the description above.

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

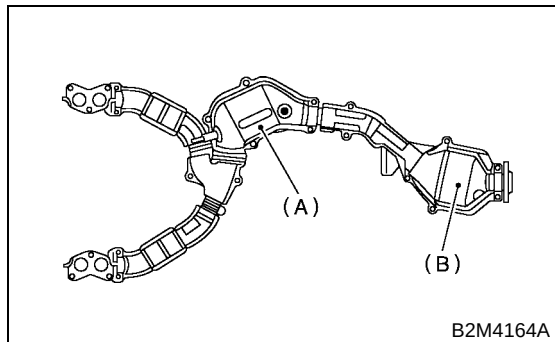
REAR CATALYTIC CONVERTER

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(SOHC)-3, REMOVAL, Front Catalytic Converter.>

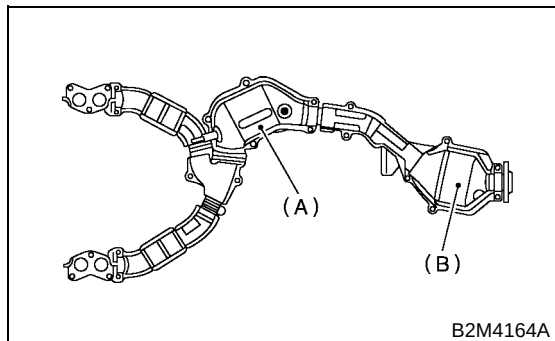


(A) Front catalytic converter

(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(SOHC)-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.

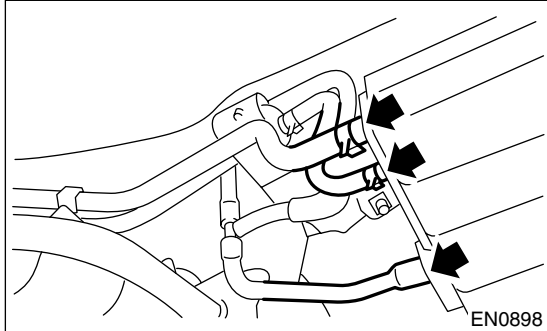
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

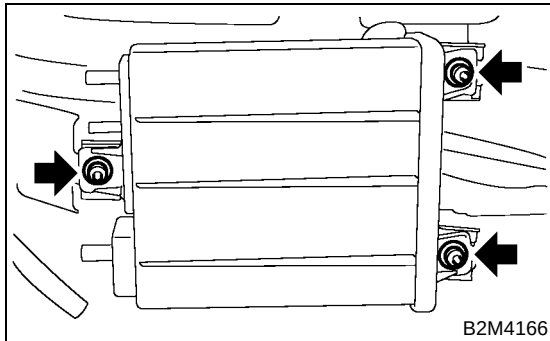
4. Canister

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen two clamps which hold two canister hoses, and disconnect evaporation hose from canister.



- 3) Remove canister from body.

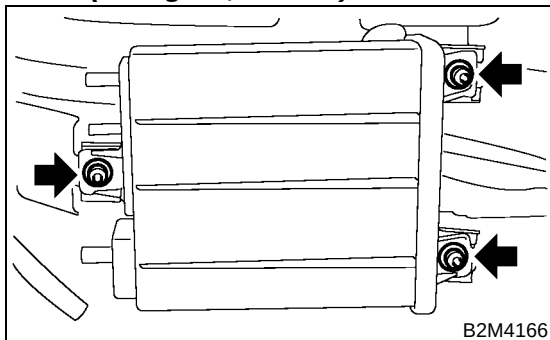


B: INSTALLATION

- 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.

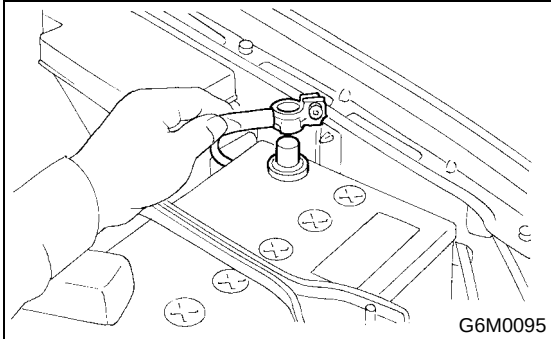
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

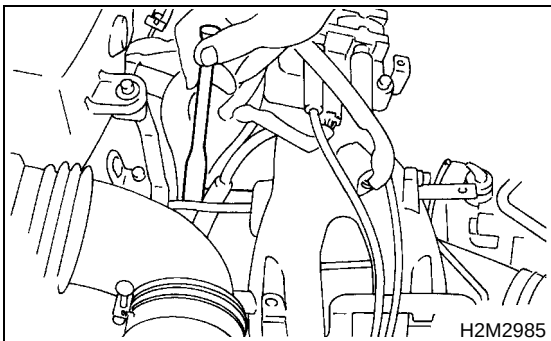
5. Purge Control Solenoid Valve

A: REMOVAL

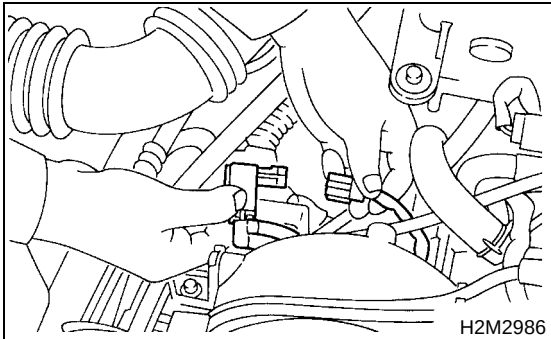
- 1) Disconnect battery ground cable.



- 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.

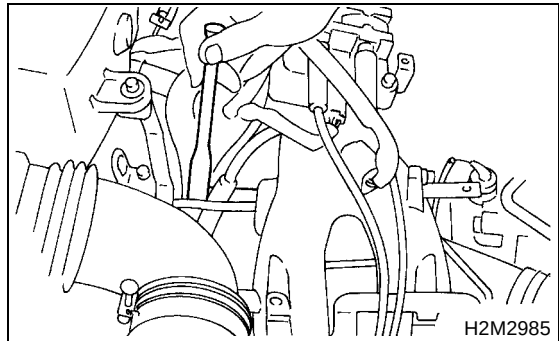


B: INSTALLATION

- 1) Install in the reverse order of removal.

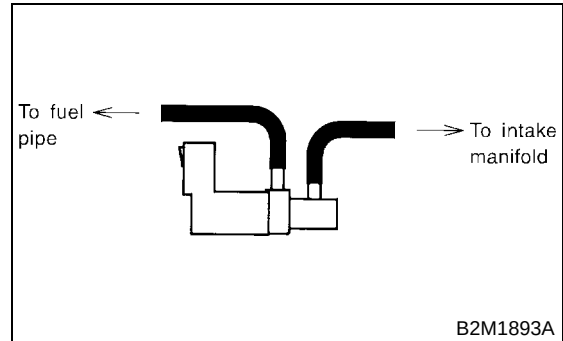
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



CAUTION:

Carefully connect the evaporation hoses.



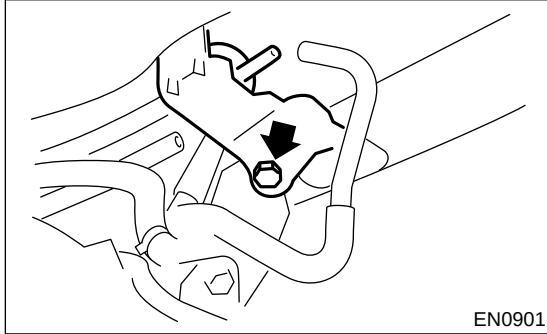
C: INSPECTION

Make sure hoses are not cracked or loose.

6. Two-way Valve

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove canister from body. <Ref. to EC(SOHC)-7, REMOVAL, Canister.>
- 3) Remove two-way valve with bracket as a single unit from body.



- 4) Remove two-way valve from bracket.

B: INSTALLTION

- 1) Install in the reverse order of removal.

C: INSPECTION

- 1) Make sure that hoses are not cracked or loose.

TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

ENGINE 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

INTAKE (INDUCTION)

IN(SOHC)

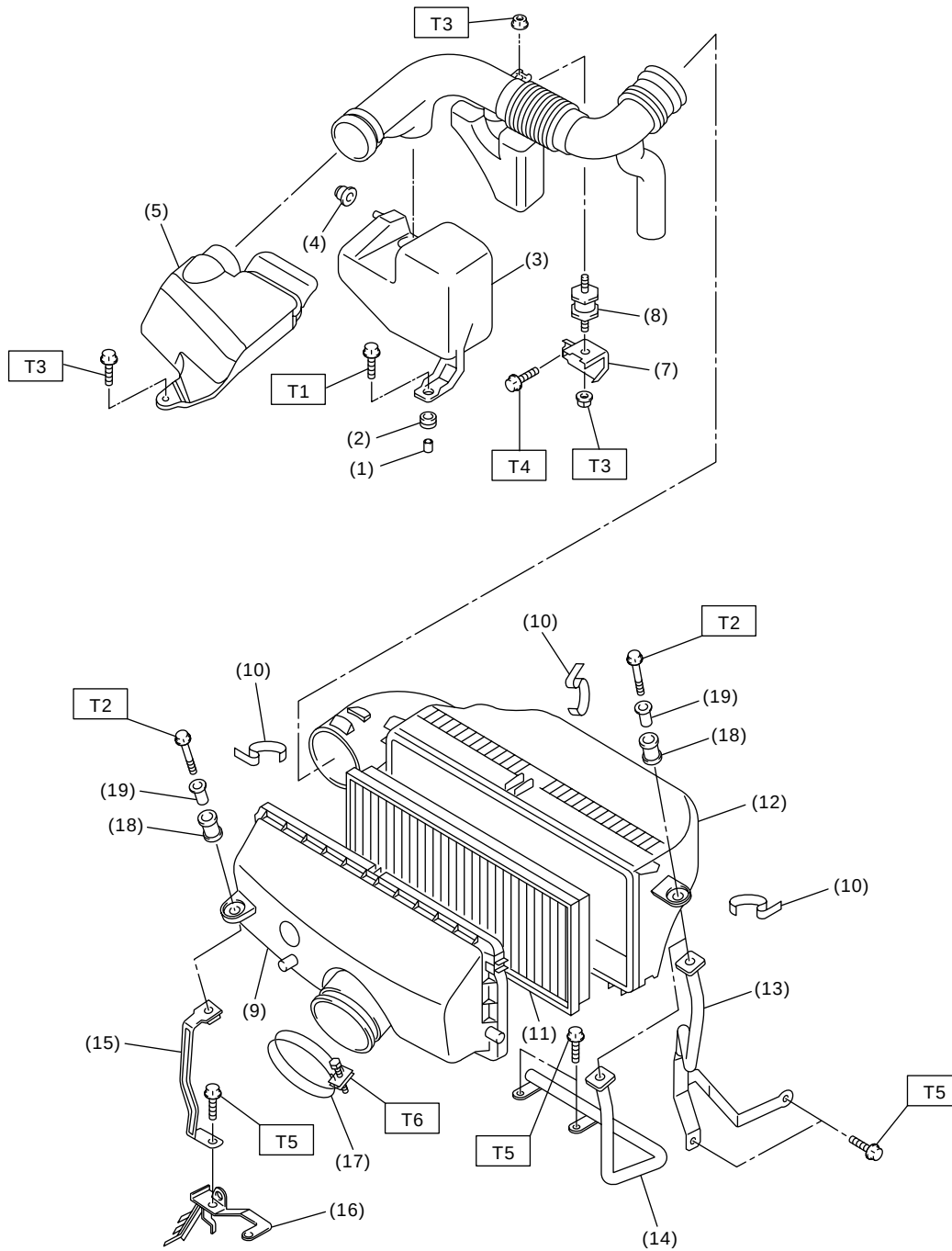
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1. General Description	2
2. Air Cleaner	5
3. Air Cleaner Case	6
4. Air Intake Duct.....	7
5. Resonator Chamber	8

GENERAL DESCRIPTION

INTAKE (INDUCTION)

1. General Description

A: COMPONENT



EN0057

IN(SOHC)-2

GENERAL DESCRIPTION

INTAKE (INDUCTION)

(1) Spacer	(12) Air cleaner case B	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(2) Bush	(13) Air cleaner case stay LH (MT vehicles)	<i>T1: 33 (3.4, 24.4)</i>
(3) Resonator chamber	(14) Air cleaner case stay LH (AT vehicles)	<i>T2: 6.5 (0.66, 4.8)</i>
(4) Cushion rubber	(15) Air cleaner case stay RH	<i>T3: 7.5 (0.76, 5.5)</i>
(5) Air intake duct A	(16) Engine harness bracket	<i>T4: 6 (0.6, 4.4)</i>
(6) Air intake duct B	(17) Clamp	<i>T5: 16 (1.6, 11.6)</i>
(7) Holder	(18) Bush	<i>T6: 3 (0.3, 2.2)</i>
(8) Cushion	(19) Spacer	
(9) Air cleaner case A		
(10) Clip		
(11) Air cleaner element		

GENERAL DESCRIPTION

INTAKE (INDUCTION)

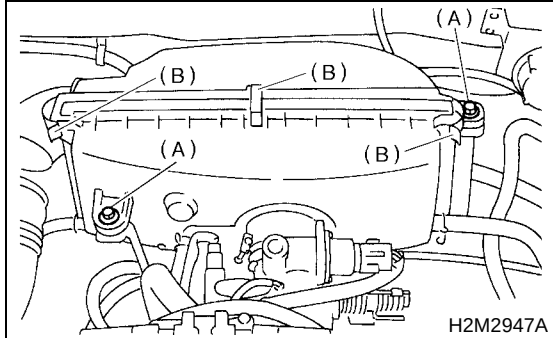
B: CAUTION

- 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 negative terminal 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.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

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

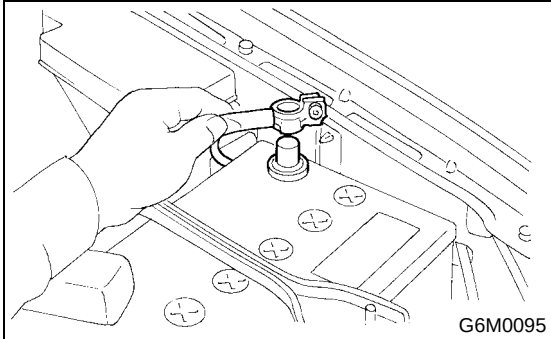
C: INSPECTION

Replace if excessively damaged or dirty.

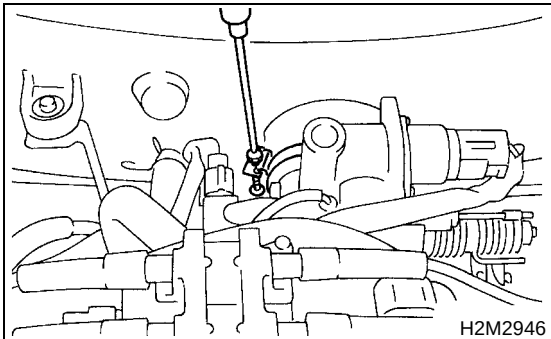
3. Air Cleaner Case

A: REMOVAL

1) Disconnect battery ground cable.

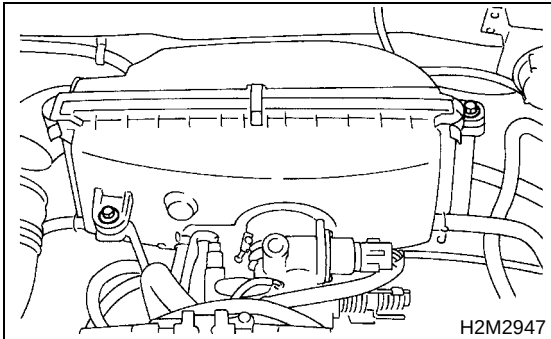


2) Loosen clamp which connects air cleaner case to throttle body.



3) Disconnect hoses from air cleaner case.

4) Remove bolts which install air cleaner case to stays.



5) Remove air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

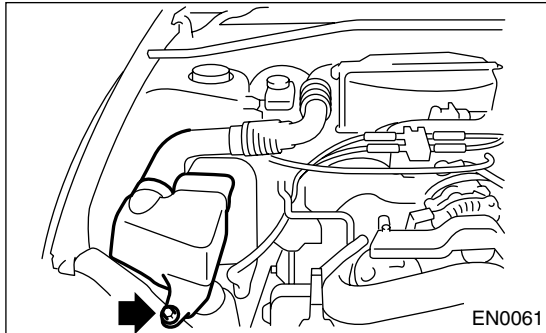
C: INSPECTION

Inspect for cracks and loose connections.

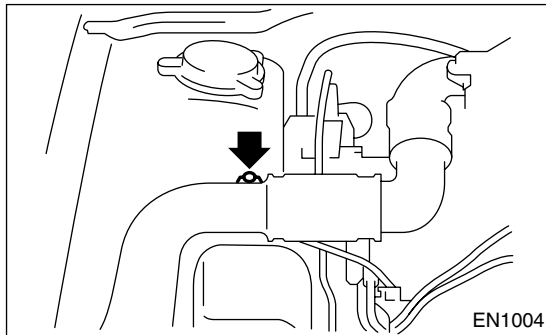
4. Air Intake Duct

A: REMOVAL

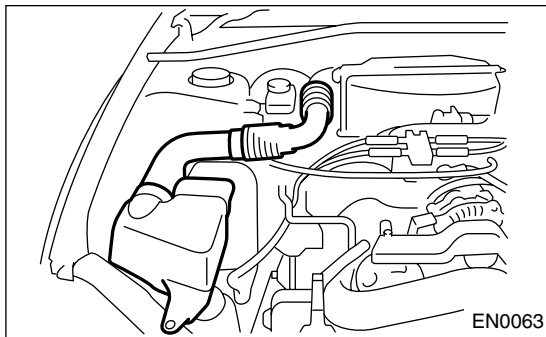
1) Remove bolts which install air intake duct (A) on the front side of body.



2) Remove bolt which installs air intake duct (B) on body.



3) Remove air intake ducts as a unit.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in the air intake duct.

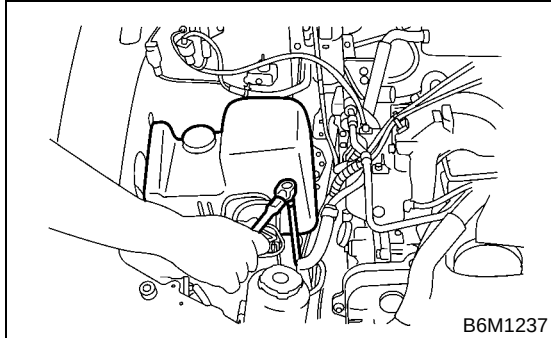
RESONATOR CHAMBER

INTAKE (INDUCTION)

5. Resonator Chamber

A: REMOVAL

- 1) Remove air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 2) Remove resonator chamber.

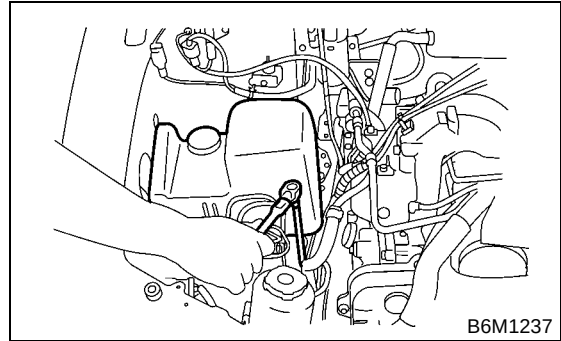


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

33 N·m (3.4 kgf-m, 24.4 ft-lb)



C: INSPECTION

Inspect for cracks and loose connections.

ENGINE 1 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.

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

MECHANICAL

ME(SOHC)

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GENERAL DESCRIPTION

MECHANICAL

1. General Description

A: SPECIFICATIONS

Engine	Model		1600 cc	2000 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)	87.9 x 65.8 (3.46 x 2.591)	92 x 75 (3.62 x 2.95)
	Displacement	cm ³ (cu in)	1,597 (97.45)	1,994 (121.67)
	Compression ratio		10.0	
	Compression pressure (at 200 — 300 rpm)	kPa (kg/cm ² , psi)	1,020 — 1,275 (10.4 — 13.0, 148 — 185)	
	Number of piston rings		Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening	10° BTDC	4° BTDC
		Closing	46° ABDC	48° ABDC
	Exhaust valve timing	Opening	42° BBDC	48° BBDC
		Closing	10° ATDC	4° 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	700±100 (No load) 850±100 (A/C switch ON)
	Firing order		1 → 3 → 2 → 4	
Ignition timing		BTDC/rpm	5°±10°/700	10°±10°/700

NOTE:

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter
US: Undersize OS: Oversize

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 bush I.D.		18.00 — 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	0.20 — 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)

GENERAL DESCRIPTION

MECHANICAL

Camshaft	Bend limit				0.020 mm (0.0008 in)
	Thrust clearance			STD	0.030 — 0.090 mm (0.0012 — 0.0035 in)
				Limit	0.11 mm (0.0043 in)
	Cam lobe height	1600 cc	Intake	STD	39.378 — 39.478 mm (1.5503 — 1.5542 in)
				Limit	39.278 mm (1.5464 in)
			Exhaust	STD	39.565 — 39.665 mm (1.5577 — 1.5616 in)
				Limit	39.465 mm (1.5537 in)
		2000 cc	Intake	STD	38.732 — 38.832 mm (1.5249 — 1.5288 in)
				Limit	38.632 mm (1.5209 in)
			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.				32.000 — 32.018 mm (1.2598 — 1.2605 in)	
Oil clearance			STD	0.055 — 0.090 mm (0.0022 — 0.0035 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				97.5 mm (3.84 in)
Valve set	Refacing angle				90°
	Contacting width		Intake	STD	1.0 mm (0.039 in)
				Limit	1.7 mm (0.067 in)
			Exhaust	STD	1.4 mm (0.055 in)
				Limit	2.1 mm (0.083 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)	
Valve spring	Free length				54.30 mm (2.1378 in)
	Squareness				2.5°, 2.4 mm (0.094 in)
	Tension/spring height				218.7 — 242.5 N (22.3 — 24.7 kgf, 49.2 — 54.5 lb)/45.0 mm (1.772 in) 526.6 — 581.6 N (53.7 — 59.3 kgf, 118.4 — 130.8 lb)/34.7 mm (1.366 in)

GENERAL DESCRIPTION

MECHANICAL

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	1600 cc	STD	A	87.905 — 87.915 mm (3.4608 — 3.4612 in)	
				B	87.895 — 87.905 mm (3.4604 — 3.4608 in)	
		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)	
	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	1600 cc	STD	A	87.885 — 87.895 mm (3.4600 — 3.4604 in)	
				B	87.875 — 87.885 mm (3.4596 — 3.4600 in)	
			0.25 mm (0.0098 in) OS		88.125 — 88.135 mm (3.4695 — 3.4699 in)	
			0.50 mm (0.0197 in) OS		88.375 — 88.385 mm (3.4793 — 3.4797 in)	
		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)	
	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 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 — 0.70 mm (0.0079 — 0.0276 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		0.010 — 0.038 mm (0.0004 — 0.0015 in)
Limit				0.05 mm (0.0020 in)		
Thickness at center portion		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)		

GENERAL DESCRIPTION

MECHANICAL

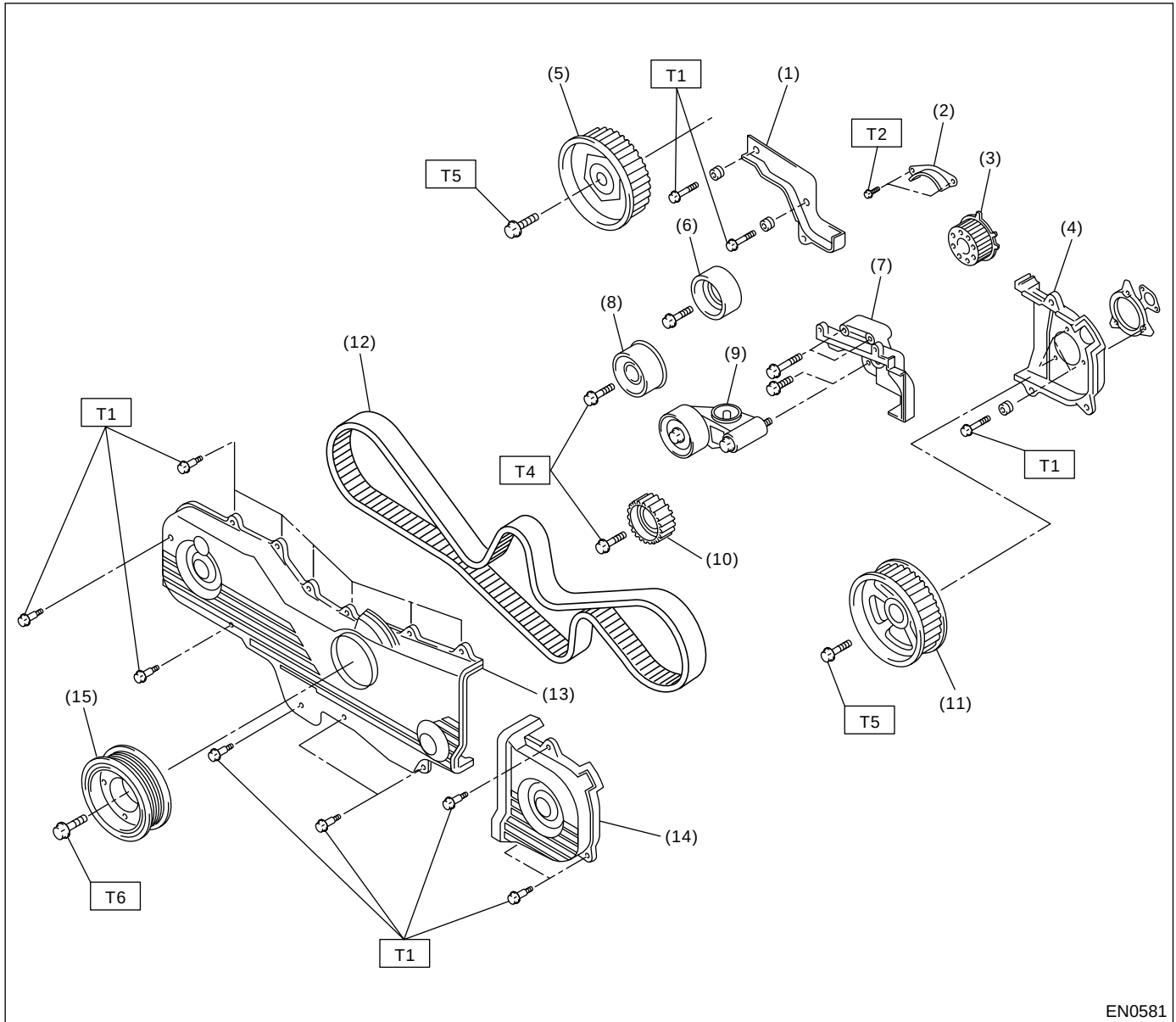
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)
Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.250 mm (0.0098 in)
	Crank pin outer diameter	1600 cc	STD	47.984 — 48.000 mm (1.8880 — 1.8898)
			0.03 mm (0.0012 in) US	47.954 — 47.970 mm (1.8879 — 1.8886)
			0.05 mm (0.0020 in) US	47.934 — 47.950 mm (1.8872 — 1.8878)
			0.25 mm (0.0098 in) US	47.734 — 47.750 mm (1.8793 — 1.8799)
		2000 cc	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		STD	0.010 — 0.030 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



EN0581

- (1) Belt cover No. 2 (RH)
- (2) Timing belt guide (MT vehicles only)
- (3) Crankshaft sprocket
- (4) Belt cover No. 2 (LH)
- (5) Camshaft sprocket No. 1
- (6) Belt idler (No. 1)
- (7) Tensioner bracket
- (8) Belt idler (No. 2)

- (9) Automatic belt tensioner ASSY
- (10) Belt idler No. 2
- (11) Camshaft sprocket No. 2
- (12) Timing belt
- (13) Front belt cover
- (14) Belt cover (LH)
- (15) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)

T2: 9.8 (1.0, 7.2)

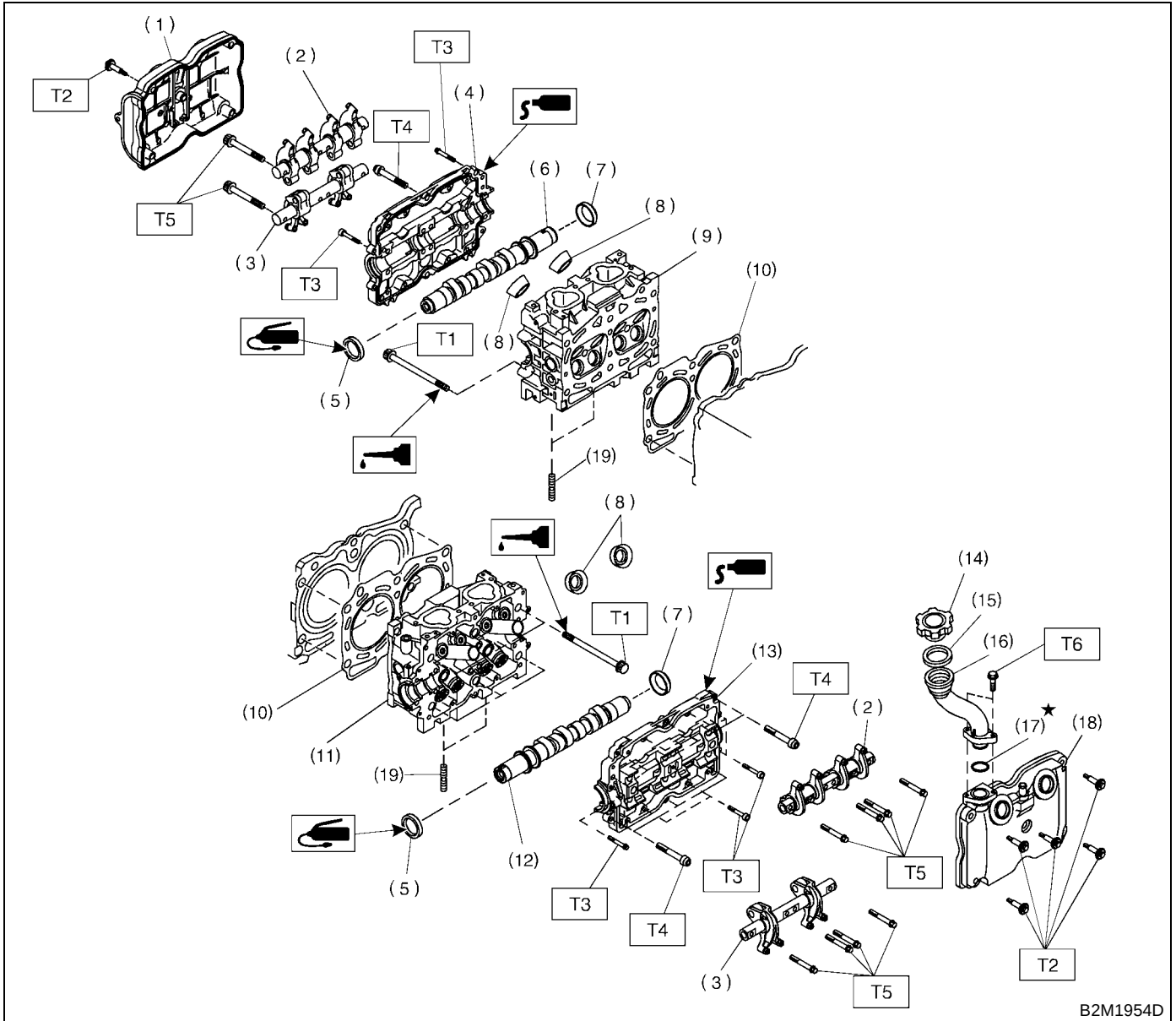
T3: 25 (2.5, 18.1)

T4: 39 (4.0, 28.9)

T5: 78 (8.0, 57.9)

T6: 127 (13.0, 94)

2. CYLINDER HEAD AND CAMSHAFT



B2M1954D

- | | |
|-------------------------------|-------------------------|
| (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 pipe |
| (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(SOHC)-60,
Installation, Cylinder Head
Assembly.>

T2: 5 (0.5, 3.6)

T3: 10 (1.0, 7.2)

T4: 18 (1.8, 13.0)

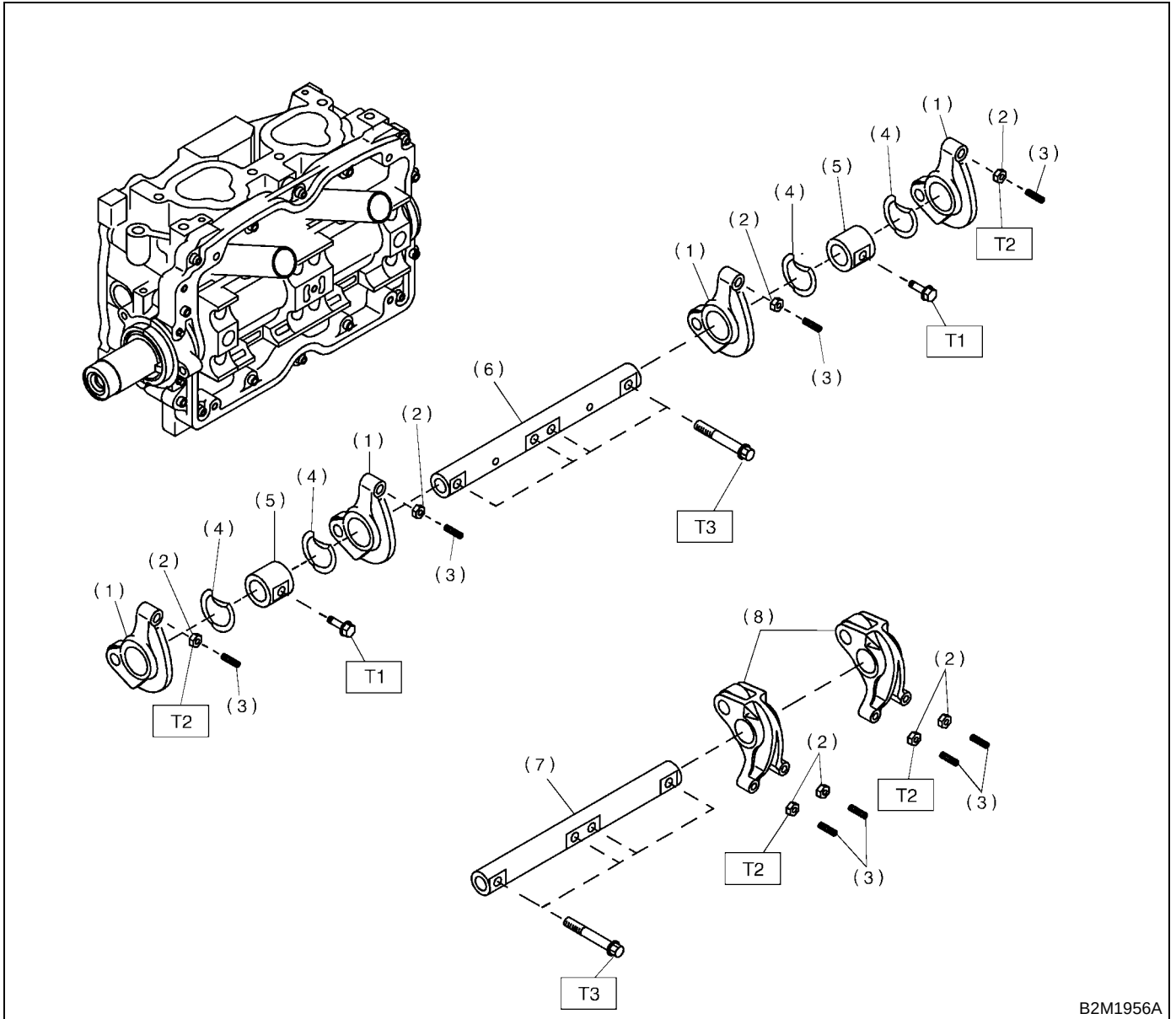
T5: 25 (2.5, 18.1)

T6: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

MECHANICAL

3. VALVE ROCKER ASSEMBLY



B2M1956A

- | | |
|-------------------------------|------------------------------|
| (1) Intake valve rocker arm | (6) Intake rocker shaft |
| (2) Valve rocker nut | (7) Exhaust rocker shaft |
| (3) Valve rocker adjust screw | (8) Exhaust valve rocker arm |
| (4) Spring | |
| (5) Rocker shaft support | |

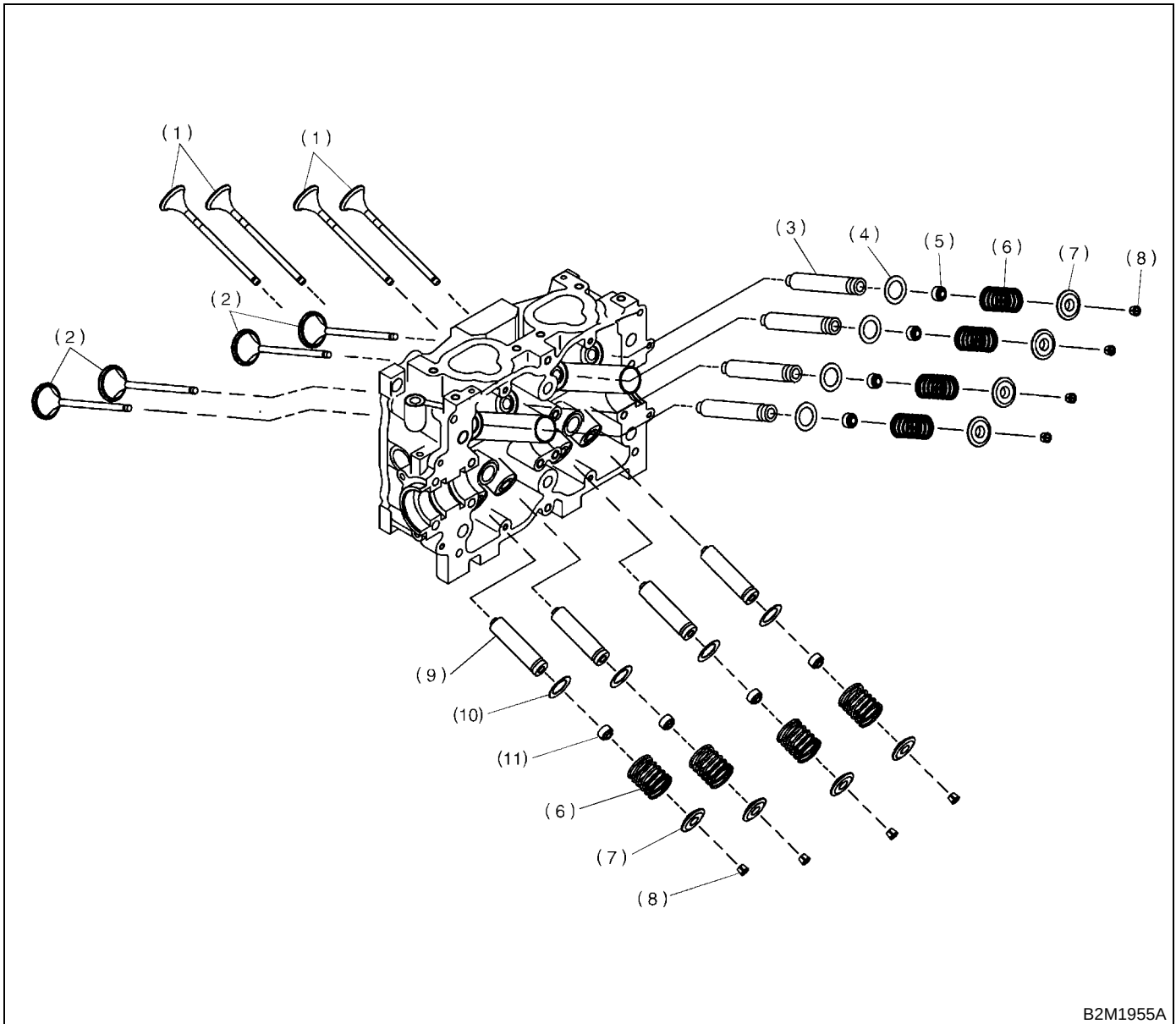
Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)

T2: 10 (1.0, 7.2)

T3: 25 (2.5, 18.1)

4. CYLINDER HEAD AND VALVE ASSEMBLY



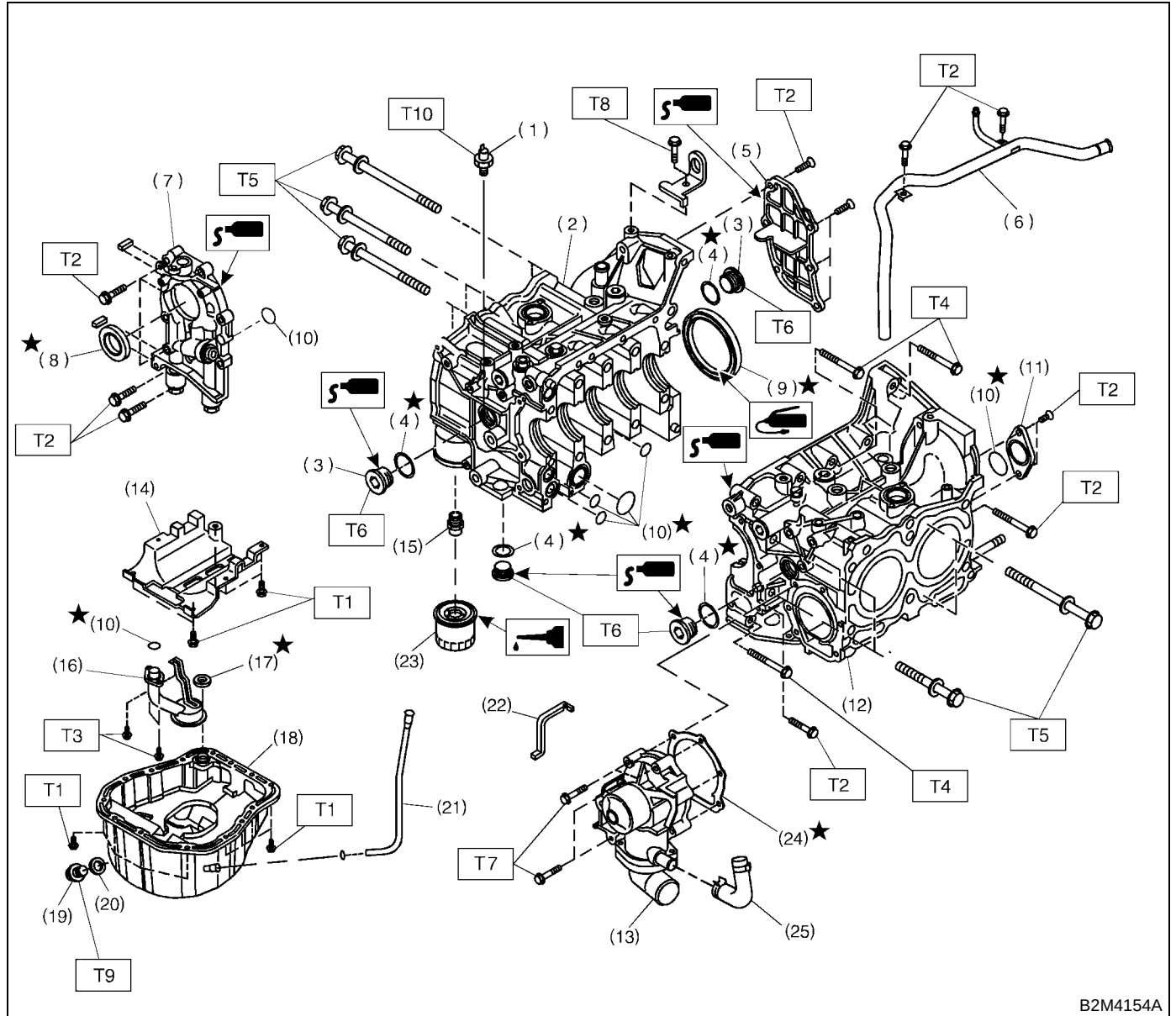
B2M1955A

- | | | |
|------------------------------|---------------------------|--------------------------------|
| (1) Exhaust valve | (5) Intake valve oil seal | (9) Exhaust valve guide |
| (2) Intake valve | (6) Valve spring | (10) Exhaust valve spring seat |
| (3) Intake valve guide | (7) Retainer | (11) Exhaust valve oil seal |
| (4) Intake valve spring seat | (8) Retainer key | |

GENERAL DESCRIPTION

MECHANICAL

5. CYLINDER BLOCK



B2M4154A

- | | |
|--------------------------|----------------------------|
| (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 | |

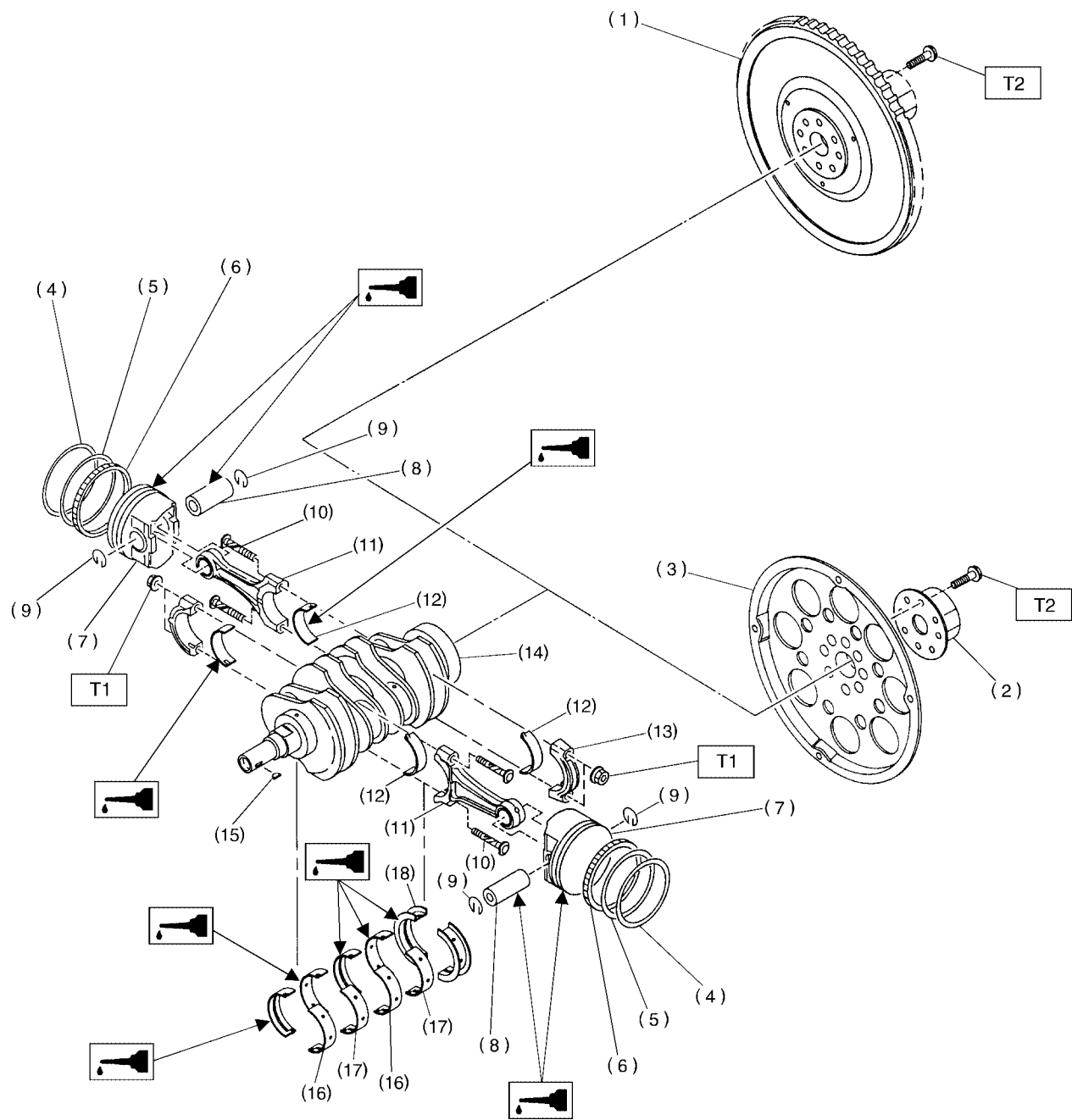
Tightening torque: N·m (kgf-m, ft-lb)

- | | |
|-------------|---|
| 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: | 47 (4.8, 34.7) |
| T6: | 69 (7.0, 50.6) |
| T7: | First 12 (1.2, 8.7)
Second 12 (1.2, 8.7) |
| T8: | 16 (1.6, 11.6) |
| T9: | 44 (4.5, 33) |
| T10: | 25 (2.5, 18.1) |

GENERAL DESCRIPTION

MECHANICAL

6. CRANKSHAFT AND PISTON



B2M3429A

GENERAL DESCRIPTION

MECHANICAL

- (1) Flywheel (MT)
- (2) Reinforcement (AT)
- (3) Drive plate (AT)
- (4) Top ring
- (5) Second ring
- (6) Oil ring
- (7) Piston
- (8) Piston pin

- (9) Circlip
- (10) Connecting rod bolt
- (11) Connecting rod
- (12) Connecting rod bearing
- (13) Connecting rod cap
- (14) Crankshaft
- (15) Woodruff key
- (16) Crankshaft bearing #1, #3

- (17) Crankshaft bearing #2, #4
- (18) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)

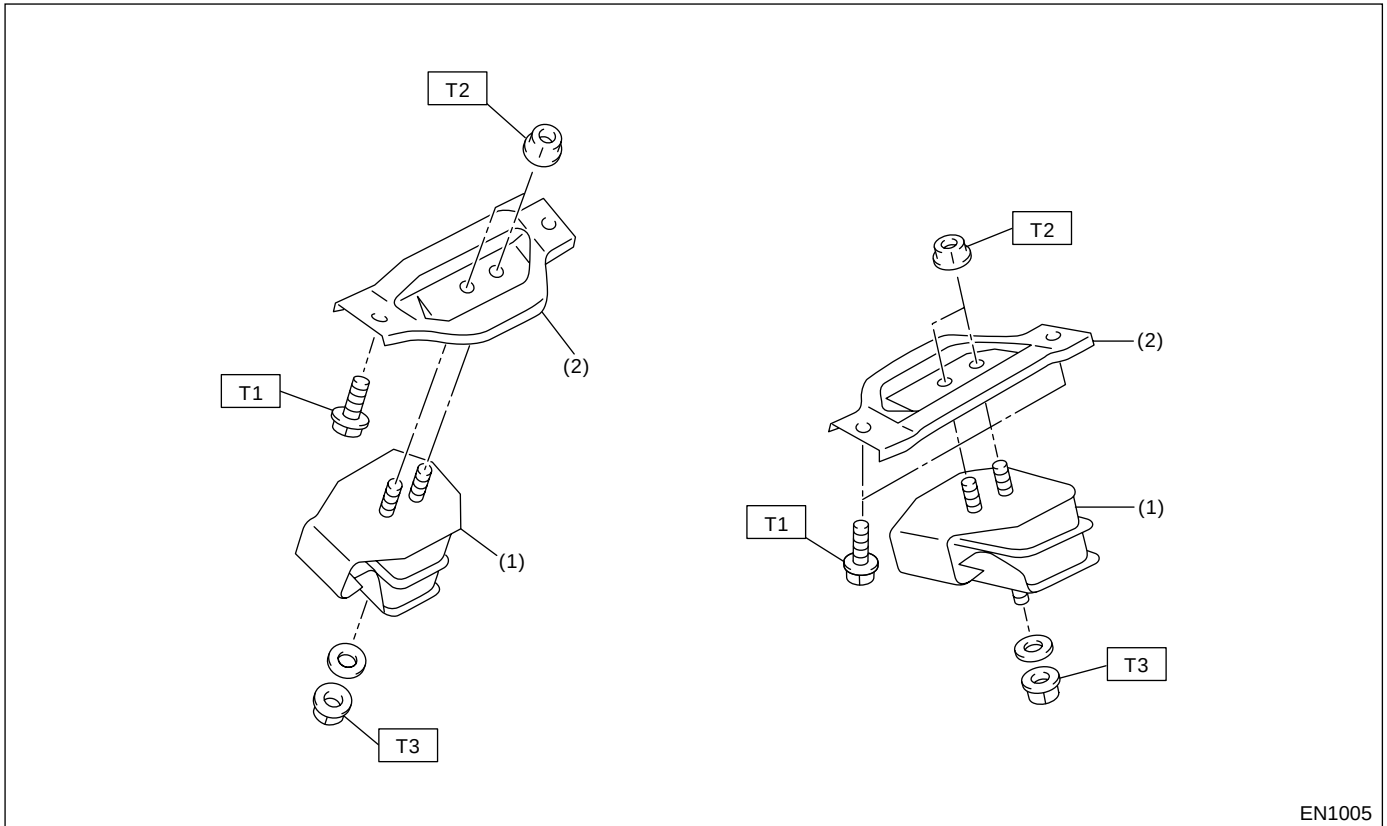
T1: 44.6 (4.55, 32.9)

T2: 72 (7.3, 52.8)

GENERAL DESCRIPTION

MECHANICAL

7. ENGINE MOUNTING



EN1005

(1) Front cushion rubber

(2) 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

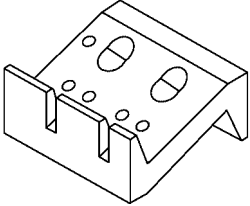
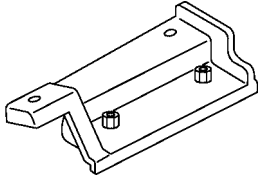
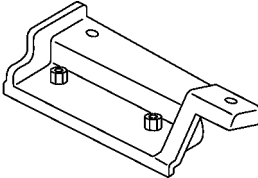
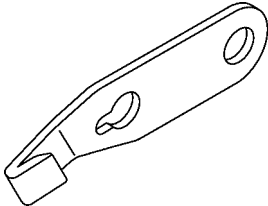
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 negative terminal 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.

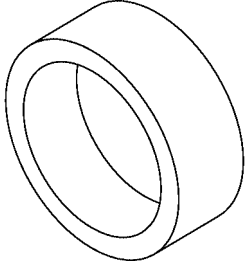
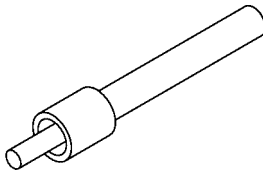
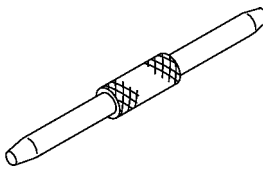
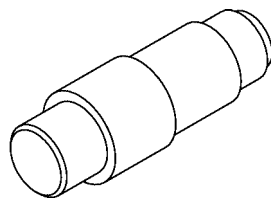
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3850	498267800	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 B2M3851	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 B2M3852	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 B2M3853	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.

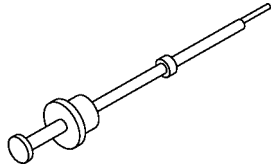
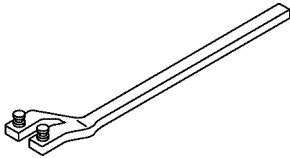
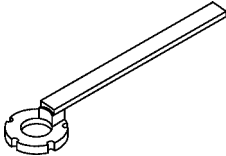
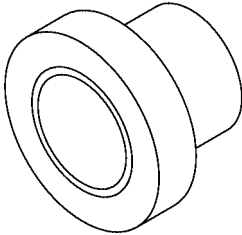
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3854	498747100 (2000 cc model) 498747000 (1600 cc model)	PISTON GUIDE	Used for installing piston in cylinder.
 B2M3855	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 B2M3856	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 B2M3857	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.

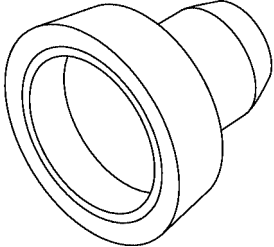
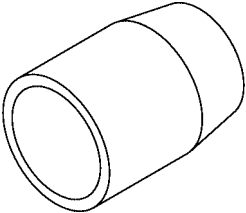
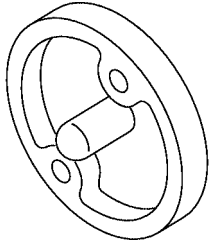
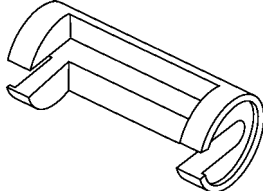
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3858	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 B2M3859	499207100	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (LH side)
 B2M4158	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (RH side)
 B2M3860	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.

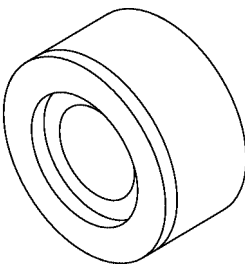
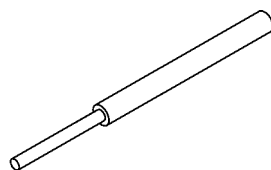
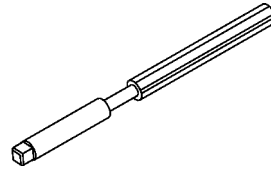
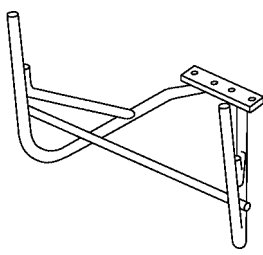
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3861	499587200	CRANKSHAFT OIL SEAL INSTALLER	- Used for installing crankshaft oil seal. - Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 B2M3862	499597000	OIL SEAL GUIDE	- Used for installing camshaft oil seal. - Used with CAMSHAFT OIL SEAL INSTALLER (499587100).
 B2M3863	499597100	CRANKSHAFT OIL SEAL GUIDE	- Used for installing crankshaft oil seal. - Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 B2M3864	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

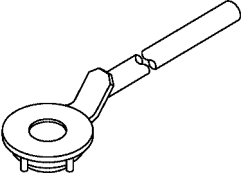
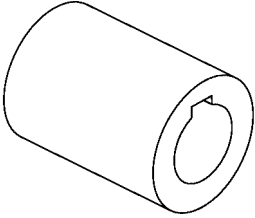
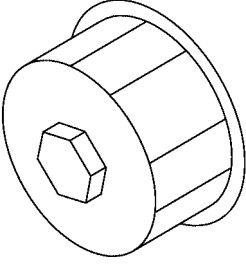
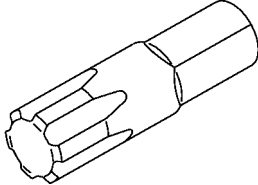
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3865	499767700 (Intake side) 499767800 (Exhaust side)	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 B2M3867	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 B2M3868	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 B2M3869	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).

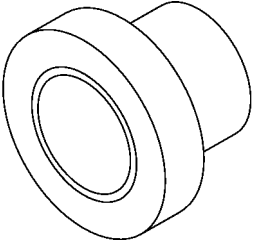
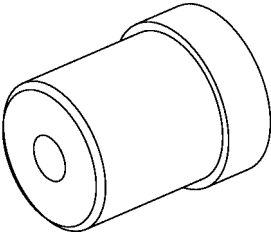
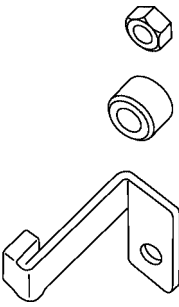
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M4157	499977300	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 B2M3871	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 B2M3872	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 B2M3873	499497000	TORX PLUS	Used for removing and installing camshaft cap.

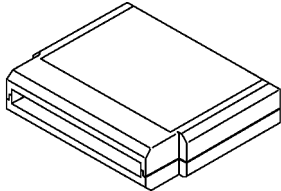
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3874	499587500	OIL SEAL INSTALLER	Used for installing front camshaft oil seal.
 B2M3875	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 B2M2043	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.

GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • 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.
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:

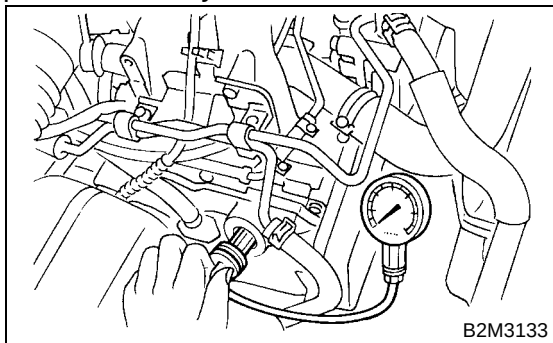
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) After warming-up the engine, turn ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release fuel pressure. <Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> or <Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(SOHC)-5, REMOVAL, Spark Plug.> or <Ref. to IG(SOHCw/oOBD)-5, REMOVAL, Spark Plug.>
- 5) Fully open throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) 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.

- 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 kPa (13.0 kgf/cm², 185 psi)

Limit;

1,020 kPa (10.4 kgf/cm², 148 psi)

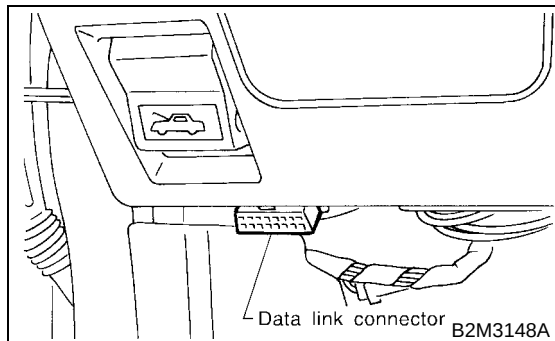
Difference between cylinders;

49 kPa (0.5 kgf/cm², 7 psi), or less

3. Idle Speed

A: INSPECTION

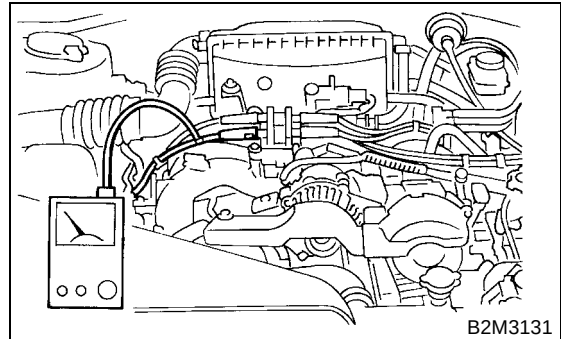
- 1) Before checking idle speed, check the following:
 - (1) Ensure that air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that hoses are connected properly.
 - (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
- 2) Warm-up the engine.
- 3) Stop the engine, and turn ignition switch to OFF.
- 4) When using SUBARU SELECT MONITOR <Ref. to ME(SOHC)-15, 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.

- 5) When using tachometer (Secondary pick-up type).

- (1) Attach the pick-up clip to No. 1 cylinder spark plug cord.
- (2) 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.

- 6) Check 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), or N or P (AT) position):

700±100 rpm

- 7) 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 neutral (MT) or N or P (AT) position]:

850±100 rpm

CAUTION:

Never rotate idle adjusting screw. If idle speed is out of specifications, refer to General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

CAUTION:

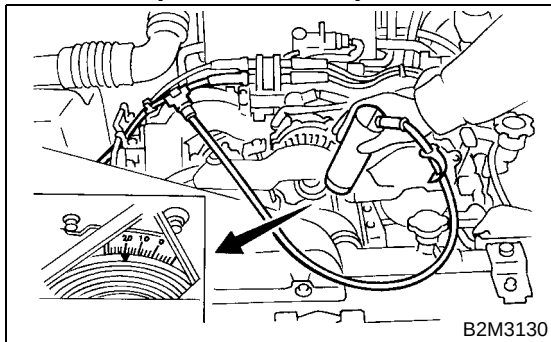
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 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 the timing light.
- 3) Start the engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:

$5^{\circ} \pm 10^{\circ} / 700$ (1600cc model)

$10^{\circ} \pm 10^{\circ} / 700$ (2000cc model)



If the timing is not correct, check the ignition control system.

Refer to Engine Control System. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-2, Basic Diagnostic Procedure.>

INTAKE MANIFOLD VACUUM

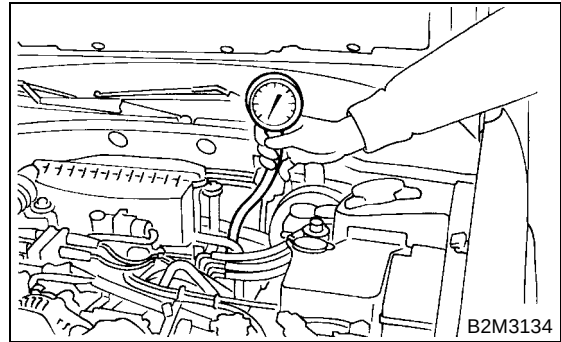
MECHANICAL

5. Intake Manifold Vacuum

A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose and install the vacuum gauge to the hose fitting on the manifold.
- 3) Keep the engine at the idle speed and read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.



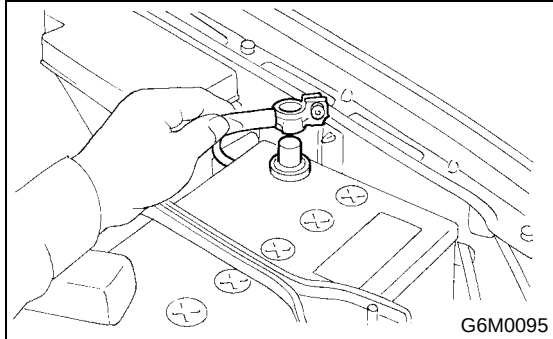
Vacuum pressure (at idling, A/C "OFF"):
Less than -60.0 kPa (-450 mmHg, -17.72 in-Hg)

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) Disconnect battery ground cable.

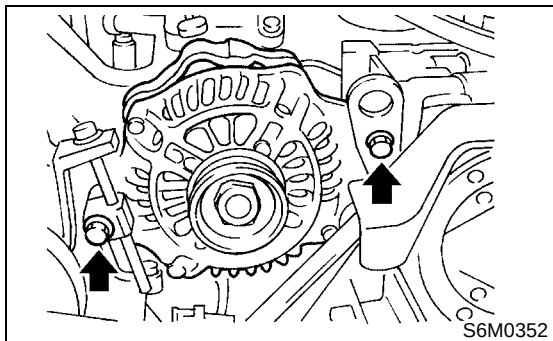


2) Remove generator from bracket.

(1) Loosen lock bolt and slider bolt, and remove front side V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>

(2) Remove generator lock bolt.

(3) Remove bolt which install generator on bracket.

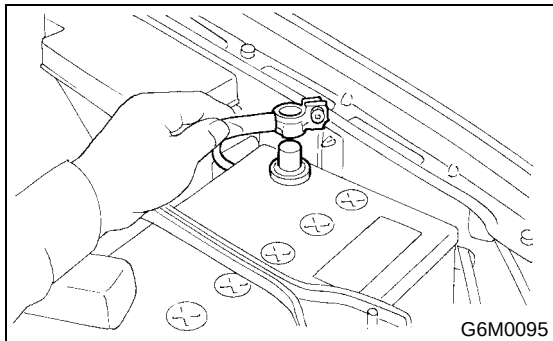


3) Disconnect connector from oil pressure switch.

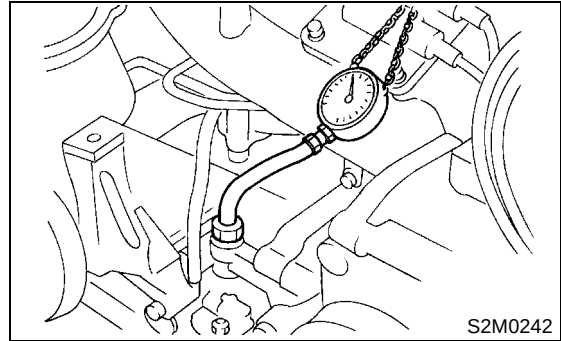
4) Remove oil pressure switch from engine cylinder block. <Ref. to LU-21, REMOVAL, Oil Pressure Switch.>

5) Connect oil pressure gauge hose to cylinder block.

6) Connect battery ground cable.



7) Start the engine, and measure 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

CAUTION:

- If oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU-26, INSPECTION, Engine Lubrication System Trouble in General.>

- If oil pressure warning light is turned ON and oil pressure is in specification, replace oil pressure switch. <Ref. to LU-26, 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 oil pressure, install oil pressure switch. <Ref. to LU-22, INSTALLATION, Oil Pressure Switch.>

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

9) Install generator and V-belt in the reverse order of removal, and adjust the V-belt deflection. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

7. Fuel Pressure

A: INSPECTION

WARNING:

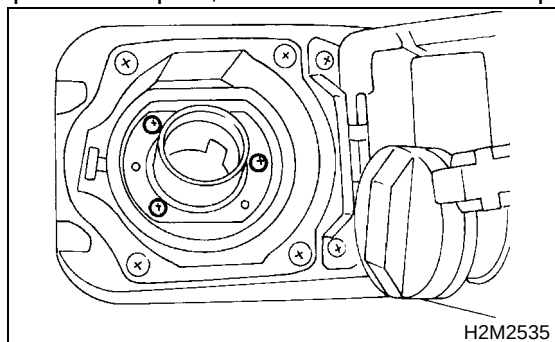
Before removing fuel pressure gauge, release fuel pressure.

NOTE:

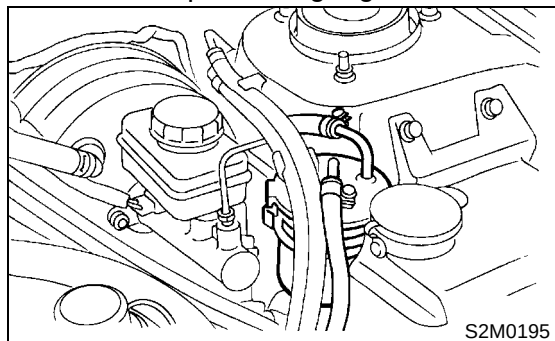
If out of specification, check or replace pressure regulator and pressure regulator vacuum hose.

1) Release fuel pressure. <Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> or <Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

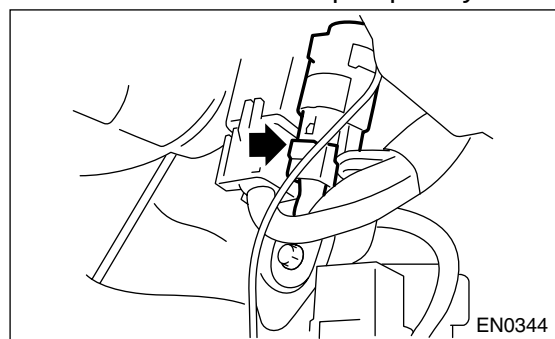
2) Open fuel flap lid, and remove fuel filler cap.



3) Disconnect fuel delivery hoses from fuel damper, and connect fuel pressure gauge.



4) Connect connector of fuel pump relay.

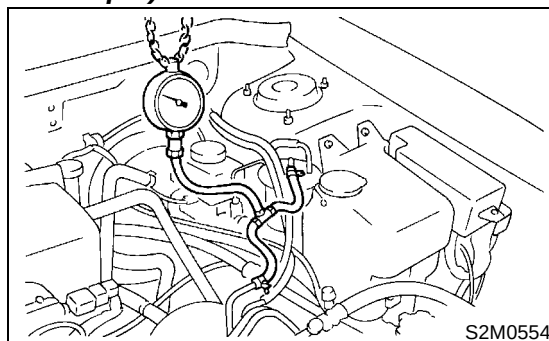


5) Start the engine.

6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

Fuel pressure:

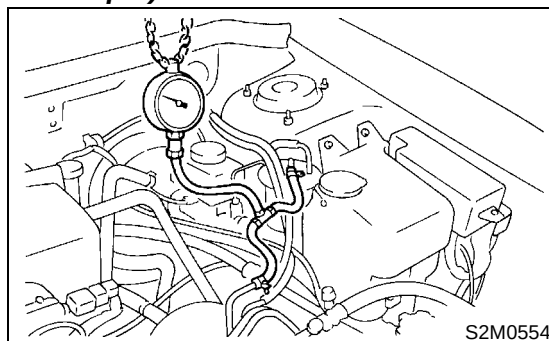
Standard; 284 — 314 kPa (2.9 — 3.2 kg/cm², 41 — 46 psi)



7) After connecting pressure regulator vacuum hose, measure 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.

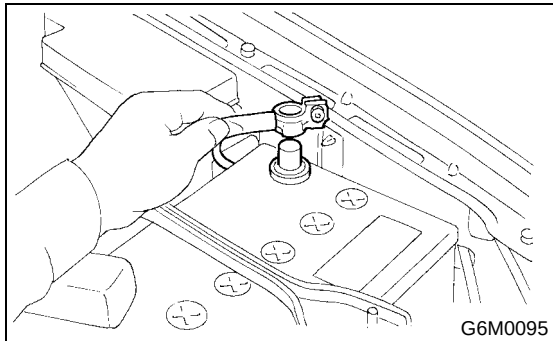
8. Valve Clearance

A: INSPECTION

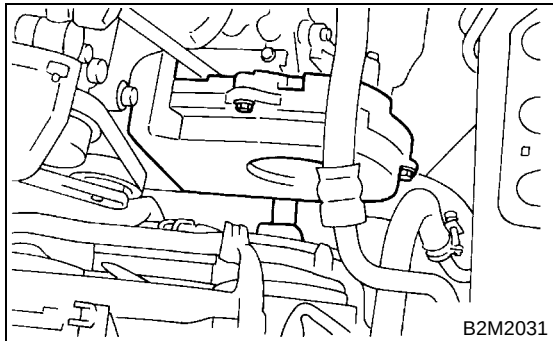
CAUTION:

Inspection and adjustment of valve clearance should be performed while engine is cold.

- 1) Set the vehicle onto the lift.
- 2) Lift-up the vehicle.
- 3) Remove under cover.
- 4) Disconnect battery ground cable.



- 5) Lower the vehicle.
- 6) Remove timing belt cover (LH).



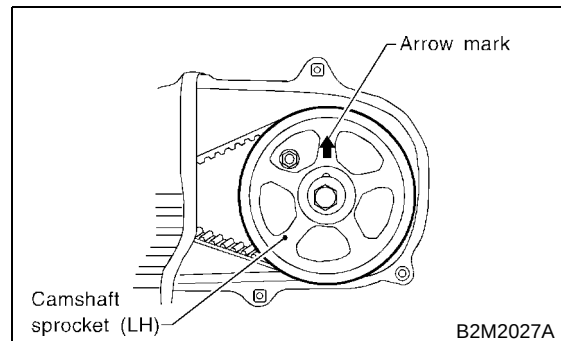
- 7) When inspecting #1 and #3 cylinders;
 - (1) Disconnect spark plug cords from spark plugs RH side. <Ref. to IG(SOHC)-5, RH SIDE, REMOVAL, Spark Plug.> or <Ref. to IG(SOHCw/oOBD)-5, RH SIDE, REMOVAL, Spark Plug.>
 - (2) Disconnect PCV hose from rocker cover (RH).
 - (3) Remove bolts, then remove rocker cover (RH).

- 8) When inspecting #2 and #4 cylinders;
 - (1) Disconnect spark plug cords from spark plugs (LH Side) <Ref. to IG(SOHC)-5, LH SIDE, REMOVAL, Spark Plug.> or <Ref. to IG(SOHCw/oOBD)-5, LH SIDE, REMOVAL, Spark Plug.>.
 - (2) Disconnect PCV hose from rocker cover (LH).
 - (3) Remove bolts, then remove rocker cover (LH).
- 9) Set #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise using ST.

ST 499977300 CRANKSHAFT PULLEY WRENCH

NOTE:

When arrow mark on camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



- 10) Measure #1 cylinder valve clearance by using thickness gauge.

CAUTION:

- Insert the thickness gauge in as horizontal a direction as possible with respect to the valve stem end face.
- Measure exhaust valve clearances while lift-up the vehicle.

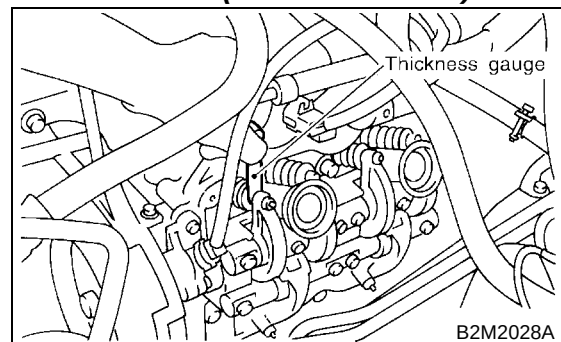
Valve clearance:

Intake;

$0.20 \pm 0.02 \text{ mm (0.0079} \pm 0.0008 \text{ in)}$

Exhaust;

$0.25 \pm 0.02 \text{ mm (0.0098} \pm 0.0008 \text{ in)}$



VALVE CLEARANCE

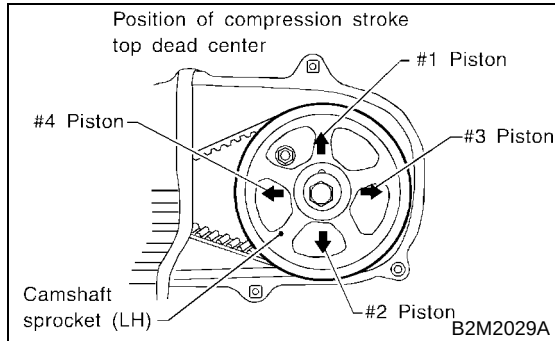
MECHANICAL

11) If necessary, adjust the valve clearance. <Ref. to ME(SOHC)-30, ADJUSTMENT, Valve Clearance.>

12) Similar to measurement procedures used for #1 cylinder, measure #2, #3 and #4 cylinder valve clearances.

NOTE:

- Be sure to set cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.
- To set #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn crankshaft pulley clockwise 90° at a time starting with arrow mark on left-hand camshaft sprocket facing up.

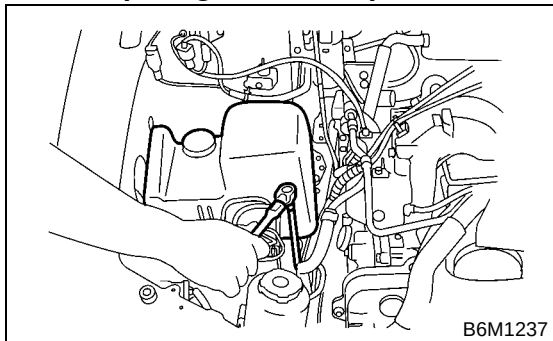


13) After inspection, install the related parts in the reverse order of removal.

Tightening torque:

Resonator chamber;

33 N·m (3.4 kgf-m, 24 ft-lb)



B: ADJUSTMENT

CAUTION:

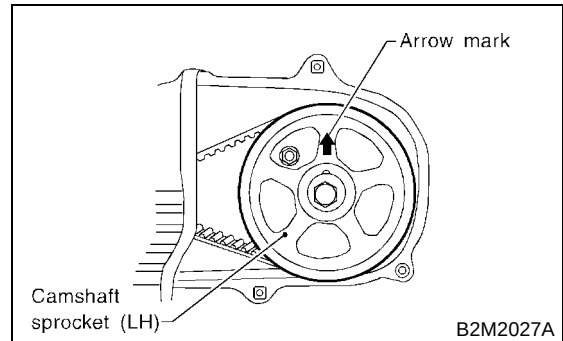
Adjustment of valve clearance should be performed while engine is cold.

1) Set #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise using ST.

ST 499977300 CRANKSHAFT PULLEY WRENCH

NOTE:

When arrow mark on 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 valve clearance, tighten valve rocker adjust screw.
 - (4) When specified valve clearance is obtained, tighten 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 exhaust valve clearances while lifting-up the vehicle.

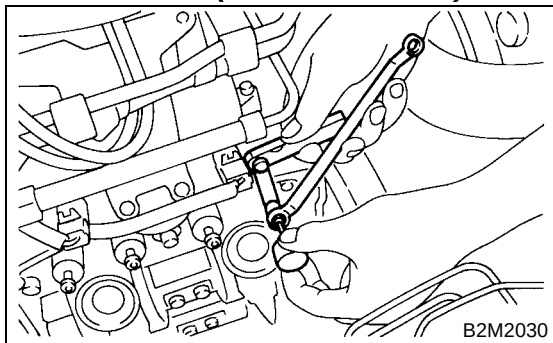
Valve clearance:

Intake;

0.20 ± 0.02 mm (0.0079 ± 0.0008 in)

Exhaust;

0.25 ± 0.02 mm (0.0098 ± 0.0008 in)

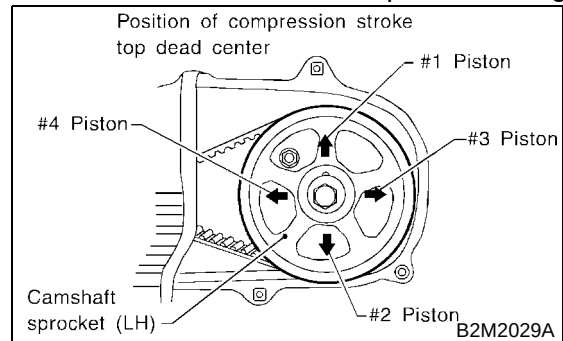


- 3) Ensure that valve clearances are within specifications.
- 4) Turn crankshaft two complete rotations until #1 cylinder piston is again set to top dead center on compression stroke.
- 5) Ensure that valve clearances are within specifications. If necessary, readjust valve clearances.

- 6) Similar to adjustment procedures used for #1 cylinder, adjust #2, #3 and #4 cylinder valve clearances.

NOTE:

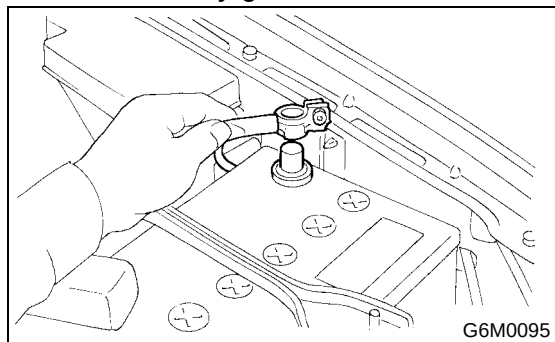
- Be sure to set cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
- To set #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn crankshaft pulley clockwise 90° at a time starting with arrow mark on left-hand camshaft sprocket facing up.



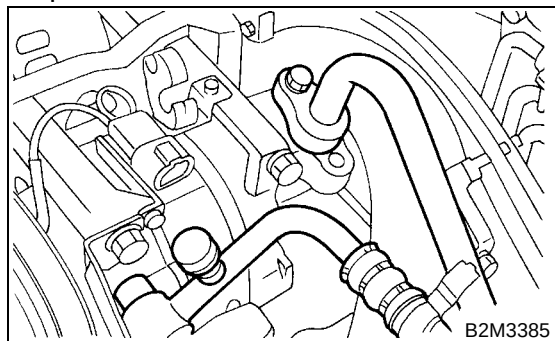
9. Engine Assembly

A: REMOVAL

- 1) Set the vehicle on lift arms.
- 2) Open front hood fully and support with stay.
- 3) Release fuel pressure. <Ref. to FU(SOHC)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> or <Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove filler cap.
- 5) Disconnect battery ground terminal.

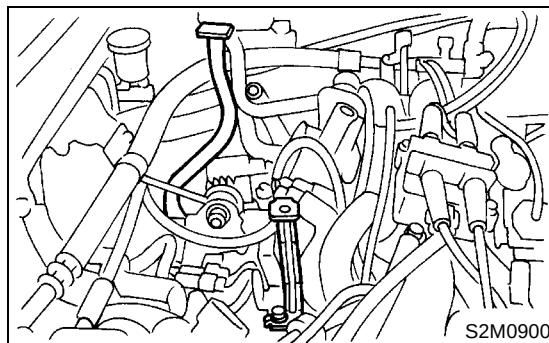


- 6) Remove air intake duct and air cleaner case. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
- 7) Remove under cover.
- 8) Remove radiator from vehicle. <Ref. to CO-37, REMOVAL, Radiator.>
- 9) Collect refrigerant, and remove pressure hoses. (With A/C)
 - (1) Place and connect the attachment hose to the refrigerant recycle system.
 - (2) Collect refrigerant from A/C system.
 - (3) Disconnect A/C pressure hoses from A/C compressor.

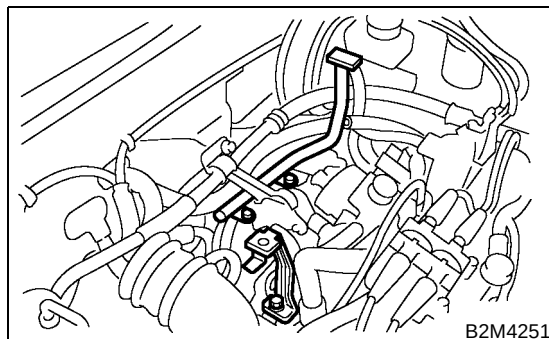


- 10) Remove air cleaner case stay.

• MT model

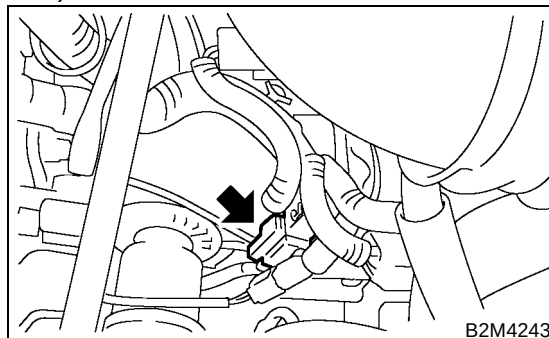


• AT model

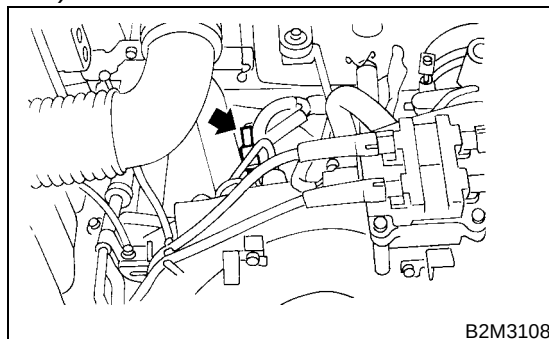


- 11) Disconnect the following connectors and cables.

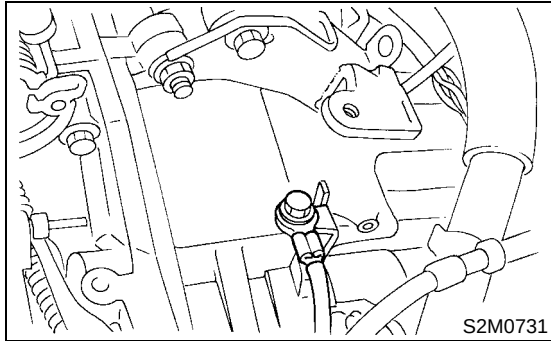
- (1) Front oxygen (A/F) sensor connector (With OBD)



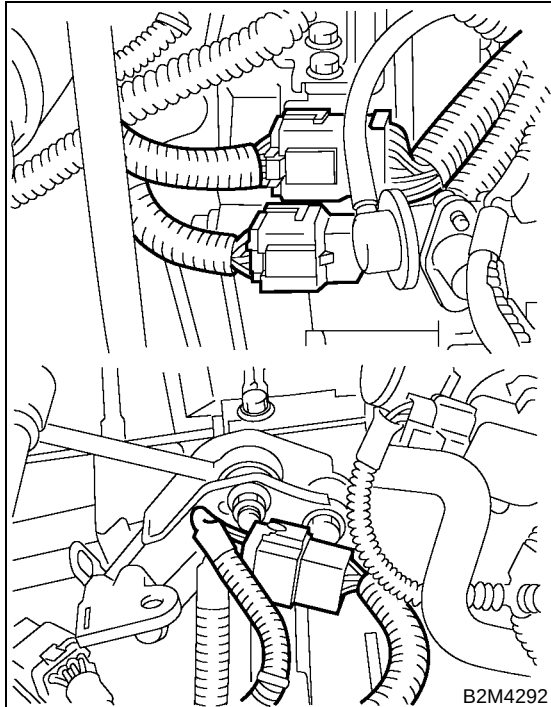
- (2) Front oxygen sensor connector (Without OBD)



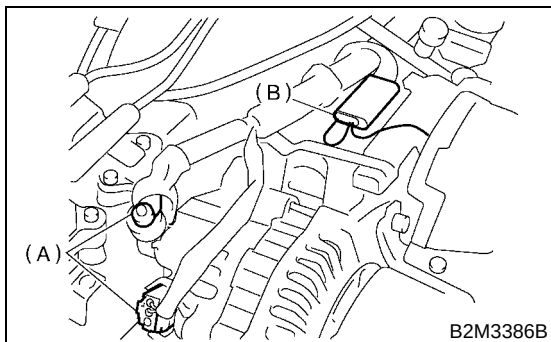
(3) Engine ground terminal



(4) Engine harness connectors

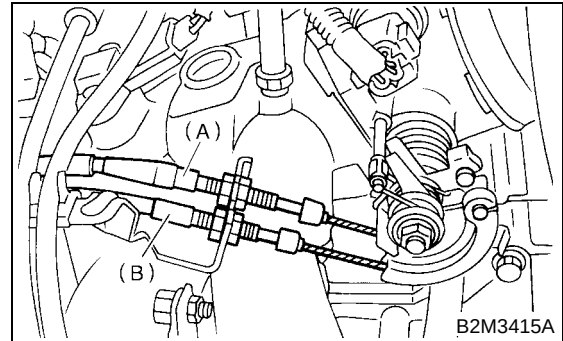


(5) Generator connector, terminal and A/C compressor connector



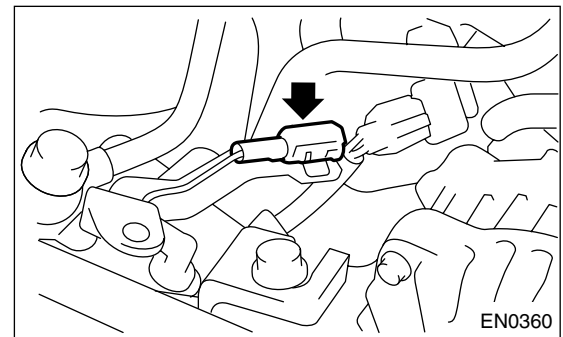
- (A) Generator connector and terminal
- (B) A/C compressor connector

(6) Accelerator cable and cruise control cable



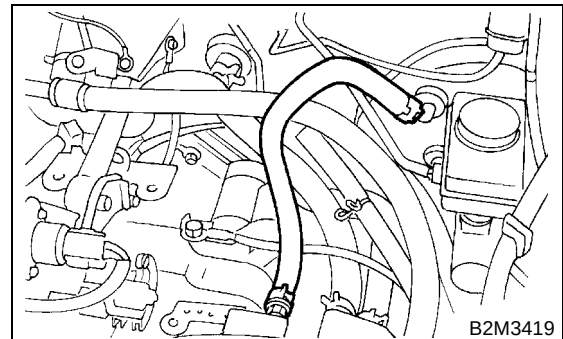
- (A) Accelerator cable
- (B) Cruise control cable

(7) Pressure switch

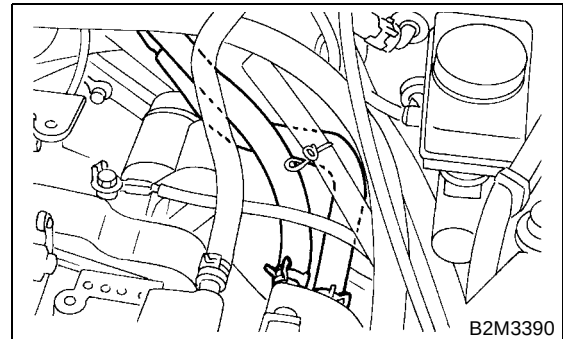


12) Disconnect the following hoses.

(1) Brake booster vacuum hose



(2) Heater inlet outlet hose

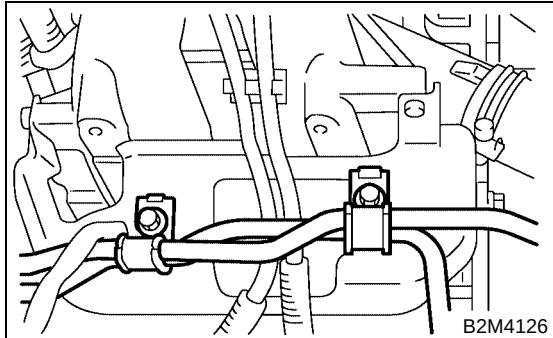


ENGINE ASSEMBLY

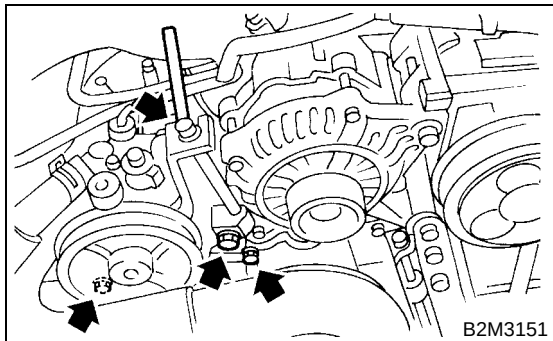
MECHANICAL

13) Remove power steering pump from bracket.

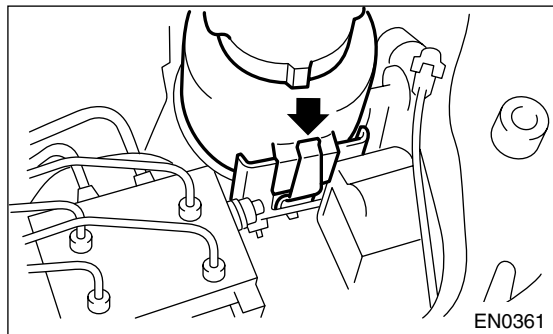
- (1) Remove resonator chamber.
- (2) Loosen lock bolt and slider bolt, and remove front side V-belt. <Ref. to ME(SOHC)-42, FRONT SIDE BELT, REMOVAL, V-belt.>
- (3) Remove pipe with bracket.



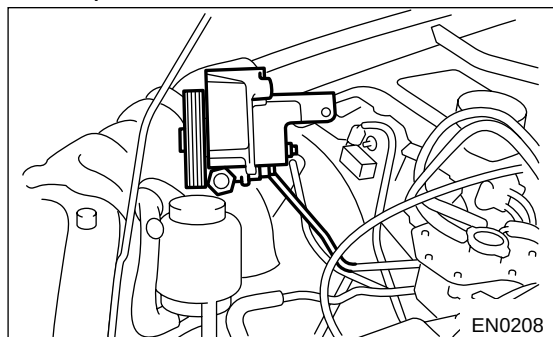
(4) Remove bolts which install power steering pump bracket.



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



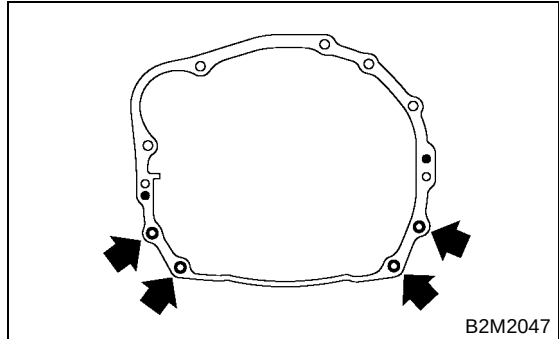
(6) Place power steering pump on the right side wheel apron.



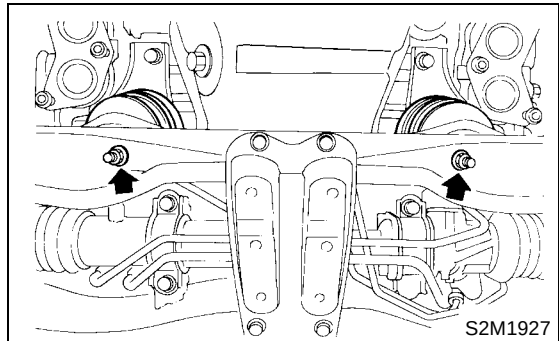
14) Remove front and center exhaust pipe.

<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.> or <Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

15) Remove nuts which hold lower side of transmission to engine.



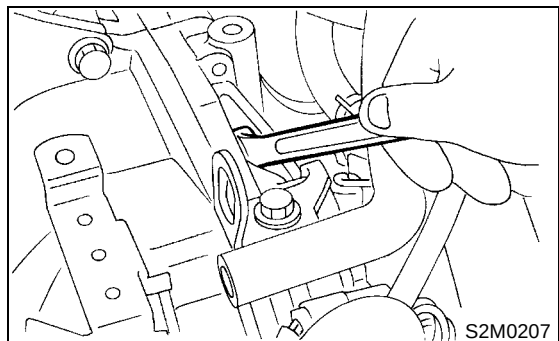
16) Remove nuts which install front cushion rubber onto front crossmember.



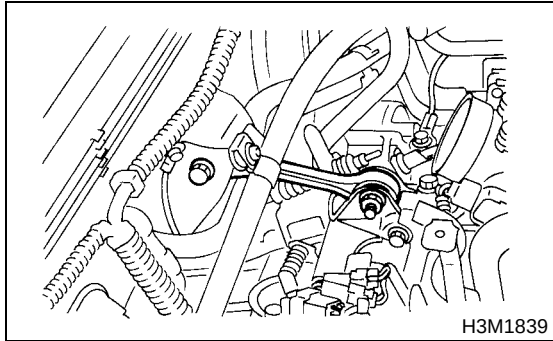
17) Separate torque converter clutch from drive plate. (AT model)

- (1) Lower the vehicle.
- (2) Remove service hole plug.
- (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



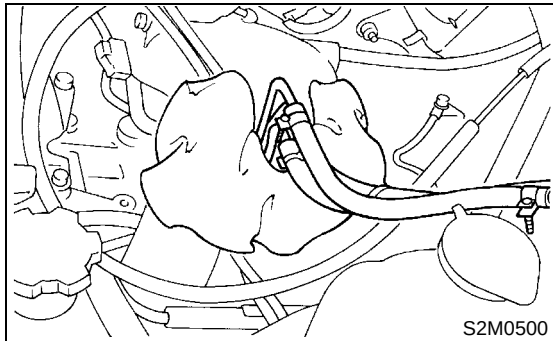
18) Remove pitching stopper.



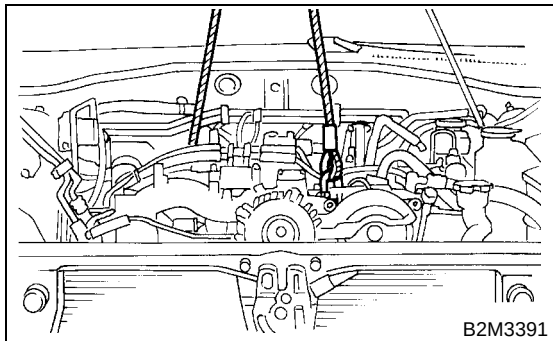
19) Disconnect fuel delivery hose, return hose and evaporation hose.

CAUTION:

- Disconnect hose with its end wrapped with cloth to prevent fuel from splashing.
- Catch fuel from hose into container.



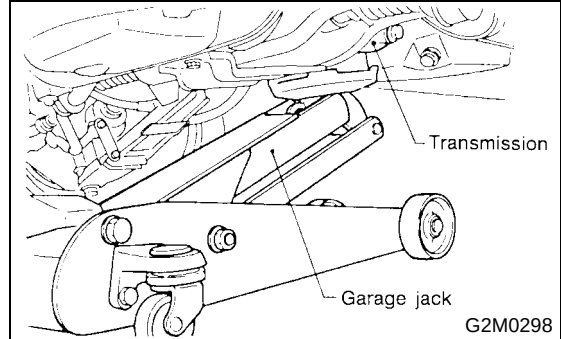
20) Support engine with a lifting device and wire ropes.



21) Support transmission with a garage jack.

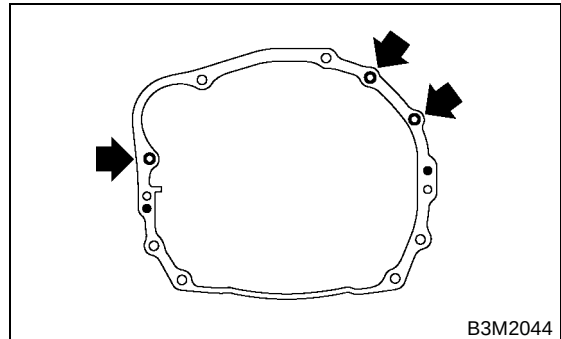
CAUTION:

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.



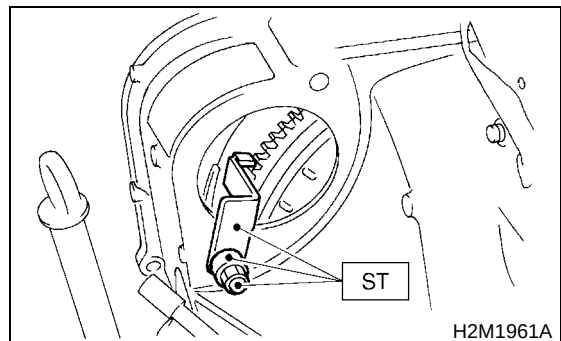
22) Separation of engine and transmission.

- (1) Remove starter. <Ref. to SC-5, REMOVAL, Starter.>
- (2) Remove bolts which hold upper side of transmission to engine.



23) Install ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



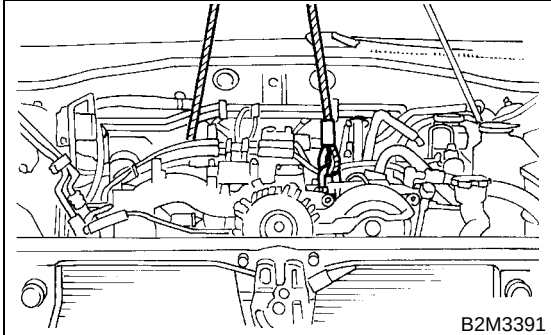
ENGINE ASSEMBLY

MECHANICAL

- 24) 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.

CAUTION:

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



B2M3391

- 25) Remove front cushion rubbers.

B: INSTALLATION

- 1) Install front cushion rubbers.

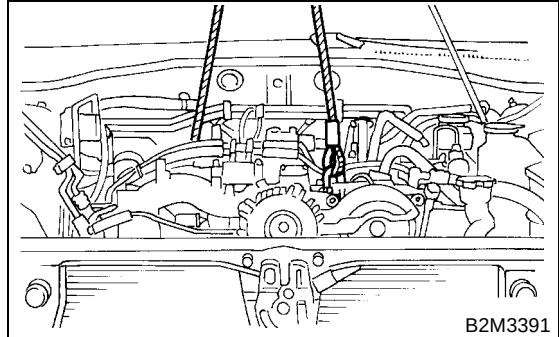
Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

- 2) Install engine onto transmission.
 - (1) Position engine in engine compartment and align it with transmission.

CAUTION:

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

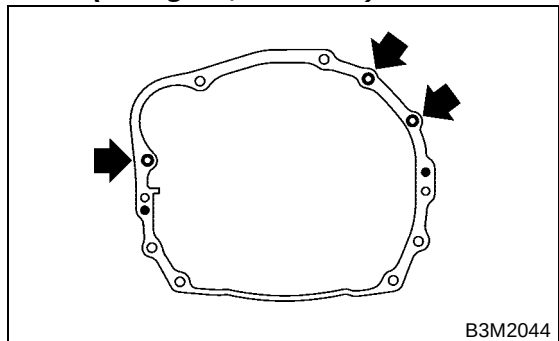


B2M3391

- (2) Apply a small amount of grease to spline of main shaft. (MT model)
- 3) Tighten bolts which hold upper side of transmission to engine.

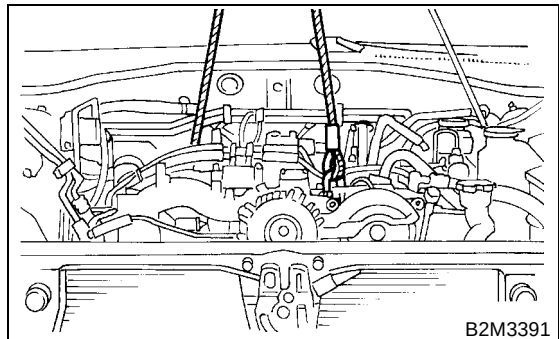
Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



B3M2044

- 4) Remove lifting device and wire ropes.



B2M3391

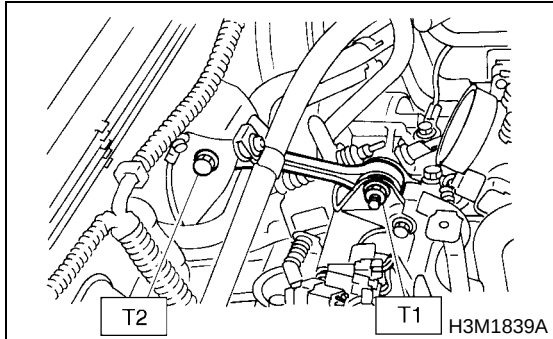
- 5) Remove garage jack.

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. (AT model)

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-6, INSTALLATION, Starter.>

9) Install torque converter clutch onto drive plate. (AT model)

- (1) Tighten bolts which hold torque converter clutch to drive plate.
- (2) Tighten other bolts while rotating the engine by using ST.

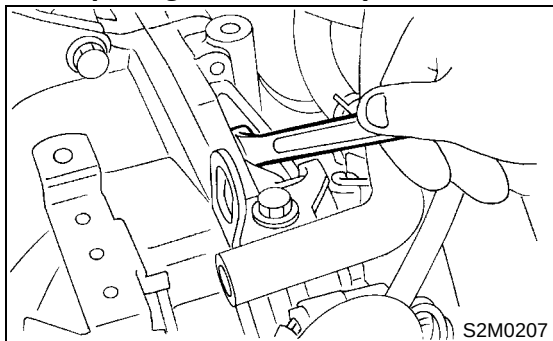
CAUTION:

Be careful not to drop bolts into torque converter clutch housing.

ST 499977300 CRANK PULLEY WRENCH

Tightening torque:

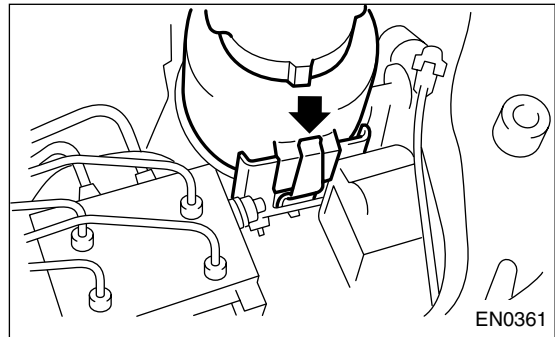
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(3) Clog plug onto service hole.

10) Install power steering pump on bracket.

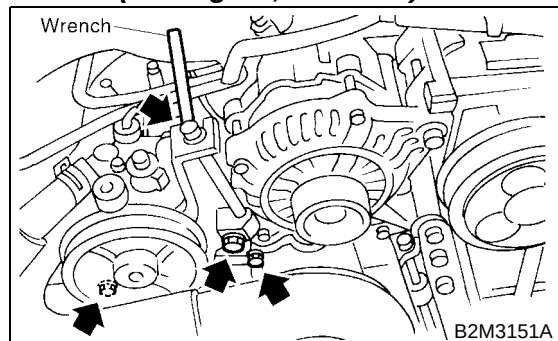
(1) Install power steering tank on bracket.



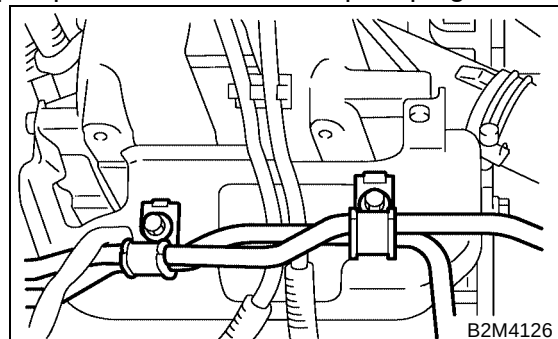
(2) Install power steering pump on bracket, and tighten bolts.

Tightening torque:

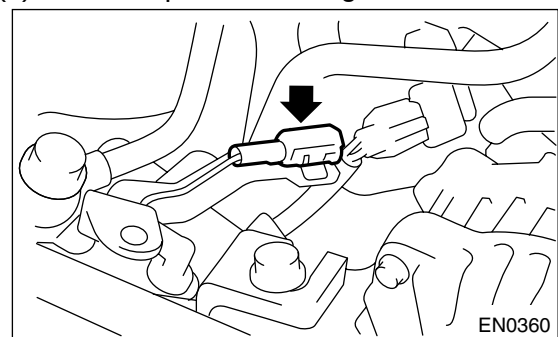
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Tighten bolt which installs power steering pump bracket, and install spark plug codes.



(4) Connect power steering switch connector.

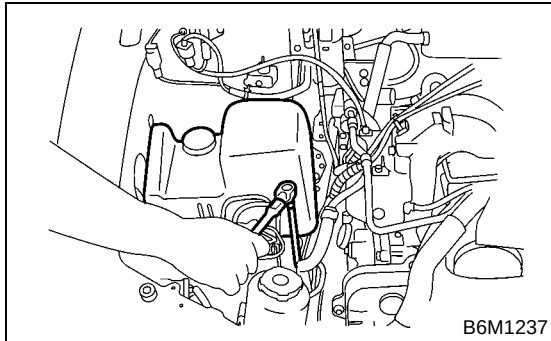


(5) Install front side V-belt, and adjust it. <Ref. to ME(SOHC)-42, FRONT SIDE BELT, INSTALLATION, V-belt.>

- (6) Install resonator chamber.

Tightening torque:

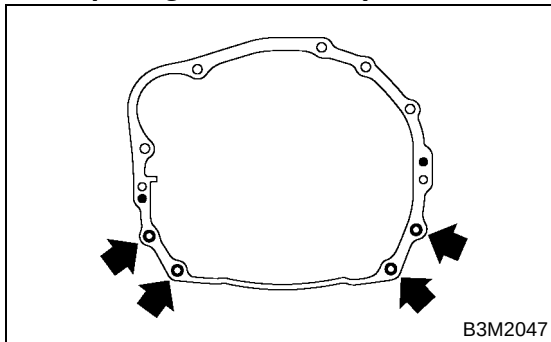
33 N·m (3.4 kgf-m, 24.6 ft-lb)



- 11) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



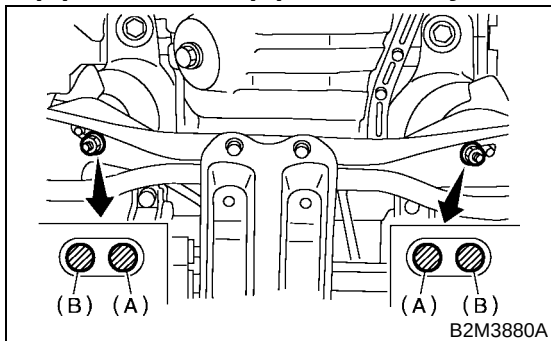
- 12) Tighten nuts which install front cushion rubber onto crossmember.

Tightening torque:

85 N·m (8.7 kgf-m, 63 ft-lb)

CAUTION:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



- 13) Install front and center exhaust pipe.
<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-10, 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) 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)

CAUTION:

After connecting each cable, adjust them.

- 17) Install air cleaner case stay.

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)

- 18) Install A/C pressure hoses.

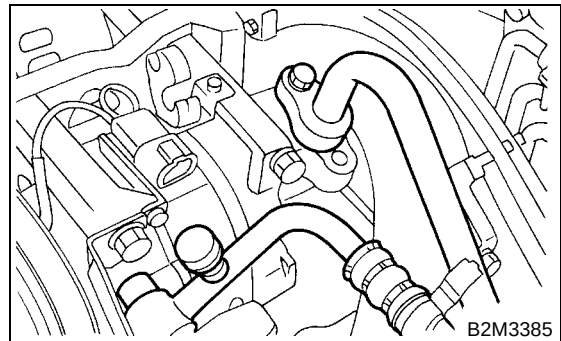
<Ref. to AC-31, INSTALLATION, Hose and Tube.>

CAUTION:

Use new O-rings.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- 19) Install radiator to vehicle. <Ref. to CO-40, INSTALLATION, Radiator.>

- 20) Install under cover.

- 21) Install battery in the vehicle, and connect cables.

- 22) Fill coolant.

<Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

- 23) Check ATF level and correct if necessary. (AT model)

<Ref. to AT-9, INSPECTION, Automatic Transmission Fluid.>

- 24) Charge A/C system with refrigerant.

<Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>

- 25) Remove front hood stay, and close front hood.

- 26) 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.

10.Engine Mounting

A: REMOVAL

- 1) Remove engine assembly. <Ref. to ME(SOHC)-32, 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.

11.Preparation for Overhaul

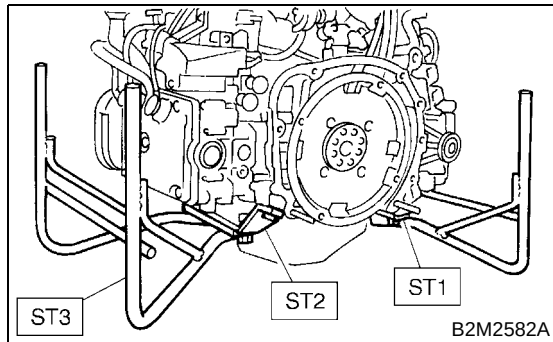
A: PROCEDURE

1) After removing the engine from the 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

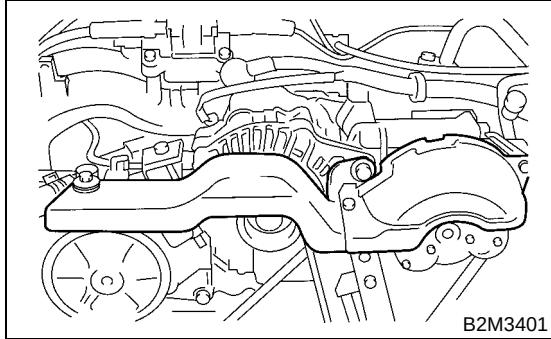
A: REMOVAL

1. FRONT SIDE BELT

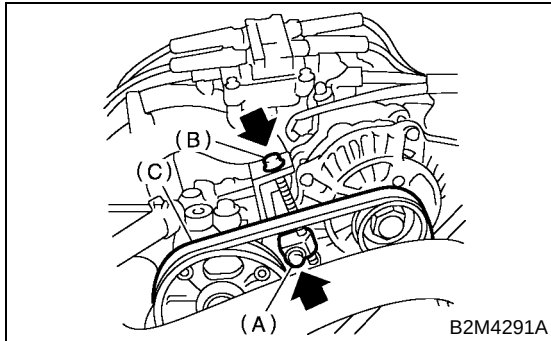
NOTE:

Perform the following procedures 1) to 4) with the engine installed to the body.

- 1) Remove V-belt cover.

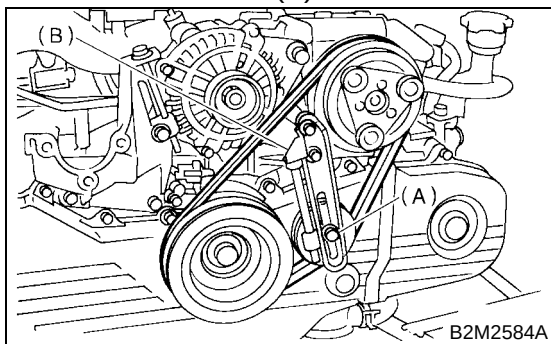


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).

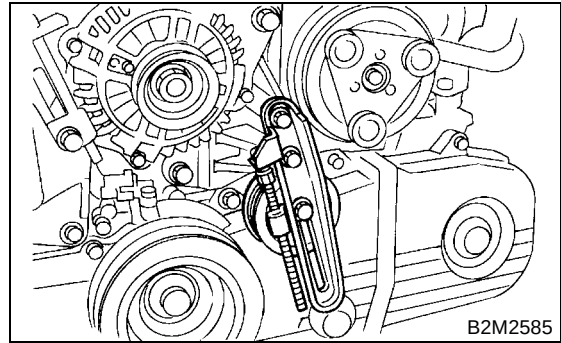


2. REAR SIDE BELT

- 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 a belt, and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(SOHC)-43, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A)
- 3) Tighten slider bolt (B).

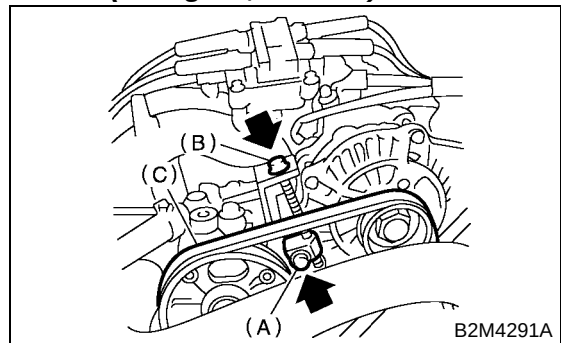
Tightening torque:

Lock bolt through bolt:

25 N·m (2.5 kgf-m, 18 ft-lb)

Slider bolt:

8 N·m (0.8 kgf-m, 5.5 ft-lb)



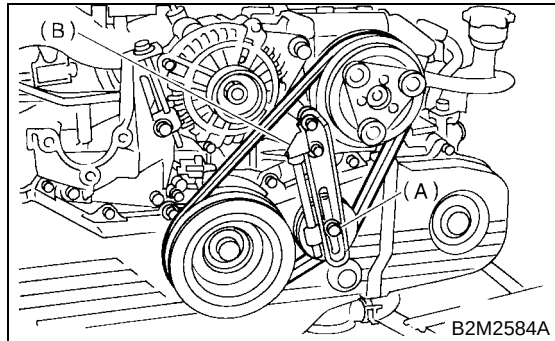
2. REAR SIDE BELT

- 1) Install a belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(SOHC)-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 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)

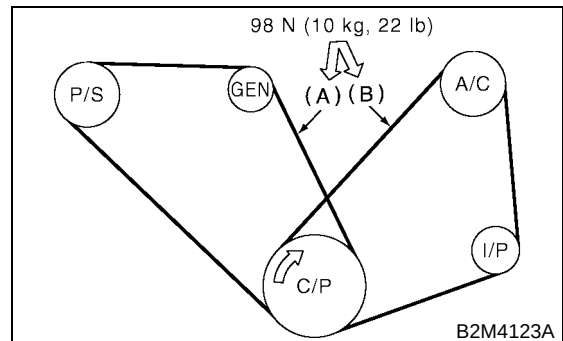
replaced: 7 — 9 mm (0.276 — 0.354 in)

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

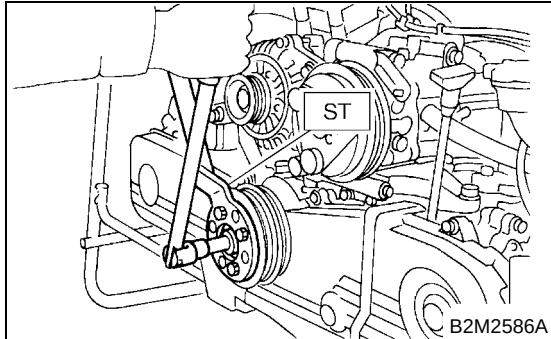
A: REMOVAL

1) Remove V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>

2) Remove crankshaft pulley bolt. To lock crankshaft, use ST.

ST 499977300 (2000 cc model)

CRANKSHAFT PULLEY WRENCH



3) Remove crankshaft pulley.

B: INSTALLATION

1) Install crankshaft pulley.

2) Install pulley bolt.

To lock crankshaft, use ST.

ST 499977300 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.

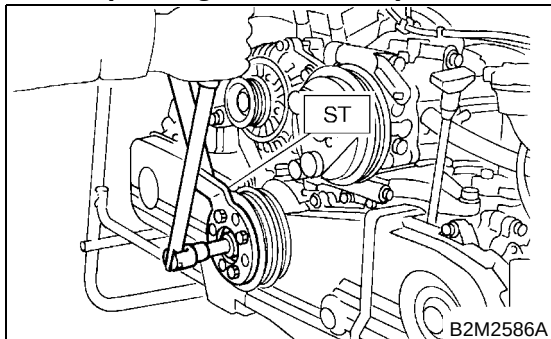
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

(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 the crankshaft pulley bolt is 45 degrees or more. If not, conduct the following procedures.

CAUTION:

If the tightening angle of crankshaft pulley bolt is less than 45 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:

12369AA011

(2) Clean the crankshaft thread using an air gun.

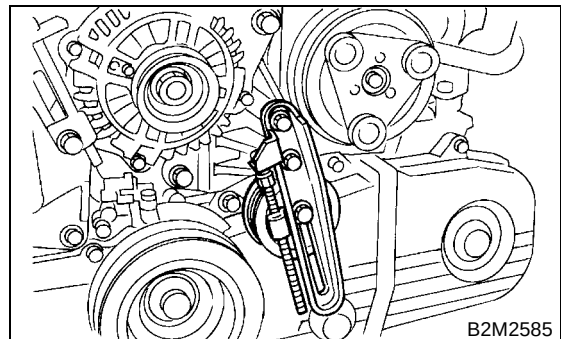
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).

(4) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

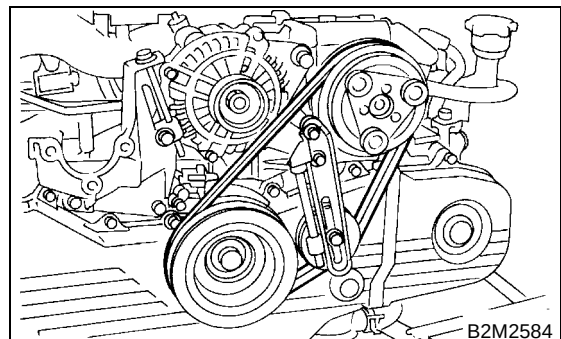
CAUTION:

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 A/C belt tensioner.



5) Install A/C belt.



C: INSPECTION

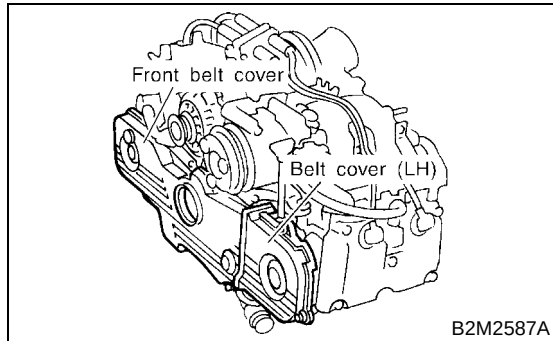
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(SOHC)-43, INSPECTION, V-belt.>

14. Belt Cover

A: REMOVAL

- 1) Remove V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover (LH).
- 4) Remove front belt cover.



B: INSTALLATION

- 1) Install front belt cover.

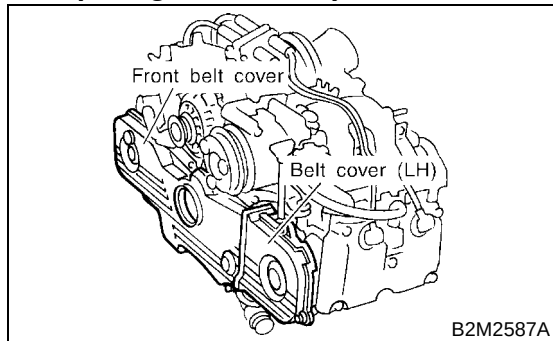
Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 2) Install belt cover (LH).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



- 3) Install crankshaft pulley. <Ref. to ME(SOHC)-44, INSTALLATION, Crankshaft Pulley.>
- 4) Install V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

C: INSPECTION

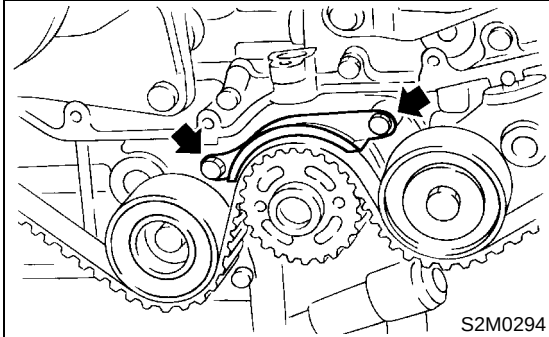
Make sure the cover is not damaged.

15. Timing Belt Assembly

A: REMOVAL

1. TIMING BELT

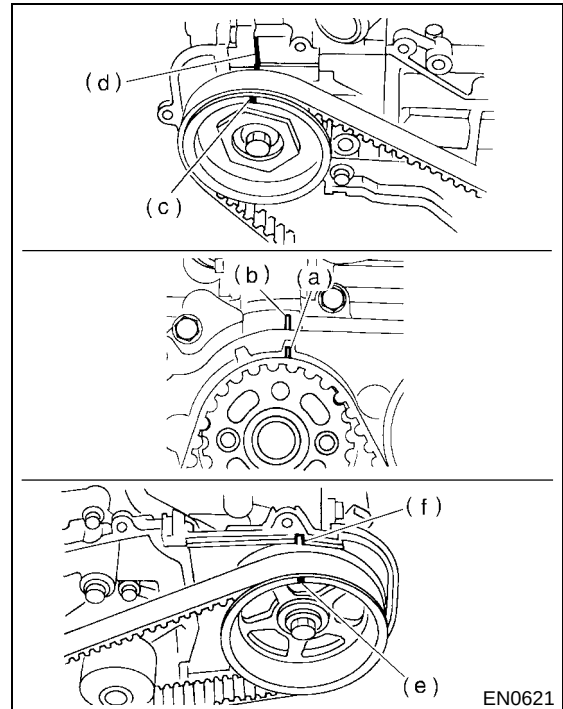
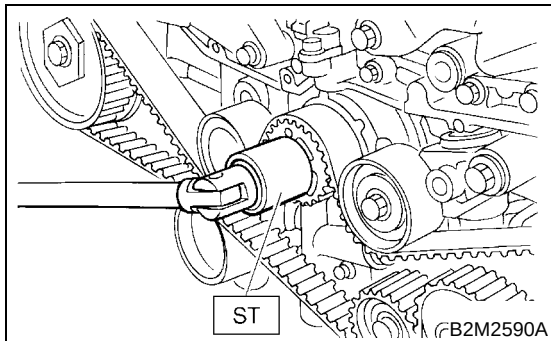
- 1) Remove V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove timing belt guide. (MT vehicle only)



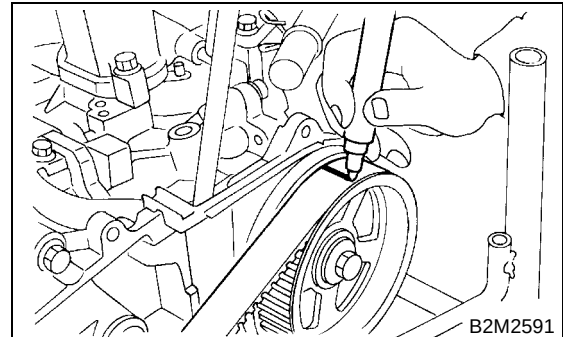
- 5) If alignment mark (a) and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as shown in procedures below.

- (1) Turn crankshaft using ST. Align mark (a) of sprocket to cylinder block notch (b) and ensure that 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.

ST 499987500 CRANKSHAFT SOCKET



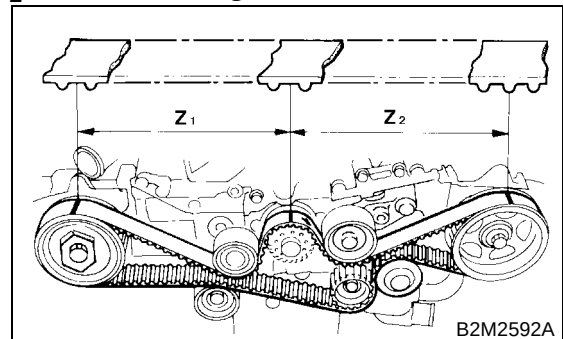
- (2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the crank sprocket and cam sprockets.



Specified data:

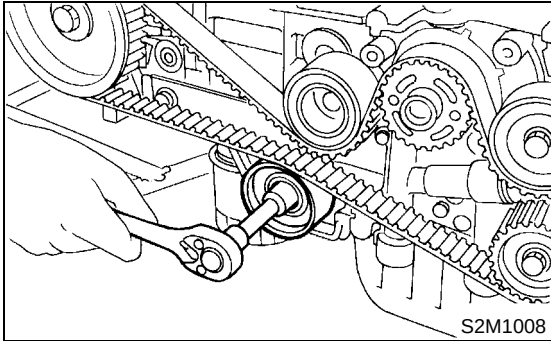
Z₁: 44 tooth length

Z₂: 40.5 tooth length

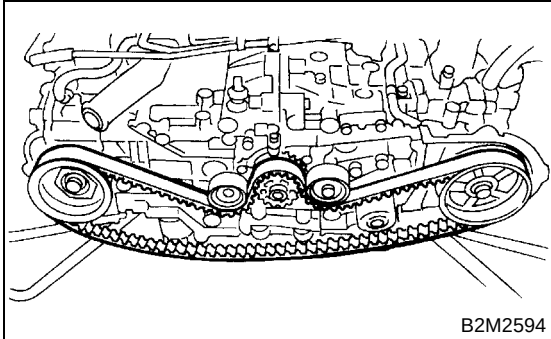


- 6) Remove belt idler (No. 2).

7) Remove belt idler No. 2.

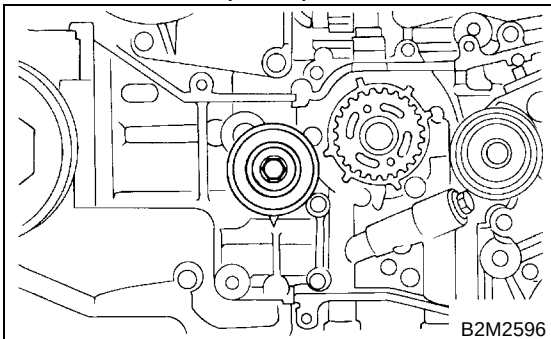


8) Remove timing belt.

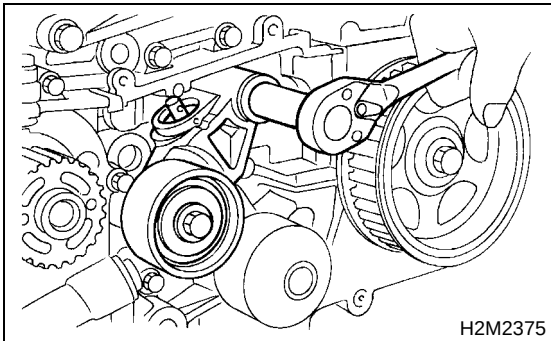


2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove belt idler (No. 1).



2) Remove automatic belt tension adjuster assembly.



B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

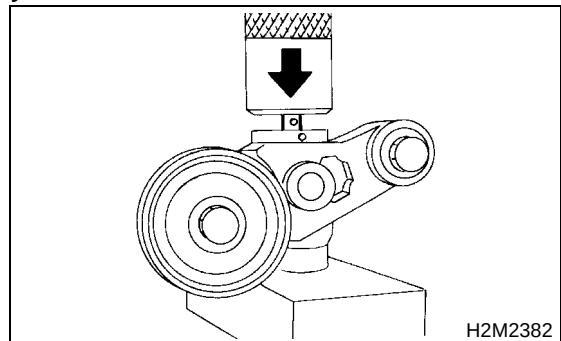
1) Preparation for installation of automatic belt tension adjuster assembly;

CAUTION:

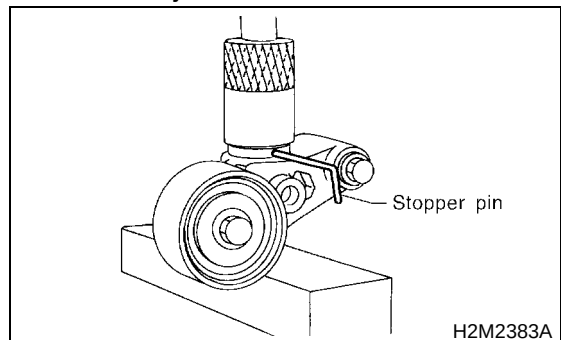
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push adjuster rod vertically.
- Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kgf, 66 lb).
- Press-in the push adjuster rod gradually taking more than three minutes.
- 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.



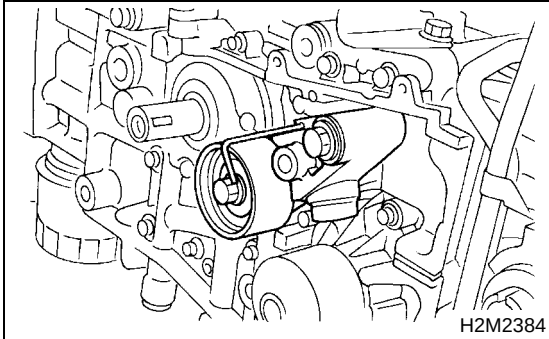
TIMING BELT ASSEMBLY

MECHANICAL

2) Install automatic belt tension adjuster assembly.

Tightening torque:

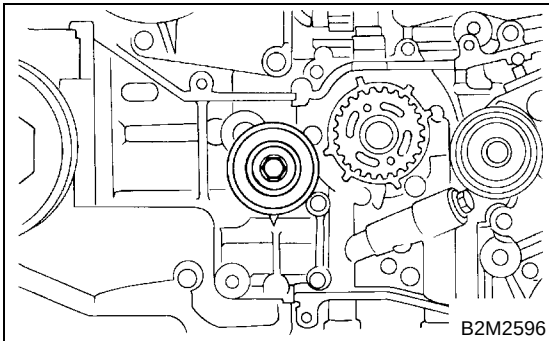
25 N·m (2.5 kgf-m, 18.4 ft-lb)



3) Install belt idler (No. 1).

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)



2. TIMING BELT

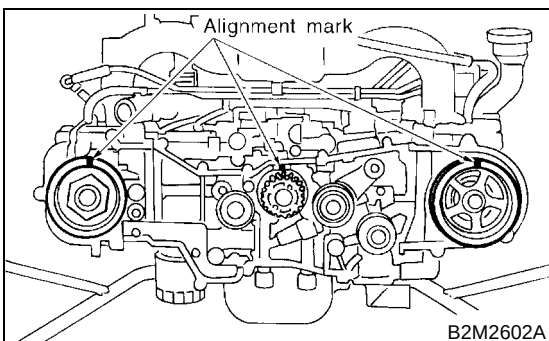
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(SOHC)-47, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

2) Installation of timing belt

(1) Turn camshaft sprocket No. 2 using ST1, and turn camshaft sprocket No. 1 using ST2 so that their alignment marks come to top positions.

ST1 499207100 CAMSHAFT SPROCKET WRENCH

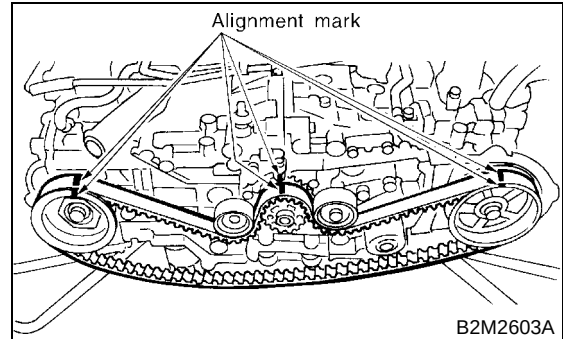
ST2 499207400 CAMSHAFT SPROCKET WRENCH



(2) While aligning alignment mark on timing belt with marks on sprockets, position timing belt properly.

CAUTION:

Ensure belt's rotating direction is correct.



3) Install belt idler No. 2.

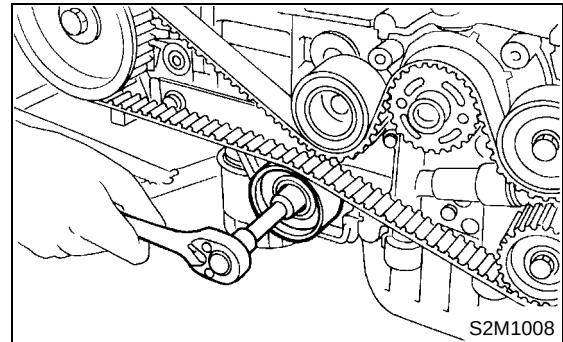
Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

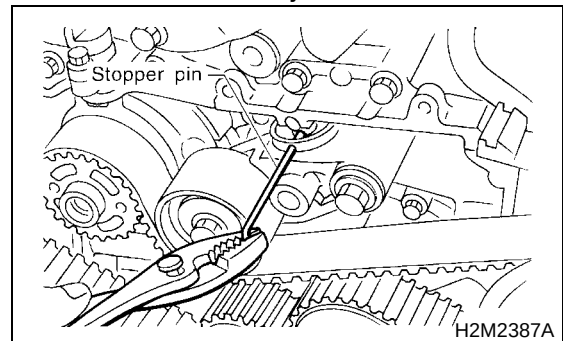
4) Install belt idler (No. 2).

Tightening torque:

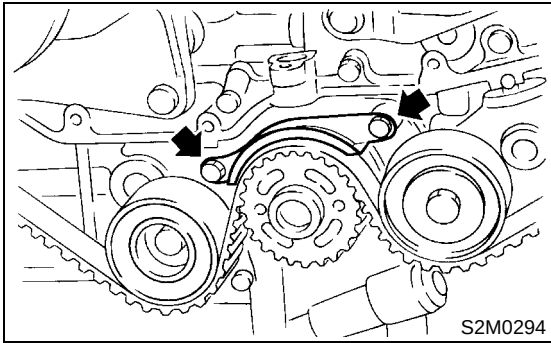
39 N·m (4.0 kgf-m, 28.9 ft-lb)



5) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove stopper pin from belt tensioner adjuster.



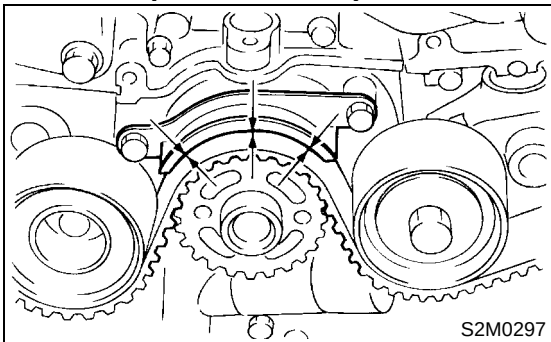
- 6) Install timing belt guide. (MT vehicles only)
 (1) Temporarily tighten remaining bolts.



- (2) Check and adjust clearance between timing belt and timing belt guide by using thickness gauge.

Clearance:

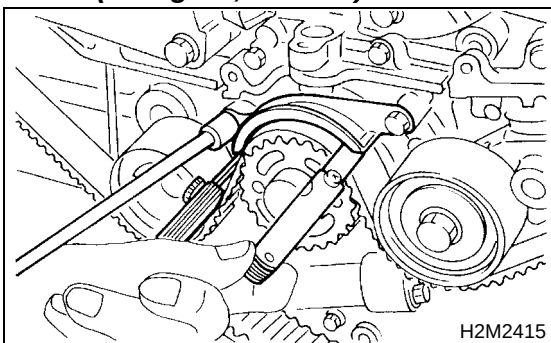
$1.0 \pm 0.5 \text{ mm}$ ($0.039 \pm 0.020 \text{ in}$)



- (3) Tighten remaining bolts.

Tightening torque:

$9.8 \text{ N}\cdot\text{m}$ ($1.0 \text{ kgf}\cdot\text{m}$, $7.2 \text{ ft}\cdot\text{lb}$)



- 7) Install belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
 8) Install crankshaft pulley. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
 9) Install V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

C: INSPECTION

1. TIMING BELT

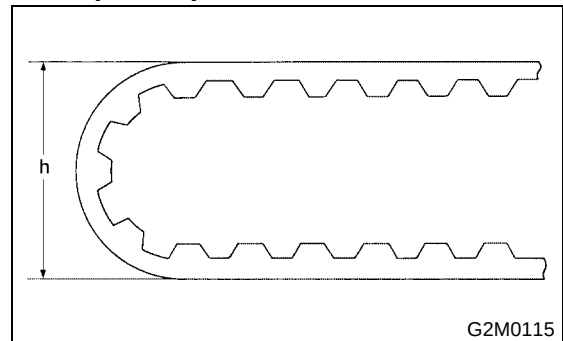
- 1) Check timing belt teeth for breaks, cracks, and wear. If any fault is found, replace belt.
- 2) Check the condition of back side of belt; if any crack is found, replace belt.

CAUTION:

- 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.

CAUTION:

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 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.

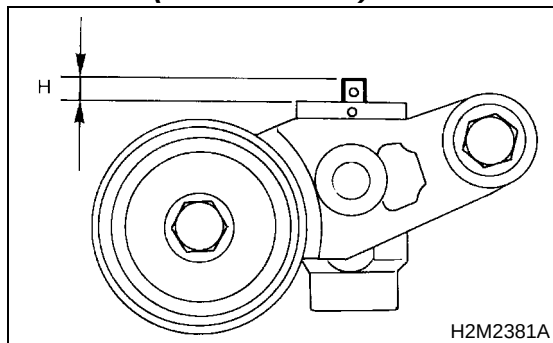
CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than three 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

$5.7 \pm 0.5 \text{ mm}$ ($0.224 \pm 0.020 \text{ in}$)

**3. BELT TENSION PULLEY**

- 1) Check mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace automatic belt tension adjuster assembly if faulty.
- 2) Check tension pulley for smooth rotation. Replace if noise or excessive play is noted.
- 3) Check tension pulley for grease leakage.

4. BELT IDLER

- 1) Check belt idler for smooth rotation. Replace if noise or excessive play is noted.
- 2) Check belt outer contacting surfaces of idler pulley for abnormal wear and scratches.
- 3) Check belt idler for grease leakage.

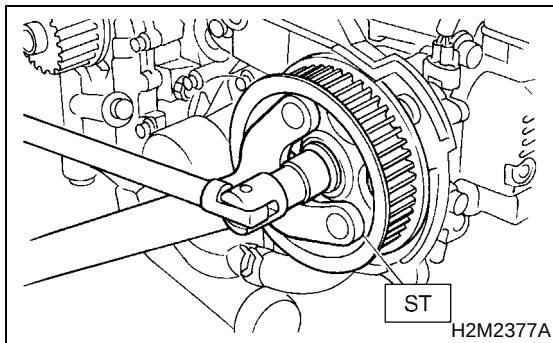
16. Camshaft Sprocket

A: REMOVAL

1. REMOVAL

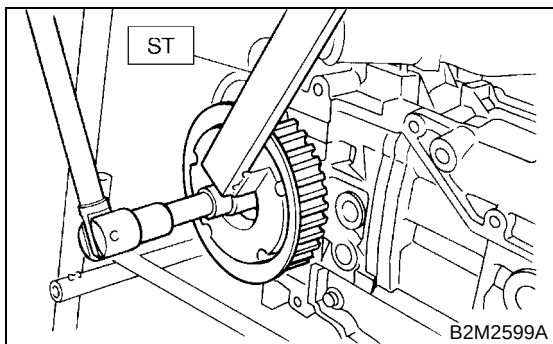
- 1) Remove V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove camshaft position sensor. <Ref. to FU(SOHC)-30, REMOVAL, Camshaft Position Sensor.> or <Ref. to FU(SOHCw/oOBD)-29, REMOVAL, Camshaft Position Sensor.>
- 6) Remove camshaft sprocket No. 2. To lock camshaft, use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH



- 7) Remove camshaft sprocket No. 1. To lock camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



B: INSTALLATION

- 1) Install camshaft sprocket No. 1. To lock camshaft, use ST.

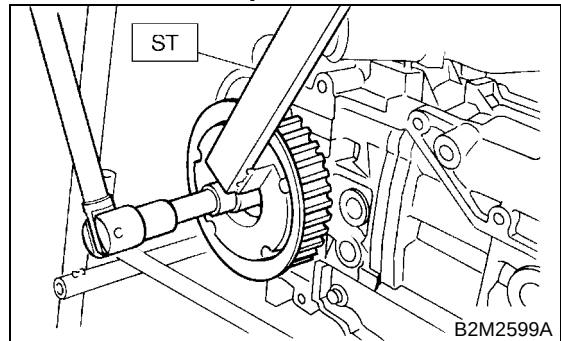
ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:

78 N·m (8.0 kgf-m, 57.9 ft-lb)

CAUTION:

Do not confuse left and right side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.

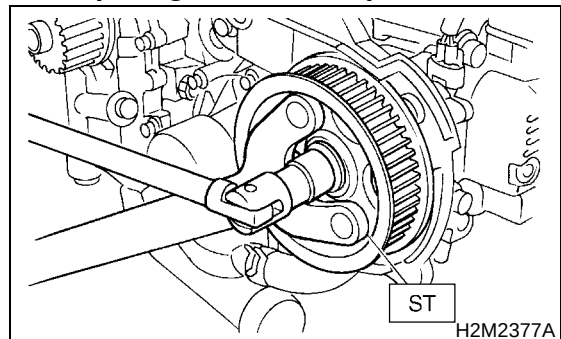


- 2) Install camshaft sprocket No. 2. To lock camshaft, use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH

Tightening torque:

78 N·m (8.0 kgf-m, 57.9 ft-lb)



- 3) Install camshaft position sensor. <Ref. to FU(SOHC)-30, INSTALLATION, Camshaft Position Sensor.> or <Ref. to FU(SOHCw/oOBD)-29, INSTALLATION, Camshaft Position Sensor.>
- 4) Install timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
- 5) Install belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
- 6) Install crankshaft pulley. <Ref. to ME(SOHC)-44, INSTALLATION, Crankshaft Pulley.>
- 7) Install V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

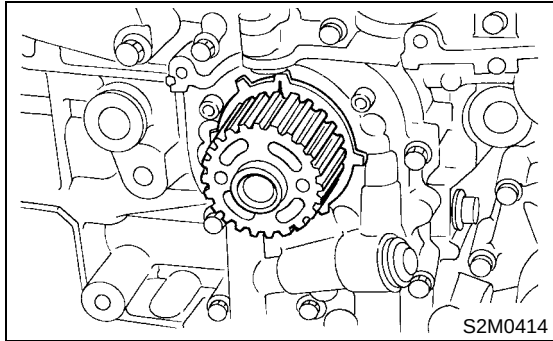
C: INSPECTION

- 1) Check sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check camshaft sprocket notch for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

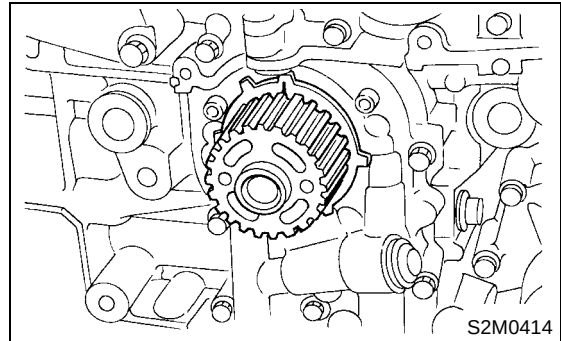
A: REMOVAL

- 1) Remove V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
- 6) Remove crankshaft sprocket.



B: INSTALLATION

- 1) Install crankshaft sprocket.



- 2) Install camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
- 3) Install timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
- 4) Install belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
- 5) Install crankshaft pulley. <Ref. to ME(SOHC)-44, INSTALLATION, Crankshaft Pulley.>
- 6) Install V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

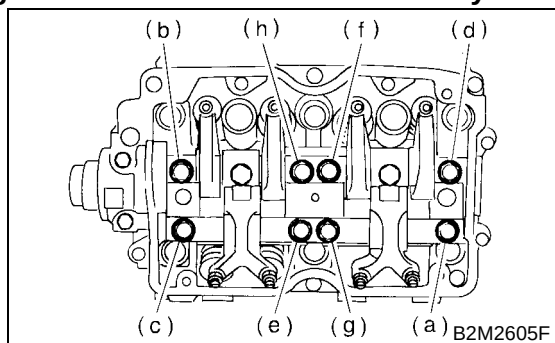
18. Valve Rocker Assembly

A: REMOVAL

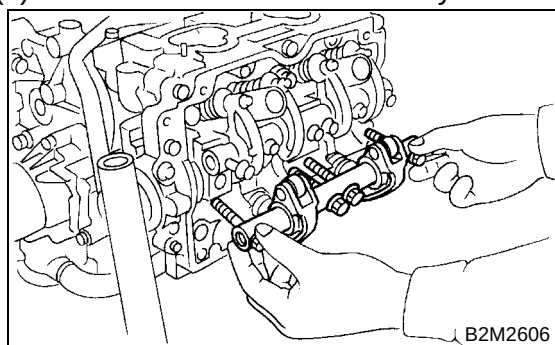
- 1) Remove V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
- 6) Disconnect PCV hose and remove rocker cover.
- 7) Removal of valve rocker assembly
 - (1) Remove bolts (a) through (h) in alphabetical sequence.

CAUTION:

Leave two or three threads of bolts (g and h) engaged to retain valve rocker assembly.



- (2) Remove valve rocker assembly.



B: INSTALLATION

- 1) Installation of valve rocker assembly
 - (1) Temporarily tighten bolts (a) through (d) equally as shown in figure.

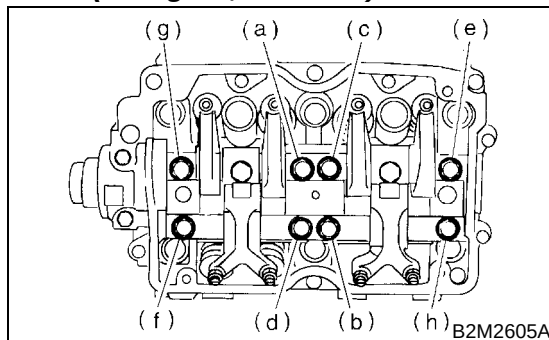
CAUTION:

Do not allow valve rocker assembly to gouge knock pins.

- (2) Tighten bolts (e) through (h) to specified torque.
- (3) Tighten 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(SOHC)-30, ADJUSTMENT, Valve Clearance.>
- 3) Install rocker cover and connect PCV hose.
- 4) Install camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
- 5) Install timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
- 6) Install belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
- 7) Install crankshaft pulley. <Ref. to ME(SOHC)-44, INSTALLATION, Crankshaft Pulley.>
- 8) Install V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

C: DISASSEMBLY

- 1) Remove bolts which secure rocker shaft.
- 2) Extract rocker shaft. Remove valve rocker arms, springs and shaft supports from rocker shaft.

CAUTION:

Arrange all removed parts in order so that they can be installed in their original positions.

- 3) Remove nut and adjuster screw from valve rocker.

D: ASSEMBLY

- 1) Install adjuster screw and nut to valve rocker.
- 2) Arrange 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)

CAUTION:

Valve rocker arms, rocker shaft and shaft supports have identification marks. Ensure parts with same markings are properly assembled.

- 3) Install valve rocker shaft securing bolts.

E: INSPECTION

1. VALVE ROCKER ARM

1) Measure inside diameter of valve rocker arm and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

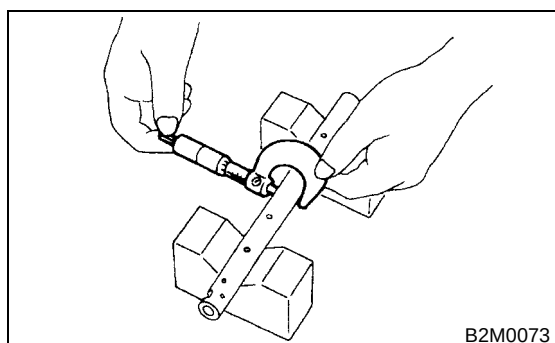
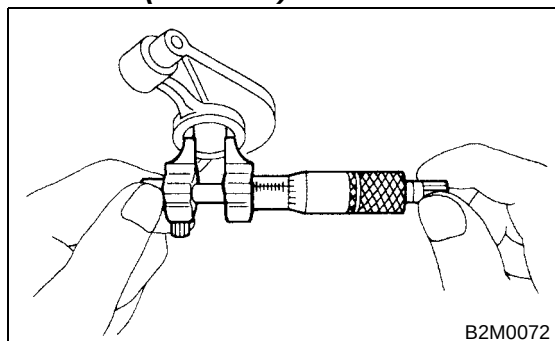
Clearance between arm and shaft:

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 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) Measure inside diameter of rocker shaft support and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between support and shaft:

Standard

0.005 — 0.039 mm (0.0002 — 0.0015 in)

Limit

0.05 mm (0.0020 in)

4) If oil clearance exceeds the limit, replace rocker shaft support or shaft, whichever shows greater amount of wear.

Rocker shaft support inside diameter:

22.005 — 22.026 mm (0.8663 — 0.8672 in)

Rocker shaft diameter:

21.987 — 22.000 mm (0.8656 — 0.8661 in)

5) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace valve rocker arm.

6) Check that valve rocker arm roller rotates smoothly. If not, replace valve rocker arm.

2. INTAKE AND EXHAUST VALVE ROCKER SHAFT

Visually check oil relief valve of shaft end for any of the following abnormalities.

- Breaks in check ball body
- Foreign particles caught in valve spring
- Oil leakage at check ball

CAUTION:

Repair or replace valve rocker shaft as necessary.

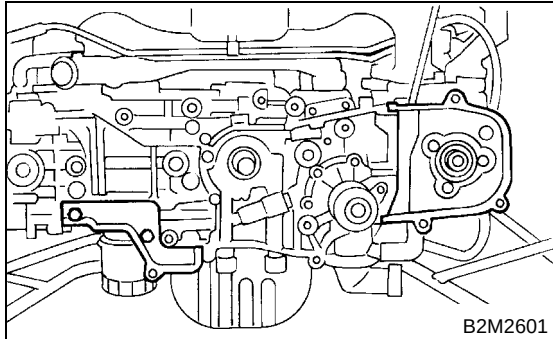
19. Camshaft

A: REMOVAL

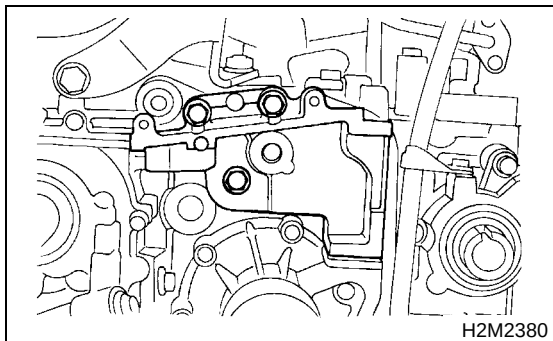
- 1) Remove V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
- 6) Remove crankshaft sprocket. <Ref. to ME(SOHC)-53, REMOVAL, Crankshaft Sprocket.>
- 7) Remove belt cover No. 2 (LH).
- 8) Remove belt cover No. 2 (RH).

CAUTION:

Do not damage or lose the seal rubber when removing belt covers.



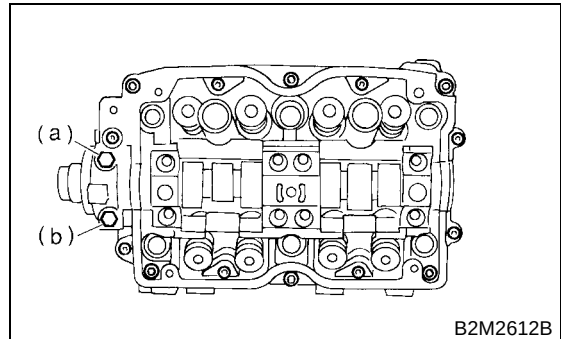
- 9) Remove tensioner bracket.



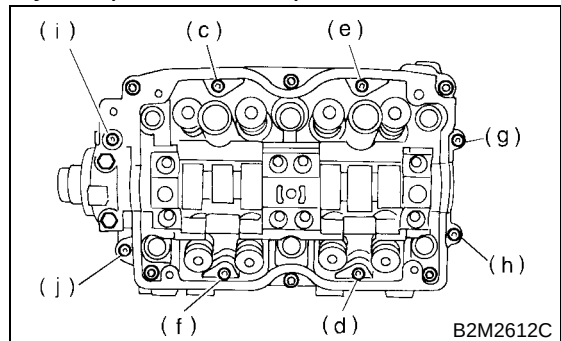
- 10) Remove camshaft position sensor support. (LH side only)
- 11) Remove oil level gauge guide. (LH side only)
- 12) Remove valve rocker assembly. <Ref. to ME(SOHC)-54, REMOVAL, Valve Rocker Assembly.>

- 13) Remove camshaft cap.

- (1) Remove bolts (a) through (b) in alphabetical sequence.

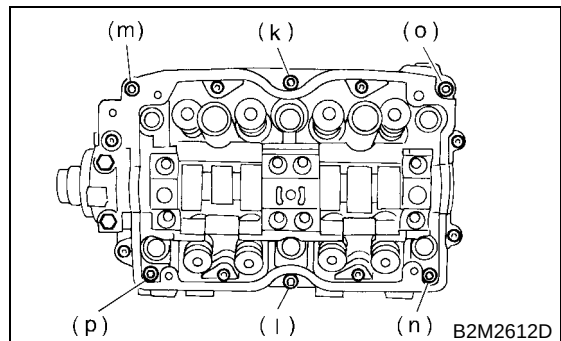


- (2) Equally loosen bolts (c) through (j) all the way in alphabetical sequence.

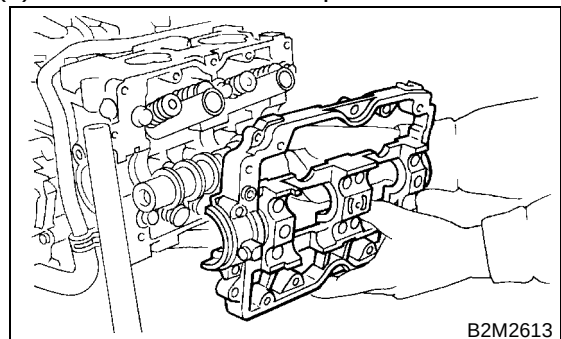


- (3) Remove bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS



- (4) Remove camshaft cap.



- 14) Remove camshaft.
- 15) Remove oil seal.

16) Remove plug from rear side of camshaft.

CAUTION:

- Do not remove oil seal unless necessary.
- Do not scratch journal surface when removing oil seal.

B: INSTALLATION

1) Apply a coat of engine oil to camshaft journals and install camshaft.

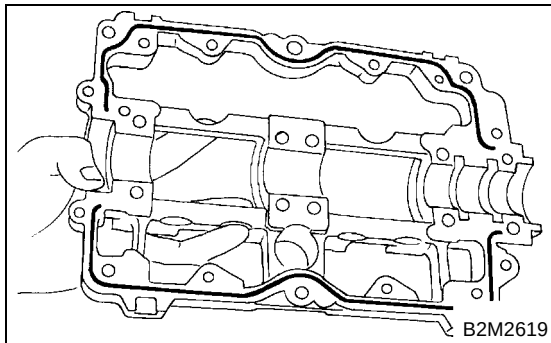
2) Install camshaft cap.

(1) Apply liquid gasket on the around of camshaft cap.

Liquid gasket:

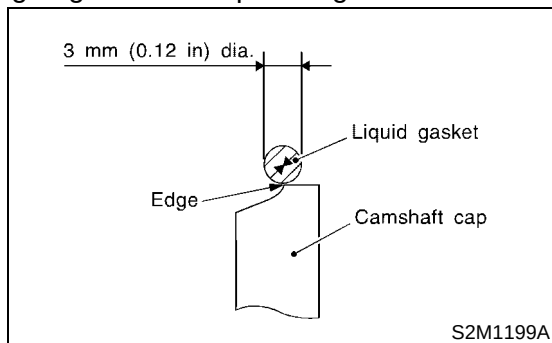
THREE BOND 1280B

P/N K0877YA018

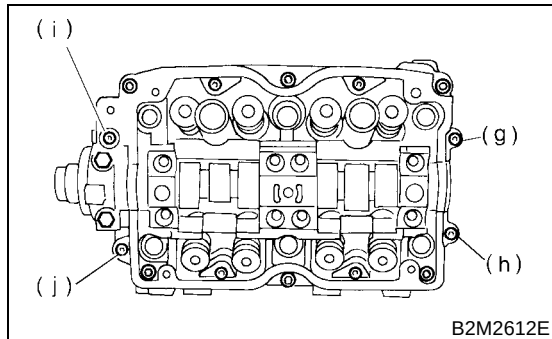


NOTE:

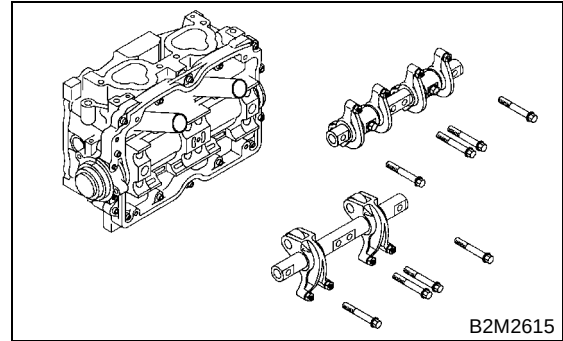
Apply a coat of 3 mm (0.12 in) dia. liquid gasket along edge of cam cap mating surface.



(2) Temporarily tighten bolts (g) through (j) in alphabetical sequence.



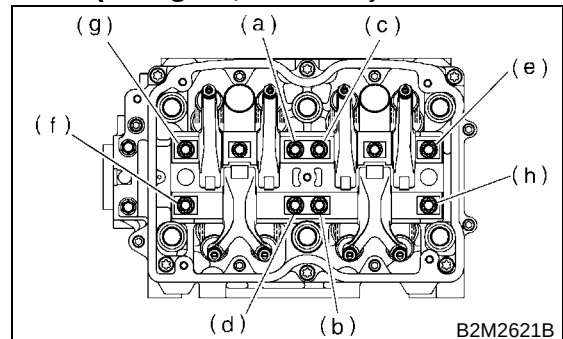
(3) Install valve rocker assembly.



(4) Tighten bolts (a) through (h) in alphabetical sequence.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

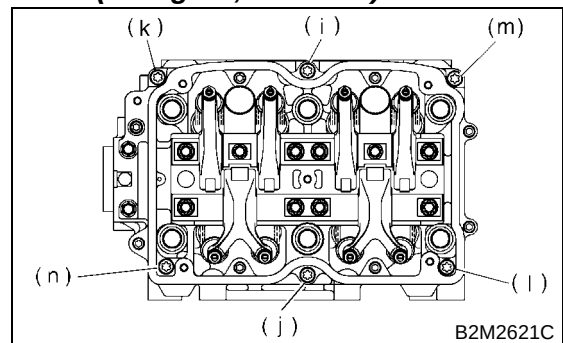


(5) Tighten TORX bolts (i) through (n) in alphabetical sequence using ST.

ST 499427000 TORX PLUS

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



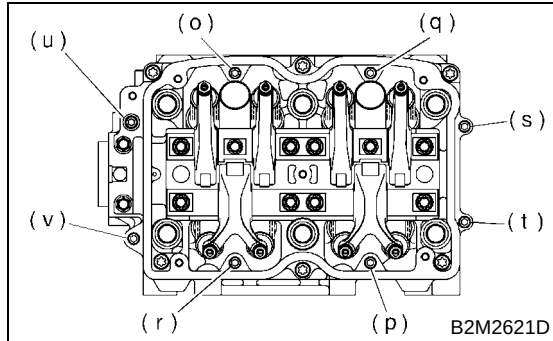
CAMSHAFT

MECHANICAL

- (6) Tighten bolts (o) through (v) in alphabetical sequence.

Tightening torque:

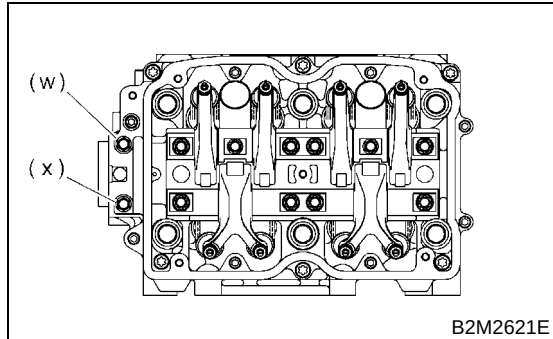
10 N·m (1.0 kgf-m, 7.2 ft-lb)



- (7) Tighten bolts (w) through (x) in alphabetical sequence.

Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)



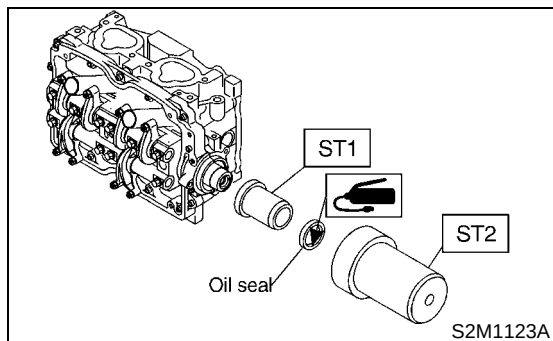
- 3) Apply a coat of grease to oil seal lips and install oil seal (A) on camshaft using ST1 and ST2.

CAUTION:

Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE

ST2 499587500 OIL SEAL INSTALLER



- 4) Install plug using ST.

ST 499587700 OIL SEAL INSTALLER

- 5) Adjust the valve clearance. <Ref. to ME(SOHC)-30, ADJUSTMENT, Valve Clearance.>

- 6) Install rocker cover and connect PCV hose.

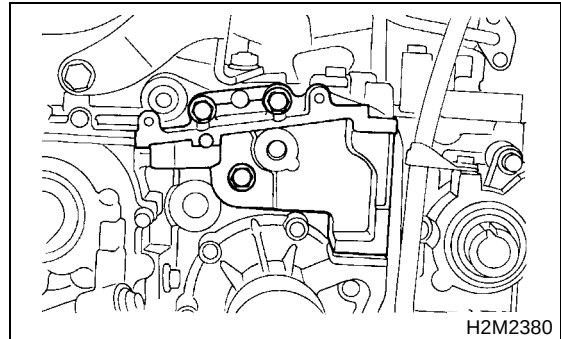
- 7) Install oil level gauge guide. (LH side only)

- 8) Install camshaft position sensor support. (LH side only)

- 9) Install tensioner bracket.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- 10) Install belt cover No. 2 (RH).

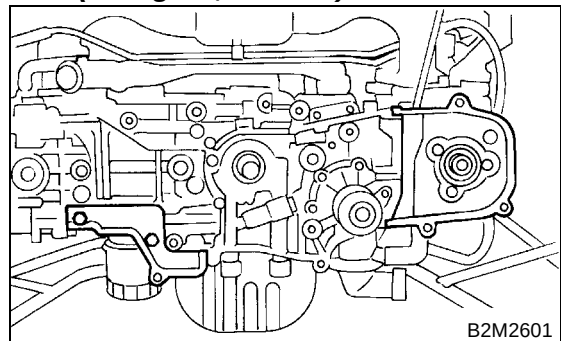
Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 11) Install belt cover No. 2 (LH).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



- 12) Install crankshaft sprocket. <Ref. to ME(SOHC)-53, INSTALLATION, Crankshaft Sprocket.>

- 13) Install camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>

- 14) Install timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>

- 15) Install belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>

- 16) Install crankshaft pulley. <Ref. to ME(SOHC)-44, INSTALLATION, Crankshaft Pulley.>

- 17) Install V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

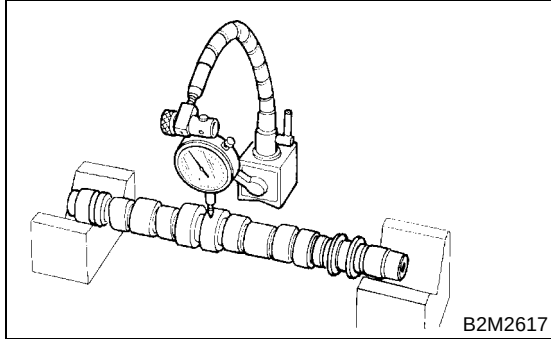
C: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

Limit:

0.025 mm (0.0010 in)



2) Check journal for damage and wear. Replace if faulty.

3) Measure outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between the two (= oil clearance). If oil clearance exceeds specifications, replace camshaft or cylinder head as necessary.

Unit: mm (in)		
Clearance 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 cam face condition; remove minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

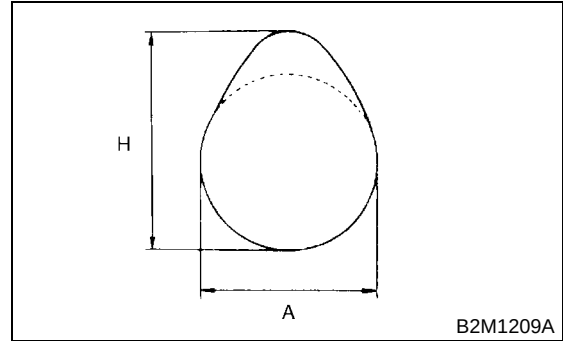
Cam height: H

Model	Item	Unit: mm (in)	
1600 cc	Intake	STD	39.378 — 39.478 (1.5503 — 1.5542)
		Limit	39.278 (1.5464)
	Exhaust	STD	39.565 — 39.665 (1.5577 — 1.5616)
		Limit	39.465 (1.5537)
2000 cc	Intake	STD	38.732 — 38.832 (1.5249 — 1.528885)
		Limit	39.632 (1.5209)
	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

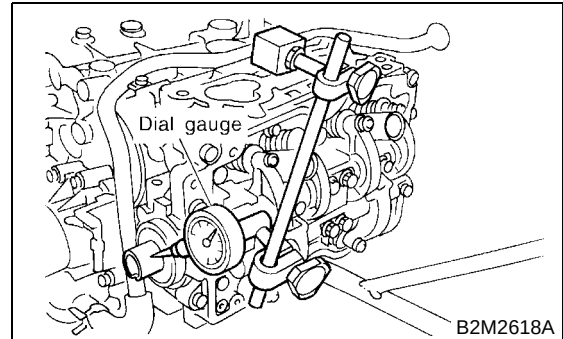
Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace camshaft support.

Standard:

0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:

0.10 mm (0.0039 in)



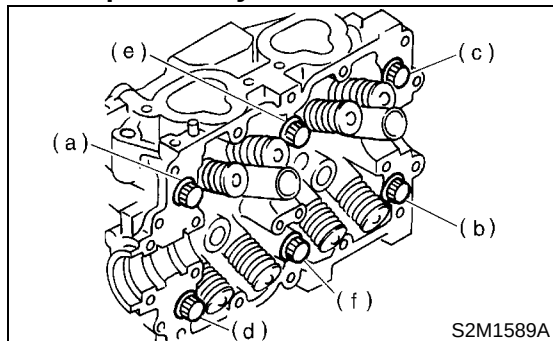
20. Cylinder Head Assembly

A: REMOVAL

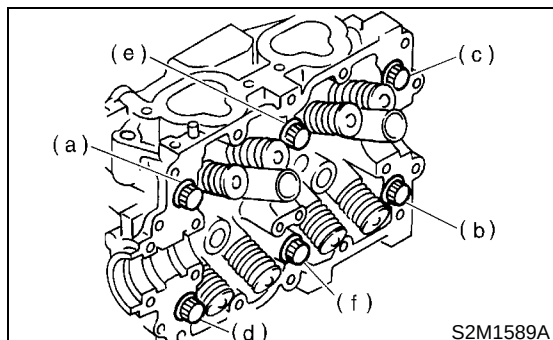
- 1) Remove V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 4) Remove timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 5) Remove camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
- 6) Remove intake manifold. <Ref. to FU(SOHC)-15, REMOVAL, Intake Manifold.> or <Ref. to FU(SOHCw/oOBD)-15, REMOVAL, Intake Manifold.>
- 7) Remove bolt which installs A/C compressor bracket on cylinder head.
- 8) Remove valve rocker assembly. <Ref. to ME(SOHC)-54, REMOVAL, Valve Rocker Assembly.>
- 9) Remove camshaft. <Ref. to ME(SOHC)-56, REMOVAL, Camshaft.>
- 10) Remove cylinder head bolts in alphabetical sequence shown in figure.

CAUTION:

Leave bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



- 11) While tapping cylinder head with a plastic hammer, separate it from cylinder block.
- 12) Remove bolts (a) and (b) to remove cylinder head.



- 13) Remove cylinder head gasket.

CAUTION:

Do not scratch the mating surface of cylinder head and cylinder block.

- 14) Similarly, remove right side cylinder head.

B: INSTALLATION

- 1) Install cylinder head and gaskets on cylinder block.

CAUTION:

- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder block and cylinder head.

- 2) Tighten cylinder head bolts.

(1) Apply a coat of engine oil to 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 bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).

(5) Tighten 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.

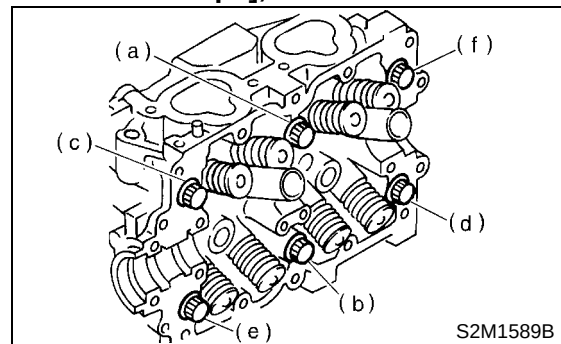
CAUTION:

Do not tighten bolts more than 90°.

(7) Further tighten all bolts by 80 to 90° in alphabetical sequence shown in figure below.

CAUTION:

Ensure that the total "re-tightening angle" [in the former two steps], do not exceed 180°.



- 3) Install camshaft. <Ref. to ME(SOHC)-57, INSTALLATION, Camshaft.>

- 4) Install valve rocker assembly. <Ref. to ME(SOHC)-54, INSTALLATION, Valve Rocker Assembly.>

- 5) Install A/C compressor bracket on cylinder head.

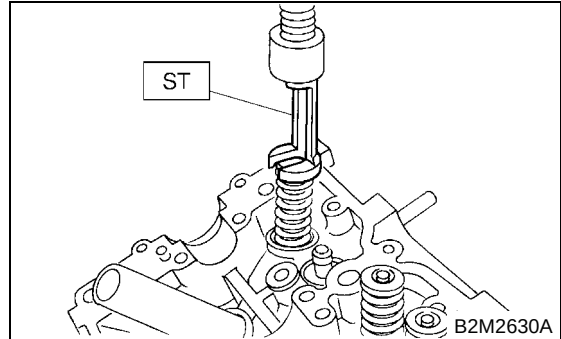
- 6) Install intake manifold. <Ref. to FU(SOHC)-17, INSTALLATION, Intake Manifold.> or <Ref. to FU(SOHCw/oOBD)-17, INSTALLATION, Intake Manifold.>
- 7) Install camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>
- 8) Install timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>
- 9) Install belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>
- 10) Install crankshaft pulley. <Ref. to ME(SOHC)-44, INSTALLATION, Crankshaft Pulley.>
- 11) Install V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

C: DISASSEMBLY

- 1) Place cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
- 2) Set ST on valve spring. Compress valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

CAUTION:

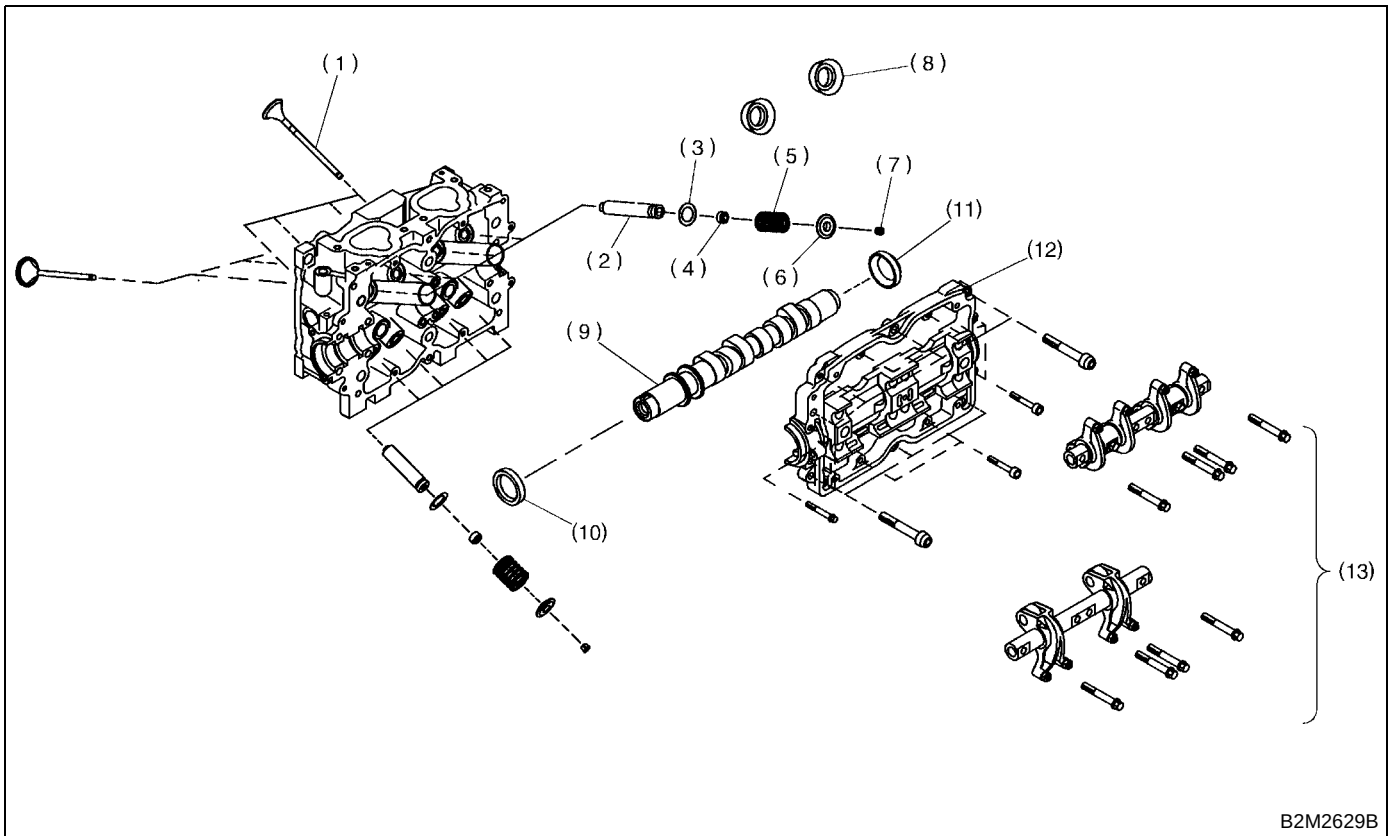
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



CYLINDER HEAD ASSEMBLY

MECHANICAL

D: ASSEMBLY



B2M2629B

- | | | |
|-----------------------|-----------------------|------------------------|
| (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 | |

1) Installation of valve spring and valve

- (1) Place cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
- (2) Coat stem of each valve with engine oil and insert valve into valve guide.

CAUTION:

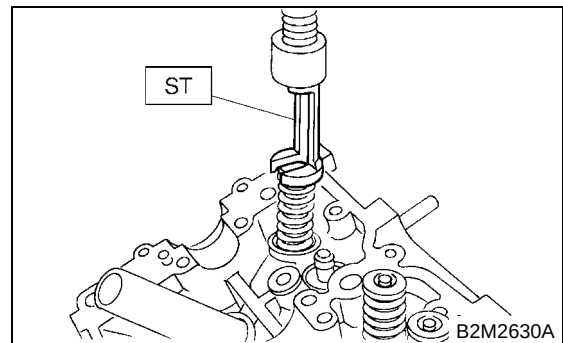
When inserting valve into valve guide, use special care not to damage the oil seal lip.

- (3) Install valve spring and retainer.

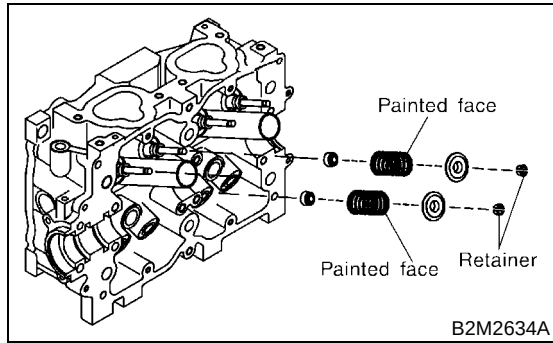
CAUTION:

Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

- (4) Set ST on valve spring.
ST 499718000 VALVE SPRING REMOVER



- (5) Compress valve spring and fit valve spring retainer key.



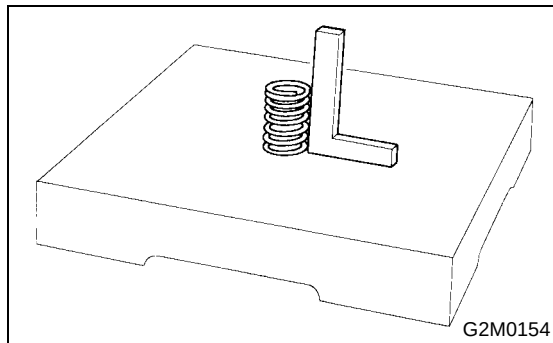
- (6) After installing, tap valve spring retainers lightly with wooden hammer for better seating.

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	54.30 mm (2.1378 in)
Squareness	2.5°, 2.4 mm (0.094 in)
Tension/spring height	218.7 — 242.5 N (22.3 — 24.7 kgf, 49.2 — 54.5 lb)/ 45.0 mm (1.772 in)
	526.6 — 581.6 N (53.7 — 59.3 kgf, 118.4 — 130.8 lb)/ 34.7 mm (1.366 in)



2. INTAKE AND EXHAUST VALVE OIL 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.

CAUTION:

- 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:

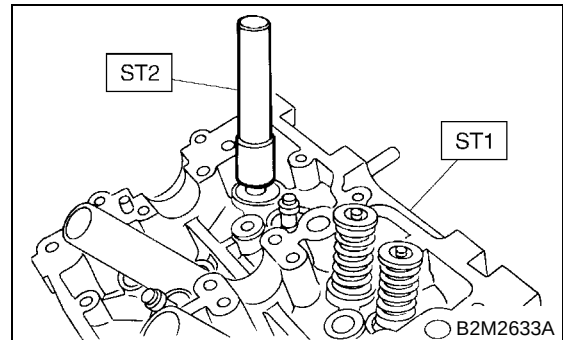
Intake [Black]

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 gas and water leaks.

- 2) Place 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.

CYLINDER HEAD ASSEMBLY

MECHANICAL

Warping limit:

0.05 mm (0.0020 in)

Grinding limit:

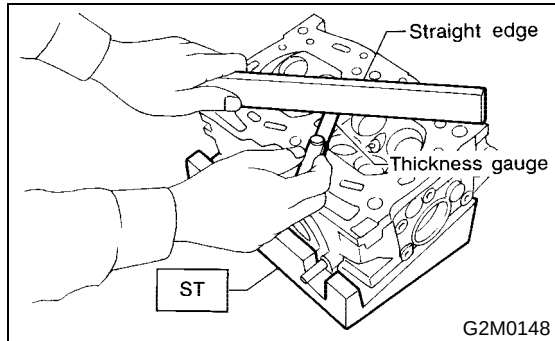
0.1 mm (0.004 in)

Standard height of cylinder head:

97.5 mm (3.839 in)

CAUTION:

Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



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

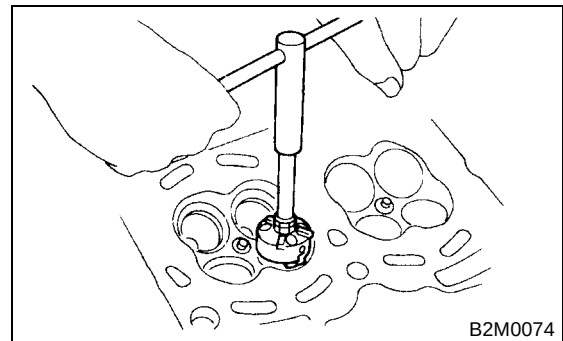
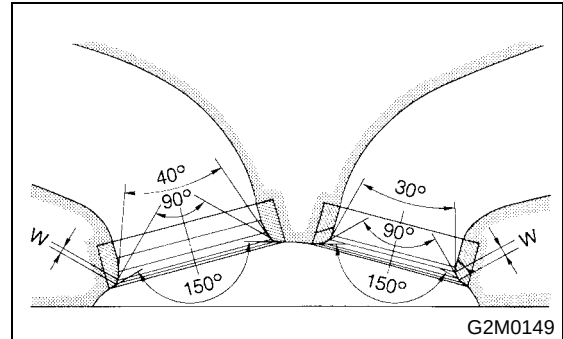
Standard 1.0 mm (0.039 in)

Limit 1.7 mm (0.067 in)

Exhaust

Standard 1.4 mm (0.055 in)

Limit 2.1 mm (0.083 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:

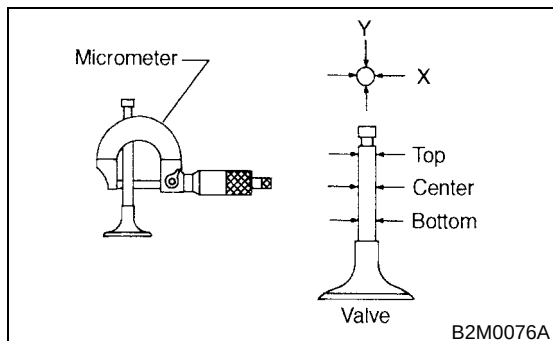
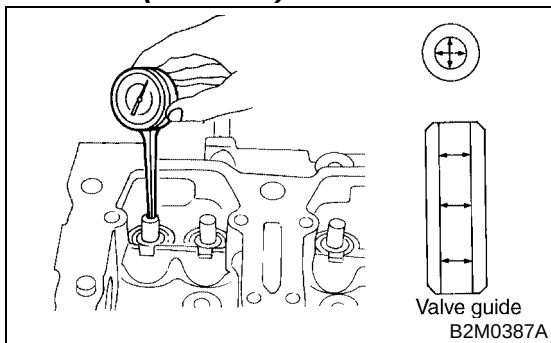
Standard

Intake 0.035 — 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 valve guide or valve itself whichever shows greater amount of wear. See 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

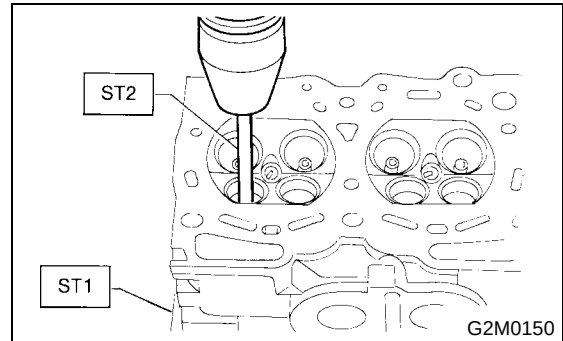
5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place 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 498267800 CYLINDER HEAD TABLE

ST2 499767200 VALVE GUIDE REMOVER



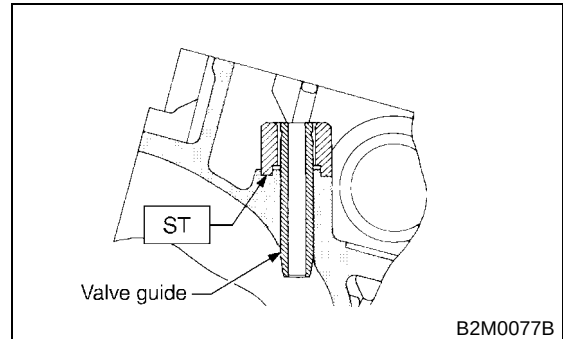
(3) Turn cylinder head upside down and place ST as shown in the figure.

Intake side:

ST 499767700 VALVE GUIDE ADJUSTER

Exhaust side:

ST 499767800 VALVE GUIDE ADJUSTER



(4) Before installing new oversize valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

CYLINDER HEAD ASSEMBLY

MECHANICAL

(5) Put 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.

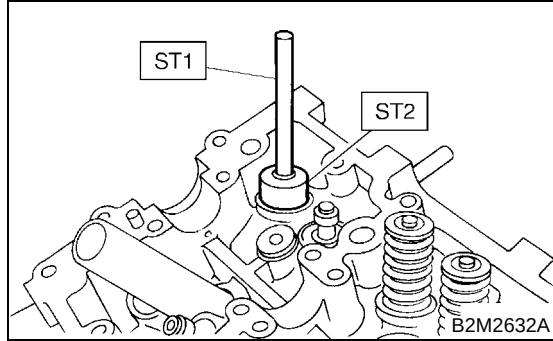
ST1 499767200 VALVE GUIDE REMOVER

Intake side:

ST2 499767700 VALVE GUIDE ADJUSTER

Exhaust side:

ST2 499767800 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

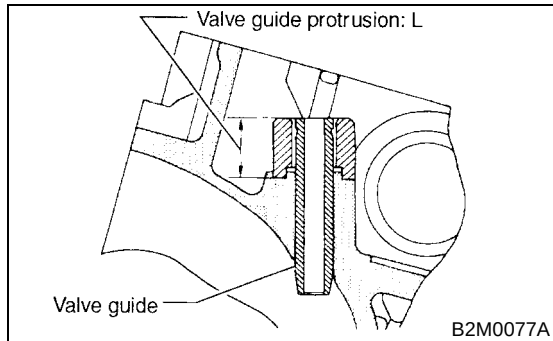
Valve guide protrusion: L

Intake

20.0 — 20.5 mm (0.787 — 0.807 in)

Exhaust

16.5 — 17.0 mm (0.650 — 0.669 in)

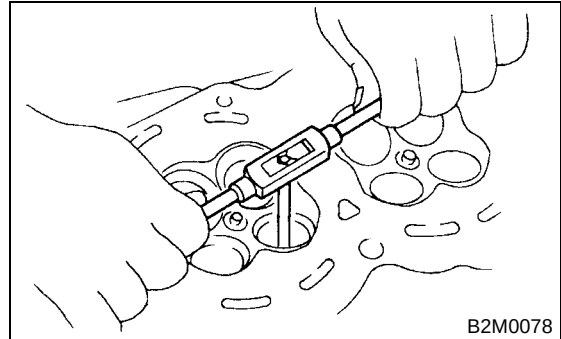


(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean valve guide to remove chips.

CAUTION:

- 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)

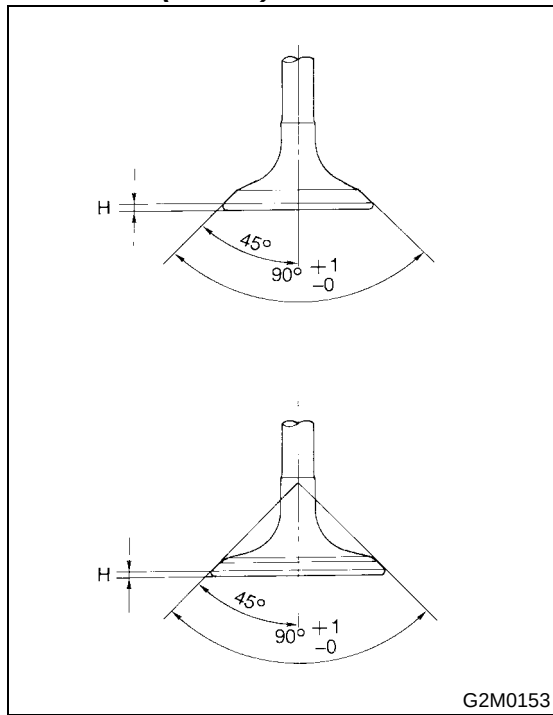
Valve overall length:

Intake

120.6 mm (4.75 in)

Exhaust

121.7 mm (4.79 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. <Ref. to ME(SOHC)-64, VALVE SEAT, ADJUSTMENT, Cylinder Head Assembly.> Install a new intake valve oil seal after lapping.

21. Cylinder Block

A: REMOVAL

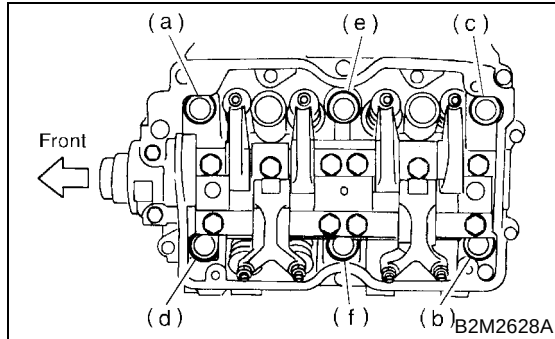
NOTE:

Before conducting this procedure, drain engine oil completely if applicable.

- 1) Remove intake manifold. <Ref. to FU(SOHC)-15, REMOVAL, Intake Manifold.> or <Ref. to FU(SOHCw/oOBD)-15, REMOVAL, Intake Manifold.>
- 2) Remove V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- 3) Remove crankshaft pulley. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
- 4) Remove belt cover. <Ref. to ME(SOHC)-45, REMOVAL, Belt Cover.>
- 5) Remove timing belt assembly. <Ref. to ME(SOHC)-46, REMOVAL, Timing Belt Assembly.>
- 6) Remove camshaft sprocket. <Ref. to ME(SOHC)-51, REMOVAL, Camshaft Sprocket.>
- 7) Remove crankshaft sprocket. <Ref. to ME(SOHC)-44, REMOVAL, Crankshaft Pulley.>
- 8) Remove generator and A/C compressor with their brackets.
- 9) Remove rocker cover.
- 10) Remove cylinder head bolts in alphabetical sequence shown in figure.

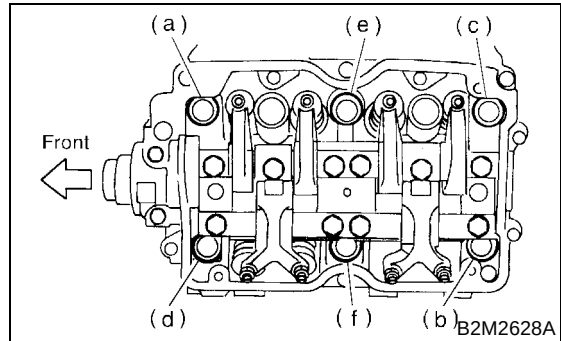
CAUTION:

Leave bolts (a) and (b) engaged by three or four threads to prevent cylinder head from falling.



- 11) While tapping cylinder head with a plastic hammer, separate it from cylinder block.

- 12) Remove bolts (a) and (b) to remove cylinder head.



- 13) Remove cylinder head gasket.

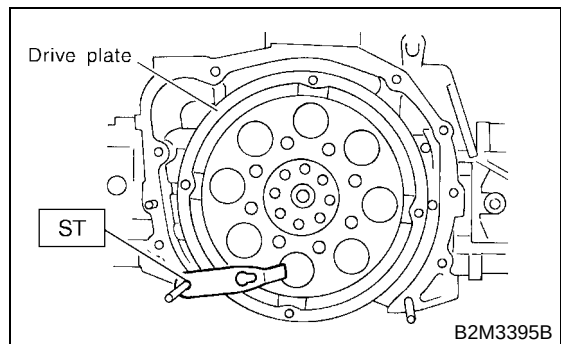
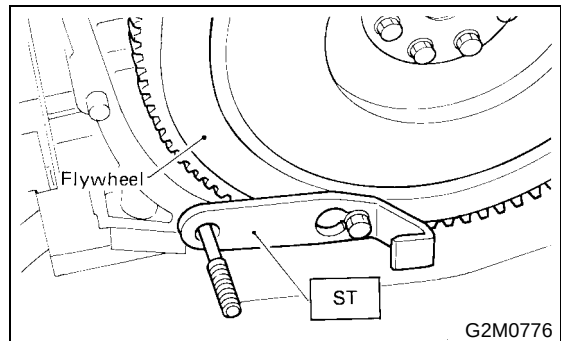
CAUTION:

Do not scratch the mating surface of cylinder head and cylinder block.

- 14) Similarly, remove right side cylinder head.
- 15) Remove clutch housing cover (MT vehicles only).
- 16) Remove flywheel (MT vehicles only) or drive plate (AT vehicles only).

Using ST, lock crankshaft.

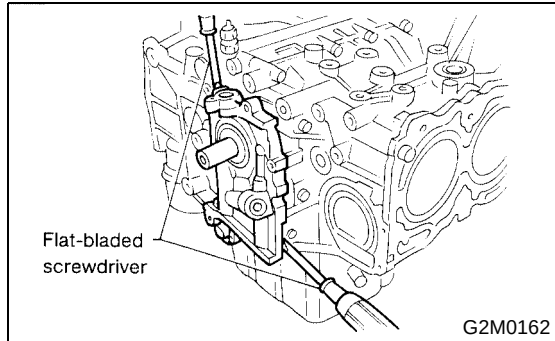
ST 498497100 CRANKSHAFT STOPPER



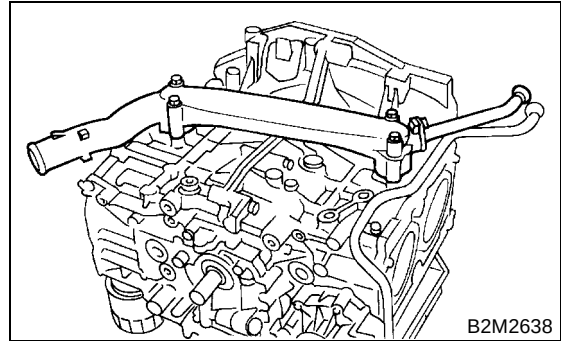
- 17) Remove oil separator cover.
 - 18) Remove water by-pass pipe for heater.
 - 19) Remove water pump.
 - 20) Remove oil pump from cylinder block.
- Use a flat-bladed screwdriver as shown in figure when removing oil pump.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and oil pump.



26) Remove water pipe.

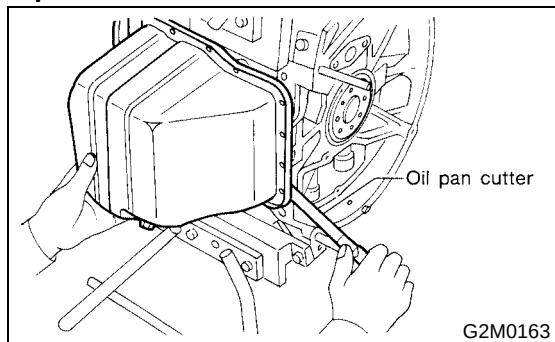


21) Removal of oil pan

- (1) Turn cylinder block with #2 and #4 piston sides facing upward.
- (2) Remove bolts which secure oil pan to cylinder block.
- (3) Insert a 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.



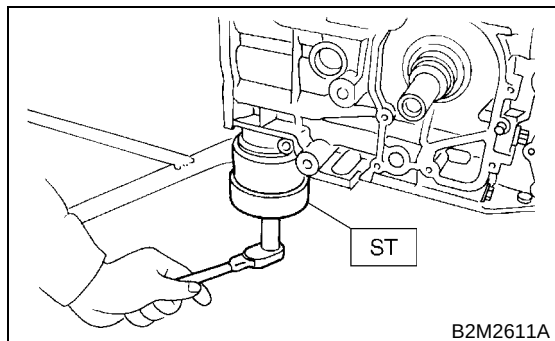
22) Remove oil strainer stay.

23) Remove oil strainer.

24) Remove baffle plate.

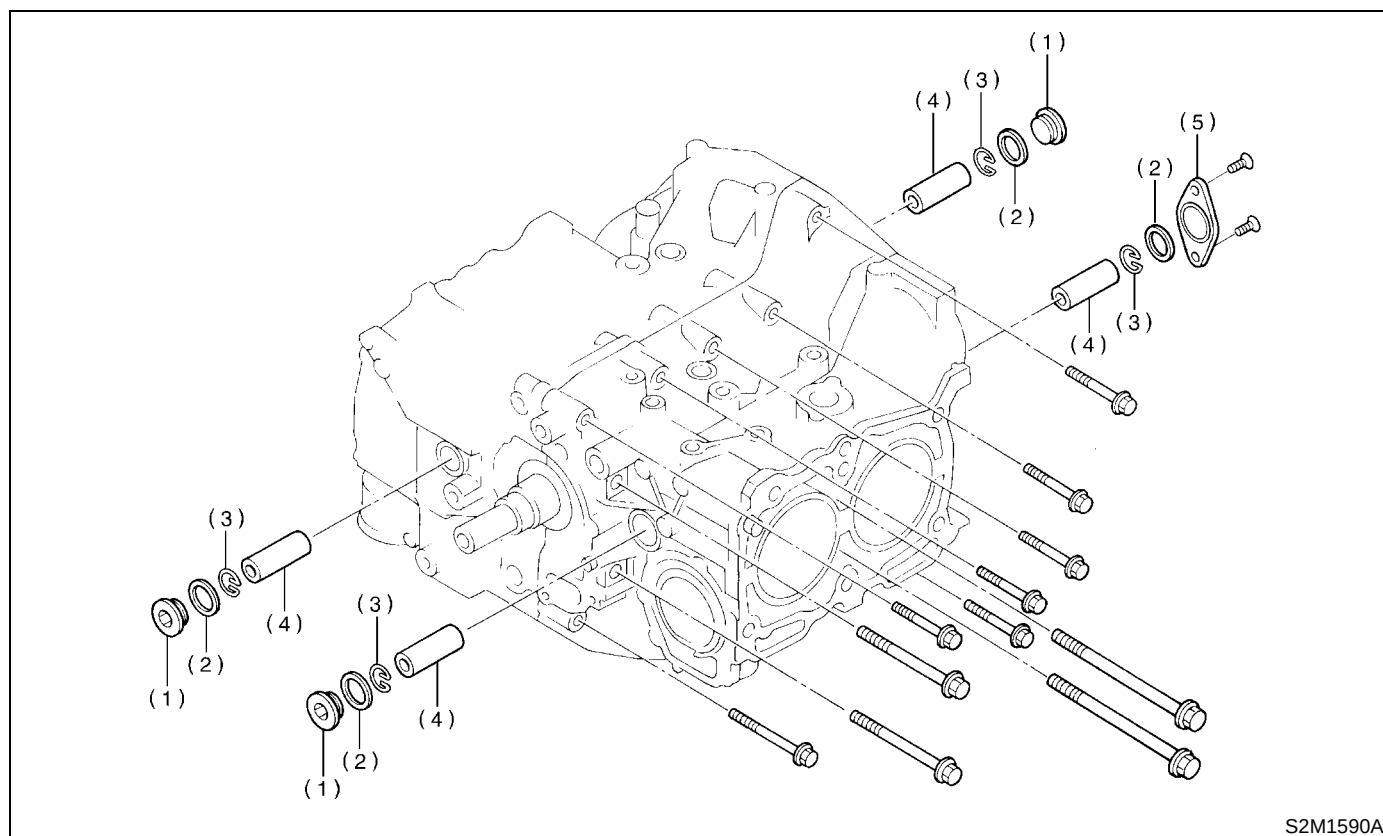
25) Remove oil filter using ST.

ST 498547000 OIL FILTER WRENCH



CYLINDER BLOCK

MECHANICAL



S2M1590A

(1) Service hole plug

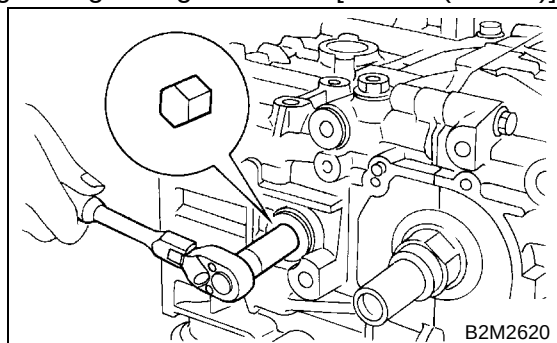
(2) Gasket

(3) Circlip

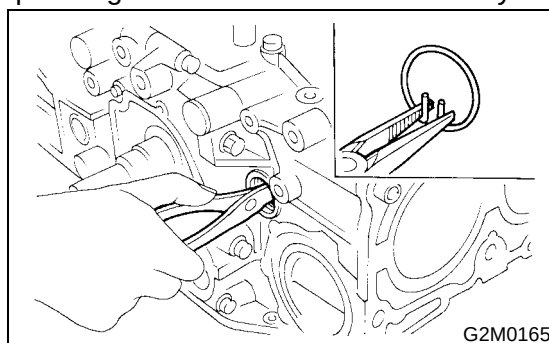
(4) Piston pin

(5) Service hole cover

27) Remove service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].



28) 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.



CYLINDER BLOCK

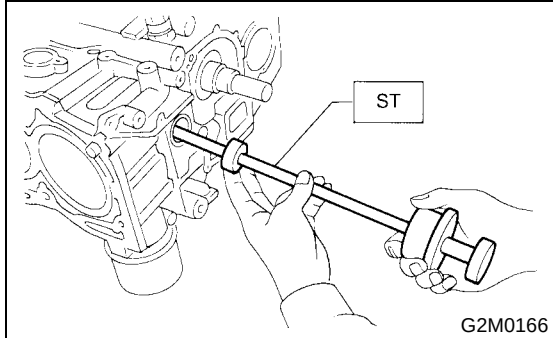
MECHANICAL

29) Draw out piston pin from #1 and #2 pistons using ST.

ST 499097700 PISTON PIN REMOVER

CAUTION:

Be careful not to confuse original combination of piston, piston pin and cylinder.



30) Similarly remove piston pins from #3 and #4 pistons.

31) Remove bolts which connect cylinder block on the side of #2 and #4 cylinders.

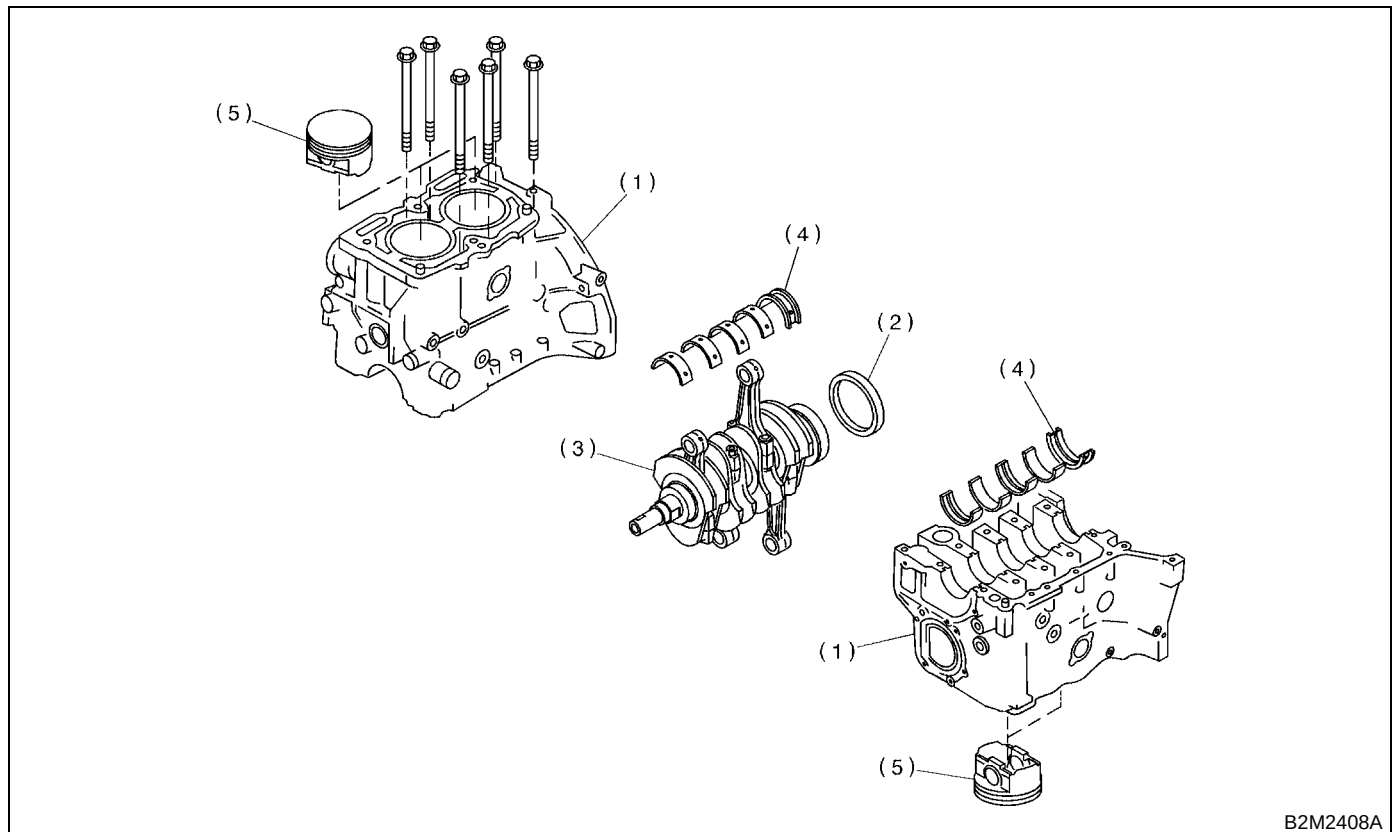
32) Back off bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.

33) Set up cylinder block so that #1 and #3 cylinders are on the upper side, then remove cylinder block connecting bolts.

34) Separate left-hand and right-hand cylinder blocks.

CAUTION:

When separating cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block

(3) Crankshaft

(5) Piston

(2) Rear oil seal

(4) Crankshaft bearing

35) Remove rear oil seal.

36) Remove crankshaft together with connecting rod.

37) Remove crankshaft bearings from cylinder block using hammer handle.

CAUTION:

Do not confuse 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.

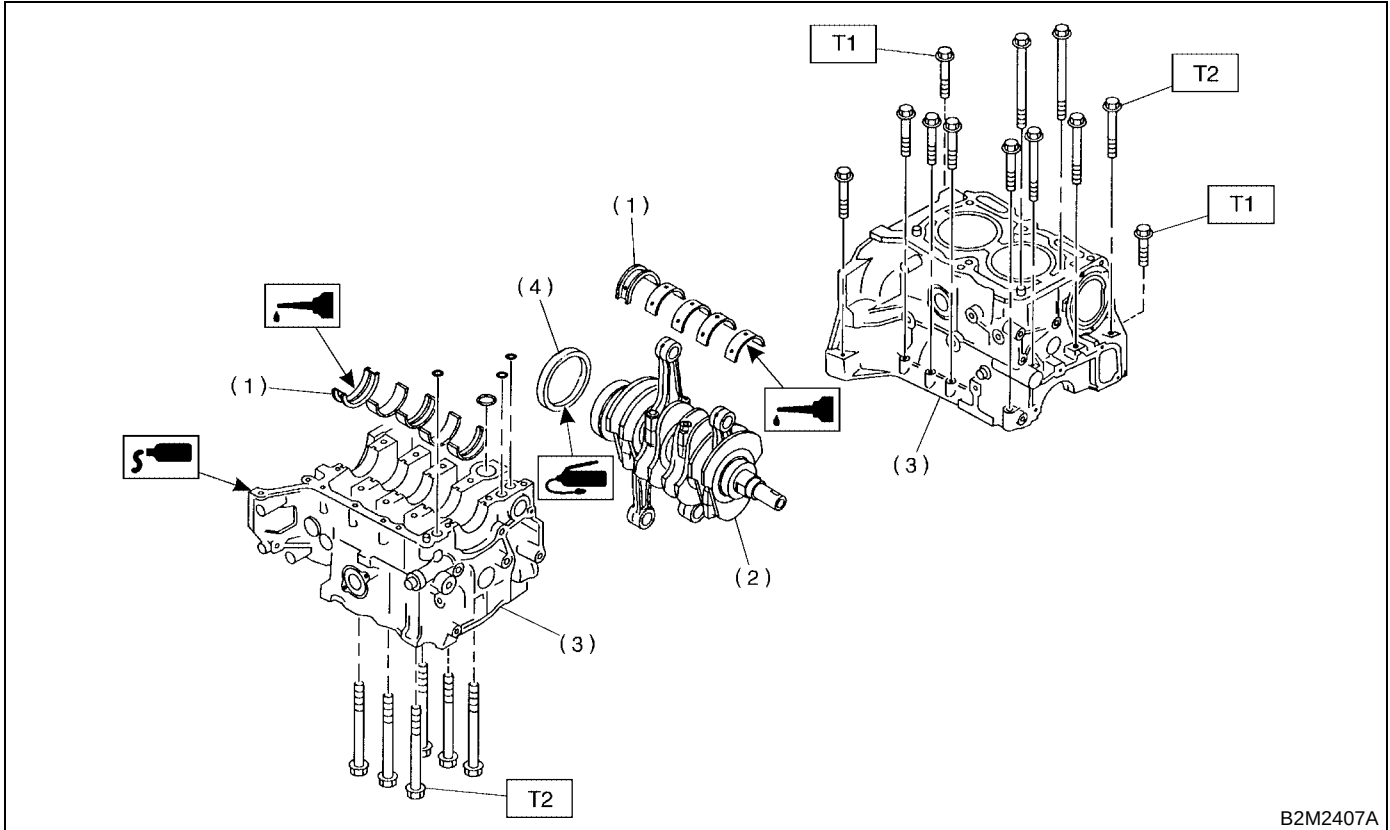
CAUTION:

Do not confuse combination of piston and cylinder.

CYLINDER BLOCK

MECHANICAL

B: INSTALLATION



B2M2407A

- (1) Crankshaft bearing
- (2) Crankshaft
- (3) Cylinder block
- (4) Rear oil seal

Tightening torque: N·m (kgf-m, ft-lb)

T1: 25 (2.5, 18.1)

T2: 47 (4.8, 34.7)

CAUTION:

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 crankshaft on the #2 and #4 cylinder block.

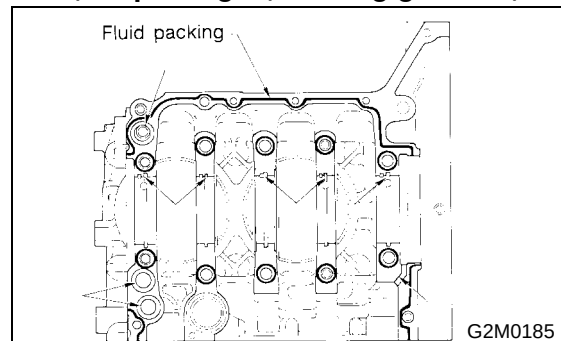
2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Fluid packing:

THREE BOND 1215 or equivalent

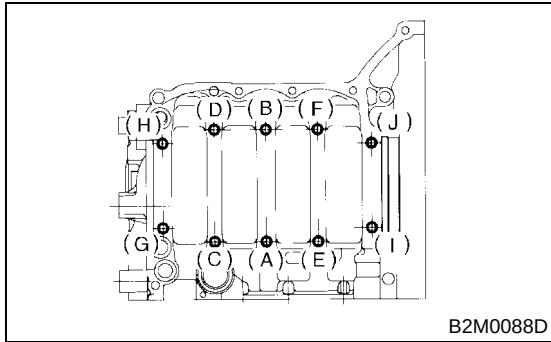
CAUTION:

Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



G2M0185

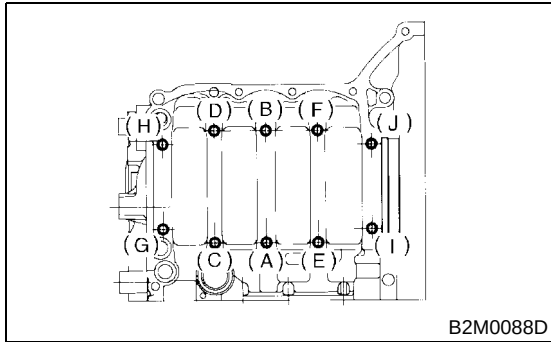
3) Temporarily tighten 10 mm cylinder block connecting bolts in alphabetical sequence shown in figure.



4) Tighten 10 mm cylinder block connecting bolts in alphabetical sequence.

Tightening torque:

47 N·m (4.8 kgf-m, 34.7 ft-lb)

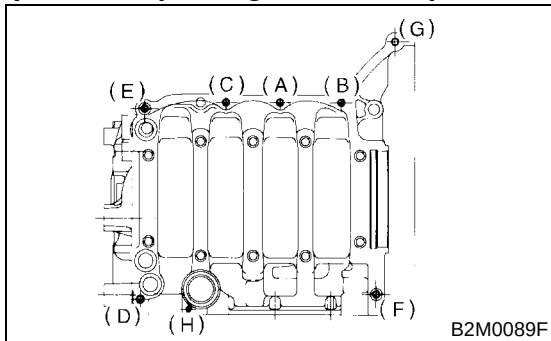


5) Tighten 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in figure.

Tightening torque:

(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)

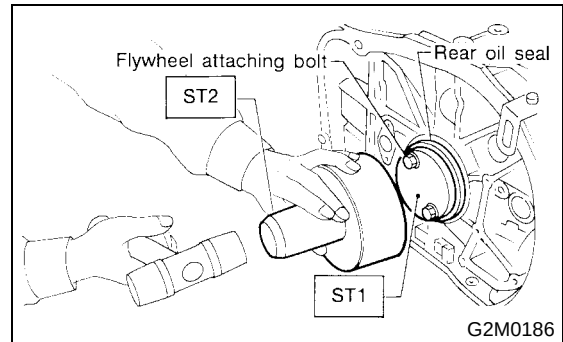
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



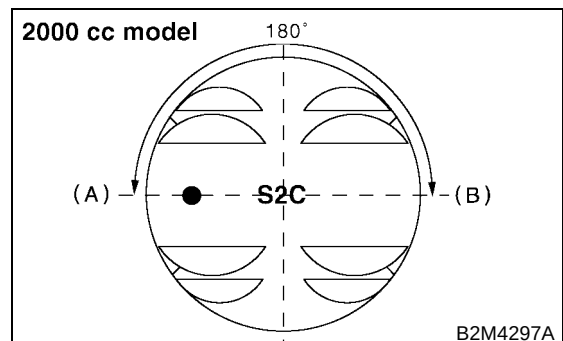
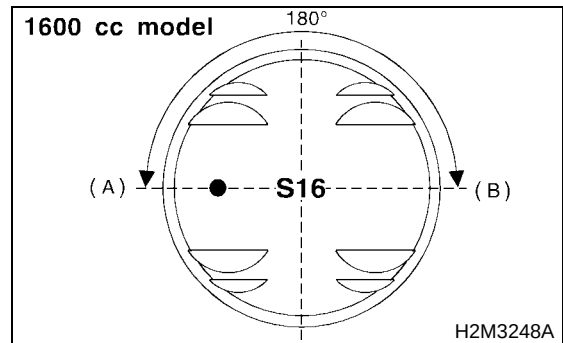
6) Install rear oil seal using ST1 and ST2.

ST1 499597100 OIL SEAL GUIDE

ST2 499587200 OIL SEAL INSTALLER



7) Position the top ring gap at (A) or (B) in the figure.

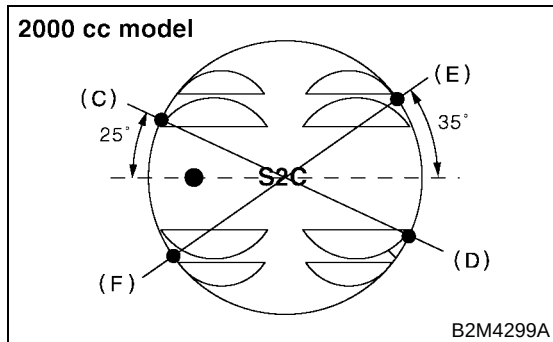
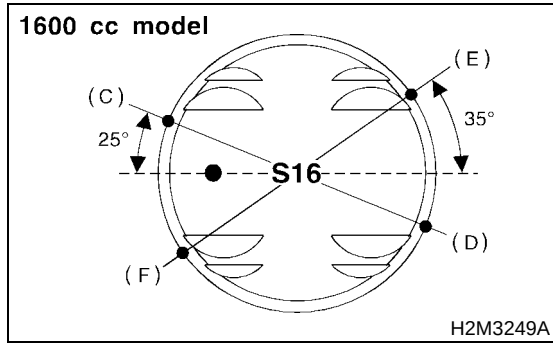


8) Position the second ring gap at 180° on the reverse side for the top ring gap.

CYLINDER BLOCK

MECHANICAL

9) Position the upper rail gap at (C) or (D) in the figure.

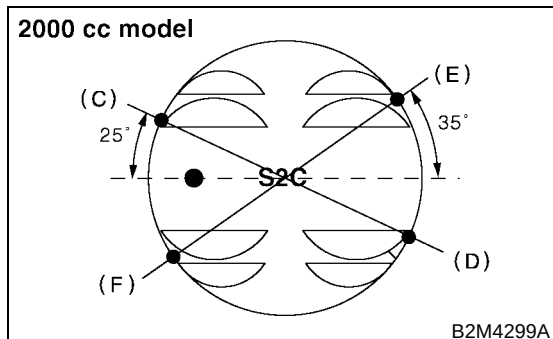
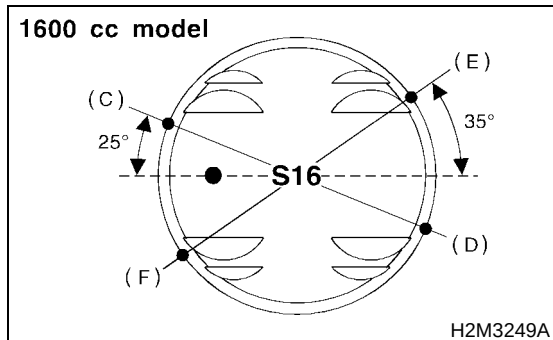


10) Position the expander gap at 180° of the reverse side for the upper rail gap.

11) Position the lower rail gap at (E) or (F) in the figure.

CAUTION:

- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

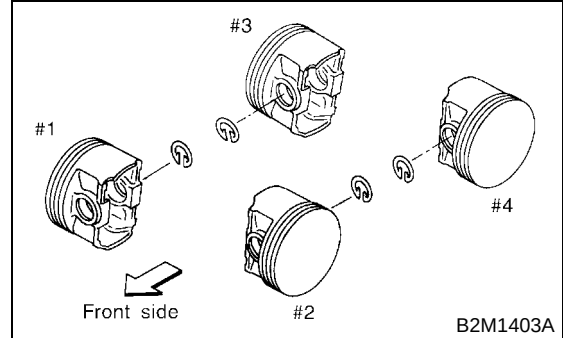


12) Install circlip.

Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

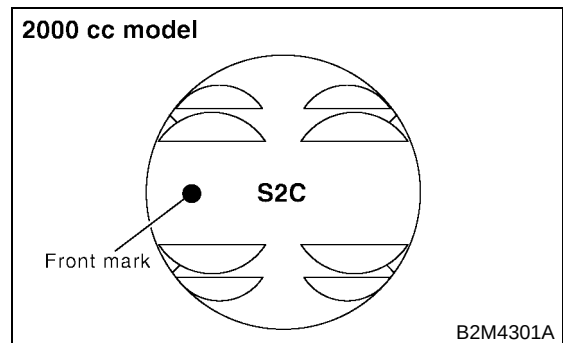
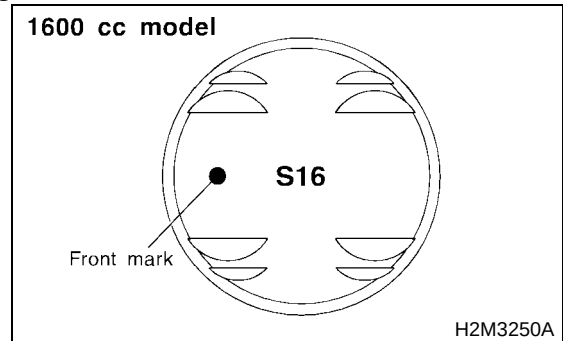
CAUTION:

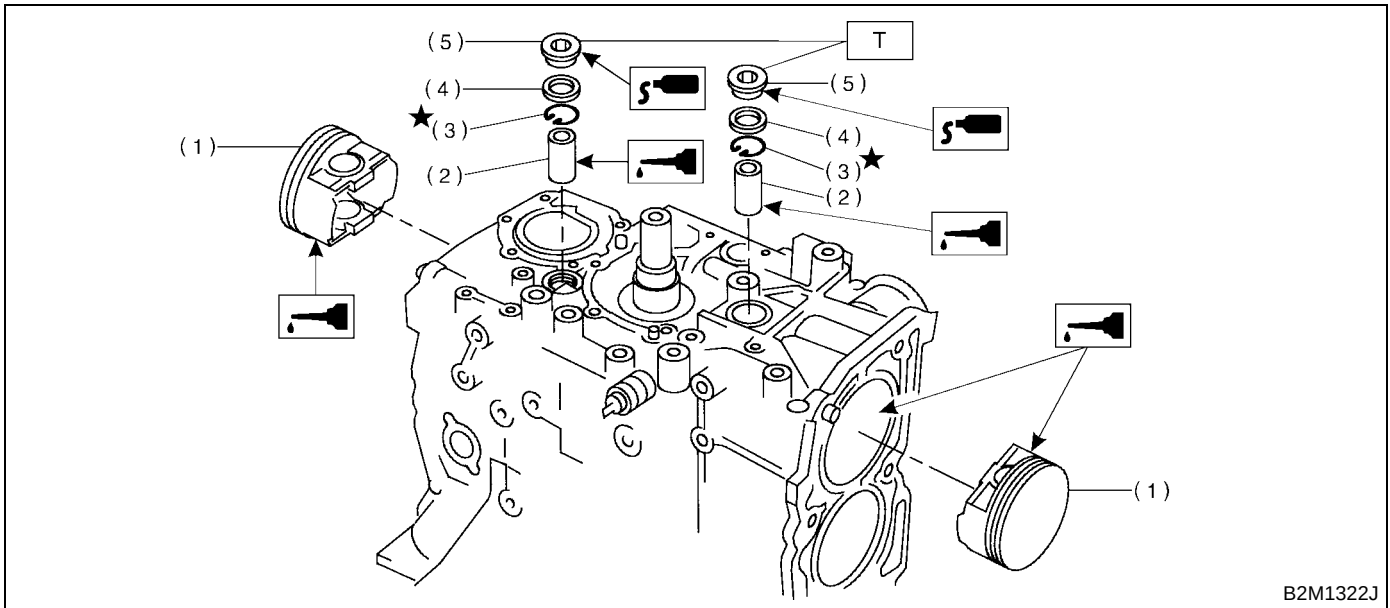
Use new circlips.



CAUTION:

Piston front mark faces towards the front of the engine.





B2M1322J

- | | |
|----------------|-----------------------|
| (1) Piston | (4) Gasket |
| (2) Piston pin | (5) Service hole plug |
| (3) Circlip | |

Tightening torque: N·m (kgf-m, ft-lb)
T: 69 (7.0, 50.6)

13) Installing piston

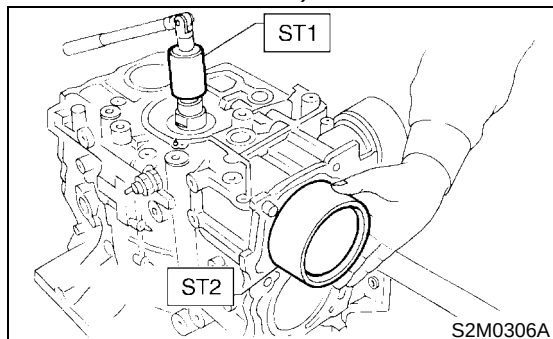
- (1) Turn cylinder block so that #1 and #2 cylinders face upward.
- (2) Using ST1, turn crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

- (3) Apply a coat of engine oil to pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747000 PISTON GUIDE (1600 cc model)

ST2 498747100 PISTON GUIDE (2000 cc model)



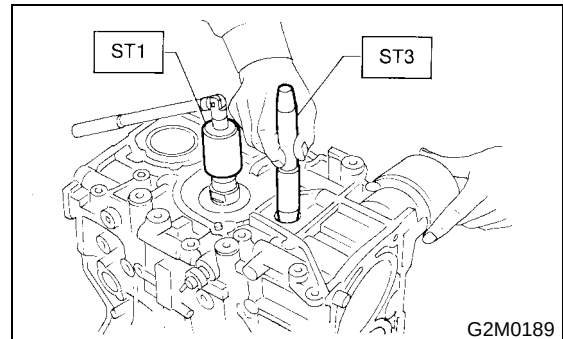
14) Installing piston pin

- (1) Insert ST3 into service hole to align piston pin hole with connecting rod small end.

CAUTION:

Apply a coat of engine oil to ST3 before insertion.

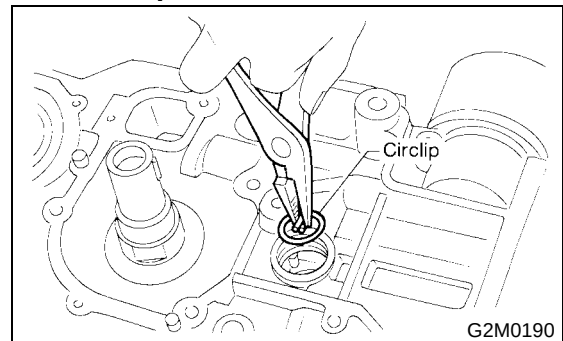
ST3 499017100 PISTON PIN GUIDE



- (2) Apply a coat of engine oil to piston pin and insert piston pin into piston and connecting rod through service hole.
- (3) Install circlip.

CAUTION:

Use new circlips.



CYLINDER BLOCK

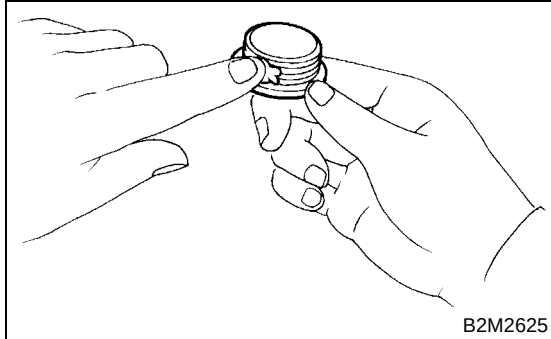
MECHANICAL

(4) Apply fluid packing around the service hole plug.

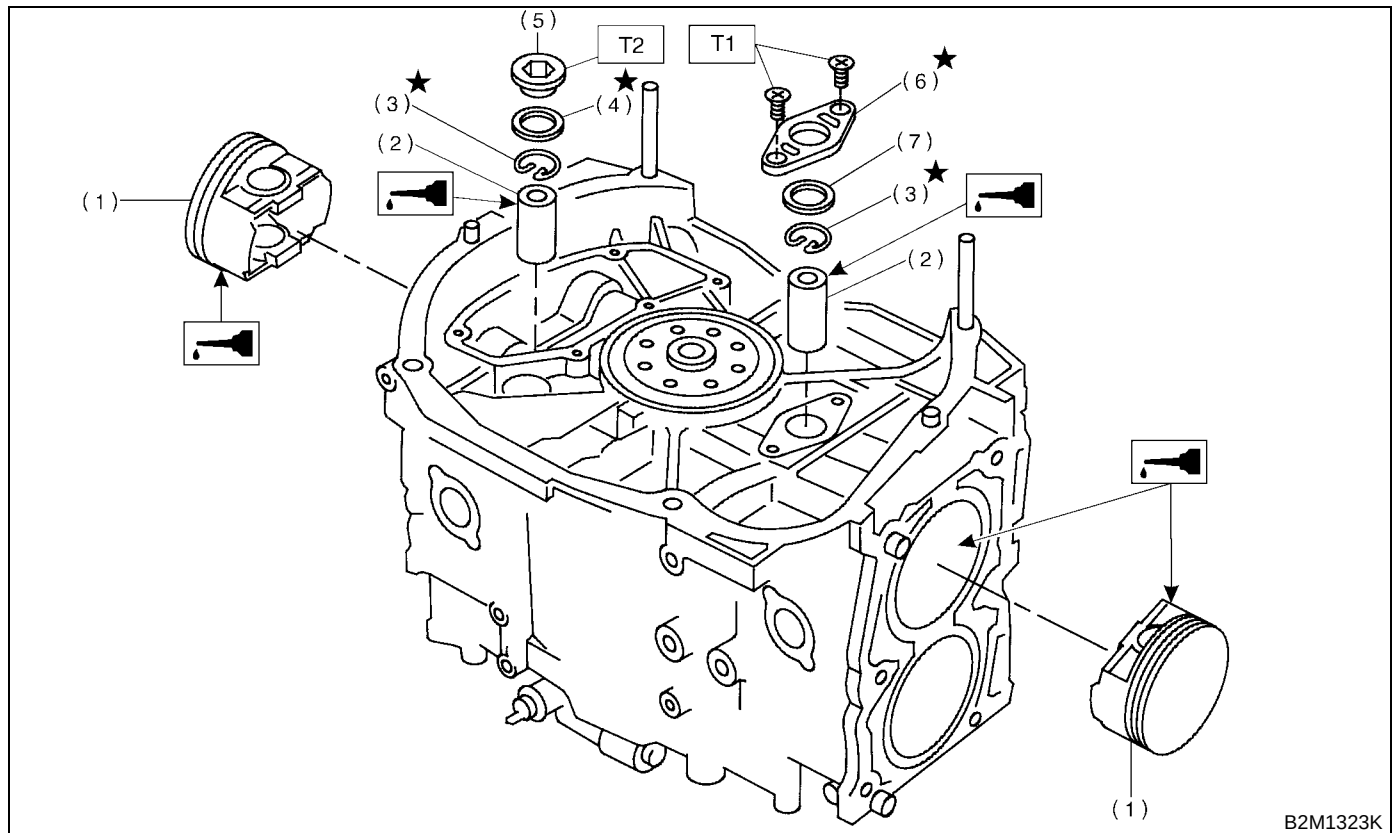
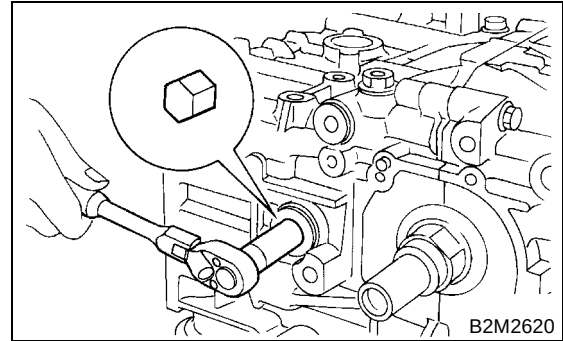
(5) Install service hole plug and gasket.

Fluid packing:

THREE BOND 1215 or equivalent



CAUTION:
Use a new gasket.



- | | |
|----------------|------------------------|
| (1) Piston | (5) Service hole plug |
| (2) Piston pin | (6) Service hole cover |
| (3) Circlip | (7) O-ring |
| (4) Gasket | |

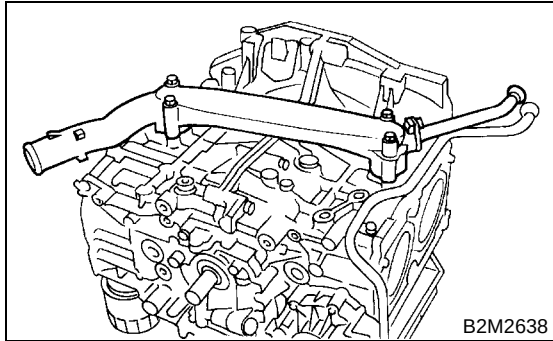
Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 69 (7.0, 50.6)

(6) Turn cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install pistons and piston pins.

- 15) Install water pipe.



- 16) Install baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

- 17) Install oil strainer and O-ring

Tightening torque:

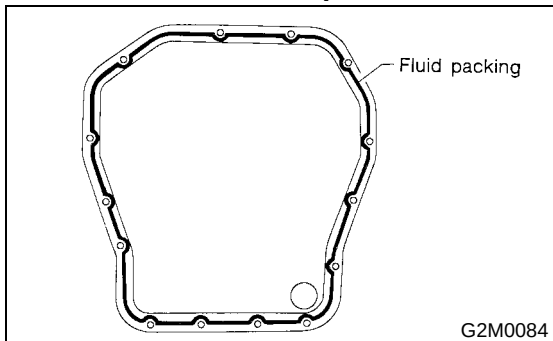
10 N·m (1.0 kgf-m, 7 ft-lb)

- 18) Install oil strainer stay.

- 19) Apply fluid packing to matching surfaces and install oil pan.

Fluid packing:

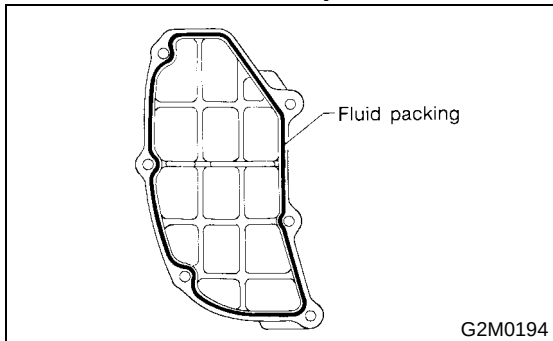
THREE BOND 1215 or equivalent



- 20) Apply fluid packing to matching surfaces and install oil separator cover.

Fluid packing:

THREE BOND 1215 or equivalent



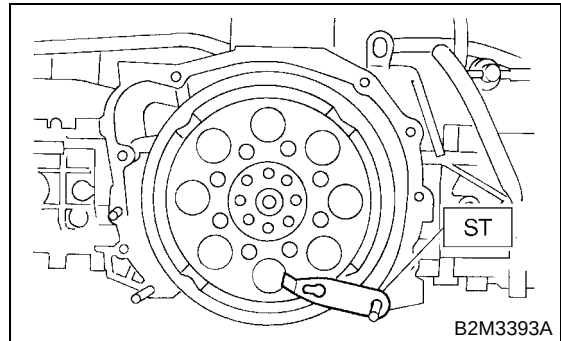
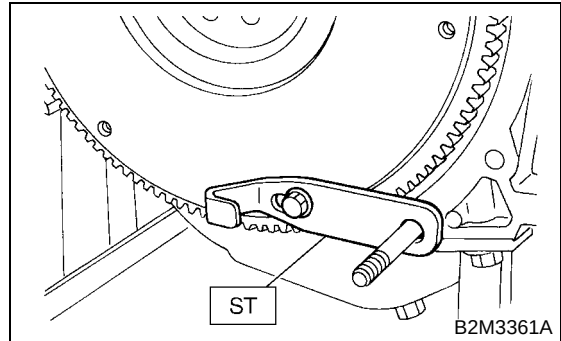
- 21) Install flywheel or drive plate.

To lock crankshaft, use ST.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:

72 N·m (7.3 kgf-m, 52.8 ft-lb)

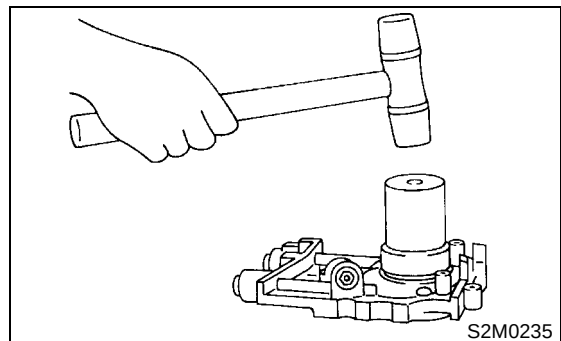


- 22) Install housing cover.

- 23) Installation of oil pump.

- (1) Discard front oil seal after removal. Replace with a new one using ST.

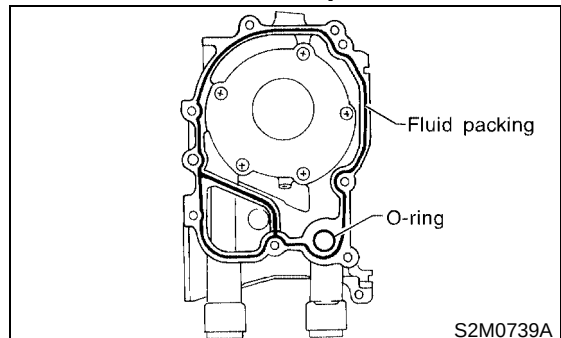
ST 499587100 OIL SEAL INSTALLER



- (2) Apply fluid packing to matching surface of oil pump.

Fluid packing:

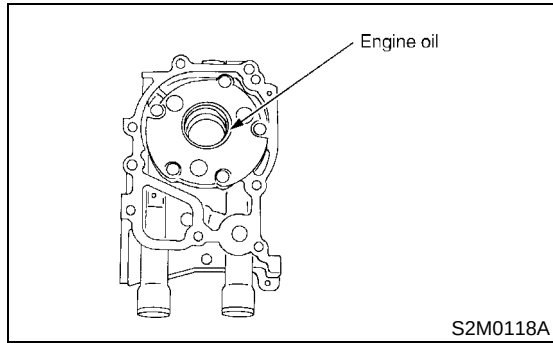
THREE BOND 1215 or equivalent



CYLINDER BLOCK

MECHANICAL

- (3) Apply a coat of engine oil to the inside of the oil seal.



- (4) Install oil pump on cylinder block. Be careful not to damage oil seal during installation.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:

- Do not forget to install O-ring and seal when installing oil pump.
- Align flat surface of oil pump's inner rotor with crankshaft before installation.

- 24) Install water pump and gasket.

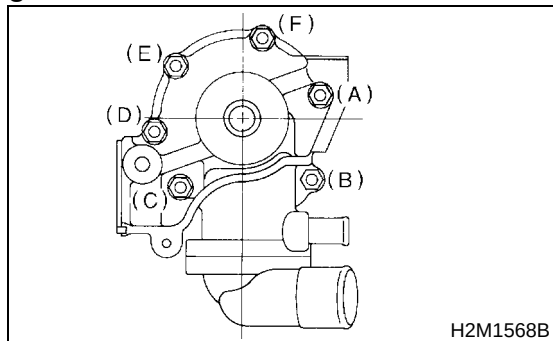
Tightening torque:

First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

CAUTION:

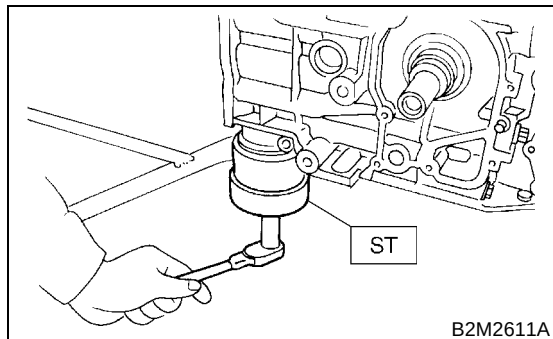
- Be sure to use a new gasket.
- When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.



- 25) Install water by-pass pipe for heater.

- 26) Install oil filter using ST.

ST 498547000 OIL FILTER WRENCH



- 27) Tighten cylinder head bolts.

- (1) Apply a coat of engine oil to 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 bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).

- (5) Tighten 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.

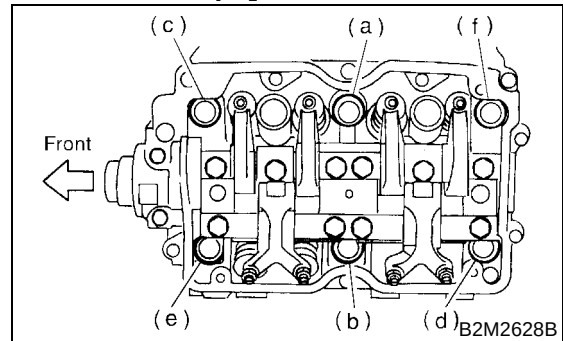
CAUTION:

Do not tighten bolts more than 90°.

- (7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:

Ensure that the total "re-tightening angle" [in the former two steps], do not exceed 180°.



- 28) Install oil level gauge guide and tighten attaching bolt (left side only).

- 29) Install rocker cover.

- 30) Install crankshaft sprocket. <Ref. to ME(SOHC)-53, INSTALLATION, Crankshaft Sprocket.>

- 31) Install camshaft sprocket. <Ref. to ME(SOHC)-51, INSTALLATION, Camshaft Sprocket.>

- 32) Install timing belt assembly. <Ref. to ME(SOHC)-47, INSTALLATION, Timing Belt Assembly.>

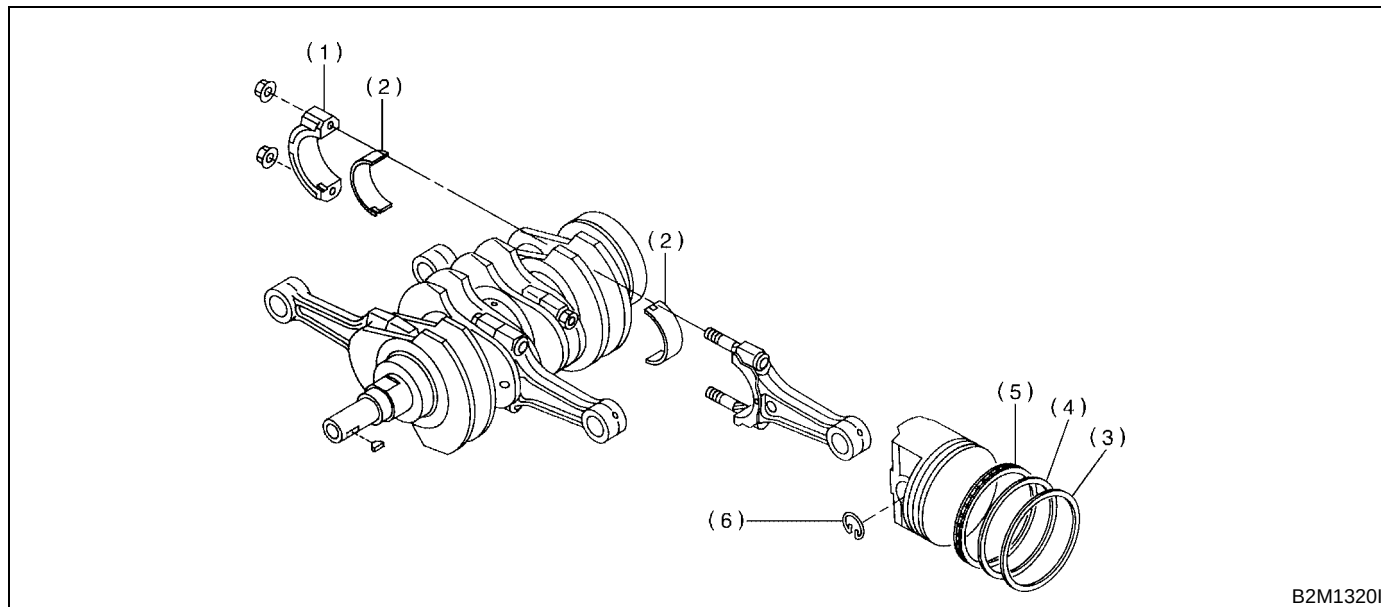
- 33) Install belt cover. <Ref. to ME(SOHC)-45, INSTALLATION, Belt Cover.>

- 34) Install crankshaft pulley. <Ref. to ME(SOHC)-44, INSTALLATION, Crankshaft Pulley.>

- 35) Install generator and A/C compressor brackets on cylinder head.

- 36) Install V-belt. <Ref. to FU(SOHC)-17, INSTALLATION, Intake Manifold.> <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

- 37) Install intake manifold. <Ref. to FU(SOHC)-17, INSTALLATION, Intake Manifold.> or <Ref. to FU(SOHCw/oOBD)-17, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY

B2M1320I

(1) Connecting rod cap

(2) Connecting rod bearing

(3) Top ring

(4) Second ring

(5) Oil ring

(6) Circlip

1) Remove connecting rod cap.

2) Remove connecting rod bearing.

CAUTION:

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.

CAUTION:

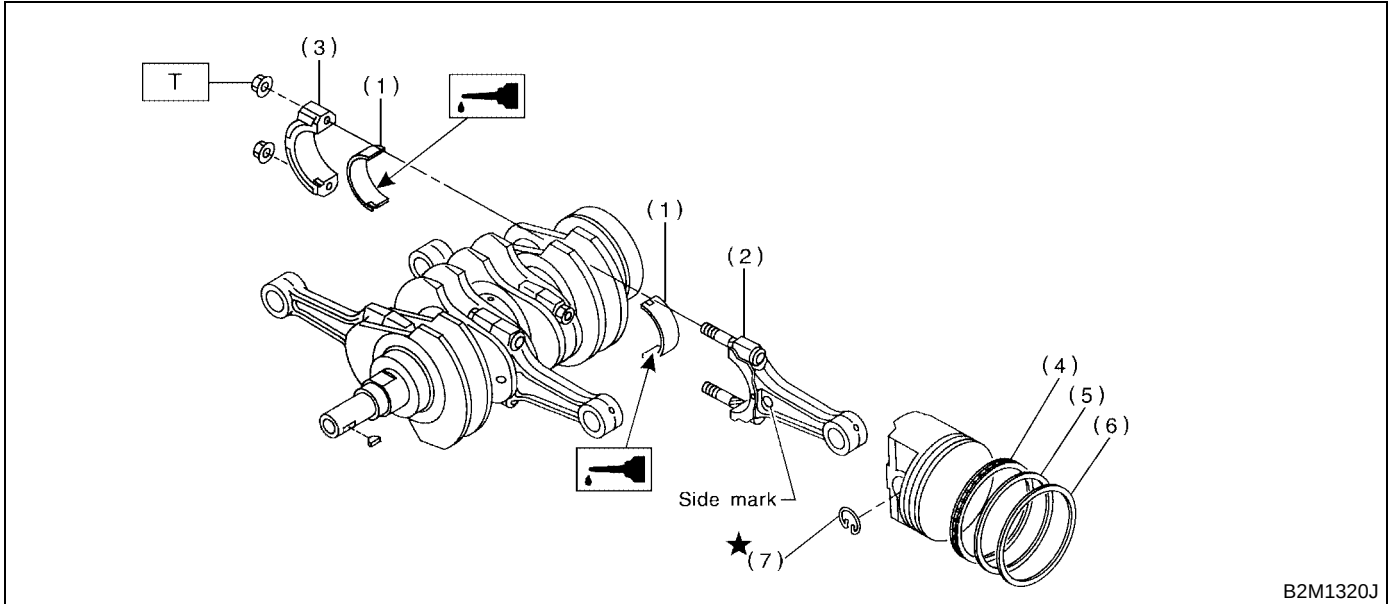
Arrange the removed piston rings in good order to prevent confusion.

5) Remove circlip.

CYLINDER BLOCK

MECHANICAL

D: ASSEMBLY



- | | |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod | (6) Top ring |
| (3) Connecting rod cap | (7) Circlip |
| (4) Oil ring | |

Tightening torque: N·m (kgf-m, ft-lb)
T: 44.6 (4.55, 32.9)

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) Install oil ring spacer, upper rail and lower rail in this order by hand. Then install second ring and top ring with a piston ring expander.

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:

201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block's front upper surface.

CAUTION:

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:

1600 cc model

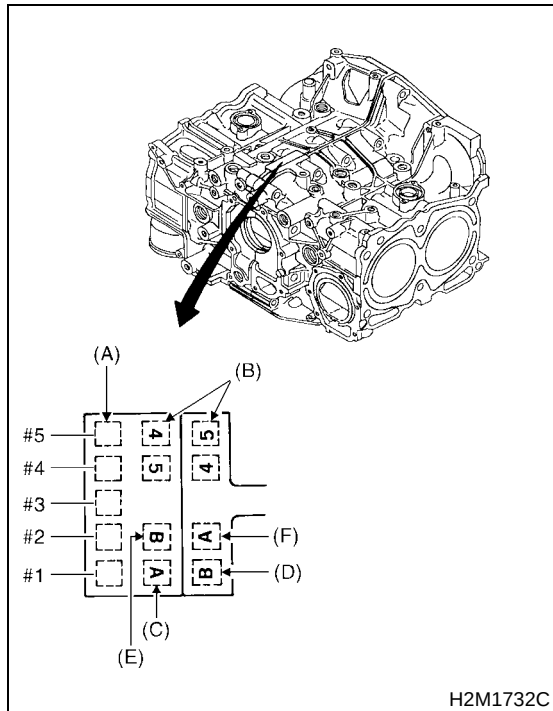
A: 87.905 — 87.915 mm (3.4608 — 3.4612 in)

B: 87.895 — 87.905 mm (3.4604 — 3.4608 in)

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)



- (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.

CAUTION:

Measurement should be performed at a temperature 20°C (68°F).

Taper:

Standard

0.015 mm (0.0006 in)

Limit

0.050 mm (0.0020 in)

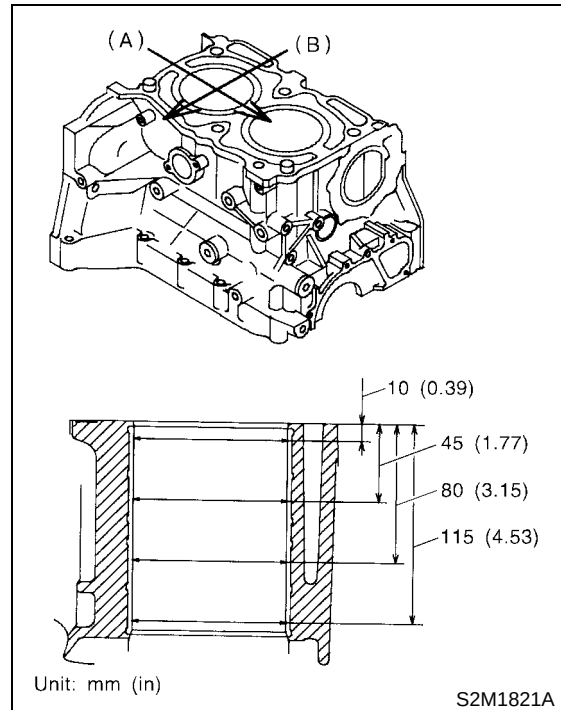
Out-of-roundness:

Standard

0.010 mm (0.0004 in)

Limit

0.050 mm (0.0020 in)



(A) 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).

CYLINDER BLOCK

MECHANICAL

Piston grade point H:

40.0 mm (1.575 in)

Piston outer diameter:

1600 cc model

Standard

A: 87.885 — 87.895 mm

(3.4600 — 3.4604 in)

B: 87.875 — 87.885 mm

(3.4596 — 3.4699 in)

0.25 mm (0.0098 in) oversize

88.125 — 88.135 mm

(3.4695 — 3.4699 in)

0.50 mm (0.0197 in) oversize

88.375 — 88.385 mm

(3.4793 — 3.4797 in)

2000 cc model

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

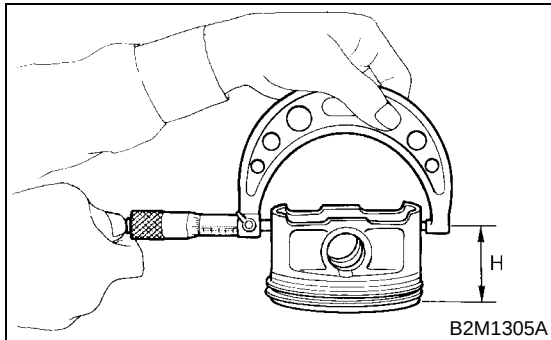
92.225 — 92.235 mm

(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.

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.

CAUTION:

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.

CAUTION:

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(SOHC)-81, 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.

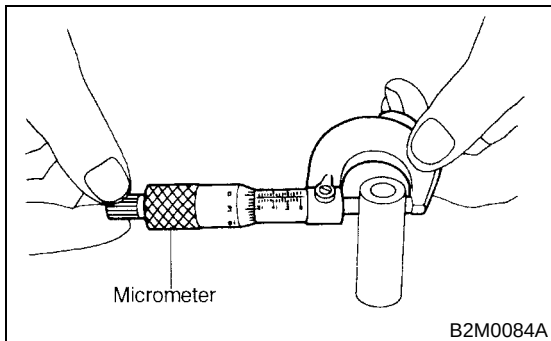
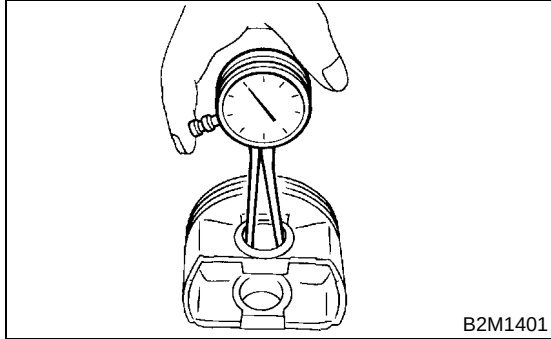
Standard clearance between piston pin and hole in piston:

Standard

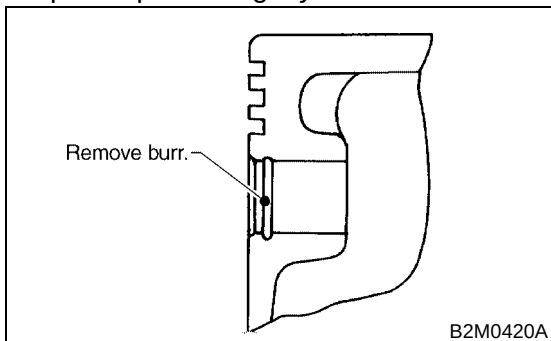
0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

0.020 mm (0.0008 in)



4) Check circlip installation groove on the piston for burr (A). If necessary, remove burr from the groove so that piston pin can lightly move.



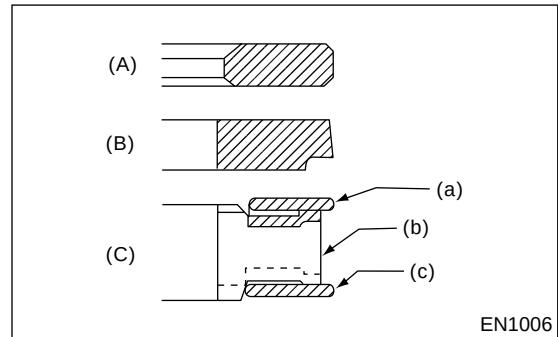
5) Check piston pin circlip for distortion, cracks and wear.

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:

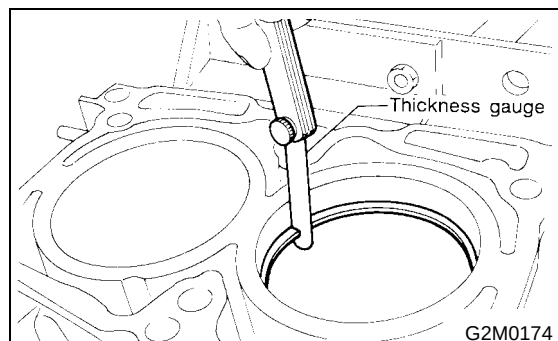
- Marks are shown on the end of the top and second rings. When installing the rings to the piston, face these marks upward.
- The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.



- (A) Top ring
- (B) Second ring
- (C) Oil ring
- (a) Upper rail
- (b) Spacer
- (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 — 0.70 (0.0079 — 0.0276)	1.5 (0.059)



CYLINDER BLOCK

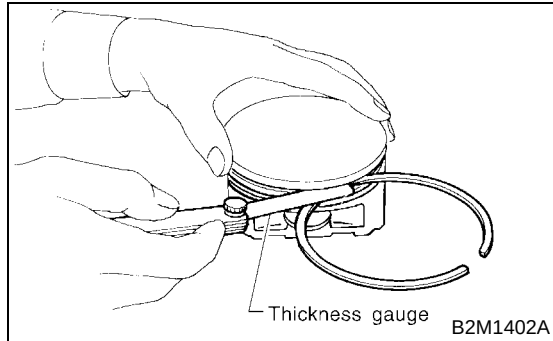
MECHANICAL

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)

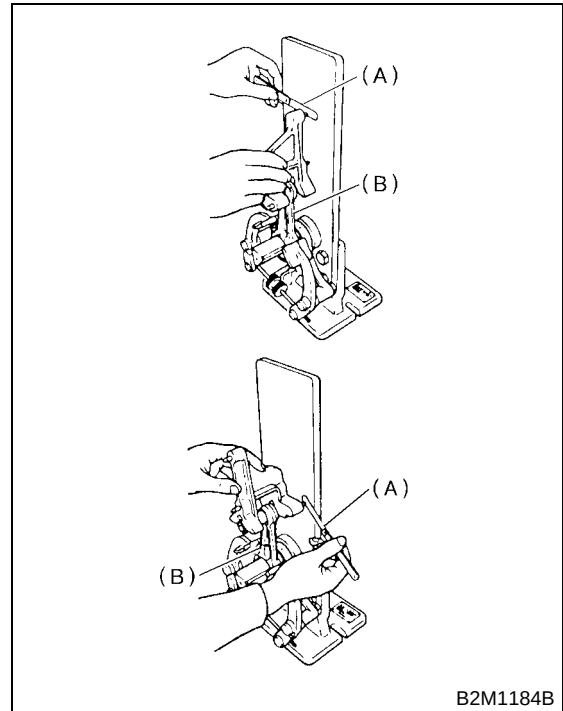


5. CONNECTING ROD

- 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.

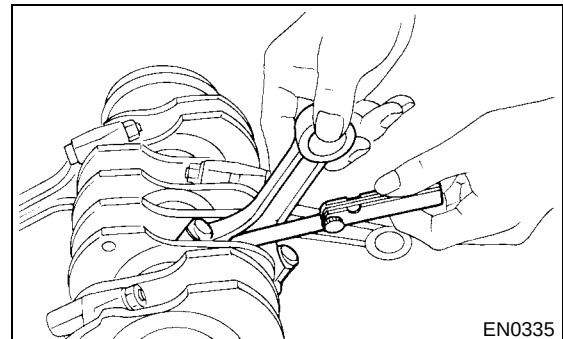
Connecting rod side clearance:

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:

• 1600 cc model

Standard

0.010 — 0.038 mm (0.0004 — 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	1.492 — 1.501 (0.0587 — 0.0591)	47.954 — 48.000 (1.8879 — 1.8898)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	47.954 — 47.970 (1.8879 — 1.8886)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	47.934 — 47.950 (1.8872 — 1.8878)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	47.734 — 47.750 (1.8793 — 1.8799)

Connecting rod oil clearance:

• 2000 cc model

Standard

0.010 — 0.038 mm (0.0004 — 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	1.492 — 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)

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.

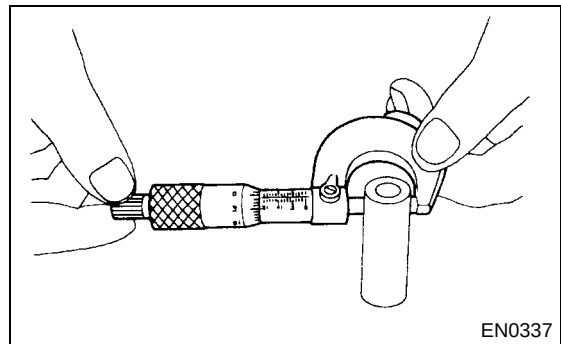
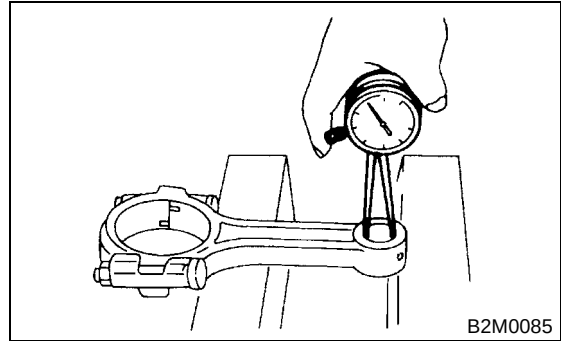
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

0.030 mm (0.0012 in)

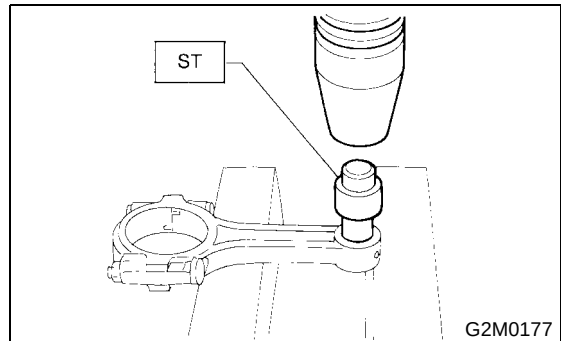


7) Replacement procedure is as follows.

(1) Remove bushing from connecting rod with ST and press.

(2) Press bushing with ST after applying oil on the periphery of bushing.

ST 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 completion of reaming, clean bushing to remove chips.

CYLINDER BLOCK

MECHANICAL

6. CRANKSHAFT AND CRANKSHAFT BEARING

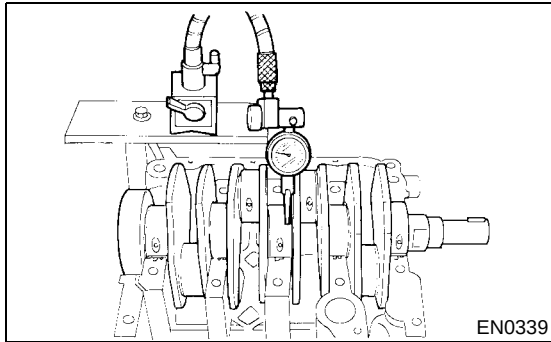
- 1) Clean crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
- 2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

CAUTION:

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

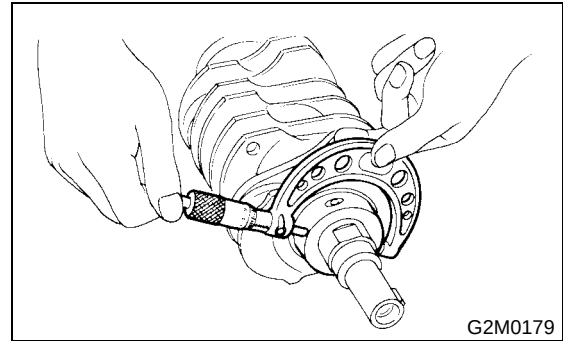
0.020 mm (0.0008 in) or less

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	1600 cc	2000 cc
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	47.984 — 48.000 (1.8891 — 1.8898)	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 — 1.510 (0.0587 — 0.0594)	1.492 — 1.501 (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)	47.954 — 47.970 (1.8879 — 1.8886)	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)	1.510 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	47.934 — 47.950 (1.8872 — 1.8878)	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)	1.520 — 1.523 (0.0598 — 0.0600)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	47.734 — 47.750 (1.8793 — 1.8799)	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)	1.620 — 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.

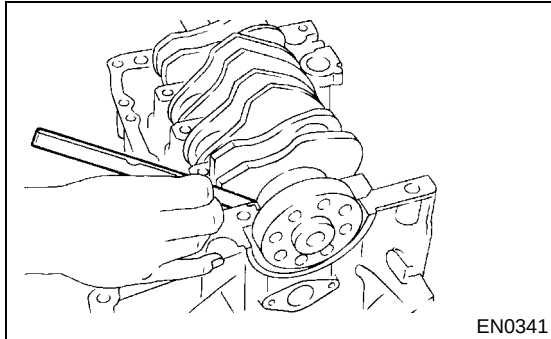
Crankshaft thrust clearance:

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	0.040 (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(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3) Initial combustion occur.	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
2. Rough idle and engine stall	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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
	• 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(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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 filter 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(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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 filter 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(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filter 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 filter 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(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-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

23.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	- Valve mechanism is defective. - Incorrect valve clearance - Worn valve rocker - Worn camshaft - Broken valve spring
Heavy and dull clank	Oil pressure is low.	- Worn crankshaft main bearing - Worn connecting rod bearing (big end)
	Oil pressure is normal.	- Loose flywheel mounting bolts - Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	- 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*)	- 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*)	- 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*)	- Unusually worn valve lifter - Worn cam gear - Worn camshaft journal bore in crankcase
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	Defective generator brush and rotor contact
Gear scream when starting engine	—	- Defective ignition starter switch - Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	- Loose drive belt - Defective water pump shaft
Hissing sound	—	- Loss of compression - Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	- Loose timing belt - Belt contacting case/adjacent part
Valve tappet noise	—	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(SOHC)-45, OPERATION, Clear Memory Mode.> or <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> or <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.> after connecting fuel injector connector.

EXHAUST

EX(SOHC)

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2. Front Exhaust Pipe.....	7
3. Center Exhaust Pipe	10
4. Rear Exhaust Pipe	11
5. Muffler	12

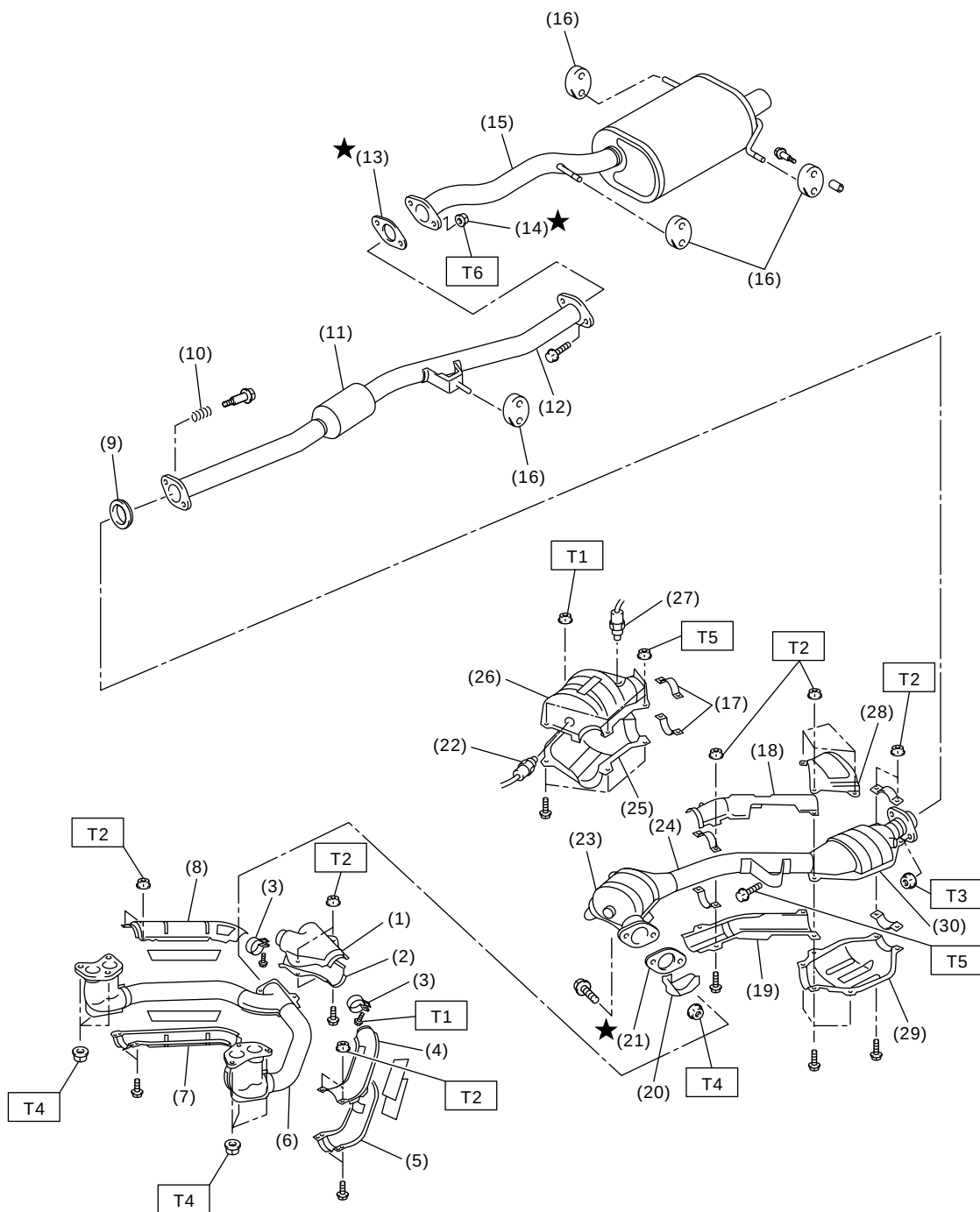
GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT

1. 1600CC



EN0349

GENERAL DESCRIPTION

EXHAUST

(1) Upper front exhaust pipe cover CTR	(14) Self-locking nut	(27) Rear oxygen sensor
(2) Lower front exhaust pipe cover CTR	(15) Muffler	(28) Upper rear catalytic converter cover
(3) Clamp	(16) Cushion rubber	(29) Lower rear catalytic converter cover
(4) Upper front exhaust pipe cover LH	(17) Lower clamp	(30) Rear catalytic converter
(5) Lower front exhaust pipe cover LH	(18) Upper center exhaust pipe cover	
(6) Front exhaust pipe	(19) Lower center exhaust pipe cover	
(7) Lower front exhaust pipe cover RH	(20) Protector	
(8) Upper front exhaust pipe cover RH	(21) Gasket	
(9) Gasket	(22) Front oxygen (A/F) sensor	
(10) Spring	(23) Front catalytic converter	
(11) Chamber	(24) Center exhaust pipe	
(12) Rear exhaust pipe	(25) Lower front catalytic converter cover	
(13) Gasket	(26) Upper front catalytic converter cover	

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)

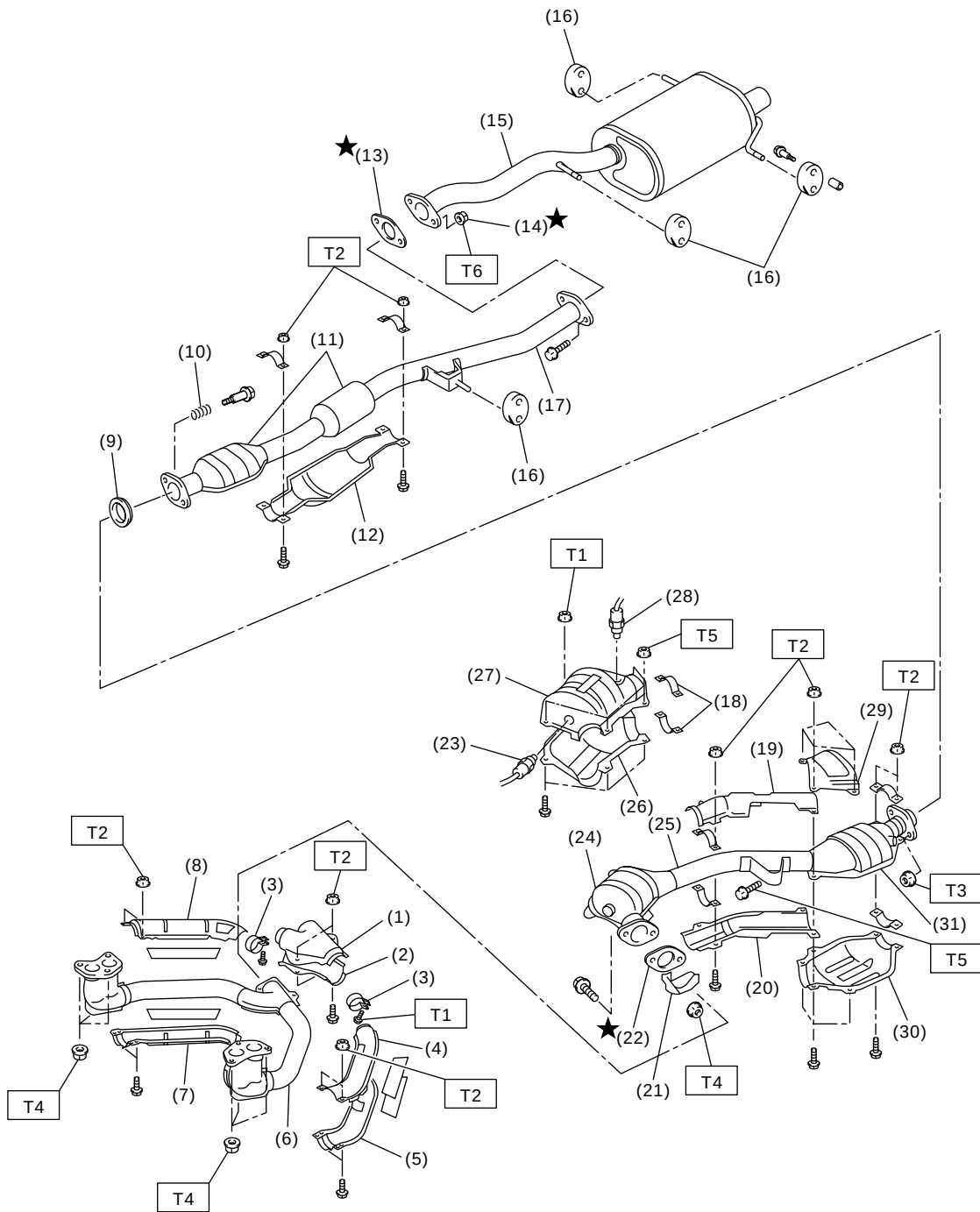
T5: 35 (3.6, 26.0)

T6: 48 (4.9, 35.4)

GENERAL DESCRIPTION

EXHAUST

2. 2000CC



EN0350

EX(SOHC)-4

GENERAL DESCRIPTION

EXHAUST

(1) Upper front exhaust pipe cover CTR	(15) Muffler	(29) Upper rear catalytic converter cover
(2) Lower front exhaust pipe cover CTR	(16) Cushion rubber	(30) Lower rear catalytic converter cover
(3) Clamp	(17) Rear exhaust pipe	(31) Rear catalytic converter
(4) Upper front exhaust pipe cover LH	(18) Lower clamp	
(5) Lower front exhaust pipe cover LH	(19) Upper center exhaust pipe cover	
(6) Front exhaust pipe	(20) Lower center exhaust pipe cover	
(7) Lower front exhaust pipe cover RH	(21) Protector	
(8) Upper front exhaust pipe cover RH	(22) Gasket	
(9) Gasket	(23) Front oxygen (A/F) sensor	
(10) Spring	(24) Front catalytic converter	
(11) Chamber	(25) Center exhaust pipe	
(12) Rear exhaust pipe cover	(26) Lower front catalytic converter cover	
(13) Gasket	(27) Upper front catalytic converter cover	
(14) Self-locking nut	(28) Rear oxygen sensor	

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)

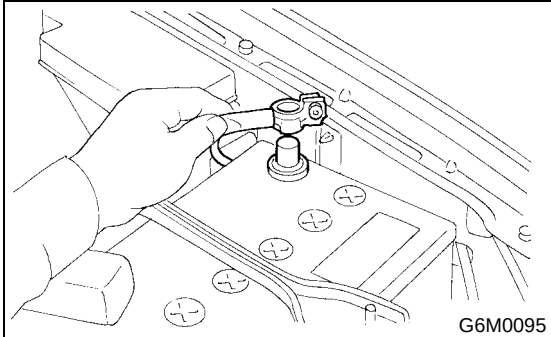
B: CAUTION

- 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 negative terminal from battery.

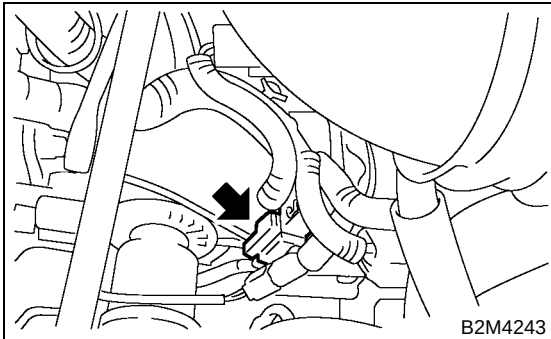
2. Front Exhaust Pipe

A: REMOVAL

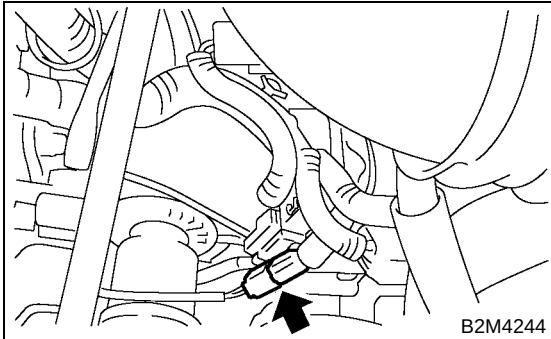
1) Disconnect battery ground cable.



2) Disconnect front oxygen (A/F) sensor connector.



3) Disconnect rear oxygen sensor connector.

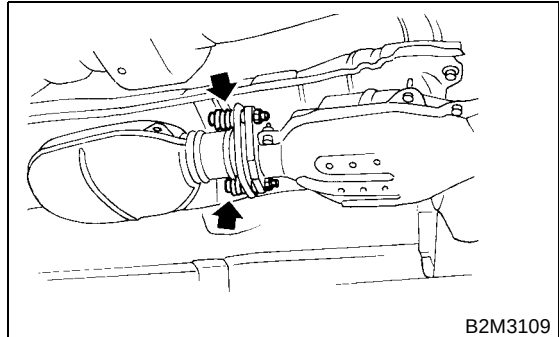


4) Lift-up the vehicle.

5) Separate front and center exhaust pipe assembly from rear exhaust pipe.

WARNING:

Be careful, exhaust pipe is hot.

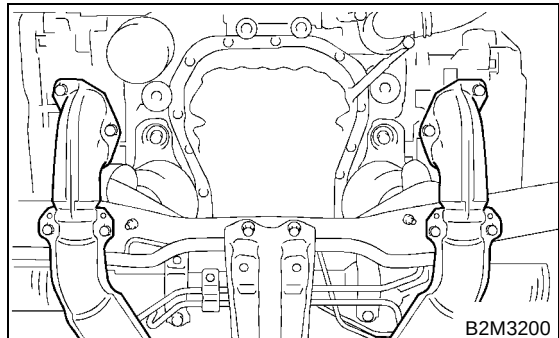


6) Remove under cover.

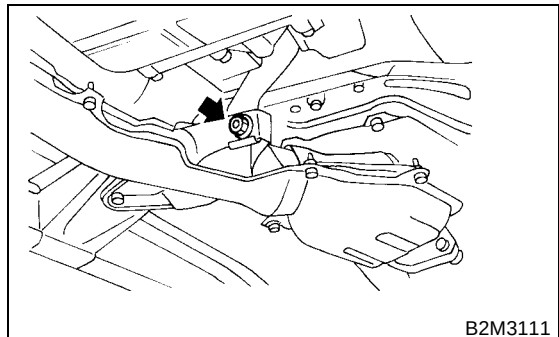
7) Remove bolts which hold front exhaust pipe onto cylinder heads.

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.

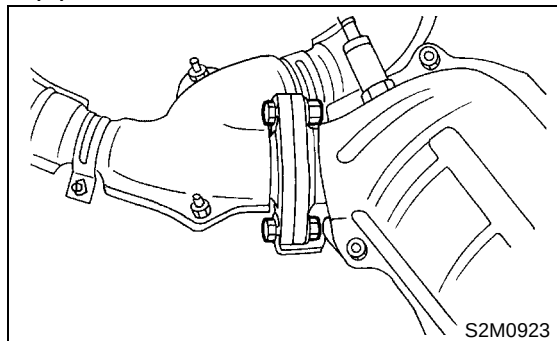
CAUTION:

- 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.

FRONT EXHAUST PIPE

EXHAUST

- 10) Separate front exhaust pipe from center exhaust pipe.



B: INSTALLATION

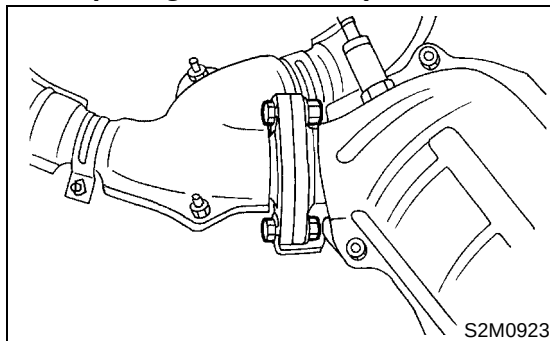
- 1) Install front exhaust pipe to center exhaust pipe.

CAUTION:

Replace gaskets with new ones.

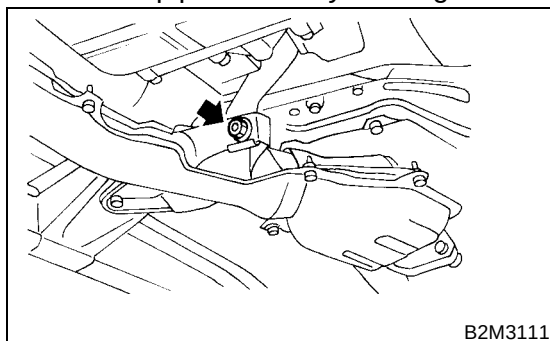
Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)



- 2) Install front and center exhaust pipe assembly to the vehicle.

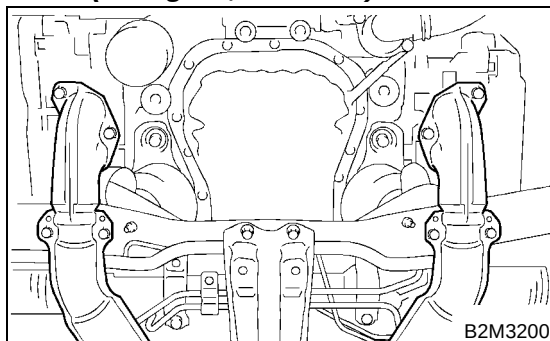
- 3) Temporarily tighten bolt which installs front and center exhaust pipe assembly to hanger bracket.



- 4) Tighten bolts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)

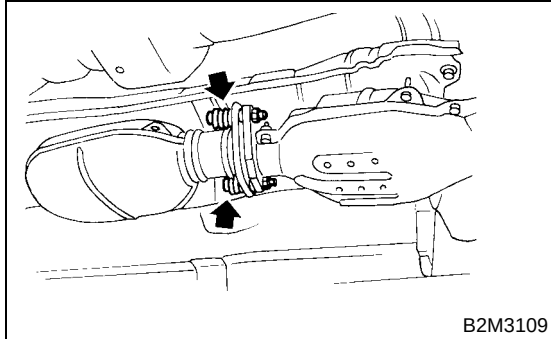


- 5) Install under cover.

- 6) Tighten bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:

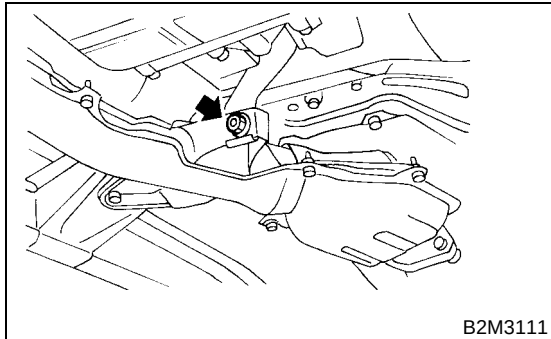
18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 7) Tighten bolt which holds front and center exhaust pipe assembly to hanger bracket.

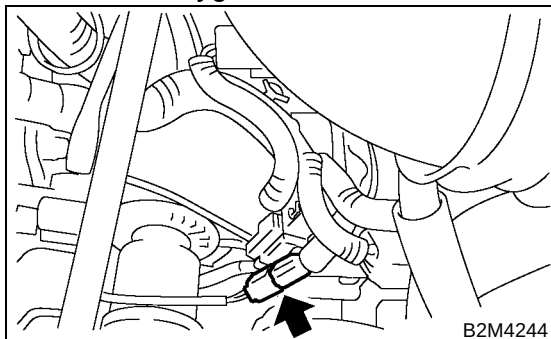
Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)

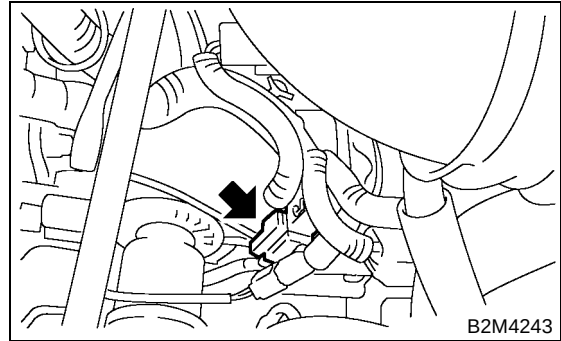


- 8) Lower the vehicle.

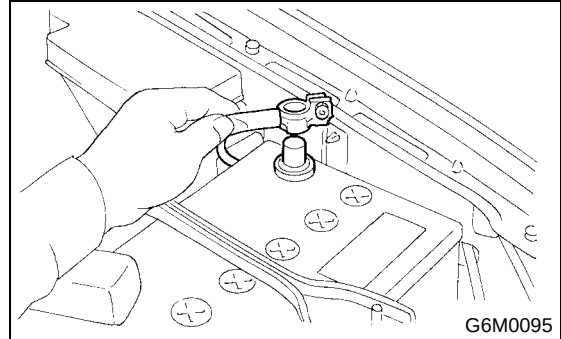
- 9) Connect rear oxygen sensor connector.



- 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(SOHC)-7, 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(SOHC)-8, 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.

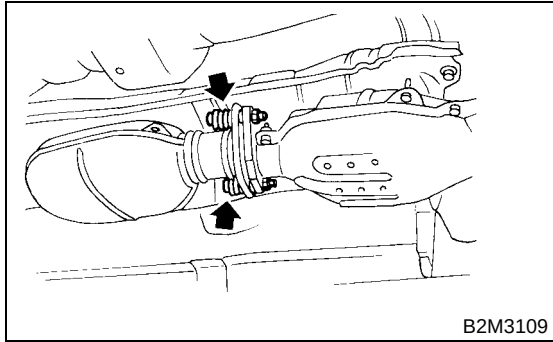
4. Rear Exhaust Pipe

A: REMOVAL

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

CAUTION:

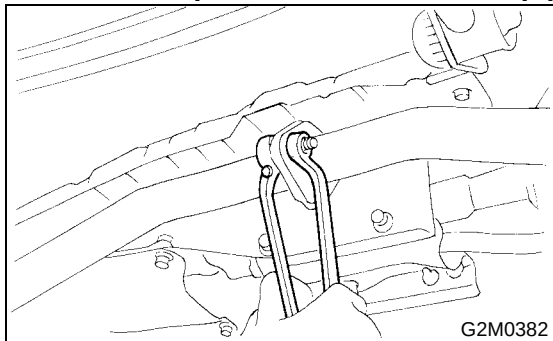
Be careful, exhaust pipe is hot.



- 2) Separate rear exhaust pipe from muffler.

CAUTION:

Be careful not to pull down rear exhaust pipe.



- 3) Remove rear exhaust pipe.

B: INSTALLATION

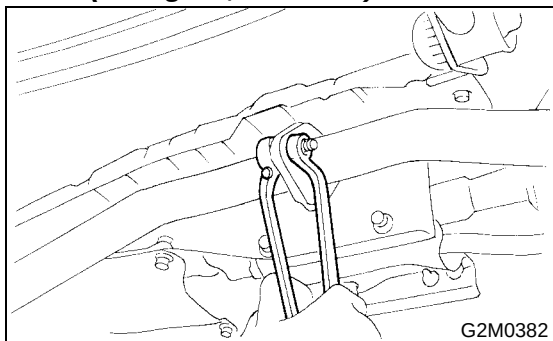
CAUTION:

Replace gaskets with new ones.

- 1) Install rear exhaust pipe to muffler.

Tightening torque:

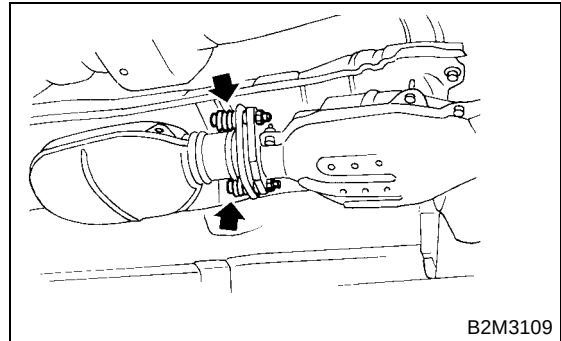
48 N·m (4.9 kgf-m, 35.4 ft-lb)



- 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.
- 3) Make sure the cushion rubber is not worn or cracked.

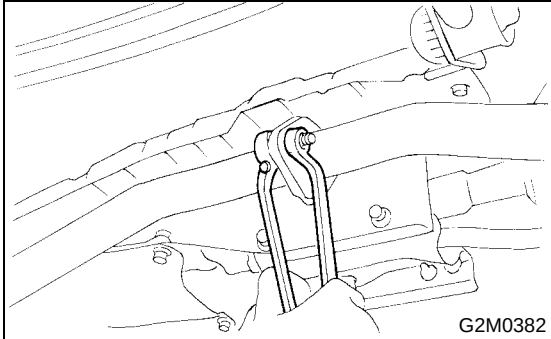
5. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

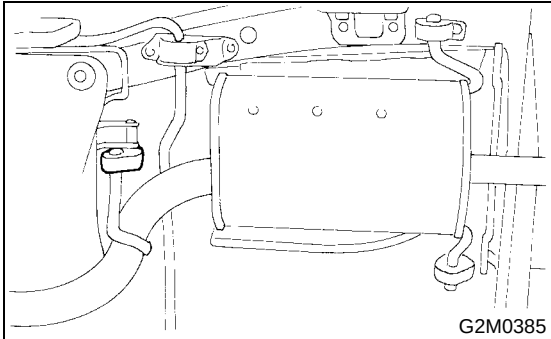
CAUTION:

Be careful, exhaust pipe is hot.



2) Apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)



3) Remove front, left and right rubber cushion, and detach muffler assembly.

B: INSTALLATION

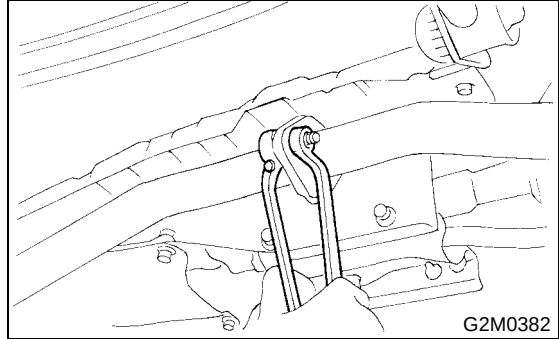
1) Install in the reverse order of removal.

CAUTION:

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.

ENGINE 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

COOLING

CO

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GENERAL DESCRIPTION

COOLING

1. General Description

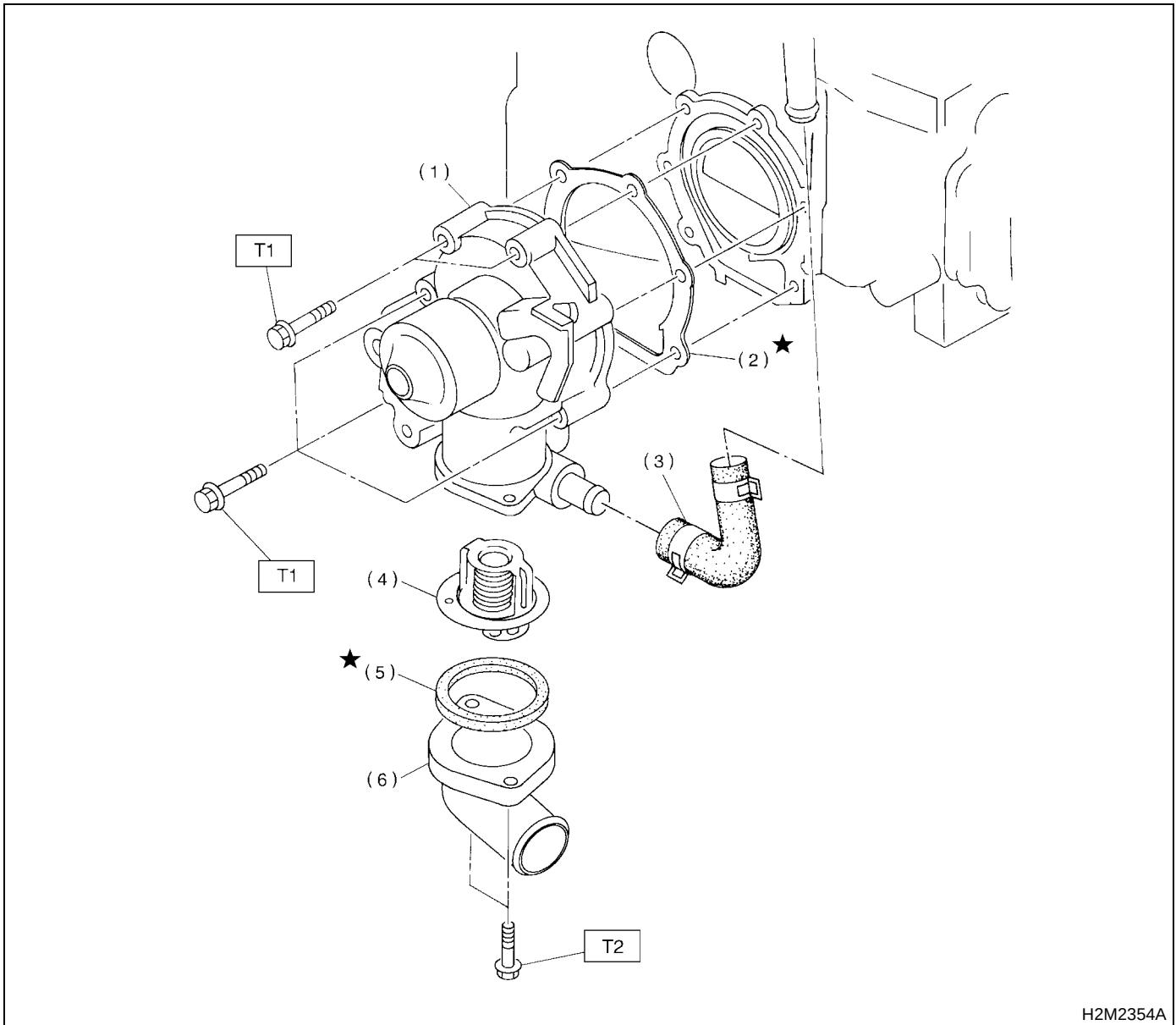
A: SPECIFICATIONS

Model			Non-turbo	Turbo
Cooling system			Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity ℓ (US qt, Imp qt)			1.6AT: Approx. 7.3 (7.71, 6.42) 1.6MT: Approx. 7.4 (7.82, 6.51) 2.0AT: Approx. 6.9 (7.29, 6.07) 2.0MT: Approx. 7 (7.4, 6.2)	Approx. 7.7 (8.14, 6.78)
Water pump	Type		Centrifugal impeller type	
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.	
		Pump speed—total engine coolant head	700 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—total engine coolant head	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—total engine coolant head	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		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	Main fan	70 W	120 W
		Sub fan	70 W	120 W
	Fan diameter × Blade		320 mm (11.81 in) × 5 (main fan) 320 mm (11.81 in) × 7 (sub fan)	
Radiator	Type		Down flow, pressure type	
	Core dimensions		691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in)	691.5 × 340 × 27 mm (27.22 × 13.39 × 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

• NON-TURBO MODEL



H2M2354A

- | | |
|-------------------------|----------------------|
| (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)

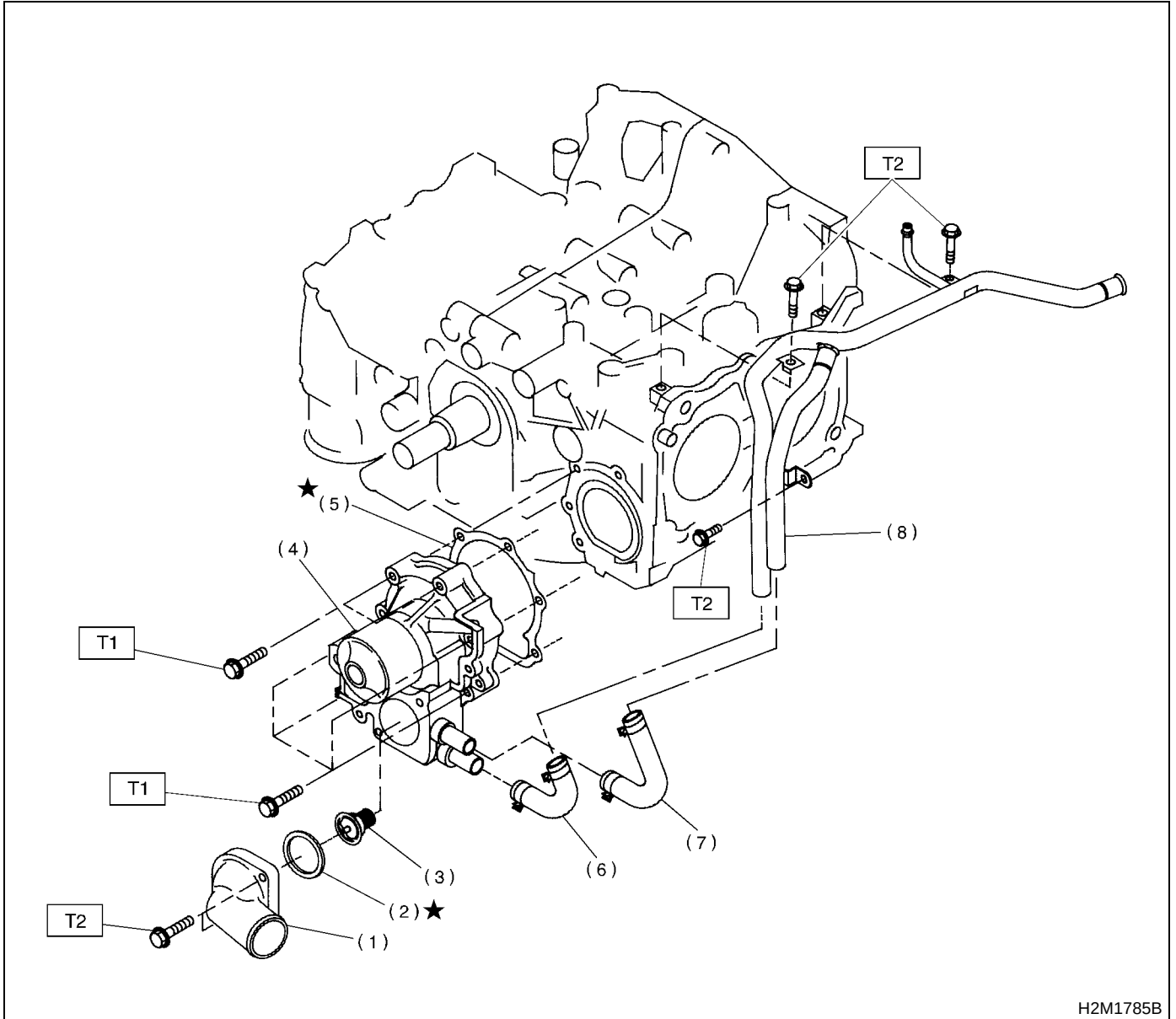
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)

T2: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

COOLING

• TURBO MODEL



- (1) Thermostat case
- (2) Gasket
- (3) Thermostat
- (4) Water pump ASSY
- (5) Gasket

- (6) Header by-pass hose
- (7) Coolant filler tank by-pass hose
- (8) Water by-pass pipe

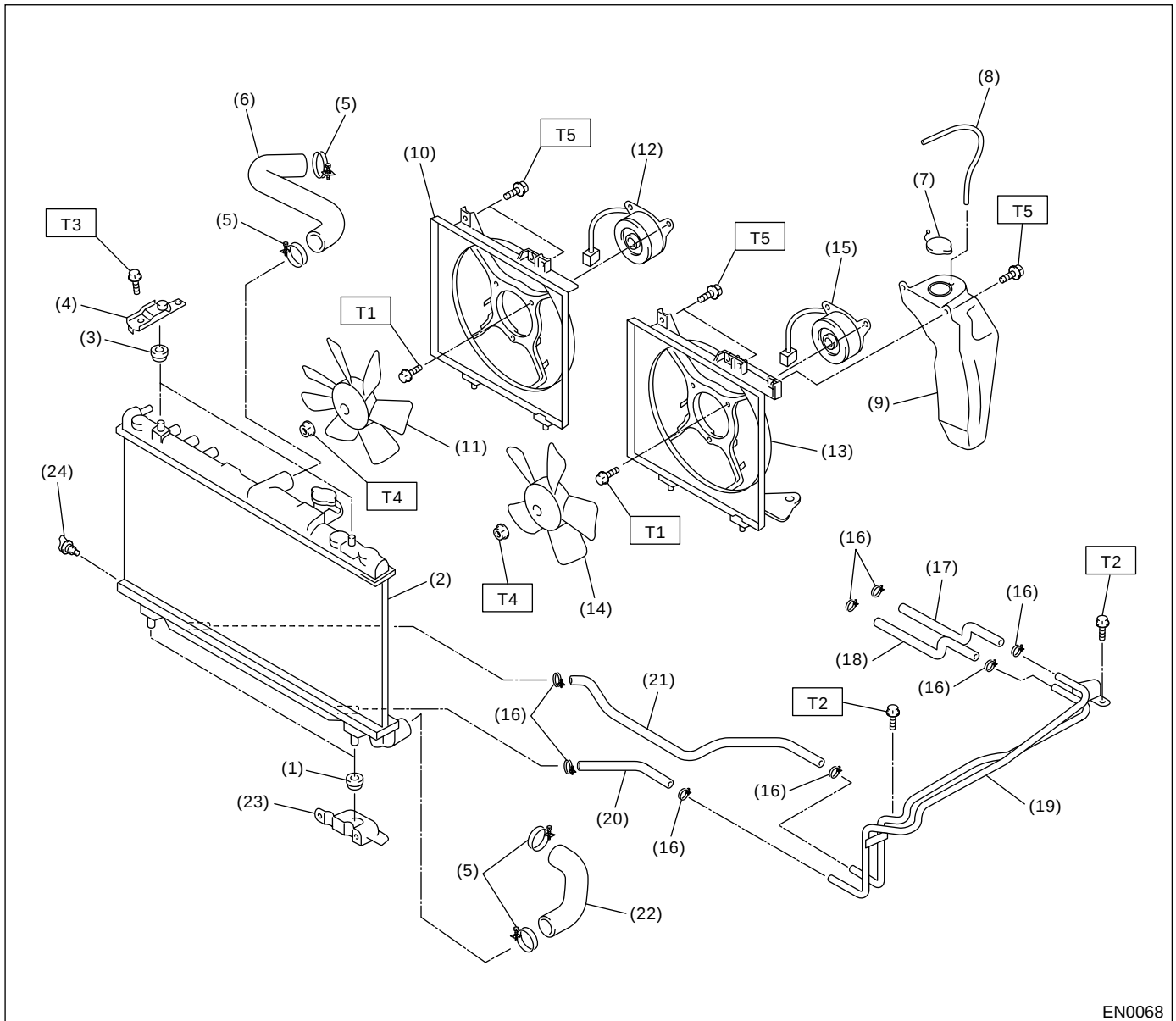
Tightening torque: N·m (kgf-m, ft-lb)

**T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)**

T2: 6.4 (0.65, 4.7)

2. RADIATOR AND RADIATOR FAN

• NON-TURBO MODEL



EN0068

- | | | |
|---------------------------------------|---|-----------------------------|
| (1) Radiator lower cushion | (13) Main fan shroud | (23) Radiator lower bracket |
| (2) Radiator | (14) Radiator main fan | (24) Radiator drain plug |
| (3) Radiator upper cushion | (15) Main fan motor | |
| (4) Radiator upper bracket | (16) ATF hose clamp (AT vehicles only) | |
| (5) Clamp | (17) ATF inlet hose A (AT vehicles only) | |
| (6) Radiator inlet hose | (18) ATF outlet hose A (AT vehicles only) | |
| (7) Engine coolant reservoir tank cap | (19) ATF pipe (AT vehicles only) | |
| (8) Over flow hose | (20) ATF inlet hose B (AT vehicles only) | |
| (9) Engine coolant reservoir tank | (21) ATF outlet hose B (AT vehicles only) | |
| (10) Sub fan shroud | (22) Radiator outlet hose | |
| (11) Radiator sub fan | | |
| (12) Sub fan motor | | |

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)

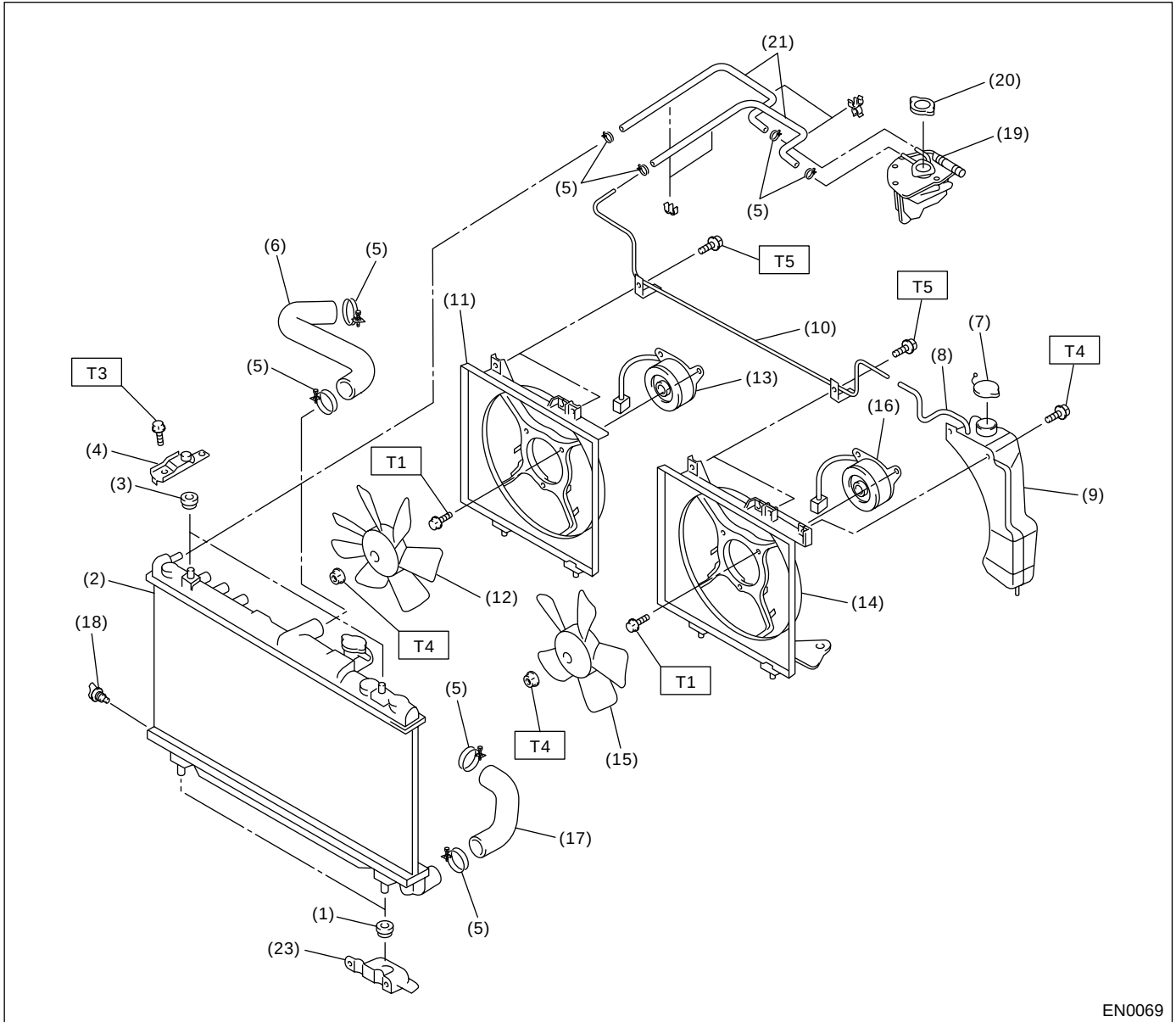
T4: 3.4 (0.35, 2.5)

T5: 4.9 (0.50, 3.6)

GENERAL DESCRIPTION

COOLING

• TURBO MODEL



EN0069

- | | |
|---------------------------------------|------------------------------|
| (1) Radiator lower cushion | (10) Over flow pipe |
| (2) Radiator | (11) Sub fan shroud |
| (3) Radiator upper cushion | (12) Radiator sub fan |
| (4) Radiator upper bracket | (13) Radiator sub fan motor |
| (5) Clamp | (14) Main fan shroud |
| (6) Radiator inlet hose | (15) Radiator main fan |
| (7) Engine coolant reservoir tank cap | (16) Radiator main fan motor |
| (8) Over flow hose | (17) Radiator outlet hose |
| (9) Engine coolant reservoir tank | (18) Radiator drain plug |

- | |
|-------------------------------------|
| (19) Engine coolant filler tank |
| (20) Engine coolant filler tank cap |
| (21) Engine coolant hose |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)

T2: 18 (1.8, 13.0)

T3: 3.4 (0.35, 2.5)

T4: 4.9 (0.50, 3.6)

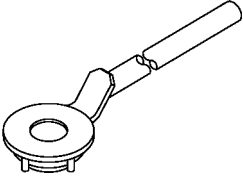
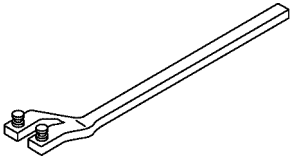
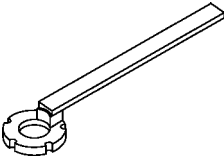
C: CAUTION

- 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 negative terminal from battery.

GENERAL DESCRIPTION

COOLING

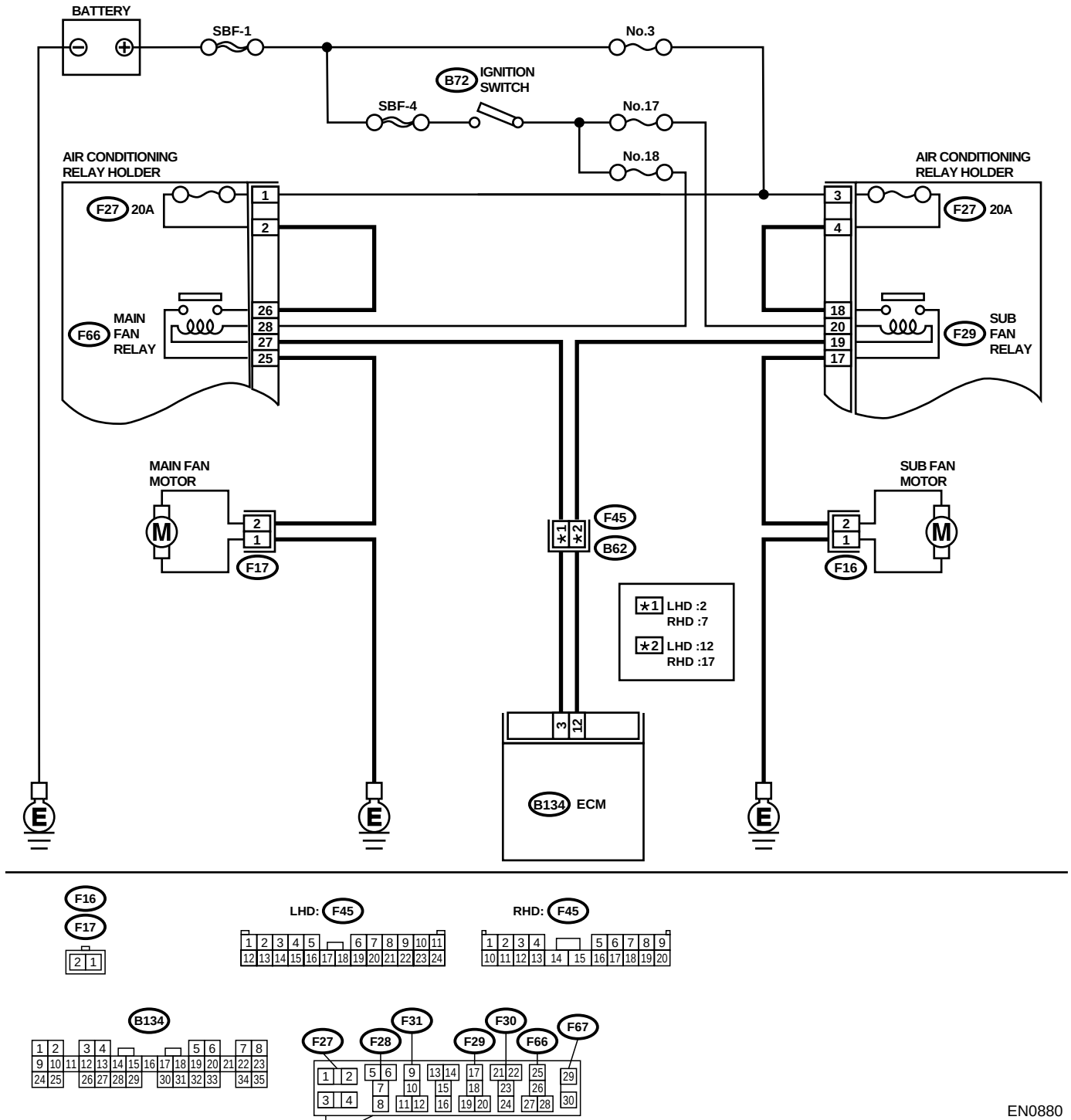
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M4157	499977300	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 B2M3859	499207100	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (Non-turbo LH side only)
 B2M4158	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

2. Radiator Main Fan System

A: SCHEMATIC

1. NON-TURBO MODEL

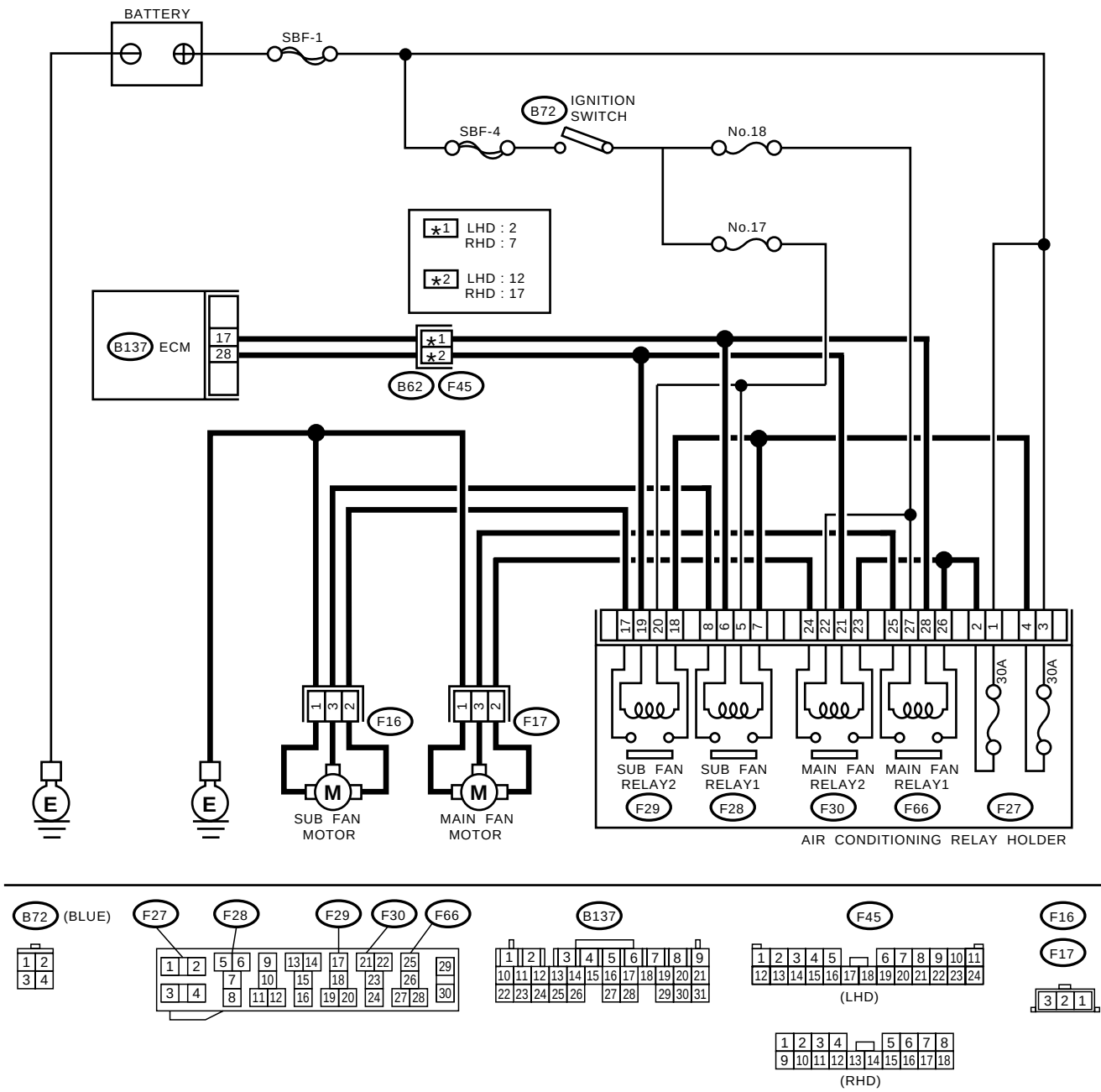


EN0880

RADIATOR MAIN FAN SYSTEM

COOLING

2. TURBO MODEL



EN0260

B: INSPECTION

1. NON-TURBO MODEL

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	Check	Yes	No
1	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 (F17) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 5.
2	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. 1 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 3.	Repair open circuit in harness between main fan motor connector and chassis ground.
3	CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step 4.
4	CHECK MAIN FAN MOTOR. 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?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
5	CHECK POWER SUPPLY TO MAIN FAN RELAY. 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. Connector & terminal (F66) No. 26 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Go to step 7.
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. 28 (+) — Chassis ground (-):	Is the voltage more than 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?	Replace fuse.	Go to step 8.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
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 (-):	Is the voltage more than 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 condition of fuse.	Is the fuse 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) Remove main fan relay. 3) Measure resistance of main fan relay. Terminal No. 26 — No. 25:	Is the resistance more than 1 MΩ?	Go to step 11.	Replace main fan relay.
11 CHECK MAIN FAN RELAY. 1) Connect battery to terminals No. 27 and No. 28 of main fan relay. 2) Measure resistance of main fan relay. Terminal No. 26 — No. 25:	Is the resistance less than 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. 25:	Is the resistance less than 1 Ω?	Go to step 13.	Repair open circuit in harness between main fan motor connector and main fan relay terminal.
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. 27 — (B134) No. 3:	Is the resistance less than 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?	Repair poor contact connector.	Contact with your Subaru distributor.

NOTE:

Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

2. TURBO MODEL

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.
- Radiator main fan does not rotate at high speed when the following conditions are both met:
 - (1) Engine coolant temperature is above 90°C (194°F)
 - (2) A/C is ON

Step	Check	Yes	No
1 CHECK OPERATION OF RADIATOR. 1)Run the engine at idle. (Vehicle stationary) 2)Turn the A/C switch to OFF. 3)Warm the engine coolant temperature over 96°C (205°F).	Does the main radiator fan rotate?	Go to step 2.	Go to step 3.
2 CHECK OPERATION OF RADIATOR. 1)Turn the A/C switch ON at condition of step 1.	Does the main radiator fan rotate faster when A/C compressor is operated?	Radiator main fan system is okay.	Go to step 17.
3 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 96°C (205°F). 4)Stop the engine and turn ignition switch to ON. 5)Measure voltage between main fan motor connector and chassis ground. Connector & terminal (F17) No. 3 (+) — Chassis ground (–):	Is the voltage more than 10 V?	Go to step 4.	Go to step 7.
4 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. 1 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 5.	Repair open circuit in harness between main fan motor connector and chassis ground.
5 CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step 6.
6 CHECK MAIN FAN MOTOR. Connect battery positive (+) terminal to terminal No. 3, and negative (–) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
7 CHECK POWER SUPPLY TO MAIN FAN RELAY1. 1)Turn ignition switch to OFF. 2)Remove main fan relay1 from A/C relay holder. 3)Measure voltage between main fan relay1 terminal and chassis ground. Connector & terminal (F66) No. 26 (+) — Chassis ground (–):	Is the voltage more than 10 V?	Go to step 8.	Go to step 9.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
8 CHECK POWER SUPPLY TO MAIN FAN RELAY1. 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay1 terminal and chassis ground. Connector & terminal (F66) No. 27 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 12 .	Go to step 11 .
9 CHECK 30 A FUSE. 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 10 .
10 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 (-):	Is the voltage more than 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.
11 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?	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.
12 CHECK MAIN FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove main fan relay1. 3) Measure resistance of main fan relay1. Terminal No. 26 — No. 25:	Is the resistance more than 1 MΩ?	Go to step 13 .	Replace main fan relay.
13 CHECK MAIN FAN RELAY. 1) Connect battery to terminals No. 27 and No. 28 of main fan relay1. 2) Measure resistance of main fan relay1. Terminal No. 26 — No. 25:	Is the resistance less than 1 Ω?	Go to step 14 .	Replace main fan relay.
14 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. 3 — (F66) No. 25:	Is the resistance less than 1 Ω?	Go to step 15 .	Repair open circuit in harness between main fan motor connector and main fan relay terminal.
15 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. 28 — (B137) No. 17:	Is the resistance less than 1 Ω?	Go to step 16 .	Repair open circuit in harness between main fan relay and ECM.
16 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?	Repair poor contact connector.	Contact with your Subaru distributor.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
17 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 96°C (205°F). 4)Turn the A/C switch ON. 5)Measure voltage while A/C compressor is rotating. 6)Measure voltage between main fan motor connector and chassis ground. Connector & terminal (F17) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 18.	Go to step 20.
18 CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step 19.
19 CHECK MAIN FAN MOTOR. 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?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
20 CHECK POWER SUPPLY TO MAIN FAN RELAY2. 1)Turn ignition switch to OFF. 2)Remove main fan relay2 from A/C relay holder. 3)Measure voltage between main fan relay2 terminal and chassis ground. Connector & terminal (F30) No. 23 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 21.	Go to step 22.
21 CHECK POWER SUPPLY TO MAIN FAN RELAY2. 1)Turn ignition switch to ON. 2)Measure voltage between main fan relay2 terminal and chassis ground. Connector & terminal (F30) No. 22 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 25.	Go to step 24.
22 CHECK 30 A FUSE. 1)Remove 30 A fuse from A/C relay holder. 2)Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 23.
23 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 (-):	Is the voltage more than 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.
24 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?	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
25 CHECK MAIN FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove main fan relay. 3) Measure resistance of main fan relay. Terminal No. 23 — No. 24:	Is the resistance more than 1 MΩ?	Go to step 26.	Replace main fan relay.
26 CHECK MAIN FAN RELAY. 1) Connect battery to terminals No. 21 and No. 22 of main fan relay. 2) Measure resistance of main fan relay. Terminal No. 23 — No. 24:	Is the resistance less than 1 Ω?	Go to step 27.	Replace main fan relay.
27 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. 24:	Is the resistance less than 1 Ω?	Go to step 28.	Repair open circuit in harness between main fan motor connector and main fan relay terminal.
28 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 (F30) No. 21 — (B134) No. 28:	Is the resistance less than 1 Ω?	Go to step 29.	Repair open circuit in harness between main fan relay and ECM.
29 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?	Repair poor contact connector.	Contact with your Subaru distributor.

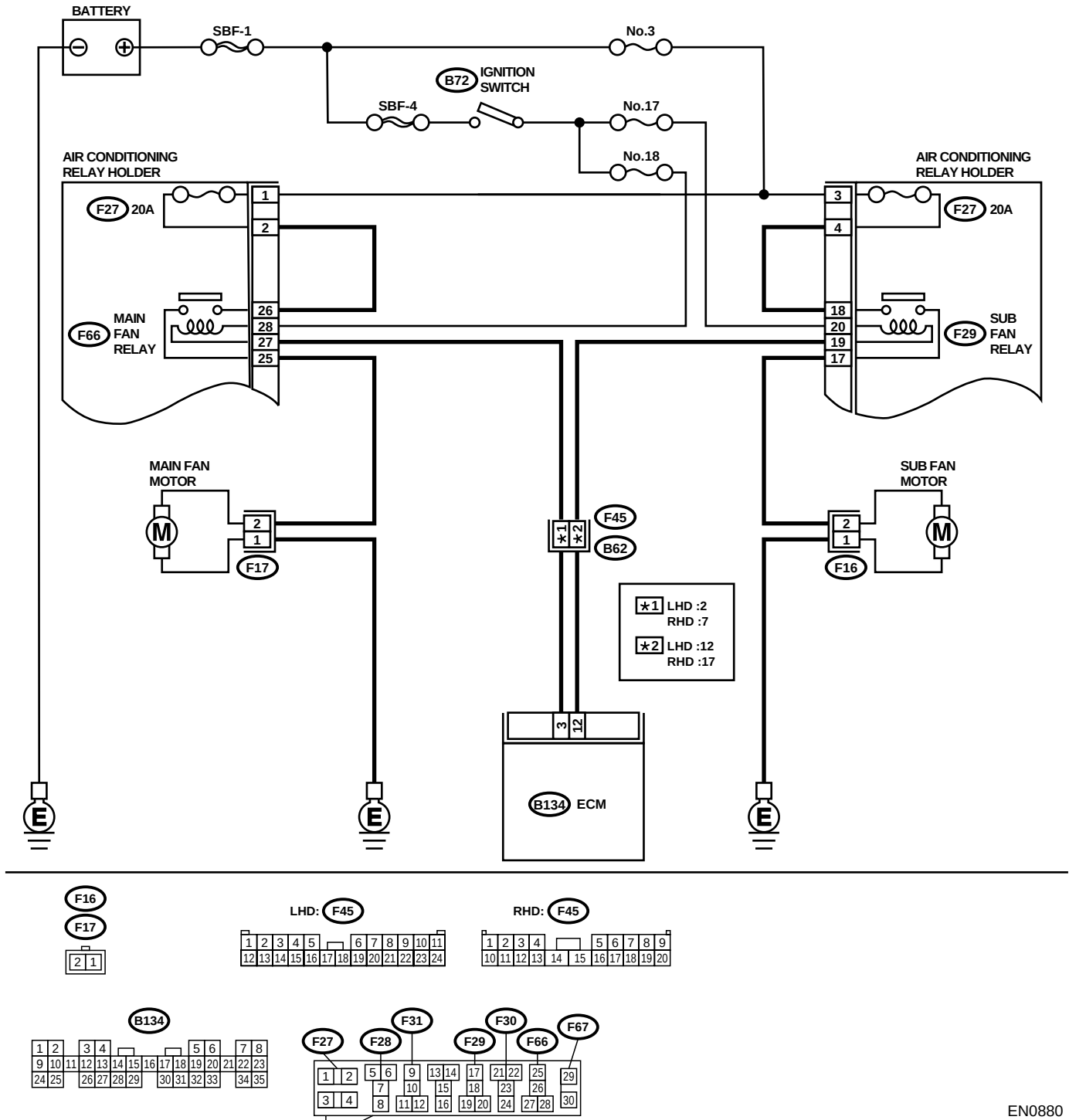
NOTE:

Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

3. Radiator Sub Fan System

A: SCHEMATIC

1. NON-TURBO MODEL

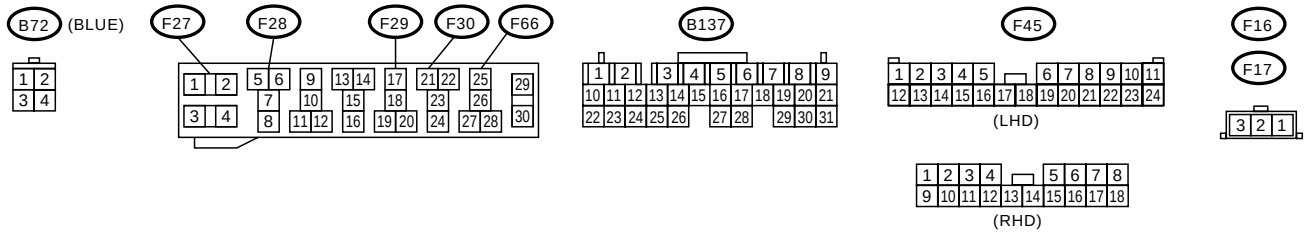
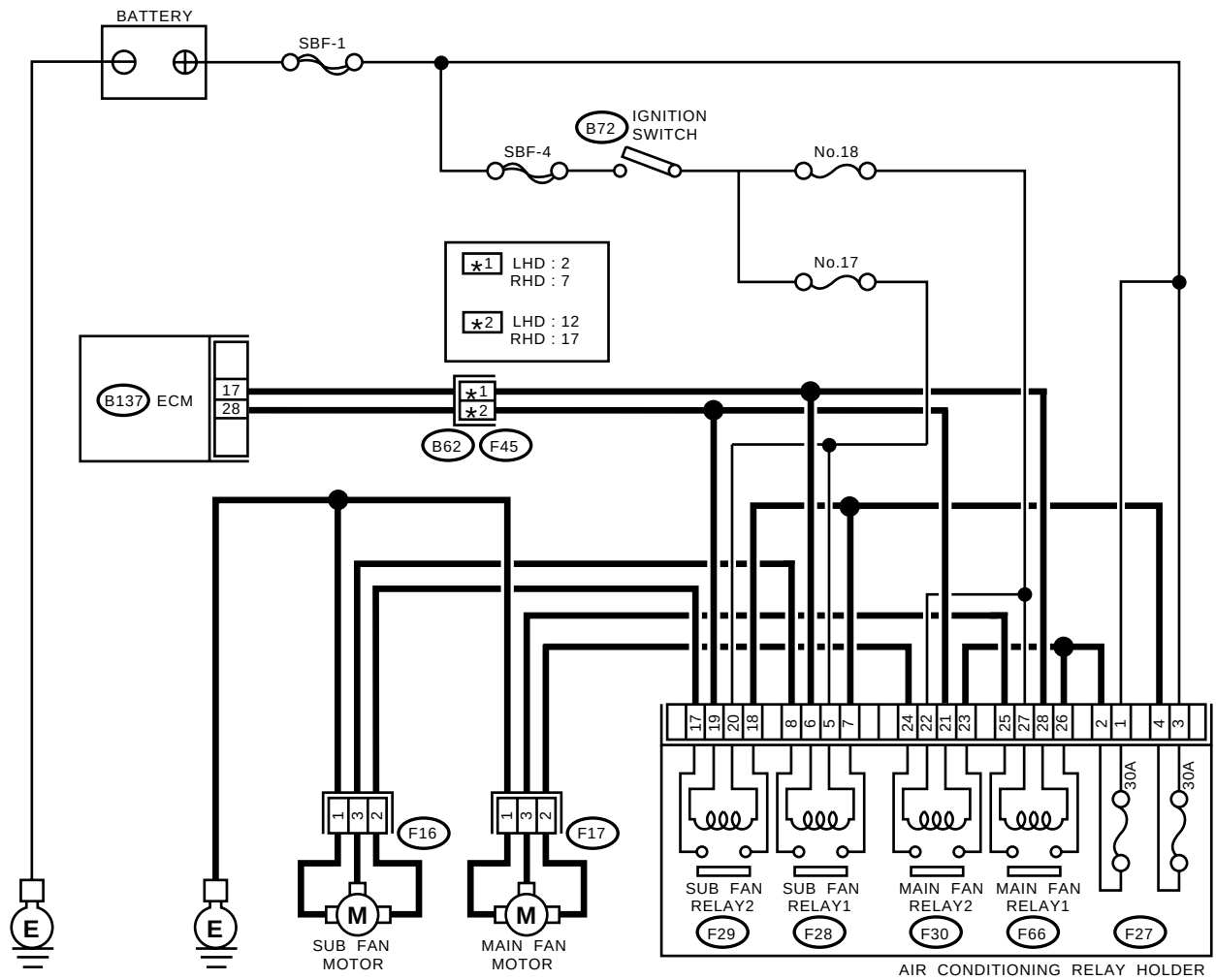


EN0880

RADIATOR SUB FAN SYSTEM

COOLING

2. TURBO MODEL



EN0260

B: INSPECTION

1. NON-TURBO MODEL

NOTE:

System for A/C equipped vehicles only.

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	Check	Yes	No
1 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 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. Connector & terminal (F16) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 5.
2 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. 1 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 3.	Repair open circuit in harness between sub fan motor connector and chassis ground.
3 CHECK POOR CONTACT. Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step 4.
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?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
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. 18 (+) — Chassis ground (-):	Is the voltage more than 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. 20 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 10.	Go to step 9.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
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?	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 (-):	Is the voltage more than 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?	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. 17 — No. 18:	Is the resistance more than 1 MΩ?	Go to step 11 .	Replace sub fan relay.
11 CHECK SUB FAN RELAY. 1)Connect battery to terminals No. 20 and No. 19 of sub fan relay. 2)Measure resistance of sub fan relay. Terminal No. 17 — No. 18:	Is the resistance less than 1 Ω?	Go to step 12 .	Replace sub fan relay.
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. 17:	Is the resistance less than 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. Connector & terminal (F28) No. 19 — (B134) No. 12:	Is the resistance less than 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?	Repair poor contact connector.	Contact with your Subaru distributor.

NOTE:

Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

2. TURBO MODEL

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under the above conditions.
- Radiator sub fan does not rotate at high speed when the following conditions are both met:
 - (1) Engine coolant temperature is above 90°C (194°F)
 - (2) A/C is ON

	Step	Check	Yes	No
1	CHECK OPERATION OF RADIATOR. 1)Run the engine at idle. (Vehicle stationary) 2)Turn the A/C switch to OFF. 3)Warm the engine coolant temperature over 96°C (205°F).	Does the radiator sub fan rotate?	Go to step 2.	Go to step 3.
2	CHECK OPERATION OF RADIATOR. 1)Turn the A/C switch ON at condition of step 1.	Does the radiator sub fan rotate faster when A/C compressor is operated?	Radiator main fan system is okay.	Go to step 17.
3	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 96°C (205°F). 4)Stop the engine and turn ignition switch to ON. 5)Measure voltage between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 3 (+) — Chassis ground (–):	Is the voltage more than 10 V?	Go to step 4.	Go to step 7.
4	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. 1 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 5.	Repair open circuit in harness between sub fan motor connector and chassis ground.
5	CHECK POOR CONTACT. Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step 6.
6	CHECK MAIN FAN MOTOR. Connect battery positive (+) terminal to terminal No. 3, and negative (–) terminal to terminal No. 1 of sub fan motor connector.	Does the main fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
7	CHECK POWER SUPPLY TO SUB FAN RELAY1. 1)Turn ignition switch to OFF. 2)Remove sub fan relay1 from A/C relay holder. 3)Measure voltage between sub fan relay1 terminal and chassis ground. Connector & terminal (F28) No. 7 (+) — Chassis ground (–):	Is the voltage more than 10 V?	Go to step 8.	Go to step 9.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
8 CHECK POWER SUPPLY TO SUB FAN RELAY1. 1)Turn ignition switch to ON. 2)Measure voltage between sub fan relay1 terminal and chassis ground. Connector & terminal (F28) No. 5 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 12 .	Go to step 11 .
9 CHECK 30 A FUSE. 1)Remove 30 A fuse from A/C relay holder. 2)Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 10 .
10 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 (-):	Is the voltage more than 10 V?	Repair open circuit in harness between 30 A fuse and sub fan relay terminal.	Repair open circuit in harness between sub fuse box connector and 30 A fuse terminal.
11 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?	Replace fuse.	Repair open circuit in harness between sub fan relay and ignition switch.
12 CHECK SUB FAN RELAY. 1)Turn ignition switch to OFF. 2)Remove main fan relay1. 3)Measure resistance of sub fan relay1. Terminal No. 7 — No. 8:	Is the resistance more than 1 MΩ?	Go to step 13 .	Replace sub fan relay.
13 CHECK SUB FAN RELAY. 1)Connect battery to terminals No. 6 and No. 5 of sub fan relay1. 2)Measure resistance of sub fan relay. Terminal No. 7 — No. 8:	Is the resistance less than 1 Ω?	Go to step 14 .	Replace sub fan relay.
14 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. 3 — (F28) No. 8:	Is the resistance less than 1 Ω?	Go to step 15 .	Repair open circuit in harness between sub fan motor connector and sub fan relay terminal.
15 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 (F28) No. 6 — (B137) No. 17:	Is the resistance less than 1 Ω?	Go to step 16 .	Repair open circuit in harness between sub fan relay and ECM.
16 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?	Repair poor contact connector.	Contact with your Subaru distributor.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
17 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 96°C (205°F). 4)Turn the A/C switch ON. 5)Measure voltage while A/C compressor is rotating. 6)Measure voltage between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 18.	Go to step 20.
18 CHECK POOR CONTACT. Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step 19.
19 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 main fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
20 CHECK POWER SUPPLY TO SUB FAN RELAY2. 1)Turn ignition switch to OFF. 2)Remove sub fan relay2 from A/C relay holder. 3)Measure voltage between sub fan relay2 terminal and chassis ground. Connector & terminal (F29) No. 18 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 21.	Go to step 22.
21 CHECK POWER SUPPLY TO SUB FAN RELAY2. 1)Turn ignition switch to ON. 2)Measure voltage between sub fan relay2 terminal and chassis ground. Connector & terminal (F29) No. 20 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 23.	Go to step 24.
22 CHECK 30 A FUSE. 1)Remove 30 A fuse from A/C relay holder. 2)Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 23.
23 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 (-):	Is the voltage more than 10 V?	Repair open circuit in harness between 30 A fuse and sub fan relay terminal.	Repair open circuit in harness between sub fuse box connector and 30 A fuse terminal.
24 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?	Replace fuse.	Repair open circuit in harness between sub fan relay and ignition switch.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
25 CHECK SUB FAN RELAY. 1)Turn ignition switch to OFF. 2)Remove sub fan relay2. 3)Measure resistance of main fan relay2. Terminal No. 18 — No. 17:	Is the resistance more than 1 MΩ?	Go to step 26.	Replace sub fan relay.
26 CHECK MAIN FAN RELAY. 1)Connect battery to terminals No. 19 and No. 20 of sub fan relay2. 2)Measure resistance of main fan relay2. Terminal No. 18 — No. 17:	Is the resistance less than 1 Ω?	Go to step 27.	Replace sub fan relay.
27 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure resistance of harness between sub fan motor connector and sub fan relay2 terminal. Connector & terminal (F16) No. 2 — (F29) No. 17:	Is the resistance less than 1 Ω?	Go to step 28.	Repair open circuit in harness between sub fan motor connector and sub fan relay terminal.
28 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 (F29) No. 19 — (B137) No. 28:	Is the resistance less than 1 Ω?	Go to step 29.	Repair open circuit in harness between sub fan relay and ECM.
29 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?	Repair poor contact connector.	Contact with your Subaru distributor.

NOTE:

Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

4. Engine Coolant

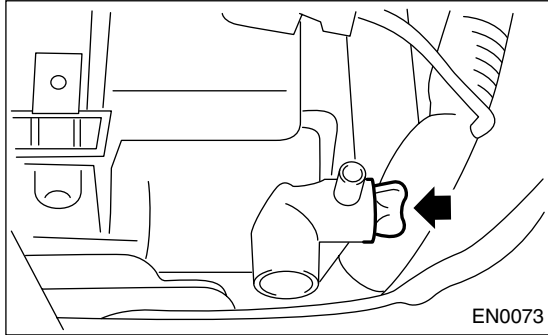
A: REPLACEMENT

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 capacity (fill up to "FULL" level):

1.6 0 AT model

Approx. 7.3 0 (7.71 US qt, 6.42 Imp qt)

1.6 0 MT model

Approx. 7.4 0 (7.82 US qt, 6.51 Imp qt)

Non-turbo 2.0 0 AT model

Approx. 6.9 0 (7.29 US qt, 6.07 Imp qt)

Non-turbo 2.0 0 MT model

Approx. 7 0 (7.4US qt, 6.2 Imp qt)

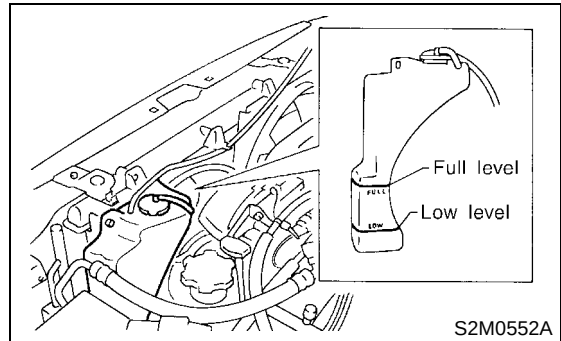
Turbo model

Approx. 7.7 0 (8.14 US qt, 6.78 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) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
- 4) If engine coolant level drops in radiator, add engine coolant to filler neck position.
- 5) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
- 6) Attach radiator cap and reservoir tank cap properly.

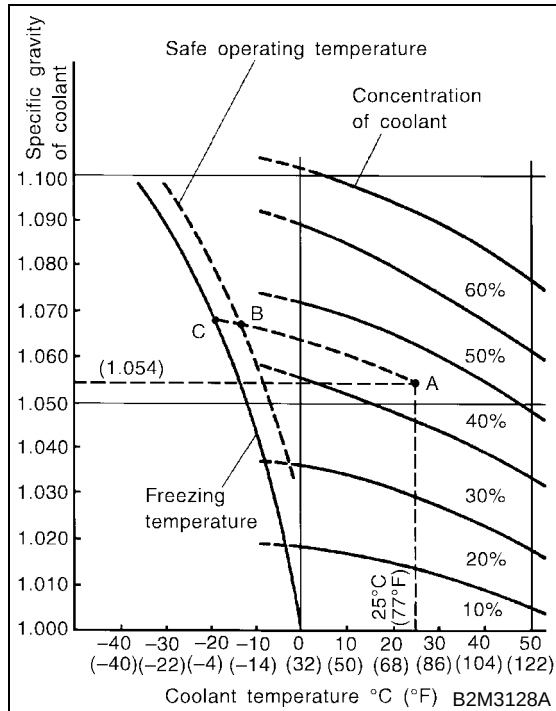
B: INSPECTION

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

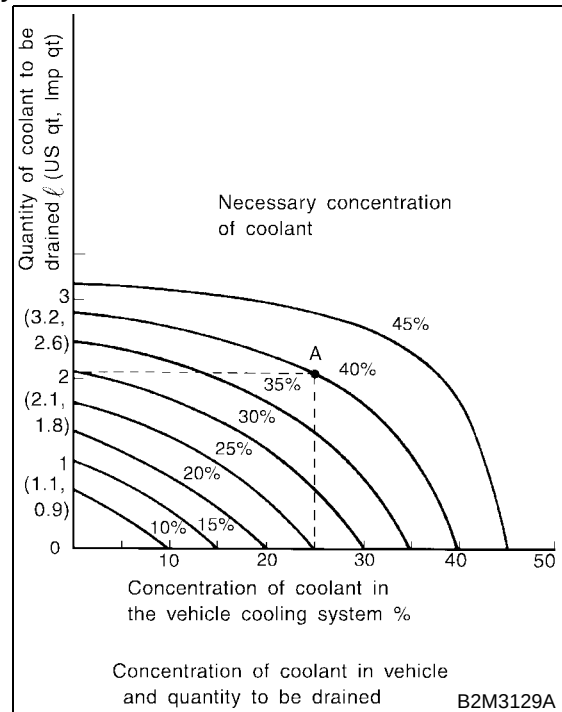
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

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.

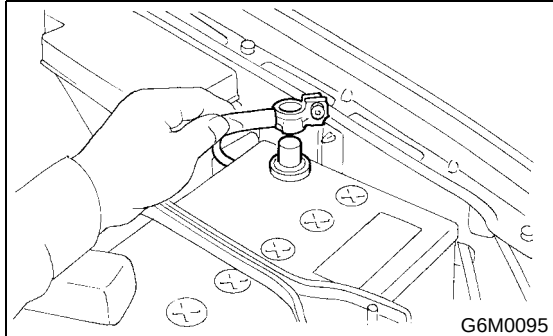


5. Water Pump

A: REMOVAL

1. NON-TURBO MODEL

1) Disconnect ground cable from the battery.



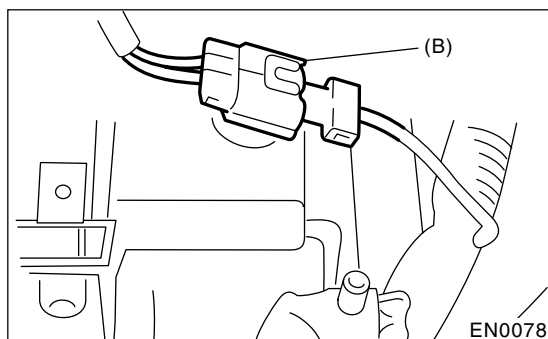
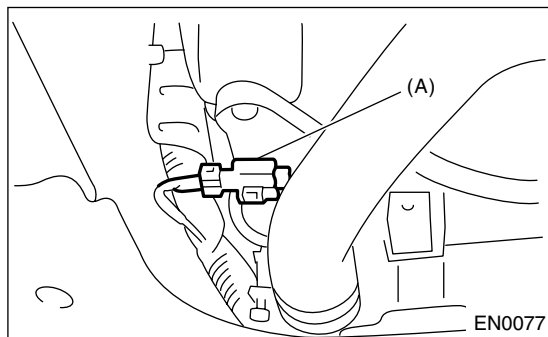
2) Lift-up the vehicle.

3) Remove under cover.

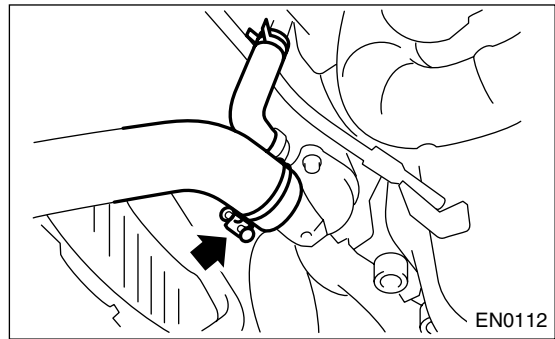
4) Drain engine coolant completely.

<Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

5) Disconnect connectors from radiator main fan (A) and sub fan (B) motors.

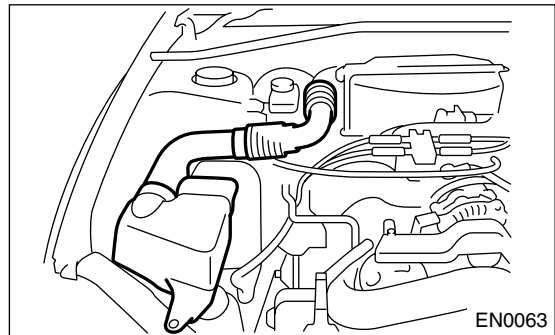


6) Disconnect radiator outlet hose and heater hose from water pump.

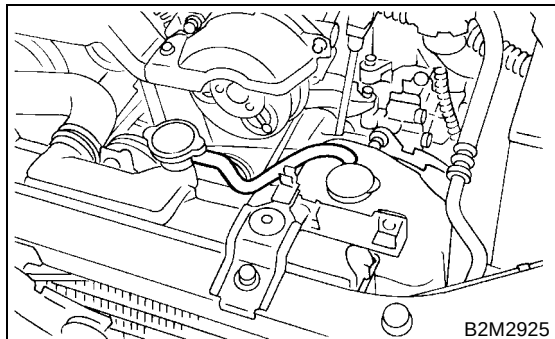


7) Lower the vehicle.

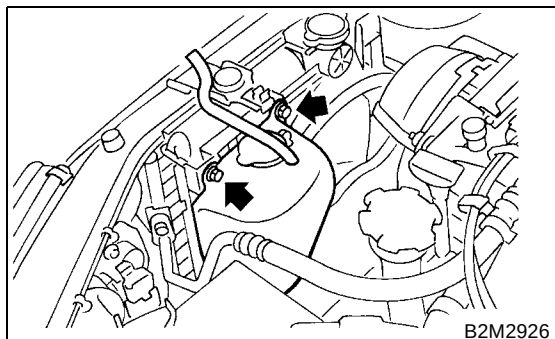
8) Remove air intake duct.



9) Disconnect over flow hose.



10) Remove reservoir tank.



11) Remove radiator main fan and sub fan assemblies. <Ref. to CO-46, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, REMOVAL, Radiator Sub Fan and Fan Motor.>

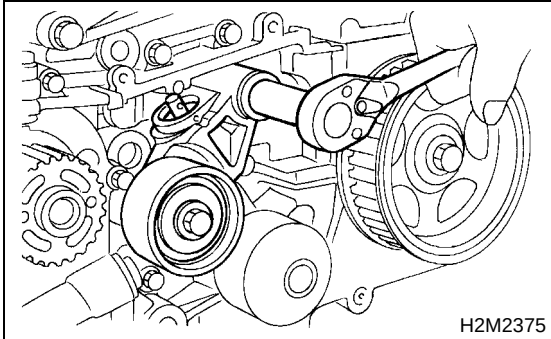
12) Remove V-belts.

<Ref. to ME(SOHC)-42, REMOVAL, V-belt.>

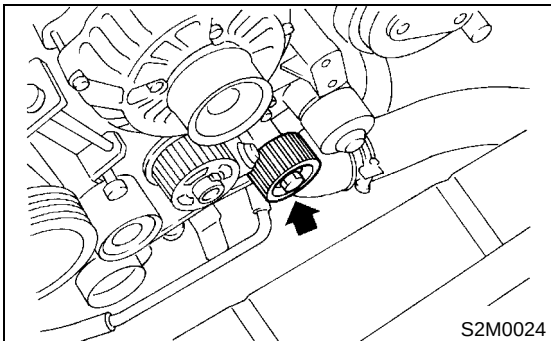
WATER PUMP

COOLING

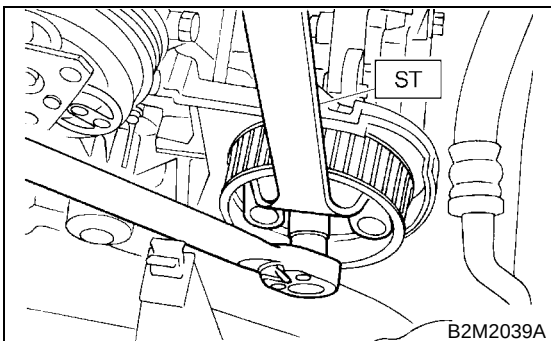
- 13) Remove timing belt.
<Ref. to ME(SOHC)-46, TIMING BELT, REMOVAL, Timing Belt Assembly.>
14) Remove automatic belt tension adjuster.



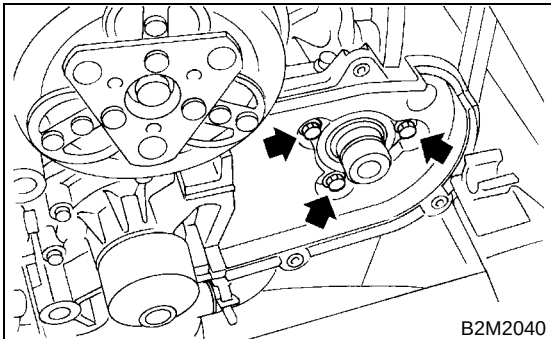
- 15) Remove belt idler No. 2.



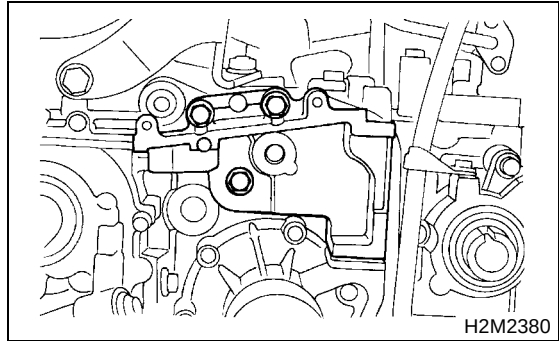
- 16) Remove left-hand camshaft sprocket by using ST.
ST 499207100 CAMSHAFT SPROCKET WRENCH



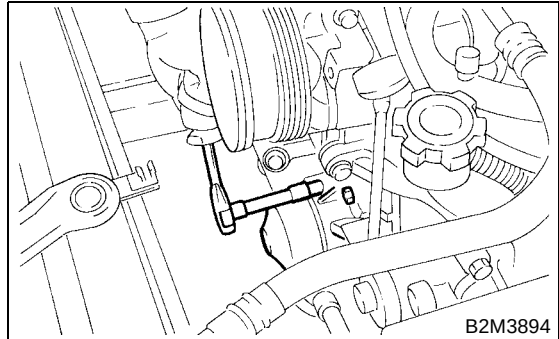
- 17) Remove left-hand belt cover No. 2.



- 18) Remove tensioner bracket.



- 19) Disconnect heater hose from water pump.
20) Remove water pump.

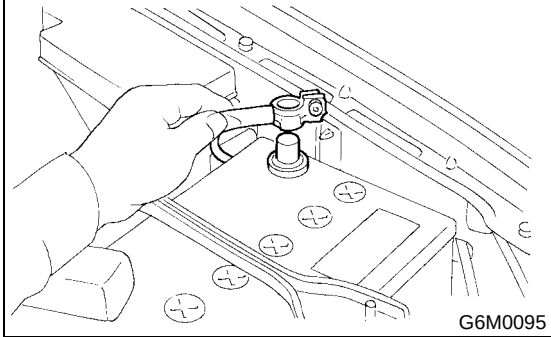


2. TURBO MODEL

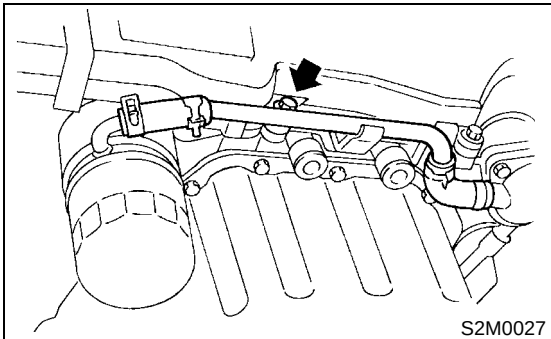
WARNING:

The radiator is pressurized. Wait until engine cools down before working on the radiator.

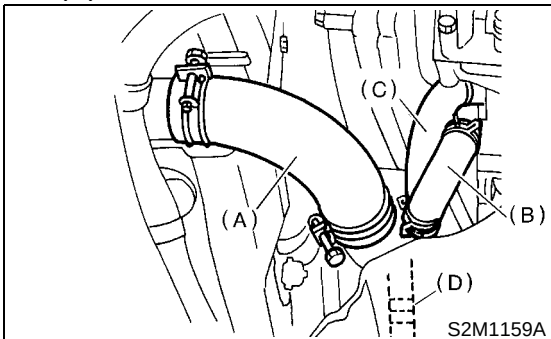
- 1) Set the vehicle on the lift.
- 2) Disconnect ground cable from the battery.



- 3) Lift-up the vehicle.
- 4) Remove under cover.
- 5) Drain engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect connectors from radiator main fan and sub fan motors.
- 7) Remove bolt which installs water by-pass pipe of oil cooler onto oil pump.

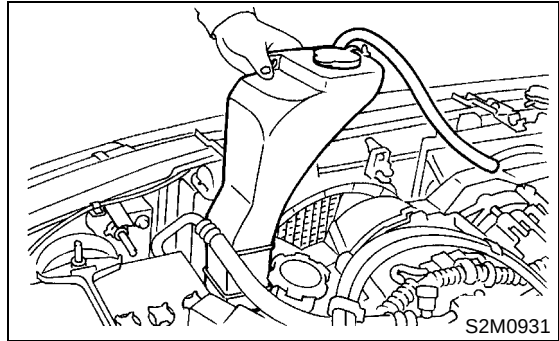


- 8) Disconnect radiator outlet hose (A) and heater hose (B) from water pump.
- 9) Disconnect water by-pass hose (C) and oil cooler hose (D).

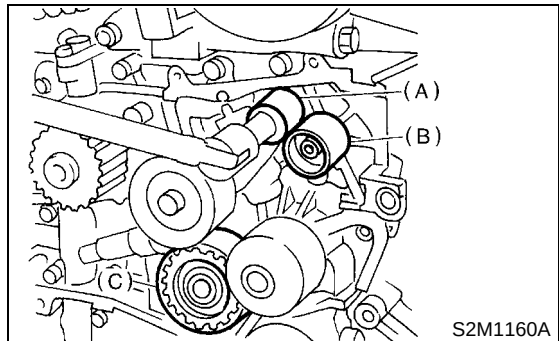


- 10) Lower the vehicle.
- 11) Disconnect over flow hose.

- 12) Remove reservoir tank.

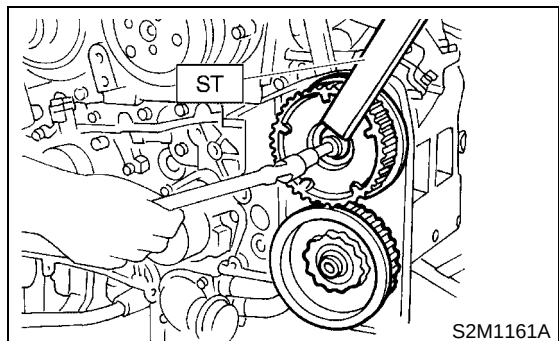


- 13) Remove radiator main fan and sub fan assemblies. <Ref. to CO-46, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, REMOVAL, Radiator Sub Fan and Fan Motor.>
- 14) Remove V-belts. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>
- 15) Remove timing belt. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Timing Belt Assembly.>
- 16) Remove automatic belt tension adjuster (A).
- 17) Remove belt idler (B).
- 18) Remove belt idler No. 2 (C).



- 19) Remove camshaft position sensor. <Ref. to FU(DOHC TURBO)-29, REMOVAL, Camshaft Position Sensor.>
- 20) Remove left-hand camshaft sprockets by using ST.

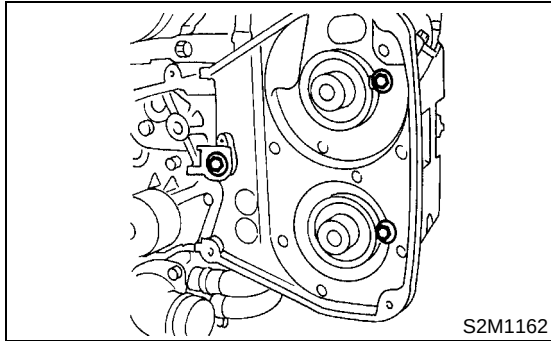
ST 499207400 CAMSHAFT SPROCKET WRENCH



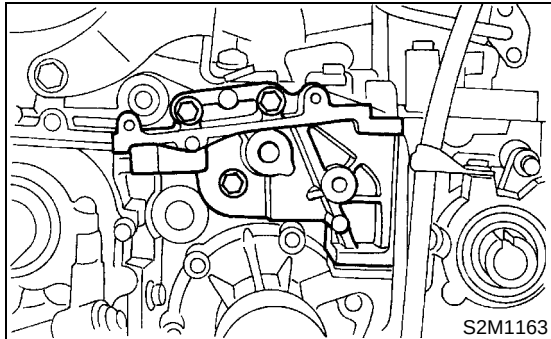
WATER PUMP

COOLING

- 21) Remove left-hand belt cover No. 2.

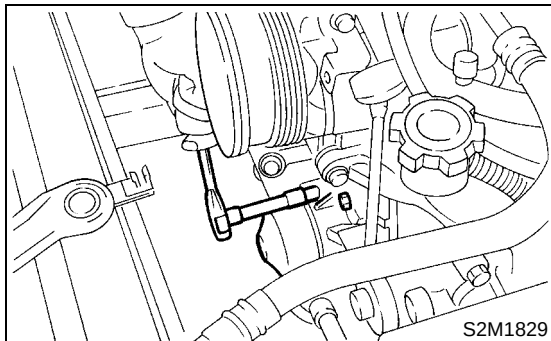


- 22) Remove tensioner bracket.



- 23) Disconnect heater hose from water pump.

- 24) Remove water pump.



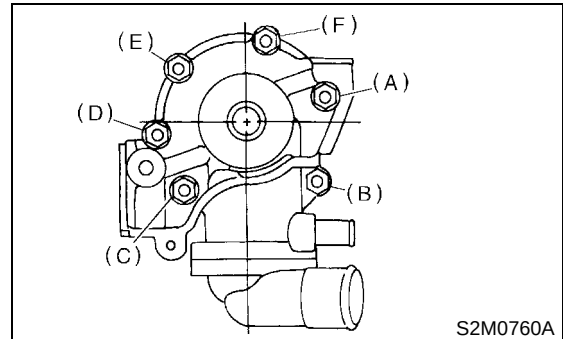
Tightening torque:

First:

12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second:

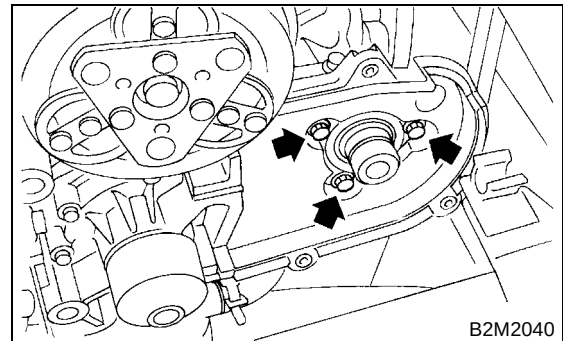
12 N·m (1.2 kgf-m, 8.7 ft-lb)



- 2) Install left-hand belt cover No. 2.

Tightening torque:

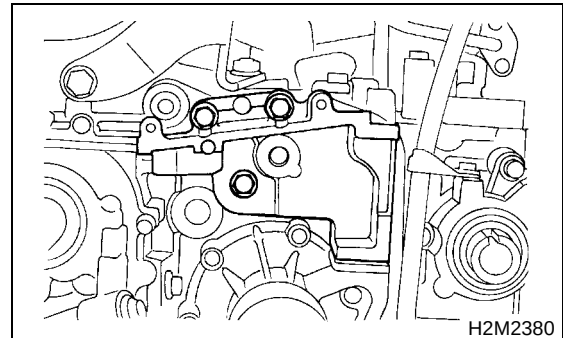
5 N·m (0.5 kgf-m, 3.6 ft-lb)



- 3) Install tensioner bracket.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



B: INSTALLATION

1. NON-TURBO MODEL

- 1) Install water pump onto left-hand cylinder head.

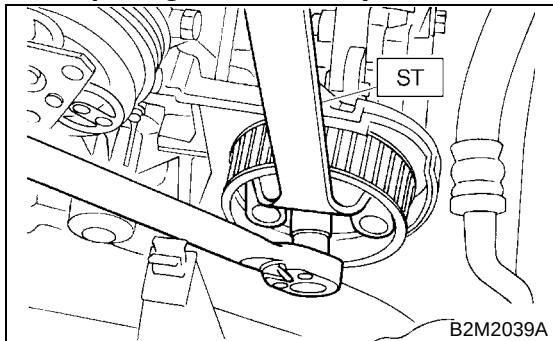
CAUTION:

- Replace gasket with a new one.
- When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.

- 4) Install left-hand camshaft sprockets by using ST.
ST 4992707100 CAMSHAFT SPROCKET
WRENCH

Tightening torque:

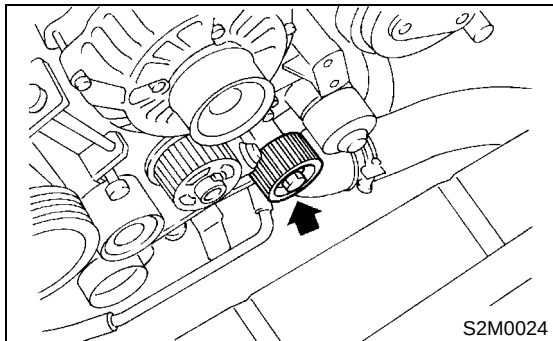
78 N·m (8.0 kgf-m, 57.9 ft-lb)



- 5) Install belt idler No. 2.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)



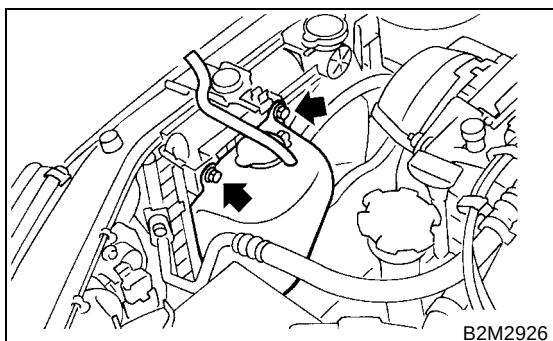
- 6) Install automatic belt tension adjuster which tension rod is held with pin. <Ref. to ME(SOHC)-47, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

- 7) Install timing belt. <Ref. to ME(SOHC)-48, TIMING BELT, INSTALLATION, Timing Belt Assembly.>

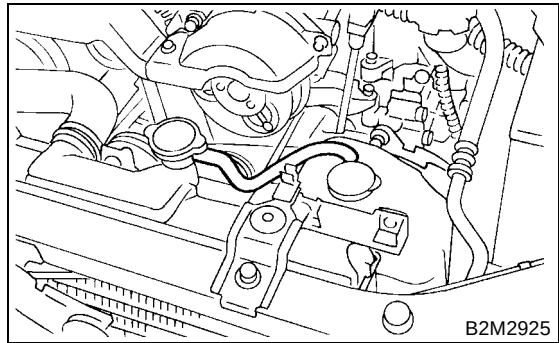
- 8) Install V-belts. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

- 9) Install radiator main fan and sub fan motor assemblies. <Ref. to CO-47, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, INSTALLATION, Radiator Sub Fan and Fan Motor.>

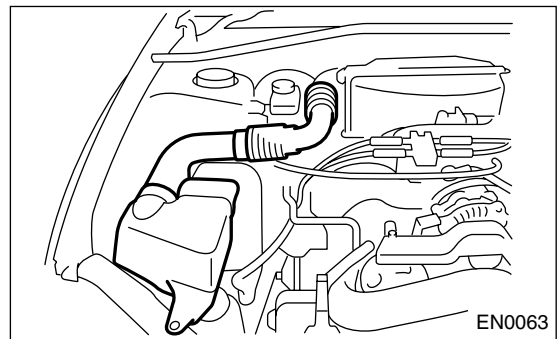
- 10) Install reservoir tank.



- 11) Connect over flow hose.

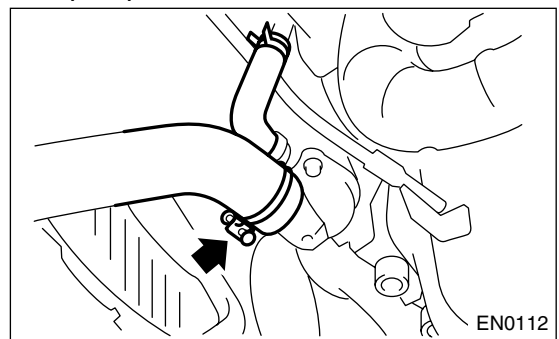


- 12) Install air intake duct.



- 13) Lift-up the vehicle.

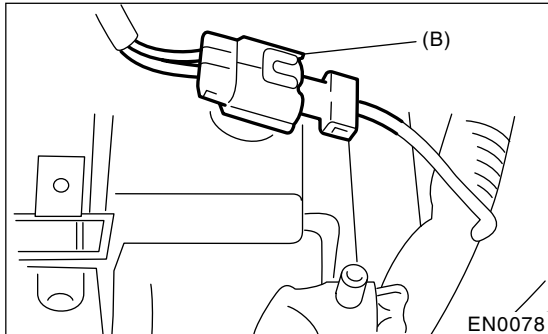
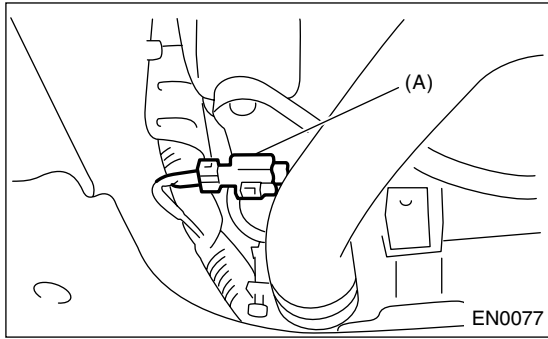
- 14) Connect radiator outlet hose and heater hose to water pump.



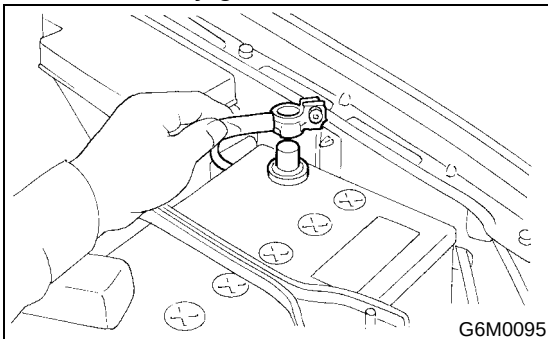
WATER PUMP

COOLING

- 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-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

2. TURBO MODEL

- 1) Install water pump onto left-hand cylinder head.

CAUTION:

- Replace gasket with a new one.
- When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.

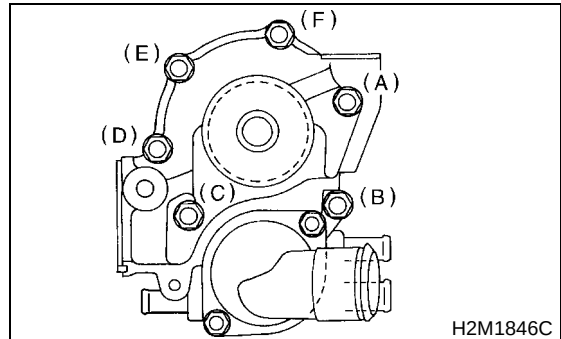
Tightening torque:

First:

12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second:

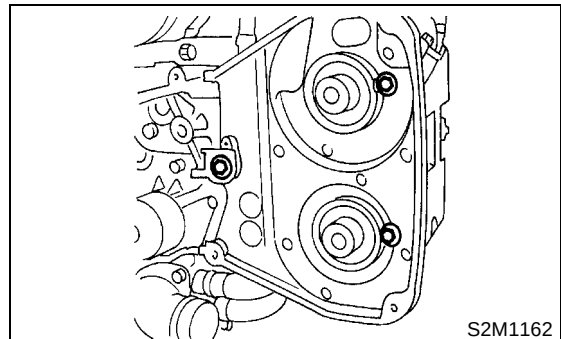
12 N·m (1.2 kgf-m, 8.7 ft-lb)



- 2) Install left-hand belt cover No. 2.

Tightening torque:

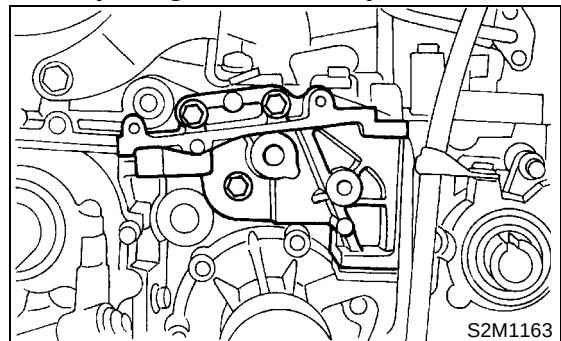
5 N·m (0.5 kgf-m, 3.6 ft-lb)



- 3) Install tensioner bracket.

Tightening torque:

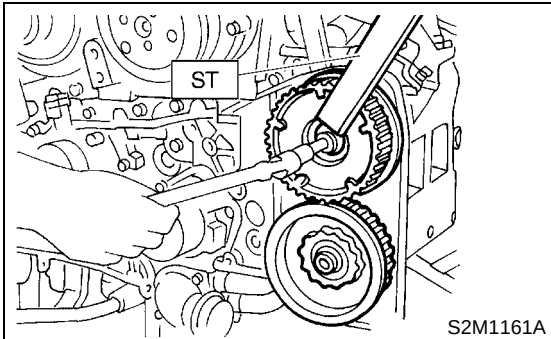
25 N·m (2.5 kgf-m, 18.1 ft-lb)



- 4) Install left-hand camshaft sprockets by using ST.
ST 499207400 CAMSHAFT SPROCKET
WRENCH

Tightening torque:

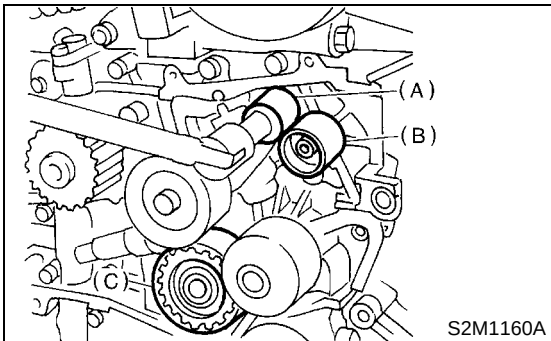
98 N·m (10.0 kgf-m, 72.4 ft-lb)



- 5) Install camshaft position sensor. <Ref. to FU(DOHC TURBO)-29, INSTALLATION, Camshaft Position Sensor.>
6) Install belt idler No. 2 (C).
7) Install belt idler (B).
8) Install automatic belt tension adjuster (A) which has a tension rod held by a pin. <Ref. to ME(DOHC TURBO)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

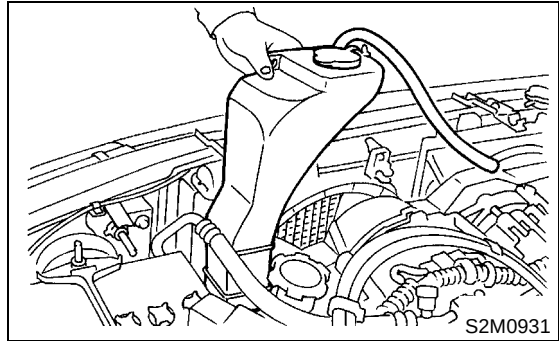
Tightening torque:

39.4 N·m (4.0 kgf-m, 28.9 ft-lb)

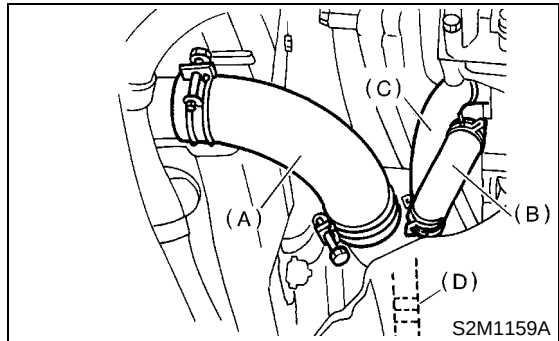


- 9) Install timing belt. <Ref. to ME(DOHC TURBO)-49, TIMING BELT, INSTALLATION, Timing Belt Assembly.>
10) Install V-belts. <Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>
11) Install radiator main fan and sub fan motor assemblies. <Ref. to CO-47, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, INSTALLATION, Radiator Sub Fan and Fan Motor.>

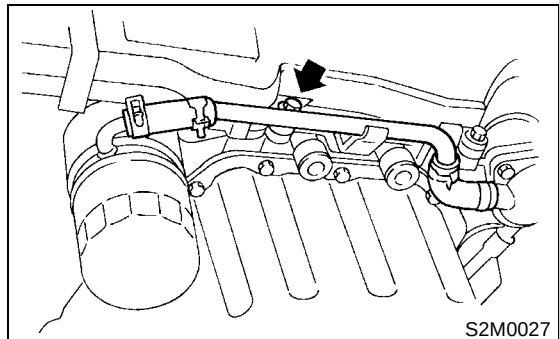
- 12) Install reservoir tank.



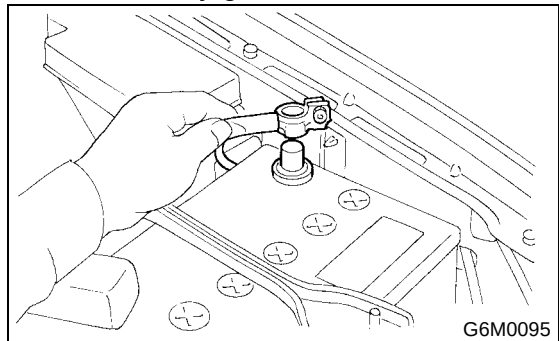
- 13) Connect over flow hose.
14) Lift-up the vehicle.
15) Connect radiator outlet hose (A) and heater hose (B) to water pump.
16) Connect water by-pass hose (C) and oil cooler hose (D).



- 17) Install bolt which installs water by-pass pipe onto oil pump.



- 18) Connect connectors to radiator main fan and sub fan motors.
19) Install under cover.
20) Lower the vehicle.
21) Connect battery ground cable.



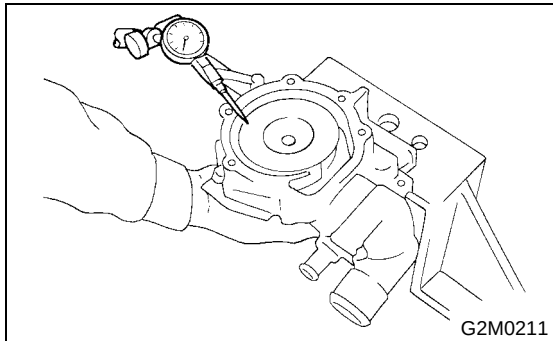
22) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

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.

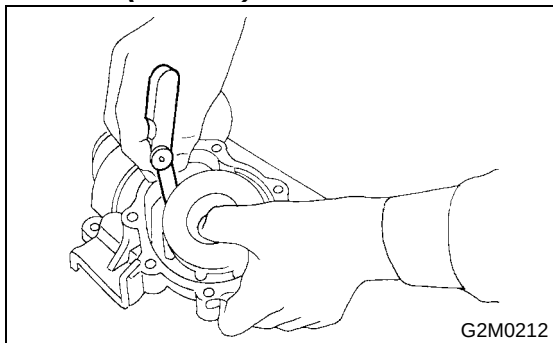
Clearance between impeller and pump case:

Standard

0.5 — 0.7 mm (0.020 — 0.028 in)

Limit

1.0 mm (0.039 in)

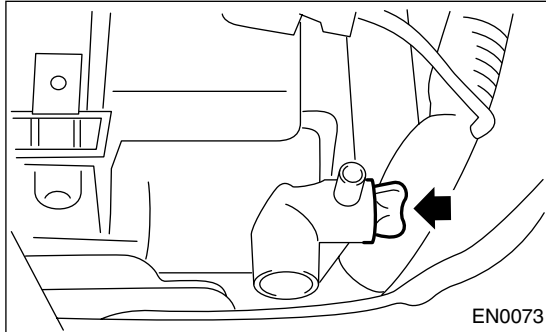


- 5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace water pump assembly.

6. Thermostat

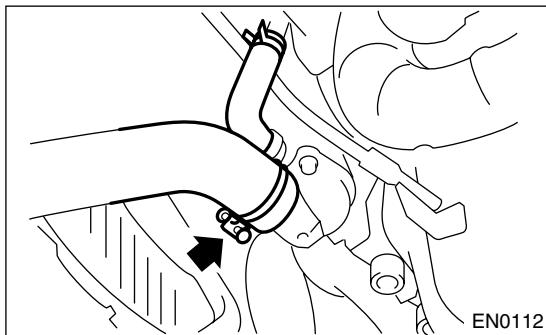
A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove under cover.
- 3) Drain engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



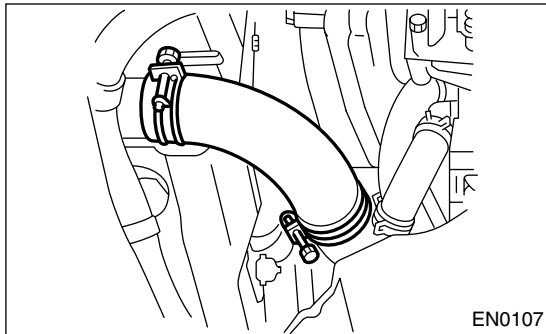
- 4) Disconnect radiator outlet hose from thermostat cover.

- Non-Turbo model

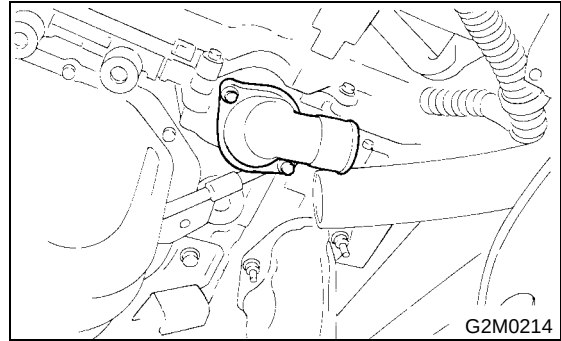


- 5) Disconnect radiator outlet hose.

- Turbo model



- 6) Remove thermostat cover and gasket, and pull out the thermostat.



B: INSTALLATION

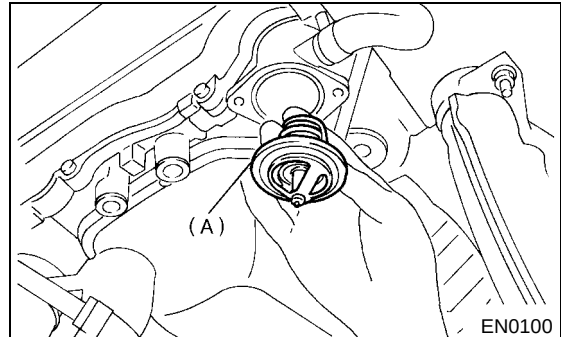
- 1) Install the thermostat in the water pump, and install the thermostat cover together with a gasket.

CAUTION:

- When reinstalling the thermostat, use a new gasket.
- The thermostat must be installed with the jiggle pin (A) facing to front side.
- At this time, set the jiggle pin of thermostat for front side.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



- 2) Fill coolant. <Ref. to CO-25, 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.

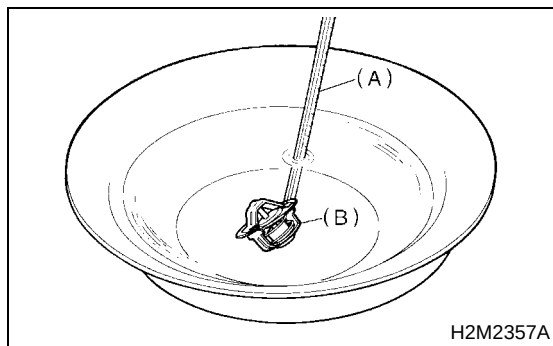
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:

76 — 80°C (169 — 176°F)

Fully opens:

91°C (196°F)



(A) Thermometer

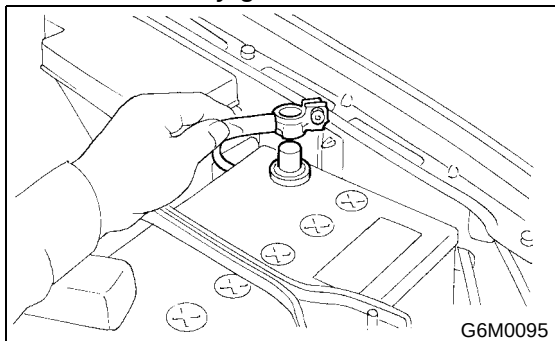
(B) Thermostat

7. Radiator

A: REMOVAL

1. NON-TURBO MODEL

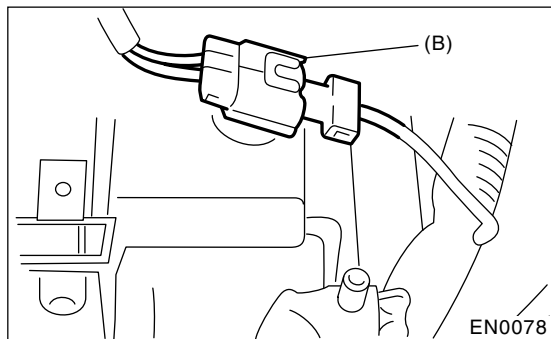
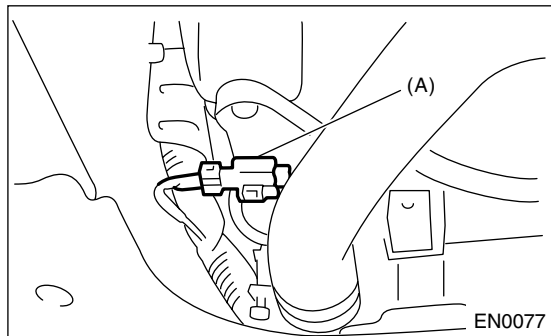
1) Disconnect battery ground cable.



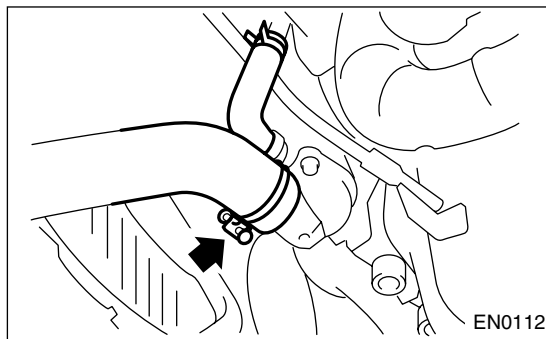
2) Lift-up the vehicle.

3) Drain engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

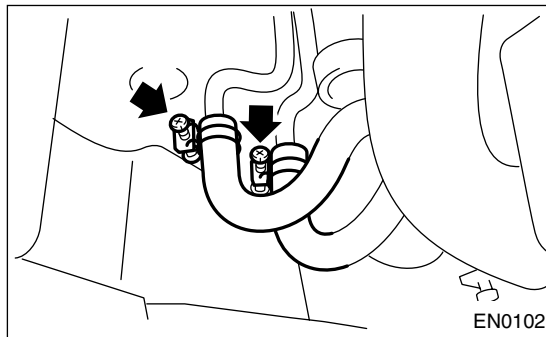
4) Disconnect connectors of radiator main fan (A) and sub fan (B) motor.



5) Disconnect radiator outlet hose from thermostat cover.

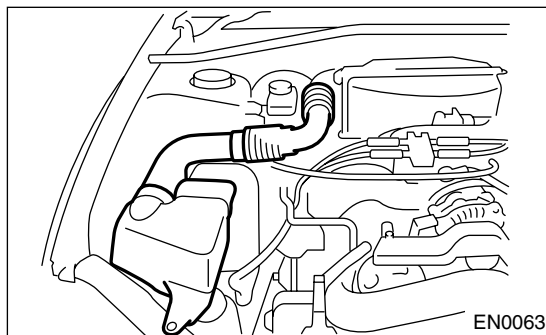


6) Disconnect ATF cooler hoses from radiator. (AT vehicles only)

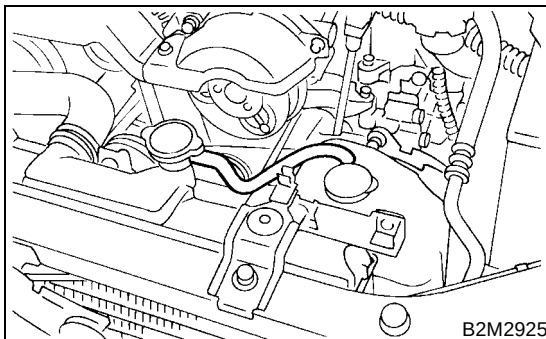


7) Lower the vehicle.

8) Remove air intake duct.



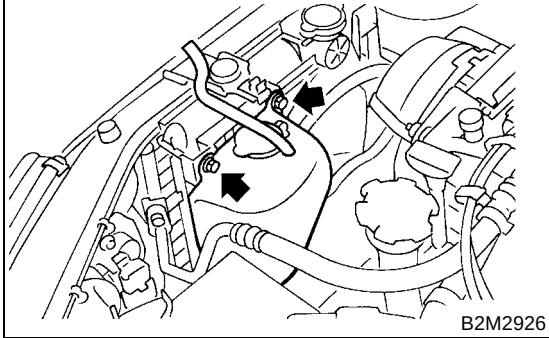
9) Disconnect over flow hose.



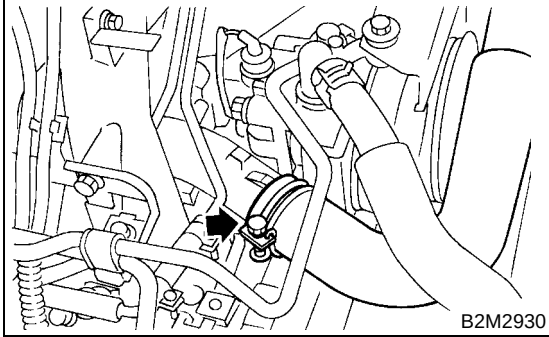
RADIATOR

COOLING

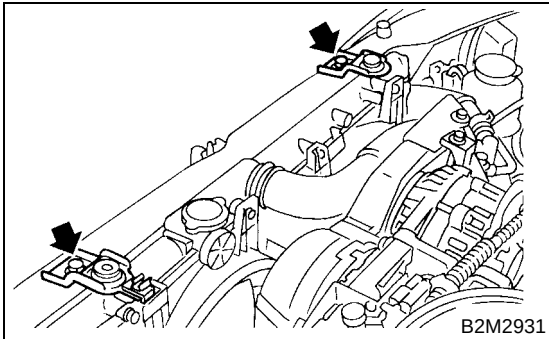
10) Remove reservoir tank.



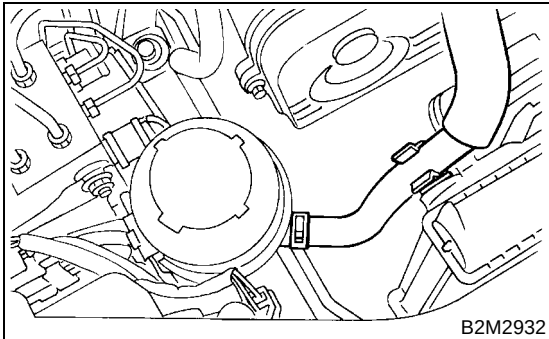
11) Disconnect radiator inlet hose from engine.



12) Remove radiator upper brackets.

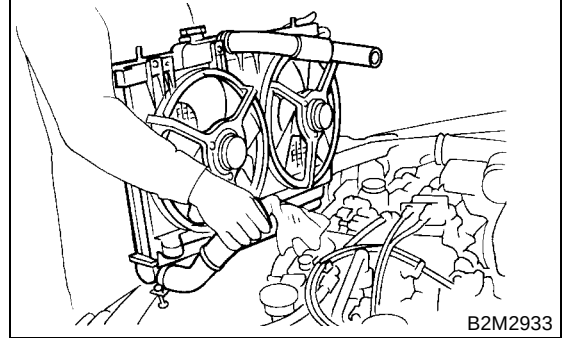


13) Detach power steering hose from the clip on the radiator.



14) While slightly lifting radiator, slide it to left.

15) Lift radiator up and away from vehicle.

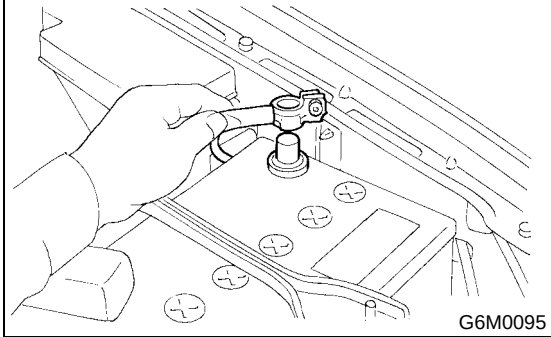


2. TURBO MODEL

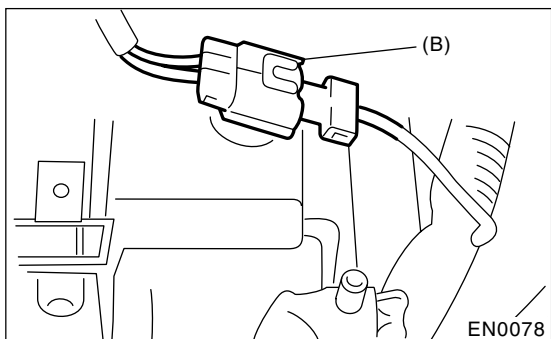
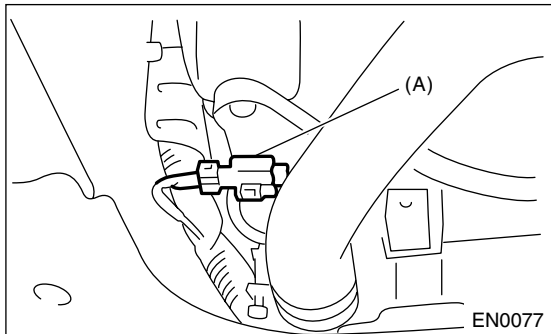
WARNING:

The radiator is pressurized. Wait until engine cools down before working on the radiator.

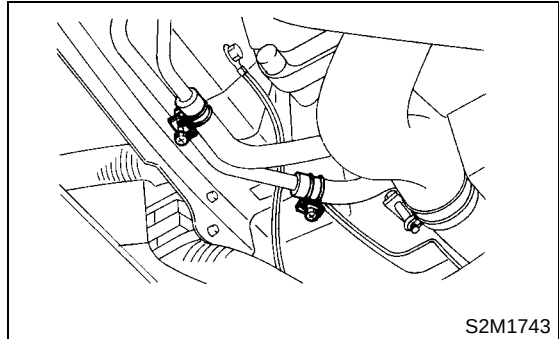
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.



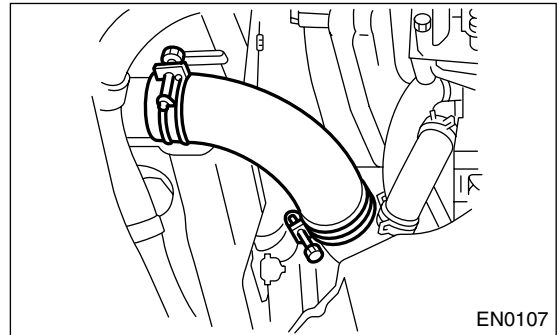
- 3) Lift-up the vehicle.
- 4) Remove under cover.
- 5) Drain engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect connectors of radiator main fan (A) and sub fan motor (B).



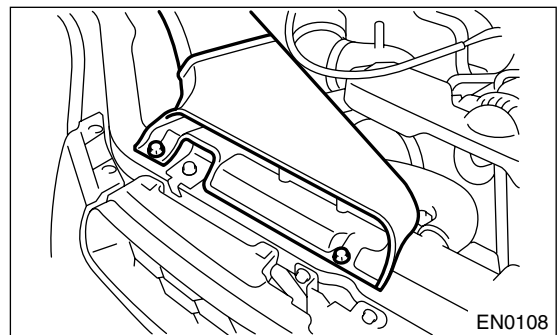
- 7) Disconnect oil cooler hoses from oil cooler pipes. (if equipped)



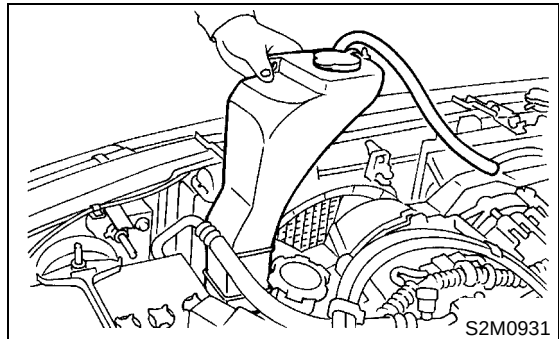
- 8) Disconnect radiator outlet hose from thermostat cover.



- 9) Lower the vehicle.
- 10) Remove air intake duct.



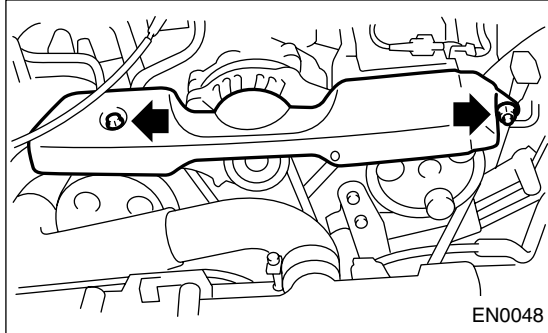
- 11) Disconnect over flow hose.
- 12) Remove reservoir tank.



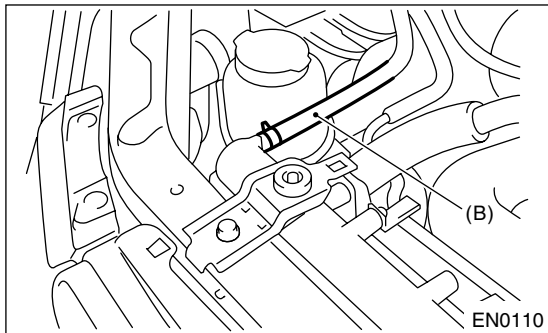
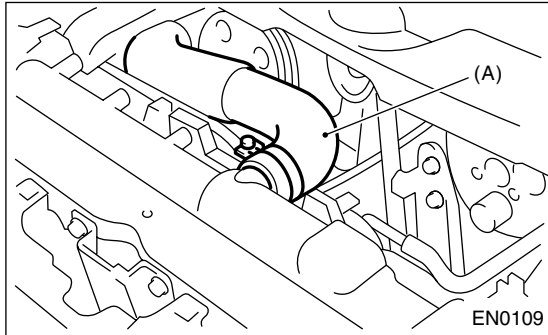
RADIATOR

COOLING

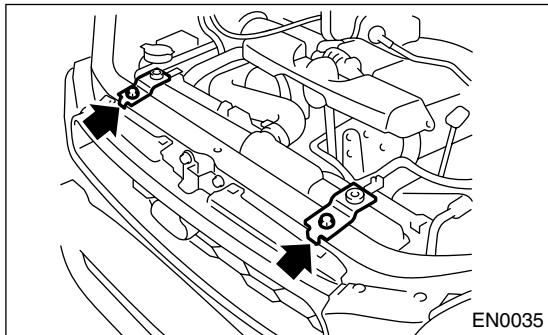
13) Remove V-belt covers.



14) Disconnect radiator inlet hose (A) and water tank hose (B) from radiator.



15) Remove radiator upper brackets.

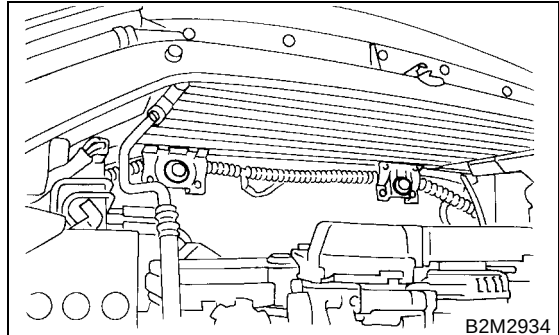


16) While slightly lifting radiator, slide it to left.
17) Lift radiator up and away from vehicle.

B: INSTALLATION

1. NON-TURBO MODEL

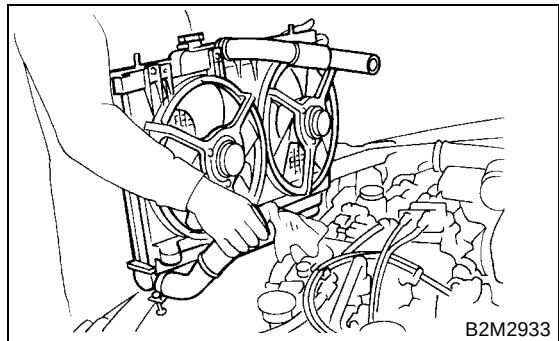
1) Attach radiator mounting cushions to holes on the vehicle.



2) Install radiator while fitting radiator pins to cushions.

NOTE:

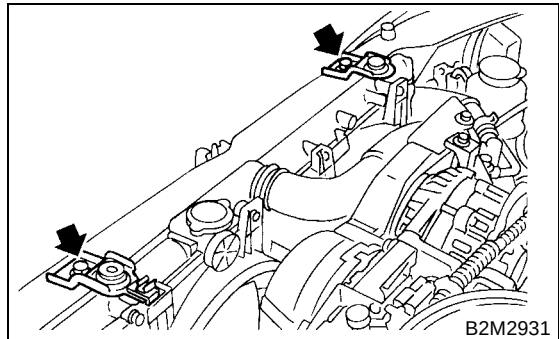
Fit pins on lower side of radiator into cushions on body side.



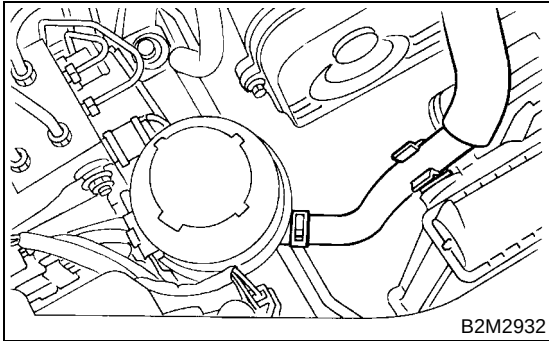
3) Install radiator brackets and tighten bolts.

Tightening torque:

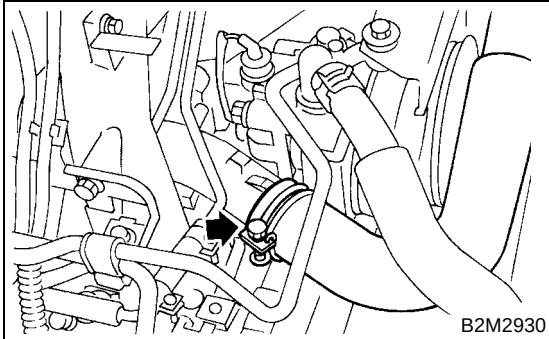
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Attach power steering hose to the radiator.



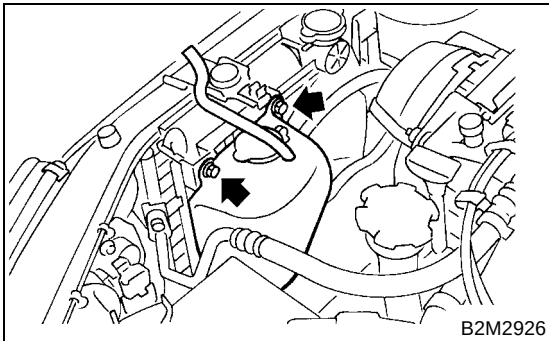
5) Connect radiator inlet hose.



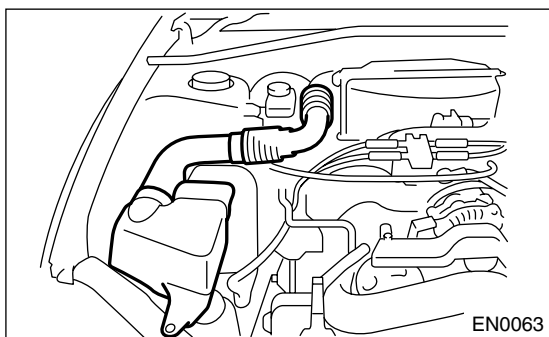
6) Install reservoir tank.

Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

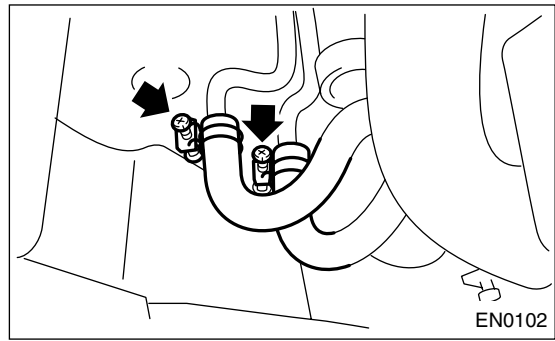


7) Install air intake duct.

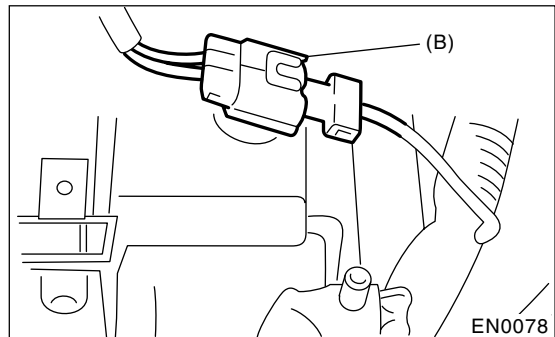
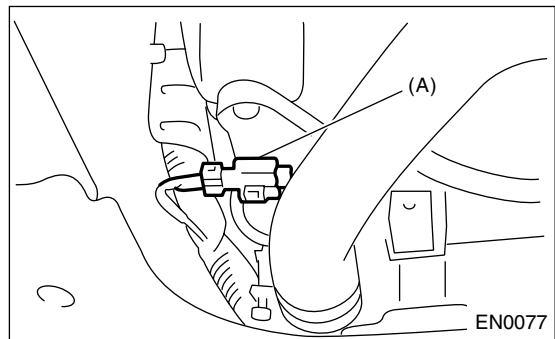


8) Lift-up the vehicle.

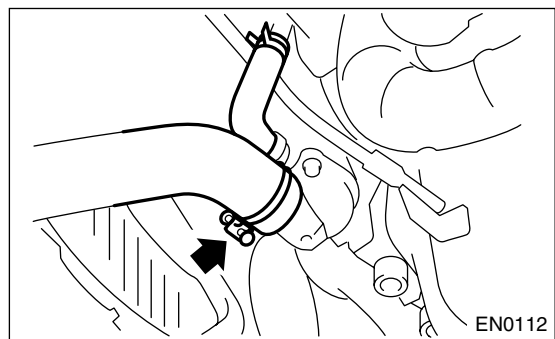
9) Connect ATF cooler hoses. (AT vehicles only)



10) Connect connectors to radiator main fan motor (A) and sub fan motor (B).



11) Connect radiator outlet hose.



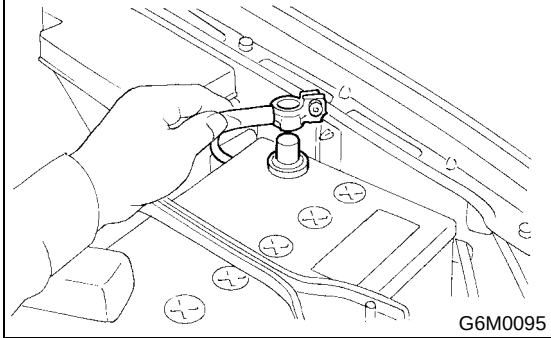
12) Install under cover.

13) Lower the vehicle.

RADIATOR

COOLING

14) Connect battery ground cable.

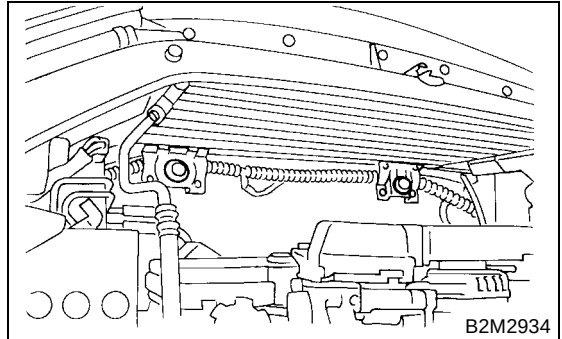


15) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

16) Check ATF level. <Ref. to AT-9, INSPECTION, Automatic Transmission Fluid.>

2. TURBO MODEL

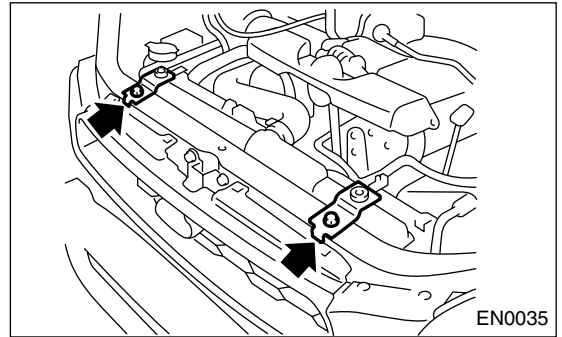
1) Attach radiator mounting cushions to holes on the vehicle.



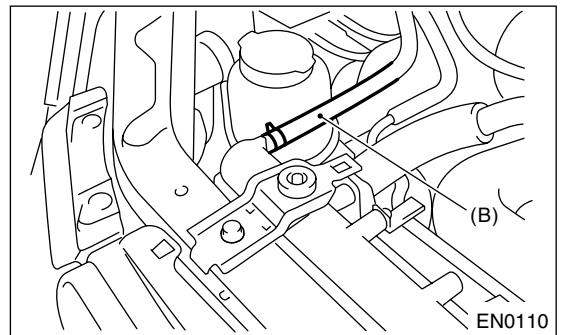
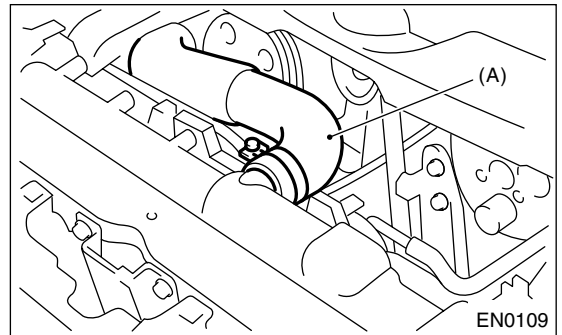
2) Install radiator brackets and tighten bolts.

Tightening torque:

18 ± 5 N·m (1.8 ± 0.5 kgf·m, 13.0 ± 3.6 ft·lb)



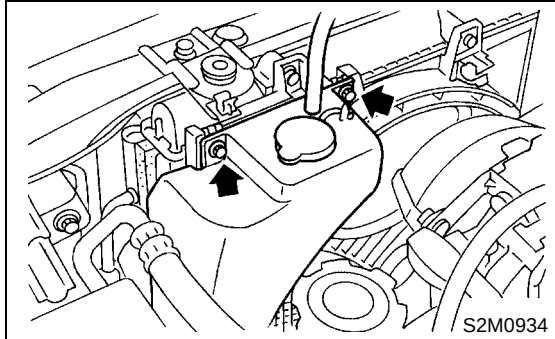
3) Connect radiator inlet hose (A) and water tank hose (B).



4) Install reservoir tank.

Tightening torque:

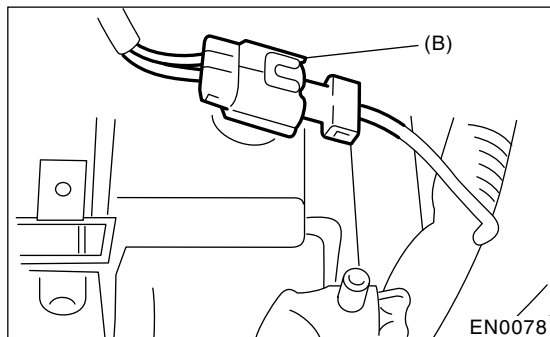
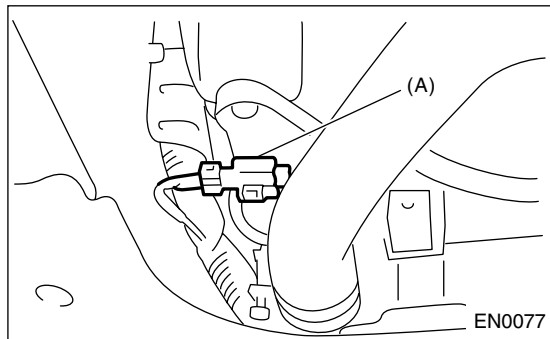
$4.9 \pm 1.5 \text{ N}\cdot\text{m}$ ($0.50 \pm 0.15 \text{ kgf}\cdot\text{m}$, $3.6 \pm 1.1 \text{ ft}\cdot\text{lb}$)



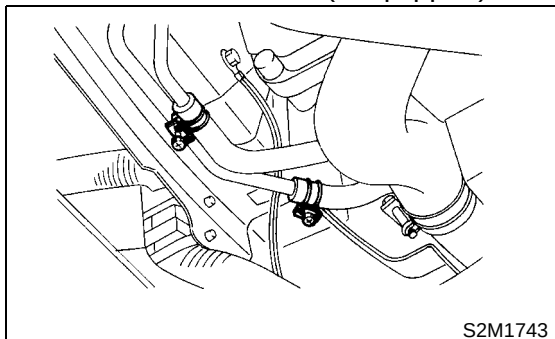
5) Connect over flow hose.

6) Lift-up the vehicle.

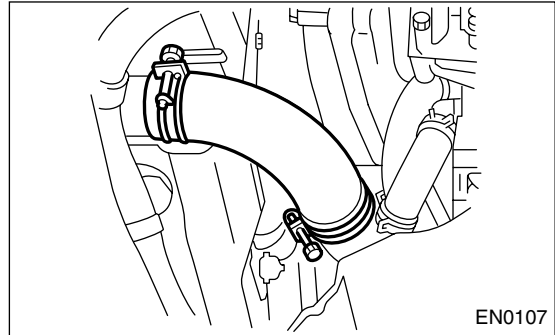
7) Connect connectors to radiator main fan motor(A) and sub fan motor(B).



8) Connect oil cooler hoses. (if equipped)



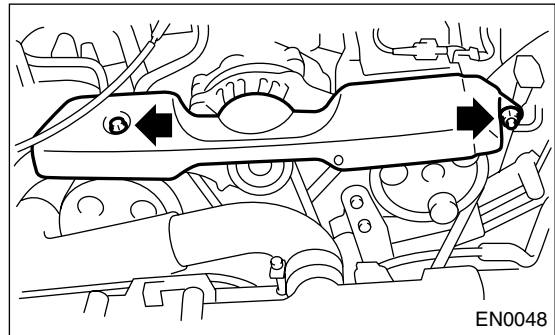
9) Connect radiator outlet hose.



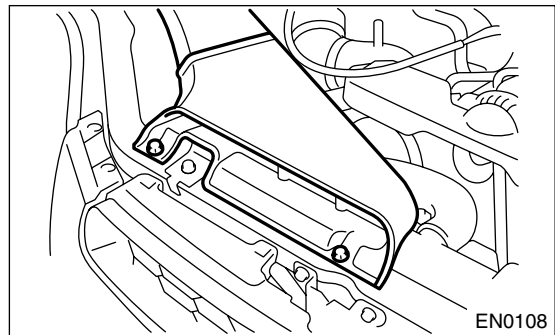
10) Install under cover.

11) Lower the vehicle.

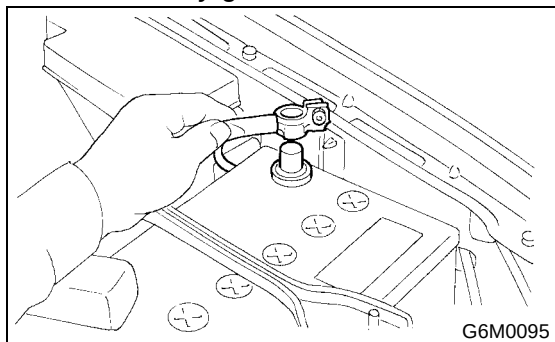
12) Install V-belt covers.



13) Install air intake duct.



14) Connect battery ground cable.

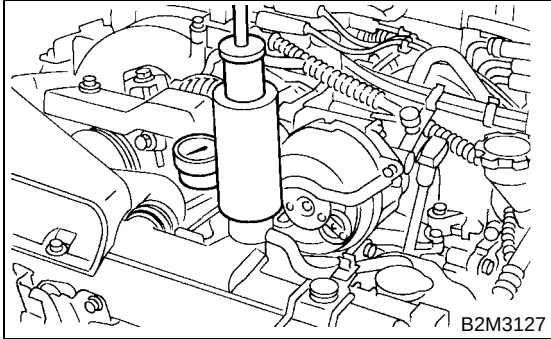


15) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

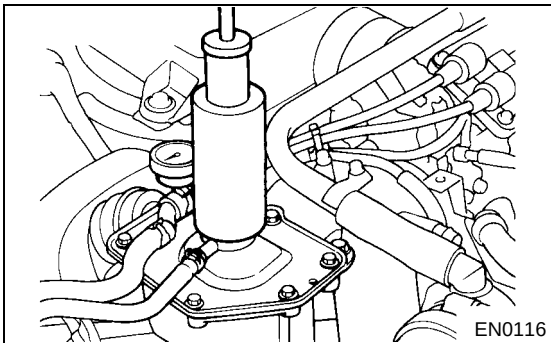
C: INSPECTION

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.

- Non-Turbo model



- Turbo model



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.

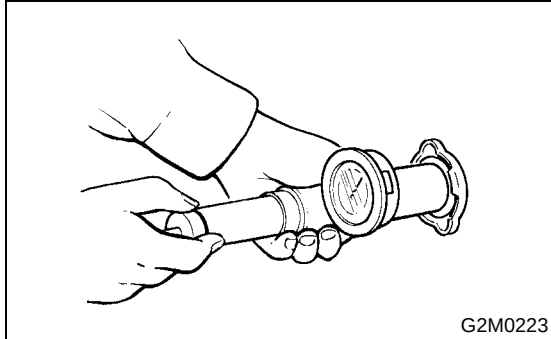
CAUTION:

- 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)

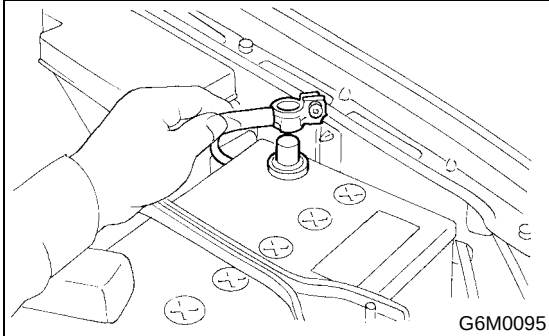
CAUTION:

Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

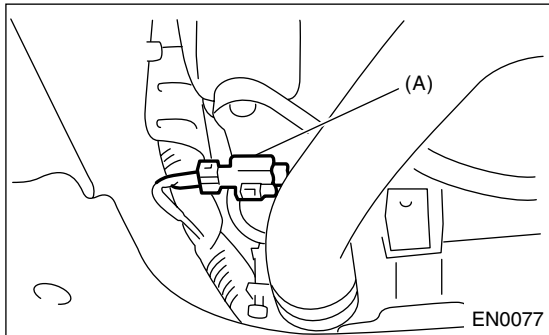
9. Radiator Main Fan and Fan Motor

A: REMOVAL

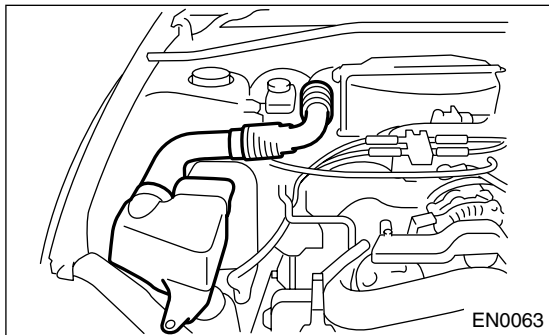
- 1) Disconnect battery ground cable.



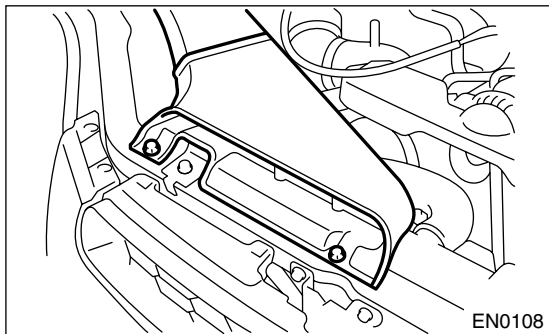
- 2) Lift-up the vehicle.
- 3) Remove under cover.
- 4) Disconnect connector of main fan motor (A).



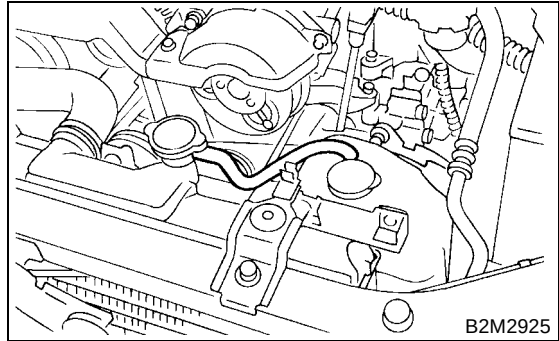
- 5) Lower the vehicle.
- 6) Remove air intake duct.
- Non-Turbo model



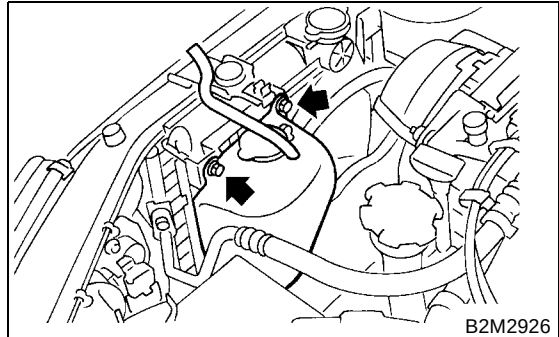
- Turbo model



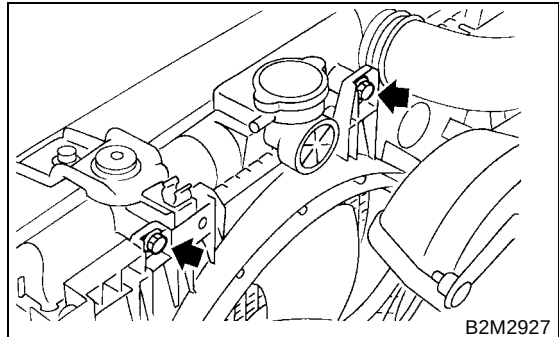
- 7) Disconnect over flow hose.



- 8) Remove over flow pipe. (Turbo model)
- 9) Remove reservoir tank.



- 10) Remove radiator main fan motor assembly.

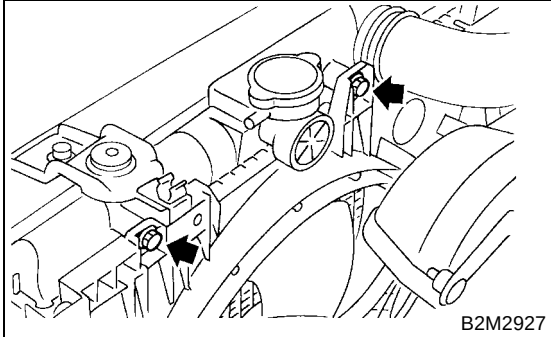


B: INSTALLATION

Install in the reverse order of removal.

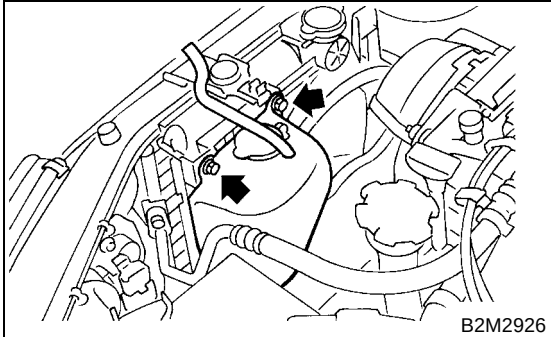
NOTE:

When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.



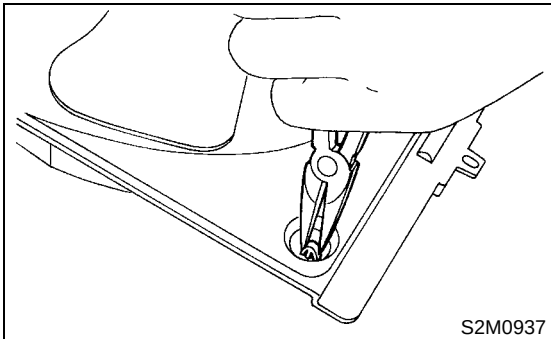
Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

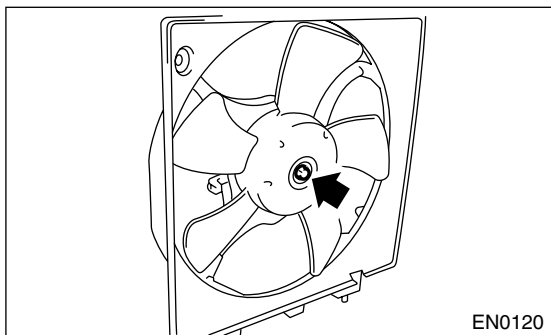


C: DISASSEMBLY

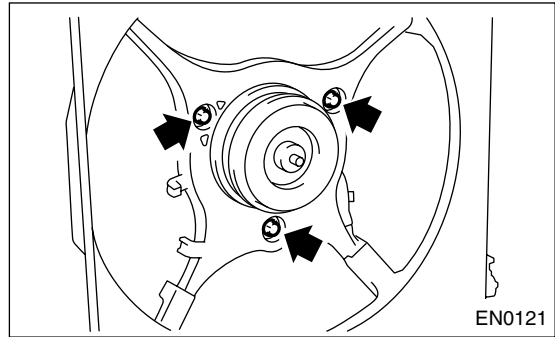
1) Remove clip which holds motor connector onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



3) Remove bolts which install fan motor onto shroud.

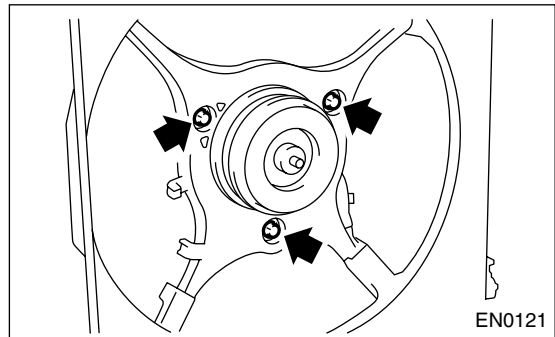


D: ASSEMBLY

Assemble in the reverse order of disassembly.

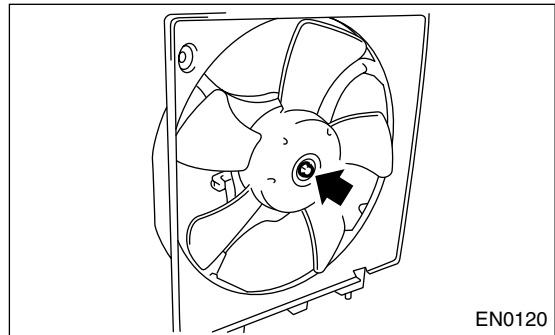
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Tightening torque:

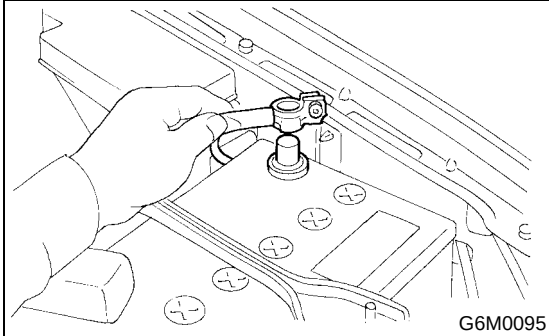
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



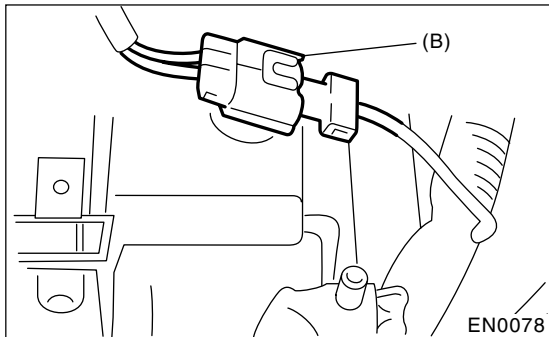
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

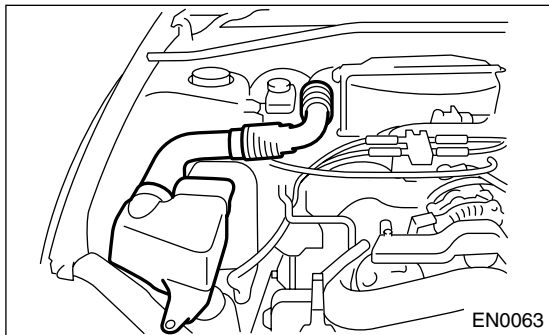
- 1) Disconnect battery ground cable.



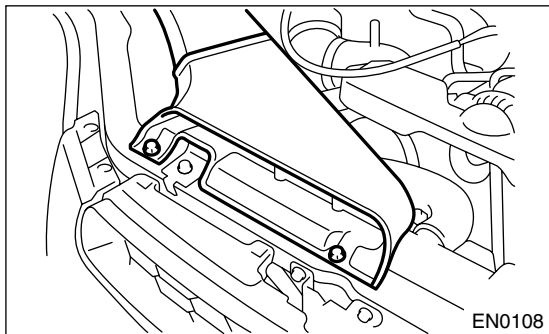
- 2) Lift-up the vehicle.
- 3) Remove under cover.
- 4) Disconnect connector of sub fan motor.



- 5) Lower the vehicle.
- 6) Remove air intake duct.
- Non-Turbo model

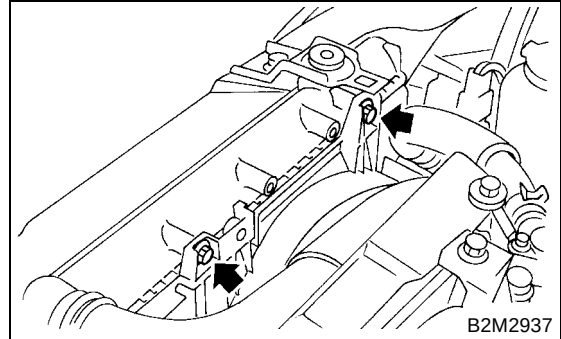


- Turbo model



- 7) Remove bolts which hold sub fan shroud to radiator.

- 8) Remove over flow pipe. (Turbo model)
- 9) Remove radiator sub fan shroud through the under side of vehicle.

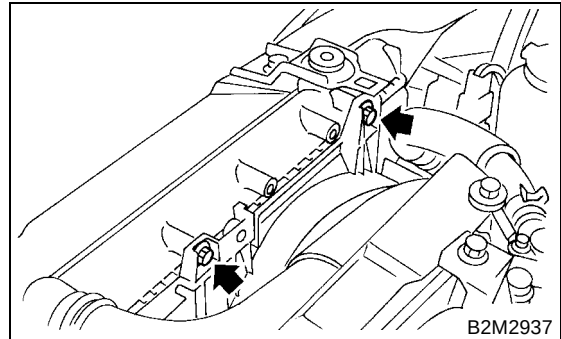


B: INSTALLATION

Install in the reverse order of removal.

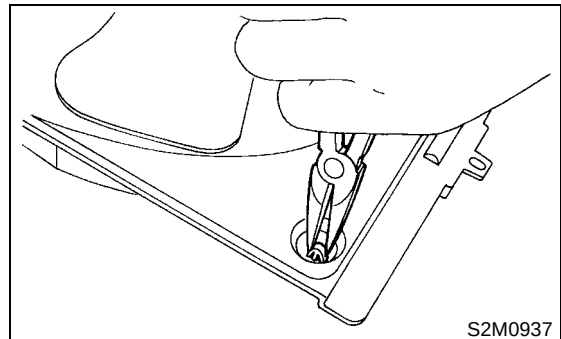
Tightening torque:

4.9 N·m (0.50 kgf·m, 3.6 ft-lb)

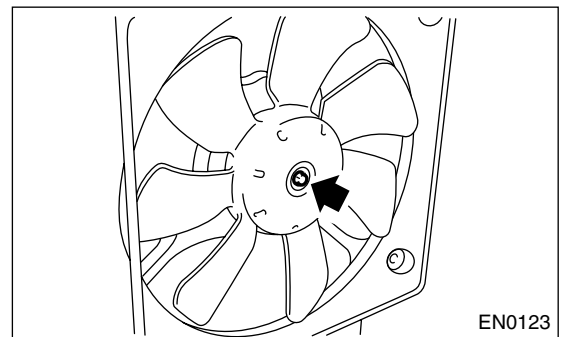


C: DISASSEMBLY

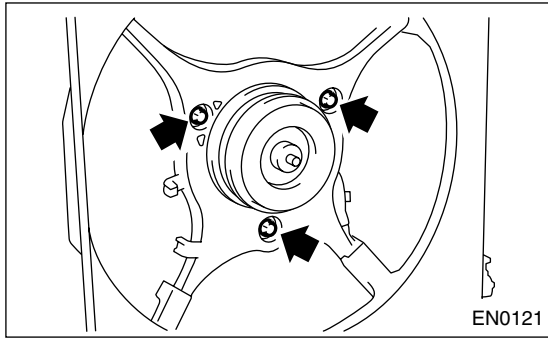
- 1) Remove clip which holds motor harness onto shroud.



- 2) Remove nut which holds fan itself onto fan motor and shroud assembly.



3) Remove bolts which install fan motor onto shroud.

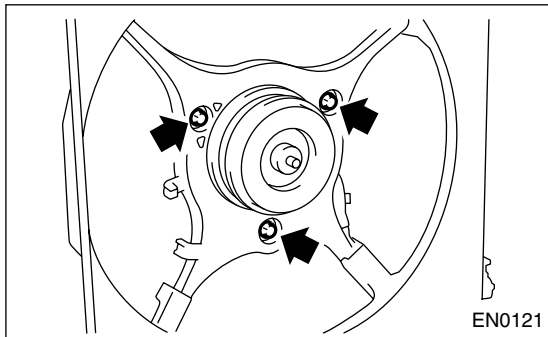


D: ASSEMBLY

Assemble in the reverse order of disassembly.

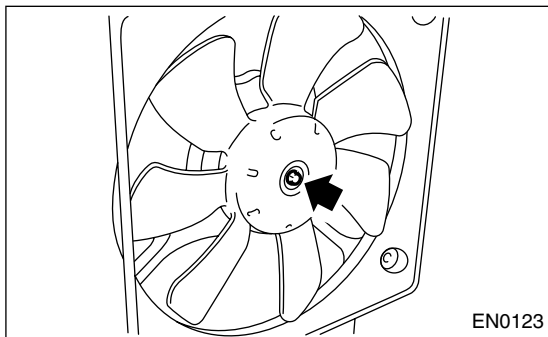
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Tightening torque:

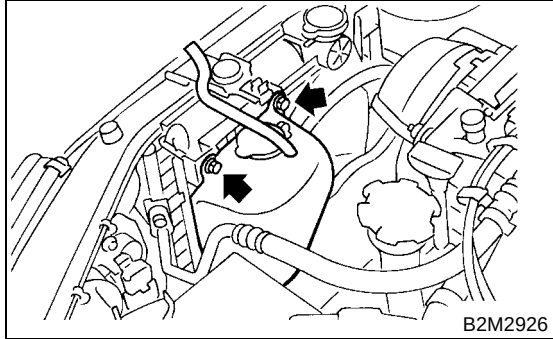
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



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.

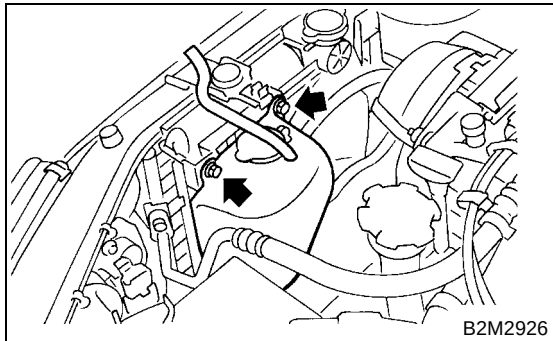


B: INSTALLATION

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.

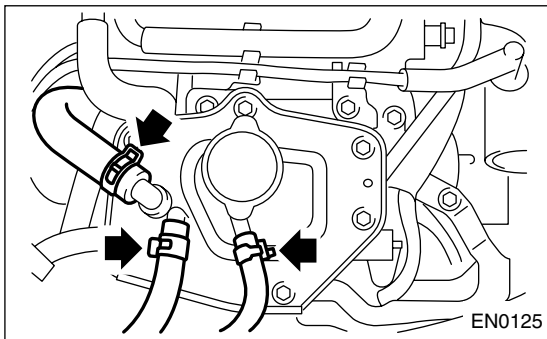
12. Coolant Filler Tank

A: REMOVAL

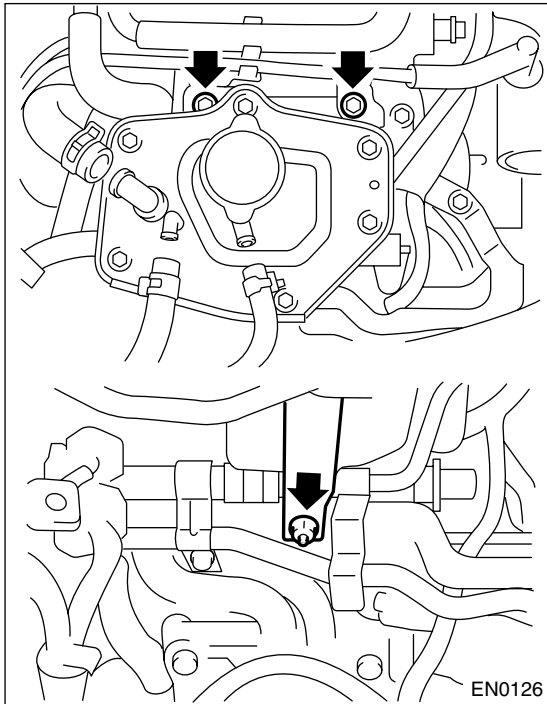
WARNING:

The radiator is pressurized. Wait until engine cools down before working on the radiator.

- 1) Drain coolant about 3.0 (3.2 US qt, 2.6 Imp qt).
<Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 2) Remove air cleaner upper cover and air intake boot. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
- 3) Remove air cleaner element.
- 4) Disconnect engine coolant hoses from coolant filler tank.



- 5) Remove bolts and nut which install coolant filler tank.
- 6) Disconnect engine coolant hose which connects the under side of coolant filler tank.
- 7) Remove coolant filler tank.



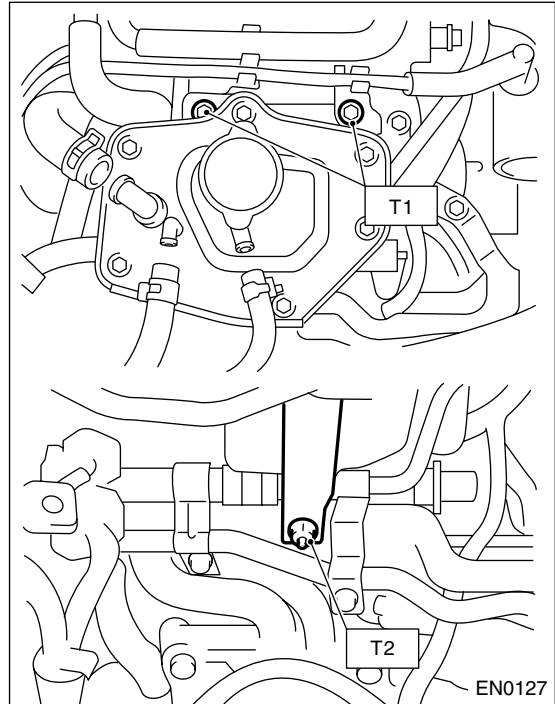
B: INSTALLATION

- 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 engine coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

ENGINE COOLING SYSTEM TROUBLE IN GENERAL

COOLING

13.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	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(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-2, Basic Diagnostic Procedure.> or <Ref. to EN(DOHC TURBO)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-2, Basic Diagnostic Procedure.> or <Ref. to EN(DOHC TURBO)-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.
	o. Improper transmission oil	Replace.
	p. Defective thermostat	Replace.
	q. 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 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 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

LUBRICATION

LU

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6. Oil Pressure Switch.....	21
7. Engine Oil Cooler	23
8. Engine Oil Filter.....	25
9. Engine Lubrication System Trouble in General.....	26

GENERAL DESCRIPTION

LUBRICATION

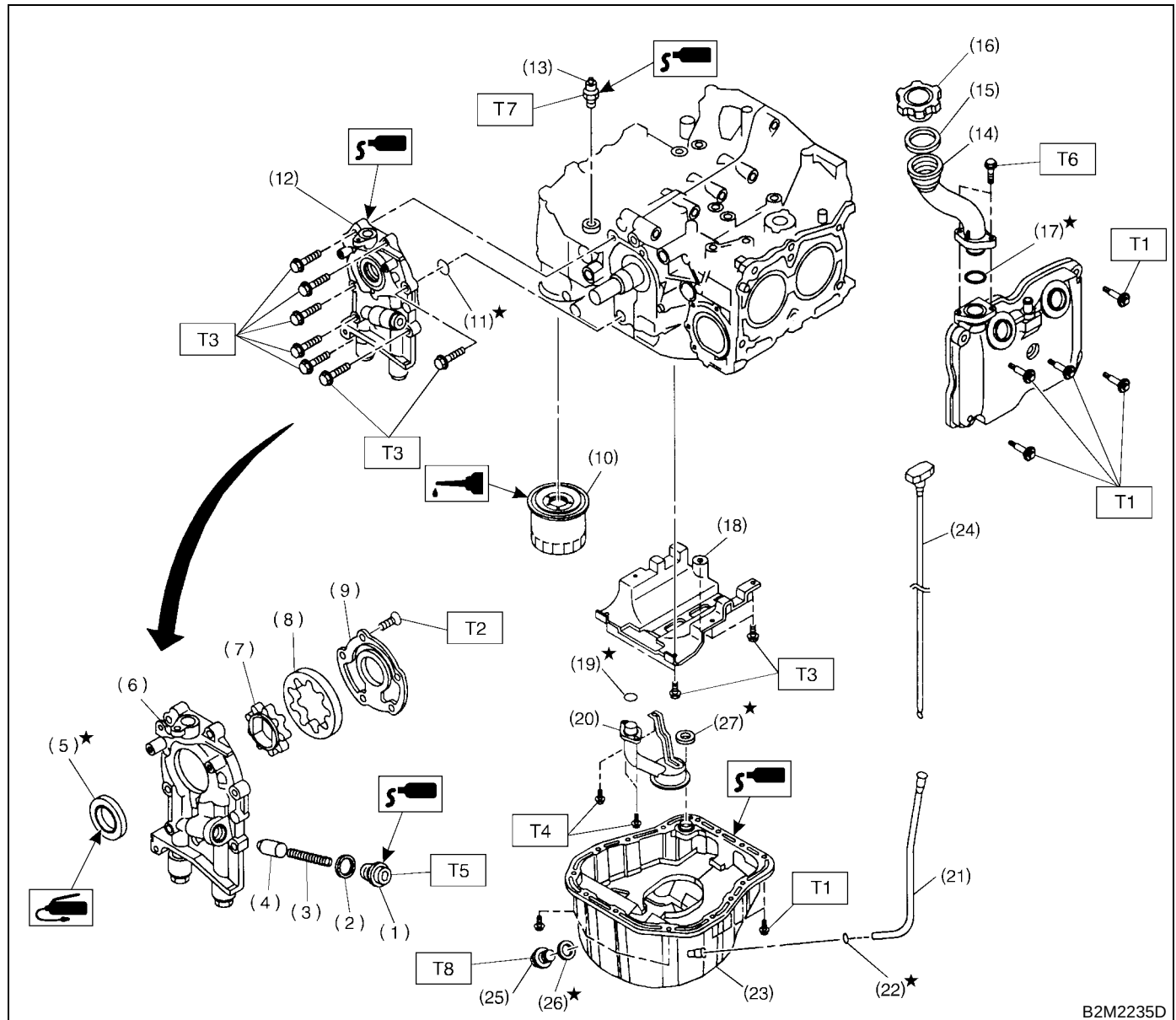
1. General Description

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 × 9 mm (3.07 × 0.35 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)	700 rpm	Discharge	- pressure	98 kPa (1.0 kg/cm ² , 14 psi)	
				- quantity	4.2 ℓ (4.4 US qt, 3.7 Imp qt)/min.	
		5,000 rpm	Discharge	- pressure	294 kPa (3.0 kg/cm ² , 43 psi)	
- quantity				42.0 ℓ (11.10 US gal, 9.24 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			1,000 cm ² (155 sq in)		
	By-pass valve opening pressure			157 kPa (1.6 kg/cm ² , 23 psi)		
	Outer diameter × width			80 × 70 mm (3.15 × 2.76 in)		
	Oil filter to engine thread size			M 20 × 1.5		
Relief valve (on rocker shaft) operation pressure				69 kPa (0.7kg/cm ² , 10 psi)		
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 (at replacement)		Non-Turbo model		4.0 ℓ (4.2 US qt, 3.5 Imp qt)		
		Turbo model		4.5 ℓ (4.8 US qt, 4.0 Imp qt)		

B: COMPONENT

1. NON-TURBO MODEL



B2M2235D

- | | |
|--------------------------|----------------------------|
| (1) Plug | (14) Oil filler duct |
| (2) Washer | (15) O-ring |
| (3) Relief valve spring | (16) Oil filler cap |
| (4) Relief valve | (17) O-ring |
| (5) Oil seal | (18) Baffle plate |
| (6) Oil pump case | (19) O-ring |
| (7) Inner rotor | (20) Oil strainer |
| (8) Outer rotor | (21) Oil level gauge guide |
| (9) Oil pump cover | (22) O-ring |
| (10) Oil filter | (23) Oil pan |
| (11) O-ring | (24) Oil level gauge |
| (12) Oil pump ASSY | (25) Drain plug |
| (13) Oil pressure switch | (26) Metal gasket |

- (27) Gasket

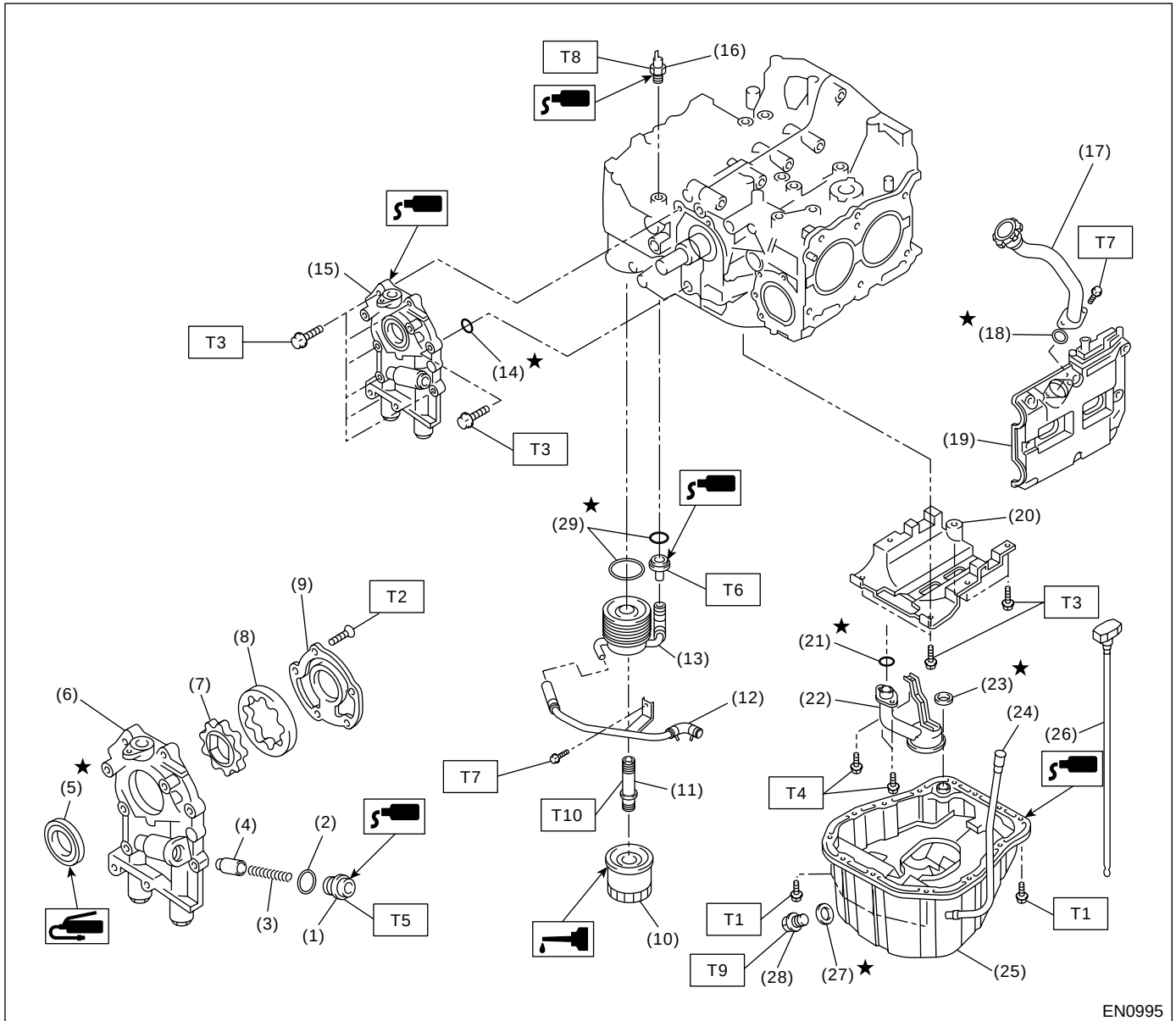
Tightening torque: N·m (kgf-m, ft-lb)

- T1: 5 (0.5, 3.6)**
T2: 5 (0.5, 3.6)
T3: 6.4 (0.65, 4.7)
T4: 10 (1.0, 7.2)
T5: 44.1 (4.5, 32.5)
T6: 6.4 (0.65, 4.7)
T7: 25 (2.5, 18.1)
T8: 44 (4.5, 33)

GENERAL DESCRIPTION

LUBRICATION

2. TURBO MODEL



EN0995

- | | |
|-------------------------|----------------------------|
| (1) Plug | (15) Oil pump ASSY |
| (2) Washer | (16) Oil pressure switch |
| (3) Relief valve spring | (17) Oil filler duct |
| (4) Relief valve | (18) O-ring |
| (5) Oil seal | (19) Cylinder head cover |
| (6) Oil pump case | (20) Baffle plate |
| (7) Inner rotor | (21) O-ring |
| (8) Outer rotor | (22) Oil strainer |
| (9) Oil pump cover | (23) Gasket |
| (10) Oil filter | (24) Oil level gauge guide |
| (11) Connector | (25) Oil pan |
| (12) Water by-pass pipe | (26) Oil level gauge |
| (13) Oil cooler | (27) Metal gasket |
| (14) O-ring | (28) Drain plug |

- (29) O-ring

Tightening torque: N·m (kgf-m, ft-lb)

- T1: 5 (0.5, 3.6)**
T2: 5 (0.5, 3.6)
T3: 6.4 (0.65, 4.7)
T4: 10 (1.0, 7.0)
T5: 44.1 (4.5, 32.5)
T6: 69 (7.0, 4.7)
T7: 6.4 (0.65, 50.6)
T8: 25 (2.5, 18.1)
T9: 44 (4.5, 33)
T10: 54 (5.5, 40)

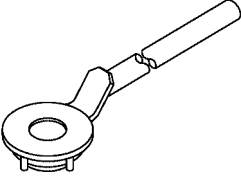
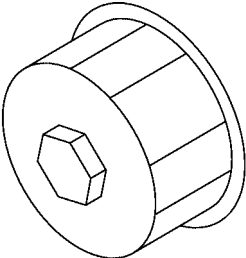
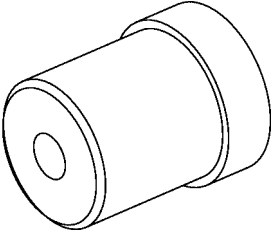
C: CAUTION

- 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 negative terminal from battery.

GENERAL DESCRIPTION

LUBRICATION

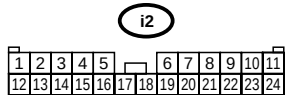
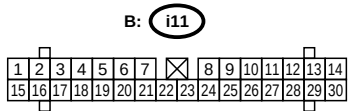
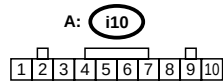
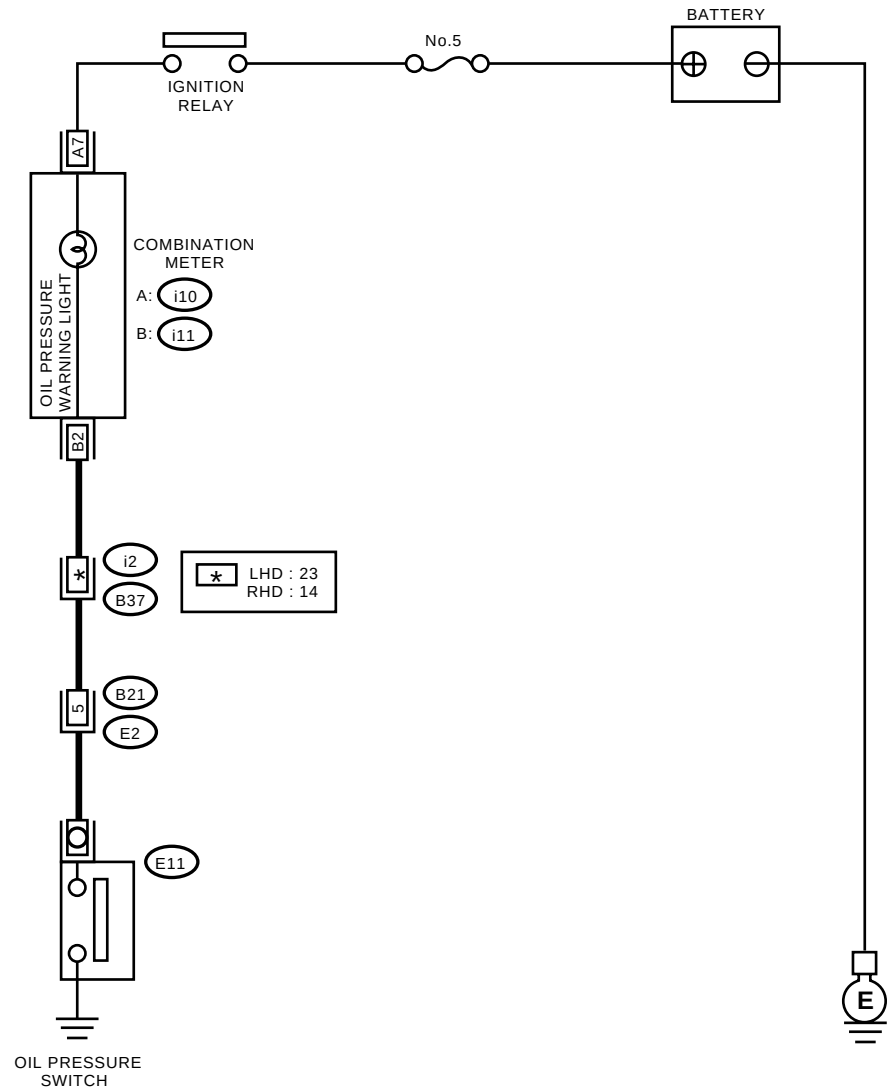
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M4157	499977300	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 B2M3872	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 B2M3875	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

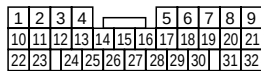
2. Oil Pressure System

A: SCHEMATIC

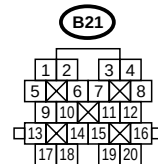
1. NON-TURBO MODEL



(LHD)



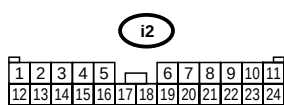
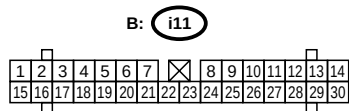
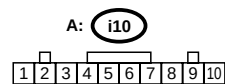
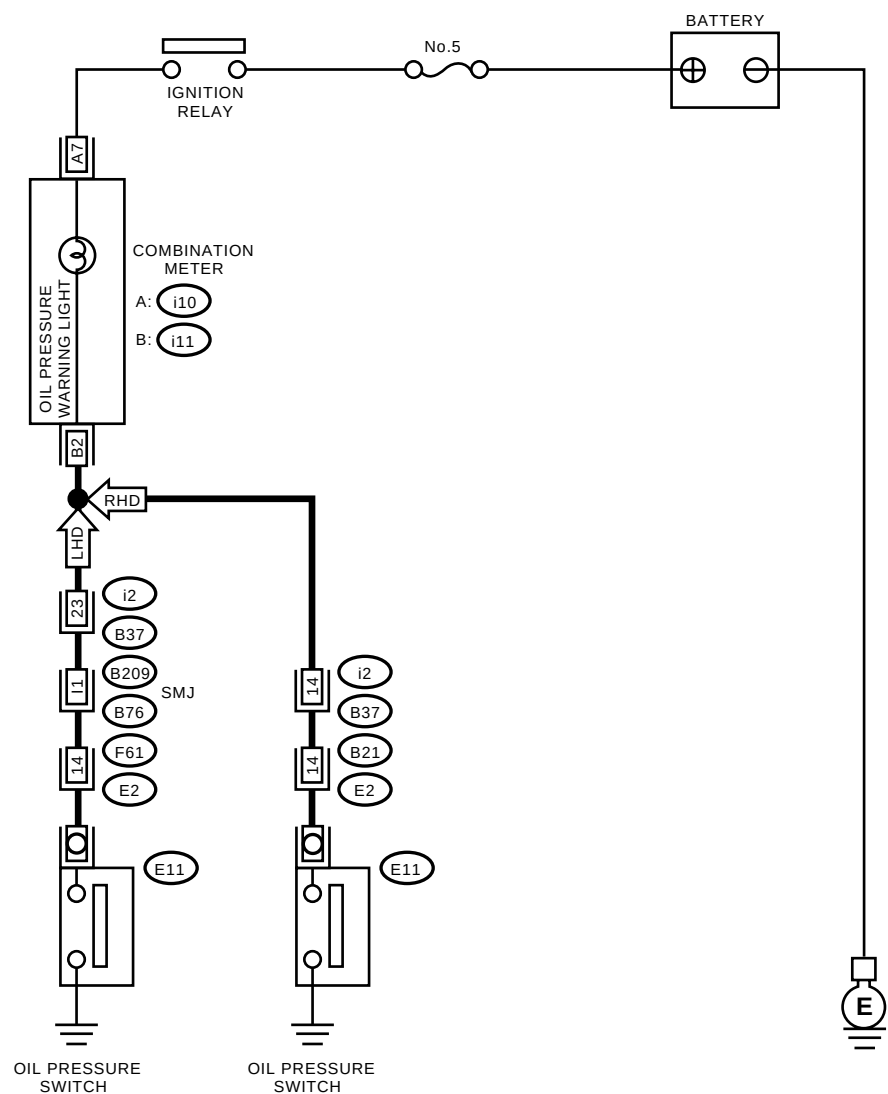
(RHD)



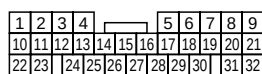
OIL PRESSURE SYSTEM

LUBRICATION

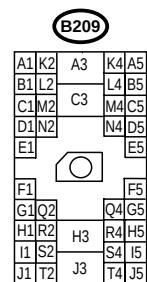
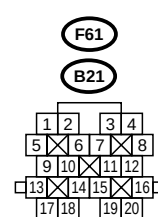
2. TURBO MODEL



(LHD)



(RHD)



EN0996

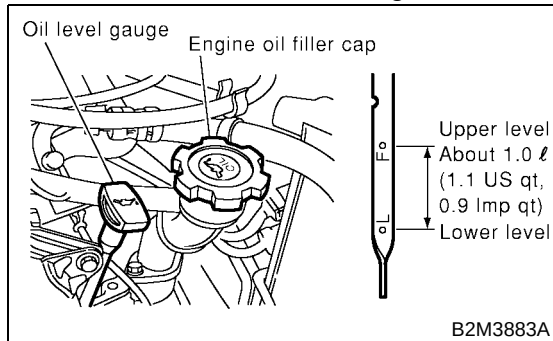
B: INSPECTION

Step	Check	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?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-10, 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 voltage more than 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. A7 — No. B2:	Is the resistance less than 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

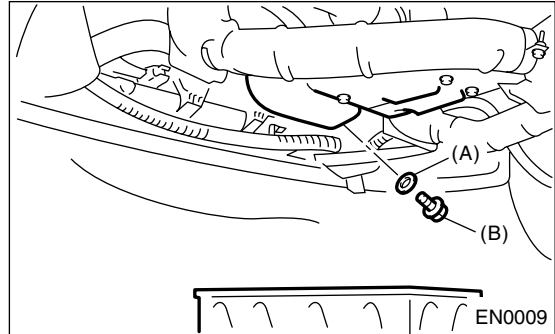
- 1) Park vehicle on a level surface.
- 2) Remove oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the engine oil level is below the "L" line, add 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) 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.



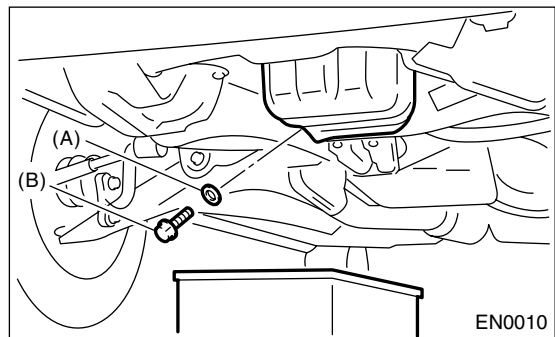
B: REPLACEMENT

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

• Non-Turbo model

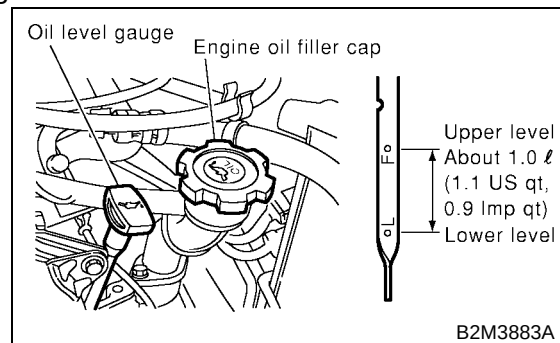


• Turbo model



- (A) Gasket
(B) Drain plug

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



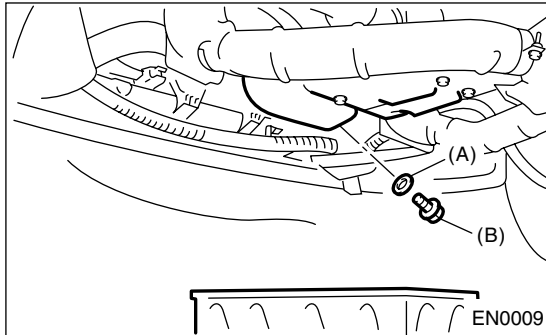
- 3) Replace drain plug gasket.

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

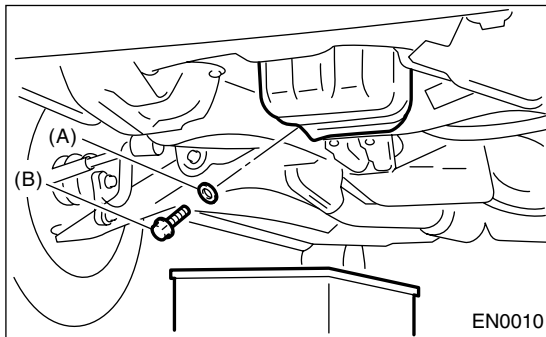
Tightening torque:

44 N·m (4.5 kgf-m, 33 ft-lb)

- Non-Turbo model



- Turbo model



- (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

API classification

SJ or SH with the words "Energy Conserving or Energy conserving II", CCMC specification G4 or G5, ACEA specification A1, A2 or A3, or New API mark displayed on the container (If it is impossible to get SJ or SH grade, you may use SG grade.)

Engine oil capacity: (Non-Turbo model)

Upper level

4.0 ℓ (4.2 US qt, 3.5 Imp qt)

Lower level

3.0 ℓ (3.2 US qt, 2.6 Imp qt)

Engine oil capacity: (Turbo model)

Upper level

4.5 ℓ (4.8 US qt, 4.0 Imp qt)

Lower level

3.5 ℓ (3.7 US qt, 3.1 Imp qt)

SAE Viscosity No. and Applicable Temperature							
(°C)	-30	-20	-15	0	15	30	40
(°F)	-22	-4	5	32	59	86	104
B2M3885A							

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:

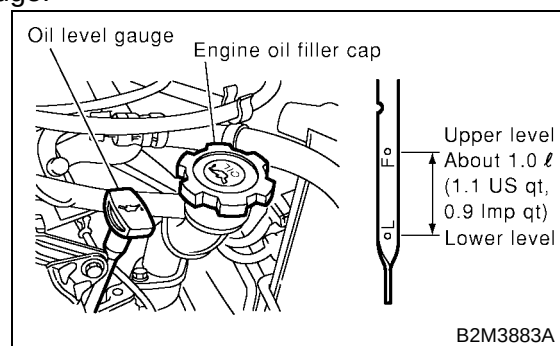
If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SJ or SH

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.

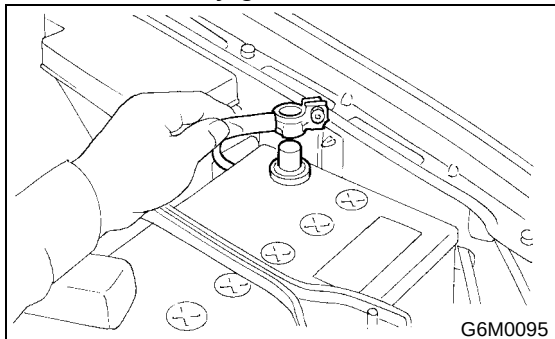
8) After engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.



4. Oil Pump

A: REMOVAL

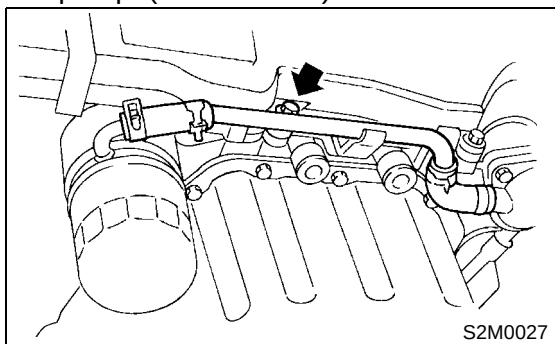
1) Disconnect battery ground cable.



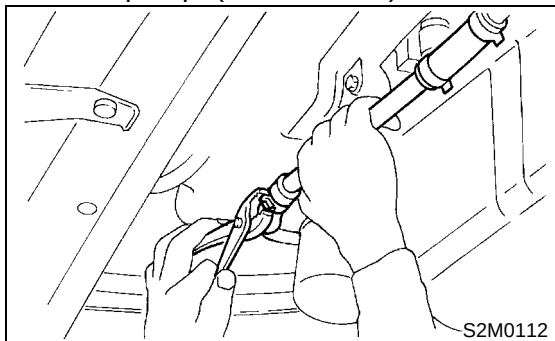
2) Lift-up the vehicle.

3) Remove under cover.

4) Remove bolts which install water pipe of oil cooler to oil pump. (Turbo model)

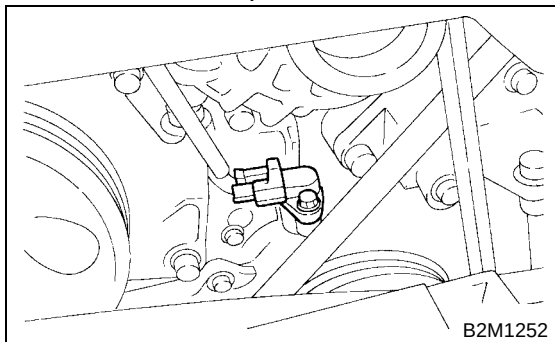


5) Remove water pipe and hoses between oil cooler and water pump. (Turbo model)



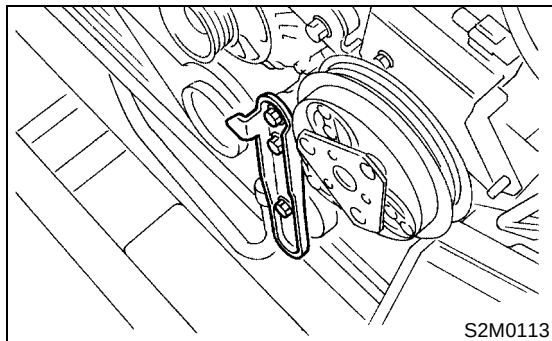
6) Remove radiator. <Ref. to CO-37, REMOVAL, Radiator.>

7) Remove crankshaft position sensor.

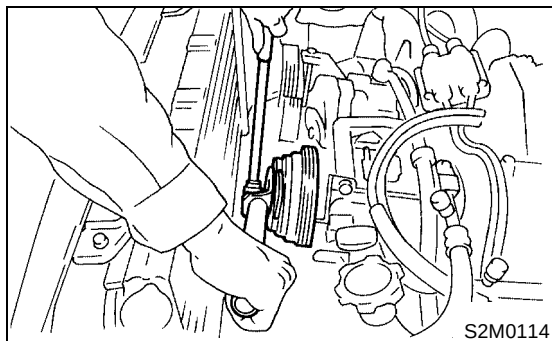


8) Remove V-belts. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.> or <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>

9) Remove rear side V-belt tensioner.

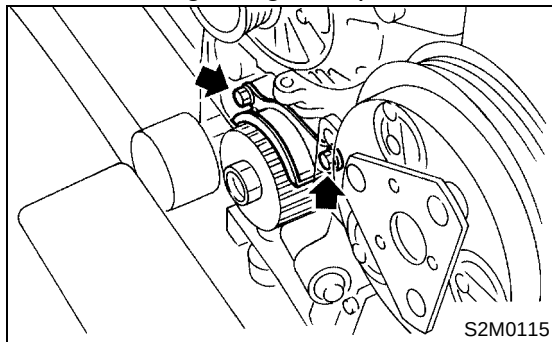


10) Remove crankshaft pulley by using ST. ST 499977300 CRANKSHAFT PULLEY WRENCH

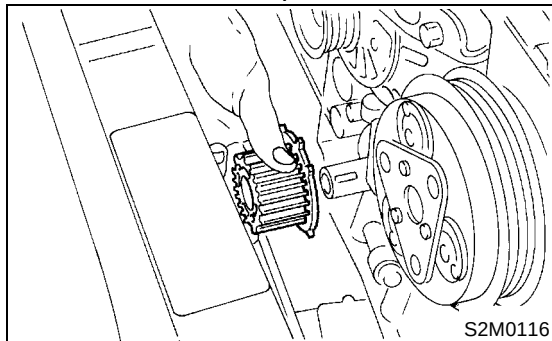


11) Remove water pump. <Ref. to CO-27, REMOVAL, Water Pump.>

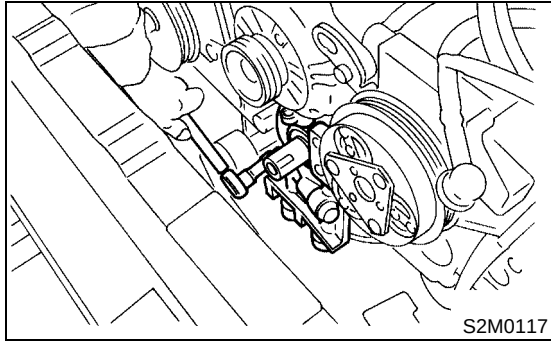
12) Remove timing belt guide. (MT vehicles only)



13) Remove crankshaft sprocket.



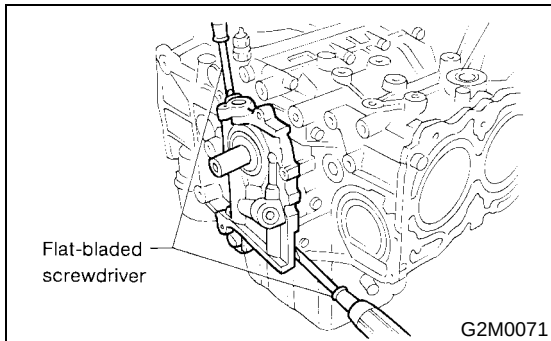
- 14) Remove bolts which install oil pump onto cylinder block.



- 15) Remove oil pump by using flat bladed screwdriver.

CAUTION:

Be careful not to scratch mating surfaces of cylinder block and oil pump.



B: INSTALLATION

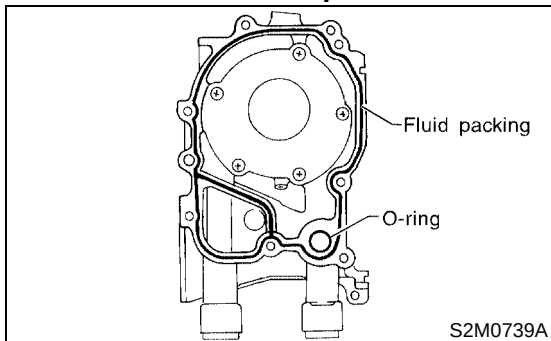
Install in the reverse order of removal.

Do the following:

- 1) Apply fluid packing to matching surfaces of oil pump.

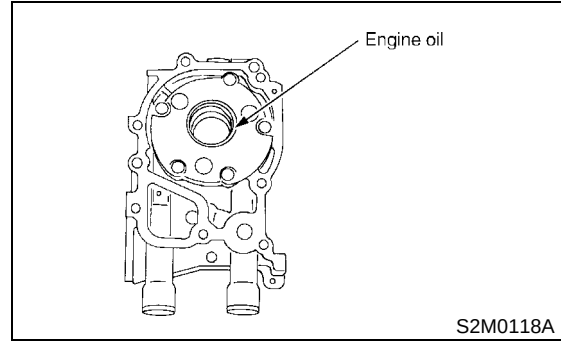
Fluid packing:

THREE BOND 1215 or equivalent



- 2) Replace O-ring with a new one.

- 3) Apply a coat of 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.

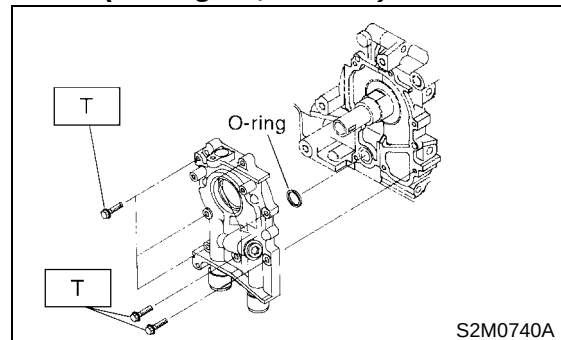
CAUTION:

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)

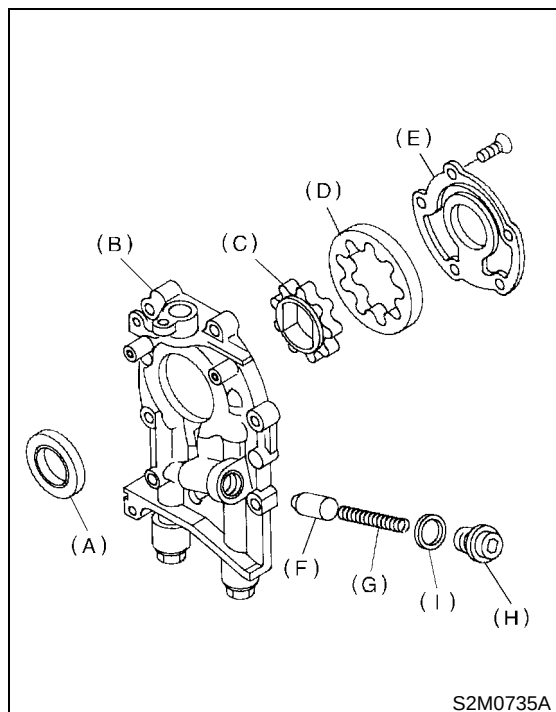


C: DISASSEMBLY

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.

CAUTION:

Before removing relief valve, loosen plug when removing oil pump from cylinder block.



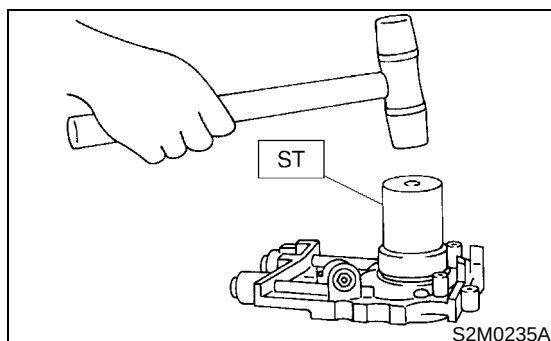
- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Washer

D: ASSEMBLY

- 1) Install front oil seal by using ST.
- ST 499587100 OIL SEAL INSTALLER

CAUTION:

Use a new oil seal.

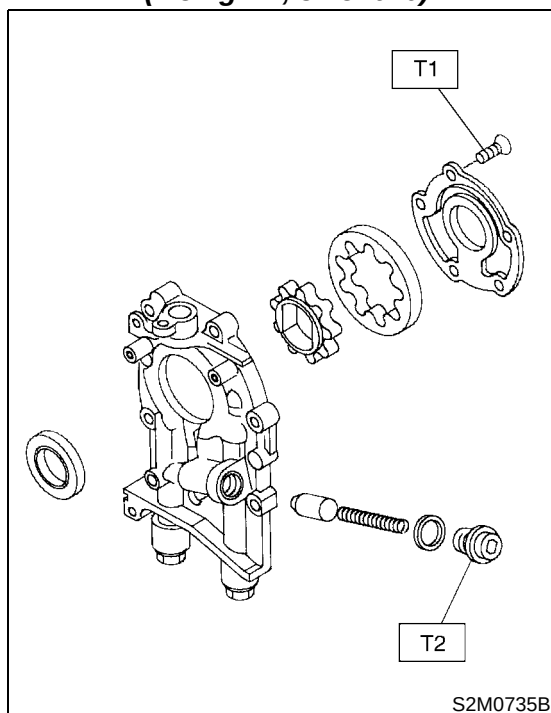


- 2) Apply a coat of engine oil to inner and outer rotors.
- 3) Install inner and outer rotors in their original positions.
- 4) Install oil relief valve and relief valve spring.
- 5) Install oil pump cover.

Tightening torque:

T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)

T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)



E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a matched set.

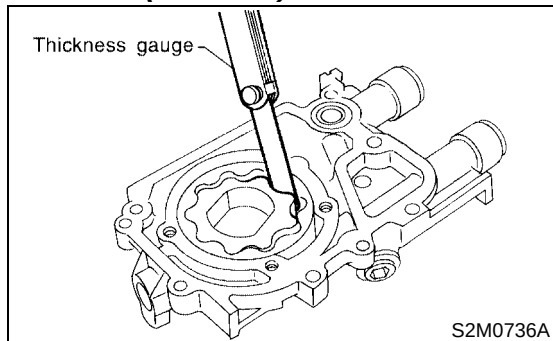
Tip clearance:

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.

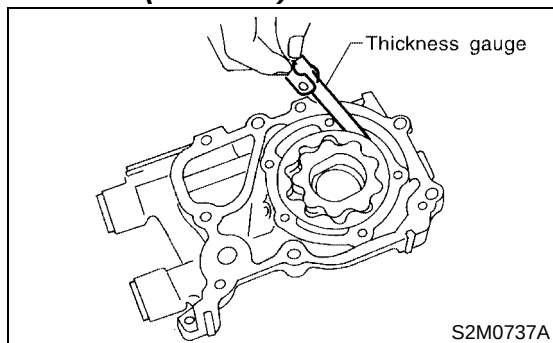
Case clearance:

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.

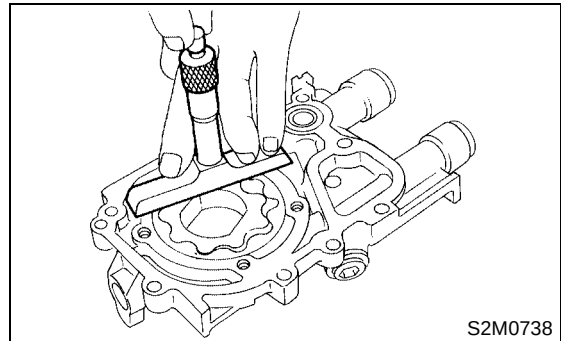
Side clearance:

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

71.8 mm (2.827 in)

Installed length

54.7 mm (2.154 in)

Load when installed

77.08 N (7.86 kg, 17.33 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

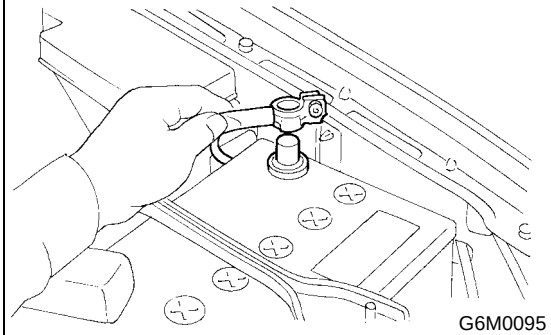
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

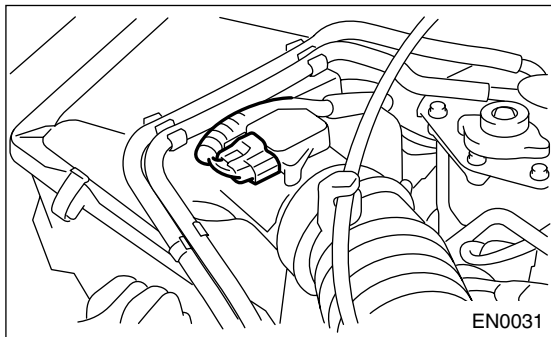
5. Oil Pan and Strainer

A: REMOVAL

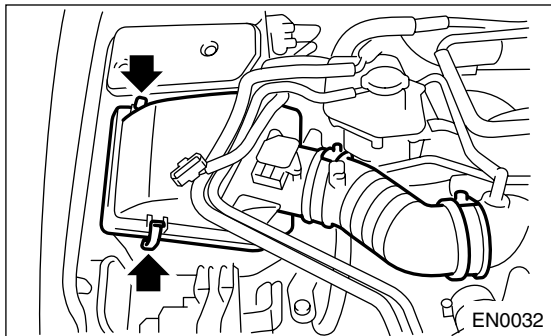
- 1) Set the vehicle on lift arms.
- 2) Remove front wheels.
- 3) Disconnect battery ground cable.



- 4) Remove air intake duct and air cleaner case. (Non-Turbo model)
<Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
- 5) Disconnect connector from mass air flow sensor. (Turbo model)

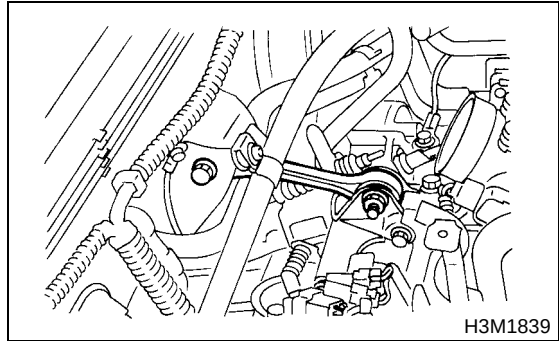


- 6) Remove air intake boot and air cleaner upper cover. (Turbo model)



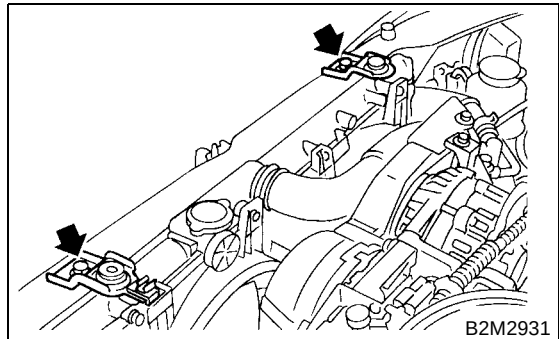
- 7) Remove intercooler (Turbo model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

- 8) Remove pitching stopper.

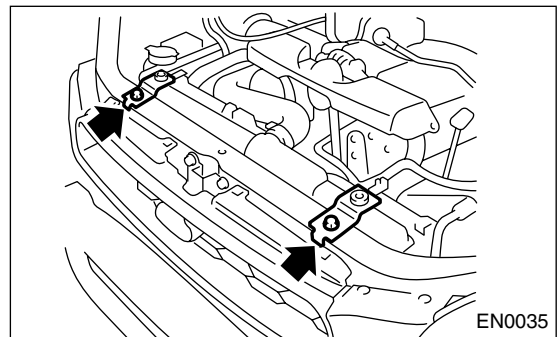


- 9) Remove radiator upper brackets.

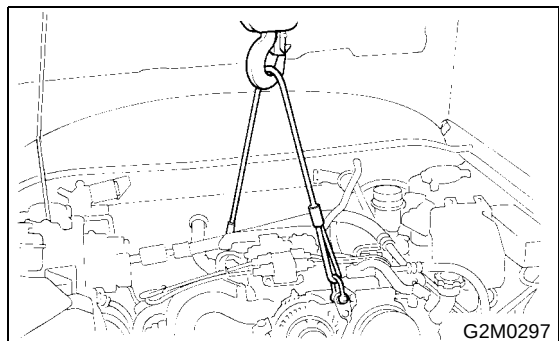
- Non-Turbo model



- Turbo model



- 10) Support engine with a lifting device and wire ropes.



- 11) Lift-up the vehicle.

CAUTION:

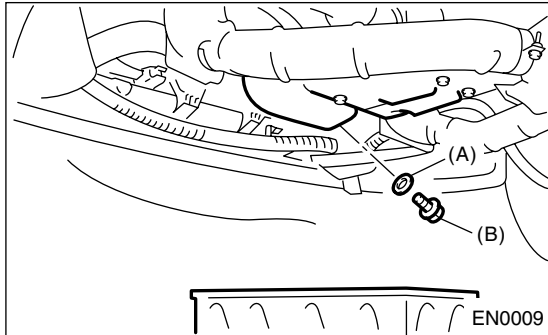
At this time, raise up wire ropes.

- 12) Remove under cover.

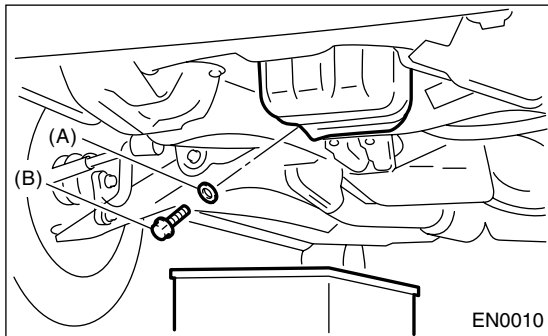
13) Drain engine oil.

Set container under the vehicle, and remove drain plug from oil pan.

- Non-Turbo model



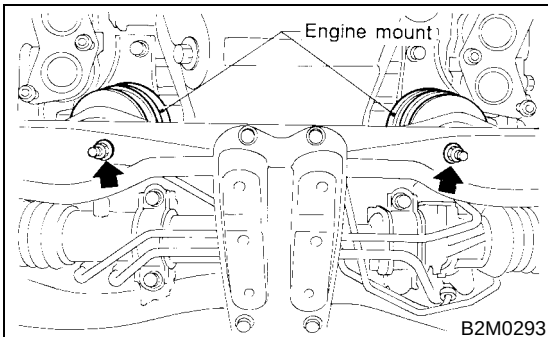
- Turbo model



- (A) Gasket
(B) Drain plug

14) Remove front and center exhaust pipes. (Non-Turbo model) <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.> or <Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

15) Remove nuts which install front cushion rubber onto front crossmember.



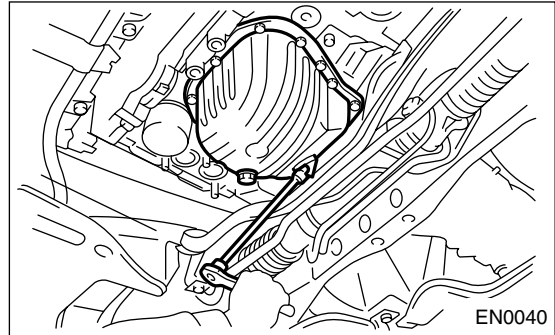
16) Remove bolts which install oil pan on cylinder block while raising up engine.

17) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

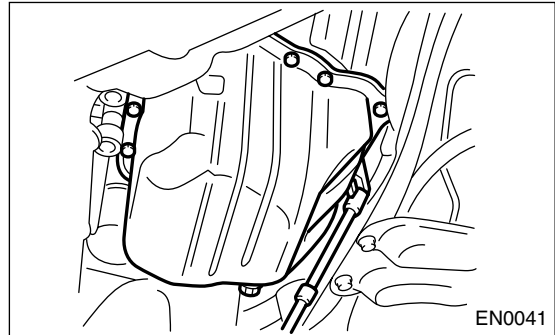
CAUTION:

Do not use a screwdriver or similar tool in place of oil pan cutter.

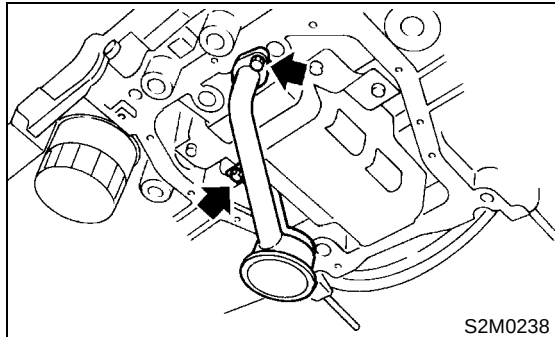
- Non-Turbo model



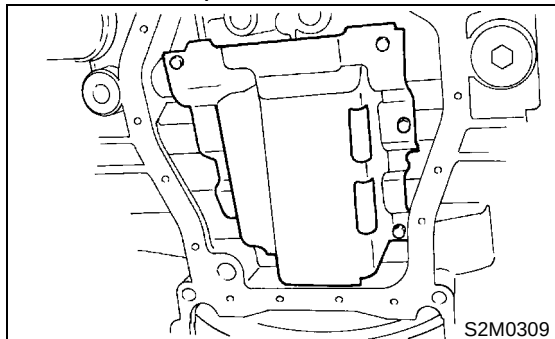
- Turbo model



18) Remove oil strainer.



19) Remove baffle plate.



OIL PAN AND STRAINER

LUBRICATION

B: INSTALLATION

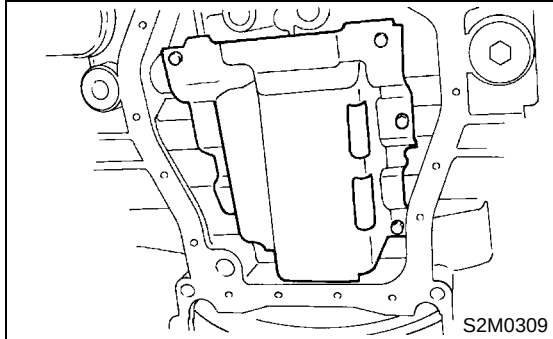
CAUTION:

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)



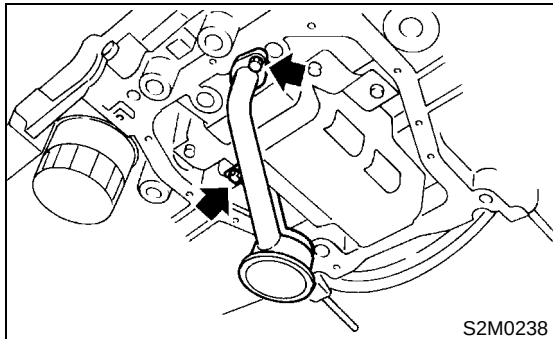
2) Install oil strainer onto baffle plate.

CAUTION:

Replace O-ring with a new one.

Tightening torque:

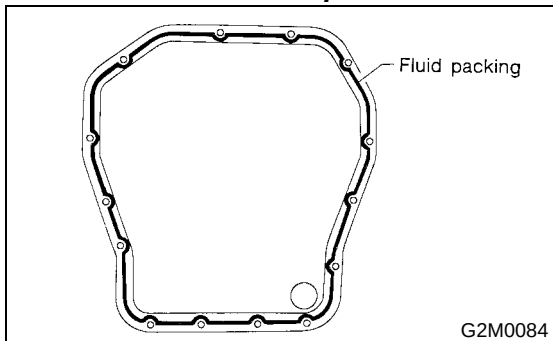
10 N·m (1.0 kgf-m, 7 ft-lb)



3) Apply fluid packing to mating surfaces and install oil pan.

Fluid packing:

THREE BOND 1215 or equivalent

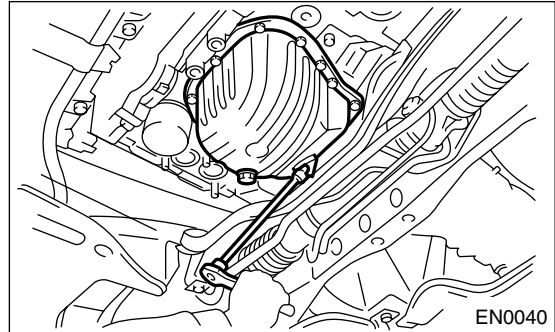


4) Tighten bolts which install oil pan onto engine block.

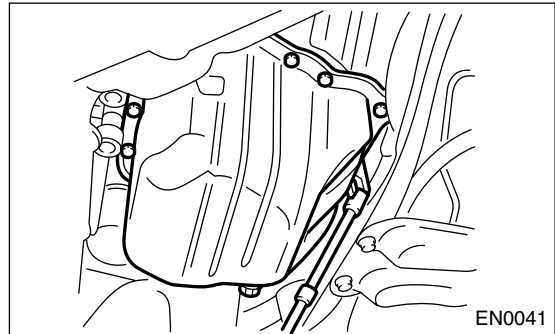
Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- Non-Turbo model



- Turbo model

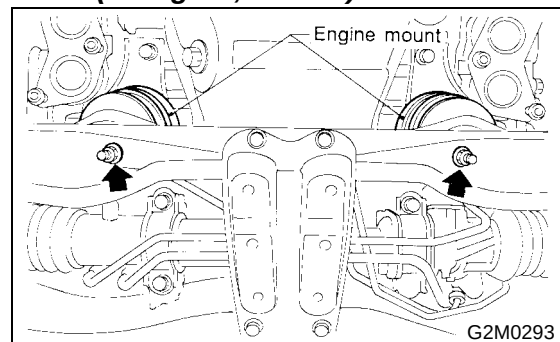


5) Lower engine onto front crossmember.

6) Tighten nuts which install front cushion rubber onto front crossmember.

Tightening torque:

69 N·m (7.0 kgf-m, 51 ft-lb)

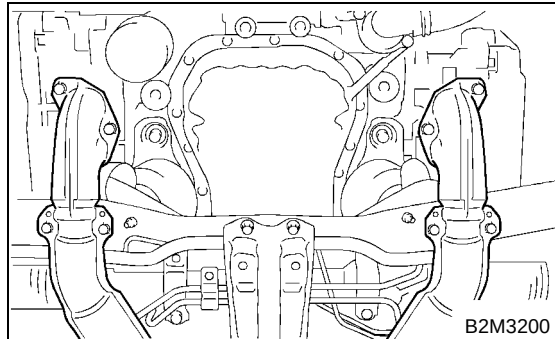


7) Install front and center exhaust pipes. (Non-Turbo model)

<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.> or <Ref. to EX(SOHCw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>

CAUTION:

Always use the new gaskets.



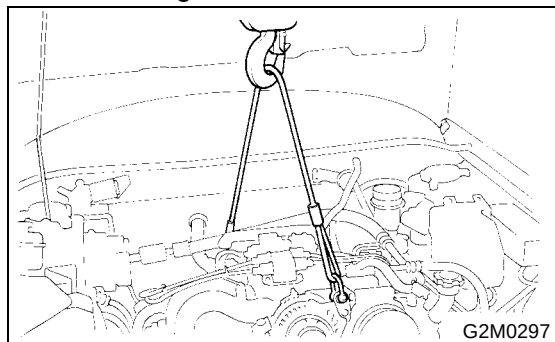
8) Install under cover.

9) Lower the vehicle.

CAUTION:

At this time, lower lifting device and release steel cables.

10) Remove lifting device and steel cables.

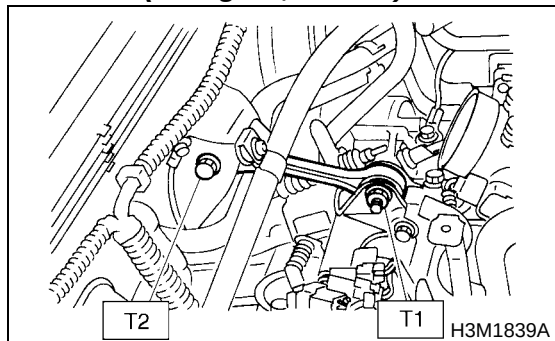


11) Install pitching stopper.

Tightening torque:

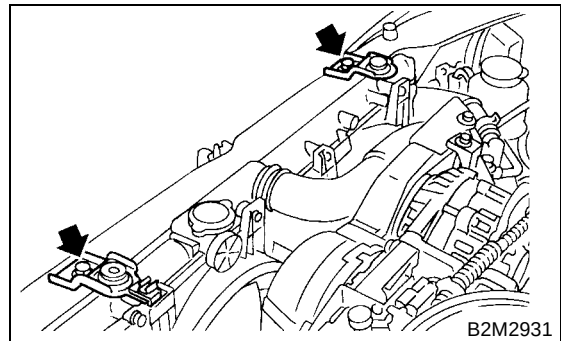
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)

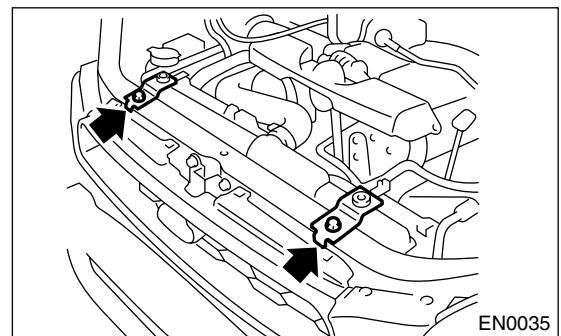


12) Install radiator upper brackets.

- Non-Turbo model



- Turbo model

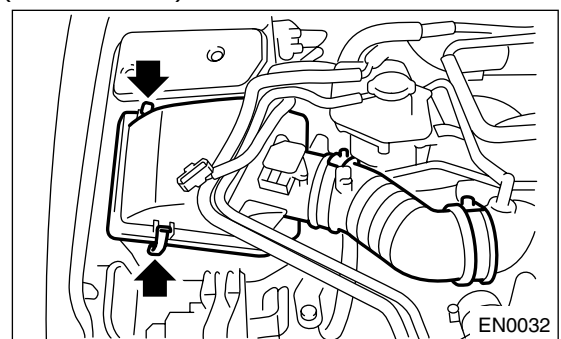


13) Install air intake duct and air cleaner case. (Non-Turbo model)

<Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>

14) Install intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>

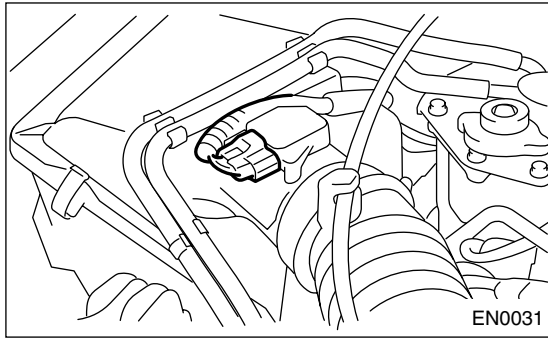
15) Install air intake boot and air cleaner upper cover. (Turbo model)



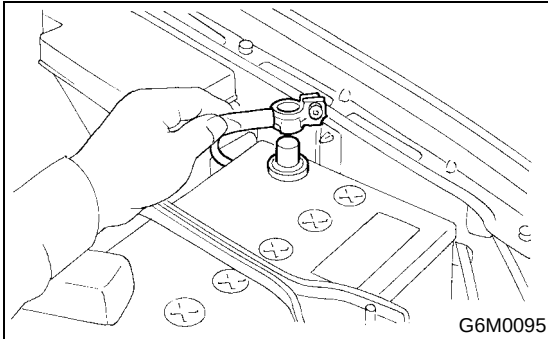
OIL PAN AND STRAINER

LUBRICATION

- 16) Connect connector to mass air flow sensor.
(Turbo model)



- 17) Install front wheels.
18) Connect battery ground cable.



- 19) Fill engine oil. <Ref. to LU-10, INSPECTION, Engine Oil.>

C: INSPECTION

By visual check make sure oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

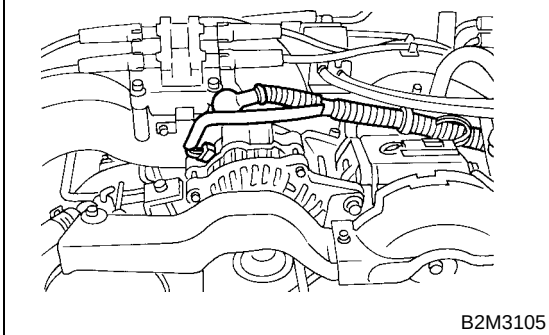
6. Oil Pressure Switch

A: REMOVAL

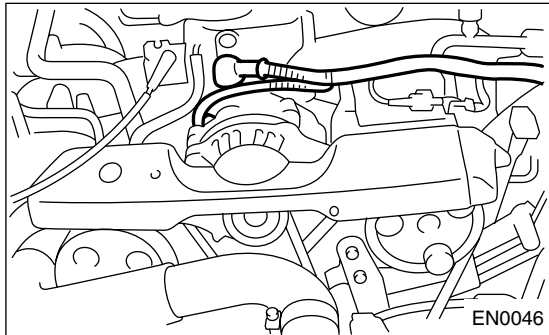
1) Remove generator from bracket.

(1) Disconnect connector and terminal from generator.

- Non-Turbo model

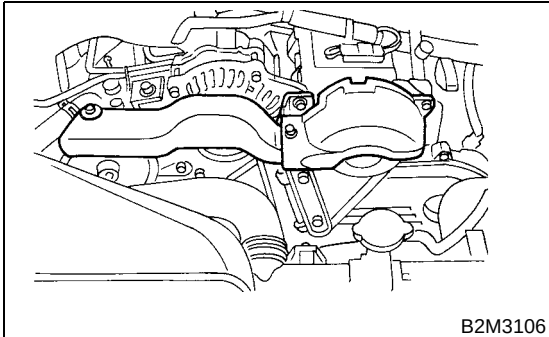


- Turbo model

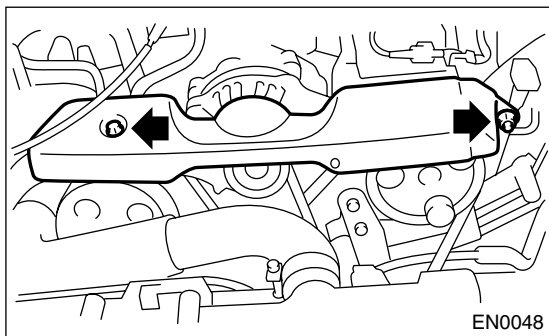


(2) Remove V-belt cover.

- Non-Turbo model

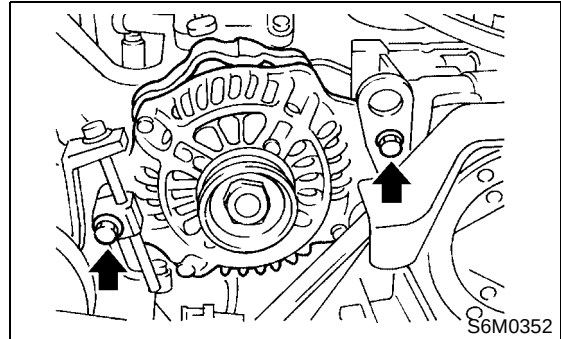


- Turbo model

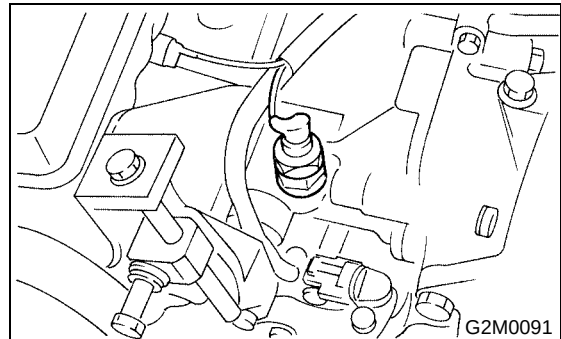


(3) Remove front side V-belt. <Ref. to ME(SO-HC)-42, REMOVAL, V-belt.> or <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>

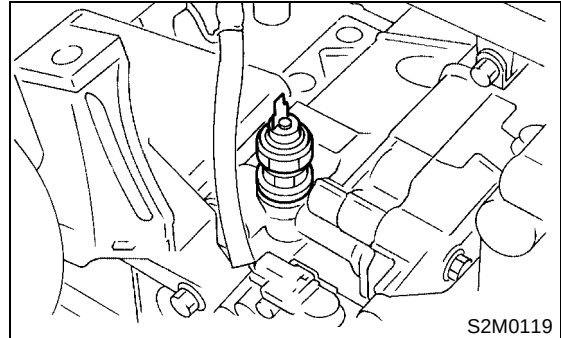
(4) Remove bolts which install generator on bracket.



2) Disconnect terminal from oil pressure switch.



3) Remove oil pressure switch.



OIL PRESSURE SWITCH

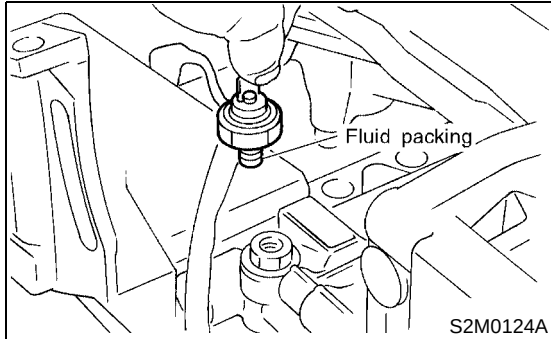
LUBRICATION

B: INSTALLATION

1) Apply fluid packing to oil pressure switch threads.

Fluid packing:

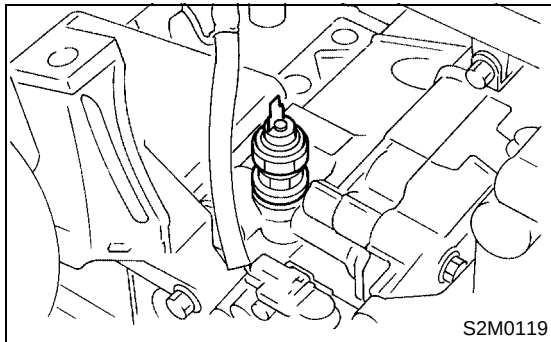
THREE BOND 1215 or equivalent



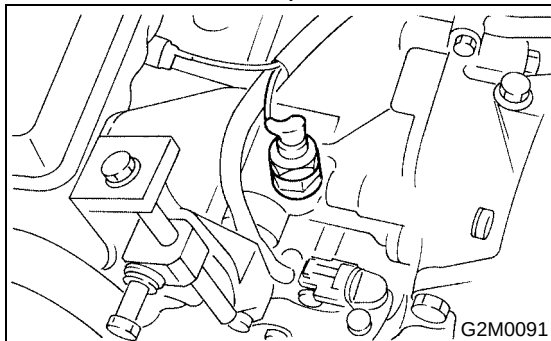
2) Install oil pressure switch onto engine block.

Tightening torque:

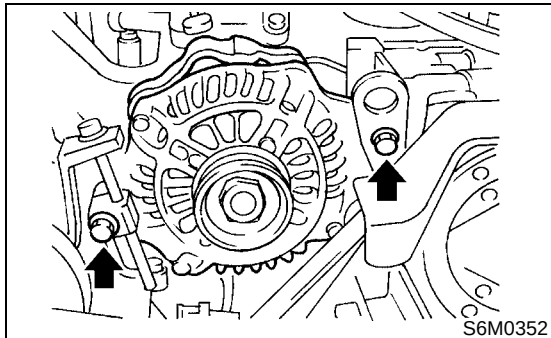
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect terminal of oil pressure switch.



4) Install generator on bracket and temporarily tighten installing bolts.

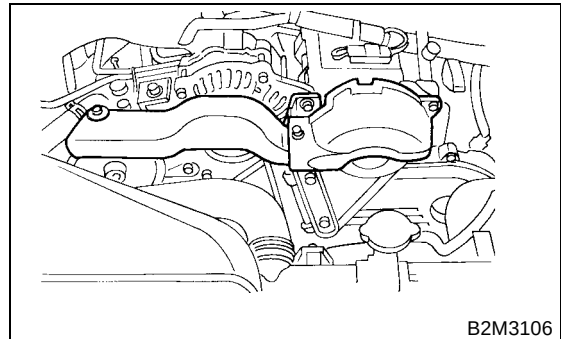


5) Install front side V-belt and adjust it.

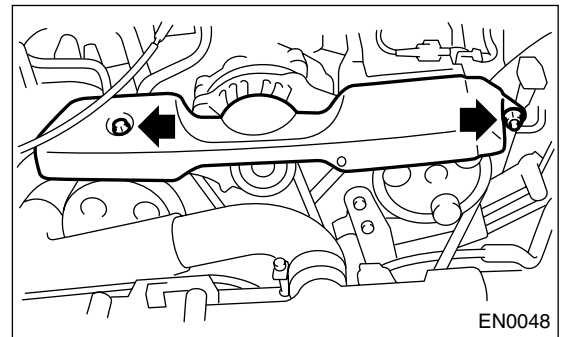
<Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>
<Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>

6) Install V-belt cover.

• Non-Turbo model

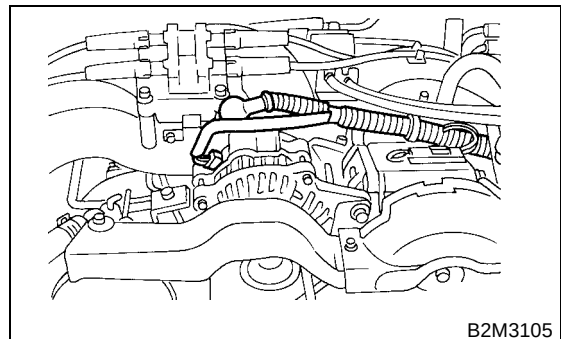


• Turbo model

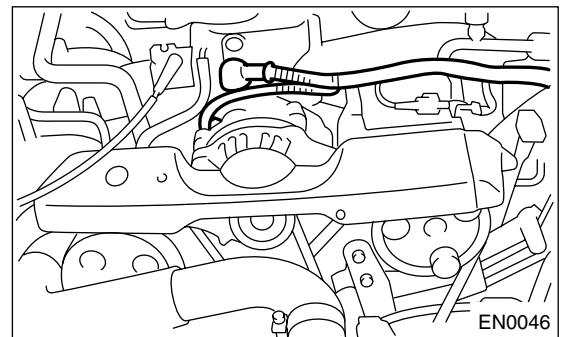


7) Connect connector and terminal to generator.

• Non-Turbo model



• Turbo model



C: INSPECTION

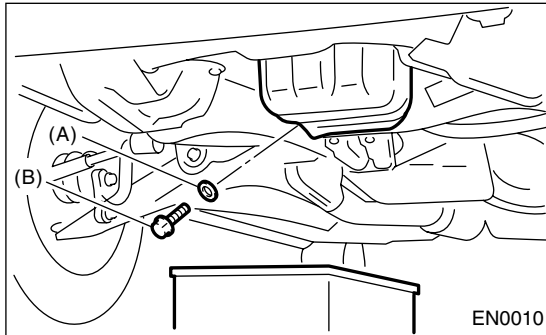
Make sure oil does not leak or seep from where the oil pressure switch is installed.

7. Engine Oil Cooler

A: REMOVAL

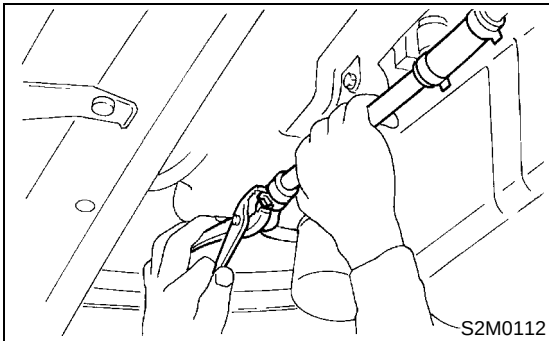
- 1) Lift-up the vehicle.
- 2) Remove under cover.
- 3) Drain engine oil.

Set container under the vehicle, and remove drain plug from oil pan.



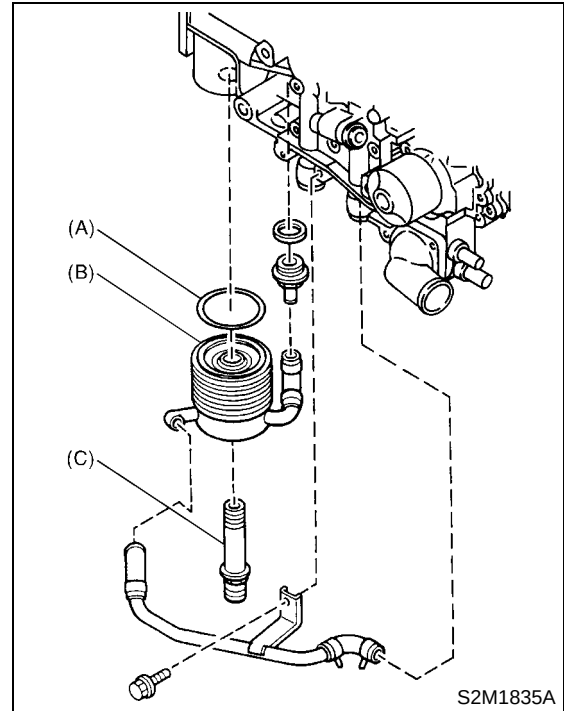
- (A) Metal gasket
(B) Drain plug

- 4) Drain coolant.
- 5) Remove water by-pass pipe between oil cooler and water pump.



- 6) Remove engine oil filter. <Ref. to LU-25, REMOVAL, Engine Oil Filter.>

- 7) Remove connector and remove 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:

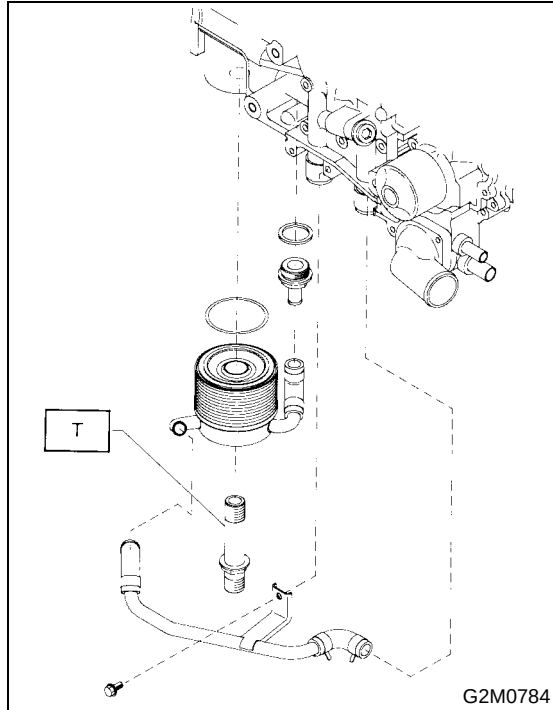
T: 54 N·m (5.5 kgf-m, 39.8 ft-lb)

CAUTION:

Always use a new O-ring.

C: INSPECTION

- 1) Check that coolant passages are not clogged using air blow method.
- 2) Check mating surfaces of cylinder block, O-ring groove and oil filter for damage.



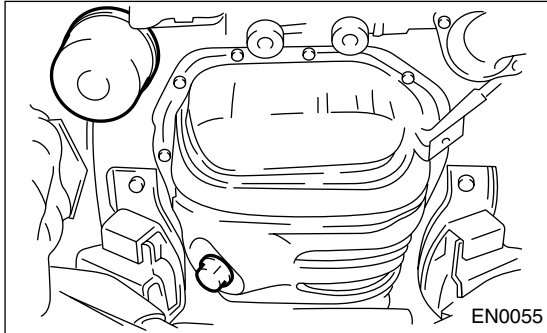
8. Engine Oil Filter

A: REMOVAL

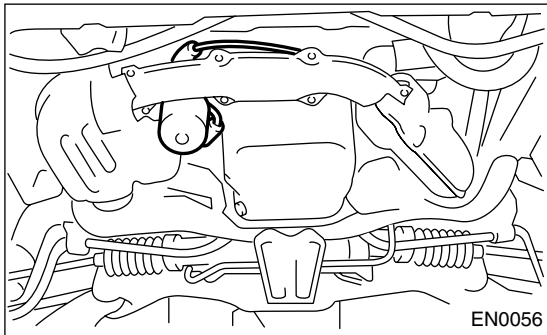
- 1) Remove under cover.
- 2) Remove oil filter with ST.

ST 498547000 OIL FILTER WRENCH

- Non-Turbo model



- Turbo model



B: INSTALLATION

- 1) Get a new oil filter and apply a thin coat of 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 permanently jointed; therefore, interior cleaning is not necessary.

- 2) Check the engine oil level. <Ref. to LU-10, INSPECTION, Engine Oil.>

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).

ENGINE 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

SPEED CONTROL SYSTEMS

SP

	Page
1. General Description	2
2. Accelerator Pedal	4
3. Accelerator Control Cable	9

GENERAL DESCRIPTION

SPEED CONTROL SYSTEMS

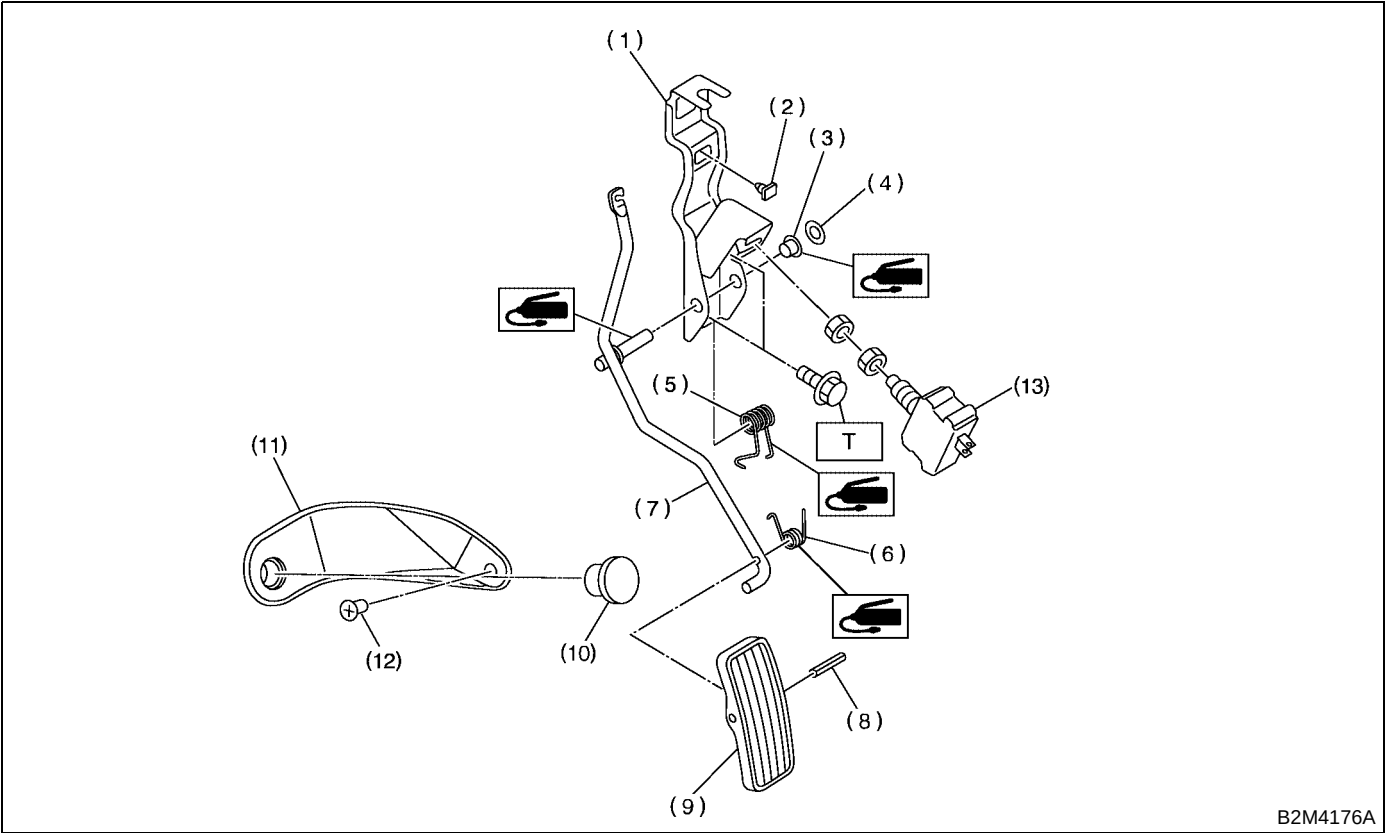
1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	1 — 4 mm (0.04 — 0.16 in)
	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)

B: COMPONENT

1. LHD MODEL



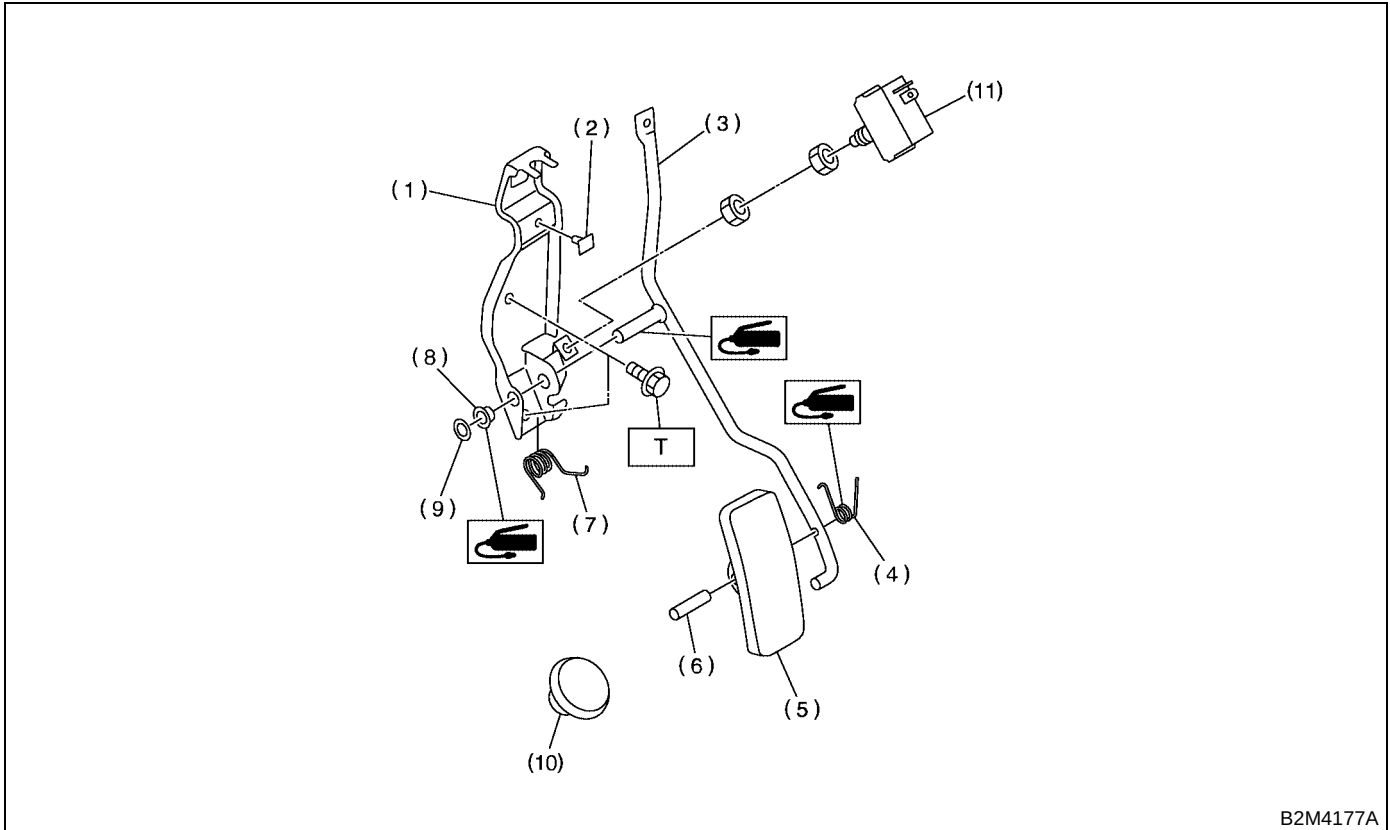
- (1) Accelerator bracket
- (2) Stopper
- (3) Bushing
- (4) Clip
- (5) Accelerator spring
- (6) Accelerator pedal spring

- (7) Accelerator pedal lever
- (8) Spring pin
- (9) Accelerator pedal
- (10) Accelerator stopper
- (11) Accelerator plate
- (12) Clip

- (13) Kick-down switch (AT model)

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

2. RHD MODEL



B2M4177A

- | | |
|------------------------------|--------------------------|
| (1) Accelerator bracket | (6) Spring pin |
| (2) Stopper | (7) Accelerator spring |
| (3) Accelerator pedal lever | (8) Bushing |
| (4) Accelerator pedal spring | (9) Clip |
| (5) Accelerator pedal | (10) Accelerator stopper |

- (11) Kick-down switch (AT model).

Tightening torque: N·m (kgf-m, ft-lb)

T: 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 negative terminal from battery.

ACCELERATOR PEDAL

SPEED CONTROL SYSTEMS

2. Accelerator Pedal

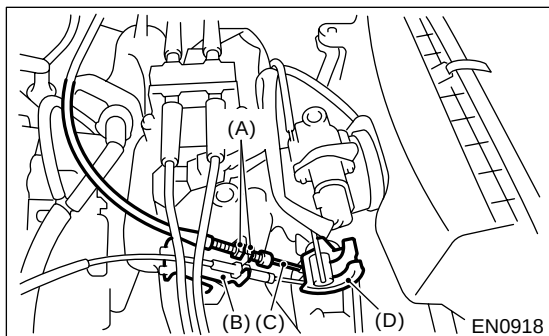
A: REMOVAL

- 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.
- 5) Disconnect accelerator cable from throttle body.

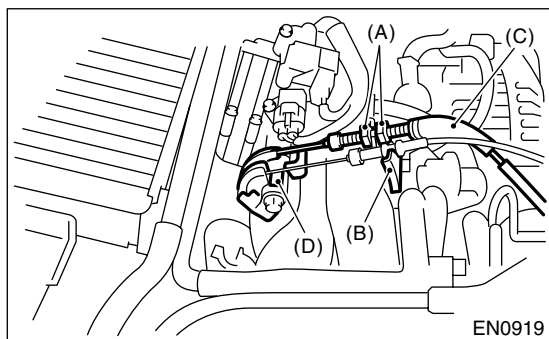
CAUTION:

Be careful not to kink accelerator cable.

- SOHC model



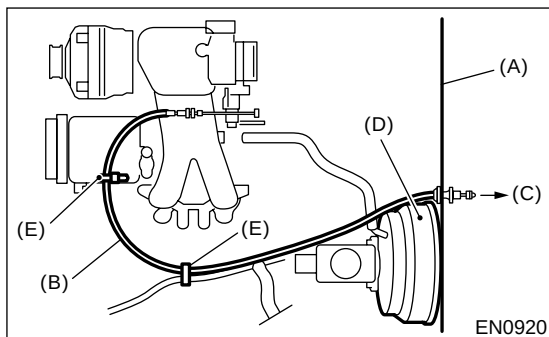
- DOHC TURBO model



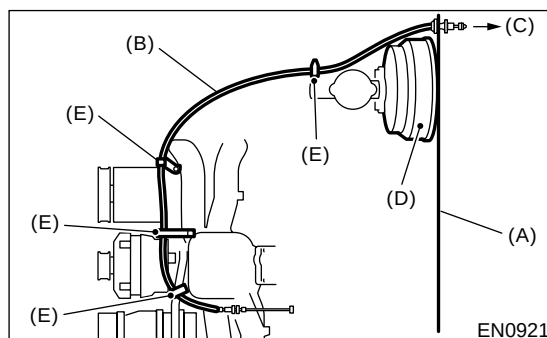
- (A) Lock nut
- (B) Accelerator cable bracket
- (C) Accelerator cable
- (D) Throttle cam

- 6) Remove clip inside engine compartment.

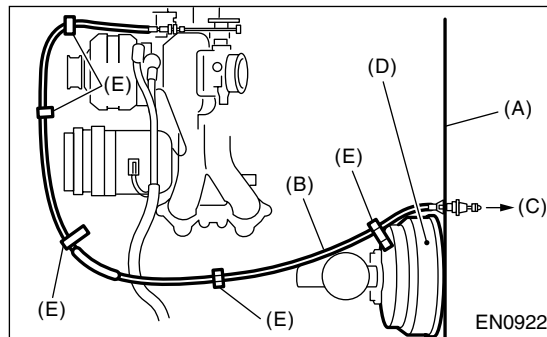
- LHD SOHC model



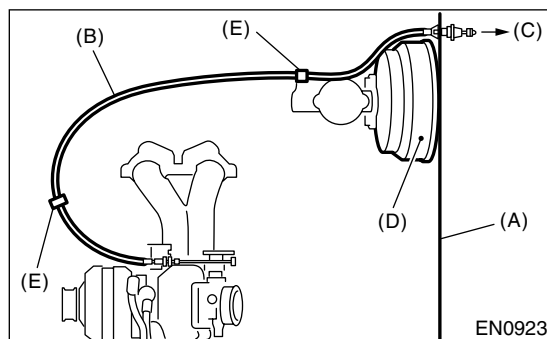
- RHD SOHC model



- LHD DOHC TURBO model



- RHD DOHC TURBO model



- (A) Toe board
- (B) Accelerator cable
- (C) To accelerator pedal
- (D) Brake booster
- (E) Clip

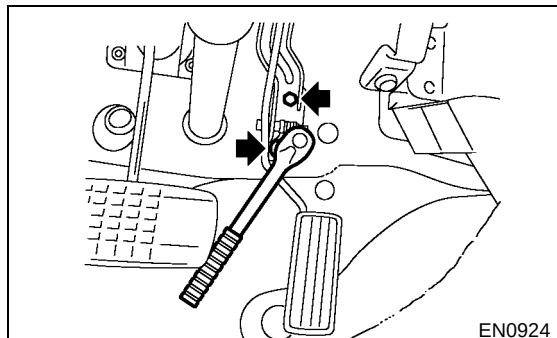
- 7) Remove instrument panel lower cover from instrument panel, and connector.

- 8) Disconnect connector from kick-down switch. (AT model)

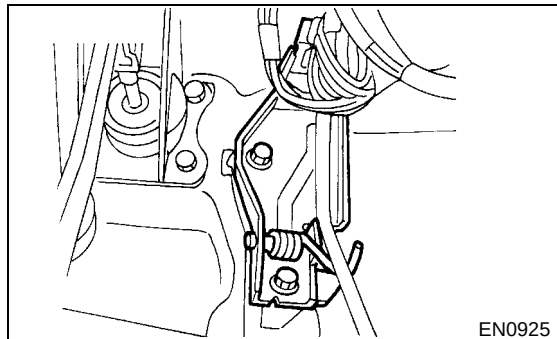
- 9) Remove brake and clutch pedal bracket. (LHD MT model) <Ref. to BR-73, REMOVAL, Brake Pedal.>

- 10) Remove accelerator pedal connecting bolt from accelerator pedal bracket.

- LHD model



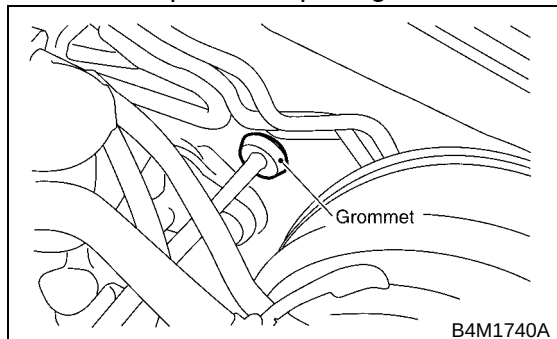
- RHD model



11) Disconnect grommet from toe board.

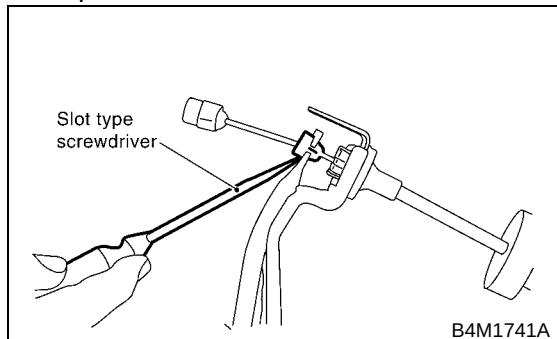
NOTE:

From inside compartment, push grommet into hole.

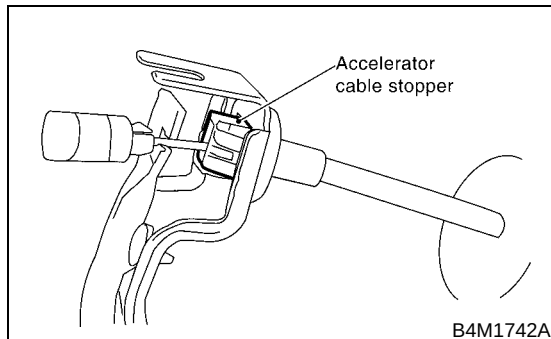


12) Pull out the cable from the toe board hole.

13) Disconnect accelerator cable bushing from accelerator pedal lever.



14) Disconnect accelerator cable stopper from bracket.



15) Separate accelerator cable and bracket.

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.

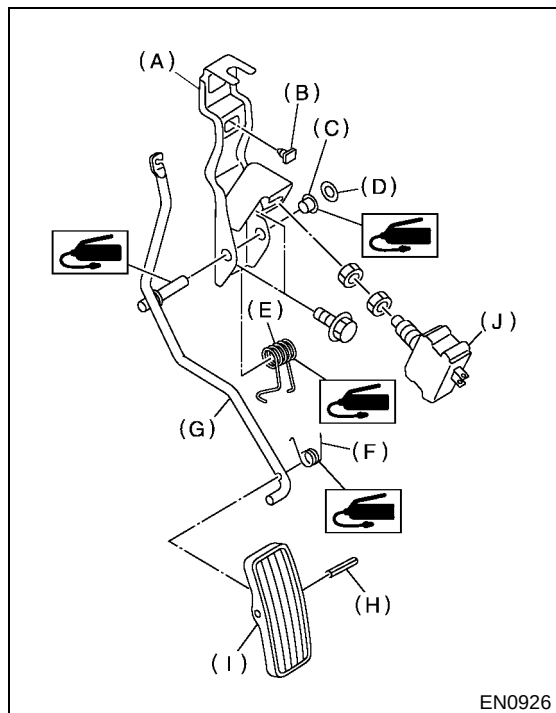
ACCELERATOR PEDAL

SPEED CONTROL SYSTEMS

C: DISASSEMBLY

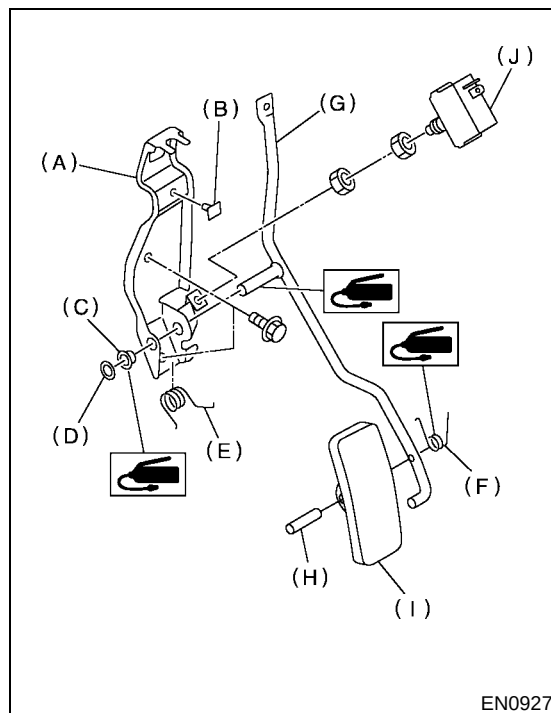
- 1) Remove the clip, and then remove the accelerator pedal from the bracket.
- 2) Pull out the spring pin, and then remove the accelerator pedal from the accelerator pedal lever.

- 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 (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.

CAUTION:

Clean and apply grease to spacer and inside bore of a accelerator pedal.

E: INSPECTION

1. ACCELERATOR PEDAL

Lightly move pedal pad in lateral the direction to ensure pedal deflection is in specified range.

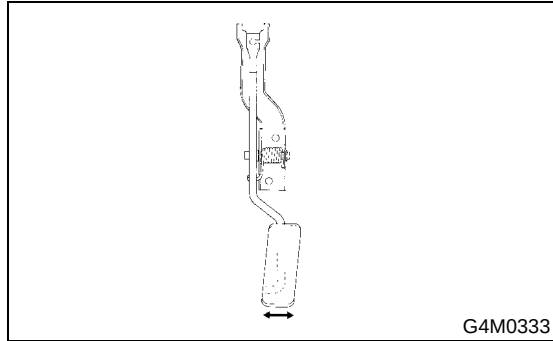
CAUTION:

If excessive deflection is noted, replace bushing and clip with new ones.

Deflection of accelerator pedal:

Service limit

5.0 mm (0.197 in) or less

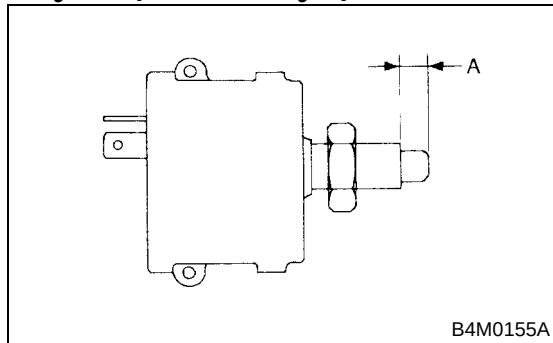


2. KICK-DOWN SWITCH

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

$2^{+1.5}_{-0}$ mm (0.079 $^{+0.059}_{-0}$ in)



F: ADJUSTMENT

1) Check pedal stroke and free play by operating accelerator pedal by hand.

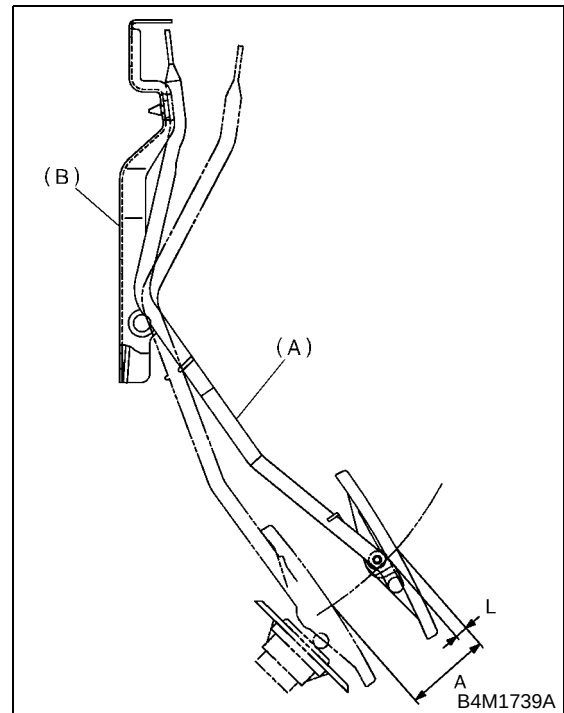
If it is not within specified value, adjust it by turning nut connecting accelerator cable to throttle body.

Free play at pedal pad: L

1 — 4 mm (0.04 — 0.16 in)

Stroke at pedal pad: A

52 — 57 mm (2.05 — 2.24 in)



(A) Accelerator pedal

(B) Accelerator pedal bracket

Accelerator cable lock nut tightening torque:

12 N·m (1.2 kgf-m, 9 ft-lb)

ACCELERATOR PEDAL

SPEED CONTROL SYSTEMS

2) 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.

CAUTION:

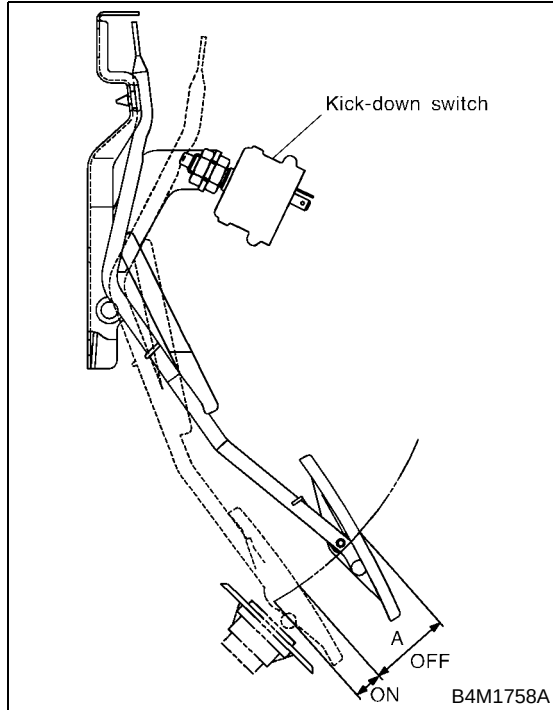
Be careful not to rotate kick-down switch.

Kick-down switch stroke: A

$48 \pm 1 \text{ mm}$ ($1.89 \pm 0.04 \text{ in}$)

Kick-down switch tightening torque:

$12 \text{ N}\cdot\text{m}$ ($1.2 \text{ kgf}\cdot\text{m}$, $9 \text{ ft}\cdot\text{lb}$)



3. Accelerator Control Cable

A: REMOVAL

- 1) Remove accelerator pedal. <Ref. to SP-4, REMOVAL, Accelerator Pedal.>
- 2) Separate accelerator cable and accelerator 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.
 - Do not apply grease to the throttle cable on the engine side.
- 2) Adjustment after pedal installation <Ref. to SP-5, INSTALLATION, Accelerator Pedal.>

C: INSPECTION

- 1) Make sure the inner cable is not twisted or frayed.
- 2) Make sure the outer cable is not cracked.

ACCELERATOR CONTROL CABLE

SPEED CONTROL SYSTEMS

ENGINE 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

IGNITION

IG(SOHC)

	Page
1. General Description	2
2. Spark Plug.....	5
3. Ignition Coil and Ignitor Assembly	8
4. Spark Plug Cord	10

GENERAL DESCRIPTION

IGNITION

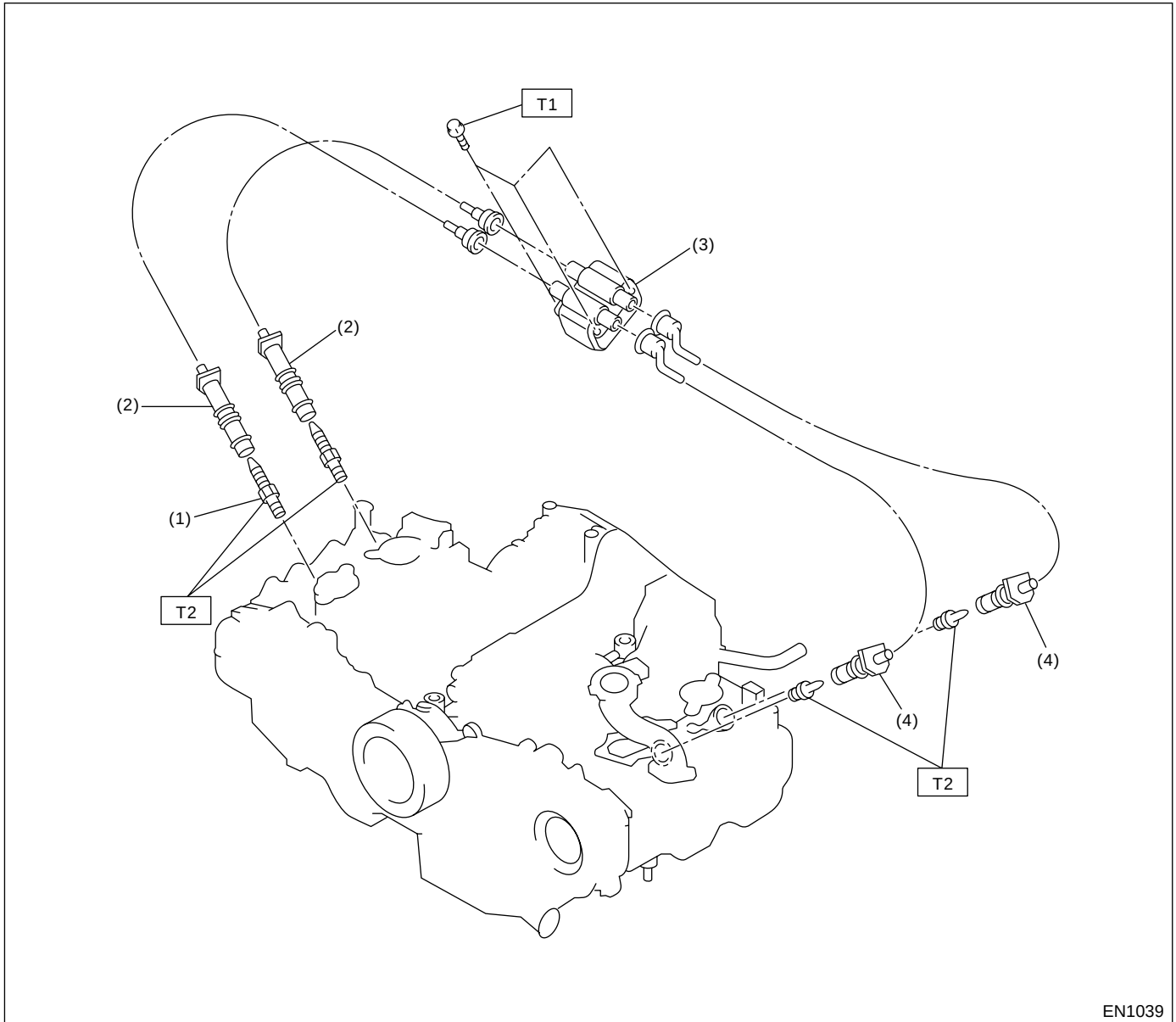
1. General Description

A: SPECIFICATIONS

Item			Designation		
Ignition coil and ignitor assembly	Model	1600cc	CM12—100C		
		2000cc	FH0137		
	Manufacturer	1600cc	HITACHI		
		2000cc	DIAMOND		
	Primary coil resistance	1600cc	0.7 Ω ±10%		
		2000cc	0.73 Ω ±10%		
	Secondary coil resistance	1600cc	13.0 k Ω ±20%		
		2000cc	12.8 k Ω ±15%		
Insulation resistance between primary terminal and case		More than 10 M Ω			
Spark plug	Type and manufacturer	1600cc	RC8YC4 CHAMPION		
			Alternate	BKR6E-11 NGK	
		2000cc	RC10YC4 CHAMPION		
			Alternate	BKR5E-11 NGK	
	Thread size		mm	14, P = 1.25	
	Spark gap		mm (in)	1.0 — 1.1 (0.039 — 0.043)	

B: COMPONENT

1. 1600CC MODEL



EN1039

- (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)

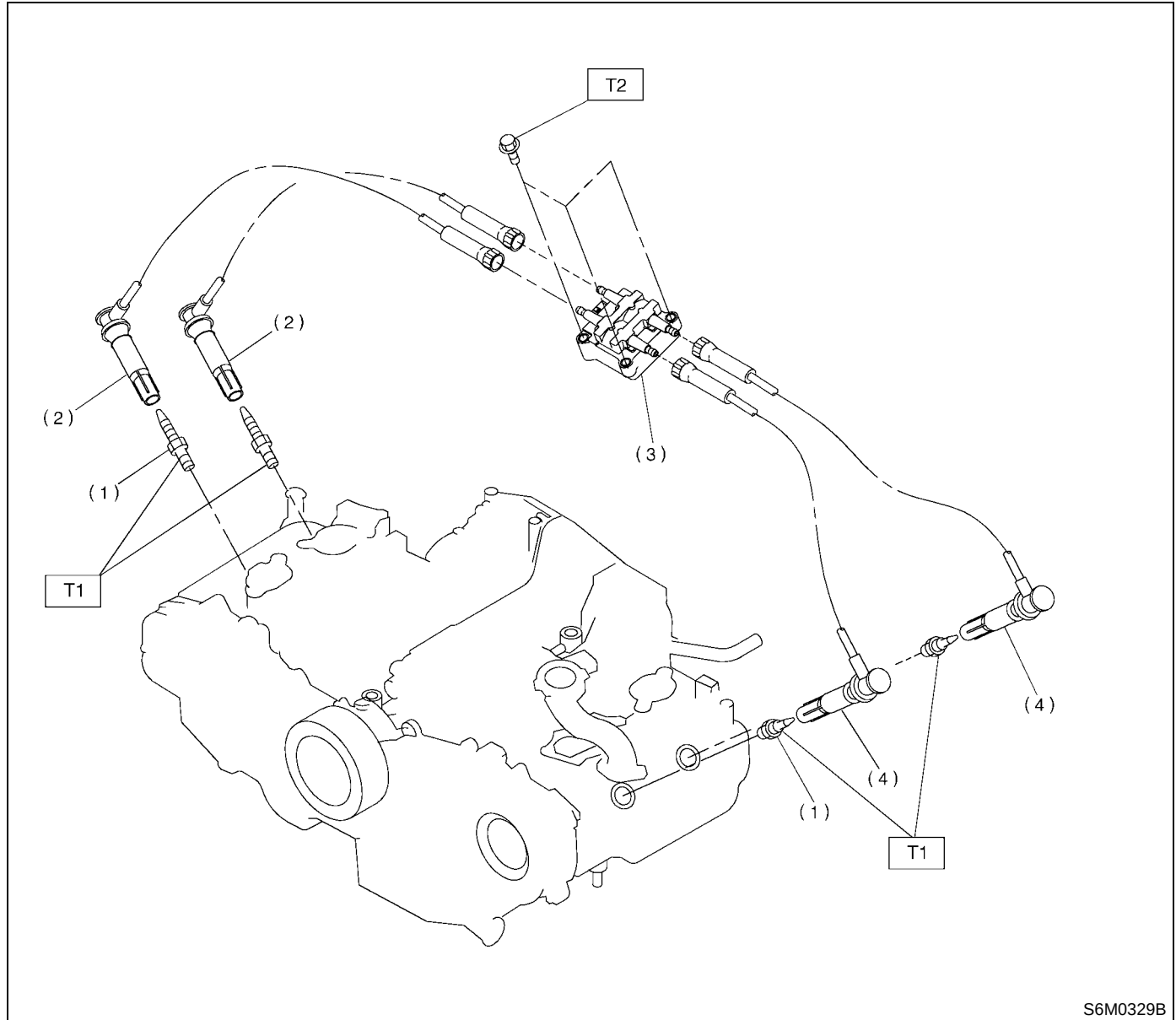
T1: 6.4 (0.65, 4.7)

T2: 21 (2.1, 15.2)

GENERAL DESCRIPTION

IGNITION

2. 2000CC MODEL



S6M0329B

- | | |
|------------------------------------|------------------------------|
| (1) Spark plug | (4) Spark plug cord (#2, #4) |
| (2) Spark plug cord (#1, #3) | |
| (3) Ignition coil and ignitor ASSY | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 21 (2.1, 15)

T2: 6.4 (0.65, 4.7)

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 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.

2. Spark Plug

A: REMOVAL

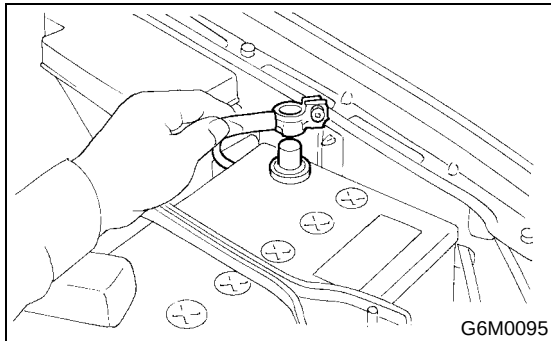
CAUTION:

All spark plugs installed on an engine, must be of the same heat range.

Spark plug	
1600cc	CHAMPION: RC8YC4 NGK: BKR6E-11 (Alternate)
2000cc	CHAMPION: RC10YC4 NGK: BKR5E-11 (Alternate)

1. RH SIDE

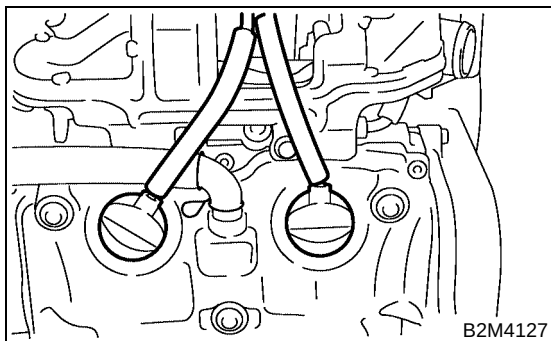
- 1) Disconnect battery ground cable.



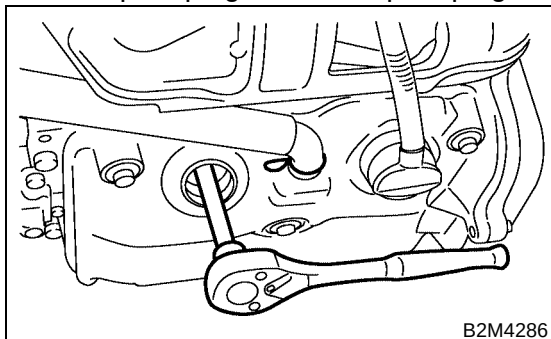
- 2) Remove air intake duct. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>

(1) Remove resonator chamber. <Ref. to IN(SOHC)>

- 3) Remove spark plug cords by pulling boot, not cord itself.

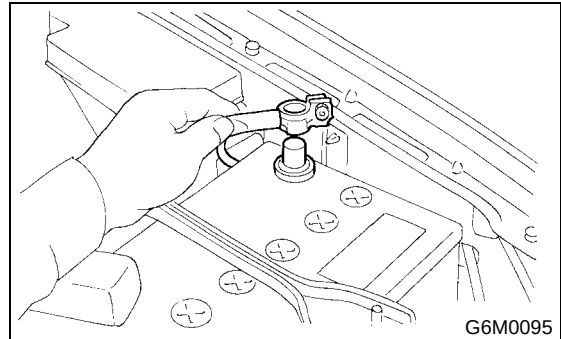


- 4) Remove spark plugs with the spark plug socket.

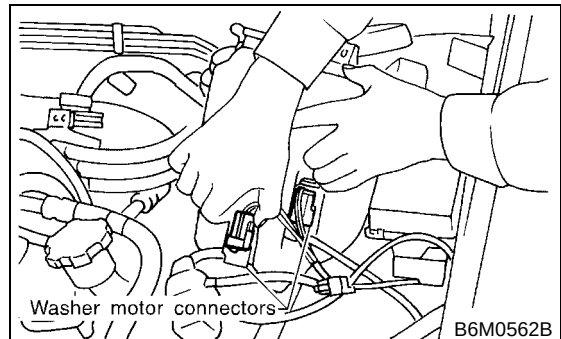


2. LH SIDE

- 1) Disconnect battery ground cable.

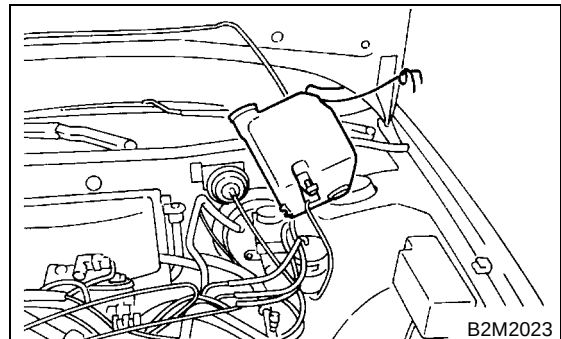


- 2) Disconnect washer motor connector.

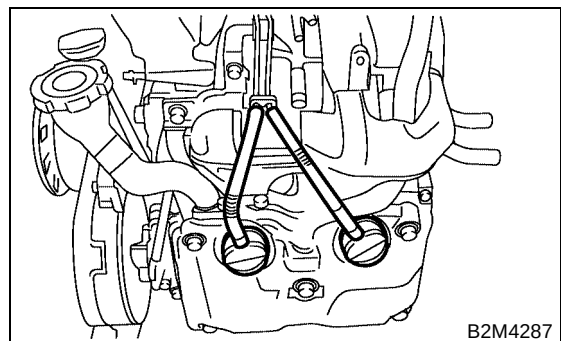


- 3) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

- 4) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



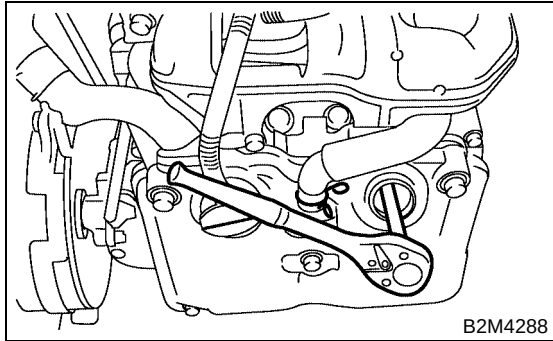
- 5) Remove spark plugs cord by pulling boot, not cord itself.



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):

20.6 N·m (2.10 kgf-m, 15.2 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.

2. LH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):

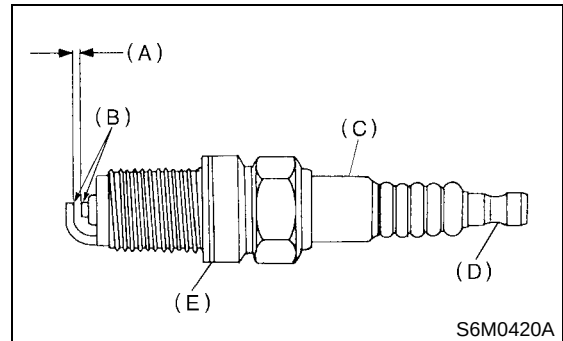
20.6 N·m (2.10 kgf-m, 15.2 ft-lb)

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

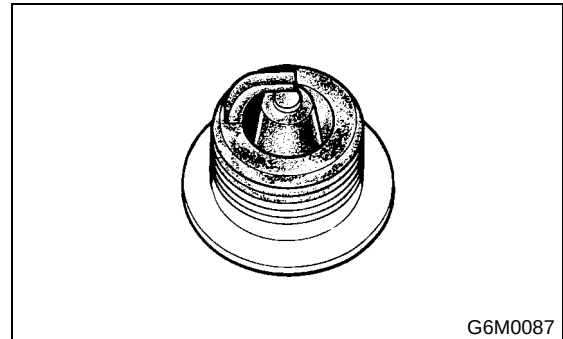
Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal

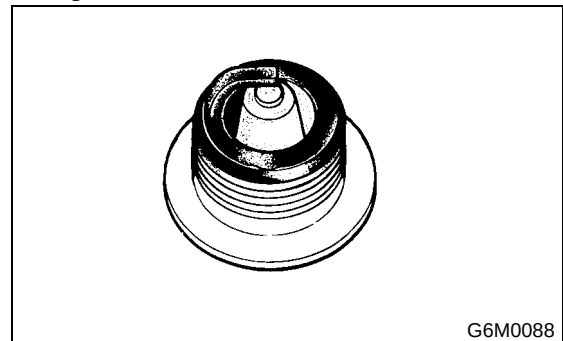
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



2) Carbon fouled

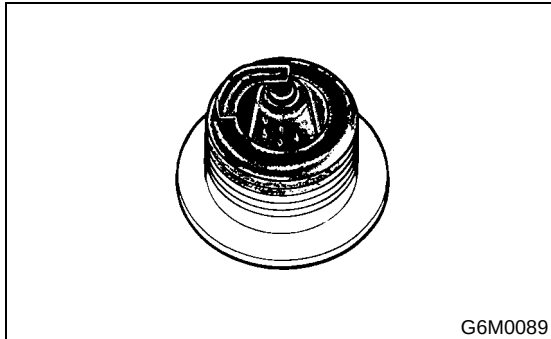
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



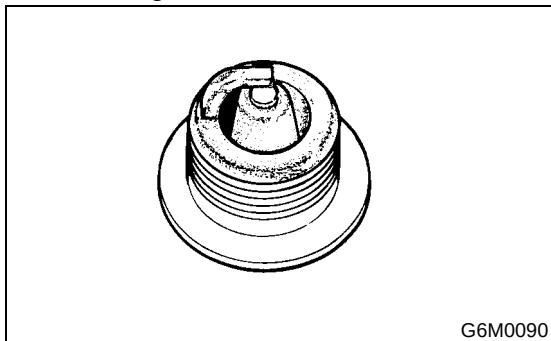
3) Oil fouled

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.

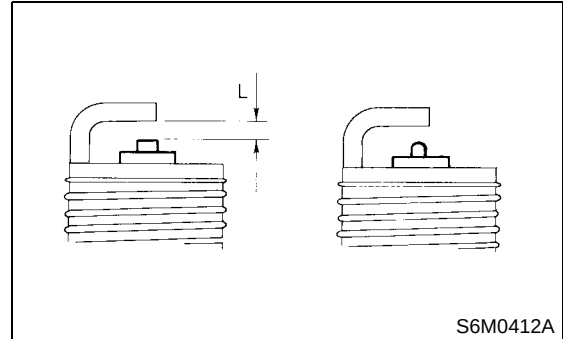


E: ADJUSTMENT

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" shape.

D: CLEANING

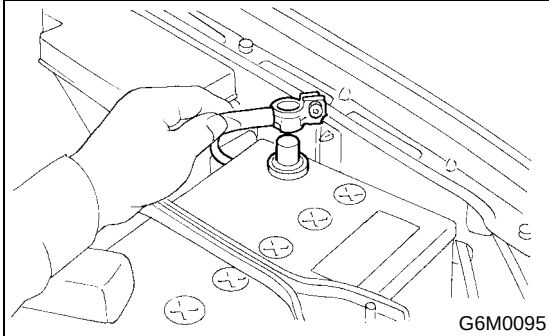
Clean spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.

If deposits are too stubborn, replace plugs.

3. Ignition Coil and Ignitor Assembly

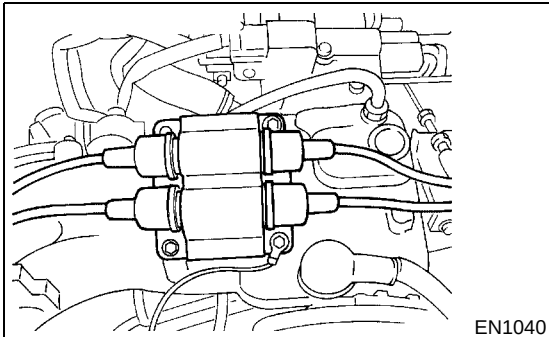
A: REMOVAL

1) Disconnect battery ground cable.

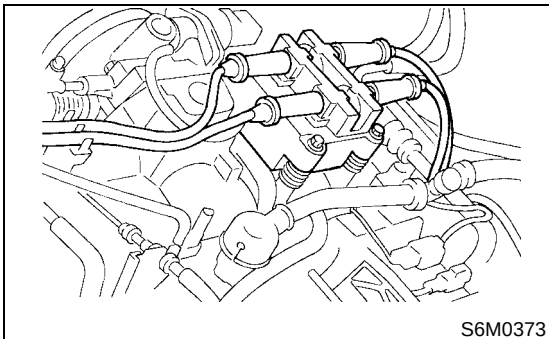


2) Disconnect spark plug cords from ignition coil and ignitor assembly.

• 1600cc MODEL



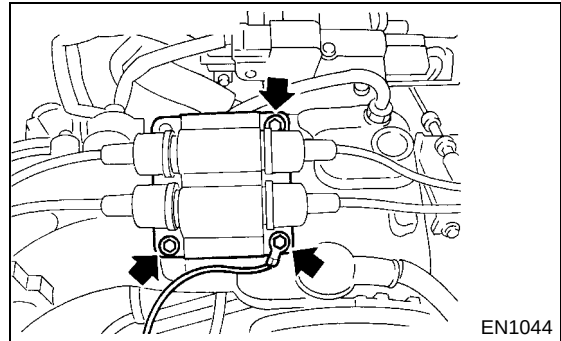
• 2000cc MODEL



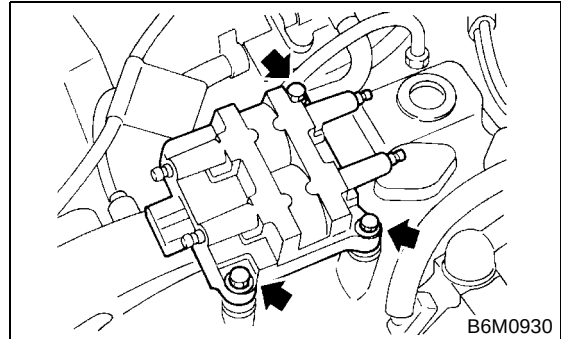
3) Disconnect connector from ignition coil and ignitor assembly.

4) Remove ignition coil and ignitor assembly.

• 1600cc MODEL



• 2000cc MODEL



B: INSTALLATION

1) Install in the reverse order of removal.

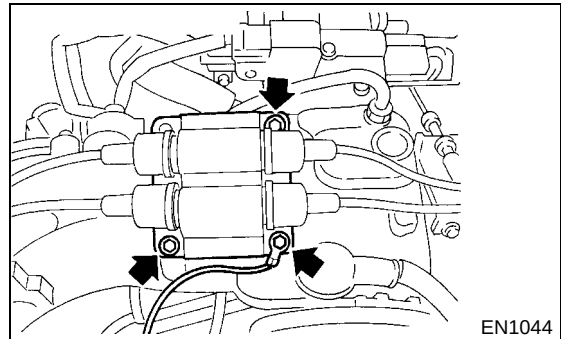
Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

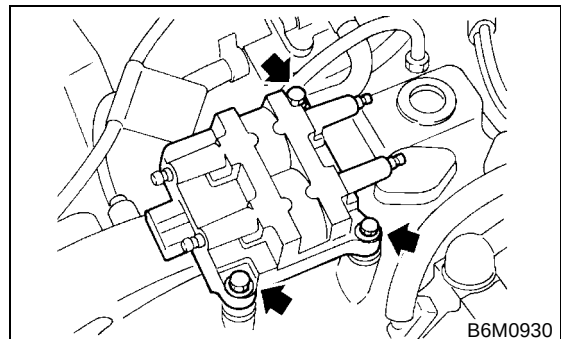
CAUTION:

Be sure to connect wires to their proper positions. Failure to do so will damage unit.

• 1600cc MODEL



• 2000cc MODEL



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:(1600cc)

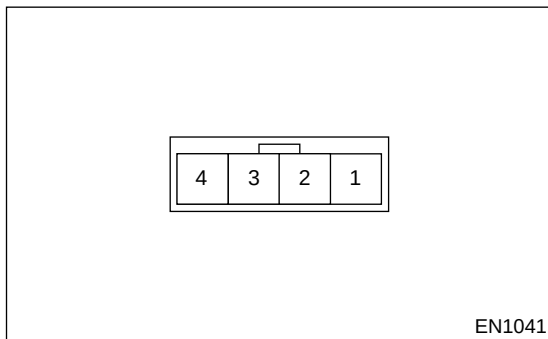
[Primary side]

Between terminal No. 1 and No. 4

$0.7 \Omega \pm 10\%$

Between terminal No. 1 and No. 2

$0.7 \Omega \pm 10\%$



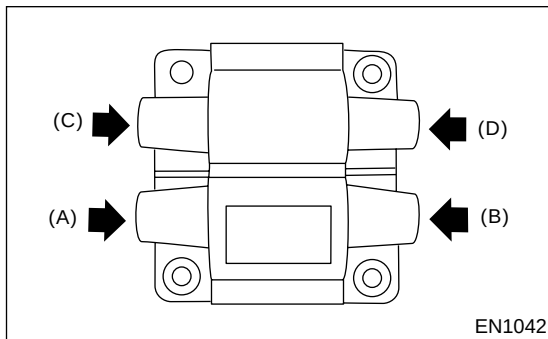
[Secondary side]

Between (A) and (B)

$13.0 k\Omega \pm 20\%$

Between (C) and (D)

$13.0 k\Omega \pm 20\%$



Specified resistance:

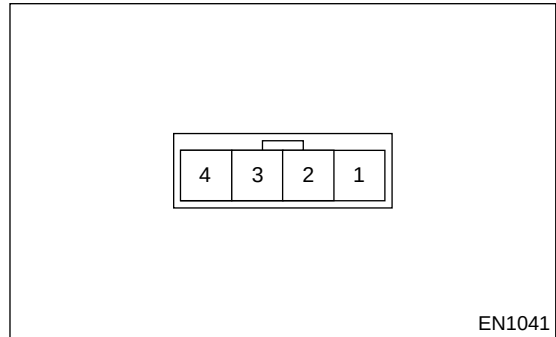
[Primary side]

Between terminal No. 1 and No. 2

$0.73 \Omega \pm 10\%$

Between terminal No. 2 and No. 4

$0.73 \Omega \pm 10\%$



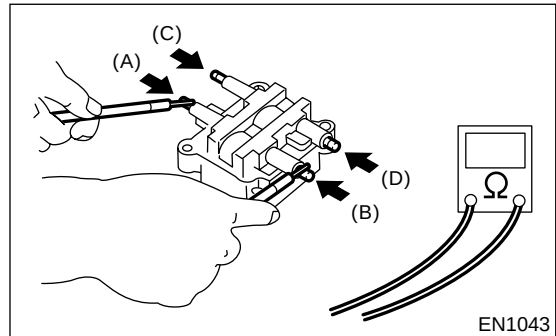
[Secondary side]

Between (A) and (B)

$12.8 k\Omega \pm 15\%$

Between (C) and (D)

$12.8 k\Omega \pm 15\%$



- 3) Insulation between primary terminal and case:
 $10 M\Omega$ 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

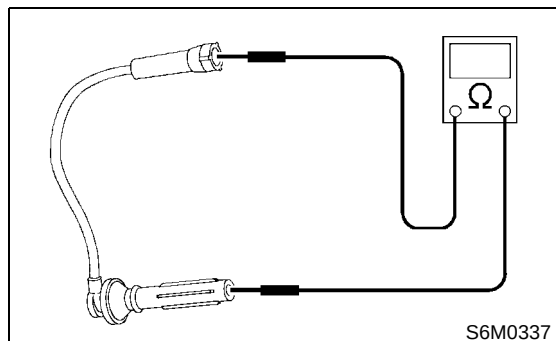
Resistance value:

#1 cord: 5.6 — 10.6

#2 cord: 7.3 — 13.7

#3 cord: 5.9 — 11.1

#4 cord: 7.3 — 13.7



ENGINE 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

STARTING/CHARGING SYSTEMS

SC

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3. Generator	12
4. Battery.....	17

GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

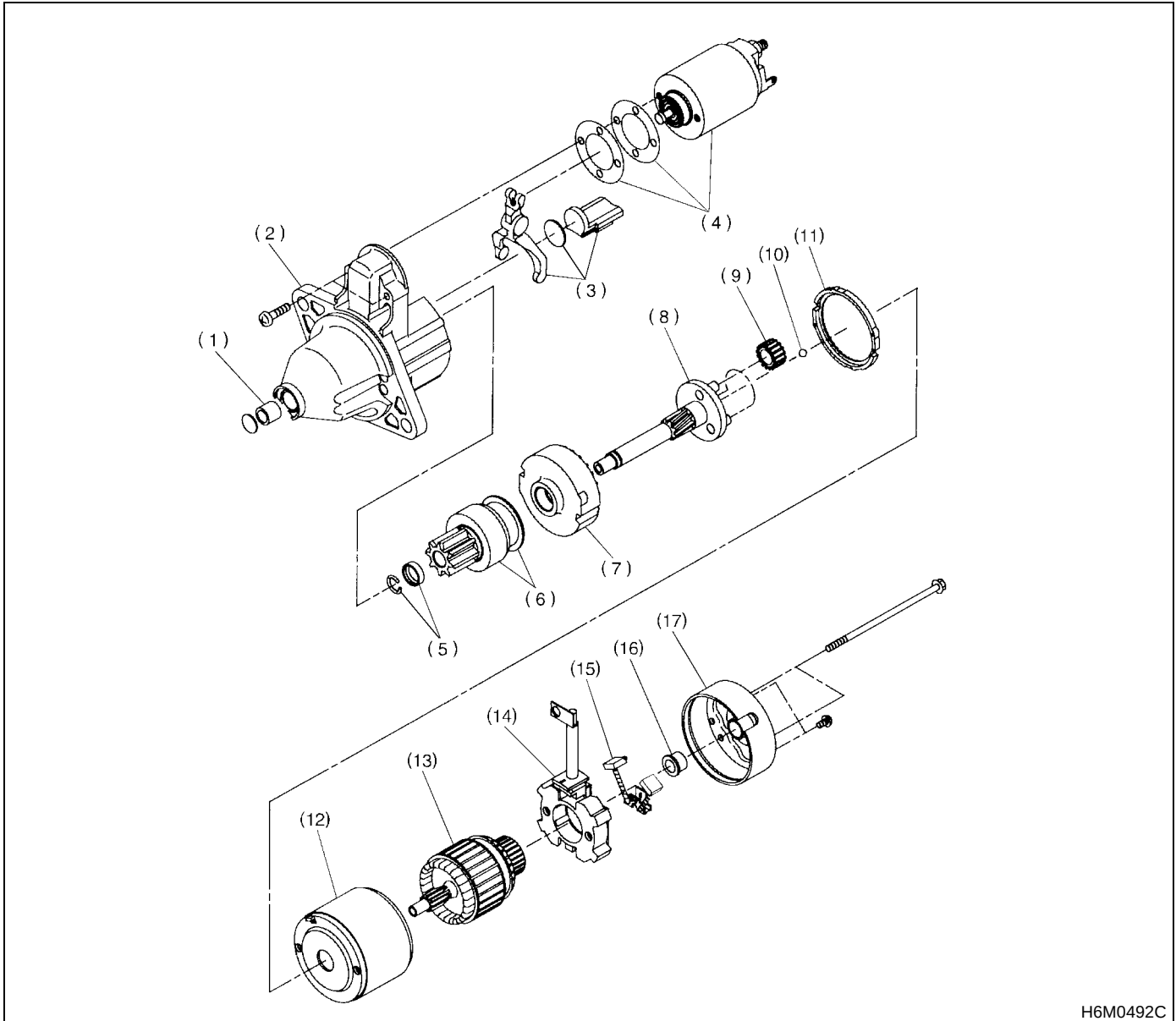
1. General Description

A: SPECIFICATIONS

Item		Designation	
Starter	Type	Reduction type	
	Vehicle type	MT vehicles	AT vehicles
	Model	M001T81681	M001T84481
	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
	Load characteristics	Voltage	7.5 V
		Current	300 A
		Torque	8.7 N·m (0.89 kg-m, 6.4 ft-lb) or more
		Rotating speed	890 rpm or more
	Lock characteristics	Voltage	4 V
		Current	780 A or less
		Torque	15.7 N·m (1.60 kg-m, 11.6 ft-lb) or more
Generator	Type	Rotating-field three-phase type, Voltage regulator built-in type, with load response control system	
	Model	A2TB2891	
	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)]	

B: COMPONENT

1. STARTER



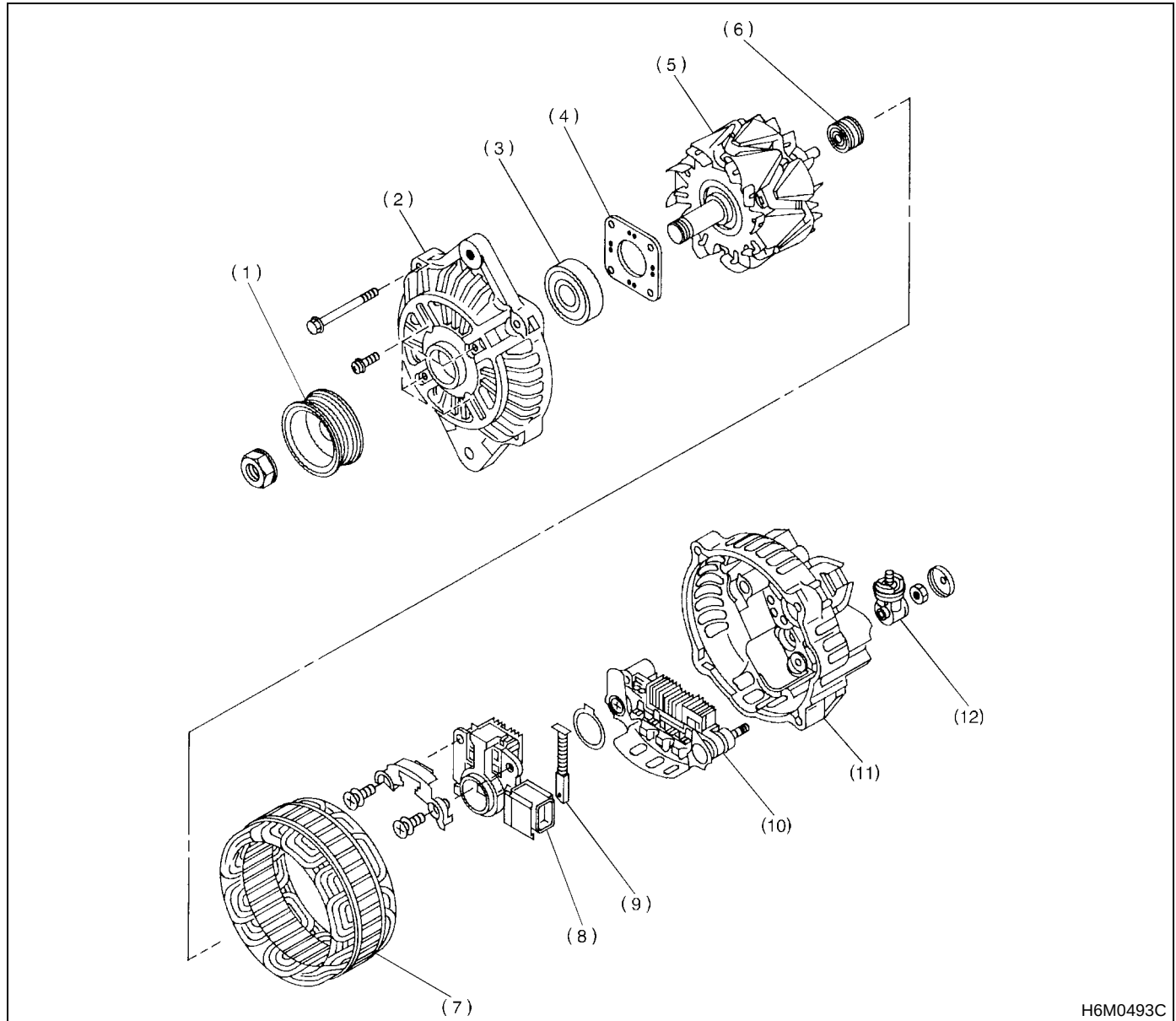
H6M0492C

- | | | |
|-------------------------|------------------------|---------------------|
| (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



H6M0493C

- | | | |
|----------------------|-----------------------------|-----------------|
| (1) Pulley | (5) Rotor | (9) Brush |
| (2) Front cover | (6) Bearing | (10) Rectifier |
| (3) Ball bearing | (7) Stator coil | (11) Rear cover |
| (4) Bearing retainer | (8) IC regulator with brush | (12) Terminal |

C: CAUTION

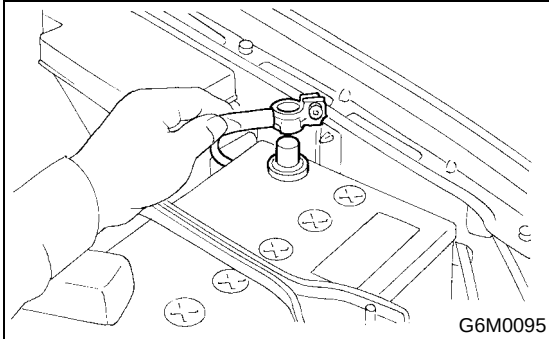
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 negative terminal from battery.

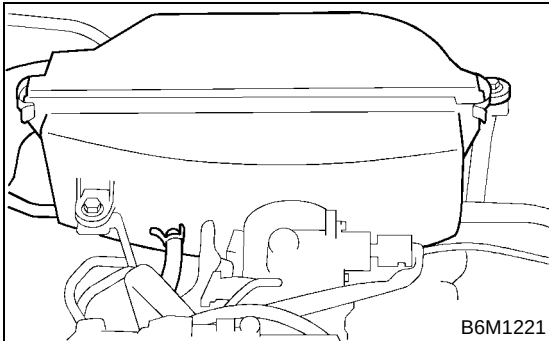
2. Starter

A: REMOVAL

1) Disconnect battery ground cable.



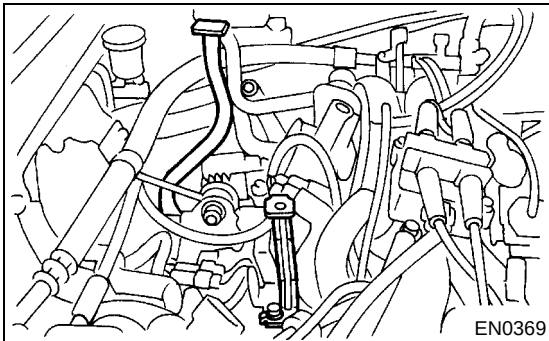
2) Remove air cleaner case. (Non-Turbo Model)



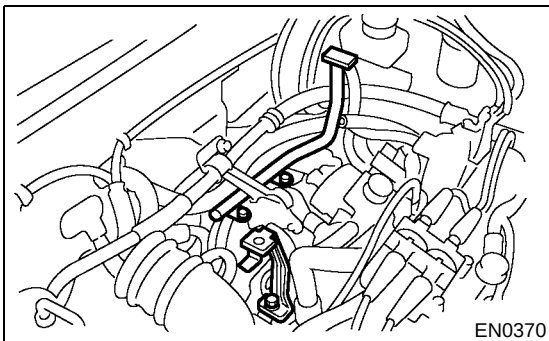
3) Remove intercooler. (Turbo Model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

4) Remove air cleaner case stay. (Non-Turbo Model)

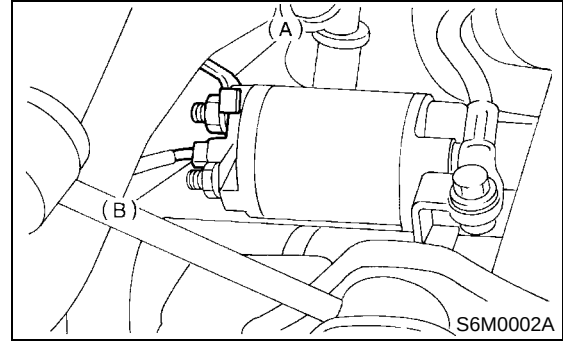
• MT vehicles



• AT vehicles



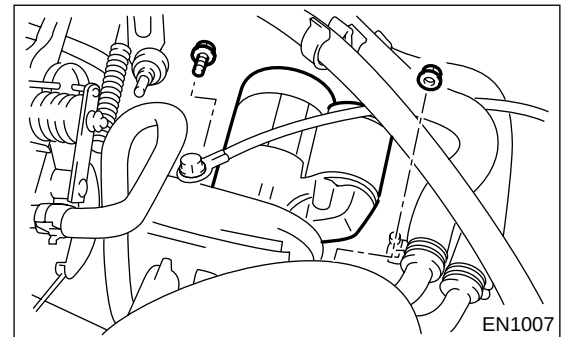
5) Disconnect connector and terminal from starter.



(A) Terminal

(B) Connector

6) Remove starter from transmission.



STARTER

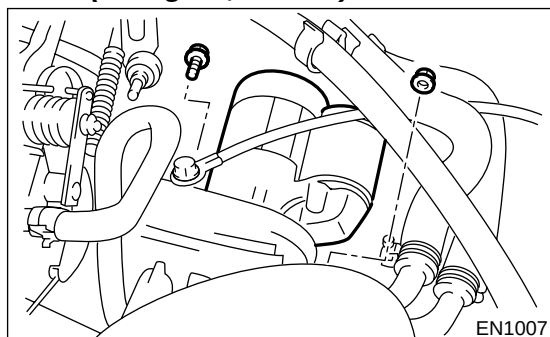
STARTING/CHARGING SYSTEMS

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)



C: DISASSEMBLY

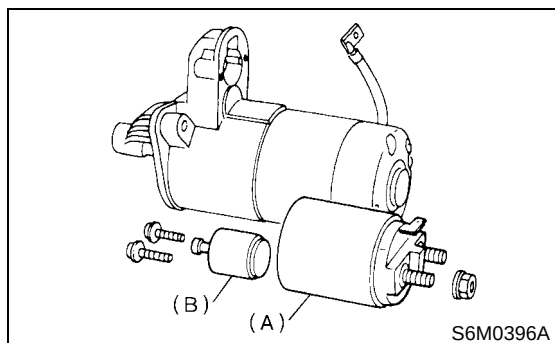
1. STARTER ASSEMBLY

1) Loosen nut which holds terminal M of switch assembly, and disconnect connector.

2) Remove bolts which hold switch assembly, and remove switch assembly, plunger and plunger spring from starter as a unit.

CAUTION:

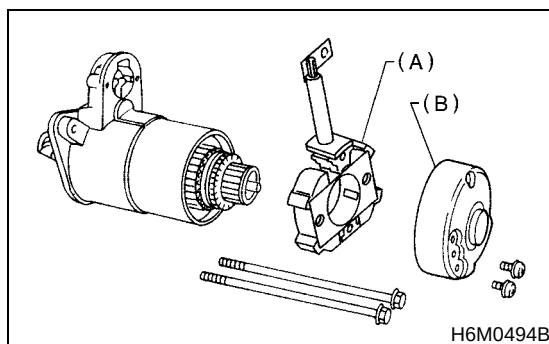
Be careful because pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



(A) Switch ASSY

(B) Plunger

3) Remove both through-bolts and brush holder screws, and detach rear bracket and brush holder.



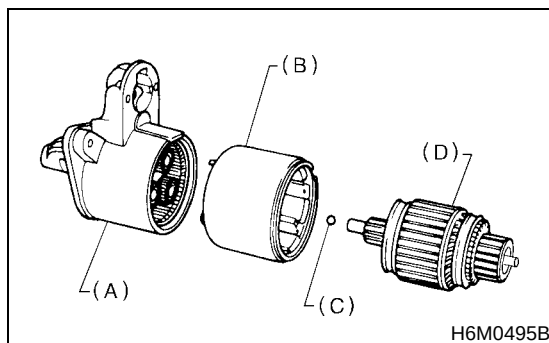
(A) Brush holder

(B) Rear bracket

4) Remove armature and yoke. Ball used as a bearing will then be removed from the end of armature.

CAUTION:

Be sure to mark an alignment mark on yoke and front bracket before removing yoke.



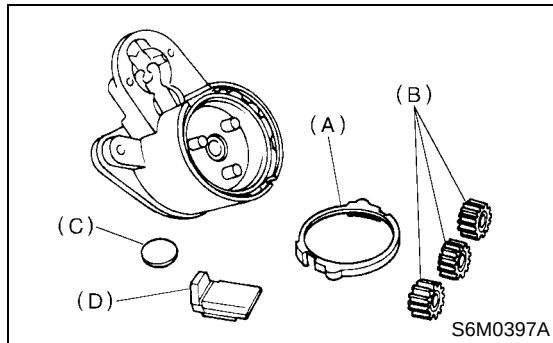
(A) Front bracket

(B) Yoke

(C) Ball

(D) Armature

5) Remove packing A, three planetary gears, packing B and plate.

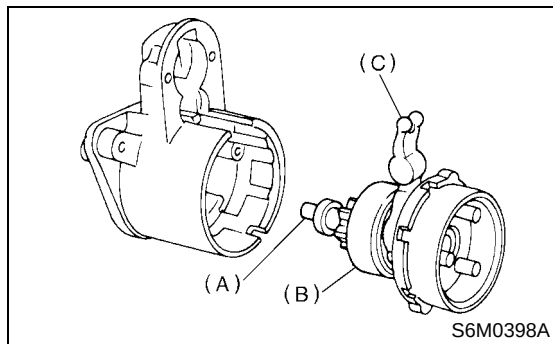


- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

6) Remove shaft assembly and overrunning clutch as a unit.

CAUTION:

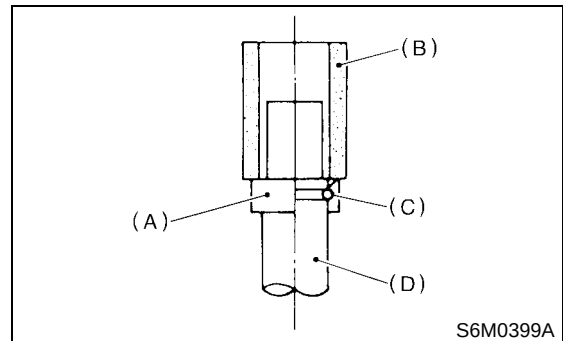
Record the direction of lever before removing.



- (A) Shaft ASSY
- (B) Overrunning clutch
- (C) Lever

7) Remove overrunning clutch from shaft assembly as follows:

- (1) Remove stopper from ring by lightly tapping a fit tool placed on stopper.
- (2) Remove ring, stopper and clutch from shaft.



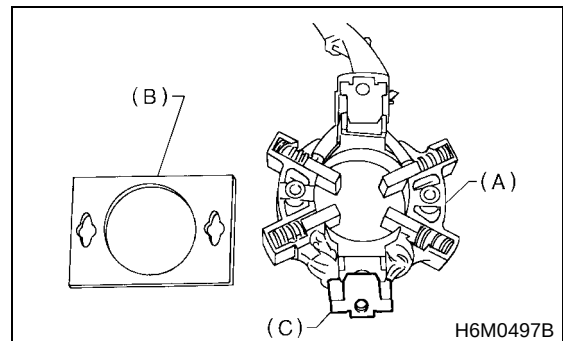
- (A) Stopper
- (B) Tool
- (C) Ring
- (D) Shaft

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

STARTER

STARTING/CHARGING SYSTEMS

D: ASSEMBLY

Assembly is in the reverse order of disassembly procedures. Do the following:

1) Carefully assemble all parts in the order of assembly and occasionally inspect nothing has been overlooked.

2) Apply grease to the following parts during assembly.

- 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

3) After assembling parts correctly, check to be 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.

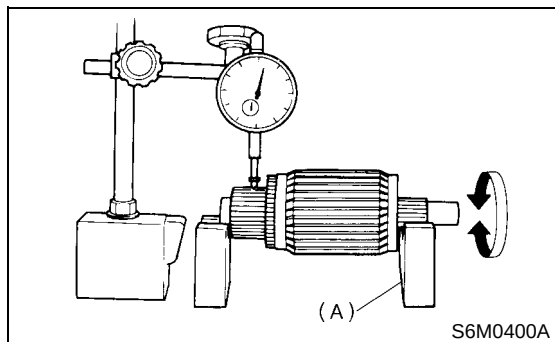
Commutator run-out:

Standard

0.05 mm (0.0020 in)

Service limit

Less than 0.10 mm (0.0039 in)



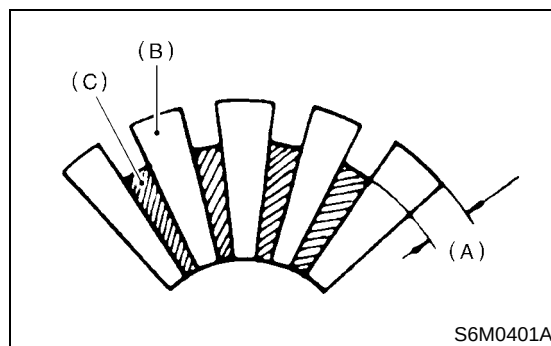
(A) V-block

3) Depth of segment mold

Check the depth of segment mold.

Depth of segment mold:

0.5 mm (0.020 in)



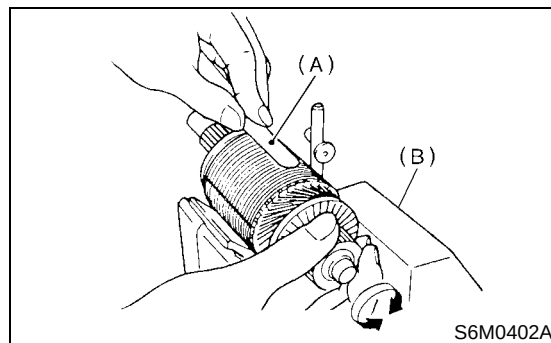
(A) Depth of mold

(B) Segment

(C) Mold

4) Armature short-circuit test

Check armature for short-circuit by placing it on growler tester. Hold a hacksaw blade against armature core while slowly rotating armature. A short-circuited armature will cause the blade to vibrate and to be attracted to core. If the hacksaw blade is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



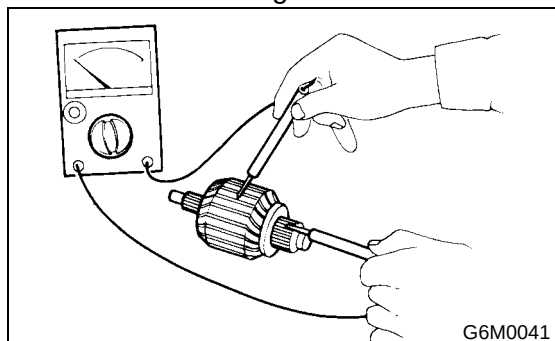
(A) Iron sheet

(B) Growler

5) Armature ground test

Using circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is a continuity, armature is grounded.

Replace armature if it is grounded.



2. YOKE

Make sure pole is set in position.

3. OVERRUNNING CLUTCH

Inspect teeth of pinion for wear and damage. Replace if it is damaged. Rotate 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.

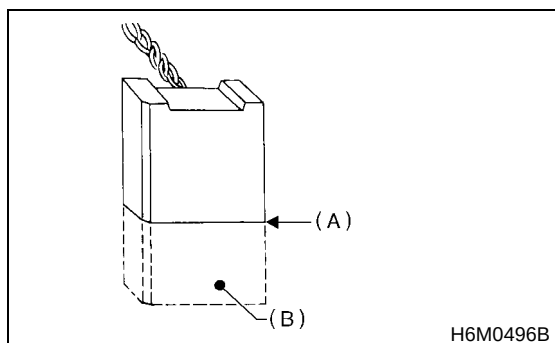
Brush length:

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 kg, 4.9 lb) (when new)

Service limit

5.9 N (0.6 kg, 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").

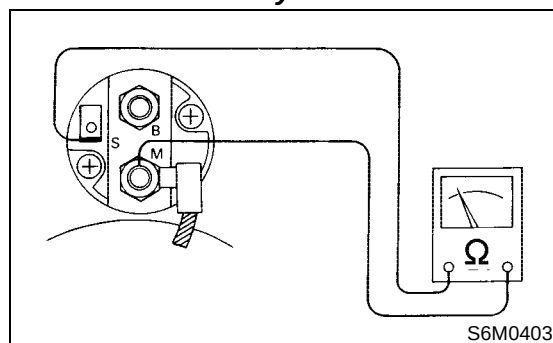
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:

S — M / Continuity

S — Ground / Continuity

M — B / No continuity



6. SWITCH ASSEMBLY OPERATION

1) Connect terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. Pinion should be forced endwise on shaft.

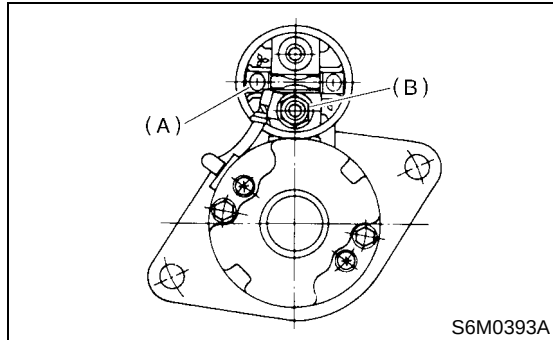
CAUTION:

With pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

STARTER

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2) Disconnect connector from terminal M, and connect positive terminal of battery and terminal M using a lead wire and ground terminal to starter body. In this test set up, pinion should return to its original position even when it is pulled out with a screwdriver.



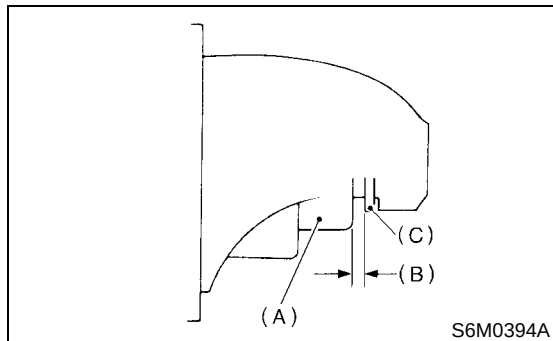
- (A) Terminal S
- (B) Terminal M

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 motor is running with the pinion forced endwise on the shaft, disconnect connector from terminal M of switch assembly and connect terminal M to ground terminal (–) of battery with a lead wire. Next, gently push pinion back with your fingertips and measure pinion gap.

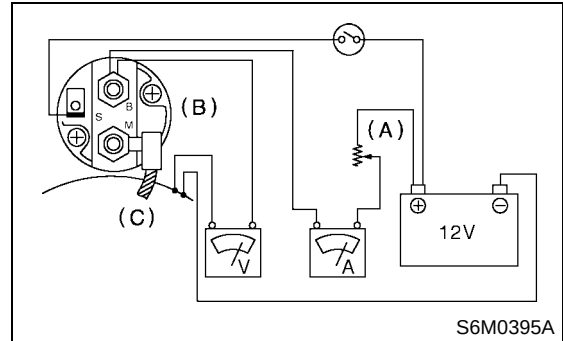
2) If pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.

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

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 specifications.

Load test (Standard):***Voltage / Load******MT vehicles******7.5 V/8.7 N·m (0.89 kg-m, 6.4 ft-lb)******AT vehicles******7.7 V/16.0 N·m (1.63 kg-m, 11.8 ft-lb)******Current / Speed******MT vehicles******300 A/890 rpm or more******AT vehicles******400 A/740 rpm or more*****3) Lock test**

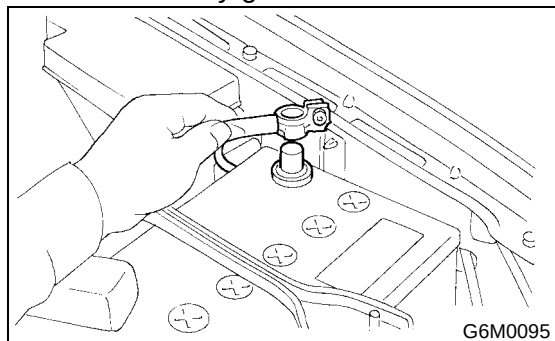
With starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (Standard):***Voltage / Current******MT vehicles******4 V/780 A or less******AT vehicles******3.5 V/940 A or less******Torque******MT vehicles******15.7 N·m (1.60 kg-m, 11.6 ft-lb) or more******AT vehicles******28.9 N·m (2.95 kg-m, 21.3 ft-lb) or more***

3. Generator

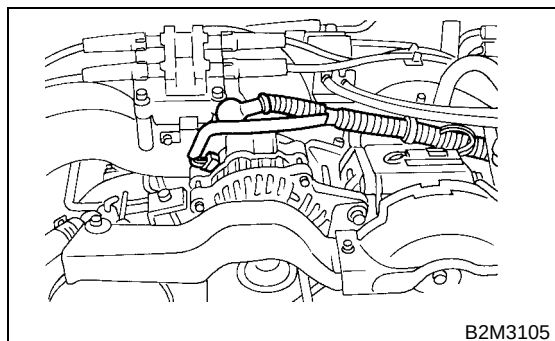
A: REMOVAL

1) Disconnect battery ground cable.

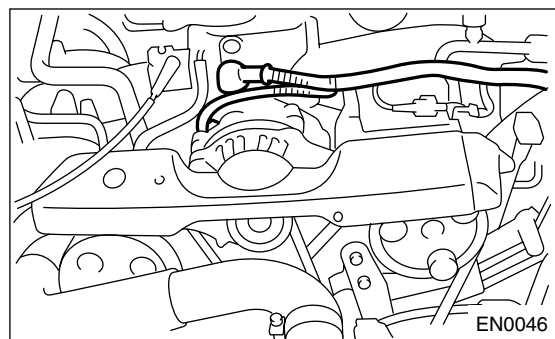


2) Disconnect connector and terminal from generator.

- Non-Turbo Model

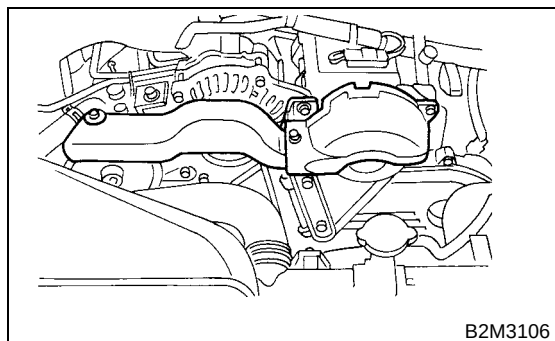


- Turbo Model

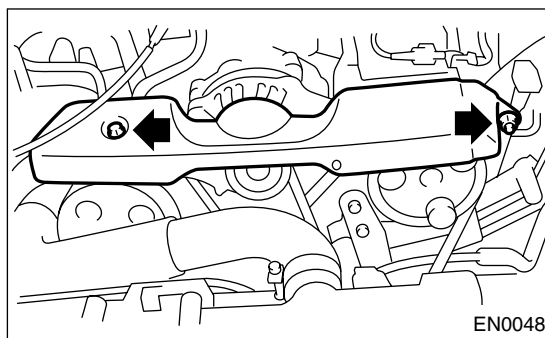


3) Remove V-belt cover.

- Non-Turbo Model



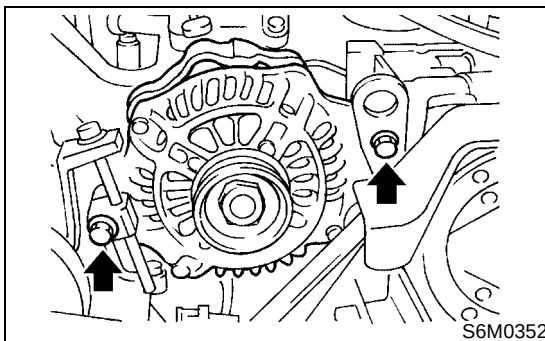
- Turbo Model



4) Remove front side V-belt.

<Ref. to ME(SOHC)-42, FRONT SIDE BELT, REMOVAL, V-belt.> or <Ref. to ME(DOHC TURBO)-43, FRONT SIDE BELT, REMOVAL, V-belt.>

5) Remove bolts which install generator onto bracket.

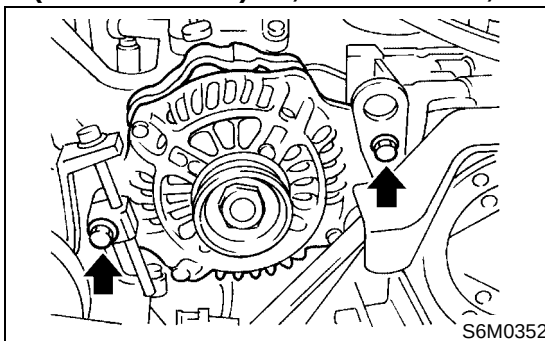


B: INSTALLATION

Install in the reverse order of removal.

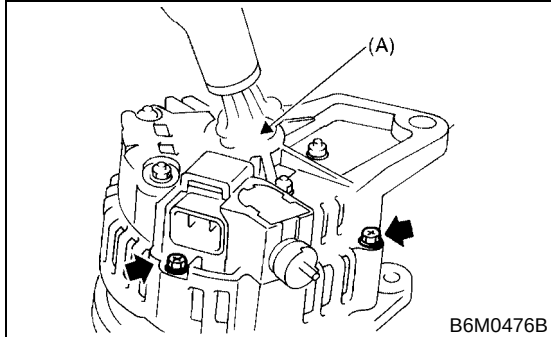
CAUTION:

Check and adjust V-belt tension. <Ref. to ME(SOHC)-43, INSPECTION, V-belt.> and <Ref. to ME(DOHC TURBO)-44, INSPECTION, V-belt.>

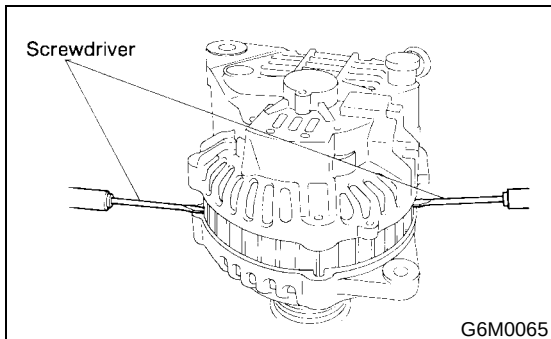


C: DISASSEMBLY

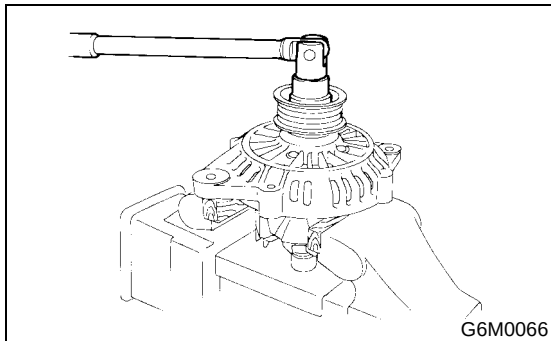
1) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.



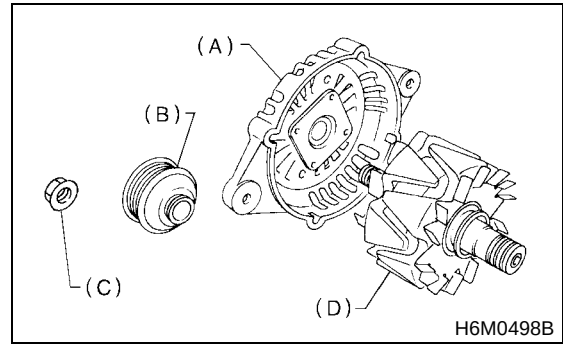
2) Remove the four through bolts. Then insert the tip of a flat-head screwdriver into the gap between the stator core and front bracket. Pry then apart to disassemble.



3) Hold rotor with a vise and remove pulley nut.



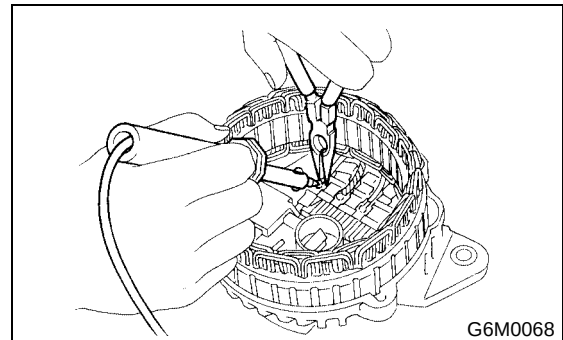
CAUTION:
When holding rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of the vise to prevent rotor from damage.



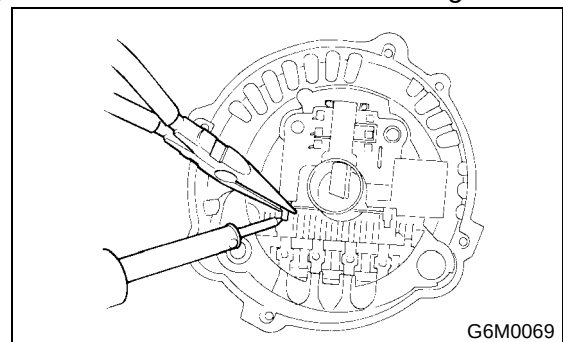
- (A) Front bracket
- (B) Pulley
- (C) Nut
- (D) Rotor

4) Unsolder connection between rectifier and stator coil to remove stator coil.

CAUTION:
Finish the work rapidly (less than three seconds) because the rectifier cannot withstand heat very well.



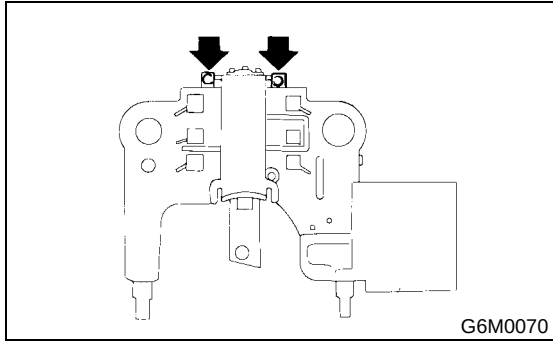
5) Remove screws which secure IC regulator to rear cover, and unsolder connection between IC regulator and rectifier to remove IC regulator.



GENERATOR

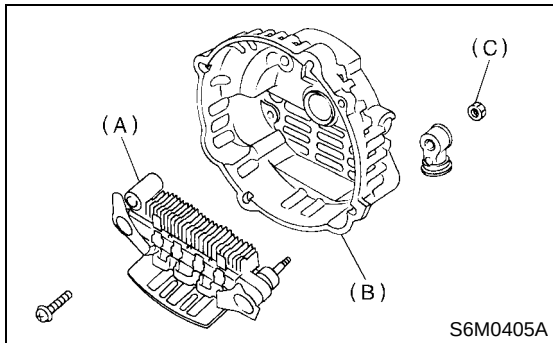
STARTING/CHARGING SYSTEMS

6) Remove the brushes by unsoldering at the pig-tails.



G6M0070

7) Remove the nut and insulating bushing at terminal B, and remove rectifier.



S6M0405A

- (A) Rectifier
- (B) Rear cover
- (C) Nut

D: ASSEMBLY

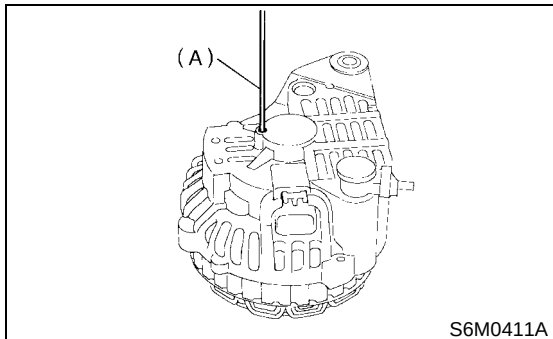
To assemble, reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into the brush holder with your finger and secure in that position by passing a [2 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire (A) through the hole shown in the figure.

CAUTION:

Be sure to remove the wire after reassembly.



S6M0411A

2) Heat the bearing box in the rear bracket [50 to 60°C (122 to 140°F)] and press the rear bearing into the rear bracket.

CAUTION:

Grease should not be applied for the rear bearing. Remove oil completely if it is found on the bearing box.

3) After reassembly, turn the pulley by hand to check that the rotor turns smoothly.

E: INSPECTION

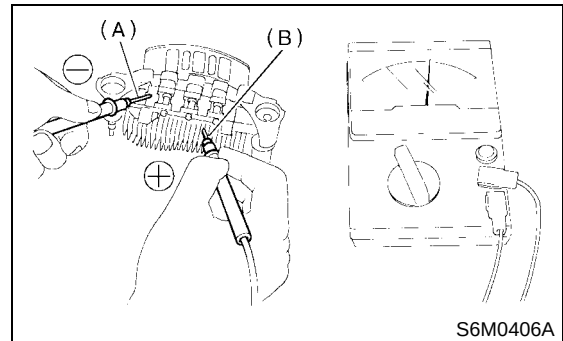
1. DIODE

CAUTION:

Never use a megger 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 the positive side heat sink. The positive diode is in good condition if continuity exists only in the direction from the diode lead to the heat sink.

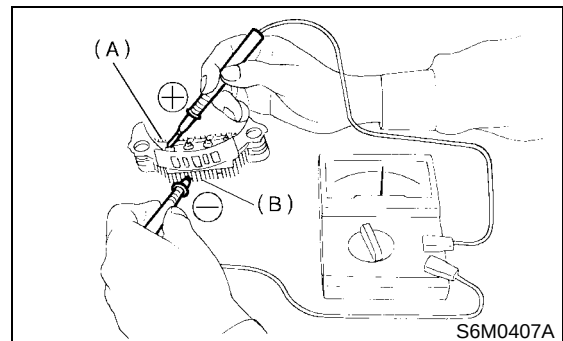


S6M0406A

- (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 continuity exists only in the direction from the heat sink to the diode lead.



S6M0407A

- (A) Diode lead
- (B) Heat sink (Negative side)

2. ROTOR

1) Slip ring surface

Inspect slip rings for contamination or any roughness of the sliding surface. Repair slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter

Measure slip ring outer diameter. If 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)

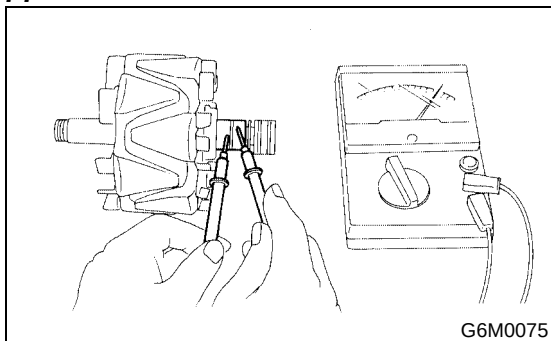
3) Continuity test

Check resistance between slip rings using circuit tester.

If the resistance is not within specification, replace rotor assembly.

Specified resistance:

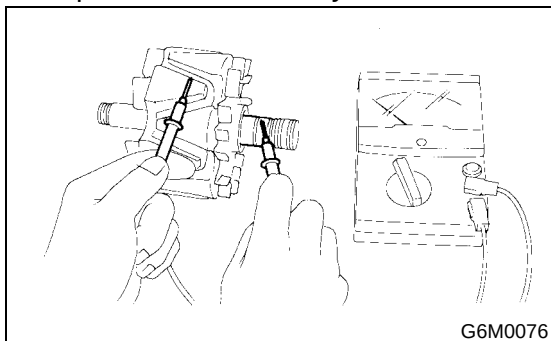
Approx. 2.7 — 3.2 Ω



G6M0075

4) Insulation test

Check continuity between slip ring and rotor core or shaft. If continuity exists, the rotor coil is grounded, and so replace rotor assembly.

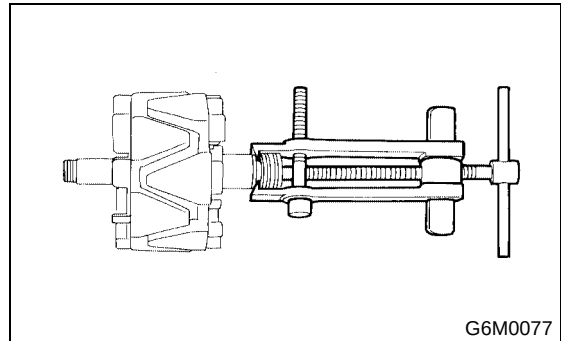


G6M0076

5) Ball bearing (rear side)

(1) Check rear ball bearing. Replace if it is noisy or if rotor does not turn smoothly.

(2) The rear bearing can be removed by using common bearing puller.

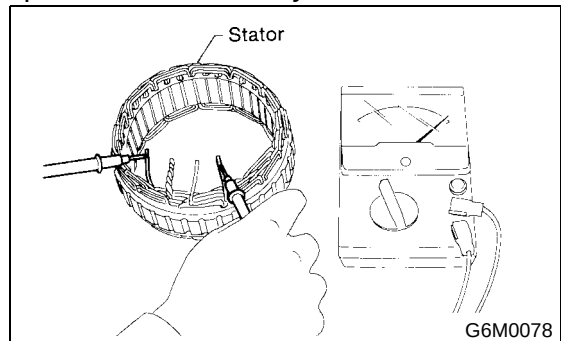


G6M0077

3. STATOR

1) Continuity test

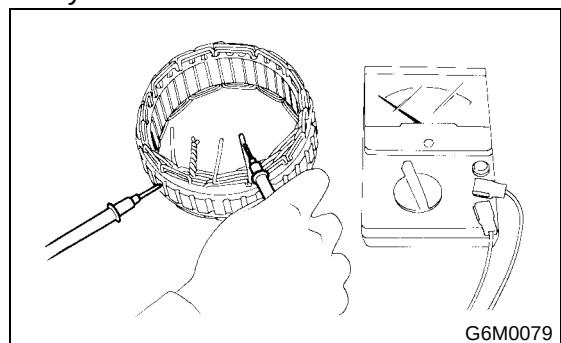
Inspect stator coil for continuity between each end of the lead wires. If there is no continuity between individual lead wires, the lead wire is broken, and so replace stator assembly.



G6M0078

2) Insulation test

Inspect stator coil for continuity between stator core and each end of the lead wire. If there is continuity, the stator coil is grounded, and so replace stator assembly.



G6M0079

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.

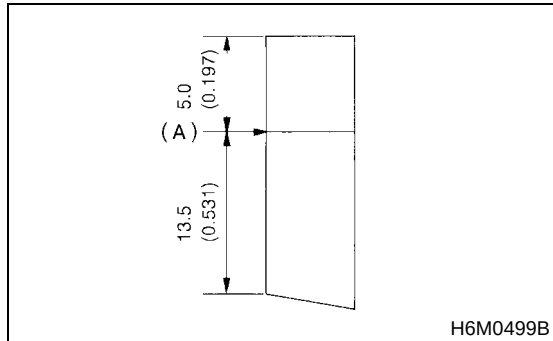
Brush length:

Standard

18.5 mm (0.728 in)

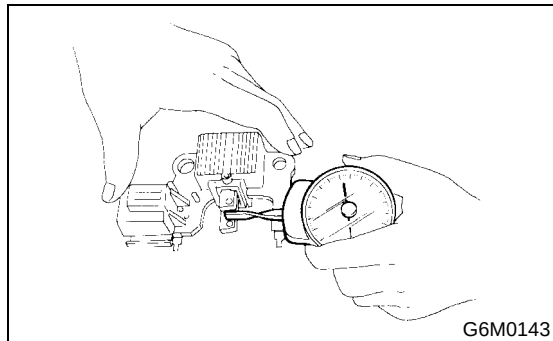
Service limit

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 the brush spring. If the pressure is less than 2.648 N (270 g, 9.52 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.609 to 5.786 N (470 to 590 g, 16.58 to 20.81 oz).



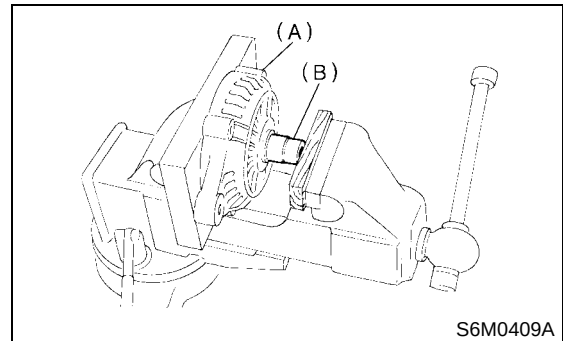
5. BEARING (FRONT SIDE)

1) Check front ball bearing. If resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

2) Replacing front bearing

(1) Remove front bearing retainer.

(2) Closely install a fit tool on the bearing inner race. Press the bearing down out of front bracket with a hand press or vise. A socket wrench can serve as the tool.

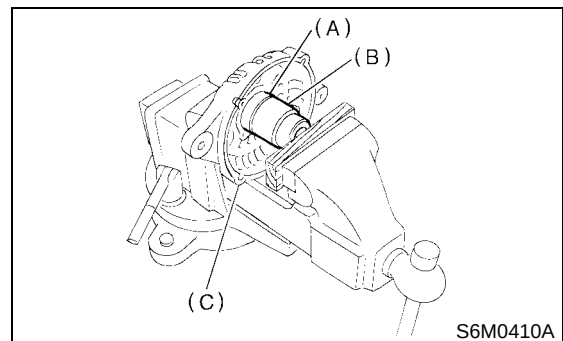


(A) Front bracket

(B) Socket wrench

(3) Set a new bearing and closely install a fit tool on the bearing outer race. Press the bearing down into place with a hand press or vise. A socket wrench can serve as the tool.

(4) Install front bearing retainer.



(A) Bearing

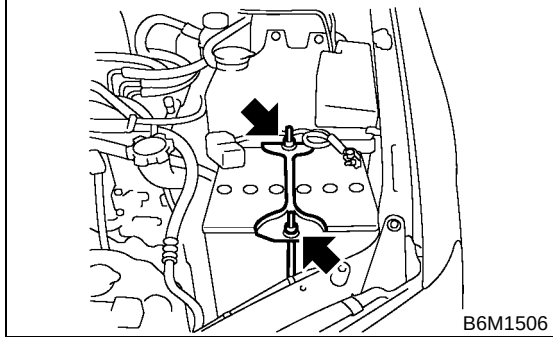
(B) Socket wrench

(C) Front bracket

4. Battery

A: REMOVAL

- 1) Disconnect the positive (+) terminal after disconnecting the negative (-) terminal of battery.
- 2) Remove flange nuts from battery rods and take off battery holder.



- 3) 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 retard the formation of corrosion.
- Connect the positive (+) terminal of battery and then the negative (-) terminal 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 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 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:

BATTERY

STARTING/CHARGING SYSTEMS

$$S_{20} = S_t + 0.0007 \times (t - 20)$$

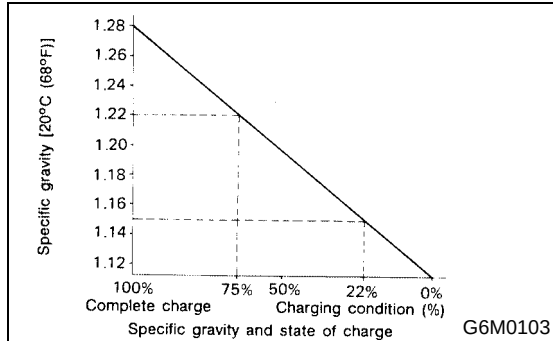
S_{20} : Specific gravity corrected at electrolyte temperature of 20°C

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 1. NORMAL CHARGING.
- Never use more than 10 amperes when charging the battery because that will shorten battery life.

ENGINE 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

ENGINE (DIAGNOSTICS)

EN(SOHC)

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BASIC DIAGNOSTIC PROCEDURE

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

Step	Check	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(SOHC)-4, CHECK, Check List for Interview.> 2)Start the engine.	Does the engine start?	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(SOHC)-60, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).	Does CHECK ENGINE malfunction indicator lamp illuminate?	Go to step 3.	Inspection using "General Diagnostics Table". <Ref. to EN(SOHC)-288, 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?	Record diagnostic trouble code. Repair the trouble cause. <Ref. to EN(SOHC)-81, List of 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(SOHC)-48, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1)Perform the clear memory mode. <Ref. to EN(SOHC)-45, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(SOHC)-42, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-88, 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-9, Automatic Transmission Fluid.>
- 2) Differential gear oil level check <Ref. to AT-11, Differential Gear Oil.>
- 3) ATF leak check <Ref. to AT-9, Automatic Transmission Fluid.>
- 4) Differential gear oil leak check <Ref. to AT-11, Differential Gear Oil.>
- 5) Stall test <Ref. to AT-13, Stall Test.>
- 6) Line pressure test <Ref. to AT-16, Line Pressure Test.>
- 7) Transfer clutch pressure test <Ref. to AT-18, Transfer Clutch Pressure Test.>
- 8) Time lag test <Ref. to AT-15, Time Lag Test.>
- 9) Road test <Ref. to AT-12, Road Test.>
- 10) Shift characteristics <Ref. to AT-18, Transfer Clutch Pressure Test.>

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. Check List for Interview

NOTE:

Use copies of this page for interviewing customers.

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others:		
Outdoor temperature	°C (°F)		
	☐ Hot ☐ Warm ☐ Cool ☐ Cold		
Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Others:		
Engine temperature	☐ Cold ☐ Warming-up ☐ After warming-up ☐ Any temperature ☐ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH)		
Headlight	☐ ON/ ☐ OFF	Rear defogger	☐ ON/ ☐ OFF
Blower	☐ ON/ ☐ OFF	Radio	☐ ON/ ☐ OFF
A/C compressor	☐ ON/ ☐ OFF	CD/Cassette	☐ ON/ ☐ OFF
Cooling fan	☐ ON/ ☐ OFF	Car phone	☐ ON/ ☐ OFF
Front wiper	☐ ON/ ☐ OFF	CB	☐ ON/ ☐ OFF
Rear wiper	☐ ON/ ☐ OFF		

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

NOTE:

Check the following items about the vehicle's state when MIL turns on.

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ☐ Yes/ ☐ No
☐ Low fuel warning light ☐ Charge indicator light ☐ AT diagnostics indicator light ☐ ABS warning light ☐ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ☐ Yes/☐ No • Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ☐ Yes/ ☐ No
• What:
d) Intentional connecting or disconnecting of hoses: ☐ Yes/ ☐ No
• What:
e) Installing of parts other than genuine parts: ☐ Yes/ ☐ No
• What: • Where:
f) Occurrence of noise: ☐ Yes/ ☐ No
• From where: • What kind:
g) Occurrence of smell: ☐ Yes/ ☐ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ☐ Yes/ ☐ No
i) Troubles occurred
☐ Engine does not start. ☐ Engine stalls during idling. ☐ Engine stalls while driving. ☐ Engine speed decreases. ☐ Engine speed does not decrease. ☐ Rough idling ☐ Poor acceleration ☐ Back fire ☐ After fire ☐ No shift ☐ Excessive shift shock

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.

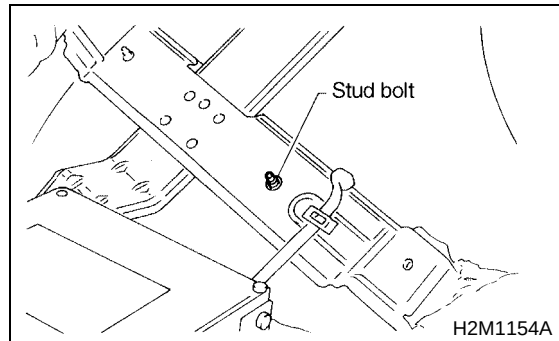
- Otherwise, the ECM may be damaged.

CAUTION:

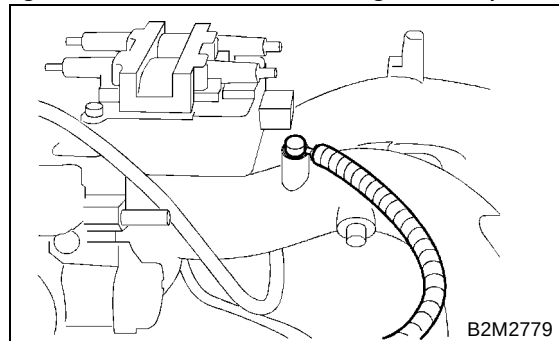
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

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.

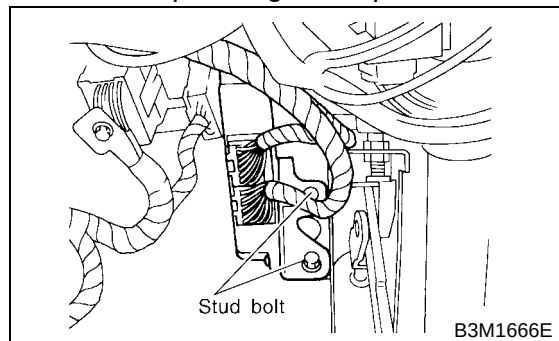
8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



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.



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.

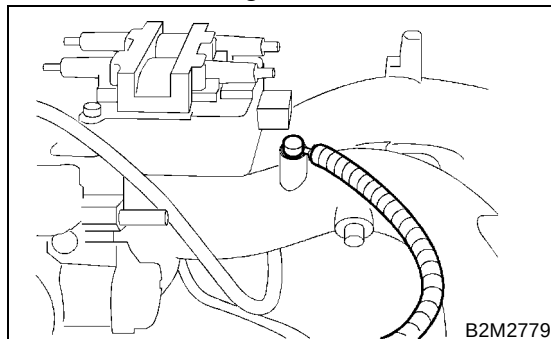
Standard voltage: 12 V

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 (MIL) 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, MIL illuminates. At the same time of the MIL 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, MIL 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.

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

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.

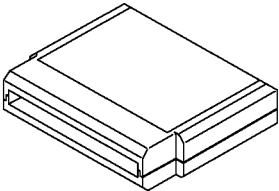
The MFI system also has the following features:

- 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
 B2M3876	24082AA150 (New adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

ELECTRICAL COMPONENTS LOCATION

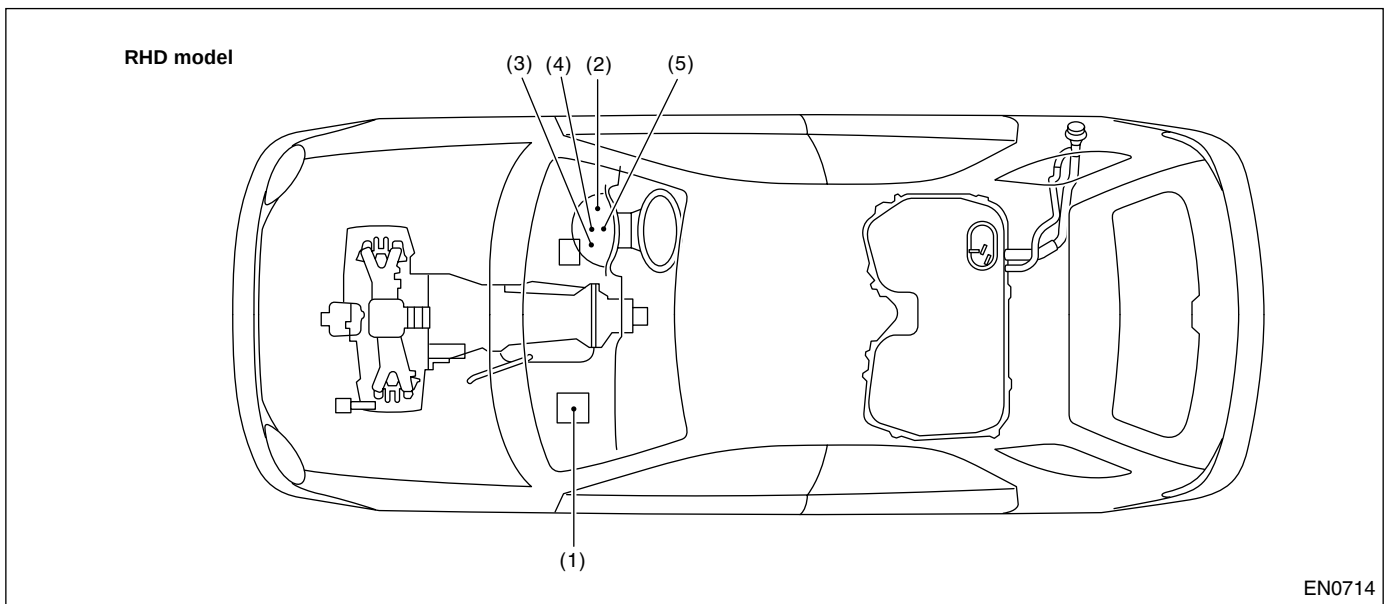
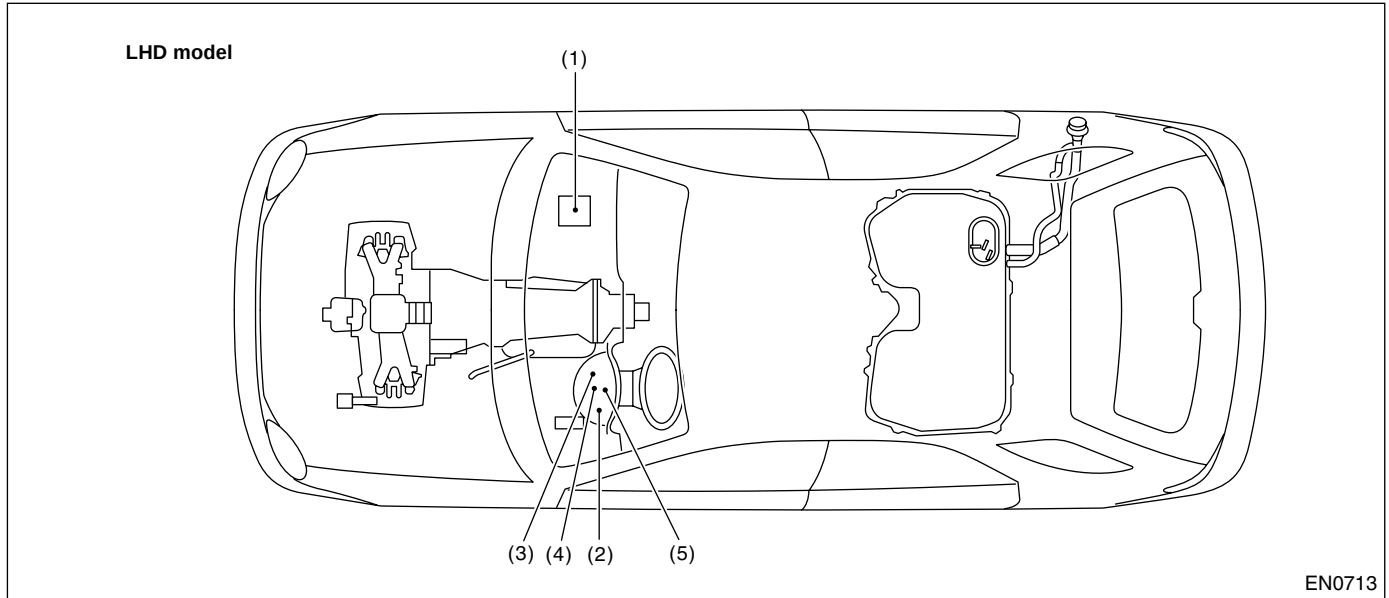
ENGINE (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

1. ENGINE

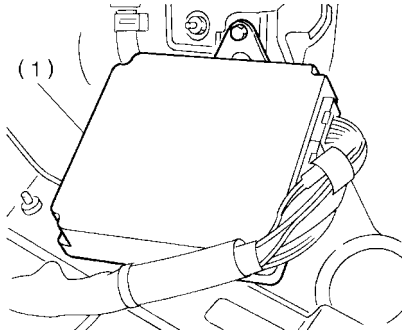
• MODULE



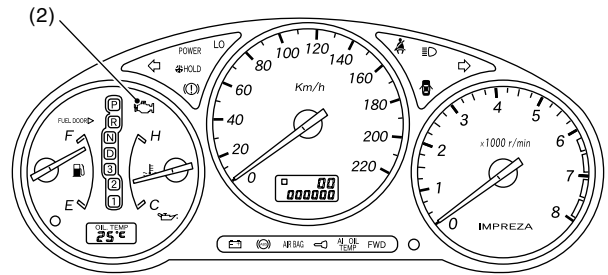
- | | |
|---|---------------------------|
| (1) Engine control module (ECM) | (3) Read memory connector |
| (2) CHECK ENGINE malfunction indicator lamp (MIL) | (4) Test mode connector |
| | (5) Data link connector |

ELECTRICAL COMPONENTS LOCATION

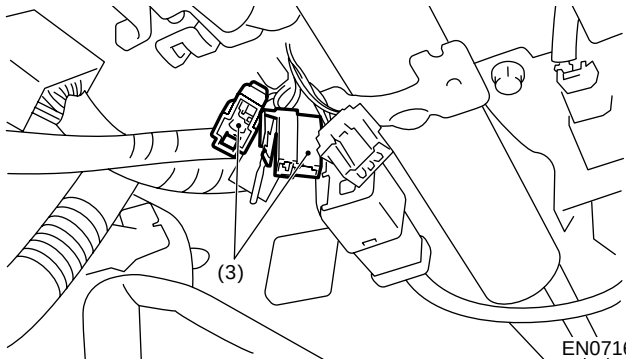
ENGINE (DIAGNOSTICS)



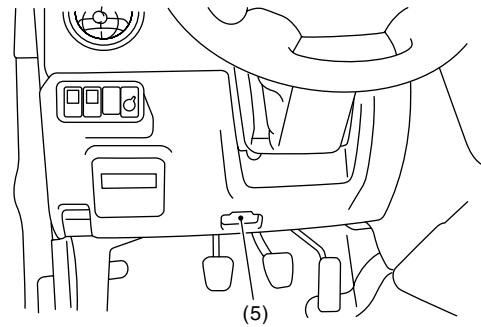
B3M1575A



EN0718



EN0716

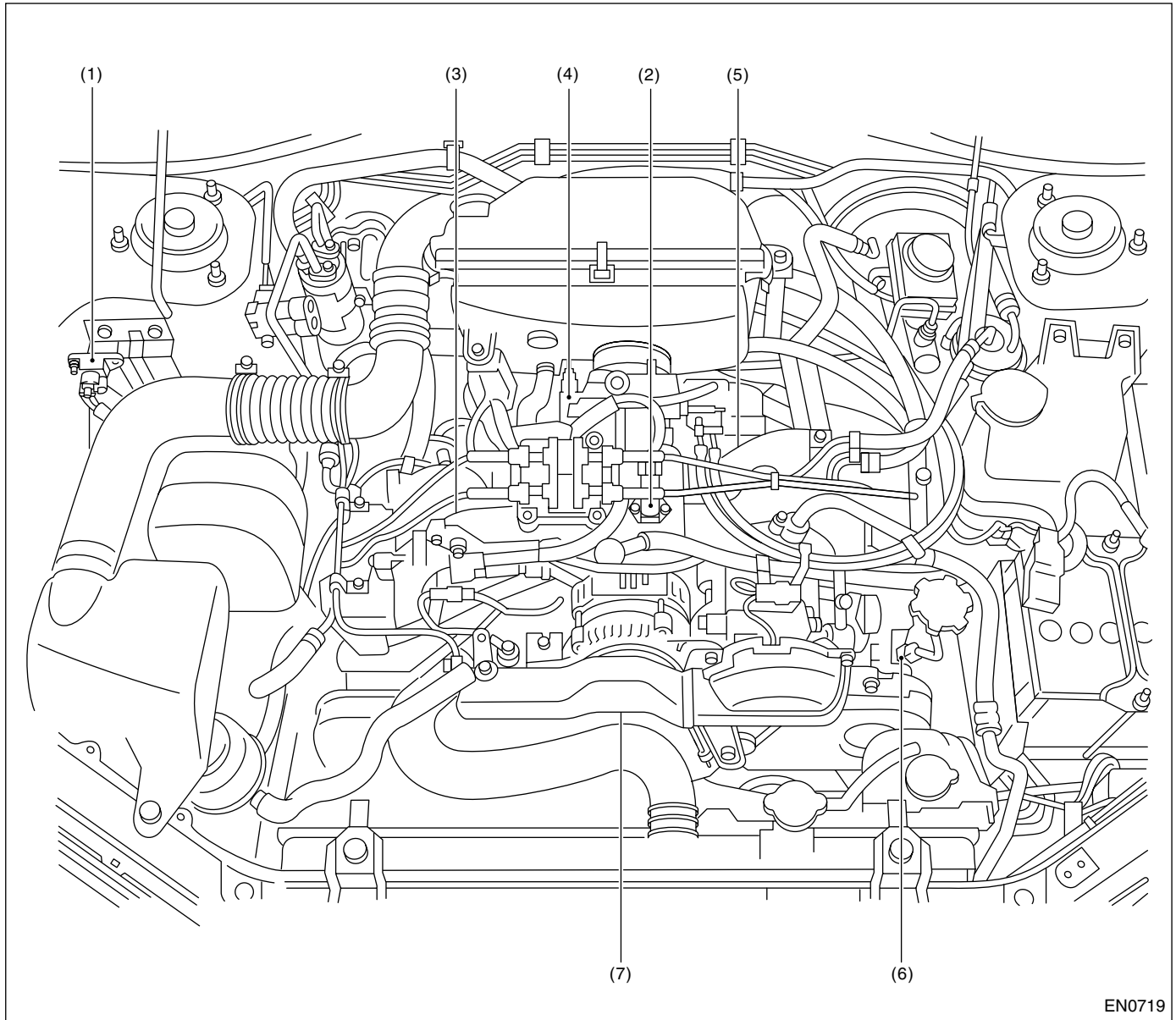


EN0717

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SENSOR



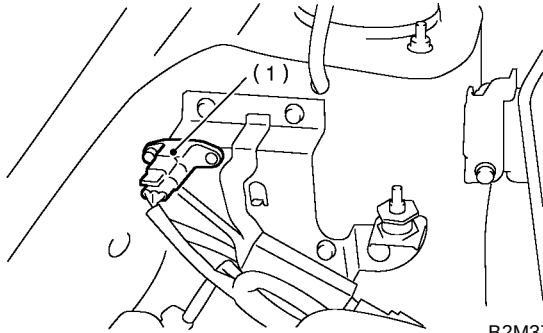
(1) Atmospheric pressure sensor
(2) Intake air temperature and pressure sensor

(3) Engine coolant temperature sensor
(4) Throttle position sensor

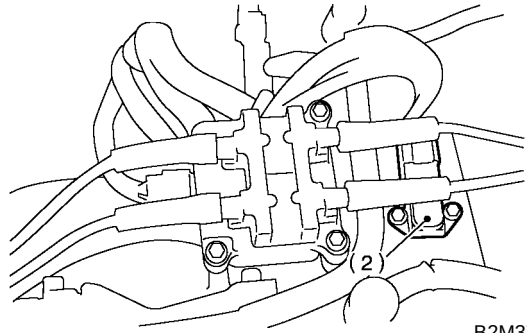
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor

ELECTRICAL COMPONENTS LOCATION

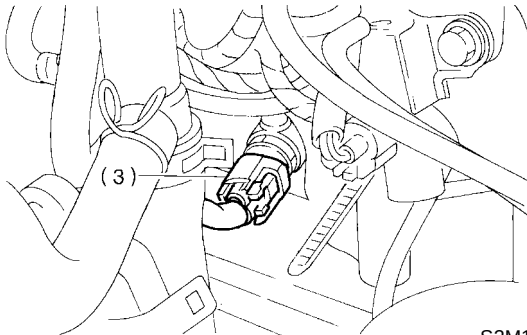
ENGINE (DIAGNOSTICS)



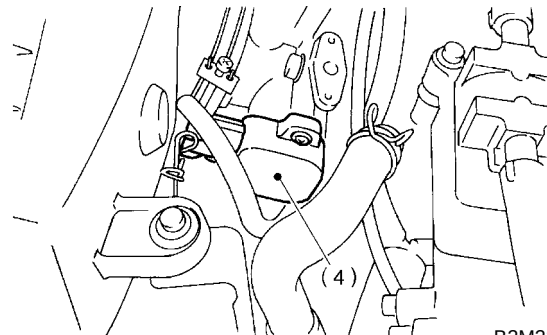
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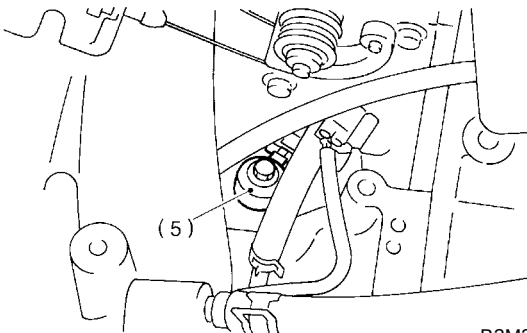
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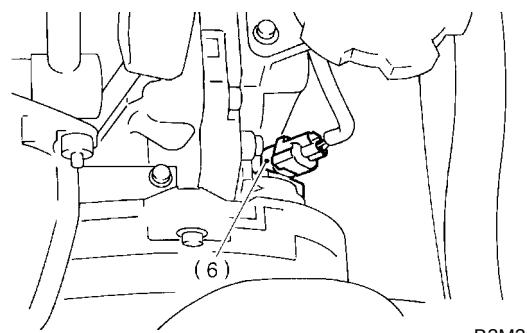
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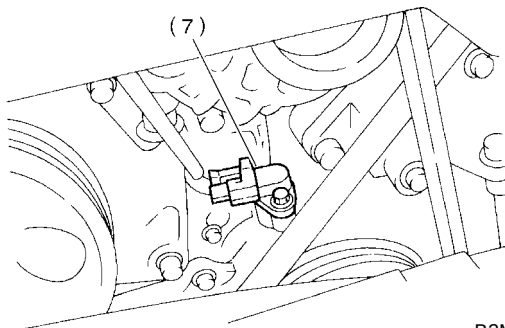
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B2M2241A



B2M2242A

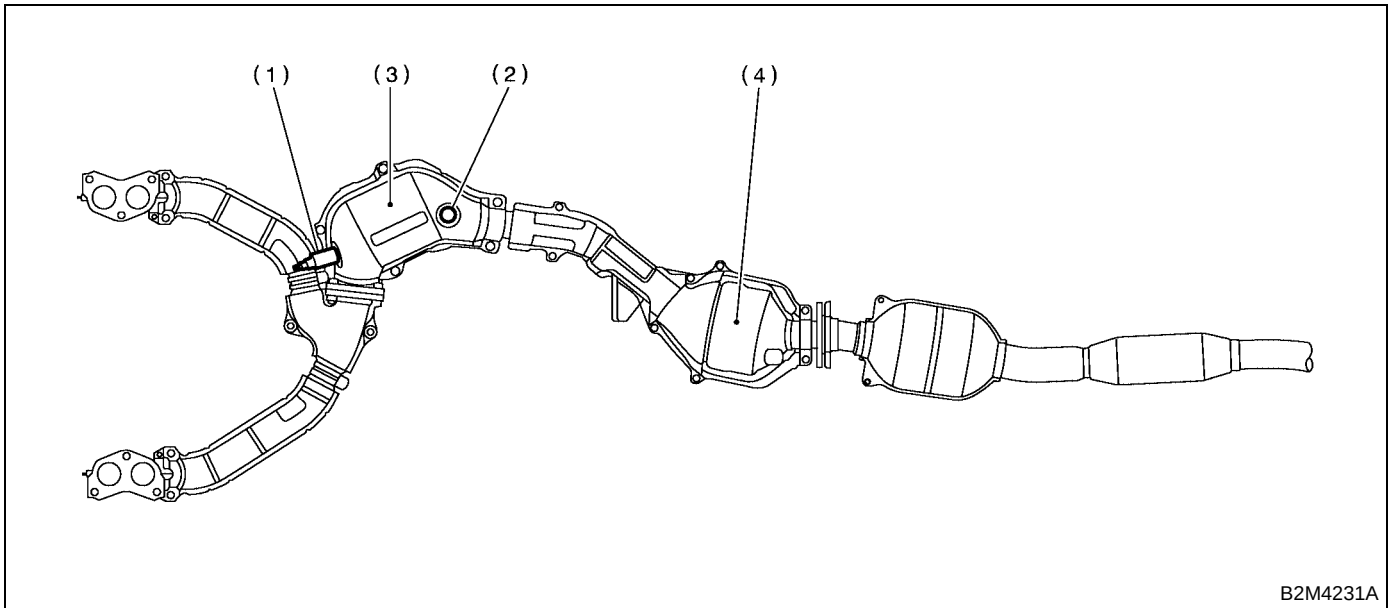


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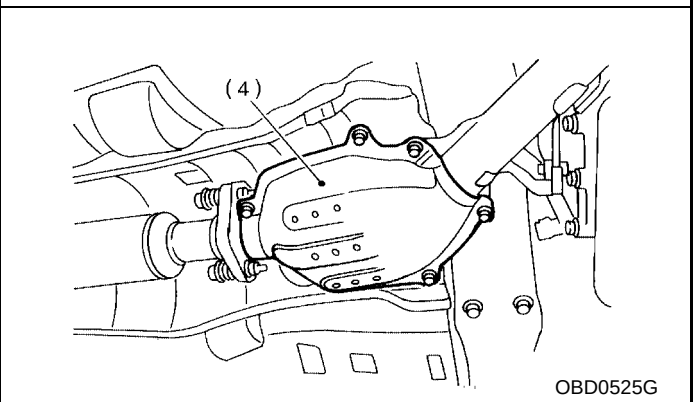
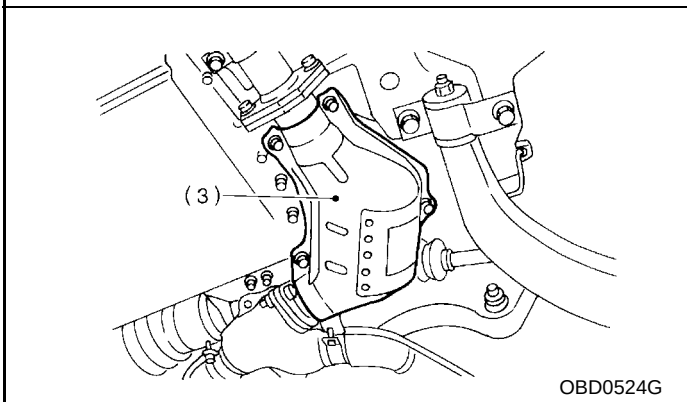
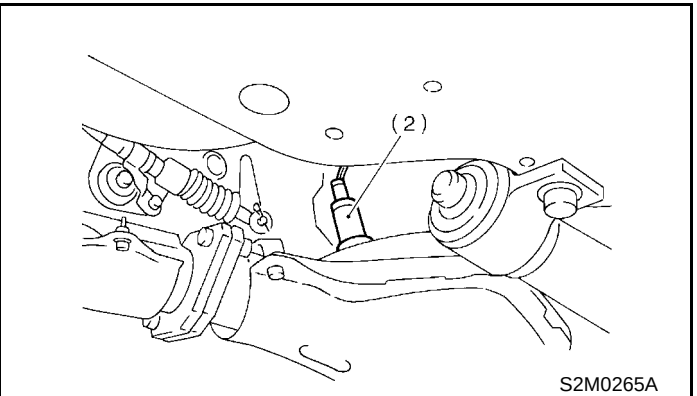
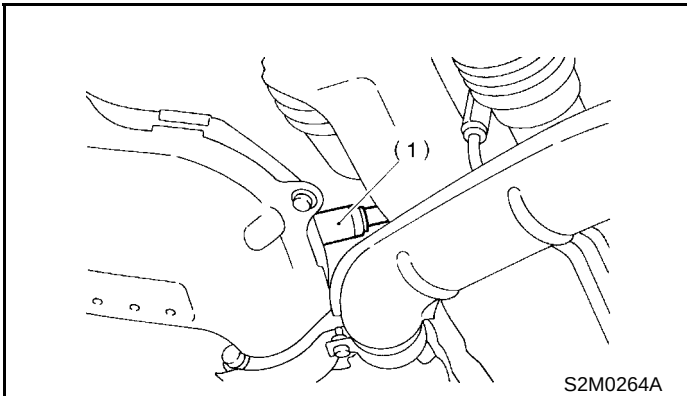
SUBARU.

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



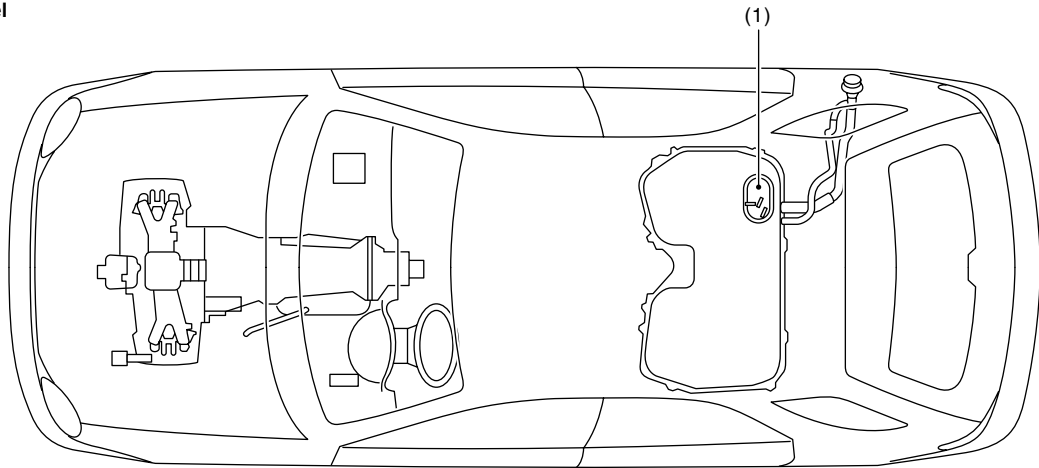
- | | |
|-------------------------------|-------------------------------|
| (1) Front oxygen (A/F) sensor | (3) Front catalytic converter |
| (2) Rear oxygen sensor | (4) Rear catalytic converter |



ELECTRICAL COMPONENTS LOCATION

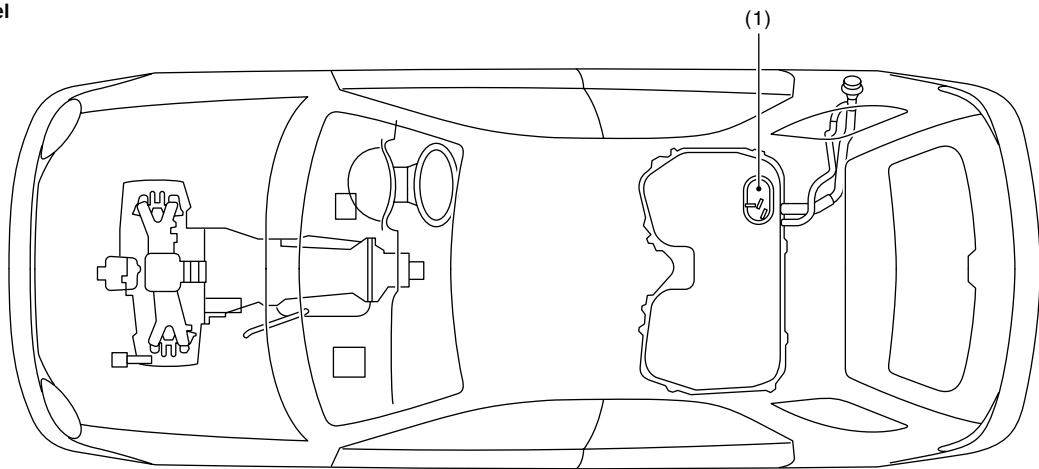
ENGINE (DIAGNOSTICS)

LHD model



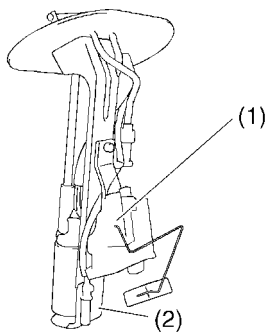
EN0732

RHD model



EN0733

(1) Fuel level sensor



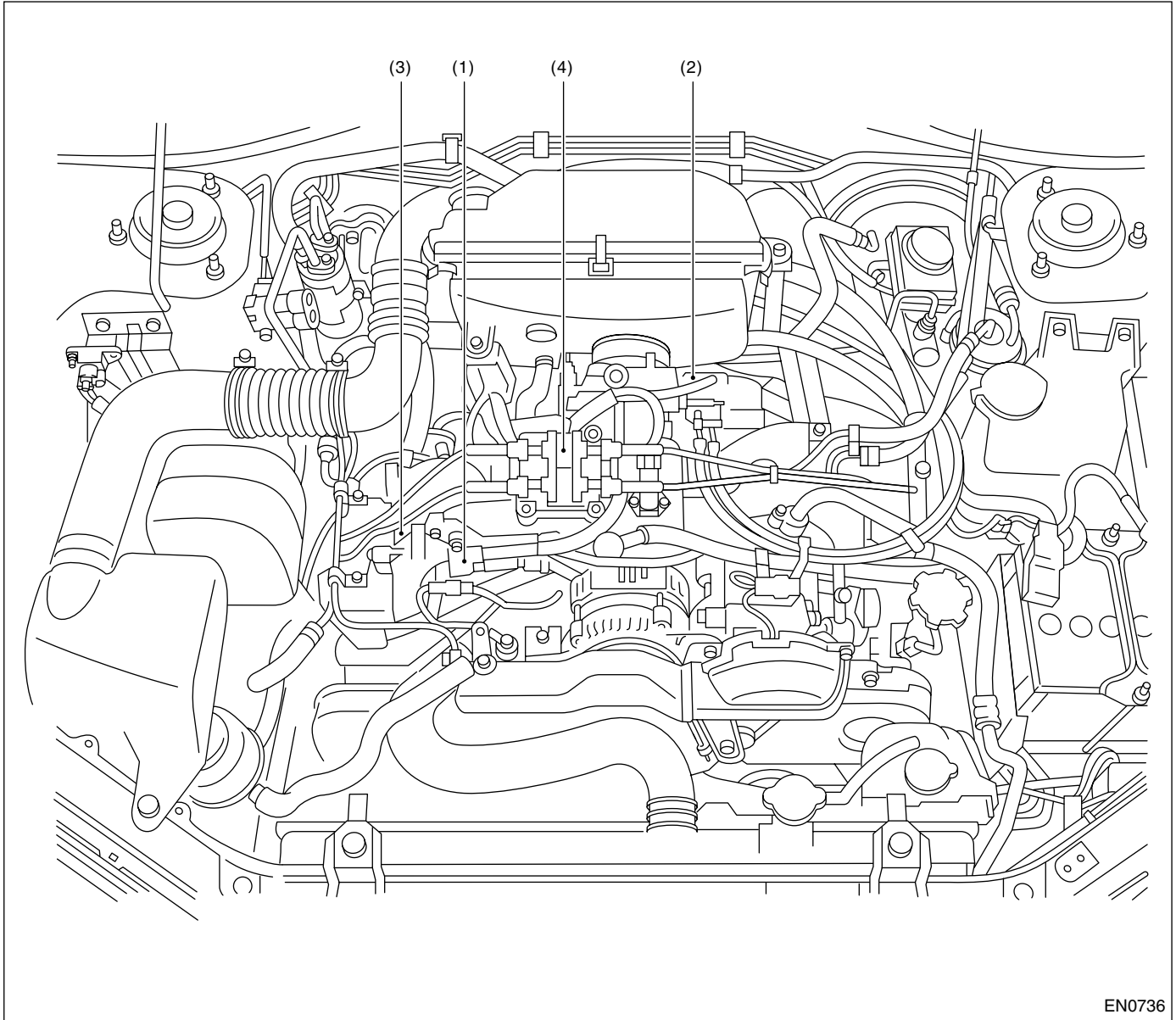
H2M3207A

SUBARU.

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



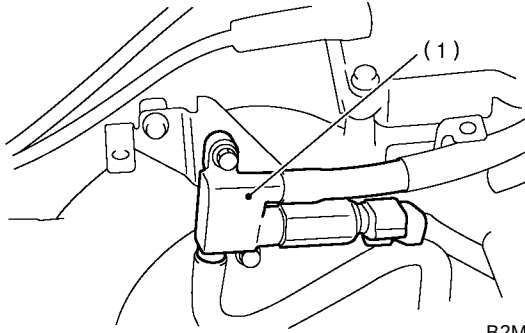
EN0736

- (1) Air assist injector solenoid valve
- (2) Idle air control solenoid valve

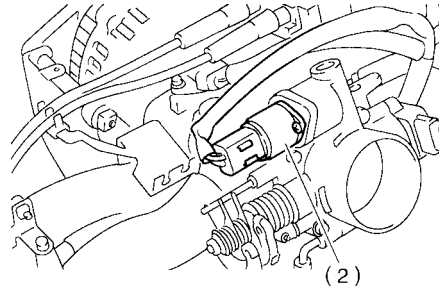
- (3) Purge control solenoid valve
- (4) Ignition coil & ignitor ASSY

ELECTRICAL COMPONENTS LOCATION

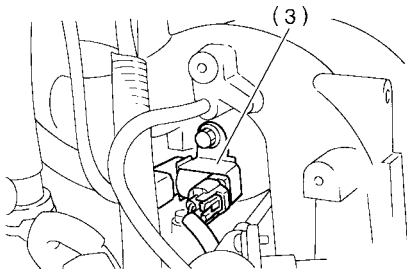
ENGINE (DIAGNOSTICS)



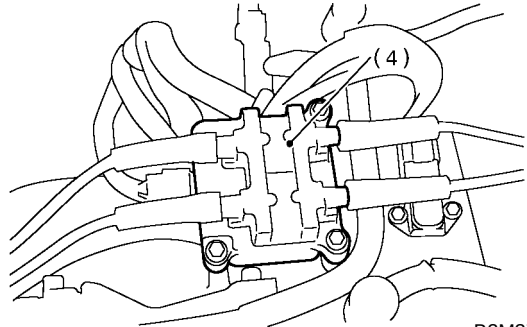
B2M3715A



H2M3259A



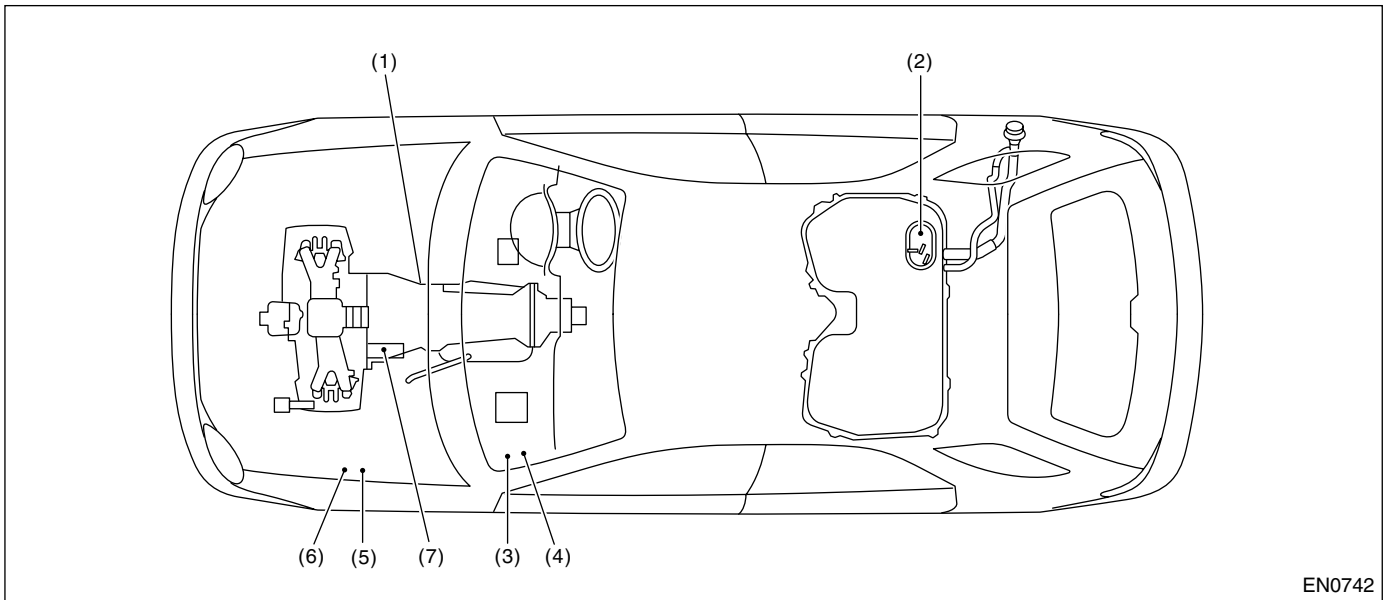
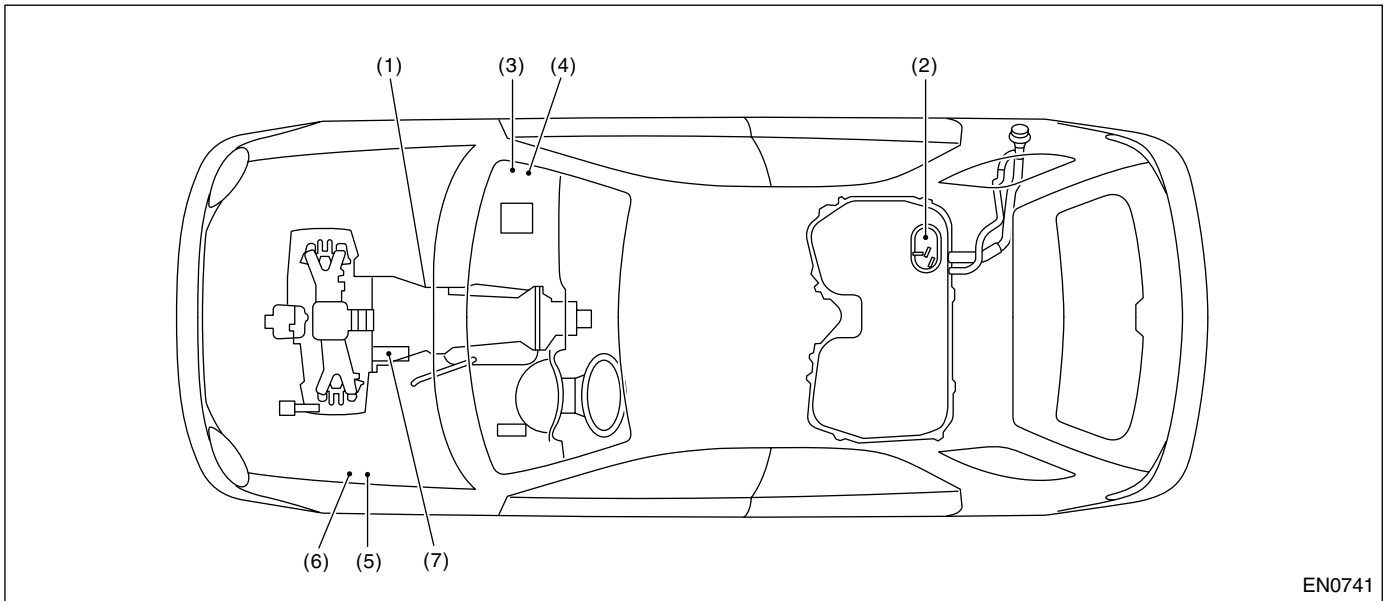
H2M3258B



B2M3720A

ELECTRICAL COMPONENTS LOCATION

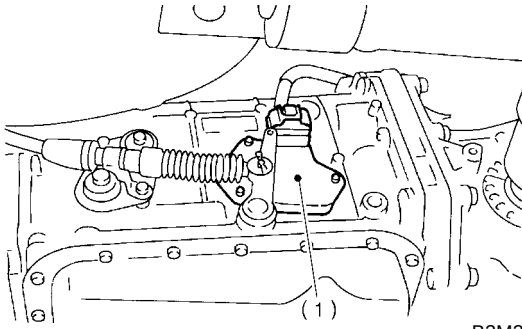
ENGINE (DIAGNOSTICS)



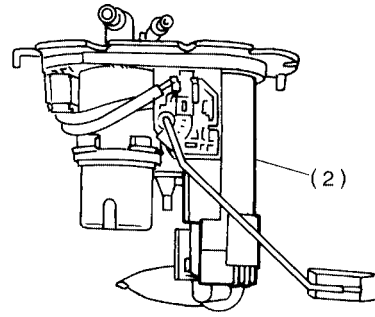
- | | | |
|----------------------|-----------------------------|-------------|
| (1) Inhibitor switch | (4) Fuel pump relay | (7) Starter |
| (2) Fuel pump | (5) Radiator main fan relay | |
| (3) Main relay | (6) Radiator sub fan relay | |

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

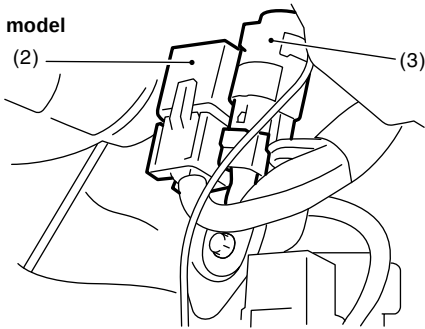


B2M2246A



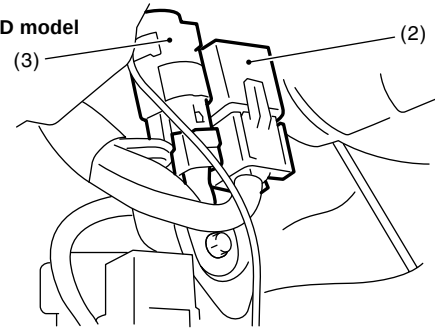
B2M2966C

LHD model

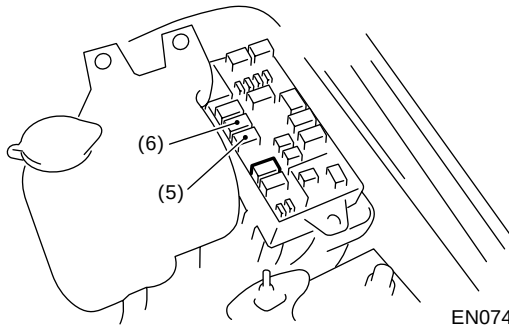


EN0744

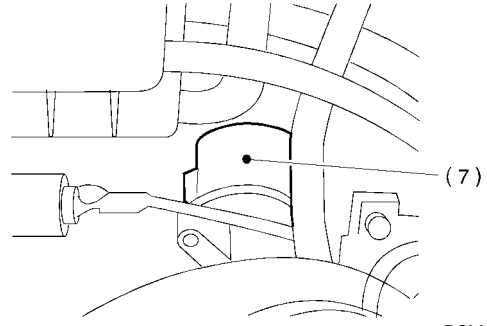
RHD model



EN0748



EN0746



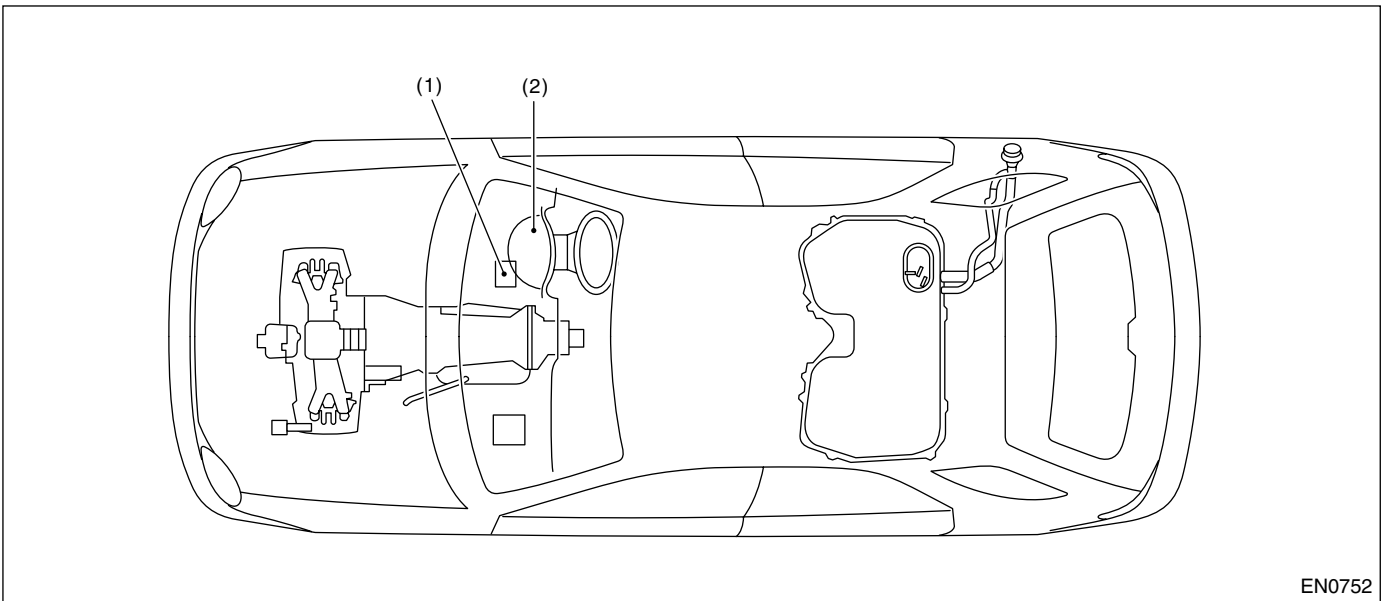
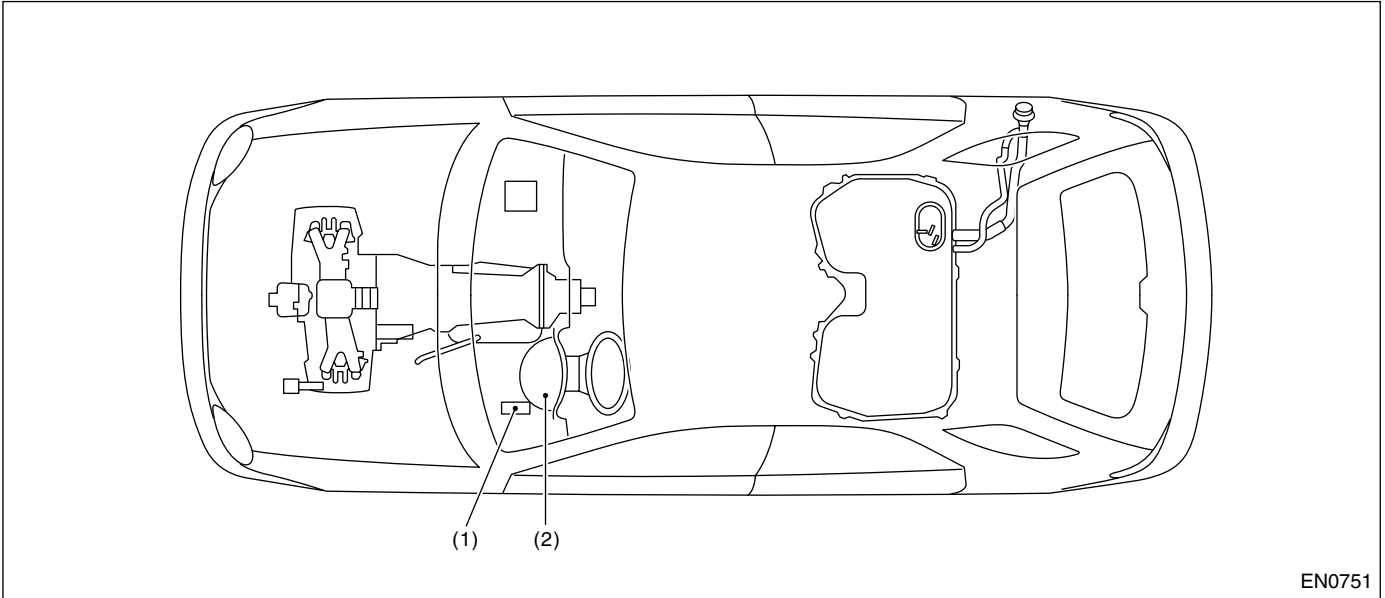
B2M2247E

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

2. TRANSMISSION

• MODULE

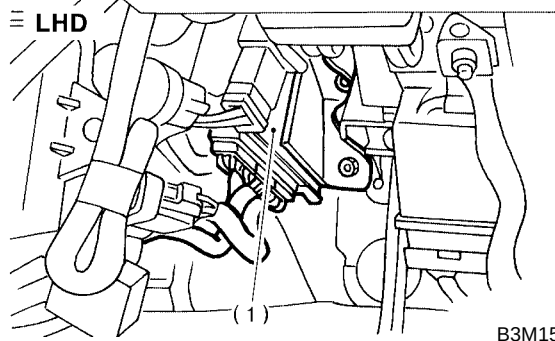


(1) Transmission Control Module (TCM) (for AT vehicles)

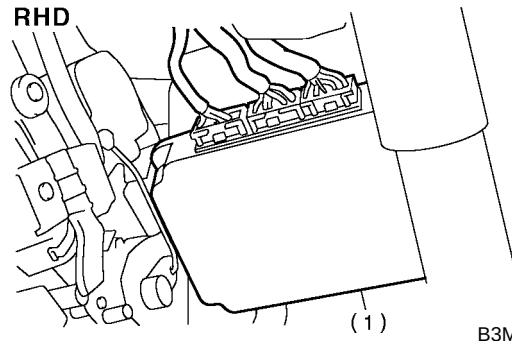
(2) AT diagnostic indicator light (for AT vehicles)

ELECTRICAL COMPONENTS LOCATION

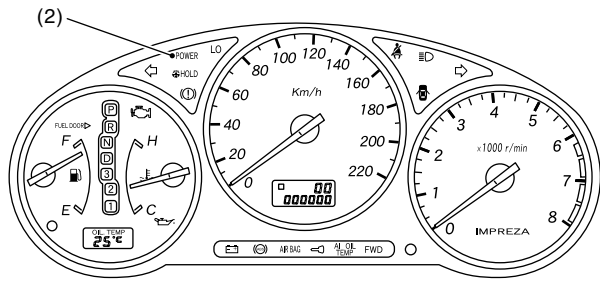
ENGINE (DIAGNOSTICS)



B3M1592D



B3M1652B



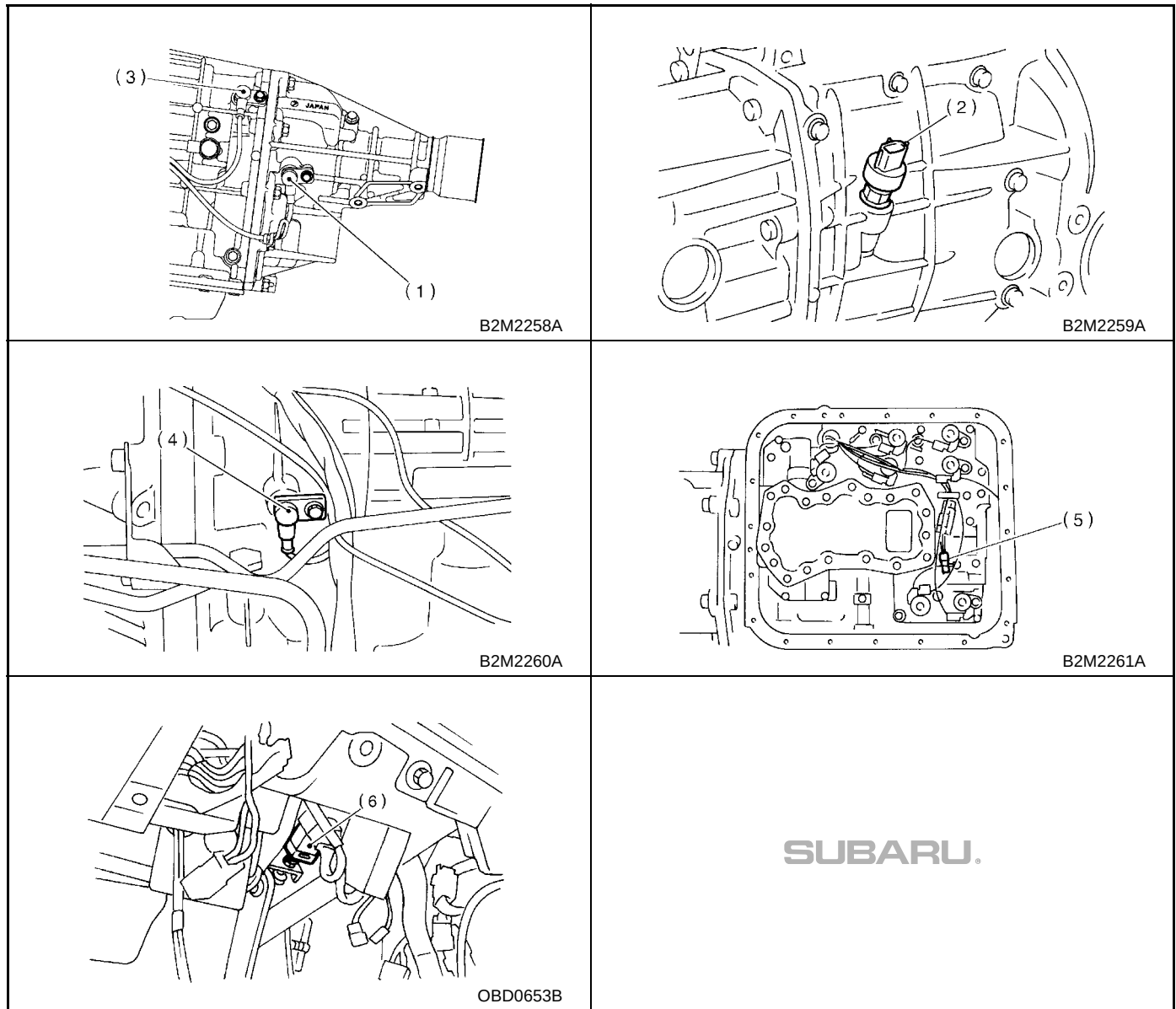
EN0754

SUBARU.

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SENSOR

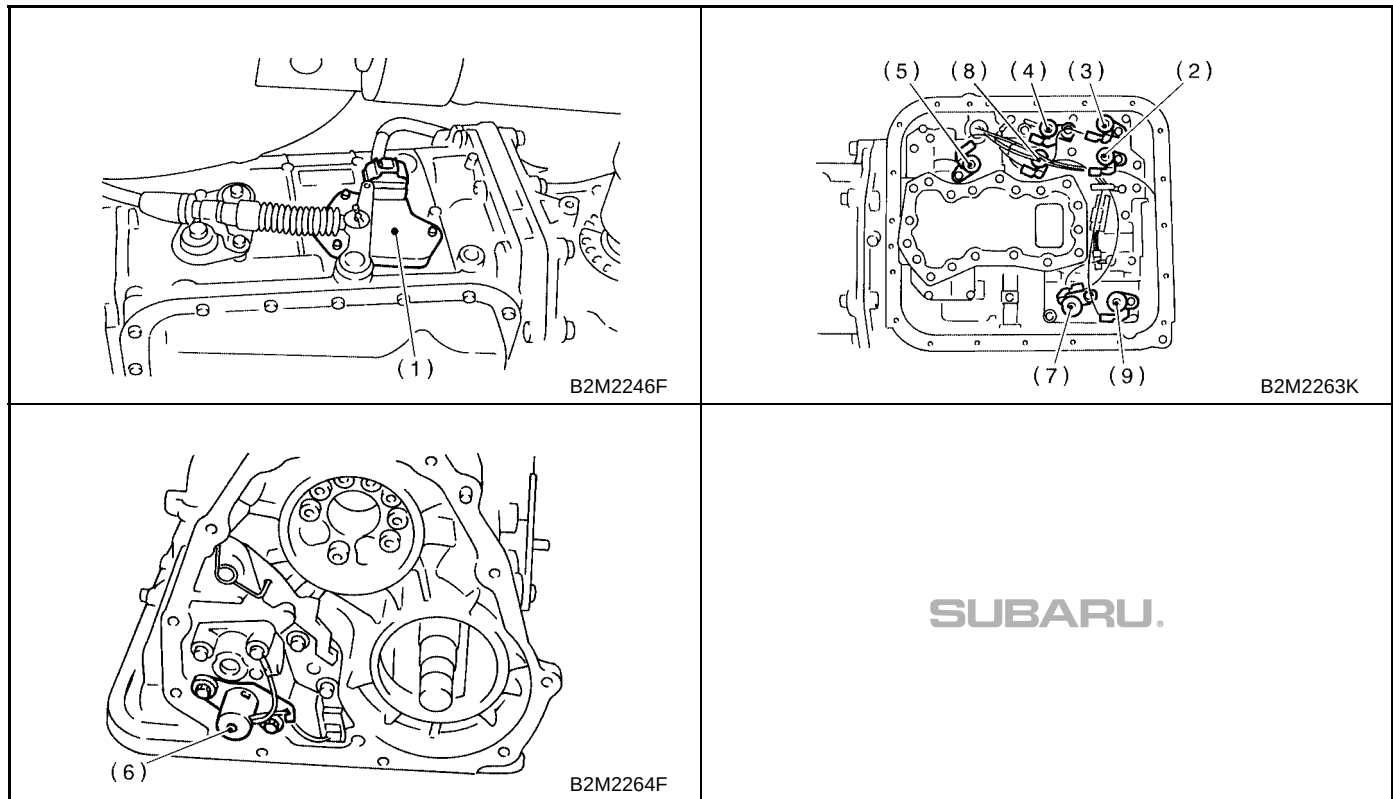


- (1) Rear vehicle speed sensor (for AT vehicles)
- (2) Front vehicle speed sensor (for MT vehicles)
- (3) Front vehicle speed sensor (for AT vehicles)
- (4) Torque converter turbine speed sensor
- (5) ATF temperature sensor (for AT vehicles)
- (6) Brake light switch

ELECTRICAL COMPONENTS LOCATION

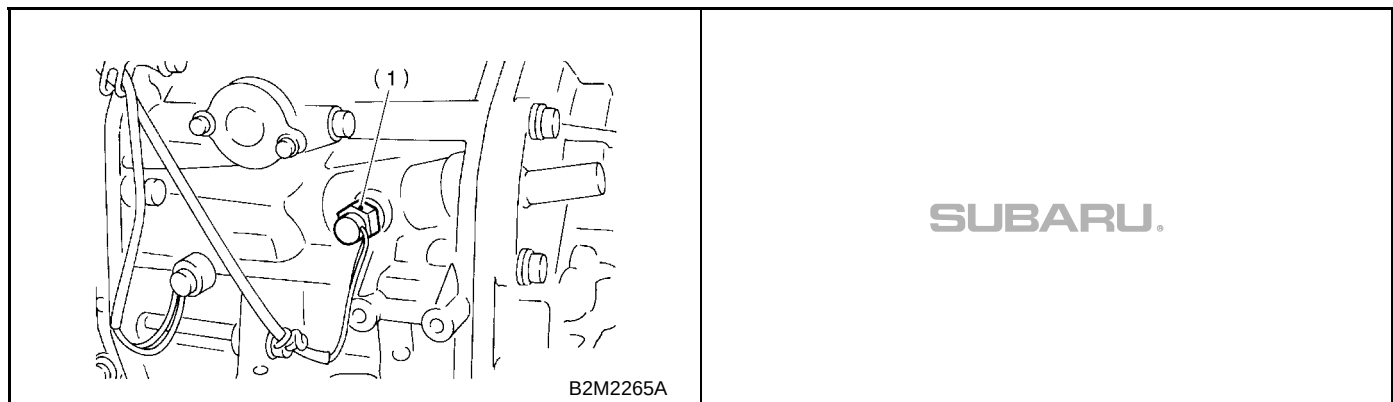
ENGINE (DIAGNOSTICS)

• SOLENOID VALVE AND SWITCH (AT VEHICLES)



- (1) 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

• SOLENOID VALVE AND SWITCH (MT VEHICLES)



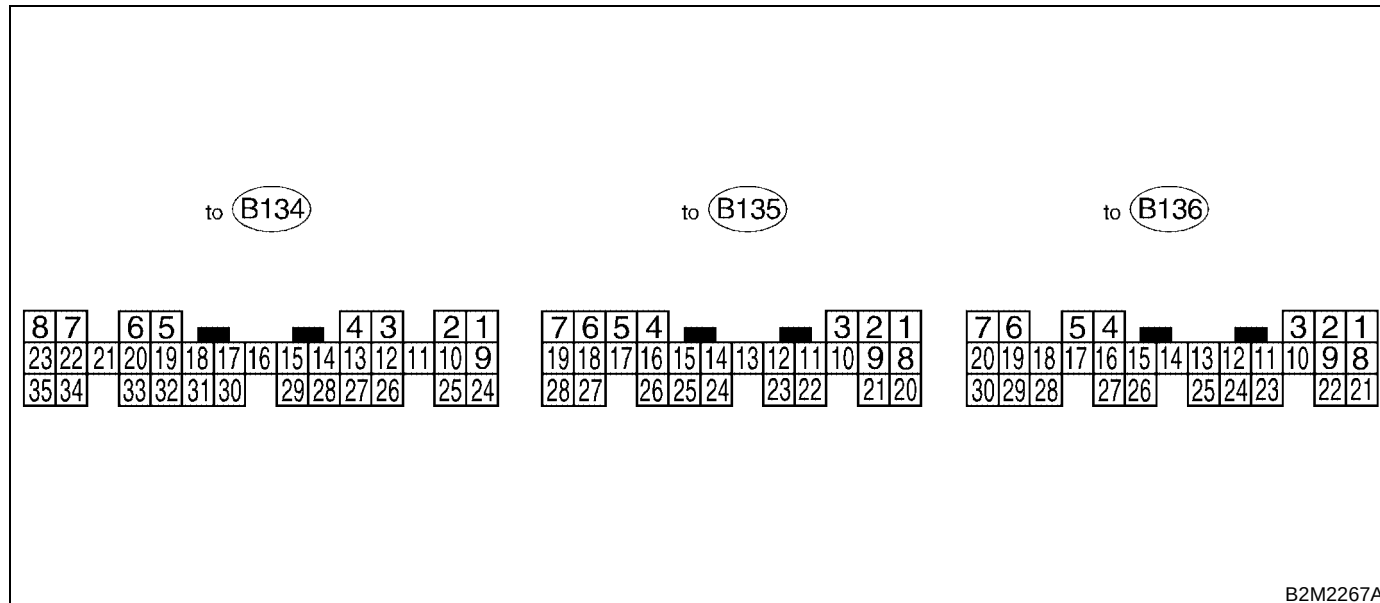
- (1) Neutral position switch

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Con- nector No.	Terminal No.		Signal (V)		Note
					Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crank- shaft posi- tion sensor	Signal (+)	B135	2*	1	0	-7 — +7	Sensor output waveform
	Signal (-)	B135		9	0	0	—
	Shield	B135		10	0	0	—
Camshaft position sensor	Signal (+)	B135	1*	2	0	-7 — +7	Sensor output waveform
	Signal (-)	B135		8	0	0	—
	Shield	B135		10	0	0	—
Throttle position sensor	Signal	B136		17	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B136		15	5	5	—
	GND (sen- sor)	B136		16	0	0	—
Rear oxy- gen sen- sor	Signal	B136		18	0	0 — 0.9	—
	Shield	B136		24	0	0	—
	GND (sen- sor)	B136		16	0	0	—
Front oxy- gen (A/F) sensor heater	Signal 1	B134		22	0 — 1.0	0 — 1.0	—
	Signal 2	B134		23	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B134		21	0 — 1.0	0 — 1.0	—
Engine coolant tempera- ture sen- sor	Signal	B136		14	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sen- sor)	B136		16	0	0	After warm-up the engine.
Vehicle speed signal		B135		24	0 or 5	0 or 5	"5" and "0" are repeatedly dis- played when vehicle is driven.
Starter switch		B135		28	0	0	Cranking: 8 — 14

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content		Con- nector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
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: 12±0.5 OFF: 0		On MT vehicle; Switch is ON when gear is in neutral position.
	AT	B135	26	ON: 0 OFF: 12±0.5		ON AT vehicle; Switch is ON when shift is in "N" or "P" posi- tion.
Test mode connector		B135	14	5	5	When connected: 0
Knock sensor	Signal	B136	4	2.8	2.8	—
	Shield	B136	25	0	0	—
Back-up power supply		B136	9	10 — 13	13 — 14	Ignition switch "OFF": 10 — 13
Control unit power sup- ply		B136	1	10 — 13	13 — 14	—
		B136	2	10 — 13	13 — 14	—
Sensor power supply		B136	15	5	5	—
Line end check 1		B135	20	0	0	—
Ignition control	#1, #2	B134	25	0	1 — 3.4	Waveform
	#3, #4	B134	26	0	1 — 3.4	Waveform
Fuel injec- tor	#1	B134	4	10 — 13	1 — 14	Waveform
	#2	B134	13	10 — 13	1 — 14	Waveform
	#3	B134	14	10 — 13	1 — 14	Waveform
	#4	B134	15	10 — 13	1 — 14	Waveform
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
	Power supply	B136	2	10 — 13	13 — 14	—
Fuel pump relay control		B134	29* 16	ON: 0.5, or less OFF: 10 — 13	0.5, or less	—
A/C relay control		B134	17	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B134	3	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B134	12	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Malfunction indicator lamp		B134	11	—	—	Light "ON": 1, or less Light "OFF": 10 — 14
Engine speed output		B134	30	—	0 — 13, or more	Waveform
Torque control 1 signal		B135	16	5	5	—
Torque control 2 signal		B135	17	5	5	—
Torque control cut sig- nal		B134	31	8	8	—
Purge control solenoid valve		B134	2	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Atmo- spheric pressure sensor	Signal	B136	29	3.9 — 4.1	2.0 — 2.3	—
	Power supply	B136	15	5	5	
	GND (sen- sor)	B136	16	0	0	
Fuel level sensor		B136	27	0.12 — 4.75	0.12 — 4.75	—

*: with immobilizer

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content	Con- nector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
AT diagnosis input signal	B135	4	Less than 1 $\longleftrightarrow$ More than 4	Less than 1 $\longleftrightarrow$ More than 4	Waveform
Small light switch	B136	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch	B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch	B135	21	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal 1	B136	19	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal 2	B136	6	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor signal 3	B136	7	0.2 — 4.9	0.2 — 4.9	—
Front oxygen (A/F) sensor signal 4	B136	20	0.2 — 4.9	0.2 — 4.9	—
Pressure sensor	B136	5	2.4 — 4.8	0.4 — 1.8	—
Intake air temperature sensor	B136	13	2.3 — 2.5	1.4 — 1.6	—
SSM/GST communication line	B135	3	Less than 1 $\longleftrightarrow$ More than 4	Less than 1 $\longleftrightarrow$ More than 4	—
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	—
GND (oxygen sensor heater 1)	B134	35	0	0	—
GND (oxygen sensor heater 2)	B134	34	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:

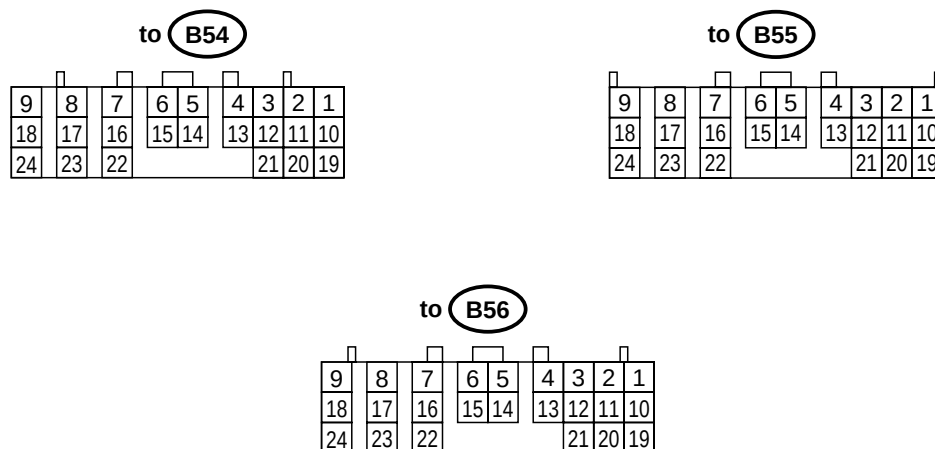
- After warm-up the engine.
- Gear position is in “N” or “P” position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



TR0532

Check with ignition switch ON.						
Content		Con- nector No.	Termi- nal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B56	1	Ignition switch OFF	10 — 16	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 16	—
		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	
ABS signal		B55	21	ABS switch ON	Less than 1	—
				ABS switch OFF	6.5 — 15	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Check with ignition switch ON.					
Content	Con- nector No.	Termi- nal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
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	
Kick-down switch	B55	11	Throttle fully opened.	Less than 1	—
			Throttle fully closed.	More than 6.5	
POWER indicator light	B56	11	Light ON	Less than 1	—
			Light OFF	More than 9	
AT OIL TEMP indicator light	B56	10	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor	B54	3	Throttle fully closed.	0.3 — 0.7	—
			Throttle fully open.	4.0 — 4.6	
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 — 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 speed at least 20 km/h (12 MPH)	More than 1 (AC range)	450 — 650
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)	More than 10.5	—
			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)	4	—
Torque control signal 2	B56	14	Ignition switch ON (with engine ON)	4	—
Torque control cut signal	B55	10	Ignition switch ON	8	—
Intake manifold pressure signal	B54	1	Engine idling after warm-up.	1.2 — 1.8	—
Shift solenoid 1	B54	22	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Check with ignition switch ON.					
Content	Con- nector No.	Termi- nal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
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	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	
2-4 brake duty solenoid	B54	18	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	
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	
Sensor ground line 1	B54	20	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
Sensor ground line 3	B54	10	—	0	Less than 1
Sensor ground line 4	B54	19	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	21			
FWD switch	B55	20	Fuse removed.	6 — 9.1	—
			Fuse installed.	Less than 1	
FWD indicator light	B56	2	Fuse ONFWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	
Data link signal (Subaru Select Monitor)	B56	15	—	—	—
		6	—	—	

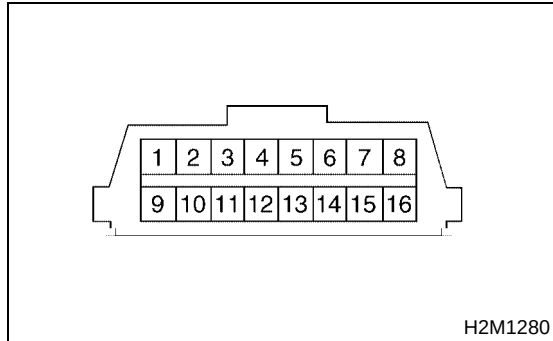
8. Data Link Connector

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 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	Subaru Select Monitor signal (ECM to Subaru Select Monitor)*	12	Ground
5	Subaru Select Monitor signal (Subaru Select Monitor to ECM)*	13	Ground
6	Line end check signal 1	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

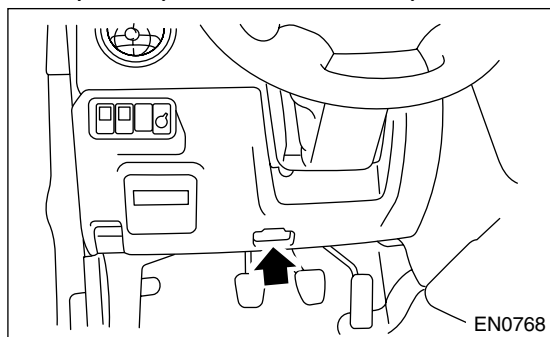
*: Circuit only for Subaru Select Monitor

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 located in the lower portion of the instrument panel (on the driver's side).



- 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(SOHC)-81, List of Diagnostic Trouble Code (DTC).>

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 MIL status	ON/OFF
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	°
0F	Intake air temperature	°C
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1 sensor 2	V and %
24	A/F sensor 1 output voltage and short term fuel trim associated with A/F sensor 1	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. 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(SOHC)-41, 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:

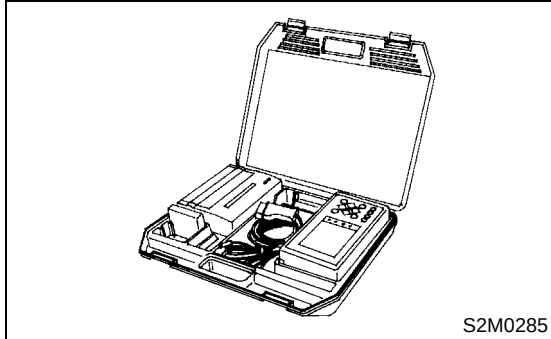
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

10. Subaru Select Monitor

A: OPERATION

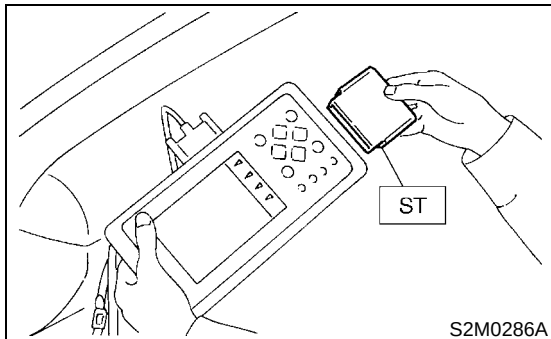
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru Select Monitor kit. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



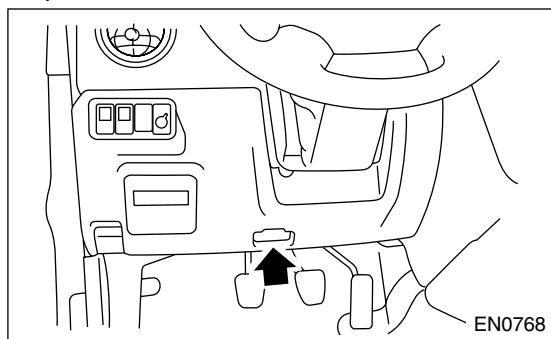
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(SOHC)-8, 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).

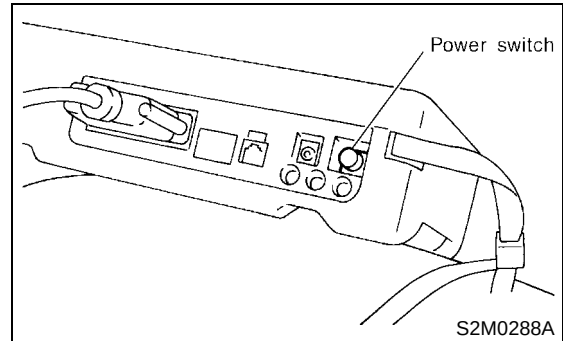


(2) Connect diagnosis cable to data link connector.

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.



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(SOHC)-41, 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(SOHC)-41, 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 #1 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	—
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 psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
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 current	Rear O2 Heater Current	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
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
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
Power steering switch signal	P/S Switch	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
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure
Starter switch signal	Starter Switch Signal	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
Air assist injector solenoid valve signal	Assist Air Sol. Valve	ON or OFF
AT vehicle ID signal	AT Vehicle ID 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 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 Diagnosis Code	—
Malfunction indicator lamp status	MI (MIL)	Complete or incomplete
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	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
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
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 psi
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	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
A/F sensor equipment	A/F sensor	ON or OFF
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	—

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 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 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.

7. READ OXYGEN SENSOR MONITORING TEST RESULTS 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 {O2 Sensor Monitor} and press the [YES] key.
 - 6) On the «O2 Sensor Select» display screen, select the {Bank 1-Sensor1} or {Bank 1-Sensor2} and press the [YES] key.
- Bank 1-Sensor1 indicates the front oxygen or A/F sensor, and Bank 1-Sensor2 indicates the rear oxygen sensor.
 - A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Oxygen sensor for monitoring test	<O2 Sensor Monitor (-----)>	—
Rich to lean oxygen sensor threshold voltage	Rich to lean sensor volt	V
Lean to rich oxygen sensor threshold voltage	Lean to rich sensor volt	V
Low oxygen sensor voltage for switch time calculation	Low sensor voltage	V
High oxygen sensor voltage for switch time calculation	High sensor voltage	V
Rich to lean oxygen sensor switch time	Rich to lean switch time	sec
Lean to rich oxygen sensor switch time	Lean to rich switch time	sec
Maximum oxygen sensor voltage for test cycle	Maximum sensor Voltage	V
Minimum oxygen sensor voltage for test cycle	Minimum sensor Voltage	V

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. 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.
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)

9. 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
Kick down switch signal	Kick Down 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.

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(SOHC)-81, 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(SOHC)-81, 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(SOHC)-81, 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

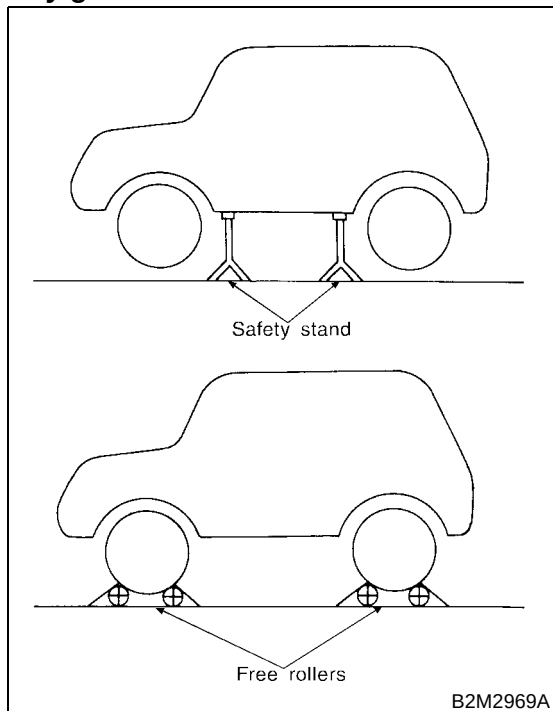
A: OPERATION

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:

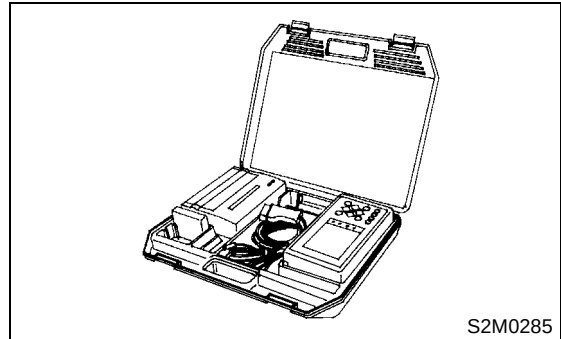
- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator 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.



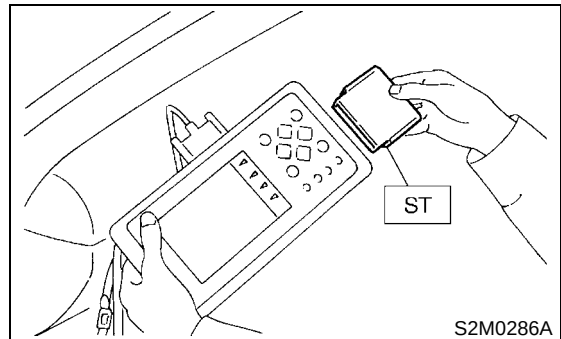
2. SUBARU SELECT MONITOR

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.

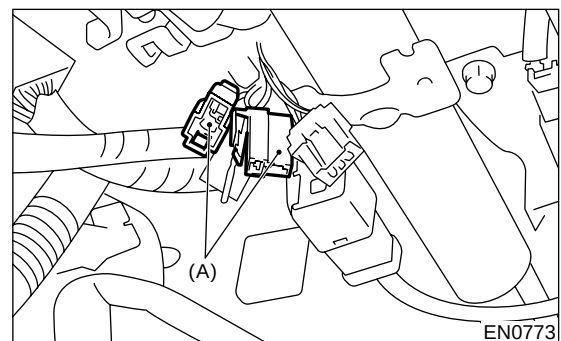
- 1) Prepare Subaru Select Monitor kit. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



- 2) Connect diagnosis cable to Subaru Select Monitor.
- 3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>

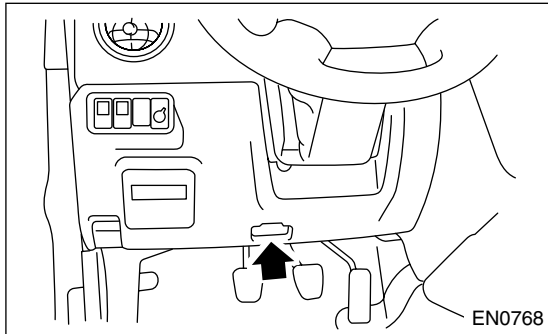


- 4) Connect test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



5) Connect Subaru Select Monitor to data link connector.

(1) Connect Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).

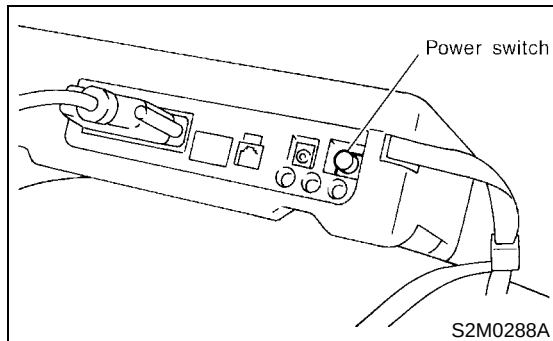


(2) Connect diagnosis cable to data link connector.

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.



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 {Dealer Check Mode Procedure} and press the [YES] key.

11) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [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(SOHC)-81, List of Diagnostic Trouble Code (DTC).>

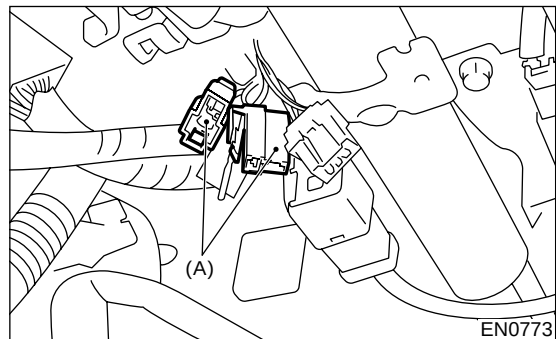
- Release the parking brake.

- 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

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data:

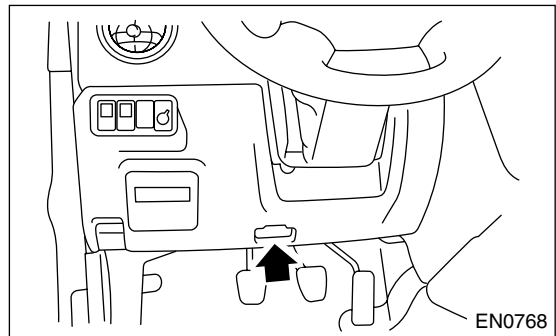
1) Connect test mode connector (A) at the lower side of the instrument panel (on the driver's side), to the side of the center console box.



2) 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.



3) 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)

4) Using the selector lever or shift lever, turn the “P” position switch and the “N” position switch to ON.

5) Depress the brake pedal to turn the brake switch ON. (AT vehicles)

6) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

NOTE:

On models without tachometer, use the tachometer (Secondary pickup type).

7) 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.

8) 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(SOHC)-81, List of Diagnostic Trouble Code (DTC).>

13. 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 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.

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.

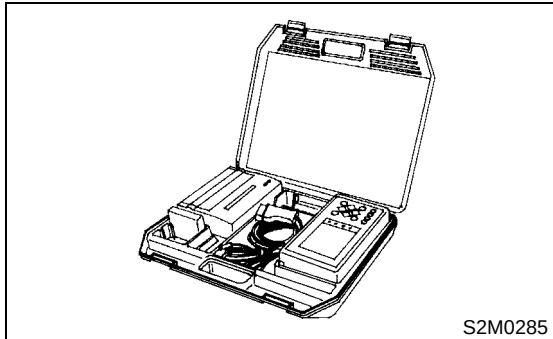
COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

14. Compulsory Valve Operation Check Mode

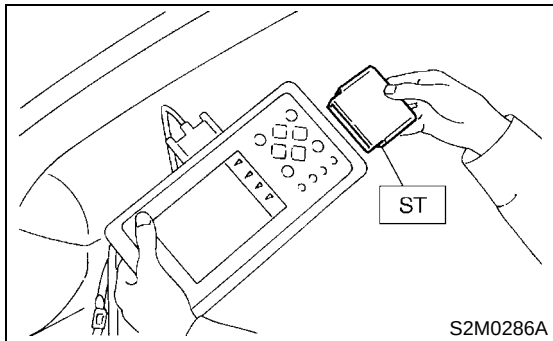
A: OPERATION

1) Prepare Subaru Select Monitor kit. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>

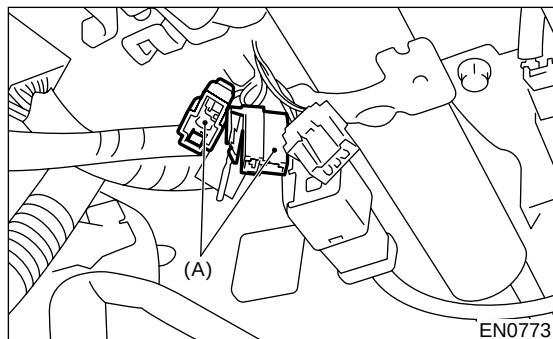


2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>

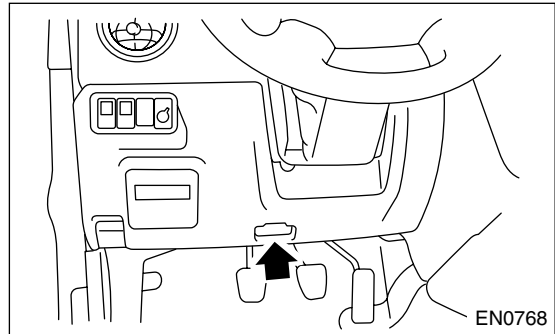


4) Connect test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



5) Connect Subaru Select Monitor to data link connector.

(1) Connect Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).

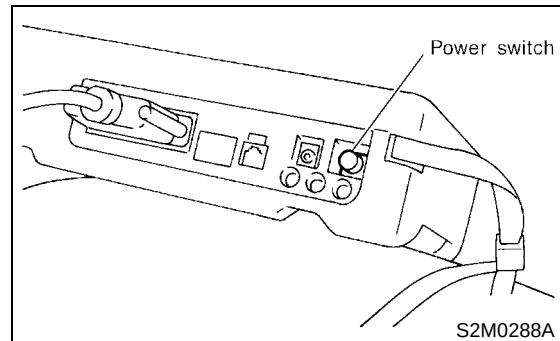


(2) Connect diagnosis cable to data link connector.

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.



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.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

- 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
EGR Solenoid Valve
ASV Solenoid Valve
PCV Solenoid Valve
Vent Control Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Fuel Tank Sensor Control Valve

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

15.Engine Malfunction Indicator Lamp (MIL)

A: PROCEDURE

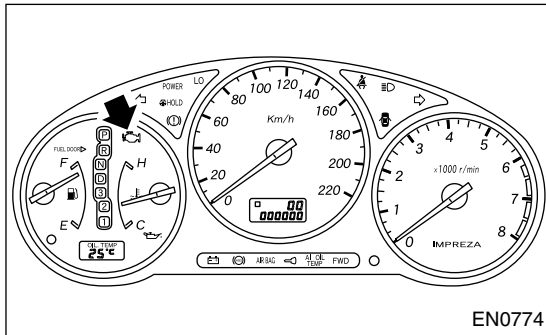
1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(SOHC)-49, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(SOHC)-50, CHECK ENGINE MALFUNCTION 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(SOHC)-52, 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(SOHC)-54, 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(SOHC)-57, 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)

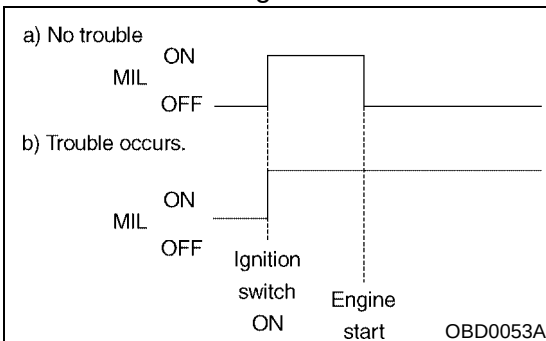
1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

NOTE:

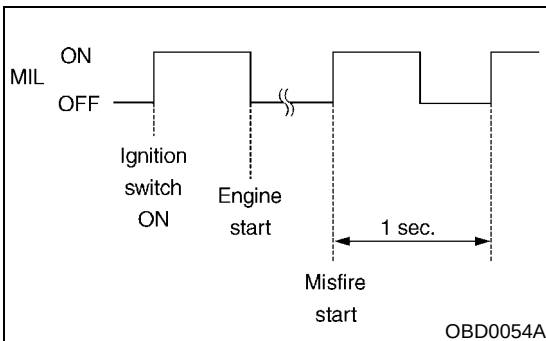
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(SOHC)-50, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>



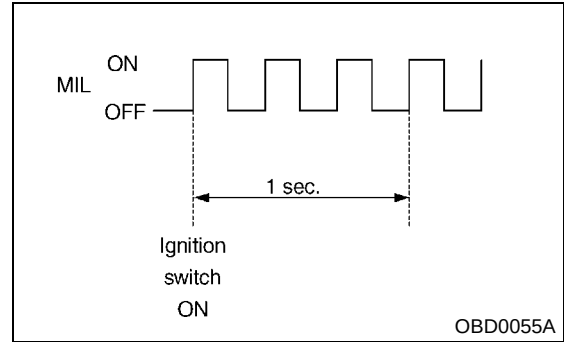
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.



4) 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.

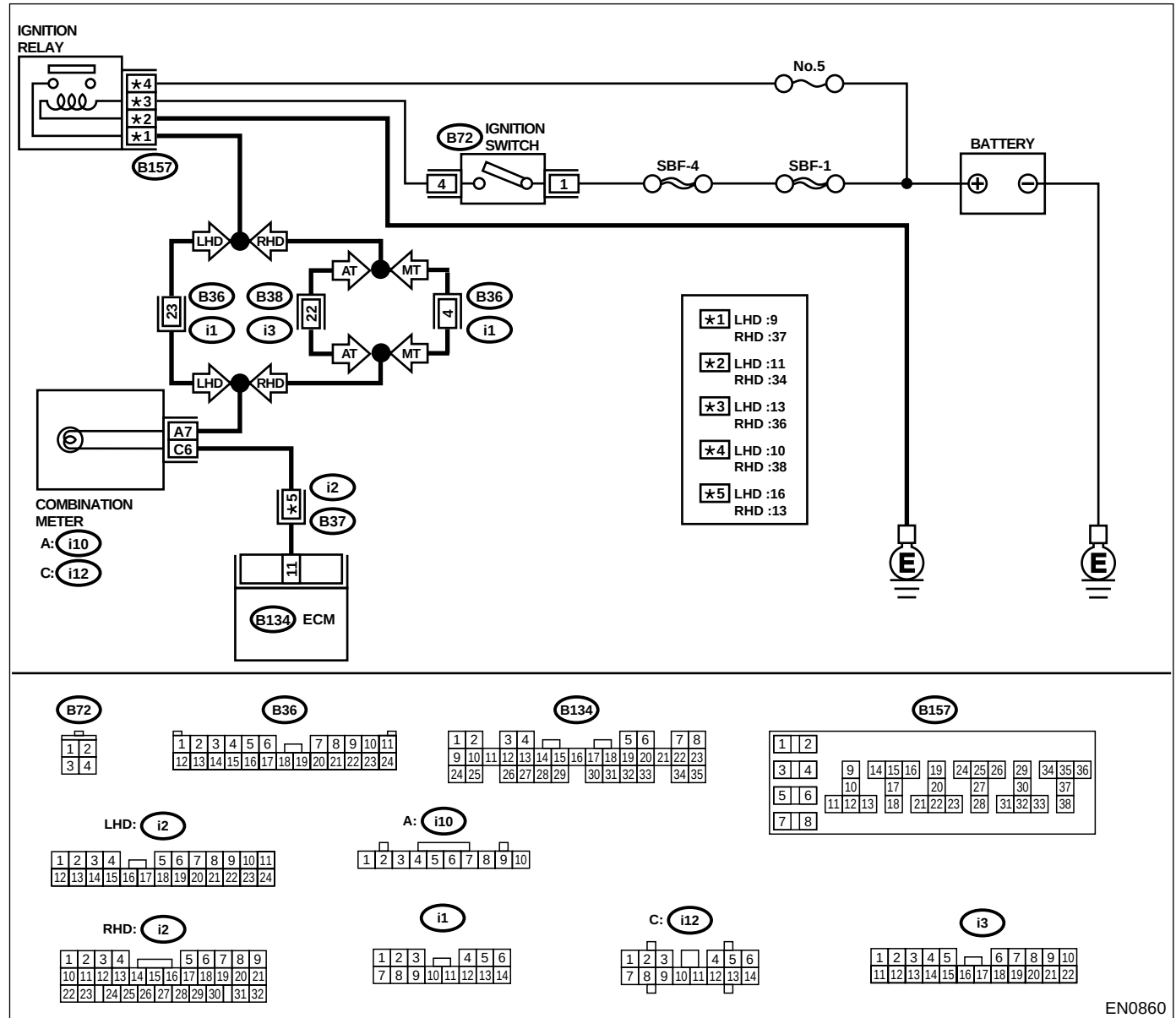


ENGINE MALFUNCTION INDICATOR LAMP (MIL)

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:**



EN0860

Step	Check	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 (-):	Go to step 4.	Go to step 2.
2	CHECK POOR CONTACT. Does the MIL come on when shaking or pulling ECM connector and harness?	Repair poor contact in ECM connector.	Go to step 3.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK ECM CONNECTOR.	Is ECM connector correctly connected?	Replace ECM. <Ref. to FU(SOHC)-48, 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-19, 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. 6:	Is resistance less than 1 Ω?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector (i2)
5 CHECK POOR CONTACT. Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	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 (i10) No. 7 (+) — Chassis ground (-):	Is voltage more than 10 V?	Go to step 7.	Check the following and repair if necessary. NOTE: • 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
7 CHECK LAMP BULB. Remove engine malfunction indicator lamp bulb.	Is lamp bulb condition OK?	Repair combination meter connector.	Replace lamp bulb.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

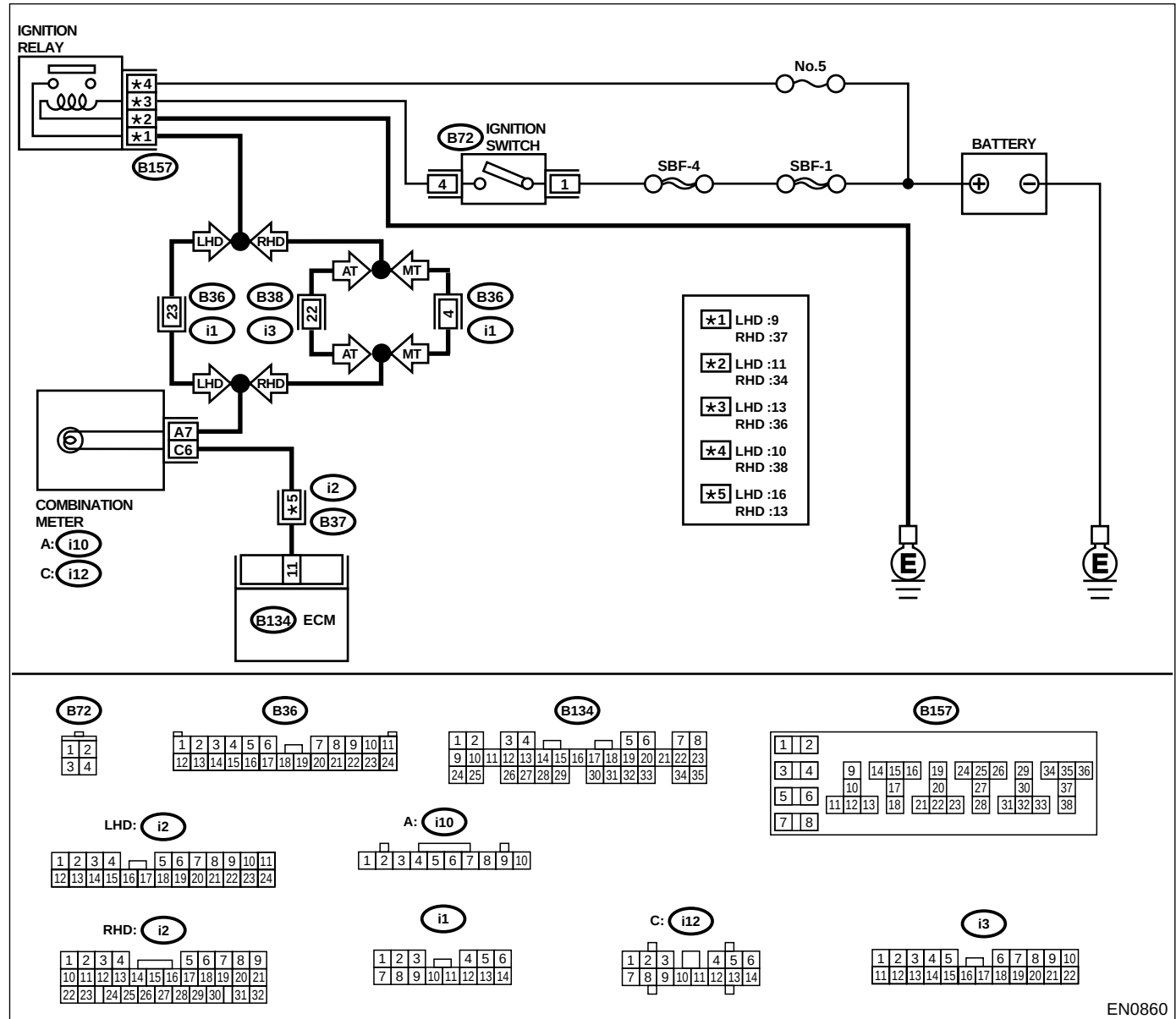
• DIAGNOSIS:

- 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:



EN0860

Step	Check	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?	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(SOHC)-48, 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.

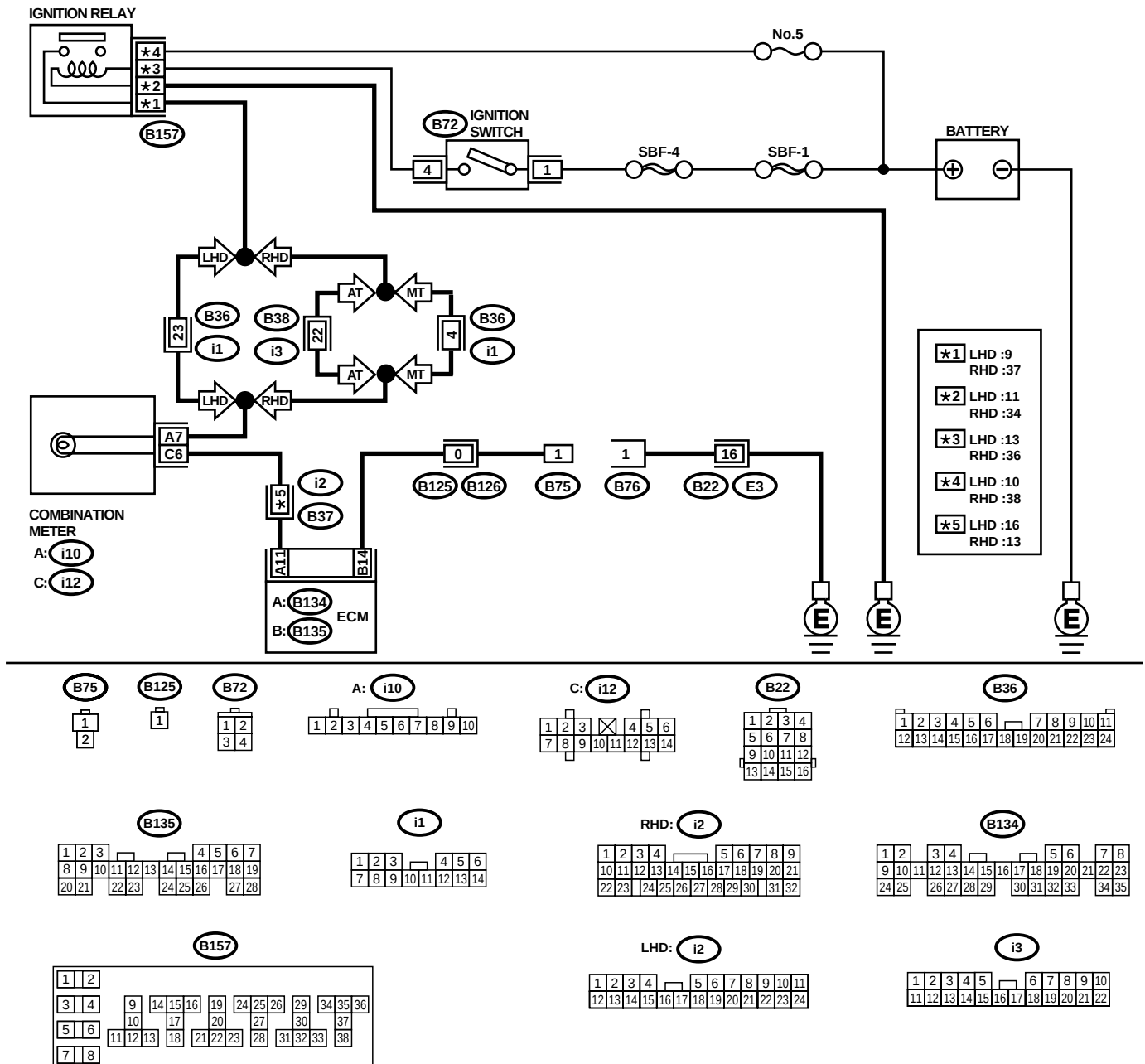
• DIAGNOSIS:

- 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:



ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	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. (engine OFF)	Does the MIL come on?	Go to step 2.	Repair the MIL circuit. <Ref. to EN(SOHC)-50, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
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 MIL come 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 resistance less than 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?	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 (B135) No. 14 — Chassis ground:	Is resistance less than 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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

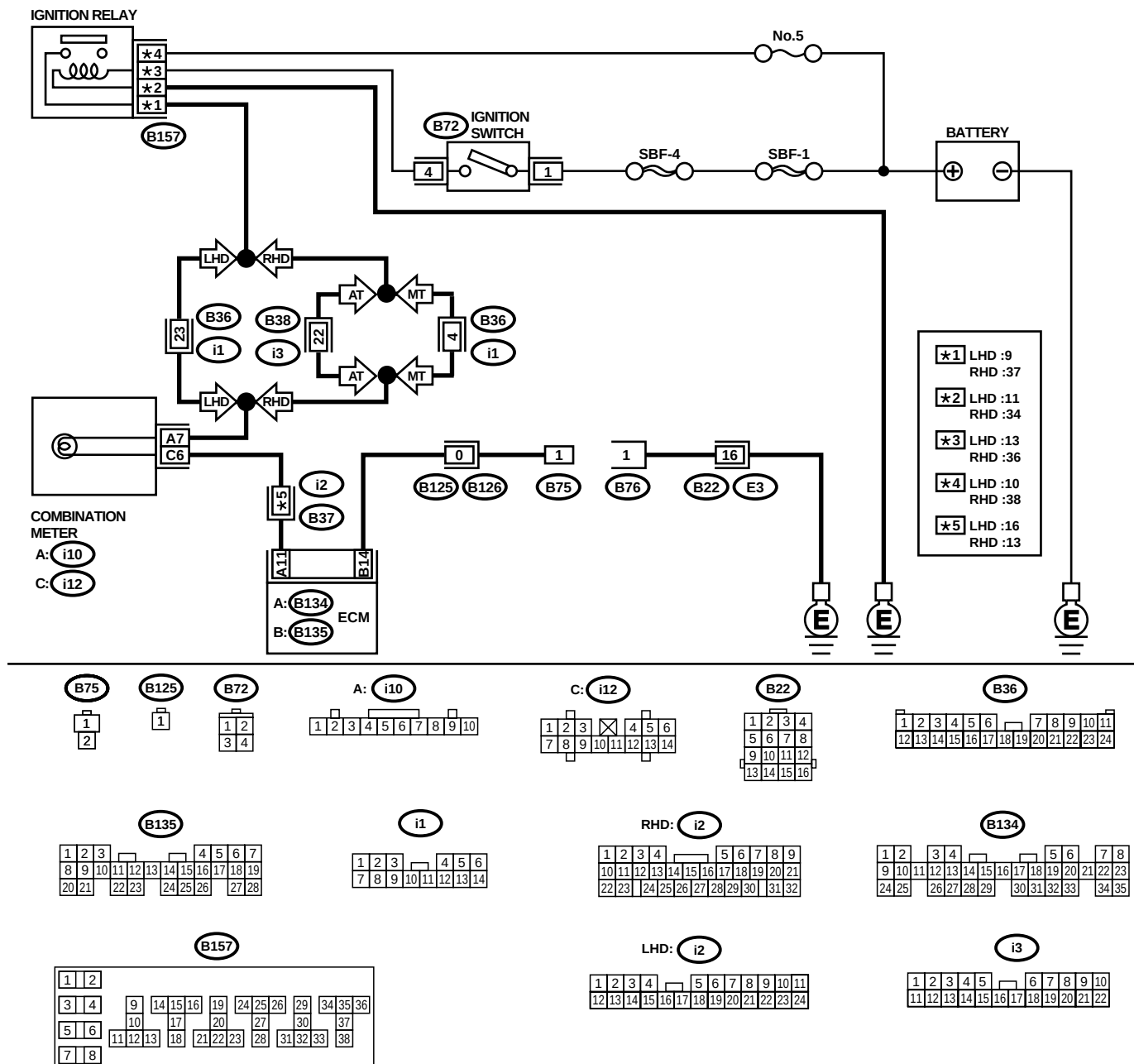
F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
 - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
 - MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN0861

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK TEST MODE CONNECTOR. 1) Disconnect test mode connector. 2) Turn ignition switch to ON.	Does MIL flash on and off?	Go to step 2.	System is in good order. NOTE: MIL 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 (B135) No. 14 — Chassis ground:	Is resistance less than 5 Ω ?	Repair short circuit in harness between ECM and test mode connector.	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

16. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(SOHC)-62, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(SOHC)-66, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(SOHC)-70, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(SOHC)-74, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(SOHC)-78, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

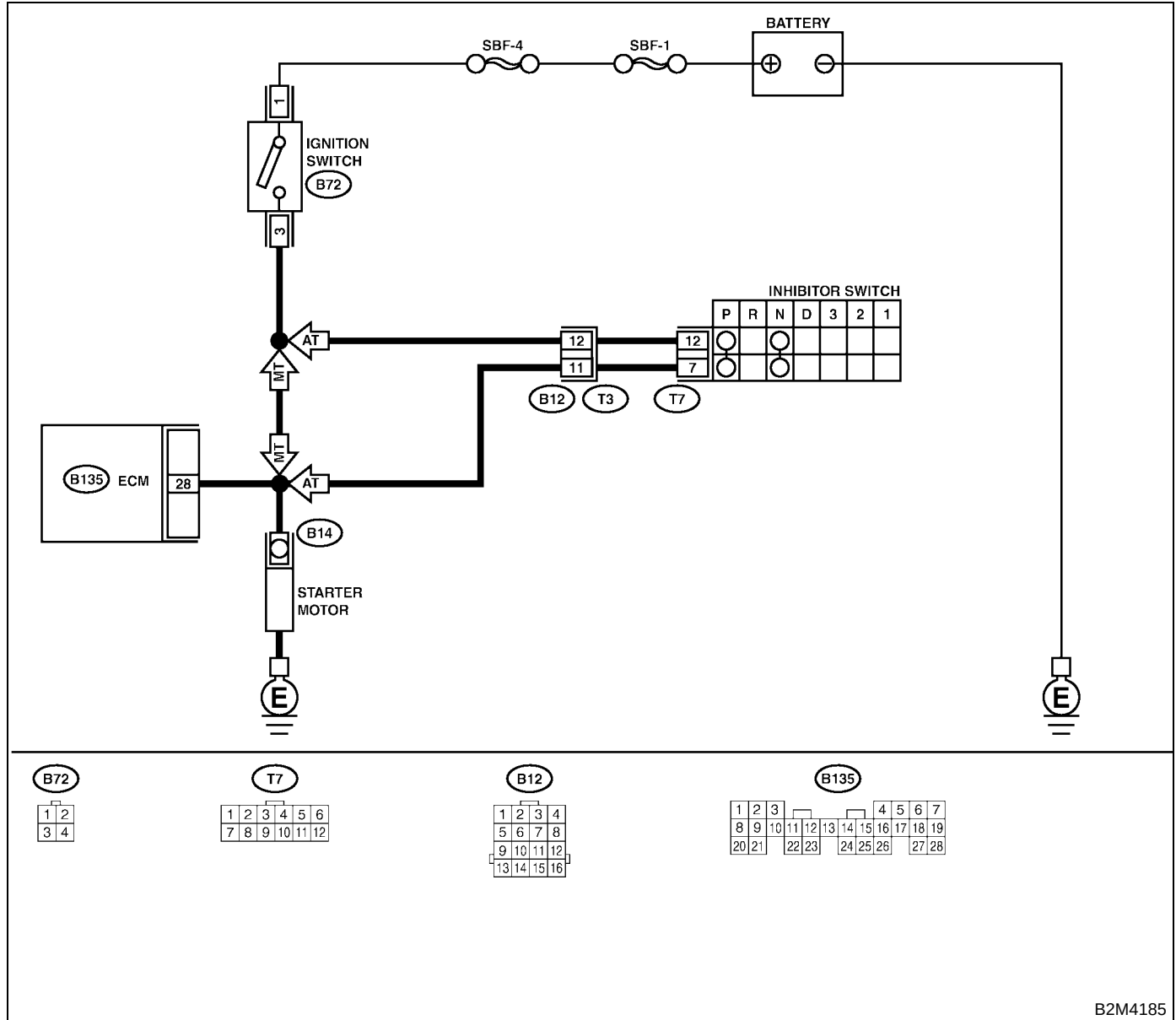
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-45, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-42, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR. Does starter motor operate when the switch starts?	Go to step 2 .	Go to step 3 .
2	CHECK DTC. <Ref. to EN(SOHC)-41, OPERATION, Read Diagnostic Trouble Code.> Is the trouble code stored in memory? <Ref. to EN(SOHC)-81, LIST, List of Diagnostic Trouble Code (DTC).>	Record DTC. Repair the trouble case. <Ref. to EN(SOHC)-88, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3 .
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.	Is the voltage more than 10 V? Go to step 4 .	Go to step 5 .
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 resistance less than 5 Ω? Check starter motor. <Ref. to SC-5, Starter.>	Repair open circuit of ground cable.
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 resistance less than 1 Ω? Repair ground short circuit.	Go to step 6 .
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 resistance less than 1 Ω? Go to step 7 .	Repair ground short circuit.
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 (-):	Is the voltage more than 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 (-):	Is the voltage more than 10 V? Go to step 9 .	Replace ignition switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK TRANSMISSION TYPE.	Is the vehicle 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 resistance less than 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. 1:	Is the resistance less than 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?	Repair poor contact in inhibitor switch connector.	Replace inhibitor switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

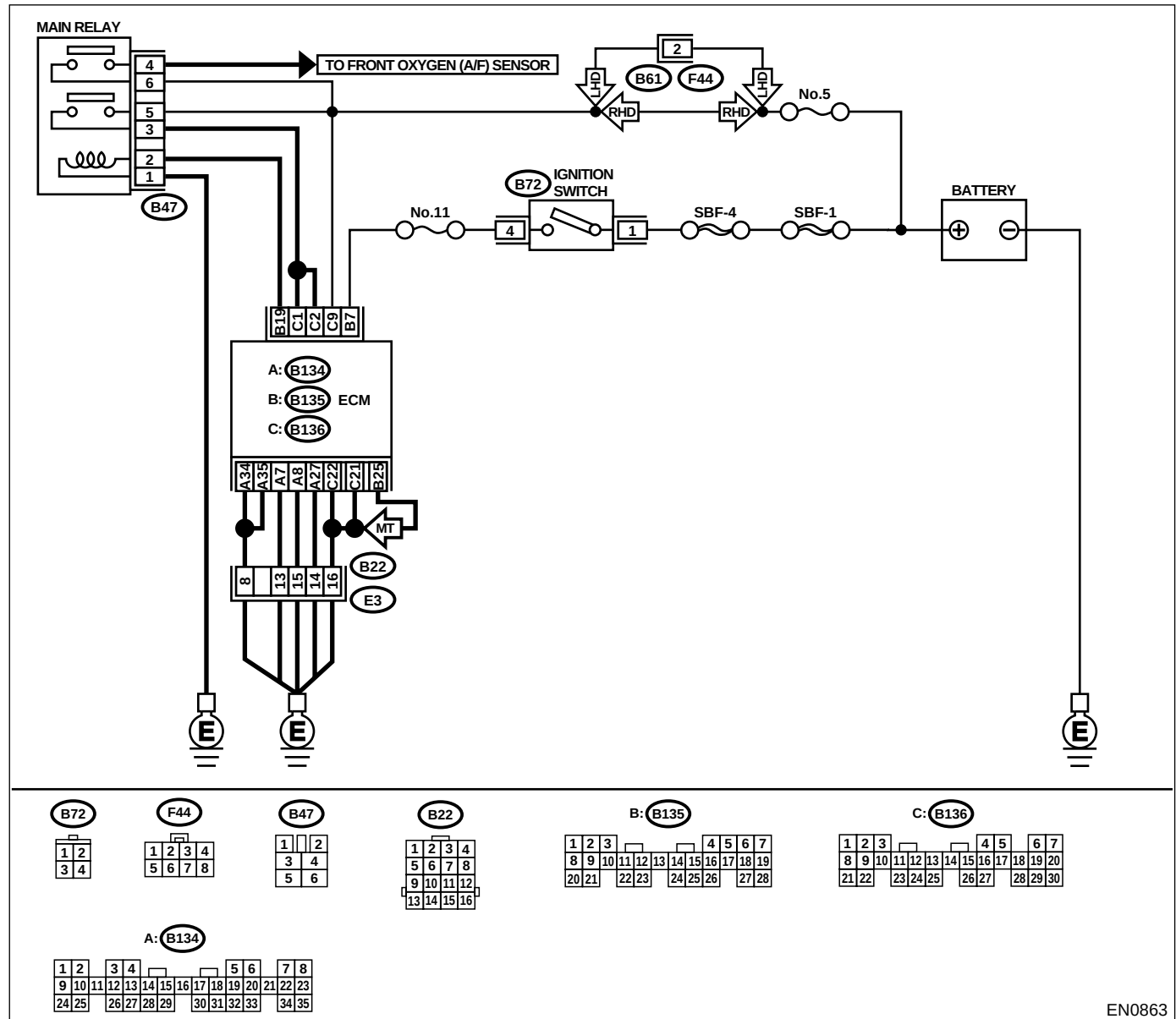
ENGINE (DIAGNOSTICS)

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-45, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(SOHC)-42, Inspection Mode.>

• WIRING DIAGRAM:



EN0863

Step	Check	Yes	No
1 CHECK MAIN RELAY. 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. Terminals No. 3 — No. 5: No. 4 — No. 5:	Is the resistance less than 10 Ω?	Go to step 2.	Replace main relay.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK GROUND CIRCUIT OF ECM. 1)Disconnect connector from ECM. 2)Measure resistance of harness between ECM and chassis ground. Connector & terminal <i>(B136) No. 21 — Chassis ground:</i> <i>(B136) No. 22 — Chassis ground:</i> <i>(B134) No. 27 — Chassis ground:</i> <i>(B134) No. 8 — Chassis ground:</i> <i>(B134) No. 7 — Chassis ground:</i> <i>(B134) No. 34 — Chassis ground:</i> <i>(B134) No. 35 — Chassis ground:</i> <i>(B135) No. 25 — Chassis ground: (MT vehicle)</i>	Is the resistance less than 5 Ω ?	Go to step 3.	Repair open circuit in harness between ECM connector and engine grounding terminal.
3 CHECK INPUT VOLTAGE OF ECM. <i>Measure voltage between ECM connector and chassis ground.</i> Connector & terminal <i>(B136) No. 9 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Repair open or ground short circuit of power supply circuit.
4 CHECK INPUT VOLTAGE OF ECM. 1)Turn ignition switch to ON. 2)Measure voltage between ECM connector and chassis ground. Connector & terminal <i>(B135) No. 7 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 5.	Repair open or ground short circuit of power supply circuit.
5 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR. 1)Turn ignition switch to OFF. 2)Measure resistance between ECM and chassis ground. Connector & terminal <i>(B135) No. 19 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair ground short circuit in harness between ECM connector and main relay connector, then replace ECM.
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 <i>(B135) No. 19 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 7.	Replace ECM.
7 CHECK INPUT VOLTAGE OF MAIN RELAY. Check voltage between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 8.	Repair open circuit in harness between ECM connector and main relay connector.
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 <i>(B47) No. 1 — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 9.	Repair open circuit between main relay and chassis ground.
9 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure voltage between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 5 (+) — Chassis ground (-):</i> <i>(B47) No. 6 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 10.	Repair open or ground short circuit in harness of power supply circuit.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(SOHC)-70, 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)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

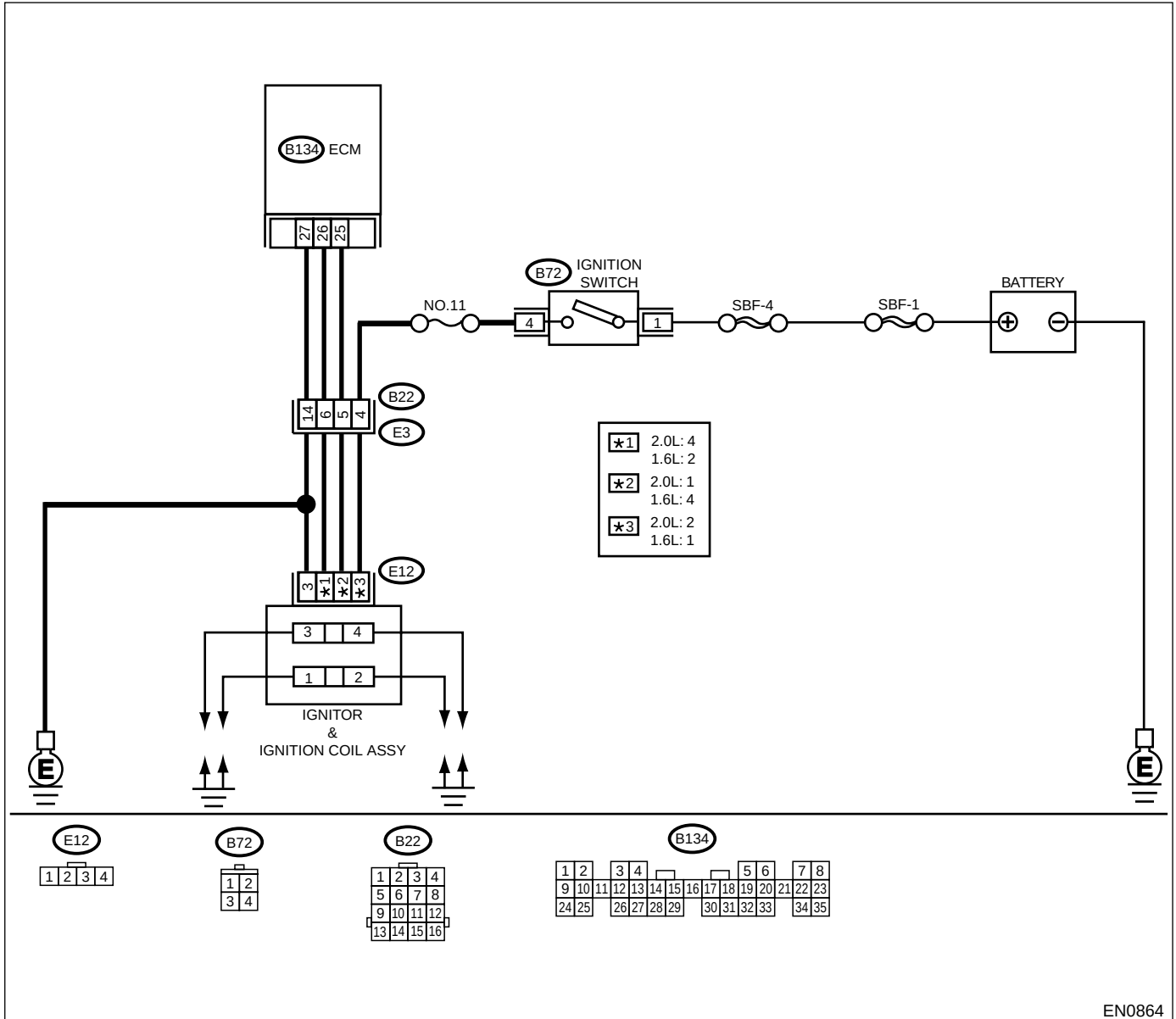
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-45, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0864

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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)While opening throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(SOHC)-74, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
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 • 2.0 L (E12) No. 2 (+) — Engine ground (-): • 1.6 L (E12) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors (B22)
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 resistance between less than 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
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 • 2.0 L No. 1 — No. 2: • 1.6 L No. 4 — No. 1:	Is the resistance between 10 and 15 kΩ?	Go to step 5.	Replace ignition coil & ignitor assembly. <Ref. to IG(SOHC)-8, Ignition Coil and Ignitor Assembly.>
5 CHECK IGNITION COIL & IGNITOR ASSEMBLY. Measure resistance between spark plug cord contact portions to check secondary coil. Terminals • 2.0 L No. 3 — No. 4: • 1.6 L No. 3 — No. 2:	Is the resistance between 10 and 15 kΩ?	Go to step 6.	Replace ignition coil & ignitor assembly. <Ref. to IG(SOHC)-8, Ignition Coil and Ignitor Assembly.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY. 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. Connector & terminal • 2.0 L (E12) No. 1 (+) — Engine ground (-): • 1.6 L (E12) No. 4 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 7.	Replace ignition coil & ignitor assembly. <Ref. to IG(SOHC)-8, Ignition Coil and Ignitor Assembly.>
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 • 2.0 L (E12) No. 4 (+) — Engine ground (-): • 1.6 L (E12) No. 4 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 8.	Replace ignition coil & ignitor assembly. <Ref. to IG(SOHC)-8, Ignition Coil and Ignitor Assembly.>
8 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. 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. Connector & terminal • 2.0 L (B134) No. 25 — (E12) No. 1: • 1.6 L (B134) No. 25 — (E12) No. 4:	Is the resistance less than 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 coupling connector (B22)
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 • 2.0 L (B134) No. 26 — (E12) No. 4: • 1.6 L (B134) No. 26 — (E12) No. 2:	Is the resistance less than 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 coupling connector (B22)
10 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure resistance of harness between ECM and engine ground. Connector & terminal: (B134) No. 25 — Engine ground:	Is the resistance more than 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	Check	Yes	No
11 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure resistance of harness between ECM and engine ground. <i>Connector & terminal</i> <i>(B134) No. 26 — Engine ground:</i>	Is the resistance more than 1 MΩ?	Go to step 12 .	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
12 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(SOHC)-74, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

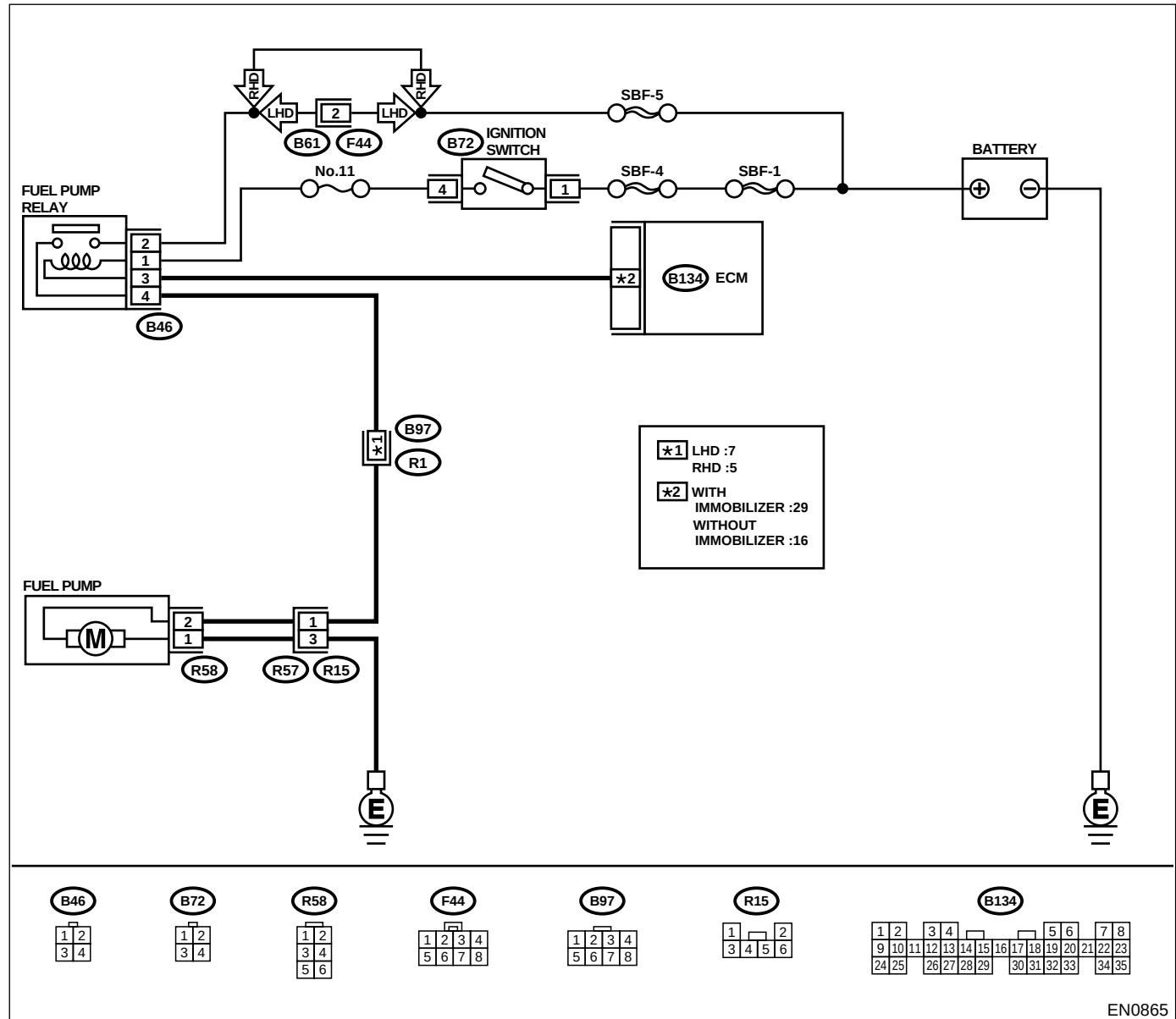
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-45, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0865

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATING SOUND OF FUEL PUMP. Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON. 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(SOHC)-46, Compulsory Valve Operation Check Mode.>	Does fuel pump produce operating sound?	Check fuel injector circuit. <Ref. to EN(SOHC)-78, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
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 resistance less than 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 (R57)
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 (-):	Is the voltage more than 10 V?	Replace fuel pump. <Ref. to FU(SOHC)-58, Fuel Pump.>	Go to step 4.
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 resistance less than 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 (R57 and B97)
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 resistance more than 1 M Ω ?	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	Check	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 resistance less than 10 Ω ?	Go to step 7.	Replace fuel pump relay. <Ref. to FU(SOHC)-50, 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 • <i>With immobilizer</i> (B134) No. 29 — (B46) No. 3: • <i>Without immobilizer</i> (B134) No. 16 — (B46) No. 3:	Is the resistance less than 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?	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(SOHC)-78, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

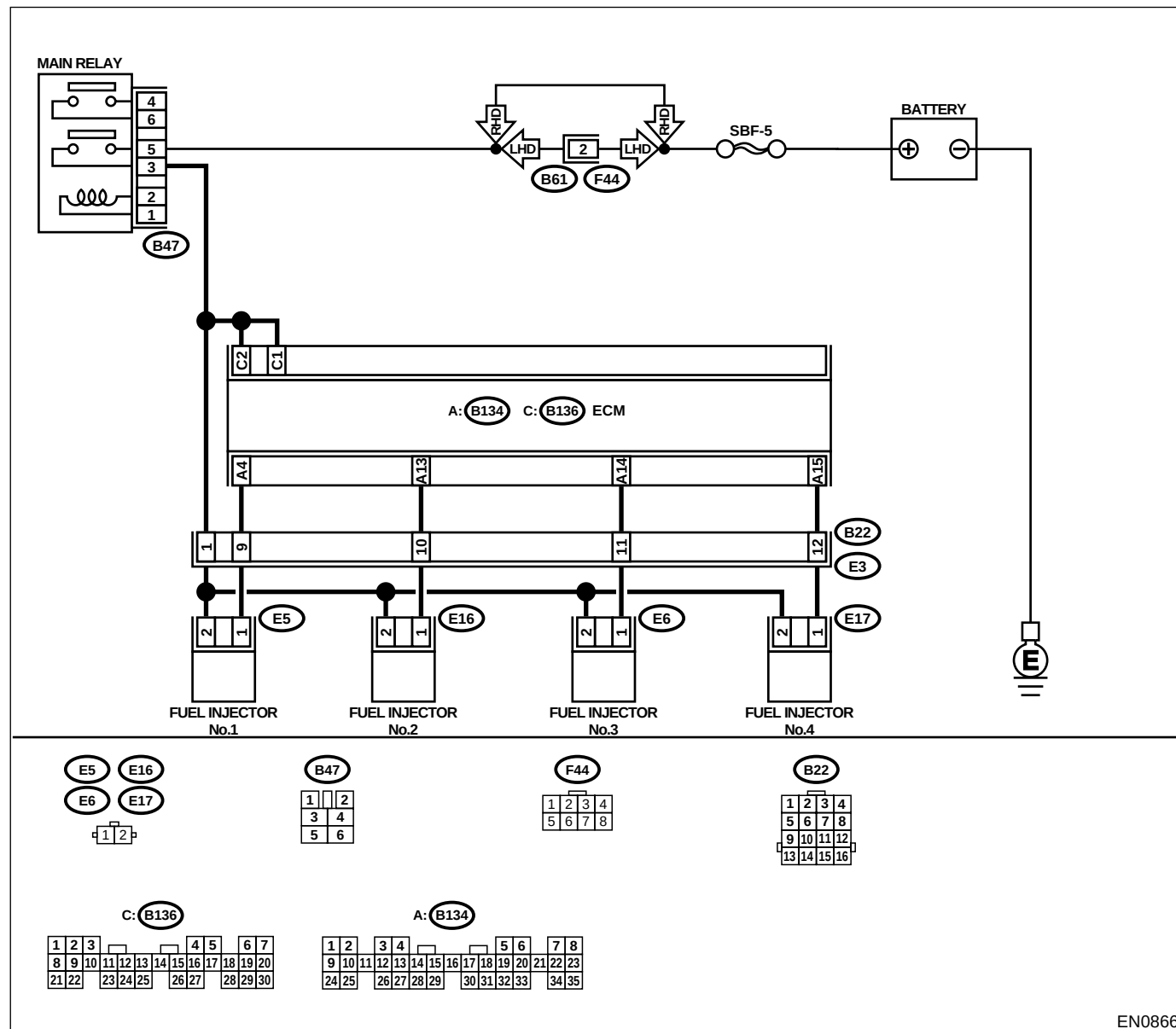
DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

ENGINE (DIAGNOSTICS)

CAUTION:

- Check or repair only faulty parts.
- After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(SOHC)-45, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(SOHC)-42, Inspection Mode.>
- **WIRING DIAGRAM:**



Step		Check	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?	Check fuel pressure. <Ref. to ME(SOHC)-28, INSPECTION, Fuel Pressure.>	Go to step 2.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 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. 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 (-):	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • 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
3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 4 — (B136) No. 2:	Is the resistance between 5 and 20 Ω ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 4 — Chassis ground:	Is the resistance less than 1 Ω ?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 13 — (B136) No. 2:	Is the resistance between 5 and 20 Ω ?	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
6 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 resistance less than 1 Ω ?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 7.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 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 resistance between 5 and 20 Ω ?	Go to step 8 .	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
8 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 resistance less than 1 Ω ?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 9 .
9 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 resistance between 5 and 20 Ω ?	Go to step 10 .	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
10 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 resistance less than 1 Ω ?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 11 .
11 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 resistance between 5 and 20 Ω ?	Go to step 12 .	Replace faulty fuel injector.
12 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(SOHC)-288, INSPECTION, General Diagnostic Table.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

17.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0031	Front oxygen (A/F) sensor heater circuit low input	<Ref. to EN(SOHC)-88, DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	Front oxygen (A/F) sensor heater circuit high input	<Ref. to EN(SOHC)-92, DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	Rear oxygen sensor heater circuit malfunction	<Ref. to EN(SOHC)-94, DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	Rear oxygen sensor heater circuit high input	<Ref. to EN(SOHC)-98, DTC P0038 — REAR OXYGEN SENSOR HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0066	Air assist injector solenoid valve circuit low input	<Ref. to EN(SOHC)-100, DTC P0066 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0067	Air assist injector solenoid valve circuit high input	<Ref. to EN(SOHC)-102, DTC P0067 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0106	Pressure sensor circuit range/performance problem (low input)	<Ref. to EN(SOHC)-104, DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Pressure sensor circuit low input	<Ref. to EN(SOHC)-106, DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Pressure sensor circuit high input	<Ref. to EN(SOHC)-110, DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature sensor circuit range/performance problem	<Ref. to EN(SOHC)-114, DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature sensor circuit low input	<Ref. to EN(SOHC)-116, DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature sensor circuit high input	<Ref. to EN(SOHC)-118, DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature sensor circuit low input	<Ref. to EN(SOHC)-122, DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature sensor circuit high input	<Ref. to EN(SOHC)-124, DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle position sensor circuit range/performance problem (high input)	<Ref. to EN(SOHC)-128, DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle position sensor circuit low input	<Ref. to EN(SOHC)-130, DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle position sensor circuit high input	<Ref. to EN(SOHC)-134, DTC P0123 — THROTTLE POSITION SENSOR 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(SOHC)-136, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	Front oxygen (A/F) sensor circuit range/performance problem (Lean)	<Ref. to EN(SOHC)-138, DTC P0130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	Front oxygen (A/F) sensor circuit malfunction (open circuit)	<Ref. to EN(SOHC)-142, DTC P0131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	Front oxygen (A/F) sensor circuit malfunction (short circuit)	<Ref. to EN(SOHC)-144, DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	Front oxygen (A/F) sensor circuit slow response	<Ref. to EN(SOHC)-146, DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0136	Rear oxygen sensor circuit malfunction	<Ref. to EN(SOHC)-148, DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	Rear oxygen sensor circuit slow response	<Ref. to EN(SOHC)-150, DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0170	Fuel trim malfunction	<Ref. to EN(SOHC)-152, DTC P0170 — FUEL TRIM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(SOHC)-154, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(SOHC)-154, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(SOHC)-154, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(SOHC)-156, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor circuit low input	<Ref. to EN(SOHC)-162, DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor circuit high input	<Ref. to EN(SOHC)-164, DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor circuit malfunction	<Ref. to EN(SOHC)-166, DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft position sensor circuit range/performance problem	<Ref. to EN(SOHC)-168, DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft position sensor circuit malfunction	<Ref. to EN(SOHC)-170, DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft position sensor circuit range/performance problem	<Ref. to EN(SOHC)-172, DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst system efficiency below threshold	<Ref. to EN(SOHC)-176, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0444	Evaporative emission control system purge control valve circuit low input	<Ref. to EN(SOHC)-178, DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0445	Evaporative emission control system purge control valve circuit high input	<Ref. to EN(SOHC)-182, DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0461	Fuel level sensor circuit range/performance problem	<Ref. to EN(SOHC)-184, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(SOHC)-186, 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(SOHC)-190, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor intermittent input	<Ref. to EN(SOHC)-194, DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0480	Cooling fan relay 1 circuit low input	<Ref. to EN(SOHC)-197, DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan function problem	<Ref. to EN(SOHC)-201, DTC P0483 — COOLING FAN FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle speed sensor malfunction	<Ref. to EN(SOHC)-204, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(SOHC)-206, 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(SOHC)-208, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter switch circuit high input	<Ref. to EN(SOHC)-210, DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect immobilizer key	<Ref. to IM-27, DTC P0153 — INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY) —, Diagnostics Chart with Trouble Code.>
P0562	Charge system circuit low input	<Ref. to EN(SOHC)-212, DTC P0562 — CHARGE SYSTEM CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0563	Charge system circuit high input	<Ref. to EN(SOHC)-214, DTC P0563 — CHARGE SYSTEM CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal control module memory check sum error	<Ref. to EN(SOHC)-216, DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Brake switch input malfunction	<Ref. to EN(SOHC)-218, DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit malfunction	<Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-trouble Code.>
P0710	Transmission fluid temperature sensor circuit malfunction	<Ref. to AT-42, TROUBLE CODE 27 — ATF TEMPERATURE SENSOR —, Diagnostic Procedure with Trouble Code.>
P0715	Torque converter turbine speed sensor circuit malfunction	<Ref. to AT-58, TROUBLE CODE 36 — TORQUE CONVERTER TURBINE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>
P0720	Output speed sensor (vehicle speed sensor 2) circuit malfunction	<Ref. to AT-53, TROUBLE CODE 33 — FRONT VEHICLE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>
P0725	Engine speed input circuit malfunction	<Ref. to AT-40, TROUBLE CODE 11 — ENGINE SPEED SIGNAL —, Diagnostic Procedure with Trouble Code.>
P0731	Gear 1 incorrect ratio	<Ref. to EN(SOHC)-220, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(SOHC)-220, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(SOHC)-220, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN(SOHC)-221, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0741	Torque converter clutch system malfunction	<Ref. to EN(SOHC)-222, DTC P0741 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque converter clutch system (Lock-up duty solenoid) electrical	<Ref. to AT-90, TROUBLE CODE 77 — LOCK-UP DUTY SOLENOID —, Diagnostic Procedure with Trouble Code.>
P0748	Pressure control solenoid (Line pressure duty solenoid) electrical	<Ref. to AT-82, TROUBLE CODE 75 — LINE PRESSURE DUTY SOLENOID —, Diagnostic Procedure with Trouble Code.>
P0753	Shift solenoid A (Shift solenoid 1) electrical	<Ref. to AT-66, TROUBLE CODE 71 — SHIFT SOLENOID 1 —, Diagnostic Procedure with Trouble Code.>
P0758	Shift solenoid B (Shift solenoid 2) electrical	<Ref. to AT-70, TROUBLE CODE 72 — SHIFT SOLENOID 2 —, Diagnostic Procedure with Trouble Code.>
P0778	2-4 brake pressure control solenoid valve circuit malfunction	<Ref. to AT-86, TROUBLE CODE 76 — 2-4 BRAKE DUTY SOLENOID —, Diagnostic Procedure with Trouble Code.>
P0785	2-4 brake timing control solenoid valve circuit malfunction	<Ref. to AT-78, TROUBLE CODE 74 — 2-4 BRAKE TIMING SOLENOID —, Diagnostic Procedure with Trouble Code.>
P1110	Atmospheric pressure sensor low input	<Ref. to EN(SOHC)-224, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor high input	<Ref. to EN(SOHC)-228, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1112	Atmospheric pressure sensor range/performance problem	<Ref. to EN(SOHC)-232, DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1137	Front oxygen (A/F) sensor circuit range/performance problem	<Ref. to EN(SOHC)-234, DTC P1137 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1142	Throttle position sensor circuit range/performance problem (low input)	<Ref. to EN(SOHC)-238, DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1146	Pressure sensor circuit range/performance problem (high input)	<Ref. to EN(SOHC)-240, DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1442	Fuel level sensor circuit range/performance problem 2	<Ref. to EN(SOHC)-242, DTC P1442 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM 2 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1480	Cooling fan relay 1 circuit high input	<Ref. to EN(SOHC)-245, DTC P1480 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1507	Idle control system malfunction (fail-safe)	<Ref. to EN(SOHC)-248, DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1510	Idle air control solenoid valve signal 1 circuit low input	<Ref. to EN(SOHC)-250, DTC P1510 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1511	Idle air control solenoid valve signal 1 circuit high input	<Ref. to EN(SOHC)-250, DTC P1511 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1512	Idle air control solenoid valve signal 2 circuit low input	<Ref. to EN(SOHC)-250, DTC P1512 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1513	Idle air control solenoid valve signal 2 circuit high input	<Ref. to EN(SOHC)-250, DTC P1513 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1514	Idle air control solenoid valve signal 3 circuit low input	<Ref. to EN(SOHC)-250, DTC P1514 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1515	Idle air control solenoid valve signal 3 circuit high input	<Ref. to EN(SOHC)-250, DTC P1515 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1516	Idle air control solenoid valve signal 4 circuit low input	<Ref. to EN(SOHC)-252, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1517	Idle air control solenoid valve signal 4 circuit high input	<Ref. to EN(SOHC)-256, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(SOHC)-258, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1540	Vehicle speed sensor malfunction 2	<Ref. to EN(SOHC)-260, DTC P1540 — VEHICLE SPEED SENSOR MALFUNCTION 2 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(SOHC)-262, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antennna	<Ref. to IM-28, DTC P1570 — ANTENNA —, Diagnostics Chart with Trouble Code.>
P1571	Reference code incompatibility	<Ref. to IM-21, DTC P1571 — REFERENCE CODE INCOMPATIBILITY —, Diagnostics Chart with Trouble Code.>
P1572	IMM circuit failure except antenna circuit	<Ref. to IM-22, DTC P1572 — IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT) —, Diagnostics Chart with Trouble Code.>
P1574	Key communication failure	<Ref. to IM-26, DTC P1574 — KEY COMMUNICATION FAILURE —, Diagnostics Chart with Trouble Code.>
P1576	EGI control module EEPROM	<Ref. to IM-27, DTC P1576 — EGI CONTROL MODULE EEPROM —, Diagnostics Chart with Trouble Code.>
P1577	IMM control module EEPROM	<Ref. to IM-27, DTC P1577 — IMM CONTROL MODULE EEPROM —, Diagnostics Chart with Trouble Code.>
P1590	Neutral position switch circuit high input (AT model)	<Ref. to EN(SOHC)-264, DTC P1590 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1591	Neutral position switch circuit low input (AT model)	<Ref. to EN(SOHC)-268, DTC P1591 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1592	Neutral position switch circuit (MT model)	<Ref. to EN(SOHC)-270, DTC P1592 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1594	Automatic transmission diagnosis input signal circuit malfunction	<Ref. to EN(SOHC)-272, DTC P1594 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1595	Automatic transmission diagnosis input signal circuit low input	<Ref. to EN(SOHC)-274, DTC P1595 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1596	Automatic transmission diagnosis input signal circuit high input	<Ref. to EN(SOHC)-276, DTC P1596 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine torque control cut signal circuit low input	<Ref. to EN(SOHC)-278, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine torque control cut signal circuit high input	<Ref. to EN(SOHC)-280, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT 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 automatic transmission	<Ref. to AT-47, TROUBLE CODE 31 — THROTTLE POSITION SENSOR —, Diagnostic Procedure with Trouble Code.>
P1701	Cruise control set signal circuit malfunction for automatic transmission	<Ref. to EN(SOHC)-282, DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1703	Low clutch timing control solenoid valve circuit malfunction	<Ref. to AT-74, TROUBLE CODE 73 — LOW CLUTCH TIMING SOLENOID —, Diagnostic Procedure with Trouble Code.>
P1711	Engine torque control signal 1 circuit malfunction	<Ref. to EN(SOHC)-284, 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(SOHC)-286, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

ENGINE 1 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.

FUEL INJECTION (FUEL SYSTEMS)	FU(SOHC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(SOHC)
INTAKE (INDUCTION)	IN(SOHC)
MECHANICAL	ME(SOHC)
EXHAUST	EX(SOHC)
COOLING	CO
LUBRICATION	LU
SPEED CONTROL SYSTEMS	SP
IGNITION	IG(SOHC)
STARTING/CHARGING SYSTEMS	SC
ENGINE (DIAGNOSTICS)	EN(SOHC)

18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

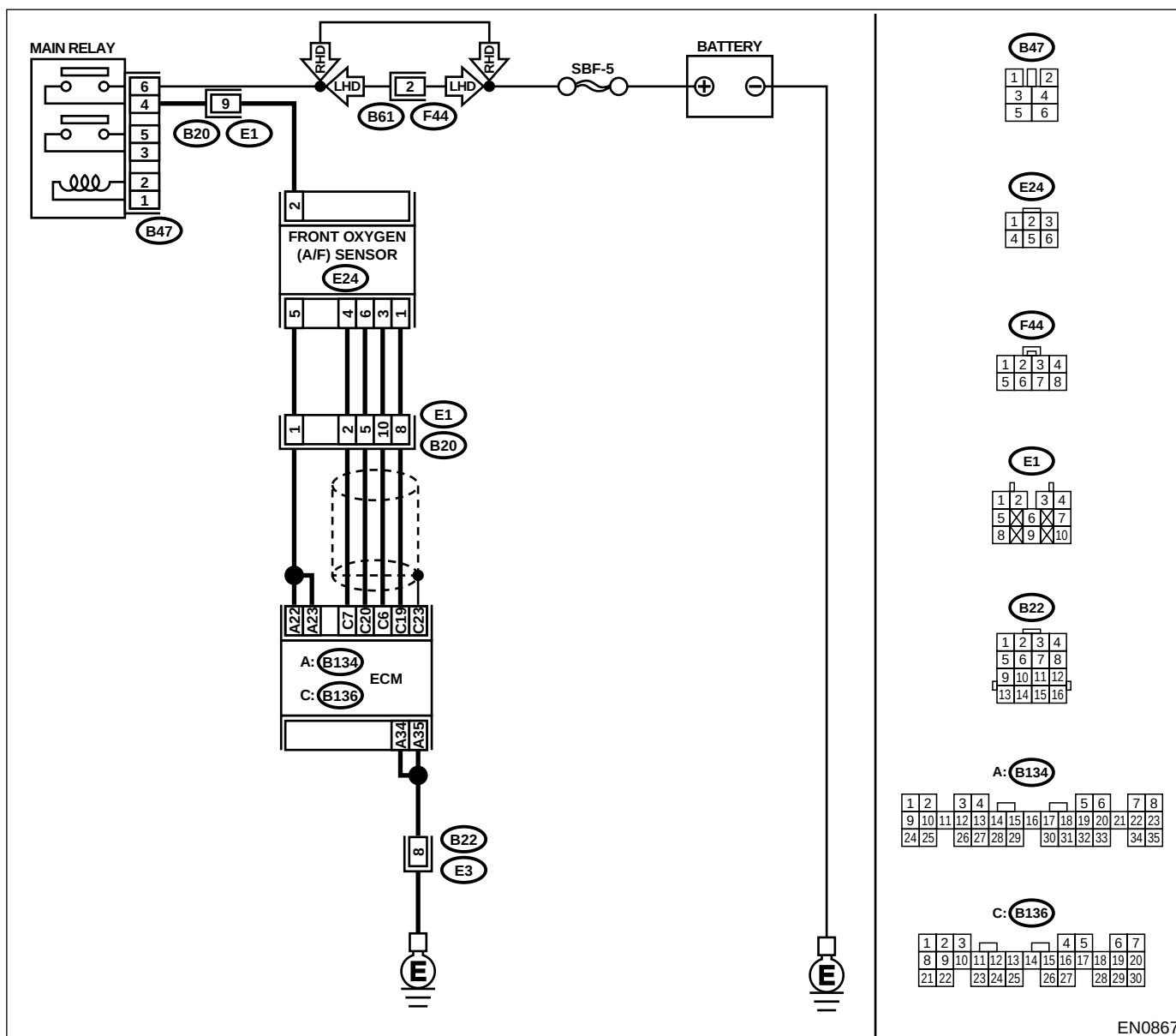
A: DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT LOW INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN0867

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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?	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 (E24) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair power supply line. NOTE: In this case, repair the following: • 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 (B134) No. 35 — Chassis ground: (B134) No. 34 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 4.	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 (B22)
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. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 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 5.
5 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 22 (+) — Chassis ground (-):	Is the voltage less than 1.0 V?	Go to step 7.	Go to step 6.
6 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 22 (+) — Chassis ground (-):	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 23 (+) — Chassis ground (-):	Is the voltage less than 1.0 V?	Go to step 9 .	Go to step 8 .
8 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 23 (+) — Chassis ground (-):	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 9 .
9 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. 5:	Is the resistance less than 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(SOHC)-51, Fuel.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

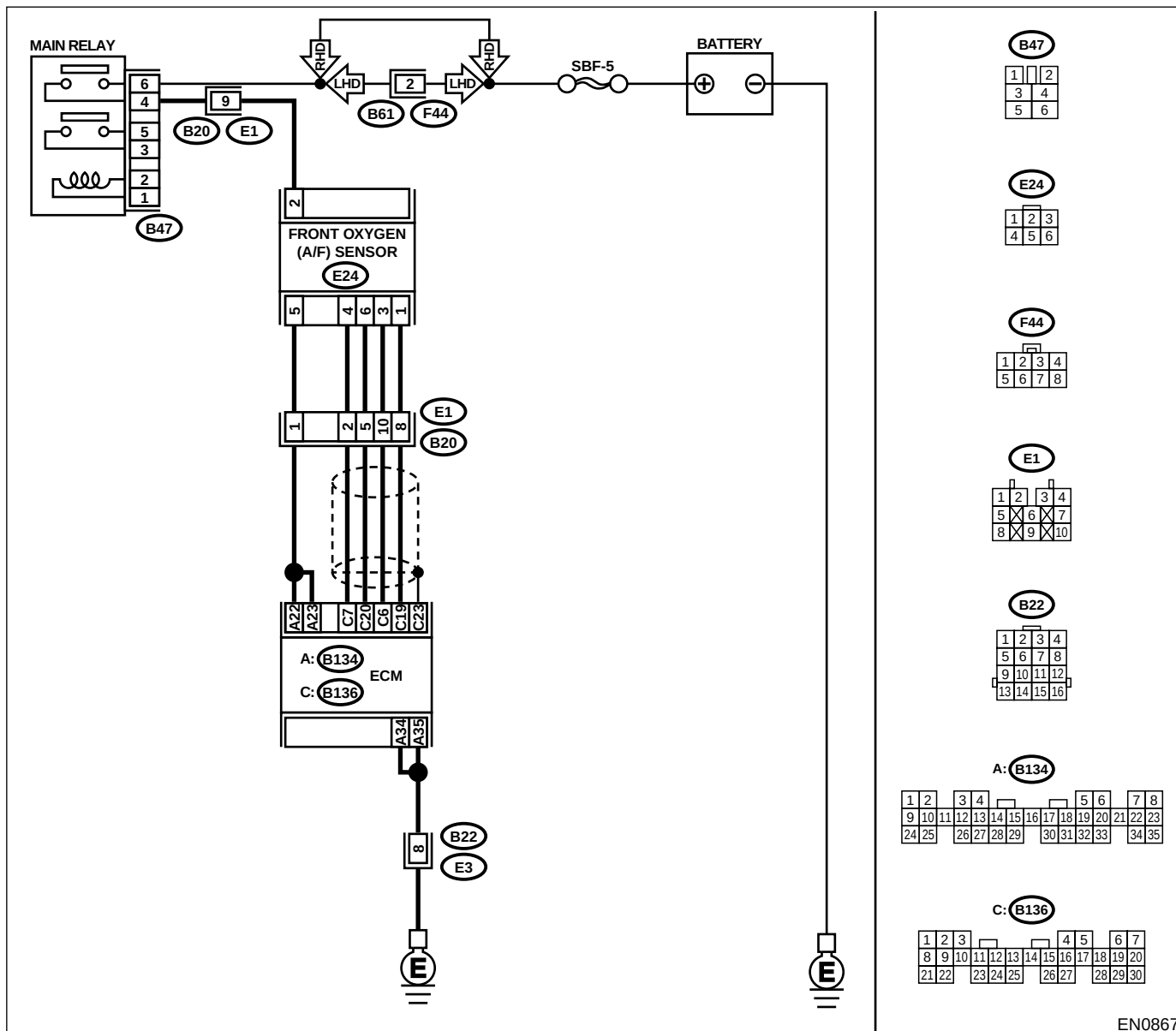
B: DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT HIGH INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, Inspection Mode.> .

- WIRING DIAGRAM:



EN0867

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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. 23 (+) — Chassis ground (-):	Is the voltage more than 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 (B134) No. 22 (+) — Chassis ground (-):	Is the voltage more than 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.3 A?	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	END
4 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 23 (+) — Chassis ground (-):	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	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 (B134) No. 22 (+) — Chassis ground (-):	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

C: DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION

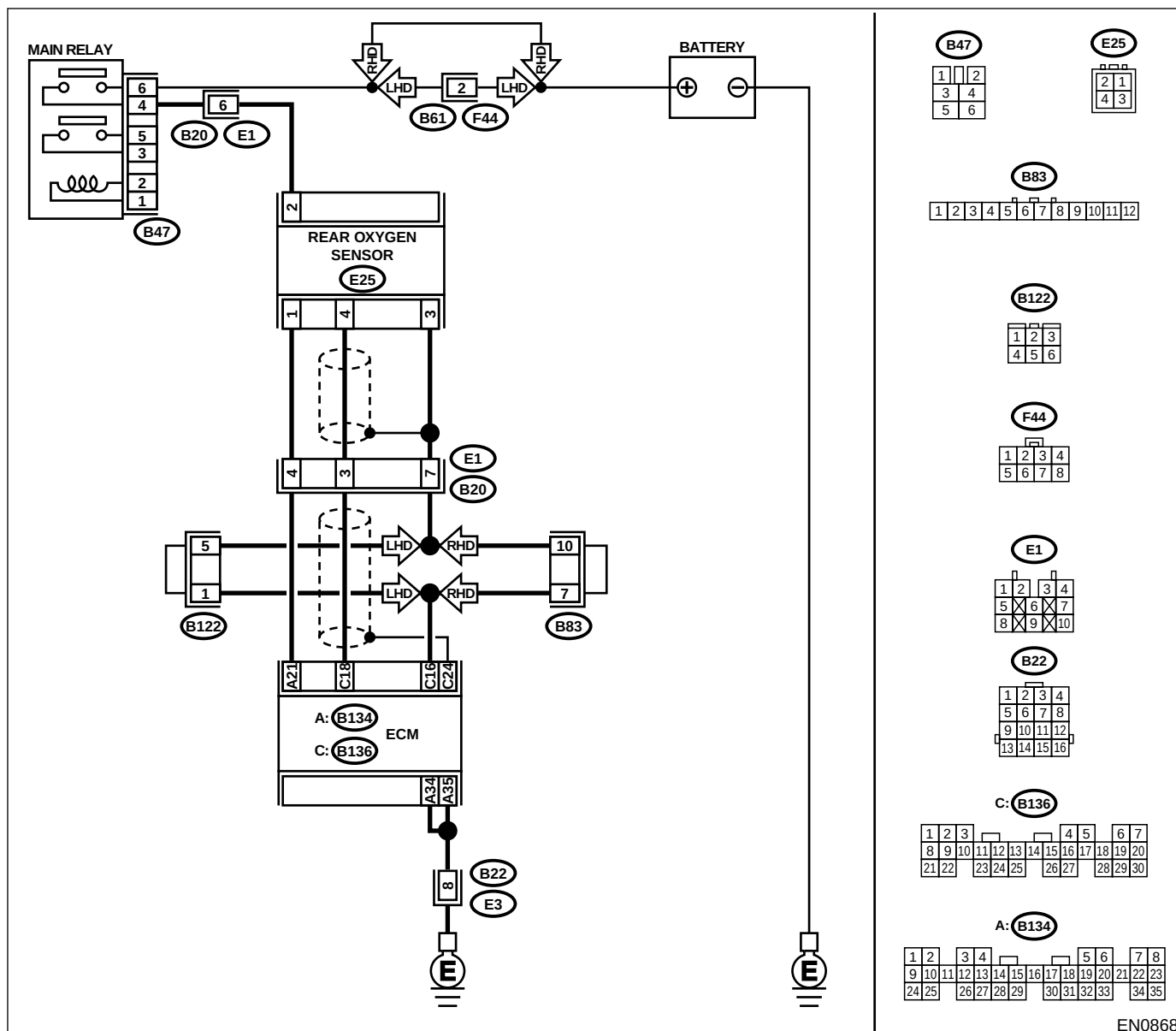
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0868

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. Connector & terminal (B134) No. 35 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Go to step 2.
2 CHECK GROUND CIRCUIT OF ECM. 1) 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 (B22) 1) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 34 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	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 (B22)
3 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. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 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 4.
4 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 21 (+) — Chassis ground (-):	Is the voltage less than 1.0 V?	Go to step 7.	Go to step 5.
5 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 21 (+) — Chassis ground (-):	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 6.
6 CHECK OUTPUT SIGNAL FROM ECM. 1) Disconnect connector from rear oxygen sensor. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 21 (+) — Chassis ground (-):	Is the voltage less than 1.0 V?	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
7	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. Connector & terminal (E25) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 8.	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector (E1)
8	CHECK REAR OXYGEN SENSOR. 1) Turn ignition switch to OFF. 2) Measure resistance between rear oxygen sensor connector terminals. Terminals No. 1 — No. 2:	Is the resistance less than 30 Ω ?	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 • Poor contact in coupling connector (E1)	Replace rear oxygen sensor. <Ref. to FU(SOHC)-46, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

D: DTC P0038 — REAR OXYGEN SENSOR HEATER CIRCUIT HIGH INPUT —

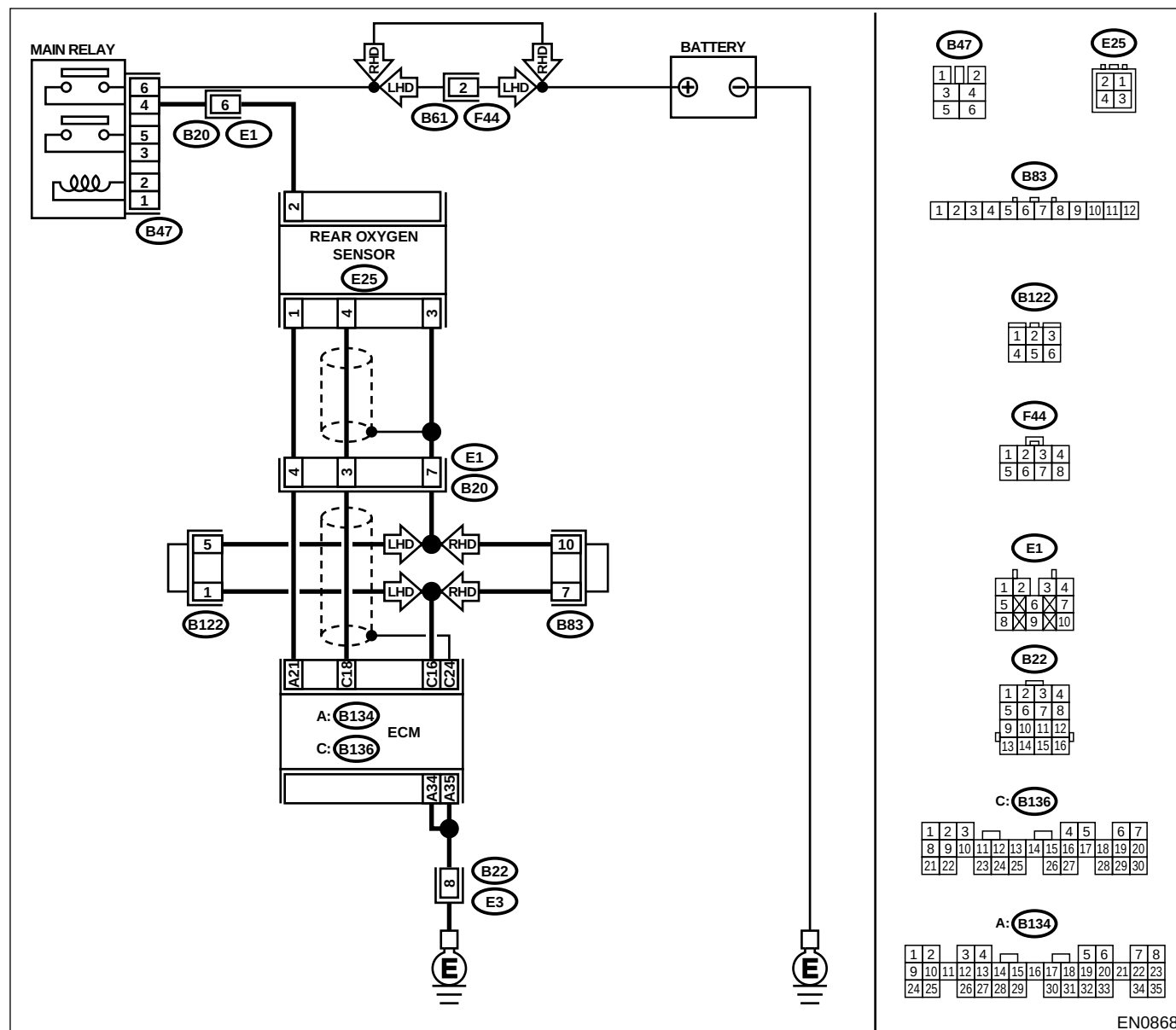
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



Step	Check	Yes	No
1	CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 21 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Go to step 2.
		Go to step 2.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 7 A?	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	END
3	CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

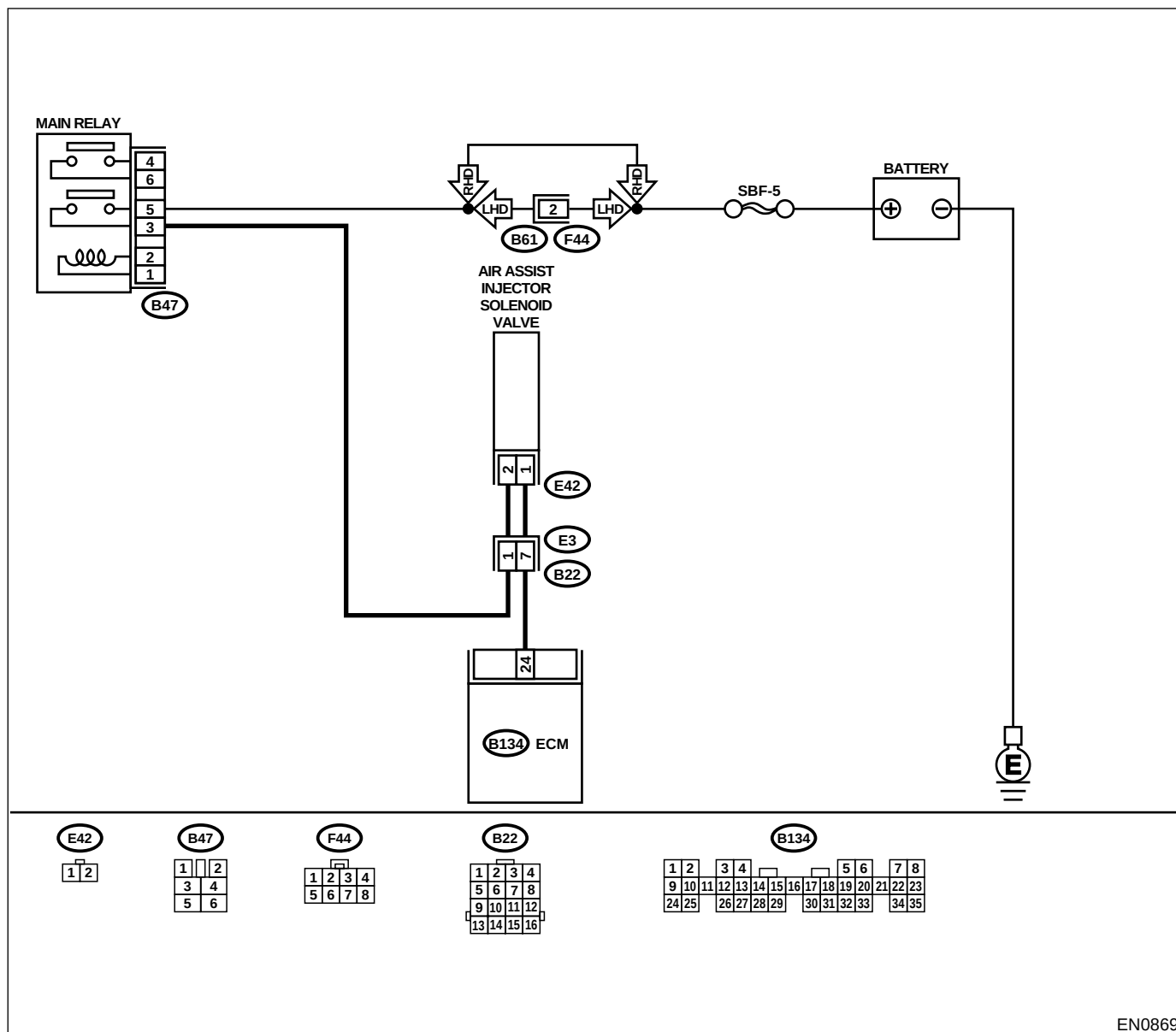
E: DTC P0066 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0869

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK POWER SUPPLY TO AIR ASSIST INJECTOR SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Disconnect connector from air assist injector solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between air assist injector solenoid valve and engine ground. Connector & terminal (E42) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between air assist injector solenoid valve and main relay connector • Poor contact in coupling connector (B22)
3 CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and air assist injector solenoid valve connector. Connector & terminal (B134) No. 24 — (E42) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and air assist injector solenoid valve connector • Poor contact in coupling connector (B22)
4 CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 24 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and air assist injector solenoid valve connector.	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM and air assist injector solenoid valve connectors.	Is there poor contact in ECM and air assist injector solenoid valve connectors?	Repair poor contact in ECM and air assist injector solenoid valve connectors.	Replace air assist injector solenoid valve. <Ref. to FU(SOHC)-38, Air Assist Injector Solenoid Valve.>

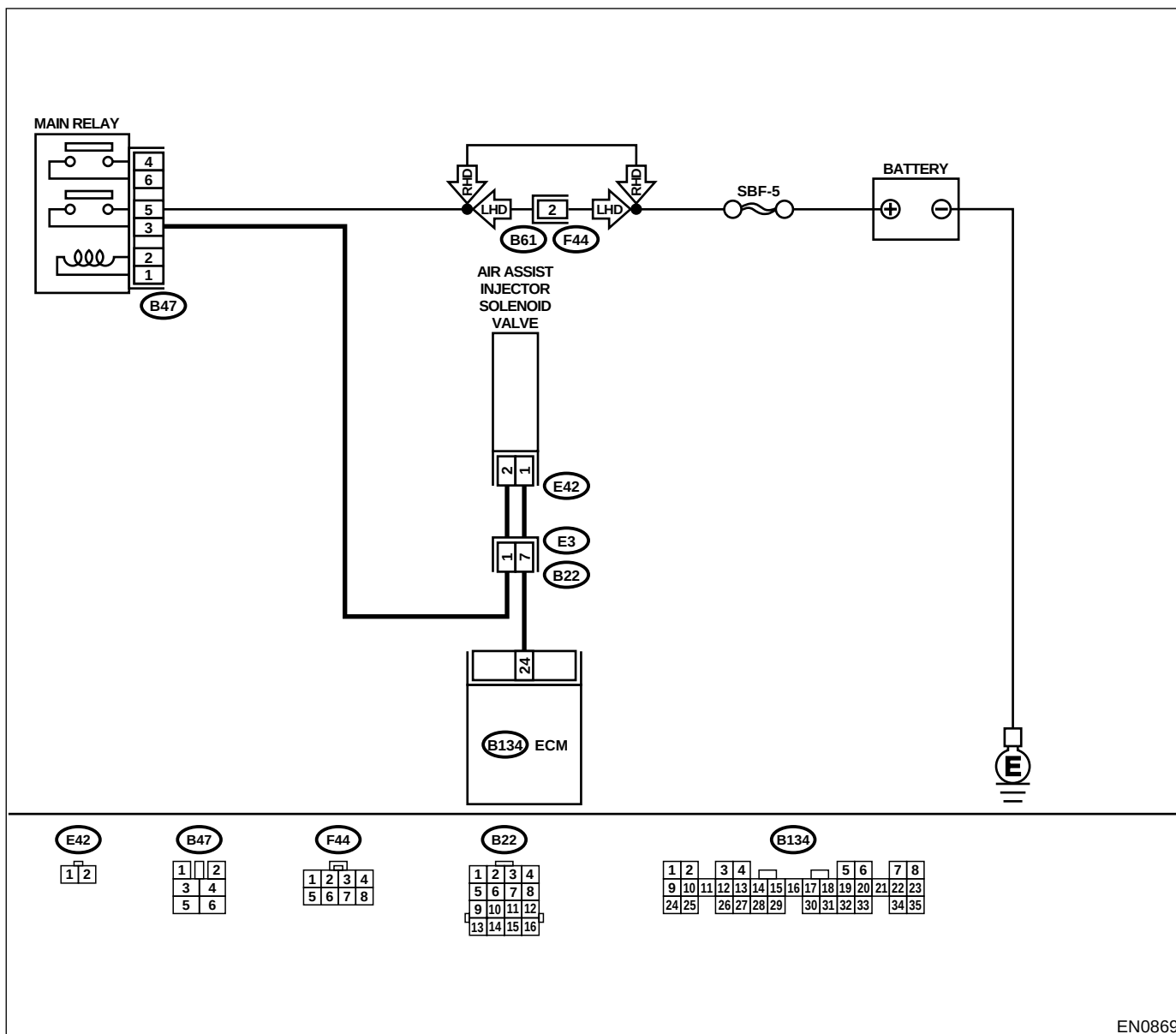
F: DTC P0067 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0869

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 3.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from air assist injector solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Replace air assist injector solenoid valve <Ref. to FU(SOHC)-38, Air Assist Injector Solenoid Valve.> and ECM <Ref. to FU(SOHC)-48, Engine Control Module.>
3 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 24 (+) — Chassis ground (-):	Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

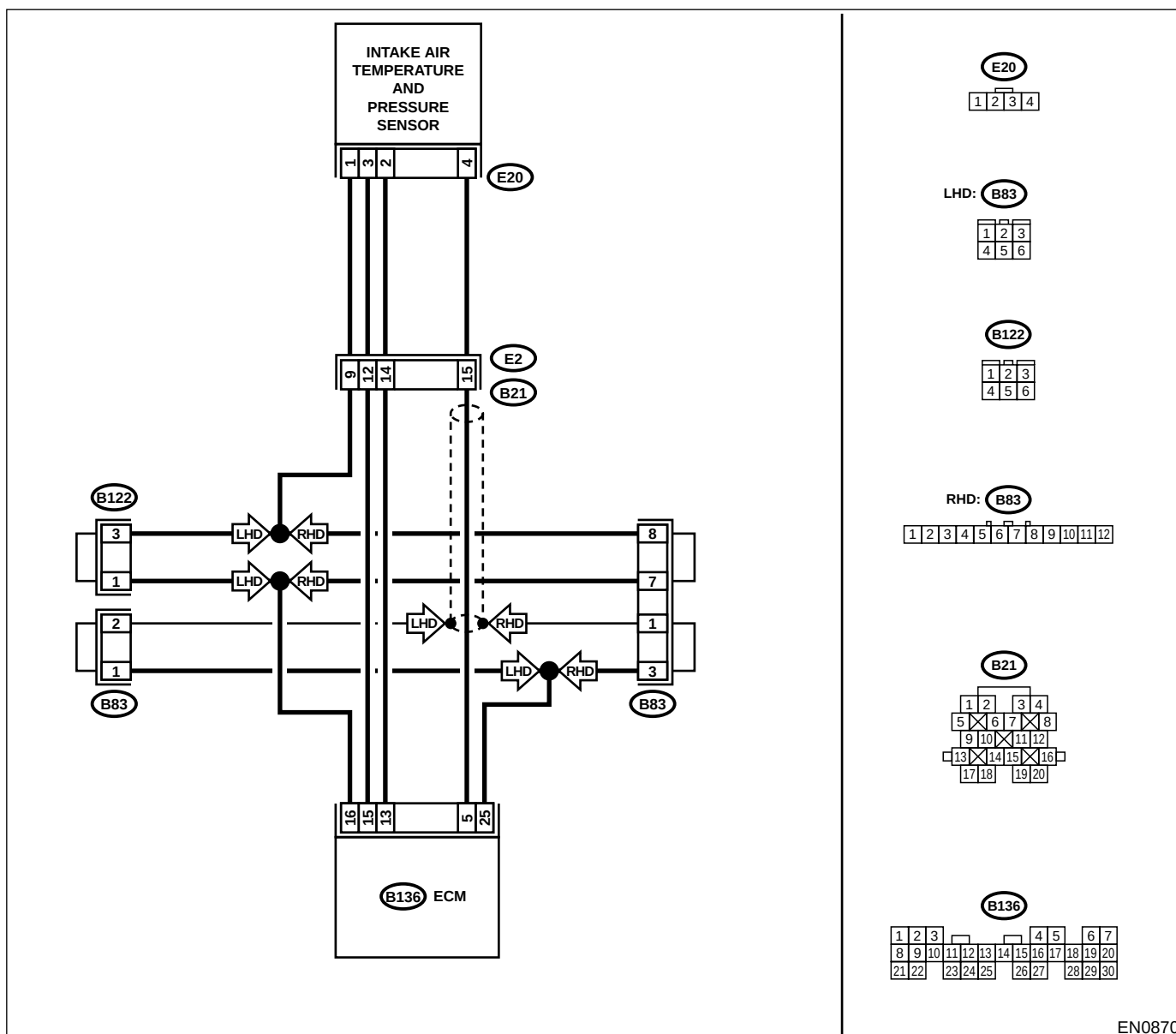
G: DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. NOTE: In this case, it is not necessary to inspect DTC P0106.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0107, P0108 or P1112?	Inspect DTC P0107, P0108 or P1112 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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?	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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification: •Intake manifold absolute pressure <i>Ignition ON</i> 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) <i>Idling</i> 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)	Is the value within the specifications?	Go to step 4.	Replace intake air temperature sensor and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>
4 CHECK THROTTLE POSITION. Read data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is throttle positioning ratio equal to or less than 5% when throttle is fully closed?	Go to step 5.	Adjust or replace throttle position sensor. <Ref. to FU(SOHC)-32, Throttle Position Sensor.>
5 CHECK THROTTLE POSITION.	Is throttle positioning ratio equal to or more than 85% when throttle is fully open?	Replace intake air temperature and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>	Replace throttle position sensor. <Ref. to FU(SOHC)-32, Throttle Position Sensor.>

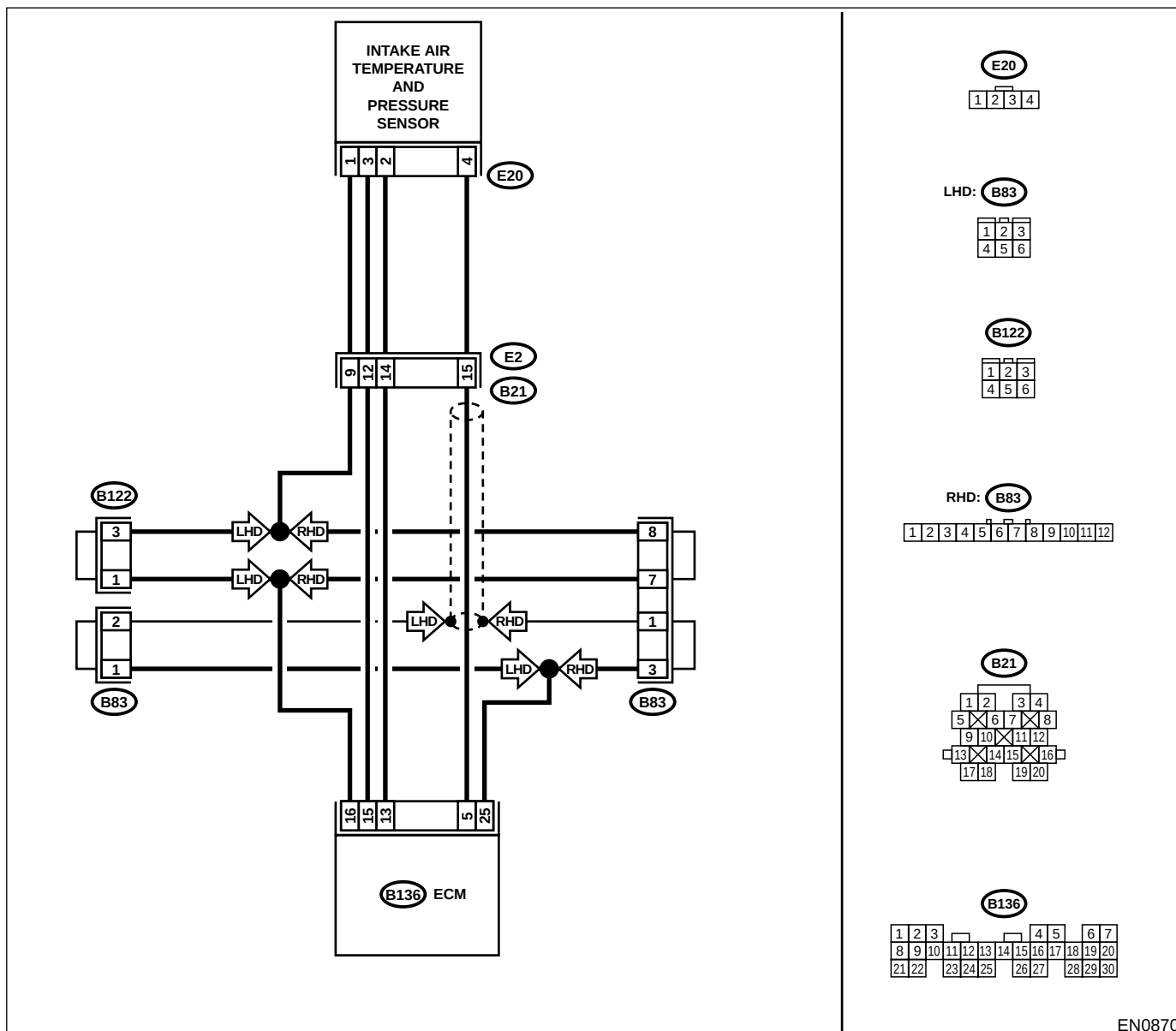
H: DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0870

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact in ECM and pressure sensor connector.	Is there poor contact in ECM or pressure sensor connector?	Repair poor contact in ECM or pressure sensor connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 5.	Go to step 4.
4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with your 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 (B136) No. 5 (+) — Chassis ground (-):	Is the voltage less than 0.2 V?	Go to step 7.	Go to step 6.
6 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.>	Does the value change more than 13.3 kPa (100 mmHg, 3.94 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 7.
7 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from intake air temperature and 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 (E20) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 8.	Repair open circuit in harness between ECM and intake air temperature and pressure sensor connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake air temperature and pressure sensor connector. Connector & terminal (B136) No. 16 — (E21) No. 1:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair open circuit in harness between ECM and intake air temperature and pressure sensor connector.
9 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. Measure resistance of harness between intake air temperature and pressure sensor connector and engine ground. Connector & terminal (E20) No. 4 — Engine ground:	Is the resistance more than 500 k Ω ?	Go to step 10.	Repair ground short circuit in harness between ECM and intake air temperature and pressure sensor connector.
10 CHECK POOR CONTACT. Check poor contact in intake manifold pressure sensor connector.	Is there poor contact in intake manifold pressure sensor connector?	Repair poor contact in intake air temperature and pressure sensor connector.	Replace intake air temperature and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>

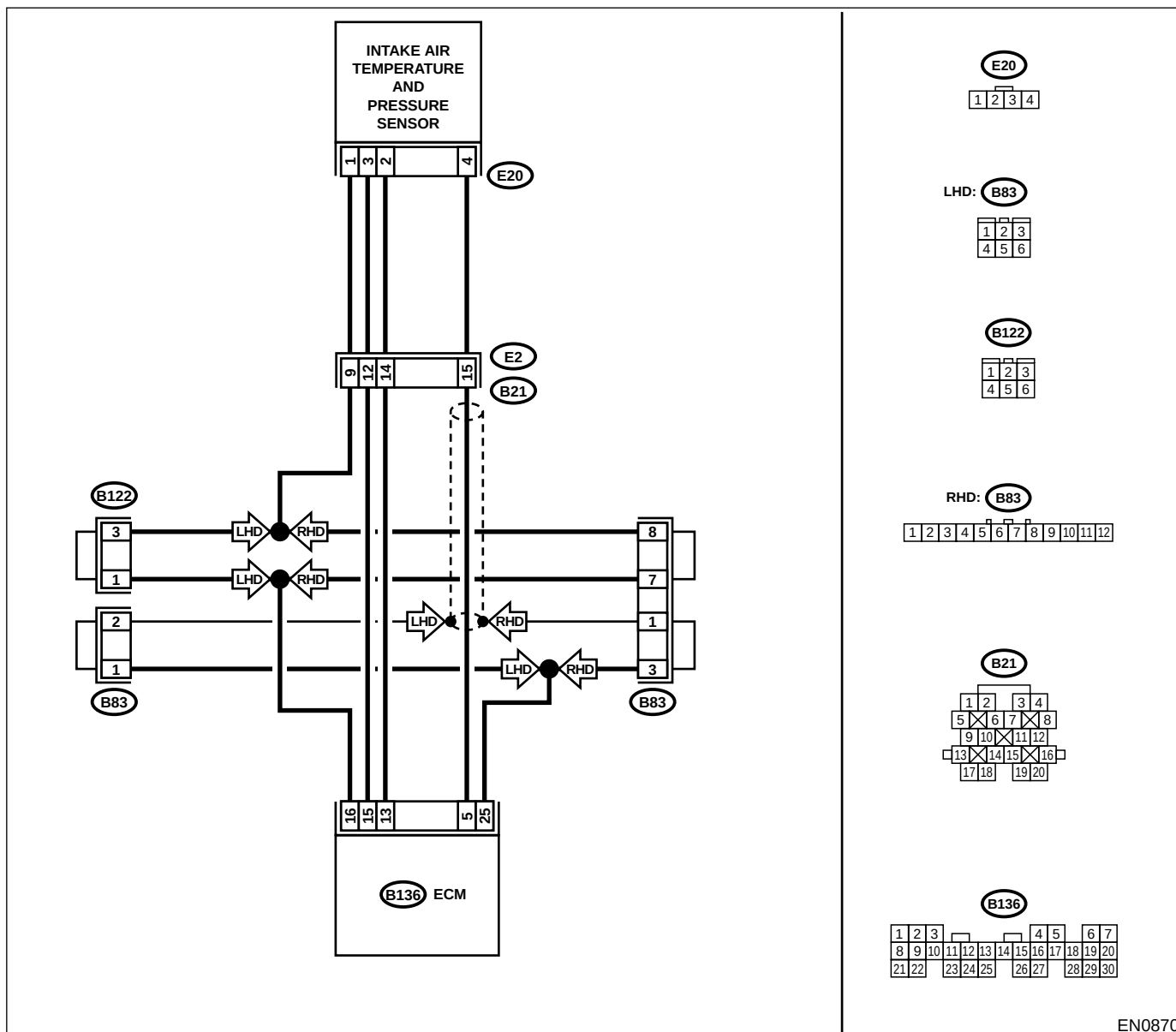
I: DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, Operation.> .

- WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Go to step 10.	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 5 (+) — Chassis ground (-):	Is the voltage less than 0.2 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.>	Does the value change more than 13.3 kPa (100 mmHg, 3.94 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from intake air temperature and pressure sensor. 3)Turn ignition switch to ON. 4)Measure voltage between intake air temperature and pressure sensor connector and engine ground. Connector & terminal (E20) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair open circuit in harness between ECM and intake air temperature and pressure sensor connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake air temperature and pressure sensor connector. Connector & terminal (B136) No. 5 — (E20) No. 4:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair open circuit in harness between ECM and intake air temperature and pressure sensor connector.
8 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. Measure resistance of harness between ECM and intake air temperature and pressure sensor connector. Connector & terminal (B136) No. 16 — (E20) No. 1:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair open circuit in harness between ECM and intake air temperature and pressure sensor connector.
9 CHECK POOR CONTACT. Check poor contact in intake air temperature and pressure sensor connector.	Is there poor contact in intake manifold pressure sensor connector?	Repair poor contact in intake air temperature and pressure sensor connector.	Replace intake air temperature and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>
10 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect connector from intake air temperature and 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Repair battery short circuit in harness between ECM and intake air temperature and pressure sensor connector.	Replace intake air temperature and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>

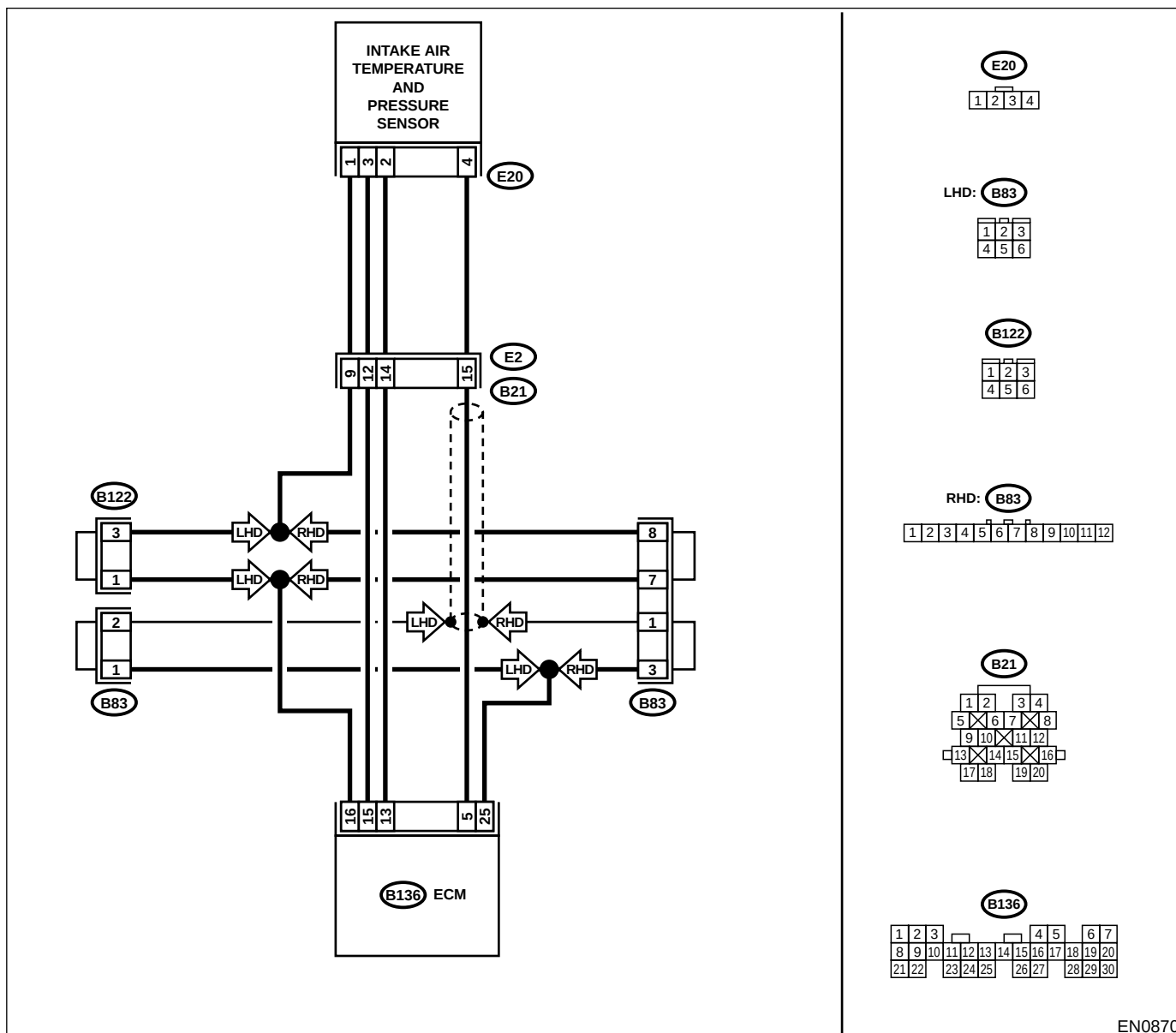
J: DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0112, P0113, P0117, P0118 or P0125?	Inspect DTC P0112, P0113, P0117, P0118 or P0125 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step 2.
2 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature between 75°C (167°F) and 95°C (203°F)?	Replace intake air temperature and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>	Inspect DTC P0125 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, List of Diagnostic Trouble Code (DTC).>

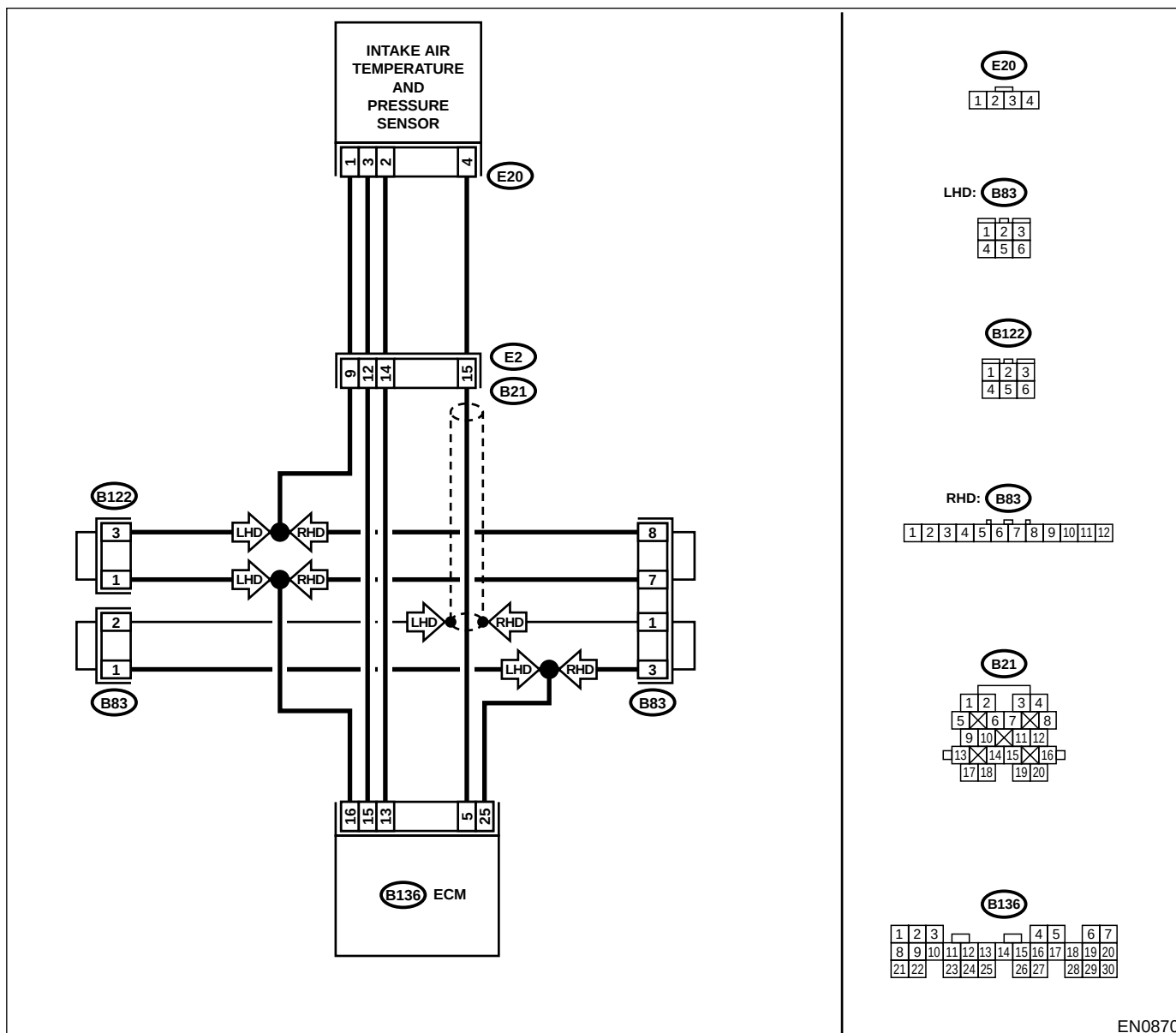
K: DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 120°C (248°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature and pressure sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83), (B122)
2 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from intake air temperature and pressure sensor. 3)Turn ignition switch to ON. 4)Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than -40°C (-40°F)?	Replace intake air temperature and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>	Repair ground short circuit in harness between intake air temperature sensor and ECM connector.

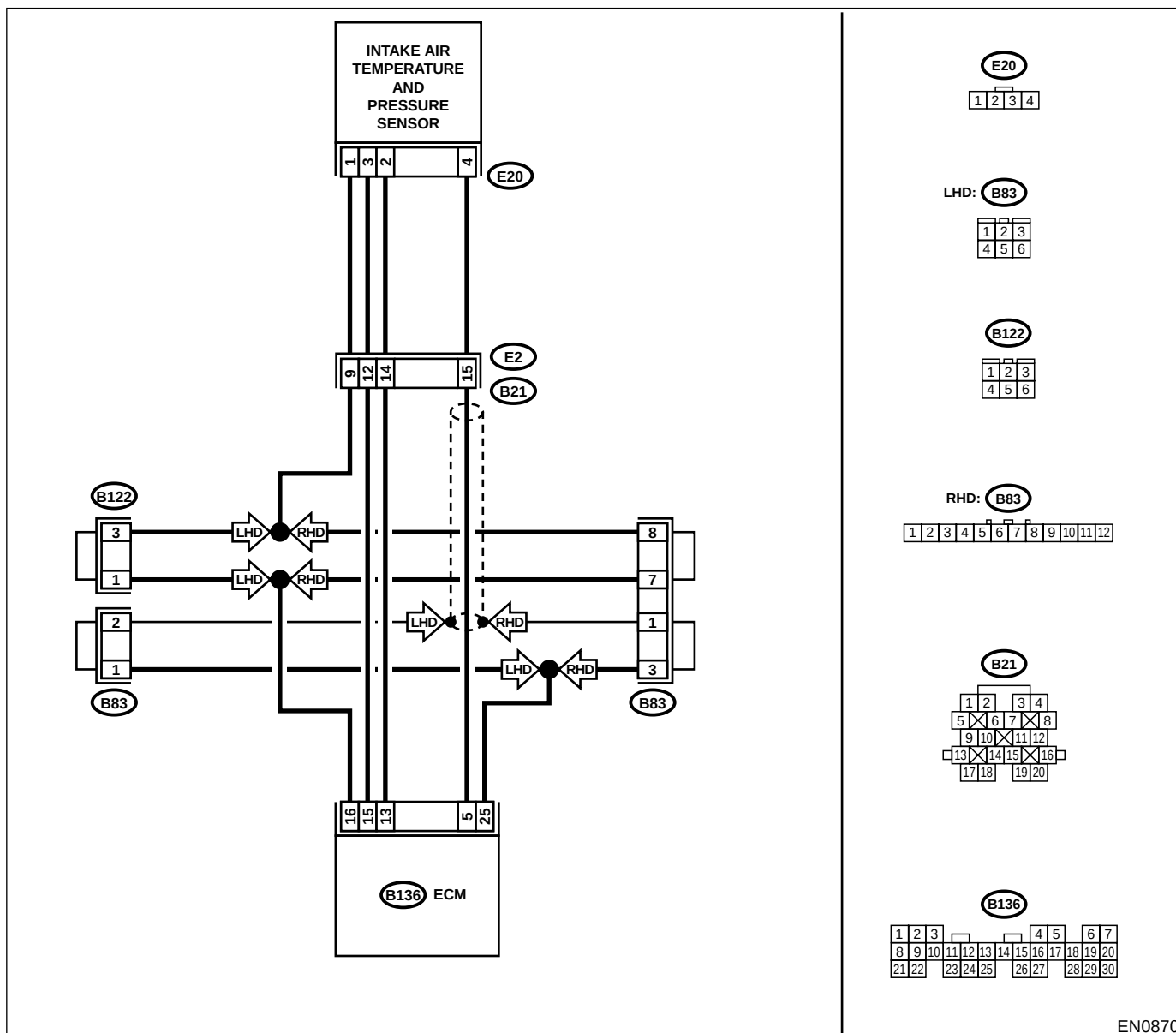
L: DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than -40°C (-40°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature and pressure sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83), (B122)
2 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from intake air temperature and pressure sensor. 3)Measure voltage between intake air temperature and pressure sensor connector and engine ground. Connector & terminal (E20) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature and pressure sensor and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to ON. 2)Measure voltage between intake air temperature and pressure sensor connector and engine ground. Connector & terminal (E20) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature and pressure sensor and ECM connector.	Go to step 4.
4 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. Measure voltage between intake air temperature and pressure sensor connector and engine ground. Connector & terminal (E20) No. 2 (+) — Engine ground (-):	Is the voltage more than 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 and pressure sensor and ECM connector • Poor contact in intake air temperature and pressure sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) and (B122)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between intake air temperature and pressure sensor connector and engine ground. Connector & terminal (E20) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Replace intake air temperature and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature and pressure sensor and ECM connector • Poor contact in intake air temperature and pressure sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) and (B122)

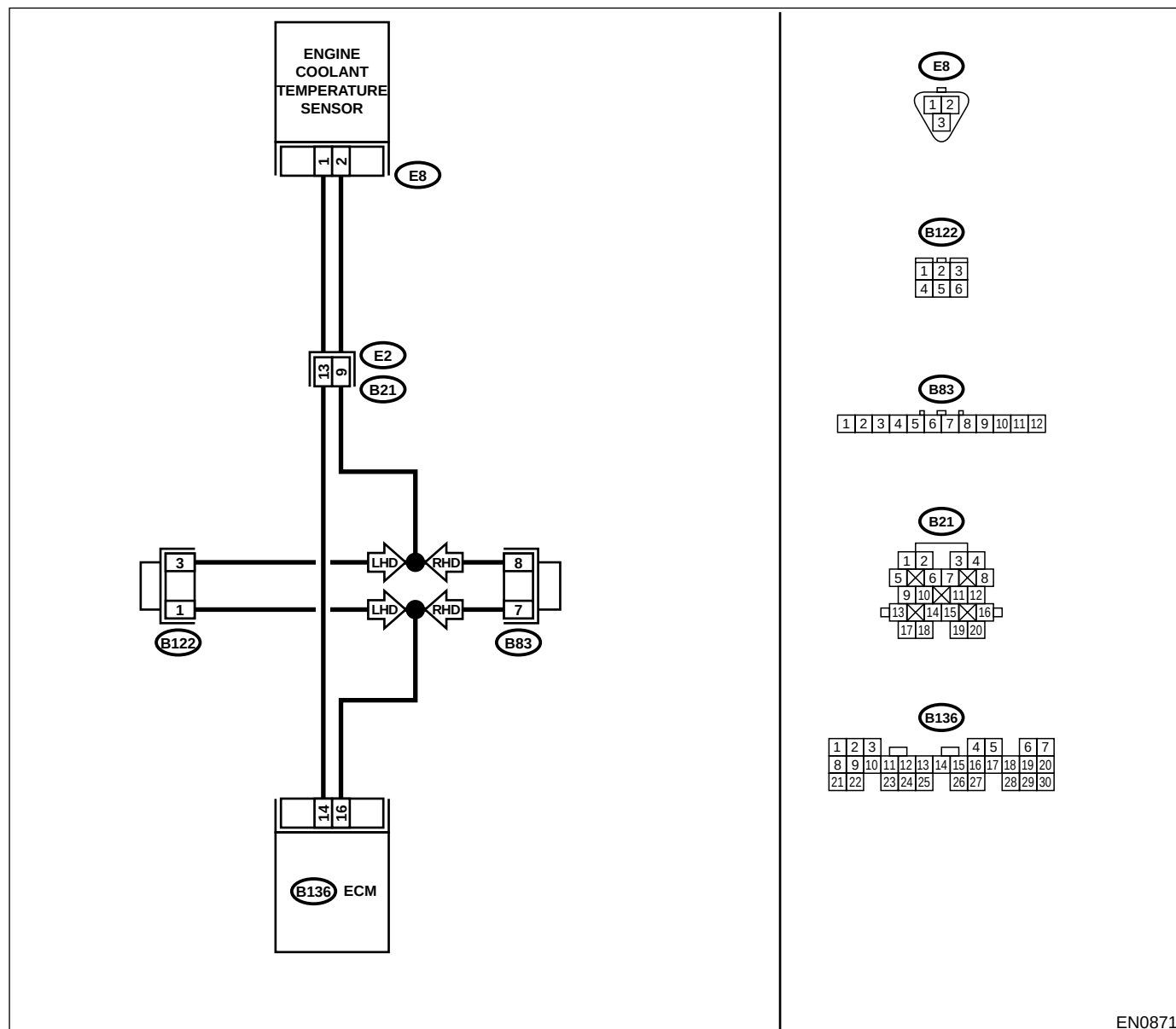
M: DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, Operation.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 150°C (302°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) or (B122)
2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from engine coolant temperature sensor. 3)Turn ignition switch to ON. 4)Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than -40°C (-40°F)?	Replace engine coolant temperature sensor. <Ref. to FU(SOHC)-28, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

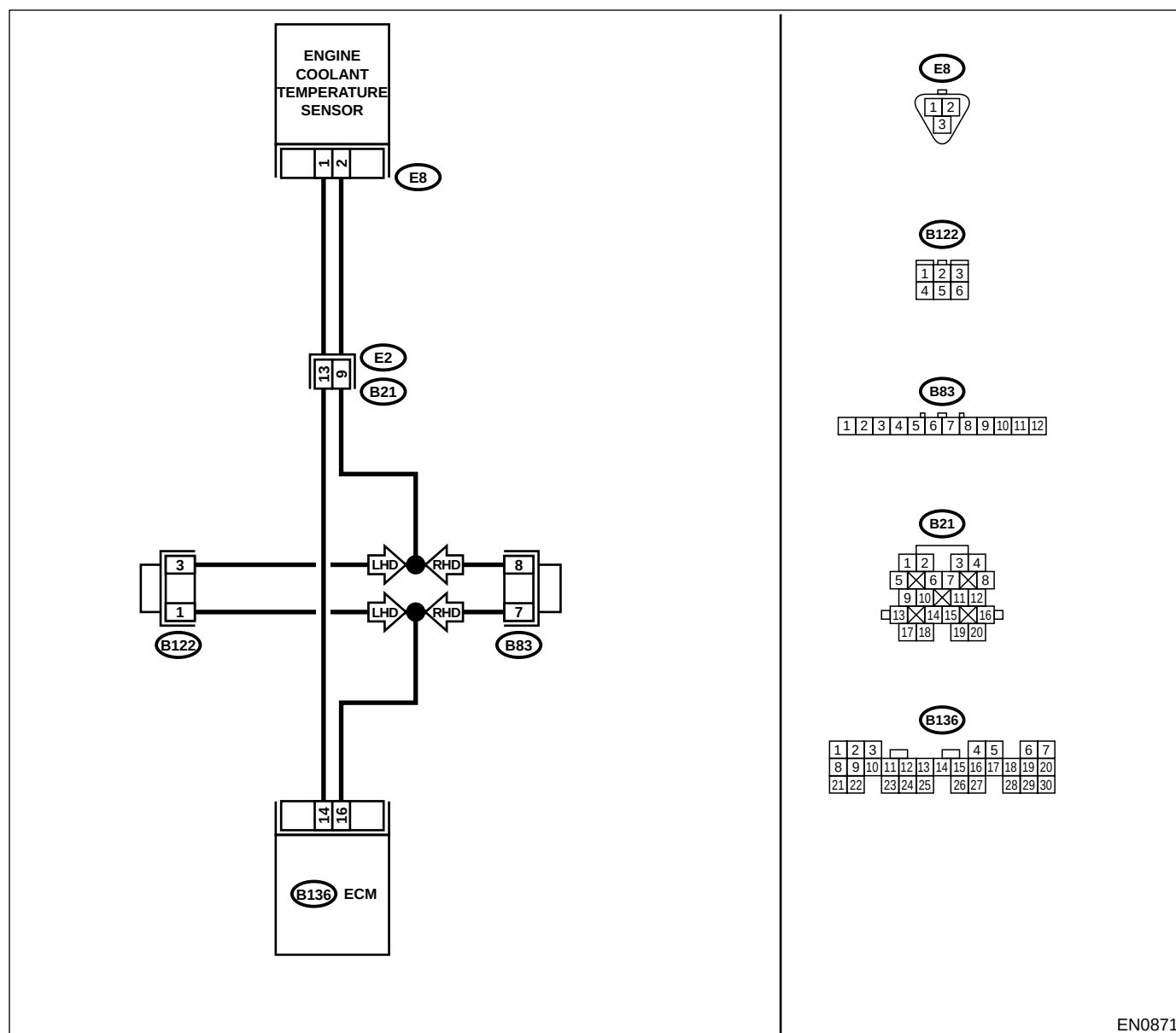
N: DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than -40°C (-40°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) or (B122)
2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from engine coolant temperature sensor. 3)Measure voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to ON. 2)Measure voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 4.
4 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. Measure voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 1 (+) — Engine ground (-):	Is the voltage more than 4 V?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • 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 joint connector (B83) or (B122)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Replace engine coolant temperature sensor. <Ref. to FU(SOHC)-28, Engine Coolant Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • 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 joint connector (B83)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

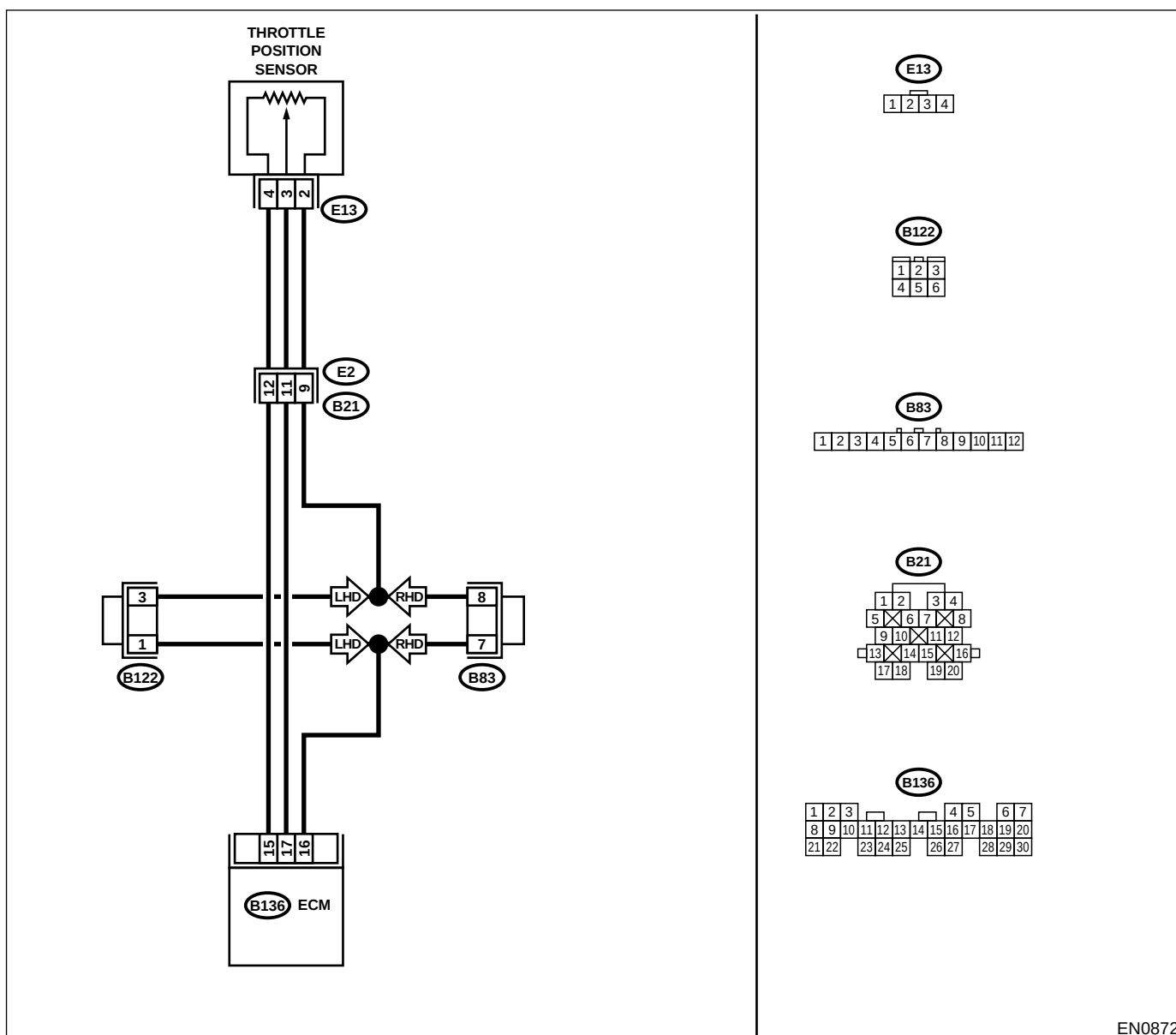
O: DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0872

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0122 or P0123?	Inspect DTC P0122 or P0123 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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(SOHC)-32, Throttle Position Sensor.>

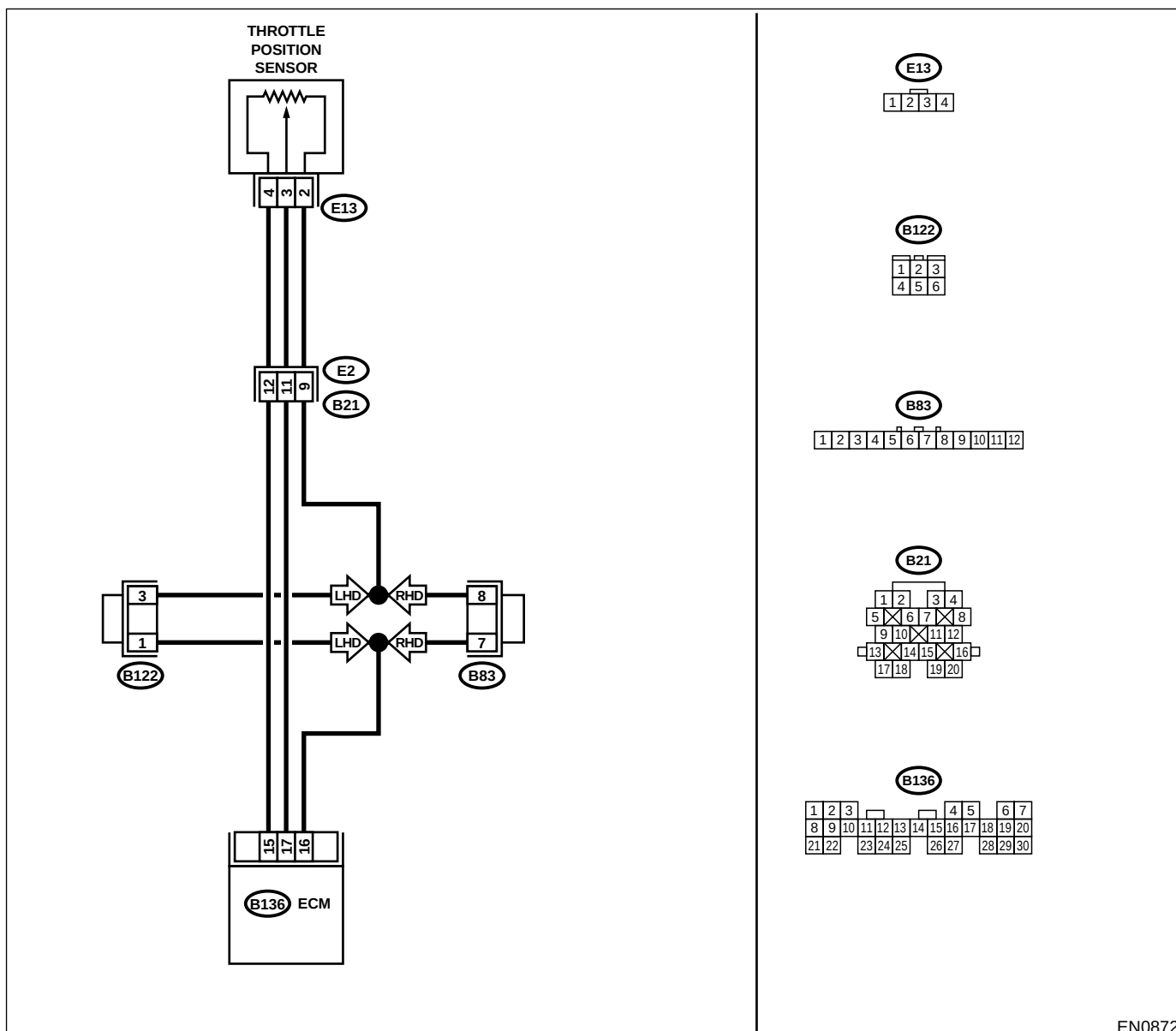
P: DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0872

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 0.1 V?	Go to step 2.	Even if MIL 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 (B21)
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground while throttle valve is fully closed. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage less than 0.1 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Measure voltage between ECM connector and chassis ground.	Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. 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. Connector & terminal (E13) No. 4 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • 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 (B21) • Poor contact in joint connector (B83) or (B122)
7 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and throttle position sensor connector. Connector & terminal (B136) No. 17 — (E13) No. 3:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • 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 (B21)
8 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. Measure resistance of harness between throttle position sensor connector and engine ground. Connector & terminal (E13) No. 3 — Engine ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in harness between throttle position sensor and ECM connector.	Go to step 9.
9 CHECK POOR CONTACT. Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor. <Ref. to FU(SOHC)-32, Throttle Position Sensor.>

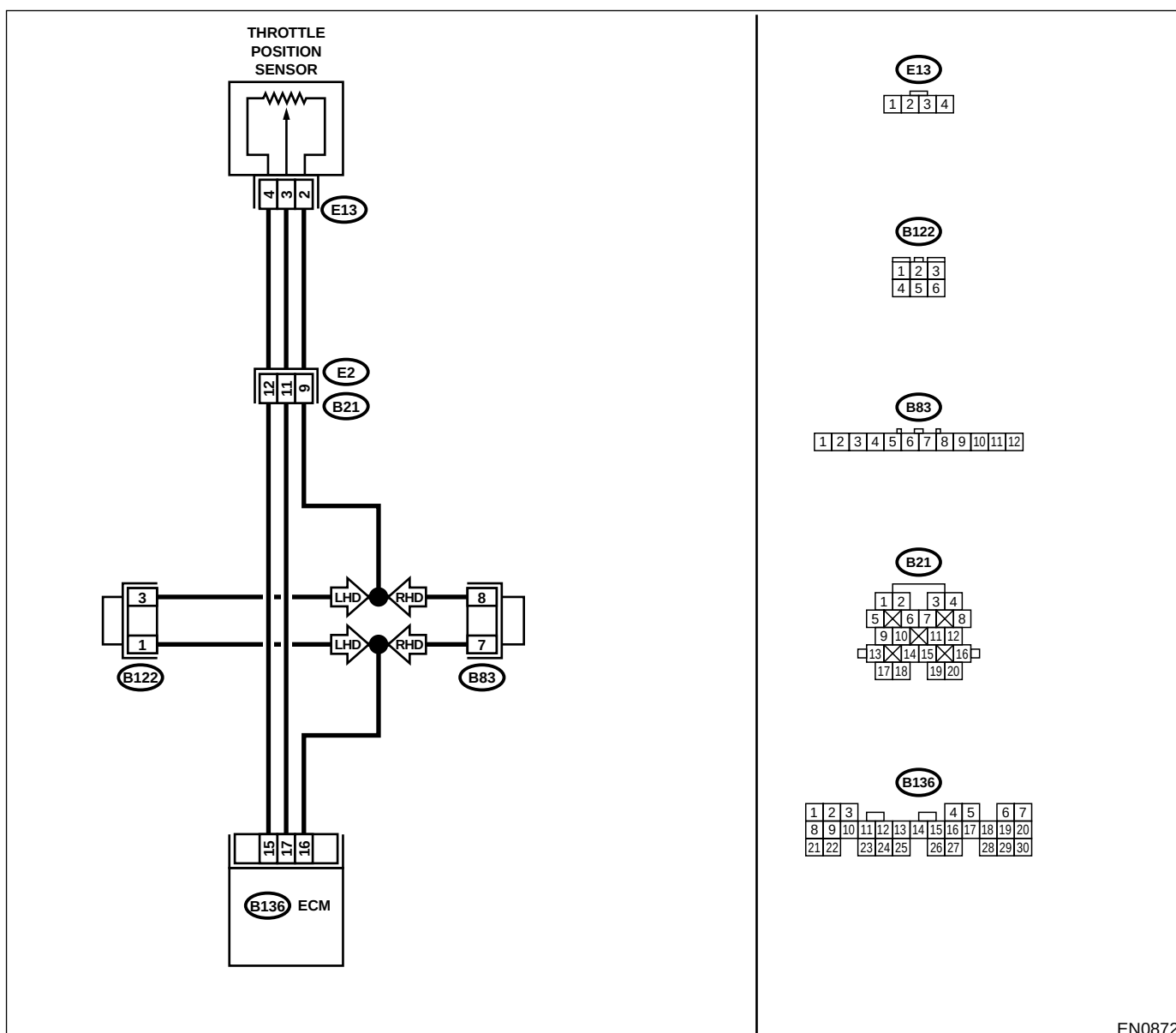
Q: DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 4.9 V?	Go to step 2.	Even if MIL 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 (B21)
2 CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from throttle position sensor. 3)Measure resistance of harness between throttle position sensor connector and engine ground. Connector & terminal (E13) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83)
3 CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to ON. 2)Measure voltage between throttle position sensor connector and engine ground. Connector & terminal (E13) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Replace throttle position sensor. <Ref. to FU(SOHC)-32, Throttle Position Sensor.>

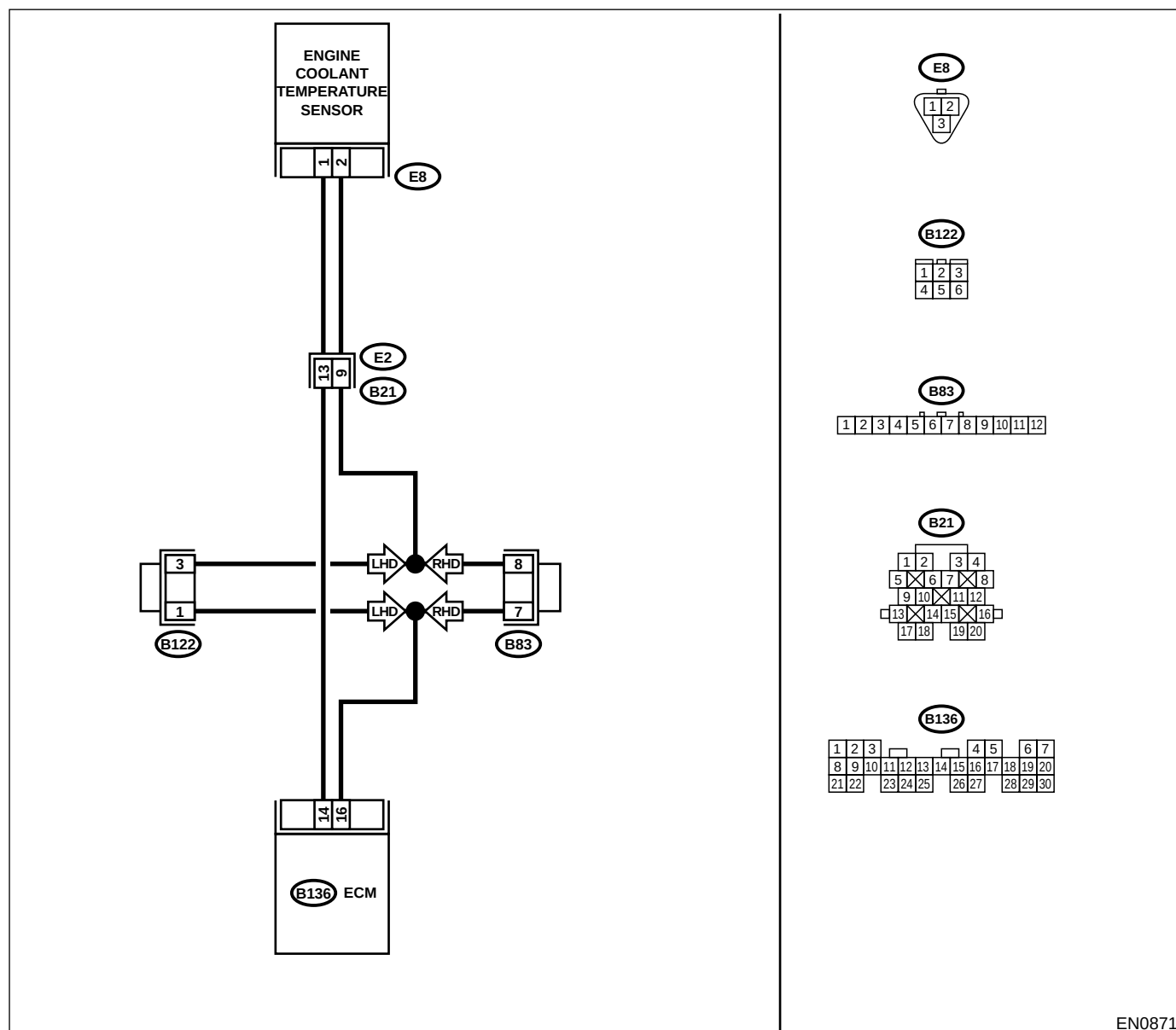
R: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0871

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0117 or P0118?	Inspect DTC P0117 or P0118 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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?	Replace thermostat. <Ref. to CO-35, Thermostat.>	Replace engine coolant temperature sensor. <Ref. to FU(SOHC)-28, Engine Coolant Temperature Sensor.>

ENGINE (DIAGNOSTICS)

MANCE PROBLEM (LEAN) —

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131, P0132, P0031 or P0032?	Inspect DTC P0131, P0132, P0031 or P0032 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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 (160°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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 0.85 and equal to less than 1.15 in idling?	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. 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.	Is the value more than 1.1 for a moment?	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. 6 — (E24) No. 3: (B136) No. 7 — (E24) No. 4: (B136) No. 19 — (E24) No. 1: (B136) No. 20 — (E24) No. 6:	Is the resistance less than 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	Check	Yes	No
5 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. Measure resistance between ECM and chassis ground. Connector & terminals (B136) No. 6 — Chassis ground: (B136) No. 7 — Chassis ground: (B136) No. 19 — Chassis ground: (B136) No. 20 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 6.	Repair ground short circuit between ECM and front oxygen (A/F) sensor.
6 CHECK EXHAUST SYSTEM. Check exhaust system parts. 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	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(SOHC)-44, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

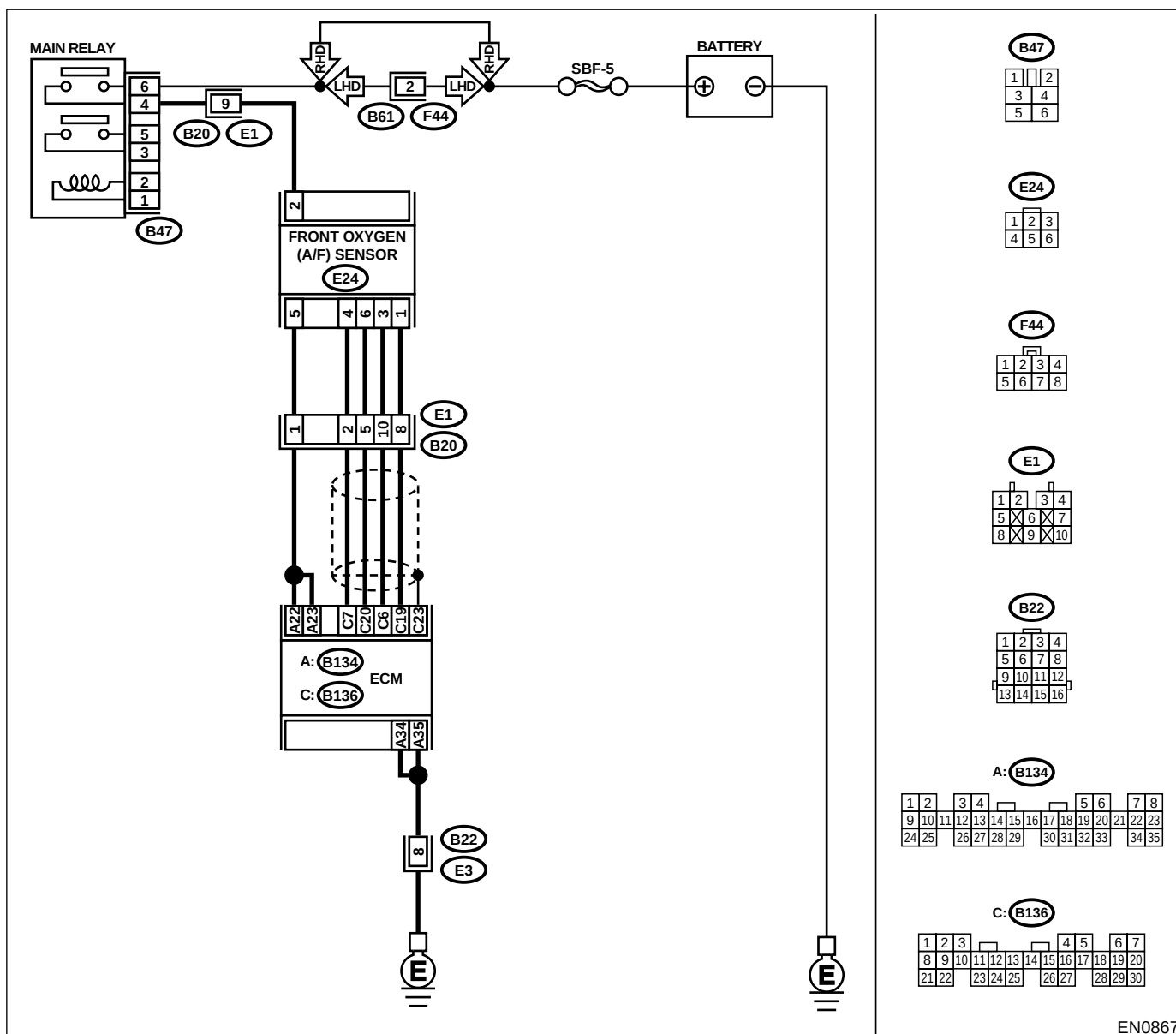
T: DTC P0131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0867

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 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. Connector & terminal (B136) No. 6 — (E24) No. 3: (B136) No. 7 — (E24) No. 4: (B136) No. 19 — (E24) No. 1: (B136) No. 20 — (E24) No. 6:	Is the resistance less than 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
2 CHECK POOR CONTACT. Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(SOHC)-44, Front Oxygen (A/F) Sensor.>

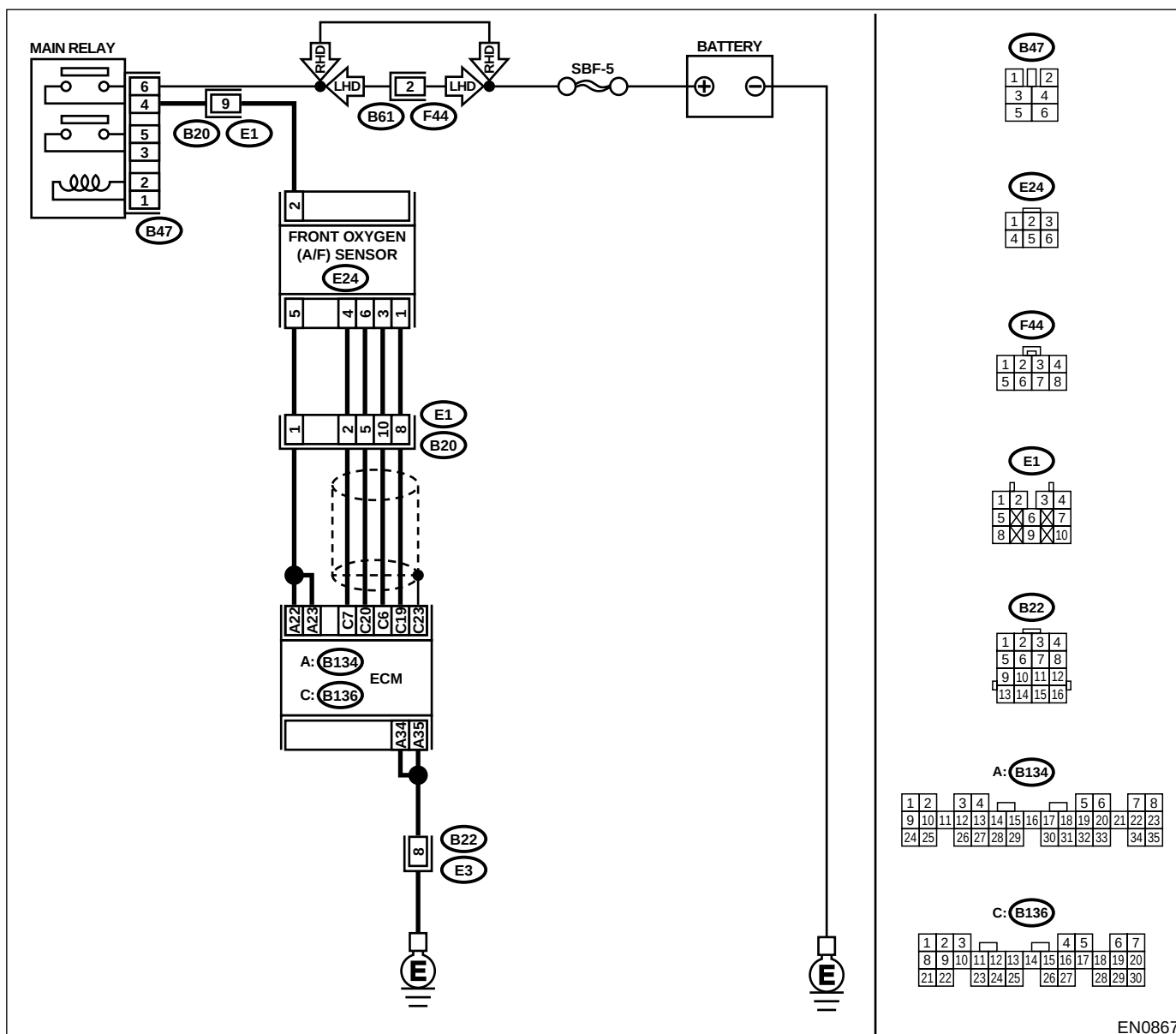
U: DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0867

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 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. 6 — Chassis ground: (B136) No. 7 — Chassis ground: (B136) No. 19 — Chassis ground: (B136) No. 20 — Chassis ground:	Is the resistance more than 10 Ω ?	Replace front oxygen (A/F) sensor. <Ref. to FU(SOHC)-44, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

V: DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE

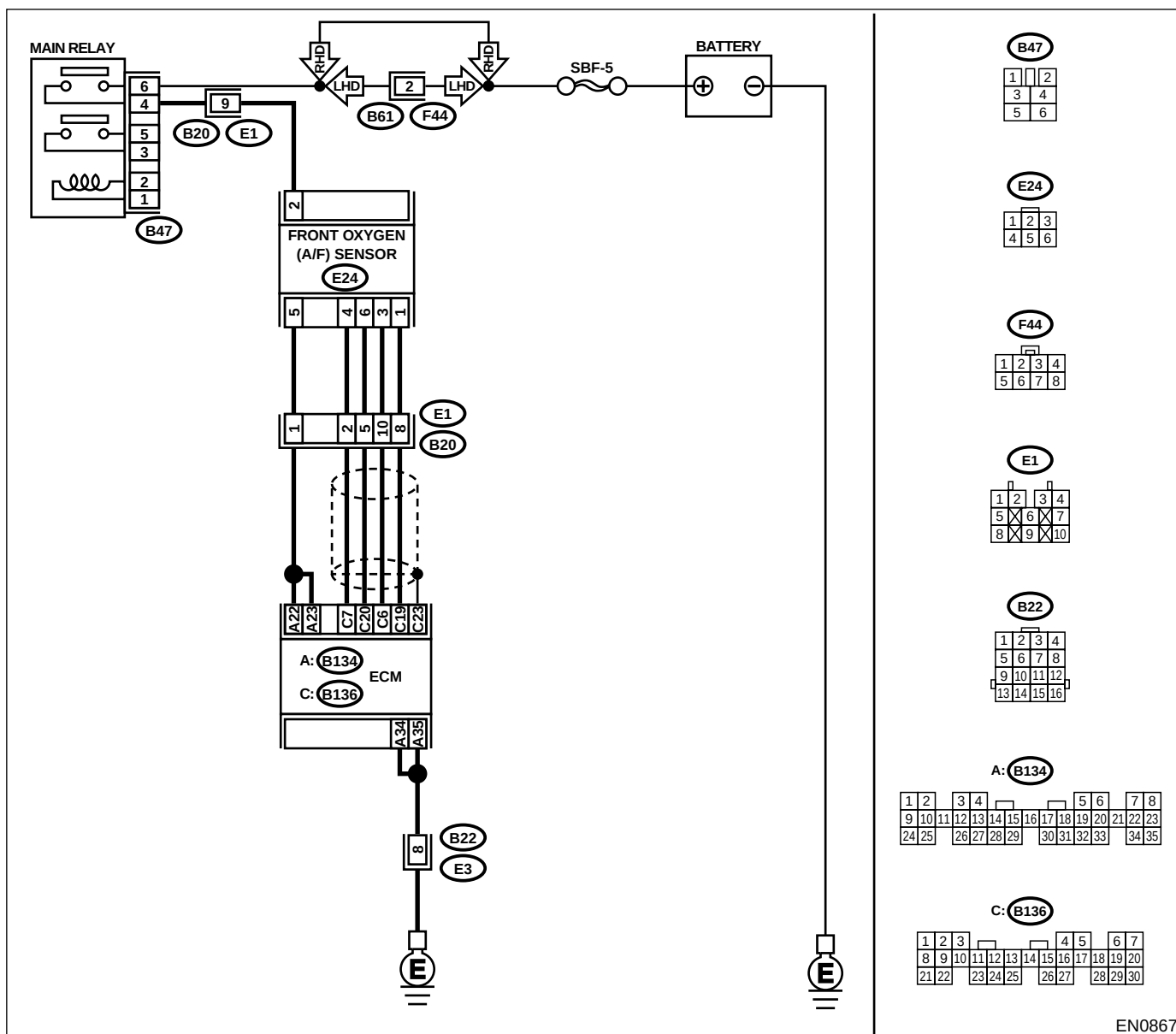
• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, Operation.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0867

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131, P0132, P0031 or P0032?	Inspect DTC P0131, P0132, P0031 or P0032 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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. •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	Is there a fault in exhaust system?	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(SOHC)-44, Front Oxygen (A/F) Sensor.>

W: DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —

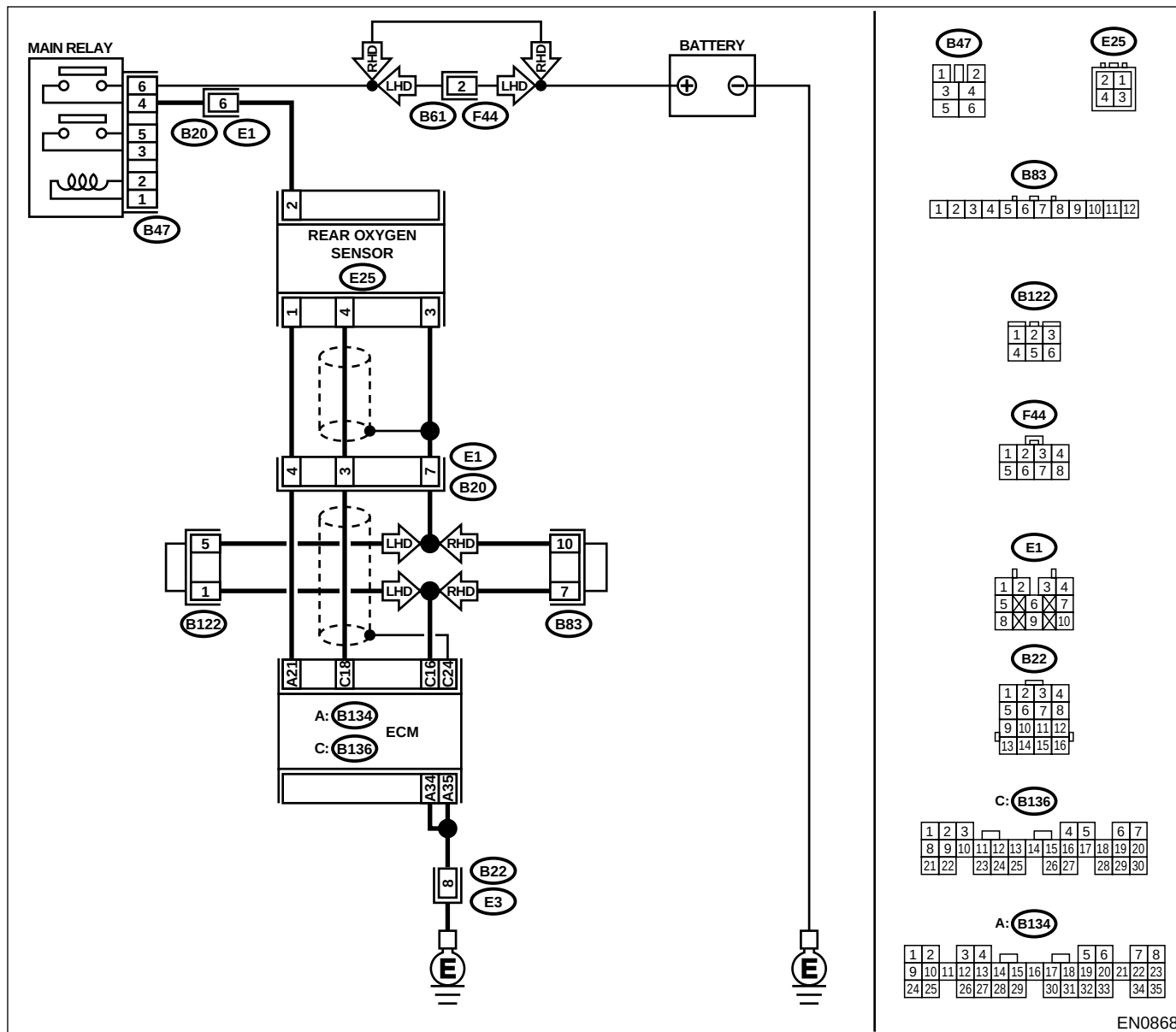
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0868

Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Go to step 2.	Go to step 3.
	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131 or P0132?		

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK FAILURE CAUSE OF P0131 or P0132. Inspect DTC P0131 or P0132 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, List of Diagnostic Trouble Code (DTC).>	Is the failure cause of P0131 or P0132 in the fuel system?	Check fuel system. NOTE: In this case, it is not necessary to inspect DTC P0136.	Go to step 3.
3 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. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step 7.	Go to step 4.
4 CHECK REAR OXYGEN SENSOR DATA. Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool.	Is the value fixed between 0.2 and 0.4 V?	Go to step 5.	Replace rear oxygen sensor. <Ref. to FU(SOHC)-44, Front Oxygen (A/F) Sensor.>
5 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 (B136) No. 16 — (E25) No. 3:	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 6.
6 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 (E25) No. 4 (+) — Engine ground (-):	Is the voltage more than 0.2 V?	Replace rear oxygen sensor. <Ref. to FU(SOHC)-44, Front Oxygen (A/F) 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
7 CHECK EXHAUST SYSTEM. Check exhaust system parts. 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	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace rear oxygen sensor. <Ref. to FU(SOHC)-44, Front Oxygen (A/F) Sensor.>

X: DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —

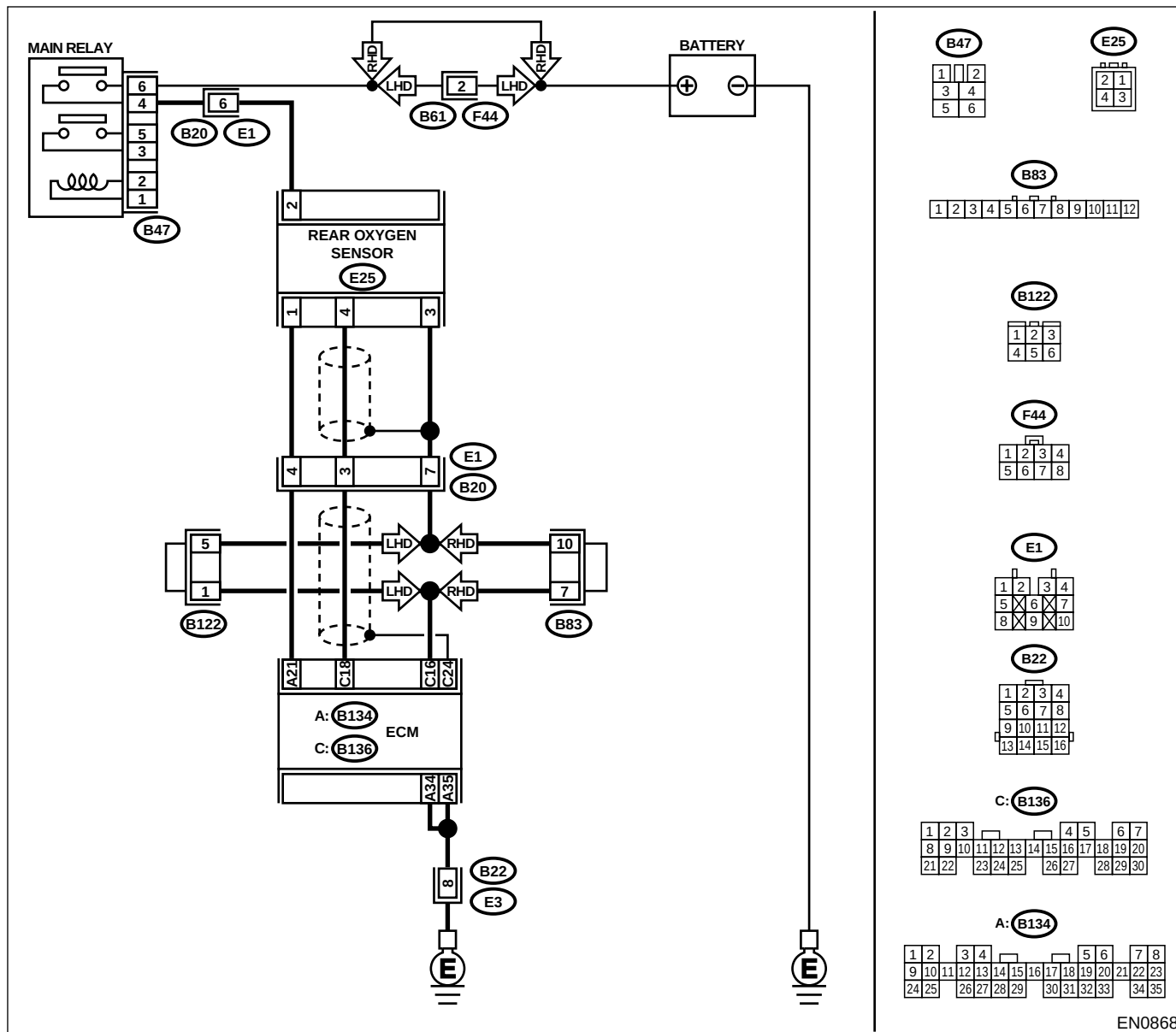
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0868

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0136?	Inspect DTC P0136 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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(SOHC)-44, Front Oxygen (A/F) Sensor.>

Y: DTC P0170 — FUEL TRIM MALFUNCTION —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step 3.
3 CHECK FUEL PRESSURE. Warning: •Place “NO FIRE” signs near the working area. •Be careful not to spill fuel on the floor. 1)Release 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. Warning: Before removing fuel pressure gauge, release fuel pressure. NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is fuel pressure between 284 and 314 kPa (2.9 — 3.2 kg/cm ² , 41 — 46 psi)?	Go to step 4.	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	Check	Yes	No
4 CHECK FUEL PRESSURE. After connecting pressure regulator vacuum hose, measure fuel pressure. Warning: Before removing fuel pressure gauge, release fuel pressure. 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.	Is fuel pressure between 206 and 235 kPa (2.1 — 2.4 kg/cm ² , 30 — 34 psi)?	Go to step 5.	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
5 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is temperature between 70°C (158°F) and 100°C (212°F)?	Go to step 6.	Replace engine coolant temperature sensor. <Ref. to FU(SOHC)-28, Engine Coolant Temperature Sensor.>
6 CHECK INTAKE MANIFOLD PRESSURE SENSOR SIGNAL. 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. Specification: 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)	Is the voltage within the specifications?	Contact with your 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(SOHC)-35, Intake Air Temperature and Pressure Sensor.>

Z: DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(SOHC)-156, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AA:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(SOHC)-156, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AB:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(SOHC)-156, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AC: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.)

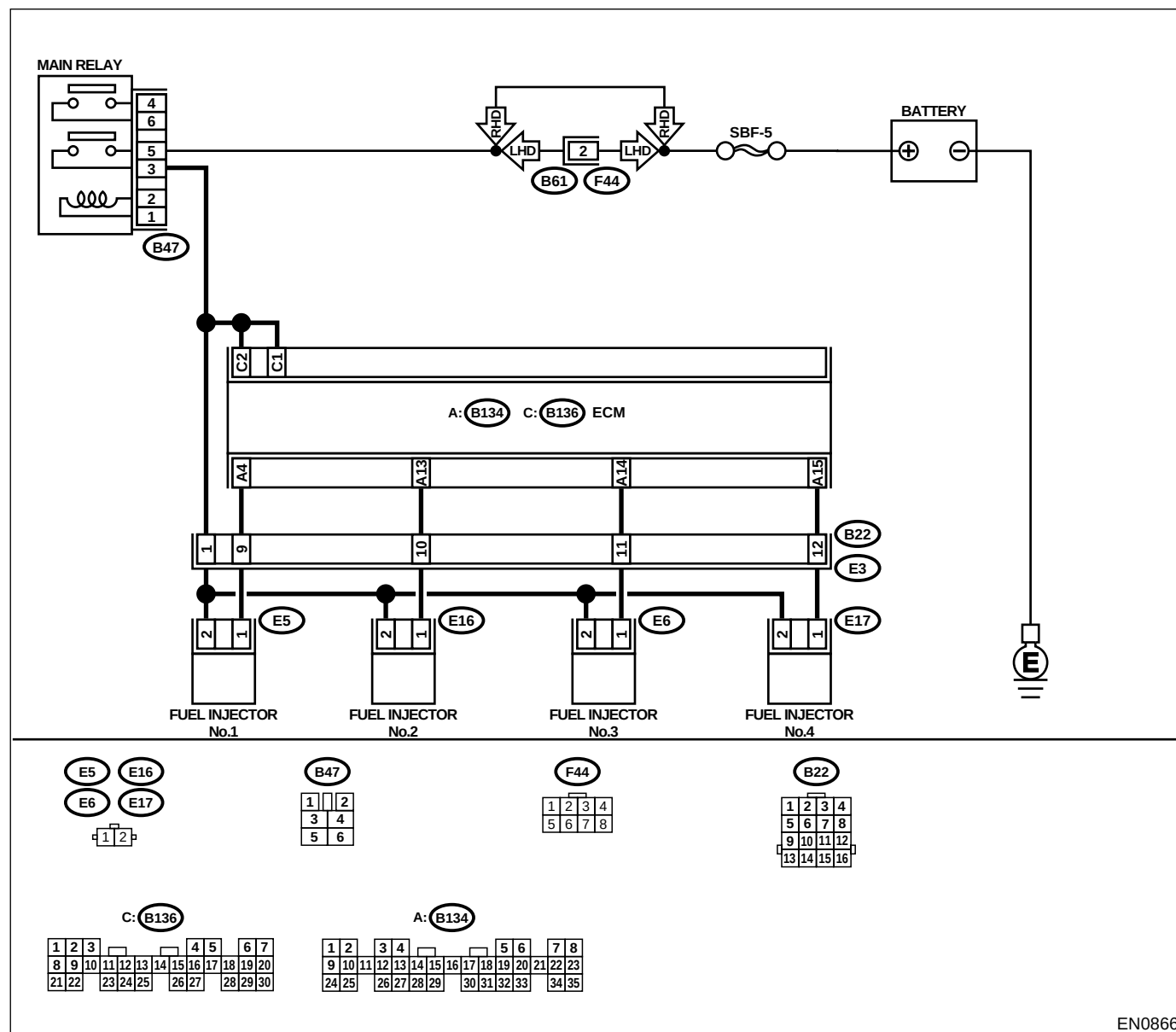
• TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0866

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P0117, P0118 or P0125?	Inspect DTC P0106, P0107, P0108, P0117, P0118 or P0125 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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. 4 (+) — Chassis ground (–): #2 (B134) No. 13 (+) — Chassis ground (–): #3 (B134) No. 14 (+) — Chassis ground (–): #4 (B134) No. 15 (+) — Chassis ground (–):	Is the voltage more than 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 resistance less than 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. 4 — (E5) No. 1: #2 (B134) No. 13 — (E16) No. 1: #3 (B134) No. 14 — (E6) No. 1: #4 (B134) No. 15 — (E17) No. 1:	Is the resistance less than 1 Ω?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B21)
5 CHECK FUEL INJECTOR. Measure resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance between 5 and 20 Ω?	Go to step 6.	Replace faulty fuel injector. <Ref. to FU(SOHC)-39, Fuel Injector.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: • 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. 4 (+) — Chassis ground (-): #2 (B134) No. 13 (+) — Chassis ground (-): #3 (B134) No. 14 (+) — Chassis ground (-): #4 (B134) No. 15 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace ECM. <Ref. to FU(SOHC)-48, 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 resistance less than 1 Ω ?	Replace faulty fuel injector <Ref. to FU(SOHC)-39, Fuel Injector.> and ECM <Ref. to FU(SOHC)-48, 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?	Tighten camshaft position sensor or crankshaft position sensor.	Go to step 10.
10 CHECK CRANKSHAFT SPROCKET. Remove timing belt cover.	Is crankshaft sprocket rusted or does it have broken teeth?	Replace crankshaft sprocket. <Ref. to ME(SOHC)-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. ST 499987500CRANKSHAFT SOCKET	Is timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(SOHC)-46, Timing Belt Assembly.>	Go to step 12.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK FUEL LEVEL.	Is the fuel meter indication 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 (MIL). 1)Clear memory using Subaru Select Monitor. <Ref. to EN(SOHC)-45, Clear Memory Mode.> 2)Start engine, and drive the vehicle more than 10 minutes.	Is the MIL coming 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?	Finish diagnostics operation, if the engine has no abnormality. NOTE: Ex. Remove spark plug cord, etc.	Repair poor contact. NOTE: In this case, repair the following: • 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
15 CHECK AIR INTAKE SYSTEM.	Is there a fault in air intake system?	Repair air intake system. NOTE: Check the following items: • 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). •Subaru Select Monitor <Ref. to EN(SOHC)-34, 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.	Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC?	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?	Go to step 22 .	Go to step 18 .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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?	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?	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?	Go to step 25 .	Go to step 26 .
21	ONLY ONE CYLINDER	Is there a fault in that cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0170. <Ref. to EN(SOHC)-152, DTC P0170 — FUEL TRIM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	GROUP OF #1 AND #2 CYLINDERS	Are there faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • 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(SOHC)-70, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0170. <Ref. to EN(SOHC)-152, DTC P0170 — FUEL TRIM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
23 GROUP OF #3 AND #4 CYLINDERS	Are there faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • 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(SOHC)-70, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0170. <Ref. to EN(SOHC)-152, DTC P0170 — FUEL TRIM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24 GROUP OF #1 AND #3 CYLINDERS	Are there faults in #1 and #3 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0170. <Ref. to EN(SOHC)-152, DTC P0170 — FUEL TRIM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25 GROUP OF #2 AND #4 CYLINDERS	Are there faults in #2 and #4 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth	Go to DTC P0170. <Ref. to EN(SOHC)-152, DTC P0170 — FUEL TRIM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26 CYLINDER AT RANDOM	Is the engine idle rough?	Go to DTC P0170. <Ref. to EN(SOHC)-152, DTC P0170 — FUEL TRIM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

ENGINE (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR 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 (B136) No. 4 — Chassis ground:	Is the resistance more than 700 kΩ?	Go to step 2.	Repair 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 (B21)
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 resistance more than 700 kΩ?	Go to step 3.	Repair 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 (B21)
3 CHECK CONDITION OF KNOCK SENSOR INSTALLATION.	Is the knock sensor installation bolt tightened securely?	Replace knock sensor. <Ref. to FU(SOHC)-31, Knock Sensor.>	Tighten knock sensor installation bolt securely.

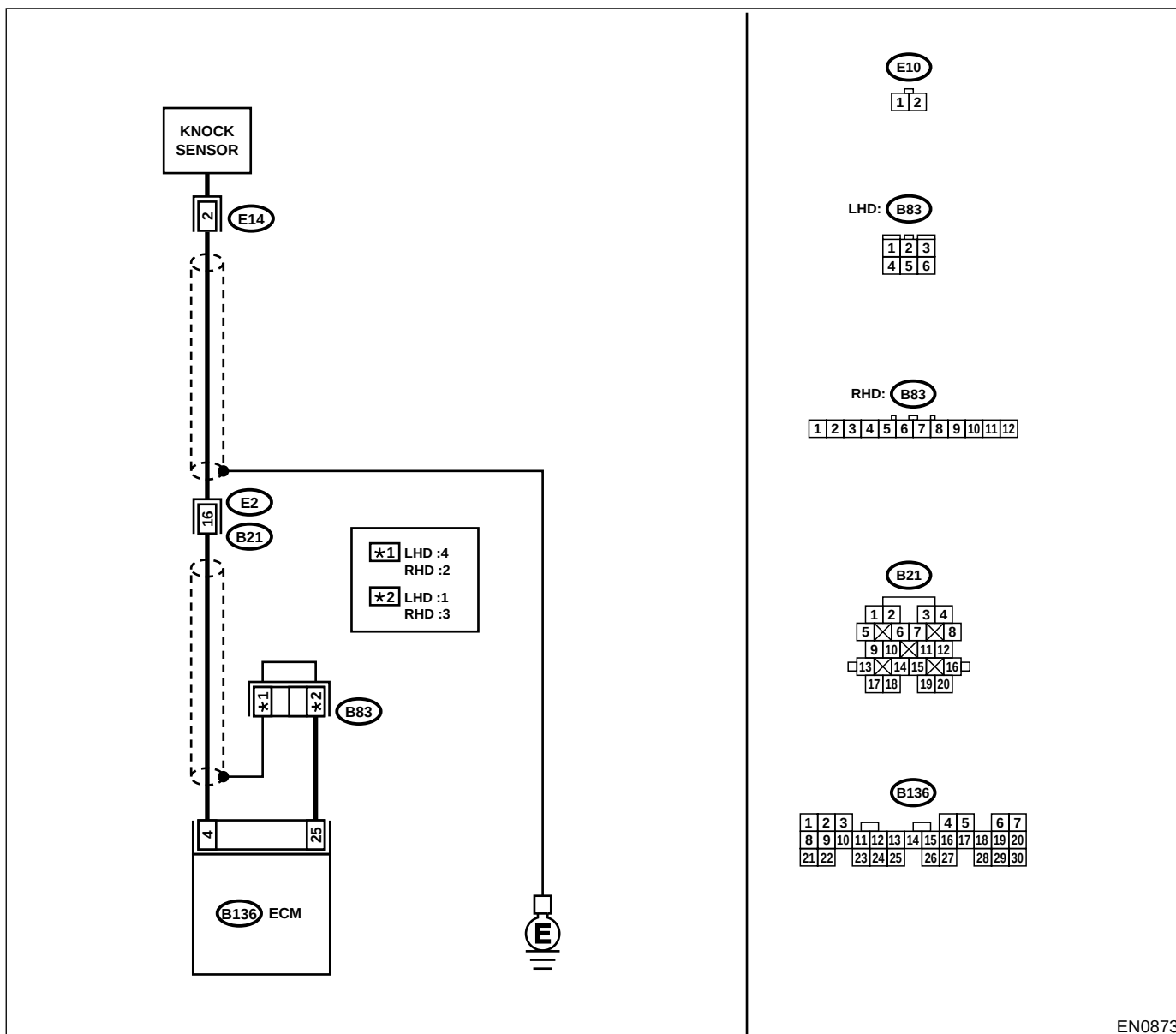
AE:DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0873

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 4 — Chassis ground:	Is the resistance less than 400 k Ω ?	Go to step 2.	Go to step 3.
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 resistance less than 400 k Ω ?	Replace knock sensor. <Ref. to FU(SOHC)-31, 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.
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 (B136) No. 4 (+) — Chassis ground (-):	Is the voltage more than 2 V?	Even if MIL 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 (B21)	Repair poor contact in ECM connector.

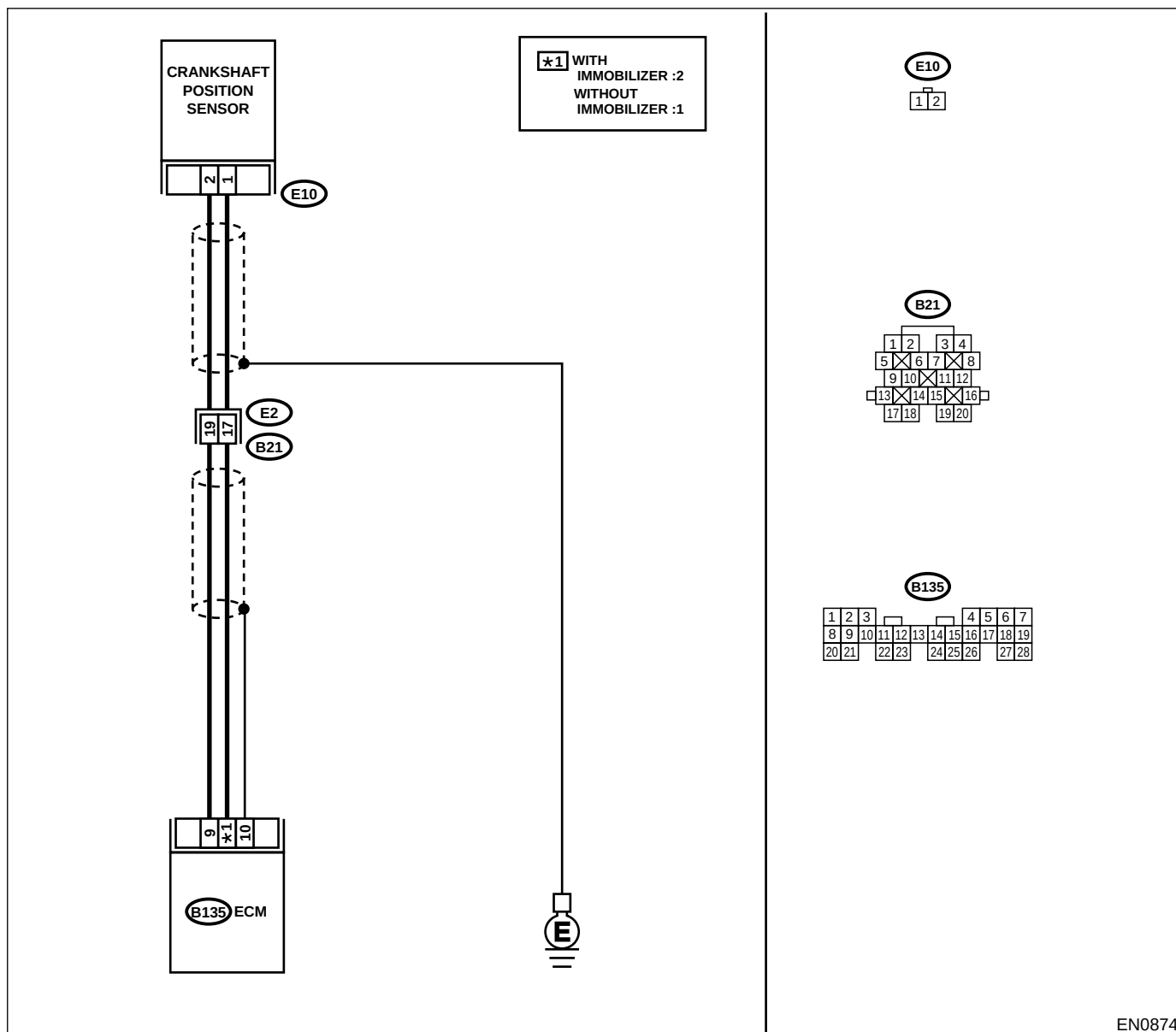
AF:DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0874

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. 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. Connector & terminal (E10) No. 1 — Engine ground:	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)	Go to step 2.
2 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure resistance of harness between crankshaft position sensor connector and engine ground. Connector & terminal (E10) No. 1 — Engine ground:	Is the resistance less than 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.
3 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure resistance of harness between crankshaft position sensor connector and engine ground. Connector & terminal (E10) No. 2 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)
4 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 5.	Tighten crankshaft position sensor installation bolt securely.
5 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 resistance between 1 and 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace crankshaft position sensor. <Ref. to FU(SOHC)-29, Crankshaft Position Sensor.>

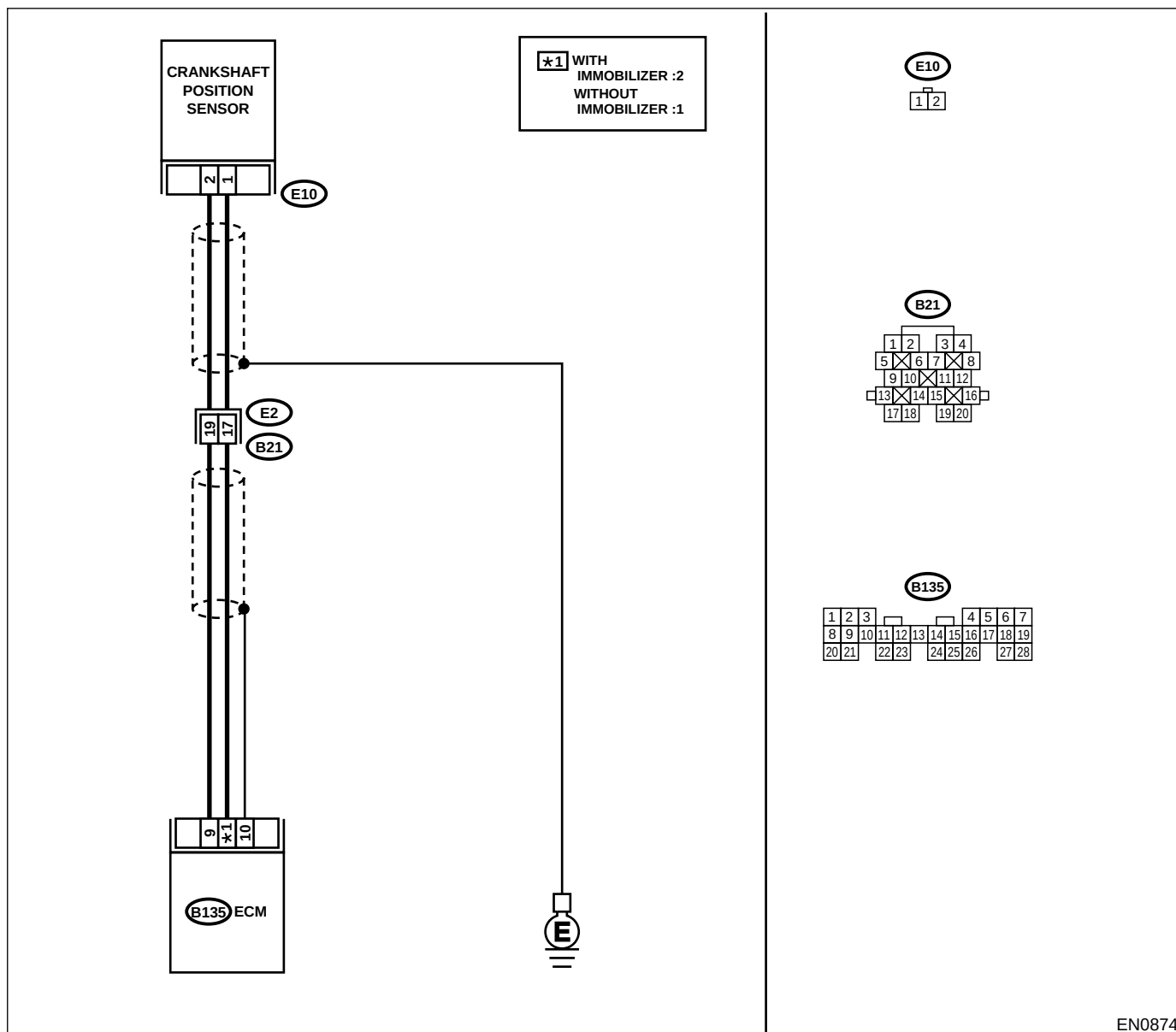
AG:DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0335?	Inspect DTC P0335 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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?	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?	Replace crankshaft sprocket. <Ref. to ME(SOHC)-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. ST 499987500CRANKSHAFT SOCKET	Is timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(SOHC)-46, Timing Belt Assembly.>	Replace crankshaft position sensor. <Ref. to <Ref. to FU(SOHC)-29, Crankshaft Position Sensor.>

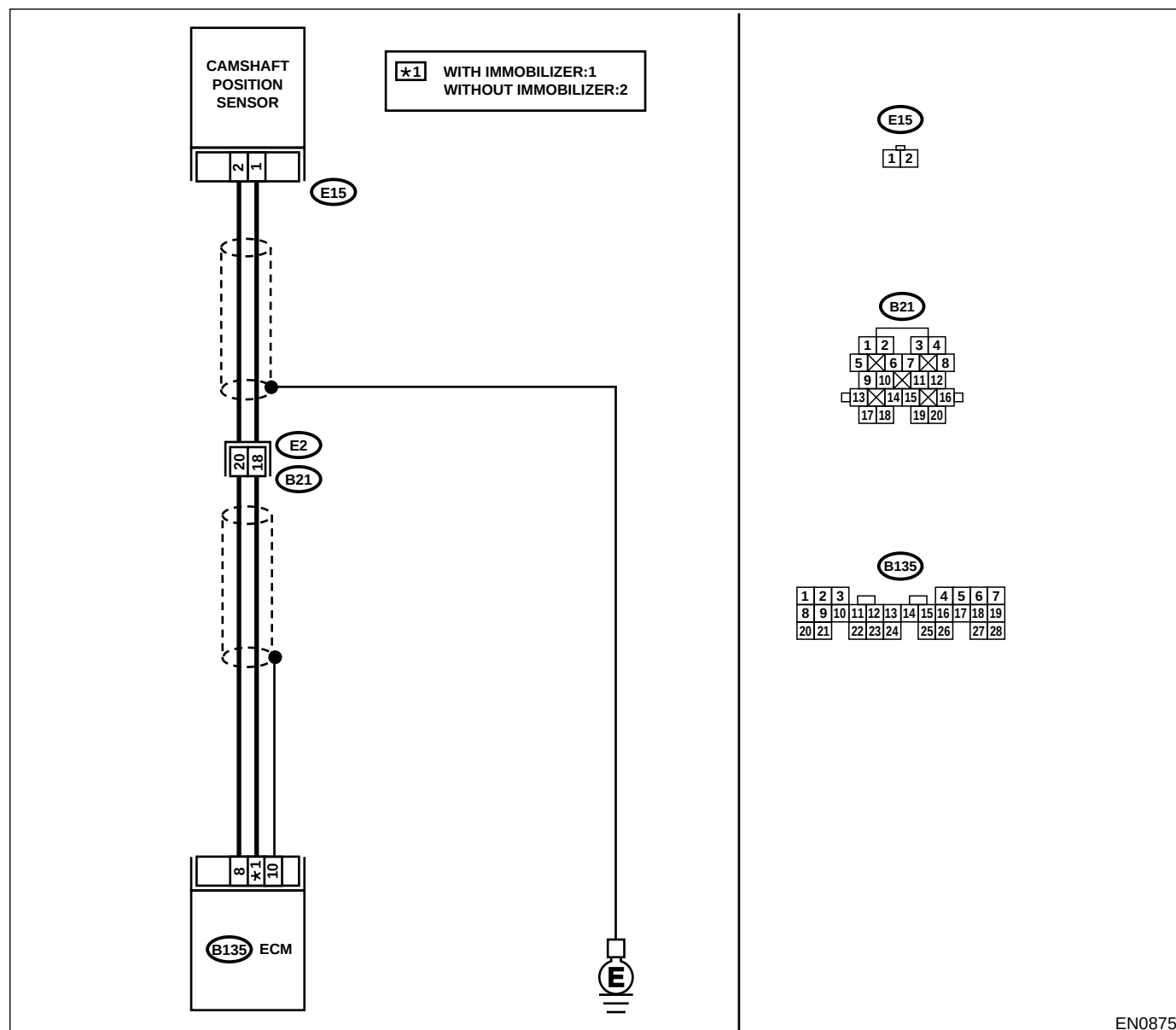
AH:DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0875

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 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:	Is the resistance more than 100 k Ω ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)	Go to step 2.
2 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 resistance less than 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 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. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)
4 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 5.	Tighten camshaft position sensor installation bolt securely.
5 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 resistance between 1 and 4 k Ω ?	Repair poor contact in camshaft position sensor connector.	Replace camshaft position sensor. <Ref. to FU(SOHC)-30, Camshaft Position Sensor.>

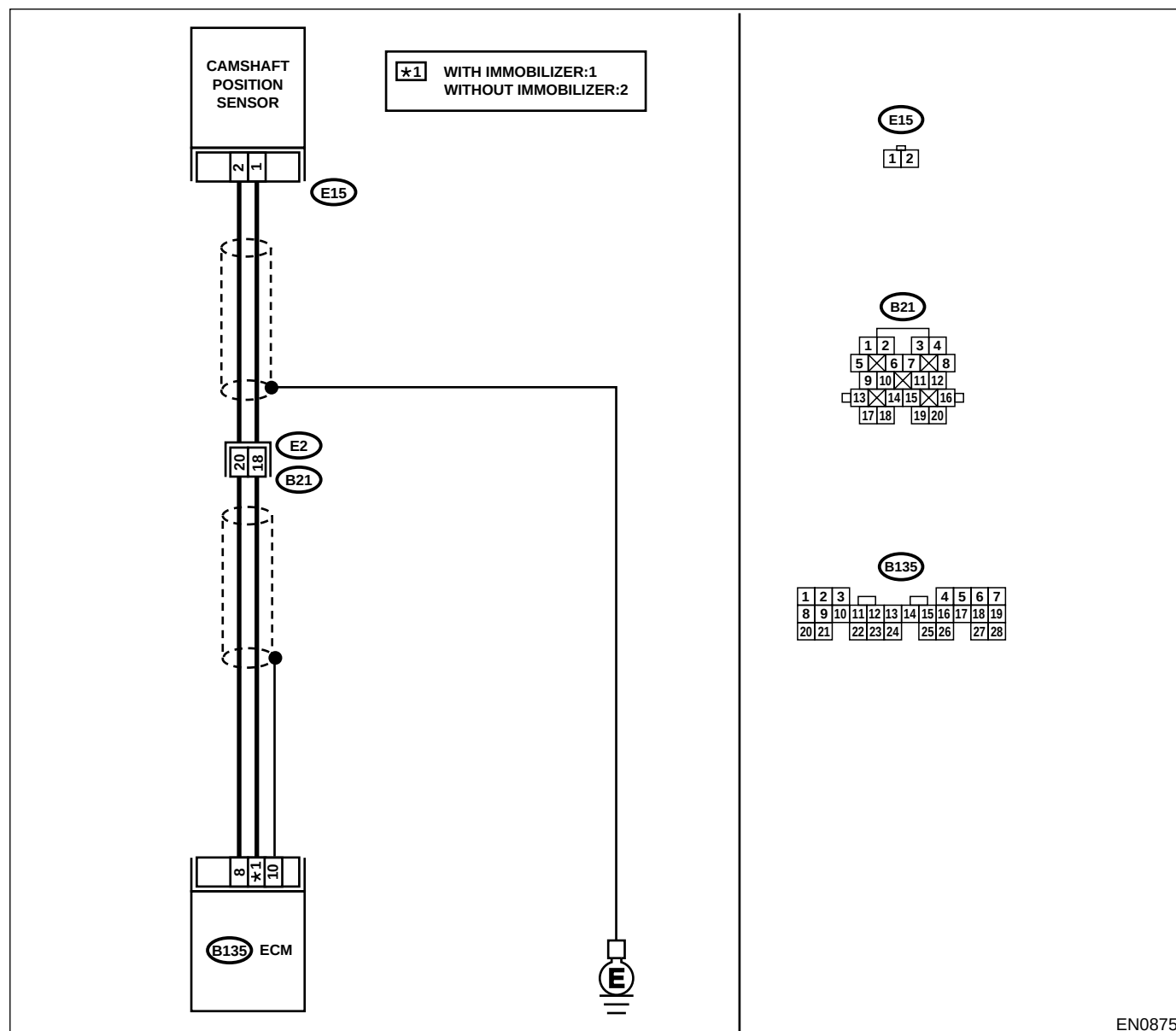
AI: DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Inspect DTC P0340 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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:	Is the resistance more than 100 k Ω ? Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)	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 resistance less than 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 resistance less than 5 Ω ? Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)
5	CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6. Tighten camshaft position sensor installation bolt securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 resistance between 1 and 4 kΩ?	Go to step 7.	Replace camshaft position sensor. <Ref. to FU(SOHC)-30, Camshaft Position Sensor.>
7 CHECK CONDITION OF CAMSHAFT POSITION SENSOR. Turn ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 8.	Tighten camshaft position sensor installation bolt securely.
8 CHECK CAMSHAFT SPROCKET. Remove front belt cover. <Ref. to ME(SOHC)-45, Belt Cover.>	Are camshaft sprocket teeth cracked or damaged?	Replace camshaft sprocket. <Ref. to ME(SOHC)-51, Camshaft Sprocket.>	Go to step 9.
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. ST 499207100 CAMSHAFT SPROCKET WRENCH	Is timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(SOHC)-46, Timing Belt Assembly.>	Replace camshaft position sensor. <Ref. to FU(SOHC)-30, Camshaft Position Sensor.>

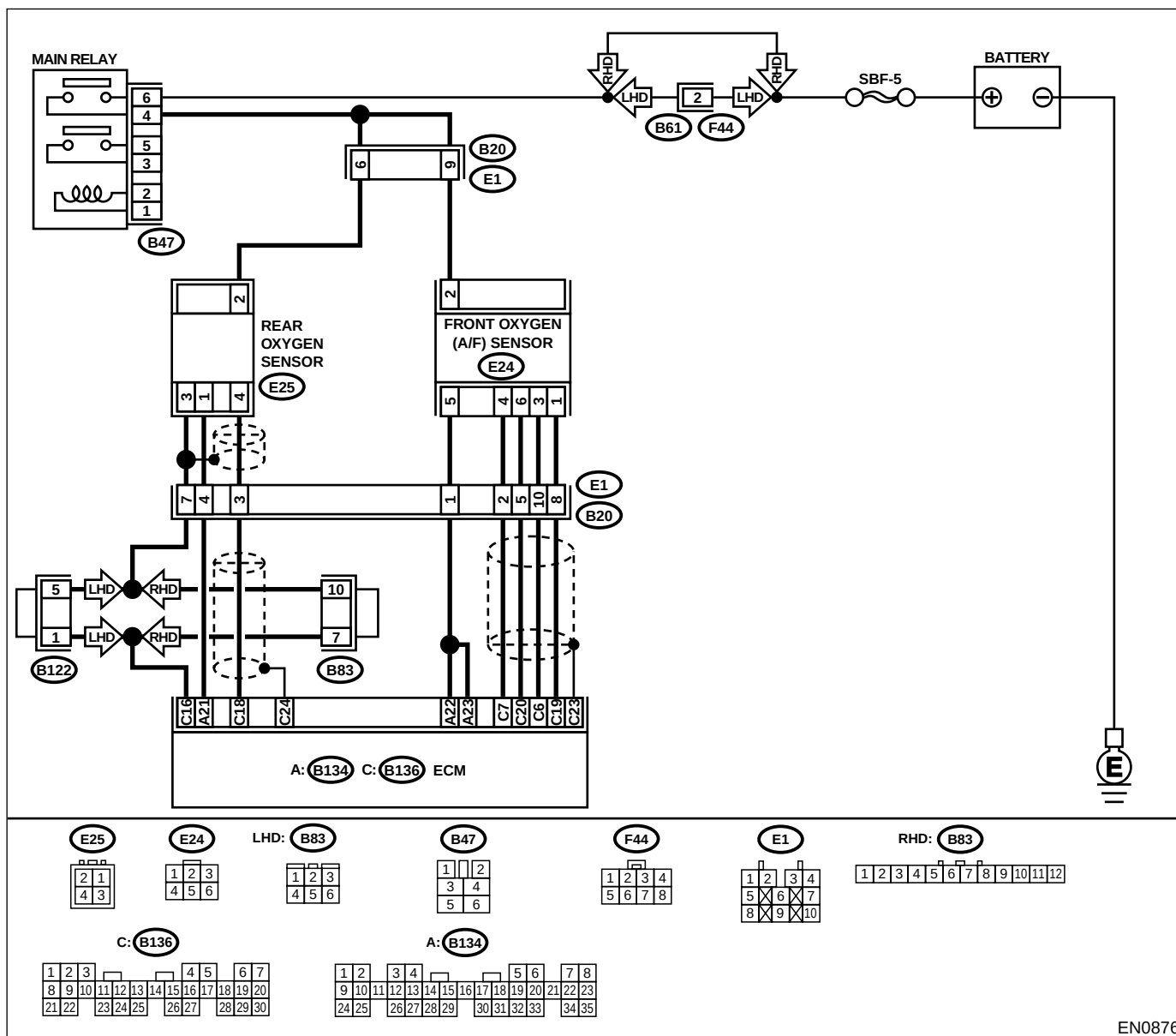
AJ:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0876

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0130, P0133, P0136, P0139, P0037, P0301, P0302, P0303, P0304, P1130, P1131, P0031, P0032 and P0038?	Inspect the relevant DTC using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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. •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?	Repair or replace exhaust system. <Ref. to EX(SOHC)-2, General Description.>	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?	Replace front catalytic converter <Ref. to EC(SOHC)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(SOHC)-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?	Replace front catalytic converter. <Ref. to EC(SOHC)-3, Front Catalytic Converter.>	Contact with your Subaru distributor. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

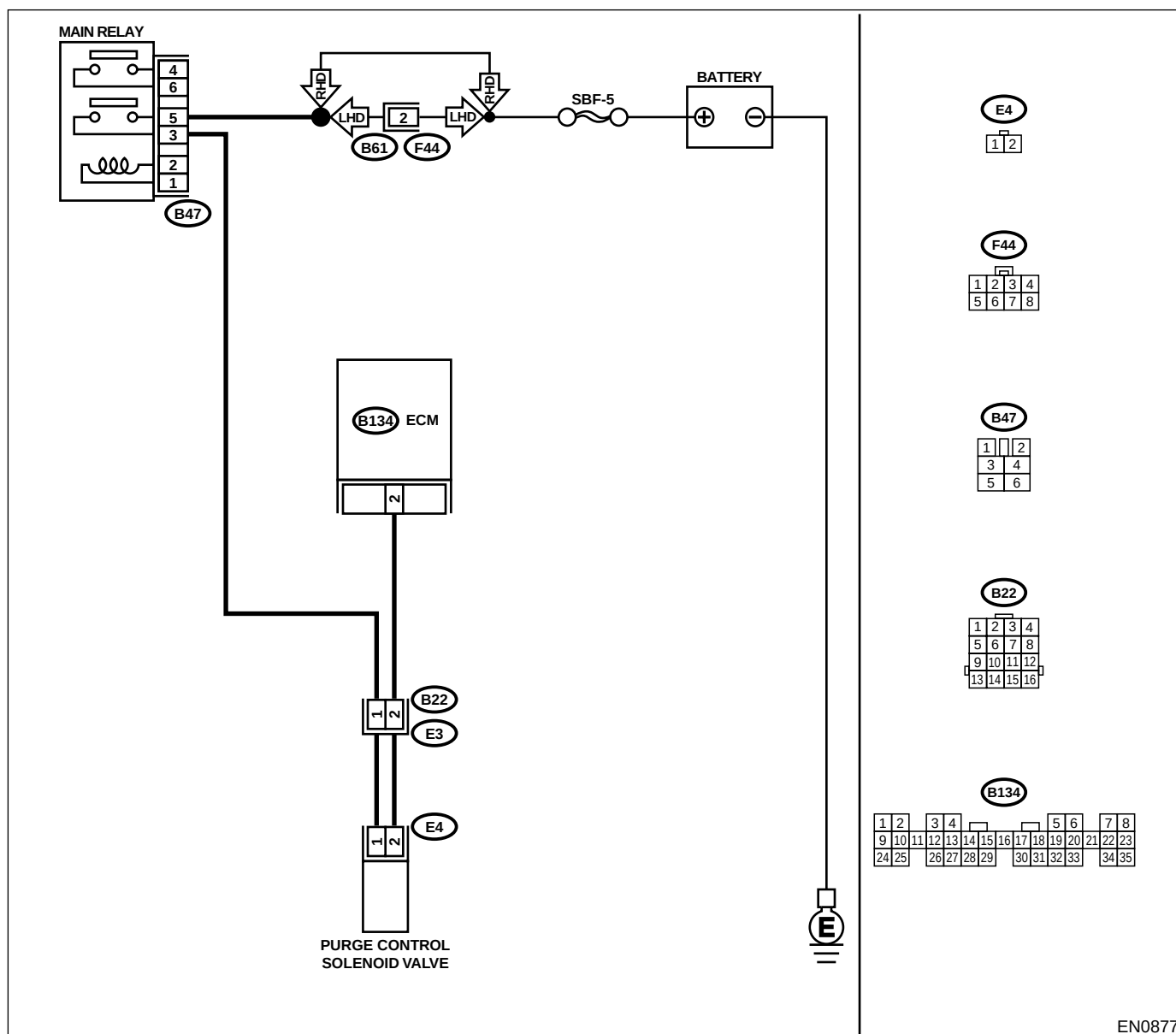
AK:DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0877

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Even if MIL 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.
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 resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step 3.
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 (B134) No. 2 — (E4) No. 2:	Is the resistance less than 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 (B22)
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 resistance between 10 and 100 Ω ?	Go to step 5.	Replace purge control solenoid valve. <Ref. to EC(SOHC)-8, Purge Control Solenoid Valve.>
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 (-):	Is the voltage more than 10 V?	Go to step 6.	Repair open circuit in harness between main relay and purge control solenoid valve connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
6	CHECK POOR CONTACT. Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge 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)

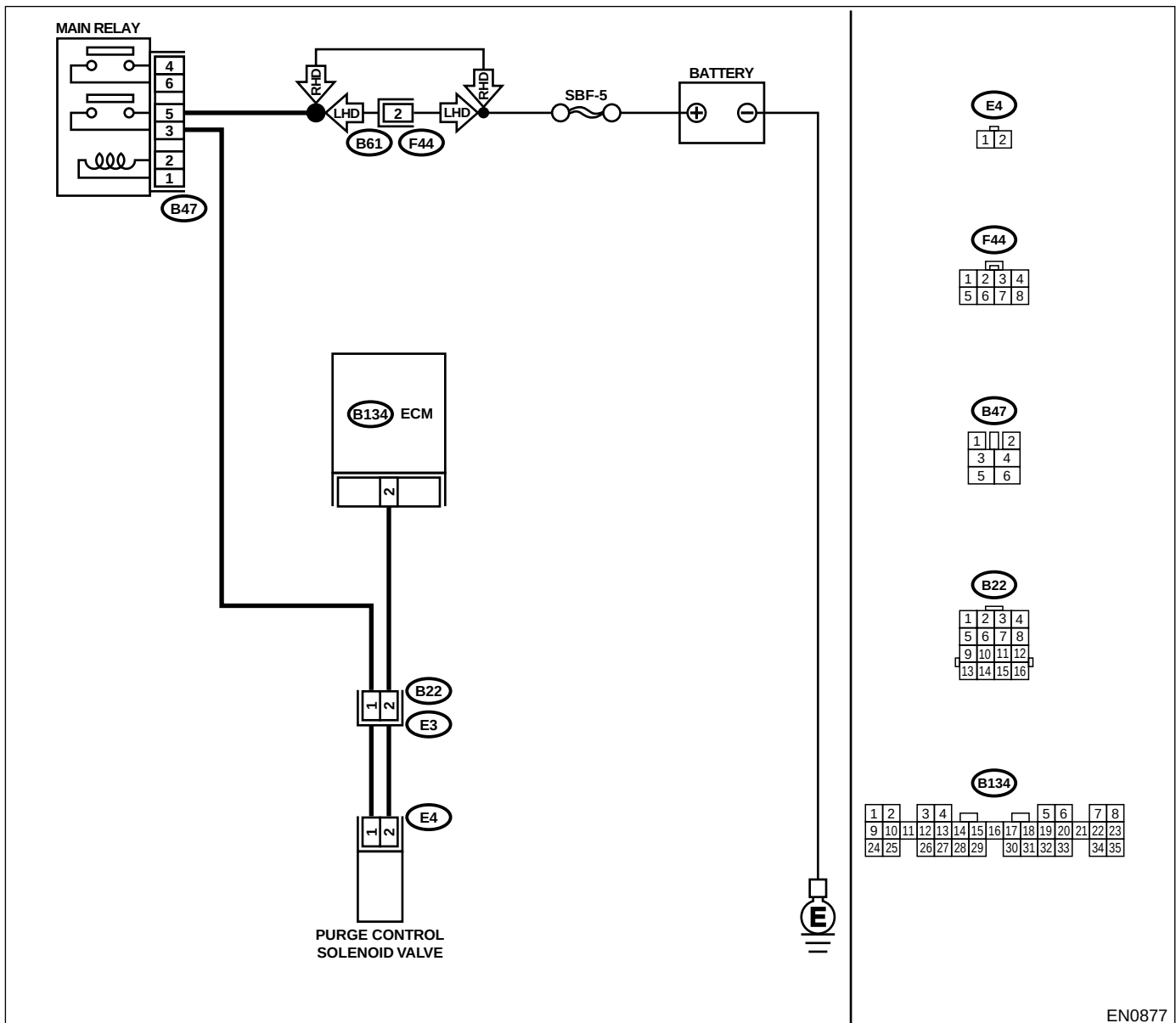
AL:DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0877

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 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. 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(SOHC)-46, Compulsory Valve Operation Check Mode.> Connector & terminal (B134) No. 2 (+) — Chassis ground (-):	Does voltage change between 0 and 10 V?	Go to step 2.	Even if MIL light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 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. Connector & terminal (B134) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Go to step 5.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Measure resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace purge control solenoid valve <Ref. to EC(SOHC)-8, Purge Control Solenoid Valve.> and ECM <Ref. to FU(SOHC)-48, Engine Control Module.>	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>

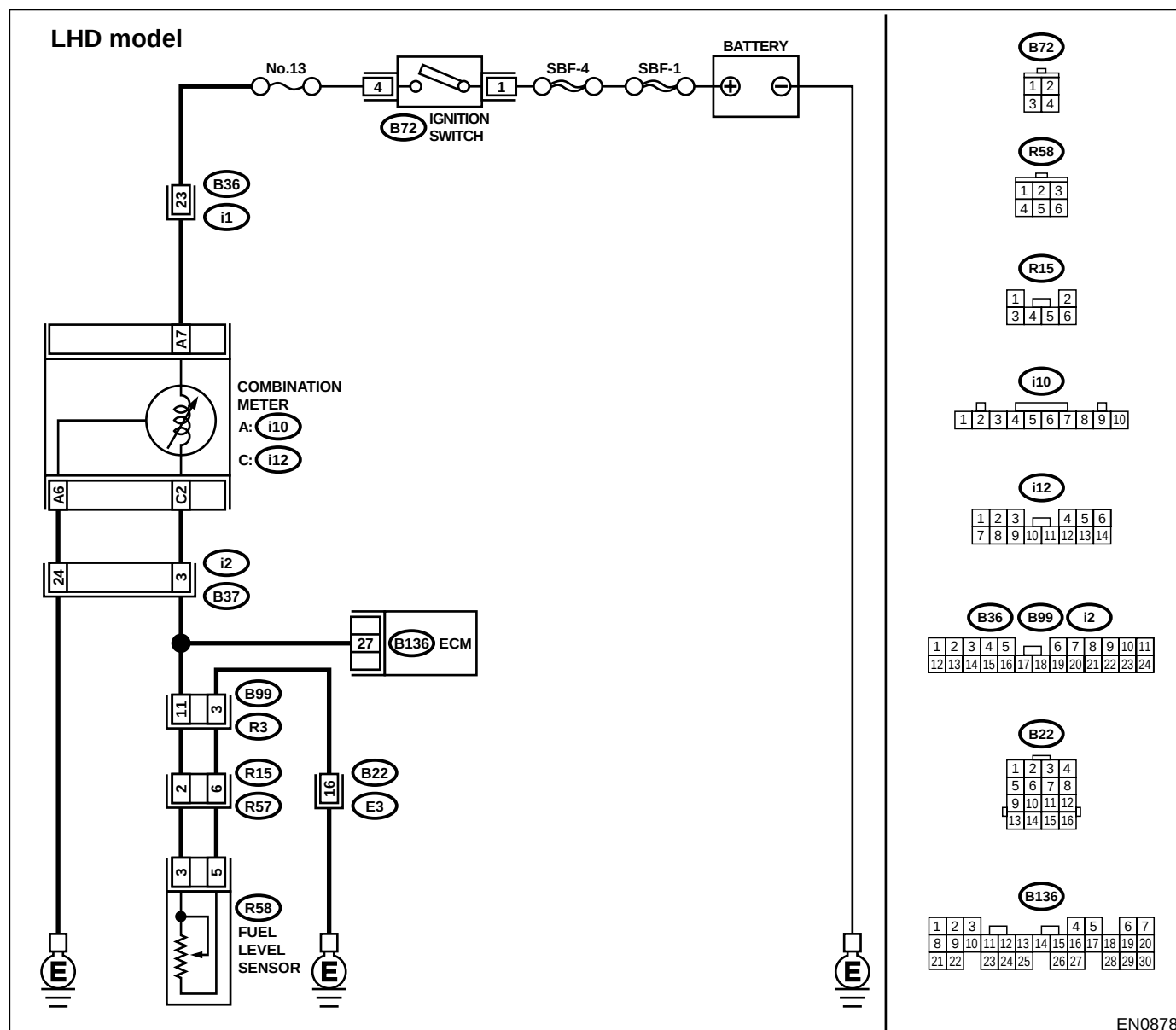
AM:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0878

ENGINE (DIAGNOSTICS)



EN(SOHC)-185

AN:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

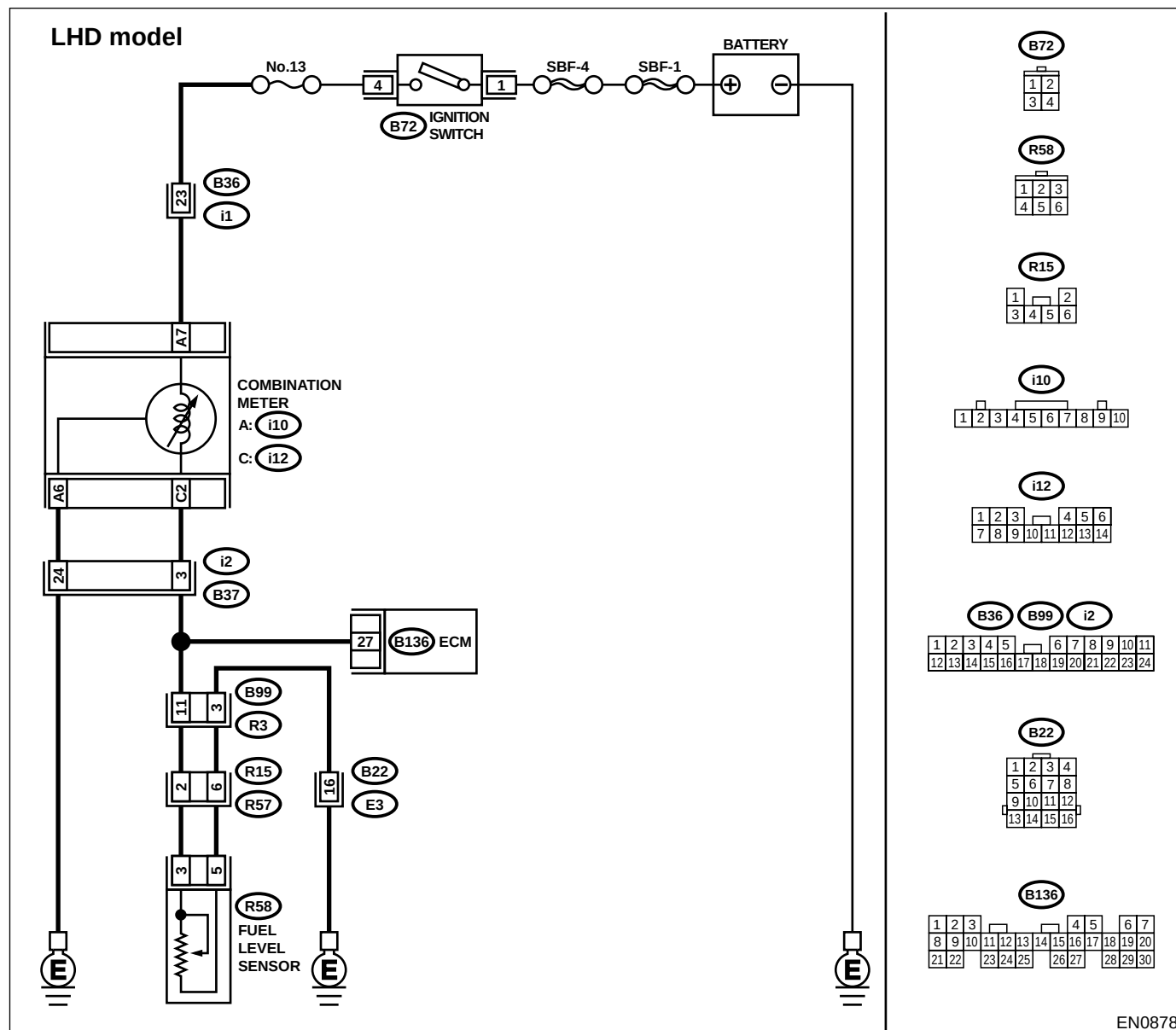
• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0878

ENGINE (DIAGNOSTICS)



EN(SOHC)-187

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read data of fuel level sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.>	Does the value change less than 0.12 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Even if MIL 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 (B99)
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 (-):	Is the voltage more than 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:	Is the resistance more than 1 MΩ?	Go to step 6.	Repair ground short circuit in harness between ECM and combination meter connector.
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 resistance less than 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 (R15)
7 CHECK FUEL TANK CORD. 1)Disconnect connector from fuel pump assembly. 2)Measure resistance between fuel pump assembly and chassis ground. Connector & terminal (R58) No. 3 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 8.	Repair ground short circuit in fuel tank cord.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK FUEL LEVEL SENSOR. 1)Remove fuel pump assembly. <Ref. to FU(SOHC)-58, Fuel Pump.> 2)Measure resistance between fuel level sensor and terminals with its float set to the full position. <i>Terminals</i> <i>No. 5 — No. 3:</i>	Is the resistance between 0.5 and 2.5 Ω ?	Repair poor contact in harness between ECM and combination meter connector.	Replace fuel level sensor.

AO:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

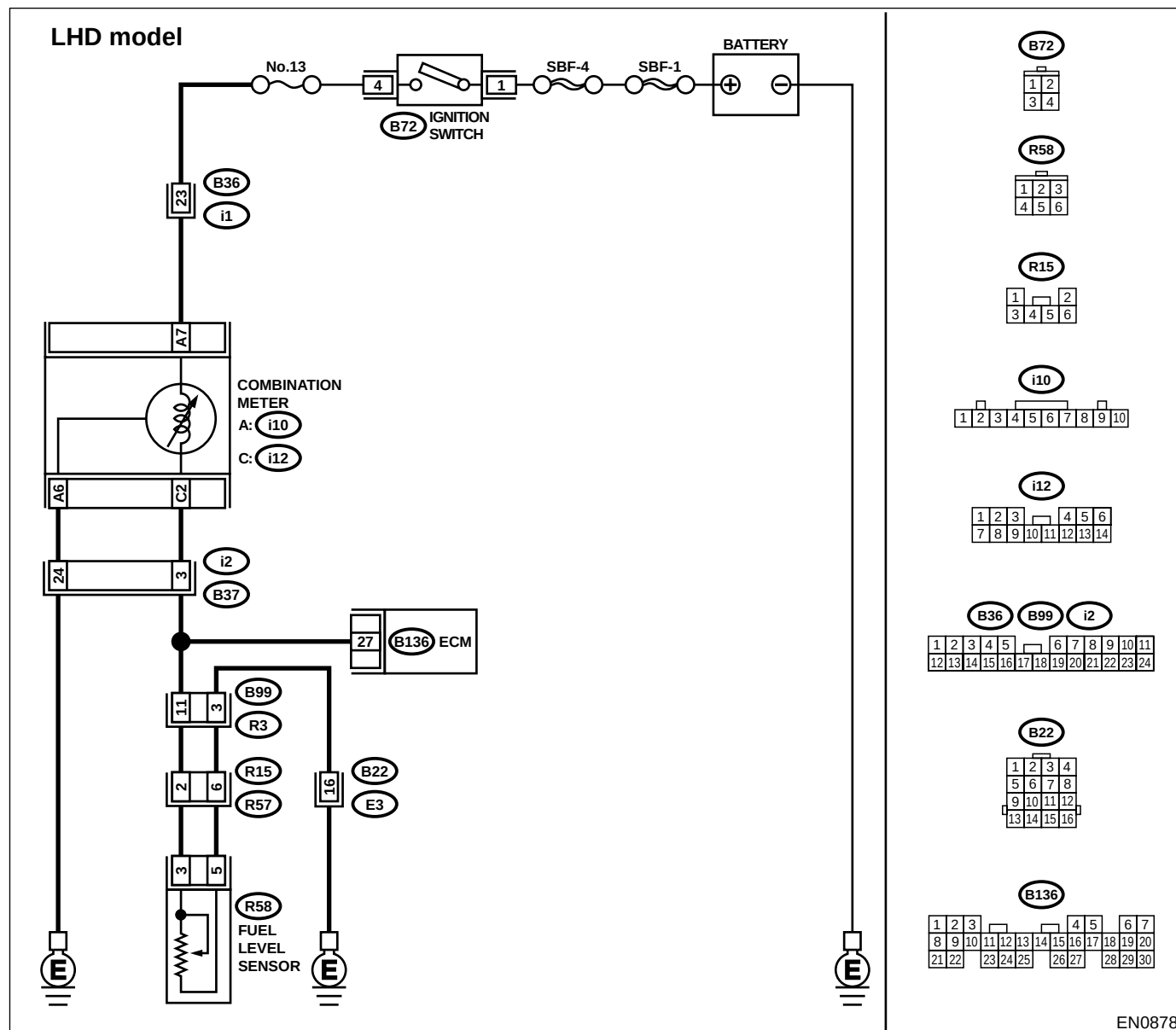
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

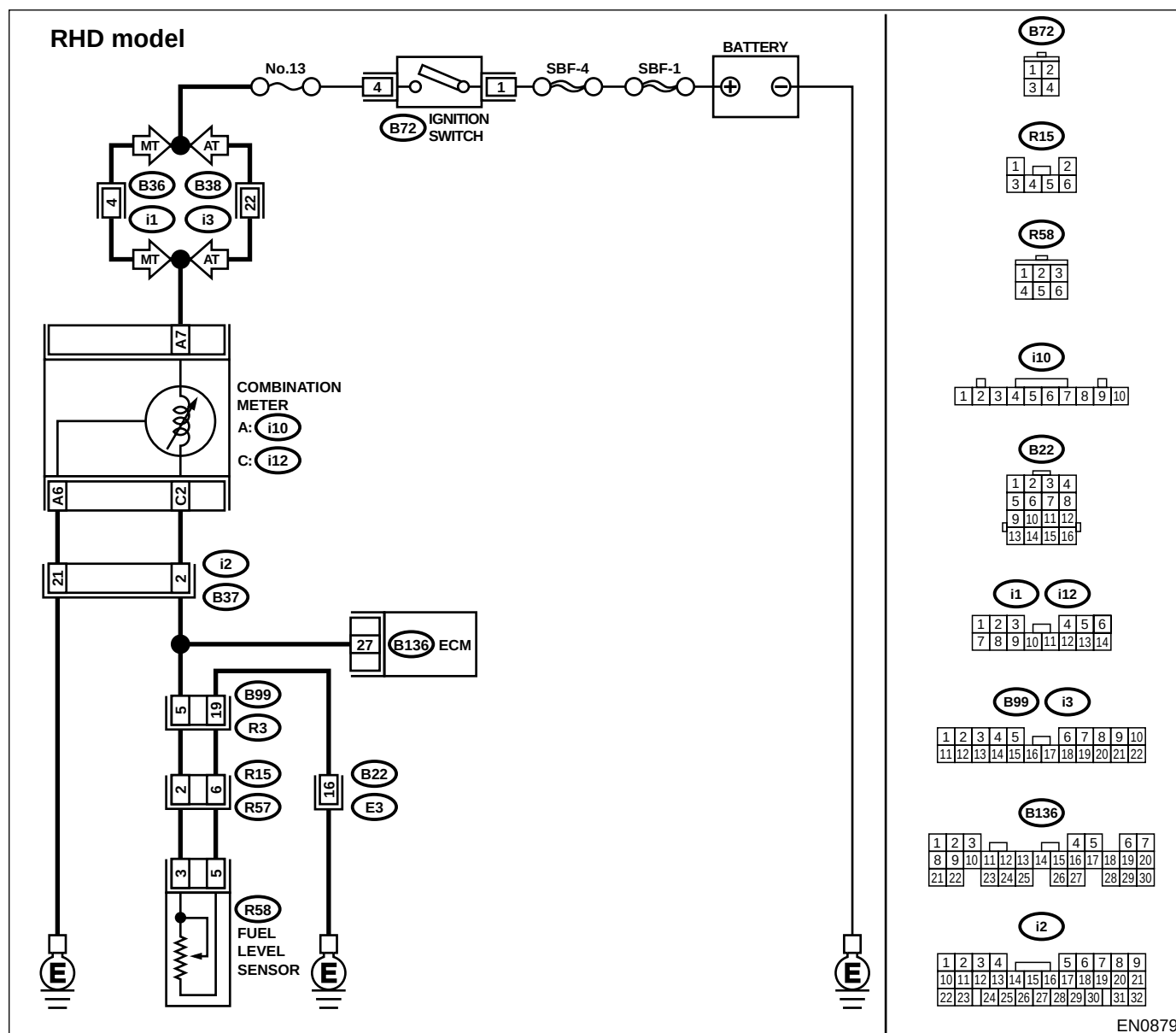
• WIRING DIAGRAM:



EN0878

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)



Step	Check	Yes	No
1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does speedometer and tachometer operate normally?	Go to step 2.
			Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 voltage more than 4.75 V?	Go to step 3.	Even if MIL 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 fuel pump connector • Poor contact in coupling connector (B22, B99 and R15)
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 (-):	Is the voltage more than 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 (B136) No. 27 — (R15) No. 2:	Is the resistance less than 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 resistance less than 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 (B22 and B99)
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. 5:	Is the resistance less than 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 level sensor. 2) Measure resistance between fuel level sensor and coupling connector. Connector & terminal (R57) No. 2 — (R58) No. 3:	Is the resistance less than 10 Ω ?	Go to step 8.	Repair open circuit between coupling connector and fuel level sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK FUEL LEVEL SENSOR. 1)Remove fuel pump assembly. <Ref. to FU(SOHC)-58, Fuel Pump.> 2)While moving fuel level sensor float up and down, measure resistance between fuel level sensor terminals. <i>Terminals</i> <i>No. 3 — No. 5:</i>	Is the resistance more than 100 Ω ?	Replace fuel level sensor. <Ref. to FU(SOHC)-60, Fuel Level Sensor.>	Replace combination meter. <Ref. to IDI-19, Combination Meter Assembly.>

AP:DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT—

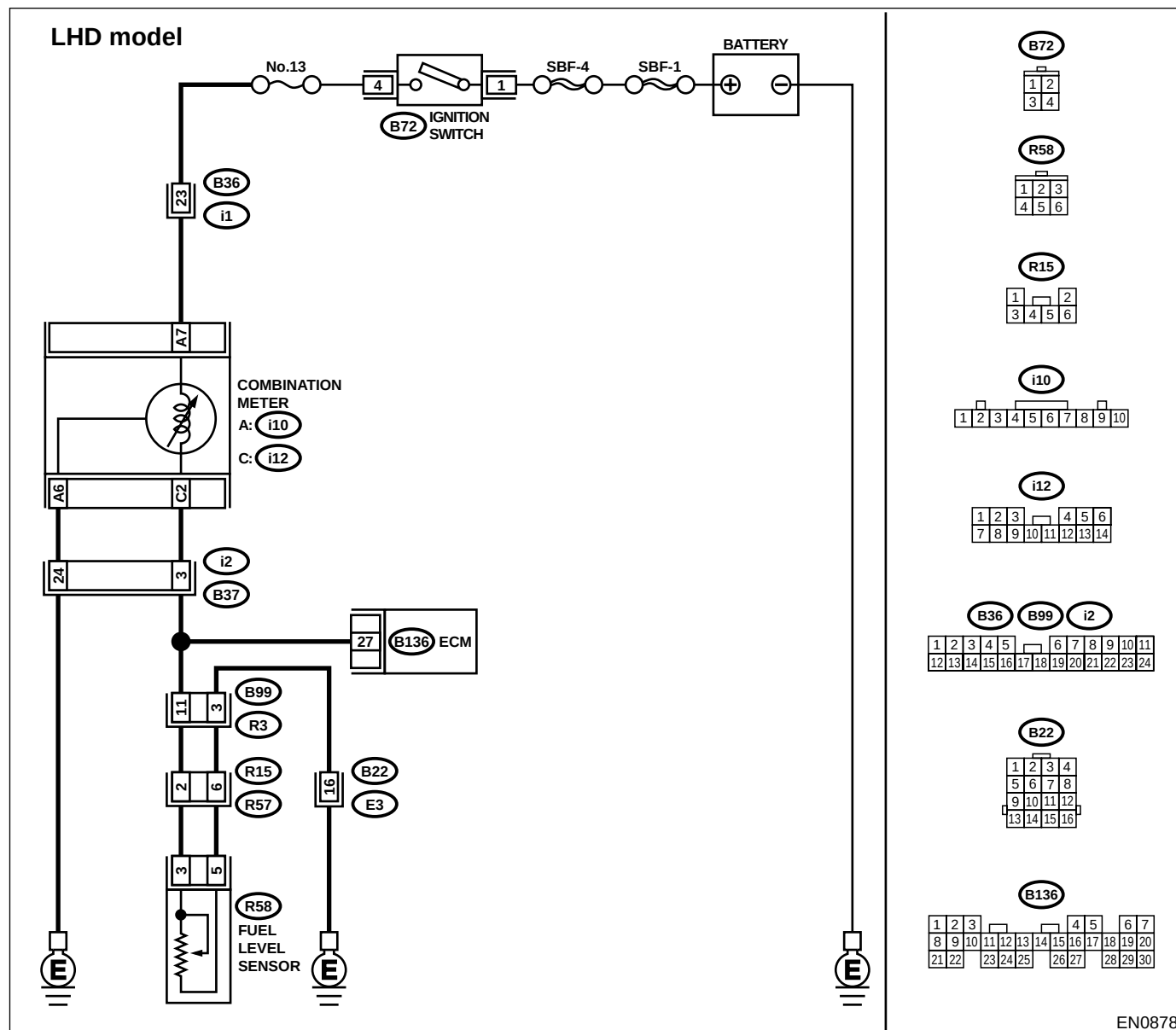
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

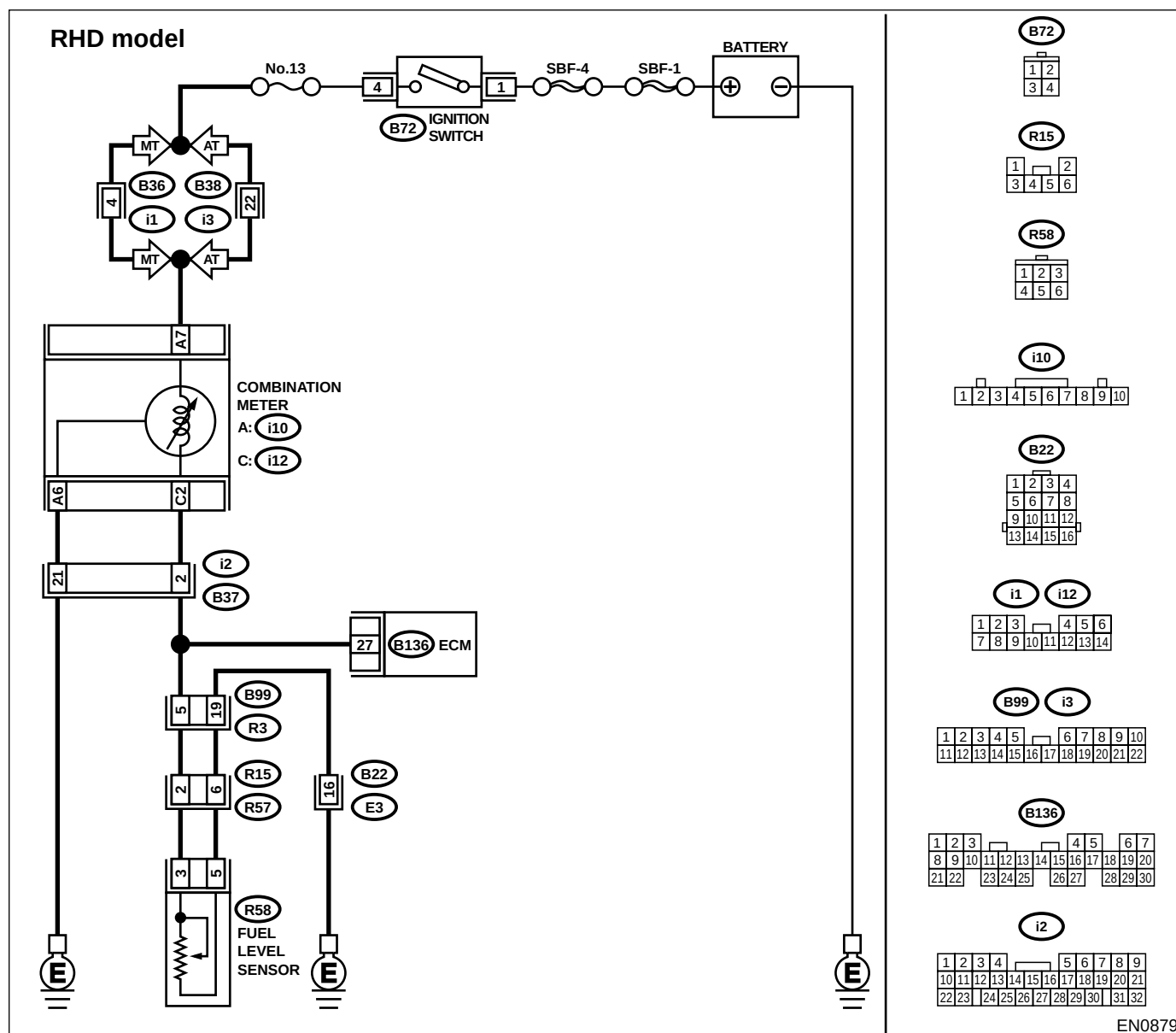
• WIRING DIAGRAM:



EN0878

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)



Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0462 or P0463?	Inspect DTC P0462 or P0463 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, List of Diagnostic Trouble Code (DTC).>
2	CHECK FUEL LEVEL SENSOR. 1) Remove fuel pump assembly. <Ref. to FU(SOHC)-58, 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. 5:	Does the resistance change smoothly?	Repair poor contact in ECM, combination meter and coupling connectors. Replace fuel level sensor. <Ref. to FU(SOHC)-60, Fuel Level Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AQ:DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Radiator fan does not operate properly.
 - Overheating

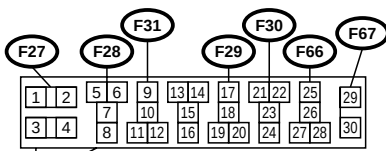
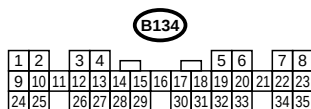
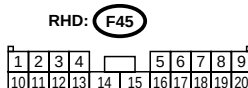
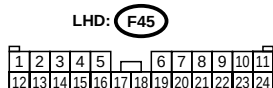
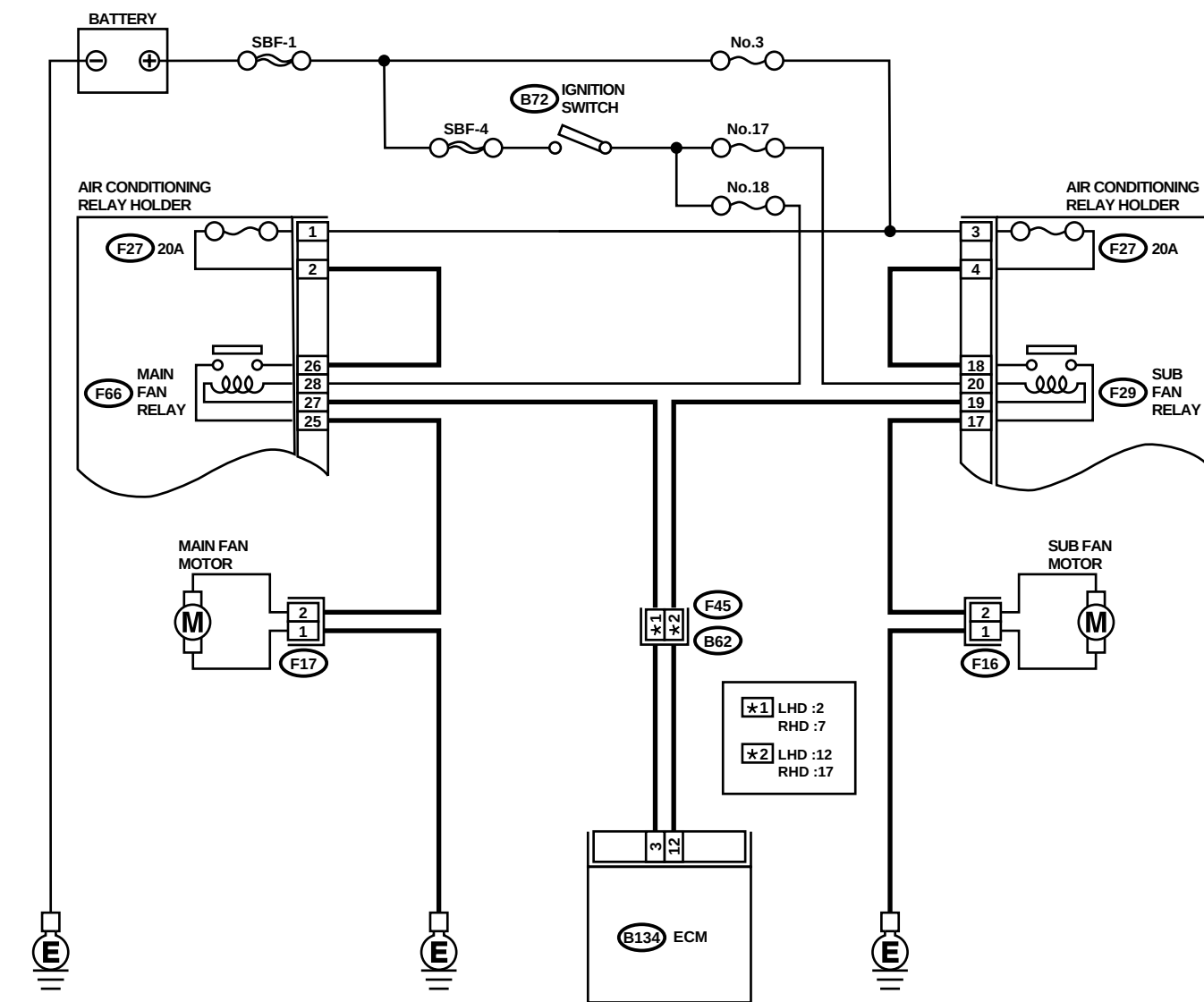
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN0880

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 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 terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> Connector & terminal (B134) No. 3 (+) — Chassis ground (-):	Does voltage change between 0 and 10 V?	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK GROUND SHORT CIRCUIT IN RADIATOR MAIN FAN RELAY CONTROL CIRCUIT. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 3 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in radiator main fan relay control circuit.	Go to step 3.
3 CHECK POWER SUPPLY FOR RELAY. 1) Remove main fan relay from A/C relay holder. 2) Turn ignition switch to ON. 3) Measure voltage between fuse and relay box (F/B) connector and chassis ground. Connector & terminal (F66) No. 28 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4 CHECK MAIN FAN RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between main fan relay terminals. Terminal No. 28 — No. 27:	Is the resistance between 87 and 107 Ω ?	Go to step 5.	Replace main fan relay.
5 CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT. Measure resistance of harness between ECM and main fan relay connector. Connector & terminal (B134) No. 3 — (F66) No. 27:	Is the resistance less than 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 (F45)
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?	Repair poor contact in ECM or main fan relay connector.	Contact with your Subaru distributor service.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AR:DTC P0483 — COOLING FAN FUNCTION PROBLEM —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

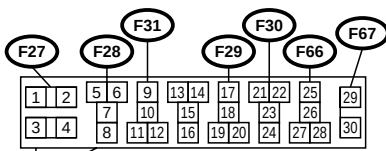
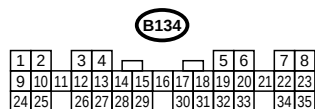
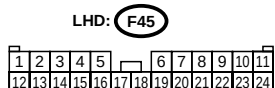
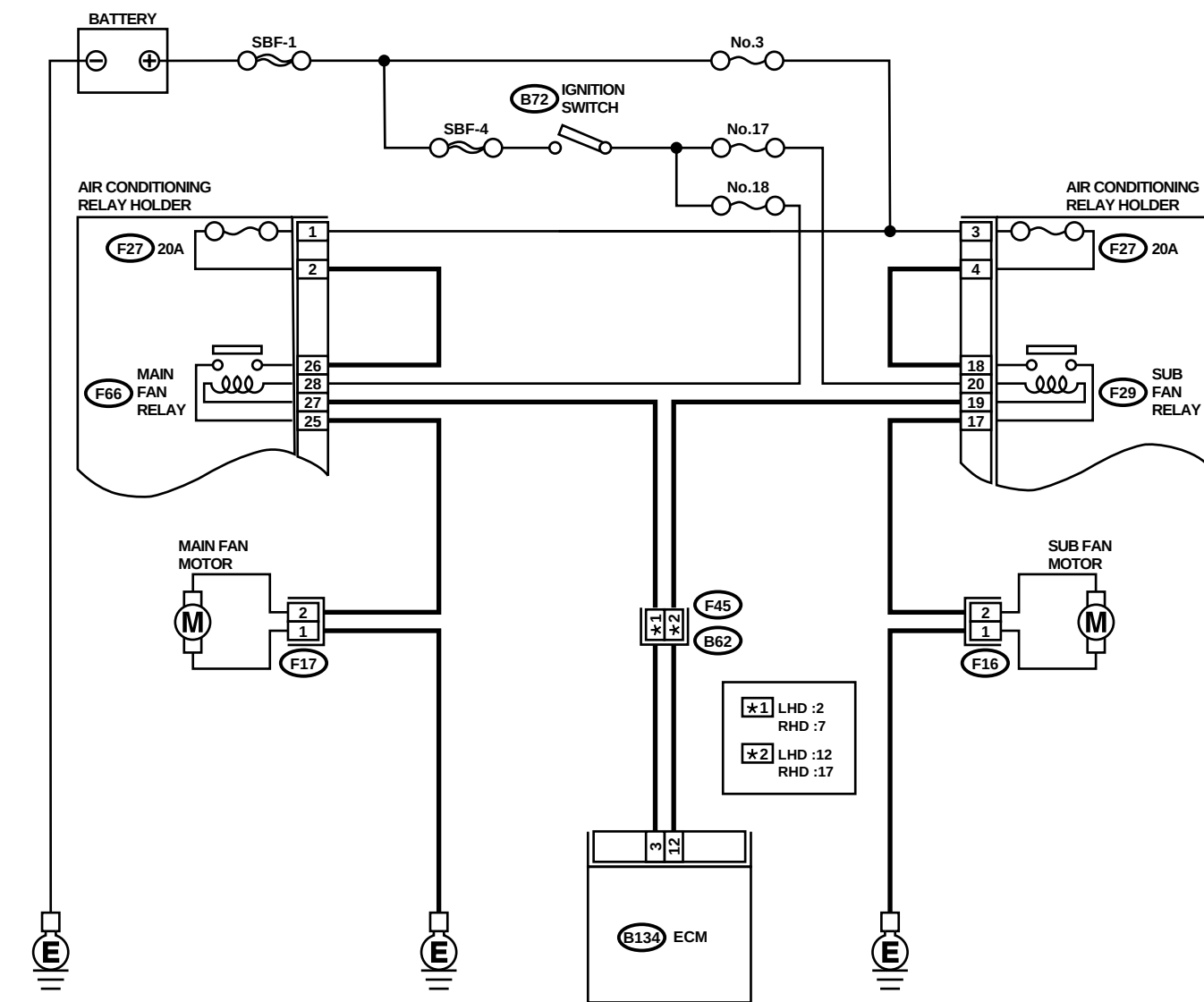
NOTE:

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:



EN0880

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC on display?	Inspect the relevant DTC using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO-9, RADIATOR MAIN FAN SYSTEM, .> and <Ref. to CO-17, RADIATOR SUB FAN SYSTEM, .>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

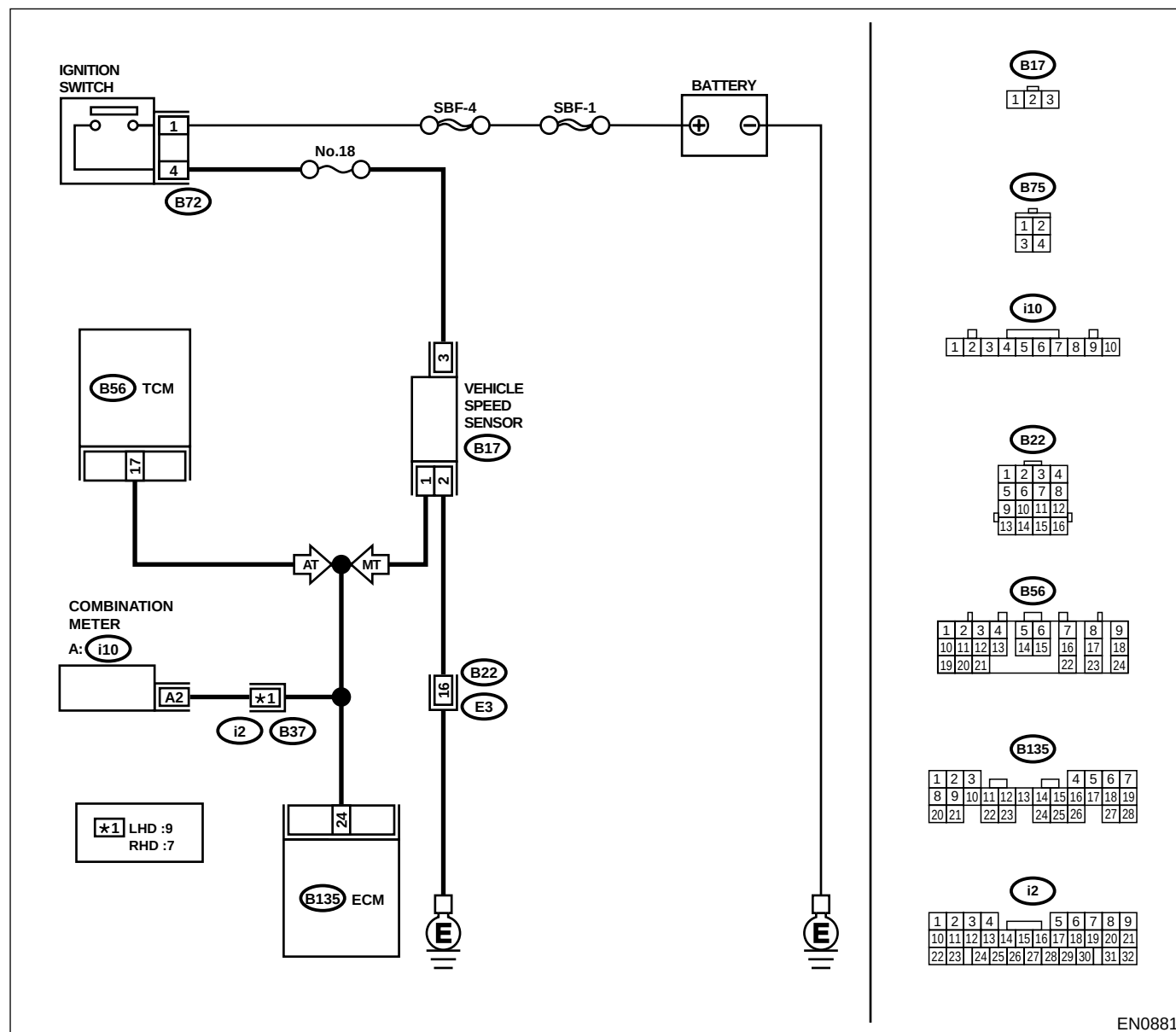
AS:DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN0881

Step	Check	Yes	No
1	CHECK TRANSMISSION TYPE.	Is the transmission type AT?	Go to step 2.
		Go to step 2.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
2	CHECK DTC P0720 ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to AT-53, TROUBLE CODE 33 — FRONT VEHICLE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>	Go to step 3.
3	CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does speedometer operate normally?	Go to step 4.	Check speedometer and vehicle speed sensor. <Ref. to IDI-21, Speedometer.> and <Ref. to AT-31, Front Vehicle Speed Sensor.> and <Ref. to AT-34, Rear Vehicle Speed Sensor.> and <Ref. to AT-35, 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 (B135) No. 24 — (i10) No. 2:	Is the resistance less than 10 Ω?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • 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 (B37)

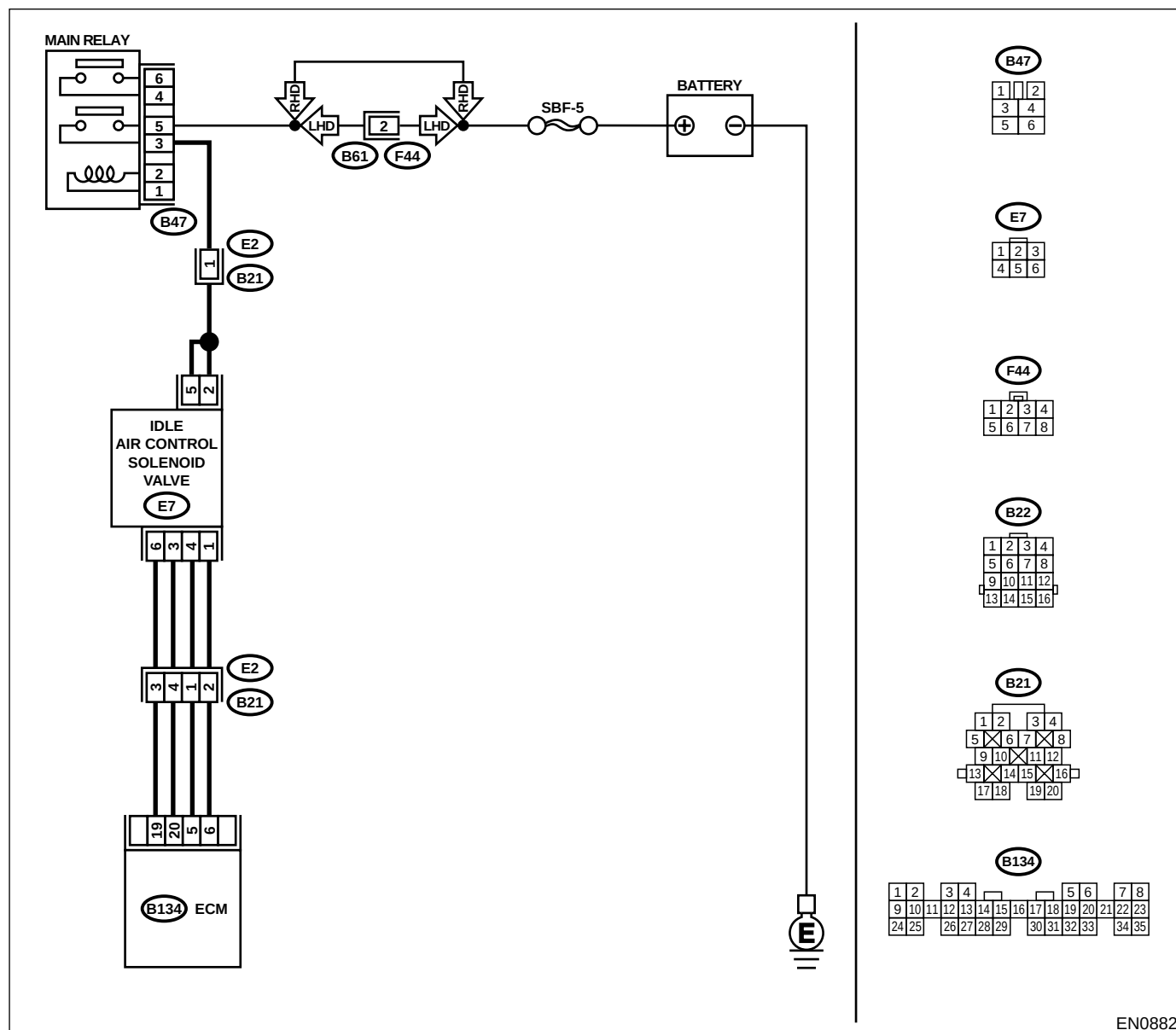
AT:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0882

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517?	Inspect DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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(SOHC)-37, REMOVAL, Idle Air Control Solenoid Valve.> 3)Remove throttle body from intake manifold. <Ref. to FU(SOHC)-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?	Replace idle air control solenoid valve. <Ref. to FU(SOHC)-37, INSTALLATION, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(SOHC)-14, INSTALLATION, Throttle Body.>

AU:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

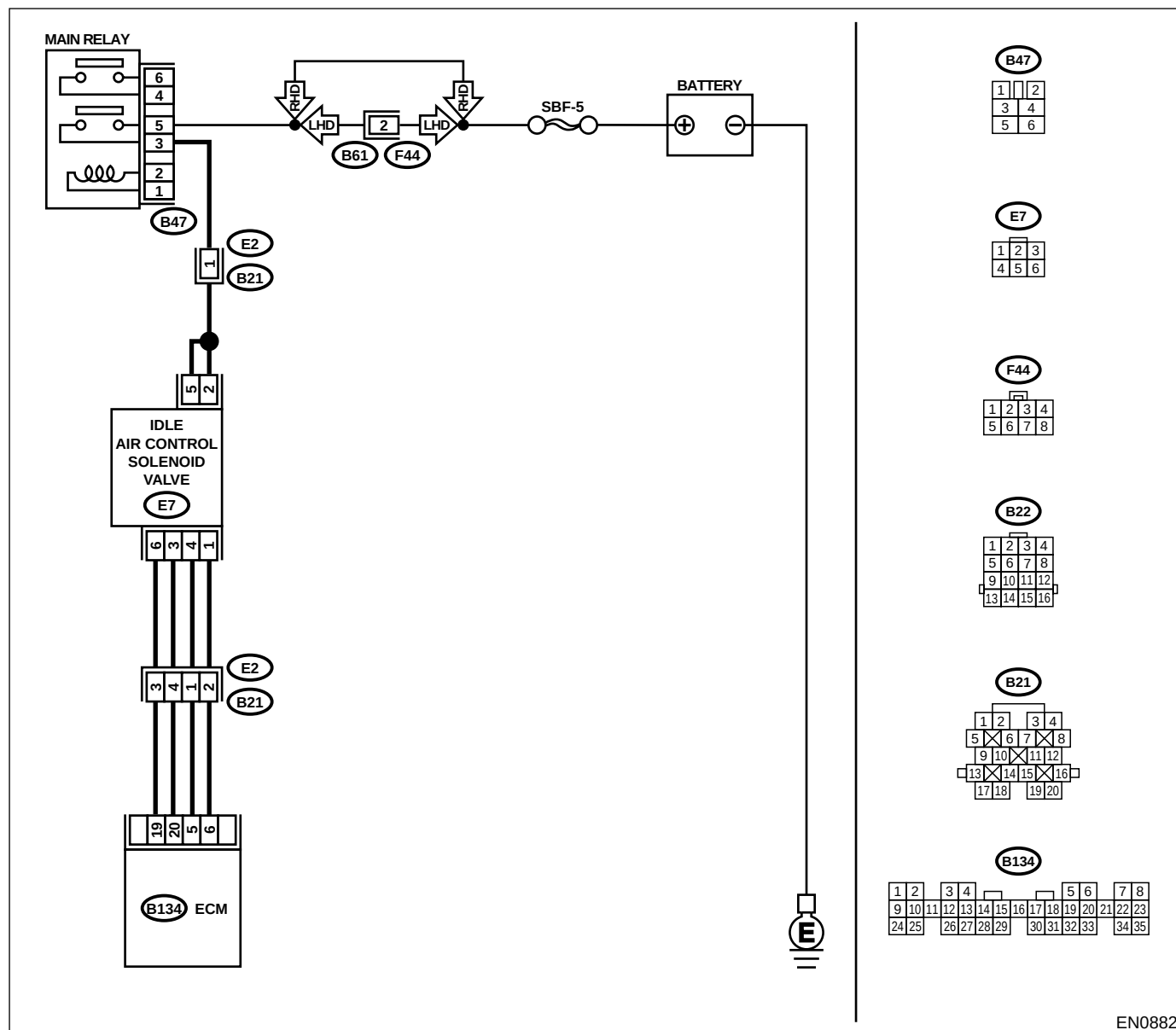
• **TROUBLE SYMPTOM:**

- 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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0882

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517?	Inspect DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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?	Repair air suction and leaks.	Go to step 3.
3 CHECK THROTTLE CABLE.	Does throttle cable have play for adjustment?	Go to step 4.	Adjust throttle cable. <Ref. to SP-9, INSTALLATION, 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(SOHC)-37, 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?	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(SOHC)-37, INSTALLATION, Idle Air Control Solenoid Valve.>

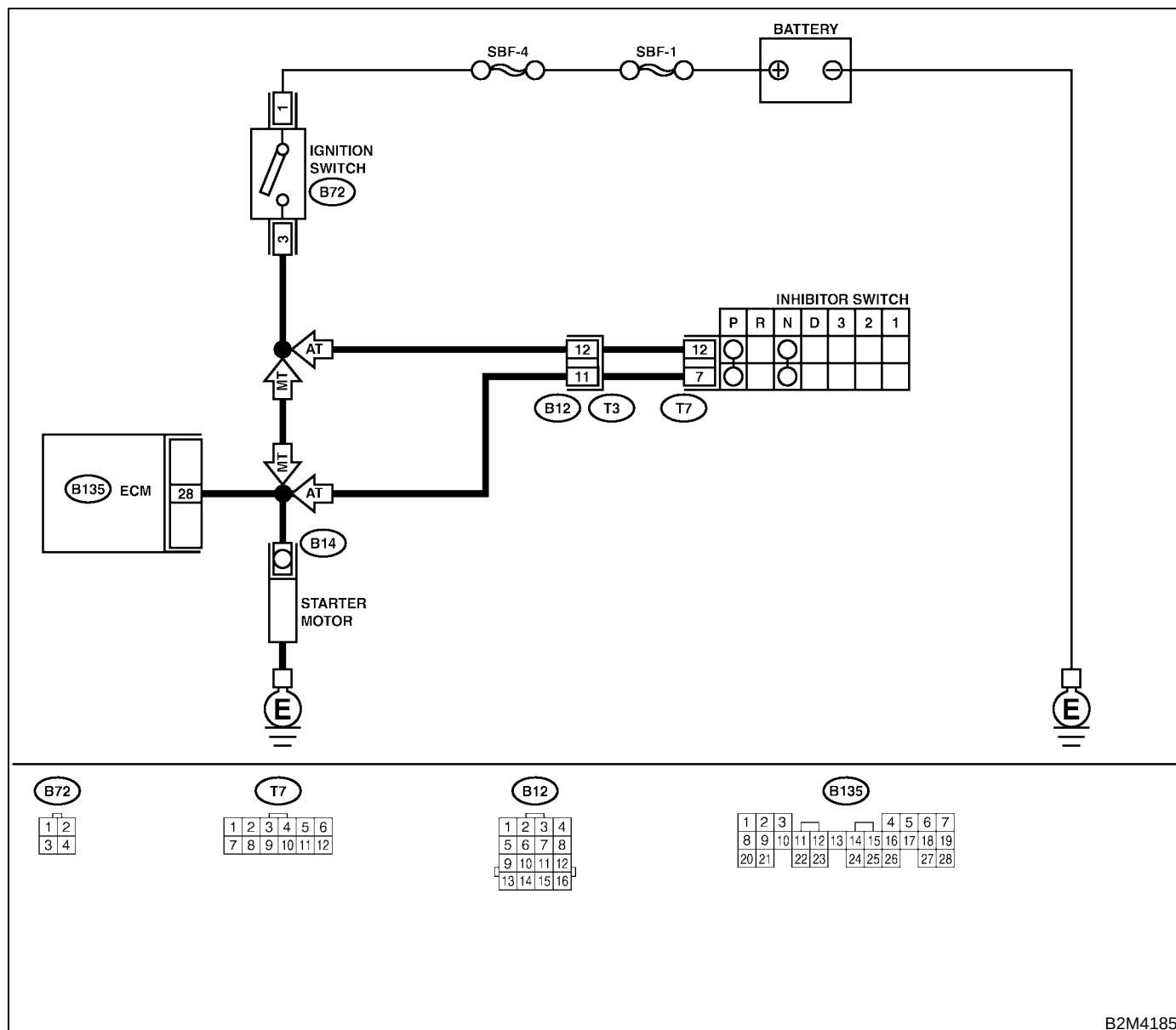
AV:DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



B2M4185

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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"?	Repair battery short circuit in starter motor circuit. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Check starter motor circuit. <Ref. to EN(SOHC)-62, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

ENGINE (DIAGNOSTICS)

AW:DTC P0562 — CHARGE SYSTEM CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**

- Power source voltage of the ECM is low.

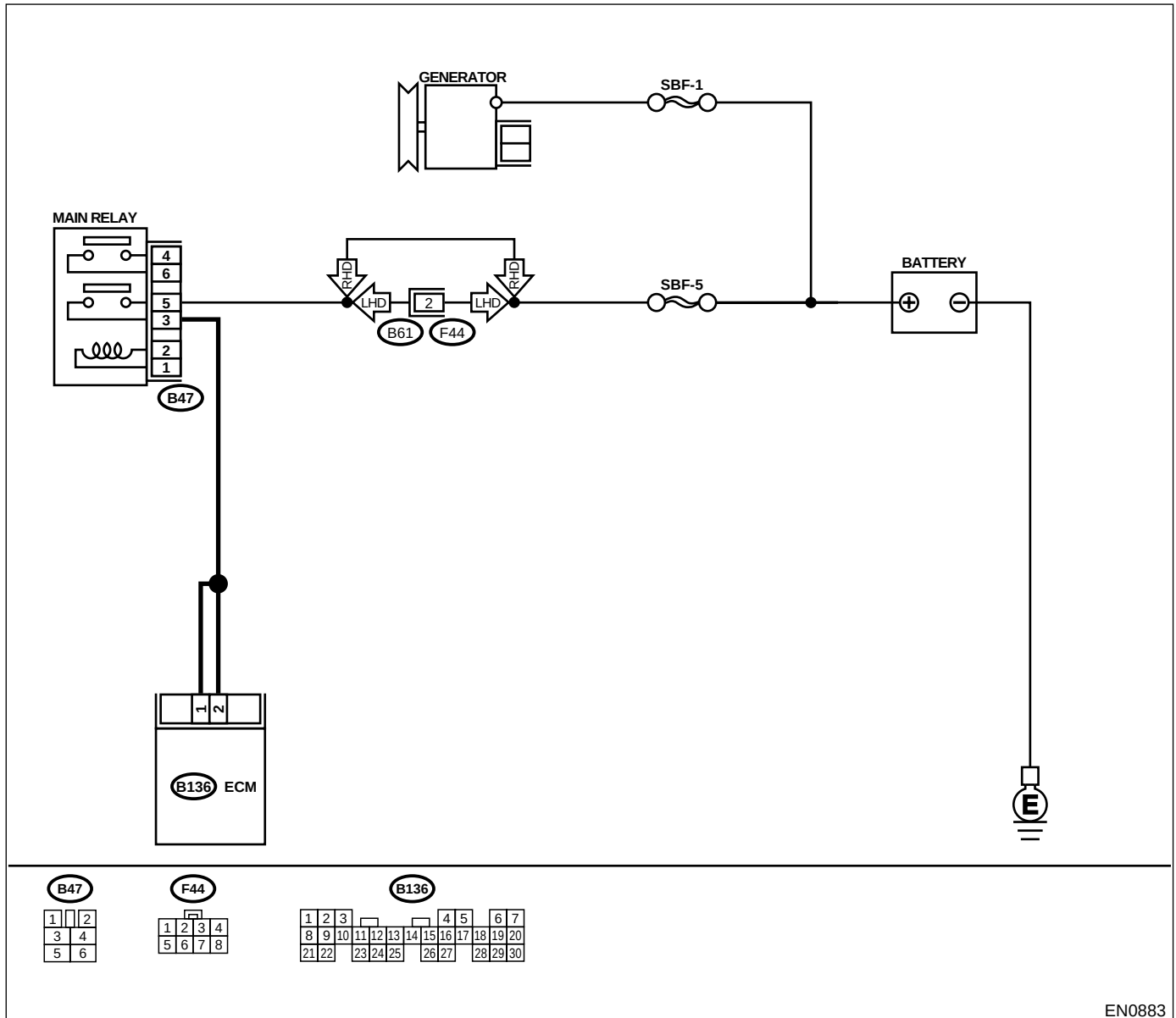
- **TROUBLE SYMPTOM:**

- Charge warning light comes on.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 voltage less than 10.8 V?	Go to step 2.	Repair generator. <Ref. to CS-20, General Diagnostic.>
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 voltage less than 10.8 V?	Go to step 3.	Repair generator. <Ref. to CS-20, General Diagnostic.>
3 CHECK BATTERY TERMINAL. Turn ignition switch to OFF.	Are the positive and negative battery terminals 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 voltage less than 10.8 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?	Repair connector.	Go to step 6.
6 CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN(SOHC)-45, Clear Memory Mode.> 3)Perform inspection mode. <Ref. to EN(SOHC)-42, Inspection Mode.> 4)Read out the trouble code. <Ref. to EN(SOHC)-41, Read Diagnostic Trouble Code.>	Is the same trouble code as in the current diagnosis still being output?	Replace generator.	Go to step 7.
7 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

ENGINE (DIAGNOSTICS)

AX:DTC P0563 — CHARGE SYSTEM CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**

- Power source voltage of the ECM is high.

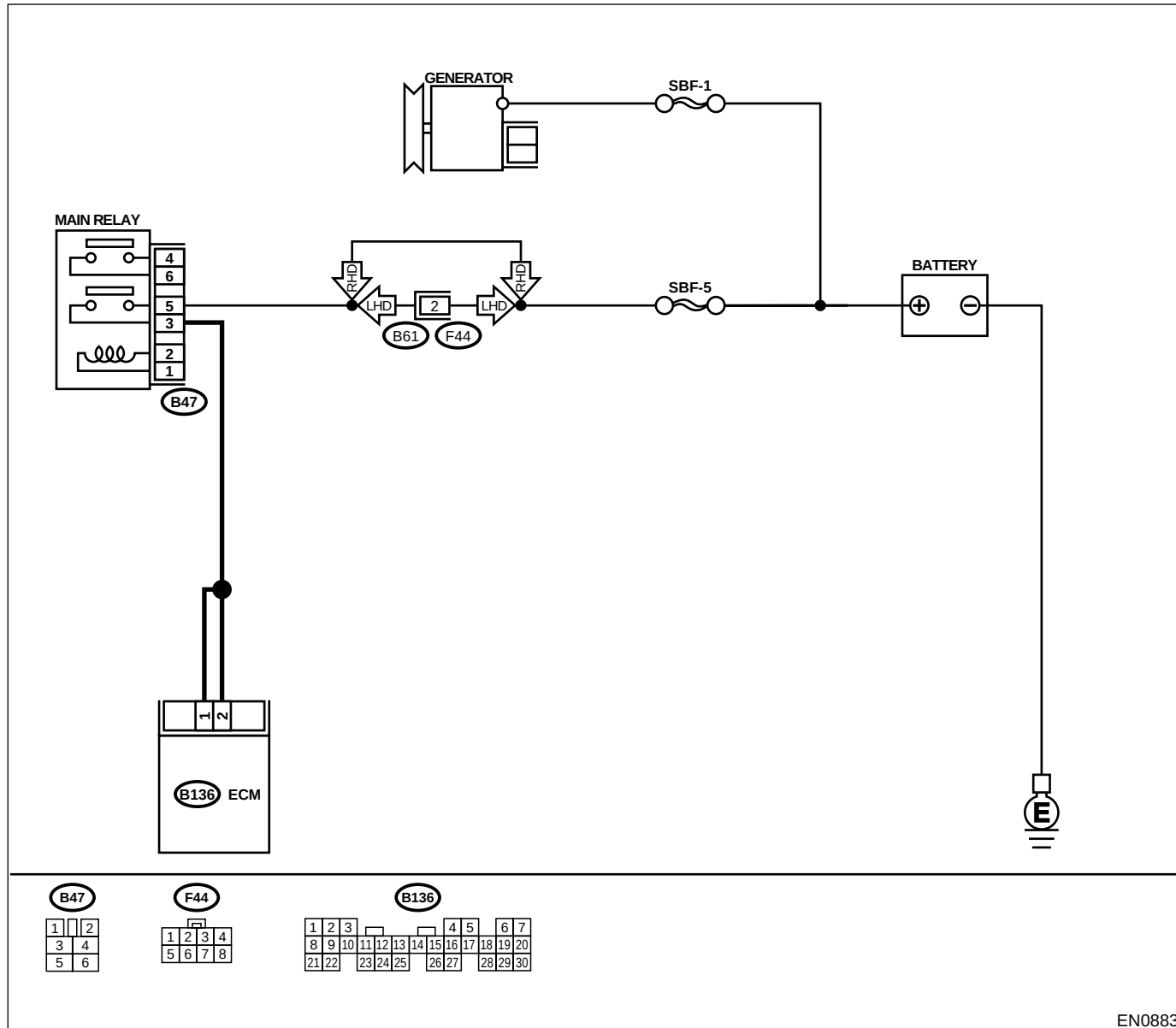
- **TROUBLE SYMPTOM:**

- Charge warning light comes on.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 voltage more than 16.2 V?	Go to step 2.	Repair generator. <Ref. to CS-20, General Diagnostic.>
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 voltage more than 16.2 V?	Go to step 3.	Repair generator. <Ref. to CS-20, General Diagnostic.>
3 CHECK BATTERY TERMINAL. Turn ignition switch to OFF.	Are the positive and negative battery terminals 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 voltage more than 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?	Repair connector.	Go to step 6.
6 CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN(SOHC)-45, Clear Memory Mode.> 3)Perform inspection mode. <Ref. to EN(SOHC)-42, Inspection Mode.> 4)Read out the trouble code. <Ref. to EN(SOHC)-41, Read Diagnostic Trouble Code.>	Is the same trouble code as in the current diagnosis still being output?	Replace generator.	Go to step 7.
7 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

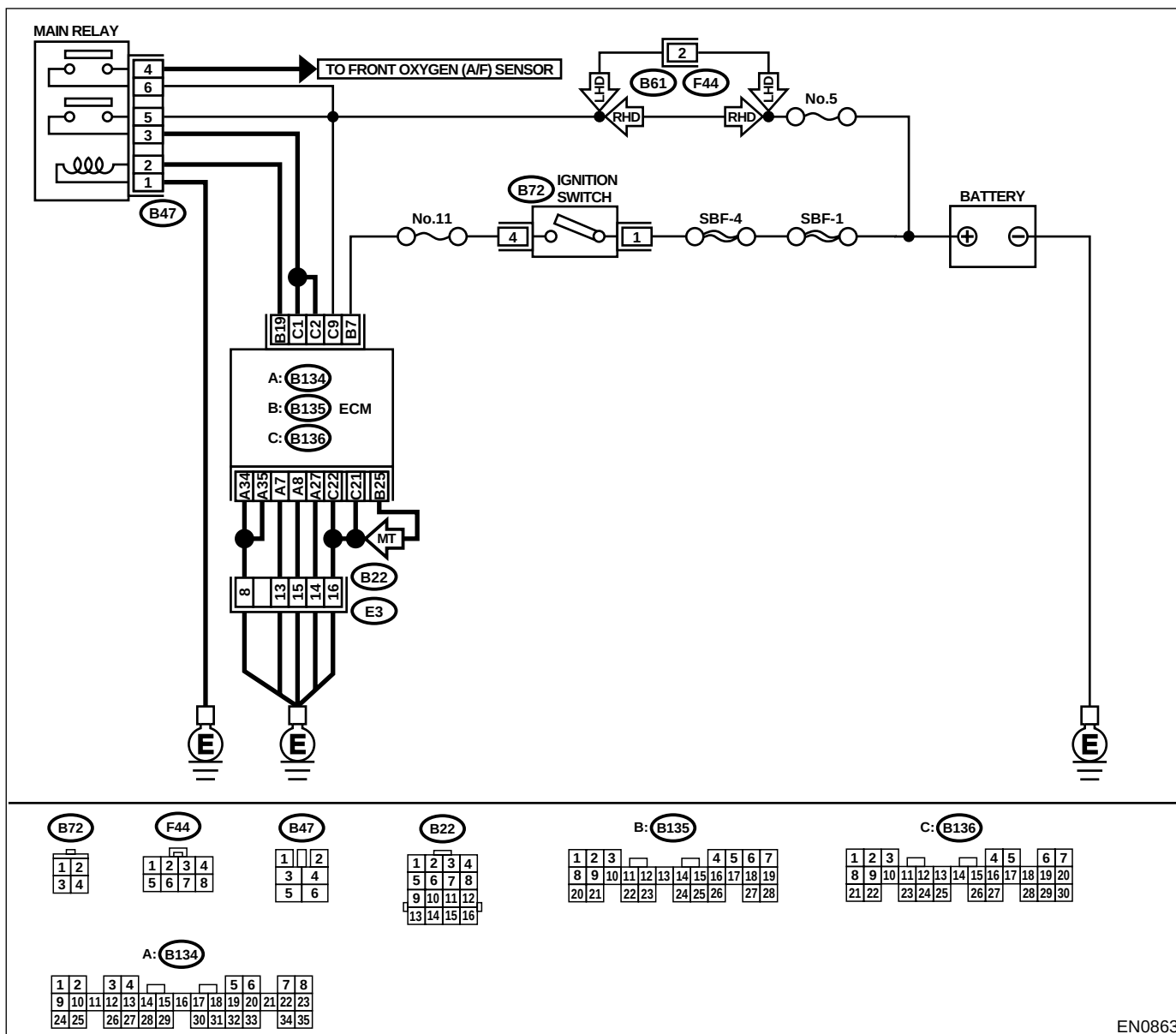
AY:DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Engine does not start.
 - Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0863

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0601?	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	It is not necessary to inspect DTC P0601.

AZ:DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —

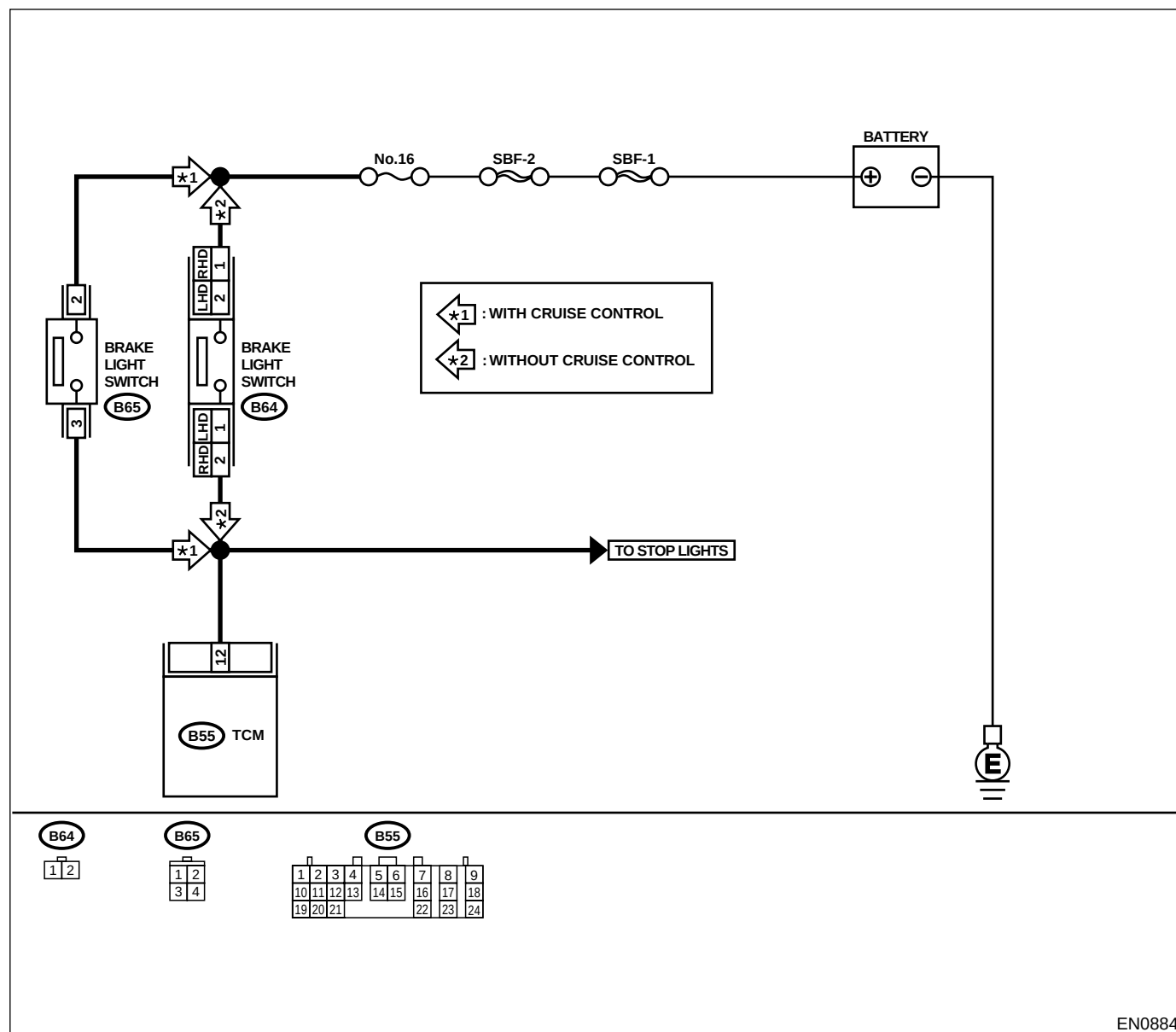
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0884

Step	Check	Yes	No
1	CHECK OPERATION OF BRAKE LIGHT.	Does brake light come on when depressing the brake pedal?	Go to step 2.
			Repair or replace brake light circuit.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 • LHD (B55) No. 24 — (B64) No.1: • RHD (B55) No. 24 — (B64) No. 2 • With cruise control (B55) No. 24 — (B65) No. 3	Is the resistance less than 1 Ω ?	Go to step 3.	Repair or replace harness and connector. NOTE: In this case, repair the following: • 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:	Is the resistance more than 1 M Ω ?	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 voltage less than 1 V when releasing the brake pedal?	Go to step 5.	Adjust or replace brake light switch. <Ref. to LI-31, STOP LIGHT SWITCH, INSPECTION, 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 voltage more than 10 V when depressing the brake pedal?	Go to step 6.	Adjust or replace brake light switch. <Ref. to LI-31, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6 CHECK POOR CONTACT. Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BA:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(SOHC)-221, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BB:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(SOHC)-221, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(SOHC)-221, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BD: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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC on display?	Inspect relevant DTC using “17. List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(SOHC)-81, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK THROTTLE POSITION SENSOR CIRCUIT. Check throttle position sensor circuit. <Ref. to AT-47, TROUBLE CODE 31 — THROTTLE POSITION SENSOR —, Diagnostic Procedure with Trouble Code.>	Is there any trouble in throttle position sensor circuit?	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-53, TROUBLE CODE 33 — FRONT VEHICLE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>	Is there any trouble in vehicle speed sensor 2 circuit?	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. <Ref. to AT-58, TROUBLE CODE 36 — TORQUE CONVERTER TURBINE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>	Is there any trouble in torque converter turbine speed sensor circuit?	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?	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?	Repair or replace automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

BE:DTC P0741 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC on display?	Inspect the relevant DTC using “17. List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(SOHC)-81, 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-90, TROUBLE CODE 77 — LOCK-UP DUTY SOLENOID —, Diagnostic Procedure with Trouble Code.>	Is there any trouble in lock-up duty solenoid circuit?	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-47, TROUBLE CODE 31 — THROTTLE POSITION SENSOR —, Diagnostic Procedure with Trouble Code.>	Is there any trouble in throttle position sensor circuit?	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-58, TROUBLE CODE 36 — TORQUE CONVERTER TURBINE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>	Is there any trouble in torque converter turbine speed sensor circuit?	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-40, TROUBLE CODE 11 — ENGINE SPEED SIGNAL —, Diagnostic Procedure with Trouble Code.>	Is there any trouble in engine speed input circuit?	Repair or replace engine speed input circuit.	Go to step 6.
6 CHECK INHIBITOR SWITCH CIRCUIT. Check inhibitor switch circuit. <Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-trouble Code.>	Is there any trouble in inhibitor switch circuit?	Repair or replace inhibitor switch circuit.	Go to step 7.
7 CHECK BRAKE LIGHT SWITCH CIRCUIT. Check brake light switch circuit. <Ref. to AT-106, CHECK BRAKE SWITCH., Diagnostic Procedure for No-trouble Code.>	Is there any trouble in brake light switch circuit?	Repair or replace brake light switch circuit.	Go to step 8.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK ATF TEMPERATURE SENSOR CIRCUIT. Check ATF temperature sensor circuit. <Ref. to AT-42, TROUBLE CODE 27 — ATF TEMPERATURE SENSOR —, Diagnostic Procedure with Trouble Code.>	Is there any trouble in ATF temperature sensor circuit?	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?	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?	Repair or replace automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

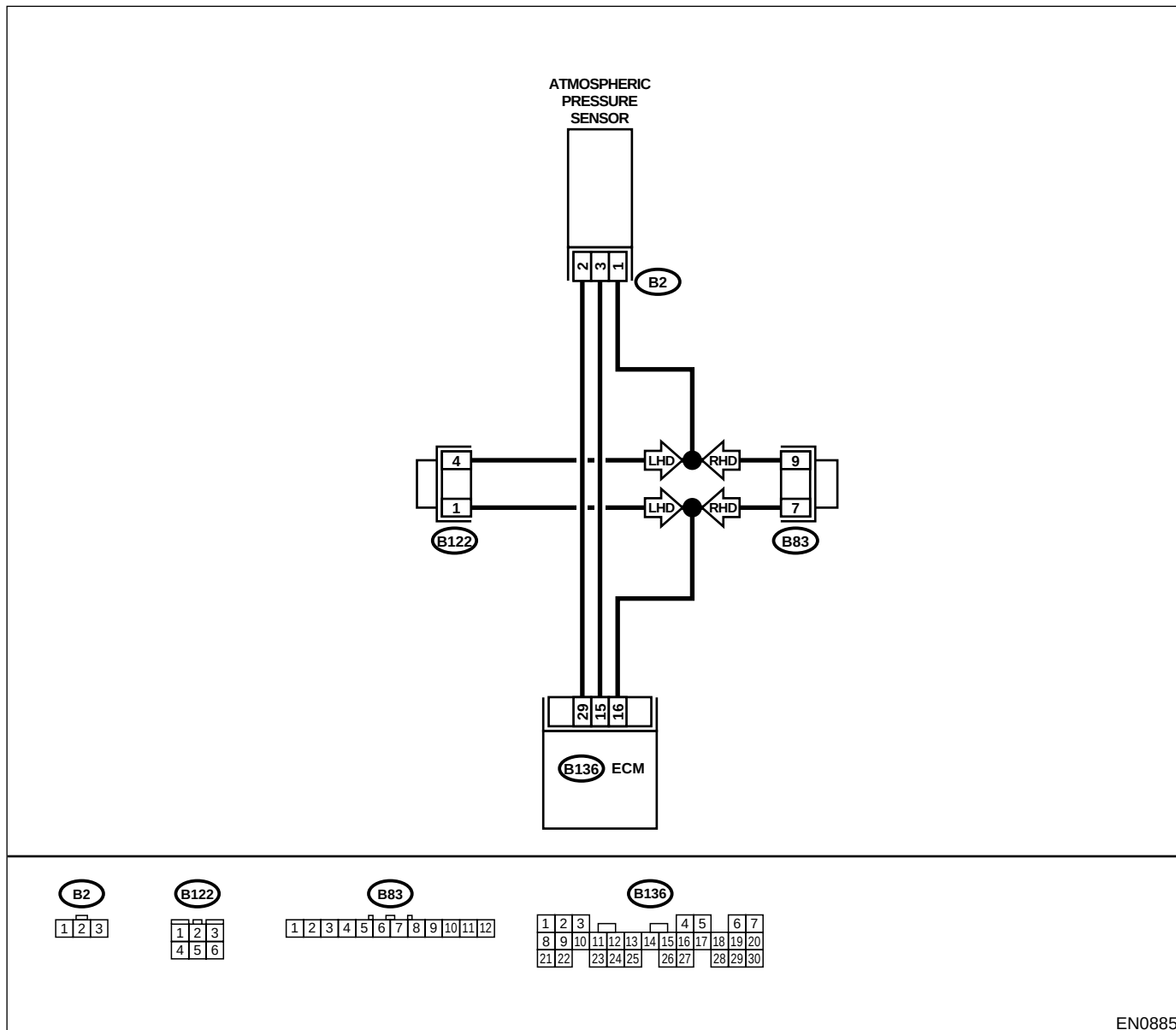
BF:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0885

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 0 kPa (0 mmHg, 0 inHg)?	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact in ECM and pressure sensor connector.	Is there poor contact in ECM or pressure sensor connector?	Repair poor contact in ECM or atmospheric pressure sensor connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 5.	Go to step 4.
4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with your Subaru distributor. 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 (B136) No. 29 (+) — Chassis ground (-):	Is the voltage less than 0.2 V?	Go to step 7.	Go to step 6.
6 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.>	Does the value change more than 0 kPa (0 mmHg, 0 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?	Repair poor contact in ECM connector.	Go to step 7.
7 CHECK HARNESS BETWEEN ECM AND ATMOSPHERIC PRESSURE SENSOR CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from atmospheric pressure sensor. 3)Turn ignition switch to ON. 4)Measure voltage between atmospheric pressure sensor connector and engine ground. Connector & terminal (B2) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and atmospheric pressure sensor connector • Poor contact in joint connector (B83)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK HARNESS BETWEEN ECM AND ATMOSPHERIC 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 (B136) No. 16 — (B2) No. 1:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure sensor connector
9 CHECK HARNESS BETWEEN ECM AND ATMOSPHERIC PRESSURE SENSOR CONNECTOR. Measure resistance of harness between pressure sensor connector and engine ground. Connector & terminal (B2) No. 2 — Engine ground:	Is the resistance more than 500 k Ω ?	Go to step 10.	Repair ground short circuit in harness between ECM and pressure sensor connector.
10 CHECK POOR CONTACT. Check poor contact in pressure sensor connector.	Is there poor contact in pressure sensor connector?	Repair poor contact in atmospheric pressure sensor connector.	Replace atmospheric pressure sensor. <Ref. to FU(SOHC)-36, Atmospheric Pressure Sensor.>

ENGINE (DIAGNOSTICS)

- Immediately at fault recognition

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

The diagram illustrates the engine control system's wiring. At the top, the **ATMOSPHERIC PRESSURE SENSOR** is connected to the **ECM (B136)** via a 3-pin connector (pins 2, 3, 1) and a 3-pin connector (pins 29, 15, 16). The **ECM** is also connected to the **B122** solenoid (pins 4, 1) and the **B83** solenoid (pins 9, 7). The **B122** and **B83** solenoids are connected to the **ECM** via a 3-pin connector (pins 4, 1) and a 3-pin connector (pins 9, 7). The **B122** and **B83** solenoids are also connected to the **ECM** via a 3-pin connector (pins 4, 1) and a 3-pin connector (pins 9, 7). The **B122** and **B83** solenoids are connected to the **ECM** via a 3-pin connector (pins 4, 1) and a 3-pin connector (pins 9, 7).

Legend:

- B2:** 1 2 3
- B122:** 1 2 3
4 5 6
- B83:** 1 2 3 4 5 6 7 8 9 10 11 12
- 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

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 140 kPa (1,050 mmHg, 41.34 inHg)?	Go to step 10.	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with your Subaru distributor. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 29 (+) — Chassis ground (-):	Is the voltage less than 0.2 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.>	Does the value change more than 0 kPa (0 mmHg, 0 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?	Repair poor contact in ECM connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from atmospheric pressure sensor. 3)Turn ignition switch to ON. 4)Measure voltage between atmospheric pressure sensor connector and engine ground. Connector & terminal (B2) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure sensor connector • Poor contact in joint connector (B83)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 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 (B136) No. 29 — (B2) No. 2:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure sensor connector
8 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. Measure resistance of harness between ECM and pressure sensor connector. Connector & terminal (B136) No. 16 — (B2) No. 1:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure sensor connector • Poor contact in joint connector (B83), (B122)
9 CHECK POOR CONTACT. Check poor contact in pressure sensor connector.	Is there poor contact in pressure sensor connector?	Repair poor contact in atmospheric pressure sensor connector.	Replace atmospheric pressure sensor. <Ref. to FU(SOHC)-36, Atmospheric Pressure Sensor.>
10 CHECK CURRENT DATA. 1) Turn ignition switch to OFF. 2) Disconnect connector from atmospheric pressure sensor. 3) Turn ignition switch to ON. 4) Read data of intake manifold absolute pressure signal using Subaru select monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 140 kPa (1,050 mmHg, 41.34 inHg)?	Repair battery short circuit in harness between ECM and atmospheric pressure sensor connector.	Replace atmospheric pressure sensor. <Ref. to FU(SOHC)-36, Atmospheric Pressure Sensor.>

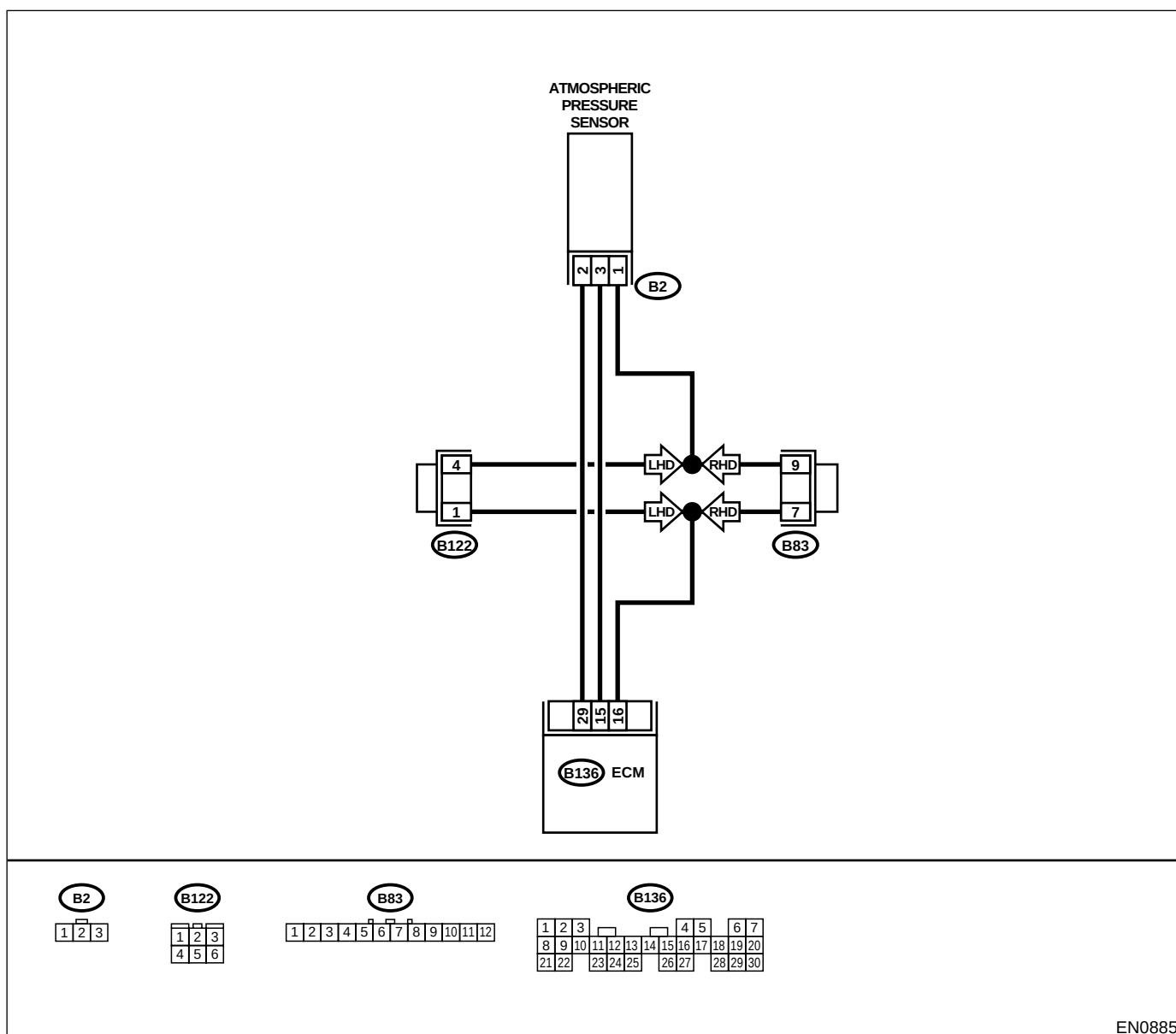
BH:DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0885

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. NOTE: In this case, it is not necessary to inspect DTC P0106.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P1110 or P1111?	Inspect DTC P0106, P0107, P0108, P1110 or P1111 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK ATMOSPHERIC PRESSURE SENSOR FILTER. 1)Turn ignition switch to OFF. 2)Disconnect connector from atmospheric pressure sensor. 3)Remove atmospheric pressure sensor. 4)Check atmospheric pressure sensor filter.	Is atmospheric pressure sensor filter non-functional? (Check for contamination, damage, water leakage, etc.)	Replace atmospheric pressure sensor filter.	Go to step 3.
3 CHECK CURRENT DATA. 1)Turn ignition switch to ON. 2)Read data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value between 73.3 kPa (550 mmHg, 21.65 inHg) and 106.6 kPa (800 mmHg, 31.50 inHg)?	Replace atmospheric pressure sensor. <Ref. to FU(SOHC)-36, Atmospheric Pressure Sensor.>	Replace intake air temperature and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

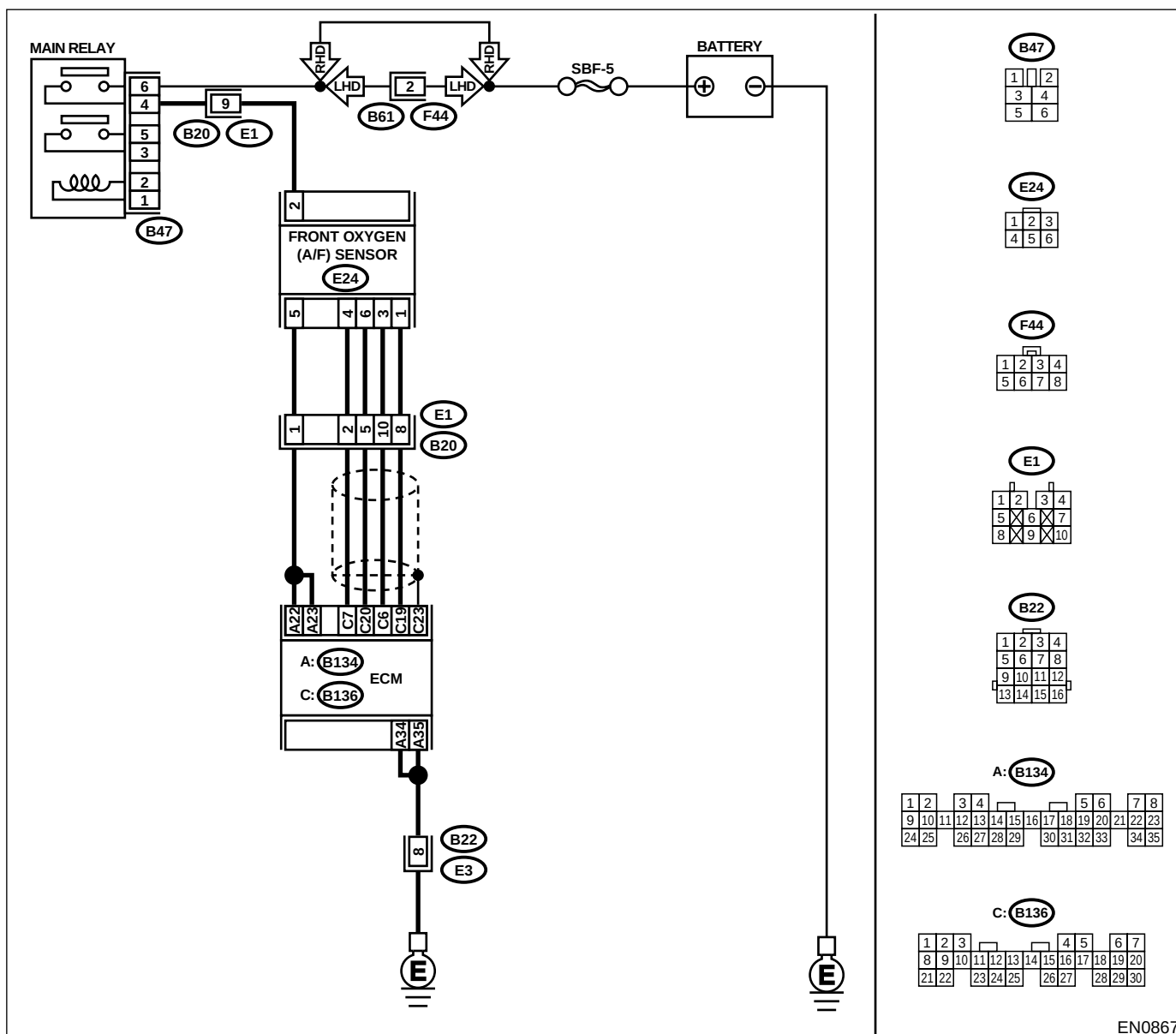
BI: DTC P1137 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0867

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131, P0132, P0031 or P0032?	Inspect DTC P0131, P0132, P0031 or P0032 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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 (160°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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 0.85 and equal to less than 1.15 in idling?	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. 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.	Is the value more than 1.1 for a moment?	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. 6 — (E24) No. 3: (B136) No. 7 — (E24) No. 4: (B136) No. 19 — (E24) No. 1: (B136) No. 20 — (E24) No. 6:	Is the resistance less than 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	Check	Yes	No
5 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. Measure resistance between ECM and chassis ground. Connector & terminals (B136) No. 6 — Chassis ground: (B136) No. 7 — Chassis ground: (B136) No. 19 — Chassis ground: (B136) No. 20 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 6.	Repair ground short circuit between ECM and front oxygen (A/F) sensor.
6 CHECK EXHAUST SYSTEM. Check exhaust system parts. 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	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(SOHC)-44, Front Oxygen (A/F) Sensor.>

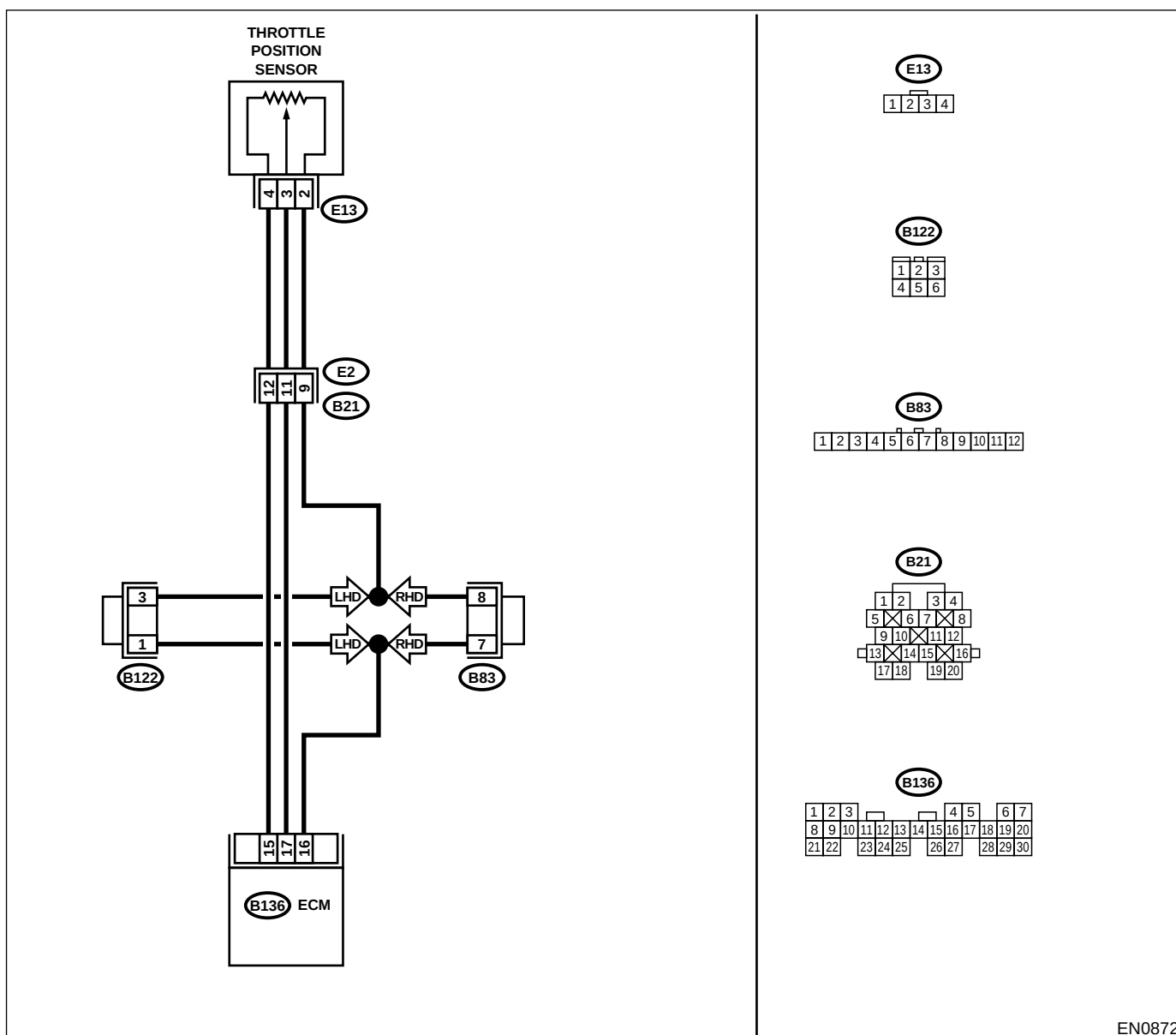
BJ:DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0122 or P0123?	Inspect DTC P0122 or P0123 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1142.	Replace throttle position sensor. <Ref. to FU(SOHC)-32, Throttle Position Sensor.>

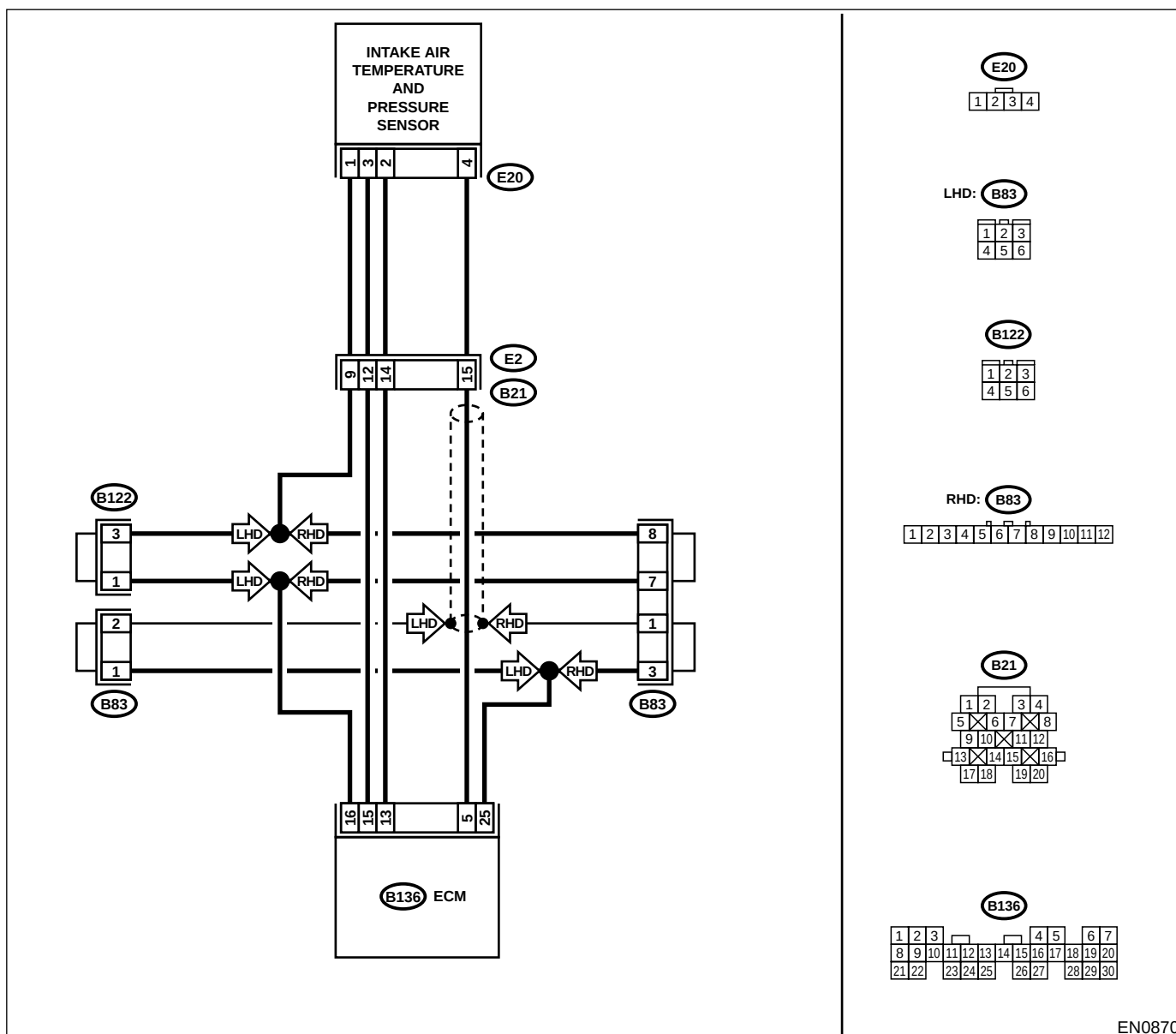
**BK:DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE
PROBLEM (HIGH INPUT) —**

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. NOTE: In this case, it is not necessary to inspect DTC P0106.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0107, P0108 or P1112?	Inspect DTC P0107, P0108 or P1112 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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?	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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification: •Intake manifold absolute pressure <i>Ignition ON</i> 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) <i>Idling</i> 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)	Is the value within the specifications?	Go to step 4.	Replace intake air temperature sensor and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>
4 CHECK THROTTLE POSITION. Read data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is throttle positioning ratio equal to or less than 5% when throttle is fully closed?	Go to step 5.	Adjust or replace throttle position sensor. <Ref. to FU(SOHC)-32, Throttle Position Sensor.>
5 CHECK THROTTLE POSITION.	Is throttle positioning ratio equal to or more than 85% when throttle is fully open?	Replace intake air temperature and pressure sensor. <Ref. to FU(SOHC)-35, Intake Air Temperature and Pressure Sensor.>	Replace throttle position sensor. <Ref. to FU(SOHC)-32, Throttle Position Sensor.>

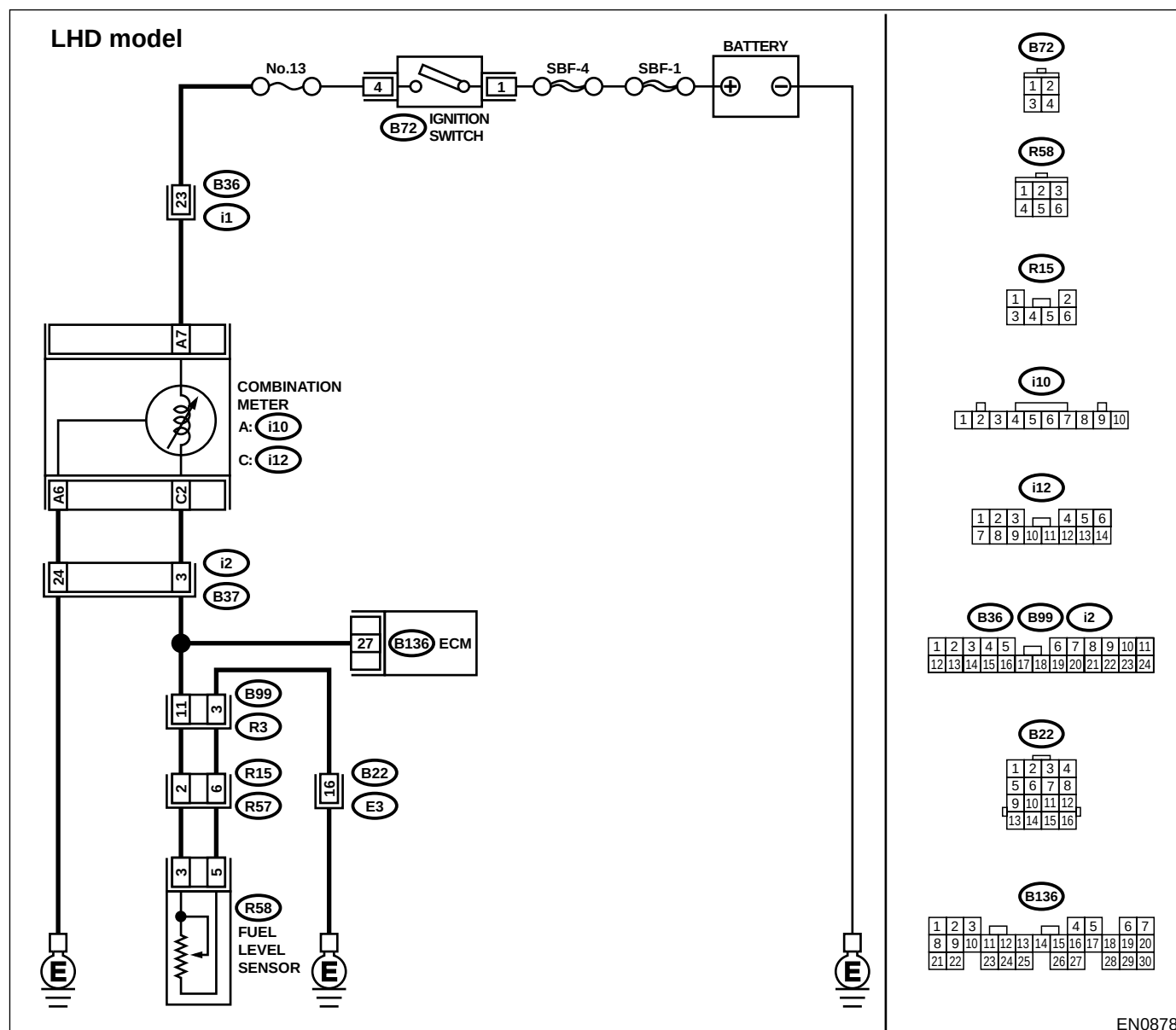
BL:DTC P1442 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM 2 —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0878

ENGINE (DIAGNOSTICS)



EN(SOHC)-243

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BM:DTC P1480 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Radiator fan does not operate properly.
 - Overheating

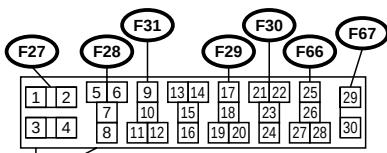
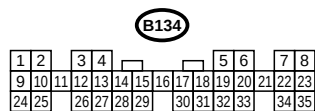
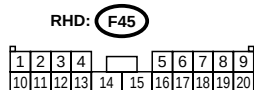
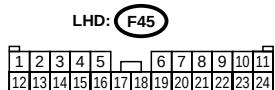
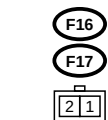
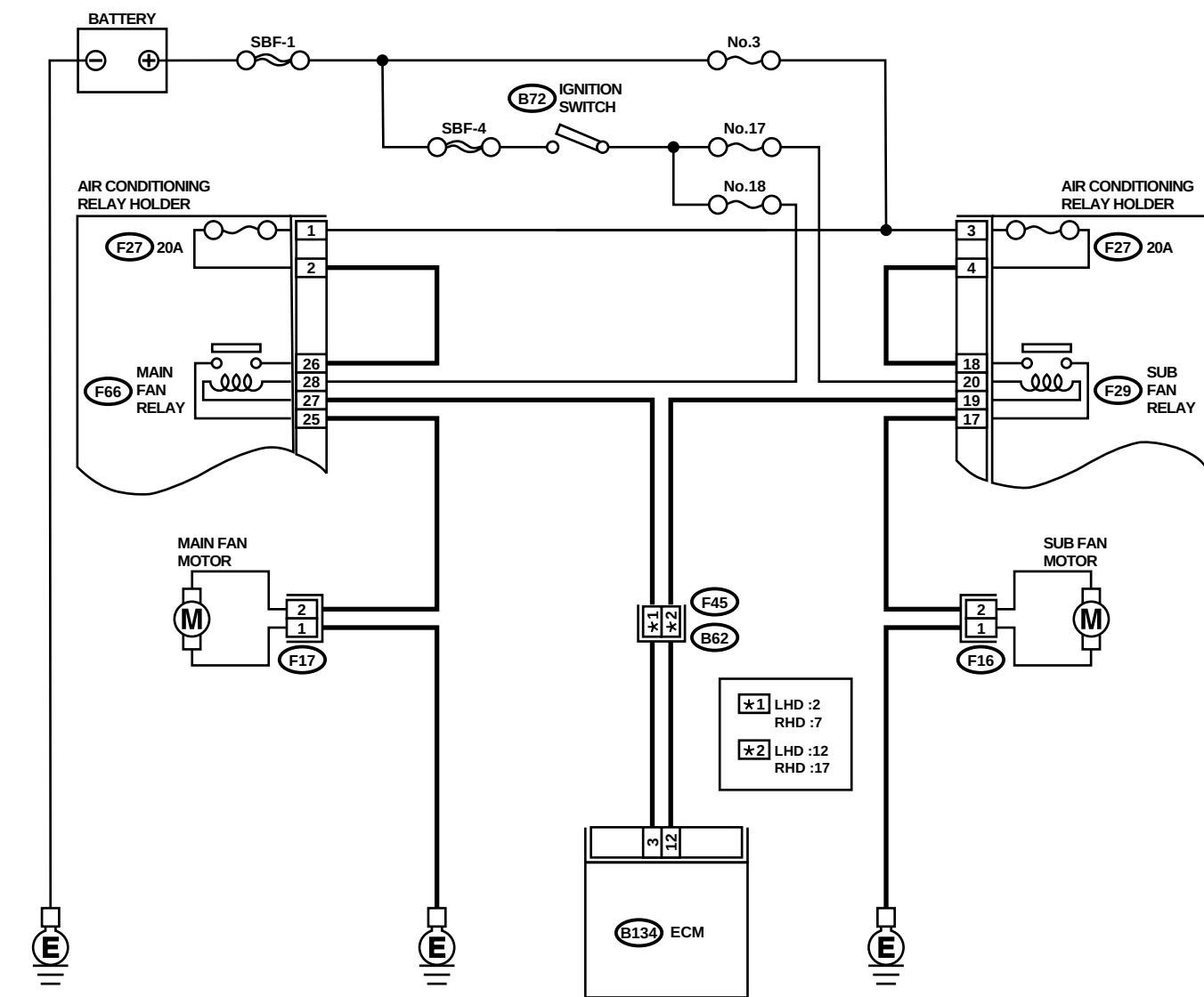
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN0880

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 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. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-46, Compulsory Valve Operation Check Mode.> Connector & terminal (B134) No. 3 (+) — Chassis ground (-):	Does voltage change between 0 and 10 V?	Even if MIL 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.
2 CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT. 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. Connector & terminal (B134) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in radiator fan relay control circuit. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Go to step 3.
3 CHECK MAIN FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove main fan relay. 3) Measure resistance between main fan relay terminals. Terminal No. 26 — No. 25:	Is the resistance less than 1 Ω ?	Replace main fan relay and ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Go to step 4.
4 CHECK SUB FAN RELAY. 1) Remove sub fan relay. 2) Measure resistance between sub fan relay terminals. Terminal No. 18 — No. 17	Is the resistance less than 1 Ω ?	Replace sub fan relay and ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>

BN:DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

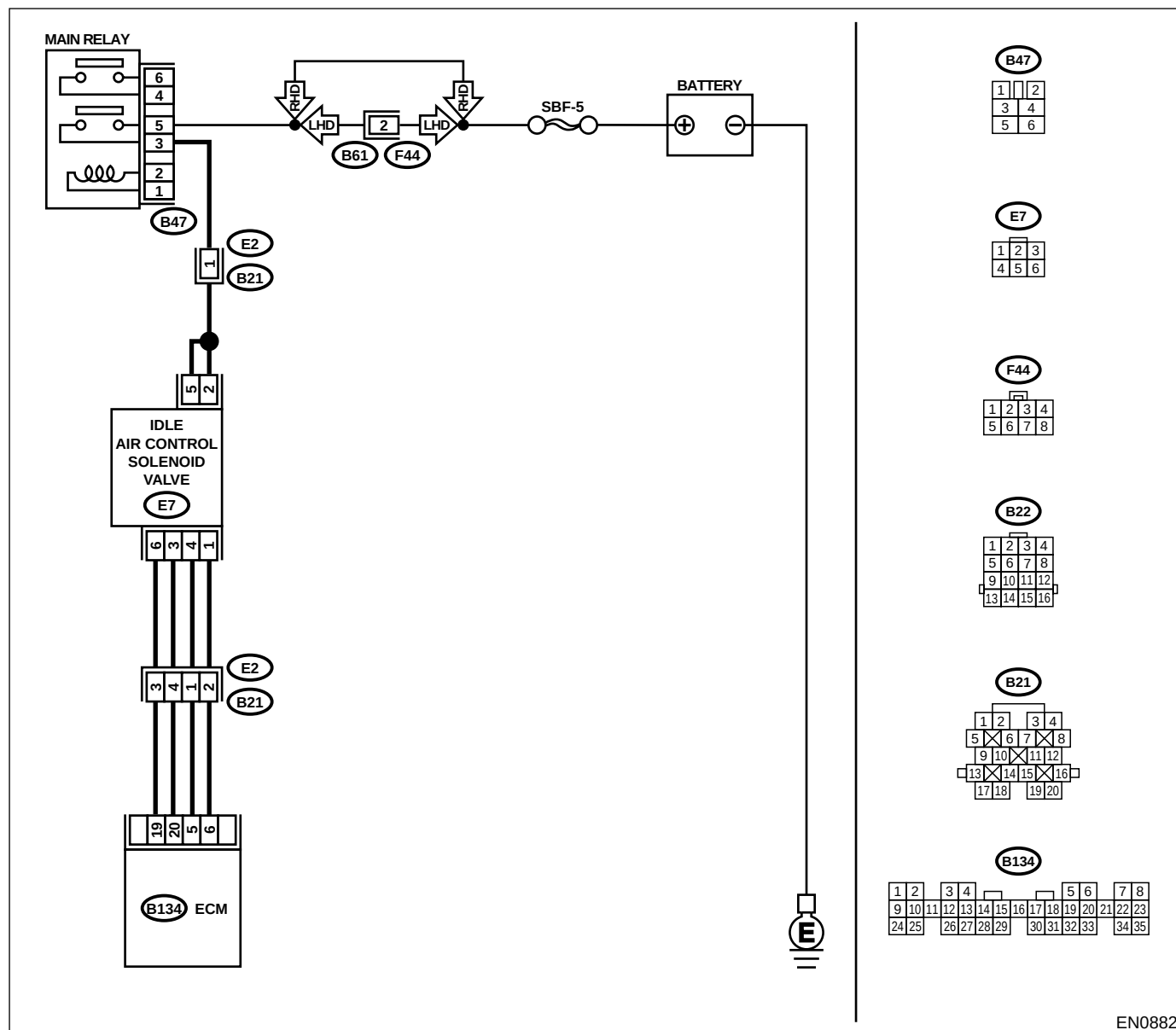
• **TROUBLE SYMPTOM:**

- 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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0882

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517?	Inspect DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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?	Repair air suction and leaks.	Go to step 3.
3 CHECK THROTTLE CABLE.	Does throttle cable have play for adjustment?	Go to step 4.	Adjust throttle cable. <Ref. to SP-9, INSTALLATION, 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(SOHC)-37, 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?	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(SOHC)-37, Idle Air Control Solenoid Valve.>

**BO:DTC P1510 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT
LOW INPUT —**

NOTE:

For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(SOHC)-252, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**BP:DTC P1511 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT
HIGH INPUT —**

NOTE:

For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(SOHC)-256, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**BQ:DTC P1512 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT
LOW INPUT —**

NOTE:

For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(SOHC)-252, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**BR:DTC P1513 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT
HIGH INPUT —**

NOTE:

For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(SOHC)-256, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**BS:DTC P1514 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT
LOW INPUT —**

NOTE:

For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(SOHC)-252, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**BT:DTC P1515 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT
HIGH INPUT —**

NOTE:

For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(SOHC)-256, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

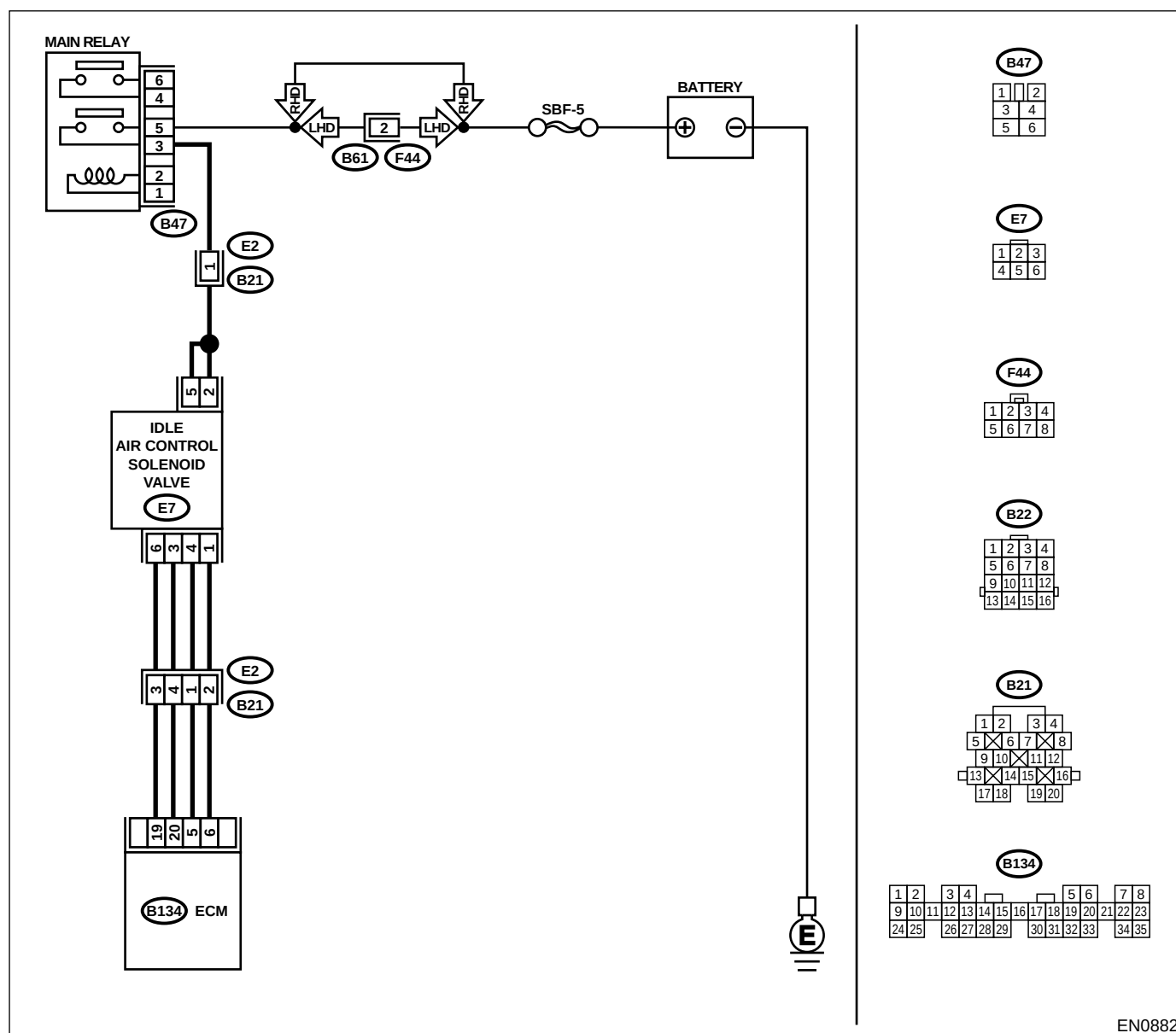
BU:DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 (-):	Is the voltage more than 10 V?	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector (B22)
2 CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE. Measure voltage between idle air control solenoid valve connector and engine ground. Connector & terminal (E7) No. 5 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector (B22)
3 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 DTC P1510; (B134) No. 5 — (E7) No. 4: DTC P1512; (B134) No. 6 — (E7) No. 1: DTC P1514; (B134) No. 19 — (E7) No. 6: DTC P1516; (B134) No. 20 — (E7) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector (B21)
4 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 DTC P1510; (B134) No. 5 — Chassis ground: DTC P1512; (B134) No. 6 — Chassis ground: DTC P1514; (B134) No. 19 — Chassis ground: DTC P1516; (B134) No. 20 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step 5.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
5	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?	Repair poor contact in ECM connector or idle air control solenoid valve connector.	Replace idle air control solenoid valve. <Ref. to FU(SOHC)-37, Idle Air Control Solenoid Valve.>

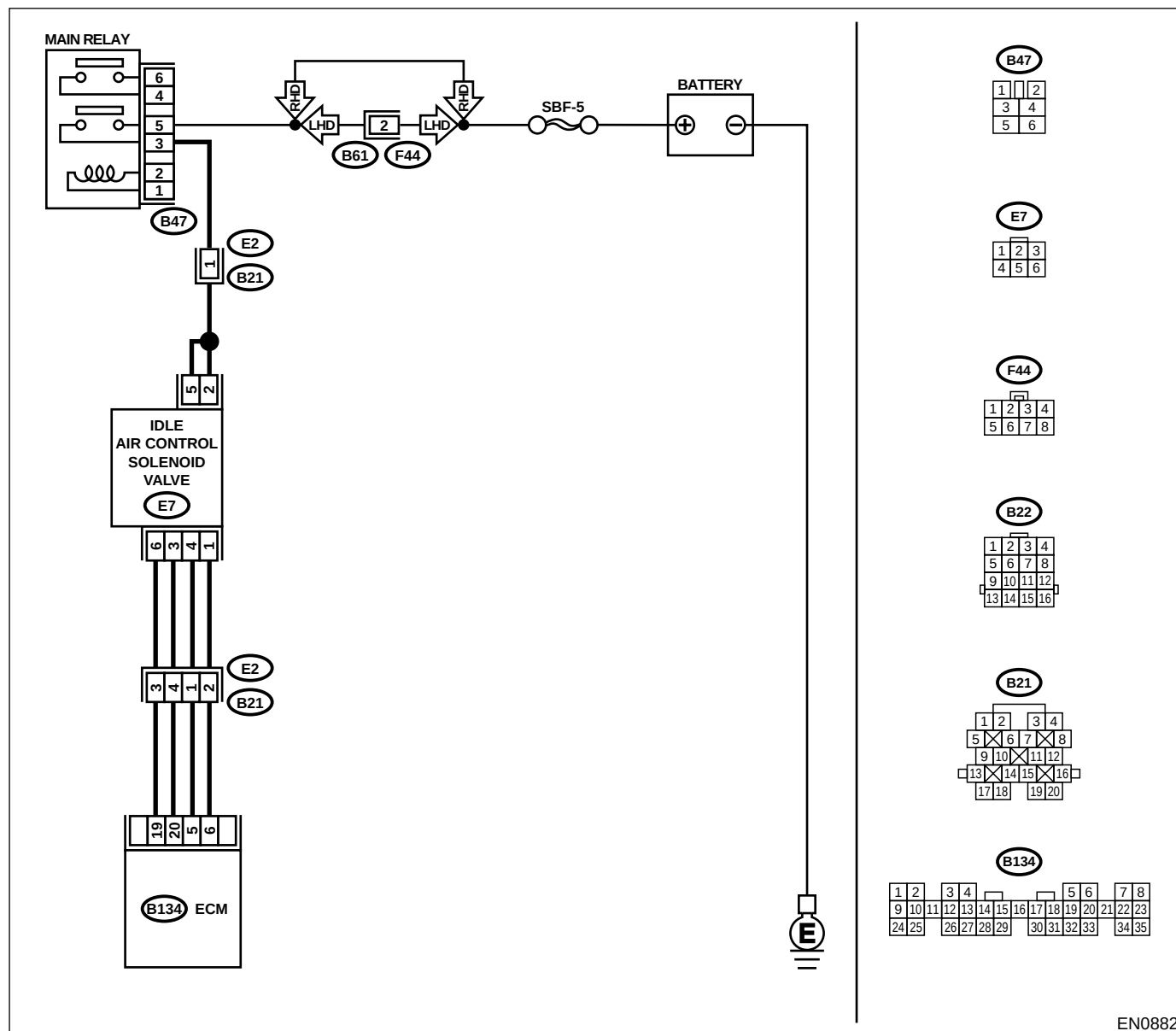
BV:DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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?	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 resistance less than 5 Ω ?	Go to step 3 .	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM connector and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector (B22)
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. 5 (+) — Chassis ground (-): DTC P1513; (B134) No. 6 (+) — Chassis ground (-): DTC P1515; (B134) No. 19 (+) — Chassis ground (-): DTC P1517; (B134) No. 20 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>

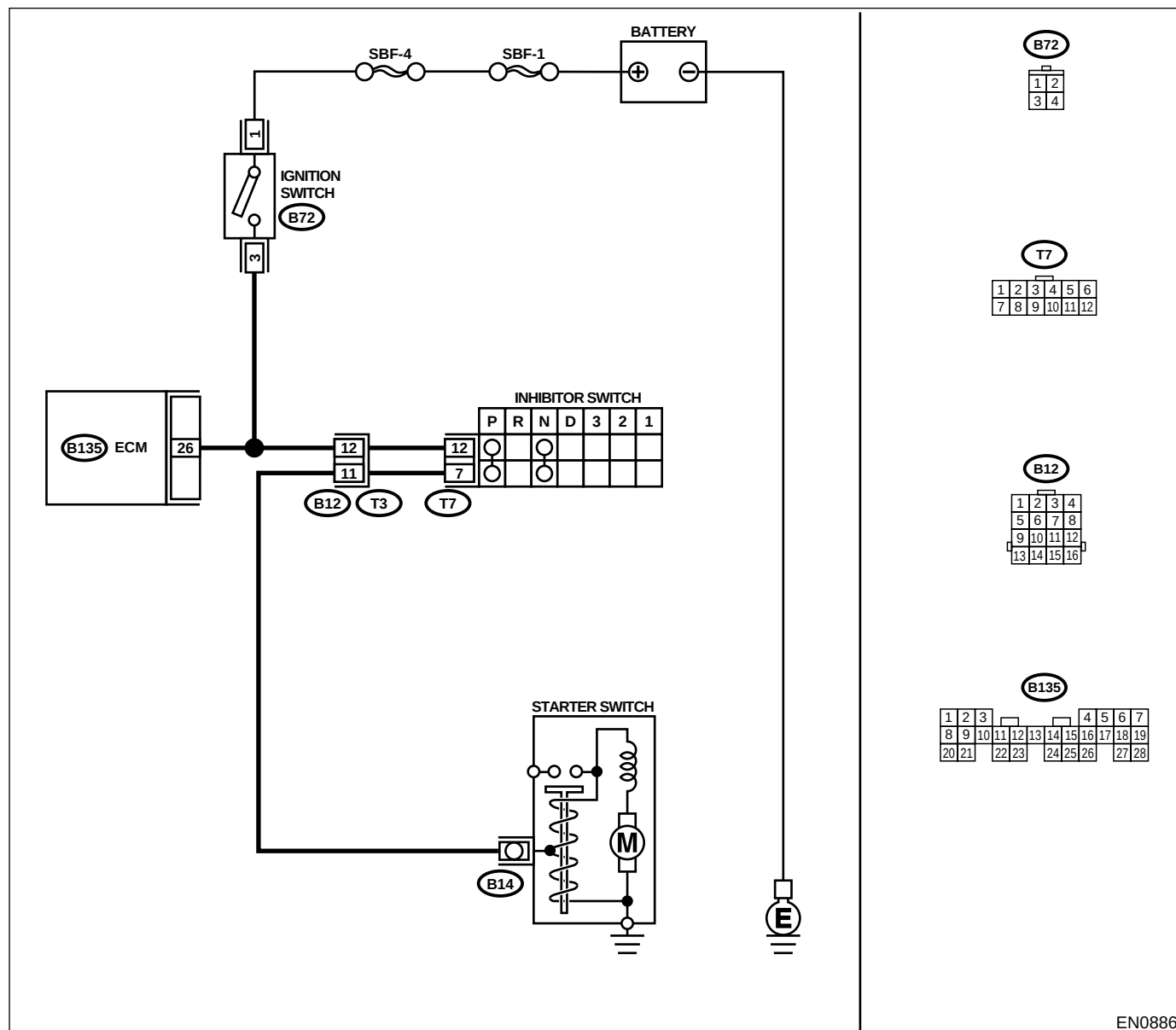
BW:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0886

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF STARTER MOTOR. NOTE: Place the inhibitor switch in the "P" or "N" position.	Does starter motor operate when ignition switch to "ST"?	Repair harness and connector. NOTE: In this case, repair the following: • 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(SOHC)-62, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

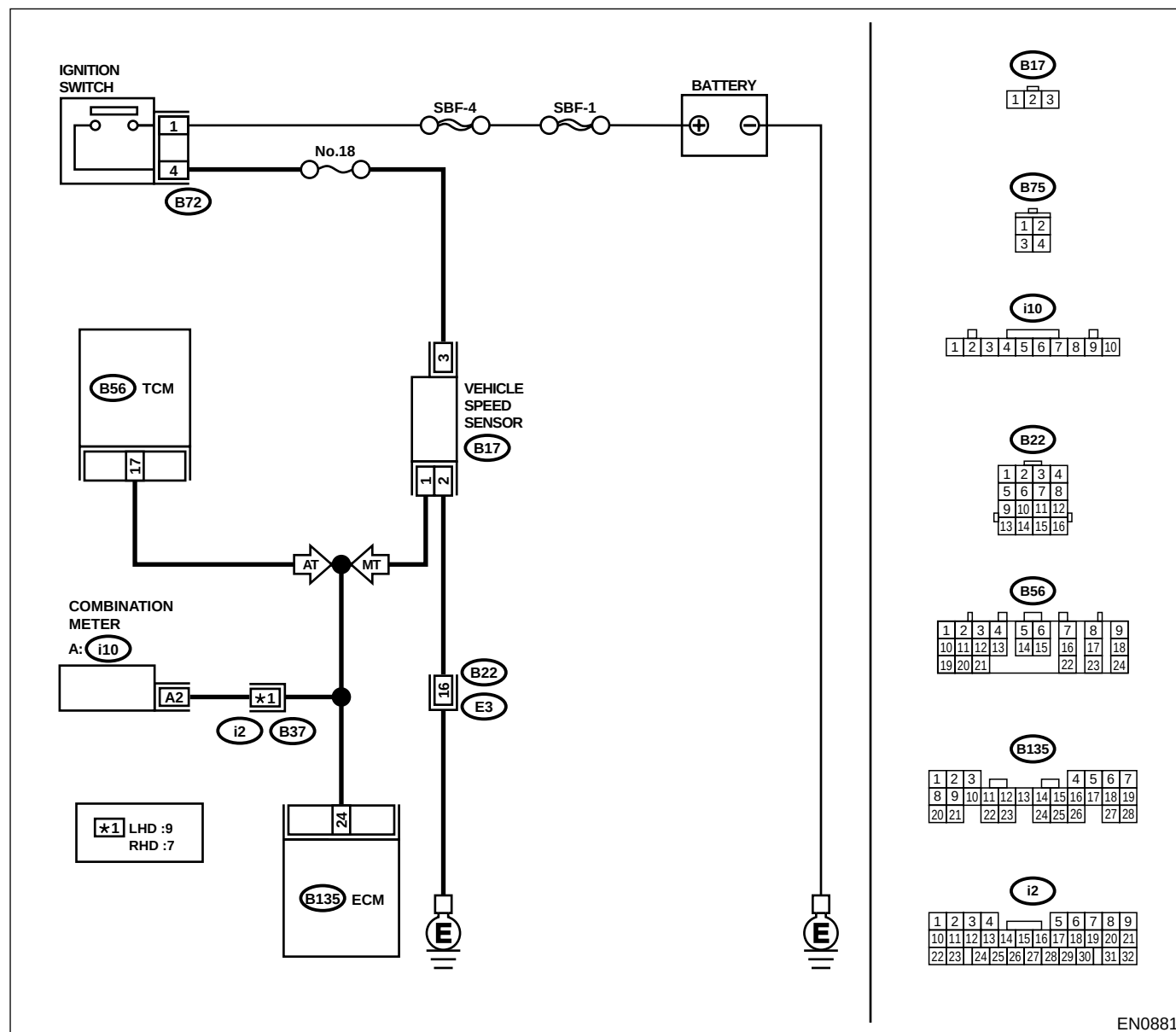
BX:DTC P1540 — VEHICLE SPEED SENSOR MALFUNCTION 2 —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0881

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK DTC P0720 ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to AT-53, TROUBLE CODE 33 — FRONT VEHICLE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>	Go to step 2.
2 CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does speedometer operate normally?	Go to step 3.	Check speedometer and vehicle speed sensor. <Ref. to IDI-21, Speedometer.>
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 (B135) No. 24 — (i10) No. 2:	Is the resistance less than 10 Ω ?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • 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 (i2)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BY:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

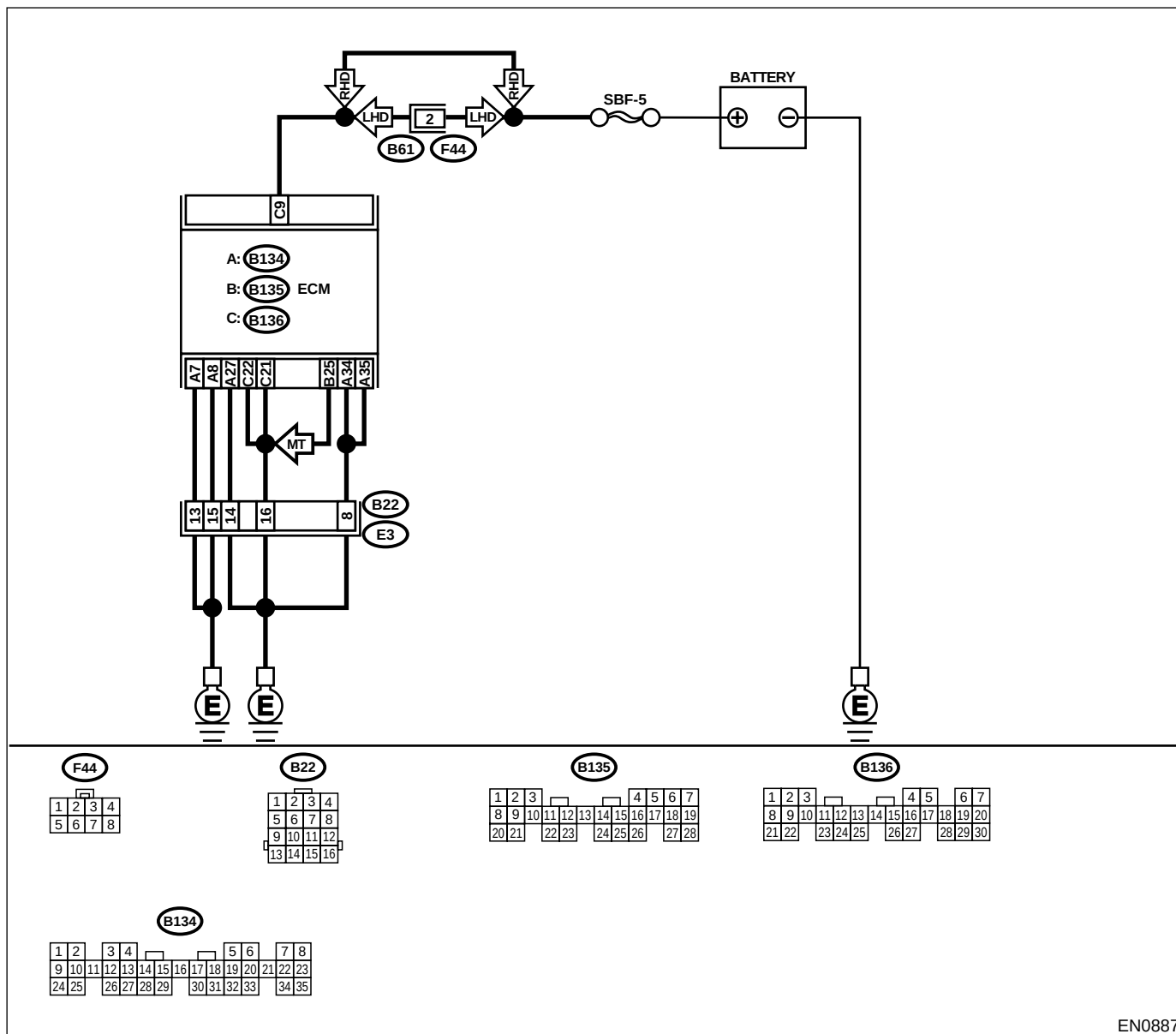
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0887

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 9 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step 2.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (B136) No. 9 — Chassis ground:	Is the resistance less than 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?	Replace fuse.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

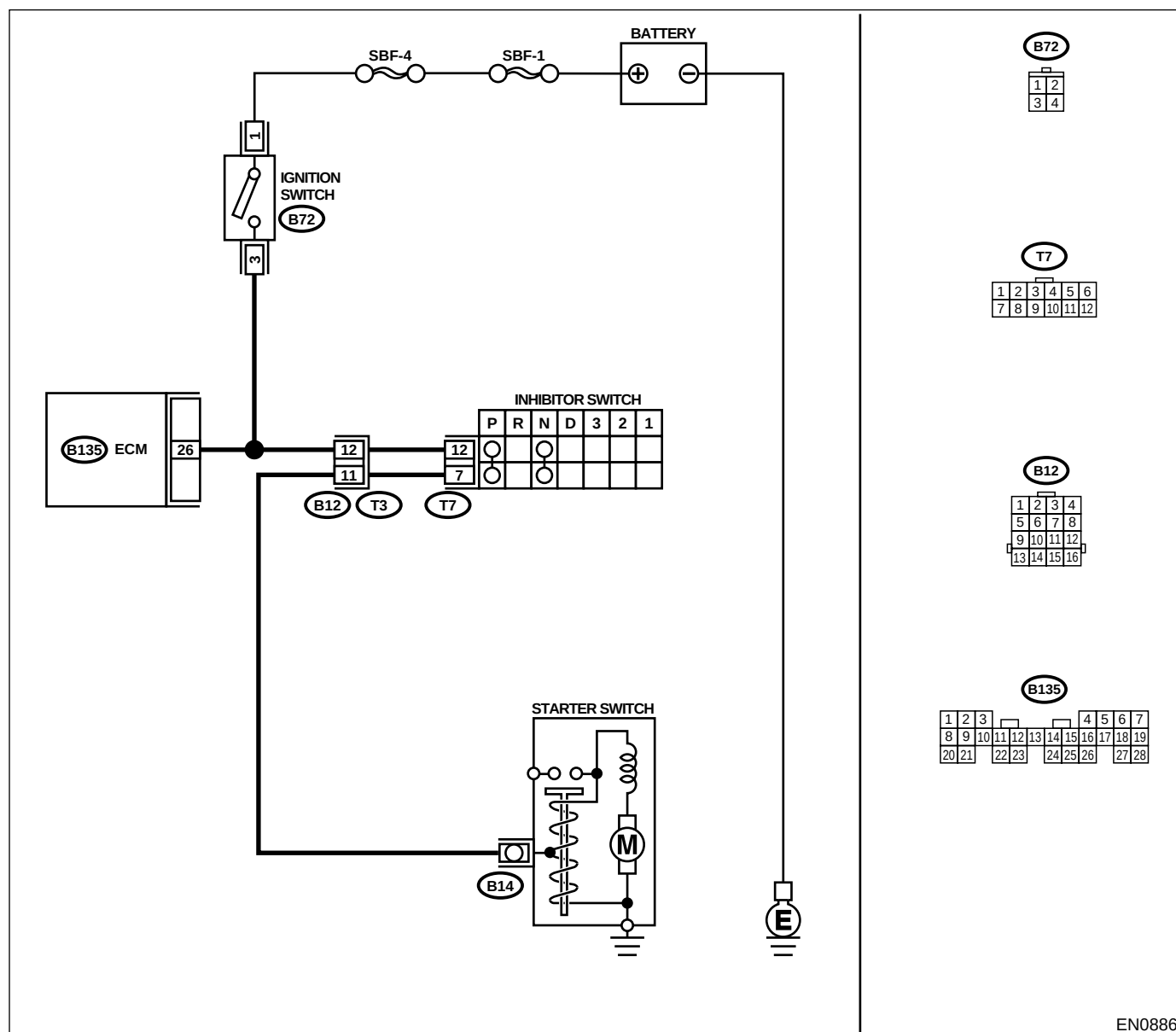
BZ:DTC P1590 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT (AT MODEL) —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0886

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK DTC P0705 ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0705?	Inspect DTC P0705 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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 selector lever "N" and "P" positions. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Go to step 5.
3 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):	Is the voltage between 4.5 and 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?	Repair poor contact in ECM connector.	Contact with your 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 (B135) No. 26 (+) — Chassis ground (-):	Is the voltage more than 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 (B135) No. 26 — (T7) No. 12:	Is the resistance less than 1 Ω?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • 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

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 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 resistance less than 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: • 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
8 CHECK INHIBITOR SWITCH. Measure resistance between inhibitor switch connector receptacle's terminals in selector lever "N" and "P" positions. Terminals No. 7 — No. 12:	Is the resistance less than 1 Ω ?	Go to step 9.	Replace inhibitor switch. <Ref. to AT-28, Inhibitor Switch.>
9 CHECK SELECTOR CABLE CONNECTION.	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-10, INSPECTION, Select Cable.>	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

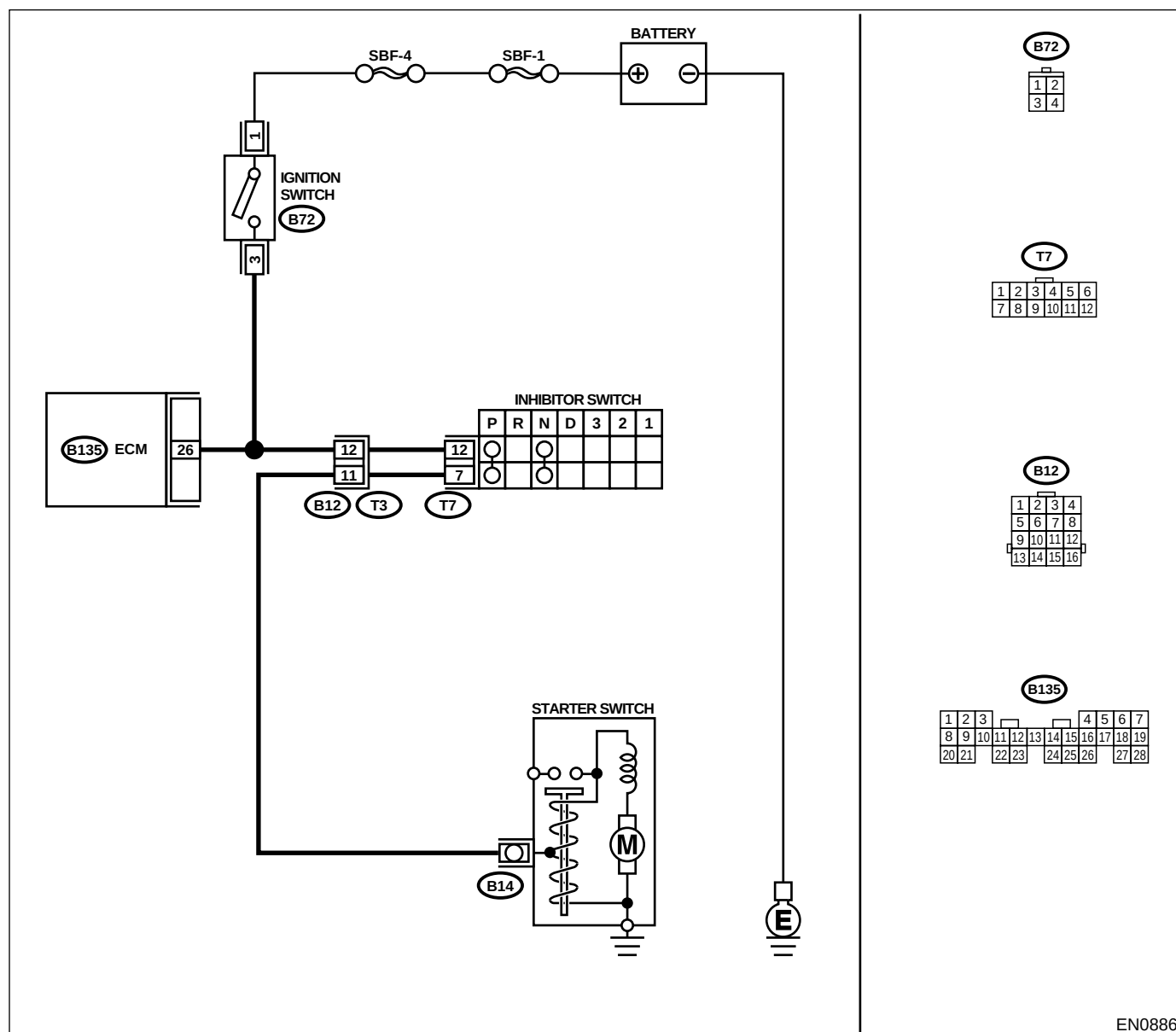
CA:DTC P1591 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (AT MODEL) —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK DTC P0705 ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0705?	Inspect DTC P0705 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-81, 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 (B135) No. 26 (+) — Chassis ground (-):	Is the voltage between 4.5 and 5.5 V at except "N" and "P" positions?	Even if MIL 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 (B135) No. 26 — Chassis ground:	Is the resistance less than 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 resistance less than 10 Ω ?	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.	Go to step 5.
5 CHECK INHIBITOR SWITCH. Measure resistance between inhibitor switch connector receptacle's terminals in selector lever except for "N" position. Terminals No. 7 — No. 12:	Is the resistance more than 1 M Ω at except "N" and "P" positions?	Go to step 6.	Replace inhibitor switch. <Ref. to AT-28, Inhibitor Switch.>
6 CHECK SELECTOR CABLE CONNECTION.	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-10, INSPECTION, Select Cable.>	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

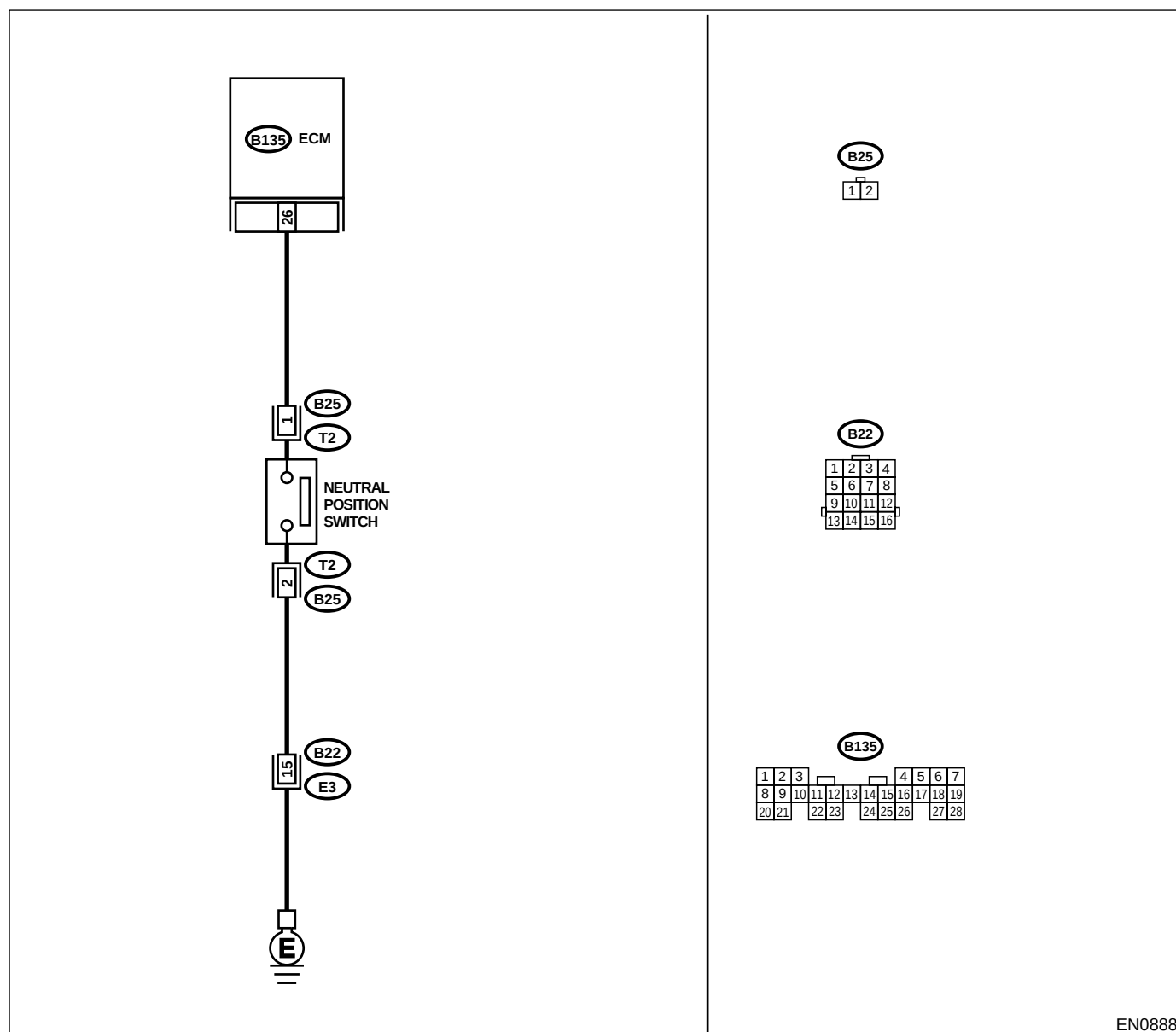
CB:DTC P1592 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (MT MODEL) —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):	Is the voltage more than 10V in neutral position?	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):	Is the voltage less than 1V in other position?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is the poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with your distributor.
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:	Is the resistance more than 1M Ω in neutral position?	Go to step 5.	Repair short circuit in transmission harness or replace neutral position switch.
5 CHECK NEUTRAL POSITION SWITCH. Measure resistance between transmission harness connector terminals.	Is the resistance less than 1 Ω in other positions?	Go to step 6.	Repair short circuit in transmission harness or replace neutral position switch.
6 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 resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step 7.
7 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 resistance less than 1 Ω ?	Go to step 8.	Repair open circuit in harness between ECM and transmission harness connector.
8 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 resistance less than 5 Ω ?	Go to step 9.	Repair open circuit between transmission harness connector and engine ground terminal.
9 CHECK POOR CONTACT. Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact with your distributor.

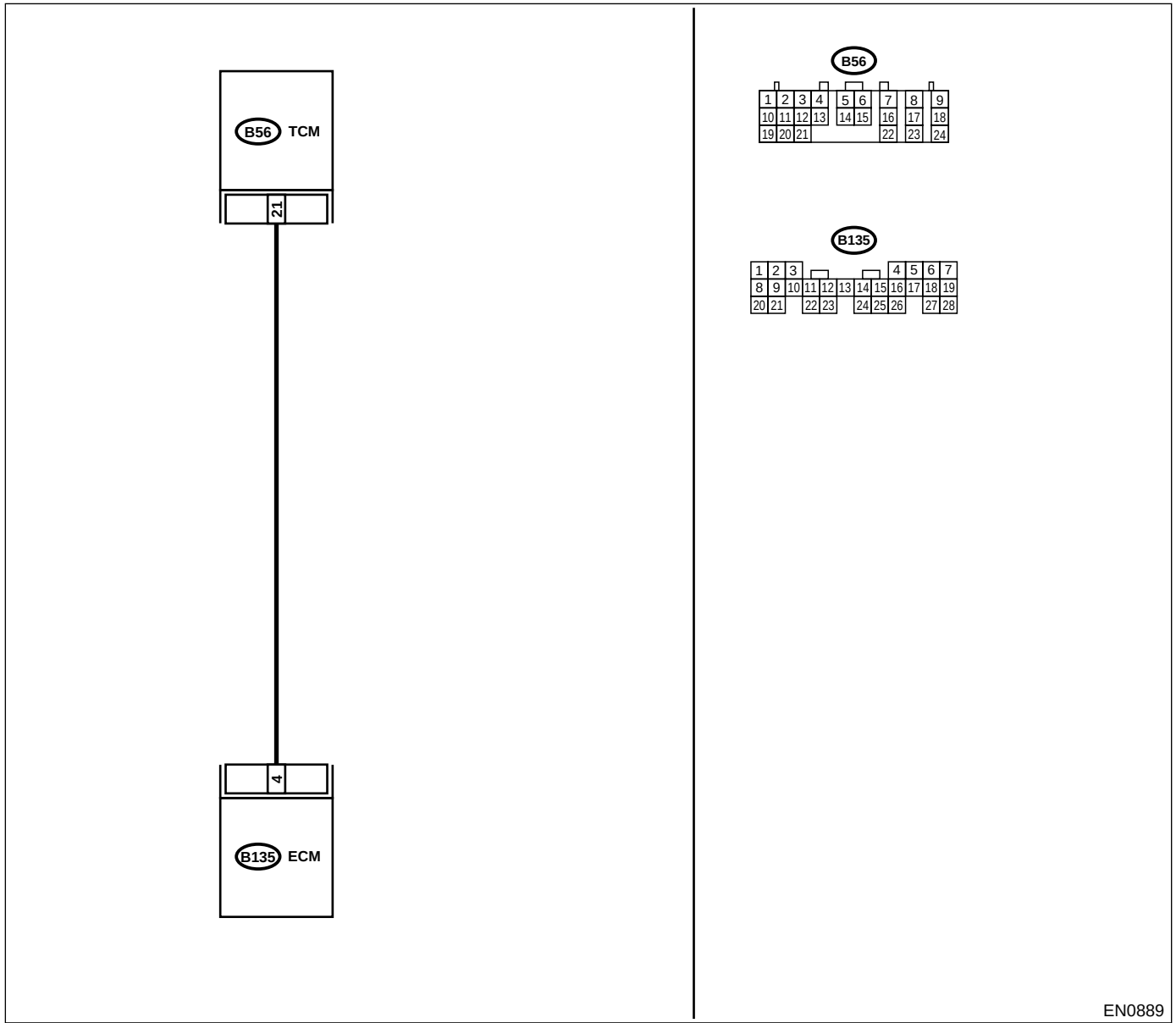
CC:DTC P1594 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL

CIRCUIT MALFUNCTION —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN0889

Step	Check	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?	Go to step 2.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK ACCESSORY.	Are car phone and/or CB installed on vehicle?	Repair grounding line of car phone or CB system.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

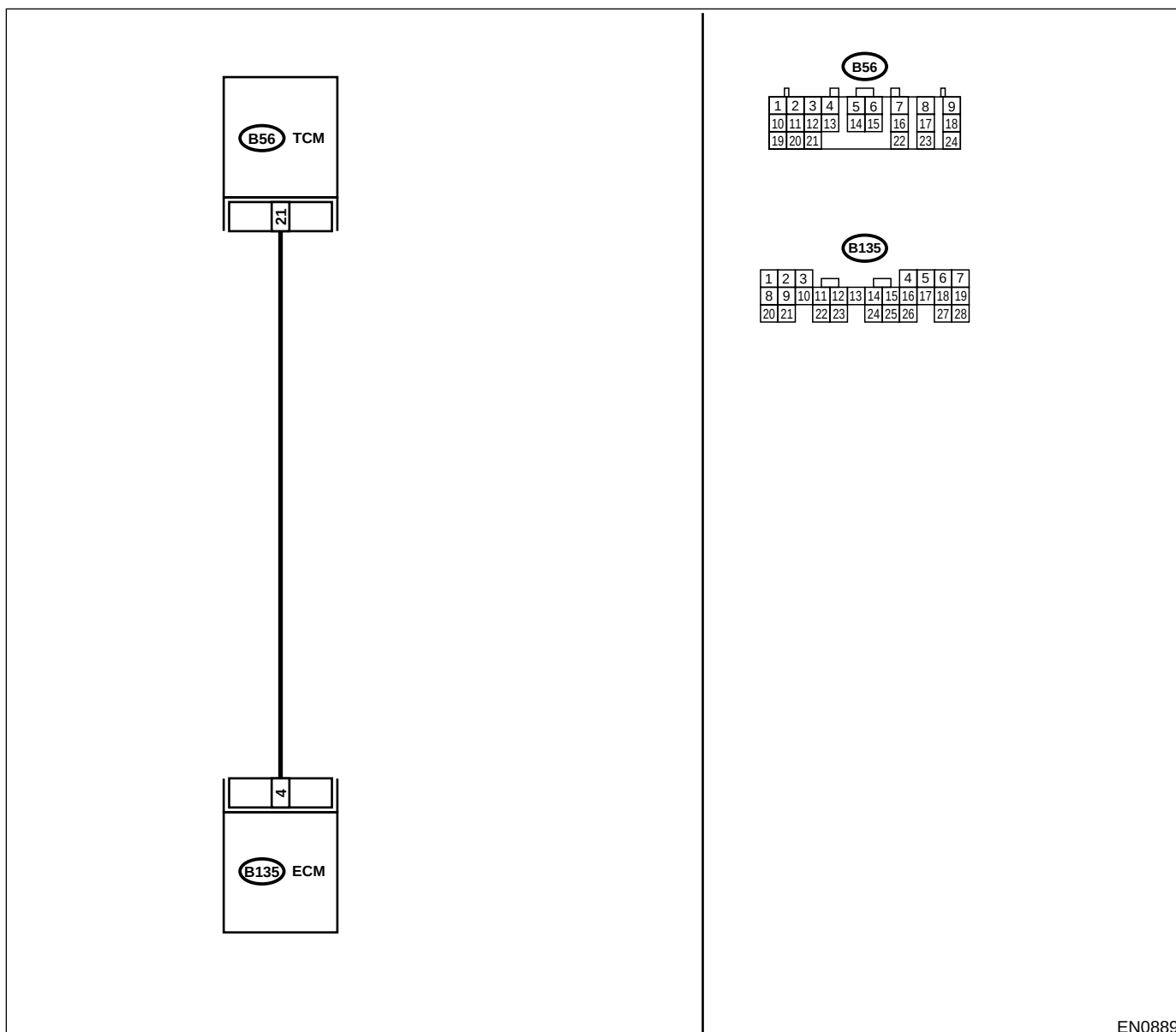
**CD:DTC P1595 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL
CIRCUIT LOW INPUT —**

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0889

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 (B135) No. 4 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 2.	Even if MIL 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
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 4 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 4 (+) — Chassis ground (-):	Is the voltage more than 5 V?	Go to step 4.	Repair poor contact in ECM connector.
4 CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION. Read trouble code for automatic transmission. <Ref. to AT-20, Read Diagnostic Trouble Code.>	Does trouble code appear for automatic transmission?	Inspect trouble code for automatic transmission. <Ref. to AT-40, Diagnostic Procedure with Trouble Code.>	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

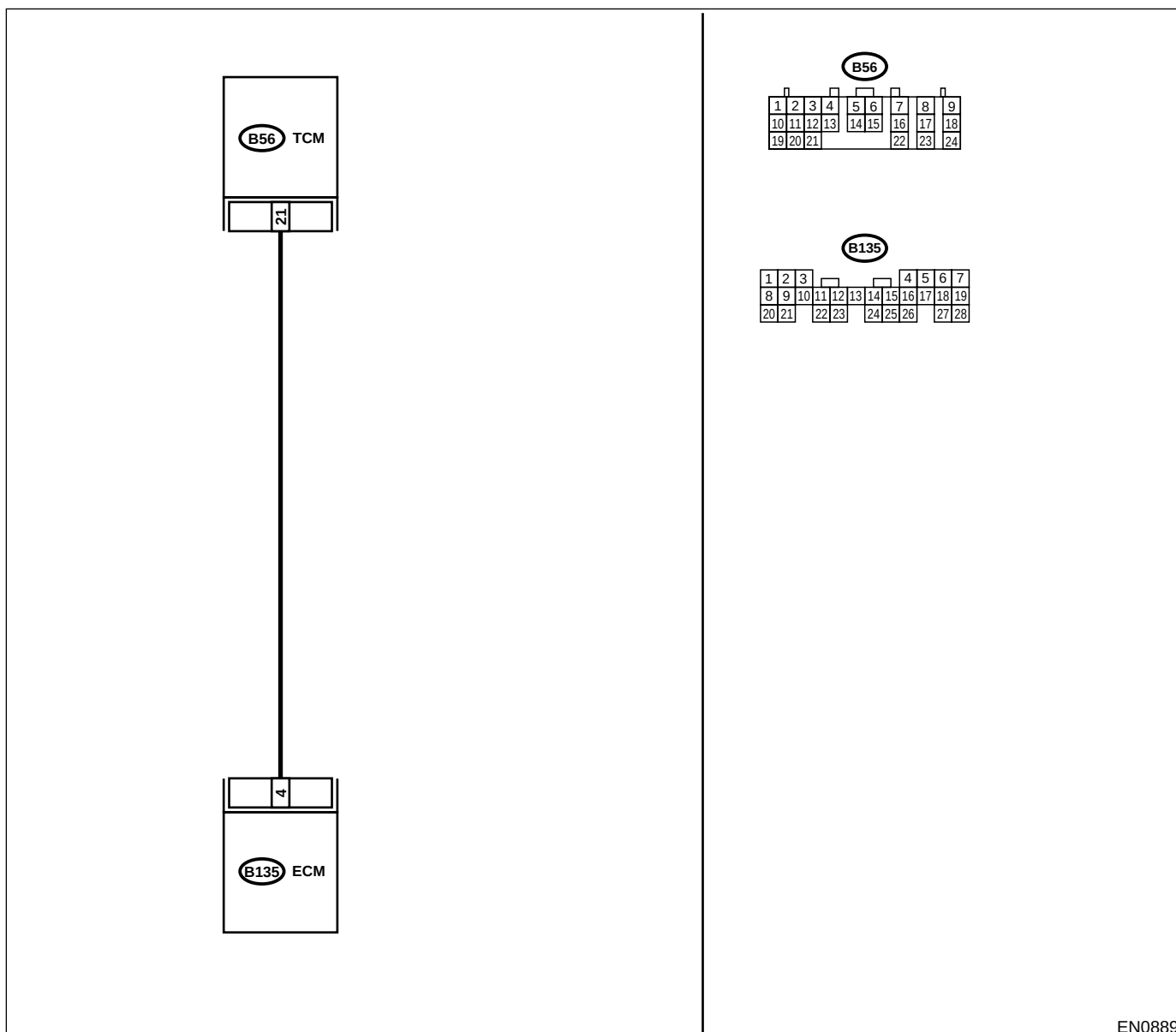
**CE:DTC P1596 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL
CIRCUIT HIGH INPUT —**

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0889

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 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. <i>Connector & terminal</i> <i>(B135) No. 4 (+) — Chassis ground (-):</i>	Is the voltage less than 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. <i>Connector & terminal</i> <i>(B135) No. 4 (+) — Chassis ground (-):</i>	Does the voltage change from 1 V to 4 V while monitoring the value with voltage meter?	Even if MIL 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 with your 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. <i>Connector & terminal</i> <i>(B54) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 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?	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

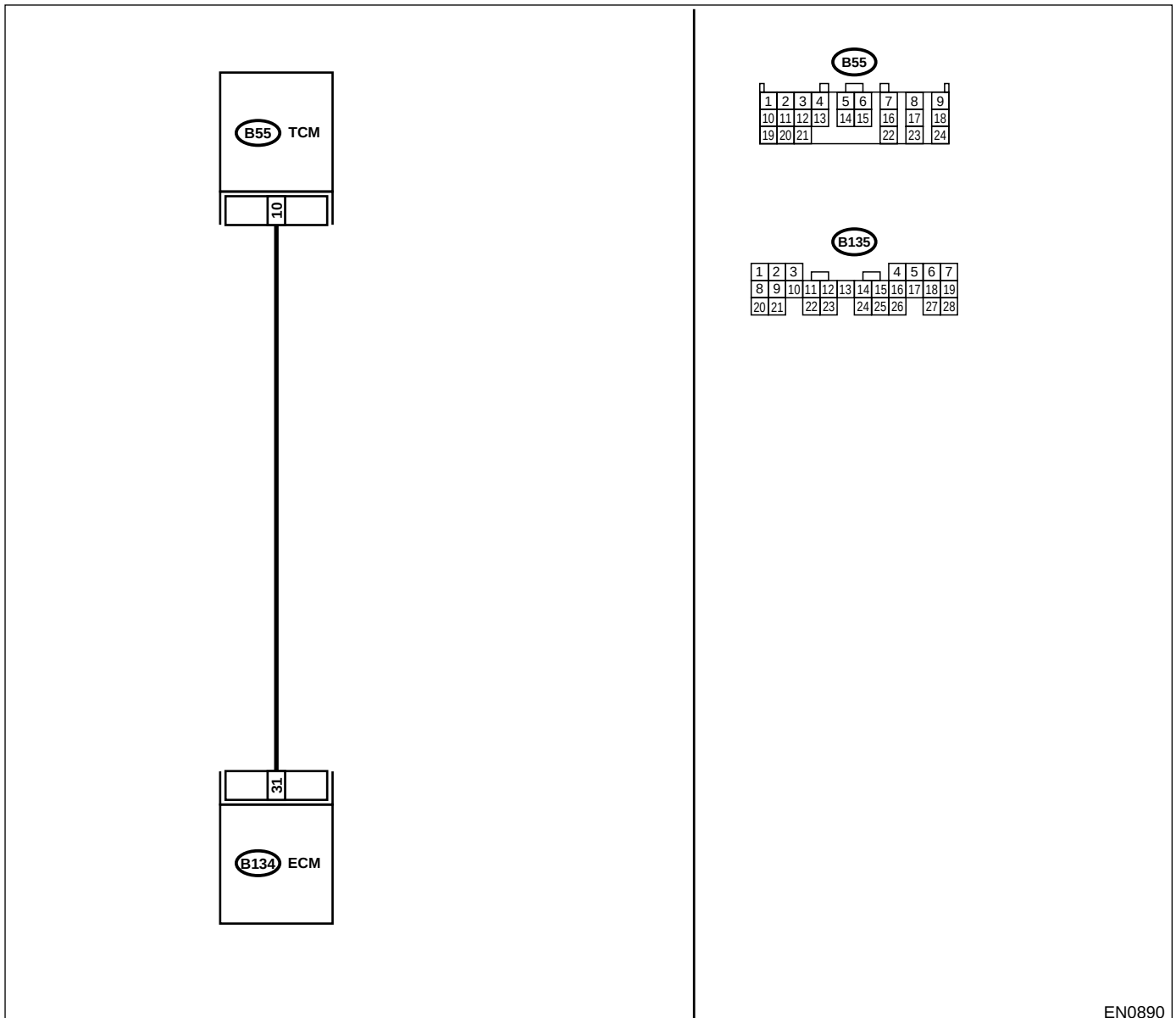
CF:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN0890

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 (B134) No. 31 (+) — Chassis ground (-):	Is the voltage more than 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 (B134) No. 31 — Chassis ground:	Is the resistance less than 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 (B134) No. 31 — (B55) No. 10:	Is the resistance less than 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)

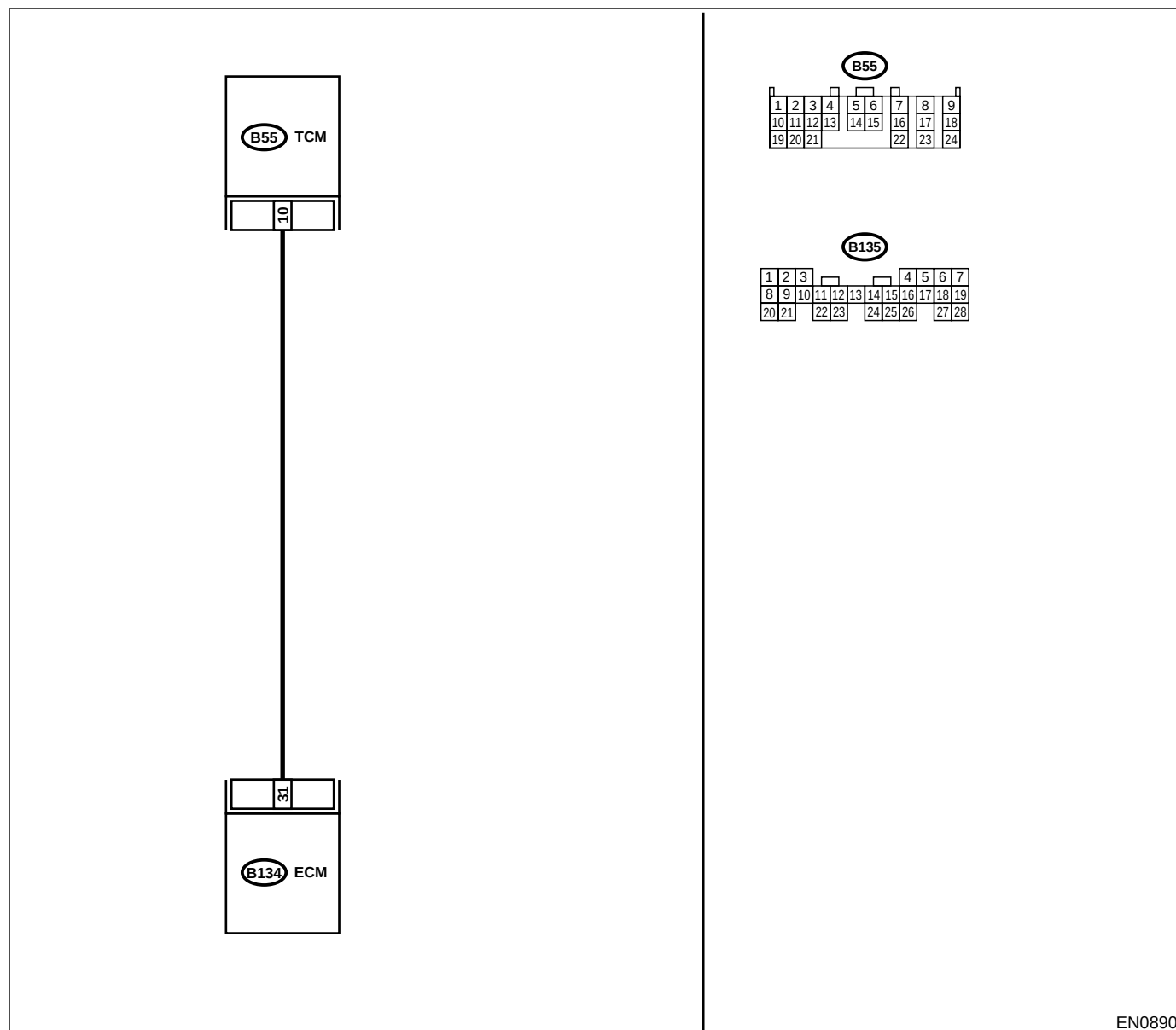
CG:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN0890

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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. <i>Connector & terminal</i> <i>(B134) No. 31 (+) — Chassis ground (-):</i>	Is the voltage less than 3 V?	Go to step 2.	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(SOHC)-48, 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. <i>Connector & terminal</i> <i>(B134) No. 31 (+) — Chassis ground (-):</i>	Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

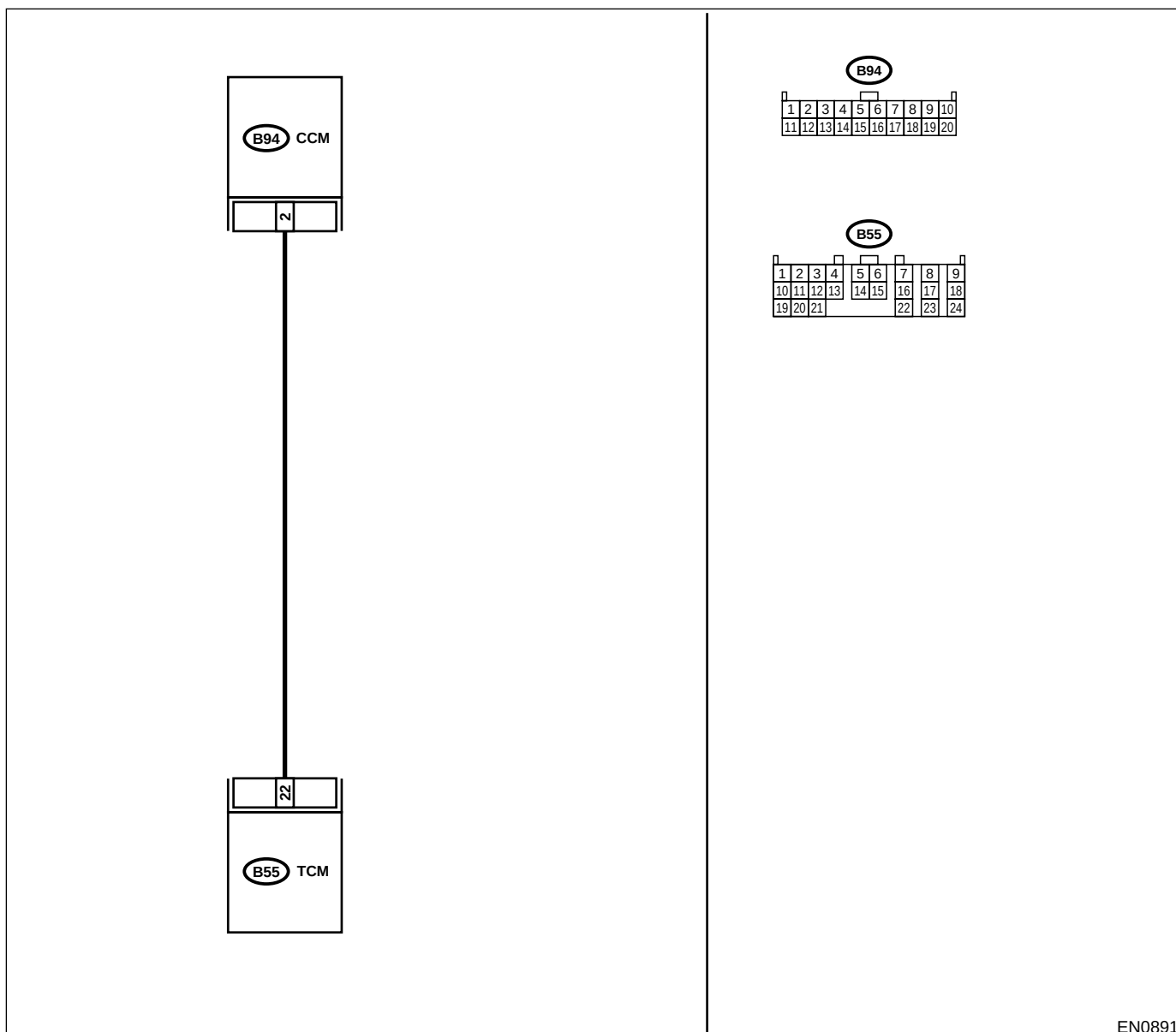
**CH:DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION
FOR AUTOMATIC TRANSMISSION —**

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0891

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair open circuit in harness between TCM and CCM connector.
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 resistance less than 10 Ω ?	Repair short circuit in harness between TCM and CCM connector.	Go to step 3.
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 resistance less than 1 V?	Go to step 4.	Check cruise control command switch circuit. <Ref. to CC-6, INSPECTION, Cruise Control Command Switch.>
4 CHECK POOR CONTACT. Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

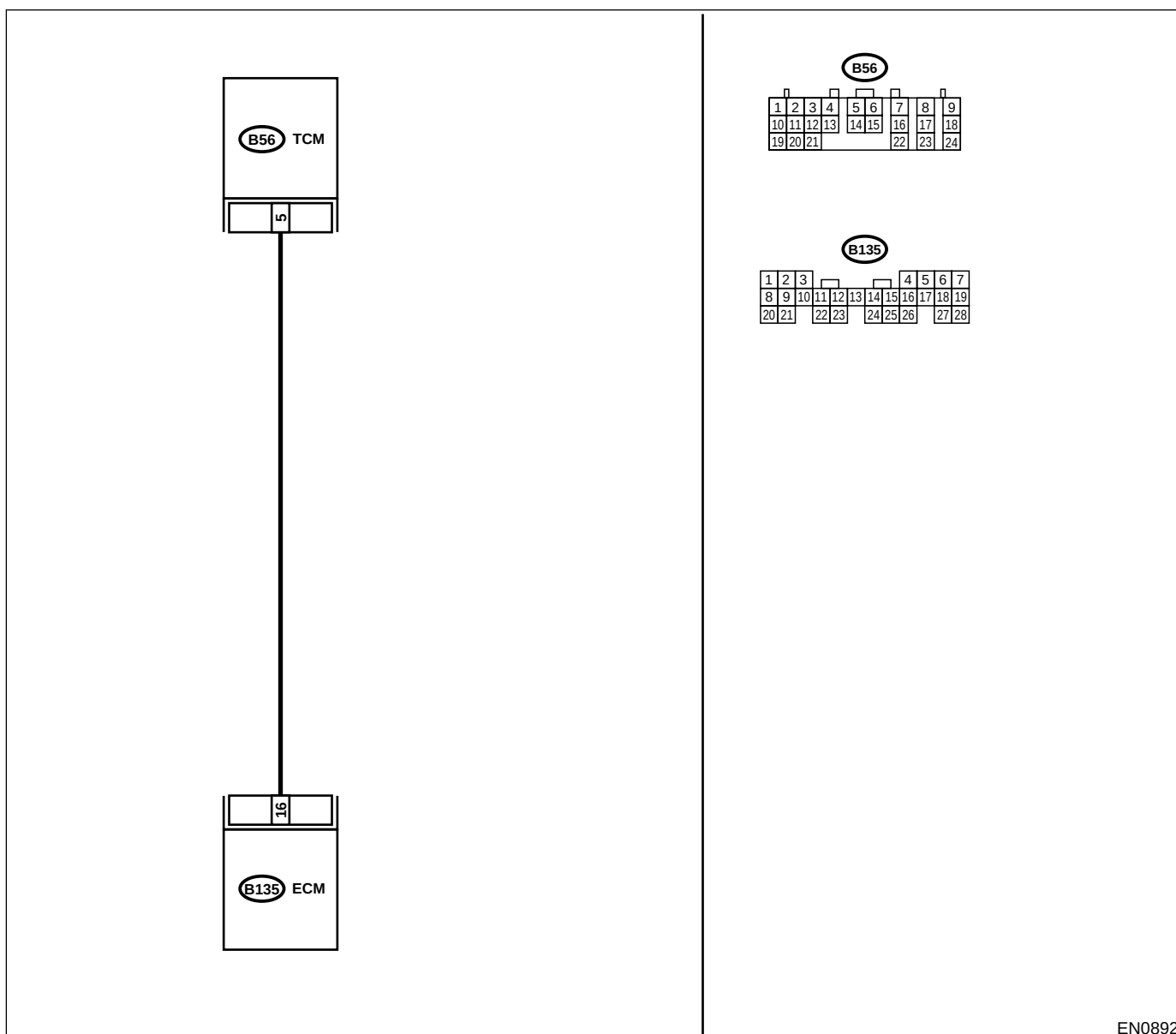
CI: DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0892

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1)Turn ignition switch to ON. 2)Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 16 (+) — Chassis ground (-):	Is the voltage more than 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 (B135) No. 16 (+) — Chassis ground (-):	Is the voltage more than 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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>
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 (B135) No. 16 — (B56) No. 5:	Is the resistance less than 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 (B135) No. 16 — Chassis ground:	Is the resistance less than 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?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

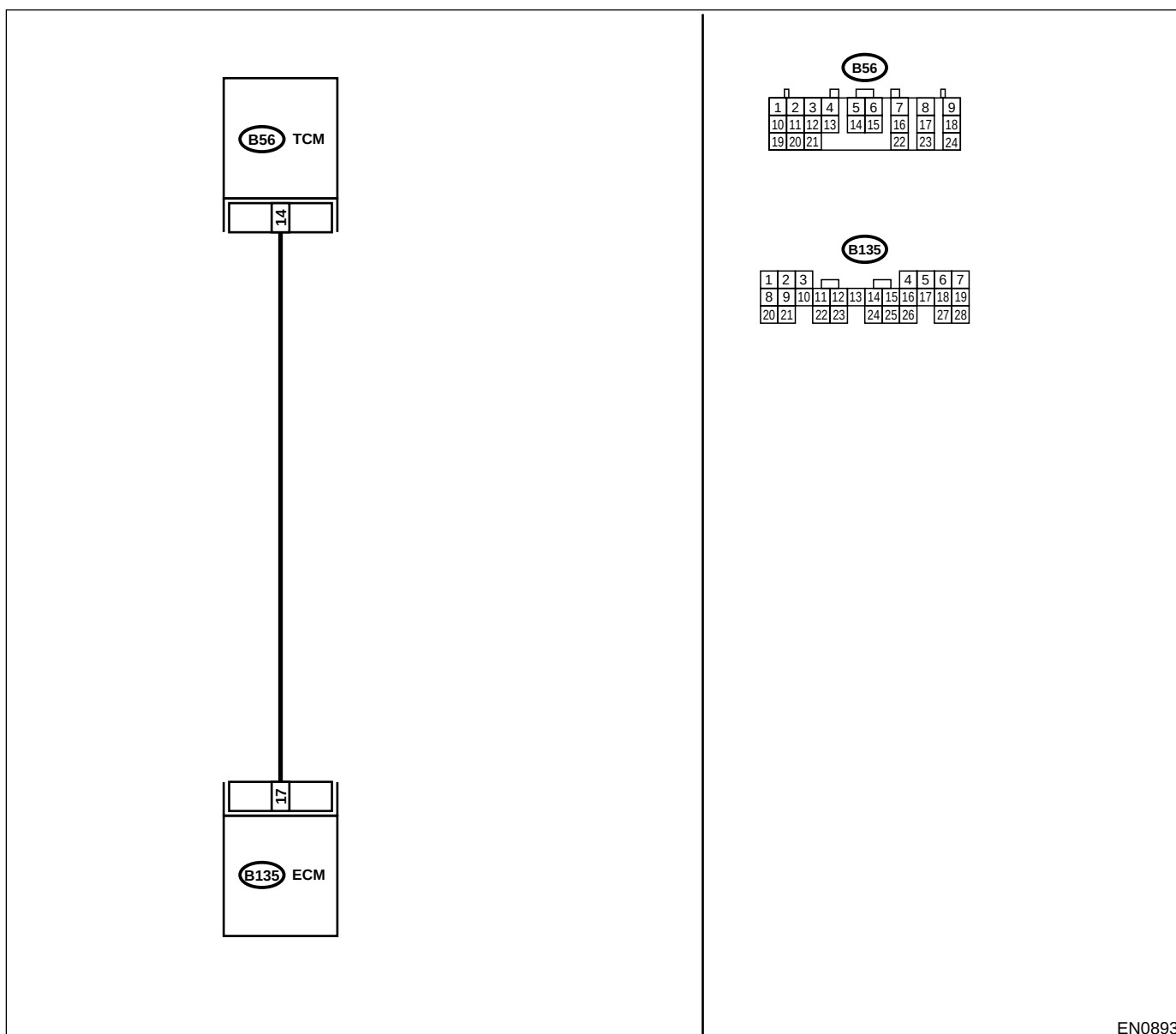
CJ:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —

- **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(SOHC)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0893

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1)Turn ignition switch to ON. 2)Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 17 (+) — Chassis ground (-):	Is the voltage more than 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 (B135) No. 17 (+) — Chassis ground (-):	Is the voltage more than 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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>
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 (B135) No. 17 — (B56) No. 14:	Is the resistance less than 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 (B135) No. 17 — Chassis ground:	Is the resistance less than 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?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

19. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(SOHC)-88, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Intake air temperature and pressure sensor 3) Ignition parts (*1) 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Intake air temperature and pressure sensor 3) Engine coolant temperature sensor (*2) 4) Ignition parts (*1) 5) Air intake system (*5) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) 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 air temperature and pressure sensor
4. Poor acceleration	1) Intake air temperature and pressure sensor 2) Throttle position sensor 3) Fuel injection parts (*4) 4) Fuel pump and fuel pump relay 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) A/C switch and A/C cut relay 9) Engine torque control signal circuit 10) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Intake air temperature and pressure sensor 2) Engine coolant temperature sensor (*2) 3) Crankshaft position sensor (*3) 4) Camshaft position sensor (*3) 5) Purge control solenoid valve 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay
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

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
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)

ENGINE 2 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.

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

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

FUEL INJECTION (FUEL SYSTEMS)

FU(SOHCw/oOBD)

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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

Model		
Fuel tank	Capacity	50 ℓ (13.2 US gal, 11.0 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

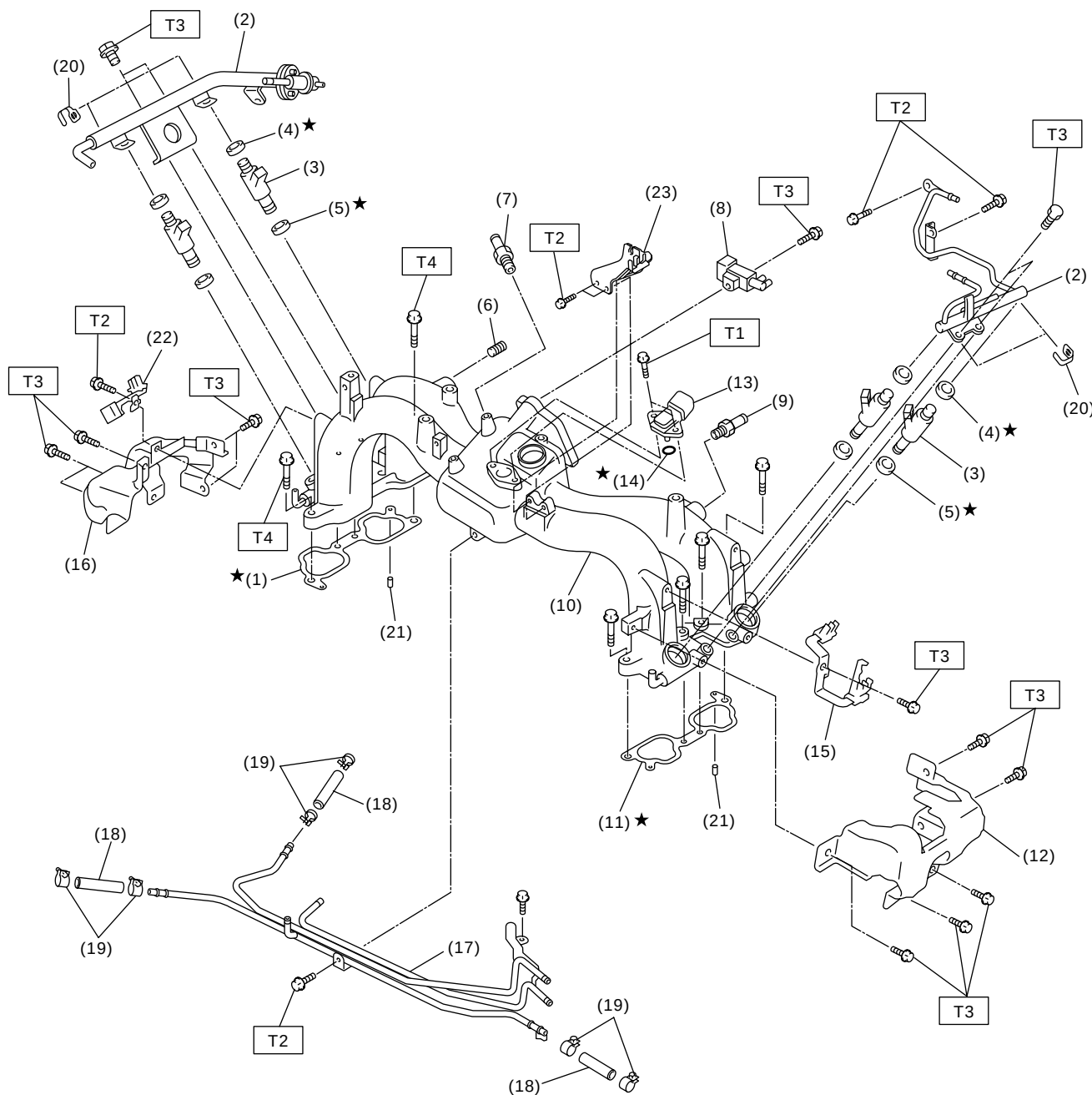
FUEL INJECTION (FUEL SYSTEMS)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

B: COMPONENT

1. INTAKE MANIFOLD



EN1002

FU(SOHCw/oOBD)-4

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

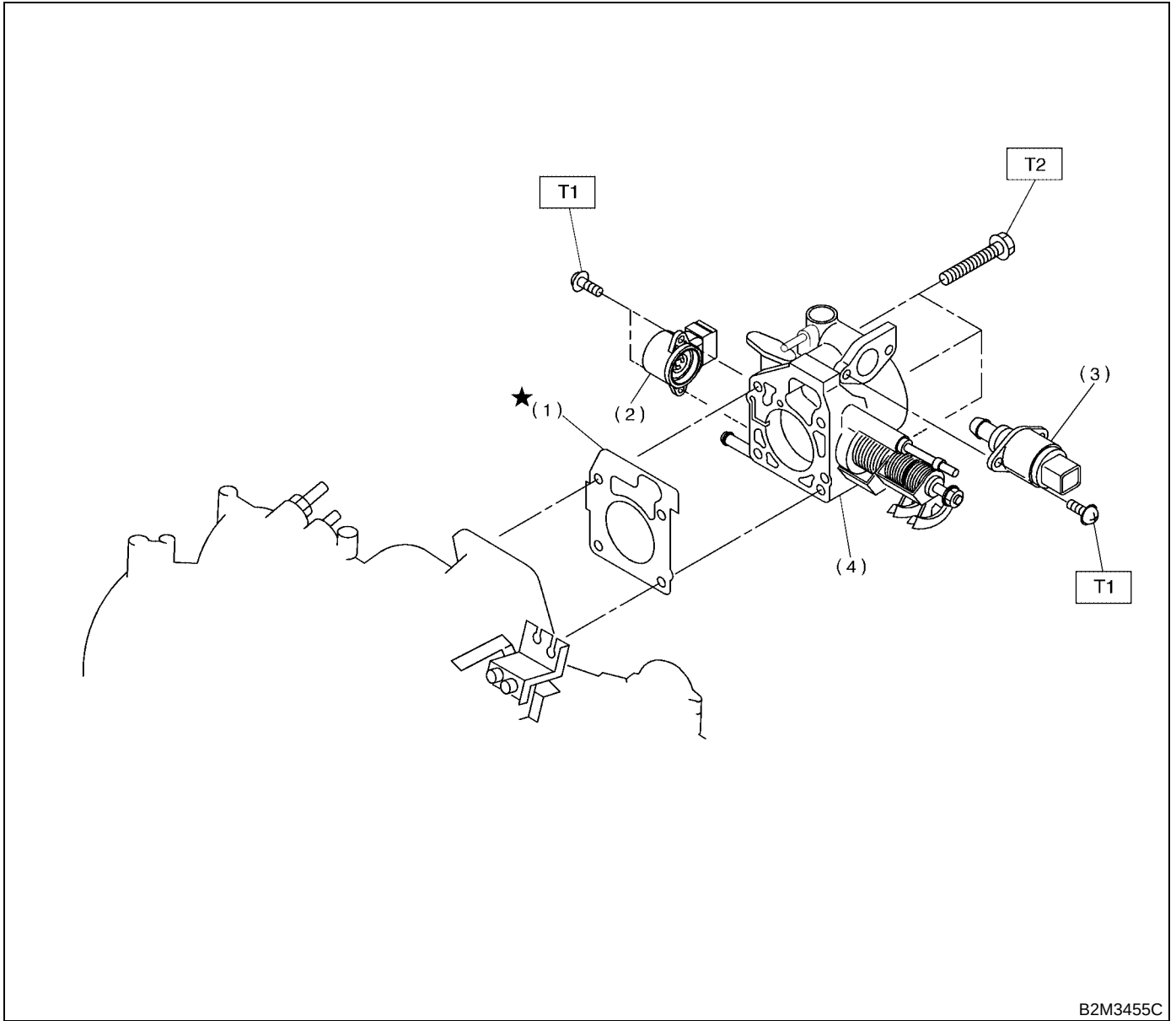
(1) Intake manifold gasket RH	(11) Intake manifold gasket LH	(20) Clip
(2) Fuel injector pipe	(12) Fuel pipe protector LH	(21) Guide pin
(3) Fuel injector	(13) Intake air temperature and pressure sensor	(22) Plug cord holder RH
(4) O-ring		(23) Accelerator cable bracket
(5) O-ring	(14) O-ring	
(6) Plug	(15) Plug cord holder LH	
(7) PCV valve	(16) Fuel pipe protector RH	
(8) Purge control solenoid valve	(17) Fuel pipe ASSY	
(9) Nipple	(18) Fuel hose	
(10) Intake manifold	(19) Clip	

Tightening torque: N·m (kgf-m, ft-lb)***T1: 3.4 (0.35, 2.5)******T2: 5.0 (0.51, 3.7)******T3: 19 (0.19, 1.4)******T4: 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)

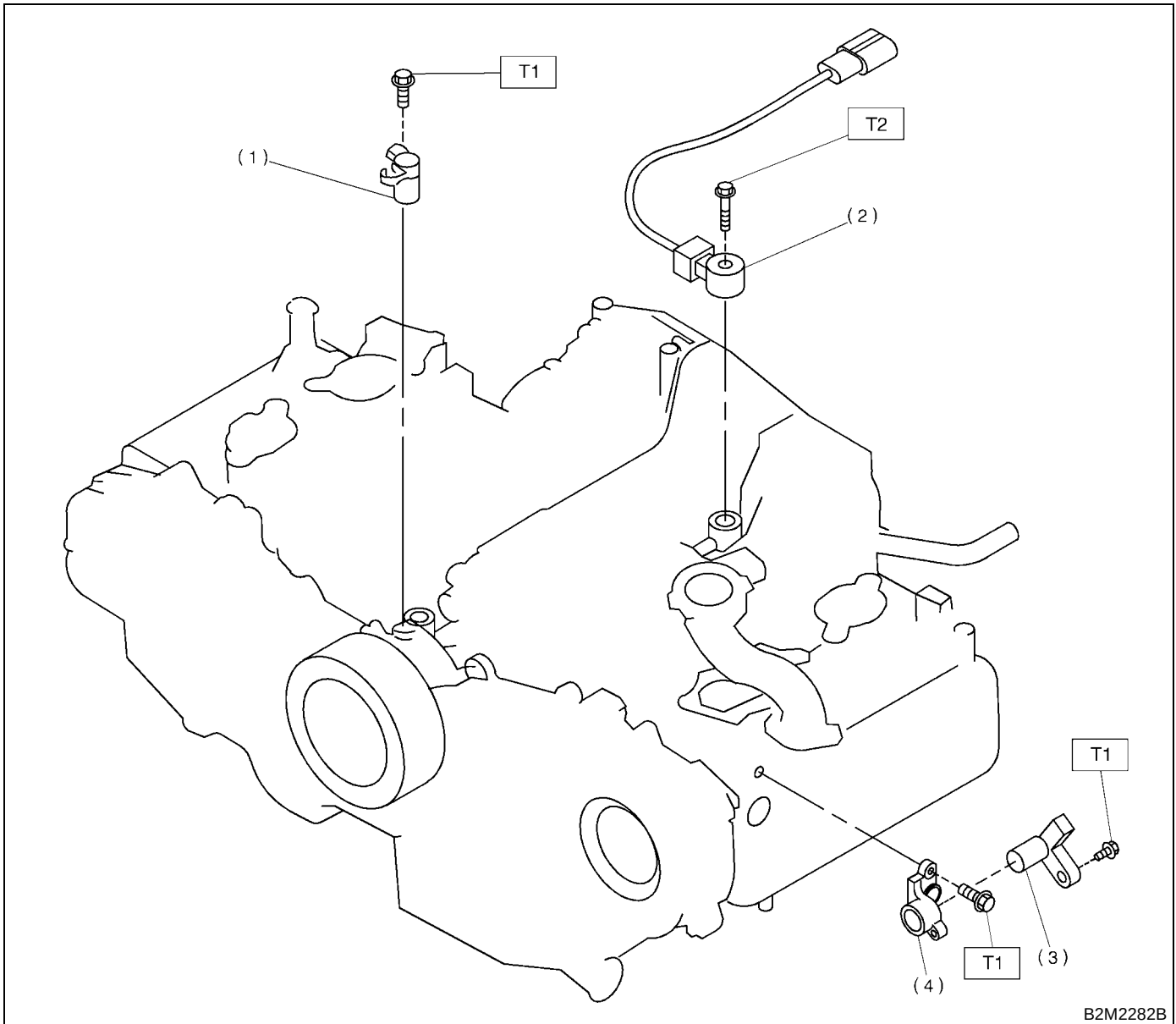
T1: 1.6 (0.16, 1.2)

T2: 22 (2.2, 16)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



B2M2282B

(1) Crankangle position sensor

(2) Knock sensor

(3) Camshaft position sensor

(4) Camshaft position sensor support

Tightening torque: N·m (kgf-m, ft-lb)

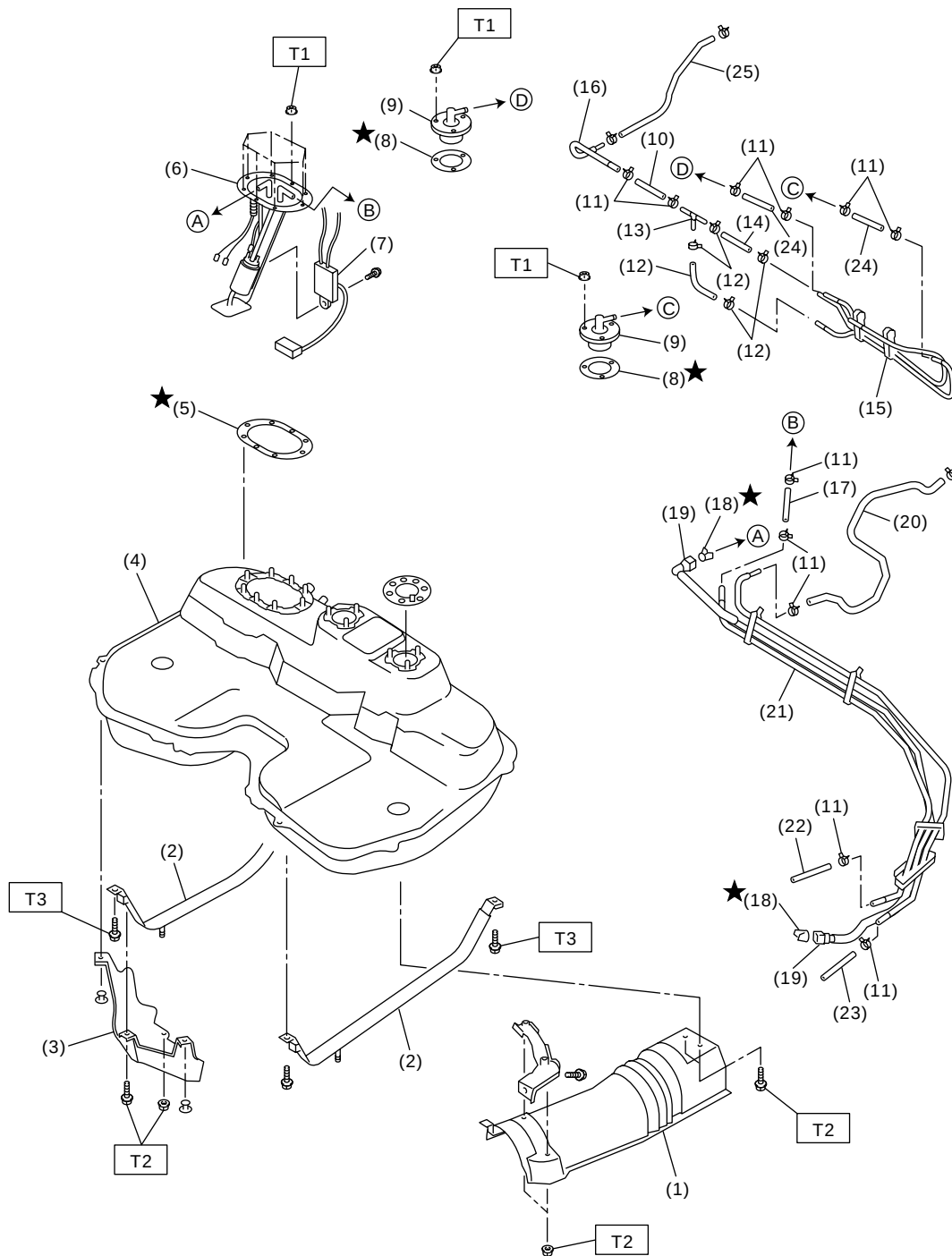
T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK



EN0439

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

(1) Heat sealed cover	(11) Clip	(21) Fuel pipe ASSY
(2) Fuel tank band	(12) Evaporation hose B	(22) Evaporation hose F
(3) Protector RH	(13) Joint pipe	(23) Fuel return hose B
(4) Fuel tank	(14) Evaporation hose C	(24) Evaporation hose G
(5) Fuel pump gasket	(15) Evaporation pipe ASSY	(25) Evaporation hose H
(6) Fuel pump ASSY	(16) Evaporation pipe	
(7) Fuel meter unit	(17) Evaporation hose D	
(8) Fuel cut valve gasket	(18) Retainer	
(9) Fuel cut valve	(19) Quick connector	
(10) Evaporation hose A	(20) Evaporation hose E	

Tightening torque: N·m (kgf-m, ft-lb)***T1: 4.4 (0.45, 3.3)******T2: 7.4 (0.75, 5.4)******T3: 33 (3.4, 25)***

FUEL INJECTION (FUEL SYSTEMS)

This diagram illustrates the exploded view of a vehicle's rear window assembly. The main components are labeled with numbers 1 through 25, and assembly points are indicated by letters A, B, and C. The assembly includes a rear window glass (1), a rear window frame (2), a rear window seal (3), a rear window trim (4), a rear window mounting bracket (5), a rear window hinge (6), a rear window latch (7), a rear window lock (8), a rear window handle (9), a rear window trim pin (10), a rear window trim clip (11), a rear window trim screw (12), a rear window trim nut (13), a rear window trim washer (14), a rear window trim gasket (15), a rear window trim seal (16), a rear window trim clip (17), a rear window trim pin (18), a rear window trim screw (19), a rear window trim nut (20), a rear window trim washer (21), a rear window trim gasket (22), a rear window trim seal (23), a rear window trim clip (24), and a rear window trim pin (25). The letters A, B, and C indicate the locations where the components are assembled.

FU(SOHCw/oOBD)-10

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

(1) Clip	(11) Fuel pipe ASSY	(21) Two-way valve drain hose A
(2) Fuel delivery hose A	(12) Grommet	(22) Connector
(3) Fuel filter bracket	(13) Canister hose A	(23) Two-way valve drain hose B
(4) Fuel filter holder	(14) Canister	(24) Clamp
(5) Fuel filter cup	(15) Canister bracket plate	(25) Front canister bracket
(6) Fuel filter	(16) Cushion	
(7) Evaporation hose	(17) Canister bracket spacer	
(8) Fuel damper	(18) Rear canister bracket	
(9) Fuel delivery hose B	(19) Two-way valve return hose	
(10) Fuel return hose	(20) Two-way valve	

Tightening torque: N·m (kgf-m, ft-lb)

T: 23 (2.34, 17.0)

FUEL INJECTION (FUEL SYSTEMS)

This diagram shows an exploded view of a mechanical assembly. The components are numbered as follows:

- (1) Main curved bracket or housing.
- (2) Small circular component, possibly a cap or seal.
- (3) Small cylindrical components, likely pins or spacers.
- (4) Circular component with a flange, possibly a flange or end cap.
- (5) Long curved pipe or tube.
- (6) Shorter curved pipe or tube.
- (7) Small component, possibly a plug or cap.
- (8) Flange or mounting plate.
- (9) Bolt or screw.
- (10) Nut or washer.
- (11) Large, complex bracket or housing.

Callouts 'T' and 'C' are used to indicate specific features or assembly points:

- 'T' indicates a threaded hole or a specific assembly point.
- 'C' indicates a specific feature or a hole in a component.

The diagram illustrates the assembly sequence and the relative positions of the various parts.

- Tightening torque: N·m (kgf-m, ft-lb)**
T: 7.5 (0.76, 5.5)

GENERAL DESCRIPTION

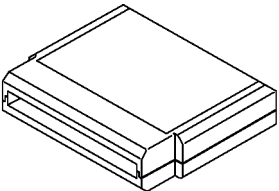
FUEL INJECTION (FUEL SYSTEMS)

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
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

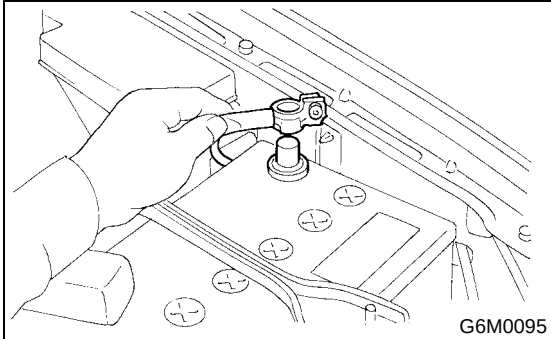
THROTTLE BODY

FUEL INJECTION (FUEL SYSTEMS)

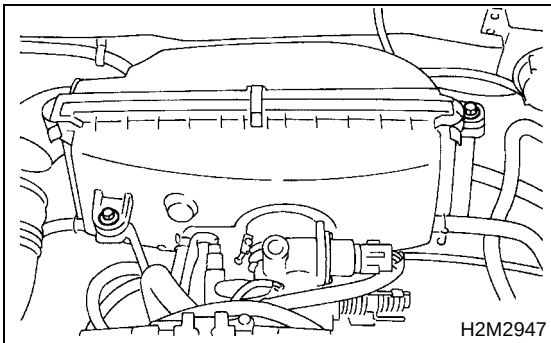
2. Throttle Body

A: REMOVAL

1) Disconnect battery ground cable.

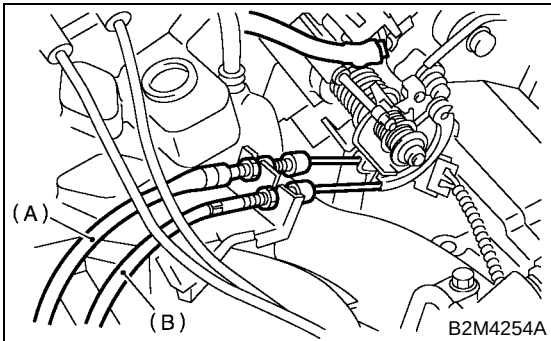


2) Remove air cleaner case.



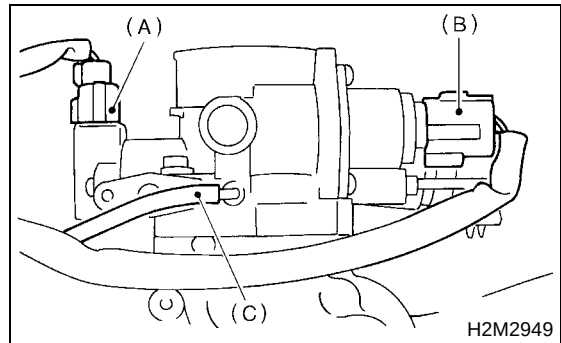
3) Disconnect accelerator cable (A).

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 air purge control solenoid valve.

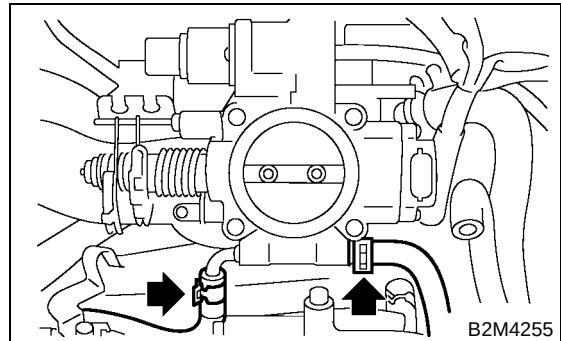


(A) Throttle position sensor

(B) Idle air control solenoid valve

(C) Air by-pass hose from purge control solenoid valve

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.

CAUTION:

Always use a new gasket.

Tightening torque:

Throttle body;

22 N·m (2.2 kgf-m, 15.9 ft-lb)

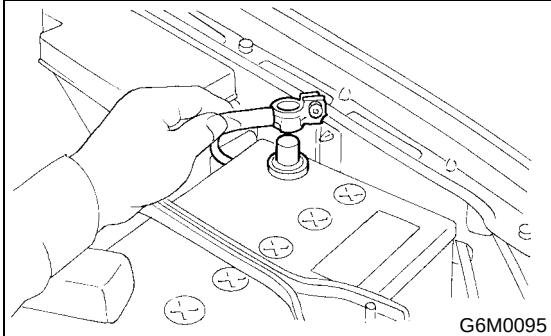
Air cleaner case;

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

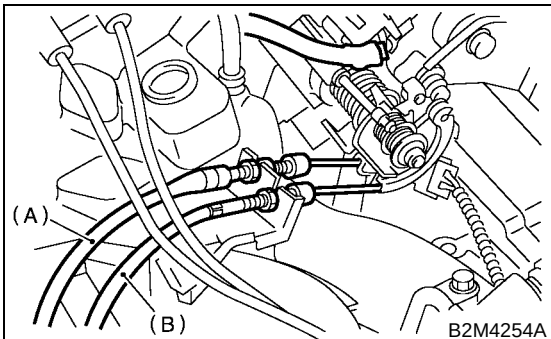
3. Intake Manifold

A: REMOVAL

- 1) Release fuel pressure. <Ref. to FU(SOHCw/oOBD)-47, 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(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
- 5) Disconnect accelerator cable (A).
- 6) Disconnect cruise control cable (B). (With cruise control model)

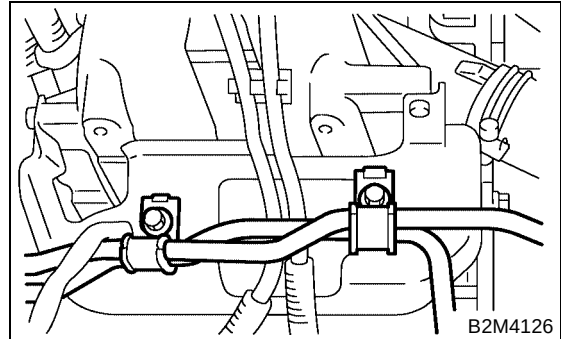


- 7) Remove power steering pump and tank from brackets.

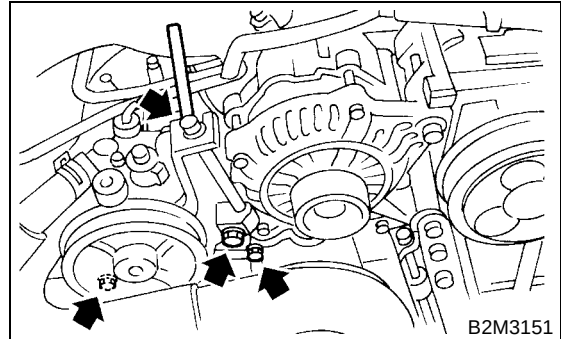
- (1) Remove resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
- (2) Remove front side V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- (3) Remove bolts which hold power steering pipes onto intake manifold protector.

NOTE:

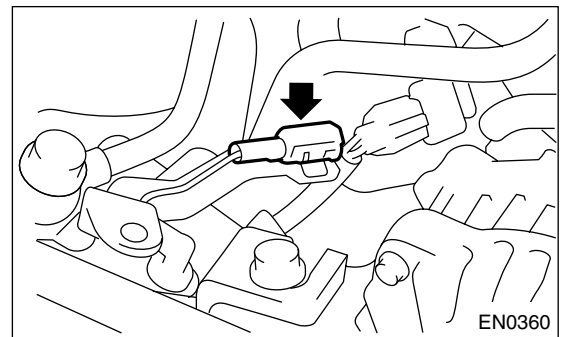
Do not disconnect power steering hose.



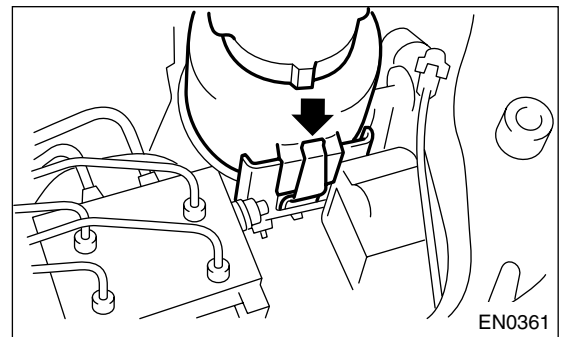
- (4) Remove bolts which install power steering pump bracket.



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



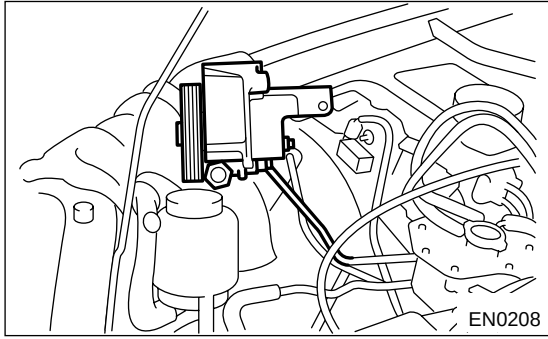
- (6) Remove power steering tank from the bracket by pulling it upwards.



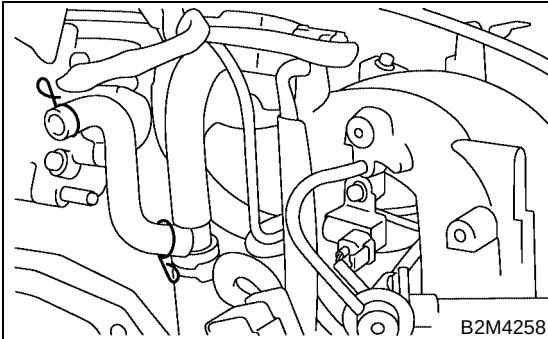
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

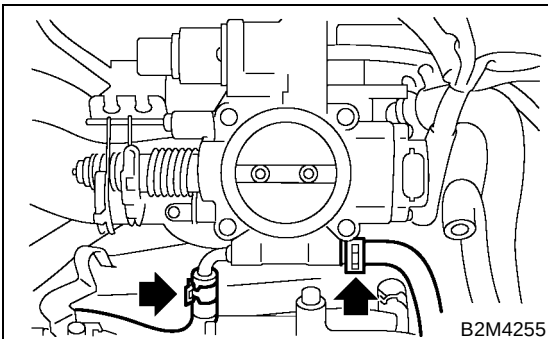
- (7) Place power steering pump and tank on the right side wheel apron.



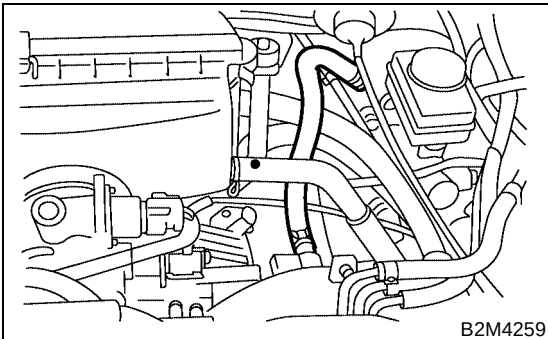
- 8) Disconnect spark plug cords from spark plugs.
9) Disconnect PCV hose from intake manifold.



- 10) Disconnect engine coolant hose from throttle body.



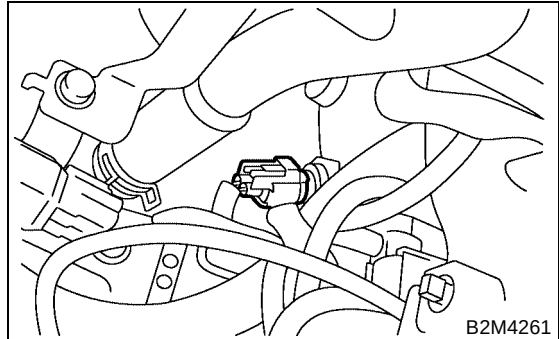
- 11) Disconnect brake booster hose.



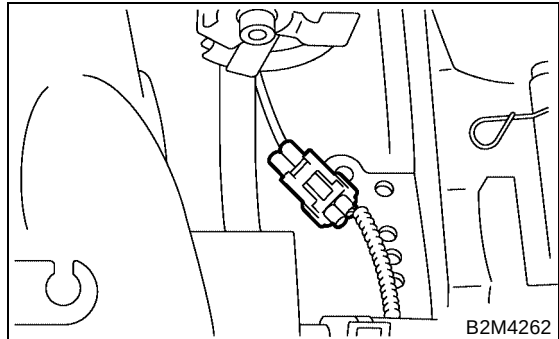
- 12) Remove air cleaner case stay RH and engine harness bracket, and disconnect engine harness connectors from bulkhead harness connectors.



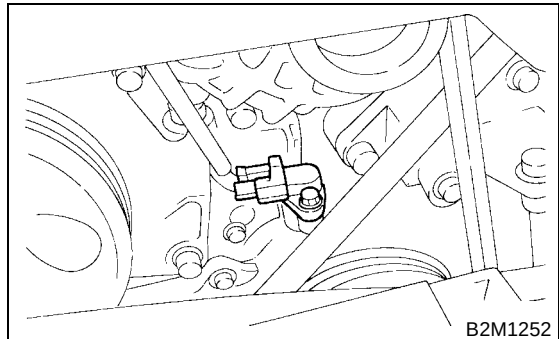
- 13) Disconnect connectors from engine coolant temperature sensor.



- 14) Disconnect knock sensor connector.



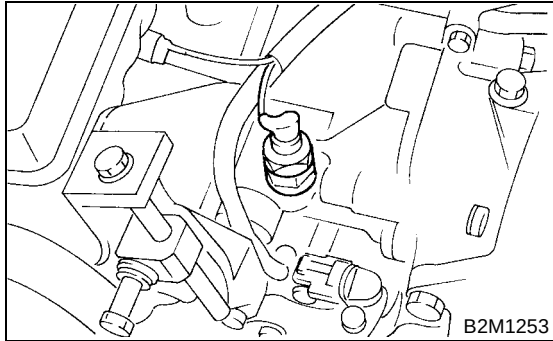
- 15) Disconnect connector from crankshaft position sensor.



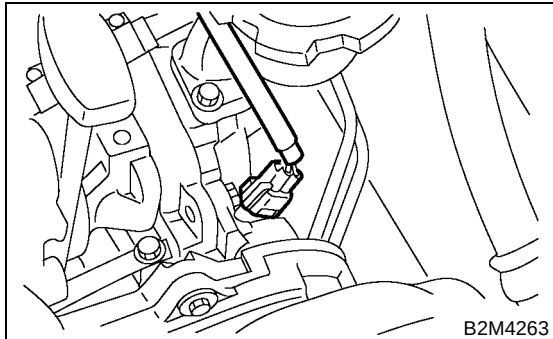
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

16) Disconnect connector from oil pressure switch.



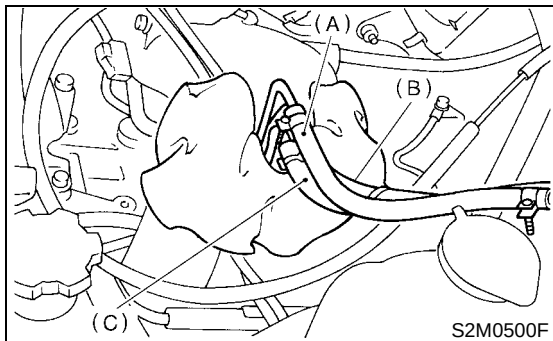
17) Disconnect connector from camshaft position sensor.



18) Disconnect fuel hoses from fuel pipes.

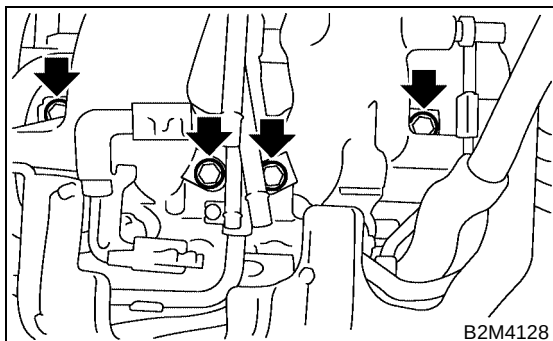
WARNING:

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

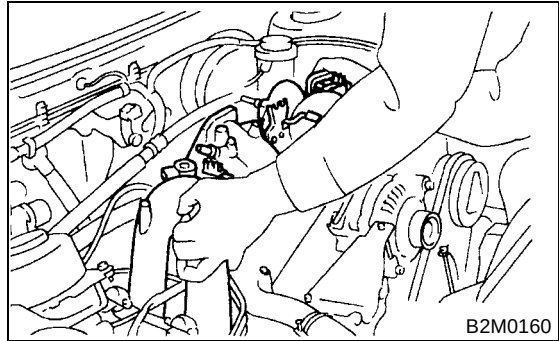


- (A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

19) Remove bolts which hold intake manifold onto cylinder heads.



20) Remove intake manifold.



B: INSTALLATION

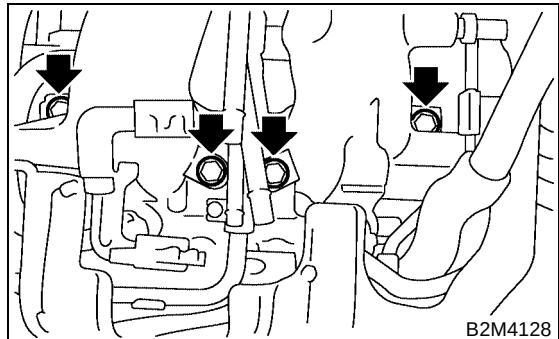
1) Install intake manifold onto cylinder heads.

CAUTION:

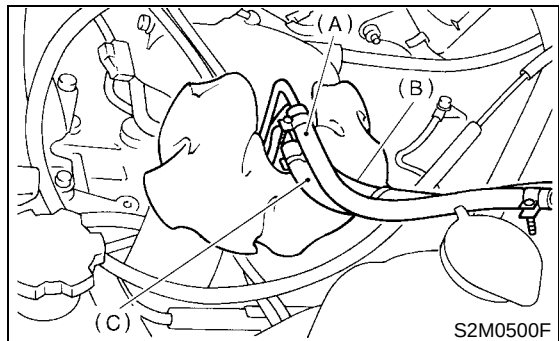
Always use new gaskets.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



2) Connect fuel hoses.

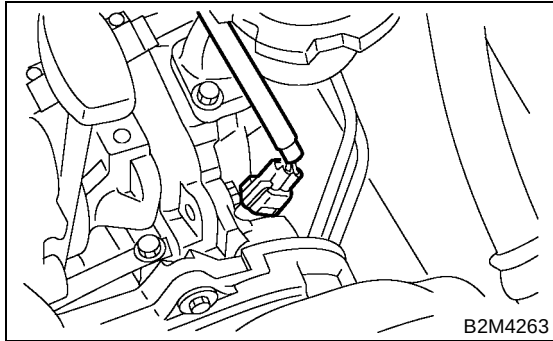


- (A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

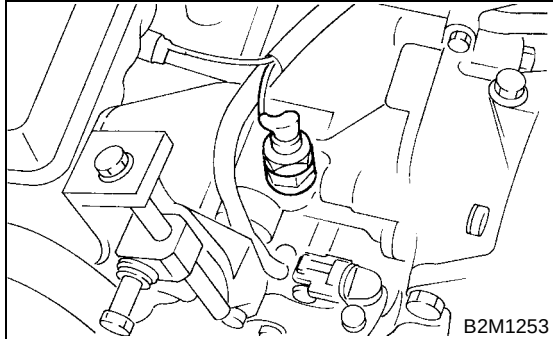
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

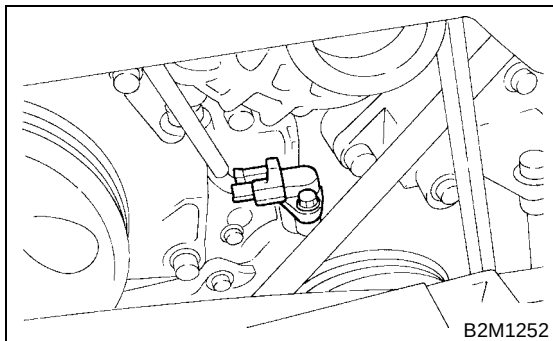
3) Connect connector to camshaft position sensor.



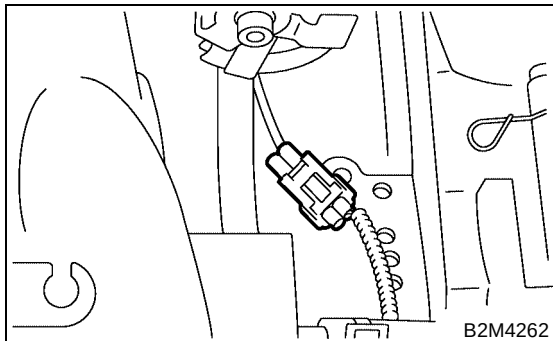
4) Connect connector to oil pressure switch.



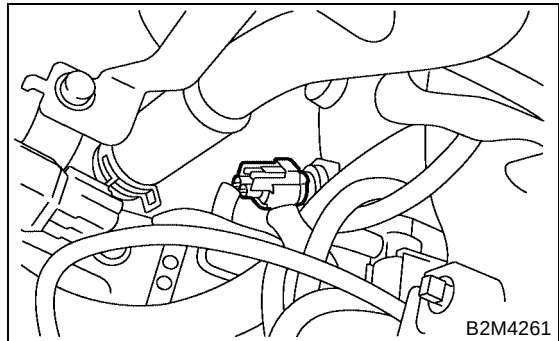
5) Connect connector to crankshaft position sensor.



6) Connect knock sensor connector.



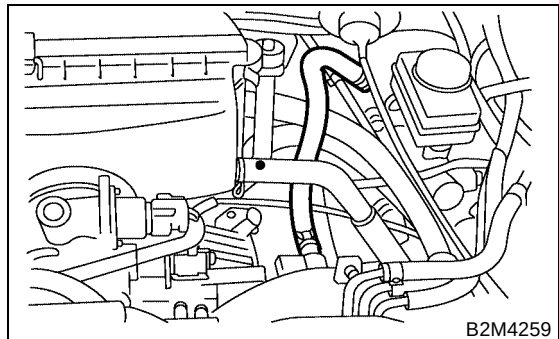
7) Connect connectors to engine coolant temperature sensor.



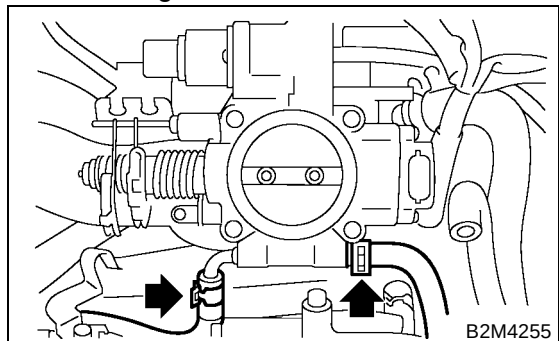
8) Install air cleaner case stay RH and engine harness bracket, and connect engine harness connectors to bulkhead connectors.



9) Connect brake booster hose.



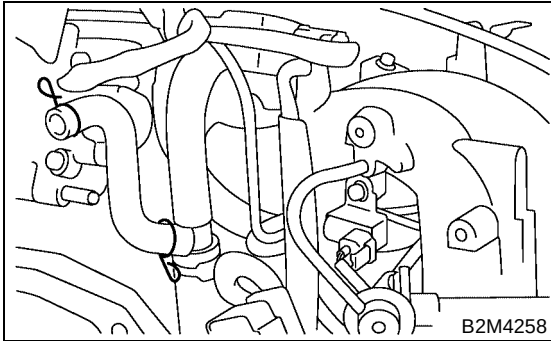
10) Connect engine coolant hose to throttle body.



INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

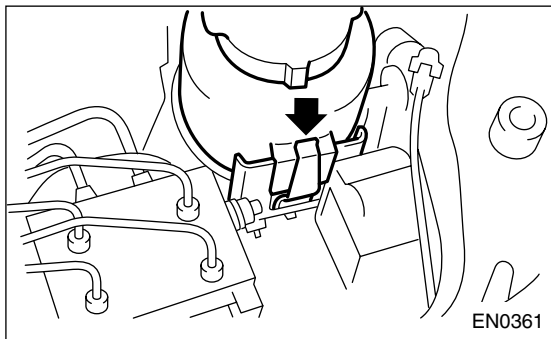
- 11) Connect PCV hose to intake manifold.



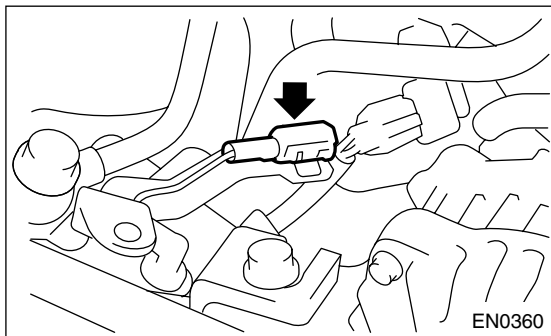
- 12) Connect spark plug cords to spark plugs.

- 13) Install power steering pump and tank on brackets.

- (1) Install power steering tank on bracket.



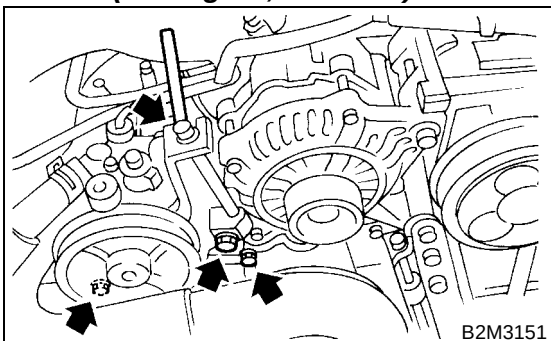
- (2) Connect connector to power steering pump switch.



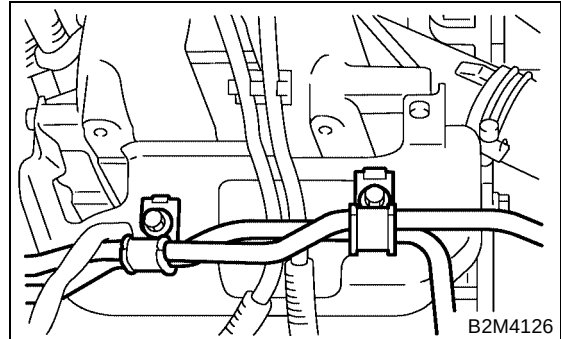
- (3) Tighten bolts which install power steering pump on bracket.

Tightening torque:

20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



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

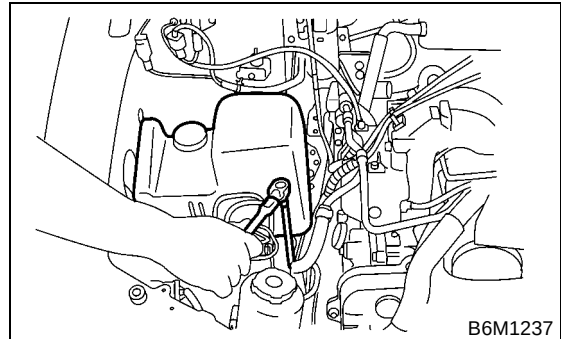


- (5) Install V-belt. <Ref. to ME(SOHC)-42, INSTALLATION, V-belt.>

- (6) Install resonator chamber.

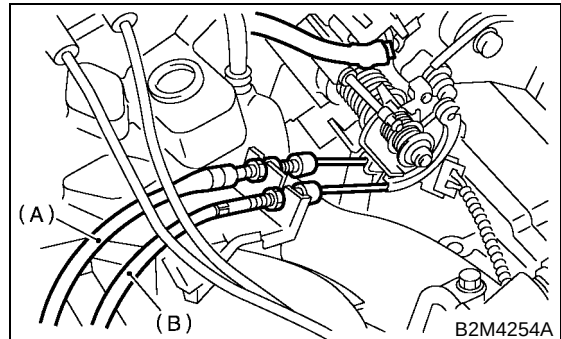
Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



- 14) Connect accelerator cable (A).

- 15) Connect cruise control cable (B). (With cruise control models)



- 16) Install air intake duct and air cleaner assembly. <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>

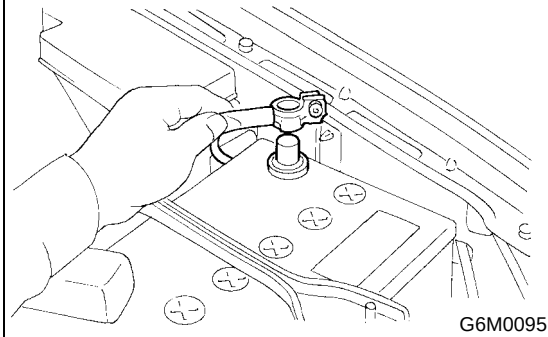
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

17) Connect connector to fuel pump relay.

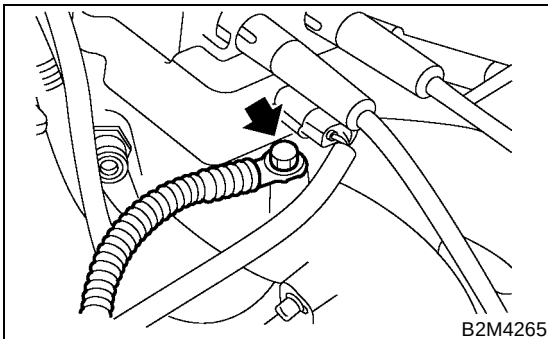


18) Connect battery ground cable.

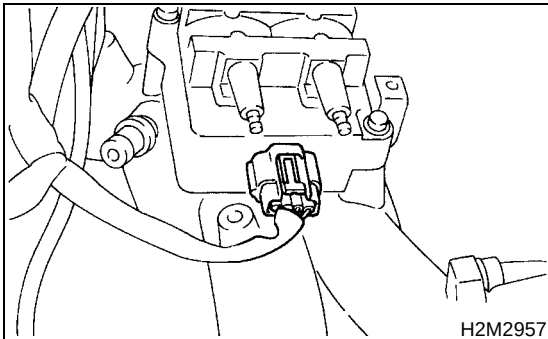


C: DISASSEMBLY

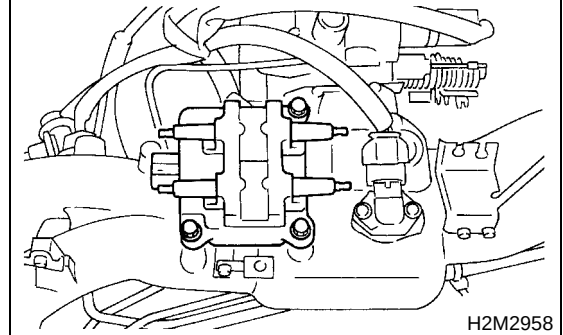
1) Disconnect engine ground terminal from intake manifold.



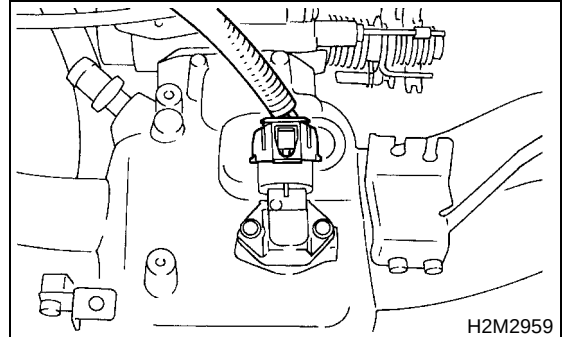
2) Disconnect connector from ignition coil and ignitor assembly.



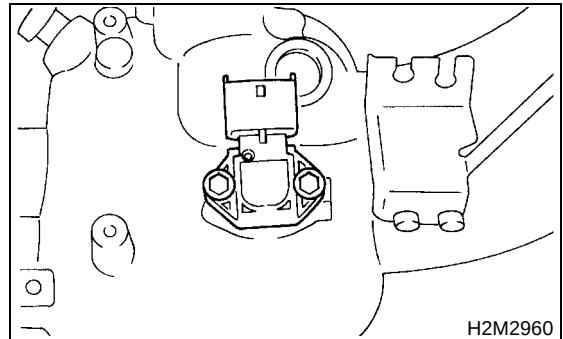
3) Remove ignition coil and ignitor assembly.



4) Disconnect connector from intake air temperature and pressure sensor.

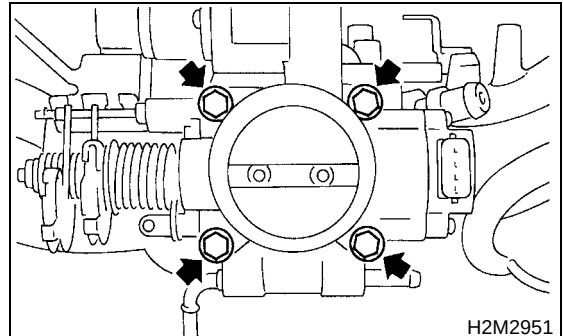


5) Remove intake air temperature and pressure sensor from intake manifold.



6) Disconnect connectors from throttle position sensor and idle air control solenoid valve.

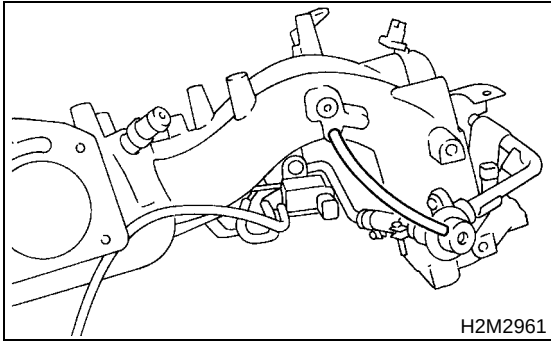
7) Remove throttle body..



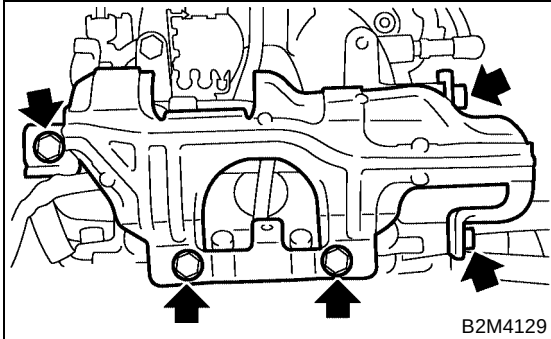
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

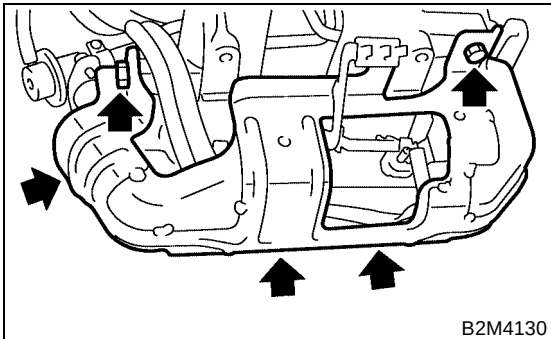
8) Disconnect pressure regulator vacuum hose from intake manifold.



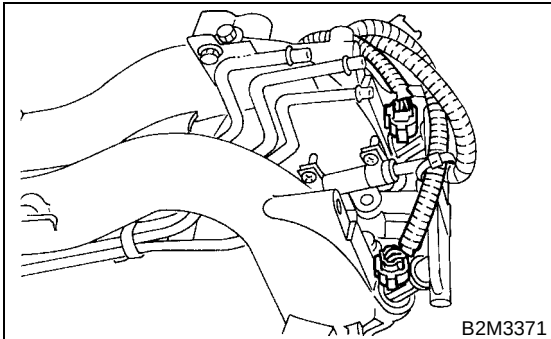
9) Remove fuel pipe protector LH.



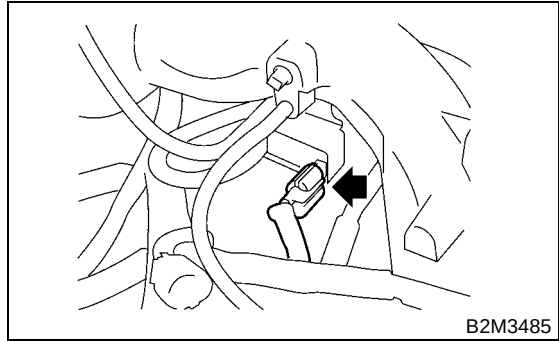
10) Remove fuel pipe protector RH.



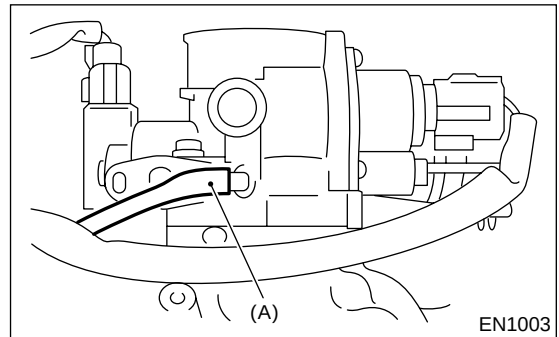
11) Disconnect connectors from fuel injectors.



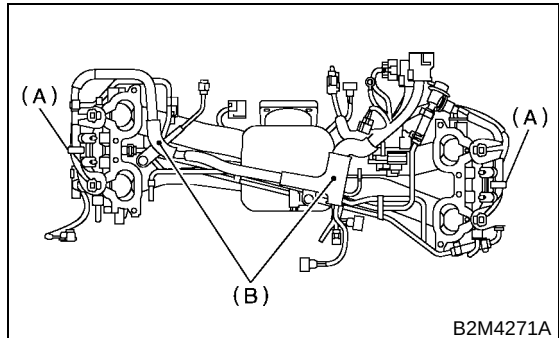
12) Disconnect connector from purge control solenoid valve.



13) Disconnect air by-pass hose (A) from purge control solenoid valve.

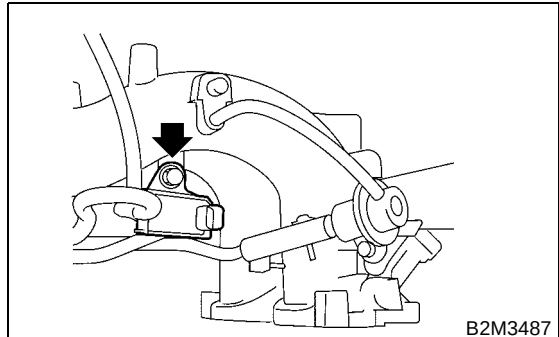


14) Remove harness bands (A) and harness bracket (B) which hold engine harness onto intake manifold.



15) Remove engine harness from intake manifold.

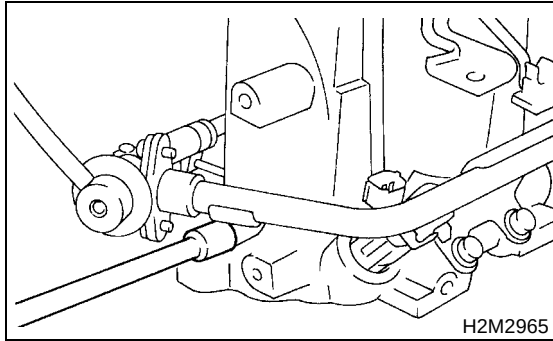
16) Remove purge control solenoid valve.



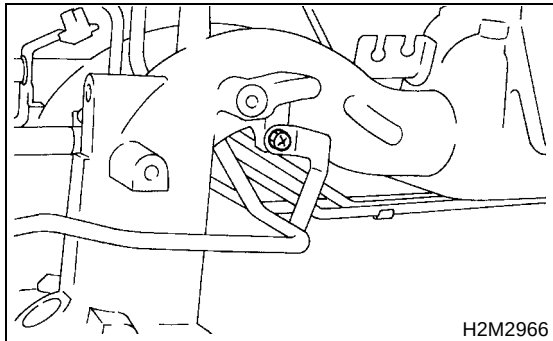
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

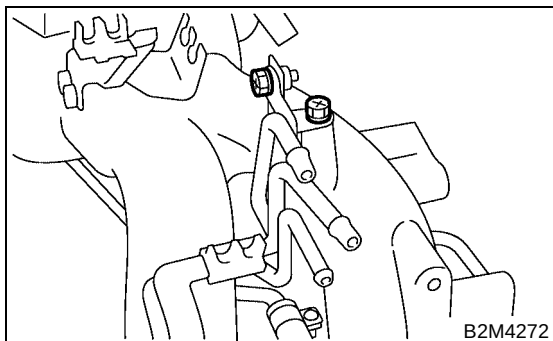
17) Remove bolt which installs injector pipe on intake manifold as shown in figure.



18) Remove bolt which installs injector pipe on intake manifold.

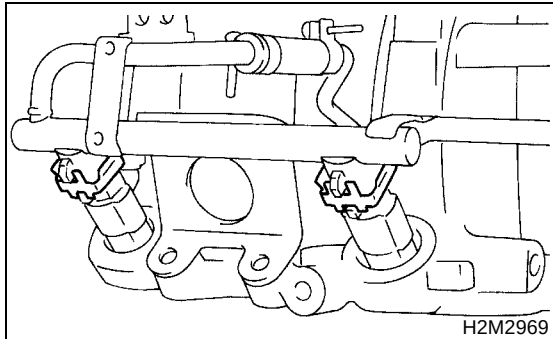


19) Remove two bolts which hold fuel pipes on the left side of intake manifold.

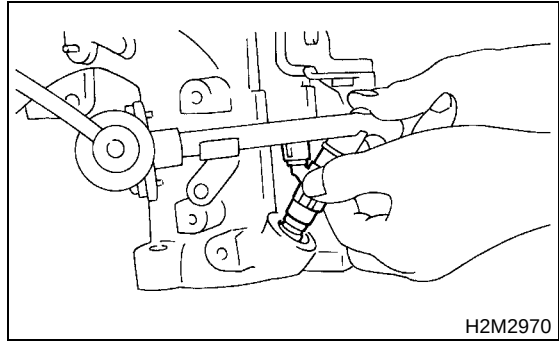


20) Remove fuel injectors.

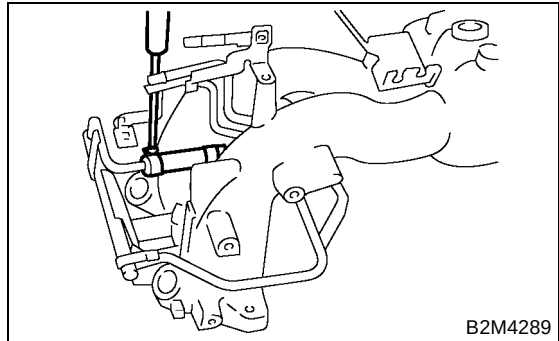
(1) Remove fuel injector securing clip.



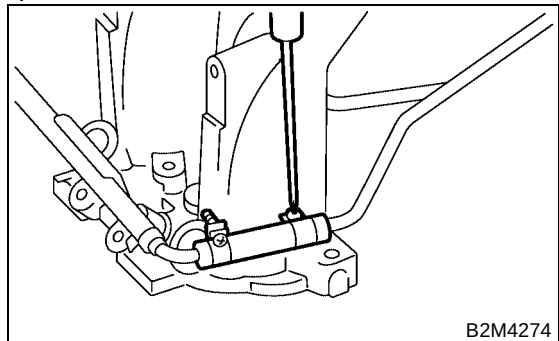
(2) Remove fuel injector while lifting up fuel injector pipe.



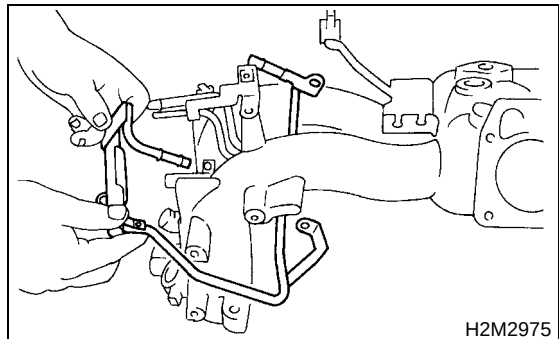
21) Loosen clamp which holds front left side fuel hose to injector pipe and remove the pipe from clamp.



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



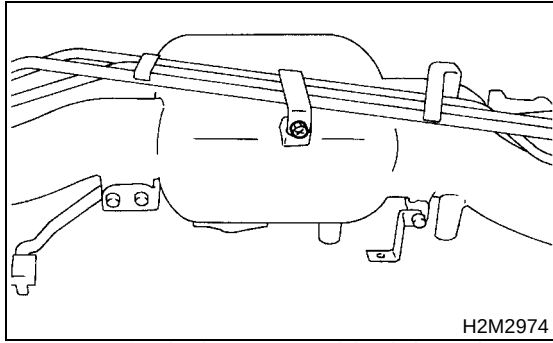
23) Remove fuel injector pipe.



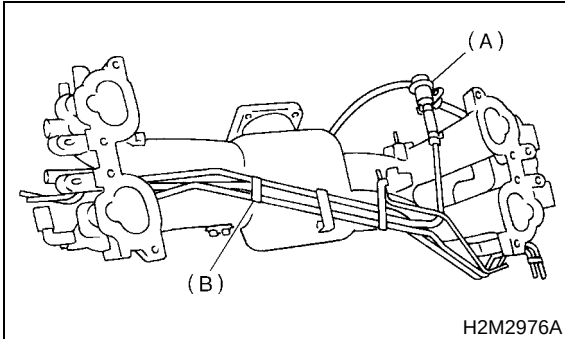
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

24) Remove bolt which installs fuel pipes on intake manifold.

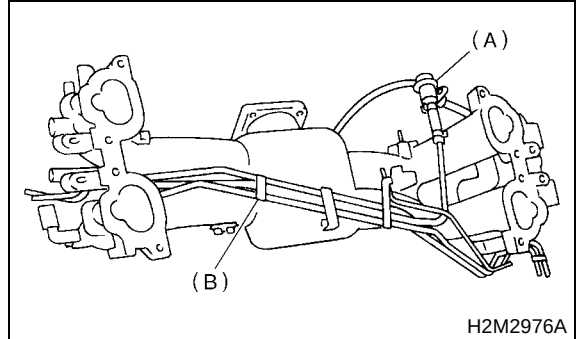


25) Remove fuel pipe assembly (B) and pressure regulator (A), from intake manifold.



D: ASSEMBLY

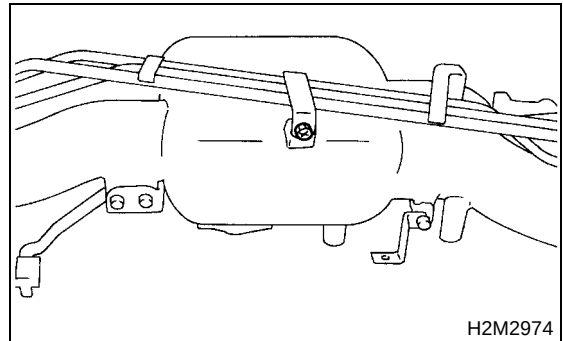
1) Install fuel pipe assembly (B) and pressure regulator (A), etc. to intake manifold.



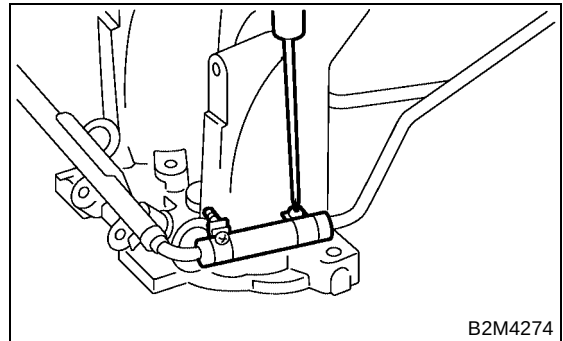
2) Tighten bolt which installs fuel pipes on intake manifold.

Tightening torque:

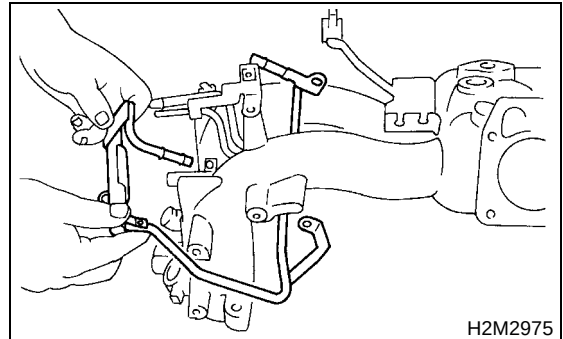
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



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



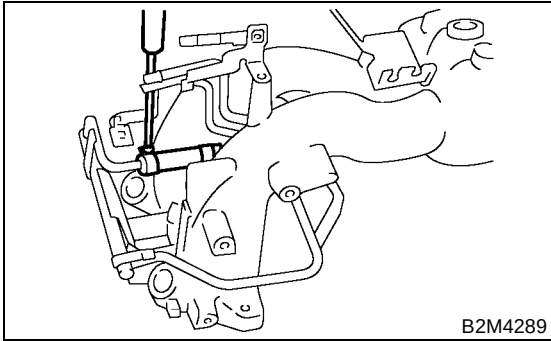
4) Install fuel injector pipe.



INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

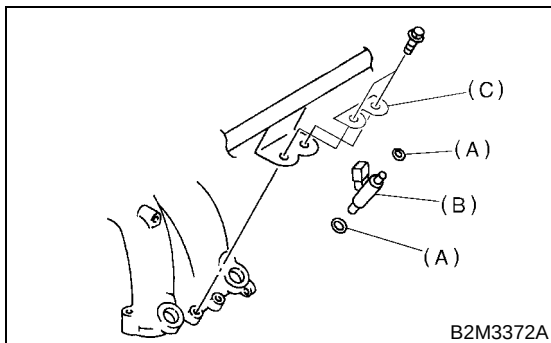
- 5) Connect left side fuel hose to injector pipe, and tighten clamp screw.



- 6) Install fuel injectors.

CAUTION:

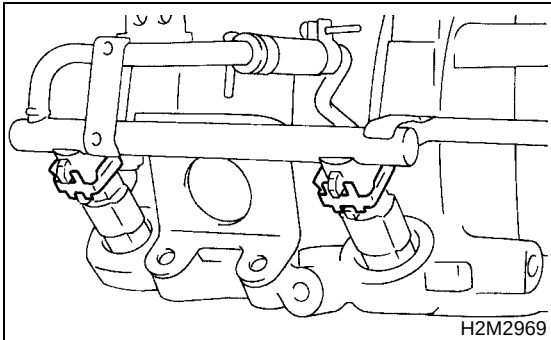
Always use new o-rings.



- (A) O-ring
(B) Fuel injector
(C) Intake manifold protector

NOTE:

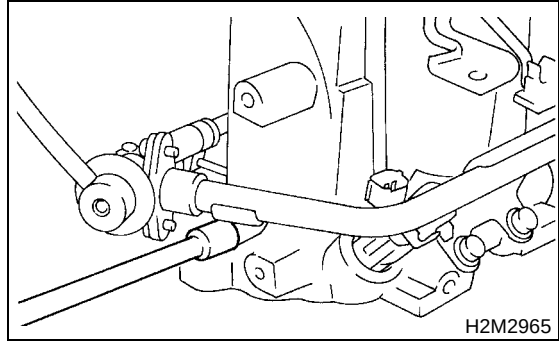
Do not forget to install the fuel injector securing clip.



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

Tightening torque:

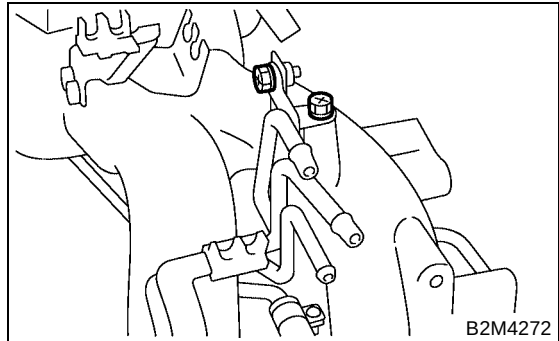
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



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

Tightening torque:

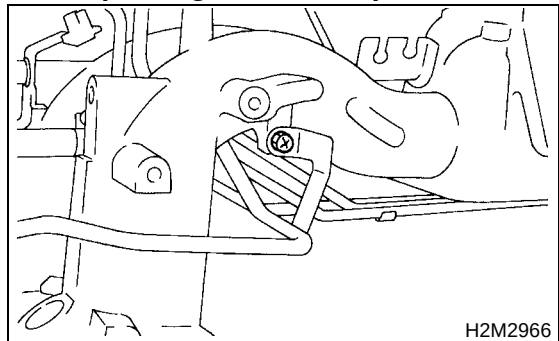
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



- 9) Tighten bolt which install injector pipe on intake manifold.

Tightening torque:

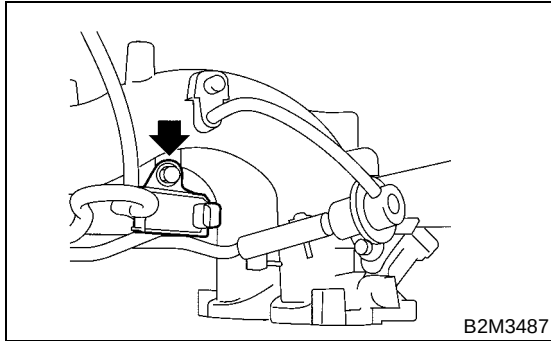
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

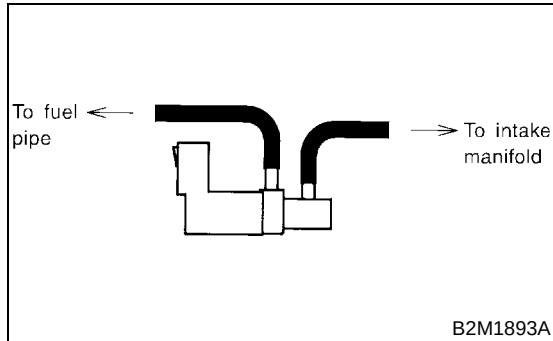
- 10) Install purge control solenoid valve.



- 11) Connect hoses to purge control solenoid valve.

CAUTION:

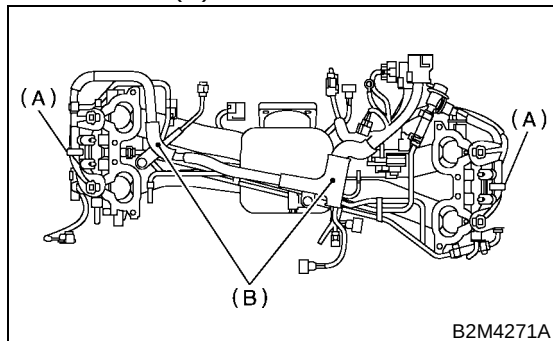
Carefully connect the evaporation hoses.



- 12) Install engine harness onto intake manifold.

- 13) Connect connectors to fuel injectors and purge control solenoid valve.

- 14) Hold engine harness by harness band (A) and harness bracket (B).



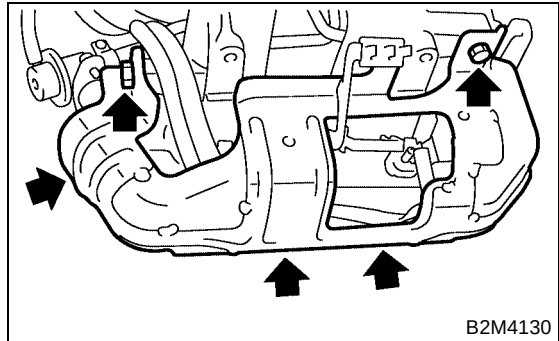
NOTE:

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

- 15) Install fuel pipe protector RH.

Tightening torque:

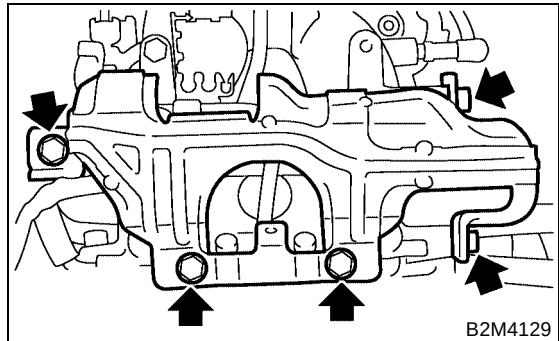
19 N·m (1.9 kgf-m, 13.7 ft-lb)



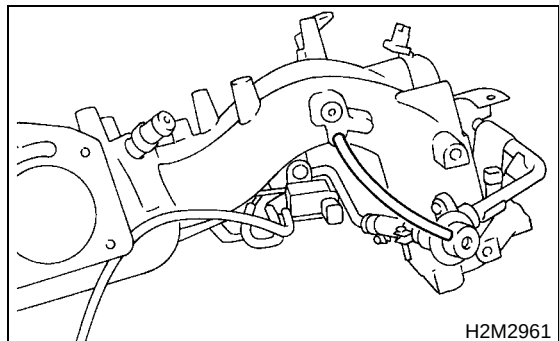
- 16) Install fuel pipe protector LH.

Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



- 17) Connect pressure regulator vacuum hose to intake manifold.



INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

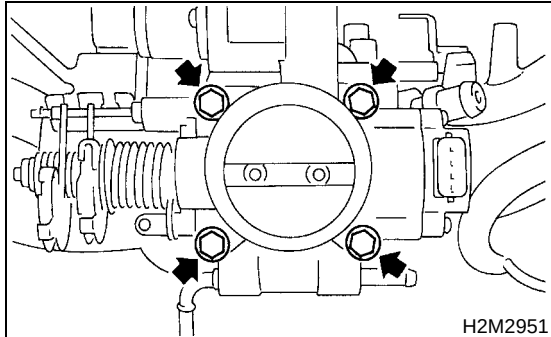
18) Install throttle body to intake manifold.

CAUTION:

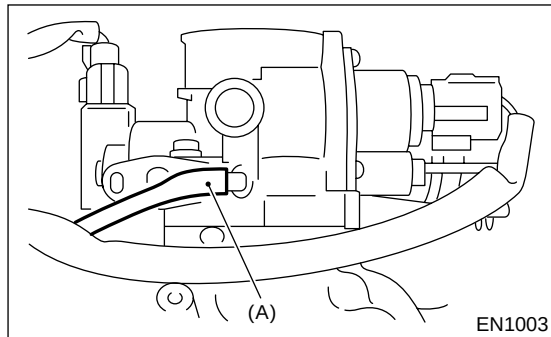
Replace gasket with a new one.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



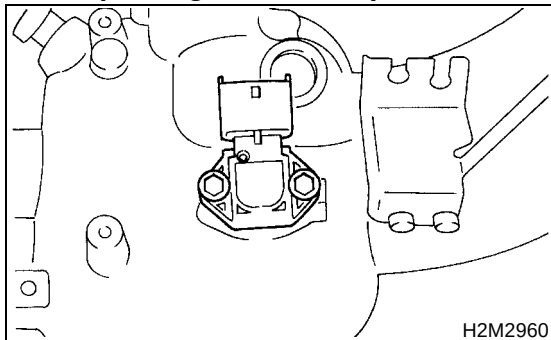
19) Connect air by-pass hose (A) from purge control solenoid valve to intake manifold.



20) Install intake air temperature and pressure sensor.

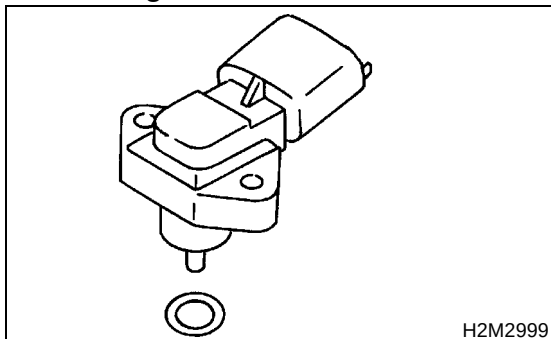
Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



CAUTION:

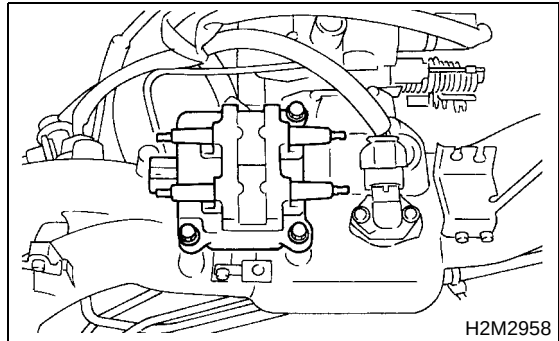
Replace O-ring with new one.



21) Connect connector to intake air temperature and pressure sensor.

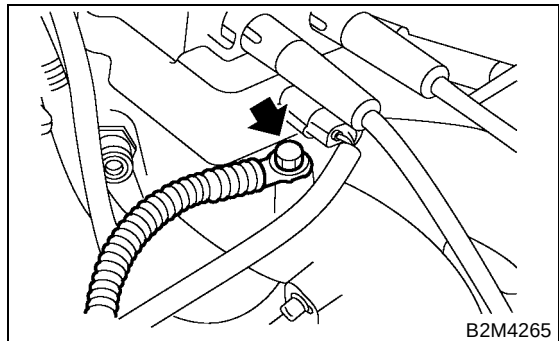
22) Connect connectors to throttle position sensor and idle air control solenoid valve.

23) Install ignition coil and ignitor assembly.



24) Connect connector to ignition coil and ignitor assembly.

25) Install engine ground terminal to intake manifold.



E: INSPECTION

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

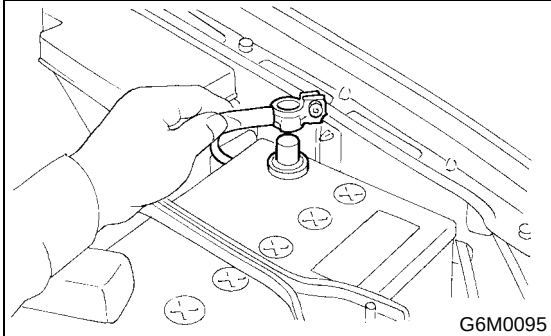
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

4. Engine Coolant Temperature Sensor

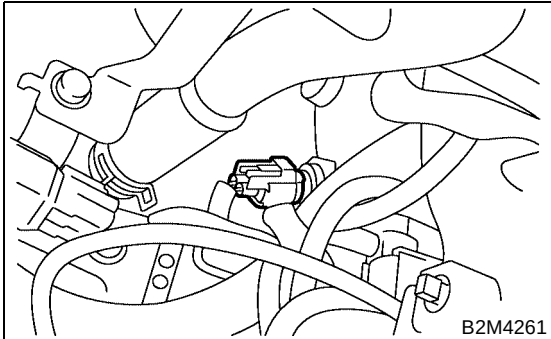
A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Remove air intake duct and air cleaner assembly. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>

- 3) Disconnect connector from engine coolant temperature sensor.



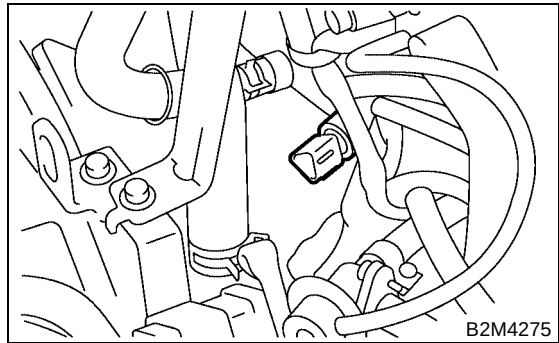
- 4) Remove engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (0.16 kgf-m, 1.2 ft-lb)



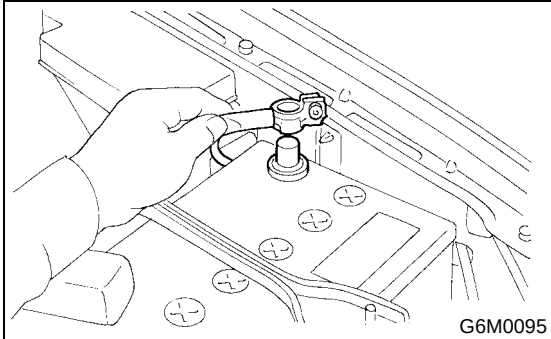
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

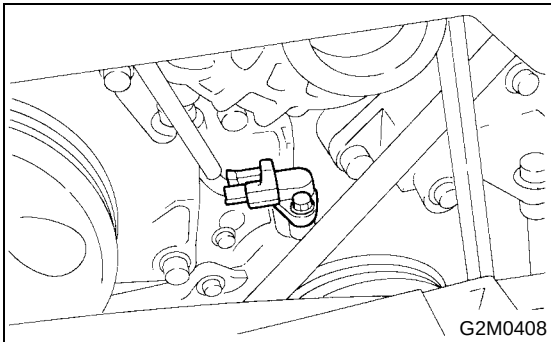
5. Crankshaft Position Sensor

A: REMOVAL

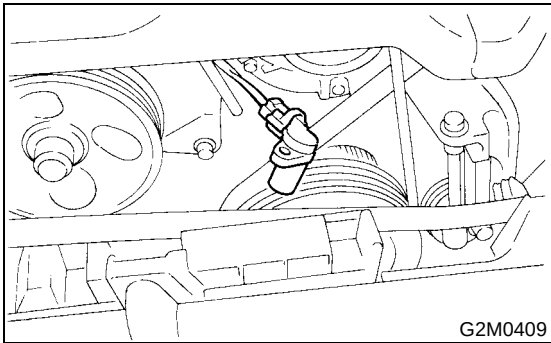
1) Disconnect battery ground cable.



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



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

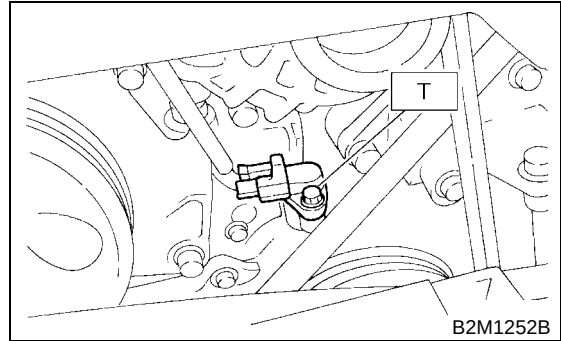


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



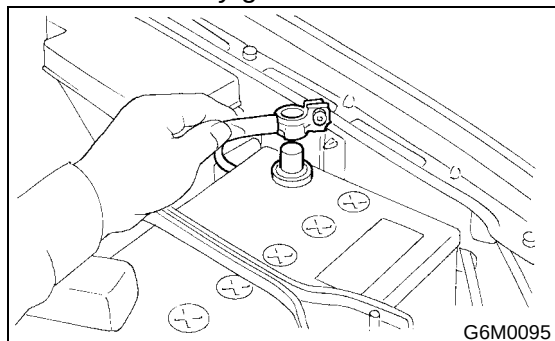
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

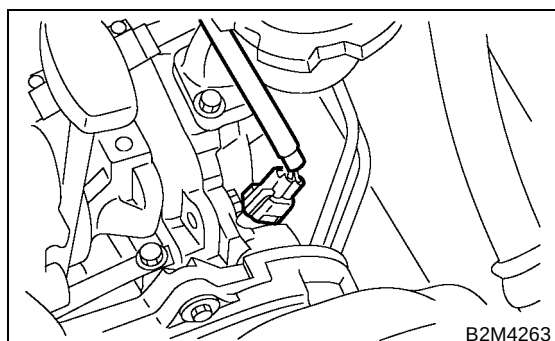
6. Camshaft Position Sensor

A: REMOVAL

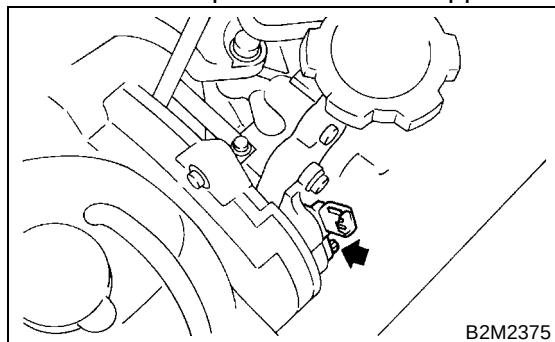
1) Disconnect battery ground cable.



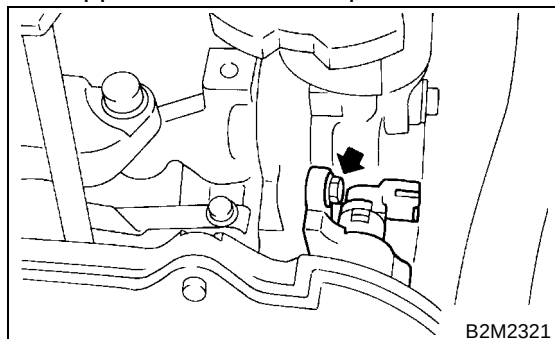
2) Disconnect connector from camshaft position sensor.



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

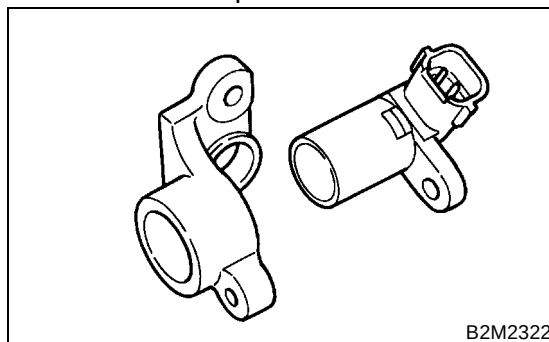


4) Remove bolt which installs camshaft position sensor support to camshaft cap LH.



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)

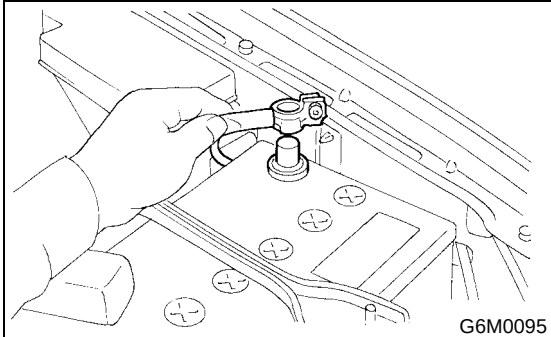
KNOCK SENSOR

FUEL INJECTION (FUEL SYSTEMS)

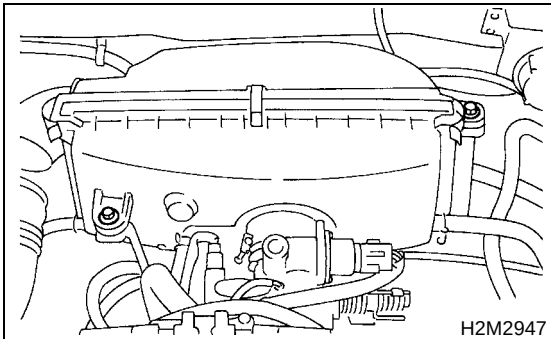
7. Knock Sensor

A: REMOVAL

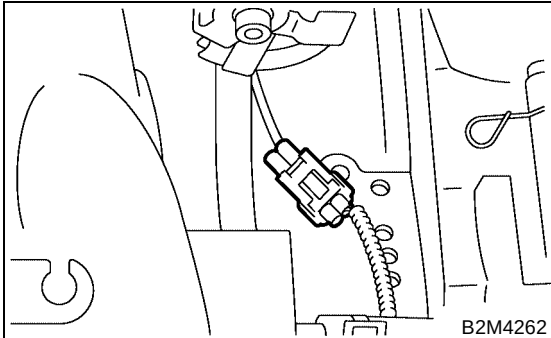
- 1) Disconnect battery ground cable from battery ground terminal.



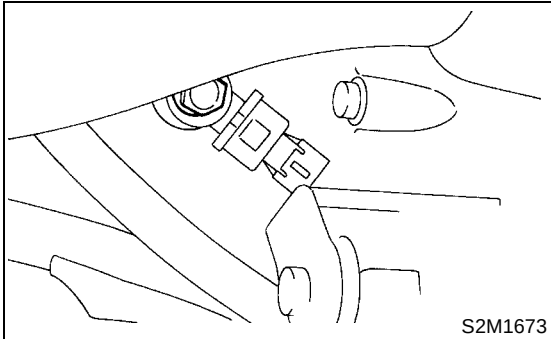
- 2) Remove air cleaner case.



- 3) Disconnect knock sensor connector.



- 4) Remove knock sensor from cylinder block.



B: INSTALLATION

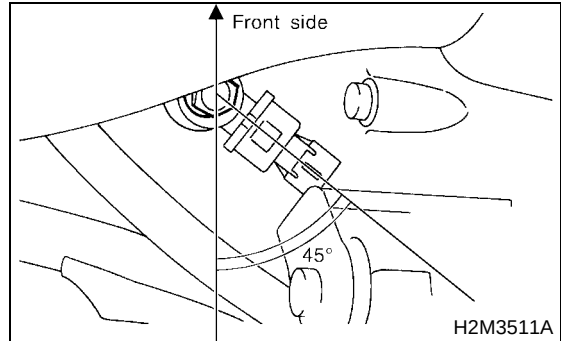
- 1) Install knock sensor to cylinder block.

Tightening torque:

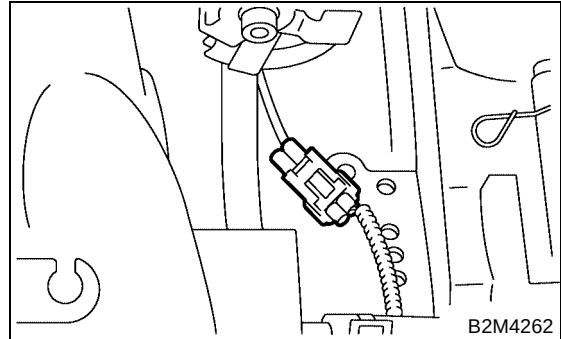
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:

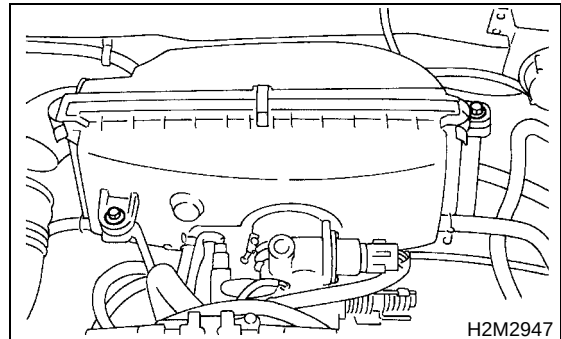
The extraction area of the knock sensor cord must be positioned at a 45° angle relative to the engine rear.



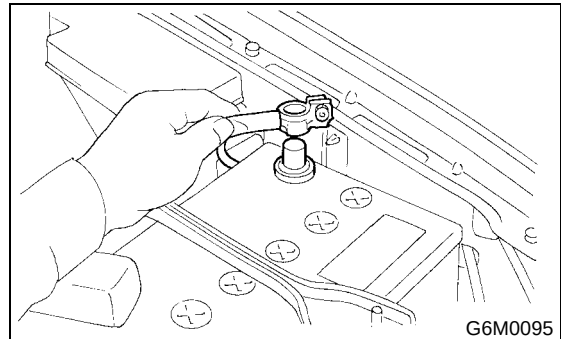
- 2) Connect knock sensor connector.



- 3) Install air cleaner case.



- 4) Connect battery ground cable.



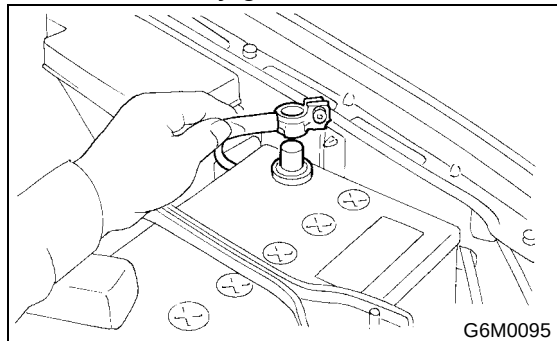
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

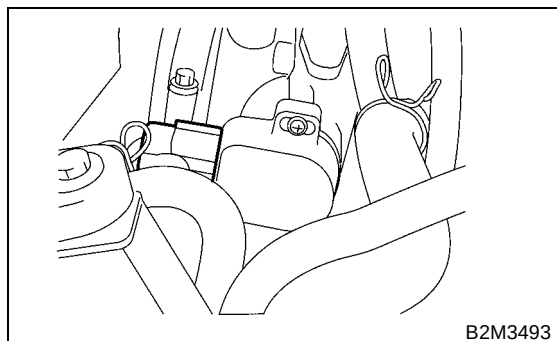
8. Throttle Position Sensor

A: REMOVAL

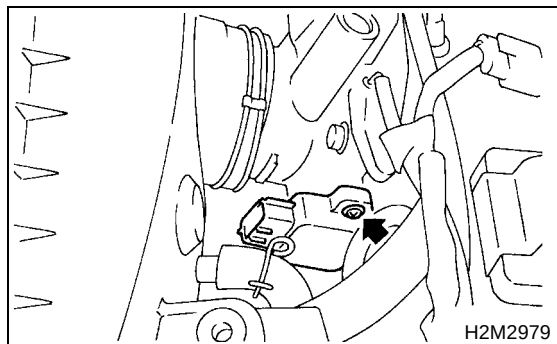
- 1) Disconnect battery ground cable.



- 2) Disconnect connector from throttle position sensor.



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



B: INSTALLATION

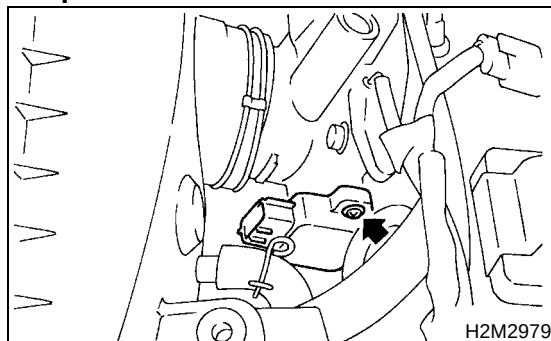
Install in the reverse order of removal.

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.

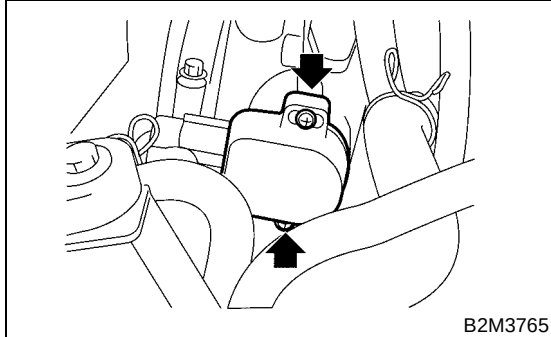


THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

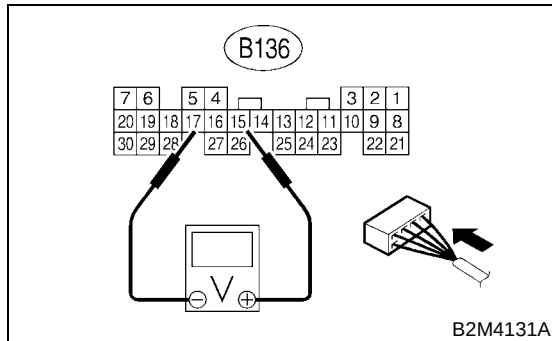
C: ADJUSTMENT

- 1) Turn ignition switch to OFF.
- 2) Loosen throttle position sensor holding screws.



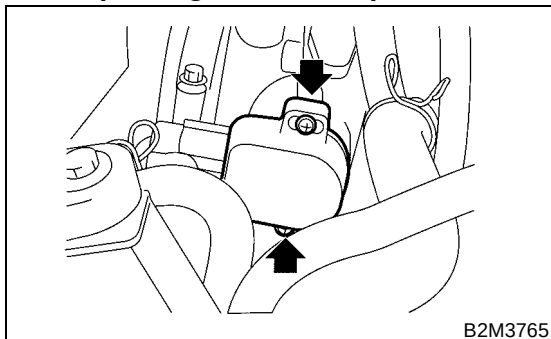
- 3) When using voltage meter;
 - (1) Take out ECM.
 - (2) Turn ignition switch to ON.
 - (3) Adjust throttle position sensor to the proper position to allow the voltage signal to ECM to be in specification.

Connector & terminal / Specified voltage
(B136) No. 15 — (B136) No. 17 / 0.45 — 0.55 V
[Fully closed.]



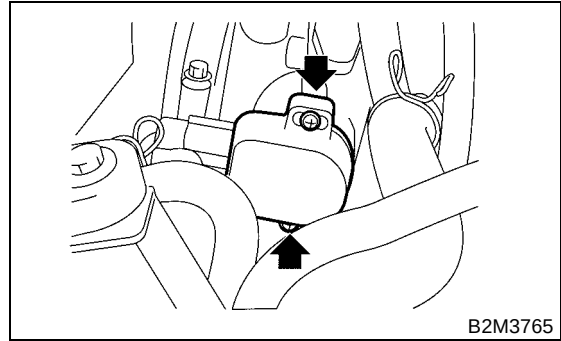
- (4) Tighten throttle position sensor holding screws.

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.

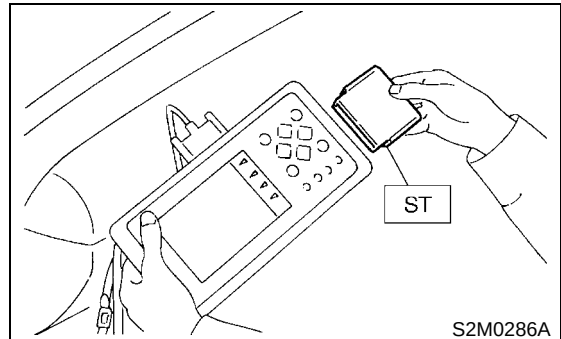
- (2) Loosen throttle position sensor holding screws.



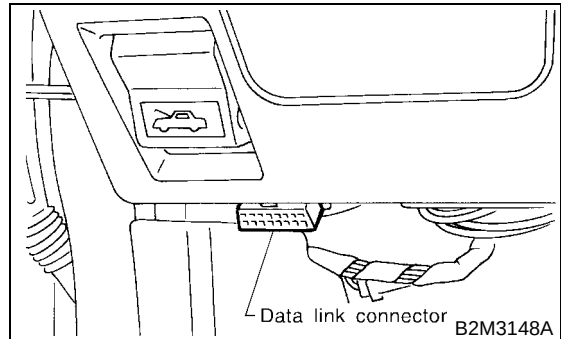
NOTE:

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

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



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



- 5) Turn ignition switch to ON, and Subaru Select Monitor switch to ON.
- 6) Select {2. Each System Check} in Main Menu.
- 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

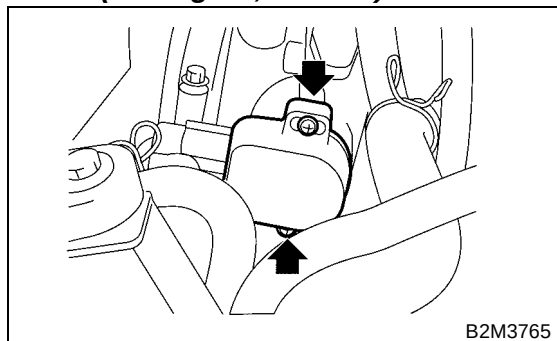
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

11) Tighten throttle position sensor holding screws.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



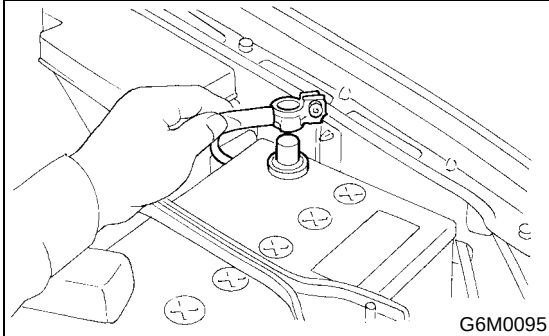
INTAKE AIR TEMPERATURE AND PRESSURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

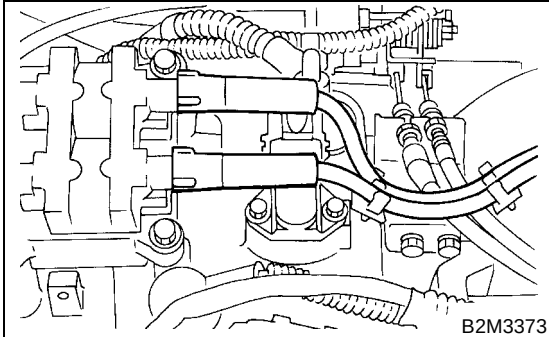
9. Intake Air Temperature and Pressure Sensor

A: REMOVAL

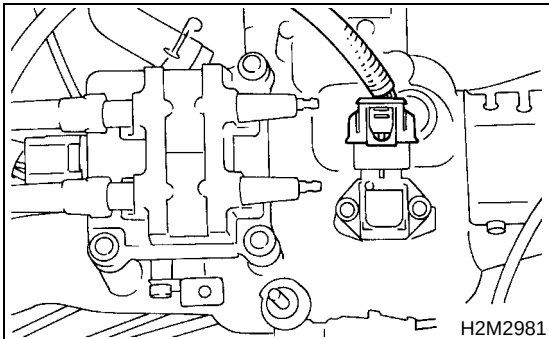
- 1) Disconnect battery ground cable.



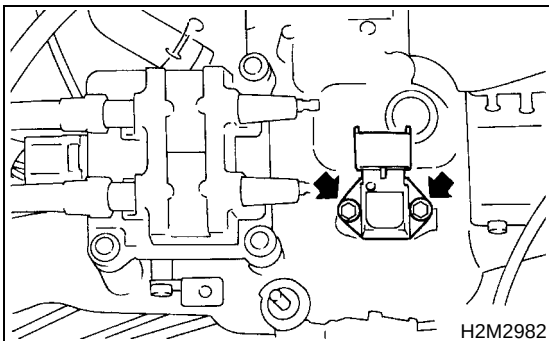
- 2) Disconnect spark plug cord from ignition coil and ignitor assembly.



- 3) Disconnect connector from intake air temperature and pressure sensor.



- 4) Remove intake air temperature and pressure sensor.

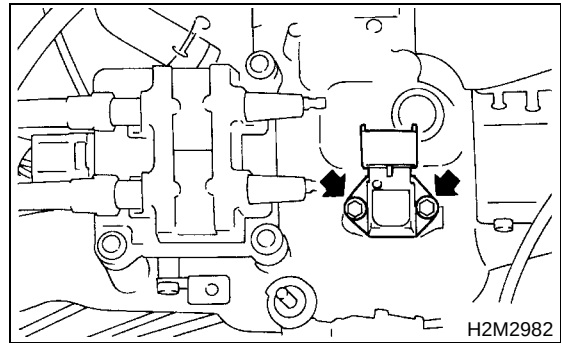


B: INSTALLATION

Install in the reverse order of removal.

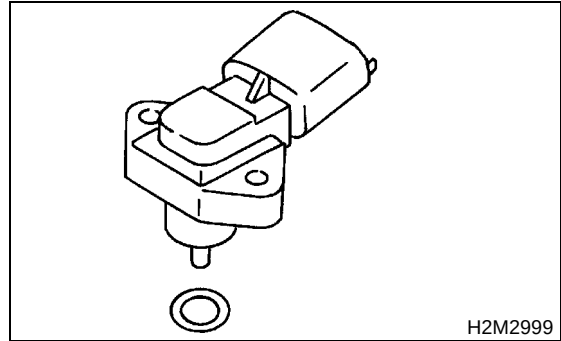
Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



CAUTION:

Replace O-ring with new one.



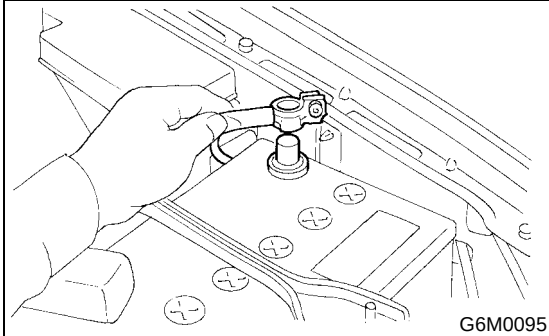
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

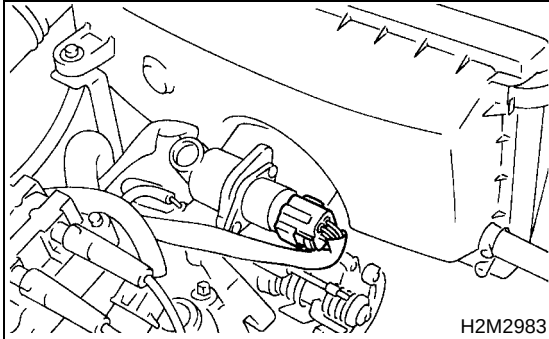
10.Idle Air Control Solenoid Valve

A: REMOVAL

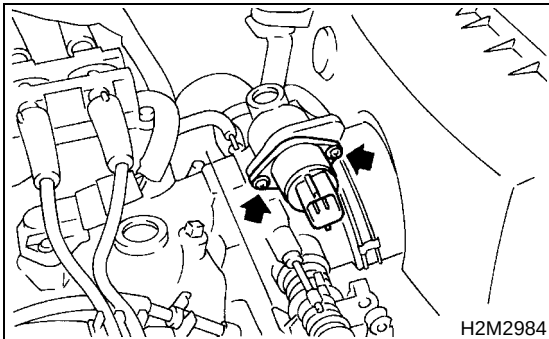
- 1) Disconnect battery ground cable.



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



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



B: INSTALLATION

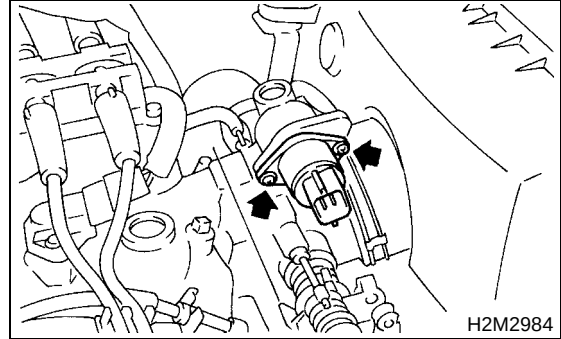
Install in the reverse order of removal.

CAUTION:

Always use new gasket.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

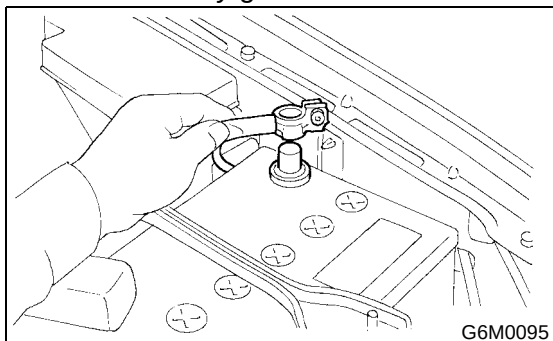


11. Fuel Injector

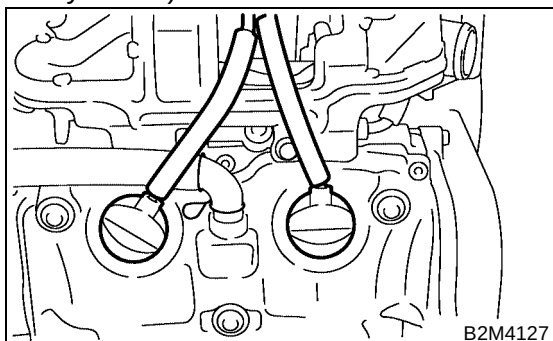
A: REMOVAL

1. RH SIDE

- 1) Release fuel pressure.
<Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.
- 3) Disconnect battery ground cable.

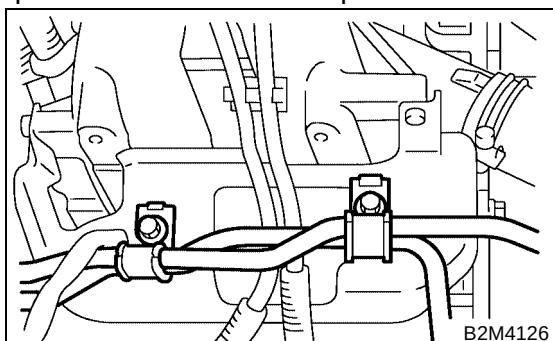


- 4) Remove resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
- 5) Remove spark plug cords from spark plugs (#1 and #3 cylinders).

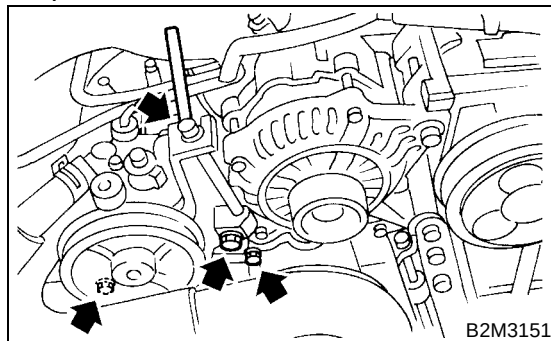


- 6) Remove power steering pump and tank from brackets.

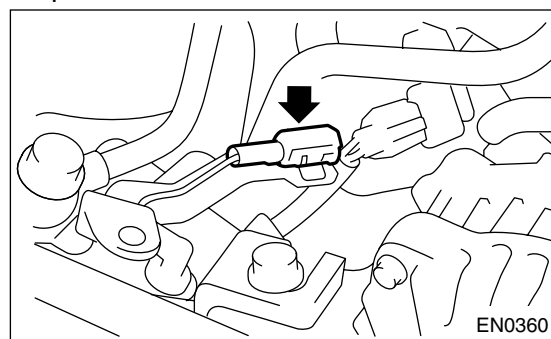
- (1) Remove front side V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.>
- (2) Remove bolts which hold power steering pipes onto intake manifold protector.



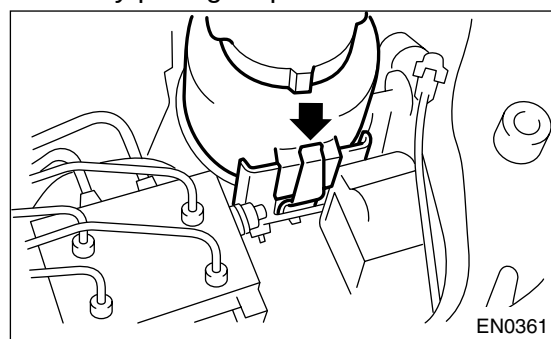
- (3) Remove bolts which install power steering pump to bracket.



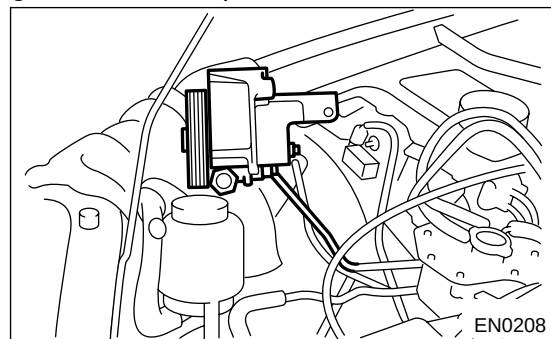
- (4) Disconnect connector from power steering pump switch.



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



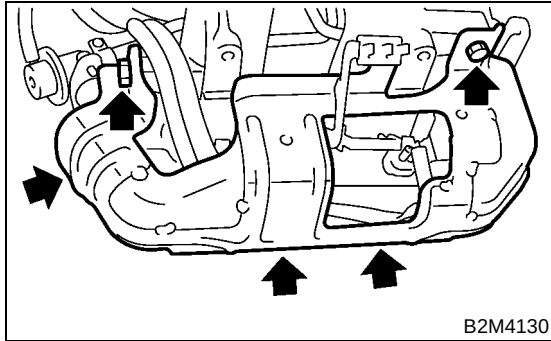
- (6) Place power steering pump and tank on the right side wheel apron.



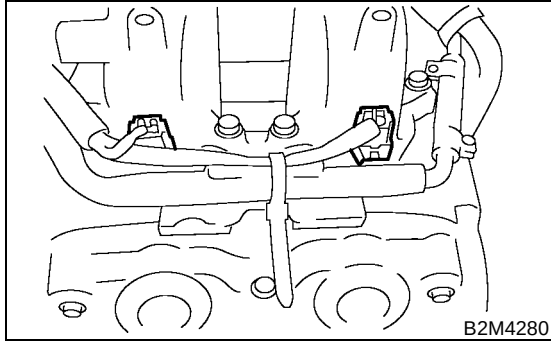
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

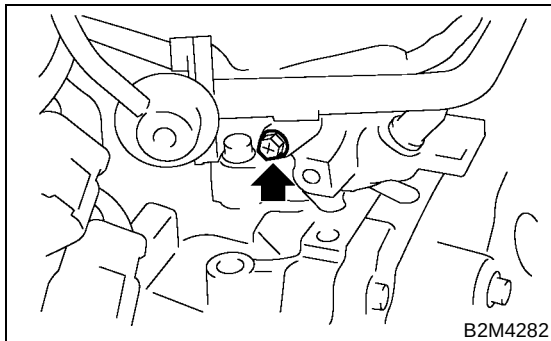
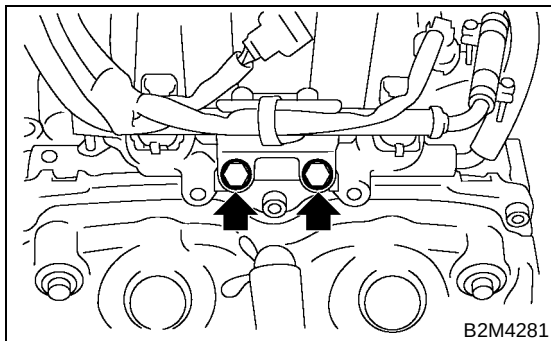
7) Remove fuel pipe protector RH.



8) Disconnect connector from fuel injector.

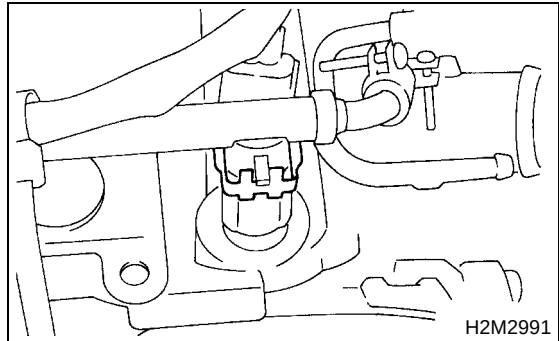


9) Remove bolts which hold injector pipe to intake manifold.

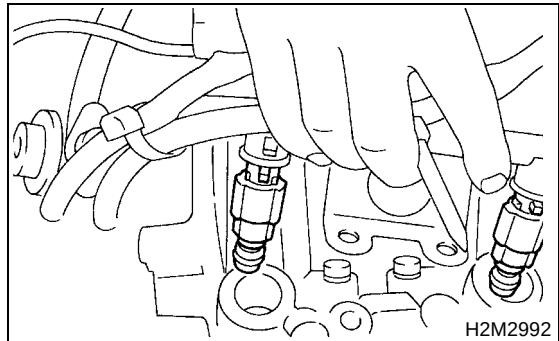


10) Remove fuel injector from intake manifold.

(1) Remove fuel injector securing clip.



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

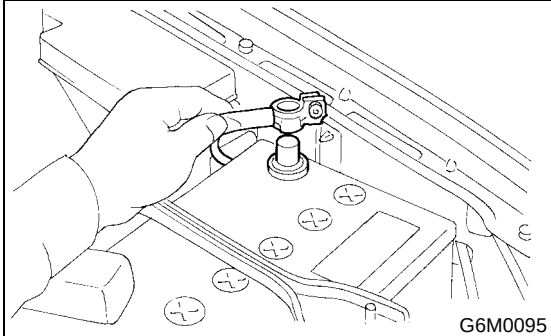


FUEL INJECTOR

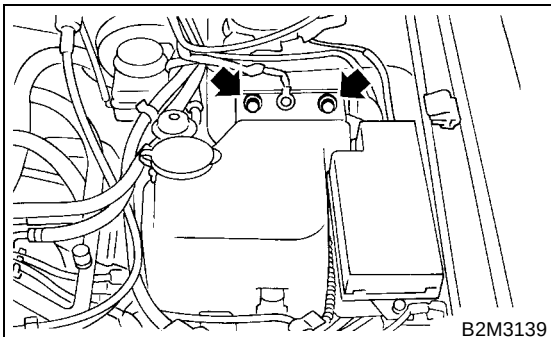
FUEL INJECTION (FUEL SYSTEMS)

2. LH SIDE

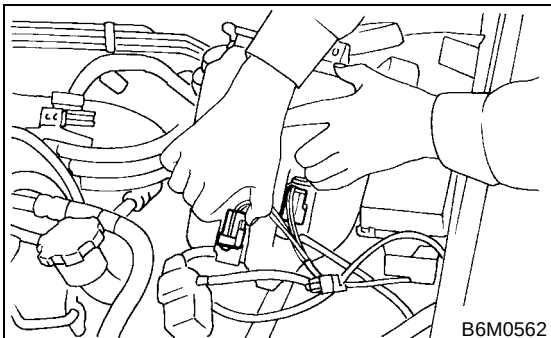
- 1) Release fuel pressure. <Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.
- 3) Disconnect battery ground cable.



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

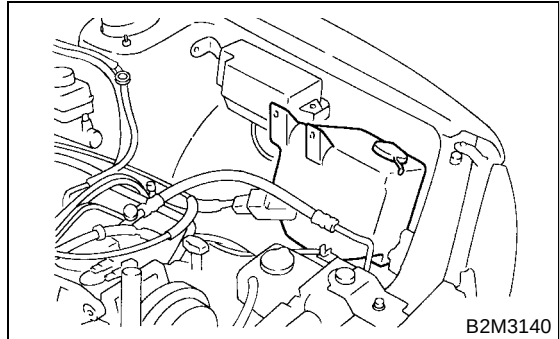


- 5) Disconnect connector from front window washer motor.
- 6) Disconnect connector from rear gate glass washer motor.

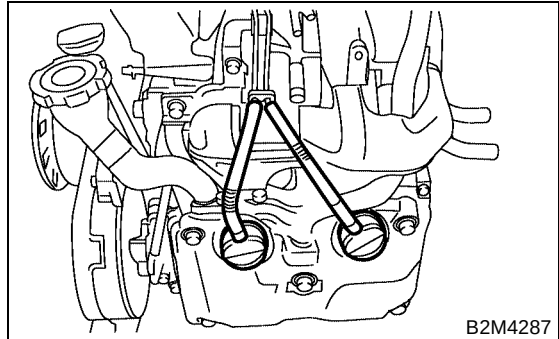


- 7) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

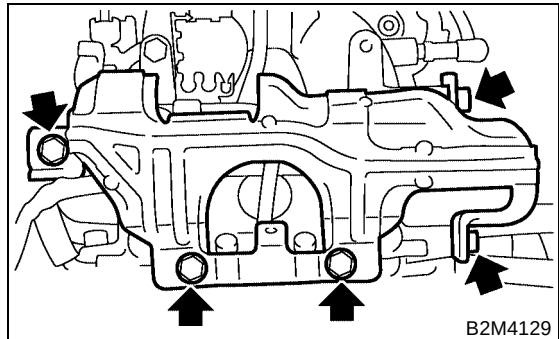
- 8) Move washer tank, and secure it away from working area.



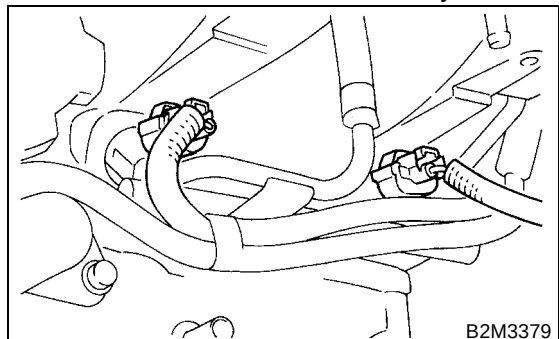
- 9) Remove spark plug cords from spark plugs (#2 and #4 cylinders).



- 10) Remove fuel pipe protector LH.



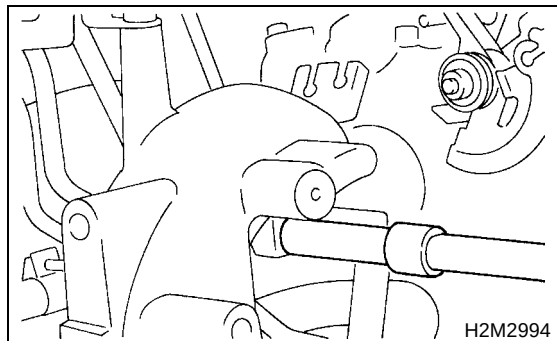
- 11) Disconnect connector from fuel injector.



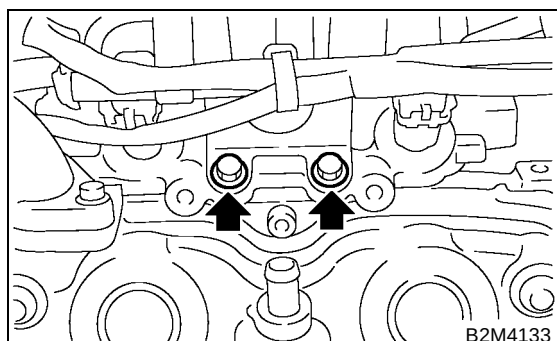
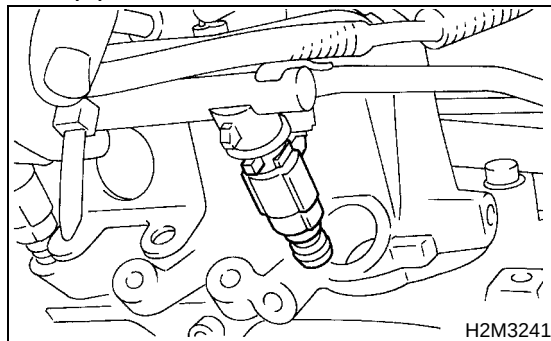
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

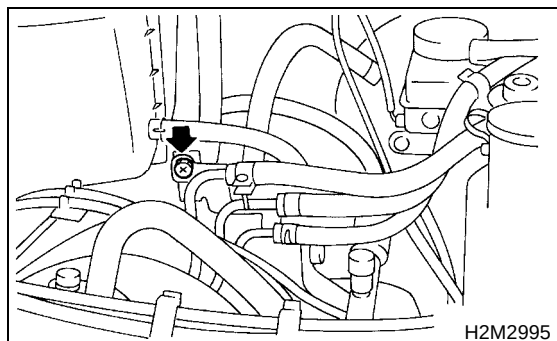
12) Remove bolt which installs injector pipe to intake manifold.



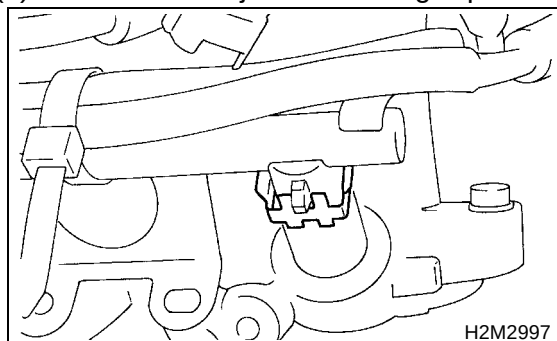
(2) Remove fuel injector while lifting up fuel injector pipe.



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



14) Remove fuel injector from intake manifold.
(1) Remove fuel injector securing clip.



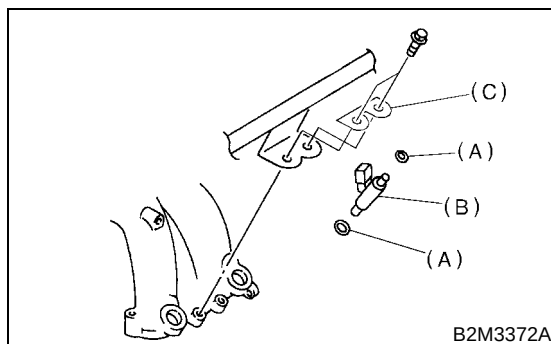
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

CAUTION:

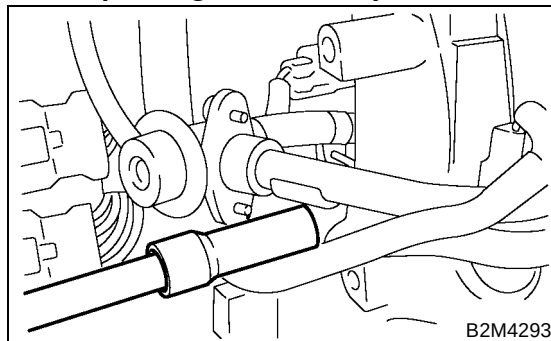
Replace O-rings with new ones.



- (A) O-ring
- (B) Fuel injector
- (C) Intake manifold protector

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

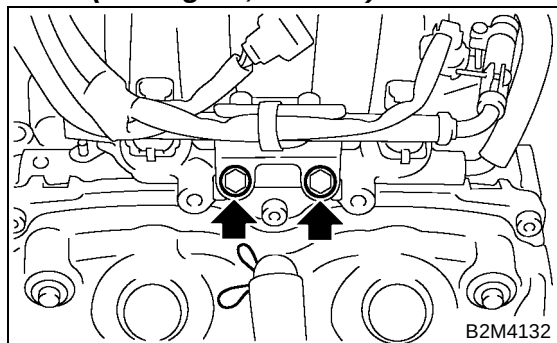


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

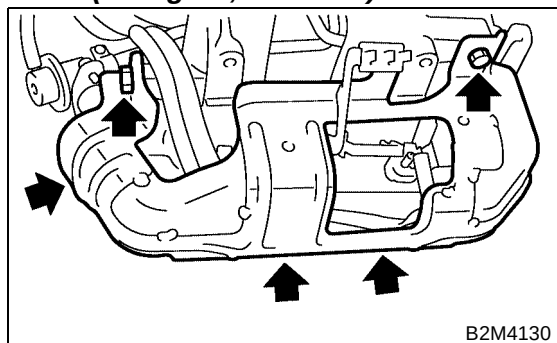
Tightening torque:

19 N·m (0.19 kgf-m, 1.4 ft-lb)



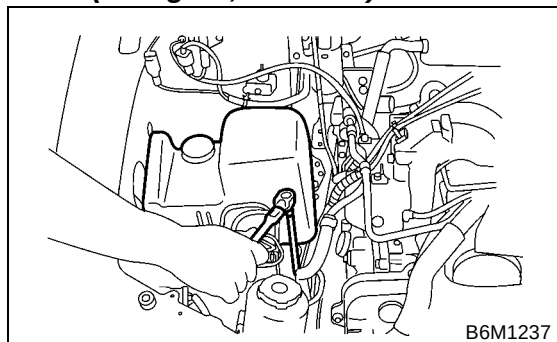
Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



Tightening torque:

32 N·m (3.3 kgf-m, 23.9 ft-lb)

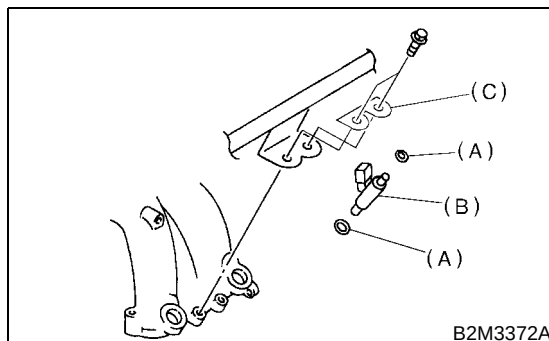


2. LH SIDE

Install in the reverse order of removal.

CAUTION:

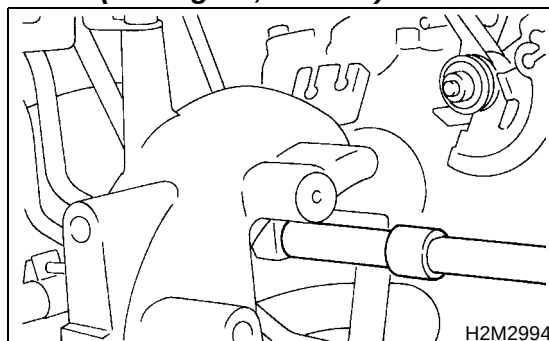
Replace O-rings with new ones.



- (A) O-ring
- (B) Fuel injector
- (C) Intake manifold protector

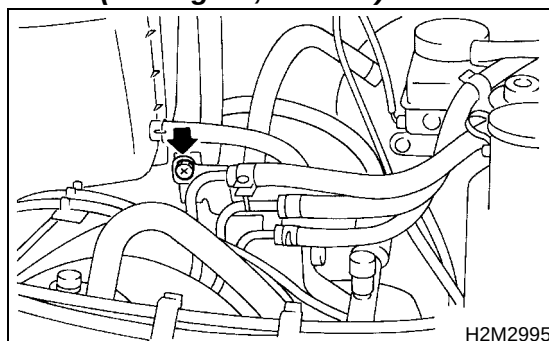
Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



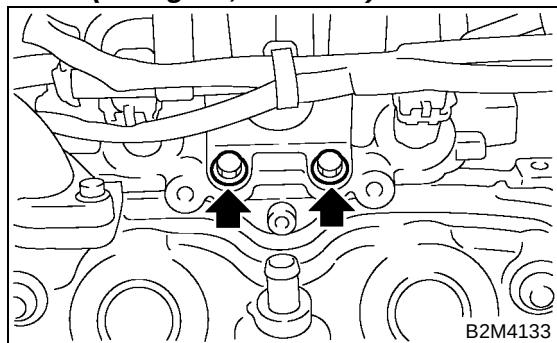
Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



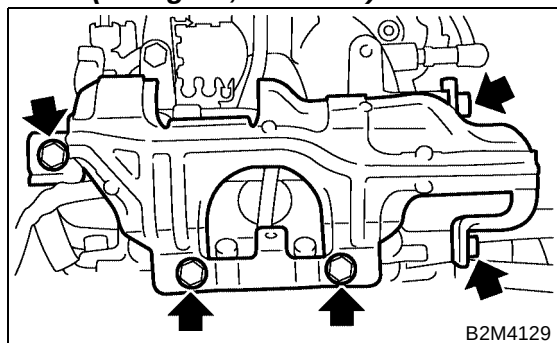
Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



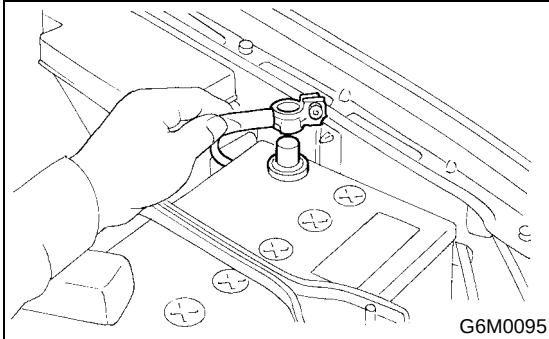
OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

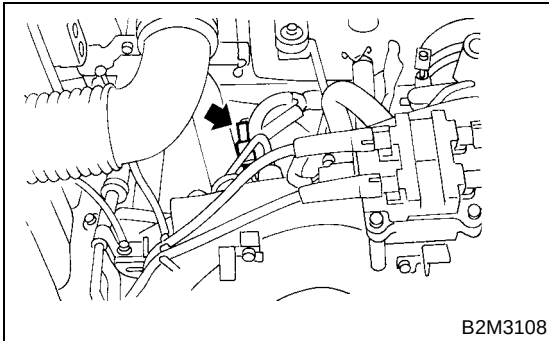
12. Oxygen Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from oxygen sensor.



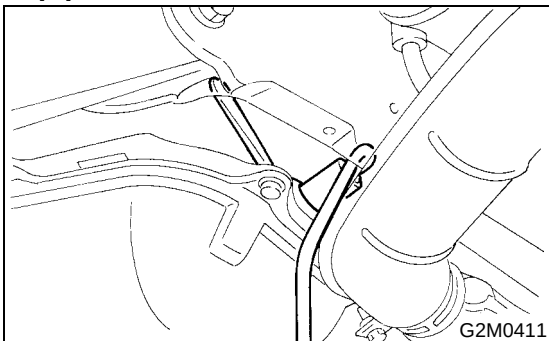
- 3) Lift-up the vehicle.
- 4) Apply SUBARU CRC or its equivalent to threaded portion of oxygen sensor, and leave it for one minute or more.

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

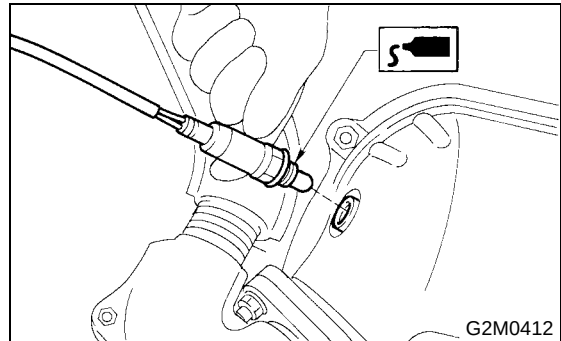
- 1) Before installing oxygen sensor, apply anti-seize compound only to threaded portion of oxygen sensor to make the next removal easier.

Anti-seize compound:

SS-30 by JET LUBE

CAUTION:

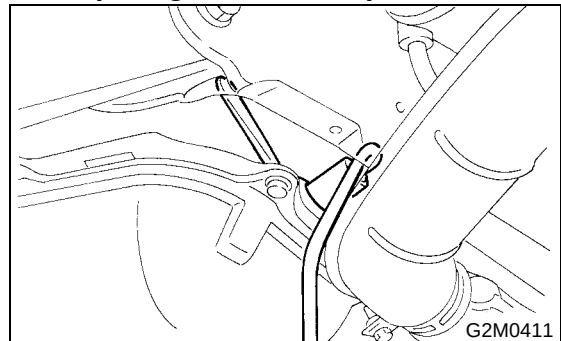
Never apply anti-seize compound to protector of oxygen sensor.



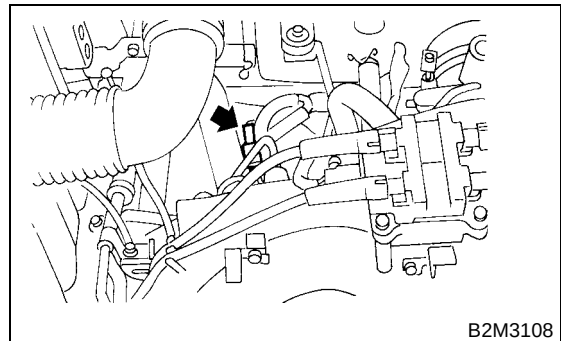
- 2) Install oxygen sensor.

Tightening torque:

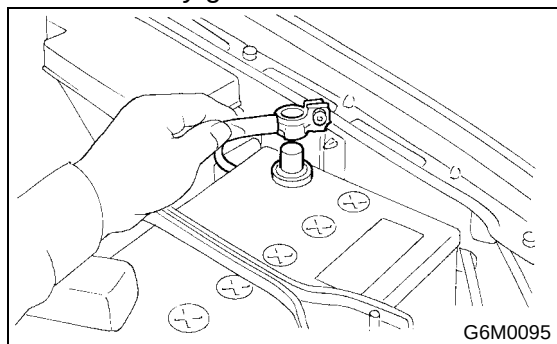
21 N·m (2.1 kgf-m, 15.2 ft-lb)



- 3) Lower the vehicle.
- 4) Connect connector of oxygen sensor.



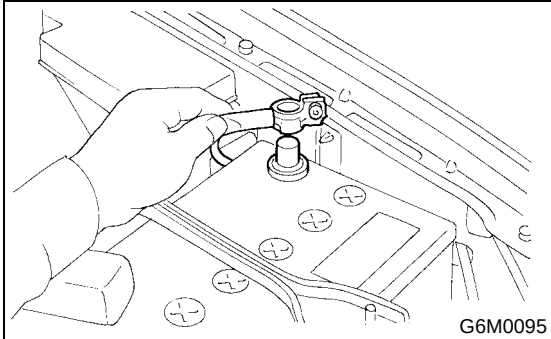
5) Connect battery ground cable.



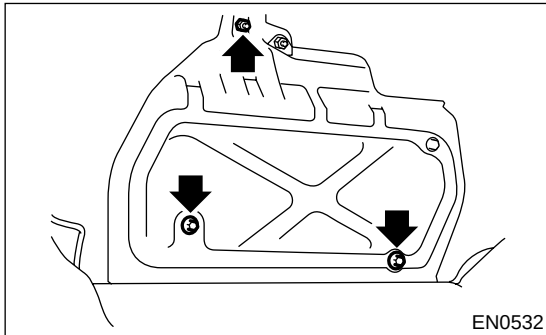
13.Engine Control Module

A: REMOVAL

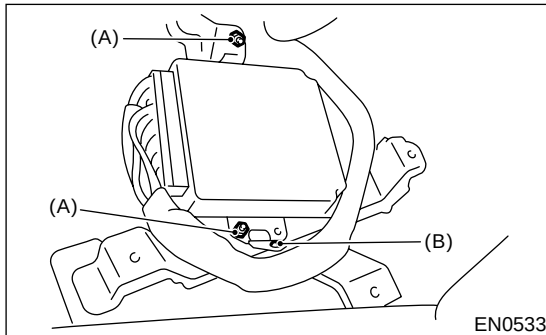
- 1) Disconnect battery ground cable.



- 2) Remove lower inner trim of passenger side.
<Ref. to EI-29, REMOVAL, Lower Inner Trim.>
3) Detach floor mat of front 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.

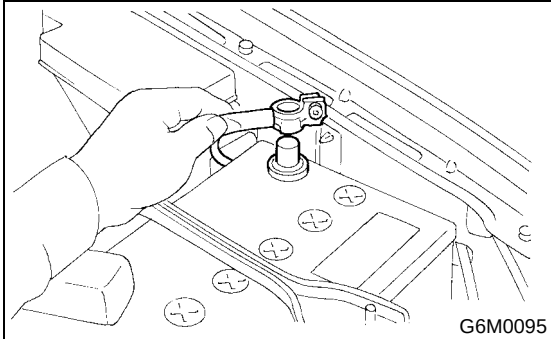
CAUTION:

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

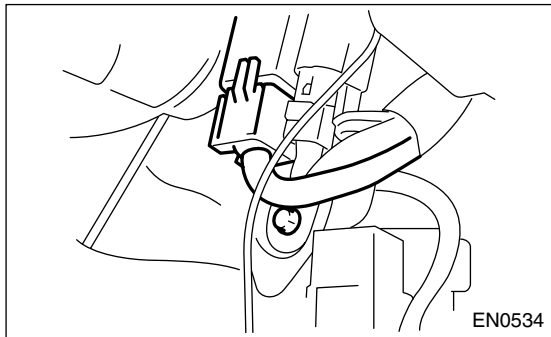
14.Main Relay

A: REMOVAL

- 1) Disconnect battery ground cable.



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



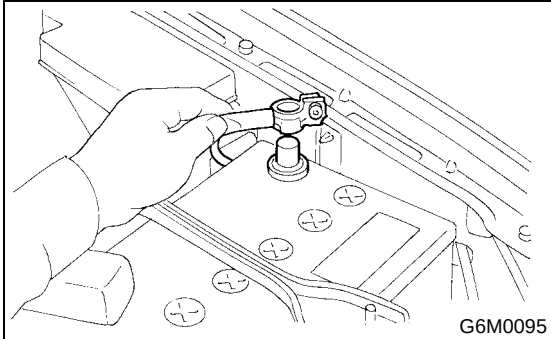
B: INSTALLATION

Install in the reverse order of removal.

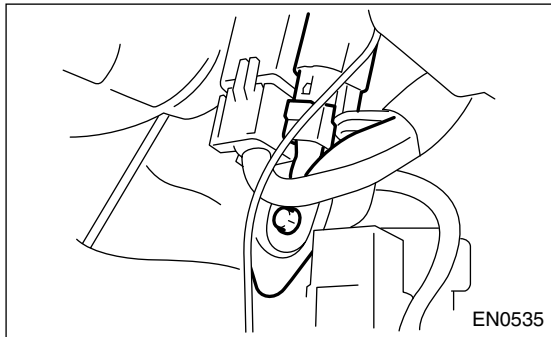
15. Fuel Pump Relay

A: REMOVAL

- 1) Disconnect battery ground cable.



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



- 5) 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 connector from fuel pump relay.



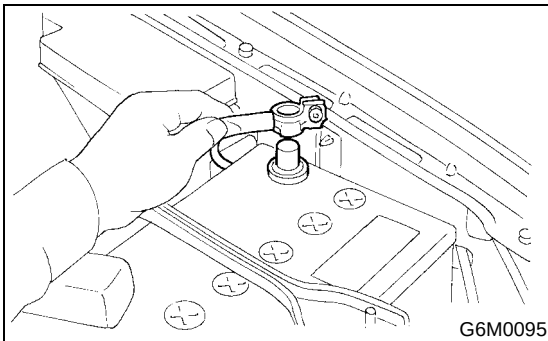
- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn ignition switch to OFF.

2. DRAINING FUEL

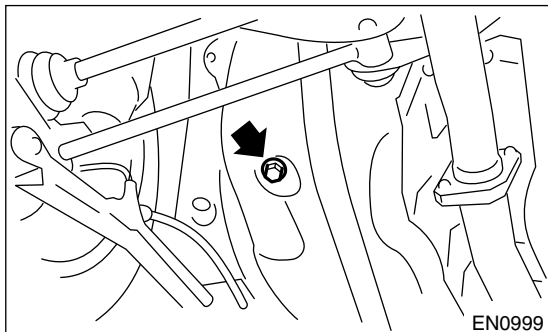
WARNING:

- 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.



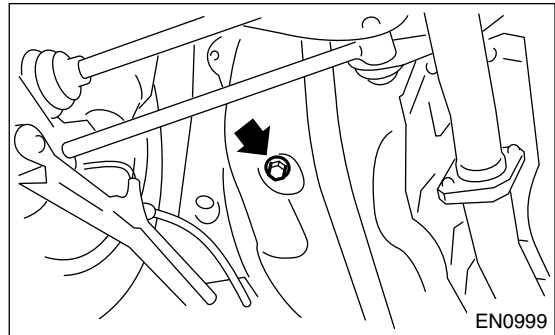
- 3) Lift-up the vehicle.
 - 4) Drain fuel from fuel tank.
- Set a container under the vehicle and remove drain plug from fuel tank.



- 5) Tighten fuel drain plug.

Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



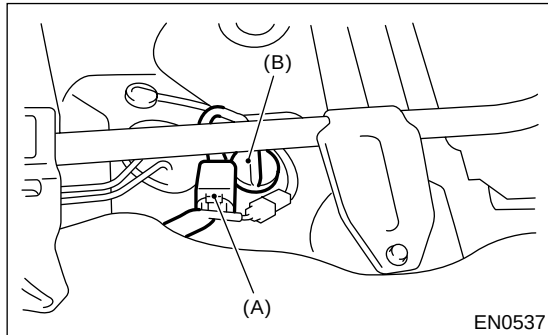
17. Fuel Tank

A: REMOVAL

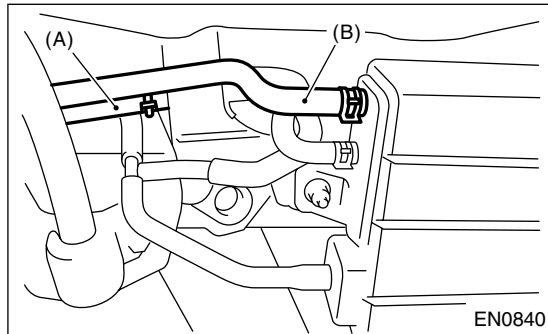
WARNING:

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

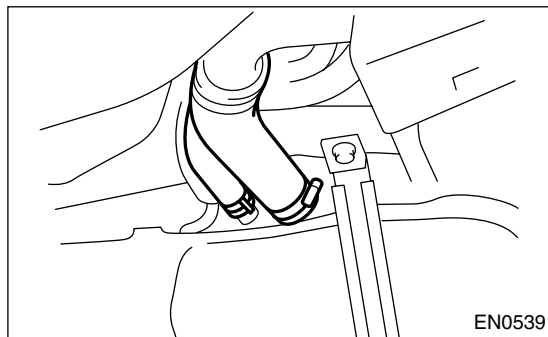
- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain fuel from fuel tank. <Ref. to FU(SOHCw/oOBD)-47, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove rear seat.
- 5) Disconnect connector (A) of fuel tank cord to rear harness.
- 6) Push grommet (B) which holds fuel tank cord on floor panel into under the body.



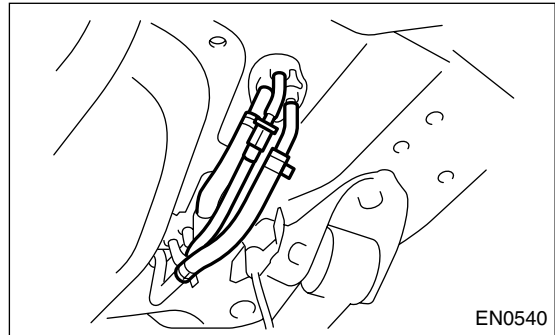
- 7) Remove rear crossmember. <Ref. to RS-22, REMOVAL, Rear Crossmember.>
- 8) Disconnect two-way valve hose (A) from two-way valve and disconnect canister hose (B) from canister.



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



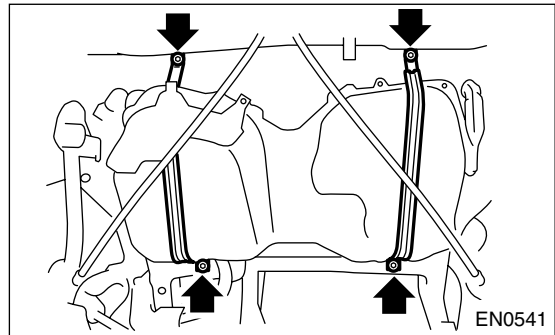
- 10) Move clips, and disconnect quick connector. <Ref. to FU(SOHCw/oOBD)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 11) Disconnect fuel hoses.



- 12) 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.

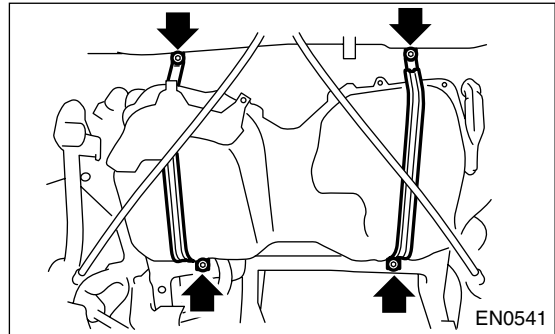


B: INSTALLATION

- 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:

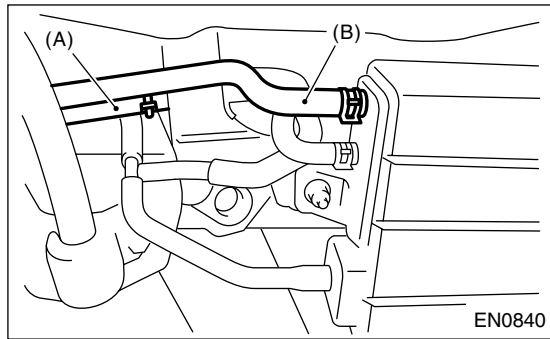
A helper is required to perform this work.



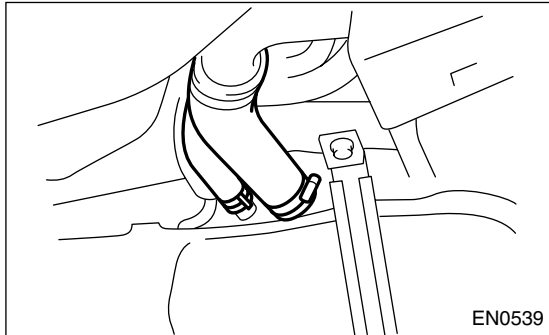
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

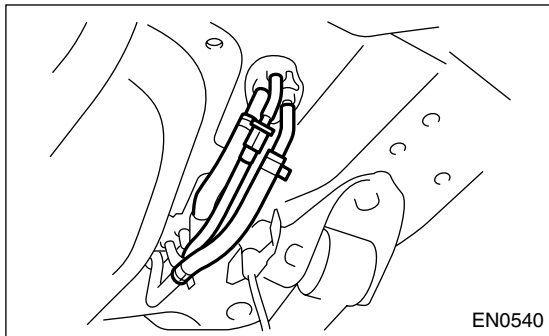
- 3) Connect two-way valve hose (A) to two-way valve and connect canister hose (B) to canister.



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



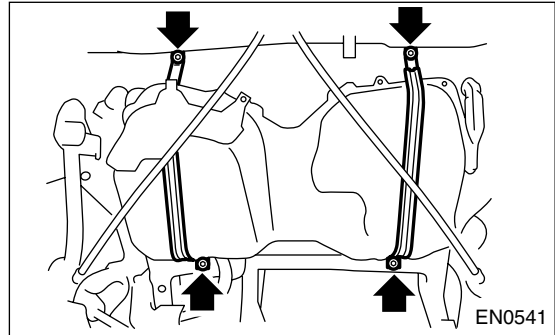
- 5) Connect fuel hoses, and hold them with clips and quick connector. <Ref. to FU(SOHCw/oOBD)-61, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



- 6) Tighten band mounting bolts.

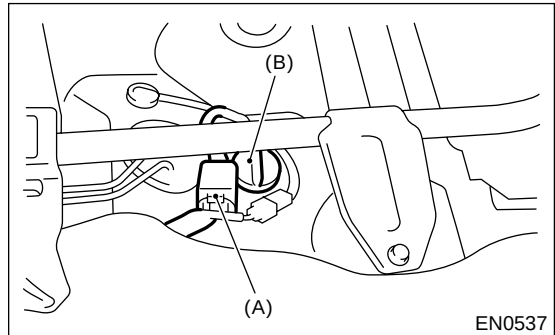
Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



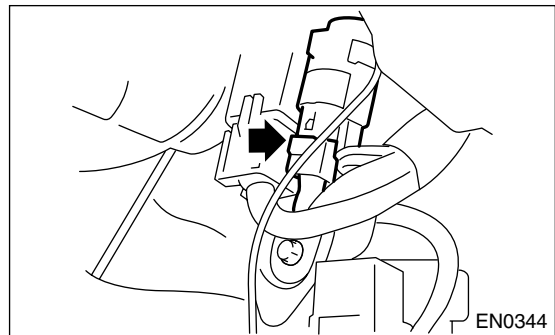
- 7) Install rear crossmember. <Ref. to RS-23, INSTALLATION, Rear Crossmember.>

- 8) Connect connectors to fuel tank cord and plug service hole with grommet.



- 9) Set rear seat and floor mat.

- 10) Connect connector to fuel pump relay.



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.

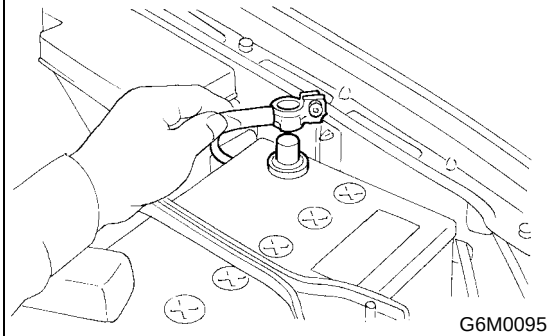
18. Fuel Filler Pipe

A: REMOVAL

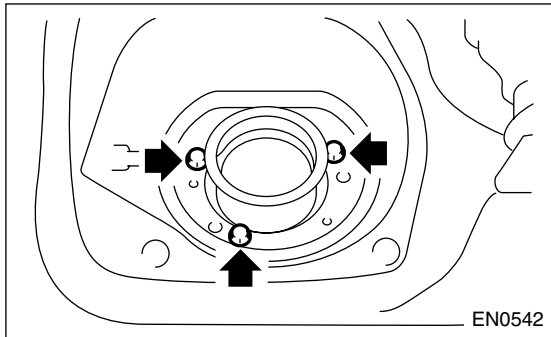
WARNING:

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

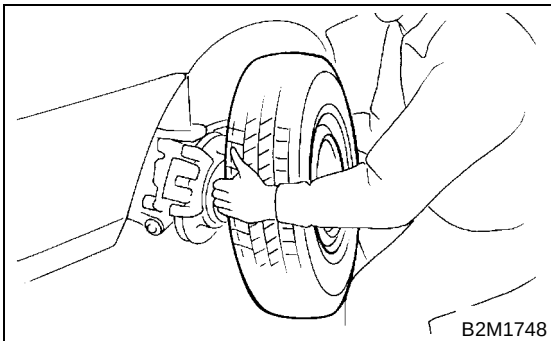
- 1) Release fuel pressure. <Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel filler flap lid and remove filler cap.
- 3) Disconnect battery ground cable.



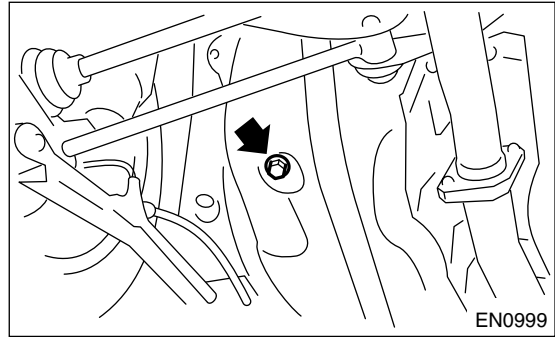
- 4) Remove screws holding packing in place.



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



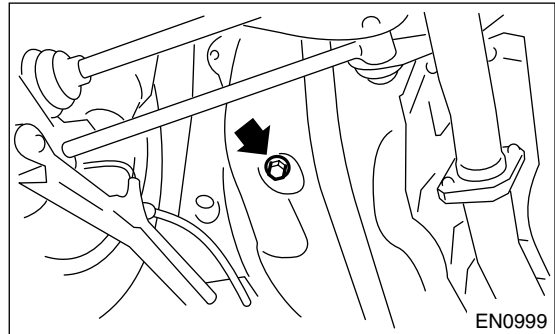
- 8) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



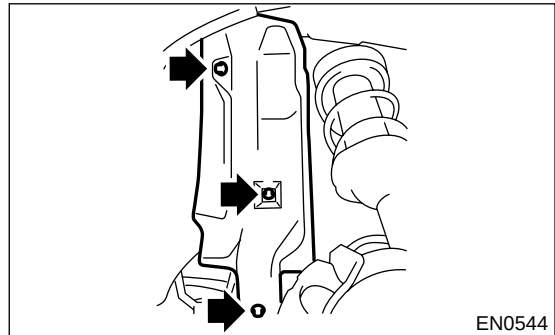
- 9) Tighten fuel drain plug and then install front right side tank cover.

Tightening torque:

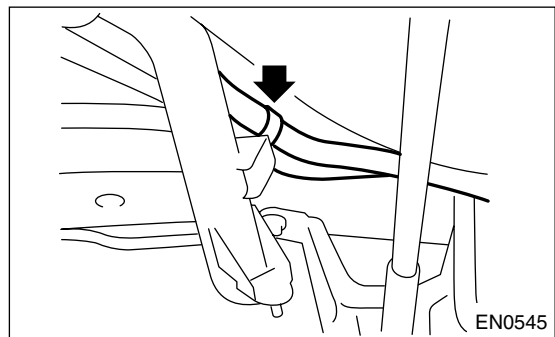
26 ± 7 N·m (2.65 ± 0.7 kg-m, 19.2 ± 5.1 ft-lb)



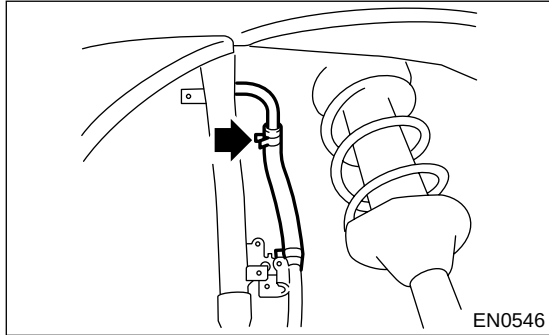
- 10) Remove fuel filler pipe protector.



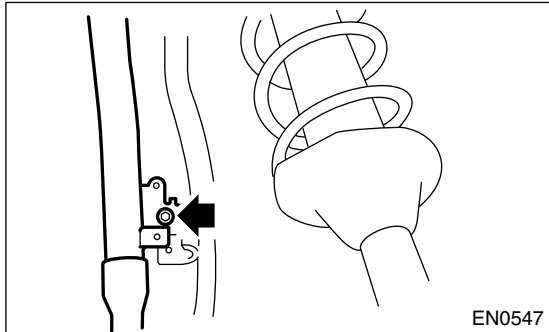
- 11) Separate evaporation hoses from clip of fuel filler pipe.



- 12) Disconnect air vent hose from fuel filler pipe.

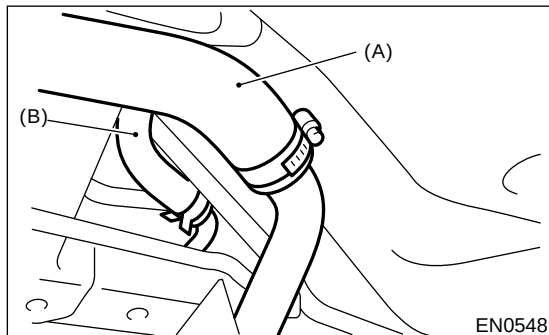


- 13) Remove bolts which hold fuel filler pipe bracket on body.



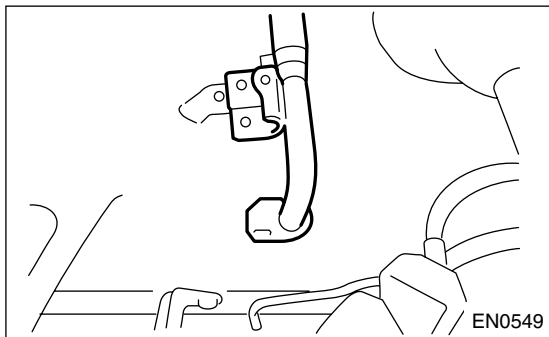
- 14) Loosen clamp and separate fuel filler hose (A) from fuel filler pipe.

- 15) Move clip and separate air vent hose (B).



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

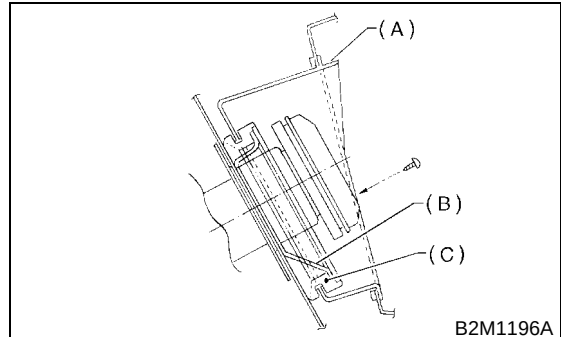
- 17) Remove air vent pipe together with clip from body.



B: INSTALLATION

- 1) Hold fuel filler flap open.

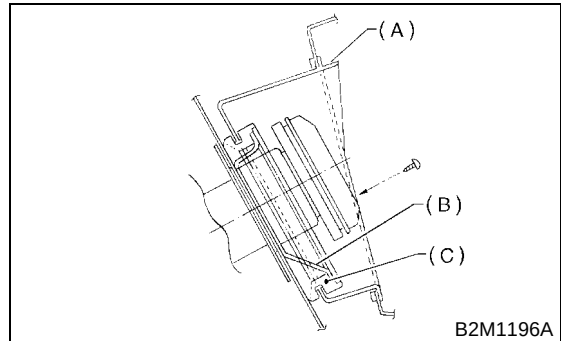
- 2) Set fuel saucer (A) with rubber packing (C) and insert fuel filler pipe into hole from the inner side of apron.



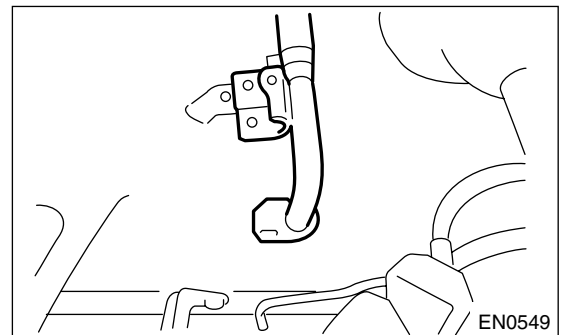
- 3) Align holes in fuel filler pipe neck and set cup (B), and tighten screws.

NOTE:

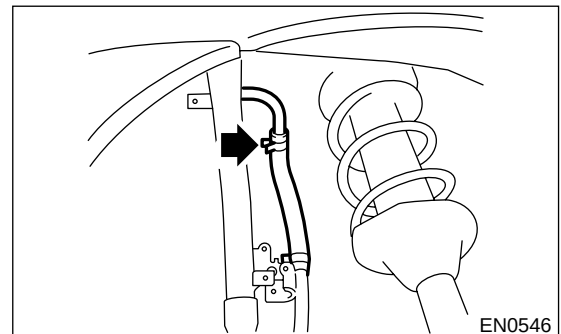
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



- 4) Install air vent pipe.



- 5) Connect air vent hose to fuel filler pipe.



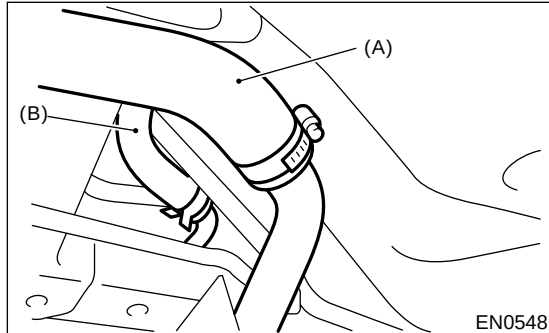
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

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

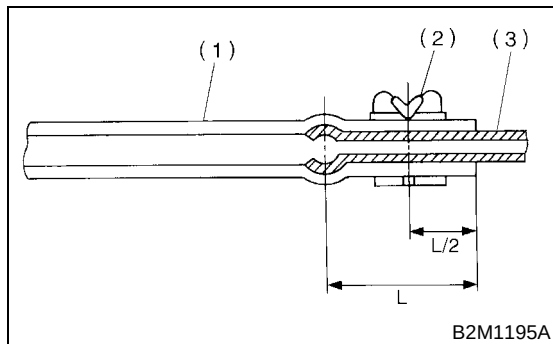
CAUTION:

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



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

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

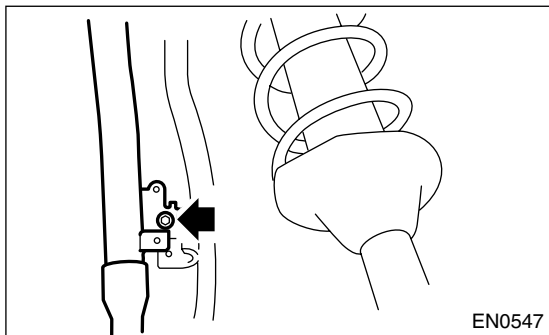


- (1) Hose
- (2) Clip
- (3) Pipe

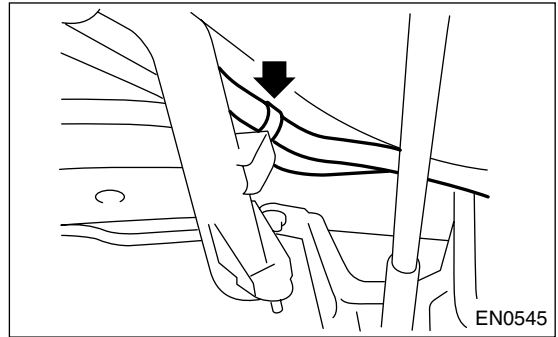
8) Tighten bolt which holds fuel filler pipe bracket on body.

Tightening torque:

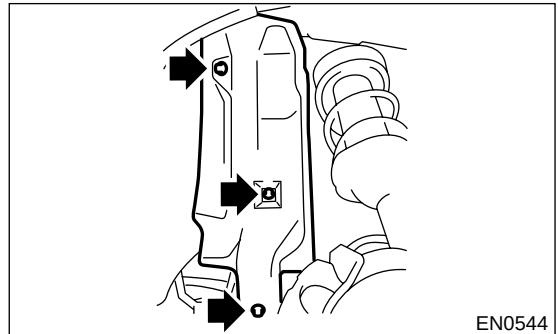
$7.5 \text{ N} \cdot \text{m (0.75 kgf} \cdot \text{m, 5.4 ft} \cdot \text{lb)}$



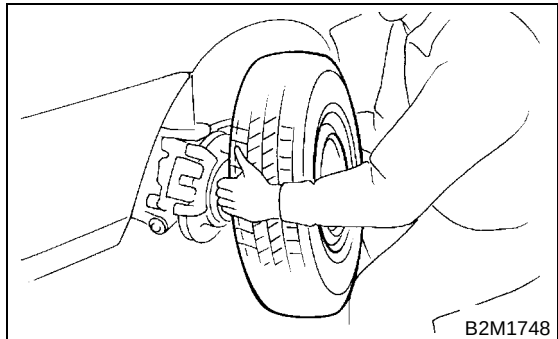
9) Tighten bolts which hold evaporation hoses onto clip of fuel filler pipe.



10) Install fuel filler pipe protector.



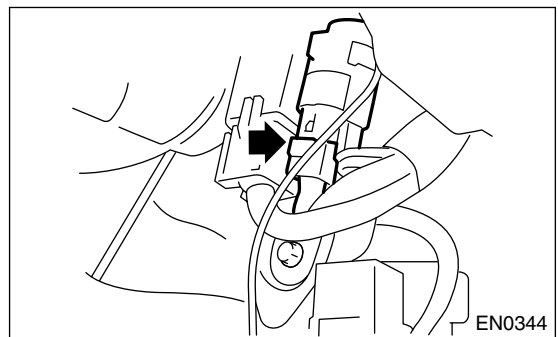
11) Install rear right wheel.



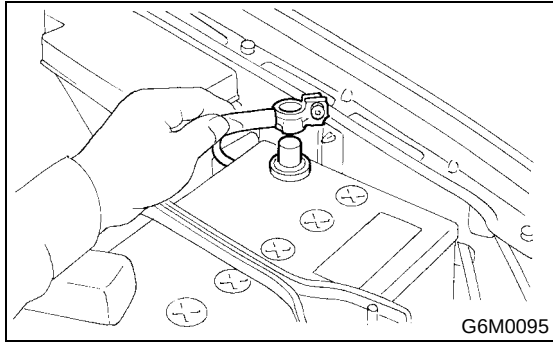
12) Lower the vehicle.

13) Tighten wheel nuts.

14) Connect connector to fuel pump relay.



15) Connect battery ground terminal.



19. Fuel Pump

A: REMOVAL

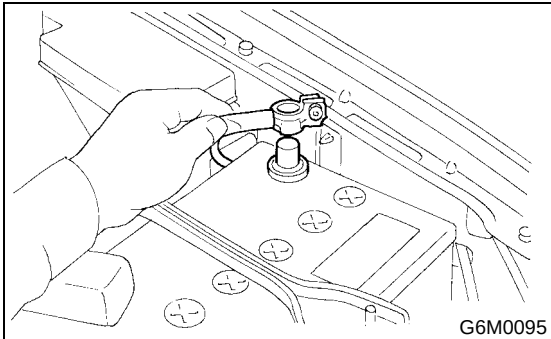
WARNING:

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

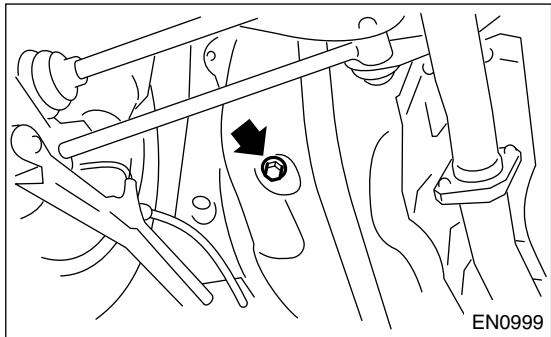
NOTE:

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

- 1) Release fuel pressure. <Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect battery ground cable.



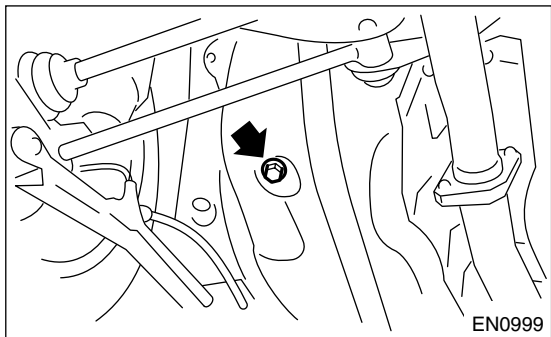
- 4) Lift-up the vehicle.
- 5) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



- 6) Tighten fuel drain plug.

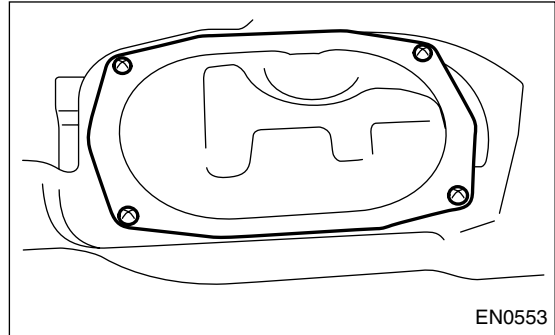
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)

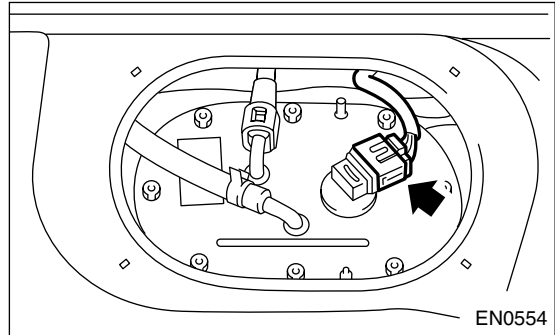


- 7) Raise rear seat and turn floor mat up.

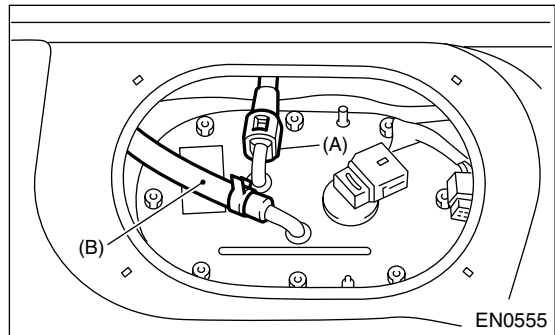
- 8) Remove access hole lid.



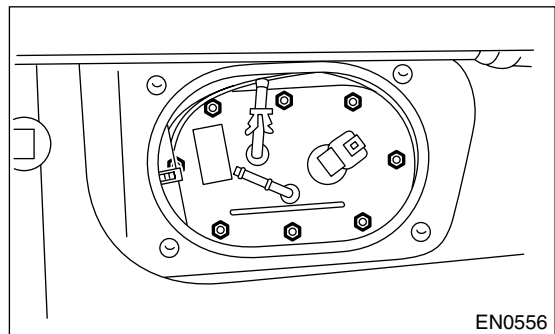
- 9) Disconnect connector from fuel pump.



- 10) Disconnect quick connector and then disconnect fuel delivery hose (A). <Ref. to FU(SOHCw/oOBD)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 11) Move clip and then disconnect fuel return hose (B).



- 12) Remove nuts which install fuel pump assembly onto fuel tank.



- 13) Take off fuel pump assembly from fuel tank.

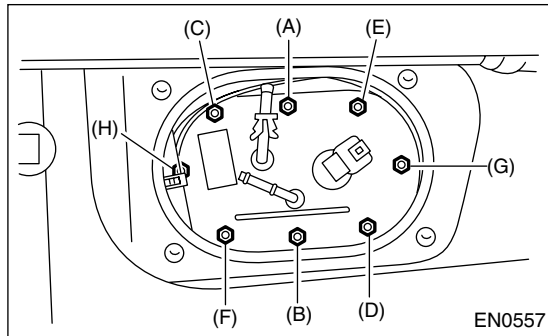
B: INSTALLATION

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

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

Tightening torque:

5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

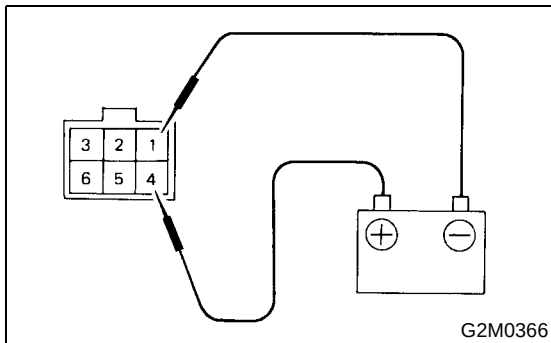


C: INSPECTION

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

WARNING:

- Wipe off the fuel completely.
- Keep 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 fuel pump for a long time under non-load condition.



20. Fuel Level Sensor

A: REMOVAL

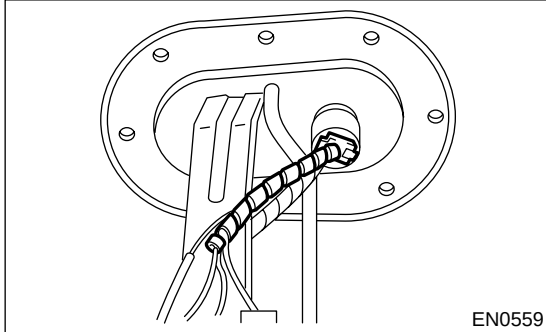
WARNING:

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

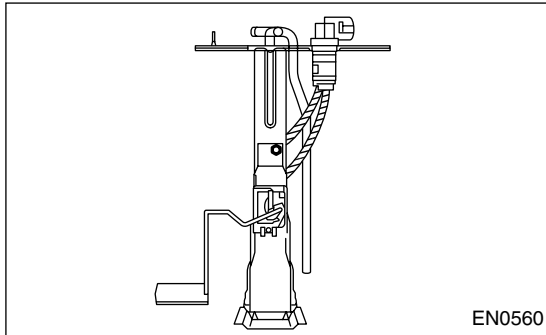
NOTE:

Fuel level sensor is built in fuel pump assembly.

- 1) Remove fuel pump assembly. <Ref. to FU(SOHCw/oOBD)-54, REMOVAL, Fuel Pump.>
- 2) Disconnect connector from fuel pump bracket.



- 3) Remove bolt which installs fuel level sensor on mounting bracket.



B: INSTALLATION

Install in the reverse order of removal.

21. Fuel Filter

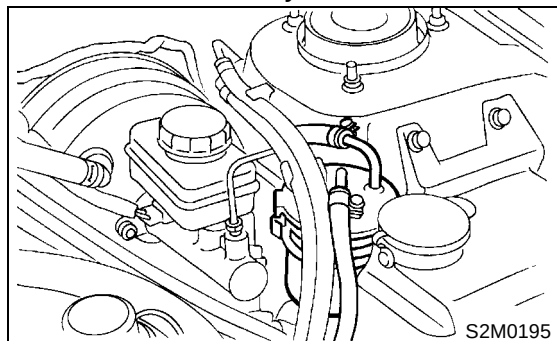
A: REMOVAL

WARNING:

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

1) Release fuel pressure. <Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Disconnect fuel delivery hoses from fuel filter.



3) Remove filter from holder.

B: INSTALLATION

CAUTION:

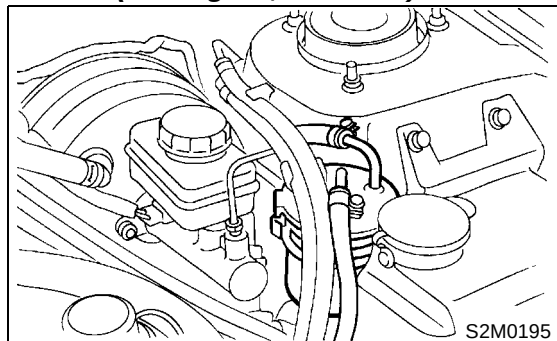
- If fuel hoses are damaged at the connecting portion, replace it with a new one.
- If clamps are badly damaged, replace with new ones.

1) Install in the reverse order of removal.

2) Tighten hose clamp screws.

Tightening torque:

12.5 N·m (1.27 kgf-m, 9.22 ft-lb)



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.

3) If water is found in it, shake and expel the water from inlet port.

22.Fuel Cut Valve

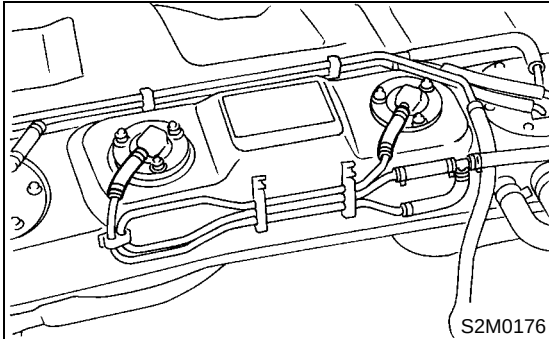
A: REMOVAL

WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.
- During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.

1) Remove fuel tank. <Ref. to FU(SOHCw/oOBD)-48, REMOVAL, Fuel Tank.>

2) Move clip and disconnect evaporation hose from fuel cut valve.



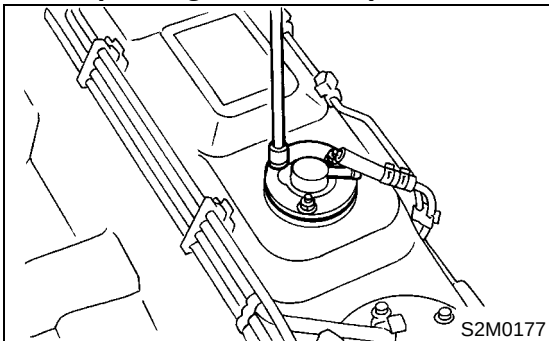
3) Remove bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

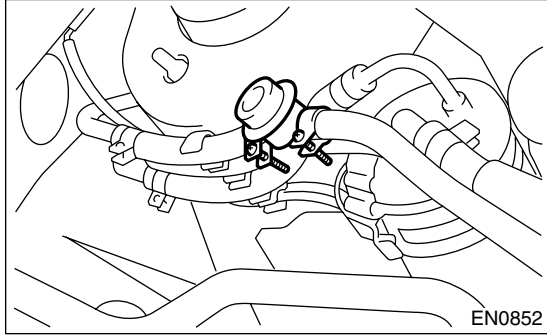
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



23.Fuel Damper Valve

A: REMOVAL

- 1) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Remove fuel damper valve from fuel return line.



B: INSTALLATION

Install in the reverse order of removal.

FUEL DELIVERY, RETURN AND EVAPORATION LINES

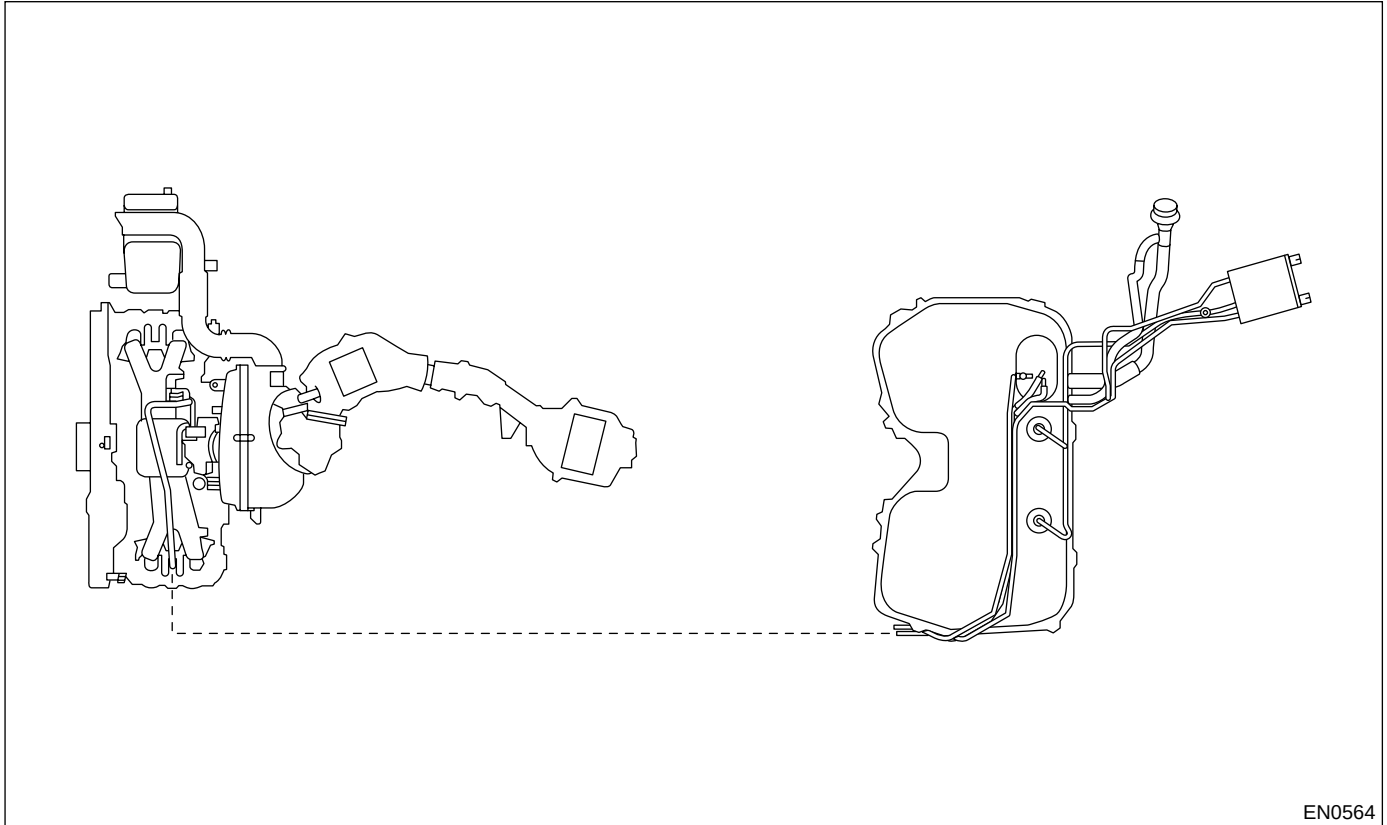
FUEL INJECTION (FUEL SYSTEMS)

24. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

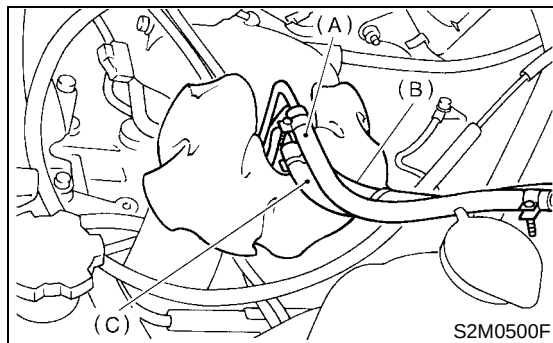
- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(SOHCw/oOBD)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

- 3) Open fuel filler flap lid and remove fuel filler cap.
- 4) Remove floor mat. <Ref. to EI-37, REMOVAL, Floor Mat.>
- 5) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



EN0564

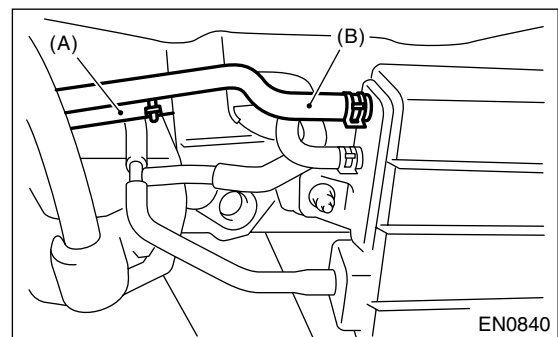
- 6) In engine compartment, detach fuel delivery hoses, return hoses and evaporation hose.



- (1) Fuel delivery hose
- (2) Return hose
- (3) Evaporation hose

- 7) Lift-up the vehicle.

- 8) Disconnect two-way valve hose (A) from two-way valve and disconnect canister hose (B) from canister.



- 9) Separate quick connector on fuel delivery and return line.

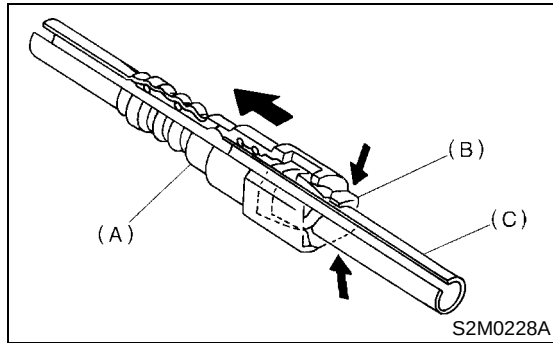
- (1) Clean pipe and connector, if they are covered with dust.
- (2) Hold connector (A) and push retainer (B) down.
- (3) Pull out connector (A) from retainer (B).

FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

CAUTION:

Replace retainer with new ones.



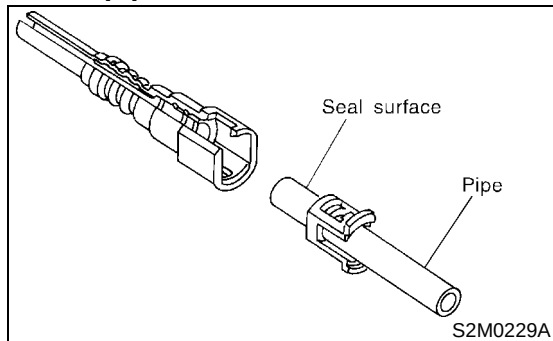
- (A) Connector
- (B) Retainer
- (C) Pipe

B: INSTALLATION

1) Connect quick connector on fuel delivery line.

CAUTION:

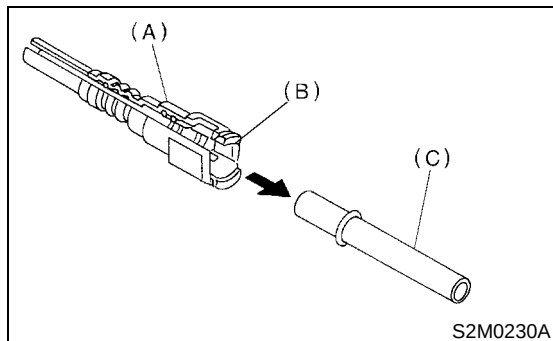
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface of pipe.



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

NOTE:

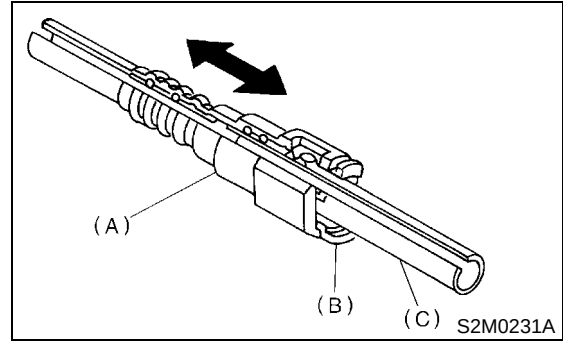
At this time, two clicking sounds are heard.



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

CAUTION:

- 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 hoses and their connections for any leakage of fuel.



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

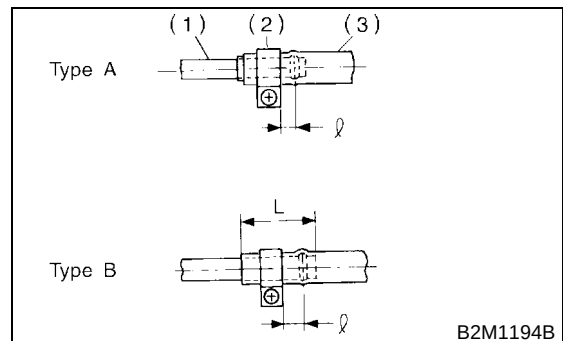
2) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.

Type B: When fitting length is not specified.

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

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



- (1) Fitting
- (2) Clamp
- (3) Hose

FUEL DELIVERY, RETURN AND EVAPORATION LINES

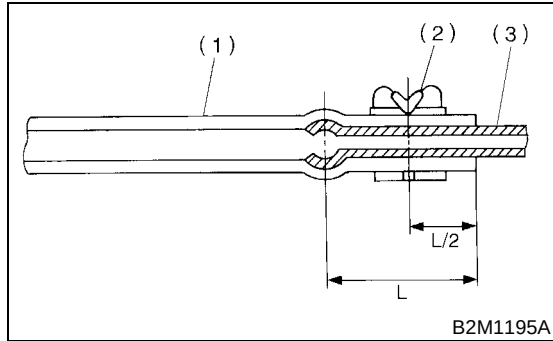
FUEL INJECTION (FUEL SYSTEMS)

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

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

CAUTION:

Be sure to inspect 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.

25. 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 fuel pump.
2)	Lowering of fuel pump function.	Replace fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace 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 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 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 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.

(3) 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.

(4) 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)

ENGINE 2 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.

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

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC(SOHCw/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 negative terminal from battery.

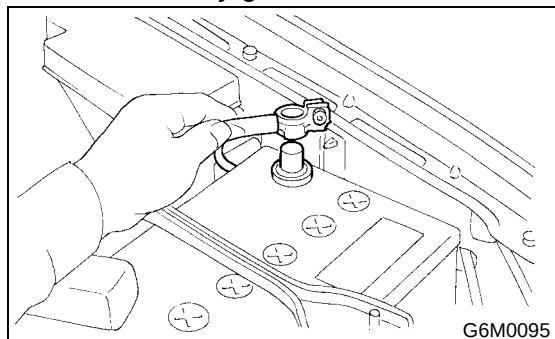
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

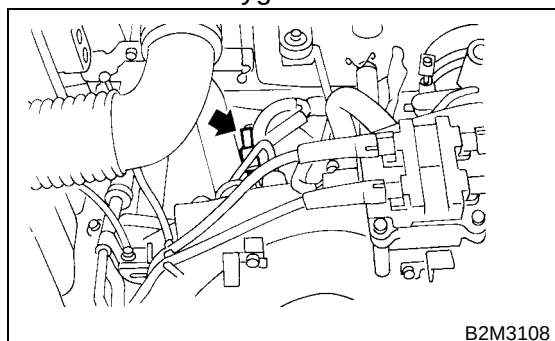
2. Front Catalytic Converter

A: REMOVAL

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



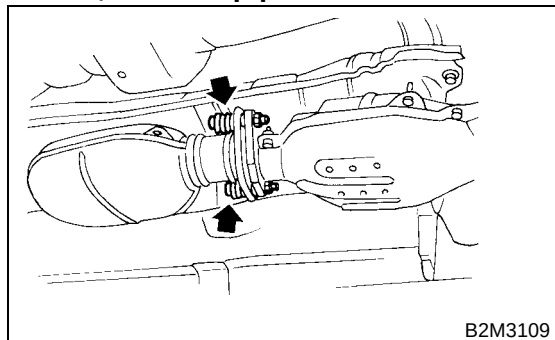
- 3) Disconnect front oxygen sensor connector.



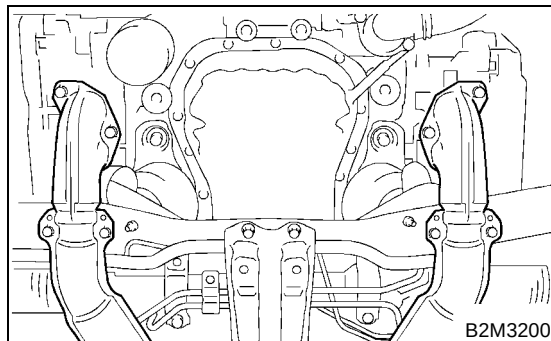
- 4) Lift-up the vehicle.
- 5) Remove under cover.
- 6) Separate center exhaust pipe from rear exhaust pipe.

CAUTION:

Be careful, exhaust pipe is hot.



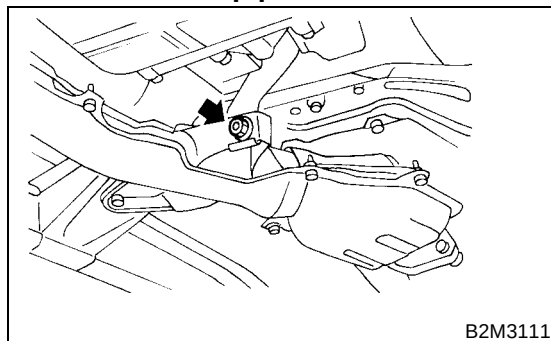
- 7) Remove bolts which hold front exhaust pipe onto cylinder heads.



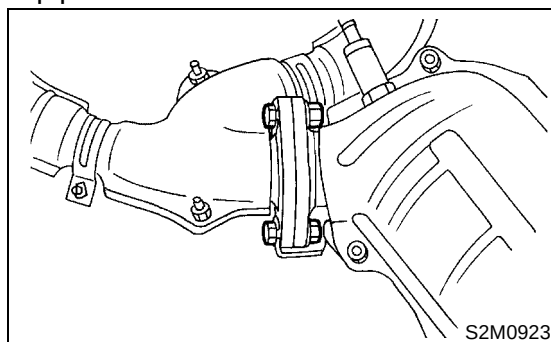
- 8) Remove front exhaust pipe and center exhaust pipe from hanger bracket.

CAUTION:

Be careful not to pull down front exhaust pipe and center exhaust pipe.



- 9) Separate front catalytic converter from front exhaust pipe.



FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

B: INSTALLATION

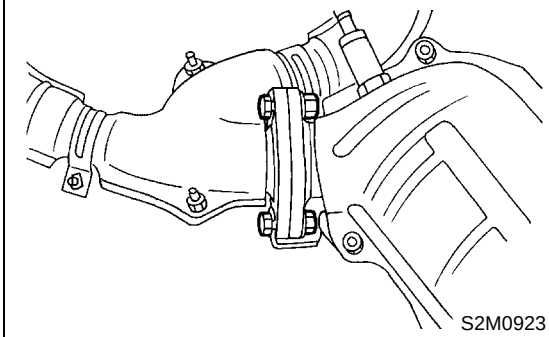
CAUTION:

Replace gaskets with new ones.

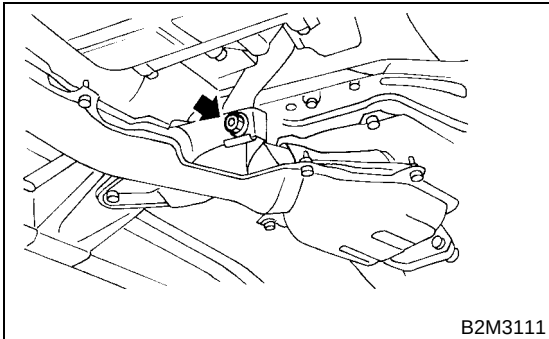
1) Install front catalytic converter to front exhaust pipe.

Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)



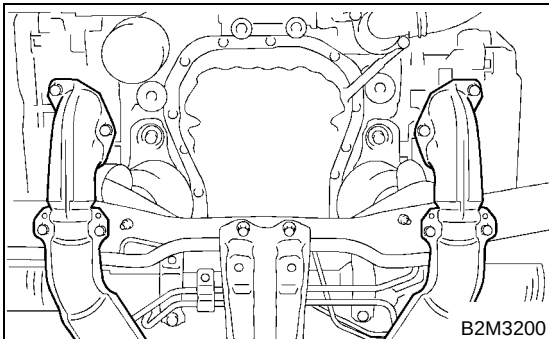
2) Install front exhaust pipe and center exhaust pipe. And temporarily tighten bolt which installs center exhaust pipe to hanger bracket.



3) Tighten bolts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

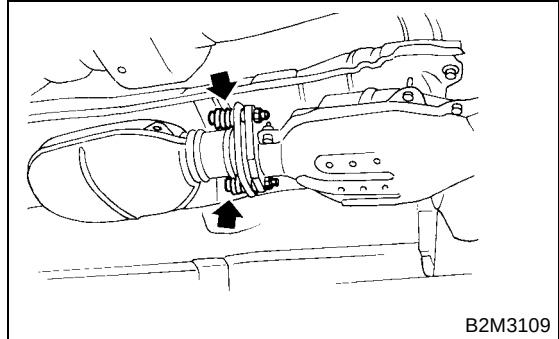
30 N·m (3.1 kgf-m, 22.4 ft-lb)



4) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:

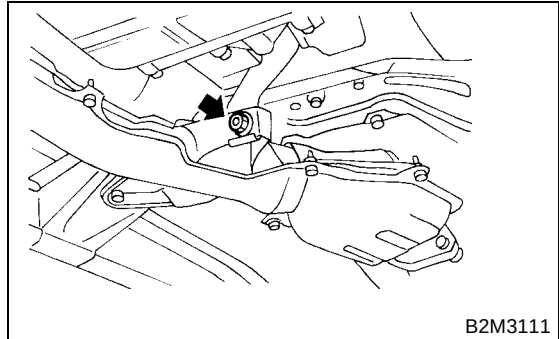
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Tighten bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:

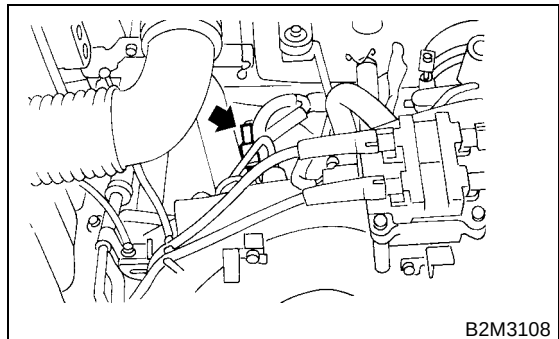
35 N·m (3.6 kgf-m, 26.0 ft-lb)



6) Install under cover.

7) Lower the vehicle.

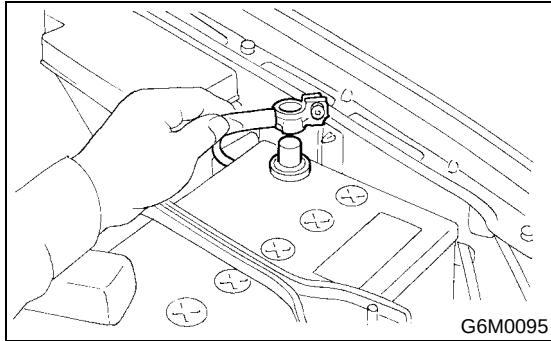
8) Connect front oxygen sensor connector.



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.

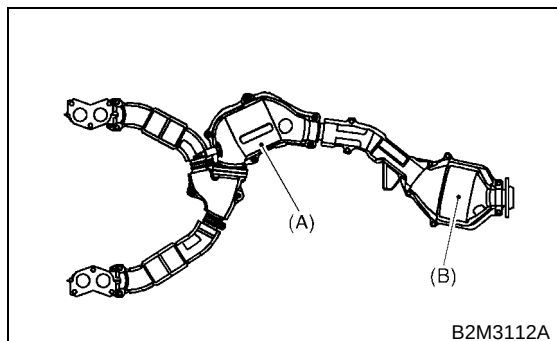
REAR CATALYTIC CONVERTER

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(SOHCw/oOBD)-3, REMOVAL, Front Catalytic Converter.>

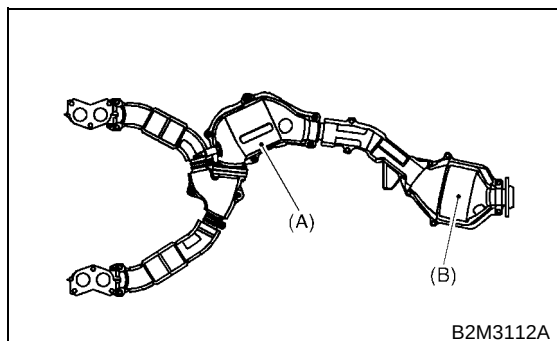


(A) Front catalytic converter

(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(SOHCw/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.

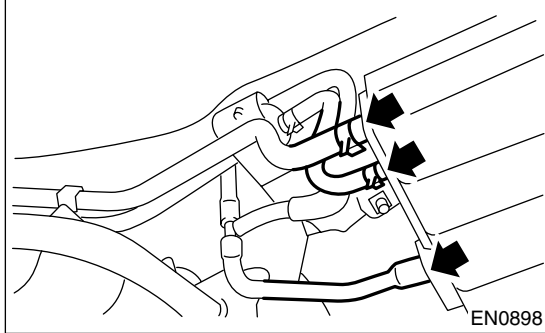
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

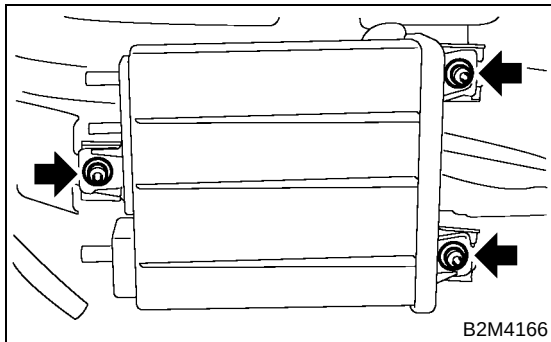
4. Canister

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen two clamps which hold two canister hoses, and disconnect evaporation three hoses from canister.



- 3) Remove canister from body.

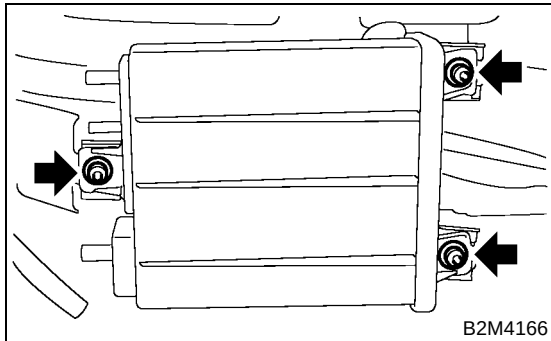


B: INSTALLATION

- 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.

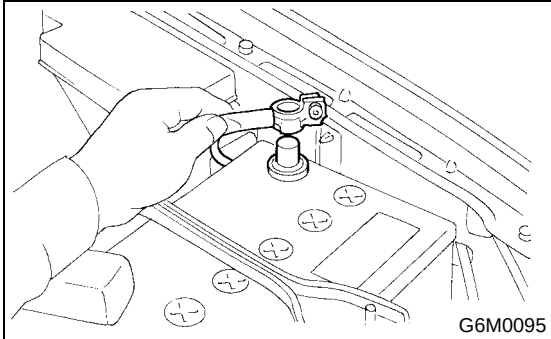
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

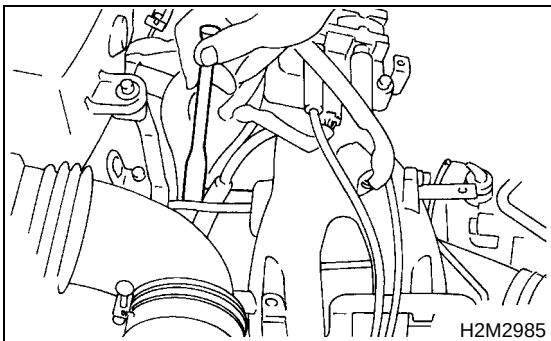
5. Purge Control Solenoid Valve

A: REMOVAL

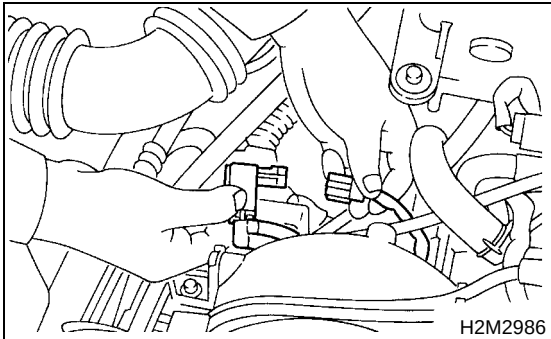
- 1) Disconnect battery ground cable.



- 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.

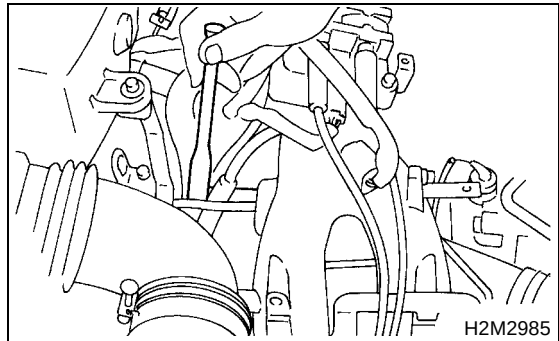


B: INSTALLATION

Install in the reverse order of removal.

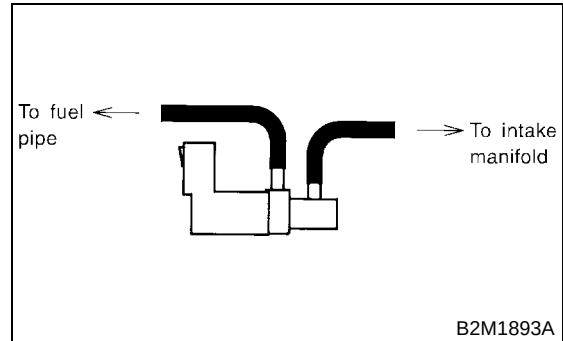
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



CAUTION:

Carefully connect the evaporation hoses.



C: INSPECTION

Make sure hoses are not cracked or loose.

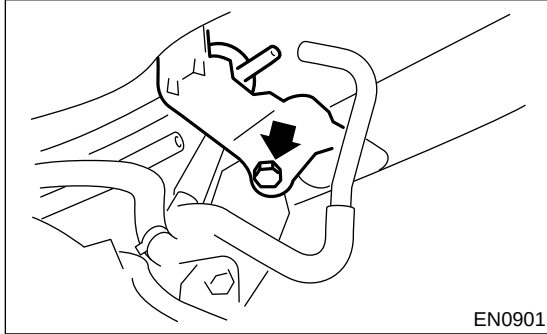
TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

6. Two-way Valve

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove canister from body. <Ref. to EC(SOHCw/oOBD)-7, REMOVAL, Canister.>
- 3) Remove two-way valve with bracket as a single unit from body.



- 4) Remove two-way valve from bracket.

B: INSTALLTION

Install in the reverse order of removal.

C: INSPECTION

Make sure that hoses are not cracked or loose.

TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

ENGINE 2 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.

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

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

EXHAUST

EX(SOHCw/oOBD)

	Page
1. General Description	2
2. Front Exhaust Pipe.....	9
3. Center Exhaust Pipe	12
4. Rear Exhaust Pipe	13
5. Muffler	14

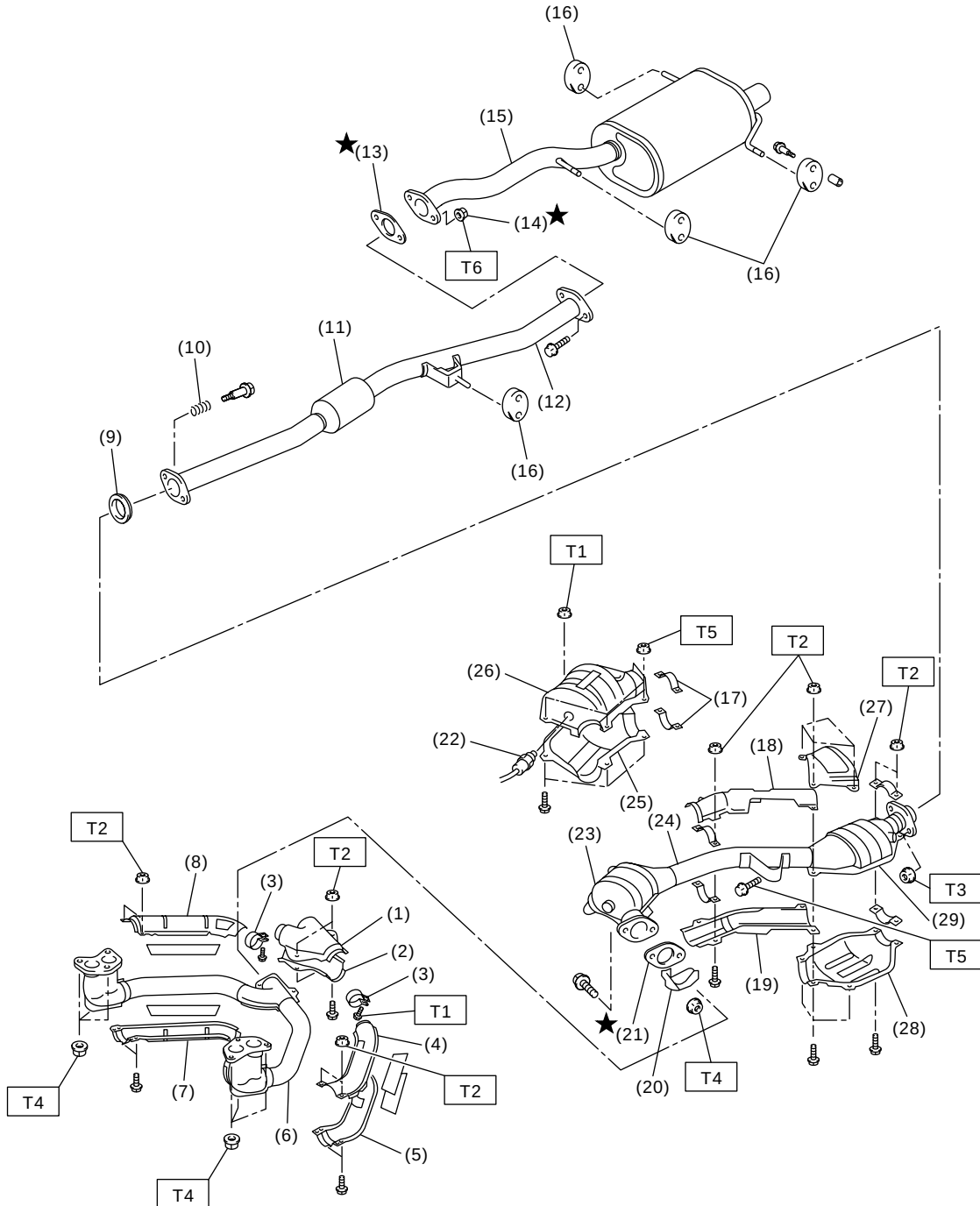
GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT

1. WITH CATALYTIC CONVERTER (1600CC MODEL)



EN0362

GENERAL DESCRIPTION

EXHAUST

(1) Upper front exhaust pipe cover CTR	(14) Self-locking nut	(27) Upper rear catalytic converter cover
(2) Lower front exhaust pipe cover CTR	(15) Muffler	(28) Lower rear catalytic converter cover
(3) Clamp	(16) Cushion rubber	(29) Rear catalytic converter
(4) Upper front exhaust pipe cover LH	(17) Lower clamp	
(5) Lower front exhaust pipe cover LH	(18) Upper center exhaust pipe cover	
(6) Front exhaust pipe	(19) Lower center exhaust pipe cover	
(7) Lower front exhaust pipe cover RH	(20) Protector	
(8) Upper front exhaust pipe cover RH	(21) Gasket	
(9) Gasket	(22) Oxygen sensor	
(10) Spring	(23) Front catalytic converter	
(11) Chamber	(24) Center exhaust pipe	
(12) Rear exhaust pipe	(25) Lower front catalytic converter cover	
(13) Gasket	(26) Upper front catalytic converter cover	

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)

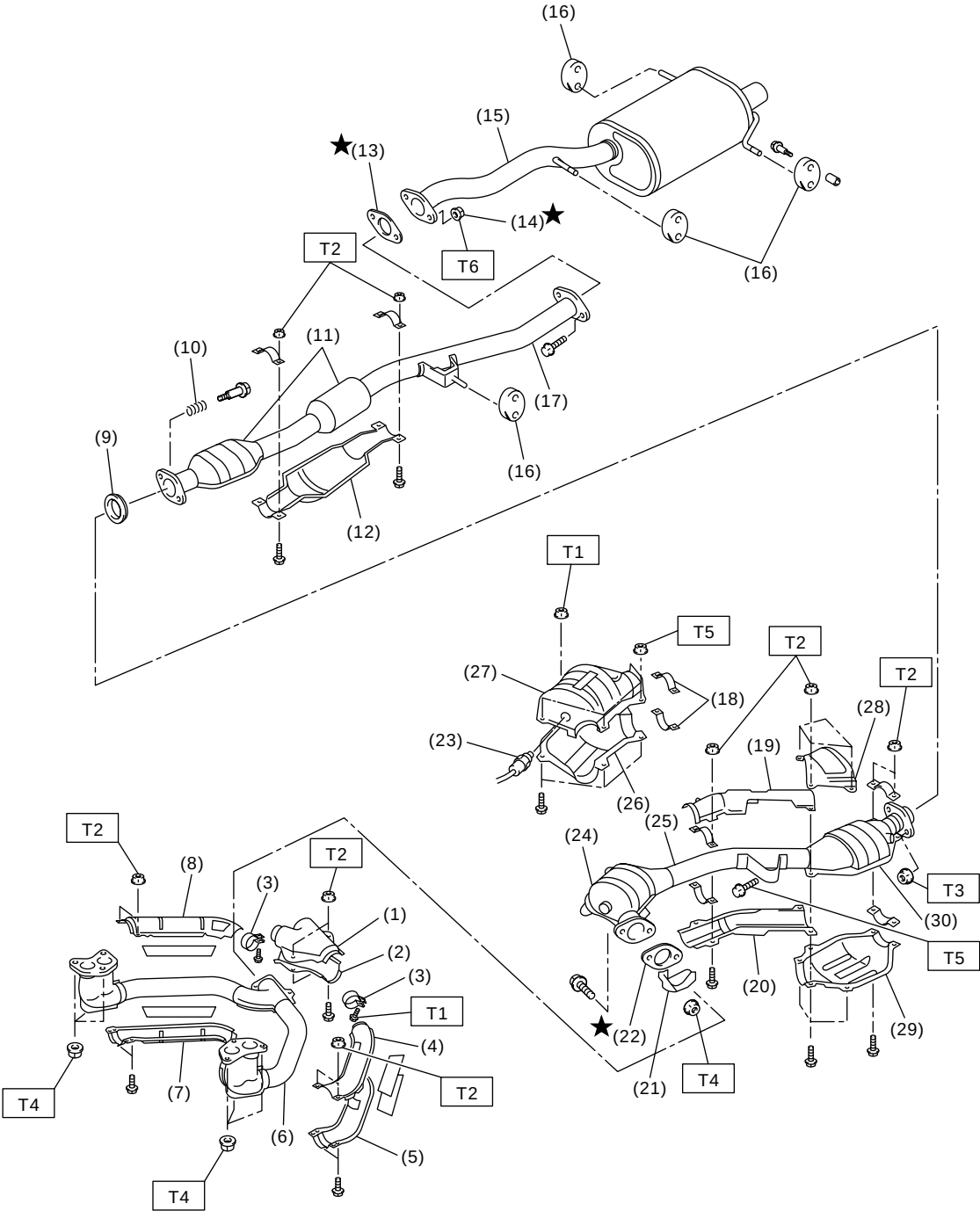
T5: 35 (3.6, 26.0)

T6: 48 (4.9, 35.4)

GENERAL DESCRIPTION

EXHAUST

2. WITH CATALYTIC CONVERTER (2000CC MODEL)



EN0363

GENERAL DESCRIPTION

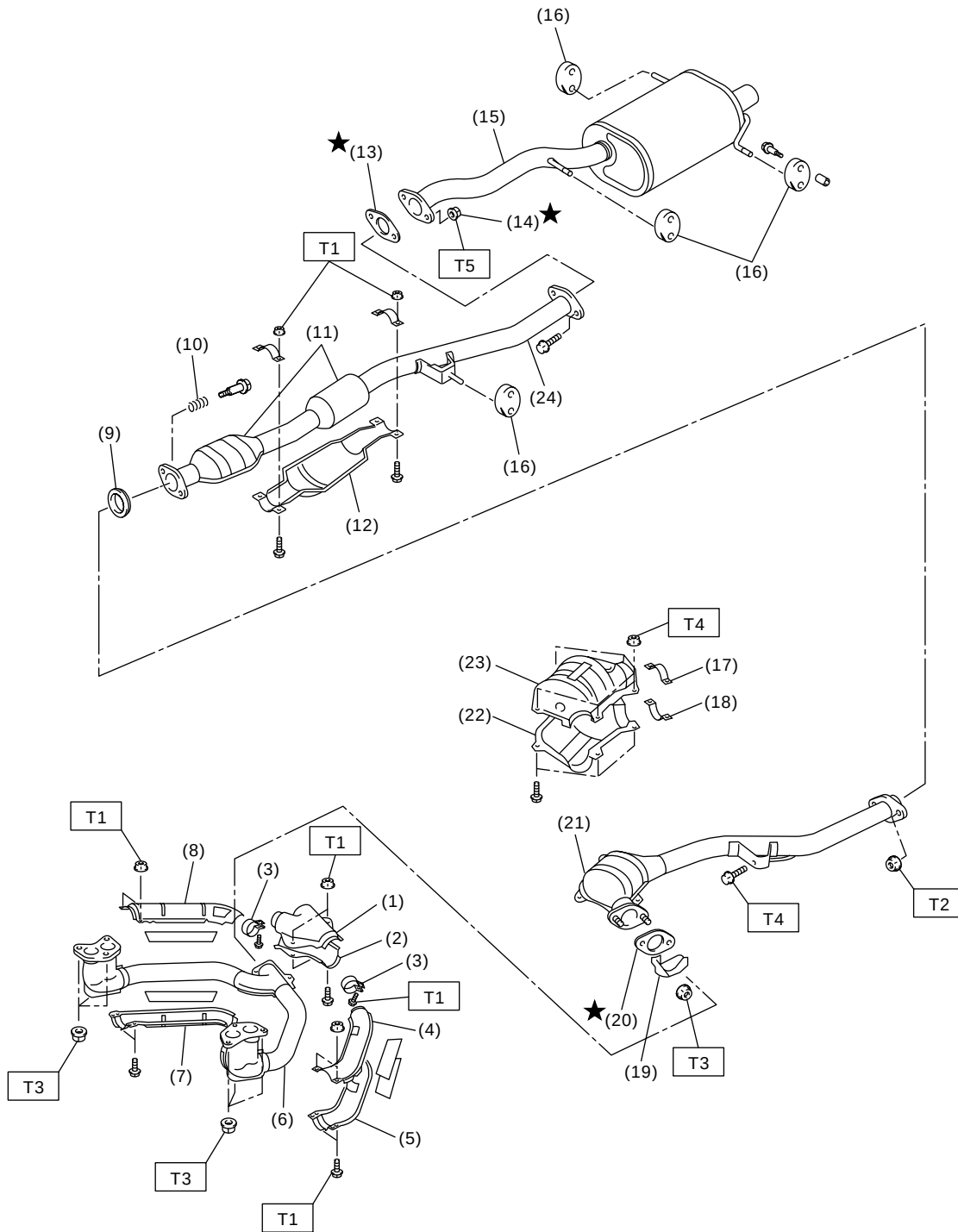
EXHAUST

(1) Upper front exhaust pipe cover CTR	(14) Self-locking nut	(27) Upper front catalytic converter cover
(2) Lower front exhaust pipe cover CTR	(15) Muffler	(28) Upper rear catalytic converter cover
(3) Clamp	(16) Cushion rubber	(29) Lower rear catalytic converter cover
(4) Upper front exhaust pipe cover LH	(17) Rear exhaust pipe	
(5) Lower front exhaust pipe cover LH	(18) Lower slump	
(6) Front exhaust pipe	(19) Upper center exhaust pipe cover	
(7) Lower front exhaust pipe cover RH	(20) Lower center exhaust pipe cover	
(8) Upper front exhaust pipe cover RH	(21) Protector	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(9) Gasket	(22) Gasket	<i>T1: 8 (0.8, 5.8)</i>
(10) Spring	(23) Oxygen sensor	<i>T2: 13 (1.3, 9.4)</i>
(11) Chamber	(24) Front catalytic converter	<i>T3: 18 (1.8, 13.0)</i>
(12) Rear exhaust pipe cover	(25) Center exhaust pipe	<i>T4: 30 (3.1, 22.4)</i>
(13) Gasket	(26) Lower front catalytic converter cover	<i>T5: 35 (3.6, 26.0)</i>
		<i>T6: 48 (4.9, 35.4)</i>

GENERAL DESCRIPTION

EXHAUST

3. WITHOUT CATALYTIC CONVERTER



EN0364

GENERAL DESCRIPTION

EXHAUST

(1) Upper front exhaust pipe cover CTR	(10) Spring	(21) Center exhaust pipe
(2) Lower front exhaust pipe cover CTR	(11) Chamber	(22) Lower center exhaust pipe cover
(3) Clamp	(12) Rear exhaust pipe cover	(23) Upper center exhaust pipe cover
(4) Upper front exhaust pipe cover LH	(13) Gasket	(24) Rear exhaust pipe
(5) Lower front exhaust pipe cover LH	(14) Self-locking nut	
(6) Front exhaust pipe	(15) Muffler	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(7) Lower front exhaust pipe cover RH	(16) Cushion rubber	<i>T1: 13 (1.3, 9.4)</i>
(8) Upper front exhaust pipe cover RH	(17) Upper clamp	<i>T2: 18 (1.8, 13.0)</i>
(9) Gasket	(18) Lower clamp	<i>T3: 30 (3.1, 22.4)</i>
	(19) Protector	<i>T4: 35 (3.6, 26.0)</i>
	(20) Gasket	<i>T5: 48 (4.9, 35.4)</i>

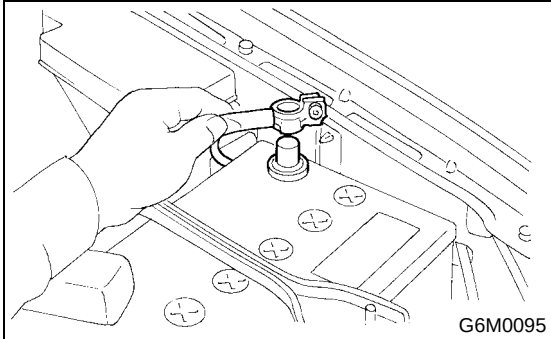
B: CAUTION

- 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 negative terminal from battery.

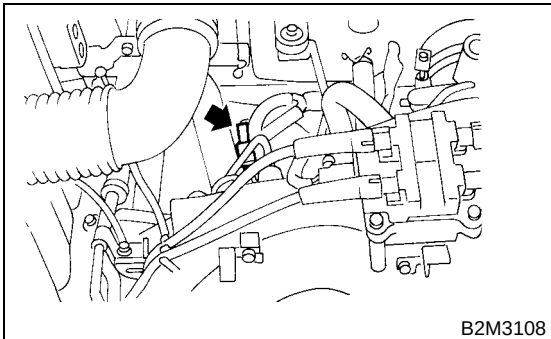
2. Front Exhaust Pipe

A: REMOVAL

1) Disconnect battery ground cable.



2) Disconnect oxygen sensor connector. (With catalytic converter)

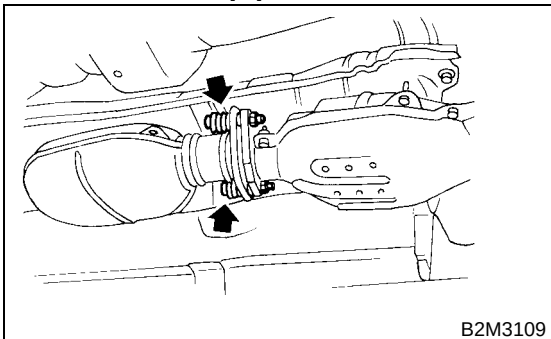


3) Lift-up the vehicle.

4) Separate front and center exhaust pipe assembly from rear exhaust pipe.

WARNING:

Be careful, exhaust pipe is hot.

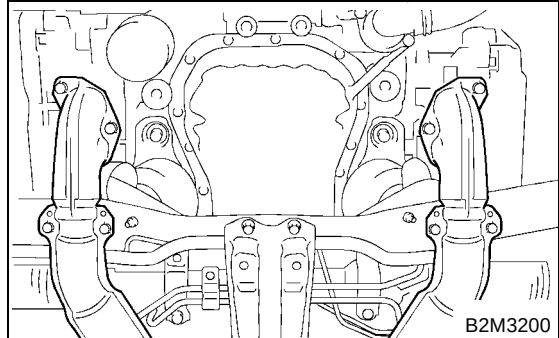


5) Remove under cover.

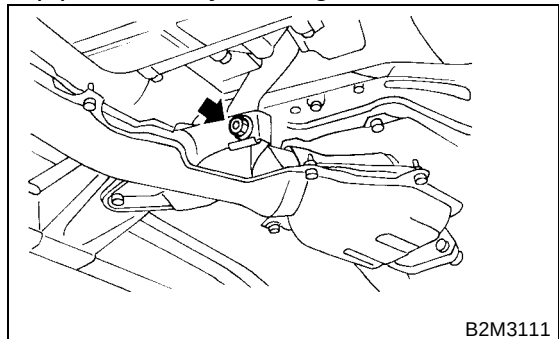
6) Remove bolts which hold front exhaust pipe onto cylinder heads.

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.

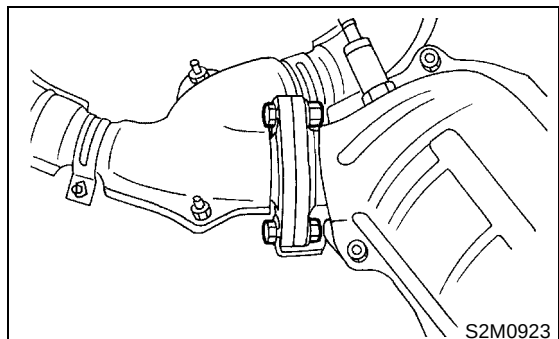


8) Remove front and center exhaust pipe assembly from the vehicle.

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

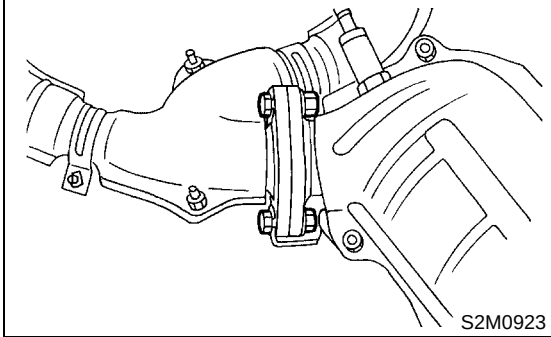
1) Install front exhaust pipe to center exhaust pipe.

CAUTION:

Replace gaskets with new ones.

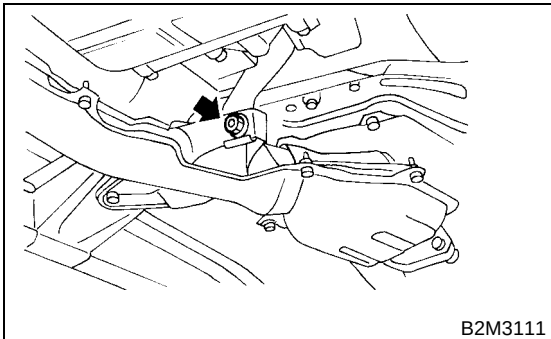
Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)



2) Install front and center exhaust pipe assembly to the vehicle.

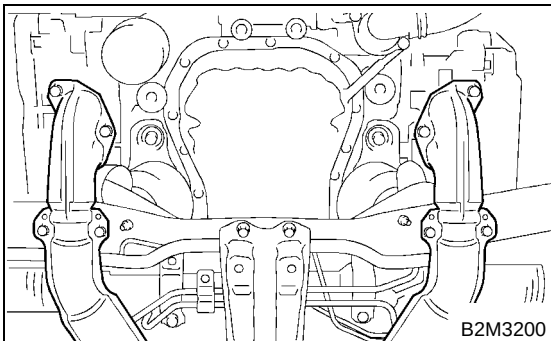
3) Temporarily tighten bolt which installs front and center exhaust pipe assembly to hanger bracket.



4) Tighten bolts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

30 N·m (3.1 kgf-m, 22.4 ft-lb)

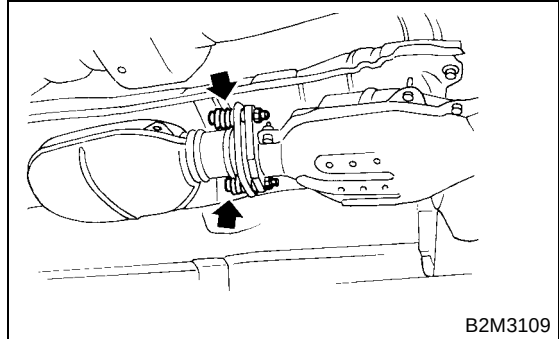


5) Install under cover.

6) Tighten bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:

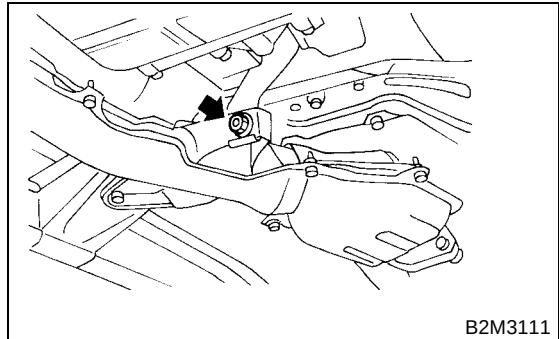
18 N·m (1.8 kgf-m, 13.0 ft-lb)



7) Tighten bolt which holds front and center exhaust pipe assembly to hanger bracket.

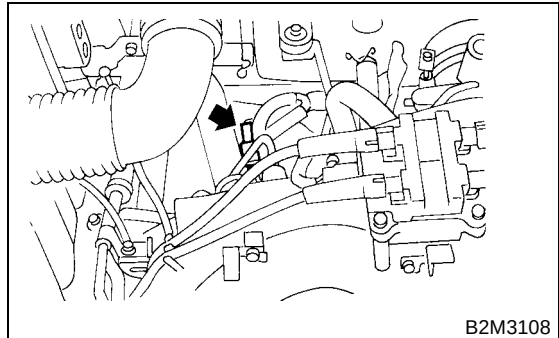
Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)

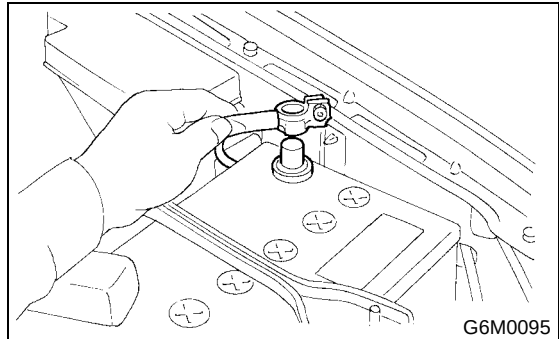


8) Lower the vehicle.

9) Connect 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(SOHCw/oOBD)-9, 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(SOHCw/oOBD)-10, 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.

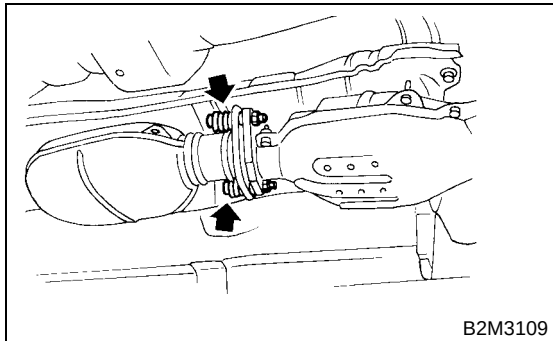
4. Rear Exhaust Pipe

A: REMOVAL

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

CAUTION:

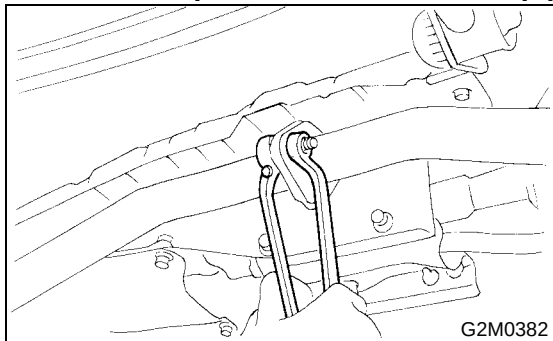
Be careful, exhaust pipe is hot.



- 2) Separate rear exhaust pipe from muffler.

CAUTION:

Be careful not to pull down rear exhaust pipe.



- 3) Remove rear exhaust pipe.

B: INSTALLATION

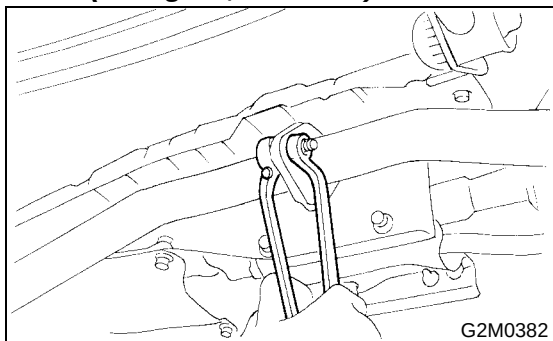
CAUTION:

Replace gaskets with new ones.

- 1) Install rear exhaust pipe to muffler.

Tightening torque:

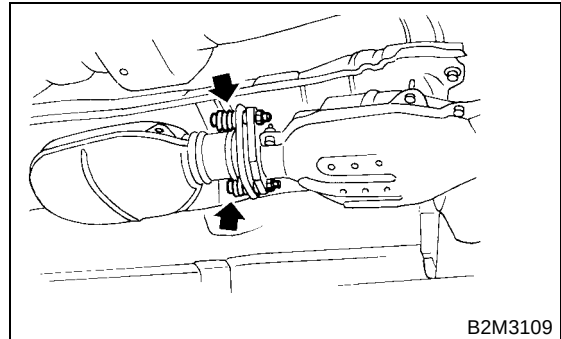
48 N·m (4.9 kgf-m, 35.4 ft-lb)



- 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.
- 3) Make sure the cushion rubber is not worn or cracked.

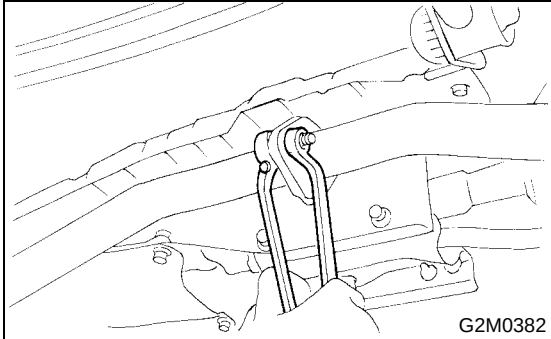
5. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

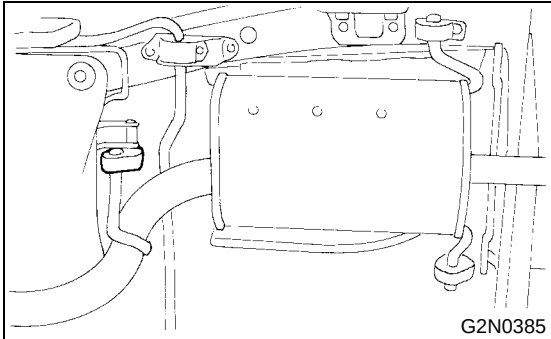
CAUTION:

Be careful, exhaust pipe is hot.



2) Apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)



3) Remove front, left, and right rubber cushion, and detach muffler assembly.

B: INSTALLATION

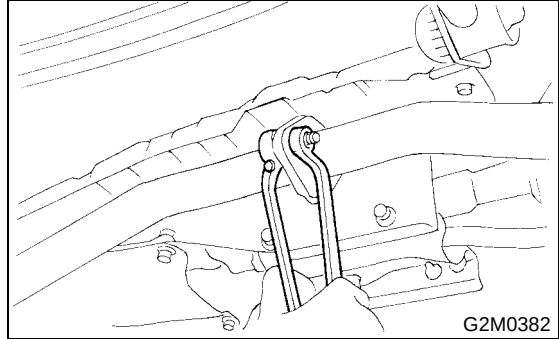
1) Install in the reverse order of removal.

CAUTION:

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.

ENGINE 2 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.

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

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

IGNITION

IG(SOHCw/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

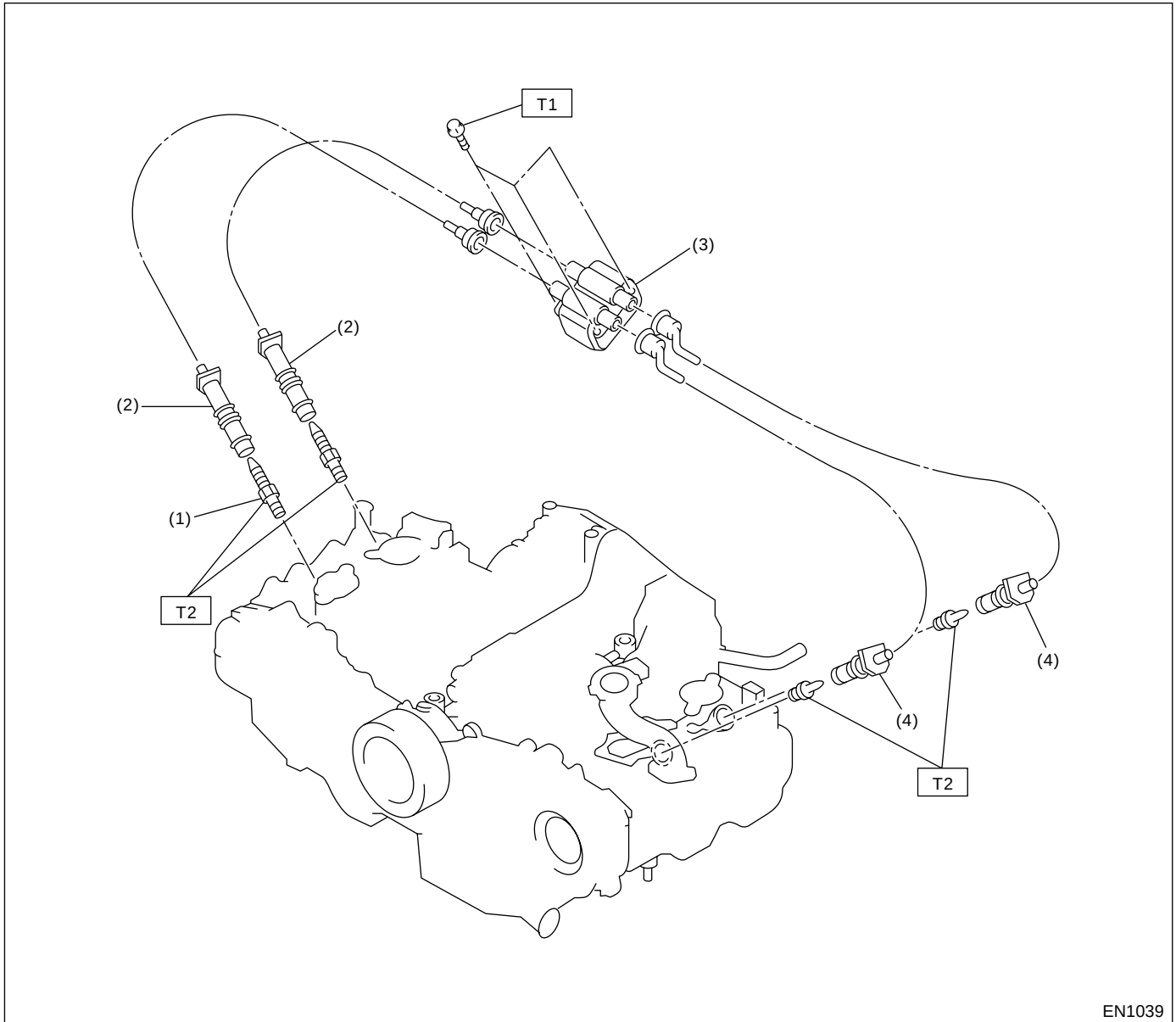
Item			Designation
Ignition coil and ignitor assembly	Model	1600cc	CM12—100C
		2000cc	FH0137
	Manufacturer	1600cc	HITACHI
		2000cc	DIAMOND
	Primary coil resistance	1600cc	0.7 Ω±10%
		2000cc	0.73 Ω±10%
	Secondary coil resistance	1600cc	13.0 kΩ±20%
		2000cc	12.8 kΩ±15%
Insulation resistance between primary terminal and case		More than 10 MΩ	
Spark plug	Type and manufacturer	1600cc	BKR6E* NGK RC8YC4** CHAMPION BKR6E-11** NGK (Alternate)
		2000cc	BKR6E* NGK RC10YC4** CHAMPION BKR5E-11** NGK (Alternate)
	Thread size mm		14, P = 1.25
	Spark gap mm (in)		0.7 — 0.8 mm (0.028 — 0.031 in)* 1.0 — 1.1 mm (0.039 — 0.043 in)**

*: Without catalytic converter

**: With catalytic converter

B: COMPONENT

1. 1600CC MODEL



- (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)

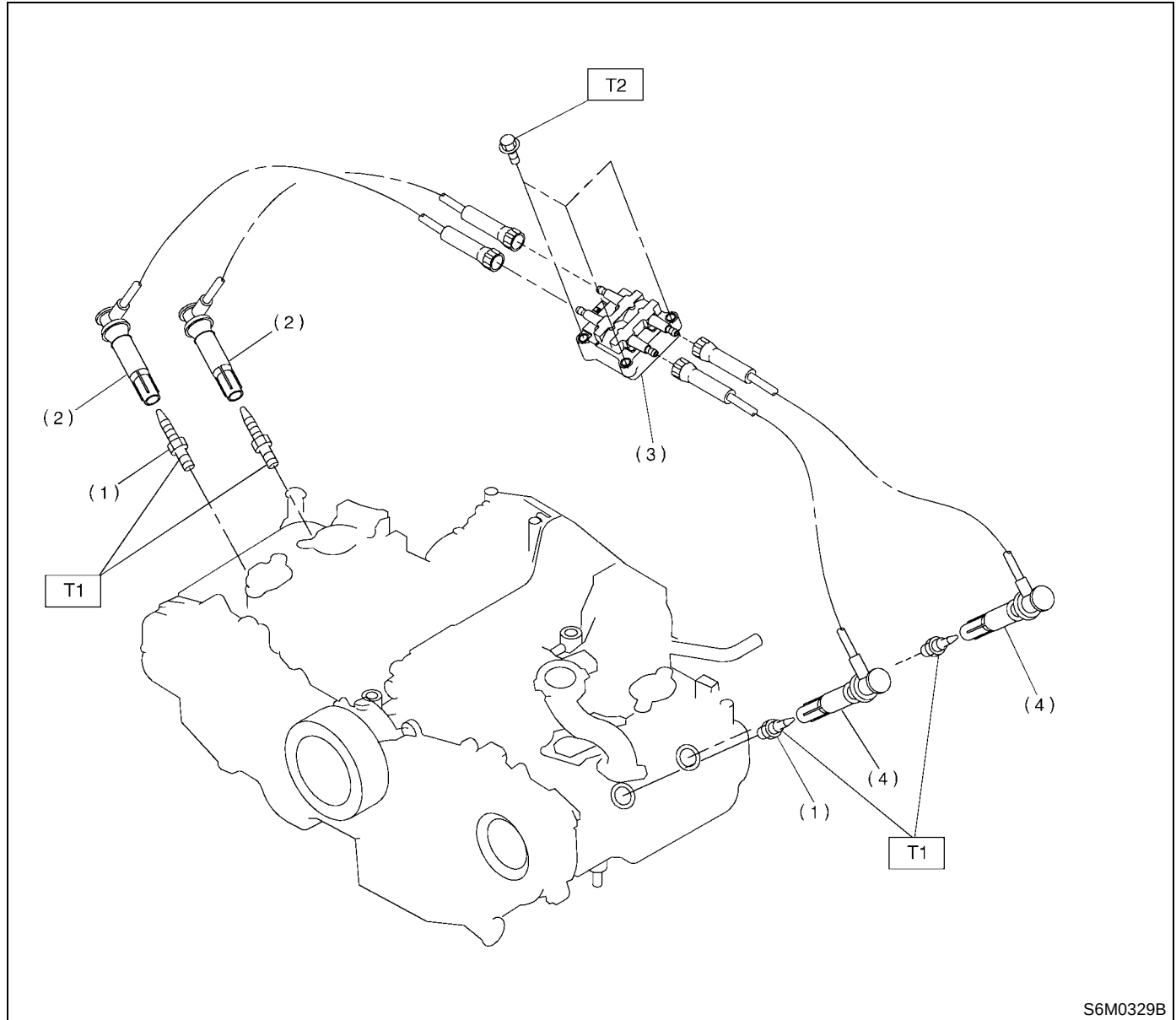
T1: 6.4 (0.65, 4.7)

T2: 21 (2.1, 15.2)

GENERAL DESCRIPTION

IGNITION

2. 2000CC MODEL



S6M0329B

- | | |
|------------------------------------|------------------------------|
| (1) Spark plug | (4) Spark plug cord (#2, #4) |
| (2) Spark plug cord (#1, #3) | |
| (3) Ignition coil and ignitor ASSY | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 21 (2.1, 15)

T2: 6.4 (0.65, 4.7)

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 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.

2. Spark Plug

A: REMOVAL

CAUTION:

All spark plugs installed on an engine, must be of the same heat range.

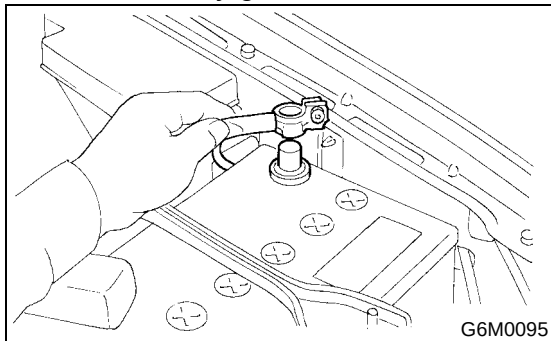
Spark plug	
1600cc	NGK: BKR6E* CHAMPION: RC8YC4** NGK: BKR6E-11** (Alternate)
2000cc	NGK: BKR6E* CHAMPION: RC10YC4** NGK: BKR5E-11** (Alternate)

*: Without catalyst model

**: With catalyst model

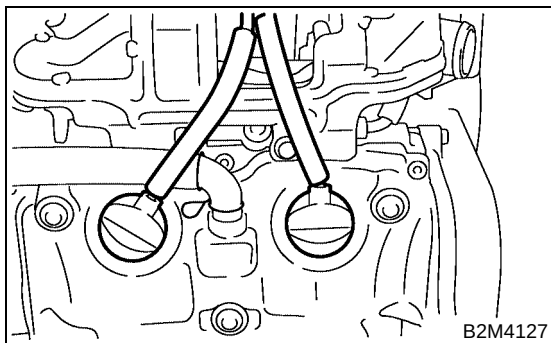
1. RH SIDE

- 1) Disconnect battery ground cable.

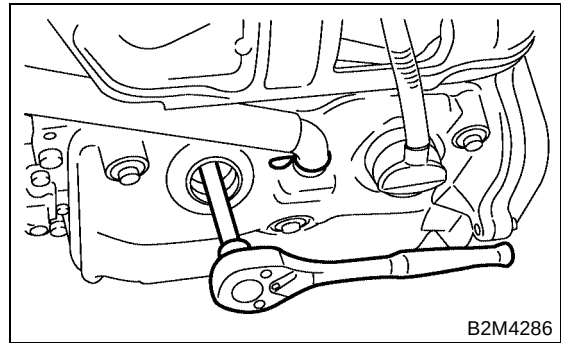


- 2) Remove resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>

- 3) Remove spark plug cords by pulling boot, not cord itself.

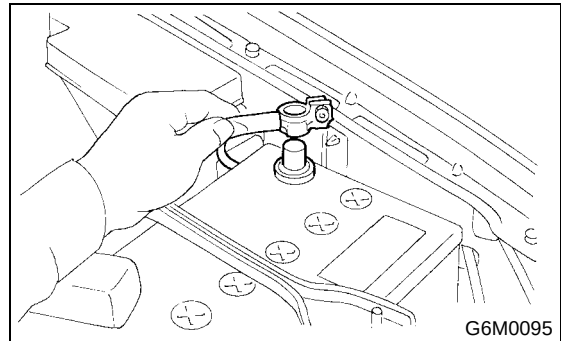


- 4) Remove spark plugs with the spark plug socket.

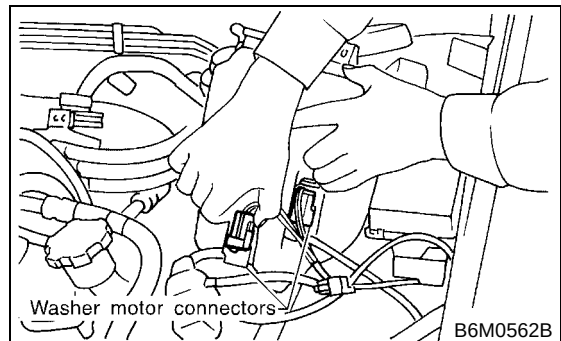


2. LH SIDE

- 1) Disconnect battery ground cable.

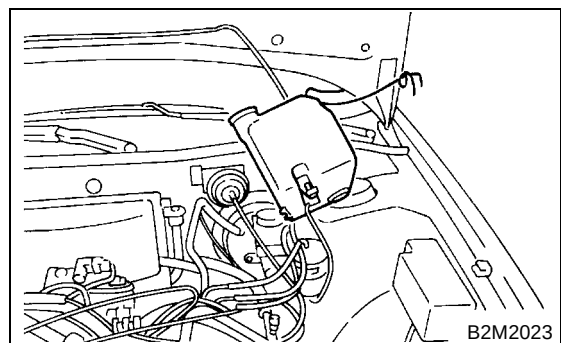


- 2) Disconnect washer motor connector.



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

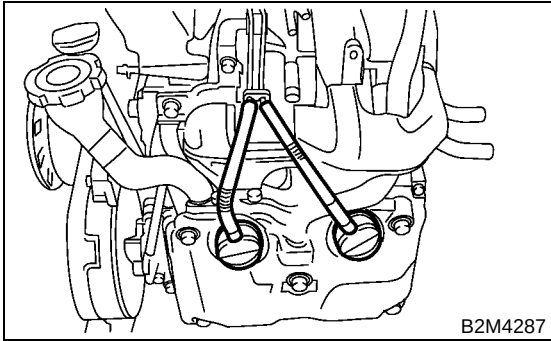
- 4) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



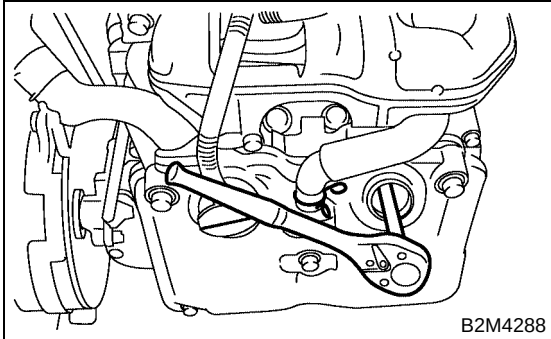
SPARK PLUG

IGNITION

5) Remove spark plugs cord by pulling boot, not cord itself.



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):
20.6 N·m (2.10 kgf-m, 15.2 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.

2. LH SIDE

1) Install in the reverse order of removal.

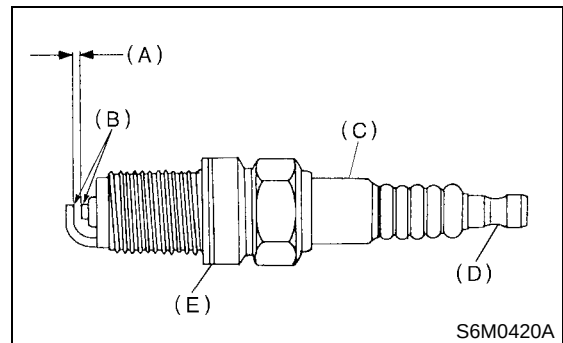
Tightening torque (Spark plug):
20.6 N·m (2.10 kgf-m, 15.2 ft-lb)

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

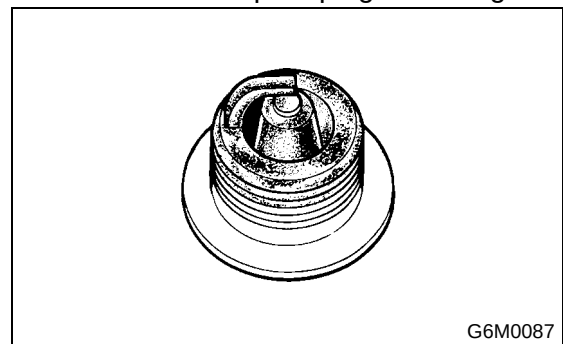
Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal

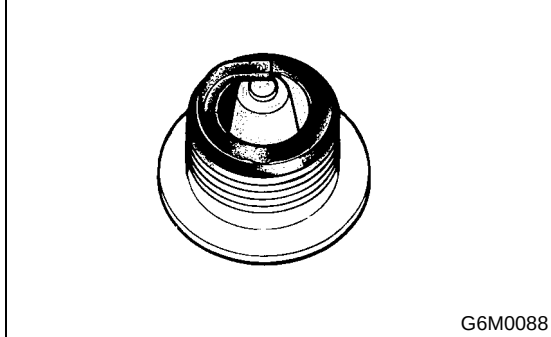
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



2) Carbon fouled

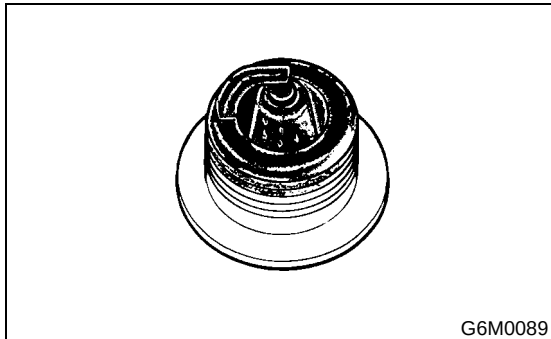
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



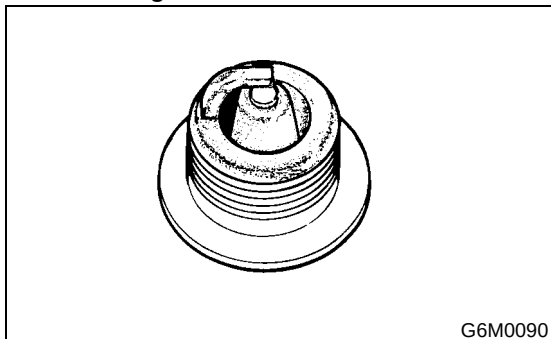
3) Oil fouled

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.



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.

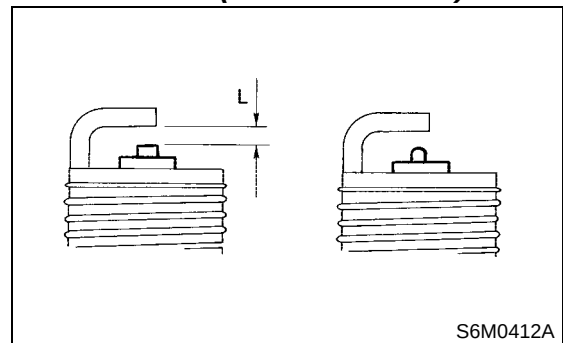
Spark plug gap: L

With catalyst:

1.0 — 1.1 mm (0.039 — 0.043 in)

Without catalyst:

0.7 — 0.8 mm (0.028 — 0.031 in)



NOTE:

Replace with new spark plug if this area is worn to "ball" shape.

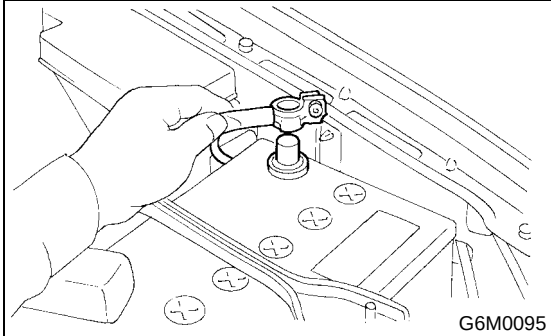
IGNITION COIL AND IGNITOR ASSEMBLY

IGNITION

3. Ignition Coil and Ignitor Assembly

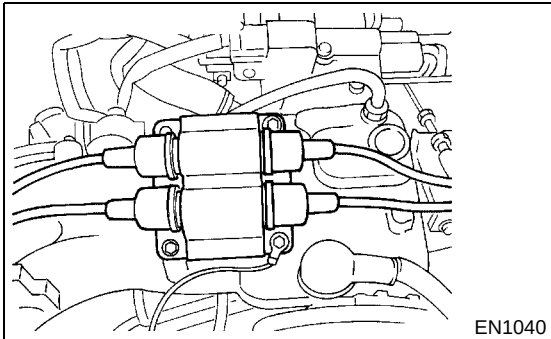
A: REMOVAL

1) Disconnect battery ground cable.

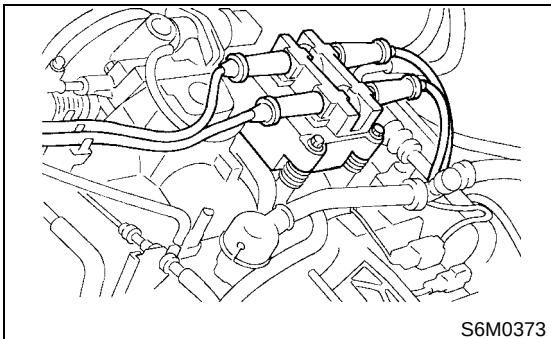


2) Disconnect spark plug cords from ignition coil and ignitor assembly.

• 1600cc MODEL



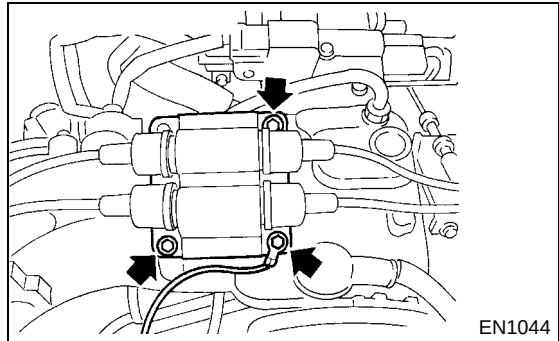
• 2000cc MODEL



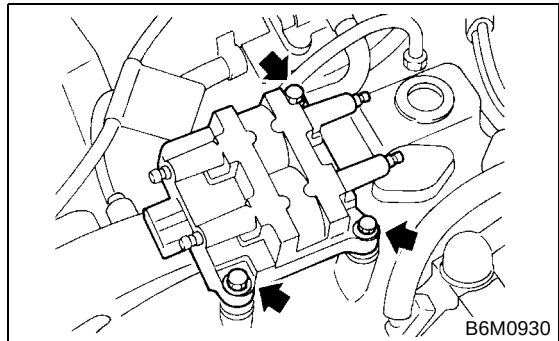
3) Disconnect connector from ignition coil and ignitor assembly.

4) Remove ignition coil and ignitor assembly.

• 1600cc MODEL



• 2000cc MODEL



B: INSTALLATION

1) Install in the reverse order of removal.

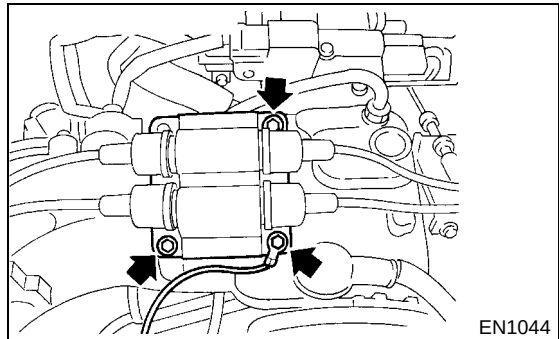
Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

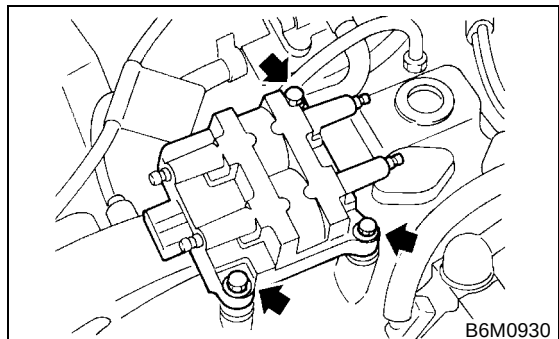
CAUTION:

Be sure to connect wires to their proper positions. Failure to do so will damage unit.

• 1600cc MODEL



• 2000cc MODEL



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:(1600cc)

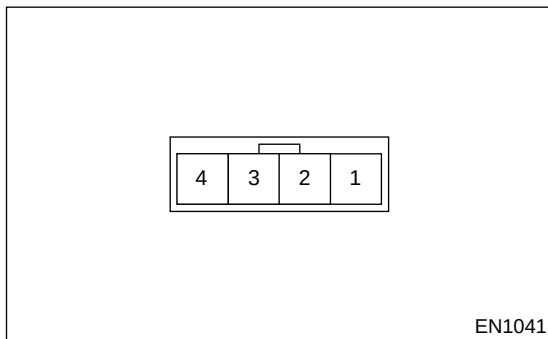
[Primary side]

Between terminal No. 1 and No. 4

$0.7 \Omega \pm 10\%$

Between terminal No. 1 and No. 2

$0.7 \Omega \pm 10\%$



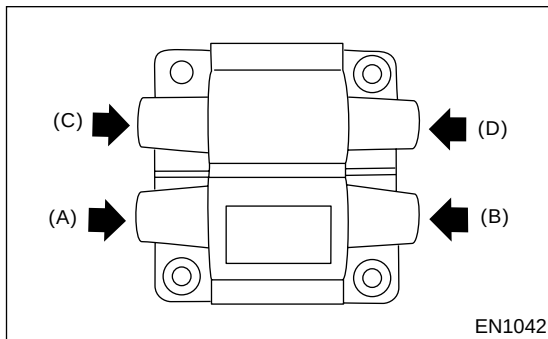
[Secondary side]

Between (A) and (B)

$13.0 \text{ k}\Omega \pm 20\%$

Between (C) and (D)

$13.0 \text{ k}\Omega \pm 20\%$



Specified resistance:(2000cc)

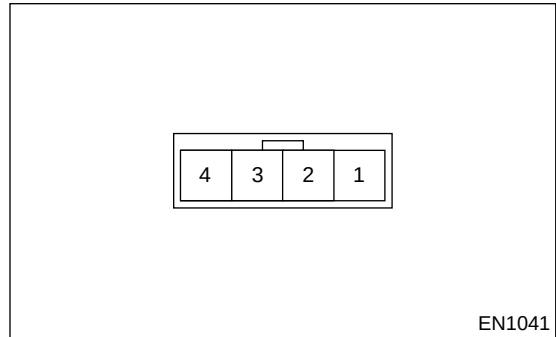
[Primary side]

Between terminal No. 1 and No. 2

$0.73 \Omega \pm 10\%$

Between terminal No. 2 and No. 4

$0.73 \Omega \pm 10\%$



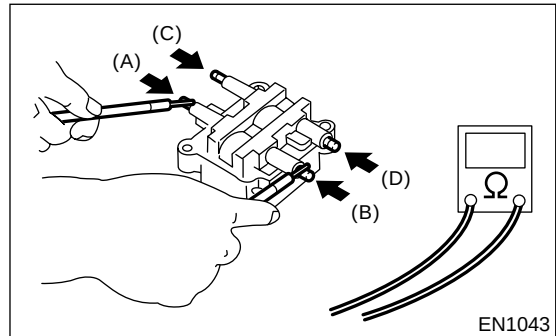
[Secondary side]

Between (A) and (B)

$12.8 \text{ k}\Omega \pm 15\%$

Between (C) and (D)

$12.8 \text{ k}\Omega \pm 15\%$



3) Insulation between primary terminal and case:
10 M Ω 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

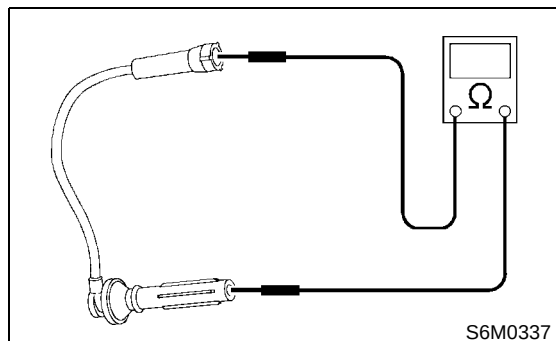
Resistance value:

#1 cord: 5.6 — 10.6

#2 cord: 7.3 — 13.7

#3 cord: 5.9 — 11.1

#4 cord: 7.3 — 13.7



ENGINE 2 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.

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

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

ENGINE (DIAGNOSTICS)

EN(SOHCw/oOBD)

	Page
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2. Check List for Interview	4
3. General Description	6
4. Electrical Components Location.....	10
5. Engine Control Module (ECM) I/O Signal	20
6. Subaru Select Monitor.....	23
7. Read Diagnostic Trouble Code	26
8. Inspection Mode.....	28
9. Clear Memory Mode.....	30
10. Compulsory Valve Operation Check Mode	31
11. Engine Malfunction Indicator Lamp (MIL)	32
12. Diagnostics for Engine Starting Failure	44
13. List of Diagnostic Trouble Code (DTC)	66
14. Diagnostic Procedure with Diagnostic Trouble Code (DTC)	68
15. General Diagnostic Table.....	114

BASIC DIAGNOSTIC PROCEDURE

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITH SUBARU SELECT MONITOR

Step	Check	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(SOHCw/oOBD)-4, CHECK, Check List for Interview.> 2)Start the engine.	Does the engine start?	Go to step 2.	Inspection using "Diagnostics for Engine Starting Failure". <Ref. to EN(SOHCw/oOBD)-44, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). <Ref. to EN(SOHCw/oOBD)-32, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>	Does MIL illuminate?	Go to step 3.	Inspection using "General Diagnostic Table". <Ref. to EN(SOHCw/oOBD)-114, 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(SOHCw/oOBD)-26, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code.>	Does the Subaru Select Monitor indicate DTC? <Ref. to EN(SOHCw/oOBD)-66, LIST, List of Diagnostic Trouble Code (DTC).>	Record diagnostic trouble code. Repair the trouble cause. <Ref. to EN(SOHCw/oOBD)-68, 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(SOHCw/oOBD)-32, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1)Perform the clear memory mode. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>	Does the Subaru Select Monitor indicate DTC? <Ref. to EN(SOHCw/oOBD)-66, LIST, List of Diagnostic Trouble Code (DTC).>	Record diagnostic trouble code. Repair the trouble cause. <Ref. to EN(SOHCw/oOBD)-68, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Go to step 4.	Complete the diagnosis.

BASIC DIAGNOSTIC PROCEDURE

ENGINE (DIAGNOSTICS)

2. WITHOUT SUBARU SELECT MONITOR

CAUTION:

- Check the connector while it is connected unless specified otherwise.

- Be sure to check again from the beginning in order to prevent secondary trouble caused by repair work.

Step	Check	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(SOHCw/oOBD)-4, CHECK, Check List for Interview.> 2)Start the engine.	Does the engine start?	Go to step 2.	Inspection using "Diagnostics for Engine Starting Failure". <Ref. to EN(SOHCw/oOBD)-44, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). <Ref. to EN(SOHCw/oOBD)-32, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>	Does MIL illuminate?	Go to step 3.	Inspection using "9. General Diagnostic Table". <Ref. to EN(SOHCw/oOBD)-114, INSPECTION, General Diagnostic Table.>
3 CHECK INDICATION OF DTC ON MIL. 1)Perform the read diagnostic trouble code (read memory mode).<Ref. to EN(SOHCw/oOBD)-26, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code.> 2)Read DTC on MIL.	Does the MIL indicate DTC? <Ref. to EN(SOHCw/oOBD)-66, LIST, List of Diagnostic Trouble Code (DTC).>	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(SOHCw/oOBD)-32, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1)Perform the clear memory mode. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>	Does the MIL indicate DTC? <Ref. to EN(SOHCw/oOBD)-66, LIST, List of Diagnostic Trouble Code (DTC).>	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	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others:		
Outdoor temperature	°F (°C)		
	☐ Hot ☐ Warm ☐ Cool ☐ Cold		
Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Others:		
Engine temperature	☐ Cold ☐ Warming-up ☐ After warming-up ☐ Any temperature ☐ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH)		
Headlight	☐ ON/ ☐ OFF	Rear defogger	☐ ON/ ☐ OFF
Blower	☐ ON/ ☐ OFF	Radio	☐ ON/ ☐ OFF
A/C compressor	☐ ON/ ☐ OFF	CD/Cassette	☐ ON/ ☐ OFF
Cooling fan	☐ ON/ ☐ OFF	Car phone	☐ ON/ ☐ OFF
Front wiper	☐ ON/ ☐ OFF	CB	☐ ON/ ☐ OFF
Rear wiper	☐ ON/ ☐ 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. ☐ Yes/ ☐ No
☐ Low fuel warning light ☐ Charge indicator light ☐ AT diagnostics indicator light ☐ ABS warning light ☐ Engine oil pressure warning light
b) Fuel level
- Lack of gasoline: ☐ Yes/☐ No - Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ☐ Yes/ ☐ No
What:
d) Intentional connecting or disconnecting of hoses: ☐ Yes/ ☐ No
What:
e) Installing of parts other than genuine parts: ☐ Yes/ ☐ No
- What: - Where:
f) Occurrence of noise: ☐ Yes/ ☐ No
- From where: - What kind:
g) Occurrence of smell: ☐ Yes/ ☐ No
- From where: - What kind:
h) Intrusion of water into engine compartment or passenger compartment: ☐ Yes/ ☐ No
i) Troubles occurred
☐ Engine does not start. ☐ Engine stalls during idling. ☐ Engine stalls while driving. ☐ Engine speed decreases. ☐ Engine speed does not decrease. ☐ Rough idling ☐ Poor acceleration ☐ Back fire ☐ After fire ☐ No shift ☐ 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.

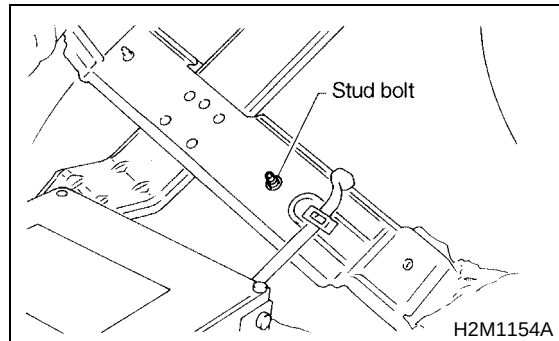
- Otherwise, the ECM may be damaged.

CAUTION:

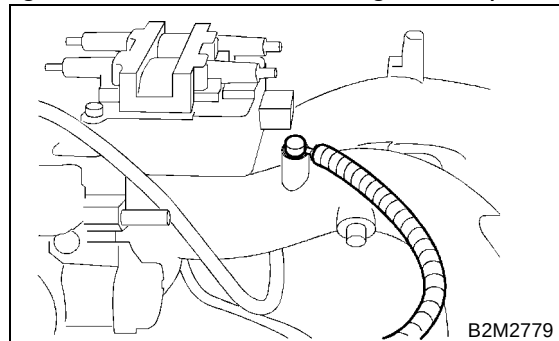
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

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.

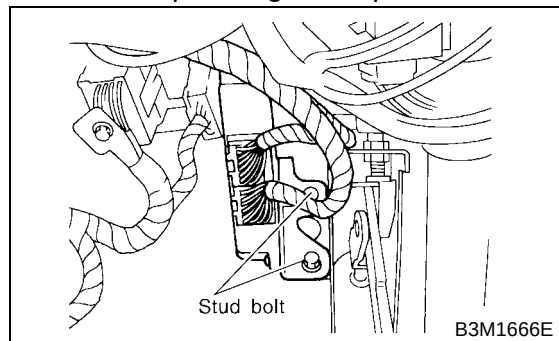
8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



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.



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.

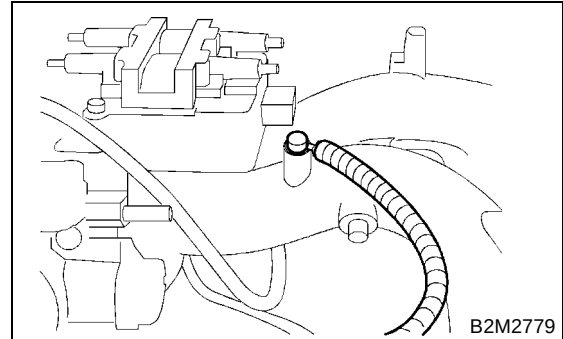
Standard voltage: 12 V

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. 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.

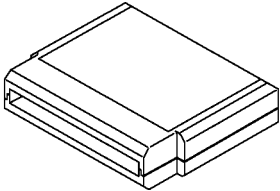
The MFI system also has the following features:

- 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
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

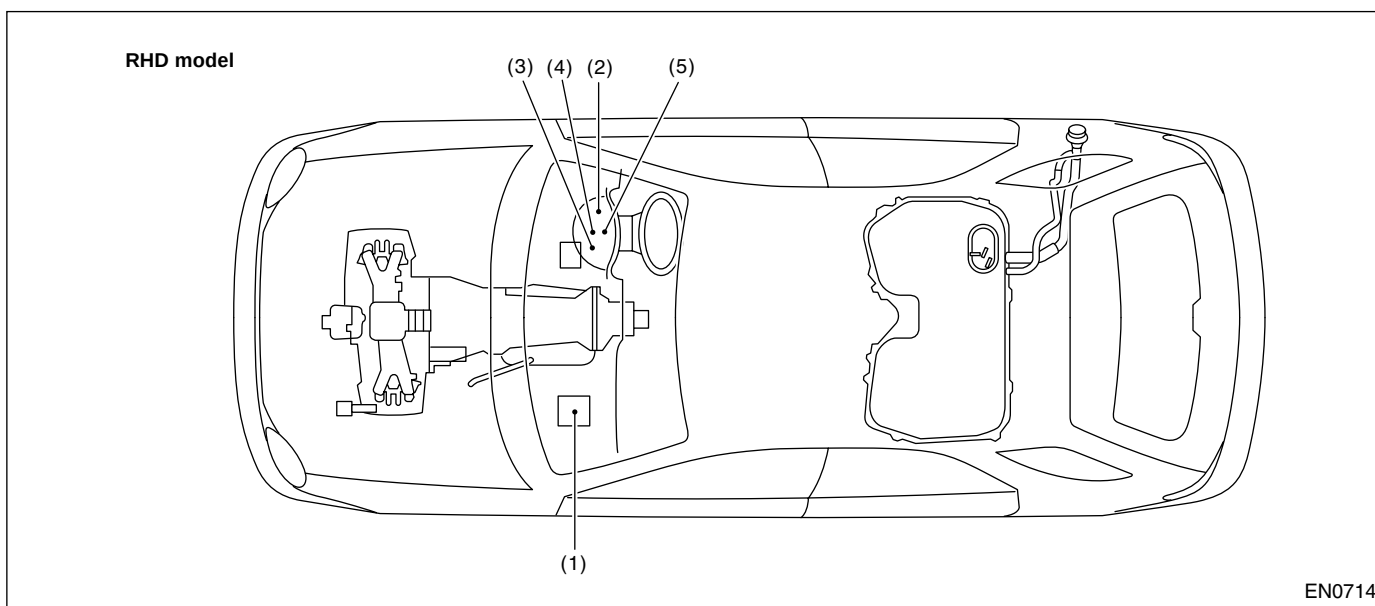
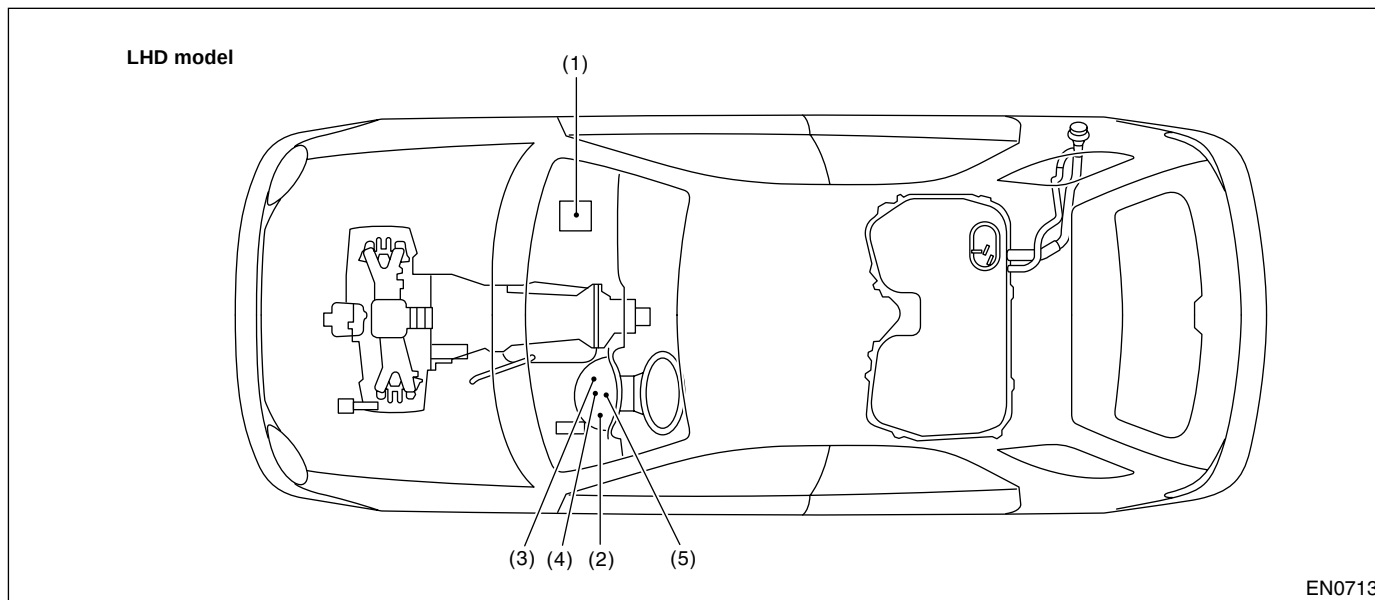
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

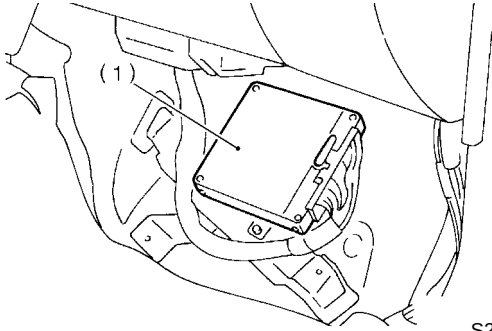
1. MODULE



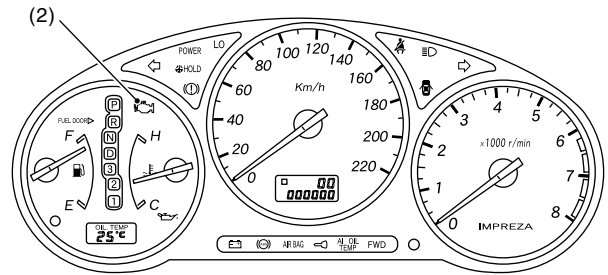
- | | |
|---|---------------------------|
| (1) Engine control module (ECM) | (3) Read memory connector |
| (2) CHECK ENGINE malfunction indicator lamp (MIL) | (4) Test mode connector |
| | (5) Data link connector |

ELECTRICAL COMPONENTS LOCATION

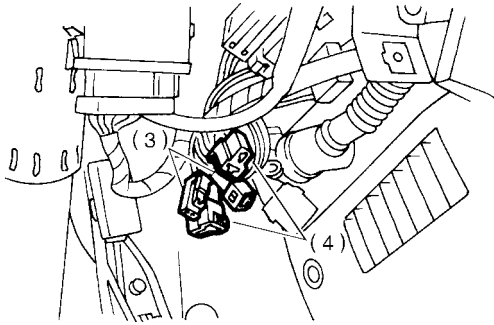
ENGINE (DIAGNOSTICS)



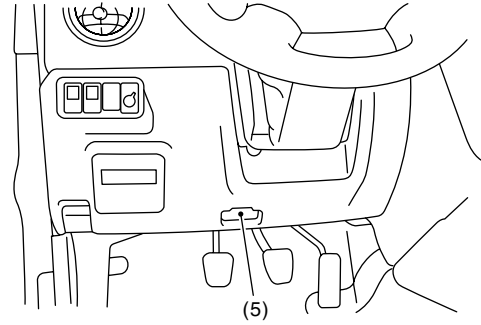
S2M0256A



EN0718



EN1034

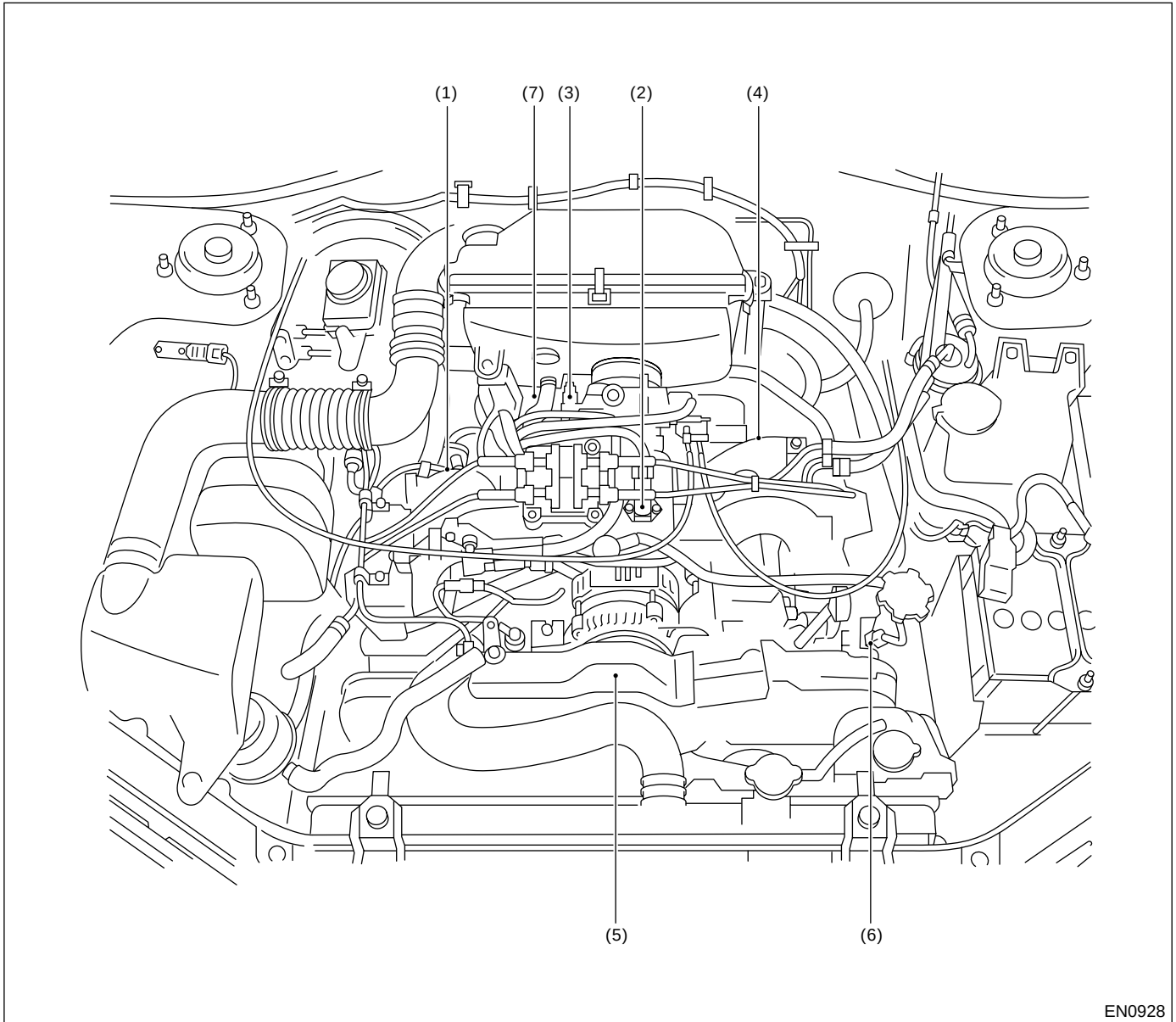


EN0717

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

2. SENSOR

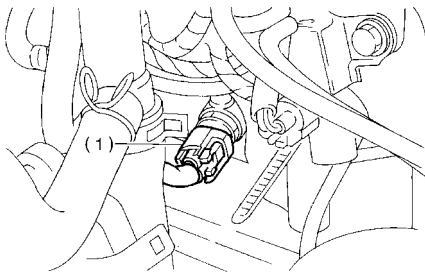


EN0928

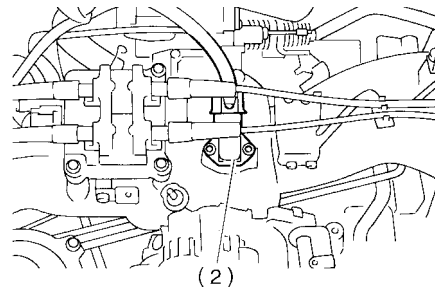
- | | | |
|--|--------------------------------|--------------------------|
| (1) Engine coolant temperature sensor | (3) Throttle position sensor | (7) Vehicle speed sensor |
| (2) Intake air temperature and pressure sensor | (4) Knock sensor | |
| | (5) Crankshaft position sensor | |
| | (6) Camshaft position sensor | |

ELECTRICAL COMPONENTS LOCATION

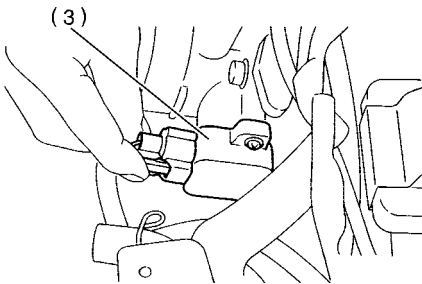
ENGINE (DIAGNOSTICS)



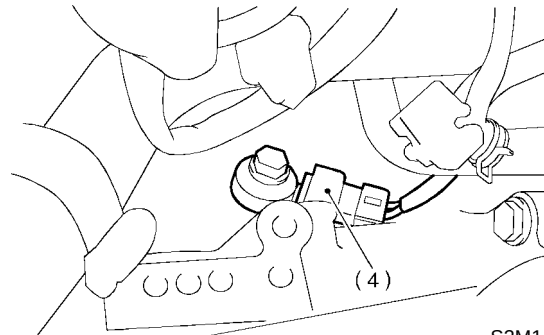
S2M1248A



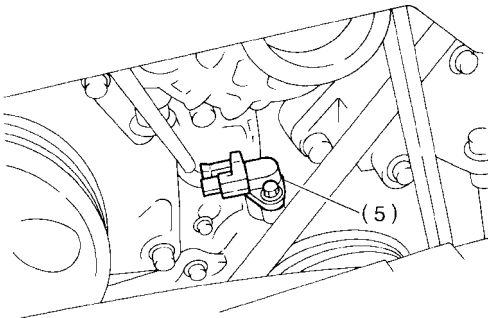
H2M3255A



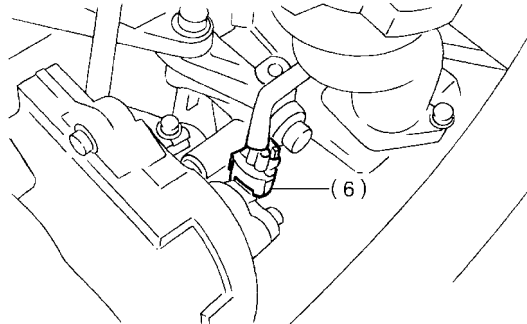
H2M3256A



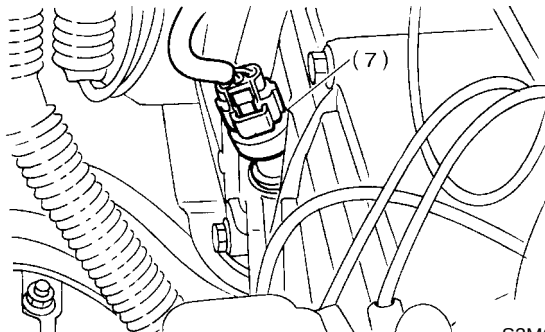
S2M1406B



B2M0213M



B2M0212F

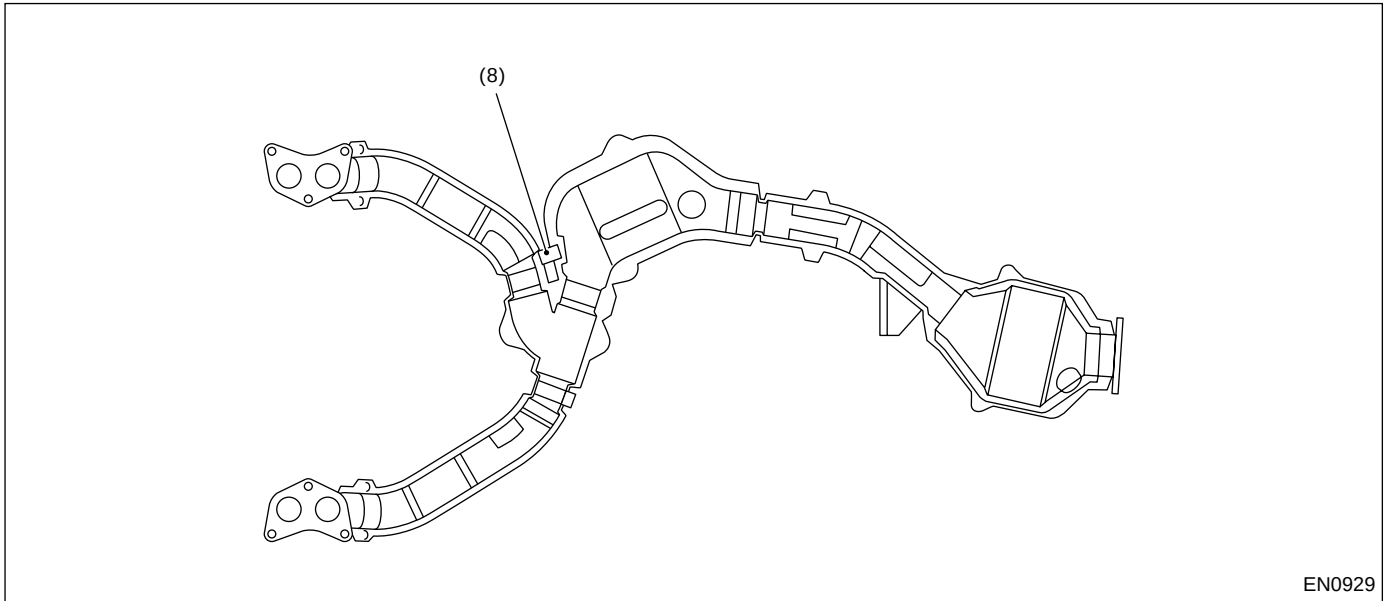


S2M0907C

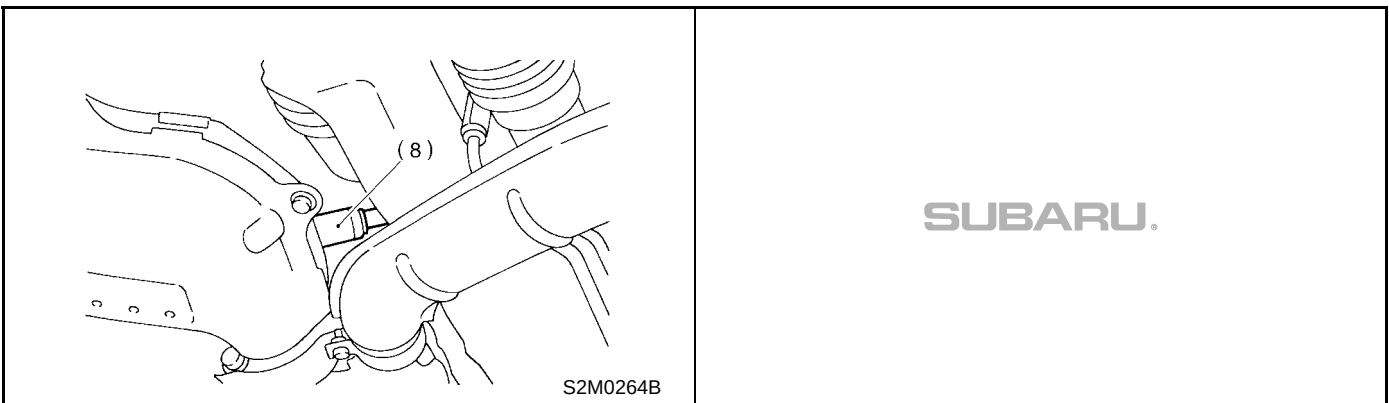
SUBARU.

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



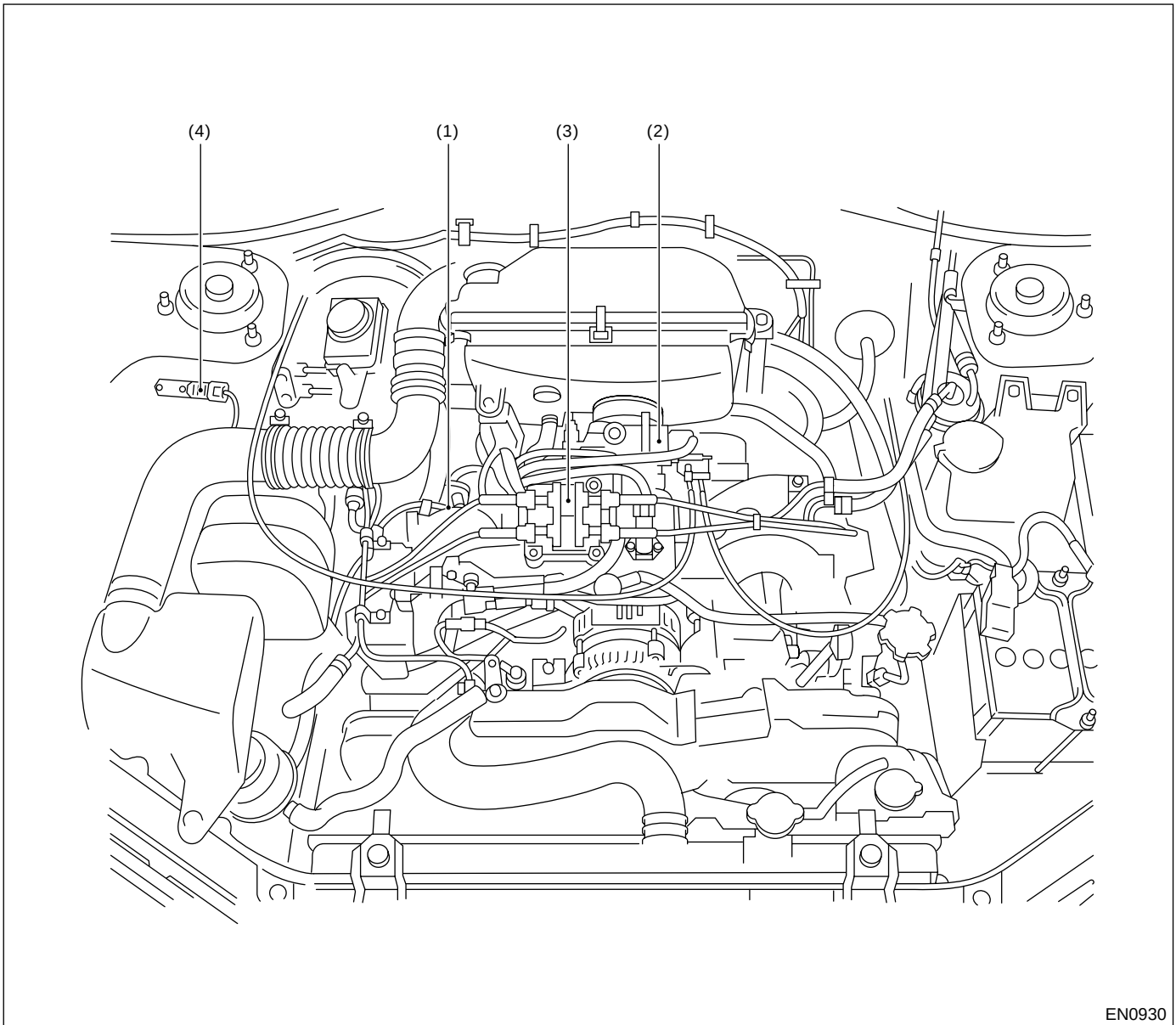
- (8) Oxygen sensor (With catalyst model)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

3. SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



EN0930

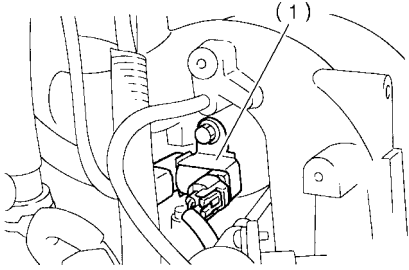
- (1) Purge control solenoid valve
- (2) Idle air control solenoid valve

- (3) Ignition coil and ignitor ASSY

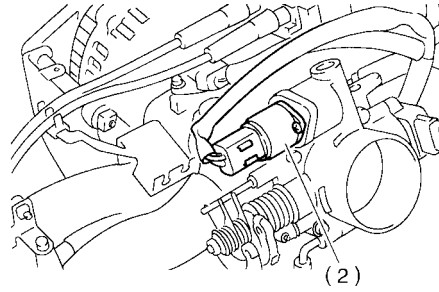
- (4) CO resistor (Without catalyst model)

ELECTRICAL COMPONENTS LOCATION

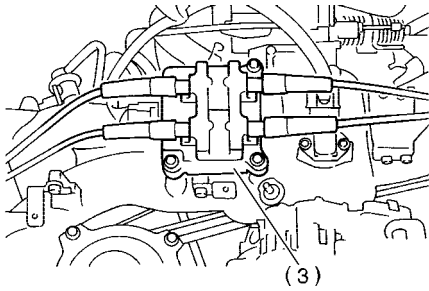
ENGINE (DIAGNOSTICS)



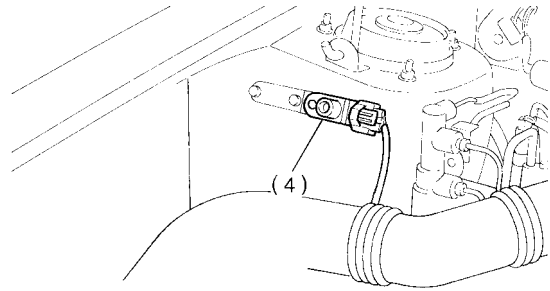
H2M3258A



H2M3259A



H2M3261A

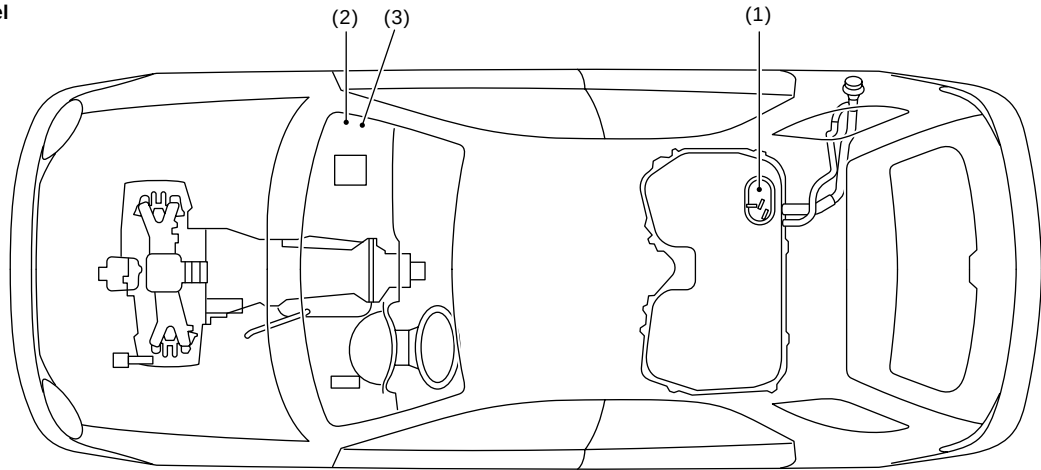


S2M1764B

ELECTRICAL COMPONENTS LOCATION

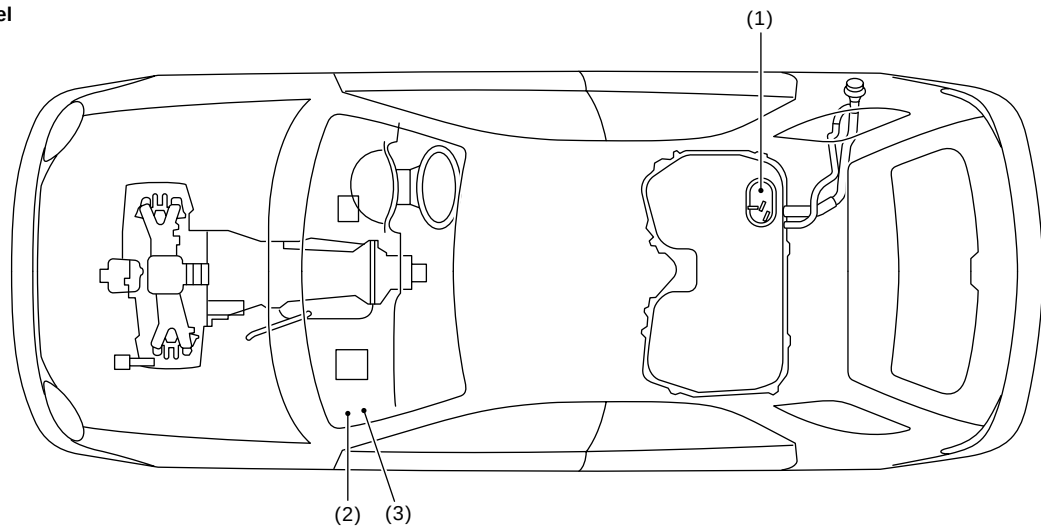
ENGINE (DIAGNOSTICS)

LHD model



EN1031

RHD model



EN1032

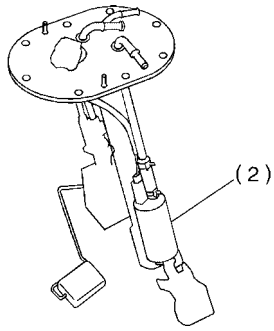
(1) Fuel pump

(2) Main relay

(3) Fuel pump relay

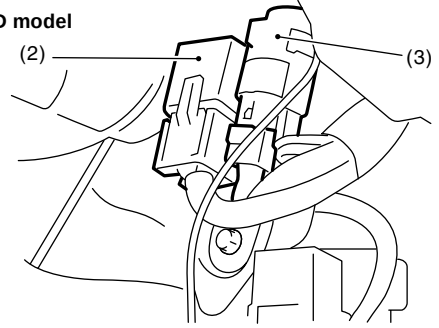
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



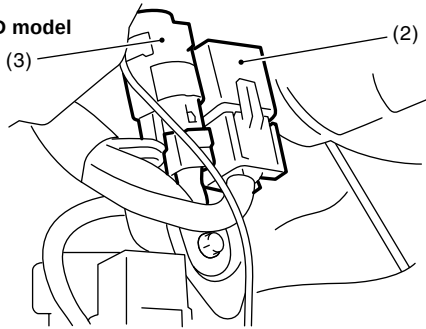
S2M1184A

LHD model



EN0744

RHD model

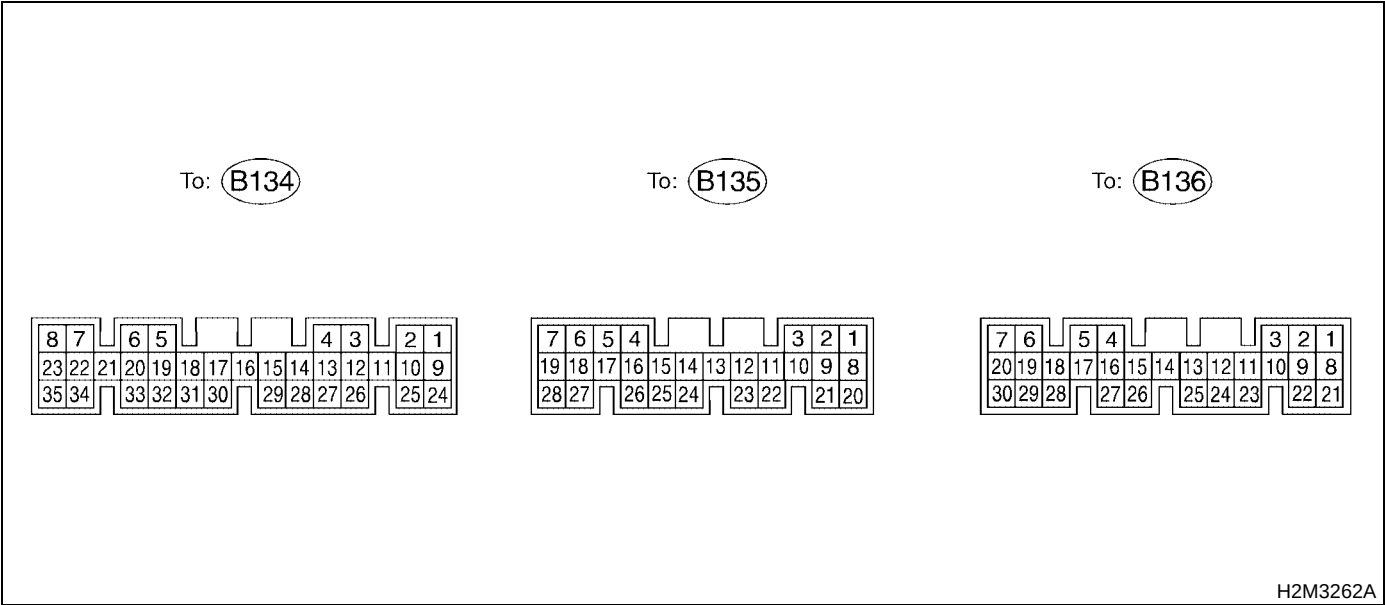


EN0748

SUBARU.

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



H2M3262A

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)		
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	—
			2				
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	2.5		MT: 0 AT: 5	MT: 0 AT: 5	—

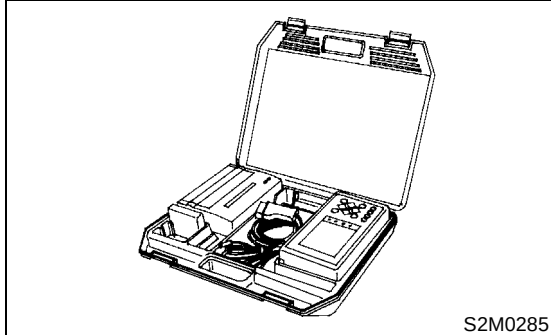
*: With immobilizer

6. Subaru Select Monitor

A: OPERATION

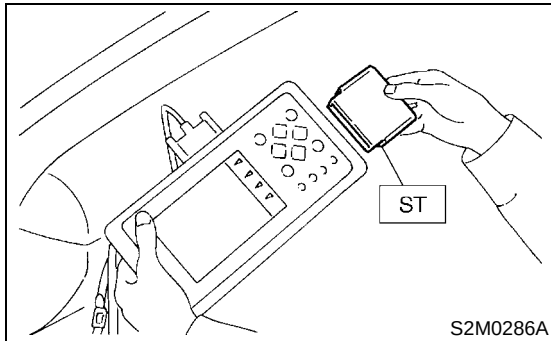
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru Select Monitor kit.



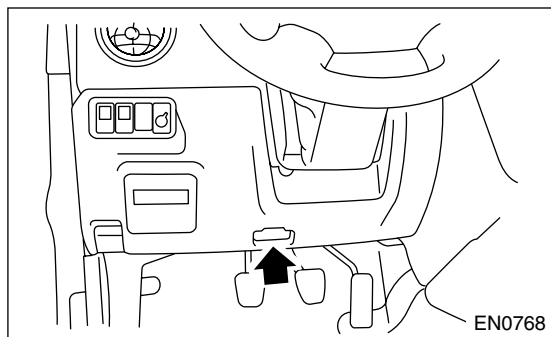
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor.



4) Connect Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).

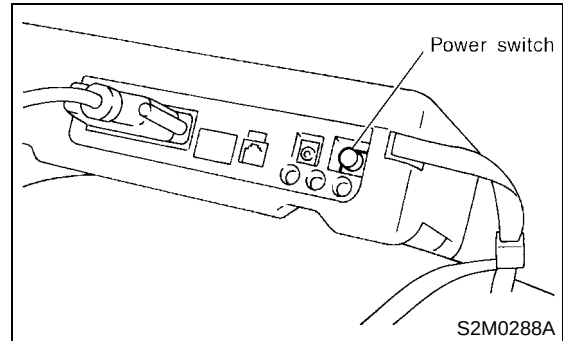


(2) Connect diagnosis cable to data link connector.

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.



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(SOHCw/oOBD)-26, Read Diagnostic Trouble Code.>

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

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.
- 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

ENGINE (DIAGNOSTICS)

7. Read Diagnostic Trouble Code

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(SOHCw/oOBD)-66, LIST, List of Diagnostic Trouble Code (DTC).>

2. WITHOUT SUBARU SELECT MONITOR

Step	Check	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(SOHCw/oOBD)-10, LOCATION, Electrical Components Location.> 3) Turn ignition switch to ON.	Does the MIL come on?	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).	Does the MIL indicate diagnostic trouble code (DTC)?	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.

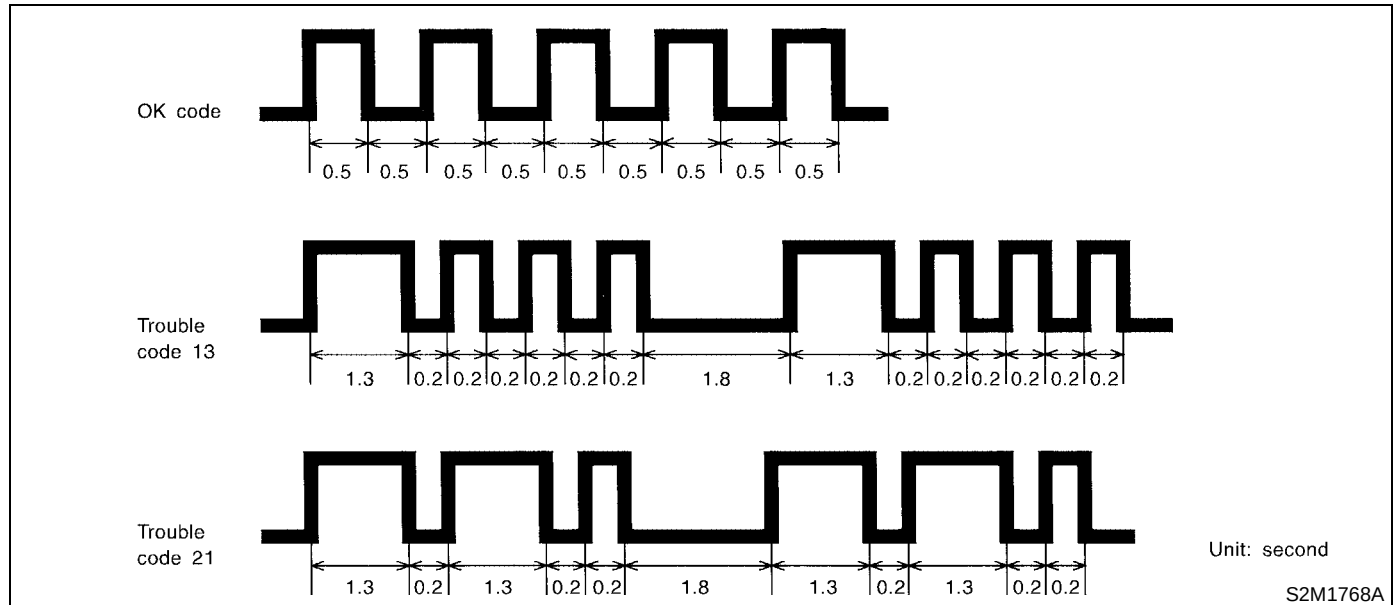
READ DIAGNOSTIC TROUBLE CODE

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(SOHCw/oOBD)-66, LIST, List of Diagnostic Trouble Code (DTC).>



8. Inspection Mode

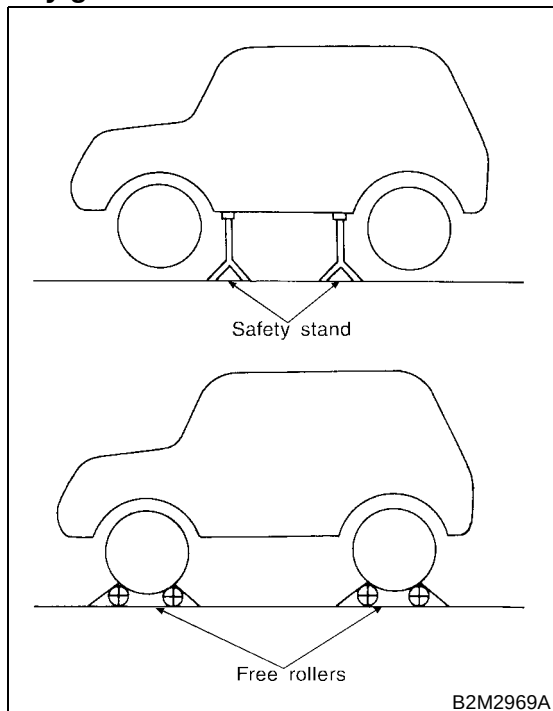
A: OPERATION

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:

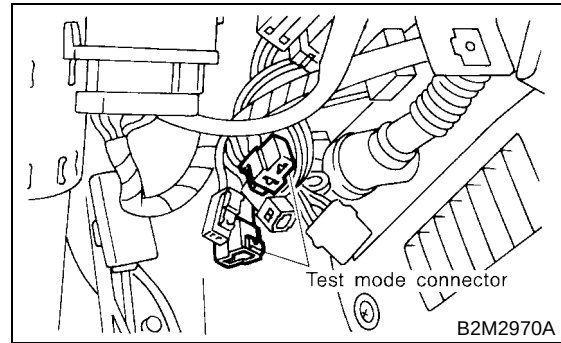
- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator 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.



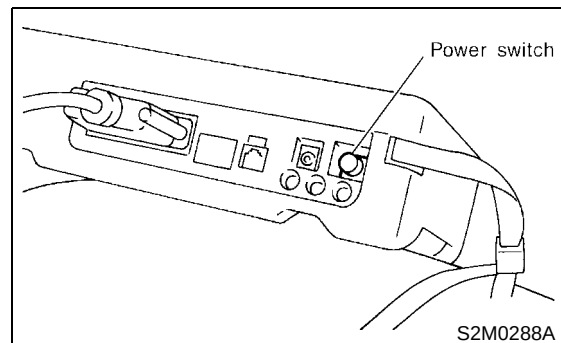
2. WITH SUBARU SELECT MONITOR

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.

- 1) Connect test mode connector (green).



- 2) Connect Subaru select monitor to data link connector. <Ref. to EN(SOHCw/oOBD)-10, LOCATION, Electrical Components Location.>
- 3) Turn ignition switch to ON (engine OFF) and Subaru select monitor switch to ON.



- 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.
 - 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(SOHCw/oOBD)-66, LIST, List of Diagnostic Trouble Code (DTC).>
- On AWD vehicles, 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 con-

trol diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

3. WITHOUT SUBARU SELECT MONITOR

Step	Check	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?	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)?	Record diagnostic trouble code (DTC) and inspect using DTC. <Ref. to EN(SOHCw/oOBD)-68, 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)?	Record diagnostic trouble code (DTC) and inspect using DTC. <Ref. to EN(SOHCw/oOBD)-68, 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.

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.

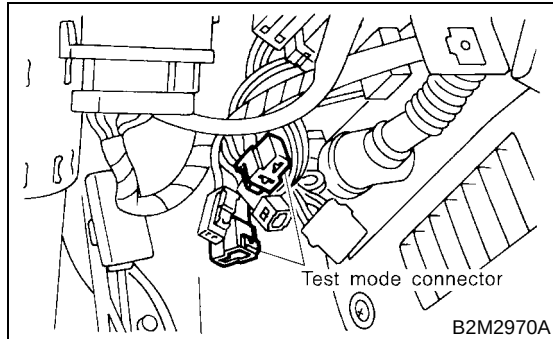
2. WITHOUT SUBARU SELECT MONITOR

Step	Check	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 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?	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. 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(SOHCw/oOBD)-66, LIST, List of Diagnostic Trouble Code (DTC).>	Record diagnostic trouble code. Repair the trouble cause. <Ref. to EN(SOHCw/oOBD)-68, 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.



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

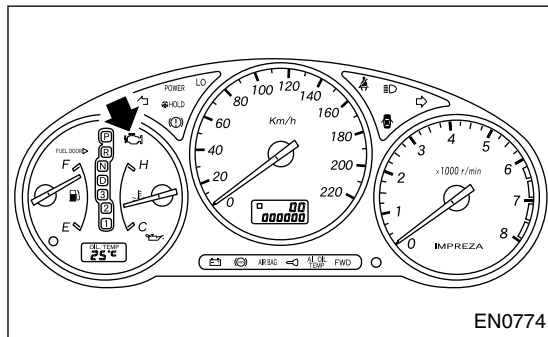
1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(SOHCw/oOBD)-32, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(SOHCw/oOBD)-34, CHECK ENGINE 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(SOHCw/oOBD)-37, 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(SOHCw/oOBD)-39, 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(SOHCw/oOBD)-42, 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)

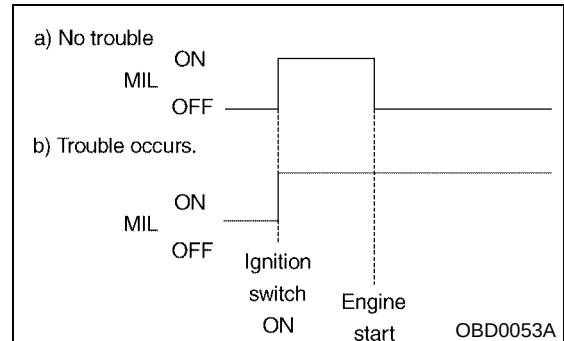
1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

NOTE:

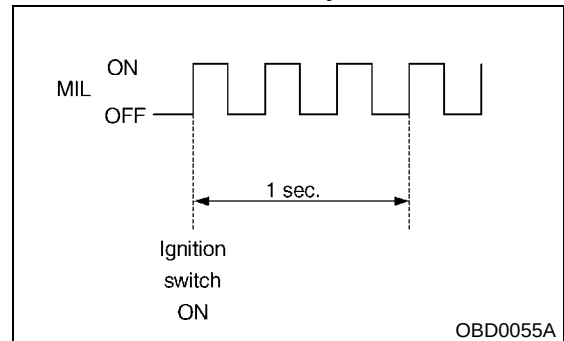
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to IDI-19, Combination Meter Assembly.>



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(SOHCw/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.

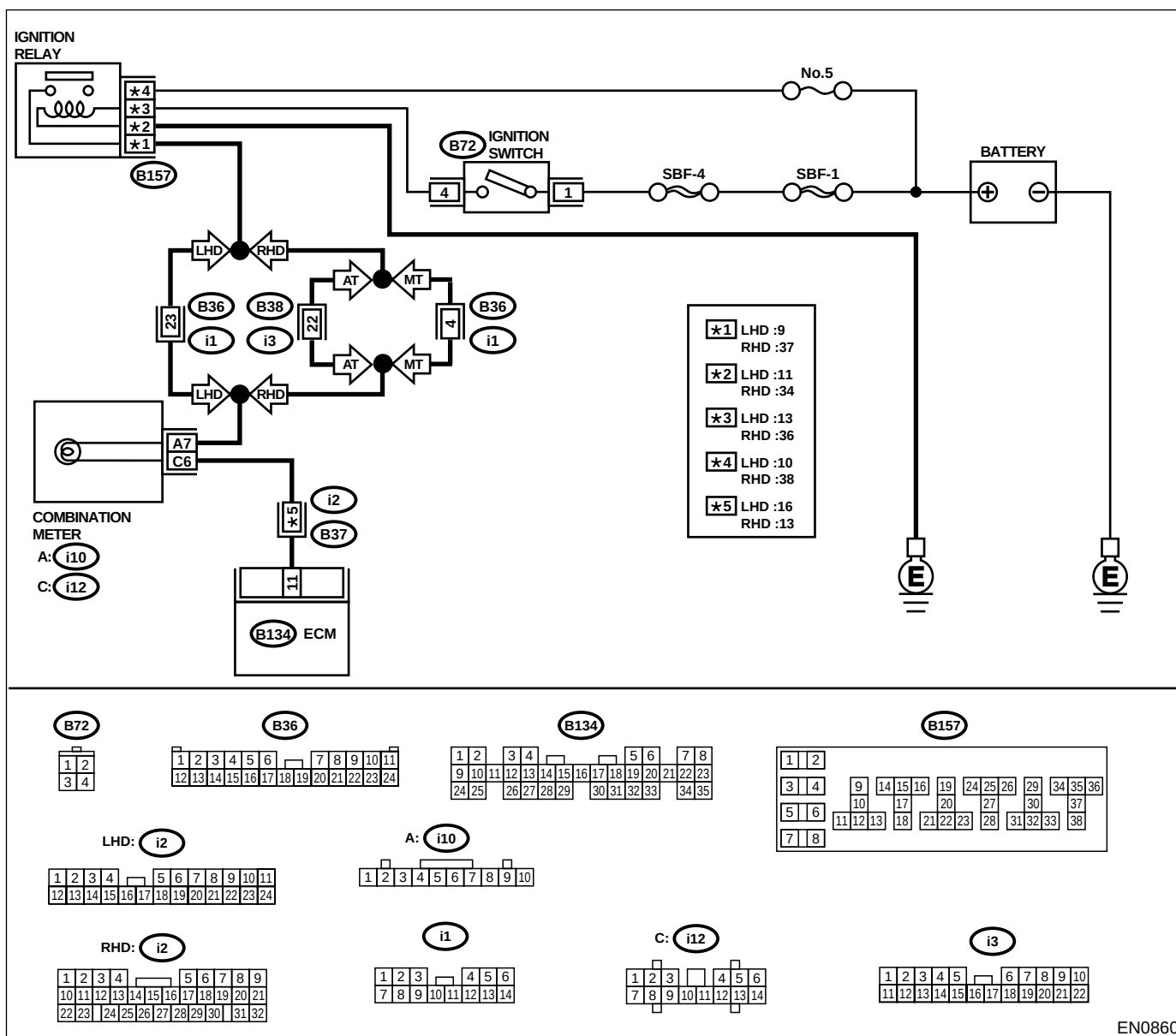


ENGINE MALFUNCTION INDICATOR LAMP (MIL)

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:**



EN0860

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	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 voltage less than 1 V?	Go to step 4.	Go to step 2.
2 CHECK POOR CONTACT.	Does the MIL come on when shaking or pulling ECM connector and harness?	Repair poor contact in ECM connector.	Go to step 3.
3 CHECK ECM CONNECTOR.	Is ECM connector correctly connected?	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-19, 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. 6:	Is resistance less than 1 Ω?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • 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-19, Combination Meter Assembly.>	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step 6.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (i10) No. 7 (+) — Chassis ground (-):	Is voltage more than 10 V?	Go to step 7.	Check the following and repair if necessary. NOTE: • 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
7 CHECK POOR CONTACT. Check poor contact in combination meter connector. <Ref. to IDI-19, Combination Meter Assembly.>	Is there poor contact in combination meter connector?	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.

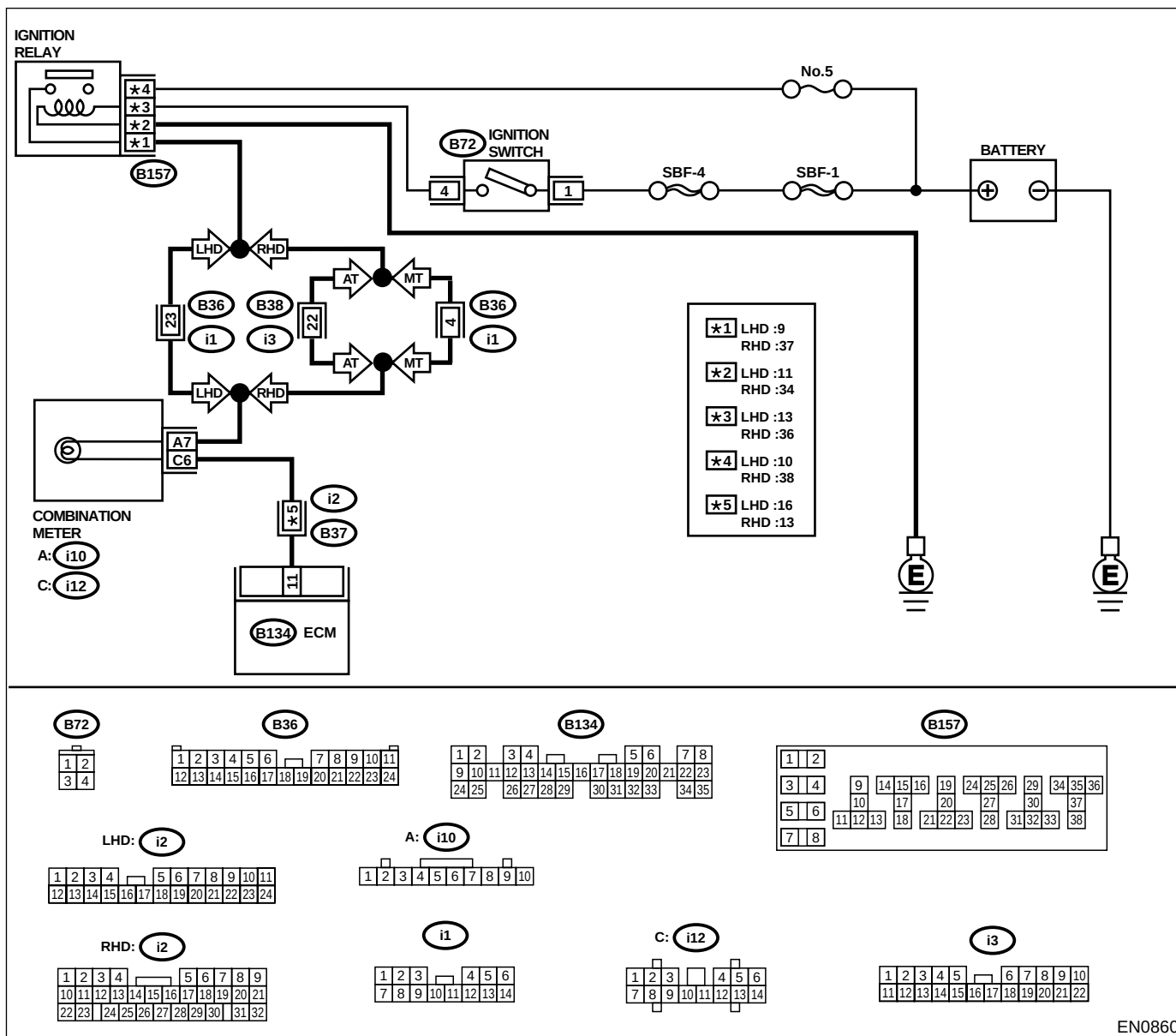
• DIAGNOSIS:

- 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:



EN0860

Step	Check	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?	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, 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.

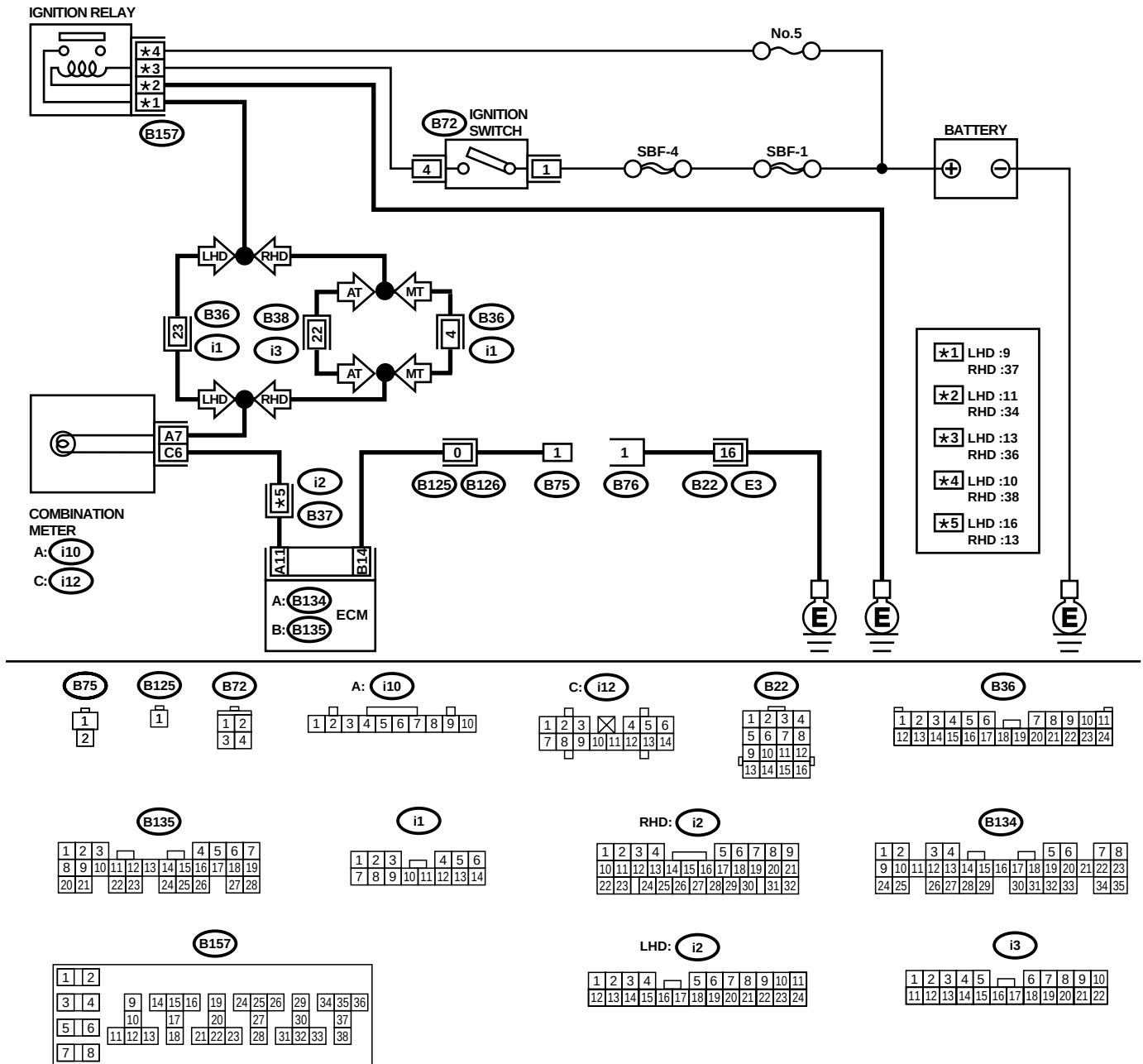
- **TROUBLE SYMPTOM:**

- When inspection mode, MIL does not blink at a cycle of 3 Hz.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN0861

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

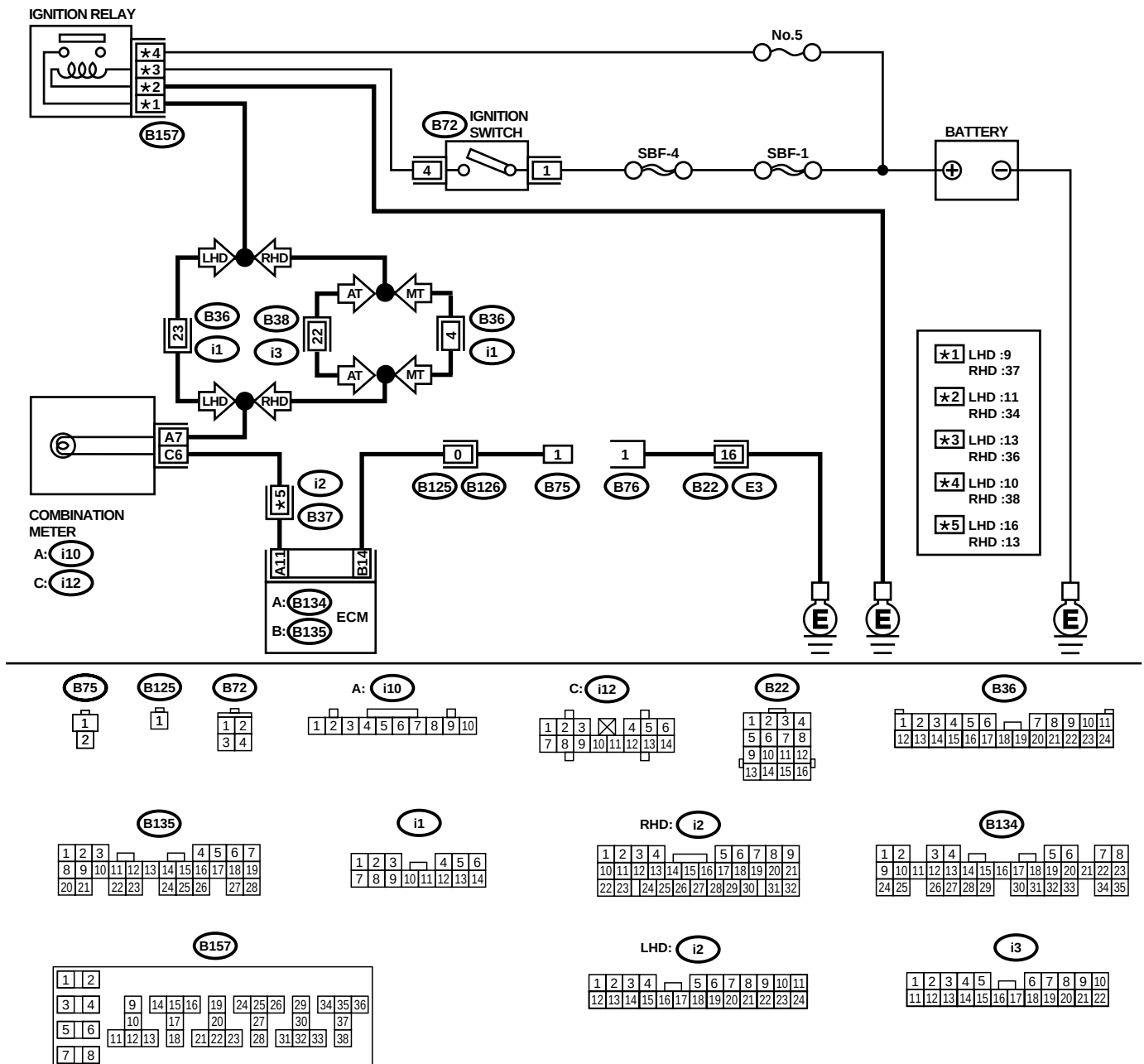
Step	Check	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Turn ignition switch to ON.	Does the MIL come on?	Go to step 2.	Repair the MIL circuit. <Ref. to EN(SOHCw/oOBD)-34, CHECK ENGINE MALFUNCTION INDICATOR 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 voltage less than 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 resistance less than 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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, 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 resistance less than 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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, 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:**



ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 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 engine ground. Connector & terminal (B135) No. 14 — Engine ground:	Is resistance less than 5 Ω ?	Repair short circuit in harness between ECM and test mode connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, Engine Control Module.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

12. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(SOHCw/oOBD)-46, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(SOHCw/oOBD)-50, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(SOHCw/oOBD)-54, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(SOHCw/oOBD)-58, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(SOHCw/oOBD)-62, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

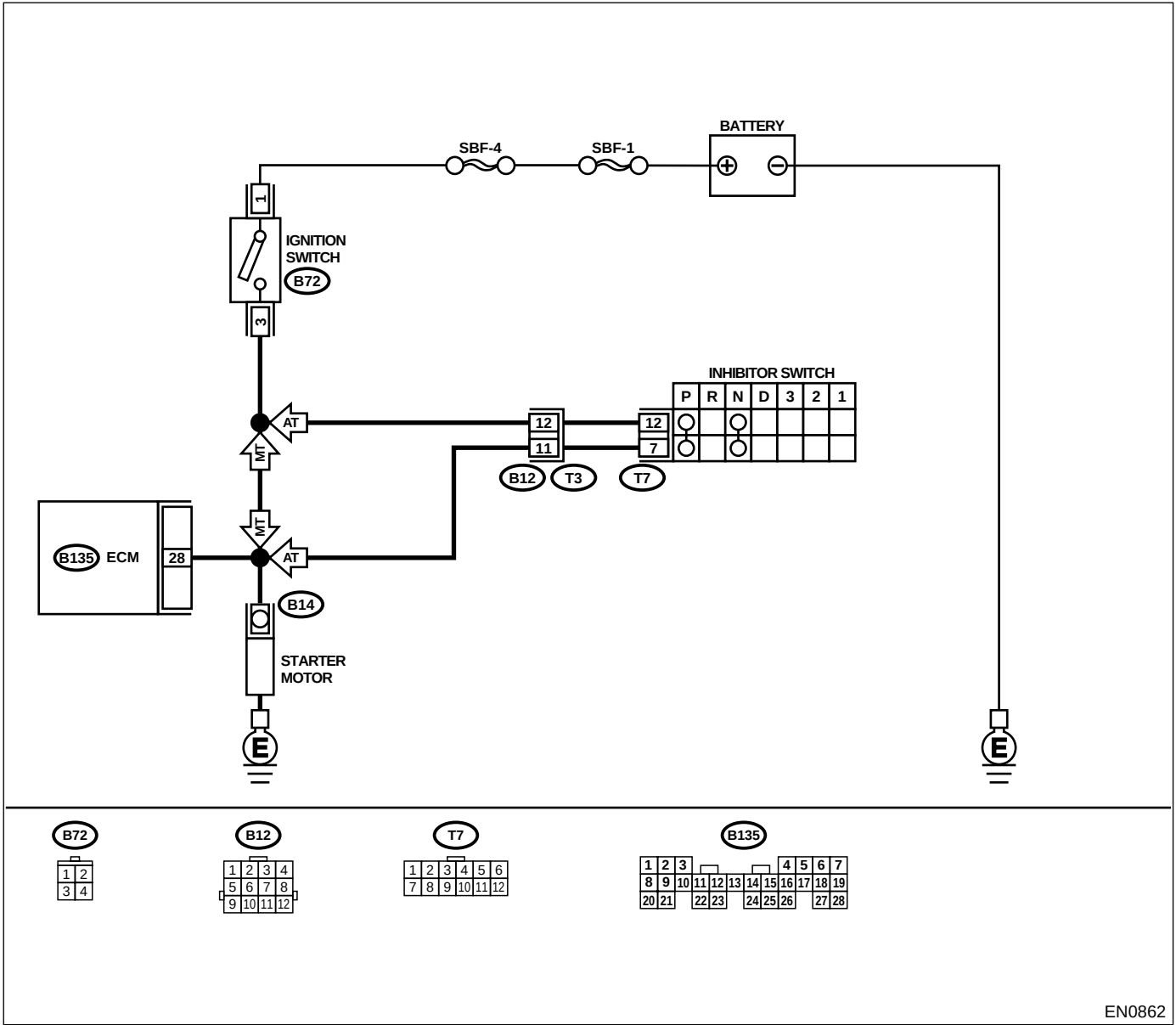
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0862

Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR. Does starter motor operate when the switch starts?	Go to step 2.	Go to step 3.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
2	CHECK DTC. <Ref. to EN(SOHCw/oOBD)-26, OPERATION, Read Diagnostic Trouble Code.>	Is the trouble code stored in memory? <Ref. to EN(SOHCw/oOBD)-66, LIST, List of Diagnostic Trouble Code (DTC).>	Record DTC. Repair the trouble cause. <Ref. to EN(SOHCw/oOBD)-68, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.
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.	Is the voltage more than 10 V?	Go to step 4.	Go to step 5.
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 resistance less than 5 Ω?	Check starter motor. <Ref. to SC-8, INSPECTION, Starter.>	Repair open circuit of ground cable.
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 resistance less than 1 Ω?	Repair ground short circuit.	Go to step 6.
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 resistance less than 1 Ω?	Go to step 7.	Repair ground short circuit.
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 (-):	Is the voltage more than 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 (-):	Is the voltage more than 10 V?	Go to step 9.	Replace ignition switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK TRANSMISSION TYPE.	Is the vehicle 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 resistance less than 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 resistance less than 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?	Repair poor contact in inhibitor switch connector.	Replace inhibitor switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

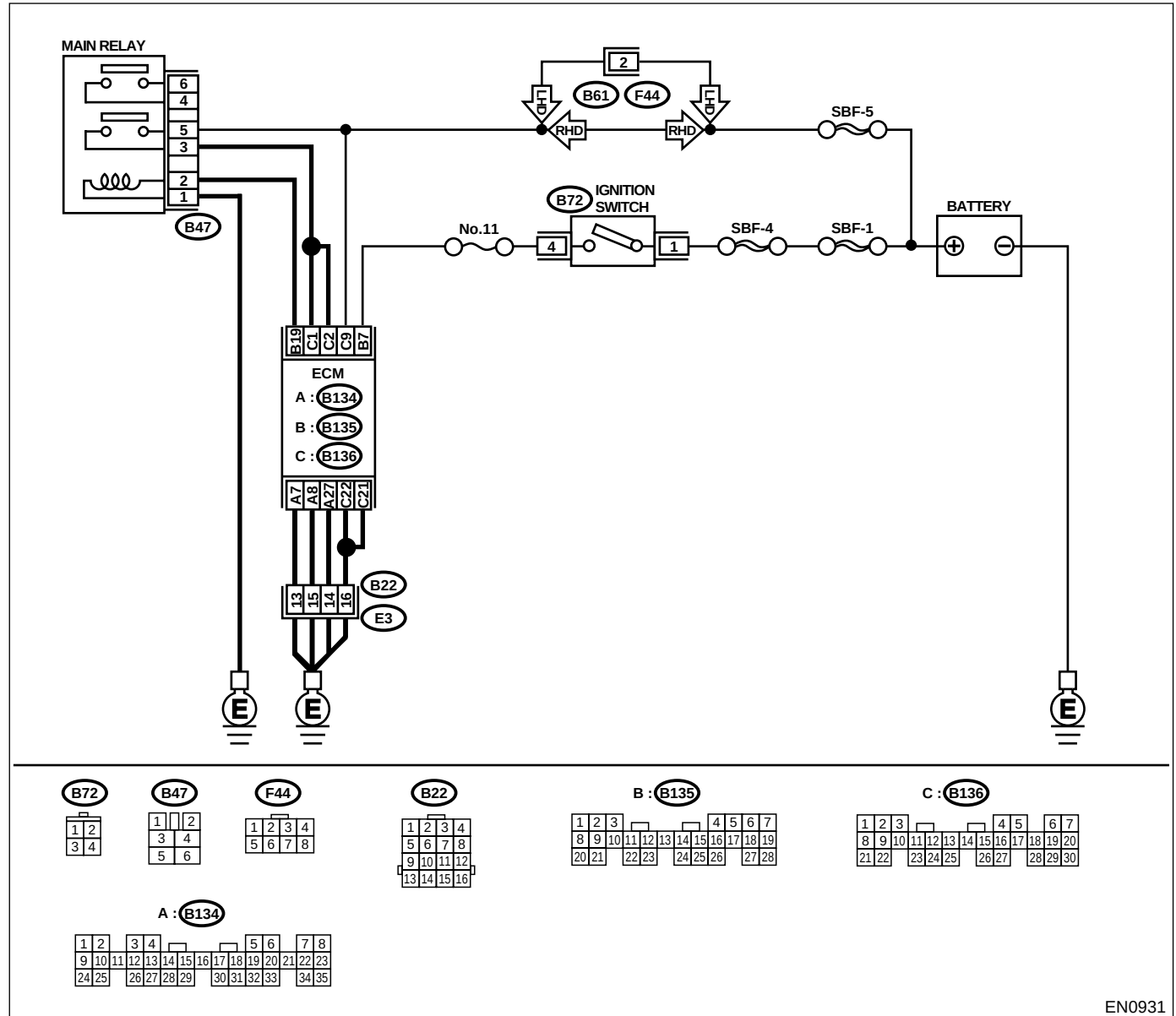
ENGINE (DIAGNOSTICS)

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(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0931

Step	Check	Yes	No
1 CHECK MAIN RELAY. 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. Terminals No. 3 — No. 5: No. 4 — No. 6:	Is the resistance less than 10 Ω?	Go to step 2.	Replace main relay.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK GROUND CIRCUIT OF ECM. 1)Disconnect connector from ECM. 2)Measure resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 21 — Chassis ground: (B136) No. 22 — Chassis ground: (B134) No. 27 — Chassis ground: (B134) No. 8 — Chassis ground: (B134) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair open circuit in harness between ECM connector and engine grounding terminal.
3 CHECK INPUT VOLTAGE OF ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 9 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open or ground short circuit of power supply circuit.
4 CHECK INPUT VOLTAGE OF ECM. 1)Turn ignition switch to ON. 2)Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 7 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair open or ground short circuit of power supply circuit.
5 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR. 1)Turn ignition switch to OFF. 2)Measure resistance between ECM and chassis ground. Connector & terminal (B135) No. 19 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair ground short circuit in harness between ECM connector and main relay connector, then replace ECM.
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 (-):	Is the voltage more than 10 V?	Go to step 7.	Replace ECM.
7 CHECK INPUT VOLTAGE OF MAIN RELAY. Check voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 8.	Repair open circuit in harness between ECM connector and main relay connector.
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 resistance less than 5 Ω ?	Go to step 9.	Repair open circuit between main relay and chassis ground.
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 (-):	Is the voltage more than 10 V?	Go to step 10.	Repair open or ground short circuit in harness of power supply circuit.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(SOHCw/oOBD)-54, 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

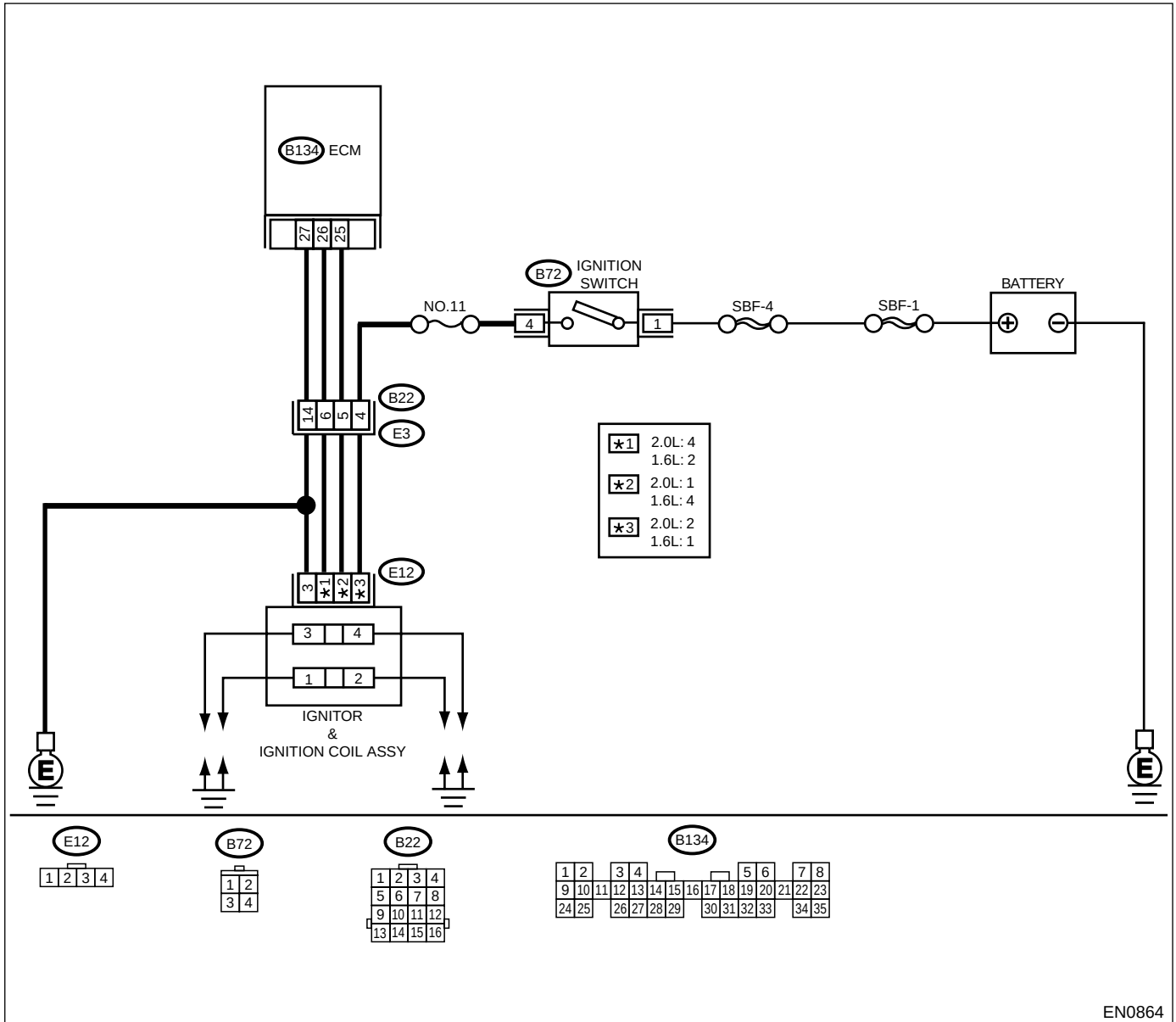
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0864

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(SOHCw/oOBD)-58, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
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 •1.6 Ω (E12) No. 1 (+) — Engine ground (-): •2.0 Ω (E12) No. 2 (+) — Engine ground (-):	Is the voltage more than 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)
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 resistance between less than 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
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 •1.6 Ω No. 4 — No. 1: •2.0 Ω No. 1 — No. 2:	Is the resistance between 10 and 15 Ω?	Go to step 5.	Replace ignition coil & ignitor assembly.
5 CHECK IGNITION COIL & IGNITOR ASSEMBLY. Measure resistance between spark plug cord contact portions to check secondary coil. Terminals •1.6 Ω No. 3 — No. 2: •2.0 Ω No. 3 — No. 4:	Is the resistance between 10 and 15 Ω?	Go to step 6.	Replace ignition coil & ignitor assembly.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 •1.6 Ω (E12) No. 4 (+) — Engine ground (-): •2.0 Ω (E12) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 7.	Replace ignition coil & ignitor assembly.
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 •1.6 Ω (E12) No. 2 (+) — Engine ground (-): •2.0 Ω (E12) No. 4 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 8.	Replace ignition coil & ignitor assembly.
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 •1.6 Ω (B134) No. 26 — (E12) No. 2: •2.0 Ω (B134) No. 26 — (E12) No. 4:	Is the resistance less than 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)
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 •1.6 Ω (B134) No. 25 — (E12) No. 4: •2.0 Ω (B134) No. 25 — (E12) No. 1:	Is the resistance less than 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)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
10 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. 27 — (E12) No. 3:	Is the resistance less than 1 Ω ?	Go to step 11 .	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)
11 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:	Is the resistance more than 1 $M\Omega$?	Go to step 12 .	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
12 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 25 — Chassis ground:	Is the resistance more than 1 $M\Omega$?	Go to step 13 .	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
13 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check spark plug and spark plug cord. <Ref. to IG(SOHCw/oOBD)-6, INSPECTION, Spark Plug.> <Ref. to IG(SOHCw/oOBD)-10, INSPECTION, Spark Plug Cord.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

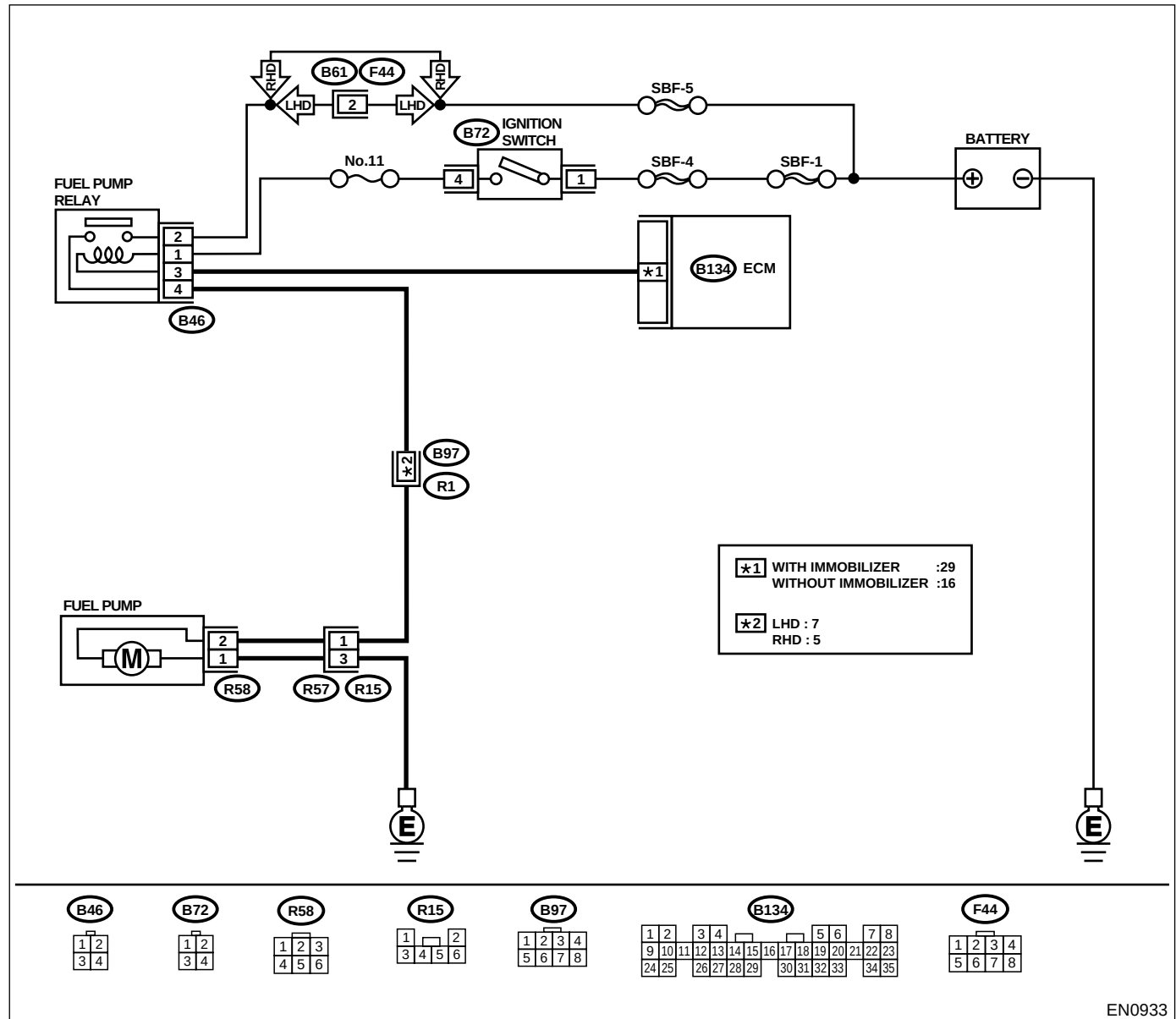
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0933

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATING SOUND OF FUEL PUMP. Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON. 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(SOHCw/oOBD)-31, OPERATION, Compulsory Valve Operation Check Mode.>	Does fuel pump produce operating sound?	Check fuel injector circuit. <Ref. to EN(SOHCw/oOBD)-62, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
2 CHECK GROUND CIRCUIT OF FUEL PUMP. 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. Connector & terminal (R58) No. 1 — Chassis ground:	Is the resistance less than 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 (R57) and (R1)
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 (-):	Is the voltage more than 10 V?	Replace fuel pump.	Go to step 4.
4 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR. 1)Turn ignition switch to OFF. 2)Measure resistance of harness between fuel pump and fuel pump relay connector. Connector & terminal (R58) No. 2 — (B46) No. 4:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump and fuel pump relay connector • Poor contact in coupling connectors (R57) and (R1)
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 resistance more than 1 M Ω ?	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	Check	Yes	No
6	CHECK FUEL PUMP RELAY. 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. Terminals No. 2 — No. 4:	Is the resistance less than 10 Ω ?	Go to step 7.	Replace 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 •With Immobilizer (B134) No. 29 — (B46) No. 3: •Without Immobilizer (B134) No. 16 — (B46) No. 3:	Is the resistance less than 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?	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(SOHCw/oOBD)-62, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

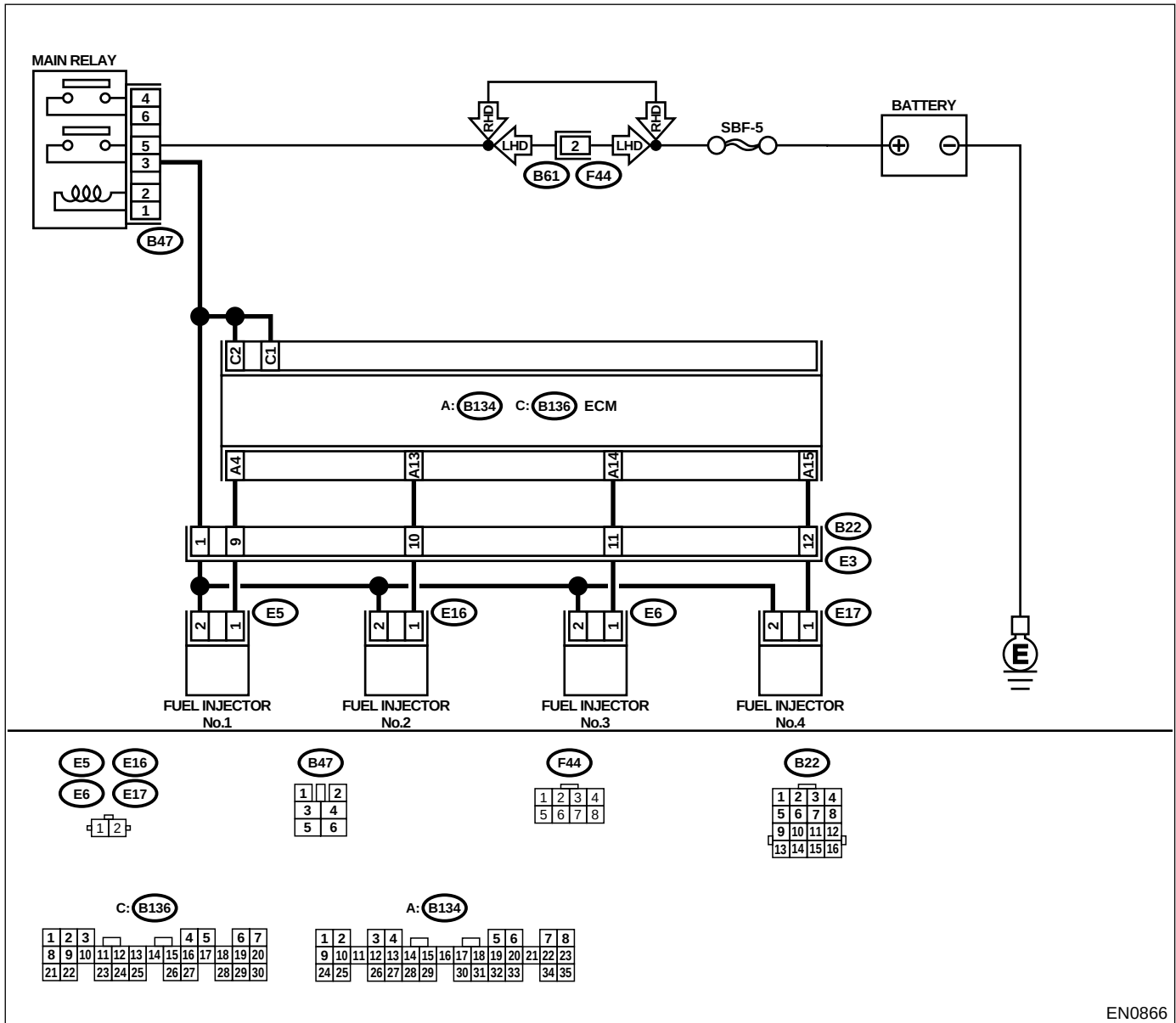
DIAGNOSTICS FOR ENGINE STARTING FAILURE

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(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>
- WIRING DIAGRAM:



EN0866

Step	Check	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.	Check fuel pressure. <Ref. to ME(SOHC)-28, INSPECTION, Fuel Pressure.>	Go to step 2.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 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. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • 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
3 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 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. Connector & terminal #2 (E16) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • 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
4 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 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. Connector & terminal #3 (E6) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • 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	Check	Yes	No
5 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 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. Connector & terminal #4 (E17) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: • 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
6 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 4 — (B136) No. 2:	Is the resistance between 11 and 12 Ω ?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
7 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 4 — Chassis ground:	Is the resistance less than 1 Ω ?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 8.
8 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 13 — (B136) No. 2:	Is the resistance between 11 and 12 Ω ?	Go to step 9.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
9 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 resistance less than 1 Ω ?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 10.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	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. 14 — (B136) No. 2:	Is the resistance between 11 and 12 Ω ?	Go to step 11 .	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
11 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 resistance less than 1 Ω ?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 12 .
12 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 resistance between 11 and 12 Ω ?	Go to step 13 .	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
13 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 resistance less than 1 Ω ?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 14 .
14 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 resistance between 11 and 12 Ω ?	Go to step 15 .	Replace faulty fuel injector.
15 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(SOHCw/oOBD)-114, 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	- 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(SOHCw/oOBD)-68, DTC 11 CRANK-SHAFT POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Starter switch	- The starter switch signal is abnormal. - The harness connector between ECM and starter switch is in short or open.	<Ref. to EN(SOHCw/oOBD)-70, DTC 12 STARTER SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
13	Camshaft position sensor	- 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(SOHCw/oOBD)-72, DTC 13 CAM-SHAFT POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	Engine coolant temperature sensor	- 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(SOHCw/oOBD)-76, DTC 21 ENGINE COOLANT TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Knock sensor	- The knock sensor signal is abnormal. - The harness connector between ECM and knock sensor is in short or open.	<Ref. to EN(SOHCw/oOBD)-80, DTC 22 KNOCK SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Idle air control solenoid valve	- 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(SOHCw/oOBD)-82, DTC 24 IDLE AIR CONTROL SOLENOID VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	Intake temperature sensor	- 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(SOHCw/oOBD)-86, DTC 26 INTAKE AIR TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Throttle position sensor	- 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(SOHCw/oOBD)-90, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Oxygen sensor	- The oxygen sensor is not in function. - The harness connector between ECM and oxygen sensor is in short or open.	<Ref. to EN(SOHCw/oOBD)-92, DTC 32 OXYGEN SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Vehicle speed signal	- The vehicle speed signal is abnormal. - The harness connector between ECM and vehicle speed sensor is in short or open.	<Ref. to EN(SOHCw/oOBD)-96, 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	- 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(SOHCw/oOBD)-98, DTC 35 PURGE CONTROL SOLENOID VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Torque control signal (AT)	- Abnormal signal is entered from TCM. - The harness connector between ECM and TCM is in short or open.	<Ref. to EN(SOHCw/oOBD)-102, DTC 38 TORQUE CONTROL SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Pressure sensor	- The pressure sensor signal is abnormal. - The harness connector between ECM and pressure sensor is in short or open.	<Ref. to EN(SOHCw/oOBD)-104, DTC 45 PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
46	CO resistor (General spec. vehicles)	- 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(SOHCw/oOBD)-106, DTC 46 CO RESISTOR (GENERAL SPEC. VEHICLES), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Neutral position switch (MT)	- The neutral position switch signal is abnormal. - The harness connector between ECM and neutral position switch is in short or open.	<Ref. to EN(SOHCw/oOBD)-108, DTC 51 NEUTRAL POSITION SWITCH (MT VEHICLE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	Park/Neutral position switch (AT)	- 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(SOHCw/oOBD)-110, 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(SOHCw/oOBD)-112, 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.

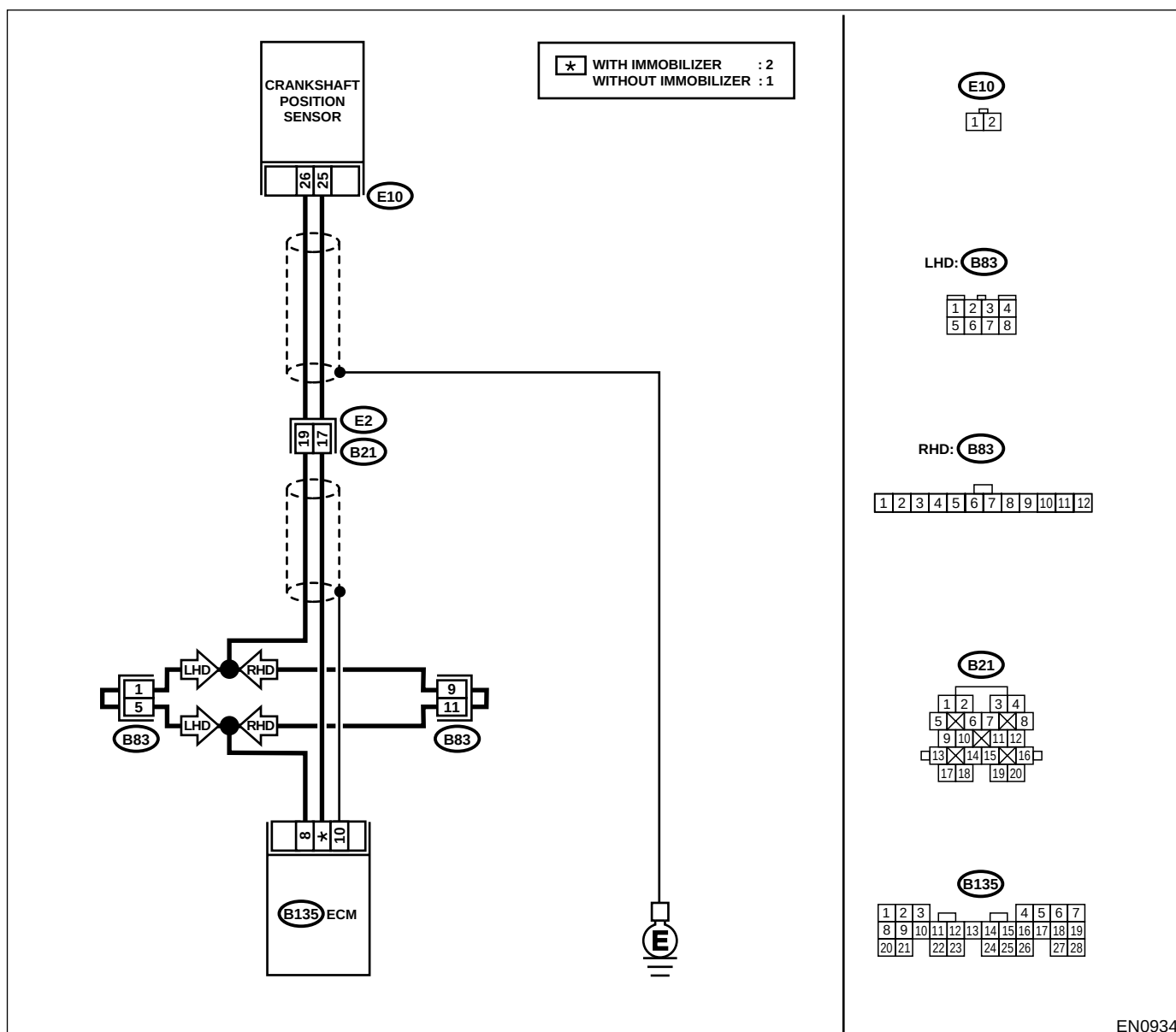
- **TROUBLE SYMPTOM:**

- Engine stalls.
- Restarting impossible

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

- **WIRING DIAGRAM:**



EN0934

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR INSTALLATION.	Are the crankshaft position sensor installing bolts tightened securely?	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 resistance between 1 and 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 •With Immobilizer (B135) No. 8 — (B135) No. 2 •Without Immobilizer (B135) No. 8 — (B135) No. 1	Is the resistance between 1 and 5 k Ω ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • 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 resistance less than 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 •With Immobilizer (B135) No. 2 (+) — (B135) No. 8 (-) •Without Immobilizer (B135) No. 1 (+) — (B135) No. 8 (-)	Is the voltage more than 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?	Repair poor contact in ECM connector.	Go to step 7.
7 CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> 3)Perform inspection mode. <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.> 4)Read out the trouble code. <Ref. to EN(SOHCw/oOBD)-26, OPERATION, Read Diagnostic Trouble Code.>	Is the same trouble code as in the current diagnosis still being output?	Replace generator.	Go to step 8.
8 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

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.

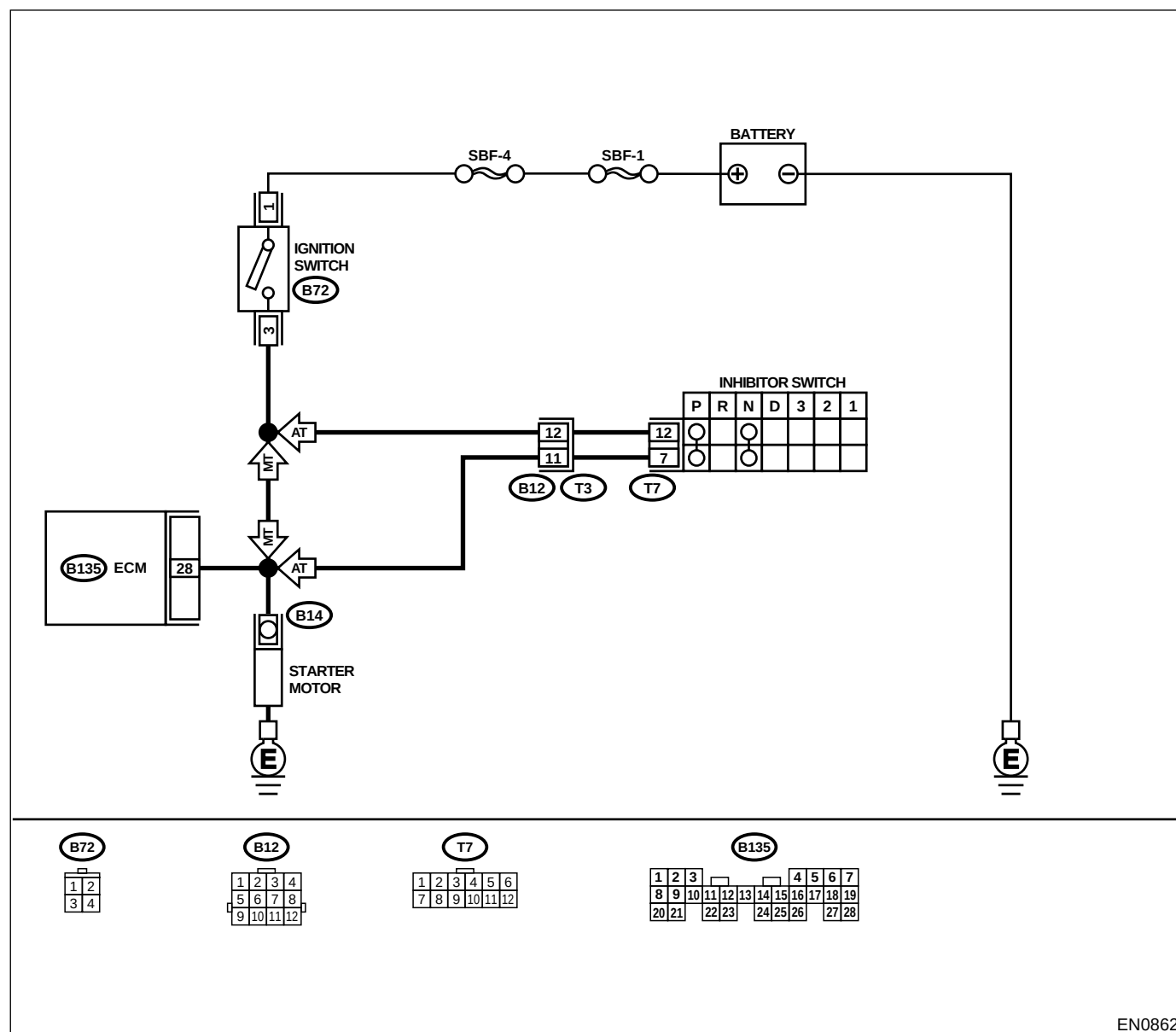
• TROUBLE SYMPTOM:

- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0862

Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR.	Does starter motor operate when ignition switch starts?	Go to step 2.
			Check starter motor circuit.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS BETWEEN ECM AND IGNITION SWITCH CONNECTOR. 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. Connector & terminal (B135) No. 28 (+) — Chassis ground (-):	Is the voltage more than 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.

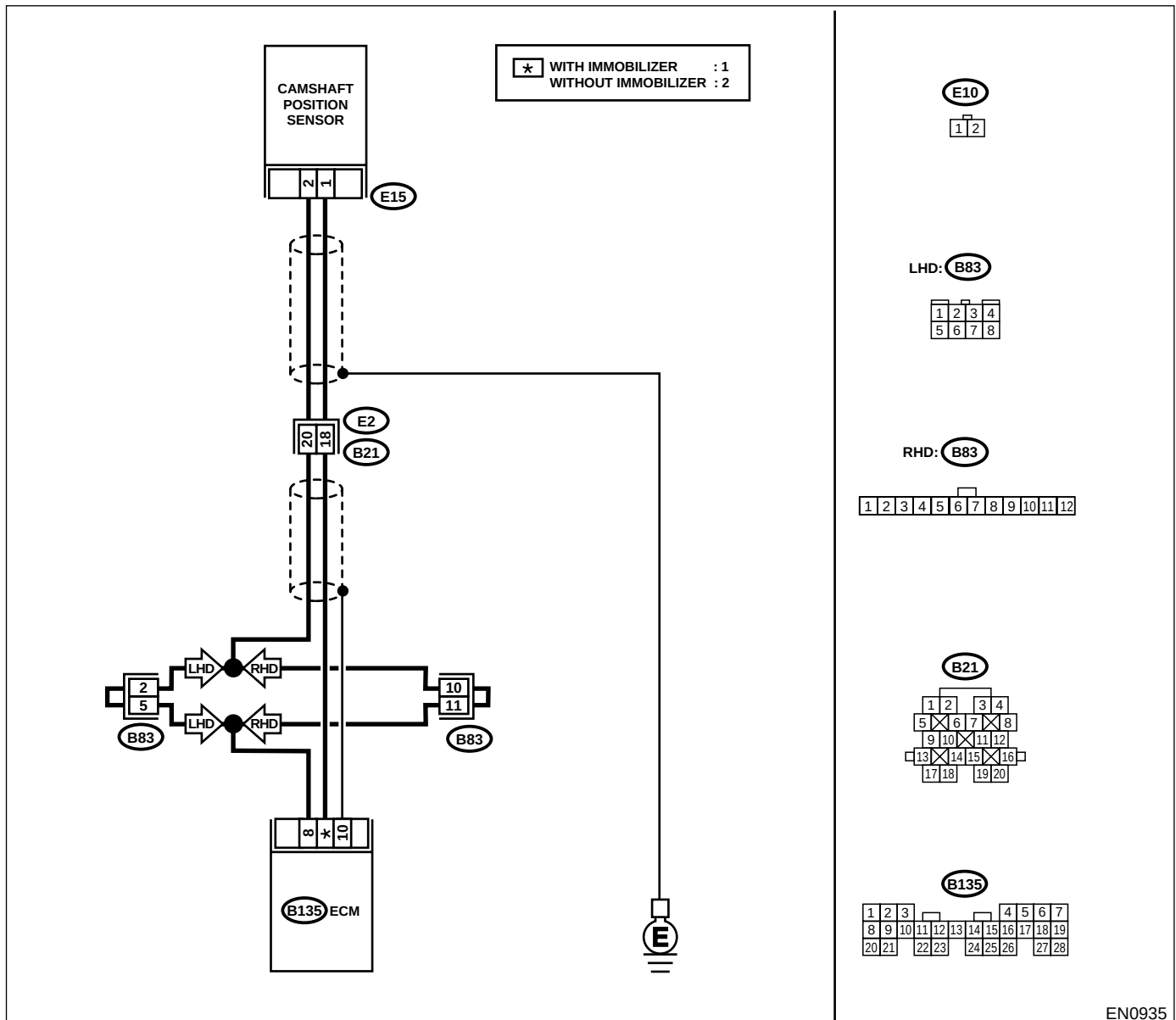
• TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CONDITION OF CAMSHAFT POSITION SENSOR INSTALLATION.	Are the camshaft position sensor installing bolts tightened securely?	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 resistance between 1 and 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 •With Immobilizer (B135) No. 8 — (B135) No. 1 •Without Immobilizer (B135) No. 8 — (B135) No. 2	Is the resistance between 1 and 5 k Ω ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • 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 resistance less than 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 •With Immobilizer (B135) No. 1 (+) — (B135) No. 8 (-) •Without Immobilizer (B135) No. 2 (+) — (B135) No. 8 (-)	Is the voltage more than 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?	Repair poor contact in ECM connector.	Go to step 7.
7 CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> 3)Perform inspection mode. <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.> 4)Read out the trouble code. <Ref. to EN(SOHCw/oOBD)-26, OPERATION, Read Diagnostic Trouble Code.>	Is the same trouble code as in the current diagnosis still being output?	Replace generator.	Go to step 8.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
8	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	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.

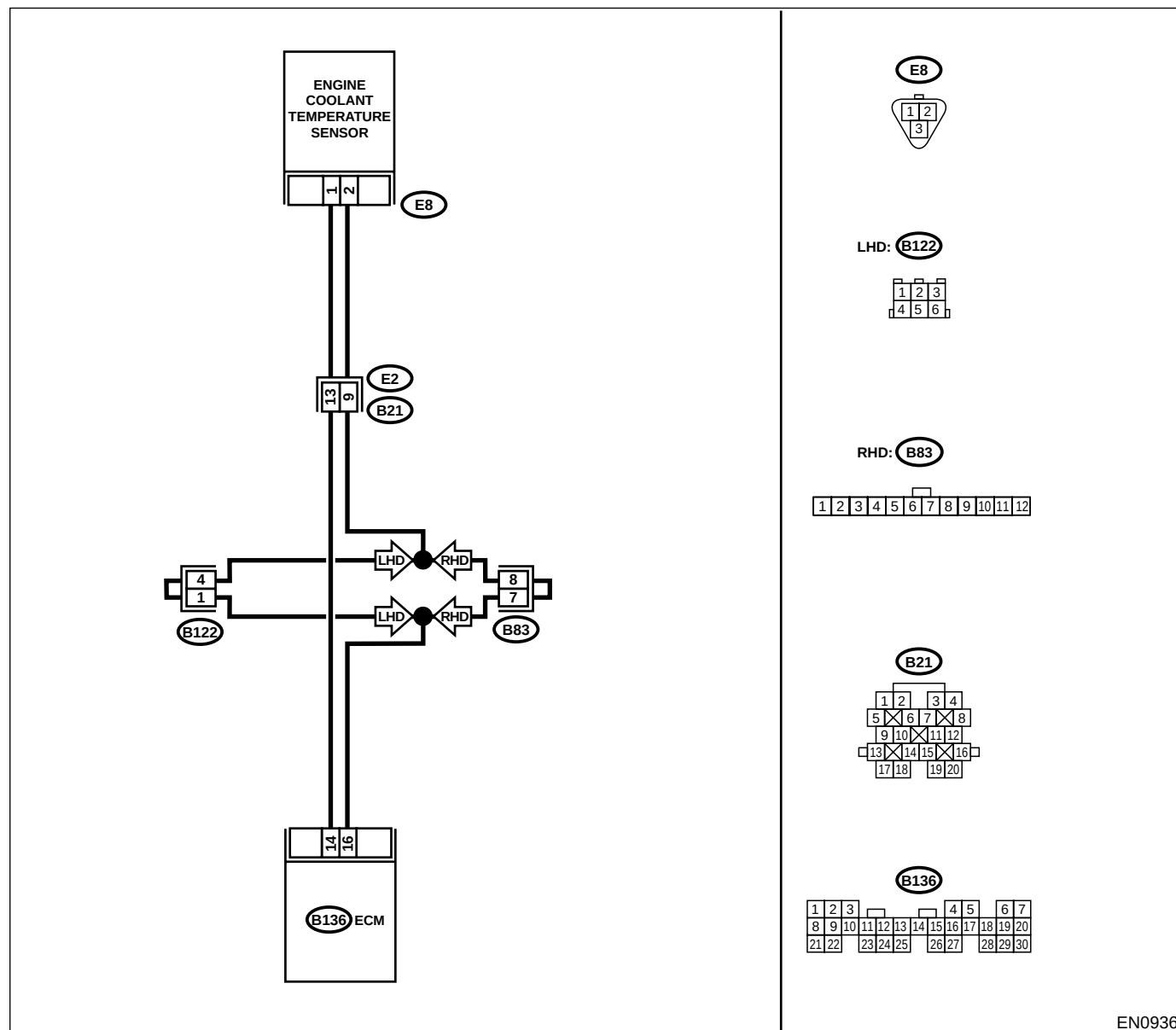
• TROUBLE SYMPTOM:

- 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(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0936

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 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. Connector & terminal (E8) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to ON. 2) Measure voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. Measure voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 1 (+) — Engine ground (-):	Is the voltage more than 4 V?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • 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	Check	Yes	No
4 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • 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)
5 CHECK ENGINE COOLANT TEMPERATURE SENSOR. Measure resistance between engine coolant temperature sensor terminals. Terminals No. 1 — No. 2:	Is the resistance between 2 and 3 k Ω at 20°C (68°F)?	Go to step 6.	Replace engine coolant temperature sensor.
6 CHECK ENGINE COOLANT TEMPERATURE SENSOR. Measure resistance between engine coolant temperature sensor terminals. Terminals No. 1 — No. 2:	Is the resistance between 0.35 and 0.4 k Ω at 80°C (176°F)?	Go to step 7.	Replace engine coolant temperature sensor.
7 CHECK ENGINE COOLANT TEMPERATURE SENSOR. Measure resistance between engine coolant temperature sensor terminals. Terminals No. 1 — No. 2:	Is the resistance between 0.2 and 0.3 k Ω at 90°C (194°F)?	Replace ECM.	Replace engine coolant temperature sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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.

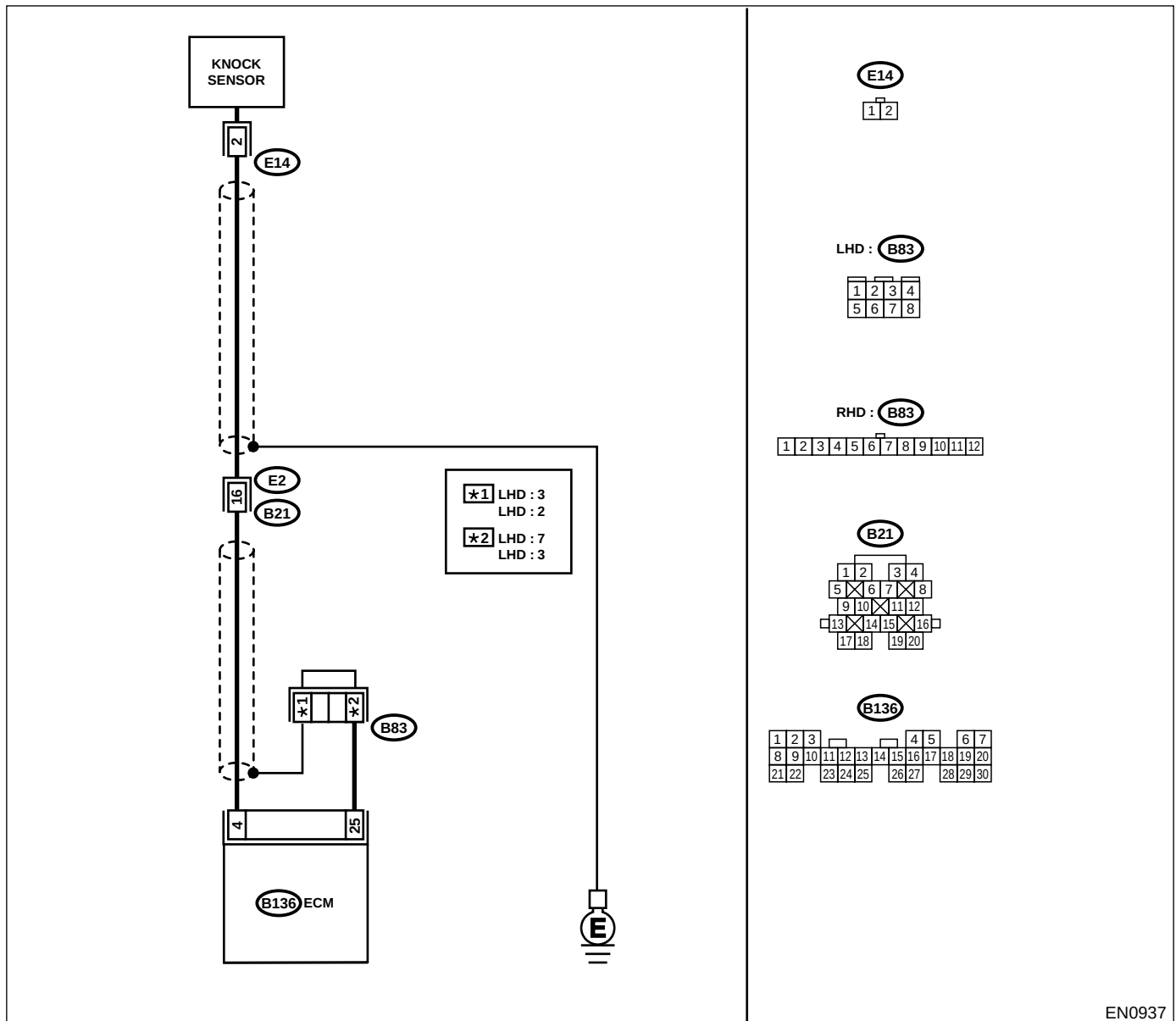
• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0937

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 (-):	Is the voltage more than 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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, 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 resistance between 530 k Ω and 590 k Ω ?	Go to step 4.	Repair 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 (B21)
4 CHECK HARNESS CONNECTOR BETWEEN ECM AND KNOCK SENSOR. Measure resistance of harness connector between ECM and knock sensor. Connector & terminal (E14) No. 2 — Chassis ground:	Is the resistance less than 1 Ω ?	Go to step 5.	Replace knock sensor. <Ref. to FU(SOHCw/oOBD)-30, Knock Sensor.>
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:	Is the resistance more than 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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, 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.

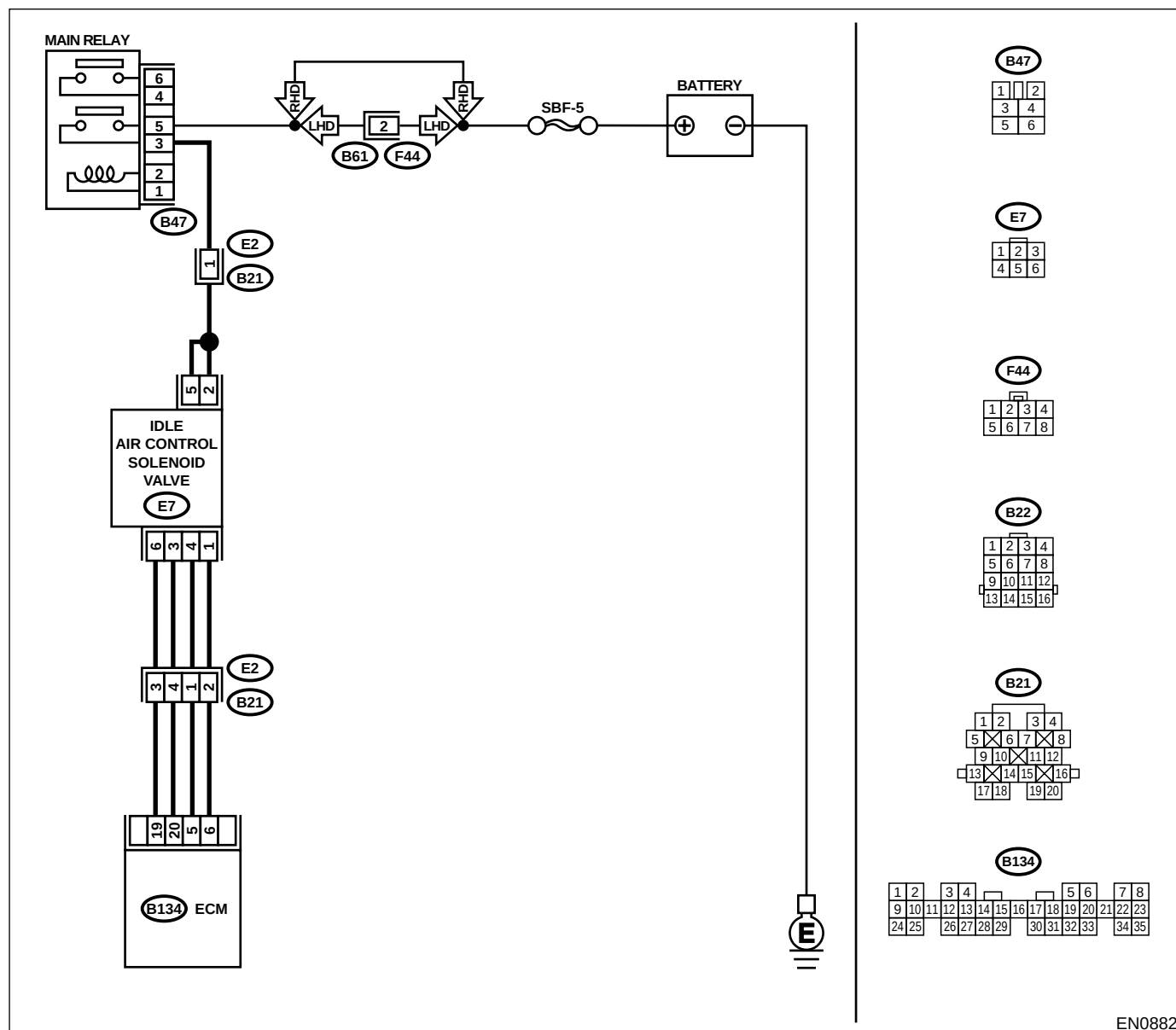
• TROUBLE SYMPTOM:

- 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(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0882

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 (-):	Is the voltage more than 10 V?	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: • 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 resistance less than 1 Ω ?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • 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:	Is the resistance more than 1 M Ω ?	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?	Repair poor contact in ECM connector or idle air control solenoid valve connector.	Go to step 5.
5 CHECK IDLE SPEED.	Is idling speed higher than standard?	Go to step 6.	Go to step 8.
6 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?	Repair air suction and leaks.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK AIR BY-PASS LINE. 1)Turn ignition switch to OFF. 2)Remove idle air control solenoid valve from throttle body. <Ref. to FU(SOHCw/oOBD)-35, 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?	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(SOHCw/oOBD)-35, Idle Air Control Solenoid Valve.>
8	CHECK AIR BY-PASS LINE. 1)Turn ignition switch to OFF. 2)Remove idle air control solenoid valve from throttle body. <Ref. to FU(SOHCw/oOBD)-35, Idle Air Control Solenoid Valve.> 3)Remove throttle body from intake manifold. <Ref. to FU(SOHCw/oOBD)-14, 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?	Replace idle air control solenoid valve. <Ref. to FU(SOHCw/oOBD)-35, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(SOHCw/oOBD)-14, Throttle Body.>

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.

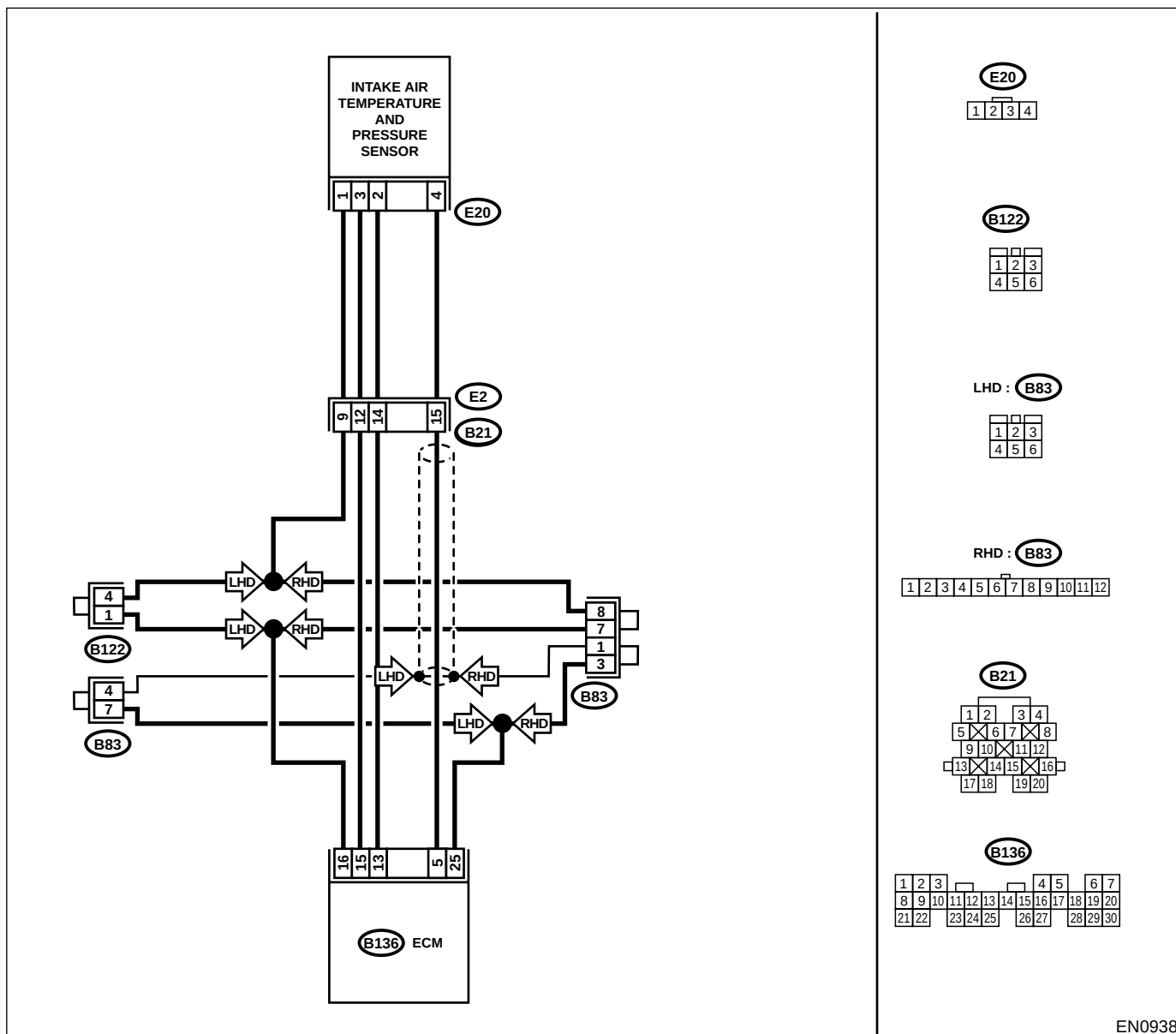
• TROUBLE SYMPTOM:

- 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(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0938

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INTAKE AIR TEMPERATURE SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Measure resistance between intake air temperature sensor terminals. <i>Terminals</i> No. 2 — No. 3:	Is the resistance between 2 and 3 kΩ at 20°C (68°F)?	Go to step 2.	Replace intake air temperature sensor. <Ref. to FU(SOHCw/oOBD)-34, Intake Air Temperature and Pressure Sensor.>
2 CHECK INTAKE AIR TEMPERATURE SENSOR. Measure resistance between intake air temperature sensor terminals. <i>Terminals</i> No. 2 — No. 3:	Is the resistance between 0.66 and 1 kΩ at 50°C (122°F)?	Go to step 3.	Replace intake air temperature sensor. <Ref. to FU(SOHCw/oOBD)-34, Intake Air Temperature and Pressure Sensor.>
3 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR. 1) Disconnect connector from ECM. 2) Measure resistance of harness connector between ECM and intake air temperature sensor connector. <i>Connector & terminal</i> (B136) No. 15 — (E20) No. 3:	Is the resistance less than 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)
4 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR. Measure resistance of harness connector between ECM and intake air temperature sensor connector. <i>Connector & terminal</i> (B136) No. 13 — (E20) No. 2:	Is the resistance less than 1 Ω?	Go to step 5.	Repair harness and connector.
5 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> (B136) No. 15 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 6.	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.
6 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> (B136) No. 13 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 7.	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		Check	Yes	No
7	CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	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.

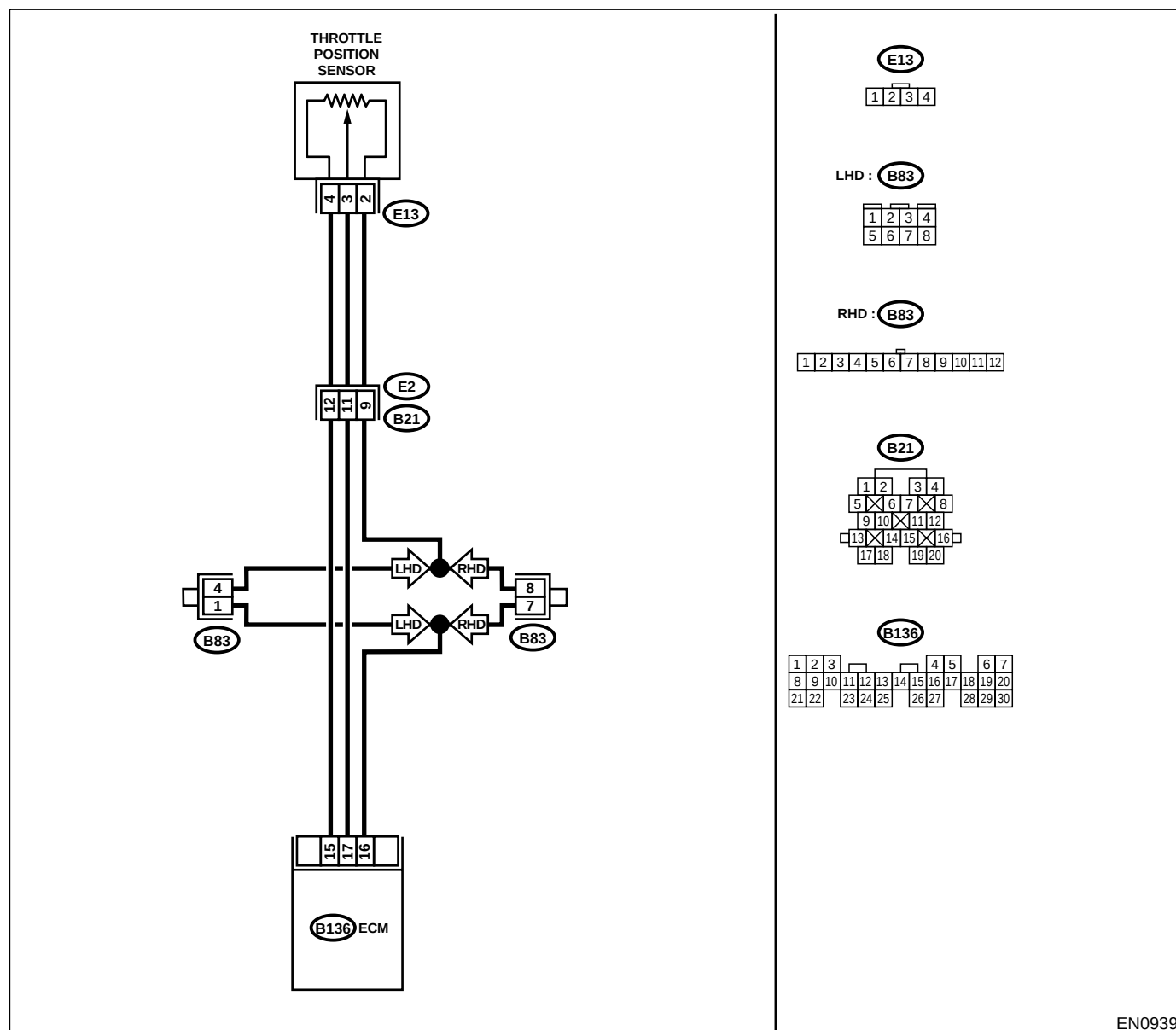
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0939

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 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 resistance less than 1 Ω ?	Go to step 2.	Repair open circuit between ECM and throttle position sensor.
2 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:	Is the resistance more than 1 $M\Omega$?	Go to step 3.	Repair ground short circuit between ECM and chassis ground.
3 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 voltage less than 0.1 V?	Go to step 5.	Go to step 4.
4 CHECK INPUT SIGNAL FROM ECM. Measure voltage between ECM terminals while throttle valve is fully opened. Connector & terminal (B136) No. 17 — No. 15:	Is the voltage more than 4.5 V?	Go to step 5.	Go to step 6.
5 CHECK POOR CONTACT. Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor.
6 CHECK CONDITION OF THROTTLE POSITION SENSOR INSTALLATION.	Are the throttle position sensor installing screw tightened securely?	Replace throttle position sensor.	Adjust throttle position sensor and tighten throttle position sensor installing screws securely.

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.

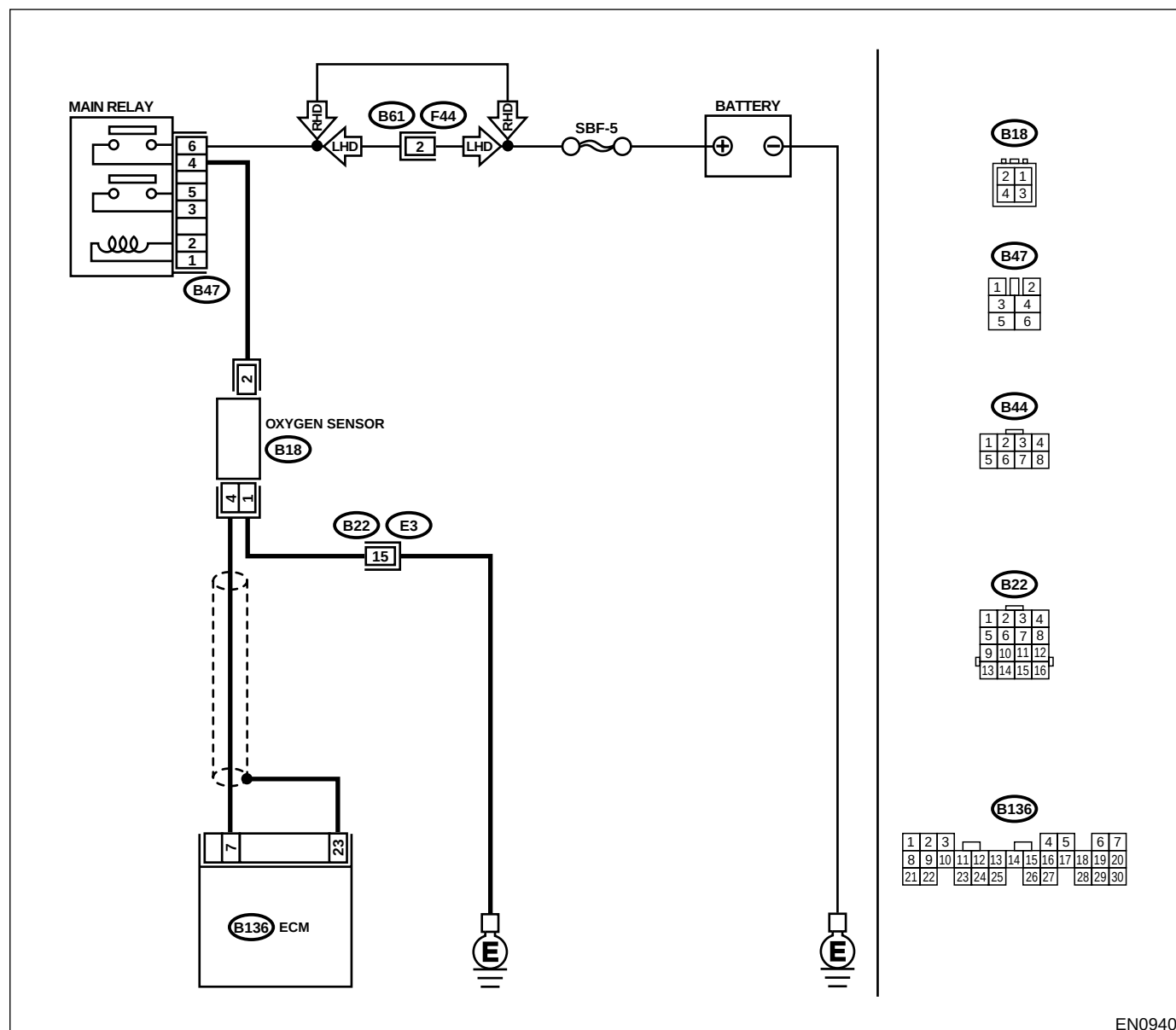
• TROUBLE SYMPTOM:

- 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(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0940

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR OTHER CAUSES AFFECTING EXHAUST GAS. NOTE: •Check for use of improper fuel. •Check if engine oil or coolant level is extremely low.	Is CO% more than 2% after engine warm up?	Check fuel system.	Go to step 2.
2 CHECK EXHAUST SYSTEM.	Is there a fault in exhaust system?	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 (-):	Is the voltage more than 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 resistance less than 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 resistance less than 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:	Is the resistance more than 1 MΩ?	Go to step 7.	Repair ground short circuit between ECM and chassis ground.
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 (-):	Is the voltage more than 0.2 V?	Go to step 8.	Repair battery short circuit between ECM and oxygen sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
8	CHECK INPUT VOLTAGE FOR ECM. 1)Connect connector to ECM and oxygen sensor. 2)Measure voltage between ECM and chassis ground. Connector & terminal (B136) No. 7 (+) — Chassis ground (-):	Do 0.1 and 1 V waveform patterns alternately appear on the oscilloscope screen?	Go to step 9.	Replace oxygen sensor.
9	CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Replace oxygen sensor connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, Engine Control Module.>

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.

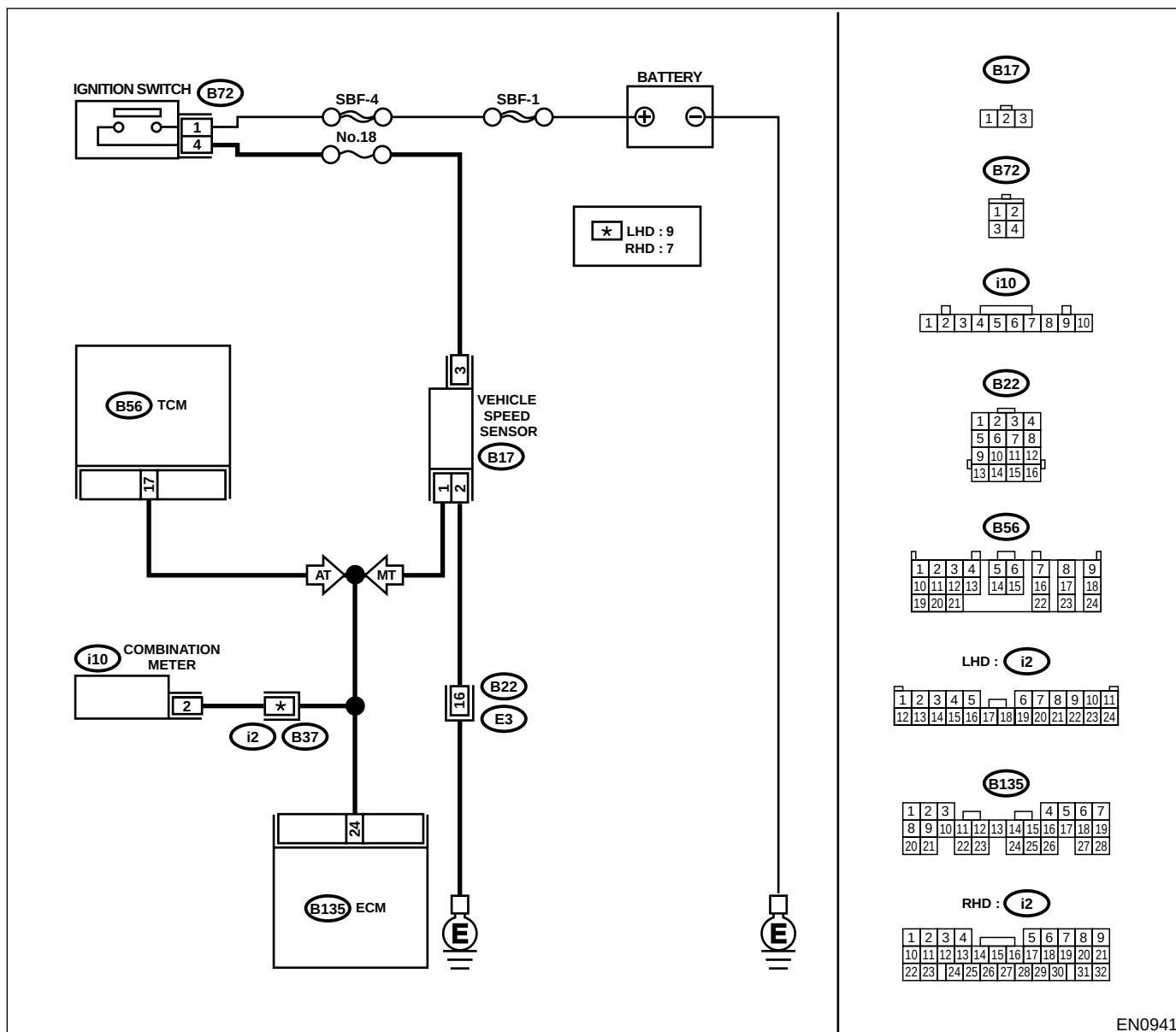
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0941

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does speedometer operate 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. Connector & terminal (B135) No. 24 (+) — Chassis ground (-): 1)Start the engine. 2)Shift on the gear position, and put the vehicle at constant speed. 3)Measure signal voltage indicated on oscilloscope.	Is the voltage more than 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?	Repair poor contact in ECM.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, 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 (-):	Is the voltage more than 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 resistance less than 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?	Repair poor contact in ECM.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, Engine Control Module.>

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.

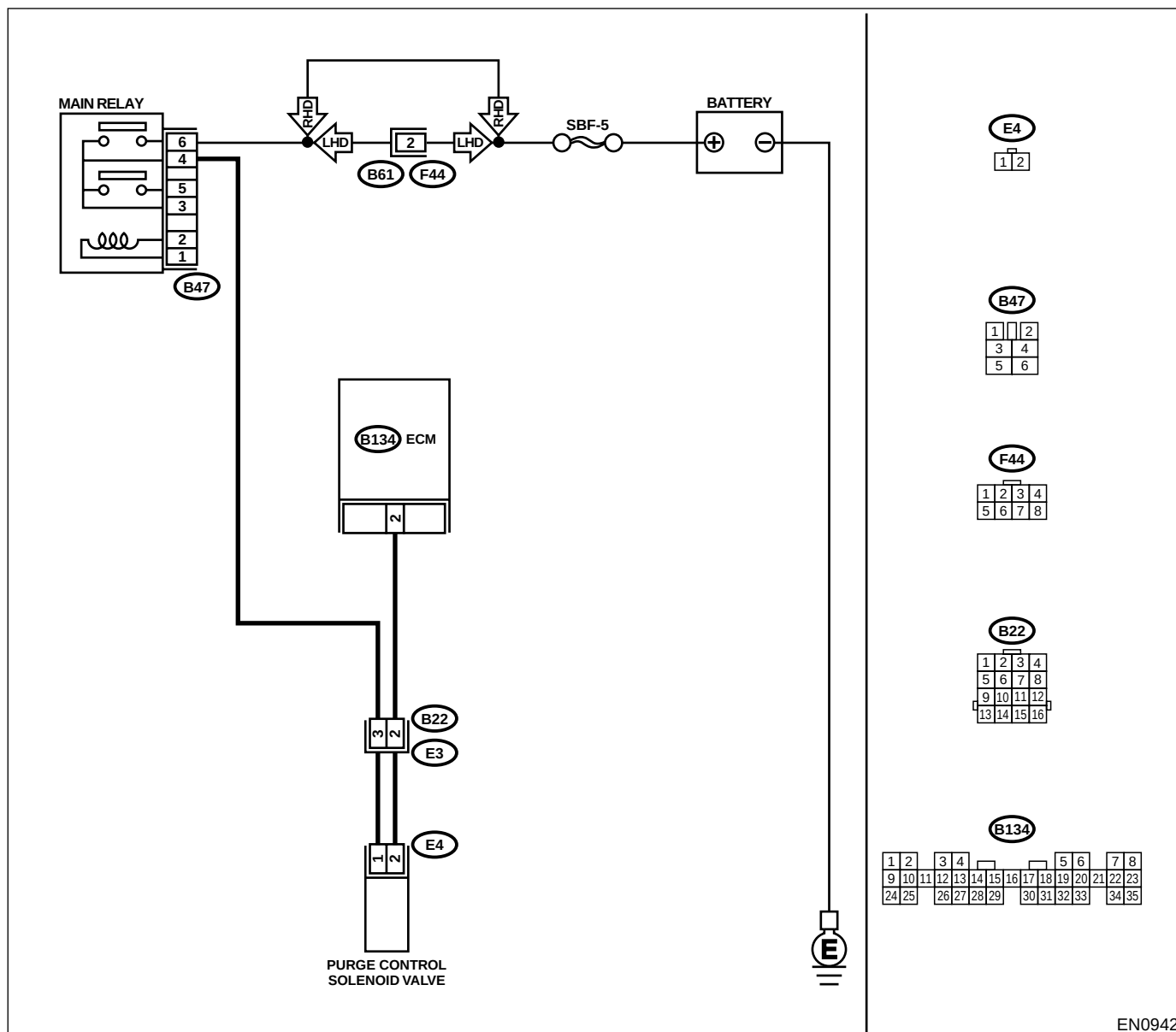
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0942

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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?	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?	Repair poor contact in ECM.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, 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 (-):	Is the voltage more than 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 resistance less than 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 resistance between 23 and 27 Ω ?	Go to step 6.	Replace purge control solenoid valve. <Ref. to EC(SOHCw/oOBD)-8, Purge Control Solenoid Valve.>
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 (-):	Is the voltage more than 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)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
7	CHECK POOR CONTACT. Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	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

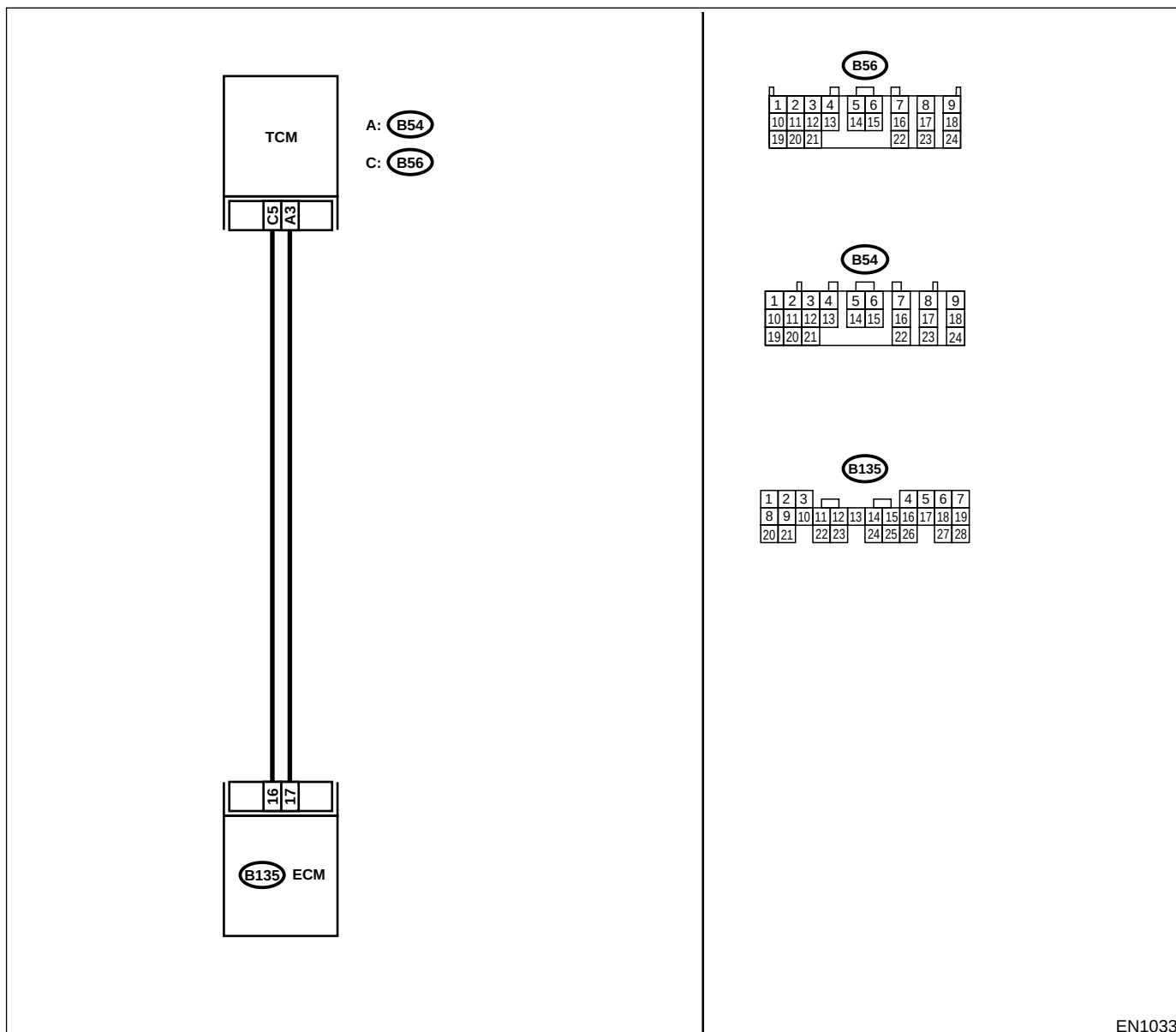
• DIAGNOSIS:

- 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(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN1033

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 resistance less than 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 there resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and TCM connector.	Replace TCM. <Ref. to AT-44, 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.

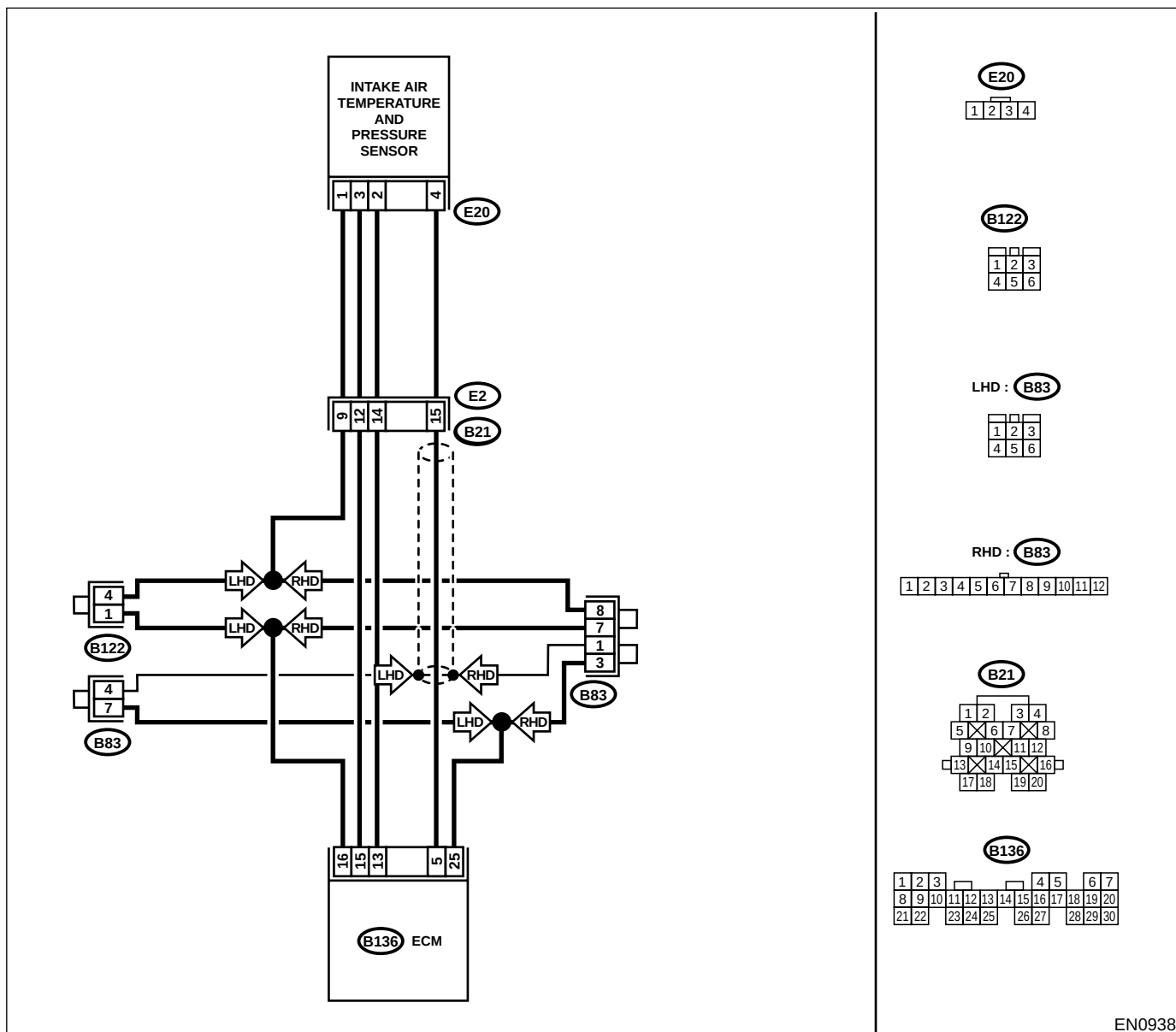
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0938

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 voltage between 4.5 and 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 resistance less than 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:	Is the resistance more than 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 voltage between 2.3 and 2.5 V?	Go to step 5.	Replace pressure sensor. <Ref. to FU(SOHCw/oOBD)-34, 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 voltage between 1.2 and 1.8 V?	Go to step 6.	Replace pressure sensor. <Ref. to FU(SOHCw/oOBD)-34, 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?	Repair poor contact in pressure sensor connector.	Replace pressure sensor. <Ref. to FU(SOHCw/oOBD)-34, 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.

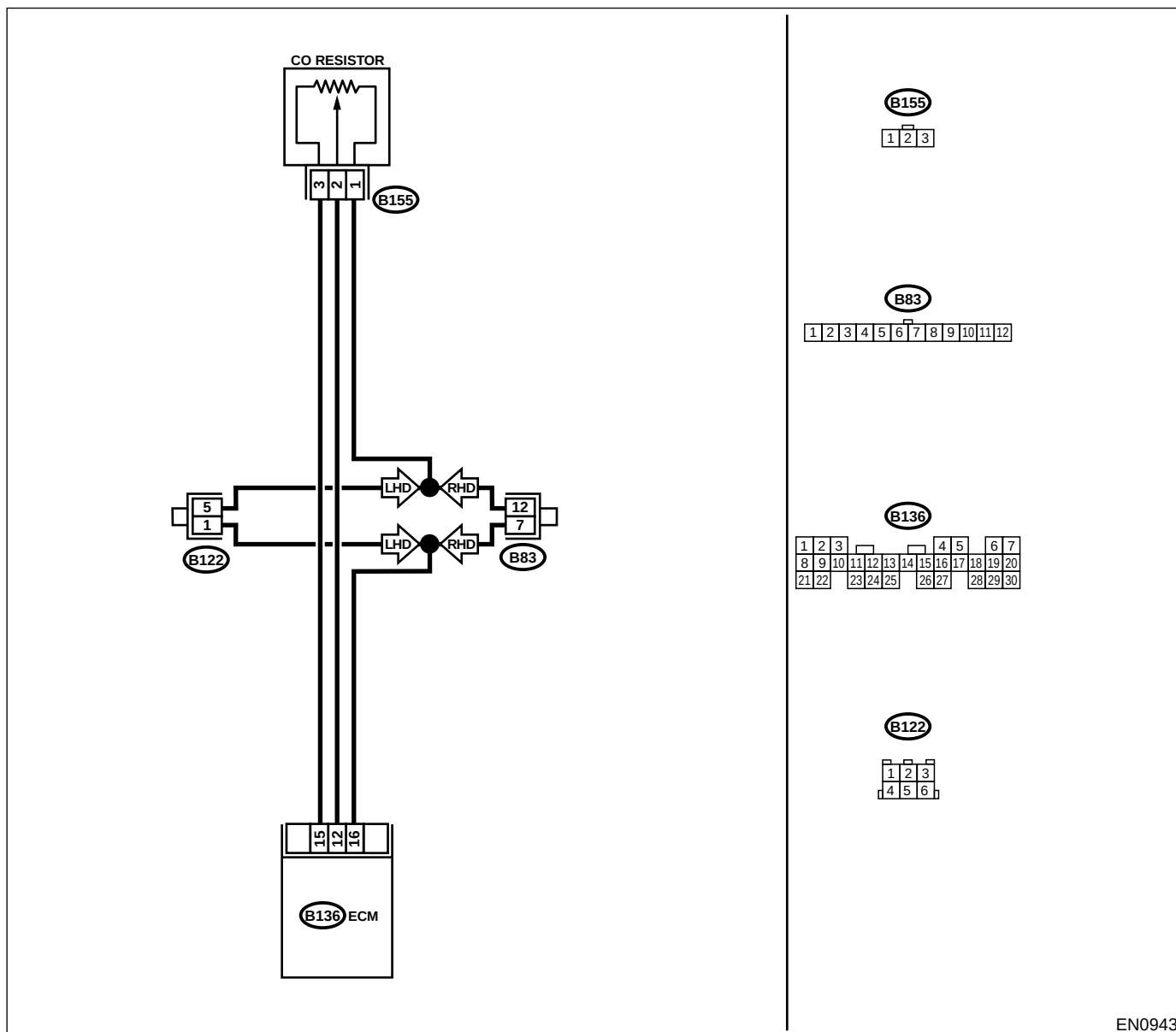
• TROUBLE SYMPTOM:

- 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(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 voltage between 0.5 and 4.5 V?	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, 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. 3: (B136) No. 12 — (B155) No. 2: (B136) No. 16 — (B155) No. 1:	Is the resistance less than 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:	Is the resistance more than 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 resistance between 4 and 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 resistance between 0 and 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.

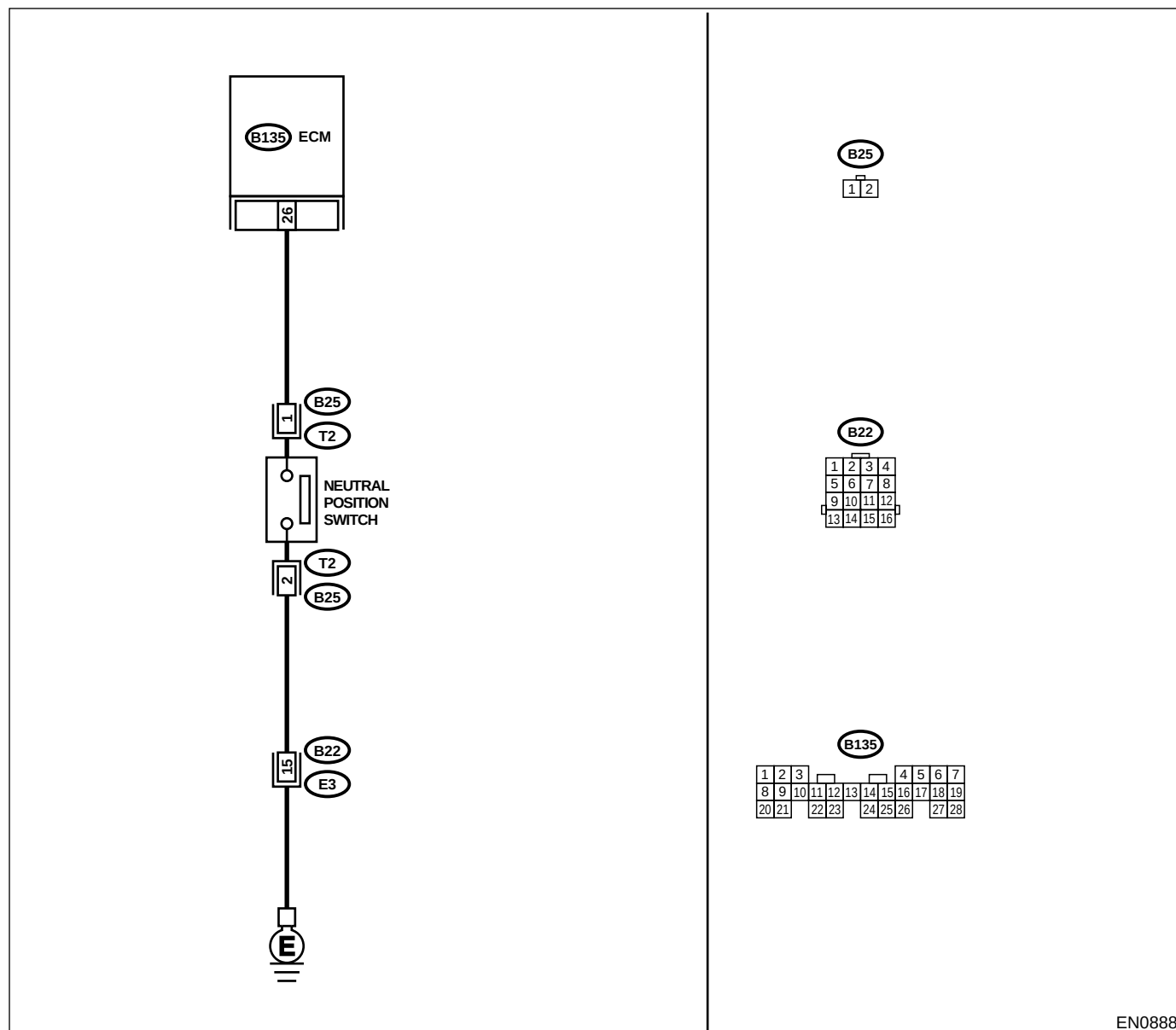
- **TROUBLE SYMPTOM:**

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

- **WIRING DIAGRAM:**



EN0888

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):	Is the voltage between 4.5 and 5.5 V in neutral position?	Go to step 3.	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM and chassis ground. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):	Is the voltage less than 1 V in other positions?	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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, Engine Control Module.>
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:	Is the resistance more than 1 MΩ in neutral position?	Go to step 5.	Repair short circuit in transmission harness or replace neutral position switch.
5 CHECK NEUTRAL POSITION SWITCH. Measure resistance between transmission harness connector terminals. Connector & terminal (T2) No. 1 — No. 2:	Is the resistance less than 10 Ω in other positions?	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 resistance less than 1 Ω?	Go to step 7.	Repair open circuit in harness between ECM and transmission harness connector.
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 resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step 8.
8 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, Engine Control Module.>

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/TCM and inhibitor switch is in short or open.

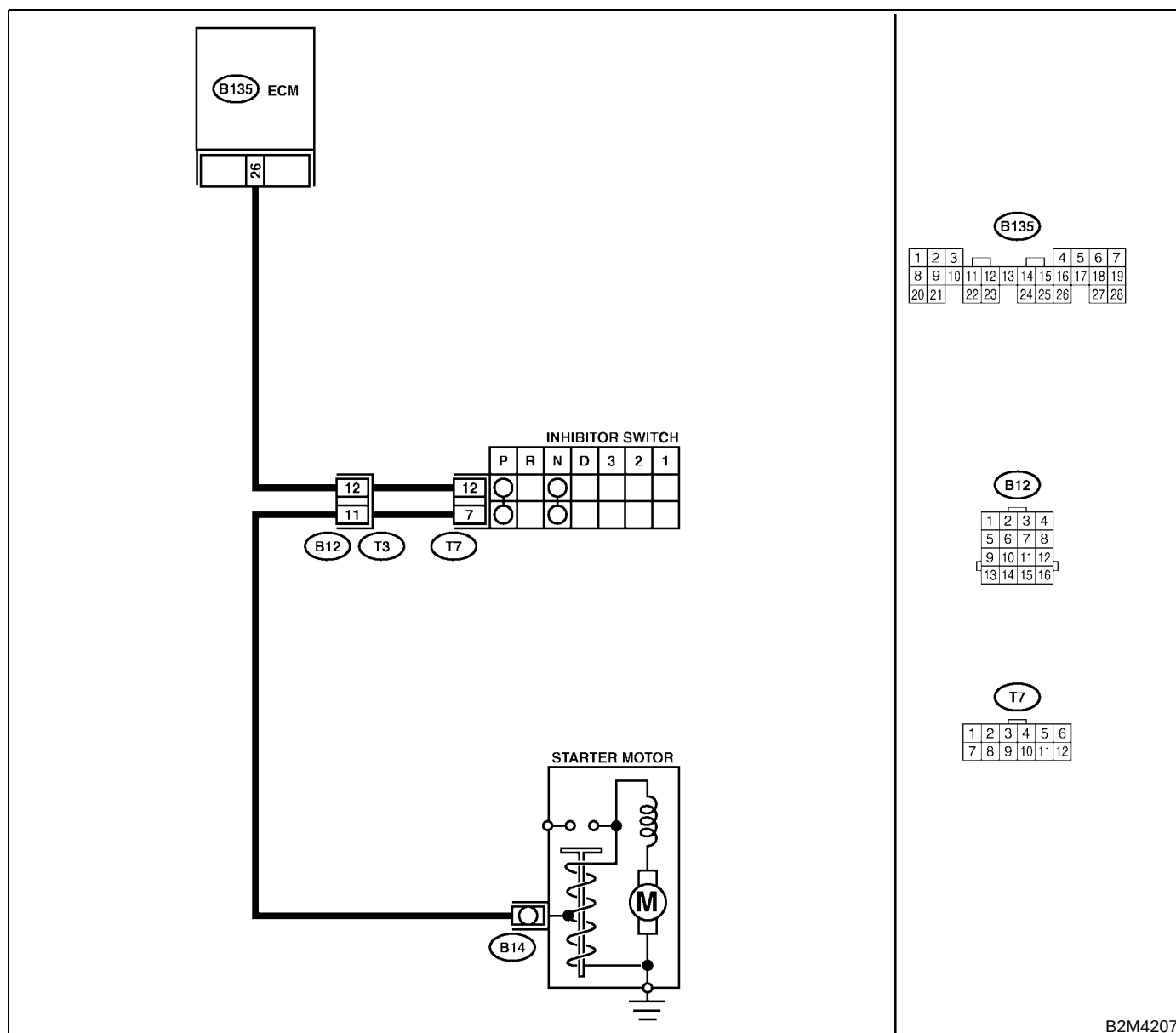
• **TROUBLE SYMPTOM:**

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 voltage less than 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?	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 resistance less than 1 Ω ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • 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 INHIBITOR SWITCH GROUND LINE. Measure resistance of harness between inhibitor switch connector and engine ground. Connector & terminal (T7) No. 12 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair open circuit in inhibitor switch ground line.
5 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 resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(SOHCw/oOBD)-44, Engine Control Module.>

ENGINE (DIAGNOSTICS)

- **DIAGNOSIS:**
 - Power source voltage of the ECM is low or high.
- **TROUBLE SYMPTOM:**
 - Charge warning light comes on.

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.>

[illegible]

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 voltage between 10.8 V and 16.2 V?	Go to step 2.	Repair generator. <Ref. to SC-12, 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 voltage between 10.8 V and 16.2 V?	Go to step 3.	Repair generator. <Ref. to SC-12, Generator.>
3 CHECK BATTERY TERMINAL. Turn ignition switch to OFF.	Are the positive and negative battery terminals 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 voltage between 10.8 V and 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?	Repair connector.	Go to step 6.
6 CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN(SOHCw/oOBD)-30, OPERATION, Clear Memory Mode.> 3)Perform inspection mode. <Ref. to EN(SOHCw/oOBD)-28, OPERATION, Inspection Mode.> 4)Read out the trouble code. <Ref. to EN(SOHCw/oOBD)-26, OPERATION, Read Diagnostic Trouble Code.>	Is the same trouble code as in the current diagnosis still being output?	Replace generator.	Go to step 7.
7 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	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 2) Pressure sensor 3) Engine coolant temperature sensor 4) Pressure regulator 5) Idle air control solenoid valve 6) Air leak in air intake system 7) ECM power supply 8) Throttle position sensor 9) Camshaft position sensor 10) Crankshaft position sensor 11) Oxygen sensor 12) Fuel pump 13) Fuel injector 14) Test mode or read memory connectors are connected. 15) Intake air temperature sensor	A B B B B B C C C C C C C C C
6. Hard to drive at constant speed	1) Pressure regulator 2) Fuel injector 3) Pressure sensor 4) Engine coolant temperature sensor 5) Throttle position sensor 6) Fuel pump	A B C C C C
7. Poor acceleration/deceleration	1) Spark plug 2) Throttle position sensor 3) Ignition coil 4) Fuel pump 5) Pressure regulator 6) Fuel injector 7) Pressure sensor 8) Engine coolant temperature sensor 9) Idle air control solenoid valve 10) Knock sensor	A B B B B B C C C C
8. Poor return to idling	1) Accelerator cable is out of adjustment 2) Throttle position sensor 3) Idle air control solenoid valve 4) Pressure sensor 5) Engine coolant temperature sensor	A B B C C
9. Back fire	1) Spark plug 2) Fuel injector 3) Ignition coil and ignitor 4) Fuel pump 5) Pressure regulator	A B C C C
10. Knocking	1) Pressure sensor 2) Fuel pump 3) Knock sensor 4) Pressure regulator 5) Engine coolant temperature sensor	A B B B C
11. Excessive fuel consumption	1) Pressure sensor 2) Pressure regulator	A B
12. Shocks while driving	1) Pressure regulator 2) ECM power supply 3) Throttle position sensor	A B B

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts	Priority
13. Poor engine revving	1) Pressure regulator 2) Pressure sensor 3) Engine coolant temperature sensor 4) Throttle sensor 5) Fuel pump	A B B B B
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 2 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.

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

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

FUEL INJECTION (FUEL SYSTEMS)

FU(DOHC TURBO)

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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

Model		
Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 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

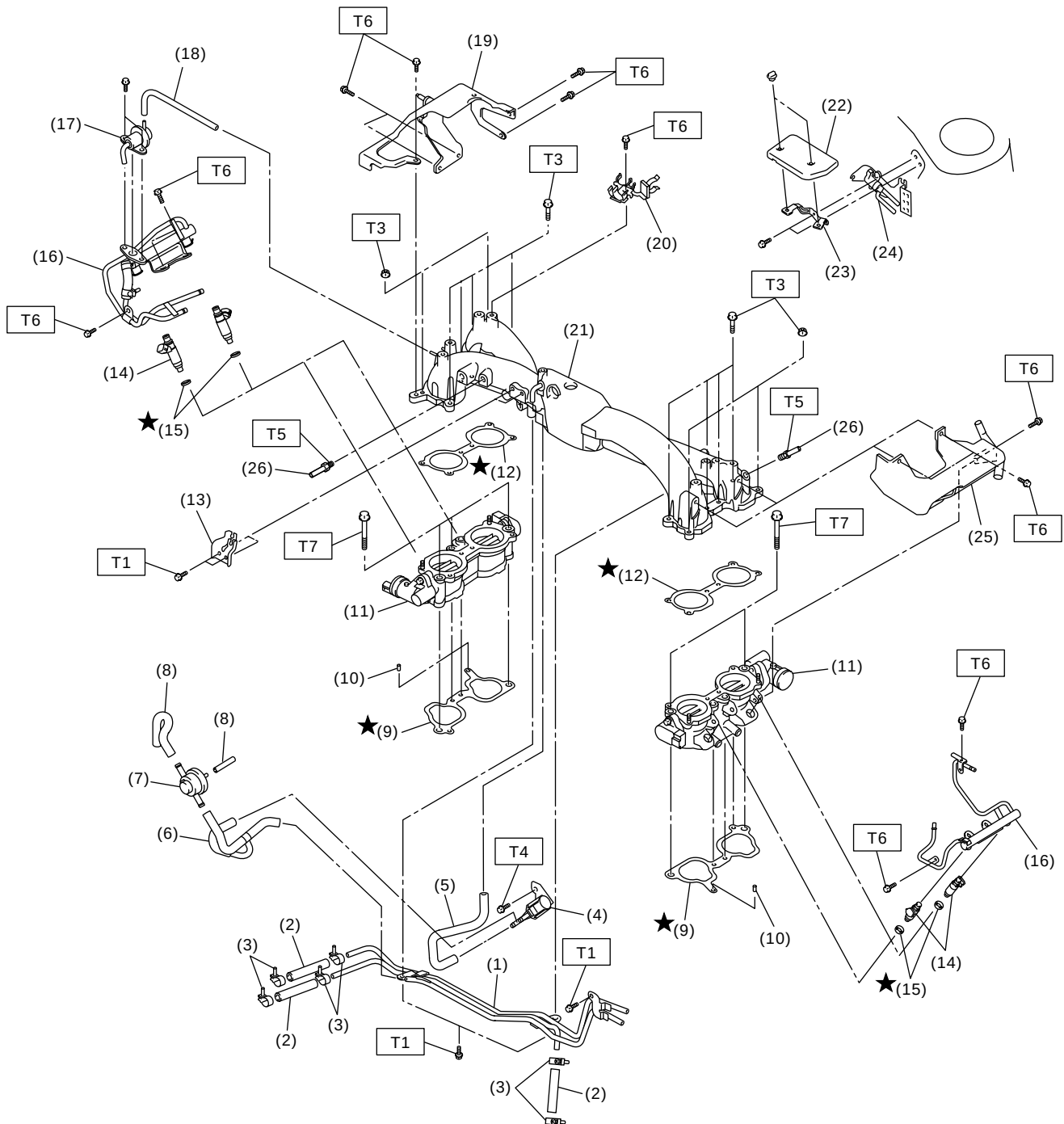
FUEL INJECTION (FUEL SYSTEMS)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

B: COMPONENT

1. INTAKE MANIFOLD



EN0778

FU(DOHC TURBO)-4

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

(1) Fuel pipe ASSY	(13) Accelerator cable bracket
(2) Fuel hose	(14) Fuel injector
(3) Clip	(15) Insulator
(4) Purge control solenoid valve	(16) Fuel injector pipe
(5) Vacuum hose	(17) Pressure regulator
(6) Vacuum control hose	(18) Pressure regulator hose
(7) Purge valve	(19) Fuel pipe protector RH
(8) Purge hose	(20) Blow-by hose stay
(9) Tumble generator valve gasket	(21) Intake manifold
(10) Guide pin	(22) Solenoid valve cover
(11) Tumble generator valve ASSY	(23) Solenoid valve cover stay
(12) Intake manifold gasket	(24) Wastegate control solenoid valve ASSY

(25) Fuel pipe protector LH
(26) Nipple

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.50, 3.7)

T2: 7.4 (0.75, 5.5)

T3: 8.25 (0.84, 6.1)

T4: 16 (1.63, 11.8)

T5: 17 (1.73, 12.5)

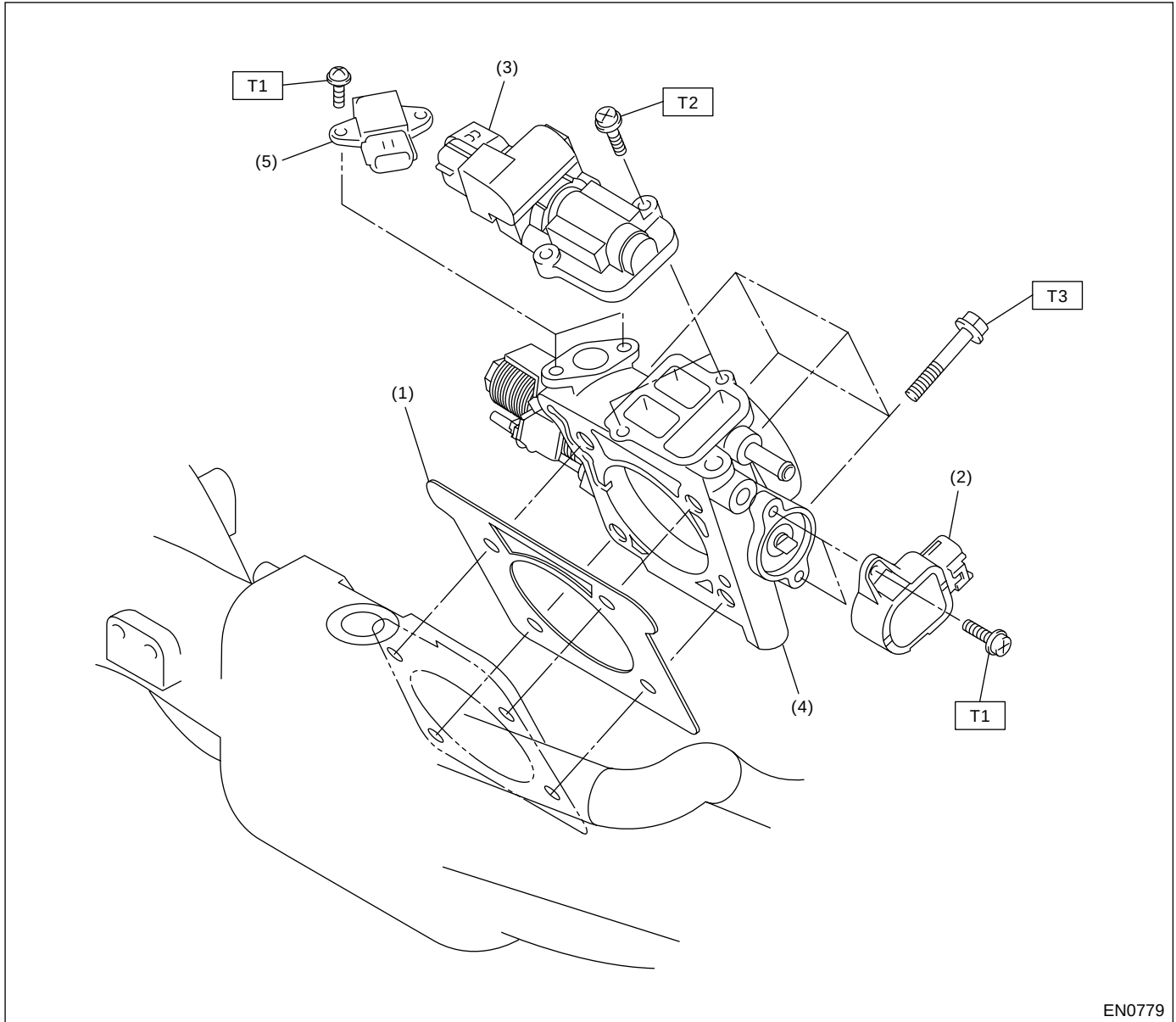
T6: 19 (1.94, 14.0)

T7: 25 (2.55, 18.4)

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
- (5) Pressure sensor

Tightening torque: N·m (kgf-m, ft-lb)

T1: 1.6 (0.16, 1.2)

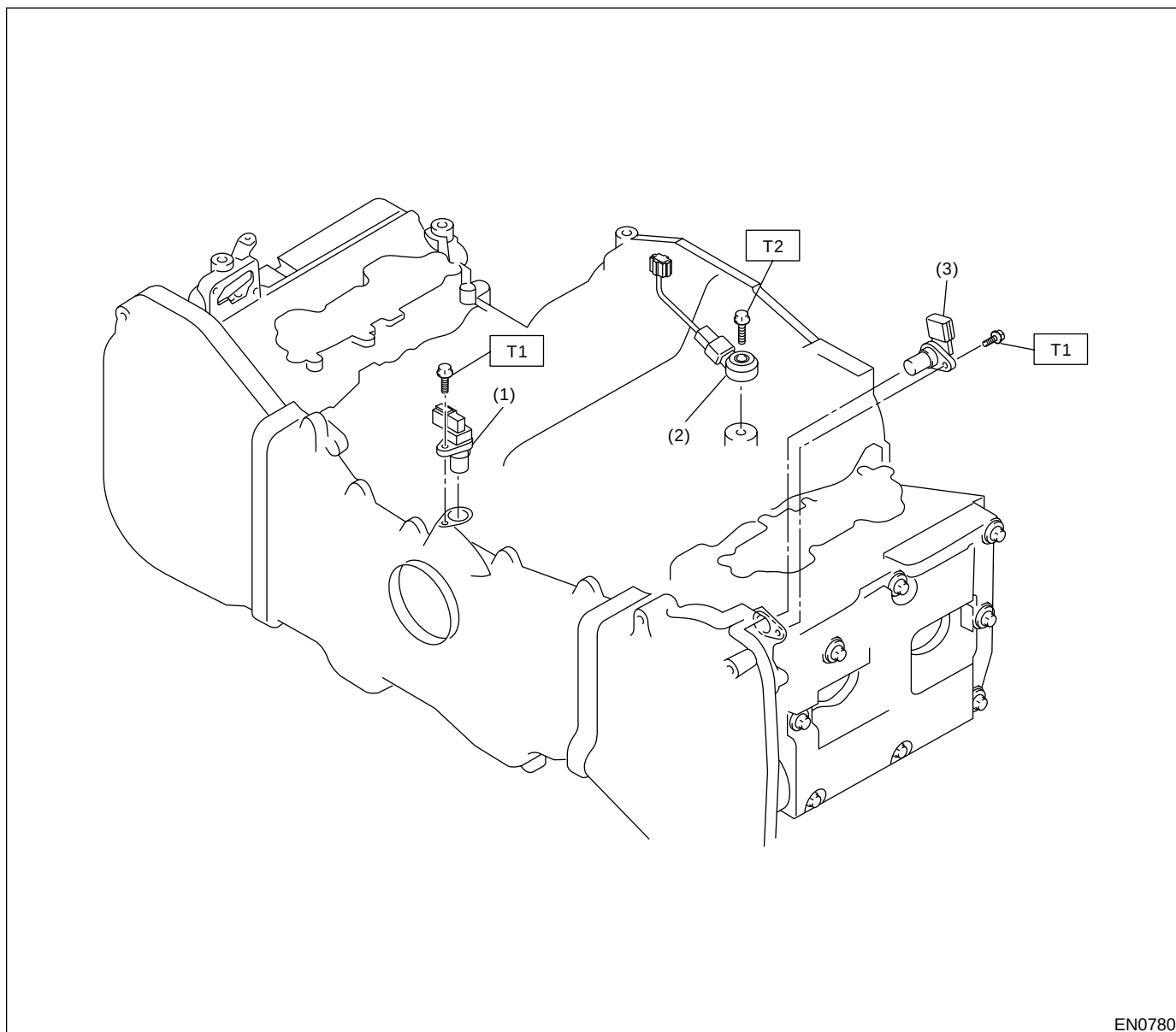
T2: 2.8 (0.29, 2.1)

T3: 22 (2.2, 16)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



EN0780

(1) Crankshaft position sensor

(3) Camshaft position sensor

(2) Knock sensor

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

FUEL INJECTION (FUEL SYSTEMS)

FU(DOHC TURBO)-8

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

(1) Heat sealed cover	(13) Evaporation hose B	(25) Fuel return hose B
(2) Fuel tank band	(14) Joint pipe	(26) Fuel sub meter gasket
(3) Protector LH	(15) Evaporation hose C	(27) Jet pump filter
(4) Protector RH	(16) Evaporation pipe ASSY	(28) Fuel sub meter unit
(5) Fuel tank	(17) Evaporation pipe	(29) Evaporation hose G
(6) Fuel pump gasket	(18) Evaporation hose D	(30) Evaporation hose H
(7) Fuel pump ASSY	(19) Fuel return hose A	
(8) Fuel meter unit	(20) Retainer	
(9) Fuel cut valve gasket	(21) Quick connector	
(10) Fuel cut valve	(22) Evaporation hose E	
(11) Evaporation hose A	(23) Fuel pipe ASSY	
(12) Clip	(24) Evaporation hose F	

Tightening torque: N·m (kgf-m, ft-lb)***T1: 4.4 (0.45, 3.3)******T2: 7.4 (0.75, 5.4)******T3: 33 (3.4, 25)***

FUEL INJECTION (FUEL SYSTEMS)

This diagram illustrates the assembly of a rear window system. The main components shown in an exploded view include:

- Window Frame (11):** The central structural component.
- Motor (14):** Connected to the frame via a linkage mechanism (13, 15, 16, 17, 18).
- Wiring Harness (12):** Connects the motor to the vehicle's electrical system (T).
- Seals and Gaskets (2, 3, 4, 5, 6, 7, 8, 9, 10):** Various components used to ensure a watertight seal around the window.
- Fasteners (1):** Multiple screws and bolts used to secure the assembly.
- Mounting Brackets (20, 21, 22, 23, 24):** Components used to attach the window frame to the vehicle body.

Arrows labeled A, B, and C indicate the sequence of assembly steps for the motor and linkage components.

FU(DOHC TURBO)-10

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

(1) Clip	(11) Fuel pipe ASSY	(21) Two-way valve drain hose A
(2) Fuel delivery hose A	(12) Grommet	(22) Connector
(3) Fuel filter bracket	(13) Canister hose A	(23) Two-way valve drain hose B
(4) Fuel filter holder	(14) Canister	(24) Clamp
(5) Fuel filter cup	(15) Canister bracket plate	(25) Front canister bracket
(6) Fuel filter	(16) Cushion	
(7) Evaporation hose	(17) Canister bracket spacer	
(8) Fuel damper	(18) Rear canister bracket	
(9) Fuel delivery hose B	(19) Two-way valve return hose	
(10) Fuel return hose	(20) Two-way valve	

Tightening torque: N·m (kgf-m, ft-lb)

T: 23 (2.34, 17.0)

FUEL INJECTION (FUEL SYSTEMS)

This diagram shows an exploded view of a mechanical assembly. The components are numbered as follows:

- (1) Main curved bracket or housing.
- (2) Small circular component, possibly a cap or seal.
- (3) Small cylindrical components, likely pins or spacers.
- (4) Circular component with a flange, possibly a flange or end cap.
- (5) Long curved pipe or tube.
- (6) Shorter curved pipe or tube.
- (7) Small component, possibly a plug or cap.
- (8) Flange or mounting plate.
- (9) Bolt or screw.
- (10) Nut or washer.
- (11) Large, complex bracket or housing.

Callouts 'T' and 'C' are used to indicate specific features or assembly points:

- 'T' indicates a threaded hole or a specific assembly point.
- 'C' indicates a specific feature or a hole in a component.

The diagram illustrates the assembly sequence and the relative positions of the various parts.

- Tightening torque: N·m (kgf-m, ft-lb)**
T: 7.5 (0.76, 5.5)

GENERAL DESCRIPTION

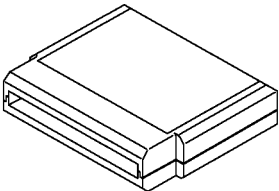
FUEL INJECTION (FUEL SYSTEMS)

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
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

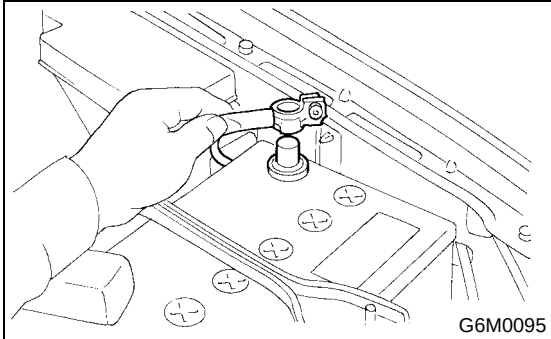
THROTTLE BODY

FUEL INJECTION (FUEL SYSTEMS)

2. Throttle Body

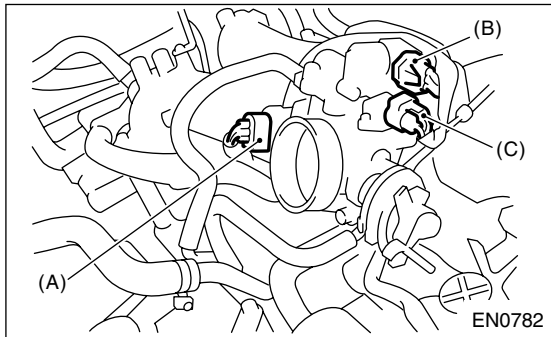
A: REMOVAL

- 1) Disconnect battery ground cable.

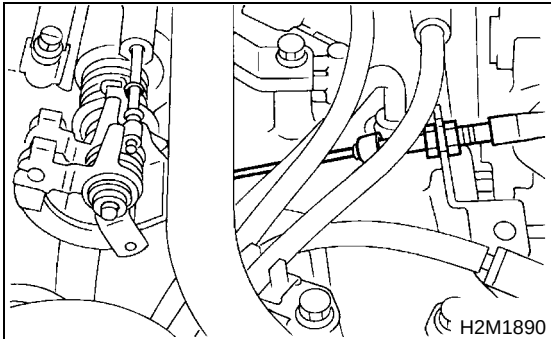


- 2) Remove intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

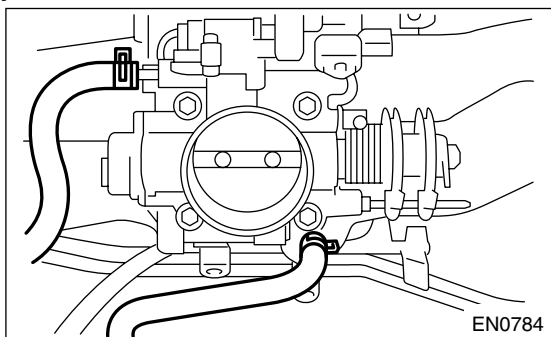
- 3) Disconnect connector from throttle position sensor (A) and idle air control solenoid valve (B) and pressure sensor (C).



- 4) Disconnect accelerator cable.



- 5) Disconnect engine coolant hoses from throttle body.



- 6) Remove bolts which secure throttle body to intake manifold.

B: INSTALLATION

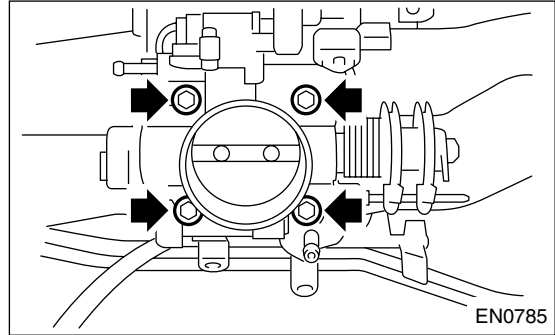
Install in the reverse order of removal.

CAUTION:

Replace gasket with a new one.

Tightening torque:

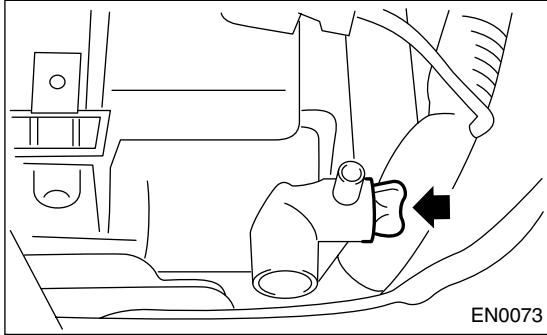
22 N·m (2.2 kgf-m, 15.9 ft-lb)



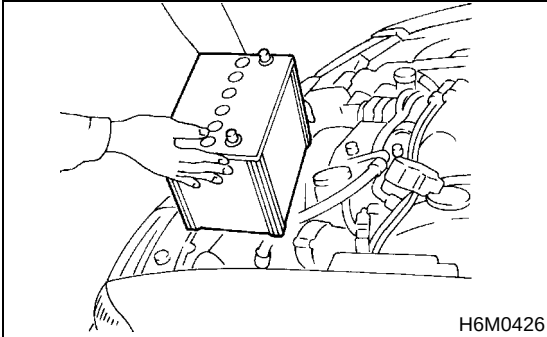
3. Intake Manifold

A: REMOVAL

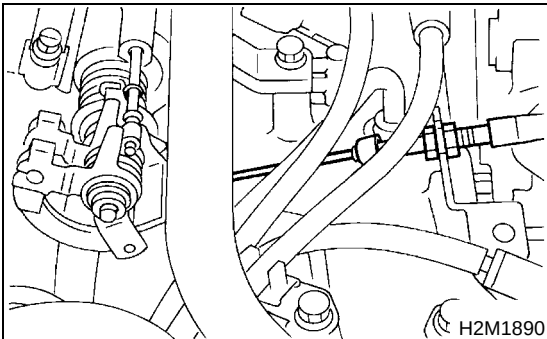
- 1) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Remove under cover.
- 3) Drain coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



- 4) Remove battery from engine compartment.

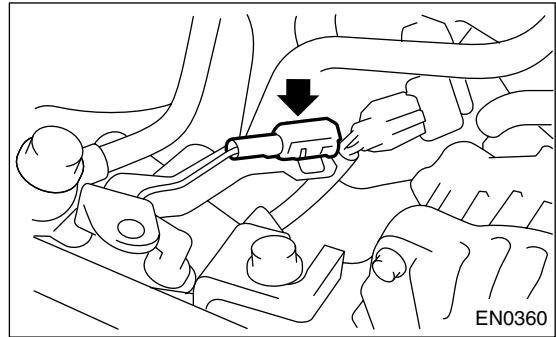


- 5) Remove air cleaner upper cover and air intake boot. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
- 6) Remove air cleaner element.
- 7) Remove intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
- 8) Disconnect accelerator cable.



- 9) Remove power steering pump from bracket.
 - (1) Remove front side V-belt. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>

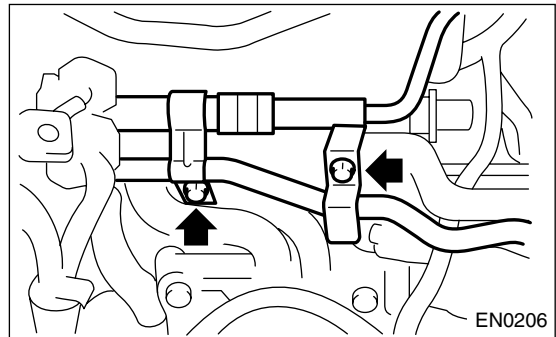
- (2) Disconnect the power steering switch connector.



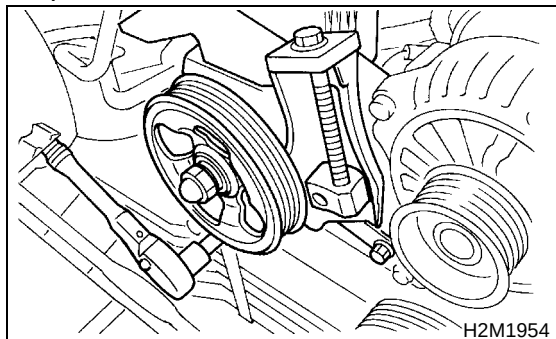
- (3) Remove bolts which secure power steering pipe brackets to intake manifold.

NOTE:

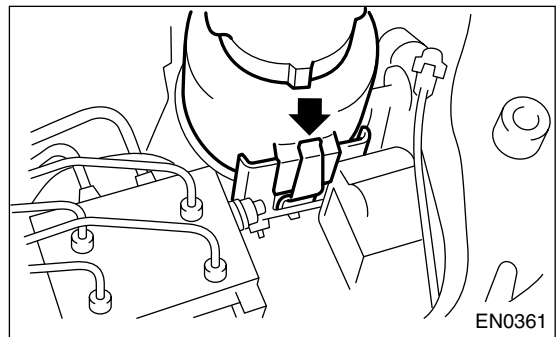
Do not disconnect power steering hose.



- (4) Remove bolts which secure power steering pump to bracket.



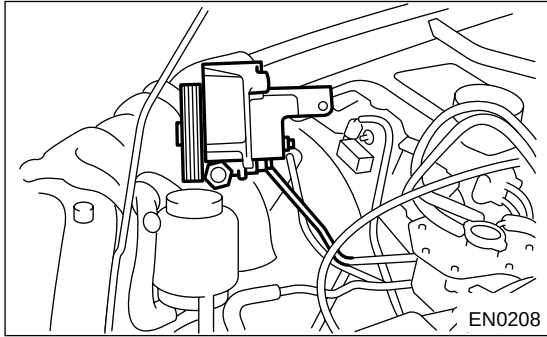
- (5) Remove power steering tank from the bracket by pulling it upward.



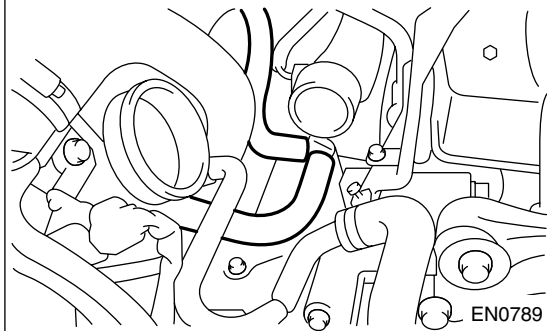
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

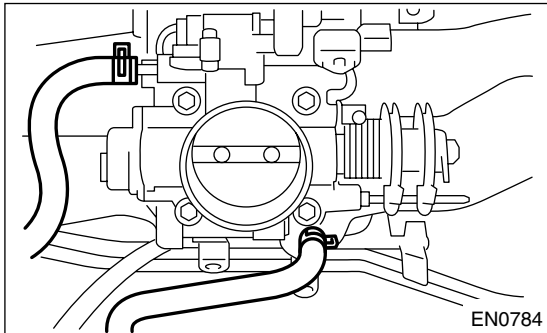
- (6) Place power steering pump on the right side wheel apron.



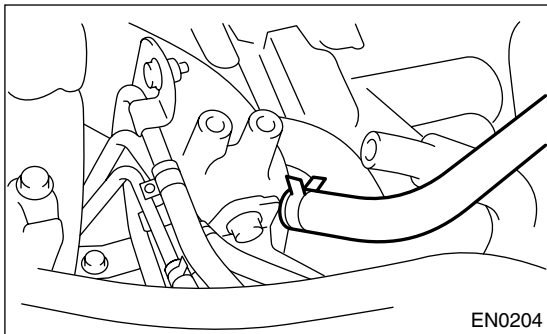
- 10) Disconnect emission hose from PCV valve.



- 11) Disconnect engine coolant hoses from throttle body.

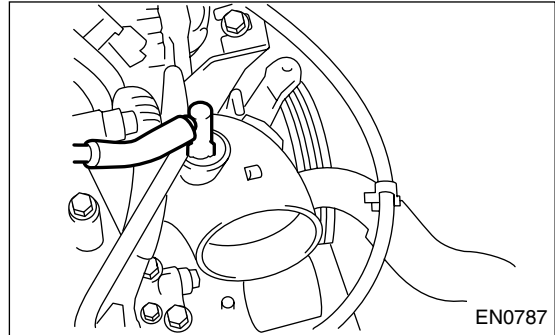


- 12) Disconnect brake booster hose (A).

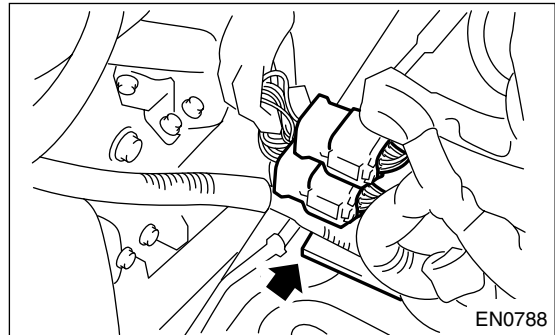


- 13) Remove coolant filler tank. <Ref. to CO-51, REMOVAL, Coolant Filler Tank.>

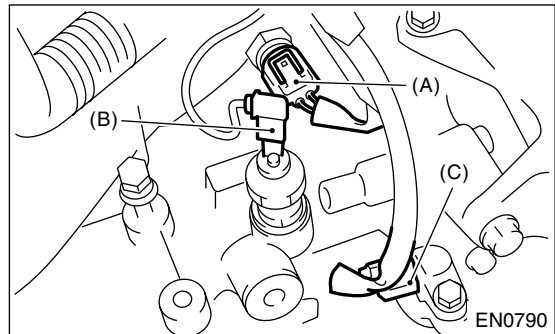
- 14) Disconnect Pressure hose from intake duct.



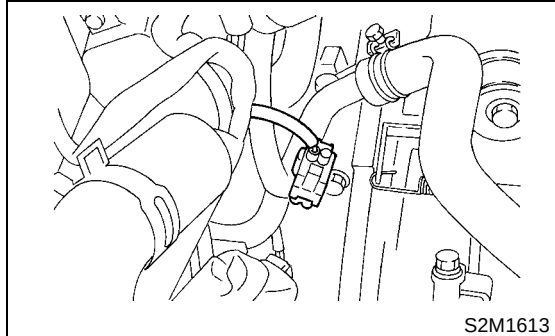
- 15) Disconnect engine harness connectors from bulkhead harness connectors, and remove engine harness connectors from bracket.



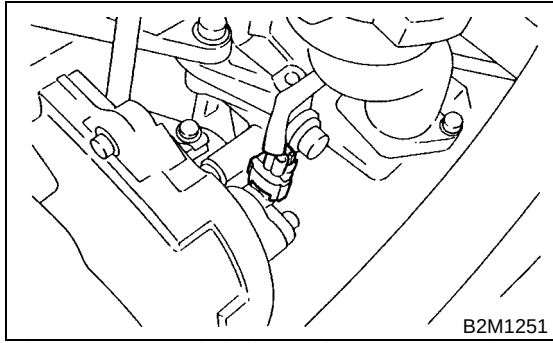
- 16) Disconnect connectors from engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



- 17) Disconnect knock sensor connector.

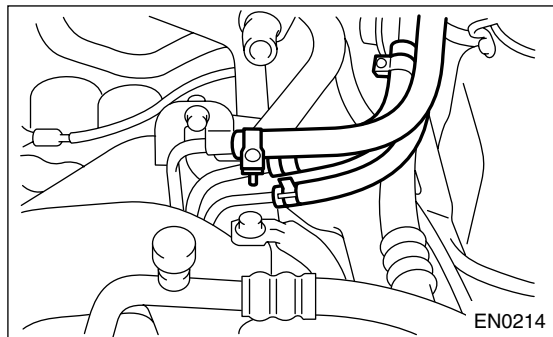


- 18) Disconnect connector from camshaft position sensor.

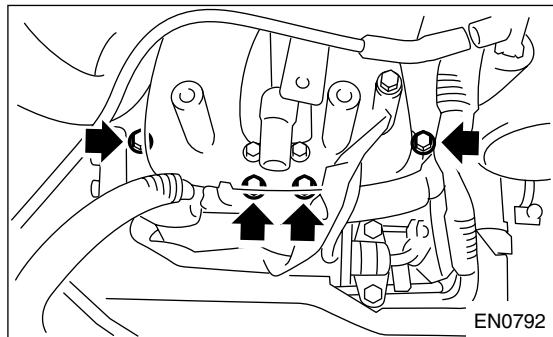


- 19) Disconnect fuel delivery hose, return hose and evaporation hose.

WARNING:
Catch fuel from hoses in a container.



- 20) Remove bolts which secure intake manifold to cylinder heads.



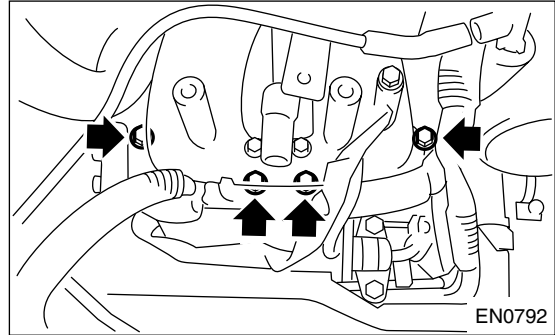
- 21) Remove intake manifold.

B: INSTALLATION

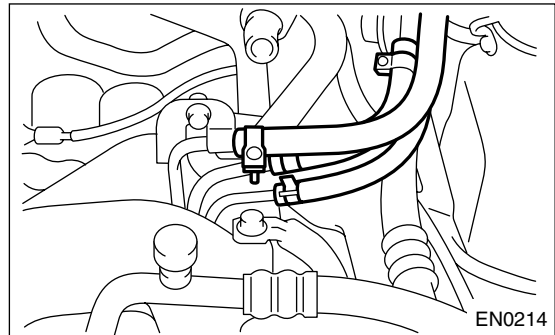
- 1) Install intake manifold onto cylinder heads.

CAUTION:
Always use new gaskets.

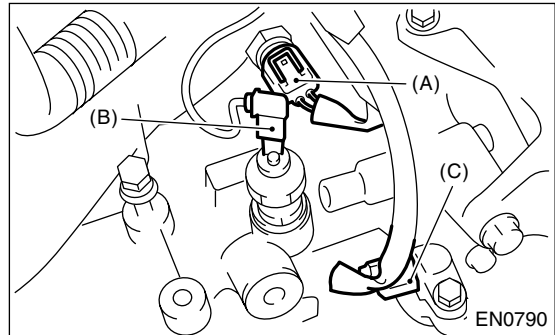
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



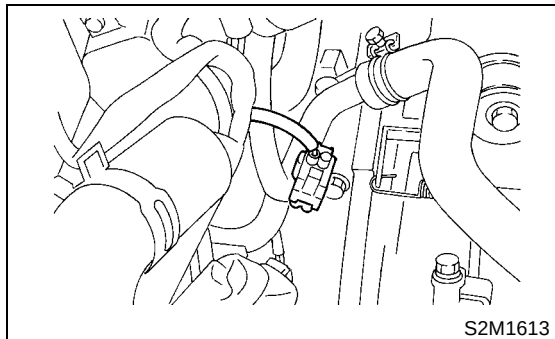
- 2) Connect fuel delivery hose, return hose, and evaporation hose.



- 3) Connect connector to oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



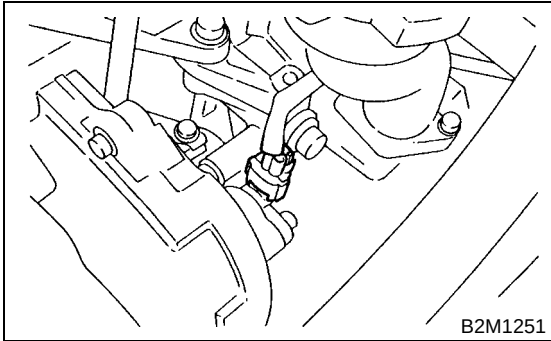
- 4) Connect connector to knock sensor.



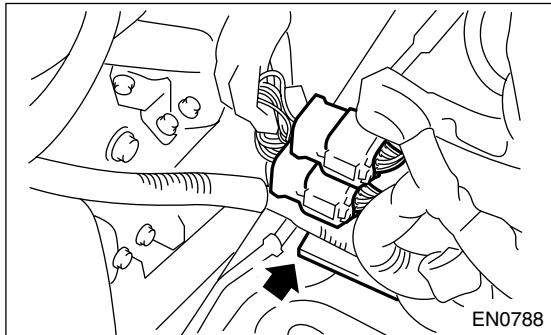
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

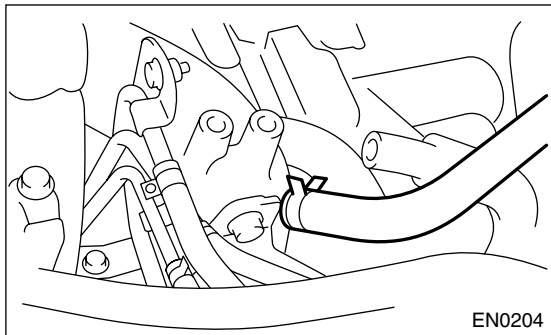
5) Connect connector to camshaft position sensor.



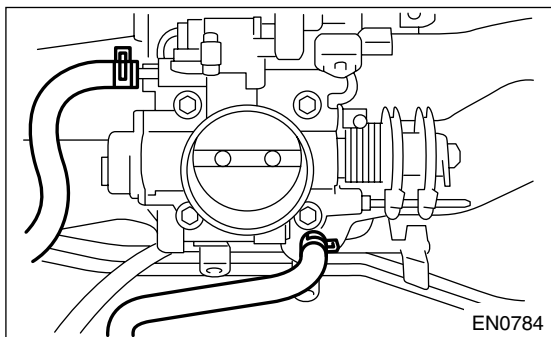
6) Connect engine harness connector to bulkhead harness connectors, and install engine harness connector to bracket.



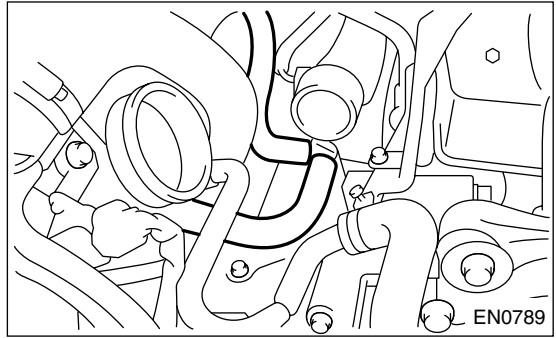
7) Connect brake booster vacuum hose (A).



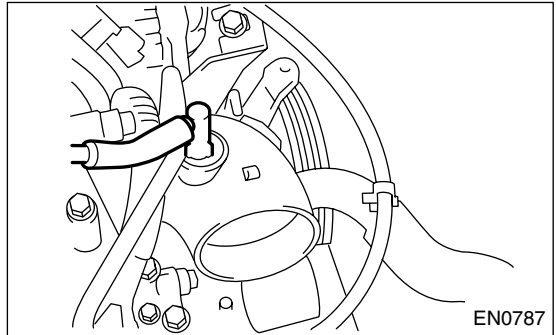
8) Connect engine coolant hoses to throttle body.



9) Connect emission hose to PCV valve.



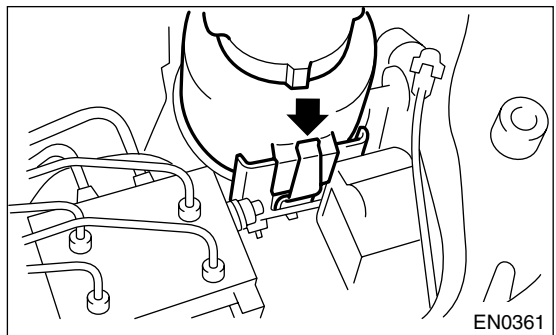
10) Connect pressure hose to intake duct.



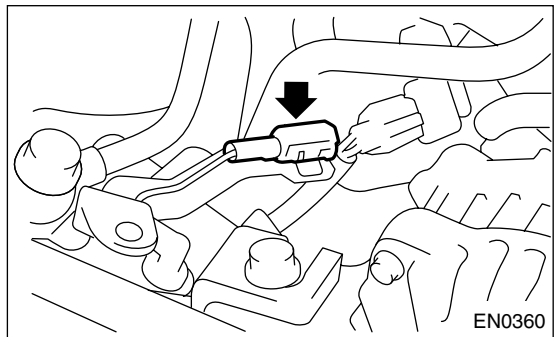
11) Install cooler filler tank. <Ref. to CO-51, INSTALLATION, Coolant Filler Tank.>

12) Install power steering pump on bracket.

(1) Install power steering tank on bracket.



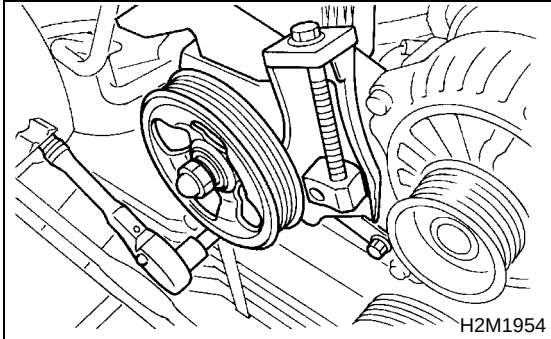
(2) Connect connector to power steering pump switch.



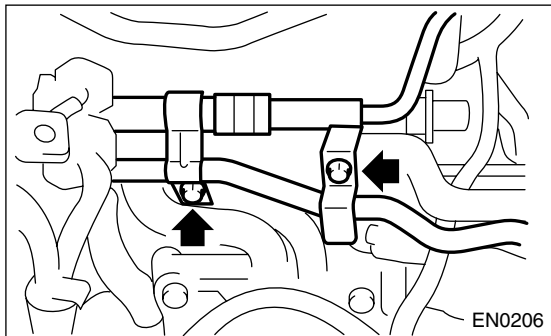
- (3) Install power steering pump on bracket, and tighten bolts.

Tightening torque:

20.1 N·m (2.05 kgf-m, 14.8 ft-lb)

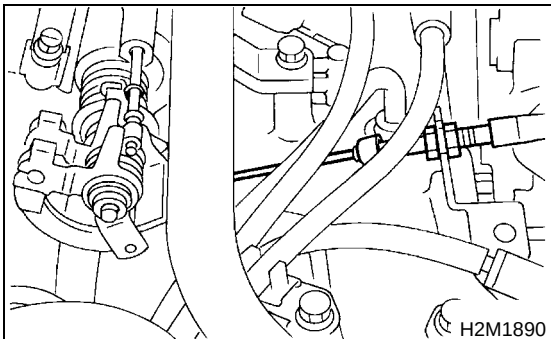


- (4) Install power steering pipe brackets on right side intake manifold.



- (5) Install front side V-belt. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>

- 13) Connect accelerator cable.



- 14) Install intercooler. <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>

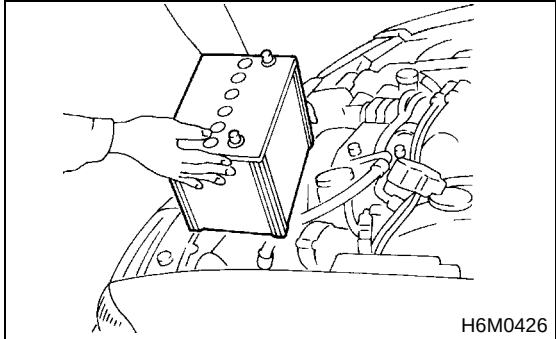
- 15) Install air cleaner element.

- 16) Install air cleaner upper cover and air intake duct as a unit. <Ref. to IN(DOHC TURBO)-7, INSTALLATION, Air Cleaner.>

- 17) Connect connector to fuel pump relay.



- 18) Install battery and connect battery cables.



- 19) Install under cover.

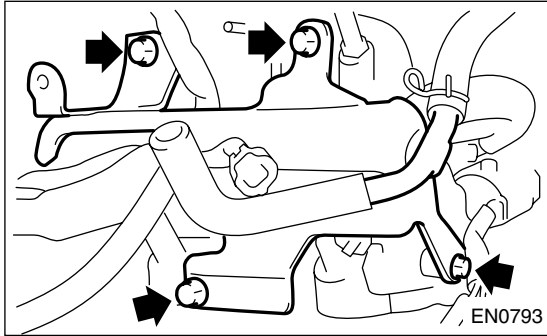
- 20) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, Engine Coolant.>

INTAKE MANIFOLD

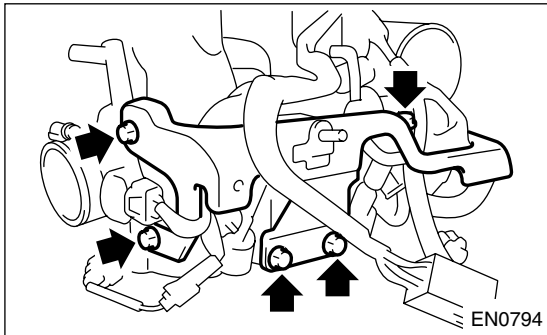
FUEL INJECTION (FUEL SYSTEMS)

C: DISASSEMBLY

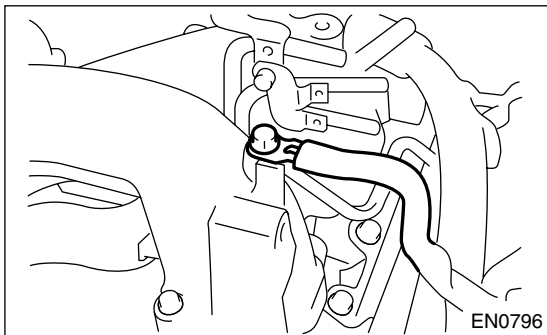
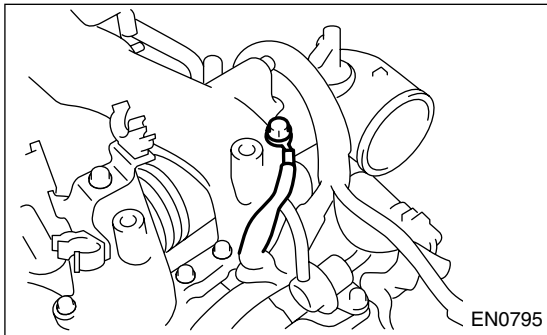
1) Remove fuel pipe protector LH.



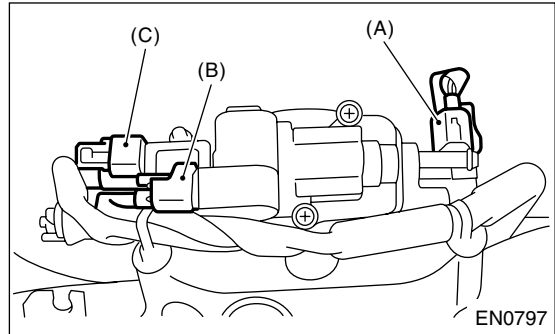
2) Remove fuel pipe protector RH.



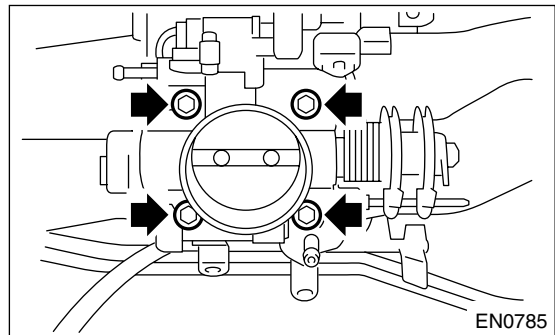
3) Remove engine ground terminal from intake manifold.



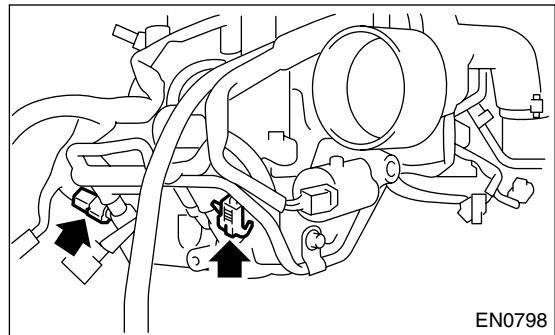
4) Disconnect connector from throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).



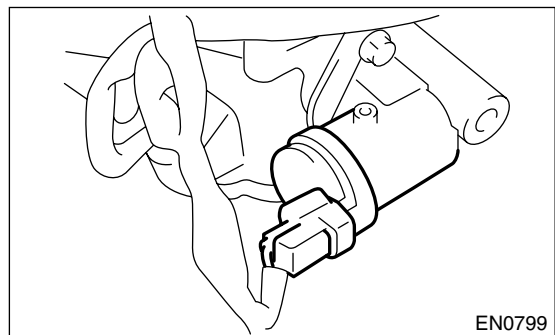
5) Remove throttle body from intake manifold.



6) Disconnect connector from fuel injector.



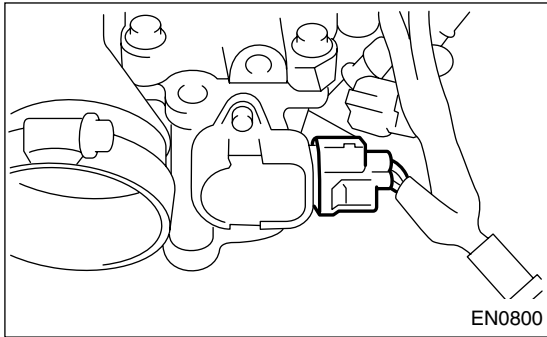
7) Disconnect connector from tumble generator valve actuator.



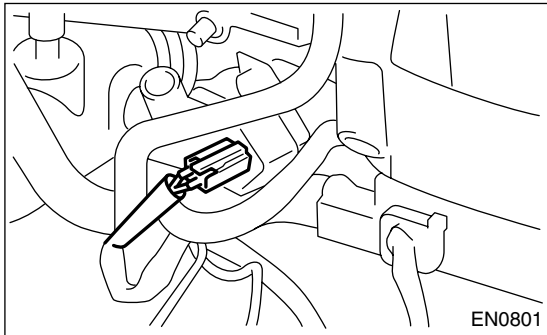
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

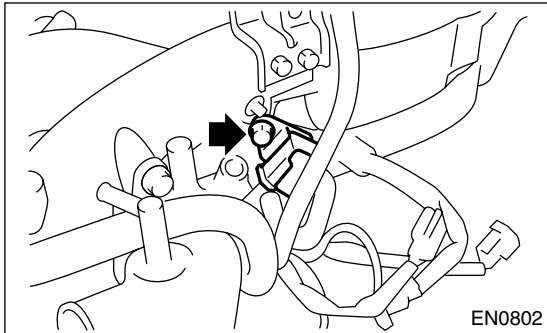
8) Disconnect connector from tumble generator valve sensor.



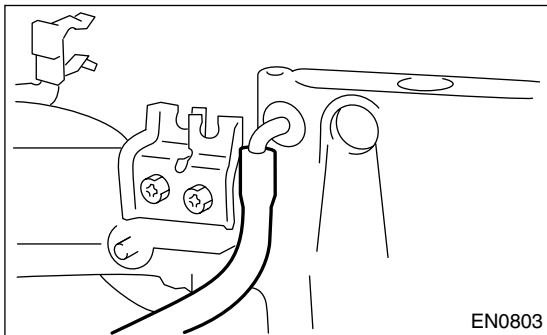
9) Disconnect connector from purge control solenoid valve.



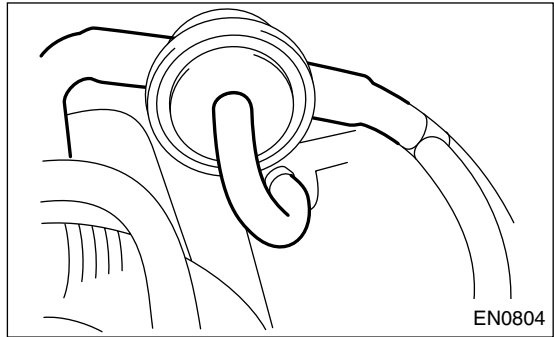
10) Remove purge control solenoid valve.



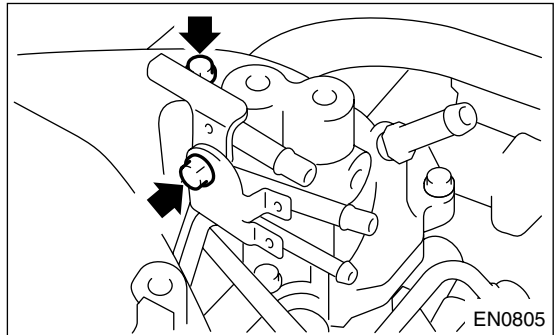
11) Disconnect evaporation hose from intake manifold.



12) Disconnect evaporation hoses from purge valve.

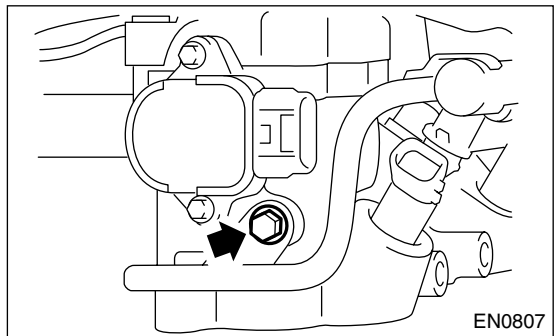
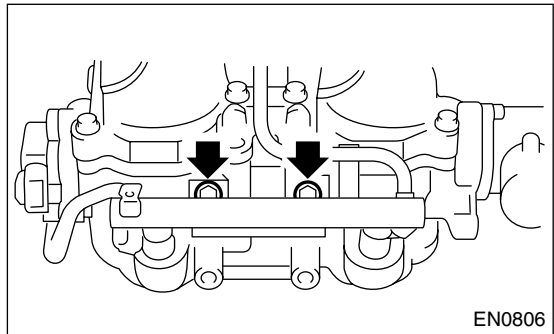


13) Remove two bolts which hold fuel pipes on the left side of intake manifold.



14) Remove bolt which hold fuel injector pipe onto intake manifold.

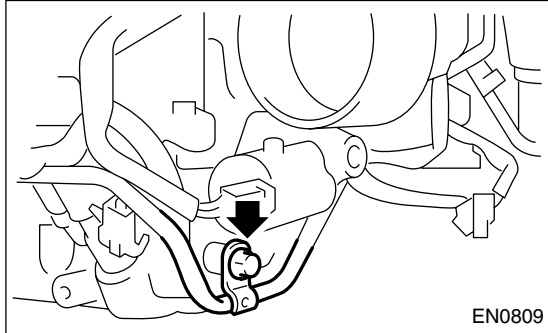
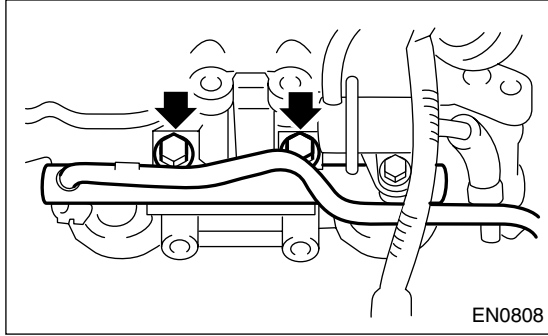
• LH SIDE



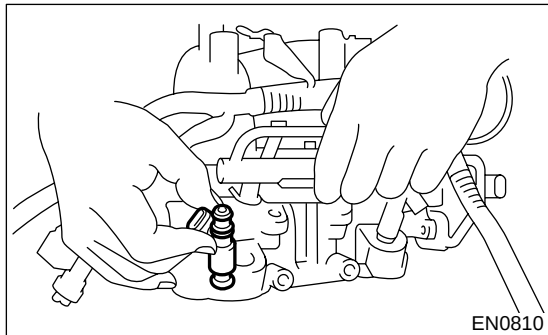
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

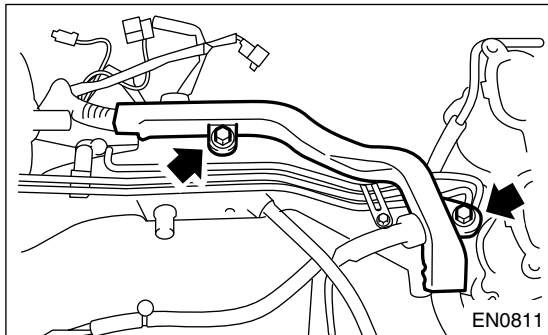
- RH SIDE



15) Remove fuel injector.

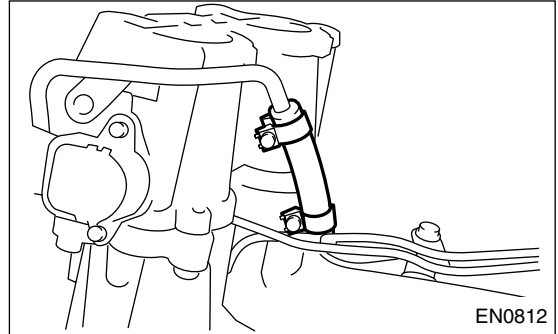


16) Remove harness bracket which hold engine harness onto intake manifold.



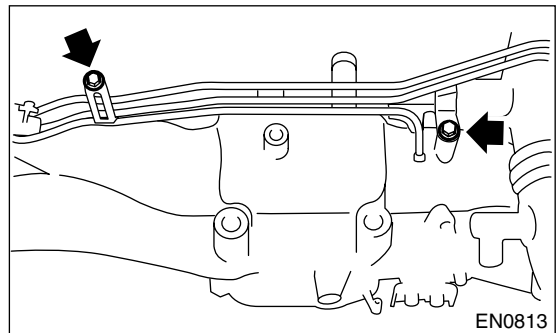
17) Remove engine harness from intake manifold.

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



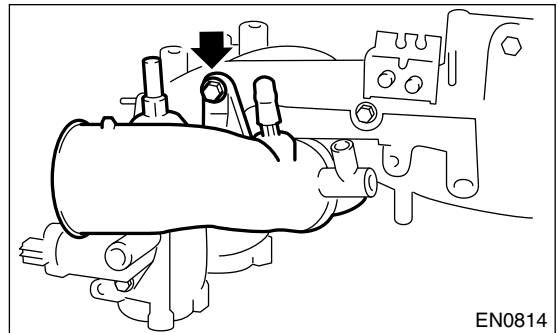
19) Remove fuel injector pipe LH.

20) Remove bolts which install fuel pipe on intake manifold.

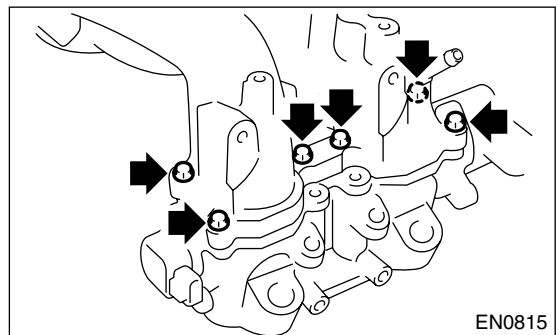


21) Remove fuel pipe assembly and pressure regulator, from intake manifold.

22) Remove intake duct from intake manifold.



23) Remove tumble generator valve assembly from intake manifold.

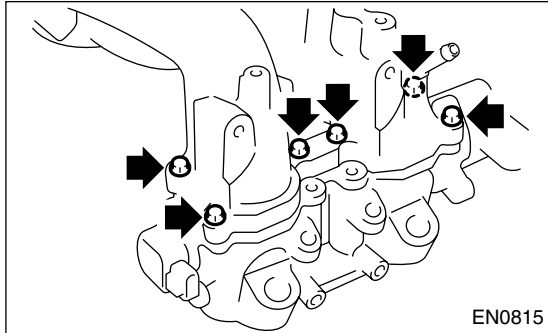


D: ASSEMBLY

1) Install tumble generator valve assembly to intake manifold.

Tightening torque:

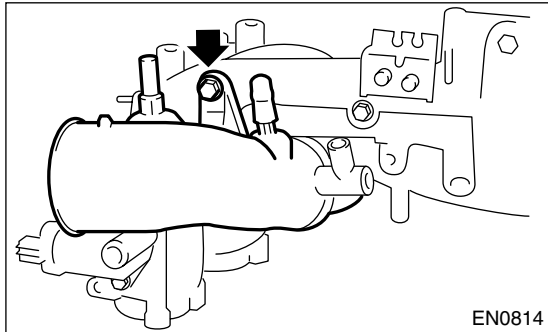
8.25 N·m (0.84 kgf-m, 6.08 ft-lb)



2) Install air intake duct to intake manifold.

Tightening torque:

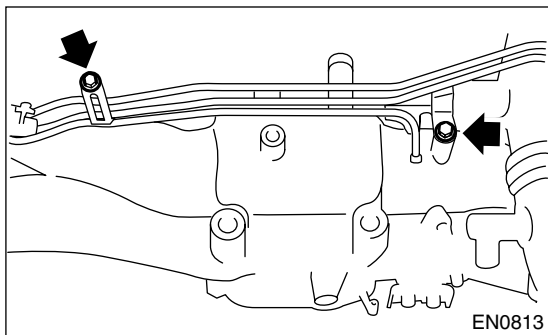
19 N·m (1.94 kgf-m, 14.0 ft-lb)



3) Install fuel pipe assembly and pressure regulator, to intake manifold.

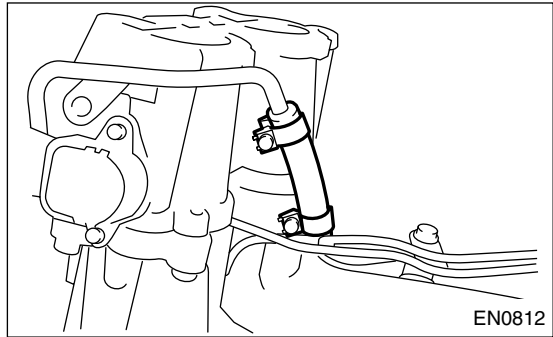
Tightening torque:

5 N·m (0.51 kgf-m, 3.69 ft-lb)



4) Install fuel injector pipe LH.

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

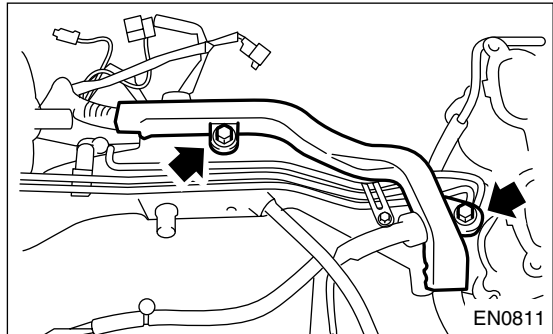


6) Install engine harness to intake manifold.

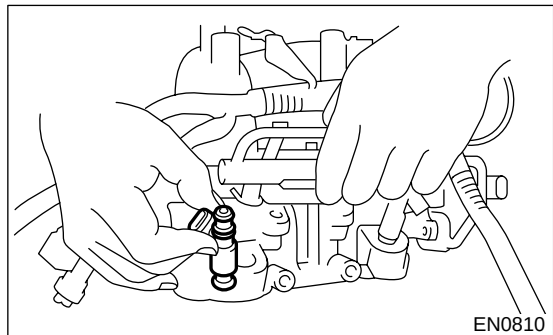
7) Install harness bracket which hold engine harness onto intake manifold.

Tightening torque:

19 N·m (1.94 kgf-m, 14.0 ft-lb)



8) Install fuel injector.



INTAKE MANIFOLD

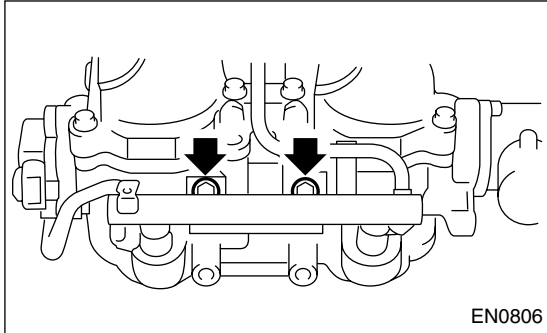
FUEL INJECTION (FUEL SYSTEMS)

9) Tighten bolt which install fuel injector pipe onto intake manifold.

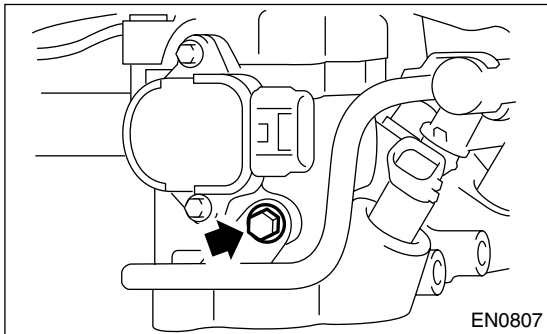
Tightening torque:

19 N·m (1.94 kgf-m, 14.0 ft-lb)

- LH SIDE

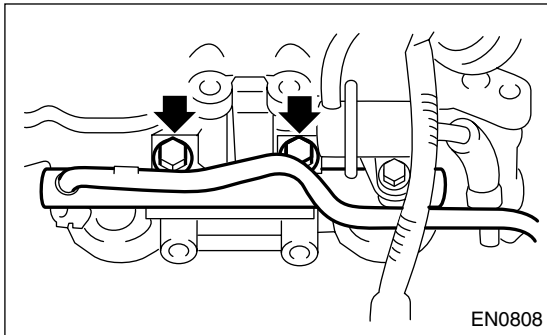


EN0806

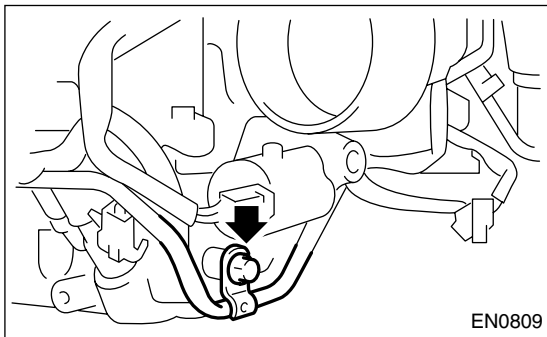


EN0807

- RH SIDE



EN0808

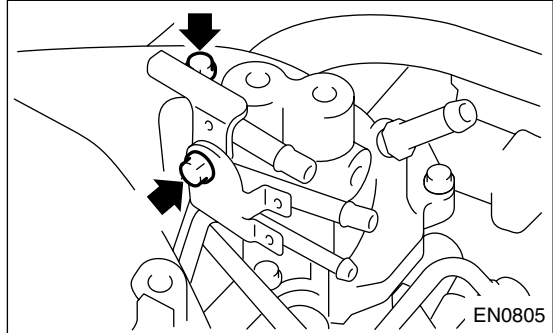


EN0809

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

Tightening torque:

5 N·m (0.51 kgf-m, 3.69 ft-lb)

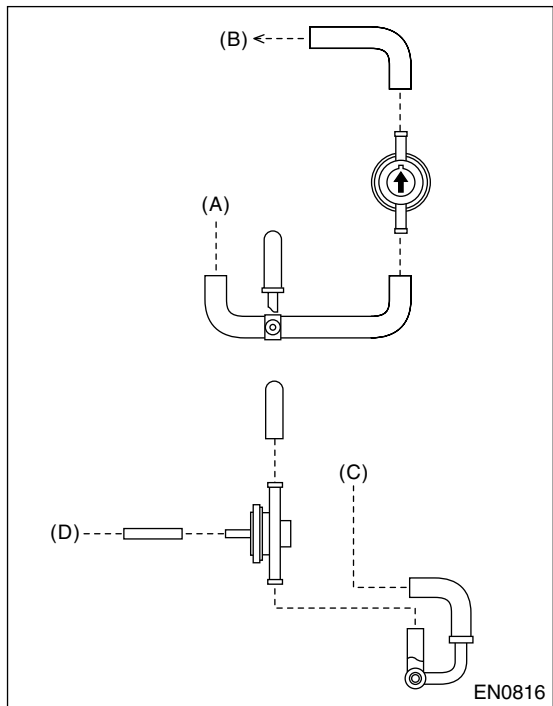


EN0805

11) Connect evaporation hoses to purge valve.

CAUTION:

Carefully connect the evaporation hoses.



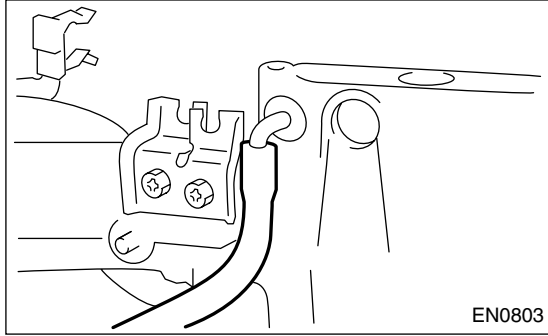
EN0816

- (A) To fuel pipe ASSY
- (B) To intake duct
- (C) To purge control solenoid valve
- (D) To intake manifold

INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

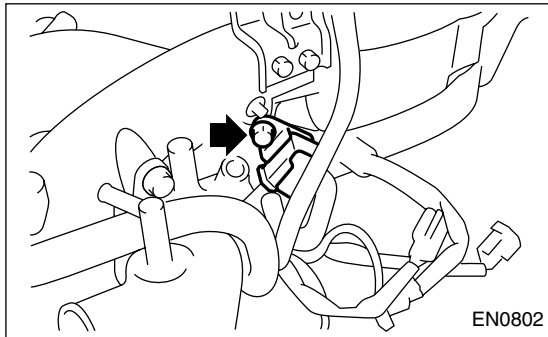
- 12) Connect evaporation hose to intake manifold.



- 13) Install purge control solenoid valve.

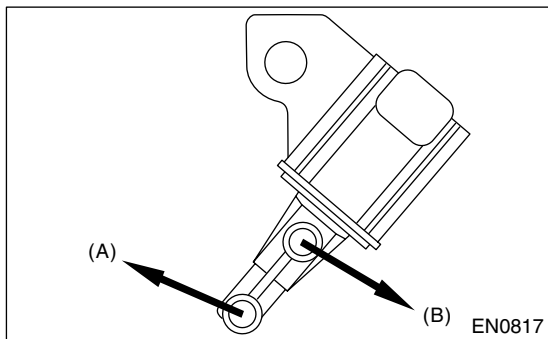
Tightening torque:

16 N·m (0.16 kgf-m, 1.2 ft-lb)



- 14) Connect hoses to purge control solenoid valve.

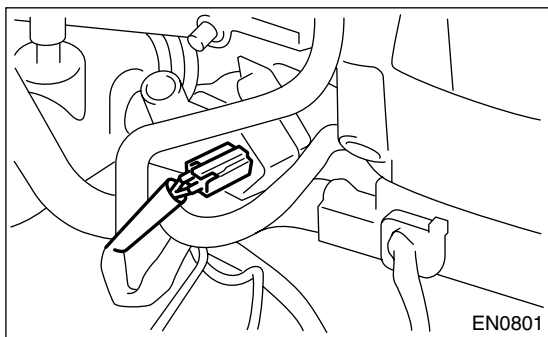
CAUTION:
Carefully connect the evaporation hoses.



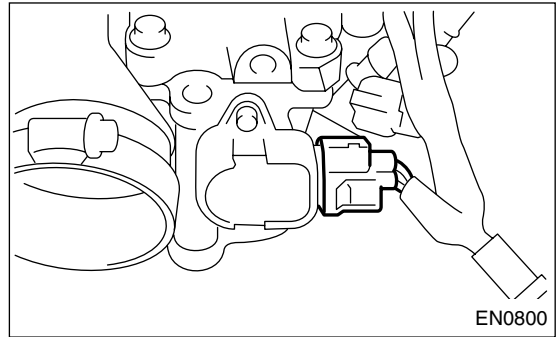
(A) To intake manifold

(B) To purge valve

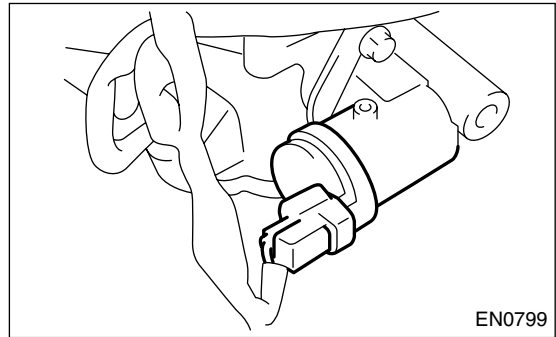
- 15) Connect connector to purge control solenoid valve.



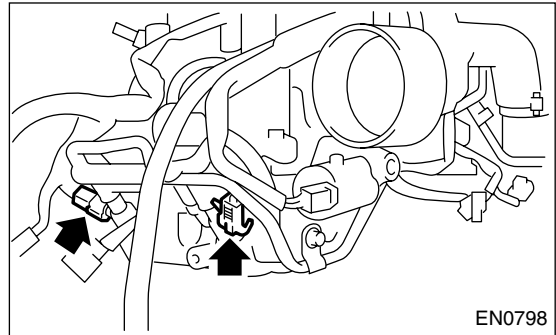
- 16) Connect connector to tumble generator valve sensor.



- 17) Connect connector to tumble generator valve actuator.



- 18) Connect connector to fuel injector.

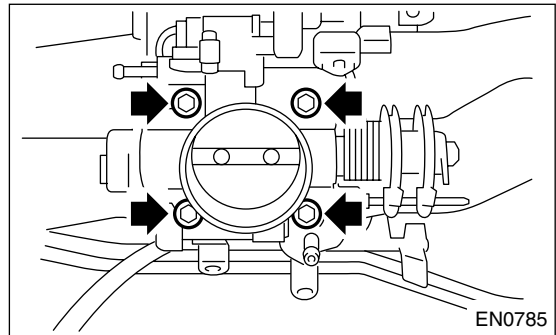


- 19) Install throttle body to intake manifold.

CAUTION:
Replace gasket with a new one.

Tightening torque:

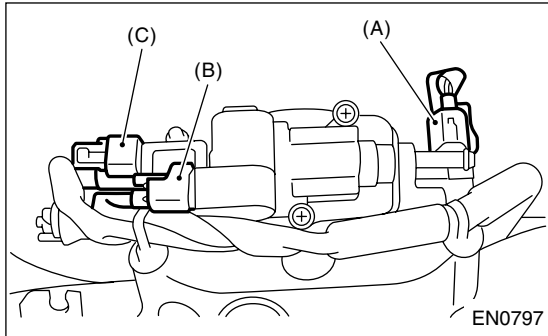
21.6 N·m (2.21 kgf-m, 15.9 ft-lb)



INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

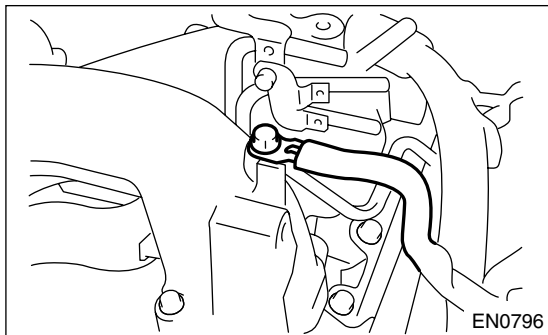
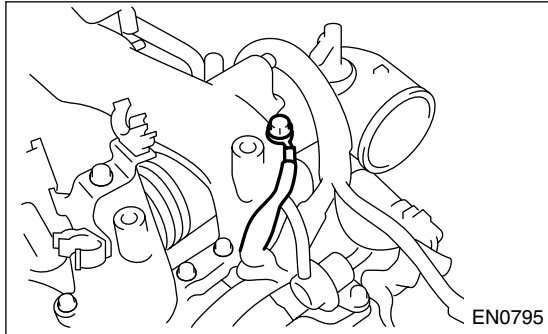
20) Connect connector to throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).



21) Install engine ground terminal to intake manifold.

Tightening torque:

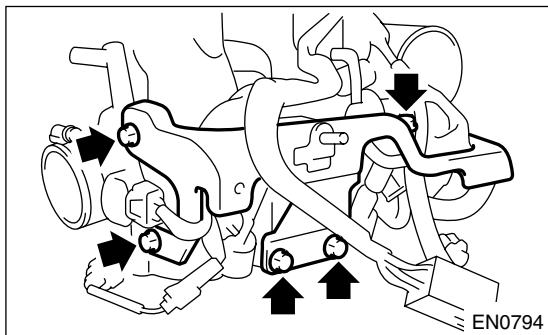
19 N·m (1.94 kgf-m, 14.0 ft-lb)



22) Install fuel pipe protector RH.

Tightening torque:

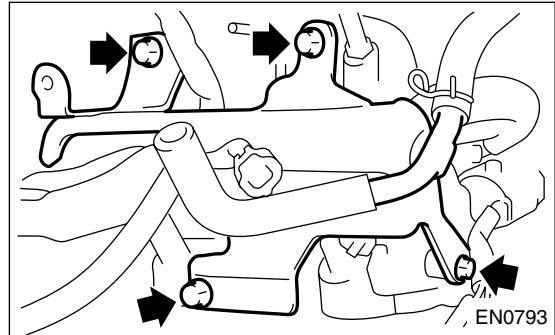
19 N·m (1.94 kgf-m, 14.0 ft-lb)



23) Install fuel pipe protector LH.

Tightening torque:

19 N·m (1.94 kgf-m, 19.0 ft-lb)



E: INSPECTION

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

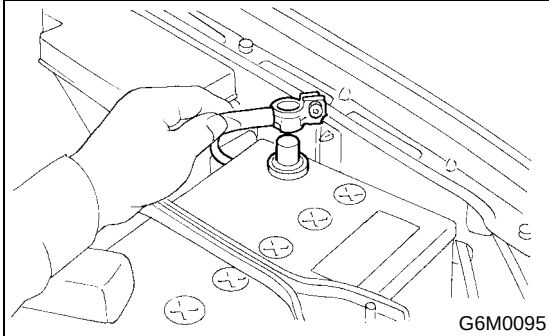
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

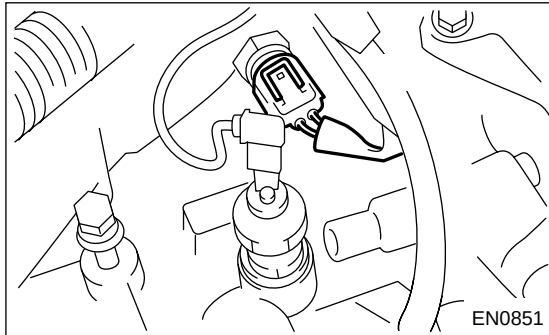
4. Engine Coolant Temperature Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Remove the generator <Ref. to SC-12, REMOVAL, Generator.>
- 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:

16 N·m (0.16 kgf-m, 1.2 ft-lb)

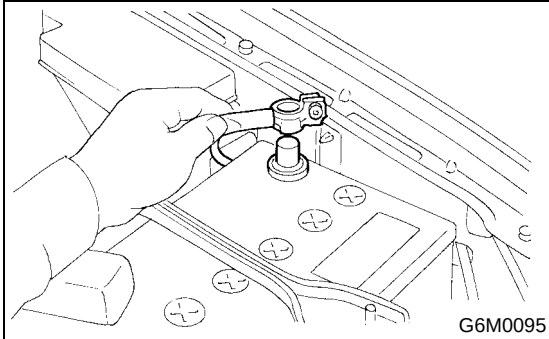
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

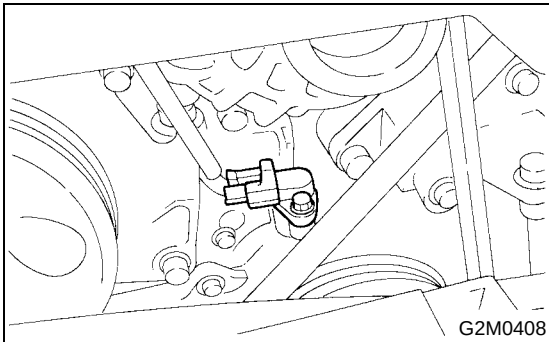
5. Crankshaft Position Sensor

A: REMOVAL

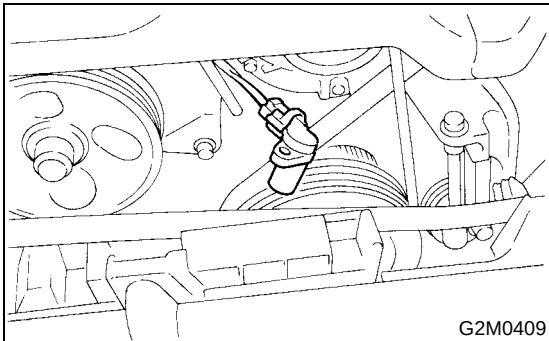
1) Disconnect battery ground cable.



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



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

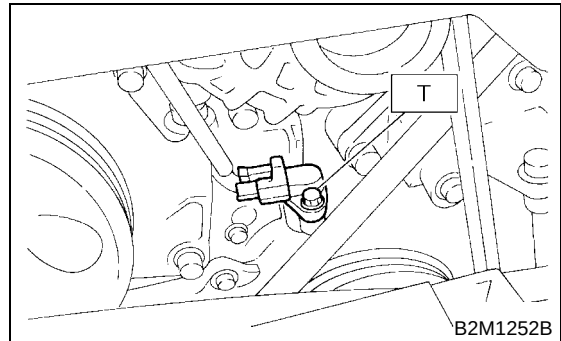


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



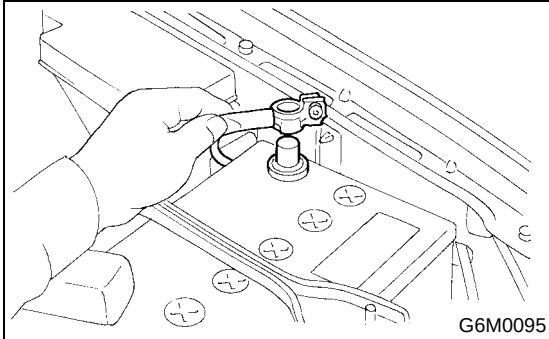
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

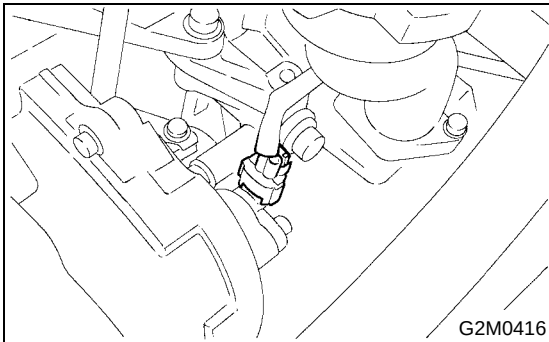
6. Camshaft Position Sensor

A: REMOVAL

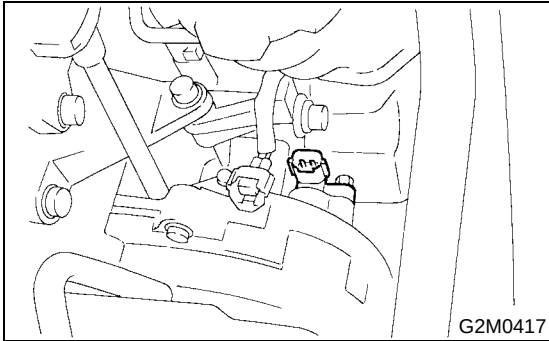
1) Disconnect battery ground cable.



2) Disconnect connector from camshaft position sensor.



3) Remove camshaft position sensor from camshaft support LH.

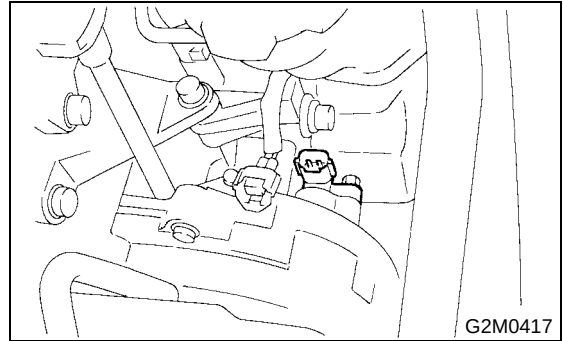


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



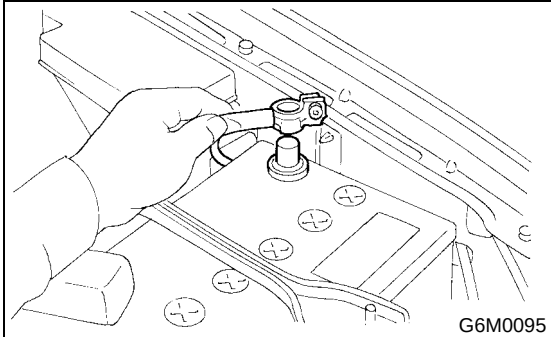
KNOCK SENSOR

FUEL INJECTION (FUEL SYSTEMS)

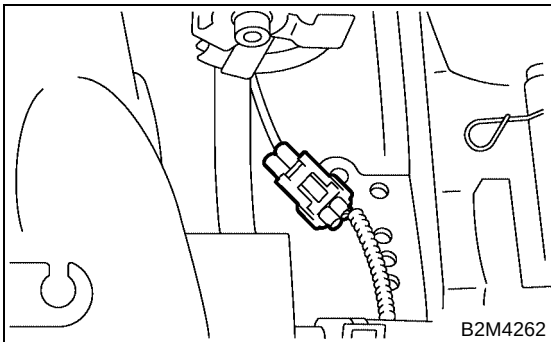
7. Knock Sensor

A: REMOVAL

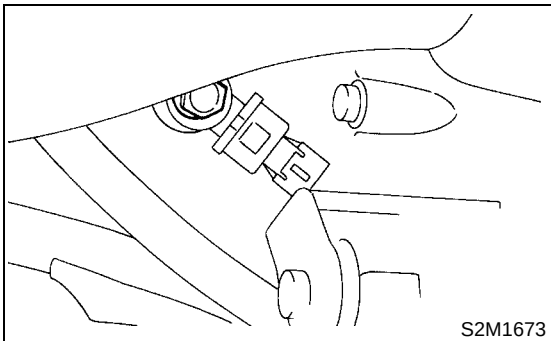
- 1) Disconnect battery ground cable from battery ground terminal.



- 2) Remove inter cooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
- 3) Disconnect knock sensor connector.



- 4) Remove knock sensor from cylinder block.



B: INSTALLATION

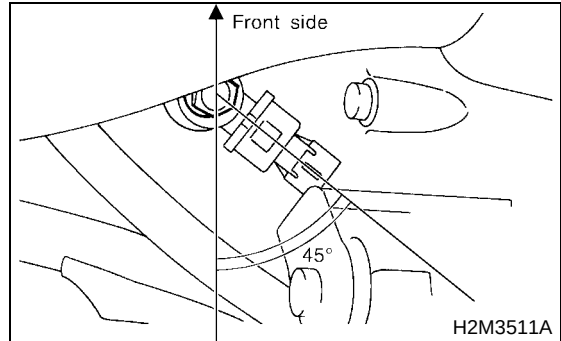
- 1) Install knock sensor to cylinder block.

Tightening torque:

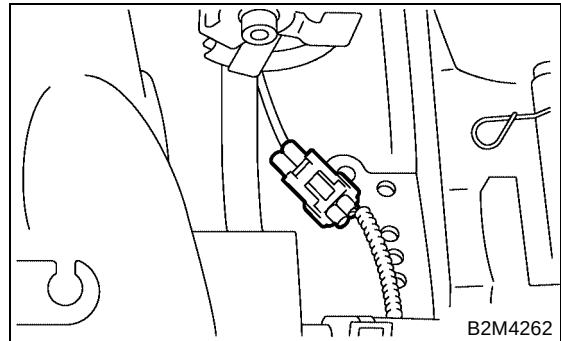
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:

The extraction area of the knock sensor cord must be positioned at a 45° angle relative to the engine rear.

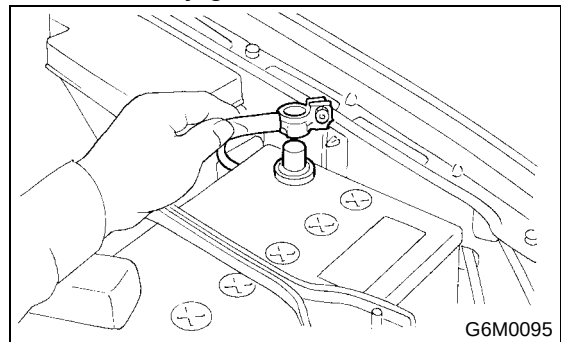


- 2) Connect knock sensor connector.



- 3) Install inter cooler. <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>

- 4) Connect battery ground cable.



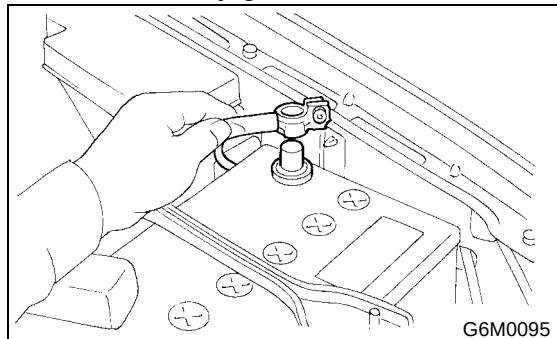
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

8. Throttle Position Sensor

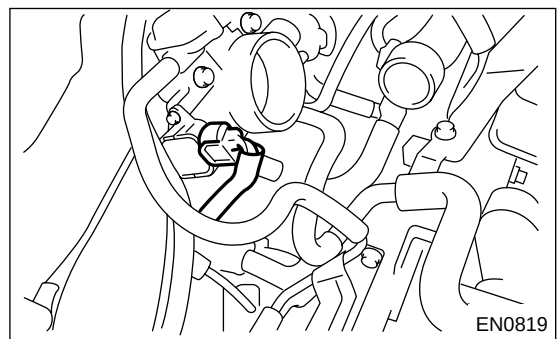
A: REMOVAL

1) Disconnect battery ground cable.

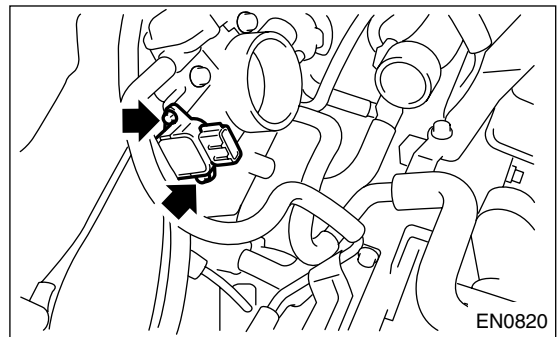


2) Remove inter cooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

3) Disconnect connector from throttle position sensor.



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



B: INSTALLATION

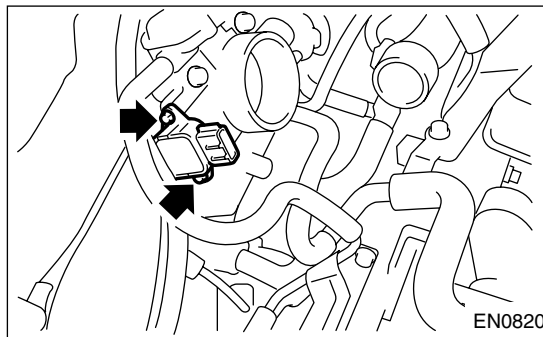
Install in the reverse order of removal.

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.



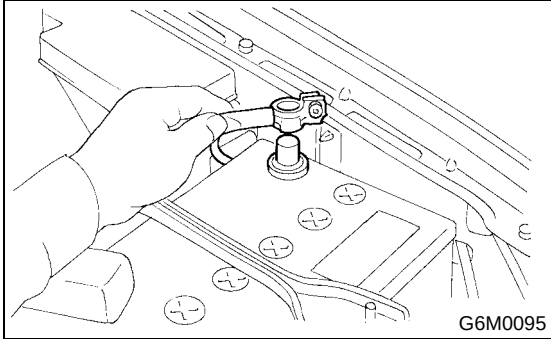
MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

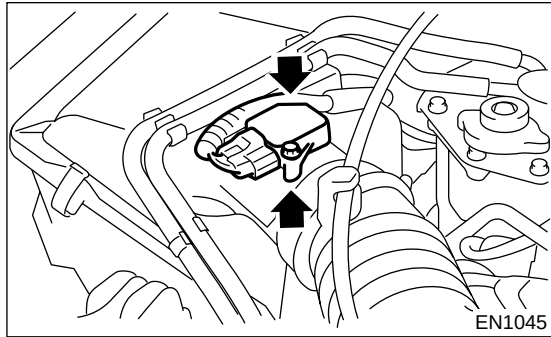
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector mass air flow and intake air temperature sensor.
- 3) Remove mass air flow and intake air temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

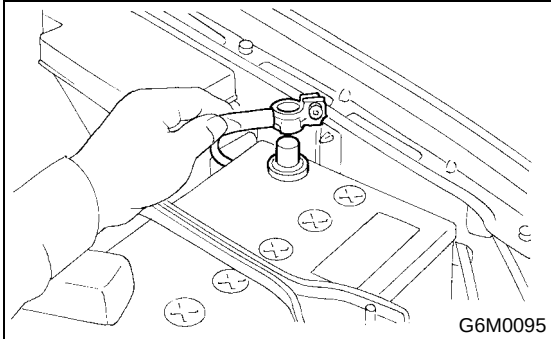
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

10. Pressure Sensor

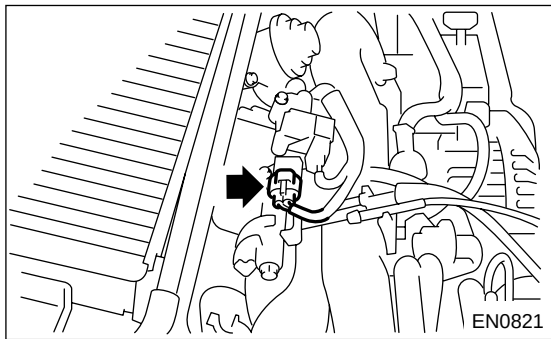
A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Remove idle air control solenoid valve. <Ref. to FU(SOHC)-37, REMOVAL, Idle Air Control Solenoid Valve.>

- 3) Disconnect connectors from pressure sensor.



- 4) Remove pressure sensor from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace gaskets for pressure sensor and idle air control solenoid valve with new ones.

Tightening torque:

2.8 N·m (0.29 kgf-m, 2.1 ft-lb)

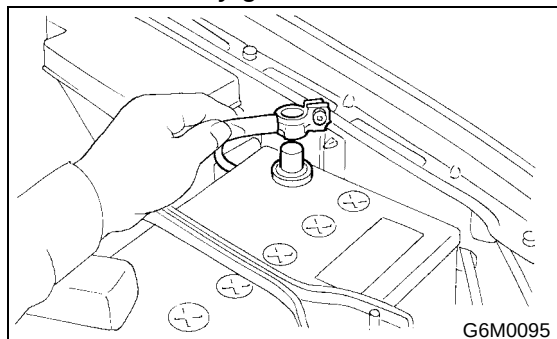
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

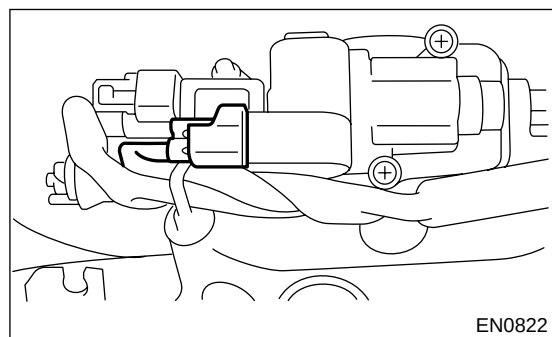
11. Idle Air Control Solenoid Valve

A: REMOVAL

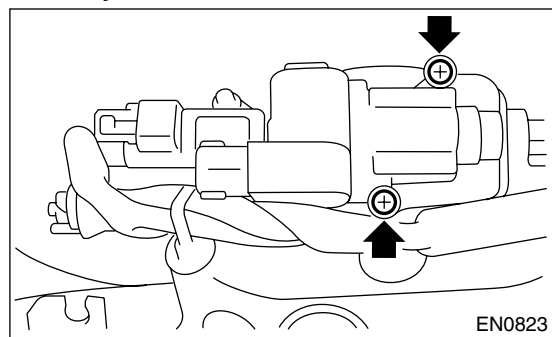
- 1) Disconnect battery ground cable.



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



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



B: INSTALLATION

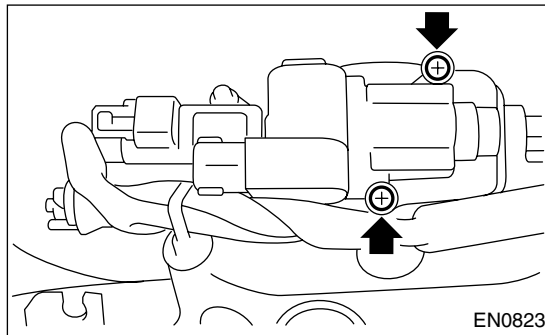
Install in the reverse order of removal.

CAUTION:

Always use new gasket.

Tightening torque:

2.8 N·m (0.29 kgf-m, 2.1 ft-lb)



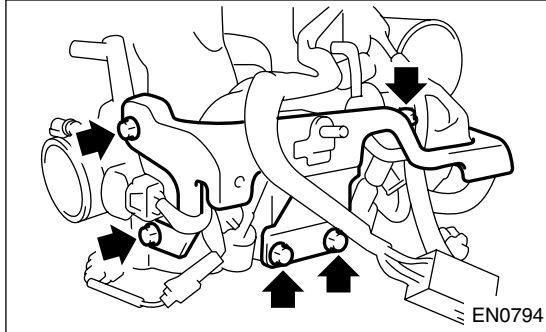
12. Fuel Injector

A: REMOVAL

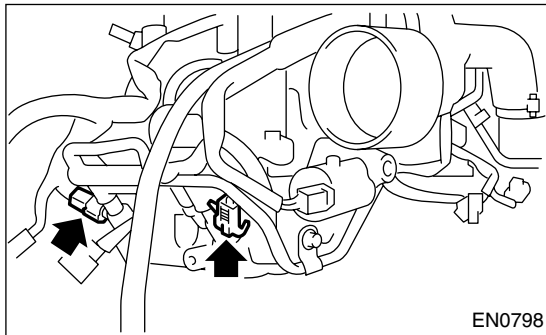
1. RH SIDE

1) Remove intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>

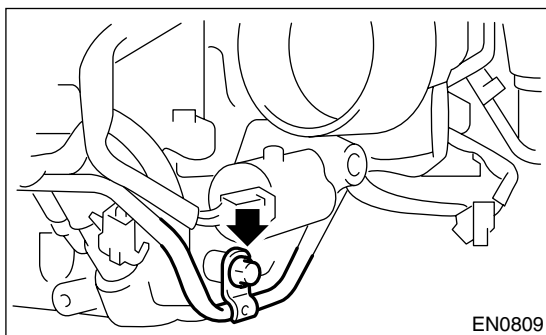
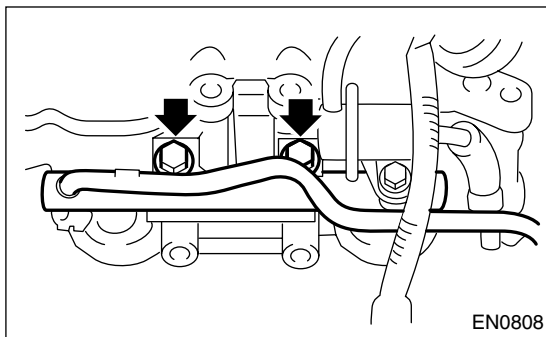
2) Remove fuel pipe protector RH.



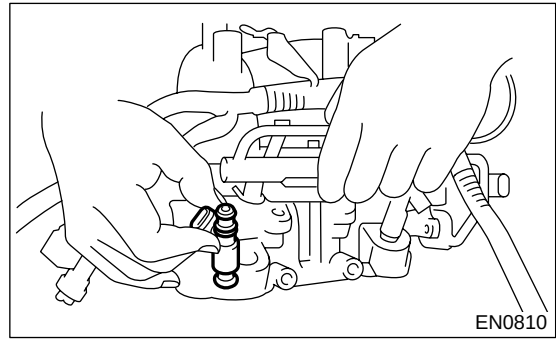
3) Disconnect connector from fuel injector.



4) Remove bolts which hold injector pipe to intake manifold.



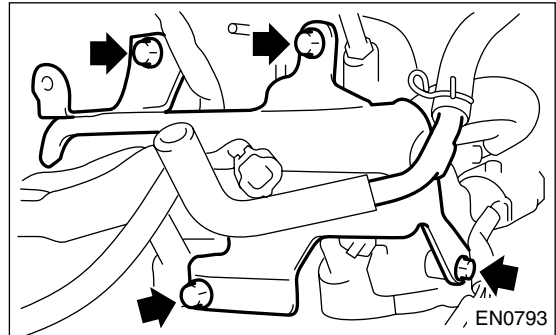
5) Remove fuel injector while lifting up fuel injector pipe.



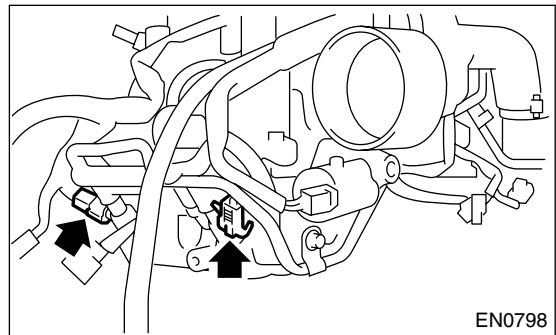
2. LH SIDE

1) Remove intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>

2) Remove fuel pipe protector LH.



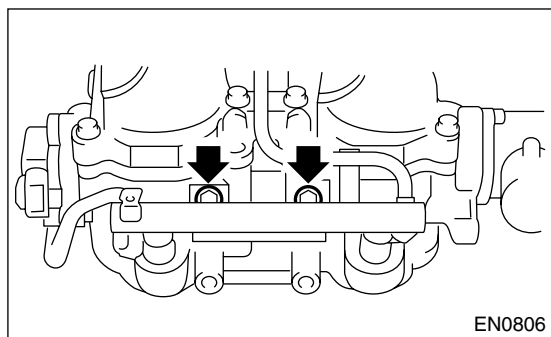
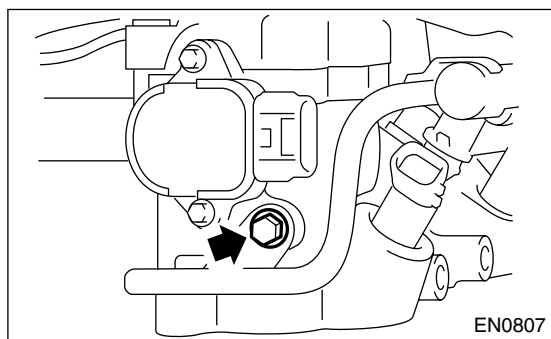
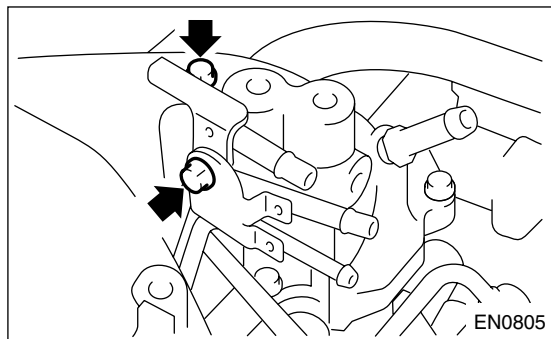
3) Disconnect connector from fuel injector.



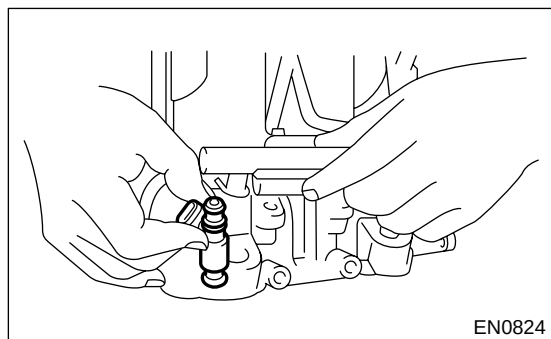
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

4) Remove bolts which hold injector pipe to intake manifold.



5) Remove fuel injector while lifting up fuel injector pipe.



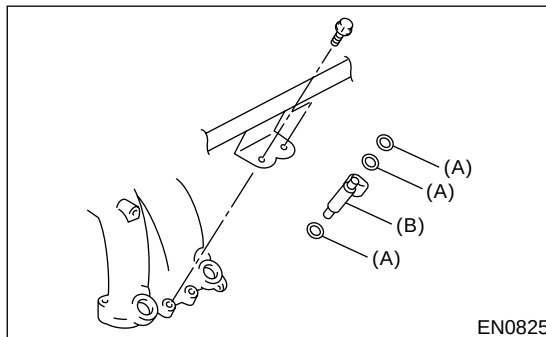
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

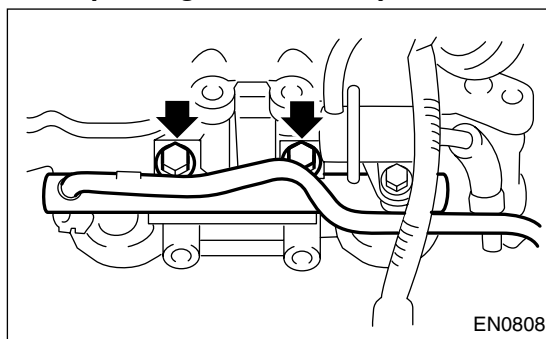
Replace O-ring and insulators with new ones.



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

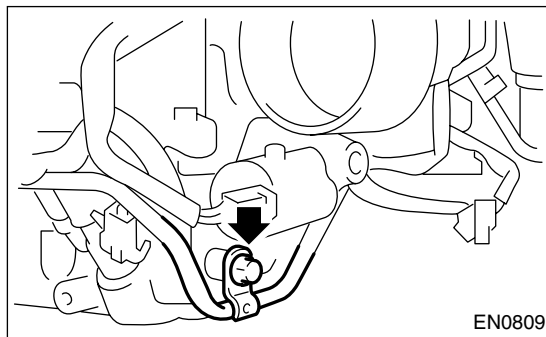
Tightening torque:

19 N·m (1.94 kgf-m, 14.0 ft-lb)



Tightening torque:

19 N·m (1.94 kgf-m, 14.0 ft-lb)

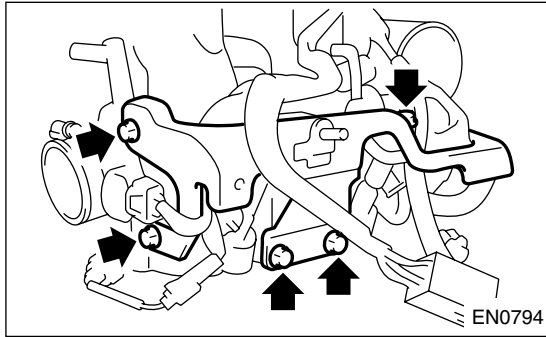


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

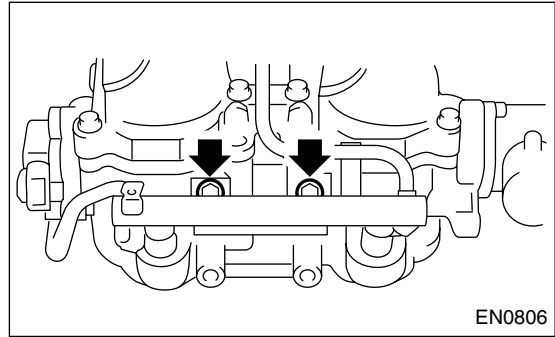
Tightening torque:

19 N·m (1.94 kgf-m, 14.0 ft-lb)



Tightening torque:

19 N·m (1.94 kgf-m, 14.0 ft-lb)

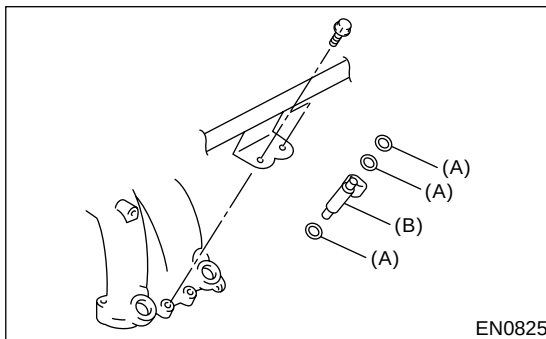


2. LH SIDE

Install in the reverse order of removal.

NOTE:

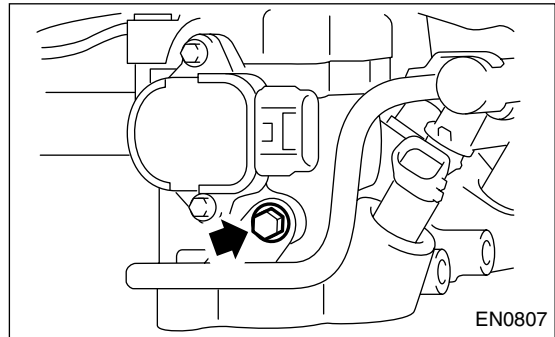
Replace O-ring and insulators with new ones.



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

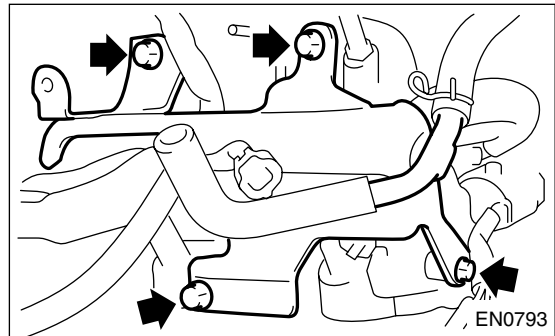
Tightening torque:

19 N·m (1.94 kgf-m, 14.0 ft-lb)



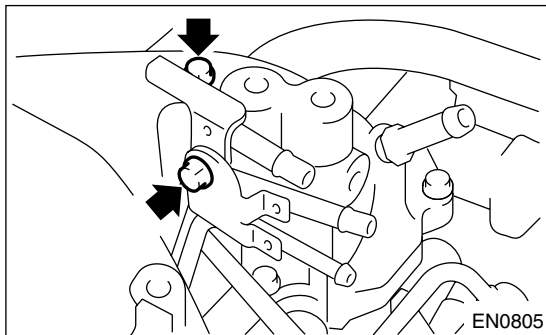
Tightening torque:

19 N·m (1.94 kgf-m, 14.0 ft-lb)



Tightening torque:

5 N·m (0.51 kgf-m, 3.69 ft-lb)



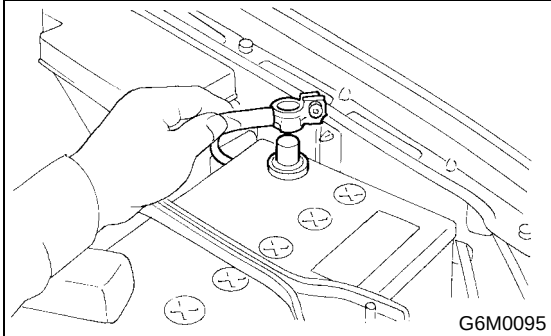
TUMBLE GENERATOR VALVE ASSEMBLY

FUEL INJECTION (FUEL SYSTEMS)

13. Tumble Generator Valve Assembly

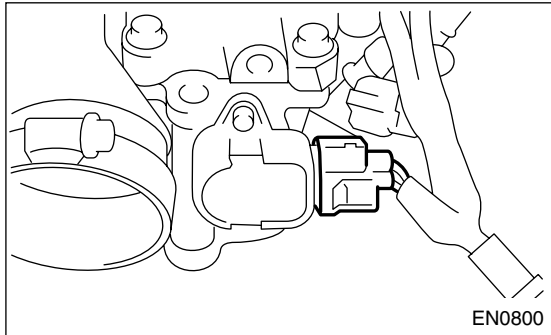
A: REMOVAL

1) Disconnect battery ground cable.

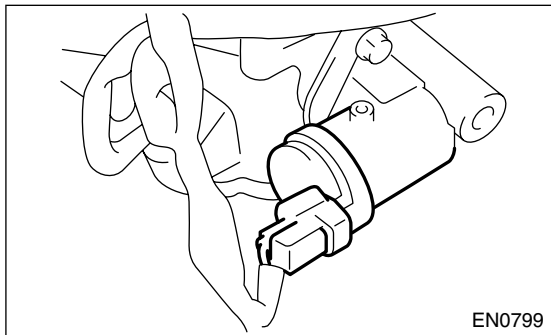


2) Remove intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>

3) Disconnect connector from tumble generator valve sensor.

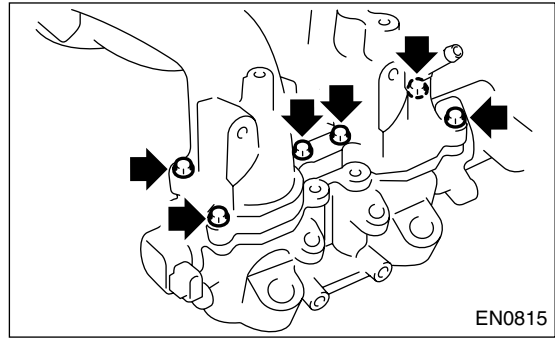


4) Disconnect connector from tumble generator valve actuator.



5) Remove fuel injector. <Ref. to FU(DOHC TURBO)-35, REMOVAL, Fuel Injector.>

6) Remove tumble generator valve body from intake manifold.



B: INSTALLATION

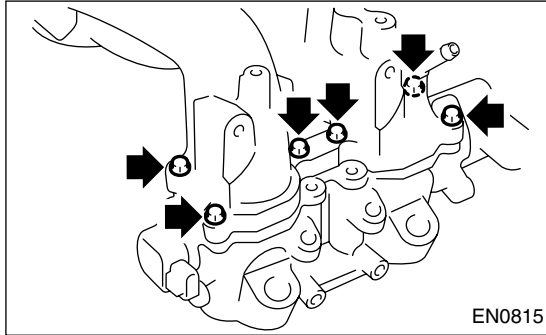
Install in the reverse order of removal.

NOTE:

Always use new gaskets.

Tightening torque:

8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



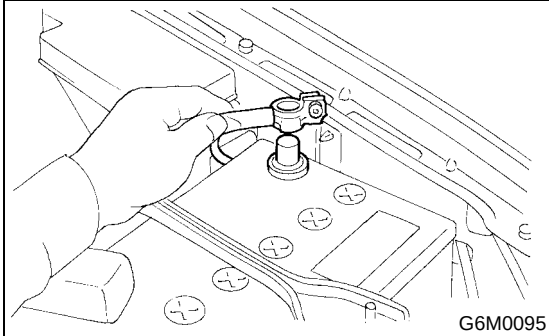
WASTEGATE CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

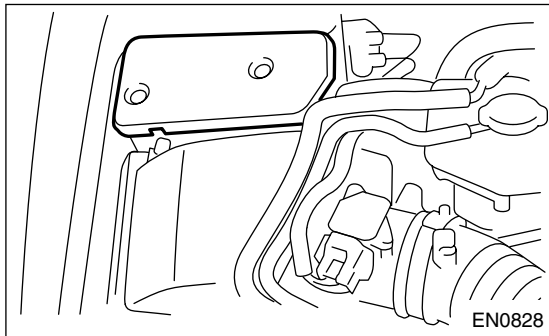
14.Wastegate Control Solenoid Valve

A: REMOVAL

- 1) Disconnect battery ground cable.

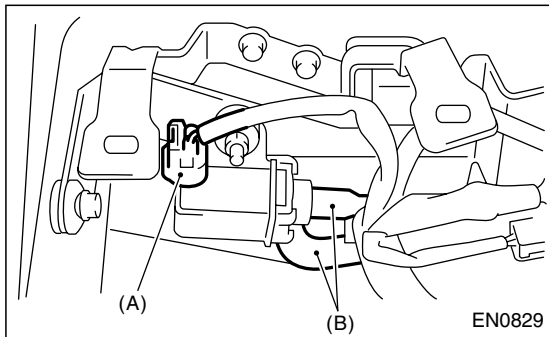


- 2) Remove solenoid valve cover.

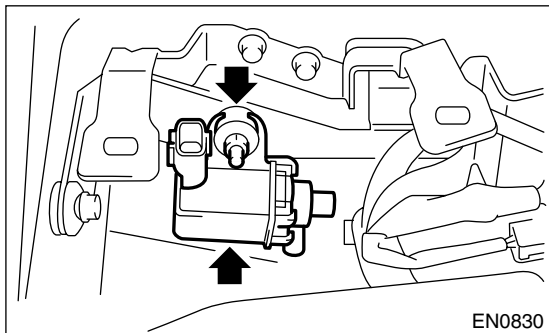


- 3) Disconnect connector (A) from wastegate control solenoid valve.

- 4) Disconnect pressure hoses (B) from wastegate control solenoid valve.



- 5) Remove wastegate control solenoid valve from bracket

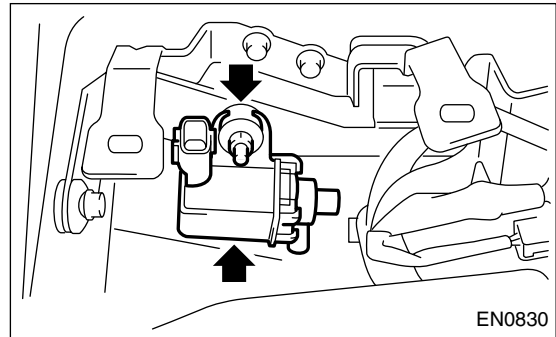


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



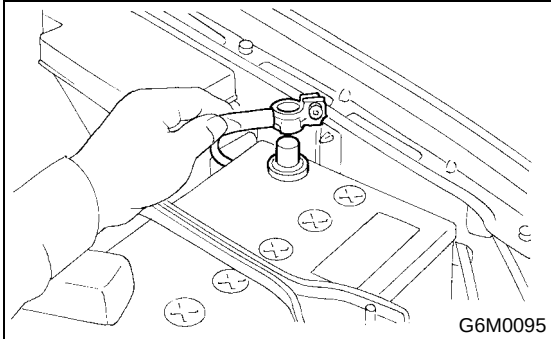
FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

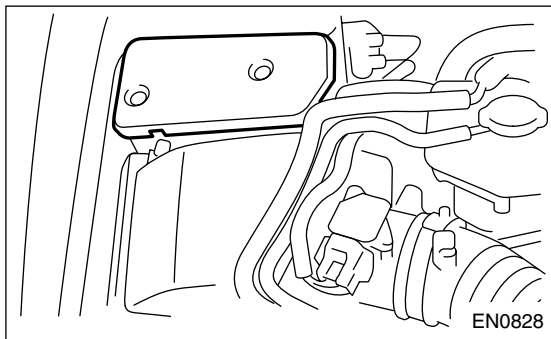
15.Front Oxygen (A/F) Sensor

A: REMOVAL

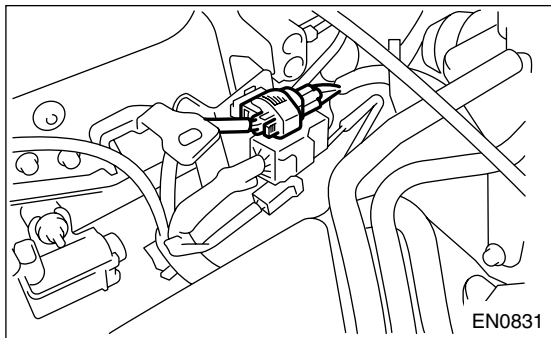
1) Disconnect battery ground cable.



2) Remove solenoid valve cover.



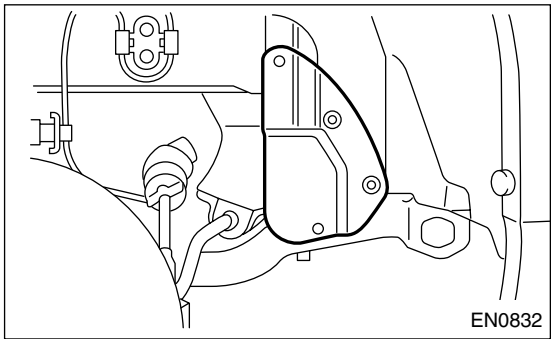
3) Disconnect connector from front oxygen (A/F) sensor.



4) Remove front right side wheel.

5) Lift-up the vehicle.

6) Remove service hole cover.



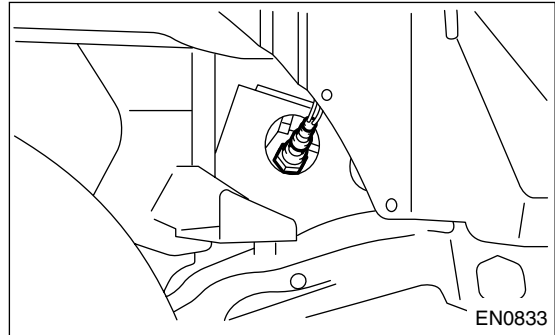
7) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

8) Remove front oxygen (A/F) sensor.

CAUTION:

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



FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

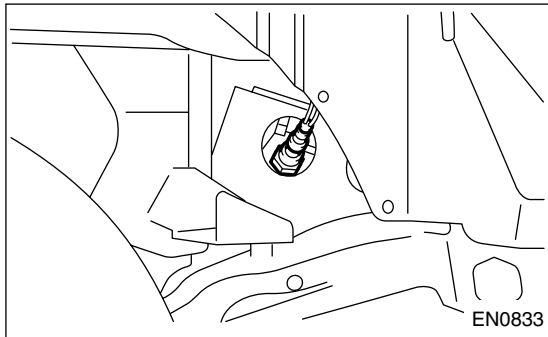
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

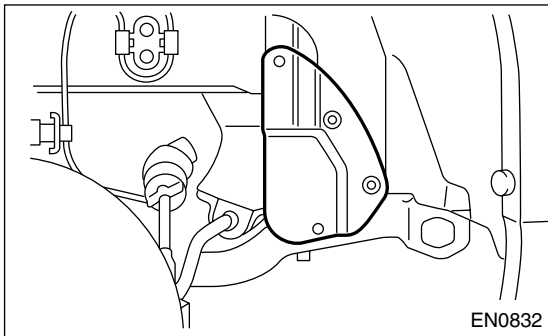
CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

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

Tightening torque:
21N·m (2.1 kgf-m, 15.2 ft-lb)



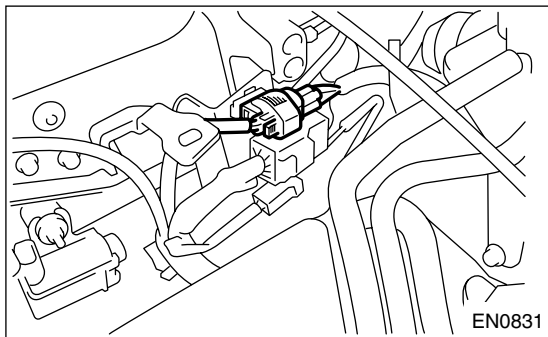
3) Install service hole cover.



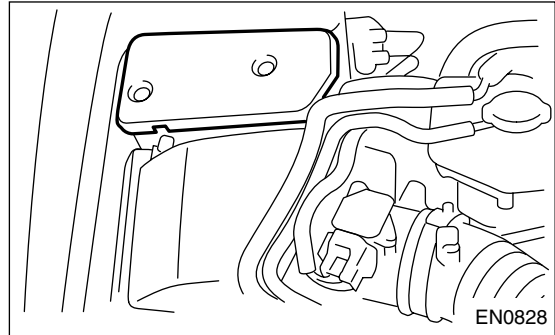
4) Lower the vehicle.

5) Install front right side wheel.

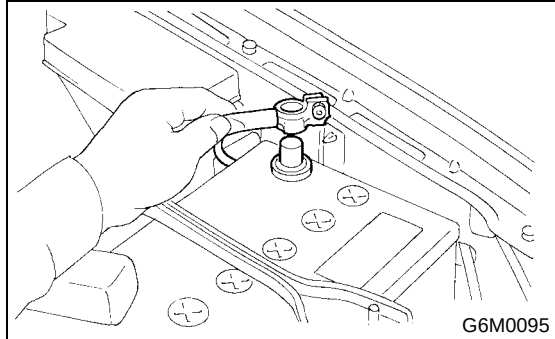
6) Connect connector of front oxygen (A/F) sensor.



7) Install solenoid valve cover.



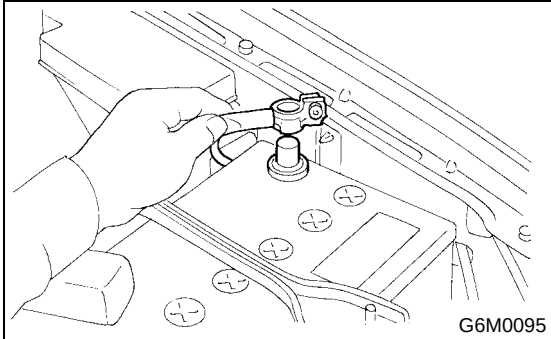
8) Connect battery ground cable.



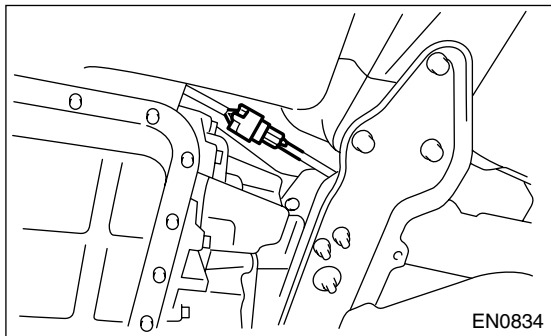
16.Rear Oxygen Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



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



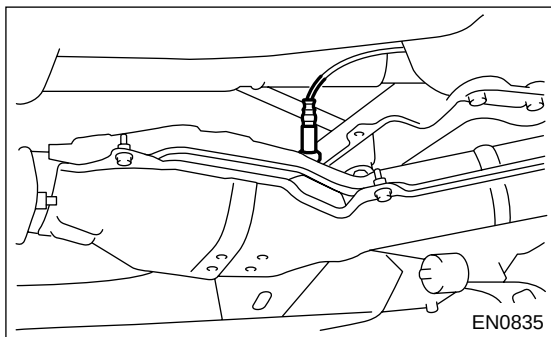
- 4) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove rear oxygen sensor.

CAUTION:

When removing the oxygen sensor, wait until exhaust pipe cools, 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.

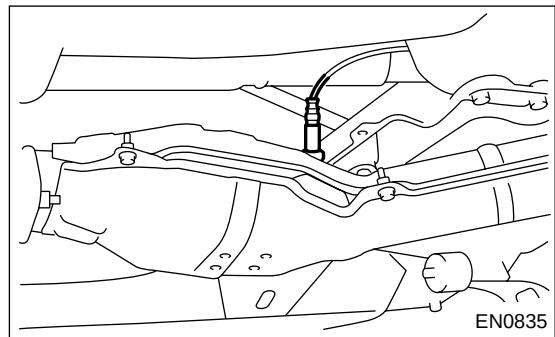
Anti-seize compound:

SS-30 by JET LUBE

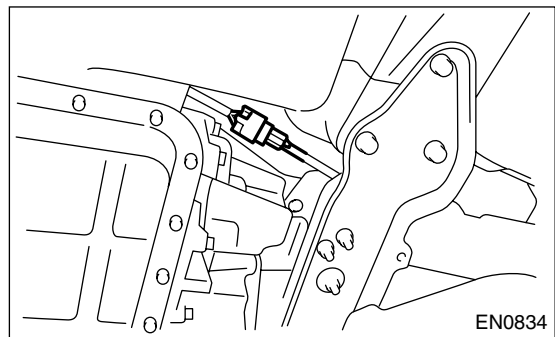
- 2) Install rear oxygen sensor.

Tightening torque:

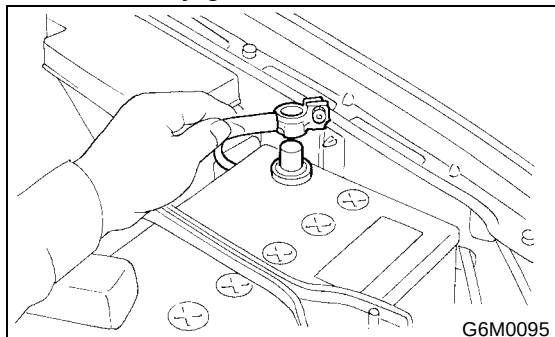
21 N·m (2.1 kgf-m, 15.2 ft-lb)



- 3) Connect connector to rear oxygen sensor.



- 4) Lower the vehicle.
- 5) Connect battery ground cable.



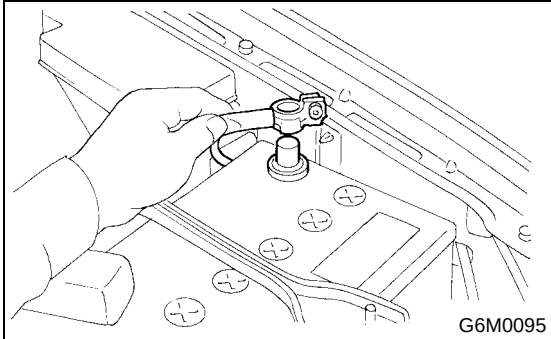
EXHAUST TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

17.Exhaust Temperature Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Remove joint pipe. <Ref. to EX(DOHC TURBO)-12, REMOVAL, Joint Pipe.>

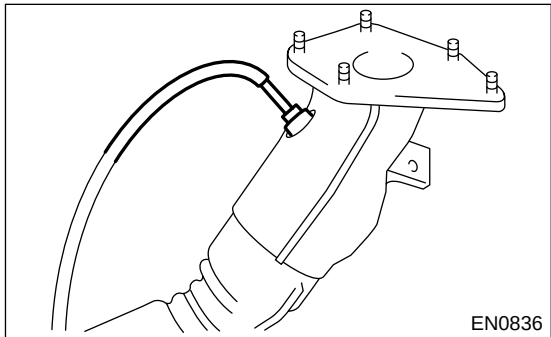
- 3) Apply SUBARU CRC or its equivalent to threaded portion of exhaust temperature sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

- 4) Remove exhaust temperature.

CAUTION:

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



B: INSTALLATION

- 1) Before installing exhaust temperature 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 exhaust temperature sensor.

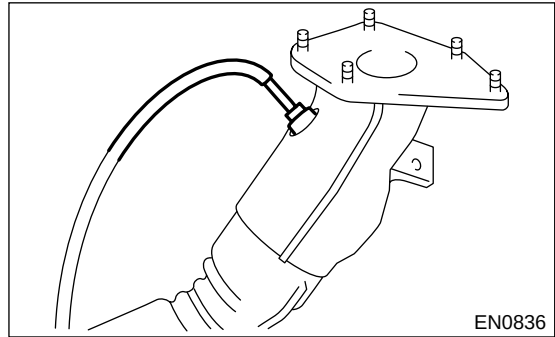
Anti-seize compound:

SS-30 by JET LUBE

- 2) Install rear oxygen sensor.

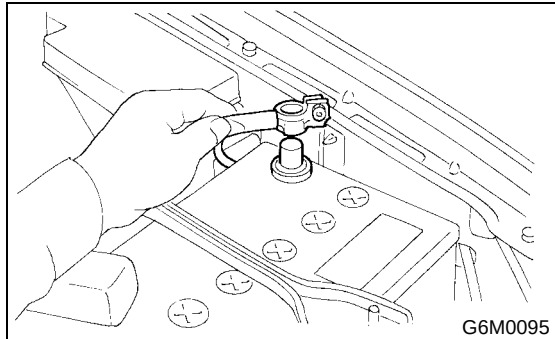
Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)



- 3) Install joint pipe <Ref. to EX(DOHC TURBO)-12, INSTALLATION, Joint Pipe.>

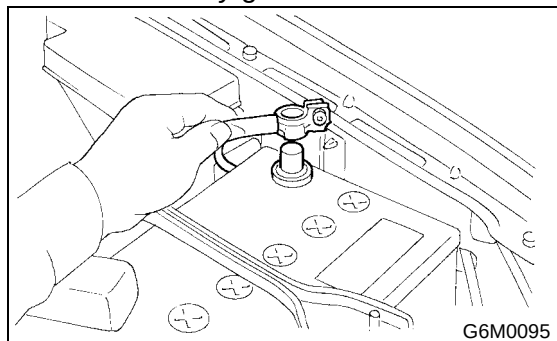
- 4) Connect battery ground cable.



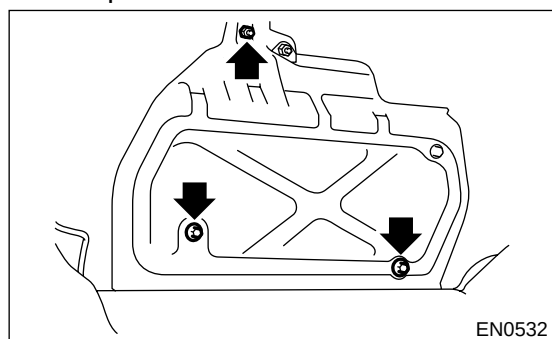
18.Engine Control Module

A: REMOVAL

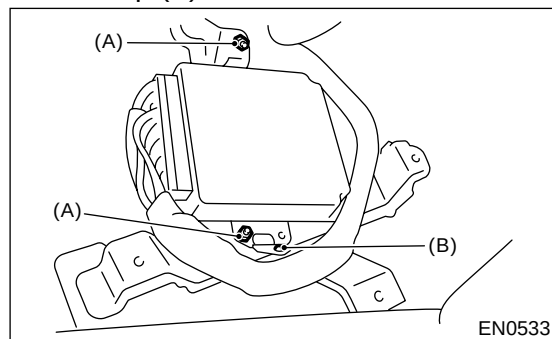
- 1) Disconnect battery ground cable.



- 2) Remove lower inner trim of passenger side.
<Ref. to EI-29, REMOVAL, Lower Inner Trim.>
3) Detach floor mat of front 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.

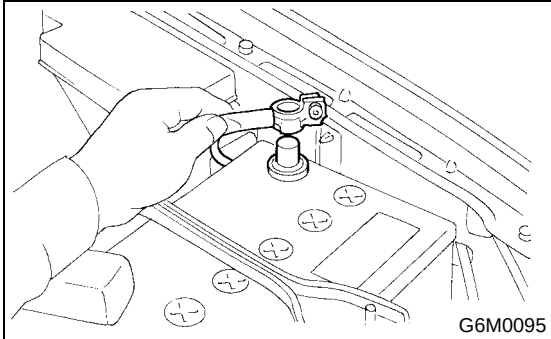
CAUTION:

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

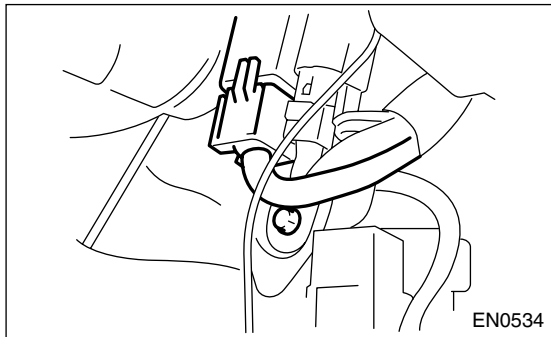
19.Main Relay

A: REMOVAL

- 1) Disconnect battery ground cable.



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



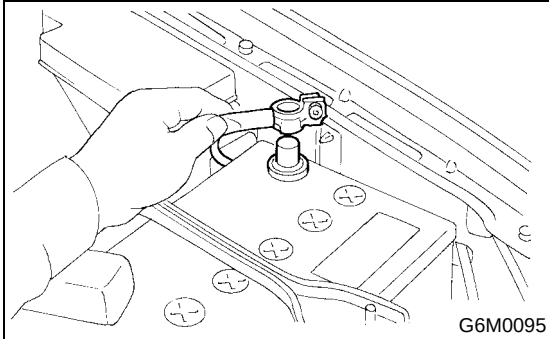
B: INSTALLATION

Install in the reverse order of removal.

20. Fuel Pump Relay

A: REMOVAL

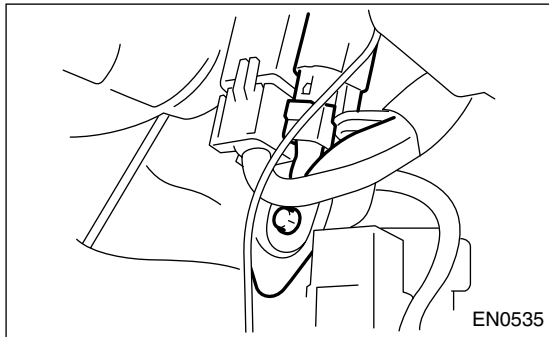
1) Disconnect battery ground cable.



2) Remove passenger's side front side sill cover.

3) Remove bolt which holds fuel pump relay bracket on body.

4) Disconnect connector from fuel pump relay.



5) Remove fuel pump relay from mounting bracket.

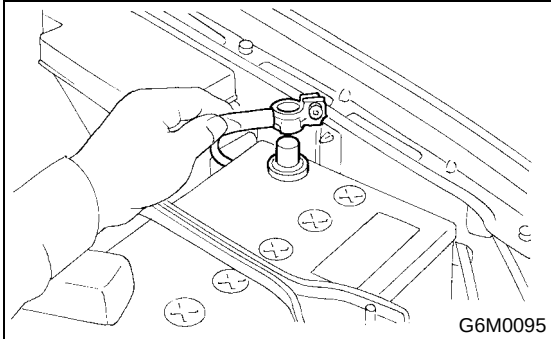
B: INSTALLATION

Install in the reverse order of removal.

21. Fuel Pump Controller

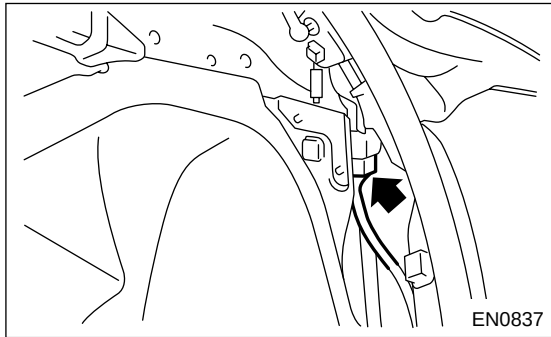
A: REMOVAL

1) Disconnect battery ground cable.

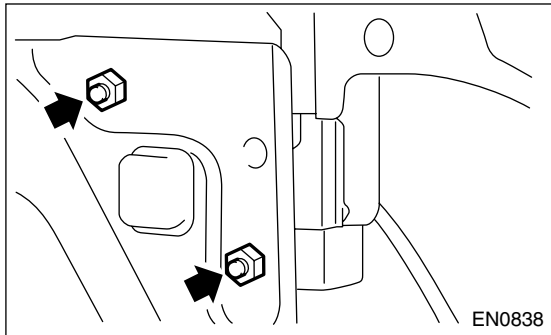


2) Remove rear quarter Trim. <Ref. to EI-30, REMOVAL, Rear Quarter Trim.>

3) Disconnect connector from fuel pump control unit.



4) Remove fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

22.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.



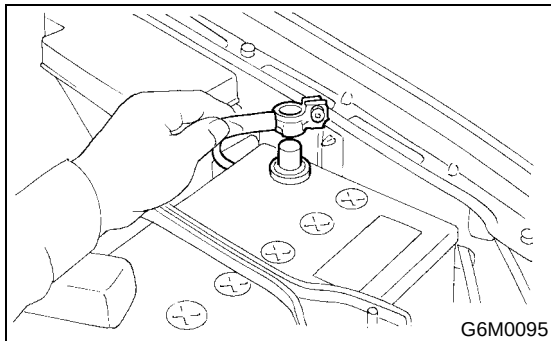
- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn ignition switch to OFF.

2. DRAINING FUEL

WARNING:

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

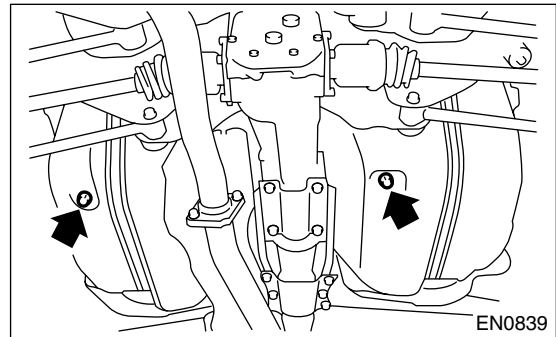
- 1) Set vehicle on the lift.
- 2) Disconnect battery ground cable.



- 3) Lift-up the vehicle.

- 4) Drain fuel from fuel tank.

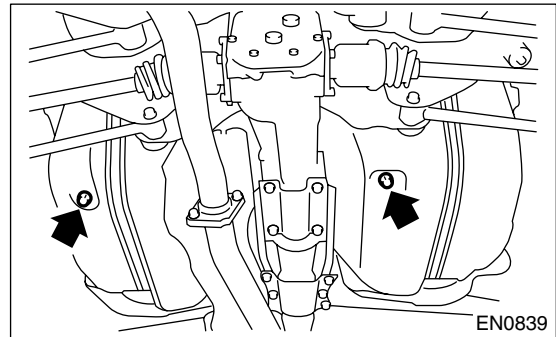
Set a container under the vehicle and remove drain plug from fuel tank.



- 5) Tighten fuel drain plug.

Tightening torque:

26 N·m (2.65 kgf·m, 19.2 ft·lb)



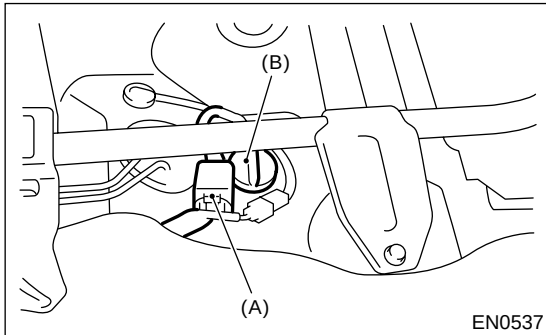
23. Fuel Tank

A: REMOVAL

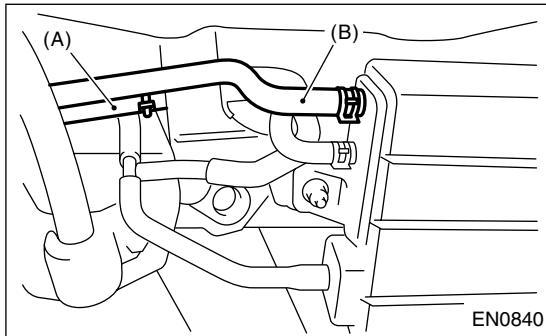
WARNING:

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

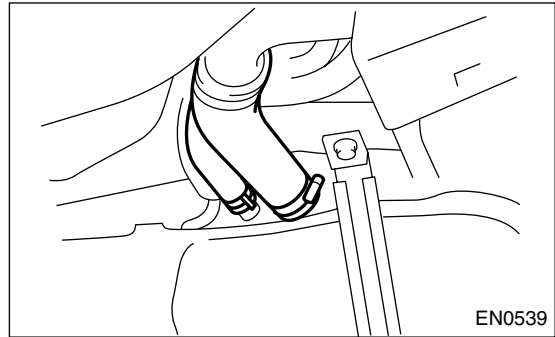
- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain fuel from fuel tank. <Ref. to FU(DOHC TURBO)-49, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove rear seat.
- 5) Disconnect connector (A) of fuel tank cord to rear harness.
- 6) Push grommet (B) which holds fuel tank cond on floor panel into under the body.



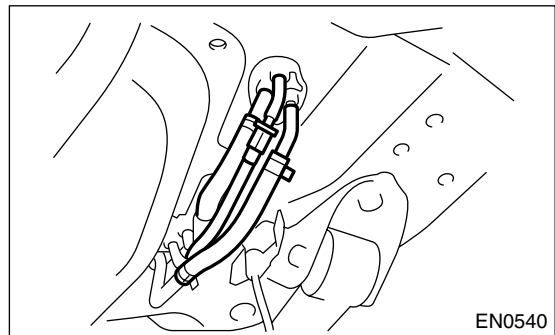
- 7) Remove rear crossmember. <Ref. to RS-22, REMOVAL, Rear Crossmember.>
- 8) Disconnect two-way valve hose (A) from two-way valve and disconnect canister hose (B) from canister.



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



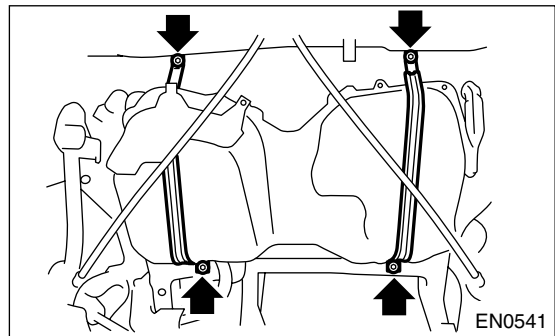
- 10) Move clips, and disconnect quick connector. <Ref. to FU(DOHC TURBO)-64, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 11) Disconnect fuel hoses.



- 12) 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.



B: INSTALLATION

- 1) Support fuel tank with transmission jack and push fuel tank harness into access hole with grommet.

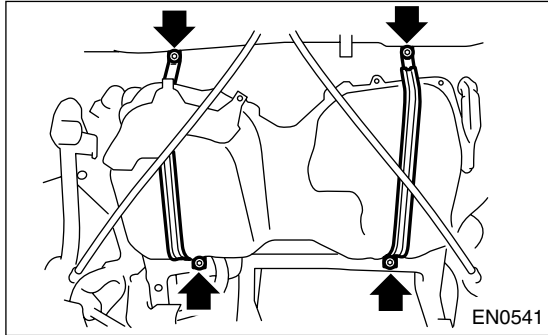
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

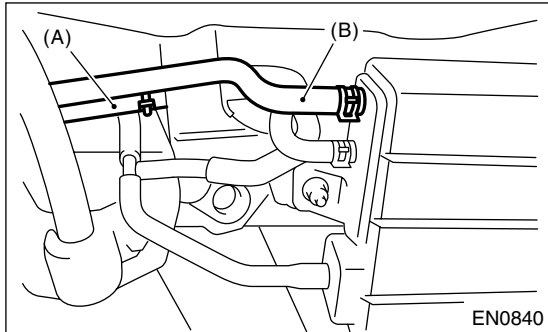
2) Set fuel tank and temporarily tighten bolts of fuel tank bands.

WARNING:

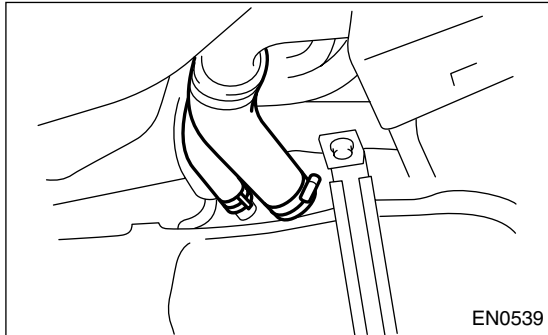
A helper is required to perform this work.



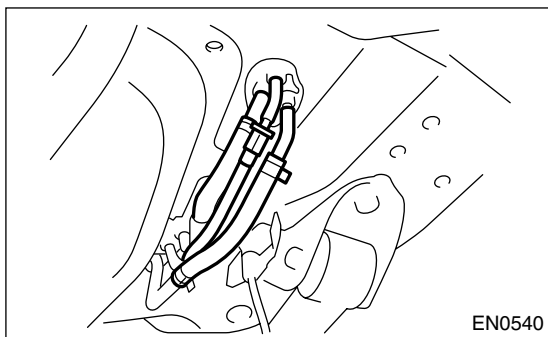
3) Connect two-way valve hose (A) to two-way valve and connect canister hose (B) to canister.



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



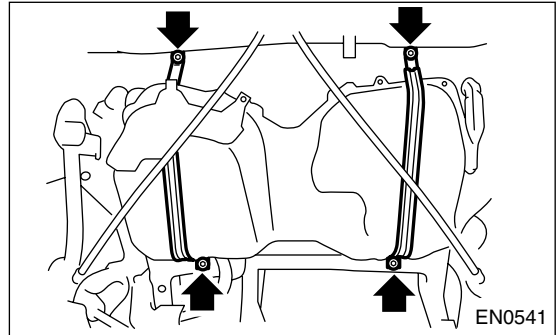
5) Connect fuel hoses, and hold then with clips and quick connector. <Ref. to FU(DOHC TURBO)-65, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



6) Tighten band mounting bolts.

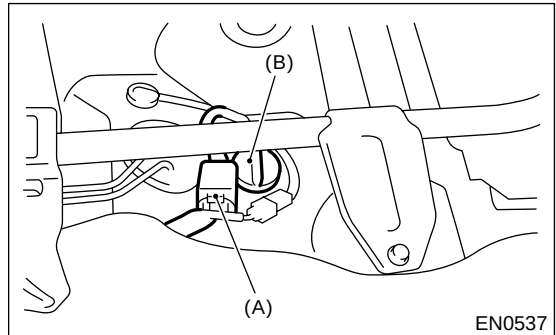
Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



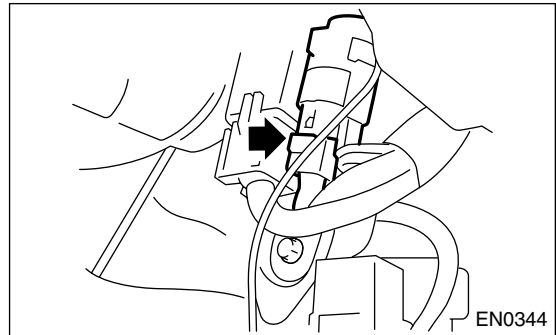
7) Install rear crossmember. <Ref. to RS-23, INSTALLATION, Rear Crossmember.>

8) Connect connector (A) to fuel tank cord and plug service hole with grommet (B).



9) Set rear seat and floor mat.

10) Connect connector to fuel pump relay.



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.

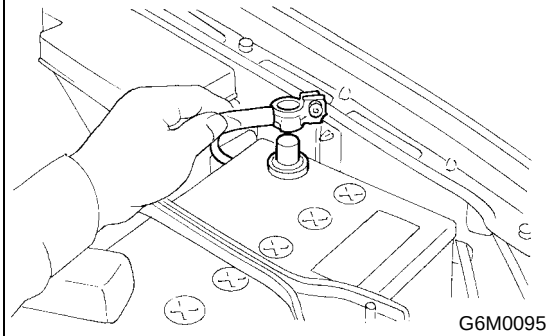
24. Fuel Filler Pipe

A: REMOVAL

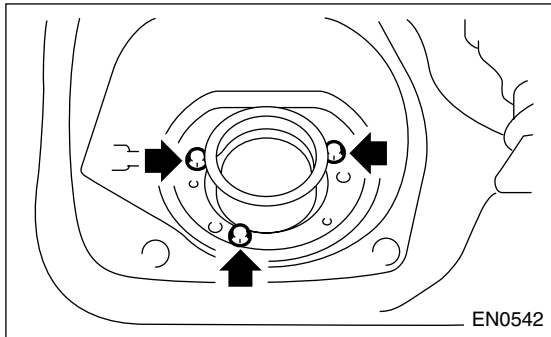
WARNING:

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

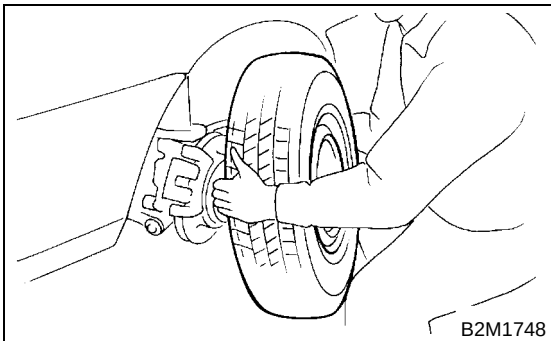
- 1) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel filler flap lid and remove filler cap.
- 3) Disconnect battery ground cable.



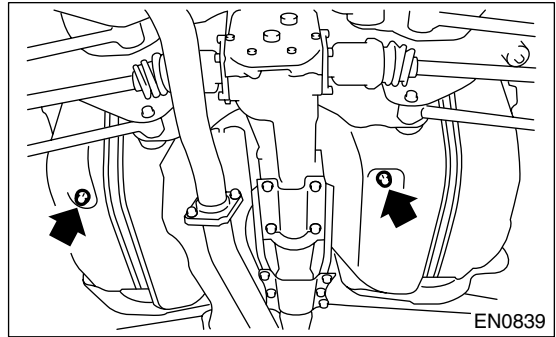
- 4) Remove screws holding packing in place.



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



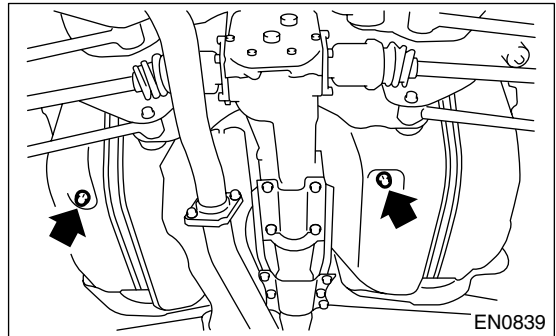
- 8) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



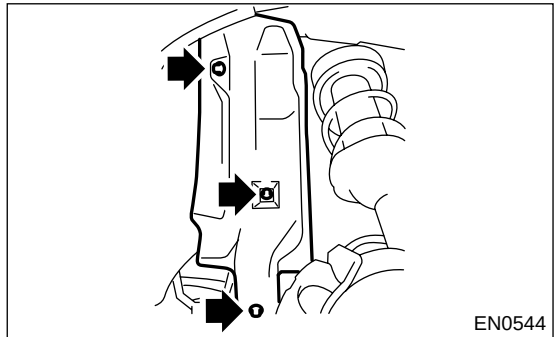
- 9) Tighten fuel drain plug and then install front right side tank cover.

Tightening torque:

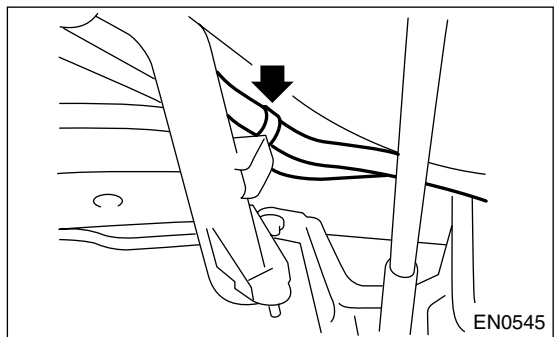
$26 \pm 7 \text{ N}\cdot\text{m}$ ($2.65 \pm 0.7 \text{ kgf}\cdot\text{m}$, $19.2 \pm 5.1 \text{ ft}\cdot\text{lb}$)



- 10) Remove fuel filler pipe protector.



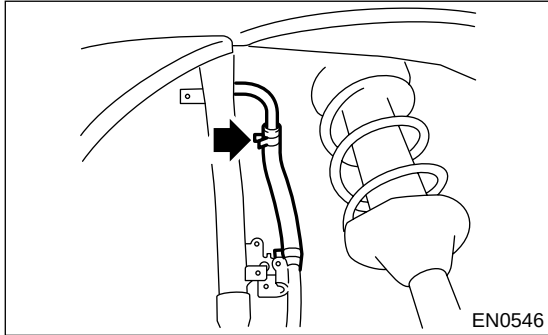
- 11) Separate evaporation hoses from clip of fuel filler pipe.



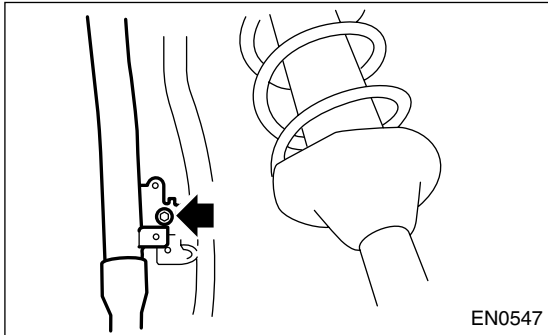
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

- 12) Deisconnect air vent hose from fuel filler pipe.

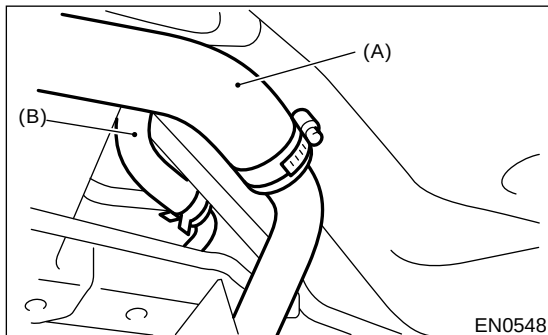


- 13) Remove bolts which hold fuel filler pipe bracket on body.



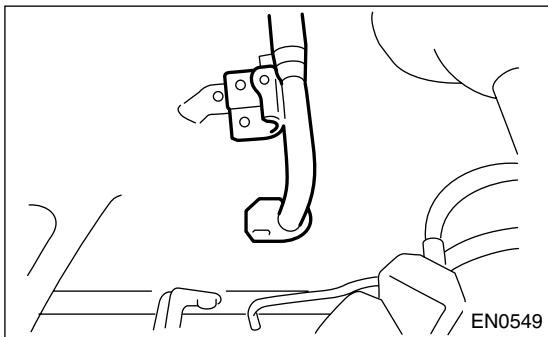
- 14) Loosen clamp and separate fuel filler hose (A) from fuel filler pipe.

- 15) Move clip and separate air vent hose (B).



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

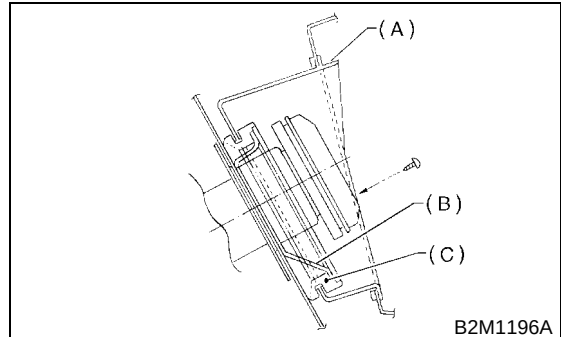
- 17) Remove air vent pipe together with clip from body.



B: INSTALLATION

- 1) Hold fuel filler flap open.

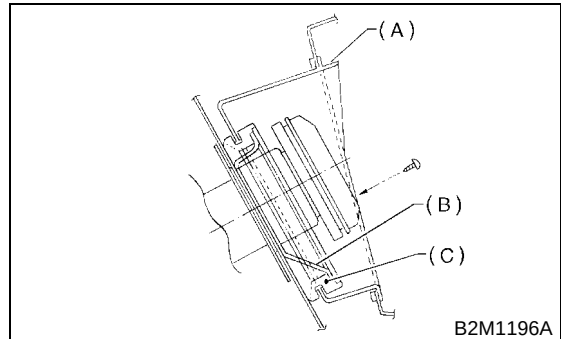
- 2) Set fuel saucer (A) with rubber packing (C) and insert fuel filler pipe into hole from the inner side of apron.



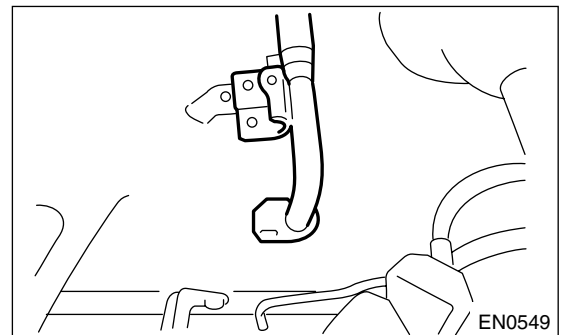
- 3) Align holes in fuel filler pipe neck and set cup (B), and tighten screws.

NOTE:

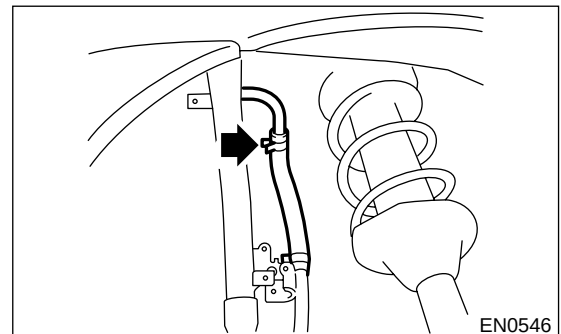
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



- 4) Install air vent pipe.



- 5) Connect air vent hose to fuel filler pipe.



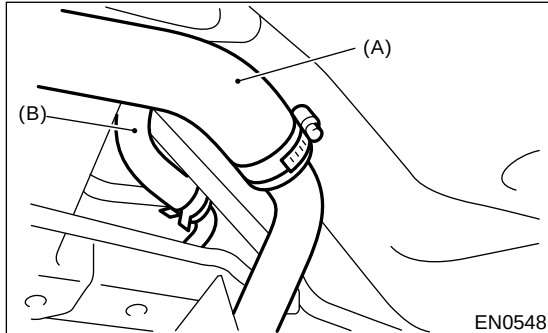
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

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

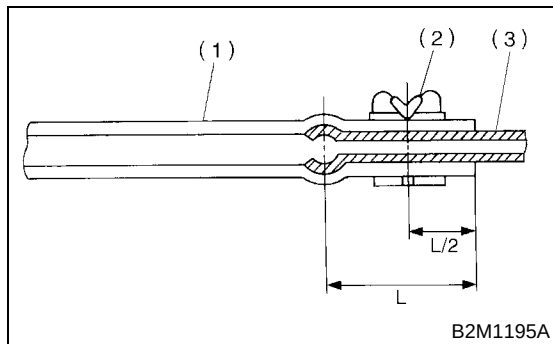
CAUTION:

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



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

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

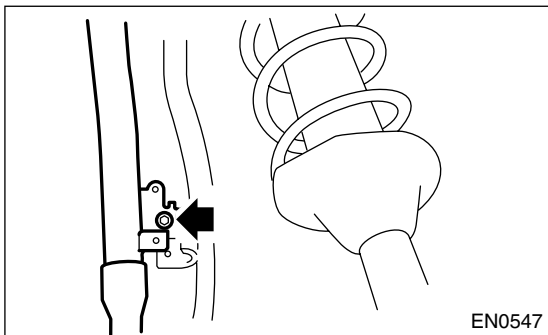


- (1) Hose
- (2) Clip
- (3) Pipe

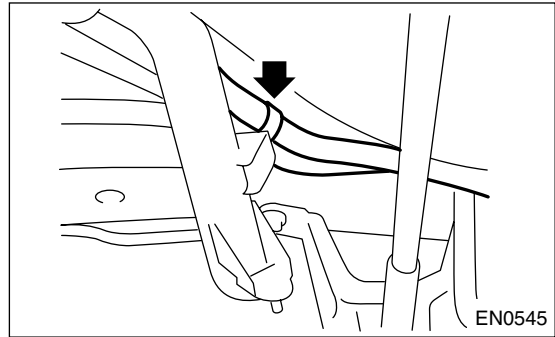
8) Tighten bolt which holds fuel filler pipe bracket on body.

Tightening torque:

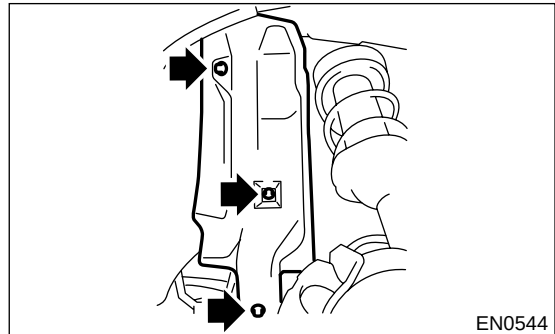
$7.4 \text{ N} \cdot \text{m (0.75 kgf} \cdot \text{m, 5.4 ft} \cdot \text{lb)}$



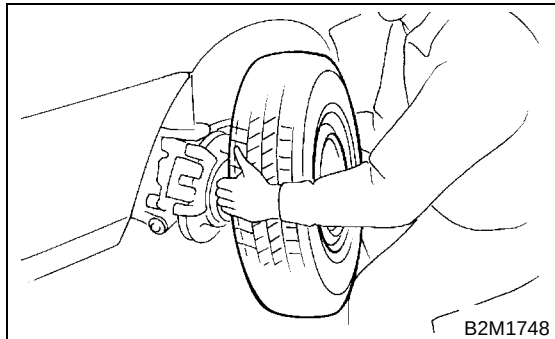
9) Tighten bolts which hold evaporation hoses onto clip of fuel filler pipe.



10) Install fuel filler pipe protector.



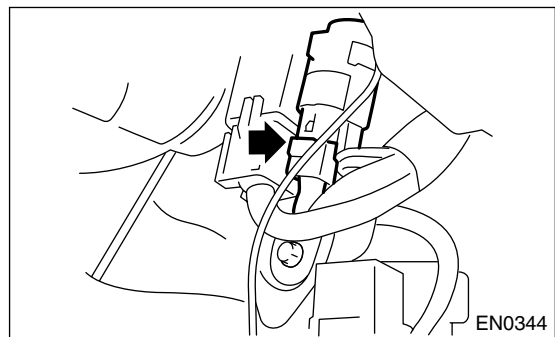
11) Install rear right wheel.



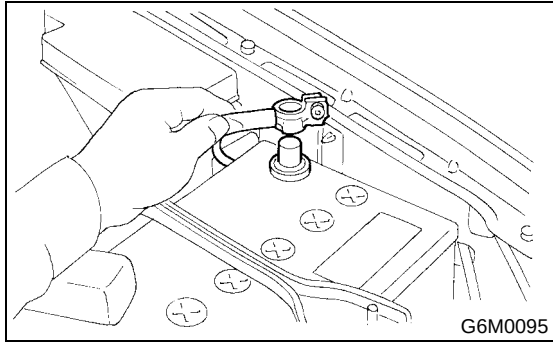
12) Lower the vehicle.

13) Tighten wheel nuts.

14) Connect connector to fuel pump relay.



15) Connect battery ground terminal.



25.Fuel Pump

A: REMOVAL

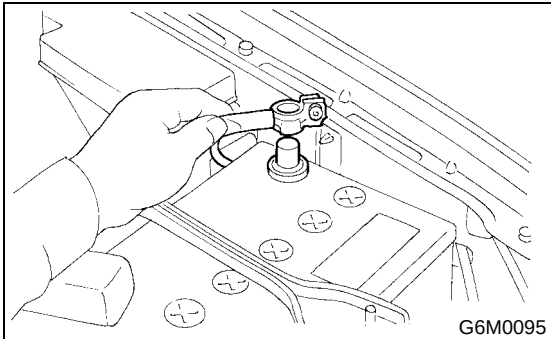
WARNING:

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

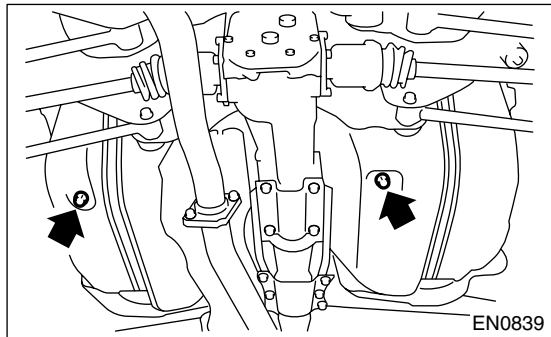
NOTE:

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

- 1) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect battery ground cable.



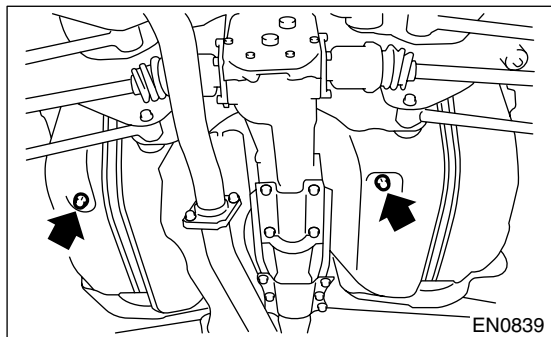
- 4) Lift-up the vehicle.
- 5) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



- 6) Tighten fuel drain plug.

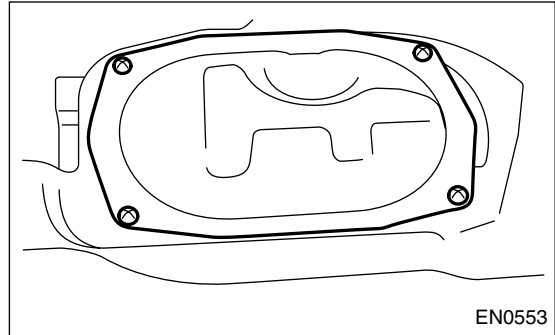
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)

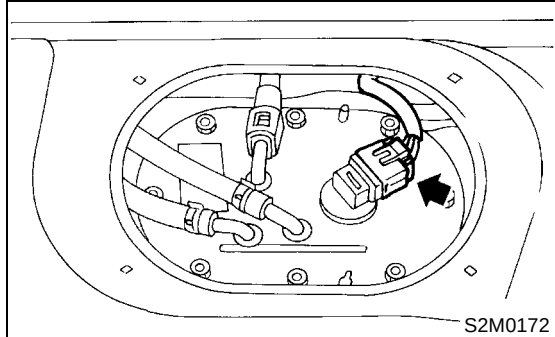


- 7) Raise rear seat and turn floor mat up.

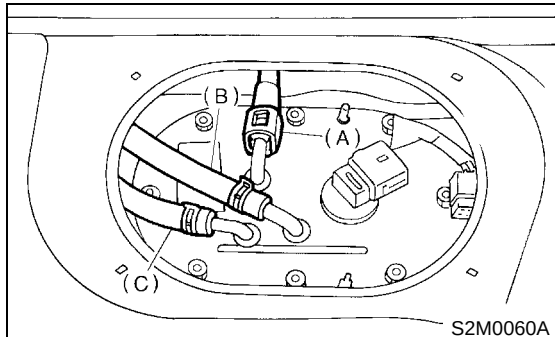
- 8) Remove access hole lid.



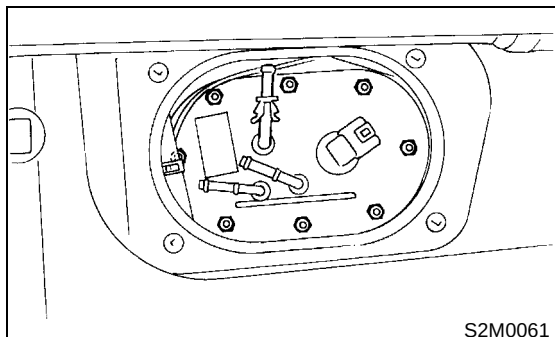
- 9) Disconnect connector from fuel pump.



- 10) Disconnect quick connector and then disconnect fuel delivery hose (A). <Ref. to FU(DOHC TURBO)-64, Fuel Delivery, Return and Evaporation Lines.>
- 11) Move clips, and then disconnect fuel return hose (B) and jet pump hose (C).



- 12) Remove nuts which install fuel pump assembly onto fuel tank.



- 13) Take off fuel pump assembly from fuel tank.

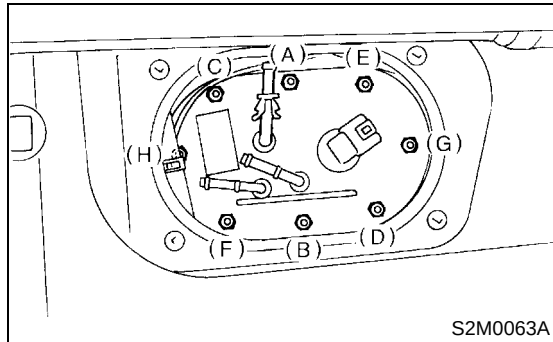
B: INSTALLATION

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

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

Tightening torque:

5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

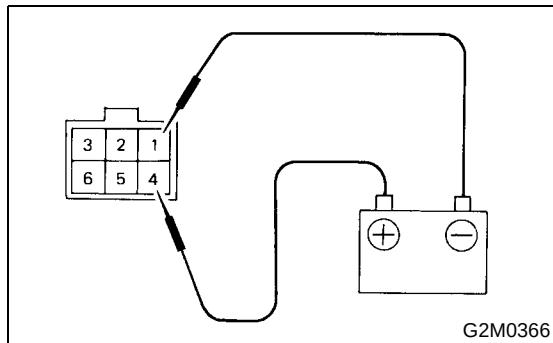


C: INSPECTION

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

WARNING:

- Wipe off the fuel completely.
- Keep 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 fuel pump for a long time under non-load condition.



26.Fuel Level Sensor

A: REMOVAL

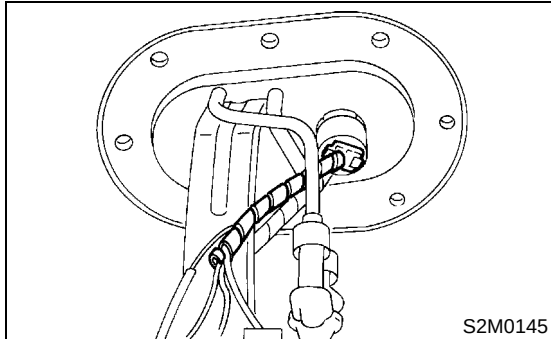
WARNING:

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

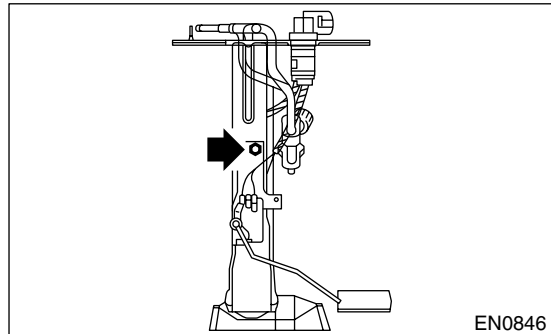
NOTE:

Fuel level sensor is built in fuel pump assembly.

- 1) Remove fuel pump assembly. <Ref. to FU(DOHC TURBO)-56, REMOVAL, Fuel Pump.>
- 2) Disconnect connector from fuel pump bracket.



- 3) Remove bolt which installs fuel level sensor on mounting bracket.



B: INSTALLATION

Install in the reverse order of removal.

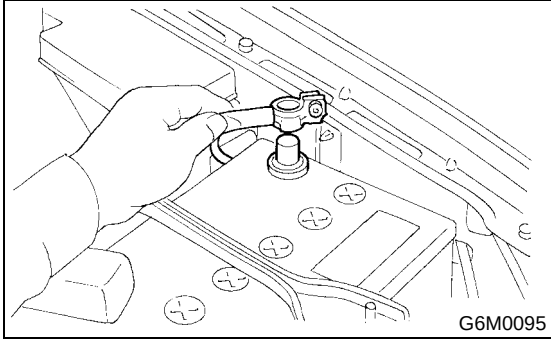
27. Fuel Sub Level Sensor

A: REMOVAL

WARNING:

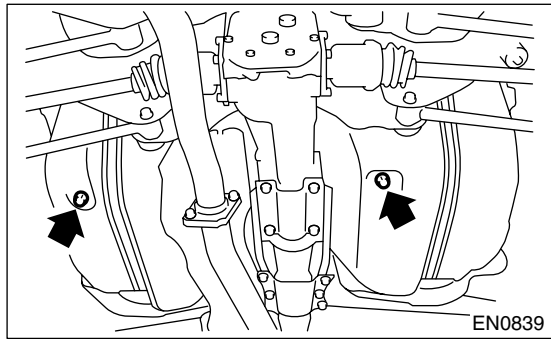
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect battery ground cable.



2) Lift-up the vehicle.

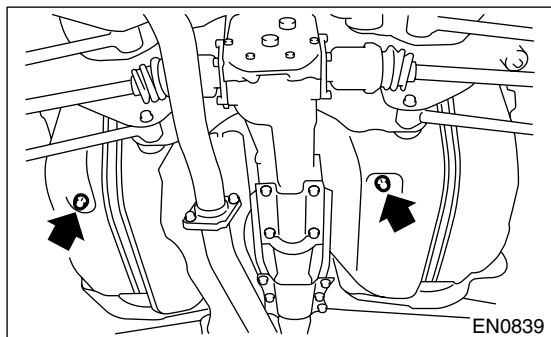
3) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



4) Tighten fuel drain plug.

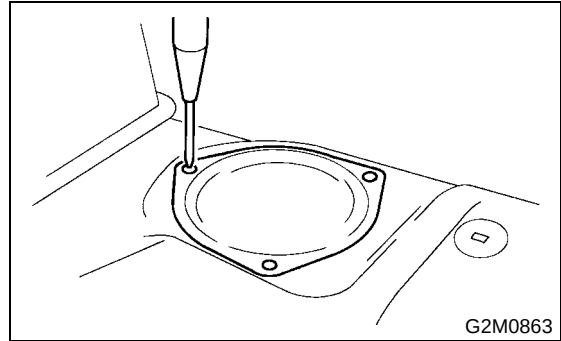
Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



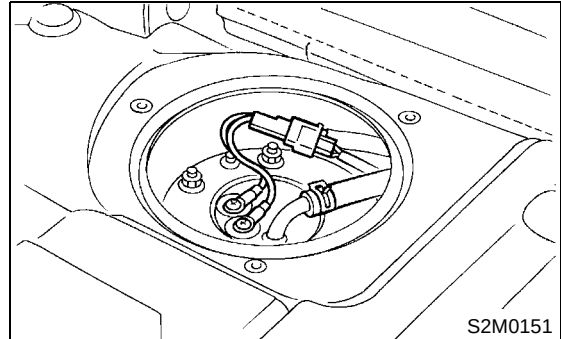
5) Remove rear seat.

6) Remove service hole cover.

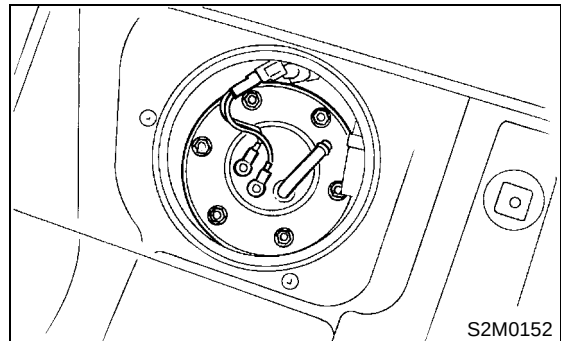


7) Disconnect connector from fuel sub meter.

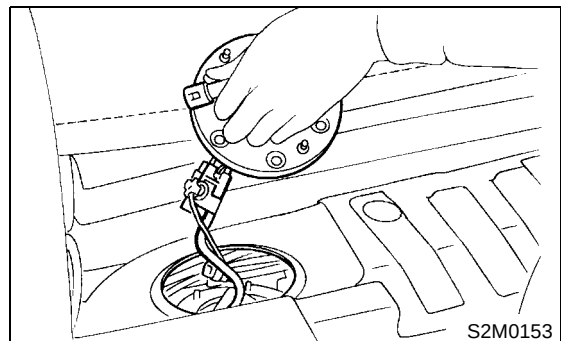
8) Disconnect fuel jet pump hose.



9) Remove bolts which install fuel sub meter unit on fuel tank.



10) Remove fuel sub meter unit.



FUEL SUB LEVEL SENSOR

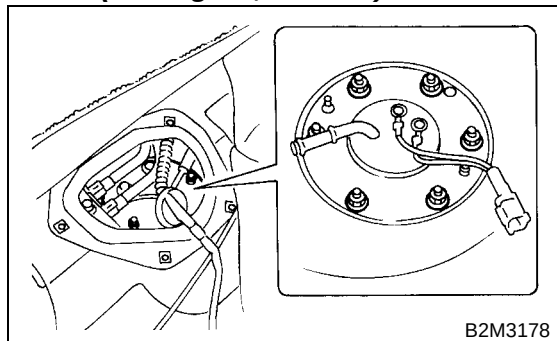
FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



B2M3178

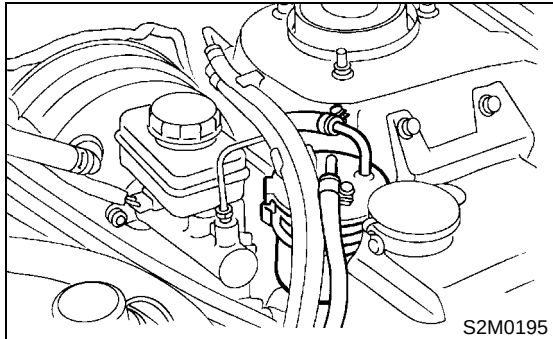
28.Fuel Filter

A: REMOVAL

WARNING:

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

- 1) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Disconnect fuel delivery hoses from fuel filter.



- 3) Remove filter from holder.

B: INSTALLATION

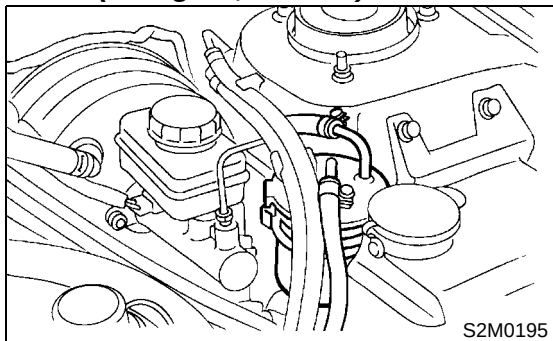
CAUTION:

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

- 1) Install in the reverse order of removal.
- 2) Tighten hose clamp screws.

Tightening torque:

1.0 N·m (0.1 kgf-m, 0.7 ft-lb)



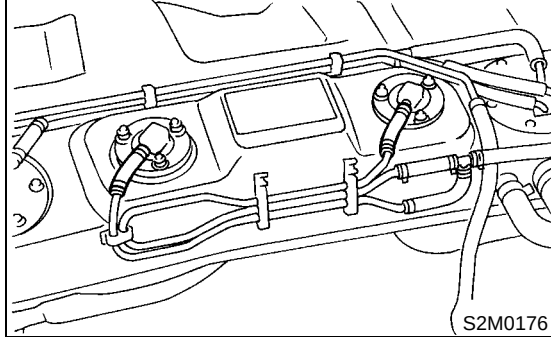
C: INSPECTION

- 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.
- 3) If water is found in it, shake and expel the water from inlet port.

29.Fuel Cut Valve

A: REMOVAL

- 1) Remove fuel tank. <Ref. to FU(DOHC TURBO)-50, REMOVAL, Fuel Tank.>
- 2) Move clip and disconnect evaporation hose from fuel cut valve.



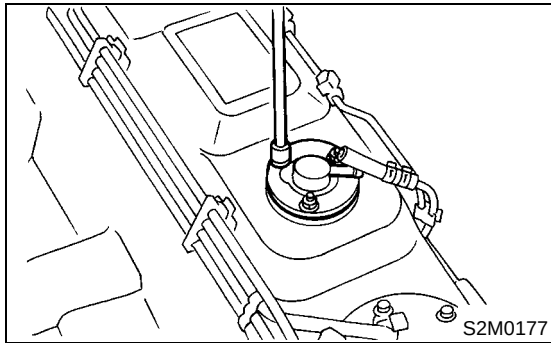
- 3) Remove bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

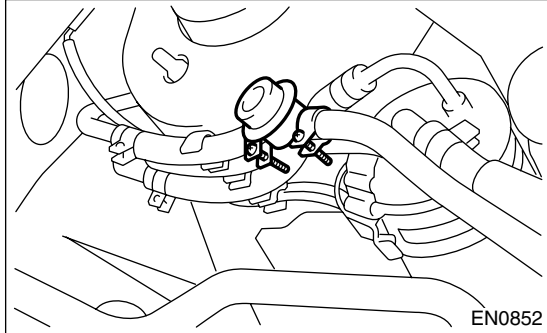
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



30.Fuel Damper Valve

A: REMOVAL

- 1) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Remove fuel damper valve from fuel return line.



B: INSTALLATION

Install in the reverse order of removal.

FUEL DELIVERY, RETURN AND EVAPORATION LINES

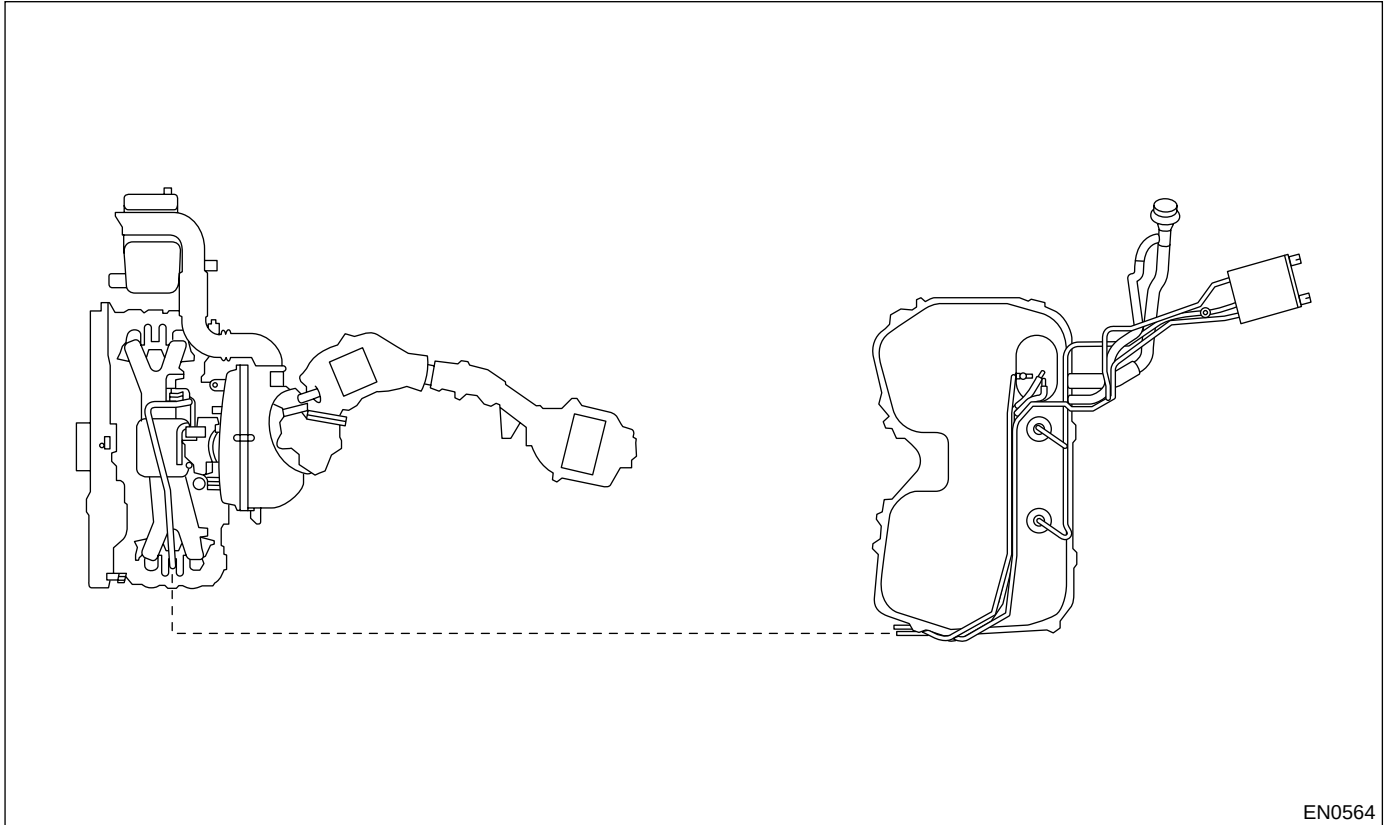
FUEL INJECTION (FUEL SYSTEMS)

31. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

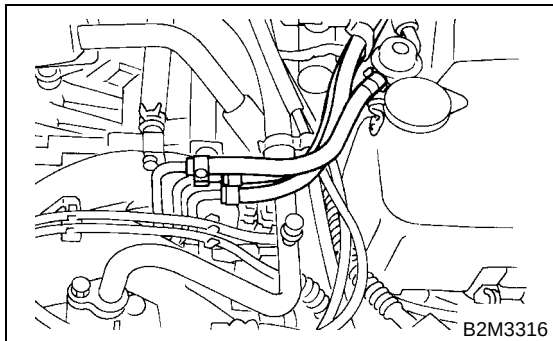
- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

- 3) Open fuel filler flap lid and remove fuel filler cap.
- 4) Remove floor mat. <Ref. to EI-37, REMOVAL, Floor Mat.>
- 5) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



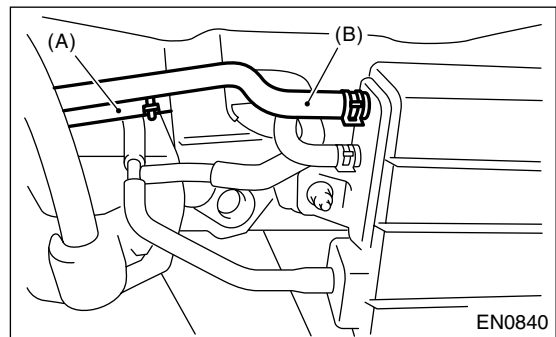
EN0564

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



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

- 8) Disconnect two-way valve hose (A) from two-way valve and disconnect canister hose (B) from canister.



EN0840

- 7) Lift-up the vehicle.

FUEL DELIVERY, RETURN AND EVAPORATION LINES

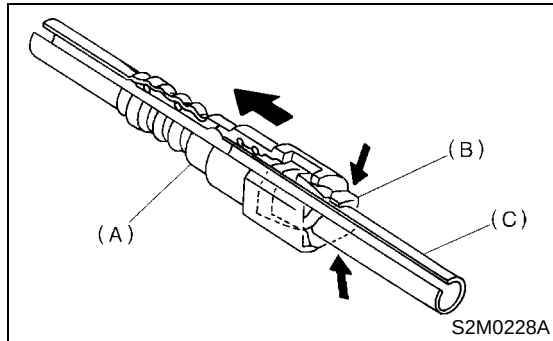
FUEL INJECTION (FUEL SYSTEMS)

9) Separate quick connector on fuel delivery and return line.

- (1) Clean pipe and connector, if they are covered with dust.
- (2) Hold connector (A) and push retainer (B) down.
- (3) Pull out connector (A) from retainer (B).

CAUTION:

Replace retainer with new ones.



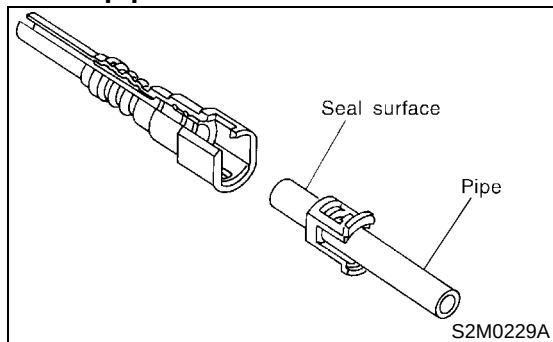
- (A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect quick connector on fuel delivery and return line.

CAUTION:

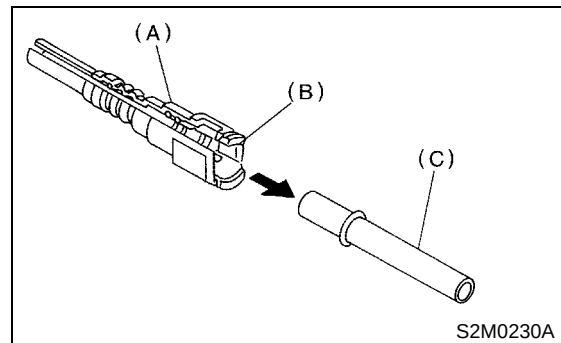
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface of pipe.



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

NOTE:

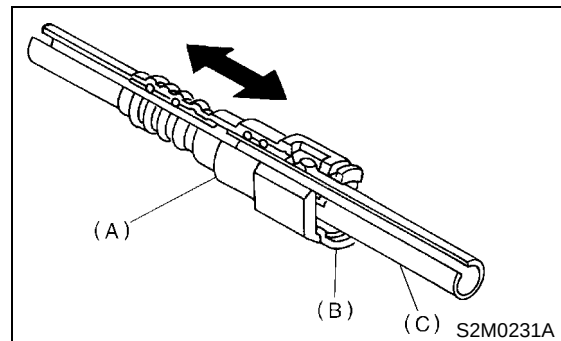
At this time, two clicking sounds are heard.



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

CAUTION:

- 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 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)

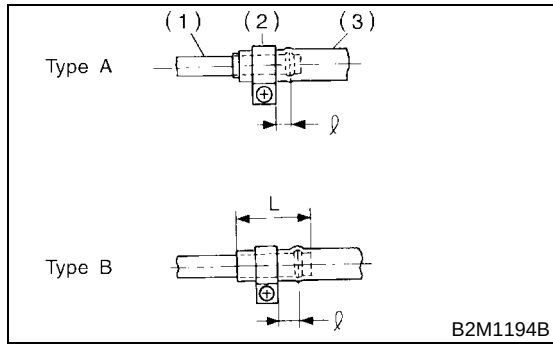
2) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.

Type B: When fitting length is not specified.

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

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



(1) Fitting

(2) Clamp

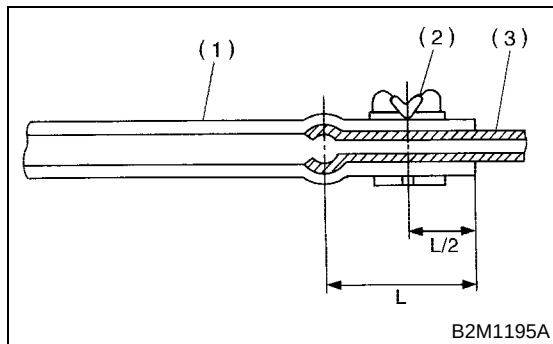
(3) Hose

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

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

CAUTION:

Be sure to inspect 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.

32. 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 fuel pump.
2)	Lowering of fuel pump function.	Replace fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace 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 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 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 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.

- Top off the fuel tank or drain the fuel completely.
 - 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.

(3) 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.

(4) 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)

ENGINE 2 SECTION

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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(SOHCw/oOBD)

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) *EC(DOHC TURBO)*

	Page
1. General Description	2
2. Front Catalytic Converter	3
3. Rear Catalytic Converter	4
4. Precatalytic Converter	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 negative terminal from battery.

FRONT CATALYTIC CONVERTER

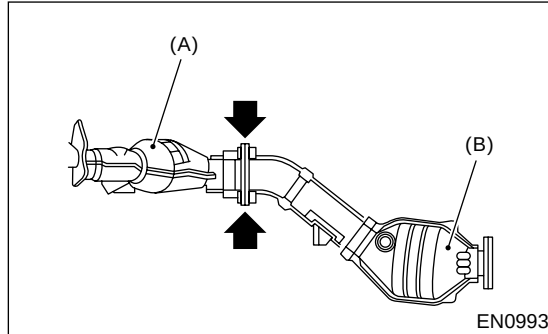
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. Front Catalytic Converter

A: REMOVAL

1) Remove center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>

2) Separate front catalytic converter (A) from rear catalytic converter (B).



B: INSTALLATION

NOTE:

Replace 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.

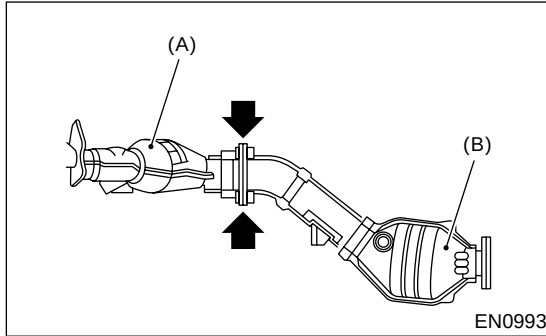
REAR CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

- 1) Remove center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>
- 2) Separate rear catalytic converter (B) from front catalytic converter (A).



B: INSTALLATION

NOTE:

Replace gaskets with new ones.
Install in the reverse order of removal.

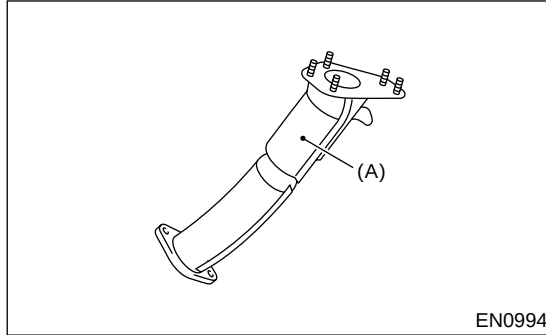
C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

4. Precatalytic Converter

A: REMOVAL

Precatalytic converter (A) is built in joint pipe. Refer to removal of joint pipe for removal procedure. <Ref. to EX(DOHC TURBO)-12, REMOVAL, Joint Pipe.>



B: INSTALLATION

Precatalytic converter is built in joint pipe. Refer to installation of joint pipe for installation procedure. <Ref. to EX(DOHC TURBO)-12, INSTALLATION, Joint Pipe.>

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

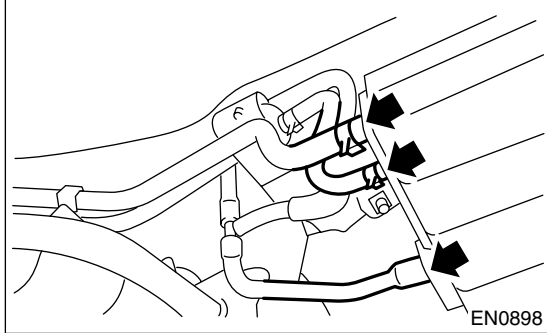
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

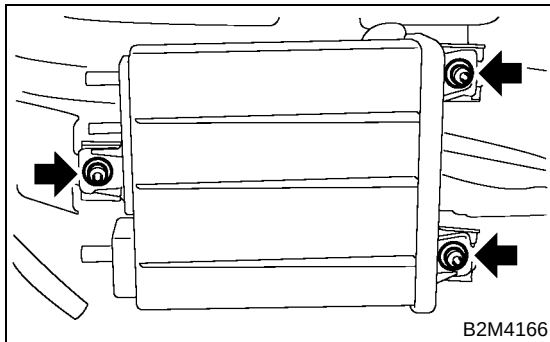
5. Canister

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.

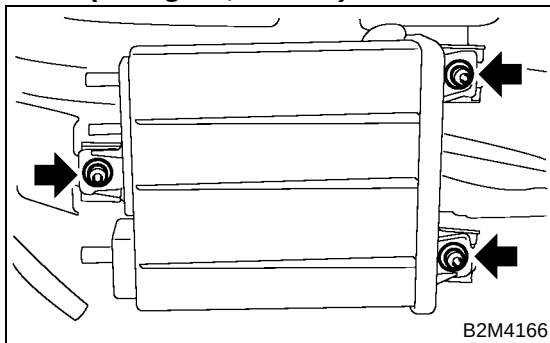


B: INSTALLATION

- 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.

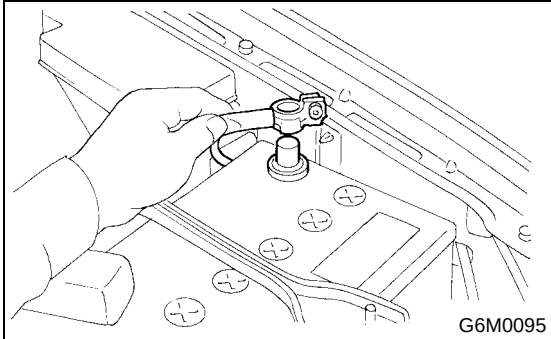
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

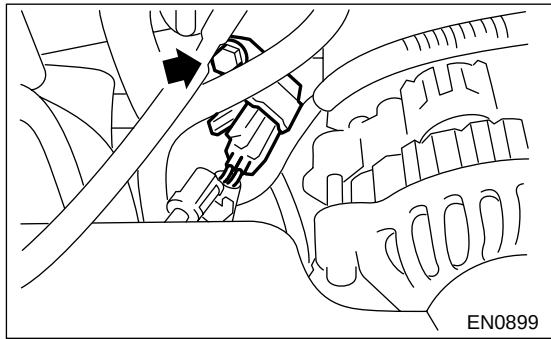
6. Purge Control Solenoid Valve

A: REMOVAL

- 1) Disconnect battery ground cable.



- 2) Disconnect connector and hoses from purge control solenoid valve.
- 3) Remove bolt which installs purge control solenoid valve onto intake manifold.

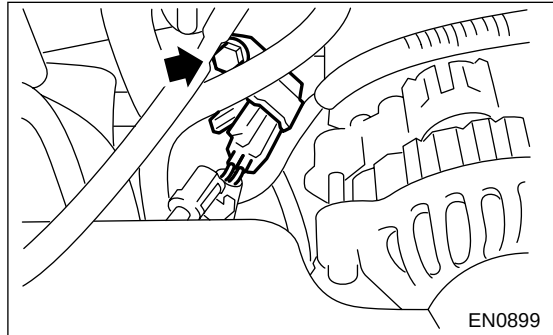


B: INSTALLATION

Install in the reverse order of removal.

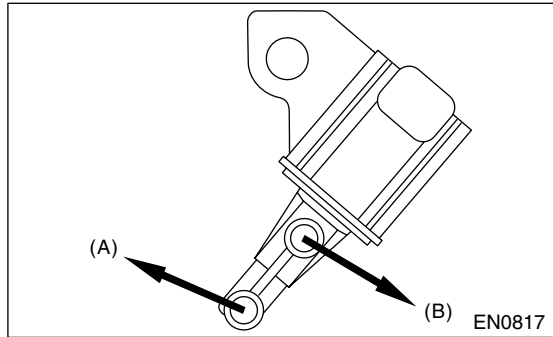
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



CAUTION:

Carefully connect the evaporation hoses.



(A) To intake manifold

(B) To purge value

C: INSPECTION

Make sure hoses are not cracked or loose.

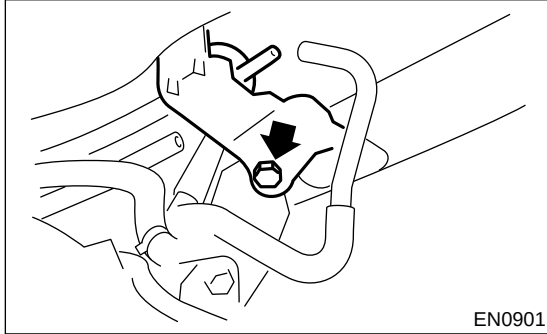
TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

7. Two-way Valve

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove canister from body. <Ref. to EC(DOHC TURBO)-6, REMOVAL, Canister.>
- 3) Remove two-way valve with bracket as a single unit from body.



- 4) Remove two-way valve from bracket.

B: INSTALLTION

Install in the reverse order of removal.

C: INSPECTION

Make sure that hoses are not cracked or loose.

ENGINE 2 SECTION

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ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

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MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

INTAKE (INDUCTION)

IN(DOHC TURBO)

	Page
1. General Description	2
2. Air Cleaner	7
3. Air Intake Duct.....	8
4. Intake Duct.....	9
5. Intercooler	10
6. Turbochager.....	12
7. Air By-pass Valve.....	14

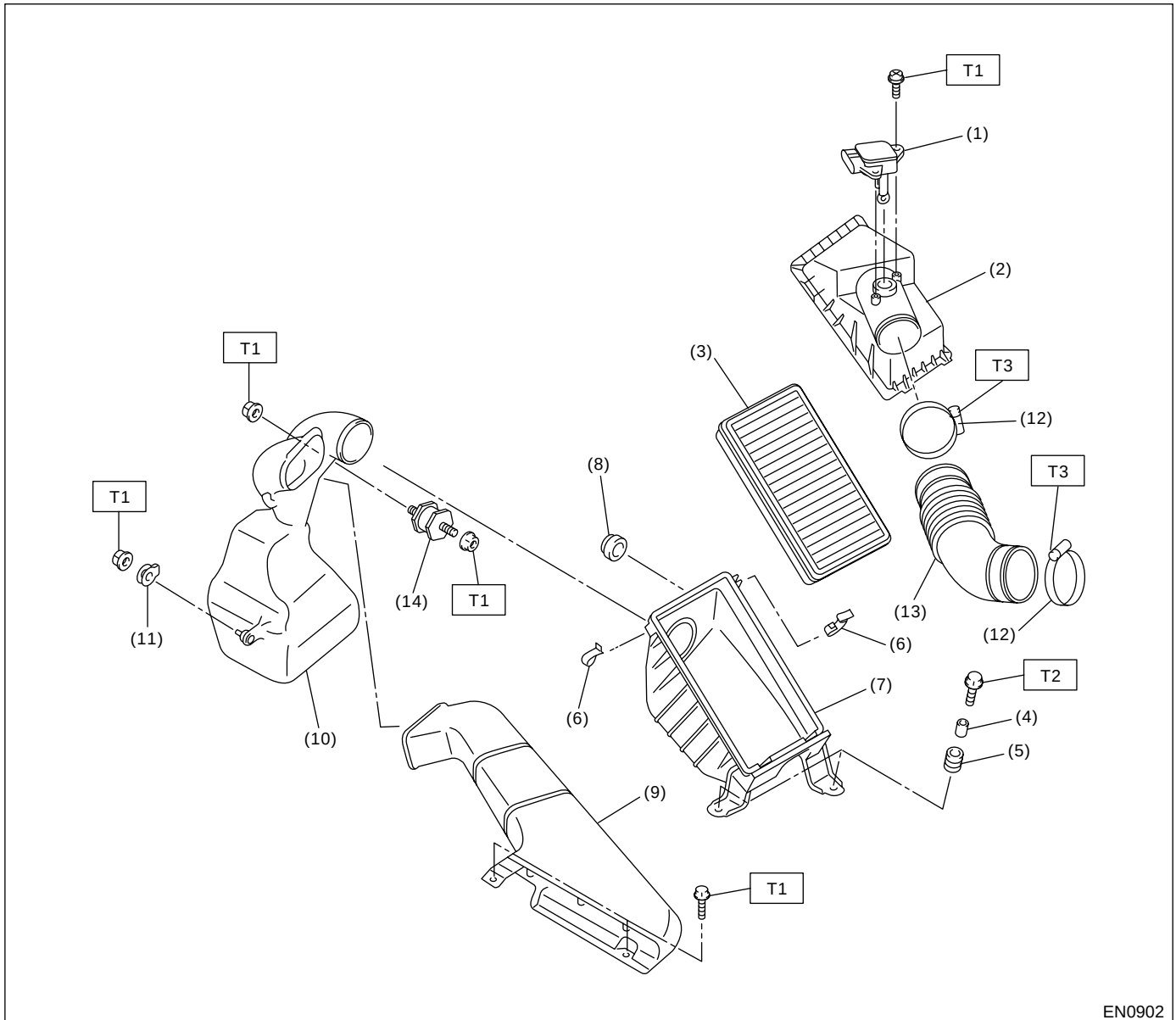
GENERAL DESCRIPTION

INTAKE (INDUCTION)

1. General Description

A: COMPONENT

1. AIR CLEANER



- | | |
|-----------------------------|-----------------------------|
| (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)

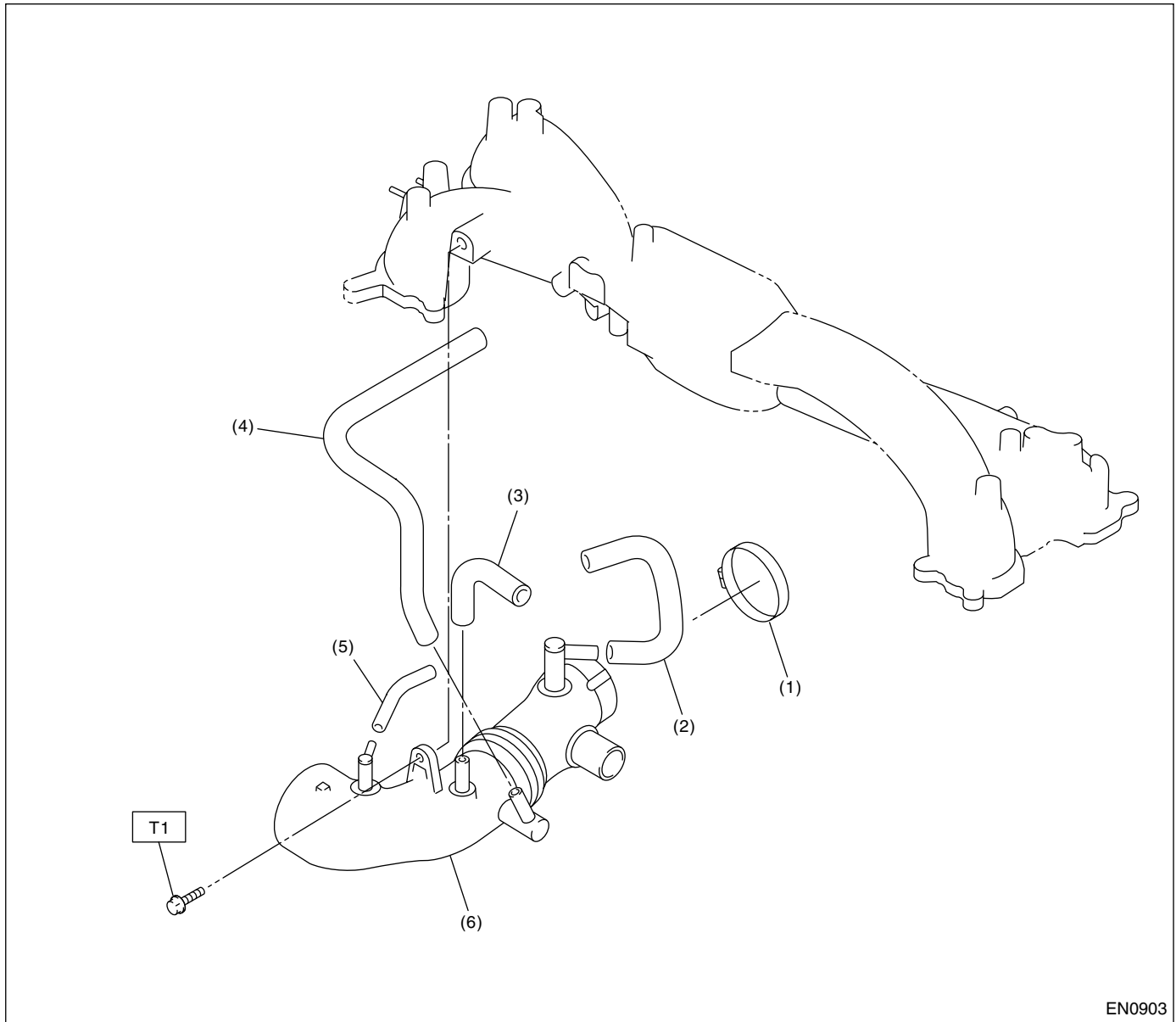
T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 25)

T3: 2.5 (0.25, 1.8)

IN(DOHC TURBO)-2

2. INTAKE DUCT



EN0903

- | | |
|------------------------|------------------------|
| (1) Clamp | (4) Air by-pass hose C |
| (2) Air by-pass hose A | (5) Air by-pass hose D |
| (3) Air by-pass hose B | (6) Intake duct |

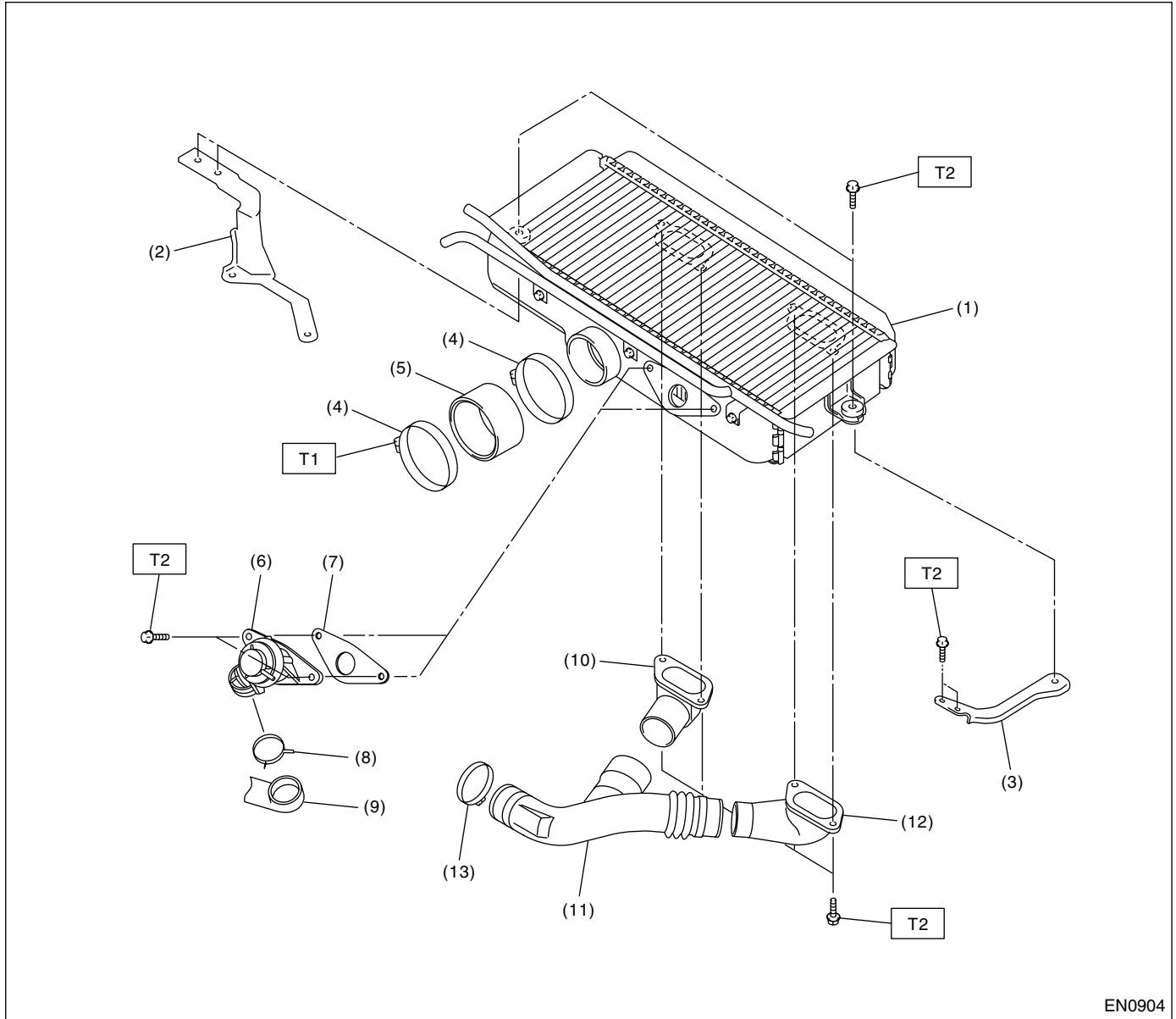
Tightening torque: N·m (kgf-m, ft-lb)

T1: 15.7 (1.6, 11.6)

GENERAL DESCRIPTION

INTAKE (INDUCTION)

3. INTER COOLER



EN0904

- | | |
|----------------------------|-------------------------|
| (1) Intercooler | (7) Gasket |
| (2) Intercooler bracket RH | (8) Clamp |
| (3) Intercooler bracket LH | (9) Air by-pass hose A |
| (4) Clamp | (10) Intercooler duct A |
| (5) Air intake duct | (11) Intercooler duct B |
| (6) Air by-pass valve | (12) Intercooler duct C |

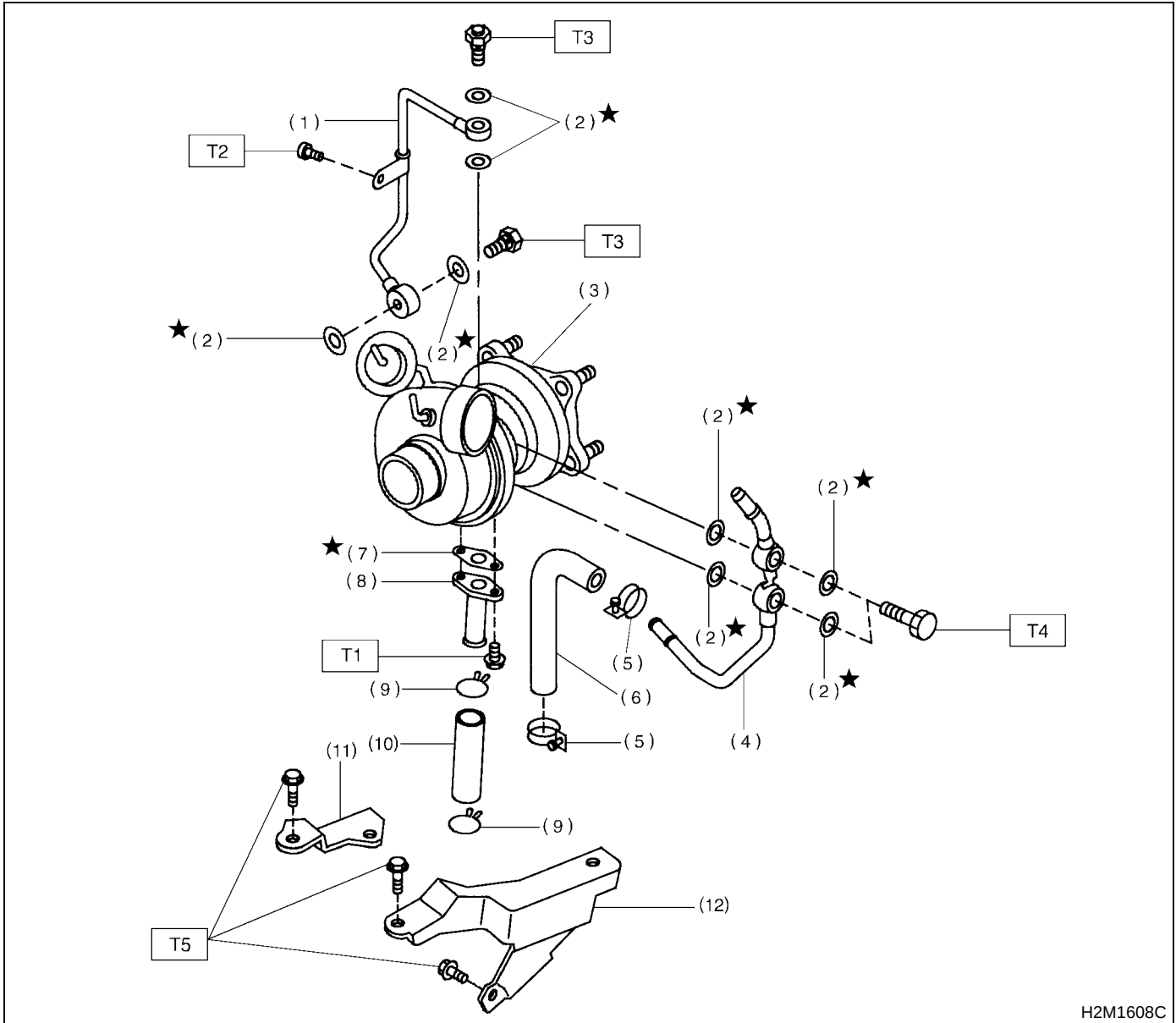
Tightening torque: N·m (kgf-m, ft-lb)

T1: 3 (0.22, 1.6)

T2: 16 (0.61, 4.4)

IN(DOHC TURBO)-4

4. TURBOCHARGER



H2M1608C

- | | |
|-------------------------|------------------------------|
| (1) Oil inlet pipe | (8) Oil outlet pipe |
| (2) Metal gasket | (9) Clip |
| (3) Turbocharger | (10) Oil outlet hose |
| (4) Water pipe | (11) Turbocharger bracket RH |
| (5) Clamp | (12) Turbocharger bracket LH |
| (6) Engine coolant hose | |
| (7) Gasket | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)

T2: 4.9 (0.50, 3.6)

T3: 29 (3.0, 21.7)

T4: 30 (3.1, 22.4)

T5: 33 (3.4, 24.6)

GENERAL DESCRIPTION

INTAKE (INDUCTION)

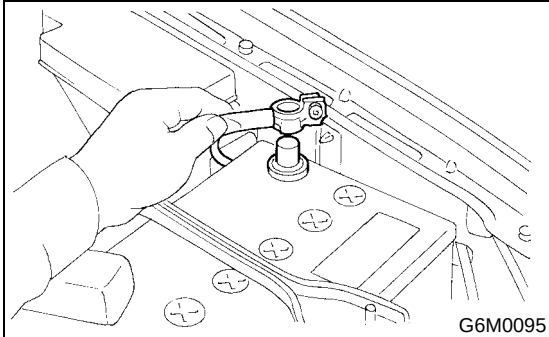
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
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- 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 negative terminal from battery.

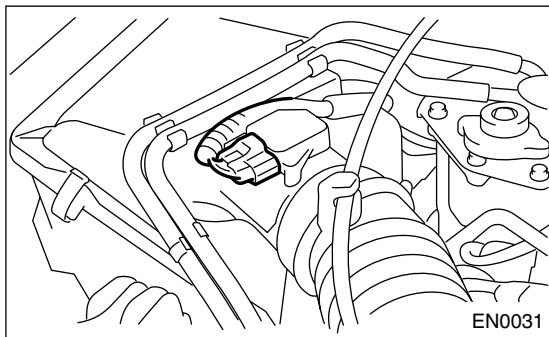
2. Air Cleaner

A: REMOVAL

- 1) Disconnect connector battery ground cable.

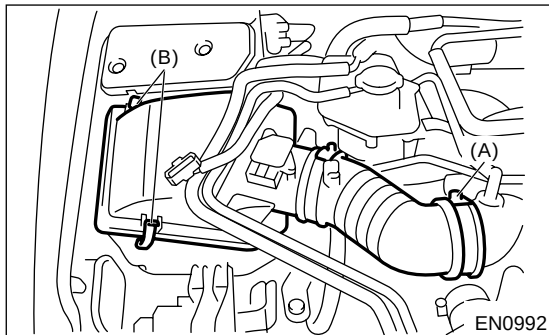


- 2) Disconnect connector from mass air flow sensor.



- 3) Loosen clamp (A) which connects air intake boot to intake duct.

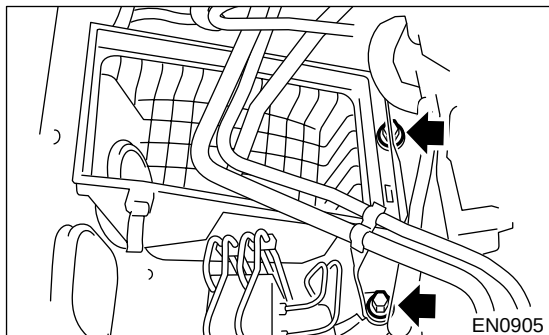
- 4) Remove the two clips (B) from air cleaner upper cover.



- 5) Remove air cleaner upper cover.

- 6) Remove air cleaner.

- 7) Remove air cleaner lower case.

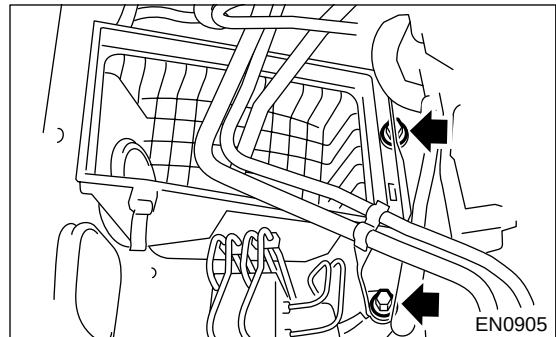


B: INSTALLATION

Install in the reverse order of removal.

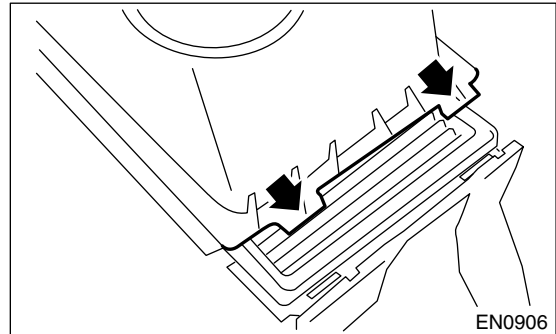
Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



CAUTION:

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



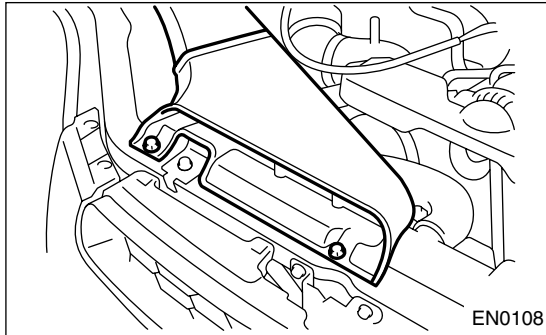
C: INSPECTION

Replace if excessively damaged or dirty.

3. Air Intake Duct

A: REMOVAL

1) Remove bolts which install air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

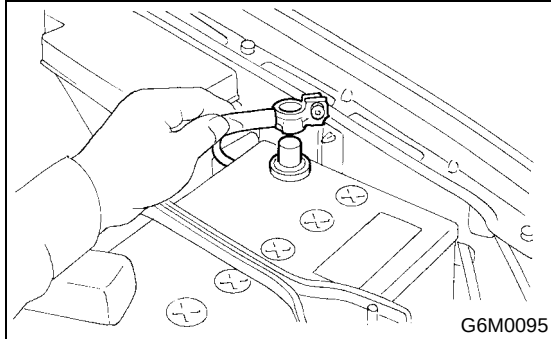
C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in the air intake duct.

4. Intake Duct

A: REMOVAL

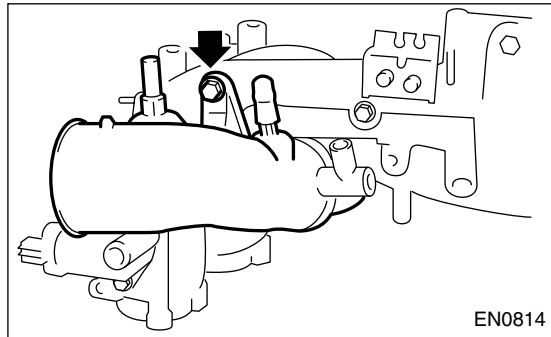
1) Disconnect battery ground cable.



2) Remove intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>

3) Remove sensor, engine harness, and fuel pipe attached to the intake manifold. <Ref. to FU(DOHC TURBO)-20, DISASSEMBLY, Intake Manifold.>

4) Remove intake duct from intake manifold.



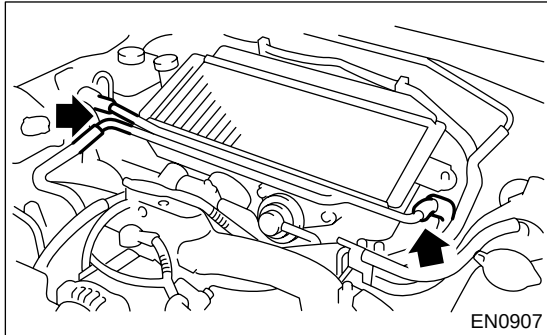
B: INSTALLATION

Install in the reverse order of removal.

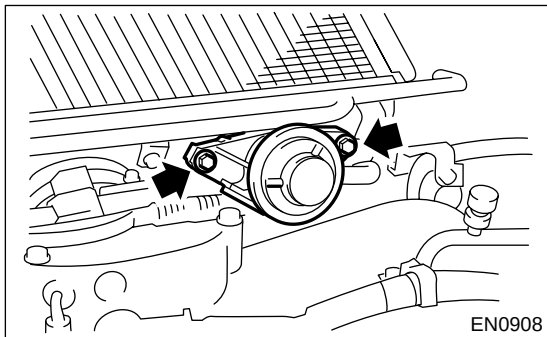
5. Intercooler

A: REMOVAL

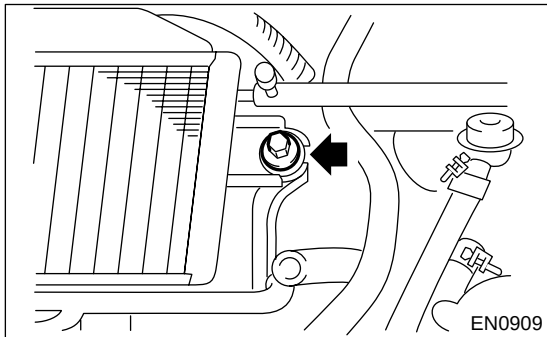
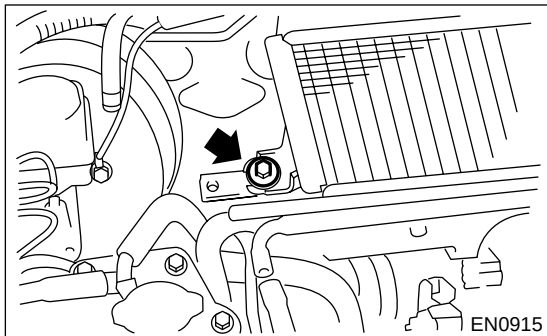
1) Disconnect air by-pass hoses from intercooler.



2) Separate air by-pass valve from intercooler.

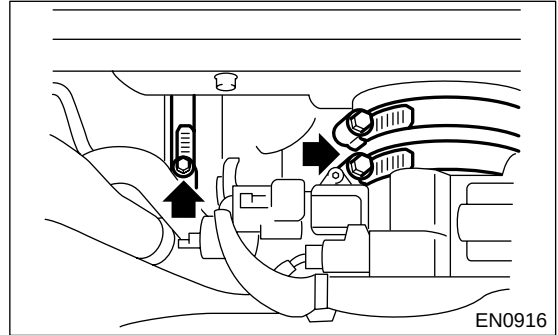


3) Remove bolts which secure intercooler to bracket.



4) Separate intercooler air duct from turbocharger.

5) Separate intercooler from throttle body.

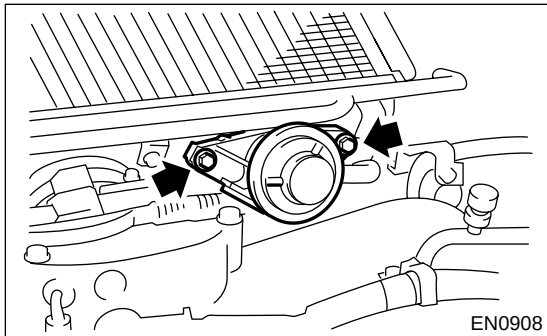
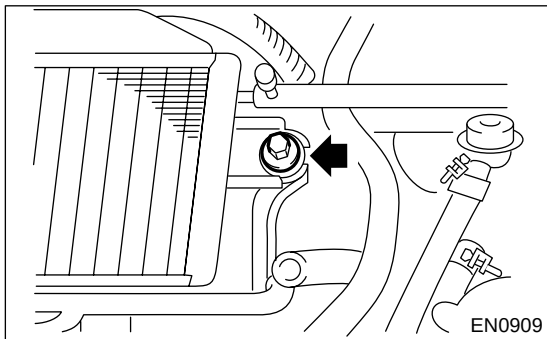
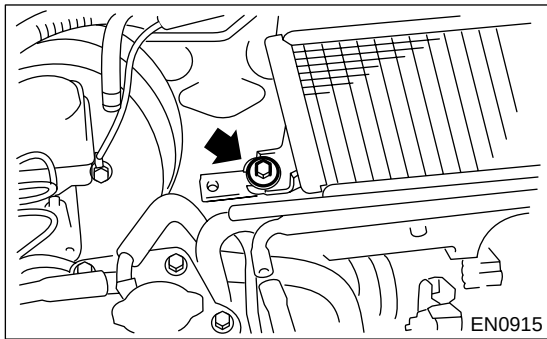


B: INSTALLATION

Install in the reverse order of removal.

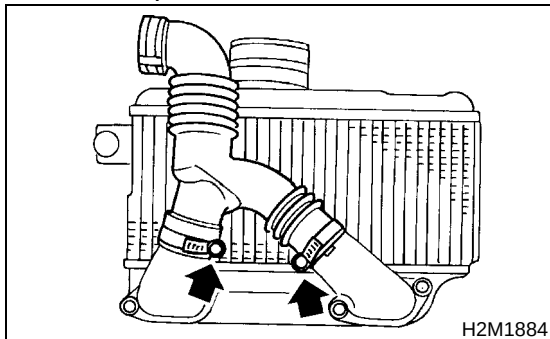
Tightening torque:

16 N·m (1.6 kgf-m, 11.7 ft-lb)

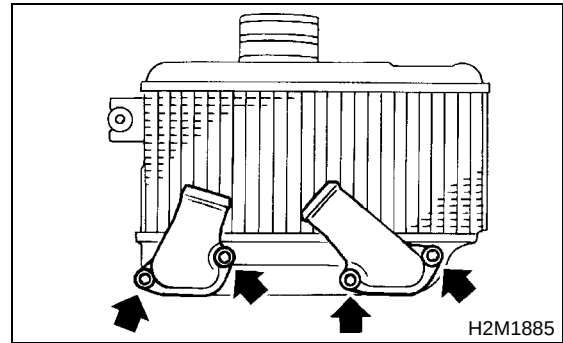


C: DISASSEMBLY

1) Loosen clamps, then remove intercooler duct.



2) Remove intercooler ducts from intercooler.

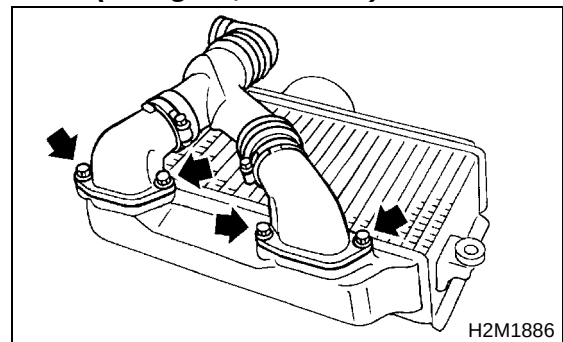


D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:

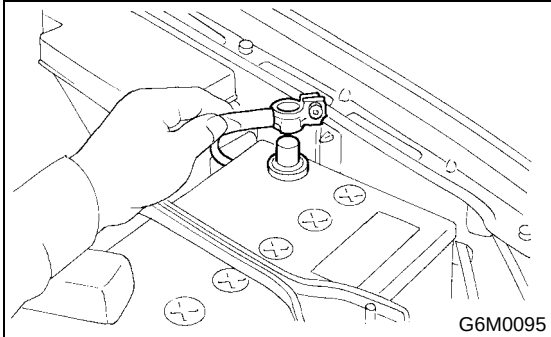
16 N·m (1.6 kgf-m, 11.7 ft-lb)



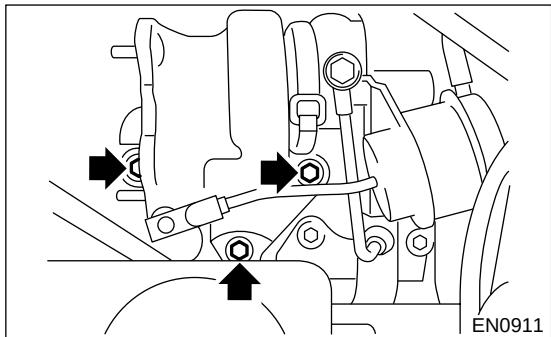
6. Turbochager

A: REMOVAL

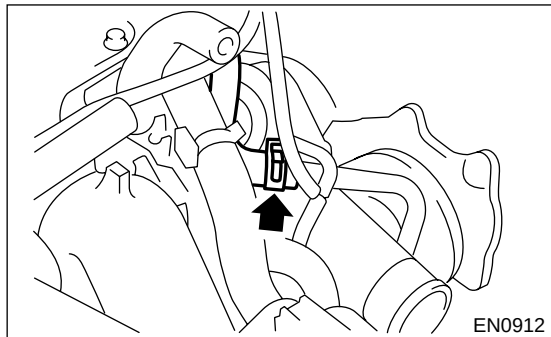
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.



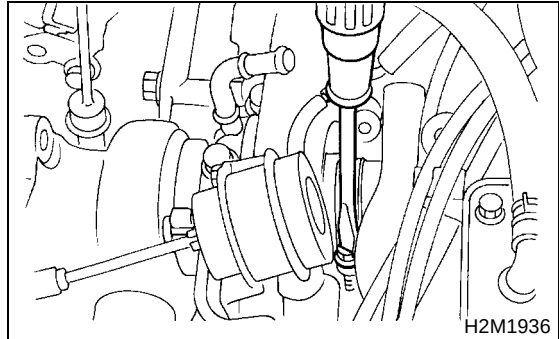
- 3) Remove center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>
- 4) Lower the vehicle.
- 5) Separate turbocharger joint pipe from turbocharger.



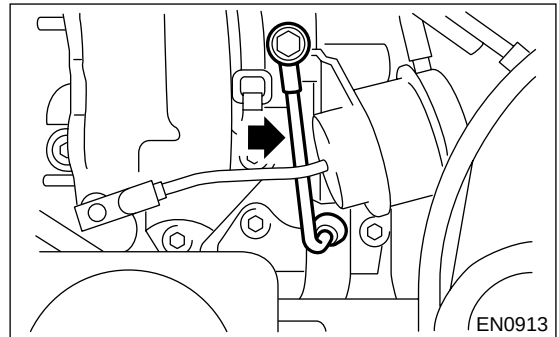
- 6) Disconnect engine coolant hose which is connected to coolant filler tank.



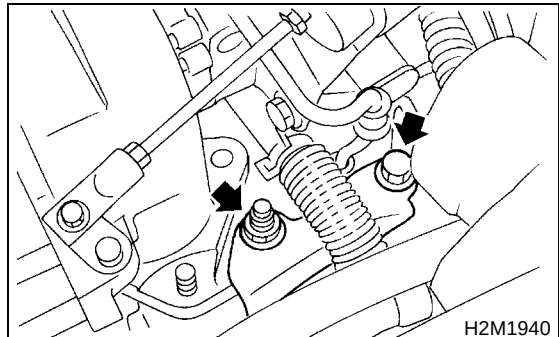
- 7) Loosen clamp which secures turbocharger to air inlet duct.



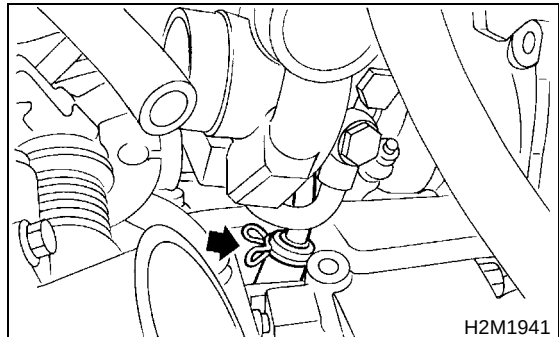
- 8) Remove bolt which secures bracket of oil pipe to turbocharger.
- 9) Remove oil pipe from turbocharger.



- 10) Remove turbocharger bracket.



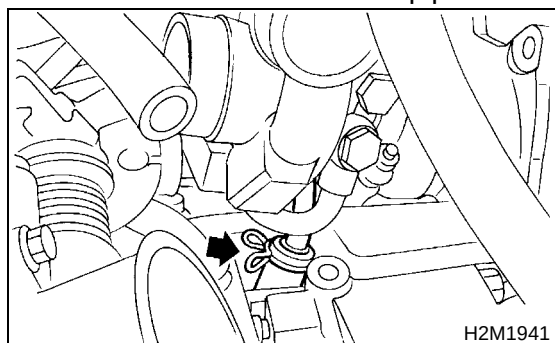
- 11) Disconnect oil outlet hose from pipe.



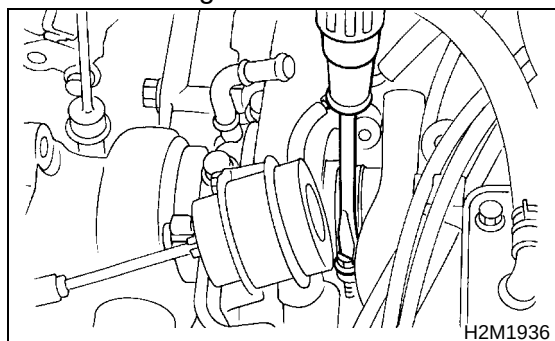
- 12) Take out turbocharger from engine compartment.

B: INSTALLATION

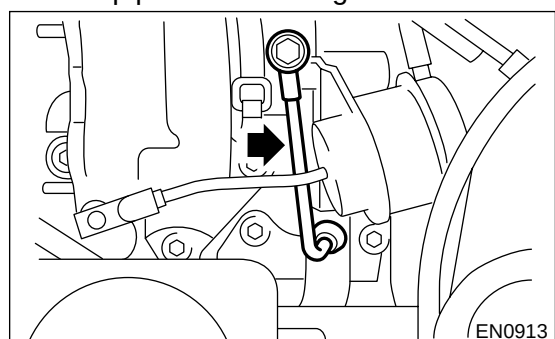
1) Connect oil outlet hose to outlet pipe.



2) Install turbocharger to air intake duct.



3) Install oil pipe to turbocharger.



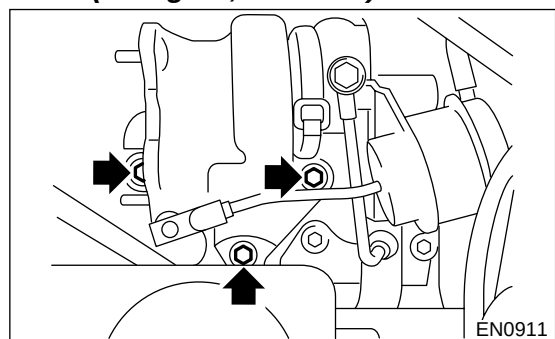
4) Install joint pipe to turbocharger.

CAUTION:

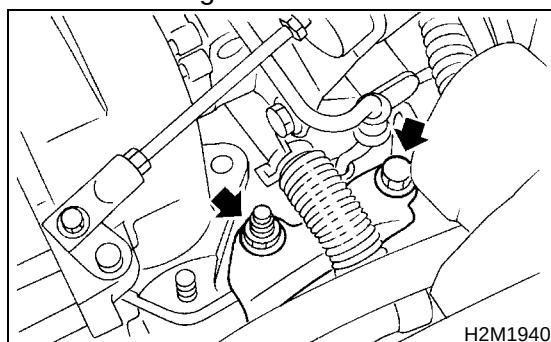
Replace gasket with a new one.

Tightening torque:

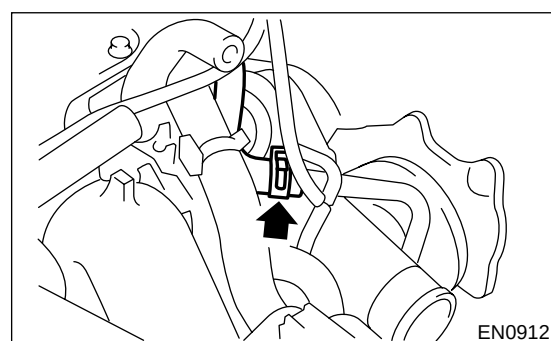
30 N·m (3.1 kgf-m, 22.4 ft-lb)



5) Install turbocharger bracket.



6) Connect engine coolant hose which is connected to coolant filler tank.



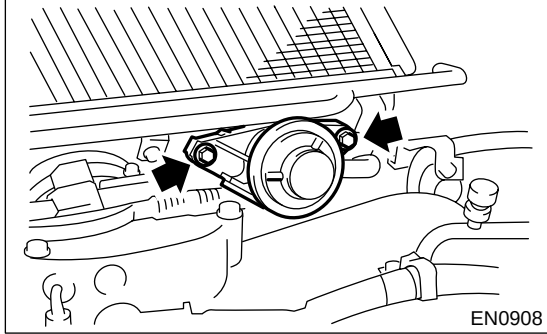
7) Lift-up the vehicle.

8) Install center exhaust pipe. <Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

7. Air By-pass Valve

A: REMOVAL

- 1) Remove air by-pass valve from intercooler.



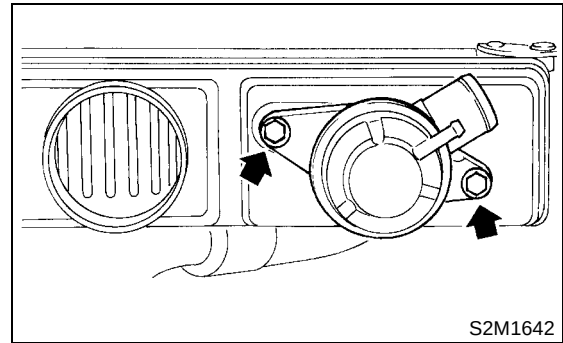
- 2) Disconnect air by-pass hoses from air by-pass valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.7 ft-lb)



ENGINE 2 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.

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

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

MECHANICAL

ME(DOHC TURBO)

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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, double overhead 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		8.0
	Compression pressure (at 200 — 300 rpm)		kPa (kgf/cm ² , psi) 981 — 1,177 (10 — 12, 142 — 171)
	Number of piston rings		Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening	10° BTDC
		Closing	50° 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 750±100 (No load) 800±150 (A/C switch ON)
	Firing order		1 → 3 → 2 → 4
	Ignition timing		BTDC/rpm 12°±3°/750 rpm

NOTE:

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

GENERAL DESCRIPTION

MECHANICAL

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 bush 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	46.05 mm (1.813 in)	
	Jounal 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)	
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 — 6.015 mm (0.2362 — 0.2368 in)	
	Protrusion above head			12.0 — 12.4 mm (0.472 — 0.488 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	5.950 — 5.965 mm (0.2343 — 0.2348 in)		
		Exhaust	5.950 — 5.965 mm(0.2343 — 0.2348 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	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			220.7±15.7 N (22.5±1.6 kgf, 49.6±3.5 lb)/36.0 mm (1.417 in) 510.9±25.5 N (52.1±2.6 kgf, 114.9±5.7 lb)/26.6 mm (1.047 in)	

GENERAL DESCRIPTION

MECHANICAL

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 — 0.26 mm (0.0079 — 0.0102 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 — 0.70 mm (0.0079 — 0.0276 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	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		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)
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)

GENERAL DESCRIPTION

MECHANICAL

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	47.954 — 48.000 mm (1.8879 — 1.8898)
			0.03 mm (0.0012 in) US	47.954 — 47.970 mm (1.8879 — 1.8886)
			0.05 mm (0.0020 in) US	47.934 — 47.950 mm (1.8872 — 1.8878)
			0.25 mm (0.0098 in) US	47.734 — 47.750 mm (1.8793 — 1.8799)
	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		STD	0.010 — 0.030 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)

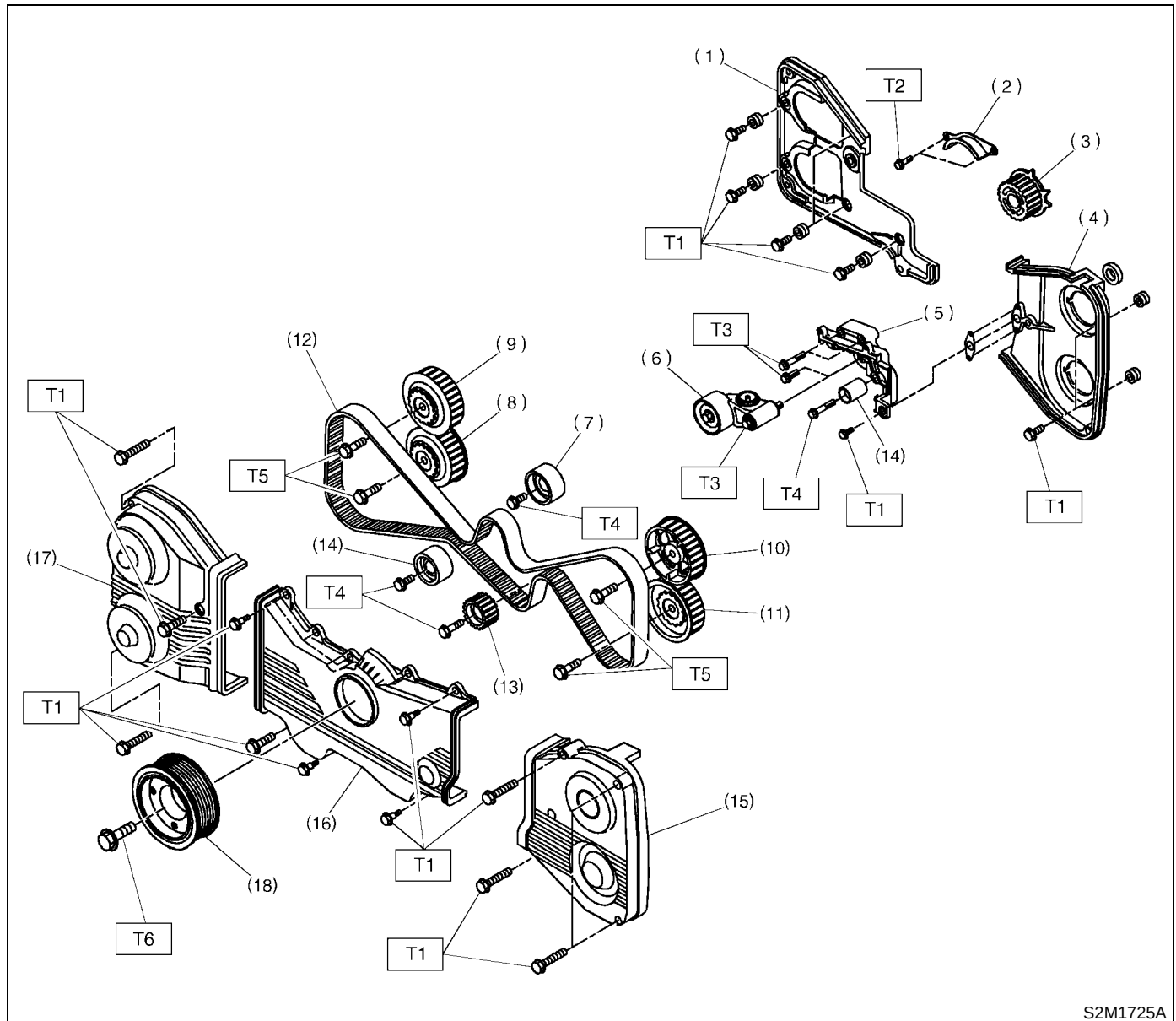
ME(DOHC TURBO)-5

GENERAL DESCRIPTION

MECHANICAL

B: COMPONENT

1. TIMING BELT



S2M1725A

- (1) Right-hand belt cover No. 2
- (2) Timing belt guide (MT vehicles only)
- (3) Crankshaft sprocket
- (4) Left-hand belt cover No. 2
- (5) Tensioner bracket
- (6) Automatic belt tension adjuster ASSY
- (7) Belt idler
- (8) Right-hand exhaust camshaft sprocket

- (9) Right-hand intake camshaft sprocket
- (10) Left-hand intake camshaft sprocket
- (11) Left-hand exhaust camshaft sprocket
- (12) Timing belt
- (13) Belt idler No. 2
- (14) Belt idler
- (15) Left-hand belt cover
- (16) Front belt cover

- (17) Right-hand belt cover
- (18) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)

T2: 10 (1.0, 7)

T3: 25 (2.5, 18.1)

T4: 39 (4.0, 28.9)

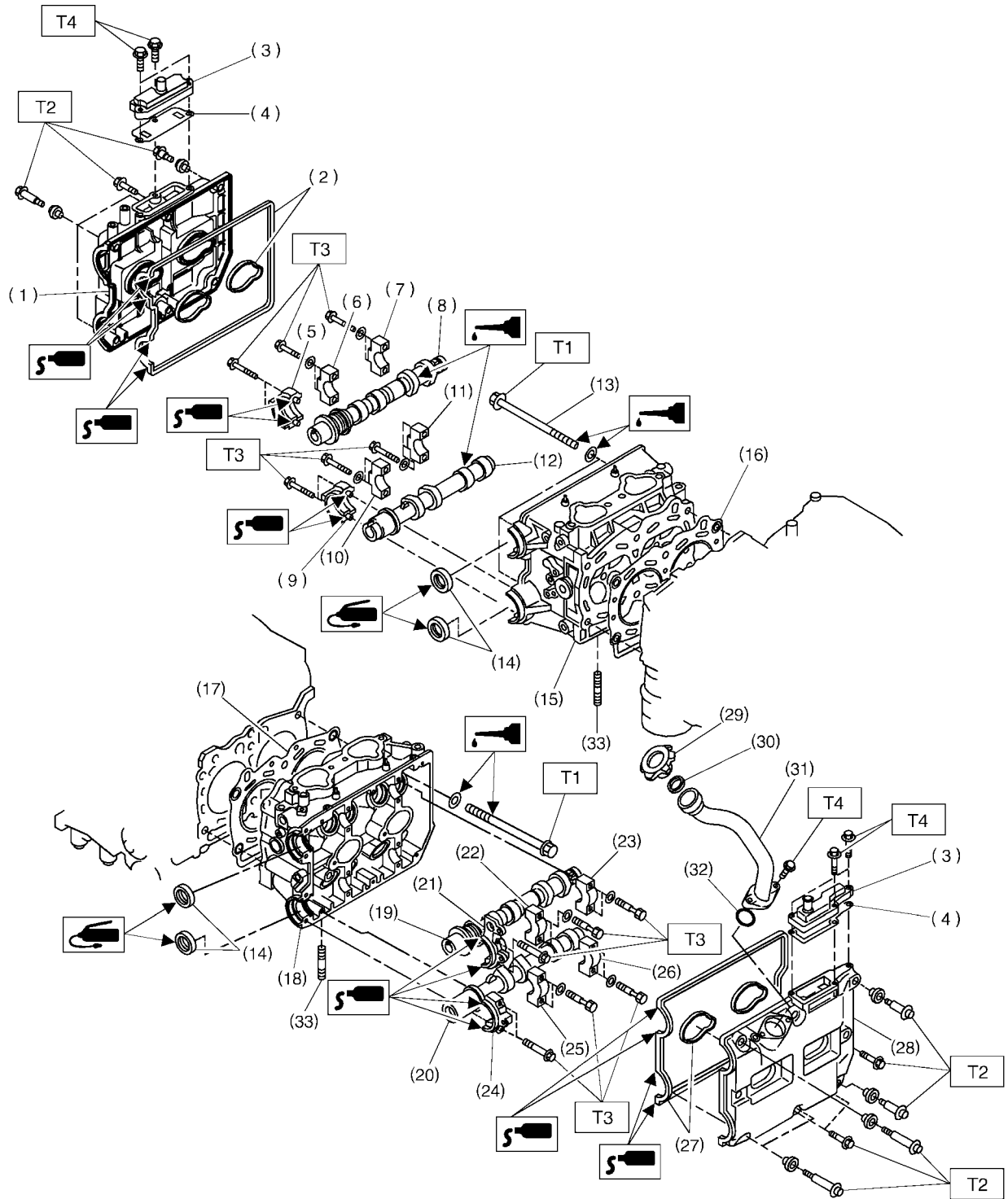
T5: 98 (10, 72.4)

T6: 127 (13, 94.0)

GENERAL DESCRIPTION

MECHANICAL

2. CYLINDER HEAD AND CAMSHAFT



S2M1188A

ME(DOHC TURBO)-8

GENERAL DESCRIPTION

MECHANICAL

- | | | |
|---------------------------------------|---------------------------------------|----------------------|
| (1) Rocker cover (RH) | (15) Cylinder head (RH) | (29) Oil filler cap |
| (2) Rocker cover gasket (RH) | (16) Cylinder head gasket (RH) | (30) Gasket |
| (3) Oil separator cover | (17) Cylinder head gasket (LH) | (31) Oil filler duct |
| (4) Gasket | (18) Cylinder head (LH) | (32) O-ring |
| (5) Intake camshaft cap (Front RH) | (19) Intake camshaft (LH) | (33) Stud bolt |
| (6) Intake camshaft cap (Center RH) | (20) Exhaust camshaft (LH) | |
| (7) Intake camshaft cap (Rear RH) | (21) Intake camshaft cap (Front LH) | |
| (8) Intake camshaft (RH) | (22) Intake camshaft cap (Center LH) | |
| (9) Exhaust camshaft cap (Front RH) | (23) Intake camshaft cap (Rear LH) | |
| (10) Exhaust camshaft cap (Center RH) | (24) Exhaust camshaft (Front LH) | |
| (11) Exhaust camshaft cap (Rear RH) | (25) Exhaust camshaft cap (Center LH) | |
| (12) Exhaust camshaft (RH) | (26) Exhaust camshaft cap (Rear LH) | |
| (13) Cylinder head bolt | (27) Rocker cover gasket (LH) | |
| (14) Oil seal | (28) Rocker cover (LH) | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: <Ref. to ME(DOHC TURBO)-63, Installation, Cylinder Head Assembly.>

T2: 5 (0.5, 3.6)

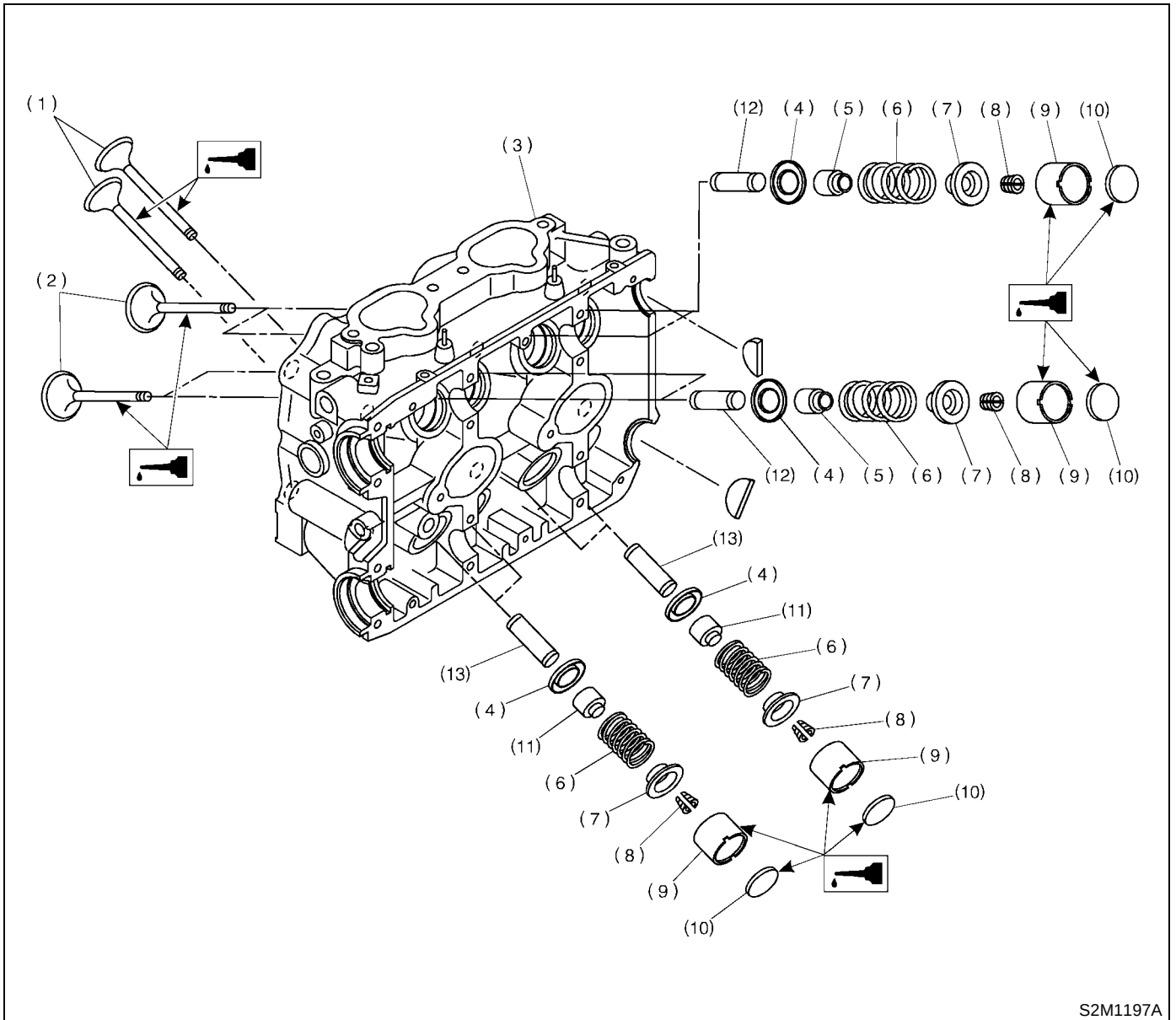
T3: 10 (1.0, 7)

T4: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

MECHANICAL

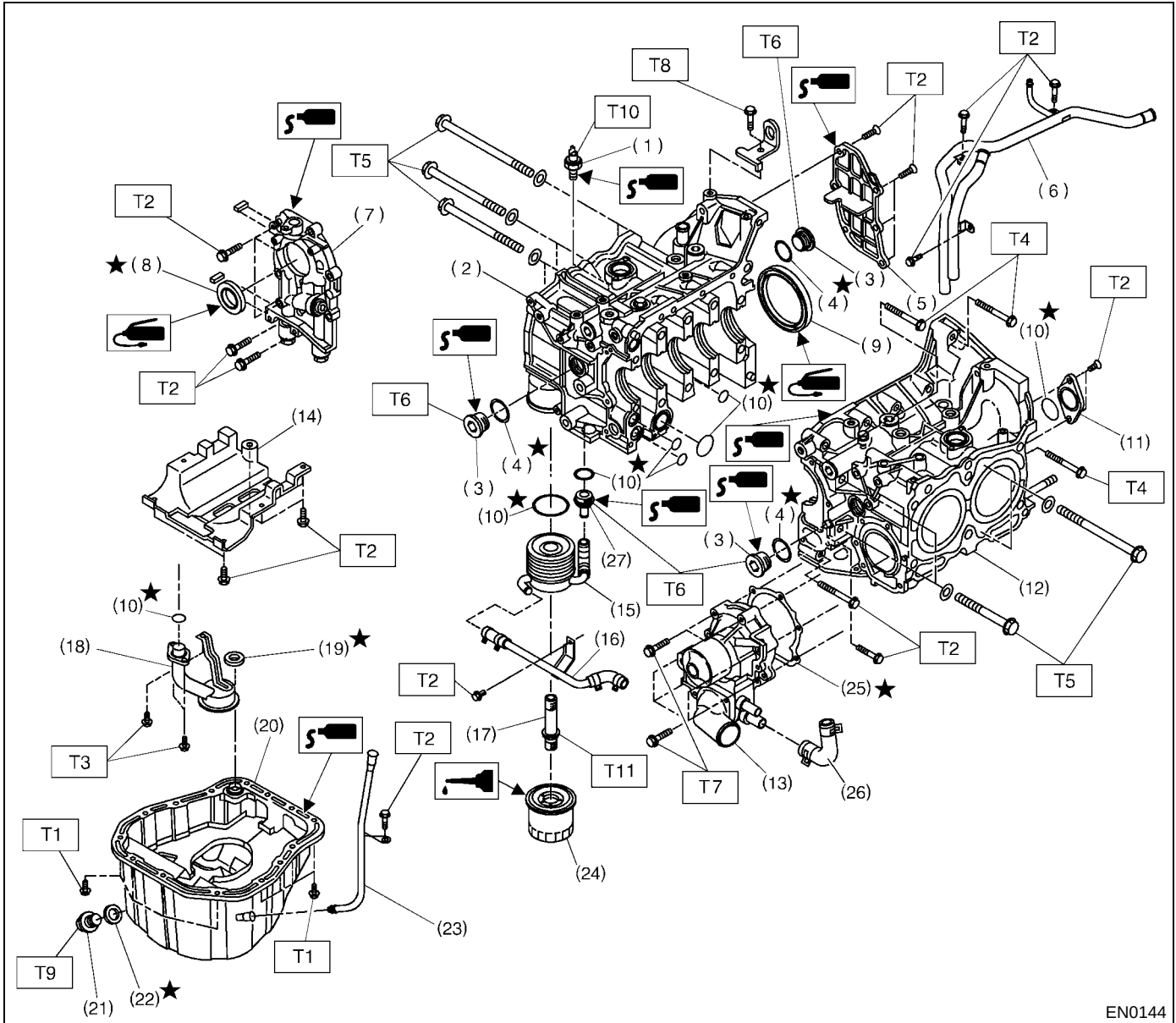
3. CYLINDER HEAD AND VALVE ASSEMBLY



S2M1197A

- | | | |
|---------------------------|------------------|-----------------------------|
| (1) Exhaust valve | (6) Valve spring | (11) Exhaust valve oil seal |
| (2) Intake valve | (7) Retainer | (12) Intake valve guide |
| (3) Cylinder head | (8) Retainer key | (13) Exhaust valve guide |
| (4) Valve spring seat | (9) Valve lifter | |
| (5) Intake valve oil seal | (10) Shim | |

4. CYLINDER BLOCK



EN0144

- | | |
|--------------------------|----------------------------|
| (1) Oil pressure switch | (15) Oil cooler |
| (2) Cylinder block (RH) | (16) Waster by-pass pipe |
| (3) Service hole plug | (17) Connector |
| (4) Gasket | (18) Oil strainer |
| (5) Oil separator cover | (19) Gasket |
| (6) Water by-pass pipe | (20) Oil pan |
| (7) Oil pump | (21) Drain plug |
| (8) Front oil seal | (22) Metal gasket |
| (9) Rear oil seal | (23) Oil level gauge guide |
| (10) O-ring | (24) Oil filter |
| (11) Service hole cover | (25) Gasket |
| (12) Cylinder block (LH) | (26) Water pump hose |
| (13) Water pump | (27) Plug |
| (14) Baffle plate | |

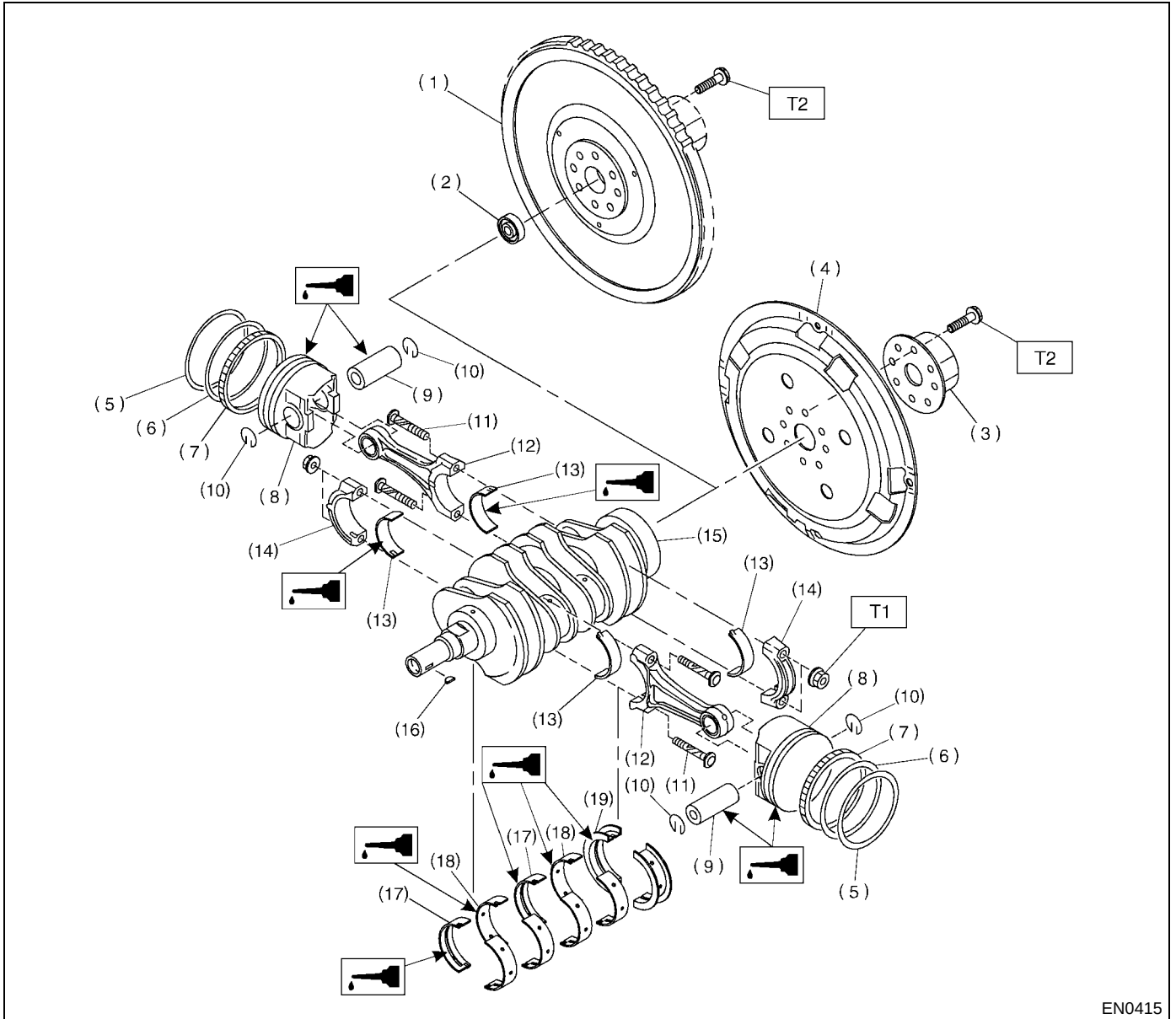
Tightening torque: N·m (kgf-m, ft-lb)

- | | |
|-------------|---|
| 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: | 47 (4.8, 34.7) |
| T6: | 69 (7.0, 50.6) |
| T7: | First 12 (1.2, 8.7)
Second 12 (1.2, 8.7) |
| T8: | 16 (1.6, 11.6) |
| T9: | 44 (4.5, 33) |
| T10: | 25 (2.5, 18.1) |
| T11: | 55 (5.5, 40) |

GENERAL DESCRIPTION

MECHANICAL

5. CRANKSHAFT AND PISTON



- (1) Flywheel (MT vehicles only)
- (2) Ball bearing (MT vehicles only)
- (3) Reinforcement (AT vehicles only)
- (4) Drive plate (AT vehicles only)
- (5) Top ring
- (6) Second ring
- (7) Oil ring
- (8) Piston

- (9) Piston pin
- (10) Circlip
- (11) Connecting rod bolt
- (12) Connecting rod
- (13) Connecting rod bearing
- (14) Connecting rod cap
- (15) Crankshaft
- (16) Woodruff key

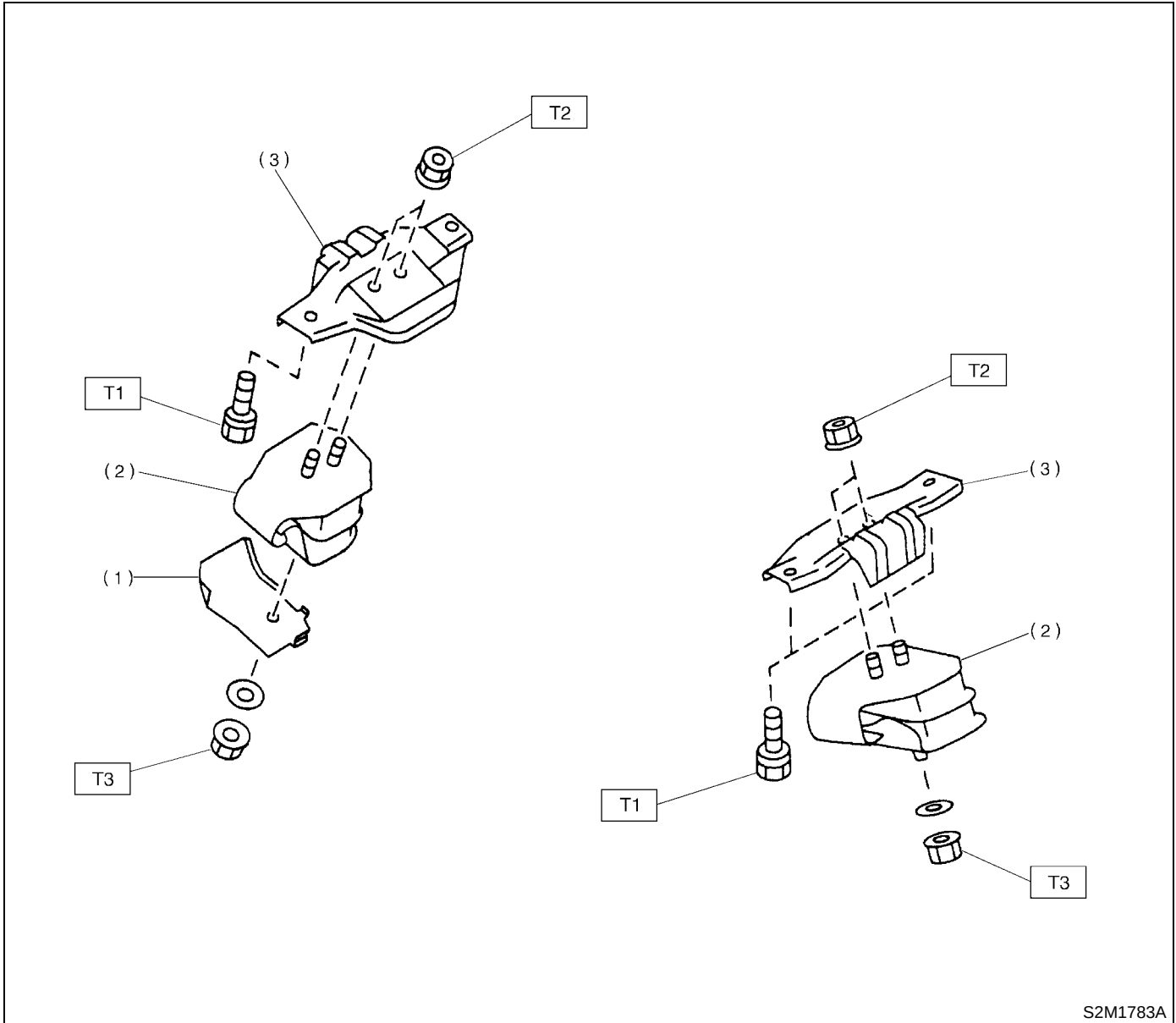
- (17) Crankshaft bearing #1, #3
- (18) Crankshaft bearing #2, #4
- (19) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)

T1: 44.6 (4.55, 32.9)

T2: 72 (7.3, 52.8)

6. ENGINE MOUNTING



S2M1783A

- (1) Hear shield cover
- (2) 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, 30.9)

T3: 85 (8.7, 62.7)

GENERAL DESCRIPTION

MECHANICAL

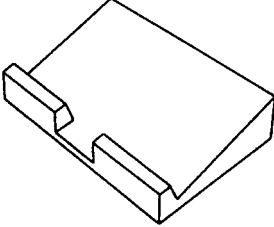
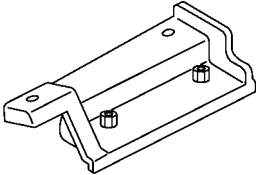
C: CAUTION

- 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 negative terminal 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.

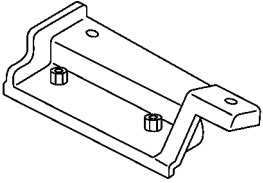
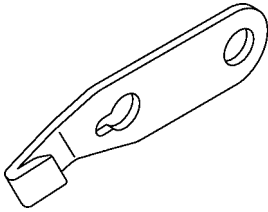
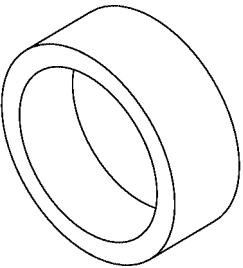
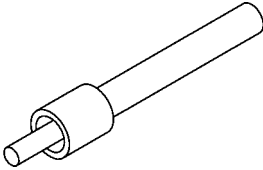
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 EN0147	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 B2M3851	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).

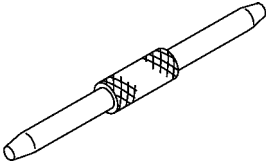
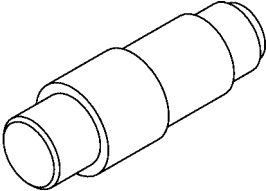
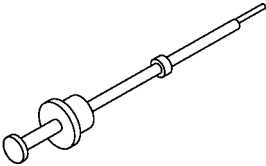
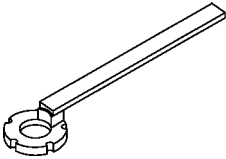
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3852	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 B2M3853	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 B2M3854	398744300	PISTON GUIDE	Used for installing piston in cylinder.
 B2M3855	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.

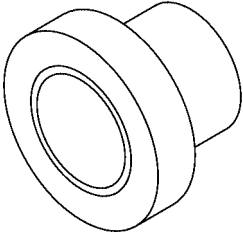
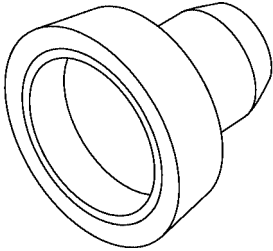
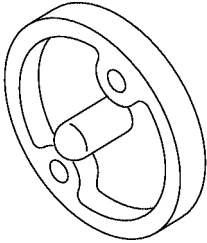
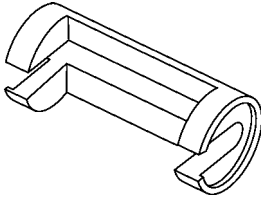
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3856	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 B2M3857	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 B2M3858	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 B2M4158	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

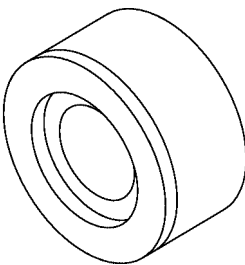
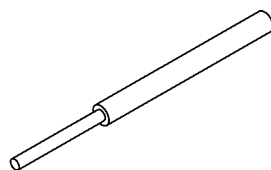
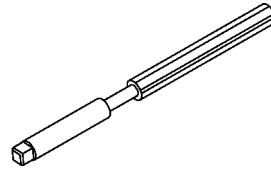
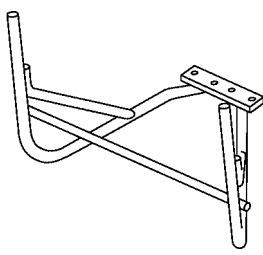
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3860	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.
 B2M3861	499587200	CRANKSHAFT OIL SEAL INSTALLER	- Used for installing crankshaft oil seal. - Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 B2M3863	499597100	CRANKSHAFT OIL SEAL GUIDE	- Used for installing crankshaft oil seal. - Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 B2M3864	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

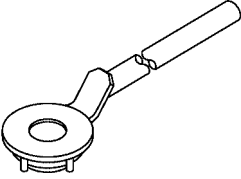
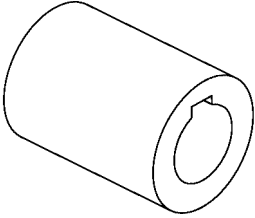
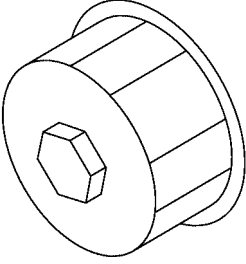
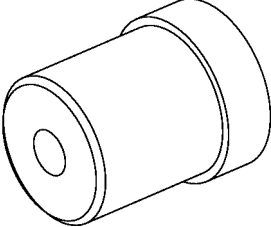
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3865	498267700	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 B2M3867	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 B2M3868	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 B2M3869	499817000	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).

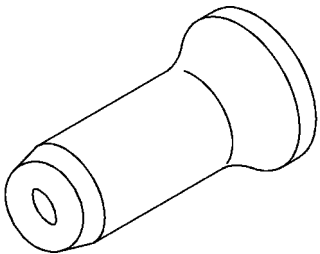
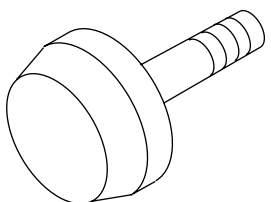
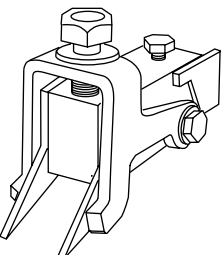
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M4157	499977300	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 B2M3871	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 B2M3872	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 B2M3875	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

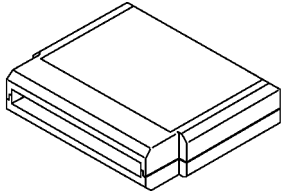
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 S1H0136	499587600	OIL SEAL GUIDE	Used for installing camshaft oil seal.
 EN0168	499597200	OIL SEAL GUIDE	• Used for installing camshaft oil seal. • Used with OIL SEAL GUIDE (499587600).
 EN0169	49818200	SHIM REPLACER	Used for correct valve clearance.

GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. - 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.
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
- Camshaft
- Cylinder Head

2. Compression

A: INSPECTION

CAUTION:

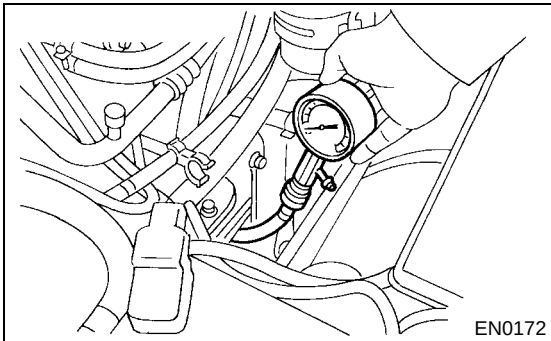
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 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(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(DOHC TURBO)-4, REMOVAL, Spark Plug.>
- 5) Fully open throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) 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.

- 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;

951 — 1,147 kPa (9.7 — 11.7 kgf/cm², 138 — 166 psi)

Limit;

834 kPa (8.5 kgf/cm², 121 psi)

Difference between cylinders;

49 kPa (0.5 kgf/cm², 7 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) Insert the cartridge to SUBARU SELECT MONITOR.
- 5) Connect SUBARU SELECT MONITOR to the data link connector.
- 6) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
- 7) Select {2. Each System Check} in Main Menu.
- 8) Select {Engine Control System} in Selection Menu.
- 9) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
- 10) Select {1.12 Data Display} in Data Display Menu.
- 11) Start the engine, and read engine idle speed.
- 12) Check idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed (No load and gears in neutral:

750±100 rpm

- 13) 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 neutral]:

800±150 rpm

CAUTION:

Never rotate idle adjusting screw. If idle speed is out of specifications, refer to General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(DOHC TURBO)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

1) Before checking ignition timing speed, 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) Insert the cartridge to SUBARU SELECT MONITOR.

5) Connect SUBARU SELECT MONITOR to the data link connector.

6) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.

7) Select {2. Each System Check} in Main Menu.

8) Select {Engine Control System} in Selection Menu.

9) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select {1.12 Data Display} in Data Display Menu.

11) Start the engine, at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:

12°±3°/750

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(DOHC TURBO)-2, Basic Diagnostic Procedure.>

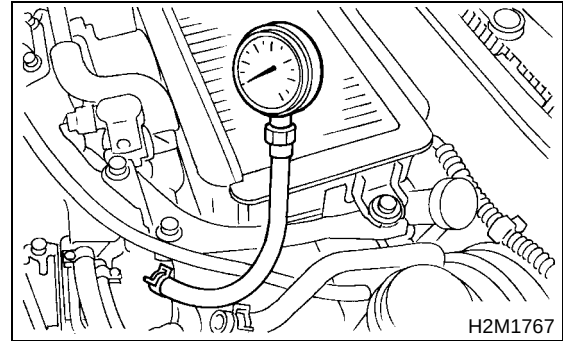
5. Intake Manifold Vacuum

A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose and install the vacuum gauge to the hose fitting on the manifold.

3) Keep the engine at the idle speed and read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.



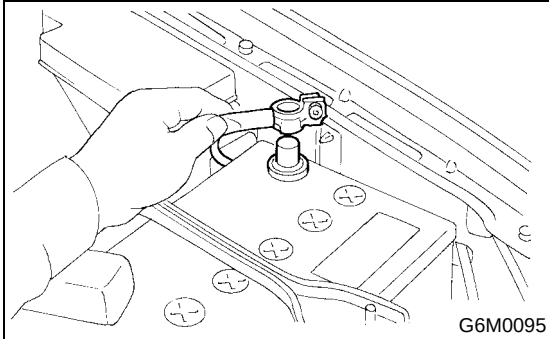
Vacuum pressure (at idling, A/C "OFF"):
Less than -60.0 kPa (-450 mmHg , -17.72 in-Hg)

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

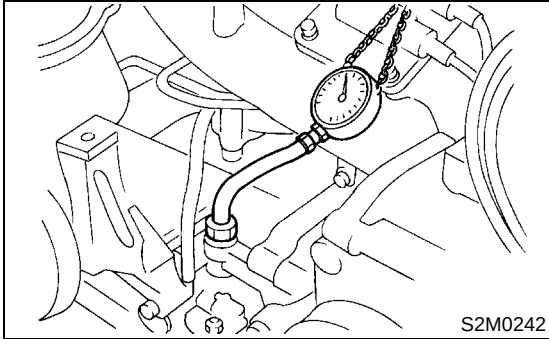
6. Engine Oil Pressure

A: INSPECTION

- 1) Remove oil pressure switch from engine cylinder block. <Ref. to LU-21, REMOVAL, Oil Pressure Switch.>
- 2) Connect oil pressure gauge hose to cylinder block.
- 3) Connect battery ground cable.



- 4) Start the engine, and measure 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

CAUTION:

- If oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU-26, INSPECTION, Engine Lubrication System Trouble in General.>
- If oil pressure warning light is turned ON and oil pressure is in specification, replace oil pressure switch. <Ref. to LU-26, 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 oil pressure, install oil pressure switch. <Ref. to LU-22, INSTALLATION, Oil Pressure Switch.>

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

7. Fuel Pressure

A: INSPECTION

WARNING:

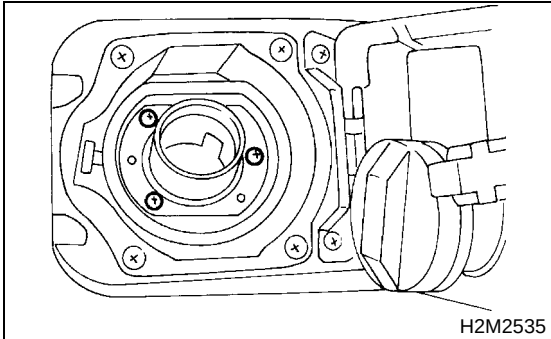
Before removing fuel pressure gauge, release fuel pressure.

NOTE:

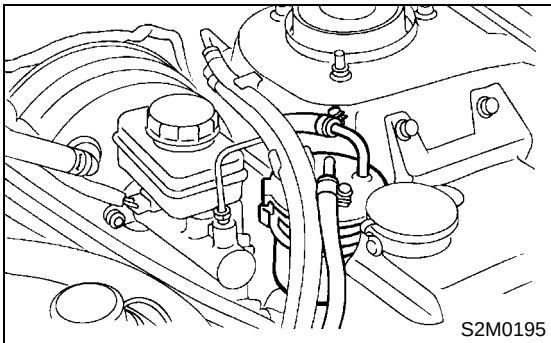
If out of specification, check or replace pressure regulator and pressure regulator vacuum hose.

1) Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

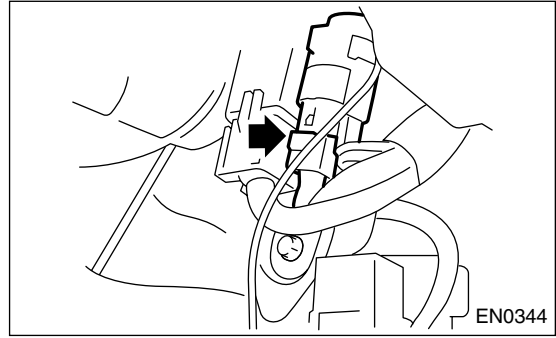
2) Open fuel flap lid, and remove fuel filler cap.



3) Disconnect fuel delivery hoses from fuel filter, and connect fuel pressure gauge.



4) Connect connector of fuel pump relay.

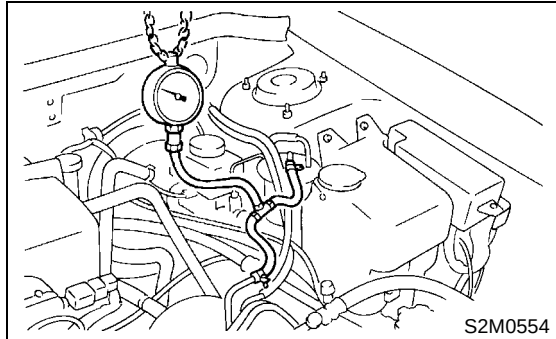


5) Start the engine.

6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

Fuel pressure:

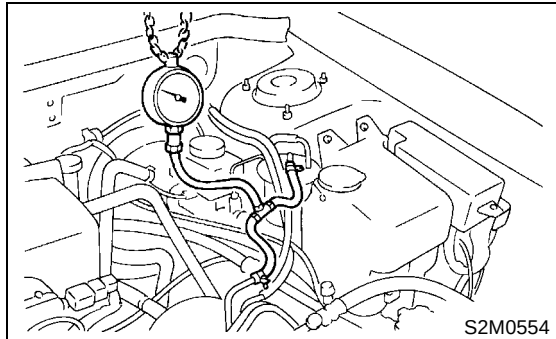
Standard; 284 — 314 kPa (2.9 — 3.2 kgf/cm², 41 — 46 psi)



7) After connecting pressure regulator vacuum hose, measure fuel pressure.

Fuel pressure:

Standard; 230 — 260 kPa (2.35 — 2.65 kgf/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.

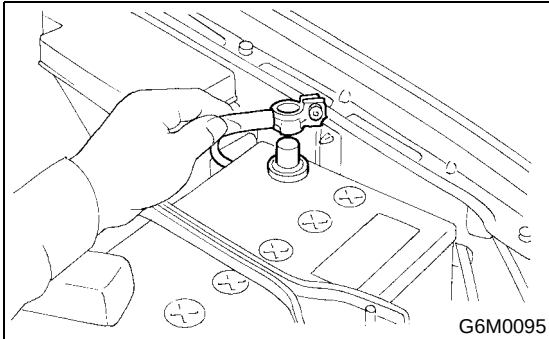
8. Valve Clearance

A: INSPECTION

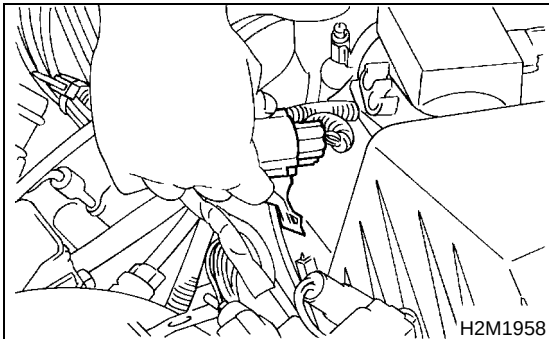
CAUTION:

Inspection and adjustment of valve clearance should be performed while engine is cold.

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

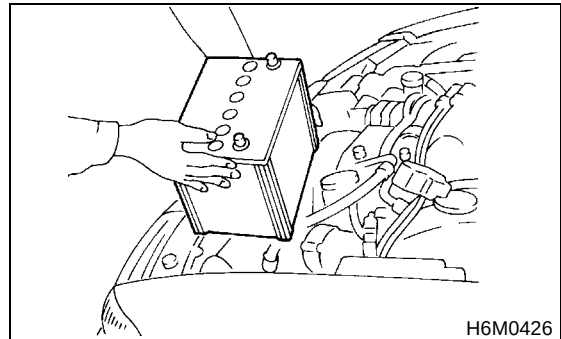


- 3) Remove air intake duct. <Ref. to IN(DOHC TURBO)-8, REMOVAL, Air Intake Duct.>
- 4) Remove one bolt which secures timing belt cover (RH).
- 5) Lift-up the vehicle.
- 6) Remove under cover.
- 7) Loosen remaining bolts which secure timing belt cover (RH), then remove belt cover.
- 8) Lower the vehicle.
- 9) When inspecting #1 and #3 cylinders:
 - (1) Pull out engine harness connector with bracket from air cleaner upper cover.

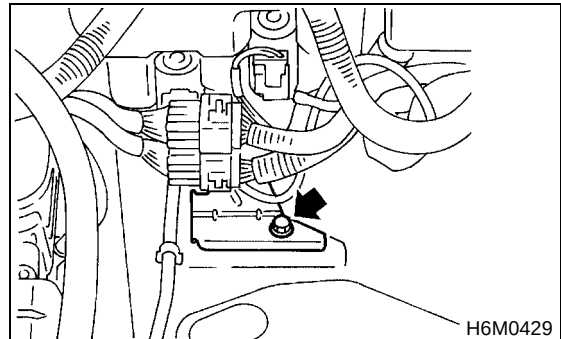


- (2) Remove air cleaner case. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
- (3) Disconnect spark plug cords from spark plugs (#1 and #3 cylinders).
- (4) Place suitable container under the vehicle.
- (5) Disconnect PCV hose from rocker cover (RH).
- (6) Remove bolts, then remove rocker cover (RH).

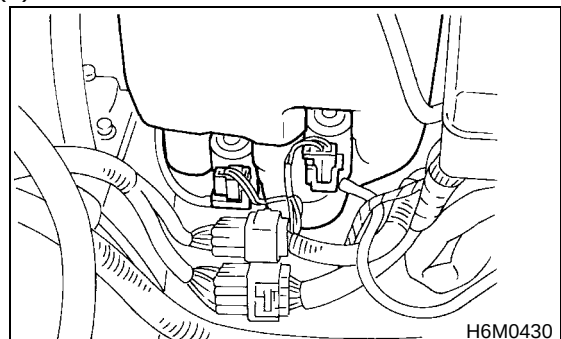
- 10) When inspecting #2 and #4 cylinders;
 - (1) Disconnect battery cables, and then remove battery and battery carrier.



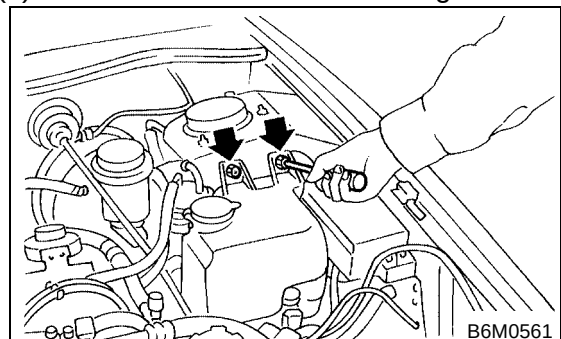
- (2) Remove bolt which secures engine harness bracket onto body.



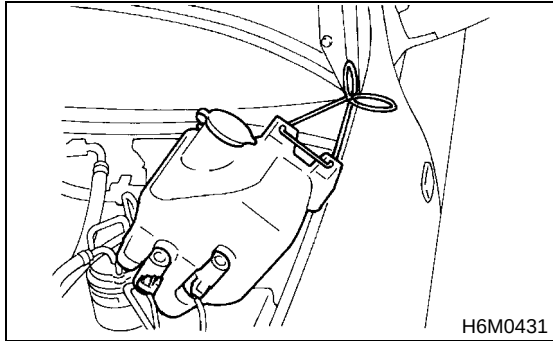
- (3) Disconnect washer motor connectors.



- (4) Remove washer tank mounting bolts.



- (5) Move washer tank upward.



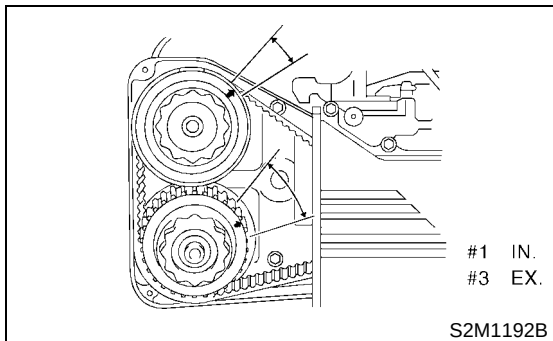
- (6) Disconnect spark plug cords from spark plugs (#2 and #4 cylinders).
 (7) Place suitable container under the vehicle.
 (8) Disconnect PCV hose from rocker cover (LH).
 (9) Remove bolts, then remove rocker cover (LH).

- 11) Turn crankshaft pulley clockwise until arrow mark on camshaft sprocket is set to position shown in figure.

NOTE:

Turn crankshaft using ST.

ST 499987500 CRANKSHAFT SOCKET



- 12) Measure #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

CAUTION:

- Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
- Measure exhaust valve clearances while lifting-up the vehicle.

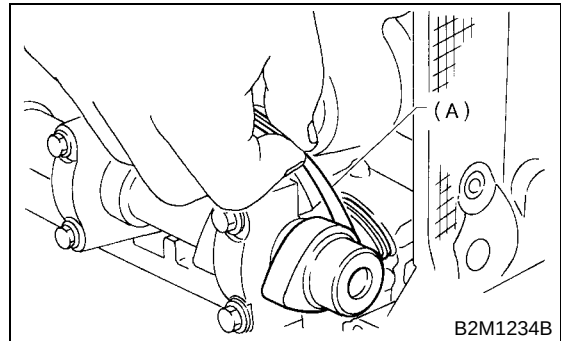
Valve clearance:

Intake: $0.20 \pm 0.02 \text{ mm}$ ($0.0079 \pm 0.0008 \text{ in}$)

Exhaust: $0.25 \pm 0.02 \text{ mm}$ ($0.0098 \pm 0.0008 \text{ in}$)

NOTE:

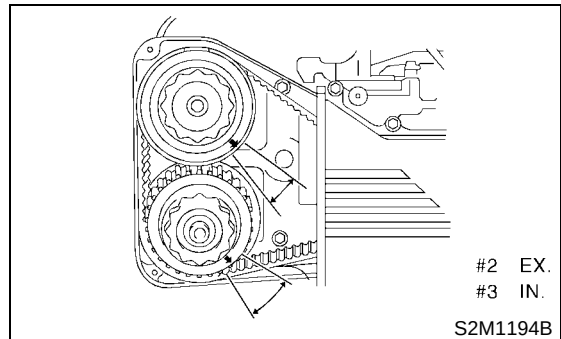
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



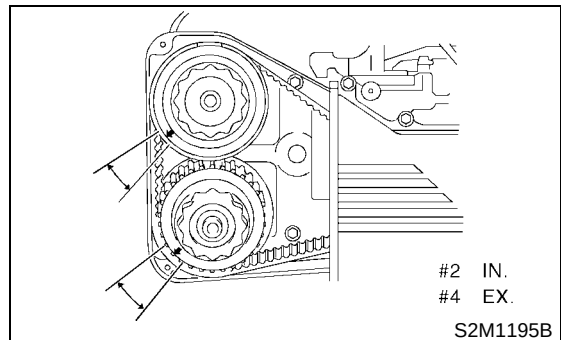
- 13) If necessary, adjust the valve clearance. <Ref. to ME(DOHC TURBO)-30, ADJUSTMENT, Valve Clearance.>

- 14) Further turn crankshaft pulley clockwise. Using the same procedures described previously, then measure valve clearances again.

- (1) Set arrow mark on camshaft sprocket to position shown in figure, and measure #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



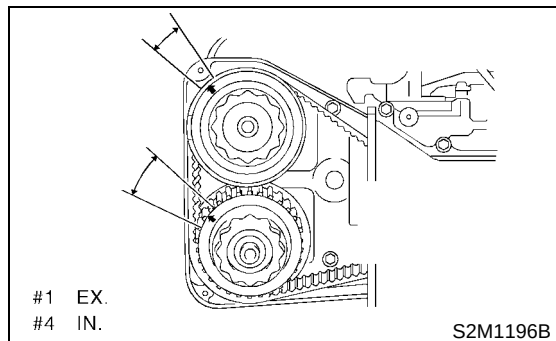
- (2) Set arrow mark on camshaft sprocket to position shown in figure, and measure #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



VALVE CLEARANCE

MECHANICAL

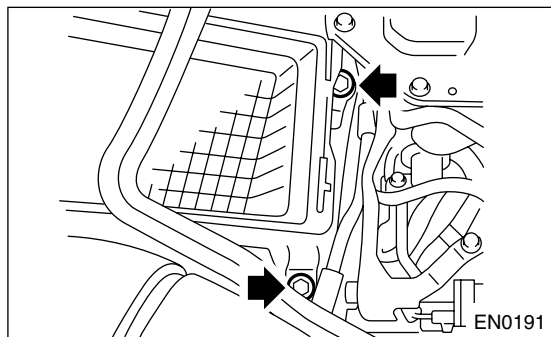
(3) Set arrow mark on camshaft sprocket to position shown in figure, and measure #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



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

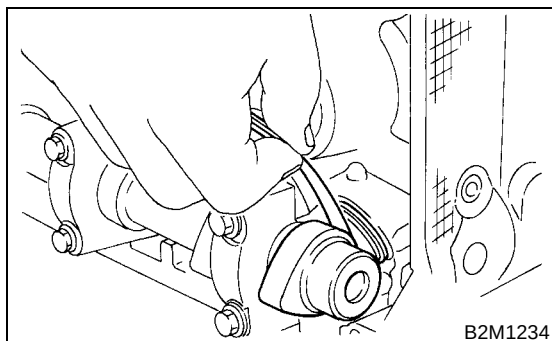
CAUTION:

Adjustment of valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to ME(DOHC TURBO)-28, INSPECTION, Valve Clearance.>

NOTE:

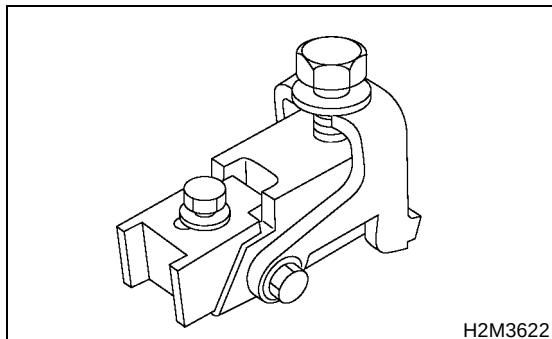
Record each valve clearance after it has been measured.



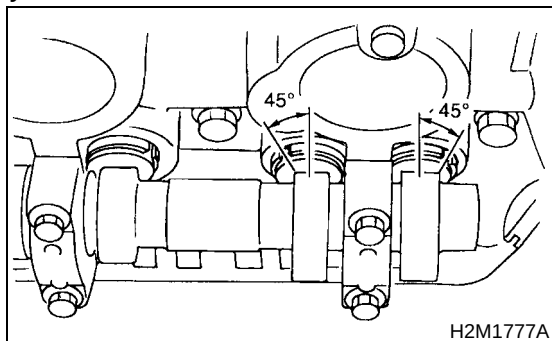
2) Remove shim from valve lifter.

(1) Prepare the ST.

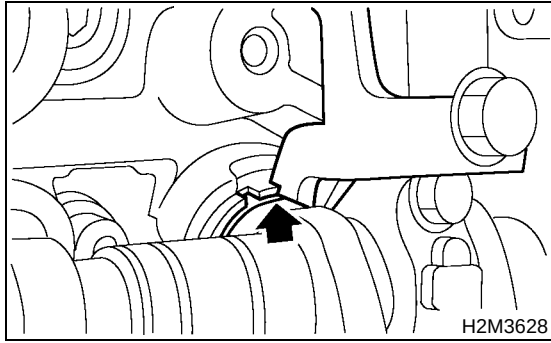
ST 498187200 SHIM REPLACER



(2) Rotate the notch of the valve lifter outward by 45°.



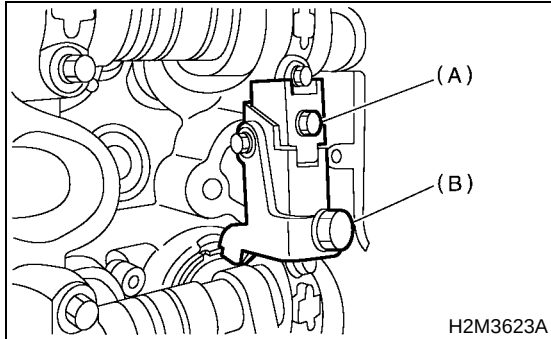
- (3) Adjust SHIM REPLACER notch to valve lifter and set it.



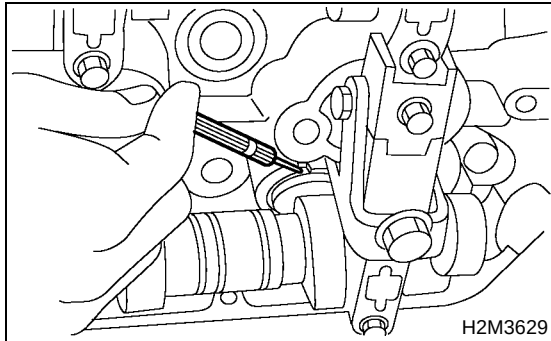
NOTE:

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.

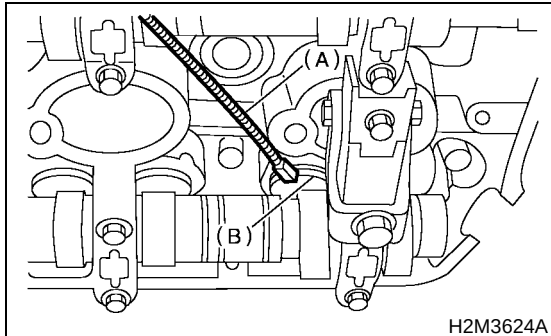


- (6) Insert tweezers into the notch of the valve lifter, and take the shim out.

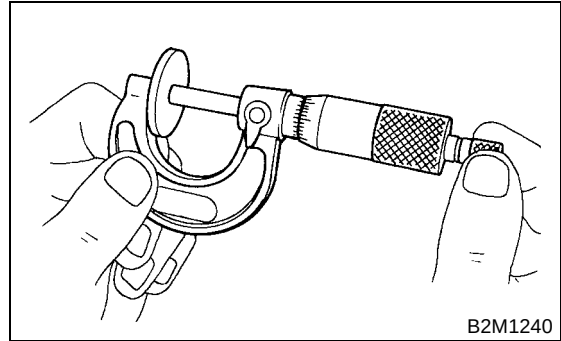


NOTE:

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	

VALVE CLEARANCE

MECHANICAL

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 AE730	2.24 (0.0882)
13218 AE750	2.26 (0.0890)
13218 AE770	2.28 (0.0898)
13218 AE790	2.30 (0.0906)
13218 AE810	2.32 (0.0913)
13218 AE830	2.34 (0.0921)
13218 AE850	2.36 (0.0929)
13218 AE870	2.38 (0.0937)
13218 AE890	2.40 (0.0945)
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 AF110	2.62 (0.1031)
13218 AF130	2.64 (0.1039)
13218 AF150	2.66 (0.1047)
13218 AF170	2.68 (0.1055)
13218 AF190	2.70 (0.1063)

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.

9. Engine Assembly

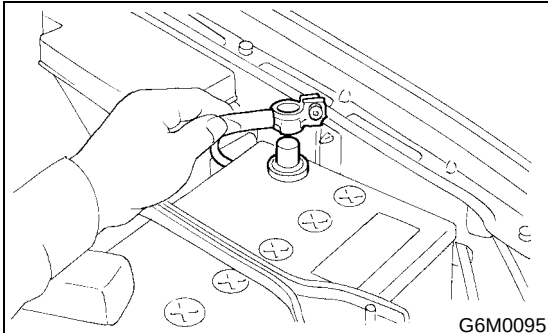
A: REMOVAL

- 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.

- (1) Disconnect fuel pump relay connector.



- (2) Start the engine, and run until stalls.
- (3) After the engine stalls, crank it for five seconds more.
- (4) Turn ignition switch to "OFF".
- 5) Remove filler cap.
- 6) Disconnect battery ground terminal.

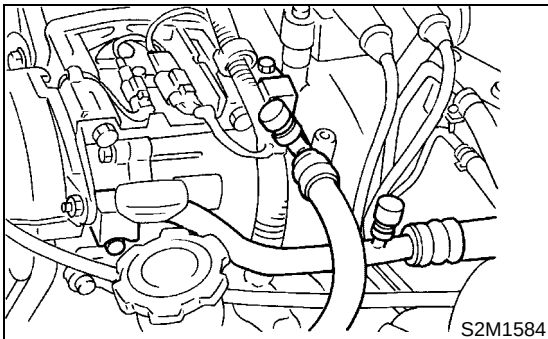


- 7) Remove radiator from vehicle. <Ref. to CO-37, REMOVAL, Radiator.>

- 8) Remove coolant filler tank. <Ref. to CO-51, REMOVAL, Coolant Filler Tank.>

- 9) Collect refrigerant, and remove pressure hoses.

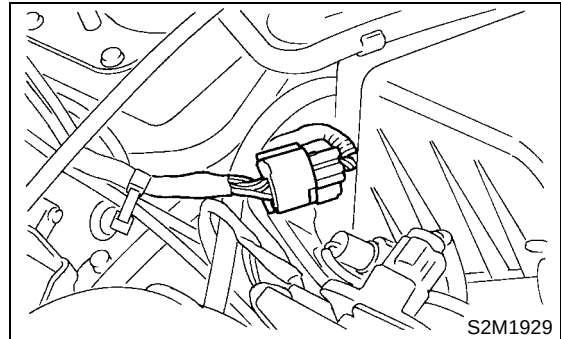
- (1) Place and connect the attachment hose to the refrigerant recycle system.
- (2) Collect refrigerant from A/C system.
- (3) Disconnect A/C pressure hoses from A/C compressor.



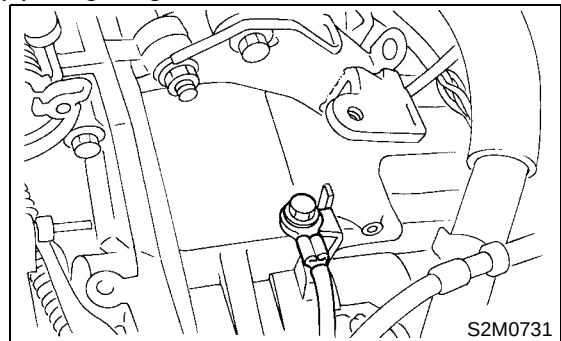
- 10) Remove intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

- 11) Disconnect the following connectors and cable.

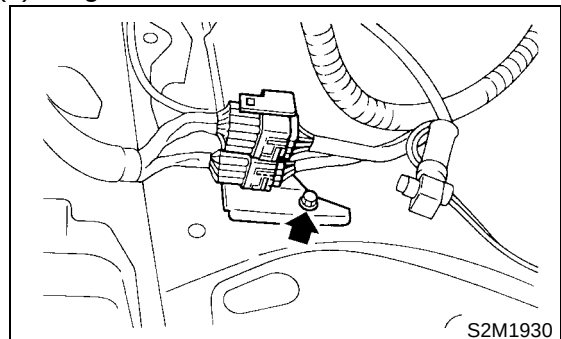
- (1) Engine harness connector



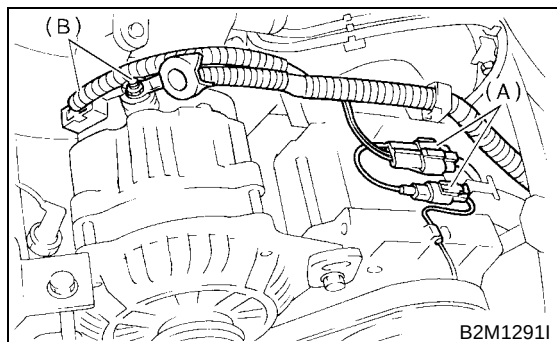
- (2) Engine ground terminal



- (3) Engine harness connector

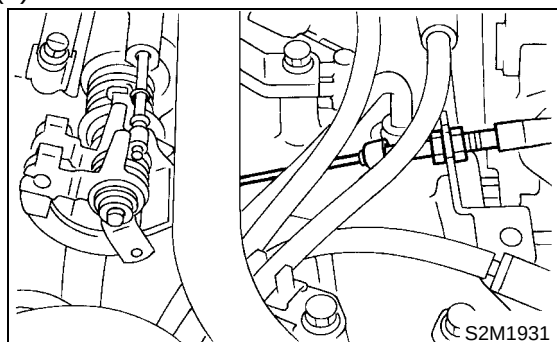


- (4) Generator connector, terminal and A/C compressor connectors

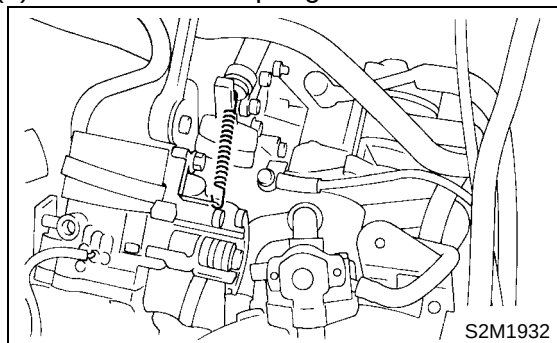


- (A) A/C compressor connector
(B) Generator connector and terminal

- (5) Accelerator cable

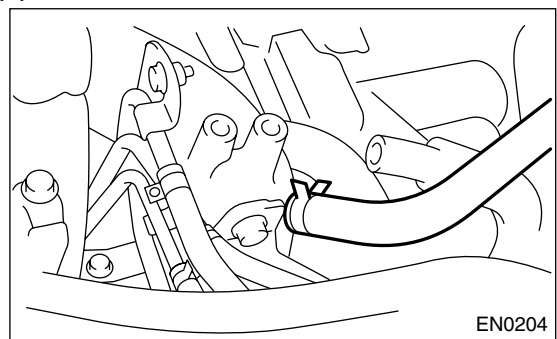


- (6) Clutch release spring

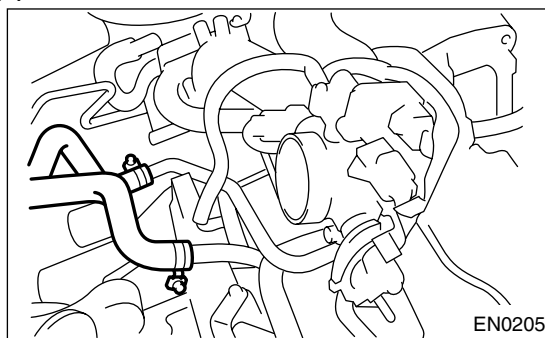


- 12) Disconnect the following hoses

- (1) Brake booster vacuum hose

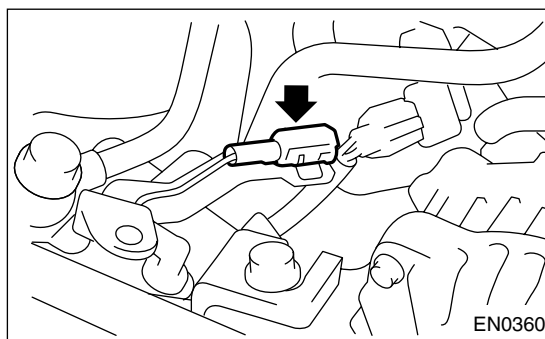


- (2) Heater inlet outlet hose

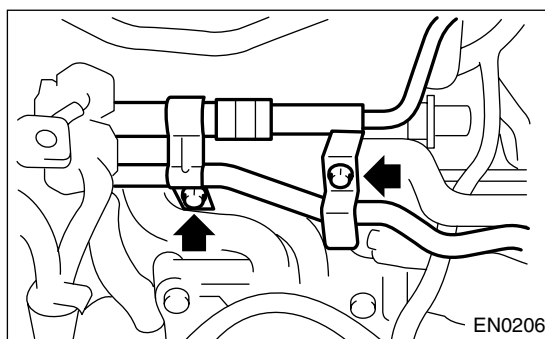


- 13) Remove power steering pump from bracket.

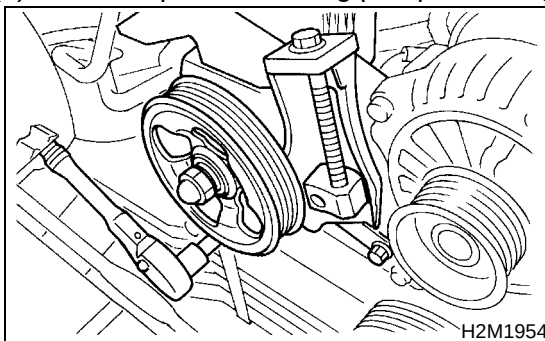
- (1) Loosen lock bolt and slider bolt, and remove front side V-belt. <Ref. to ME(DOHC TURBO)-43, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.



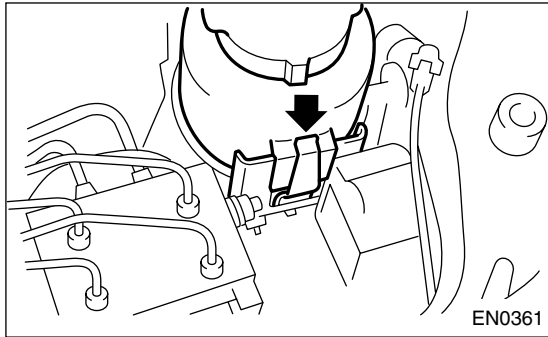
- (3) Remove pipe with bracket from intake manifold.



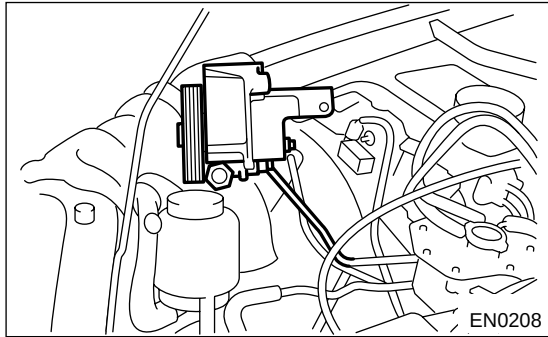
- (4) Remove power steering pump from engine.



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

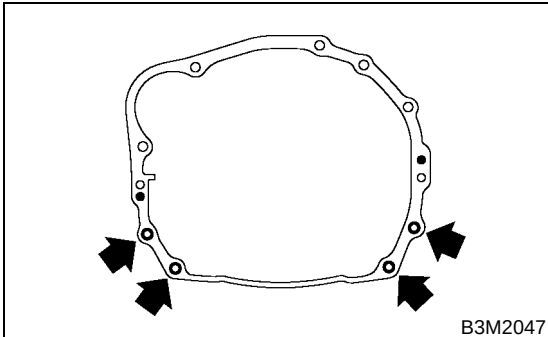


- (6) Place power steering pump on the right side wheel apron.

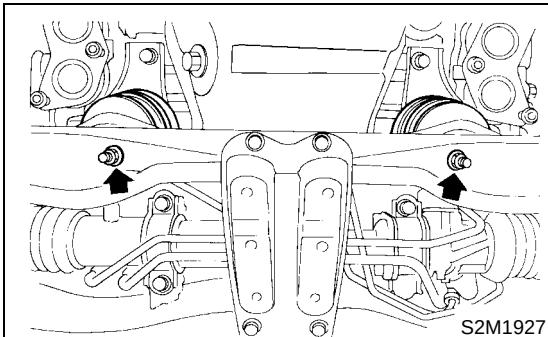


- 14) Remove center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>

- 15) Remove nuts which hold lower side of transmission to engine.



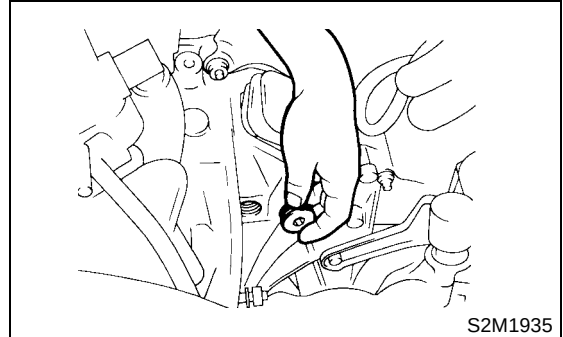
- 16) Remove nuts which install front cushion rubber onto front crossmember.



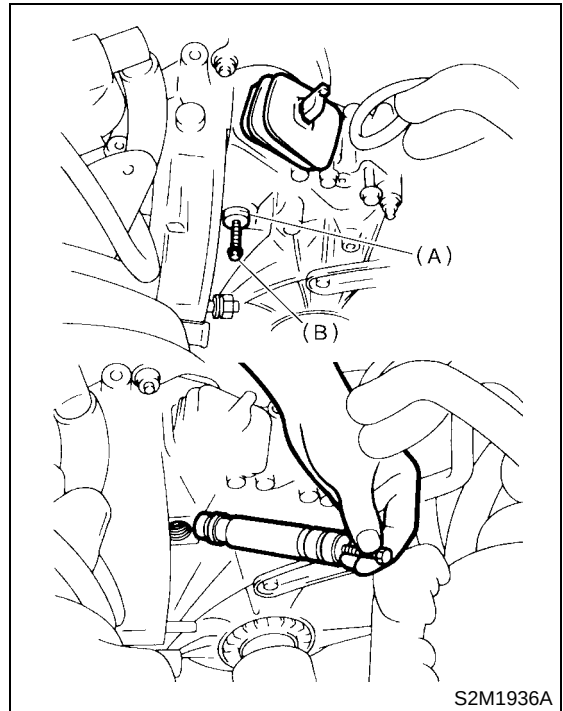
- 17) Separate clutch release fork from release bearing.

- (1) Remove clutch operating cylinder from transmission.

- (2) Remove plug using 10 mm hexagon wrench.



- (3) Screw 6 mm dia. bolt into release fork shaft, and remove it.



(A) Shaft

(B) Bolt

- (4) Raise release fork and unfasten release bearing tabs to free release fork.

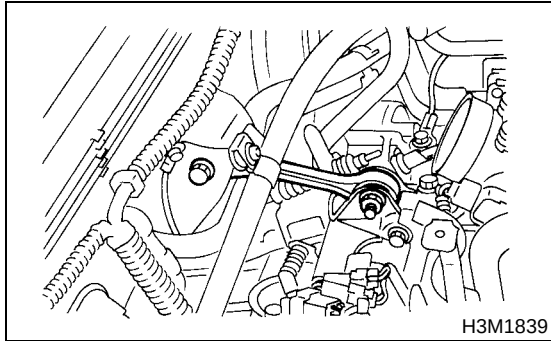
CAUTION:

Step (4) is required to prevent interference with engine when removing engine from transmission.

ENGINE ASSEMBLY

MECHANICAL

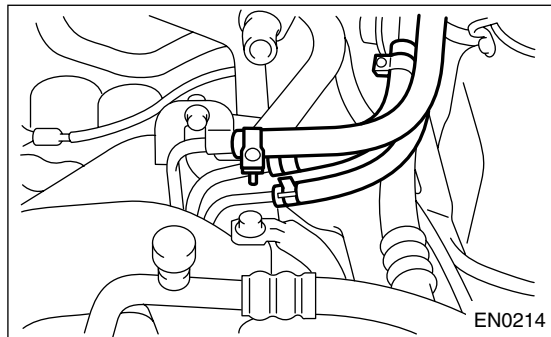
18) Remove pitching stopper.



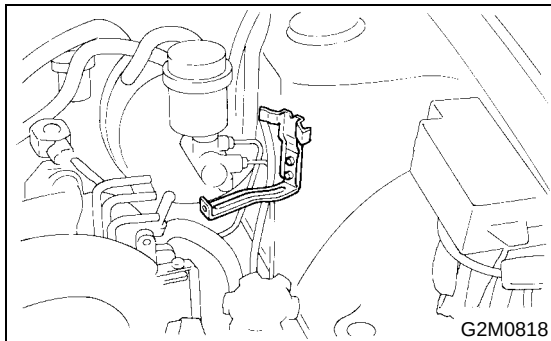
19) Disconnect fuel delivery hose, return hose and evaporation hose.

CAUTION:

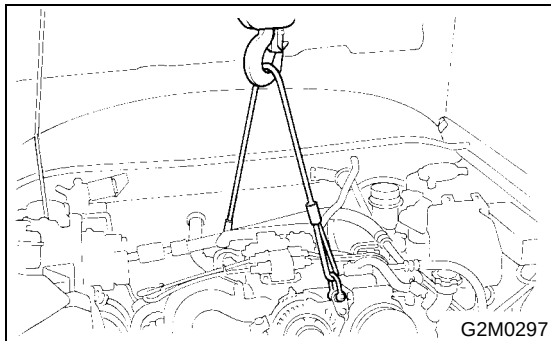
- Catch fuel from hose into container.
- Disconnect hose with its end wrapped with cloth to prevent fuel from splashing.



20) Remove fuel filter and bracket.



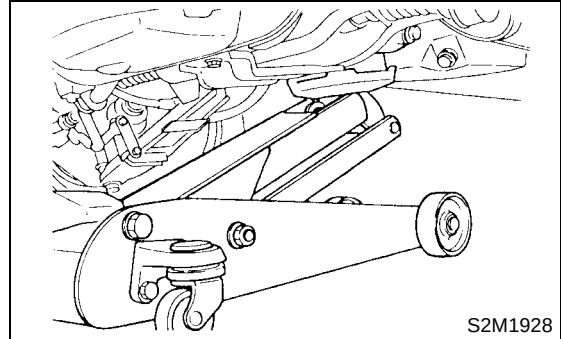
21) Support engine with a lifting device and wire ropes.



22) Support transmission with a garage jack.

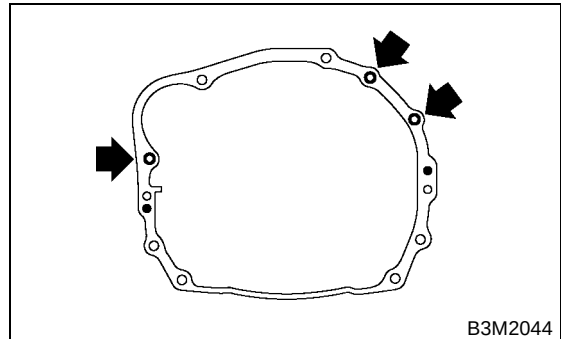
CAUTION:

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.



23) Separation of engine and transmission.

- (1) Remove starter. <Ref. to SC-5, REMOVAL, Starter.>
- (2) Remove bolt which holds right upper side of transmission to engine.



24) Remove engine from vehicle.

- (1) Slightly raise engine.
- (2) Raise transmission with garage jack.
- (3) Move engine horizontally until mainshaft is withdrawn from clutch cover.
- (4) Slowly move engine away from engine compartment.

CAUTION:

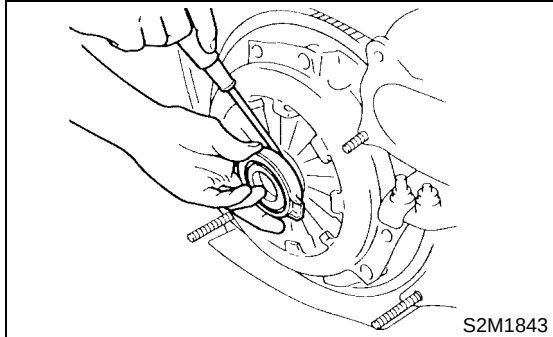
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

25) Remove front cushion rubbers.

B: INSTALLATION

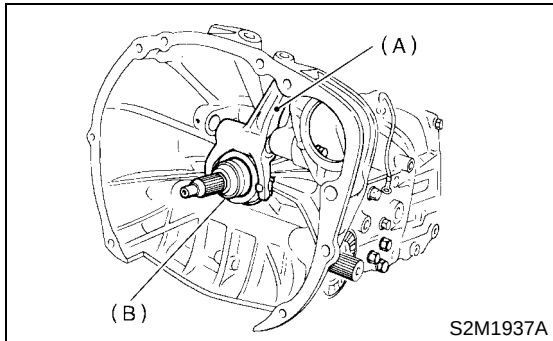
1) Install clutch release fork and bearing onto transmission.

(1) Remove release bearing from clutch cover with flat type screw driver.



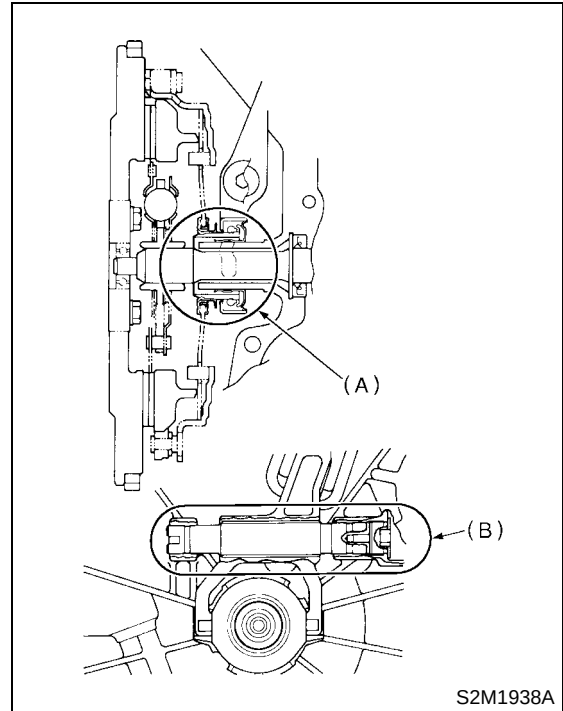
(2) Install release bearing on transmission.

(3) Install release fork into release bearing tab.



- (A) Release fork
- (B) Release bearing

- (4) Apply grease to specified points.
- Spline FX2200
- Shaft SUNLIGHT 2

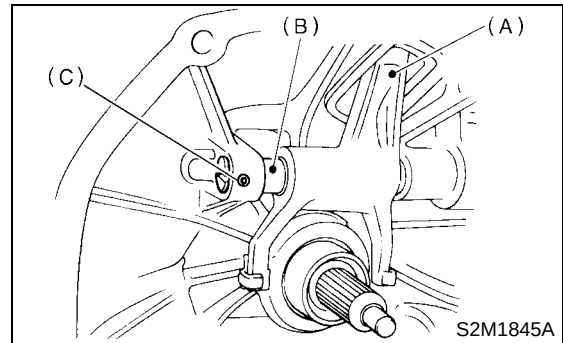


- (A) Spline (FX2200)
- (B) Shaft (SUNLIGHT 2)

(5) Insert release fork shaft into release fork.

CAUTION:

Make sure the cutout portion of release fork shaft contacts spring pin.



- (A) Release fork
- (B) Release shaft
- (C) Spring pin

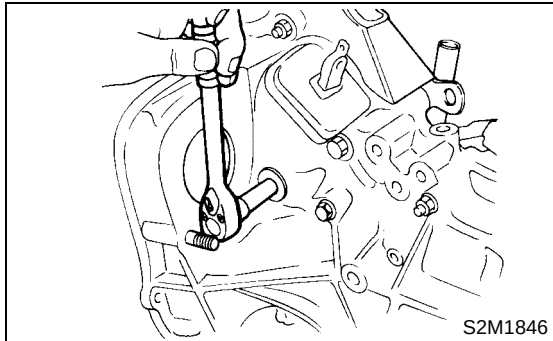
ENGINE ASSEMBLY

MECHANICAL

- (6) Tighten plug.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



- 2) Install front cushion rubbers to engine.

Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

- 3) Install engine onto transmission.

- (1) Position engine in engine compartment and align it with transmission.

CAUTION:

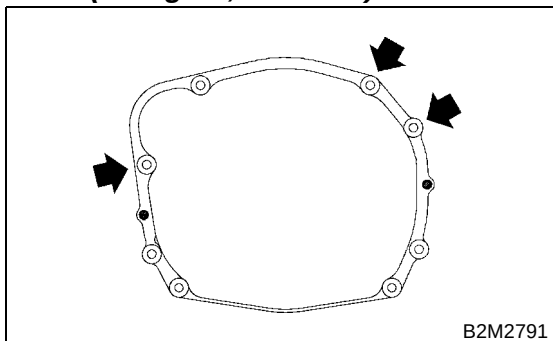
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

- (2) Apply a small amount of grease to splines of mainshaft.

- 4) Tighten bolt which hold right upper side of transmission to engine.

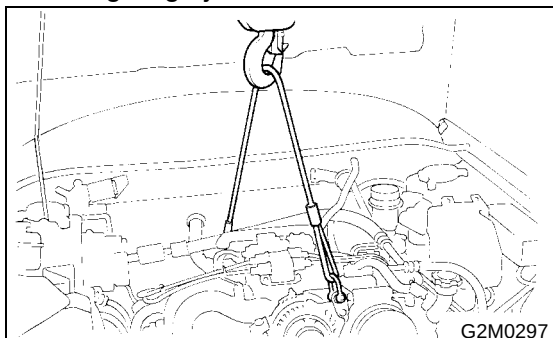
Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



- 5) Remove lifting device and wire ropes.

- 6) Remove garage jack.

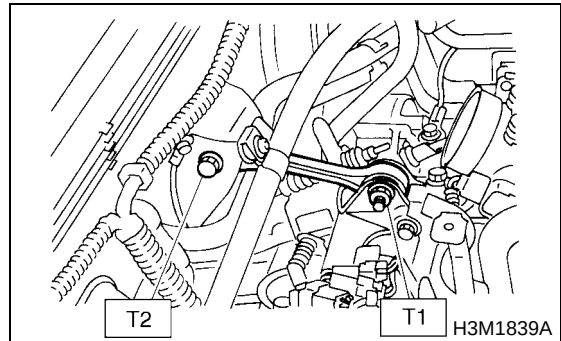


- 7) Install pitching stopper.

Tightening torque:

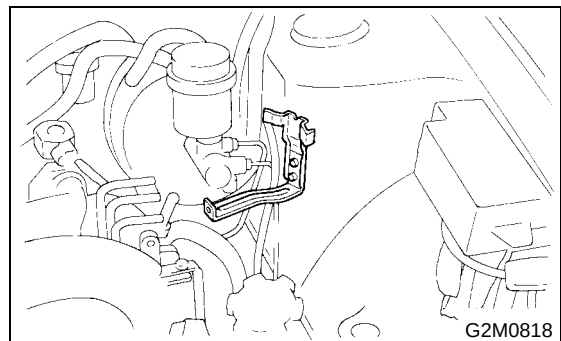
T1: 49 N·m (5.0 kgf-m, 36.2 ft-lb)

T2: 57 N·m (5.8 kgf-m, 42 ft-lb)



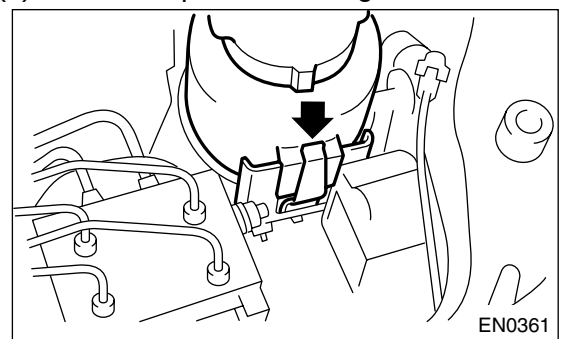
- 8) Install starter. <Ref. to SC-6, INSTALLATION, Starter.>

- 9) Install fuel filter and bracket.



- 10) Install power steering pump on bracket.

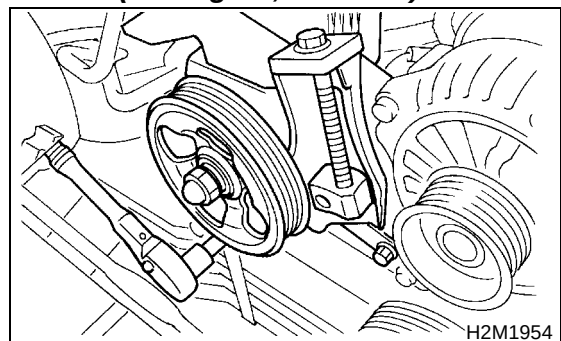
- (1) Install the power steering tank on bracket.



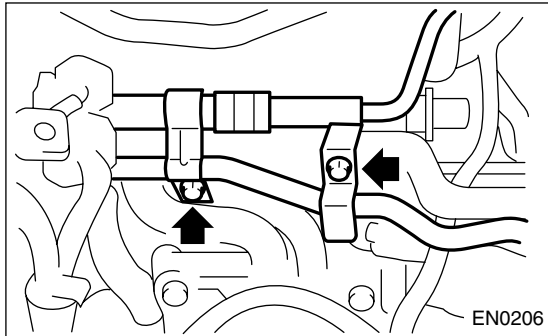
- (2) Install power steering pump on bracket, and tighten bolts.

Tightening torque:

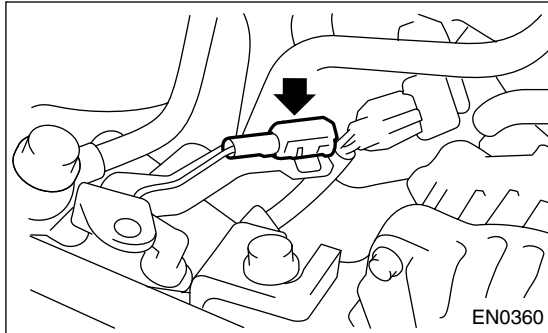
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



- (3) Install power steering pipe bracket on right side intake manifold, and install spark plug codes.



- (4) Connect power steering switch connector.

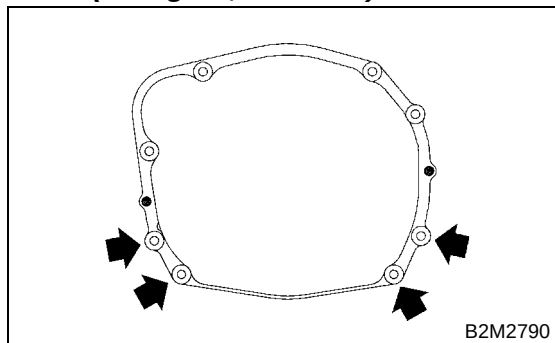


- (5) Install front side V-belt, and adjust it. <Ref. to ME(SOHC)-42, FRONT SIDE BELT, INSTALLATION, V-belt.>

- 11) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



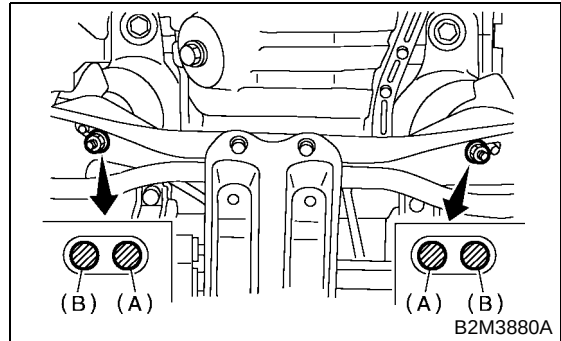
- 12) Tighten nuts which install front cushion rubber onto crossmember.

Tightening torque:

83 N·m (8.5 kgf-m, 61 ft-lb)

CAUTION:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



- 13) Install center exhaust pipe.

<Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center 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 and terminals.

- (1) Engine ground terminal
- (2) Engine harness connectors
- (3) Generator connector and terminal
- (4) A/C compressor connectors (With A/C)

- 16) Connect the following cables.

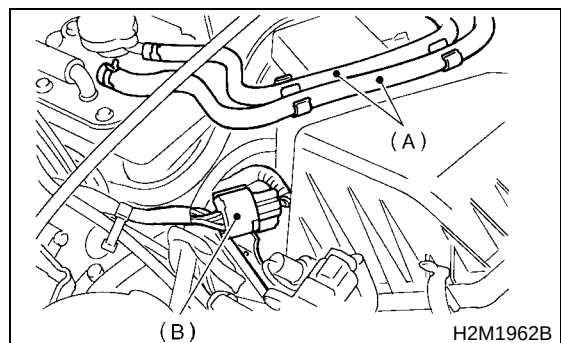
- (1) Accelerator cable
- (2) Clutch release spring

CAUTION:

After connecting each cable, adjust them.

- 17) Install air intake system.

- (1) Install intercooler. <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>
- (2) Install air cleaner element and air cleaner upper cover.
- (3) Install engine harness connector bracket.
- (4) Install filler hose to air cleaner case.



- (A) Filler hose
(B) Connector bracket

ENGINE ASSEMBLY

MECHANICAL

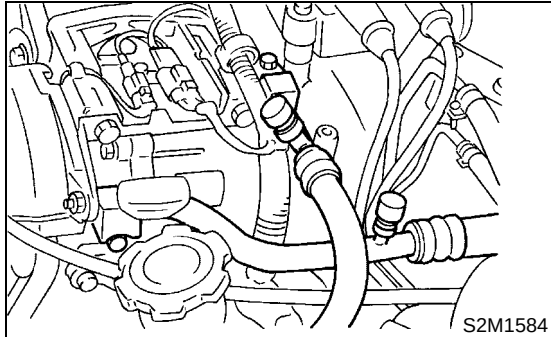
18) Install A/C pressure hoses. (With A/C)

CAUTION:

Use new O-rings.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



19) Install radiator. <Ref. to CO-40, INSTALLATION, Radiator.>

20) Install coolant filler tank. <Ref. to CO-51, INSTALLATION, Coolant Filler Tank.>

21) Install window washer tank.

22) Install battery in the vehicle, and connect cables.

23) Fill coolant.

<Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

24) Charge A/C system with refrigerant.

<Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>

25) Remove front hood stay, and close front hood.

26) Take off the vehicle from lift arms.

10.Engine Mounting

A: REMOVAL

- 1) Remove engine assembly. <Ref. to ME(DOHC TURBO)-33, REMOVAL, Engine Assembly.>
- 2) Remove engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Engine mounting;

35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

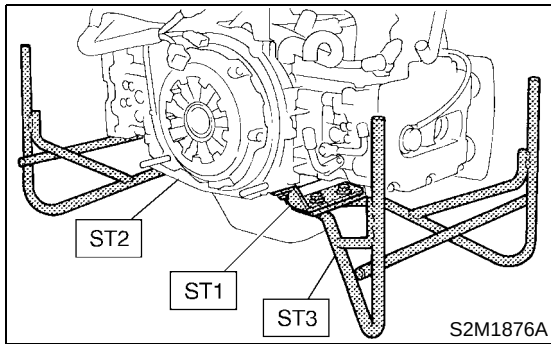
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from the 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

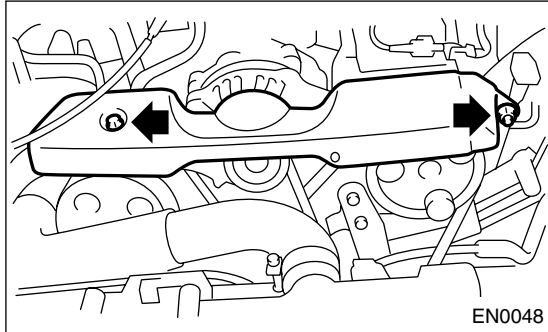
A: REMOVAL

1. FRONT SIDE BELT

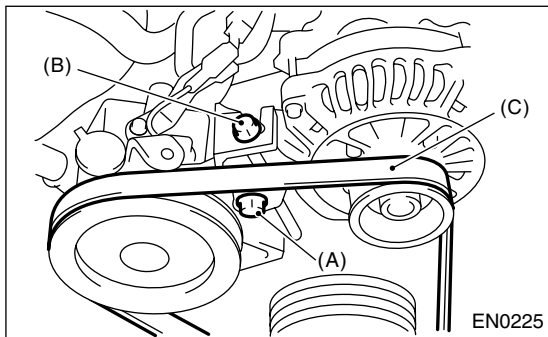
NOTE:

Perform the following procedures 1) to 4) with the engine installed to the body.

- 1) Remove V-belt cover.

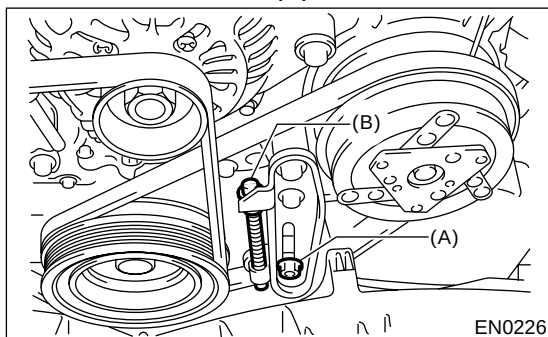


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).

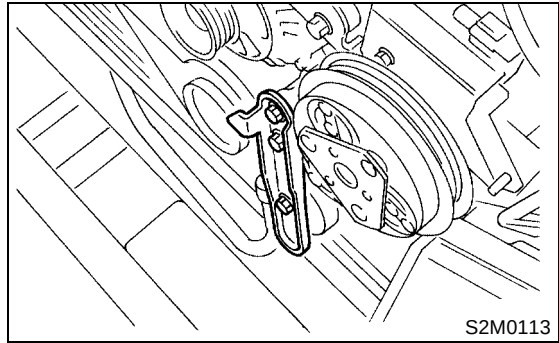


2. REAR SIDE BELT

- 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 a belt, and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(DOHC TURBO)-44, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A)
- 3) Tighten slider bolt (B).

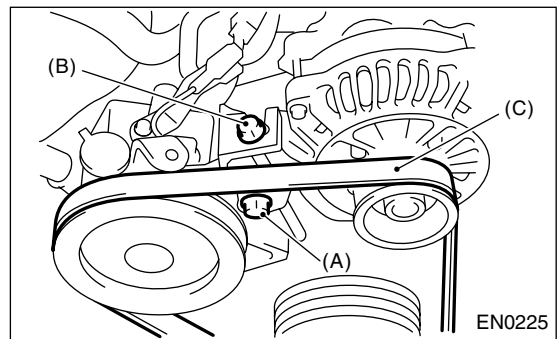
Tightening torque:

Lock bolt through bolt:

25 N·m (2.5 kgf-m, 18 ft-lb)

Slider bolt:

8 N·m (0.8 kgf-m, 5.5 ft-lb)



V-BELT

MECHANICAL

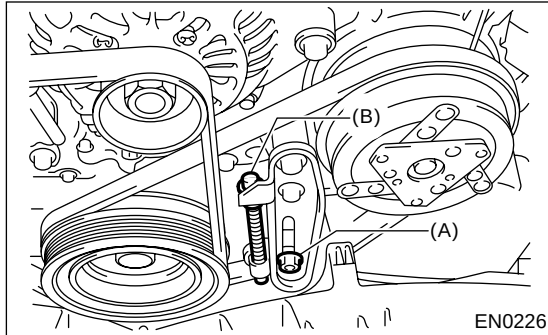
2. REAR SIDE BELT

- 1) Install a belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(DOHC TURBO)-44, 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 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 — 9 mm (0.276 — 0.354 in)

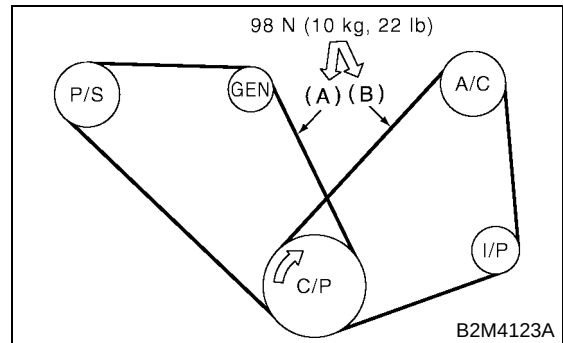
reused: 9 — 11 mm (0.354 — 0.433 in)

(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

13.Crankshaft Pulley

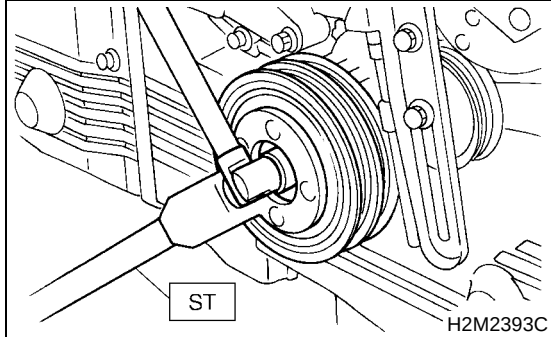
A: REMOVAL

1) Remove V-belt. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>

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 pulley bolt.

To lock crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.

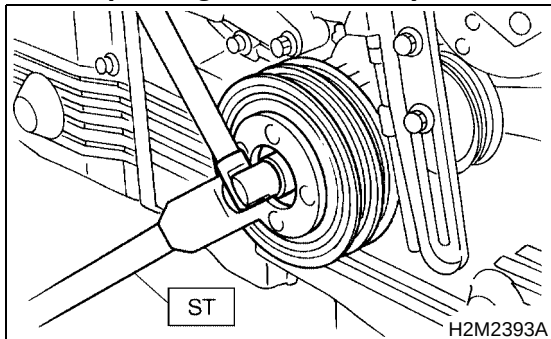
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

(3) Tighten the 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 the crankshaft pulley bolt is 65 degrees or more. If not, conduct the following procedures (1) through (4).

(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:

12369AA011

(2) Clean the crankshaft thread using an air gun.

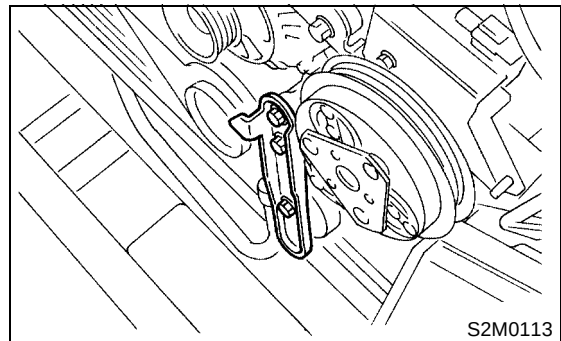
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).

(4) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

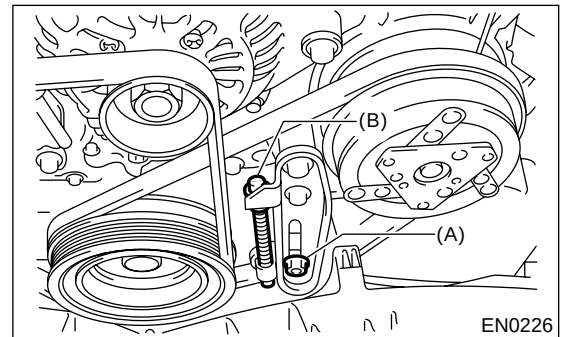
CAUTION:

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 A/C belt tensioner.



5) Install A/C belt.



C: INSPECTION

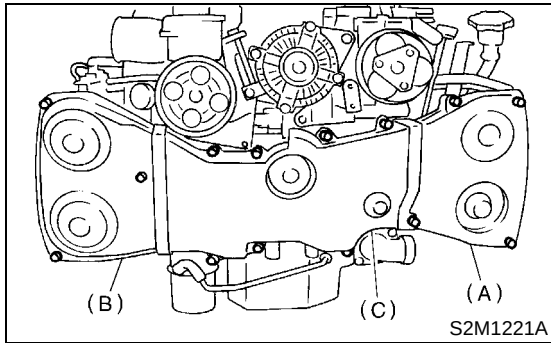
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(DOHC TURBO)-44, INSPECTION, V-belt.>

14. Belt Cover

A: REMOVAL

- 1) Remove V-belt. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, REMOVAL, Crankshaft Pulley.>
- 3) Remove left-hand belt cover (A).
- 4) Remove right-hand belt cover (B).
- 5) Remove front belt cover (C).



B: INSTALLATION

- 1) Install front belt cover (C).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 2) Install right-hand belt cover (B).

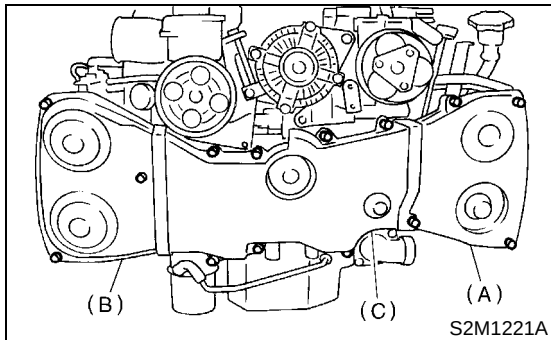
Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 3) Install left-hand belt cover (A).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



- 4) Install crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, INSTALLATION, Crankshaft Pulley.>
- 5) Install V-belt. <Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>

C: INSPECTION

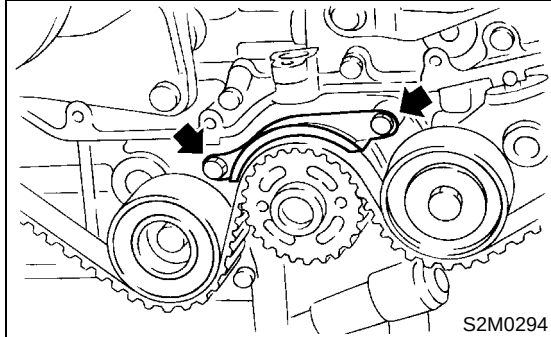
Make sure the cover is not damaged.

15. Timing Belt Assembly

A: REMOVAL

1. TIMING BELT

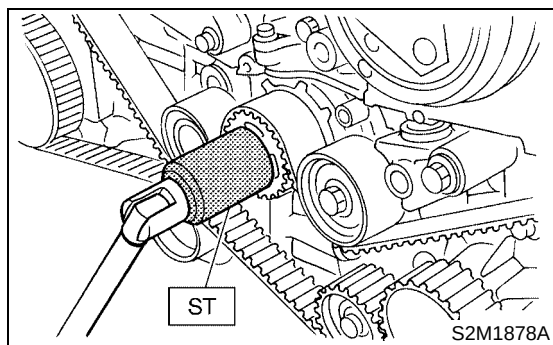
- 1) Remove V-belt. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Belt Cover.>
- 4) Remove timing belt guides.



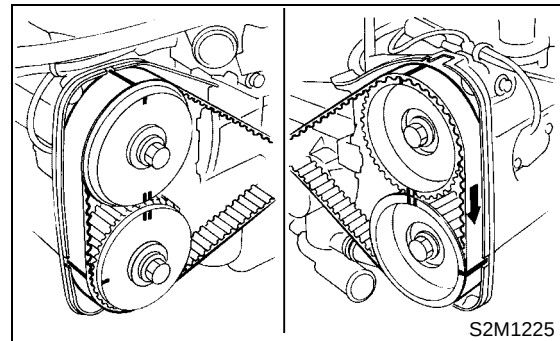
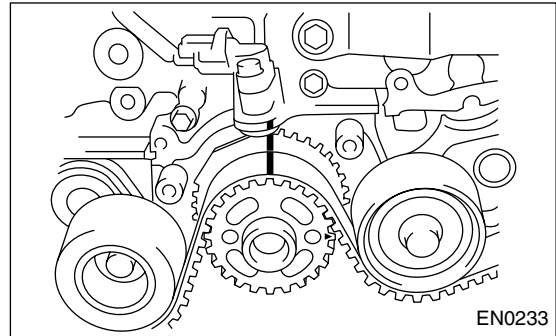
- 5) If alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as follows:

(1) Turn crankshaft using ST, and align alignment marks on crankshaft sprocket, left-hand intake camshaft sprocket, left-hand exhaust camshaft sprocket, right-hand intake camshaft sprocket and right hand exhaust camshaft sprocket with notches of belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET



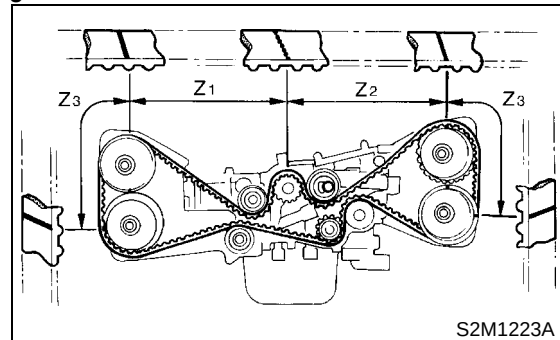
- (2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the sprockets.



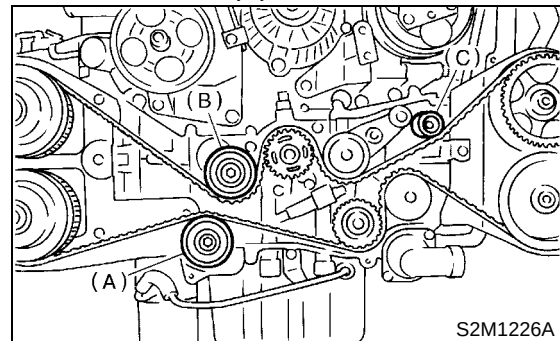
Z₁: 54.5 tooth length

Z₂: 51 tooth length

Z₃: 28 tooth length



- 6) Remove belt idler (A).



- 7) Remove timing belt.

TIMING BELT ASSEMBLY

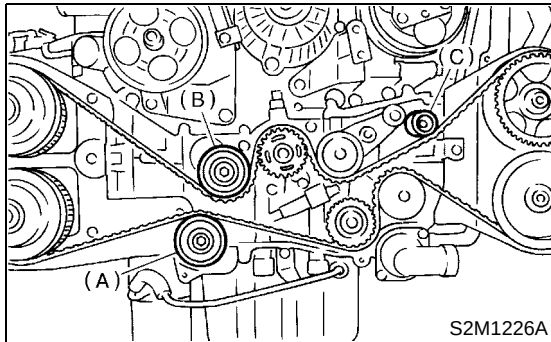
MECHANICAL

CAUTION:

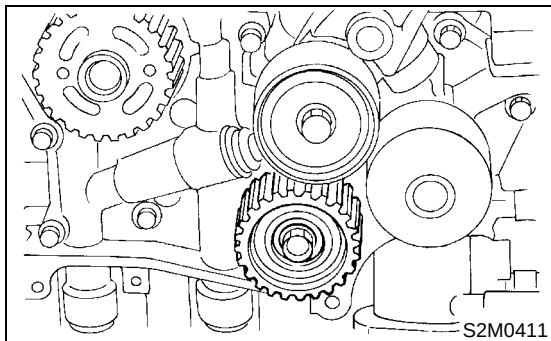
After timing belt has been removed, never rotate intake and exhaust, camshaft sprocket. If camshaft sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

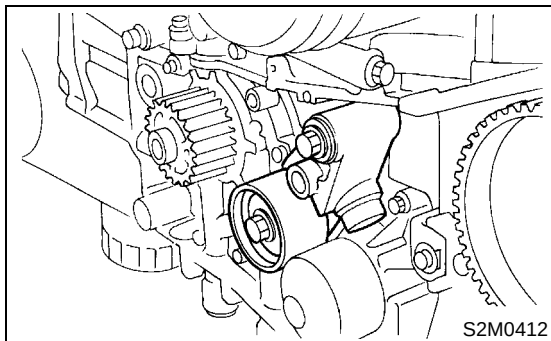
- 1) Remove belt idler (B) and (C).



- 2) Remove belt idler No. 2.



- 3) Remove automatic belt tension adjuster assembly.



B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

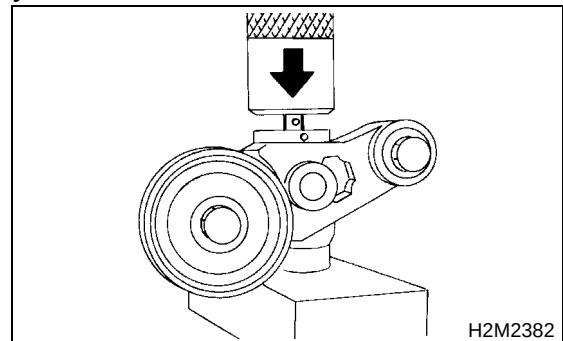
- 1) Preparation for installation of automatic belt tension adjuster assembly:

CAUTION:

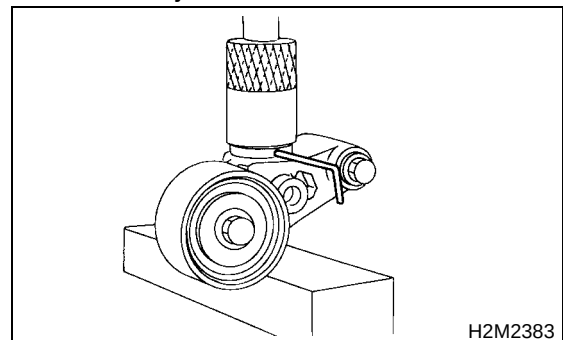
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push adjuster rod vertically.
- Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kgf, 66 lb).
- Press-in the push adjuster rod gradually taking more than three minutes.
- 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.



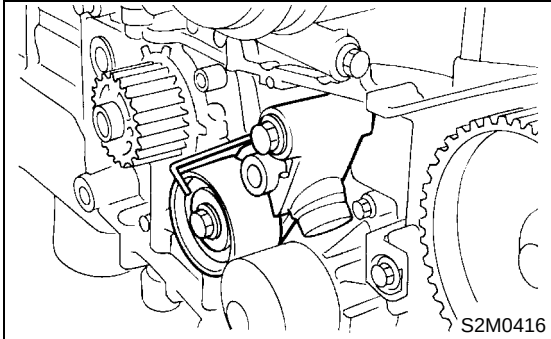
- (3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



2) Install automatic belt tension adjuster assembly.

Tightening torque:

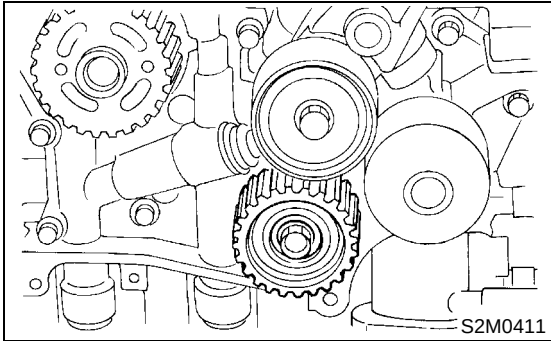
39 N·m (4.0 kgf-m, 28.9 ft-lb)



3) Install belt idler No. 2.

Tightening torque:

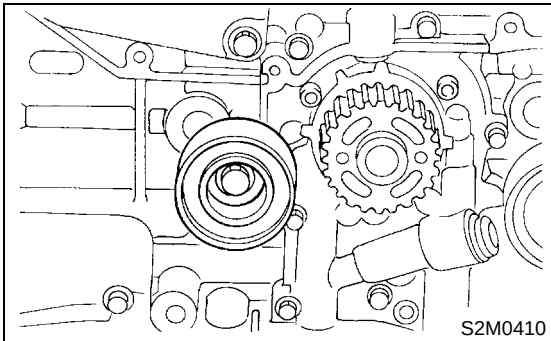
39 N·m (4.0 kgf-m, 28.9 ft-lb)



4) Install belt idler.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

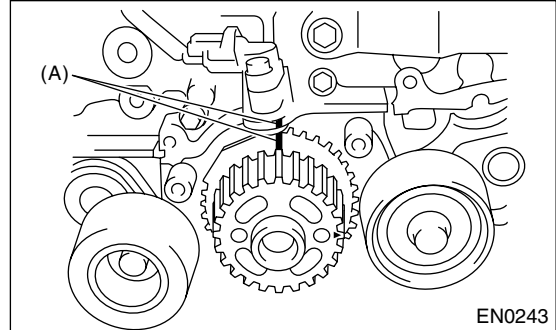


2. TIMING BELT

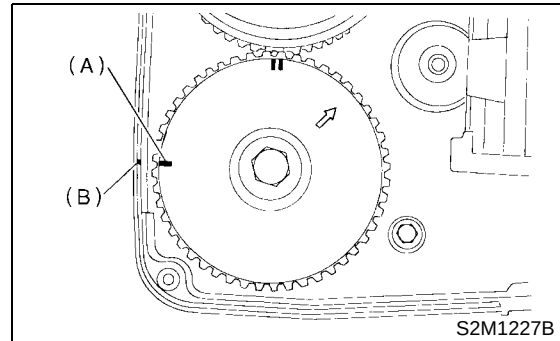
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(DOHC TURBO)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, Timing Belt Assembly.>

2) Crankshaft and camshaft sprocket alignment.

(1) Align mark (A) on crankshaft sprocket with mark on the oil pump cover at cylinder block.

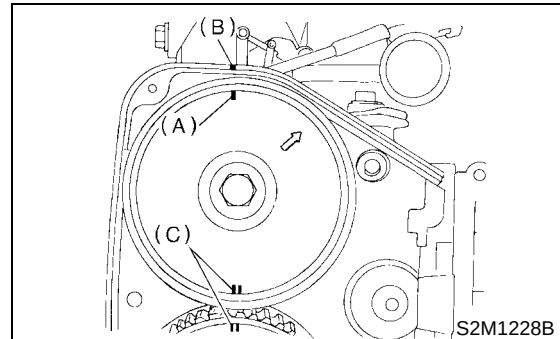


(2) Align single line mark (A) on right-hand exhaust camshaft sprocket with notch (B) on belt cover.



(3) Align single line mark (A) on right-hand intake camshaft sprocket with notch (B) on belt cover.

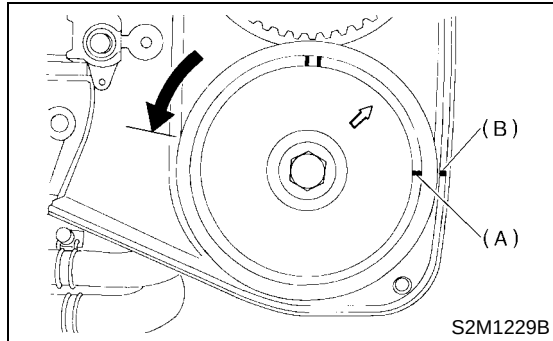
(Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)



TIMING BELT ASSEMBLY

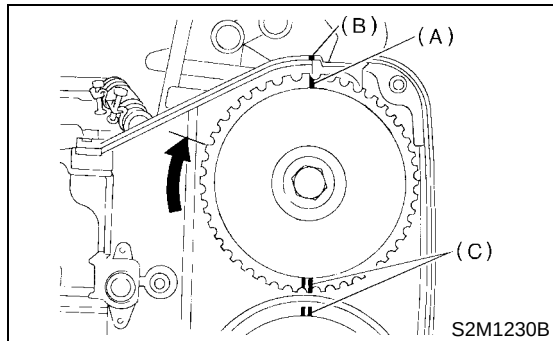
MECHANICAL

(4) Align single line mark (A) on left-hand exhaust camshaft sprocket with notch (B) on belt cover by turning sprocket counterclockwise (as viewed from front of engine).



(5) Align single line mark (A) on left-hand intake camshaft sprocket with notch (B) on belt cover by turning sprocket clockwise (as viewed from front of engine).

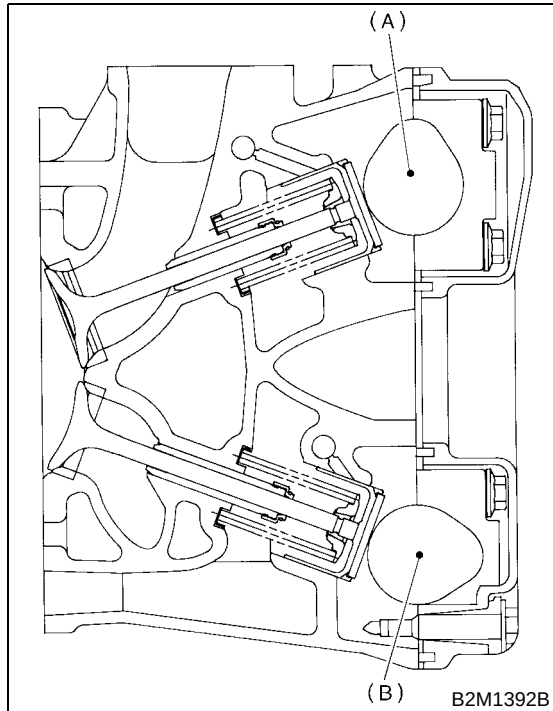
Ensure double lines (C) on intake and exhaust camshaft sprockets are aligned.



(6) Ensure camshaft and crankshaft sprockets are positioned properly.

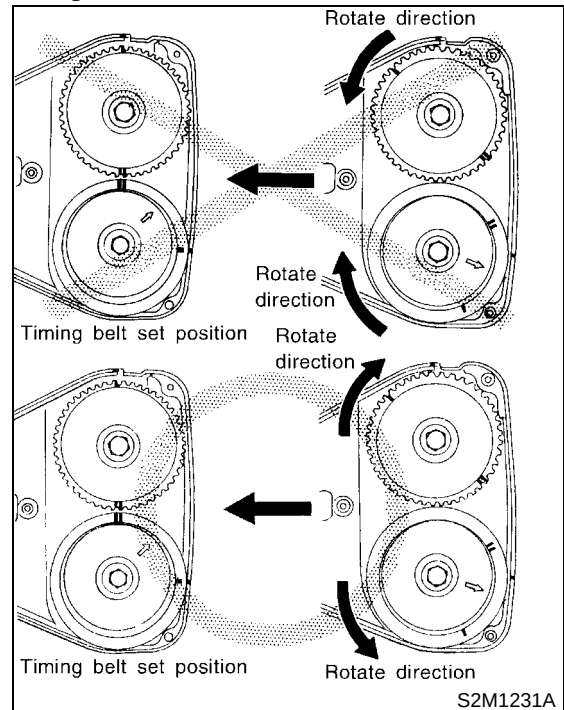
CAUTION:

- Intake and exhaust camshafts for this DOHC engine can be independently rotated with timing belts removed. As can be seen from the figure, if intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



(A) Intake camshaft
(B) Exhaust camshaft

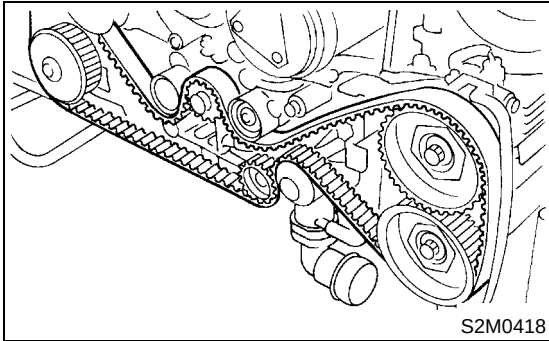
- When timing belts are not installed, four camshafts are held at the “zero-lift” position, where all cams on camshafts do not push intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
- When camshafts are rotated to install timing belts, #2 intake and #4 exhaust cam of 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 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 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.



TIMING BELT ASSEMBLY

MECHANICAL

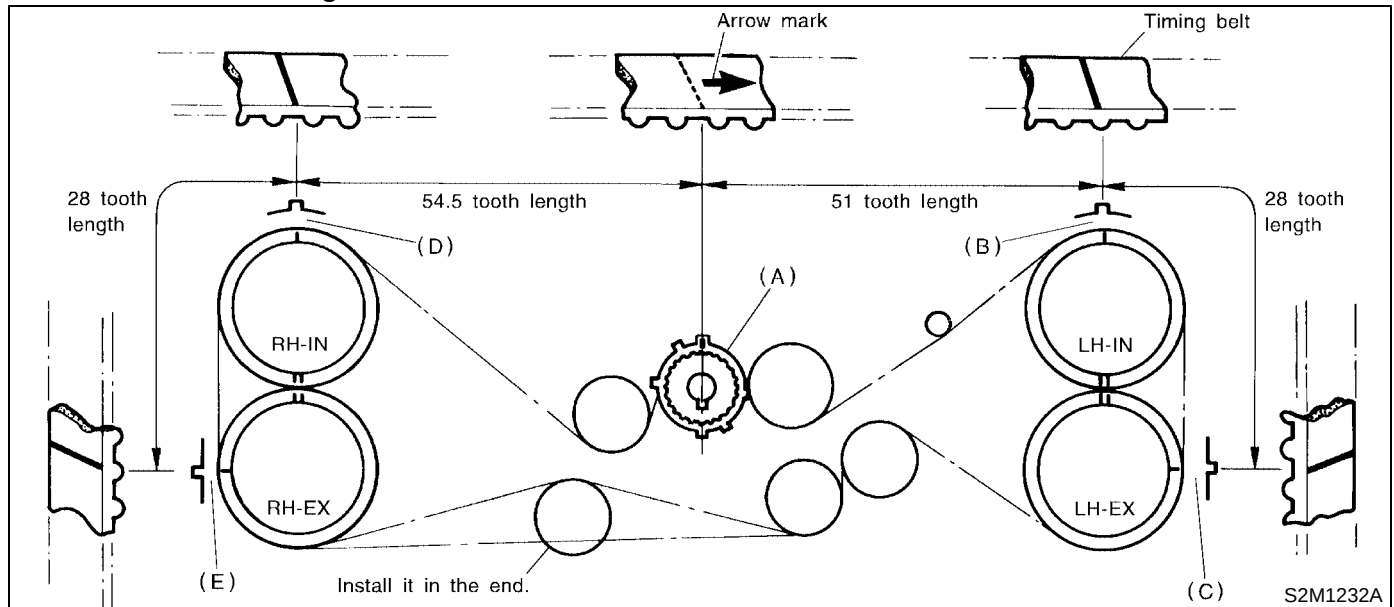
3) Installation of timing belt



Align alignment mark on timing belt with marks on sprockets in the alphabetical order shown in figure. While aligning marks, position timing belt properly.

CAUTION:

- Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
- Ensure belt's rotating direction is correct.



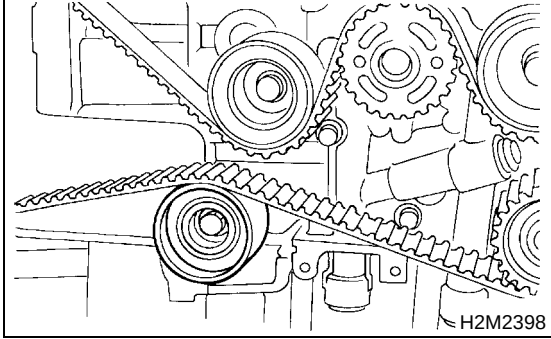
4) Install belt idlers.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

CAUTION:

Make sure that the marks on timing belt and sprockets are aligned.



5) After ensuring that the marks on timing belt and sprockets are aligned, remove stopper pin from tensioner adjuster.

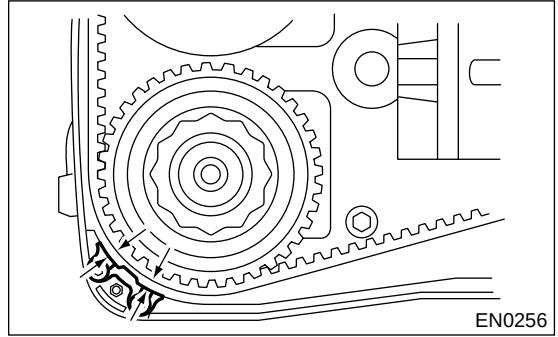
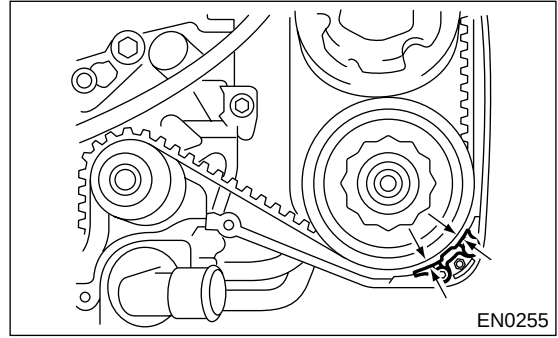
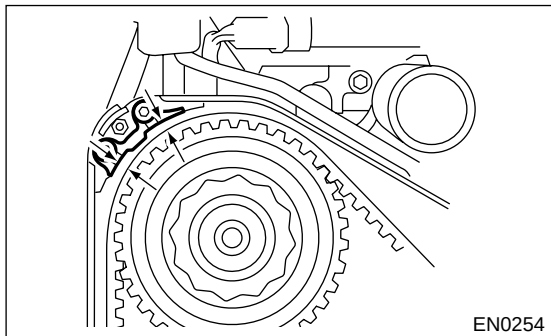
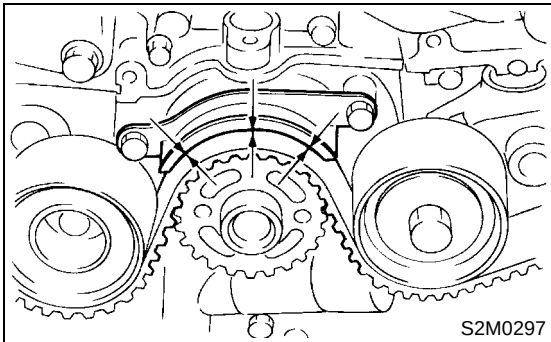
6) Install timing belt guide.

(1) Temporarily tighten remaining bolts.

(2) Check and adjust clearance between timing belt and timing belt guide.

Clearance:

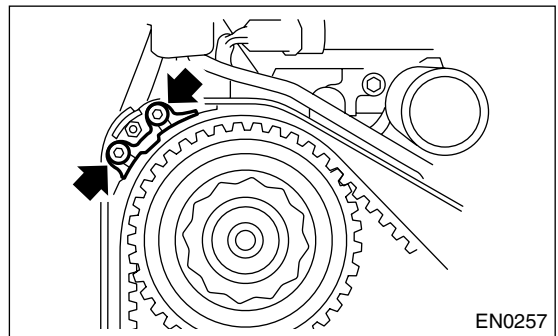
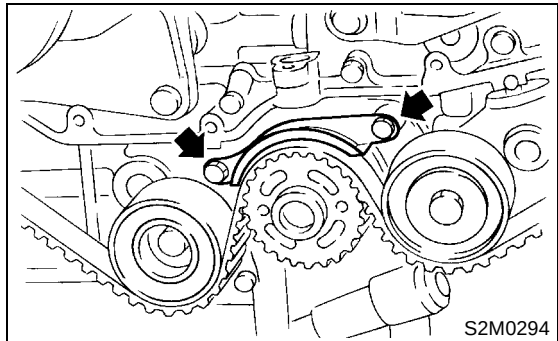
1.0±0.5 mm (0.039±0.020 in)

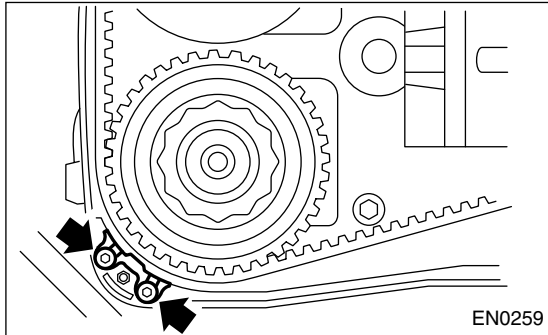
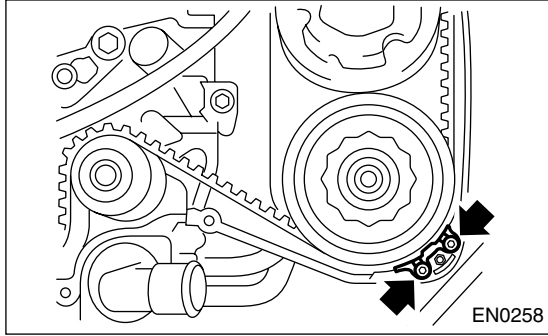


(3) Tighten remaining bolts.

Tightening torque:

9.8 N·m (1.0 kgf-m, 7.2 ft-lb)





7) Install belt cover. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Belt Cover.>

8) Install crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, REMOVAL, Crankshaft Pulley.>

9) Install V-belt. <Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>

C: INSPECTION

1. TIMING BELT

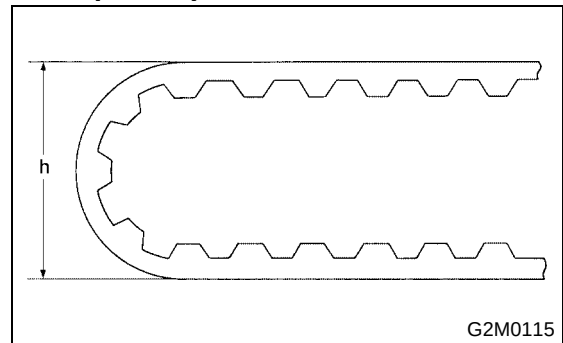
- 1) Check timing belt teeth for breaks, cracks, and wear. If any fault is found, replace belt.
- 2) Check the condition of back side of belt; if any crack is found, replace belt.

CAUTION:

- 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 automatic belt tension adjuster assembly.

CAUTION:

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 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.

CAUTION:

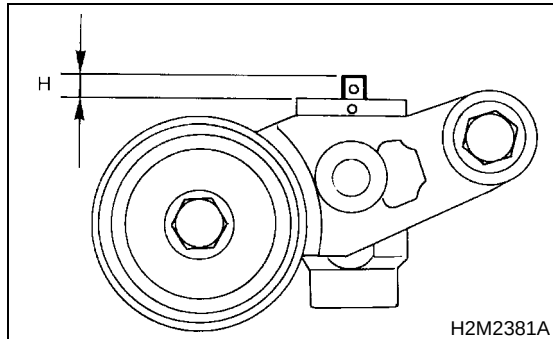
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push adjuster rod vertically.

- Press-in the push adjuster rod gradually taking more than three 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

$5.7 \pm 0.5 \text{ mm}$ ($0.224 \pm 0.020 \text{ in}$)



3. BELT TENSION PULLEY

- 1) Check mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace belt tension pulley if faulty.
- 2) Check belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
- 3) Check belt tension pulley for grease leakage.

4. BELT IDLER

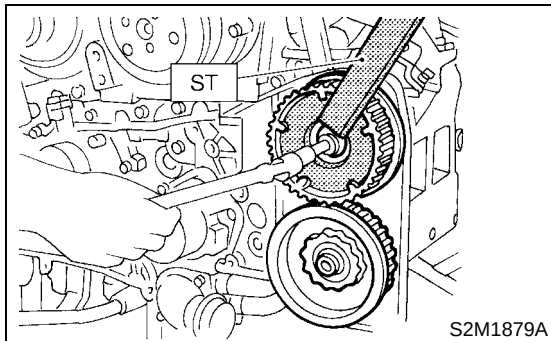
- 1) Check idler for smooth rotation. Replace if noise or excessive play is noted.
- 2) Check outer contacting surfaces of idler pulley for abnormal wear and scratches.
- 3) Check idler for grease leakage.

16. Camshaft Sprocket

A: REMOVAL

- 1) Remove V-belt. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Belt Cover.>
- 4) Remove timing belt assembly. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Timing Belt Assembly.>
- 5) Remove camshaft position sensor. <Ref. to FU(DOHC TURBO)-29, REMOVAL, Camshaft Position Sensor.>
- 6) Remove camshaft sprockets. To lock camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



B: INSTALLATION

- 1) Install camshaft sprocket No. 1. and No. 2. To lock camshaft, use ST.

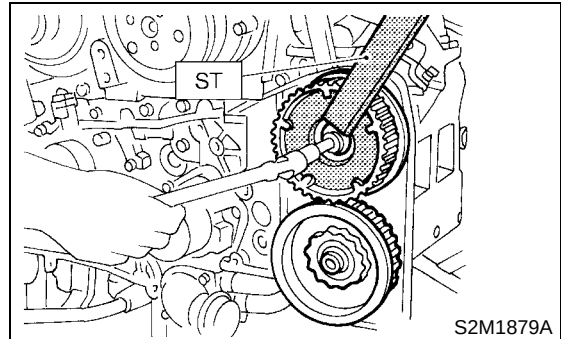
ST 499207100 CAMSHAFT SPROCKET WRENCH

Tightening torque:

98 N·m (10 kgf-m, 72.4 ft-lb)

CAUTION:

Do not confuse left and right side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.



- 2) Install camshaft position sensor. <Ref. to FU(DOHC TURBO)-29, INSTALLATION, Camshaft Position Sensor.>
- 3) Install timing belt assembly. <Ref. to ME(DOHC TURBO)-48, INSTALLATION, Timing Belt Assembly.>
- 4) Install belt cover. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Belt Cover.>
- 5) Install crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, INSTALLATION, Crankshaft Pulley.>
- 6) Install V-belt. <Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>

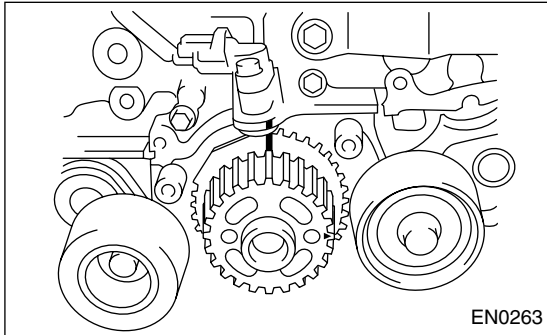
C: INSPECTION

- 1) Check sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

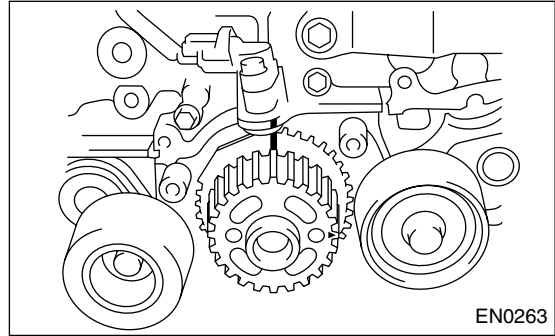
A: REMOVAL

- 1) Remove V-belt. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Belt Cover.>
- 4) Remove timing belt assembly. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Timing Belt Assembly.>
- 5) Remove camshaft sprocket. <Ref. to ME(DOHC TURBO)-56, REMOVAL, Camshaft Sprocket.>
- 6) Remove crankshaft sprocket.



B: INSTALLATION

- 1) Install crankshaft sprocket.



- 2) Install camshaft sprocket. <Ref. to ME(DOHC TURBO)-56, INSTALLATION, Camshaft Sprocket.>
- 3) Install timing belt assembly. <Ref. to ME(DOHC TURBO)-48, INSTALLATION, Timing Belt Assembly.>
- 4) Install belt cover. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Belt Cover.>
- 5) Install crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, INSTALLATION, Crankshaft Pulley.>
- 6) Install V-belt. <Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>

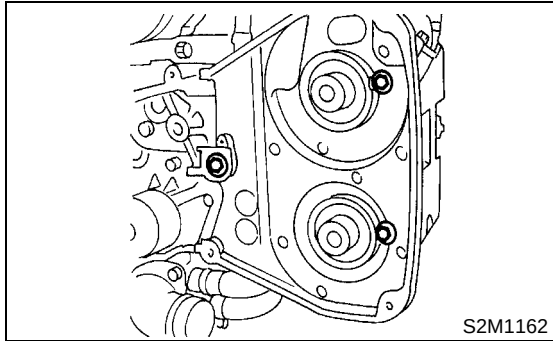
C: INSPECTION

- 1) Check sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

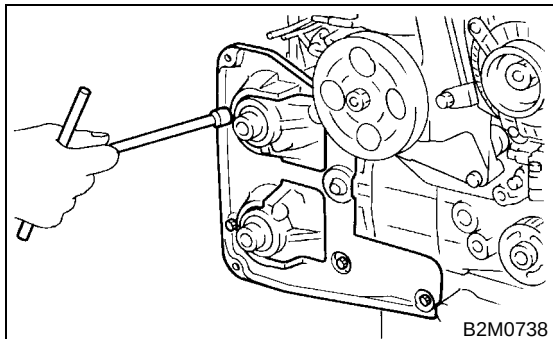
18. Camshaft

A: REMOVAL

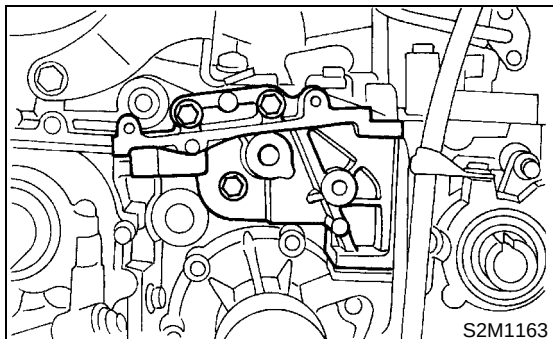
- 1) Remove V-belt. <Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Belt Cover.>
- 4) Remove timing belt assembly. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Timing Belt Assembly.>
- 5) Remove camshaft sprocket. <Ref. to ME(DOHC TURBO)-56, REMOVAL, Camshaft Sprocket.>
- 6) Remove crankshaft sprocket. <Ref. to ME(DOHC TURBO)-57, REMOVAL, Crankshaft Sprocket.>
- 7) Remove left-hand belt cover No. 2.



- 8) Remove right-hand belt cover No.2.

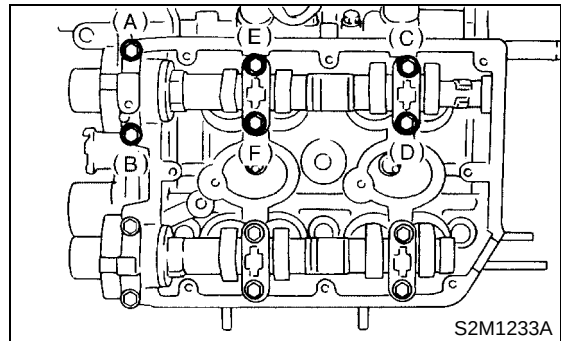


- 9) Remove tensioner bracket.

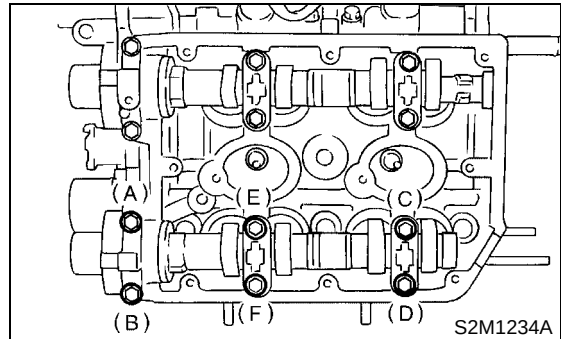


- 10) Remove oil level gauge guide. (LH side only)
- 11) Remove spark plug cord.
- 12) Remove rocker cover and gasket.

- 13) Loosen intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in figure.



- 14) Remove camshaft caps and intake camshaft.
- 15) Loosen exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in figure.



- 16) Remove camshaft caps and exhaust camshaft.

CAUTION:

Arrange camshaft caps in order so that they can be installed in their original positions.

- 17) Similarly, remove right-hand camshafts and related parts.

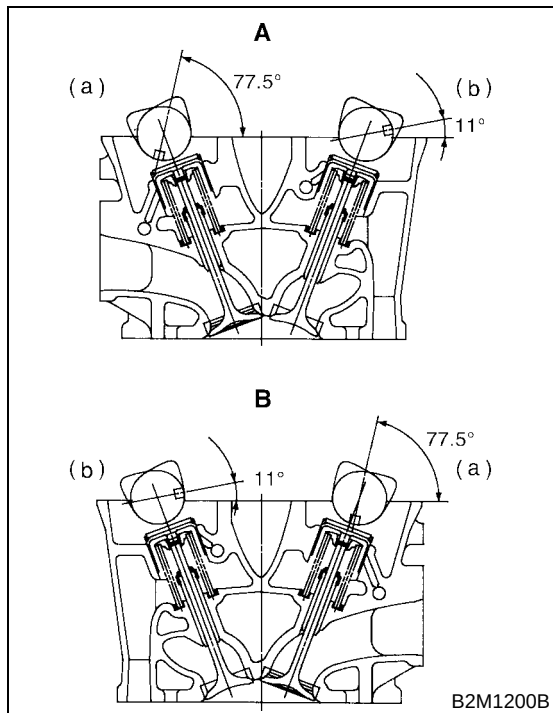
B: INSTALLATION

1) Camshaft installation

Apply engine oil to cylinder head at camshaft bearing location before installing camshaft. Install camshaft so that each valves is close to or in contact with "base circle" of cam lobe.

CAUTION:

- When camshafts are positioned as shown in figure, camshafts need to be rotated at a minimum to align with timing belt during installation.
 - Right-hand camshaft need not be rotated when set at position shown in figure.
- Left-hand intake camshaft: Rotate 80° clockwise.
Left-hand exhaust camshaft: Rotate 45° counterclockwise.



- A Left side cylinder head
B Right side cylinder head
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap installation

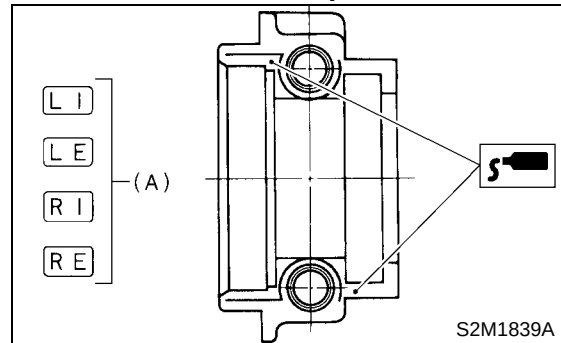
- (1) Apply fluid packing sparingly to cap mating surface.

CAUTION:

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:

THREE BOND 1215 or equivalent

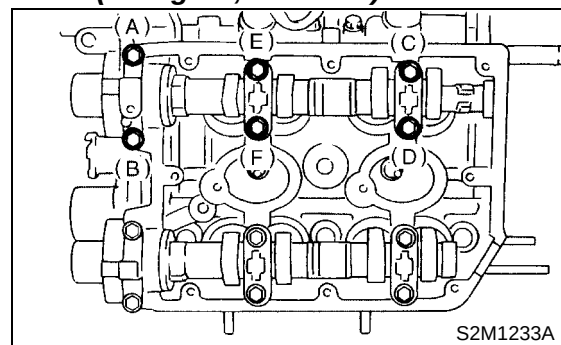


- (2) Apply engine oil to cap bearing surface and install cap on camshaft as shown by identification mark (A).

- (3) Gradually tighten cap in at least two stages in alphabetical sequence shown in figure, and then tighten to specified torque.

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)



- (4) Similarly, tighten cap on exhaust side. After tightening cap, ensure camshaft rotates only slightly while holding it at "base" circle.

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

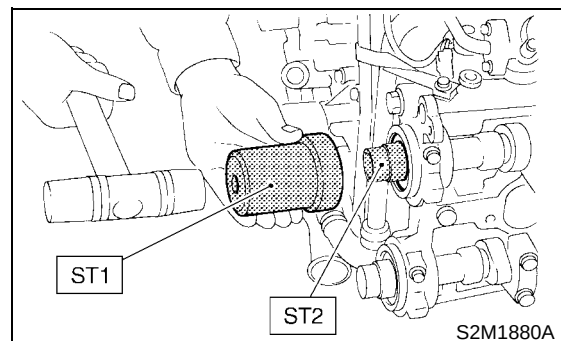
3) Camshaft oil seal installation

Apply grease to new oil seal lips and press onto front end of camshaft by using ST1 and ST2.

CAUTION:

Use a new oil seal.

- ST1 499587600 OIL SEAL INSTALLER
ST2 499597200 OIL SEAL GUIDE



CAMSHAFT

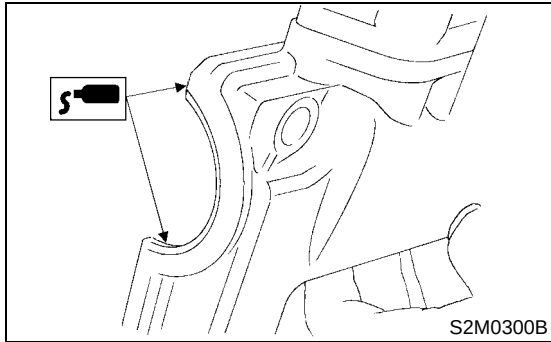
MECHANICAL

4) Rocker cover installation

- (1) Install gasket on rocker cover.
Install peripheral gasket and ignition coil gasket.
- (2) Apply fluid packing to four front open edges of peripheral gasket.

Fluid packing:

THREE BOND 1215 or equivalent



- (3) Install rocker cover on cylinder head.
Ensure gasket is properly positioned during installation.

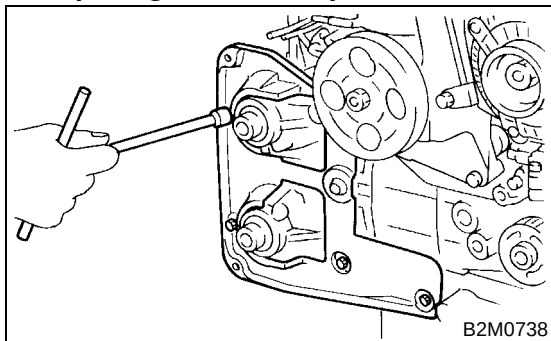
5) Install spark plug cord.

6) Similarly, install parts on right-hand side.

7) Install right-hand belt cover No. 2.

Tightening torque:

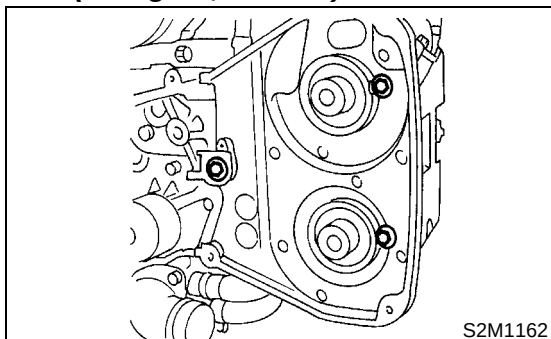
5 N·m (0.5 kgf-m, 3.6 ft-lb)



8) Install left-hand belt cover No. 2.

Tightening torque:

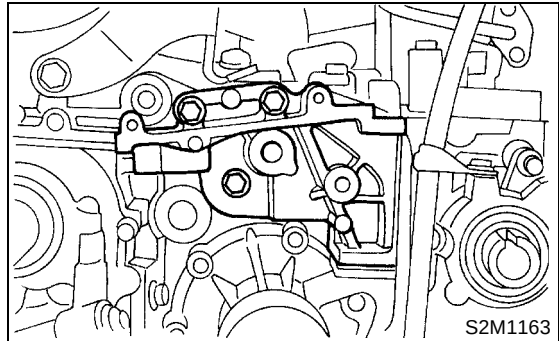
5 N·m (0.5 kgf-m, 3.6 ft-lb)



9) Install tensioner bracket.

Tightening torque:

25± 3 N·m (2.5± 0.3 kg-m, 18.1± 2.2 ft-lb)



10) Install crankshaft sprocket. <Ref. to ME(DOHC TURBO)-56, INSTALLATION, Camshaft Sprocket.>

11) Install camshaft sprockets. <Ref. to ME(DOHC TURBO)-56, INSTALLATION, Camshaft Sprocket.>

12) Install timing belt assembly. <Ref. to ME(DOHC TURBO)-48, INSTALLATION, Timing Belt Assembly.>

13) Install belt cover. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Belt Cover.>

14) Install crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, INSTALLATION, Crankshaft Pulley.>

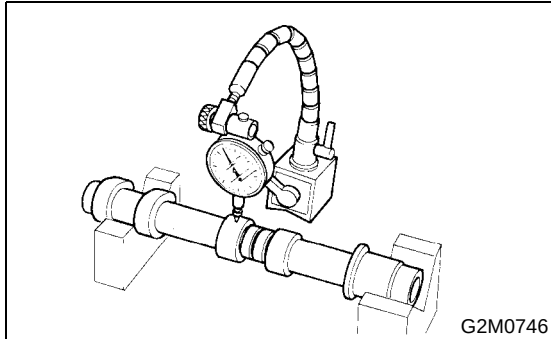
15) Install V-belt. <Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>

C: INSPECTION

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.

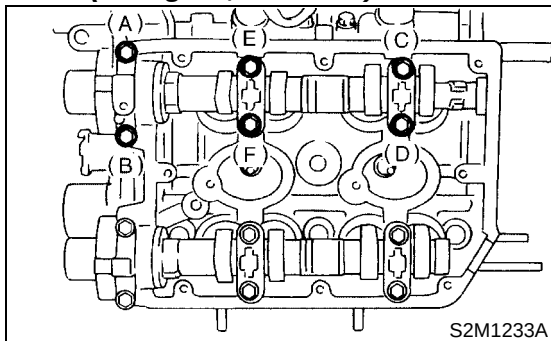
	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.9635 (1.4939 — 1.4946 in)	29.946 — 29.963 (1.1790 — 1.1796 in)

4) Measurement of the camshaft journal oil clearance

- (1) Clean the bearing caps and camshaft journals.
- (2) Place the camshafts on the cylinder head. (Without installing valve rocker.)
- (3) Place plastigauge across each of the camshaft journals.
- (4) Gradually tighten cap in at least two stages in alphabetical sequence shown in figure, and then tighten to specified torque.

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)



CAUTION:

Do not turn the camshaft.

- (5) Remove the bearing caps.

(6) Measure the widest point of the plastigauge on each journal.

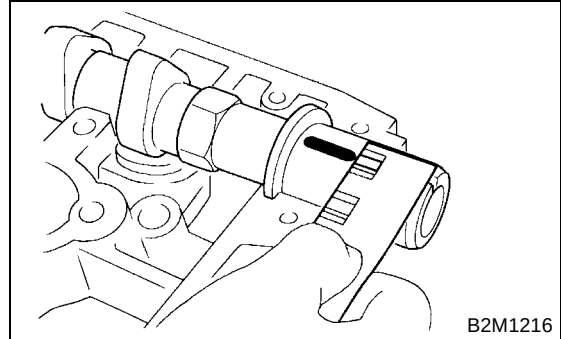
If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:

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:

46.25 — 46.35 mm (1.821 — 1.825 in)

Exhaust:

46.15 — 46.25 mm (1.817 — 1.821 in)

Limit:

Intake:

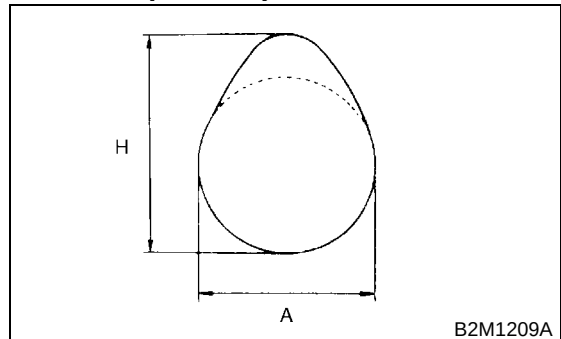
46.15 mm (1.817 in)

Exhaust:

46.05 mm (1.813 in)

Cam base circle diameter A:

37.0 mm (1.457 in)



CAMSHAFT

MECHANICAL

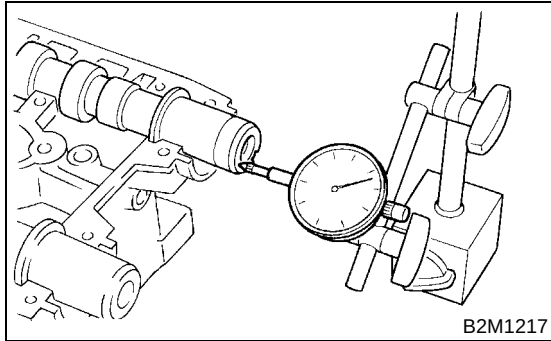
6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace caps and cylinder head as a set. If necessary replace camshaft.

Standard:

0.015 — 0.070 mm (0.0006 — 0.0028 in)

Limit:

0.1 mm (0.004 in)



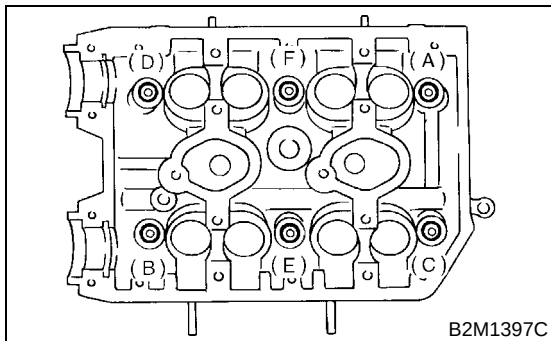
19. Cylinder Head Assembly

A: REMOVAL

- 1) Remove V-belt. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>
- 2) Remove crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, REMOVAL, Crankshaft Pulley.>
- 3) Remove belt cover. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Belt Cover.>
- 4) Remove timing belt assembly. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Timing Belt Assembly.>
- 5) Remove camshaft sprocket. <Ref. to ME(DOHC TURBO)-56, REMOVAL, Camshaft Sprocket.>
- 6) Remove intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>
- 7) Remove bolt which installs A/C compressor bracket on cylinder head.
- 8) Remove camshaft. <Ref. to ME(DOHC TURBO)-58, REMOVAL, Camshaft.>
- 9) Remove cylinder head bolts in alphabetical sequence shown in figure.

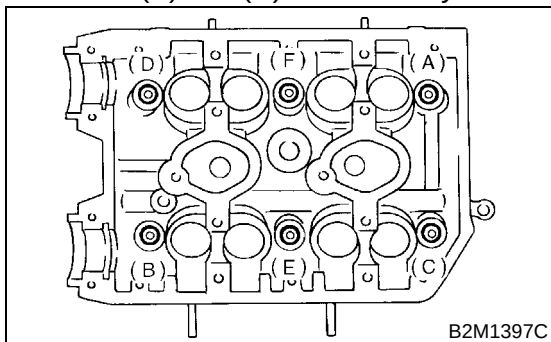
CAUTION:

Leave bolts (A) and (D) engaged by three or four threads to prevent cylinder head from falling.



- 10) While tapping cylinder head with a plastic hammer, separate it from cylinder block.

Remove bolts (A) and (D) to remove cylinder head.



- 11) Remove cylinder head gasket.

CAUTION:

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.

CAUTION:

- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

- 2) Tighten cylinder head bolts.

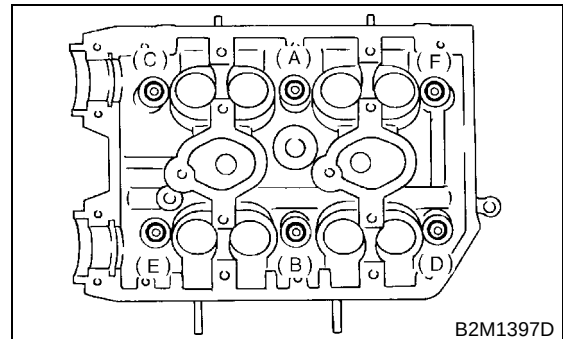
(1) Apply a coat of engine oil to washers and bolt threads.

(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.

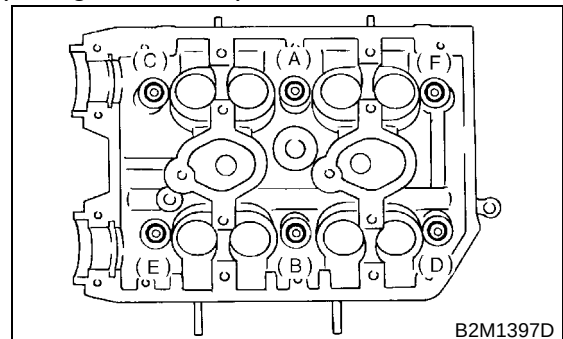
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.

(3) Back off all bolts by 180° first; back them off by 180° again.

(4) Tighten bolts (A) and (B) to 34 N·m (3.5 kgf-m, 25 ft-lb).



- (5) Tighten 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.

CAUTION:

Do not tighten bolts more than 90°.

- (7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:

Ensure that the total “re-tightening angle” [in the two previous steps] do not exceed 180°.

- 3) Install camshaft. <Ref. to ME(DOHC TURBO)-59, INSTALLATION, Camshaft.>

- 4) Install A/C compressor bracket on cylinder head.

CYLINDER HEAD ASSEMBLY

MECHANICAL

- 5) Install intake manifold. <Ref. to FU(DOHC TURBO)-17, INSTALLATION, Intake Manifold.>
- 6) Install camshaft sprocket. <Ref. to ME(DOHC TURBO)-56, INSTALLATION, Camshaft Sprocket.>
- 7) Install timing belt assembly. <Ref. to ME(DOHC TURBO)-48, INSTALLATION, Timing Belt Assembly.>
- 8) Install belt cover. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Belt Cover.>
- 9) Install crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, INSTALLATION, Crankshaft Pulley.>
- 10) Install V-belt. <Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>

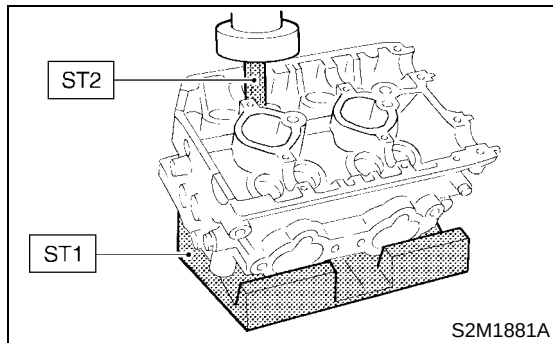
C: DISASSEMBLY

- 1) Remove valve shims and valve lifters.
- 2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

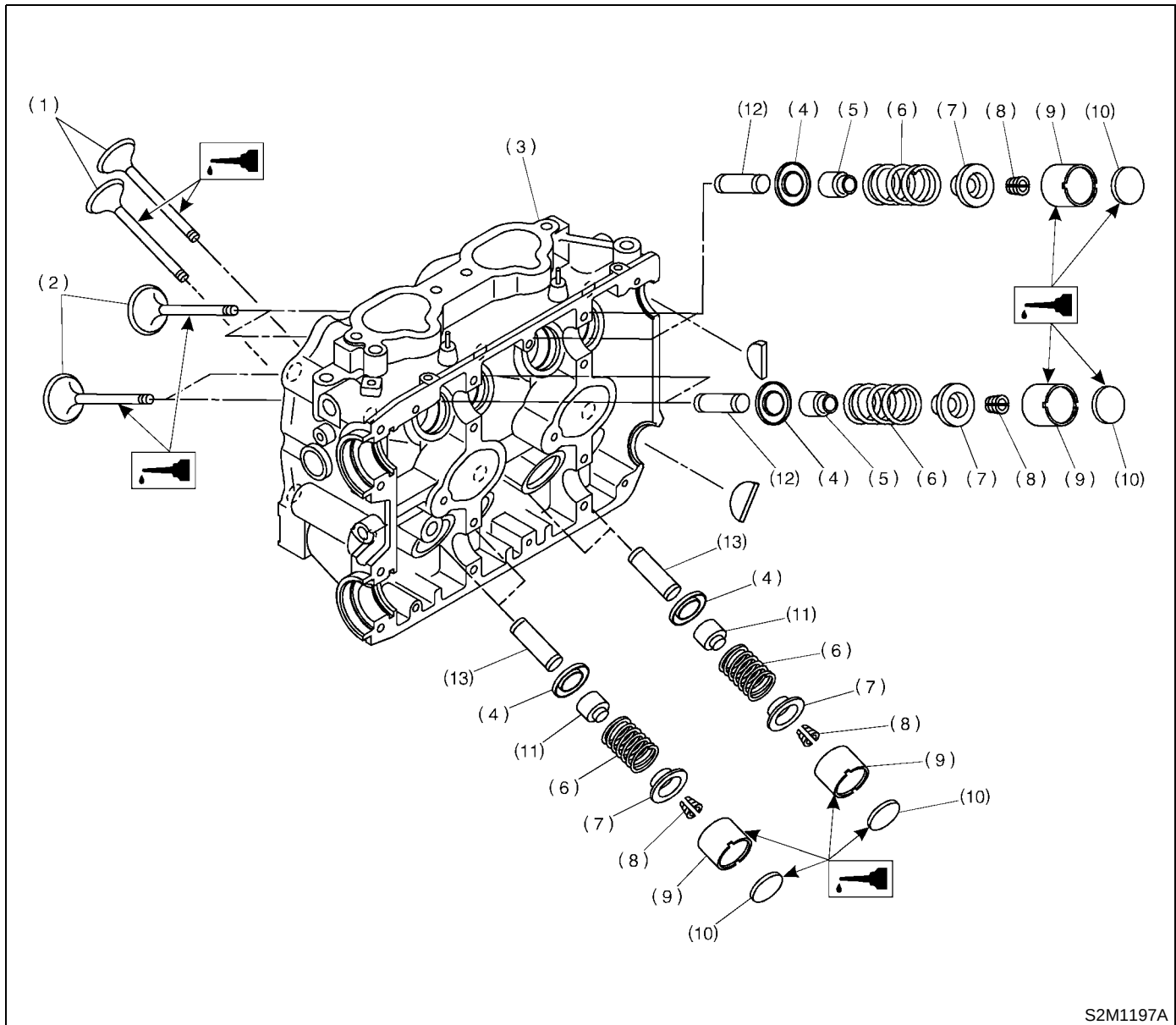
ST 498267600 CYLINDER HEAD TABLE
ST 499718000 VALVE SPRING REMOVER

CAUTION:

- Keep 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.



D: ASSEMBLY



S2M1197A

- | | | |
|---------------------------|------------------|-----------------------------|
| (1) Exhaust valve | (6) Valve spring | (11) Exhaust valve oil seal |
| (2) Intake valve | (7) Retainer | (12) Intake valve guide |
| (3) Cylinder head | (8) Retainer key | (13) Exhaust valve guide |
| (4) Valve spring seat | (9) Valve lifter | |
| (5) Intake valve oil seal | (10) Shim | |

CYLINDER HEAD ASSEMBLY

MECHANICAL

- 1) Installation of valve spring and valve
 - (1) Coat stem of each valve with engine oil and insert valve into valve guide.

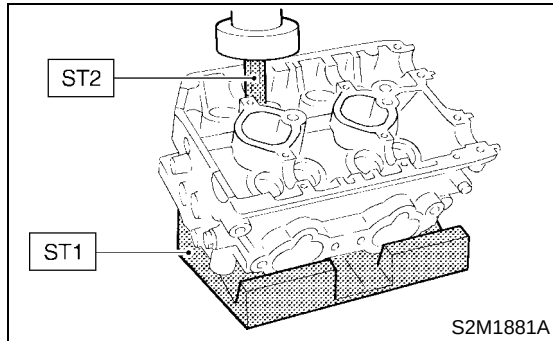
CAUTION:

When inserting valve into valve guide, use special care not to damage the oil seal lip.

- (2) Set cylinder head on ST1.
 - (3) Install valve spring and retainer using ST2.
- ST 498267600 CYLINDER HEAD TABLE
ST 499718000 VALVE SPRING REMOVER

CAUTION:

Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.



- (4) Compress valve spring and fit valve spring retainer key.
 - (5) 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.

E: INSPECTION

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 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:

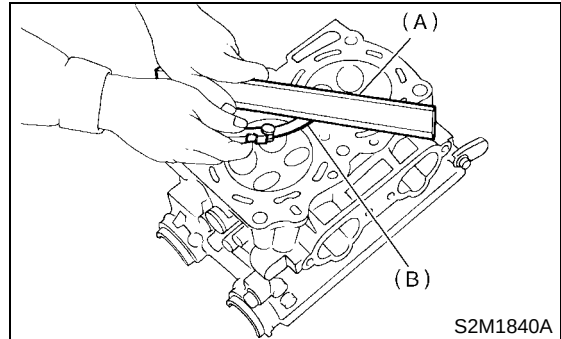
0.3 mm (0.012 in)

Standard height of cylinder head:

127.5 mm (5.02 in)

CAUTION:

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 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)

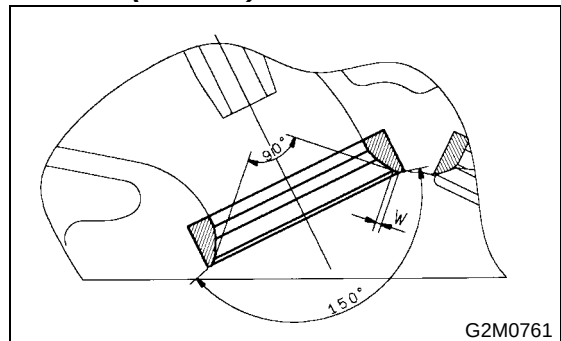
Exhaust

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

0.035 — 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 valve guide or valve itself whichever shows greater amount of wear. See 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)

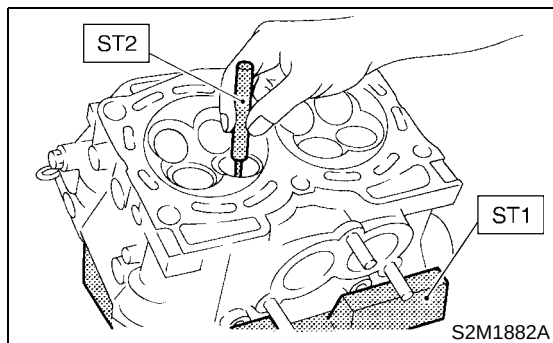
Exhaust

5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

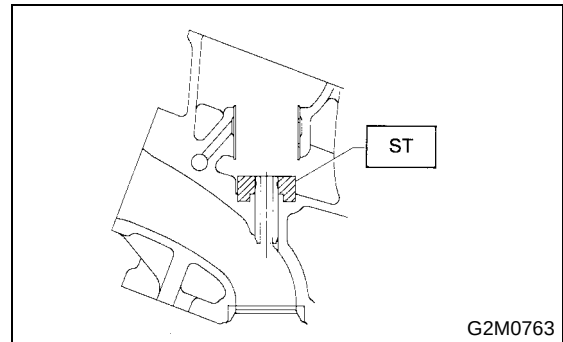
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn cylinder head upside down and place ST as shown in the figure.

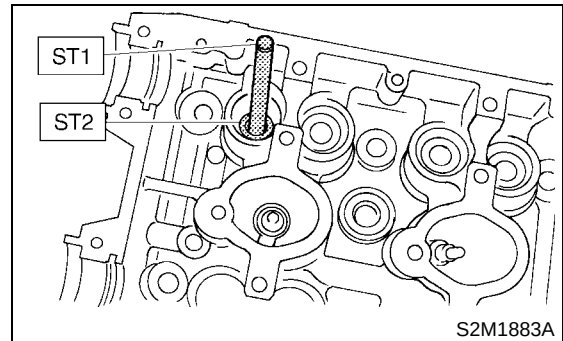
ST 498767700 VALVE GUIDE ADJUSTER



(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, 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 498267700 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L

12.0 — 12.4 mm (0.472 — 0.488 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 499767400 VALVE GUIDE REAMER

CAUTION:

- 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.

CYLINDER HEAD ASSEMBLY

MECHANICAL

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)

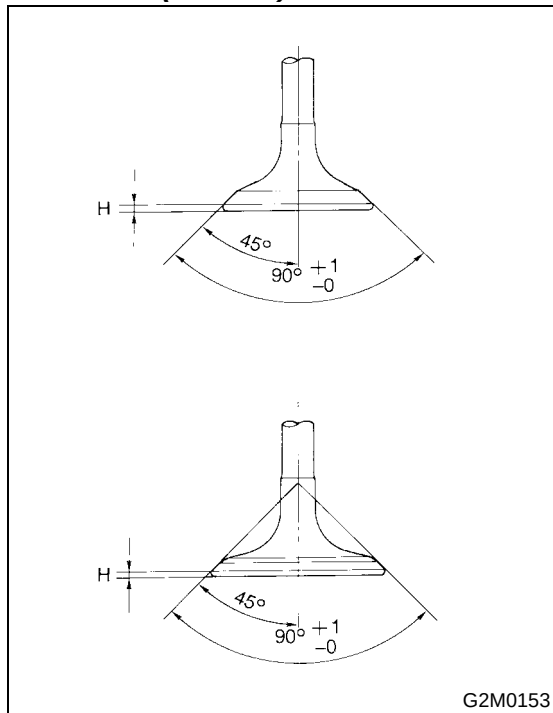
Valve overall length:

Intake

104.4 mm (4.110 in)

Exhaust

104.7 mm (4.122 in)



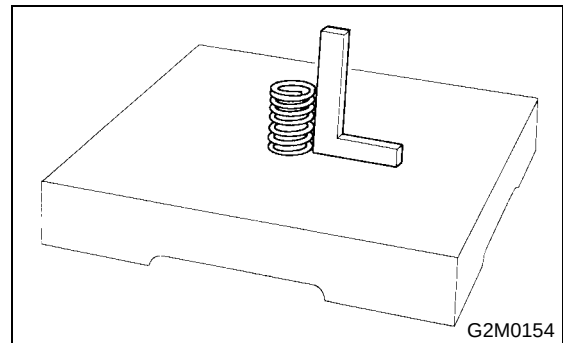
2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRINGS

1) Check valve springs for damage, free length, and tension. Replace valve spring if it is not to the specifications presented in the table.

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.

	Valve spring
Free length	44.67 mm (1.7587 in)
Tension/spring height	220.7±15.7 N (22.5 ± 1.6 kgf, 49.6±3.5 lb)/36.0 mm (1.417 in)
	510.9±25.5 N (52.1±2.6 kgf, 114.9±5.7 lb)/26.6 mm (1.047 in)
Squareness	2.5°, 2.0 mm (0.079 in)



6. INTAKE AND EXHAUST VALVE OIL 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.

- 1) Place cylinder head on ST1.
 - 2) Press in oil seal to the specified dimension indicated in the figure by using ST2.
- ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE GUIDE REMOVER

CAUTION:

- Apply engine oil to oil seal before force-fitting.
- Differentiate between intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:

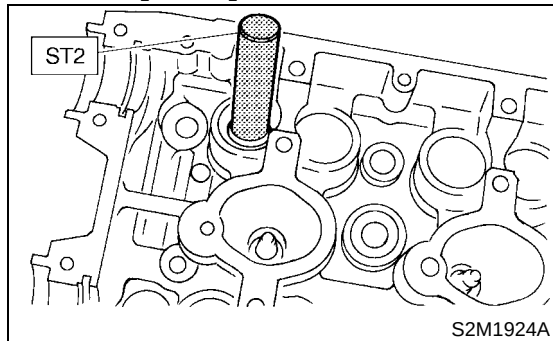
Intake [Black]

Exhaust [Brown]

Color of spring part:

Intake [Silver]

Exhaust [Silver]

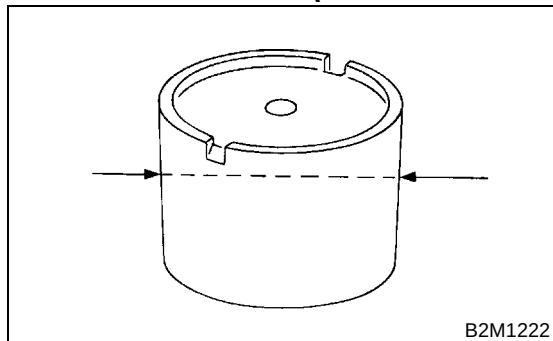


7. VALVE LIFTER

- 1) Check valve lifter visually.
- 2) Measure outer diameter of valve lifter.

Outer diameter:

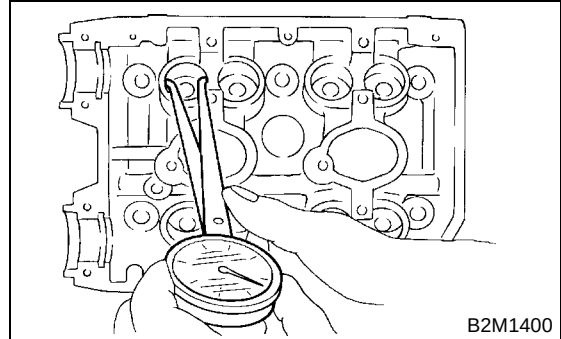
34.959 — 34.975 mm (1.3763 — 1.3770 in)



- 3) Measure inner diameter of valve lifter mating part on cylinder head.

Inner diameter:

34.994 — 35.016 mm (1.3777 — 1.3786 in)



CAUTION:

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)

20. Cylinder Block

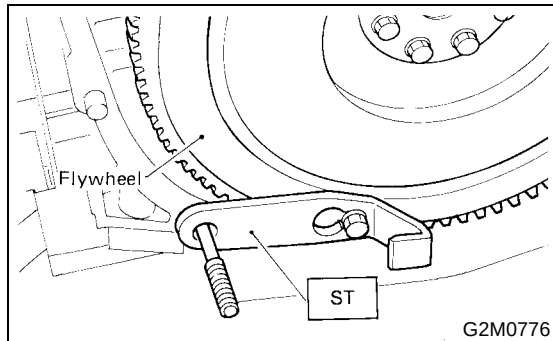
A: REMOVAL

NOTE:

Before conducting this procedure, drain engine oil completely if applicable.

- 1) Remove intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>
 - 2) Remove V-belt. <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>
 - 3) Remove crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, REMOVAL, Crankshaft Pulley.>
 - 4) Remove belt cover. <Ref. to ME(DOHC TURBO)-46, REMOVAL, Belt Cover.>
 - 5) Remove timing belt assembly. <Ref. to ME(DOHC TURBO)-47, REMOVAL, Timing Belt Assembly.>
 - 6) Remove camshaft sprocket. <Ref. to ME(DOHC TURBO)-56, REMOVAL, Camshaft Sprocket.>
 - 7) Remove crankshaft sprocket. <Ref. to ME(DOHC TURBO)-57, REMOVAL, Crankshaft Sprocket.>
 - 8) Remove generator and A/C compressor with their brackets.
 - 9) Remove cylinder head assembly. <Ref. to ME(DOHC TURBO)-63, REMOVAL, Cylinder Head Assembly.>
 - 10) Remove clutch housing cover.
 - 11) Remove flywheel.
- Using ST, lock crankshaft.

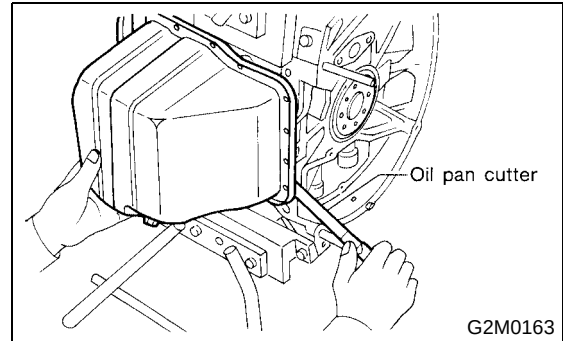
ST 498497100 CRANKSHAFT STOPPER



- 12) Remove oil separator cover.
- 13) Remove water by-pass pipe for heater.
- 14) Removal of oil pan
 - (1) Turn cylinder block with #2 and #4 piston sides facing upward.
 - (2) Remove bolts which secure oil pan to cylinder block.
 - (3) Insert a 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.

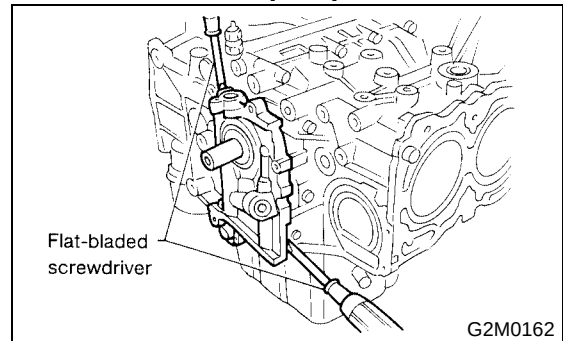


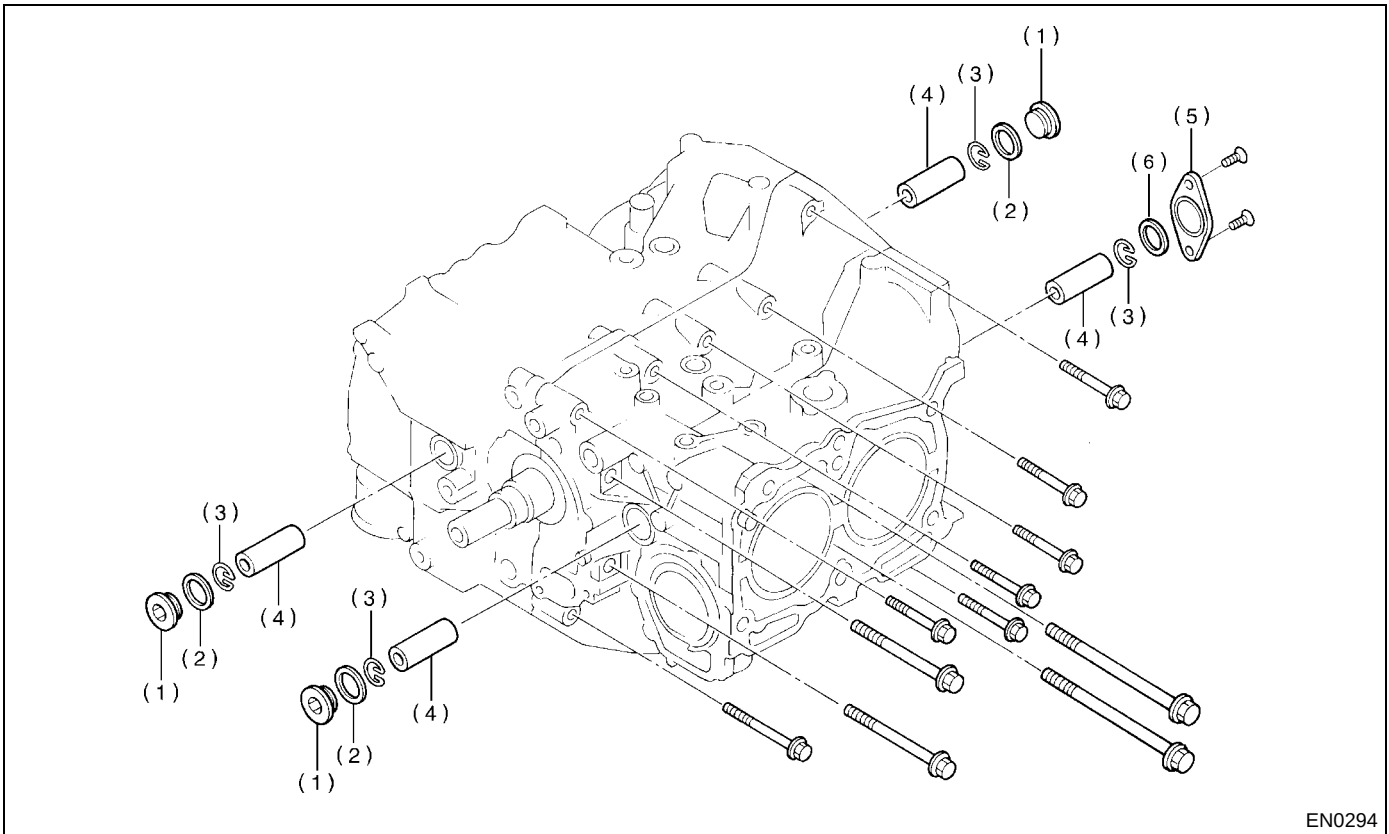
- 15) Remove oil strainer stay.
- 16) Remove oil strainer.
- 17) Remove baffle plate.
- 18) Remove water pips.
- 19) Remove water pump.
- 20) Remove oil pump from cylinder block.

Use a flat-bladed screwdriver as shown in figure when removing oil pump.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and oil pump.





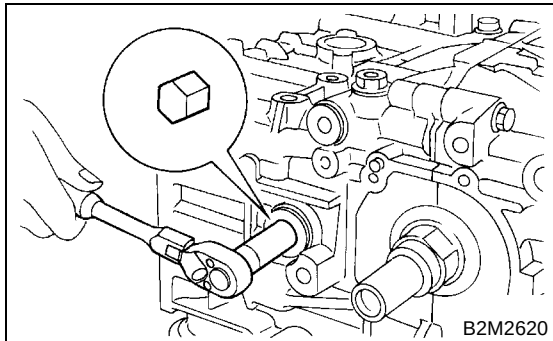
EN0294

- (1) Service hole plug
- (2) Gasket

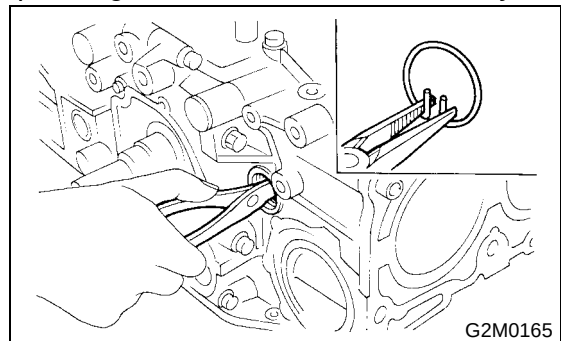
- (3) Circlip
- (4) Piston pin

- (5) Service hole cover
- (6) O-ring

21) Remove service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].



22) 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.



CYLINDER BLOCK

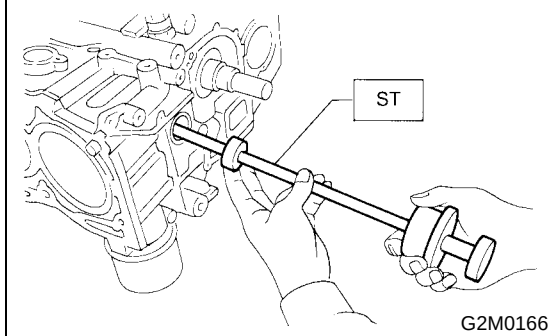
MECHANICAL

23) Draw out piston pin from #1 and #2 pistons using ST.

ST 499097700 PISTON PIN REMOVER

CAUTION:

Be careful not to confuse original combination of piston, piston pin and cylinder.



24) Similarly remove piston pins from #3 and #4 pistons.

25) Remove bolts which connect cylinder block on the side of #2 and #4 cylinders.

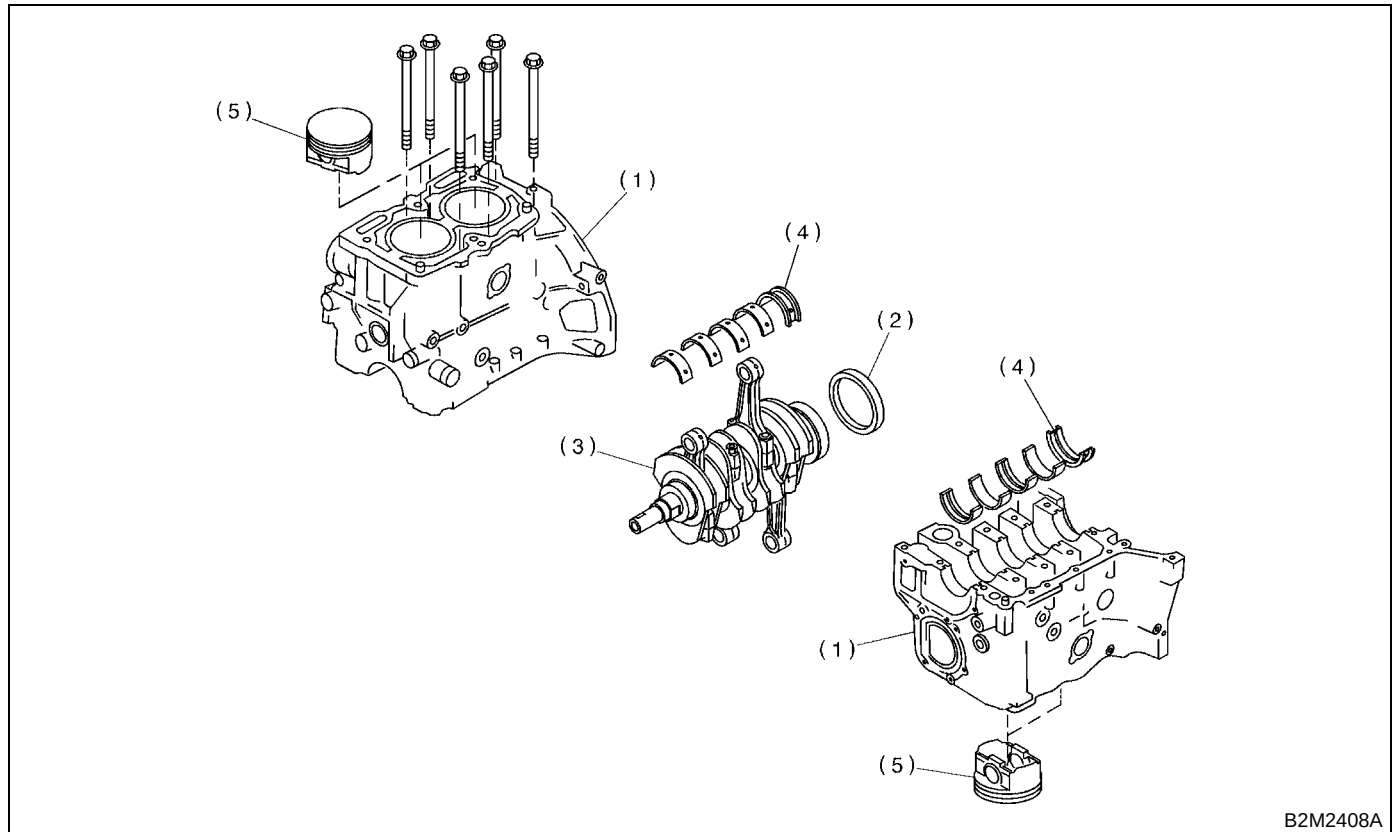
26) Back off bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.

27) Set up cylinder block so that #1 and #3 cylinders are on the upper side, then remove cylinder block connecting bolts.

28) Separate left-hand and right-hand cylinder blocks.

CAUTION:

When separating cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block

(3) Crankshaft

(5) Piston

(2) Rear oil seal

(4) Crankshaft bearing

29) Remove rear oil seal.

30) Remove crankshaft together with connecting rod.

31) Remove crankshaft bearings from cylinder block using hammer handle.

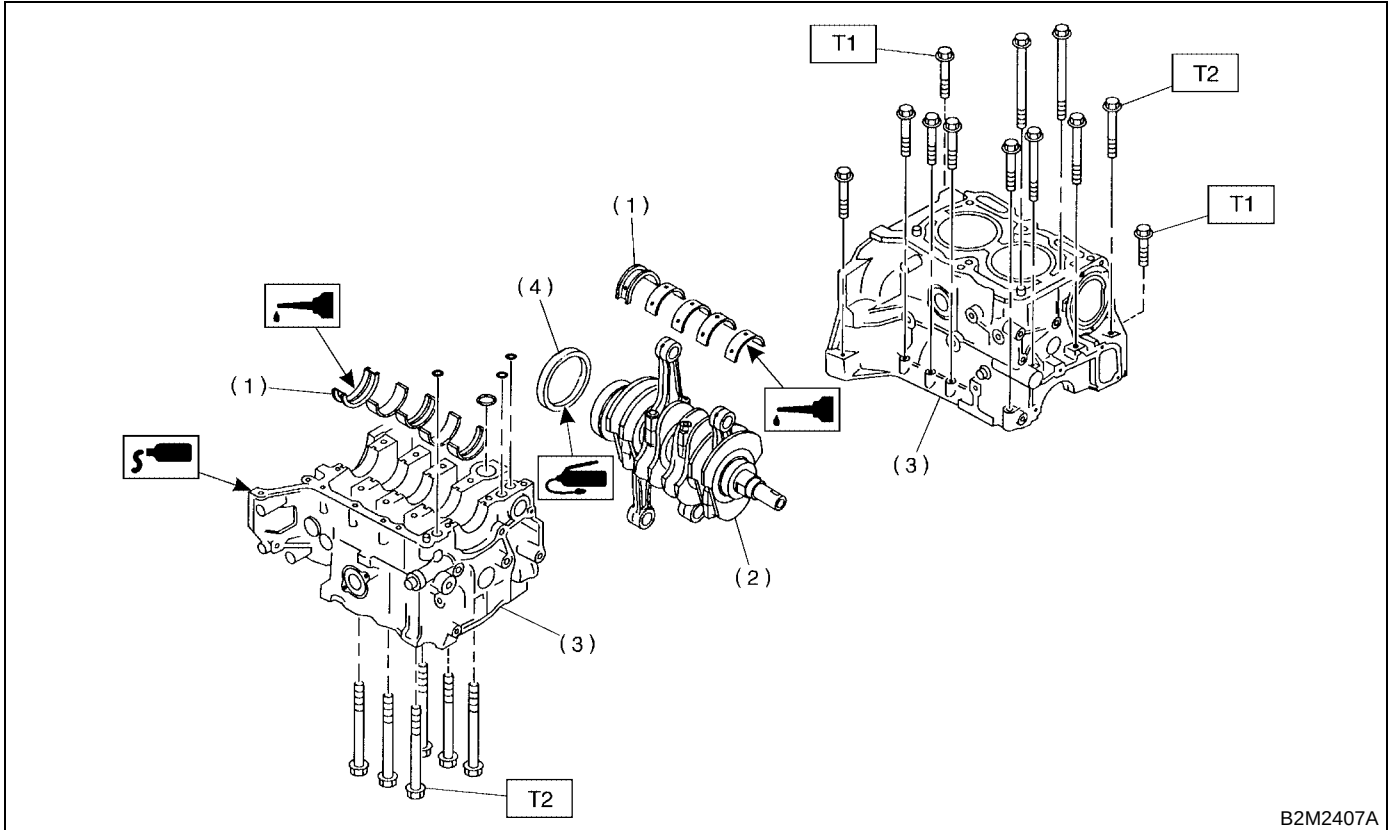
CAUTION:

Do not confuse combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

32) Draw out each piston from cylinder block using wooden bar or hammer handle.

CAUTION:

Do not confuse combination of piston and cylinder.

B: INSTALLATION

B2M2407A

- (1) Crankshaft bearing (4) Rear oil seal
 (2) Crankshaft
 (3) Cylinder block

Tightening torque: N·m (kgf-m, ft-lb)

T1: 25 (2.5, 18.1)

T2: 47 (4.8, 34.7)

CAUTION:

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 crankshaft on the #2 and #4 cylinder block.

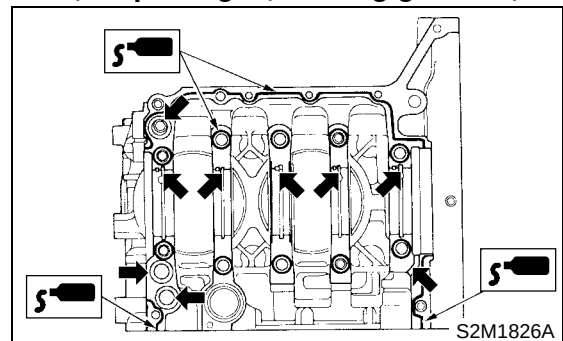
2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Fluid packing:

THREE BOND 1215 or equivalent

CAUTION:

Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.

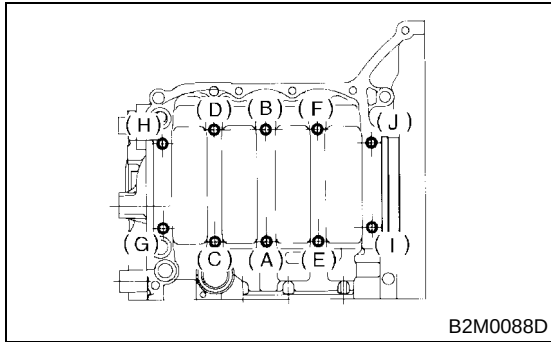


S2M1826A

CYLINDER BLOCK

MECHANICAL

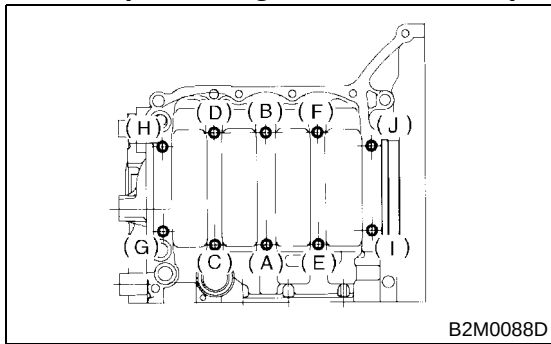
3) Temporarily tighten 10 mm cylinder block connecting bolts in alphabetical sequence shown in figure.



4) Tighten 10 mm cylinder block connecting bolts in alphabetical sequence.

Tightening torque:

$47 \pm 3 \text{ N}\cdot\text{m}$ ($4.8 \pm 0.3 \text{ kgf}\cdot\text{m}$, $34.7 \pm 2.2 \text{ ft}\cdot\text{lb}$)

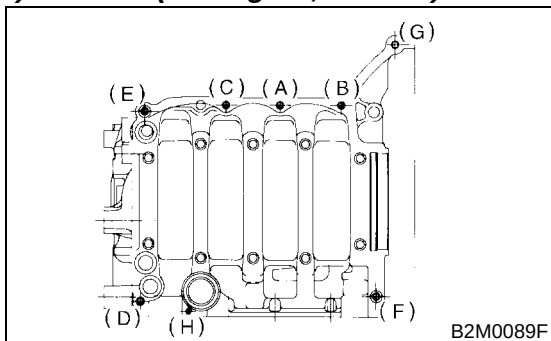


5) Tighten 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in figure.

Tightening torque:

(A) — (G): $25 \pm 2 \text{ N}\cdot\text{m}$ ($2.5 \pm 0.2 \text{ kgf}\cdot\text{m}$, $18.1 \pm 1.4 \text{ ft}\cdot\text{lb}$)

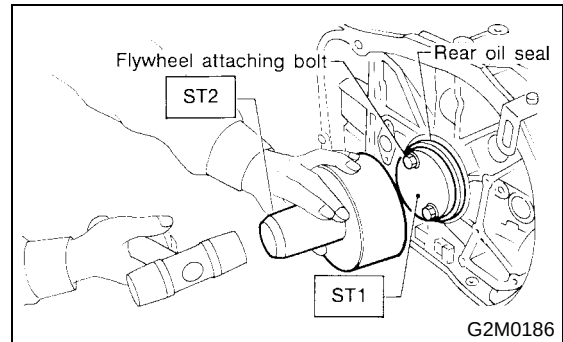
(H): $6.4 \text{ N}\cdot\text{m}$ ($0.65 \text{ kgf}\cdot\text{m}$, $4.7 \text{ ft}\cdot\text{lb}$)



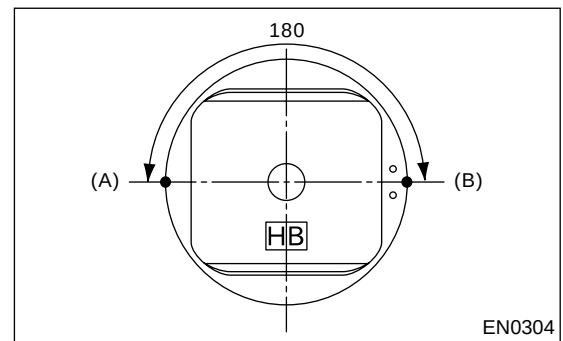
6) Install rear oil seal using ST1 and ST2.

ST1 499597100 OIL SEAL GUIDE

ST2 499587200 OIL SEAL INSTALLER

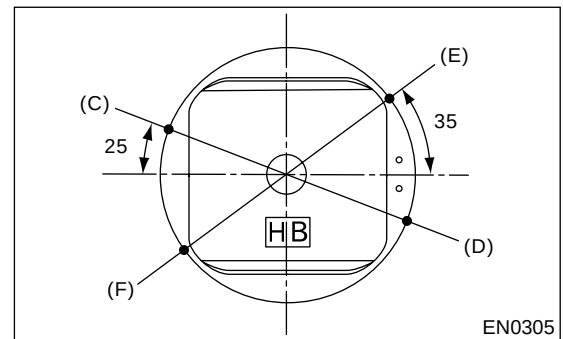


7) Position the top ring gap at (A) or (B) in the figure.



8) Position the second ring gap at 180° on the reverse side for the top ring gap.

9) Position the upper rail gap at (C) or (D) in the figure.



10) Position the expander gap at 180° of the reverse side for the upper rail gap.

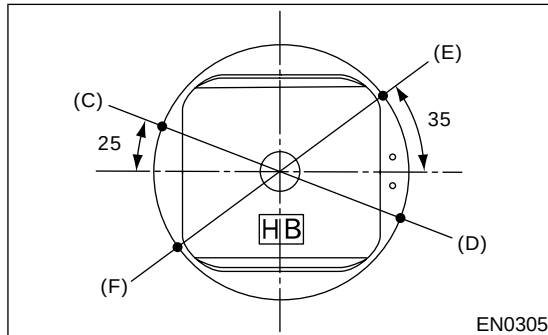
11) Position the lower rail gap at (E) or (F) in the figure.

CYLINDER BLOCK

MECHANICAL

CAUTION:

- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

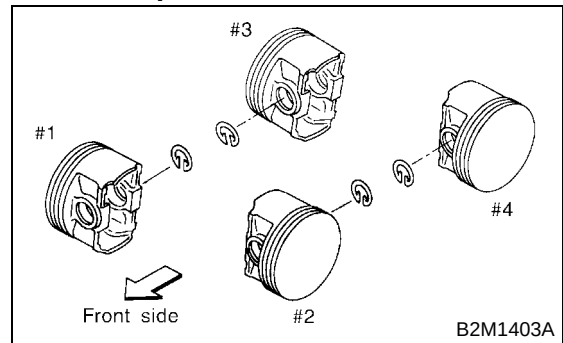


12) Install circlip.

Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

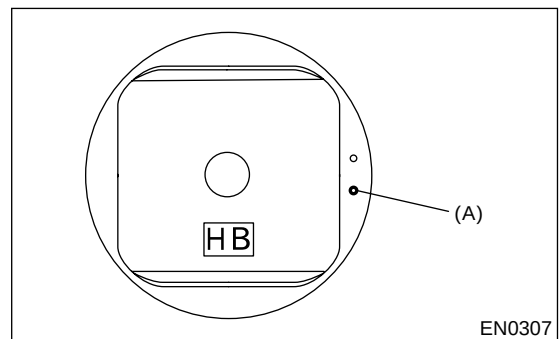
CAUTION:

Use new circlips.

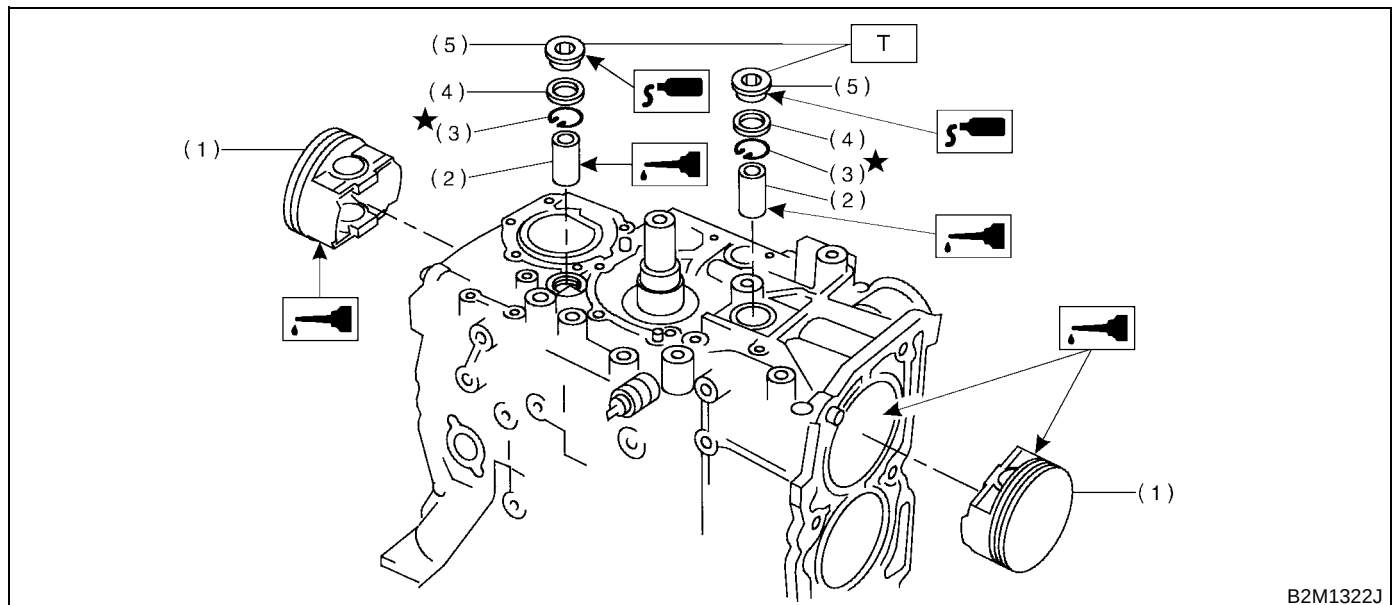


CAUTION:

Piston front mark faces towards the front of the engine.



(A) Front mark



- | | |
|----------------|-----------------------|
| (1) Piston | (4) Gasket |
| (2) Piston pin | (5) Service hole plug |
| (3) Circlip | |

Tightening torque: N·m (kgf-m, ft-lb)
T: 69 (7.0, 50.6)

CYLINDER BLOCK

MECHANICAL

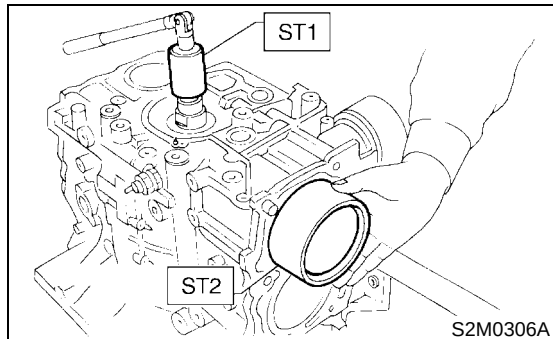
13) Installing piston

- (1) Turn cylinder block so that #1 and #2 cylinders face upward.
- (2) Using ST1, turn 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 insert pistons in their cylinders using ST2.

ST2 498744300 PISTON GUIDE



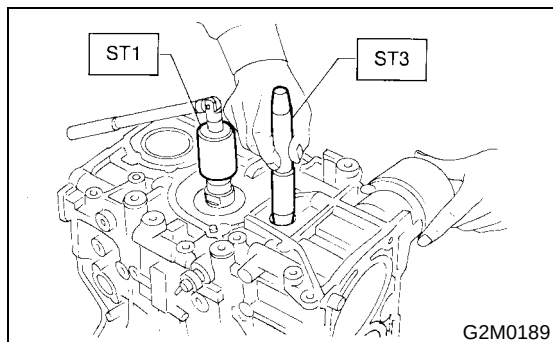
14) Installing piston pin

- (1) Insert ST3 into service hole to align piston pin hole with connecting rod small end.

CAUTION:

Apply a coat of engine oil to ST3 before insertion.

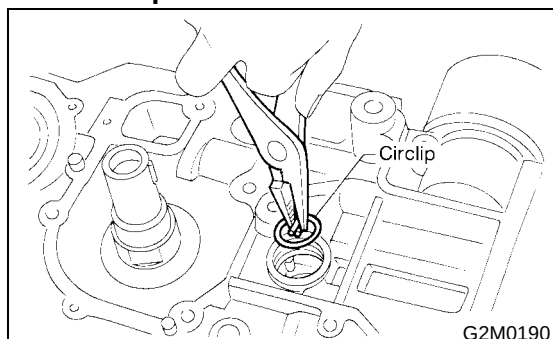
ST3 499017100 PISTON PIN GUIDE



- (2) Apply a coat of engine oil to piston pin and insert piston pin into piston and connecting rod through service hole.
- (3) Install circlip.

CAUTION:

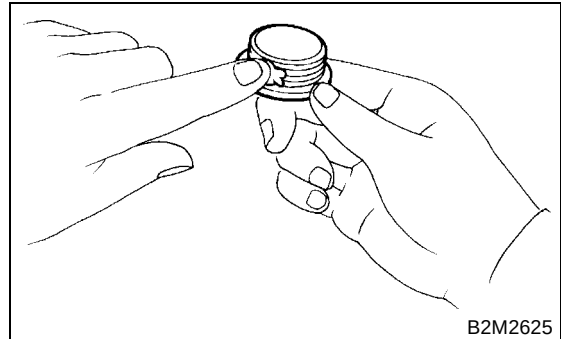
Use new circlips.



- (4) Apply fluid packing around the service hole plug.

Fluid packing:

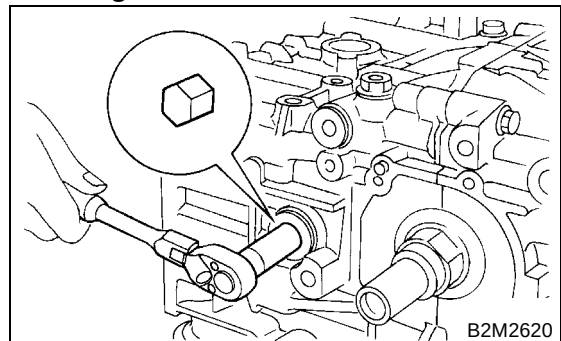
THREE BOND 1215 or equivalent

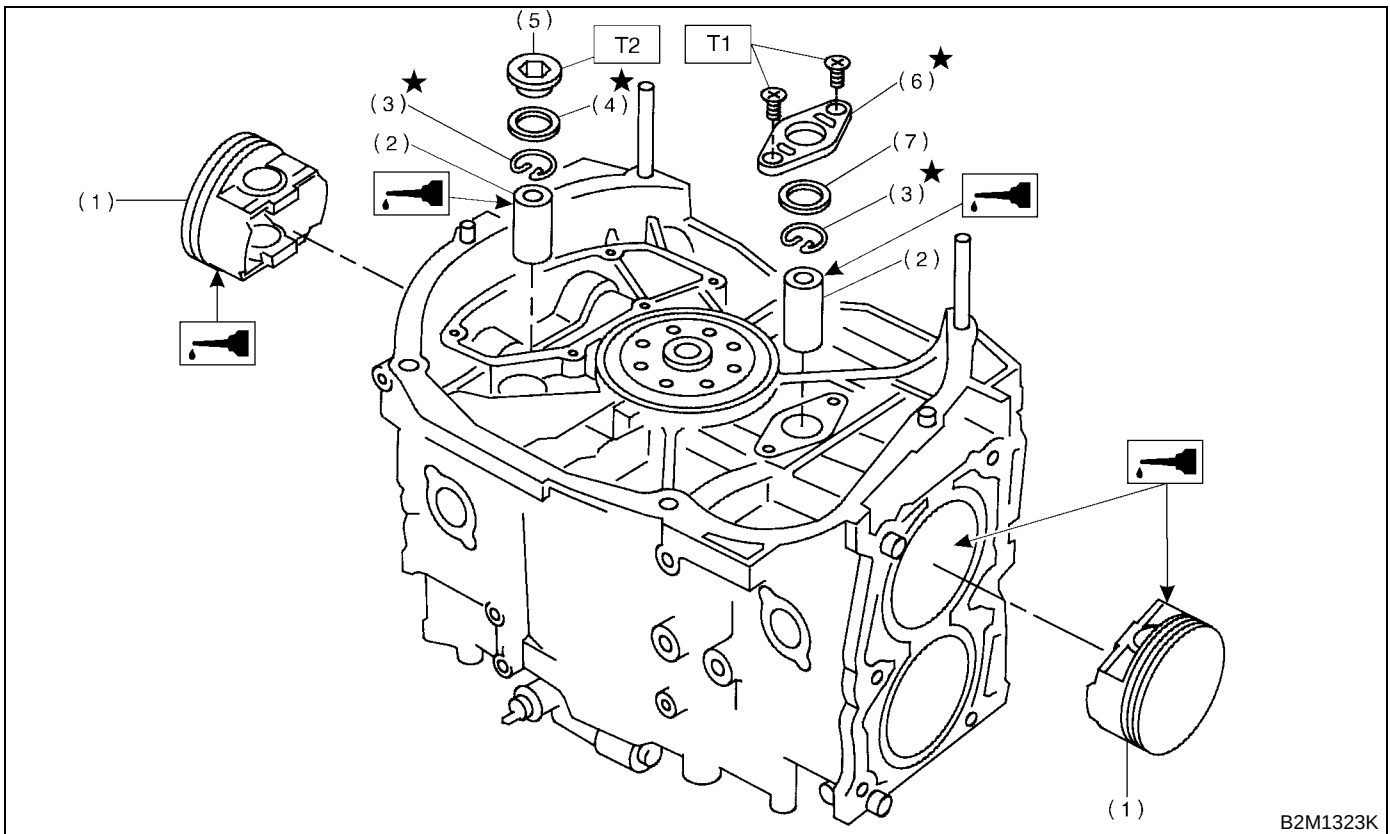


- (5) Install service hole plug and gasket.

CAUTION:

Use a new gasket.





B2M1323K

- | | |
|----------------|------------------------|
| (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: 69 (7.0, 50.6)

(6) Turn cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install pistons and piston pins.

- 15) Install water pipe.
16) Install baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

- 17) Install oil strainer and O-ring

Tightening torque:

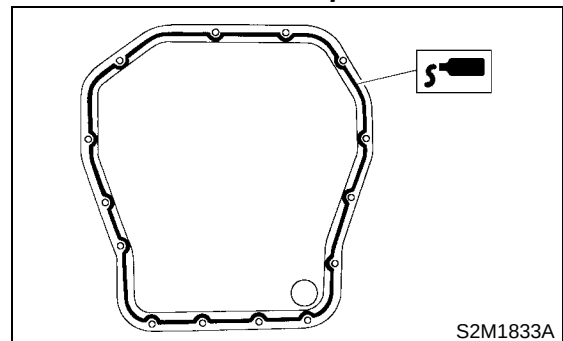
10 N·m (1.0 kgf-m, 7 ft-lb)

- 18) Install oil strainer stay.

19) Apply fluid packing to matching surfaces and install oil pan.

Fluid packing:

THREE BOND 1215 or equivalent



S2M1833A

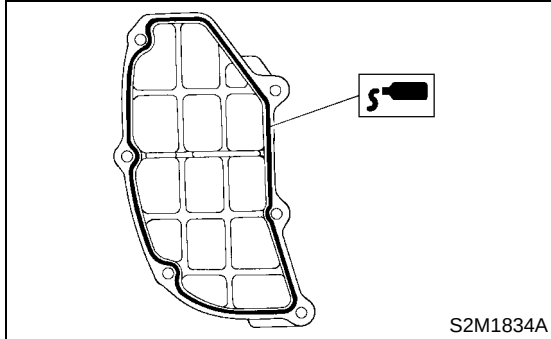
CYLINDER BLOCK

MECHANICAL

20) Apply fluid packing to matching surfaces and install oil separator cover.

Fluid packing:

THREE BOND 1215 or equivalent



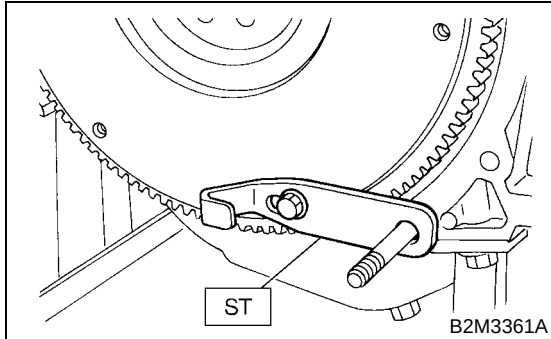
21) Install flywheel.

To lock crankshaft, use ST.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:

72 N·m (7.3 kgf-m, 52.8 ft-lb)

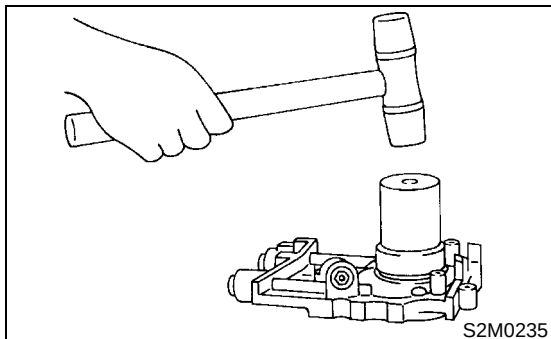


22) Install housing cover.

23) Installation of oil pump

(1) Discard front oil seal after removal. Replace with a new one using ST.

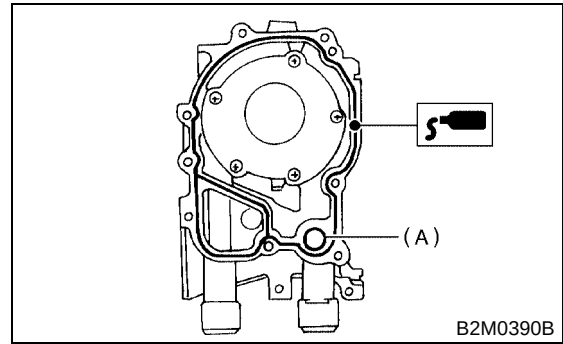
ST 499587100 OIL SEAL INSTALLER



(2) Apply fluid packing to matching surface of oil pump.

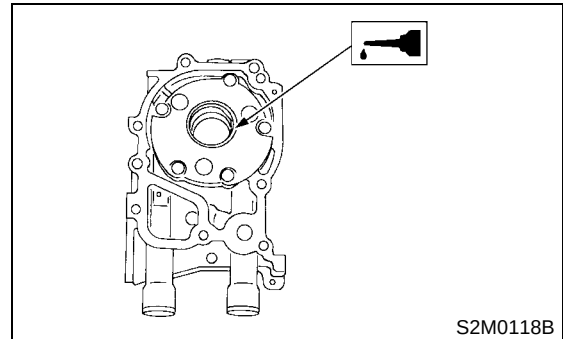
Fluid packing:

THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install oil pump on cylinder block. Be careful not to damage oil seal during installation.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:

- Do not forget to install O-ring and seal when installing oil pump.
- Align flat surface of oil pump's inner rotor with crankshaft before installation.

24) Install water pump and gasket.

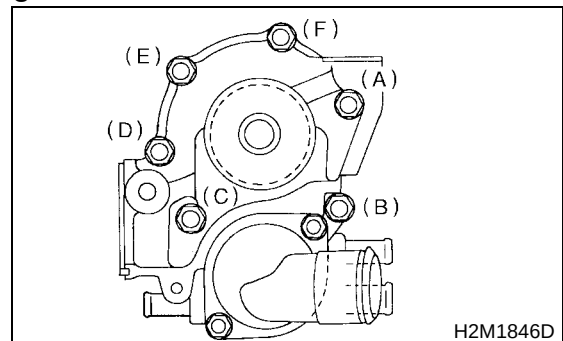
Tightening torque:

First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

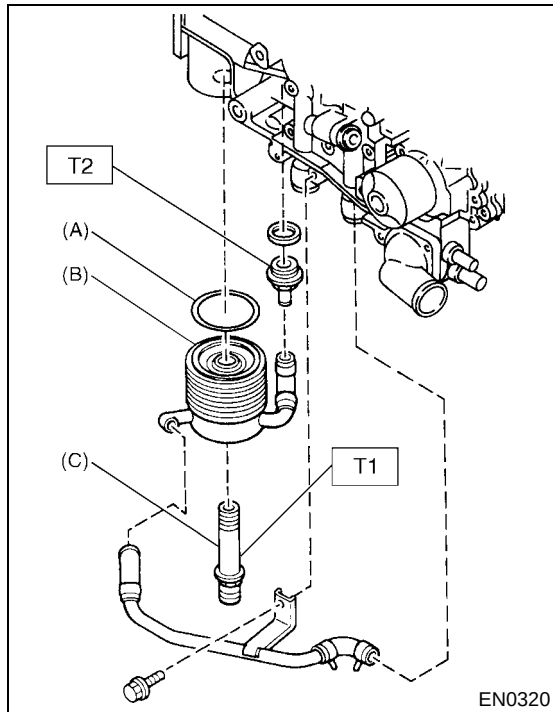
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

CAUTION:

- Be sure to use a new gasket.
- When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.

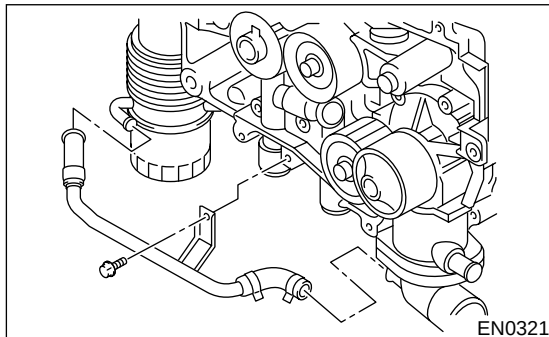


- 25) Install water by-pass pipe for heater.
 26) Install oil cooler.

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)**

- (A) O-ring
 (B) Oil cooler
 (C) Connector

- 27) Install oil filter using ST.
 ST 498547000 OIL FILTER WRENCH
 28) Install water by-pass pipe between oil cooler and water pump.



- 29) Install water pipe.

CAUTION:**Always use a new O-ring.**

- 30) Install cylinder head assembly. <Ref. to ME(DOHC TURBO)-63, INSTALLATION, Cylinder Head Assembly.>
 31) Install oil level gauge guide and tighten attaching bolt (left side only).
 32) Install rocker cover.

- 33) Install crankshaft sprocket. <Ref. to ME(DOHC TURBO)-57, INSTALLATION, Crankshaft Sprocket.>

- 34) Install camshaft sprocket. <Ref. to ME(DOHC TURBO)-56, INSTALLATION, Camshaft Sprocket.>

- 35) Install timing belt assembly. <Ref. to ME(DOHC TURBO)-48, INSTALLATION, Timing Belt Assembly.>

- 36) Install belt cover. <Ref. to ME(DOHC TURBO)-46, INSTALLATION, Belt Cover.>

- 37) Install crankshaft pulley. <Ref. to ME(DOHC TURBO)-45, INSTALLATION, Crankshaft Pulley.>

- 38) Install generator and A/C compressor brackets on cylinder head.

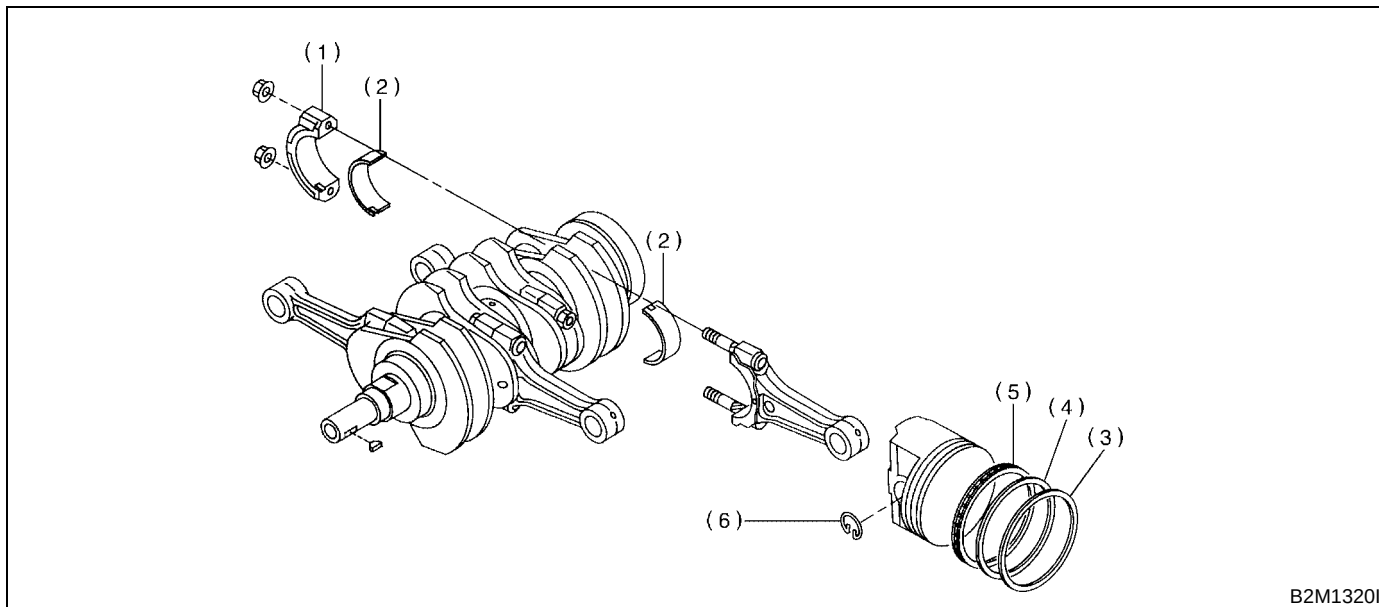
- 39) Install V-belt. <Ref. to ME(DOHC TURBO)-43, INSTALLATION, V-belt.>

- 40) Install intake manifold. <Ref. to FU(DOHC TURBO)-15, REMOVAL, Intake Manifold.>

CYLINDER BLOCK

MECHANICAL

C: DISASSEMBLY



B2M1320I

(1) Connecting rod cap

(2) Connecting rod bearing

(3) Top ring

(4) Second ring

(5) Oil ring

(6) Circlip

1) Remove connecting rod cap.

2) Remove connecting rod bearing.

CAUTION:

Arrange removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

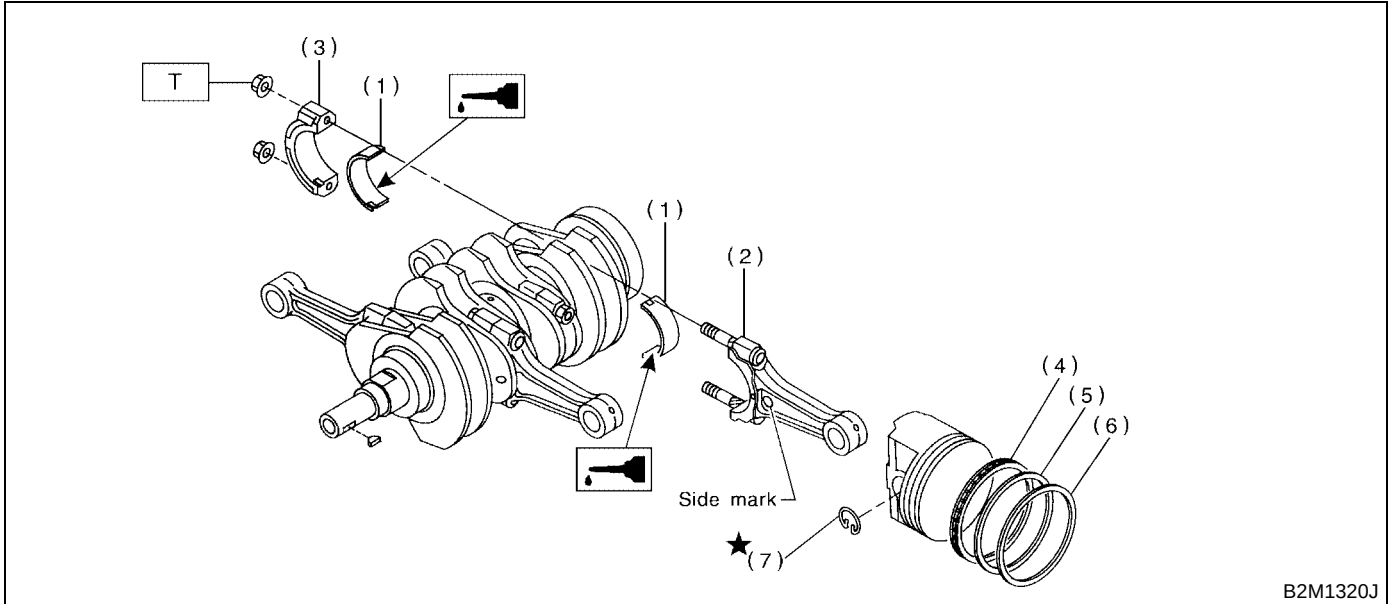
3) Remove piston rings using the piston ring expander.

4) Remove the oil ring by hand.

CAUTION:

Arrange the removed piston rings in good order to prevent confusion.

5) Remove circlip.

D: ASSEMBLY

B2M1320J

- | | |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod | (6) Top ring |
| (3) Connecting rod cap | (7) Circlip |
| (4) Oil ring | |

Tightening torque: N·m (kgf-m, ft-lb)
T: 44.6 (4.55, 32.9)

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) Install oil ring spacer, upper rail and lower rail in this order by hand. Then install second ring and top ring with a piston ring expander.

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:

201.0 mm (7.91 in)

CYLINDER BLOCK

MECHANICAL

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block's front upper surface.

CAUTION:

Measurement should be performed at a temperature 20°C (68°F).

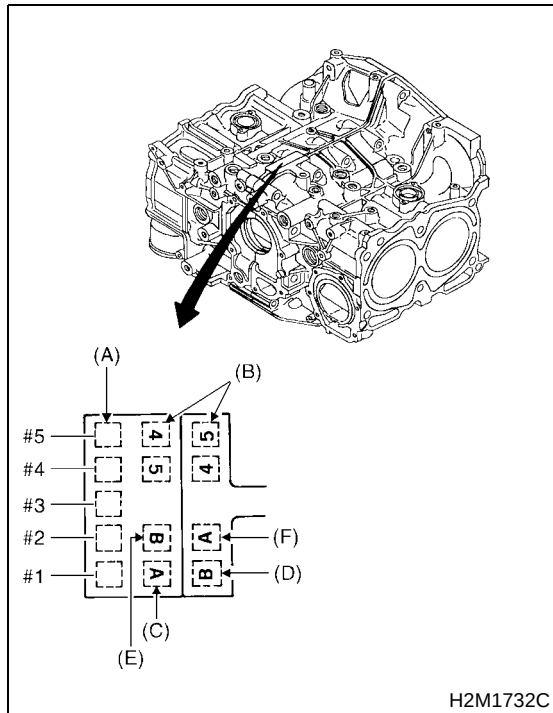
NOTE:

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: 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.

CAUTION:

Measurement should be performed at a temperature 20°C (68°F).

Taper:

Standard

0.015 mm (0.0006 in)

Limit

0.050 mm (0.0020 in)

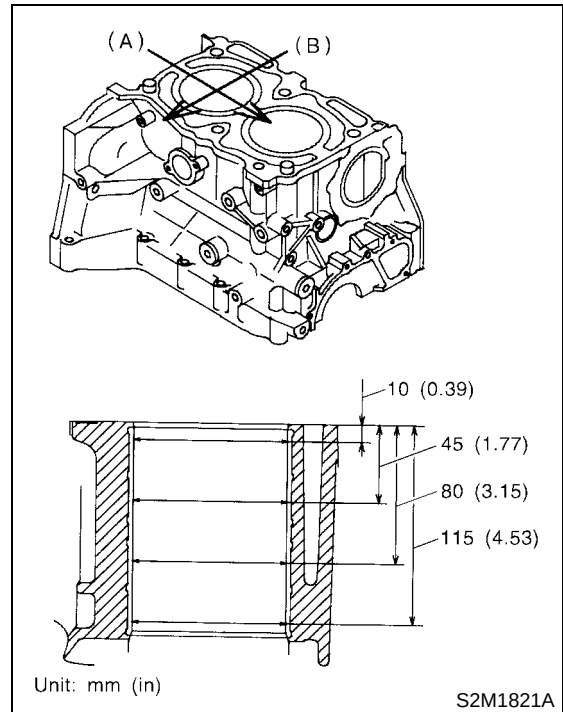
Out-of-roundness:

Standard

0.010 mm (0.0004 in)

Limit

0.050 mm (0.0020 in)



- (A) 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:
37.0 mm (1.457 in)

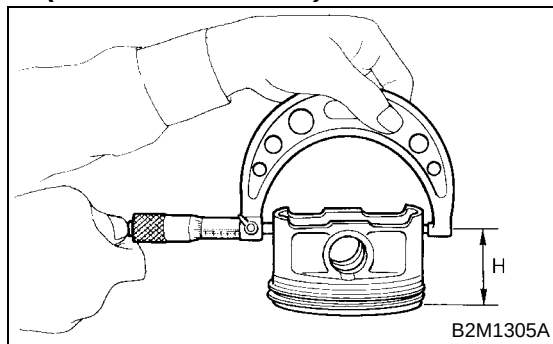
Piston outer diameter:
Standard

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.

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.

CAUTION:

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.

CAUTION:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to tem-

perature 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(DOHC TURBO)-82, 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.

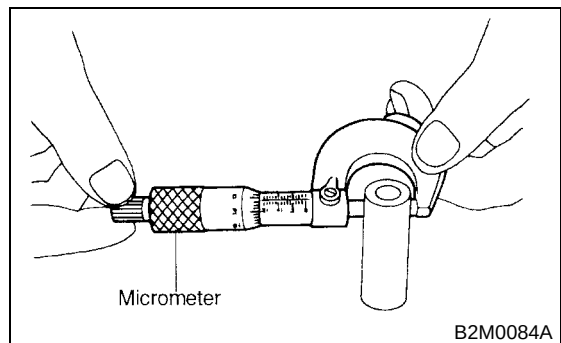
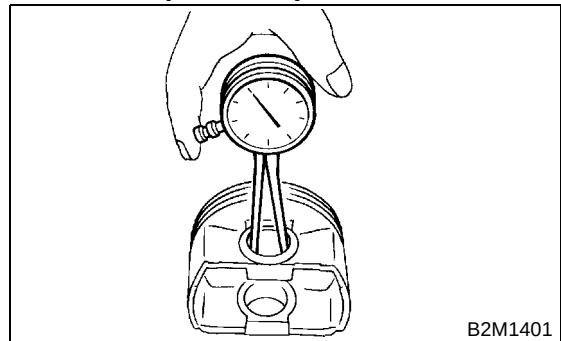
Standard clearance between piston pin and hole in piston:

Standard

0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

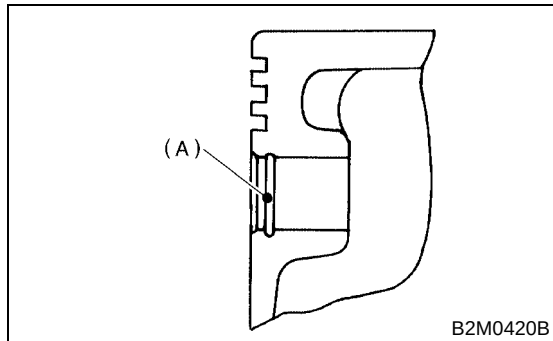
0.020 mm (0.0008 in)



CYLINDER BLOCK

MECHANICAL

4) Check circlip installation groove on the piston for burr (A). If necessary, remove burr from the groove so that piston pin can lightly move.



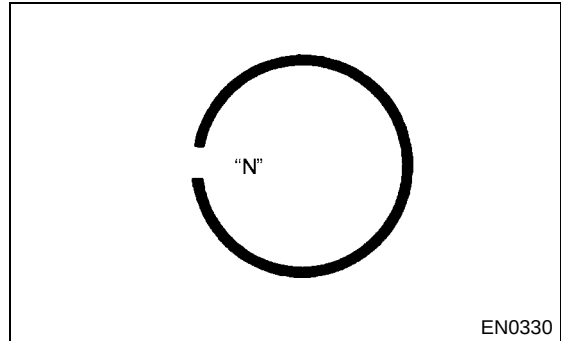
5) Check piston pin circlip for distortion, cracks and wear.

4. PISTON RING

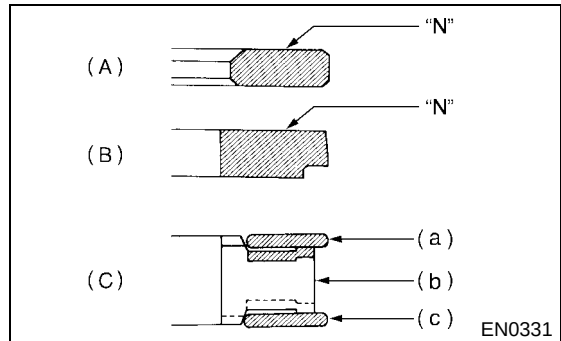
1) If piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace piston ring with a new one of the same size as the piston.

CAUTION:

- "N" is marked on the end of the top and second rings. When installing the rings to the piston, face this mark upward.



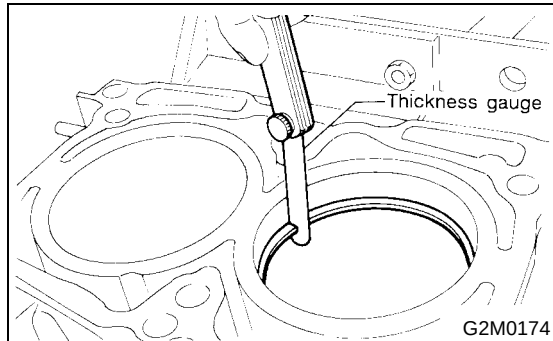
- The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.



- (A) Top ring
- (B) Second ring
- (C) Oil ring
- (D) Upper rail
- (E) Spacer
- (F) 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 — 0.70 (0.0079 — 0.0276)	1.5 (0.059)

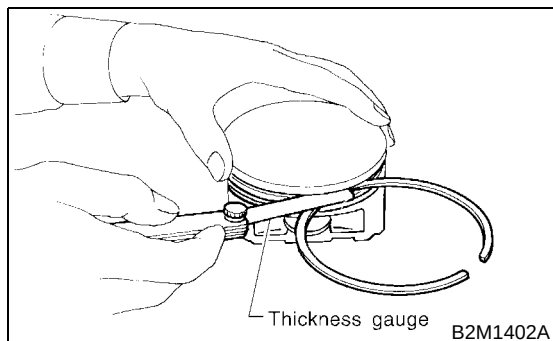


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

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)

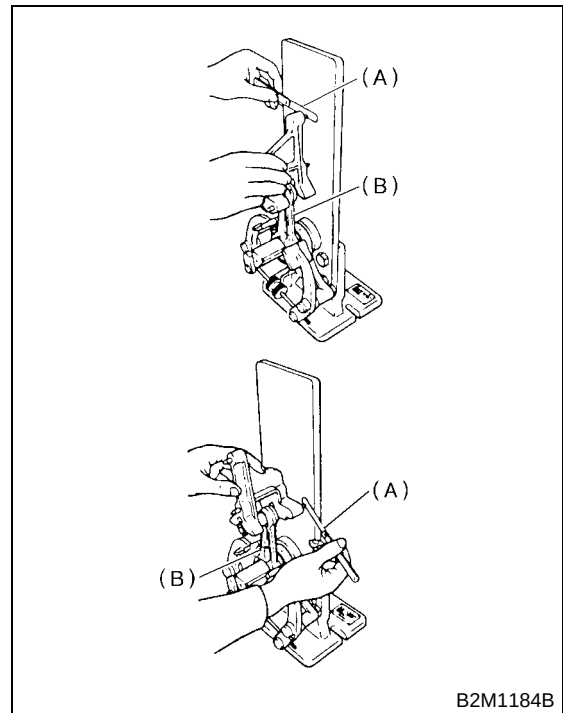


5. CONNECTING ROD

- 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.

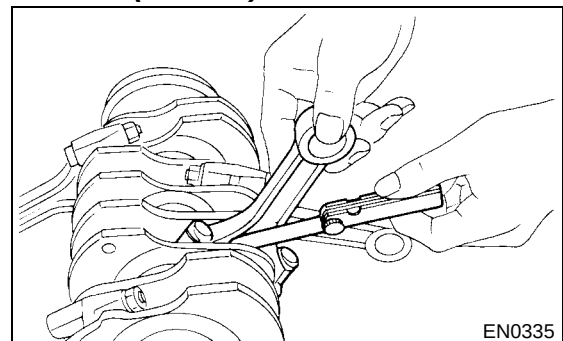
Connecting rod side clearance:

Standard

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Limit

0.4 mm (0.016 in)



CYLINDER BLOCK

MECHANICAL

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

0.05 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)	47.984 — 48.000 (1.8891 — 1.8898)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	47.954 — 47.970 (1.8879 — 1.8886)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	47.934 — 47.950 (1.8872 — 1.8878)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	47.734 — 47.750 (1.8793 — 1.8799)

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.

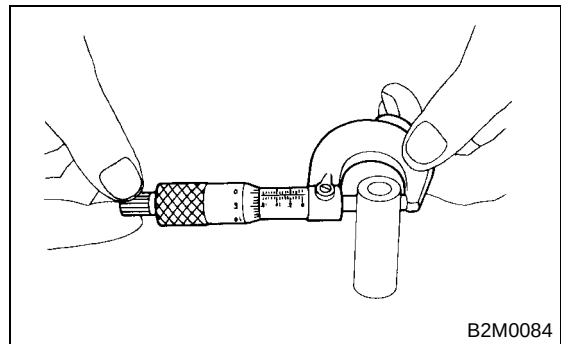
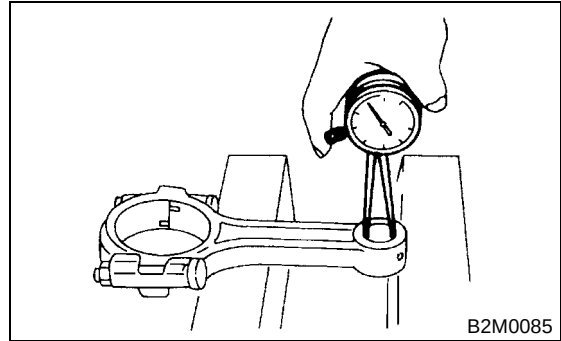
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

0.030 mm (0.0012 in)

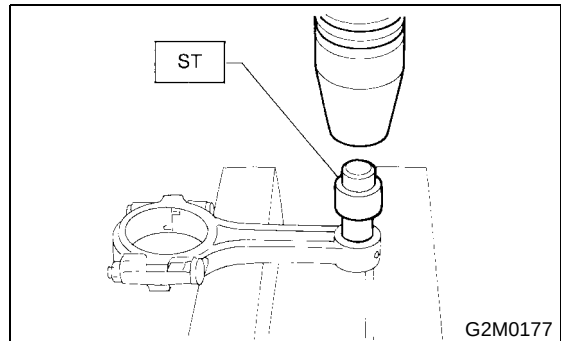


7) Replacement procedure is as follows.

(1) Remove bushing from connecting rod with ST and press.

(2) Press bushing with ST after applying oil on the periphery of bushing.

ST 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 completion of reaming, clean bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

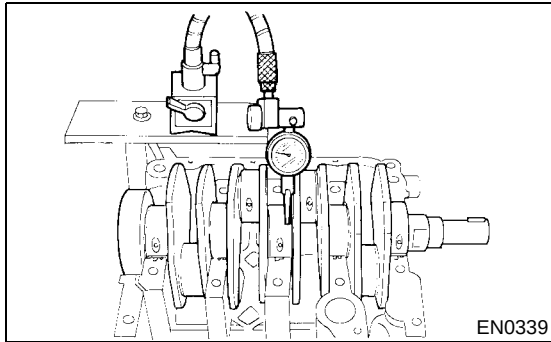
- 1) Clean crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
- 2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

CAUTION:

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

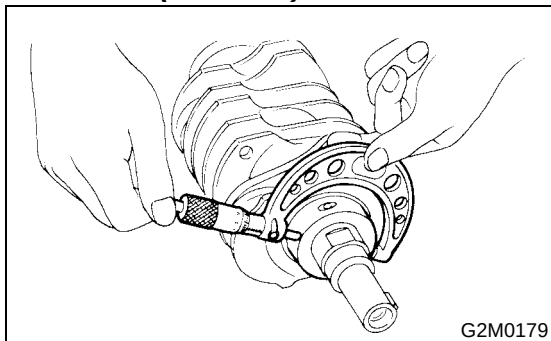
0.020 mm (0.0008 in) or less

Taper limit

0.07 mm (0.0028 in)

Grinding limit

0.250 mm (0.0098 in)



CYLINDER BLOCK

MECHANICAL

		Unit: mm (in)		
		Crank journal diameter		Crank pin diameter
		#1, #3, #5	#2, #4	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	47.984 — 48.000 (1.8891 — 1.8898)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.492 — 1.510 (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)	47.954 — 47.970 (1.8879 — 1.8886)
	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)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	47.934 — 47.950 (1.8872 — 1.8878)
	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.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	47.734 — 47.750 (1.8793 — 1.8799)
	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.

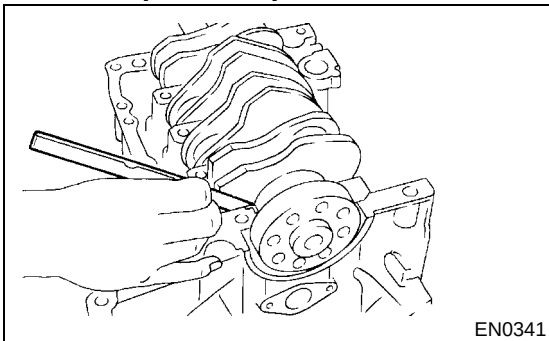
Crankshaft thrust clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)



EN0341

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	0.040 (0.0016)

21.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(DOHC TURBO)-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(DOHC TURBO)-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(DOHC TURBO)-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(DOHC TURBO)-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
	• 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(DOHC TURBO)-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 filter 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(DOHC TURBO)-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 filter 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(DOHC TURBO)-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(DOHC TURBO)-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(DOHC TURBO)-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(DOHC TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filter 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 filter 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(DOHC TURBO)-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.	- Valve mechanism is defective. - Incorrect valve clearance - Worn valve rocker - Worn camshaft - Broken valve spring
Heavy and dull clank	Oil pressure is low.	- Worn crankshaft main bearing - Worn connecting rod bearing (big end)
	Oil pressure is normal.	- Loose flywheel mounting bolts - Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	- 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*)	- 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*)	- 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*)	- Unusually worn valve lifter - Worn cam gear - Worn camshaft journal bore in crankcase
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	Defective generator brush and rotor contact
Gear scream when starting engine	—	- Defective ignition starter switch - Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	- Loose drive belt - Defective water pump shaft
Hissing sound	—	- Loss of compression - Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	- Loose timing belt - Belt contacting case/adjacent part
Valve tappet noise	—	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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(DOHC TURBO)-35, OPERATION, Inspection Mode.> after connecting fuel injector connector.

ENGINE 2 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.

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

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

EXHAUST

EX(DOHC TURBO)

	Page
1. General Description	2
2. Front Exhaust Pipe.....	6
3. Center Exhaust Pipe	8
4. Joint Pipe	12
5. Rear Exhaust Pipe	13
6. Muffler	14

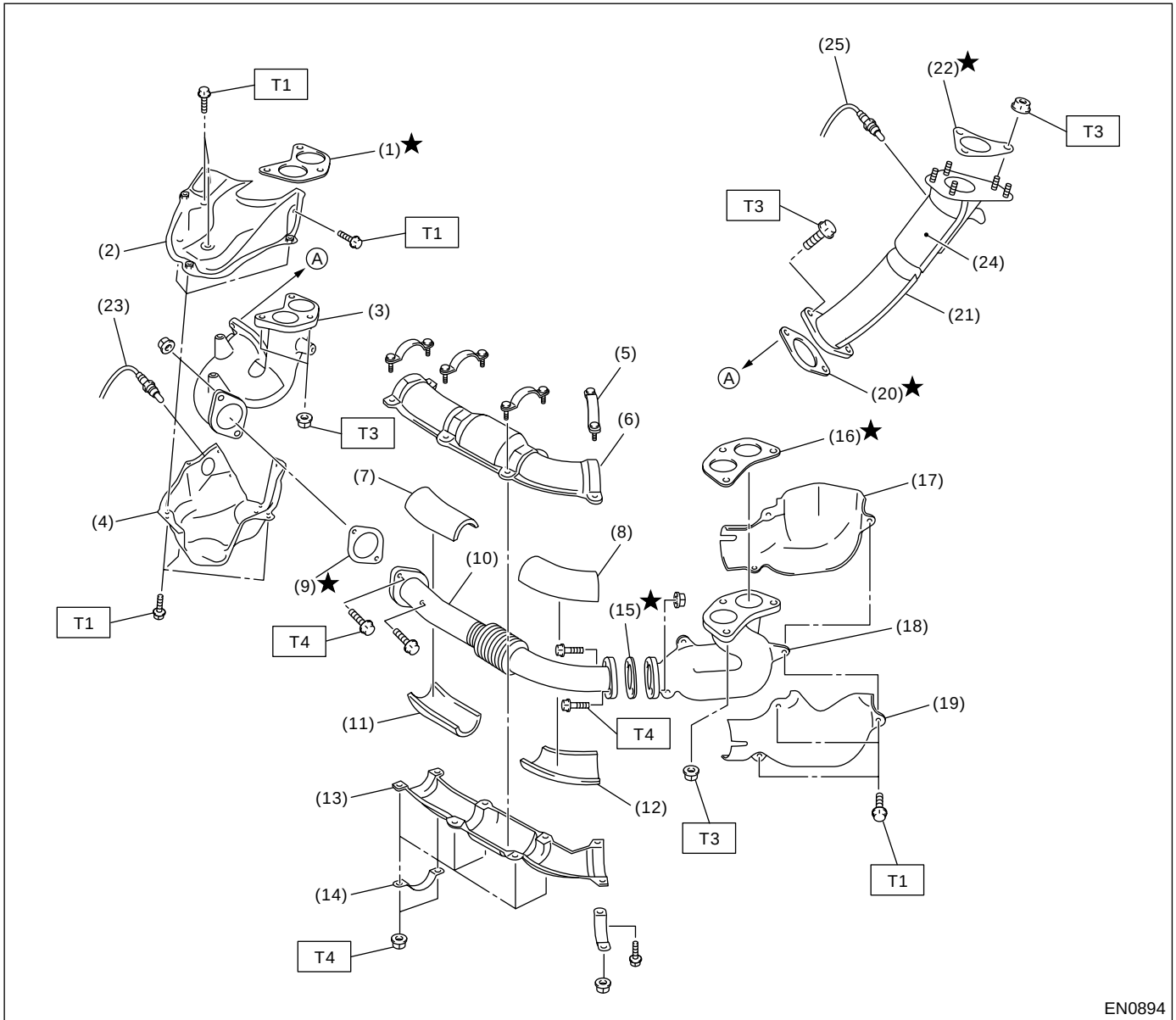
GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE



EN0894

GENERAL DESCRIPTION

EXHAUST

(1) Gasket	(11) Front exhaust pipe lower insulator (RH)	(21) Turbocharger joint pipe
(2) Upper exhaust manifold cover (RH)	(12) Front exhaust pipe lower insulator (LH)	(22) Gasket
(3) Exhaust manifold (RH)	(13) Front exhaust pipe lower cover	(23) Front oxygen (A/F) sensor
(4) Lower exhaust manifold cover (RH)	(14) Front exhaust pipe lower clamp	(24) Precatalytic converter
(5) Front exhaust pipe upper clamp	(15) Gasket	(25) Exhaust temperature sensor
(6) Front exhaust pipe upper cover	(16) Gasket	
(7) Front exhaust pipe upper insulator (RH)	(17) Upper exhaust manifold cover (LH)	
(8) Front exhaust pipe upper insulator (LH)	(18) Exhaust manifold (LH)	
(9) Gasket	(19) Lower exhaust manifold cover (LH)	
(10) Front exhaust pipe	(20) Gasket	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 18.6 (1.9, 13.7)

T2: 25 (2.5, 18.1)

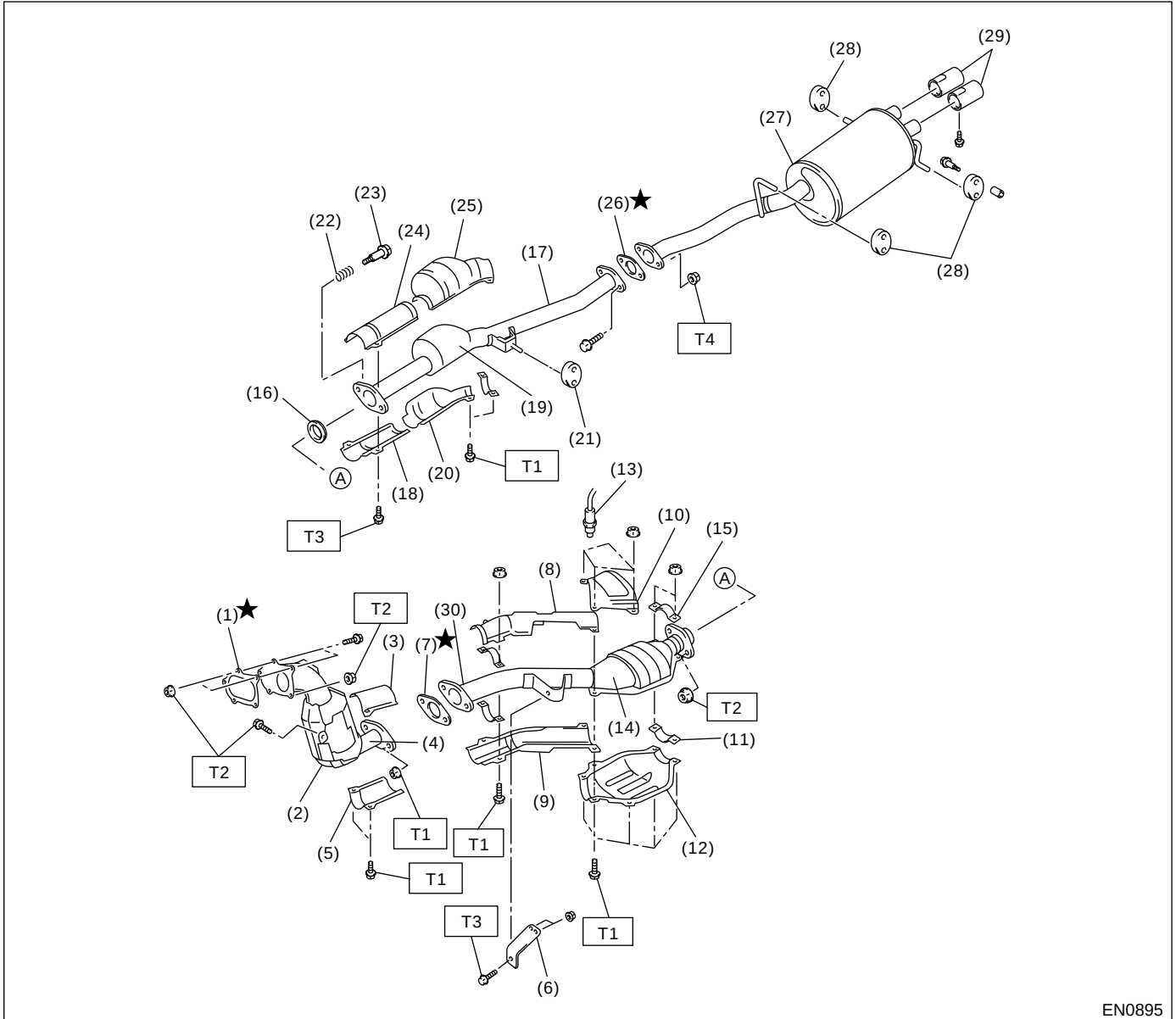
T3: 35 (3.6, 26.0)

T4: 39 (4, 28.9)

GENERAL DESCRIPTION

EXHAUST

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



EN0895

(1) Gasket	(14) Rear catalytic converter	(25) Upper rear exhaust pipe cover (Rear)
(2) Front catalytic converter	(15) Upper clamp	(26) Gasket
(3) Upper center pipe cover (Front)	(16) Gasket	(27) Muffler
(4) Center exhaust pipe (Front)	(17) Rear exhaust pipe	(28) Cushion
(5) Lower center pipe cover (Front)	(18) Lower rear exhaust pipe cover (Front)	(29) Muffler cutter
(6) Bracket	(19) Chamber	(30) Center exhaust pipe (Rear)
(7) Gasket	(20) Lower rear exhaust pipe cover (Rear)	
(8) Upper center pipe cover (Rear)	(21) Cushion	
(9) Lower center pipe cover (Rear)	(22) Spring	
(10) Upper rear catalytic converter cover	(23) Bolt	
(11) Lower clamp	(24) Upper rear exhaust pipe cover (Front)	
(12) Lower rear catalytic converter cover		
(13) Rear oxygen sensor		

Tightening torque: N·m (kgf-m, ft-lb)

T1: 18 (1.8, 13.0)

T2: 30 (3.1, 22.4)

T3: 35 (3.6, 26.0)

T4: 48 (4.9, 35.4)

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 negative terminal from battery.

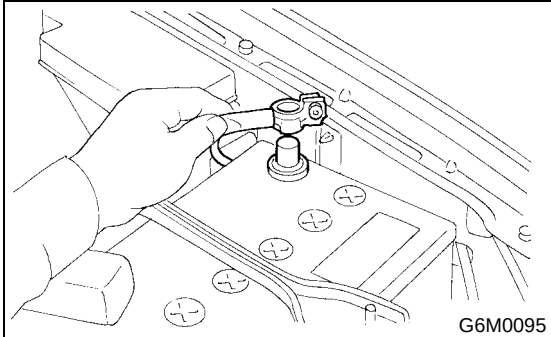
FRONT EXHAUST PIPE

EXHAUST

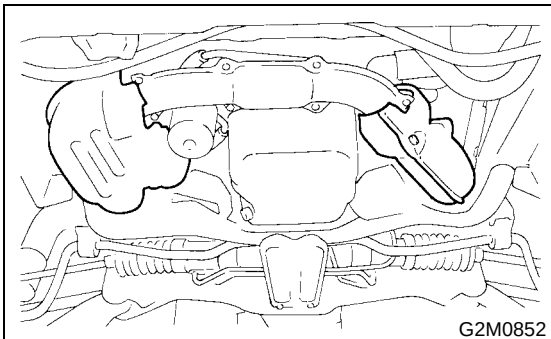
2. Front Exhaust Pipe

A: REMOVAL

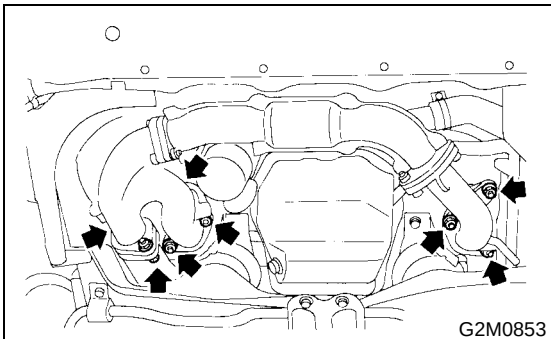
- 1) Disconnect battery ground cable.



- 2) Remove front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-41, REMOVAL, Front Oxygen (A/F) Sensor.>
3) Remove under cover.
4) Remove lower exhaust manifold cover (RH).
5) Remove lower and upper exhaust manifold covers (LH).

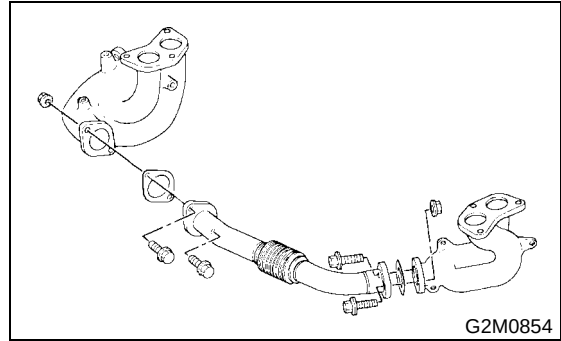


- 6) Remove bolts and nuts which hold front exhaust pipe assembly to turbocharger joint pipe.
7) While holding front exhaust pipe assembly with one hand, remove nuts which hold front exhaust pipe assembly to cylinder head exhaust port.



- 8) Remove front exhaust pipe assembly.
9) Remove covers from exhaust manifold and front exhaust pipe.

- 10) Separate front exhaust pipe from exhaust manifold.



B: INSTALLATION

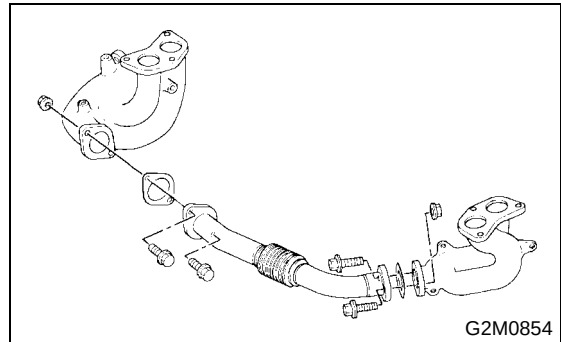
CAUTION:

Replace gaskets with new ones.

- 1) Assemble front exhaust pipe and exhaust manifold.

Tightening torque:

39 N·m (4 kgf-m, 28.9 ft-lb)



- 2) Install front exhaust pipe covers.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

- 3) Install upper exhaust manifold cover (RH).

Tightening torque:

18.6 N·m (1.9 kgf-m, 13.7 ft-lb)

- 4) Install front exhaust pipe assembly.

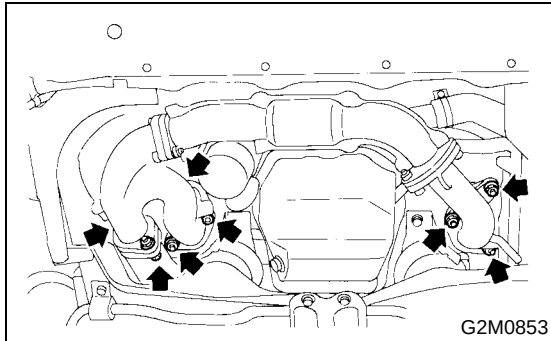
Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)

5) Connect exhaust manifold (RH) to turbocharger joint pipe.

Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)



6) Install upper and lower exhaust manifold covers (LH).

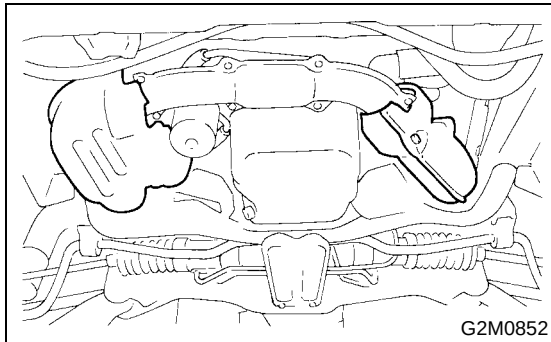
Tightening torque:

18.6 N·m (1.9 kgf-m, 13.7 ft-lb)

7) Install lower exhaust manifold cover (RH).

Tightening torque:

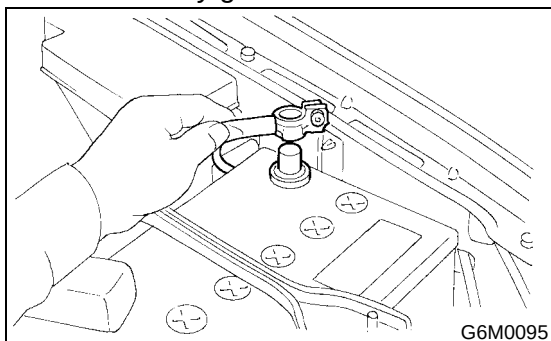
18.6 N·m (1.9 kgf-m, 13.7 ft-lb)



8) Install front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-42, INSTALLATION, Front Oxygen (A/F) Sensor.>

9) Install under cover.

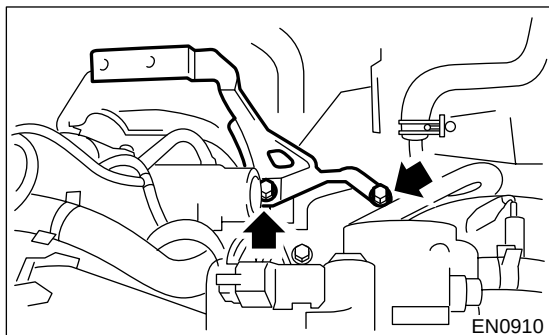
10) Connect battery ground cable.



3. Center Exhaust Pipe

A: REMOVAL

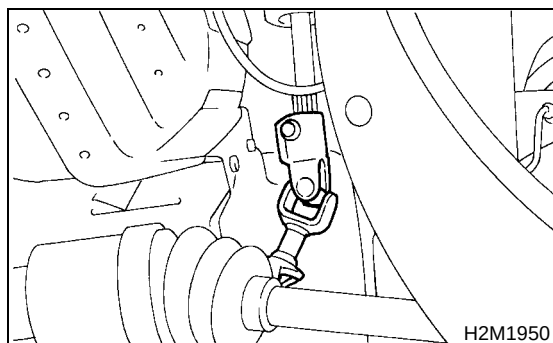
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.
- 3) Remove intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
- 4) Remove intercooler bracket.



- 5) Lift-up the vehicle.
- 6) Remove under cover.
- 7) Remove universal joint bolts and then remove universal joint (RHD model only).

CAUTION:

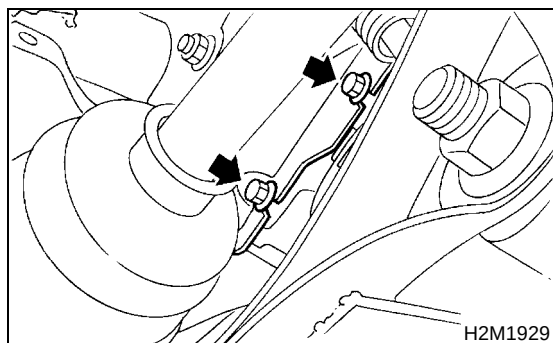
Scribe alignment marks on universal joint so that it can be reassembled at the original serration.



- 8) Remove bolts which install the lower side of turbocharger upper cover.

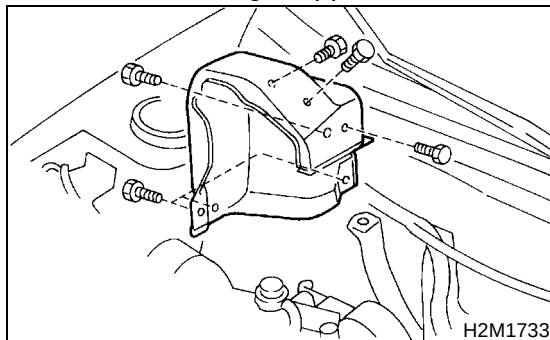
CAUTION:

Be careful, turbocharger and exhaust pipe are hot.

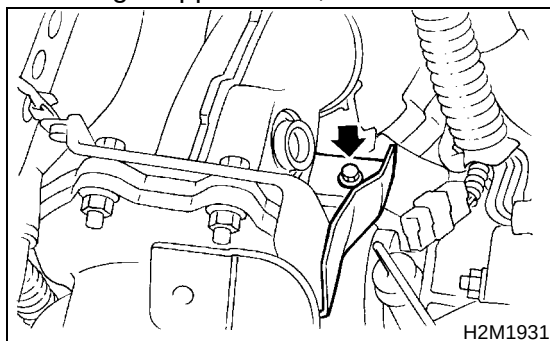


- 9) Lower the vehicle.

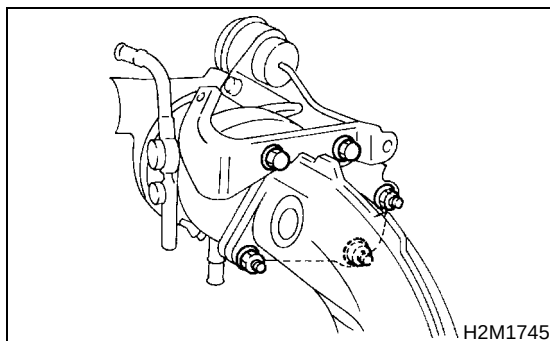
- 10) Remove turbocharger upper cover.



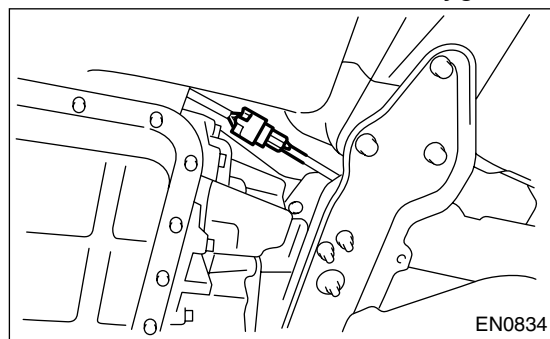
- 11) Remove bolts which install the lower upper side of turbocharger upper cover, and remove it.



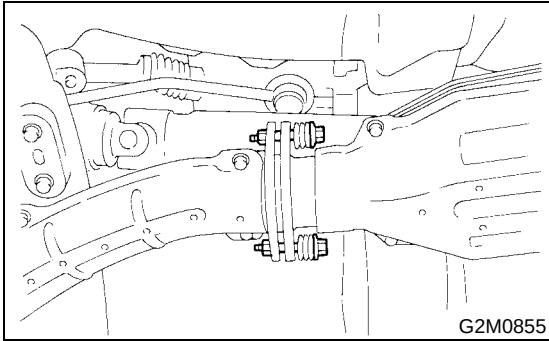
- 12) Separate center exhaust pipe from turbocharger.



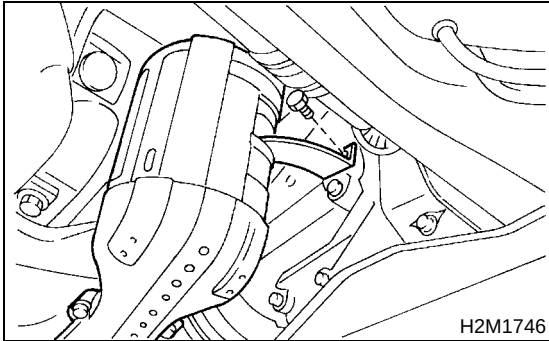
- 13) Lift-up the vehicle.
- 14) Disconnect connector from rear oxygen sensor.



- 15) Separate center exhaust pipe from rear exhaust pipe.



- 16) Remove bolt which holds center exhaust pipe bracket to transmission.

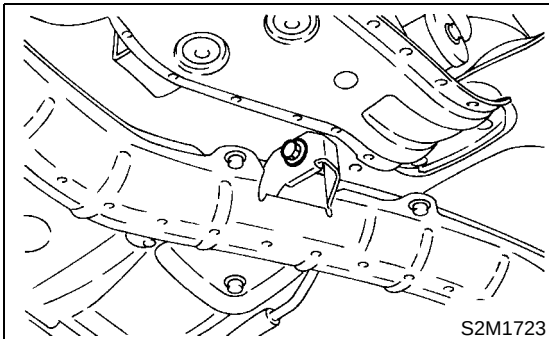


- 17) Remove intercooler bracket.

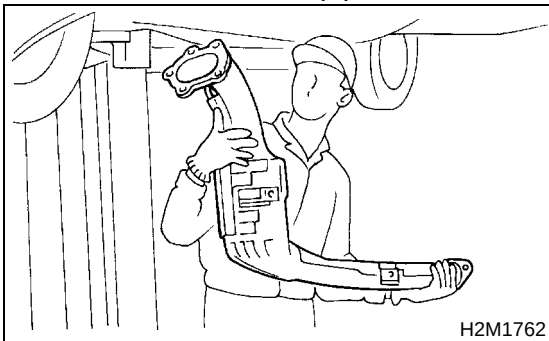
- 18) Remove bolt which holds center exhaust pipe to hanger bracket.

CAUTION:

Be careful not to pull down center exhaust pipe.



- 19) Remove center exhaust pipe.



B: INSTALLATION

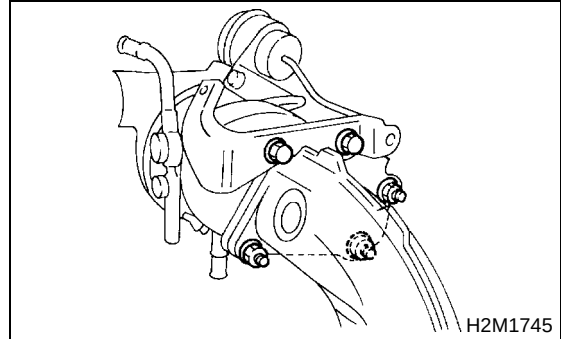
CAUTION:

Replace gaskets with new ones.

- 1) Install center exhaust pipe and temporarily tighten bolt which holds center exhaust pipe to hanger bracket.
- 2) Temporarily tighten bolt which holds center pipe to transmission.
- 3) Connect center exhaust pipe to turbocharger.

Tightening torque:

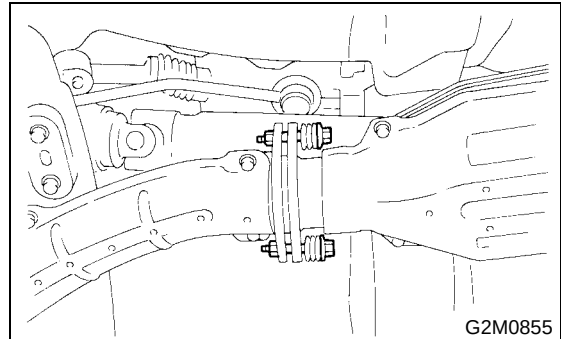
30 N·m (3.1 kgf-m, 22.4 ft-lb)



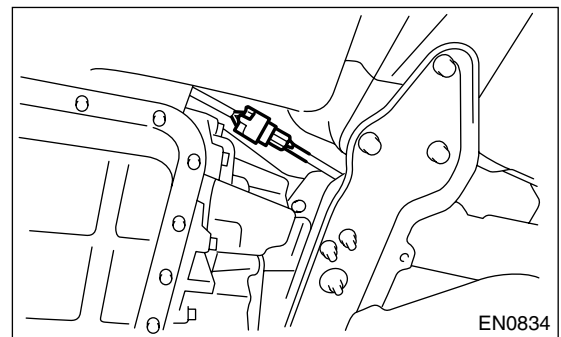
- 4) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 5) Connect connector to rear oxygen sensor.



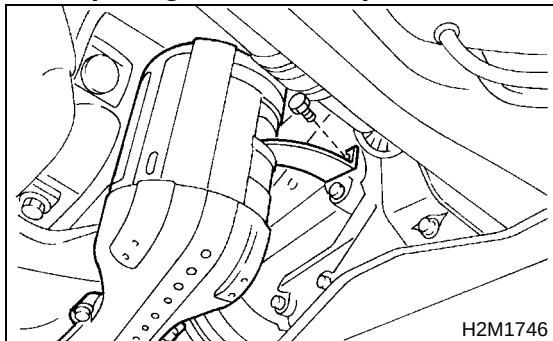
CENTER EXHAUST PIPE

EXHAUST

6) Tighten bolt which holds center exhaust pipe bracket to transmission.

Tightening torque:

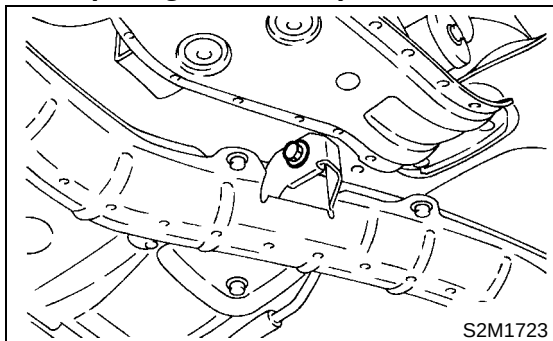
30 N·m (3.1 kgf-m, 22.4 ft-lb)



7) Tighten bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:

35 N·m (3.6 kgf-m, 26 ft-lb)



8) Tighten bolts which hold intercooler bracket.

Tightening torque:

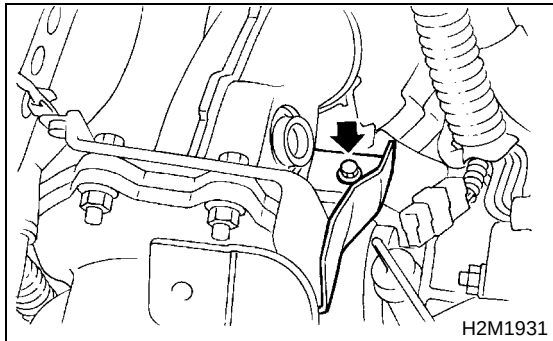
35 N·m (3.6 kgf-m, 26.0 ft-lb)

9) Lower the vehicle.

10) Place turbocharger lower cover, and tighten bolts which install the upper side of lower cover.

Tightening torque:

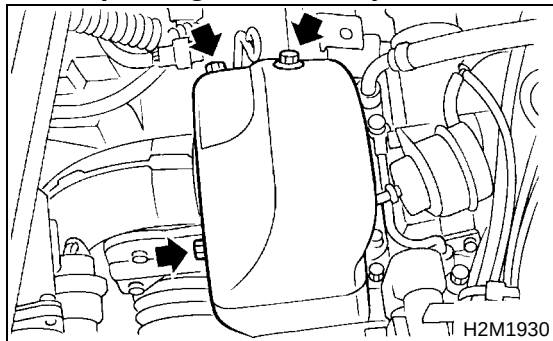
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



11) Place turbocharger upper cover, and tighten bolts which install the upper side of upper cover.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

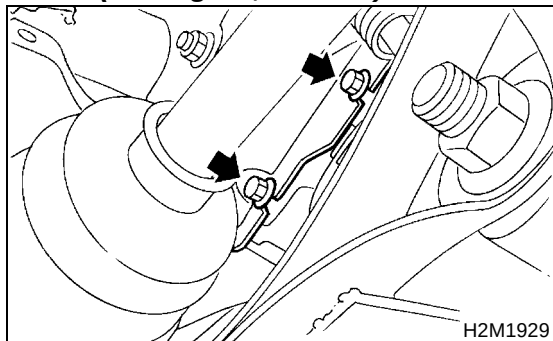


12) Lift-up the vehicle.

13) Tighten bolts which install the under side of turbocharger upper cover.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



14) Install universal joint (RHD model only).

(1) Align bolt 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 side, then that on the short yoke side.

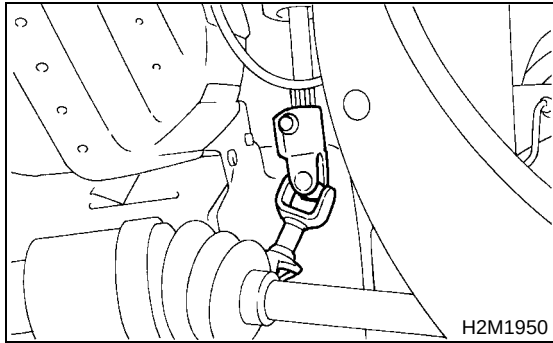
Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

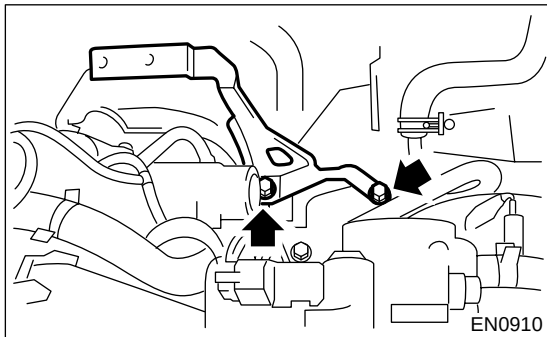
CAUTION:

- Make sure that universal joint bolts are tightened through notches 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)



- 15) Install under cover.
- 16) Lower the vehicle.
- 17) Install intercooler bracket.

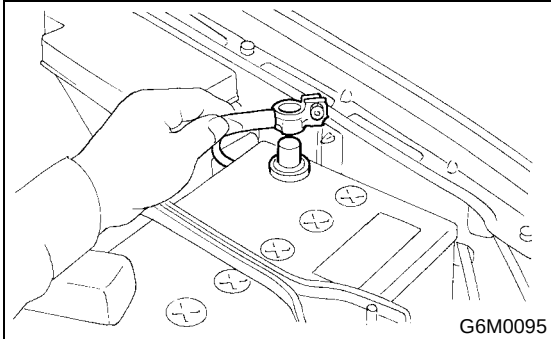


- 18) Install intercooler. <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>
- 19) Align center of roll connector. (With airbag model) <Ref. to AB-11, ROLL CONNECTOR, INSPECTION, Inspection Locations After a Collision.>

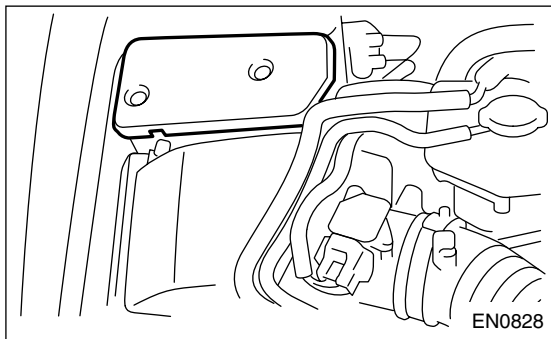
4. Joint Pipe

A: REMOVAL

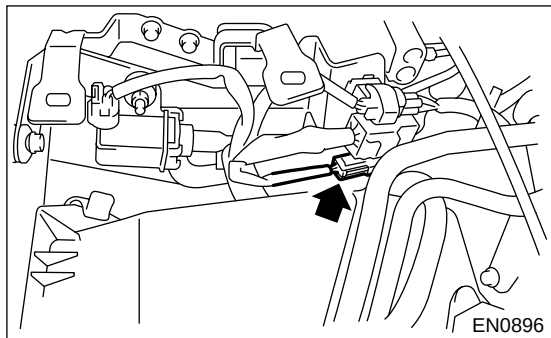
1) Disconnect battery ground cable.



2) Remove solenoid valve cover.



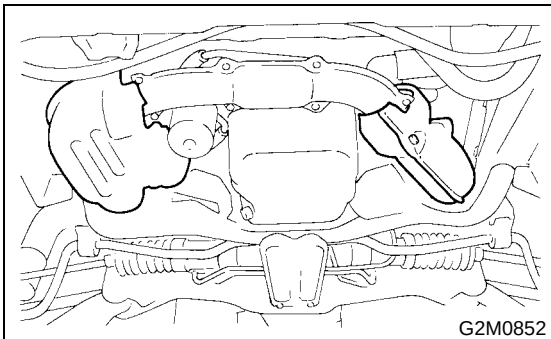
3) Disconnect from exhaust temperature sensor connector.



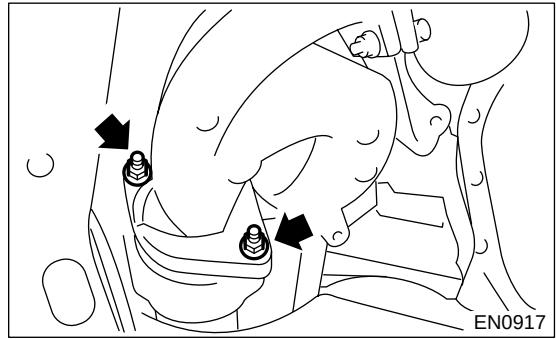
4) Remove front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-41, REMOVAL, Front Oxygen (A/F) Sensor.>

5) Remove under cover.

6) Remove lower exhaust manifold cover (RH).



7) Remove nuts. Which hold front exhaust manifold to joint pipe.



8) Remove center exhaust pipe. <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>

9) Remove turbocharger. <Ref. to IN(DOHC TURBO)-12, REMOVAL, Turbocharger.>

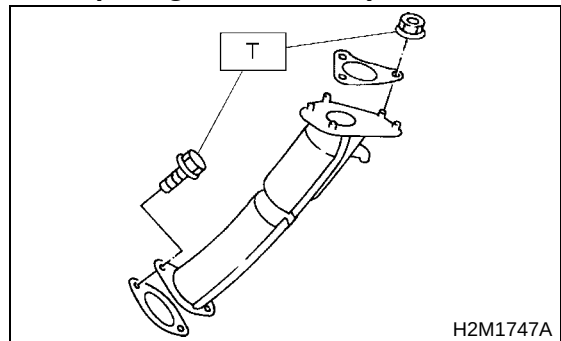
10) Take off joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

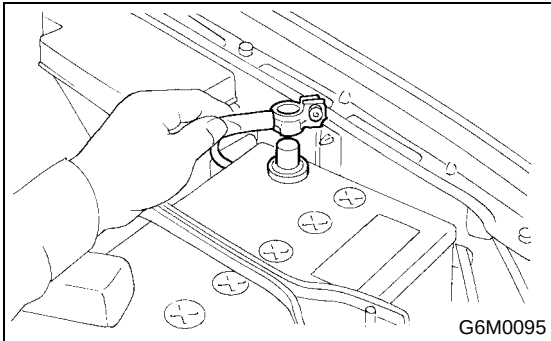
35 N·m (3.6 kgf-m, 26.0 ft-lb)



5. Rear Exhaust Pipe

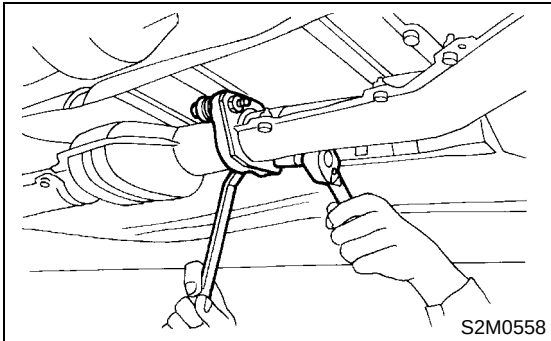
A: REMOVAL

- 1) Disconnect battery ground cable.



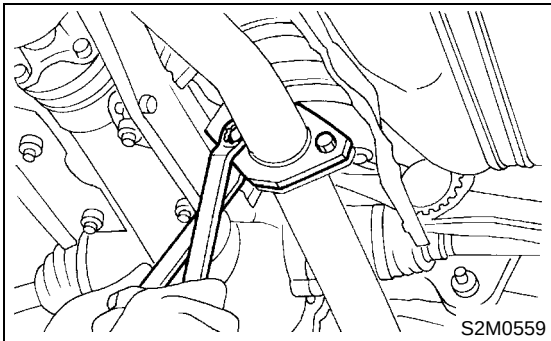
- 2) Lift up the vehicle.
- 3) Separate rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.



- 4) Separate rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down rear exhaust pipe.



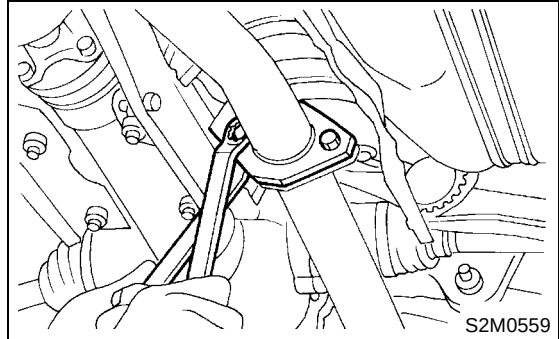
- 5) Remove rear exhaust pipe.

B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

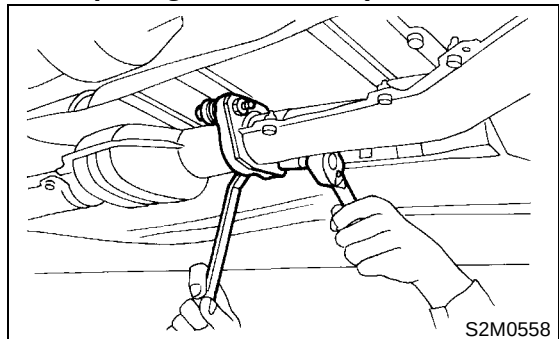
- 1) Install rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

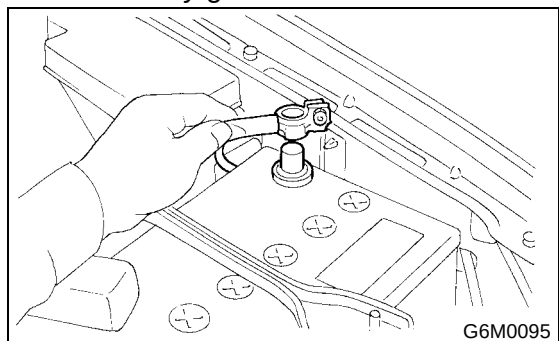


- 2) Install rear exhaust pipe to center exhaust pipe.

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



- 3) Lower the vehicle.
- 4) 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) Make sure the cushion rubber is not worn or cracked.

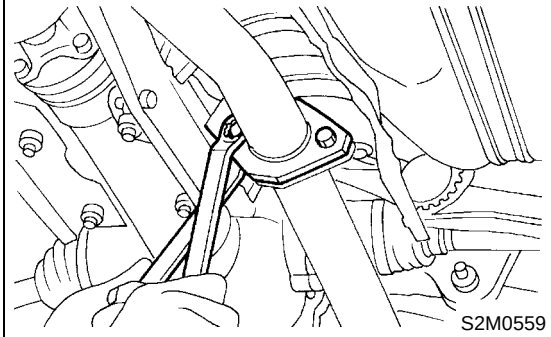
6. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

CAUTION:

Be careful, exhaust pipe is hot.



2) Remove rubber cushions, and detach muffler.

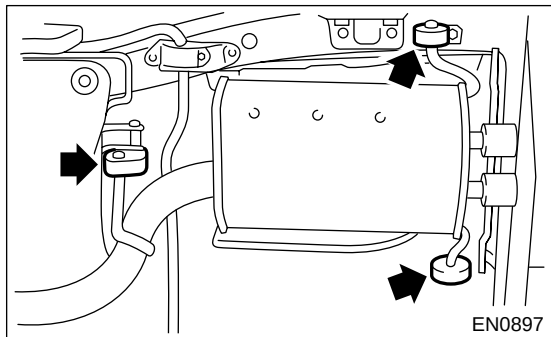
CAUTION:

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)



B: INSTALLATION

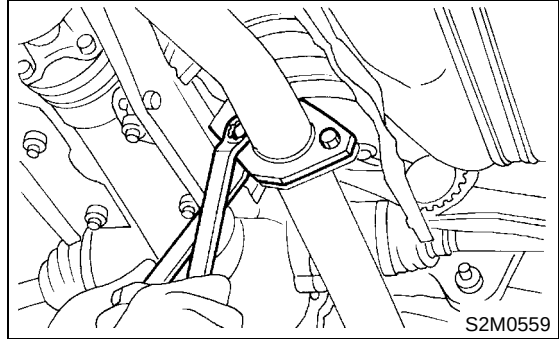
1) Install in the reverse order of removal.

CAUTION:

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.

ENGINE 2 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.

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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(SOHCw/oOBD)

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

IGNITION

IG(DOHC TURBO)

	Page
1. General Description	2
2. Spark Plug.....	4
3. Ignition Coil and Ignitor Assembly	8

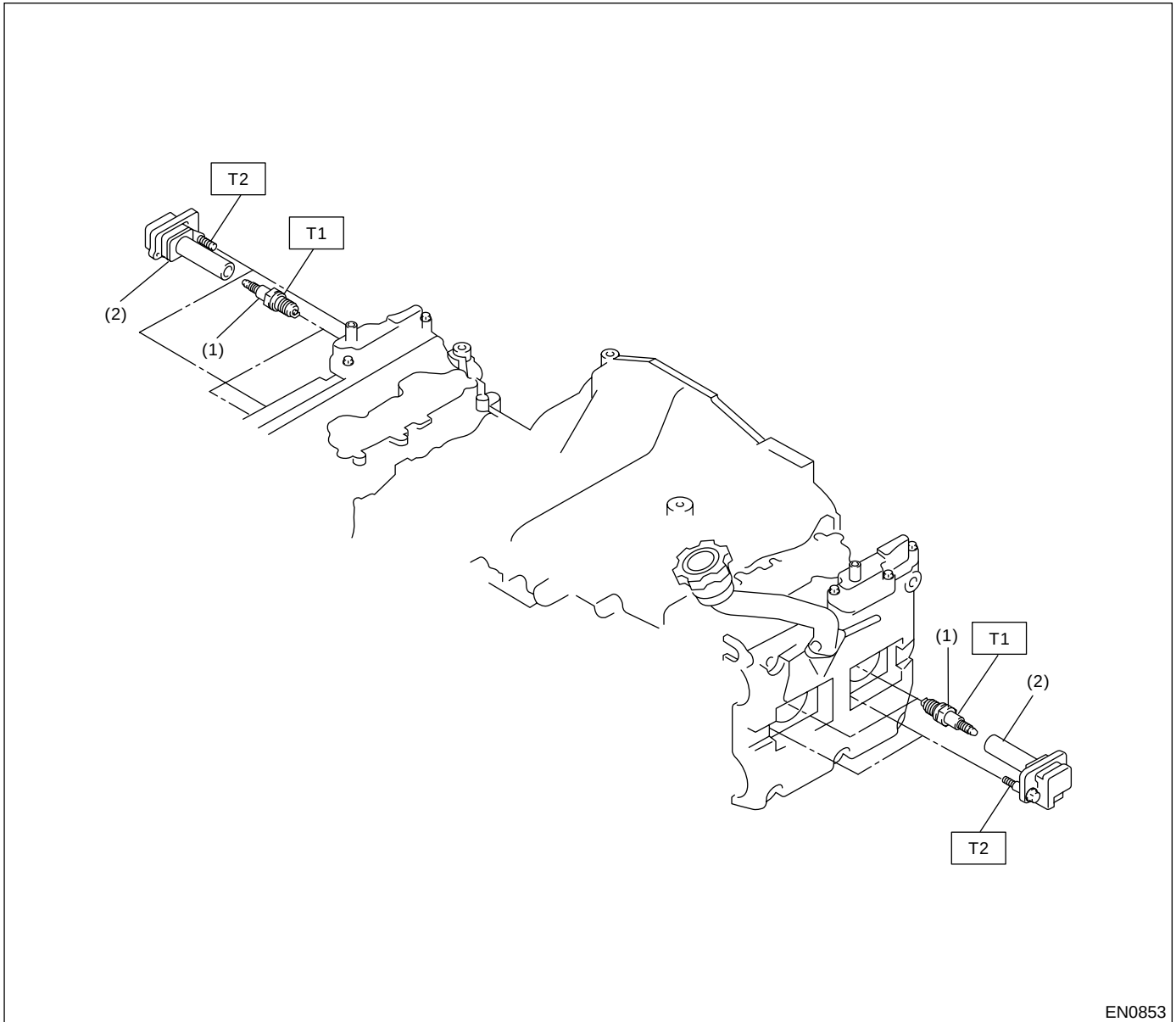
GENERAL DESCRIPTION

IGNITION

1. General Description

A: SPECIFICATIONS

Item		Designation
Ignition coil and ignitor assembly	Model	FK0140
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	PFR6G NGK
	Thread size mm	14, P = 1.25
	Spark gap mm (in)	0.7 — 0.8 (0.028 — 0.031)

B: COMPONENT

EN0853

- (1) Spark plug
- (2) Ignition coil and ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15)**T2: 16 (1.6, 11.7)****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 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.

SPARK PLUG

IGNITION

2. Spark Plug

A: REMOVAL

CAUTION:

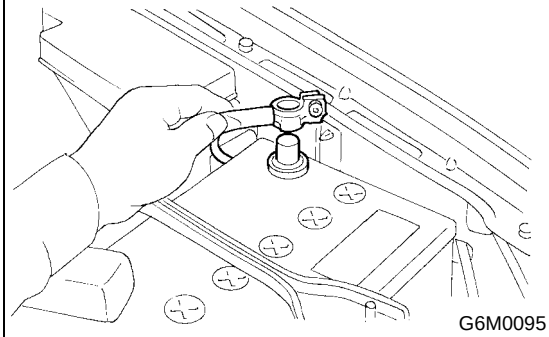
All spark plugs installed on an engine, must be of the same heat range.

Spark plug:

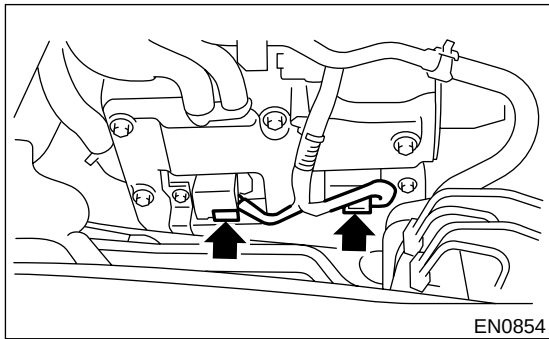
NGK: PFR6G

1. RH SIDE

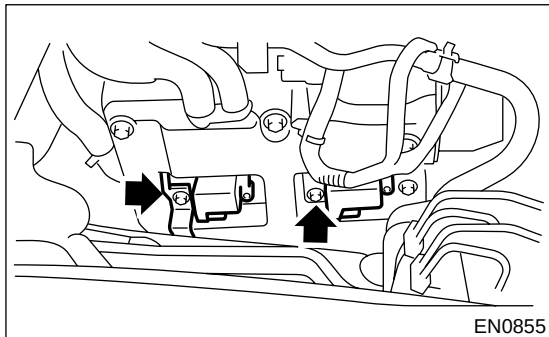
- 1) Disconnect battery ground cable.



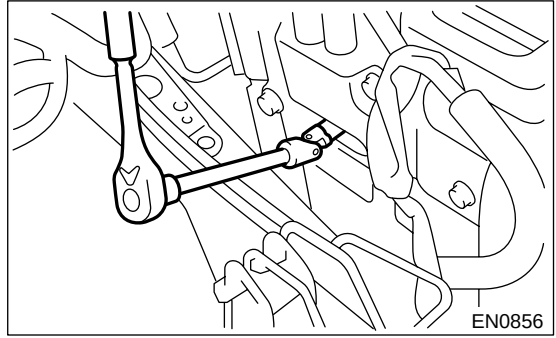
- 2) Remove air cleaner lower case. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
- 3) Disconnect connector from ignition coil.



- 4) Remove ignition coil.

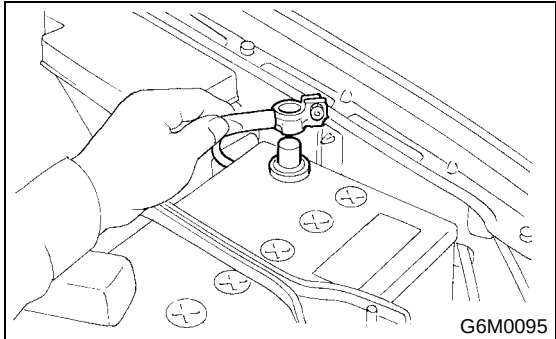


- 5) Remove spark plugs with the spark plug socket.

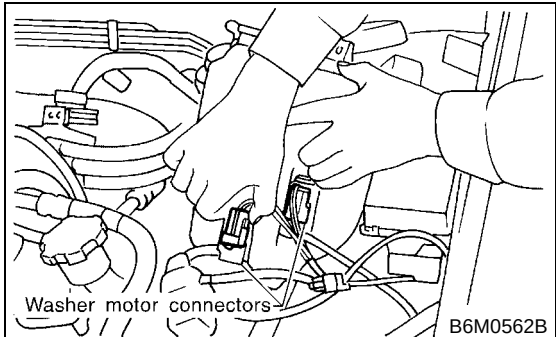


2. LH SIDE

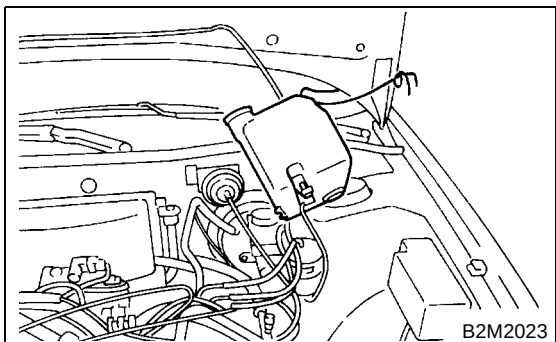
- 1) Disconnect battery cables, and then remove battery and battery carrier.



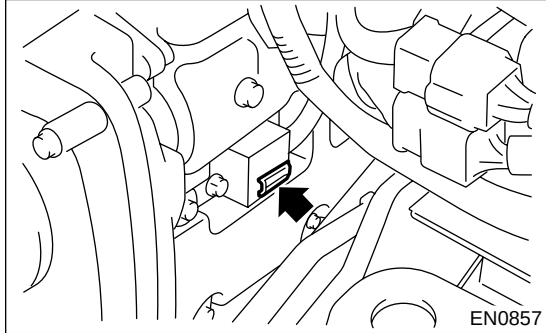
- 2) Disconnect washer motor connector.



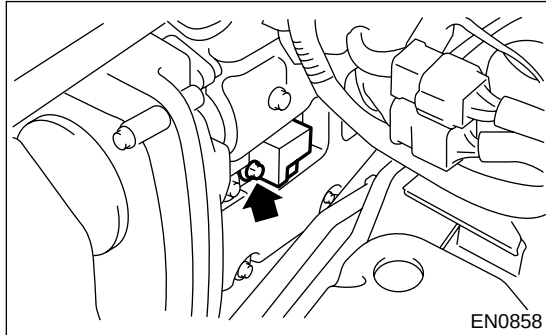
- 3) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.
- 4) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



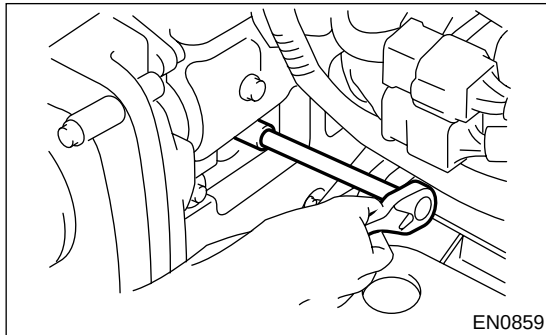
5) Disconnect connector from ignition coil.



6) Remove ignition coil.



7) 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)

Tightening torque (Ignition coil):

16 N·m (1.63 kgf-m, 11.8 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.

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)

Tightening torque (Ignition coil):

16 N·m (1.63 kgf-m, 11.8 ft-lb)

CAUTION:

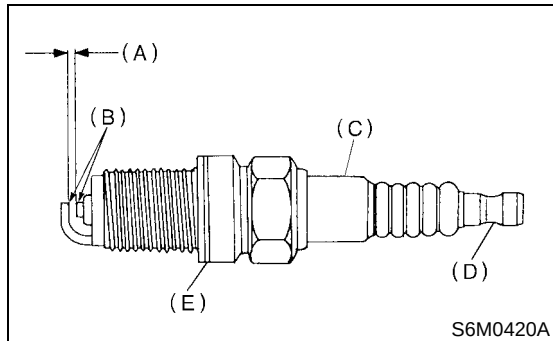
The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

SPARK PLUG

IGNITION

C: INSPECTION

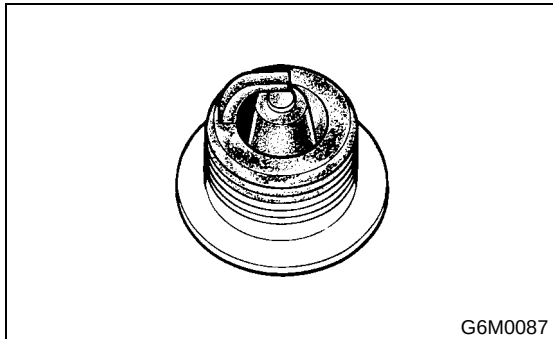
Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal

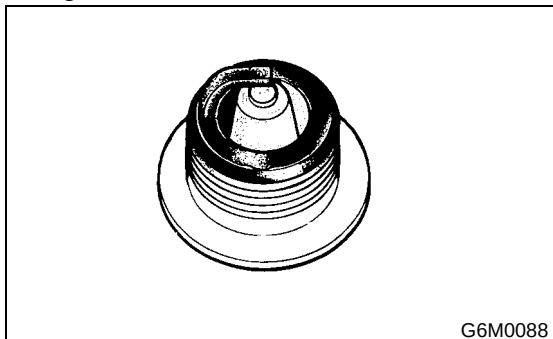
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



2) Carbon fouled

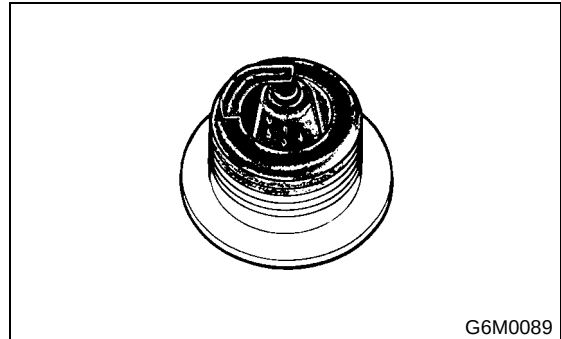
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



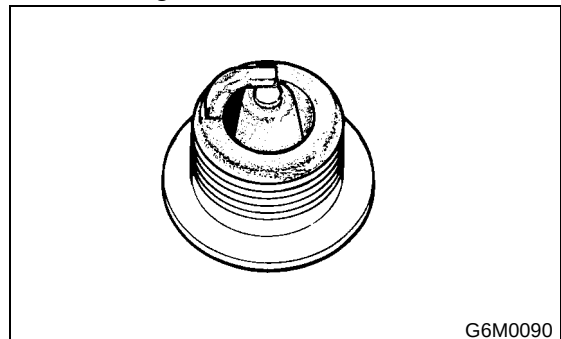
3) Oil fouled

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.



D: ADJUSTMENT

Clean spark plugs in a sand blast type cleaner.

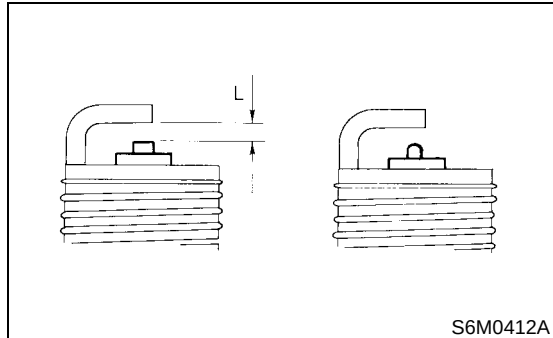
Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.

If deposits are too stubborn, replace plugs.

After cleaning spark plugs, recondition firing surface of electrodes with file. Then correct the spark plug gap using a gap gauge.

Spark plug gap: L

0.7 — 0.8 mm (0.028 — 0.031 in)

**NOTE:**

Replae with new spark plug if this area 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(DOHC TURBO)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

16 N·m (1.63 kgf-m, 11.8 ft-lb)

C: INSPECTION

- Igniter is integrated with the coil. Therefore resistance cannot be measured.

ENGINE 2 SECTION

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ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

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ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

ENGINE (DIAGNOSTICS)

EN(DOHC TURBO)

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BASIC DIAGNOSTIC PROCEDURE

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

Step	Check	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(DOHC TURBO)-3, CHECK, Check List for Interview.> 2)Start the engine.	Does the engine start?	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(DOHC TURBO)-52, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).	Does CHECK ENGINE malfunction indicator lamp illuminate?	Go to step 3.	Inspection using "General Diagnostics Table". <Ref. to EN(DOHC TURBO)-301, 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?	Record diagnostic trouble code. Repair the trouble cause. <Ref. to EN(DOHC TURBO)-69, List of 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(DOHC TURBO)-41, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1)Perform the clear memory mode. <Ref. to EN(DOHC TURBO)-38, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(DOHC TURBO)-35, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-74, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. Check List for Interview

Check the following items when problem has occurred.

A: CHECK

NOTE:

Use copies of this page for interviewing customers.

1. CHECK LIST NO. 1

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others:		
Outdoor temperature	°C (°F)		
	☐ Hot ☐ Warm ☐ Cool ☐ Cold		
Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Others:		
Engine temperature	☐ Cold ☐ Warming-up ☐ After warming-up ☐ Any temperature ☐ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH)		
Headlight	☐ ON/ ☐ OFF	Rear defogger	☐ ON/ ☐ OFF
Blower	☐ ON/ ☐ OFF	Radio	☐ ON/ ☐ OFF
A/C compressor	☐ ON/ ☐ OFF	CD/Cassette	☐ ON/ ☐ OFF
Cooling fan	☐ ON/ ☐ OFF	Car phone	☐ ON/ ☐ OFF
Front wiper	☐ ON/ ☐ OFF	CB	☐ ON/ ☐ OFF
Rear wiper	☐ ON/ ☐ 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. ☐ Yes/ ☐ No
☐ Low fuel warning light ☐ Charge indicator light ☐ AT diagnostics indicator light ☐ ABS warning light ☐ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ☐ Yes/☐ No • Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ☐ Yes/ ☐ No
• What:
d) Intentional connecting or disconnecting of hoses: ☐ Yes/ ☐ No
• What:
e) Installing of parts other than genuine parts: ☐ Yes/ ☐ No
• What: • Where:
f) Occurrence of noise: ☐ Yes/ ☐ No
• From where: • What kind:
g) Occurrence of smell: ☐ Yes/ ☐ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ☐ Yes/ ☐ No
i) Troubles occurred
☐ Engine does not start. ☐ Engine stalls during idling. ☐ Engine stalls while driving. ☐ Engine speed decreases. ☐ Engine speed does not decrease. ☐ Rough idling ☐ Poor acceleration ☐ Back fire ☐ After fire ☐ No shift ☐ Excessive shift shock

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.

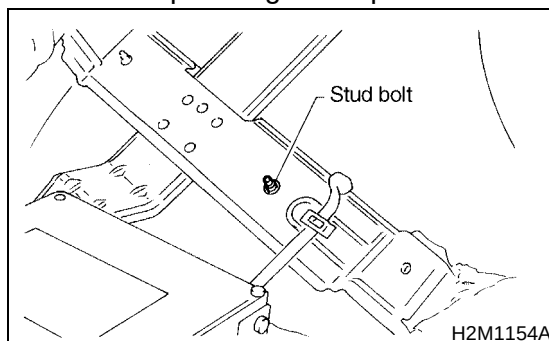
- Otherwise, the ECM may be damaged.

CAUTION:

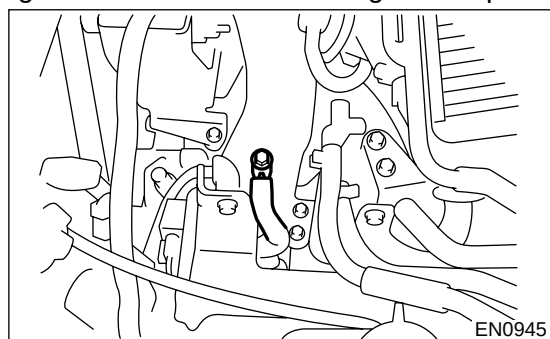
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

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.

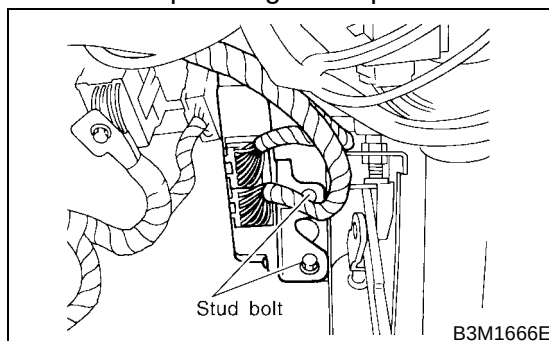
8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



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.



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.

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

- 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) 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.

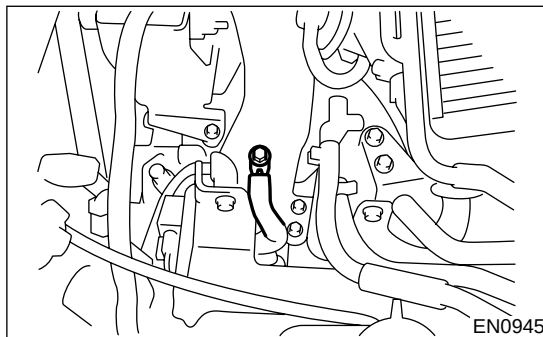
Standard voltage: 12 V

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 (MIL) 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, MIL illuminates. At the same time of the MIL 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, MIL 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, 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

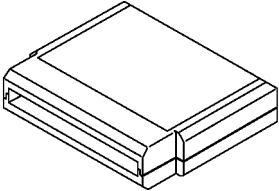
pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

• 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.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150 (Newly adapted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

ELECTRICAL COMPONENTS LOCATION

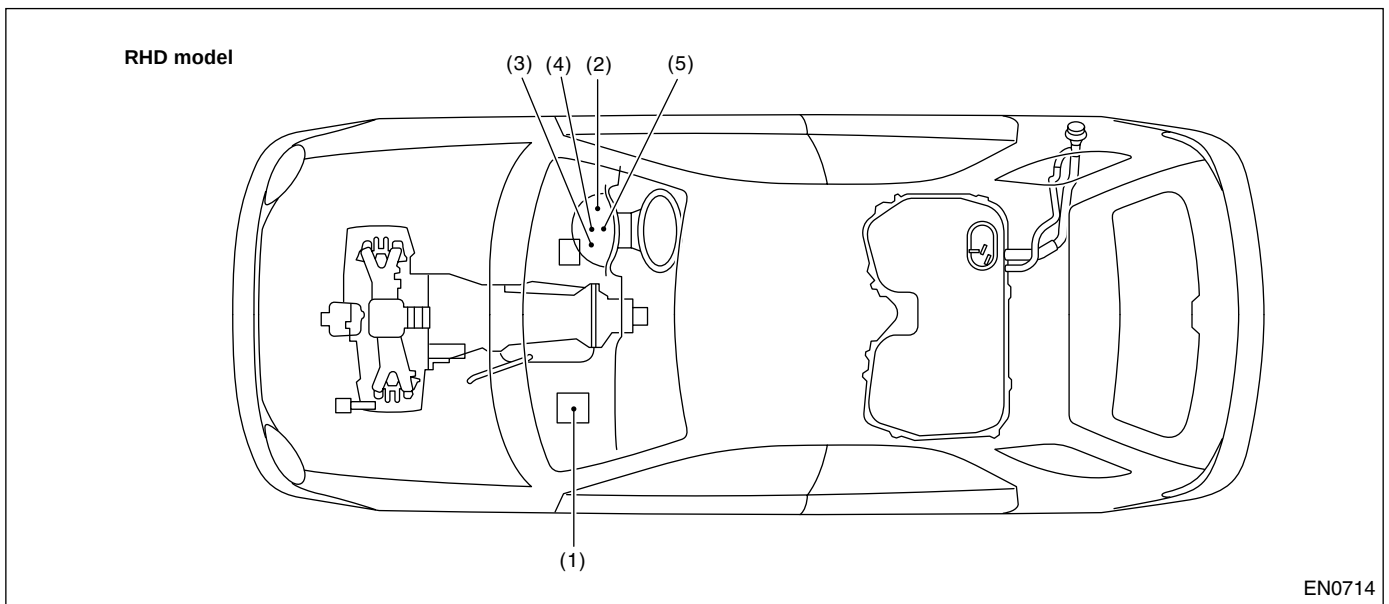
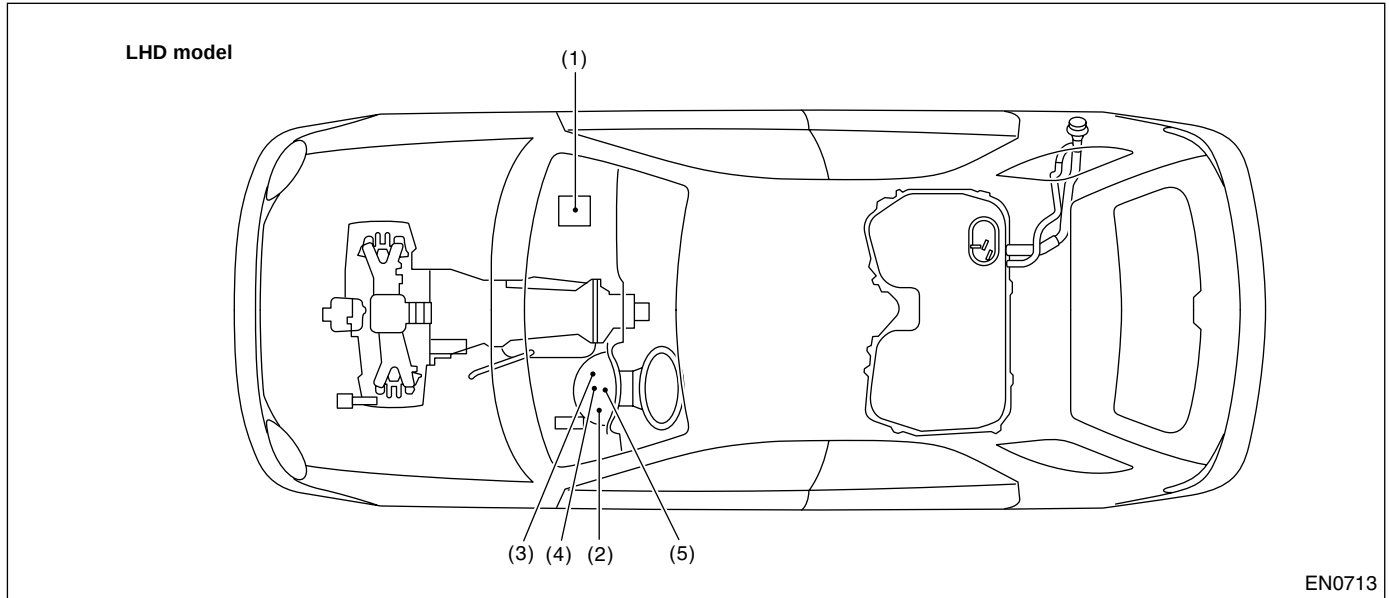
ENGINE (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

1. ENGINE

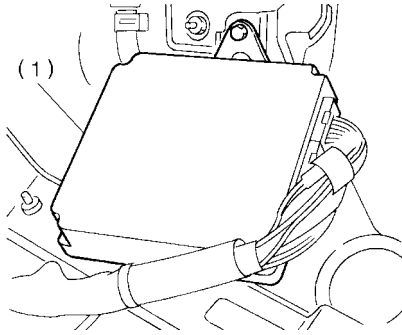
• MODULE



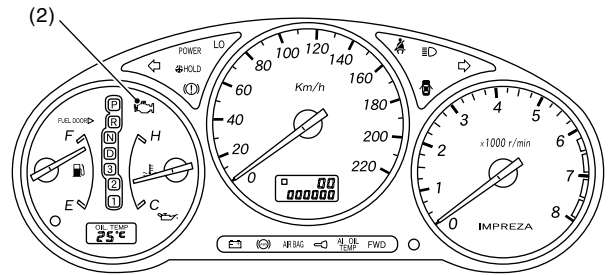
- | | |
|---|---------------------------|
| (1) Engine control module (ECM) | (3) Read memory connector |
| (2) CHECK ENGINE malfunction indicator lamp (MIL) | (4) Test mode connector |
| | (5) Data link connector |

ELECTRICAL COMPONENTS LOCATION

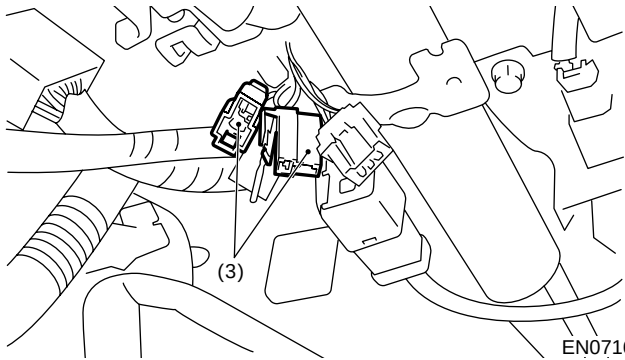
ENGINE (DIAGNOSTICS)



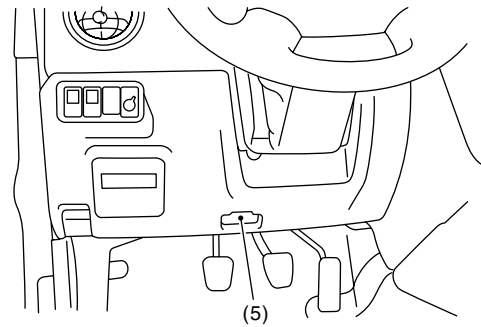
B3M1575A



EN0718



EN0716

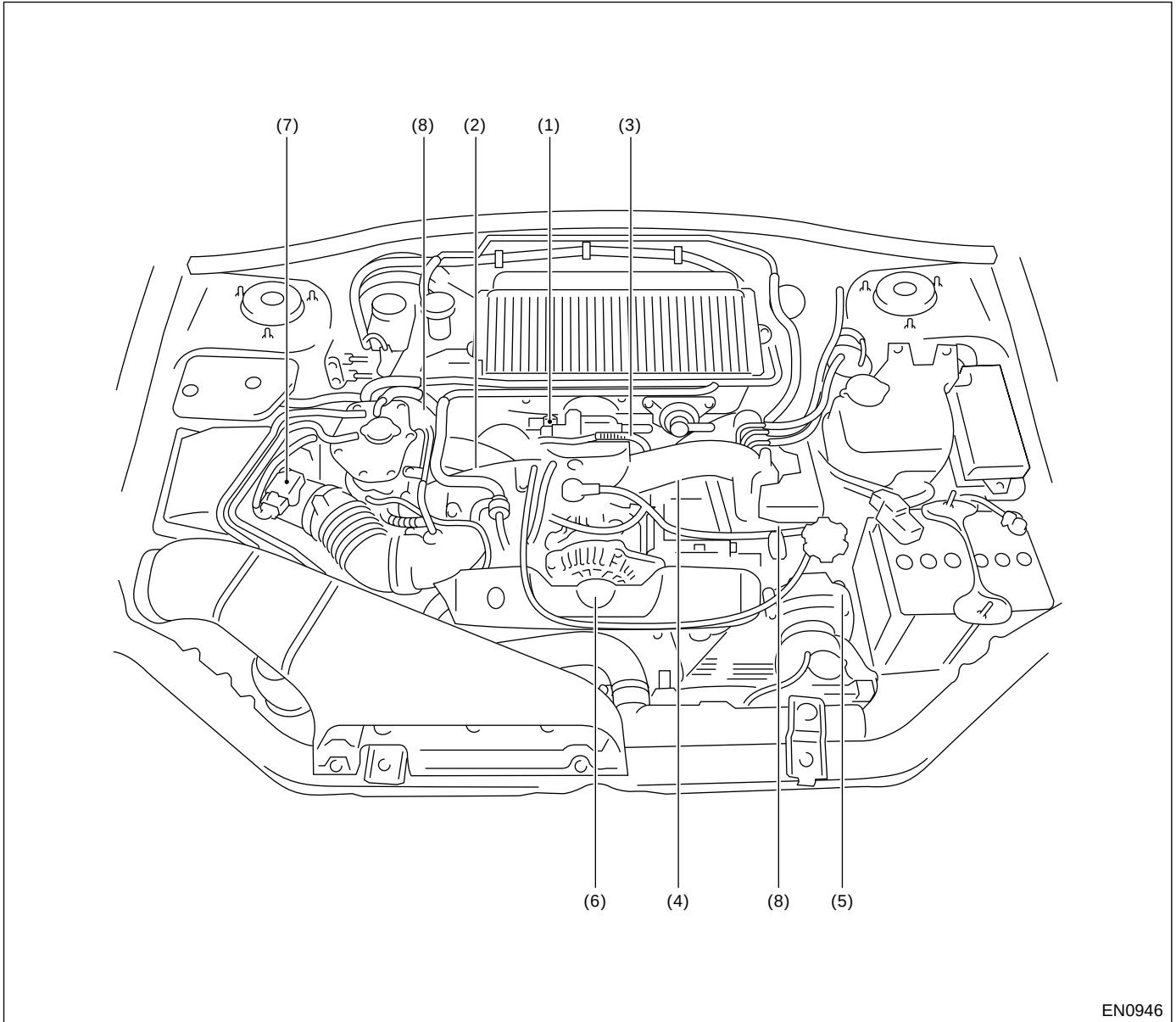


EN0717

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SENSOR

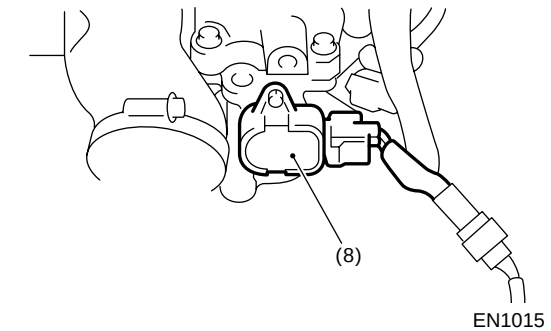
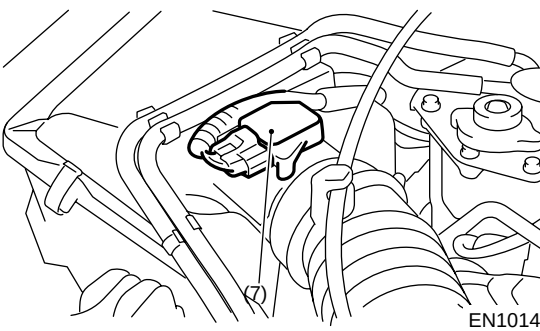
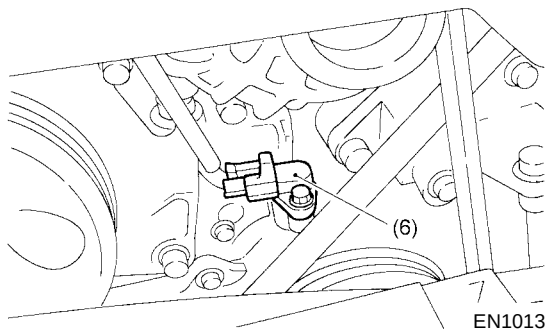
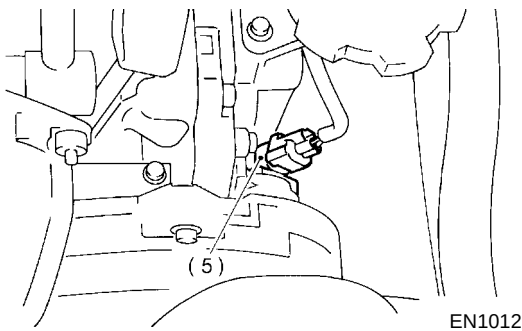
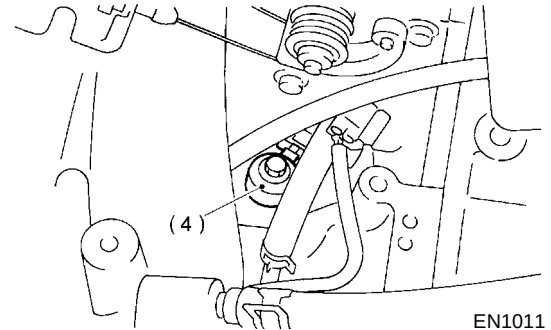
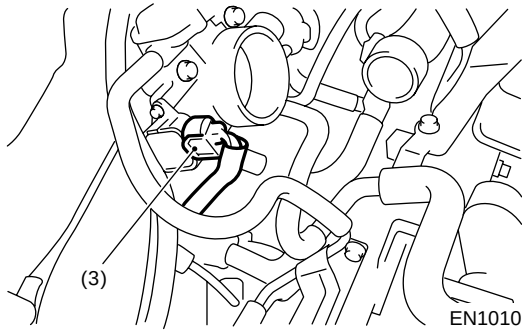
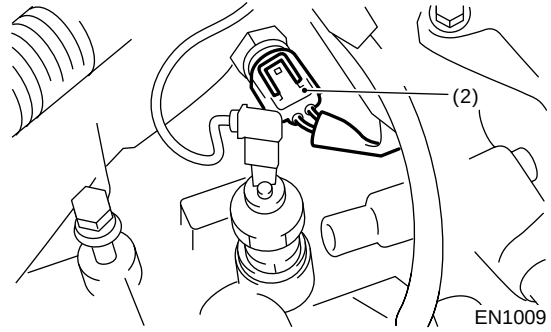
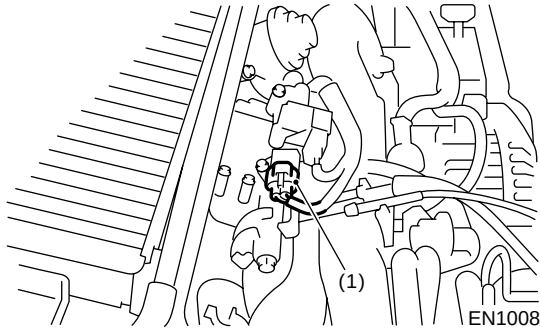


EN0946

- | | | |
|---------------------------------------|---|--|
| (1) Pressure sensor | (4) Knock sensor | (8) Tumble generator valve position sensor |
| (2) Engine coolant temperature sensor | (5) Camshaft position sensor | |
| (3) Throttle position sensor | (6) Crankshaft position sensor | |
| | (7) Mass air flow and intake air temperature sensor | |

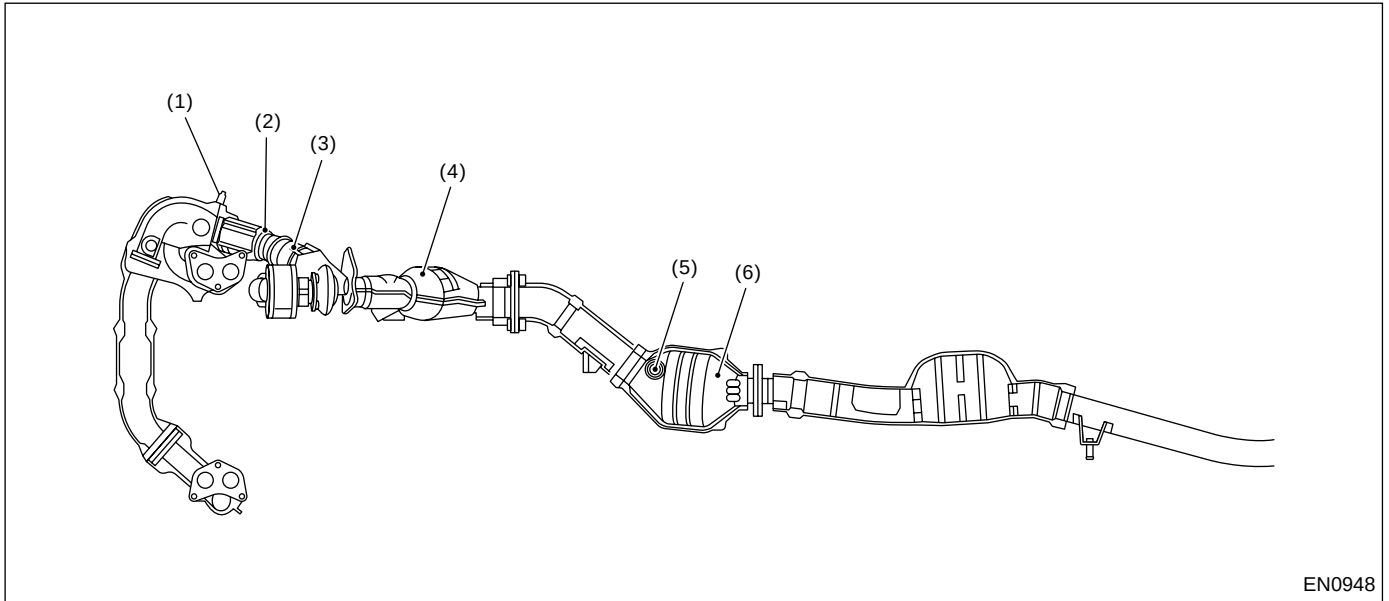
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



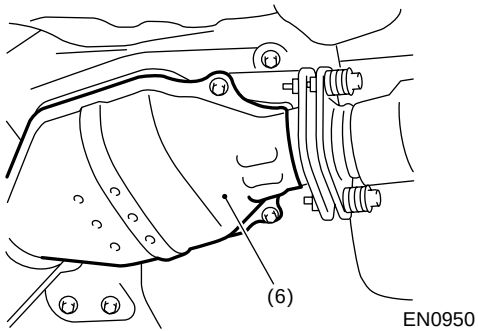
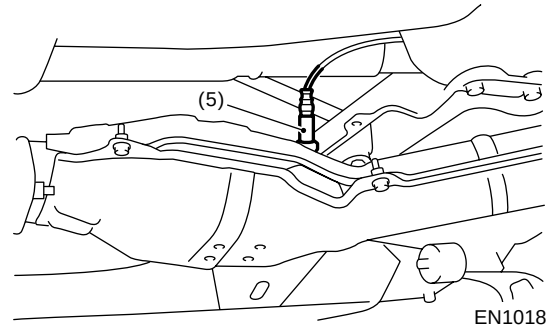
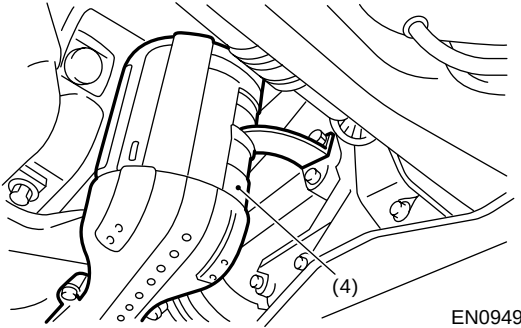
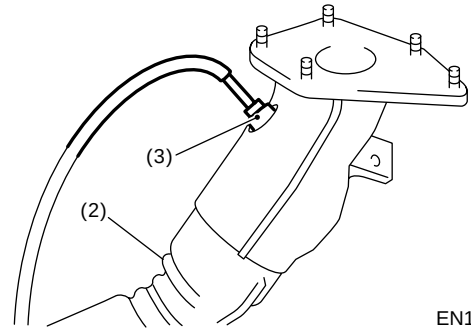
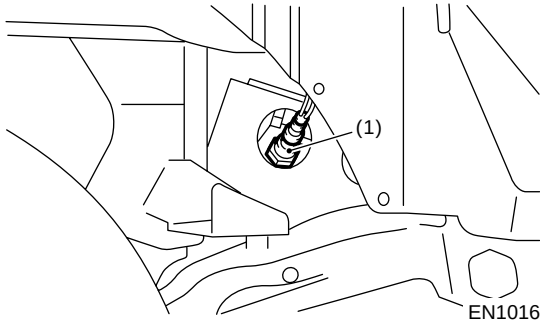
(1) Front oxygen (A/F) sensor
(2) Precatalytic converter

(3) Exhaust temperature sensor
(4) Front catalytic converter

(5) Rear oxygen sensor
(6) Rear catalytic converter

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

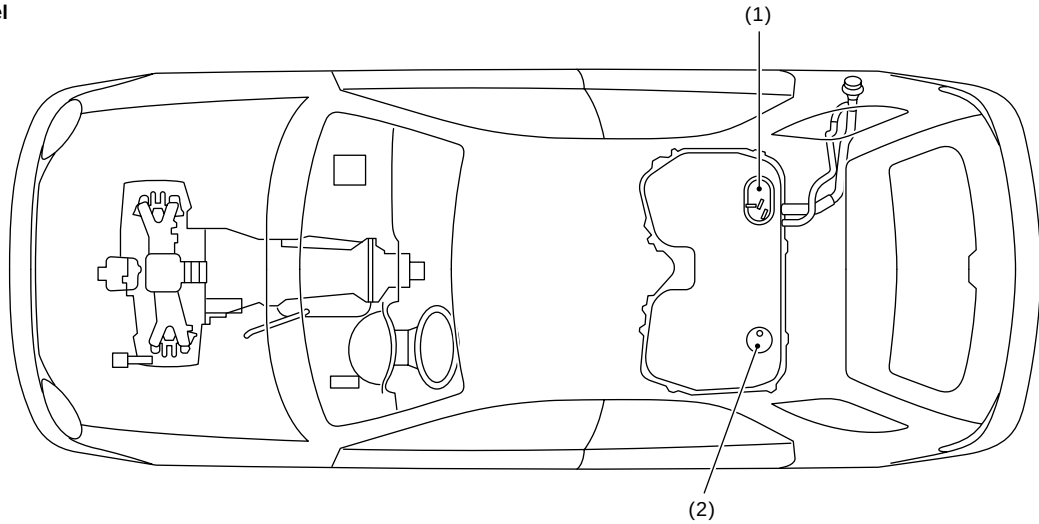


SUBARU.

ELECTRICAL COMPONENTS LOCATION

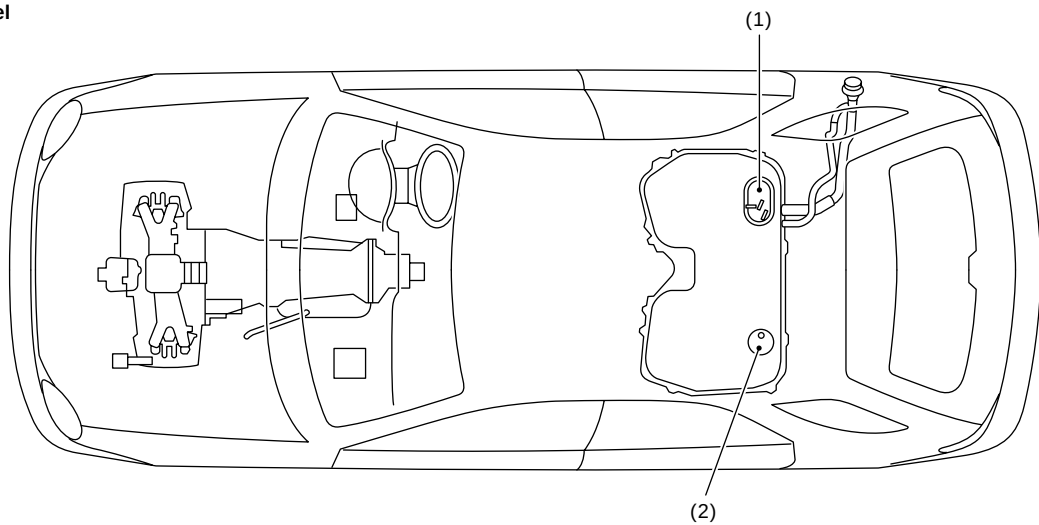
ENGINE (DIAGNOSTICS)

LHD model



EN1019

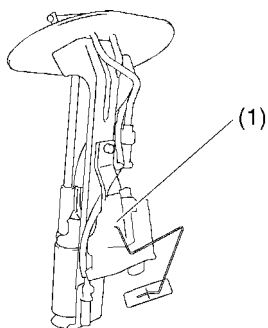
RHD model



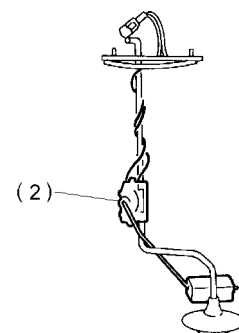
EN1020

(1) Fuel level sensor

(2) Fuel sub level sensor



EN1036

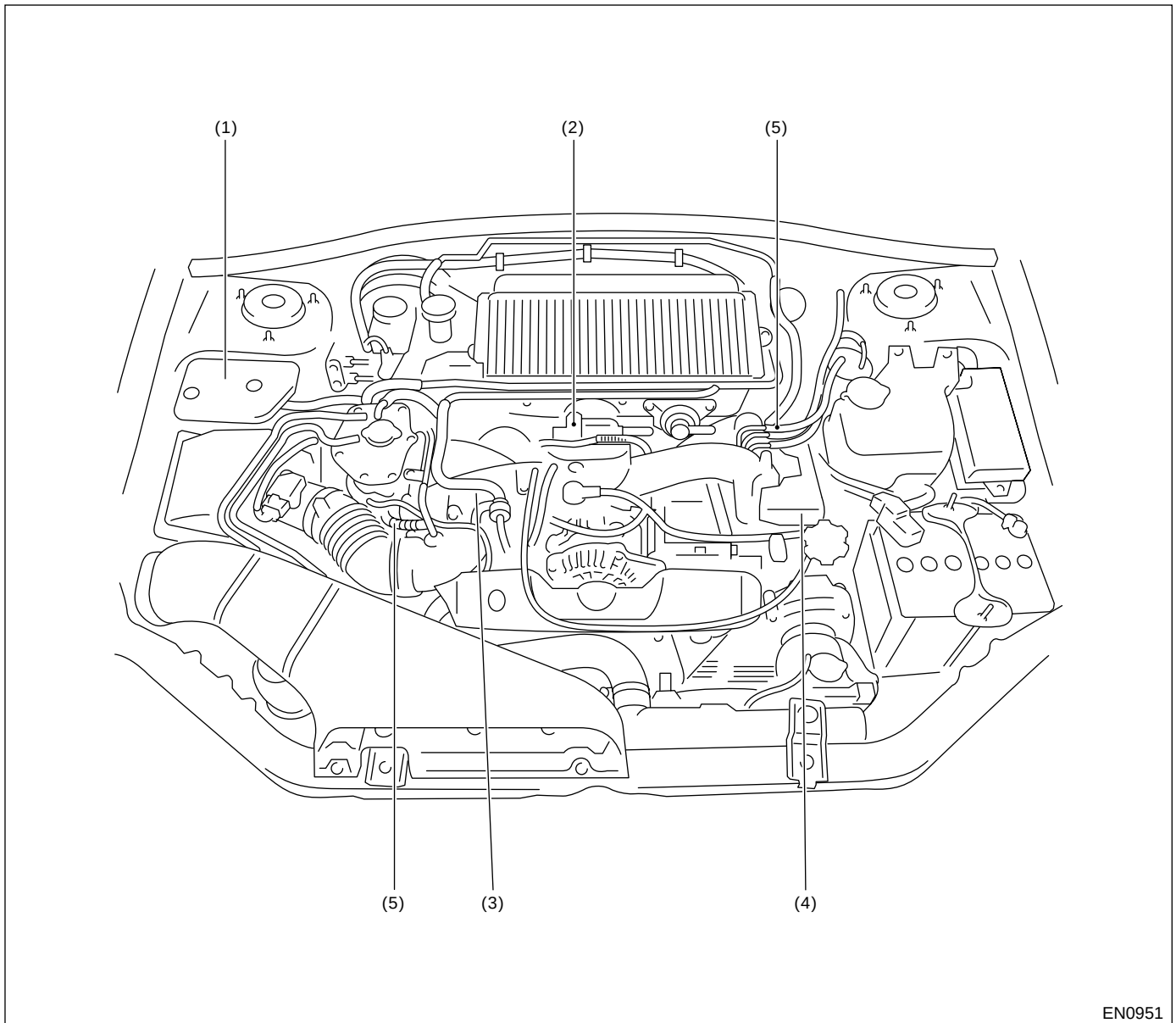


EN1037

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS

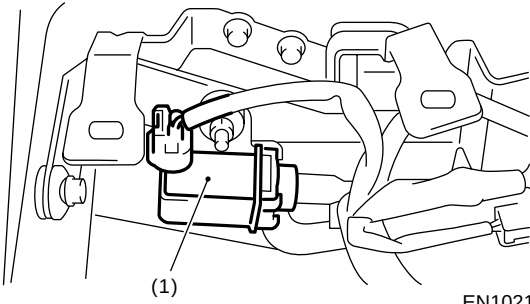


EN0951

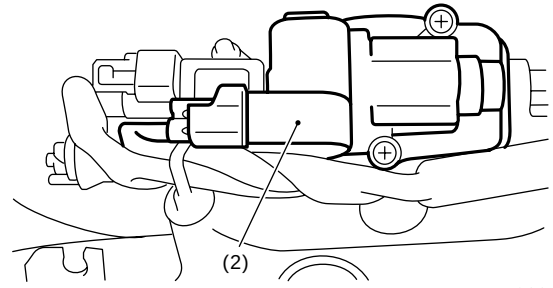
- | | | |
|--------------------------------------|----------------------------------|-------------------------------------|
| (1) Wastegate control solenoid valve | (3) Purge control solenoid valve | (5) Tumble generator valve actuator |
| (2) Idle air control solenoid valve | (4) Ignition coil | |

ELECTRICAL COMPONENTS LOCATION

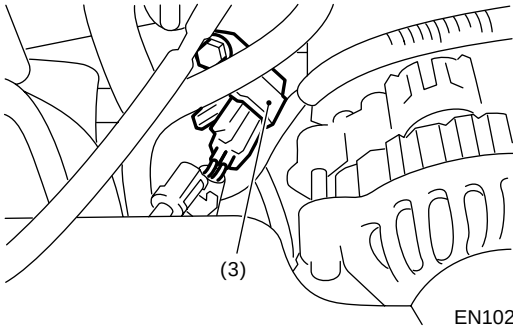
ENGINE (DIAGNOSTICS)



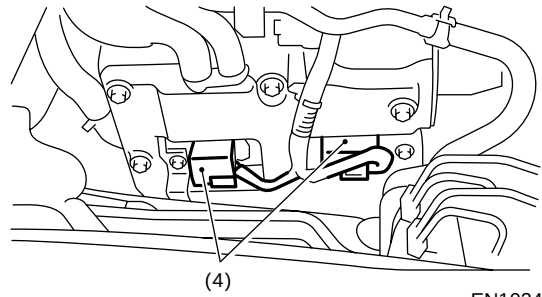
EN1021



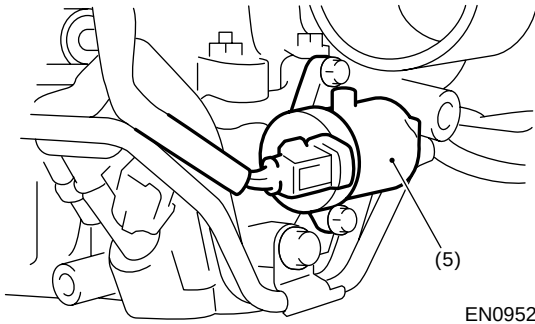
EN1022



EN1023



EN1024



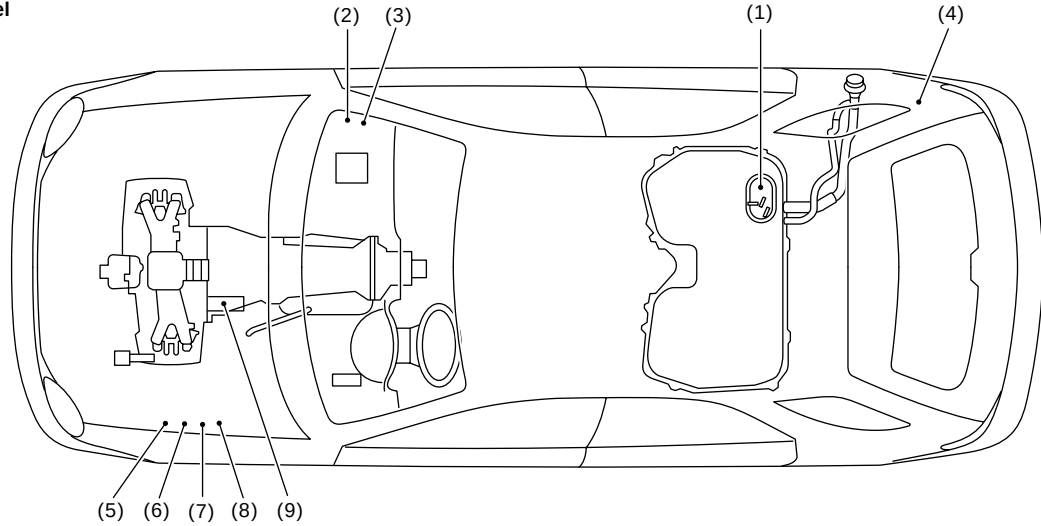
EN0952

SUBARU.

ELECTRICAL COMPONENTS LOCATION

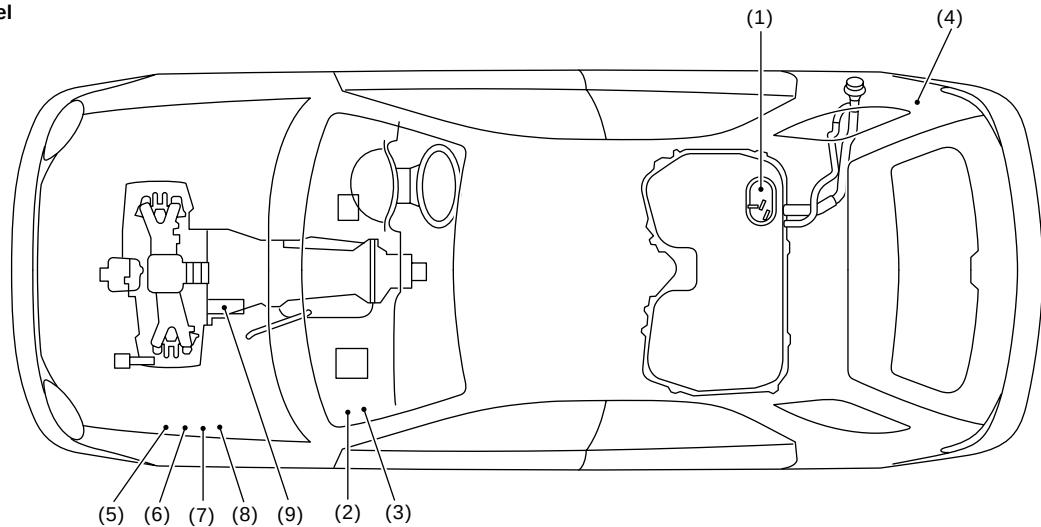
ENGINE (DIAGNOSTICS)

LHD model



EN1025

RHD model

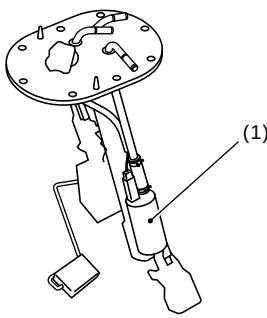
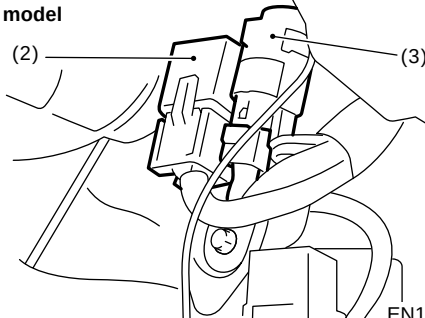
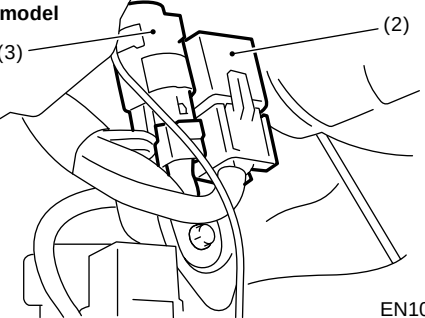
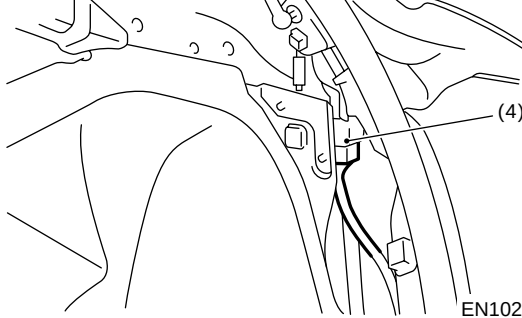
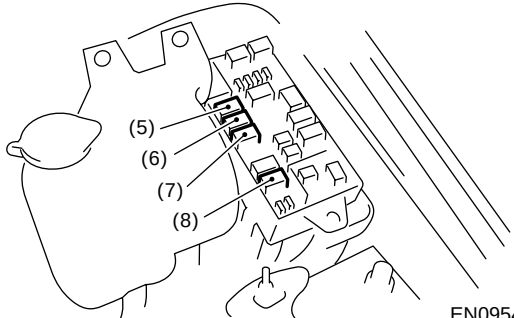
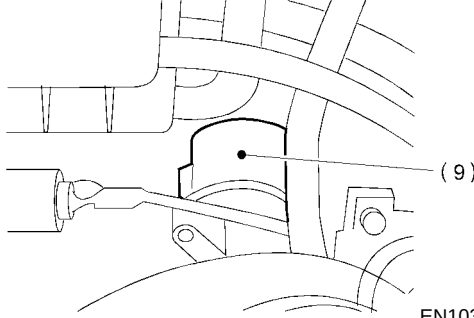


EN1026

- | | | |
|---------------------|-------------------------------|------------------------------|
| (1) Fuel pump | (4) Fuel pump controller | (7) Radiator sub fan relay 1 |
| (2) Main relay | (5) Radiator main fan relay 1 | (8) Radiator sub fan relay 2 |
| (3) Fuel pump relay | (6) Radiator main fan relay 2 | (9) Starter |

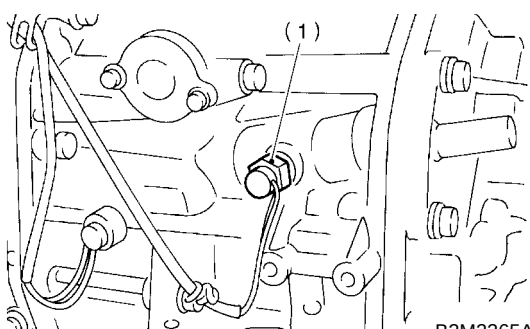
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

 EN0953	LHD model  EN1027
RHD model  EN1028	 EN1029
 EN0954	 EN1030

2. TRANSMISSION

• SOLENOID VALVE AND SWITCH (MT VEHICLES)

 B2M2265A	SUBARU.
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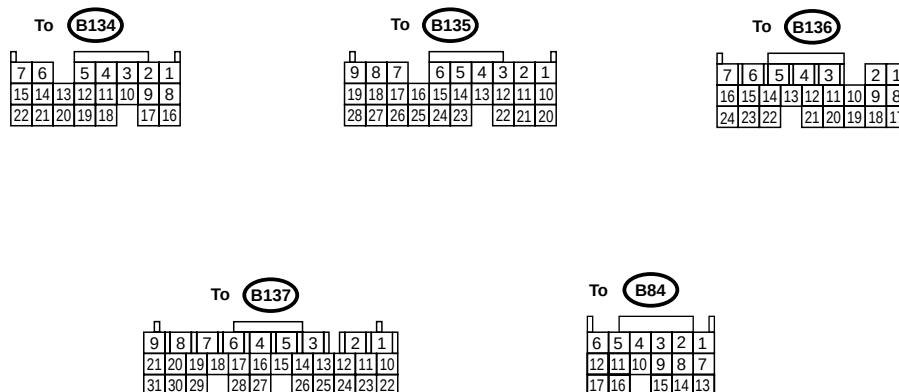
(1) Neutral position switch

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



EN0955

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	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 dis- played when vehicle is driven.

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)	
Mass air flow sen- sor	Signal	B84	13	—	0.3 — 4.5	—
	Shield	B84	8	0	0	—
	GND	B84	7	0	0	—
Intake air temperature sensor signal		B135	27	—	—	—
Exhaust gas tem- perature sensor	Signal	B135	16	—	—	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve posi- tion sensor RH	Signal	B84	23	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve posi- tion sensor LH	Signal	B84	13	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve RH (open)		B84	4	0 or 5	0 or 5	—
Tumble generator valve RH (close)		B84	5	0 or 5	0 or 5	—
Tumble generator valve LH (open)		B84	11	0 or 5	0 or 5	—
Tumble generator valve LH (close)		B84	10	0 or 5	0 or 5	—
Wastegate control sole- noid 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		B134	8	ON: 12±0.5 OFF: 0		Switch is ON when gear is in neutral 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 sup- ply		B137	2	10 — 13	13 — 14	—
		B137	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	13 — 14	Waveform
	#2	B136	23	0	13 — 14	Waveform
	#3	B136	22	0	13 — 14	Waveform
	#4	B136	21	0	13 — 14	Waveform

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)	
Fuel injec- tor	#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
Purge control solenoid valve		B137	16	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
pressure sensor	Signal	B135	8	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B135	9	5	5	
	GND (sen- sor)	B135	19	0	0	
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
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 pres- sure switch		B135	24	10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sen- sor signal (+)		B137	19	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sen- sor signal (–)		B137	29	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sen- sor shield		B136	7	0	0	—
SSM/GST communica- tion 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	—

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 1)	B137	9	0	0	—
GND (oxygen sensor heater 2)	B137	8	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 neutral position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

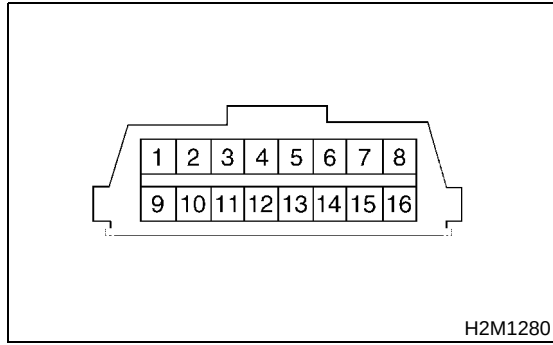
7. Data Link Connector

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 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	Subaru Select Monitor signal (ECM to Subaru Select Monitor)*	12	Ground
5	Subaru Select Monitor signal (Subaru Select Monitor to ECM)*	13	Ground
6	Line end check signal 1	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

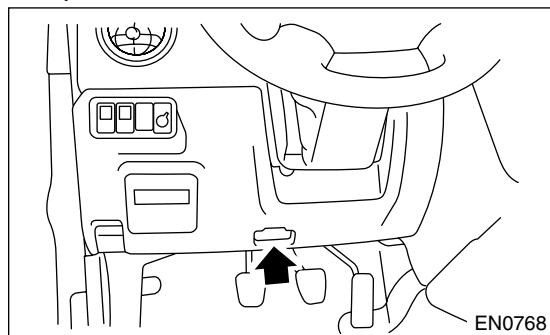
*: Circuit only for Subaru Select Monitor

8. 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 located in the lower portion of the instrument panel (on the driver's side).



- 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(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>

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 MIL status	ON/OFF
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	°
0F	Intake air temperature	°C
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
24	A/F sensor 1 output voltage and short term fuel trim associated with A/F sensor 1	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. 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(DOHC TURBO)-34, 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:

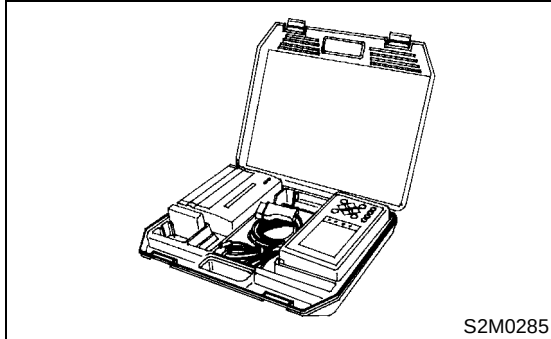
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

9. Subaru Select Monitor

A: OPERATION

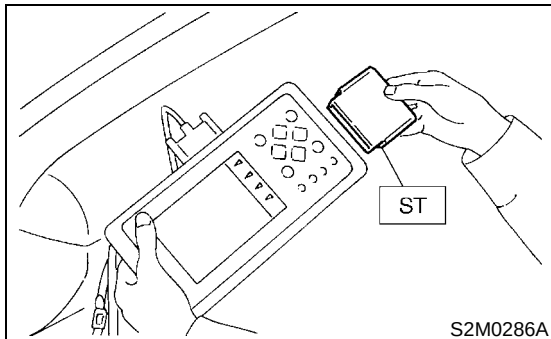
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru Select Monitor kit. <Ref. to EN(DOHC TURBO)-7, PREPARATION TOOL, General Description.>



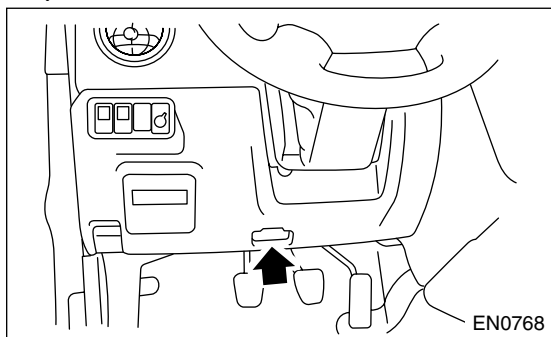
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(DOHC TURBO)-7, 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).

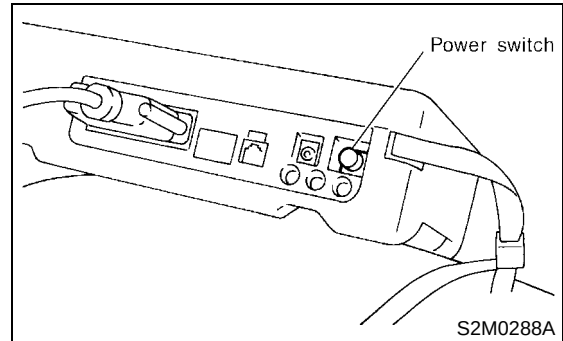


(2) Connect diagnosis cable to data link connector.

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.



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(DOHC TURBO)-34, 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(DOHC TURBO)-34, 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 #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 current	A/F Sensor #1 Current	mA
A/F sensor resistance	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
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 psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
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	%
Tumble generator valve position sensor signal (right side)	TGV Position Sensor R	V
Tumble generator valve position sensor signal (left side)	TGV Position Sensor L	V
Tumble generator valve drive signal	TGV Drive	OPEN or CLOSE
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Learned ignition timing	Learned Ignition Timing	deg
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

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure
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
Power steering switch signal	P/S Switch	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
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	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
Tumble generator valve output signal	TGV Output	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 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 Diagnosis Code	—
Malfunction indicator lamp status	MI (MIL)	Complete or incomplete
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	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
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
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 psi
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	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
A/F sensor equipment	A/F sensor	ON or OFF
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	—

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 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 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.

7. READ OXYGEN SENSOR MONITORING TEST RESULTS 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 {O2 Sensor Monitor} and press the [YES] key.
 - 6) On the «O2 Sensor Select» display screen, select the {Bank 1-Sensor1} or {Bank 1-Sensor2} and press the [YES] key.
- Bank 1-Sensor1 indicates the front oxygen or A/F sensor, and Bank 1-Sensor2 indicates the rear oxygen sensor.
 - A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Oxygen sensor for monitoring test	<O2 Sensor Monitor (-----)>	—
Rich to lean oxygen sensor threshold voltage	Rich to lean sensor volt	V
Lean to rich oxygen sensor threshold voltage	Lean to rich sensor volt	V
Low oxygen sensor voltage for switch time calculation	Low sensor voltage	V
High oxygen sensor voltage for switch time calculation	High sensor voltage	V
Rich to lean oxygen sensor switch time	Rich to lean switch time	sec
Lean to rich oxygen sensor switch time	Lean to rich switch time	sec
Maximum oxygen sensor voltage for test cycle	Maximum sensor Voltage	V
Minimum oxygen sensor voltage for test cycle	Minimum sensor Voltage	V

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. 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 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.
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.
Tumble generator valve actuator signal	TGV Signal	ON or OFF	When TGV actuator signal is entered.
Tumble generator valve drive signal	TGV Drive	ON or OFF	When TGV moves and valve opens.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

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 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(DOHC TURBO)-69, 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(DOHC TURBO)-69, 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(DOHC TURBO)-69, 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).

11. Inspection Mode

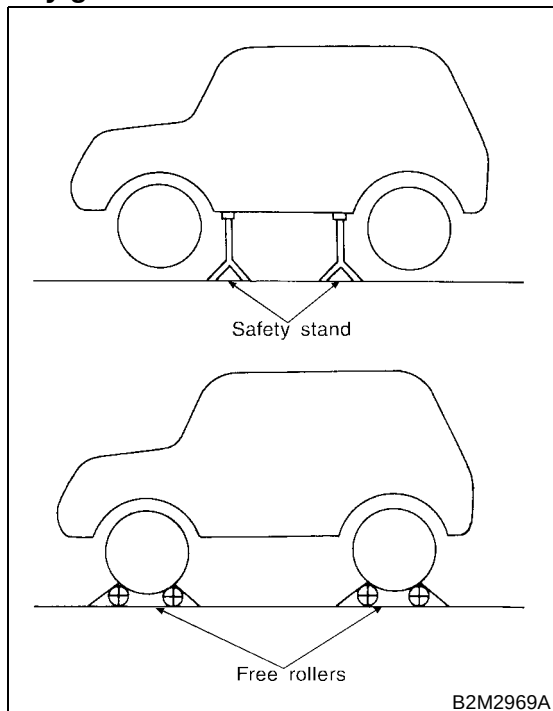
A: OPERATION

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:

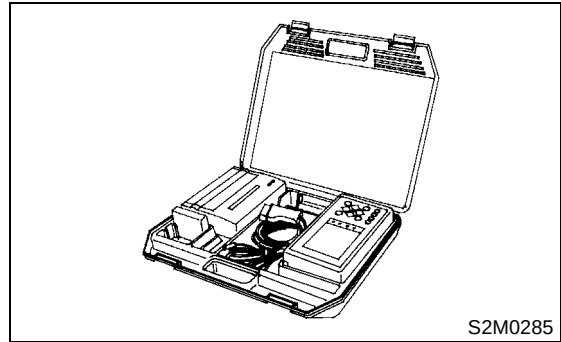
- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator 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.



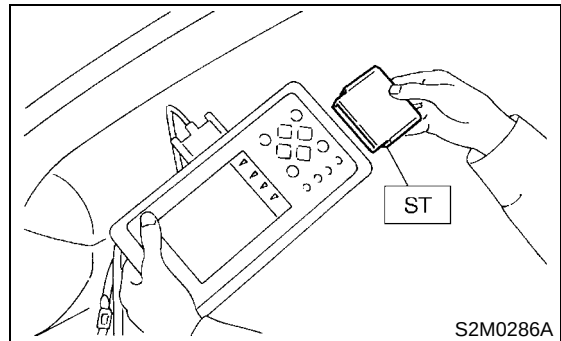
2. SUBARU SELECT MONITOR

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.

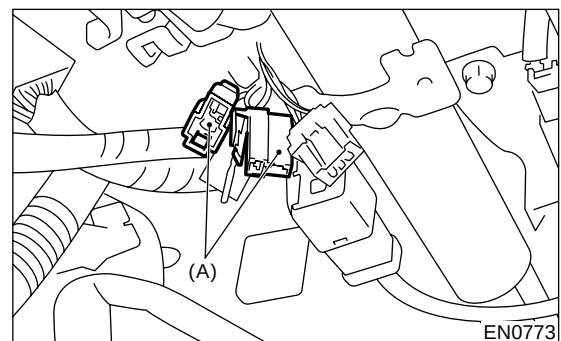
- 1) Prepare Subaru Select Monitor kit. <Ref. to EN(DOHC TURBO)-7, PREPARATION TOOL, General Description.>



- 2) Connect diagnosis cable to Subaru Select Monitor.
- 3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(DOHC TURBO)-7, PREPARATION TOOL, General Description.>



- 4) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.

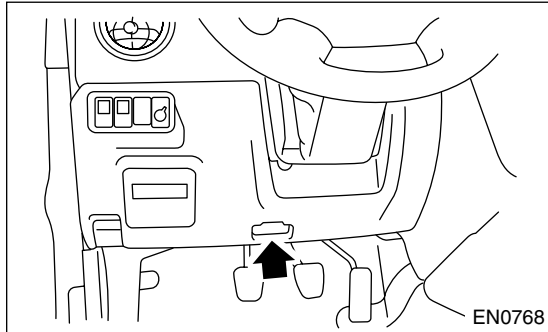


- 5) Connect Subaru Select Monitor to data link connector.

INSPECTION MODE

ENGINE (DIAGNOSTICS)

- (1) Connect Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).

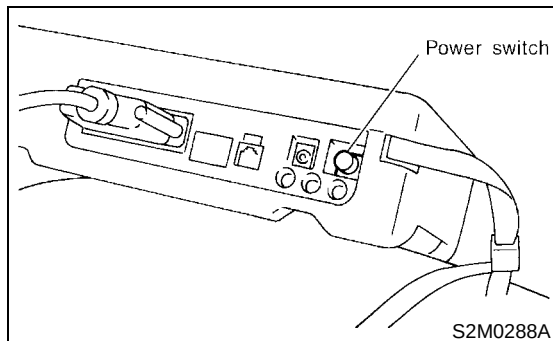


- (2) Connect diagnosis cable to data link connector.

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.



- 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 {Dealer Check Mode Procedure} and press the [YES] key.
- 11) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [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

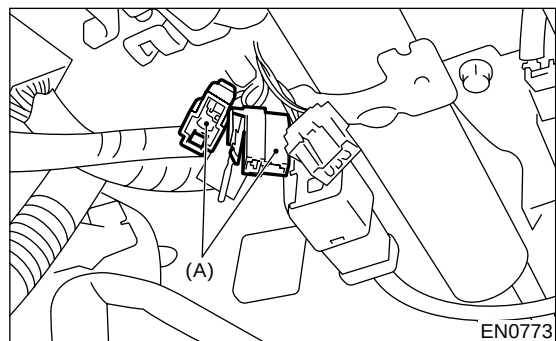
(DTC). <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>

- 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

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data:

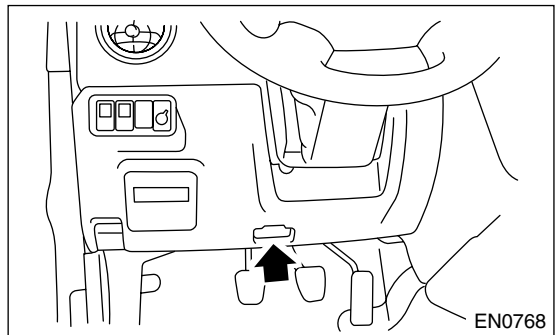
- 1) Connect test mode connector at the lower side of the instrument panel (on the driver's side), to the side of the center console box.



- 2) 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.



- 3) Start the engine.

NOTE:

Depress clutch pedal when starting the engine.

- 4) Using the shift lever, turn the "N" position switch to ON.
- 5) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.
- 6) Place the shift lever in the "1st" gear and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:

The speed difference between front and rear wheels may light the ABS warning light, but this in-

icates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

7) 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(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>

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 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.

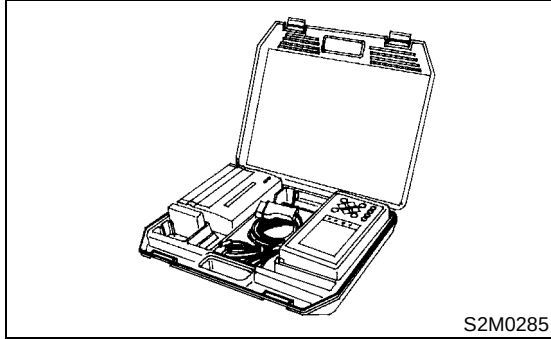
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

13. Compulsory Valve Operation Check Mode

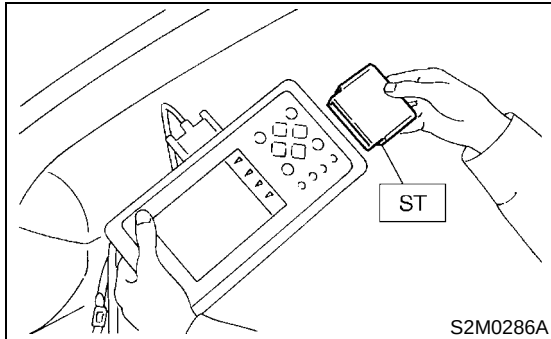
A: OPERATION

1) Prepare Subaru Select Monitor kit. <Ref. to EN(DOHC TURBO)-7, PREPARATION TOOL, General Description.>

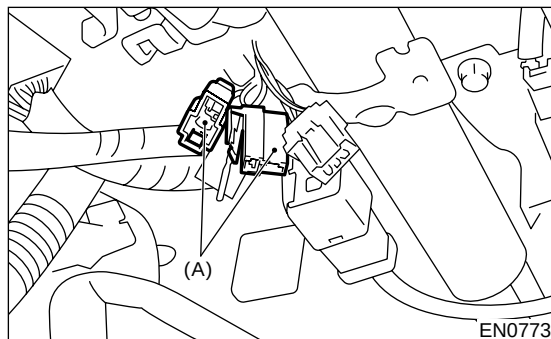


2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(DOHC TURBO)-7, PREPARATION TOOL, General Description.>

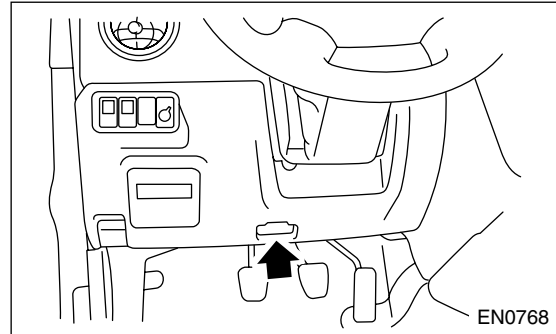


4) Connect test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



5) Connect Subaru Select Monitor to data link connector.

(1) Connect Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).

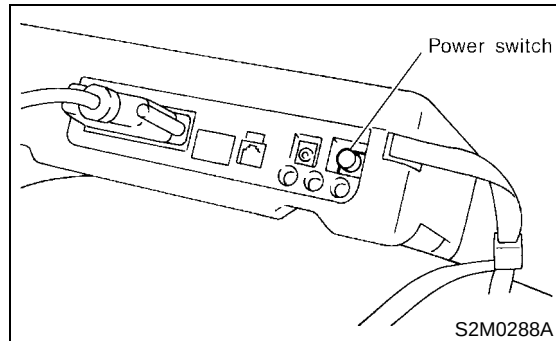


(2) Connect diagnosis cable to data link connector.

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.



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.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

- 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
EGR Solenoid Valve
ASV Solenoid Valve
PCV Solenoid Valve
Vent Control Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve
Fuel Tank Sensor Control Valve

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

14.Engine Malfunction Indicator Lamp (MIL)

A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(DOHC TURBO)-42, 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(DOHC TURBO)-44, 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(DOHC TURBO)-46, 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(DOHC TURBO)-47, 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(DOHC TURBO)-50, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

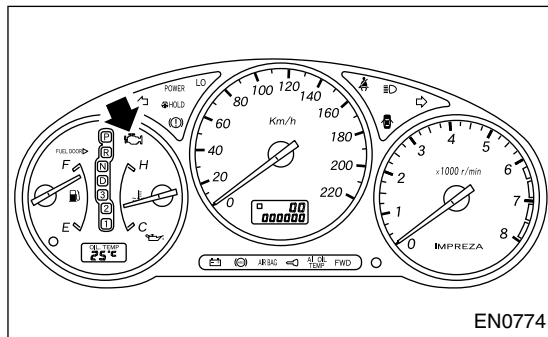
ENGINE (DIAGNOSTICS)

B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

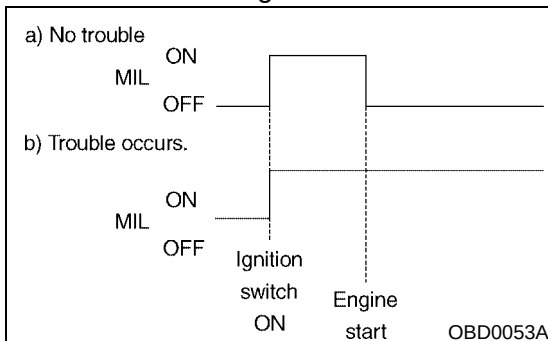
1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

NOTE:

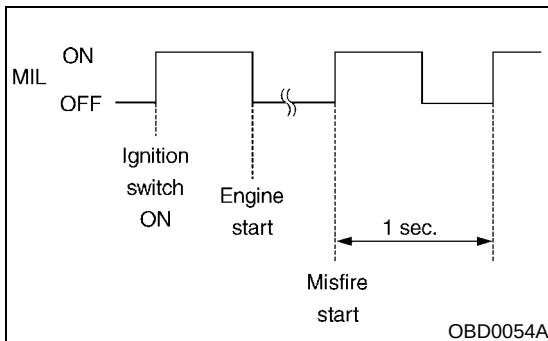
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(DOHC TURBO)-44, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>



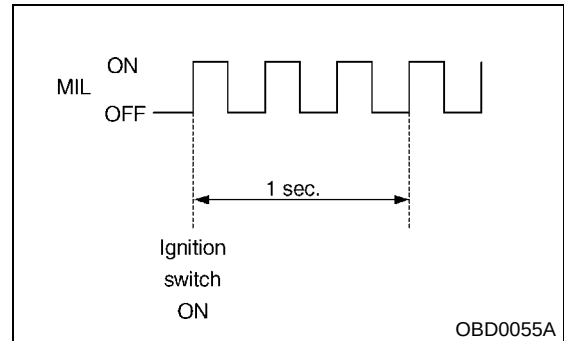
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.



4) 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)

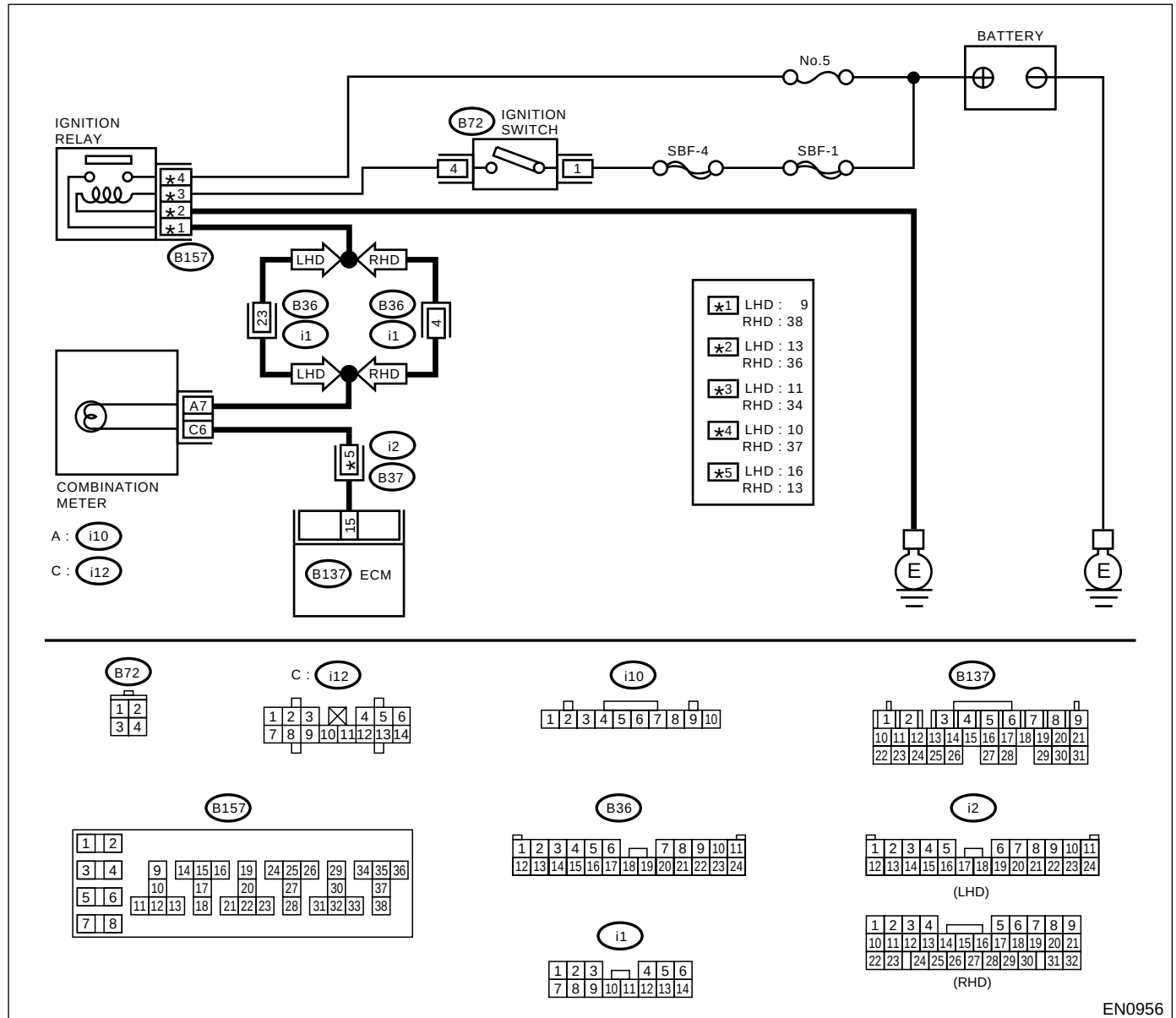
ENGINE (DIAGNOSTICS)

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:**



EN0956

Step	Check	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 (-):	Go to step 4.	Go to step 2.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK POOR CONTACT.	Does the MIL come on when shaking or pulling ECM connector and harness?	Repair poor contact in ECM connector.	Go to step 3 .
3 CHECK ECM CONNECTOR.	Is ECM connector correctly connected?	Replace ECM. <Ref. to FU(DOHC TURBO)-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-19, Combination Meter Assembly.> 3)Disconnect connector from ECM and combination meter. 4)Measure resistance of harness between ECM and combination meter connector. Connector & terminal (B137) No. 15 — (i12) No. 6:	Is resistance less than 1 Ω?	Go to step 5 .	Repair harness and connector. NOTE: In this case, repair the following: • 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?	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 (i10) No. 7 (+) — Chassis ground (-):	Is voltage more than 10 V?	Go to step 7 .	Check the following and repair if necessary. NOTE: • 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
7 CHECK LAMP BULB. Remove engine malfunction indicator lamp bulb.	Is lamp bulb condition OK?	Repair combination meter connector.	Replace lamp bulb.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

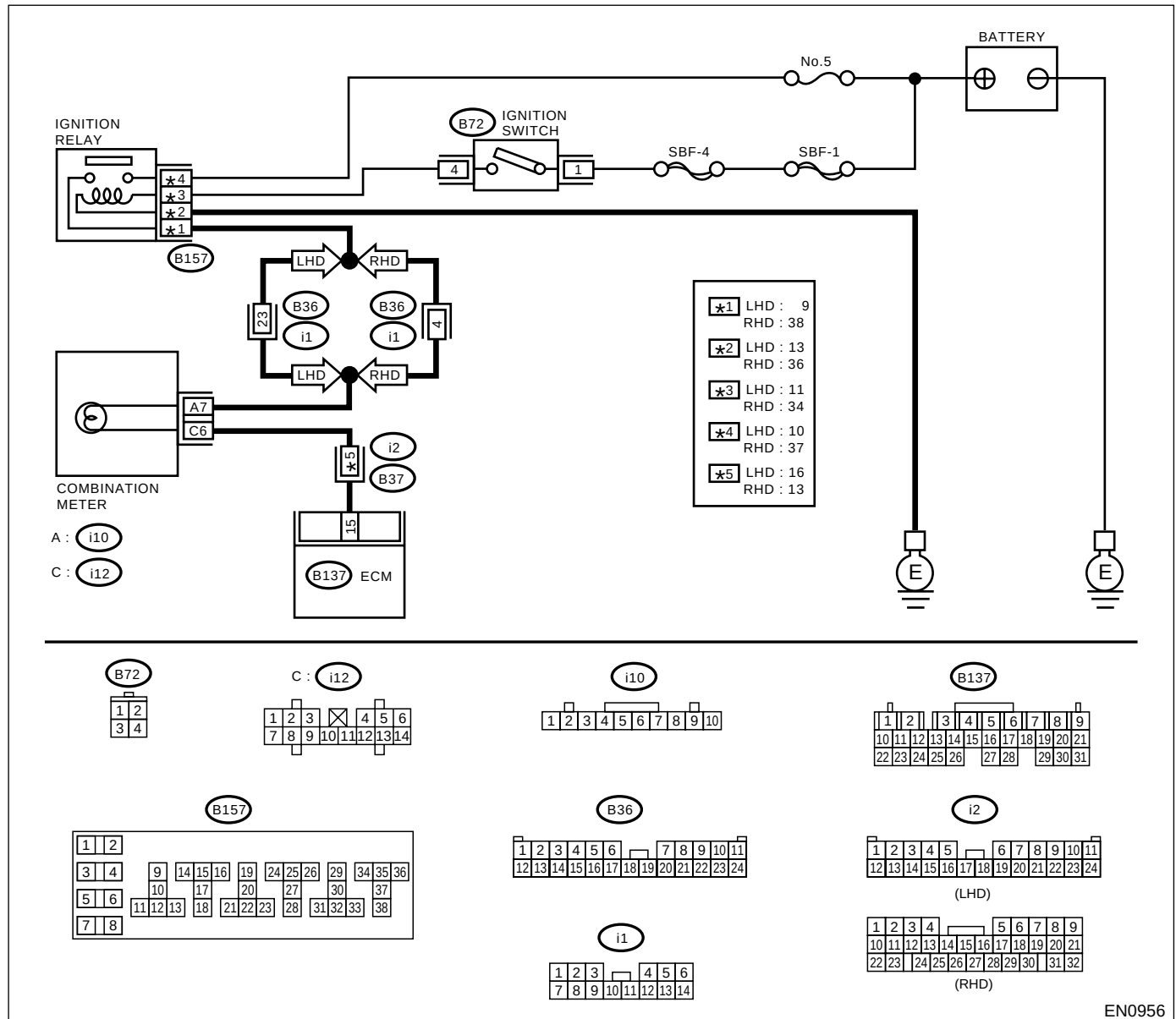
• DIAGNOSIS:

- 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:



EN0956

Step	Check	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.	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>

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.

ENGINE (DIAGNOSTICS)

IGNITION RELAY

IGNITION SWITCH (B72)

BATTERY

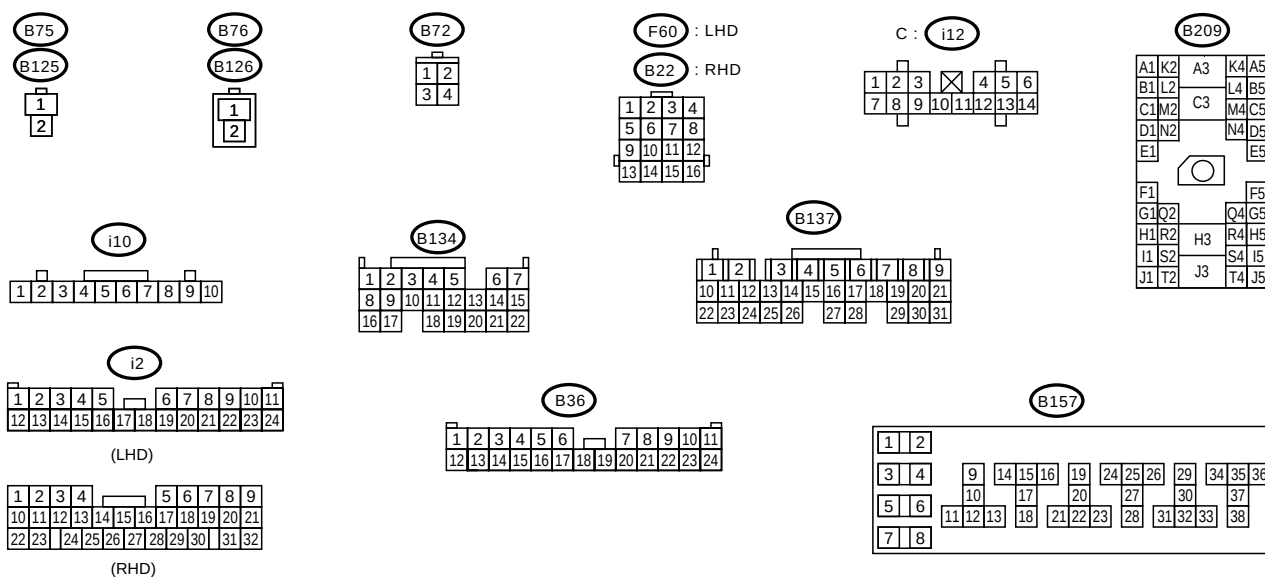
COMBINATION METER

Legend:

*1	LHD : 9 RHD : 38
*2	LHD : 13 RHD : 36
*3	LHD : 11 RHD : 34
*4	LHD : 10 RHD : 37
*5	LHD : 16 RHD : 13

Other components and labels:

- No.5
- SBF-4
- SBF-1
- B157
- A7
- C6
- *5
- i2
- B37
- 1
- B125
- B126
- B75
- B76
- LHD
- D2
- RHD
- B209
- F76
- RHD
- F60 :LHD
- B22 :RHD
- 16
- E3
- E
- E
- E
- B134
- B137
- ECM
- A5
- B15



EN(DOHC TURBO)-48

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	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. (engine OFF)	Does the MIL come on?	Go to step 2.	Repair the MIL circuit. <Ref. to EN(DOHC TURBO)-44, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
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 MIL come 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 resistance less than 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?	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 resistance less than 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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>

ENGINE (DIAGNOSTICS)

- **DIAGNOSIS:**

- Test mode connector circuit is shorted.

- MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.

[illegible]

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK TEST MODE CONNECTOR. 1) Disconnect test mode connector. 2) Turn ignition switch to ON.	Does MIL flash on and off?	Go to step 2.	System is in good order. NOTE: MIL 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:	Is resistance less than 5 Ω ?	Repair short circuit in harness between ECM and test mode connector.	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

15. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(DOHC TURBO)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(DOHC TURBO)-56, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(DOHC TURBO)-60, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(DOHC TURBO)-64, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(DOHC TURBO)-66, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

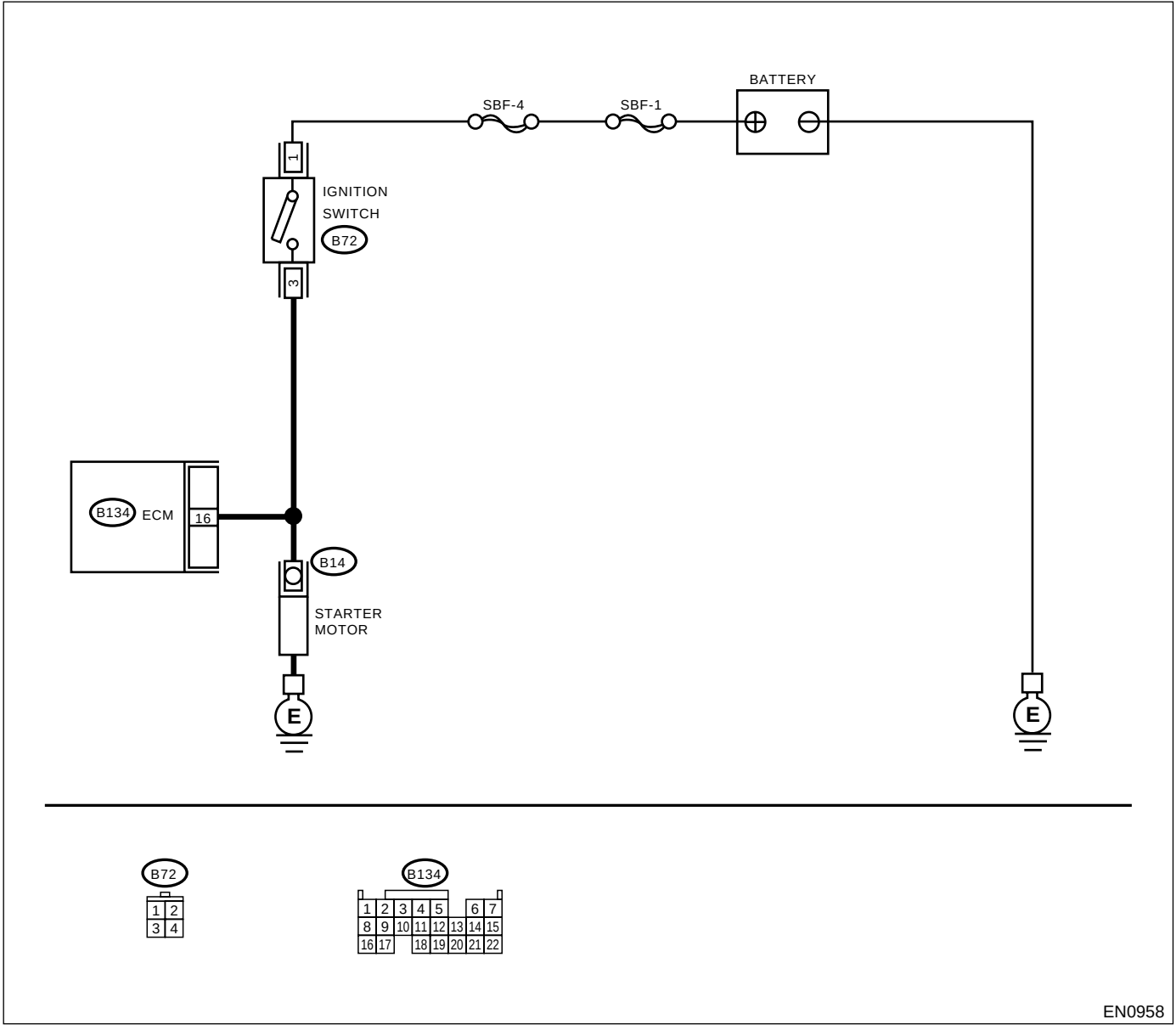
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(DOHC TURBO)-38, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0958

Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR. Does starter motor operate when the switch starts?	Go to step 2.	Go to step 3.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
2	CHECK DTC. <Ref. to EN(DOHC TURBO)-34, OPERATION, Read Diagnostic Trouble Code.>	Is the trouble code stored in memory? <Ref. to EN(DOHC TURBO)-69, LIST, List of Diagnostic Trouble Code (DTC).>	Record DTC. Repair the trouble case. <Ref. to EN(DOHC TURBO)-74, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.
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 (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 5.
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 resistance less than 5 Ω?	Check starter motor. <Ref. to SC-5, Starter.>	Repair open circuit of ground cable.
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 resistance less than 1 Ω?	Repair ground short circuit.	Go to step 6.
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 resistance less than 1 Ω?	Go to step 7.	Repair ground short circuit.
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 (-):	Is the voltage more than 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 (-):	Is the voltage more than 10 V?	Repair open circuit between ignition switch and starter motor circuit.	Go to step 9.
9	CHECK POOR CONTACT. Check poor contact in ignition switch connector.	Is there poor contact in ignition switch connector?	Repair poor contact in ignition switch connector.	Replace ignition switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

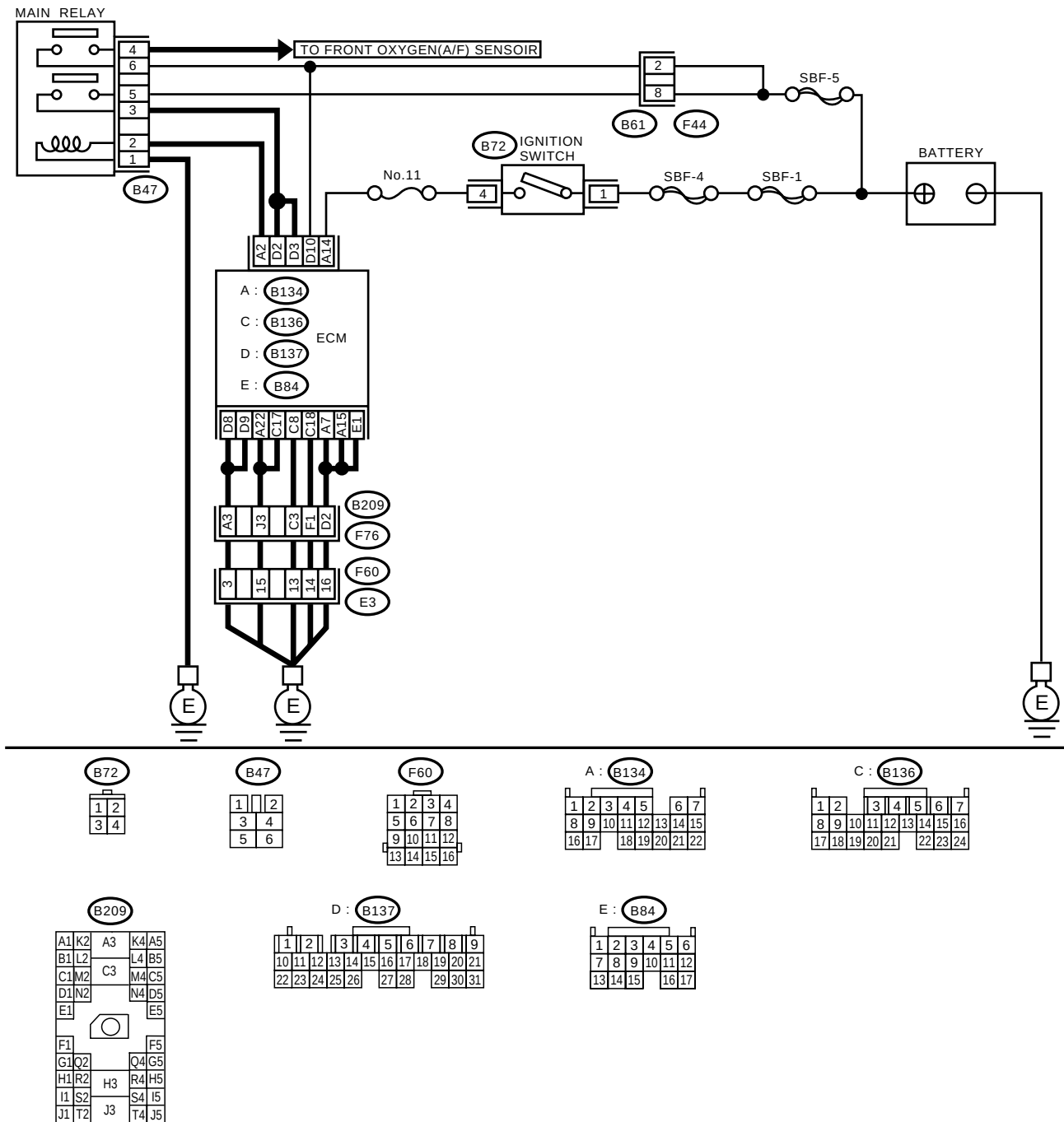
ENGINE (DIAGNOSTICS)

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(DOHC TURBO)-38, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(DOHC TURBO)-35, Inspection Mode.>

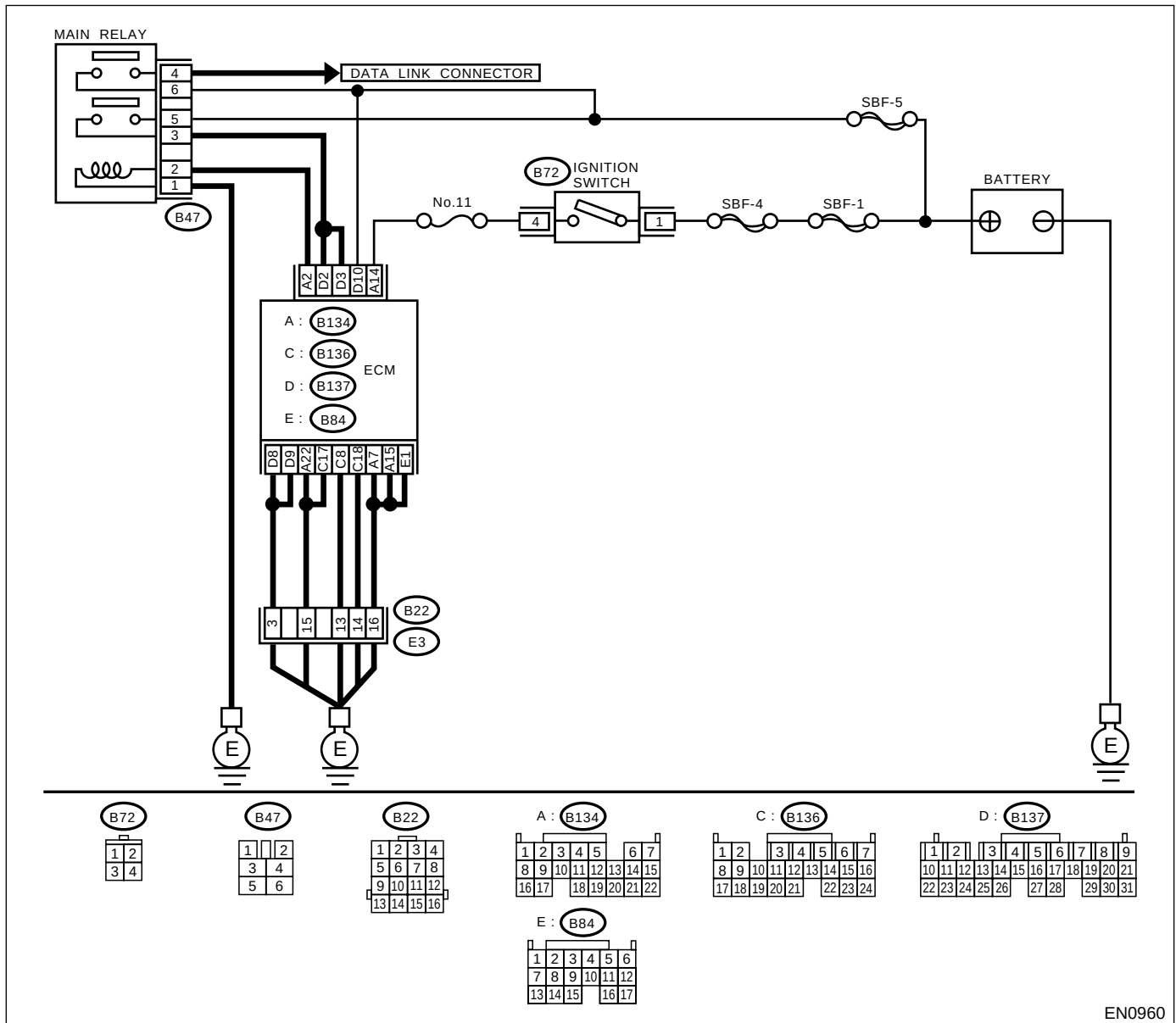
- WIRING DIAGRAM:
- LHD MODEL



DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

• RHD MODEL



Step	Check	Yes	No
1 CHECK MAIN RELAY. 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. Terminals No. 3 — No. 5: No. 4 — No. 6:	Is the resistance less than 10 Ω?	Go to step 2.	Replace main relay.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK GROUND CIRCUIT OF ECM. 1)Disconnect connector from ECM. 2)Measure resistance of harness between ECM and chassis ground. Connector & terminal <i>(B134) No. 7 — Chassis ground:</i> <i>(B134) No. 15 — Chassis ground:</i> <i>(B134) No. 22 — Chassis ground:</i> <i>(B136) No. 8 — Chassis ground:</i> <i>(B136) No. 17 — Chassis ground:</i> <i>(B136) No. 18 — Chassis ground:</i> <i>(B137) No. 8 — Chassis ground:</i> <i>(B137) No. 9 — Chassis ground:</i> <i>(B84) No. 1 — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 3.	Repair open circuit in harness between ECM connector and engine grounding terminal.
3 CHECK INPUT VOLTAGE OF ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal <i>(B137) No. 10 (+) — Chassis ground (-):</i> <i>(B134) No. 14 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Repair open or ground short circuit of power supply circuit.
4 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR. 1)Turn ignition switch to OFF. 2)Measure resistance between ECM and chassis ground. Connector & terminal <i>(B134) No. 2 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair ground short circuit in harness between ECM connector and main relay connector, then replace ECM.
5 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 <i>(B134) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 6.	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>
6 CHECK INPUT VOLTAGE OF MAIN RELAY. Check voltage between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 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 <i>(B47) No. 1 — Chassis ground:</i>	Is the resistance less than 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 <i>(B47) No. 5 (+) — Chassis ground (-):</i> <i>(B47) No. 6 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 9.	Repair open or ground short circuit in harness of power supply circuit.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(DOHC TURBO)-60, 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

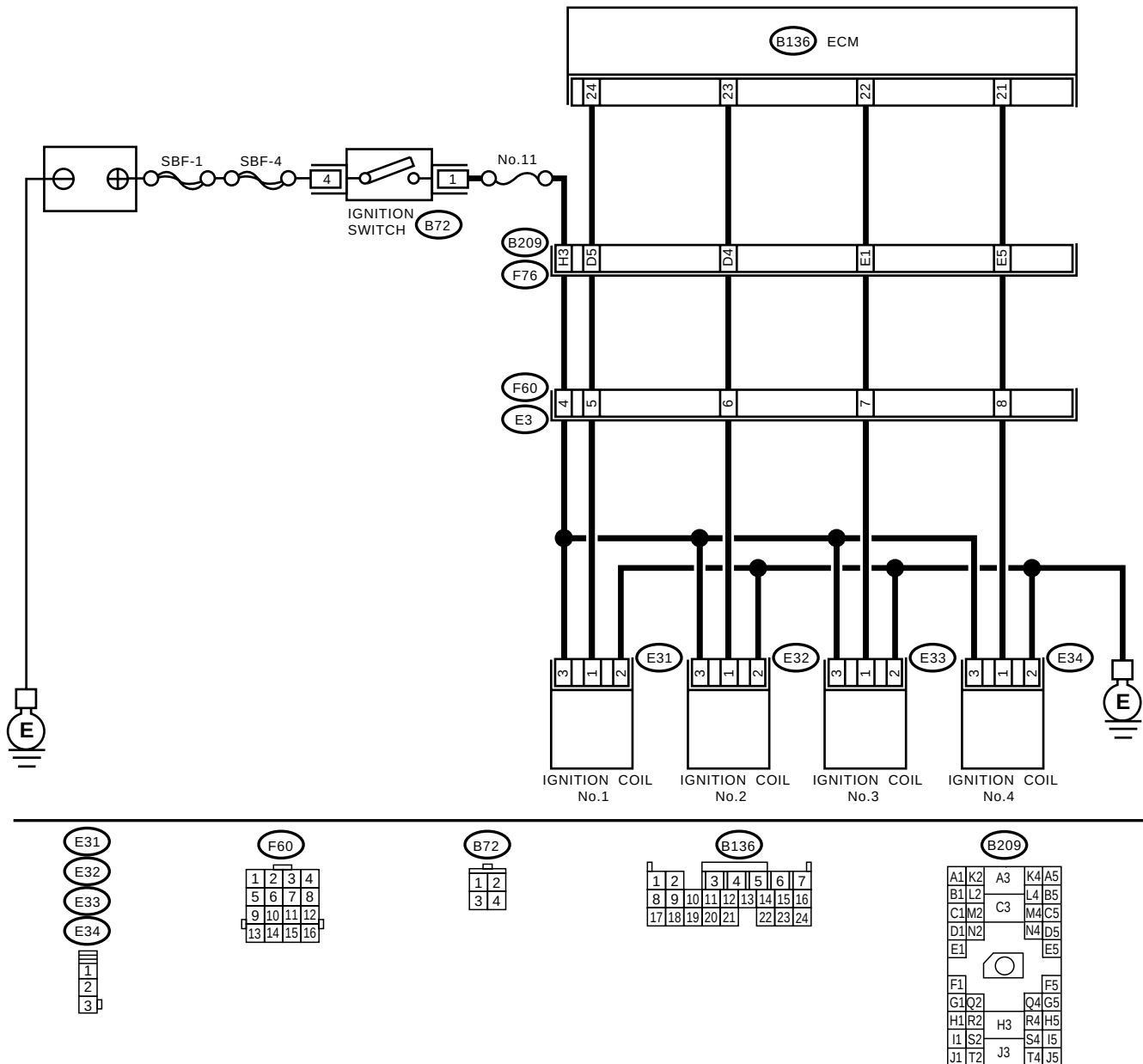
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(DOHC TURBO)-38, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- WIRING DIAGRAM:
- LHD MODEL

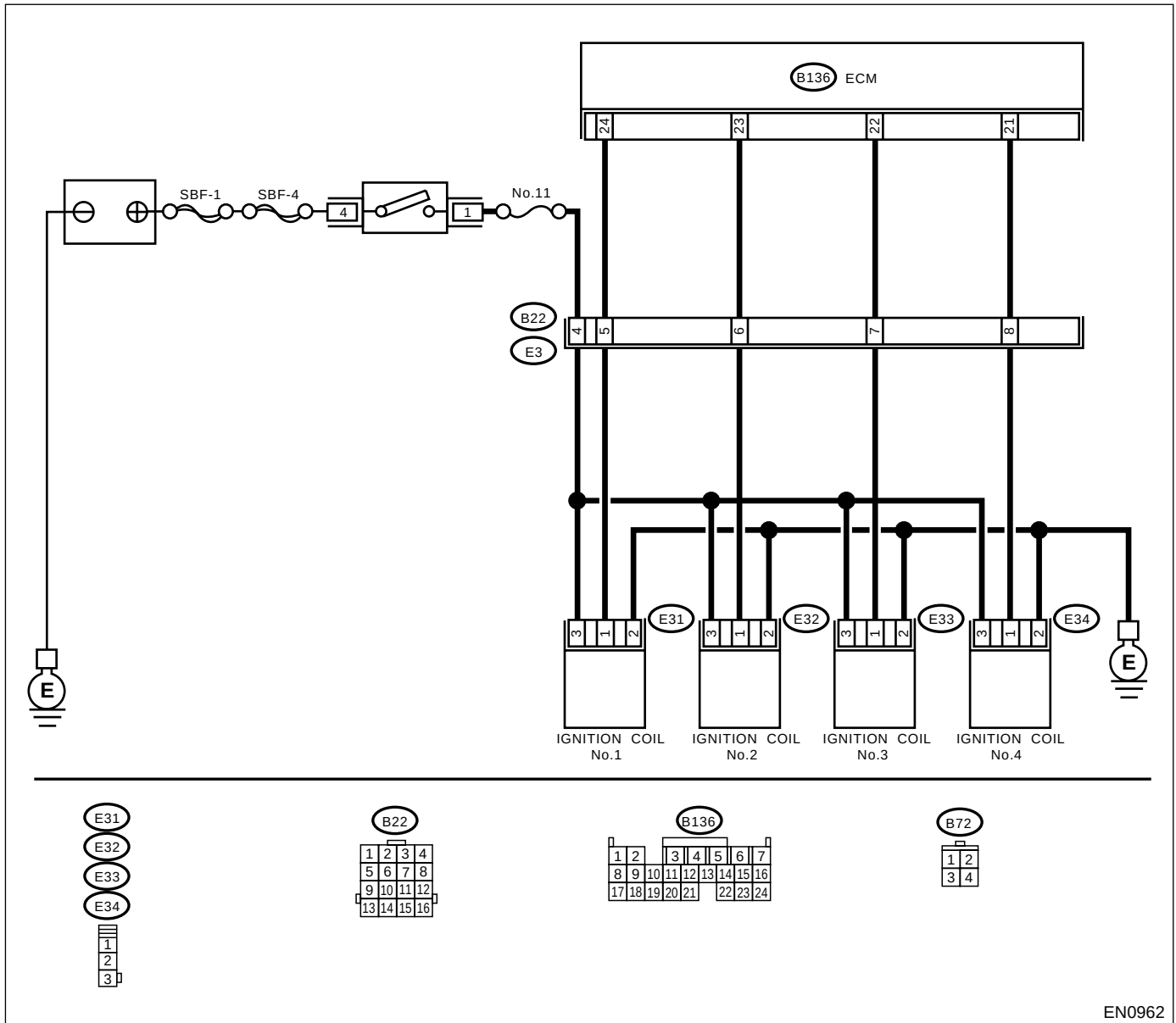


EN0961

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0962

Step	Check	Yes	No
1 CHECK SPARK PLUG CONDITION. 1)Remove spark plug. <Ref. to IG(DOHC TURBO)-5, INSTALLATION, Spark Plug.> 2)Check spark plug condition. <Ref. to IG(DOHC TURBO)-6, INSPECTION, Spark Plug.>	Is spark plug's status OK?	Go to step 2.	Replace spark plug
2 CHECK IGNITION SYSTEM FOR SPARKS. 1)Connect spark plug to ignition coil. 2)Release fuel pressure. <Ref. to FU(DOHC TURBO)-49, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> 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?	Check fuel pump system. <Ref. to EN(DOHC TURBO)-64, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 3.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 10 V?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • 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:	Is the resistance between less than 5 Ω?	Go to step 5.	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
5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. 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. 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:	Is the resistance less than 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
6 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure resistance of harness between ECM and engine ground. Connector & terminal: (B136) No. 21 — Engine ground: (B136) No. 22 — Engine ground: (B136) No. 23 — Engine ground: (B136) No. 24 — Engine ground:	Is the resistance more than 1 MΩ?	Go to step 7.	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
7 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ignition coil and ignitor assembly.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

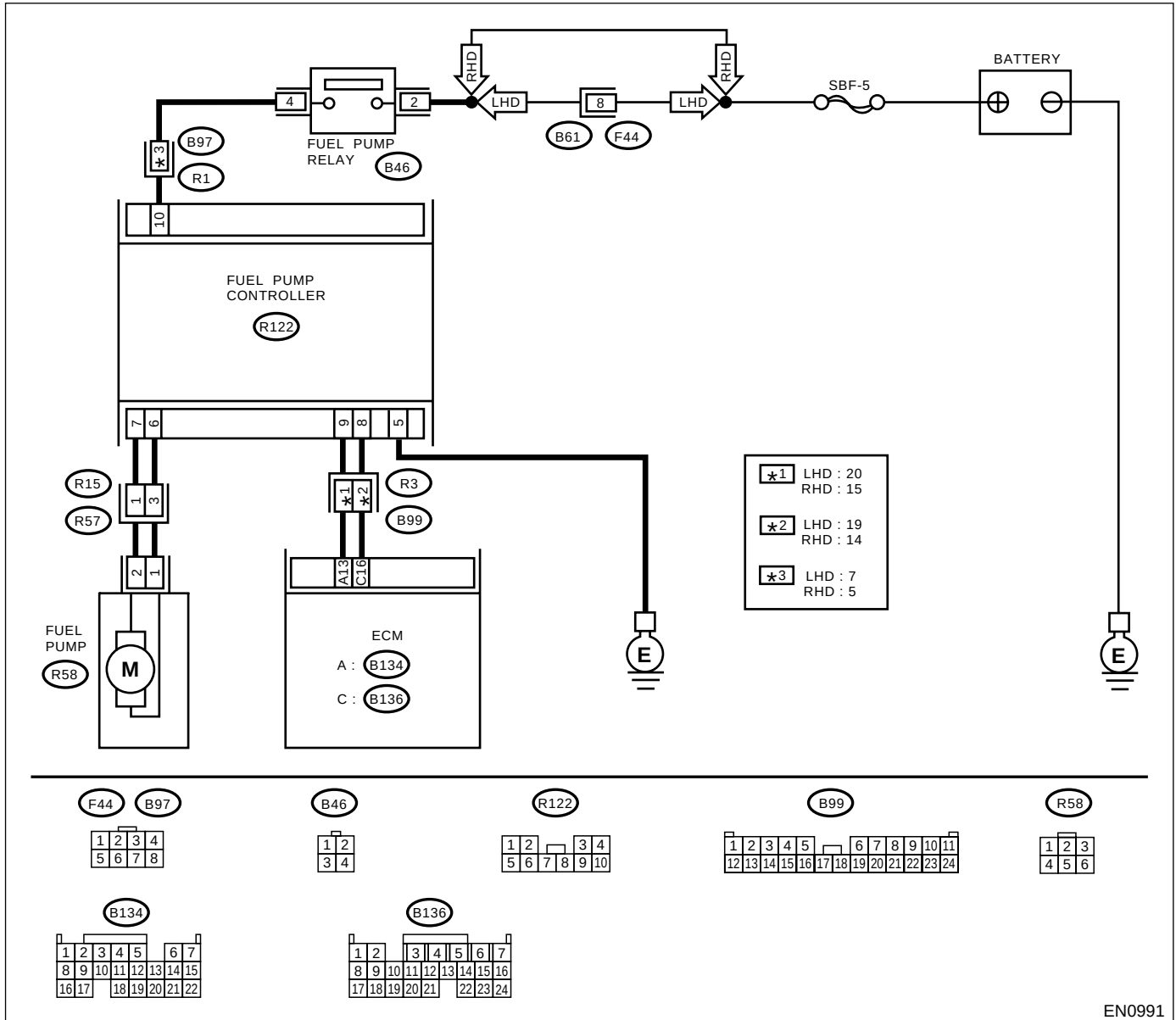
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(DOHC TURBO)-38, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0991

DIAGNOSTICS FOR ENGINE STARTING FAILURE

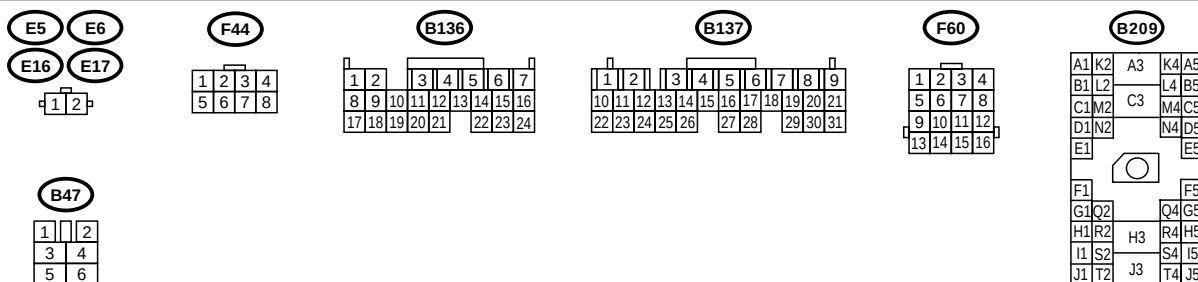
ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATING SOUND OF FUEL PUMP. Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON. 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(DOHC TURBO)-39, Compulsory Valve Operation Check Mode.>	Does fuel pump produce operating sound?	Check fuel injector circuit. <Ref. to EN(DOHC TURBO)-66, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Record DTC. Repair the trouble case. <Ref. to EN(DOHC TURBO)-74, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

ENGINE (DIAGNOSTICS)

CAUTION:

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ENGINE (DIAGNOSTICS)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 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. 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 (-):	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • 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
3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect connector from ECM. 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 — (E6) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
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:	Is the resistance less than 1 Ω ?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step 5.
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 resistance between 5 and 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?	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(DOHC TURBO)-301, 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	Front oxygen (A/F) sensor heater circuit low input	<Ref. to EN(DOHC TURBO)-74, DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	Front oxygen (A/F) sensor heater circuit high input	<Ref. to EN(DOHC TURBO)-78, DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	Rear oxygen sensor heater circuit malfunction	<Ref. to EN(DOHC TURBO)-80, DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	Rear oxygen sensor heater circuit high input	<Ref. to EN(DOHC TURBO)-84, DTC P0038 — REAR OXYGEN SENSOR HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass air flow sensor circuit range/performance problem (high input)	<Ref. to EN(DOHC TURBO)-86, DTC P0101 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass air flow sensor circuit low input	<Ref. to EN(DOHC TURBO)-88, DTC P0102 — MASS AIR FLOW SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass air flow sensor circuit high input	<Ref. to EN(DOHC TURBO)-92, DTC P0103 — MASS AIR FLOW SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0106	Pressure sensor circuit range/performance problem (low input)	<Ref. to EN(DOHC TURBO)-94, DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Pressure sensor circuit low input	<Ref. to EN(DOHC TURBO)-98, DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Pressure sensor circuit high input	<Ref. to EN(DOHC TURBO)-102, DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature sensor circuit range/performance problem	<Ref. to EN(DOHC TURBO)-106, DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature sensor circuit low input	<Ref. to EN(DOHC TURBO)-108, DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature sensor circuit high input	<Ref. to EN(DOHC TURBO)-110, DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature sensor circuit low input	<Ref. to EN(DOHC TURBO)-114, DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature sensor circuit high input	<Ref. to EN(DOHC TURBO)-116, DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle position sensor circuit range/performance problem (high input)	<Ref. to EN(DOHC TURBO)-120, DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle position sensor circuit low input	<Ref. to EN(DOHC TURBO)-122, DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0123	Throttle position sensor circuit high input	<Ref. to EN(DOHC TURBO)-126, DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient coolant temperature for closed loop fuel control	<Ref. to EN(DOHC TURBO)-130, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	Front oxygen (A/F) sensor circuit range/performance problem (low input)	<Ref. to EN(DOHC TURBO)-132, DTC P0131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	Front oxygen (A/F) sensor circuit range/performance problem (high input)	<Ref. to EN(DOHC TURBO)-134, DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	Front oxygen (A/F) sensor circuit slow response	<Ref. to EN(DOHC TURBO)-136, DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0136	Rear oxygen sensor circuit malfunction	<Ref. to EN(DOHC TURBO)-138, DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	Rear oxygen sensor circuit slow response	<Ref. to EN(DOHC TURBO)-140, DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	Fuel trim malfunction (A/F too lean)	<Ref. to EN(DOHC TURBO)-142, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	Fuel trim malfunction (A/F too rich)	<Ref. to EN(DOHC TURBO)-143, DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Wastegate control solenoid valve malfunction (high input)	<Ref. to EN(DOHC TURBO)-146, DTC P0244 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Wastegate control solenoid valve circuit low input	<Ref. to EN(DOHC TURBO)-148, DTC P0245 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Wastegate control solenoid valve circuit high input	<Ref. to EN(DOHC TURBO)-152, DTC P0246 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(DOHC TURBO)-154, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(DOHC TURBO)-154, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(DOHC TURBO)-154, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(DOHC TURBO)-156, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor circuit low input	<Ref. to EN(DOHC TURBO)-164, DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor circuit high input	<Ref. to EN(DOHC TURBO)-166, DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor circuit malfunction	<Ref. to EN(DOHC TURBO)-168, DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft position sensor circuit range/performance problem	<Ref. to EN(DOHC TURBO)-170, DTC P0336 — Crankshaft Position Sensor Circuit Range/Performance Problem —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0340	Camshaft position sensor circuit malfunction	<Ref. to EN(DOHC TURBO)-172, DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft position sensor circuit range/performance problem	<Ref. to EN(DOHC TURBO)-174, DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst system efficiency below threshold	<Ref. to EN(DOHC TURBO)-178, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0444	Evaporative emission control system purge control valve circuit low input	<Ref. to EN(DOHC TURBO)-180, DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0445	Evaporative emission control system purge control valve circuit high input	<Ref. to EN(DOHC TURBO)-184, DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance problem	<Ref. to EN(DOHC TURBO)-187, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(DOHC TURBO)-190, 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(DOHC TURBO)-194, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor intermittent input	<Ref. to EN(DOHC TURBO)-198, DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0480	Cooling fan relay 1 circuit low input	<Ref. to EN(DOHC TURBO)-201, DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan function problem	<Ref. to EN(DOHC TURBO)-205, DTC P0483 — COOLING FAN FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle speed sensor malfunction	<Ref. to EN(DOHC TURBO)-208, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(DOHC TURBO)-210, 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(DOHC TURBO)-212, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle control system circuit low input	<Ref. to EN(DOHC TURBO)-214, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle control system circuit high input	<Ref. to EN(DOHC TURBO)-216, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter switch circuit high input	<Ref. to EN(DOHC TURBO)-218, DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect immobilizer key	<Ref. to IM-27, DTC P0513 — INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY) —, Diagnostics Chart with Trouble Code.>
P0545	Exhaust gas temperature sensor circuit low input	<Ref. to EN(DOHC TURBO)-220, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0546	Exhaust gas temperature sensor circuit high input	<Ref. to EN(DOHC TURBO)-222, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal control module memory check sum error	<Ref. to EN(DOHC TURBO)-226, DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1086	Tumble generator valve #2 (LH) position sensor circuit low input	<Ref. to EN(DOHC TURBO)-230, DTC P1086 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1087	Tumble generator valve #2 (LH) position sensor circuit high input	<Ref. to EN(DOHC TURBO)-234, DTC P1087 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1088	Tumble generator valve #1 (RH) position sensor circuit low input	<Ref. to EN(DOHC TURBO)-238, DTC P1088 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1089	Tumble generator valve #1 (RH) position sensor circuit high input	<Ref. to EN(DOHC TURBO)-242, DTC P1089 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1090	Tumble generator valve #1(RH) malfunction (stuck open)	<Ref. to EN(DOHC TURBO)-245, DTC P1090 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1091	Tumble generator valve #1(RH) malfunction (stuck close)	<Ref. to EN(DOHC TURBO)-246, DTC P1091 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1092	Tumble generator valve #2(LH) malfunction (stuck open)	<Ref. to EN(DOHC TURBO)-247, DTC P1092 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1093	Tumble generator valve #2(LH) malfunction (stuck close)	<Ref. to EN(DOHC TURBO)-248, DTC P1093 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1094	Tumble generator valve circuit #1 (opencircuit)	<Ref. to EN(DOHC TURBO)-250, DTC P1094 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1095	Tumble generator valve circuit #1 (overcurrent)	<Ref. to EN(DOHC TURBO)-252, DTC P1095 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OVERCURRENT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1096	Tumble generator valve circuit #2 (opencircuit)	<Ref. to EN(DOHC TURBO)-254, DTC P1096 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1097	Tumble generator valve circuit #2 (overcurrent)	<Ref. to EN(DOHC TURBO)-256, DTC P1097 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OVERCURRENT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor low input	<Ref. to EN(DOHC TURBO)-257, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor high input	<Ref. to EN(DOHC TURBO)-257, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1112	Atmospheric pressure sensor range/performance problem	<Ref. to EN(DOHC TURBO)-258, DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1130	Front oxygen sensor circuit malfunction (open circuit)	<Ref. to EN(DOHC TURBO)-260, DTC P1130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1131	Front oxygen sensor circuit malfunction (short circuit)	<Ref. to EN(DOHC TURBO)-262, DTC P1131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1134	Front oxygen (A/F) sensor micro-computer problem	<Ref. to EN(DOHC TURBO)-264, DTC P1134 — FRONT OXYGEN (A/F) SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1139	Front oxygen (A/F) sensor #1 heater circuit performance/range problem	<Ref. to EN(DOHC TURBO)-266, DTC P1139 — FRONT OXYGEN (A/F) SENSOR #1 HEATER CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1141	Mass air flow sensor circuit range/performance problem (low input)	<Ref. to EN(DOHC TURBO)-268, DTC P1141 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1142	Throttle position sensor circuit range/performance problem (low input)	<Ref. to EN(DOHC TURBO)-270, DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1146	Pressure sensor circuit range/performance problem (high input)	<Ref. to EN(DOHC TURBO)-272, DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1230	Fuel pump control unit malfunction	<Ref. to EN(DOHC TURBO)-276, DTC P1230 — FUEL PUMP CONTROLLER MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1244	Wastegate control solenoid valve malfunction (low input)	<Ref. to EN(DOHC TURBO)-280, DTC P1244 — WASTEGATE CONTROL SOLENOID VALVE RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1245	Wastegate control solenoid valve malfunction (fail-safe)	<Ref. to EN(DOHC TURBO)-282, DTC P1245 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1301	Fire due to increased exhaust temperature	<Ref. to EN(DOHC TURBO)-284, DTC P1301 — FIRE DUE TO INCREASED EXHAUST TEMPERATURE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1312	Exhaust temperature sensor malfunction	<Ref. to EN(DOHC TURBO)-286, DTC P1312 — EXHAUST GAS TEMPERATURE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1480	Cooling fan relay 1 circuit high input	<Ref. to EN(DOHC TURBO)-289, DTC P1480 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1507	Idle control system malfunction (fail-safe)	<Ref. to EN(DOHC TURBO)-292, DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(DOHC TURBO)-294, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	High exhaust temperature detected	<Ref. to EN(DOHC TURBO)-296, DTC P1544 — HIGH EXHAUST TEMPERATURE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(DOHC TURBO)-298, DTC P1560 — Back-up Voltage Circuit Malfunction —.>
P1570	Antenna	<Ref. to IM-28, DTC P1570 — ANTENNA —, Diagnostics Chart with Trouble Code.>
P1571	Reference code incompatibility	<Ref. to IM-21, DTC P1571 — REFERENCE CODE INCOMPATIBILITY —, Diagnostics Chart with Trouble Code.>
P1572	IMM circuit failure except antenna circuit	<Ref. to IM-22, DTC P1572 — IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT) —, Diagnostics Chart with Trouble Code.>
P1574	Key communication failure	<Ref. to IM-26, DTC P1574 — KEY COMMUNICATION FAILURE —, Diagnostics Chart with Trouble Code.>
P1576	EGI control module EEPROM	<Ref. to IM-27, DTC P1576 — EGI CONTROL MODULE EEPROM —, Diagnostics Chart with Trouble Code.>
P1577	IMM control module EEPROM	<Ref. to IM-27, DTC P1577 — IMM CONTROL MODULE EEPROM —, Diagnostics Chart with Trouble Code.>

ENGINE 2 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.

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

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

EXHAUST EX(SOHCw/oOBD)

IGNITION IG(SOHCw/oOBD)

ENGINE(DIAGNOSTICS) EN(SOHCw/oOBD)

FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)

INTAKE (INDUCTION) IN(DOHC TURBO)

MECHANICAL ME(DOHC TURBO)

EXHAUST EX(DOHC TURBO)

IGNITION IG(DOHC TURBO)

ENGINE (DIAGNOSTICS) EN(DOHC TURBO)

17. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

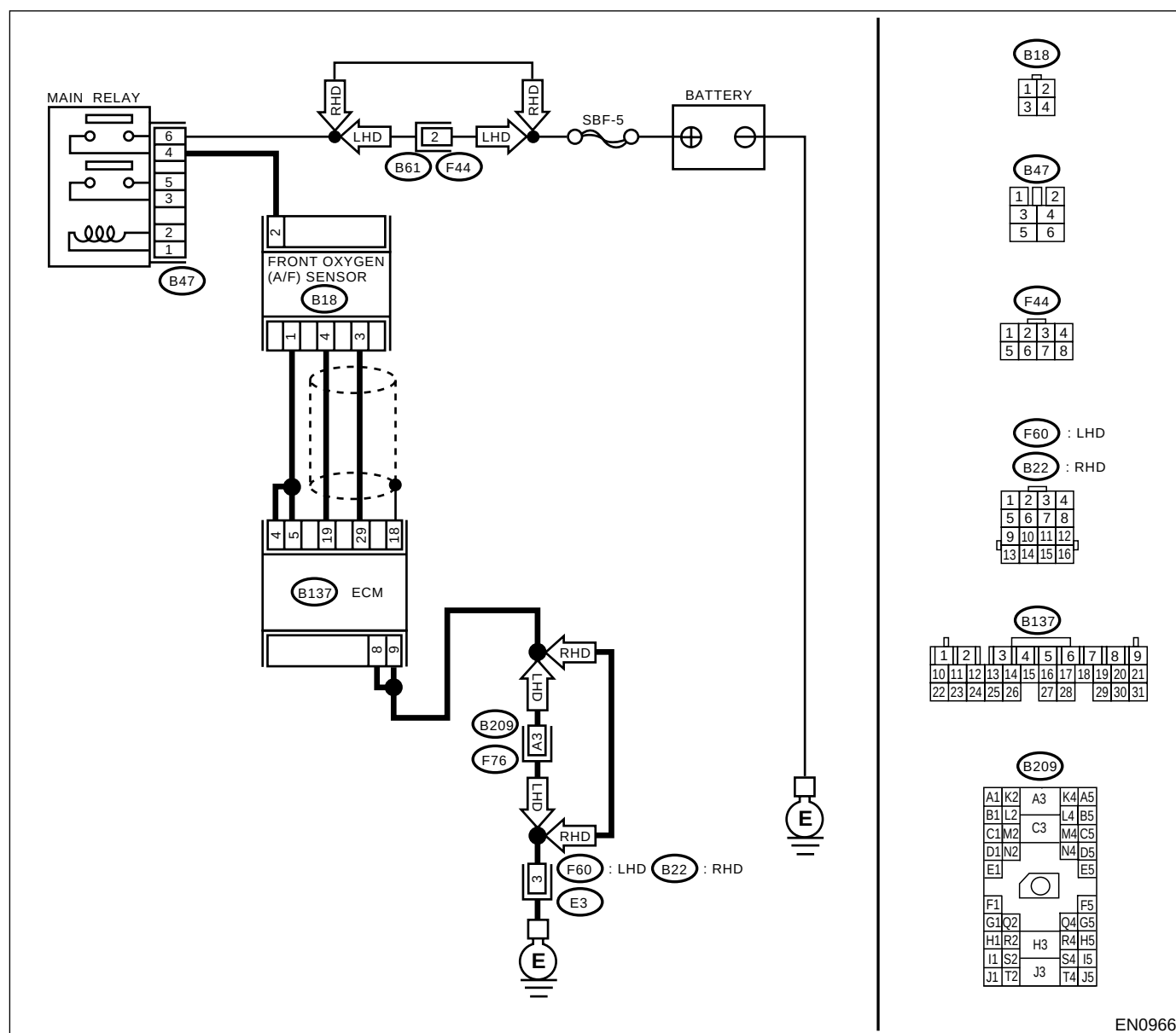
A: DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT LOW INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0966

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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?	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. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair power supply line. NOTE: In this case, repair the following: • 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 (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 4.	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
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. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 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 5.
5 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-):	Is the voltage less than 1.0 V?	Go to step 7.	Go to step 6.
6 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-):	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 5 (+) — Chassis ground (-):	Is the voltage less than 1.0 V?	Go to step 9 .	Go to step 8 .
8 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 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 9 .
9 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 resistance less than 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(DOHC TURBO)-41, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

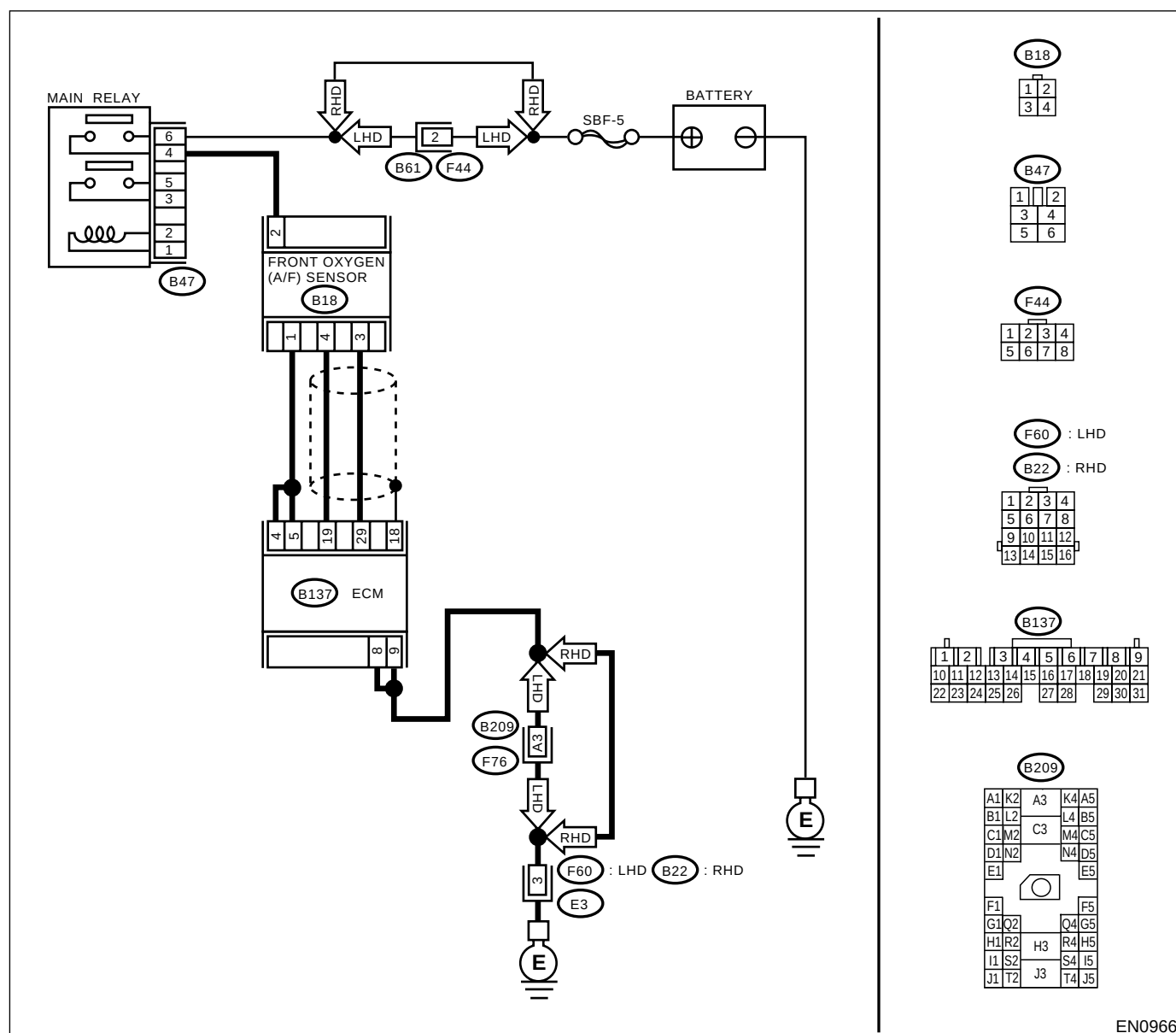
B: DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT HIGH INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0966

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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 (-): (B137) No. 5 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Go to step 3.	Go to step 2.
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.3 A?	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	END
3 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-): (B137) No. 5 (+) — Chassis ground (-):	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

C: DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION

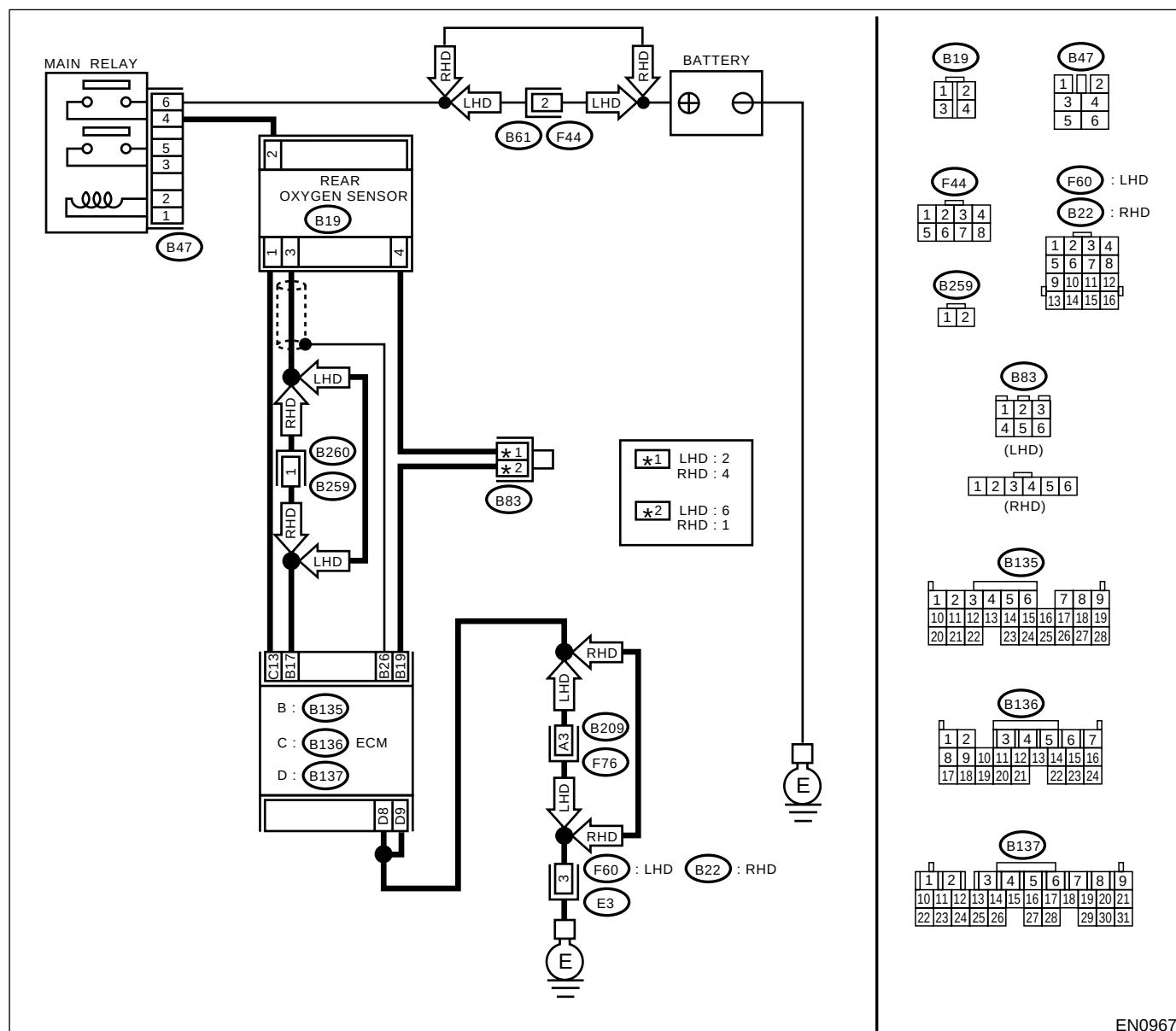
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0967

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. Connector & terminal (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground:	Is the resistance less than 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
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. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 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.
3 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 13 (+) — Chassis ground (-):	Is the voltage less than 1.0 V?	Go to step 6.	Go to step 4.
4 CHECK OUTPUT SIGNAL FROM ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 13 (+) — Chassis ground (-):	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 5.
5 CHECK OUTPUT SIGNAL FROM ECM. 1) Disconnect connector from rear oxygen sensor. 2) Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 13 (+) — Chassis ground (-):	Is the voltage less than 1.0 V?	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. Connector & terminal (B19) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7 CHECK REAR OXYGEN SENSOR. 1) Turn ignition switch to OFF. 2) Measure resistance between rear oxygen sensor connector terminals. Terminals No. 1 — No. 2:	Is the resistance less than 30 Ω ?	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 • Poor contact in coupling connector	Replace rear oxygen sensor. <Ref. to FU(DOHC TURBO)-43, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

D: DTC P0038 — REAR OXYGEN SENSOR HEATER CIRCUIT HIGH INPUT —

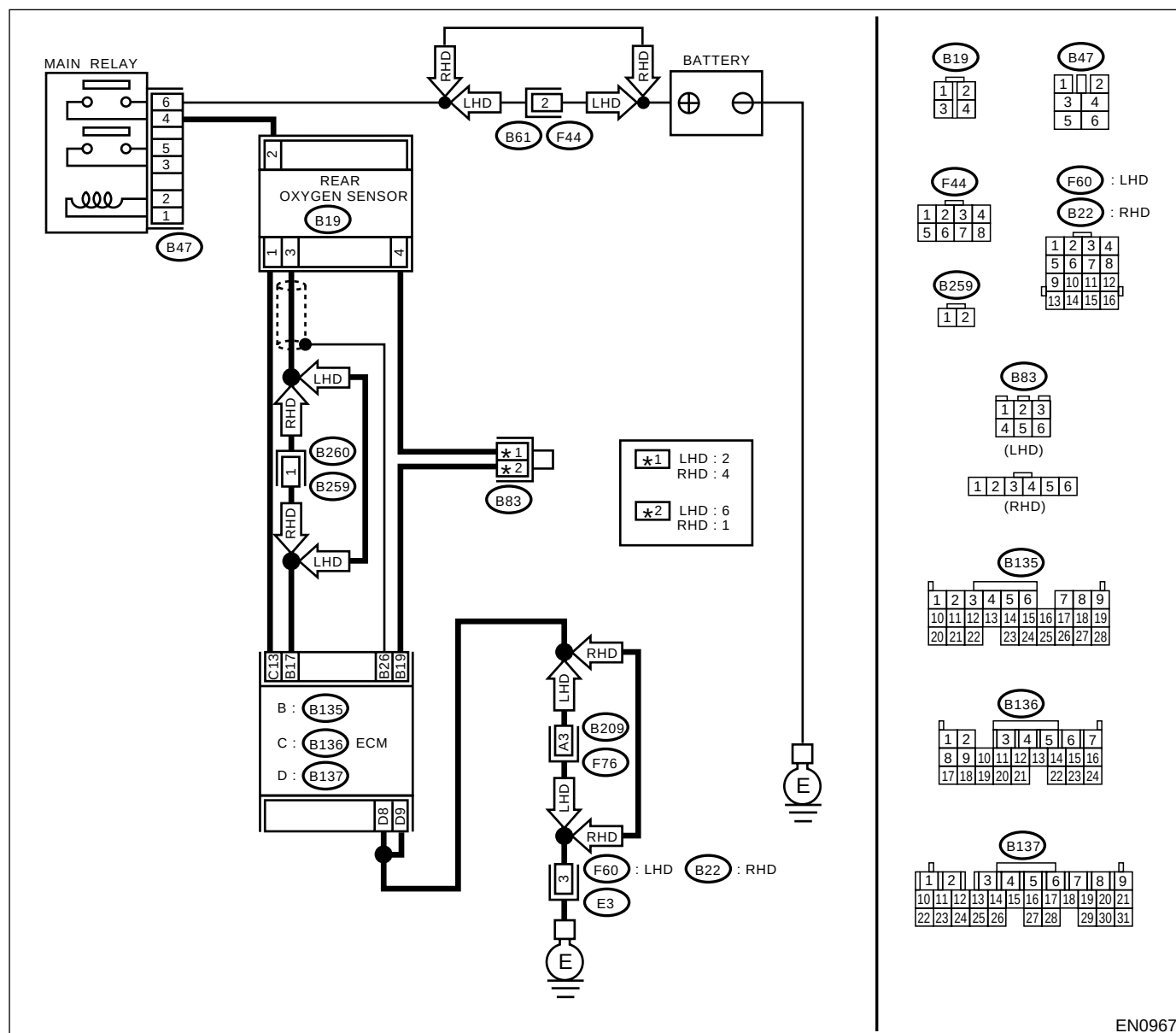
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0967

Step	Check	Yes	No
1	CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 13 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Go to step 2.
		Go to step 2.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 7 A?	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	END
3	CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

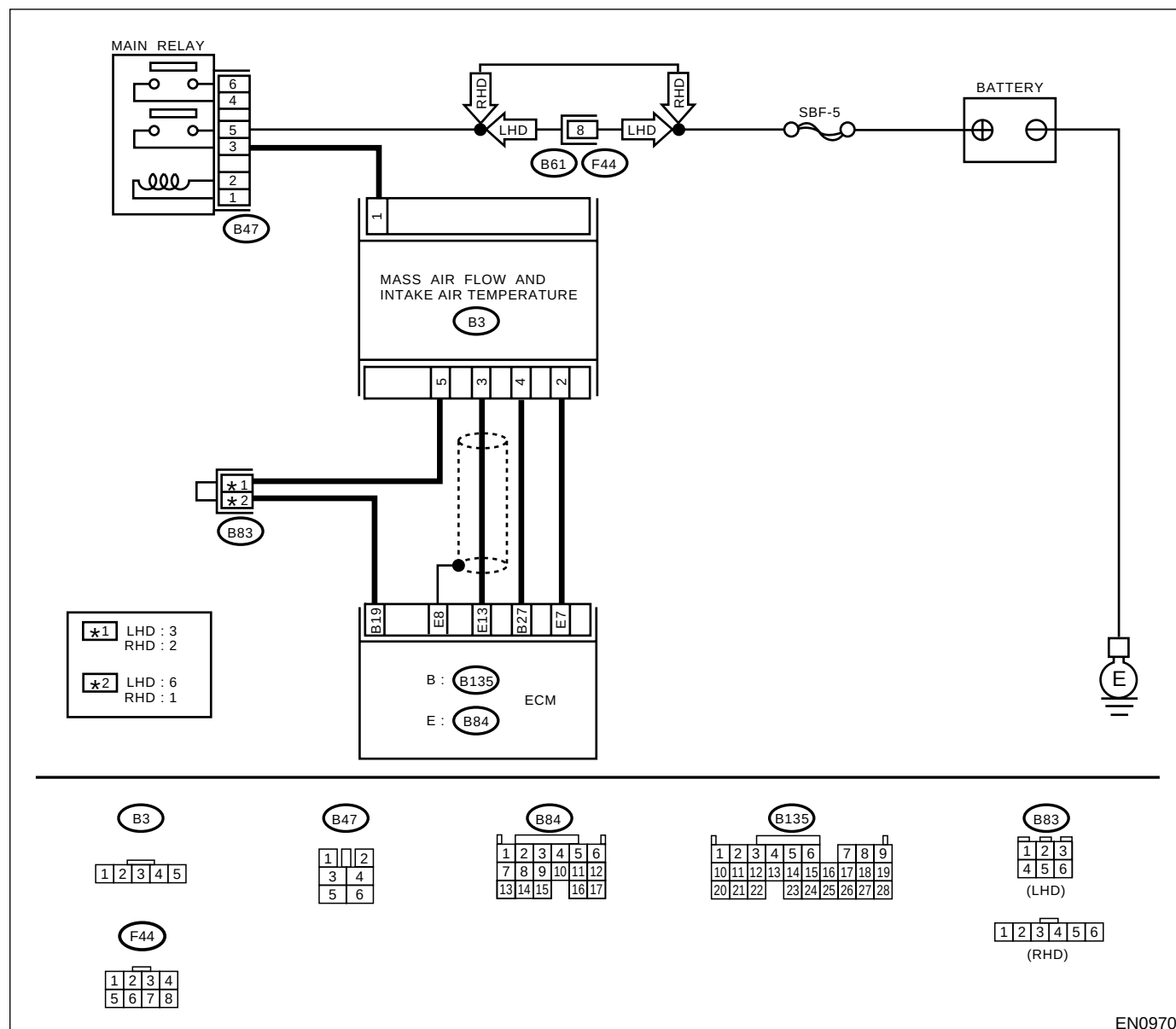
E: DTC P0101 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

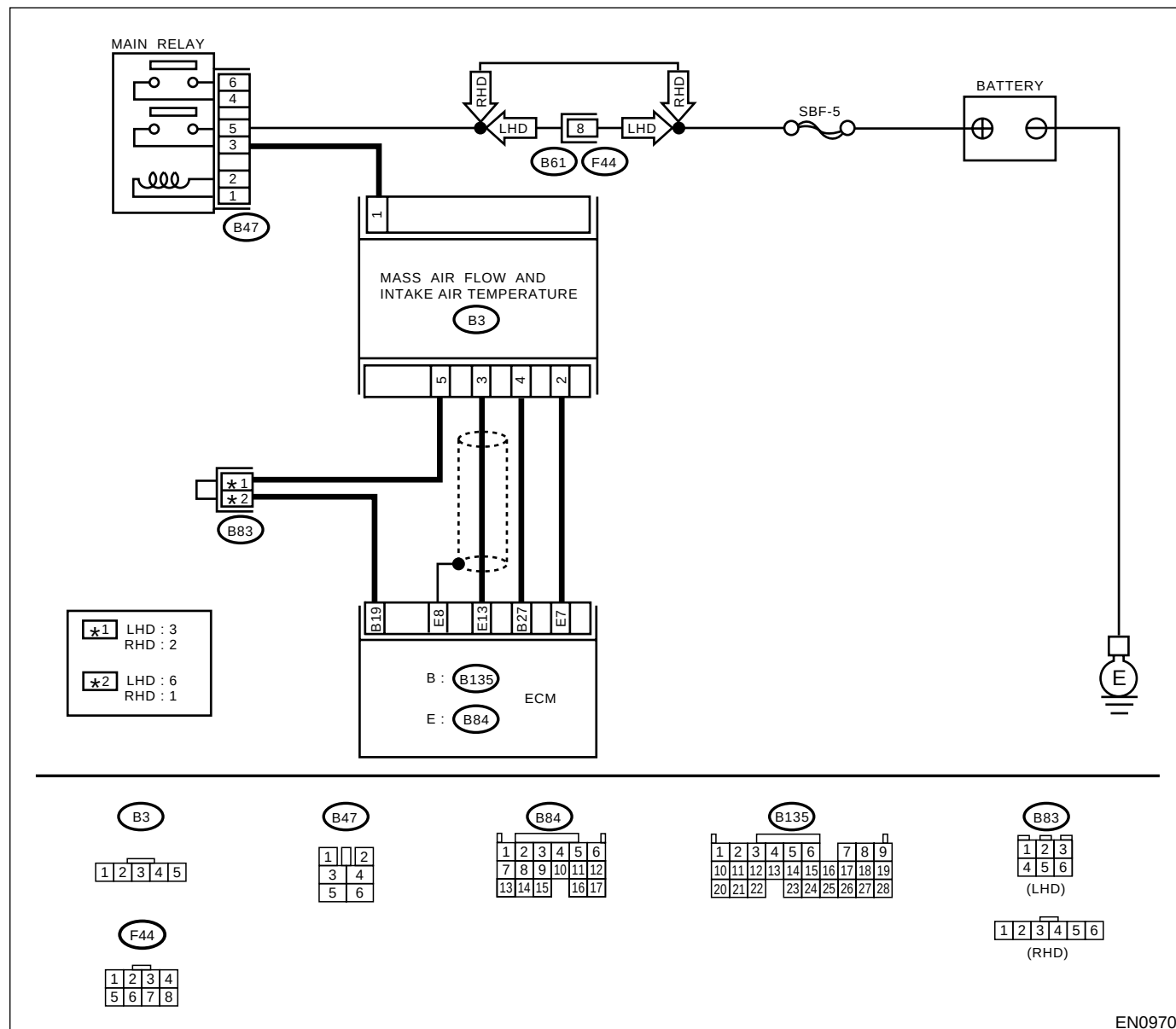
Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0102 or P0113?	Inspect DTC P0102 or P0103 using "10. Diagnostics Chart with Trouble Code". NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-32, Mass Air Flow and Intake Air Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

F: DTC P0102 — MASS AIR FLOW SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Poor driving performance
- **WIRING DIAGRAM:**



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA. 1) Turn ignition switch to OFF. 2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Start engine. 5) Read data of mass air flow sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 1.3 g/sec (0.172 lb/min) or 0.3 V and equal to or less than 240 g/sec (32 lb/min) or 4.58 V?	Even if MIL 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. NOTE: In this case, repair the following: • 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	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground while engine is idling. Connector & terminal (B84) No. 13 (+) — Chassis ground (-):	Is the voltage less than 0.2 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Measure voltage between ECM connector and chassis ground while engine is idling.	Does the voltage change more than 0.2 V by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?	Repair poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from mass air flow sensor. 3) Turn ignition switch to ON. 4) Measure voltage between mass air flow sensor connector and chassis ground. Connector & terminal (B3) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10V?	Go to step 5.	Repair open circuit between mass air flow sensor and main relay
5 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and mass air flow sensor connector. Connector & terminal (B84) No. 13 — (B3) No. 3: (B135) No. 27 — (B3) No. 4: (B135) No. 19 — (B3) No. 5:	Is the resistance less than 1Ω?	Go to step 6.	Repair open circuit between ECM and mass air flow sensor connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR Measure resistance of harness between ECM and chassis ground. Connector & terminal (B84) No. 13 — Chassis ground: (B135) No. 27 — Chassis ground: (B135) No. 19 — Chassis ground:	Is the resistance more than 1MΩ?	Go to step 7.	Repair ground short circuit between ECM and mass air flow sensor connector.
7 CHECK POOR CONTACT Check poor contact in mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair poor contact in mass air flow sensor connector.	Replace mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-32, Mass Air Flow and Intake Air Temperature Sensor.>

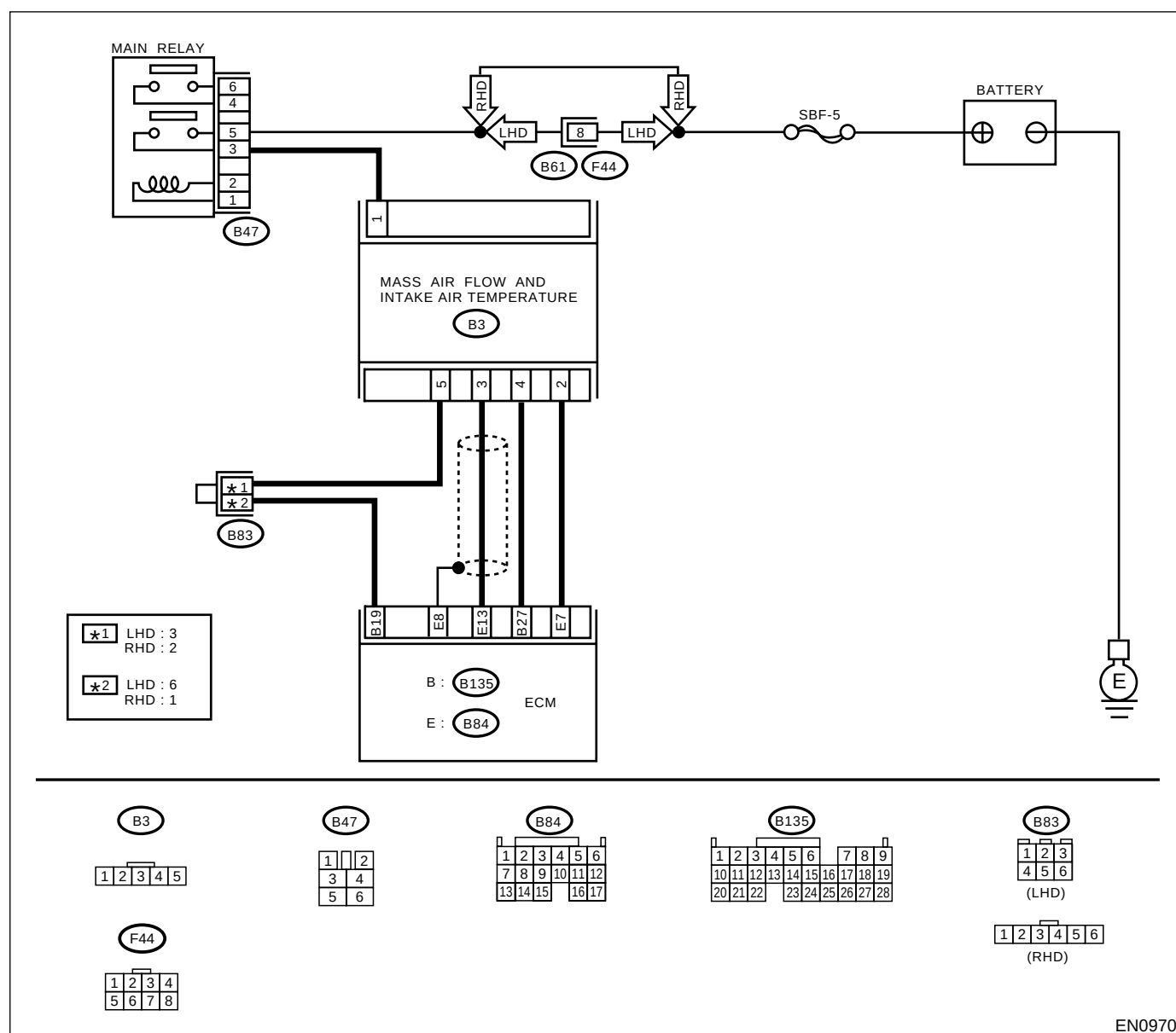
G: DTC P0103 — MASS AIR FLOW SENSOR CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA. 1) Turn ignition switch to OFF. 2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Start engine. 5) Read data of mass air flow sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 1.3 g/sec (0.172 lb/min) or 0.3 V and equal to or less than 240 g/sec (32 lb/min) or 4.58 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR. 1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect connector from mass air flow 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 mass air flow sensor signal using Subaru select monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 240 g/sec (32 lb/min) or 4.58 V in function mode F06?	Repair battery short circuit in harness between mass air flow sensor and ECM connector. After repair, replace ECM.	Replace mass air flow sensor.

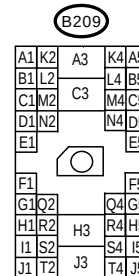
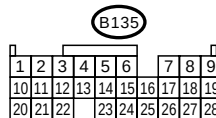
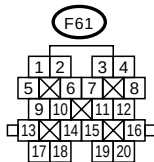
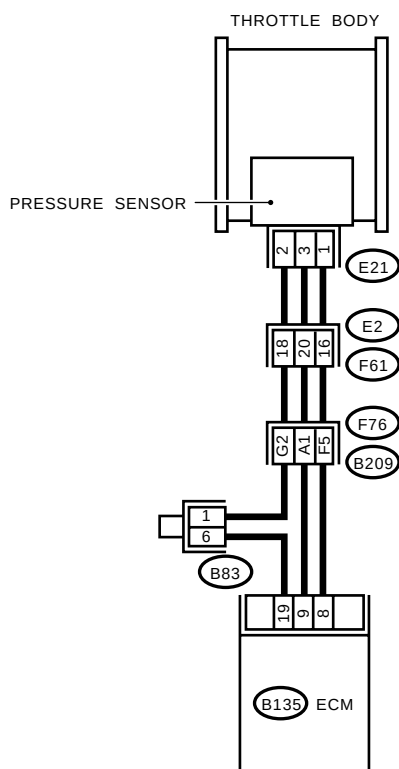
H: DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• LHD MODEL:

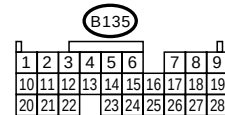
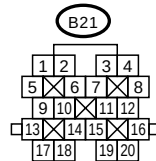
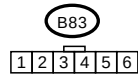
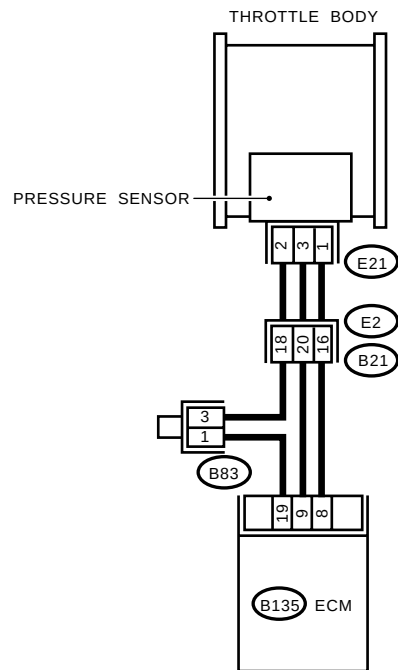


EN0969

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL:



EN0968

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step 2.	Check throttle position sensor circuit. <Ref. to EN(DOHC TURBO)-120, DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, 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.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0107 or P0108?	Inspect DTC P0107 or P0108 using "17. List of Diagnostic Trouble Code (DTC) for MT Vehicles". <Ref. to EN(DOHC TURBO)-69, 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 pressure sensor installation bolt tightened securely?	Go to step 4.	Tighten pressure sensor installation bolt securely.
4 CHECK CONDITION OF THROTTLE BODY.	Is the throttle body installation bolt tightened securely?	Replace pressure sensor. <Ref. to FU(DOHC TURBO)-33, Pressure Sensor.>	Tighten throttle body installation bolt securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

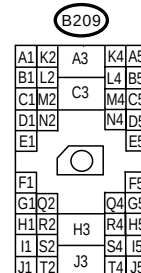
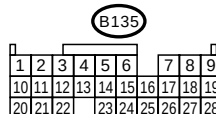
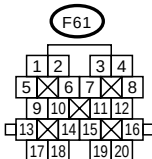
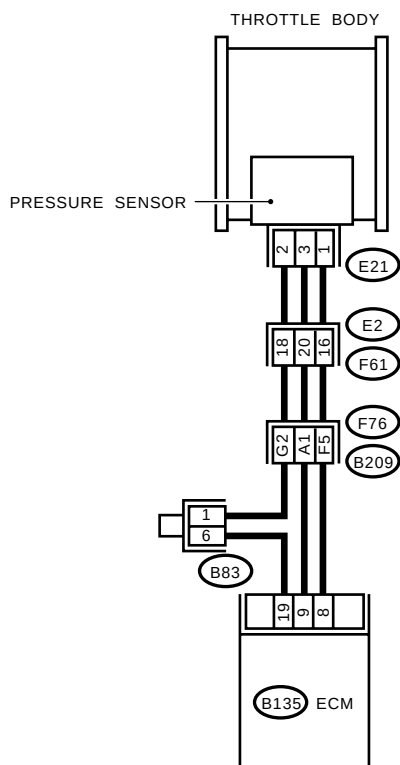
I: DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- WIRING DIAGRAM:
- LHD MODEL

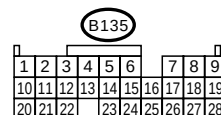
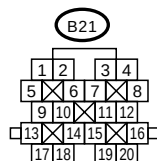
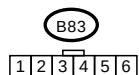
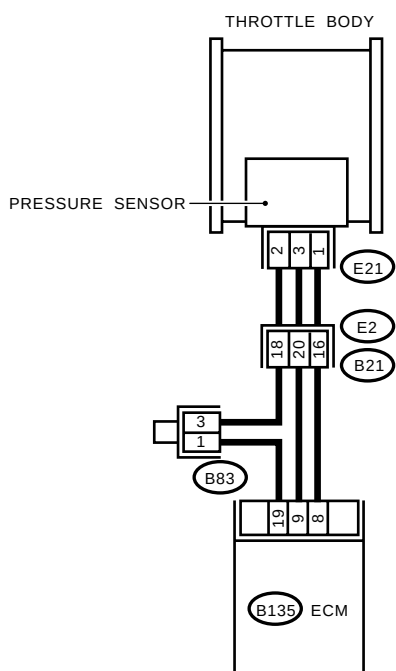


EN0969

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0968

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than -7.2 kPa (-54 mmHg, -2.1 inHg)?	Go to step 3.	Go to step 2.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2	CHECK POOR CONTACT. Check poor contact in ECM and pressure sensor connector.	Repair poor contact in ECM or pressure sensor connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
3	CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage more than 4.5 V? Go to step 5.	Go to step 4.
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 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter? Repair poor contact in ECM connector.	Contact with your 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 (B135) No. 8 (+) — Chassis ground (-):	Is the voltage less than 0.7 V? Go to step 6.	Contact with your 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 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. Connector & terminal (E21) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V? Go to step 7.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
7	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 intake manifold pressure sensor connector. Connector & terminal (B135) No. 19 — (E21) No. 2:	Is the resistance less than 1 Ω ? Go to step 8.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
8	CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. Measure resistance of harness between intake manifold pressure sensor connector and engine ground. Connector & terminal (E21) No. 1 — Engine ground:	Is the resistance more than 1 M Ω ? Go to step 9.	Repair ground short circuit in harness between ECM and intake manifold pressure sensor connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
9	CHECK POOR CONTACT. Check poor contact in pressure sensor connector.	Is there poor contact in pressure sensor connector?	Repair poor contact in pressure sensor connector.	Replace pressure sensor. <Ref. to FU(DOHC TURBO)-33, Pressure Sensor.>

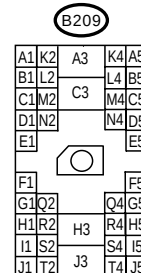
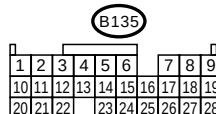
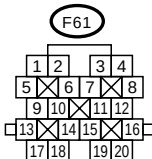
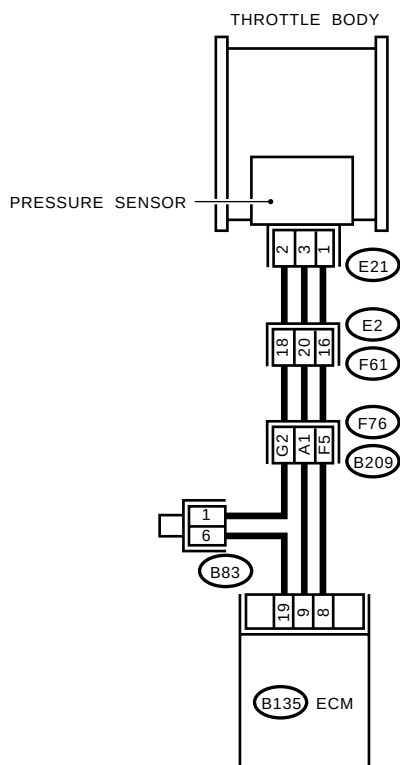
J: DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD MODEL**

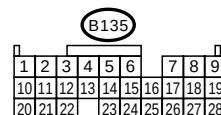
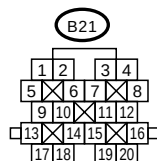
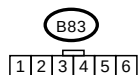
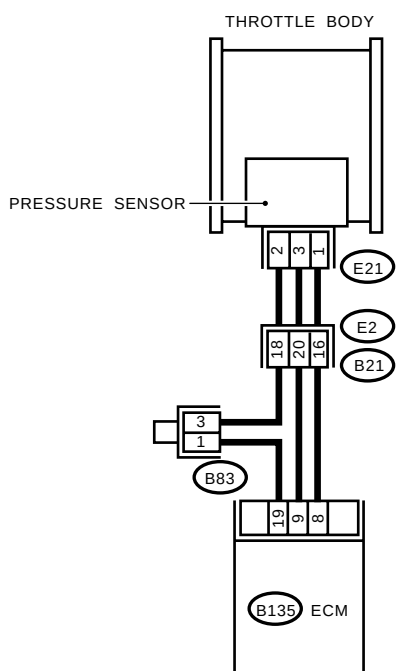


EN0969

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0968

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 282 kPa (2121 mmHg, 83.50 inHg)?	Go to step 9.	Go to step 2.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
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 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage less than 0.7 V?	Go to step 5.	Contact with your 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 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. Connector & terminal (E21) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 6.	Repair open circuit in harness between ECM and pressure sensor connector.
6 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. 8 — (E21) No. 1:	Is the resistance less than 1 Ω ?	Go to step 7.	Repair open circuit in harness between ECM and pressure sensor connector.
7 CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR. Measure resistance of harness between ECM and pressure sensor connector. Connector & terminal (B135) No. 19 — (E21) No. 2:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair open circuit in harness between ECM and pressure sensor connector.
8 CHECK POOR CONTACT. Check poor contact in pressure sensor connector.	Is there poor contact in pressure sensor connector?	Repair poor contact in pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(DOHC TURBO)-33, Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 282 kPa (2121 mmHg, 83.50 inHg)?	Repair battery short circuit in harness between ECM and pressure sensor connector.	Replace pressure sensor. <Ref. to FU(DOHC TURBO)-33, Pressure Sensor.>

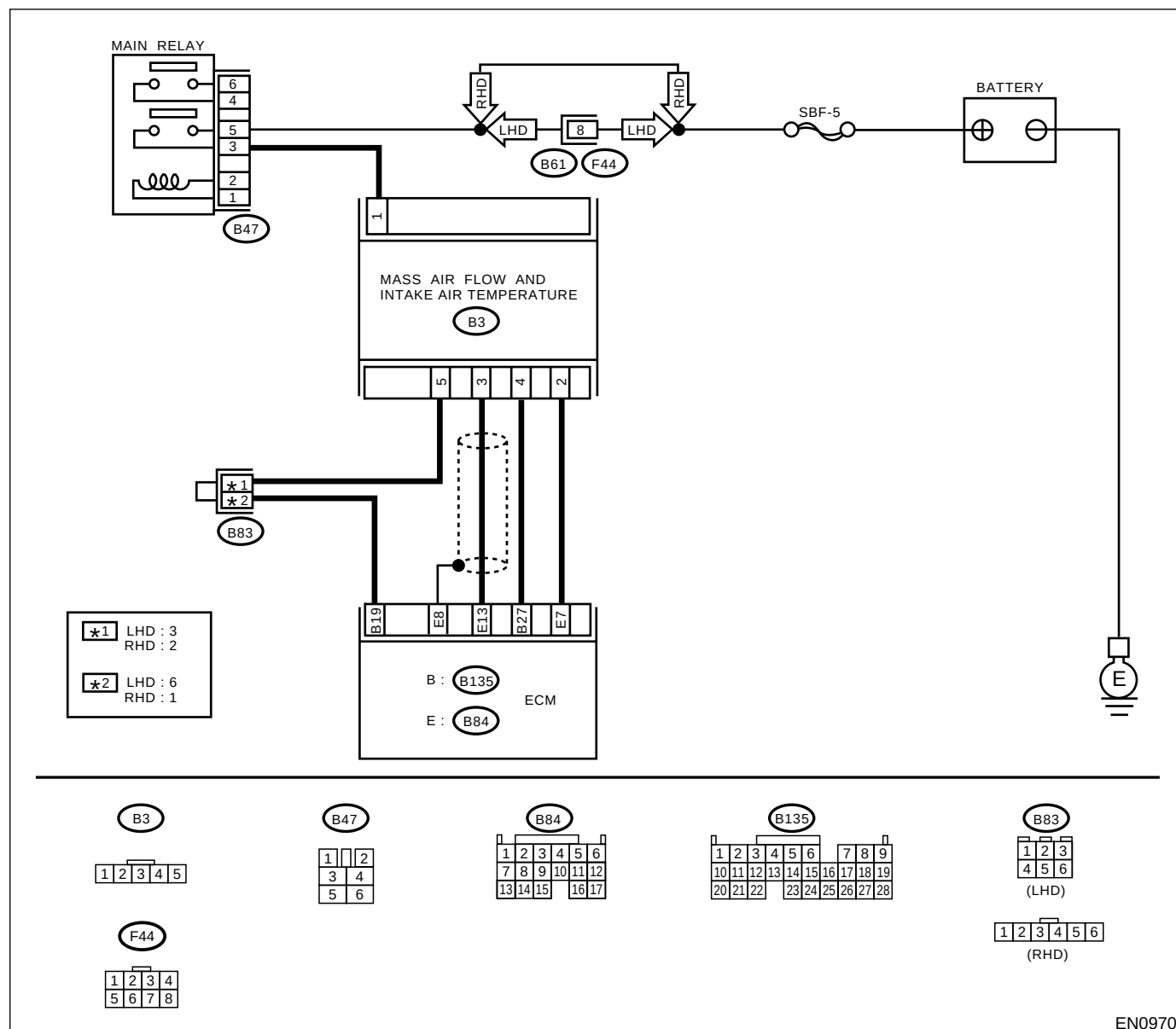
K: DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0112, P0113, P0117, P0118 or P0125?	Inspect DTC P0112, P0113, P0117, P0118 or P0125 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step 2.
2 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature between 75°C (167°F) and 95°C (203°F)?	Replace mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-32, Mass Air Flow and Intake Air Temperature Sensor.>	Inspect DTC P0125 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>

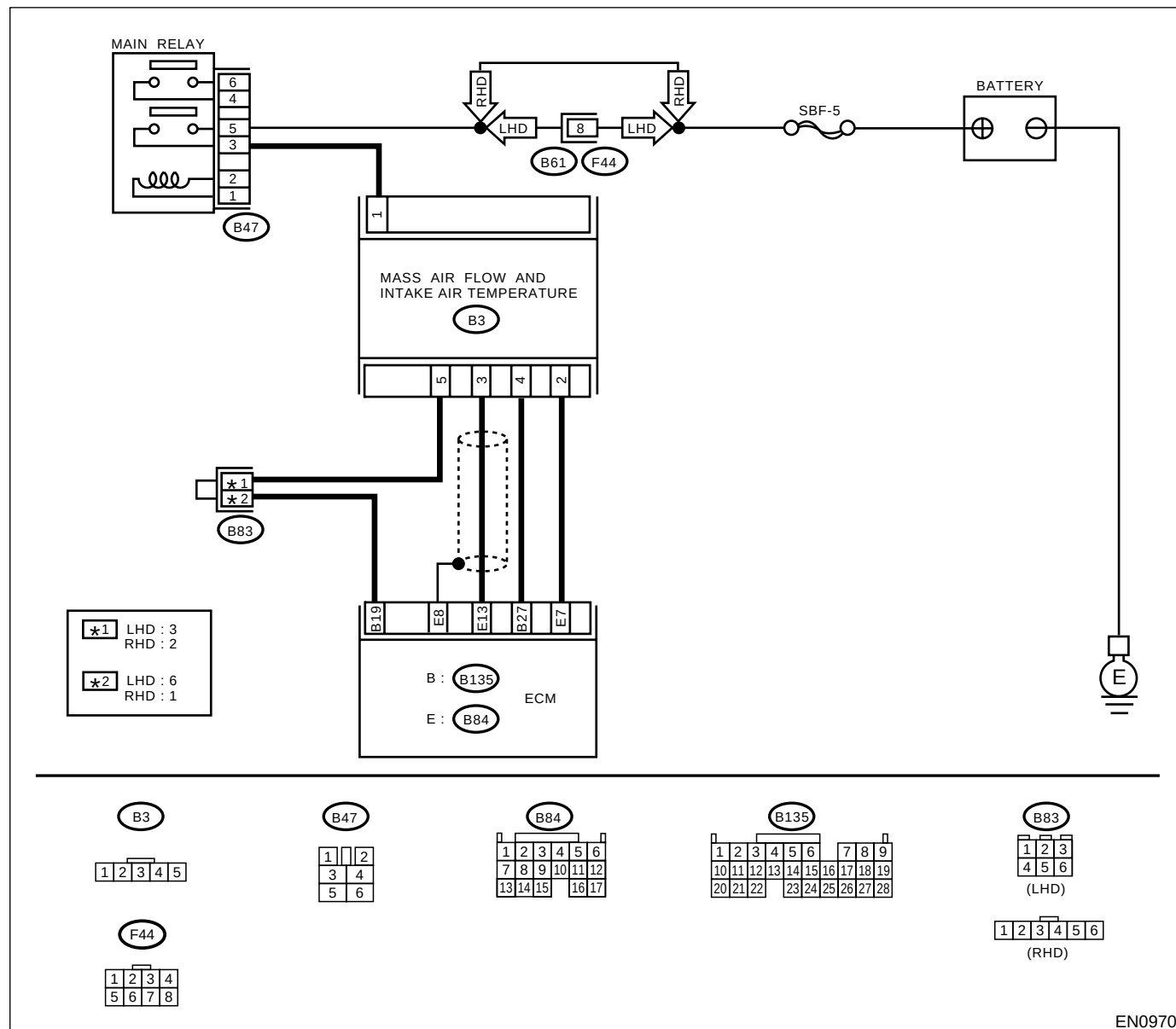
L: DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 55°C (131°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from mass air flow and intake air temperature sensor. 3)Turn ignition switch to ON. 4)Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than -36°C (-97°F)?	Replace mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-32, Mass Air Flow and Intake Air Temperature Sensor.>	Repair ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

ENGINE (DIAGNOSTICS)

- Immediately at fault recognition

- Erroneous idling
- Poor driving performance

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

MAIN RELAY

BATTERY

SBF-5

MASS AIR FLOW AND INTAKE AIR TEMPERATURE (B3)

ECM (B135)

Legend:

- *1 LHD : 3, RHD : 2
- *2 LHD : 6, RHD : 1

Diagram components and connections:

- MAIN RELAY:** A 6-pin connector with pins 1, 2, 3, 4, 5, and 6. Pin 1 is connected to the ECM (B135) pin 19. Pin 2 is connected to the ECM (B135) pin 19. Pin 3 is connected to the ECM (B135) pin 19. Pin 4 is connected to the ECM (B135) pin 19. Pin 5 is connected to the ECM (B135) pin 19. Pin 6 is connected to the ECM (B135) pin 19.
- BATTERY:** A 12V battery connected to the SBF-5 switch and the ECM (B135) pin 19.
- SBF-5:** A switch connected to the battery and the ECM (B135) pin 19.
- MASS AIR FLOW AND INTAKE AIR TEMPERATURE (B3):** A 5-pin connector with pins 1, 2, 3, 4, and 5. Pin 1 is connected to the ECM (B135) pin 19. Pin 2 is connected to the ECM (B135) pin 19. Pin 3 is connected to the ECM (B135) pin 19. Pin 4 is connected to the ECM (B135) pin 19. Pin 5 is connected to the ECM (B135) pin 19.
- ECM (B135):** A 19-pin connector with pins 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19. Pin 19 is connected to the battery and the SBF-5 switch. Pin 1 is connected to the ECM (B135) pin 19. Pin 2 is connected to the ECM (B135) pin 19. Pin 3 is connected to the ECM (B135) pin 19. Pin 4 is connected to the ECM (B135) pin 19. Pin 5 is connected to the ECM (B135) pin 19. Pin 6 is connected to the ECM (B135) pin 19. Pin 7 is connected to the ECM (B135) pin 19. Pin 8 is connected to the ECM (B135) pin 19. Pin 9 is connected to the ECM (B135) pin 19. Pin 10 is connected to the ECM (B135) pin 19. Pin 11 is connected to the ECM (B135) pin 19. Pin 12 is connected to the ECM (B135) pin 19. Pin 13 is connected to the ECM (B135) pin 19. Pin 14 is connected to the ECM (B135) pin 19. Pin 15 is connected to the ECM (B135) pin 19. Pin 16 is connected to the ECM (B135) pin 19. Pin 17 is connected to the ECM (B135) pin 19. Pin 18 is connected to the ECM (B135) pin 19.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than -36°C (-97°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from mass air flow and intake air temperature sensor. 3)Measure voltage between mass air flow and intake air temperature sensor connector and engine ground. Connector & terminal (B3) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to ON. 2)Measure voltage between mass air flow and intake air temperature sensor connector and engine ground. Connector & terminal (B3) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step 4.
4 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. Measure voltage between mass air flow and intake air temperature sensor and pressure sensor connector and engine ground. Connector & terminal (B3) No. 2 (+) — Engine ground (-):	Is the voltage more than 3 V?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • 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	Check	Yes	No
5 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between mass air flow and intake air temperature sensor and engine ground. Connector & terminal (B3) No. 5 — Engine ground:	Is the resistance less than 5 Ω ?	Replace mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-32, Mass Air Flow and Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • 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

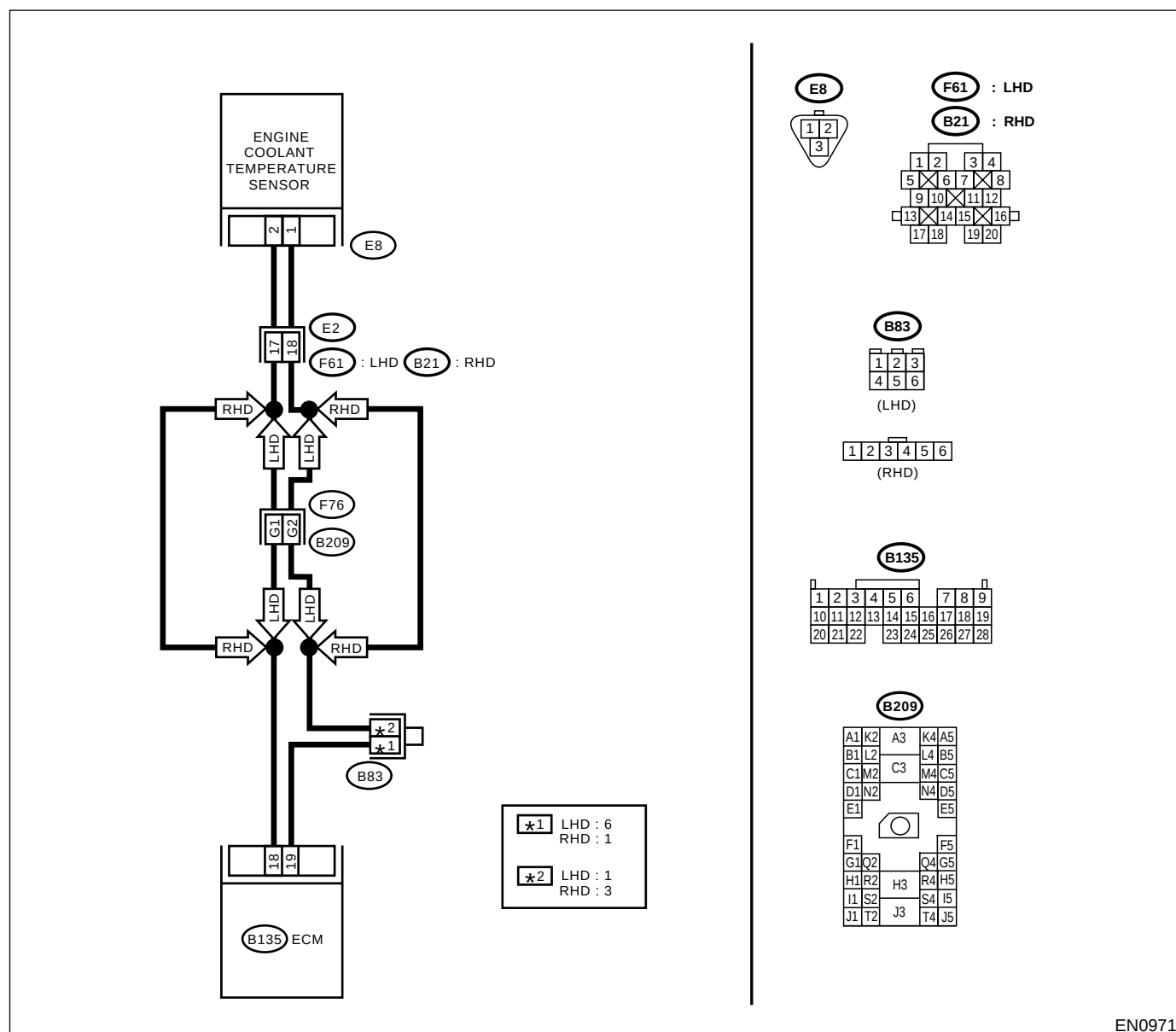
N: DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 150°C (302°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from engine coolant temperature sensor. 3)Turn ignition switch to ON. 4)Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than -40°C (-40°F)?	Replace engine coolant temperature sensor. <Ref. to FU(DOHC TURBO)-27, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

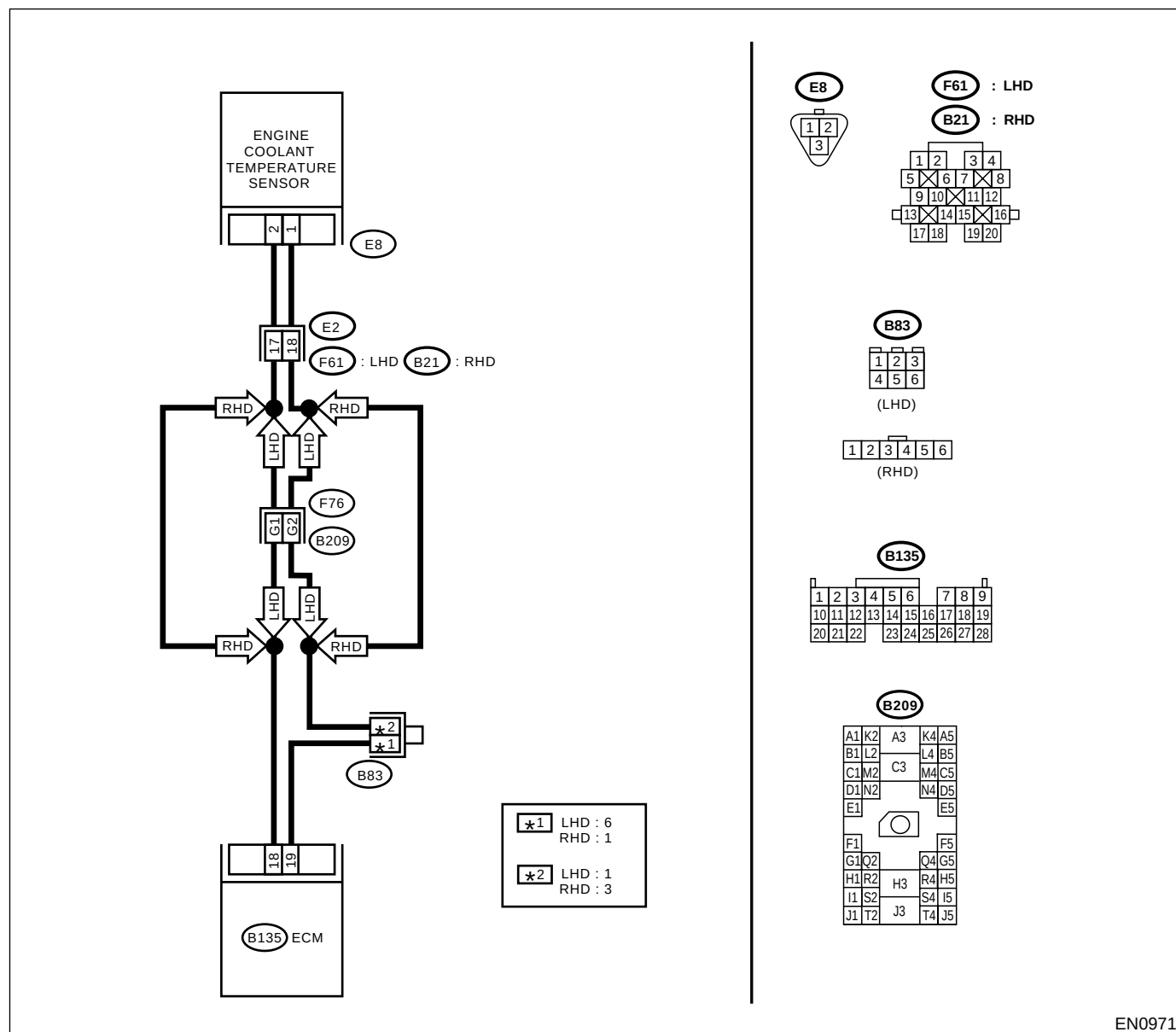
O: DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than -40°C (-40°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from engine coolant temperature sensor. 3)Measure voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to ON. 2)Measure voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 4.
4 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. Measure voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 2 (+) — Engine ground (-):	Is the voltage more than 4 V?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • 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)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Replace engine coolant temperature sensor. <Ref. to FU(DOHC TURBO)-27, Engine Coolant Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • 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

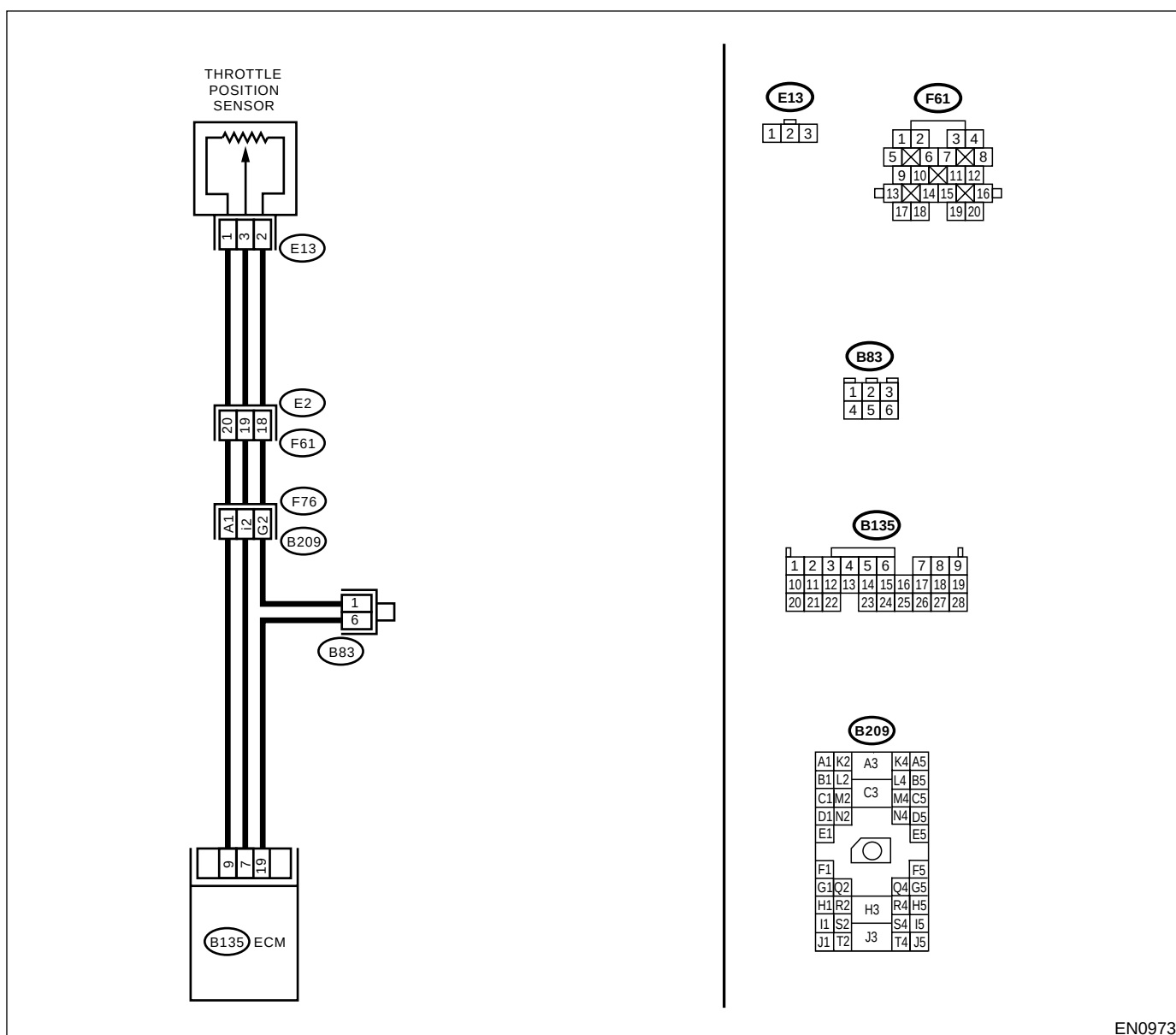
P: DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Poor driving performance
 - Fuel is cut.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD MODEL**

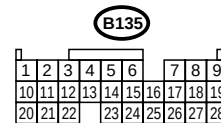
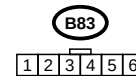
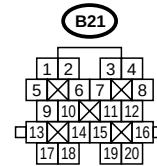
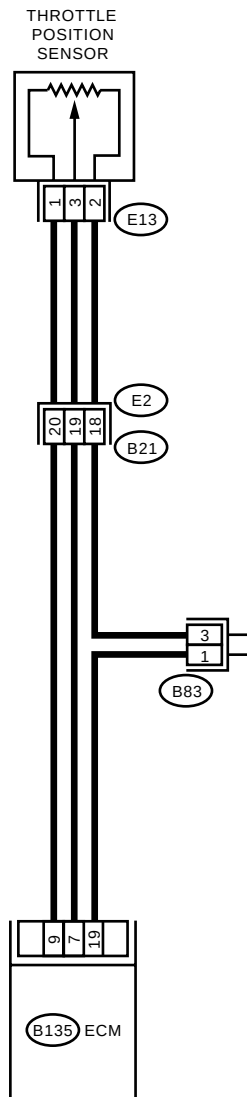


EN0973

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0972

Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0122, P0123 or P1507?	Inspect DTC P0122, P0123 or P1507 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, 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(DOHC TURBO)-31, Throttle Position Sensor.>

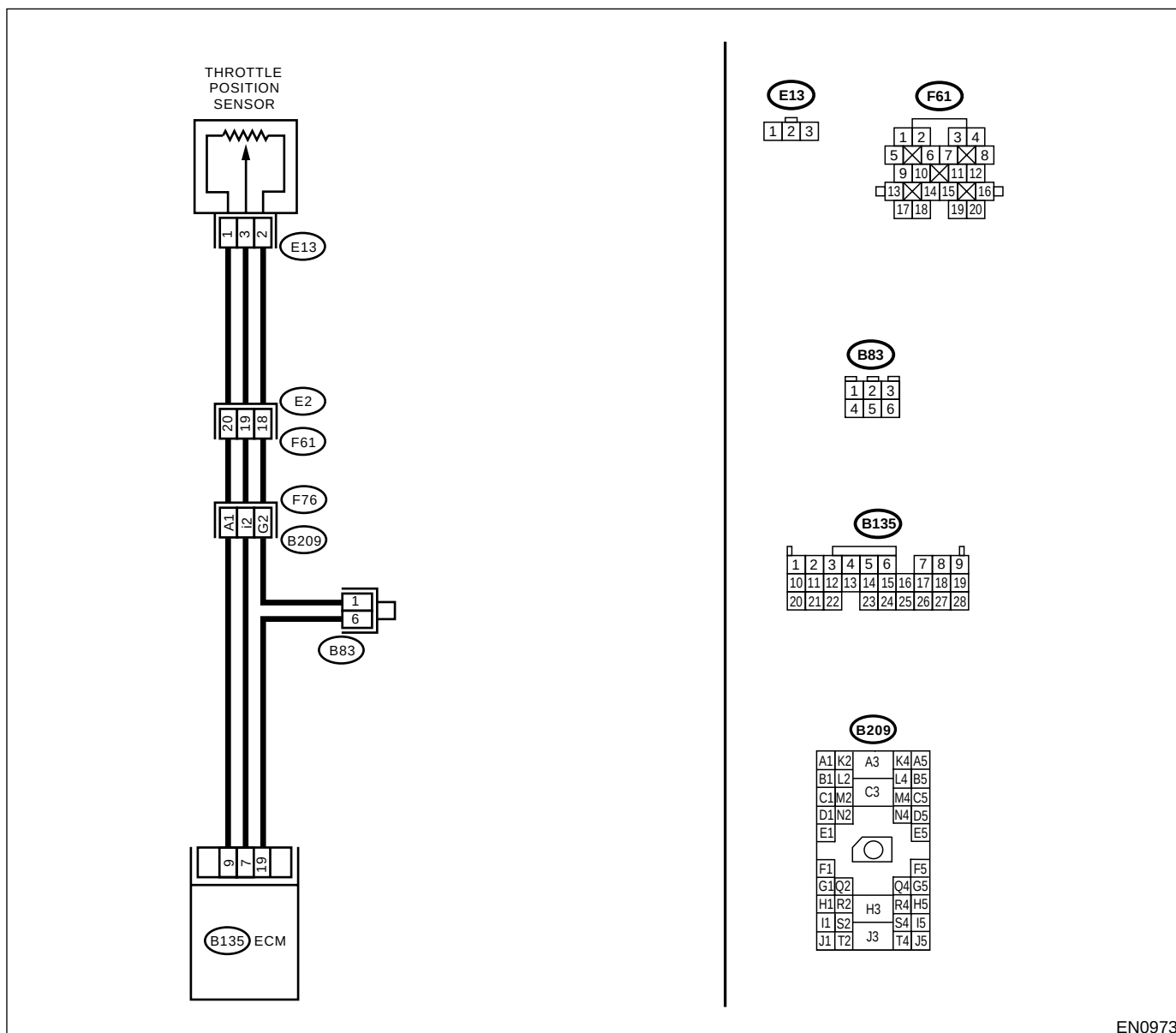
Q: DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD MODEL**

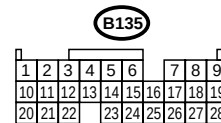
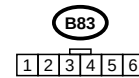
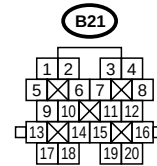
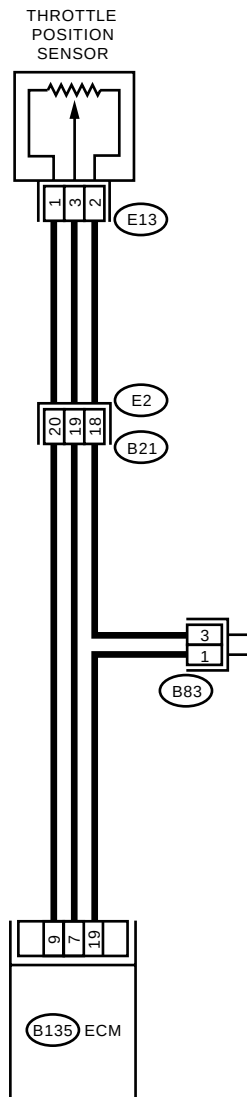


EN0973

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0972

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 0.1 V?	Go to step 2.	Even if MIL 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
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground while throttle valve is fully closed. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
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 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 7 (+) — Chassis ground (-):	Is the voltage less than 0.1 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Measure voltage between ECM connector and chassis ground.	Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. 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. Connector & terminal (E13) No. 1 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • 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
7 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and throttle position sensor connector. Connector & terminal (B135) No. 7 — (E13) No. 3:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • 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
8 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. Measure resistance of harness between throttle position sensor connector and engine ground. Connector & terminal (E13) No. 3 — Engine ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in harness between throttle position sensor and ECM connector.	Go to step 9.
9 CHECK POOR CONTACT. Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor. <Ref. to FU(DOHC TURBO)-31, Throttle Position Sensor.>

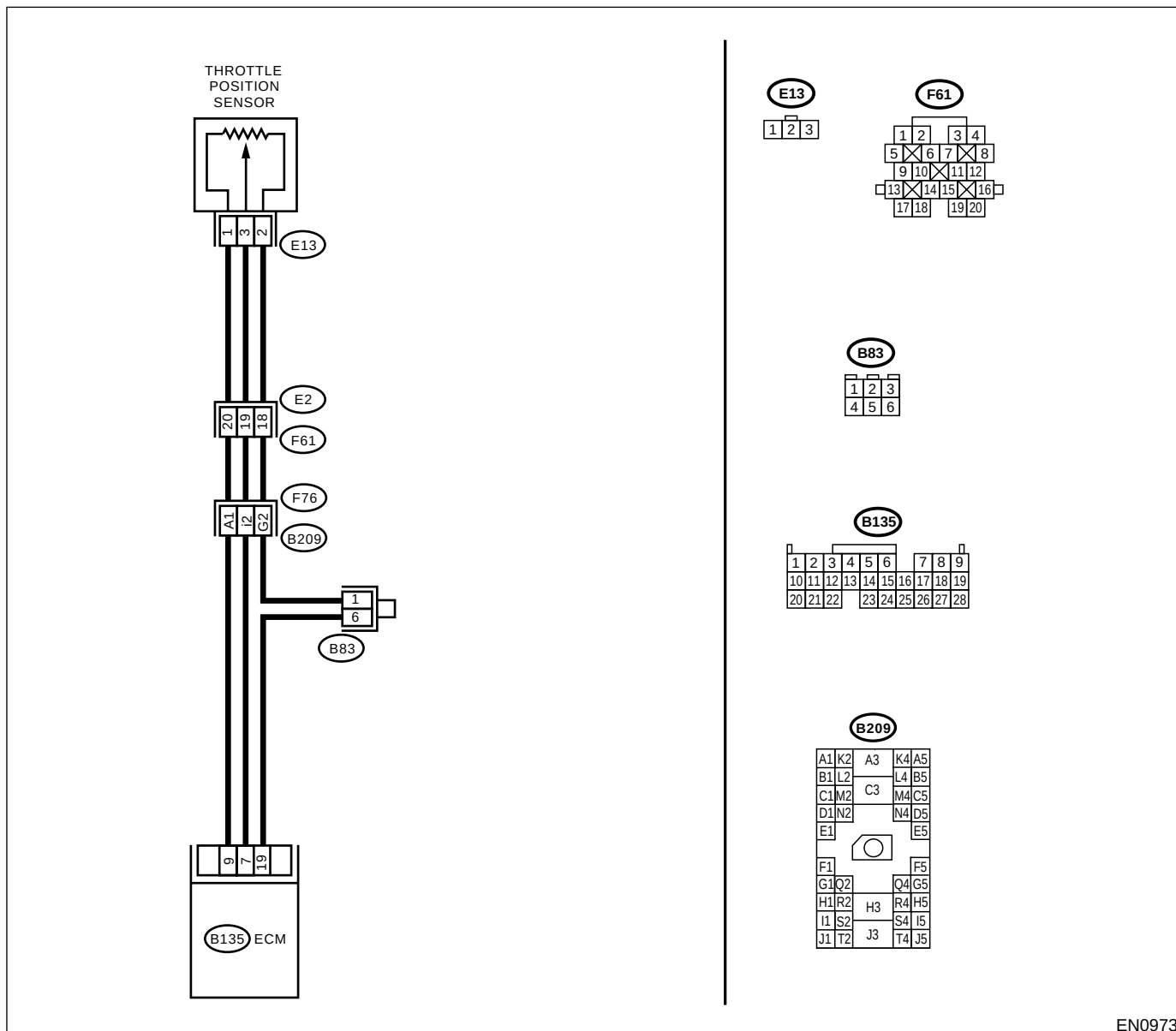
R: DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD MODEL**

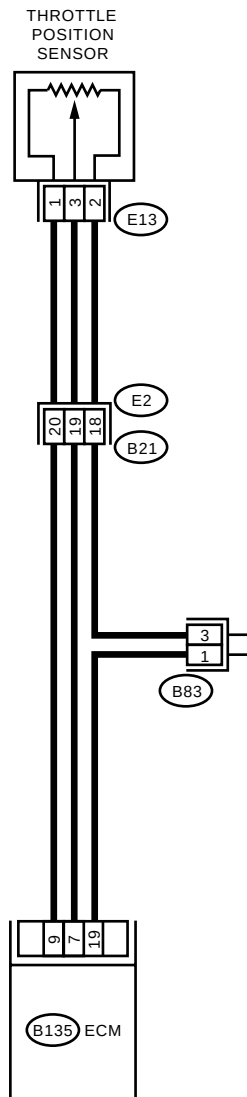


EN0973

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



E13

1	2	3
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B21

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

B83

1	2	3	4	5	6
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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								

EN0972

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 4.9 V?	Go to step 2.	Even if MIL 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
2 CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from throttle position sensor. 3)Measure resistance of harness between throttle position sensor connector and engine ground. Connector & terminal (E13) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3 CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to ON. 2)Measure voltage between throttle position sensor connector and engine ground. Connector & terminal (E13) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Replace throttle position sensor. <Ref. to FU(DOHC TURBO)-31, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

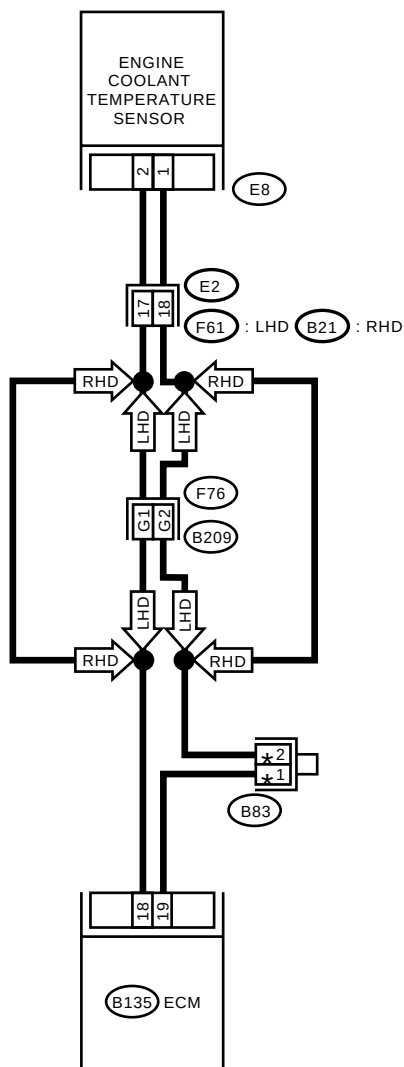
S: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Engine would not return to idling.

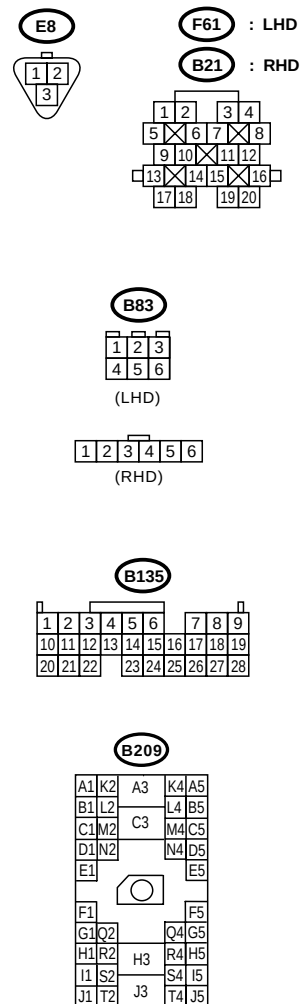
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



*1	LHD : 6 RHD : 1
*2	LHD : 1 RHD : 3



EN0971

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0117 or P0118?	Inspect DTC P0117 or P0118 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step 2.
2 CHECK ENGINE COOLING SYSTEM. NOTE: Check the following items. •Thermostat open stuck •Coolant level •Coolant freeze •Tire diameter	Is there a fault in engine cooling system?	Replace thermostat. <Ref. to CO-35, Thermostat.>	Replace engine coolant temperature sensor. <Ref. to FU(DOHC TURBO)-27, Engine Coolant Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

T: DTC P0131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

NOTE:

For the diagnostic procedure, refer to DTC P0132. <Ref. to EN(DOHC TURBO)-134, DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

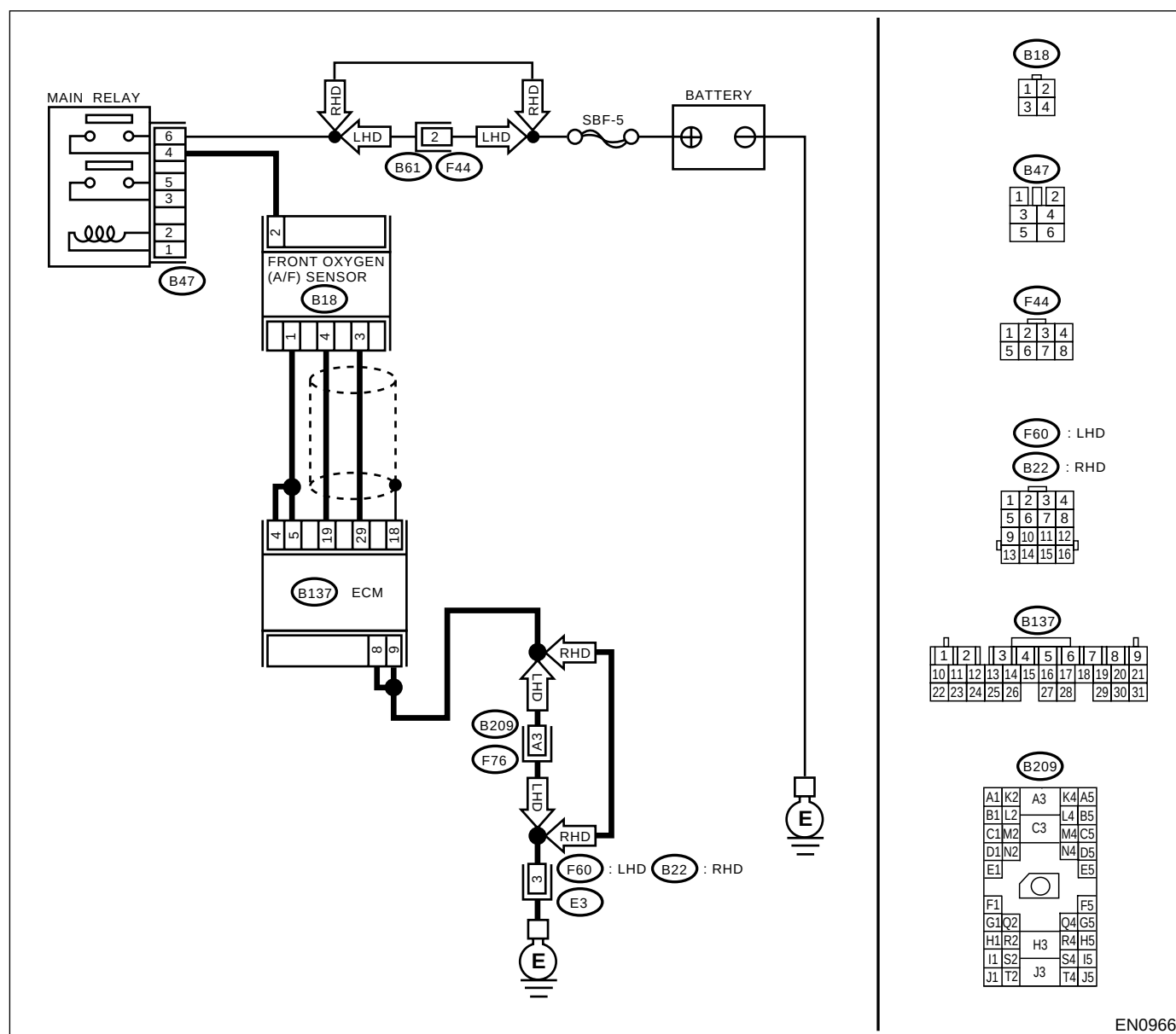
U: DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031, P0032, P1131, P1134 or P1139?	Inspect DTC P0031, P0032, P1131, P1134 or P1139 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>
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 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.>	Does the LED of {Rear O2 Rich Signal} blink?	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector. Check rear oxygen sensor circuit. <Ref. to FU(DOHC TURBO)-43, Rear Oxygen Sensor.>
4	CHECK EXHAUST SYSTEM. Check exhaust system parts. 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	Is there a fault in exhaust system?	Repair or replace faulty parts. Replace front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-41, Front Oxygen (A/F) Sensor.>

ENGINE (DIAGNOSTICS)

- Two consecutive driving cycles with fault

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

REFERENCES



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031, P0032, P0131, P0132, P1130, P1131, P1134 or P1139?	Inspect DTC P0031, P0032, P0131, P0132, P1130, P1131, P1134 or P1139 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, 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. •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	Is there a fault in exhaust system?	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-41, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

W: DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —

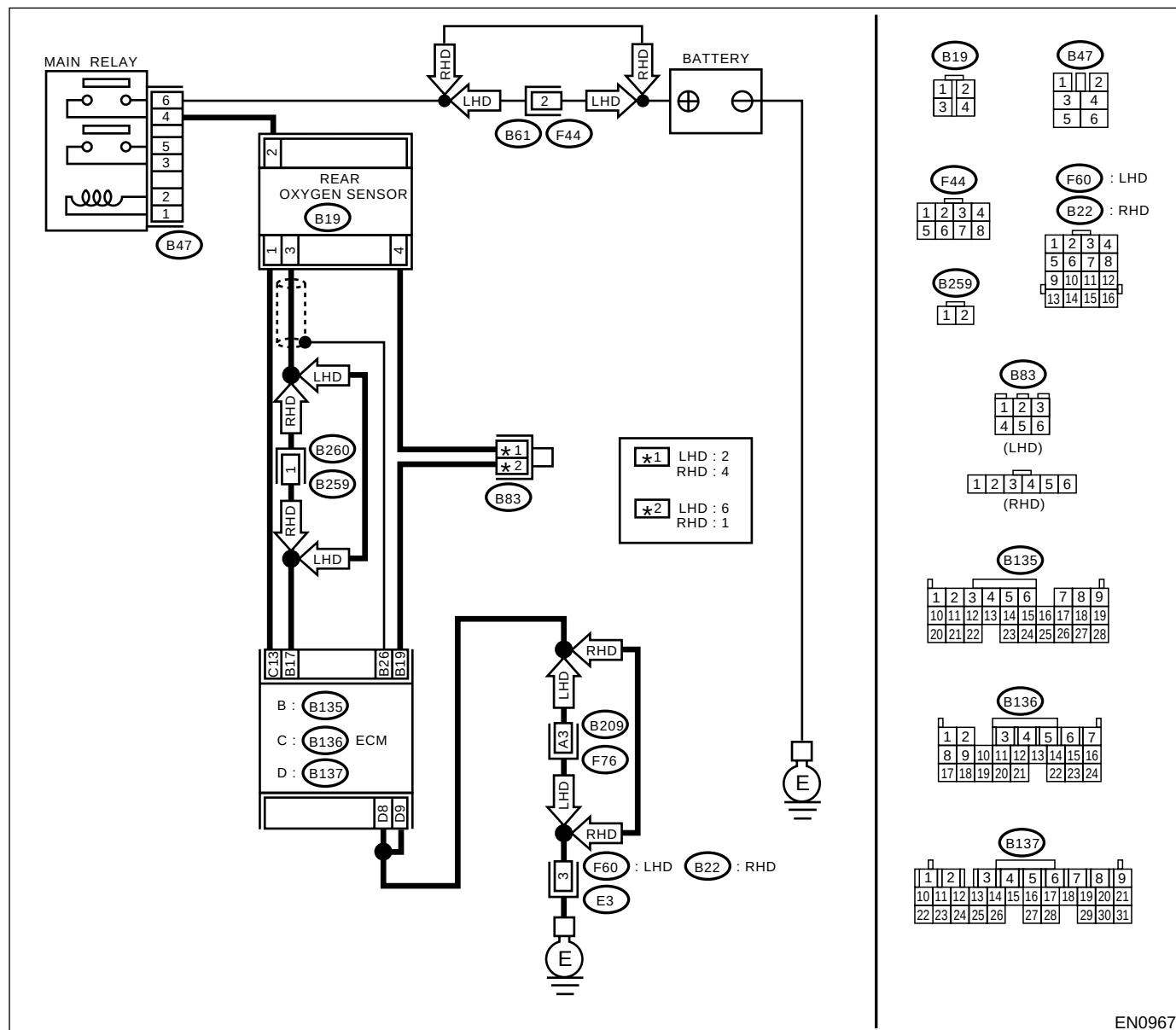
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



Step	Check	Yes	No	
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131 or P0132?	Go to step 2.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK FAILURE CAUSE OF P0131 or P0132. Inspect DTC P0131 or P0132 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>	Is the failure cause of P0131 or P0132 in the fuel system?	Check fuel system. NOTE: In this case, it is not necessary to inspect DTC P0136.	Go to step 3.
3 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. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step 7.	Go to step 4.
4 CHECK REAR OXYGEN SENSOR DATA. Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool.	Is the value fixed between 0.2 and 0.4 V?	Go to step 5.	Replace rear oxygen sensor. <Ref. to FU(DOHC TURBO)-43, Rear Oxygen Sensor.>
5 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. 26 — (B19) No. 4:	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 6.
6 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 (B19) No. 3 (+) — Engine ground (-):	Is the voltage more than 0.2 V?	Replace rear oxygen sensor. <Ref. to FU(DOHC TURBO)-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
7 CHECK EXHAUST SYSTEM. Check exhaust system parts. 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	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace rear oxygen sensor. <Ref. to FU(DOHC TURBO)-43, Rear Oxygen Sensor.>

X: DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —

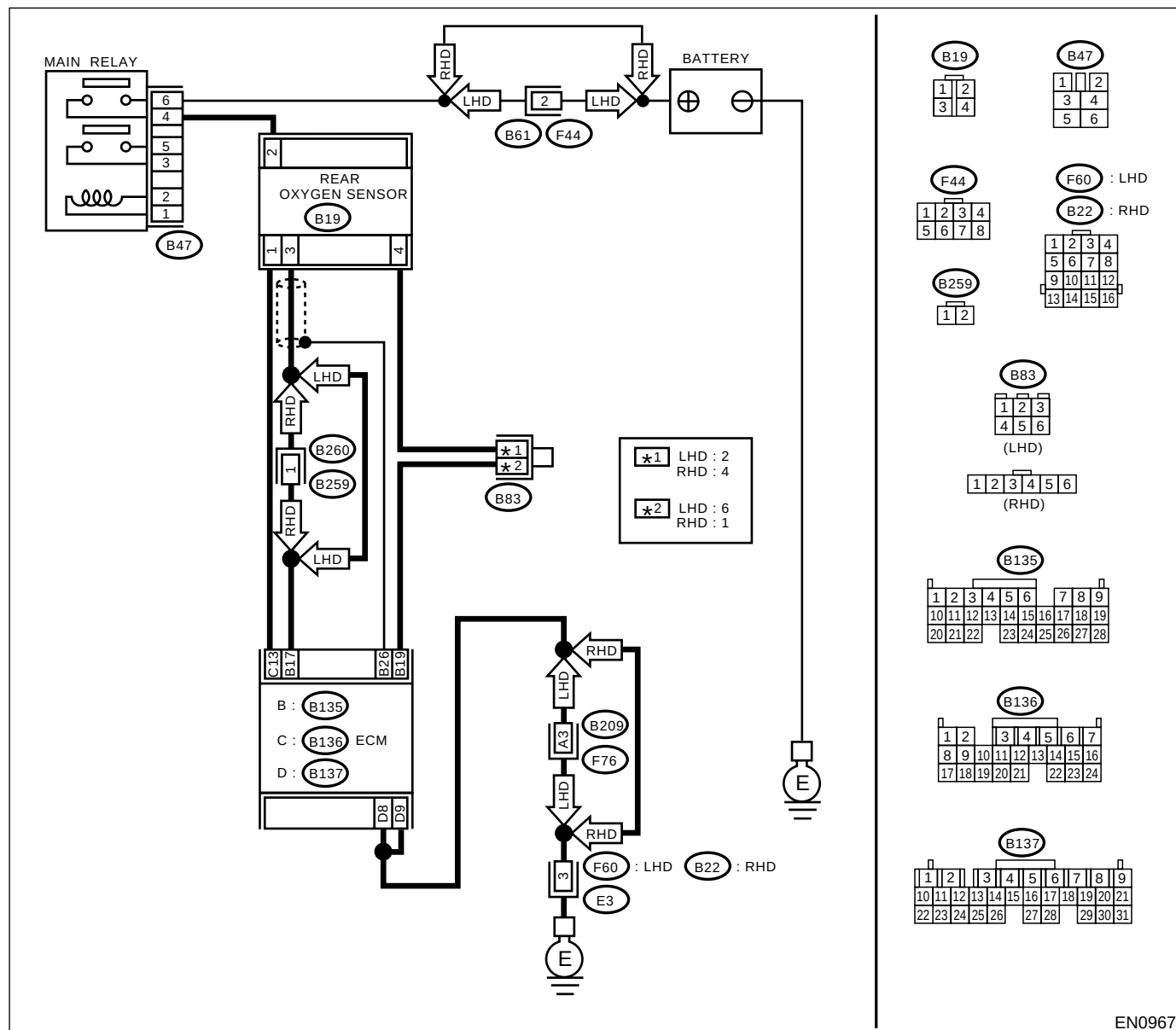
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0967

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0136?	Inspect DTC P0136 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, 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(DOHC TURBO)-43, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Y: DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —

NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(DOHC TURBO)-143, DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Z: DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

Step	Check	Yes	No
1	CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair exhaust system. Go to step 2.
2	CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system. Go to step 3.
3	CHECK FUEL PRESSURE. Warning: •Place “NO FIRE” signs near the working area. •Be careful not to spill fuel on the floor. 1)Release 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. Warning: Before removing fuel pressure gauge, release fuel pressure. NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is fuel pressure between 284 and 314 kPa (2.9 — 3.2 kg/cm ² , 41 — 46 psi)?	Go to step 4. 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	Check	Yes	No
4 CHECK FUEL PRESSURE. After connecting pressure regulator vacuum hose, measure fuel pressure. Warning: Before removing fuel pressure gauge, release fuel pressure. 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.	Is fuel pressure between 206 and 235 kPa (2.1 — 2.4 kg/cm ² , 30 — 34 psi)?	Go to step 5.	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
5 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is temperature greater than 60°C (140°F)?	Go to step 6.	Replace engine coolant temperature sensor. <Ref. to FU(DOHC TURBO)-27, Engine Coolant Temperature Sensor.>
6 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 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification: •Intake manifold absolute pressure 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)	Is the value within the specifications?	Go to step 7.	Replace mass air flow and intake manifold pressure sensor. <Ref. to FU(DOHC TURBO)-32, Mass Air Flow and Intake Air Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK INTAKE AIR TEMPERATURE 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 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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is value obtained when ambient temperature is subtracted from intake air temperature greater than -10°C (14°F) and less than 50°C (122°F)?	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check mass air flow and intake air temperature sensor. <Ref. to FU(DOHC TURBO)-32, Mass Air Flow and Intake Air Temperature Sensor.>

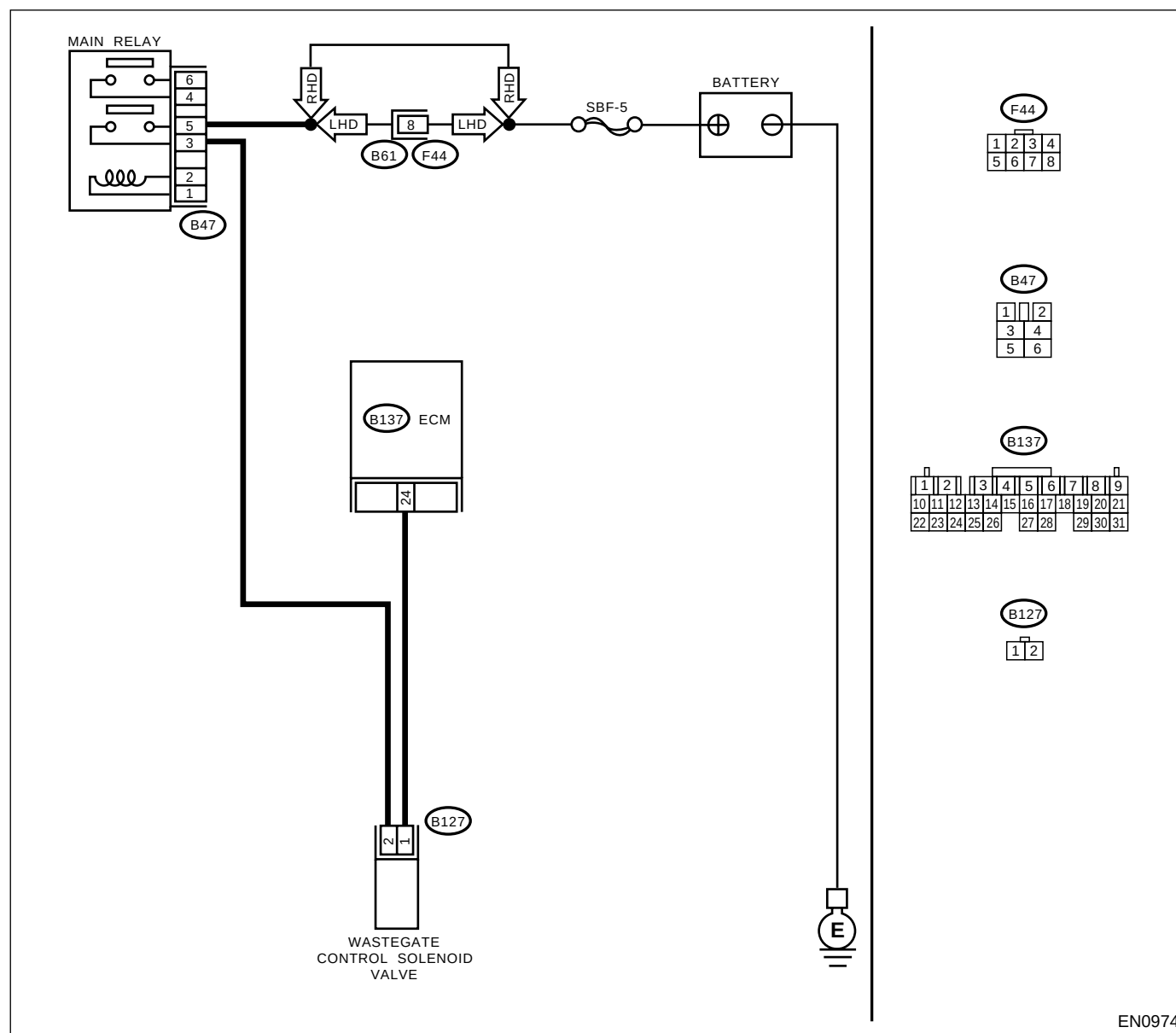
AA:DTC P0244 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (HIGH INPUT) —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0245 or P0246?	Inspect DTC P0245 or P0246 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace wastegate control solenoid valve. <Ref. to FU(DOHC TURBO)-40, Wastegate Control Solenoid Valve.>

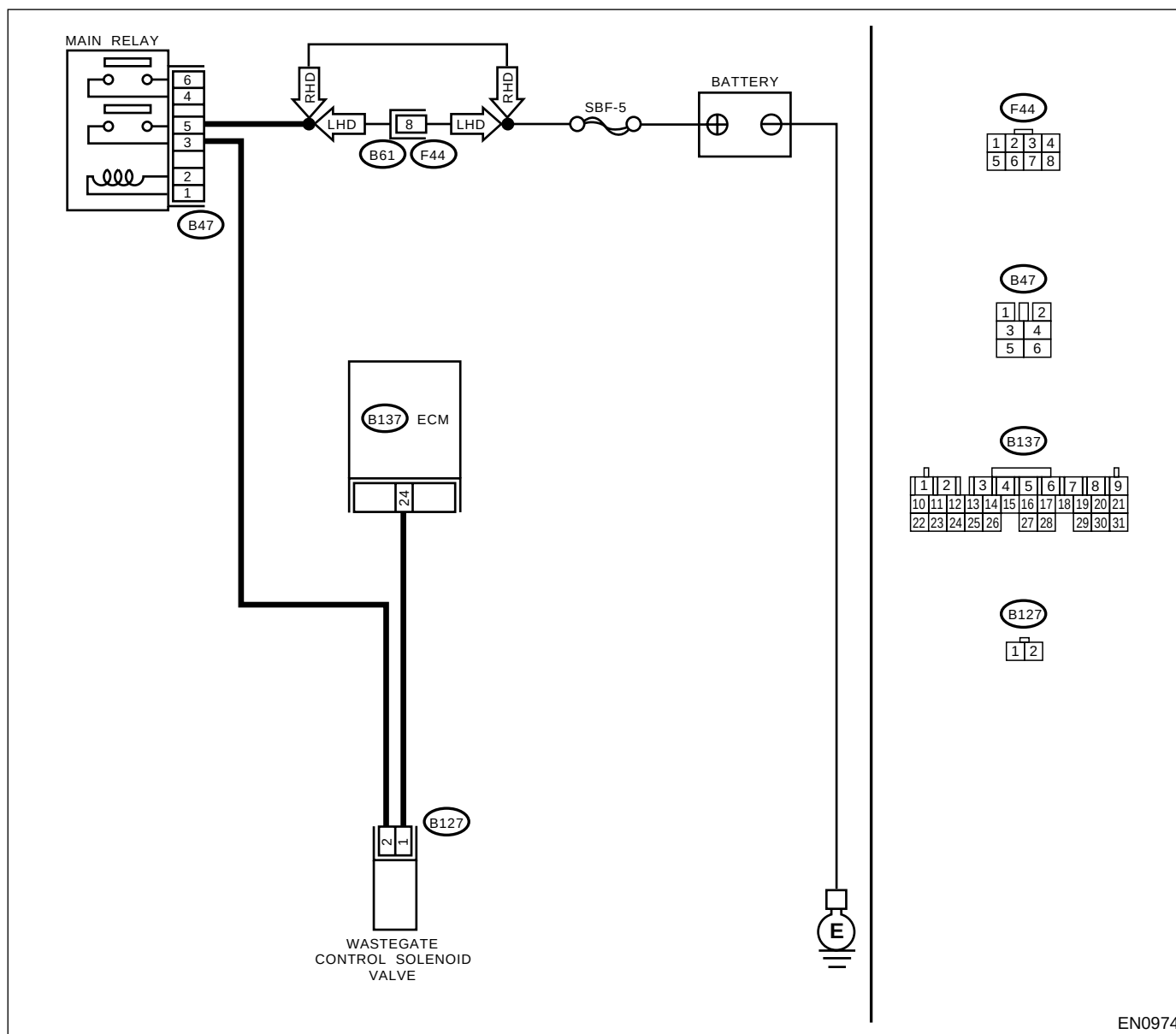
AB:DTC P0245 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0974

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B137) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Even if MIL 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.
2 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from wastegate control solenoid valve and ECM. 3) Measure resistance of harness between wastegate control solenoid valve connector and engine ground. Connector & terminal (B127) No. 1 — Engine ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and wastegate control solenoid valve connector.	Go to step 3.
3 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure resistance of harness between ECM and wastegate control solenoid valve of harness connector. Connector & terminal (B137) No. 24 — (B127) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair 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
4 CHECK WASTEGATE 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 resistance between 30 and 34 Ω ?	Go to step 5.	Replace wastegate control solenoid valve. <Ref. to FU(DOHC TURBO)-40, Wastegate Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure voltage between wastegate control solenoid valve and engine ground. Connector & terminal (B127) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 6.	Repair open circuit in harness between main relay and wastegate control solenoid valve connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
6	CHECK POOR CONTACT. Check poor contact in wastegate control solenoid valve connector.	Is there poor contact in wastegate control solenoid valve connector?	Repair 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.

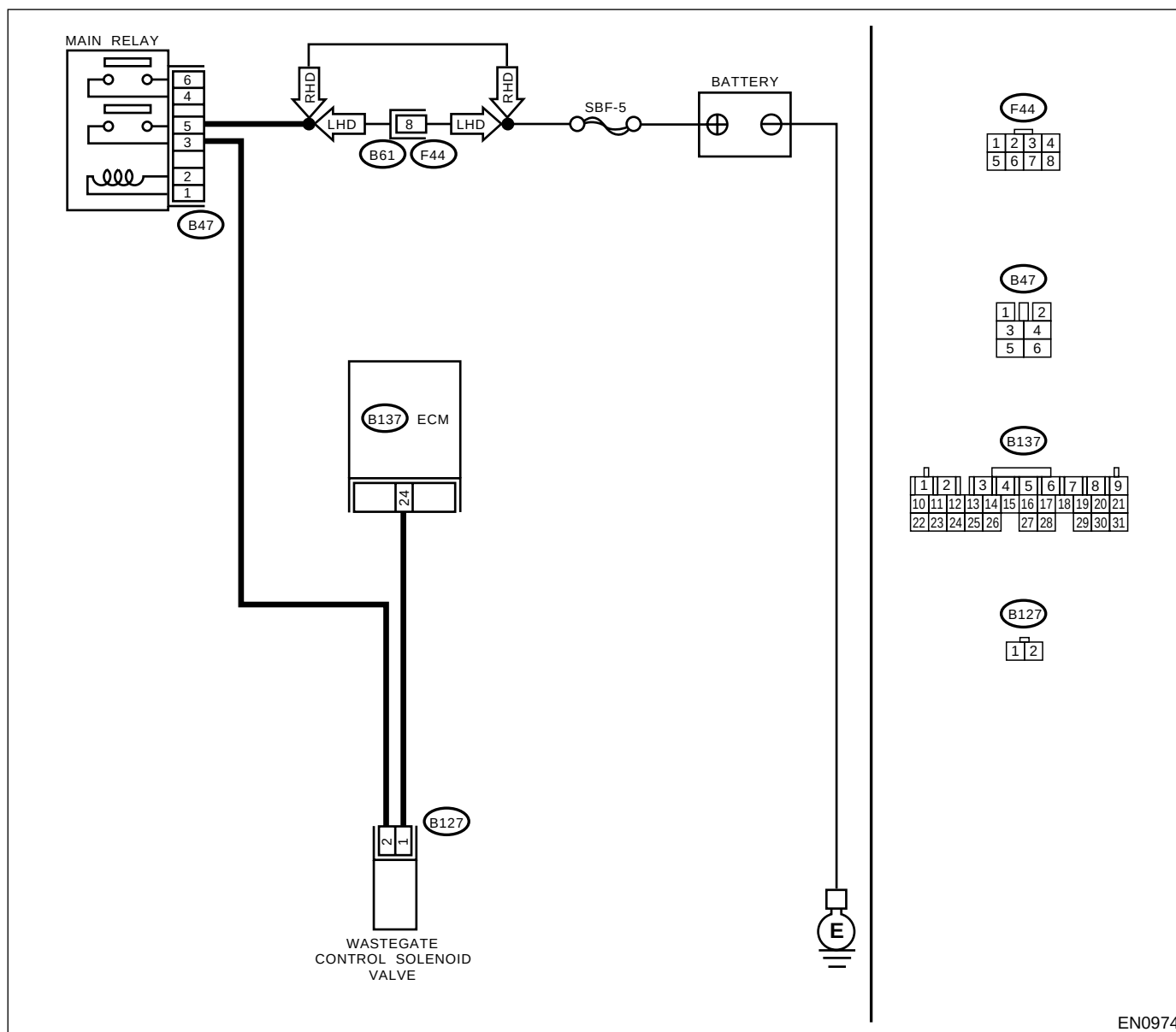
AC:DTC P0246 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0974

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. Connector & terminal (B137) No. 24 (+) — Chassis ground (-):	Is the voltage more than 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?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>
3 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from wastegate control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. Connector & terminal (B137) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Go to step 4.
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Measure resistance between wastegate control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace wastegate control solenoid valve <Ref. to FU(DOHC TURBO)-40, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>

AD:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(DOHC TURBO)-156, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AE:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(DOHC TURBO)-156, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AF:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(DOHC TURBO)-156, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AG: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:

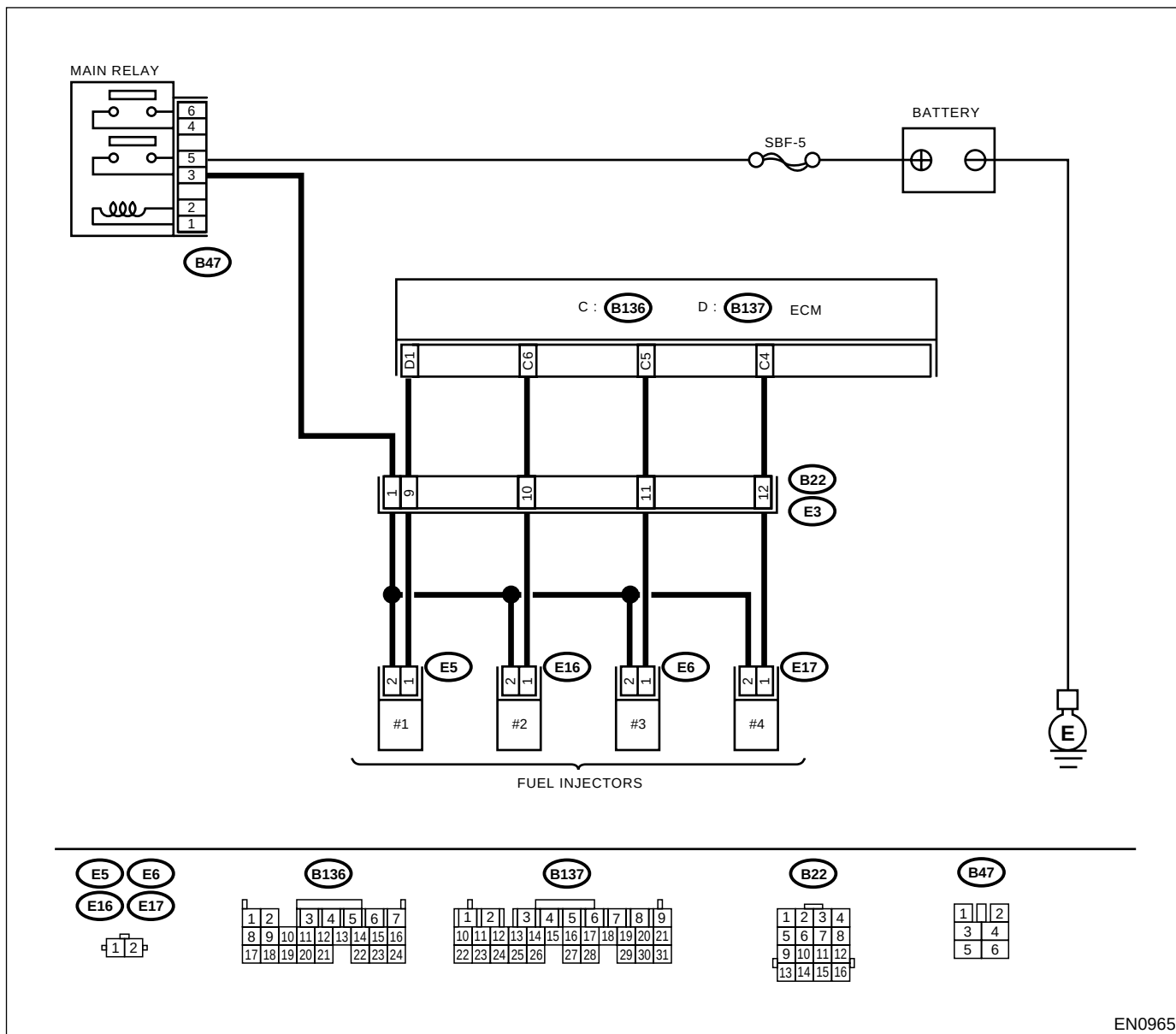
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0965

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P0117, P0118 or P0125?	Inspect DTC P0106, P0107, P0108, P0117, P0118 or P0125 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.
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 (—):	Is the voltage more than 10 V?	Go to step 7.
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) Disconnect connector from ECM. 4) 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 resistance less than 10 Ω ?	Repair ground short circuit in harness between fuel injector and ECM connector.
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 (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:	Is the resistance less than 1 Ω ?	Go to step 5.
5	CHECK FUEL INJECTOR. Measure resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance between 5 and 20 Ω ?	Go to step 6.
			Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
			Replace faulty fuel injector. <Ref. to FU(DOHC TURBO)-35, Fuel Injector.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: • 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 (B137) No. 1 (+) — Chassis ground (-): #2 (B136) No. 6 (+) — Chassis ground (-): #3 (B136) No. 5 (+) — Chassis ground (-): #4 (B136) No. 4 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-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 resistance less than 1 Ω ?	Replace faulty fuel injector <Ref. to FU(DOHC TURBO)-35, Fuel Injector.> and ECM <Ref. to FU(DOHC TURBO)-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?	Tighten camshaft position sensor or crankshaft position sensor.	Go to step 10.
10 CHECK CRANKSHAFT SPROCKET. Remove timing belt cover.	Is crankshaft sprocket rusted or does it have broken teeth?	Replace crankshaft sprocket. <Ref. to ME(DOHC TURBO)-57, Crankshaft Sprocket.>	Go to step 11.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500CRANKSHAFT SOCKET	Is timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(DOHC TURBO)-47, Timing Belt Assembly.>	Go to step 12 .
12 CHECK FUEL LEVEL.	Is the fuel meter indication 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 (MIL). 1)Clear memory using Subaru Select Monitor. <Ref. to EN(DOHC TURBO)-38, Clear Memory Mode.> 2)Start engine, and drive the vehicle more than 10 minutes.	Is the MIL coming 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?	Finish diagnostics operation, if the engine has no abnormality. NOTE: Ex. Remove spark plug cord, etc.	Repair poor contact. NOTE: In this case, repair the following: • 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
15 CHECK AIR INTAKE SYSTEM.	Is there a fault in air intake system?	Repair air intake system. NOTE: Check the following items: • 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 .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
16 CHECK MISFIRE SYMPTOM. 1) Turn ignition switch to ON. 2) Read diagnostic trouble code (DTC). • Subaru Select Monitor <Ref. to EN(DOHC TURBO)-28, 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.	Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC?	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?	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?	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?	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?	Go to step 25 .	Go to step 26 .
21 ONLY ONE CYLINDER	Is there a fault in that cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-142, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22 GROUP OF #1 AND #2 CYLINDERS	Are there faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • 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(DOHC TURBO)-60, Ignition Control System.>	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-142, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
23 GROUP OF #3 AND #4 CYLINDERS	Are there faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • 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(DOHC TURBO)-60, Ignition Control System.>	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-142, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24 GROUP OF #1 AND #3 CYLINDERS	Are there faults in #1 and #3 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-142, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25 GROUP OF #2 AND #4 CYLINDERS	Are there faults in #2 and #4 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-142, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26 CYLINDER AT RANDOM	Is the engine idle rough?	Go to DTC P0171 and P0172. <Ref. to EN(DOHC TURBO)-142, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

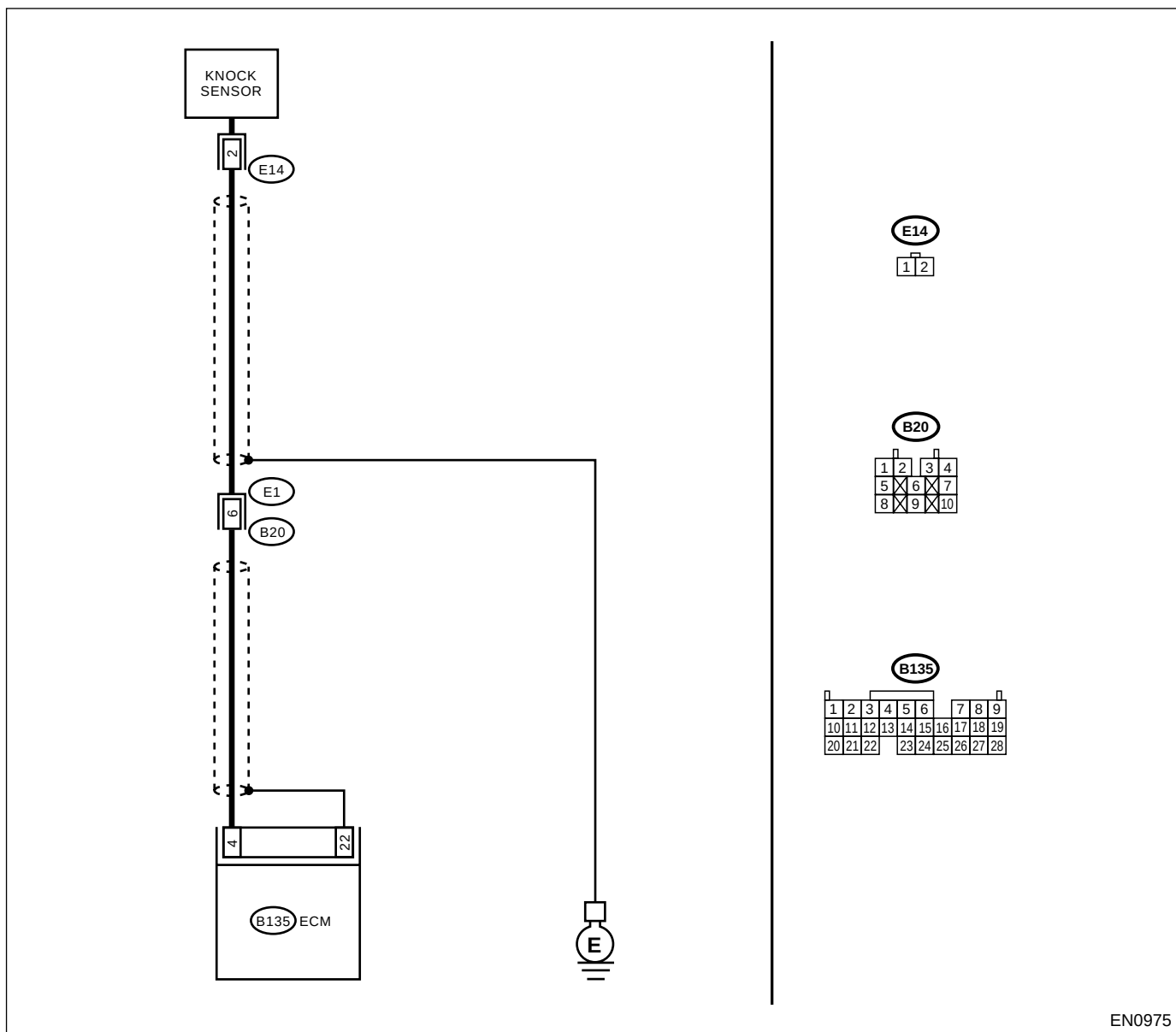
AH:DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0975

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR 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:	Is the resistance more than 700 kΩ?	Go to step 2.	Repair 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
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 resistance more than 700 kΩ?	Go to step 3.	Repair 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
3 CHECK CONDITION OF KNOCK SENSOR INSTALLATION.	Is the knock sensor installation bolt tightened securely?	Replace knock sensor. <Ref. to FU(DOHC TURBO)-30, Knock Sensor.>	Tighten knock sensor installation bolt securely.

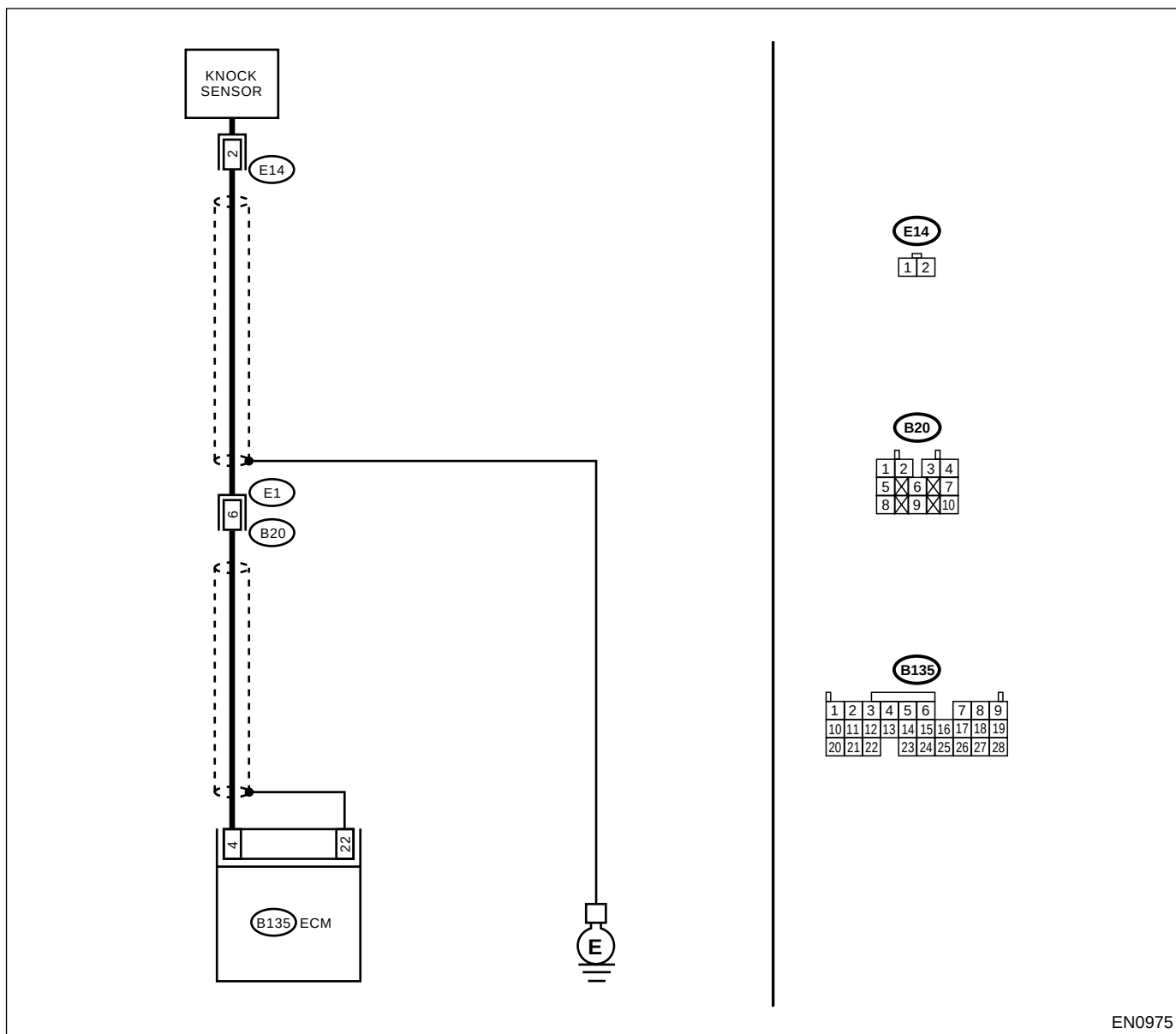
AI: DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0975

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 4 — Chassis ground:	Is the resistance less than 400 k Ω ?	Go to step 2.	Go to step 3.
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 resistance less than 400 k Ω ?	Replace knock sensor. <Ref. to FU(DOHC TURBO)-30, 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.
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. 4 (+) — Chassis ground (-):	Is the voltage more than 2 V?	Even if MIL 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.

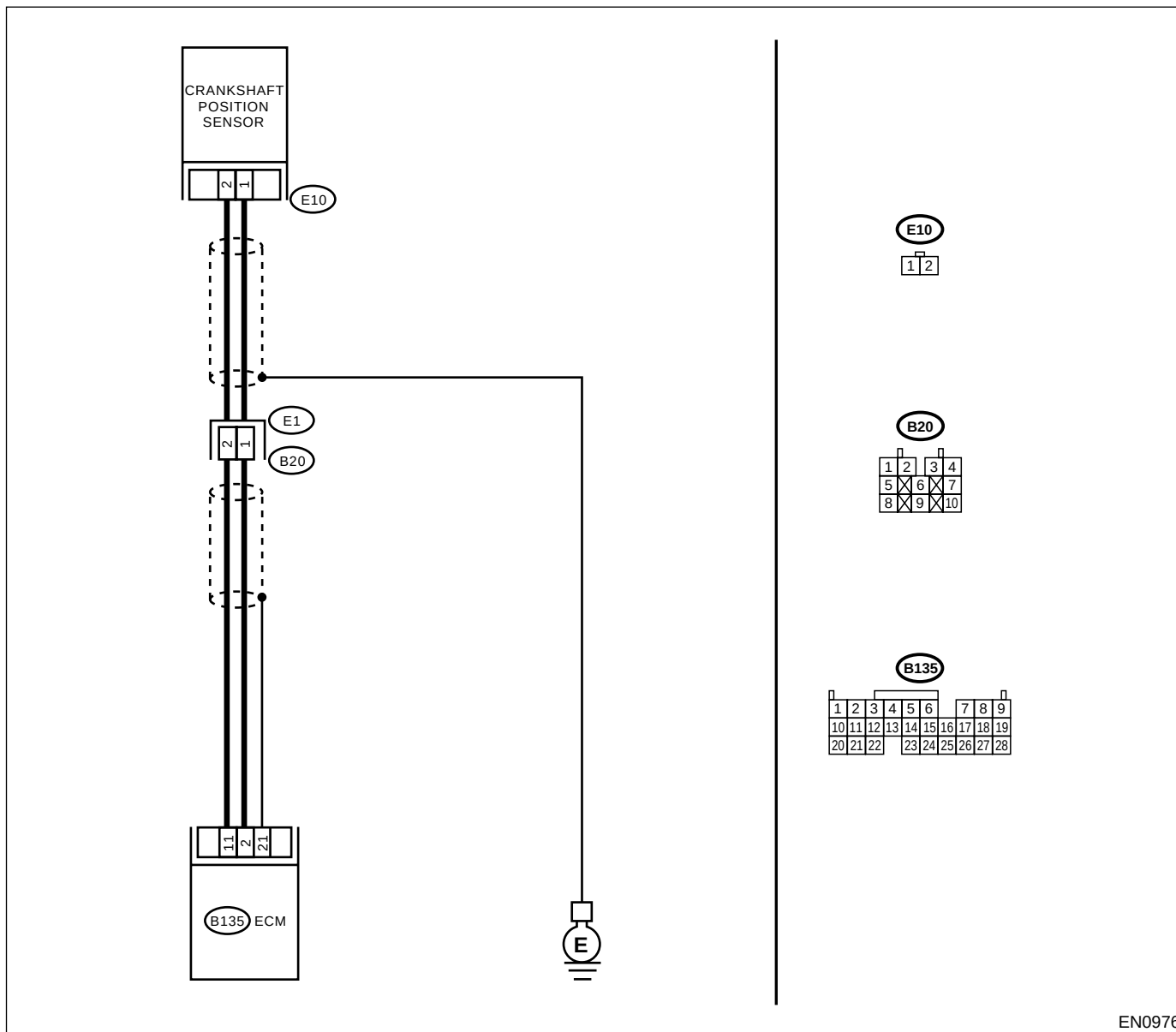
AJ:DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0976

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. 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. Connector & terminal (E10) No. 1 — Engine ground:	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • 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.
2 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure resistance of harness between crankshaft position sensor connector and engine ground. Connector & terminal (E10) No. 1 — Engine ground:	Is the resistance less than 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.
3 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure resistance of harness between crankshaft position sensor connector and engine ground. Connector & terminal (E10) No. 2 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 5.	Tighten crankshaft position sensor installation bolt securely.
5 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 resistance between 1 and 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace crankshaft position sensor. <Ref. to FU(DOHC TURBO)-28, Crankshaft Position Sensor.>

ENGINE (DIAGNOSTICS)

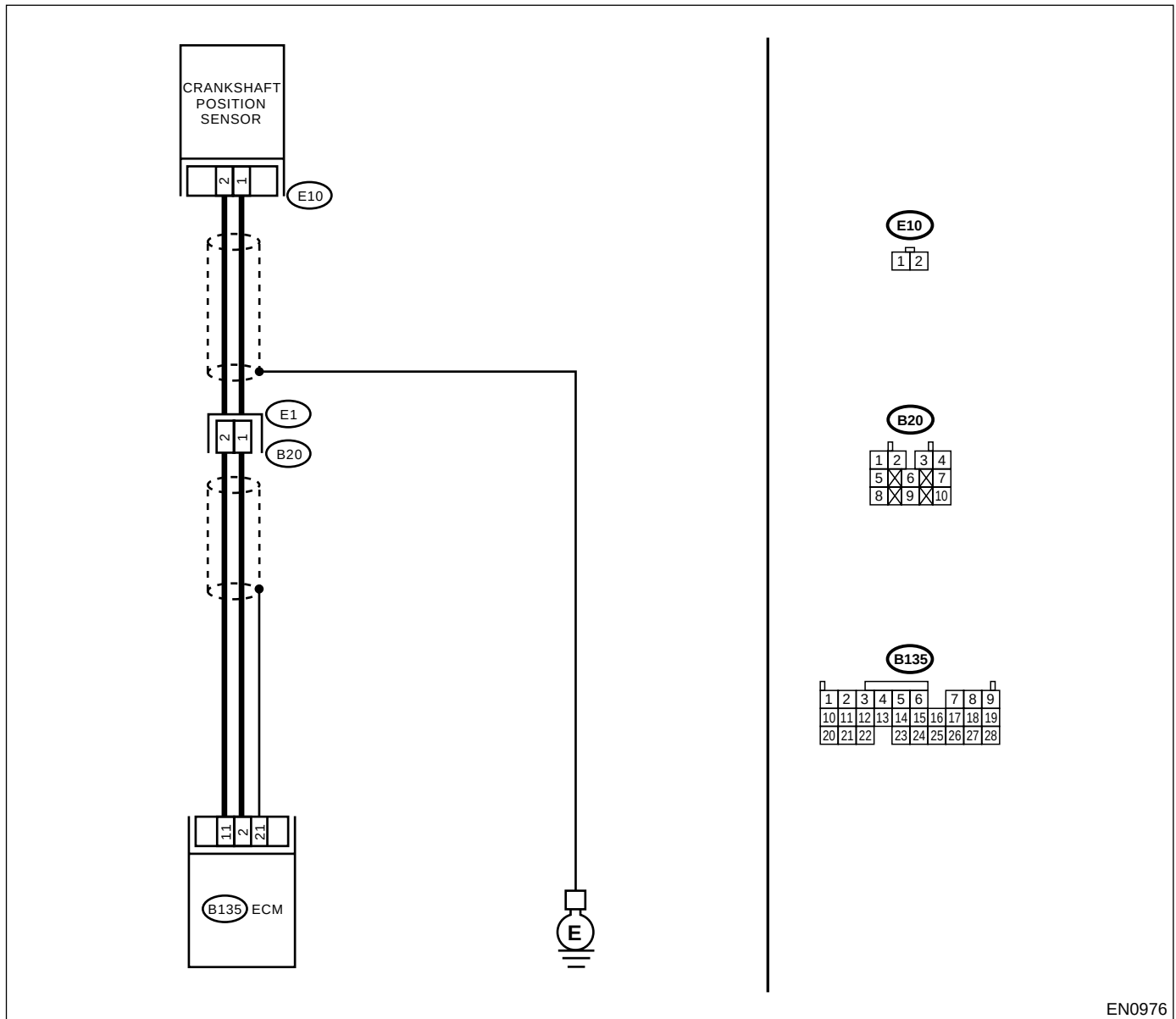
AK:DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0335?	Inspect DTC P0335 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, 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?	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?	Replace crankshaft sprocket. <Ref. to FU(DOHC TURBO)-28, Crankshaft Position Sensor.>	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. ST 499987500CRANKSHAFT SOCKET	Is timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(DOHC TURBO)-47, Timing Belt Assembly.>	Replace crankshaft position sensor. <Ref. to FU(DOHC TURBO)-28, Crankshaft Position Sensor.>

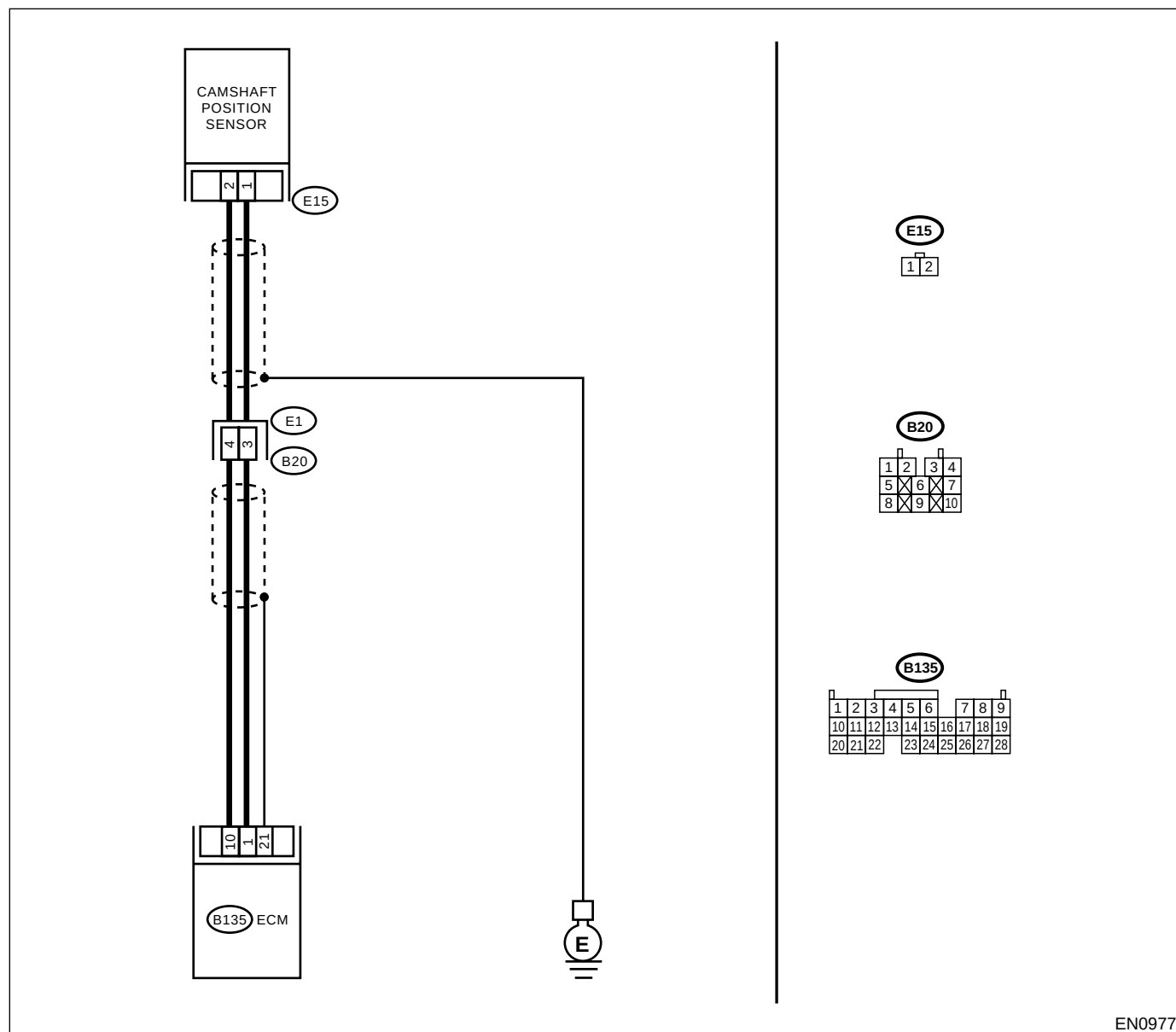
AL:DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0977

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 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:	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • 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.
2 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 resistance less than 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 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. 2 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 5.	Tighten camshaft position sensor installation bolt securely.
5 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 resistance between 1 and 4 kΩ?	Repair poor contact in camshaft position sensor connector.	Replace camshaft position sensor. <Ref. to FU(DOHC TURBO)-29, Camshaft Position Sensor.>

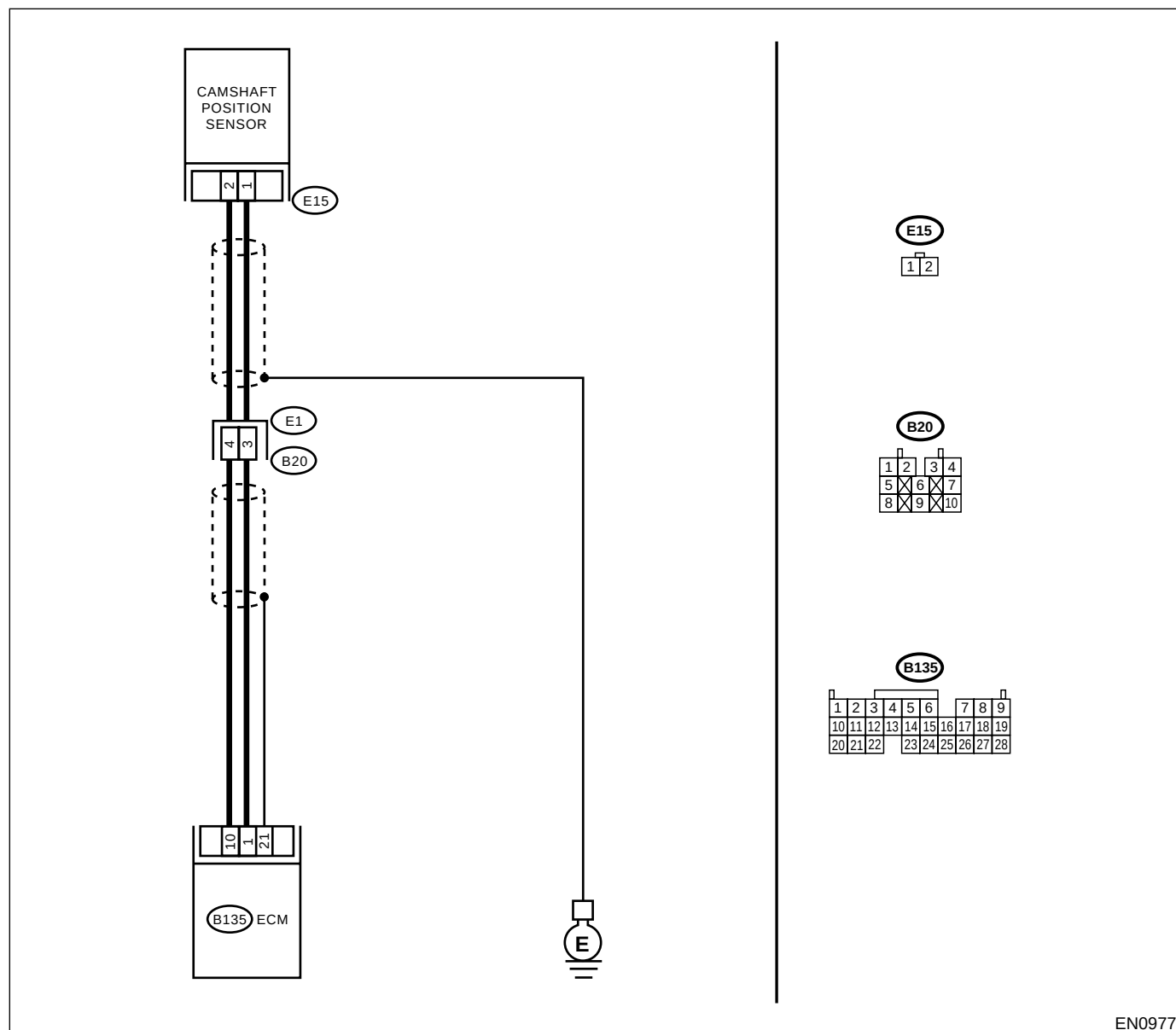
AM:DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0977

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0340?	Inspect DTC P0340 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, 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:	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • 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 resistance less than 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 resistance less than 5 Ω?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • 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?	Go to step 6.	Tighten camshaft position sensor installation bolt securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 resistance between 1 and 4 kΩ?	Go to step 7.	Replace camshaft position sensor. <Ref. to FU(DOHC TURBO)-29, Camshaft Position Sensor.>
7 CHECK CONDITION OF CAMSHAFT POSITION SENSOR. Turn ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 8.	Tighten camshaft position sensor installation bolt securely.
8 CHECK CAMSHAFT SPROCKET. Remove front belt cover. <Ref. to ME(SOHC)-45, Belt Cover.>	Are camshaft sprocket teeth cracked or damaged?	Replace camshaft sprocket. <Ref. to ME(DOHC TURBO)-56, Camshaft Sprocket.>	Go to step 9.
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. ST 499207100CAMSHAFT SPROCKET WRENCH	Is timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(DOHC TURBO)-47, Timing Belt Assembly.>	Replace camshaft position sensor. <Ref. to FU(DOHC TURBO)-29, Camshaft Position Sensor.>

AN:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —

• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

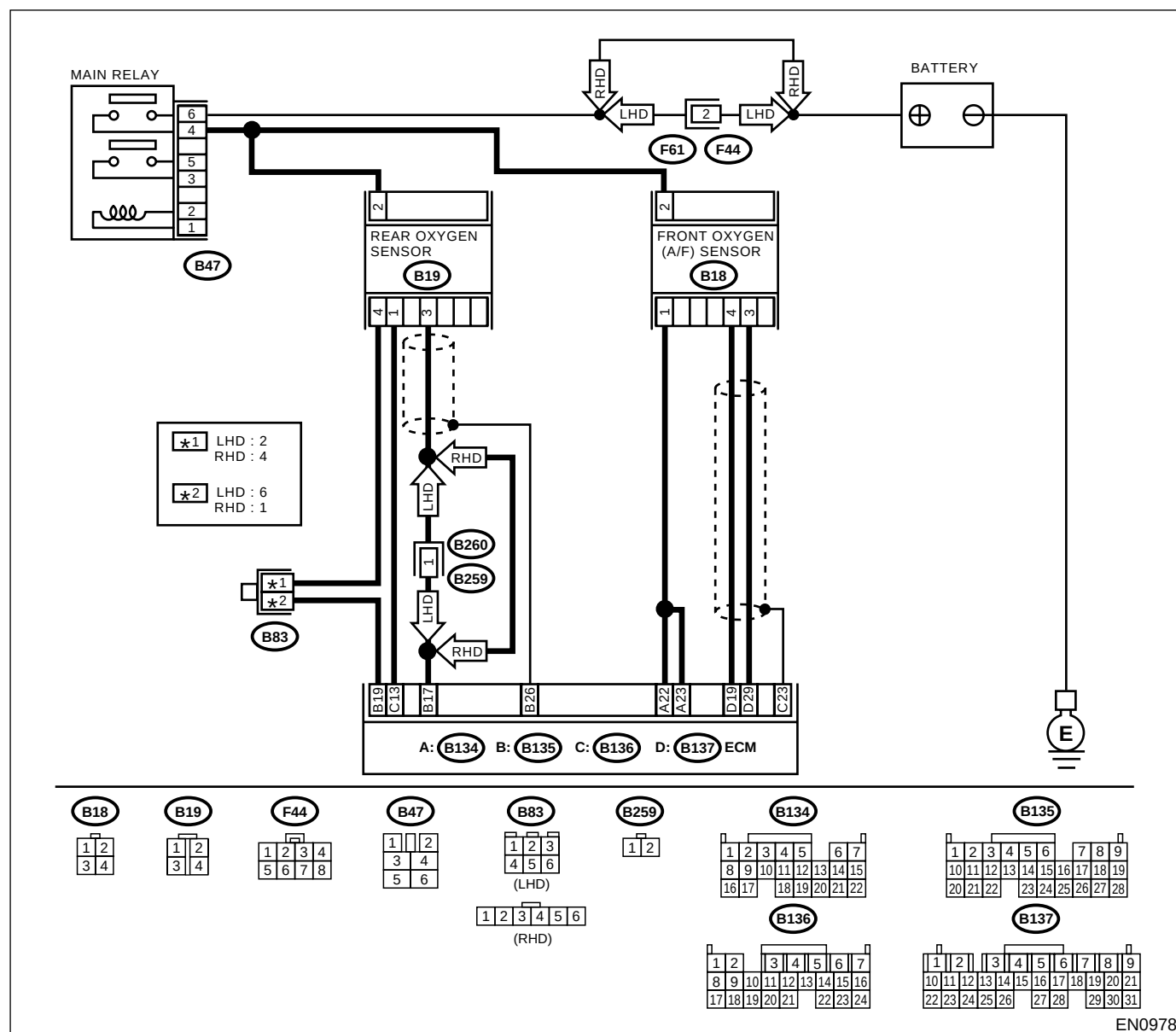
• **TROUBLE SYMPTOM:**

- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0978

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031, P0032, P0131, P0132, P0133, P1130, P1131, P1134, P1139, P0037, P0038, P0136 and P0139?	Inspect the relevant DTC using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, 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. •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?	Repair or replace exhaust system. <Ref. to EX(DOHC TURBO)-2, General Description.>	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?	Replace front catalytic converter <Ref. to EC(DOHC TURBO)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(DOHC TURBO)-4, 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?	Replace front catalytic converter. <Ref. to EC(DOHC TURBO)-3, Front Catalytic Converter.>	Contact with your Subaru distributor. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

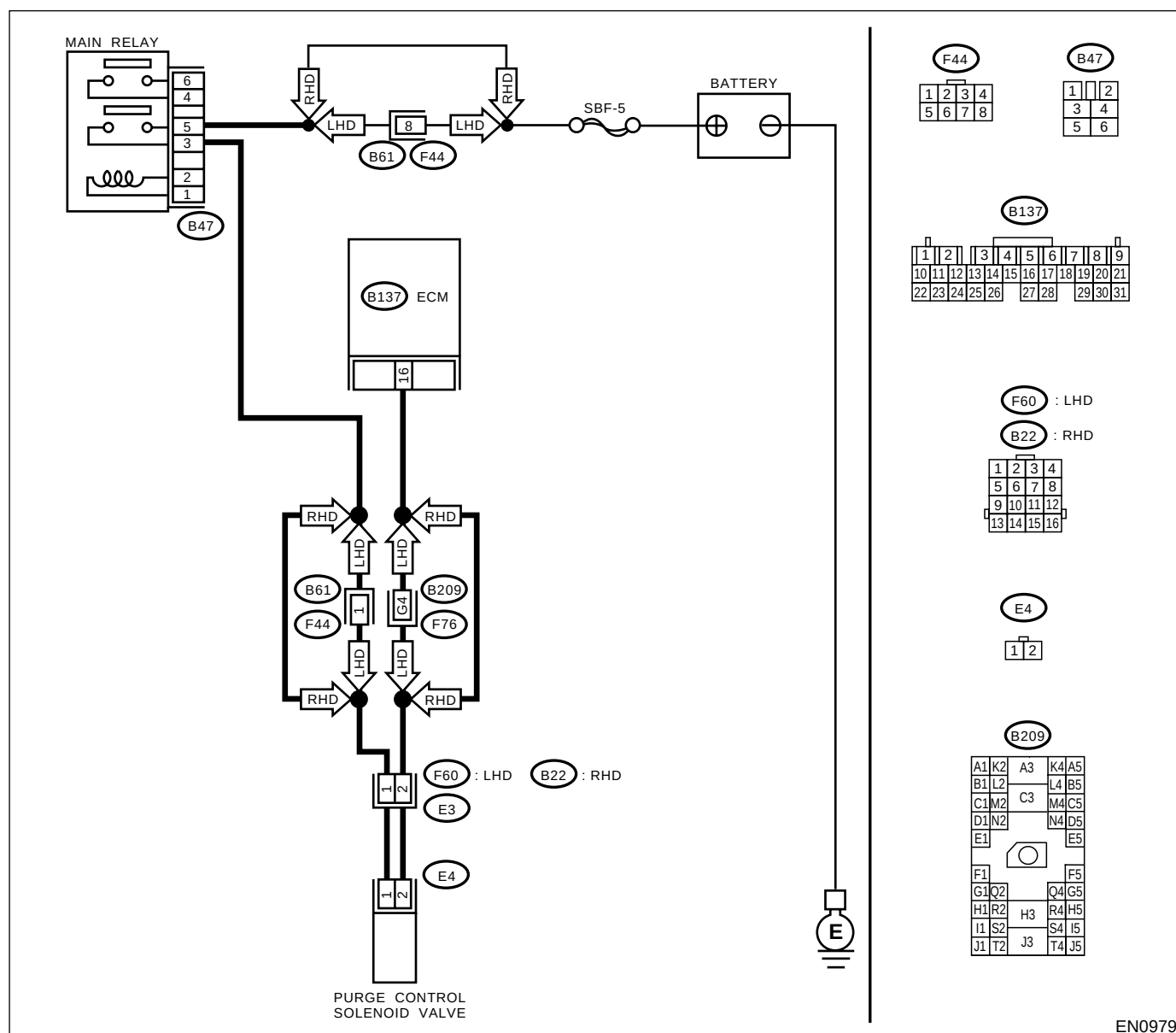
AO:DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0979

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 10 V?	Even if MIL 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.
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 resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step 3.
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 resistance less than 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
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 resistance between 10 and 100 Ω ?	Go to step 5.	Replace purge control solenoid valve. <Ref. to EC(DOHC TURBO)-7, Purge Control Solenoid Valve.>
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 (-):	Is the voltage more than 10 V?	Go to step 6.	Repair open circuit in harness between main relay and purge control solenoid valve connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
6	CHECK POOR CONTACT. Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge 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)

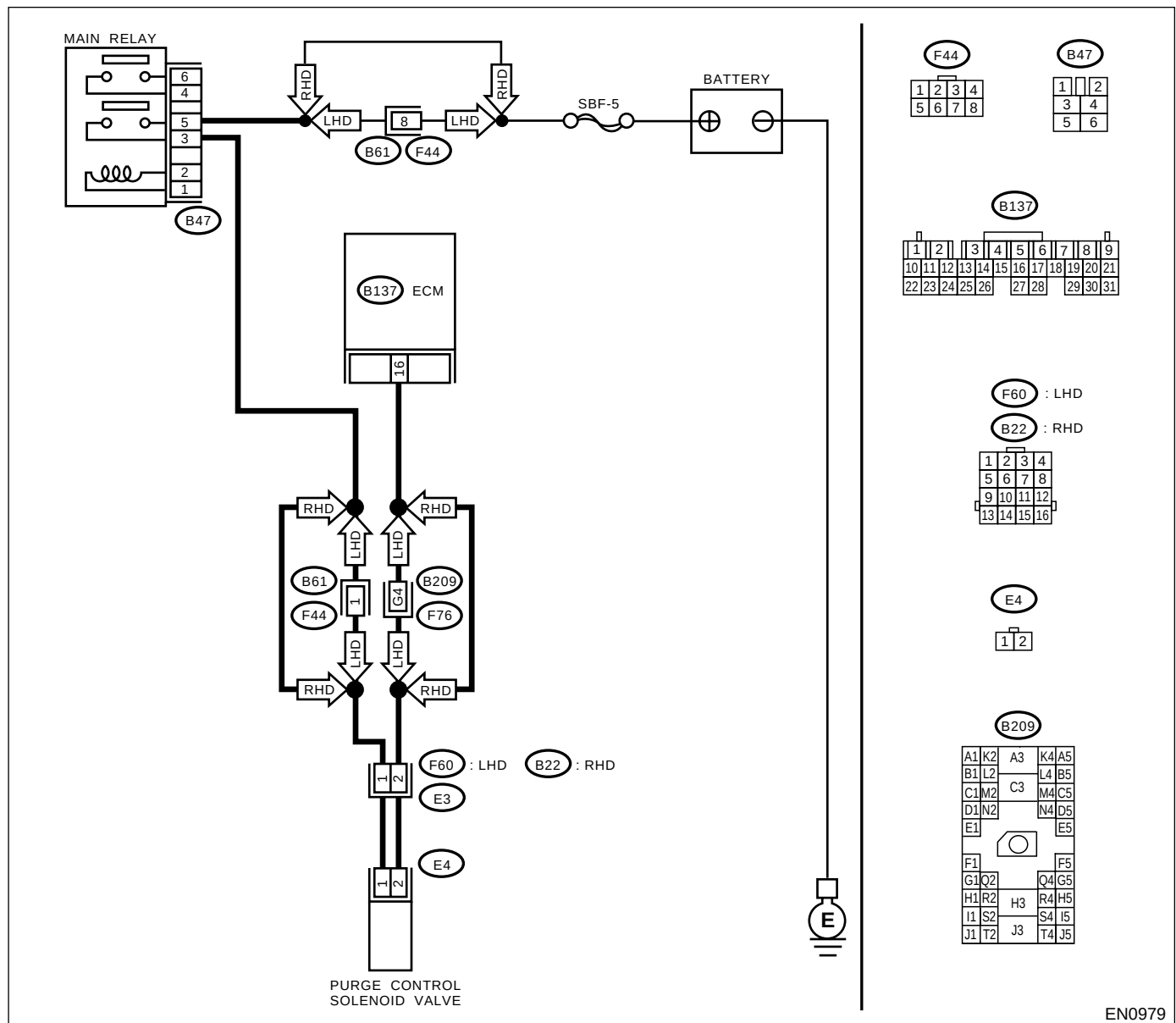
AP:DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0979

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 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. 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(DOHC TURBO)-39, Compulsory Valve Operation Check Mode.> Connector & terminal (B137) No. 16 (+) — Chassis ground (-):	Does voltage change between 0 and 10 V?	Go to step 2.	Even if MIL light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2 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 (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 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. Connector & terminal (B137) No. 16 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Go to step 5.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Measure resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace purge control solenoid valve <Ref. to EC(DOHC TURBO)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

**AQ:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE
PROBLEM —**

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

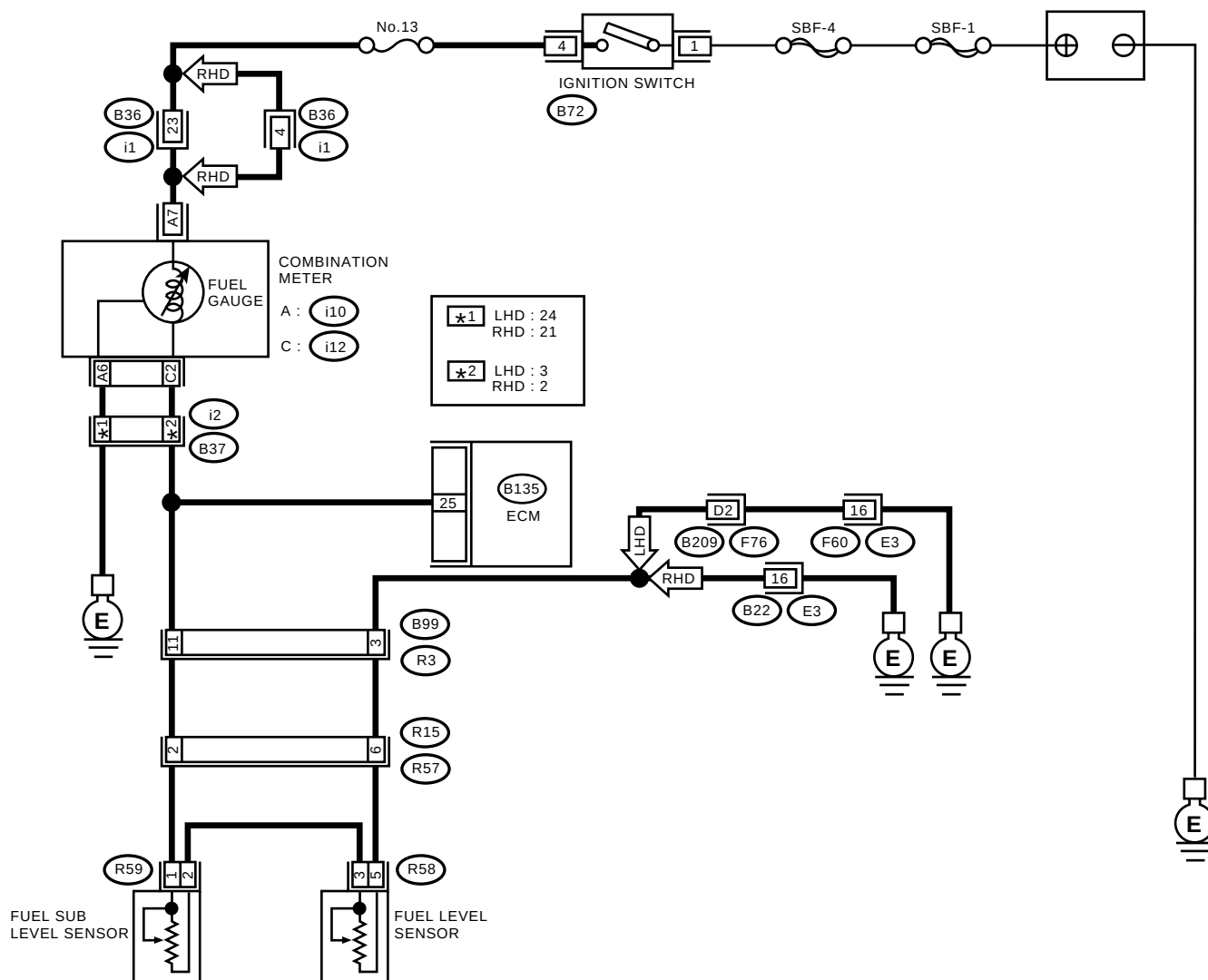
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



B72
1 2
3 4

i1
1 2 3 4 5 6
7 8 9 10 11 12 13 14

i10
1 2 3 4 5 6 7 8 9 10

i12
1 2 3 4 5 6
7 8 9 10 11 12 13 14

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

R15
1 2
3 4 5 6

R59
1 2

R58
1 2 3
4 5 6

F60 : LHD
B22 : RHD
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16

B209
A1 K2 A3 K4 A5
B1 L2 L4 B5
C1 M2 M4 C5
D1 N2 N4 D5
E1 E5
F1 F5
G1 Q2 Q4 G5
H1 R2 R4 H5
I1 S2 H3 S4 I5
J1 T2 J3 T4 J5

B36
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24

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
(LHD)
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
(RHD)

EN0980

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0462 or P0463?	Inspect DTC P0462 or P0463 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, 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(DOHC TURBO)-58, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(DOHC TURBO)-59, Fuel Sub Level Sensor.>

AR:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

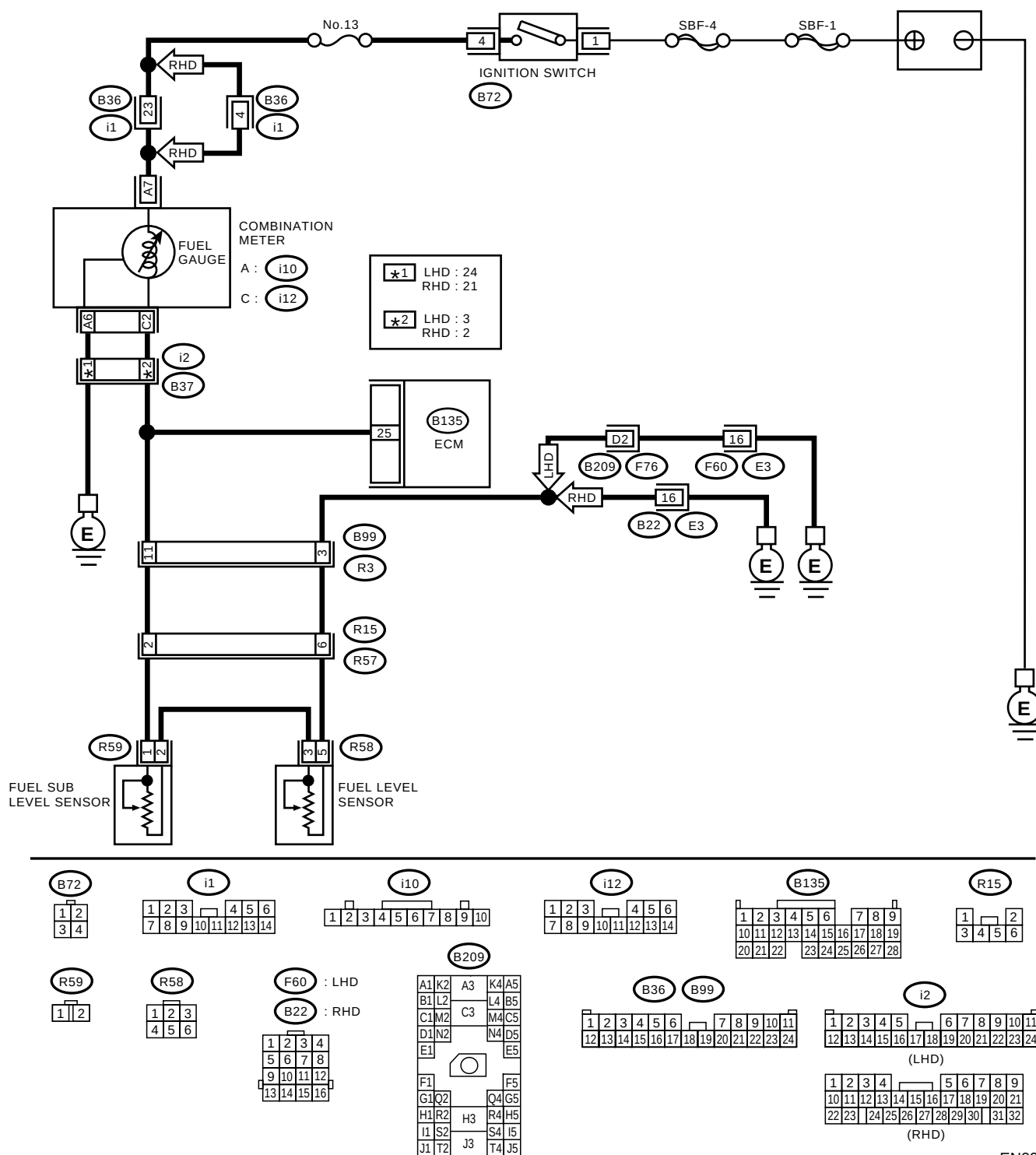
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0980

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does speedometer and tachometer operate 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 (B135) No. 25 (+) — Chassis ground (-):	Is the voltage less than 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. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.>	Does the value change less than 0.12 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Even if MIL 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 (-):	Is the voltage more than 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), (i12) and ECM connector. 3) Measure resistance between ECM and chassis ground. Connector & terminal (B135) No. 25 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 6.	Repair ground short circuit in harness between ECM and combination meter connector.
6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. Measure resistance between ECM and combination meter connector. Connector & terminal (B135) No. 25 — (i12) No. 2:	Is the resistance less than 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

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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:	Is the resistance more than 1 MΩ?	Go to step 8.	Repair ground short circuit in fuel tank cord.
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:	Is the resistance more than 1 MΩ?	Go to step 9.	Repair ground short circuit in fuel tank cord.
9 CHECK FUEL LEVEL SENSOR. 1)Remove fuel pump assembly. <Ref. to FU(DOHC TURBO)-56, Fuel Pump.> 2)Measure resistance between fuel level sensor and terminals with its float set to the full position. Terminals No. 3 — No. 5:	Is the resistance between 0.5 and 2.5 Ω?	Go to step 10.	Replace fuel level sensor.
10 CHECK FUEL SUB LEVEL SENSOR. 1)Remove fuel sub level sensor. <Ref. to FU(DOHC TURBO)-59, 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 resistance between 0.5 and 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace fuel sub level sensor.

AS:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

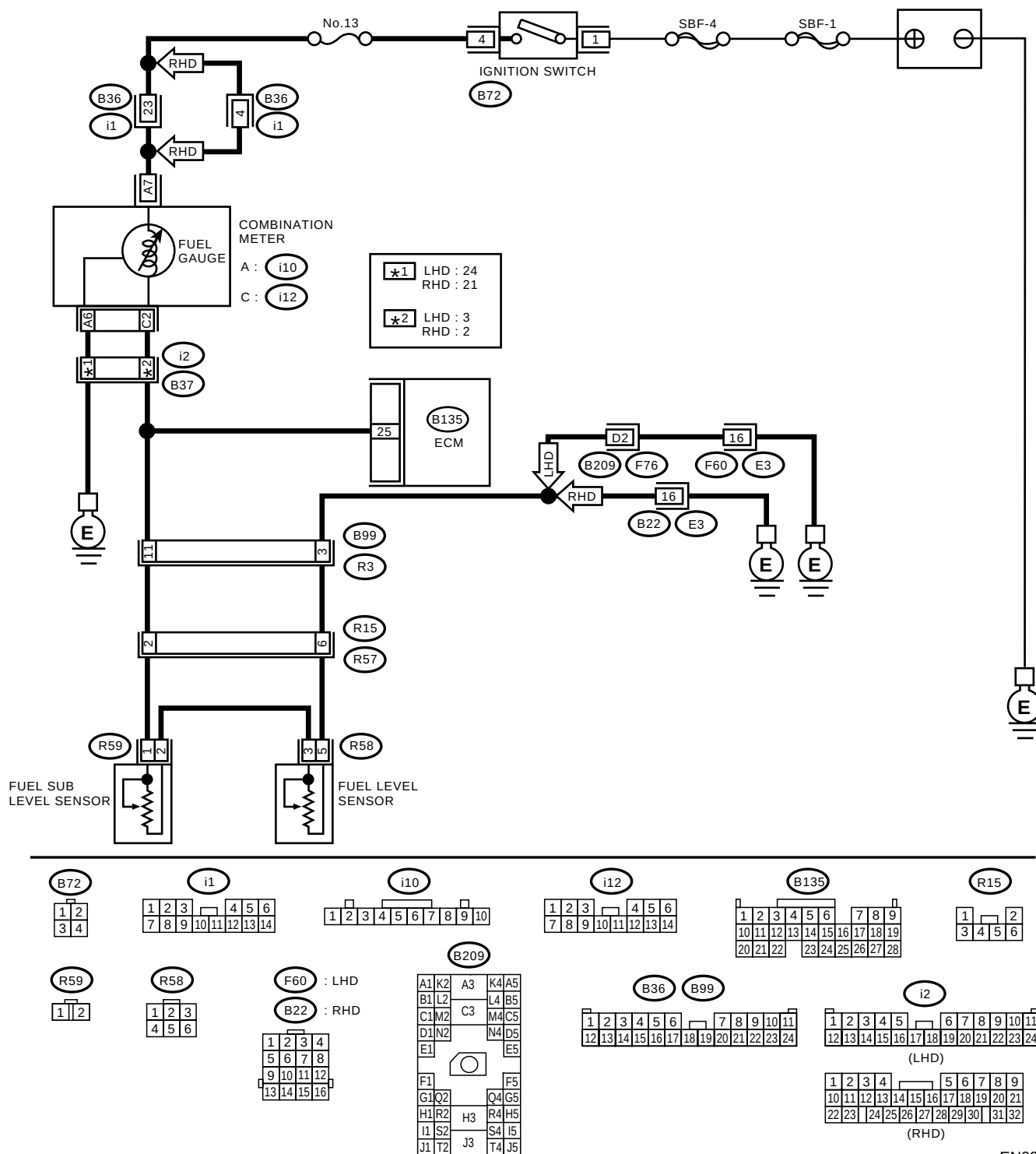
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0980

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does speedometer and tachometer operate 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 (B135) No. 25 (+) — Chassis ground (-):	Is the voltage more than 4.75 V?	Go to step 3.	Even if MIL 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 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 (-):	Is the voltage more than 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 resistance less than 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 resistance less than 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
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. 5:	Is the resistance less than 10 Ω ?	Go to step 7.	Repair open circuit between coupling connector and fuel level sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
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. 3 — (R59) No. 2:	Is the resistance less than 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 resistance less than 10 Ω ?	Go to step 9.	Repair open circuit between coupling connector and fuel sub level sensor.
9	CHECK FUEL LEVEL SENSOR. 1)Remove fuel pump assembly. <Ref. to FU(DOHC TURBO)-56, Fuel Pump.> 2)While moving fuel level sensor float up and down, measure resistance between fuel level sensor terminals. Terminals No. 3 — No. 5:	Is the resistance more than 53 Ω ?	Replace fuel level sensor. <Ref. to FU(DOHC TURBO)-58, Fuel Level Sensor.>	Go to step 10.
10	CHECK FUEL SUB LEVEL SENSOR. 1)Remove fuel sub level sensor. <Ref. to FU(DOHC TURBO)-59, 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:	Is the resistance more than 45 Ω ?	Replace fuel sub level sensor. <Ref. to FU(DOHC TURBO)-59, Fuel Sub Level Sensor.>	Replace combination meter. <Ref. to IDI-19, Combination Meter Assembly.>

AT:DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT—

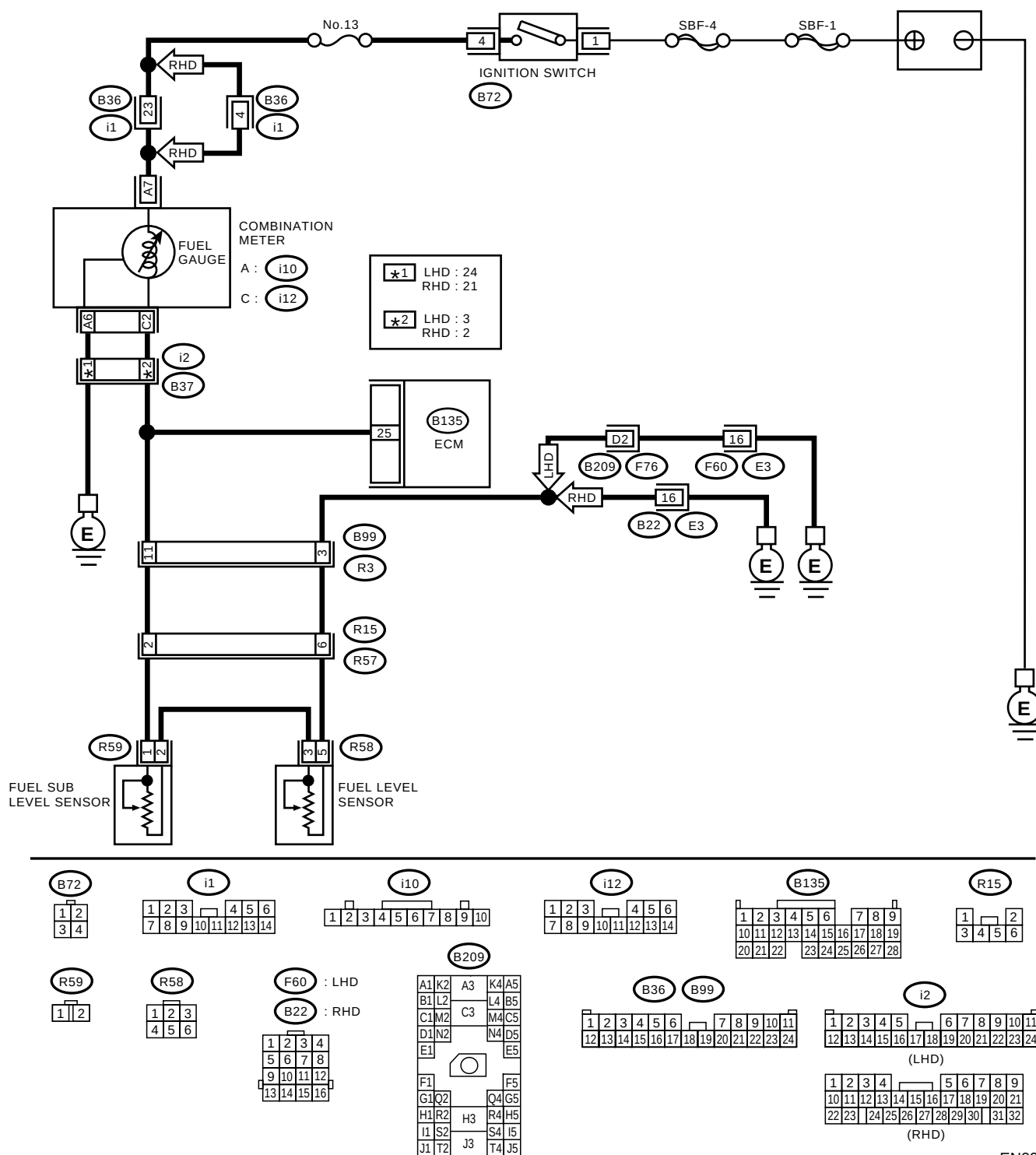
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0980

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0462 or P0463?	Inspect DTC P0462 or P0463 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL LEVEL SENSOR. 1)Remove fuel pump assembly. <Ref. to FU(DOHC TURBO)-56, 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. 5:	Does the resistance change smoothly between approx. 0.5 Ω and approx. 52 Ω?	Go to step 3.	Replace fuel level sensor. <Ref. to FU(DOHC TURBO)-58, 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(DOHC TURBO)-59, 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 between approx. 0.5 Ω and approx. 44 Ω?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace fuel sub level sensor. <Ref. to FU(DOHC TURBO)-59, Fuel Sub Level Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AU:DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Radiator fan does not operate properly.
 - Overheating

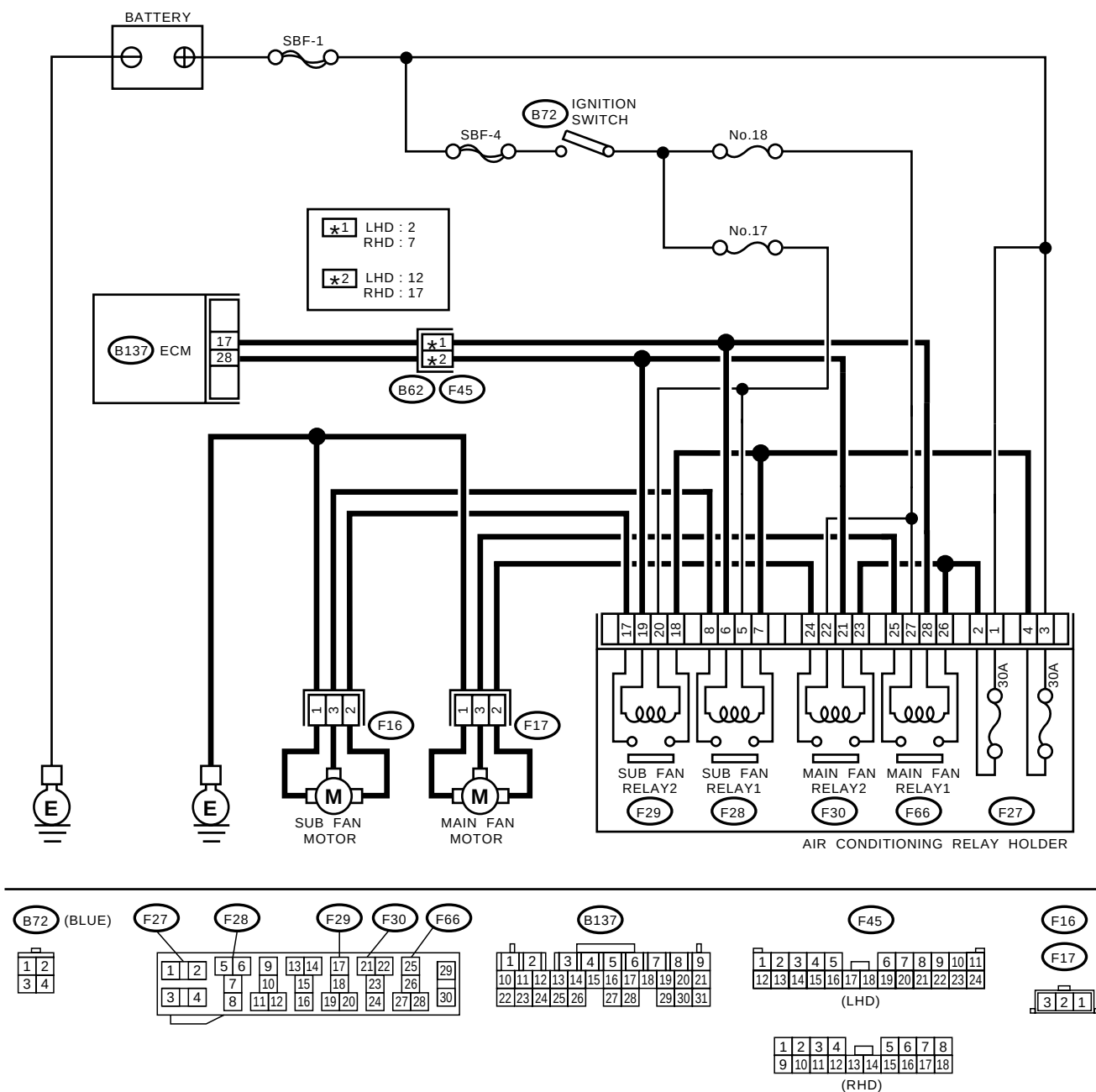
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN0981

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 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 terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> Connector & terminal (B137) No. 17 (+) — Chassis ground (-): (B137) No. 28 (+) — Chassis ground (-):	Does voltage change between 0 and 10 V?	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK GROUND SHORT CIRCUIT IN RADIATOR MAIN FAN RELAY CONTROL CIRCUIT. 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B137) No. 17 — Chassis ground: (B137) No. 28 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in radiator main fan relay control circuit.	Go to step 3.
3 CHECK POWER SUPPLY FOR RELAY. 1) Remove main fan relay 1 and 2 from A/C relay holder. 2) Turn ignition switch to ON. 3) Measure voltage between fuse and relay box (F/B) connector and chassis ground. Connector & terminal (F66) No. 27 (+) — Chassis ground (-): (F30) No. 22 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4 CHECK MAIN FAN RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between main fan relay terminals. Terminal No. 27 — No. 28: (Main fan relay 1) No. 22 — No. 21: (Main fan relay 2)	Is the resistance between 87 and 107 Ω ?	Go to step 5.	Replace main fan relay.
5 CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT. Measure resistance of harness between ECM and main fan relay connector. Connector & terminal (B137) No. 17 — (F66) No. 28: (B137) No. 28 — (F30) No. 21:	Is the resistance less than 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
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?	Repair poor contact in ECM or main fan relay connector.	Contact with your Subaru distributor service.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AV:DTC P0483 — COOLING FAN FUNCTION PROBLEM —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

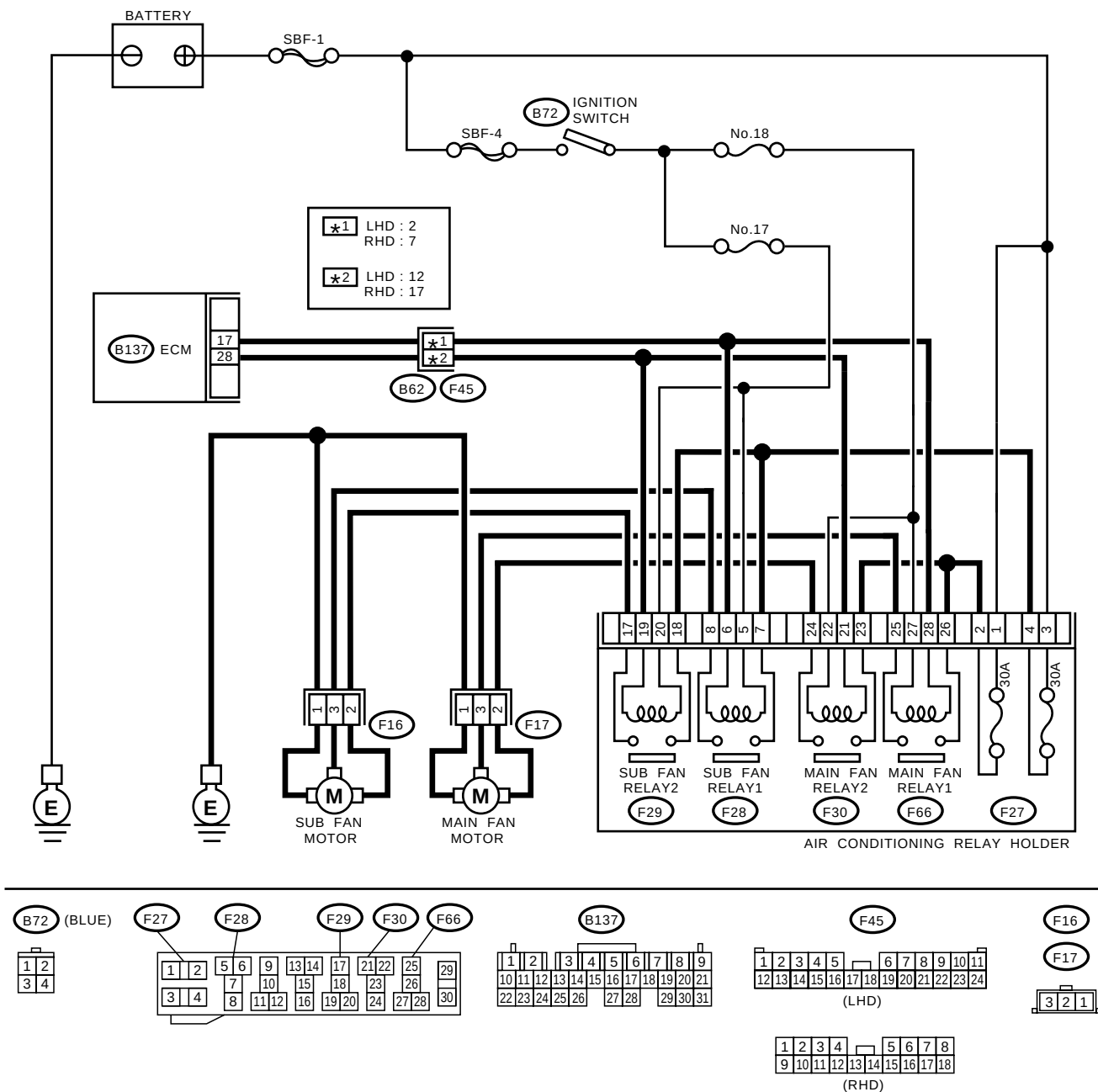
NOTE:

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:



EN0981

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC on display?	Inspect the relevant DTC using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>	Check radiator fan, fan motor and thermostat. <Ref. to CO-9, Radiator Main Fan System.> and <Ref. to CO-17, Radiator Sub Fan System.> If thermostat is stuck, replace thermostat.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

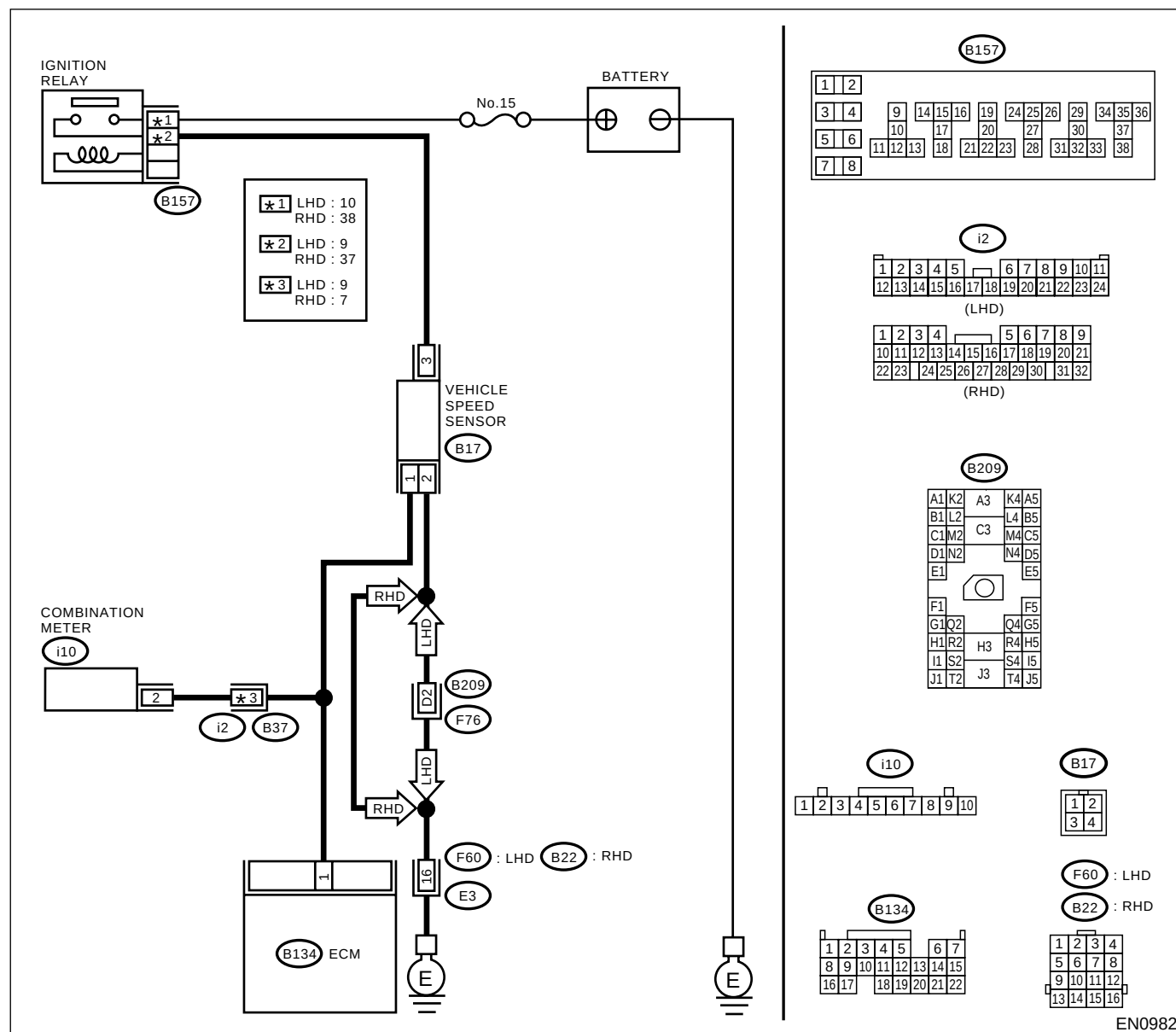
AW:DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0982

Step	Check	Yes	No
1	CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does speedometer operate normally?	Go to step 2.
			Check speedometer and vehicle speed sensor. <Ref. to IDI-21, Speedometer.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 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. <i>Connector & terminal</i> <i>(B134) No. 1 — (i10) No. 2:</i>	Is the resistance less than 10 Ω ?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • 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

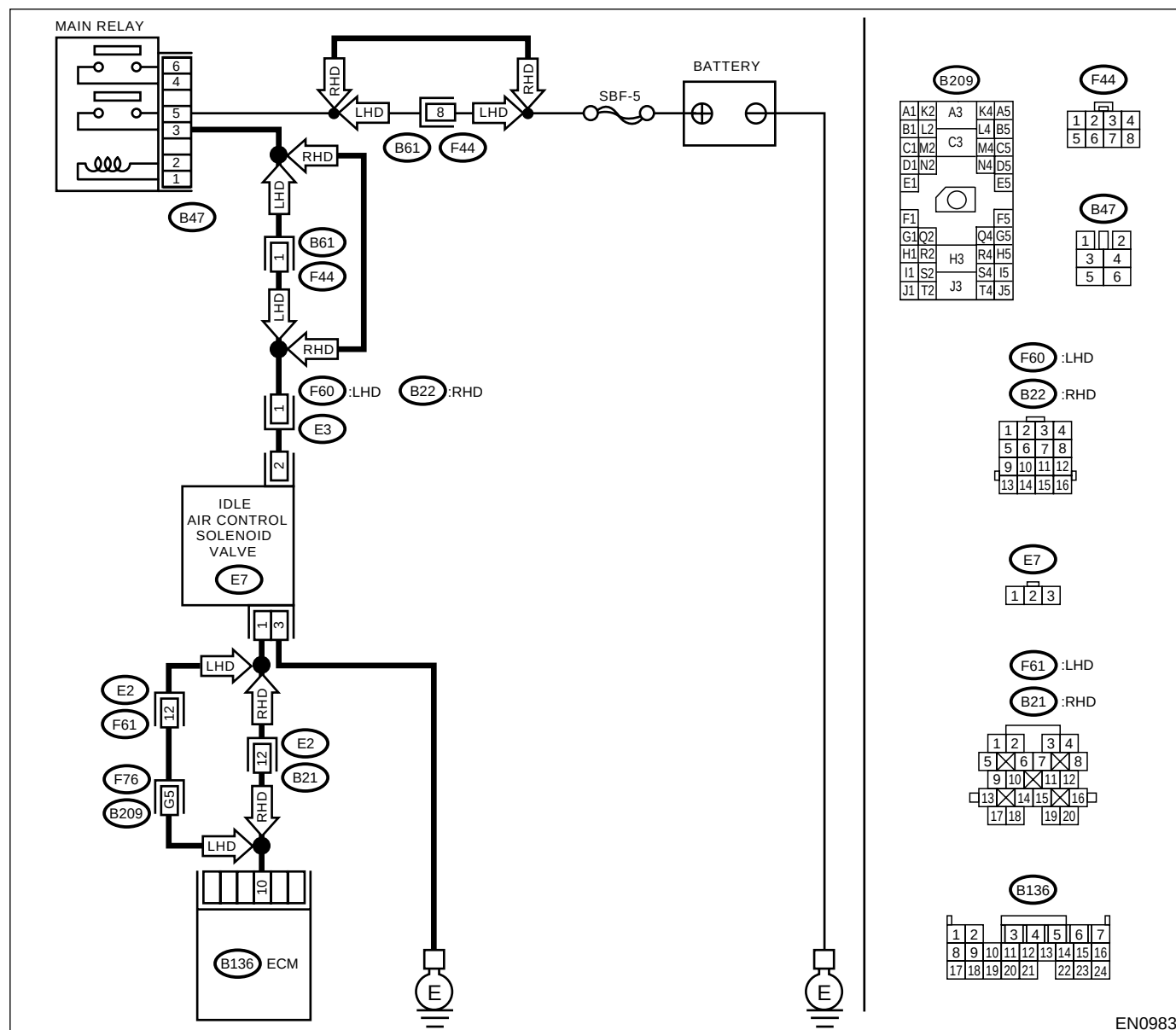
AX:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0983

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0508 or P509?	Inspect DTC P0505 or P1505 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step 2.
2 CHECK IDLE AIR CONTROL SOLENOID VALVE. 1)Turn ignition switch to OFF. 2)Remove idle air control solenoid valve from throttle body. <Ref. to FU(DOHC TURBO)-34, REMOVAL, Idle Air Control Solenoid Valve.> 3)Using an air gun, force air into idle air control solenoid valve by-pass air inlet. Confirm that forced air subsequently escapes from both main air passage and assist air passage.	Does air flow out?	Go to step 4.	Replace idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-34, Idle Air Control Solenoid Valve.> After replace, Go to step 3.
3 CHECK IDLE AIR CONTROL SOLENOID VALVE DUTY RATIO. 1)Turn ignition switch to ON. 2)Start engine, and warm-up the engine. 3)Turn all accessory switches to OFF. 4)Read data of idle air control solenoid valve duty ratio using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 60%?	Go to step 4.	END.
4 CHECK BY-PASS AIR LINE. 1)Turn ignition switch to OFF. 2)Remove idle air control solenoid valve from throttle body. <Ref. to FU(DOHC TURBO)-34, REMOVAL, Idle Air Control Solenoid Valve.> 3)Remove throttle body to intake manifold. <Ref. to FU(DOHC TURBO)-14, REMOVAL, Throttle Body.> 4)Using an air gun, force air into solenoid valve installation area and throttle valve interior. Confirm that forced air subsequently escapes from both these areas.	Does air flow out?	Replace idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-34, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(DOHC TURBO)-14, Throttle Body.>

ENGINE (DIAGNOSTICS)

AY:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

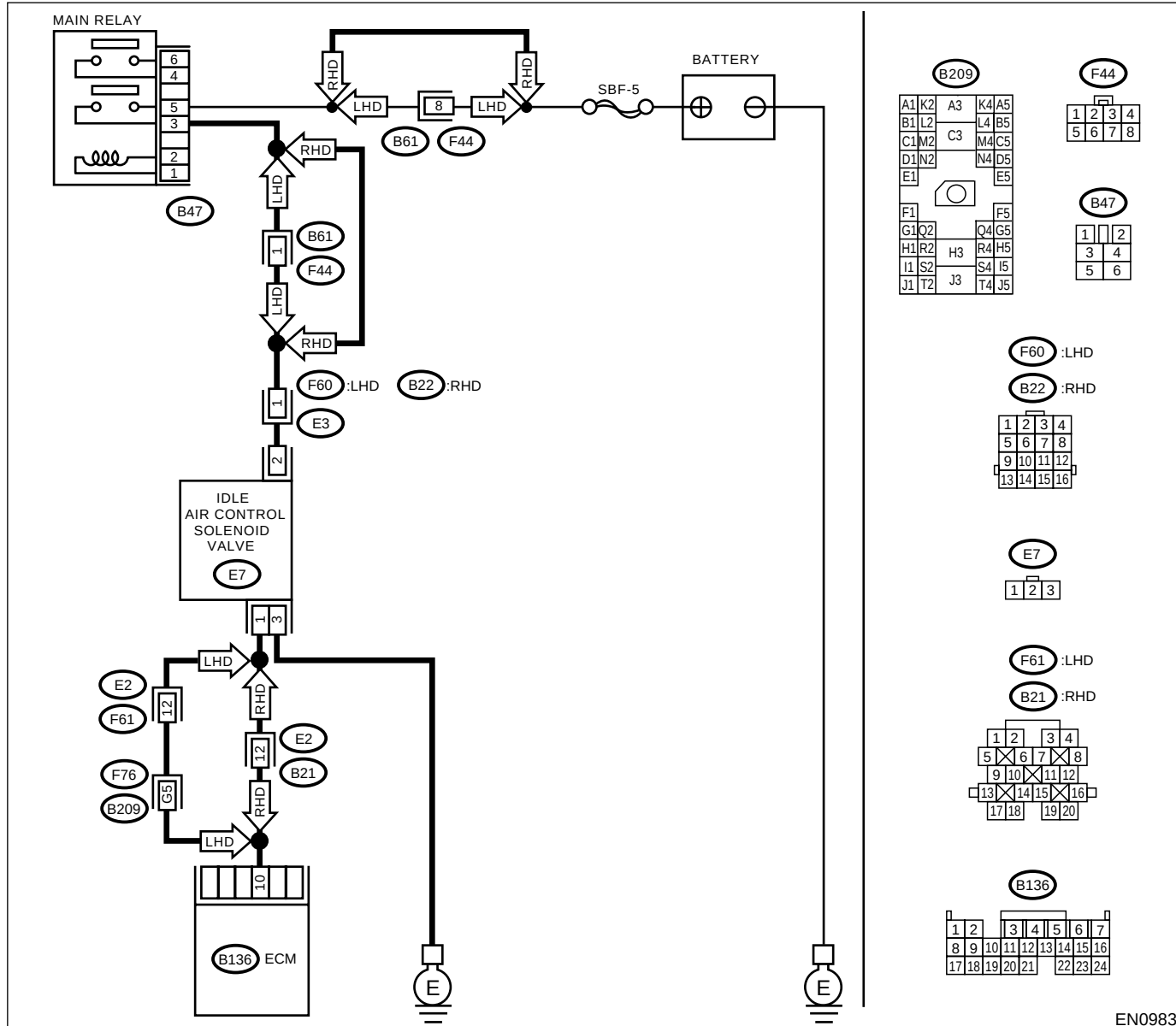
- **TROUBLE SYMPTOM:**

- 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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0508 or P509?	Inspect DTC P0505 or P1505 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step 2.
2 CHECK THROTTLE CABLE.	Does throttle cable have play for adjustment?	Go to step 3.	Adjust throttle cable. <Ref. to SP-9, INSTALLATION, 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. • 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?	Repair air suction and leaks.	Replace idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-34, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

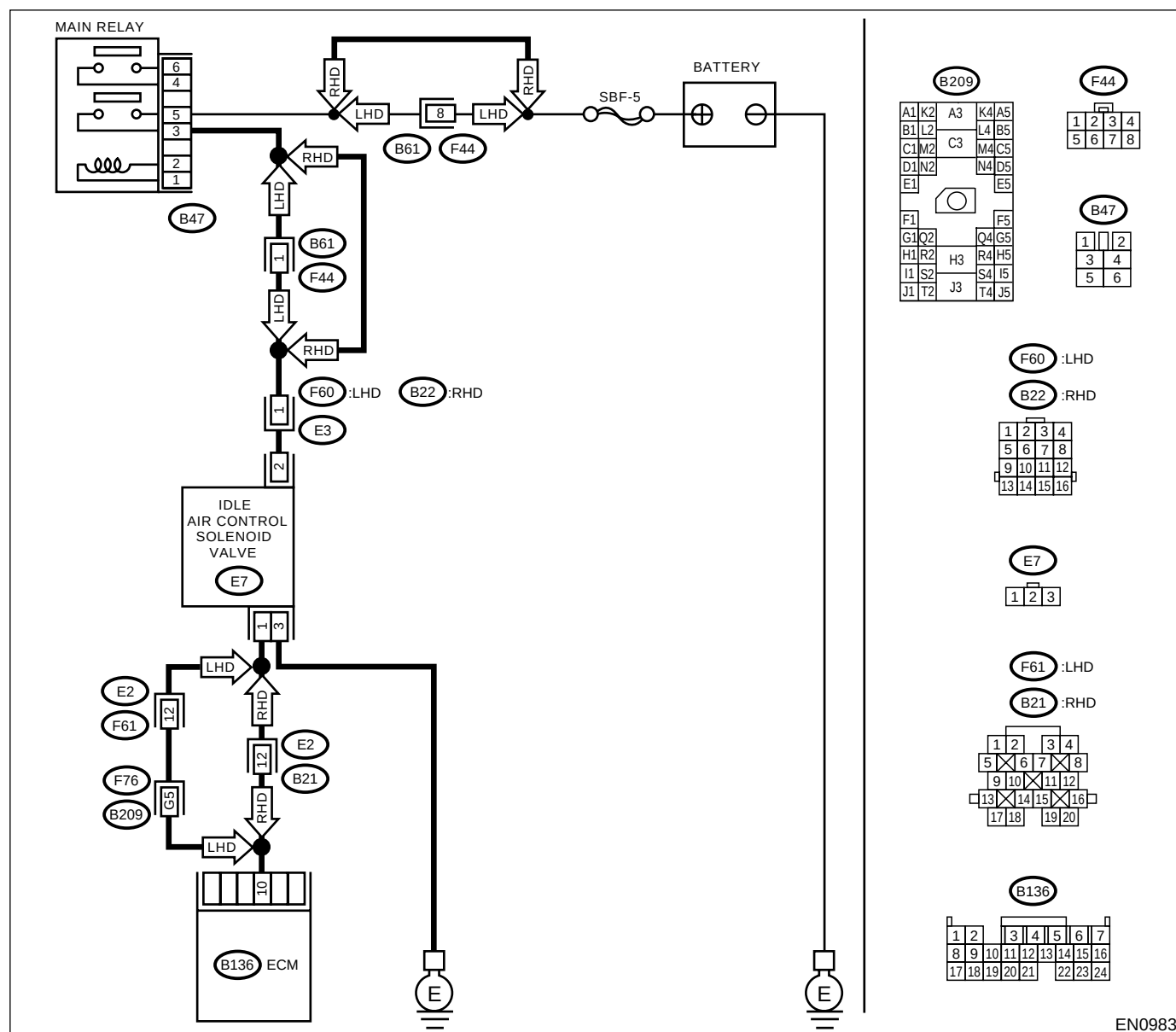
AZ:DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0983

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 3 V?	Repair poor contact in ECM connector.	Go to step 2.
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 (-):	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay 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 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 resistance less than 1 Ω ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
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 resistance less than 10 Ω ?	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step 5.
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 resistance less than 5 Ω ?	Go to step 6.	Repair open circuit in harness between idle air control solenoid valve connector and engine ground terminal.
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?	Repair poor contact in ECM and idle air control solenoid valve connectors.	Replace idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-34, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

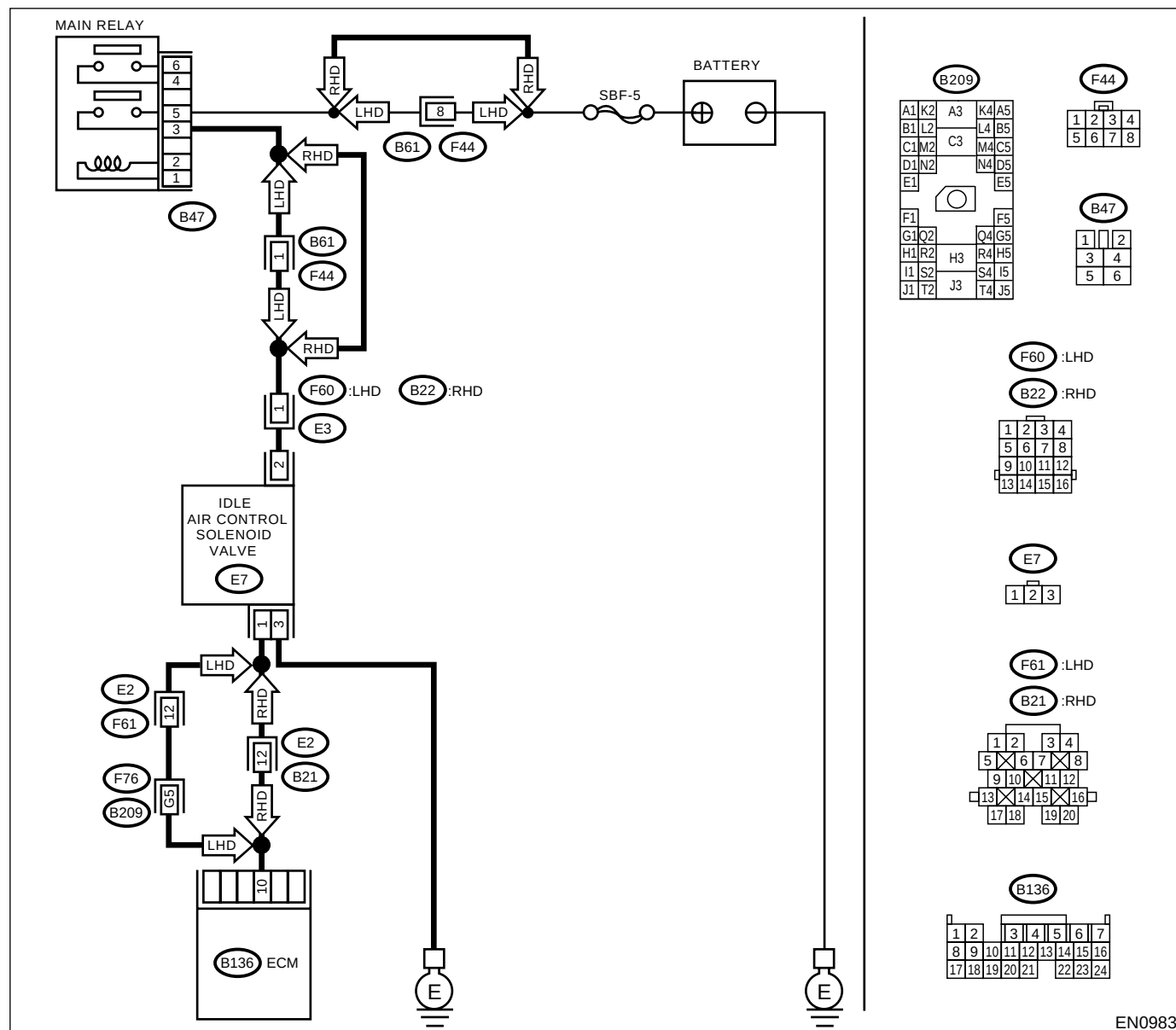
BA:DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0983

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK THROTTLE CABLE.	Does throttle cable have play for adjustment?	Go to step 2.	Adjust throttle cable. <Ref. to SP-9, INSTALLATION, 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 (-):	Is the voltage more than 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 (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Replace idle air control solenoid valve <Ref. to FU(DOHC TURBO)-34, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(DOHC TURBO)-45, 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 more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Contact with your Subaru distributor service. NOTE: Insepection by DTM is required, because probable cause is deterioration of multiple parts.

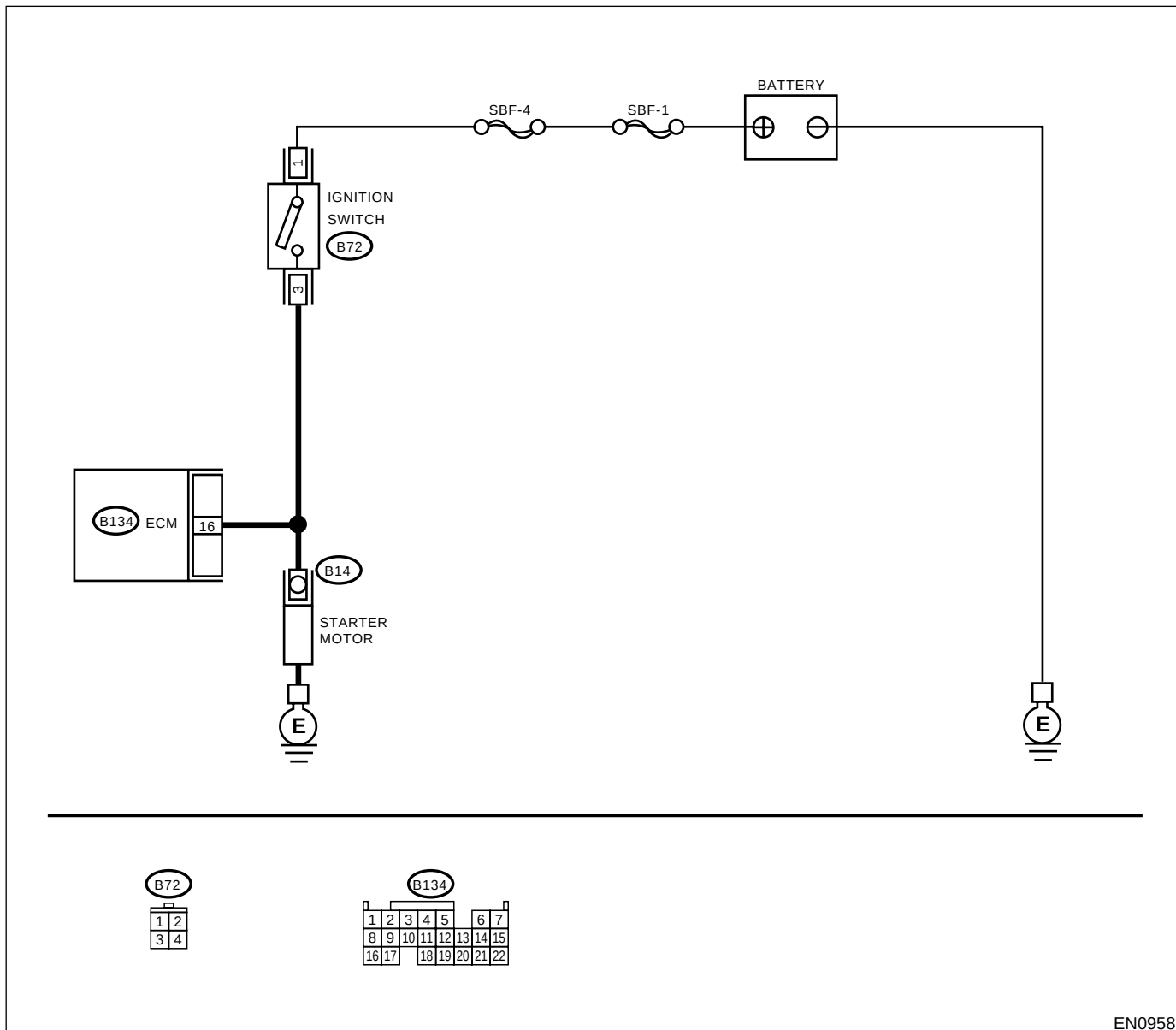
BB:DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0958

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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"?	Repair battery short circuit in starter motor circuit. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Check starter motor circuit. <Ref. to EN(DOHC TURBO)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

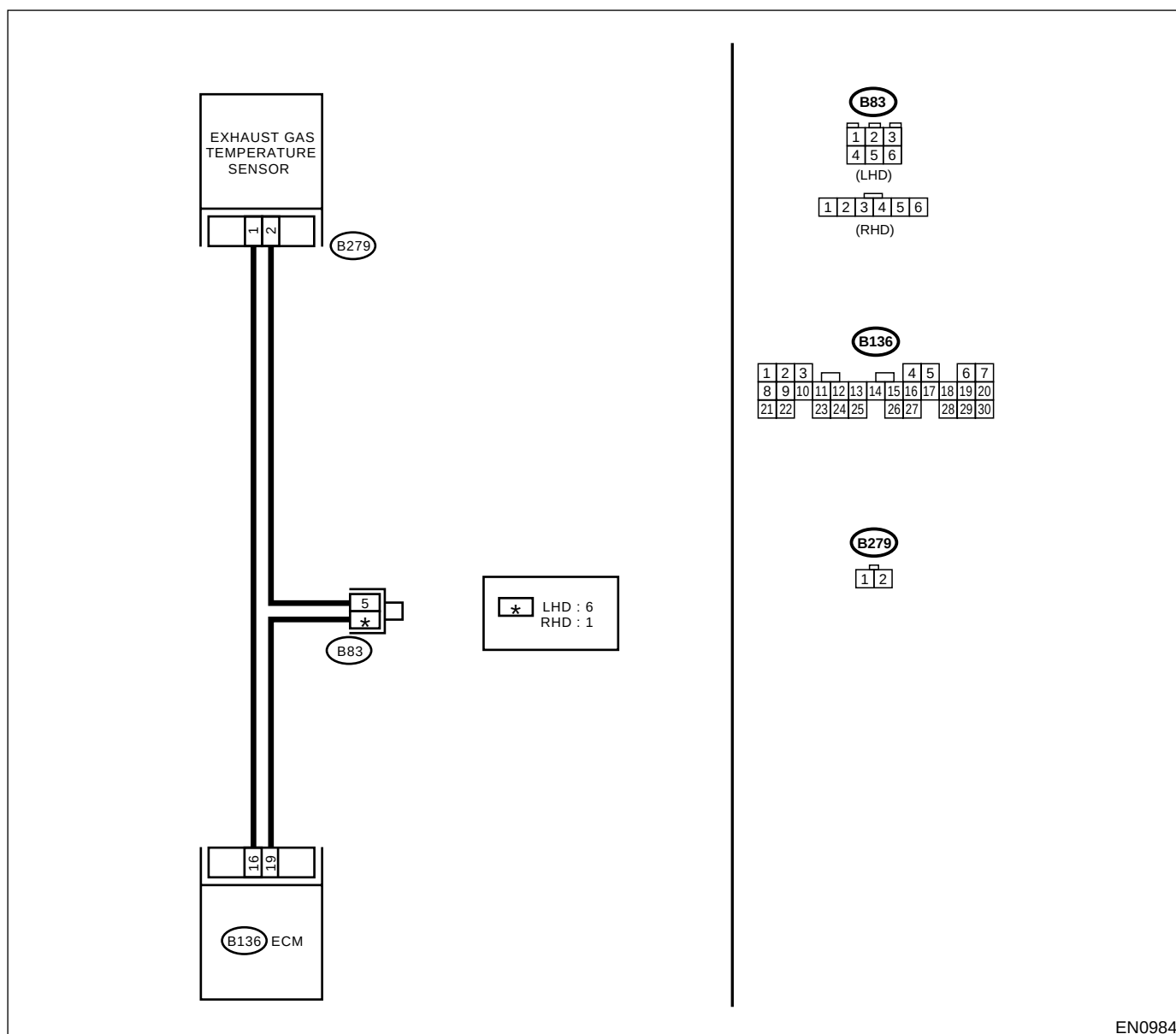
BC:DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 1200°C (2192°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2 CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from exhaust gas temperature sensor. 3)Turn ignition switch to ON. 4)Read data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 372°C (702°F)?	Replace exhaust gas temperature sensor. <Ref. to FU(DOHC TURBO)-44, Exhaust Temperature Sensor.>	Repair ground short circuit in harness between exhaust gas temperature sensor and ECM connector.

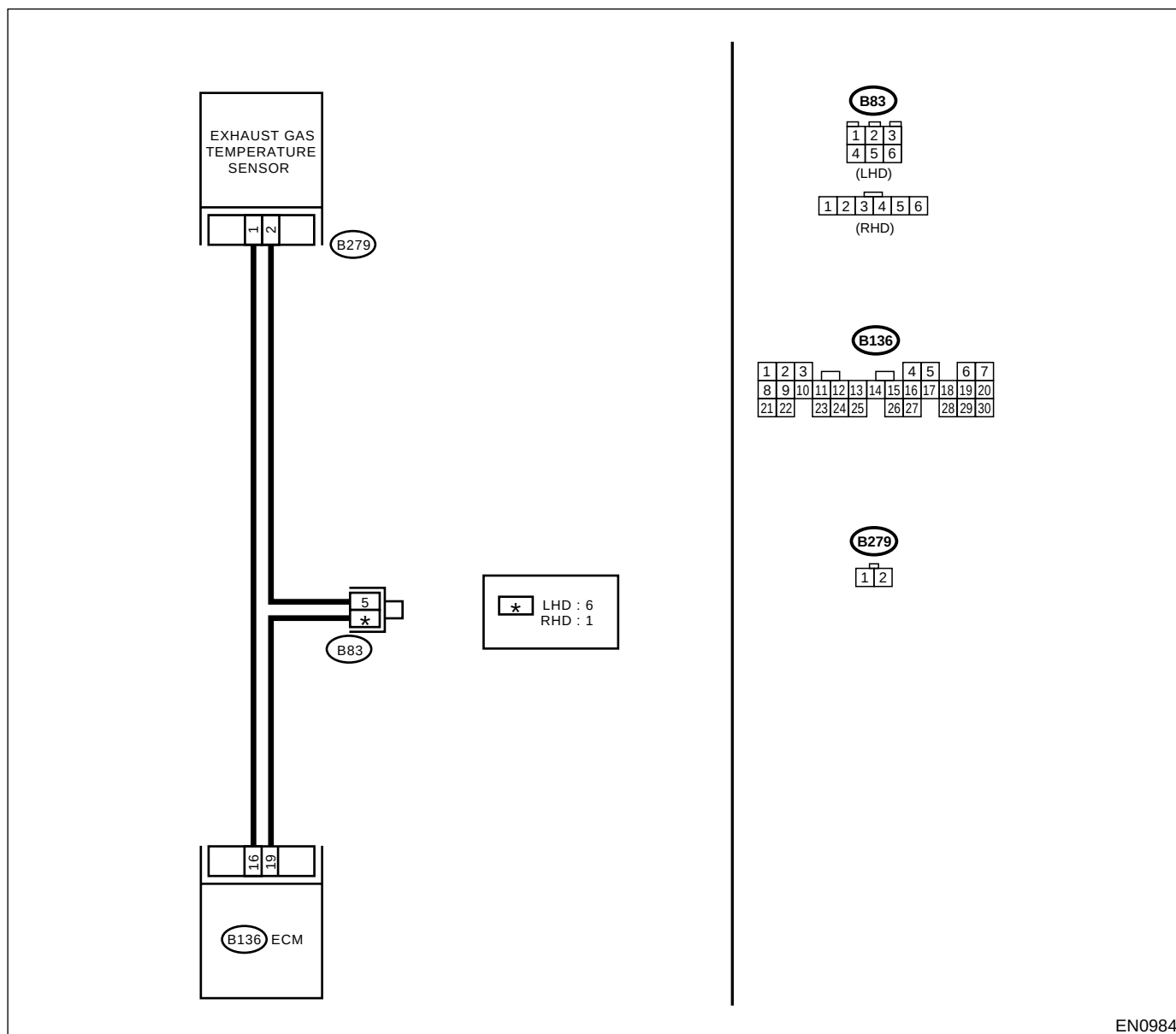
BD:DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 372°C (702°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2 CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from exhaust gas temperature sensor. 3)Measure voltage between exhaust gas temperature sensor connector and engine ground. Connector & terminal (B279) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to ON. 2)Measure voltage between exhaust gas temperature sensor connector and engine ground. Connector & terminal (B279) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step 4.
4 CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR. Measure voltage between exhaust gas temperature sensor connector and engine ground. Connector & terminal (B279) No. 1 (+) — Engine ground (-):	Is the voltage more than 4 V?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between exhaust gas temperature sensor connector and engine ground. Connector & terminal (B279) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Replace exhaust gas temperature sensor. <Ref. to FU(DOHC TURBO)-44, Exhaust Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BE:DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine does not start.
 - Engine stalls.

CAUTION:

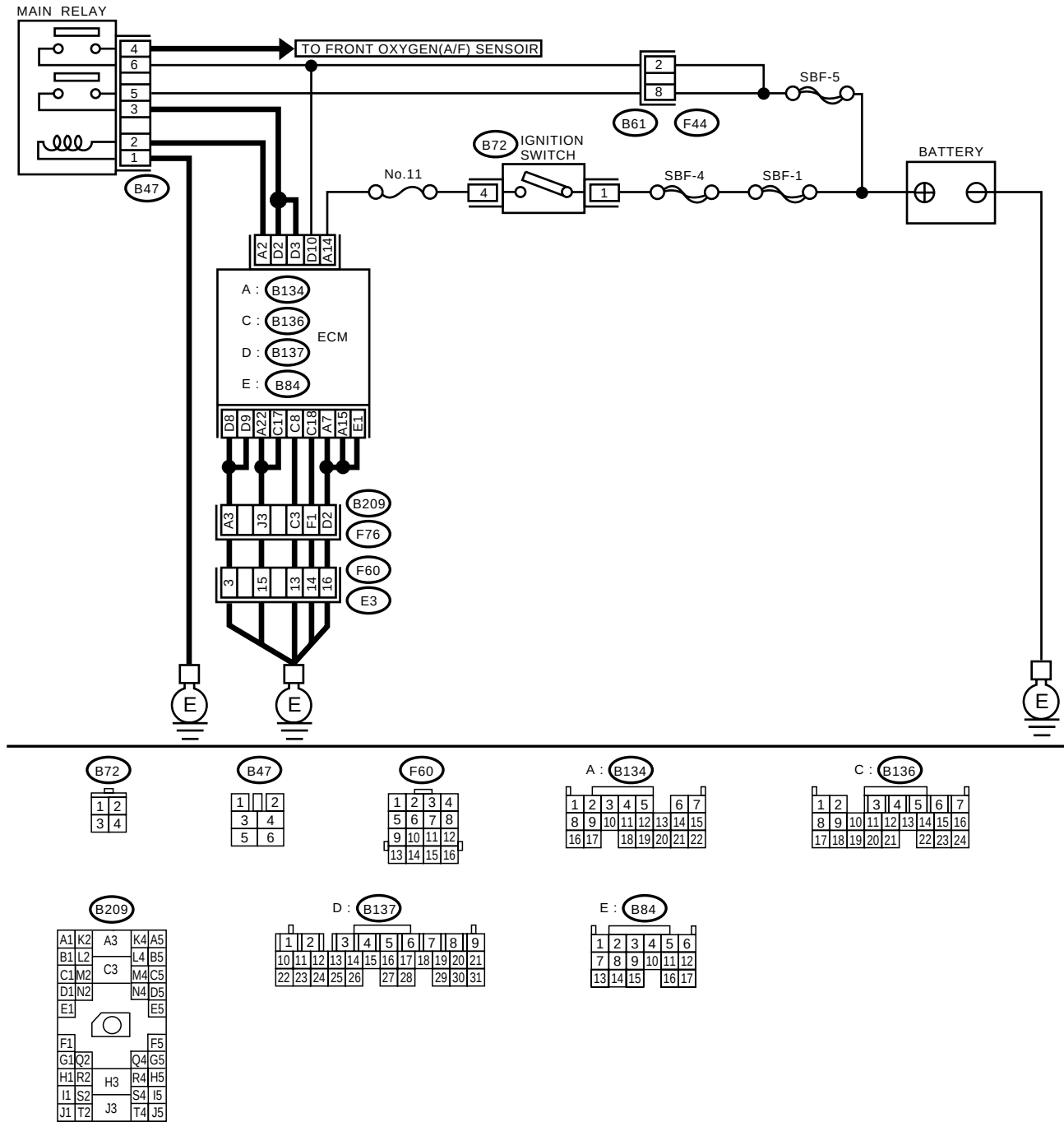
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• LHD MODEL

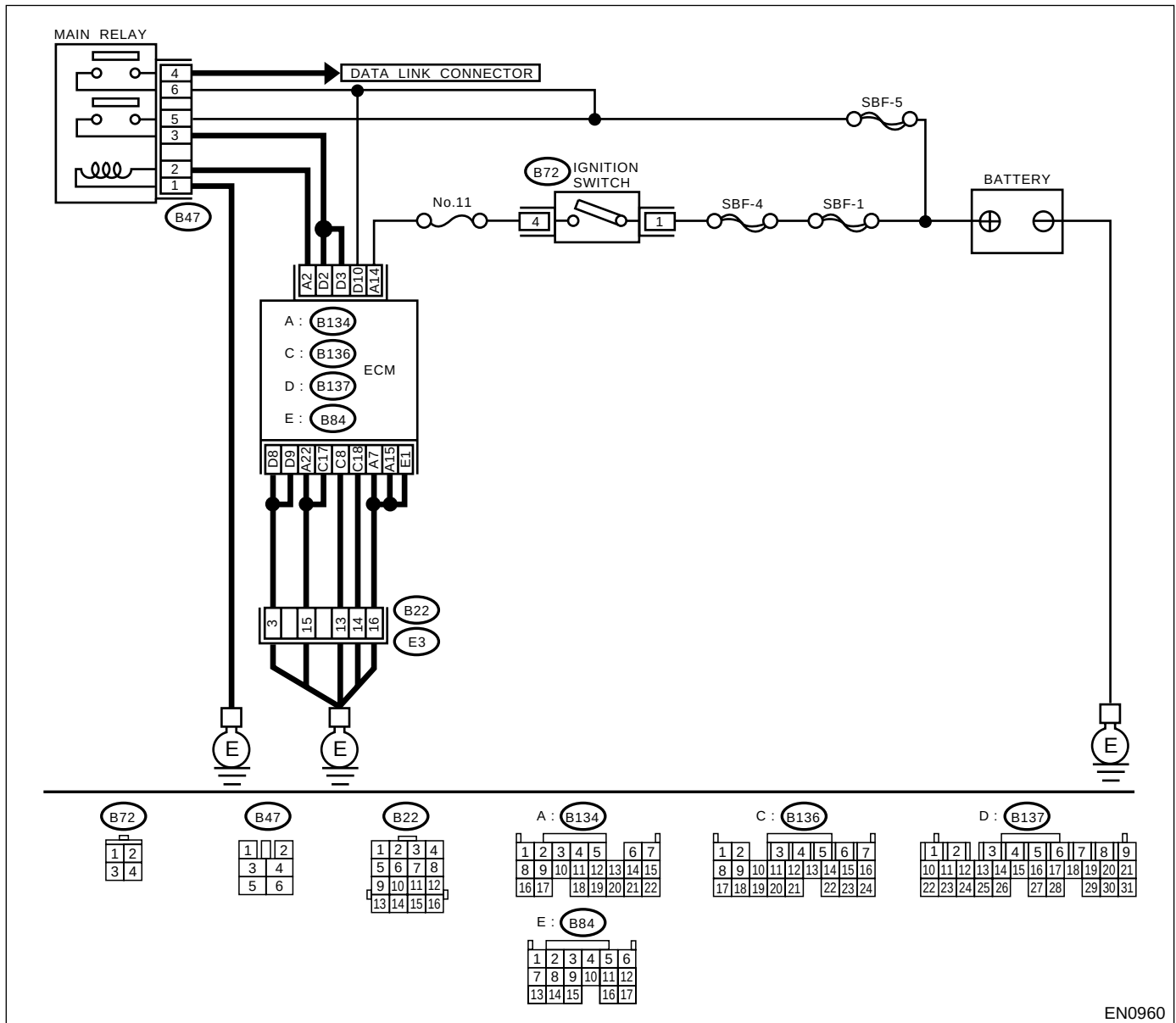


EN0959

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0960

Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>
			It is not necessary to inspect DTC P0604.

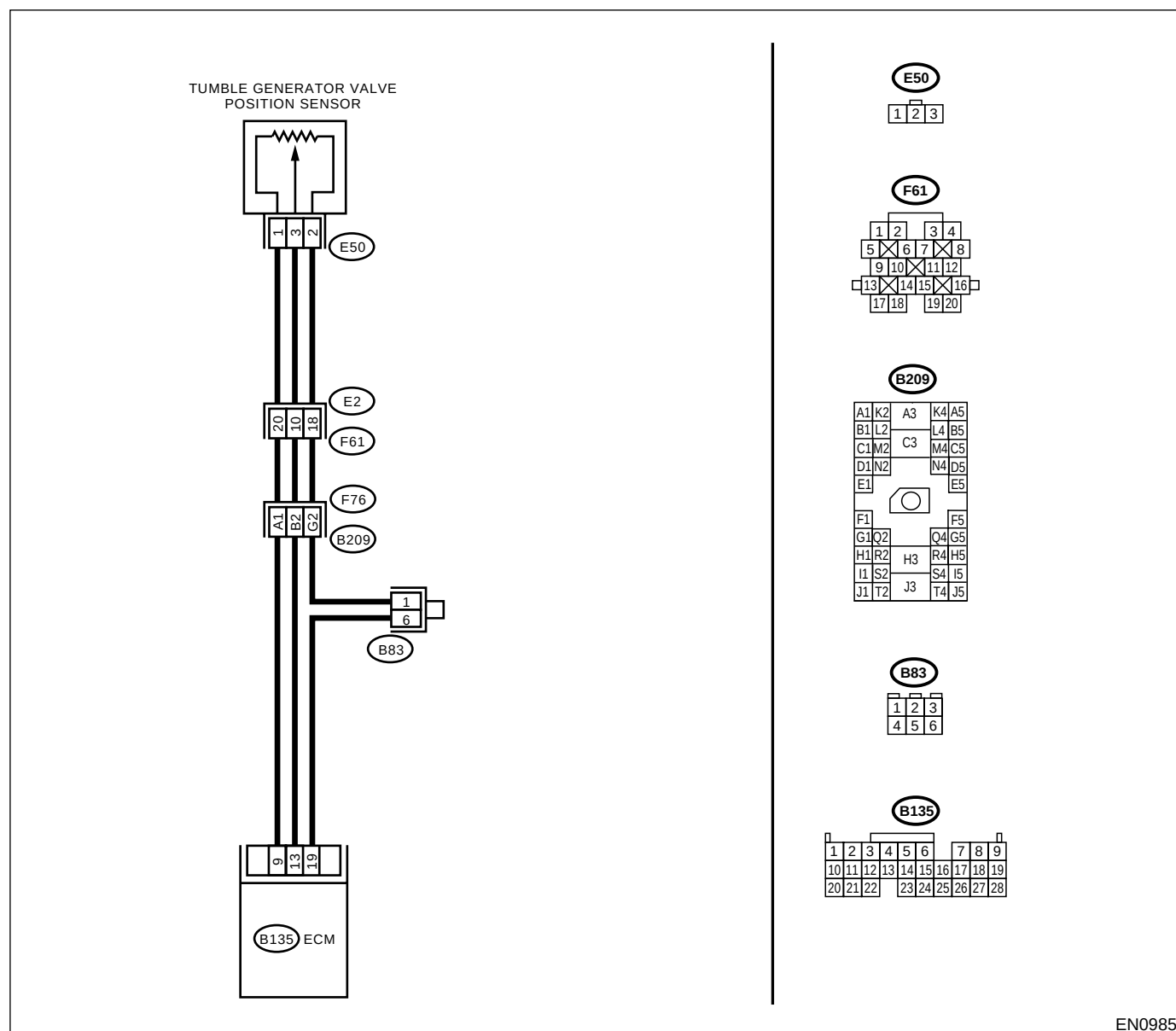
**BF: DTC P1086 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR
CIRCUIT LOW INPUT —**

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD MODEL**



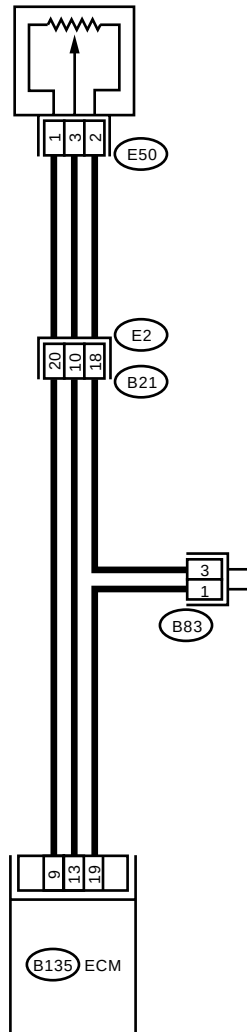
EN0985

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL

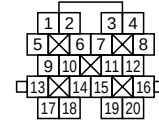
TUMBLE GENERATOR VALVE
POSITION SENSOR



(E50)

1 2 3

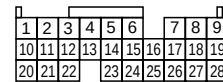
(B21)



(B83)

1 2 3 4 5 6

(B135)



EN0986

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 0.1 V?	Go to step 2.	Even if MIL 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
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground while tumble generator valve is fully closed. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
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 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 13 (+) — Chassis ground (-):	Is the voltage less than 0.1 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Measure voltage between ECM connector and chassis ground.	Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connectors from tumble generator valve position sensor. 3) Turn ignition switch to ON. 4) Measure voltage between tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 1 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and tumble generator valve position sensor connector. Connector & terminal (B135) No. 13 — (E50) No. 3:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. Measure resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 3 — Engine ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in harness between tumble generator valve position sensor and ECM connector.	Go to step 9.
9 CHECK POOR CONTACT. Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair poor contact in tumble generator valve position sensor connector.	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>

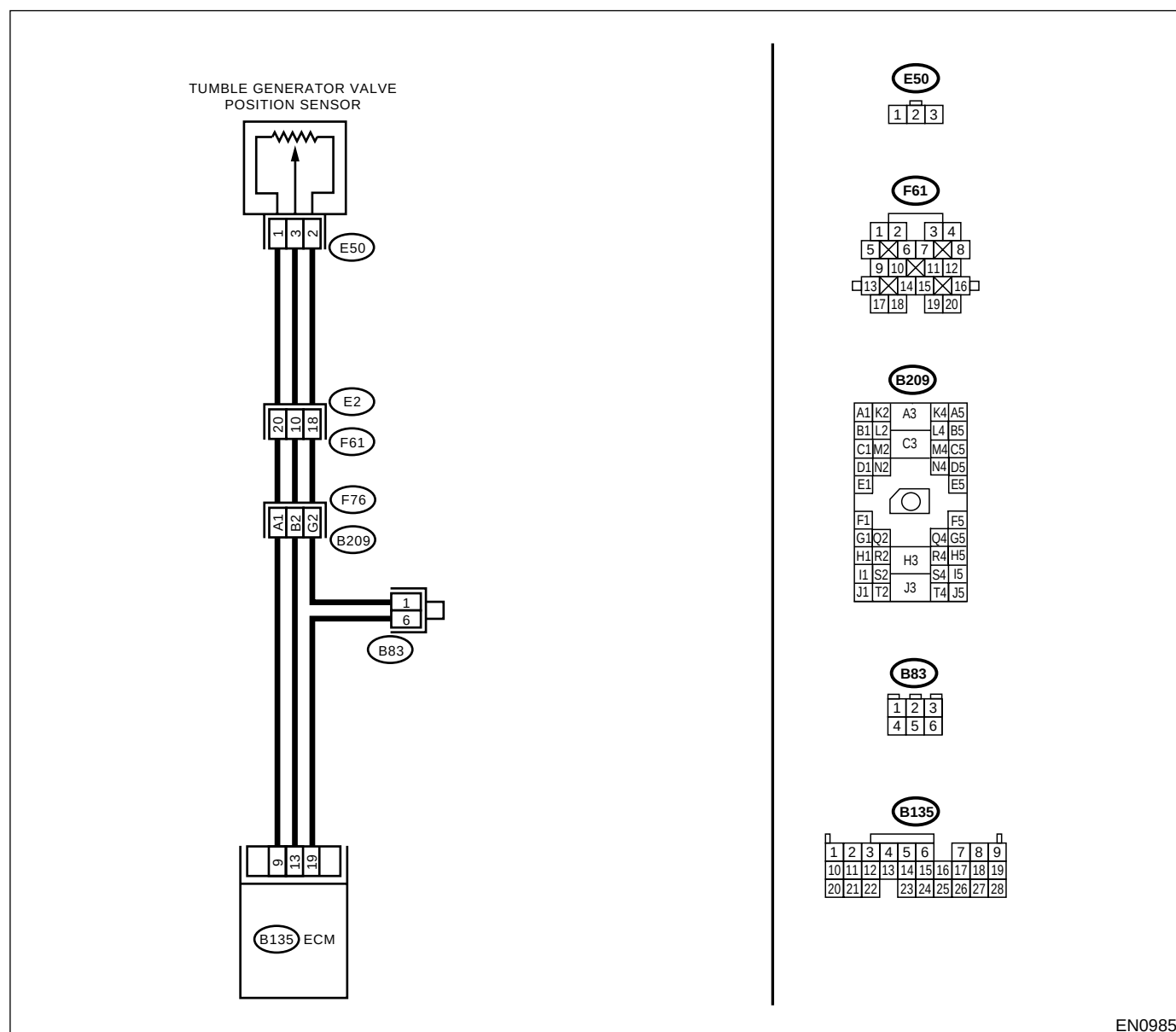
**BG:DTC P1087 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR
CIRCUIT HIGH INPUT —**

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Poor driving performance

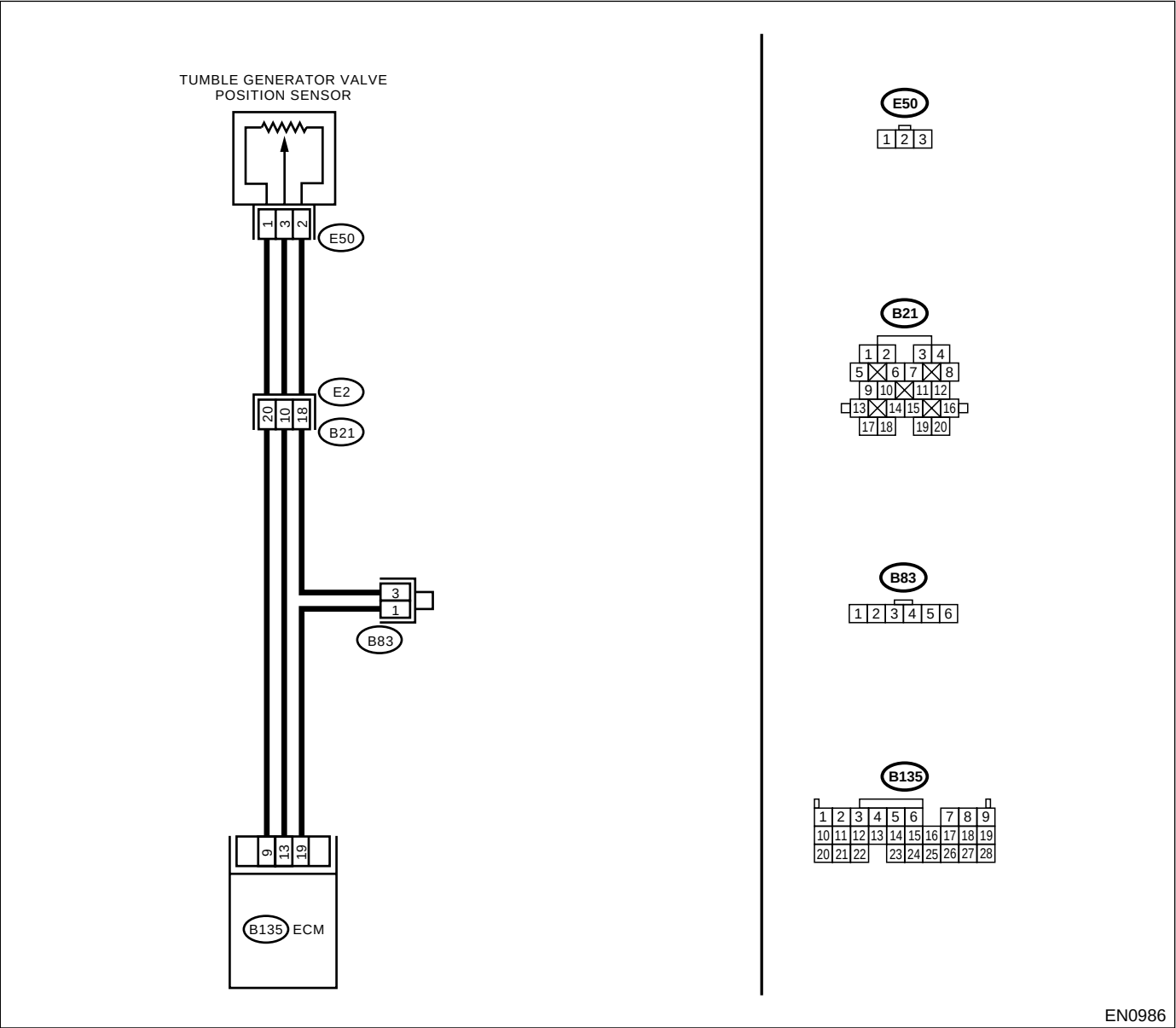
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0985



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 4.9 V?	Go to step 2.	Even if MIL 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 tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from throttle position sensor. 3)Measure resistance of harness between throttle position sensor connector and engine ground. Connector & terminal (E50) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3 CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to ON. 2)Measure voltage between throttle position sensor connector and engine ground. Connector & terminal (E50) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>

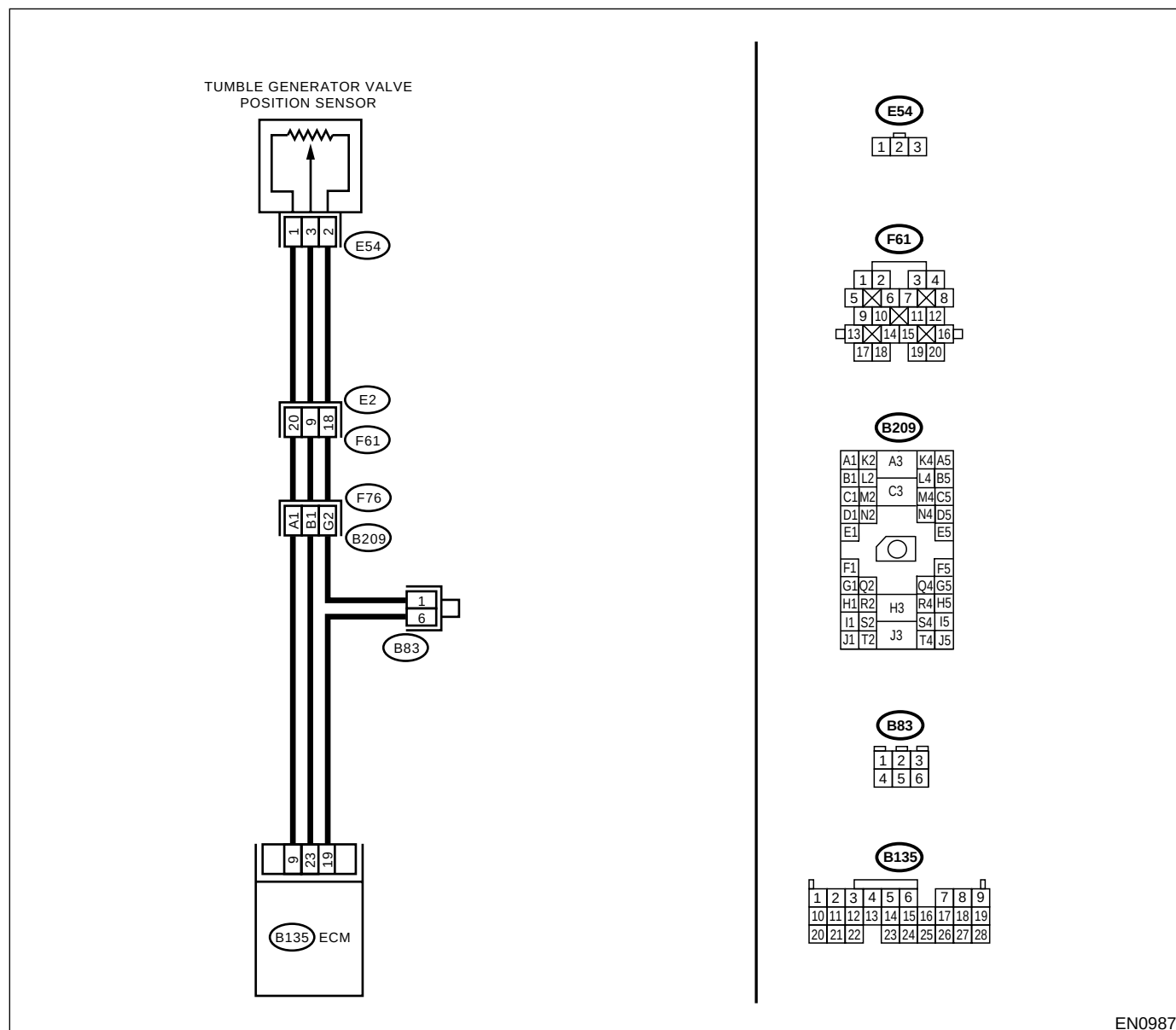
BH: DTC P1088 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD MODEL**

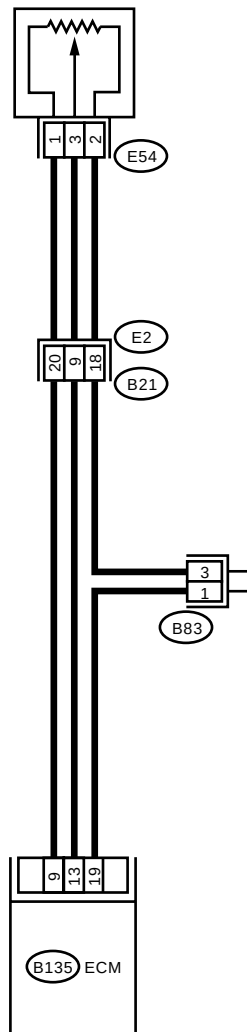


DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

- RHD MODEL

TUMBLE GENERATOR VALVE
POSITION SENSOR



E54

1 2 3

B21

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

B83

1 2 3 4 5 6

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								

EN0988

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 0.1 V?	Go to step 2.	Even if MIL 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 tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground while throttle valve is fully closed. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
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 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4 CHECK INPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 23 (+) — Chassis ground (-):	Is the voltage less than 0.1 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Measure voltage between ECM connector and chassis ground.	Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 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. Connector & terminal (E54) No. 1 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve 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
7 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and throttle position sensor connector. Connector & terminal (B135) No. 23 — (E54) No. 3:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. Measure resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 3 — Engine ground:	Is the resistance less than 10 Ω ?	Repair ground short circuit in harness between tumble generator valve position sensor and ECM connector.	Go to step 9.
9 CHECK POOR CONTACT. Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair poor contact in tumble generator valve position sensor connector.	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>

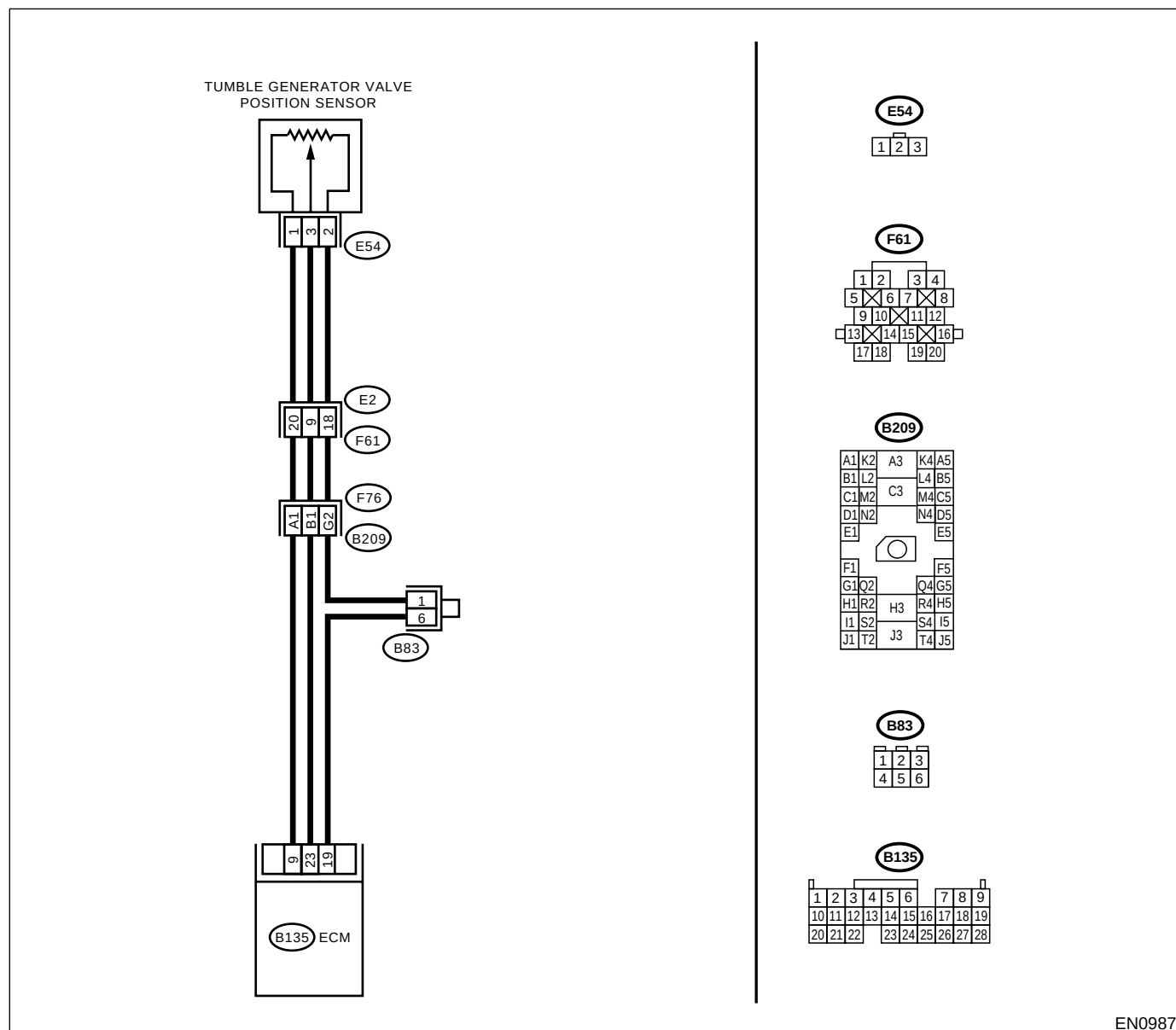
**BI: DTC P1089 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR
CIRCUIT HIGH INPUT —**

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD MODEL**

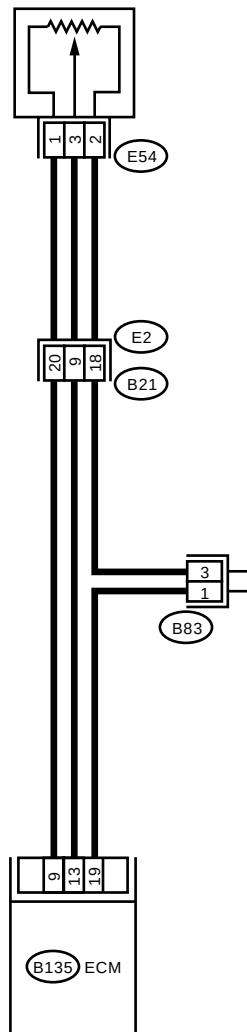


DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

- RHD MODEL

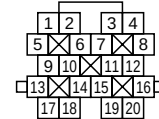
TUMBLE GENERATOR VALVE
POSITION SENSOR



(E54)

1 2 3

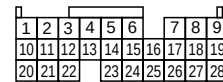
(B21)



(B83)

1 2 3 4 5 6

(B135)



EN0988

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start engine. 2)Read data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 4.9 V?	Go to step 2.	Even if MIL 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 tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from throttle position sensor. 3)Measure resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1)Turn ignition switch to ON. 2)Measure voltage between throttle position sensor connector and engine ground. Connector & terminal (E54) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>

BJ:DTC P1090 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK OPEN) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate P1088, P1089, P1094 or P1095?	Inspect DTC P1088, P1089, P1094 or P1095 using List of Diagnostic Trouble Code (DTC) <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH 1)Remove tumble generator valve assembly. 2)Check tumble generator valve body.	Does tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BK:DTC P1091 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK CLOSE) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate P1088, P1089, P1094 or P1095?	Inspect DTC P1088, P1089, P1094 or P1095 using List of Diagnostic Trouble Code (DTC) <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH 1)Remove tumble generator valve assembly. 2)Check tumble generator valve body.	Does tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

BL:DTC P1092 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK OPEN) —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate P1086, P1087, P1096 or P1097?	Inspect DTC P1086, P1087, P1096 or P1097 using List of Diagnostic Trouble Code (DTC) <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH 1)Remove tumble generator valve assembly. 2)Check tumble generator valve body.	Does tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BM:DTC P1093 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK CLOSE) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate P1086, P1087, P1096 or P1097?	Inspect DTC P1086, P1087, P1096 or P1097 using List of Diagnostic Trouble Code (DTC) <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH 1)Remove tumble generator valve assembly. 2)Check tumble generator valve body.	Does tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

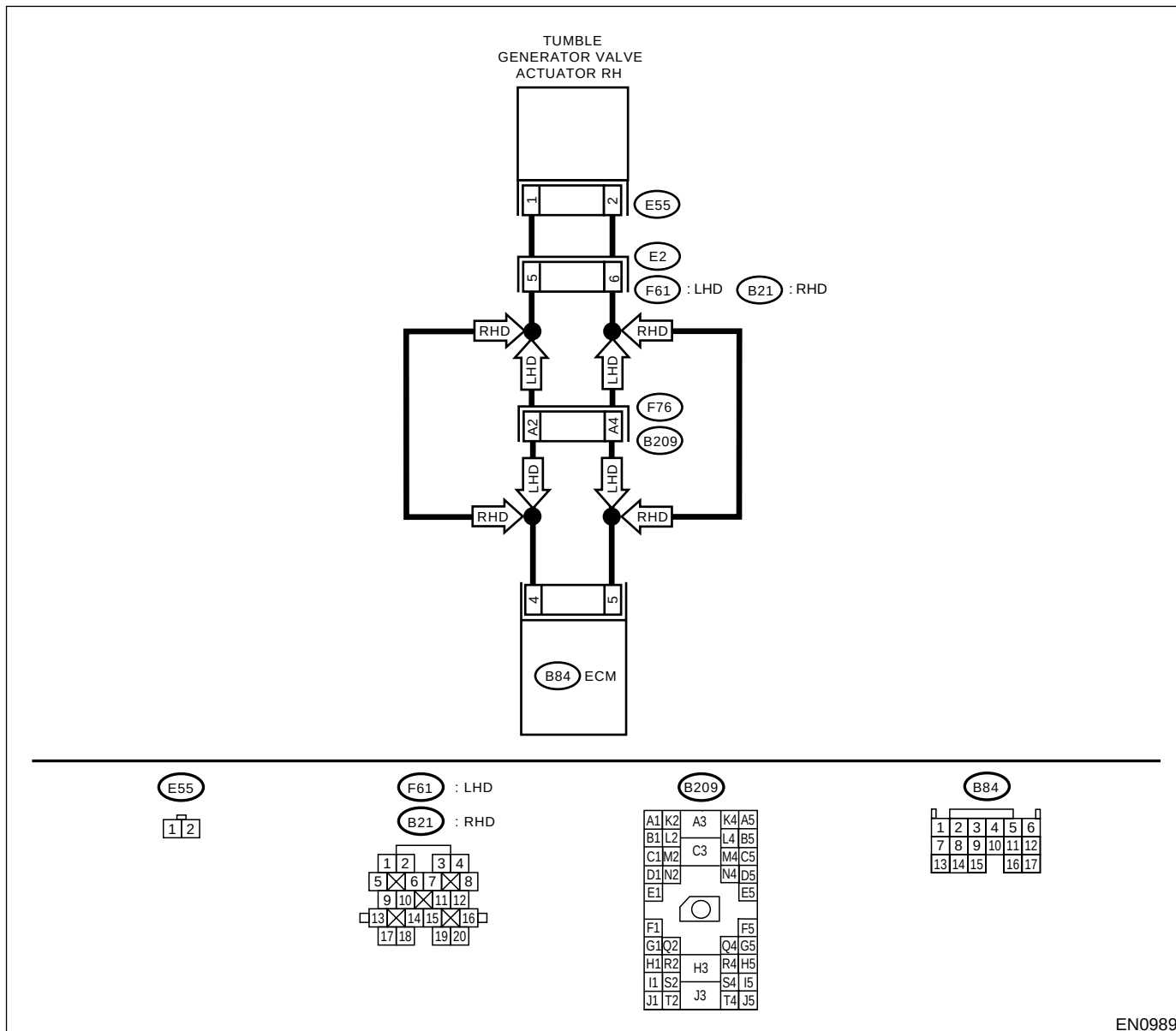
BN:DTC P1094 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OPEN CIRCUIT)

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from tumble generator valve and ECM connector. 3) Measure resistance between tumble generator valve actuator and ECM connector. Connector & terminal (E55) No. 1 — (B84) No.4: (E55) No. 2 — (B84) No.5:	Is the resistance less than 1Ω?	Go to step 2.	Repair open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2 CHECK POOR CONTACT. Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector.	Repair poor contact in tumble generator valve actuator connector.	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>

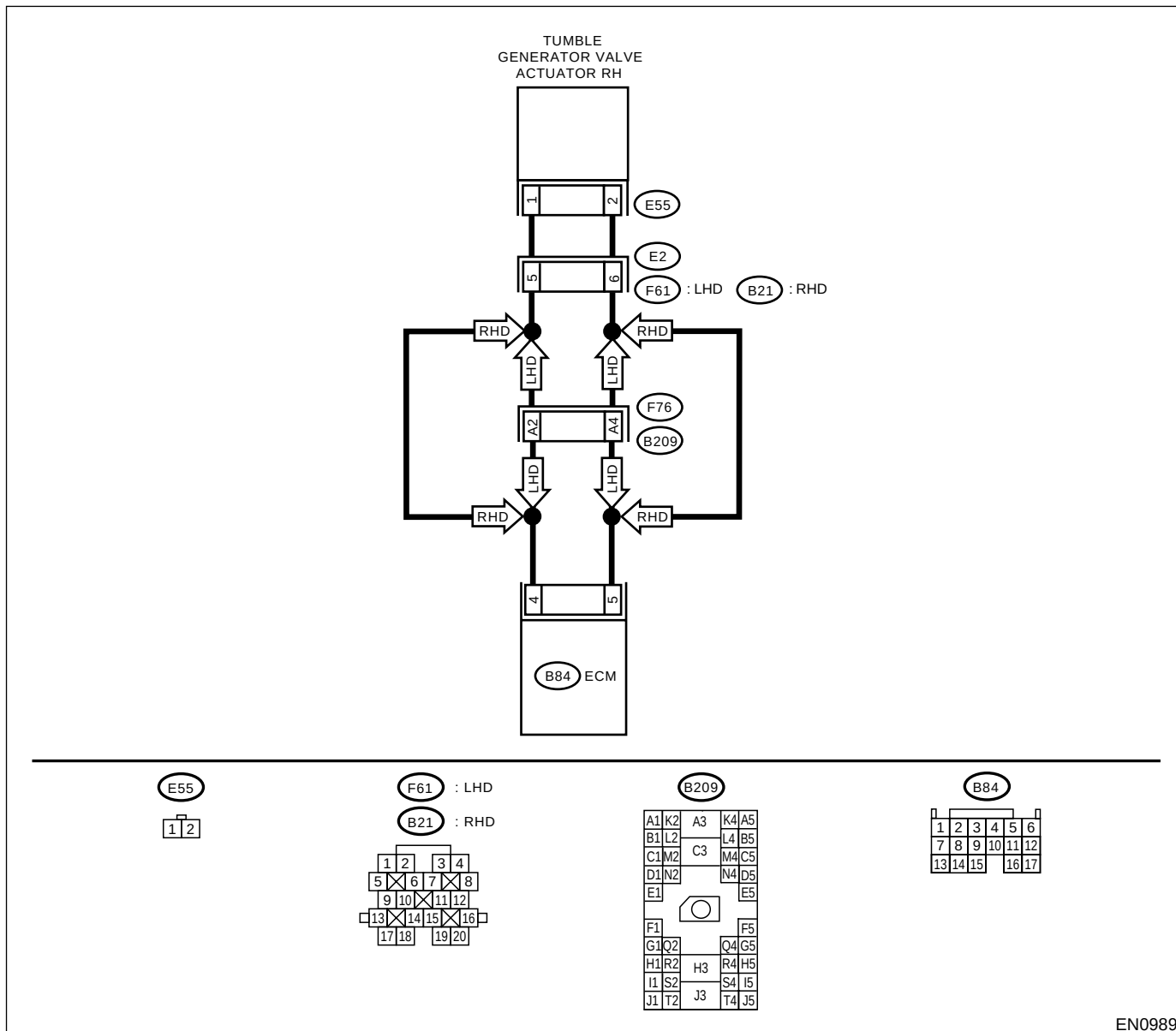
BO:DTC P1095 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OVERCURRENT)

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0989

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from tumble generator valve connector. 3) Measure voltage between tumble generator valve actuator and chassis ground. Connector & terminal (E55) No. 1 (+) — Chassis ground (-): (E55) No. 2 (+) — Chassis ground (-):	Is the voltage less than 5V?	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>	Repair battery short circuit between ECM and tumble generator valve actuator.

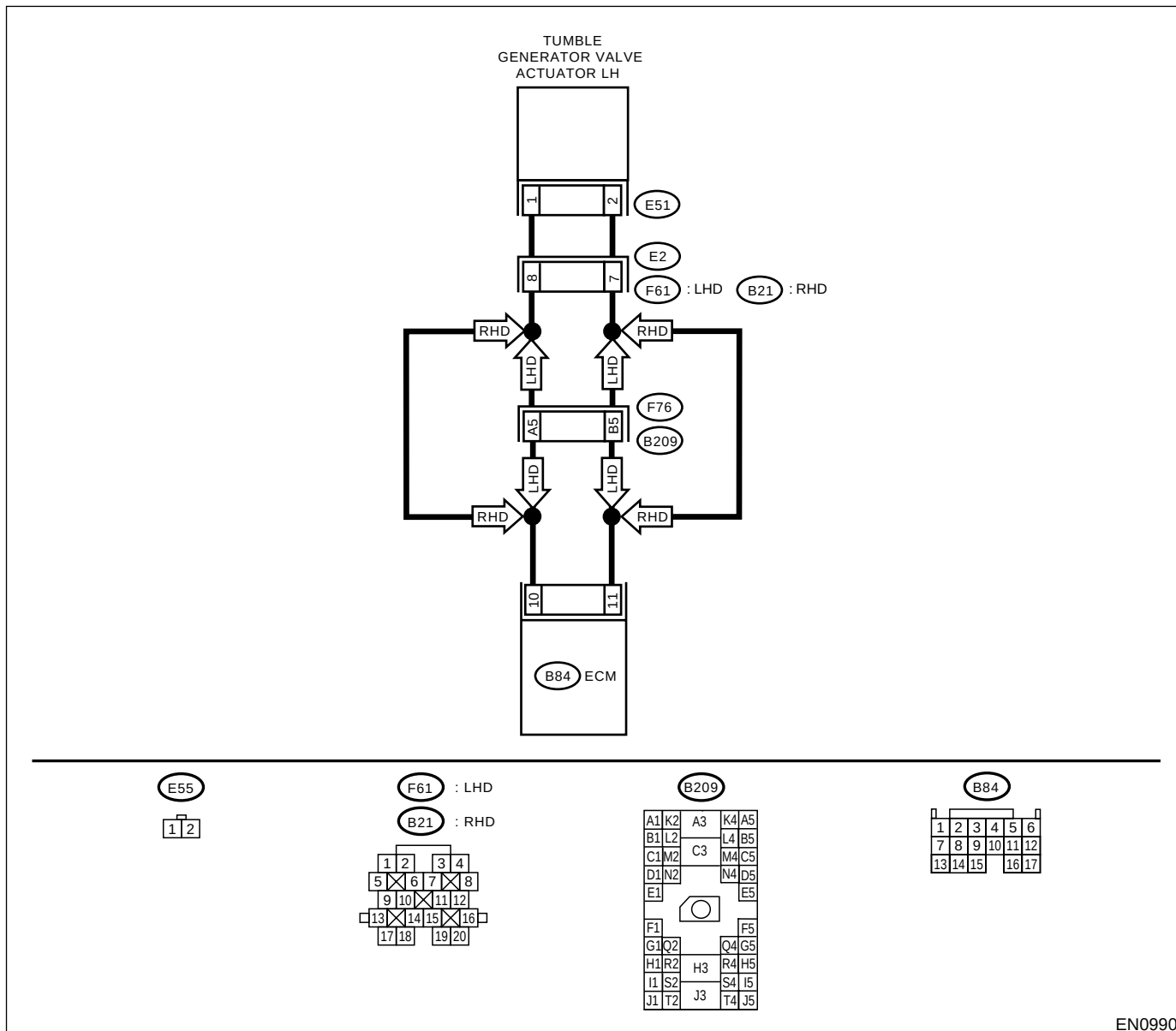
BP:DTC P1096 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OPEN CIRCUIT)

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from tumble generator valve and ECM connector. 3) Measure resistance between tumble generator valve actuator and ECM connector. Connector & terminal (E51) No. 1 — (B84) No. 10: (E51) No. 2 — (B84) No. 11:	Is the resistance less than 1Ω?	Go to step 2.	Repair open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2 CHECK POOR CONTACT. Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector.	Repair poor contact in tumble generator valve actuator connector.	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>

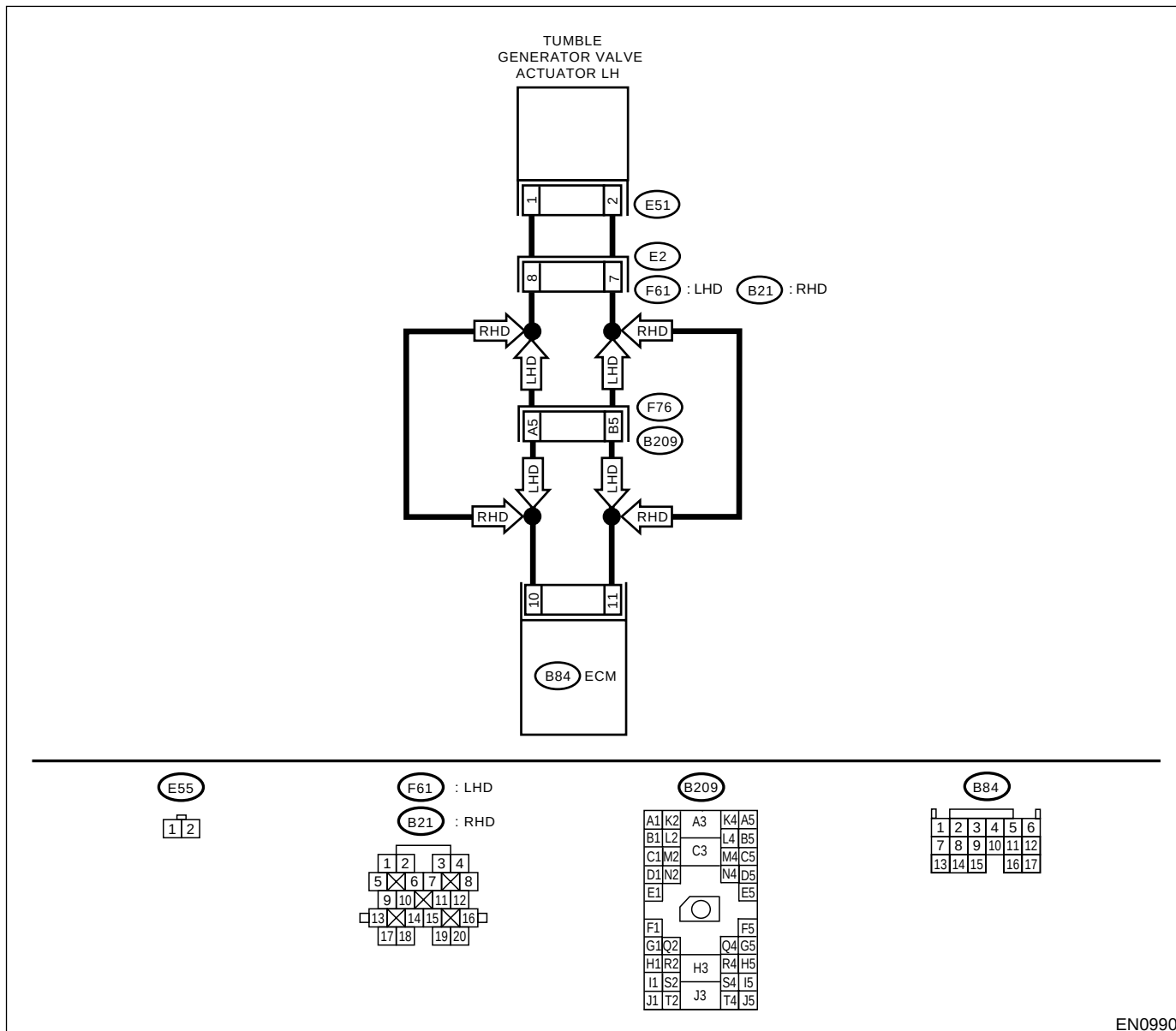
BQ:DTC P1097 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OVERCURRENT)

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from tumble generator valve connector. 3) Measure voltage between tumble generator valve actuator and chassis ground. Connector & terminal (E51) No. 1 (+) — Chassis ground (-): (E51) No. 2 (+) — Chassis ground (-):	Is the voltage less than 5V?	Replace tumble generator valve assembly. <Ref. to FU(DOHC TURBO)-38, Tumble Generator Valve Assembly.>	Repair battery short circuit between ECM and tumble generator valve actuator.

BR:DTC P1110 — ATMOSPHERIC PRESSURE 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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1110.

BS:DTC P1111 — ATMOSPHERIC PRESSURE 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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	Replace ECM. <Ref. to FU(DOHC TURBO)-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)

BT:DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P1110 or P1111?	Inspect DTC P0106, P0107, P0108, P1110 or P1111 using "17. List of Diagnostic Trouble Code (DTC)".<Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.

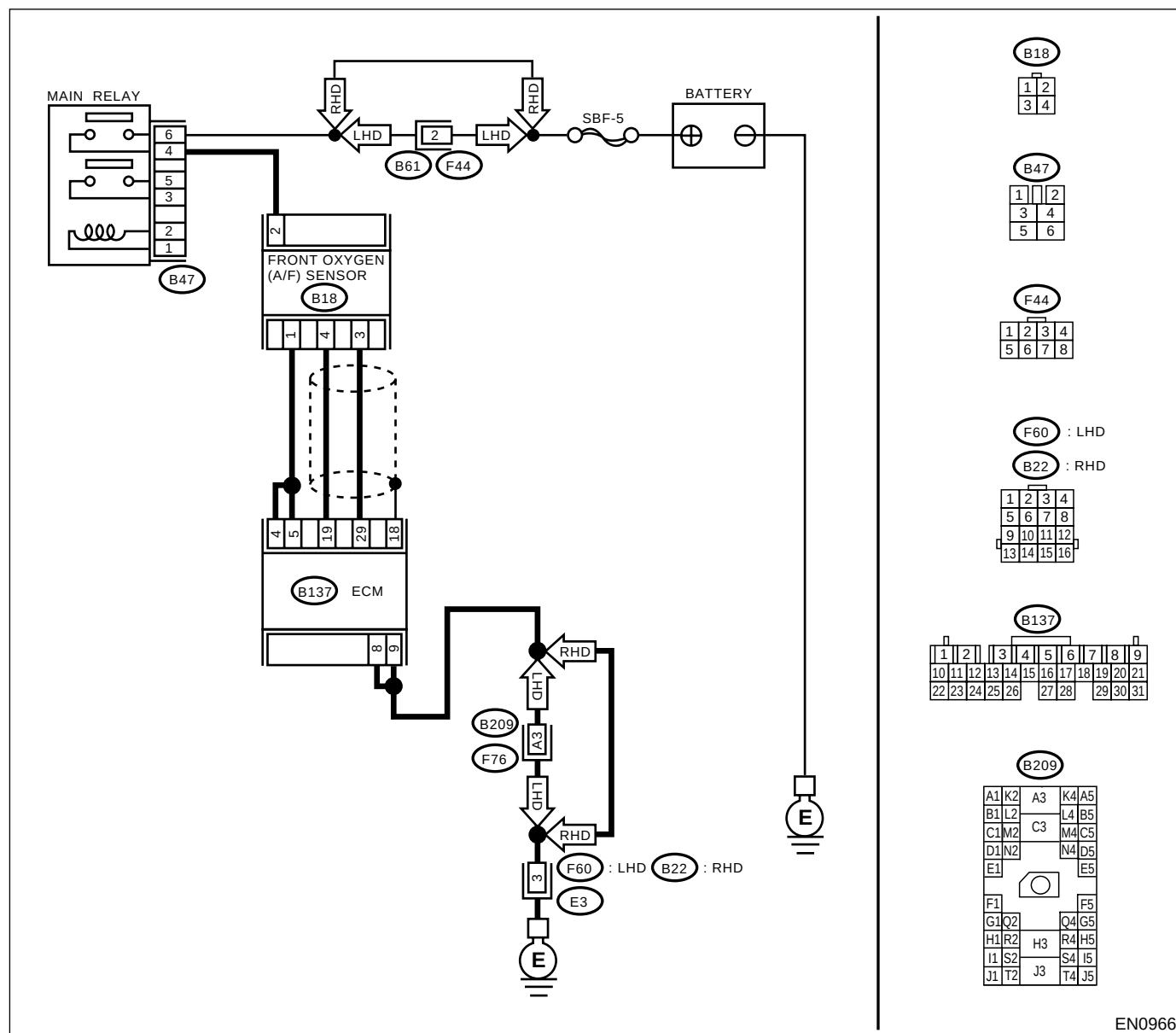
BU: DTC P1130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0966

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 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. Connector & terminal (B137) No. 29 — (B18) No. 3: (B137) No. 19 — (B18) No. 4:	Is the resistance less than 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
2 CHECK POOR CONTACT. Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-41, Front Oxygen (A/F) Sensor.>

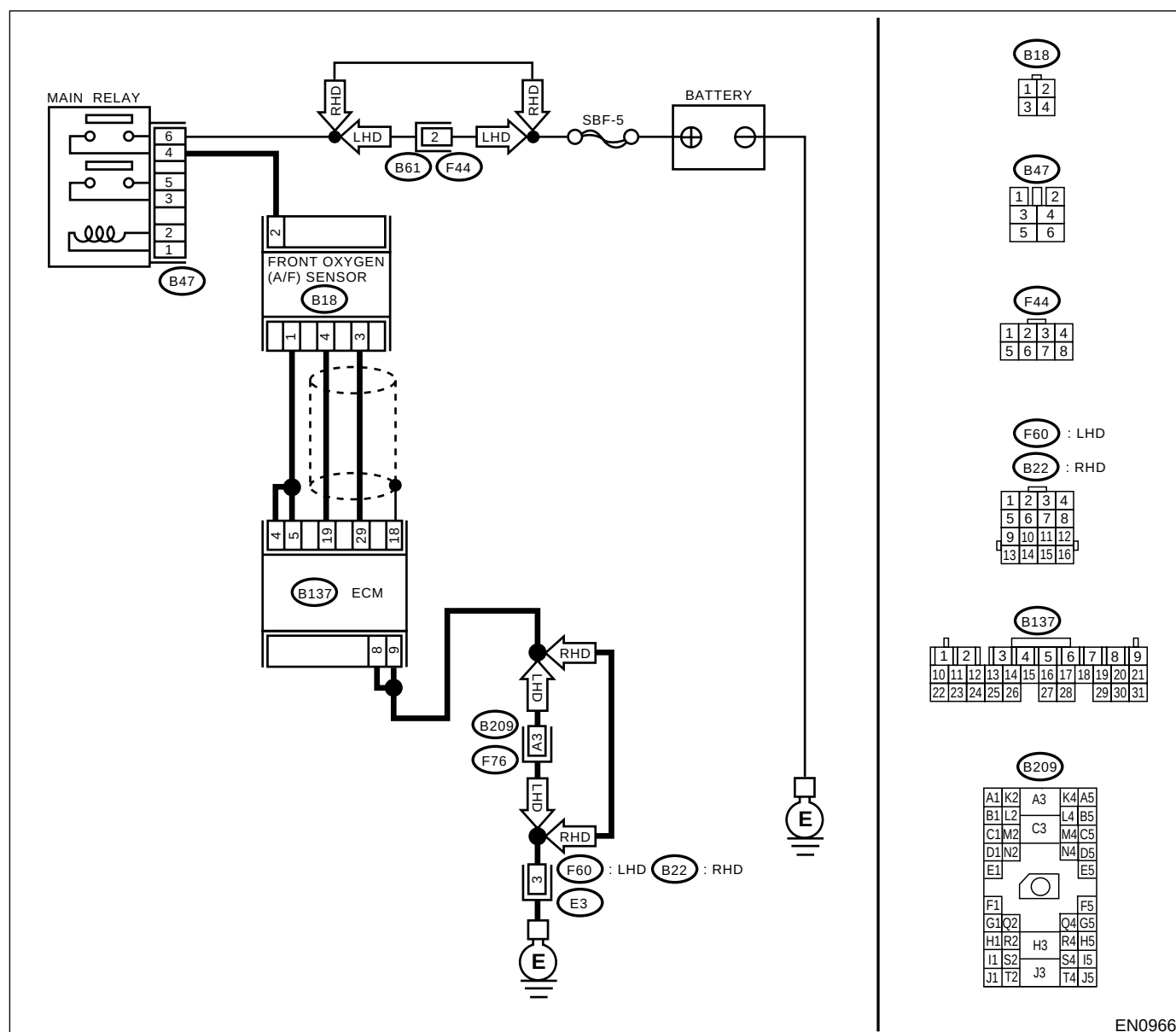
BV: DTC P1131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0966

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. Connector & terminal (B137) No. 19 — Chassis ground:	Is the resistance more than 10 Ω ?	Go to step 2.	Repair ground short 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 connector and chassis ground. Connector & terminal (B137) No. 29 — Chassis ground:	Is the resistance more than 10 Ω ?	Go to step 3.	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 19 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 5.
4 CHECK OUTPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 19 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Repair poor contact in ECM connector.
5 CHECK OUTPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage more than 4.95 V?	Go to step 6.	Replace front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-41, Front Oxygen (A/F) Sensor.>
6 CHECK OUTPUT SIGNAL FOR ECM. Measure voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Repair poor contact in ECM connector.

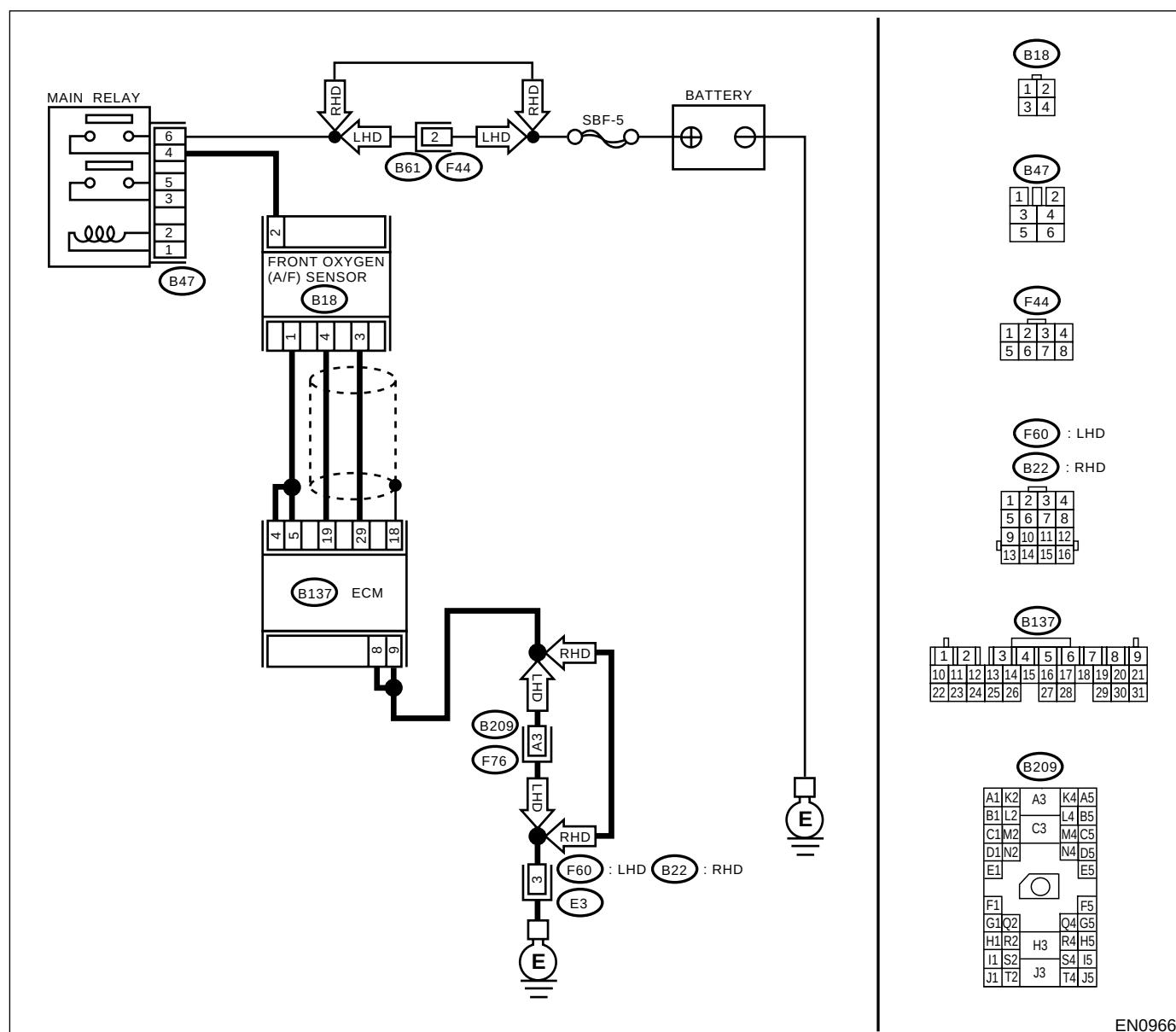
BW:DTC P1134 — FRONT OXYGEN (A/F) SENSOR MICRO-COMPUTER PROBLEM —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0966

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	It is not necessary to inspect DTC P1134.

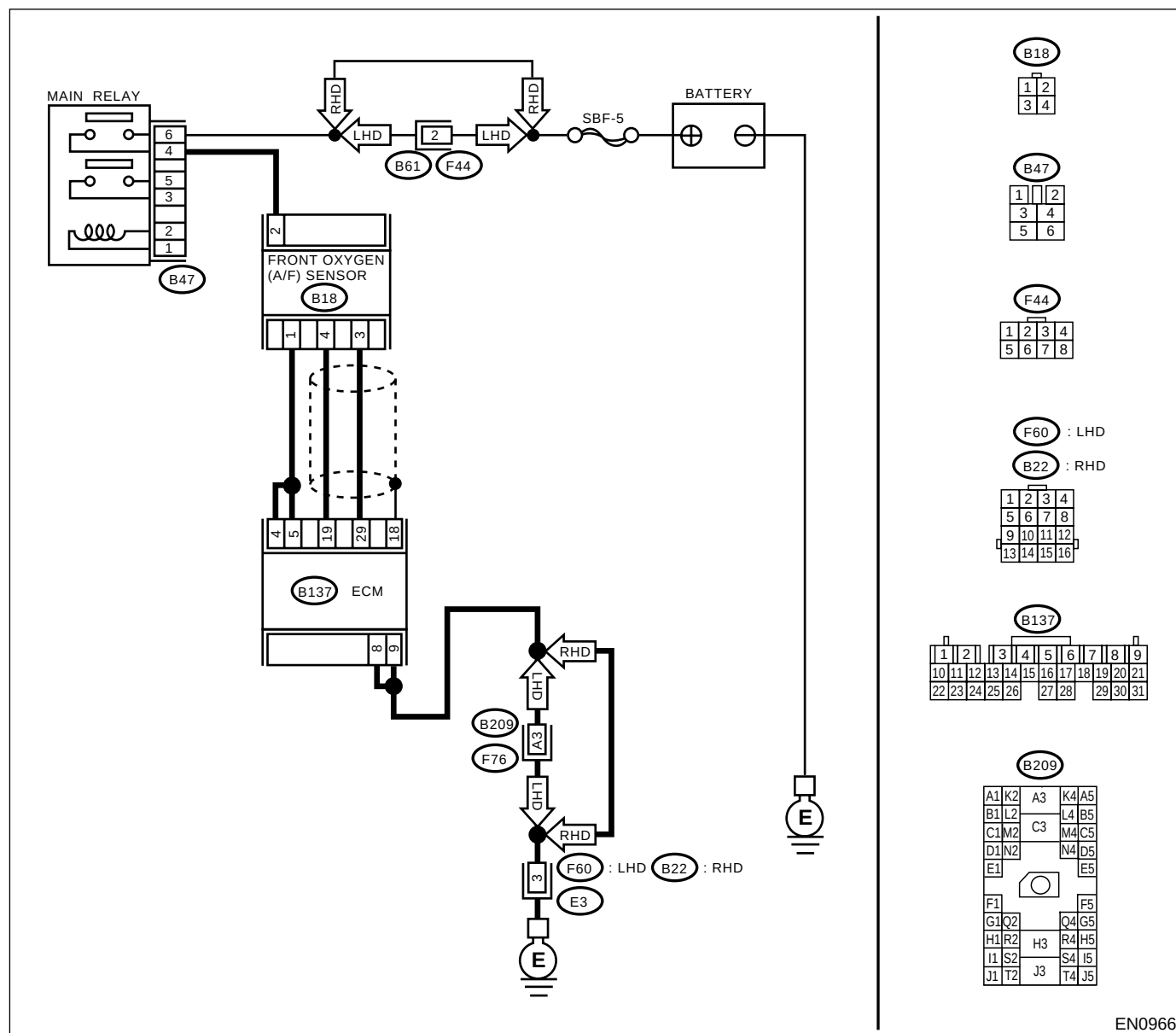
BX: DTC P1139 — FRONT OXYGEN (A/F) SENSOR #1 HEATER CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0966

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	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. 5 — (B18) No. 1: (B137) No. 4 — (B18) No. 1:	Is the resistance less than 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 — (B18) No. 4: (B137) No. 29 — (B18) No. 3:	Is the resistance less than 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 main relay and front oxygen (A/F) sensor connector. Connector & terminal (B47) No. 4 — (B18) No. 2:	Is the resistance less than 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 resistance less than 5 Ω ?	Go to step 5.	Replace front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-41, 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?	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(DOHC TURBO)-41, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

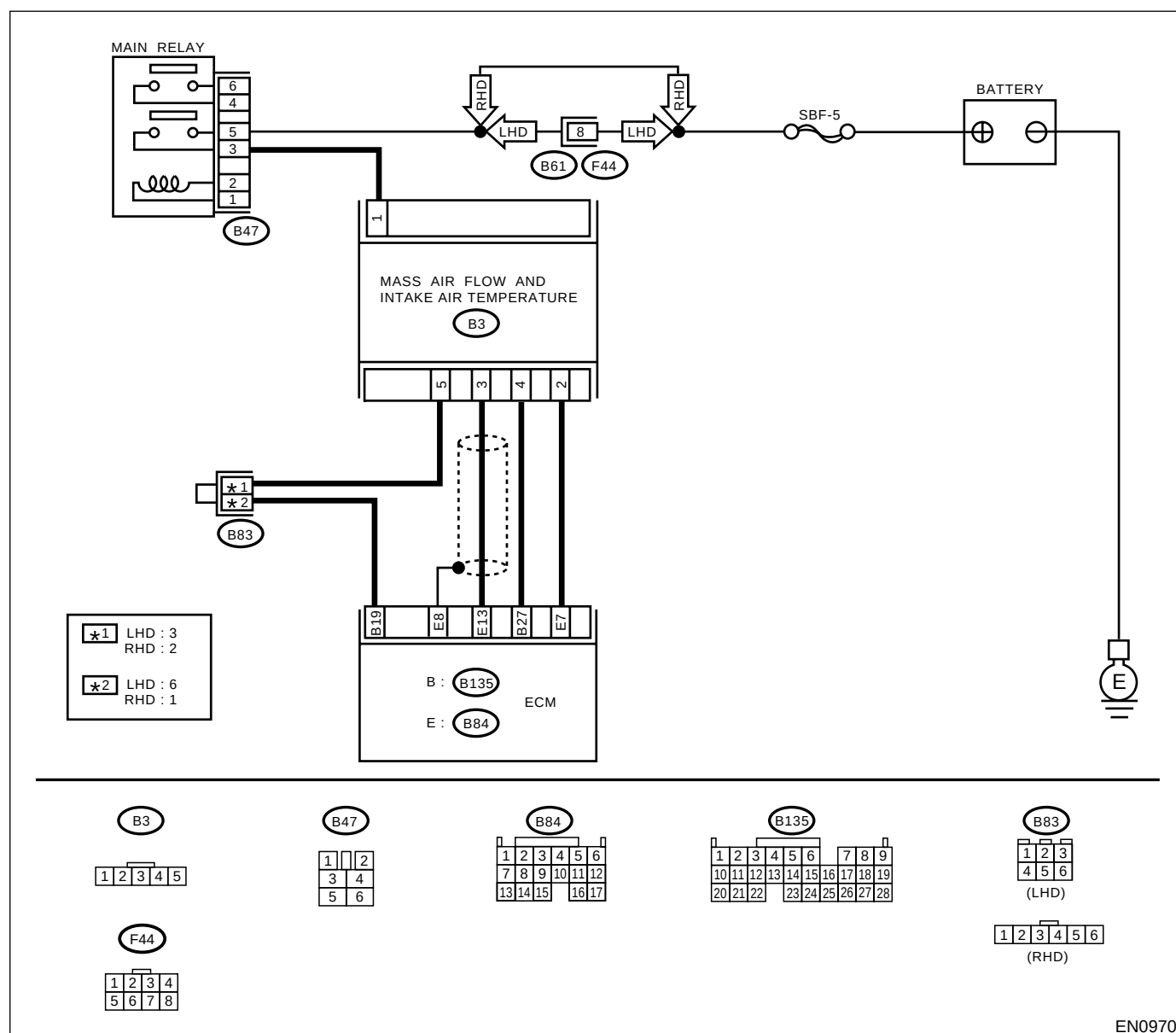
BY:DTC P1141 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does Subaru select monitor or OBD-II general scan tool indicate DTC P0102 or P0103?	Inspect DTC P0102 or P0103 using "10. Diagnostics Chart with Trouble Code"<Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1141.	Replace mass air flow and intake air temperature sensor.

ENGINE (DIAGNOSTICS)

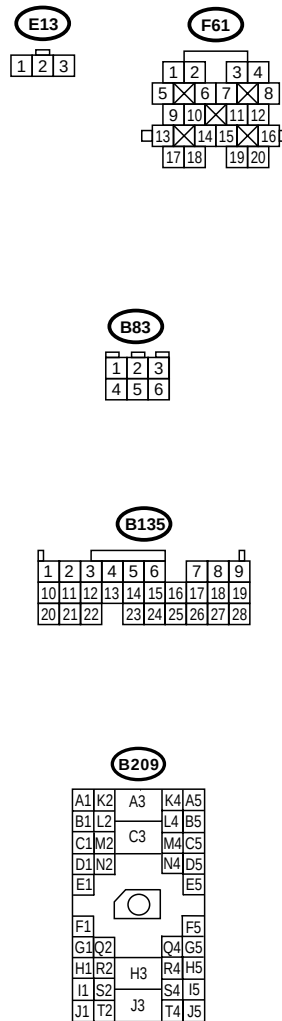
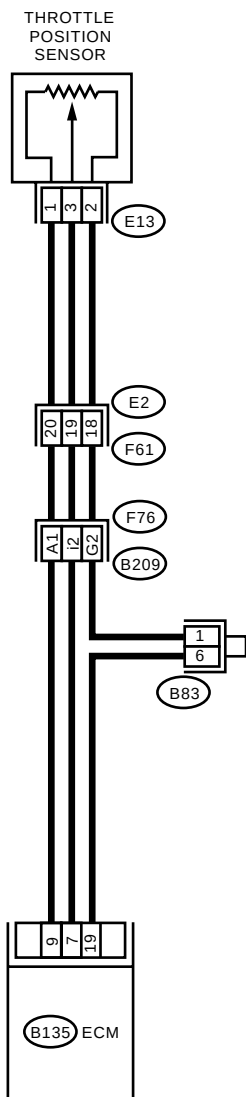
BZ:DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- WIRING DIAGRAM:
- LHD MODEL

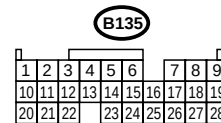
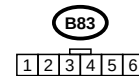
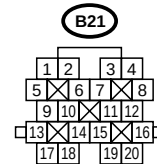
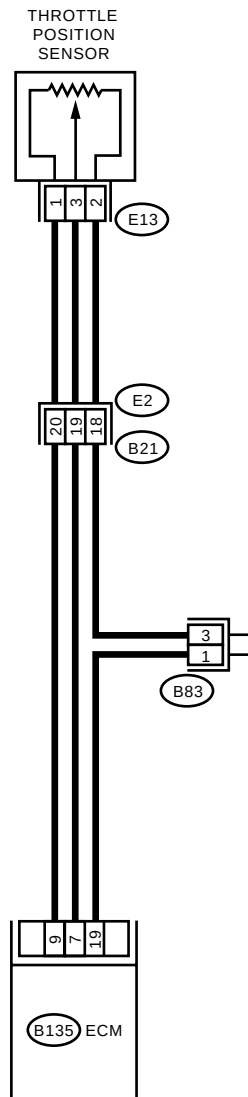


EN0973

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0972

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0122 or P0123?	Inspect DTC P0122 or P0123 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1142.	Replace throttle position sensor. <Ref. to FU(DOHC TURBO)-31, Throttle Position Sensor.>

ENGINE (DIAGNOSTICS)

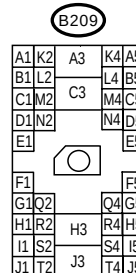
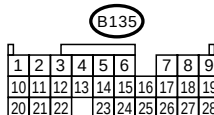
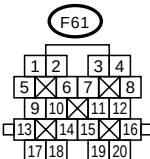
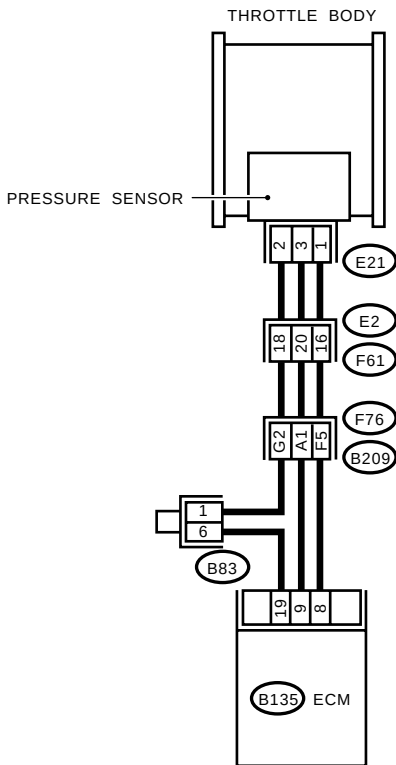
PROBLEM (HIGH INPUT) —

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**
- **LHD MODEL**

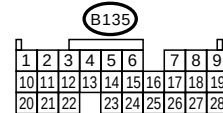
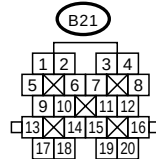
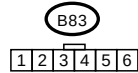
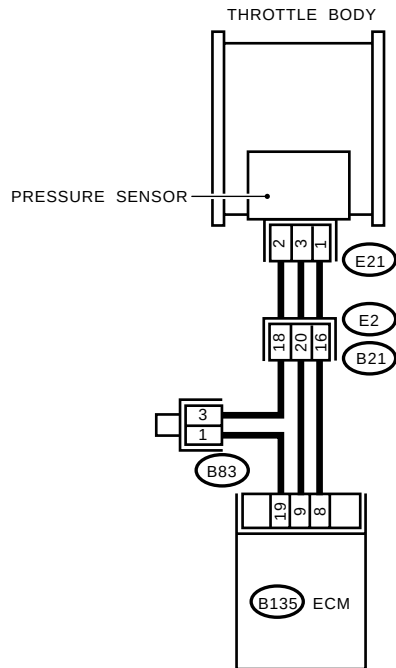


EN0969

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0968

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY. NOTE: In this case, it is not necessary to inspect DTC P0106.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0107, P0108 or P1112?	Inspect DTC P0107, P0108 or P1112 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, 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?	Repair air intake system.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification: • Intake manifold absolute pressure <i>Ignition ON</i> 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) <i>Idling</i> 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)	Is the value within the specifications?	Go to step 4.	Replace intake air temperature sensor and pressure sensor. <Ref. to FU(DOHC TURBO)-33, Pressure Sensor.>
4 CHECK THROTTLE POSITION. Read data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(DOHC TURBO)-28, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is throttle positioning ratio equal to or less than 5% when throttle is fully closed?	Go to step 5.	Adjust or replace throttle position sensor. <Ref. to FU(DOHC TURBO)-31, Throttle Position Sensor.>
5 CHECK THROTTLE POSITION.	Is throttle positioning ratio equal to or more than 85% when throttle is fully open?	Replace intake air temperature and pressure sensor. <Ref. to FU(DOHC TURBO)-33, Pressure Sensor.>	Replace throttle position sensor. <Ref. to FU(DOHC TURBO)-31, Throttle Position Sensor.>

CB:DTC P1230 — FUEL PUMP CONTROLLER MALFUNCTION —

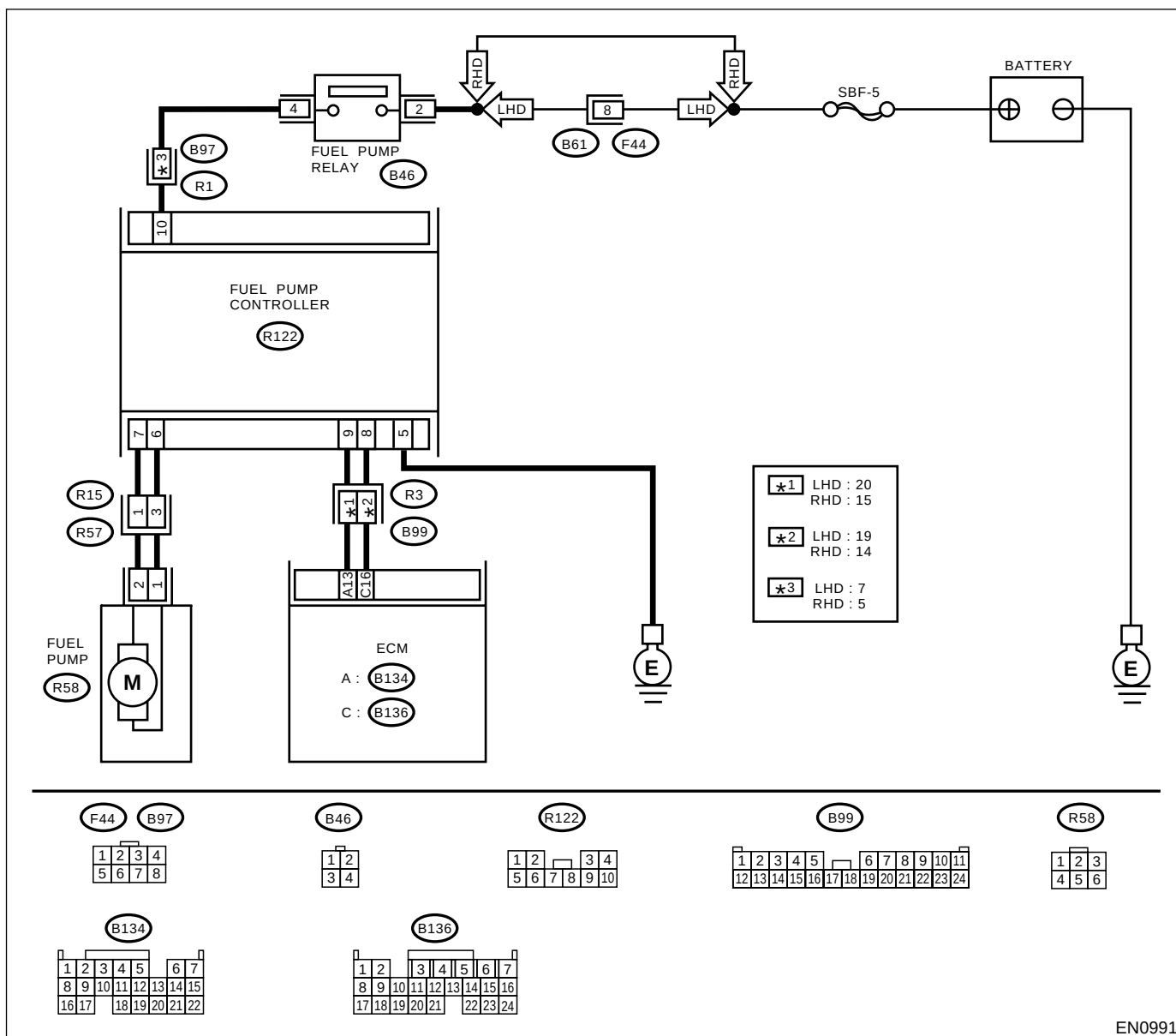
• **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0991

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROLLER. 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. Connector & terminal (R122) No. 10 (+) — Chassis ground (-):	Is the voltage more than 10V?	Go to step 2.	Repair power supply circuit. NOTE: In this case repair the following: • 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.
2 CHECK GROUND CIRCUIT OF FUEL PUMP CONTROLLER. 1) Turn ignition switch to OFF. 2) Measure resistance of harness between fuel pump controller and chassis ground. Connector & terminal (R122) No. 5 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump controller and chassis ground. • Poor contact in fuel pump controller connector.
3 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR. 1) Disconnect connector from fuel pump. 2) Measure resistance of harness between fuel pump controller and fuel pump connector. Connector & terminal (R122) No. 7 — (R58) No. 2: (R122) No. 6 — (R58) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair open circuit between fuel pump controller and fuel pump.
4 CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR. Measure resistance of harness between fuel pump controller and chassis ground. Connector & terminal (R122) No. 7 — Chassis ground: (R122) No. 6 — Chassis ground:	Is the resistance more than 1M Ω ?	Go to step 5.	Repair ground short circuit between fuel pump controller and fuel pump.
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 — (B134) No. 13: (R122) No. 8 — (B136) No. 16:	Is the resistance less than 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.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
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:	Is the resistance more than 1M Ω ?	Go to step 7.	Repair ground short circuit between fuel pump controller and ECM.
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.	Repair poor contact in ECM and fuel pump controller.	Replace fuel pump controller. <Ref. to FU(DOHC TURBO)-48, Fuel Pump Controller.>

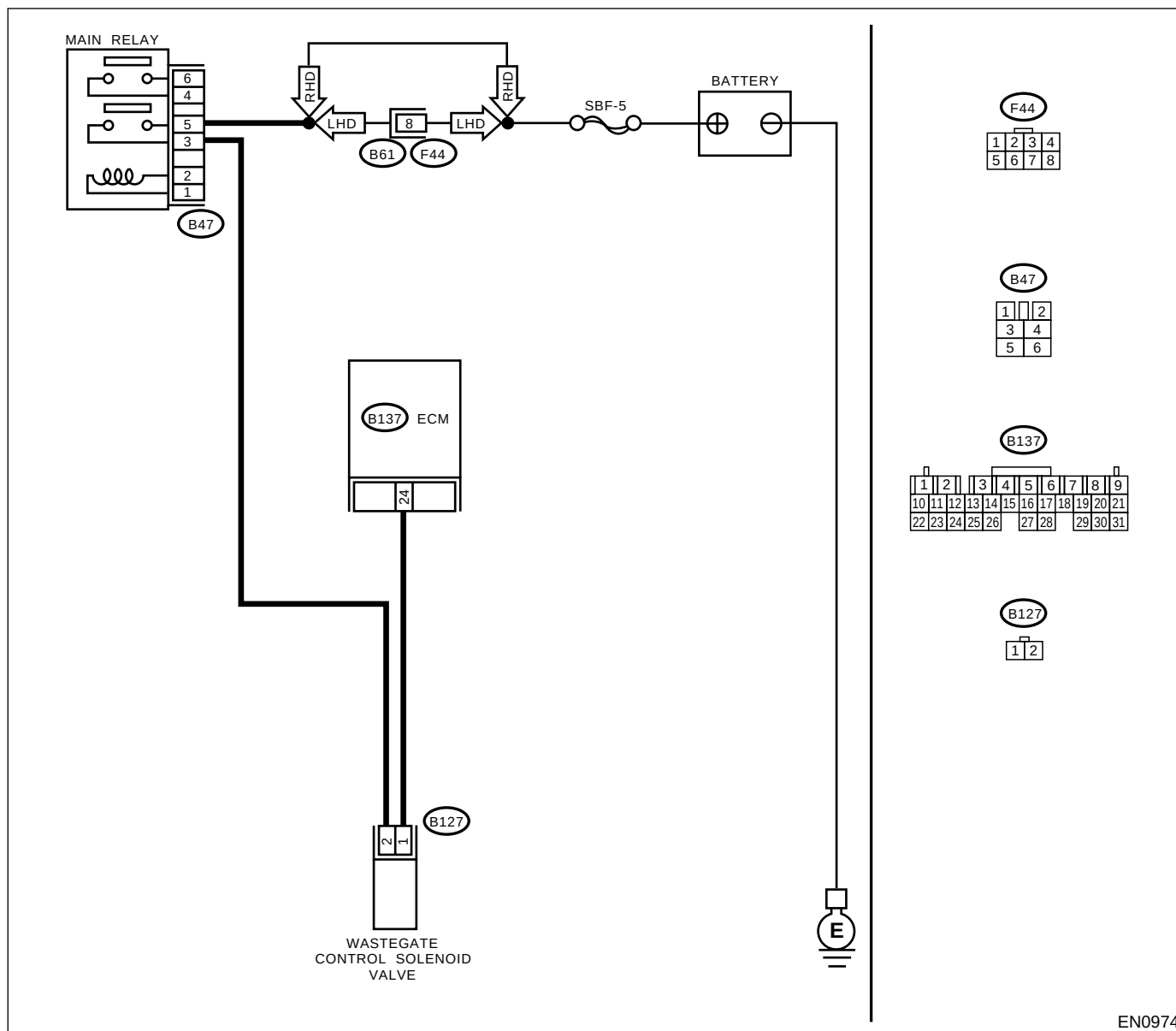
CC:DTC P1244 — WASTEGATE CONTROL SOLENOID VALVE RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0974

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0245 or P0246?	Inspect DTC P0245 or P0246 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1142.	Replace wastegate control solenoid valve. <Ref. to FU(DOHC TURBO)-40, Wastegate Control Solenoid Valve.>

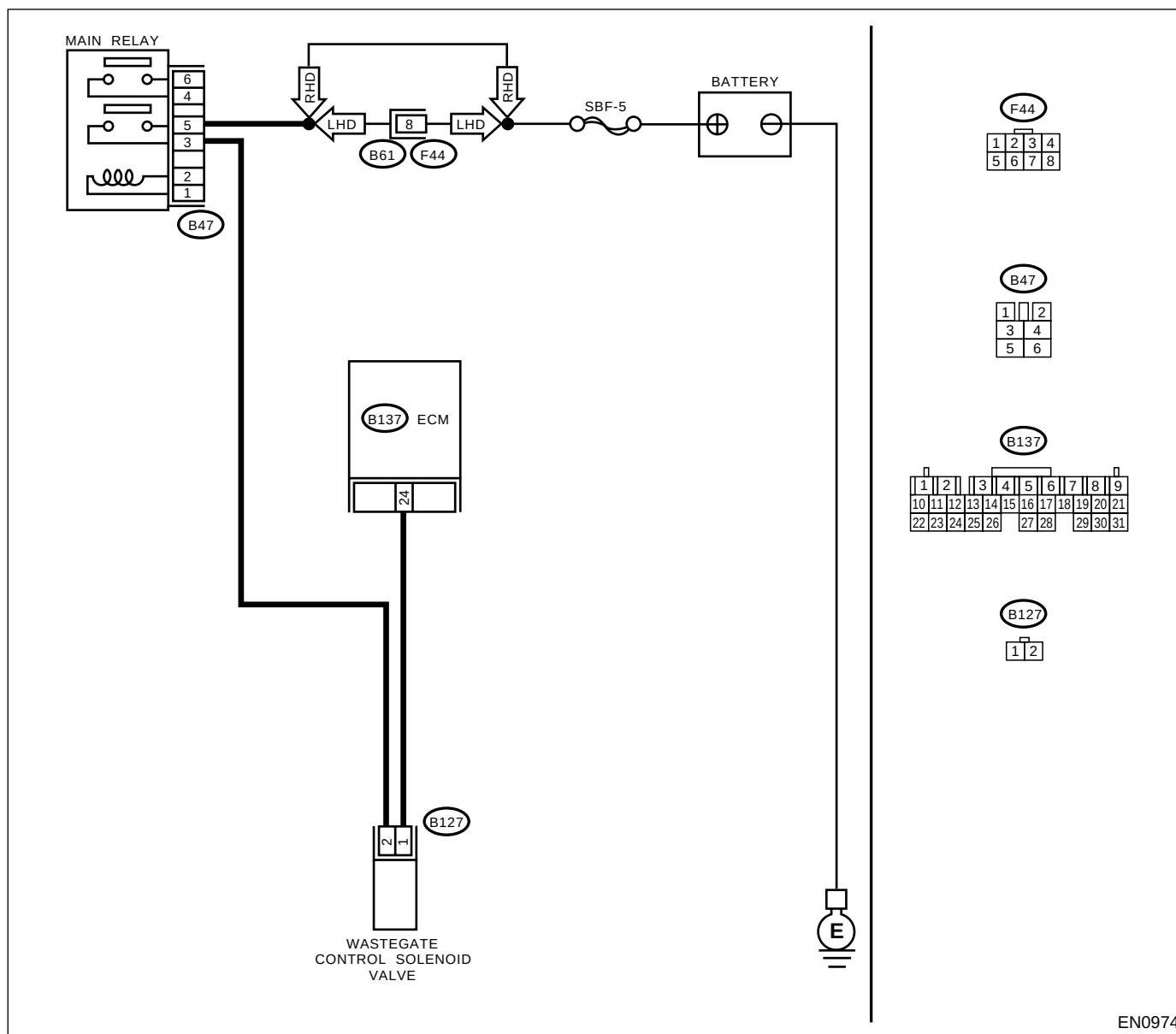
CD:DTC P1245 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (FAIL-SAFE) —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, Operation.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0244, P0245, P0246 or P1244?	Inspect DTC P0244, P0245, P0246 or P1244 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Replace wastegate control solenoid valve. <Ref. to FU(DOHC TURBO)-40, Wastegate Control Solenoid Valve.>

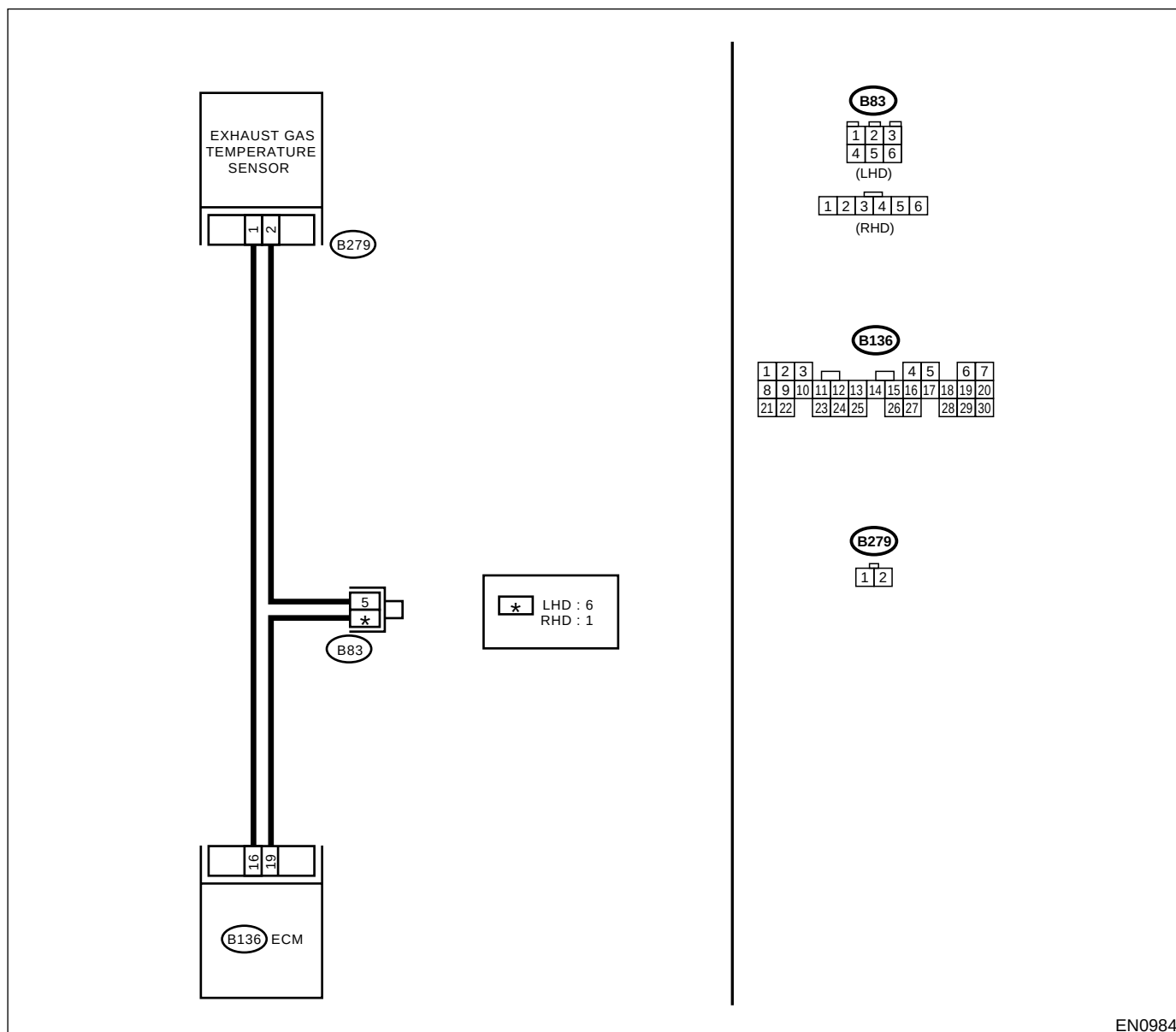
CE:DTC P1301 — FIRE DUE TO INCREASED EXHAUST TEMPERATURE —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0984

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC. Conduct troubleshooting for all DTC P0301, P0302, P0303 and P0304. <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>	Does failure for repair or replacement exist?	Repair or replace failure, then replace precat- alytic converter.	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, be- cause probable cause is deteriora- tion of multiple parts.

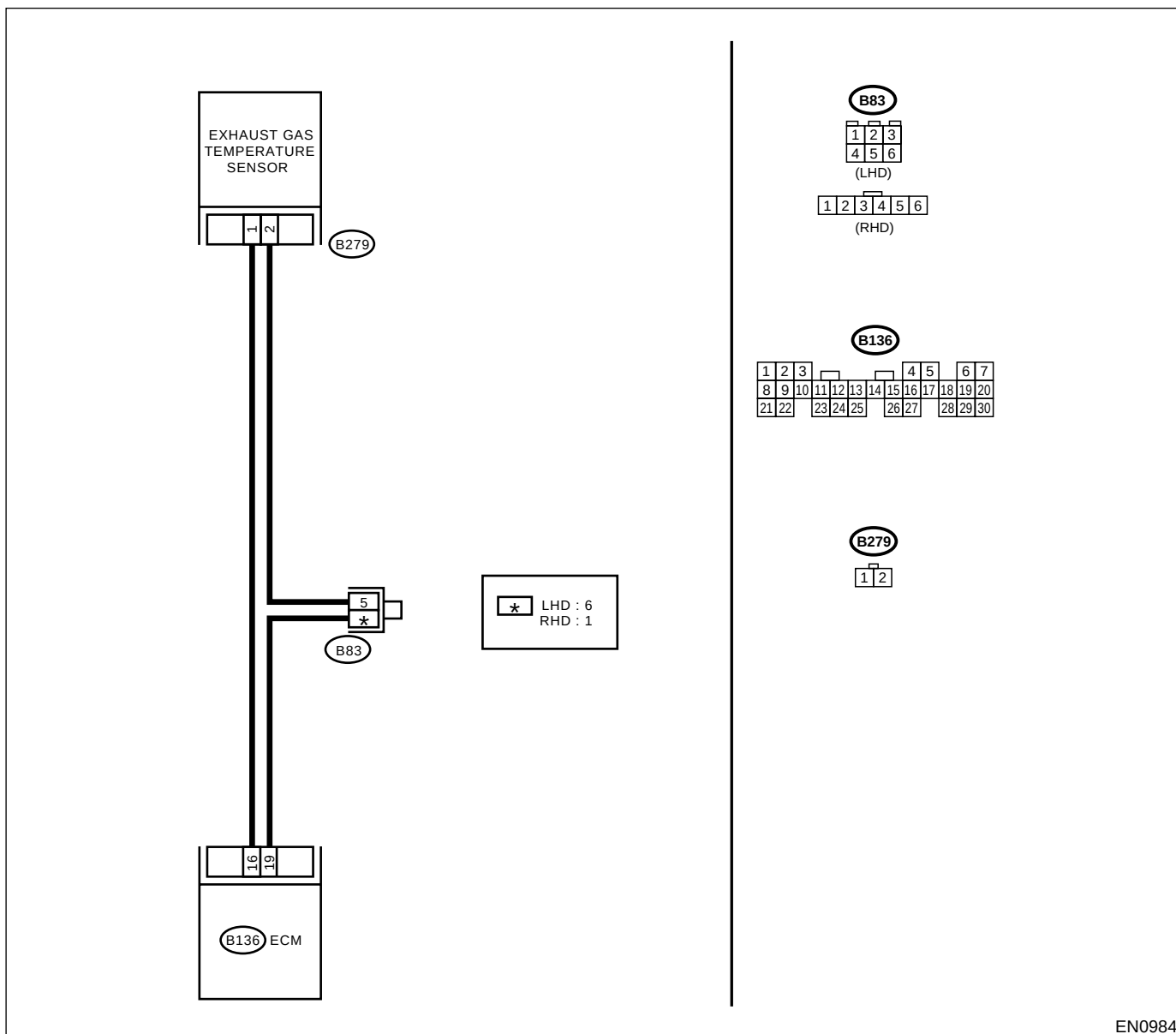
CF:DTC P1312 — EXHAUST GAS TEMPERATURE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0984

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0545 or P0546?	Inspect DTC P0545, P0546 or P1544 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1312.	Replace exhaust gas temperature sensor. <Ref. to FU(DOHC TURBO)-44, Exhaust Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CG:DTC P1480 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Radiator fan does not operate properly.
 - Overheating

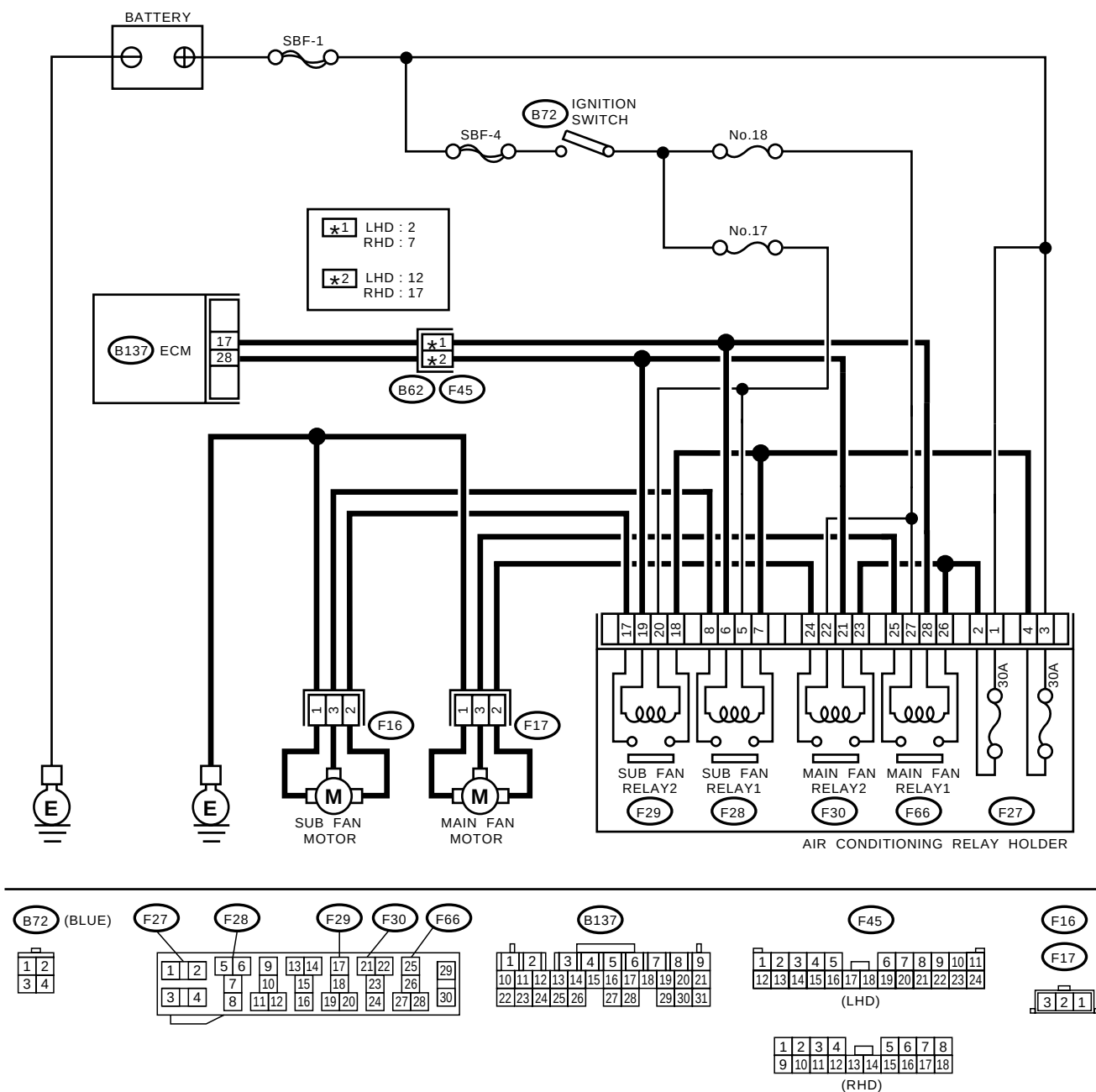
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, Operation.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN0981

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 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. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(DOHC TURBO)-39, Compulsory Valve Operation Check Mode.> Connector & terminal (B137) No. 17 (+) — Chassis ground (-): (B137) No. 28 (+) — Chassis ground (-):	Does voltage change between 0 and 10 V?	Even if MIL 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.
2 CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT. 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. Connector & terminal (B137) No. 17 (+) — Chassis ground (-): (B137) No. 28 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in radiator fan relay control circuit. After repair, replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Go to step 3.
3 CHECK MAIN FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove main fan relay 1 and 2. 3) Measure resistance between main fan relay terminals. Terminal No. 25 — No. 26 (Main fan relay 1) No. 23 — No. 24 (Main fan relay 2)	Is the resistance less than 1 Ω ?	Replace main fan relay and ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Go to step 4.
4 CHECK SUB FAN RELAY. 1) Remove sub fan relay. 2) Measure resistance between sub fan relay terminals. Terminal No. 7 — No. 8 (Sub fan relay 1) No. 17 — No. 18 (Sub fan relay 2)	Is the resistance less than 1 Ω ?	Replace sub fan relay and ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>

CH:DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

• DTC DETECTING CONDITION:

- Immediately at fault recognition

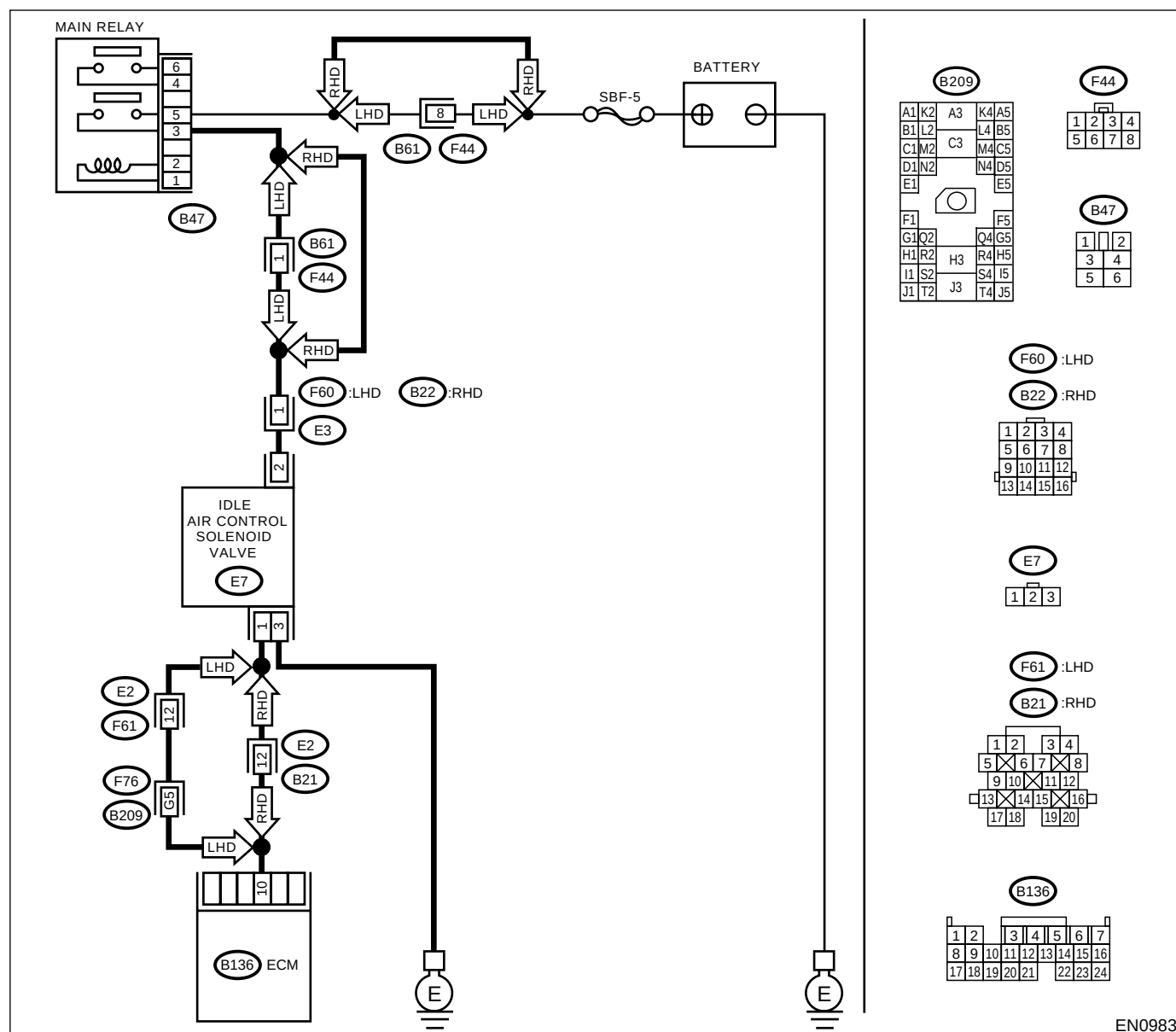
• TROUBLE SYMPTOM:

- 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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:



EN0983

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0506, P0507, P0508, P0509 or P1142?	Inspect DTC P0506, P0507, P0508, P0509 or P1142 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN(DOHC TURBO)-69, 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?	Repair air suction and leaks.	Go to step 3.
3 CHECK THROTTLE CABLE.	Does throttle cable have play for adjustment?	Go to step 4.	Adjust throttle cable. <Ref. to SP-9, INSTALLATION, 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(DOHC TURBO)-34, 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?	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(DOHC TURBO)-34, Idle Air Control Solenoid Valve.>

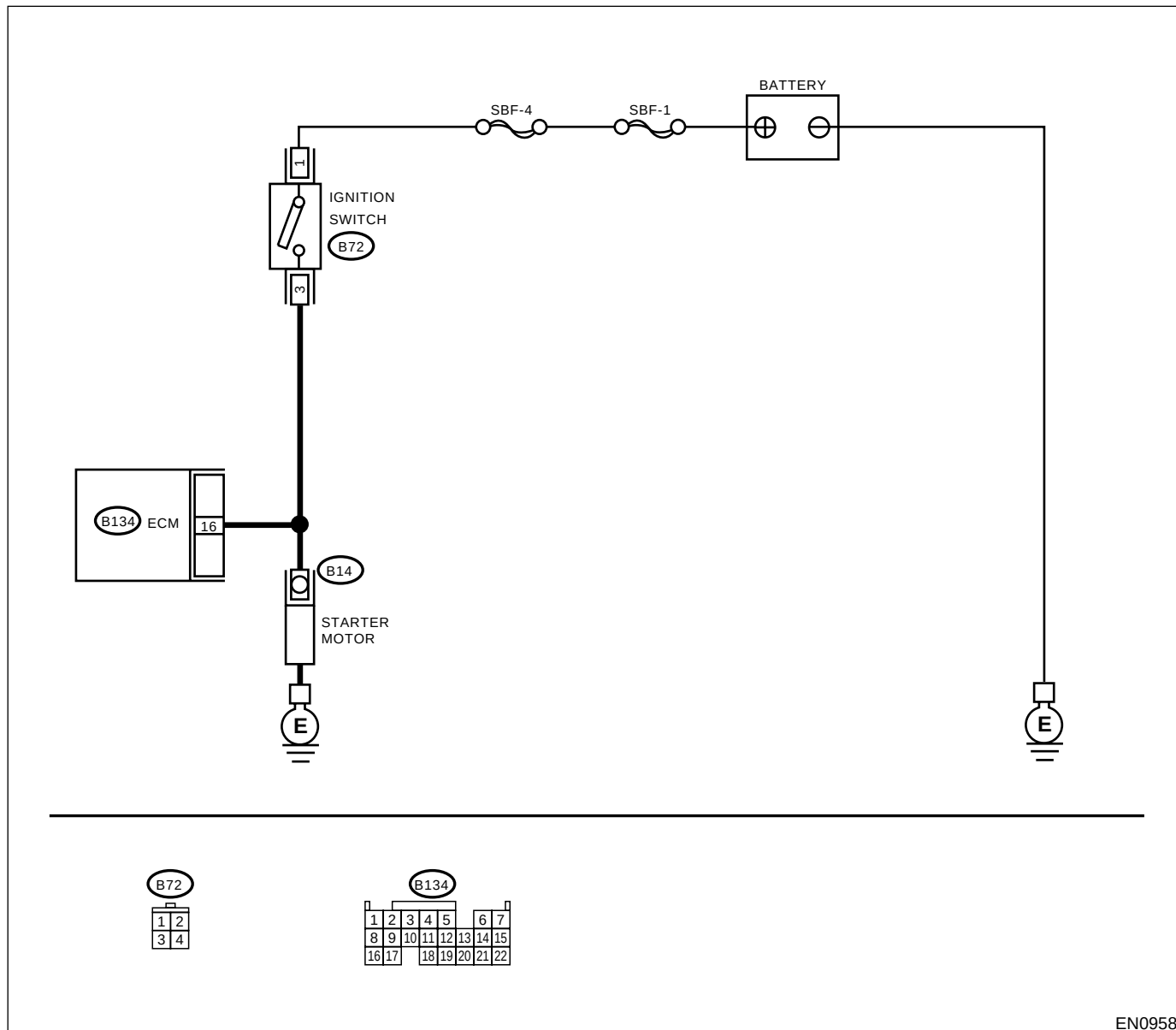
CI: DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0958

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF STARTER MOTOR.	Does starter motor operate when ignition switch to "ST"?	Repair harness and connector. NOTE: In this case, repair the following: • 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(DOHC TURBO)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

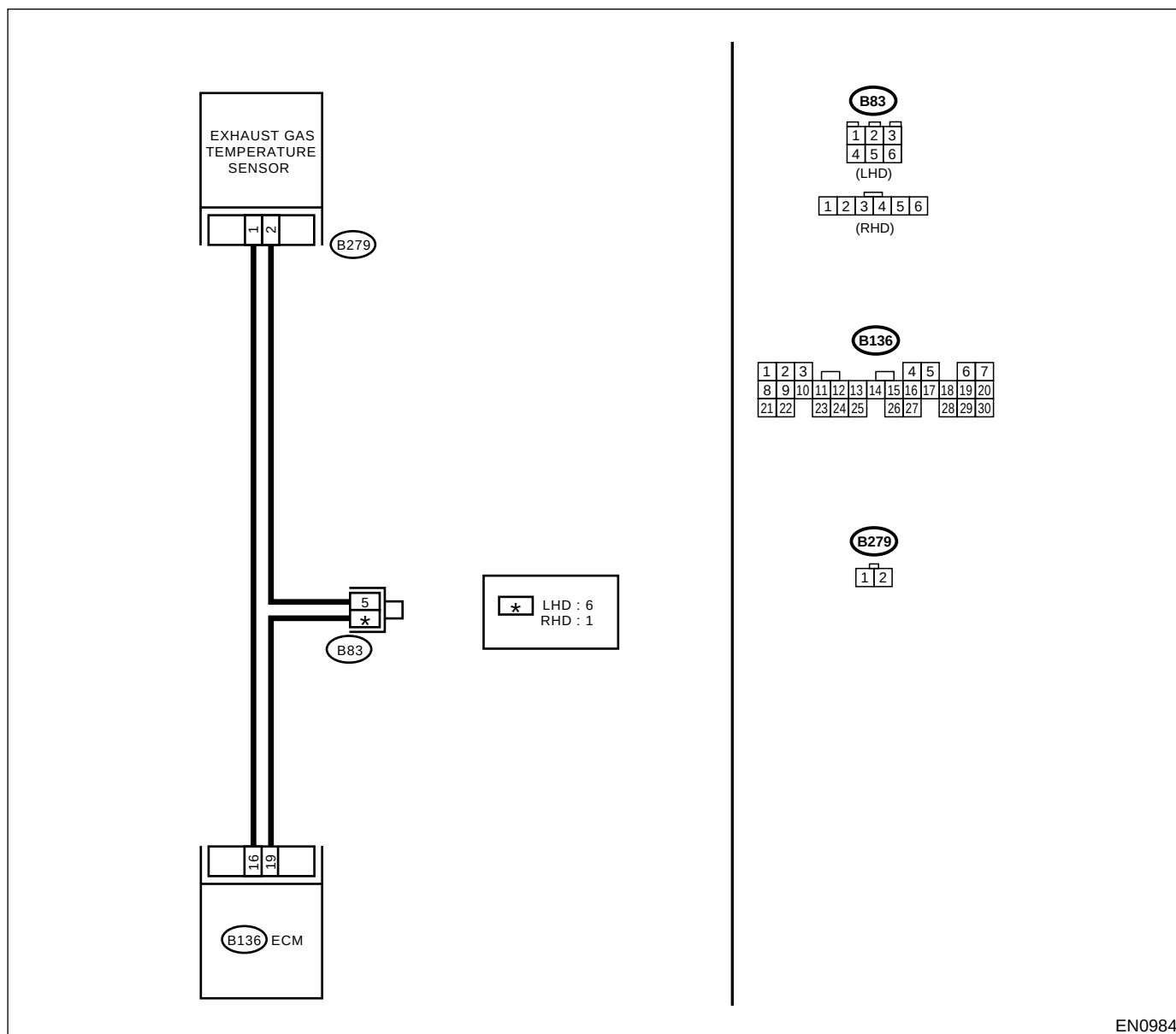
CJ:DTC P1544 — HIGH EXHAUST TEMPERATURE DETECTED —

- **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(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0984

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0335, P0336, P0340, P0341, P0545, P0546, P1312, P0102, P0103, P0101, P1141, P0301, P0302, P0303, P0304, P1301, P0171, P0133, P1134, P0131, P0132, P1130, P1131, P1139, P0031, P0032, P0139, P0136, P0039 or P0037?	Inspect DTC P0335, P0336, P0340, P0341, P0545, P0546, P1312, P0102, P0103, P0101, P1141, P0301, P0302, P0303, P0304, P1301, P0171, P0133, P1134, P0131, P0132, P1130, P1131, P1139, P0031, P0032, P0139, P0136, P0039 or P0037 using List of Diagnostic Trouble Code (DTC). <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1544.	Go to step 2.
2 CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. •Loose installation of exhaust manifold •Cracks or hole of exhaust manifold •Loose installation of front oxygen (A/F) sensor	Is there a fault in exhaust system?	Repair or replace failure, then replace pre-catalytic converter.	Contact with your 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)

CK:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

• DTC DETECTING CONDITION:

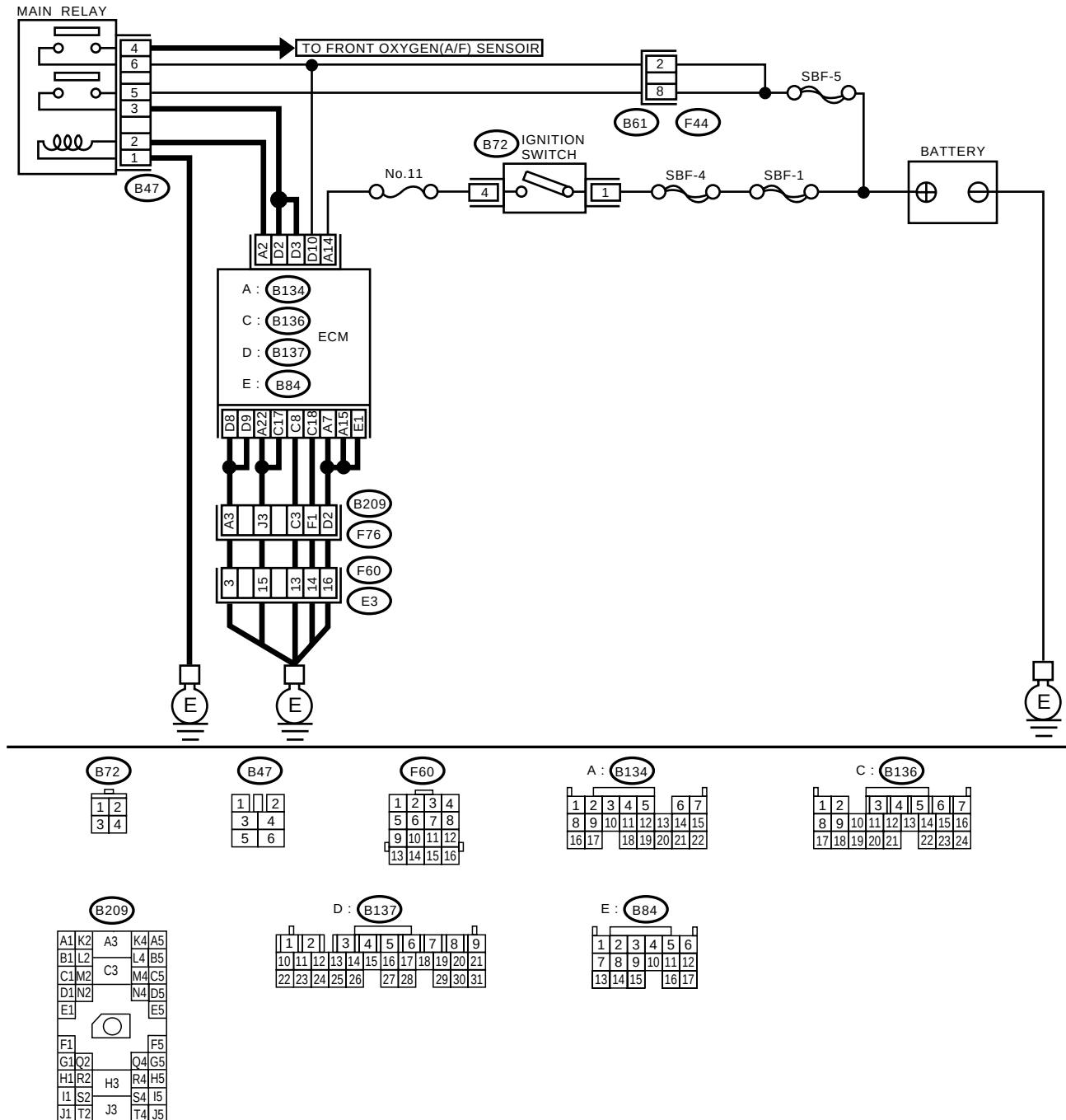
- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(DOHC TURBO)-38, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(DOHC TURBO)-35, Inspection Mode.> .

• WIRING DIAGRAM:

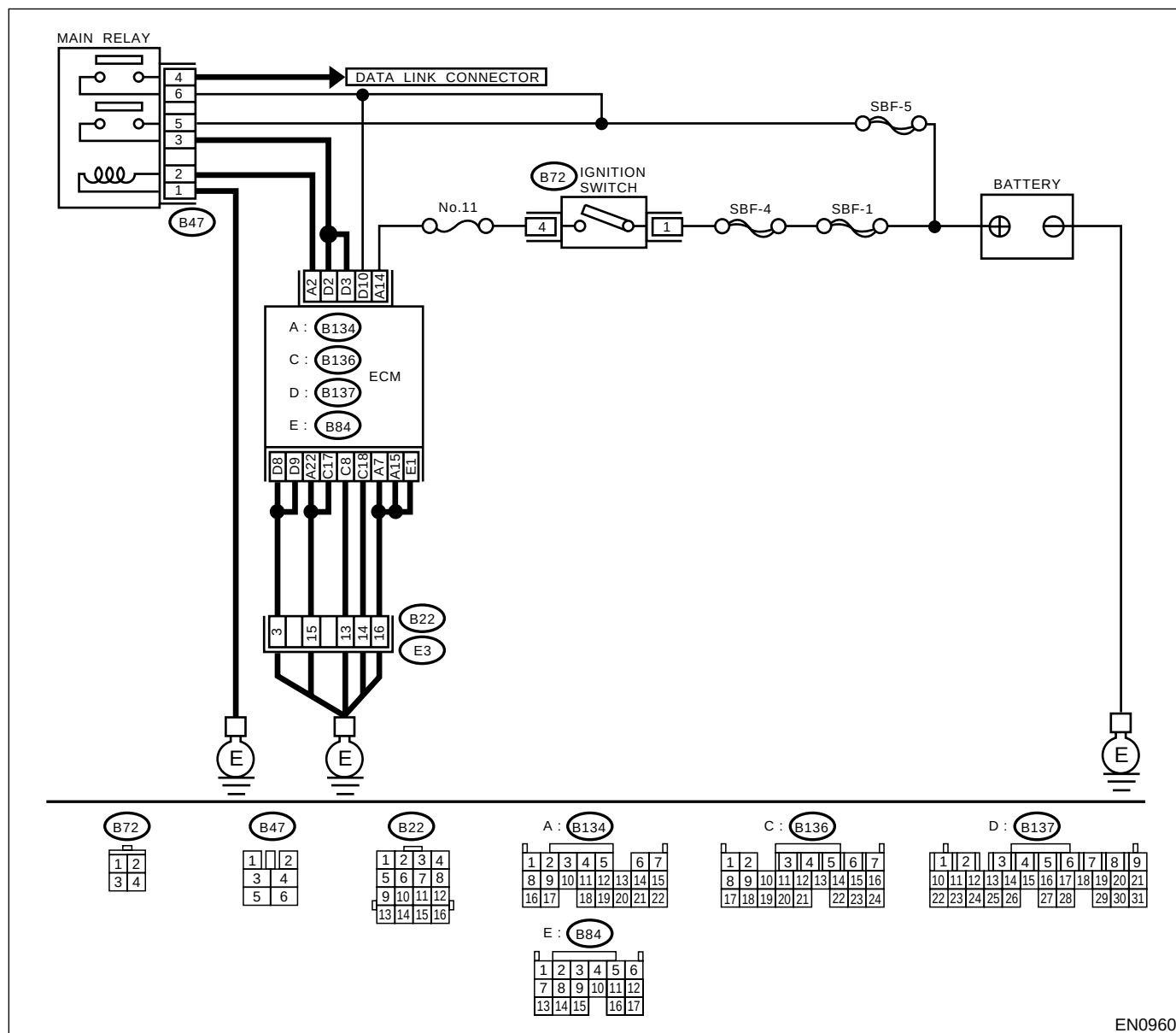
• LHD MODEL



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD MODEL



EN0960

Step	Check	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 (-):	Is the voltage more than 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 resistance less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK FUSE SBF-5.	Is fuse blown?	Replace fuse.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

18. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(DOHC TURBO)-89, Engine Trouble in General.>

Symptom	Problem parts
1. 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)
2. 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
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) Pressure sensor 6) Mass air flow sensor
4. 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)
5. 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

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
6. 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
7. 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
8. 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 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.

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



	Page
1. General Description	2
2. Select Lever	7
3. Select Cable	9
4. MT Gear Shift Lever	12
5. MT Drive Select Lever	17
6. Drive Select Cable	19
7. General Diagnostic	20

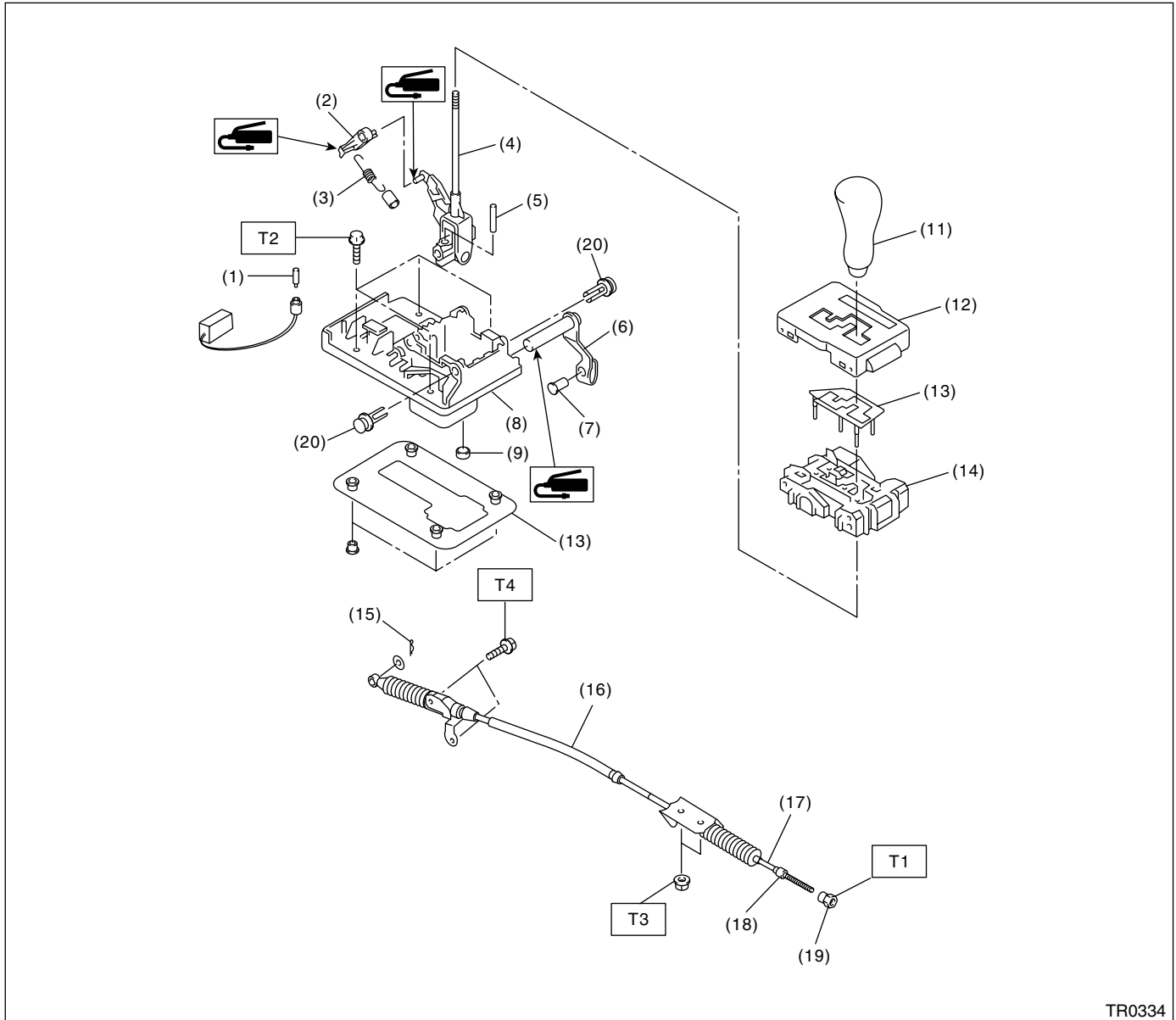
1. General Description

A: SPECIFICATIONS

Item		Specification
Vibration torque of rod against lever	N·m (kgf-m, ft-lb)	0.7 (0.07, 0.5) or less

B: COMPONENT

1. AT SELECT LEVER



TR0334

- (1) Indicator light bulb
- (2) Detent arm
- (3) Detent spring
- (4) Select lever upper
- (5) Straight pin
- (6) Select lever lower
- (7) Pin
- (8) Plate
- (9) Grommet

- (10) Packing
- (11) Grip
- (12) Indicator cover
- (13) Cushion
- (14) Guide plate
- (15) Snap pin
- (16) Outer cable
- (17) Inner cable
- (18) Nut B

- (19) Nut A
- (20) Clip

Tightening torque: N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

T2: 13 (1.3, 9.4)

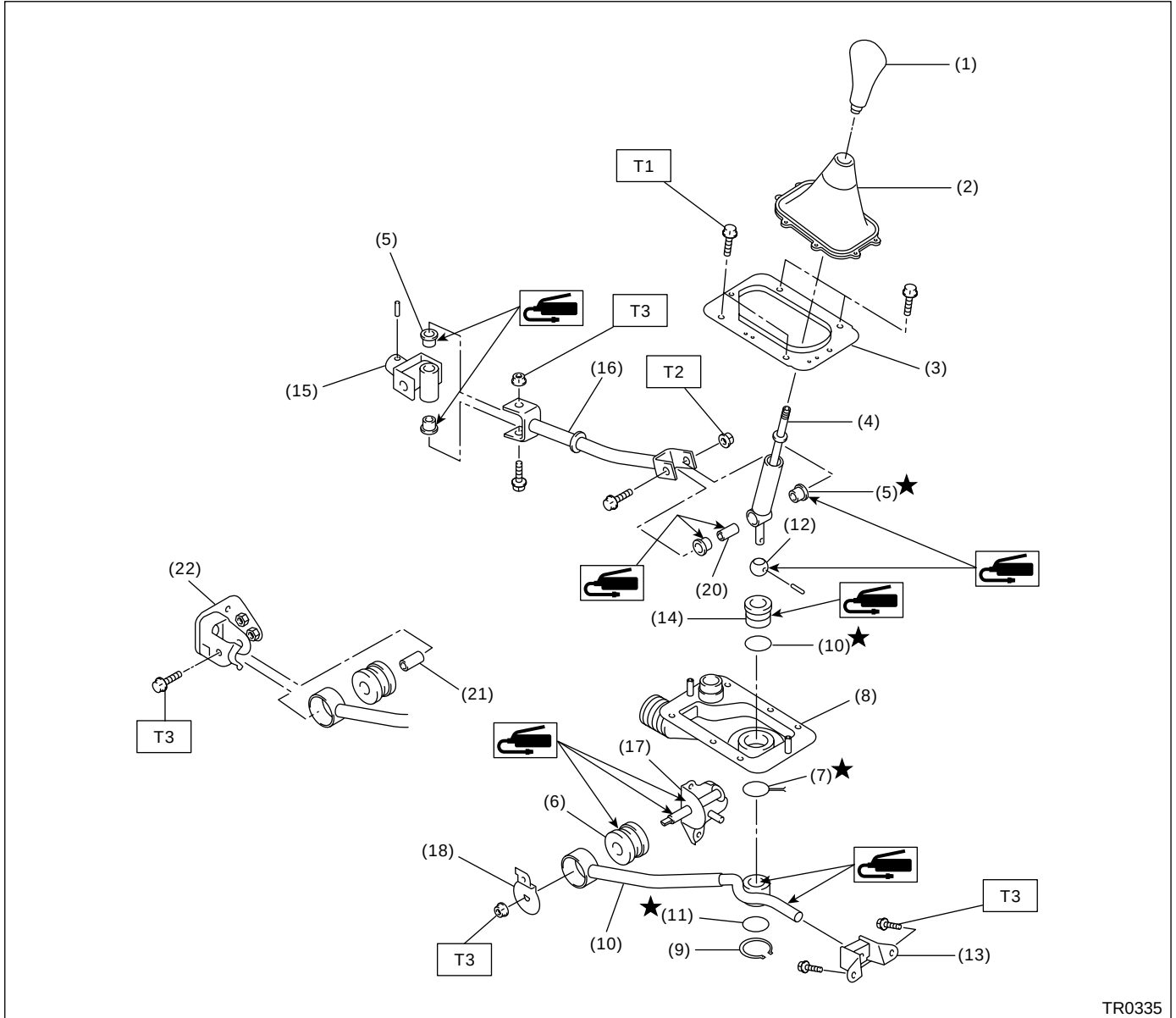
T3: 18 (1.8, 13.0)

T4: 33 (3.4, 25)

GENERAL DESCRIPTION

CONTROL SYSTEMS

2. MT GEAR SHIFT LEVER



- | | | |
|--------------------------|----------------------------|--------------------------|
| (1) Gear shift knob | (10) O-ring A | (19) Stay |
| (2) Console boot | (11) O-ring B | (20) Spacer |
| (3) Boot plate | (12) Bushing (Shift lever) | (21) Spacer (FWD model) |
| (4) Lever | (13) Cushion rubber | (22) Bracket (FWD model) |
| (5) Bushing | (14) Bushing (Stay rear) | |
| (6) Bushing (Stay front) | (15) Joint | |
| (7) Locking wire | (16) Rod | |
| (8) Boot | (17) Bracket (AWD model) | |
| (9) Snap ring | (18) Washer | |

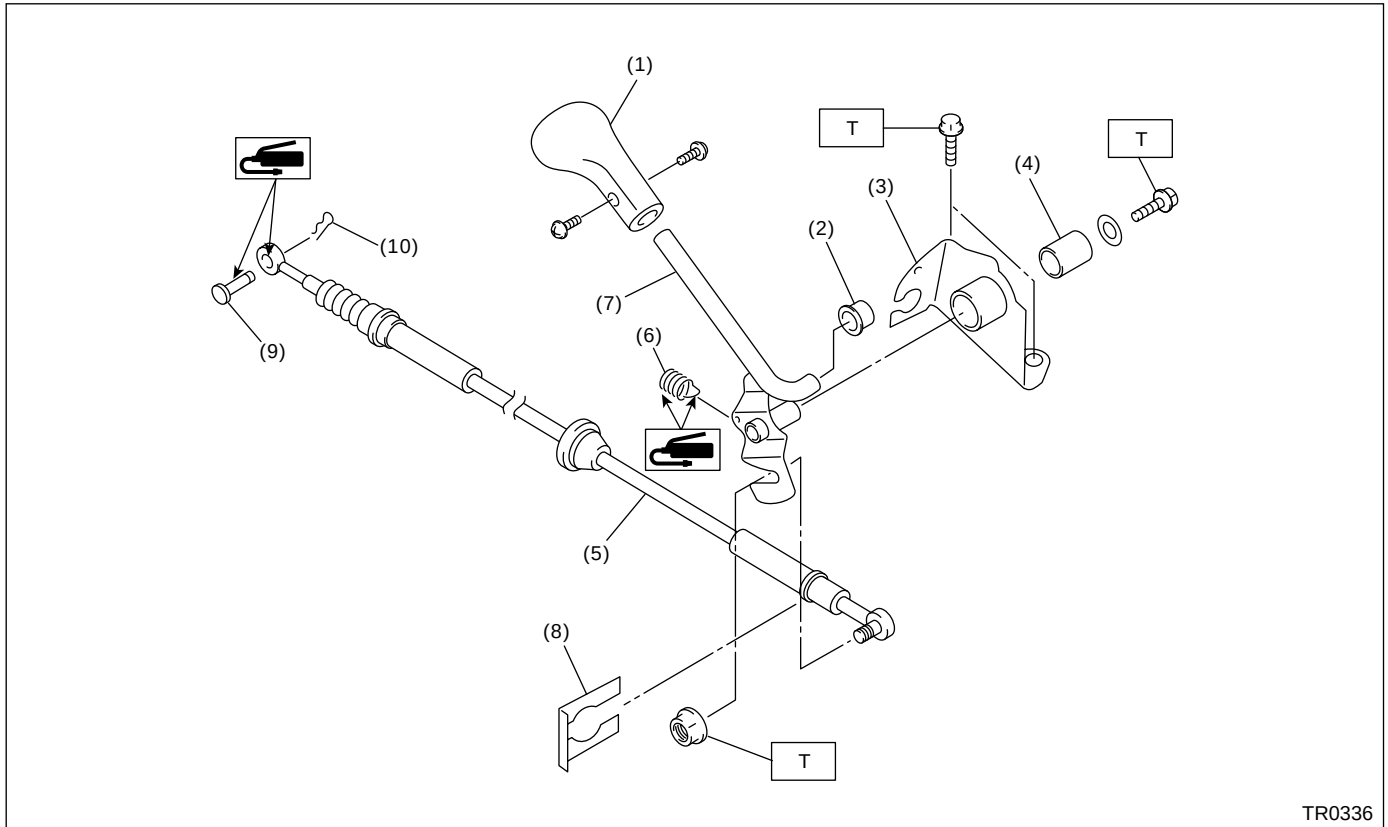
Tightening torque: N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

T2: 11.8 (1.2, 8.7)

T3: 18 (1.8, 13.0)

3. DRIVE SELECT LEVER



TR0336

- | | |
|-------------|----------------|
| (1) Knob | (6) Spring |
| (2) Cap | (7) Lever |
| (3) Plate | (8) Clamp |
| (4) Bushing | (9) Clevis pin |
| (5) Cable | (10) Snap ring |

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

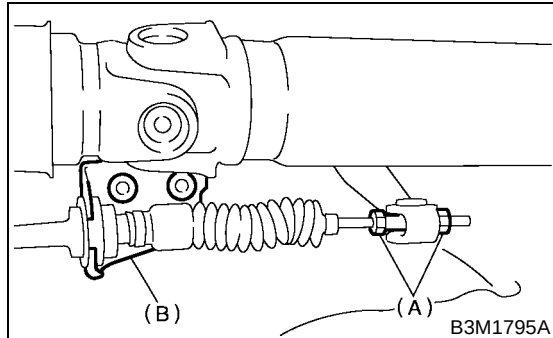
C: CAUTION

- 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Before disconnecting electrical connectors, be sure to disconnect negative terminal from battery.

2. Select Lever

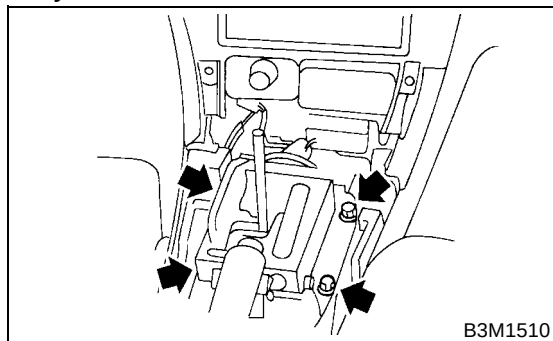
A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Move the select lever to the "N" position.
- 4) Lift-up the vehicle.
- 5) Remove rear exhaust pipe and 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-24, REMOVAL, Console Box.>
- 10) Disconnect the connectors, then remove the four bolts to take out the select lever assembly from the body.

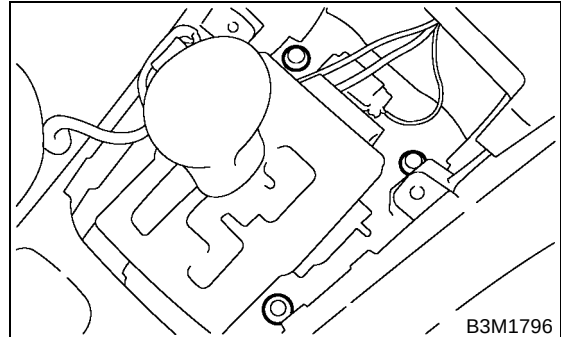


B: INSTALLATION

- 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-22, INSTALLATION, Glove 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.
- 8) Adjust the select cable position. <Ref. to CS-10, ADJUSTMENT, Select Cable.>
- 9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
- 10) Inspect the following items. If the following inspection reveals problems, adjust the select cable and inhibitor switch. <Ref. to CS-10, ADJUSTMENT, Select Cable.> and <Ref. to AT-28, ADJUSTMENT, Inhibitor Switch.>
 - (1) The engine starts operating when select lever is in position "P", 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.
- 11) Install heat shield cover. (If equipped)
- 12) Install rear exhaust pipe and muffler.

SELECT LEVER

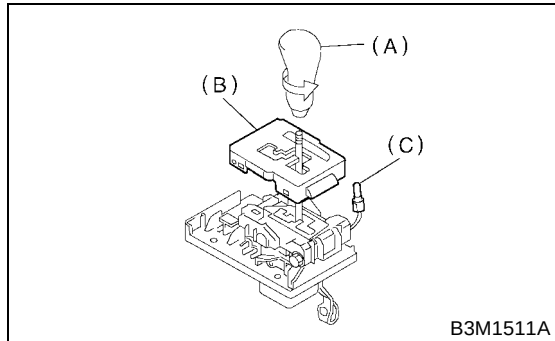
CONTROL SYSTEMS

C: DISASSEMBLY

- 1) Remove grip.
- 2) Remove indicator light and then remove indicator cover.

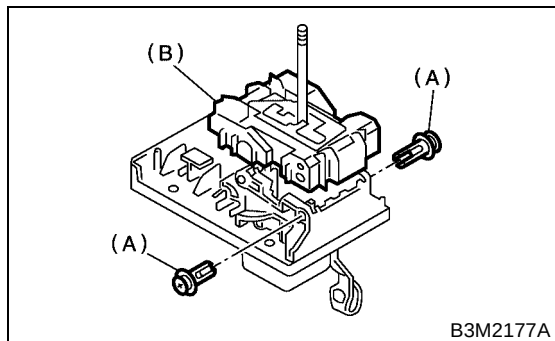
NOTE:

Be careful not to break the indicator light during removal.



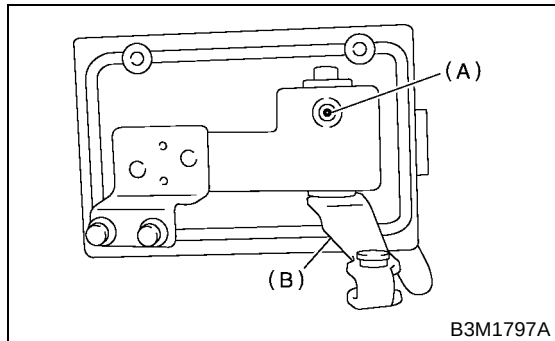
- (A) Grip
- (B) Indicator cover
- (C) Indicator light

- 3) Remove clips and then remove guide plate.



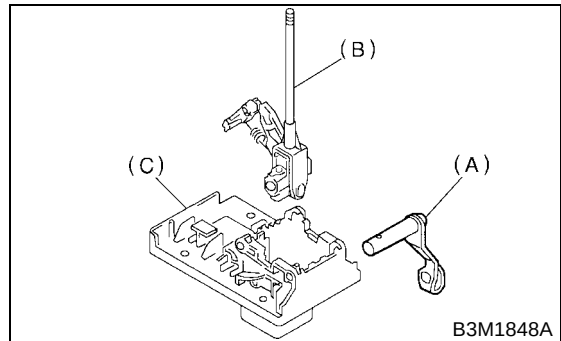
- (A) Clips
- (B) Guide plate

- 4) Remove cap and then extract straight pin.



- (A) Straight pin
- (B) Select lever lower

- 5) Remove select lever lower then take away select lever upper from plate.



- (A) Select lever lower
- (B) Select lever upper
- (C) Plate

D: ASSEMBLY

- 1) Clean all parts before assembly.
- 2) Apply grease [NIGHTIGHT LYW No. 2 or equivalent] to each parts. <Ref. to CS-3, AT Select Lever.>
- 3) Assembly is in the reverse order of disassembly.
- 4) After completion of fitting, transfer 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 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 selector lever upper... it should move smoothly.

3. Select Cable

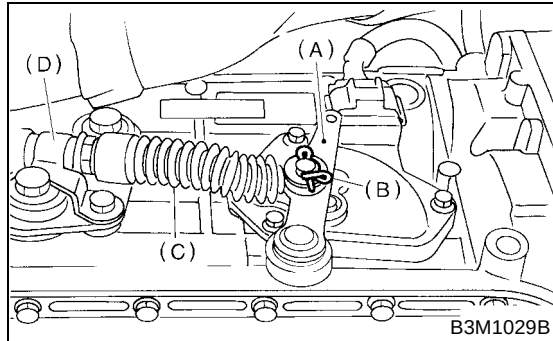
A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Prior to removal, set lever to "N" position.
- 4) Lift-up the vehicle.
- 5) Remove front and center exhaust pipe.

CAUTION:

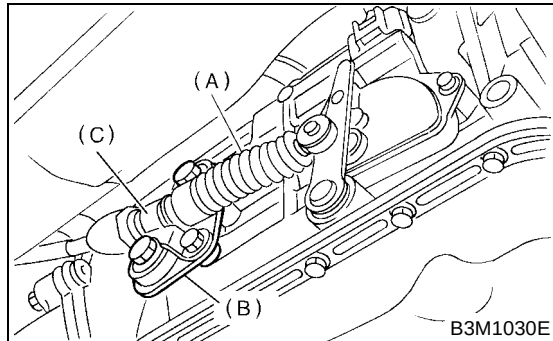
When removing exhaust pipes, be careful each exhaust pipe does not drop out.

- 6) Remove heat shield cover. (If equipped)
- 7) Remove snap pin from range select lever.



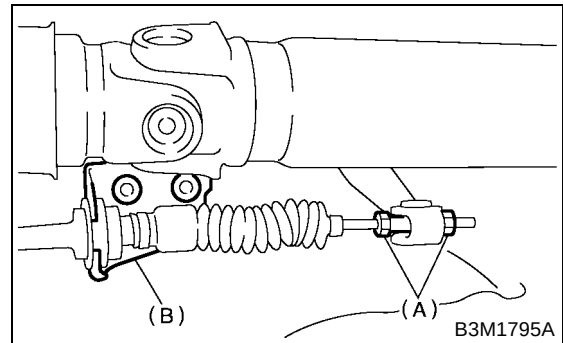
- (A) Range select lever
- (B) Snap pin
- (C) Select cable
- (D) Clamp

- 8) Remove plate assembly from transmission case.



- (A) Select cable
- (B) Plate ASSY
- (C) Clamp

- 9) Disconnect cable from select lever and then remove cable bracket.



- (A) Adjusting nuts
- (B) Cable bracket

- 10) Remove select cable from plate assembly.

SELECT CABLE

CONTROL SYSTEMS

B: INSTALLATION

- 1) Install select cable to plate assembly.

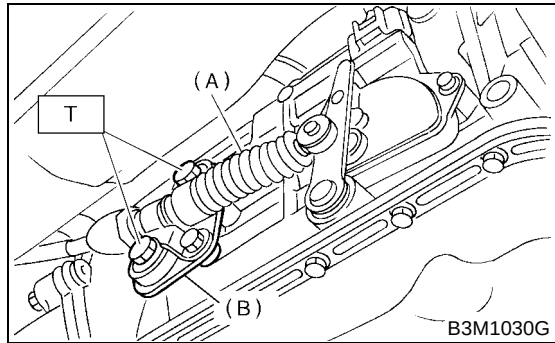
Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)

- 2) Install select cable to range select lever.
- 3) Install plate assembly to transmission.

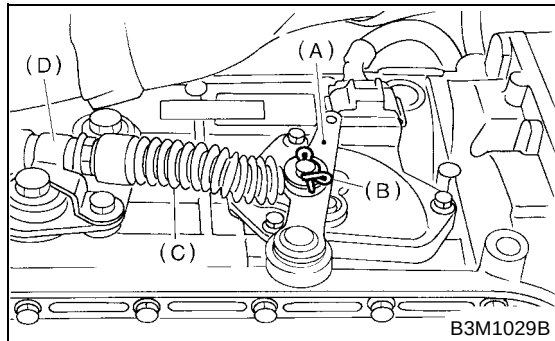
Tightening torque:

T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



- (A) Select cable
(B) Plate ASSY

- 4) Install snap pin to range select lever.



- (A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp

- 5) Move the select lever to the "N" position, then adjust the select cable position. <Ref. to CS-10, ADJUSTMENT, Select Cable.>
- 6) Install heat shield cover. (If equipped)
- 7) Install from and center exhaust pipe.

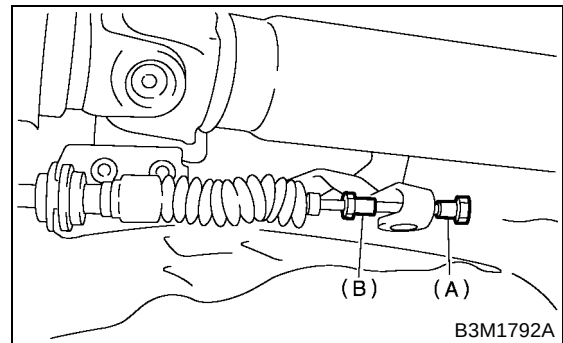
C: INSPECTION

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.

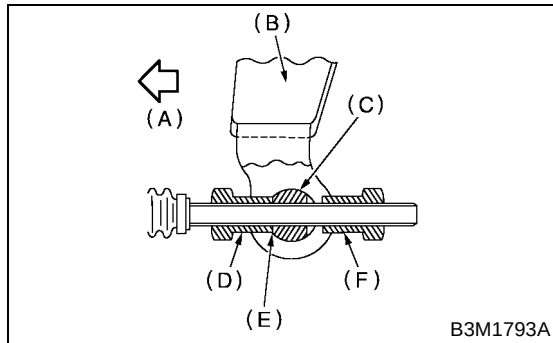
D: ADJUSTMENT

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Set lever to "N" position.
- 4) Lift-up the vehicle.
- 5) Remove rear exhaust pipe and muffler.
- 6) Remove heat shield cover. (If equipped)
- 7) Loosen the adjusting nut on each side.



- (A) Adjusting nut A
(B) Adjusting nut B

8) Turn adjusting nut B until it lightly touches the connector.

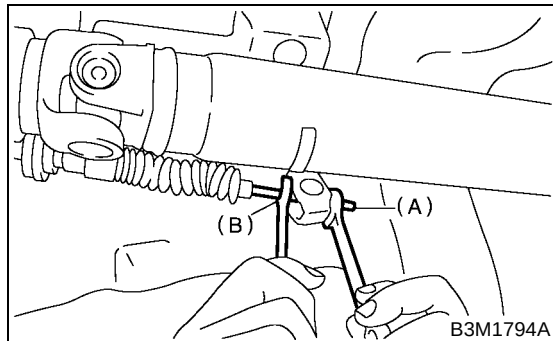


- (A) Front side
- (B) Select lever
- (C) Connector
- (D) Adjusting nut B
- (E) Contact point
- (F) Adjusting nut A

9) 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

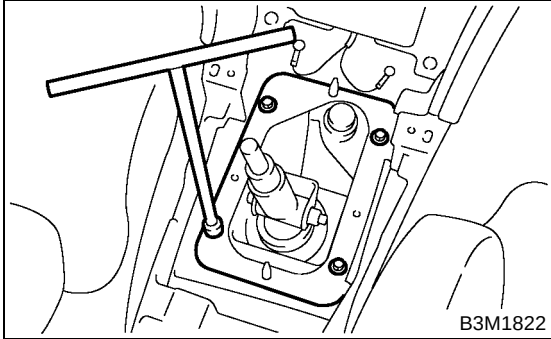
10) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.

11) Install in the reverse order of removal.

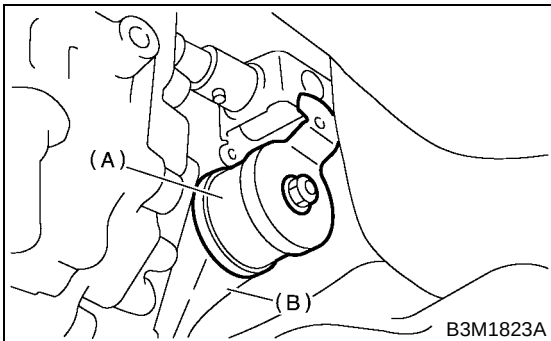
4. MT Gear Shift Lever

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Remove gear shift knob.
- 3) Disconnect ground terminal from battery.
- 4) Remove console box. <Ref. to EI-24, REMOVAL, Console Box.>
- 5) Remove boot plate from body.

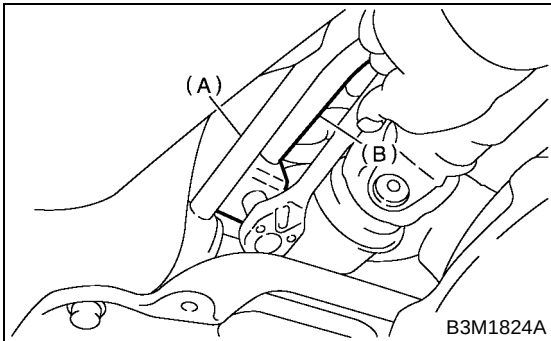


- 6) Lift-up the vehicle.
- 7) Remove rear exhaust pipe and muffler.
- 8) Remove heat shield cover. (If equipped)
- 9) Remove stay from transmission bracket.



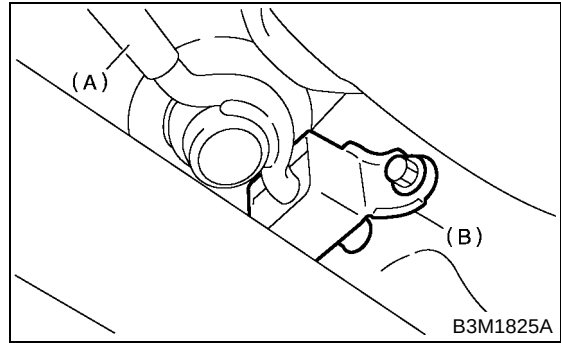
- (A) Stay
(B) Transmission bracket

- 10) Remove rod from joint.



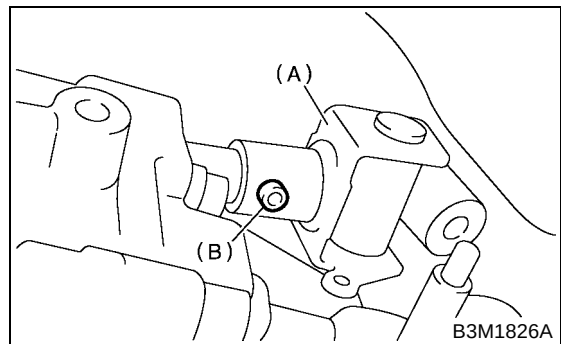
- (A) Stay
(B) Rod

- 11) Remove cushion rubber from body.



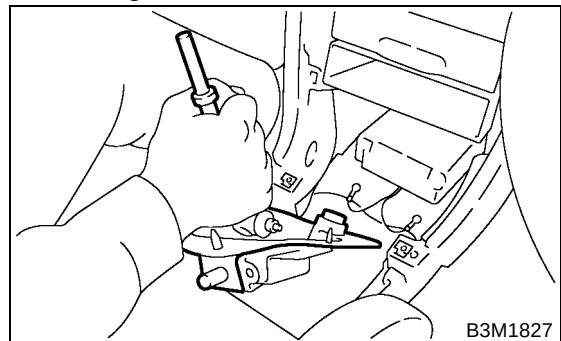
- (A) Rod
(B) Cushion rubber

- 12) Remove joint and then extract straight pin.



- (A) Joint
(B) Straight pin

- 13) Lower the vehicle.
- 14) Remove gear shift lever.

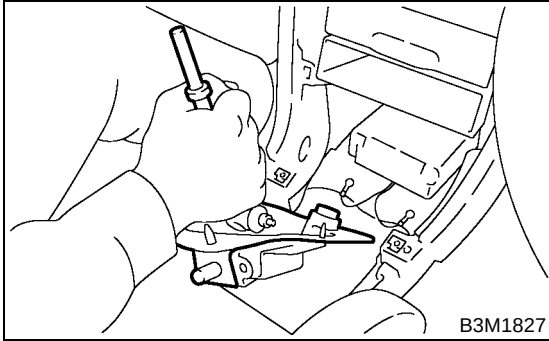


B: INSTALLATION

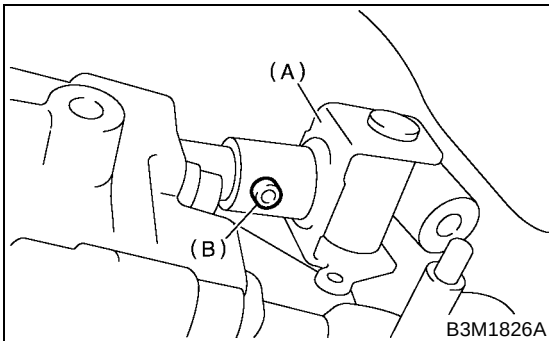
- 1) Install the joint to the transmission and secure with the straight pin.
- 2) Insert gear shift lever from room side.

NOTE:

After inserting rod and stay, temporarily put them onto transmission mount.



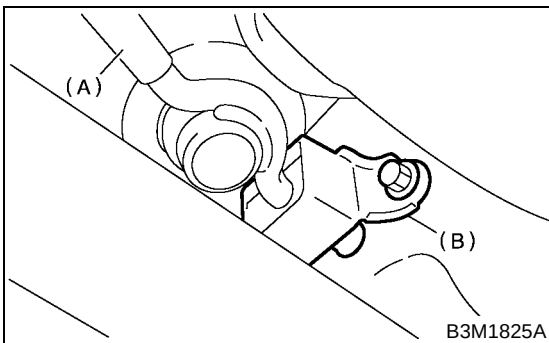
- 3) Lift-up the vehicle.
- 4) Install joint to shifter arm.
- 5) Insert straight pin.



- 6) Mount cushion rubber on the body.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

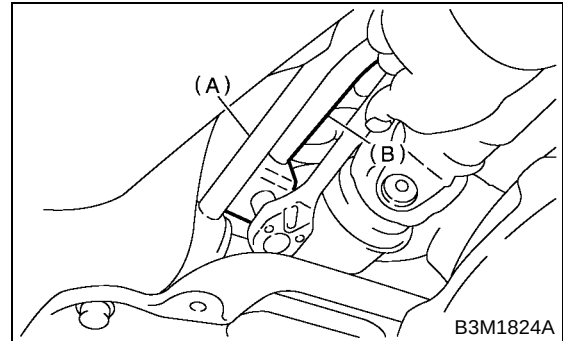


- (A) Cushion rubber
(B) Stay

- 7) Connect rod to the joint.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

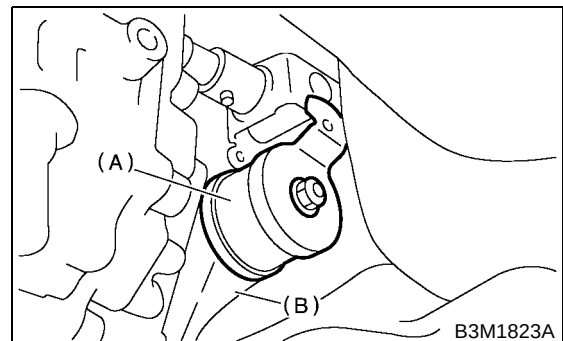


- (A) Stay
(B) Rod

- 8) Connect stay to transmission bracket.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



- (A) Stay
(B) Transmission bracket

- 9) Install heat shield cover. (If equipped)
- 10) Install rear exhaust pipe and muffler.
- 11) Lower the vehicle.
- 12) Install boot plate to body.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

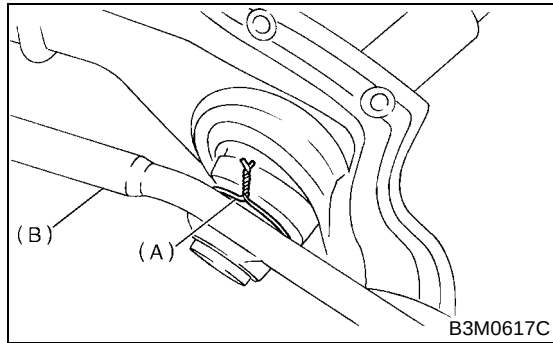
- 13) Install consol box. <Ref. to EI-24, INSTALLATION, Console Box.>

MT GEAR SHIFT LEVER

CONTROL SYSTEMS

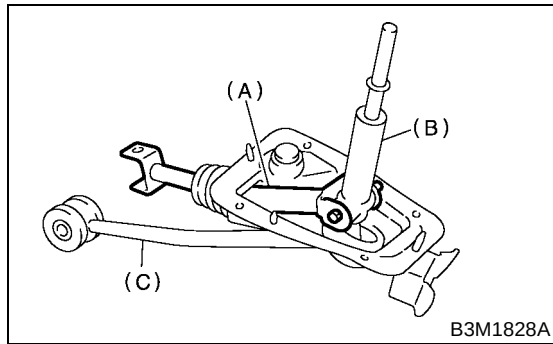
C: DISASSEMBLY

1) Disassemble locking wire.



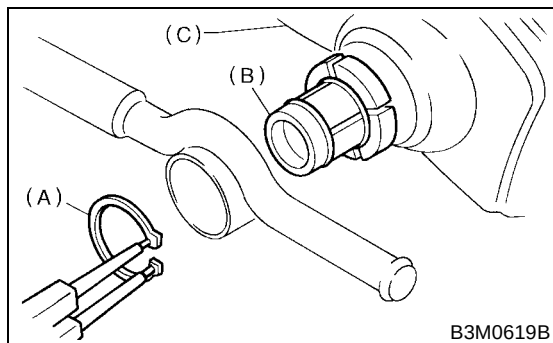
- (A) Locking wire
- (B) Stay

2) Remove rod from gear shift lever.



- (A) Rod
- (B) Gear shift lever
- (C) Stay

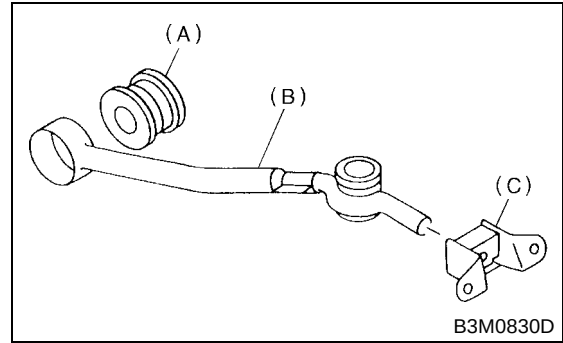
3) Remove snap ring from bush D, then disconnect stay.



- (A) Snap ring
- (B) Bushing D
- (C) Boot

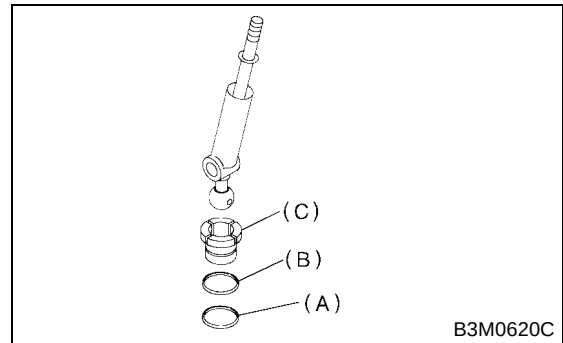
4) Remove boot from gear shift lever.

5) Remove bush and cushion rubber from stay.



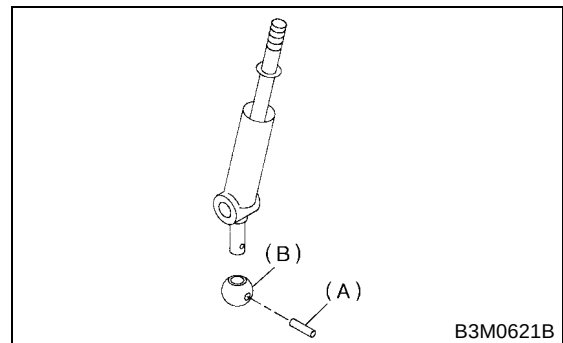
- (A) Bushing
- (B) Stay
- (C) Cushion rubber

6) Remove O-ring, then disconnect bush D.



- (A) O-ring A
- (B) O-ring B
- (C) Bushing D

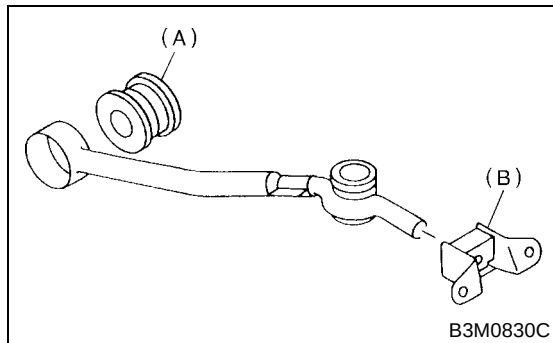
7) Draw out straight pin, then remove bush C from gear shift lever.



- (A) Straight pin
- (B) Bushing C

D: ASSEMBLY

- 1) Clean all parts before assembly.
- 2) Mount the bushing B and cushion rubber on the stay.

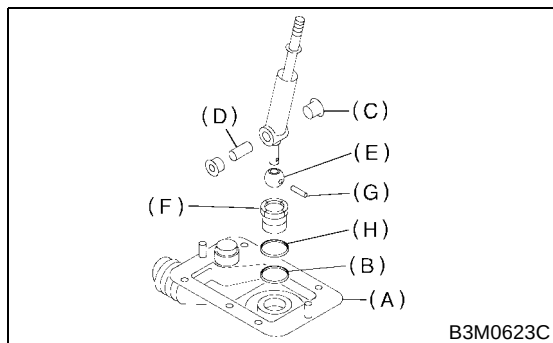


- (A) Bushing
(B) Cushion rubber

- 3) Mount each part; boot, O-ring, bush A, spacer, bush B, bush D and straight pin on the gear shift lever.

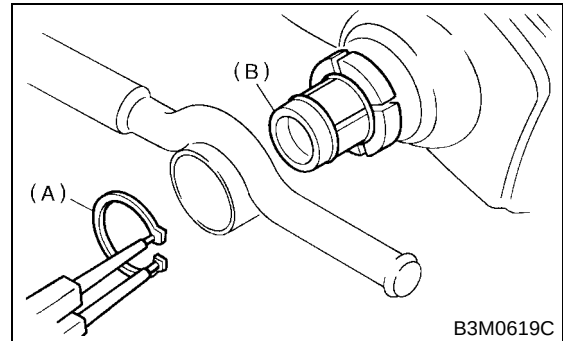
CAUTION:

- Always use new O-rings.
- Apply grease [DNIGHTIGHT LYW No. 2 or equivalent] to the inner and side surfaces of the bushing when installing the spacer.



- (A) Boot
(B) O-ring B
(C) Bushing A
(D) Spacer
(E) Bushing C
(F) Bushing D
(G) Straight pin
(H) O-ring A

- 4) Insert the gear shift lever into the boot hole.
- 5) Install snap ring and stay to the bushing D.

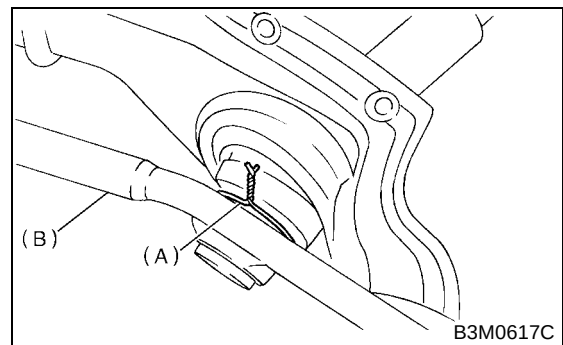


- (A) Snap ring
(B) Bushing D

- 6) Tighten with locking wire to the extent that the boot will not come off.

CAUTION:

Always use new locking wire.

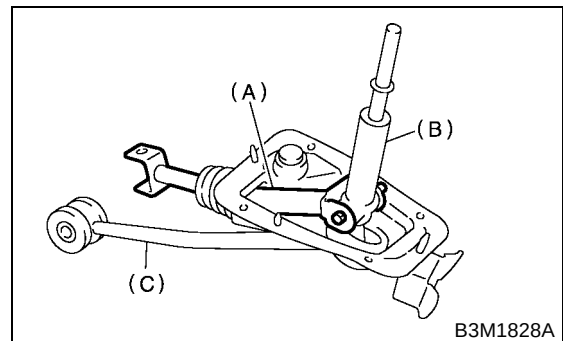


- (A) Locking wire
(B) Stay

- 7) Insert the rod into the boot hole.
- 8) Connect rod to gear shift lever.

Tightening torque:

11.8 N·m (1.2 kgf-m, 8.7 ft-lb)



- (A) Rod
(B) Shift lever
(C) Stay

MT GEAR SHIFT LEVER

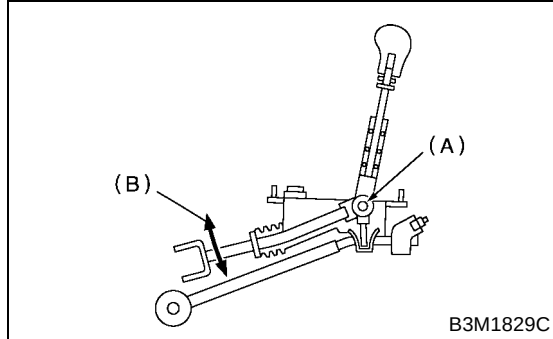
CONTROL SYSTEMS

9) Check the swing torque of the rod in relation to the gear shift lever.

If the torque exceeds the specification, replace bushing or retighten nuts.

Rocking torque:

0.7 N·m (0.07 kgf-m, 0.5 ft-lb) or less



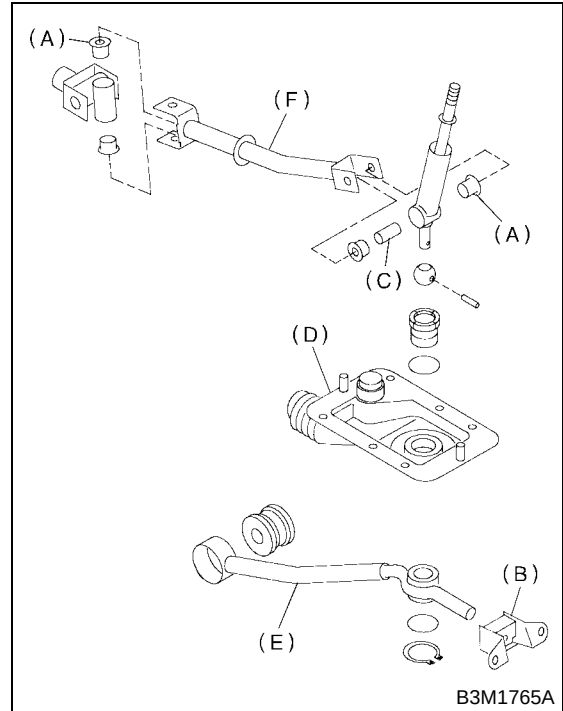
(A) Center of rotation

(B) Swing torque

10) Check that there is no excessive play and that parts move smoothly.

E: INSPECTION

1) Check each part (bushing A, 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 A

(B) Cushion rubber

(C) Spacer

(D) Boot

(E) Stay

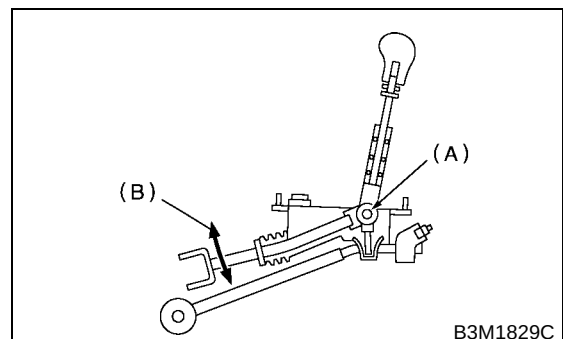
(F) Rod

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.

Rocking torque:

0.7 N·m (0.07 kgf-m, 0.5 ft-lb) or less



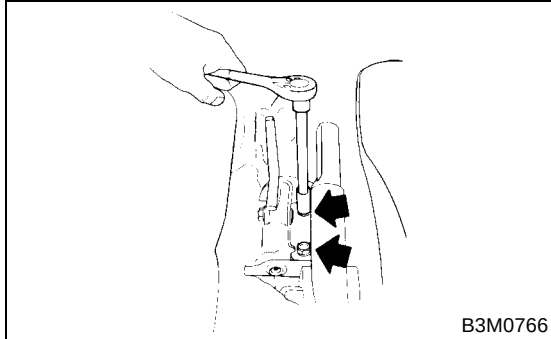
(A) Center of rotation

(B) Swing torque

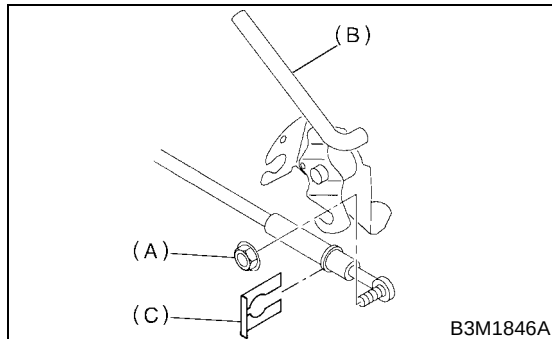
5. MT Drive Select Lever

A: REMOVAL

- 1) Apply parking brake and place chocks to hold wheels.
- 2) Disconnect ground terminal from battery.
- 3) Set drive select lever to HI position.
- 4) Remove the drive select lever knob.
- 5) Remove console box. <Ref. to EI-24, Console Box.>
- 6) Remove the bolt installing drive select lever assembly on body.



- 7) Remove nut, clamp and then disconnect the cable from drive select lever assembly.



- (A) Nut
- (B) Drive select lever
- (C) Clamp

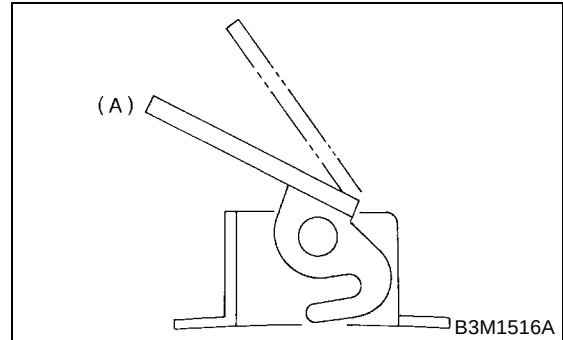
B: INSTALLATION

- 1) Install drive select lever.

Tightening torque:

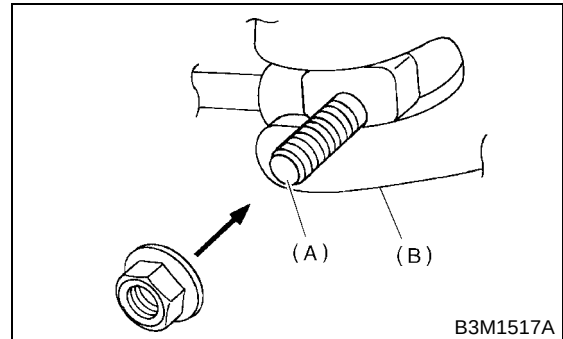
18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 2) Set drive select lever to HI position.



- (A) HI position

- 3) Be sure to insert cable end bolt into lever arm slit.



- (A) Cable end bolt
- (B) Lever arm

- 4) Tighten nut where cable end bolt comes to a stop.

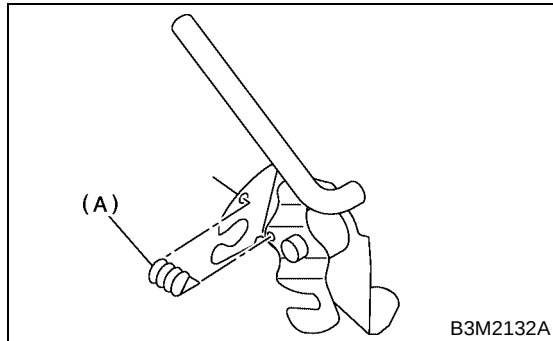
Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 5) Install in the reverse order of removal.

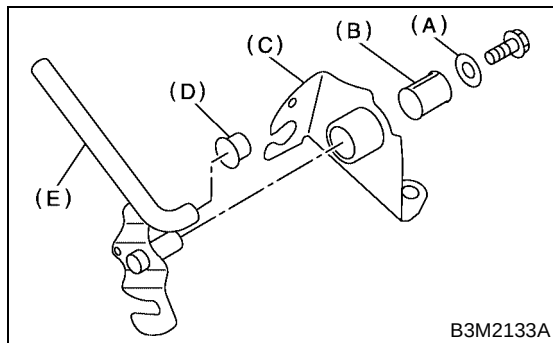
C: DISASSEMBLY

1) Remove spring.



(A) Spring

2) Remove lever, cap and bushing.



- (A) Washer
- (B) Bushing
- (C) Plate
- (D) Cap
- (E) Lever

D: ASSEMBLY

1) Assemble in the reverse order of disassembly.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Make sure the select lever moves smoothly.

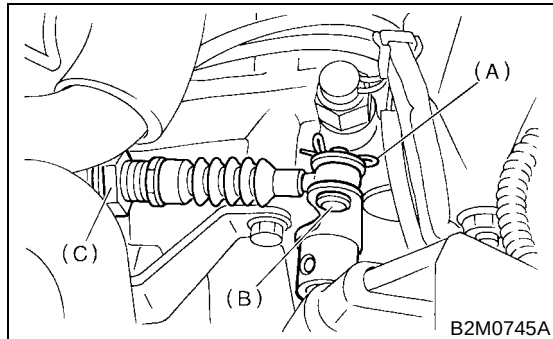
E: INSPECTION

- 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

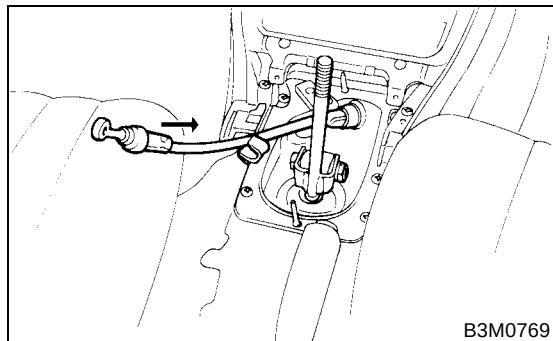
A: REMOVAL

- 1) Remove the drive select lever. <Ref. to CS-17, REMOVAL, MT Drive Select Lever.>
- 2) Remove intake duct. <Ref. to IN(SOHC)-7, Air Intake Duct.>
- 3) Remove air cleaner case. <Ref. to IN(SOHC)-6, Air Cleaner Case.>
- 4) Remove snap ring and clevis pin.
- 5) Loosen the nut and disconnect the cable from cable bracket.



- (A) Snap ring
- (B) Clevis pin
- (C) Nut

- 6) 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-19, 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.

D: ADJUSTMENT

- 1) Set the drive select lever to HI position.
- 2) Remove the drive select lever knob.
- 3) Remove console box. <Ref. to EI-24, 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**A: INSPECTION**

Symptom	Possible cause	Remedy
1. Select lever	(1) Starter does not run.	Adjust select cable and inhibitor switch, or inspect circuit.
	(2) Back-up light does not light up.	Adjust select cable and inhibitor switch, or inspect circuit.

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

AUTOMATIC TRANSMISSION

AT

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GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

1. General Description

A: SPECIFICATIONS

1. TORQUE CONVERTER CLUTCH

Model	1.6 L model	2.0 L model
Type	Symmetric, 3 element, single stage, 2 phase torque converter	
Stall torque ratio	2.2 — 2.4	2.0 — 2.2
Nominal diameter	236 mm (9.29 in)	246 mm (9.69 in)
Stall speed (at sea level)	2,200 — 2,700 rpm	2,000 — 2,500 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

	Gear ratio
1st	2.785
2nd	1.545
3rd	1.000
4th	0.694
Rev	2.272

5. PLANETARY GEAR AND PLATE

	1.6 L model	2.0 L model
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	3	4
Drive & driven plate number of low clutch	4	
Drive & driven plate number of reverse clutch	1	2
Drive & driven plate number of 2-4 brake	2	3
Drive & driven plate number of low & reverse brake	4	

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

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 $\leftarrow$ $\rightarrow$ 2nd $\leftarrow$ $\rightarrow$ 3rd $\leftarrow$ $\rightarrow$ 4th
3 (3rd)	Automatic gear change 1st $\leftarrow$ $\rightarrow$ 2nd $\leftarrow$ $\rightarrow$ 3rd $\leftarrow$ 4th
2 (2nd)	Automatic gear change 1st $\leftarrow$ $\rightarrow$ 2nd $\leftarrow$ 3rd $\leftarrow$ 4th
1 (1st)	1st gear locked (Deceleration possible 1st $\leftarrow$ 2nd $\leftarrow$ 3rd $\leftarrow$ 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	1.6 L model	8.0 — 8.3 $\varnothing$ (8.5 — 8.8 US qt, 7.0 — 7.3 Imp qt)
	2.0 L model	8.4 — 8.7 $\varnothing$ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)
Lubrication system	Forced feed lubrication with oil pump	
Oil	Automatic transmission fluid (above mentioned)	

10.FINAL REDUCTION

Model	1.6 L model	2.0 L model																		
Front final gear ratio	4.444 (40/9)	4.111 (37/9)																		
Lubrication oil	ITEM • Front differential gear oil API Classification GL - 5 SAE Viscosity No. and Applicable Temperature <table><tr><td>(°C)</td><td>-30</td><td>-26</td><td>-15</td><td>-5</td><td>0</td><td>15</td><td>25</td><td>30</td></tr><tr><td>(°F)</td><td>-22</td><td>-15</td><td>5</td><td>23</td><td>32</td><td>59</td><td>77</td><td>86</td></tr></table> 90 85W 80W 80W-90 H3M1235A		(°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	1.2 ℓ (1.3 US qt, 1.1 Imp qt)																			

8. COOLING AND HARNESS

Model	1.6 L and 2.0 L models
Cooling system	Liquid-cooled cooler incorporated in radiator
ATF cooling system (Radiation capacity)	4.630 kW (3,981 kcal/h, 15,797 BTU/h)
Inhibitor switch	12 poles
Transmission harness	20 poles

9. TRANSFER

Model	2.0 L model
Transfer clutch	Hydraulic multi-plate clutch
Drive & driven plate number of transfer clutch	4
Control method	Electronic, hydraulic type
Lubricant	The same Automatic transmission fluid used in automatic transmission
1st reduction gear ratio	1.000 (53/53)

GENERAL DESCRIPTION

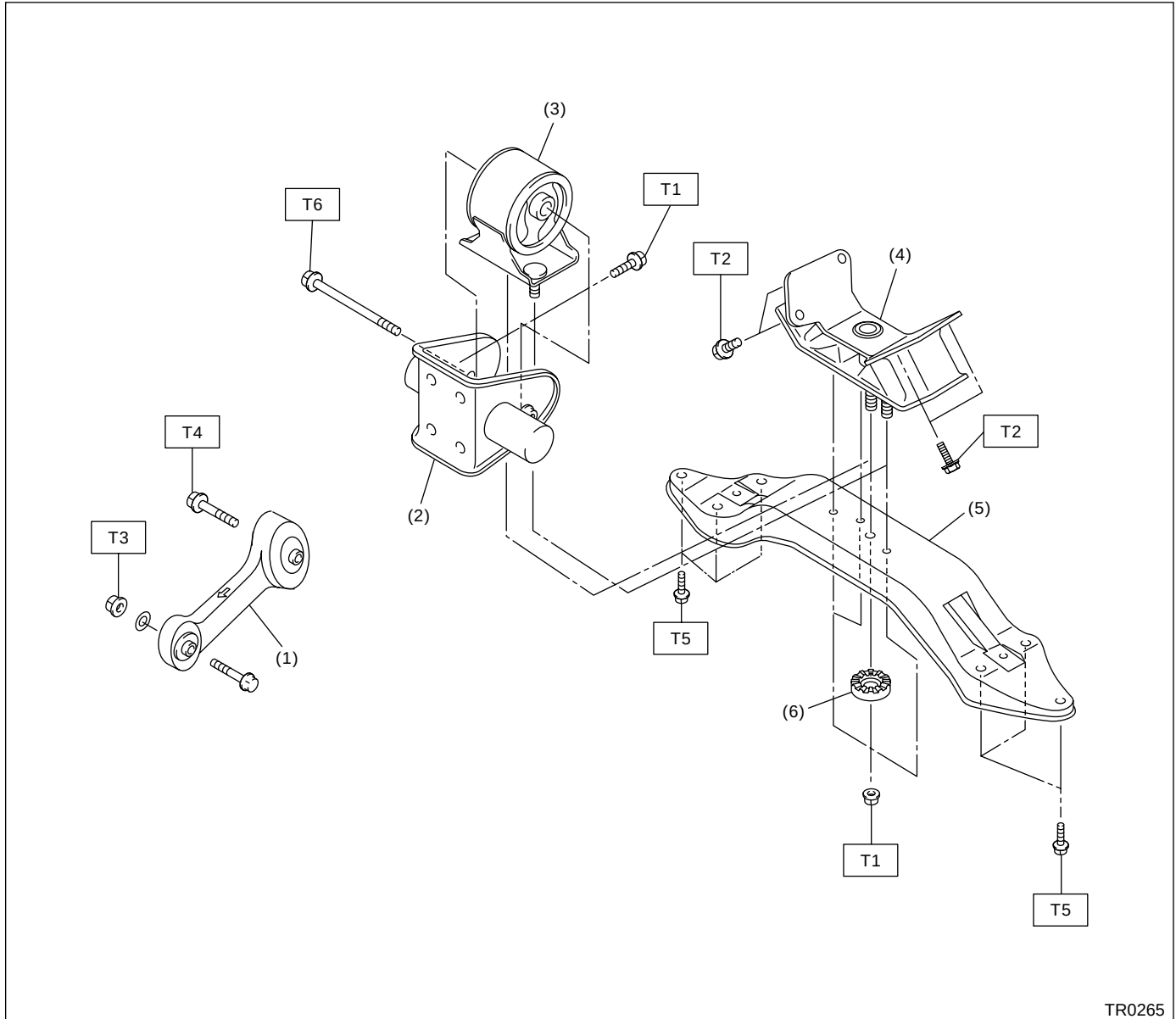
AUTOMATIC TRANSMISSION

B: COMPONENT

NOTE:

For information about other transmission mounting components, refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0853ZE> a separate publication.

1. TRANSMISSION MOUNTING



- (1) Pitching stopper
- (2) Rear bracket (FWD)
- (3) Rear cushion rubber (FWD)
- (4) Rear cushion rubber (AWD)
- (5) Crossmember
- (6) 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)

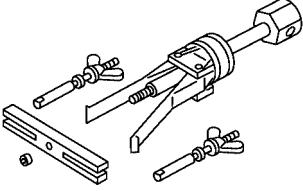
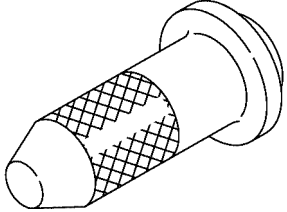
T6: 123 (12.5, 90)

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.

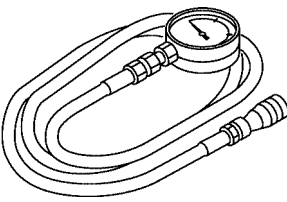
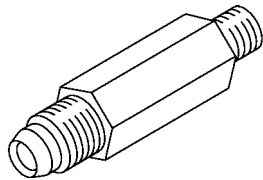
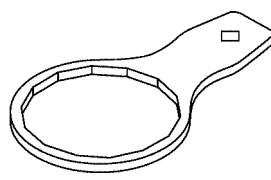
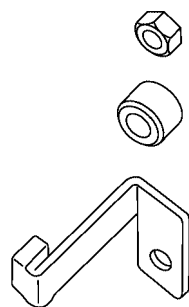
- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- 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
 B3M1977	398527700	PULLER ASSY	Used for removing and installing extension case roller bearing.
 B3M1972	498057300	INSTALLER	Used for installing extension oil seal.

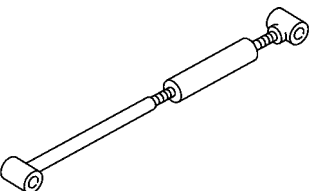
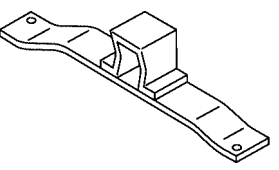
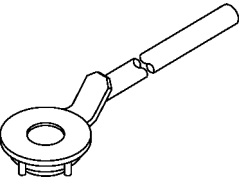
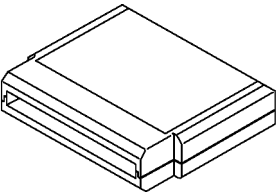
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M2040	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 B3M2041	498897200	ADAPTER	Used oil pump housing when measuring reverse clutch pressure and line pressure.
 B3M2042	498545400	FILTER WRENCH	Used for removing and installing ATF filter.
 B3M2043	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.

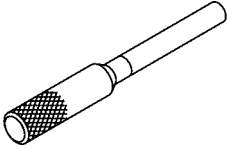
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1976	41099AA020	ENGINE SUPPORT	Used for supporting engine.
 B3M1975	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.
 B2M4157	499977300	CRANK PULLEY WRENCH	Used for stopping rotating of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 B2M3876	24082AA150	CARTRIDGE	Troubleshooting for electrical systems.

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. - English: 22771AA030 (Without printer) - German: 22771AA070 (Without printer) - French: 22771AA080 (Without printer) - Spanish: 22771AA090 (Without printer)
 B3M2008	499267300	STOPPER PIN	Used for installing inhibitor switch.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

2. Automatic Transmission Fluid

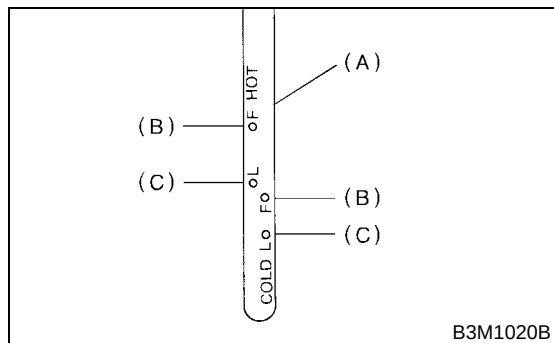
A: INSPECTION

1) Check the level of the ATF.

- (1) Raise ATF temperature to 60 to 80°C (140 to 176°F) from 40 to 60°C (104 to 140°F) (when cold) by driving a distance of 5 to 10 km (3 to 6 miles).

NOTE:

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



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

- (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 60°C (140°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 60°C (140°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.

- 2) Check the fluid 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 ATF completely.

CAUTION:

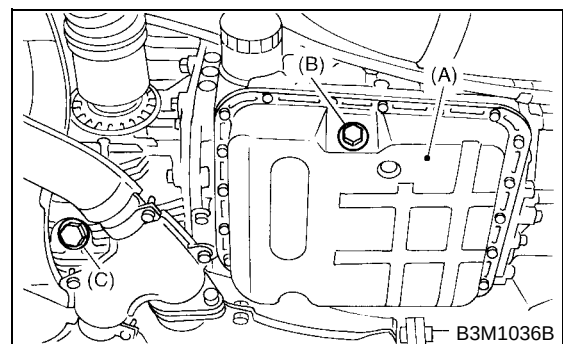
Directly after the engine has been running, the ATF is hot. Be careful not to burn yourself.

NOTE:

Tighten ATF drain plug after draining ATF.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- (A) Oil pan
- (B) Drain plug
- (C) Differential oil drain plug

- 3) Lower the vehicle.

- 4) Pour ATF into the oil charge pipe.

Recommended fluid:

Dexron III type automatic transmission fluid

AUTOMATIC TRANSMISSION FLUID

AUTOMATIC TRANSMISSION

Capacity:

Fill the same amount of fluid drained from drain plug hole.

Capacity when transmission is overhauled:

1.6 L model:

8.0 — 8.3 ℓ (8.5 — 8.8 US qt, 7.0 — 7.3 Imp qt)

2.0 L model:

8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)

5) Check the level and leaks of the ATF.

<Ref. to AT-9, REPLACEMENT, Automatic Transmission Fluid.>

3. Differential Gear 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 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.

- 3) Lower the vehicle.
- 4) Pour gear oil into the gauge hole.

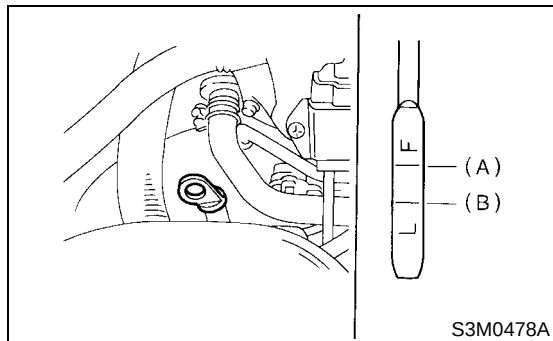
Recommended fluid:

Use GL-5 or equivalent.

Gear oil capacity:

1.2 ℓ (1.3 US qt, 1.1 Imp qt)

- 5) Check the level of the differential gear oil.
<Ref. to AT-11, INSPECTION, Differential Gear Oil.>



- (A) Upper level
(B) Lower level

B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Drain differential gear oil completely.

CAUTION:

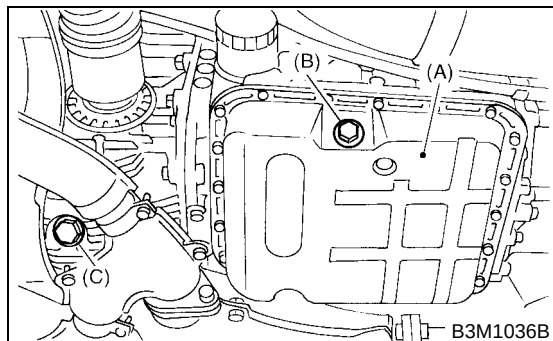
Directly after the engine has been running, the differential gear oil is hot. Be careful not to burn yourself.

NOTE:

Tighten differential gear oil drain plug after draining differential gear oil.

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. Road Test

A: INSPECTION

1. GENERAL PRECAUTION

Road tests should be conducted to properly diagnose the condition of the automatic transmission.

CAUTION:

When performing 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 rpm does not change sharply when the axle 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 gear remains in 3rd when going up a grade.
- Check that gear remains in 3rd when applying the brakes while going down a grade.

10. 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:

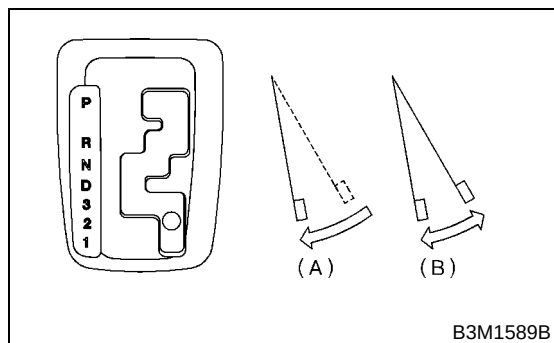
- (1) Check that throttle valve opens fully.
- (2) Check that engine oil level is correct.
- (3) Check that coolant level is correct.
- (4) Check that ATF level is correct.
- (5) Check that differential gear oil level is correct.
- (6) Increase ATF temperature to 50 to 80°C (122 to 176°F) by idling the engine for approximately 30 minutes (with select lever set to "N" or "P").

2) Install an engine tachometer at a location visible from the driver's compartment and mark the stall speed range on the tachometer scale.

3) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.

4) Move the manual linkage to ensure it operates properly, and shift the select lever to the 2 range.

5) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.



(A) Brake pedal

(B) Accelerator pedal

6) When the engine speed is stabilized, read that speed quickly and release the accelerator pedal.

7) Shift the select lever to Neutral, and cool down the engine by idling it for more than one minute.

8) Record the stall speed.

9) If stall speed in 2 range is higher than specifications, low clutch slipping and 2-4 brake slipping may occur. To identify it, conduct the same test as above in D range.

10) Perform the stall tests with the select lever in the R range.

NOTE:

- Do not continue the stall test for MORE THAN FIVE 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 one 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):

1.6 L model: 2,200 — 2,700

2.0 L model: 2,000 — 2,500

STALL TEST

AUTOMATIC TRANSMISSION

3. EVALUATION

Stall speed (at sea level)	Position	Cause
Less than specifications	2, R	• Throttle valve not fully open • Erroneous engine operation • Torque converter clutch's one-way clutch slipping
Greater than specifications	D	• Line pressure too low • Low clutch slipping • One-way clutch malfunctioning
	R	• Line pressure too low • Reverse clutch slipping • Low & reverse brake slipping
	2	• 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.

CAUTION:

- Perform the test at normal operation fluid temperature 60 to 80°C (140 to 176°F).
- Be sure to allow a one 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 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 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)

CAUTION:

- Before measuring line pressure, jack-up all wheels.
- Maintain temperature of ATF at approximately 50°C (122°F) during measurement. (ATF will reach the above temperature after idling the engine for approximately 30 minutes with select lever in "N" or "P".)

2) Line pressure measurement (under heavy load)

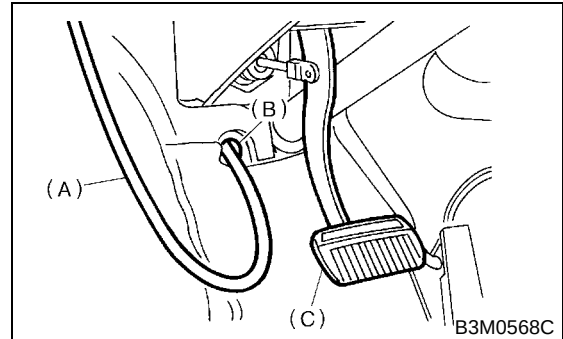
CAUTION:

- Before measuring line pressure, apply both foot and parking brakes with all wheels chocked (Same as for "stall" test conditions).
- Measure line pressure when select lever is in "R", "2" with engine under stall conditions.
- Measure 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. Wait for at least one minute before measurement.)
- Maintain the temperature of ATF at approximately 50°C (122°F) during measurement. (ATF will reach the above temperature after idling the engine for approximately 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 the engine compartment.

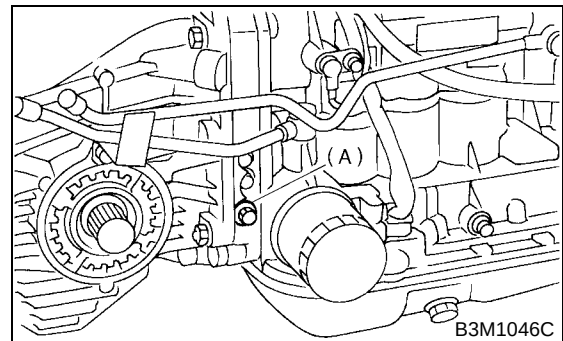
ST 498575400 OIL PRESSURE GAUGE ASSY



- (A) Pressure gauge hose
(B) Hole in toe board (blank cap hole)
(C) Brake pedal

2) Remove the test plug and install ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



- (A) Test plug

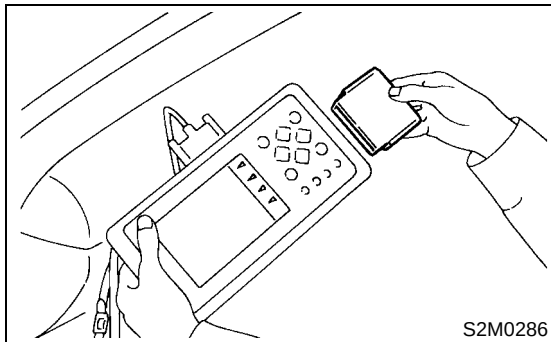
3) Connect ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER

ST2 498575400 OIL PRESSURE GAUGE ASSY

4) Check for duty ratio changes by opening and closing throttle valve using Subaru Select Monitor.

(1) Insert the cartridge to Subaru Select Monitor. <Ref. to AT-5, PREPARATION TOOL, General Description.>



(2) Connect Subaru Select Monitor to data link connector.

5) Check 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	100	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

Check transfer clutch pressure in accordance with the following chart in the same manner as with line pressure.

ST 498897700 OIL PRESSURE ADAPTER SET

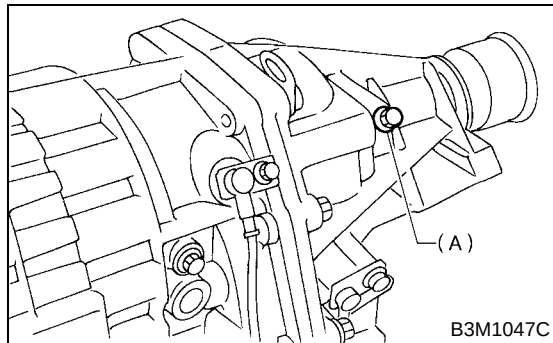
ST 498575400 OIL PRESSURE GAUGE ASSY

AWD mode: "D" range

FWD mode: "P" range, engine speed 2,000 rpm

CAUTION:

Before setting in FWD mode, install spare fuse on FWD mode switch.



(A) Test plug

2. EVALUATION

NOTE:

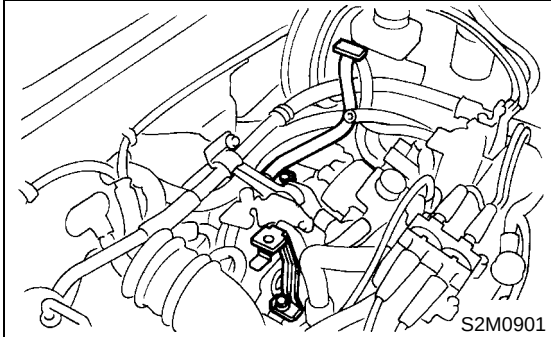
If oil pressure is not produced or if it does not change in the AWD mode, the transfer duty solenoid or transfer valve assembly may be malfunctioning. If oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

Standard transfer clutch pressure kPa (kg/cm ² , psi)			
Duty ratio (%)	Throttle position	AWD mode	FWD mode
5	Full closed	932 — 1,089 (9.5 — 11.1, 135 — 158)	—
60	2/3 throttle	216 — 294 (2.2 — 3.0, 31 — 43)	—
95	Full open	—	0 (0, 0)

9. Automatic Transmission Assembly

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Open front hood fully, and support with stay.
- 3) Disconnect battery ground terminal.
- 4) Remove air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 5) Remove air cleaner case. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
- 6) Remove air cleaner case stay.



- 7) Remove front, center, rear exhaust pipe and muffler.

With OBD

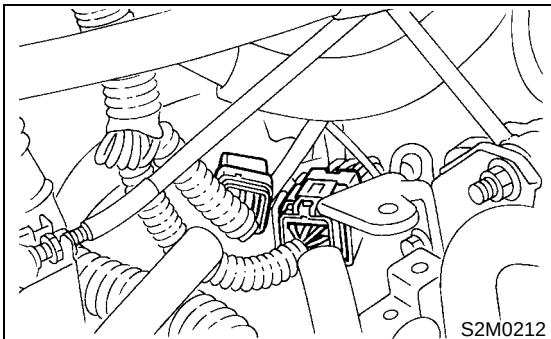
<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, REMOVAL, Muffler.>

Without OBD

<Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHCw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, REMOVAL, Muffler.>

- 8) Disconnect the following connectors.

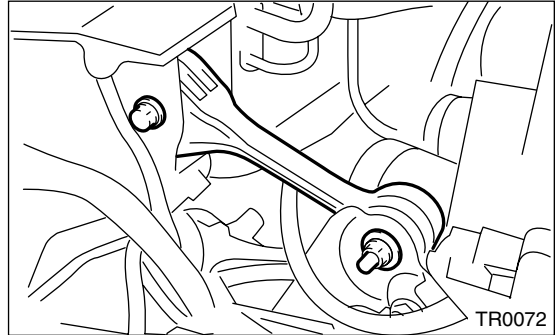
- (1) Transmission harness connector



- (2) Transmission ground terminal

- 9) Remove starter. <Ref. to SC-5, REMOVAL, Starter.>

- 10) Remove pitching stopper.



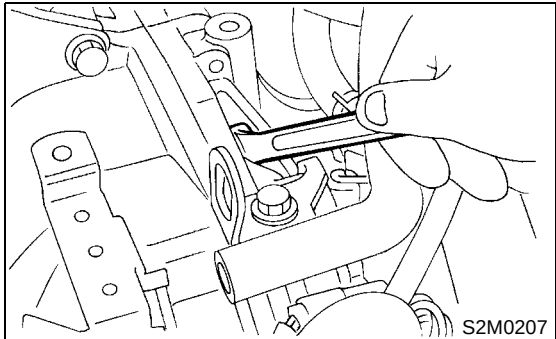
- 11) Separate torque converter clutch from drive plate.

- (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:

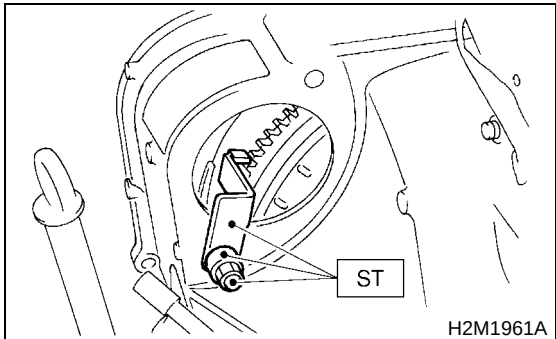
Be careful not to drop bolts into torque converter clutch housing.

ST 499977300 CRANK PULLEY WRENCH



- 12) Install ST to torque converter clutch case.

ST 498277200 STOPPER SET



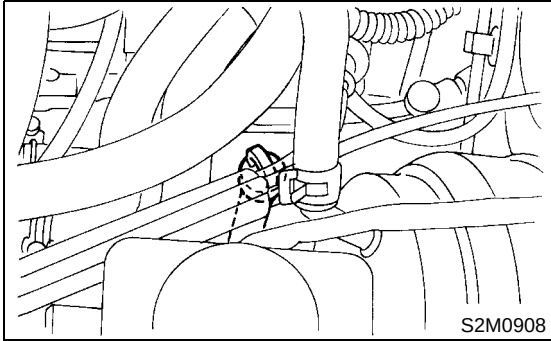
- 13) Remove ATF level gauge.

AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

CAUTION:

Plug opening to prevent entry of foreign particles into transmission fluid.

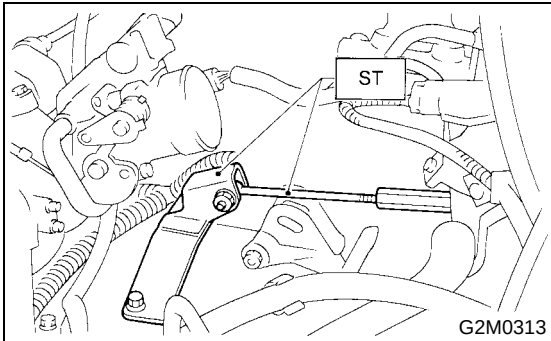


14) Set ST.

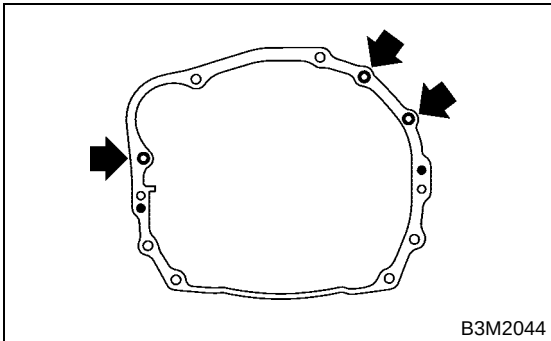
NOTE:

Also is available Part No. 927670000.

ST 41099AA020 ENGINE SUPPORT ASSY



15) Remove bolt which holds right upper side of transmission to engine.

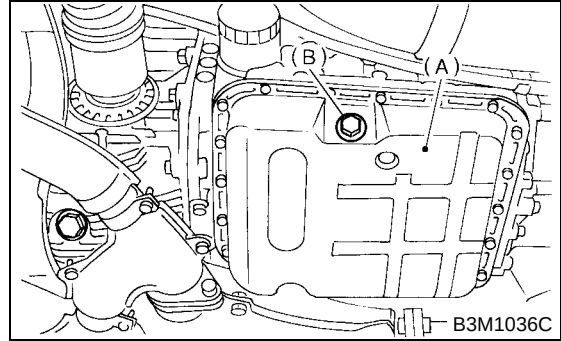


16) Lift-up the vehicle.

17) Remove under cover.

18) Remove heat shield cover.

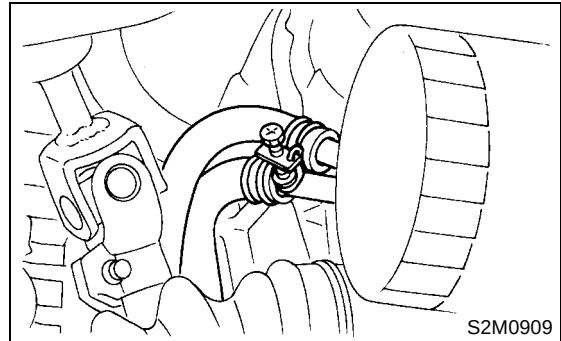
19) Drain ATF to remove ATF drain plug.



(A) Oil pan

(B) Drain plug

20) Disconnect ATF cooler hoses from pipes of transmission side, and remove ATF level gauge guide.



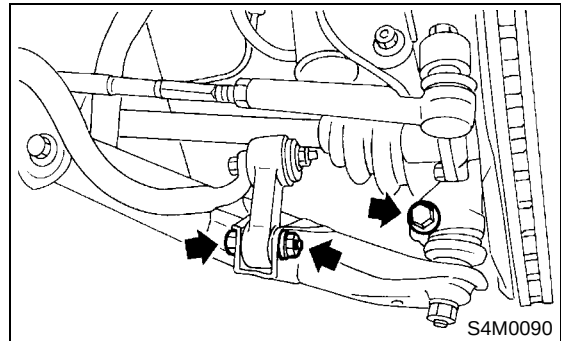
21) Remove propeller shaft.

<Ref. to DS-16, REMOVAL, Propeller Shaft.>

22) Remove shift select cable. <Ref. to CS-9, REMOVAL, Select Cable.>

23) Disconnect stabilizer link from transverse link.

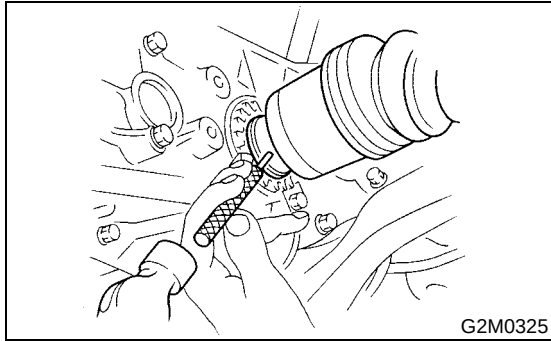
24) Remove bolt securing ball joint of transverse link to housing.



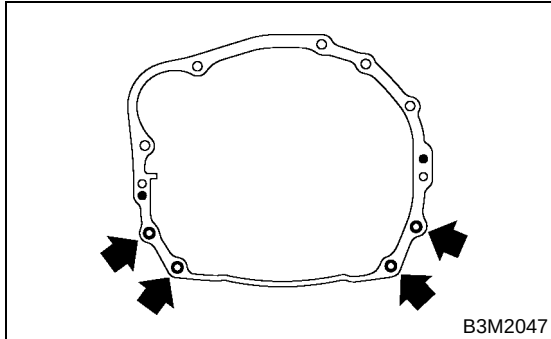
AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

25) Remove spring pins and separate front drive shafts from each side of the transmission.



26) Remove nuts which hold lower side of transmission to engine.

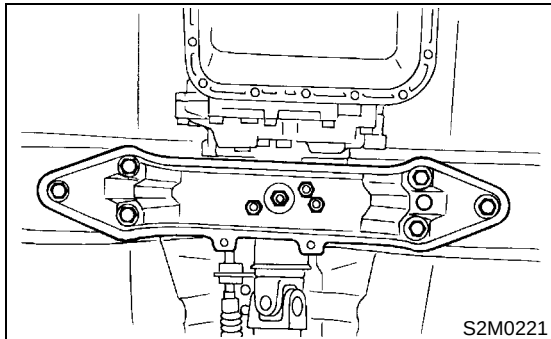


27) Place transmission jack under transmission.

CAUTION:

- Make sure that the support plates of transmission jack don't touch the oil pan.

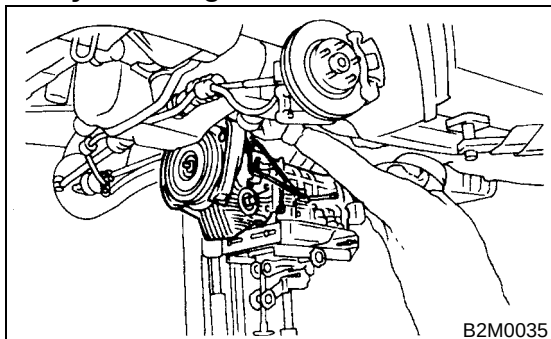
28) Remove transmission rear crossmember from vehicle.



29) Remove transmission.

CAUTION:

Move transmission and torque converter as a unit away from engine.



AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

B: INSTALLATION

- 1) Install rear cushion rubber to transmission assembly.

Tightening torque:

1.6L MODEL:

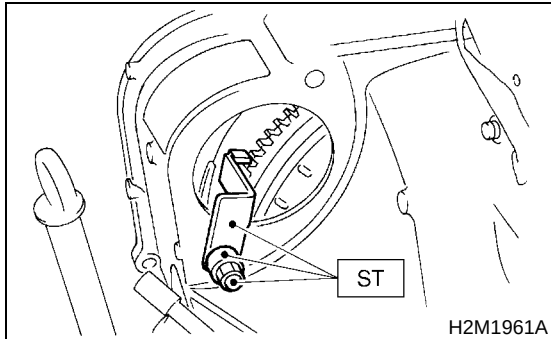
123 N·m (12.5 kgf-m, 90 ft-lb)

2.0L MODEL:

38 N·m (3.9 kgf-m, 28 ft-lb)

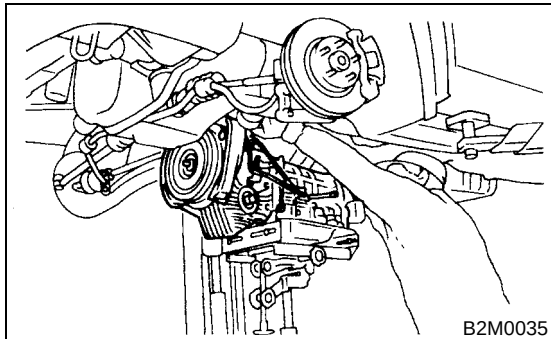
- 2) Install ST to torque converter clutch case.

ST 498277200 STOPPER SET



- 3) Install transmission onto engine.

- (1) Gradually raise transmission with transmission jack.



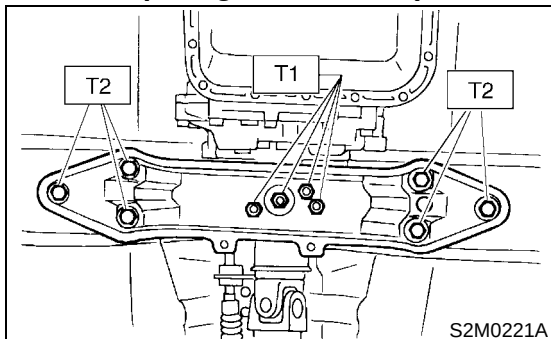
- (2) Engage them at splines.

- 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, 51.4 ft-lb)

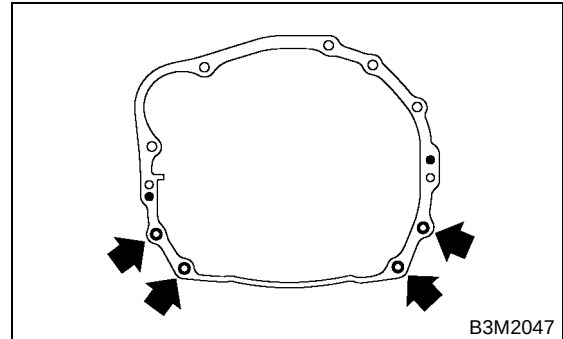


- 5) Take off transmission jack.

- 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)



- 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

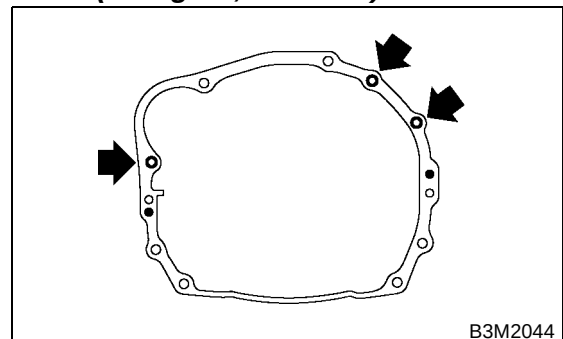
- (2) Install starter.

<Ref. to SC-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)



AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

- 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.

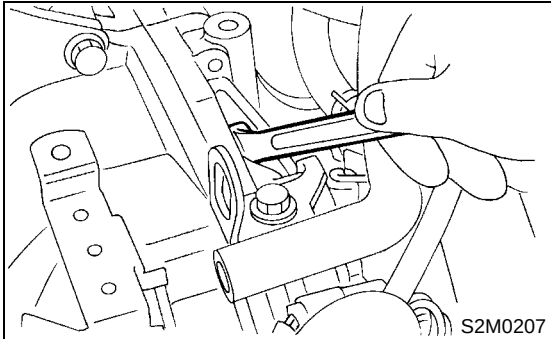
CAUTION:

Be careful not to drop bolts into torque converter clutch housing.

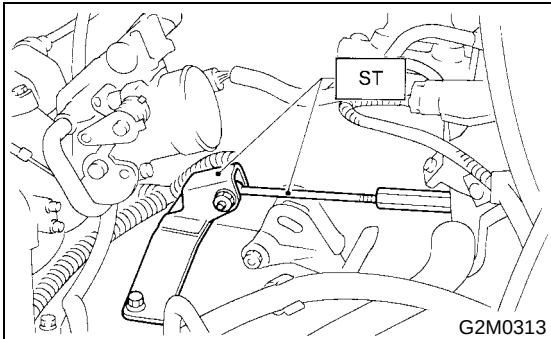
ST 499977300 CRANK PULLEY WRENCH

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- (3) Clog plug onto service hole.
10) Remove ST.

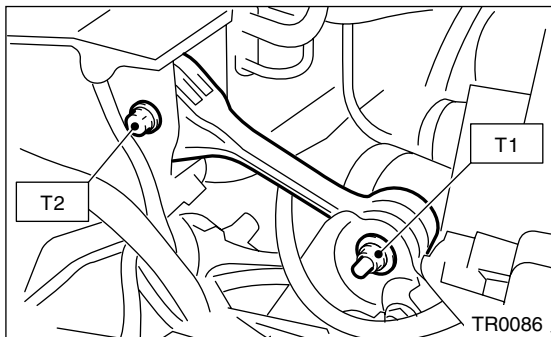


- 11) Install pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)

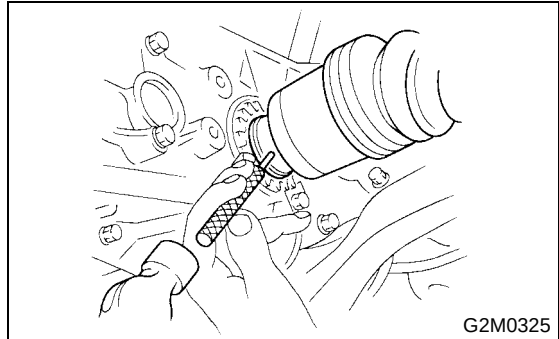


- 12) Lift-up the vehicle.
Install front drive shafts into transmission.

- (1) Lift-up the vehicle.
(2) Install front drive shaft into transmission.
(3) Drive spring pin into chamfered hole of drive shaft.

CAUTION:

Always use a new spring pin.



- 13) Install ball joint into housing.
14) Connect stabilizer link to transverse link, and temporarily tighten bolts.

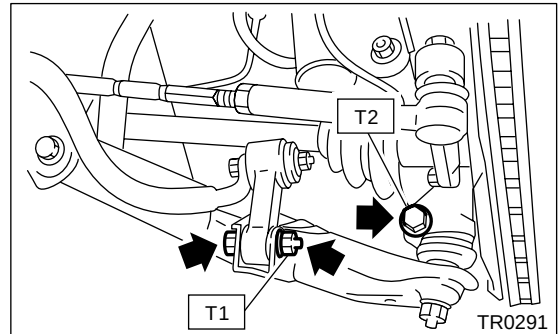
CAUTION:

Discard loosened self-locking nut and replace with a new one.

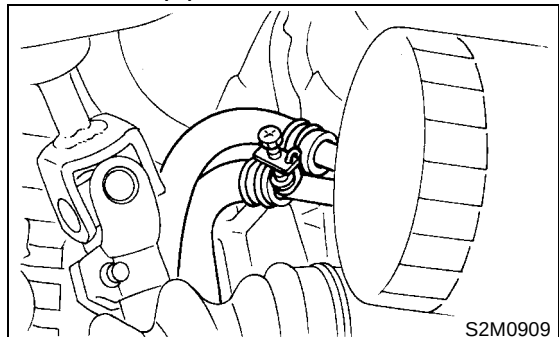
Tightening torque:

T1: 30 N·m (3.1 kgf-m, 22.4 ft-lb)

T2: 50 N·m (5.1 kgf-m, 37 ft-lb)



- 15) Install shift select cable onto select lever.
<Ref. to CS-10, INSTALLATION, Select Cable.>
16) Install ATF level gauge guide, and connect ATF cooler hoses to pipe.



- 17) Install propeller shaft.
<Ref. to DS-17, INSTALLATION, Propeller Shaft.>

AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

18) Install heat shield cover.

19) Install front, center, rear exhaust pipes and muffler.

With OBD

<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, INSTALLATION, Muffler.>

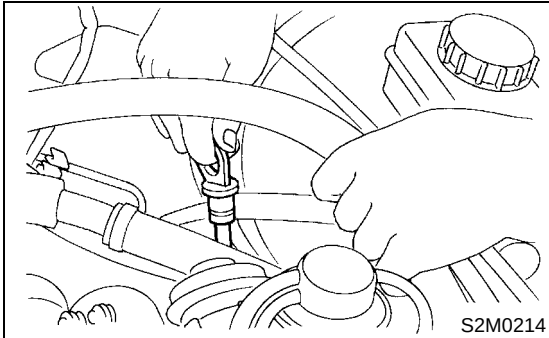
Without OBD

<Ref. to EX(SOHCw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHCw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, INSTALLATION, Muffler.>

20) Install under cover.

21) Lower the vehicle.

22) Install ATF level gauge.



23) Connect the following connectors.

- (1) Transmission harness connectors
- (2) Transmission ground terminal

24) Connect the following cables.

- (1) Cruise control cable (With cruise control vehicles)

25) Install air cleaner case stay.

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)

26) Install air cleaner case. <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>

27) Install air intake duct. <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>

28) Connect battery ground cable.

29) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole.

Recommended fluid:

Dexron III type automatic transmission fluid

Fluid capacity:

1.6 L model:

8.0 — 8.3 ℓ (8.5 — 8.8 US qt, 7.0 — 7.3 Imp qt)

2.0 L model:

8.4 — 8.7 ℓ (8.9 — 9.2 USqt, 7.4 — 8.4 Imp qt)

30) Take off vehicle from lift arms.

31) Check select lever operation.

<Ref. to AT-28, INSPECTION, Inhibitor Switch.>

32) Check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

33) Check the vehicle on the road tester.

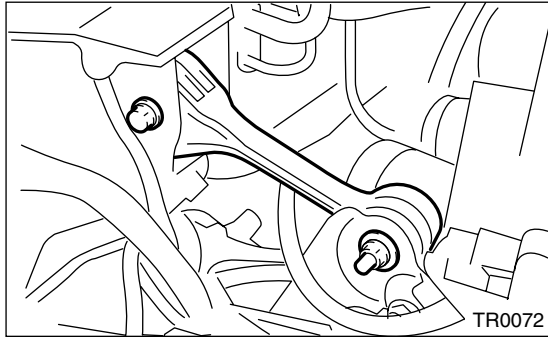
<Ref. to AT-12, Road Test.>

10. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

- 1) Disconnect battery ground terminal.
- 2) Remove the air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 3) Remove the air cleaner case. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
- 4) Remove the pitching stopper.



2. CROSSMEMBER AND CUSHION RUBBER

- 1) Disconnect battery ground terminal.
- 2) Jack-up vehicle and support it with sturdy racks.
- 3) Remove the front, center, rear exhaust pipes and muffler.

With OBD

<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, REMOVAL, Muffler.>

Without OBD

<Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHCw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, REMOVAL, Muffler.>

CAUTION:

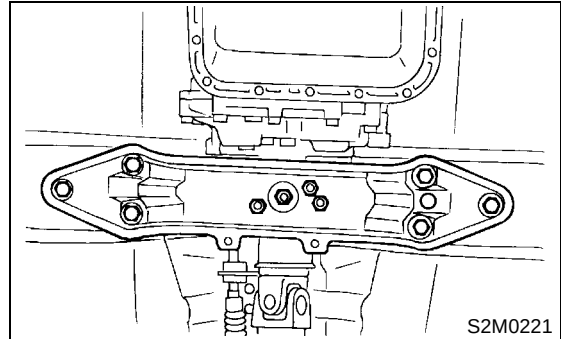
When removing exhaust pipes, be careful each exhaust pipe does not drop out.

- 4) Remove the heat shield cover.
- 5) Set the transmission jack under the transmission.

CAUTION:

- Make sure that the support plates of transmission jack don't touch the oil pan.

- 6) Remove the crossmember.



- 7) Remove the rear cushion rubber.

B: INSTALLATION

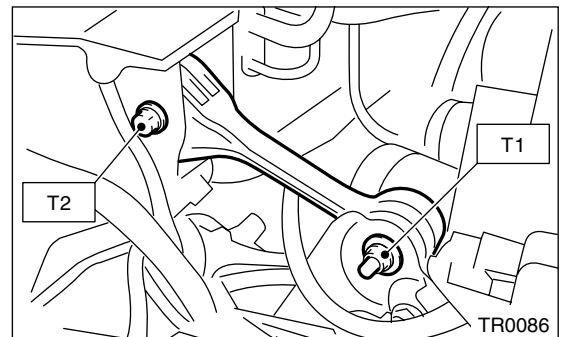
1. PITCHING STOPPER

- 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 intake duct and cleaner case.

TRANSMISSION MOUNTING SYSTEM

AUTOMATIC TRANSMISSION

2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:

1.6 L model:

123 N·m (12.5 kgf-m, 90 ft-lb)

2.0 L model:

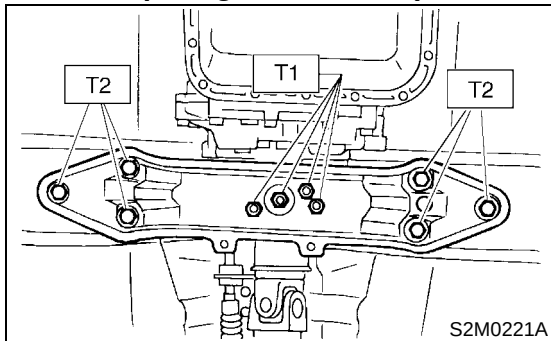
38 N·m (3.9 kgf-m, 28 ft-lb)

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, 51.4 ft-lb)



3) Remove the transmission jack.

4) Install the heat shield cover.

5) Install the front, center, rear exhaust pipes and the muffler.

With OBD

<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, INSTALLATION, Muffler.>

Without OBD

<Ref. to EX(SOHCw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHCw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, 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.

11.Extension Case Oil Seal

A: INSPECTION

Make sure ATF does not leak from the joint of the transmission and propeller shaft. If so, replace oil seal. <Ref. to AT-27, REPLACEMENT, Extension Case Oil Seal.>

B: REPLACEMENT

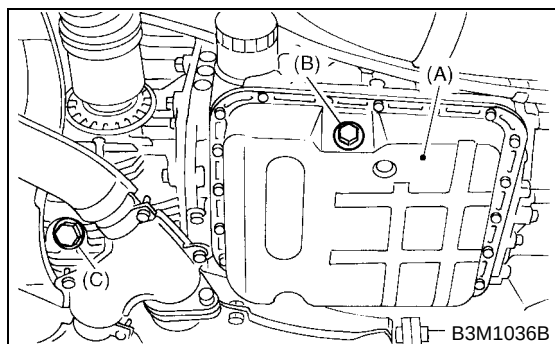
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground terminal.
- 3) Lift up the vehicle.
- 4) Clean transmission exterior.
- 5) Drain ATF completely.

NOTE:

Tighten ATF drain plug after draining ATF.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- (A) Oil pan
- (B) Drain plug
- (C) Differential oil drain plug

- 6) Remove the rear exhaust pipe and muffler.

With OBD

<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, REMOVAL, Muffler.>

Without OBD

<Ref. to EX(SOHCw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, REMOVAL, Muffler.>

- 7) Remove the heat shield cover.

- 8) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>

- 9) Using ST, remove the oil seal.

ST 398527700 PULLER ASSY

- 10) Using ST, install the oil seal.

ST 498057300 INSTALLER

- 11) Install the propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>

- 12) Install the heat shield cover.

- 13) Install the rear exhaust pipe and muffler.

With OBD

<Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, INSTALLATION, Muffler.>

Without OBD

<Ref. to EX(SOHCw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, INSTALLATION, Muffler.>

- 14) Pour ATF and check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

INHIBITOR SWITCH

AUTOMATIC TRANSMISSION

12. Inhibitor Switch

A: INSPECTION

When 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 inhibitor switch connector.
- 2) Check continuity in inhibitor switch circuits with select lever moved to each position.

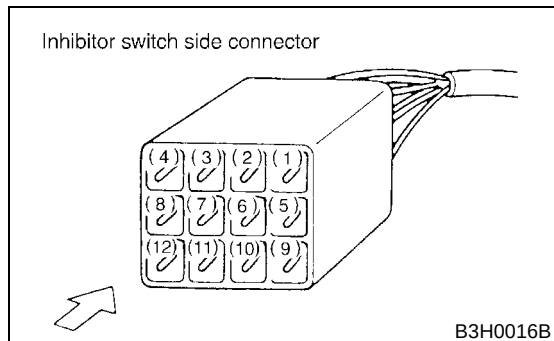
CAUTION:

Also check that continuity in ignition circuit does not exist when select lever is in R, D, 3, 2 and 1 ranges.

NOTE:

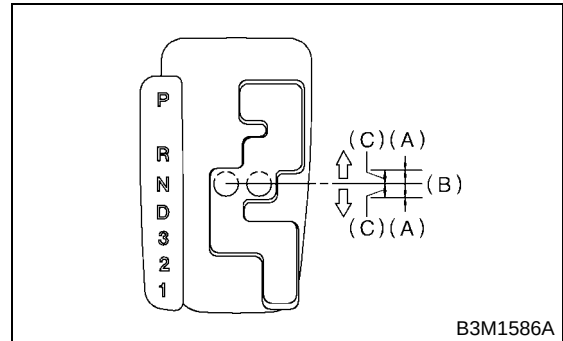
If inhibitor switch is inoperative, check for poor contact of connector on transmission side.

	Position	Pin No.
Signal sent to TCM	P	4 — 3
	R	4 — 2
	N	4 — 1
	D	4 — 8
	3	4 — 7
	2	4 — 6
	1	4 — 5
Starter 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 the 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-28, ADJUSTMENT, Inhibitor Switch.>



(A) Continuity does not exist.

(B) Continuity exists.

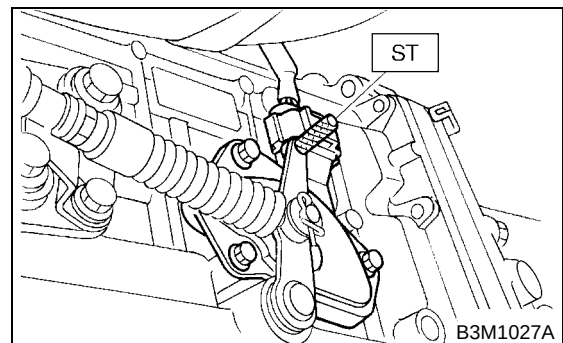
(C) 1.5°

- 4) Repeat the above checks. If there are abnormalities, adjust the select cable. <Ref. to CS-10, ADJUSTMENT, Select Cable.>

B: ADJUSTMENT

- 1) Shift the select lever to the N range.
- 2) Loosen the three inhibitor switch securing bolts.
- 3) Insert ST as vertical as possible into the holes in the inhibitor switch lever and switch body.

ST 499267300 STOPPER PIN



- 4) Tighten the three inhibitor switch bolts.

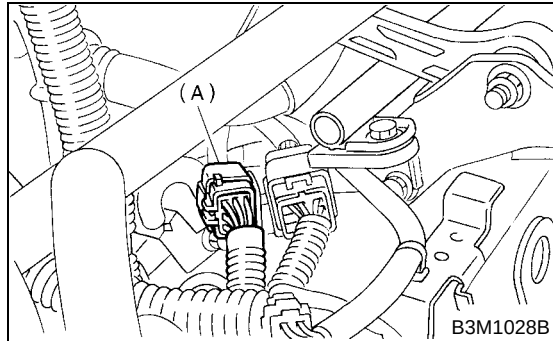
Tightening torque:

3.4 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.

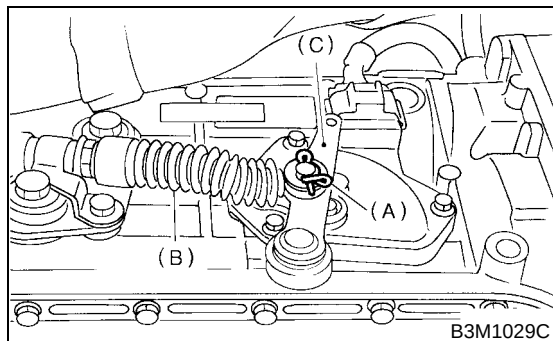
C: REMOVAL

- 1) Set up the vehicle on the lift.
- 2) Move select lever to neutral position.
- 3) Remove air intake duct and cleaner case.
- 4) Disconnect inhibitor switch connector.



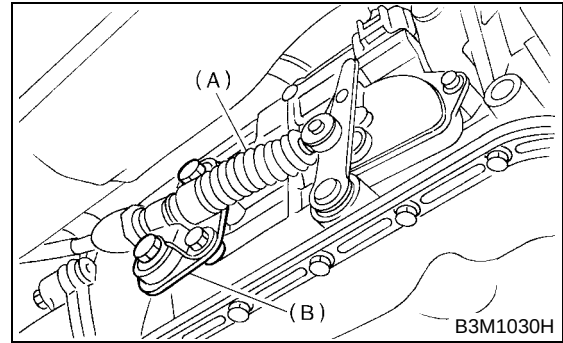
(A) Inhibitor switch

- 5) Remove inhibitor switch connector from stay.
 - 6) Lift-up the vehicle.
 - 7) Remove front exhaust pipe with center exhaust pipe.
- With OBD
<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>
- Without OBD
<Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>
- 8) Remove snap pin from range select lever.



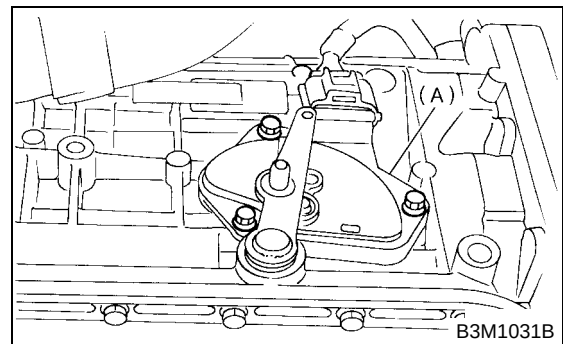
(A) Snap pin
(B) Select cable
(C) Range select lever

- 9) Remove plate assembly from transmission case.



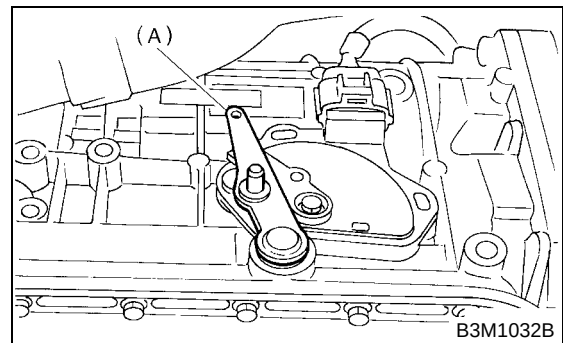
(A) Select cable
(B) Plate ASSY

- 10) Remove bolts.



(A) Inhibitor switch

- 11) Move range select lever to parking position (left side).

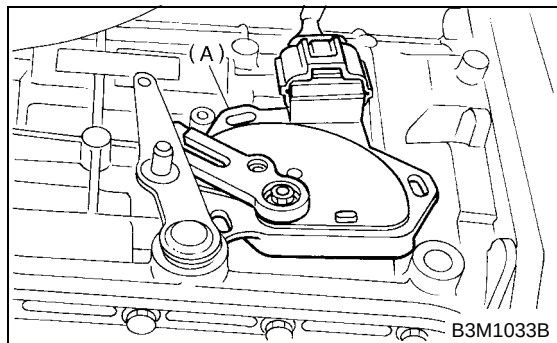


(A) Range select lever

INHIBITOR SWITCH

AUTOMATIC TRANSMISSION

12) Remove inhibitor switch from transmission.



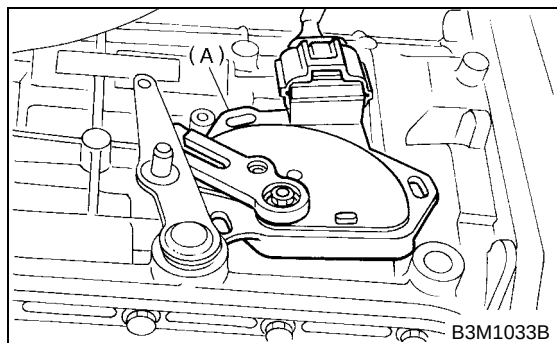
(A) Inhibitor switch

13) Disconnect inhibitor switch harness from inhibitor switch.

D: INSTALLATION

1) Connect inhibitor switch harness to inhibitor switch.

2) Install inhibitor switch to transmission case.



(A) Inhibitor switch

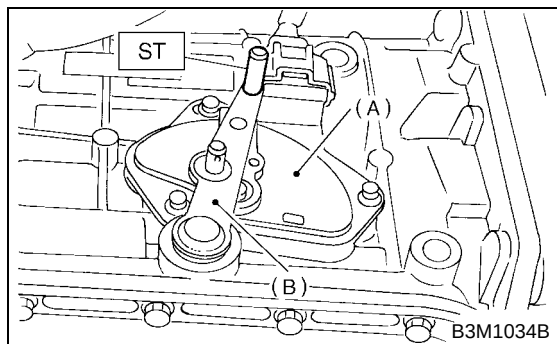
3) Move range select lever to neutral position.

4) Using ST, tighten bolts of inhibitor switch.

ST 499267300 STOPPER PIN

Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



(A) Inhibitor switch

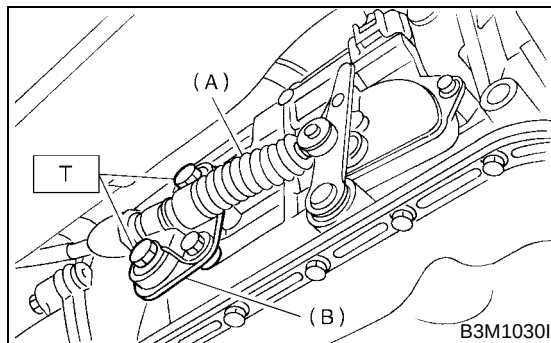
(B) Range select lever

5) Install select cable to range select lever.

6) Install plate assembly to transmission.

Tightening torque:

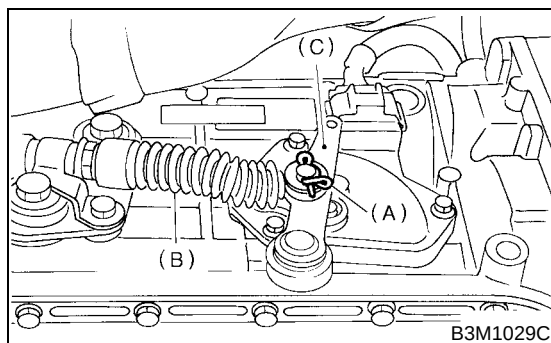
T: 24.5 N·m (2.50 kgf-m, 18.1 ft-lb)



(A) Select cable

(B) Plate ASSY

7) Install snap pin to range select lever.



(A) Snap ring

(B) Select cable

(C) Range select lever

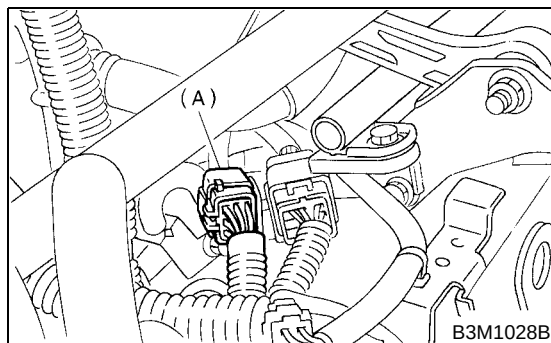
8) Install front exhaust pipe with center exhaust pipe.

<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.> or <Ref. to EX(SOHCw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>

9) Lower the vehicle.

10) Install inhibitor switch connector from stay.

11) Connect inhibitor switch connector.



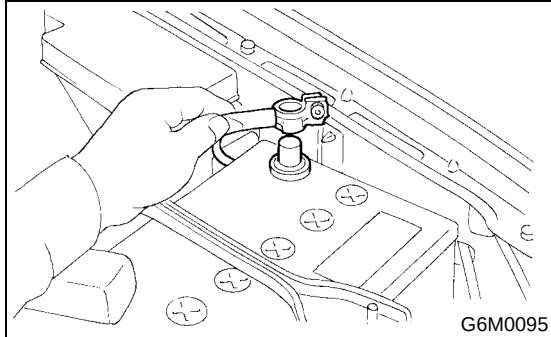
(A) Inhibitor switch

12) Install air intake duct and cleaner case.

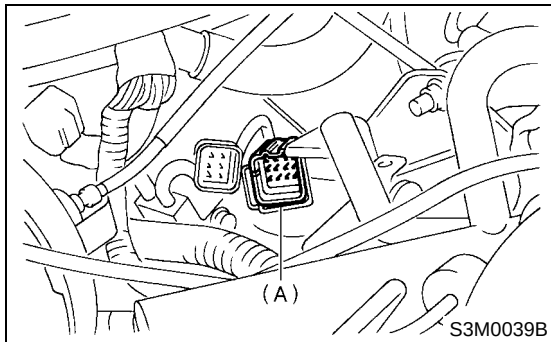
13. Front Vehicle Speed Sensor

A: REMOVAL

- 1) Set up the vehicle on the lift.
- 2) Disconnect battery ground terminal.



- 3) Disconnect transmission connector.



(A) Transmission connector

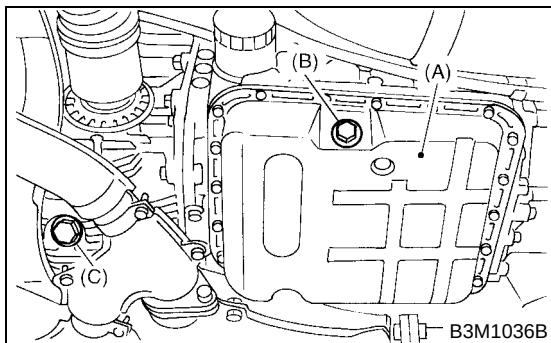
- 4) Remove the transmission connector from stay.
- 5) Lift-up the vehicle.
- 6) Clean transmission exterior.
- 7) Drain ATF completely.

NOTE:

Tighten ATF drain plug after draining ATF.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- (A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

- 8) Remove front, center, exhaust pipes and muffler. With OBD

<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, REMOVAL, Muffler.>

Without OBD

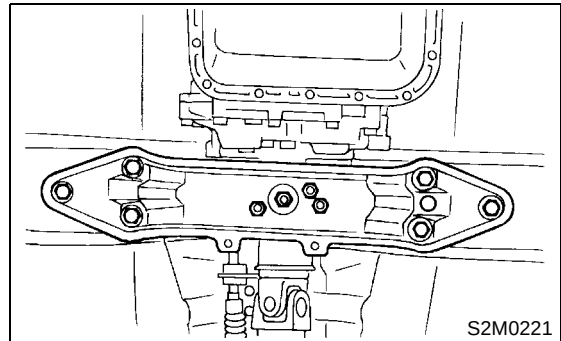
<Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(SOHCw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, REMOVAL, Muffler.>

- 9) Remove the shield cover.
- 10) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>
- 11) Place transmission jack under transmission.

CAUTION:

- Make sure that the support plates of transmission jack don't touch the oil pan.

- 12) Remove the transmission rear crossmember bolts.



- 13) Lower the AT jack.

NOTE:

Do not separate the AT jack and transmission.

- 14) Remove the oil cooler outlet pipe.

CAUTION:

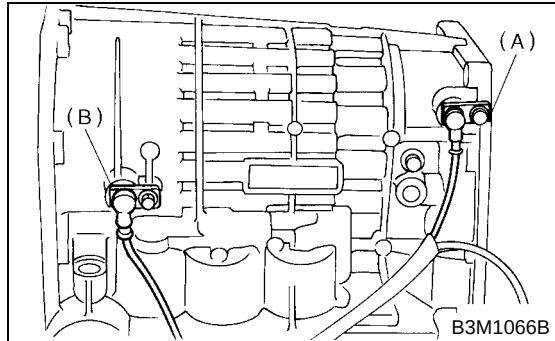
When removing outlet pipe, be careful not to lose balls and springs used with retaining screws.

FRONT VEHICLE SPEED SENSOR

AUTOMATIC TRANSMISSION

15) Remove front and rear vehicle speed sensor and torque converter turbine speed sensor.

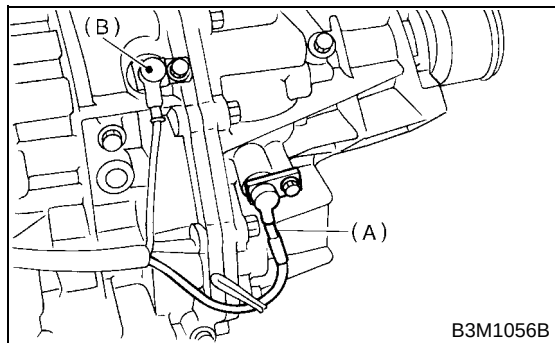
• **Front vehicle speed sensor and torque converter turbine speed sensor**



(A) Front vehicle speed sensor

(B) Torque converter turbine speed sensor

• **Rear vehicle speed sensor**

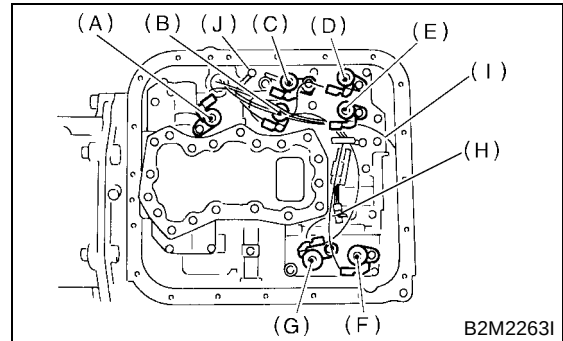


(A) Rear vehicle speed sensor

(B) Front vehicle speed sensor

16) Remove oil pan.

17) Disconnect duty solenoids and ATF temperature sensor connectors. Remove connectors from clip and disconnect connectors at 9 places.



(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

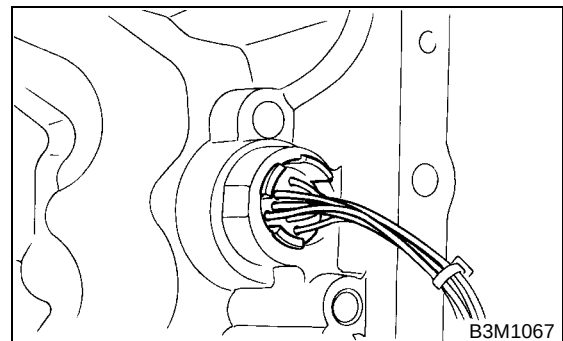
(I) Transfer duty solenoid (Brown)

(J) Transmission ground

18) Remove harness assembly.

B: INSTALLATION

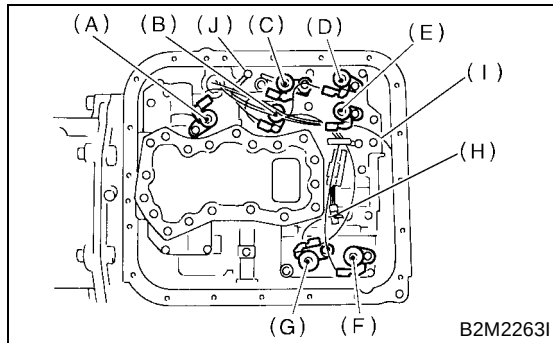
1) Pass the harness assembly through the hole in the transmission case.



FRONT VEHICLE SPEED SENSOR

AUTOMATIC TRANSMISSION

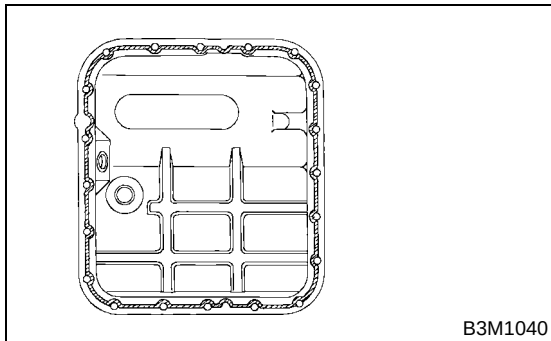
2) Connect harness connectors at 9 places.
Connect connectors of same color, and secure connectors to valve body using clips.



- (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) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)
- (J) Transmission ground

3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:
Three Bond 1217B



4) Install the oil pan.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

5) 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)

6) Install oil cooler outlet pipe.

CAUTION:

Be sure to use a new aluminum washer.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

7) Install transmission rear crossmember bolts.

Tightening torque:

75 N·m (7.6 kgf-m, 55 ft-lb)

8) Install propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>

9) Install shield cover.

10) Install front, center, rear exhaust pipes and muffler.

With OBD

<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.> and <Ref. to EX(SOHC)-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, INSTALLATION, Muffler.>

Without OBD

<Ref. to EX(SOHCw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(SOHCw/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, INSTALLATION, Muffler.>

11) Lower the vehicle.

12) Install the transmission connector to the stay.

13) Install air intake duct and air cleaner case.

14.Rear Vehicle Speed Sensor

A: REMOVAL

When removing the rear vehicle speed sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-31, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the rear vehicle speed sensor, refer to "Front Vehicle Speed Sensor." <Ref. to AT-32, 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-31, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor."
<Ref. to AT-32, INSTALLATION, Front Vehicle Speed Sensor.>

16. Control Valve Body

A: REMOVAL

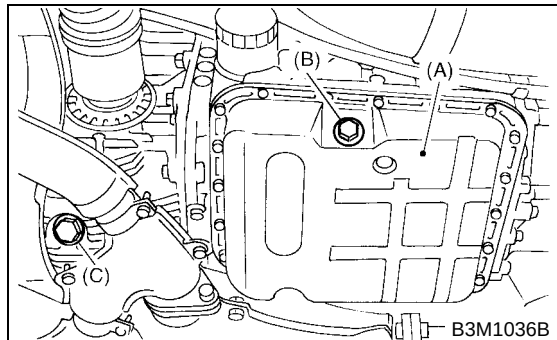
- 1) Lift-up the vehicle.
- 2) Clean transmission exterior.
- 3) Drain ATF completely.

NOTE:

Tighten ATF drain plug after draining ATF.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



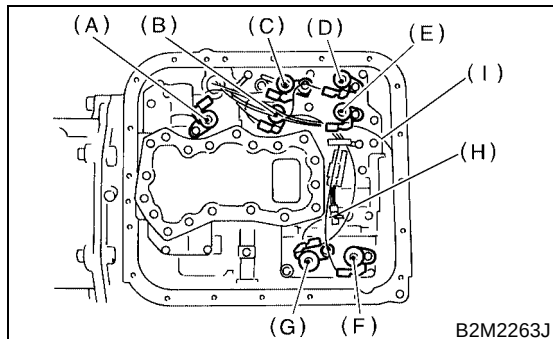
- (A) Oil pan
- (B) Drain plug
- (C) Differential oil drain plug

- 4) Remove the oil pan.

NOTE:

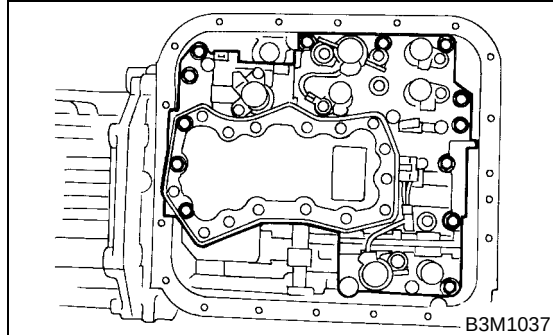
- Remove and clean the magnet.
- Remove the old gasket on the oil pan and transmission case completely.

- 5) Disconnect duty solenoids and ATF temperature sensor connectors. Remove connectors from clip and disconnect 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)

- 6) Remove the control valve. When removing control valve body, be careful not to interfere with transfer duty solenoid wiring

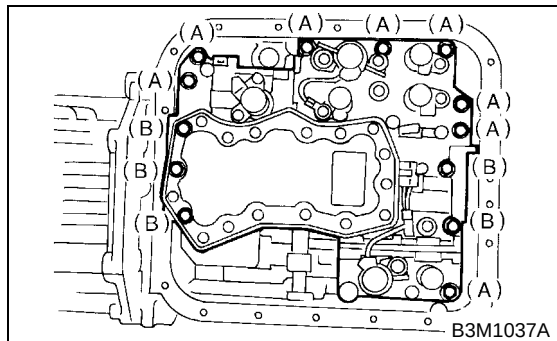


B: INSTALLATION

- 1) Set the range select lever in "N" position.
- 2) Install the control valve and ground earth connectors.

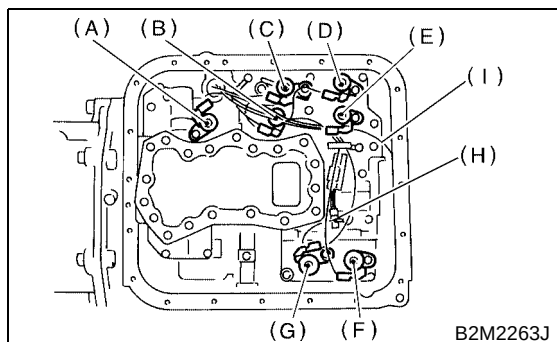
Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



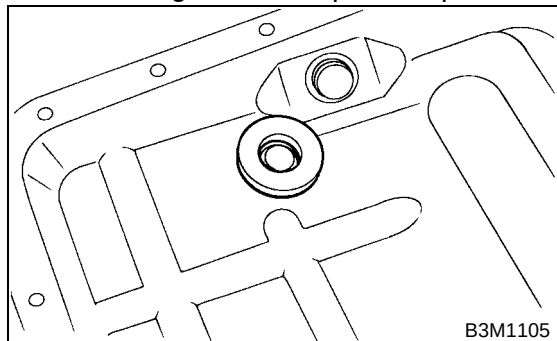
- (A) Short bolts
- (B) Long bolts

- 3) Connect all connector.



- (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)

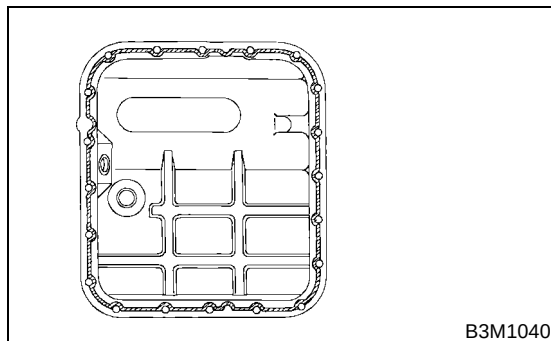
- 4) Attach the magnet at the specified position.



- 5) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:

Tree Bond 1217B



- 6) Install the oil pan.

Tightening torque:

4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

- 7) Pour ATF into the oil charge pipe.

Recommended fluid:

Dexron III type automatic transmission fluid

Fluid capacity:

1.6 L models:

8.0 — 8.3 ℓ (8.5 — 8.8 US qt, 7.0 — 7.3 Imp qt)

2.0 L model:

8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)

- 8) Check the level of the ATF.

<Ref. to AT-9, Automatic Transmission Fluid.>

C: DISASSEMBLY

Refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0853ZE> a separate publication.

D: ASSEMBLY

Refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0853ZE> a separate publication.

E: INSPECTION

Refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0853ZE> a separate publication.

17. Shift Solenoids, Duty Solenoids and ATF Temperature Sensor

A: REMOVAL

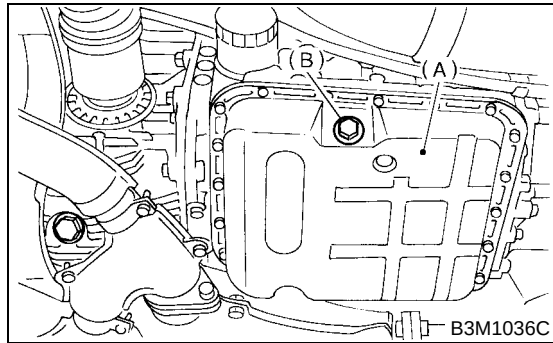
- 1) Lift-up the vehicle.
- 2) Clean transmission exterior.
- 3) Drain ATF completely.

NOTE:

Tighten ATF drain plug after draining ATF.

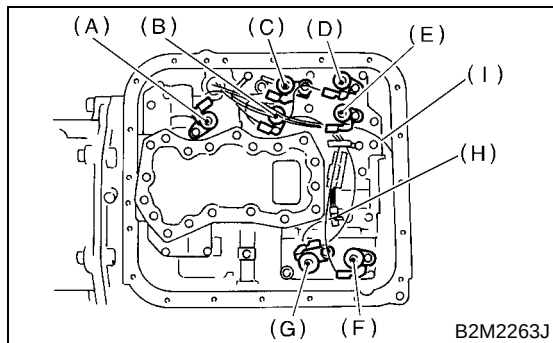
Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



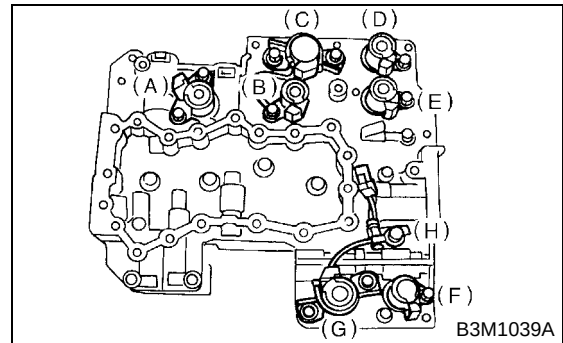
- (A) Oil pan
- (B) Drain plug

- 4) Remove oil pan.
- 5) Disconnect solenoid and sensor connectors. Remove connectors from clip and disconnect 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)

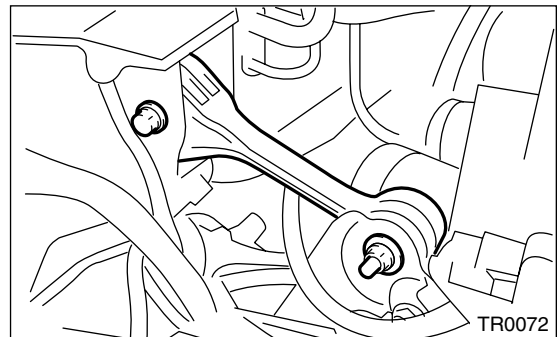
- 6) Remove solenoids, duty solenoids and ATF temperature sensor.



- (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

1. TRANSFER DUTY SOLENOID AND TRANSFER VALVE BODY

- 1) Set up the vehicle on the lift.
- 2) Disconnect battery ground terminal.
- 3) Remove air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 4) Remove air cleaner case. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
- 5) Remove pitching stopper.



- 6) Remove front exhaust pipe with center exhaust pipe.

With OBD

<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>

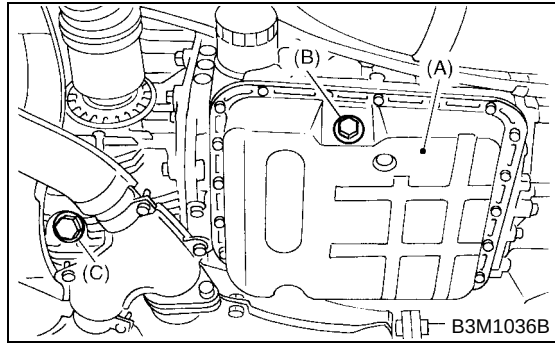
Without OBD

<Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

SHIFT SOLENOIDS, DUTY SOLENOIDS AND ATF TEMPERATURE SENSOR

AUTOMATIC TRANSMISSION

7) Raise vehicle and drain ATF.



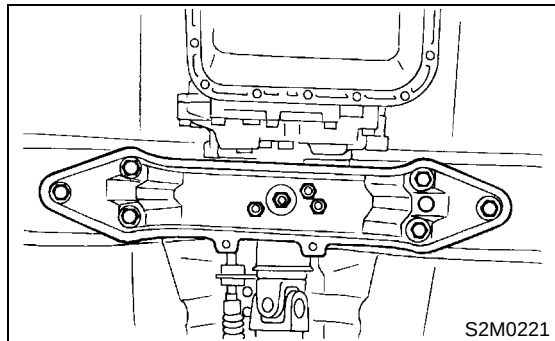
- (A) Oil pan
- (B) Drain plug
- (C) Differential oil drain plug

8) Remove heat shield cover.

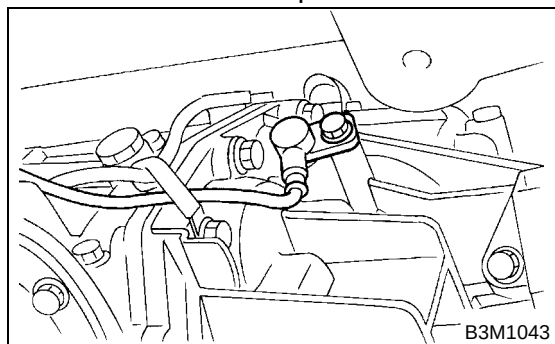
9) Remove propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>

10) Remove rear crossmember.

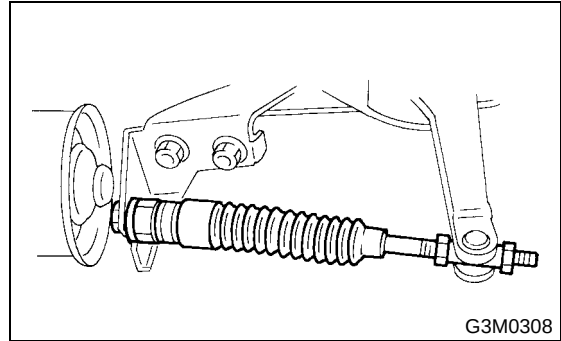
- (1) Support transmission using a transmission jack and raise slightly.
- (2) Remove bolts and nuts as shown in Figure.



11) Remove rear vehicle speed sensor.



12) Remove select cable nut.



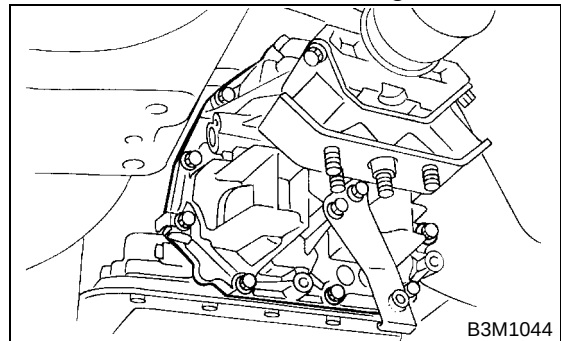
13) Move gear select cable so that extension bolts can be removed.

14) Remove bolts.

15) Remove extension case.

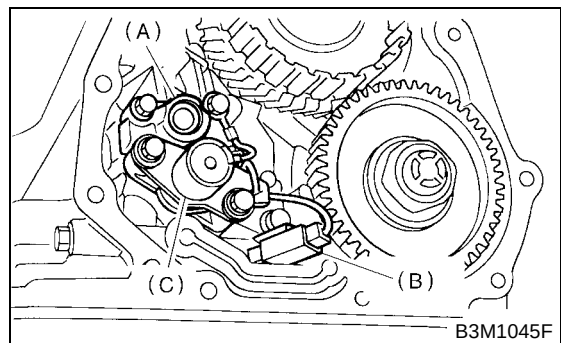
NOTE:

Use a container to catch oil flowing from extension.



16) Disconnect transfer duty solenoid connector.

17) Remove transfer duty solenoid and transfer valve body.



- (A) Transfer valve body
- (B) Transfer duty solenoid connector
- (C) Transfer duty solenoid

SHIFT SOLENOIDS, DUTY SOLENOIDS AND ATF TEMPERATURE SENSOR

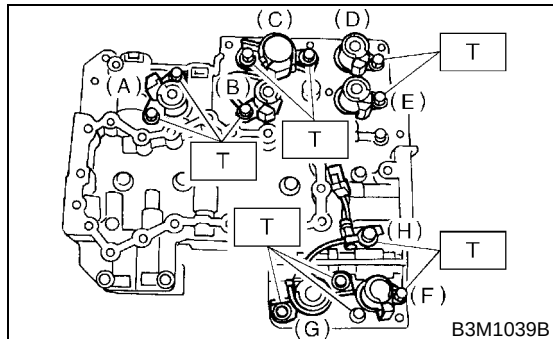
AUTOMATIC TRANSMISSION

B: INSTALLATION

1) Install solenoids and ATF temperature sensor.

Tightening torque:

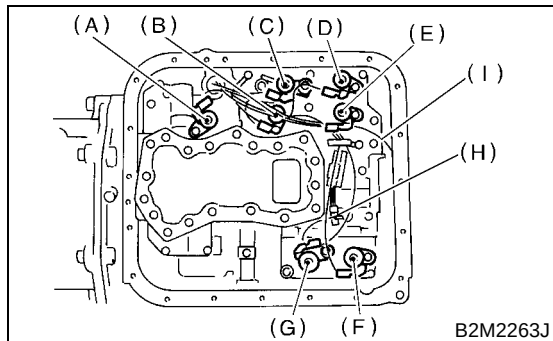
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



- (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

2) Connect harness connectors.

Connect connectors of same color, and secure connectors to valve body using clips.

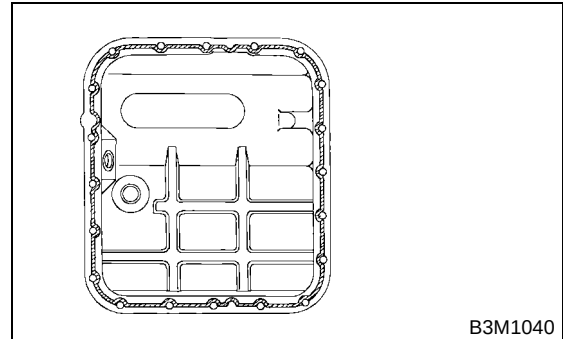


- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)

3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:

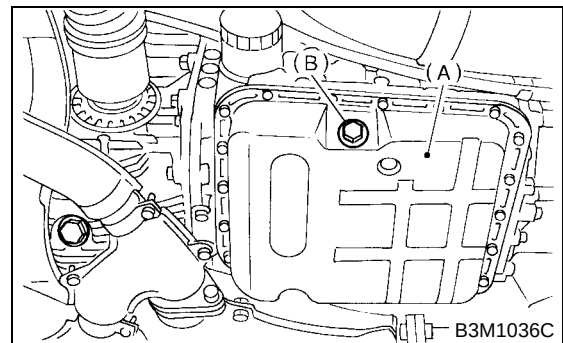
Tree Bond 1217B



4) Install oil pan.

Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



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

5) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole.

Recommended fluid:

Dexron III type automatic transmission fluid

Fluid capacity:

1.6 L model:

8.0 — 8.3 ℓ (8.5 — 8.8 US qt, 7.0 — 7.3 Imp qt)

2.0 L model:

8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)

6) Check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

1. TRANSFER DUTY SOLENOID AND TRANSFER VALVE BODY

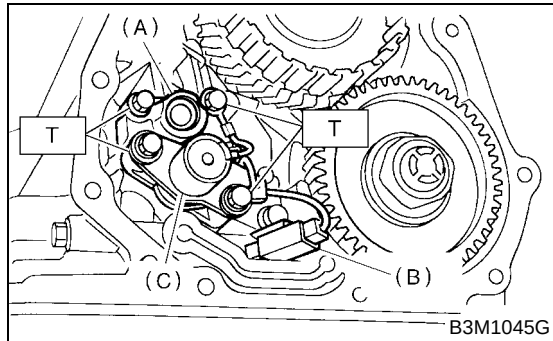
1) Install transfer duty solenoid and transfer valve body.

- (1) Install transfer duty solenoid and transfer valve body.

Tightening torque:

T: 8 N·m (0.8 kg-m, 5.8 ft-lb)

- (2) Connect transfer duty solenoid connector.



- (A) Transfer valve body
- (B) Transfer duty solenoid connector
- (C) Transfer duty solenoid

2) Install extension case to transmission case.

- (1) Tighten 11 bolts.

Tightening torque:

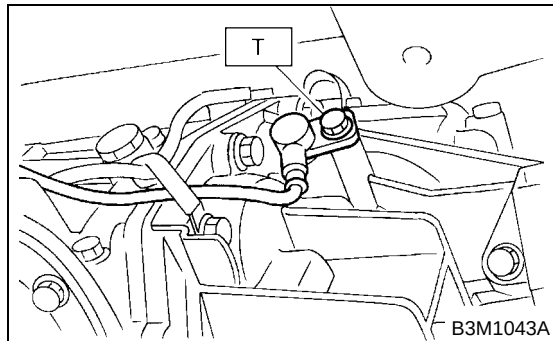
25 N·m (2.5 kg-m, 18.1 ft-lb)

- (2) Adjust the select cable. <Ref. to CS-10, ADJUSTMENT, Select Cable.>

3) Install rear vehicle speed sensor.

Tightening torque:

T: 7 N·m (0.7 kg-m, 5.1 ft-lb)



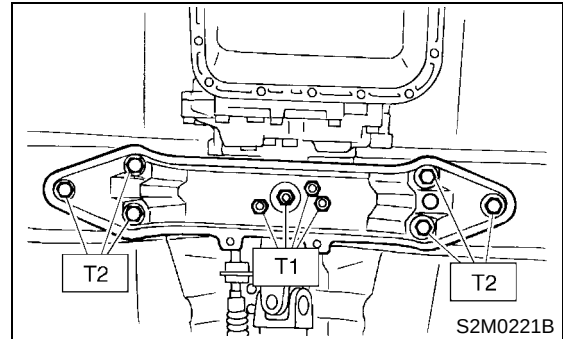
4) Install rear crossmember.

- (1) Tighten bolts.

Tightening torque:

T1: 35 N·m (3.6 kg-m, 26 ft-lb)

T2: 70 N·m (7.1 kg-m, 51.4 ft-lb)



- (2) Lower and remove transmission jack.

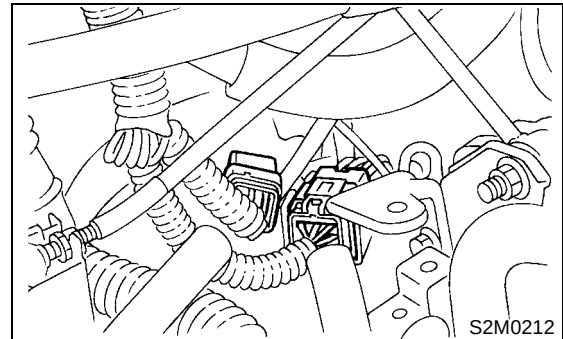
5) Install propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>

6) Install front exhaust pipe and center exhaust pipe.

7) Lower and remove jack.

8) Connect the following parts:

- (1) Oxygen sensor connector
- (2) Transmission harness connector

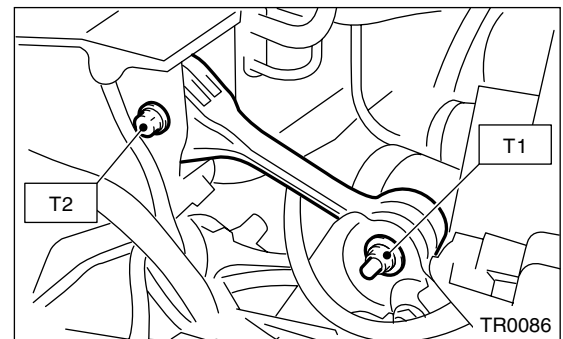


9) Install pitching stopper.

Tightening torque:

T1: 49 N·m (5.0 kg-m, 36.2 ft-lb)

T2: 57 N·m (5.8 kg-m, 42 ft-lb)



10) Install air cleaner case and duct.

SHIFT SOLENOIDS, DUTY SOLENOIDS AND ATF TEMPERATURE SENSOR

AUTOMATIC TRANSMISSION

11) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole.

Recommended fluid:

Dexron III type automatic transmission fluid

Fluid capacity:

1.6 L model; 8.0 - 8.3 L (8.5 - 8.8 US qt, 7.0 - 7.3 Imp qt)

2.0 L model; 8.4 - 8.7 L (8.9 - 9.2 US qt, 7.4 - 7.3 Imp qt)

12) Check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

18.ATF Filter

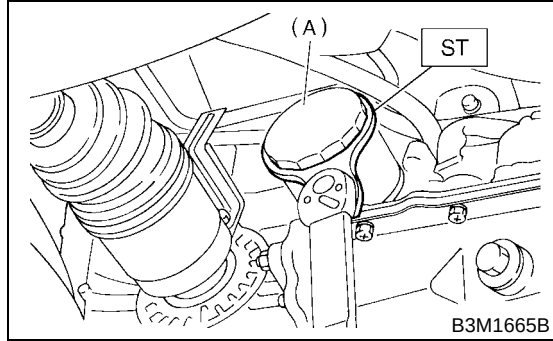
A: REMOVAL

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

- 3) Get new ATF filter and apply a thin coat of ATF to the oil seal.

B: INSTALLATION

- 1) Install ATF filter. Turn it by hand, being careful not to damage oil seal.
- 2) Using ST, tighten ATF filter to transmission case. Calculate ATF 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)	6 (0.6, 4.3)
150 (5.91)	5 (0.5, 3.6)
200 (7.87)	4 (0.4, 2.9)
250 (9.84)	3 (0.3, 2.2)

CAUTION:

Align ST with torque wrench while tightening ATF filter.

ST 498545400 OIL FILTER WRENCH

- 3) Add ATF.
- 4) Inspect level of ATF. <Ref. to AT-9, 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.

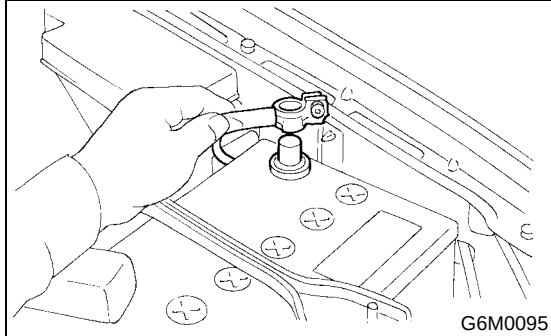
TRANSMISSION CONTROL MODULE (TCM)

AUTOMATIC TRANSMISSION

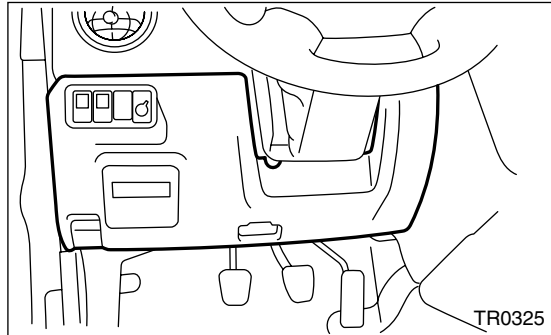
19. Transmission Control Module (TCM)

A: REMOVAL

- 1) Disconnect battery ground terminal.

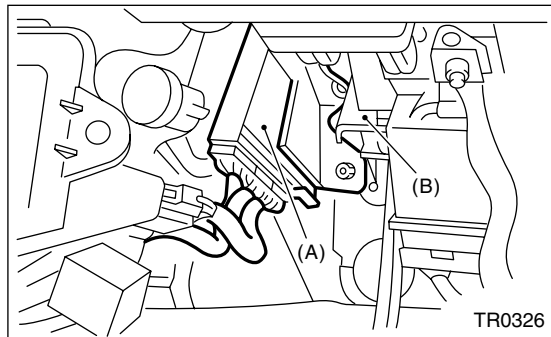


- 2) Remove lower cover and then disconnect connector.



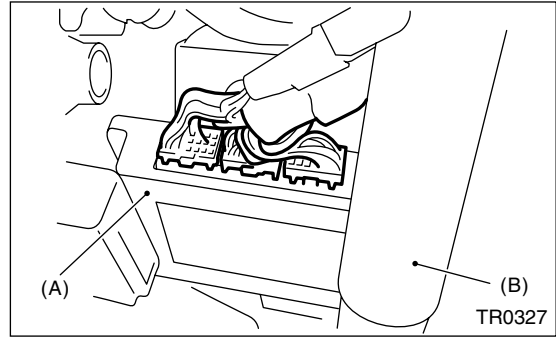
- 3) Disconnect connectors from transmission control module.

LHD model



- (A) Transmission control module
(B) Brake pedal bracket

RHD model



- (A) Transmission control module
(B) Column shaft

- 4) Remove transmission control module.

B: INSTALLATION

- 1) Install transmission control module.

Tightening torque:

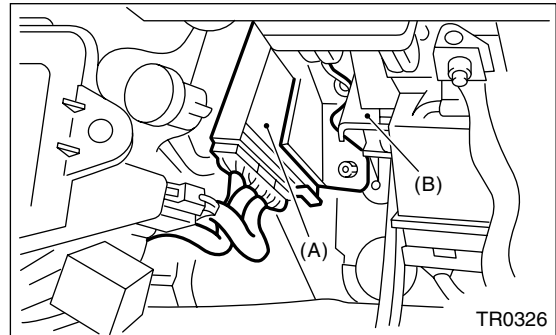
LHD model

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

RHD model

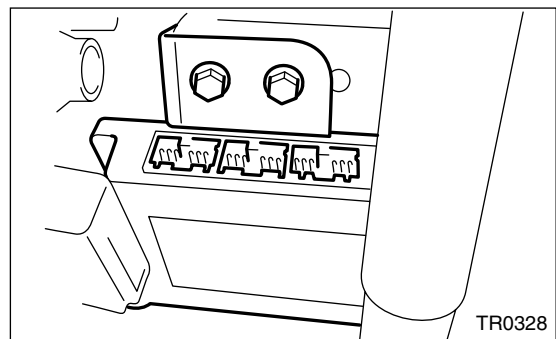
25 N·m (2.5 kgf-m, 18.1 ft-lb)

LHD model



- (A) Transmission control module
(B) Brake pedal bracket

RHD model



- (A) Transmission control module
(B) Column shaft

- 2) Connect connectors to transmission control module.
- 3) Install in the reverse order of removal.

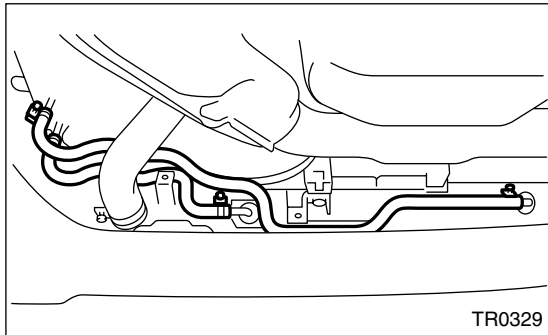
20.ATF Cooler Pipe and Hose

A: REMOVAL

- 1) Set the vehicle on the 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:

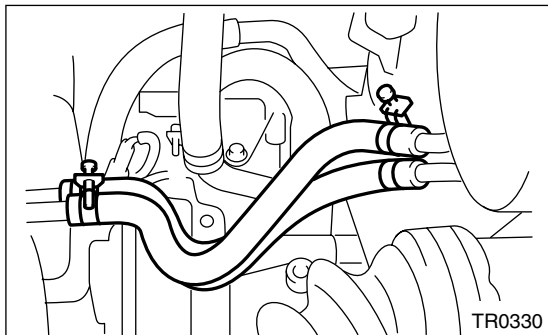
- Do not remove with a screwdriver or other pointed tools.
- When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.



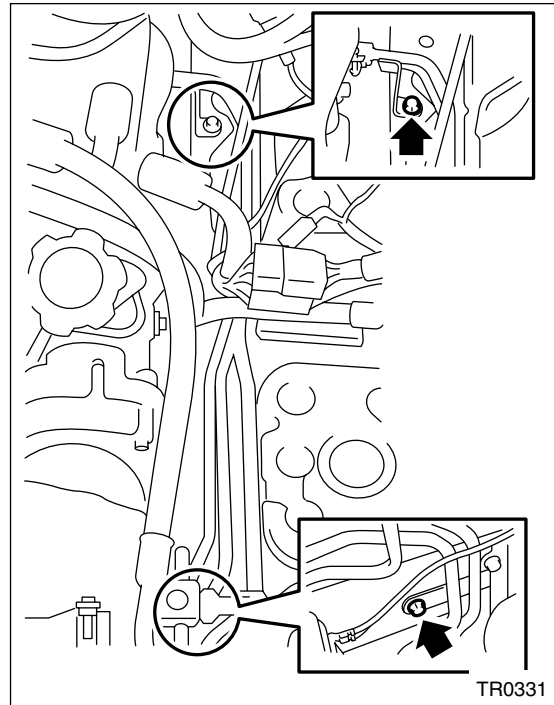
- 6) Disconnect ATF cooler hoses from pipes.

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.



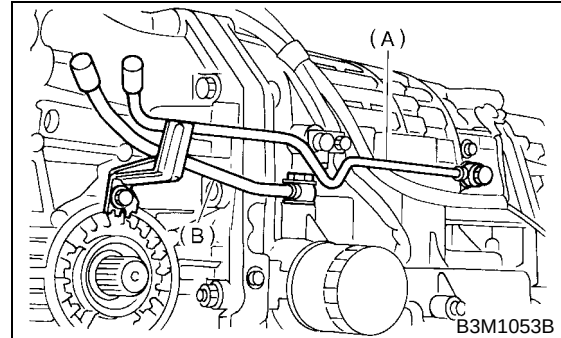
- 7) Remove ATF cooler pipe from frame.



- 8) Remove the oil cooler inlet and outlet pipes.

CAUTION:

When removing outlet pipe, be careful not to lose ball and spring used with retaining screw.



- (A) Inlet pipe
(B) Outlet pipe

ATF COOLER PIPE AND HOSE

AUTOMATIC TRANSMISSION

B: INSTALLATION

1) Install the oil cooler outlet and inlet pipes.

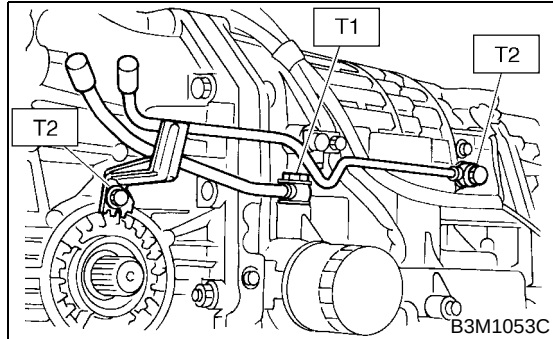
CAUTION:

Be sure to use a new aluminum washer.

Tightening torque:

T1: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

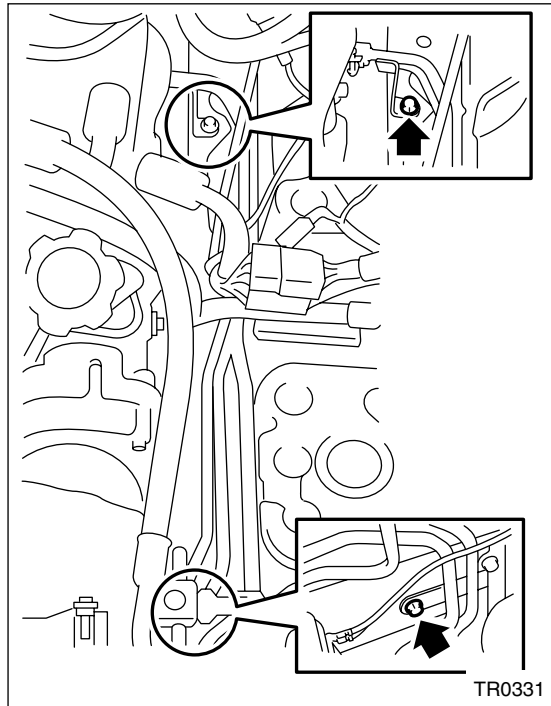
T2: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Inlet pipe

(B) Outlet pipe

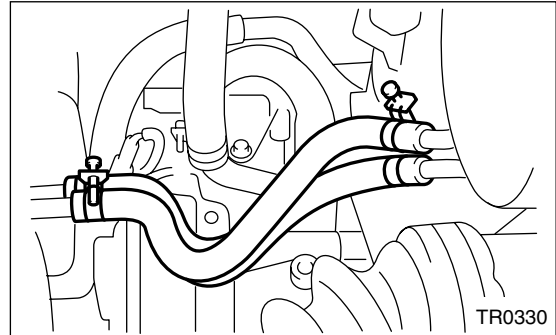
2) Install ATF cooler pipe to frame.



3) Connect ATF cooler hose to pipe transmission side.

NOTE:

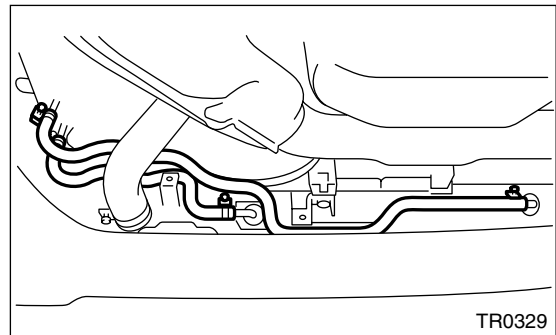
- Install so that the hose is not folded over, excessively bent, or twisted.
- Be careful to insert the hose to the specified position.



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-9, 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.

ATF COOLER PIPE AND HOSE

AUTOMATIC TRANSMISSION

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

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

AT

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BASIC DIAGNOSTIC PROCEDURE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1)Ask the customer when and how the trouble occurred using interview checklist. <Ref. to AT-4, Check List for Interview.> 2)Before performing diagnosis, inspect the following items which might influence the AT problems. •General inspection <Ref. to AT-5, INSPECTION, General Description.> •Oil leak •Stall speed test <Ref. to AT-13, Stall Test.> •Line pressure test <Ref. to AT-16, Line Pressure Test.> •Transfer clutch pressure test <Ref. to AT-18, Transfer Clutch Pressure Test.> •Time lag test <Ref. to AT-15, Time Lag Test.> •Road test <Ref. to AT-12, Road Test.> •Inhibitor switch <Ref. to AT-28, Inhibitor Switch.>	Is unit that might influence the AT problem normal?	Go to step 2.	Repair or replace each item.
2 CHECK POWER INDICATOR LIGHT. Turn ignition switch to ON.	Does not the POWER indicator light light up?	Go to step 3.	Go to step 4.
3 CHECK POWER INDICATOR LIGHT. 1)Turn ignition switch to OFF. 2)Repair POWER indicator light circuit or power supply and ground line circuit. <Ref. to AT-26, Diagnostic Procedure for Power Indicator Light.> 3)Turn ignition switch to ON.	Is the POWER indicator light flashing?	Go to step 4.	Go to step 5.
4 CHECK INDICATION OF TROUBLE CODE. Calling up trouble code. Without SUBARU SELECT MONITOR <Ref. to AT-20, WITHOUT SUBARU SELECT MONITOR, Read Diagnostic Trouble Code.> With SUBARU SELECT MONITOR <Ref. to AT-21, WITH SUBARU SELECT MONITOR, Read Diagnostic Trouble Code.> NOTE: If the communication function of the select monitor cannot be executed normally, check the communication circuit. <Ref. to AT-35, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Select Monitor Communication.>	Is the trouble code displayed?	Go to step 6. NOTE: Record all trouble codes.	Go to step 5.

BASIC DIAGNOSTIC PROCEDURE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
5 PERFORM THE GENERAL DIAGNOSTICS. 1)Inspect using "Diagnostic Procedure for No-trouble Code".<Ref. to AT-101, Diagnostic Procedure for No-trouble Code.> 2)Inspect using "Symptom Related Diagnostic". <Ref. to AT-129, Symptom Related Diagnostic.> 3)Perform the clear memory mode. Without SUBARU SELECT MONITOR <Ref. to AT-23, WITH SUBARU SELECT MONITOR, Clear Memory Mode.> With SUBARU SELECT MONITOR <Ref. to AT-23, WITHOUT SUBARU SELECT MONITOR, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to AT-22, Inspection Mode.> Calling up the trouble code. Without SUBARU SELECT MONITOR <Ref. to AT-20, WITHOUT SUBARU SELECT MONITOR, Read Diagnostic Trouble Code.> With SUBARU SELECT MONITOR <Ref. to AT-21, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code.>	Is the trouble code displayed?	Complete the diagnosis.	Go to step 6.
6 PERFORM THE DIAGNOSIS. 1)Inspect using "Diagnostics Chart with Trouble Code".<Ref. to AT-40, Diagnostic Procedure with Trouble Code.> NOTE: For trouble code table, refer to "List of Diagnostic Trouble Code".<Ref. to AT-25, List of Diagnostic Trouble Code.> 2)Repair trouble cause. 3)Perform the clear memory mode. Without SUBARU SELECT MONITOR <Ref. to AT-23, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> With SUBARU SELECT MONITOR <Ref. to AT-23, WITHOUT SUBARU SELECT MONITOR, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to AT-22, Inspection Mode.> 5)Calling up the trouble code. Without SUBARU SELECT MONITOR <Ref. to AT-20, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code.> With SUBARU SELECT MONITOR <Ref. to AT-21, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code.>	Is the trouble code displayed?	Complete the diagnosis.	Inspect using "Diagnostics Chart with Diagnostic Connector". <Ref. to AT-40, Diagnostic Procedure with Trouble Code.>

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

NOTE:

A: CHECK

Customer's name				
Data vehicle brought in				
Data of repair				
Trans. model	TRANSMISSION		VIN	
Odometer reading	km/h or mile			
Frequency	☐ Continuous ☐ Intermittent (times a day)			
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others ()			
Place	☐ High ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Rough road ☐ Others ()			
Outdoor temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold			
Vehicle speed	km/h (MPH)			
Malfunction indicator lamp (MIL)	☐ Continuously lit		☐ Not lit	
Select lever position	☐ P ☐ R ☐ N ☐ D ☐ 3 ☐ 2 ☐ 1			
Driving condition	☐ Not affected ☐ At racing ☐ While decelerating		☐ At starting ☐ While accelerating ☐ While turning (☐ RH/ ☐ LH)	
POWER switch	☐ ON ☐ OFF			
HOLD switch	☐ ON ☐ OFF			
Symptoms	☐ No up-shift			
	☐ No down-shift			
	☐ No kick down			
	☐ Vehicle does not move (☐ Any position ☐ Particular position)			
	☐ Lock-up malfunction			
	☐ Noise or vibration			
	☐ Shift shock or slip			
	☐ Select lever does not move			
	☐ Others ()			

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 6.5 mm (0.256 in).

B: INSPECTION

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12V or more

Specific gravity: Above 1.260

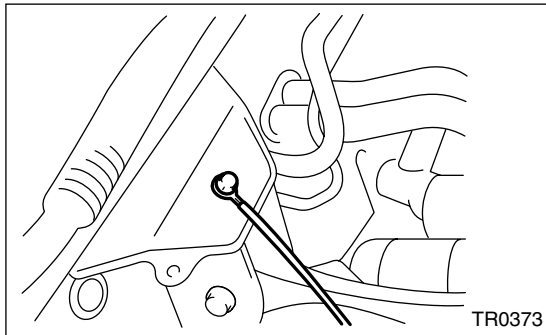
2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

- **Chassis side**

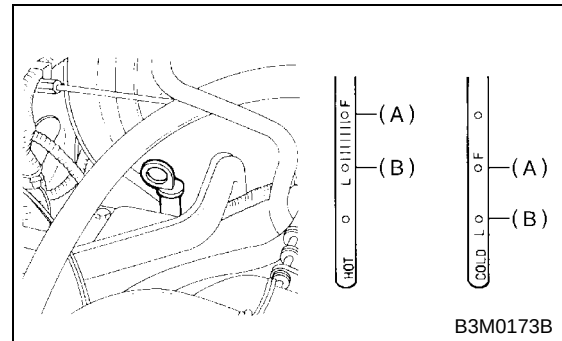
Tightening torque:

13 ± 3 N·m (1.3 ± 0.3 kgf-m, 9.4 ± 2.2 ft-lb)



3. ATF LEVEL

Make sure that ATF level is in the specification.

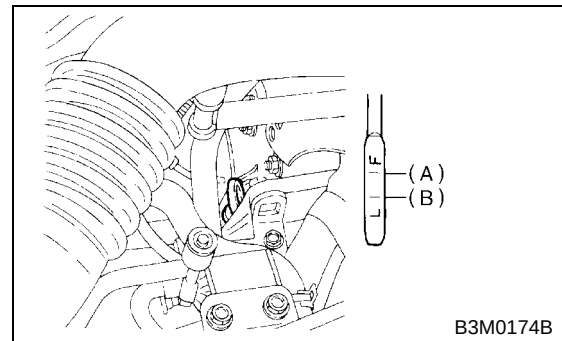


(A) Upper level

(B) Lower level

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that front differential oil level is in the specification.



(A) Upper level

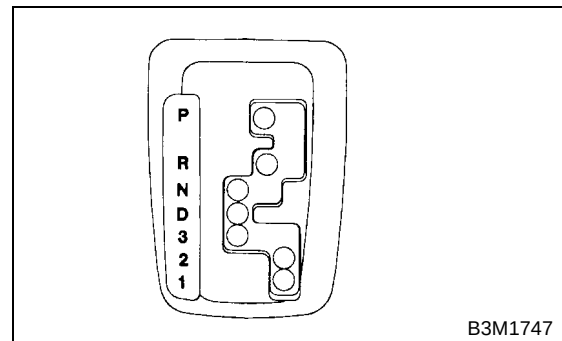
(B) Lower level

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 selector lever.

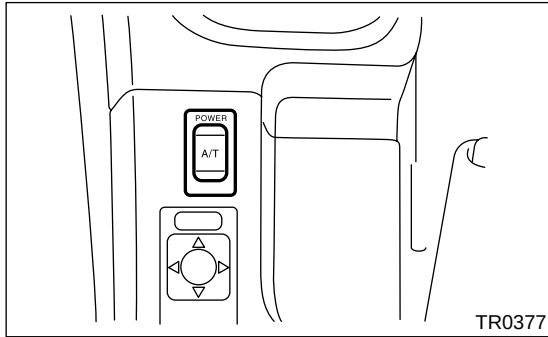


GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

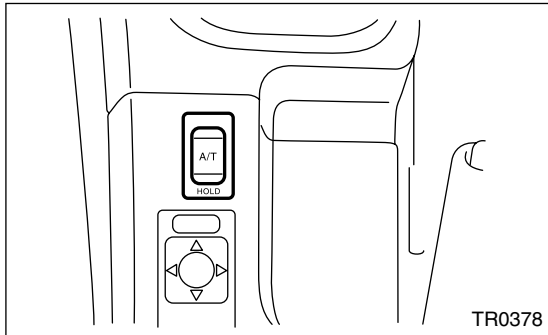
6. POWER SWITCH

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.

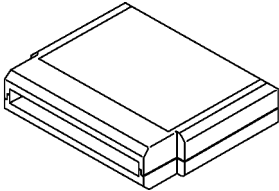


GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • 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.

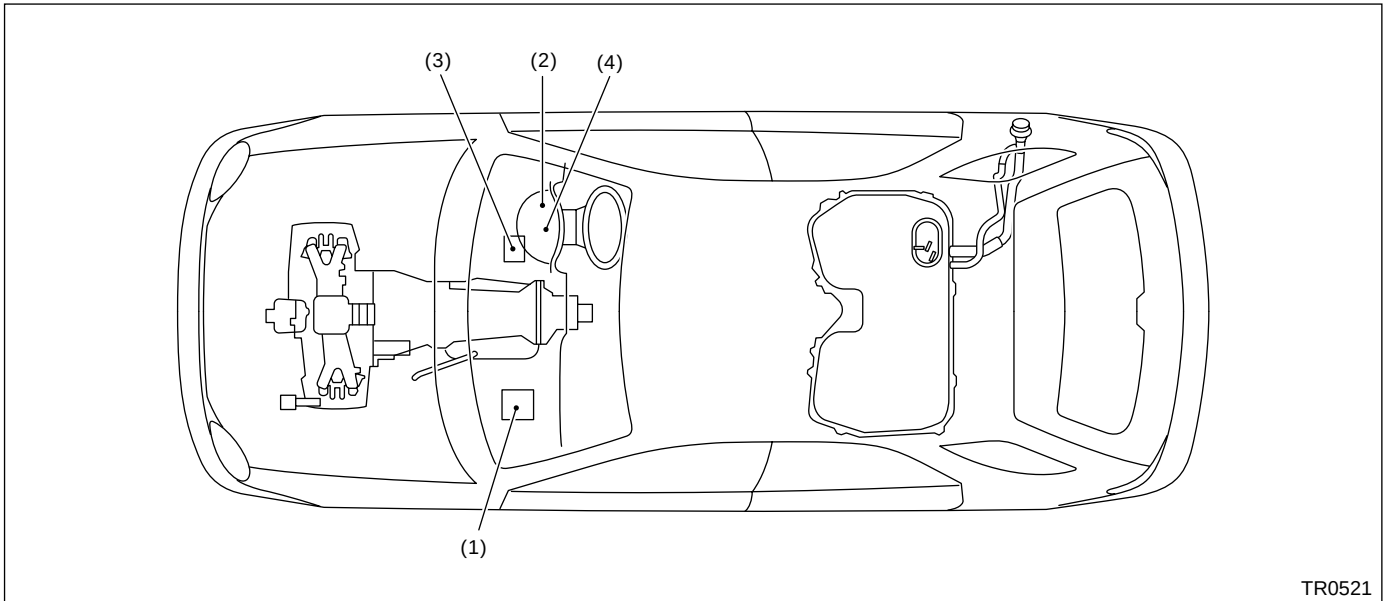
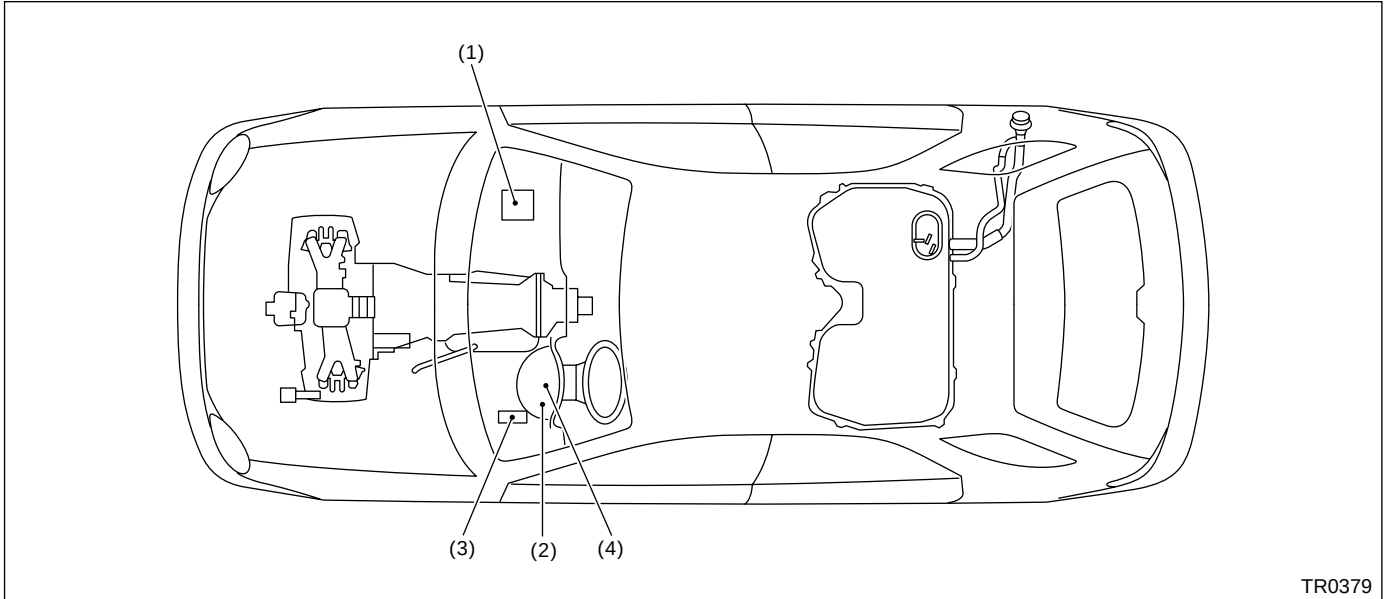
ELECTRICAL COMPONENTS LOCATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

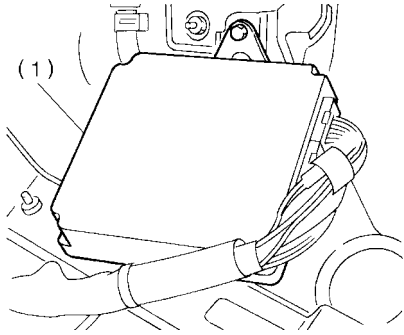
1. CONTROL MODULE



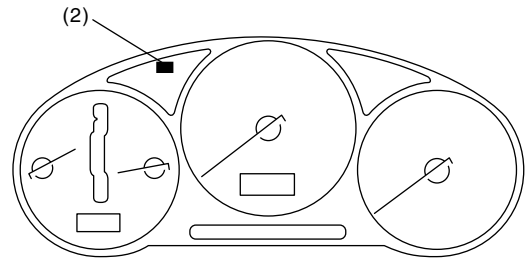
- | | |
|---|---------------------------------------|
| (1) Engine control module (ECM) | (3) Transmission control module (TCM) |
| (2) POWER indicator light (AT diagnostic indicator light) | (4) Data link connector |

ELECTRICAL COMPONENTS LOCATION

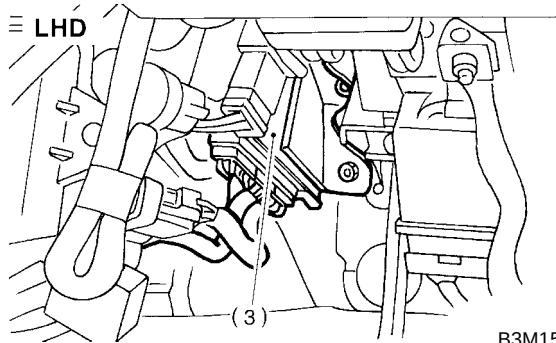
AUTOMATIC TRANSMISSION (DIAGNOSTICS)



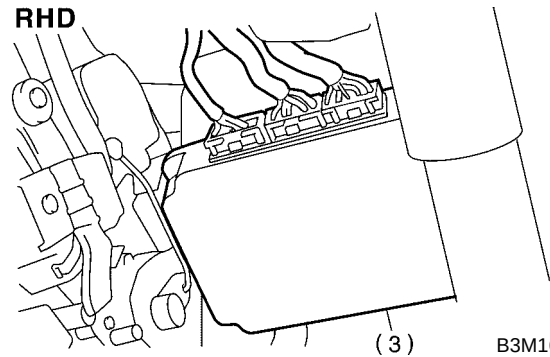
B3M1575A



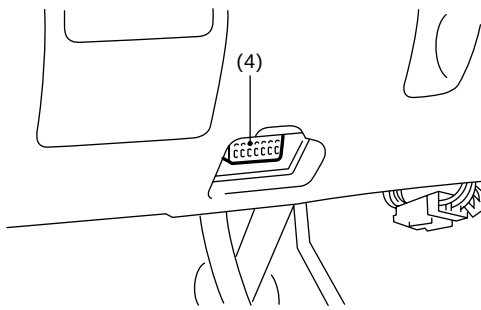
TR0383



B3M1592B



B3M1652A



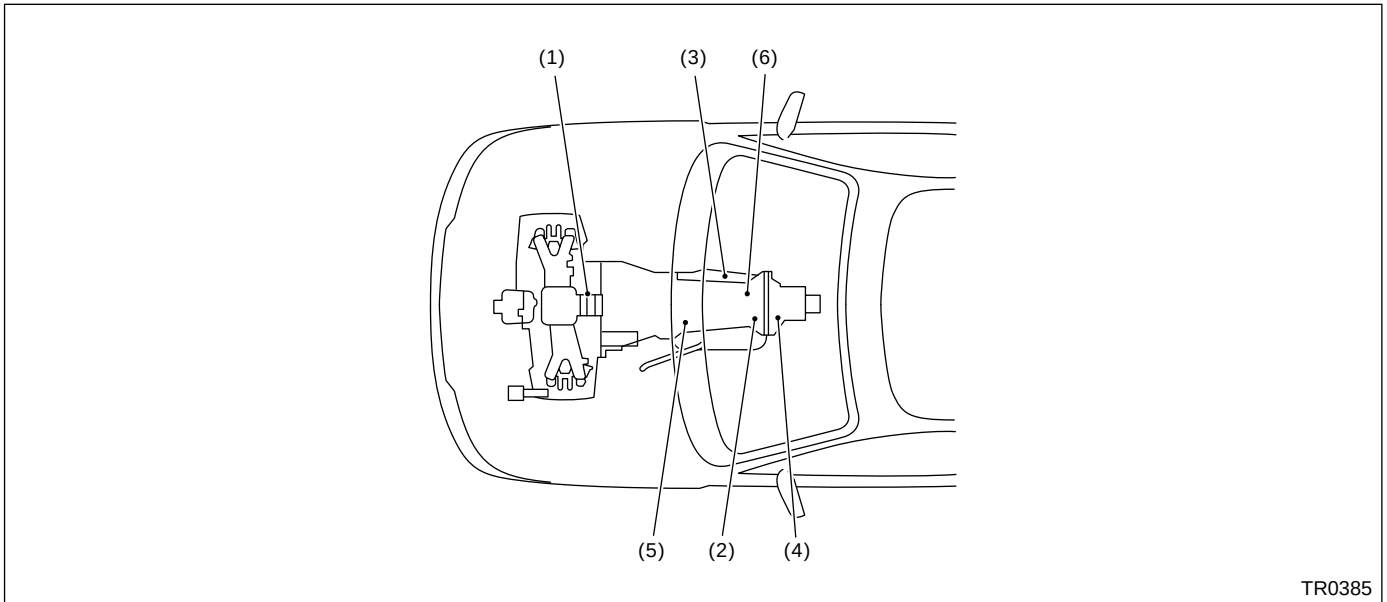
TR0382

SUBARU.

ELECTRICAL COMPONENTS LOCATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

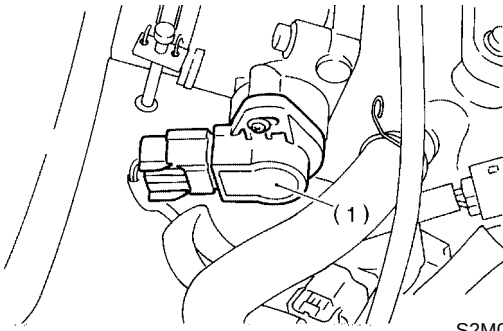
2. SENSOR



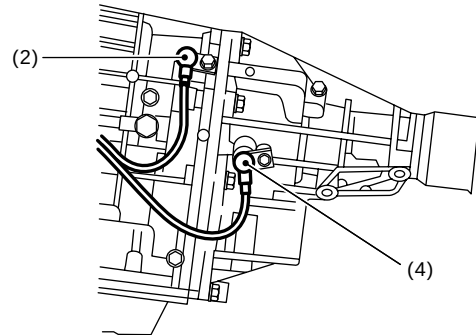
- | | | |
|--------------------------------|---|----------------------------|
| (1) Throttle position sensor | (4) Rear vehicle speed sensor | (6) ATF temperature sensor |
| (2) Front vehicle speed sensor | (5) Torque converter turbine speed sensor | |
| (3) Inhibitor switch | | |

ELECTRICAL COMPONENTS LOCATION

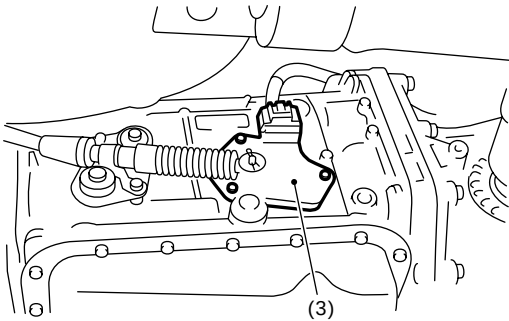
AUTOMATIC TRANSMISSION (DIAGNOSTICS)



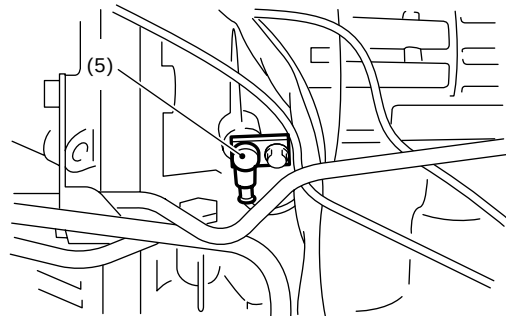
S2M0262B



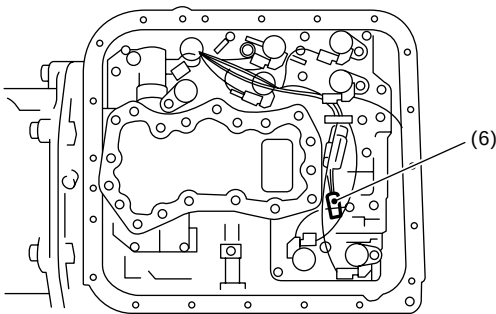
TR0387



TR0388



TR0390



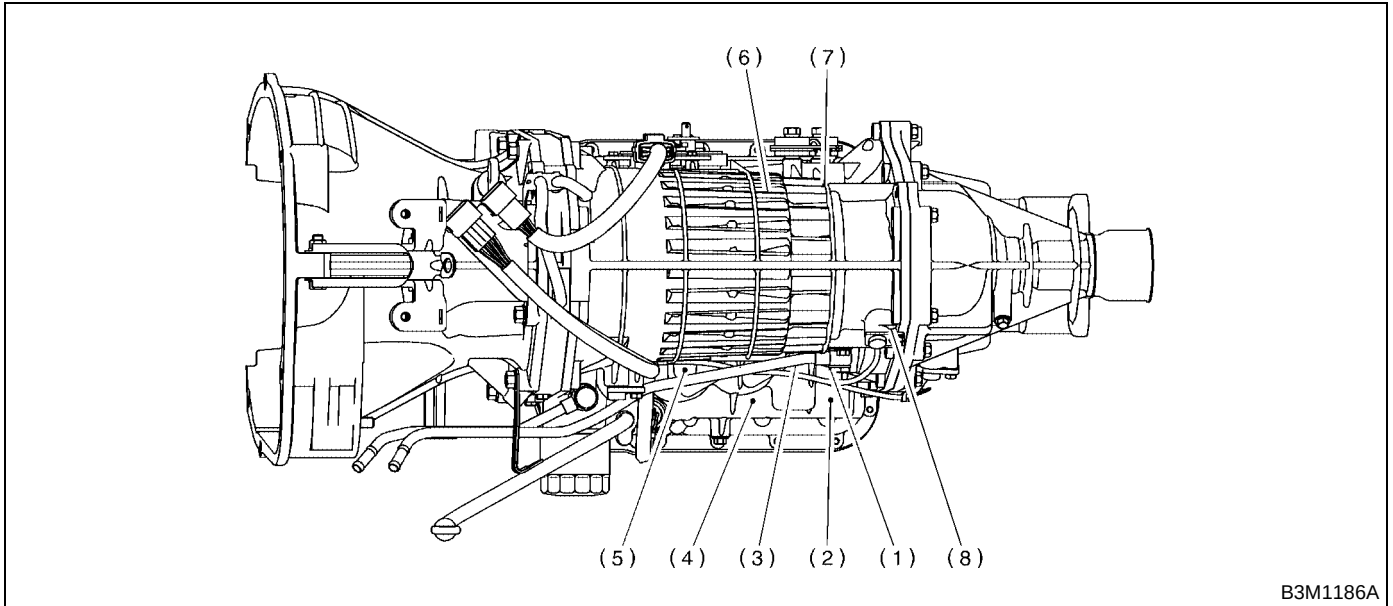
TR0389

SUBARU.

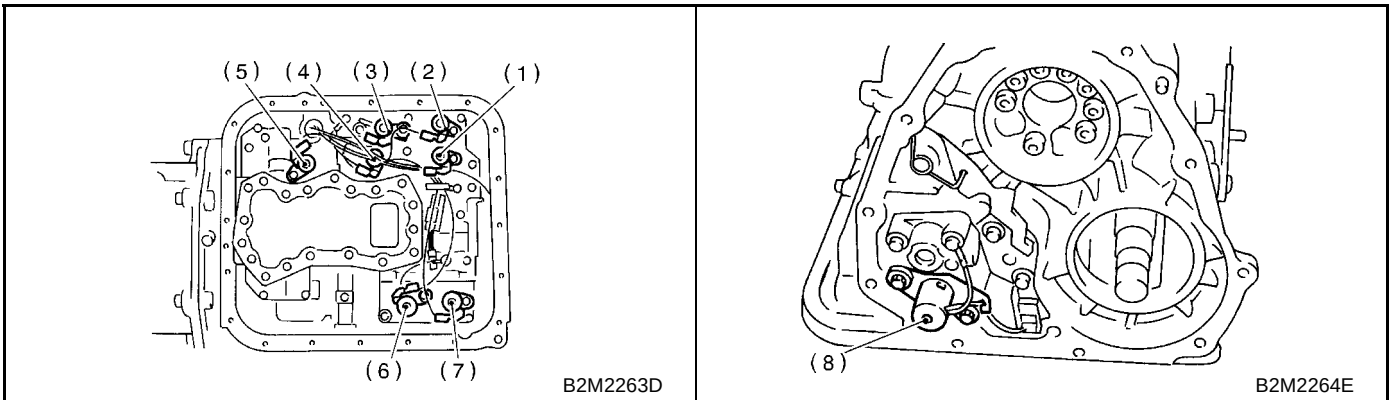
ELECTRICAL COMPONENTS LOCATION

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 | |

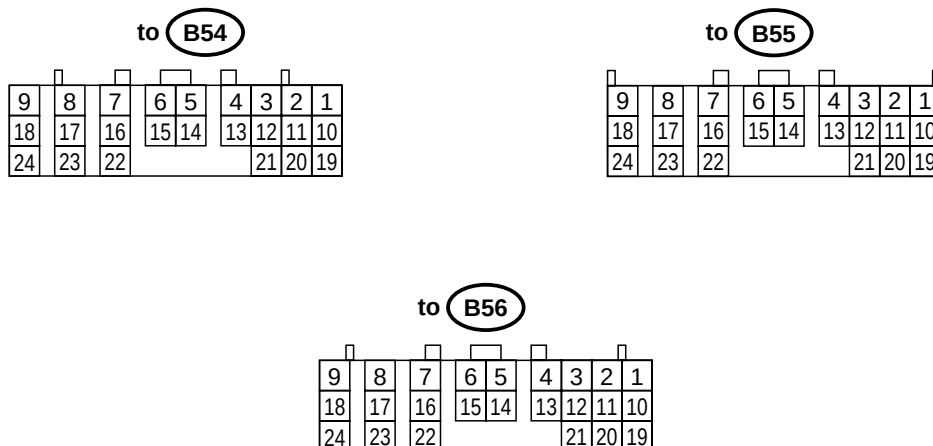


TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



TR0532

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 — 16	—
Ignition power supply	B54	23	Ignition switch ON (with engine OFF)	10 — 16	—
	B54	24			
Inhibitor 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	
	B55	14	Select lever in "N" range	Less than 1	—
			Select lever in any other than "N" range (except "P" range)	More than 8	
	B55	3	Select lever in "R" range	Less than 1	—
			Select lever in any other than "R" range	More than 8	
	B55	4	Select lever in "D" range	Less than 1	—
			Select lever in any other than "D" range	More than 8	
	B55	5	Select lever in "3" range	Less than 1	—
			Select lever in any other than "3" range	More than 8	
	B55	6	Select lever in "2" range	Less than 1	—
			Select lever in any other than "2" range	More than 8	
	B55	7	Select lever in "1" range	Less than 1	—
			Select lever in any other than "1" range	More than 8	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

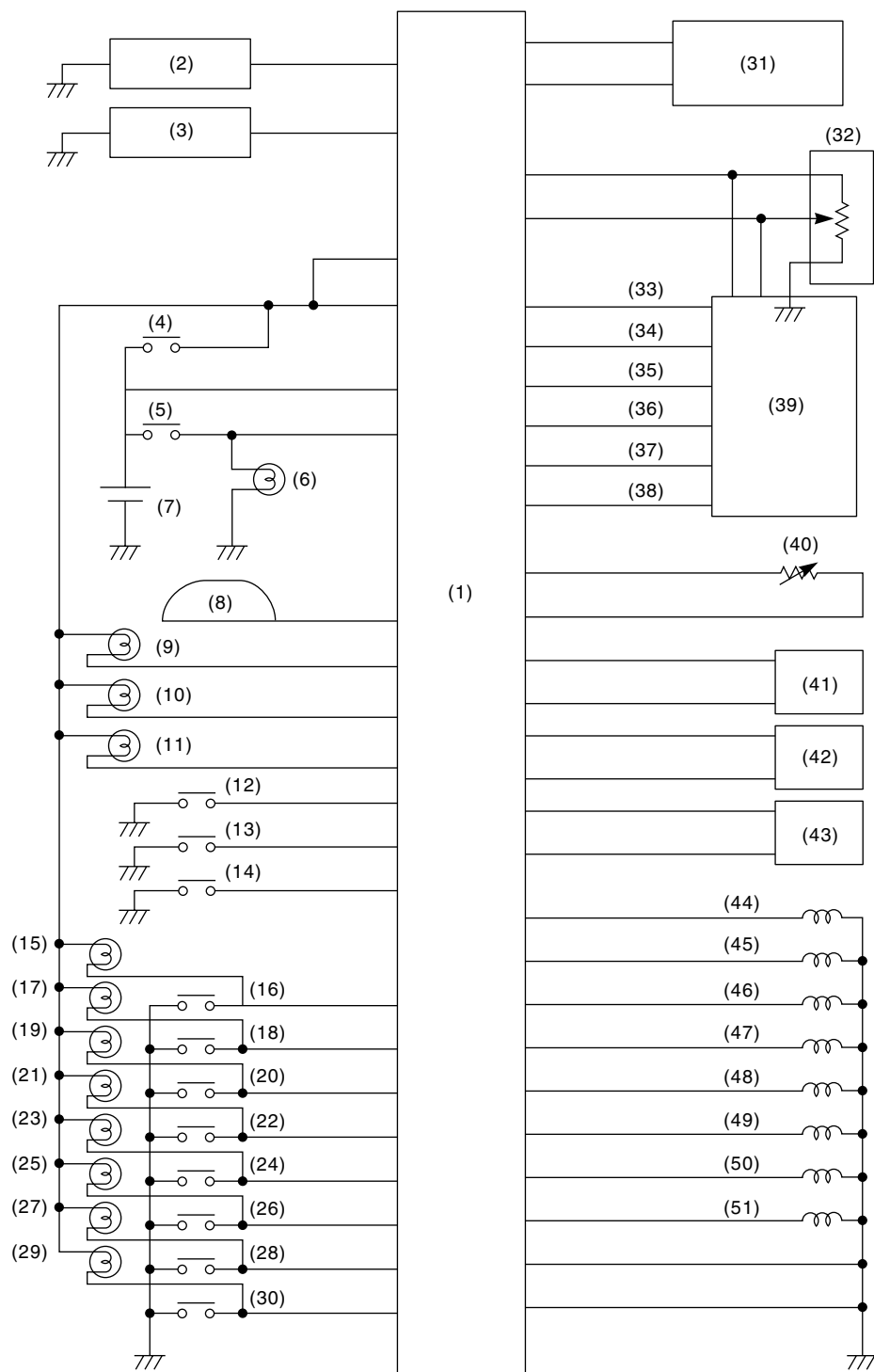
Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Brake switch	B55	12	Brake pedal depressed.	More than 10.5	—
			Brake pedal released.	Less than 1	
Kick-down switch	B55	11	Throttle fully opened.	Less than 1	—
			Throttle 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.	0.3 — 0.7	—
			Throttle fully open.	4.0 — 4.6	
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)	More than 10.5	—
			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	B54	1	Engine idling after warm-up.	1.2 — 1.8	—
Shift solenoid 1	B54	22	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Check with ignition switch ON.					
Content	Con- nector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
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	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	
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	B55	20	Fuse removed	6 — 9.1	—
			Fuse installed	Less than 1	—
FWD indicator light	B56	2	Fused ON FWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	—
ABS signal	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	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—
		6	—	—	

B: SCHEMATIC



TR0395

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

(1) Transmission control module	(18) "P" range switch	(36) Torque control signal 1
(2) Cruise control module	(19) "R" range indicator light	(37) Intake manifold pressure signal
(3) ABS control module	(20) "R" range switch	(38) AT diagnostics signal
(4) Ignition switch	(21) "N" range indicator light	(39) Engine control module
(5) Brake switch	(22) "N" range switch	(40) ATF temperature sensor
(6) Brake light	(23) "D" range indicator light	(41) Torque converter turbine speed sensor
(7) Battery	(24) "D" range switch	
(8) Combination meter (Speedometer circuit)	(25) "3" range indicator light	(42) Rear vehicle speed sensor
(9) AT OIL TEMP light	(26) "3" range switch	(43) Front vehicle speed sensor
(10) FWD indicator light	(27) "2" range indicator light	(44) Shift solenoid 1
(11) POWER indicator light	(28) "2" range switch	(45) Shift solenoid 2
(12) FWD switch	(29) "1" range indicator light	(46) 2-4 brake timing solenoid
(13) Power switch	(30) "1" range switch	(47) Line pressure duty solenoid
(14) Kick-down switch	(31) Data link connector	(48) 2-4 brake duty solenoid
(15) Hold indicator light	(32) Throttle position sensor	(49) Lock-up duty solenoid
(16) Hold switch	(33) Engine speed signal	(50) Low clutch timing solenoid
(17) "P" range indicator light	(34) Torque control cut signal	(51) Transfer duty solenoid
	(35) Torque control signal 2	

SUBARU SELECT MONITOR

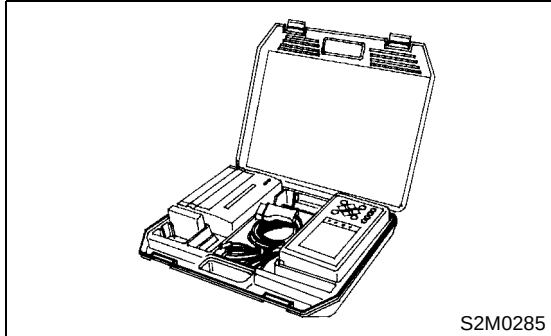
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

6. Subaru Select Monitor

A: OPERATION

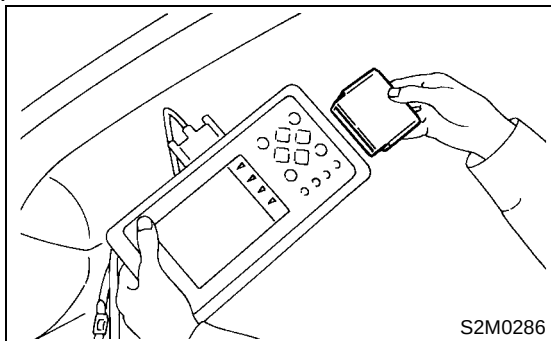
1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare Subaru Select Monitor kit.



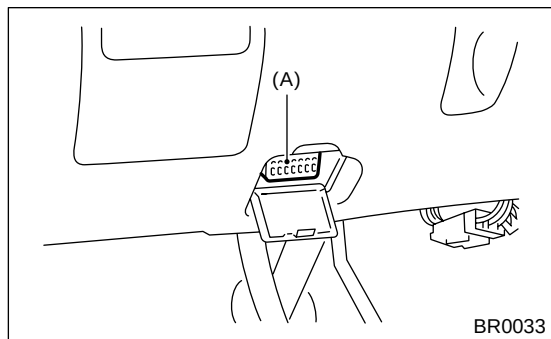
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor.
<Ref. to AT-7, 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).



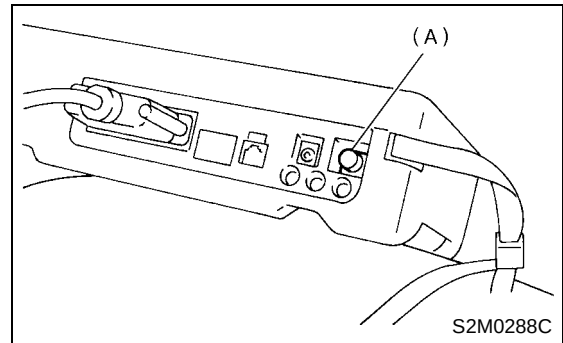
(A) Data link connector

(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) 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-25, List of Diagnostic Trouble Code.>

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.

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.

SUBARU SELECT MONITOR

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

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	Mani. Pressure Voltage	V
2 wheel drive switch signal	FWD Switch	ON or OFF
Stop lamp switch signal	Stop Light 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	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

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

7. Read Diagnostic Trouble Code

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

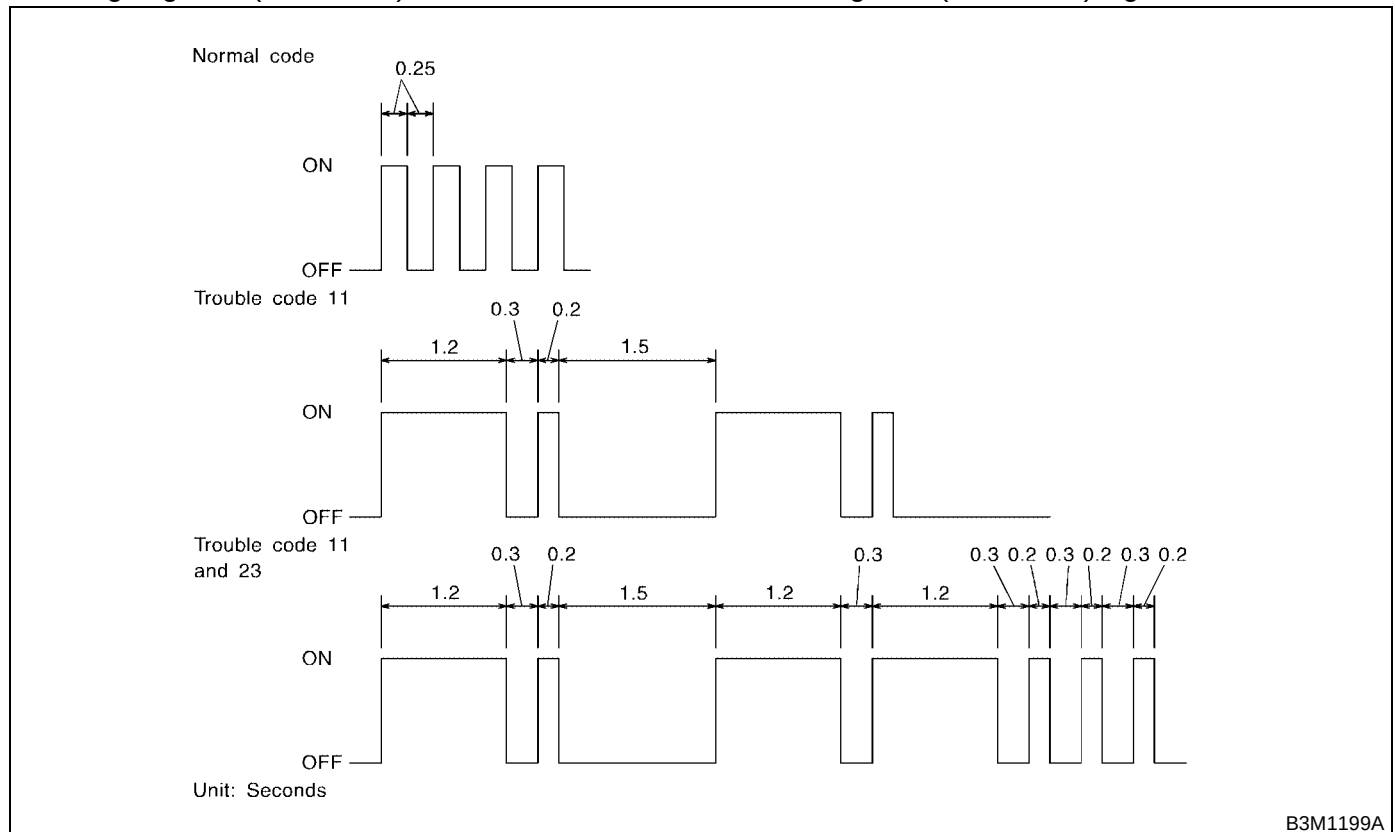
Step	Check	Yes	No
1 PERFORM READ DIAGNOSTIC TROUBLE CODE. 1)Warm-up the engine. 2)Turn ignition switch to OFF. 3)Turn ignition switch to ON. 4)Start the engine. 5)Drive vehicle at speeds greater than 20 km/h (12 MPH). 6)Stop vehicle. 7)Brake pedal depressed and move select lever to 1 range. 8)Turn ignition 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).	Repair power supply and ground circuit.<Ref. to AT-31, CHECK POWER SUPPLY AND GROUND LINE, Diagnostic Procedure for Power Indicator Light.>	Go to step 2.
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).	AT system is normal.	Go to step 3.
3 CHECK INDICATOR LIGHT.	Is trouble code outputted?	Inspect problem corresponding with trouble code. NOTE: Record all trouble codes.	Go to step 4.
4 CHECK INDICATOR LIGHT.	Does indicator light remains illuminated?	Repair power indicator light circuit <Ref. to AT-26, Diagnostic Procedure for Power Indicator Light.>, or Inspect inhibitor switch, wiring, TCM, etc.	Calling up trouble code again.

READ DIAGNOSTIC TROUBLE CODE

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-18, OPERATION, Subaru Select Monitor.>

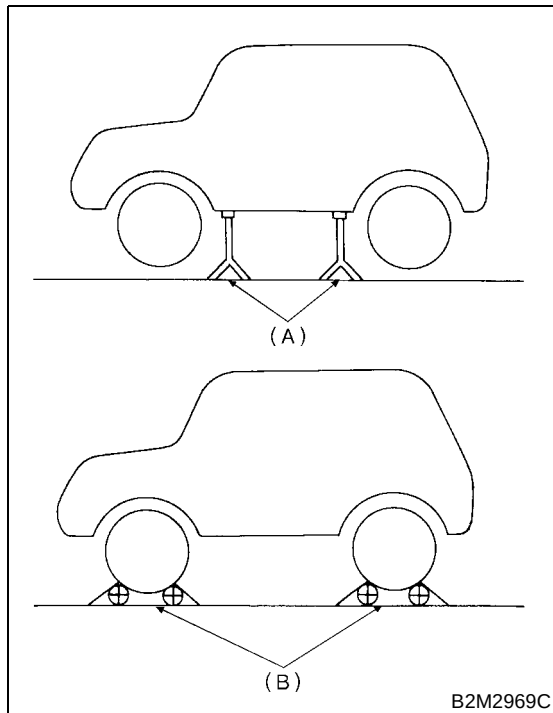
8. Inspection Mode

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 fuse (located under the light or left lower position of the instrument panel).

CLEAR MEMORY:

Removal of No. 4 fuse (for at least one minute)

- The No. 4 fuse is located in the line to the memory back-up power supply of the TCM. Removal of this fuse clears the previous trouble codes stored in the TCM memory.
- Be sure to remove the No. 4 fuse 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-19, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

POWER INDICATOR LIGHT DISPLAY

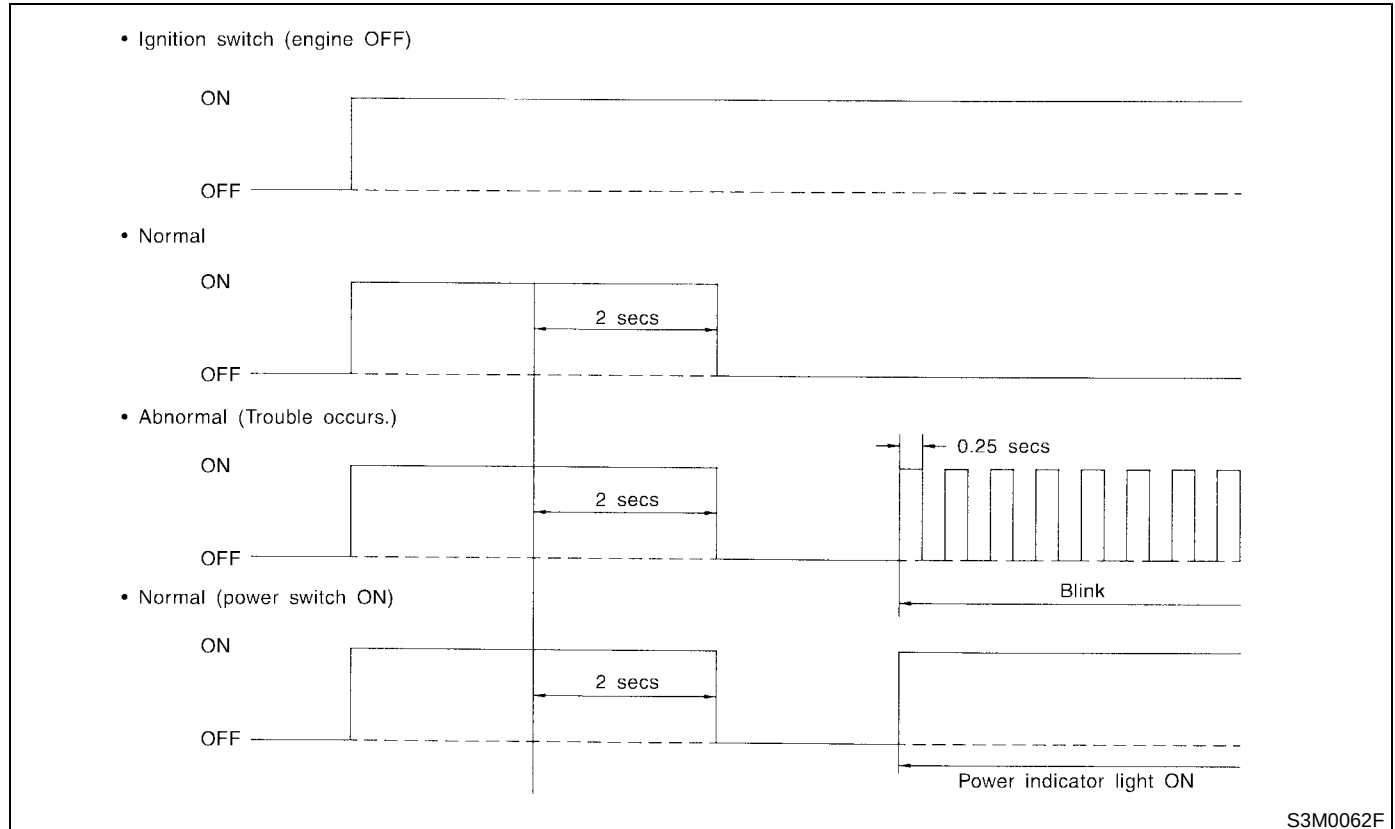
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

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 trouble code during on-board diag-

nostics 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.



S3M0062F

LIST OF DIAGNOSTIC TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

11.List of Diagnostic Trouble Code

A: LIST

Trouble code	Item	Content of diagnosis	Index
11	Engine speed signal	Detects open or shorted input signal circuit.	<Ref. to AT-40, TROUBLE CODE 11 — ENGINE SPEED SIGNAL —, Diagnostic Procedure with Trouble Code.>
27	ATF temperature sensor	Detects open or shorted input signal circuit.	<Ref. to AT-42, TROUBLE CODE 27 — ATF TEMPERATURE SENSOR —, Diagnostic Procedure with Trouble Code.>
31	Throttle position sensor	Detects open or shorted input signal circuit.	<Ref. to AT-47, TROUBLE CODE 31 — THROTTLE POSITION SENSOR —, Diagnostic Procedure with Trouble Code.>
33	Front vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-53, TROUBLE CODE 33 — FRONT VEHICLE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>
36	Torque converter turbine speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-58, TROUBLE CODE 36 — TORQUE CONVERTER TURBINE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>
38	Torque control signal	Detects open or shorted input signal circuit.	<Ref. to AT-62, TROUBLE CODE 38 — TORQUE CONTROL SIGNAL —, Diagnostic Procedure with Trouble Code.>
45	Intake manifold pressure signal	Detects open or shorted input signal circuit.	<Ref. to AT-64, TROUBLE CODE 45 — INTAKE MANIFOLD PRESSURE SIGNAL —, Diagnostic Procedure with Trouble Code.>
71	Shift solenoid 1	Detects open or shorted output signal circuit.	<Ref. to AT-66, TROUBLE CODE 71 — SHIFT SOLENOID 1 —, Diagnostic Procedure with Trouble Code.>
72	Shift solenoid 2	Detects open or shorted output signal circuit.	<Ref. to AT-70, TROUBLE CODE 72 — SHIFT SOLENOID 2 —, Diagnostic Procedure with Trouble Code.>
73	Low clutch timing solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-74, TROUBLE CODE 73 — LOW CLUTCH TIMING SOLENOID —, Diagnostic Procedure with Trouble Code.>
74	2-4 brake timing solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-78, TROUBLE CODE 74 — 2-4 BRAKE TIMING SOLENOID —, Diagnostic Procedure with Trouble Code.>
75	Line pressure duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-82, TROUBLE CODE 75 — LINE PRESSURE DUTY SOLENOID —, Diagnostic Procedure with Trouble Code.>
76	2-4 brake duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-86, TROUBLE CODE 76 — 2-4 BRAKE DUTY SOLENOID —, Diagnostic Procedure with Trouble Code.>
77	Lock-up duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-90, TROUBLE CODE 77 — LOCK-UP DUTY SOLENOID —, Diagnostic Procedure with Trouble Code.>
79	Transfer duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-94, TROUBLE CODE 79 — TRANSFER DUTY SOLENOID —, Diagnostic Procedure with Trouble Code.>
93	Rear vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-98, TROUBLE CODE 93 — REAR VEHICLE SPEED SENSOR —, Diagnostic Procedure with Trouble Code.>

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.

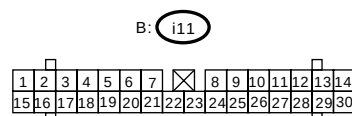
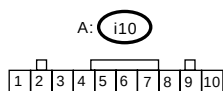
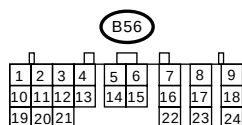
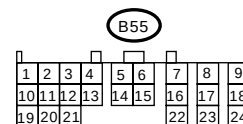
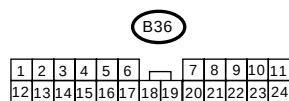
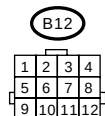
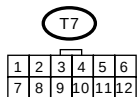
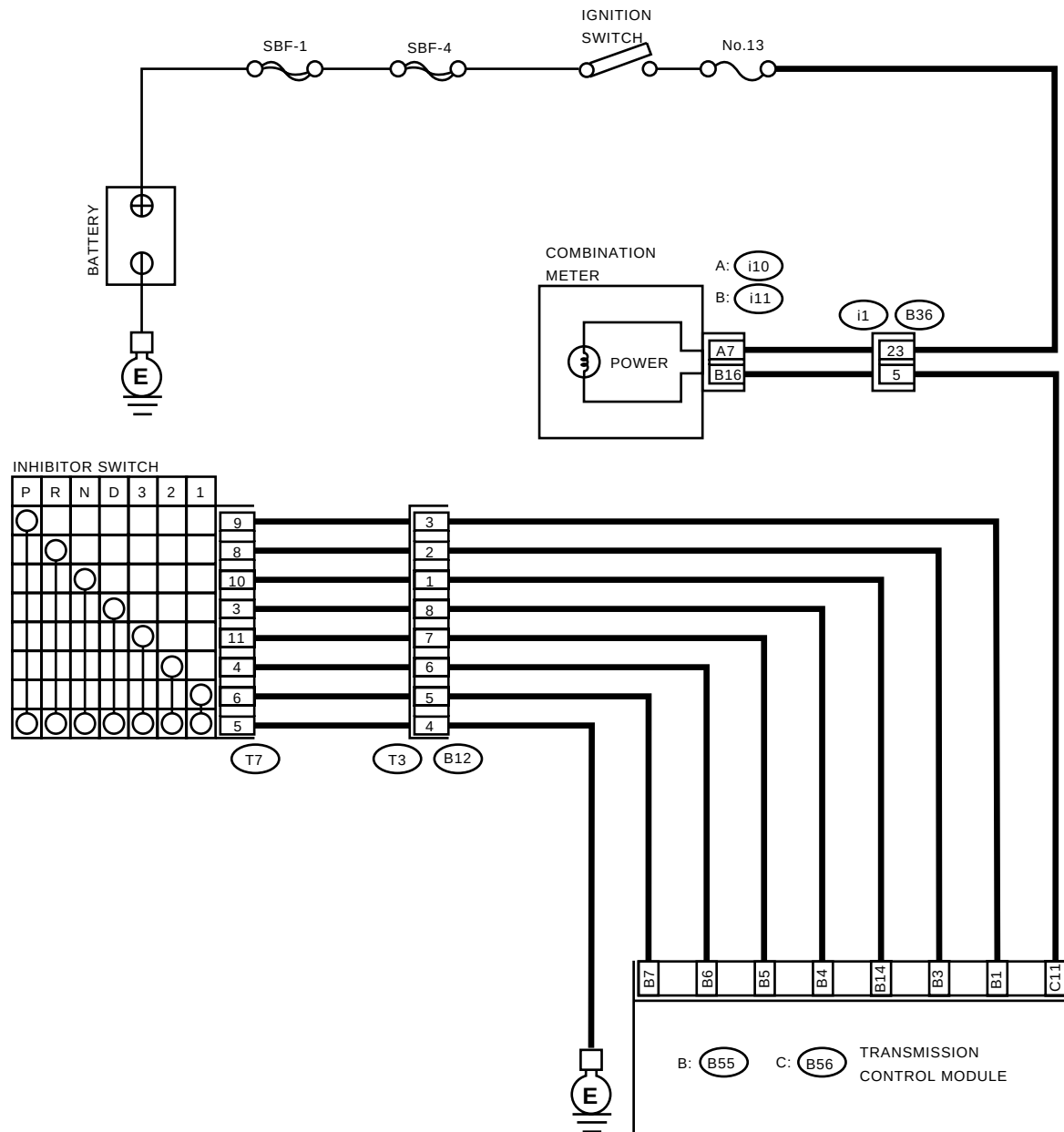
TROUBLE SYMPTOM:

- 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.

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

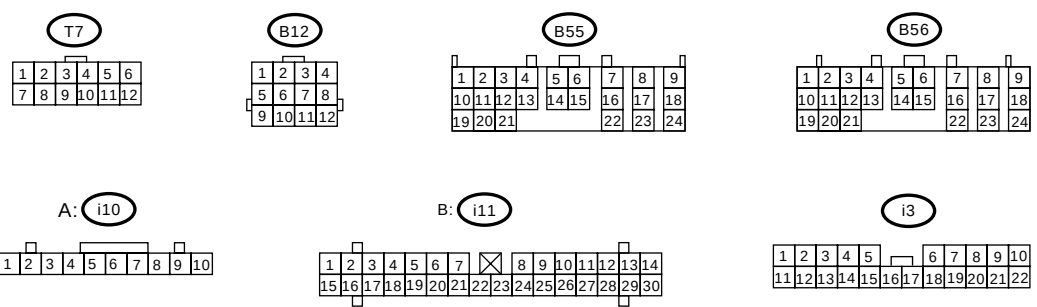
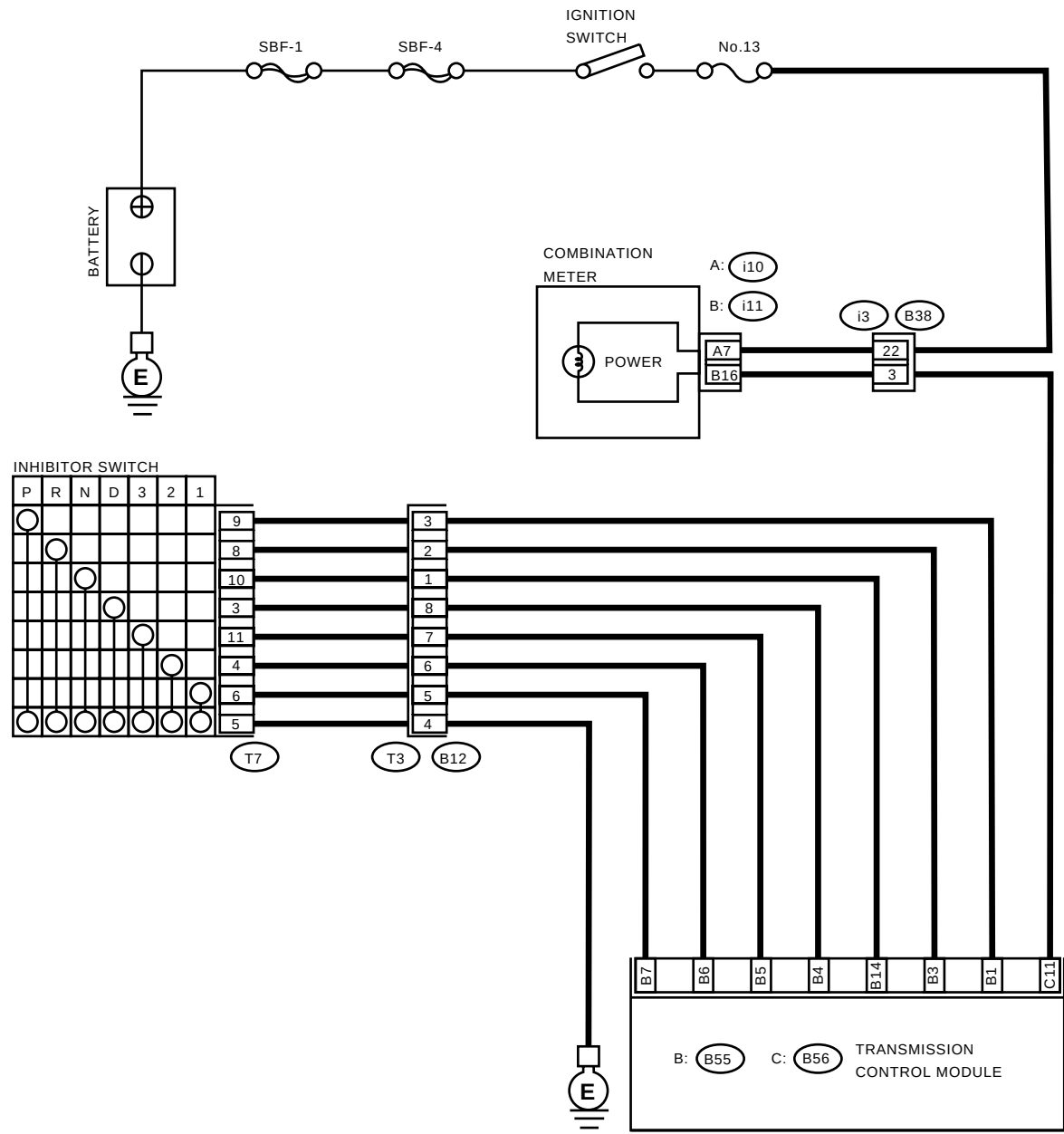
WIRING DIAGRAM: LHD MODEL



TR0400

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

RHD MODEL



DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER INDICATOR LIGHT. Turn ignition switch to ON (engine OFF).	Does POWER indicator light illuminate?	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?	Go to step 4 .	Replace POWER indicator light bulb.
3 CHECK POWER INDICATOR LIGHT. Perform "Read Diagnostic Trouble Code". <Ref. to AT-20, Read Diagnostic Trouble Code.>	Does POWER indicator light blink?	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. 13). Remove fuse (No. 13).	Is the fuse (No. 13) blown out?	Replace fuse (No. 13). If replaced fuse (No. 13) is blown out easily, repair short circuit in harness between fuse (No. 13) and combination meter.	Go to step 5 .
5 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH. 1)Turn ignition switch to ON (engine OFF). 2)Measure voltage between combination meter connector and chassis ground. Connector & terminal (i10) No. 7 (+) — Chassis ground (-):	Is voltage more than 9 V?	Go to step 6 .	Repair open circuit in harness between combination meter and battery.
6 CHECK COMBINATION METER. Measure voltage between combination meter connector and chassis ground. Connector & terminal (i11) No. 16 (+) — Chassis ground (-):	Is voltage less than 1 V?	Go to step 7 .	Repair combination meter. <Ref. to IDI-19, Combination Meter Assembly.>
7 CHECK OPEN CIRCUIT OF HARNESS. 1)Turn ignition switch to OFF. 2)Disconnect connector from combination meter connector. 3)Measure resistance of harness between combination meter. Connector & terminal (B56) No. 11 — (i11) No. 16:	Is the resistance less than 1 Ω ?	Go to step 8 .	Repair open circuit in harness between TCM and combination meter, and poor contact in coupling connector.
8 CHECK INPUT SIGNAL FOR TCM. 1)Connect connector to TCM and combination meter. 2)Turn ignition switch to ON (engine OFF). 3)Measure voltage between TCM connector and chassis ground. Connector & terminal (B56) No. 11 (+) — Chassis ground (-):	Is the voltage less than 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-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK INHIBITOR SWITCH. 1)Connect Subaru Select Monitor to data link connector. 2)Turn ignition switch to ON. 3)Subaru Select Monitor to ON. 4)Read data of range switch using Subaru Select Monitor. •Range switch is indicated in ON ⇔ OFF.	When each range is selected, does LED of Subaru Select Monitor light up?	Go to step 10 .	Check inhibitor switch circuit. <Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-trouble Code.>
10 CHECK SHORT CIRCUIT OF HARNESS. 1)Disconnect connector from TCM. 2)Remove combination meter. 3)Disconnect connector from combination meter. 4)Measure resistance of harness connector between TCM and chassis ground. Connector & terminal/specified resistance (B56) No. 11 (+) — Chassis ground (-):	Is the resistance less than 1 MΩ?	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>	Repair short circuit in harness between combination meter connector and TCM connector.

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

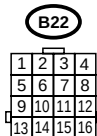
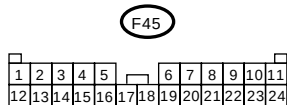
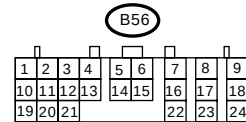
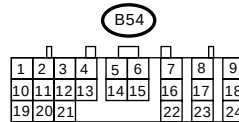
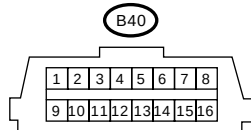
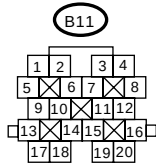
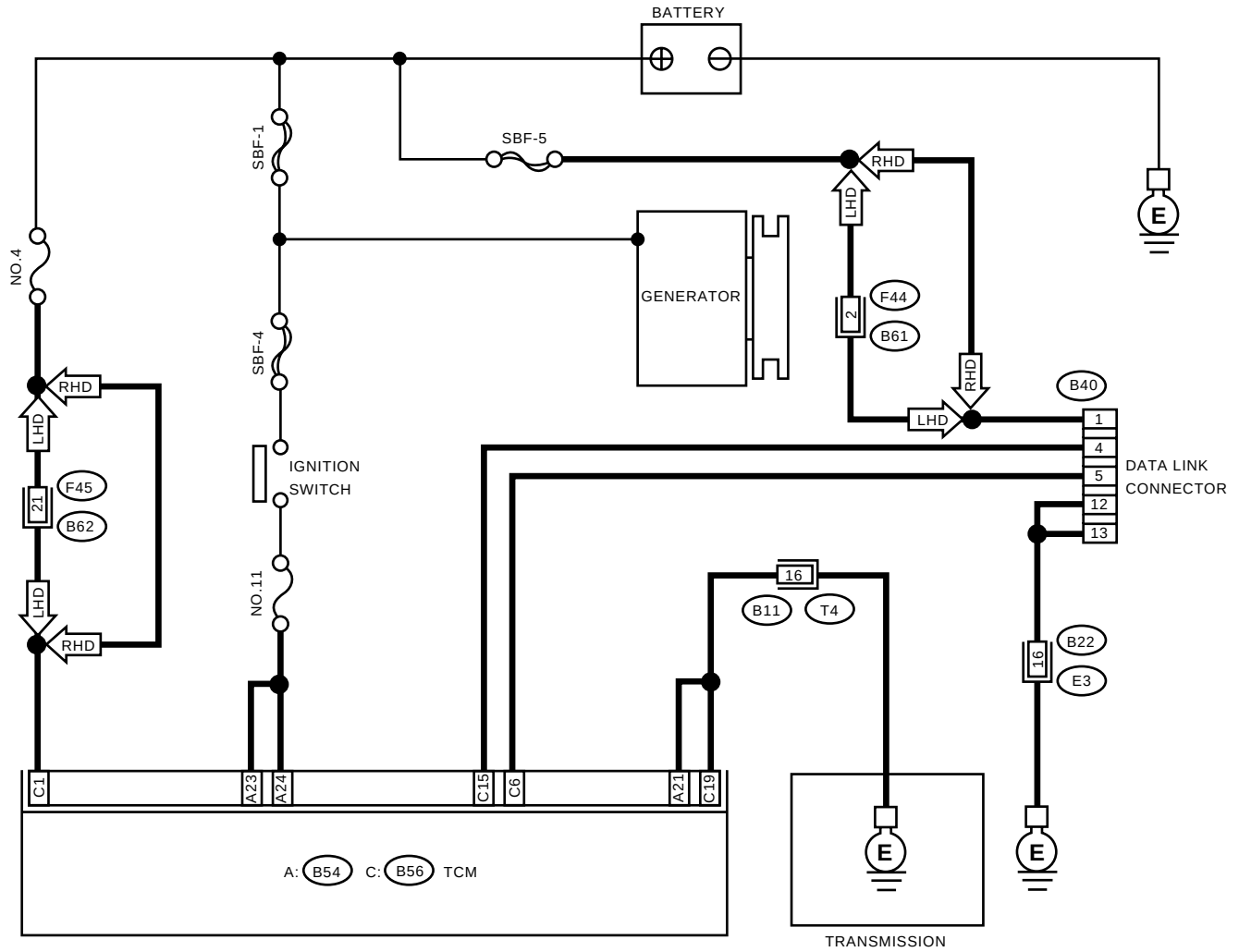
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: CHECK POWER SUPPLY AND GROUND LINE

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK IGNITION SWITCH.	Is ignition switch ON?	Go to step 2 .	Turn ignition switch ON.
2 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 voltage between 10 and 15 V?	Go to step 3 .	Repair generator. <Ref. to SC-12, Generator.>
3 CHECK BATTERY TERMINAL. Turn ignition switch to OFF.	Is there poor contact at battery terminal?	Repair battery terminal.	Go to step 4 .
4 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 voltage between 10 and 15 V?	Go to step 6 .	Go to step 5 .
5 CHECK FUSE (NO. 4). Remove fuse (No. 4).	Is the fuse (No. 4) blown out?	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.
6 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 (-):	Is the voltage more than 10 V?	Go to step 8 .	Go to step 7 .
7 CHECK FUSE (NO. 11). Remove fuse (No. 11).	Is the fuse (No. 11) blown out?	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. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
8 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 resistance less than 1 Ω ?	Go to step 9 .	Repair open circuit in harness between TCM, transmission harness connector, and poor contact in coupling connector.

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 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 resistance less than 1 Ω ?	Go to step 10 .	Repair open circuit in harness between transmission and transmission ground.
10 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in control module power supply, ground line and data link connector?	Repair connector.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

13.Diagnostic Procedure for Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:

- Faulty harness connector

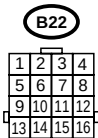
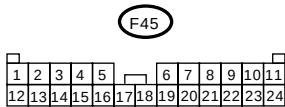
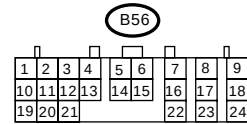
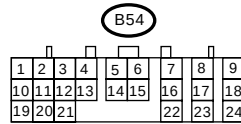
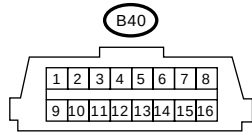
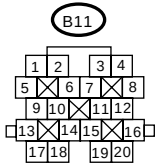
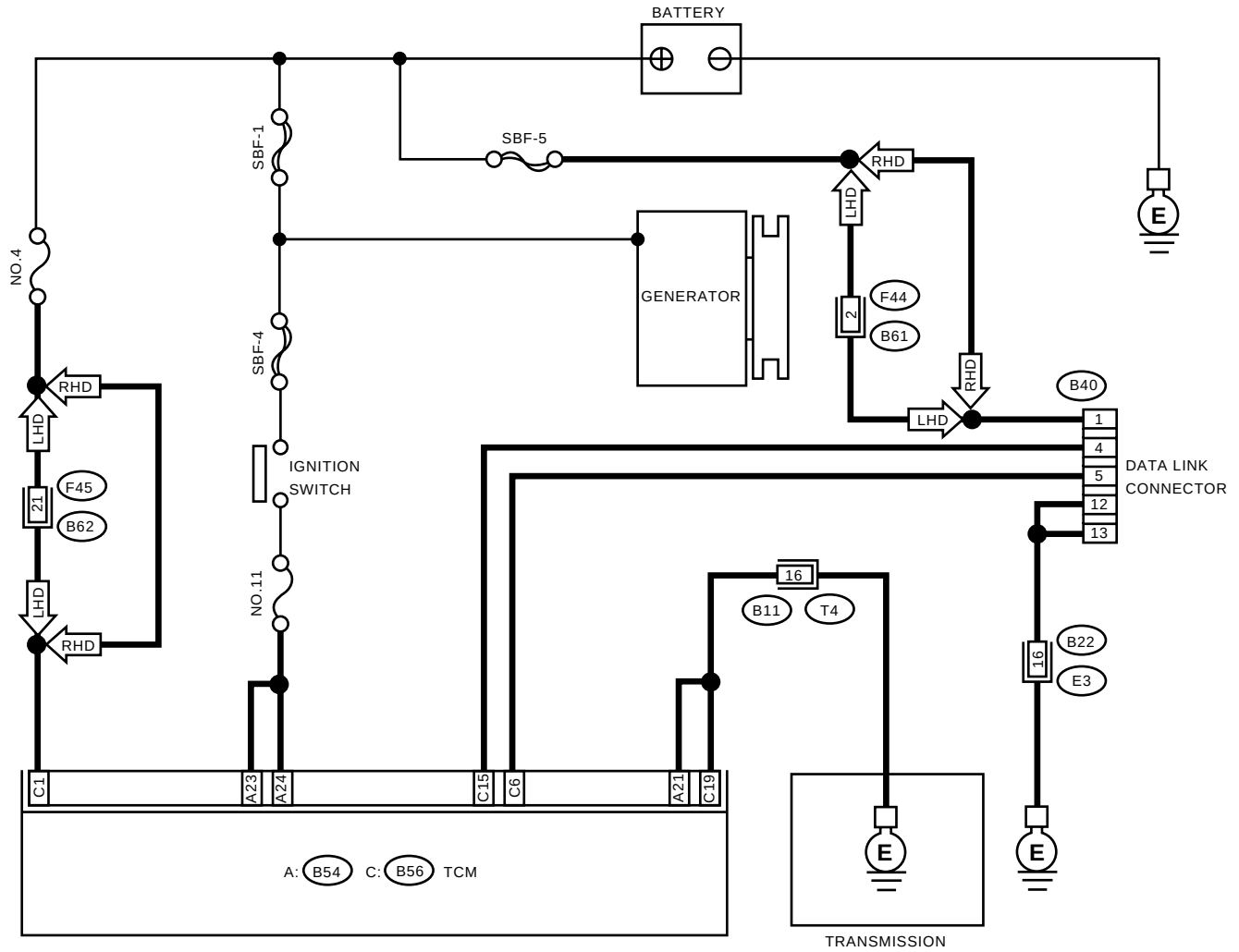
TROUBLE SYMPTOM:

- Select monitor communication failure

DIAGNOSTIC PROCEDURE FOR SELECT MONITOR COMMUNICATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR SELECT MONITOR COMMUNICATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT. Measure voltage between data link connector and chassis ground. Connector & terminal (B40) No. 1 — Chassis ground:	Is the voltage more than 10V?	Go to step 2.	Repair harness and connector between battery and data link connector, and poor contact in coupling connector.
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 resistance less than 1Ω?	Go to step 3.	Repair open circuit in harness between data link connector and ground terminal, and poor contact in coupling connector.
3 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to ON. 2) Using the select monitor, check whether communication to other systems (such as engine, ABS etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step 8.	Go to step 4.
4 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Disconnect TCM connector. 3) Check whether communication to other systems (such as ABS etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step 8.	Go to step 5.
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 other systems (such as ABS etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Inspect ECM.	Go to step 6.
6 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Connect ECM connector. 3) Disconnect ABSCM&H/U connector. 4) Check whether communication to other systems (such as engine etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Inspect ABSCM&H/U.	Go to step 7.
7 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Connect ABSCM&H/U module connector. 3) Disconnect cruise control module connector. 4) Check whether communication to other systems (such as engine etc.) can be executed normally. NOTE: If the vehicle is not equipped with cruise control, Go to step 8.	Are the name and year of the system displayed on the select monitor?	Inspect cruise control module.	Go to step 8.

DIAGNOSTIC PROCEDURE FOR SELECT MONITOR COMMUNICATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn ignition switch to OFF. 2) Connect cruise control module connector. 3) Disconnect immobilizer control module connector. 4) Check whether communication to other systems (such as engine etc.) can be executed normally. NOTE: If the vehicle is not equipped with cruise control, Go to step 9.	Are the name and year of the system displayed on the select monitor?	Inspect immobilizer control module.	Go to step 9.
9 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect TCM, ECM, ABSCM&H/U, cruise control module and immobilizer control module connectors. 3) Measure resistance between TCM connector and chassis ground. Connector & terminal (B40) No. 5 — Chassis ground: (B40) No. 4 — Chassis ground:	Is the resistance more than 1M Ω ?	Go to step 10.	Repair harness and connector between each control module and data link connector.
10 CHECK OUTPUT SIGNAL FOR TCM. 1) Turn ignition switch to ON. 2) Measure voltage between TCM and chassis ground. Connector & terminal (B40) No. 5 — Chassis ground: (B40) No. 4 — Chassis ground:	Is the voltage more than 1 V?	Repair harness and connector between each control module and data link connector.	Go to step 11.
11 CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR. Measure resistance between TCM connector and data link connector. Connector & terminal (B56) No. 6 — (B40) No. 5: (B56) No. 15 — (B40) No. 4:	Is the resistance less than 0.5 Ω ?	Go to step 12.	Repair harness and connector between TCM and data link connector.
12 CHECK INSTALLATION OF TCM CONNECTOR. Turn ignition switch to OFF.	Is TCM connector inserted into TCM?	Go to step 13.	Insert TCM connector into TCM.
13 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in control module and data link connector?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

14.Diagnostic Procedure with Trouble Code

A: TROUBLE CODE 11 — ENGINE SPEED SIGNAL —

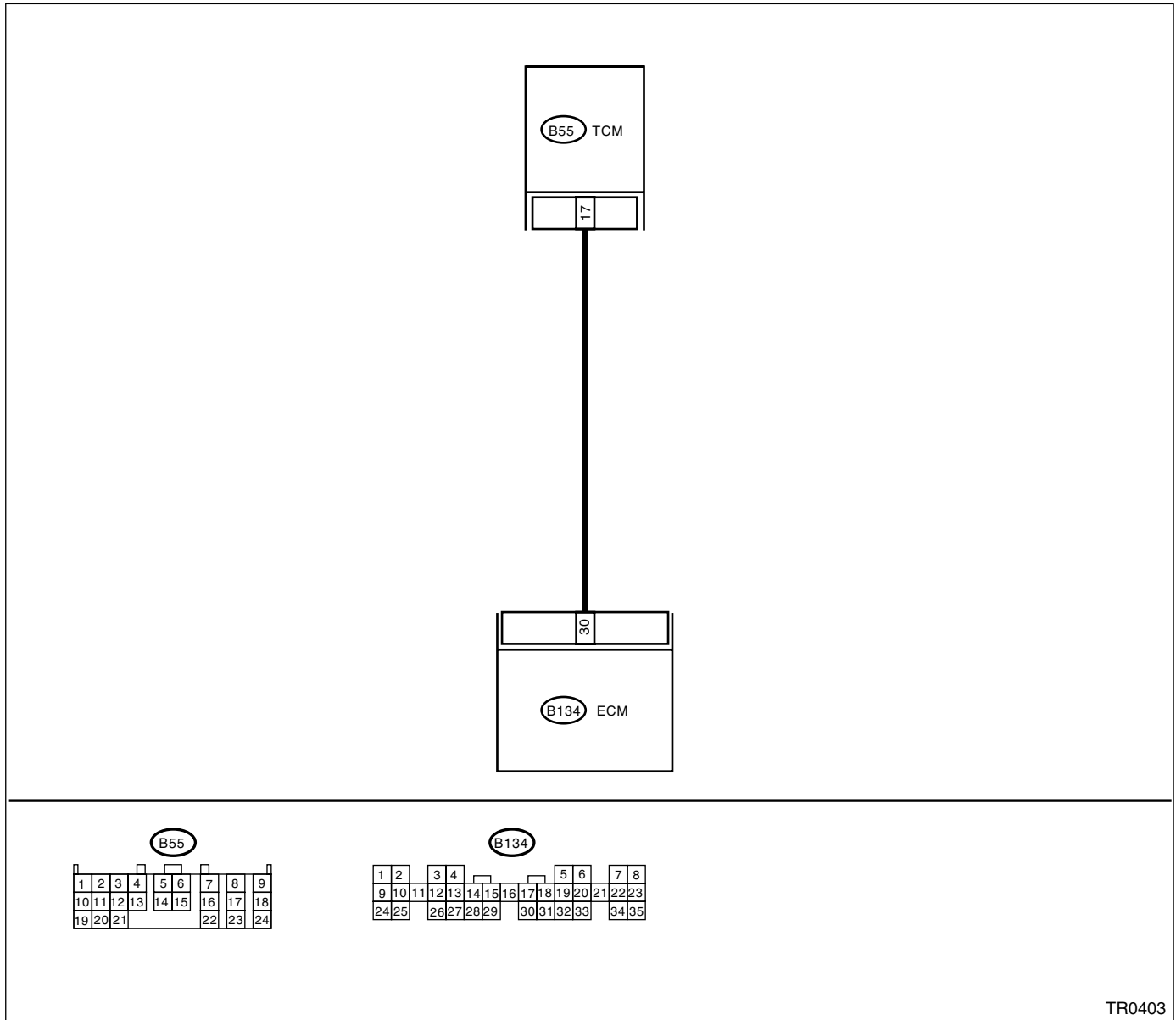
DIAGNOSIS:

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 TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 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 (B55) No. 17 — (B134) No. 30:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair open circuit in harness between TCM and ECM connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure resistance of harness between TCM connector and chassis ground. Connector & terminal (B55) No. 17 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair short circuit in harness between TCM and ECM connector.
3 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 5.	Go to step 4.
4 CHECK INPUT SIGNAL FOR TCM. 1) Connect connectors to TCM and ECM. 2) Turn ignition switch to ON (engine OFF). 3) Measure voltage between TCM connector and chassis ground. Connector & terminal (B55) No. 17 (+) — Chassis ground (-):	Is the voltage more than 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.
5 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 engine speed using Subaru Select Monitor. • Display shows engine speed signal value sent from ECM.	Is the revolution value the same as the tachometer reading shown on the combination meter?	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.
6 CHECK POOR CONTACT.	Is there poor contact in engine speed signal circuit?	Repair poor contact.	Go to step 7.
7 CONFIRM TROUBLE CODE 11.	Replace ECM with a new one. Does the trouble code appear again, after the memory has been cleared?	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>	Replace ECM.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: TROUBLE CODE 27 — ATF TEMPERATURE SENSOR —

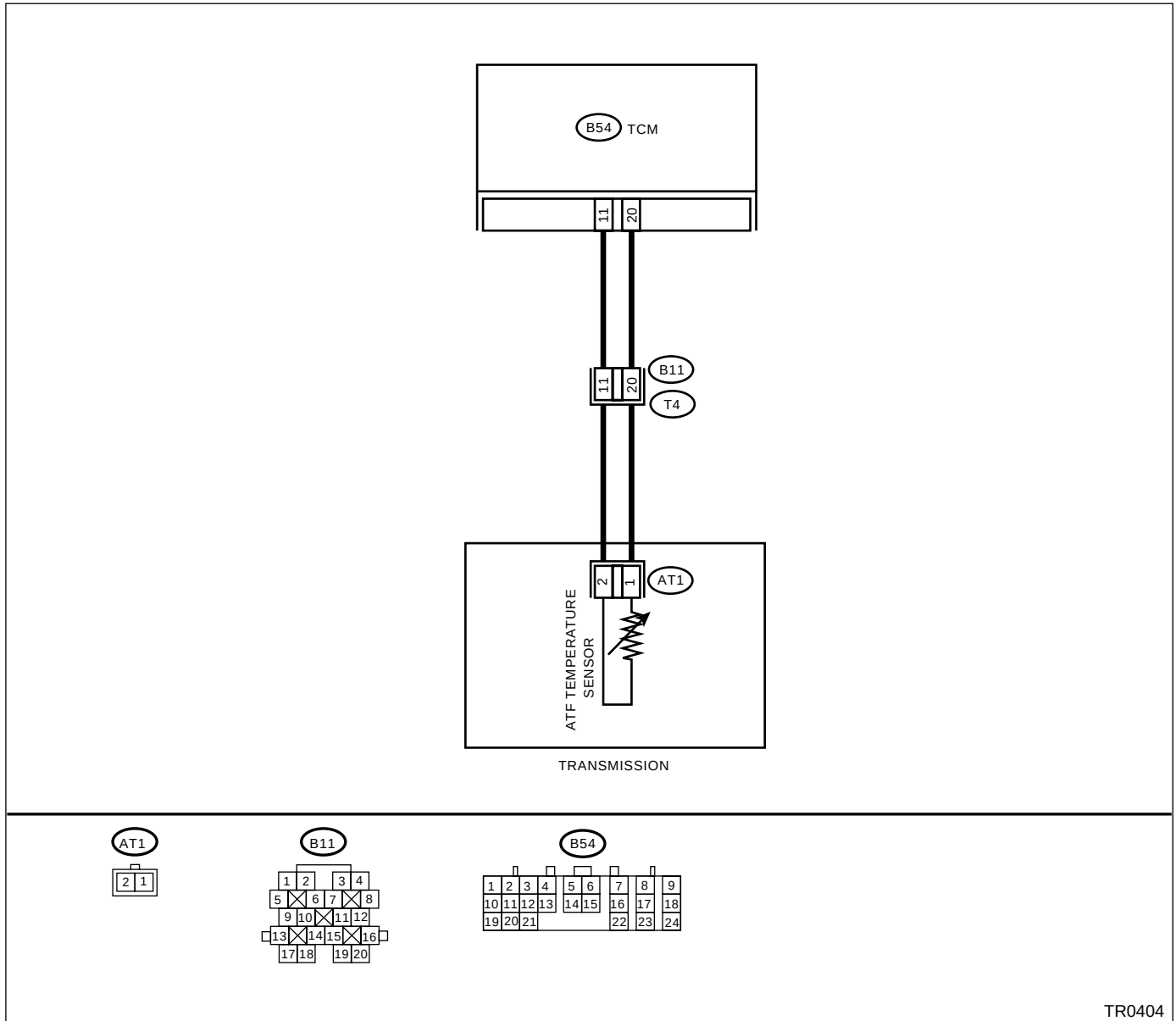
DIAGNOSIS:

Input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0404

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. 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. 20 — (B11) No. 12:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. Measure resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 11 — (B11) No. 11:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair open circuit in harness between TCM and transmission connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. Measure resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 20 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 4.	Repair short circuit in harness between TCM and transmission connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. Measure resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 11 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair short circuit in harness between TCM and transmission connector.
5 CHECK ATF TEMPERATURE SENSOR. 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). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 5) Disconnect connector from transmission. 6) Measure resistance between transmission connector terminals. Connector & terminal (T4) No. 11 — No. 12:	Is the resistance between 275 and 375 Ω ?	Go to step 6.	Go to step 11.
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?	Go to step 7.	Go to step 11.
7 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 9.	Go to step 8.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
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 voltage between 0.4 and 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?	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?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
11	CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from transmission. 3)Remove transmission connector from bracket. 4)Lift-up the vehicle and place safety stand. CAUTION: On AWD models, raise all wheels off ground. 5)Drain automatic transmission fluid. CAUTION: Do not drain the automatic transmission fluid until it cools down. 6)Remove oil pan, and disconnect connector from ATF temperature sensor connector. 7)Measure resistance of harness between ATF temperature sensor and transmission connector. Connector & terminal (T4) No. 11 — (AT1) No. 2:	Is the resistance less than 1 Ω?	Go to step 12.	Repair open circuit in harness between ATF temperature sensor and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. Measure resistance of harness between ATF temperature sensor and transmission connector. <i>Connector & terminal</i> <i>(T4) No. 12 — (AT1) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 13 .	Repair open circuit in harness between ATF temperature sensor and transmission connector.
13 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. Measure resistance of harness between transmission connector and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 11 — Transmission ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 14 .	Repair short circuit in harness between ATF temperature sensor and transmission connector.
14 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. Measure resistance of harness between transmission connector and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 12 — Transmission ground:</i>	Is the resistance more than 1 $M\Omega$?	Replace ATF temperature sensor. <Ref. to AT-38, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>	Repair short circuit in harness between ATF temperature sensor and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: TROUBLE CODE 31 — THROTTLE POSITION SENSOR —

DIAGNOSIS:

Input signal circuit of throttle position sensor is open or shorted.

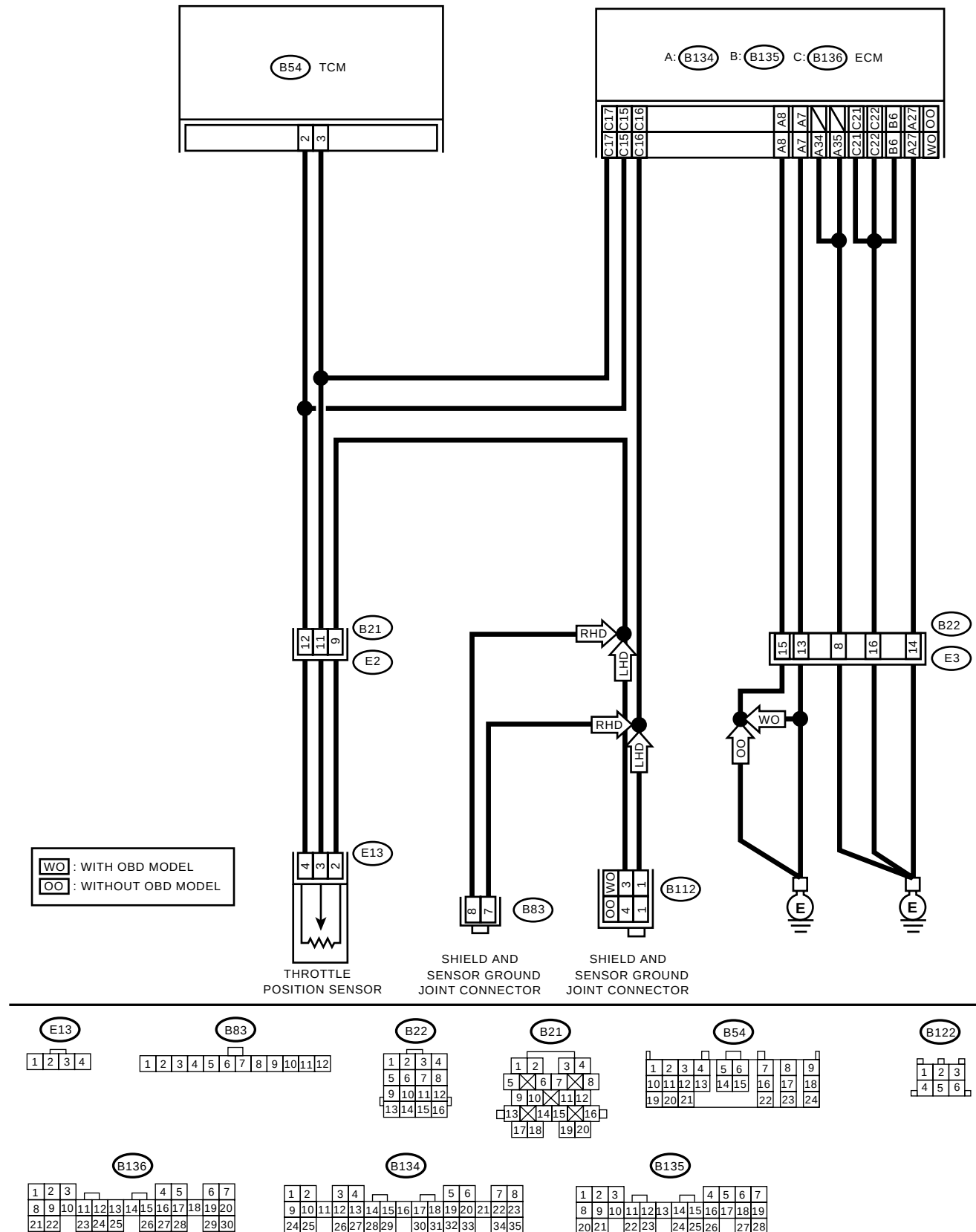
TROUBLE SYMPTOM:

Shift point too high or too low; excessive shift shock; excessive tight corner “braking”.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM:



TR0405

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ENGINE GROUND TERMINALS.	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 H4 ENGINE WITH 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: (B134) No. 35 — Engine ground: (B134) No. 34 — Engine ground: (B135) No. 6 — Engine ground: H4 ENGINE 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:	Go to step 3.	Repair open circuit in harness between ECM connector and engine grounding terminal.
3	CHECK THROTTLE POSITION SENSOR. 1) Disconnect connector from throttle position sensor. 2) Measure resistance between throttle position sensor connector receptacle's terminals. Terminals No. 4 — No. 2:	Go to step 4.	Replace throttle position sensor.
4	CHECK THROTTLE POSITION SENSOR. Measure resistance between throttle position sensor connector receptacle's terminals. Terminals No. 2 — No. 3:	Go to step 5.	Replace throttle position sensor.
5	CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR. 1) Disconnect connector from TCM. 2) Measure resistance of harness between TCM and throttle position sensor connector. Connector & terminal (B55) No. 3 — (E13) No. 3:	Go to step 6.	Repair open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
6	CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR. Measure resistance of harness between TCM and throttle position sensor connector. Connector & terminal (B54) No. 2 — (E13) No. 4:	Go to step 7.	Repair open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
7	CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR. Measure resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 3 — Chassis ground:	Go to step 8.	Repair short circuit in harness between TCM and throttle position sensor connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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:	Is the resistance more than 1 MΩ?	Go to step 9.	Repair short circuit in harness between TCM and throttle position sensor connector.
9 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure resistance of harness between TCM and ECM connector. Connector & terminal (B54) No. 3 — (B136) No. 17:	Is the resistance less than 1 Ω?	Go to step 10.	Repair open circuit in harness between TCM and ECM connector.
10 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure resistance of harness between TCM and ECM connector. Connector & terminal (B54) No. 2 — (B136) No. 15:	Is the resistance less than 1 Ω?	Go to step 11.	Repair open circuit in harness between TCM and ECM connector.
11 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 14.	Go to step 12.
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 voltage between 0.3 and 0.7 V in throttle fully closed?	Go to step 13.	Go to step 18.
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 voltage between 4.0 and 4.6 V with throttle fully open?	Go to step 16.	Go to step 18.
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 the value voltage between 0.3 and 0.7 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 the value voltage between 4.0 and 4.6 V?	Go to step 17.	Go to step 18.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 voltage between 4.8 and 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 value voltage between 4.8 and 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?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

D: TROUBLE CODE 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.

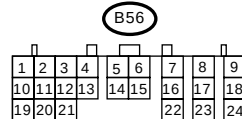
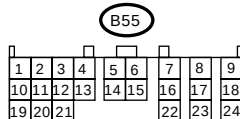
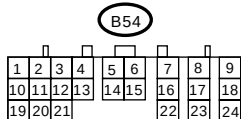
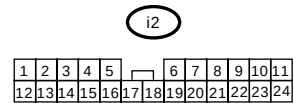
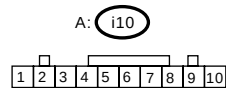
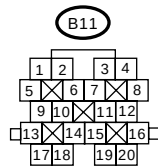
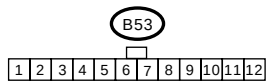
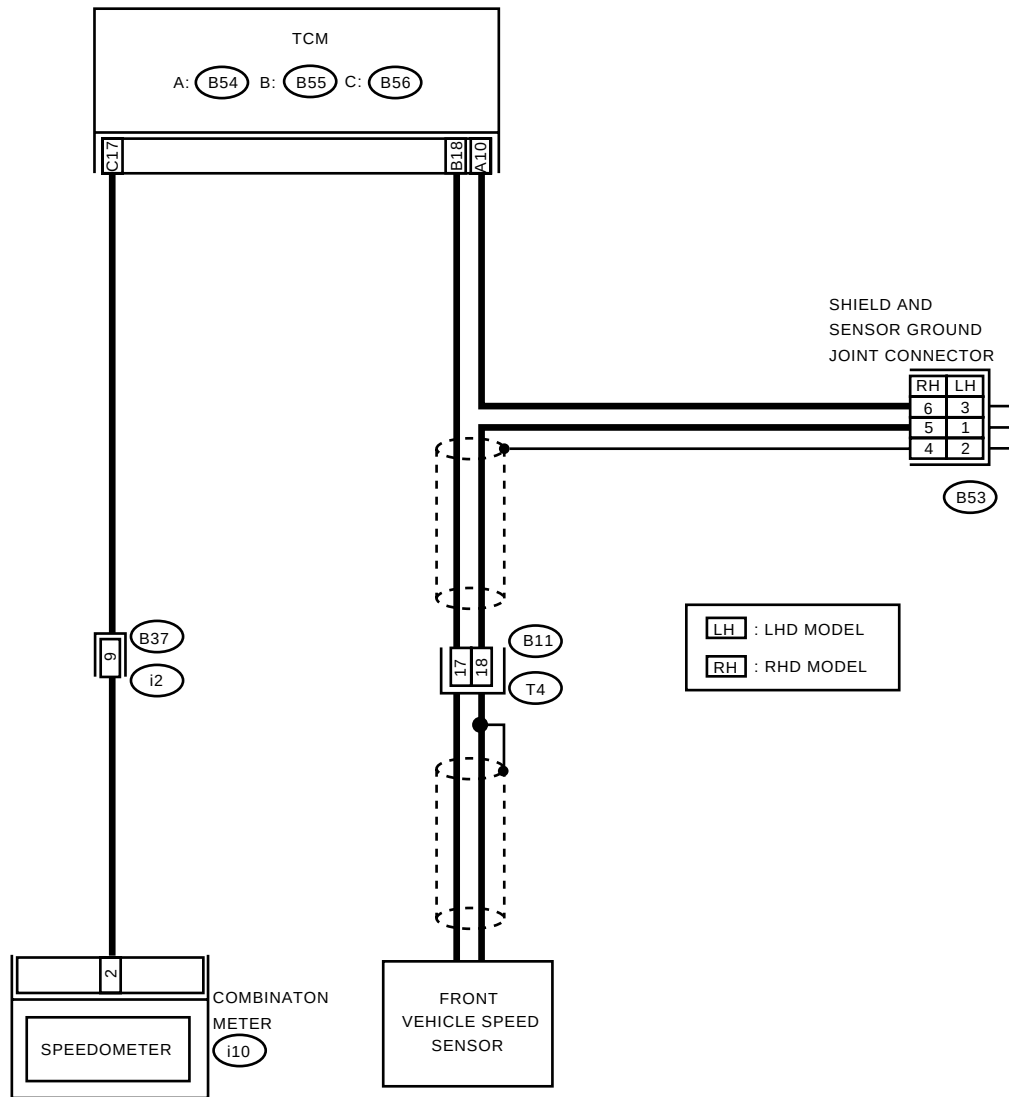
TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	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 resistance less than 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 resistance less than 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:	Is the resistance more than 1 M Ω ?	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:	Is the resistance more than 1 M Ω ?	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 resistance between 450 and 650 Ω ?	Go to step 6.	Replace front vehicle speed sensor. <Ref. to AT-31, Front Vehicle Speed Sensor.>
6 PREPARE OSCILLOSCOPE.	Do you have oscilloscope?	Go to step 9.	Go to step 7.
7 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 10.	Go to step 8.
8 CHECK INPUT SIGNAL FOR TCM. 1) Connect all connectors. 2) Lift-up or raise the vehicle and place safety stands. CAUTION: On AWD models, raise all wheels off floor. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. 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.> 4) Measure voltage between TCM connector terminals. Connector & terminal (B55) No. 18 (+) — (B54) No. 10 (-):	Is the voltage more than AC 1 V?	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contactor or harness may be the case. Repair harness or connector in the front vehicle speed sensor circuit.	Go to step 11.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK FRONT VEHICLE SPEED SENSOR USING OSCILLOSCOPE. 1)Connect all connectors. 2)Lift-up the vehicle and place safety stand. CAUTION: On AWD models, raise all wheels off ground. 3)Set oscilloscope to TCM connector terminals. Positive probe; (B55) No. 18 Earth lead; (B54) No. 10 4)Start the engine, and drive the wheels slowly. 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.> 5)Measure signal voltage indicated on oscilloscope.	Is the voltage more than AC 4 V?	Even if "POWER" indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contactor or harness may be the case. Repair harness or connector in the front vehicle speed sensor circuit.	Go to step 11.
10 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1)Connect all connectors. 2)Connect Subaru Select Monitor to data link connector. 3)Lift-up or raise the vehicle and place safety stands. CAUTION: On AWD models, raise all wheels off floor. 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. •Compare speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in "km/h" or "MPH". 1)Slowly increase vehicle speed to 60 km/h or 37 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.>	Does the speedometer indication increase 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 connector or harness may be the case. Repair harness or connector in the front vehicle speed sensor circuit.	Go to step 11.
11 CHECK POOR CONTACT.	Is there poor contact in front vehicle speed sensor circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

E: TROUBLE CODE 36 — TORQUE CONVERTER TURBINE SPEED SENSOR —

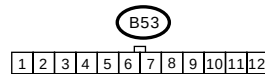
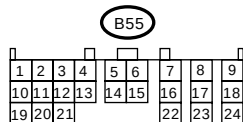
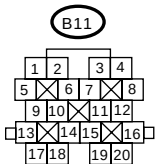
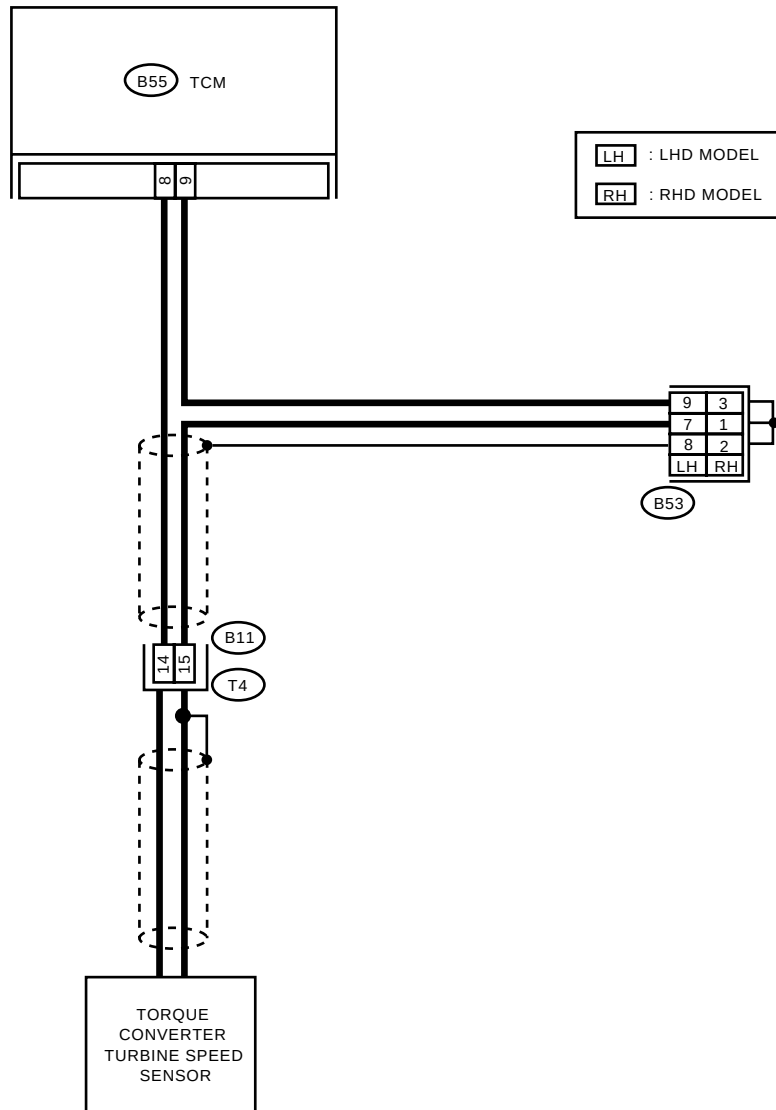
DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0407

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	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. <i>Connector & terminal</i> <i>(T4) No. 14 — No. 15:</i>	Is the resistance between 450 and 650 Ω ?	Go to step 2.	Replace turbine speed sensor. <Ref. to AT-35, 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. <i>Connector & terminal</i> <i>(B55) No. 8 — (B11) No. 14:</i>	Is the resistance less than 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. <i>Connector & terminal</i> <i>(B55) No. 9 — (B11) No. 15:</i>	Is the resistance less than 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. <i>Connector & terminal</i> <i>(B55) No. 9 — Chassis ground:</i>	Is the resistance more than 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. <i>Connector & terminal</i> <i>(B55) No. 8 — Chassis ground:</i>	Is the resistance more than 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?	Go to step 10.	Go to step 7.
7 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 9.	Go to step 8.
8 CHECK INPUT SIGNAL FOR TCM. 1) Connect connectors to TCM and transmission. 2) Start the engine and move select lever to "P" or "N" range. 3) Measure voltage between TCM connector terminals. <i>Connector & terminal</i> <i>(B55) No. 8 (+) — No. 9 (-):</i>	Is the voltage more than 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.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK INPUT SIGNAL FOR 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 and turn Subaru Select Monitor switch to ON. 4)Start the engine. 5)Move select lever to "P" or "N" range. 6)Read data of turbine speed using Subaru Select Monitor. •Compare tachometer with Subaru Select Monitor indications.	Is the revolution value same as the tachometer reading shown on the combination meter?	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 .
10 CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE. 1)Connect connectors to TCM and transmission. 2)Set oscilloscope to TCM connector terminals. Positive probe; (B55) No. 8 Earth lead; (B55) No. 9 3)Start the engine and move select lever to "P" or "N" range.	Is the signal voltage more than 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 .
11 CHECK POOR CONTACT.	Is there poor contact in torque converter turbine speed sensor circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

F: TROUBLE CODE 38 — TORQUE CONTROL SIGNAL —

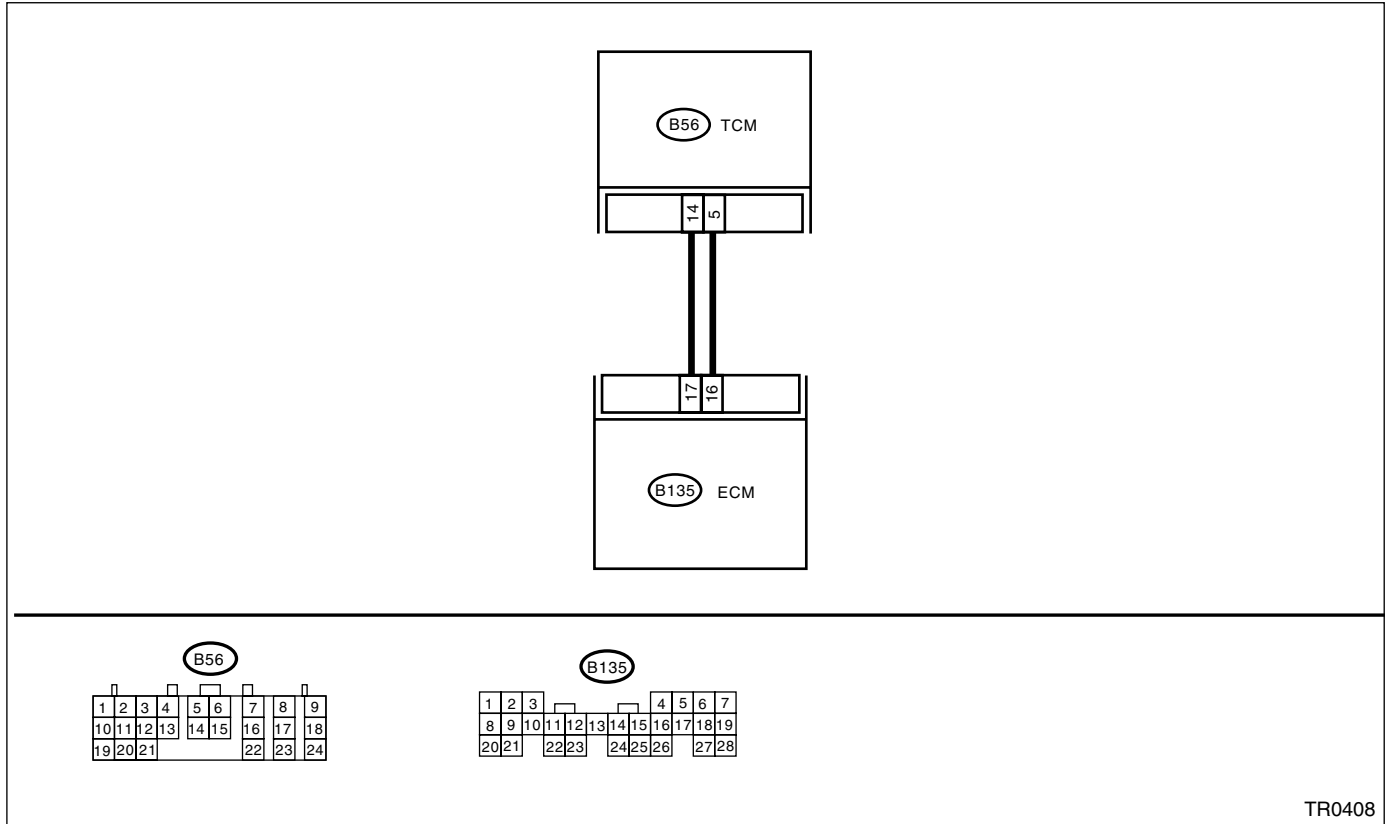
DIAGNOSIS:

- The signal circuit is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0408

Step	Check	Yes	No
1 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 (B56) No. 14 — (B135) No. 17: (B56) No. 5 — (B135) No. 16:	Is the resistance less than 1 Ω?	Go to step 2.	Repair open circuit in harness between TCM and ECM connector.
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:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair short circuit in harness between TCM and ECM connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 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.
4 CHECK POOR CONTACT.	Is there poor contact in torque control signal circuit?	Repair poor contact.	Go to step 5.
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?	Remove dirt and rust.	Go to step 6.
6 CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY. Check installing condition of ground line in transmission and body. Tightening torque: 13±3 N·m (1.3±0.3 kgf-m, 9.4±2.2 ft-lb)	Is tightening torque value within specification?	Go to step 7.	Tighten to specified torque.
7 CHECK GROUND LINE INSIDE TRANSMISSION. 1)Drain AT fluid and remove oil pan. 2)Check tightening torque value of ground line installing bolt. Tightening torque: T: 8±1 N·m (0.8±0.1 kgf-m, 5.8±0.7 ft-lb)	Is tightening torque value within specification?	Go to step 9.	Tighten to specified torque.
8 CHECK GROUND CIRCUIT OF ECM. <Ref. to AT-47, TROUBLE CODE 31 — THROTTLE POSITION SENSOR —, Diagnostic Procedure with Trouble Code.>	Is there any trouble?	Repair ground terminal and/or ground circuit of ECM.	Go to step 9.
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 (-):	Is each voltage more than 4.8 V?	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>	Replace ECM.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

G: TROUBLE CODE 45 — INTAKE MANIFOLD PRESSURE SIGNAL —

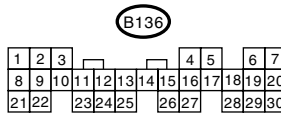
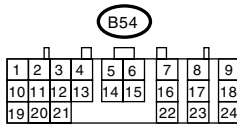
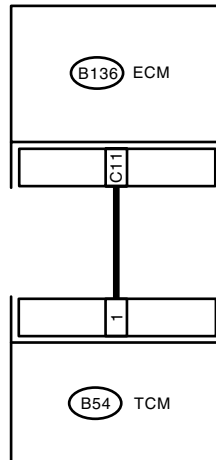
DIAGNOSIS:

Input signal circuit of TCM from ECM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0409

Step	Check	Yes	No
1 CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM <Ref. to AT-47, TROUBLE CODE 31 — THROTTLE POSITION SENSOR —, Diagnostic Procedure with Trouble Code.>	Is there any trouble?	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 (B54) No. 1 — (B136) No. 11:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair open circuit in harness between TCM and ECM connector.
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 resistance more than 1 $M\Omega$?	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?	Go to step 6.	Go to step 5.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 voltage between 0.4 and 1.8 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 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 the value between 0.4 and 1.8 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 7.
7 CHECK POOR CONTACT.	Is there poor contact in intake manifold pressure signal circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

H: TROUBLE CODE 71 — SHIFT SOLENOID 1 —

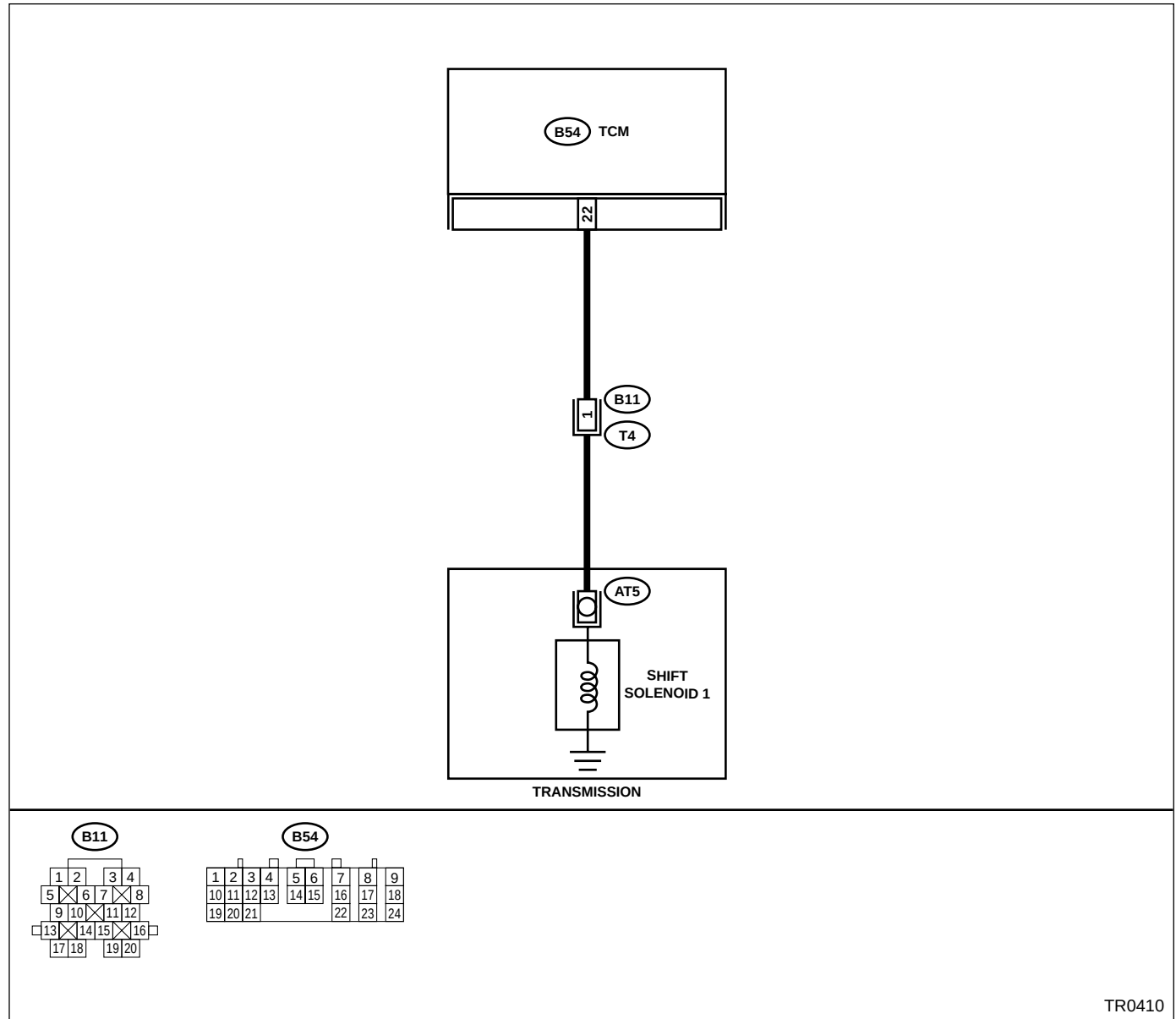
DIAGNOSIS:

Output signal circuit of shift solenoid 1 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1)Turn ignition switch to OFF. 2)Disconnect connector from TCM and trans- mission. 3)Measure resistance of harness between TCM and shift solenoid 1 connector. Connector & terminal (B54) No. 22 — (B11) No. 1:	Is the resistance less than 1 Ω?	Go to step 2.	Repair open circuit in harness between TCM and transmission con- nector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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:	Is the resistance more than 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 resistance between 10 and 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 (-):	Is the voltage more than 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 voltage less than 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?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
7 CHECK SHIFT SOLENOID 1 (IN TRANSMISSION). 1)Remove transmission connector from bracket. 2)Lift-up or raise the vehicle and support with safety stand. CAUTION: On AWD models, raise all wheels off ground. 3)Drain automatic transmission fluid. CAUTION: Do not drain the automatic transmission fluid until it cools down. 4)Remove oil pan, and disconnect connector from shift solenoid 1. 5)Measure resistance between shift solenoid 1 connector and transmission ground. Terminal No. 1 — Transmission ground:	Is the resistance between 10 and 16 Ω?	Go to step 8.	Replace shift solenoid 1. <Ref. to AT-38, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION. Measure resistance of harness between shift solenoid 1 and transmission connector. Connector & terminal (AT5) No. 1 — (T4) No. 1:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair open circuit in harness between shift solenoid 1 and transmission connector.
9 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION. Measure resistance of harness between shift solenoid 1 connector and transmission ground. Connector & terminal (T4) No. 1 — Transmission ground:	Is the resistance more than 1 $M\Omega$?	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 TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

I: TROUBLE CODE 72 — SHIFT SOLENOID 2 —

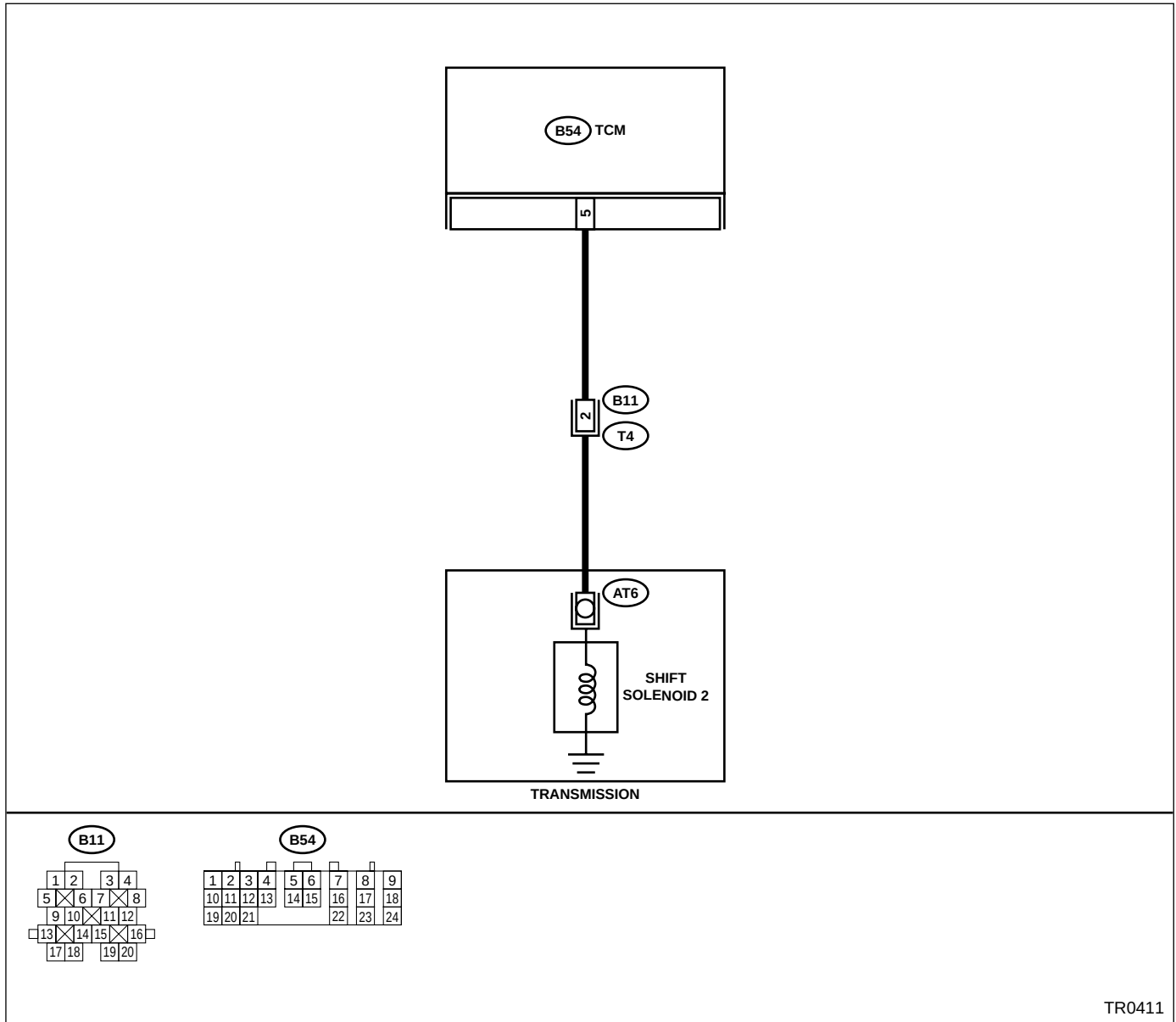
DIAGNOSIS:

Output signal circuit of shift solenoid 2 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



Step	Check	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 2 connector. Connector & terminal (B54) No. 5 — (B11) No. 2:	Is the resistance less than 1 Ω?	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM connector and transmission ground. Connector & terminal (B54) No. 5 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
3 CHECK SHIFT SOLENOID 2. Measure resistance between transmission connector terminals. Connector & terminal (T4) No. 2 — No. 16:	Is the resistance between 10 and 16 Ω?	Go to step 4.	Go to step 6.
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. CAUTION: On AWD models, 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.> 5)Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 22 (+) — Chassis ground (-):	Is the voltage less than 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.
5 CHECK POOR CONTACT.	Is there poor contact in shift solenoid 2 circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 resistance between 10 and 16 Ω ?	Go to step 7.	Replace shift solenoid 2 assembly. <Ref. to AT-38, 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 resistance less than 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:	Is the resistance more than 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 TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

J: TROUBLE CODE 73 — LOW CLUTCH TIMING SOLENOID —

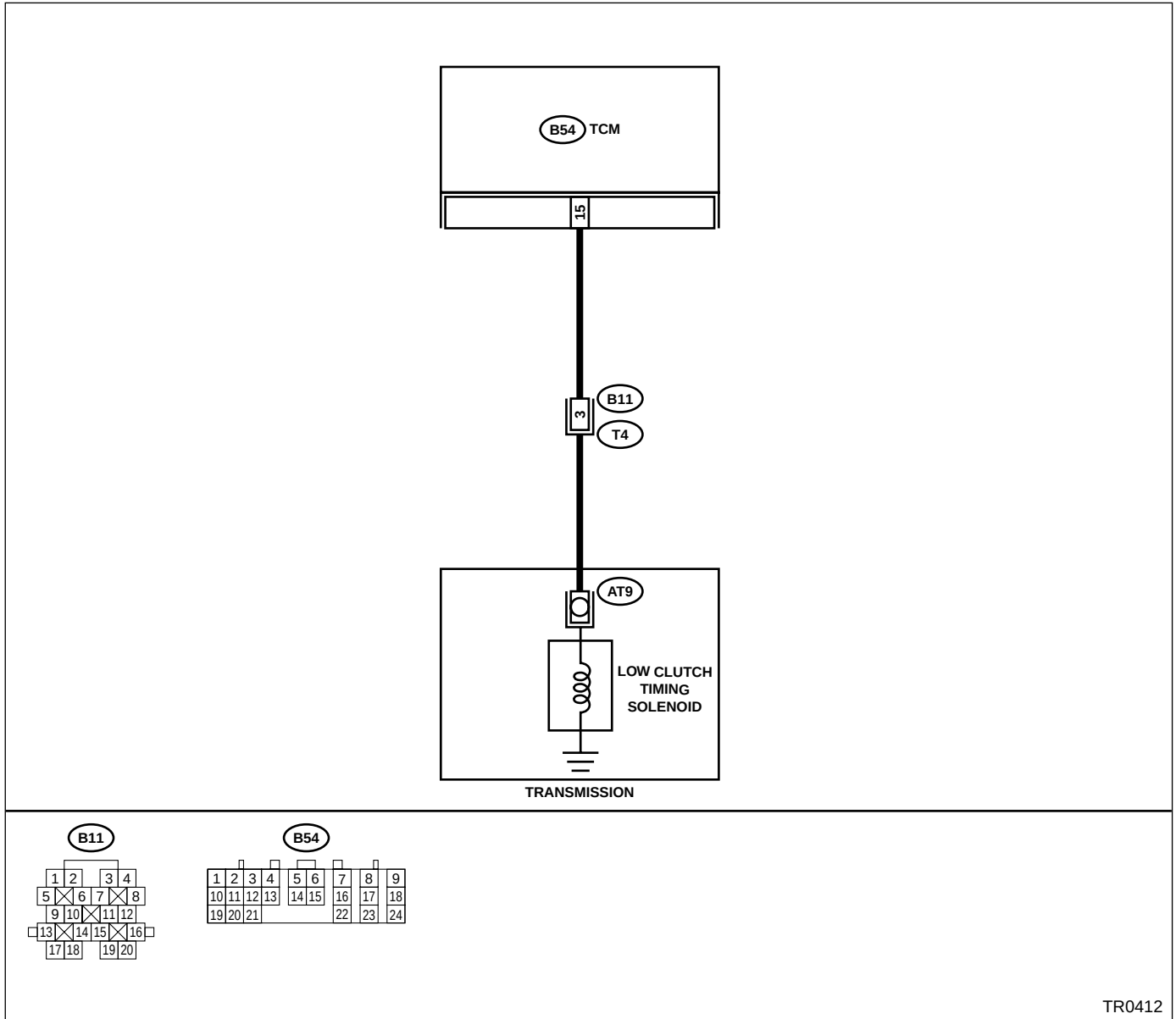
DIAGNOSIS:

Output signal circuit of low clutch timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0412

Step	Check	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 resistance less than 1 Ω?	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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:	Is the resistance more than 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 resistance between 10 and 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 (-):	Is the voltage more than 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 voltage less than 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?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
7 CHECK LOW CLUTCH TIMING SOLENOID (IN TRANSMISSION). 1)Remove transmission connector from bracket. 2)Lift-up or raise the vehicle and support with safety stand. CAUTION: On AWD models, raise all wheels off ground. 3)Drain automatic transmission fluid. CAUTION: Do not drain the automatic transmission fluid until it cools down. 4)Remove oil pan, and disconnect connector from low clutch timing solenoid. 5)Measure resistance between low clutch timing solenoid connector and transmission ground. Terminal No. 1 — Transmission ground:	Is the resistance between 10 and 16 Ω?	Go to step 8.	Replace low clutch timing solenoid. <Ref. to AT-38, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION. Measure resistance of harness between low clutch timing solenoid and transmission connector. <i>Connector & terminal (AT9) No. 1 — (T4) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 9.	Repair open circuit in harness between low clutch timing solenoid and transmission connector.
9 CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION. Measure resistance of harness between low clutch timing solenoid connector and transmission ground. <i>Connector & terminal (T4) No. 3 — Transmission ground:</i>	Is the resistance more than 1 $M\Omega$?	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 TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

K: TROUBLE CODE 74 — 2-4 BRAKE TIMING SOLENOID —

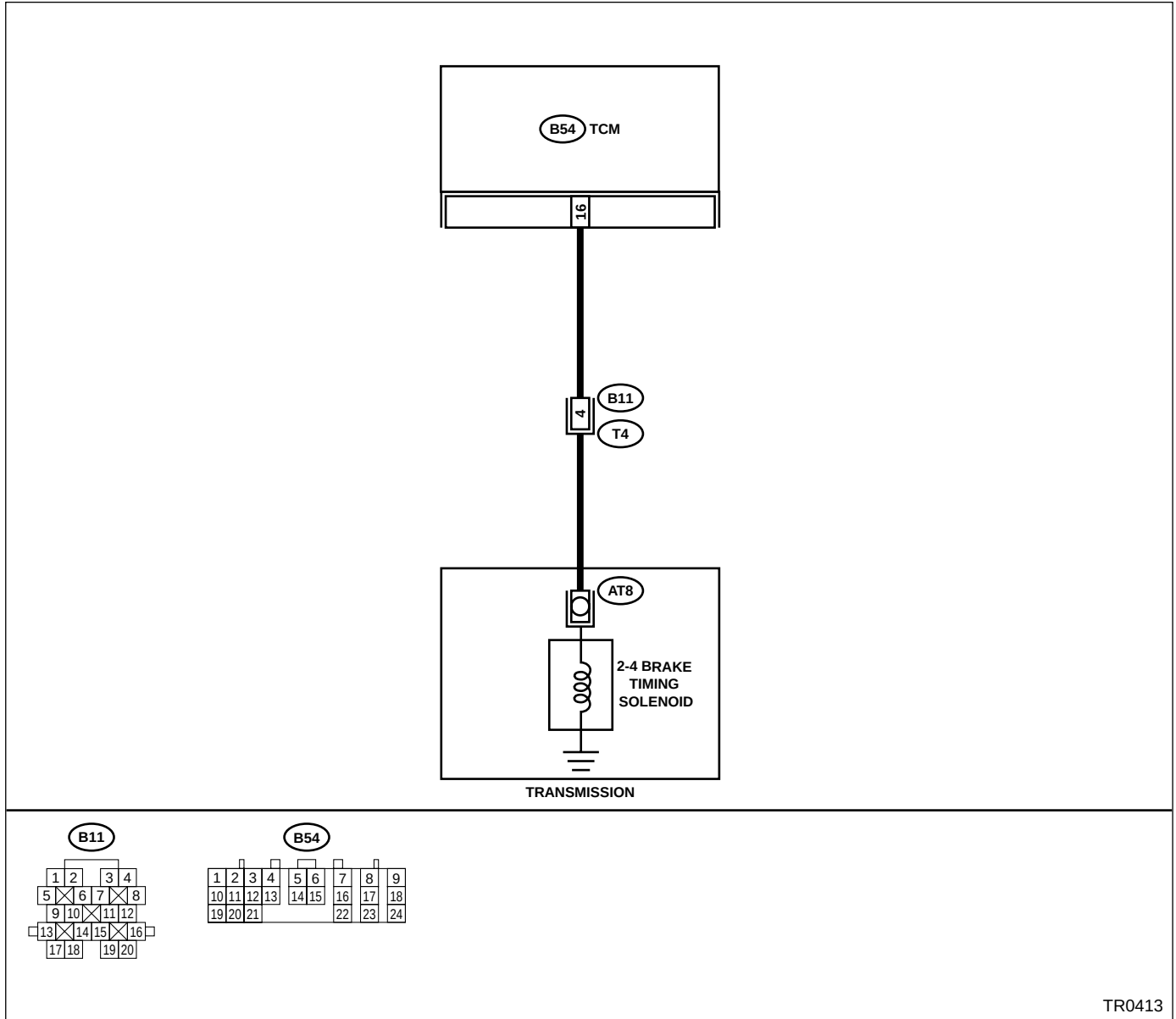
DIAGNOSIS:

Output signal circuit of 2-4 brake timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0413

Step	Check	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. 16 — (B11) No. 4:	Is the resistance less than 1 Ω?	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance of harness between TCM connector and transmission ground. Connector & terminal (B54) No. 16 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
3 CHECK 2-4 BRAKE TIMING SOLENOID. Measure resistance between transmission connector terminals. Connector & terminal (T4) No. 4 — No. 16:	Is the resistance between 10 and 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)Lift-up or raise the vehicle and support with safety stand. CAUTION: On AWD models, 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.> 5)Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 16 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 5.	Go to step 6.
5 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Move selector lever to "D", and slowly increase vehicle speed to 65 km/h (40 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.> 2)Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 16 (+) — Chassis ground (-):	Is the voltage more than 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.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
6	CHECK POOR CONTACT.	Is there poor contact in 2-4 brake timing solenoid circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
7	CHECK 2-4 BRAKE TIMING SOLENOID (IN TRANSMISSION). 1)Remove transmission connector from bracket. 2)Lift-up or raise the vehicle and support with safety stand. CAUTION: On AWD models, raise all wheels off ground. 3)Drain automatic transmission fluid. CAUTION: Do not drain the automatic transmission fluid until it cools down. 4)Remove oil pan, and disconnect connector from 2-4 brake timing solenoid. 5)Measure resistance between 2-4 brake timing solenoid connector and transmission ground. Terminal No. 1 — Transmission ground:	Is the resistance between 10 and 16 Ω ?	Go to step 8.	Replace 2-4 brake timing solenoid. <Ref. to AT-38, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION. Measure resistance of harness between 2-4 brake timing solenoid and transmission connector. Connector & terminal (AT8) No. 1 — (T4) No. 4:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair open circuit in harness between 2-4 brake timing solenoid and transmission connector.
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:	Is the resistance more than 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 2-4 brake timing solenoid and transmission.	Repair short circuit harness between 2-4 brake timing solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

L: TROUBLE CODE 75 — LINE PRESSURE DUTY SOLENOID —

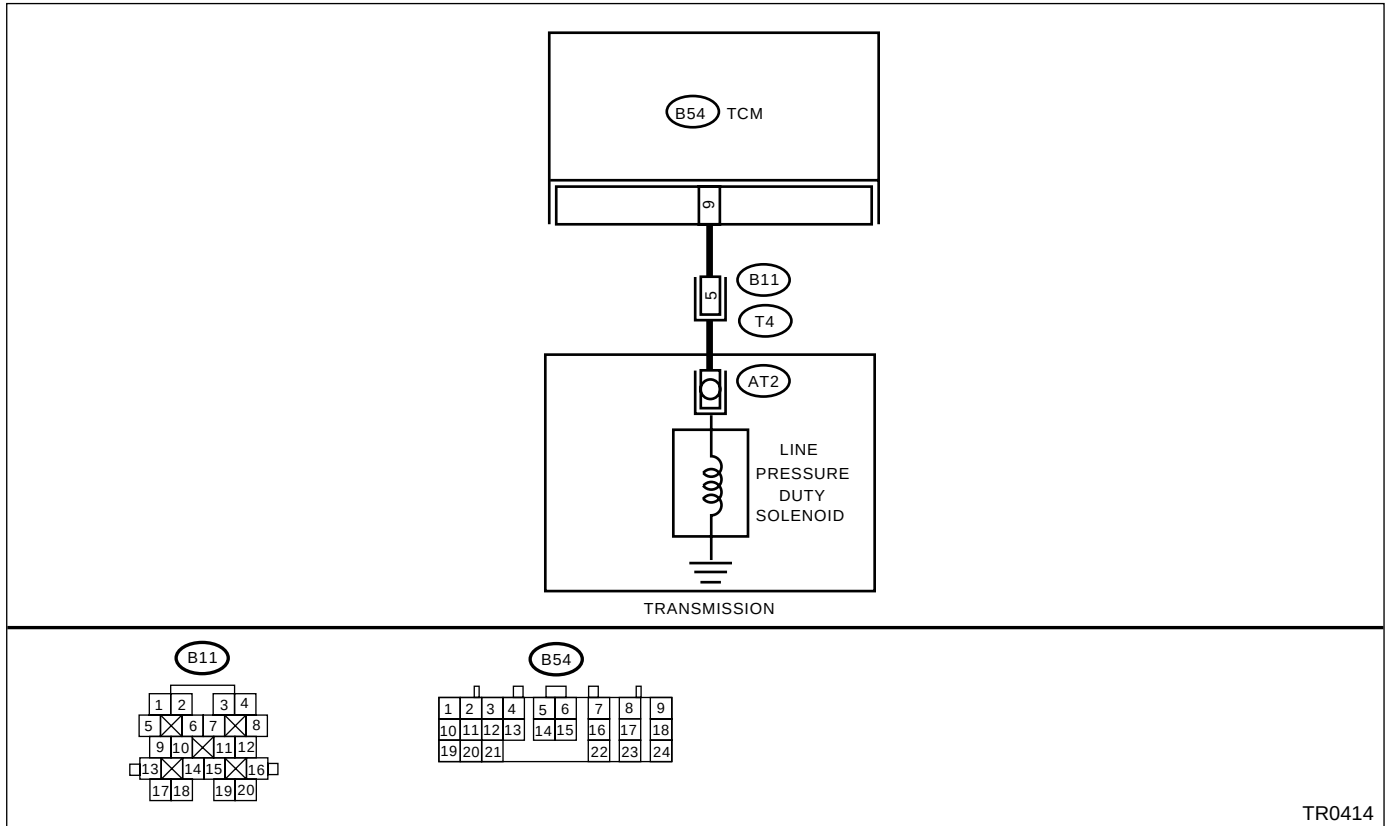
DIAGNOSIS:

Output signal circuit of line pressure duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0414

Step	Check	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 resistance less than 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:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
3 CHECK LINE PRESSURE DUTY SOLENOID. Measure resistance between transmission connector receptacle's terminals. Terminal (T4) No. 5 — No. 16:	Is the resistance between 2.0 and 4.5 Ω ?	Go to step 4.	Go to step 10.
4 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 7.	Go to step 5.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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)Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 9 (+) — Chassis ground (-):	Is the voltage between 1.5 and 5.0 V with throttle fully closed?	Go to step 6.	Go to step 9.
6 CHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 9 (+) — Chassis ground (-):	Is the voltage less than 1 V with throttle fully open?	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.
7 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)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). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 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. •Line pressure duty solenoid is indicated in "%". 1)Throttle is fully closed.	Is the value 100%?	Go to step 8.	Go to step 9.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Turn ignition switch to ON (Engine OFF). 2) Throttle is fully open.	Is the value less than 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 .
9 CHECK POOR CONTACT.	Is there poor contact in line pressure duty solenoid circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
10 CHECK LINE PRESSURE DUTY SOLENOID (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 line pressure duty solenoid. 4) Measure resistance between line pressure duty solenoid connector and transmission ground. Terminal No. 1 — Transmission ground:	Is the resistance between 2.0 and 4.5 Ω ?	Go to step 11 .	Replace line pressure duty solenoid. <Ref. to AT-38, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
11 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID. Measure resistance of harness between line pressure duty solenoid and transmission connector. Connector & terminal (T4) No. 5 — (AT2) No. 1:	Is the resistance less than 1 Ω ?	Go to step 12 .	Repair open circuit in harness between line pressure duty solenoid and transmission connector.
12 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID. Measure resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 5 — Transmission ground:	Is the resistance more than 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 line pressure duty solenoid and transmission.	Repair short circuit in harness between line pressure duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

M: TROUBLE CODE 76 — 2-4 BRAKE DUTY SOLENOID —

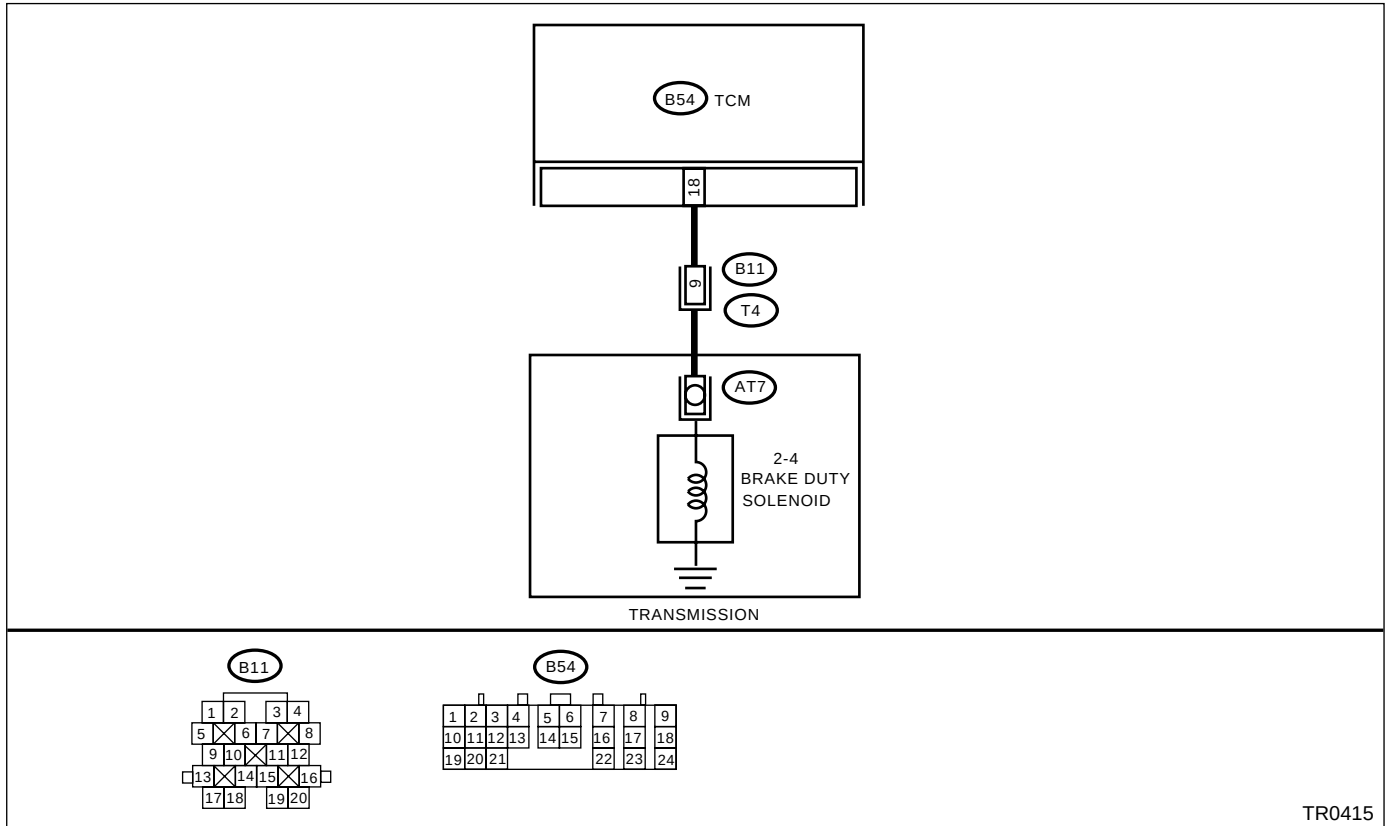
DIAGNOSIS:

Output signal circuit of 2-4 brake duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0415

Step	Check	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 resistance less than 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:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair short circuit in harness between TCM and transmission connector.
3 CHECK 2-4 BRAKE DUTY SOLENOID. Measure resistance between transmission connector receptacle's terminals. Terminal (T4) No. 16 — No. 9:	Is the resistance between 2.0 and 4.5 Ω ?	Go to step 4.	Go to step 10.
4 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 7.	Go to step 5.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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)Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 18 (+) — Chassis ground (-):	Is the voltage between 1.5 and 5.0 V with throttle fully closed?	Go to step 6.	Go to step 9.
6 CHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 18 (+) — Chassis ground (-):	Is the voltage less than 1 V with throttle fully open?	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.
7 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 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). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 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. •2-4 brake duty solenoid is indicated in "%". 1)Throttle is fully closed.	Is the value 100%?	Go to step 8.	Go to step 9.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Turn ignition switch to ON (Engine OFF). 2) Throttle is fully open.	Is the value less than 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 .
9 CHECK POOR CONTACT.	Is there poor contact in 2-4 brake duty solenoid circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
10 CHECK 2-4 BRAKE DUTY SOLENOID (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 2-4 brake duty solenoid. 4) Measure resistance between 2-4 brake duty solenoid connector and transmission ground. Terminal No. 1 — Transmission ground:	Is the resistance between 2.0 and 4.5 Ω ?	Go to step 11 .	Replace 2-4 brake duty solenoid. <Ref. to AT-38, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
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. Connector & terminal (T4) No. 9 — (AT7) No. 1:	Is the resistance less than 1 Ω ?	Go to step 12 .	Repair open circuit in harness between 2-4 brake duty solenoid and transmission connector.
12 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID. Measure resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 9 — Transmission ground:	Is the resistance more than 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 line pressure duty solenoid and transmission.	Repair short circuit in harness between 2-4 brake duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

N: TROUBLE CODE 77 — LOCK-UP DUTY SOLENOID —

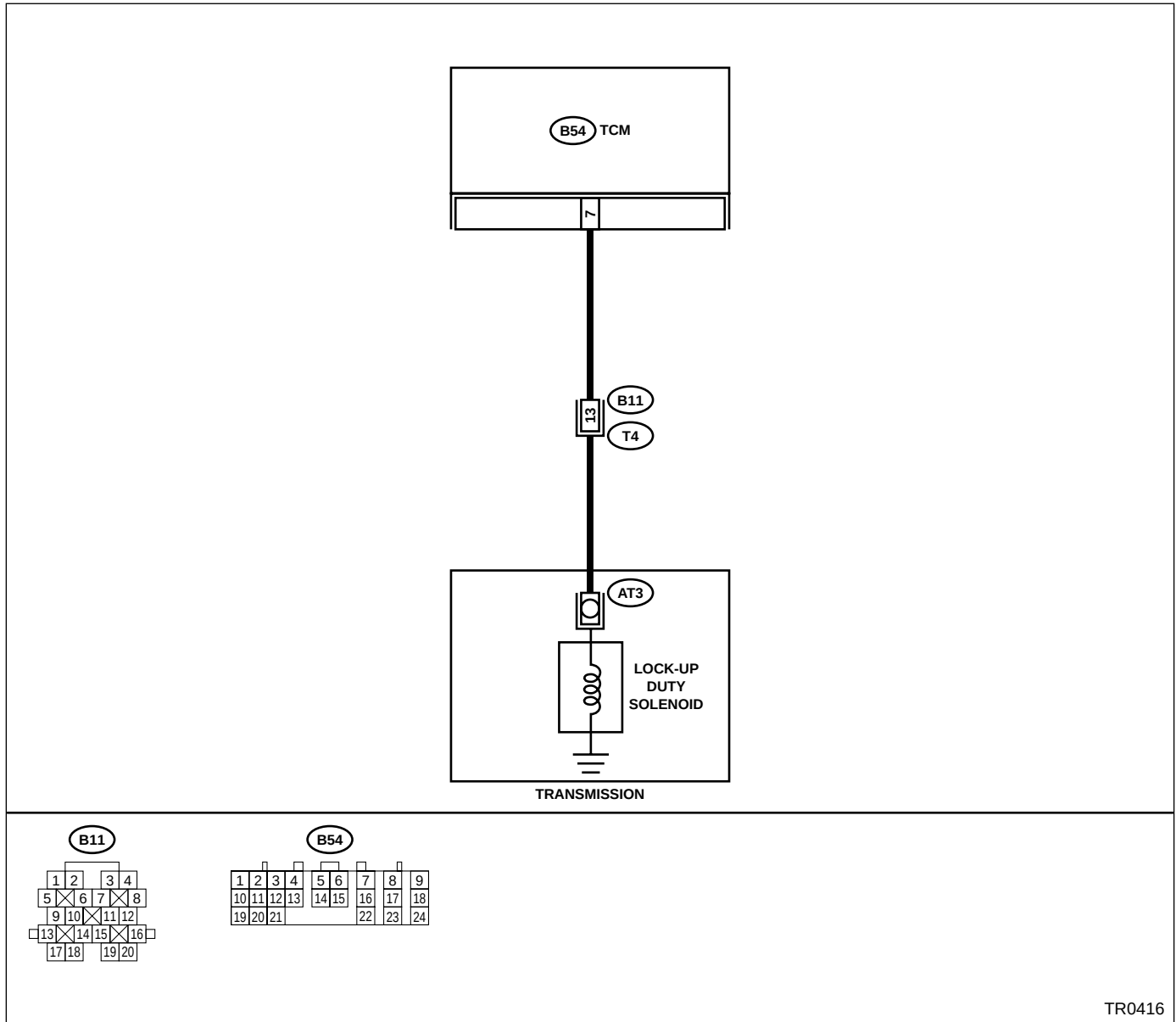
DIAGNOSIS:

Output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

No "lock-up" (after engine warm-up).

WIRING DIAGRAM:



TR0416

Step	Check	Yes	No
1	CHECK TROUBLE CODE.	Go to another trouble code.	Go to step 2.
	Do multiple trouble codes appear in the on-board diagnostics test mode?		

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 resistance than 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:	Is the resistance more than 1 M Ω ?	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 resistance between 10 and 17 Ω ?	Go to step 5.	Go to step 11.
5 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 8.	Go to step 6.
6 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Connect connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. CAUTION: On AWD models, 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 75 km/h (47 MPH). Wheels will lock-up. 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.> 5) Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 7 (+) — Chassis ground (-):	Is the voltage more than 8.5 V?	Go to step 7.	Go to step 10.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Return the engine to idling speed and move select lever to "N". 2)Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 7 (+) — Chassis ground (-):	Is the voltage less than 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.
8	CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1)Connect connectors to TCM and transmission. 2)Lift-up the vehicle and place safety stand. CAUTION: On AWD models, raise all wheels off ground. 3)Connect Subaru Select Monitor to data link connector. 4)Start the engine, and turn Subaru Select Monitor switch to ON. 5)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. 6)Read data of lock-up duty solenoid using Subaru Select Monitor. •Lock-up duty solenoid is indicated in "%". 1)Move selector lever to "D" and slowly increase vehicle speed to 75 km/h (47 MPH). Wheels will lock-up. 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.>	Is the value 95%?	Go to step 9.	Go to step 10.
9	CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. Return the engine to idling speed and move selector lever to "N". 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.>	Is the value 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.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK POOR CONTACT.	Is there poor contact in lock-up duty solenoid circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
11 CHECK LOCK-UP DUTY SOLENOID (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 lock-up duty solenoid. 4)Measure resistance between lock-up duty solenoid connector and transmission ground. Terminal No. 1 — Transmission ground:	Is the resistance between 10 and 17 Ω ?	Go to step 12 .	Replace lock-up duty solenoid. <Ref. to AT-38, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
12 CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION. Measure resistance of harness between lock-up duty solenoid and transmission connector. Connector & terminal (T4) No. 13 — (AT3) No. 1:	Is the resistance less than 1 Ω ?	Go to step 13 .	Repair open circuit in harness between TCM and transmission connector.
13 CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION. Measure resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 13 — Transmission ground:	Is the resistance more than 1 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 lock-up duty solenoid and transmission.	Repair short circuit in harness between lock-up duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

O: TROUBLE CODE 79 — TRANSFER DUTY SOLENOID —

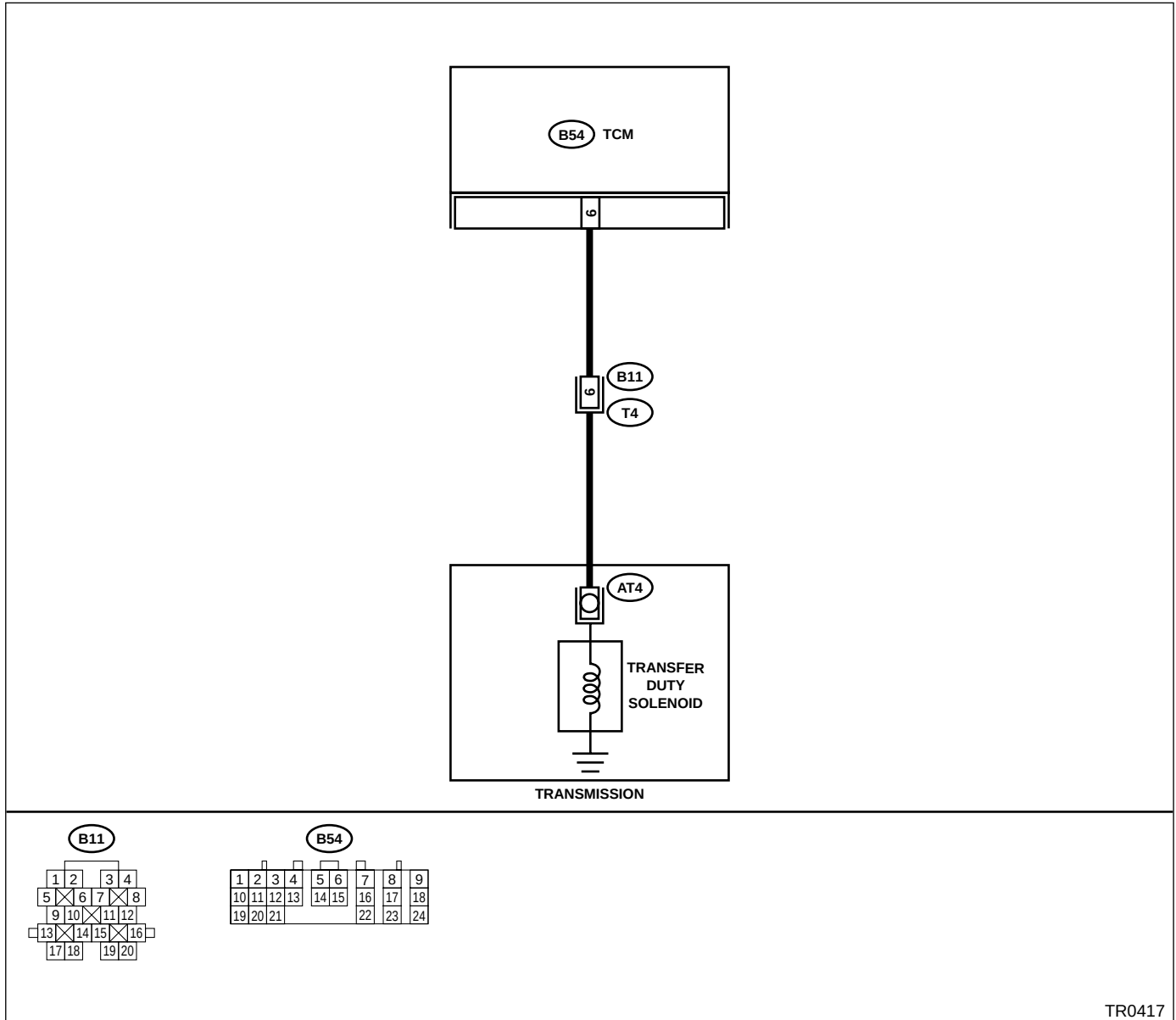
DIAGNOSIS:

Output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive “braking” in tight corners.

WIRING DIAGRAM:



TR0417

Step	Check	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 resistance less than 1 Ω?	Go to step 2.	Repair open circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure resistance harness connector between TCM and chassis ground. Connector & terminal (B54) No. 6 — Chassis ground:	Is the resistance more than 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 resistance between 10 and 17 Ω?	Go to step 4.	Go to step 10.
4 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	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)Throttle is fully closed. 4)Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 6 (+) — Chassis ground (-):	Is the voltage less than 1 V in "P" range?	Go to step 6.	Go to step 9.
6 CHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 6 (+) — Chassis ground (-):	Is the voltage between 5 and 7 V in "D" range?	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 9.
7 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)Move select lever to "D" with throttle fully open (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 the value between 5 and 10%?	Go to step 8.	Go to step 9.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 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) Rear data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in "%".	Is the value between approx. 60% and approx. 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 TCM and transmission.	Go to step 9.
9 CHECK POOR CONTACT.	Is there poor contact in transfer duty solenoid circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
10 CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION). 1) Lift-up the vehicle and place safety stand. CAUTION: On AWD models, raise all wheels off ground. 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 resistance between 10 and 17 Ω ?	Go to step 11.	Replace transfer duty solenoid.
11 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 resistance less than 1 Ω ?	Go to step 12.	Repair open circuit in harness between transfer duty solenoid and transmission connector.
12 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:	Is the resistance more than 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 contact in the transfer duty solenoid and transmission.	Repair short circuit in harness between transfer duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

P: TROUBLE CODE 93 — REAR VEHICLE SPEED SENSOR —

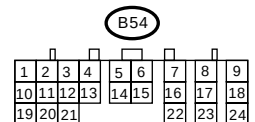
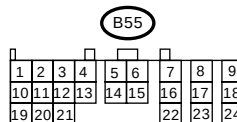
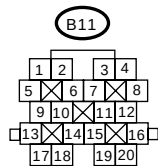
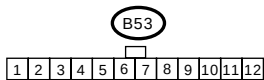
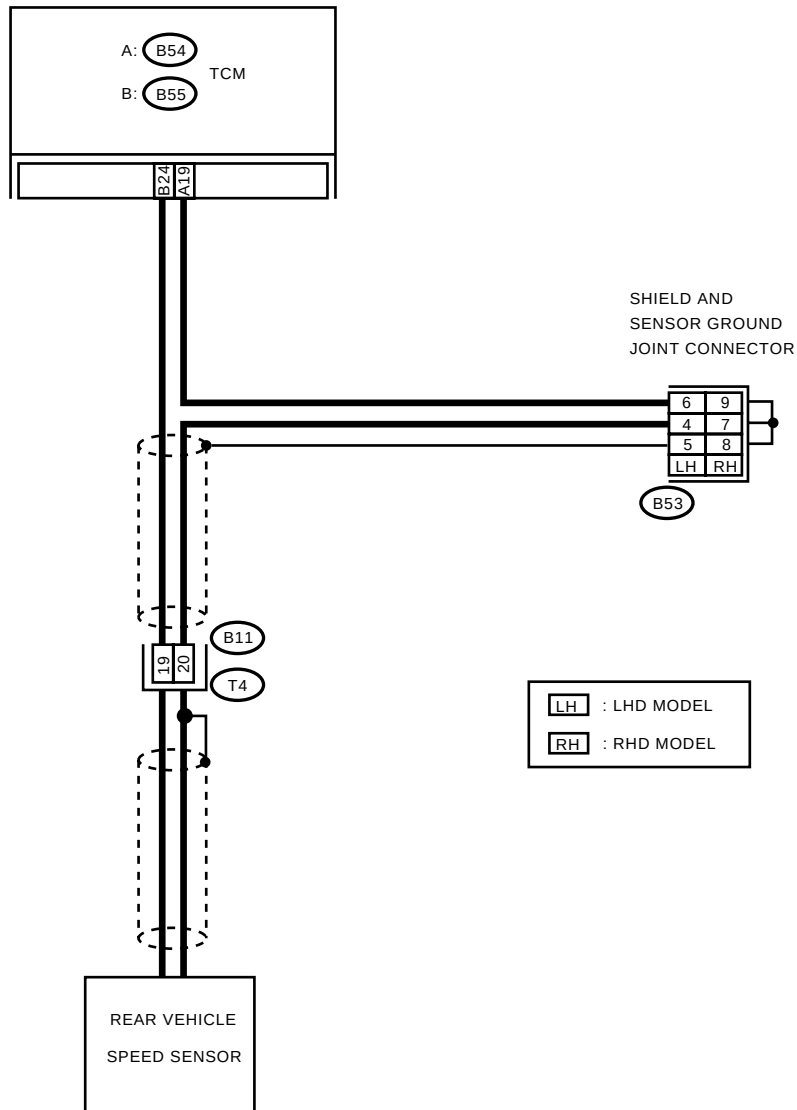
DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock-up or excessive tight corner “braking”.

WIRING DIAGRAM:



TR0418

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	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 resistance less than 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 resistance less than 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:	Is the resistance more than 1 M Ω ?	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:	Is the resistance more than 1 M Ω ?	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 resistance between 450 and 650 Ω ?	Go to step 6.	Replace rear vehicle speed sensor. <Ref. to AT-34, Rear Vehicle Speed Sensor.>
6 PREPARE OSCILLOSCOPE.	Do you have oscilloscope?	Go to step 10.	Go to step 7.
7 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 9.	Go to step 8.
8 CHECK INPUT SIGNAL FOR TCM. 1)Connect connectors to TCM and transmission. 2)Lift-up or raise the vehicle and place safety stands. CAUTION: On AWD models, raise all wheels off floor. 3)Start the engine and set vehicle in 20 km/h (12 MPH) condition. 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.> 4)Measure voltage between TCM connector terminals. Connector & terminal (B55) No. 24 (+) — (B54) No. 19 (-):	Is the voltage more than 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.

DIAGNOSTIC PROCEDURE WITH TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
9	CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1)Connect connectors to TCM and transmission. 2)Connect Subaru Select Monitor to data link connector. 3)Lift-up or raise the vehicle and place safety stands. CAUTION: On AWD models, raise all wheels off floor. 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. •Compare speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in "km/h" or "MPH". 1)Slowly increase vehicle speed to 60 km/h or 37 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.>	Does the speedometer indication increase 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.
10	CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE. 1)Connect connectors to TCM and transmission. 2)Lift-up or raise the vehicle and place safety stands. CAUTION: On AWD models, raise all wheels off floor. 3)Set oscilloscope to TCM connector terminals. Positive probe; (B55) No. 24 Earth lead; (B54) No. 19 4)Start the engine and set vehicle in 20 km/h (12 MPH) condition. 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.> 5)Measure signal voltage indicated on oscilloscope.	Is the signal voltage more than 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.
11	CHECK POOR CONTACT.	Is there poor contact in rear vehicle speed sensor circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

15.Diagnostic Procedure for No-trouble Code

A: CHECK GEAR POSITION.

Step	Check	Yes	No
1 CHECK GEAR POSITION. 1)Lift-up the vehicle and place safety stand. CAUTION: On AWD models, raise all wheels off ground. 2)Start the engine. 3)Move select lever to "D", and drive vehicle. 4)Read data of gear position using Subaru Select Monitor. •Gear position is indicated. 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.>	Does the transmission gear correspond to the gear which is shown on display?	Go to step 2.	Check shift solenoid 1 and shift solenoid 2 signal circuit. <Ref. to AT-66, TROUBLE CODE 71 — SHIFT SOLENOID 1 —, Diagnostic Procedure with Trouble Code.> and <Ref. to AT-70, TROUBLE CODE 72 — SHIFT SOLENOID 2 —, Diagnostic Procedure with Trouble Code.>
2 CHECK VEHICLE.	Is the target AWD vehicle?	Go to step CHECK FWD SWITCH.<Ref. to AT-102, CHECK FWD SWITCH., Diagnostic Procedure for No-trouble Code.>	Go to step CHECK BRAKE SWITCH. <Ref. to AT-106, CHECK BRAKE SWITCH., Diagnostic Procedure for No-trouble Code.>

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: CHECK FWD SWITCH.

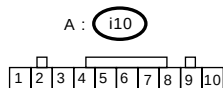
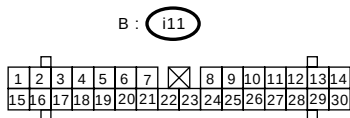
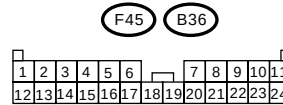
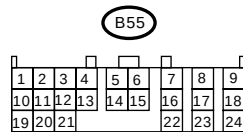
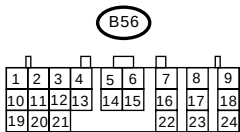
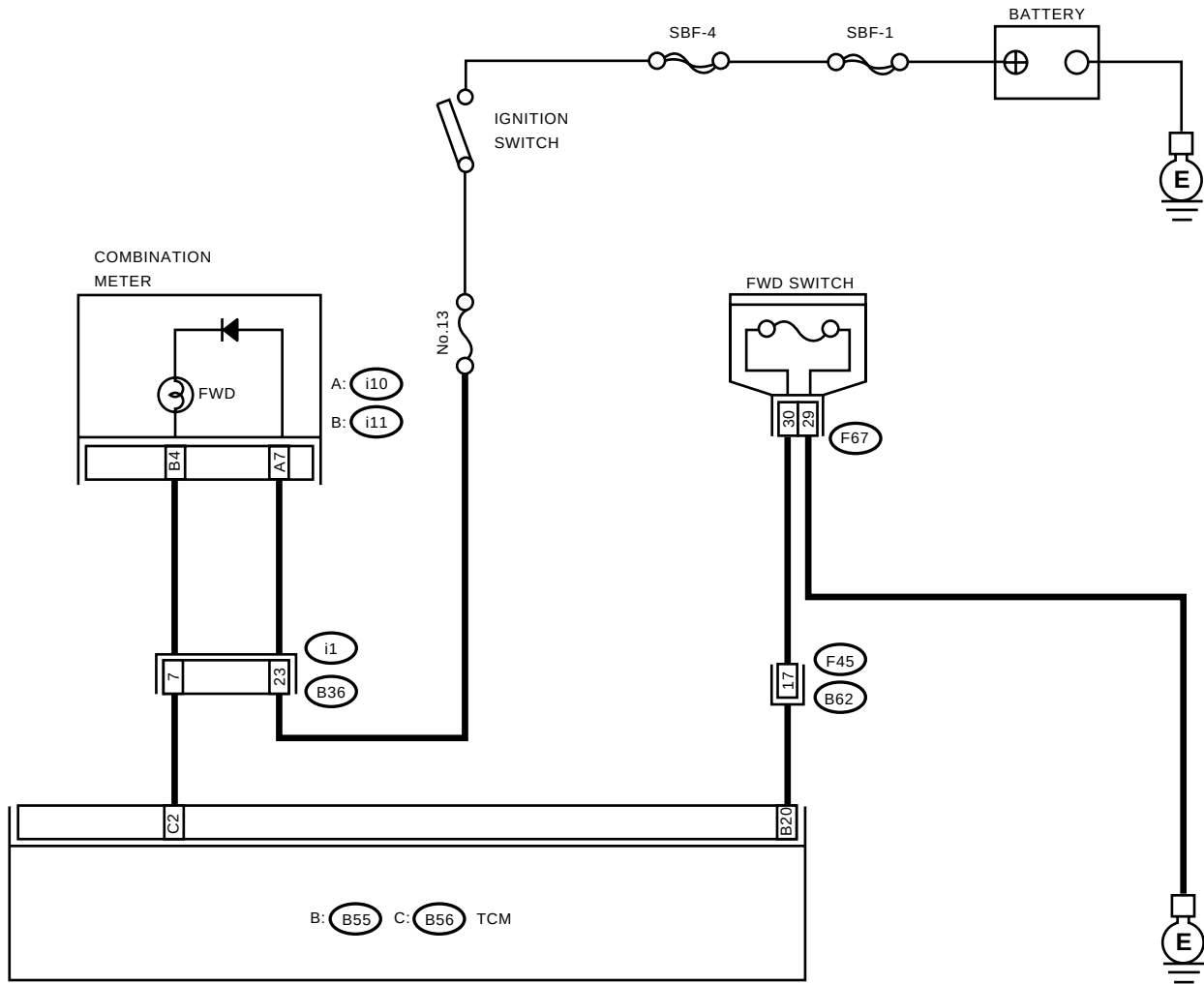
DIAGNOSIS:

- LED does not come on even if FWD switch is ON.
- FWD switch circuit is open or short.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

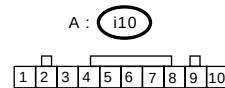
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM: LHD MODEL



AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Wiring diagram of a vehicle's forward lighting system. The circuit includes a battery, a fuse block with fuses F45 and F62, a forward switch, a combination meter, and a TCM. The forward switch controls the forward lamp (FWD) and the forward lamp (FWD) is connected to the TCM. The ignition switch is connected to the forward switch. The combination meter is connected to the forward switch. The TCM is connected to the forward switch.



DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FWD SWITCH.	When fuse is inserted to FWD switch, does LED light up?	Go to step CHECK BRAKE SWITCH.<Ref. to AT-106, CHECK BRAKE SWITCH., Diagnostic Procedure for No-trouble Code.>	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?	Go to step 3.	Replace FWD indicator light bulb. <Ref. to IDI-19, 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. 30:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair open circuit in harness between TCM and FWD switch connector.
4 CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND. Measure resistance of harness between FWD switch and chassis ground. Connector & terminal (F67) No. 29 — Chassis ground:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair open circuit in harness between FWD switch connector and chassis ground.
5 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:	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair short circuit in harness between TCM and FWD switch connector.
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 voltage less than 1 V in FWD switch while installing?	Go to step 7.	Go to step 11.
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 (-):	Is the voltage more than 10 V in FWD switch while removing?	Go to step 8.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
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 — (i11) No. 4:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair open circuit in harness between TCM and combination meter and poor contact in coupling connector.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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. <i>Connector & terminal</i> <i>(B56) No. 2 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	Go to step 10.	Repair short circuit in harness between TCM and combination meter connector.
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. <i>Connector & terminal</i> <i>(B56) No. 2 — Chassis ground:</i>	Is the voltage less than 1 V in FWD switch while installing?	Go to step 11.	Go to step 12.
11 CHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure signal voltage for TCM while removing the fuse from FWD switch connector. <i>Connector & terminal</i> <i>(B56) No. 2 — Chassis ground:</i>	Is the voltage more than 10 V in FWD switch while removing?	Go to step 12.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
12 CHECK POOR CONTACT.	Is there poor contact in FWD switch circuit?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

C: CHECK BRAKE SWITCH.

Step	Check	Yes	No
1 CHECK BRAKE SWITCH.	When the brake pedal is depressed, does LED light up?	Go to step CHECK ABS SWITCH. <Ref. to AT-107, CHECK ABS SWITCH., Diagnostic Procedure for No-trouble Code.>	Check brake switch circuit. <Ref. to EN(SOHC)-218, DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

D: CHECK ABS SWITCH.

Step	Check	Yes	No
1 CHECK ABS SWITCH.	Does the LED of ABS switch light up?	Check ABS switch circuit. <Ref. to ABS-142, TROUBLE CODE 44 — ABS-AT CONTROL (NON CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.> and <Ref. to ABS-144, TROUBLE CODE 44 — ABS-AT CONTROL (CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.>	Go to step CHECK CRUISE CONTROL SWITCH. <Ref. to AT-107, CHECK CRUISE CONTROL SWITCH., Diagnostic Procedure for No-trouble Code.>

E: CHECK CRUISE CONTROL SWITCH.

Step	Check	Yes	No
1 CHECK CRUISE CONTROL SWITCH.	When cruise control is set, does LED light up?	Go to step CHECK KICK-DOWN SWITCH. <Ref. to AT-108, CHECK KICK-DOWN SWITCH., Diagnostic Procedure for No-trouble Code.>	Check cruise control. <Ref. to CC-28, Diagnostics Chart with Trouble Code.>

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

F: CHECK KICK-DOWN SWITCH.

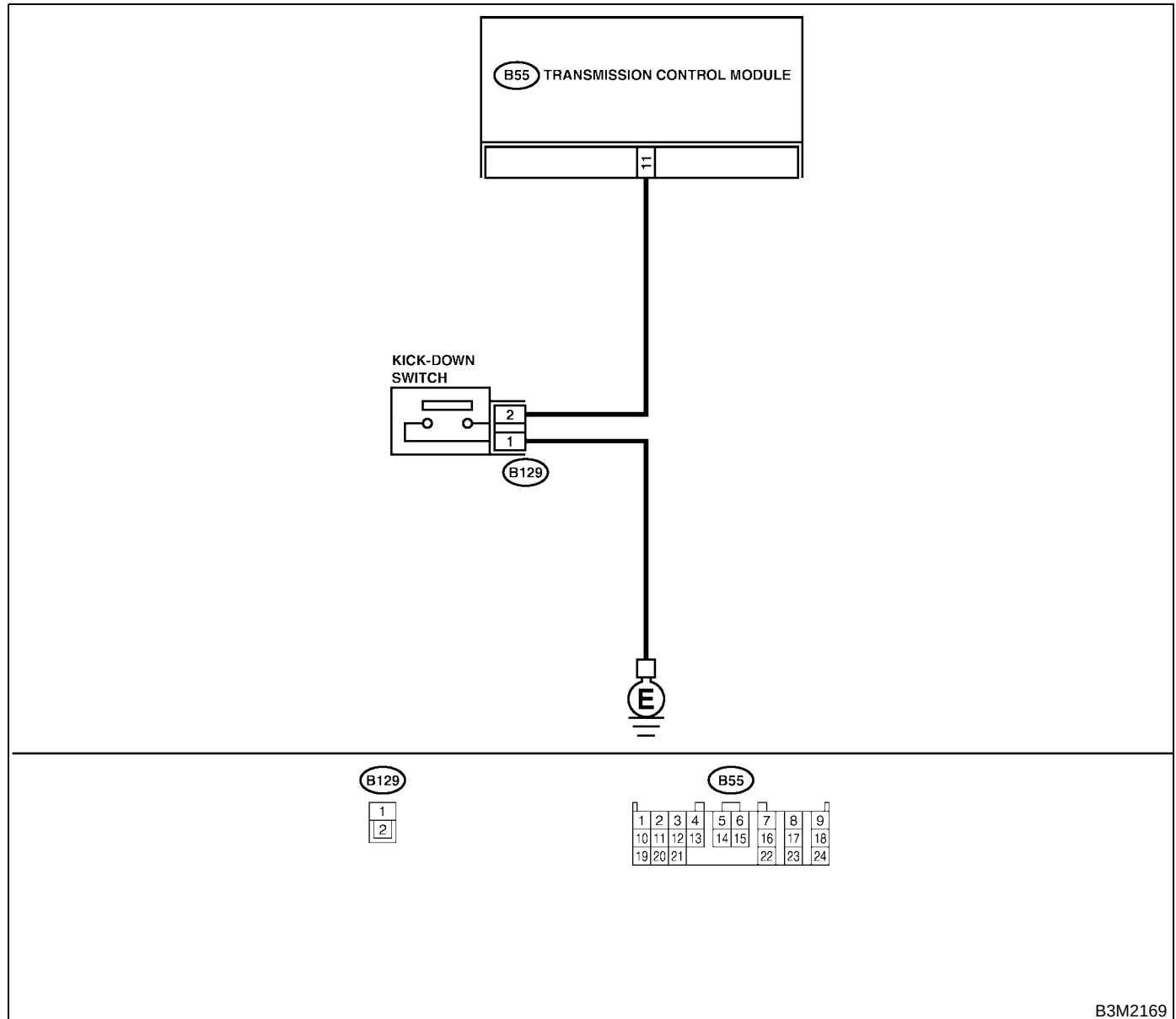
DIAGNOSIS:

- The kick-down switch is ON when the throttle is fully opened but is OFF when the throttle is partially open or fully closed.

TROUBLE SYMPTOM:

No kick-down occurs (when the throttle is fully opened).

WIRING DIAGRAM:



B3M2169

Step	Check	Yes	No
1	CHECK KICK-DOWN SWITCH OPERATION. When the accelerator pedal is depressed, does "ON" displayed?	Go to step CHECK POWER MODE SWITCH. <Ref. to AT-110, CHECK POWER MODE SWITCH., Diagnostic Procedure for No-trouble Code.>	Go to step 2.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 resistance less than 1 Ω ?	Go to step 3.	Repair open circuit in harness between kick-down switch and TCM.
3 CHECK KICK-DOWN SWITCH. Measure resistance for kick-down switch when depressing the accelerator pedal. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Go to step 4.	Replace kick-down switch. <Ref. to SP-4, Accelerator Pedal.>
4 CHECK KICK-DOWN SWITCH. Measure resistance for kick-down switch when pressing the accelerator pedal. Terminals No. 1 — No. 2:	Is the resistance more than 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. Connector & terminal (B55) No. 11 — (B129) No. 2:	Is the resistance less than 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. Connector & terminal (B55) No. 11 — Chassis ground:	Is the resistance more than 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. Connector & terminal (B55) No. 11 (+) — Chassis ground (-):	Is the voltage less than 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. Connector & terminal (B55) No. 11 (+) — Chassis ground (-):	Is the voltage more than 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?	Repair poor contact.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

G: CHECK POWER MODE SWITCH.

DIAGNOSIS:

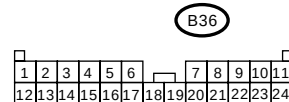
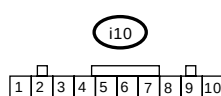
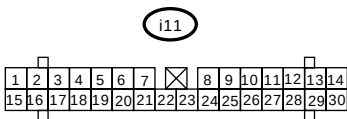
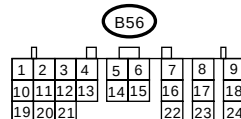
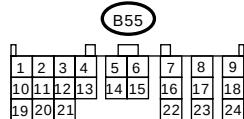
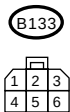
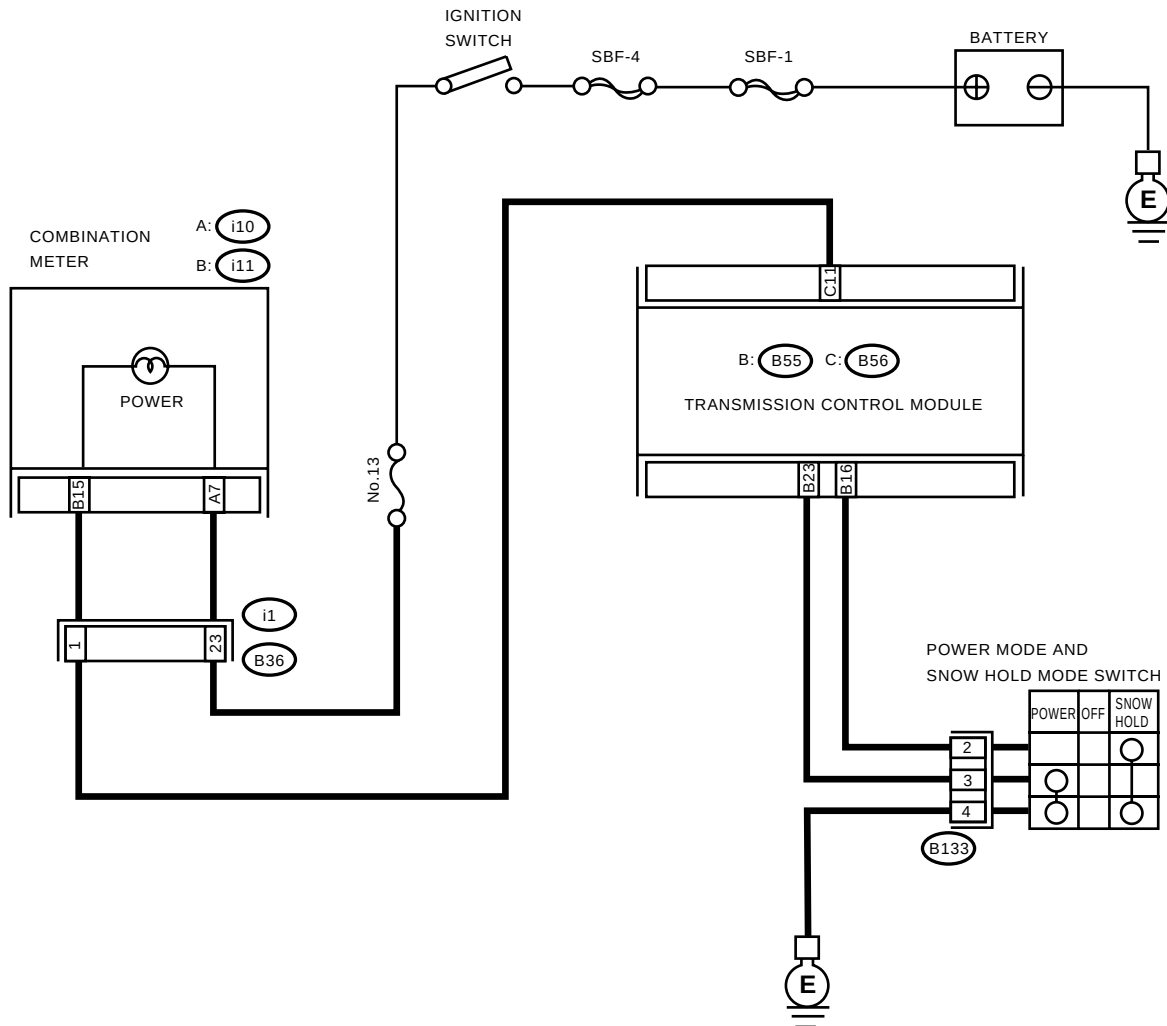
- LED does not come on when power switch is ON.
- Power switch circuit is open or shorted.

TROUBLE SYMPTOM:

No power mode occurs.

WIRING DIAGRAM:

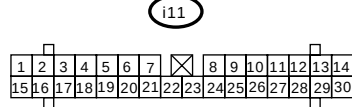
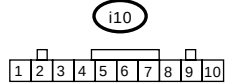
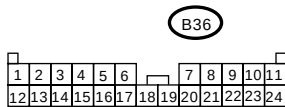
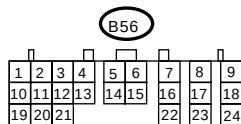
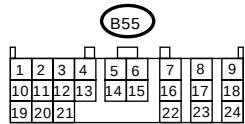
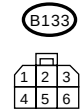
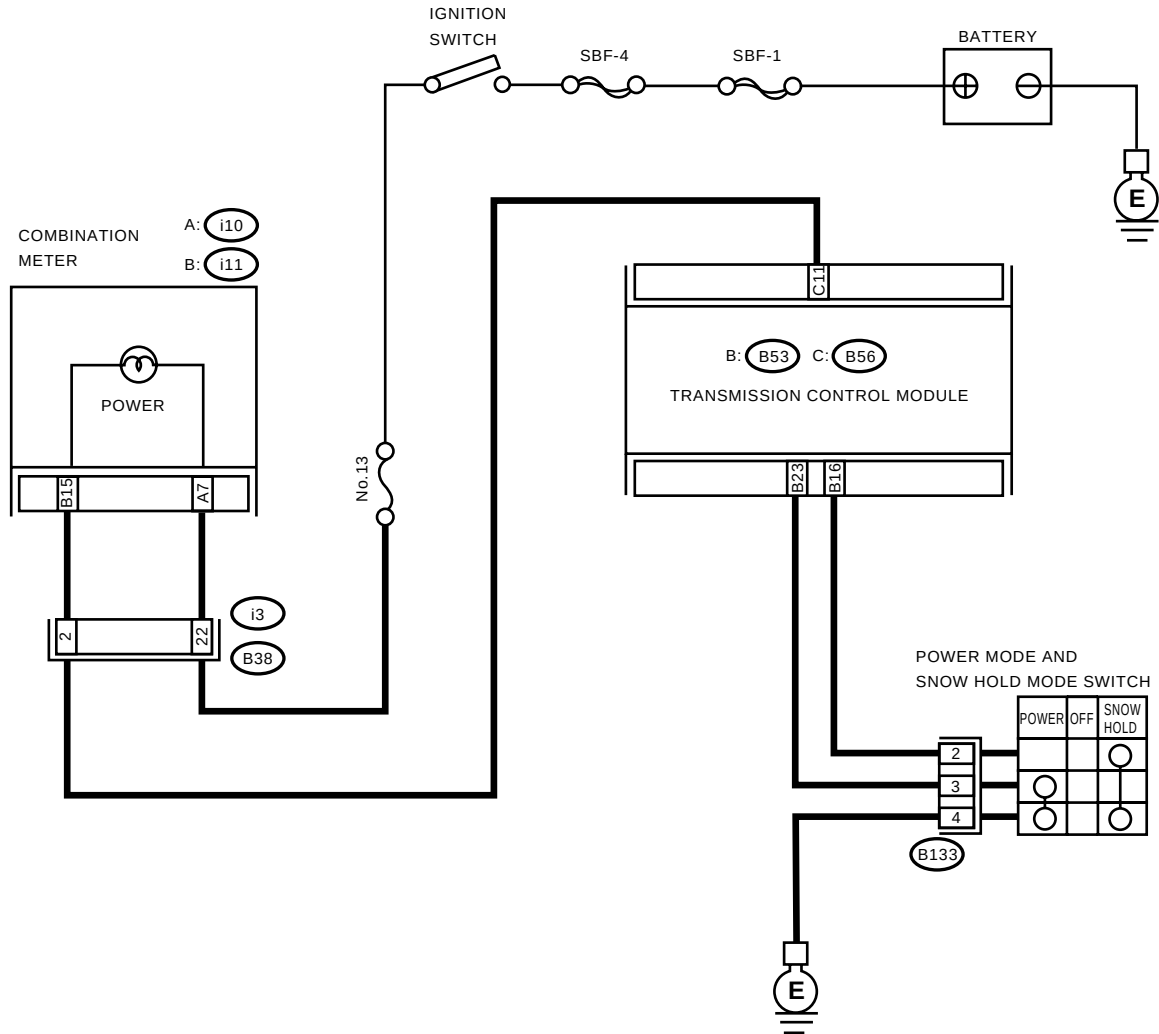
LHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

RHD MODEL



TR0423

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SWITCH OPERATION.	When power switch is turned OFF, does LED light up?	Go to step 5 .	Go to step 2 .
2 CHECK POWER SWITCH OPERATION.	When power switch is turned ON, does LED light up?	Go to step CHECK INHIBITOR SWITCH. <Ref. to AT-114, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-trouble Code.>	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?	Go to step 4 .	Replace POWER indicator light bulb. <Ref. to IDI-19, 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 resistance less than 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 resistance less than 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:	Is the resistance more than 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 resistance less than 1 Ω ?	Go to step 8 .	Repair open circuit in harness between TCM and power switch connector.
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:	Is the resistance more than 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 (-):	Is the voltage more than 10 V?	Go to step 10 .	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 voltage less than 1 V?	Go to step 11 .	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
11 CHECK POOR CONTACT.	Is there poor contact?	Repair poor contact.	A temporary poor contact of the connector or harness or connector in power switch circuit.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

H: CHECK INHIBITOR SWITCH.

DIAGNOSIS:

Input signal circuit of inhibitor switch is open or shorted.

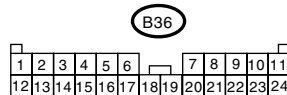
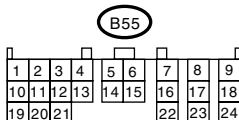
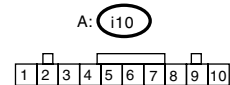
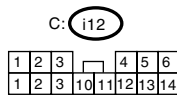
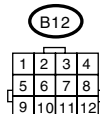
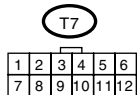
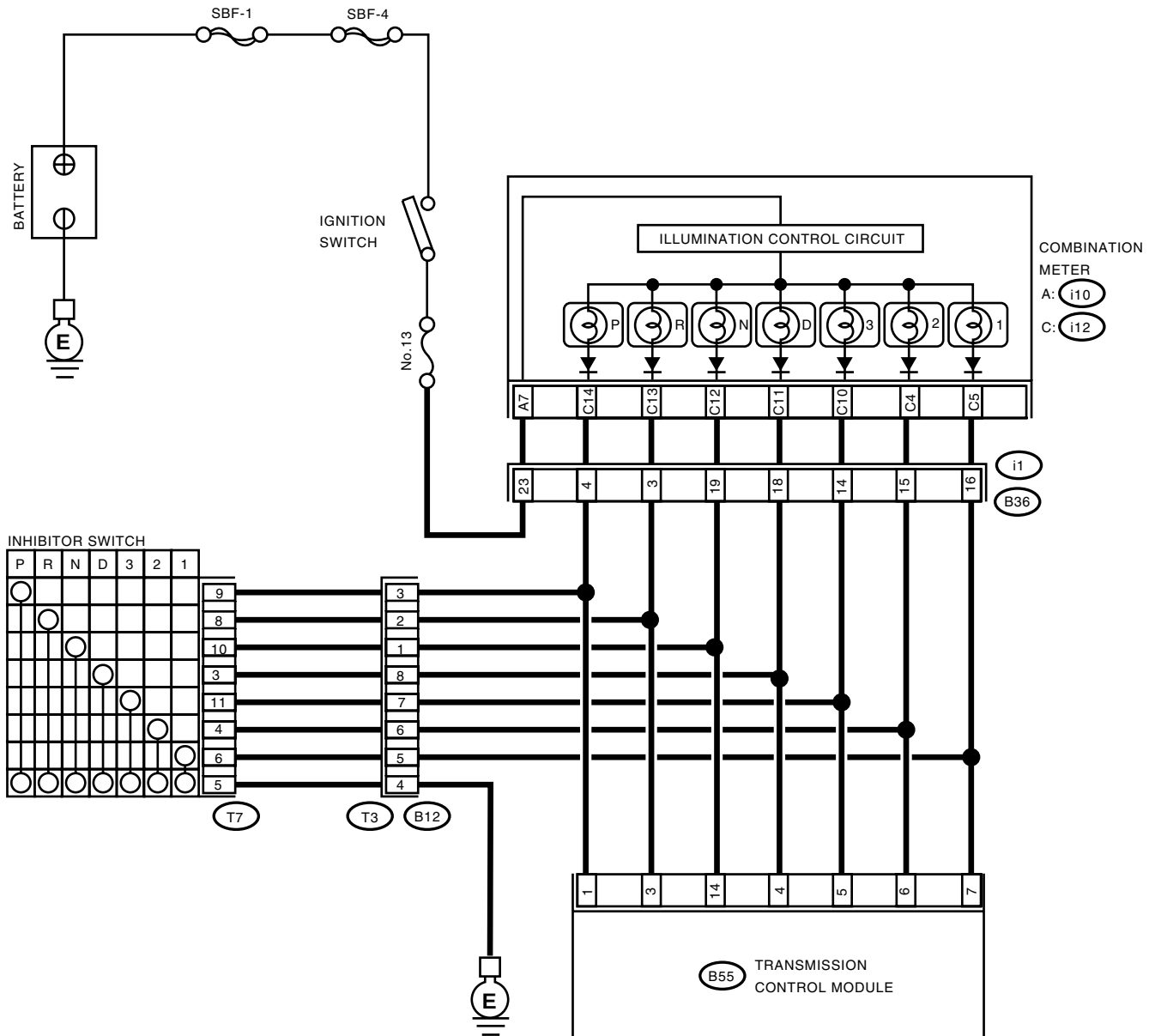
TROUBLE SYMPTOM:

- 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.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

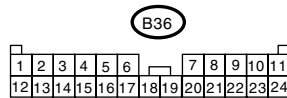
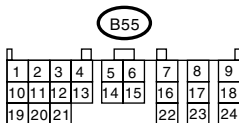
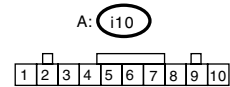
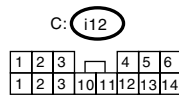
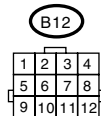
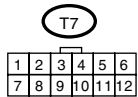
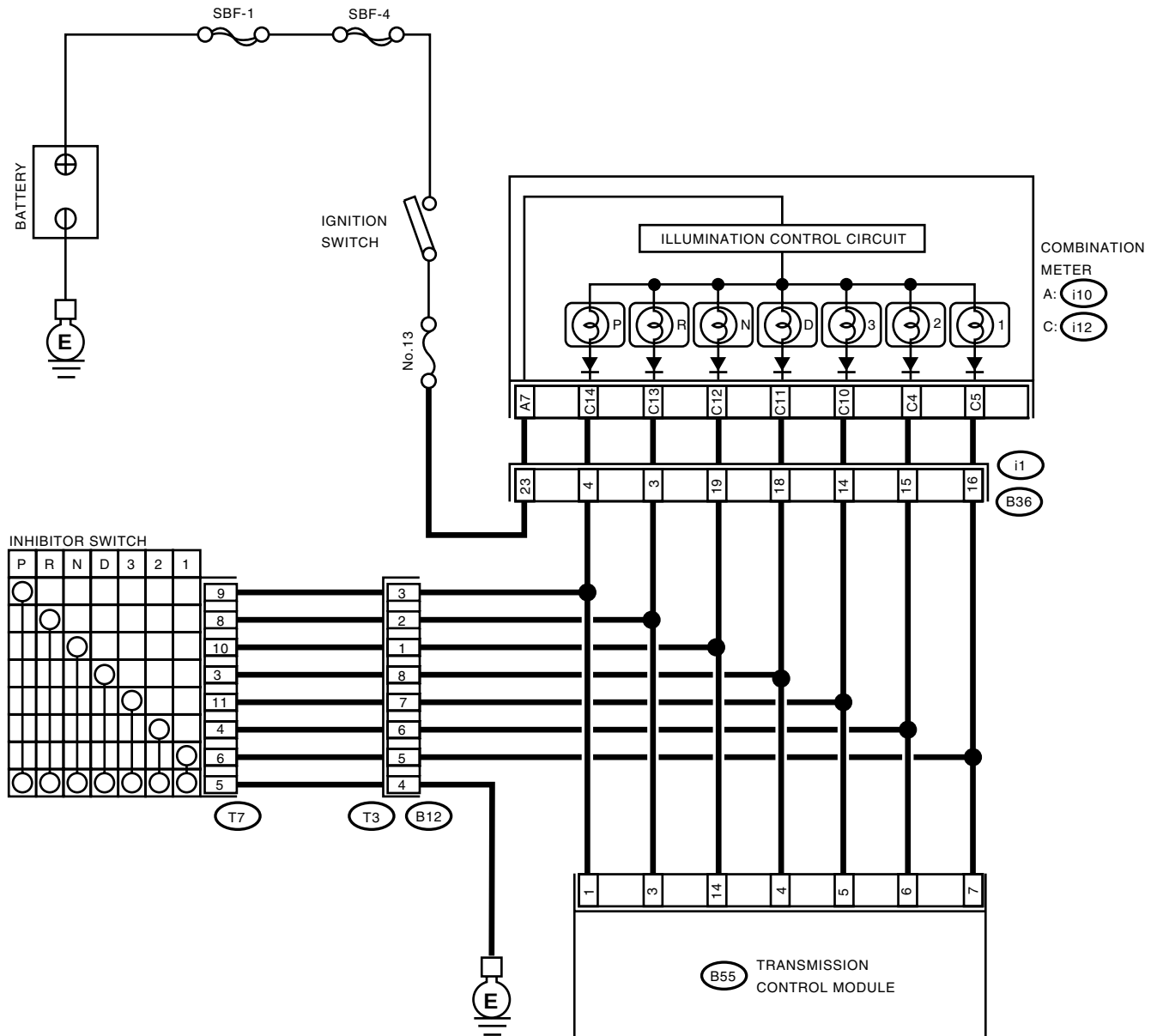
WIRING DIAGRAM: LHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

RHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK "P" RANGE SWITCH.	When "P" range is selected, does LED light up?	Go to step 2.	Go to step 22.
2	CHECK INDICATOR LIGHT.	Does combination meter "P" range indicator illuminate?	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?	Go to step 28.	Go to step 4.
4	CHECK "R" RANGE SWITCH.	When the "R" range is selected, does LED light up?	Go to step 5.	Go to step 29.
5	CHECK INDICATOR LIGHT.	Does combination meter "R" range indicator illuminate?	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?	Go to step 34.	Go to step 7.
7	CHECK "N" RANGE SWITCH.	When the "N" range is selected, does LED light up?	Go to step 8.	Go to step 35.
8	CHECK INDICATOR LIGHT.	Does combination meter "N" range indicator illuminate?	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?	Go to step 40.	Go to step 10.
10	CHECK "D" RANGE SWITCH.	When the "D" range is selected, does LED light up?	Go to step 11.	Go to step 41.
11	CHECK INDICATOR LIGHT.	Does combination meter "D" range indicator illuminate?	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?	Go to step 46.	Go to step 13.
13	CHECK "3" RANGE SWITCH.	When the "3" range is selected, does LED light up?	Go to step 14.	Go to step 47.
14	CHECK INDICATOR LIGHT.	Does combination meter "3" range indicator illuminate?	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?	Go to step 52.	Go to step 16.
16	CHECK "2" RANGE SWITCH.	When the "2" range is selected, does LED light up?	Go to step 17.	Go to step 53.
17	CHECK INDICATOR LIGHT.	Does combination meter "2" range indicator illuminate?	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?	Go to step 58.	Go to step 19.
19	CHECK "1" RANGE SWITCH.	When the "1" range is selected, does LED light up?	Go to step 20.	Go to step 59.
20	CHECK INDICATOR LIGHT.	Does combination meter "1" range indicator illuminate?	Go to step 21.	Go to step 62.
21	CHECK "1" RANGE SWITCH.	When the "P" range is selected, does "1" range LED light UP?	Go to step 64.	Go to step CHECK HOLD SWITCH. <Ref. to AT-124, CHECK HOLD SWITCH., Diagnostic Procedure for No-trouble Code.>

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 resistance less than 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 resistance less than 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) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 1 (+) — Chassis ground (-):	Is the voltage less than 1 V in "P" range?	Go to step 25.	Go to step 65.
25 CHECK INPUT SIGNAL FOR TCM. Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 1 (+) — Chassis ground (-):	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
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?	Go to step 27.	Replace "P" range indicator light bulb. <Ref. to IDI-19, 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 (B55) No. 1 — (i12) No. 14:	Is the resistance more than 1 Ω ?	Go to step 65.	Repair open circuit in harness between TCM 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:	Is the resistance less than 1 M Ω ?	Go to step 29.	Repair ground short circuit in "P" range circuit.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 resistance less than 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) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V in "R" range?	Go to step 31.	Go to step 65.
31 CHECK INPUT SIGNAL FOR TCM. Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 3 (+) — Chassis ground (-):	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace TCM. <Ref. to AT-44, 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?	Go to step 33.	Replace "R" range indicator light bulb. <Ref. to IDI-19, 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 (B55) No. 3 (+) — (i12) No. 13 (-):	Is the resistance less than 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:	Is the resistance more than 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 resistance less than 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-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	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)Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 14 (+) — Chassis ground (-):	Is the voltage less than 1 V in "N" range?	Go to step 37.	Go to step 65.
37 CHECK INPUT SIGNAL FOR TCM. Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 14 (+) — Chassis ground (-):	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace TCM. <Ref. to AT-44, 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?	Go to step 39.	Replace "N" range indicator light bulb. <Ref. to IDI-19, 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 (B55) No. 14 — (i12) No. 12:	Is the resistance less than 1 Ω ?	Go to step 65.	Repair open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
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:	Is the resistance more than 1 M Ω ?	Go to step 41.	Repair ground short circuit in "N" range circuit.
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 resistance less than 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)Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 4 (+) — Chassis ground (-):	Is the voltage less than 1 V in "D" range?	Go to step 43.	Go to step 65.
43 CHECK INPUT SIGNAL FOR TCM. Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 4 (+) — Chassis ground (-):	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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?	Go to step 45.	Replace "D" range indicator light bulb. <Ref. to IDI-19, 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 (B55) No. 4 — (i12) No. 11:	Is the resistance less than 1 Ω ?	Go to step 65.	Repair open circuit in harness between TCM connector and combination meter, and TCM connector.
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:	Is the resistance more than 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 — (T7) No. 11:	Is the resistance less than 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)Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 5 (+) — Chassis ground (-):	Is the voltage less than 1 V in "3" range?	Go to step 49.	Go to step 65.
49 CHECK INPUT SIGNAL FOR TCM. Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 5 (+) — Chassis ground (-):	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace TCM. <Ref. to AT-44, 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?	Go to step 51.	Replace "3" range indicator light bulb. <Ref. to IDI-19, Combination Meter Assembly.>
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 (B55) No. 5 — (i12) No. 10:	Is the resistance more than 1 Ω ?	Go to step 65.	Repair open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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:	Is the resistance more than 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 resistance less than 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)Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 6 (+) — Chassis ground (-):	Is the voltage less than 1 V in "2" range?	Go to step 55.	Go to step 65.
55 CHECK INPUT SIGNAL FOR TCM. Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 6 (+) — Chassis ground (-):	Is the voltage more than 8.0 V in other ranges?	Go to step 65.	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
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?	Go to step 57.	Replace "2" range indicator light bulb. <Ref. to IDI-19, 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 (B55) No. 6 — (i12) No. 4:	Is the resistance less than 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:	Is the resistance more than 1 MΩ?	Go to step 59.	Repair ground short circuit in "2" range circuit.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 resistance less than 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) Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 7 (+) — Chassis ground (-):	Is the voltage less than 1 V in "1" range?	Go to step 61.	Go to step 65.
61 CHECK INPUT SIGNAL FOR TCM. Measure voltage between TCM and chassis ground. Connector & terminal (B55) No. 7 (+) — Chassis ground (-):	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace TCM. <Ref. to AT-44, 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?	Go to step 63.	Replace "1" range indicator light bulb. <Ref. to IDI-19, 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 (B55) No. 7 — (i12) No. 5:	Is the resistance less than 1 Ω ?	Go to step 65.	Repair open circuit in harness between TCM and combination meter, 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:	Is the resistance more than 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?	Repair poor contact.	Adjust inhibitor switch and select cable. <Ref. to AT-28, ADJUSTMENT, Inhibitor Switch.> and <Ref. to CS-9, Select Cable.>

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

I: CHECK HOLD SWITCH.

DIAGNOSIS:

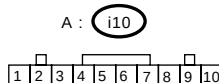
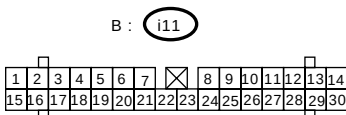
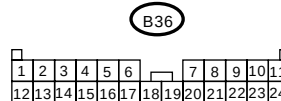
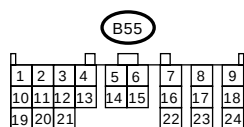
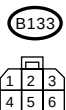
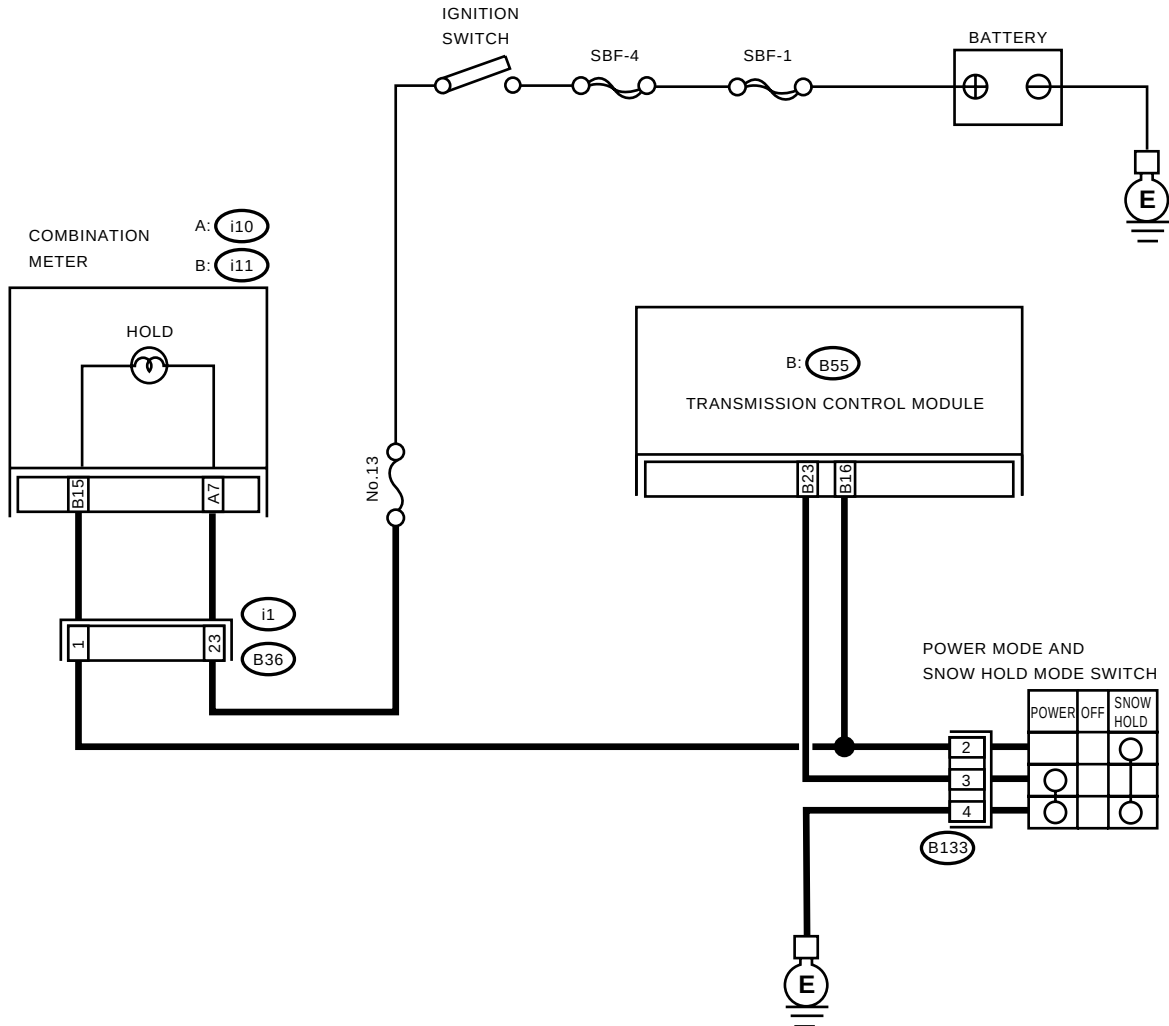
- LED does not come on when hold switch is ON.
- Hold switch circuit is open or shorted.

TROUBLE SYMPTOM:

- 2nd gear is not held.
- Failure of vehicle to start in 2nd gear except 1st range.

WIRING DIAGRAM:

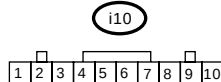
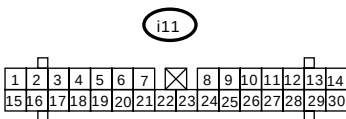
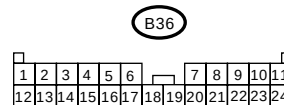
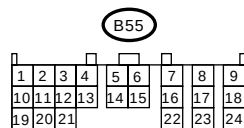
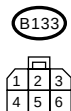
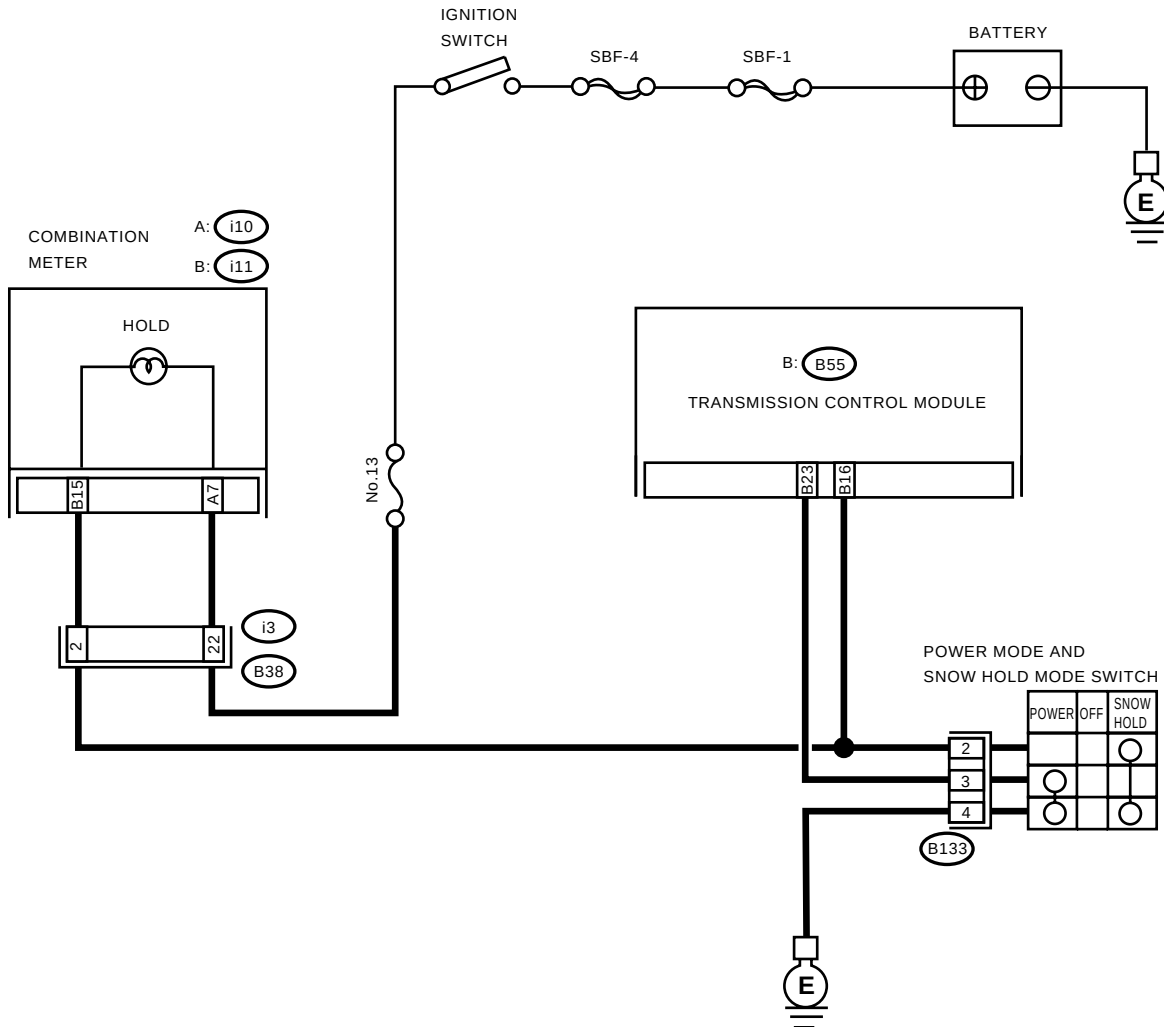
LHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

RHD MODEL



TR0427

Step	Check	Yes	No
1	CHECK HOLD SWITCH OPERATION.	When hold switch is turned OFF, does LED light up?	Go to step 5.
		Go to step 2.	

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HOLD SWITCH OPERATION.	When hold switch is turned ON, does LED light up?	Go to step CHECK FWD LIGHT. <Ref. to AT-128, CHECK FWD LIGHT, Diagnostic Procedure for No-trouble Code.>	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?	Go to step 4.	Replace HOLD indicator light bulb. <Ref. to IDI-19, 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 resistance less than 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. 2:	Is the resistance less than 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. 2:	Is the resistance more than 1 M Ω ?	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. 2:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair open circuit in harness between TCM and hold switch connector and poor contact in coupling connector.
8 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. Measure resistance of harness connector TCM and combination meter. Connector & terminal (B55) No. 16 — (i11) No. 15:	Is the resistance less than 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:	Is the resistance more than 1 M Ω ?	Go to step 10.	Repair short circuit in harness between TCM and hold switch connector.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
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 (-):	Is the voltage more than 8 V?	Go to step 11 .	Replace TCM. <Ref. to AT-44, 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 voltage less than 1 V?	Go to step 12 .	Replace TCM. <Ref. to AT-44, Transmission Control Module (TCM).>
12 CHECK POOR CONTACT.	Is there poor contact?	Repair poor contact.	A temporary poor contact of the connector or harness or connector in hold switch circuit.

DIAGNOSTIC PROCEDURE FOR NO-TROUBLE CODE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

J: CHECK FWD LIGHT

Step	Check	Yes	No
1 CHECK VEHICLE.	Is the target AWD vehicle?	Go to step 2.	Go to step Symptom Related Diagnostic. <Ref. to AT-129, Symptom Related Diagnostic.>
2 CHECK FWD LIGHT.	Does the LED of FWD light illuminate?	Check FWD light circuit. <Ref. to AT-102, CHECK FWD SWITCH., Diagnostic Procedure for No-trouble Code.>	Go to step Symptom Related Diagnostic. <Ref. to AT-129, Symptom Related Diagnostic.>

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".	• Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when select lever is in "P" or "N".	• Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	• Strainer • ATF level too high or too low
Noise occurs while driving in "D1".	• 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".	• Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in "D4".	• 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.	• Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in "N".	• TCM • Low clutch
Shock occurs when select lever is moved from "N" to "D".	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from "N" to "D".	• 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".	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from "N" to "R".	• 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).	• 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).	• 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).	• Select cable • Select lever • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in "R" range only (engine stalls).	• Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in "D", "3" range only (engine revving up).	• Low clutch • One-way clutch
Vehicle does not start in "D", "3" or "2" range only (engine revving up).	• Low clutch
Vehicle does not start in "D", "3" or "2" range only (engine stalls).	• Reverse clutch
Vehicle starts in "R" range only (engine revving up).	• Control valve
Acceleration during standing starts is poor (high stall rpm).	• 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).	• 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).	• TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in "R" (normal stall rpm).	• Control valve • High clutch • 2-4 brake • Planetary gear
No shift occurs from 1st to 2nd gear.	• 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.	• 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.	• TCM • Shift solenoid 1 • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is in "3" range.	• Inhibitor switch • TCM • Throttle position sensor • Control valve
Engine brake is not effected when select lever is in "3" or "2" range.	• Control valve
Engine brake is not effected when select lever is in "1" range.	• Control valve • Low & reverse brake
Shift characteristics are erroneous.	• Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • Control valve • Ground earth
No lock-up occurs.	• TCM • Throttle position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake is not effected.	• Select cable • Select lever • Parking mechanism
Shift lever cannot be moved or is hard to move from "P" range.	
ATF spurts out.	• ATF level too high
Differential oil spurts out.	• Differential gear oil too high
Differential oil level changes excessively.	• Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	• High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs from 1st to 2nd gear.	• 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.	• 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.	• 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.	• 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.	• 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.	• 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.	• 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.	• 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.	• 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.	• 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.	• TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper • Hold switch
Vibration occurs during turns (tight corner "braking" phenomenon).	• 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.	• 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.	• TCM • FWD switch • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	• Select cable • Select lever • Detent spring • Manual plate

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
Select lever is too high to move (unreasonable resistance).	• Detent spring • Manual plate
Select lever slips out of operation during acceleration or while driving on rough terrain.	• Select cable • Select lever • Detent spring • Manual plate

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

MANUAL TRANSMISSION AND DIFFERENTIAL

MT

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GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

1. General Description

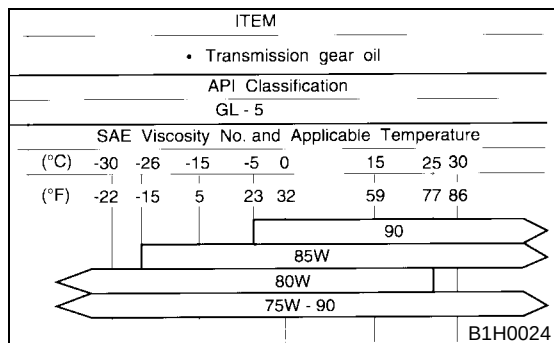
A: SPECIFICATIONS

1. MANUAL TRANSMISSION AND DIFFERENTIAL

Item			Model			
			FWD	AWD		
			1.6L	1.6L	2.0L	2.0L Turbo
Type			5-forward speeds with synchromesh and 1-reverse (5 x 2-forward speeds with synchromesh and 1-reverse) *1			
Transmission gear ratio		1st	3.454			3.454
		2nd	2.062			1.947
		3rd	1.448			1.366
		4th	1.088			0.972
		5th	0.825			0.738
		Reverse	3.333			
Auxiliary transmission gear ratio (Dual-range only)		High	—	1.000		—
		Low		1.447		
Front reduction gear	Final	Type of gear	Hypoid			
		Gear ratio	4.111		3.900	
Rear reduction gear	Transfer	Type of gear	—	Helical		
		Gear ratio	—	1.000		1.100
	Final	Type of gear	—	Hypoid		
		Gear ratio	—	4.111	3.900	3.545
Front differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)			
Center differential	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	FWD model		3.3 ℓ (3.5 US qt, 2.9 Imp qt)	—		
	AWD model	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)		—

2. TRANSMISSION GEAR OIL

Recommended oil



GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

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

• AWD model

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)

• FWD model

Selection of 1st driven gear

1st driven gear	
Outer diameter of bushing mm (in)	Part No.
42.019 — 42.033 (1.6543 — 1.6548)	32231AA840
42.005 — 42.018 (1.6537 — 1.6543)	32231AA850
41.990 — 42.004 (1.6531 — 1.6537)	32231AA860

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)		
Part No.	Mark	Remarks
32812AA201	4	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA211	5	Standard
32812AA221	6	Become distant from 5th gear by 0.2 mm (0.008 in)

5th shifter fork (Turbo)		
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)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

9. TRANSFER CASE OR REAR 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.

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:

T: Tight

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)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

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 (0.0004 — 0.0059 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

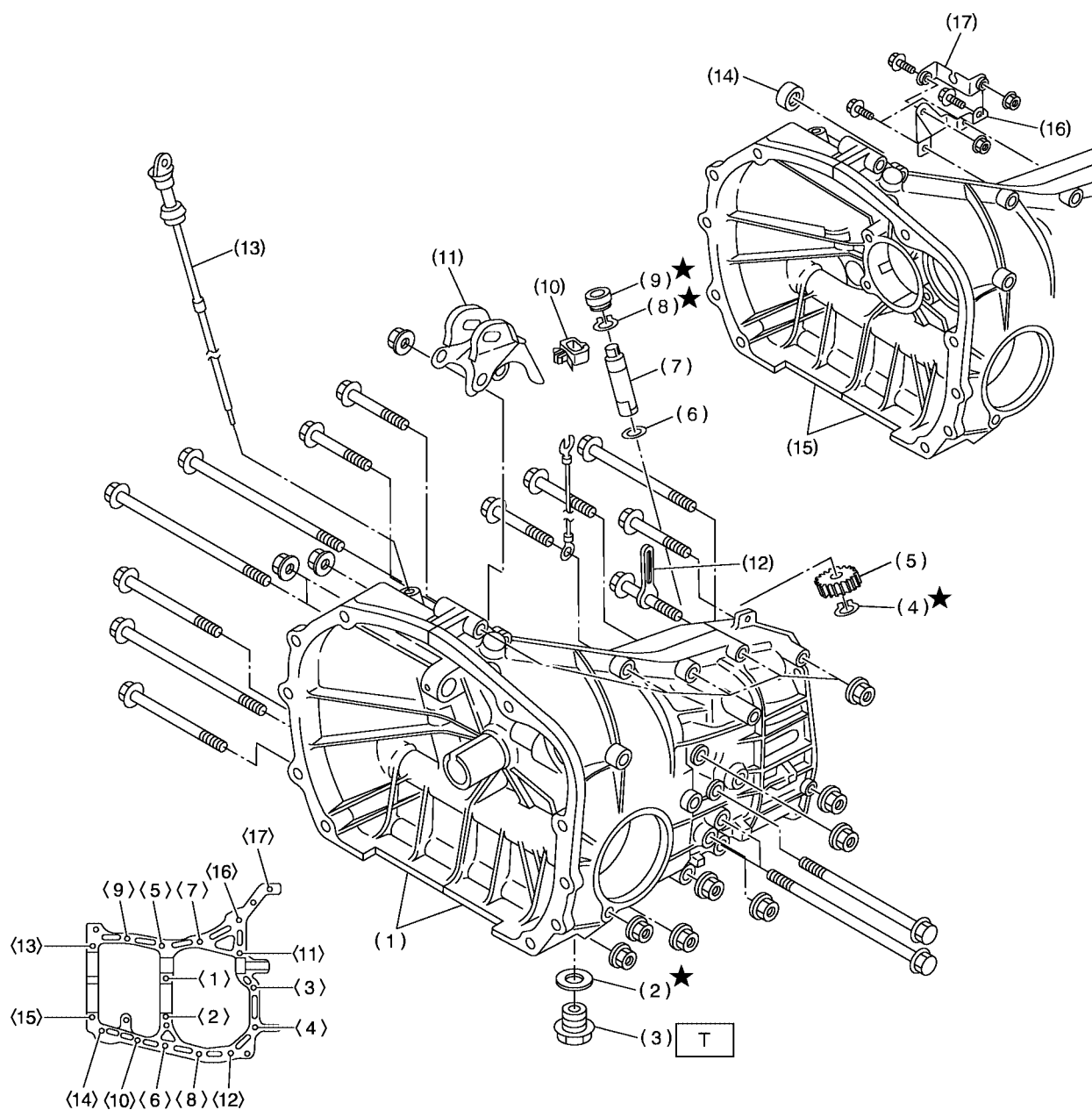
MANUAL TRANSMISSION AND DIFFERENTIAL

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

B: COMPONENT

1. TRANSMISSION CASE



B3M2174A

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

- | | | |
|-----------------------------|--|--|
| (1) Transmission case ASSY | (9) Oil seal | (16) High-low cable bracket A (Dual-range) |
| (2) Gasket | (10) Clamp | |
| (3) Drain plug | (11) Pitching stopper bracket | (17) High-low cable bracket B (Dual-range) |
| (4) Snap ring (Outer) | (12) Clip | |
| (5) Speedometer driven gear | (13) Oil level gauge | |
| (6) Washer | (14) Oil seal (Dual-range) | |
| (7) Speedometer shaft | (15) Transmission case ASSY (Dual-range) | |
| (8) Snap ring (Outer) | | |

Tightening torque: N·m (kgf-m, ft-lb)

T: 44 (4.5, 32.5)

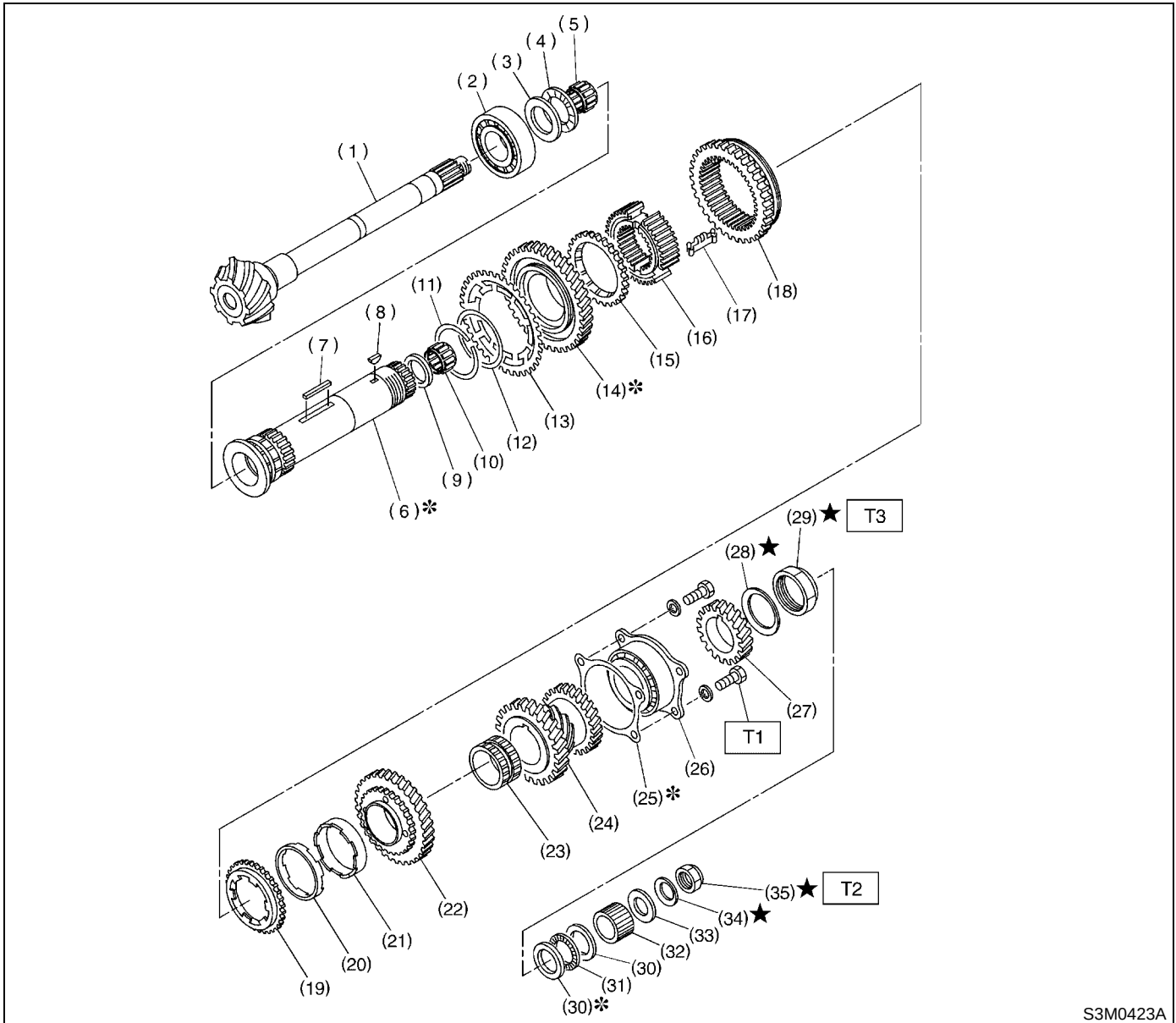
Size	All models	Tightening torque: N·m (kgf-m, ft-lb)
8 mm bolt	<5> — <15>	25 (2.5, 18.1)
10 mm bolt	<1> — <4> <16> — <17>	39 (4.0, 28.9)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

2. DRIVE PINION ASSEMBLY

• AWD MODEL



- (1) Drive pinion shaft
- (2) Roller bearing
- (3) Washer
- (4) Thrust bearing
- (5) Needle bearing
- (6) Driven shaft
- (7) Key
- (8) Woodruff key
- (9) Drive pinion collar
- (10) Needle bearing
- (11) Snap ring (Outer)
- (12) Washer
- (13) Sub gear
- (14) 1st driven gear

- (15) Baulk ring
- (16) 1st-2nd synchronizer hub
- (17) Insert key
- (18) Reverse driven gear
- (19) Outer baulk ring
- (20) Synchro cone
- (21) Inner baulk ring
- (22) 2nd driven gear
- (23) 2nd driven gear bush
- (24) 3rd-4th driven gear
- (25) Driven pinion shim
- (26) Roller bearing
- (27) 5th driven gear
- (28) Lock washer

- (29) Lock nut
- (30) Washer
- (31) Thrust bearing
- (32) Differential bevel gear sleeve
- (33) Washer
- (34) Lock washer
- (35) Lock nut

Tightening torque: N·m (kgf·m, ft·lb)

T1: 29 (3.0, 21.7)

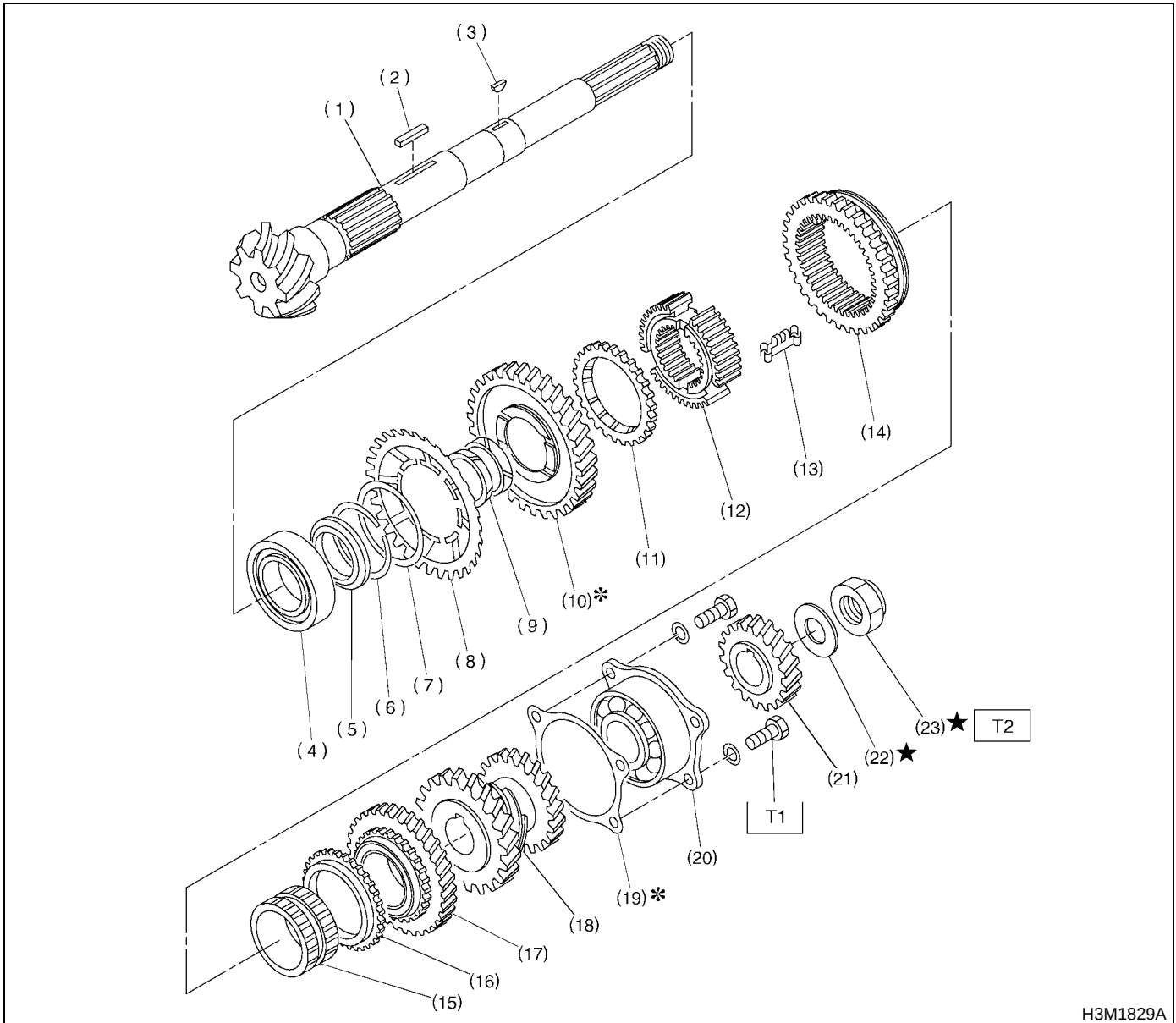
T2: 118 (12.0, 86.8)

T3: 265 (27, 195)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

• FWD MODEL



H3M1829A

- | | | |
|---------------------------|-------------------------------|----------------------|
| (1) Drive pinion shaft | (11) 1st baulk ring | (21) 5th driven gear |
| (2) Key | (12) 1st-2nd synchronizer hub | (22) Lock washer |
| (3) Woodruff key | (13) Insert key | (23) Lock nut |
| (4) Roller bearing | (14) Reverse driven gear | |
| (5) 1st gear thrust plate | (15) 2nd baulk ring | |
| (6) Outer snap ring | (16) 2nd driven gear | |
| (7) Washer | (17) 2nd gear bushing | |
| (8) 1st sub gear | (18) 3rd-4th driven gear | |
| (9) 1st gear bushing | (19) Drive pinion shim | |
| (10) 1st driven gear | (20) Ball bearing | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 29 (3.0, 21.7)

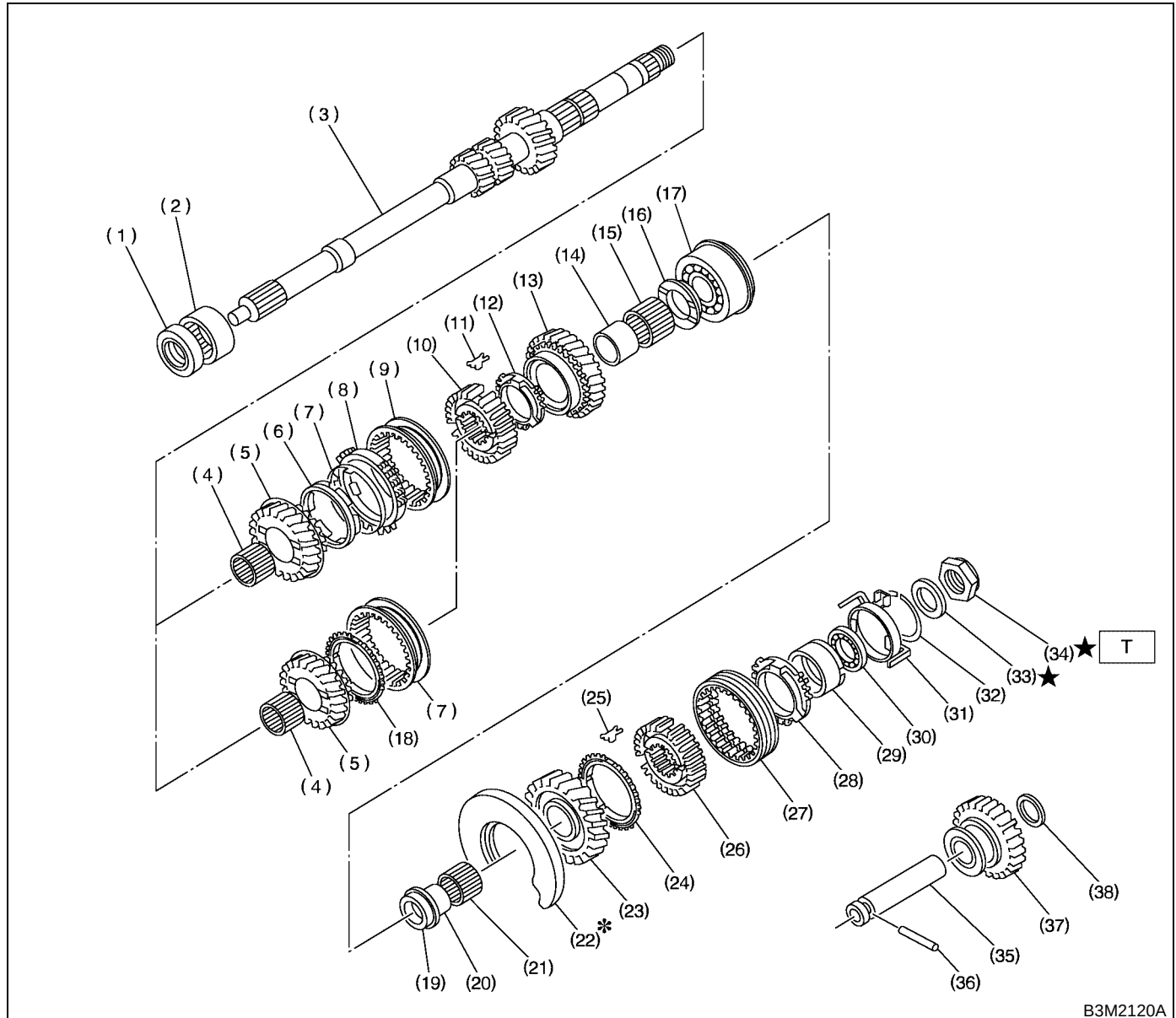
T2: 118 (12.0, 86.8)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

3. MAIN SHAFT ASSEMBLY

• AWD MODEL



B3M2120A

- | | | |
|------------------------------------|-----------------------------------|-------------------------------|
| (1) Oil seal | (15) Needle bearing | (29) Rev synchro cone |
| (2) Needle bearing | (16) 4th gear thrust washer | (30) Ball bearing |
| (3) Transmission main shaft | (17) Ball bearing | (31) Synchro cone stopper |
| (4) Needle bearing | (18) Baulk ring (Non-turbo model) | (32) Snap ring |
| (5) 3rd drive gear | (19) 5th gear thrust washer | (33) Lock washer |
| (6) Inner baulk ring (Turbo model) | (20) 5th needle bearing race | (34) Lock nut |
| (7) 3rd synchro cone (Turbo model) | (21) Needle bearing | (35) Reverse idler gear shaft |
| (8) Outer baulk ring (Turbo model) | (22) Main shaft rear plate | (36) Straight pin |
| (9) 3rd-4th coupling sleeve | (23) 5th drive gear | (37) Reverse idler gear |
| (10) 3rd-4th synchronizer hub | (24) 5th baulk ring | (38) Washer |
| (11) 3rd-4th shifting insert key | (25) 5th-Rev shifting insert key | |
| (12) 4th baulk ring | (26) 5th-Rev synchronizer hub | |
| (13) 4th drive gear | (27) 5th-Rev coupling sleeve | |
| (14) 4th needle bearing race | (28) Rev baulk ring | |

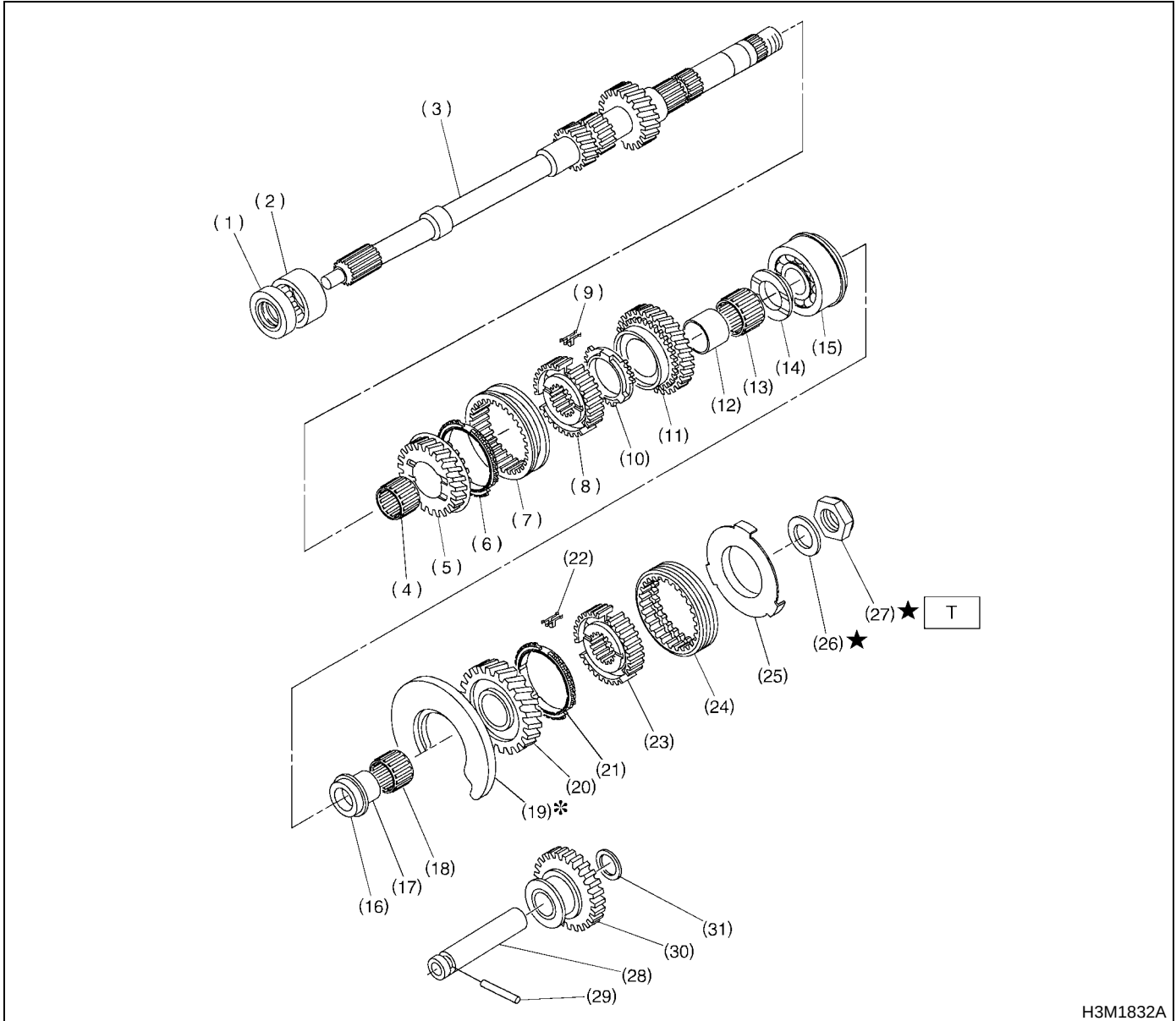
Tightening torque: N·m (kgf-m, ft-lb)

T: 118 (12.0, 86.8)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

• FWD MODEL



H3M1832A

- | | | |
|------------------------------|------------------------------------|-------------------------------|
| (1) Oil seal | (13) Needle bearing | (25) Insert stopper plate |
| (2) Needle bearing | (14) 4th gear thrust washer | (26) Lock washer |
| (3) Transmission main shaft | (15) Ball bearing | (27) Lock nut |
| (4) Needle bearing | (16) 5th gear thrust washer | (28) Straight pin |
| (5) 3rd drive gear | (17) 5th needle bearing race | (29) Reverse idler gear shaft |
| (6) 3rd baulk ring | (18) Needle bearing | (30) Reverse idler gear |
| (7) Coupling sleeve | (19) Main shaft rear plate | (31) Washer |
| (8) Synchronizer hub | (20) 5th drive gear | |
| (9) Shifting insert key | (21) 5th baulk ring | |
| (10) 4th baulk ring | (22) Shifting insert key (5th-Rev) | |
| (11) 4th drive gear | (23) Synchronizer hub (5th-Rev) | |
| (12) 4th needle bearing race | (24) Coupling sleeve (5th-Rev) | |

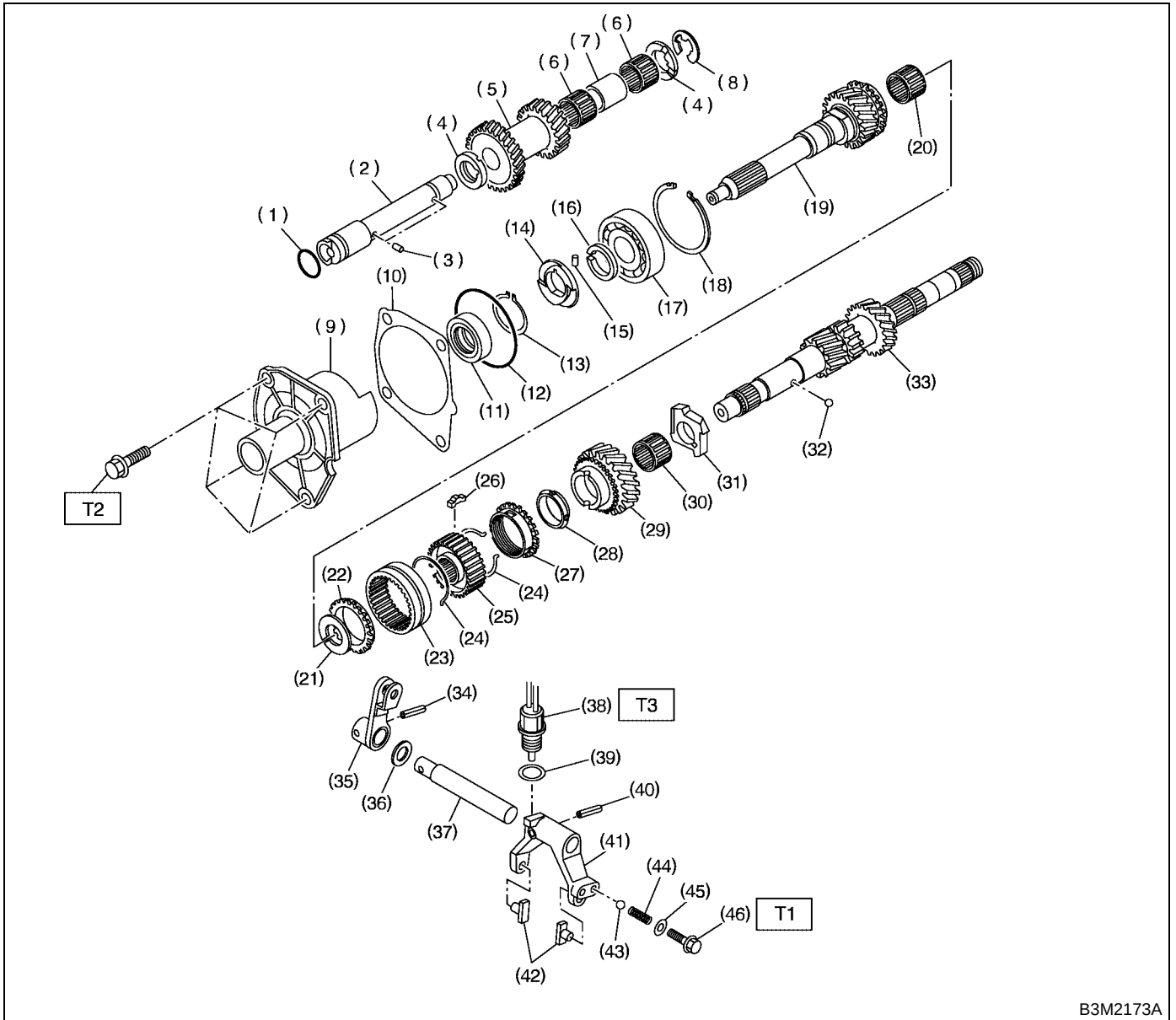
Tightening torque: N·m (kgf-m, ft-lb)

T: 118 (12.0, 86.8)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

4. AUXILIARY TRANSMISSION GEARS



B3M2173A

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

(1) O-ring	(19) Input shaft	(37) High-low shifter shaft
(2) High-low counter shaft	(20) Needle bearing	(38) Low switch
(3) Straight pin	(21) Snap ring (Outer-25)	(39) Gasket
(4) High-low counter washer	(22) High-low baulk ring	(40) High-low shifter fork
(5) Counter gear	(23) High-low coupling sleeve	(41) Straight pin
(6) Needle bearing	(24) High-low synchronizer spring	(42) High-low shifter piece
(7) Counter gear collar	(25) High-low synchronizer hub	(43) Ball
(8) Snap ring (Outer-19)	(26) Shifting insert	(44) Spring
(9) Input shaft holder	(27) High-low baulk ring	(45) Gasket
(10) Input shaft shim	(28) Friction damper	(46) Plug
(11) Oil seal	(29) Input low gear	
(12) O-ring	(30) Needle bearing	
(13) Snap ring (Outer-28)	(31) Input low gear spacer	
(14) Oil squeeze	(32) Ball	
(15) Straight pin	(33) Main shaft	
(16) Snap ring (Outer-28)	(34) Straight pin	
(17) Ball bearing	(35) High-low shifter lever	
(18) Snap ring (Inner-68)	(36) Washer	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 15.7 (1.6, 11.6)

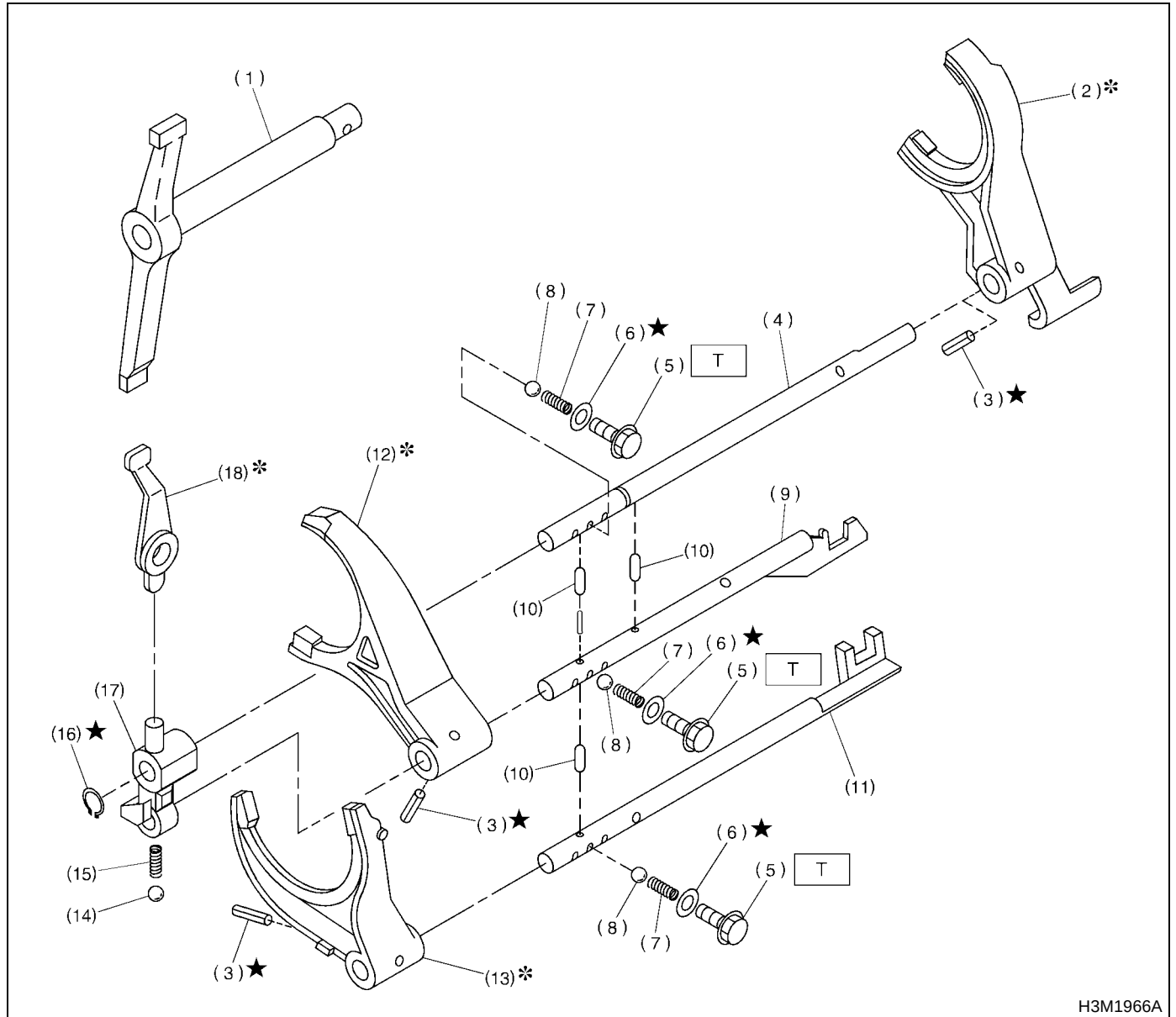
T2: 20 (2, 14.5)

T3: 25 (2.5, 18.1)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

5. SHIFTER FORK AND SHIFTER ROD



H3M1966A

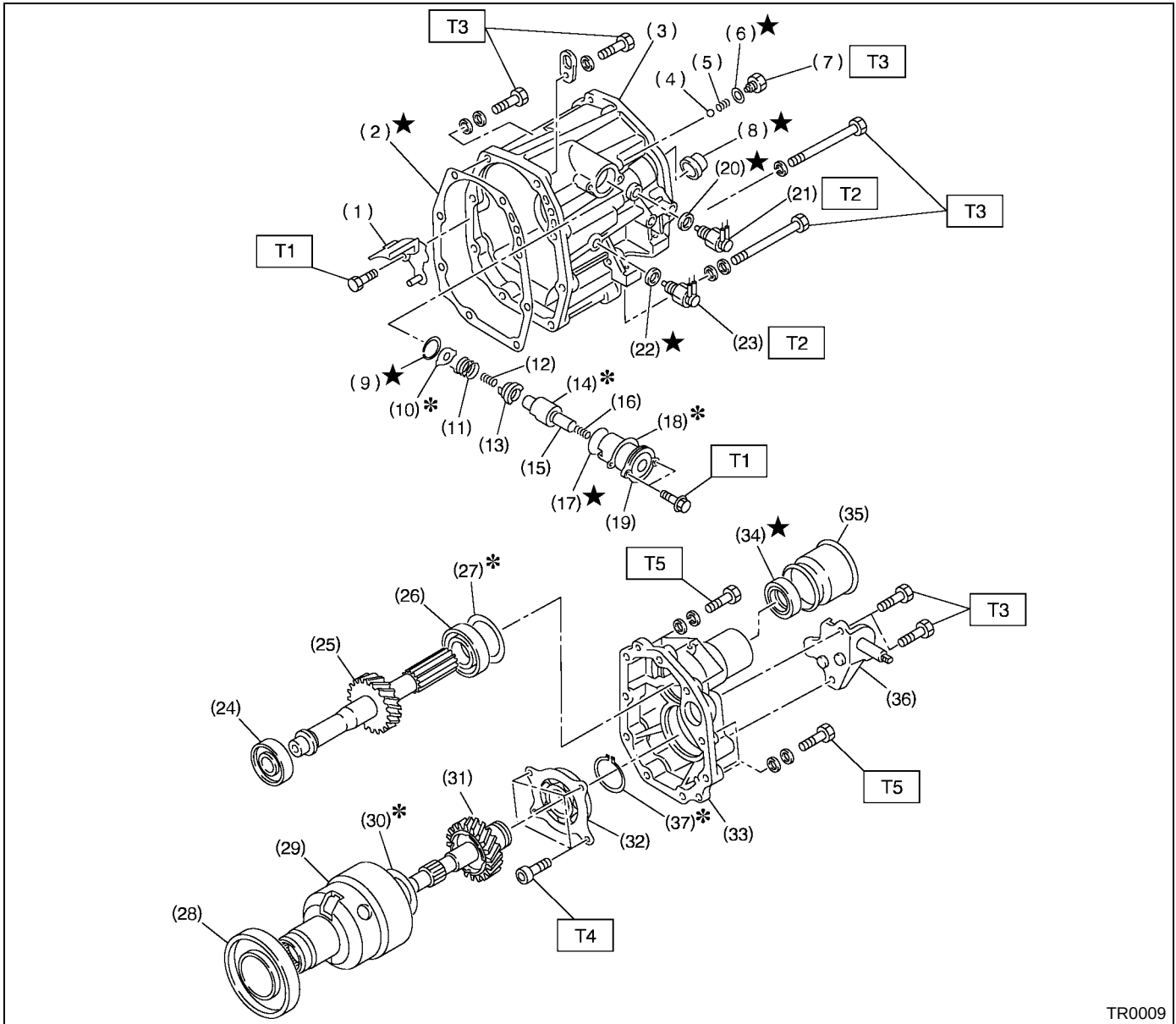
- | | | |
|--------------------------|---------------------------|----------------------------|
| (1) Shifter arm | (9) 3rd-4th fork rod | (17) Reverse fork rod arm |
| (2) 5th shifter fork | (10) Interlock plunger | (18) Reverse shifter lever |
| (3) Straight pin | (11) 1st-2nd fork rod | |
| (4) Reverse 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: 19.6 (2.0, 14.5)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

6. TRANSFER CASE AND EXTENSION



TR0009

- | | | |
|----------------------------|----------------------------|--------------------------|
| (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 |
| (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: 10 (1.0, 7.2)

T3: 25 (2.5, 18.1)

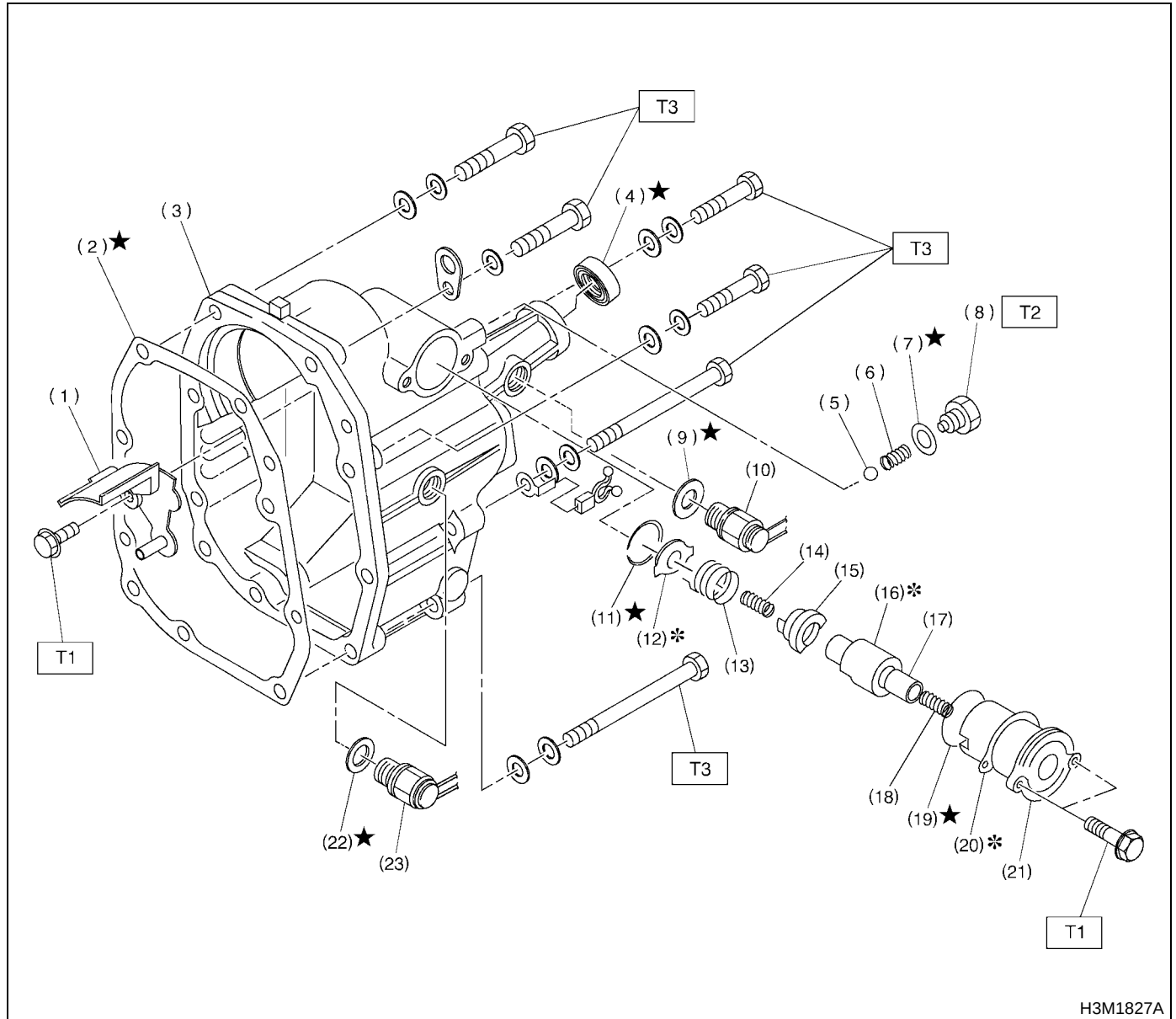
T4: 26 (2.7, 20)

T5: 40 (4.1, 29.7)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

7. REAR CASE



- | | | |
|---------------------------|----------------------------|---------------------------|
| (1) Oil guide | (11) Snap ring (Inner) | (21) Reverse check sleeve |
| (2) Case gasket | (12) Reverse check plate | (22) Gasket |
| (3) Rear case | (13) Reverse check spring | (23) Back-up light switch |
| (4) Oil seal | (14) Reverse return spring | |
| (5) Ball | (15) Reverse check cam | |
| (6) Reverse accent spring | (16) Reverse accent shaft | |
| (7) Washer | (17) Return spring cap | |
| (8) Plug | (18) Return spring | |
| (9) Gasket | (19) O-ring | |
| (10) Neutral switch | (20) Adjusting select shim | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

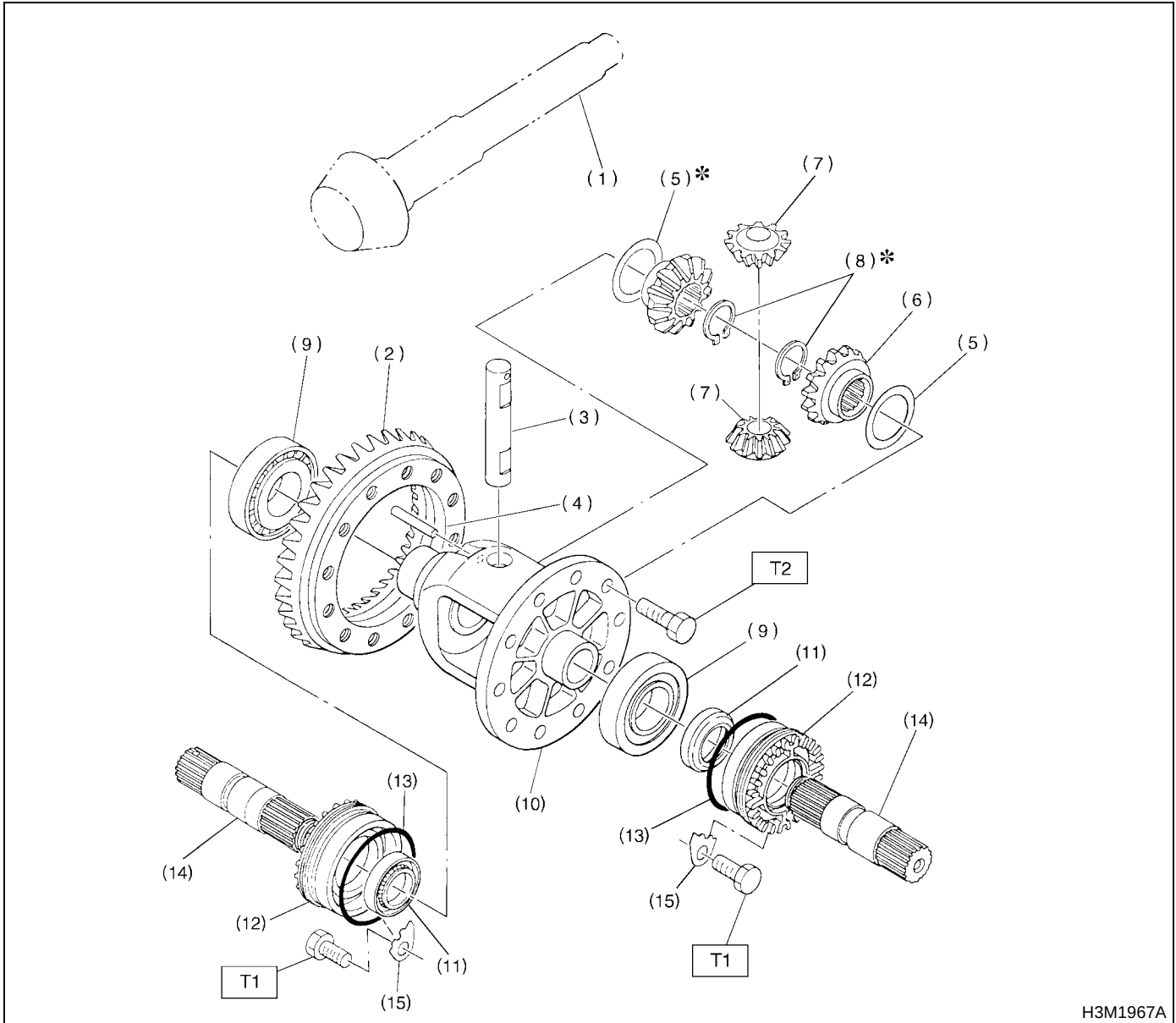
T2: 10 (1.0, 7.2)

T3: 25 (2.5, 18.1)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

8. FRONT DIFFERENTIAL



- | | |
|-------------------------------|---------------------------------|
| (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)

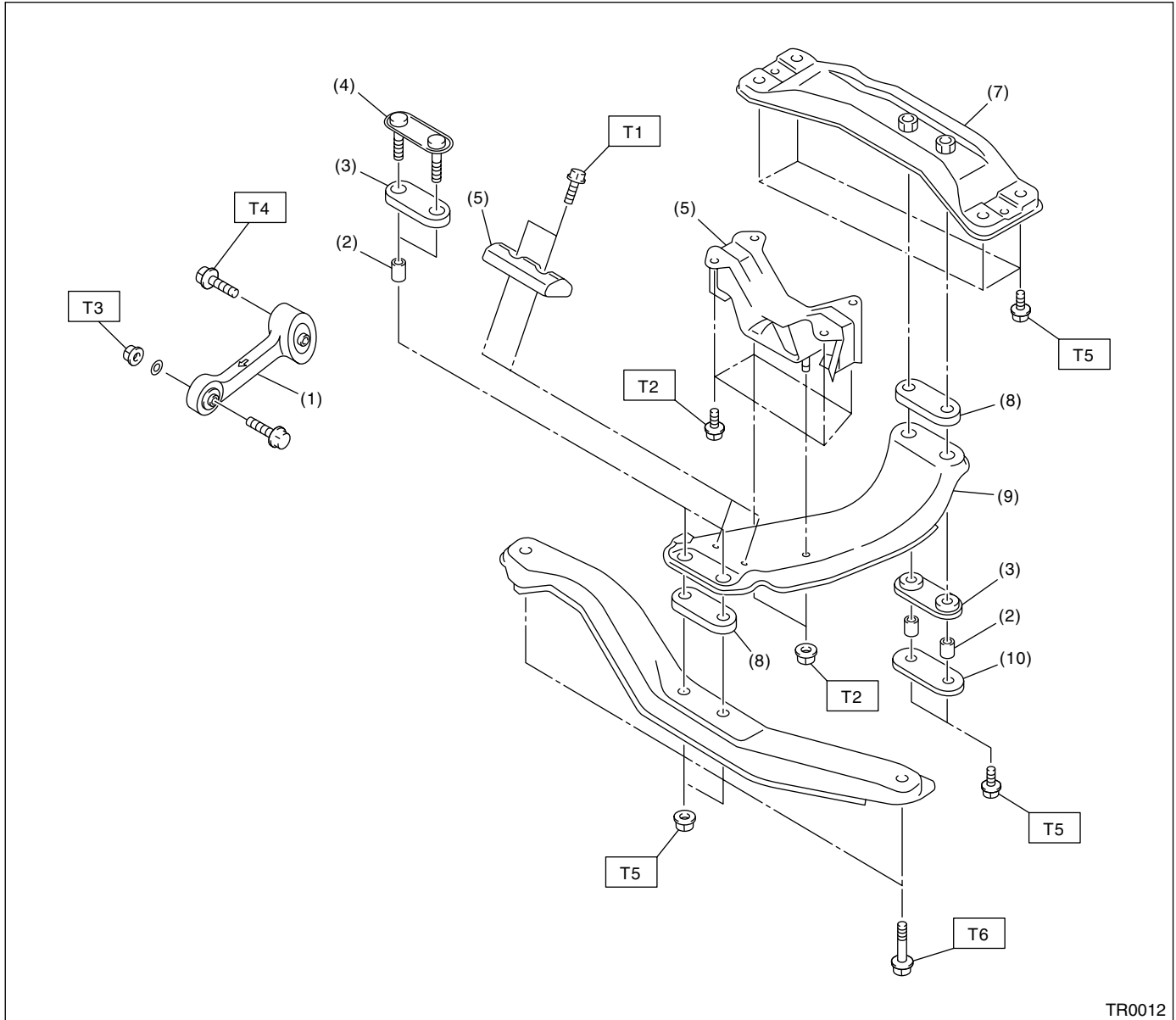
T2: 62 (6.3, 45.6)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

9. TRANSMISSION MOUNTING

• 2.0L MODEL



- | | |
|-----------------------------------|------------------------|
| (1) Pitching stopper (Resin type) | (8) Cushion D |
| (2) Spacer | (9) Center crossmember |
| (3) Cushion C | (10) Rear plate |
| (4) Front plate | (11) Front crossmember |
| (5) Damper (Turbo model) | |
| (6) Rear cushion rubber | |
| (7) Rear crossmember | |

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)

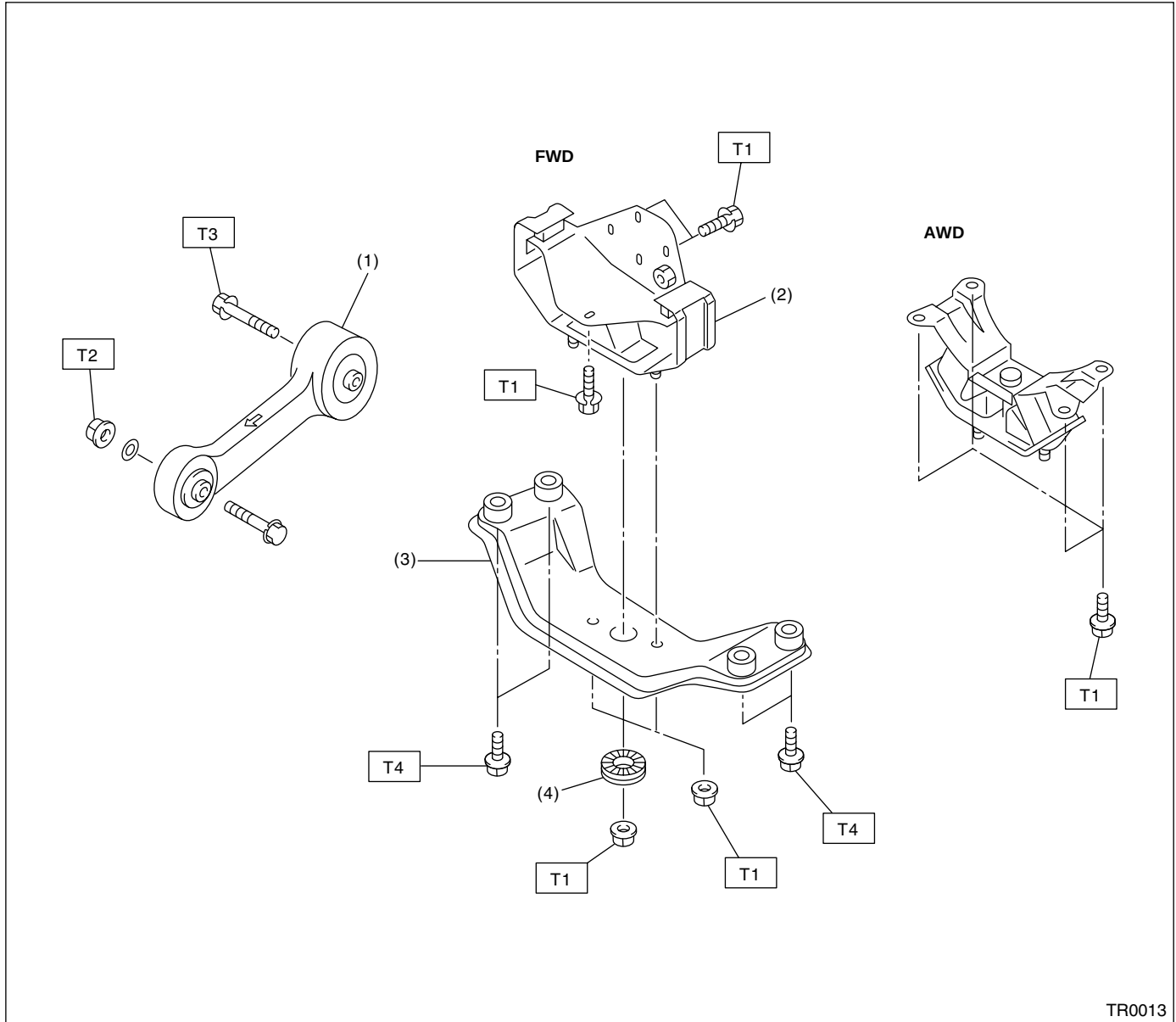
T5: 70 (7.1, 51)

T6: 140 (14.3, 103)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

• 1.6L MODEL



- (1) Pitching stopper
- (2) Rear cushion rubber
- (3) Rear crossmember
- (4) Rubber cushion

Tightening torque: N·m (kgf-m, ft-lb)

T1: 35 (3.57, 25.8)

T2: 50 (5.1, 36.9)

T3: 58 (5.9, 42.8)

T4: 70 (7.1, 51.6)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

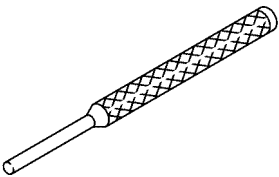
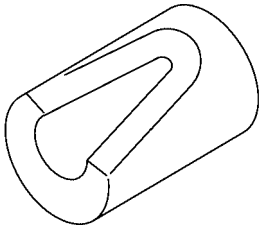
C: CAUTION

- 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old seal.

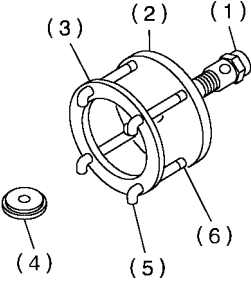
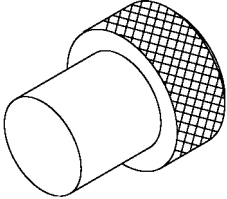
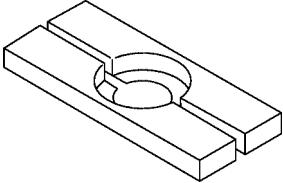
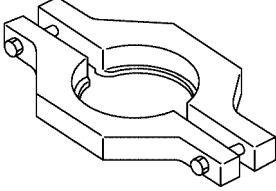
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1938	398791700	REMOVER	Used for removing and installing spring pin (6 mm).
 B3M1939	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.

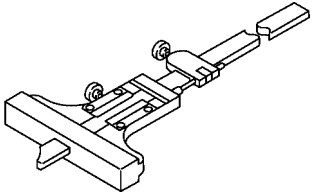
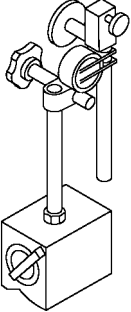
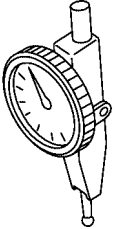
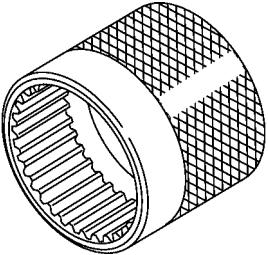
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1940A	399527700	PULLER SET	Used for removing and installing roller bearing (Differential). (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000)
 B3M1941	399780104	WEIGHT	Used for measuring preload on roller bearing.
 B3M1942	498077000	REMOVER	Used for removing roller bearing of drive pinion shaft.
 B3M1943	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.

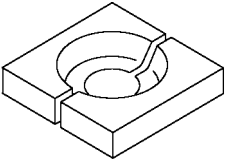
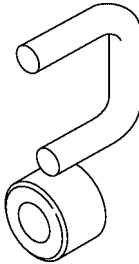
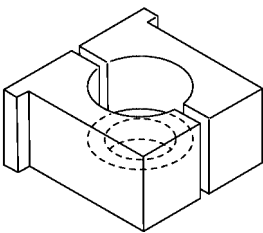
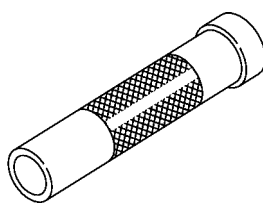
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1944	498147000	DEPTH GAUGE	Used for adjusting main shaft axial end play.
 B3M1945	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 B3M1946	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).
 B3M1947	498427100	STOPPER	Used for securing the drive pinion shaft assembly and driven gear assembly when removing the drive pinion shaft assembly lock nut.

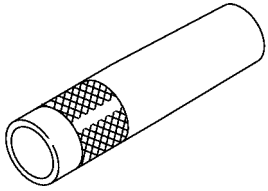
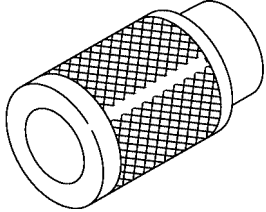
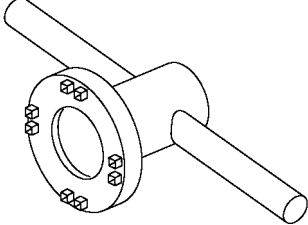
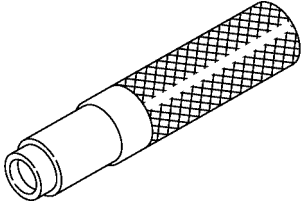
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1911	498517000	REPLACER	- Used for removing drive pinion thrust plate and roller bearing race. - For FWD.
 B3M1948	498787100	MAIN SHAFT STOPPER	Used for removing and installing transmission main shaft lock nut.
 B3M1949	498937000	TRANSMISSION HOLDER	Used for removing and installing transmission main shaft lock nut.
 B3M1950	499277100	BUSH 1-2 INSTALLER	Used for installing 1st driven gear thrust plate and 1st-2nd driven gear bush.

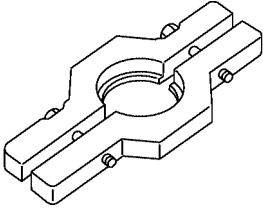
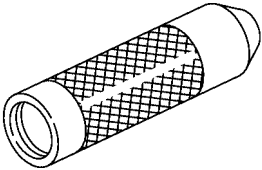
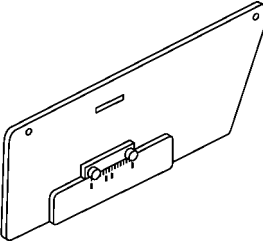
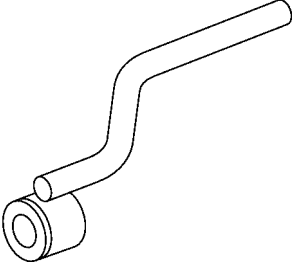
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1951	499277200	INSTALLER	Used for press-fitting the 2nd driven gear, roller bearings, and 5th driven gear onto the driven shaft.
 B3M1952	499757002	INSTALLER	- 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).
 B3M1953	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 B3M1954	499827000	PRESS	Used for installing speedometer oil seal when installing speedometer cable to transmission.

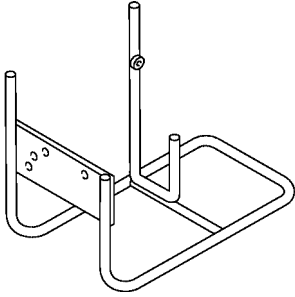
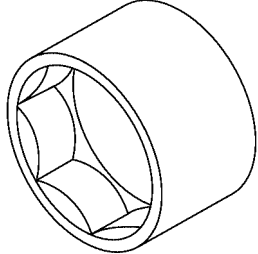
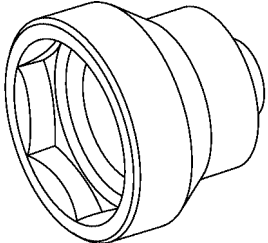
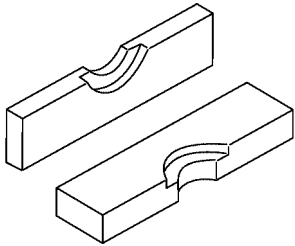
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1955	499857000	5TH DRIVEN GEAR REMOVER	Used for removing 5th driven gear.
 B3M1956	499877000	RACE 4-5 INSTALLER	• Used for installing 4th needle bearing race and ball bearing onto transmission main shaft. • Used with REMOVER (899714110).
 B3M1957	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting drive pinion shim.
 B3M1958	499927100	HANDLE	Used for fitting transmission main shaft.

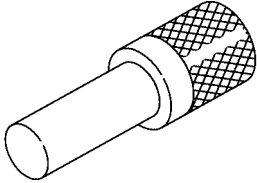
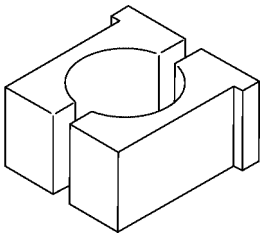
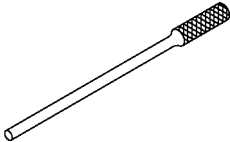
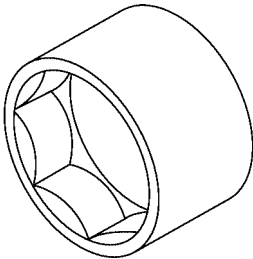
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1959	499937100	TRANSMISSION STAND	Stand used for transmission disassembly and assembly.
 B3M1960	499987003	SOCKET WRENCH (35)	Used for removing and installing driven pinion lock nut and main shaft lock nut.
 B3M1961	499987300	SOCKET WRENCH (50)	Used for removing and installing driven gear assembly lock nut.
 B3M1962	899714110	REMOVER	Used for fixing transmission main shaft, drive pinion, rear drive shaft.

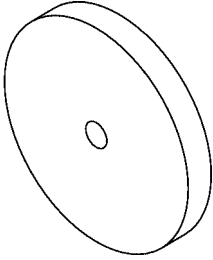
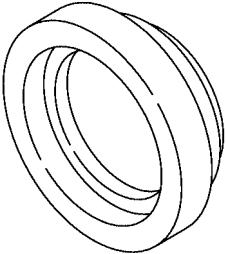
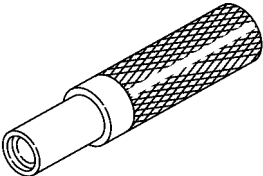
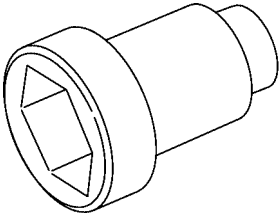
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1963	899864100	REMOVER	Used for removing parts on transmission main shaft and drive pinion.
 B3M1964	899884100	HOLDER	Used for tightening lock nut on sleeve.
 B3M1965	899904100	REMOVER	Used for removing and installing straight pin.
 B3M1966	899988608	SOCKET WRENCH (27)	Used for removing and installing drive pinion lock nut.

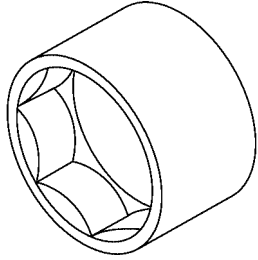
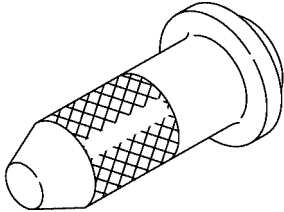
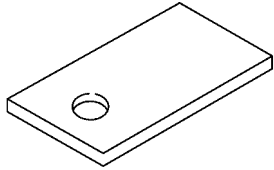
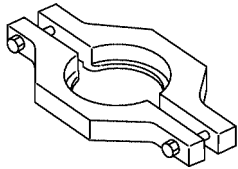
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1967	398497701	ADAPTER	- Used for installing roller bearing onto differential case. - Used with INSTALLER (499277100).
 B3M1968	499587000	INSTALLER	Used for installing driven gears to driven shaft.
 B3M1969	899824100	PRESS	Used for installing speedometer shaft oil seal.
 B3M1970	499987100	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.

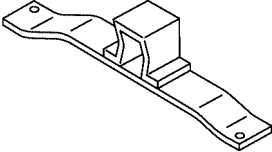
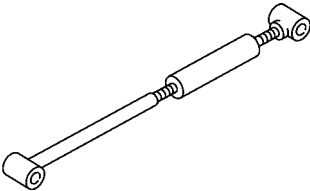
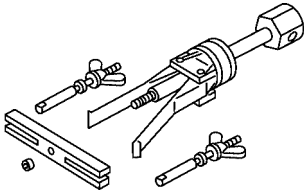
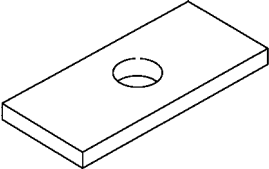
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1971	899984103	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 B3M1972	498057300	INSTALLER	Used for installing extension oil seal.
 B3M1973	498255400	PLATE	Used for measuring backlash.
 B3M1974	498077400	SYNCHRONIZER CONE REMOVER	Used for removing synchronizer cone of main shaft.

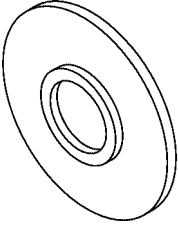
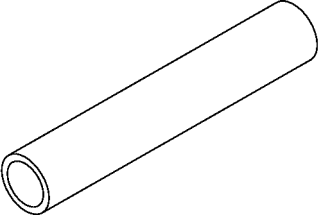
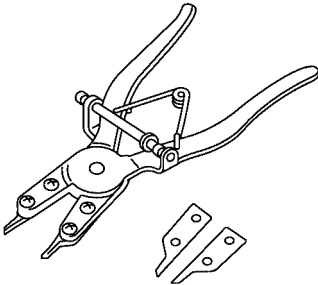
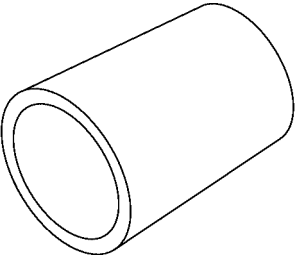
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1975	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.
 B3M1976	41099AA020	ENGINE SUPPORT	Used for supporting engine.
 B3M1977	398527700	PULLER ASSY	Used for removing and installing extension case roller bearing.
 B3M1978	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.

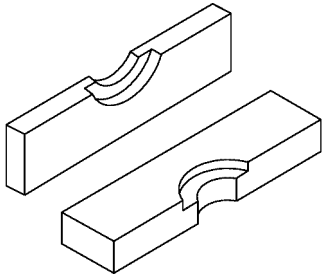
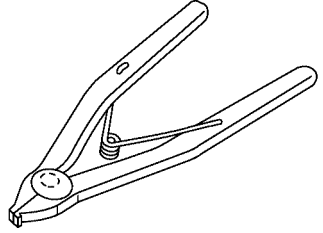
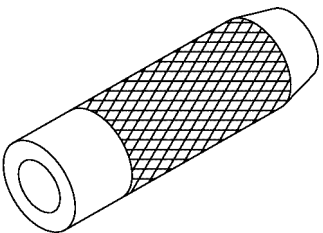
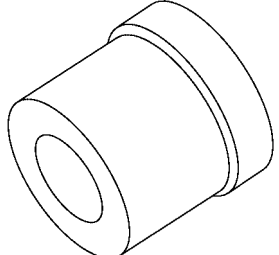
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1905	38177700	INSTALLER	- Used for installing bearing cone of transfer driven gear (transfer case side). - Used for installing ball bearing of transfer drive gear.
 B3M2122	398507703	DUMMY COLLAR	- Used for installing input shaft holder oil seal. - For dual-range model.
 B3M2123	398663600	PLIERS	- Used for removing and installing input shaft snap ring. - For dual-range model.
 B3M2124	499757001	SNAP RING GUIDE	- Used for installing snap ring (OUT 25). - For dual-range model.

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M2125	899858600	RETAINER	- Used for removing ball bearing. - For dual-range model.
 B3M2126	899474100	EXPANDER	- Used for removing and installing snap ring. - For dual-range model.
 B3M2127	899580100	INSTALLER	- Used when pressing ball bearings into input shaft. - For dual-range model.
 B3M2129	399513600	INSTALLER	- Used when pressing ball bearings into input shaft. - For dual-range model.

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

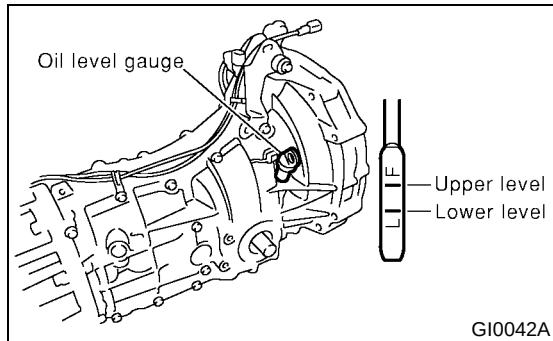
TRANSMISSION GEAR OIL

MANUAL TRANSMISSION AND DIFFERENTIAL

2. Transmission Gear Oil

A: INSPECTION

- 1) Park vehicle on a level surface.
- 2) Turn ignition switch to OFF, and wait until the engine cools.
- 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 on it. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



B: REPLACEMENT

- 1) Pull out oil level gauge.
- 2) Lift-up the vehicle.
- 3) Drain transmission gear oil completely.

CAUTION:

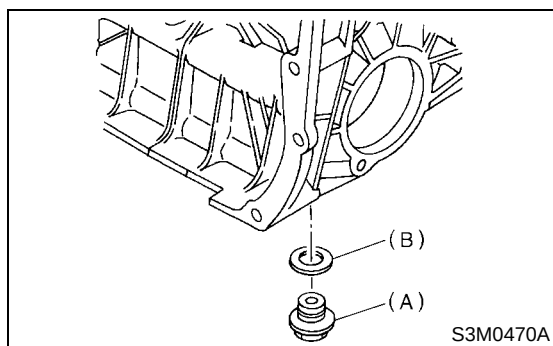
Directly after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.

NOTE:

Tighten transmission gear oil drain plug after draining transmission gear oil.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Drain plug

(B) Gasket

- 5) Pour gear oil into the gauge hole.

Recommended gear oil:

Use GL-5 or equivalent.

Gear oil capacity:

FWD model;

3.3 ℓ (3.5 US qt, 2.9 Imp qt)

AWD Single-range model;

3.5 ℓ (3.7 US qt, 3.1 Imp qt)

AWD Dual-range model;

4.0 ℓ (4.2 US qt, 3.5 Imp qt)

- 6) Check the level of the transmission gear oil.

CAUTION:

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.

NOTE:

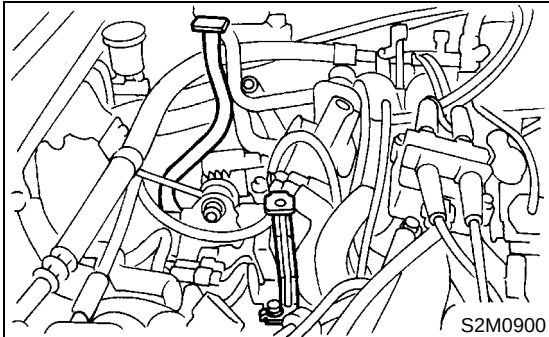
The level should be within the specified range marked on the gauge.

- 4) Lower the vehicle.

3. Manual Transmission Assembly

A: REMOVAL

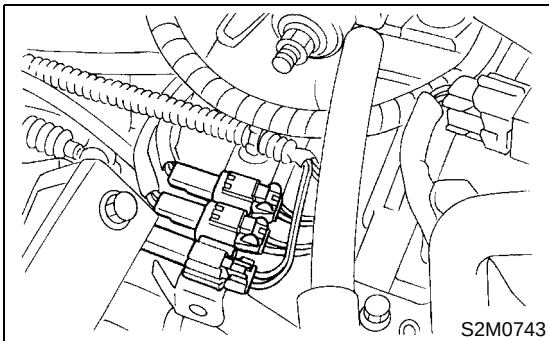
- 1) Open front hood fully, and support with stay.
- 2) Disconnect battery ground terminal.
- 3) Remove air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
- 4) Remove air cleaner case stay. (Non-turbo model)



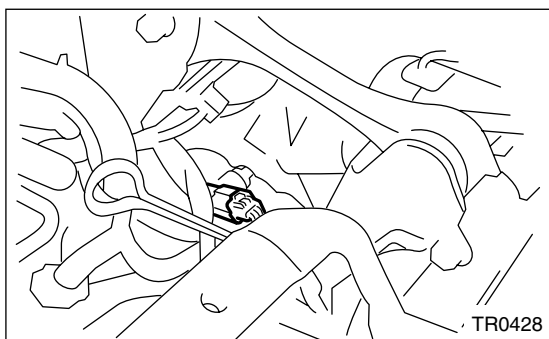
- 5) Remove intercooler (Turbo model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
- 6) Disconnect the following connectors.

- (1) Neutral position switch connector
- (2) Back-up light switch connector
- (3) High-low switch connector (Dual-range model)

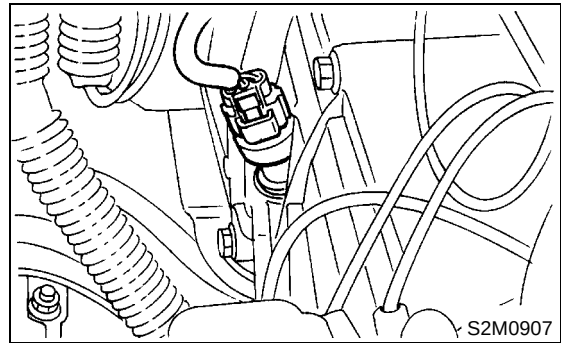
Non-turbo model



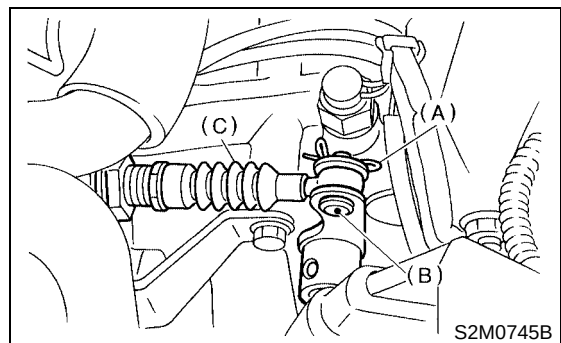
Turbo model



- (4) Vehicle speed sensor



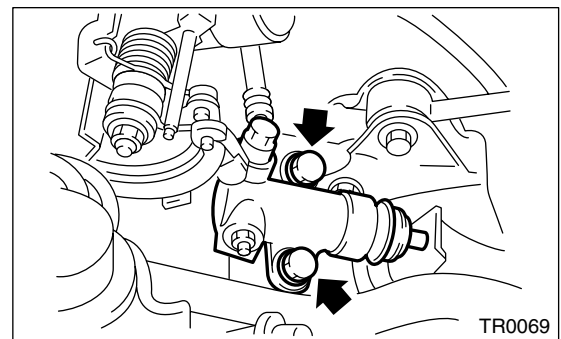
- 7) Remove snap pin and pin from the drive select cable.
- 8) Remove the drive select cable on the transmission. (Dual-range model)



- (A) Snap pin
(B) Pin
(C) Drive select cable

- 9) Remove starter. <Ref. to SC-5, REMOVAL, Starter.>
- 10) Remove operating cylinder from transmission. (2.0 L model)

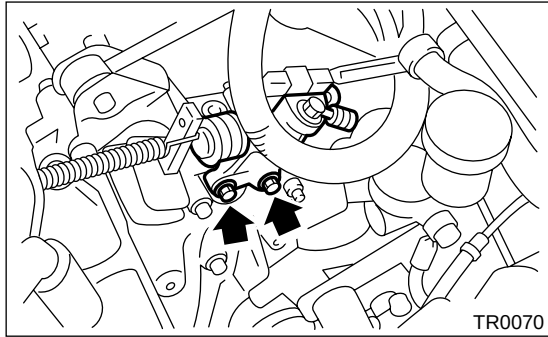
- Non-turbo model



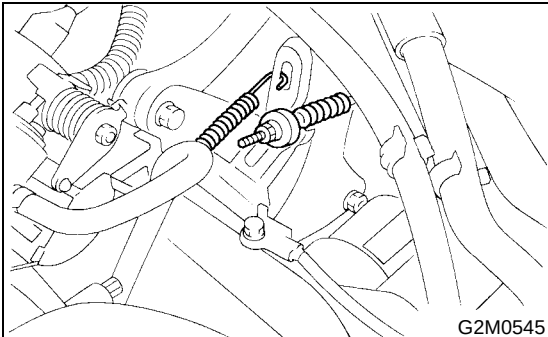
MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

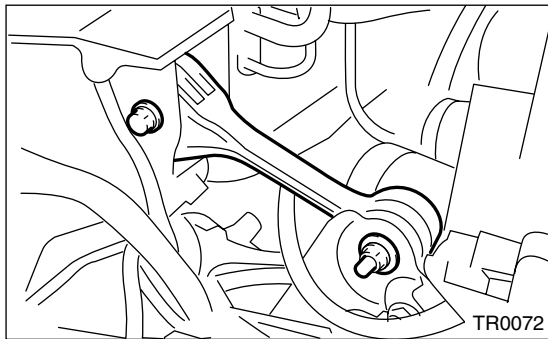
- Turbo model



- 11) Disconnect the return spring and clutch cable.
(1.6 L model)



- 12) Remove pitching stopper.

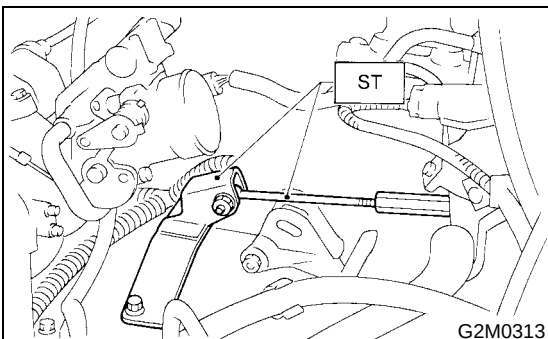


- 13) Set ST.

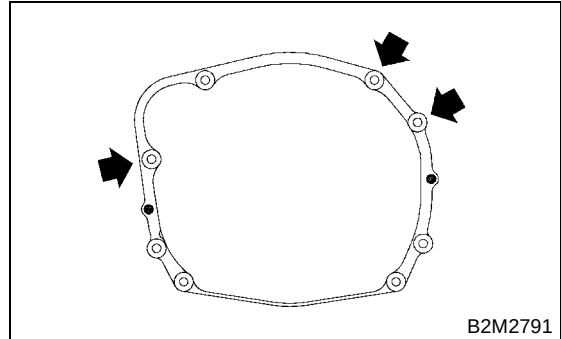
NOTE:

Also is available Part No. 927670000.

ST 41099AA020 ENGINE SUPPORT ASSY



- 14) Remove bolt which holds right upper side of transmission to engine.



- 15) Remove front and center exhaust pipes. (Non-turbo model) with OBD <Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.> without OBD <Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

- 16) Remove center exhaust pipe. (Turbo model). <Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>

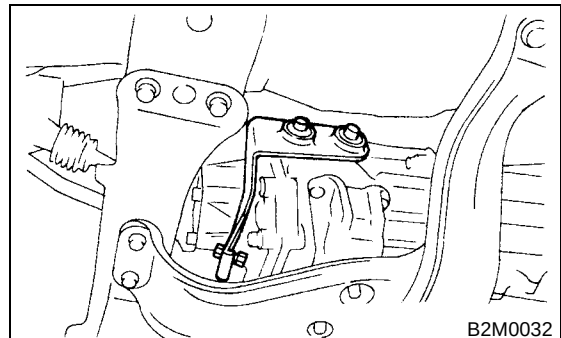
- 17) Remove rear exhaust pipe and muffler.

CAUTION:

When removing exhaust pipes, be careful each exhaust pipe does not drop out.

- 18) Remove heat shield cover.

- 19) Remove hanger bracket from right side of transmission.



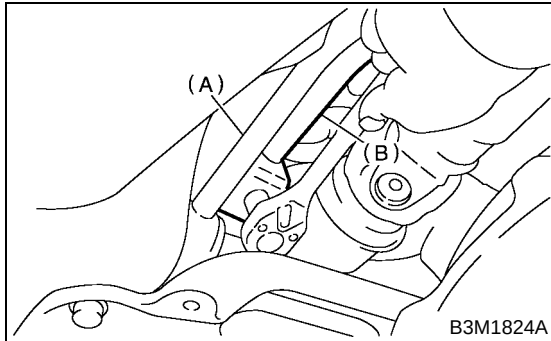
- 20) Remove propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>

MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

21) Remove gear shift rod and stay from transmission.

- (1) Disconnect stay from transmission.
- (2) Disconnect rod from transmission.

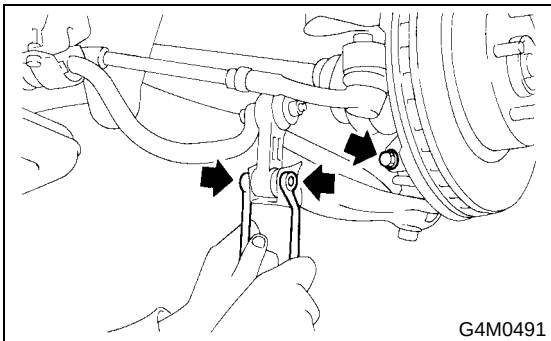


- (A) Stay
(B) Rod

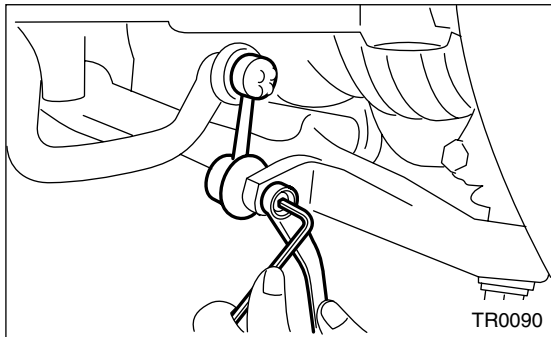
22) Disconnect stabilizer link from transverse link.

23) Remove bolt securing ball joint of transverse link to housing.

- Except sedan turbo model



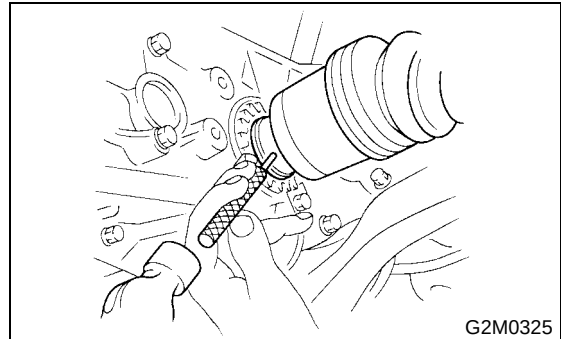
- Sedan turbo model



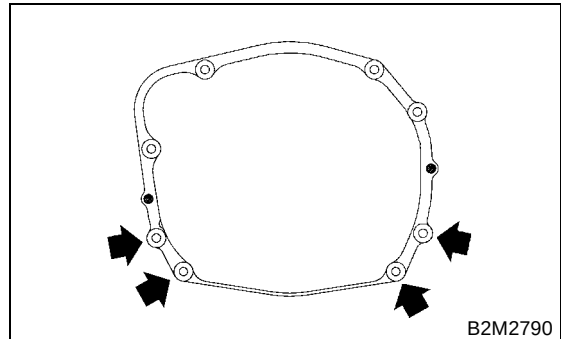
24) Remove spring pins and separate front drive shafts from each side of the transmission.

CAUTION:

Discard removing spring pin. Replace with a new one.



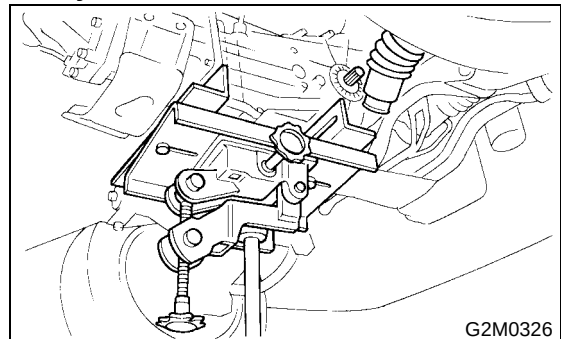
25) Remove nuts which hold lower side of transmission to engine.



26) Place transmission jack under transmission.

CAUTION:

Always support transmission case with a transmission jack.

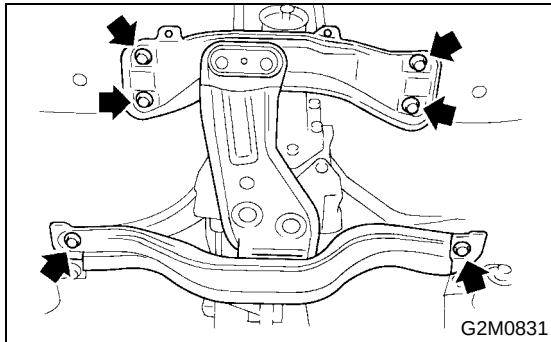


MANUAL TRANSMISSION ASSEMBLY

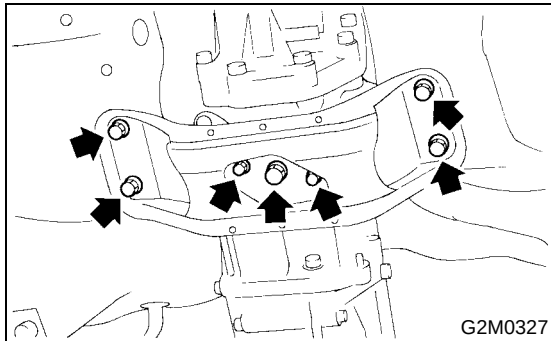
MANUAL TRANSMISSION AND DIFFERENTIAL

27) Remove transmission rear crossmember from vehicle.

- AWD model



- FWD model



28) Remove transmission.

CAUTION:

Move transmission jack toward rear until main shaft is withdrawn from clutch cover.

29) Separate transmission assembly and rear cushion rubber.

B: INSTALLATION

1) Install rear cushion rubber to transmission assembly.

Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

2) Install clutch release lever and bearing onto transmission. (Turbo model) <Ref. to CL-19, INSTALLATION, Release Bearing and Lever.>

3) Install transmission onto engine.

- (1) Gradually raise transmission with transmission jack.
- (2) Engage them at splines.

CAUTION:

Be careful not to strike main shaft against clutch cover.

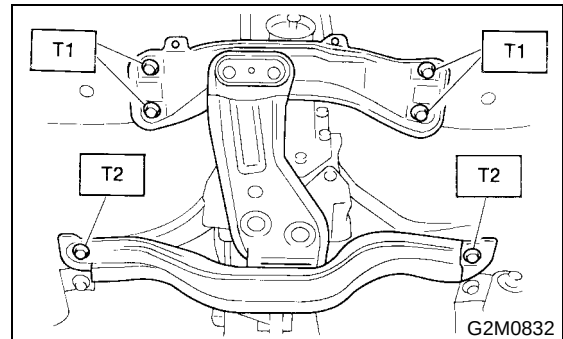
4) Install transmission rear crossmember.

- AWD model

Tightening torque:

T1: 70 N·m (7.1 kgf-m, 51 ft-lb)

T2: 140 N·m (14.3 kgf-m, 103 ft-lb)

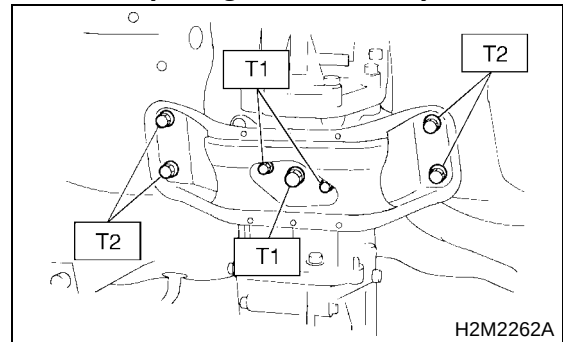


- FWD model

Tightening torque:

T1: 35 N·m (3.6 kgf-m, 26 ft-lb)

T2: 70 N·m (7.1 kgf-m, 51.6 ft-lb)

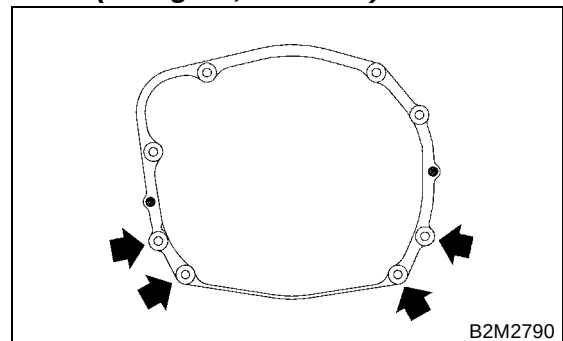


5) Take off transmission jack.

6) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



7) Connect engine and transmission.

(1) Install starter.

<Ref. to SC-6, INSTALLATION, Starter.>

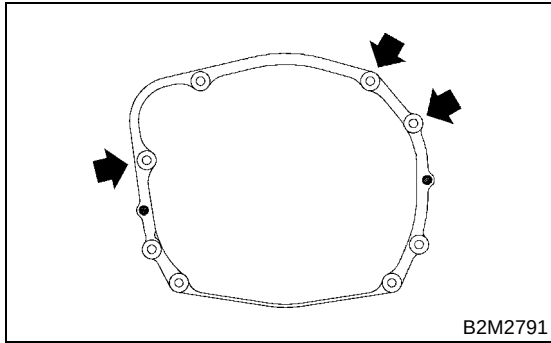
(2) Tighten bolt which holds right upper side of transmission to engine.

MANUAL TRANSMISSION ASSEMBLY

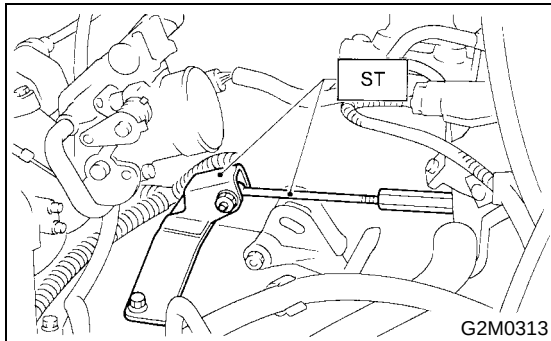
MANUAL TRANSMISSION AND DIFFERENTIAL

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



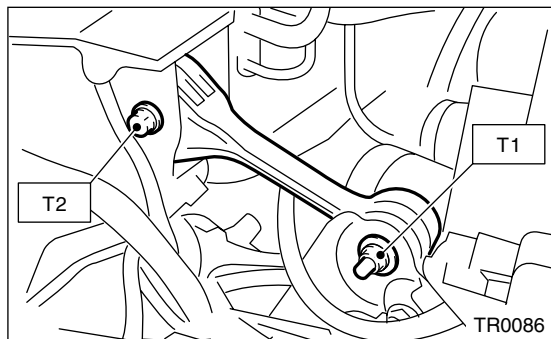
8) Remove ST.



9) 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)



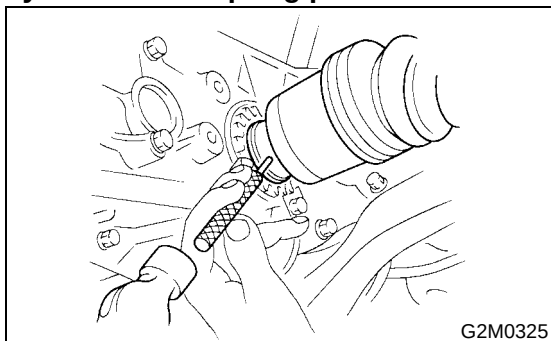
10) Lift-up the vehicle.

11) Install front drive shaft into transmission.

12) Drive spring pin into chamfered hole of drive shaft.

CAUTION:

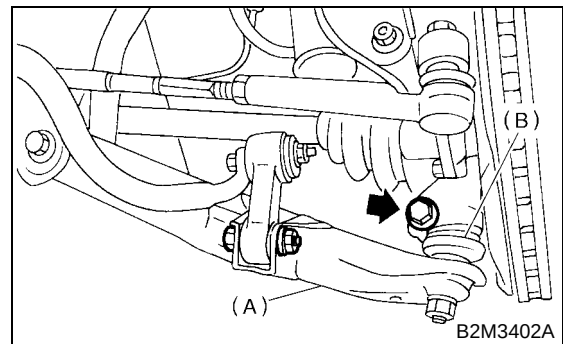
Always use a new spring pin.



13) Install ball joints of lower arm into knuckle arm of housing, and tighten installing bolts.

Tightening torque:

49 N·m (5.0 kgf-m, 36 ft-lb)



(A) Transverse link

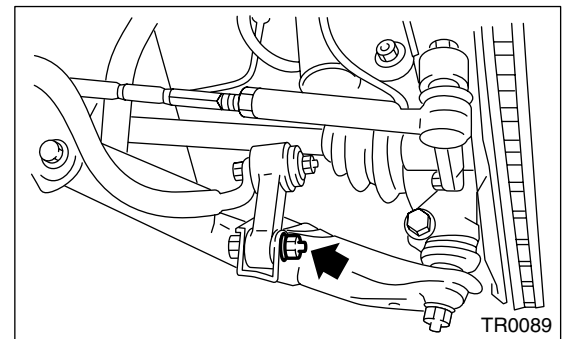
(B) Ball joint

14) Install stabilizer link from transverse link.

• Except sedan turbo model

Tightening torque:

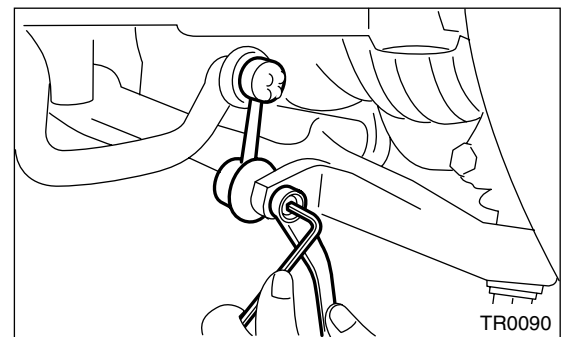
30 N·m (3.1 kgf-m, 22.1 ft-lb)



• Sedan turbo model

Tightening torque:

45 N·m (4.6 kgf-m, 33.2 ft-lb)

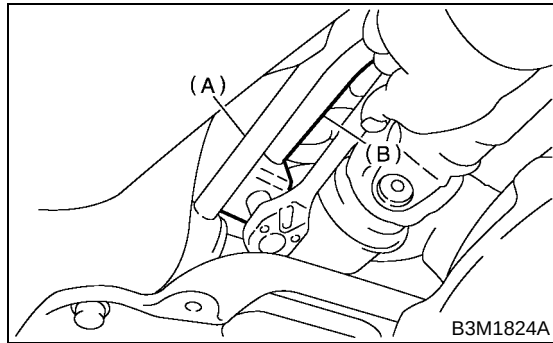


MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

15) Install gear shift rod and stay.

(1) Install gear shift rod onto transmission.



(A) Stay

(B) Rod

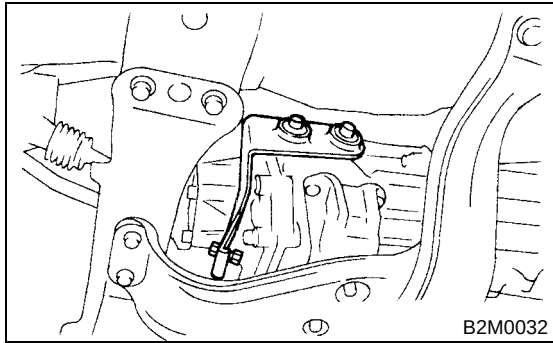
(2) Install stay onto transmission.

16) Install propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>

17) Install heat shield cover.

18) Install rear exhaust pipe and muffler.

19) Install hanger bracket on right side of transmission.



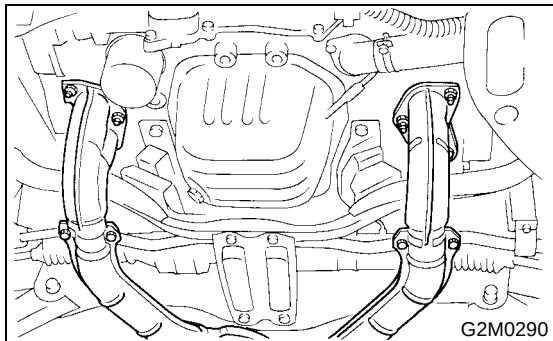
20) Install front exhaust pipe and center exhaust pipe. (Non-turbo model)

Without OBD

<Ref. to EX(SOHCw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>

With OBD

<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>



21) Install center exhaust pipe. (Turbo model)
<Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

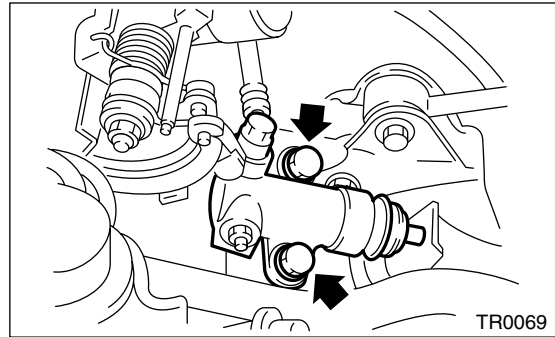
22) Install under cover.

23) Install operating cylinder. (2.0 L model)

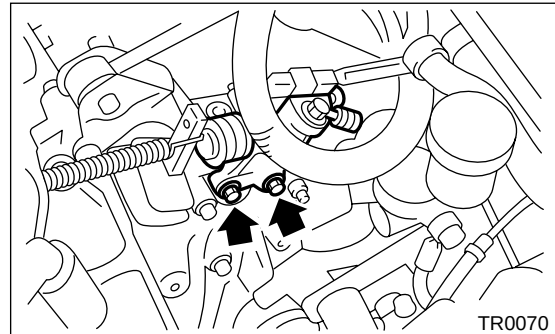
Tightening torque:

37 N·m (3.8 kgf-m, 27.5 ft-lb)

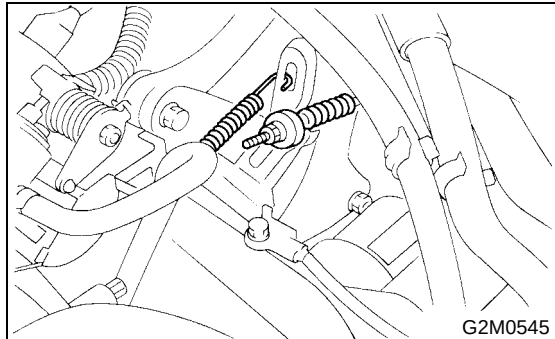
• Non-turbo model



• Turbo model



24) Connect the return spring and clutch cable. (1.6 L 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.

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)

27) Install air cleaner case.

28) Connect battery ground cable.

29) Take off vehicle from lift arms.

TRANSMISSION MOUNTING SYSTEM

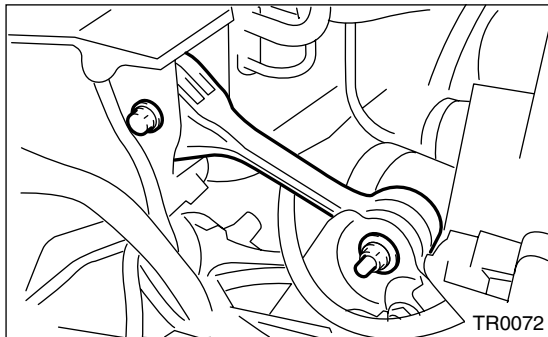
MANUAL TRANSMISSION AND DIFFERENTIAL

4. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

- 1) Disconnect battery ground terminal.
- 2) Remove the air intake duct and cleaner case.
- 3) Remove the air intake duct (Non-turbo model).
<Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 4) Remove the air cleaner case (Non-turbo model).
<Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
- 5) Remove the inter cooler (Turbo model). <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
- 6) Remove the pitching stopper.



2. CROSSMEMBER AND CUSHION RUBBER

- 1) Disconnect battery ground terminal.
- 2) Jack-up vehicle and support it with sturdy racks.
- 3) Remove the front, center exhaust pipes. (Non-turbo model)
Without OBD
<Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>
With OBD
<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>

CAUTION:

When removing exhaust pipes, be careful each exhaust pipe does not drop out.

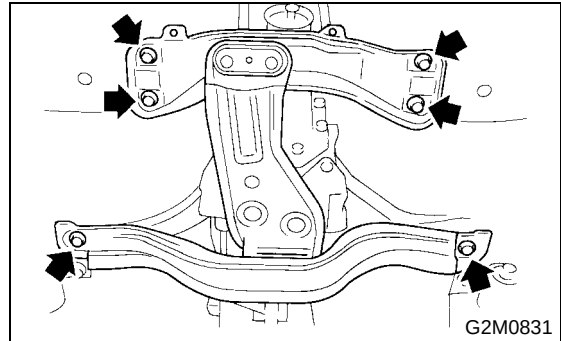
- 4) Remove center exhaust pipe. (Turbo model)
<Ref. to EX(DOHC TURBO)-8, REMOVAL, Center Exhaust Pipe.>
- 5) Remove rear exhaust pipe and muffler.
- 6) Remove the heat shield cover.
- 7) Set the transmission jack under the transmission body.

CAUTION:

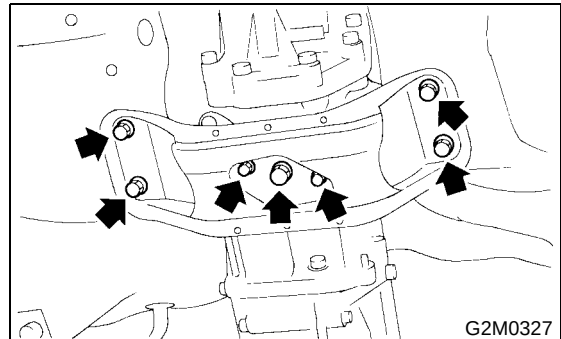
Always support transmission case with a transmission jack.

- 8) Remove the rear crossmember.

- AWD model



- FWD model



- 9) Remove the rear cushion rubber.

B: INSTALLATION

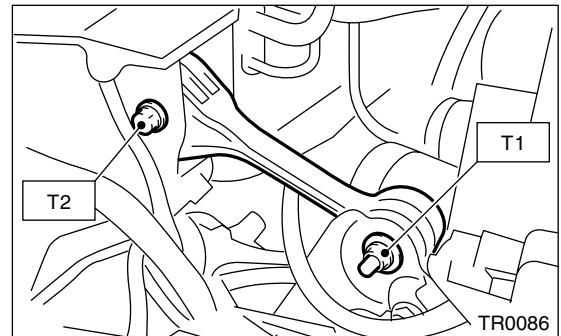
1. PITCHING STOPPER

- 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 intake duct and cleaner case. (Non-turbo model)
<Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
- 3) Install the intercooler. (Turbo model)
<Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>
- 4) Connect battery ground terminal.

TRANSMISSION MOUNTING SYSTEM

MANUAL TRANSMISSION AND DIFFERENTIAL

2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:

35 N·m (3.6 kgf-m, 26 ft-lb)

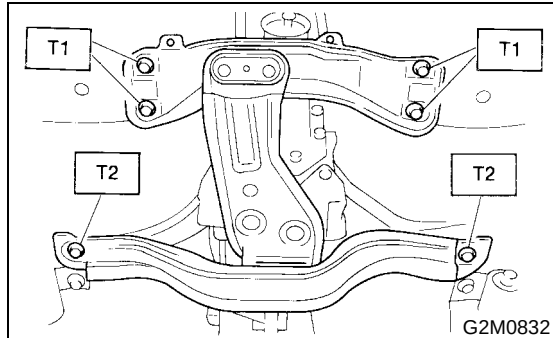
2) Install the crossmember.

- AWD model

Tightening torque:

T1: 70 N·m (7.1 kgf-m, 51 ft-lb)

T2: 140 N·m (14.3 kgf-m, 103 ft-lb)

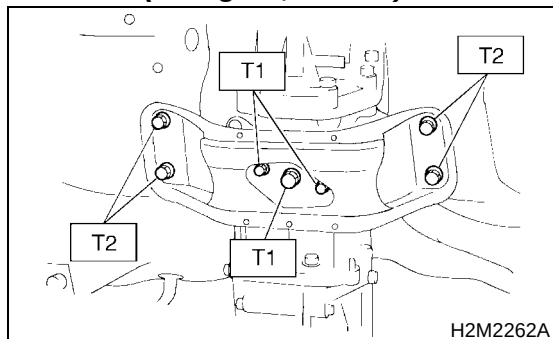


- FWD model

Tightening torque:

T1: 3.5 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 and center exhaust pipes. (Non-turbo model)

Without OBD

<Ref. to EX(SOHCw/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>

With OBD

<Ref. to EX(SOHC)-8, INSTALLATION, Front Exhaust Pipe.>

6) Install center exhaust pipe. (Turbo model) <Ref. to EX(DOHC TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

7) Install rear exhaust pipe and 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

11) Pour gear oil and check the oil level. <Ref. to MT-36, REPLACEMENT, Transmission Gear Oil.>

A: REPLACEMENT

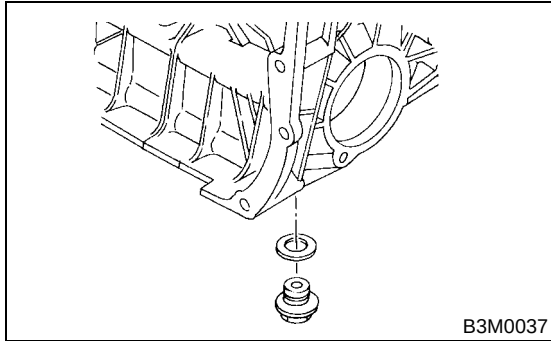
- 1) Clean transmission exterior.
- 2) Drain gear oil completely.

NOTE:

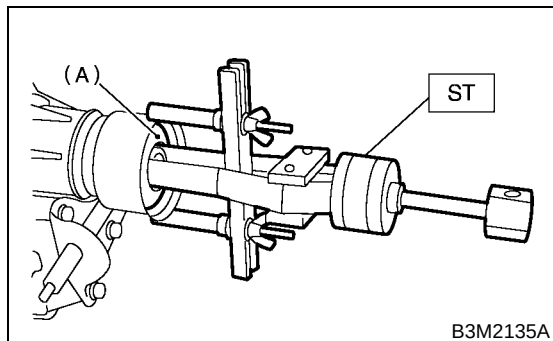
Tighten drain plug after draining gear oil.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)

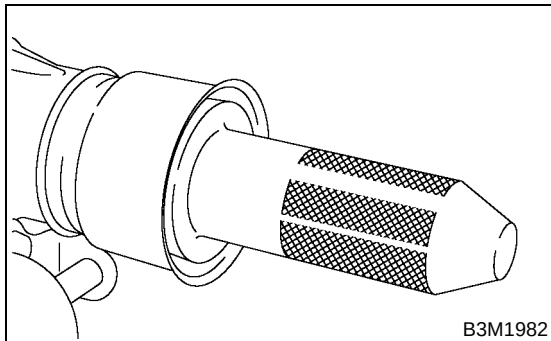


- 3) Remove rear exhaust pipe and muffler.
- 4) Remove heat shield cover.
- 5) Remove propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>
- 6) Using ST, remove the oil seal.
ST 398527700 PULLER ASSY



(A) Oil seal

- 7) Using ST, install the oil seal.
ST 498057300 INSTALLER



- 8) Install the propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>
- 9) Install the heat shield cover.
- 10) Install the rear exhaust pipe and muffler.

SWITCHES AND HARNESS

MANUAL TRANSMISSION AND DIFFERENTIAL

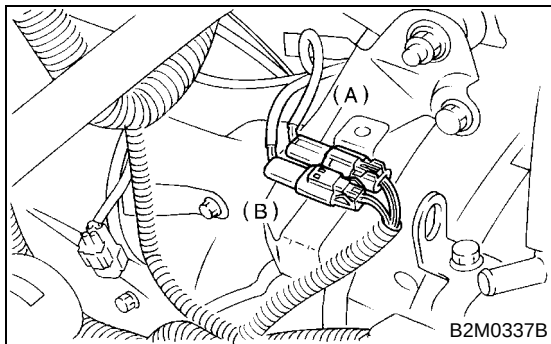
6. Switches and Harness

A: REMOVAL

1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

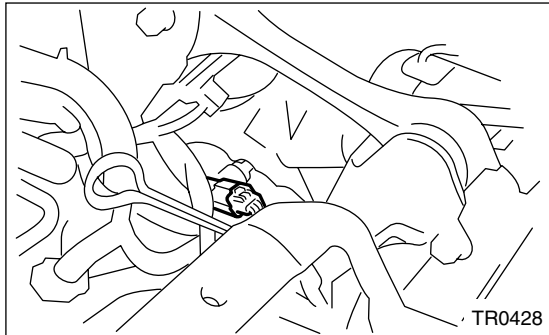
- 1) Disconnect connector battery ground terminal.
- 2) Remove air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 3) Remove intercooler (Turbo model). <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
- 4) Disconnect connector back-up light switch and neutral position switch.

- Non-turbo model



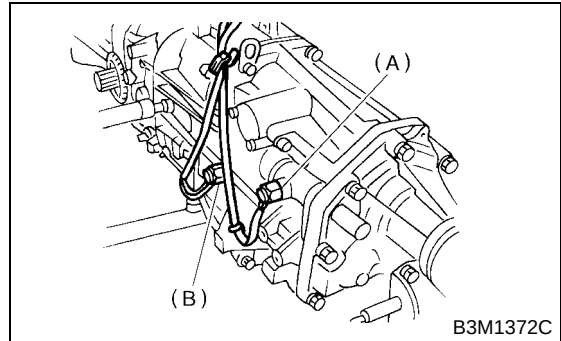
- (A) Neutral switch (Brown)
(B) Back-up light switch (Gray)

- Turbo model



- 5) Lift-up the vehicle.

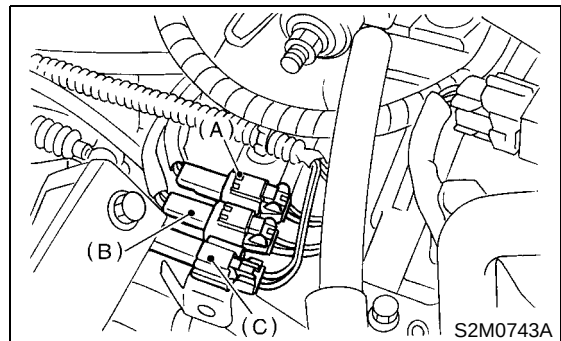
- 6) Remove back-up light switch and neutral position switch with harness.



- (A) Neutral switch (Brown connector)
(B) Back-up light switch (Gray connector)

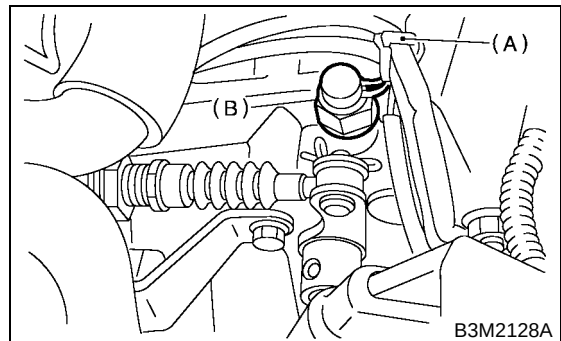
2. HIGH-LOW SWITCH

- 1) Disconnect connector battery ground terminal.
- 2) Remove air intake duct and cleaner case. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-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

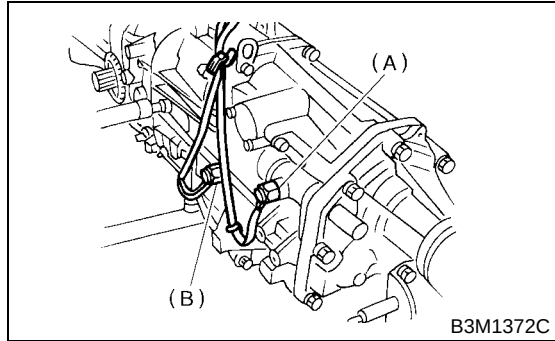
B: INSTALLATION

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(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>

4) Install intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>

5) Connect battery ground terminal.

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(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>

5) Connect battery ground terminal.

C: INSPECTION

1. BACK-UP LIGHT SWITCH

Inspect the back-up light switch. <Ref. to LI-29, INSPECTION, Back-up Light System.>

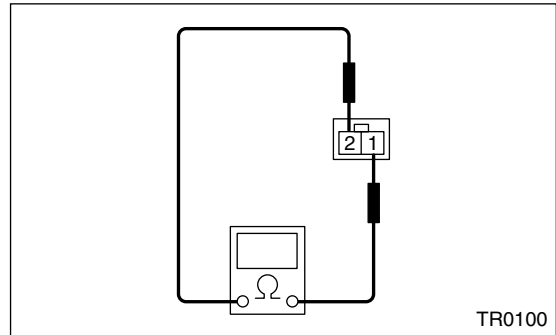
2. NEUTRAL POSITION SWITCH

1) Turn ignition switch to OFF.

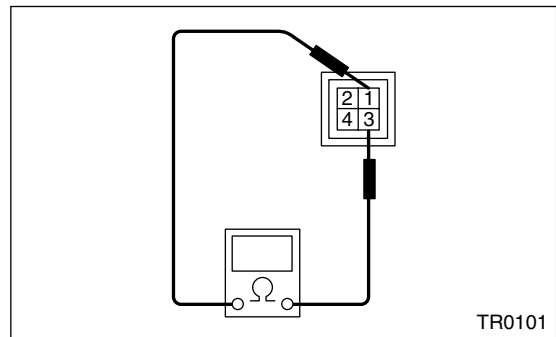
2) Disconnect connector neutral position switch.

3) Using the circuit tester, verify the current in neutral position. Also verify that there is no current in positions other than neutral.

- Non-turbo model



- Turbo model



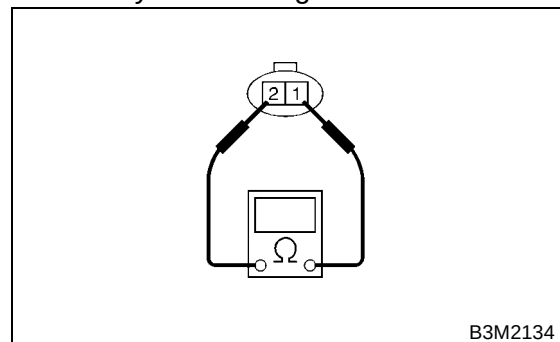
4) Replace defective parts.

3. HIGH-LOW SWITCH

1) Turn ignition switch to OFF.

2) Disconnect connector high-low switch.

3) Set drive select lever in LO position, and make sure continuity exists using circuit tester.

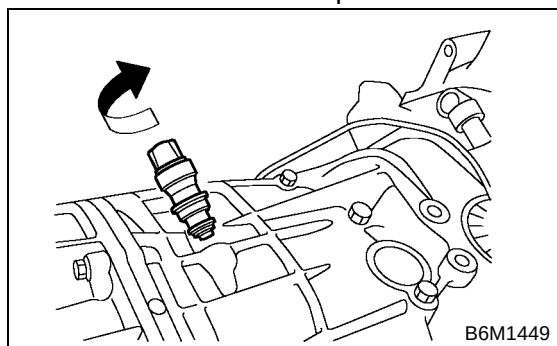


4) Replace defective parts.

7. Vehicle Speed Sensor

A: REMOVAL

- 1) Disconnect ground terminal from battery.
- 2) Lift-up the vehicle.
- 3) Remove front, center rear exhaust pipes and muffler.
- 4) Disconnect connector from vehicle speed sensor.
- 5) 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 and muffler.
- 5) Lower the vehicle.
- 6) Connect battery ground terminal.

C: INSPECTION

Inspect the vehicle speed sensor.

Without OBD

<Ref. to EN(SOHCw/oOBD)-96, DTC 33 VEHICLE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

With OBD Non-Turbo model

<Ref. to EN(SOHC)-204, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Turbo model

<Ref. to EN(DOHC TURBO)-208, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

8. Preparation for Overhaul

A: PROCEDURE

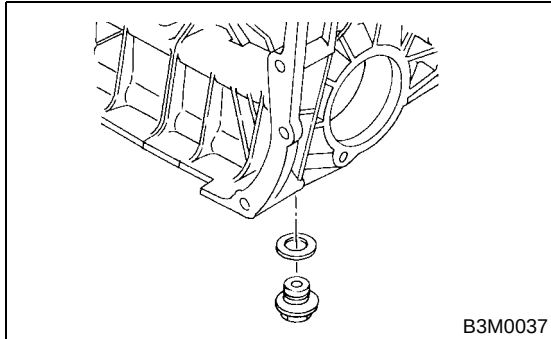
- 1) Clean oil, grease, dirt and dust from transmission.
- 2) Remove drain plug to drain oil. After draining, retighten it as before.

CAUTION:

Replace gasket with a new one.

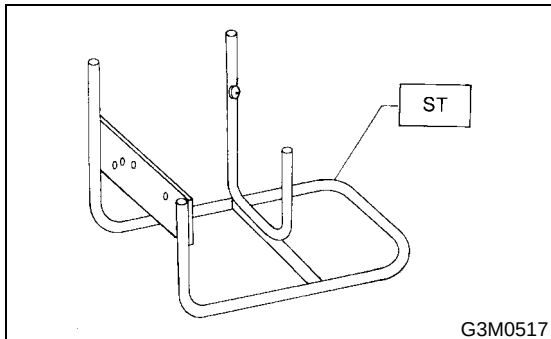
Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



- 3) Attach transmission to ST.

ST 499937100 TRANSMISSION STAND



- 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.

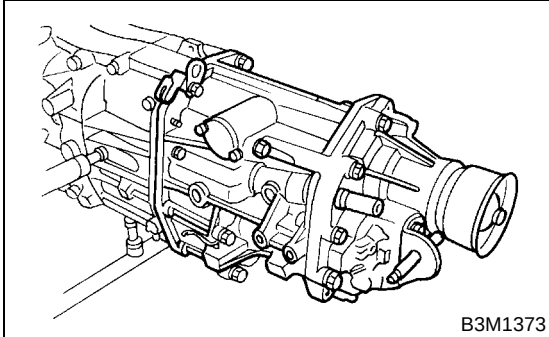
TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

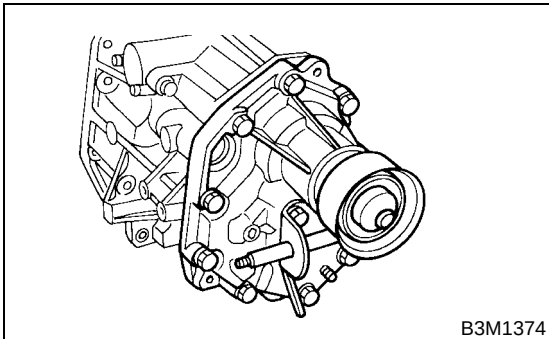
9. Transfer Case and Extension Case Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-46, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly.

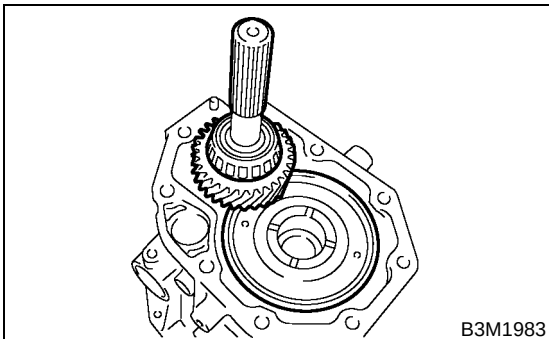


- 4) Remove shifter arm.
- 5) Remove extension case assembly.

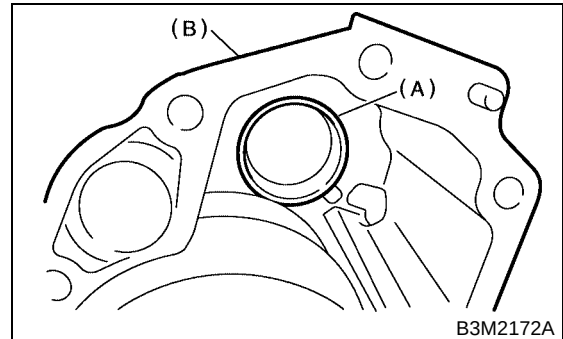


B: INSTALLATION

- 1) Install center differential and transfer driven gear into transfer case.

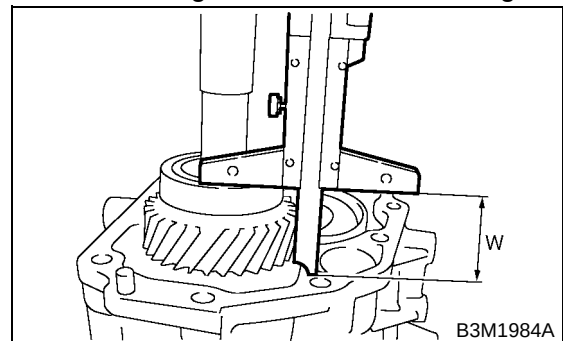


- 2) Remove bearing cone from the extension case assembly, and install to taper roller bearing of the transfer driven gear.



- (A) Bearing cone (Extension case)
(B) Extension case

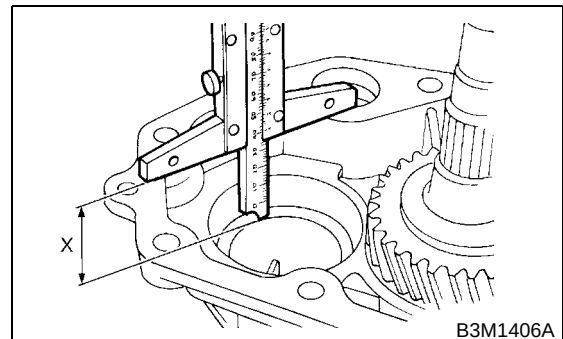
- 3) While pressing the bearing cone horizontally, turn the driven shaft ten rotations.
- 4) Measure height "W" between transfer case and taper roller bearing on the transfer driven gear.



- 5) Measure depth "X".

NOTE:

Measure with bearing cone and thrust washer removed.



- 6) Calculate space "t" using the following equation:
 $t = X - W + 0.2 \text{ to } 0.3 \text{ mm (0.008 to 0.012 in)}$
- 7) Select nearest washer in the following table:

Standard clearance between thrust washer and taper roller bearing:

0.2 — 0.3 mm T (0.008 — 0.012 in T)

TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

NOTE:

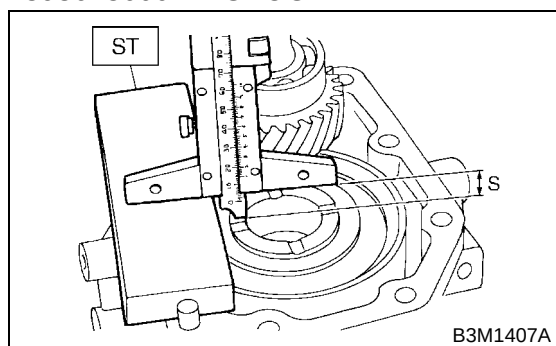
T: Tight

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.

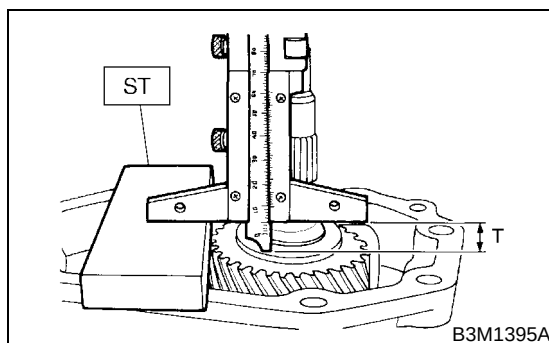
9) Measure depth "S" between transfer case and center differential.

ST 398643600 GAUGE



10) Measure depth "T" between extension case and transfer drive gear.

ST 398643600 GAUGE



11) Calculate space "U" using the following equation: $U = S - T$

12) 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)

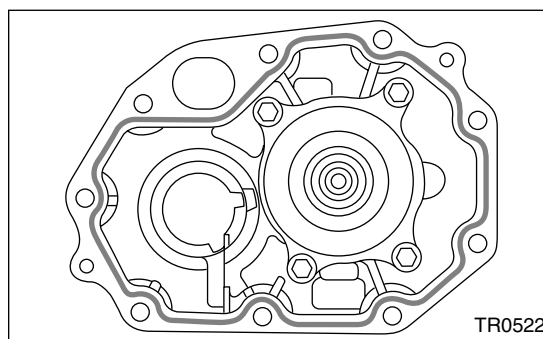
13) Fit thrust washer on center differential.

14) Install bearing cone into extension case.

15) Apply proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket:

THREE BOND 1215B



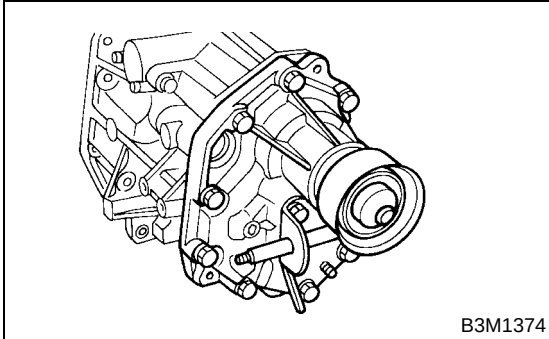
TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

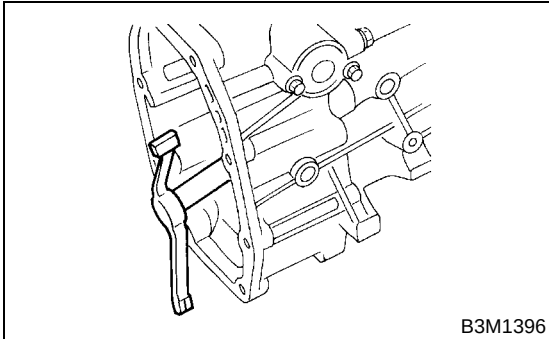
16) Install extension assembly into transfer case.

Tightening torque:

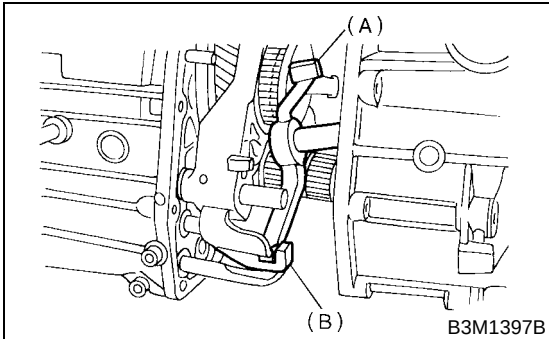
40N·m (4.1 kgf-m, 29.7 ft-lb)



17) Install shifter arm to transfer case.



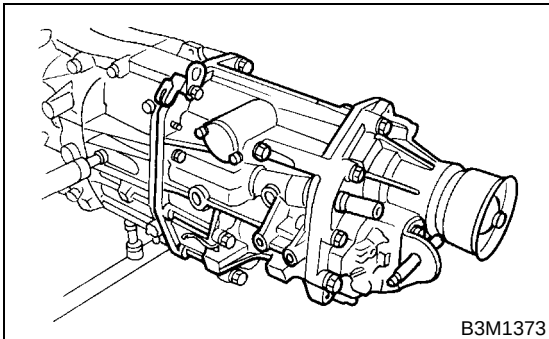
18) Hang the shifter arm on the 3rd-4th fork rod.



19) Install transfer case with extension case assembly to transmission case.

Tightening torque:

25N·m (2.5 kgf-m, 18.1 ft-lb)

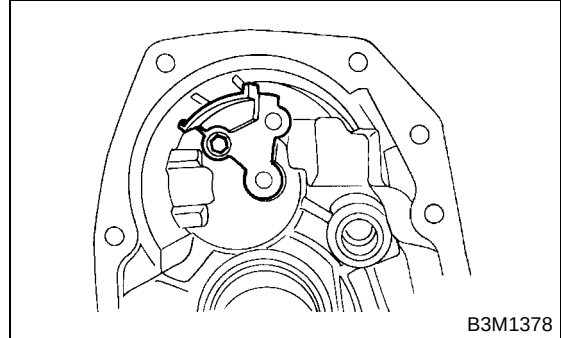


C: DISASSEMBLY

1. TRANSFER CASE

1) Remove reverse check assembly. <Ref. to MT-60, REMOVAL, Reverse Check Sleeve.>

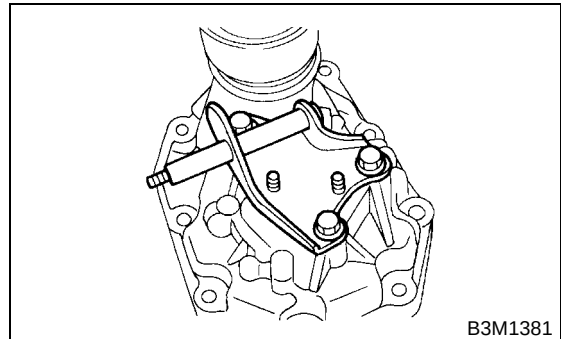
2) Remove oil guide.



2. EXTENSION CASE

1) Remove transfer drive gear assembly. <Ref. to MT-55, REMOVAL, Transfer Drive Gear.>

2) Remove shift bracket.



3) Remove oil seal from extension case. <Ref. to MT-45, OIL SEAL, .>

D: ASSEMBLY

1. EXTENSION CASE

1) Using ST, install oil seal to extension case. <Ref. to MT-45, Oil Seal.>

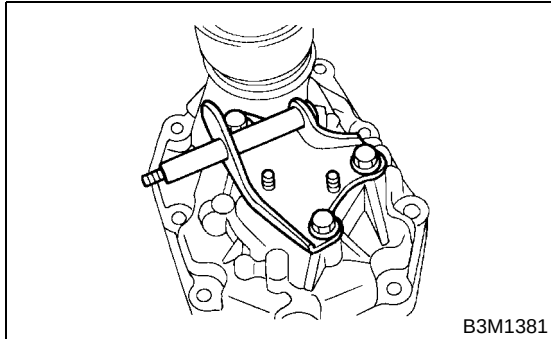
CAUTION:

Use new oil seal.

2) Install shift bracket to extension case.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



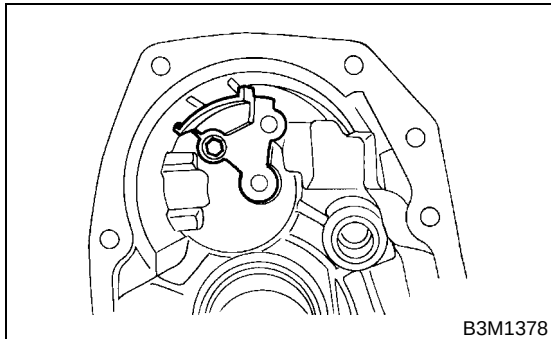
3) Install transfer drive gear to extension case. <Ref. to MT-55, INSTALLATION, Transfer Drive Gear.>

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-60, INSTALLATION, Reverse Check Sleeve.>

10.Rear Case

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle.<Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-46, REMOVAL, Switches and Harness.>
- 3) Remove rear case.

B: INSTALLATION

- 1) Install rear case.

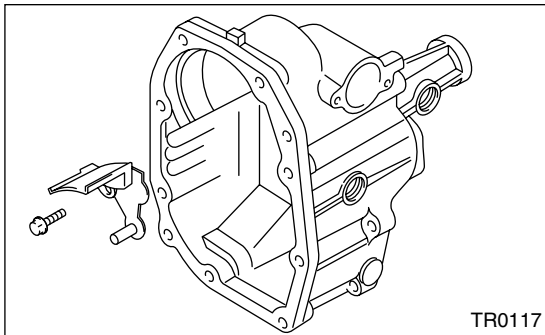
Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

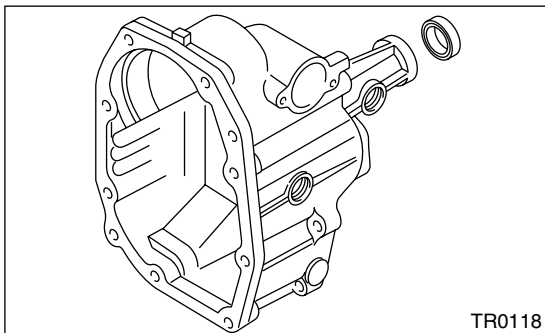
- 2) Install back-up light switch and neutral position switch.<Ref. to MT-47, INSTALLATION, Switches and Harness.>
- 3) Install the manual transmission assembly from vehicle.<Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

- 1) Remove the reverse check assembly.<Ref. to MT-60, REMOVAL, Reverse Check Sleeve.>
- 2) Remove oil guide.



- 3) Remove oil seal.



D: ASSEMBLY

- 1) Install oil seal.
- 2) Install oil guide.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

- 3) Install the reverse check assembly.<Ref. to MT-60, INSTALLATION, Reverse Check Sleeve.>

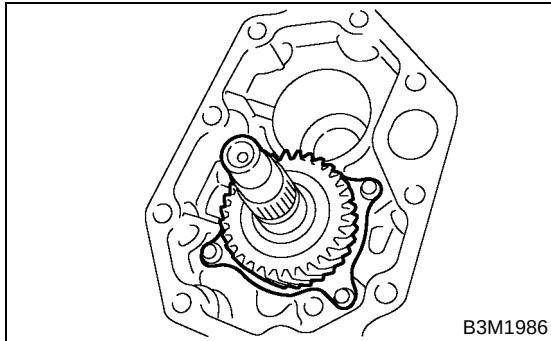
TRANSFER DRIVE GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

11. Transfer Drive Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-46, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove extension case assembly.
- 5) Remove transfer driven gear.
- 6) Remove transfer drive gear.

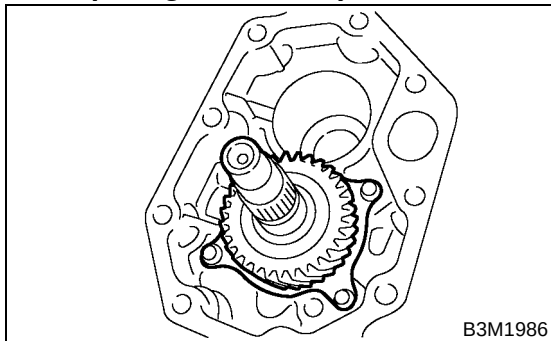


B: INSTALLATION

- 1) Install transfer drive gear.

Tightening torque:

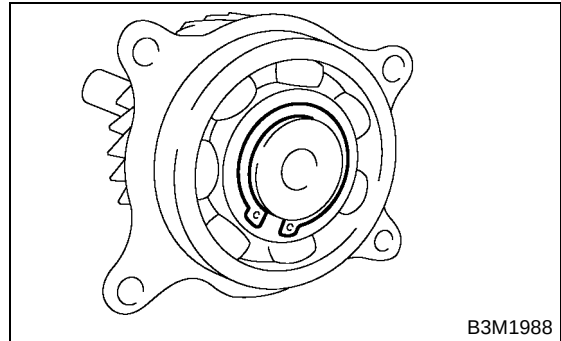
26 N·m (2.7 kgf-m, 20 ft-lb)



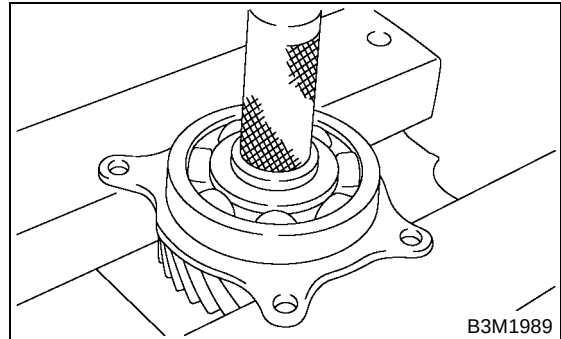
- 2) Install transfer driven gear.
- 3) Install the extension case assembly.
- 4) Install transfer case and extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install back-up light switch and neutral position switch. <Ref. to MT-47, INSTALLATION, Switches and Harness.>
- 6) Install the manual transmission assembly from vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

- 1) Remove snap ring.



- 2) Remove ball bearing.



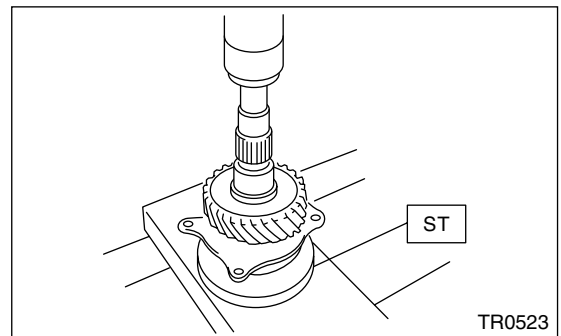
D: ASSEMBLY

- 1) Set the ST applying to inner race of bearing and instal to drive shaft.

ST 398177700 INSTALLER

CAUTION:

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.

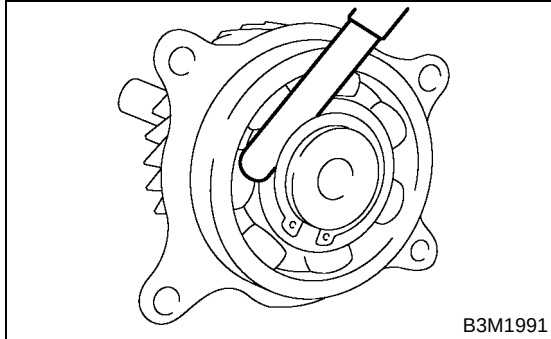
TRANSFER DRIVE GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

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)



4) If the measurement is not within the specification, select suitable snap ring.

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

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

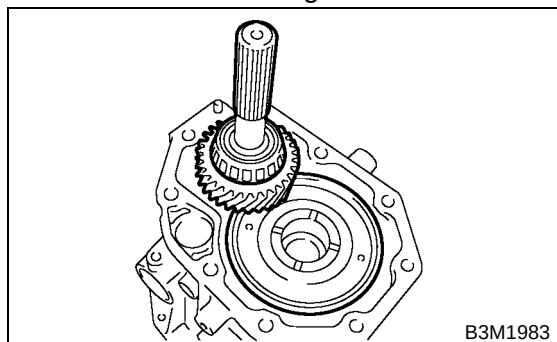
Replace drive gear in the following cases:

- If their tooth surfaces and shaft are excessively broken or damaged.

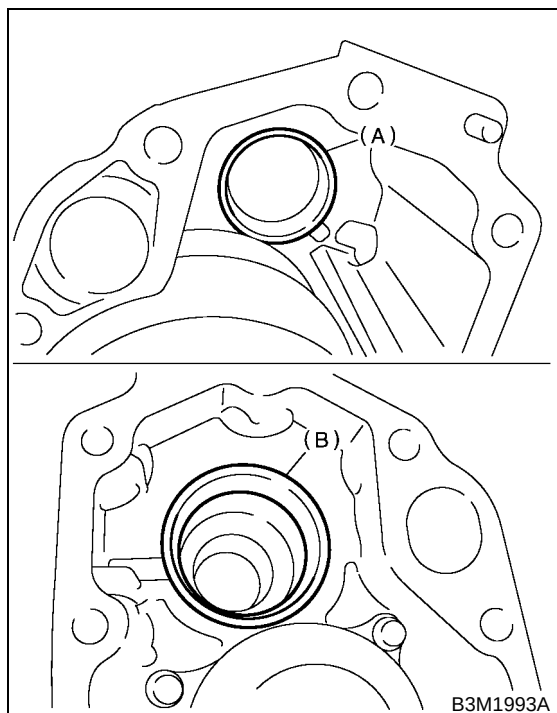
12. Transfer Driven Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-46, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove extension case assembly.
- 5) Remove transfer driven gear.



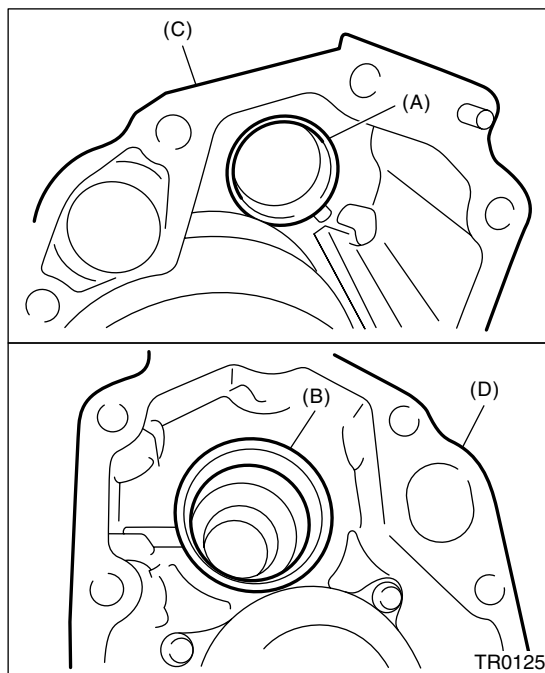
- 6) Remove bearing cup from extension case and transfer case.



- (A) Bearing cup (transfer case)
(B) Bearing cup (extension case)

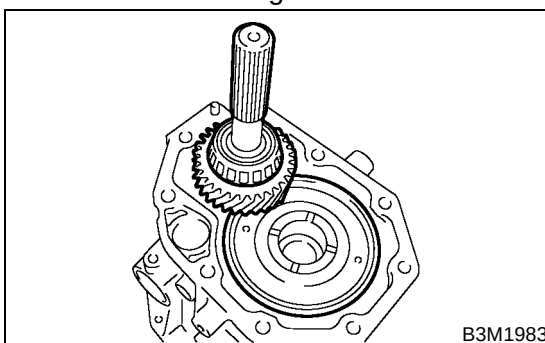
B: INSTALLATION

- 1) Install bearing cup to extension case and transfer case.



- (A) Bearing cup
(B) Bearing cup
(C) Transfer case
(D) Extension case

- 2) Install transfer driven gear.



- 3) Install transfer case and extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install back-up light switch and neutral position switch. <Ref. to MT-47, INSTALLATION, Switches and Harness.>
- 5) Install the manual transmission assembly to vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

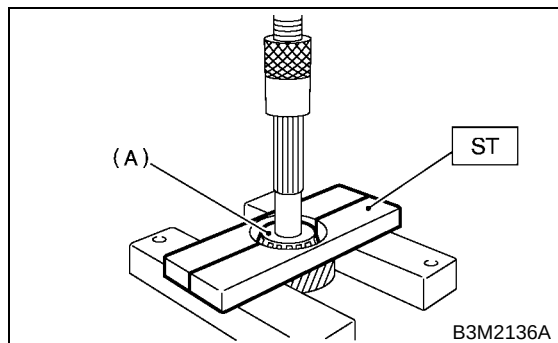
TRANSFER DRIVEN GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

C: DISASSEMBLY

1) Using ST, remove roller bearing (extension case side).

ST 498077000 REMOVER

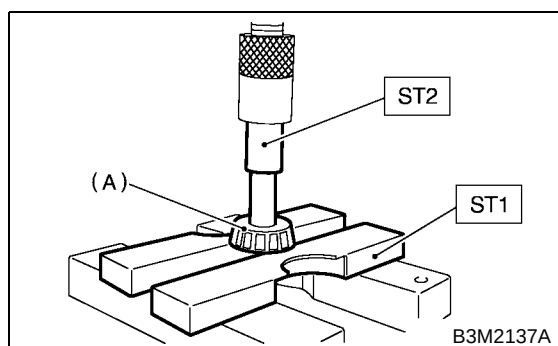


(A) Roller bearing

2) Using ST1 and ST2, remove roller bearing (transfer case side).

ST1 498077000 REMOVER

ST2 899864100 REMOVER



(A) Roller bearing

D: ASSEMBLY

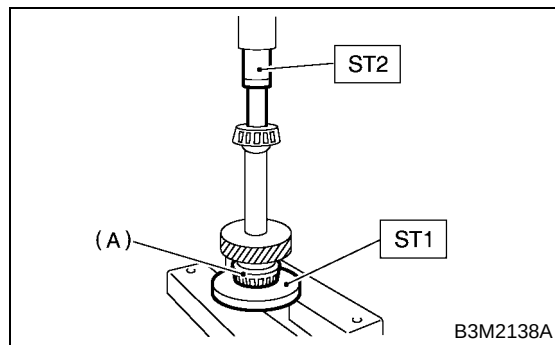
1) Using ST, install roller bearing (extension case side).

ST1 398177700 INSTALLER

ST2 899864100 REMOVER

CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



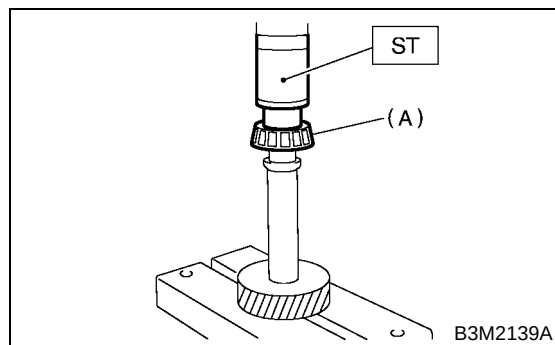
(A) Roller bearing

2) Using ST, install roller bearing (transfer case side).

ST 499757002 INSTALLER

CAUTION:

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.

13.Center Differential

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly.<Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transfer driven gear. <Ref. to MT-57, 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-57, INSTALLATION, Transfer Driven Gear.>
- 3) Install the extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 5) Install the back-up light switch and neutral position switch. <Ref. to MT-46, REMOVAL, Switches and Harness.>
- 6) Install the manual transmission assembly to vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

NOTE:

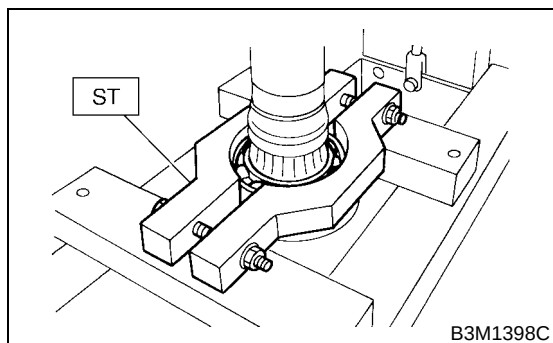
Do not disassemble center differential because it is a non-disassemble part.

Remove ball bearing using ST.

CAUTION:

Do not reuse ball bearing.

ST 498077300 CENTER DIFFERENTIAL
BEARING REMOVER

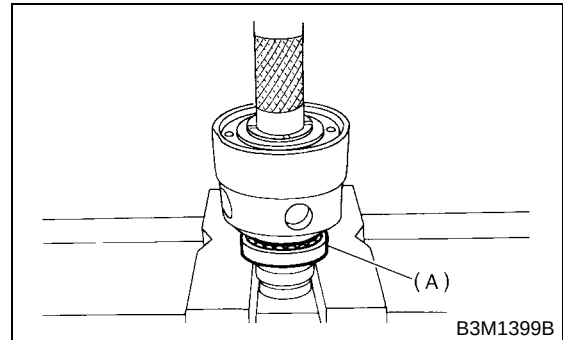


D: ASSEMBLY

Install ball bearing to center differential assembly.

CAUTION:

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

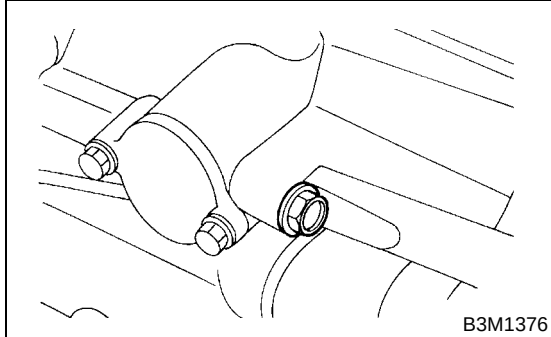
REVERSE CHECK SLEEVE

MANUAL TRANSMISSION AND DIFFERENTIAL

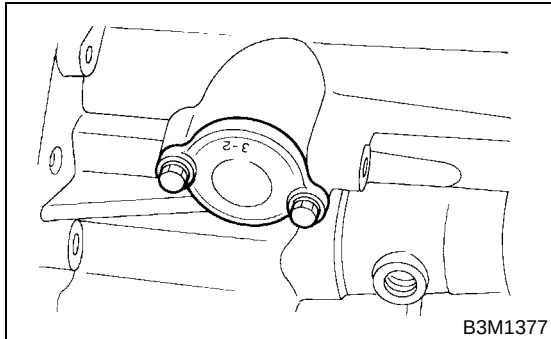
14.Reverse Check Sleeve

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-50, 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.

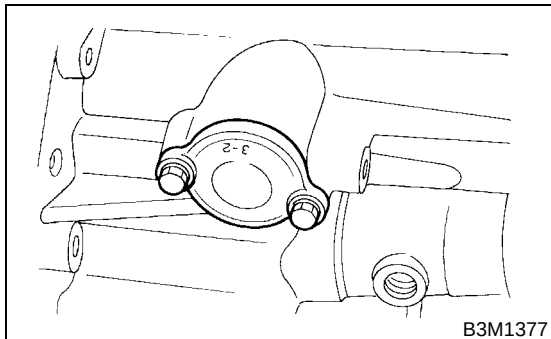


B: INSTALLATION

- 1) Install the reverse check sleeve.

Tightening torque:

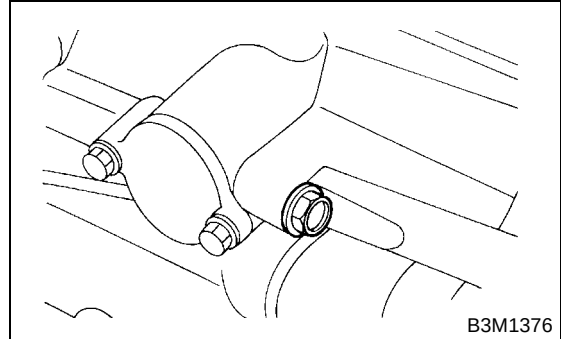
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



- 2) Install ball, spring, washer and plug to transfer case.

Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)



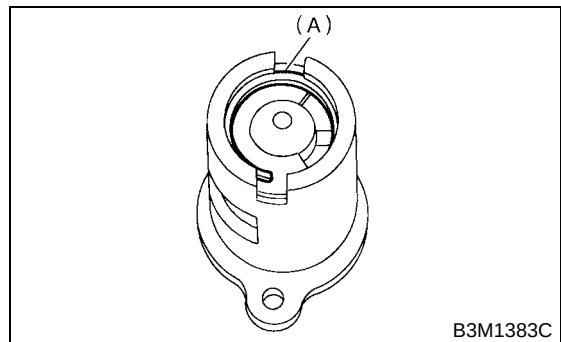
- 3) Install the shifter arm to transfer case assembly.
- 4) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the manual transmission assembly to vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

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.

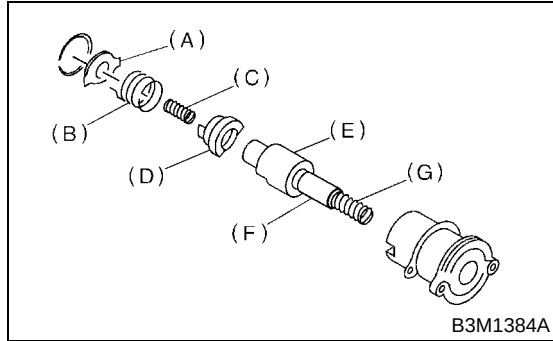


(A) Snap ring

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:

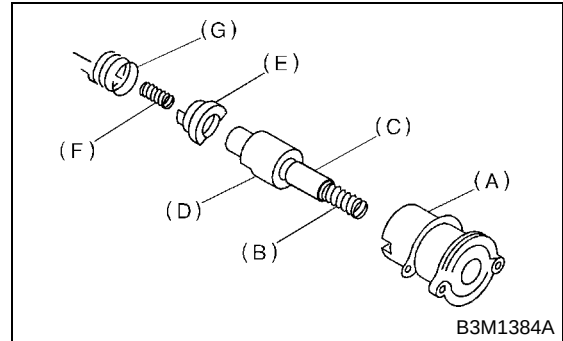
- Reverse check sleeve assembly uses an O-ring which should not be scratched.
- Be careful not to break adjustment shim placed between reverse check sleeve assembly and case.

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) Reverse check cam
- (C) Return spring (5th-Rev)
- (D) Reverse accent shaft
- (E) Return spring cap
- (F) Return spring (1st-2nd)
- (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 O-ring in groove in sleeve.

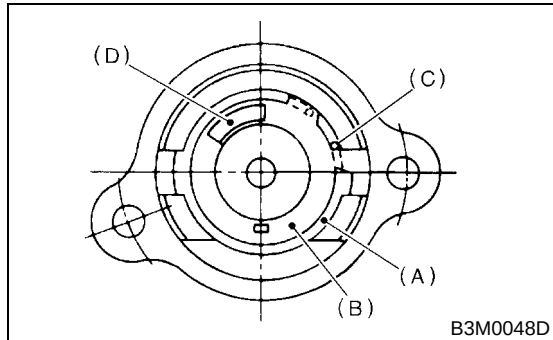
REVERSE CHECK SLEEVE

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-62, 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.

CAUTION:

Be careful not to break O-ring when placing shim(s).

NOTE:

- 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.

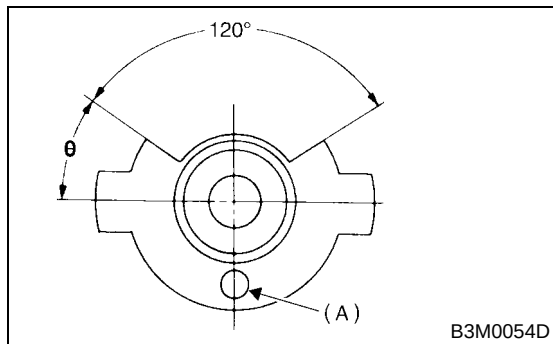
REVERSE CHECK SLEEVE

MANUAL TRANSMISSION AND DIFFERENTIAL

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

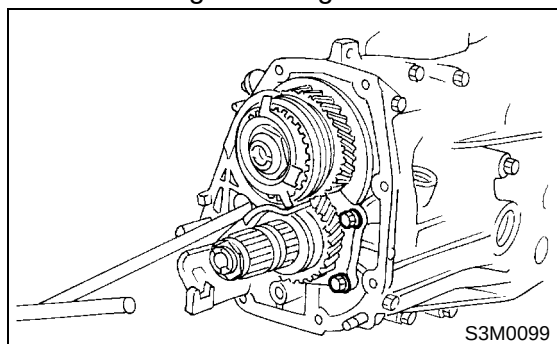
MANUAL TRANSMISSION AND DIFFERENTIAL

15. Transmission Case

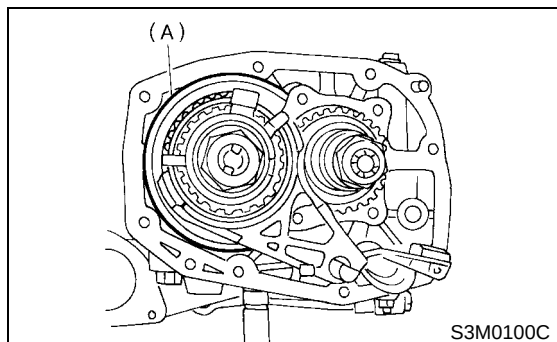
A: REMOVAL

1. SINGLE-RANGE AND FWD MODEL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove clutch release lever. <Ref. to CL-19, REMOVAL, Release Bearing and Lever.>
- 3) Remove transfer case with extension case assembly. (AWD model) <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove rear case. (FWD model) <Ref. to MT-54, REMOVAL, Rear Case.>
- 5) Remove bearing mounting bolts.

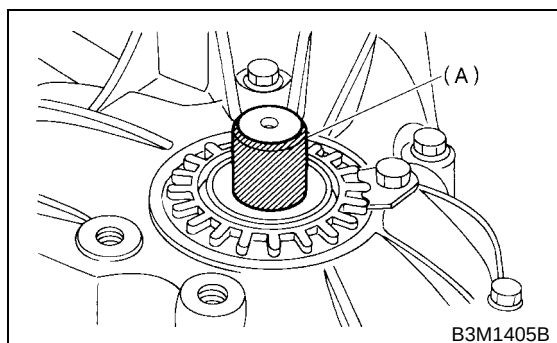


- 6) Remove main shaft rear plate.



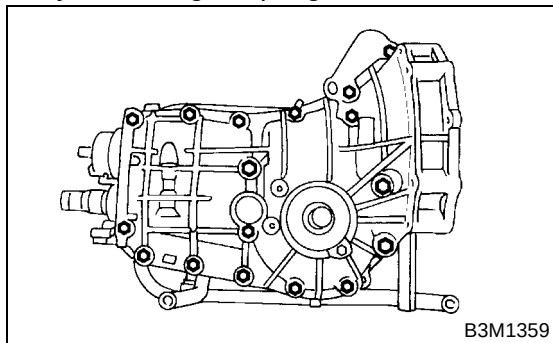
(A) Main shaft rear plate

- 7) Put vinyl tape around splines of right and left axle drive shafts to prevent damage to oil seal.



(A) Vinyl tape

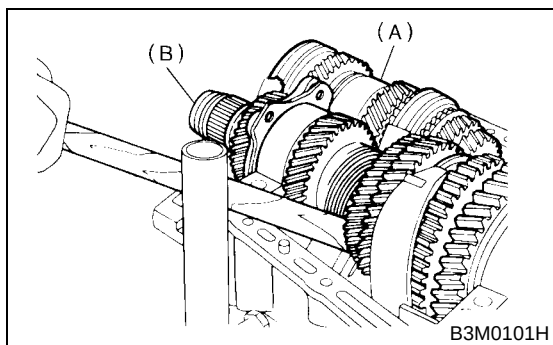
- 8) Separate transmission case into right and left cases by loosening coupling bolts and nuts.



- 9) 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

- 10) Remove main shaft assembly.

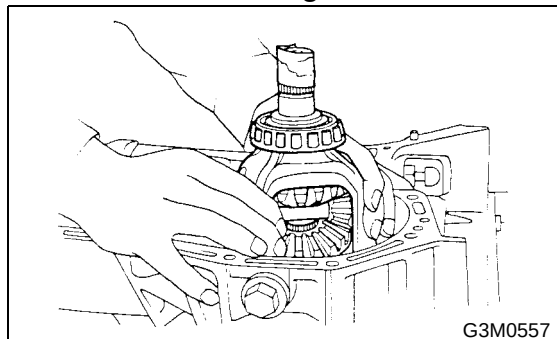
TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

11) Remove differential assembly.

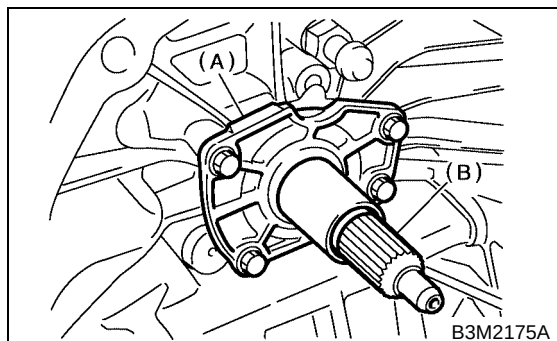
CAUTION:

- Be careful not to confuse right and left roller bearing outer races.
- Be careful not to damage retainer oil seal.



2. DUAL-RANGE

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove clutch release lever. <Ref. to CL-19, REMOVAL, Release Bearing and Lever.>
- 3) Remove transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the input shaft holder.



- (A) Input shaft holder
(B) Input shaft

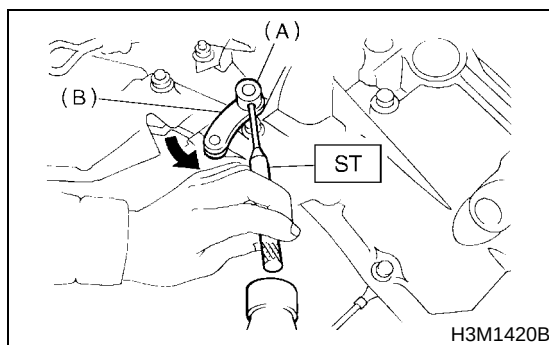
5) Remove the high-low switch. <Ref. to MT-46, REMOVAL, Switches and Harness.>

6) Using ST, drive out straight pin, and remove high-low shifter lever.

ST 398791700 STRAIGHT PIN REMOVER 2

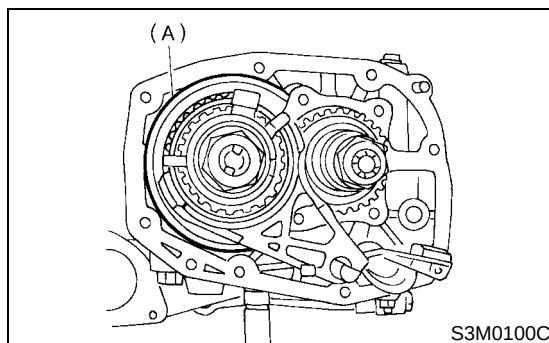
NOTE:

When driving out straight pin, remove it in the direction that it does not butt against transmission case.



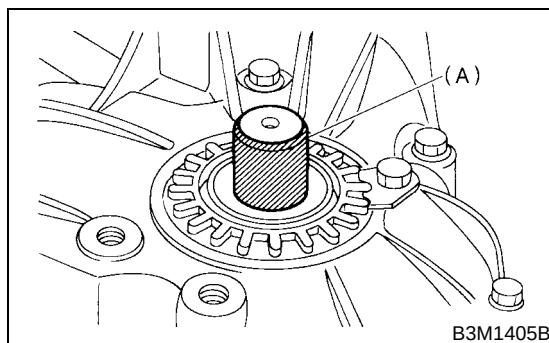
- (A) Straight pin
(B) High-low shifter lever

7) Remove main shaft rear plate.



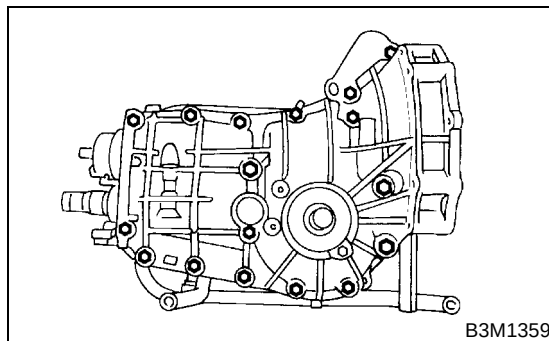
- (A) Main shaft rear plate

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.



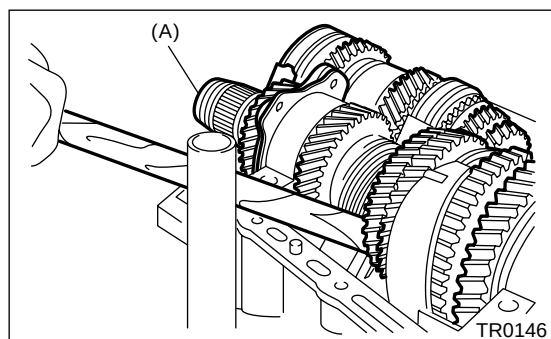
TRANSMISSION CASE

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.



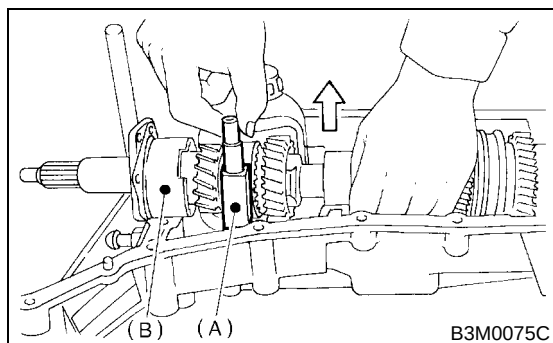
(A) Drive pinion shaft assembly

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.

CAUTION:

Be careful not to drop the two high-low shifter pieces.



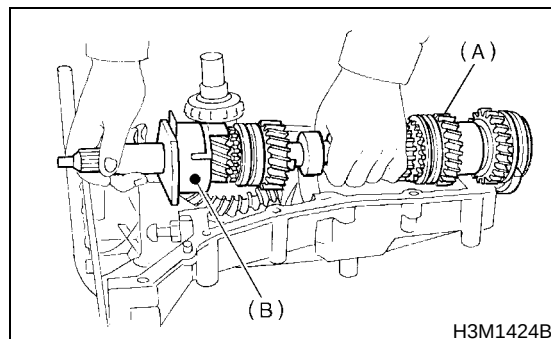
(A) High-low shifter fork

(B) Input shaft ASSY

12) Remove main shaft assembly and input shaft assembly.

CAUTION:

Be careful not to drop input shaft and main shaft as they are separable.



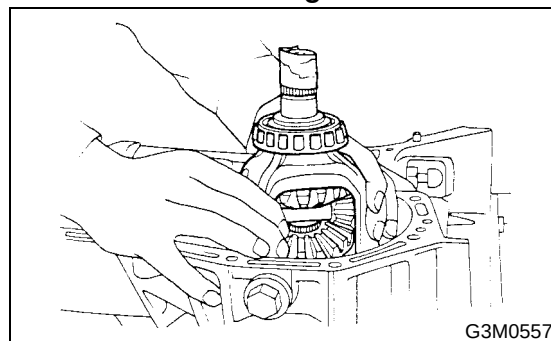
(A) Main shaft ASSY

(B) Input shaft ASSY

13) Remove differential assembly.

CAUTION:

- 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 AND FWD MODEL

- 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 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.

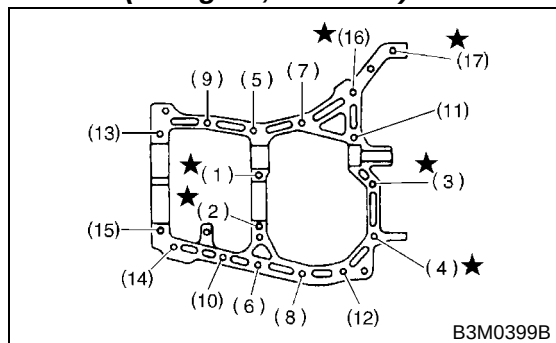
Tightening torque:

8 mm bolt

25 N·m (2.5 kgf-m, 18.1 ft-lb)

★ 10 mm bolt

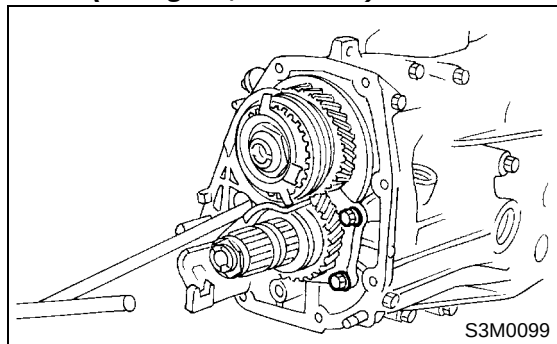
39 N·m (4.0 kgf-m, 28.9 ft-lb)



7) Tighten ball bearing attachment bolts.

Tightening torque:

29 N·m (3.0 kgf-m, 21.7 ft-lb)

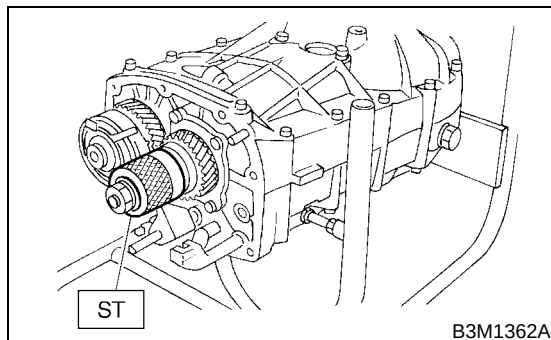


8) Backlash adjustment of hypoid gear and preload adjustment of roller bearing

NOTE:

Support drive pinion assembly with ST. (AWD model)

ST 498427100 STOPPER



9) Place the transmission with case left side facing downward and put ST1 on bearing cup.

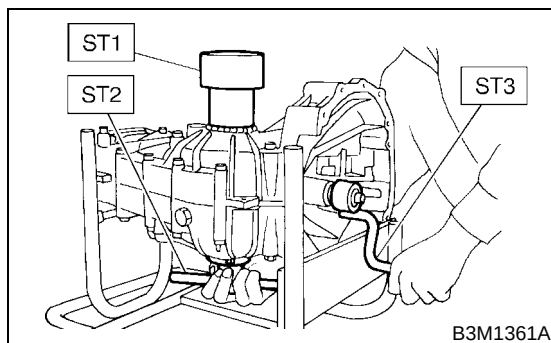
10) Screw retainer assembly into left case from the bottom with ST2. Fit ST3 on the transmission main shaft. Shift gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2.

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

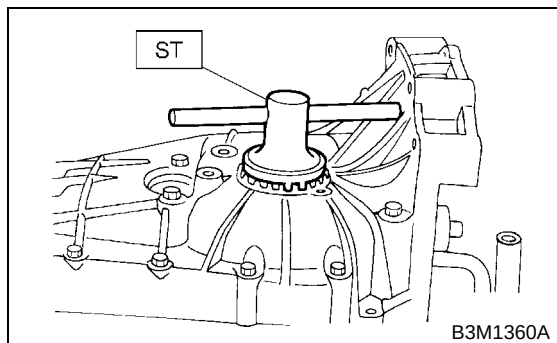
MANUAL TRANSMISSION AND DIFFERENTIAL

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-104, INSPECTION, Front Differential Assembly.>

17) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen retainer until the O-ring groove appears. Fit O-ring into the groove and tighten retainer into the position where retainer has been tightened in.

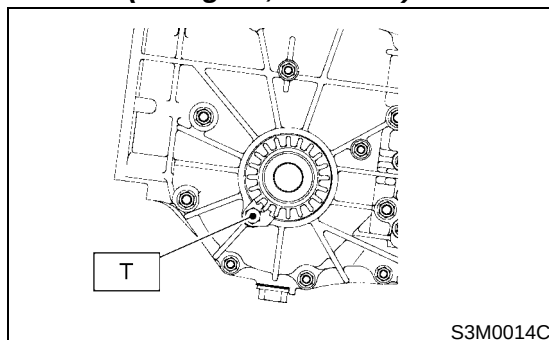
Tighten lock plate.

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-80, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

19) Install clutch release lever and bearing. <Ref. to CL-19, INSTALLATION, Release Bearing and Lever.>

20) Install transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install the manual transmission assembly into the vehicle. <Ref. to MT-40, 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 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.

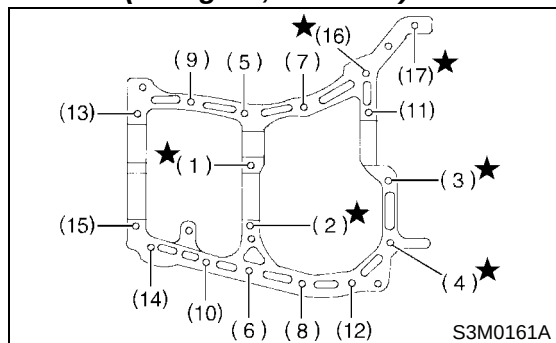
Tightening torque:

8 mm bolt

25 N·m (2.5 kgf-m, 18.1 ft-lb)

★ 10 mm bolt

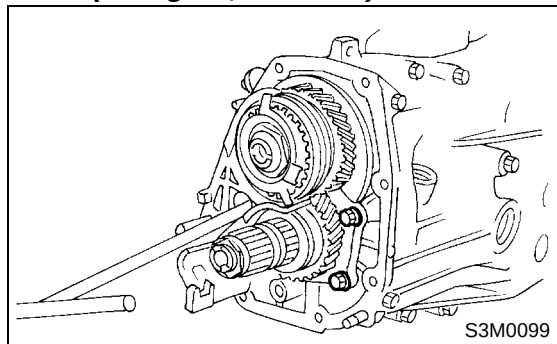
39 N·m (4.0 kgf-m, 28.9 ft-lb)



7) Tighten ball bearing attachment bolts.

Tightening torque:

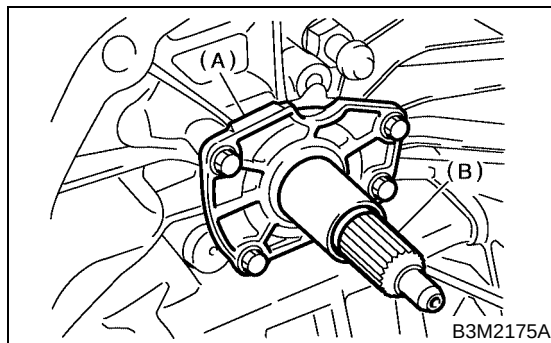
29 N·m (3.0 kgf-m, 21.7 ft-lb)



8) Tighten input shaft holder attaching bolts.

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)



(A) Input shaft holder

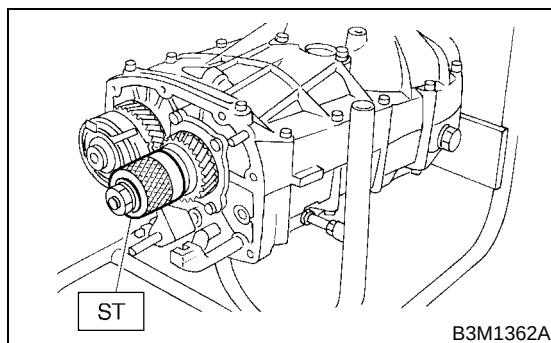
(B) Input shaft

9) Backlash adjustment of hypoid gear and preload adjustment of roller bearing

NOTE:

Support drive pinion assembly with ST. (AWD model)

ST 498427100 STOPPER



10) Place the transmission with case left side facing downward and put ST1 on bearing cup.

TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

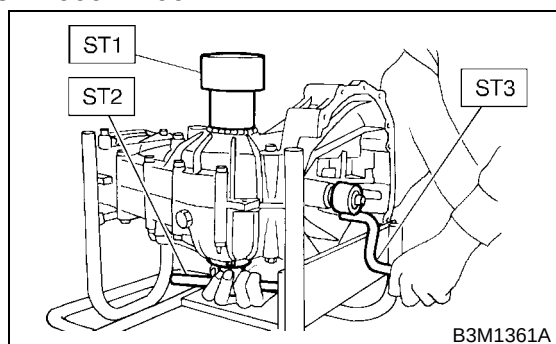
11) Screw retainer assembly into left case from the bottom with ST2. Fit ST3 on the transmission main shaft. Shift gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2.

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

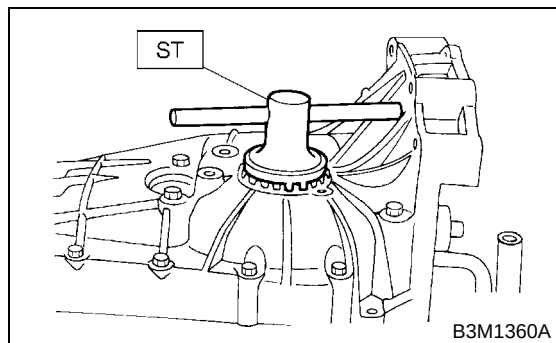


12) Remove weight and screw in retainer without O-ring on the upper side and stop at the point where slight resistance is felt.

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-104, 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 O-ring into the groove and tighten retainer into the position where retainer has been tightened in.

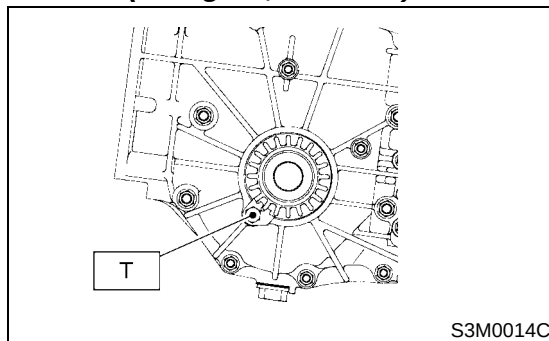
Tighten lock plate.

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-80, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

20) Install transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install clutch release lever and bearing. <Ref. to CL-19, INSTALLATION, Release Bearing and Lever.>

22) Install the manual transmission assembly into the vehicle. <Ref. to MT-40, 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

16. Main Shaft Assembly for Single-Range

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove transfer case with extension case assembly. (AWD model) <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove rear case (FWD model) <Ref. to MT-54, REMOVAL, Rear Case.>
- 4) Remove transmission case. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 5) Remove drive pinion shaft assembly. <Ref. to MT-91, REMOVAL, Drive Pinion Shaft Assembly.>
- 6) Remove main shaft assembly.

B: INSTALLATION

- 1) Install the needle bearing and oil seal onto the front of transmission main shaft assembly.

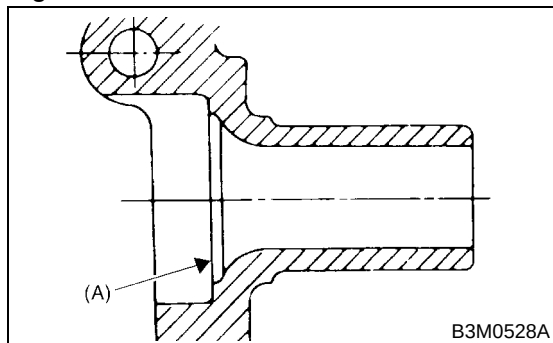
CAUTION:

- 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-91, INSTALLATION, Drive Pinion Shaft Assembly.>
- 4) Install transmission case. <Ref. to MT-66, INSTALLATION, Transmission Case.>
- 5) Install transfer case with extension case assembly (AWD model). <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 6) Install Rear case. (FWD model) <Ref. to MT-54, INSTALLATION, Rear Case.>

- 7) Install the manual transmission assembly to vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1. AWD MODEL

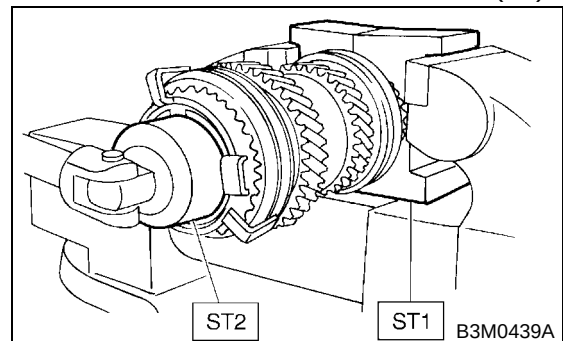
- 1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.
- 2) Remove lock nut from transmission main shaft assembly.

NOTE:

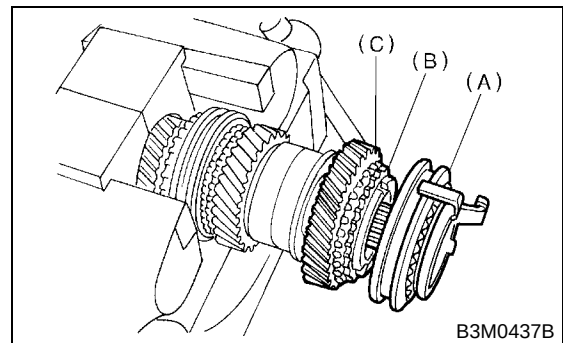
Remove caulking before off lock nut.

ST1 499987000 TRANSMISSION HOLDER

ST2 498937003 SOCKET WRENCH (35)



- 3) Remove 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.

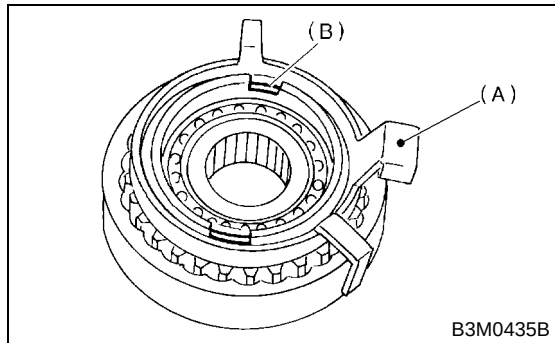


- (A) 5th-Rev sleeve and hub ASSY
- (B) Baulk ring
- (C) 5th drive gear

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

4) Remove snap ring and synchro cone stopper from 5th-Rev sleeve and hub assembly.



- (A) Synchro cone stopper
(B) Snap ring

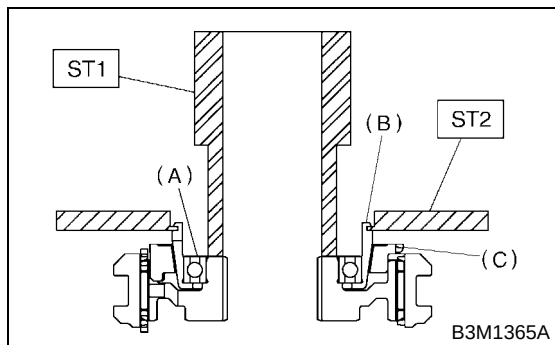
5) Using ST1, ST2 and a press, remove ball bearing, synchro cone and baulk ring (Rev).

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

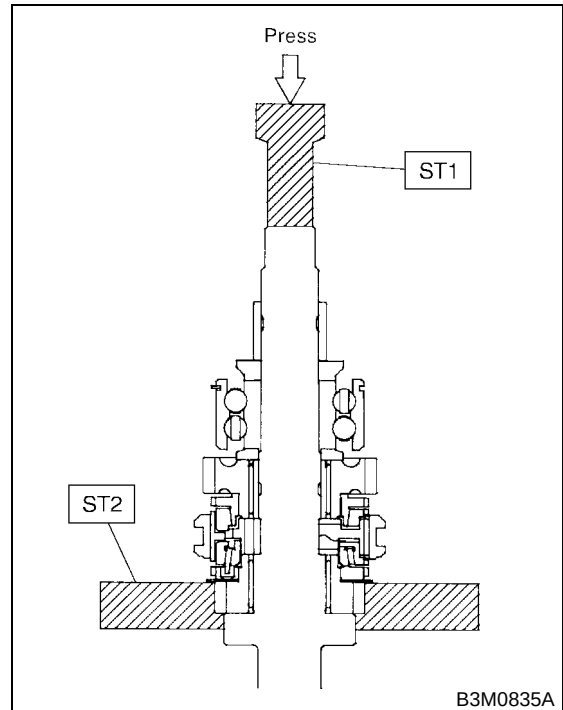
6) Using ST1 and ST2, remove the rest of parts.

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



2. FWD MODEL

1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.

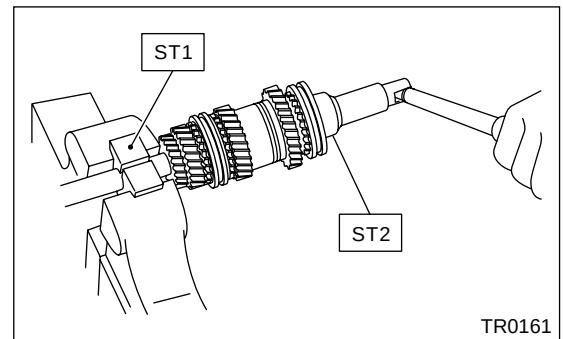
2) Remove lock nut.

NOTE:

Remove caulking before taking off lock nut.

ST1 498937000 TRANSMISSION HOLDER

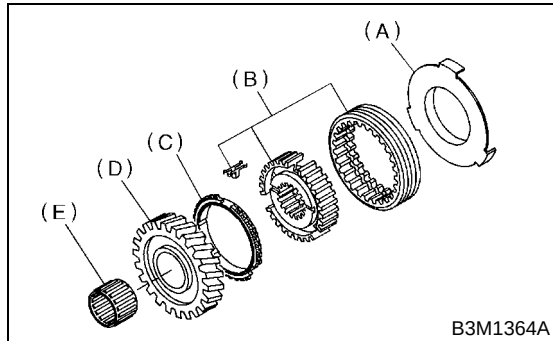
ST2 499987003 SOCKET WRENCH (35)



MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

3) Remove insert stopper plate, sleeve and hub assembly No. 2, baulk ring, 5th drive gear, and needle bearing.



- (A) Insert stopper plate
- (B) Sleeve and hub ASSY No. 2
- (C) Baulk ring
- (D) 5th drive gear
- (E) Needle bearing

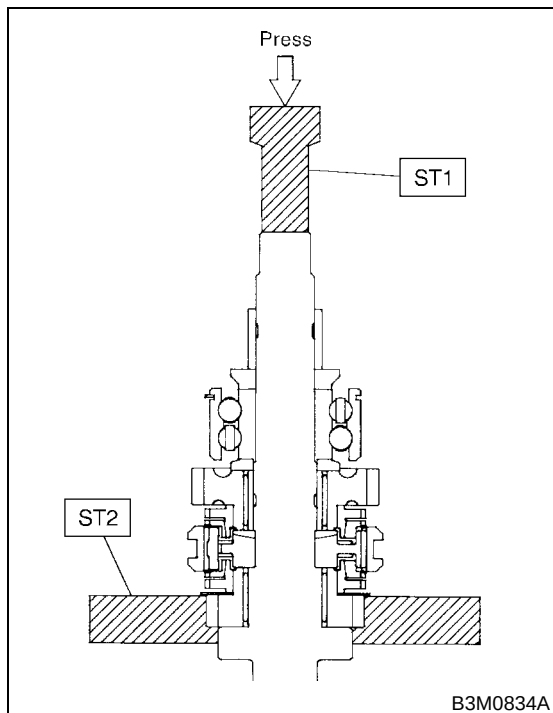
4) Using ST1, ST2 and a press, remove the rest of parts.

NOTE:

Replace sleeve and hub with ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines before hand.

ST1 899864100 REMOVER

ST2 899714110 REMOVER



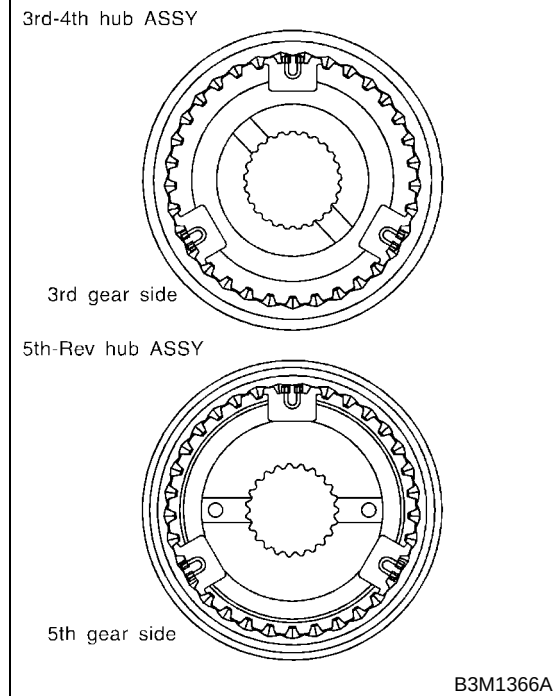
D: ASSEMBLY

1. AWD NON-TURBO MODEL

1) Assemble when each sleeve and hub assembly are disassembled.

NOTE:

Position open ends of spring 120° apart.



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.

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

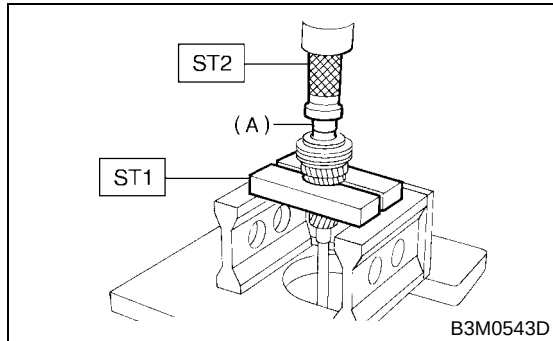
3) Install 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

CAUTION:

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

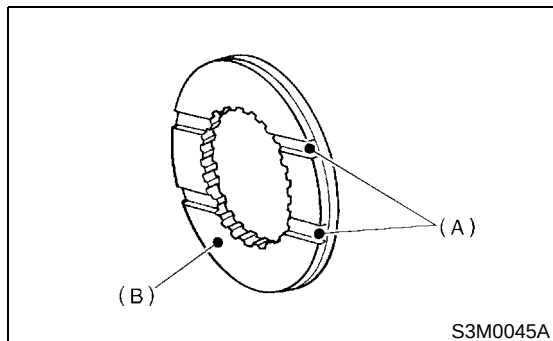


(A) 4th needle bearing race

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

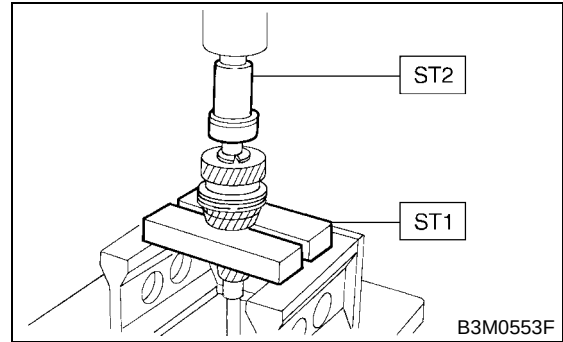
5) Drive ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

CAUTION:

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.

CAUTION:

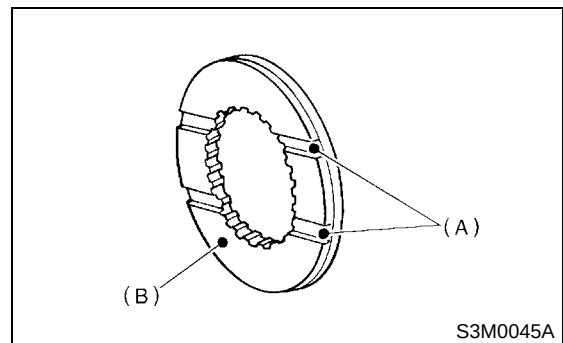
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Face thrust washer in the correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



(A) Groove

(B) 4th gear thrust washer

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

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.

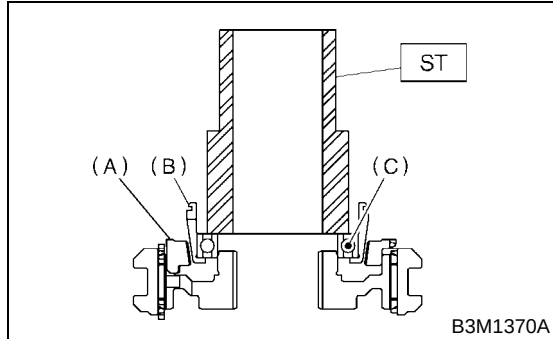
CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

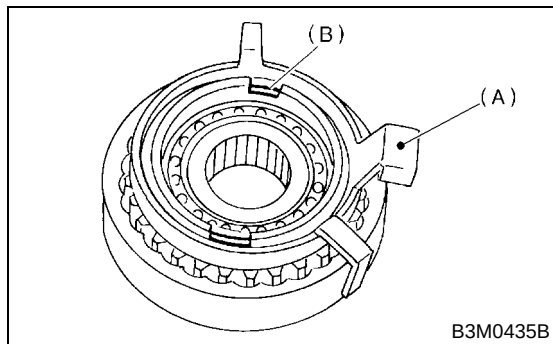
- Use new ball bearing.
- After press fitting, make sure synchro cone rotates freely.

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.

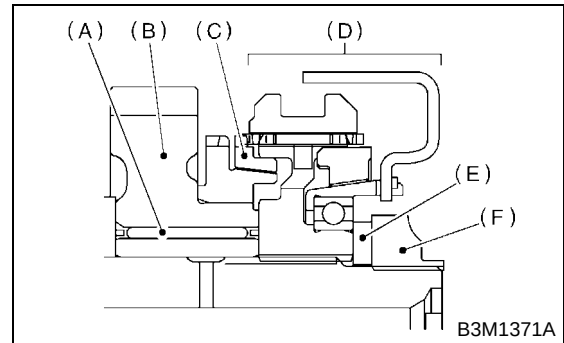


- (A) Synchro cone stopper
(B) Snap ring

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:

118 N·m (12.0 kgf-m, 86.8 ft-lb)

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

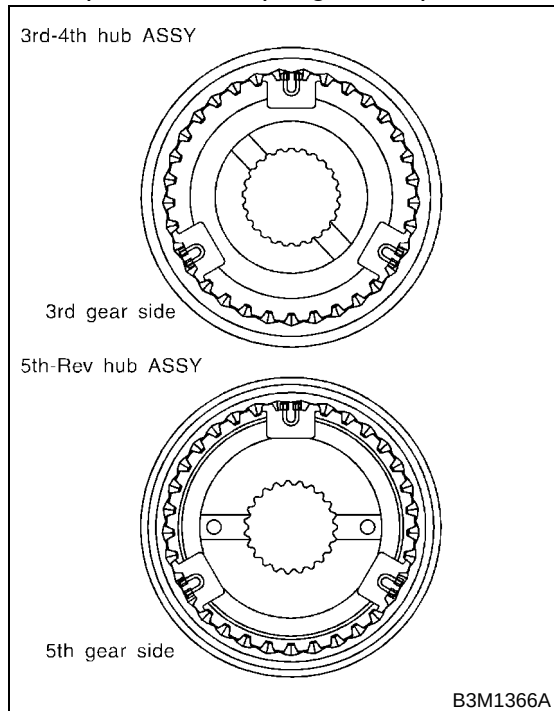
MANUAL TRANSMISSION AND DIFFERENTIAL

2. AWD TURBO MODEL

1) Assemble each sleeve and hub assembly.

NOTE:

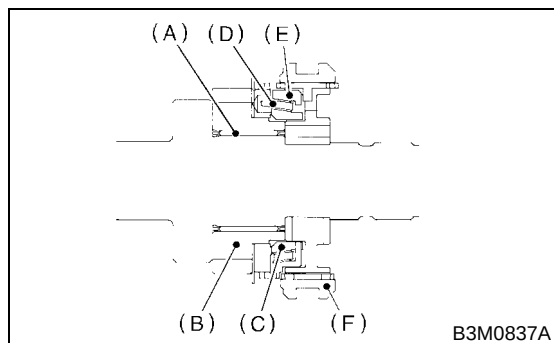
Position open ends of spring 120° apart.



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

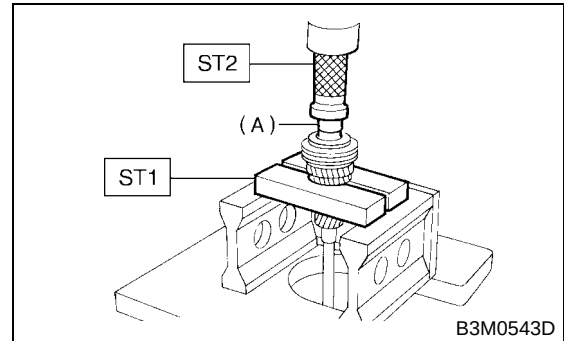
3) Install 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

CAUTION:

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

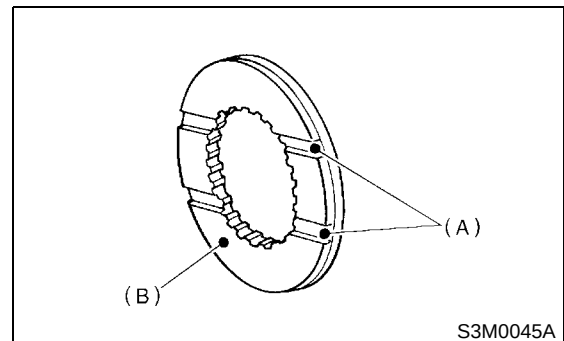


(A) 4th needle bearing race

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

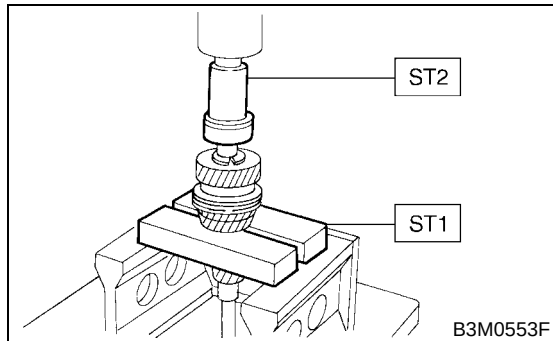
5) Drive ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

CAUTION:

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.

CAUTION:

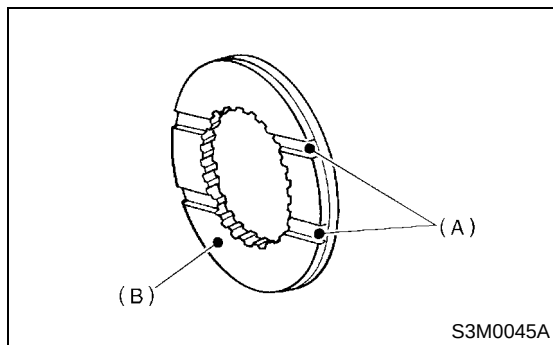
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Face thrust washer in the correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



(A) Groove

(B) 4th gear thrust washer

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.

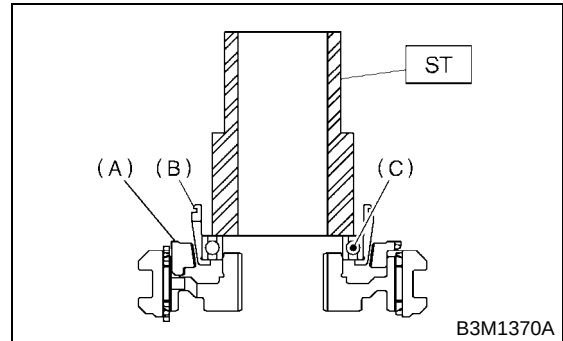
CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

- Use new ball bearing.
- After press fitting, make sure synchro cone rotates freely.

ST 499757002 INSTALLER

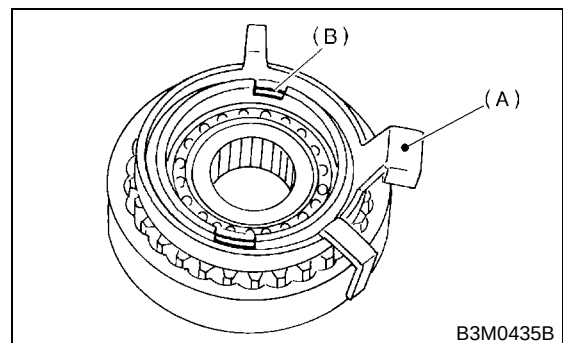


(A) Baulk ring

(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

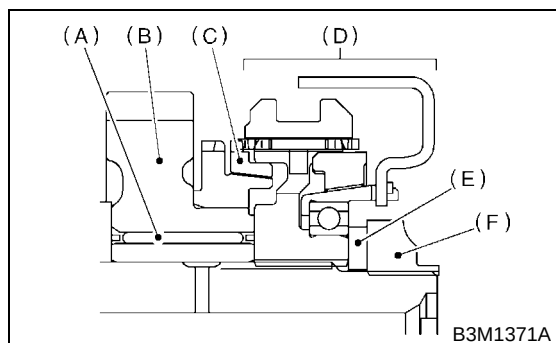
10) Install the rest parts to the rear section of transmission main shaft.

NOTE:

Align groove in baulk ring with shifting insert.

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL



- (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:

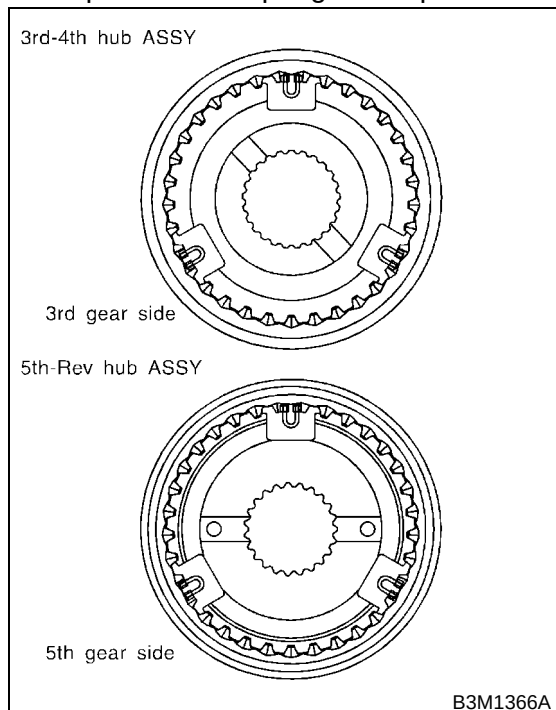
118 N·m (12.0 kgf-m, 86.8 ft-lb)

3. FWD MODEL

1) Assemble sleeve and hub assembly for 3rd-4th and 5th-Rev.

NOTE:

Position open ends of spring 120° apart.



2) Install 3rd drive gear, baulk ring, and sleeve and hub assembly for 3rd-4th needle bearing (32 x 36 x 25.7) on transmission main shaft.

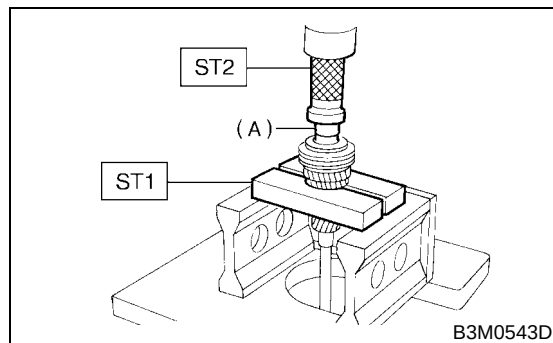
NOTE:

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

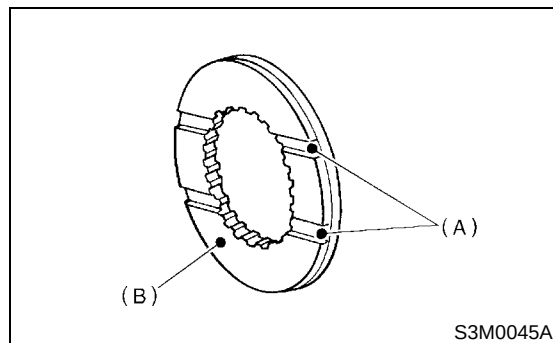


(A) 4th needle bearing

4) Install baulk ring, needle bearing (32 x 30 x 25.7), 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

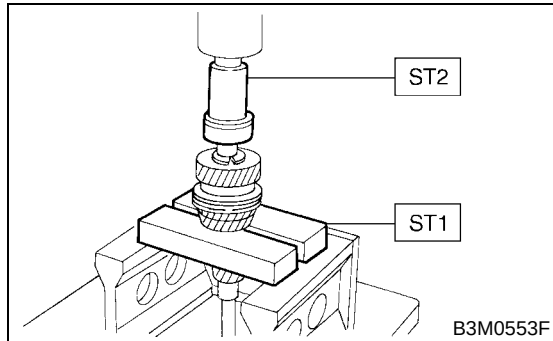
MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

5) Drive ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



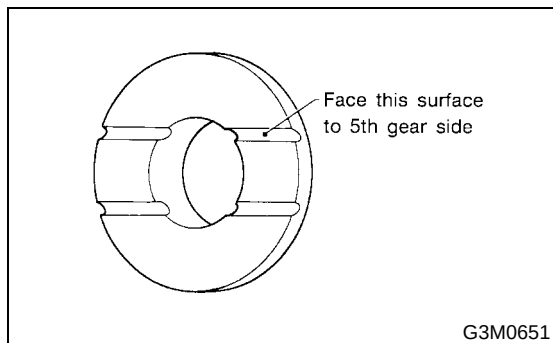
6) Using the same tools as in step 5) above, install the following parts onto the rear section of transmission main shaft.

NOTE:

Face thrust washer in the correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



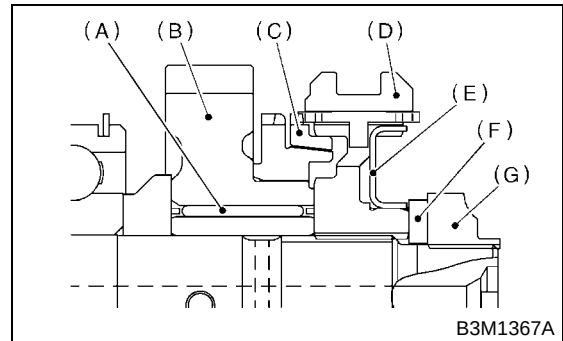
7) Install the following parts to the rear section transmission main shaft.

ST1 499987003 SOCKET WRENCH

ST2 498937000 TRANSMISSION HOLDER

NOTE:

- Align groove in baulk ring with shifting insert.
- Be sure to fit pawl of insert stopper plate into 4 mm (0.16 in) dia. hole in the boss section of synchronizer hub.



- (A) Needle bearing
- (B) 5th drive gear
- (C) Baulk ring
- (D) Sleeve and hub ASSY
- (E) Insert stopper plate
- (F) Lock washer
- (G) Lock nut

8) Tighten lock nuts (22 x 13) to the specified torque using ST1 and ST2.

NOTE:

Secure lock nuts in two places after tightening.

Tightening torque:

118 N·m (12.0 kgf-m, 86.8 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.

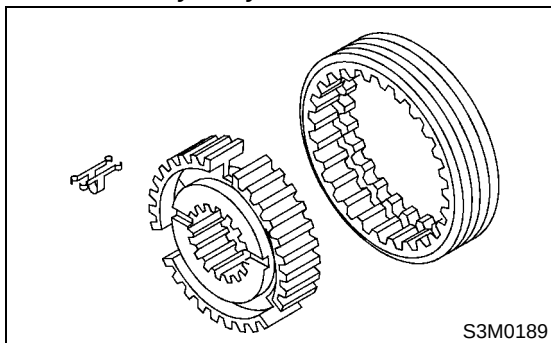
4) Baulk ring

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

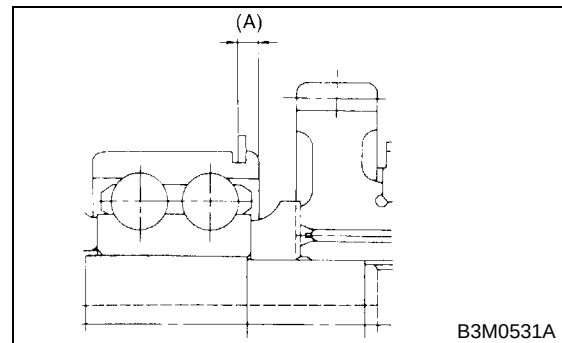
Using ST, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table:

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

17. Main Shaft Assembly for Dual-Range

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove transmission case. <Ref. to MT-64, REMOVAL, Transmission Case.>
- 4) Remove drive pinion shaft assembly. <Ref. to MT-91, 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-91, INSTALLATION, Drive Pinion Shaft Assembly.>
- 5) Install transmission case. <Ref. to MT-66, INSTALLATION, Transmission Case.>
- 6) Install transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 7) Install the manual transmission assembly to vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

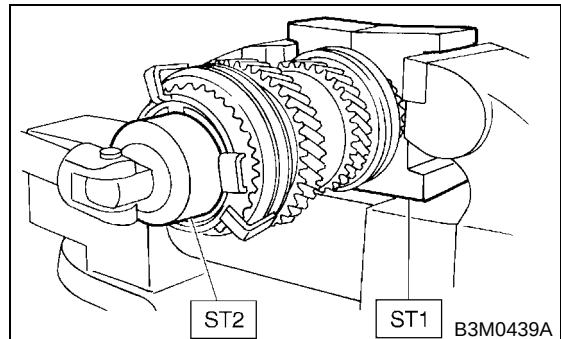
- 1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.
- 2) Remove lock nut from transmission main shaft assembly.

NOTE:

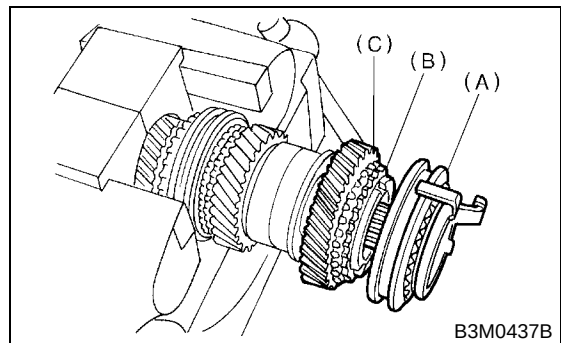
Remove caulking before taking off lock nut.

ST1 498937000 TRANSMISSION HOLDER

ST2 499987003 SOCKET WRENCH (35)

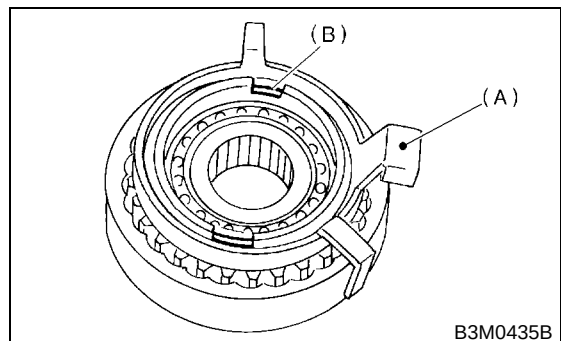


- 3) Remove 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



- (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

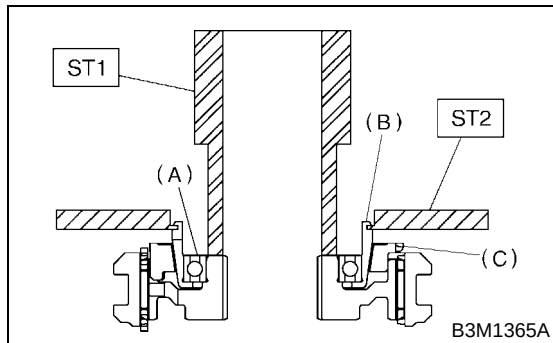
5) Using ST1, ST2 and a press, remove ball bearing, synchro cone and baulk ring (Rev).

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

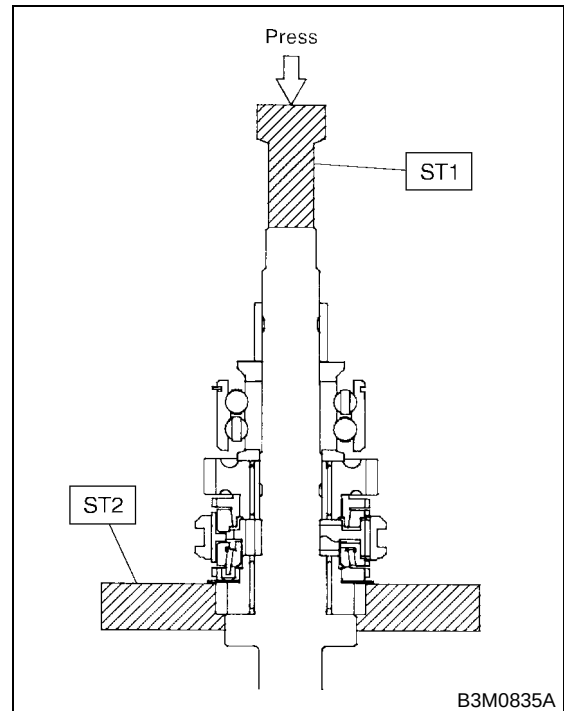
6) Using ST1 and ST2, remove the rest of parts.

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.

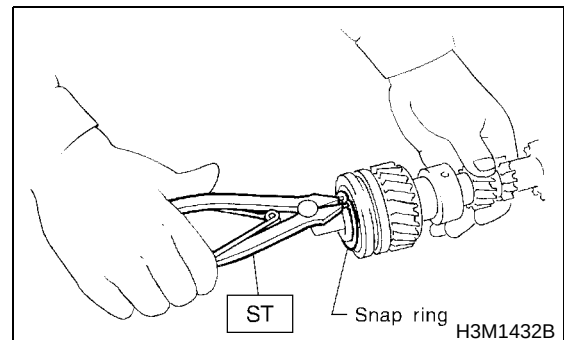
ST1 899864100 REMOVER

ST2 899714110 REMOVER



7) Remove snap ring from main shaft.

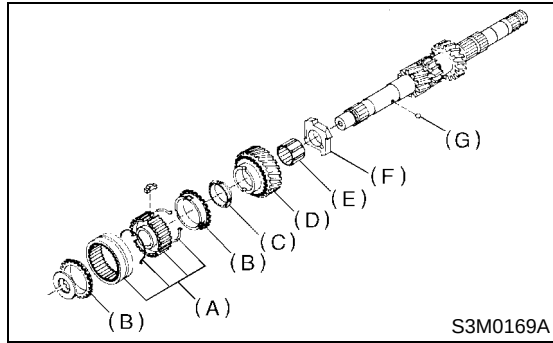
ST 899474100 EXPANDER



MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

8) Remove the rest of parts.



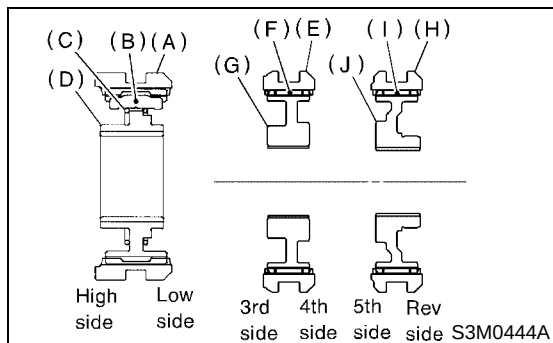
- (A) Sleeve and hub ASSY
- (B) High-low baulk ring
- (C) Friction damper
- (D) Low input gear
- (E) Needle bearing
- (F) Input low gear spacer
- (G) Ball

D: ASSEMBLY

1) 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

2) Install 3rd drive gear, baulk ring, sleeve and hub assembly for 3rd-4th needle bearing on transmission main shaft.

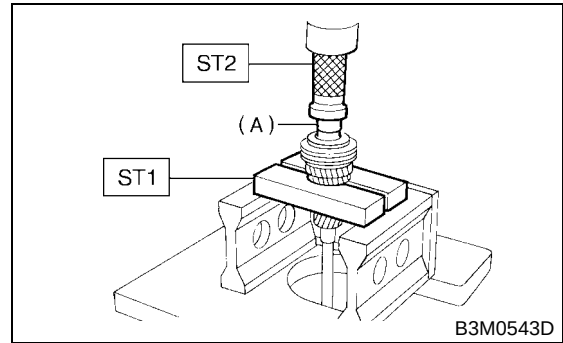
NOTE:

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

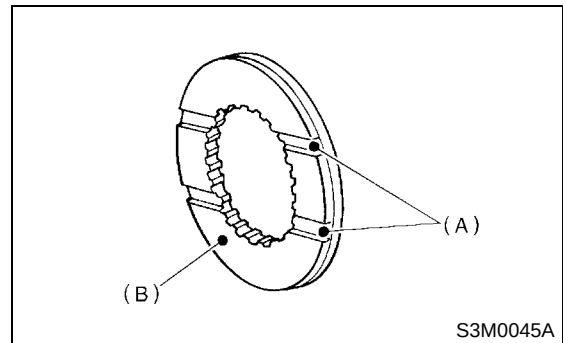


(A) 4th needle bearing race

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

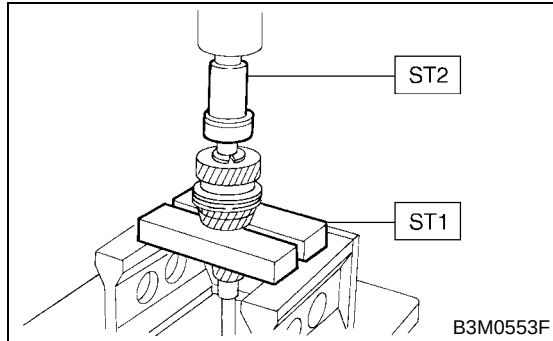
MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

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



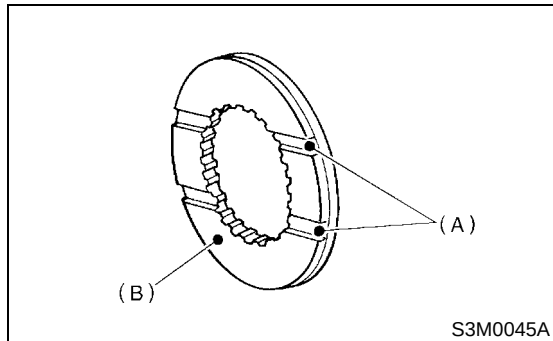
6) Using ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

NOTE:

Face thrust washer in the correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



(A) Groove

(B) 4th gear thrust washer

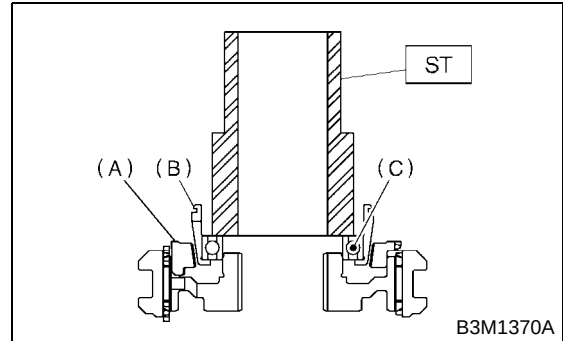
7) Install bearing onto synchro cone.

8) Install baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

NOTE:

- Use new ball bearing.
- After press fitting, make sure synchro cone rotates freely.

ST 499757002 INSTALLER

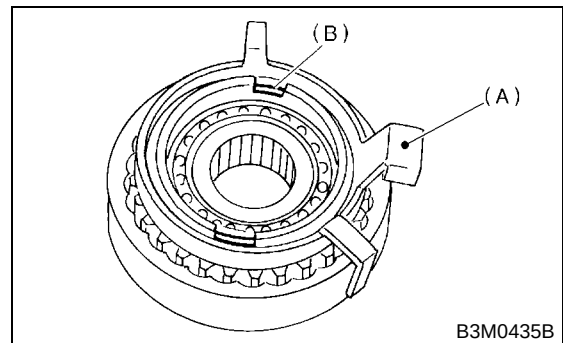


(A) Baulk ring

(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

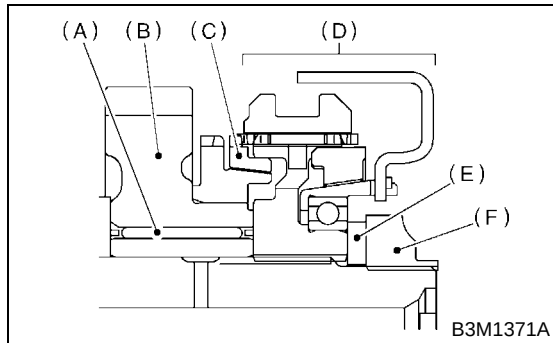
MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

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)

12) Install needle bearing on main shaft.

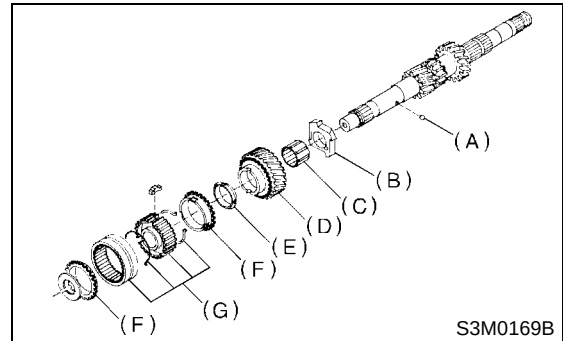
13) Install the parts to the front section of transmission main shaft.

CAUTION:

Be careful not to damage the graded section of transmission main shaft when installing needle bearing.

NOTE:

- 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 snap ring to the rod section of transmission main shaft using ST1 and ST2.

CAUTION:

Use only new snap ring.

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-80, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

INPUT SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

18.Input Shaft Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove transmission case. <Ref. to MT-64, REMOVAL, Transmission Case.>
- 4) Remove drive pinion shaft assembly. <Ref. to MT-91, 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-91, INSTALLATION, Drive Pinion Shaft Assembly.>
- 5) Install the transmission case. <Ref. to MT-66, INSTALLATION, Transmission Case.>
- 6) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 7) Install manual transmission assembly on vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

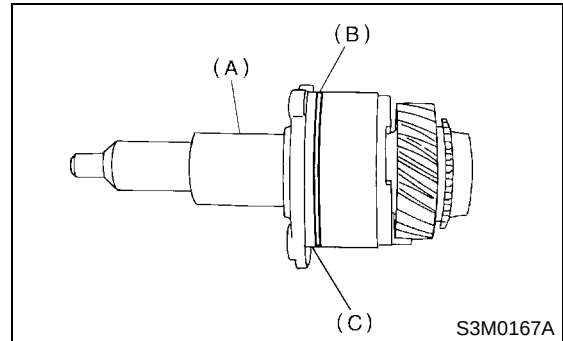
- 1) Remove O-ring from input shaft holder. Also, remove input shaft holder shim.

CAUTION:

Use new O-ring.

NOTE:

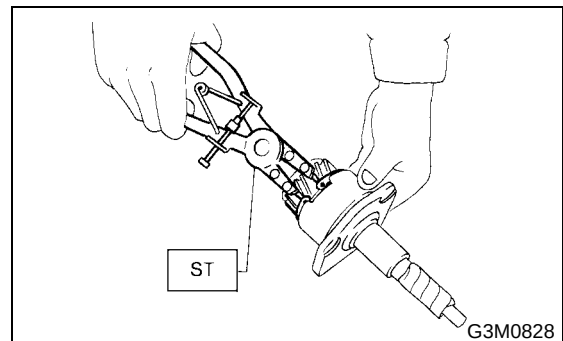
Number of shims used varies from none to two.



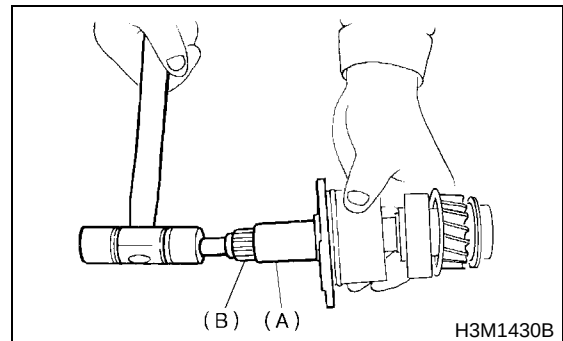
- (A) Input shaft holder
- (B) O-ring
- (C) Input shaft holder shim

- 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.

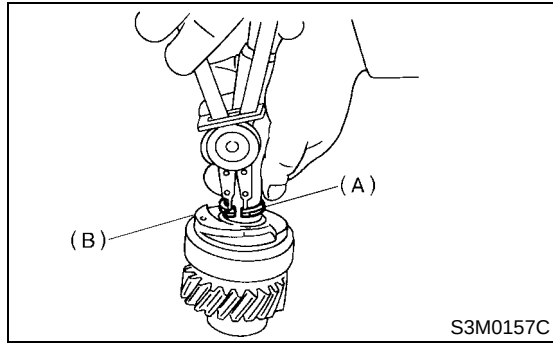


- (A) Input shaft holder
- (B) Input shaft

INPUT SHAFT ASSEMBLY

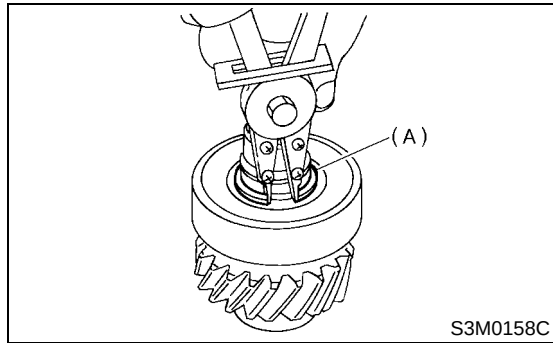
MANUAL TRANSMISSION AND DIFFERENTIAL

5) Remove outer snap ring. Then remove oil squeeze plate and straight pin.



(A) Snap ring
(B) Oil squeeze plate

6) Remove snap ring.



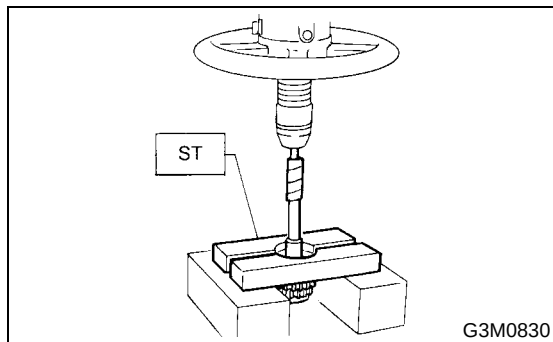
(A) Snap ring

7) Using a press and ST, remove ball bearing.

NOTE:

Remove inner snap ring before pressing.

ST 498077000 REMOVER



8) Remove oil seal from input shaft holder.

D: ASSEMBLY

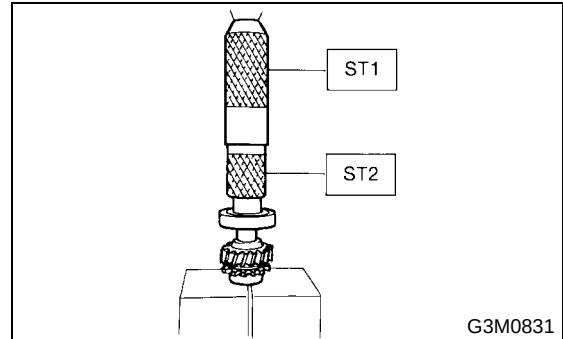
1) Install ball bearing onto input shaft.

NOTE:

Place snap ring between input shaft gear and ball bearing beforehand. Use the table at 5) as a guide in selecting a suitable snap ring.

ST1 899580100 INSTALLER

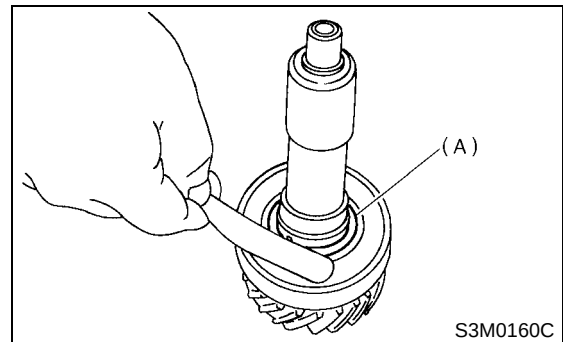
ST2 399513600 INSTALLER



2) Install snap ring on input shaft.

NOTE:

Select a suitable snap ring so that the axial play of ball bearing is held within 0 to 0.12 mm (0 to 0.0047 in).



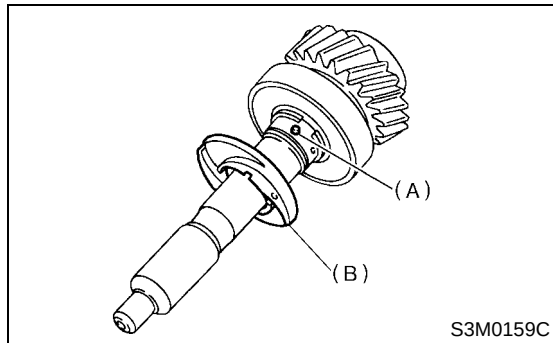
(A) Snap ring
(B) Thickness gauge

Snap ring	
Part No.	Thickness mm (in)
805028050	2.48 (0.0976)
805028060	2.56 (0.1008)
805028070	2.64 (0.1039)

INPUT SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

3) Install straight pin and oil squeeze plate to input shaft.



(A) Straight pin
(B) Oil squeeze plate

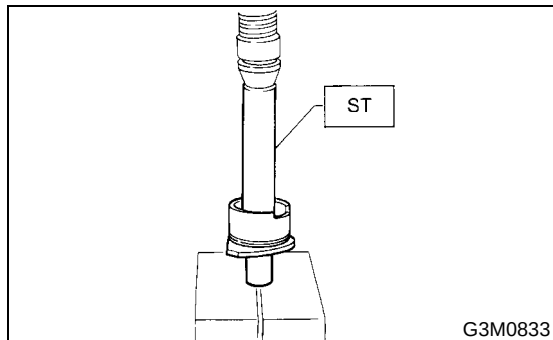
4) Install snap ring.

5) Drive oil seal into input shaft holder.

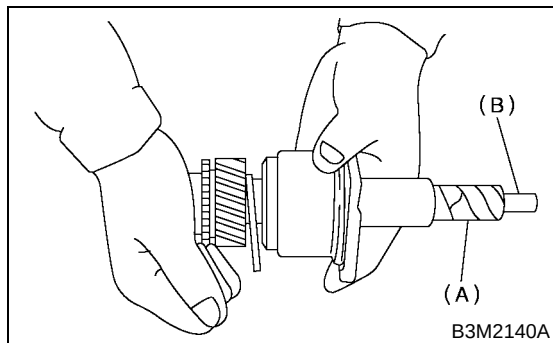
NOTE:

Apply a coat of grease to sealing lips before installing oil seal.

ST 398507703 DUMMY COLLAR



6) Wind vinyl tape around shaft splines and insert input shaft into holder by lightly tapping it by hand.



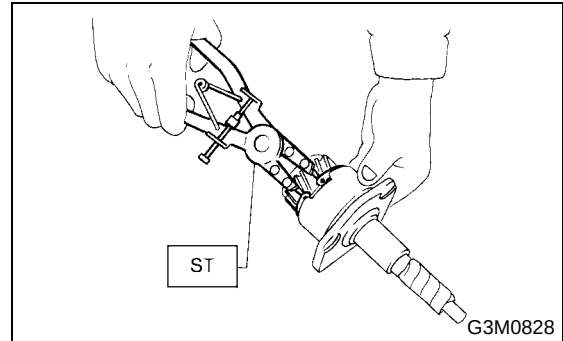
(A) Vinyl tape
(B) Input shaft

7) Install snap ring to input shaft holder.

NOTE:

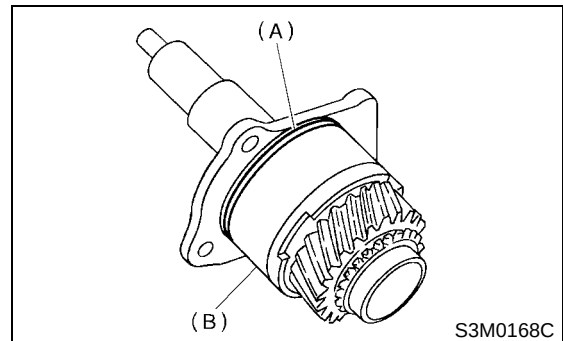
Select a suitable snap ring so that clearance between snap ring and bearing is held within 0 to 0.12 mm (0 to 0.0047 in).

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)

8) Install 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.

INPUT SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

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.

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

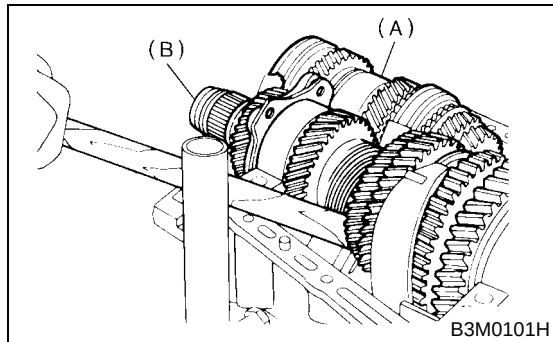
19. Drive Pinion Shaft Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove transfer case with extension case assembly. (AWD model) <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove rear case. (FWD model) <Ref. to MT-54, REMOVAL, Rear Case.>
- 4) Remove transmission case. (FWD model) <Ref. to MT-64, REMOVAL, Transmission Case.>
- 5) Remove drive pinion shaft assembly.

NOTE:

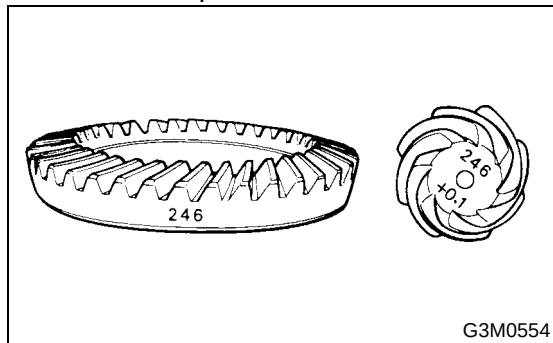
Use a hammer handle, etc. to remove if too tight.



- (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.



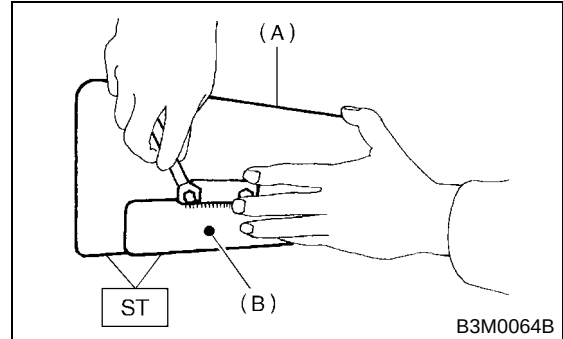
- 3) Place drive pinion shaft assembly on right hand transmission main case without shim and tighten bearing mounting bolts.

- 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



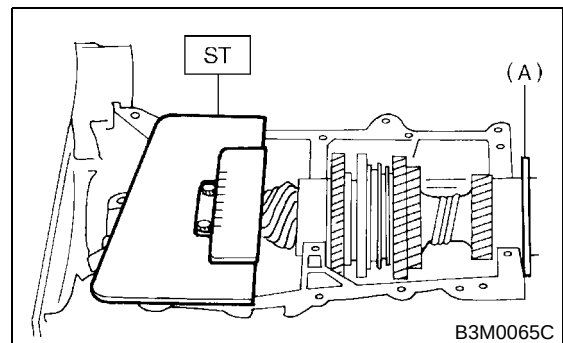
- (A) Plate
(B) Scale

- 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-102, 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 cynchronizing mechanisms. <Ref. to MT-98, INSPECTION, Drive Pinion Shaft Assembly.>

11) Install transmission case. <Ref. to MT-66, INSTALLATION, Transmission Case.>

12) Install transfer case with extension case assembly. (AWD model) <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>

13) Install rear case. (FWD model) <Ref. to MT-54, INSTALLATION, Rear Case.>

14) Install the manual transmission assembly to vehicle. <Ref. to MT-37, Manual Transmission Assembly.>

C: DISASSEMBLY

1. AWD MODEL

CAUTION:

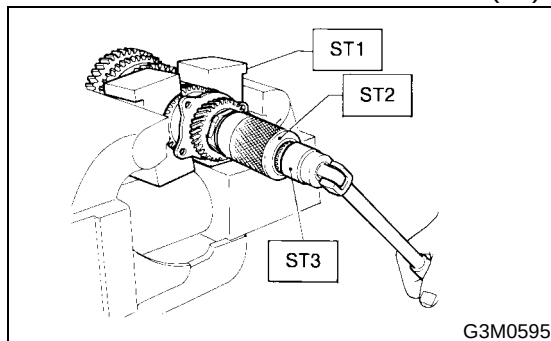
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) during disassembly or reassembly to prevent damage.

1) Straighten lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.

ST1 899884100 HOLDER

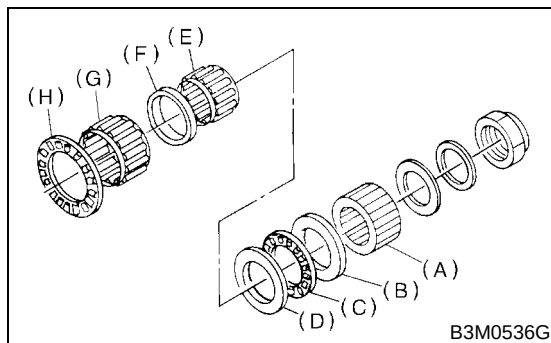
ST2 498427100 STOPPER

ST3 899988608 SOCKET WRENCH (27)



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.

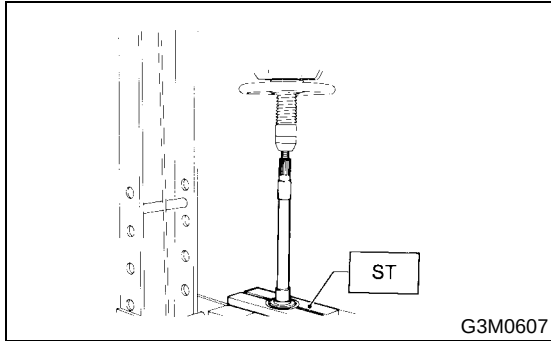
CAUTION:

Do not reuse roller bearing.

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

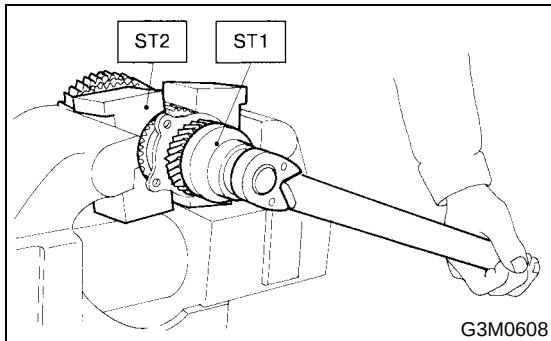
ST 498077000 REMOVER



4) Straighten lock nut at staked portion. Remove the lock nut using ST1 and ST2.

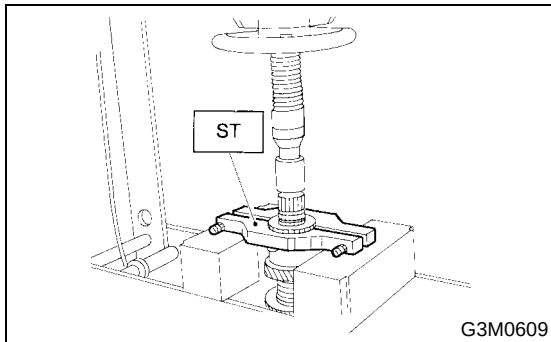
ST1 499987300 SOCKET WRENCH (50)

ST2 899884100 HOLDER



5) Remove 5th driven gear using ST.

ST 499857000 5TH DRIVEN GEAR REMOVER

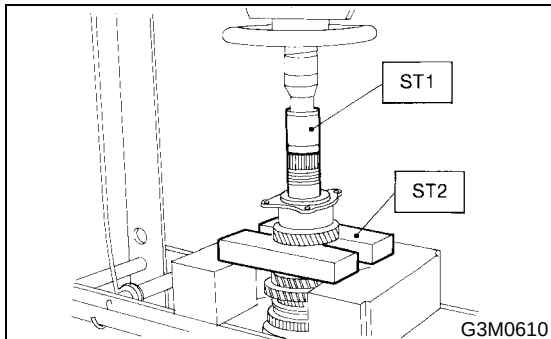


6) Remove woodruff key.

7) Remove roller bearing, 3rd-4th driven gear using ST1 and ST2.

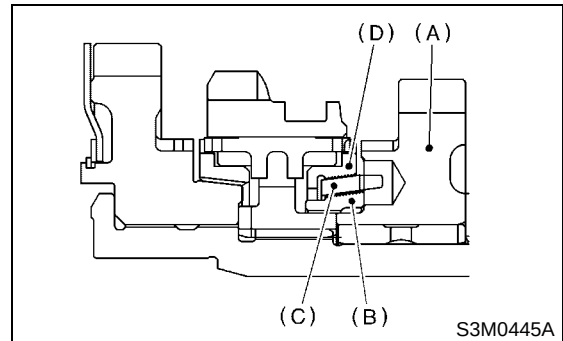
ST1 499757002 INSTALLER

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

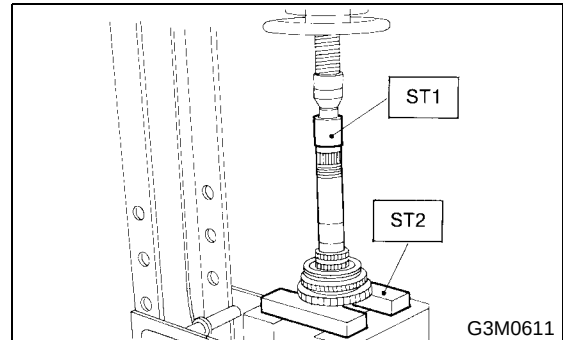
10) Remove 1st driven gear, 2nd gear bushing, gear and hub using ST1 and ST2.

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.

2. FWD MODEL

1) Loosen lock nut using ST1 and ST2.

ST1 49987100 or 499987003 or 899984103
SOCKETWRENCH (35)

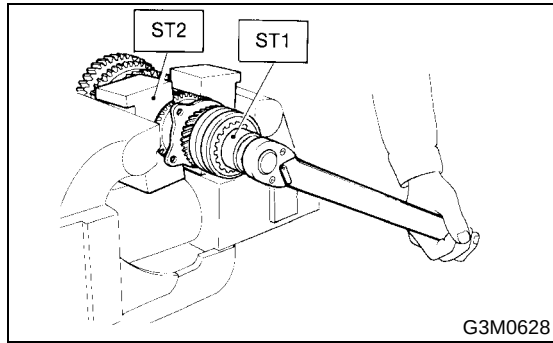
ST2 899884100
HOLDER

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

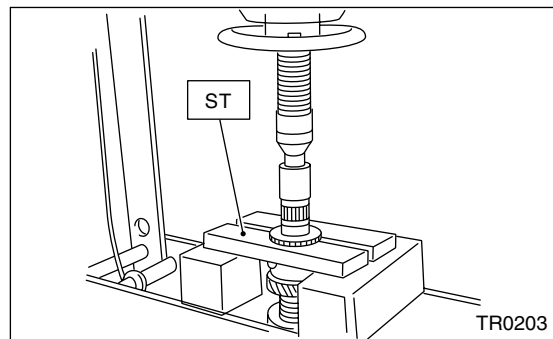
NOTE:

Remove caulking before taking off lock nut.



2) Remove 5th driven gear using a press.

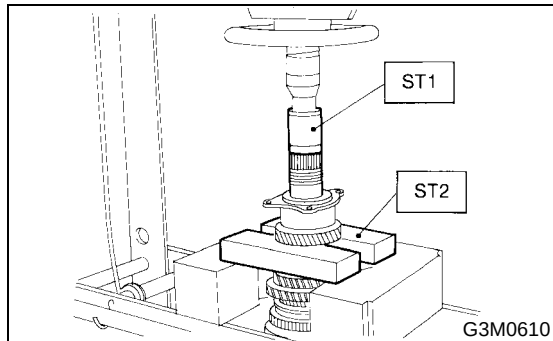
ST 498077000 5TH DRIVEN GEAR REMOVED



3) Remove woodruff key.

4) Remove roller bearing and 3rd-4th driven gear using ST1 and ST2.

ST1 499757002 SNAP RING GUIDE
ST2 899714110 REMOVER



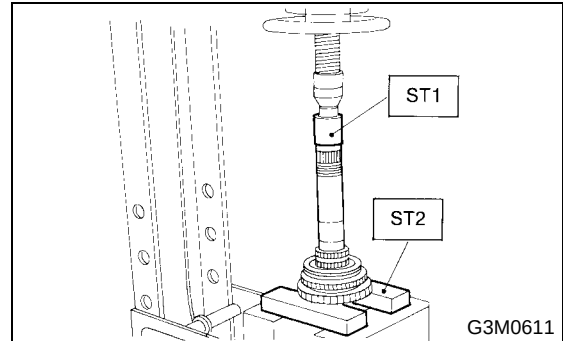
5) Remove 2nd driven gear assembly.

6) Remove 3rd-4th driven gear key.

7) Remove 1st driven gear, 2nd gear bushing, and gear & hub assembly using ST1 and ST2.

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 SNAP RING GUIDE
ST2 899714110 REMOVER

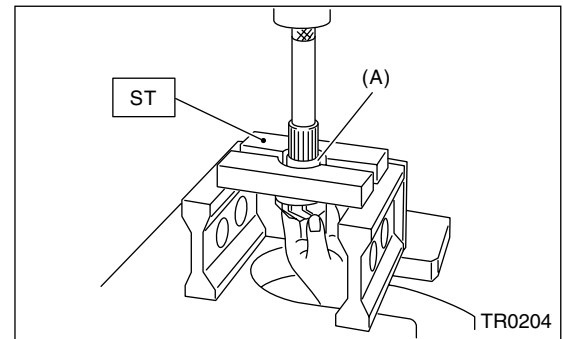


8) Remove 1st gear bushing, 1st driven gear thrust plate, and roller bearing using ST and press.

ST 498517000 REPLACER

CAUTION:

Replace roller bearing (41 x 71 x 23) with a new one if this disassembly is performed.



(A) 1st gear bushing

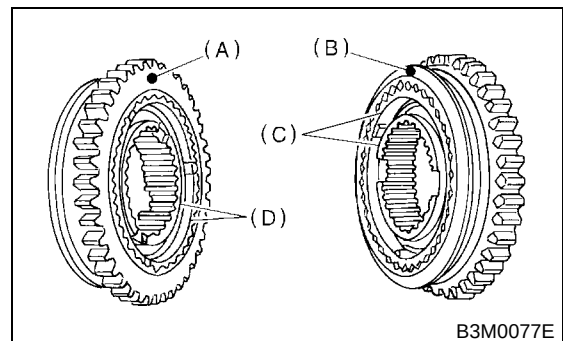
D: ASSEMBLY

1. AWD MODEL

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

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

- 2) Install washer, snap ring and sub gear 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.

CAUTION:

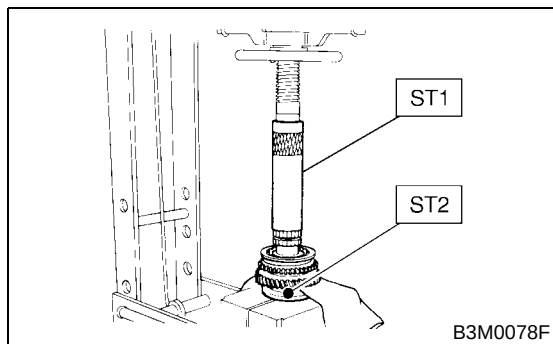
- Attach a cloth to the end of driven shaft to prevent damage.
- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

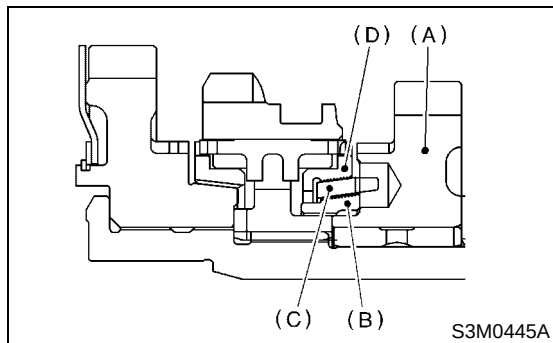
When press fitting, align oil holes of shaft and bush.

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.

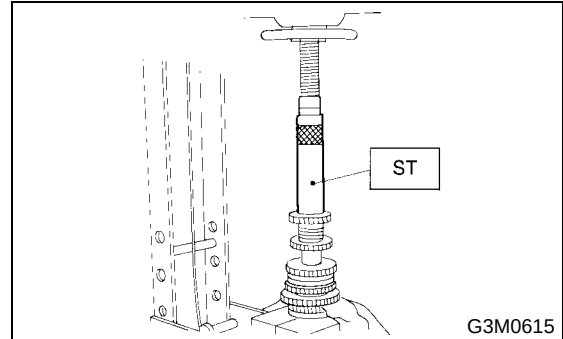
CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Align groove in baulk ring with insert.

ST 499277200 INSTALLER

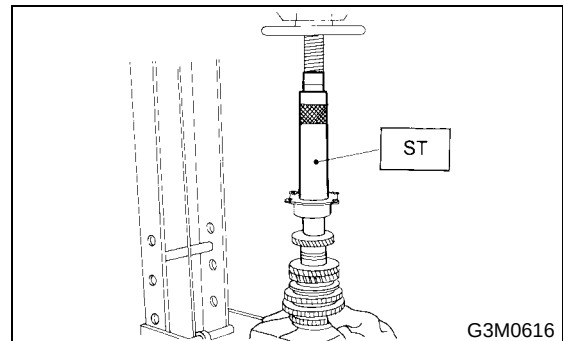


- 7) Install a set of roller bearings onto the driven shaft using ST and press.

CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST 499277200 INSTALLER

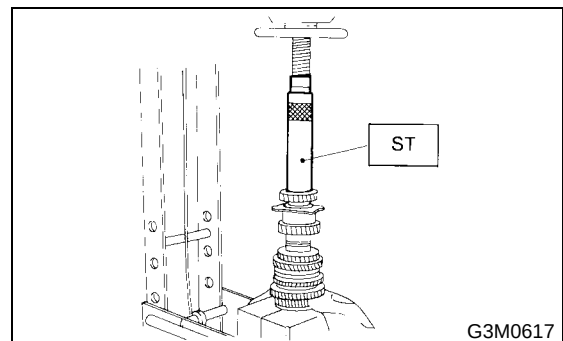


- 8) Position woodruff key in groove on the rear of driven shaft. Install 5th driven gear onto drive shaft using ST and press.

CAUTION:

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.

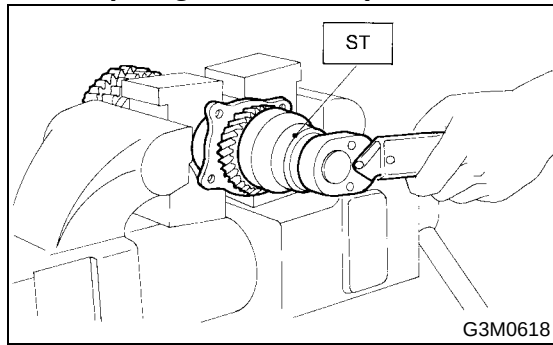
ST 499987300 SOCKET WRENCH (50)

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

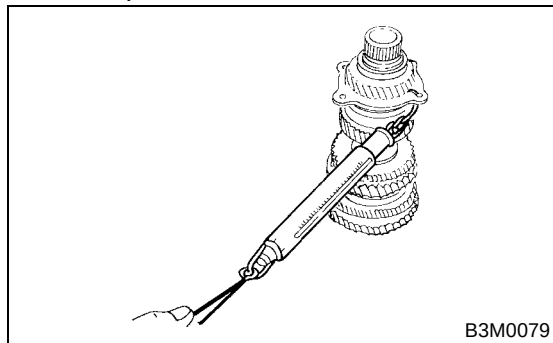
Tightening torque:

265 N·m (27 kgf-m, 195 ft-lb)



NOTE:

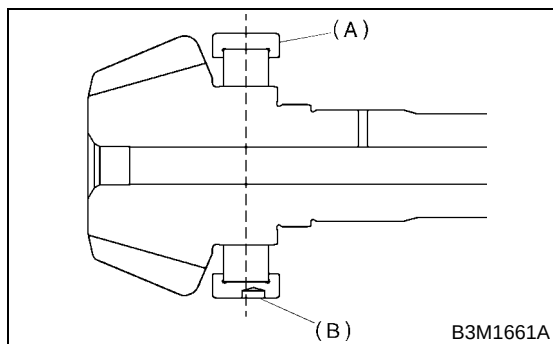
- Stake lock nut at two points.
- Using spring balancer, check that starting torque of roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.33ft).



10) 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.



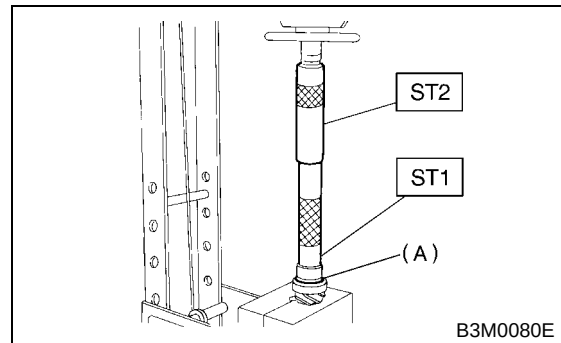
- (A) Roller bearing
(B) Knock pin hole

11) Install washer using ST1, ST2 and press.

CAUTION:

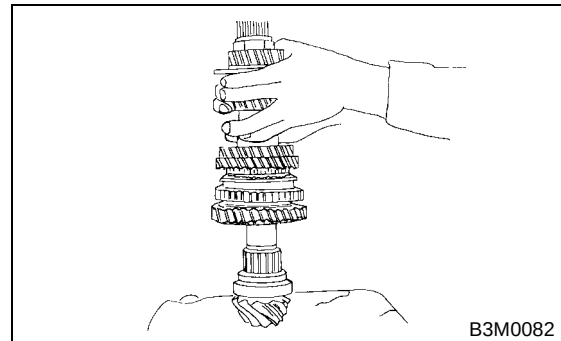
- Discard old lock nuts, replace with new ones.
- Secure lock nut in four places.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 499277200 INSTALLER



(A) Washer

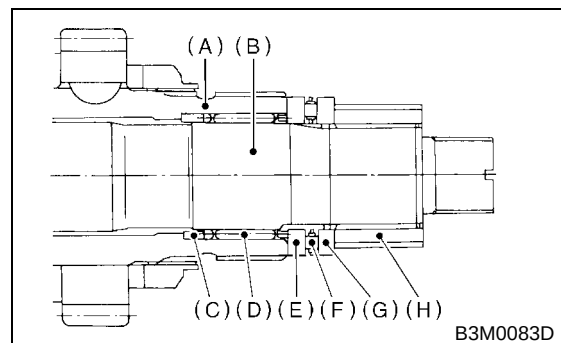
12) Install thrust bearing and needle bearing. Install driven shaft assembly.



13) 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

DRIVE PINION SHAFT ASSEMBLY

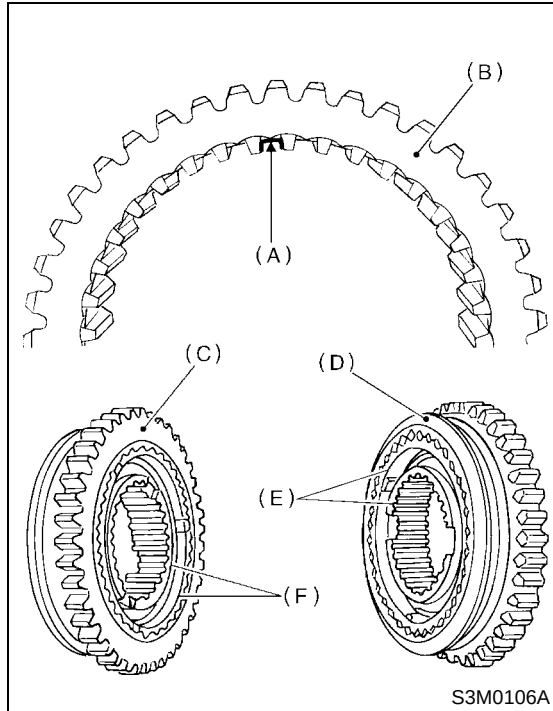
MANUAL TRANSMISSION AND DIFFERENTIAL

2. FWD MODEL

1) Assemble gear and hub assembly.

NOTE:

- Use new gear and hub assembly, if gear or hub have been replaced.
- Be sure the insert keys are correctly located in the insert key grooves inside the reverse driven gear.



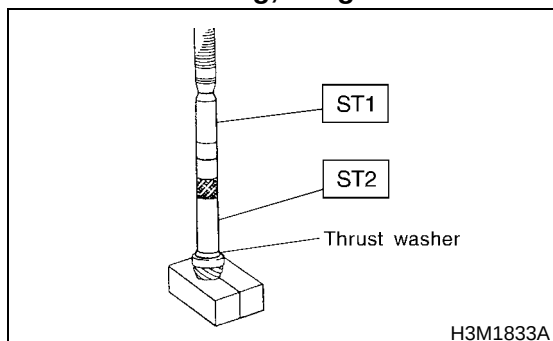
- (A) Key grooves
(B) Reverse driven gear
(C) 1st driven gear side
(D) 2nd driven gear side
(E) Flush surface
(F) Stepped surface

2) Drive roller bearing onto drive pinion shaft and 1st driven gear thrust washer using ST1 and ST2.

ST1 499277000 RACE 4-5 INSTALLER
ST2 499277100 BUSH 1-2 INSTALLER

CAUTION:

Use new roller bearing, 1st gear thrust washer.



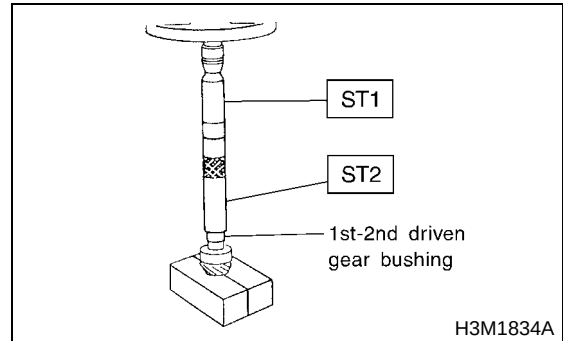
3) Install 1st-2nd driven gear bushing onto drive pinion shaft.

NOTE:

Bushing may be installed with either side up.

ST1 499877000 RACE 4-5 INSTALLER

ST2 499277100 BUSH 1-2 INSTALLER



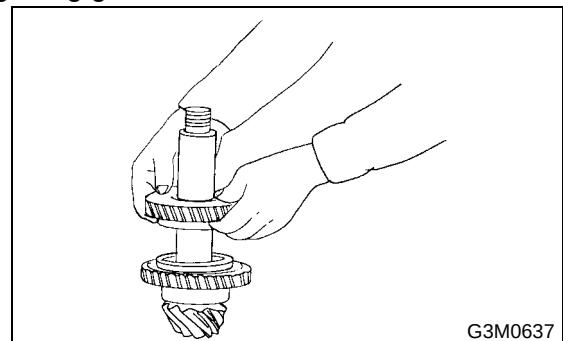
4) Measure outside diameter of 1st driven gear bushing to determine suitable 1st driven gear.

Bushing outside diameter mm (in)	1st driven gear
42.019 — 42.033 (1.6543 — 1.6548)	32231AA840
42.005 — 42.018 (1.6537 — 1.6543)	32231AA850
41.990 — 42.004 (1.6531 — 1.6537)	32231AA860

5) Install 1st driven gear, 1st-2nd balk ring and gear and hub assembly (already assembled in previous step) to drive pinion shaft by hand.

NOTE:

Align ring groove with insert.

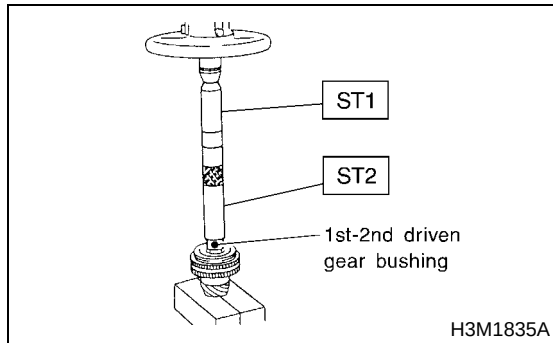


DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

6) Install 1st-2nd driven gear bushing to drive pinion shaft using ST1 and ST2.

ST1 499877000 RACE 4-5 INSTALLER
ST2 499277100 BUSH 1-2 INSTALLER



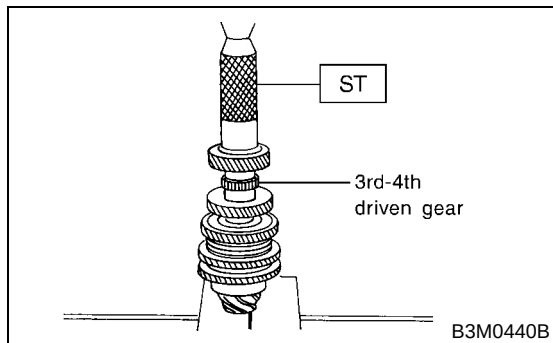
7) Install 2nd driven gear and 1st-2nd bask ring to drive pinion shaft by hand.

8) Install key into the groove on drive pinion shaft and install 3rd-4th driven gear.

NOTE:

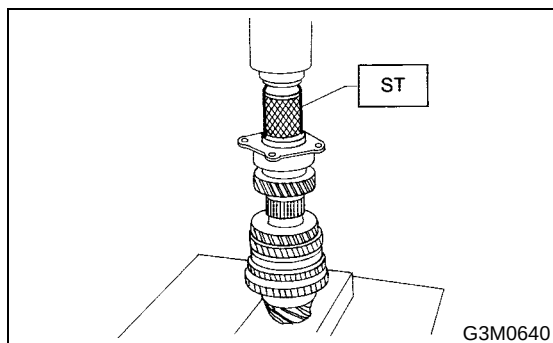
Ball bearing may be installed without using the tool. There should be no problem.

ST 499877000 RACE 4-5 INSTALLER



9) Install ball bearing (29 x 74 x 38) on drive pinion shaft with ST.

ST 499277100 BUSH 1-2 INSTALLER

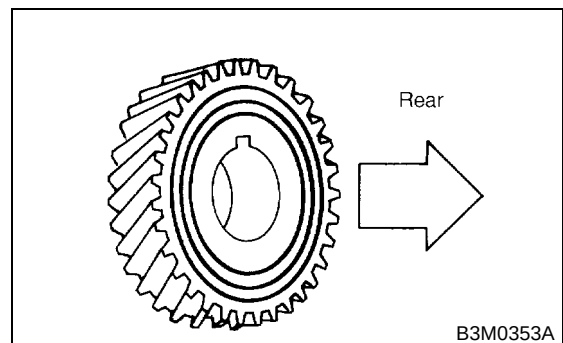
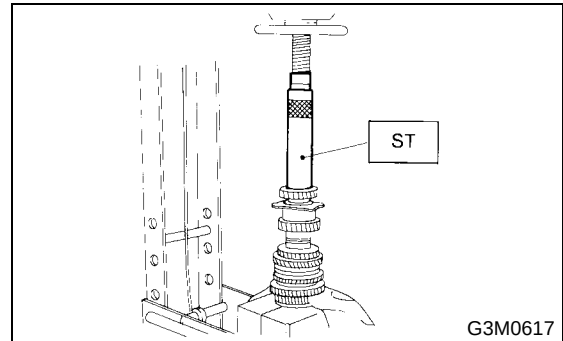


10) Position woodruff key in groove on the rear of drive pinion shaft. Install 5th driven gear onto drive shaft using ST and press.

ST 499277100 INSTALLER

CAUTION:

- Face 5th driven gear in the correct direction.
- Be careful not to dislocate woodruff key while installing 5th gear.



11) Install lock washer and tighten lock nut to the specified torque using ST1 and ST2.

ST1 49987100 or 499987003 or 899984103
SOCKETWRENCH (35)

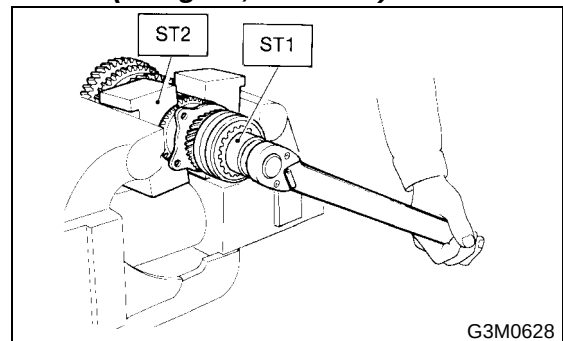
ST2 899884100 HOLDER

CAUTION:

- Discard old lock nuts, replace with new ones.
- Secure lock nut in four places.

Tightening torque:

118 N·m (12 kgf·m, 86.8 ft·lb)



E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

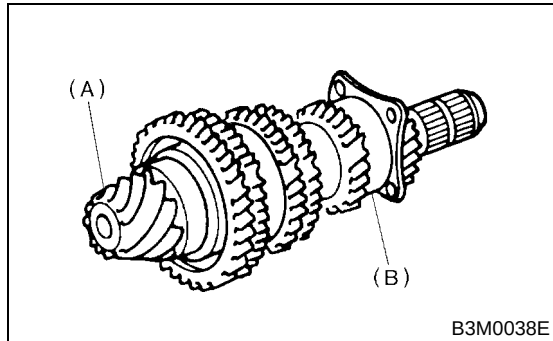
Replace bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

- 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.

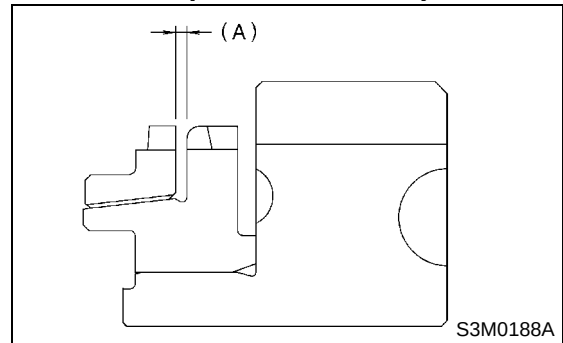
4) Baulk ring

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):

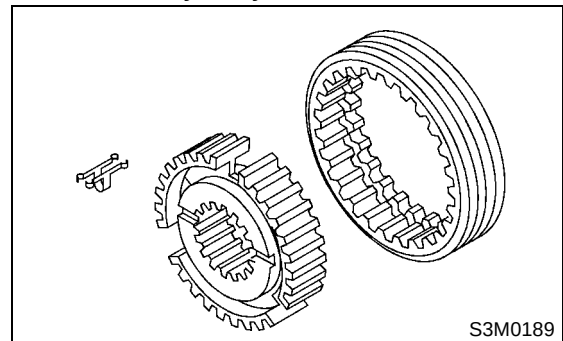
0.5 — 1.0 mm (0.020 — 0.040 in)



- 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.

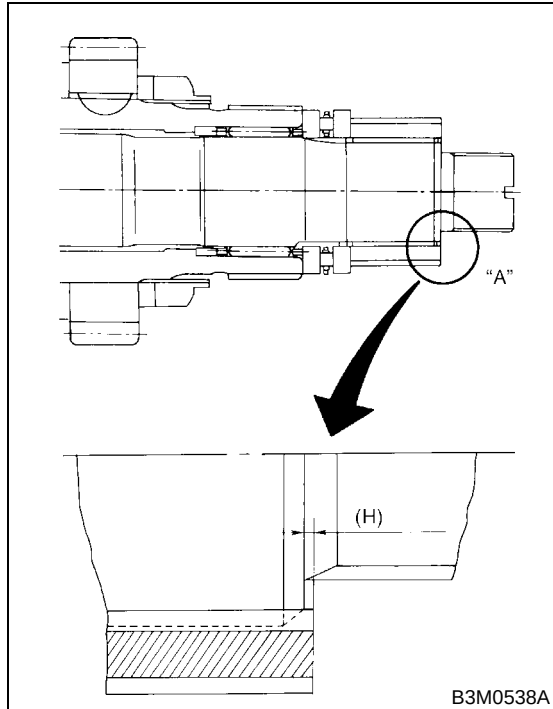
DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

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).

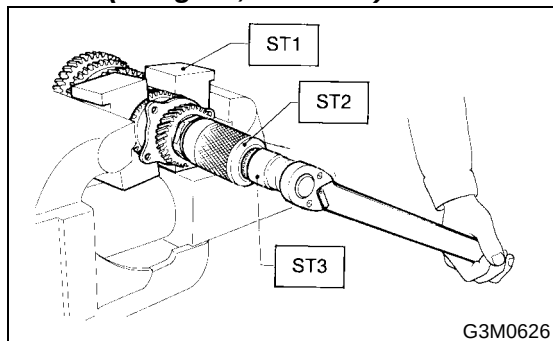


2) Using ST1, ST2 and ST3, tighten lock nut to the specified torque.

ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)

Tightening torque:

118 N·m (12 kgf·m, 86.8 ft·lb)



3) After removing ST2, measure starting torque using torque driver.

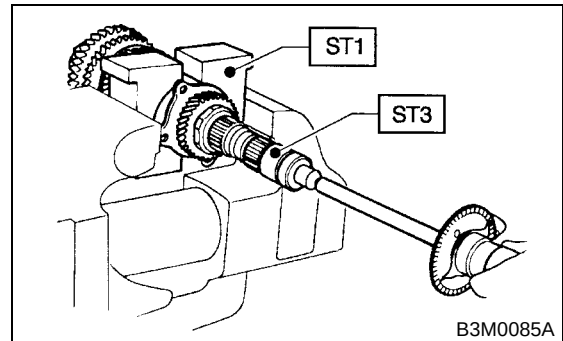
ST1 899884100 HOLDER

ST3 899988608 SOCKET WRENCH (27)

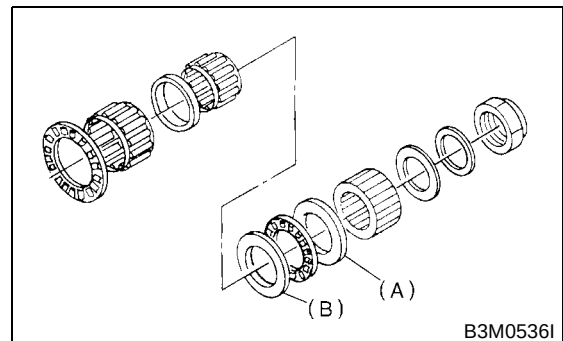
Starting torque:

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

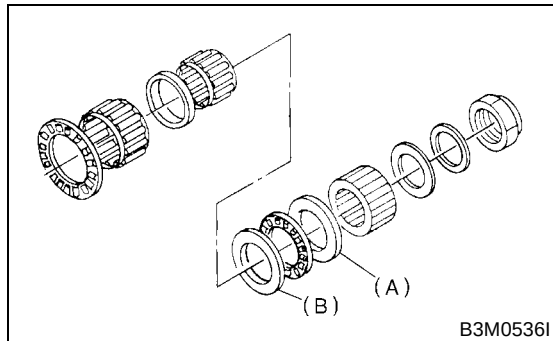
(B) Adjusting washer No.2

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)

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

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

20.Front Differential Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove transfer case with extension case assembly (AWD model). <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove rear case (FWD model) <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove transmission case. <Ref. to MT-64, REMOVAL, Transmission Case.>
- 5) Remove drive pinion shaft assembly. <Ref. to MT-91, REMOVAL, Drive Pinion Shaft Assembly.>
- 6) Remove main shaft assembly.

Single-range model:

<Ref. to MT-71, REMOVAL, Main Shaft Assembly for Single-Range.>

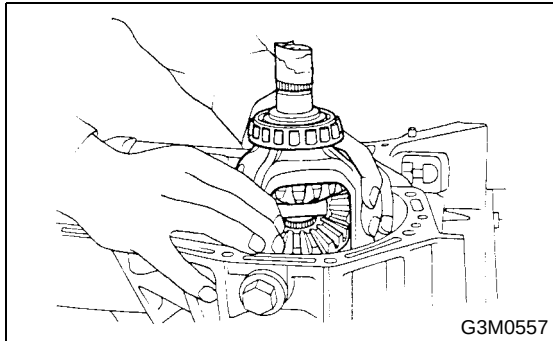
Dual-range model:

<Ref. to MT-81, REMOVAL, Main Shaft Assembly for Dual-Range.>

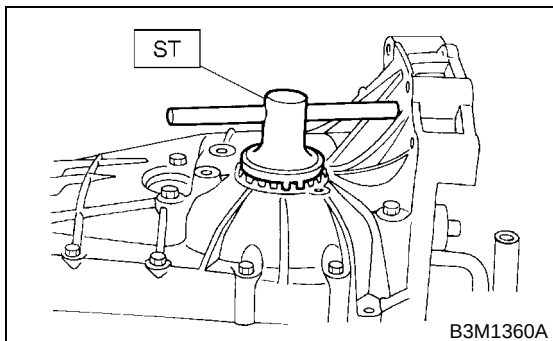
- 7) Remove differential assembly.

CAUTION:

- Be careful not to confuse right and left roller bearing outer races.
- Be careful not to damage retainer oil seal.



- 8) Remove differential side retainers using ST. ST 499787000 WRENCH ASSY



B: INSTALLATION

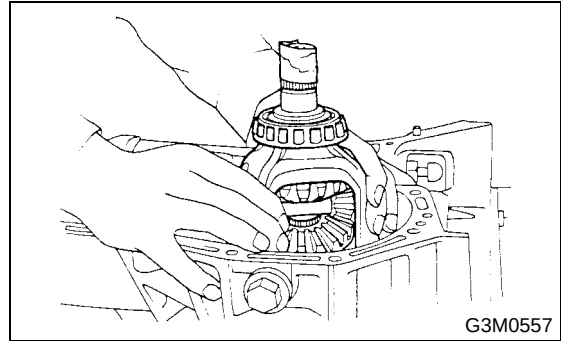
- 1) Install differential side retainers using ST. ST 499787000 WRENCH ASSY
- 2) Install differential assembly.

CAUTION:

Be careful not to fold the sealing lip of oil seal.

NOTE:

Wrap the left and right splines sections of axle shaft with vinyl tape to prevent scratches.



- 3) Install main shaft assembly. <Ref. to MT-81, INSTALLATION, Main Shaft Assembly for Dual-Range.>
- 4) Install drive pinion assembly. <Ref. to MT-91, INSTALLATION, Drive Pinion Shaft Assembly.>
- 5) Install transmission case. <Ref. to MT-66, INSTALLATION, Transmission Case.>
- 6) Install transfer case with extension case assembly (AWD model). <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 7) Install rear case (FWD model) <Ref. to MT-54, INSTALLATION, Rear Case.>
- 8) Install the manual transmission assembly to vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

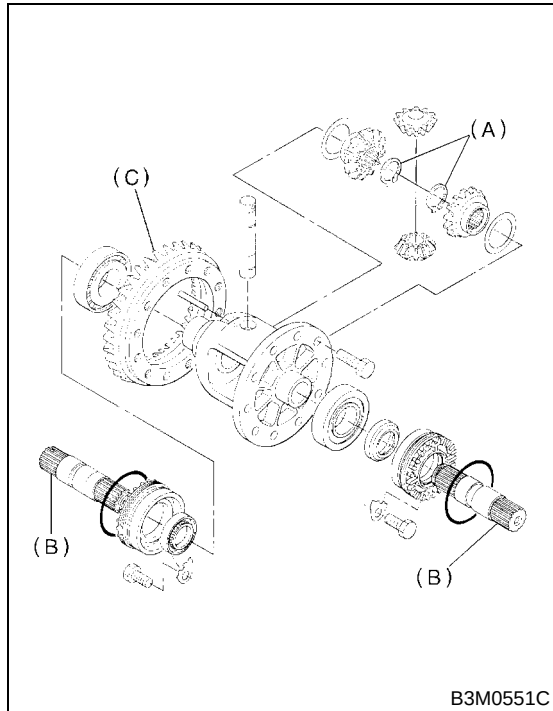
C: DISASSEMBLY

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.

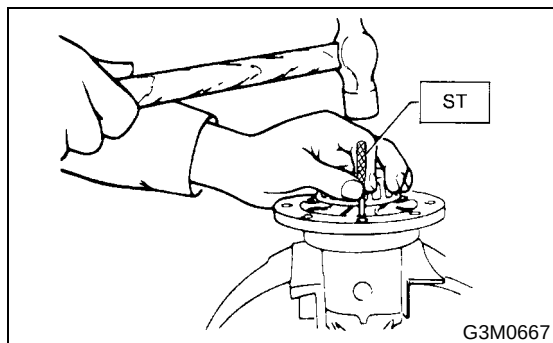
2) Loosen twelve bolts and remove hypoid driven gear.



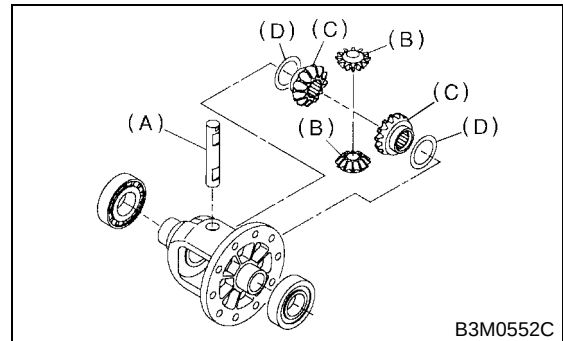
- (A) Snap ring
- (B) Axle drive shaft
- (C) Hypoid driven gear

3) Drive out straight pin from differential assembly toward hypoid driven gear.

ST 899904100 REMOVER

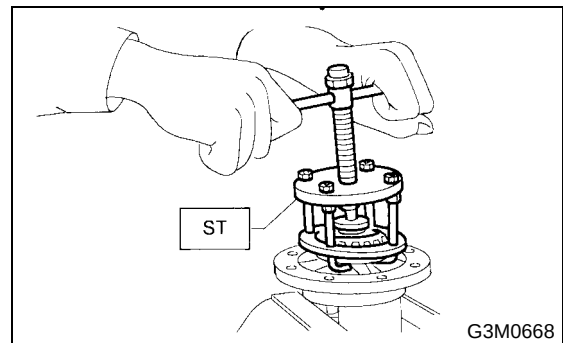


4) Pull out pinion shaft, and remove differential bevel pinion and gear and washer.



- (A) Pinion shaft
- (B) Bevel pinion
- (C) Bevel gear
- (D) Washer

5) Remove roller bearing using ST.
ST 399527700 PULLER SET

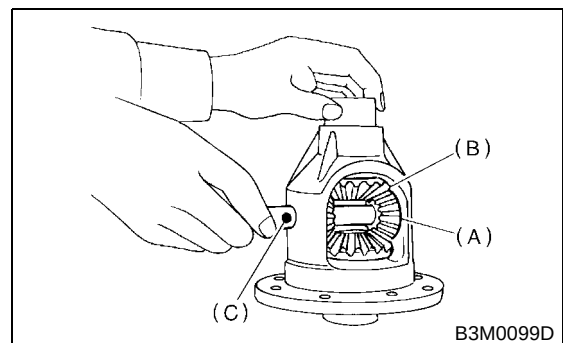


D: ASSEMBLY

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

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

2) Measure backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it. <Ref. to MT-106, ADJUSTMENT, Front Differential Assembly.>

NOTE:

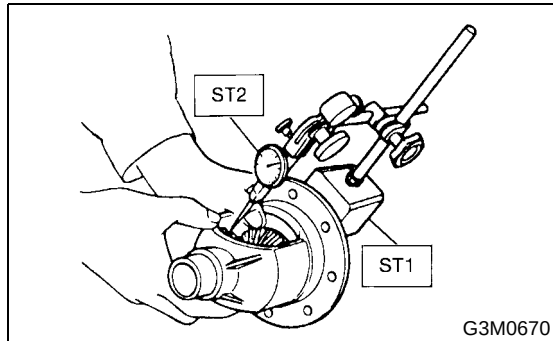
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE

ST2 498247100 DIAL GAUGE

Standard backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

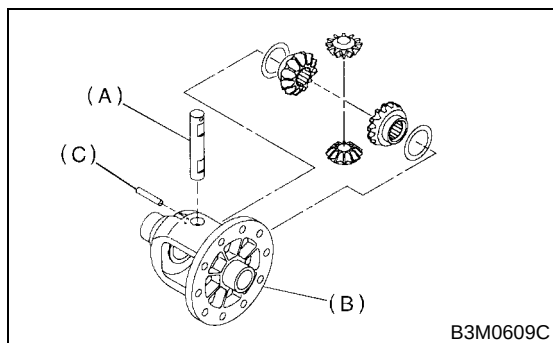


3) Align pinion shaft and differential case at their holes, and drive straight pin into holes from the hypoid driven gear side, using ST.

NOTE:

Lock straight pin after installing.

ST 899904100 REMOVER



- (A) Pinion shaft
- (B) Differential case
- (C) Straight pin

4) Install roller bearing to differential case.

CAUTION:

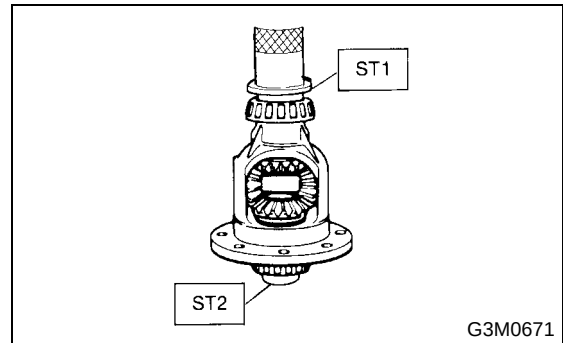
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Be careful because roller bearing outer races are used as a set.

ST1 499277100 BUSH 1-2 INSTALLER

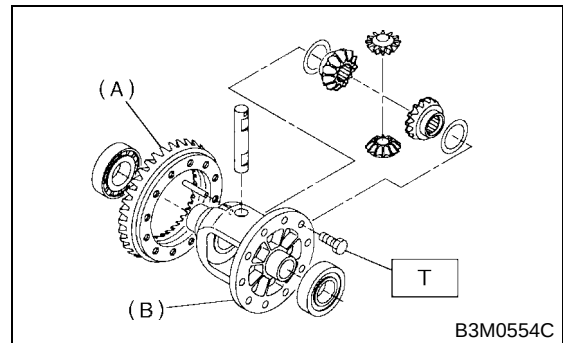
ST2 398497701 ADAPTER



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

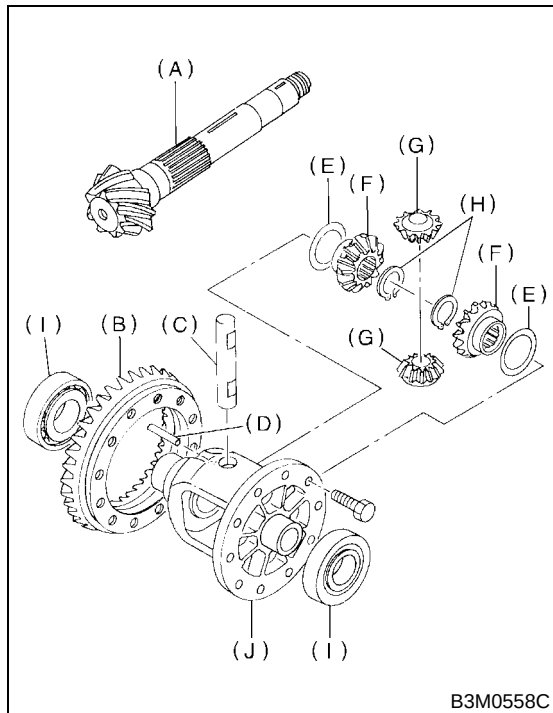
E: INSPECTION

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.

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL



- (A) Drive pinion shaft
- (B) Hypoid driven gear
- (C) Pinion shaft
- (D) Straight pin
- (E) Washer
- (F) Differential bevel gear
- (G) Differential bevel pinion
- (H) Snap ring
- (I) Roller bearing
- (J) Differential case

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.

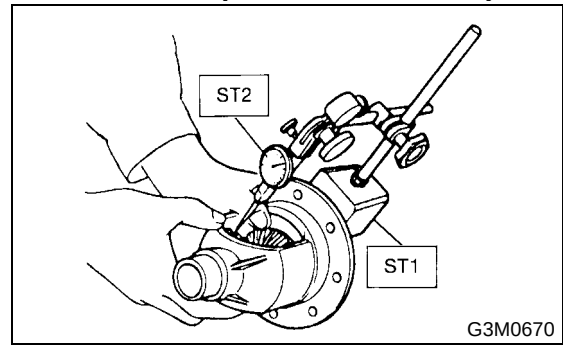
NOTE:

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)



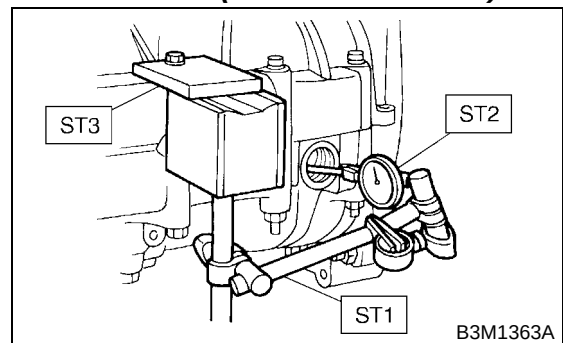
2. HYPOID GEAR BACKLASH

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.

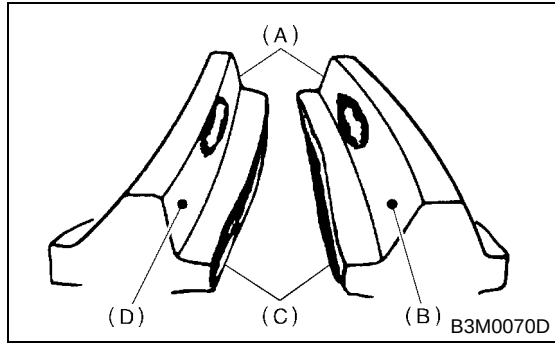
3. TOOTH CONTACT OF HYPOID GEAR

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-106, ADJUSTMENT, Front Differential Assembly.>

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

- 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-102, 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.

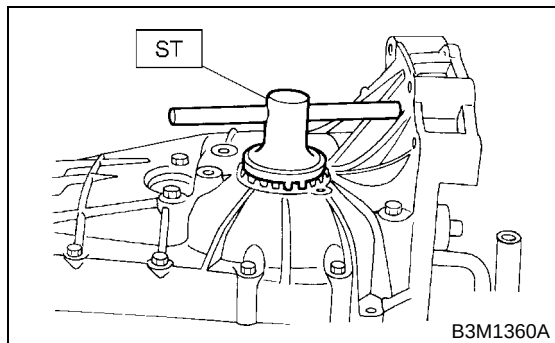
Standard backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

2. HYPOID GEAR BACKLASH

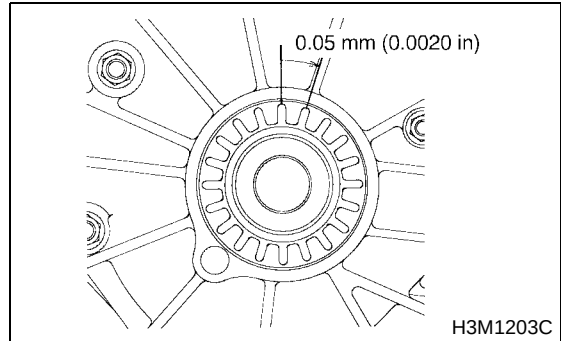
Adjust backlash by turning holder in right side case.

ST 499787000 WRENCH ASSY



NOTE:

Each time holder rotates one tooth, backlash changes by 0.05 mm (0.020 in).

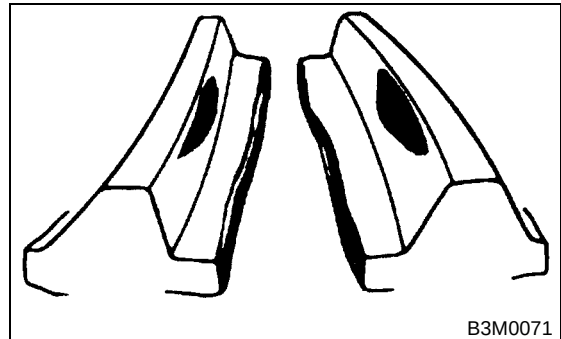


3. TOOTH CONTACT OF HYPOID GEAR

Adjust until the teeth contact is correct.

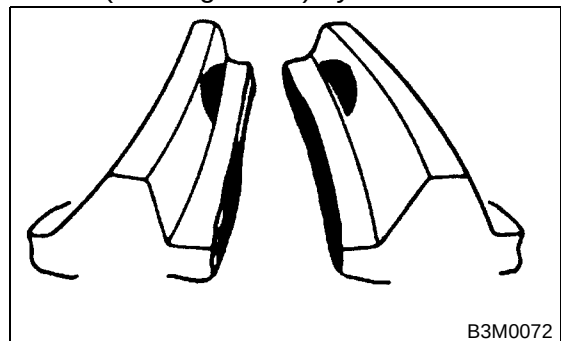
- Backlash is excessive.

To reduce backlash, loosen holder on the upper side (case right side) and turn in the holder on the lower side (case left side) by the same amount.



- Backlash is insufficient.

To increase backlash, loosen holder on the lower side (case left side) and turn in the holder on the upper side (case right side) by the same amount.

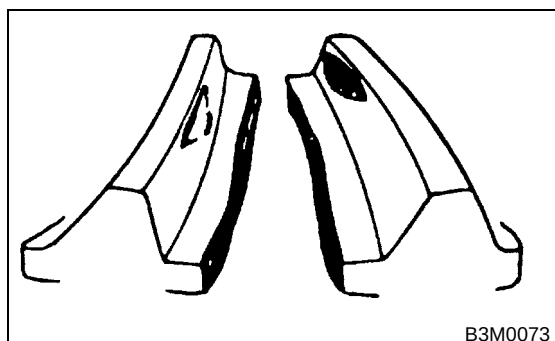


FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

- The drive pinion shim selected before is too thick.

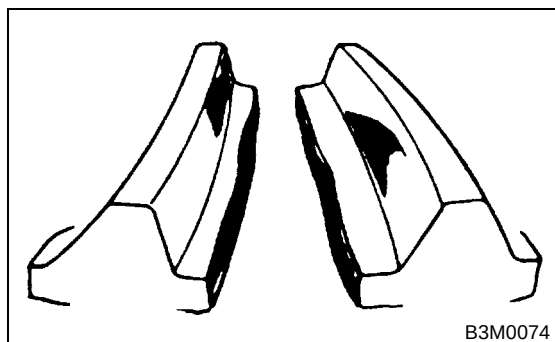
Reduce its thickness.



B3M0073

- The drive pinion shim selected before is too thin.

Increase its thickness.



B3M0074

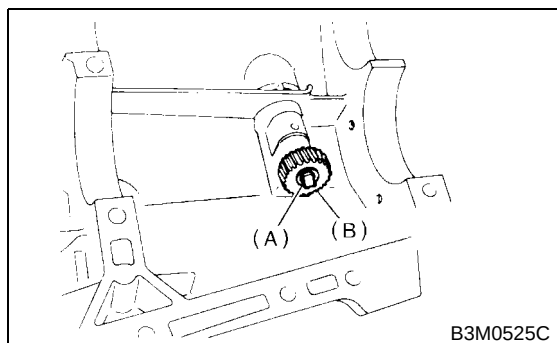
SPEEDOMETER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

21.Speedometer Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-46, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly (AWD model). <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove rear case (FWD model) <Ref. to MT-54, REMOVAL, Rear Case.>
- 5) Remove transmission case. <Ref. to MT-64, REMOVAL, Transmission Case.>
- 6) Remove vehicle speed sensor. <Ref. to MT-48, REMOVAL, Vehicle Speed Sensor.>
- 7) 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.

CAUTION:

Use new oil seal, if it has been removed.

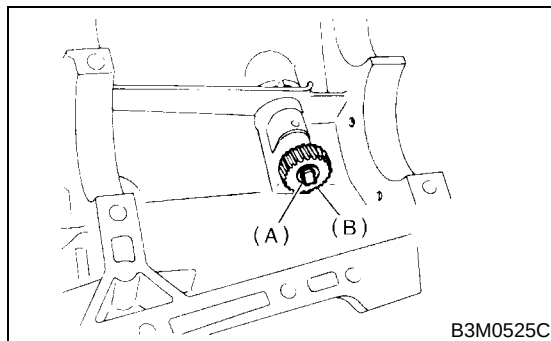
ST 899824100 or 499827000PRESS

- 2) Install vehicle speed sensor. <Ref. to MT-48, INSTALLATION, Vehicle Speed Sensor.>

- 3) Install speedometer driven gear and snap ring.

CAUTION:

Use new snap ring, if it has been removed.



- (A) Outer snap ring
(B) Speedometer driven gear

- 4) Install transmission case. <Ref. to MT-66, INSTALLATION, Transmission Case.>

- 5) Install transfer case with extension case assembly (AWD model). <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>

- 6) Install rear case (FWD model). <Ref. to MT-54, INSTALLATION, Rear Case.>

- 7) Install back-up light switch and neutral position switch. <Ref. to MT-47, INSTALLATION, Switches and Harness.>

- 8) Install the manual transmission assembly to vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the speedometer gear, oil seal and speedometer shaft for damage. Replace if damaged.

22.Reverse Idler Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-46, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly (AWD model). <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove rear case (FWD model). <Ref. to MT-54, REMOVAL, Rear Case.>
- 5) Remove transmission case. <Ref. to MT-91, REMOVAL, Drive Pinion Shaft Assembly.>
- 6) Remove drive pinion shaft assembly. <Ref. to MT-91, REMOVAL, Drive Pinion Shaft Assembly.>
- 7) Remove main shaft assembly.

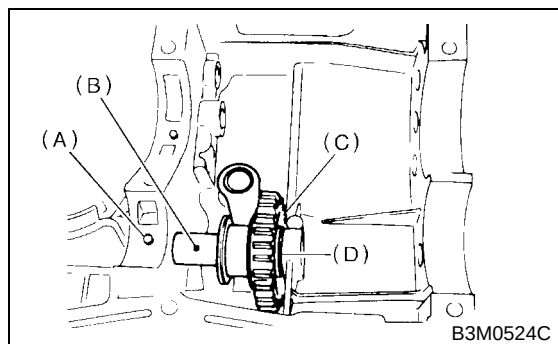
Single-range model:

<Ref. to MT-71, REMOVAL, Main Shaft Assembly for Single-Range.>

Dual-range model:

<Ref. to MT-81, REMOVAL, Main Shaft Assembly for Dual-Range.>

- 8) Remove differential assembly. <Ref. to MT-102, REMOVAL, Front Differential Assembly.>
- 9) Remove shifter forks and rods. <Ref. to MT-111, REMOVAL, Shifter Fork and Rod.>
- 10) 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

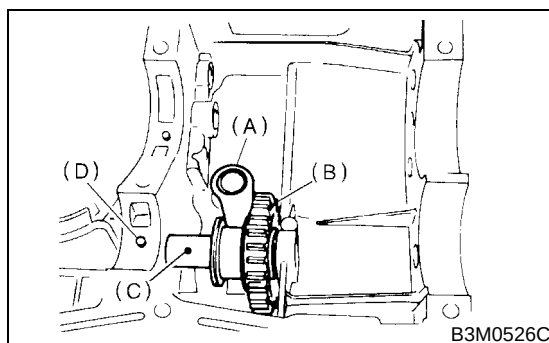
- 11) Remove reverse shifter lever.

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-109, INSTALLATION, Reverse Idler Gear.> and <Ref. to MT-110, ADJUSTMENT, Reverse Idler Gear.>

- 3) Install shifter forks and rods. <Ref. to MT-111, INSTALLATION, Shifter Fork and Rod.>

- 4) Install differential assembly. <Ref. to MT-102, INSTALLATION, Front Differential Assembly.>

- 5) Install main shaft assembly.

Single-range model:

<Ref. to MT-71, INSTALLATION, Main Shaft Assembly for Single-Range.>

Dual-range model:

<Ref. to MT-81, INSTALLATION, Main Shaft Assembly for Dual-Range.>

- 6) Install drive pinion shaft assembly. <Ref. to MT-91, INSTALLATION, Drive Pinion Shaft Assembly.>

- 7) Install transmission case. <Ref. to MT-66, INSTALLATION, Transmission Case.>

- 8) Install transfer case with extension case assembly (AWD model). <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>

- 9) Install rear case (FWD model). <Ref. to MT-66, INSTALLATION, Transmission Case.>

- 10) Install back-up light switch and neutral position switch. <Ref. to MT-47, INSTALLATION, Switches and Harness.>

- 11) Install the manual transmission assembly to vehicle. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

- 1) Move the reverse shifter rod toward the reverse side. Inspect clearance between reverse idler gear and transmission case wall.

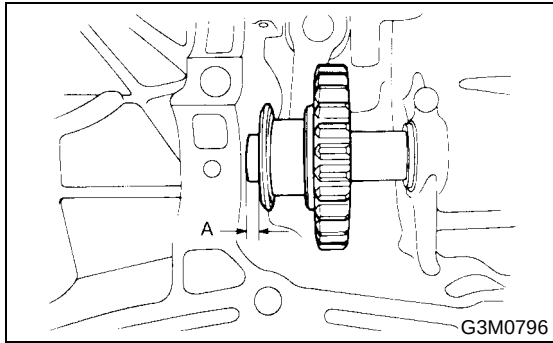
If out of specification, select the appropriate reverse shifter lever and adjust.

REVERSE IDLER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

Clearance A:

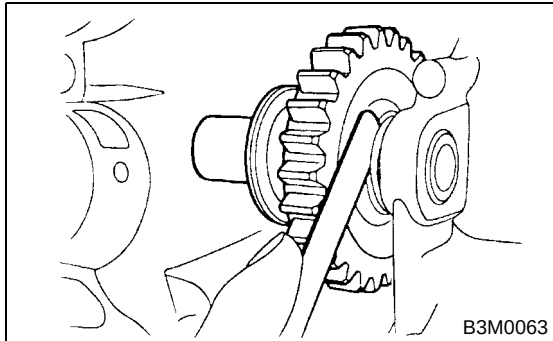
6.0 — 7.5 mm (0.236 — 0.295 in)



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)



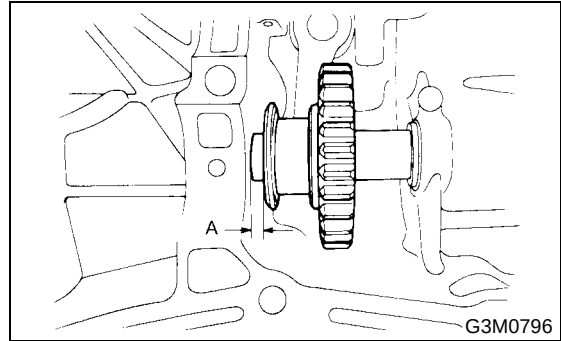
3) Check the reverse idler gear and shaft for damage. Replace if damaged.

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)

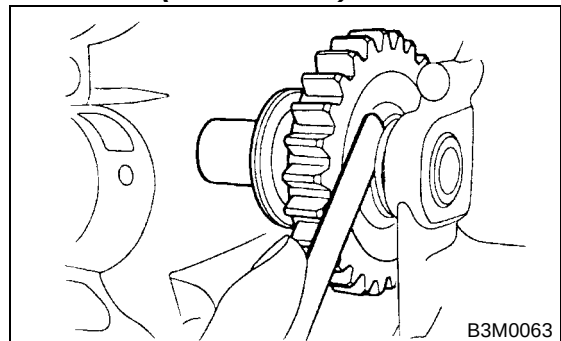


Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to case wall

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)

23.Shifter Fork and Rod

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove back-up light switch and neutral position switch. <Ref. to MT-46, REMOVAL, Switches and Harness.>
- 3) Remove transfer case with extension case assembly (AWD model). <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove rear case (FWD model). <Ref. to MT-54, REMOVAL, Rear Case.>
- 5) Remove transmission case. <Ref. to MT-64, REMOVAL, Transmission Case.>
- 6) Remove drive pinion shaft assembly. <Ref. to MT-91, REMOVAL, Drive Pinion Shaft Assembly.>
- 7) Remove main shaft assembly.

Single-range model:

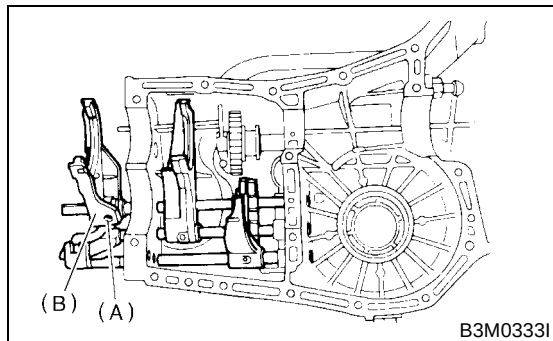
<Ref. to MT-71, REMOVAL, Main Shaft Assembly for Single-Range.>

Dual-range model:

<Ref. to MT-81, REMOVAL, Main Shaft Assembly for Dual-Range.>

- 8) Remove differential assembly. <Ref. to MT-102, REMOVAL, Front Differential Assembly.>
- 9) Drive out straight pin with ST, and 5th shifter fork.

ST 398791700 STRAIGHT PIN REMOVER

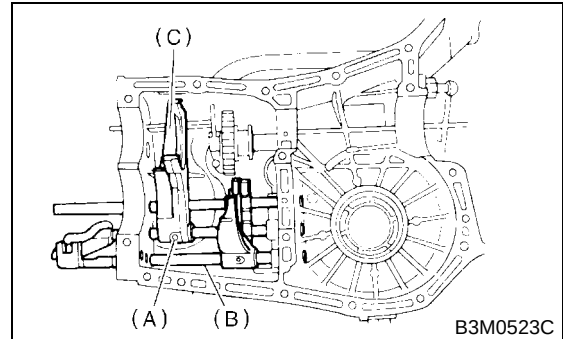


- (A) Straight pin
(B) 5th shifter fork

- 10) Remove plugs, springs and checking balls.
- 11) 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

- 12) Drive out straight pin, and pull out 1-2 fork rod and shifter fork.

- 13) 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.

- 14) 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.

CAUTION:

Apply grease to plunger to prevent it from falling.

ST 399411700 ACCENT BALL INSTALLER

- 2) Position ball, spring and gasket in reverse shifter rod hole, on left side transmission case, and tighten checking ball plug.

CAUTION:

Replace gasket with a new one.

- 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 drive straight pin into these holes using ST.

CAUTION:

Replace straight pin with a new one.

NOTE:

- Set other rods to neutral.

SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

- Make sure interlock plunger is on the 3-4 fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

5) Install interlock plunger onto 3-4 fork rod.

CAUTION:

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 straight pin into these holes.

CAUTION:

Replace straight pin with a new one.

NOTE:

- Set reverse fork rod to neutral.
- Make sure interlock plunger (installing before) is on the reverse fork rod side.

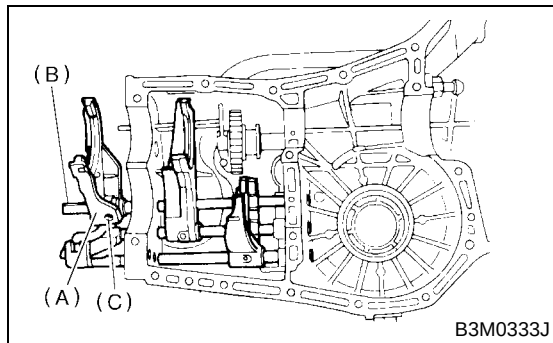
ST 398791700 STRAIGHT PIN REMOVER

8) Install 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and drive straight pin into place.

CAUTION:

Replace straight pin with a new one.

ST 398791700 STRAIGHT PIN REMOVER

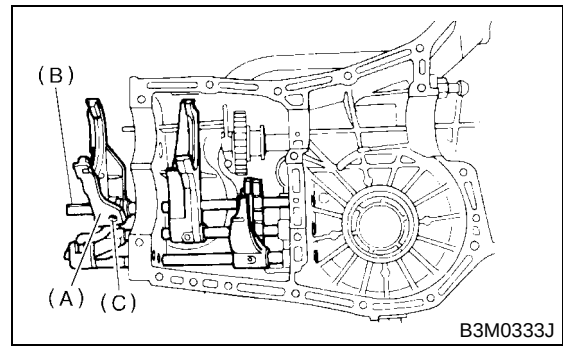


- (A) 5th shifter fork
- (B) Reverse fork rod
- (C) Straight pin

9) Position balls, checking ball springs and gaskets into 3-4 and 1-2 rod holes, and install plugs.

CAUTION:

Replace gasket with a new one.



- (A) 5th shifter fork
- (B) Reverse fork rod
- (C) Straight pin

10) Install differential assembly. <Ref. to MT-102, INSTALLATION, Front Differential Assembly.>

11) Install main shaft assembly.

Single-range model:

<Ref. to MT-71, INSTALLATION, Main Shaft Assembly for Single-Range.>

Dual-range model:

<Ref. to MT-81, INSTALLATION, Main Shaft Assembly for Dual-Range.>

12) Install drive pinion shaft assembly. <Ref. to MT-91, INSTALLATION, Drive Pinion Shaft Assembly.>

13) Install transmission case. <Ref. to MT-66, INSTALLATION, Transmission Case.>

14) Install transfer case with extension case assembly (AWD model). <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>

15) Install rear case (FWD model). <Ref. to MT-54, INSTALLATION, Rear Case.>

16) Install back-up light switch and neutral position switch. <Ref. to MT-47, INSTALLATION, Switches and Harness.>

17) Install the manual transmission assembly to vehicle. <Ref. to MT-40, 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.

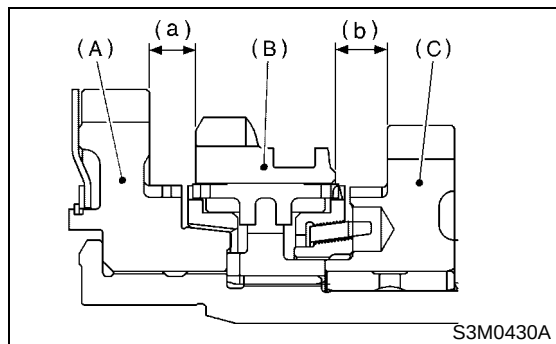
SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

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)



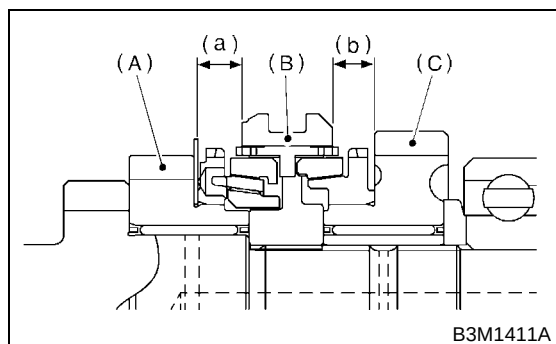
- (A) 1st driven gear
- (B) Reverse driven gear
- (C) 2nd driven gear

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in).
32804AA070	—	Standard
32804AA080	3	Become distant from 2nd gear by 0.2 mm (0.008 in).

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)



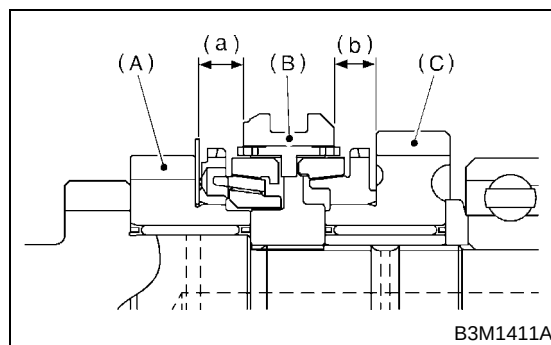
- (A) 3rd drive gear
- (B) Coupling sleeve
- (C) 4th drive gear

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in).
32810AA071	—	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)		
Part No.	Mark	Remarks
32812AA201	4	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA211	5	Standard
32812AA221	6	Become distant from 5th gear by 0.2 mm (0.008 in).

5th shifter fork (Turbo)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA241	—	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):

1st — 2nd to 3rd — 4th:

0.4 — 1.4 mm (0.016 — 0.055 in)

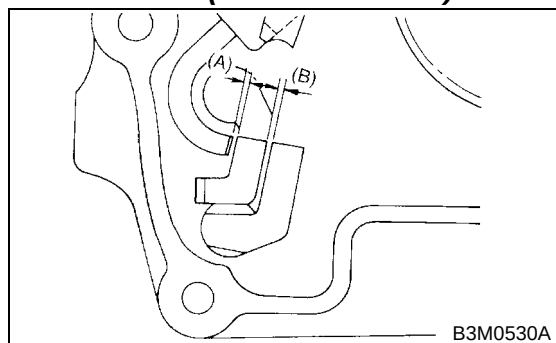
SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

Clearance (B):

3rd — 4th to 5th:

0.5 — 1.3 mm(0.020 — 0.051 in)



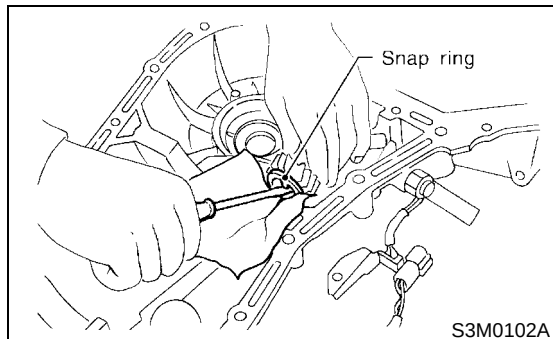
COUNTER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

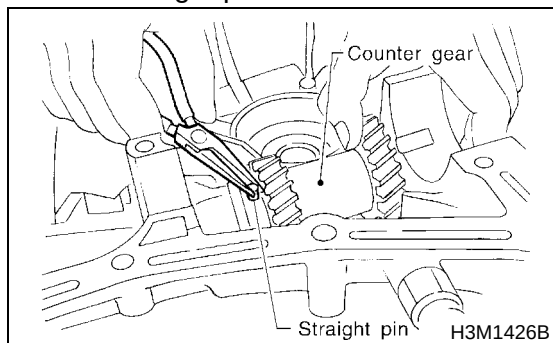
24.Counter Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove transmission case. <Ref. to MT-64, REMOVAL, Transmission Case.>
- 4) Move counter gear shaft until it touches transmission case, and remove snap ring with a suitable tool.



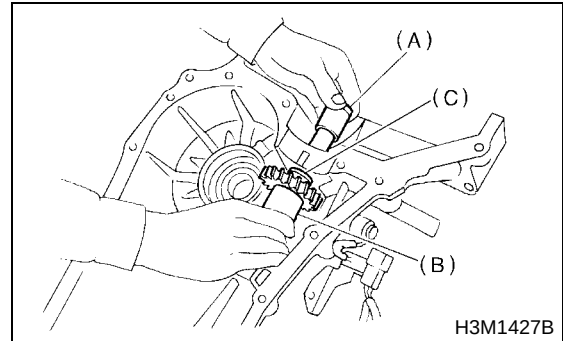
- 5) Slide washer at rear of high-low counter shaft, and remove straight pin from counter shaft.



- 6) Remove counter shaft from transmission case, taking care not to drop counter gear and the two washers.

CAUTION:

- 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 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-66, INSTALLATION, Transmission Case.>
- 4) Install the transfer case with extension case assembly. <Ref. to MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the manual transmission assembly on vehicle. <Ref. to MT-40, 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.

COUNTER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

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-116, ADJUSTMENT, Counter Gear.>

D: ADJUSTMENT

Selection of snap ring

If the measurement is not with in the specification, select suitable snap ring.

Snap ring	
Part No.	Thickness mm (in)
031319000	1.50 (0.0591)
805019010	1.72 (0.0677)

25. 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 adjustment	Adjust.
	(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.	(k) Worn reverse idler gear and bushing	Replace.
	(a) Insufficient or improper lubrication	Lubricate or replace with specified oil.
	(b) Worn or damaged gears and bearings 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.	Replace.

GENERAL DIAGNOSTIC

MANUAL TRANSMISSION AND DIFFERENTIAL

2. DIFFERENTIAL

Symptom	Possible cause	Remedy
1. Broken differential (case, gear, bearing, etc.) NOTE: Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.	(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.
2. Differential and hypoid gear noises 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. • 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.

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**

CLUTCH SYSTEM

CL

	Page
1. General Description	2
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10. Clutch Pedal.....	32
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GENERAL DESCRIPTION

CLUTCH SYSTEM

1. General Description

A: SPECIFICATIONS

Model			1.6L	2.0L NON-TURBO	2.0L TURBO
Clutch cover	Type		Push type		Pull type
	Diaphragm set load				

I.D.: Inner diameter

O.D.: Outer diameter

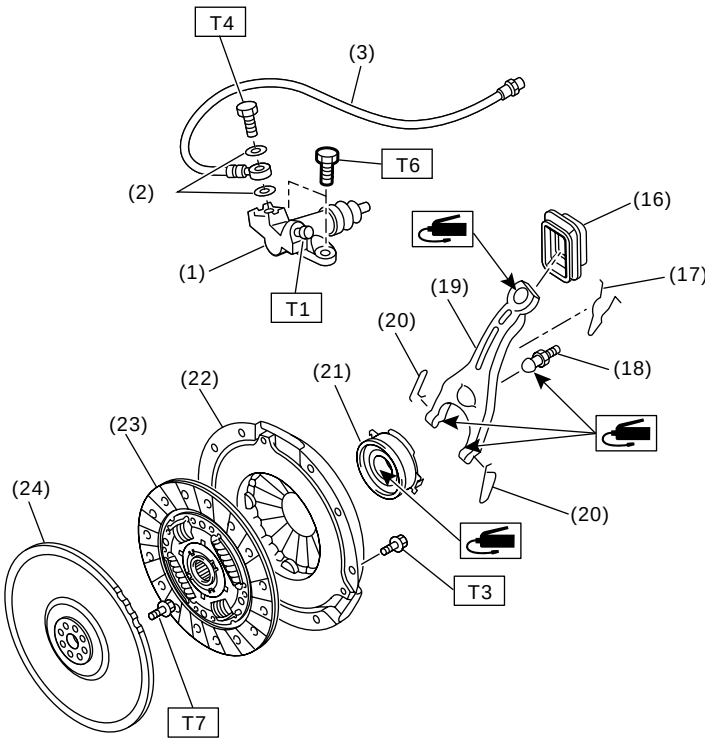
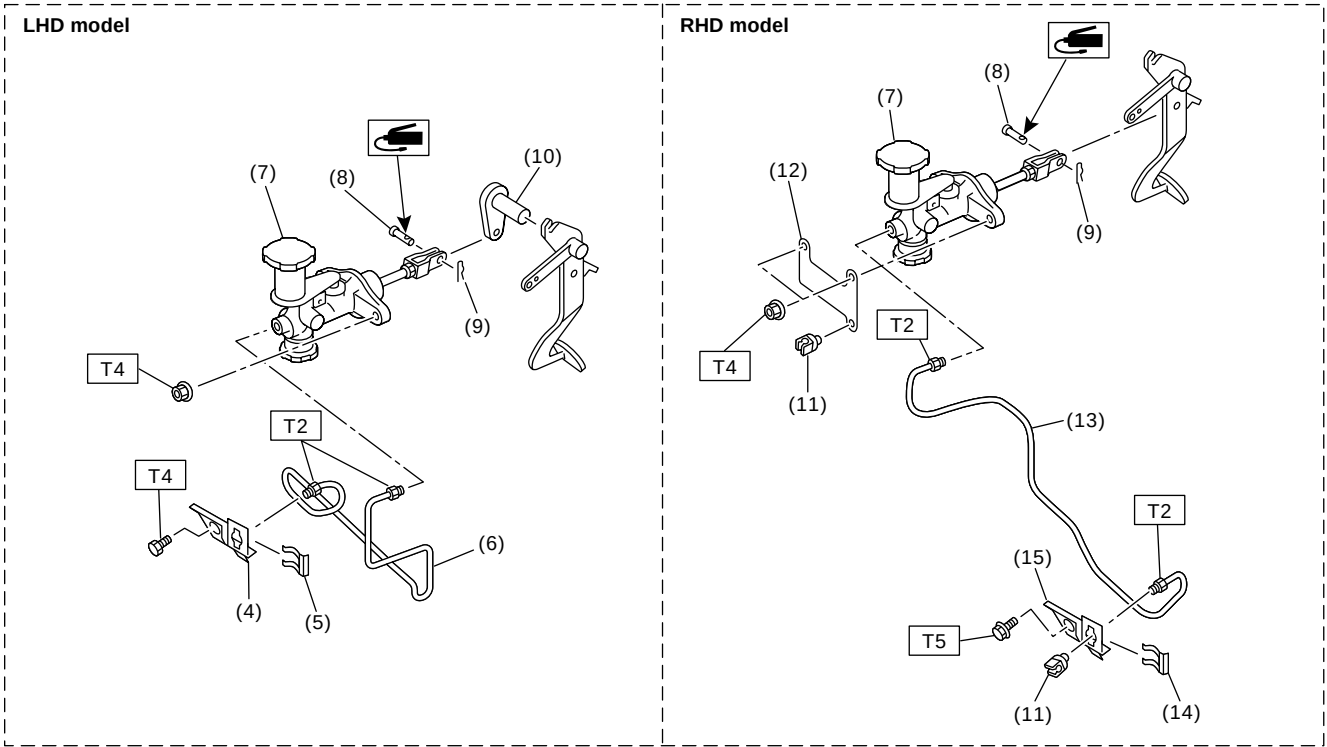
B: COMPONENT

1. CLUTCH SYSTEM

GENERAL DESCRIPTION

CLUTCH SYSTEM

• 2.0L NON-TURBO MODEL



GENERAL DESCRIPTION

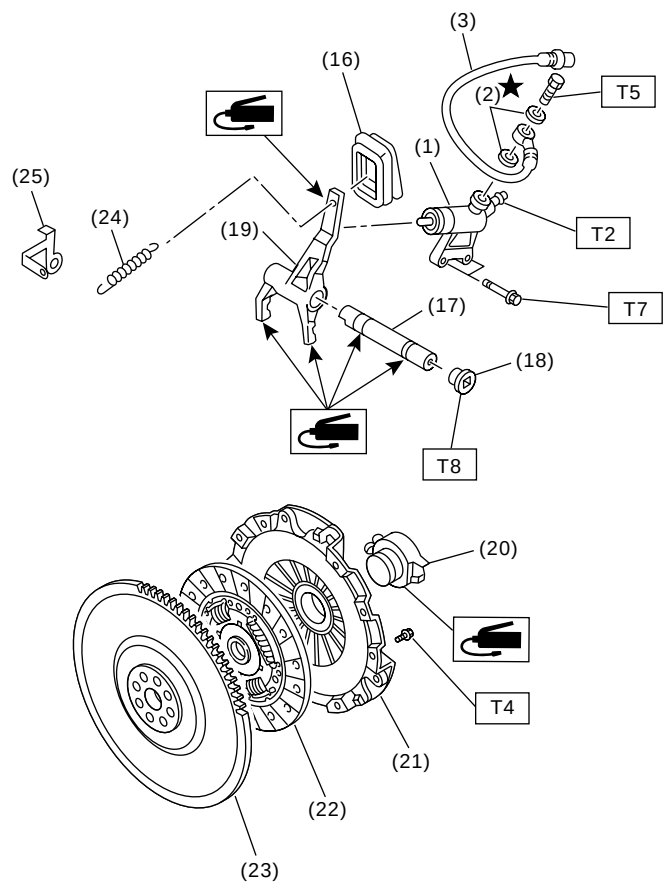
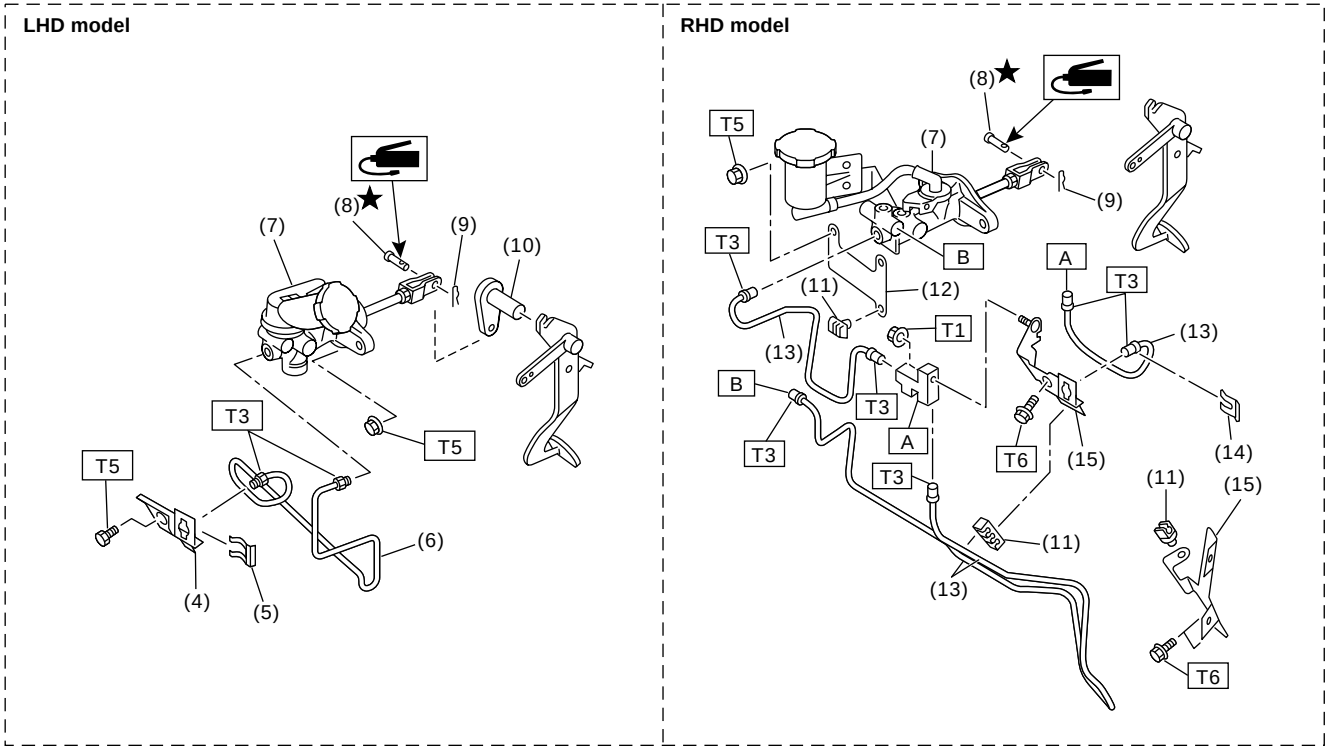
CLUTCH SYSTEM

(1) Operating cylinder	(13) Clutch pipe	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(2) Washer	(14) Clamp	<i>T1: 8 (0.8, 5.8)</i>
(3) Clutch hose	(15) Bracket	<i>T2: 15 (1.5, 11)</i>
(4) Bracket	(16) Clutch release lever sealing	<i>T3: 15.7 (1.6, 11.6)</i>
(5) Clip	(17) Retainer spring	<i>T4: 18 (1.8, 13.0)</i>
(6) Pipe	(18) Pivot	<i>T5: 25 (2.5, 18.1)</i>
(7) Master cylinder ASSY	(19) Release lever	<i>T6: 37 (3.8, 27.5)</i>
(8) Clevis pin	(20) Clip	<i>T7: 72 (7.3, 52.8)</i>
(9) Snap pin	(21) Release bearing	
(10) Lever	(22) Clutch cover	
(11) Clamp	(23) Clutch disc	
(12) Bracket	(24) Flywheel	

GENERAL DESCRIPTION

CLUTCH SYSTEM

• 2.0L TURBO MODEL



GENERAL DESCRIPTION

CLUTCH SYSTEM

(1) Operating cylinder	(14) Clamp	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(2) Washer	(15) Bracket	<i>T1: 7.5 (0.76, 5.53)</i>
(3) Clutch hose	(16) Clutch release lever sealing	<i>T2: 8 (0.8, 5.8)</i>
(4) Bracket	(17) Release lever shaft	<i>T3: 15 (1.5, 11)</i>
(5) Clip	(18) Plug	<i>T4: 15.7 (1.6, 11.6)</i>
(6) Pipe	(19) Release lever	<i>T5: 18 (1.8, 13.0)</i>
(7) Master cylinder ASSY	(20) Release bearing	<i>T6: 25 (2.5, 18.1)</i>
(8) Clevis pin	(21) Clutch cover	<i>T7: 37 (3.8, 27.5)</i>
(9) Snap pin	(22) Clutch disc	<i>T8: 44 (4.5, 32.5)</i>
(10) Lever	(23) Flywheel	
(11) Clamp	(24) Spring	
(12) Bracket	(25) Bracket	
(13) Clutch pipe		

CLUTCH SYSTEM

This exploded view diagram illustrates the components of a vehicle door latch assembly. The parts are numbered as follows:

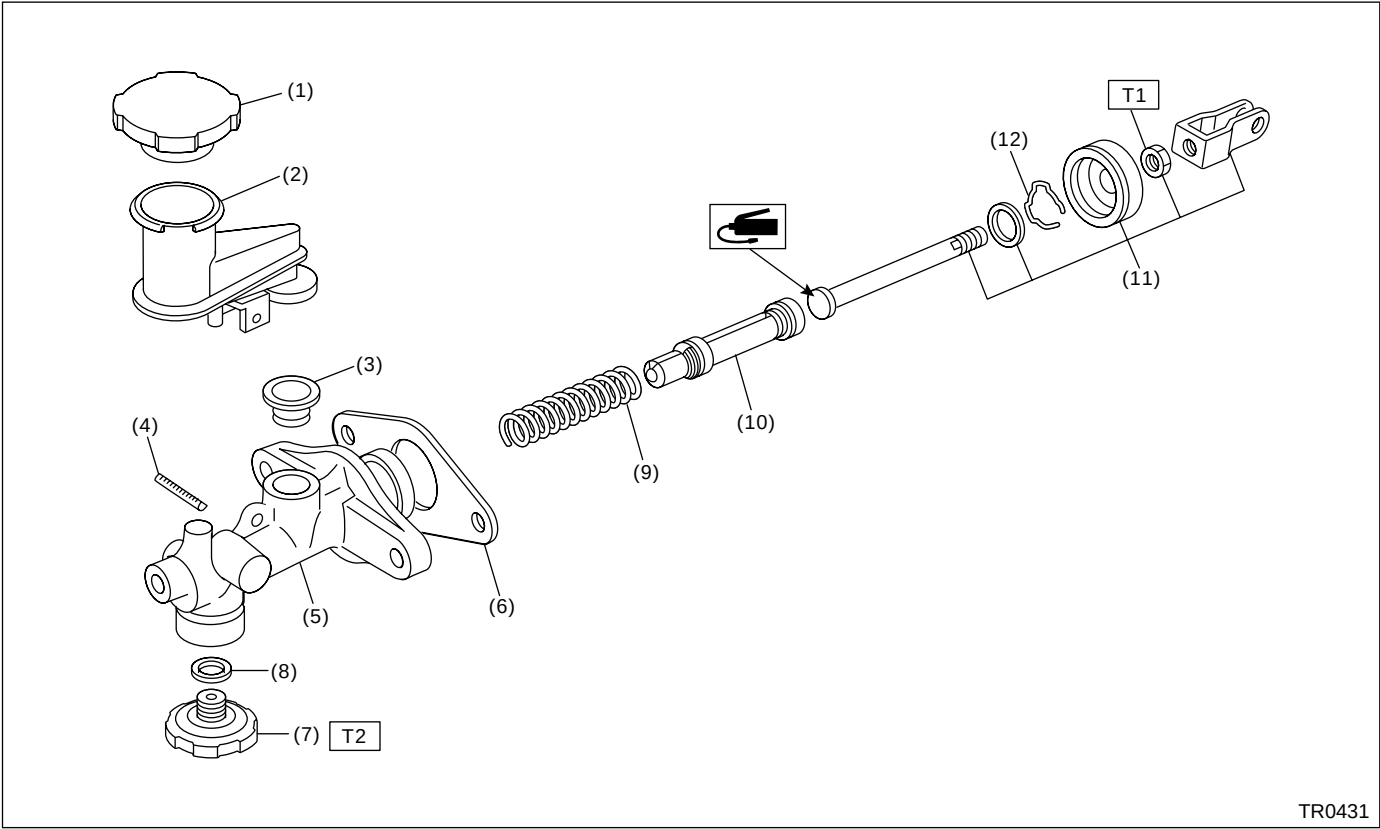
- (1) Latch body
- (2) Latch bolt
- (3) Latch cable
- (4) Latch cable bracket
- (5) Latch cable bracket
- (6) Latch cable bracket
- (7) Latch cable bracket
- (8) Latch cable bracket
- (9) Latch cable bracket
- (10) Latch cable bracket
- (11) Latch cable bracket
- (12) Latch cable bracket

Labels 'T' and '(3)' are also present, indicating specific components or assembly points.

- Tightening torque: N·m (kgf·m, ft·lb)**
T: 15.7 (1.6, 11.6)

2. MASTER CYLINDER

• 2.0L NON-TURBO MODEL



- | | |
|---------------------|-----------------------|
| (1) Reservoir cap | (7) Diaphragm spring |
| (2) Reservoir tank | (8) Gasket |
| (3) Oil seal | (9) Return spring |
| (4) Straight pin | (10) Piston |
| (5) Master cylinder | (11) Push rod |
| (6) Seat | (12) Piston stop ring |

Tightening torque: N·m (kgf-m, ft-lb)

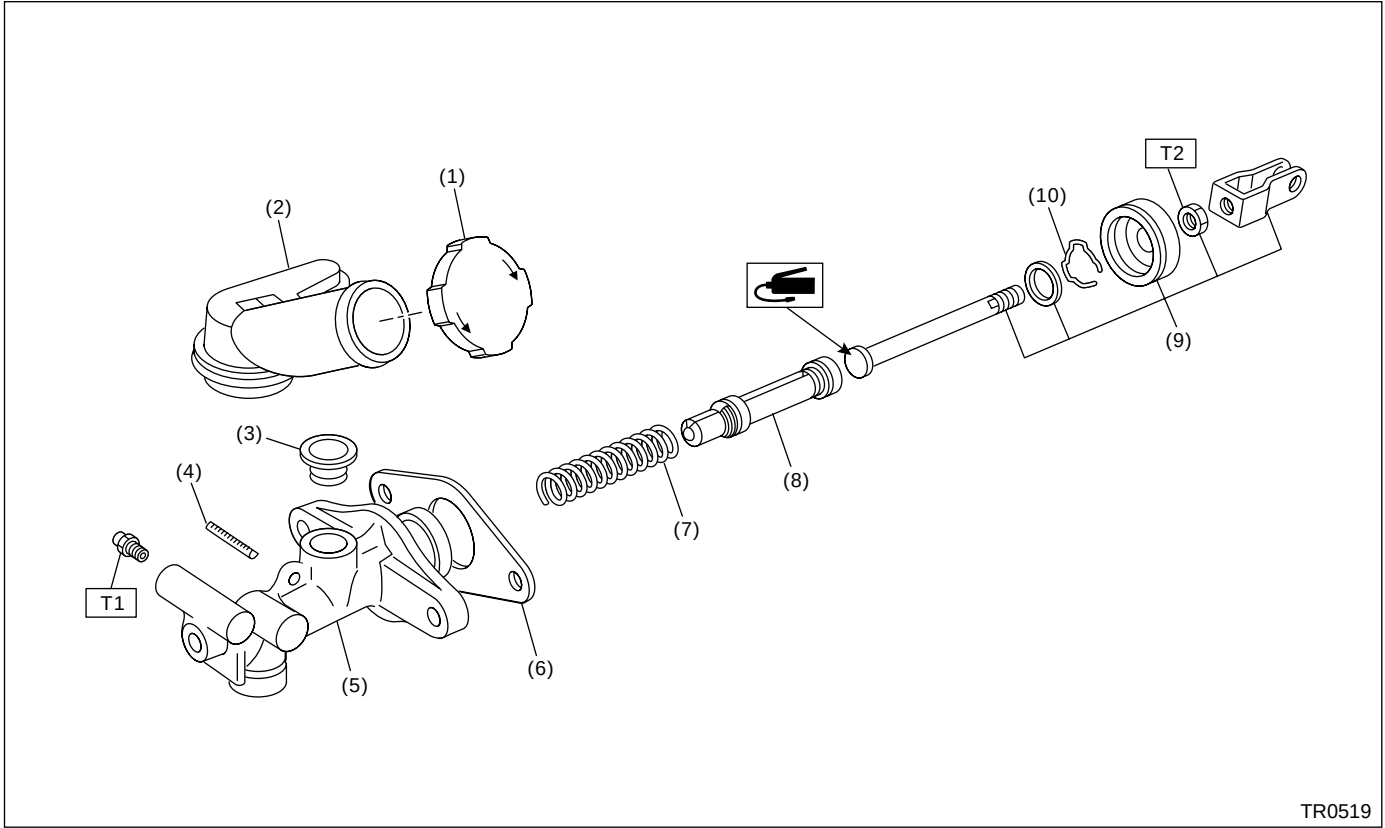
T1: 10 (1.0, 7)

T2: 46.6 (4.75, 34.4)

GENERAL DESCRIPTION

CLUTCH SYSTEM

• LHD TURBO MODEL

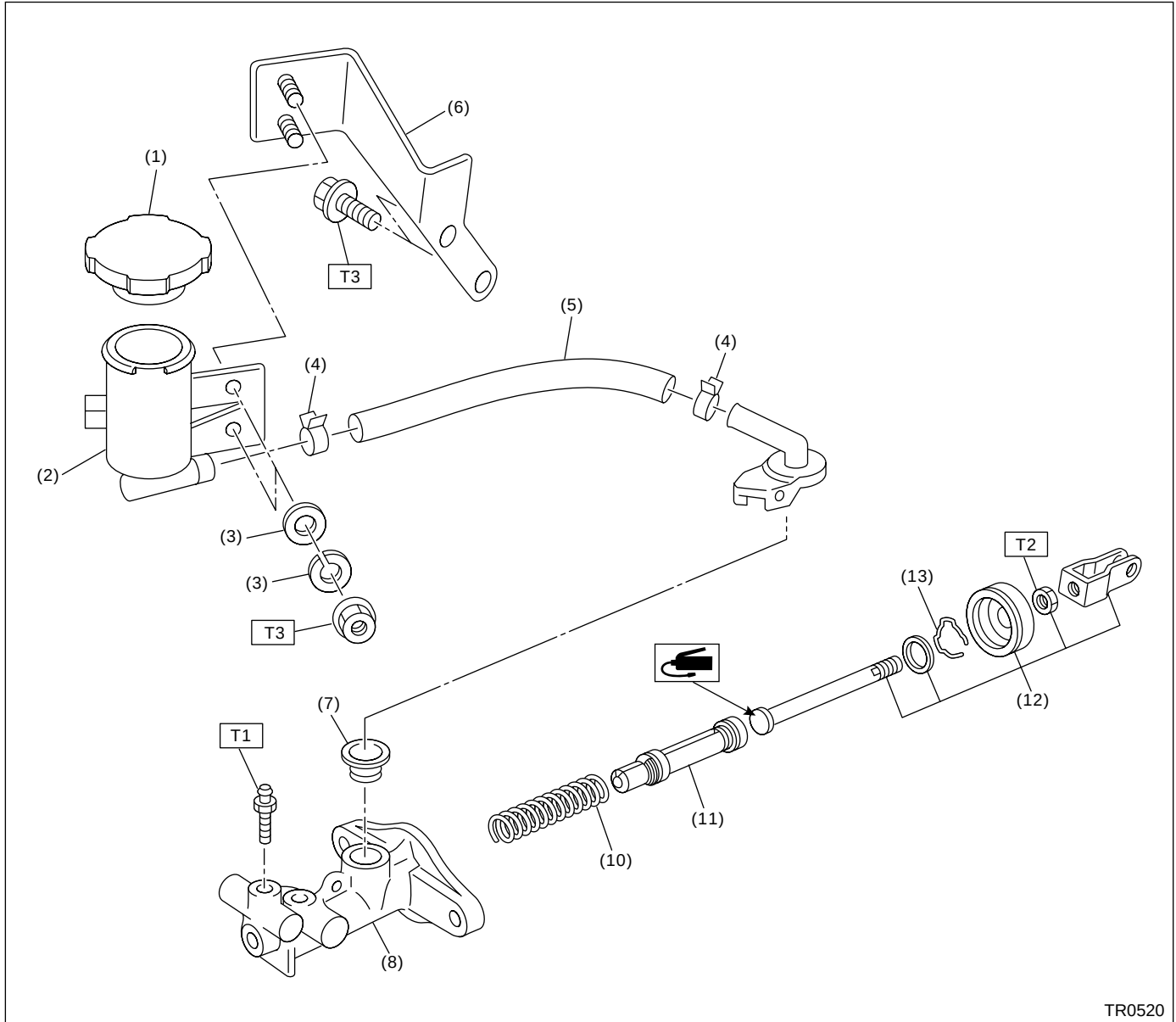


TR0519

- | | |
|---------------------|-----------------------|
| (1) Reservoir cap | (6) Seat |
| (2) Reservoir tank | (7) Return spring |
| (3) Oil seal | (8) Piston |
| (4) Straight pin | (9) Push rod |
| (5) Master cylinder | (10) Piston stop ring |

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 10 (1.0, 7)

• RHD TURBO MODEL



TR0520

- | | |
|----------------------------|---------------------|
| (1) Reservoir cap | (7) Oil seal |
| (2) Reservoir tank | (8) Master cylinder |
| (3) Washer | (9) Seat |
| (4) Clip | (10) Return spring |
| (5) Hose | (11) Piston |
| (6) Reservoir tank bracket | (12) Push rod |

- (13) Piston stop ring

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 10 (1.0, 7)

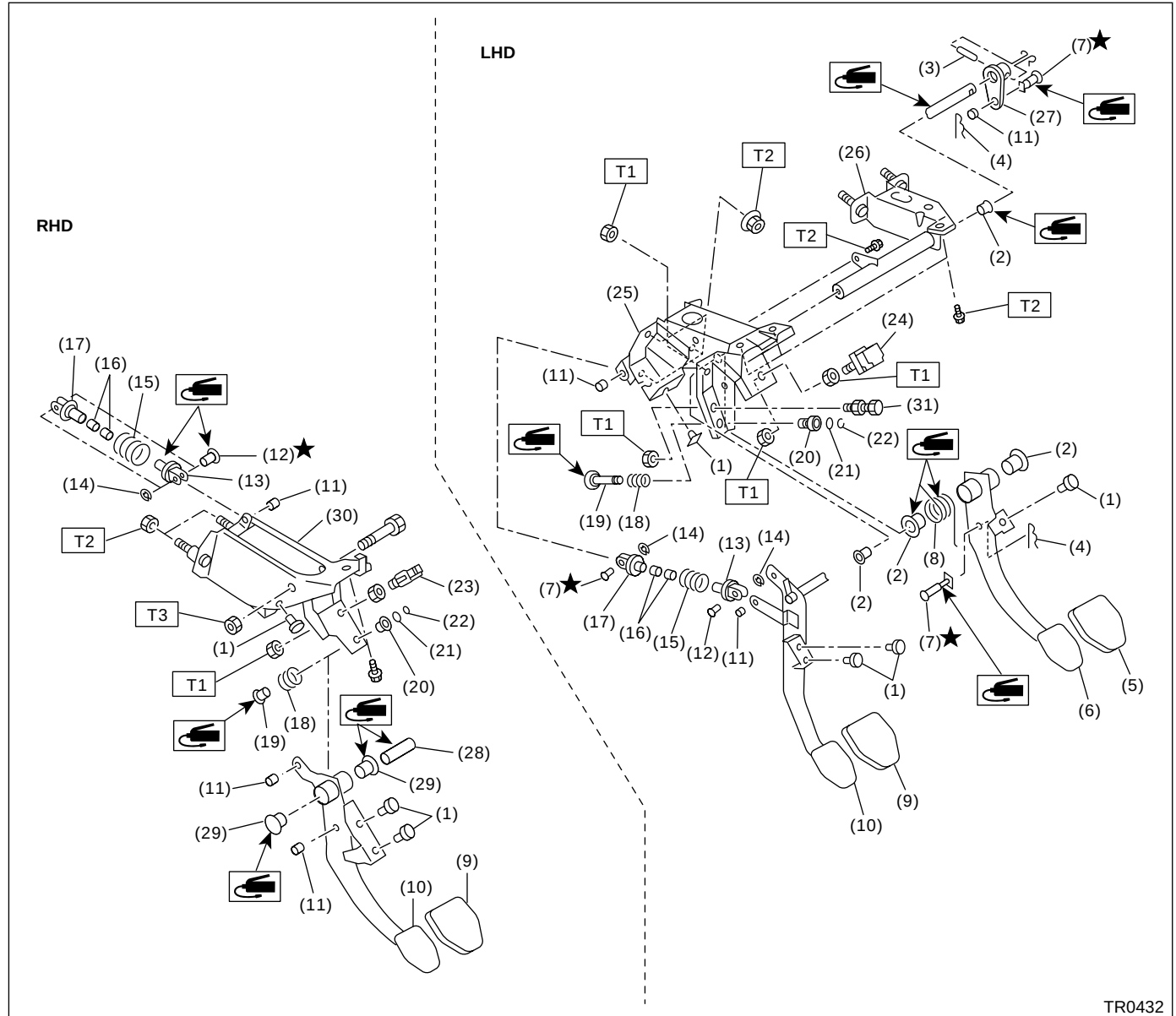
T3: 18 (1.8, 13.3)

GENERAL DESCRIPTION

CLUTCH SYSTEM

3. CLUTCH PEDAL

• 2.0L MODEL



TR0432

(1) Stopper	(13) Assist rod A	(25) Pedal bracket
(2) Bushing	(14) Clip	(26) Clutch master cylinder bracket
(3) Spring pin	(15) Assist spring	(27) Lever
(4) Snap pin	(16) Assist bushing	(28) Spacer
(5) Brake pedal pad	(17) Assist rod B	(29) Bushing
(6) Brake pedal	(18) Spring S	(30) Clutch pedal bracket
(7) Clevis pin	(19) Rod S	(31) Adjust bolt
(8) Brake pedal spring	(20) Bushing S	
(9) Clutch pedal pad	(21) O-ring	
(10) Clutch pedal	(22) Clip	
(11) Bushing C	(23) Clutch switch (With cruise control)	
(12) Clutch clevis pin	(24) Stop light switch	

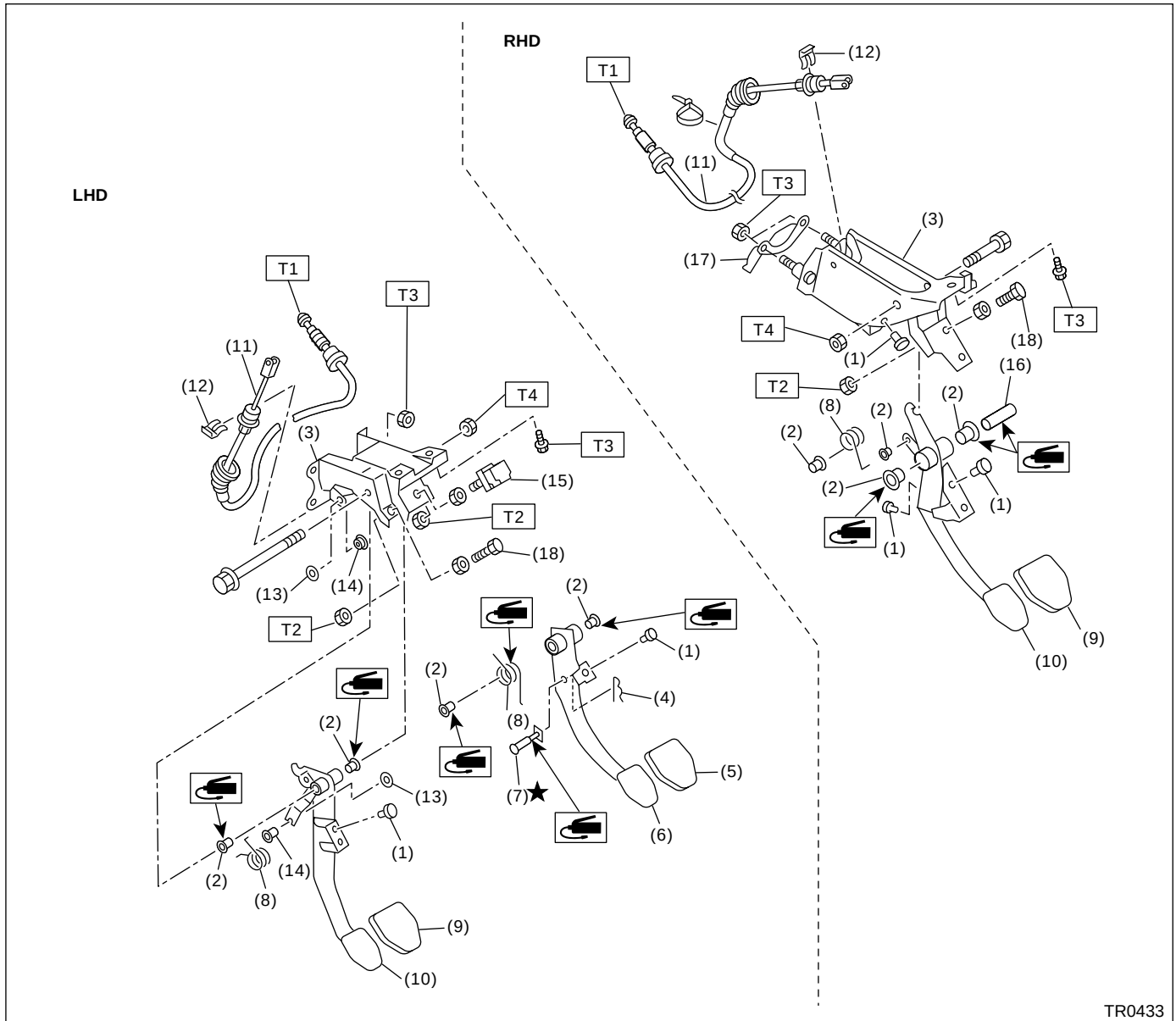
Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 30 (3.1, 22.4)

• 1.6L MODEL



TR0433

- | | |
|--------------------------|-------------------------|
| (1) Stopper | (9) Clutch pedal pad |
| (2) Bushing | (10) Clutch pedal |
| (3) Clutch pedal bracket | (11) Clutch cable |
| (4) Snap pin | (12) Clutch cable clamp |
| (5) Brake pedal pad | (13) Clip |
| (6) Brake pedal | (14) Spring assist |
| (7) Clevis pin | (15) Stop light switch |
| (8) Spring | (16) Spacer |

- | |
|------------------|
| (17) Bracket |
| (18) Adjust bolt |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5.9 (0.6, 4.3)

T2: 8 (0.8, 5.8)

T3: 18 (1.8, 13.0)

T4: 29 (3.0, 21.7)

GENERAL DESCRIPTION

CLUTCH SYSTEM

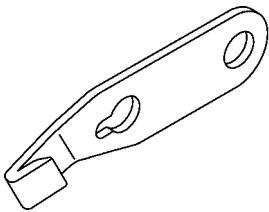
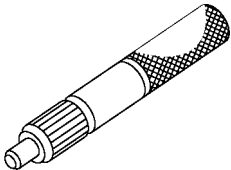
C: CAUTION

- 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 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Keep fluid away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3853	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening tightening bolt, etc.
 B2M4112	499747100	CLUTCH DISC GUIDE	Used when installing clutch disc to flywheel.

2. GENERAL PURPOSE TOOLS

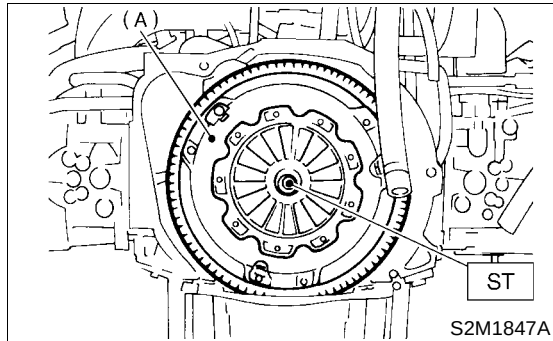
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Dial Gauge	Used for measuring clutch disk run-out.

2. Clutch Disc and Cover

A: REMOVAL

- 1) Remove transmission assembly from vehicle body. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Install ST on flywheel.

ST 499747100 CLUTCH DISC GUIDE



(A) Clutch cover

- 3) Remove clutch cover and clutch disc.

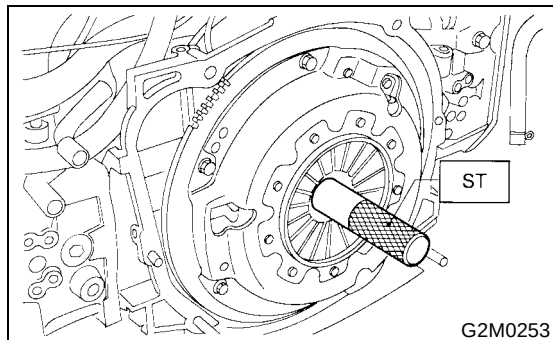
CAUTION:

- Take care not to allow oil on the clutch disc facing.
- Do not disassemble either clutch cover or clutch disc.

B: INSTALLATION

- 1) Insert ST into the clutch disc and install them on the flywheel by inserting the ST end into the pilot bearing.

ST 499747100 CLUTCH DISC GUIDE



- 2) Install clutch cover on flywheel and tighten bolts to the specified torque.

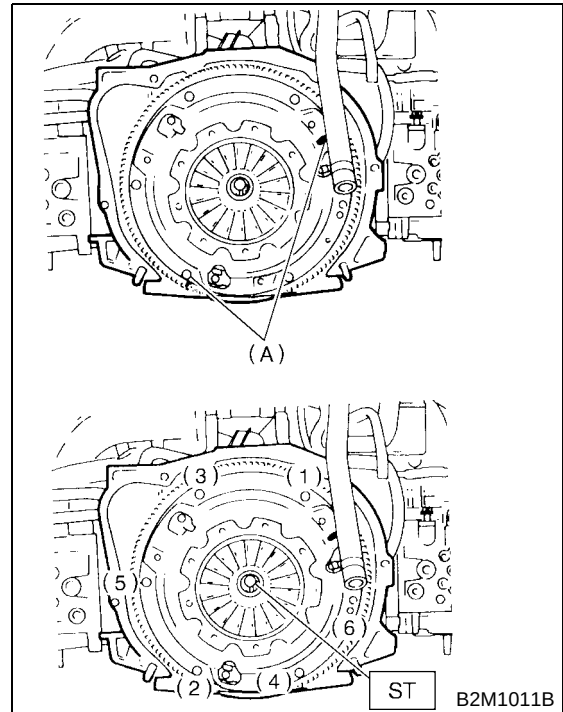
NOTE:

- 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-40, INSTALLATION, Manual Transmission Assembly.>

CLUTCH DISC AND COVER

CLUTCH SYSTEM

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.

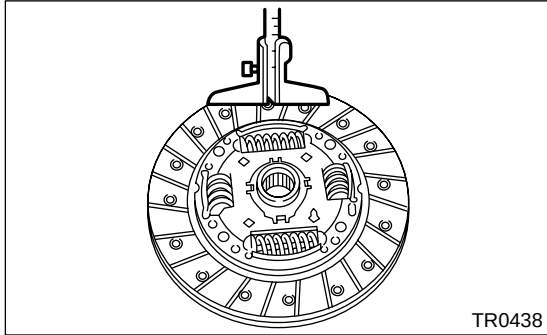
Depth of rivet head:

Limit of sinking

0.3 mm (0.012 in)

CAUTION:

Do not wash clutch disc with any cleaning fluid.

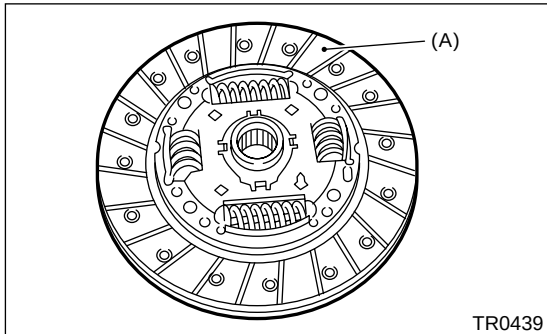


2) Hardened facing

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.



(A) Facing

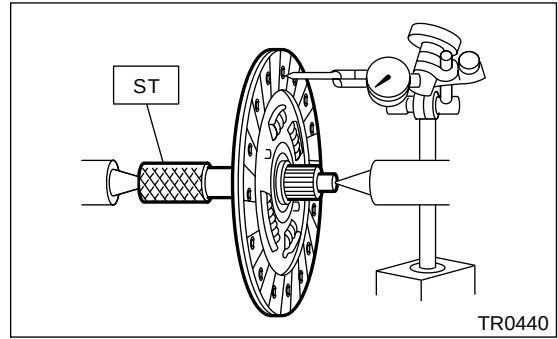
4) Deflection on facing

If deflection exceeds the specified value at the outer circumference of facing, repair or replace.

ST 499747100 CLUTCH DISC GUIDE

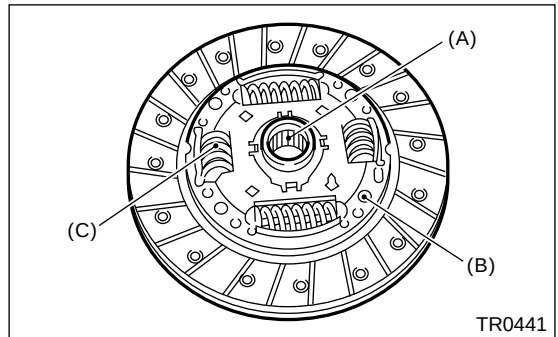
Limit for deflection:

1.0 mm (0.039 in) at R = 107 mm (4.21 in)



5) Worn spline, loose rivets and torsion spring failure

Replace defective parts.



(A) Spline

(B) Rivet

(C) Torsion spring

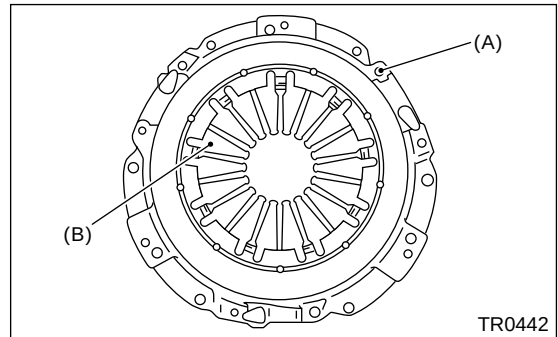
2. CLUTCH COVER

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.



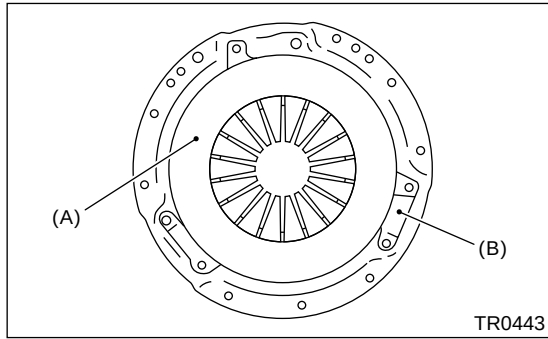
(A) Thrust rivet

(B) Diaphragm spring

3) Damaged or worn disc contact surface of pressure plate.

4) Loose strap plate setting bolt.

5) Worn diaphragm sliding surface.



(A) Pressure plate

(B) Strap plate

3. Flywheel

A: REMOVAL

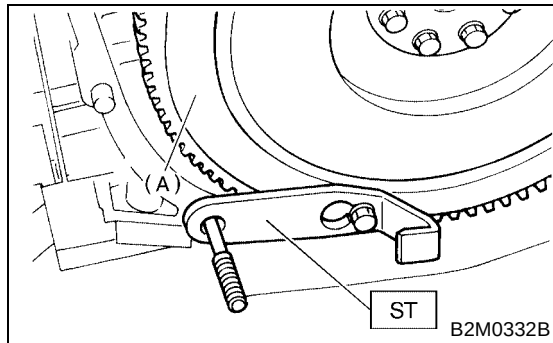
- 1) Remove transmission assembly. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>
- 2) Remove clutch cover and clutch disc. <Ref. to CL-15, REMOVAL, Clutch Disc and Cover.>

CAUTION:

- Take care not to allow oil on the clutch disc facing.
- Do not disassemble either clutch cover or clutch disc.

- 3) Using ST, remove flywheel.

ST 498497100 CRANKSHAFT STOPPER

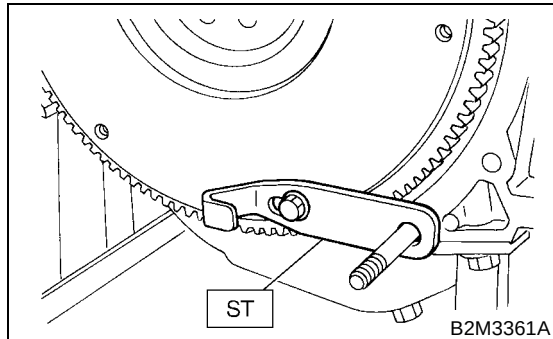


(A) Flywheel

B: INSTALLATION

- 1) Install flywheel and ST.

ST 498497100 CRANKSHAFT STOPPER



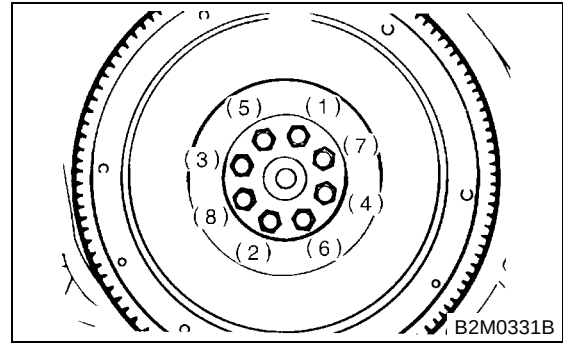
- 2) Tighten the flywheel attaching bolts to the specified torque.

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-15, INSTALLATION, INSTALLATION, Clutch Disc and Cover.>

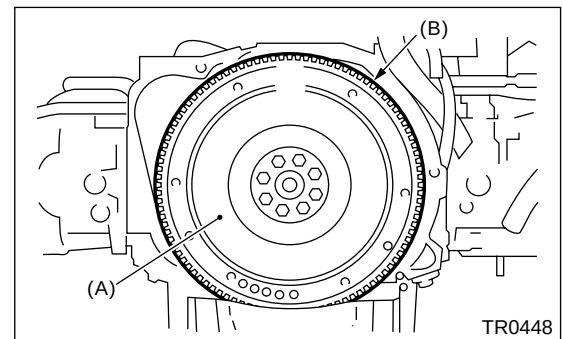
- 4) Install transmission assembly. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

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.



(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.

4. Release Bearing and Lever

A: REMOVAL

1. NON-TURBO MODEL

1) Remove transmission assembly from vehicle body.

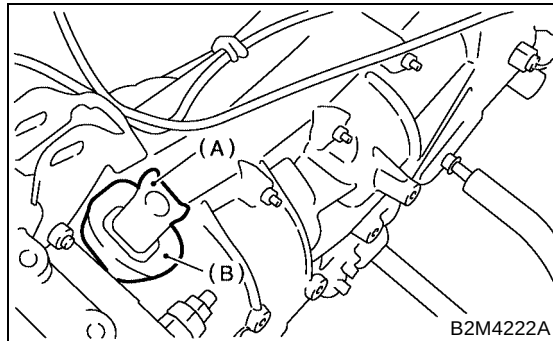
<Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>

2) Remove the two clips from clutch release lever and remove release bearing.

CAUTION:

Be careful not to deform clips.

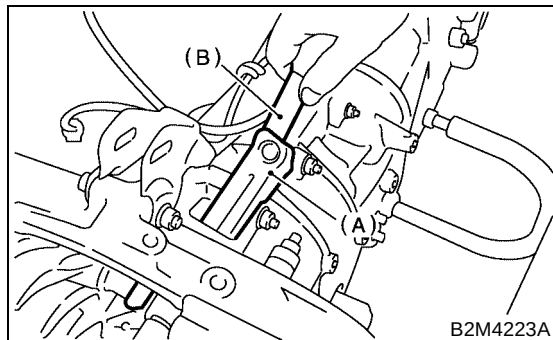
3) Remove release lever seal.



(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

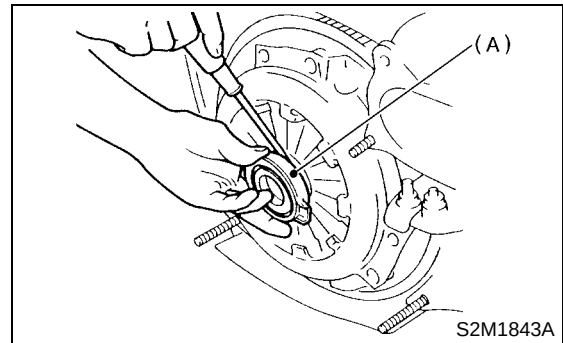
2. TURBO MODEL

1) Remove transmission assembly from vehicle body. <Ref. to MT-37, REMOVAL, Manual Transmission Assembly.>

2) Remove clutch release lever from transmission.

3) Put clutch release bearing in engine side.

4) Remove clutch release bearing from clutch cover using flat-type screwdriver.



(A) Clutch release bearing

B: INSTALLATION

1. NON-TURBO MODEL

CAUTION:

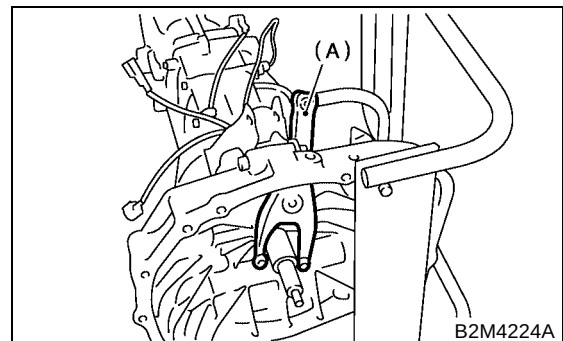
Before or during assembling, lubricate the following points with a light coat of grease.

- 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) 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.
- Confirm that retainer spring is securely fitted by observing it through the main case hole.



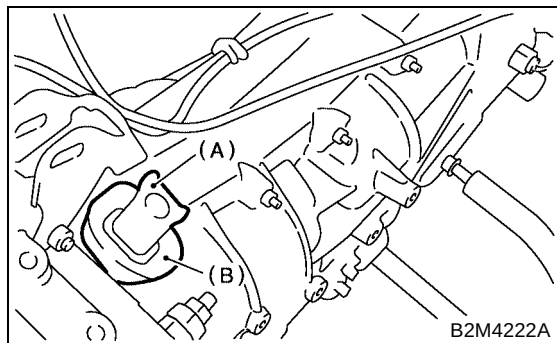
(A) Release lever

2) Install release bearing and fasten it with two clips.

RELEASE BEARING AND LEVER

CLUTCH SYSTEM

3) Install release lever seal.



- (A) Release lever
- (B) Release lever seal

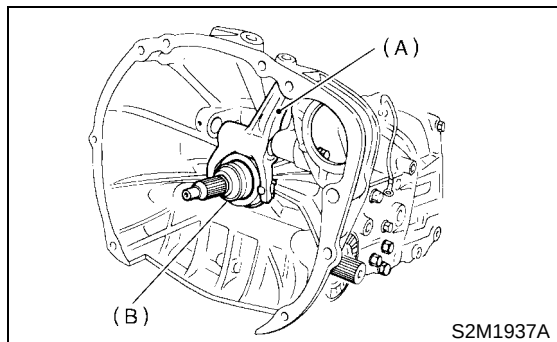
4) Install transmission assembly.

<Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

2. TURBO MODEL

1) Install release bearing on transmission.

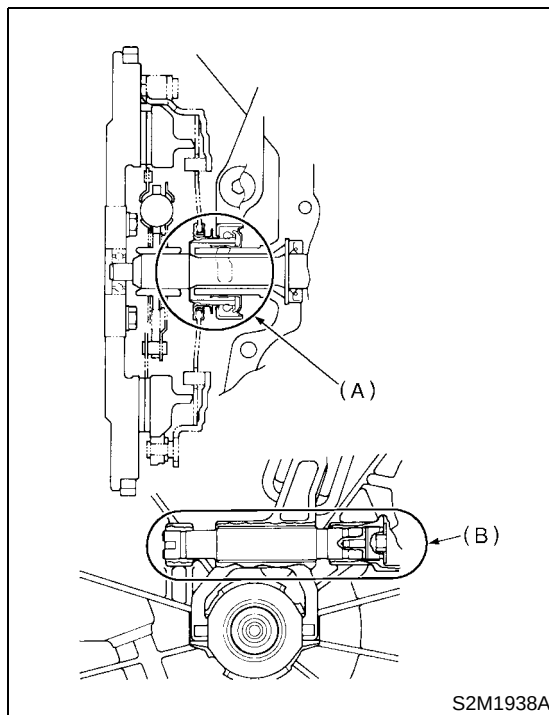
2) Insert release fork into release bearing tab.



- (A) Release fork
- (B) Release bearing

3) Apply grease to specified points:

- Spline FX2200
- Shaft SUNLIGHT 2

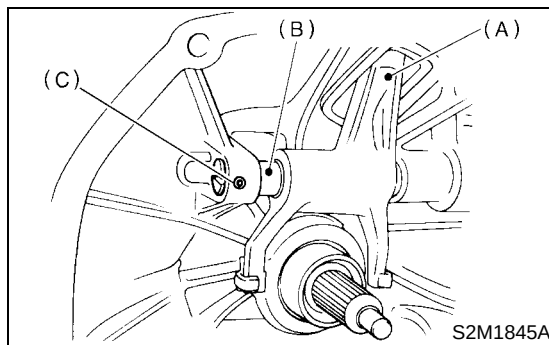


- (A) Spline (FX2200)
- (B) Shaft (SUNLIGHT 2)

4) Insert release fork shaft into release fork.

CAUTION:

Make sure the cutout portion of release fork shaft contacts spring pin.

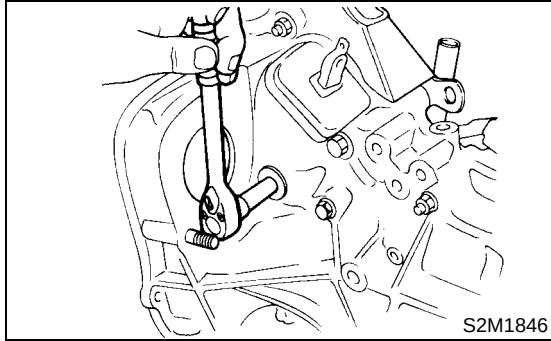


- (A) Release fork
- (B) Release shaft
- (C) Spring pin

5) Tighten plug.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



6) Install transmission assembly. <Ref. to MT-40, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1. RELEASE BEARING

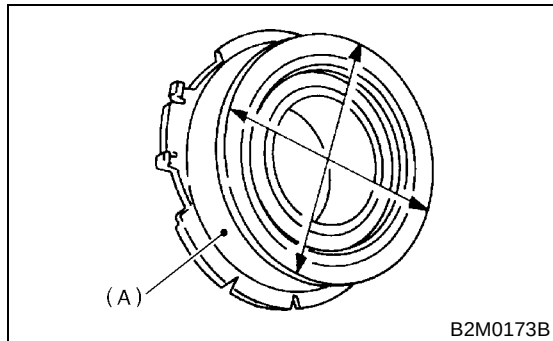
CAUTION:

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.

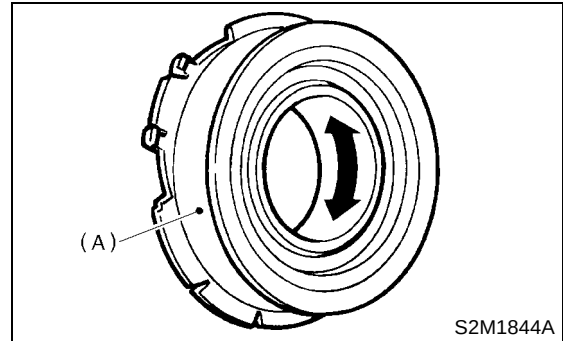
Radial direction stroke:

1.4 mm (0.055 in)



(A) Bearing case

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.

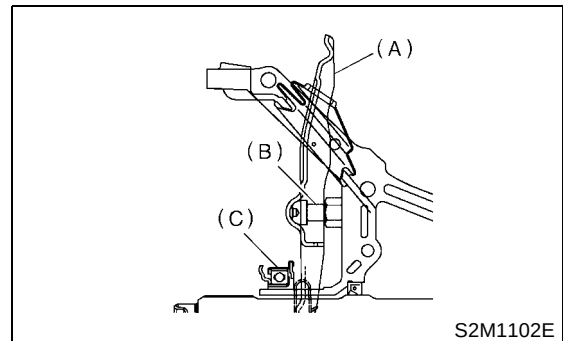


(A) Bearing case

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

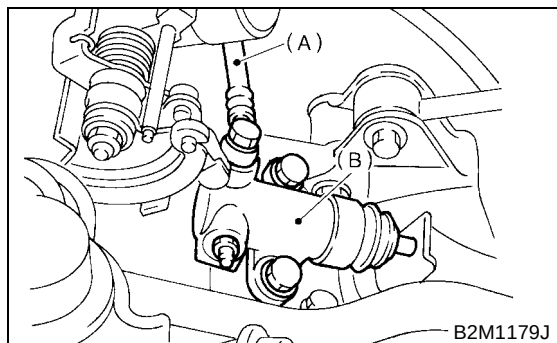
A: REMOVAL

- 1) Remove air cleaner case and air intake duct (Non-turbo model). <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 2) Remove intercooler (Turbo model). <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
- 3) Remove clutch hose from operating cylinder.

CAUTION:

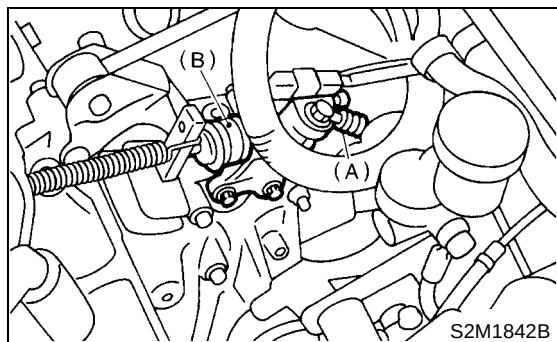
Cover hose joint to prevent clutch fluid from flowing out.

Non-turbo model



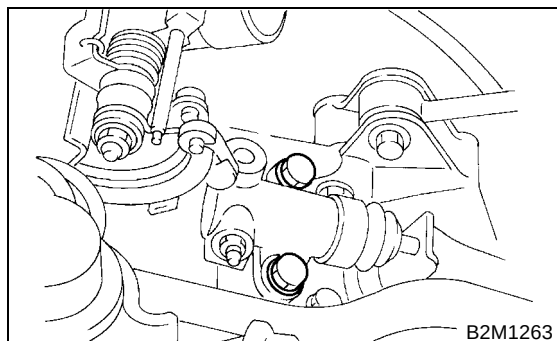
- (A) Clutch hose
- (B) Operating cylinder

Turbo model

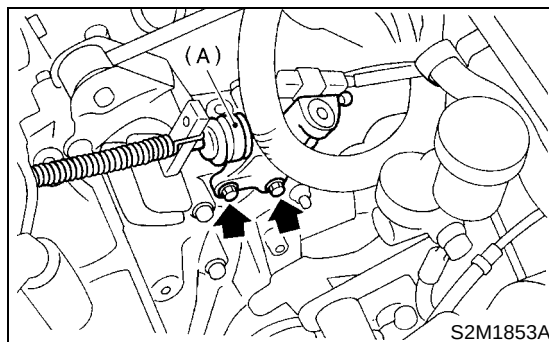


- (A) Clutch hose
- (B) Operating cylinder

- 4) Remove operating cylinder from transmission.
- Non-turbo model



Turbo model



B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

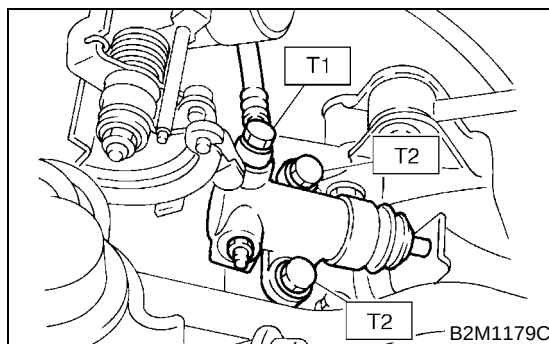
Before installing operating cylinder, apply grease (SUNLIGHT 2: P/N 003602010) to contact point of release lever and operating cylinder.

Tightening torque:

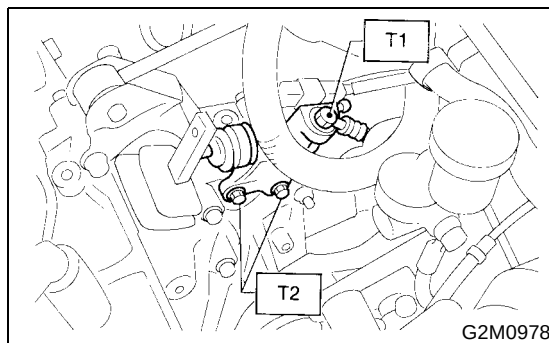
T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)

T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)

Non-turbo model

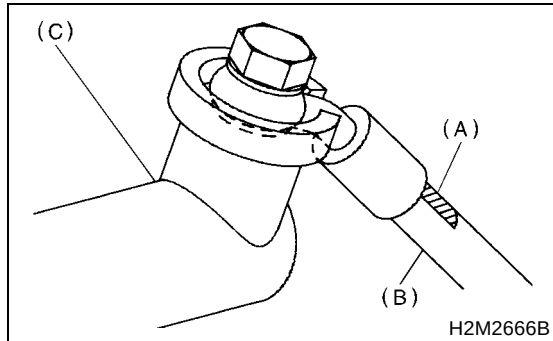


Turbo model



NOTE:

- Be sure to install the clutch hose with the mark side facing upward.
- Be careful not to twist the clutch hose during installation.



- (A) Marking
- (B) Clutch hose
- (C) Operating cylinder

2) After bleeding air from operating cylinder, ensure that clutch operates properly.

<Ref. to CL-30, Clutch Fluid Air Bleeding.>

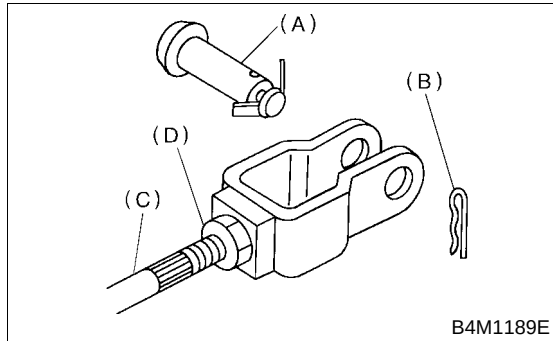
C: INSPECTION

- 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.

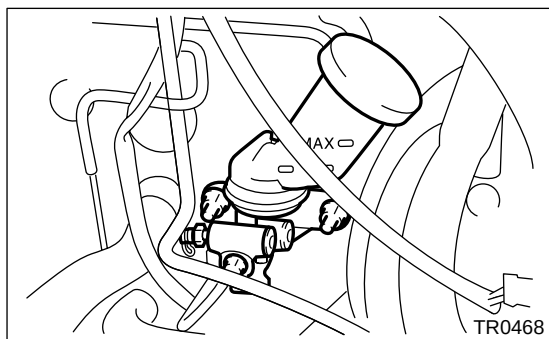


- (A) Clevis pin
- (B) Snap pin
- (C) Push rod
- (D) Lock nut

- 3) Remove air cleaner case and air intake duct (Non-turbo model). <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 4) Remove intercooler (Turbo model). <Ref. to IN(DOHC TURBO)-10, 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.

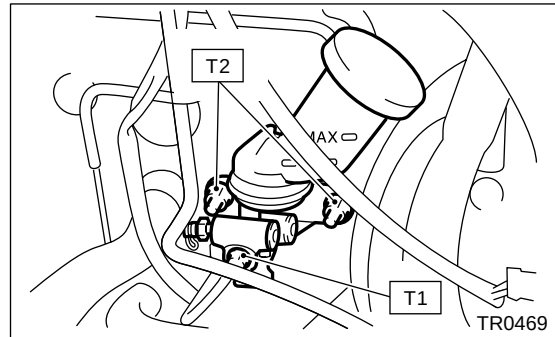
CAUTION:

Check that pipe is routed properly.

Tightening torque:

T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

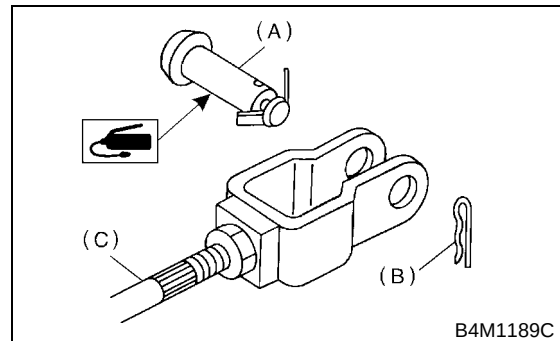
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 2) Connect push rod of master cylinder to clutch pedal, and install clevis pin and snap pin.

NOTE:

Apply grease to clevis pin.



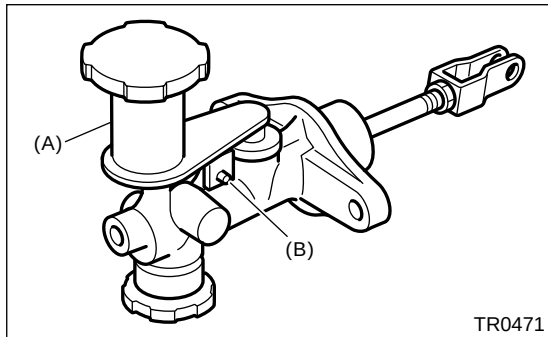
- (A) Clevis pin
- (B) Snap pin
- (C) Push rod

- 3) After bleeding air from system, ensure that clutch operates properly. <Ref. to CL-30, Clutch Fluid Air Bleeding.>
- 4) Install air cleaner case and air intake duct (Non-turbo model). <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
- 5) Install intercooler (Turbo model). <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>

C: DISASSEMBLY

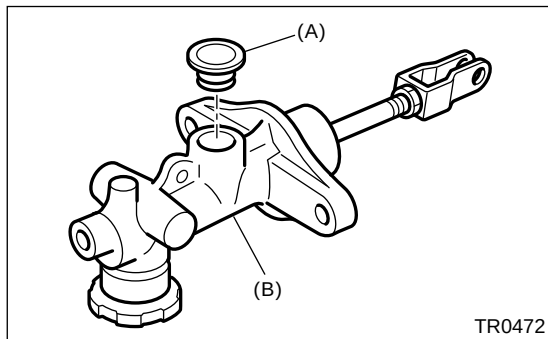
1. EXCEPT RHD TURBO MODEL

1) Remove straight pin and reservoir tank.



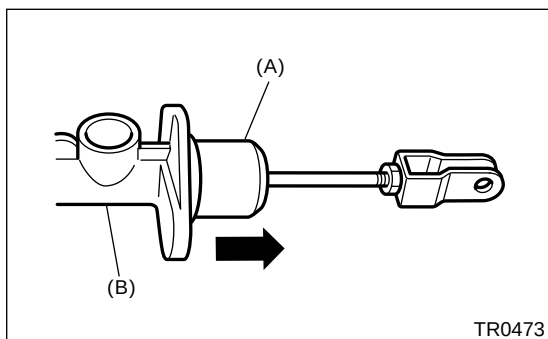
- (A) Reservoir tank
- (B) Straight pin

2) Remove oil seal.



- (A) Oil seal
- (B) Master cylinder

3) Move the cylinder boot backward.



- (A) Cylinder boot
- (B) Master cylinder

4) Remove stop ring.

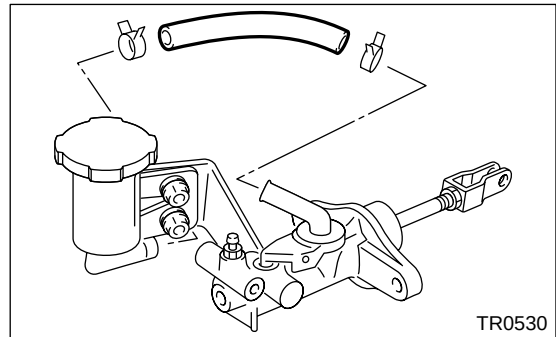
CAUTION:
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

5) Remove clutch damper. (2.0L Non-turbo model)

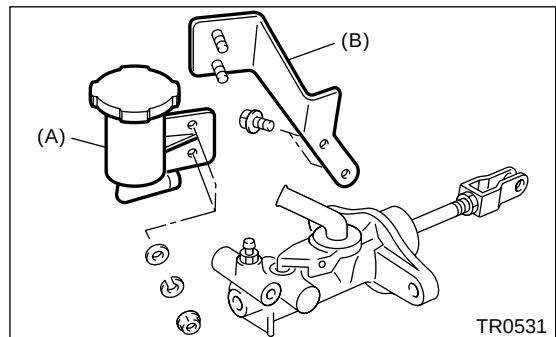
6) Remove air bleeder. (Turbo model)

2. RHD TURBO MODEL

1) Remove hose.

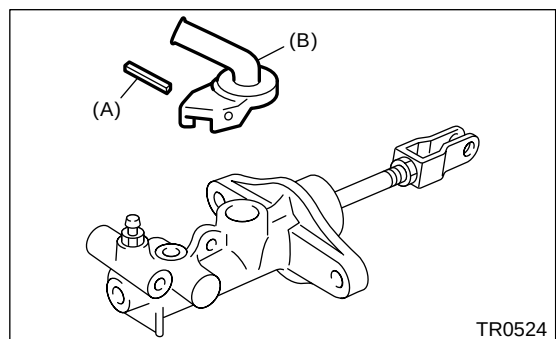


2) Remove reservoir tank and bracket.



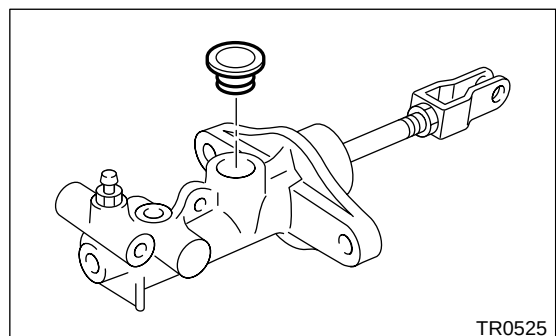
- (A) Reservoir tank
- (B) Bracket

3) Remove straight pin and adapter.



- (A) Straight pin
- (B) Adapter

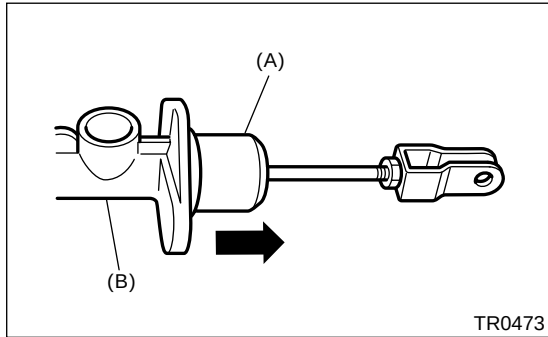
4) Remove oil seal.



MASTER CYLINDER

CLUTCH SYSTEM

5) Move the cylinder boot backward.



- (A) Cylinder boot
(B) Master cylinder

6) Remove the stop ring.

CAUTION:

Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

7) Remove air bleeder.

D: ASSEMBLY

1. EXCEPT RHD TURBO MODEL

1) Install clutch damper. (2.0L Non-turbo model)

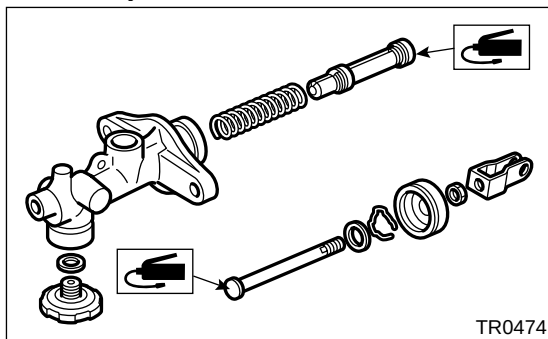
Tightening torque:

46.6 N·m (4.75 kgf-m, 34.4 ft-lb)

2) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

Grease:

SILICONE GREASE G40M (Part No. 004404003)



3) To assemble the master cylinder reverse the sequence of disassembly procedure.

Tightening torque:

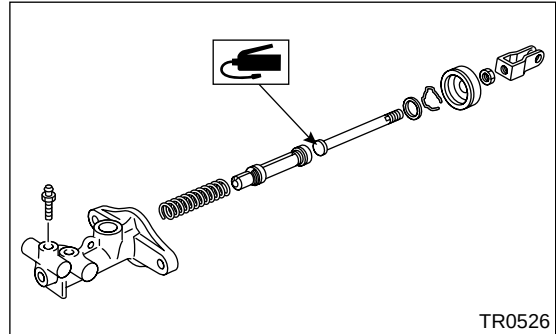
10 N·m (1.0 kgf-m, 7 ft-lb)

2. RHD TURBO MODEL

1) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

Grease:

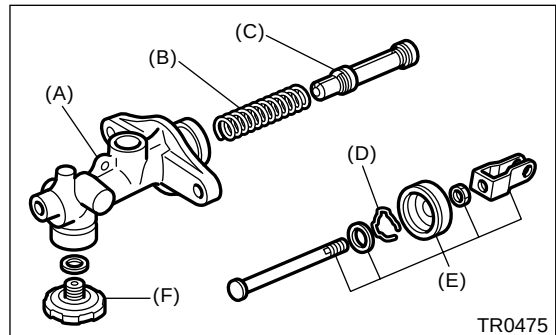
SILICONE GREASE G40M (Part No. 004404003)



2) Assemble in the reverse order of disassemble.

E: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, fluid reservoir, return spring, gasket, clutch damper and hose replace the faulty part.



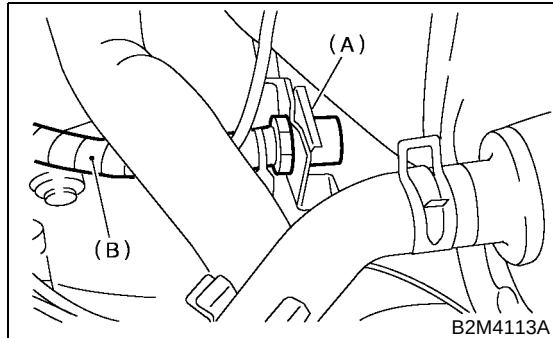
- (A) Master cylinder body
(B) Return spring
(C) Piston
(D) Stop ring
(E) Rod ASSY
(F) Clutch damper

7. Clutch Pipe and Hose

A: REMOVAL

1. EXCEPT RHD TURBO MODEL

- 1) Remove air cleaner case and air intake duct.
- 2) Drain clutch fluid. <Ref. to CL-29, Clutch Fluid.>
- 3) Remove clutch pipe from the clutch hose and master cylinder.
- 4) Pull out clamp, then remove clutch hose from bracket.

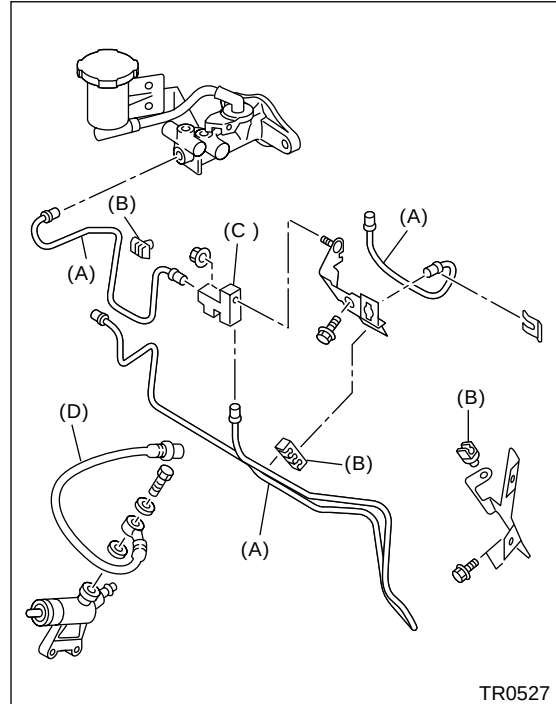


- (A) Clamp
(B) Clutch hose

- 5) Remove hose from operating cylinder.
- 6) Remove bracket.

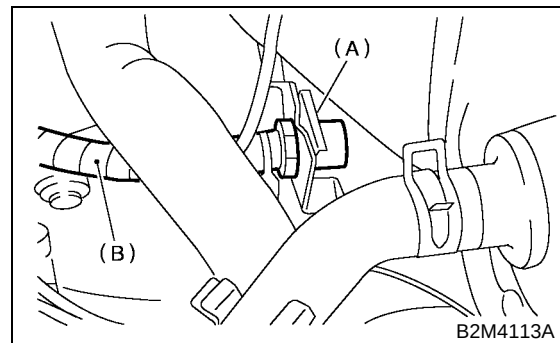
2. RHD TURBO MODEL

- 1) Remove intercooler. <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
- 2) Drain clutch fluid. <Ref. to CL-29, Clutch Fluid.>
- 3) Remove clutch pipe from master cylinder, connector and clutch hose.



- (A) Clutch pipe
(B) Clip
(C) Connector
(D) Clutch hose

- 4) Pull out clamp, then remove clutch hose from bracket.



- (A) Clamp
(B) Clutch hose

- 5) Remove connector.
- 6) Remove bracket.

CLUTCH PIPE AND HOSE

CLUTCH SYSTEM

B: INSTALLATION

1. EXCEPT RHD TURBO MODEL

Install in the reverse order of removal.

NOTE:

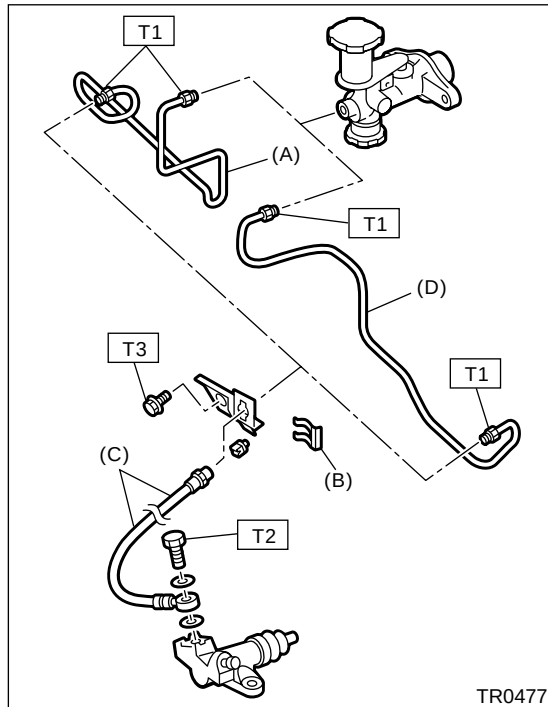
Bleed clutch fluid. <Ref. to CL-30, Clutch Fluid Air Bleeding.>

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)

T3: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



- (A) Clutch pipe (LHD model)
- (B) Clip
- (C) Clutch hose
- (D) Clutch pipe (RHD model)

2. RHD TURBO MODEL

Install in the reverse order of removal.

NOTE:

Bleed clutch fluid. <Ref. to CL-30, Clutch Fluid Air Bleeding.>

Tightening torque:

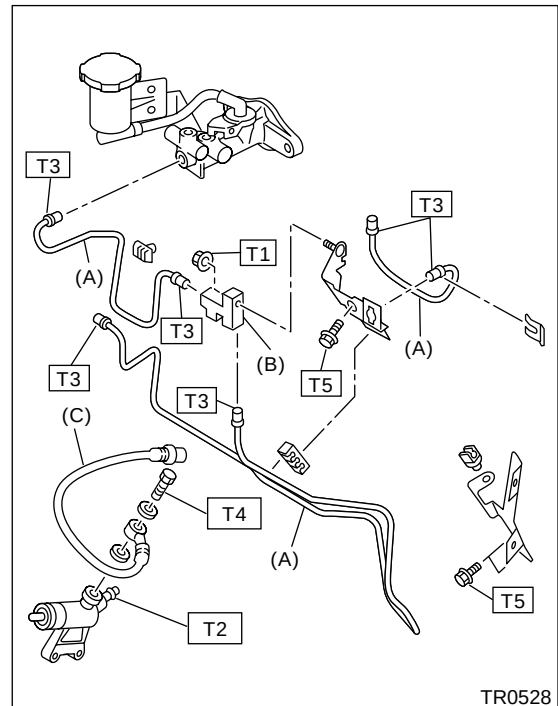
T1: 7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

T2: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

T3: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

T4: 18 N·m (1.8 kgf-m, 13.0 ft-lb)

T5: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



- (A) Clutch pipe
- (B) Connector
- (C) Clutch hose

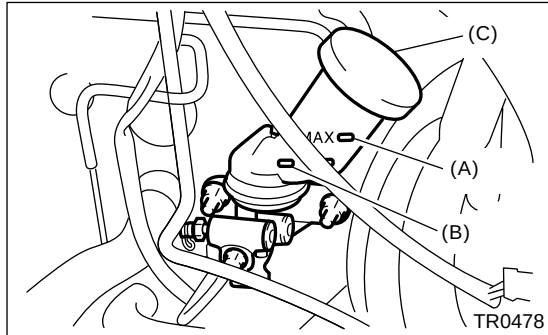
C: INSPECTION

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) Inspect the fluid level using scale on the outside of the reservoir tank. If the level is below "M2N", add fluid to bring it up to "MAX", and also inspect for leakage.



- (A) Max. level
(B) Min. level
(C) Reservoir tank

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.

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 and air duct.
- 2) Either jack-up vehicle and place a safety stand under it, or lift-up vehicle.
- 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

9. Clutch Fluid Air Bleeding

A: PROCEDURE

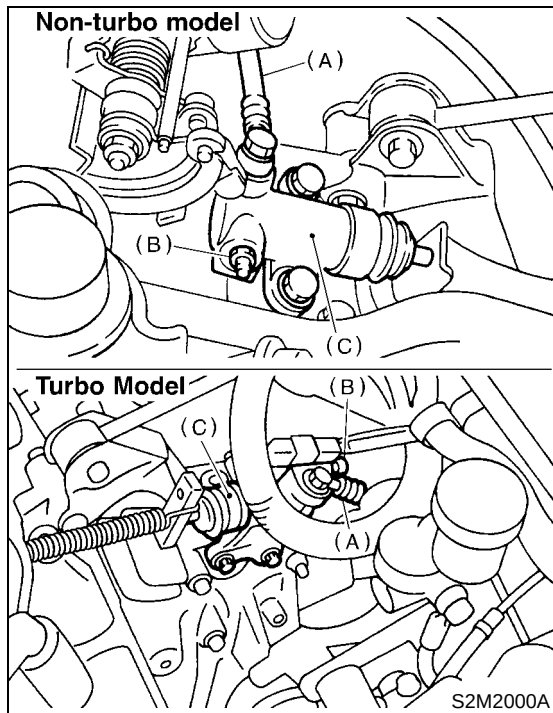
NOTE:

Bleed air from oil line with the help of a co-worker.

1) Remove air cleaner case and air intake duct. (Non-turbo model) <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>

2) Remove intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

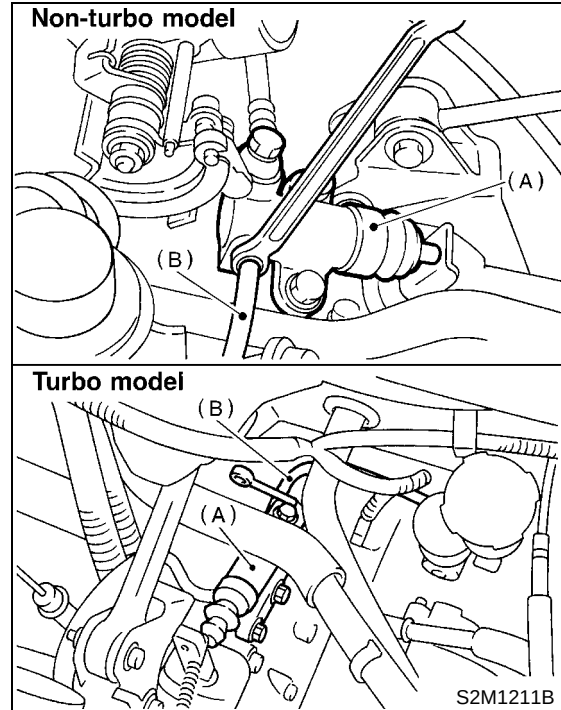
3) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.



- (A) Clutch hose
- (B) Air bleeder
- (C) Operating cylinder

4) 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

5) Repeat these steps until there are no more air bubbles in the vinyl tube.

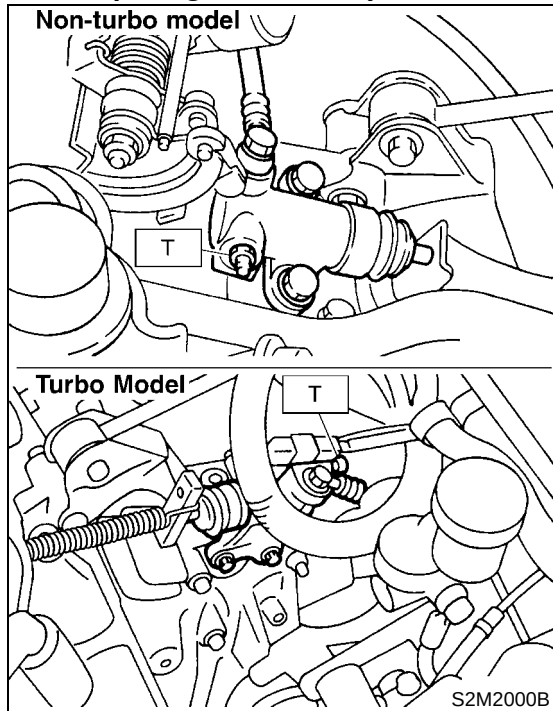
CAUTION:

Cover bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

6) Tighten air bleeder.

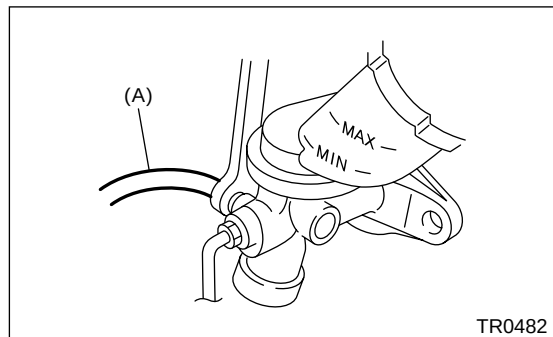
Tightening torque:

$T: 8 \text{ N}\cdot\text{m}$ (0.8 kgf-m, 5.8 ft-lb)



7) Repeat 2) through 4) using air bleeder on operating cylinder. (Non-turbo model)

8) Repeat steps 2) through 4) using air bleeder on master cylinder operating cylinder. (Turbo model)



(A) Vinyl tube

9) Tighten air bleeder.

Tightening torque:

$8 \text{ N}\cdot\text{m}$ (0.8 kgf-m, 5.8 ft-lb)

10) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.

11) After bleeding air from system, ensure that clutch operates properly.

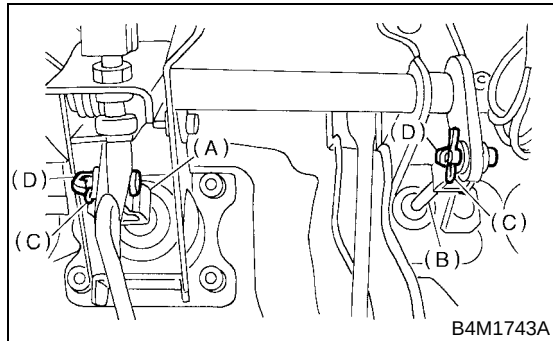
10. Clutch Pedal

A: REMOVAL

1. LHD MODEL

• 2.0L model

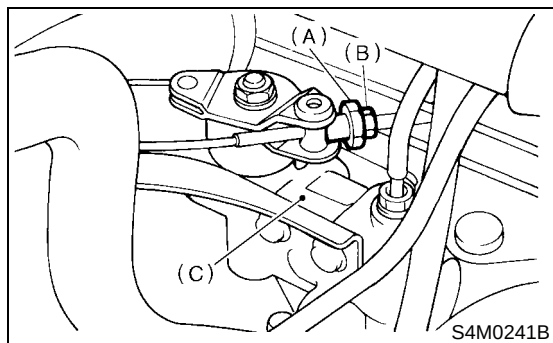
- 1) Remove steering column. <Ref. to PS-30, REMOVAL, Tilt Steering Column.>
- 2) Disconnect connectors from stop light and clutch switches.
- 3) Remove snap pins which secure lever to push rod and operating rod.
- 4) Remove clevis pins which secure lever to push rod and operating rod.



- (A) Operating rod
- (B) Push rod
- (C) Snap pin
- (D) Clevis pin

- 5) Remove air cleaner case and intake duct. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>

- 6) Remove PHV adjusting nut and lock nut. (with hill holder)

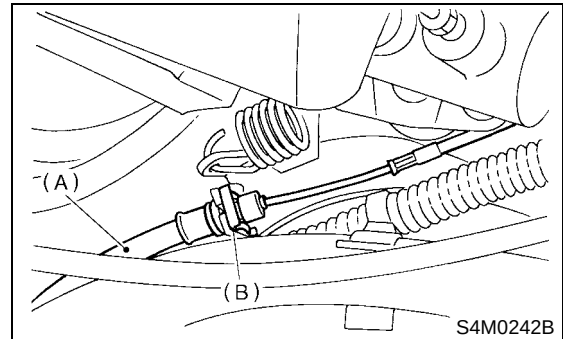


- (A) Adjusting nut
- (B) Lock nut
- (C) PHV

- 7) Remove cable clamp, and disconnect PHV cable from PHV. (with hill holder)

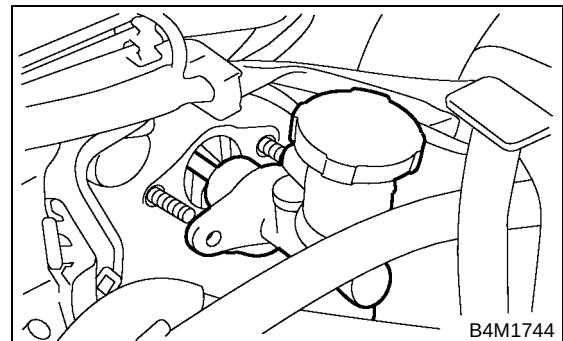
CAUTION:

Carefully protect boot and inner cable from damage when disconnecting PHV cable.



- (A) PHV cable
- (B) Clamp

- 8) Remove nut which secures clutch master cylinder.

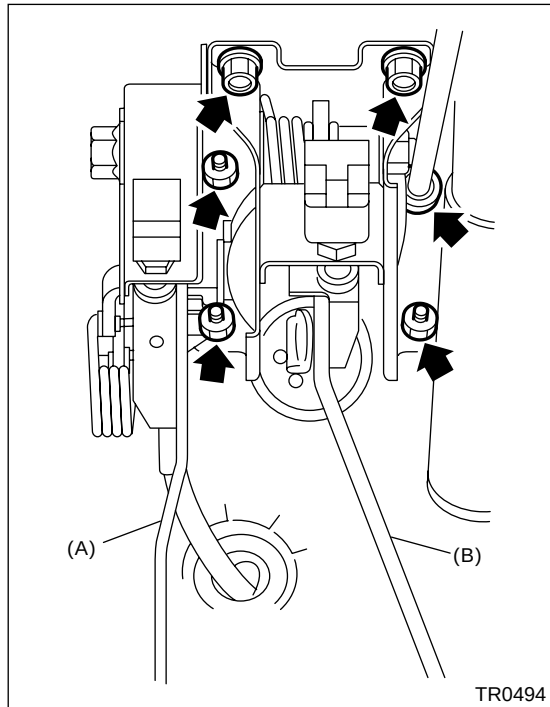


- 9) Remove bolts and nuts which secure brake and clutch pedals, and remove pedal assembly.

• 1.6L model

- 1) Remove battery ground terminal.
- 2) Remove air cleaner case and intake duct. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 3) Disconnect clutch cable from release lever.
- 4) Remove instrument panel lower cover.
- 5) Disconnect operating rod of brake pedal.
- 6) Remove electrical connectors (for stop light switch, etc.)

7) Remove bolts and nuts which secure brake and clutch pedals, and remove pedal bracket and clutch cable as a unit.



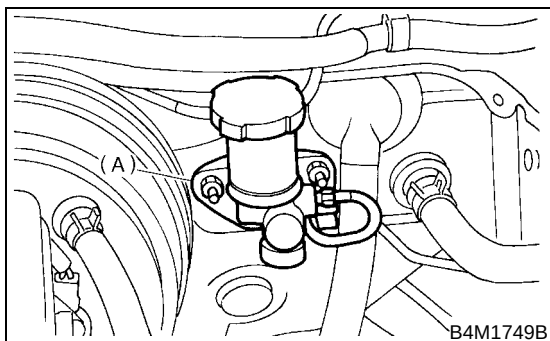
(A) Clutch pedal
(B) Brake pedal

8) Depress clutch pedal, disconnect clutch cable from clutch pedal.

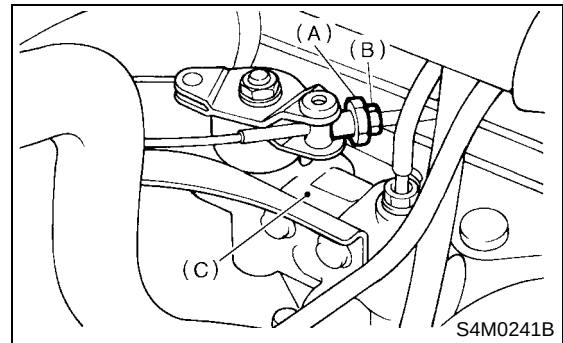
2. RHD MODEL

• 2.0L model

- 1) Disconnect ground terminal from battery.
- 2) Disconnect connector from clutch. (With cruise control)
- 3) Remove snap pin and clevis pin that join push rod and clutch pedal.
- 4) Remove master cylinder mounting nuts.



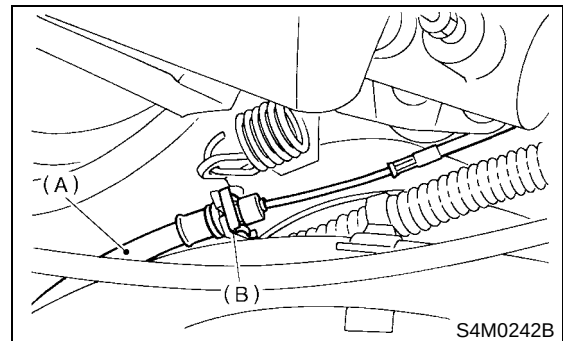
5) Remove PHV adjusting nut and lock nut. (with hill holder)



(A) Adjusting nut
(B) Lock nut
(C) PHV

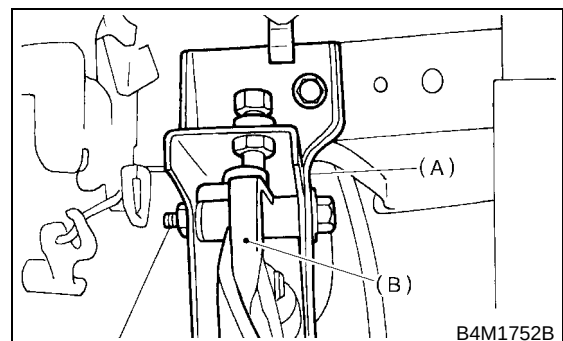
6) Remove cable clamp and disconnect PHV cable from PHV. (with hill holder)

CAUTION:
Carefully protect boot and inner cable from damage when disconnecting PHV cable.



(A) PHV cable
(B) Clamp

7) Remove clutch pedal and bracket as a unit.



(A) Clutch pedal bracket
(B) Clutch pedal

CLUTCH PEDAL

CLUTCH SYSTEM

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.

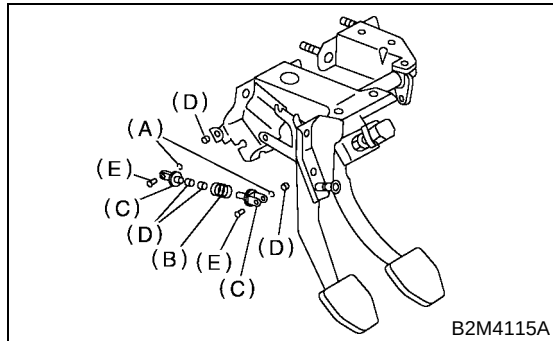
2) Adjustment of clutch pedal and adjustment after pedal installation.<Ref. to CL-36, ADJUSTMENT, Clutch Pedal.>

C: DISASSEMBLY

1. LHD MODEL

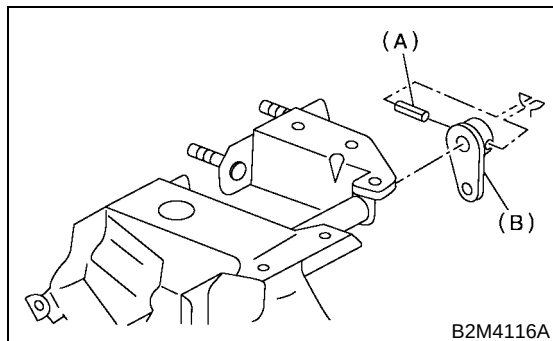
• 2.0L model

- 1) Remove clutch switches.
- 2) Remove clips, assist spring, rod and bushing.



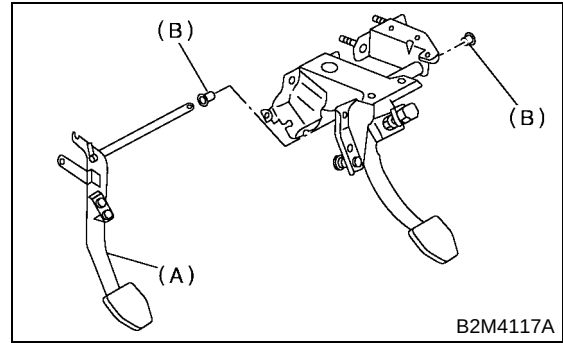
- (A) Clip
- (B) Assist spring
- (C) Assist rod
- (D) Bushing
- (E) Clevis pin

3) Remove spring pin and lever.



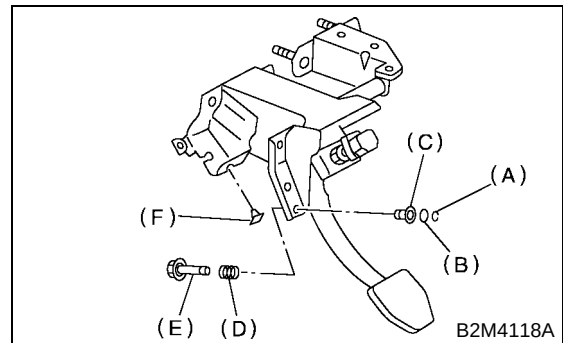
- (A) Pin
- (B) Lever

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.



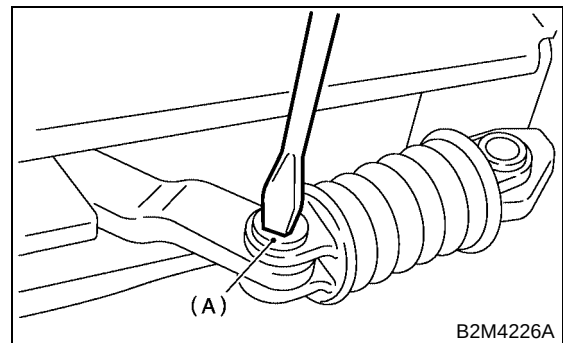
- (A) Clip
- (B) O-ring
- (C) Bushing S
- (D) Spring S
- (E) Rod S
- (F) Stopper

6) Remove stoppers from clutch pedal.

7) Remove clutch pedal pad. (Non-turbo model)

2. RHD MODEL

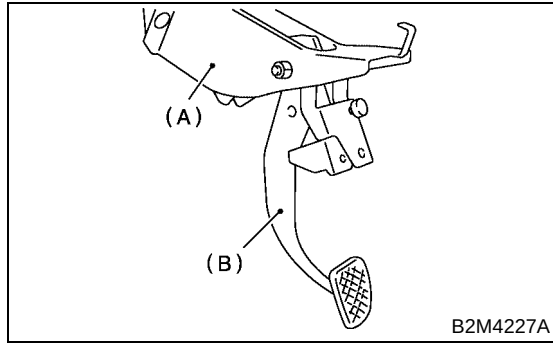
- 1) Remove clutch switch.
- 2) Remove clip, pull out clevis pin.



- (A) Clevis pin

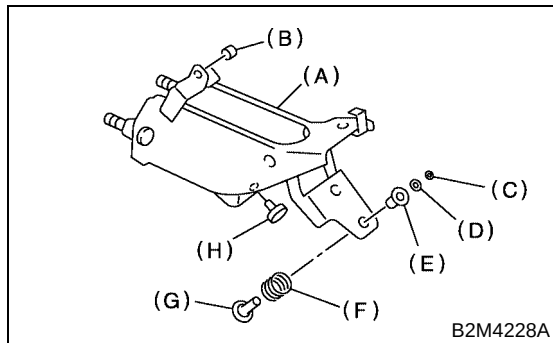
3) Remove assist rod, spring and bushing.

4) Remove clutch pedal from clutch pedal bracket.



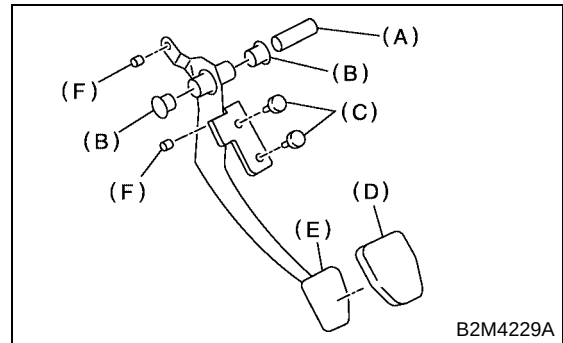
- (A) Clutch pedal bracket
- (B) Clutch pedal

5) Remove following parts (B to H) from clutch pedal bracket (A) as shown in figure.



- (A) Clutch pedal bracket
- (B) Bushing C
- (C) Clip
- (D) O-ring
- (E) Bushing S
- (F) Spring S
- (G) Rod S
- (H) Bushing

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, O-ring, clip, bushing, clutch switch and bushing C to clutch pedal bracket.

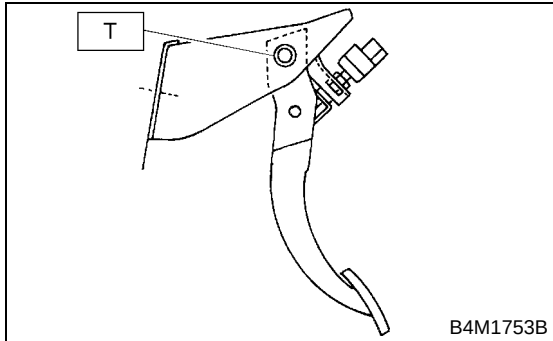
CLUTCH PEDAL

CLUTCH SYSTEM

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.

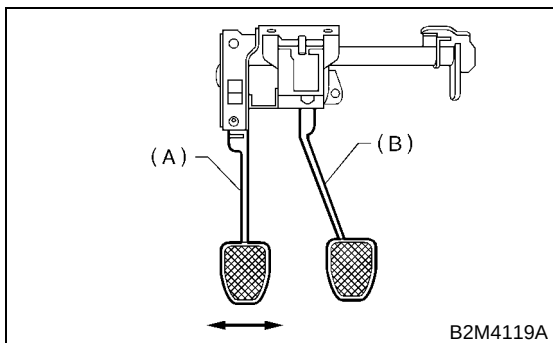
CAUTION:

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. CLUTCH PEDAL

• 2.0L model

1) Turn lock nuts until clutch pedal full stroke length is within specifications.

CAUTION:

Do not attempt to turn clutch switch to adjust clutch pedal full stroke length.

NOTE:

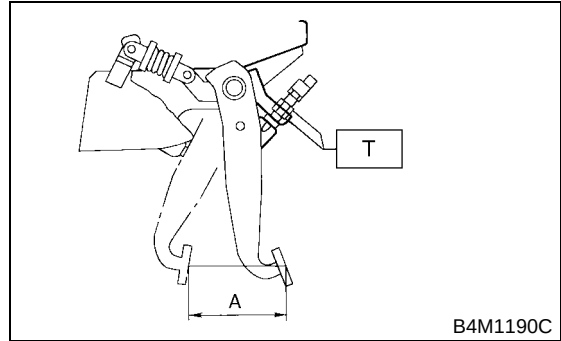
If lock nuts cannot adjust clutch pedal full stroke length to specifications, turn master cylinder push rod to adjust it.

Specified clutch pedal full stroke: A

130 — 135 mm (5.12 — 5.31 in)

Tightening torque (Clutch switch lock nut):

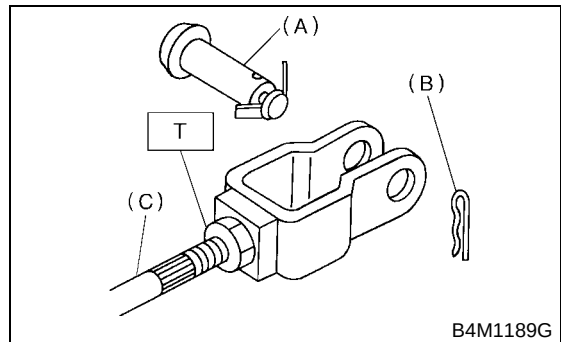
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



2) Turn master cylinder push rod so that clevis pin moves to the left and then to the right. Clevis pin must move without resistance while it is rattling.

Tightening torque (Push rod lock nut):

T: 10 N·m (1.0 kgf-m, 7 ft-lb)



(A) Clevis pin

(B) Snap pin

(C) Push rod

(D) Lock nut

3) Depress and release clutch pedal 2 to 3 times to ensure that clutch pedal and release fork operate smoothly. If clutch pedal and release fork do not operate smoothly, bleed air from clutch hydraulic system. <Ref. to CL-30, Clutch Fluid Air Bleeding.>

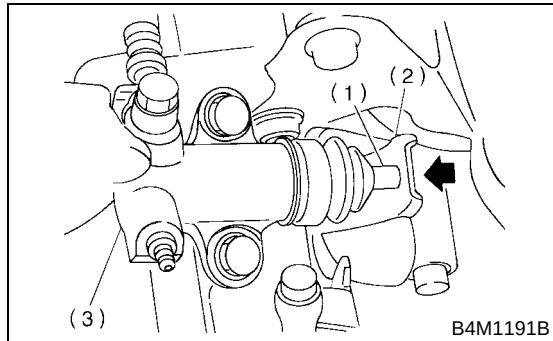
4) Measure clutch pedal full stroke length again to ensure that it is within specifications. If it is not, repeat adjustment procedures again from the beginning.

Specified clutch pedal full stroke:

130 — 135 mm (5.12 — 5.31 in)

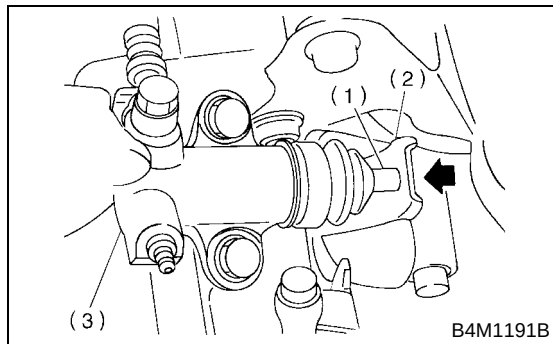
5) Move clevis pin to the left and then to the right. It should move without resistance while it is rattling. If resistance is felt, repeat adjustment procedures again from the beginning.

6) Push release lever until operating cylinder push rod retracts. Ensure that clutch fluid level in reservoir tank increases. If clutch fluid level increases, hydraulic clutch is properly adjusted; if fluid level does not increase or push rod does not retract, replace master cylinder with new one. <Ref. to CL-24, Master Cylinder.>



- (1) Push rod
- (2) Release lever
- (3) Operating cylinder

7) Push release lever until operating cylinder push rod retracts. Check that clutch fluid level in reservoir tank increases.



- (1) Push rod
- (2) Release lever
- (3) Operating cylinder

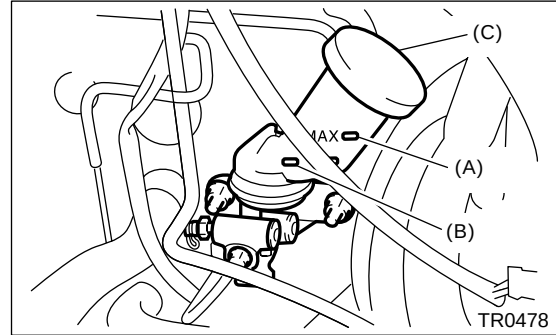
8) If clutch fluid level increases, hydraulic clutch play is correct.

9) If clutch fluid level does not increase or push rod does not retract, clutch pedal must be readjusted.

10) Check the fluid level on the outside of the reservoir tank. If the level is below "MIN", add clutch fluid to bring it up to "MAX".

Recommended clutch fluid:

FMVSS No. 116, fresh DOT 3 or DOT 4 brake fluid



- (A) Max. level
- (B) Min. level
- (C) Reservoir tank

• 1.6L model

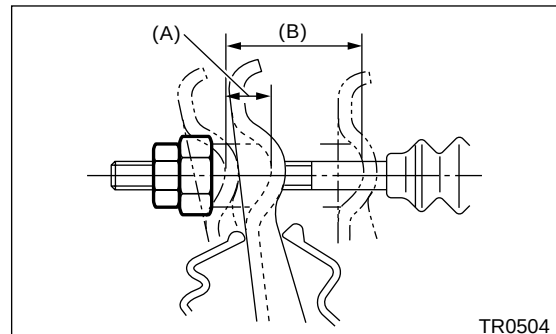
- 1) Remove battery ground terminal.
- 2) Remove air cleaner case and intake duct. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 3) Remove release lever return spring from lever.
- 4) Loosen the lock nut.
- 5) Adjust spherical nut so that the play is within the specified value the lever end (center of spherical nut).

CAUTION:

Take care not to twist the cable during adjustment.

Play: 3 — 4 mm (0.12 — 0.16 in)

Full stroke: 24 — 26 mm (0.94 — 1.02 in)



- (A) Play
- (B) Full stroke

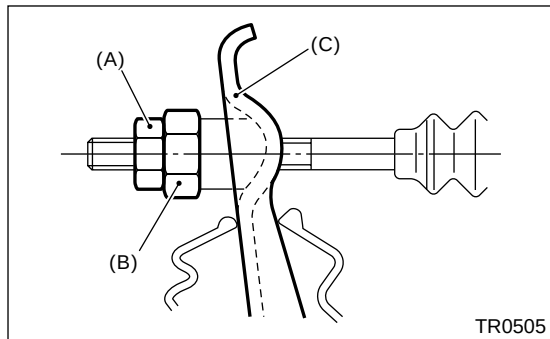
CLUTCH PEDAL

CLUTCH SYSTEM

6) Upon completion of adjustment, securely lock spherical nut with lock nut.

Tightening torque:

5.9 N·m (0.60 kgf-m, 4.3 ft-lb)



- (A) Lock nut
- (B) Spherical nut
- (C) Clutch release lever

7) Install return spring on lever.

NOTE:

Hook the long hook side of the return spring with the lever.

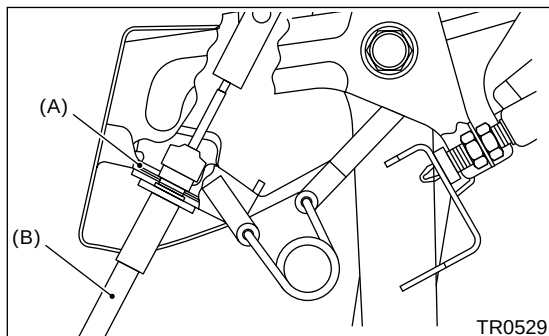
8) Depress clutch pedal to assure there is no abnormality in the clutch system.

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

11. Clutch Cable

A: REMOVAL

- 1) Remove battery ground terminal.
- 2) Remove air cleaner case and intake duct. <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 3) Disconnect clutch cable from release lever.
- 4) Depress clutch pedal to the floor.
- 5) Remove clutch cable clamp from pedal bracket.



- (A) Clamp
(B) Clutch cable

- 6) Remove clutch cable from body.

B: INSTALLATION

- 1) Clean clutch pedal fitting hole, and apply grease. Connect clutch to clutch pedal.
- 2) Fit clutch pedal to pedal bolt, and connect clutch cable to bracket with clamp.
- 3) Connect clutch cable end to pedal end.
- 4) Connect clutch cable to release lever.
- 5) Install grommet to toe board.
- 6) Adjustment after cable installation. <Ref. to CL-36, ADJUSTMENT, Clutch Pedal.>
- 7) Install air cleaner case and intake duct. <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>

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.

12.Clutch Switch

A: REMOVAL

- 1) Remove battery ground terminal.
- 2) Disconnect connector from clutch switch.
- 3) Remove clutch switch.

B: INSTALLATION

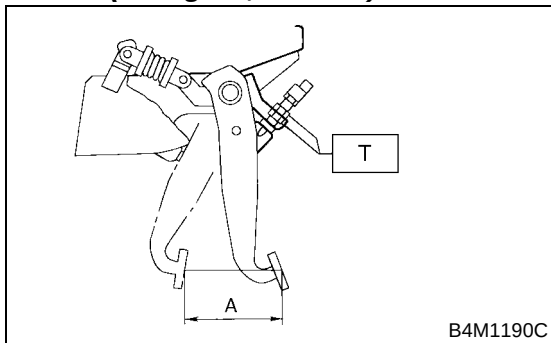
- 1) Move clevis pin of the push rod right and left and hold where it moves smoothly, then measure stroke of clutch pedal.

Specified clutch pedal full stroke:A

130 — 135 mm (5.12 — 5.31 in)

Tightening torque:

T: 8 N·m (0.8 kgf·m, 5.8 ft-lb)



- 2) If clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-36, ADJUSTMENT, Clutch Pedal.>

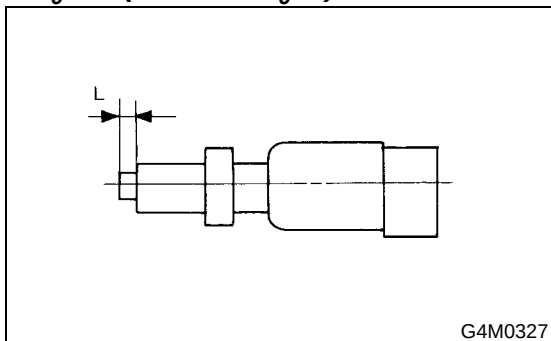
- 3) Connect clutch switch connector.

C: INSPECTION

- 1) If clutch switch does not operate properly (or if it does not stop at the specified position), replace with new one.

Specified position: L

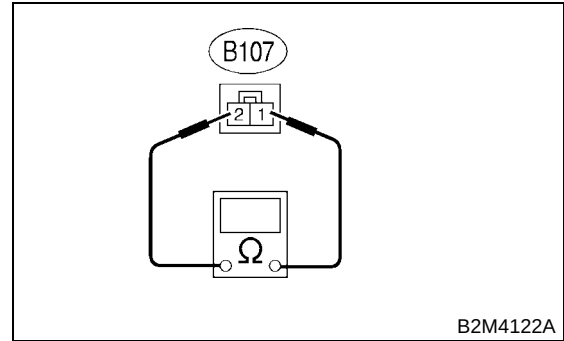
$2^{+1.5}_{-0} \text{ mm } (0.079^{+0.059}_{-0} \text{ in})$



- 2) Check clutch switch continuity. If continuity is not as specified, replace the switch.

Switch position	Tester connection	Specified condition
Switch pin free	1 — 2	Continuity
Switch pin pushed in		No continuity

Clutch switch (With cruise control)



13. General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptom	Possible cause	Corrective
1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms • 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 flywheel	Correct or replace.
	(e) Defective release bearing holder	Correct or replace.
2. Clutch drags. 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. • Method of testing: <Ref. to CL-42, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.> It may be judged as insufficient disengagement of clutch if any noise occurs during this test.	(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.
3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.	(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 defection.
	(d) Warped pressure plate or flywheel	Correct or replace.
	(e) Loose disc rivets	Replace clutch disc.
	(f) Loose engine mounting	Retighten or replace mounting.
	(g) Improper adjustment of pitching stopper	Adjustment.

GENERAL DIAGNOSTIC TABLE

CLUTCH SYSTEM

Symptom	Possible cause	Corrective
4. Noisy clutch Examine whether the noise is generated when the clutch is disengaged, engaged, or partially engaged.	(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.
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	Check	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 there any abnormal noise from the transmission gear?	Go to step 2.	Clutch is normal.
2 CHECK GEAR NOISE. Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds.	Is there any abnormal noise from the transmission gear?	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. 1)Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds. 2)With the clutch disengaged, shift from N to R, R to N several times.	Is there any abnormal noise from the transmission gear?	Defect in clutch disengaging. Inspect clutch disc, clutch cover, clutch release, and clutch pedal free play.	Clutch and fly-wheel seizure. Inspect clutch disc, spline of clutch disc hub.

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

FRONT SUSPENSION

FS 

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1. General Description	2
2. Wheel Alignment	8
3. Front Transverse Link	16
4. Front Ball Joint	18
5. Front Strut	19
6. Front Stabilizer	23
7. Front Crossmember	24
8. General Diagnostic Table.....	25

GENERAL DESCRIPTION

FRONT SUSPENSION

1. General Description

A: SPECIFICATIONS

1. STABILIZER

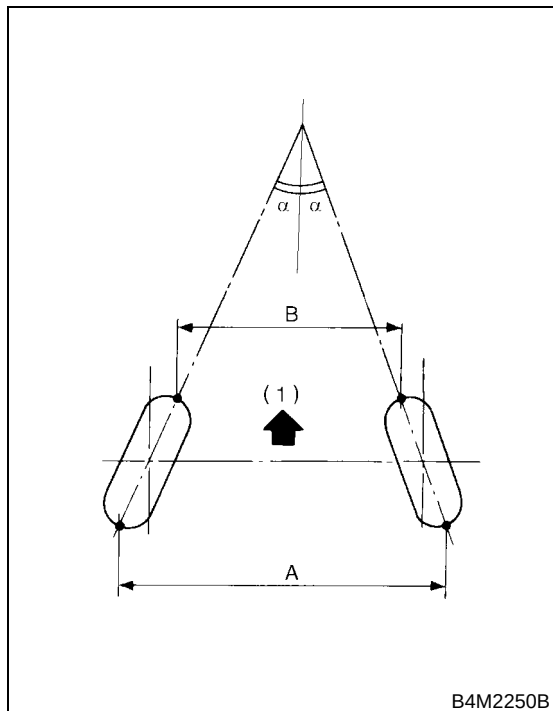
Model	Bar dia.
ALL MODEL	20 mm (0.79 in)

2. WHEEL ALIGNMENT

Model	Sedan		Wagon		OUTBACK
	Turbo	Non-turbo	Turbo	Non-turbo	
Camber (tolerance: $\pm 0^{\circ}45'$)	$-0^{\circ}25'$	$-0^{\circ}15'$	$-0^{\circ}20'$	$-0^{\circ}10'$	$-0^{\circ}05'$
Caster (common difference: $\pm 0^{\circ}45'$)	$3^{\circ}35'$	$3^{\circ}25'$	$3^{\circ}35'$	$3^{\circ}25'$	$3^{\circ}25'$
Toe-in	0 ± 3 mm (0 ± 0.12 in) Each toe angle: $\pm 0^{\circ}07'30''$				
Kingpin angle (tolerance: $\pm 0^{\circ}45'$)	$14^{\circ}35'$	$14^{\circ}20'$	$13^{\circ}45'$	$13^{\circ}30'$	$13^{\circ}20'$
Wheel arch height [tolerance: ± 12 mm (± 0.47 in)]	396 mm (15.59 in)	406 mm (15.98 in)	387 mm (15.24 in)	397 mm (15.63 in)	402 mm (15.83 in)

NOTE:

- Front and rear toe-ins 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 exceeds specifications, check suspension parts and connections for deformities; replace with new ones as required.



(1) Front

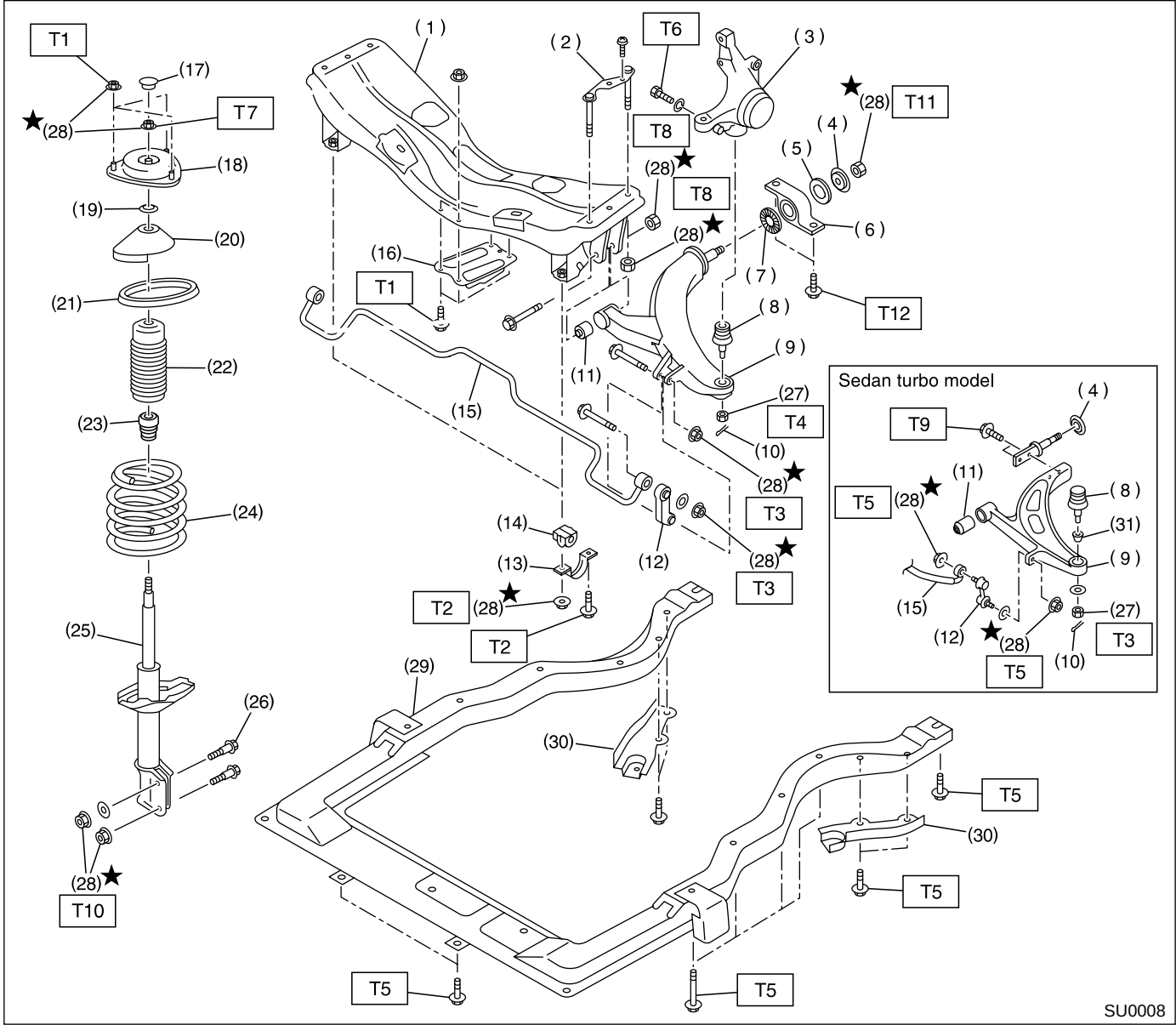
A – B = Positive: Toe-in, Negative: Toe-out

α = Each toe angle

GENERAL DESCRIPTION

FRONT SUSPENSION

B: COMPONENT



SU0008

GENERAL DESCRIPTION

FRONT SUSPENSION

(1) Front crossmember	(16) Jack-up plate	(31) Boss
(2) Bolt ASSY	(17) Dust seal	
(3) Housing	(18) Strut mount	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(4) Washer	(19) Spacer	<i>T1: 20 (2.0, 14.5)</i>
(5) Stopper rubber (Rear)	(20) Upper spring seat	<i>T2: 25 (2.5, 18.1)</i>
(6) Rear bushing	(21) Rubber seat	<i>T3: 30 (3.1, 22)</i>
(7) Stopper rubber (Front)	(22) Dust cover	<i>T4: 40 (4.1, 30)</i>
(8) Ball joint	(23) Helper	<i>T5: 45 (4.6, 33)</i>
(9) Transverse link	(24) Coil spring	<i>T6: 50 (5.1, 37)</i>
(10) Cotter pin	(25) Damper strut	<i>T7: 55 (5.6, 41)</i>
(11) Front bushing	(26) Adjusting bolt	<i>T8: 100 (10.2, 74)</i>
(12) Stabilizer link	(27) Castle nut	<i>T9: 155 (15.8, 114)</i>
(13) Clamp	(28) Self-locking nut	<i>T10: 175 (17.8, 129)</i>
(14) Bushing	(29) Sub frame	<i>T11: 190 (19.4, 140)</i>
(15) Stabilizer	(30) Cover	<i>T12: 250 (25.5, 184)</i>

C: CAUTION

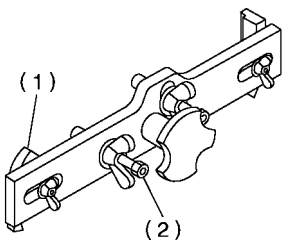
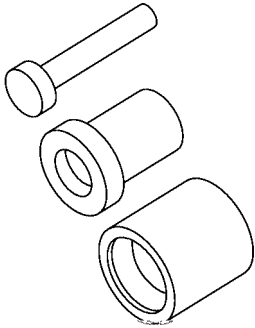
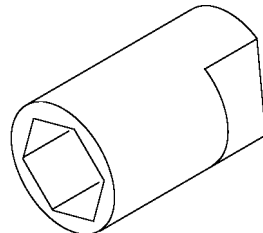
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.

GENERAL DESCRIPTION

FRONT SUSPENSION

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2378A	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 B4M2385	927680000	INSTALLER & REMOVER SET	Used for replacing transverse link bushing.
 B4M2384	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.

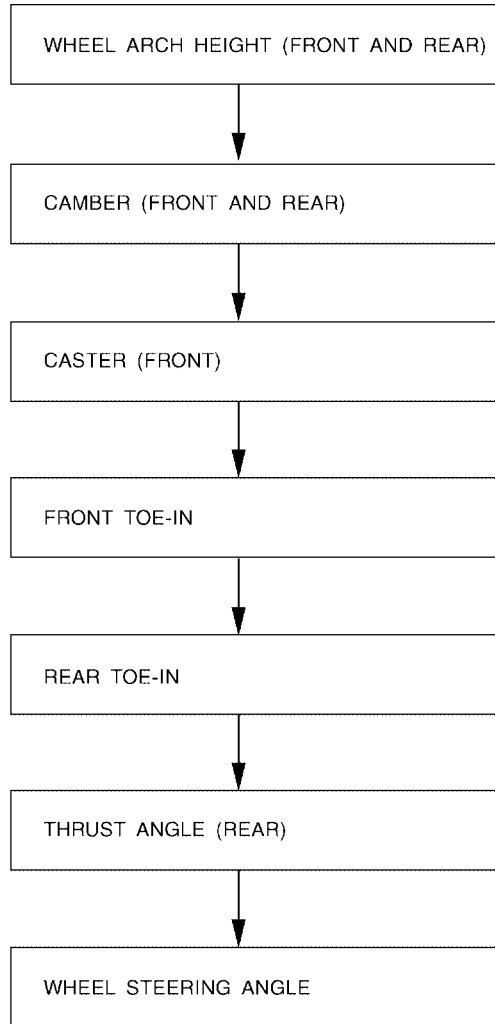
WHEEL ALIGNMENT

FRONT SUSPENSION

2. Wheel Alignment

A: INSPECTION

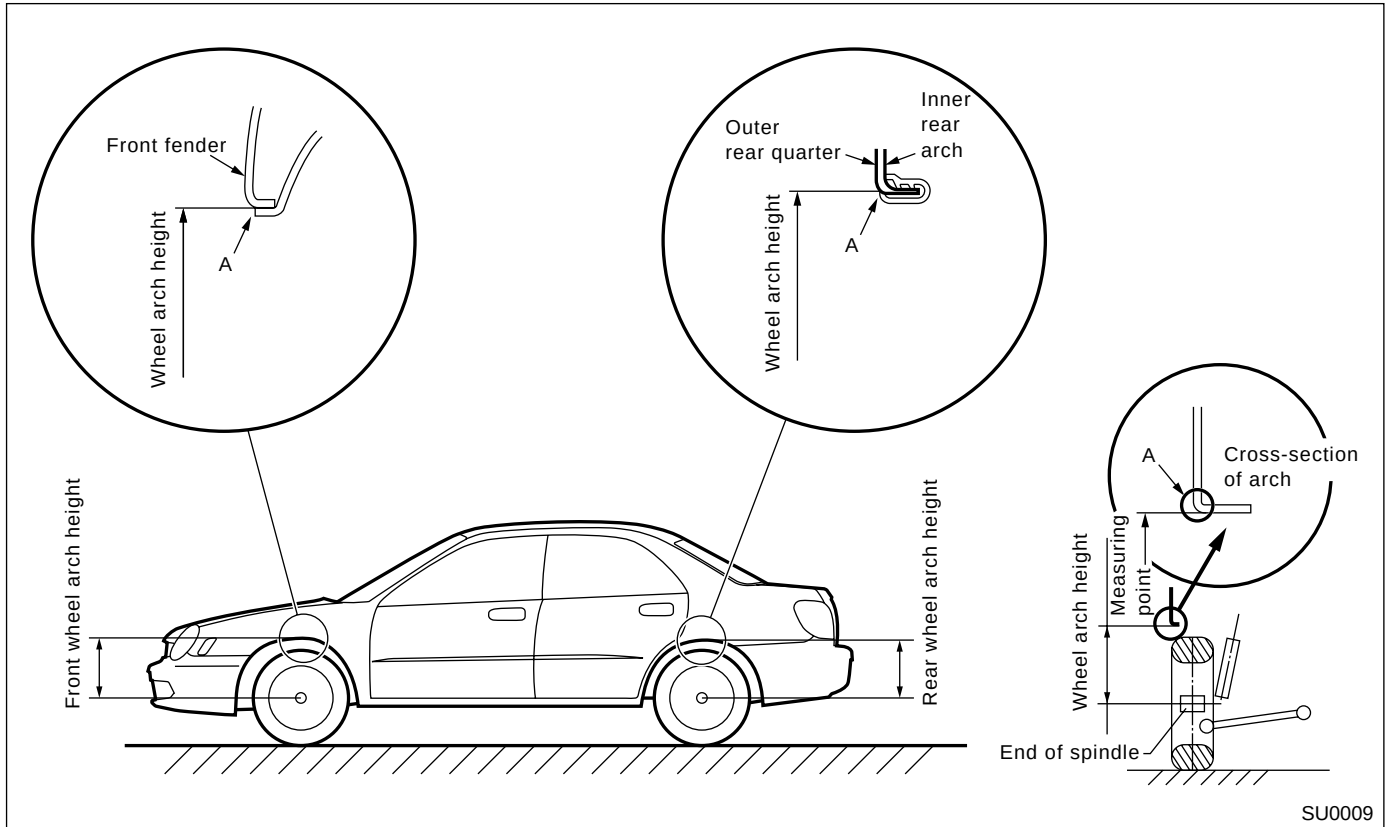
Check, adjust and/or measure wheel alignment in accordance with procedures indicated in figure:



B4M1088A

1. WHEEL ARCH HEIGHT

- 1) Adjust tire pressure to specifications.
- 2) Set vehicle under "curb weight" conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
- 3) Set steering wheel in a wheel-forward position.
- 4) Suspend thread from wheel arch (point "A" in figure below) to determine a point directly above center of spindle.
- 5) Measure distance between measuring point "A" and center of spindle.



SU0009

Model		Specified wheel arch height	
		Turbo	Non-turbo
Sedan	Front	396±12 mm (15.59±0.47 in)	406±12 mm (15.98±0.47 in)
	Rear	376±12 mm (14.80±0.47 in)	381±12 mm (15.0±0.47 in)
Wagon	Front	387±12 mm (15.24±0.47 in)	397±12 mm (15.63±0.47 in)
	Rear	376±12 mm (14.80±0.47 in)	381±12 mm (15.0±0.47 in)
OUTBACK	Front	—	402±12 mm (15.83±0.47 in)
	Rear	—	386±12 mm (15.20±0.47 in)

WHEEL ALIGNMENT

FRONT SUSPENSION

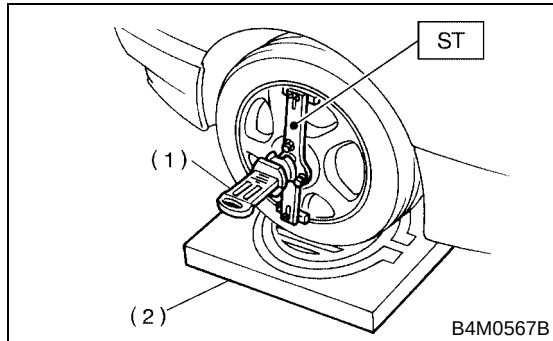
2. CAMBER

• 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

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:

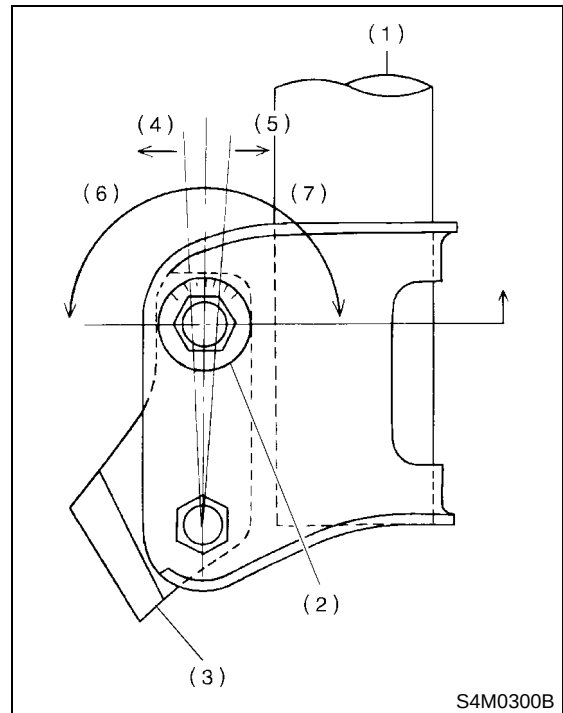
- When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.

- 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

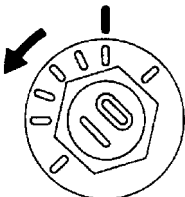
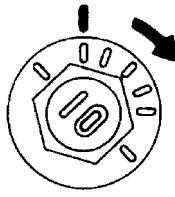
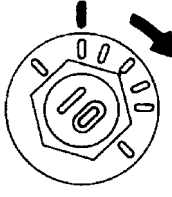
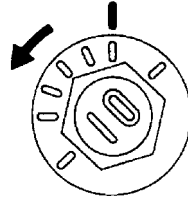
(3) Housing

(4) Outer

(5) Inner

(6) Camber is increased.

(7) Camber is decreased.

	Left side	Right side
Camber is increased.	 Rotate counterclockwise. B4M0190	 Rotate clockwise. B4M0350
Camber is decreased.	 Rotate clockwise. B4M0350	 Rotate counterclockwise. B4M0190

3) Tighten the two self-locking nuts.

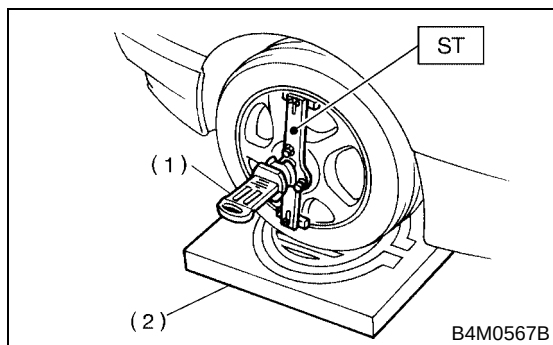
Tightening torque:

175 N·m (17.8 kgf-m, 129 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

NOTE:

Refer to the "SPECIFICATIONS" for the caster values. <Ref. to FS-2, SPECIFICATIONS, General Description.>

4. FRONT WHEEL TOE-IN

• Inspection

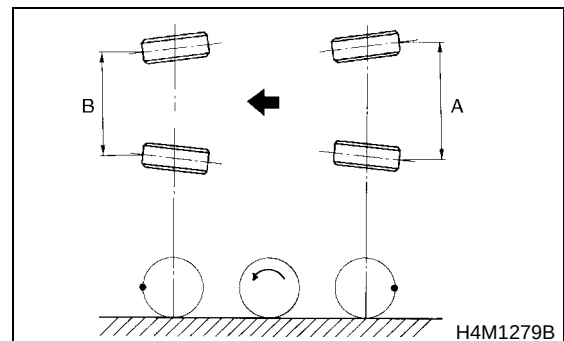
- 1) Using a toe gauge, measure front wheel toe-in.

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

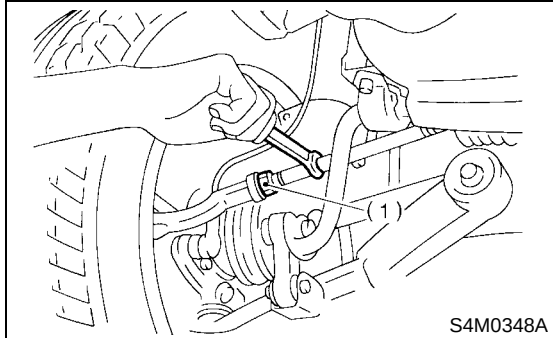
- 1) Loosen the left and right side steering tie-rod lock nuts.

WHEEL ALIGNMENT

FRONT SUSPENSION

2) Turn the left and right tie rods equal amounts until the toe-in is at the specification.

Both the left and right tie-rods 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.

5. REAR WHEEL TOE-IN

• Inspection

1) Using a toe-in gauge, measure rear wheel toe-in.

Toe-in:

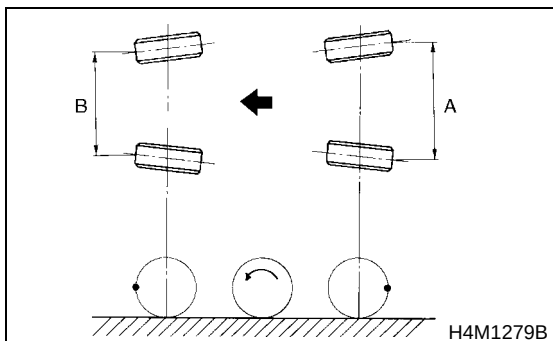
-1±2 mm (-0.039±0.079 in)

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:

$$A - B = \text{Toe-in}$$



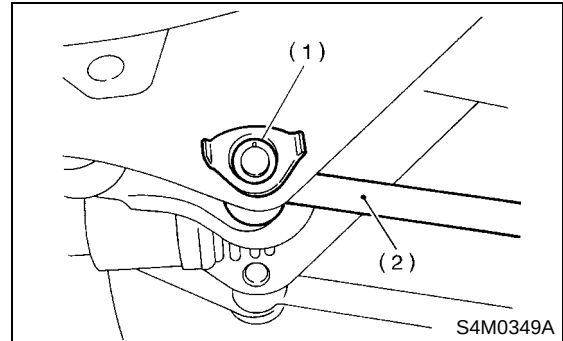
• Adjustment

1) Loosen 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

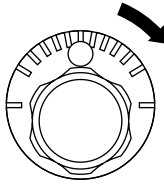
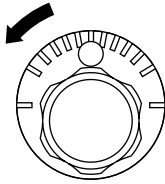
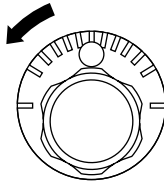
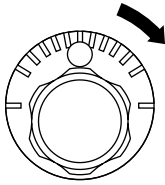
2) Turn adjusting bolt head until toe-in is at the specification.

WHEEL ALIGNMENT

FRONT SUSPENSION

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 1.5 mm (0.12 in).

	Left side	Right side
Toe-in is increased.	 Rotate clockwise. B4M0192	 Rotate counterclockwise. B4M0352
Toe-in is decreased.	 Rotate counterclockwise. B4M0352	 Rotate clockwise. B4M0192

3) Tighten self-locking nut.

Tightening torque:

100 N·m (10.2 kgf-m, 74 ft-lb)

6. 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:

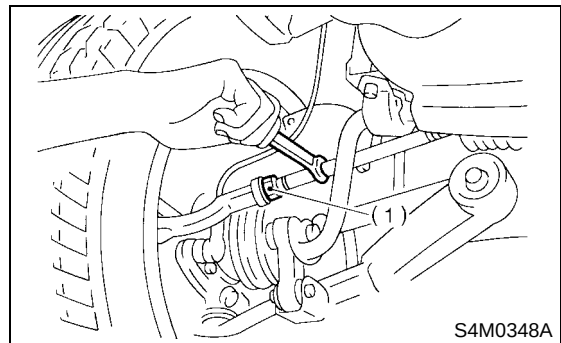
Model	Turbo and OUT-BACK	Others
Inner wheel	$34^{\circ}30' \pm 1.5^{\circ}$	$37^{\circ}20' \pm 1.5^{\circ}$
Outer wheel	$34^{\circ}30' \pm 1.5^{\circ}$	$32^{\circ}25' \pm 1.5^{\circ}$

• 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

WHEEL ALIGNMENT

FRONT SUSPENSION

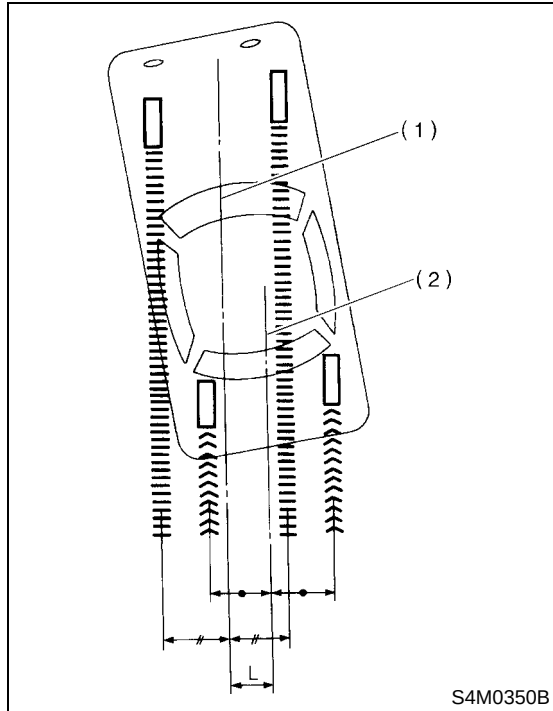
7. THRUST ANGLE

• Inspection

- 1) Position vehicle on a level surface.
- 2) Move vehicle 3 to 4 meters 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 20' when "L" is equal to or less than 15 mm (59 in).



- (1) Center line of loci (front axle)
- (2) Center line of loci (rear axle)

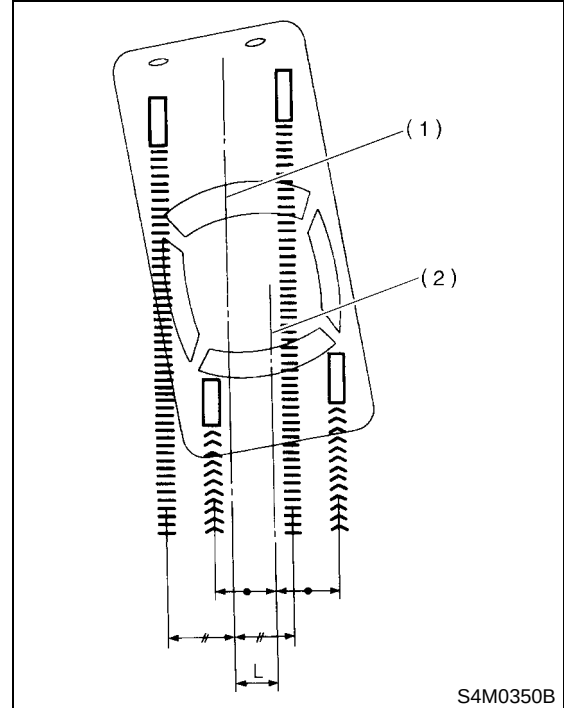
• Adjustment

- 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 16' ["L" is almost equal to 12 mm (0.472 in)].

Thrust angle:

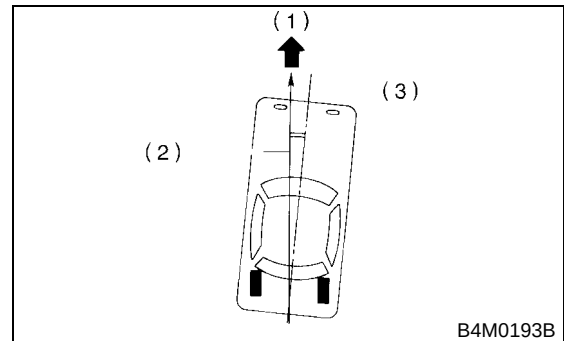
0°±20'



- (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

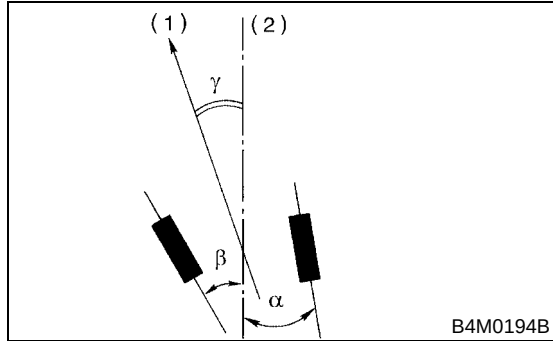
Thrust angle: $r = (\alpha - \beta)/2$

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.

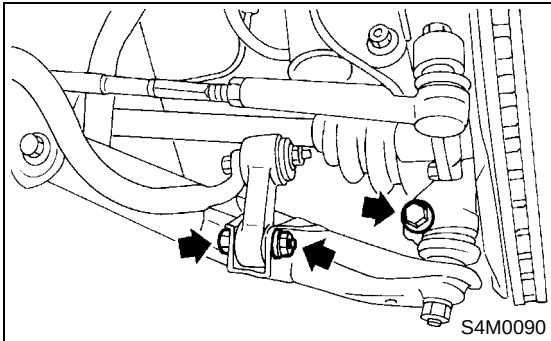


- (1) Front
- (2) Body center line

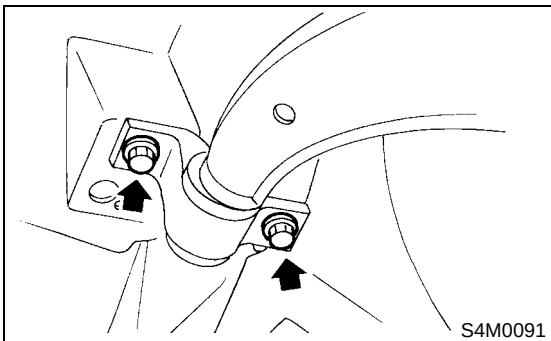
3. Front Transverse Link

A: REMOVAL

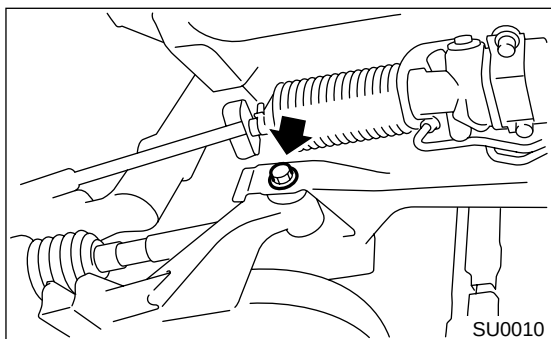
- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Lift-up the vehicle and remove the wheel.
- 4) Remove sub frame.
- 5) Disconnect stabilizer link from transverse link.
- 6) Remove bolt securing ball joint of transverse link to housing.



- 7) Remove nut (do not remove bolt.) securing transverse link to crossmember.
- 8) Remove two bolts securing bushing bracket of transverse link to vehicle body at rear bushing location.



- 9) Extract ball joint from housing.
- 10) 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.

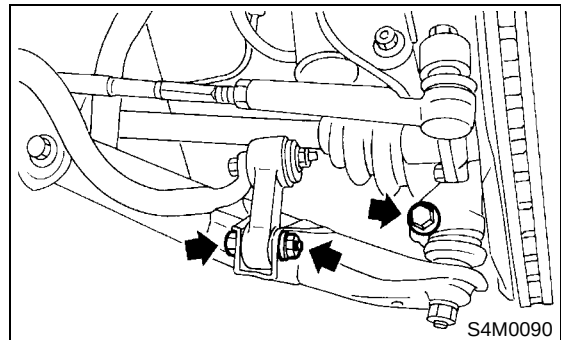
CAUTION:

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 curb weight.

- (1) Transverse link and stabilizer

Tightening torque:

Sedan Turbo model:

45 N·m (4.6 kgf-m, 33 ft-lb)

Except sedan Turbo model:

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)

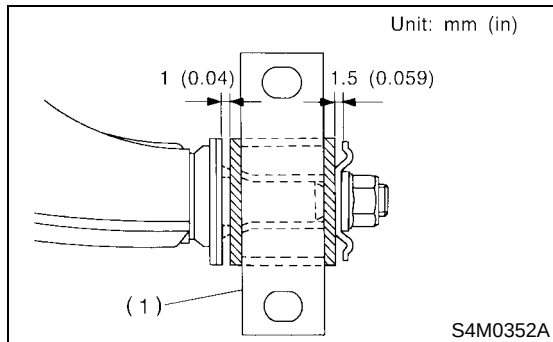
- (3) Transverse link rear bushing and body

Tightening torque:

250 N·m (25.5 kgf-m, 184 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.



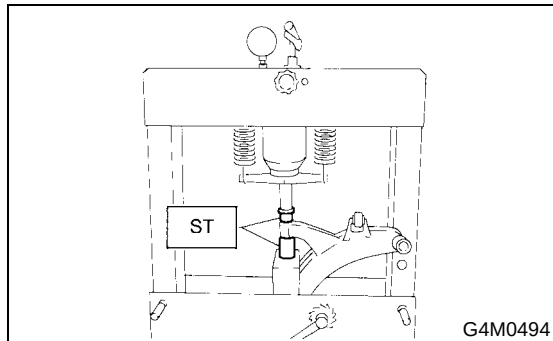
(1) Rear bushing

C: DISASSEMBLY

1. FRONT BUSHING

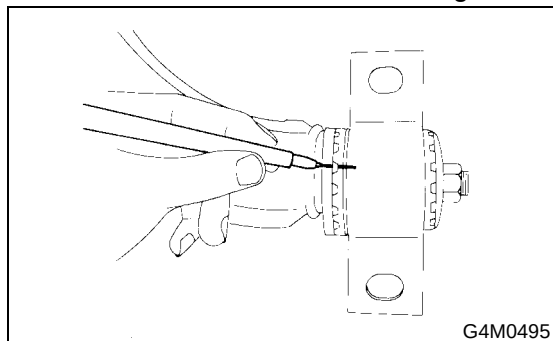
Using ST, press front bushing out of place.

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.



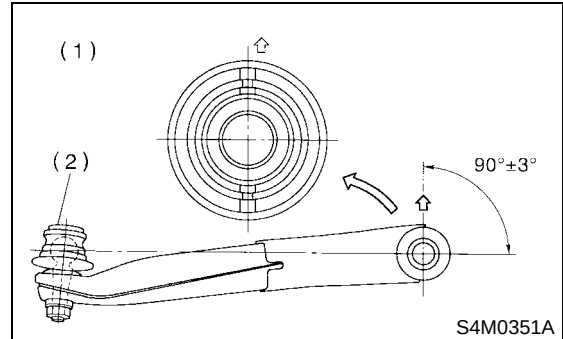
D: ASSEMBLY

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:

190 N·m (19.4 kgf-m, 140 ft-lb)

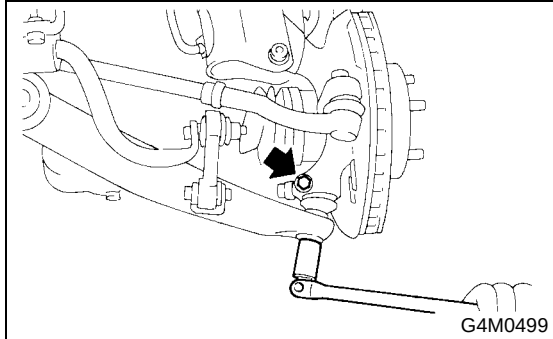
E: INSPECTION

- 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) Remove the wheel.
- 2) Pull out the cotter pin from the ball stud, remove the castle nut, and extract the ball stud from the transverse link.
- 3) Remove the bolt securing the ball joint to the housing.



- 4) Extract the ball joint from the housing.

B: INSTALLATION

- 1) Install ball joint onto housing.

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.

Torque (Castle nut):

Sedan turbo model:

30 N·m (3.1 kgf-m, 22ft-lb)

Except sedan turbo model:

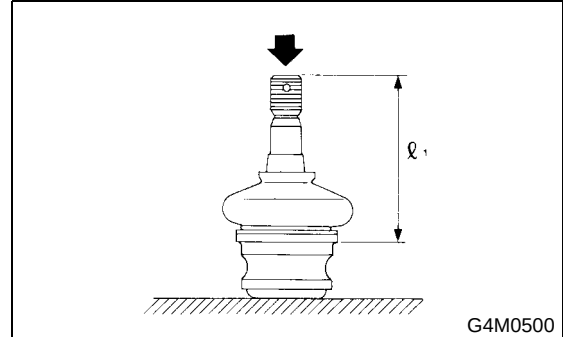
40 N·m (4.1 kgf-m, 30ft-lb)

- 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.

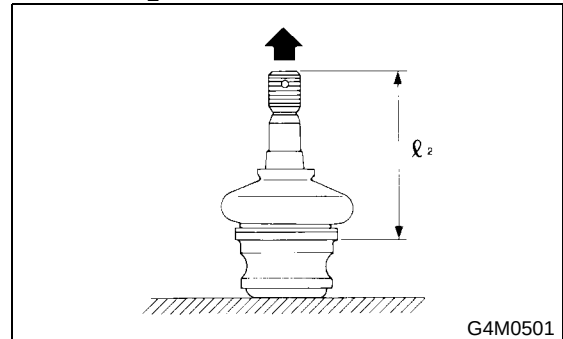
C: INSPECTION

- 1) Measure play of ball joint by the following procedures. Replace with a new one when the 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 plays from the following formula.

$$S = \ell_2 - \ell_1$$

- (4) When plays are larger than the following value, replace with a new one.

FRONT BALL JOINT

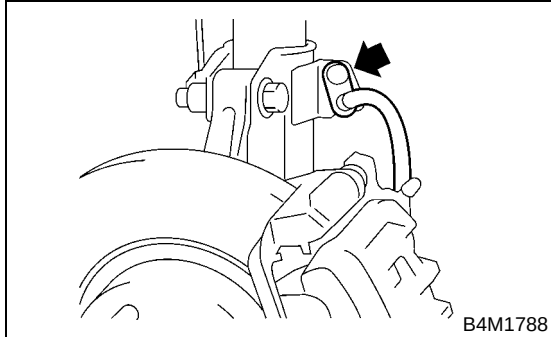
Specified play for replacement: S
Less than 0.3 mm (0.012 in)

- 2) When 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.

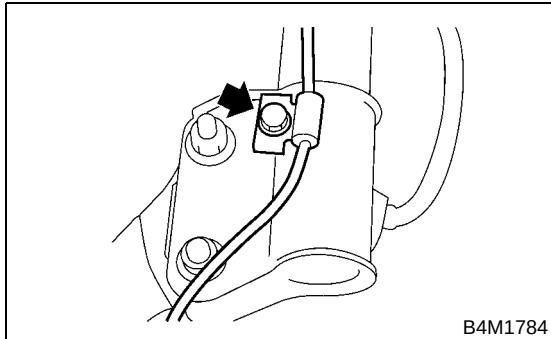
5. Front Strut

A: REMOVAL

- 1) Remove wheel.
- 2) Remove bolt securing brake hose from strut.



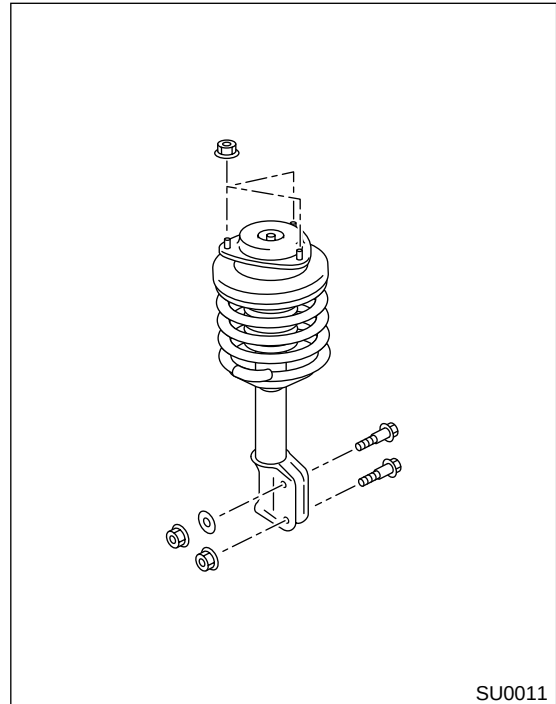
- 3) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
- 4) Remove bolt securing the ABS sensor harness.



- 5) Remove two bolts securing housing to strut.

CAUTION:
While holding head of adjusting bolt, loosen self-locking nut.

- 6) Remove the three nuts securing strut mount to body.



FRONT STRUT

FRONT SUSPENSION

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:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

4) Install bolts which secure brake hose to strut.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

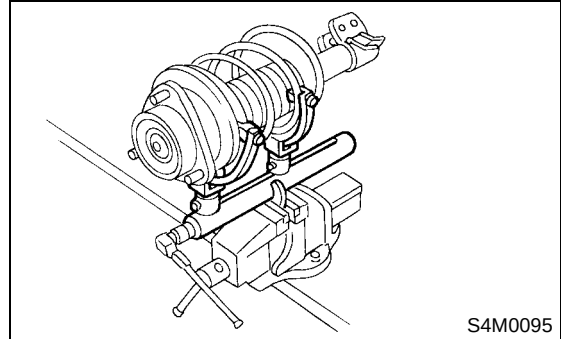
5) Install wheels.

NOTE:

Check wheel alignment and adjust if necessary.

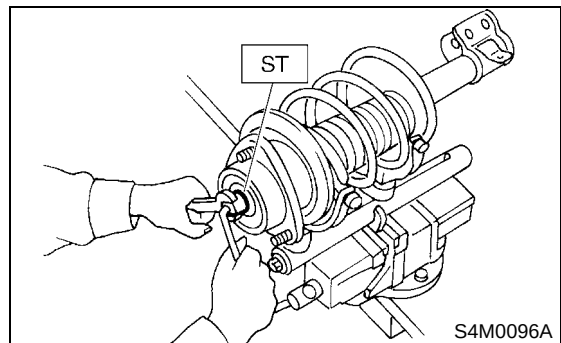
C: DISASSEMBLY

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.

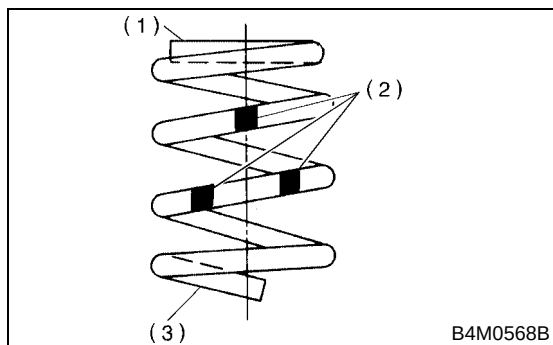
NOTE:

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.

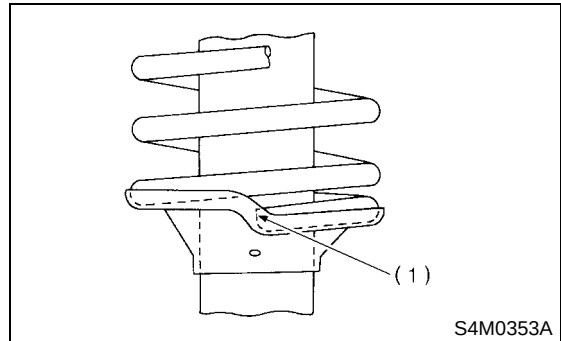
NOTE:

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 fits well into the spring seat as shown.

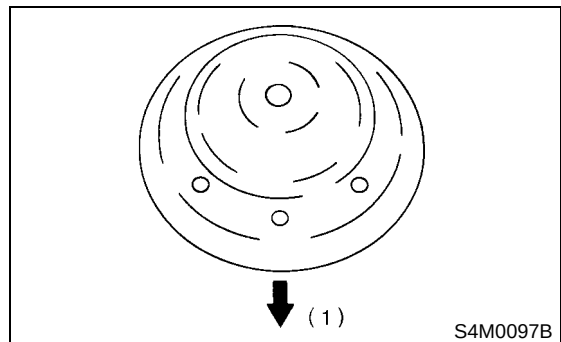


6) Install helper and dust cover to the piston rod.

7) Pull the piston rod fully upward, and install rubber seat and 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:

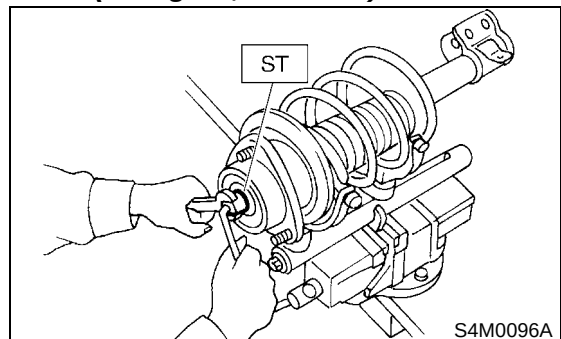
Be sure to use a new self-locking nut.

9) Using hexagon wrench to prevent strut rod from turning, tighten self-locking nut with ST.

ST 927760000 STRUT MOUNT SOCKET

Tightening torque:

54 N·m (5.5 kgf-m, 39.8 ft-lb)



10) Loosen the coil spring carefully.

E: INSPECTION

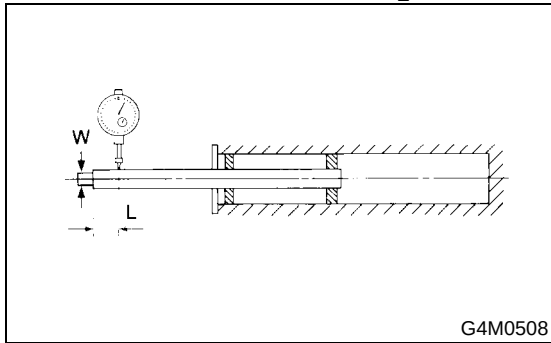
Check the disassembled parts for cracks, damage and wear, and replace with new parts if defective.

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: P_1 . Apply a force of 20 N (2 kgf, 4 lb) in the opposite direction of "W", then read dial gauge indication: P_2 .



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.

F: DISPOSAL

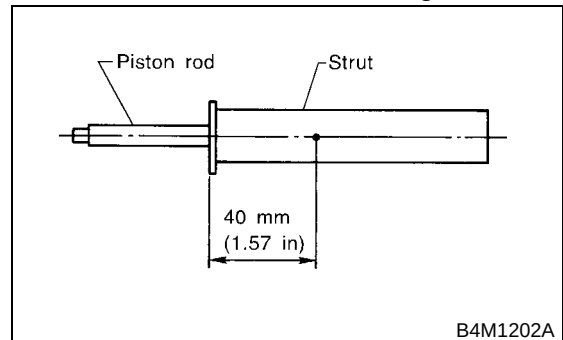
CAUTION:

- On struts which have "GAS FILLED" marked on outer housing under spring seat, completely discharge gas before disposing, following the methods below.
- Do not disassemble strut damper or place into a fire.
- Drill holes before disposing of gas filled struts.
- Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and/or filings.

**GAS FILLED
DO NOT OPEN
DO NOT HEAT**

B4M1201

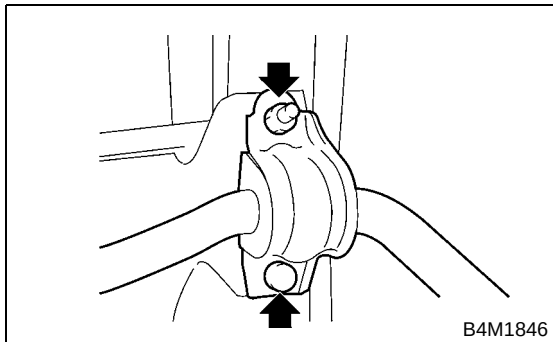
- 1) Place gas filled strut on a flat and level surface with piston rod fully extended.
- 2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in areas shown in the figure.



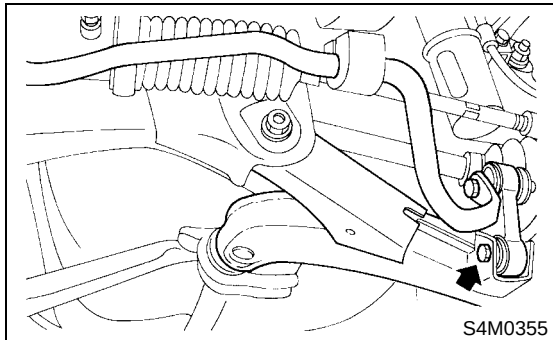
6. Front Stabilizer

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 sub frame.
- 4) Remove bolts which secure stabilizer to cross-member.



- 5) Remove bolts which secure stabilizer link to front transverse link.

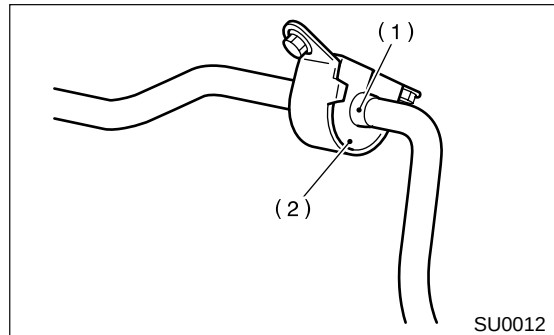


B: INSTALLATION

- 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 curb weight.

Tightening torque (Sedan turbo model):

Jack-up plate to crossmember:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

Stabilizer link to front transverse link:

45 N·m (4.6 kgf-m, 33 ft-lb)

Stabilizer to crossmember:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

Tightening torque (Except sedan turbo model):

Jack-up plate to crossmember:

20 N·m (2.0 kgf-m, 14.5 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)

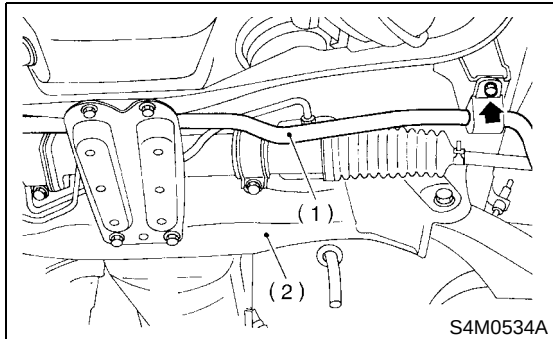
C: INSPECTION

- 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.

7. Front Crossmember

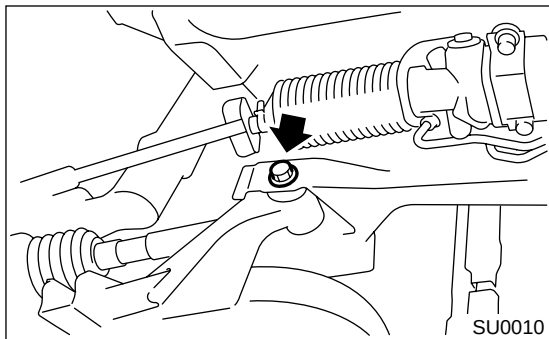
A: REMOVAL

- 1) Disconnect ground terminal from battery.
- 2) Lift-up vehicle and remove front tires and wheels.
- 3) Remove sub frame.
- 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.
- 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 lower crossmember gradually 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 curb weight.

Tightening torque:

Transverse link bushing to crossmember:

100 N·m (10.2 kgf-m, 74 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:

85 N·m (8.7 kgf-m, 62.7 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. 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.

GENERAL DIAGNOSTIC TABLE

FRONT SUSPENSION

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

REAR SUSPENSION

RS

	Page
1. General Description	2
2. Wheel Alignment	10
3. Rear Stabilizer	11
4. Rear Trailing Link	12
5. Rear Strut	16
6. Lateral link	18
7. Rear Crossmember	22
8. General Diagnostic Table	24

GENERAL DESCRIPTION

REAR SUSPENSION

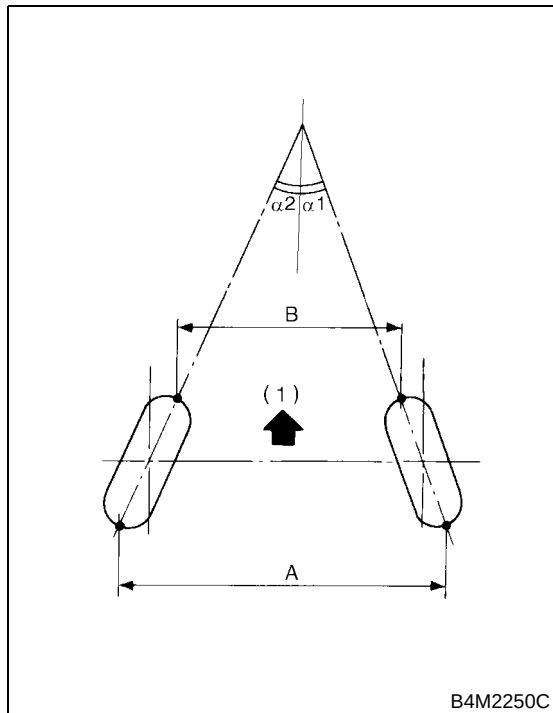
1. General Description

A: SPECIFICATIONS

Item	Sedan		Wagon		OUTBACK
	Turbo	Non-turbo	Turbo	Non-turbo	
Camber (tolerance: $\pm 0^{\circ}45'$)	$-1^{\circ}30'$	$-1^{\circ}25'$	$-1^{\circ}20'$	$-1^{\circ}15'$	$-1^{\circ}10'$
Toe-in	-1 ± 2 mm (-0.039 ± 0.079 in) Each toe-in angle: $\pm 0^{\circ}07'30''$				
Wheel arch height [tolerance: ± 12 mm (± 0.47 in)]	376 mm (14.80 in)	381 mm (15.0 in)	376 mm (14.80 in)	381 mm (15.0 in)	386 mm (15.20 in)
Thrust angle	$0^{\circ} \pm 20'$				
Diameter of stabilizer	20 mm (0.79 in)	—	17 mm (0.67 in)	—	—

NOTE:

- Front and rear toe-ins 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 exceeds 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

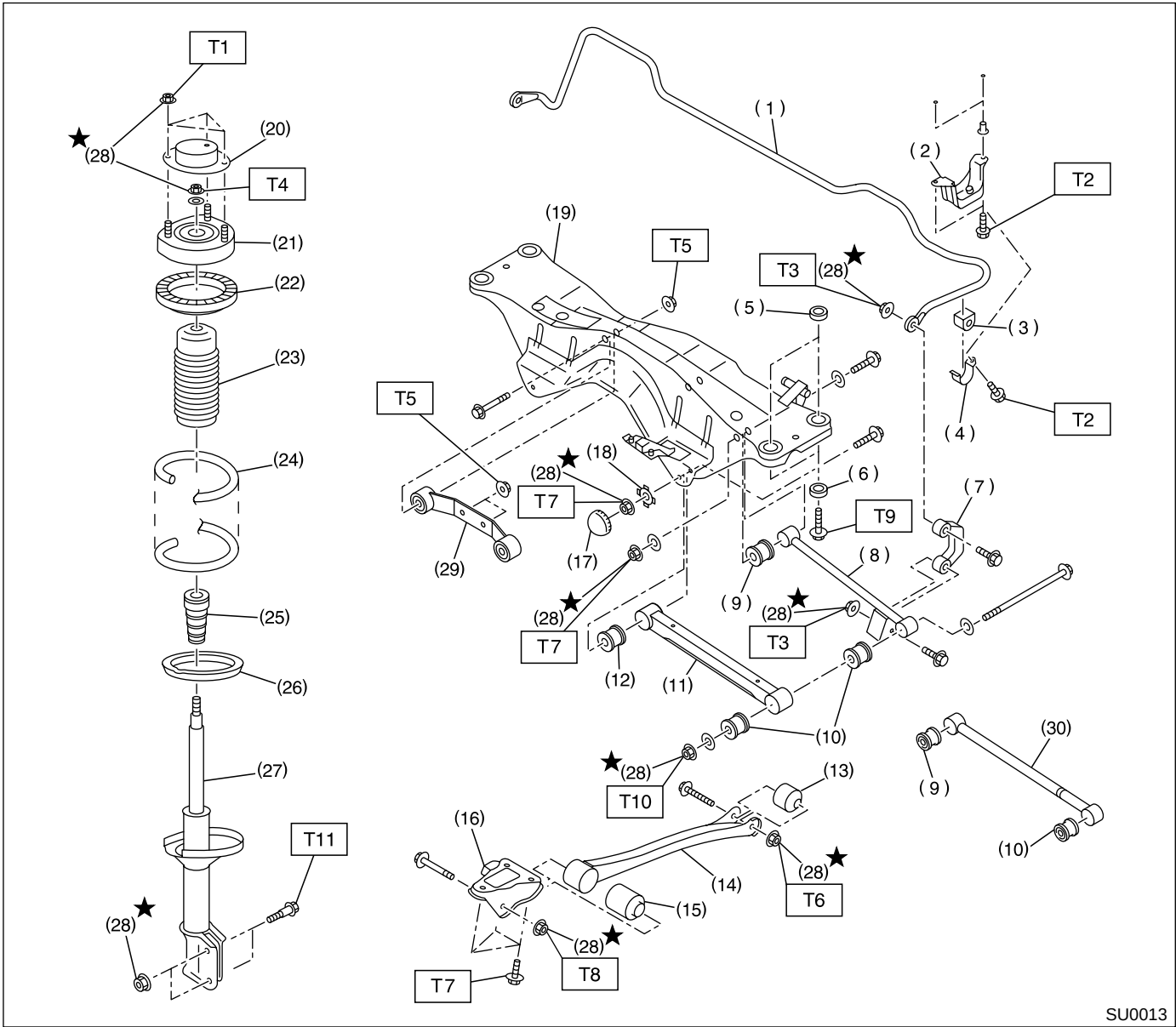
GENERAL DESCRIPTION

REAR SUSPENSION

B: COMPONENT

1. REAR SUSPENSION

• AWD model



SU0013

GENERAL DESCRIPTION

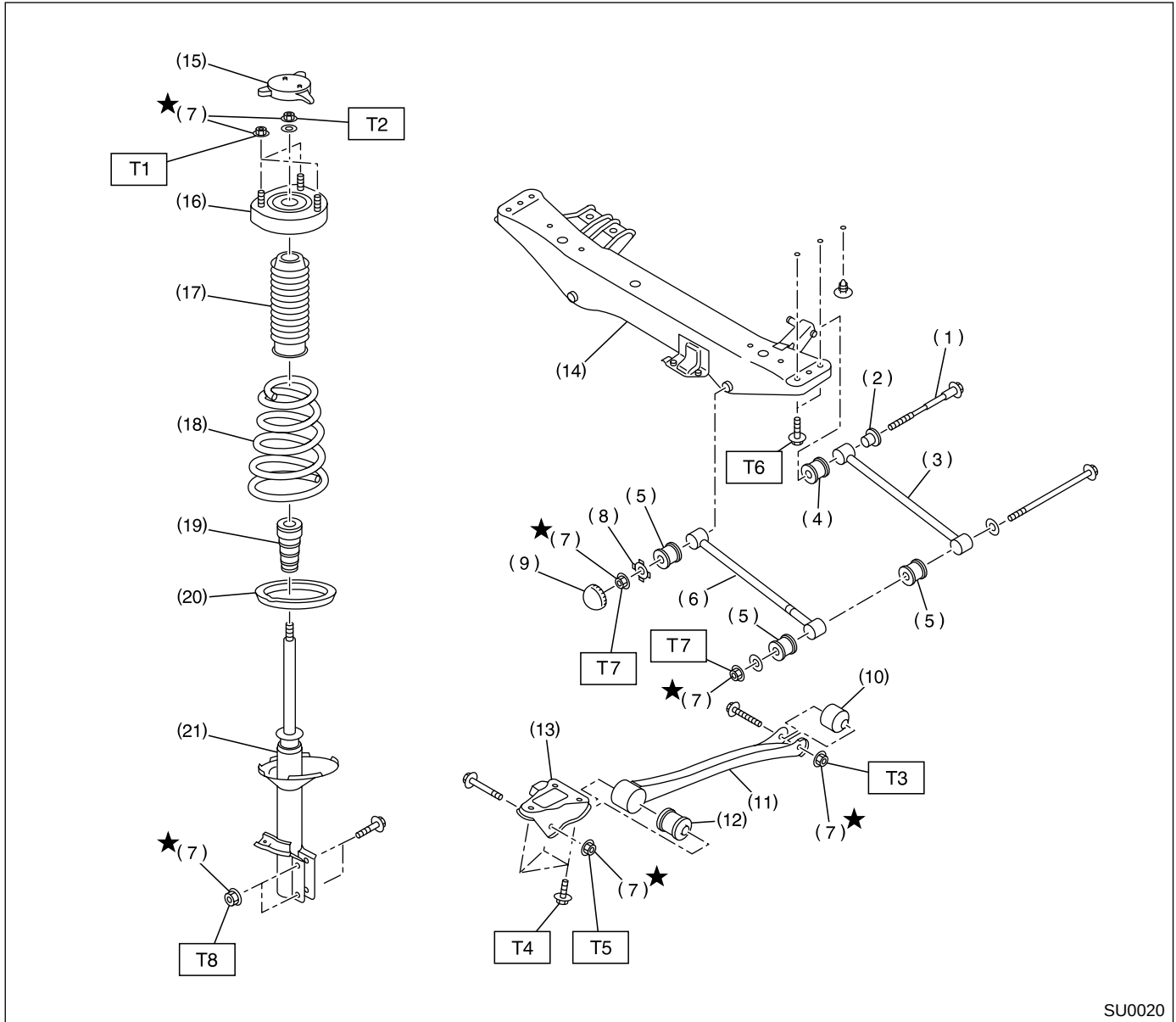
REAR SUSPENSION

(1) Stabilizer (Turbo model)	(16) Trailing link bracket	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(2) Stabilizer bracket (Turbo model)	(17) Cap (Protection)	<i>T1: 20 (2.0, 14.5)</i>
(3) Stabilizer bushing (Turbo model)	(18) Washer	<i>T2: 25 (2.5, 18.1)</i>
(4) Clamp (Turbo model)	(19) Rear crossmember	<i>T3: 45 (4.6, 33.2)</i>
(5) Floating bushing	(20) Strut mount cap	<i>T4: 55 (5.6, 41)</i>
(6) Stopper	(21) Strut mount	<i>T5: 70 (7.1, 52)</i>
(7) Stabilizer link (Turbo model)	(22) Rubber seat upper	<i>T6: 90 (9.2, 66)</i>
(8) Rear lateral link (Turbo model)	(23) Dust cover	<i>T7: 100 (10.2, 74)</i>
(9) Bushing (C)	(24) Coil spring	<i>T8: 115 (11.7, 85)</i>
(10) Bushing (A)	(25) Helper	<i>T9: 130 (13.3, 96)</i>
(11) Front lateral link	(26) Rubber seat lower	<i>T10: 135 (13.8, 100)</i>
(12) Bushing (B)	(27) Damper strut	<i>T11: 220 (22.4, 162)</i>
(13) Trailing link rear bushing	(28) Self-locking nut	
(14) Trailing link	(29) Rear differential member rear	
(15) Trailing link front bushing	(30) Rear lateral link (Non-turbo model)	

GENERAL DESCRIPTION

REAR SUSPENSION

• FWD model



- | | |
|---------------------------------|----------------------------------|
| (1) Adjusting bolt | (12) Trailing link front bushing |
| (2) Adjusting wheel | (13) Trailing link bracket |
| (3) Rear lateral link | (14) Crossmember |
| (4) Bushing (D) | (15) Cap |
| (5) Bushing (A) | (16) Strut mount |
| (6) Front lateral link | (17) Dust cover |
| (7) Self-locking nut | (18) Coil spring |
| (8) Washer | (19) Helper |
| (9) Cap | (20) Rubber seat lower |
| (10) Trailing link rear bushing | (21) Damper strut |
| (11) Trailing link | |

Tightening torque: N·m (kgf-m, ft-lb)

- T1: 20 (2.0, 14.5)**
T2: 55 (5.6, 41)
T3: 90 (9.2, 66)
T4: 100 (10.2, 74)
T5: 115 (11.7, 85)
T6: 130 (13.3, 96)
T7: 135 (13.8, 100)
T8: 220 (22.4, 162)

C: CAUTION

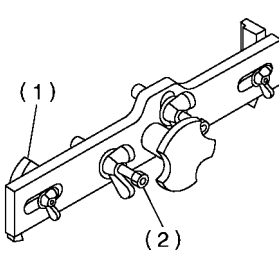
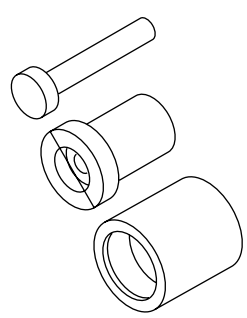
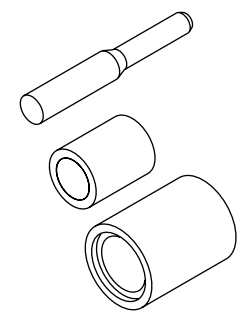
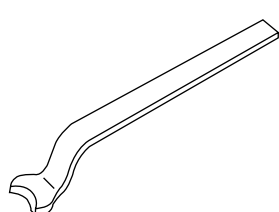
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.

GENERAL DESCRIPTION

REAR SUSPENSION

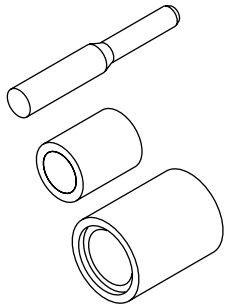
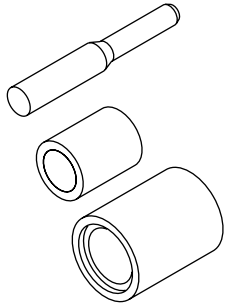
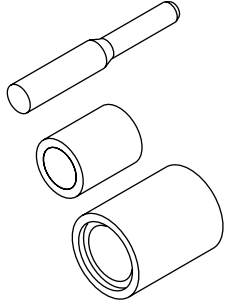
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2378A	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 SU0014	927720000	INSTALLER & REMOVER	Used for replacing front bushing.
 SU0015	927730000	INSTALLER & REMOVER	Used for replacing rear bushing.
 SU0016	28099PA100	REMOVER	Used for removing DOJ.

GENERAL DESCRIPTION

REAR SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 SU0015	927710000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 SU0015	92770000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 SU0015	927690000	HELPER SOCKET WRENCH	Used for replacing lateral link bushing.

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

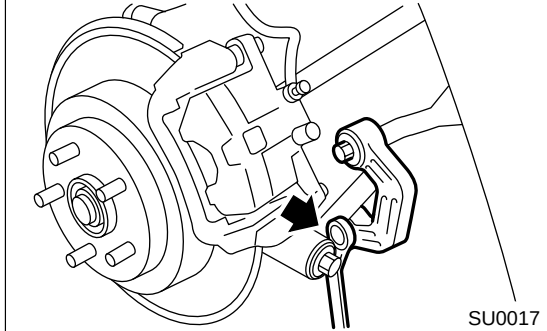
NOTE:

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-8, INSPECTION, Wheel Alignment.>

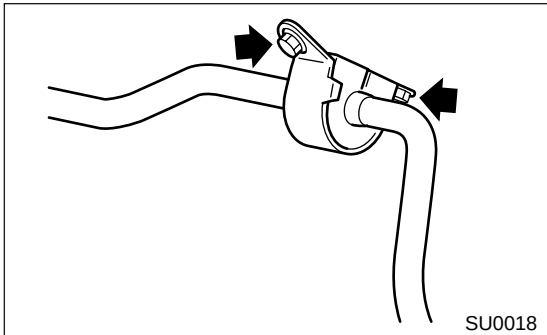
3. Rear Stabilizer

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 lateral link.



- 3) Remove bolt and nut which secure stabilizer to stabilizer bracket.

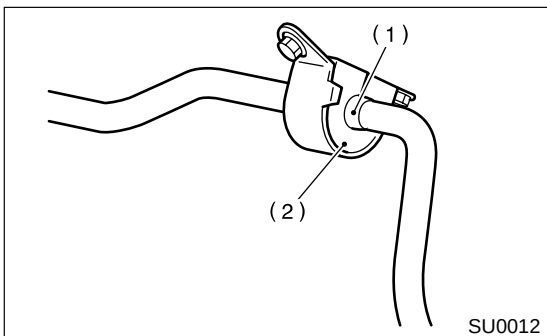


B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

- Install bushing 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 curb weight.

Tightening torque:

Stabilizer link to rear lateral link

45 N·m (4.6 kgf-m, 33.2 ft-lb)

Stabilizer to stabilizer bracket

25 N·m (2.5 kgf-m, 18.1 ft-lb)

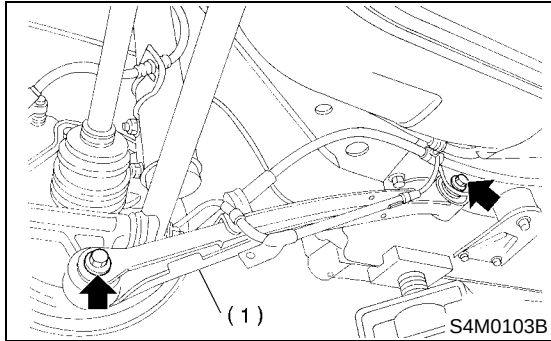
C: INSPECTION

- 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.

4. Rear Trailing Link

A: REMOVAL

- 1) Loosen rear wheel nuts.
- 2) Jack-up vehicle, support it with safety stands (rigid racks) and remove rear wheels.
- 3) Remove both rear parking brake clamp and ABS sensor harness. (Models equipped with ABS)
- 4) Remove bolt which secure trailing link to trailing link bracket.



(1) Trailing link

- 5) Remove bolt which secure trailing link to rear housing.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is at curb weight condition.

NOTE:

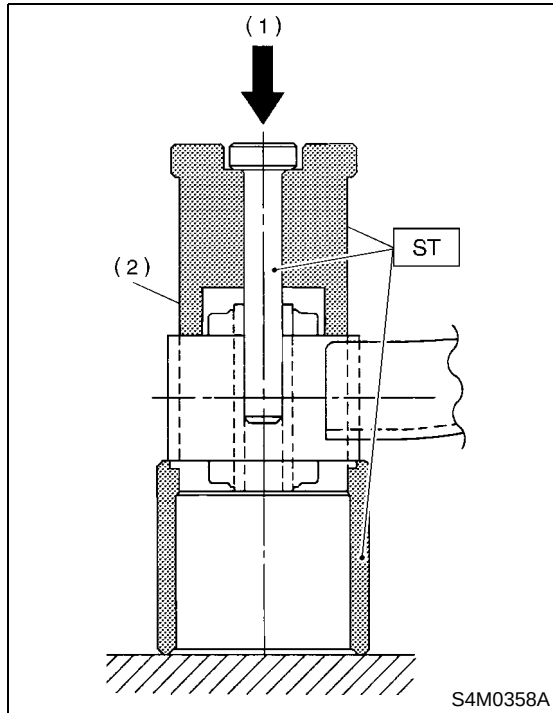
Check wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

Using ST, press front bushing out of place.

ST 927720000 INSTALLER & REMOVER SET



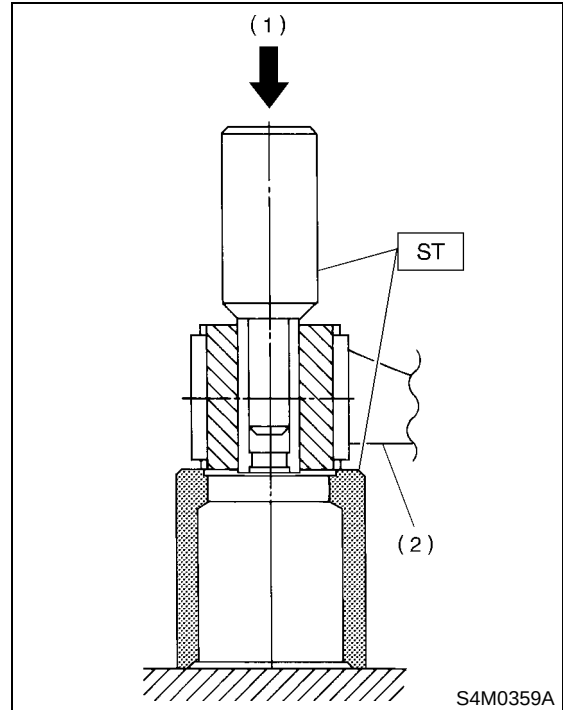
- (1) Press
- (2) Trailing link

2. REAR BUSHING

1) Remove housing. <Ref. to DS-24, REMOVAL, Rear Axle.>

2) Using ST, press rear bushing out of place.

ST 927730000 INSTALLER & REMOVER SET



- (1) Press
- (2) Housing

REAR TRAILING LINK

REAR SUSPENSION

D: ASSEMBLY

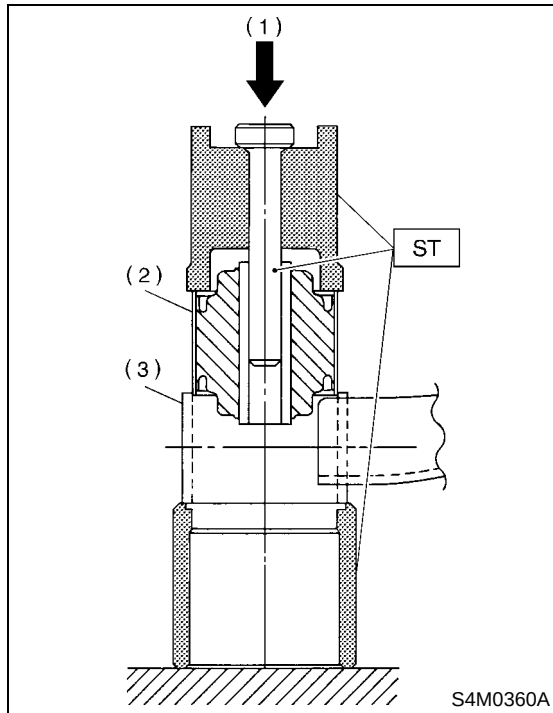
1. FRONT BUSHING

Using ST, press bushing into trailing link.

ST 927720000 INSTALLER & REMOVER SET

CAUTION:

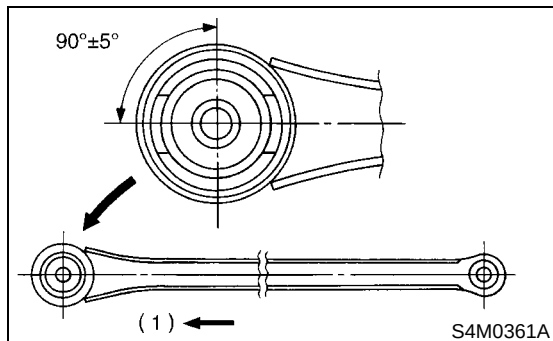
When installing bushing, turn ST plunger up-side down and press it until plunger end surface contacts trailing link end surface.



- (1) Press
- (2) Front bushing
- (3) Trailing link

CAUTION:

Install front bushing in the proper direction, as shown in figure.



- (1) Front

2. REAR BUSHING

1) Using ST, press bushing into trailing link.

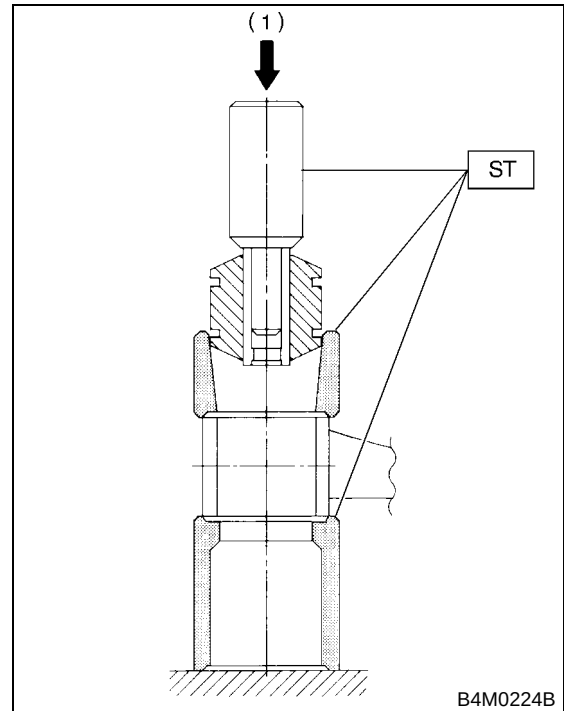
ST 927730000 INSTALLER & REMOVER SET

NOTE:

If it is difficult to press bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

SPECIFIED lubricant:

TIRE LUBE : water = 1 : 3



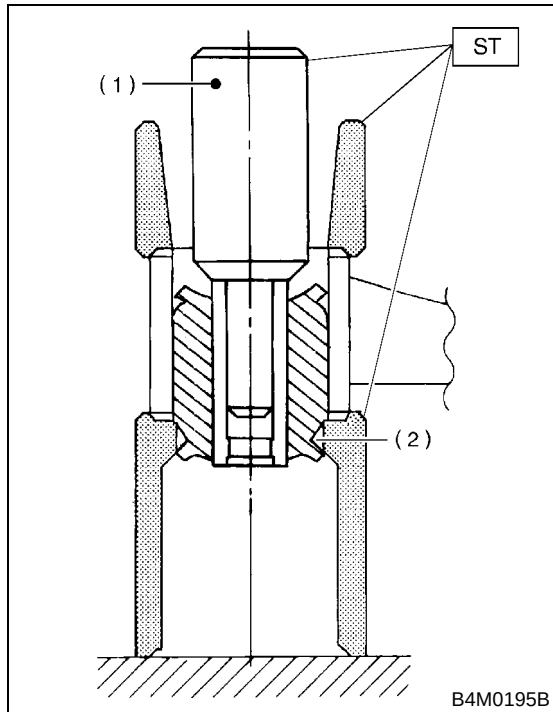
- (1) Press

REAR TRAILING LINK

REAR SUSPENSION

2) Press ST plunger until bushing flange protrudes beyond trailing link.

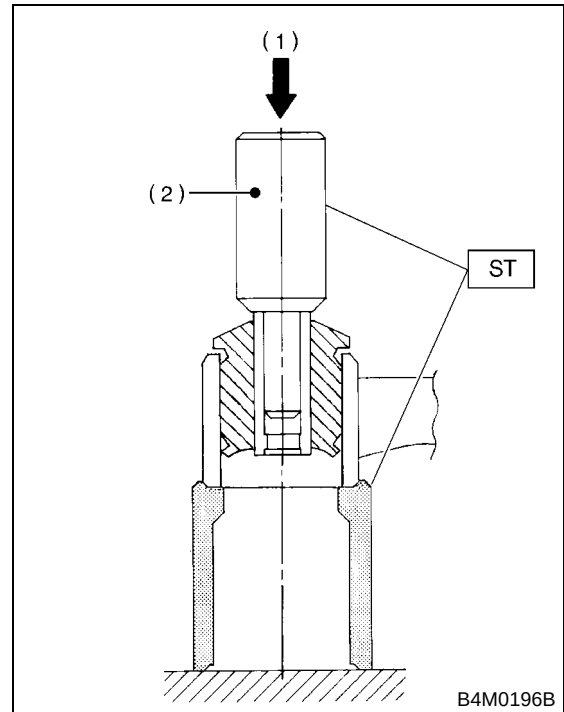
ST 927730000 INSTALLER & REMOVER SET



- (1) Plunger
- (2) Flange

3) Turn trailing link upside down. Press ST plunger in the direction opposite that outlines in the former procedure until bushing is correctly positioned in trailing link.

ST 927730000 INSTALLER & REMOVER SET



- (1) Press
- (2) Plunger

4) Install housing. <Ref. to DS-27, INSTALLATION, Rear Axle.>

E: INSPECTION

Check trailing links for bends, corrosion or damage.

5. Rear Strut

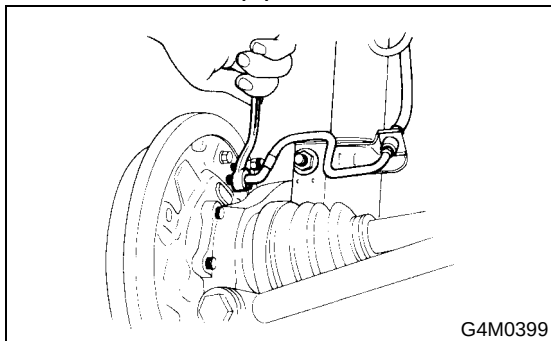
9) Remove nuts securing strut mount to body.

A: REMOVAL

- 1) Depress brake pedal and secure it in that position using a wooden block, etc. (FWD only)
- 2) Remove rear seat cushion and backrest. (Sedan model)
- 3) Remove strut cap of quarter trim. (Wagon model)
- 4) Loosen rear wheel nuts.
- 5) Jack-up vehicle, support it with safety stands (rigid racks) and remove rear wheels.
- 6) FWD models:

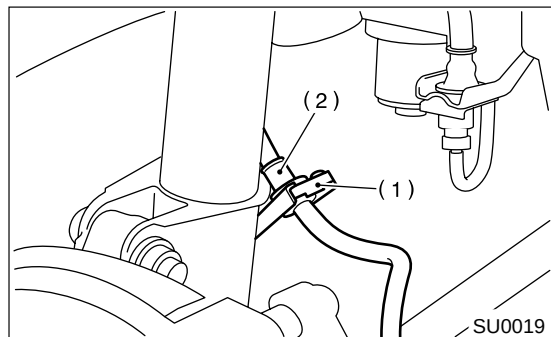
Remove brake hose clip.

Disconnect brake hose from brake pipe from strut, and disconnect brake pipe from drum brake.



7) AWD models:

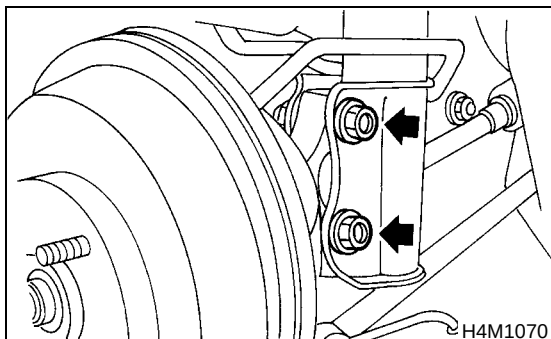
Remove brake hose clip and remove brake hose from rear strut.



(1) Brake hose clip

(2) Brake hose

8) Remove bolts which secure rear strut to housing.



B: INSTALLATION

1) Tighten self-locking nut used to secure strut mount to car body.

CAUTION:

Discard loosened self-locking nut, and replace with a new one.

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Tighten bolts which secure rear strut to housing.

Tightening torque:

220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:

Discard loosened self-locking nut, and replace with a new one.

3) AWD model

Install brake hose to lower side of strut, then insert brake hose clip.

FWD model

Connect brake hose to brake pipe.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

Insert brake hose clip between brake hose and lower side of strut.

CAUTION:

- Check that hose clip is positioned properly.
- Check brake hose for twisting, or excessive tension.

- (Model equipped with ABS)

Do not subject ABS sensor harness to excessive tension.

4) Be sure to bleed air from brake system.

5) Lower vehicle and tighten wheel nut.

Tightening torque:

90 N·m (9.2 kgf-m, 66 ft-lb)

6) (Sedan model)

Install rear seat backrest and rear seat cushion.

(Wagon model)

Install strut cap to rear quarter trim.

NOTE:

Check wheel alignment and adjust if necessary.

C: DISASSEMBLY

For disassembly of rear strut, refer to procedures outlined under front strut as a guide. <Ref. to FS-20, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures.

<Ref. to FS-21, ASSEMBLY, Front Strut.>

E: INSPECTION

Refer to Front Strut as a guide for inspection procedures.

<Ref. to FS-22, INSPECTION, Front Strut.>

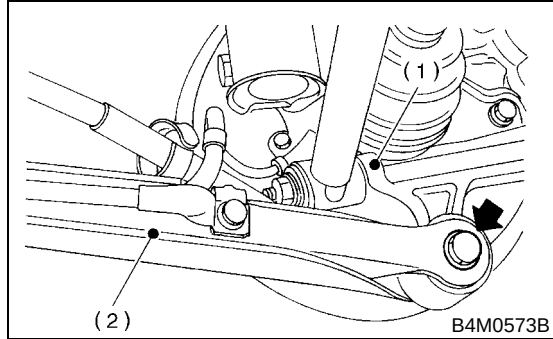
F: DISPOSAL

Refer to Front Strut as a guide for disposal procedures.<Ref. to FS-22, DISPOSAL, Front Strut.>

6. Lateral link

A: REMOVAL

- 1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
- 2) Remove stabilizers. (Turbo model)
- 3) Remove ABS sensor harness from trailing link. (Models equipped with ABS)
- 4) Remove bolt securing trailing link to housing.



- (1) Rear housing
(2) Trailing link

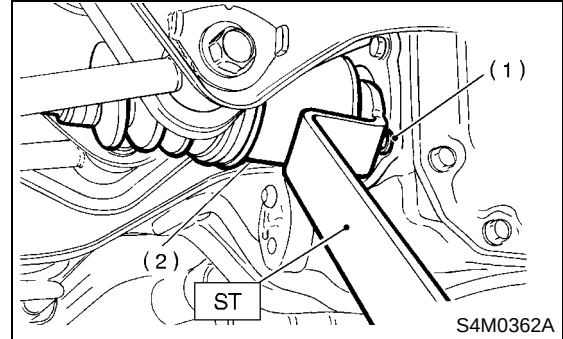
- 5) Remove bolts which secure lateral link assembly to rear housing.

- 6) Remove DOJ from rear differential using ST. (2.0 L MT model)

ST 28099PA100 DRIVE SHAFT REMOVER

NOTE:

The side spline shaft circlip comes out together with the shaft.



- (1) Bolt
(2) DOJ

CAUTION:

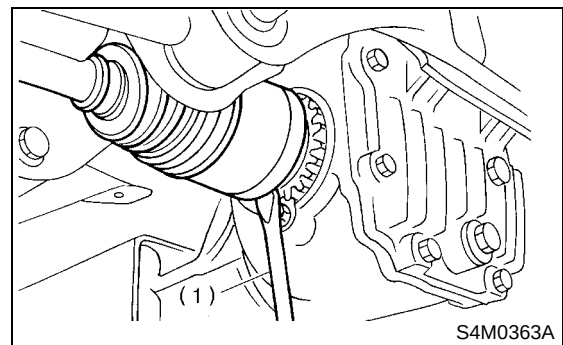
Be careful not to damage side bearing retainer. Always use bolt shown in figure, as supporting point for ST during removal.

- 7) Remove DOJ from rear differential using tire lever.

(Except for 2.0 L MT model)

NOTE:

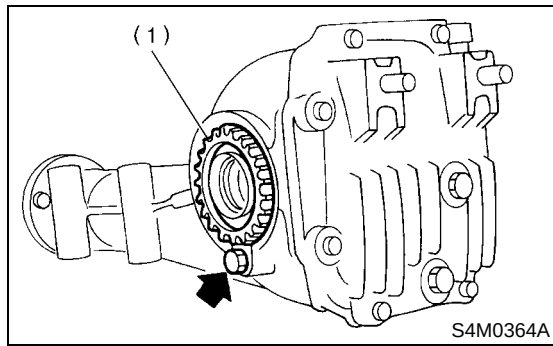
The side spline shaft circlip comes out together with the shaft.



- (1) Tire lever

CAUTION:

When removing the DOJ from the rear differential, fit tire lever to the bolt as shown in figure so as not to damage the axle shaft holder.



(1) Axle shaft holder

8) Scribe an alignment mark on rear lateral link adjusting bolt and crossmember.

9) Remove bolts securing front and rear lateral links to crossmember, detach lateral links.

CAUTION:

To loosen adjusting bolt, always loosen nut while holding the head of adjusting bolt.

B: INSTALLATION

Install in the reverse order of removal. Observe the following instructions.

- Installation of DOJ to differential:<Ref. to DS-37, INSTALLATION, Rear Drive Shaft.>

CAUTION:

- **Do not allow DOJ splines to damage side oil seal.**
- **Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.**
- **Tighten nut when installing adjusting bolt.**
- **Replace self-locking nut and DOJ circlip with new ones.**

NOTE:

Check wheel alignment and adjust if necessary.

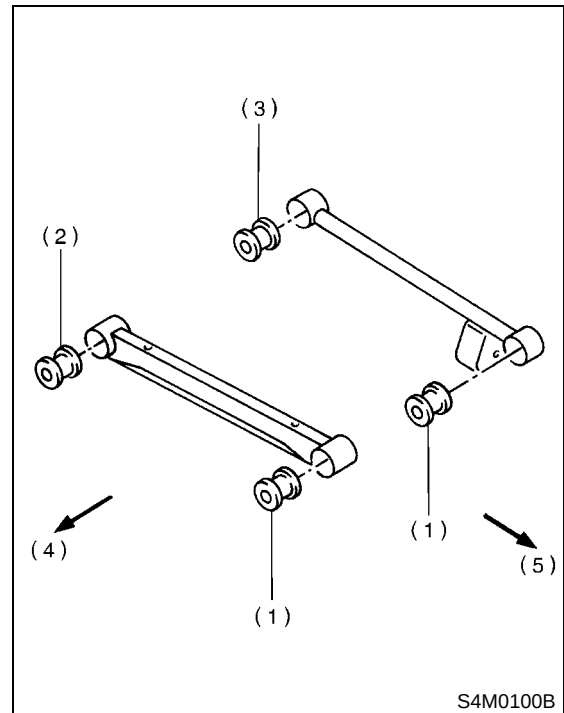
C: DISASSEMBLY

Using ST, press bushing out of place.

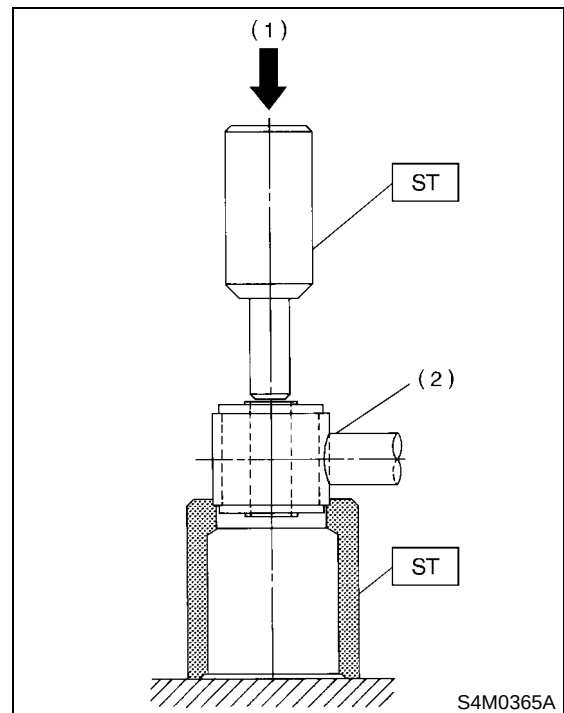
NOTE:

- Using the following table as a guide, verify the type of bushings.
- Select ST according to the type of bushings used.

Bushing	ST:INSTALLER & REMOVER SET
Bushing A	927700000
Bushing B	927690000
Bushing C	927700000
Bushing D	927710000



- (1) Bushing A
- (2) FWD: Bushing A, AWD: Bushing B
- (3) FWD: Bushing D, AWD: Bushing C
- (4) Front
- (5) Outside of body



- (1) Press
- (2) Lateral link

LATERAL LINK

REAR SUSPENSION

D: ASSEMBLY

1) Using ST, press bushing into place.

CAUTION:

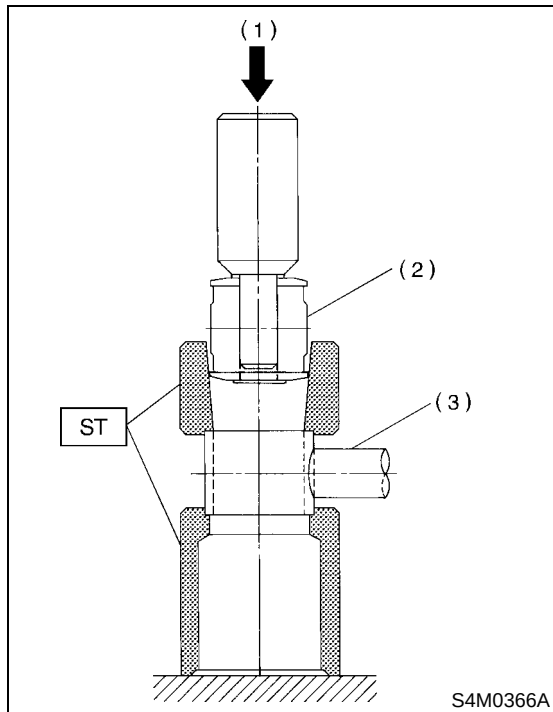
Select ST according to the type of bushings used.

NOTE:

- Using the same ST as that used during disassembly.
- If it is difficult to press bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

Specified lubricant:

TIRE LUBE : water = 1 : 3

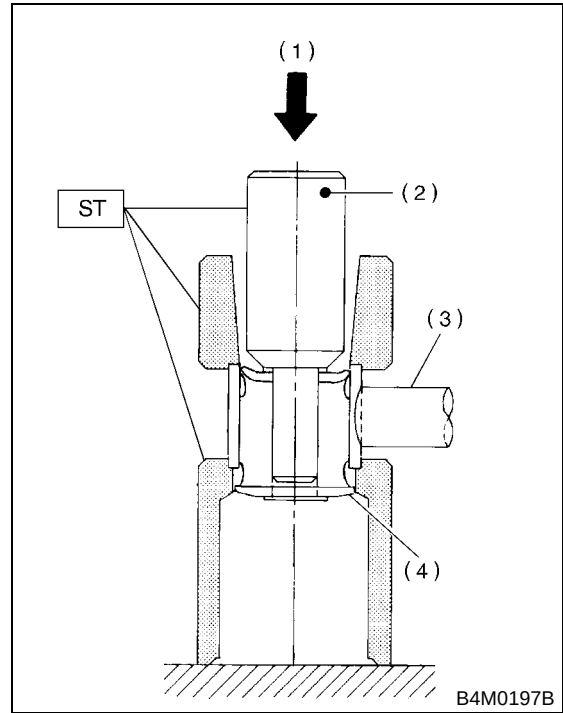


- (1) Press
- (2) Bushing
- (3) Lateral link

2) Press ST plunger until bushing flange protrudes beyond lateral link.

NOTE:

Using the same ST as that used during disassembly.

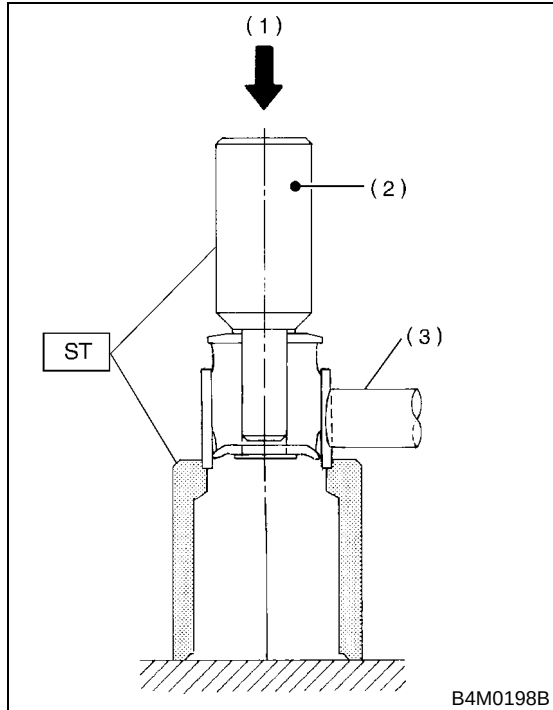


- (1) Press
- (2) Plunger
- (3) Lateral link
- (4) Flange

3) Turn lateral link upside down. Press ST plunger in the direction opposite that outlined in the former procedure until bushing is correctly positioned in trailing link.

NOTE:

Using the same ST as that used during dissassembly.



- (1) Press
- (2) Plunger
- (3) Lateral link

E: INSPECTION

Visually check lateral links for damage or bends.

7. Rear Crossmember

A: REMOVAL

1. AWD MODEL

CAUTION:

Do not subject ABS sensor harness to excessive tension. (Models equipped with ABS)

1) Separate front exhaust pipe and rear exhaust pipe.

2) Remove rear exhaust pipe and muffler.

3) Remove rear differential.

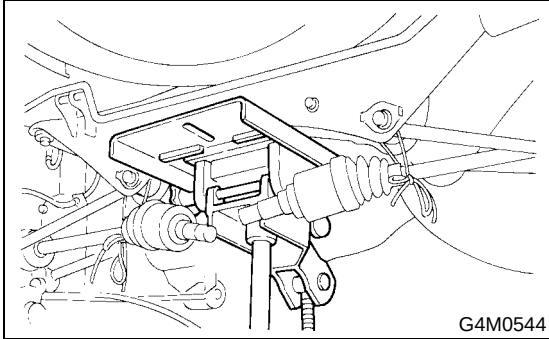
T-type

<Ref. to DI-25, REMOVAL, Rear Differential for T-type.>

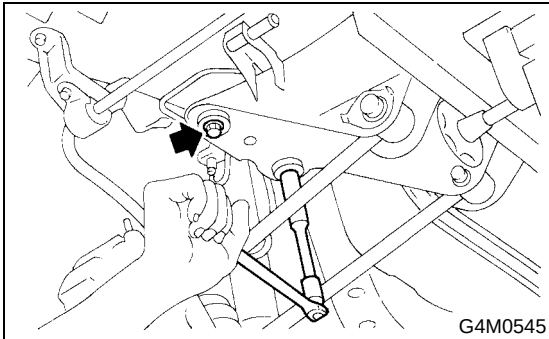
VA-type

<Ref. to DI-40, REMOVAL, Rear Differential for VA-type.>

4) Place transmission jack under rear crossmember.



5) Remove bolts securing crossmember to vehicle body, and remove crossmember.



6) Scribe an alignment mark on rear lateral link cam bolt and crossmember.

7) Remove front and rear lateral links by loosening nuts.

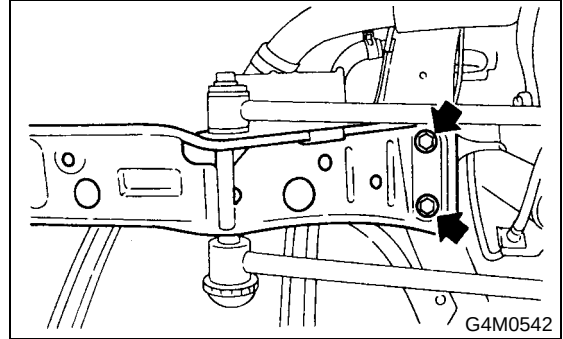
2. FWD MODEL

1) Disconnect lateral links from housing.

2) Remove rear exhaust pipe and muffler.

3) Remove heat-shield cover.

4) Remove four bolts securing crossmember to body.



B: INSTALLATION

1. AWD MODEL

- 1) Install in the reverse order of removal.
- 2) For installation and tightening torque of rear differential;
T-type
<Ref. to DI-27, INSTALLATION, Rear Differential for T-type.>
VA-type
<Ref. to DI-42, INSTALLATION, Rear Differential for VA-type.>
- 3) Always tighten rubber bushing when wheels are in full contact with the ground and vehicle is curb weight.

NOTE:

Check wheel alignment and adjust if necessary.

2. FWD MODEL

Install in the reverse order of removal.

CAUTION:

- Discard loosened self-locking nut and replace with a new one.
- Always tighten nut (not adjusting bolt), when tightening adjusting bolt.
- Always tighten rubber bushing when wheels are in full contact with the ground and vehicle is curb weight.

NOTE:

Check wheel alignment and adjust if necessary.

C: INSPECTION

Check removed parts for wear, damage and cracks, and correct or replace if defective.

GENERAL DIAGNOSTIC TABLE

REAR SUSPENSION

8. 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.

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

WHEEL AND TIRE SYSTEM

WT

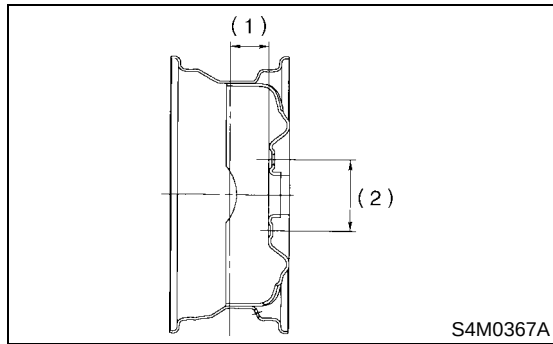
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1. General Description	2
2. Tire	4
3. Steel Wheel.....	5
4. Aluminum Wheel	6
5. Wheel Balancing	7
6. "T-type" Tire	8
7. Full Wheel Cap.....	9
8. General Diagnostics Table.....	10

GENERAL DESCRIPTION

WHEEL AND TIRE SYSTEM

1. General Description

A: SPECIFICATIONS



(1) Offset

(2) P.C.D.

		Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Front and rear	Except OUTBACK	175/70R14 84T	14 × 5 1/2JJ	55 (2.17)	100 (3.94) Dia
		185/70R14 88H			
		195/60R15 88H	15 × 6JJ		
		215/45 R17 87W	17 × 7JJ		
	OUTBACK	P205/55 R16 89V	16 × 6 1/2JJ		
T-Type tire		T125/70 D15 95M	15 × 4T	53 (2.09)	
		T135/70 D16 100M	15 × 6T	50 (1.97)	

		Tire size	Tire inflation pressure kPa (kg/cm ² , psi)	
			Light load	Full load
Front and rear	Except OUTBACK	175/70 R14 84T	Fr: 220 (2.2, 32) Rr: 200 (2.0, 29)	Fr: 220 (2.2, 32) Rr: 220 (2.2, 32)
		185/70 R14 88H		
		195/60 R15 88H		
		215/45 R17 87W		
	OUTBACK	P205/55 R16 89V	FR: 230 (2.3, 33) Rr: 220 (2.2, 32)	
T-Type tire		T125/70 D15 95M	420 (4.2, 60)	
		T135/70 D16 100M		

NOTE:

- "T-type" tire for temporary use is supplied as a spare tire.
- At trailer towing, rear inflation pressure is 250 kPa (2.5 kg/cm², 36 psi).

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
723141290	5 g (0.18 oz)
723141300	10 g (0.35 oz)
723141310	15 g (0.53 oz)
723141320	20 g (0.71 oz)
723141330	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	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

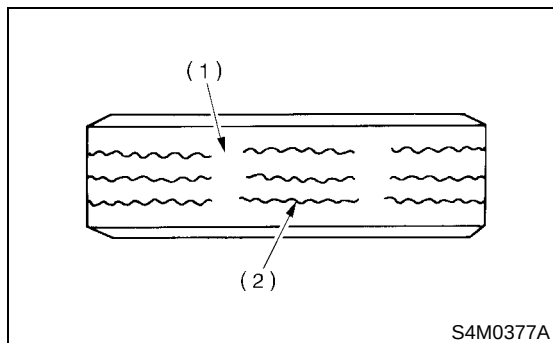
- 1) Take stone, glass, nail etc. off the tread groove.
- 2) Replace tire:

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.



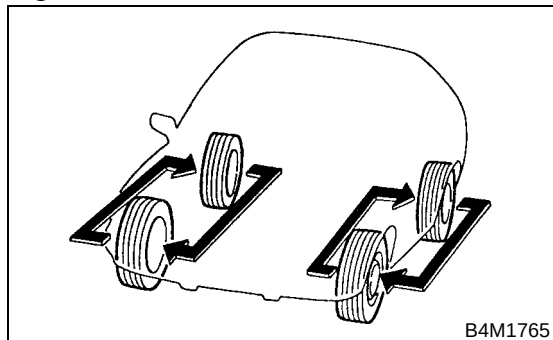
- (1) Tread wear indicator
(2) Tire tread

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.

NOTE:

- Place wheels with their outer sides facing upward 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:

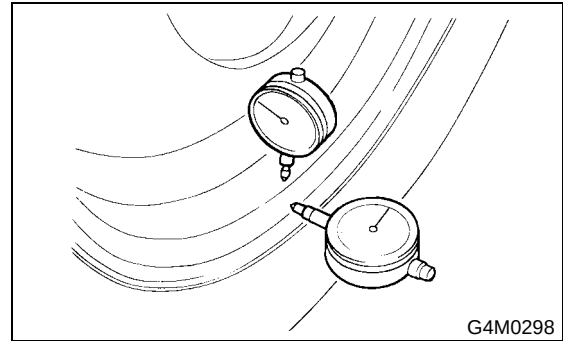
90 N·m (9.1 kgf-m, 65.7 ft-lb)

CAUTION:

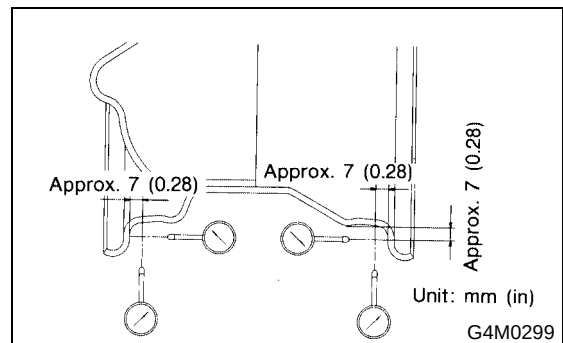
- Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached. For drum brake models, excess tightening of wheel nuts may cause wheels to "judder".
 - Do not depress the wrench with a foot; Always use both hands when tightening.
 - 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)	



- 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
723141290	5 g (0.18 oz)
723141300	10 g (0.35 oz)
723141310	15 g (0.53 oz)
723141320	20 g (0.71 oz)
723141330	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	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)

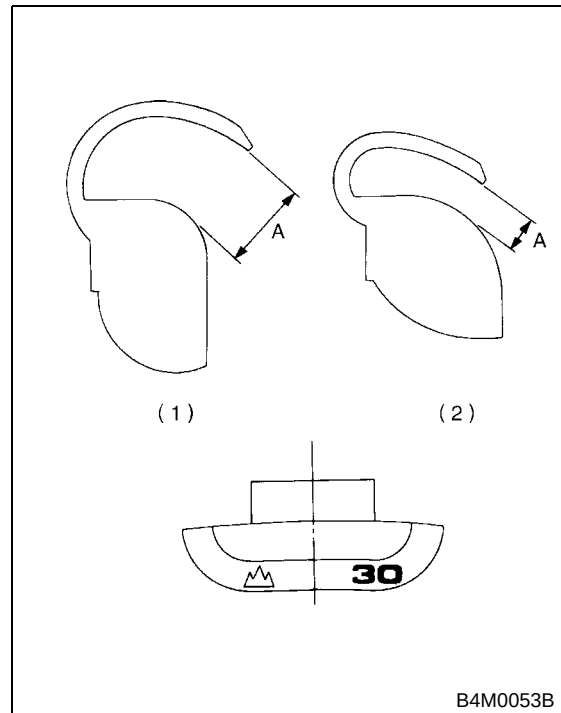
- 4) Install the selected weight to the point designated by dynamic balancing.
- 5) Using dynamic balancing, measure wheel balance again. Check that wheel balance is correctly adjusted.

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:

- 55 g (1.94 oz) weight used with aluminum wheel is not available.
- Balance weights are available for use with any of 14- to 16-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.

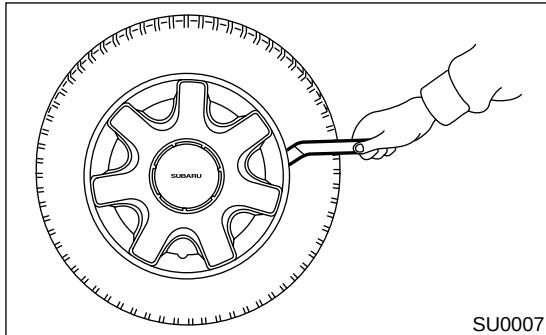
CAUTION:

Replace the tire with a new one.

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 DIAGNOSTICS TABLE

WHEEL AND TIRE SYSTEM

8. General Diagnostics 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

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

DIFFERENTIALS

DI

	Page
1. General Description	2
2. Differential Gear Oil.....	23
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4. Rear Differential for T-type.....	25
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9. General Diagnostic Table.....	65

GENERAL DESCRIPTION

DIFFERENTIALS

1. General Description

A: SPECIFICATIONS

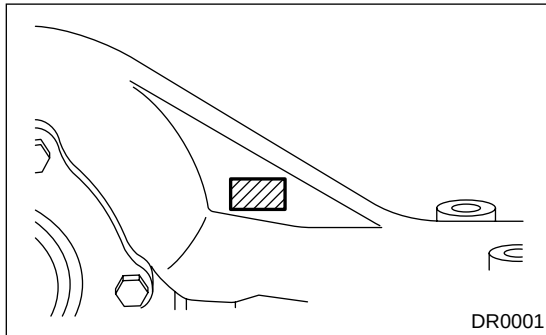
MODEL	Non-Turbo		Turbo
	1.6 L	2.0 L	
		AT MT	
Rear differential type	VA type		T type
	XN		EG EF (with LSD)
Type of gear	Hypoid gear		
Gear ratio (Number of gear teeth)	4.111 (37/9)		3.545 (39/11)
Oil capacity	0.8 $\varnothing$ (0.8 US qt, 0.7 Imp qt)		
Rear differential gear oil	GL-5		

• Identification

When replacing a rear differential assembly, select the correct one according to the following table.

CAUTION:

Using the different rear differential assembly causes the drive line and tires to “drag” or emit abnormal noise when AWD is selected.



• Rear differential gear oil

Recommended oil

CAUTION:

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

ITEM									
• Rear differential gear oil									
API Classification									
GL-5									
SAE Viscosity No. and Application	Temperature								
(°C)	-30	-26	-15	-5	0	15	25	30	
(°F)	-22	-15	5	23	32	59	77	86	
H3M1272A									

GENERAL DESCRIPTION

DIFFERENTIALS

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)
Side gear backlash mm (in)		T-type	0.10 — 0.20 (0.0039 — 0.0079)
		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)

2. ADJUSTING PARTS

• VA-type

Front and rear bearing preload at companion flange bolt hole	New bearing	12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb)
Preload adjusting spacer	Part No.	Length
	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	Part No.	Thickness
	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)

GENERAL DESCRIPTION

DIFFERENTIALS

	Part No.	Thickness.
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	0.05 — 0.15 mm (0.0020 — 0.0059 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)
Crown gear to drive pinion backlash	Limit	0.10 — 0.15 mm (0.0039 — 0.0059 in)
Crown gear runout on its back surface		0.05 mm (0.0020 in)

• T-type

Front and rear bearing preload at companion flange bolt hole	New bearing	19.6 — 28.4 N (2.0 — 2.9 kgf, 4.4 — 6.4 lb)
	Used bearing	8.34 — 16.67 N (0.85 — 1.7 kgf, 1.87 — 3.75 lb)
Preload adjusting spacer	Part No.	Length
	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	Part No.	Length
	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)

GENERAL DESCRIPTION

DIFFERENTIALS

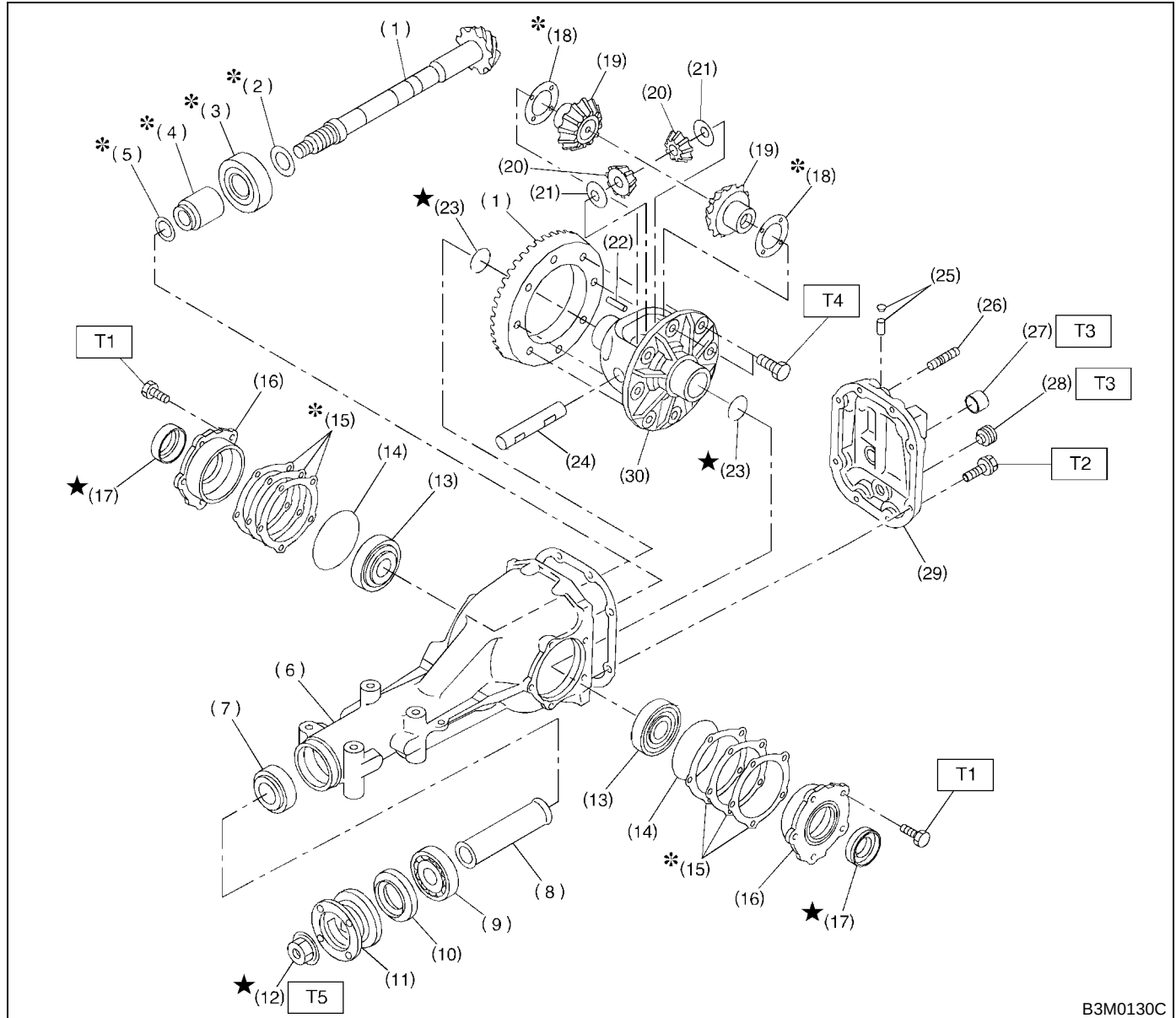
Pinion height adjusting shim	Part No.	Thickness
	383495200	3.09 mm (0.1217 in)
	383505200	3.12 mm (0.1228 in)
	383515200	3.15 mm (0.1240 in)
	383525200	3.18 mm (0.1252 in)
	383535200	3.21 mm (0.1264 in)
	383545200	3.24 mm (0.1276 in)
	383555200	3.27 mm (0.1287 in)
	383565200	3.30 mm (0.1299 in)
	383575200	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 backlash	0.1 — 0.2 mm (0.0039 — 0.0079 in)	
Side gear thrust washer (Non-Turbo model)	Part No.	Thickness
	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)
	383445204	0.90 — 0.95 mm (0.0354 — 0.0374 in)
	383445205	0.95 — 1.0 mm (0.0374 — 0.0394 in)
Side bearing standard width	—	20.00 mm (0.7874 in)
Side bearing retainer shim	Part No.	Thickness
	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)
Crown gear to drive pinion backlash	Limit	0.10 — 0.20 mm (0.0039 — 0.0079 in)
Crown gear runout on its back surface		0.05 mm (0.0020 in)

GENERAL DESCRIPTION

DIFFERENTIALS

B: COMPONENT

1. REAR DIFFERENTIAL FOR T-TYPE WITHOUT LSD



B3M0130C

(1) Pinion crown gear set	(13) Side bearing	(25) Air breather cap
(2) Pinion height adjusting washer	(14) O-ring	(26) Stud bolt
(3) Rear bearing	(15) Side bearing retainer shim	(27) Oil filler plug
(4) Bearing preload adjusting spacer	(16) Side bearing retainer	(28) Oil drain plug
(5) Bearing preload adjusting washer	(17) Side oil seal	(29) Rear cover
(6) Differential carrier	(18) Side gear thrust washer	(30) Differential case
(7) Front bearing	(19) Side gear	
(8) Spacer	(20) Pinion mate gear	
(9) Pilot bearing	(21) Pinion mate gear washer	
(10) Front oil seal	(22) Pinion shaft lock pin	
(11) Companion flange	(23) Circlip	
(12) Self-locking nut	(24) Pinion mate shaft	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 10.3 (1.05, 7.6)

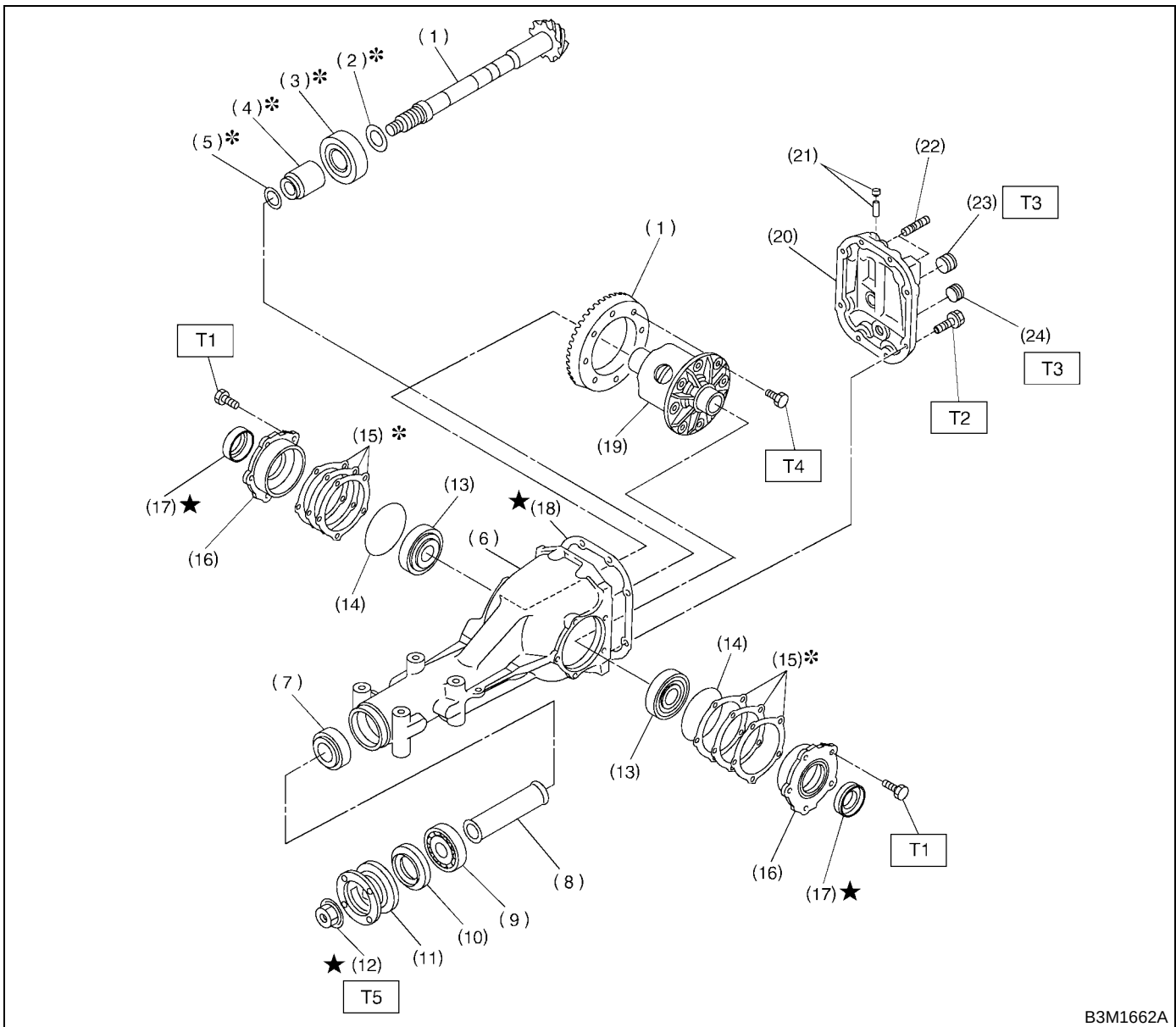
T2: 29.4 (3.00, 21.7)

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



B3M1662A

- | | |
|--------------------------------------|---------------------------------|
| (1) Pinion crown gear set | (12) Self-locking nut |
| (2) Pinion height adjusting shim | (13) Side bearing |
| (3) Rear bearing | (14) O-ring |
| (4) Bearing preload adjusting spacer | (15) Side bearing retainer shim |
| (5) Bearing preload adjusting washer | (16) Side bearing retainer |
| (6) Differential carrier | (17) Side oil seal |
| (7) Front bearing | (18) Gasket |
| (8) Collar | (19) Differential case |
| (9) Pilot bearing | (20) Rear cover |
| (10) Front oil seal | (21) Air breather cap |
| (11) Companion flange | (22) Stud bolt |

- | |
|----------------------|
| (23) Oil filler plug |
| (24) Oil drain plug |

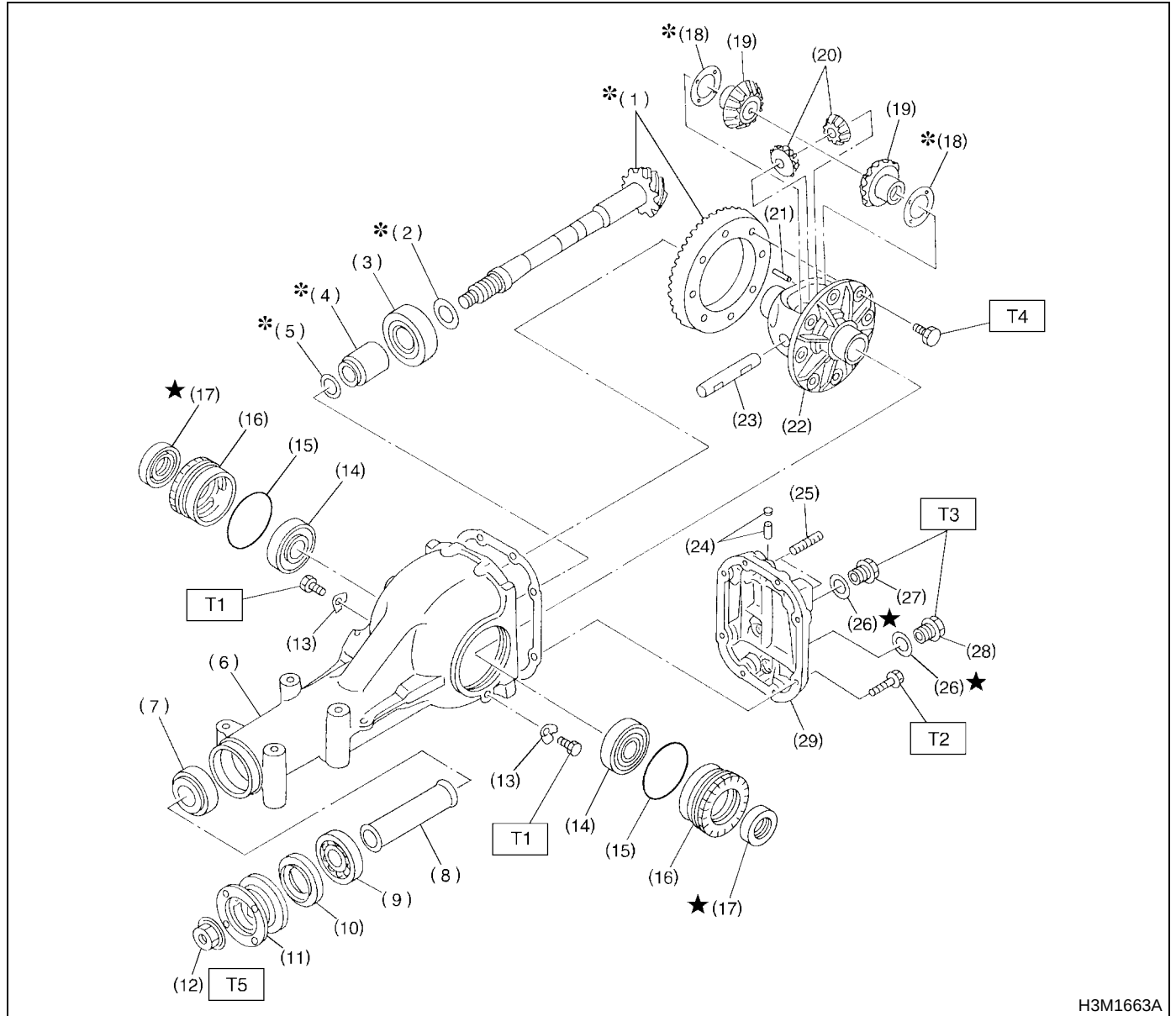
Tightening torque: N·m (kgf-m, ft-lb)

- | | |
|------------|-----------------------------|
| 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



H3M1663A

- | | | |
|--------------------------------------|------------------------------|----------------------|
| (1) Pinion crown gear set | (13) Lock plate | (25) Stud bolt |
| (2) Pinion height adjusting shim | (14) Side bearing | (26) Gasket |
| (3) Rear bearing | (15) O-ring | (27) Oil filler plug |
| (4) Bearing preload adjusting spacer | (16) Axle shaft holder | (28) Oil drain plug |
| (5) Bearing preload adjusting washer | (17) Side oil seal | (29) Rear cover |
| (6) Differential carrier | (18) Side gear thrust washer | |
| (7) Front bearing | (19) Side gear | |
| (8) Collar | (20) Pinion mate gear | |
| (9) Pilot bearing | (21) Pinion shaft lock pin | |
| (10) Front oil seal | (22) Differential case | |
| (11) Companion flange | (23) Pinion mate shaft | |
| (12) Self-locking nut | (24) Air breather cap | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 25 (2.5, 18.1)

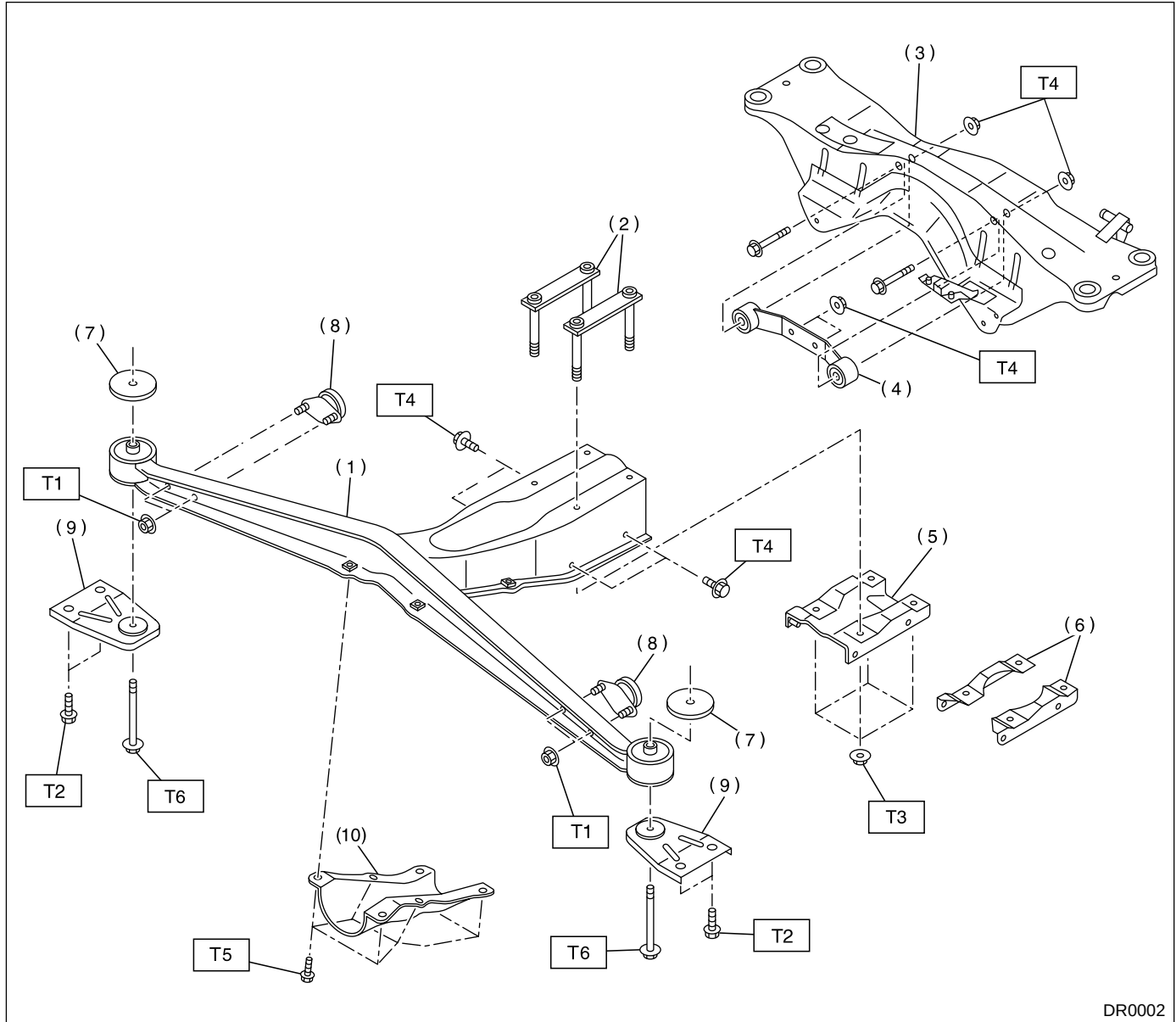
T2: 25 (2.5, 18.1)

T3: 34 (3.5, 25.3)

T4: 62 (6.3, 45.6)

T5: 188 (19.2, 139)

4. REAR DIFFERENTIAL MOUNTING SYSTEM



- | | |
|--|-------------------------------------|
| (1) Differential front member | (7) Stopper |
| (2) Plate | (8) Dynamic damper |
| (3) Crossmember | (9) Differential mount bracket |
| (4) Differential rear member | (10) Differential mount front cover |
| (5) Differential mount lower bracket (TURBO model) | |
| (6) Differential mount lower bracket (Non-turbo model) | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 20 (2.0, 14.5)

T2: 33 (3.4, 24.3)

T3: 65 (6.6, 47.9)

T4: 70 (7.1, 51.6)

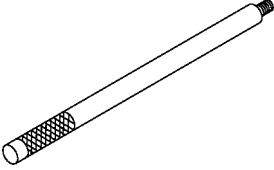
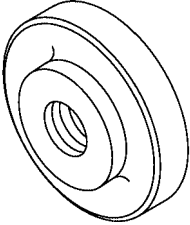
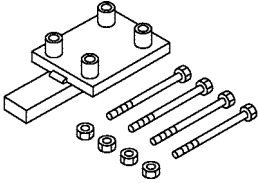
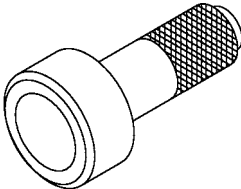
T5: 90 (9.2, 66.4)

T6: 100 (10.2, 73.8)

C: CAUTION

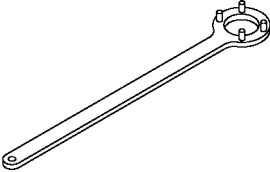
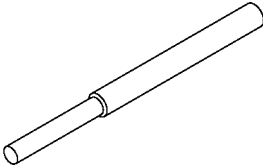
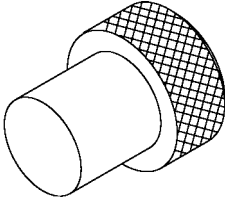
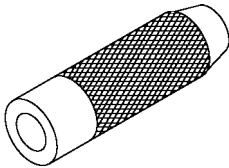
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Avoid damaging the mating face of the case.

D: PREPARATION TOOL**1. SPECIAL TOOLS**

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1893	398477701	HANDLE	Used for installing front and rear bearing cone.
 B3M1894	398477702	DRIFT	Used press-fitting the bearing cone of differential carrier (rear).
 B3M1895	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 B3M1896	498447120	DRIFT	Used for installing front oil seal.

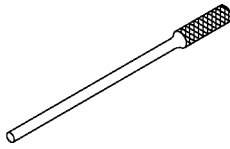
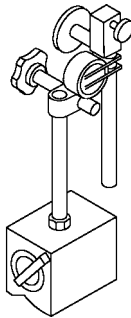
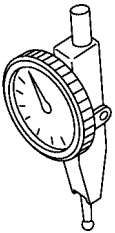
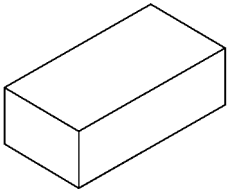
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1897	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when loosening and tightening self-lock nut.
 B3M1898	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 B3M1899	399780104	WEIGHT	Used for installing front bearing cone, pilot bearing companion flange.
 B3M1900	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.

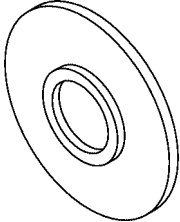
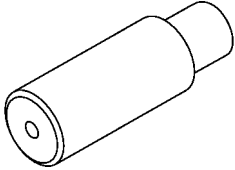
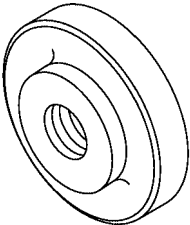
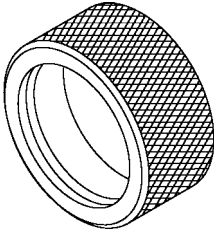
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1901	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 B3M1902	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear.. • Used with DIAL GAUGE (498247100).
 B3M1903	498247100	DIAL GAUGE	• Used measuring backlash between side gear and pinion, hypoid gear. • Used with MAGNET BASE (498247001).
 B3M1904	398507704	BLOCK	Used for adjusting pinion height and preload.

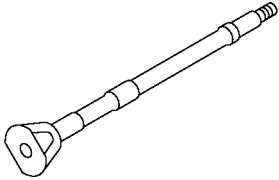
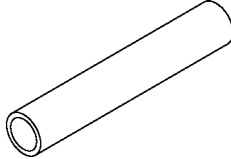
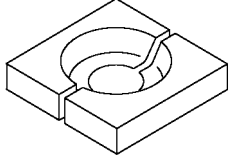
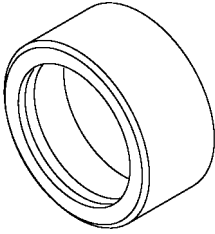
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1905	398177700	INSTALLER	- Used for installing rear bearing cone. - For T-type.
 B3M1906	398457700	ATTACHMENT	- Used for removing side bearing retainer. - For T-type.
 B3M1907	398477703	DRIFT2	- Used for press-fitting the bearing race (rear) of differential carrier. - For T-type.
 B3M1908	398437700	DRIFT	- Used for installing side oil seal. - For T-type.

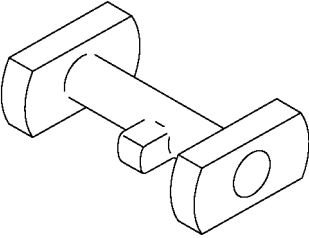
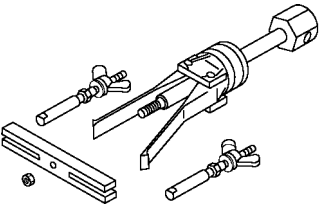
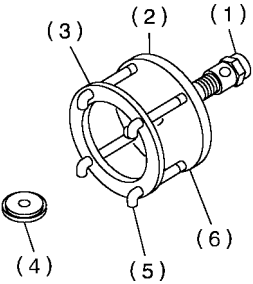
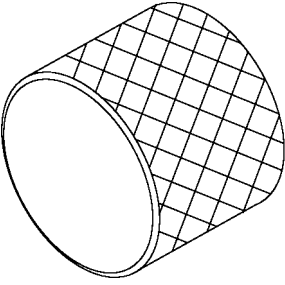
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1909	398507702	DUMMY SHAFT	- Used for adjusting pinion height and preload. - For T-type.
 B3M1910	398507703	DUMMY COLLAR	- Used for adjusting pinion height and preload. - For T-type.
 B3M1911	398517700	REPLACER	- Used for removing rear bearing cone. - For T-type.
 B3M1912	398487700	DRIFT	- Used for press-fitting the side bearing cone. - For T-type.

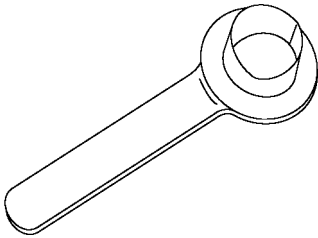
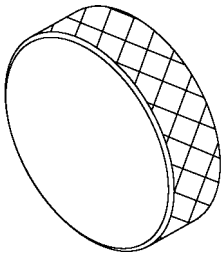
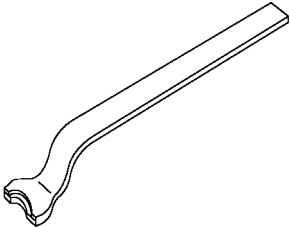
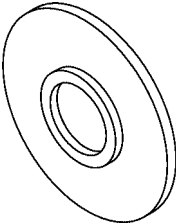
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1913	398507701	DIFFERENTIAL CARRIER GAUGE	- Used for adjusting pinion height. - For T-type.
 B3M1914	398527700	PULLEY ASSY	- Used for removing front oil seal. - Used for removing side bearing cup. (T-type)
 B3M1915A	398527700	PULLER SET	- Used for extracting side bearing cone. (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000) - For T-type.
 B3M1916	398227700	WEIGHT	- Used for installing side bearing. - For T-type.

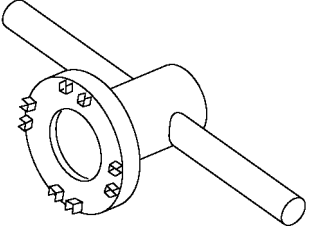
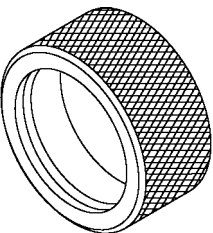
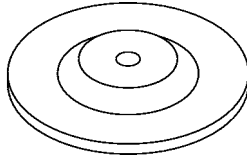
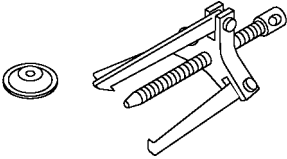
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1917	28099PA090	OIL SEAL PROTECTOR	- Used for installing rear drive shaft into rear differential. - For protecting oil seal.
 B3M1918	398237700	GAUGE	- Used for installing side bearing. - For T-type.
 B3M1919	28099PA100	DRIVE SHAFT REMOVER	- Used for removing rear drive shaft from rear differential. - For T-type.
 B3M1920	498175500	INSTALLER	- Used for installing rear bearing cone. - For VA-type.

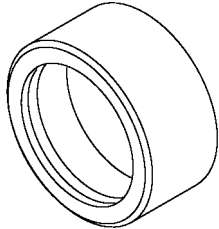
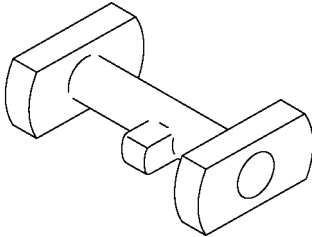
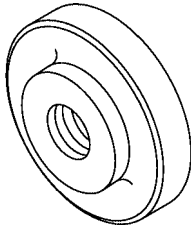
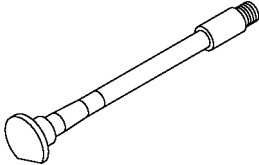
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1921	499785500	WRENCH ASSY	- Used for removing and installing side oil seal holder. - For VA-type.
 B3M1922	498447100	DRIFT	- Used for installing oil seal. - For VA-type.
 B3M1923	399520105	SEAT	- Used for removing side bearing cone. - Used with PULLER SET (899524100). - For VA-type.
 B3M1930	399703602	PULLEY ASSY	Used for removing companion flange

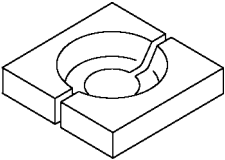
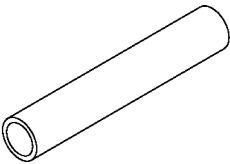
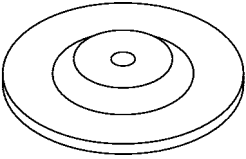
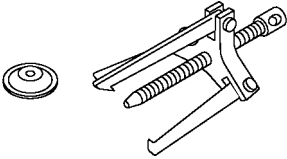
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1924	498485400	DRIFT	- Used for installing side bearing cone. - For VA-type.
 B3M1925	498505501	DIFFERENTIAL CARRIER GAUGE	- Used for adjusting pinion height. - For VA-type.
 B3M1926	498447110	DRIFT	- Used for press-fitting the bearing race (front) of differential carrier. - For VA-type.
 B3M1927	498447150	DUMMY SHAFT	- Used for adjusting pinion height and Pre-load. - For VA-type.

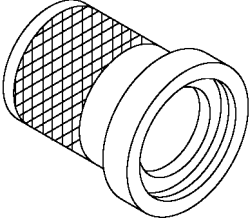
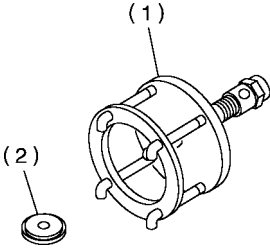
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1911	498515500	REPLACER	- Used for removing rear bearing cone. - For VA-type.
 B3M1977	32285AA000	DUMMY COLLAR	- Used for adjusting pinion height and Pre-load. - For VA-type.
 B3M1928	499705404	SEAT	- Used for removing side bearing race. - Used with PULLEY ASSY (499705401). - For VA-type.
 B3M1930	499705401	PULLEY ASSY	- Used for removing side bearing race. - Used with SEAT (499705404). - For VA-type.

GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B3M1931	899874100	INSTALLER	Used for installing companion flange.
 B3M1932A	899524100	PULLER SET	- Used for removing side bearing cone of differential. - For VA-type. (1) Puller (2) Cap

GENERAL DESCRIPTION

DIFFERENTIALS

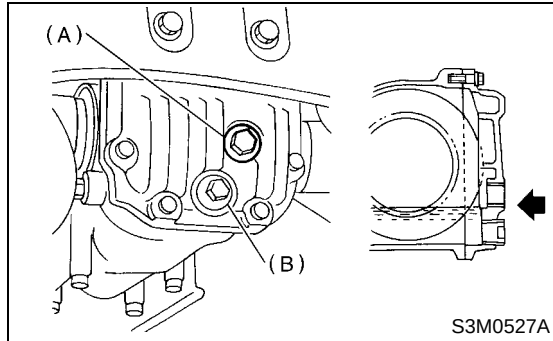
2. GENERAL PURPOSE TOOLS

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)

2. Differential Gear Oil

A: INSPECTION

- 1) Take out filler plug, and replace gear oil if it is contaminated or deteriorated. <Ref. to DI-23, 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.



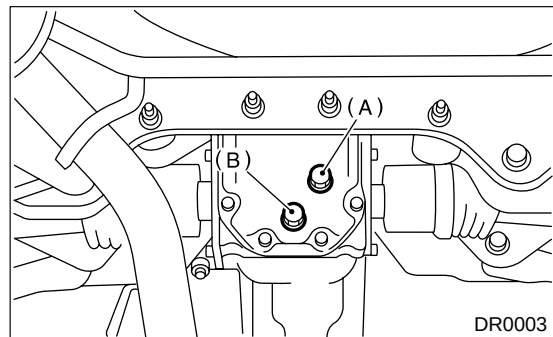
(A) Filler plug
(B) Drain plug

B: REPLACEMENT

- 1) Disconnect ground terminal 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.

CAUTION:

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 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)

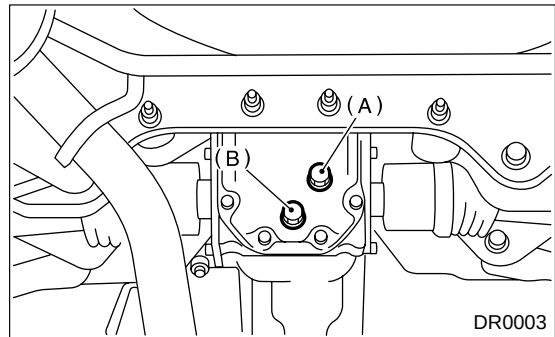
- 5) Fill differential carrier with gear oil to the upper plug level.

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)



- 6) Install filler plug.

CAUTION:

- Apply fluid packing to drain plug in T-type.
- VA-type uses a new aluminum gasket.

Fluid packing:

THREE BOND 1105 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

Refer to AUTOMATIC TRANSMISSION in separate publication "AUTOMATIC TRANSMISSION for Front Differential.

2. MT MODEL

For front differential of manual transmission, refer to "MT" section. <Ref. to MT-102, Front Differential Assembly.>

4. Rear Differential for T-type

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Move select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Loosen wheel nuts.
- 6) Jack-up vehicle and support it with sturdy racks.
- 7) Remove wheels.
- 8) Remove rear exhaust pipe and muffler.

Non-turbo model without OBD

<Ref. to EX(SOHCw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, REMOVAL, Muffler.>

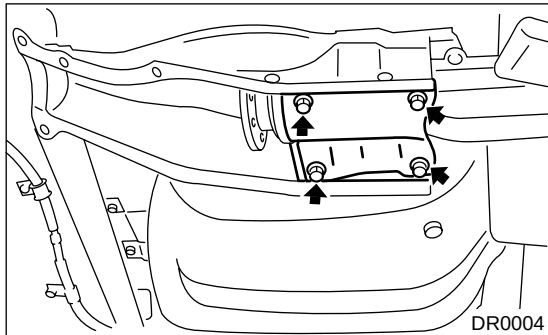
Non-turbo model with OBD

<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>

- 9) Remove front cover of rear differential mount.



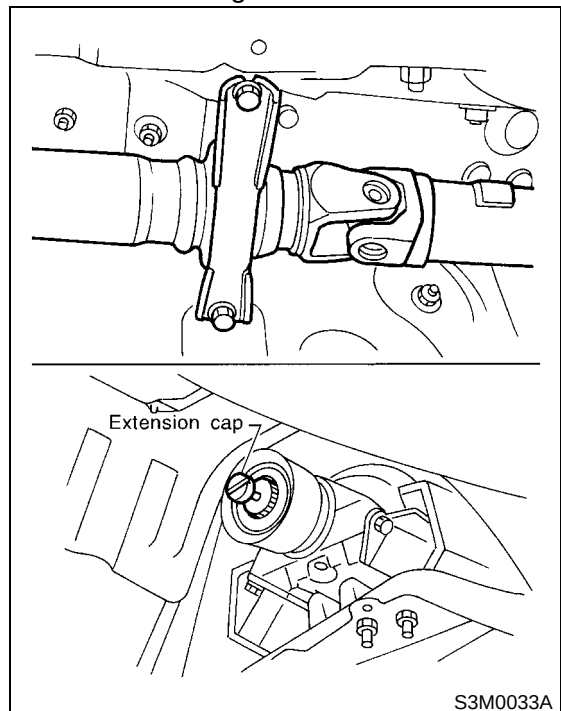
- 10) Remove propeller shaft.

CAUTION:

When removing propeller shaft, pay attention not to damage the sliding surfaces of rear drive shaft (extension) spline, oil seal and sleeve yoke.

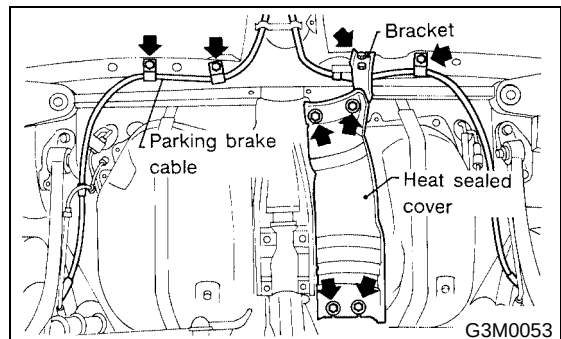
NOTE:

- Prepare an oil can and cap since the transmission oil flows out from the extension at removing propeller shaft.
- Insert the cap into the extension to prevent transmission oil from flowing out immediately after removing the propeller shaft.
- If extension cap is not available, cover the opening with a vinyl bag in order to prevent transmission gear oil or ATF leakage.



- 11) Remove heat sealed cover.

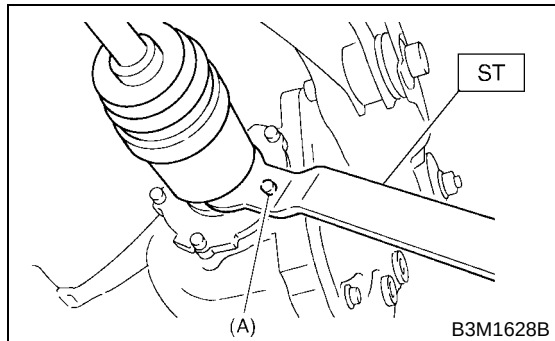
- 12) Remove clamps and bracket of parking brake cable.



REAR DIFFERENTIAL FOR T-TYPE

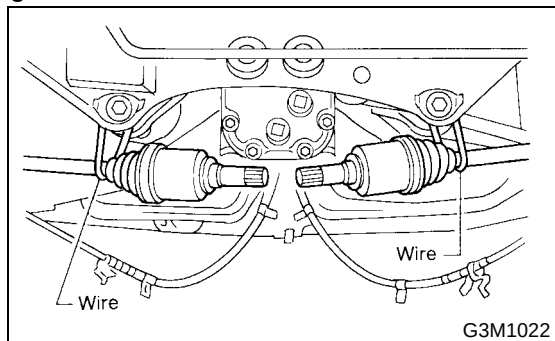
DIFFERENTIALS

- 13) Remove DOJ of rear drive shaft from rear differential using ST. <Ref. to DI-59, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA100 DRIVE SHAFT REMOVER

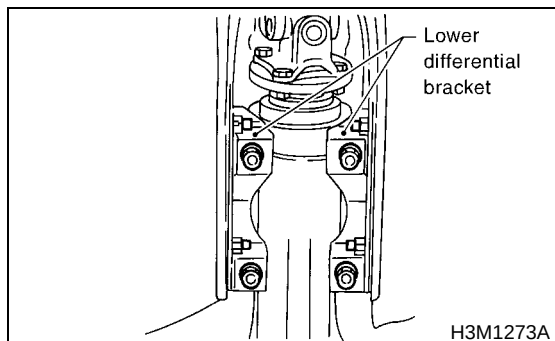


(A) Bolt

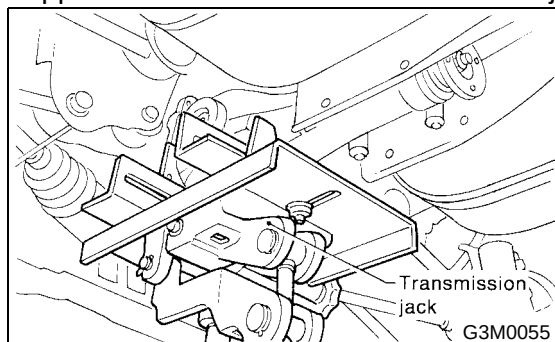
- 14) Secure rear drive shaft to rear crossmember using wire.



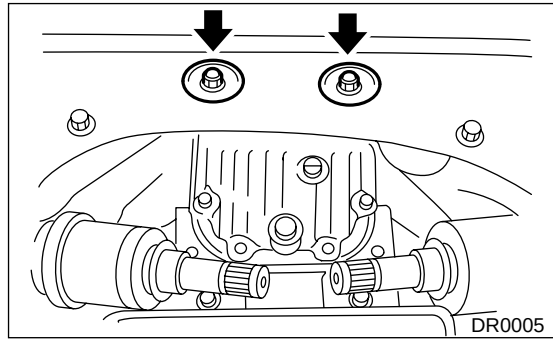
- 15) Remove lower differential bracket.



- 16) Support rear differential with transmission jack.



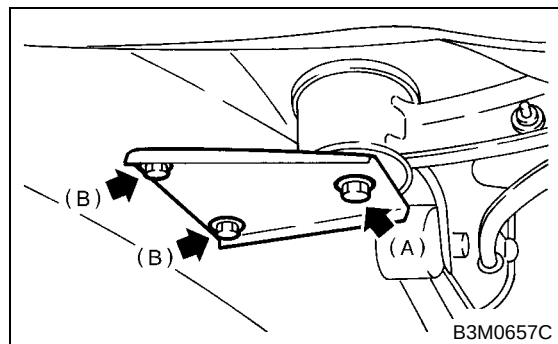
- 17) Remove self-locking nuts connecting rear differential to rear crossmember.



- 18) Remove bolts which secure rear differential front member to body. Loosen bolt A first, then remove bolts B.

NOTE:

Support front member with the use of a helper to prevent it from dropping.

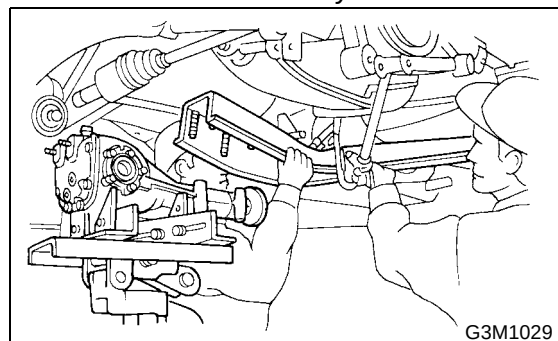


(A) Bolt A

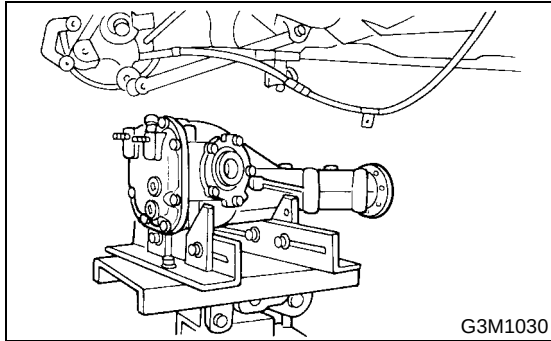
(B) Bolt B

- 19) Remove bolt A.

- 20) While slowly lowering transmission jack, move rear differential forward and remove front member and rear differential from body.



21) Remove rear differential from front member.



B: INSTALLATION

To install, reverse the removal sequence.

1) Install the air breather cap tapping with a plastic hammer.

CAUTION:

Be sure to install new air breather cap.

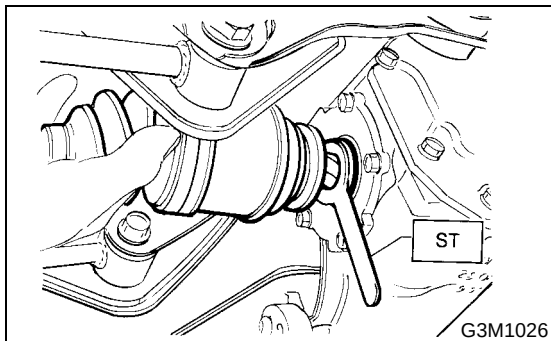
2) Position front member on body by passing it under parking brake cable and securing to rear differential.

NOTE:

When installing rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

3) Install DOJ of drive shaft into rear differential. <Ref. to DI-59, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



4) Installing procedure hereafter is in reverse order of removal.

5) After installation, fill differential carrier with gear oil to the filler plug level.

NOTE:

Apply fluid packing to plug.

Fluid packing:

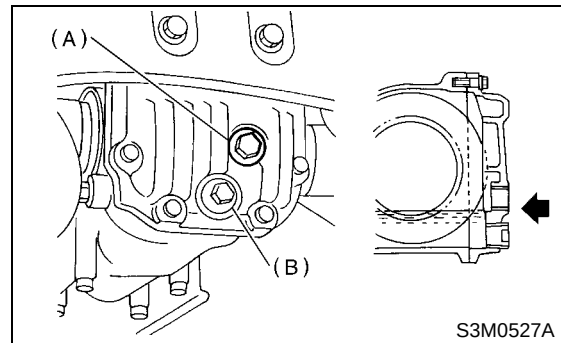
THREE BOND 1105 or equivalent

Oil capacity:

0.8 ① (0.8 US qt, 0.7 Imp qt)

Tightening torque:

49 N·m (5.0 kgf-m, 36.2 ft-lb)



(A) Filler plug

(B) Drain plug

C: DISASSEMBLY

To detect real cause of trouble, inspect the following items before disassembling.

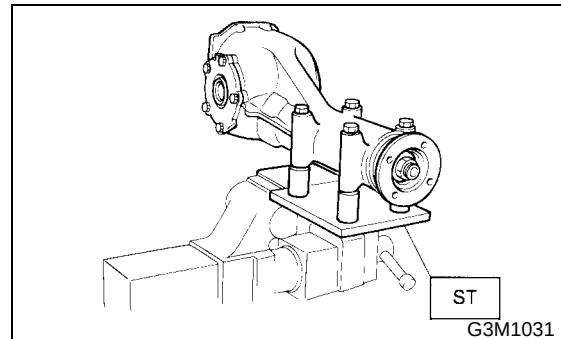
- Tooth contact of crown gear and pinion, and backlash

- 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

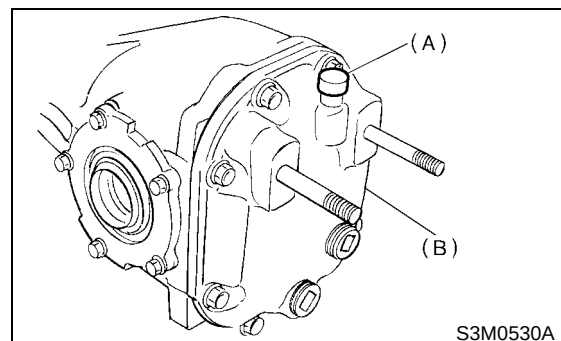


2) Drain gear oil by removing plug.

3) Remove the air breather cap.

NOTE:

Do not attempt to replace the air breather cap unless necessary.



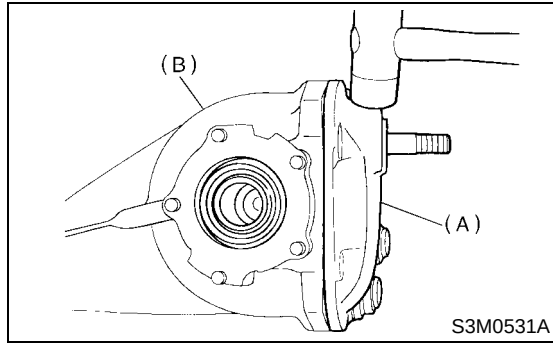
(A) Air breather cap

(B) Rear cover

REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

4) Remove rear cover by loosening retaining bolts.



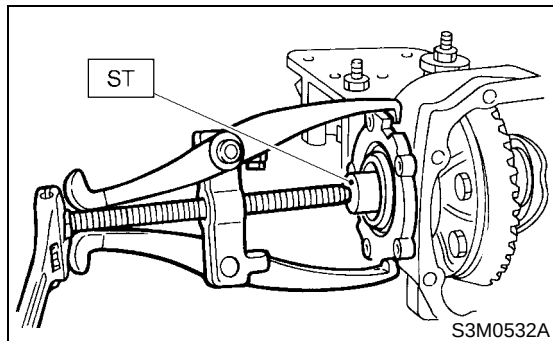
- (A) Rear cover
(B) Differential carrier

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.

CAUTION:

Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

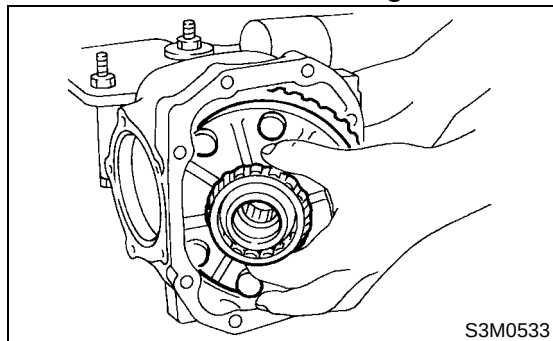
ST 398457700 ATTACHMENT



6) Pull out differential case assembly from differential carrier.

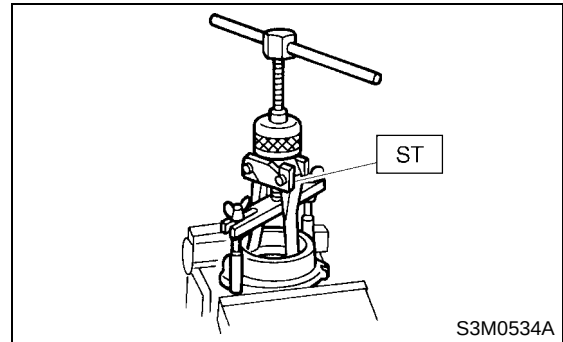
CAUTION:

Be careful not to hit the teeth against the case.



7) When replacing side bearing, pull bearing cup from side bearing retainer using ST.

ST 398527700 PULLER ASSY



8) Extract bearing cone with ST.

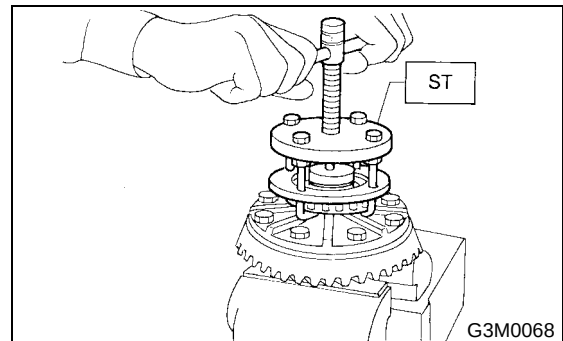
CAUTION:

Do not attempt to disassemble the parts unless necessary.

NOTE:

- 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.

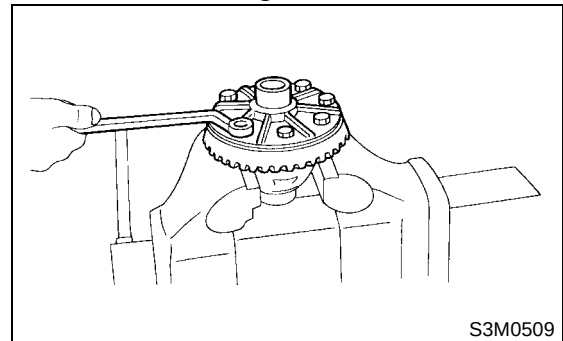
ST 398527700 PULLER SET



9) Remove crown gear by loosening crown gear bolts.

CAUTION:

Further disassembling is not allowed.

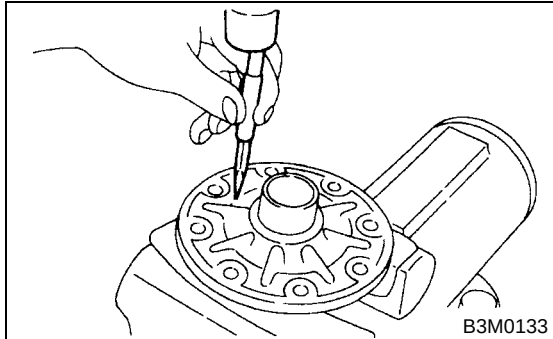


10) Drive out pinion shaft lock pin from crown gear side. (Without LSD)

NOTE:

The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.

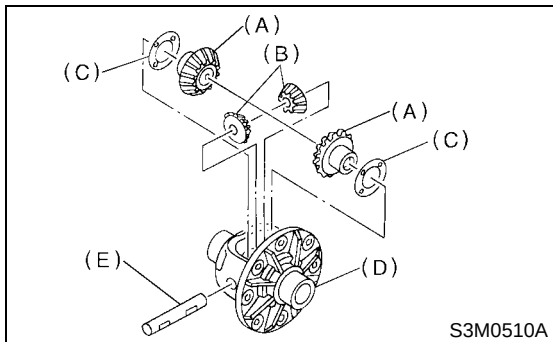
ST 899904100 STRAIGHT PIN REMOVER



11) Draw out pinion mate shaft and remove pinion mate gears, side gears, side gears and thrust washers. (Without LSD)

NOTE:

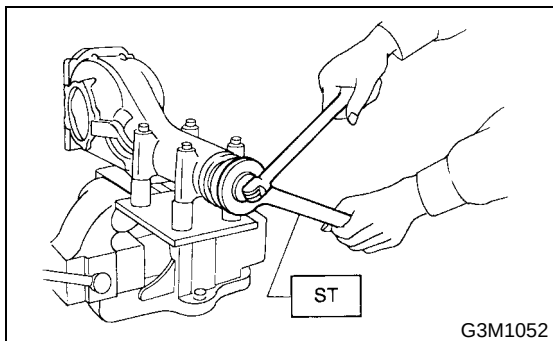
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



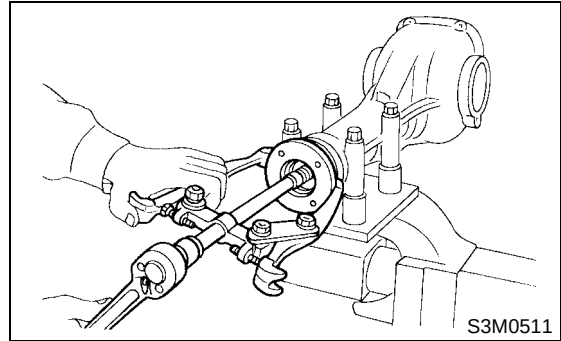
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

12) Hold companion flange with ST and remove drive pinion nut.

ST 498427200 FLANGE WRENCH



13) Extract the companion flange with a puller.

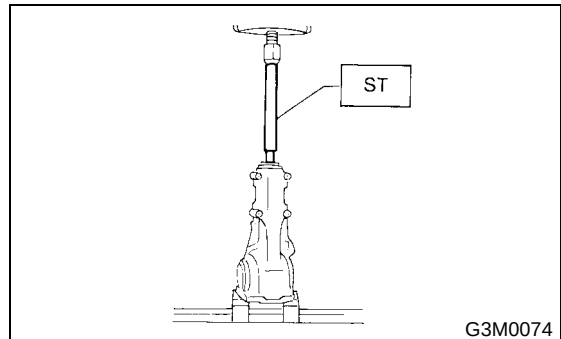


14) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

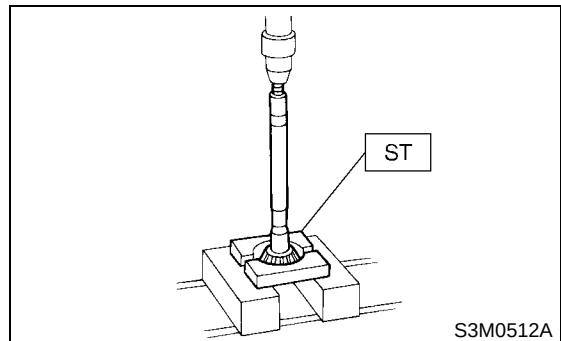


15) Remove rear bearing cone from drive pinion by supporting cone with ST.

NOTE:

Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER

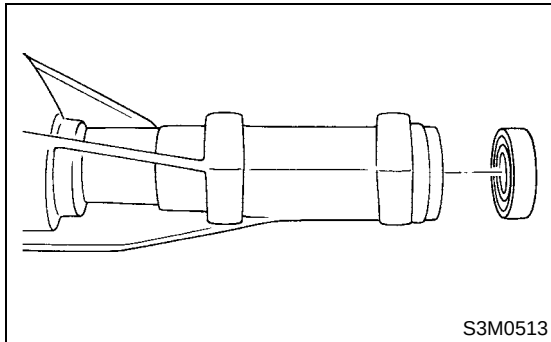


REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

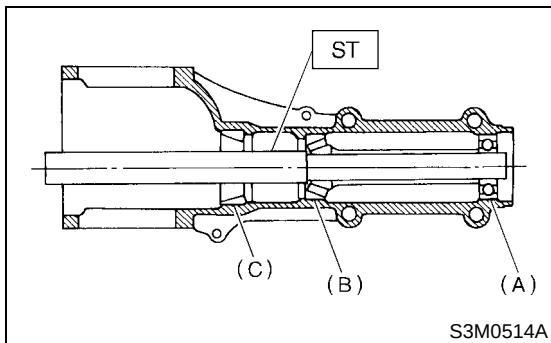
16) Remove front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



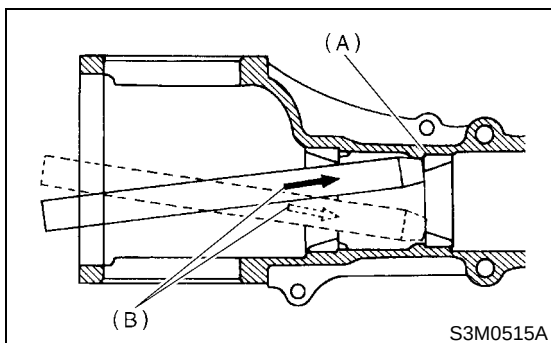
17) Remove pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT



- (A) Pinion bearing
- (B) Front bearing
- (C) Rear bearing cup

18) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.

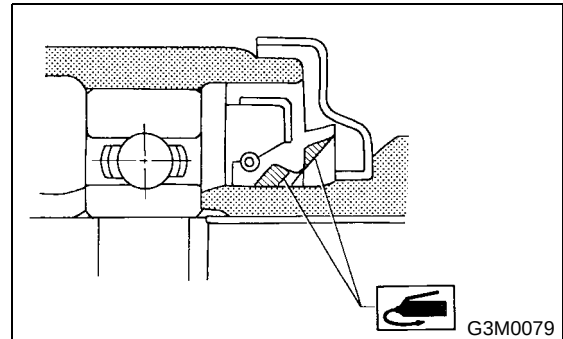


- (A) 2 cutouts along diagonal lines
- (B) Tap alternately with brass bar.

D: ASSEMBLY

1) Precautions for assembling

- 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.



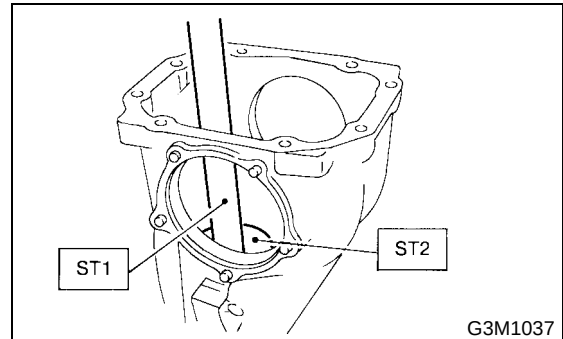
2) Adjusting preload for front and rear bearings

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 into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE

ST2 398477703 DRIFT 2



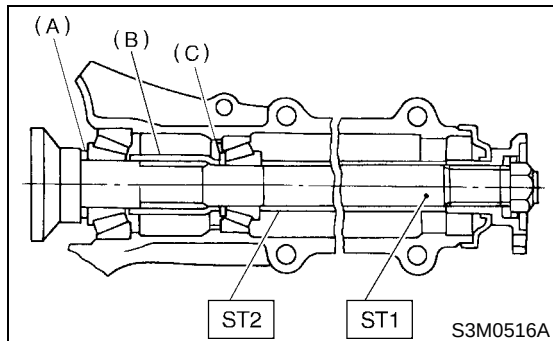
(2) Insert ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

CAUTION:

- Re-use the used washer if not deformed.
- Use a new rear bearing cone.

(3) 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

(4) 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.

CAUTION:

Use a new lock nut.

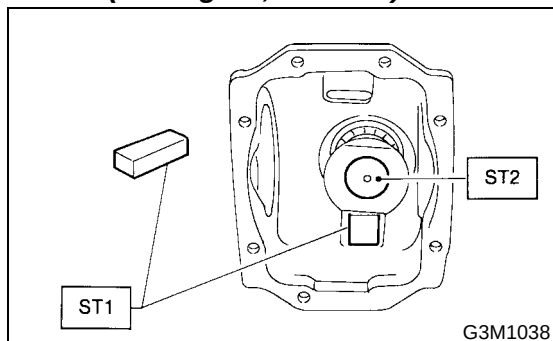
NOTE:

- 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:

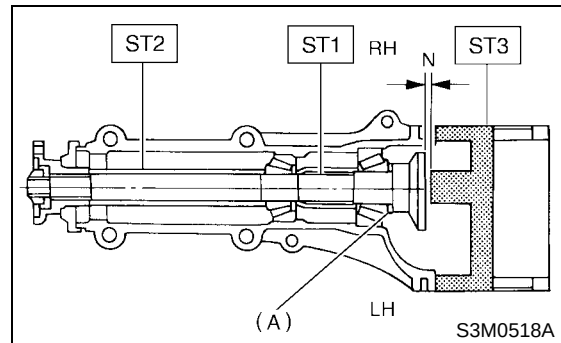
181 N·m (18.5 kgf-m, 134 ft-lb)



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



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)
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)

3) 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:
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

REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

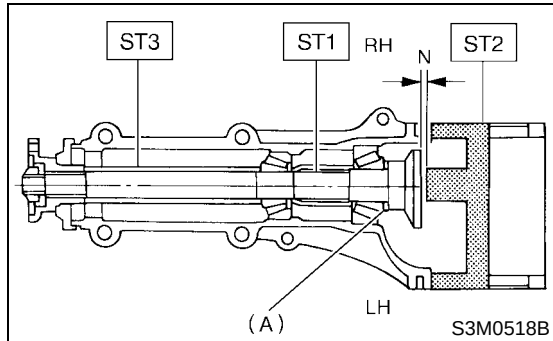
NOTE:

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

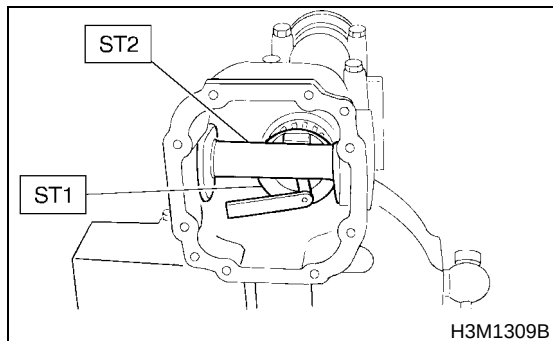
(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:

Make sure there is no clearance between the case and ST2.

ST1 398507702 DUMMY SHAFT

ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(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 shim temporarily inserted mm (in)	
To	Thickness of pinion height adjusting shim mm (in)	
N	Reading of thickness gauge mm (in)	
H	Figure marked on drive pinion head	
Memo:		

(Example of calculation)

$$T_o = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$N = 0.23 \text{ mm } H = +1,$$

$$T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42$$

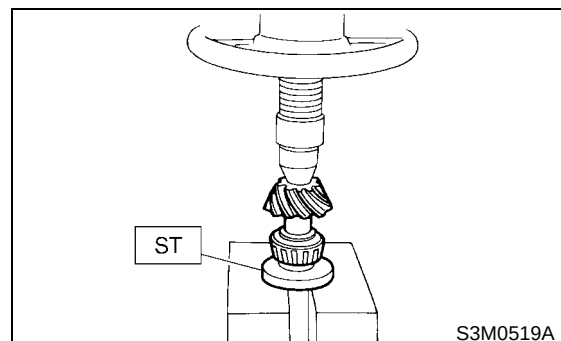
Result: Thickness = 3.42 mm

Therefore use the shim 383605200.

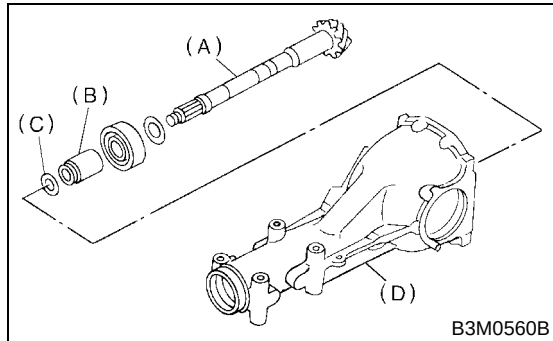
Pinion height adjusting shim	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	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)

4) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 398177700 INSTALLER



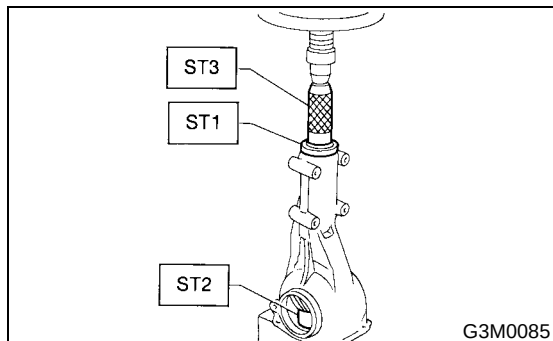
5) Insert drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



- (A) Drive pinion
- (B) Bearing adjusting spacer
- (C) Washer
- (D) Differential carrier

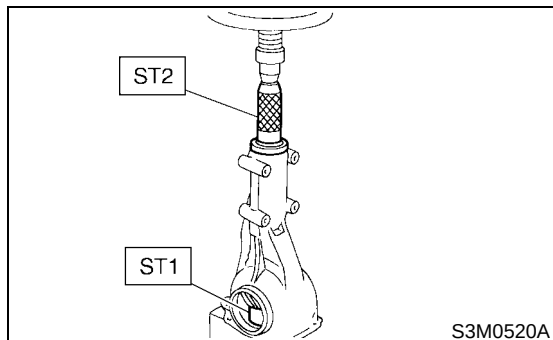
6) Press-fit front bearing cone into case with ST1, ST2 and ST3.

ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



7) Insert spacer, then press-fit pilot bearing with ST1 and ST2.

ST1 399780104 WEIGHT
ST2 899580100 INSTALLER

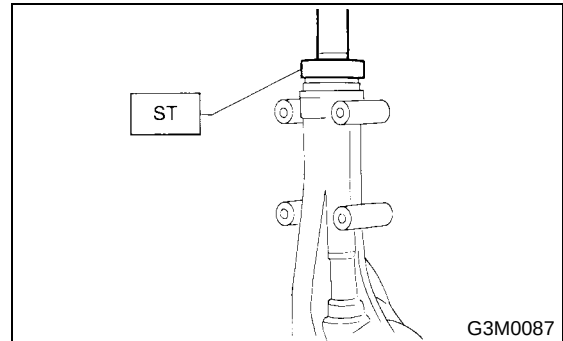


8) Fit a new oil seal with ST.

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 DRIFT

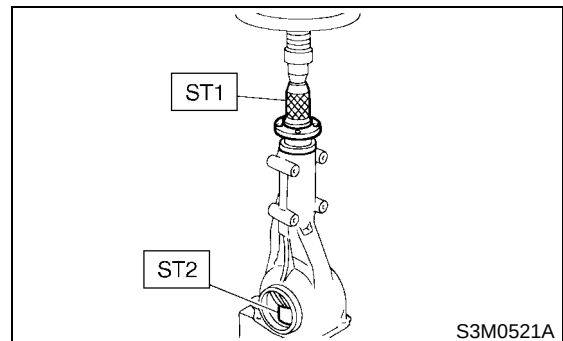


9) Press-fit companion flange with ST1 and ST2.

CAUTION:

Be careful not to damage bearing.

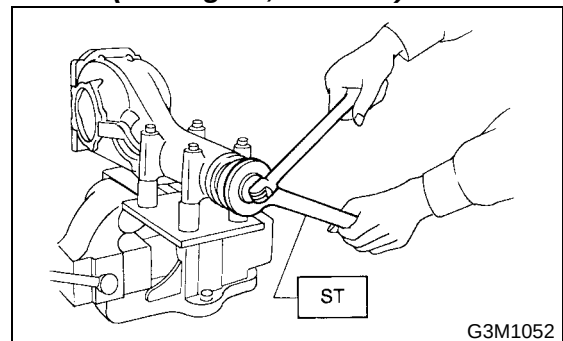
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



10) Install self-locking nut. Then tighten it with ST.
ST 498427200 FLANGE WRENCH

Tightening torque:

181 N·m (18.5 kgf-m, 134 ft-lb)



11) Assembling differential case

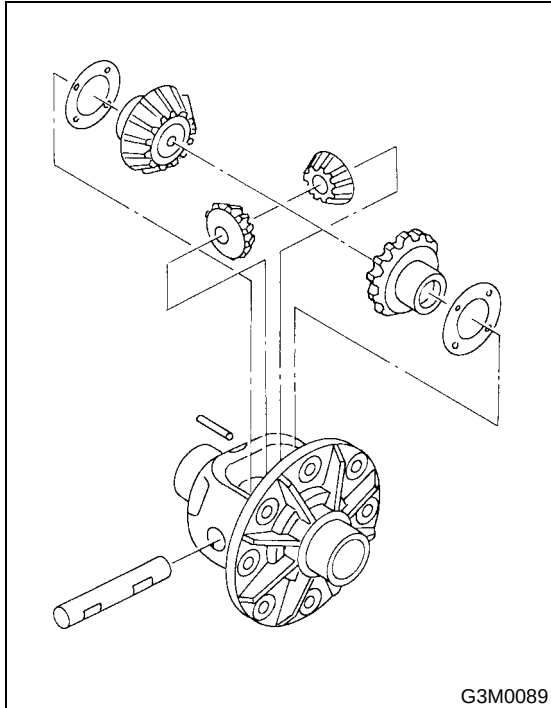
Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case. (Without LSD)

REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

CAUTION:

- 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.

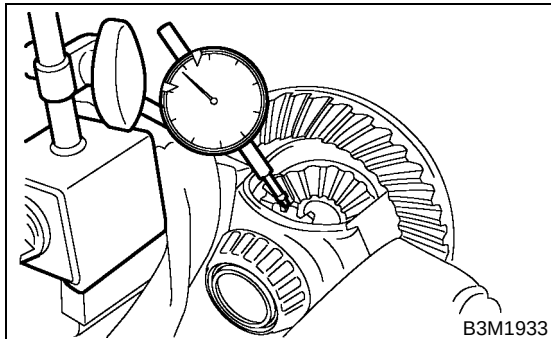


G3M0089

- (1) Measure the side gear backlash.

Side gear back clearance:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



B3M1933

- (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.

- 12) Install crown gear on differential case.

CAUTION:

Before installing bolts, apply Lock Tite to bolt threads.

Lock Tite:

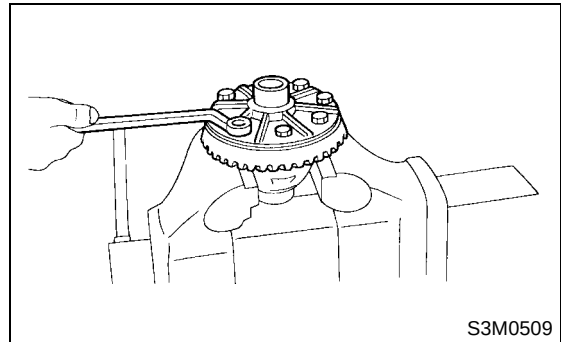
THREE BOND 1324 or equivalent

NOTE:

Tighten diagonally while tapping the bolt heads.

Tightening torque:

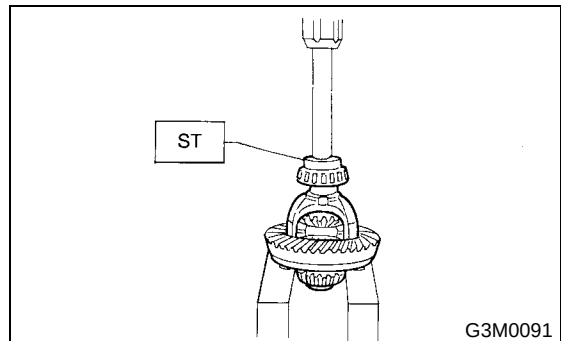
103 N·m (10.5 kgf-m, 76 ft-lb)



S3M0509

- 13) Press side bearing cone onto differential case with ST.

ST 398487700 DRIFT

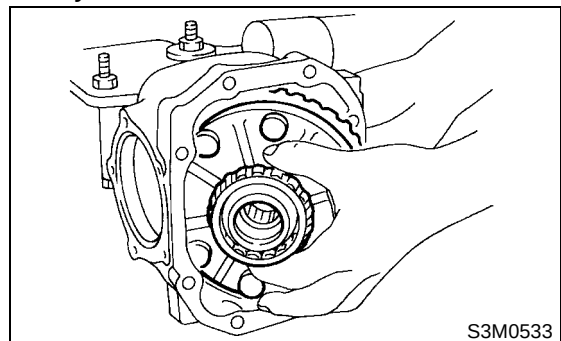


G3M0091

- 14) 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.



S3M0533

(3) Install side retainer shims and O-rings to the left and right retainers from which they were removed.

NOTE:

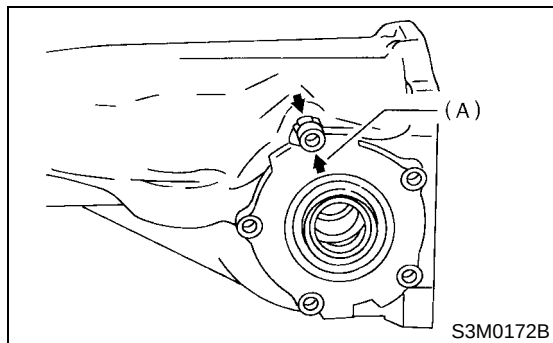
- Replace broken or cracked O-ring with new one.
- Replace broken or corroded side retainer shim with new one of same thickness.

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.

CAUTION:

Be careful that side bearing outer race is not damaged by bearing roller.



(A) Arrow mark

(5) Tighten side bearing retainer bolts.

CAUTION:

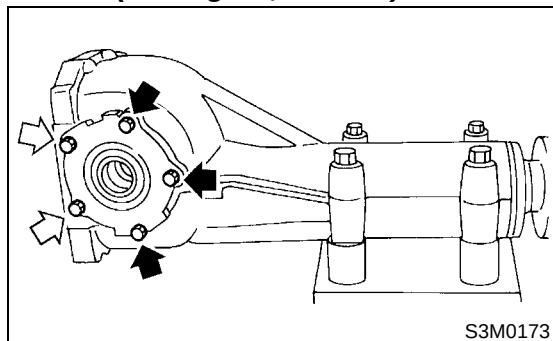
Before tightening the two side bearing retainer bolts, apply Lock Tite to bolt threads.

⇒ **Lock Tite:**

THREE BOND 1105 or equivalent

Tightening torque:

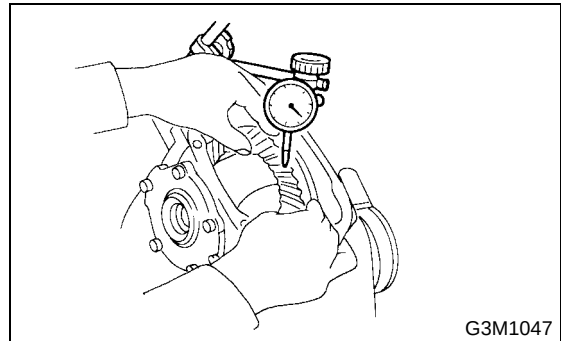
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



(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.

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, if the increase of the resistance is not within the specified range, readjust side bearing retainer shims.

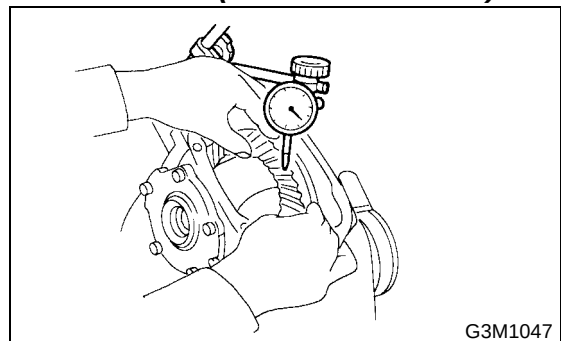
Turning resistance increase:

2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

15) Re-check crown gear-to-pinion backlash.

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



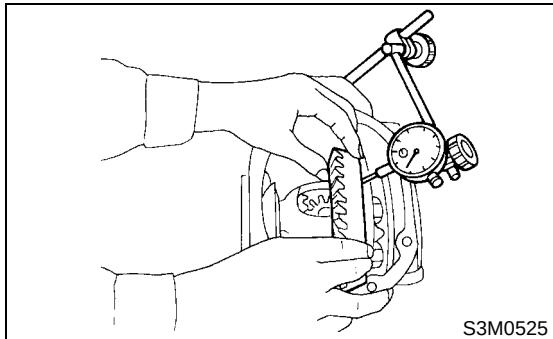
REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

16) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotate smoothly.

Limit of runout:

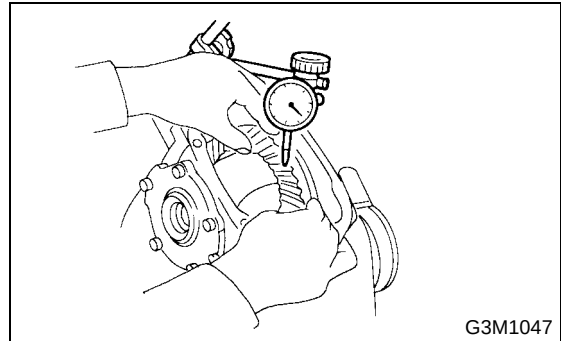
Less than 0.05 mm (0.0020 in)



(2) Hypoid gear backlash

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 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".

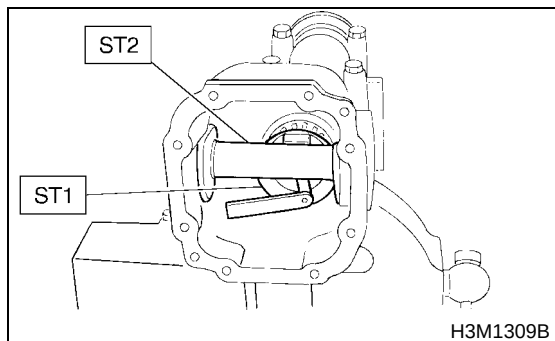
NOTE:

Be sure to wipe off red lead completely after adjustment is completed.

18) 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.

(1) Drive pinion height

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



$$T = T_o + N - (H \times 0.01) - 0.20 \text{ (mm)}$$

Where:

T = Thickness of pinion height adjusting shim (mm)

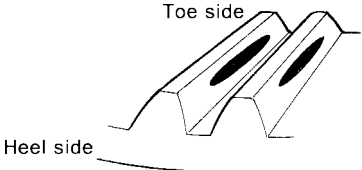
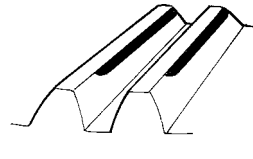
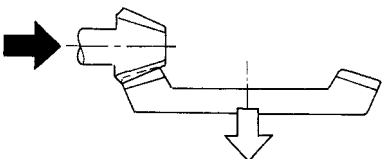
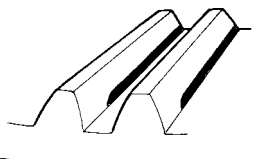
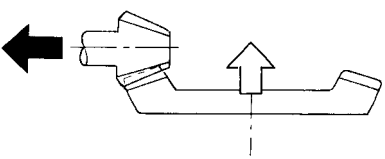
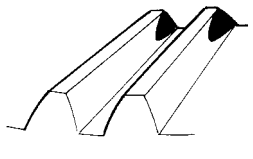
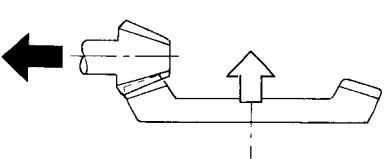
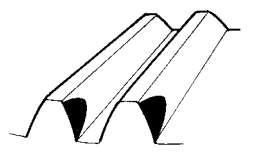
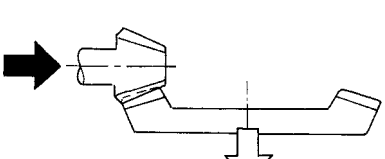
T_o = Thickness of shim temporarily inserted (mm)

N = Reading of thickness gauge (mm)

H = Figure marked on drive pinion head

REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

TOOTH CONTACT PATTERN		
Condition	Contact pattern	Adjustment
Correct tooth contact Tooth contact pattern slightly shifted towards toe under no load rotation. (When loaded, contact pattern moves toward heel.)	 G3M0098A	—
Face contact Backlash is too large.	This may cause noise and chipping at tooth ends.  G3M0098B	Increase thickness of drive pinion height adjusting shim in order to bring drive pinion closer to crown gear center.  G3M0098F
Flank contact Backlash is too small.	This may cause noise and stepped wear on surfaces.  G3M0098C	Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.  G3M0098G
Toe contact Contact area is small.	This may cause chipping at toe ends.  G3M0098D	Adjust as for flank contact.  G3M0098G
Heel contact Contact area is small.	This may cause chipping at heel ends.  G3M0098E	Adjust as for face contact.  G3M0098F

 : Adjusting direction of drive pinion
 : Adjusting direction of crown gear

REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

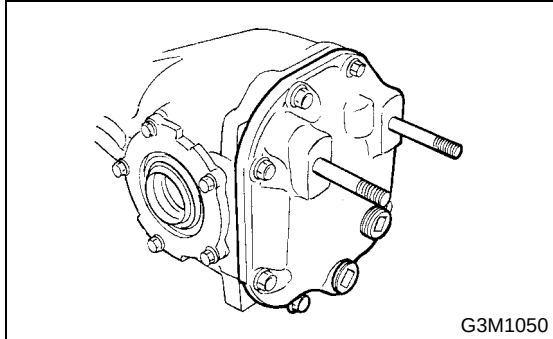
19) Install rear cover and tighten bolts to specified torque.

CAUTION:

Securely connect ground terminal of rear differential temperature sensor.

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.

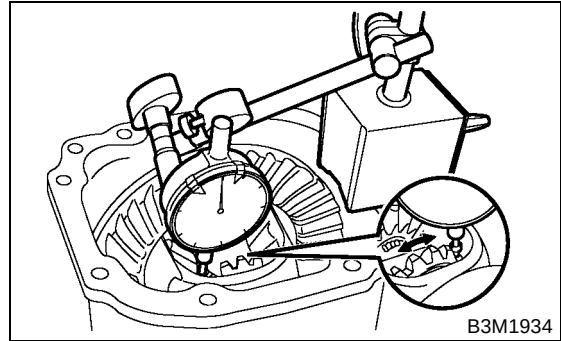
1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear.

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.



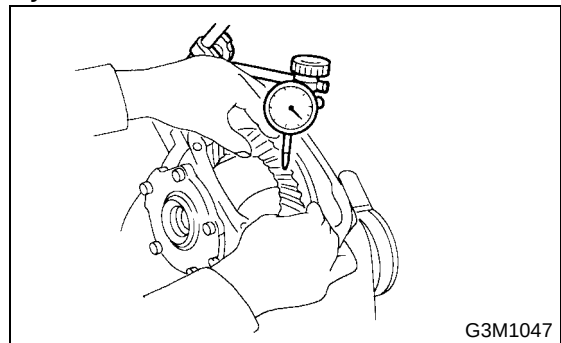
2. CROWN GEAR BACKLASH

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.



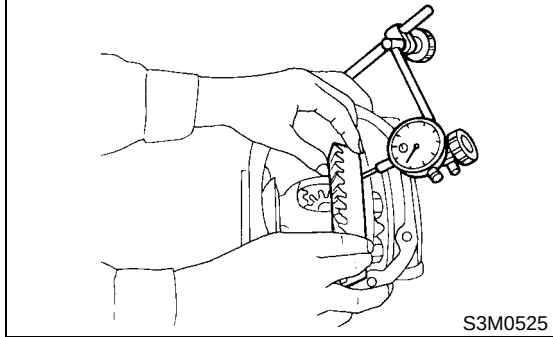
3. CROWN GEAR RUNOUT

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 driven pinion. <Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

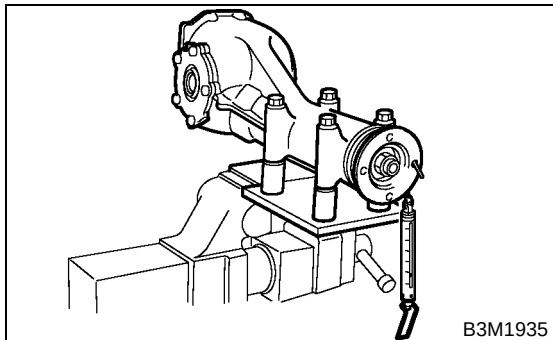
5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Total preload:

2.9 — 10.8 N·m (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.>

REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

5. Rear Differential for VA-type

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Move select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Loosen wheel nuts.
- 6) Jack-up vehicle and support it with sturdy racks.
- 7) Remove wheels.
- 8) Remove rear exhaust pipe and muffler.

Non-turbo model without OBD

<Ref. to EX(SOHCw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, REMOVAL, Muffler.>

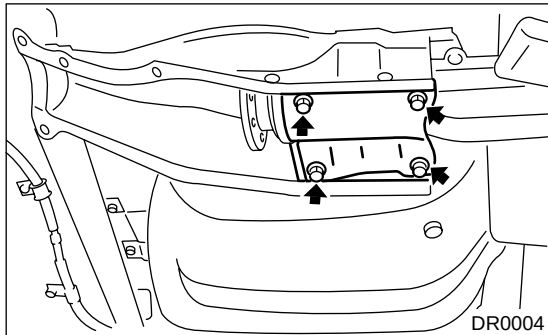
Non-turbo model with OBD

<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>

- 9) Remove front cover of rear differential mount.



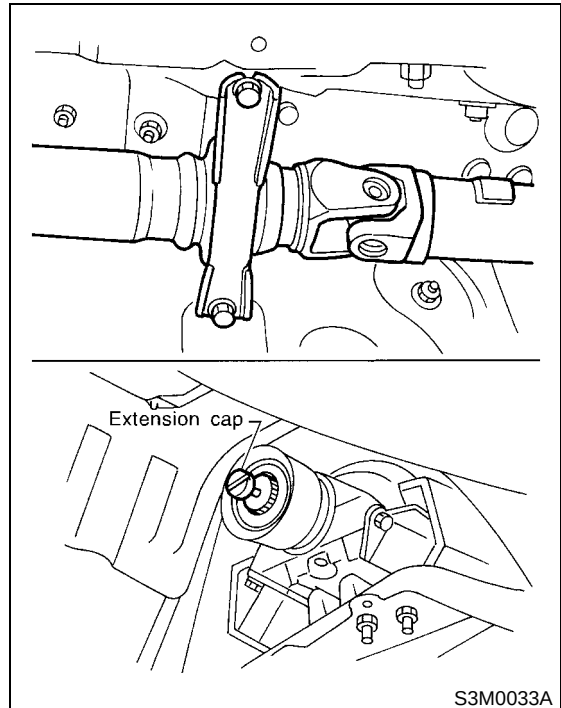
- 10) Remove propeller shaft.

CAUTION:

When removing propeller shaft, pay attention not to damage the sliding surfaces of rear drive shaft (extension) spline, oil seal and sleeve yoke.

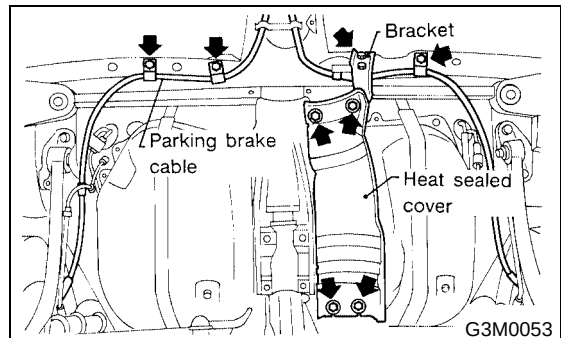
NOTE:

- Prepare an oil can and cap since the transmission oil flows out from the extension at removing propeller shaft.
- Insert the cap into the extension to prevent transmission oil from flowing out immediately after removing the propeller shaft.



- 11) Remove heat sealed cover.

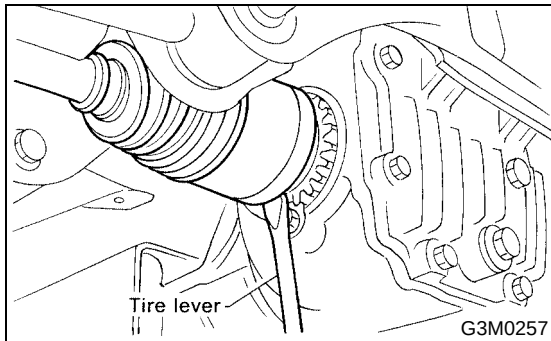
- 12) Remove clamps and bracket of parking brake cable.



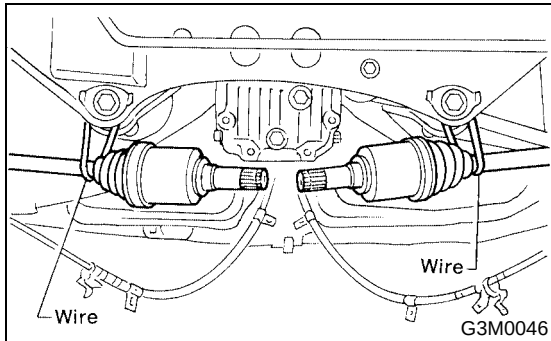
REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

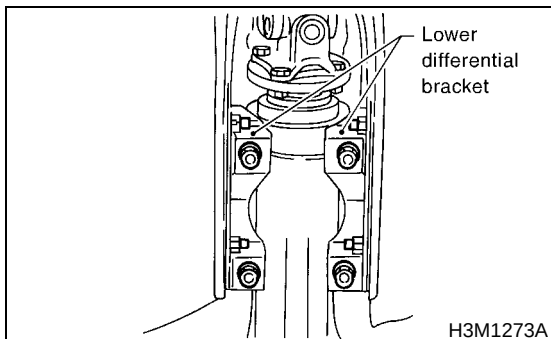
13) Remove DOJ of rear drive shaft from rear differential.<Ref. to DI-59, REPLACEMENT, Rear Differential Side Oil Seal.>



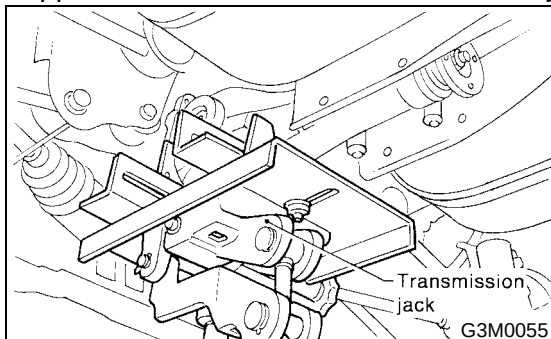
14) Secure rear drive shaft to rear crossmember using wire.



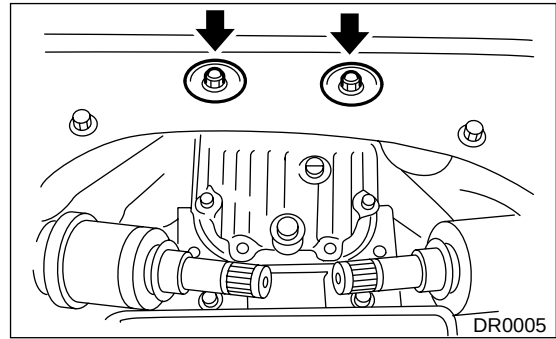
15) Remove lower differential bracket..



16) Support rear differential with transmission jack.



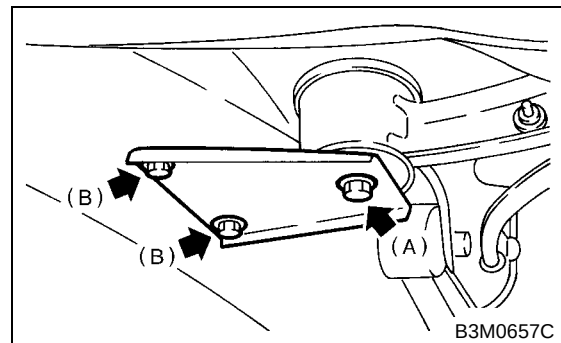
17) Remove self-locking nuts connecting rear differential to rear crossmember.



18) Remove bolts which secure rear differential front member to bolts B.

NOTE:

Support front member with the use A first, then removal bolts B.



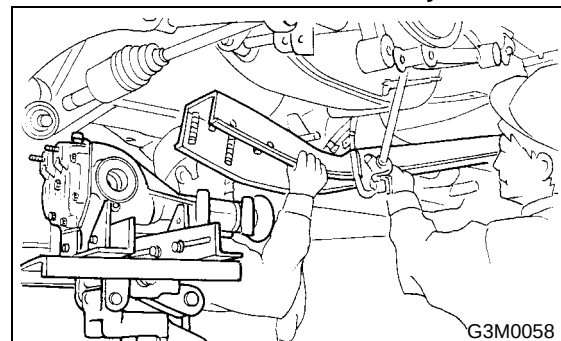
(A) Bolt A

(B) Bolt B

19) Remove bolt A.

20) While slowly lowering transmission jack, move rear differential forward and remove bolts from rear crossmember.

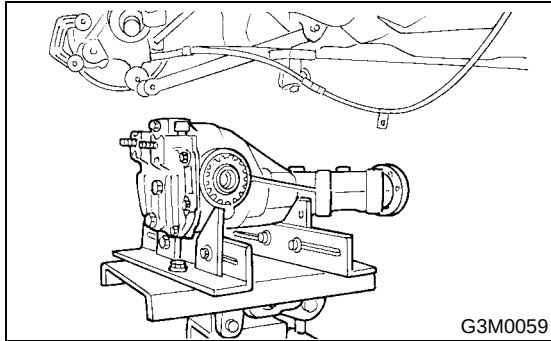
21) Remove front member from body.



REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

22) Remove rear differential from body.



B: INSTALLATION

To install, reverse the removal sequence.

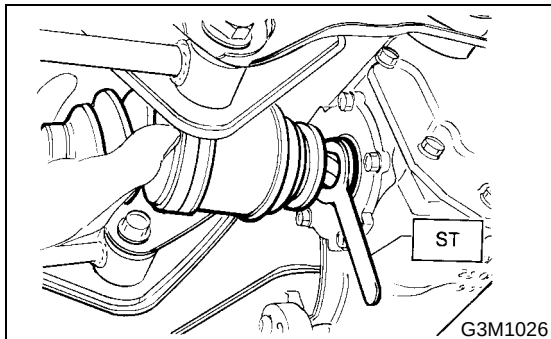
1) Position front member on body by passing it under parking cable and securing to rear differential.

NOTE:

When installing rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

2) Install DOJ of rear drive shaft into rear differential. <Ref. to DI-59, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



3) Install in the reverse order of removal.

4) After installation, fill differential carrier with gear oil to the upper plug level.

NOTE:

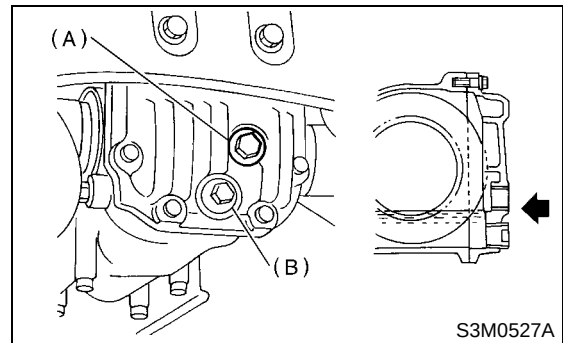
Use a new aluminum gasket when installing the plug.

Oil capacity:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)

Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)



(A) Filler plug

(B) Drain plug

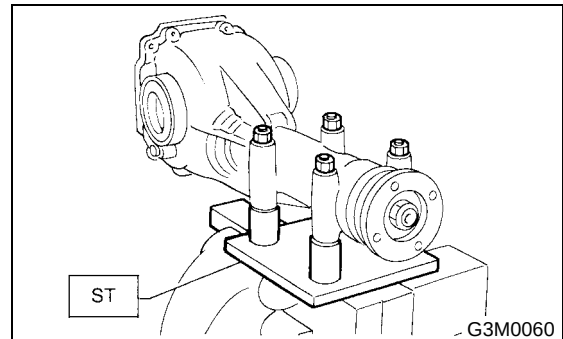
C: DISASSEMBLY

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

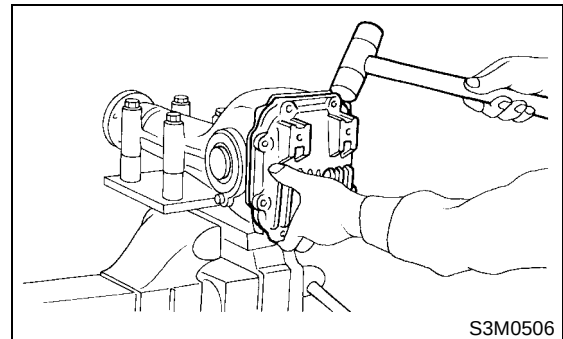
1) Set ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT



2) Drain gear oil by removing plug.

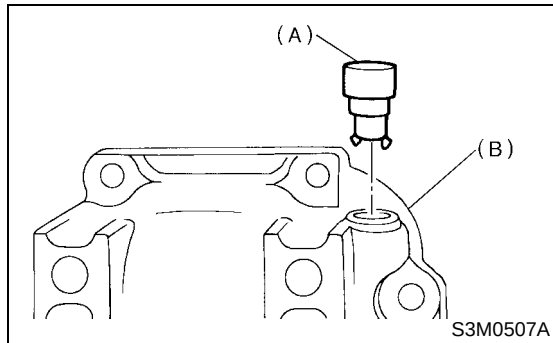
3) Remove rear cover by loosening retaining bolts.



4) Replace air breather cap.

NOTE:

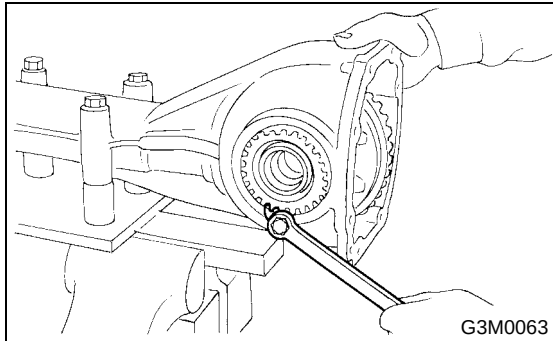
Do not attempt to replace the air breather cap unless necessary.



(A) Air breather cap

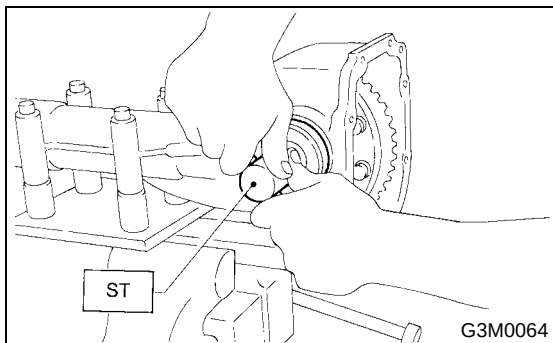
(B) Rear cover

5) Remove right and left lock plates.



6) Remove right and left holders with ST.

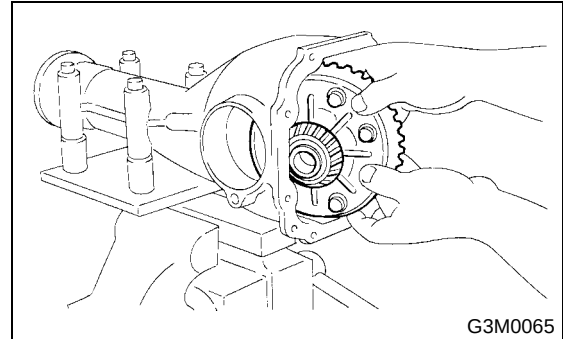
ST 499785500 WRENCH



7) Pull out differential assembly from differential case.

CAUTION:

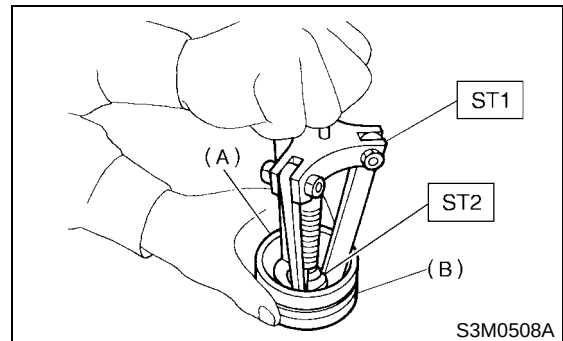
Be careful not to hit the teeth against the case.



8) Remove bearing race from right and left holders with ST1 and ST2.

ST1 499705401 PULLEY ASSY

ST2 499705404 SEAT



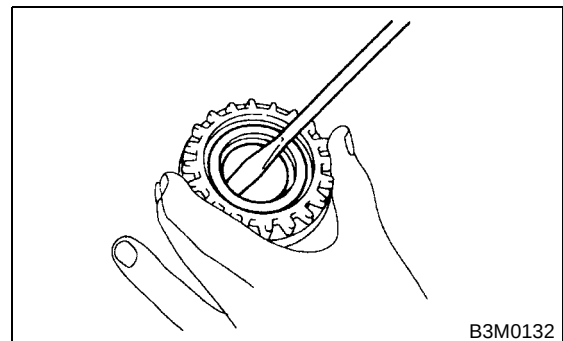
(A) Bearing race

(B) Holder

9) Remove oil seal from right and left holders with screwdriver.

CAUTION:

Perform this operation only when changing oil seal.



REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

10) Extract bearing cone with ST1 and ST2.

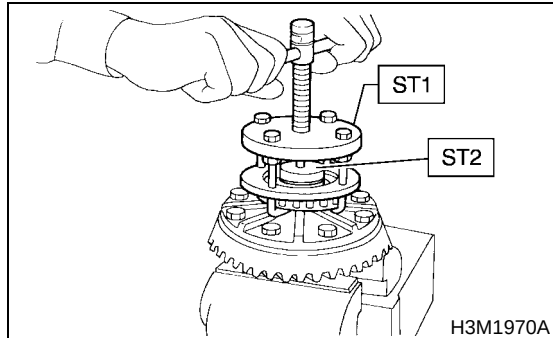
CAUTION:

Do not attempt to disassemble the parts unless necessary.

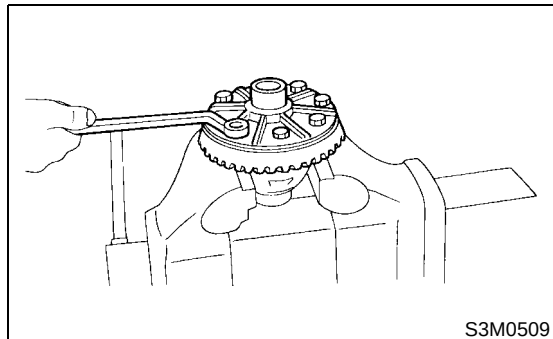
NOTE:

- 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.

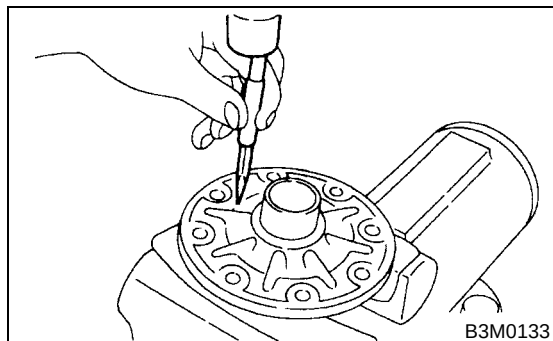


12) Drive out pinion shaft lock pin from crown gear side.

NOTE:

The lock pin is staked at the pin hole end on the differential case; do not drive it out forcibly before unstaking it.

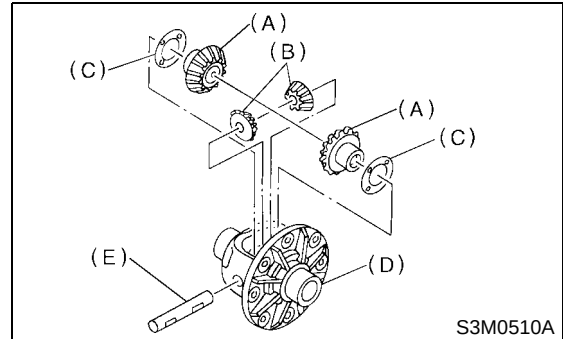
ST 899904100 STRAIGHT PIN REMOVER



13) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

NOTE:

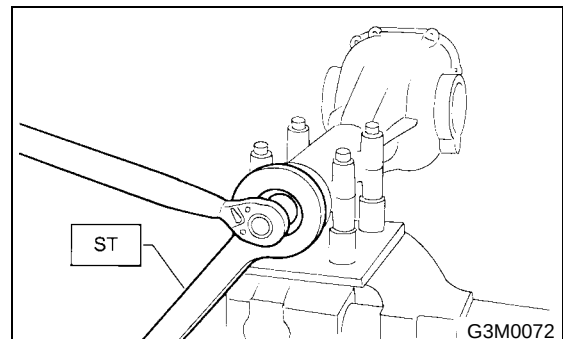
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



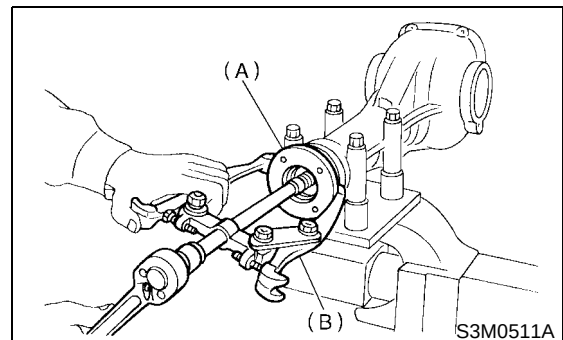
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

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

REAR DIFFERENTIAL FOR VA-TYPE

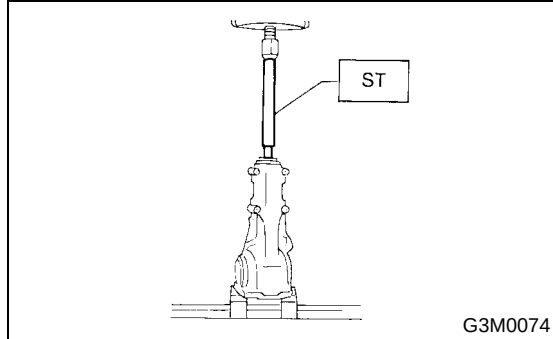
DIFFERENTIALS

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

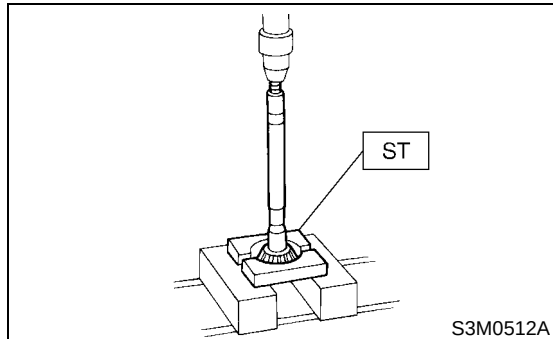


17) Remove rear bearing cone from drive pinion by supporting cone with ST.

NOTE:

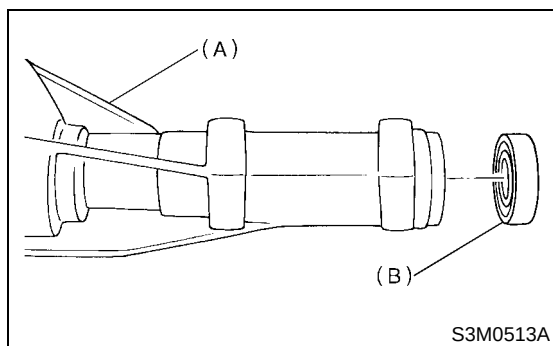
Place the replacer so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER



18) Remove front oil seal from differential carrier using ST.

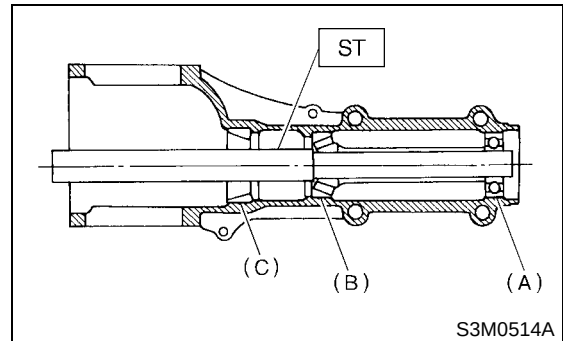
ST 398527700 PULLER SET



- (A) Differential carrier
- (B) Front oil seal

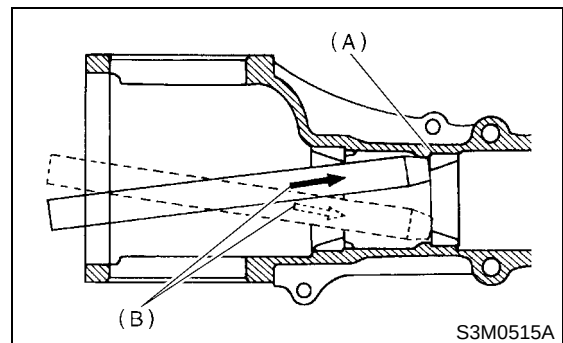
19) Remove pilot bearing together with front bearing cone using ST.

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.

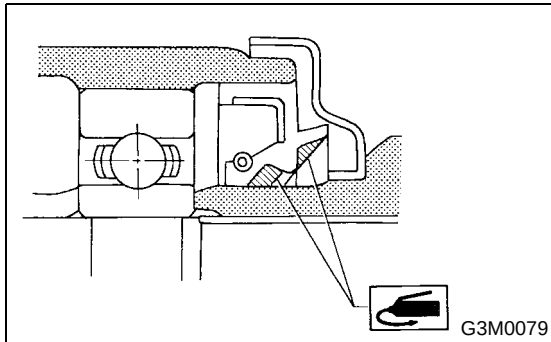
REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

D: ASSEMBLY

1) Precautions for assembling

- 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.



2) 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 into differential carrier with ST1 and ST2.

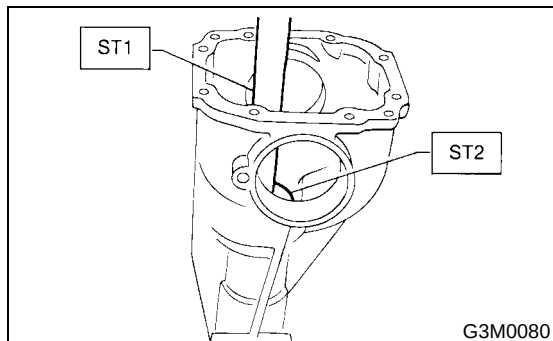
ST1 398477701 HANDLE

ST2 398477702 DRIFT

- (2) Press front bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE

ST2 498447110 DRIFT



- (3) Insert front bearing cone.

CAUTION:

Use a new front bearing cone.

- (4) Insert ST1 into case with pinion height adjusting shim and rear bearing cone fitted onto it.

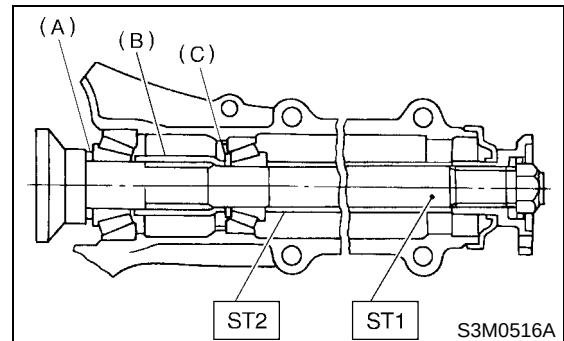
CAUTION:

- Re-use the used washer if not deformed.
- Use a new rear bearing cone.

- (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.

CAUTION:

Use a new self-locking nut.

NOTE:

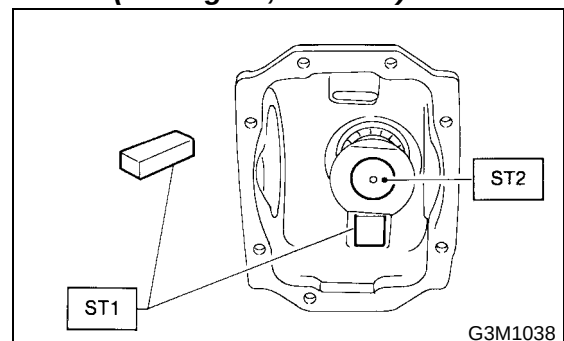
- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.

ST1 398507704 BLOCK

ST2 498447150 DUMMY SHAFT

Tightening torque:

188 N·m (19.2 kgf-m, 139 ft-lb)



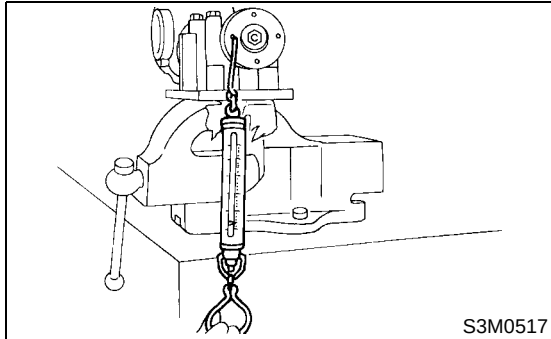
REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

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



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)
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)

REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

3) 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

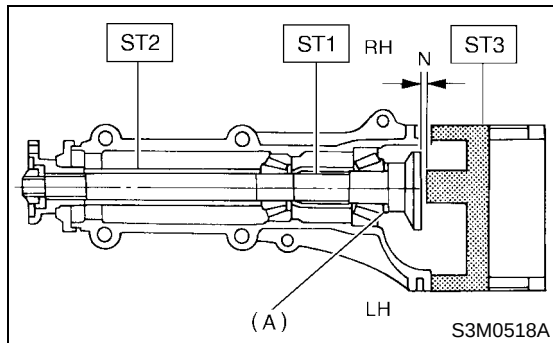
Front and rear bearing preload
For new bearing: 12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb) at companion flange bolt hole

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



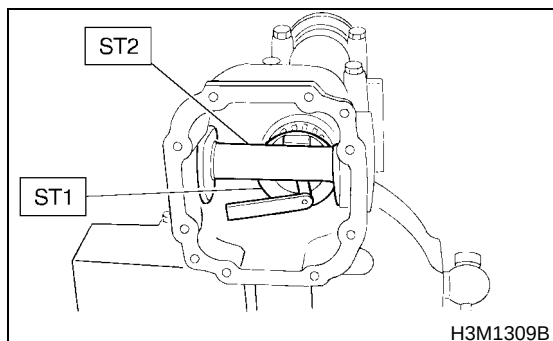
(A) Pinion height adjusting shim

- (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



- (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)

$$T_o = 0.15 \text{ mm}$$

$$N = 0.1 \text{ mm}$$

$$T = 0.15 + 0.1 - 0.05 = 0.2 \text{ mm}$$

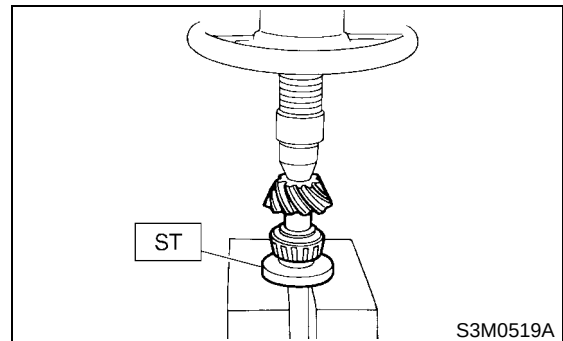
Result: Thickness = 0.2 mm

Therefore use the 32295AA220.

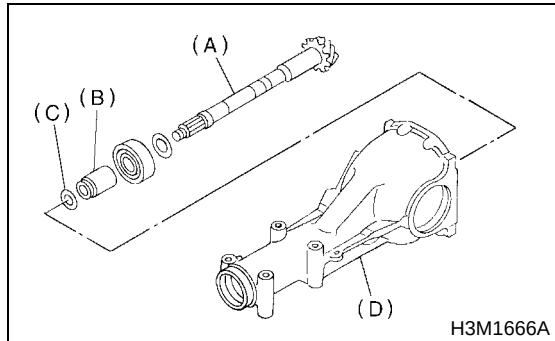
Pinion height adjusting shim	
Part No.	Thickness mm (in)
32295AA200	0.150 (0.0059)
32295AA210	0.175 (0.0069)
32295AA220	0.200 (0.0079)
32295AA230	0.225 (0.0089)
32295AA240	0.250 (0.0098)
32295AA250	0.275 (0.0108)

- 4) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 498175500 INSTALLER



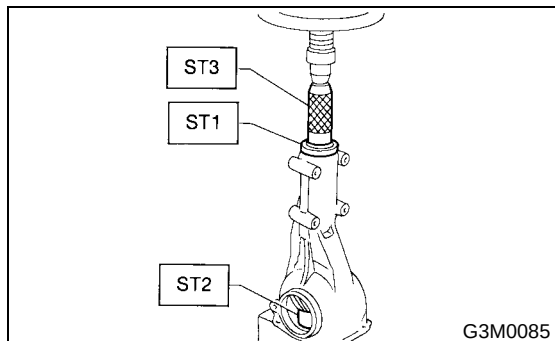
5) Insert drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



- (A) Drive pinion
- (B) Bearing preload adjusting spacer
- (C) Bearing preload adjusting washer
- (D) Differential carrier

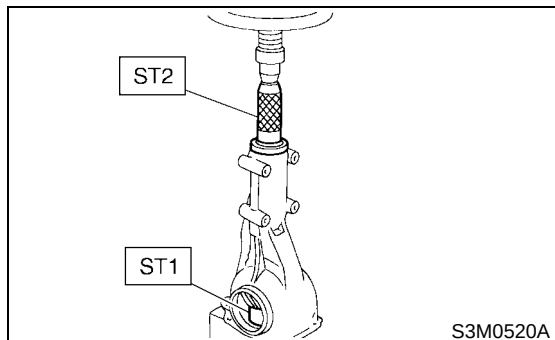
6) Press-fit front bearing cone into carrier with ST1, ST2 and ST3.

ST1 32285AA000 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



7) Insert spacer, then press-fit pilot bearing with ST1 and ST2.

ST1 399780104 WEIGHT
ST2 899580100 INSTALLER

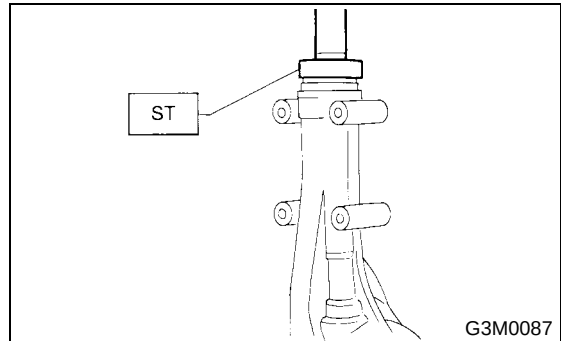


8) Fit a new oil seal with ST.

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 DRIFT

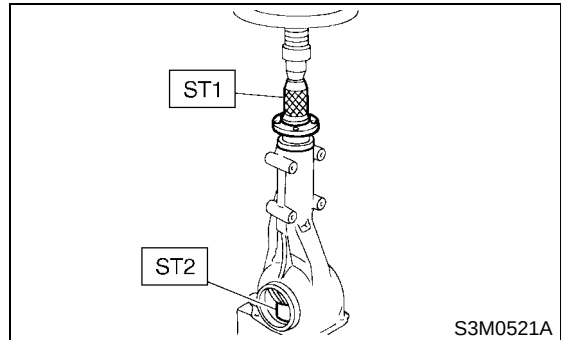


9) Press-fit companion flange with ST1 and ST2.

CAUTION:

Be careful not to damage bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT

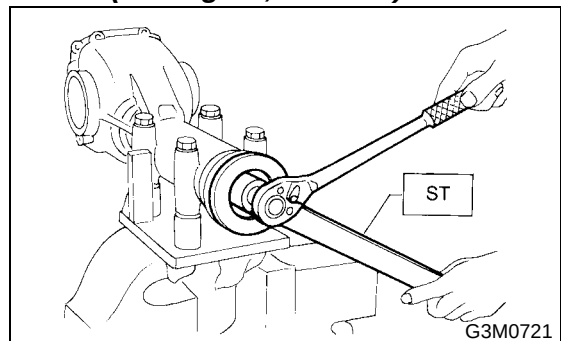


10) Install self-locking nut. Then tighten it with ST.

ST 498427200 FLANGE WRENCH

Tightening torque:

188 N·m (19.2 kgf-m, 139 ft-lb)



REAR DIFFERENTIAL FOR VA-TYPE

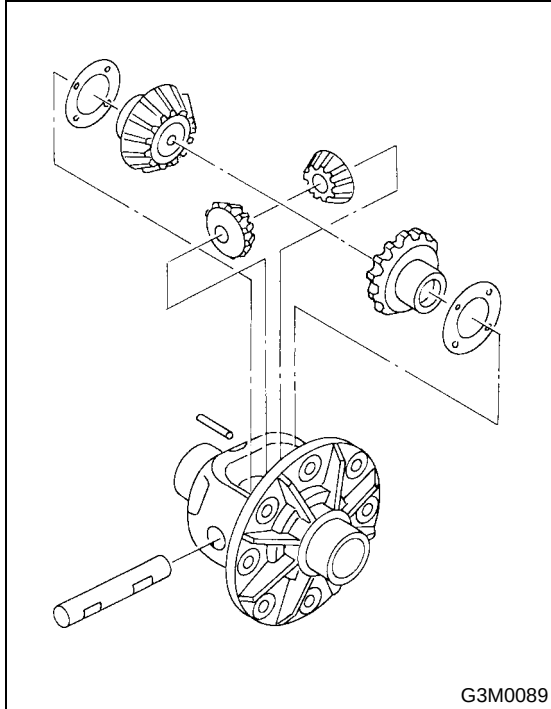
DIFFERENTIALS

11) Assembling differential case

Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

NOTE:

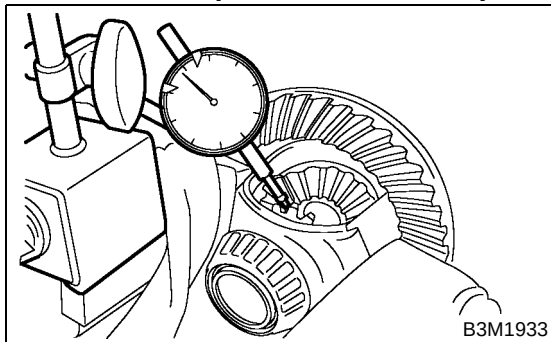
- Apply gear oil on both sides of the washer and on the side gear shaft before installing.
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(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.

(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.

CAUTION:

Before installing bolts, apply Lock Tite to bolt threads.

Lock Tite

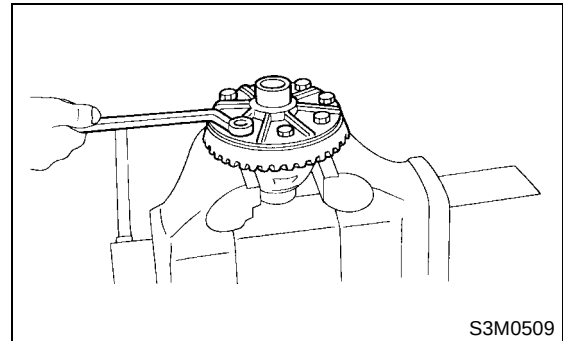
THREE BOND 1324 or equivalent

NOTE:

Tighten diagonally while tapping the bolt heads.

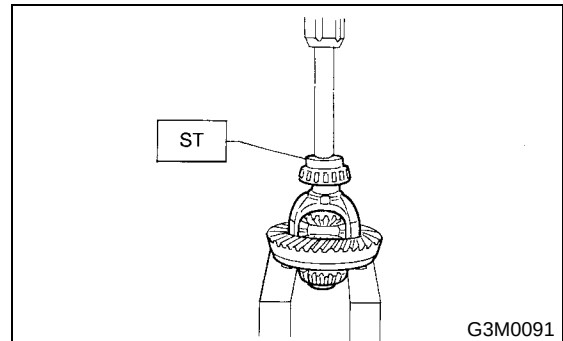
Tightening torque:

62 N·m (6.3 kgf-m, 45.6 ft-lb)



12) Press side bearing cone onto differential case with ST.

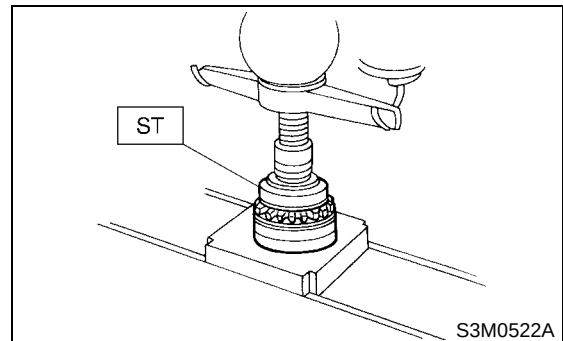
ST 498485400 DRIFT



13) Assemble holders.

(1) Install oil seal into right and left holders.

ST 498447100 DRIFT

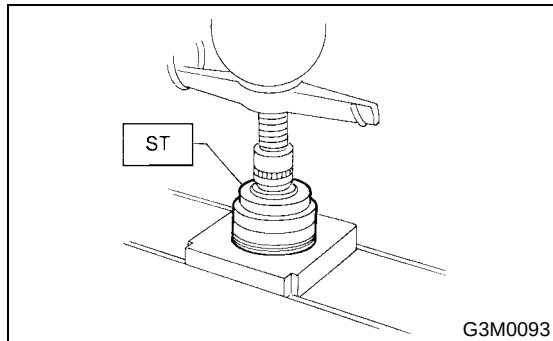


REAR DIFFERENTIAL FOR VA-TYPE

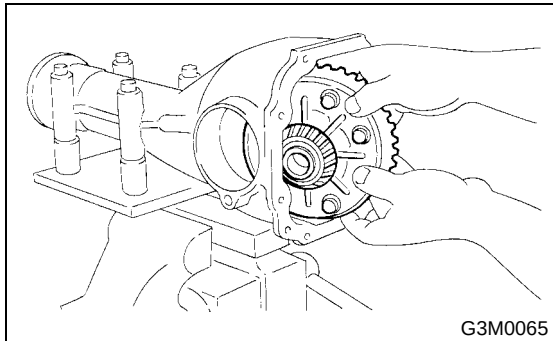
DIFFERENTIALS

- (2) Install bearing race into right and left holders.

ST 398477702 BEARING OUTER RACE
DRIFT



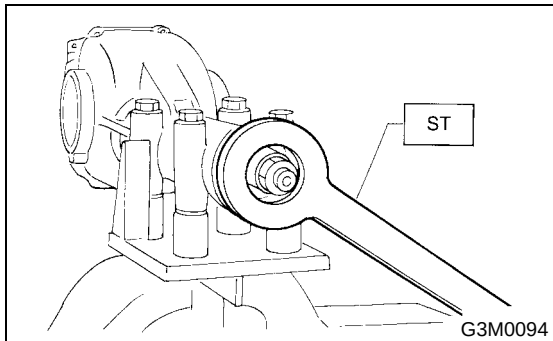
- (3) Install the differential case assembly into differential carrier in the reverse order of disassembly.



- 14) Perform adjustment of backlash of pinion crown gear set and adjustment of preload of differential side bearing.

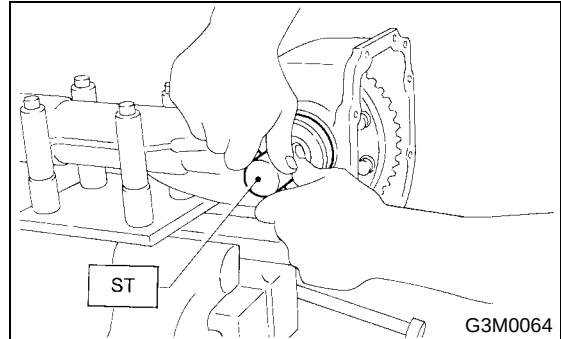
- (1) Turn drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



- (2) Screw in side (left-side) holder until light contact is made with ST.

ST 499785500 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).

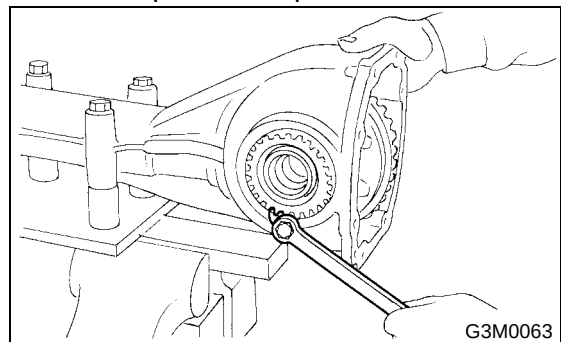
[Back off amount of side (left-side) holder + 1/2 tooth.]

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:

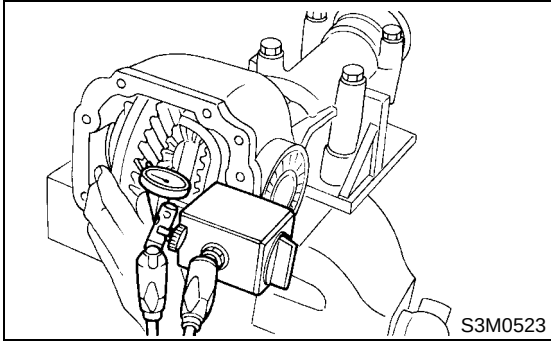
If measured backlash is not within specified range, repeat procedures for pinion crown gear set backlash adjustment and differential side bearing preload adjustment.

REAR DIFFERENTIAL FOR VA-TYPE

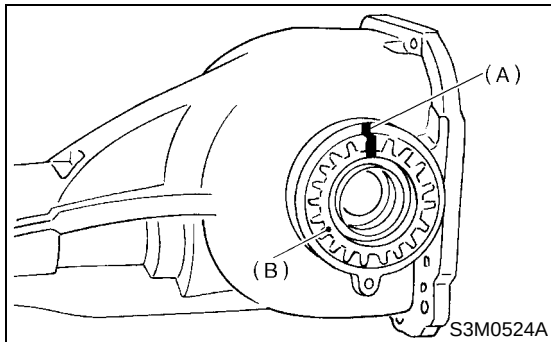
DIFFERENTIALS

Backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)



15) 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.



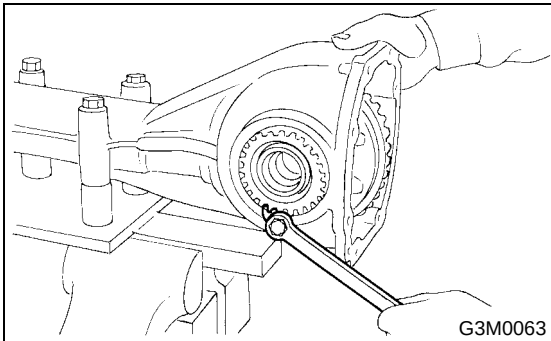
(A) Matching mark

(B) Holder

16) Tighten bolt of lock plate to specified torque.

Tightening torque:

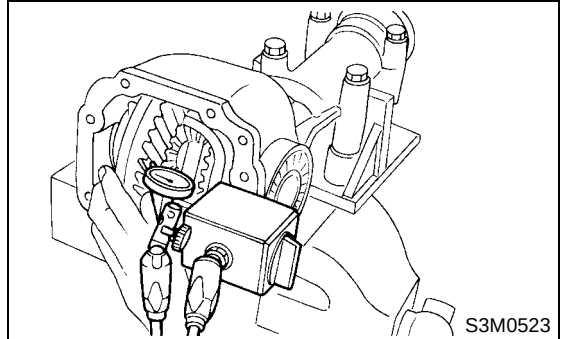
25 N·m (2.5 kgf-m, 18.1 ft-lb)



17) Re-check crown gear-to-pinion backlash.

Backlash:

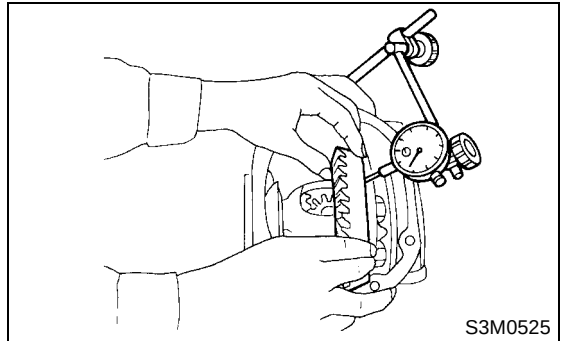
0.10 — 0.15 mm (0.0039 — 0.0059 in)



18) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotate smoothly.

Limit of runout:

0.05 mm (0.0020 in)



19) 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:

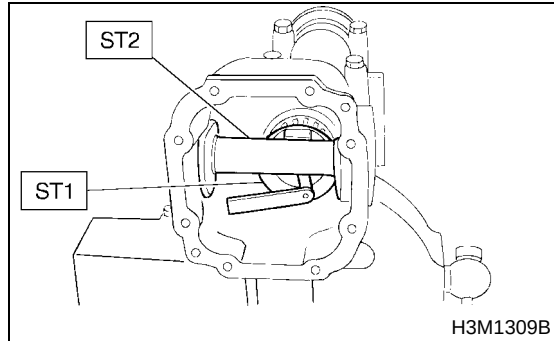
Be sure to wipe off red lead completely after adjustment is completed.

20) 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.

(1) Drive pinion height

ST1 498447150 DUMMY SHAFT

ST2 498505501 DIFFERENTIAL GAUGE



$$T = T_o + N - 0.05 \text{ (mm)}$$

where

T = Thickness of pinion height adjusting shim (mm)

T_o = Thickness of shim originally installed (mm)

N = Reading of thickness gauge (mm)

(2) Differential side bearing preload

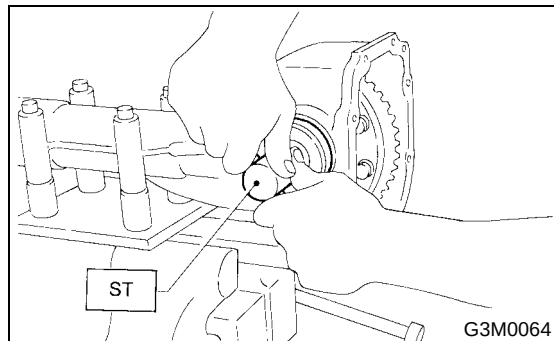
Screw in side (left-side) holder until light contact is made with ST.

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.

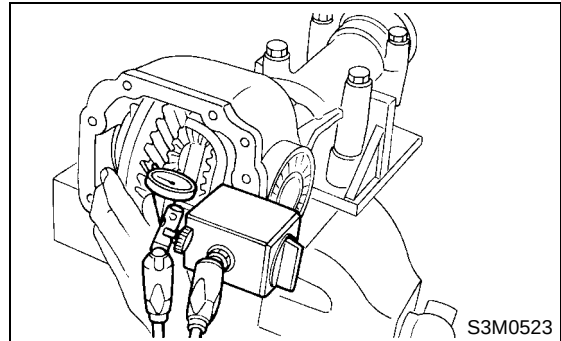
ST 499785500 WRENCH



(3) Hypoid gear backlash

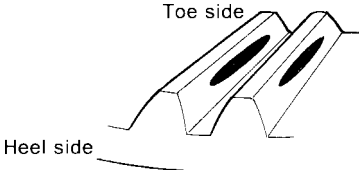
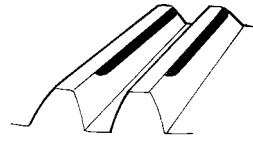
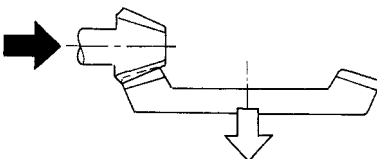
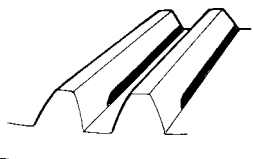
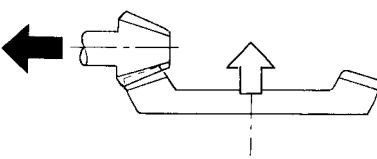
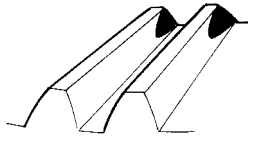
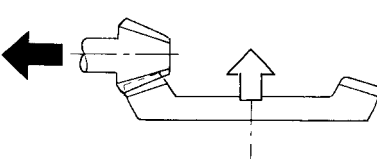
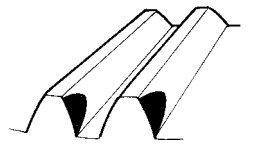
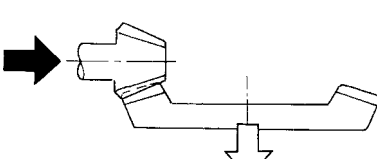
Backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)



REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

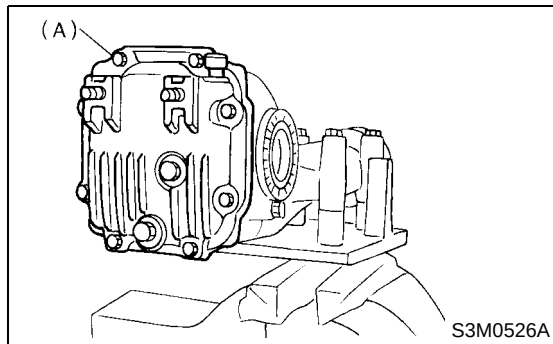
TOOTH CONTACT PATTERN		
Condition	Contact pattern	Adjustment
Correct tooth contact Tooth contact pattern slightly shifted towards toe under no load rotation. (When loaded, contact pattern moves toward heel.)	 G3M0098A	—
Face contact Backlash is too large.	This may cause noise and chipping at tooth ends.  G3M0098B	Increase thickness of drive pinion height adjusting washer in order to bring drive pinion closer to crown gear center.  G3M0098F
Flank contact Backlash is too small.	This may cause noise and stepped wear on surfaces.  G3M0098C	Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from crown gear center.  G3M0098G
Toe contact	Contact area is small. This may cause chipping at toe ends.  G3M0098D	Adjust as for flank contact.  G3M0098G
Heel contact	Contact area is small. This may cause chipping at heel ends.  G3M0098E	Adjust as for face contact.  G3M0098F

 : Adjusting direction of drive pinion
 : Adjusting direction of crown gear

21) Install rear cover and tighten bolts to specified torque.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Rear cover

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.

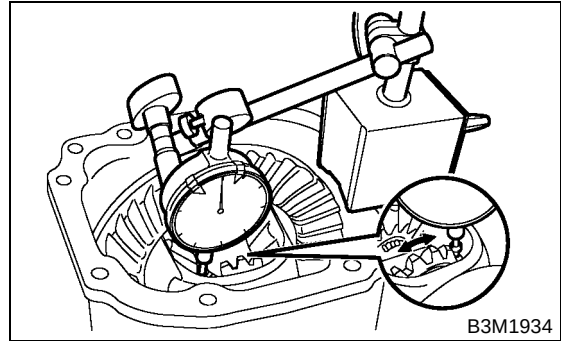
1. SIDE GEAR BACKLASH

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.



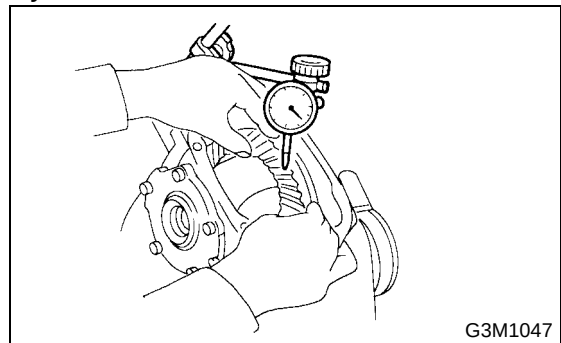
2. CROWN GEAR BACKLASH

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.



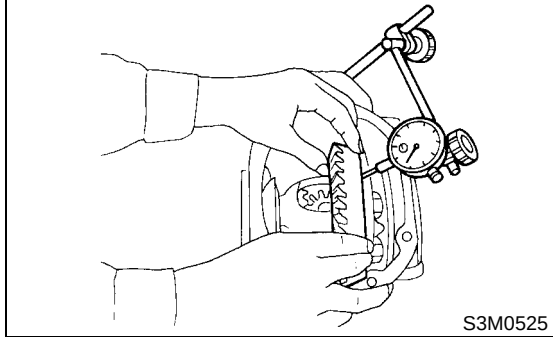
3. CROWN GEAR RUNOUT

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-46, ASSEMBLY, Rear Differential for VA-type.>

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust side gear backlash.

<Ref. to DI-46, ASSEMBLY, Rear Differential for VA-type.>

2. CROWN GEAR BACKLASH

Adjust crown gear backlash.

<Ref. to DI-46, ASSEMBLY, Rear Differential for VA-type.>

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

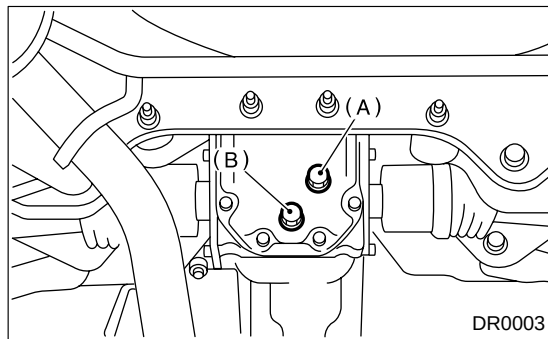
Adjust the tooth contact between crown gear and drive pinion gear.

<Ref. to DI-46, ASSEMBLY, Rear Differential for VA-type.>

6. Rear Differential Front Oil Seal

A: REPLACEMENT

- 1) Set the vehicle on the lift.
- 2) Disconnect ground cable from battery.
- 3) Move select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Remove oil drain plug, and drain gear oil.



- (A) Filler plug
(B) Drain plug

- 6) Install oil drain plug.

NOTE:

- Apply fluid packing to drain plug in T-type.
- VA-type uses a new aluminum gasket.

Tightening torque:

T-type;

49 N·m (5.0 kgf·m, 36.2 ft-lb)

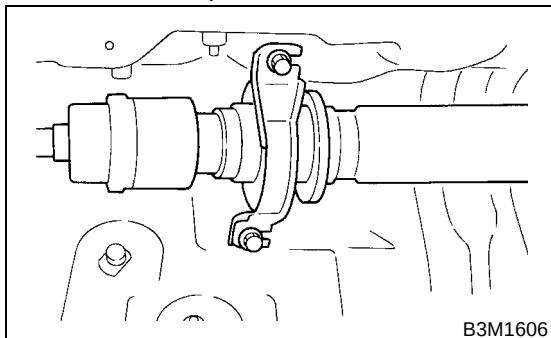
VA-type;

33 N·m (3.4 kgf·m, 24.6 ft-lb)

- 7) Jack-up rear wheels and support the vehicle body with sturdy racks.

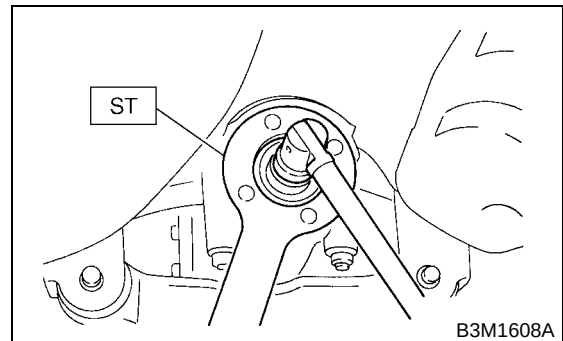
- 8) Remove rear exhaust pipe and muffler.

- 9) Remove propeller shaft from body. <Ref. to DS-16, REMOVAL, Propeller Shaft.>

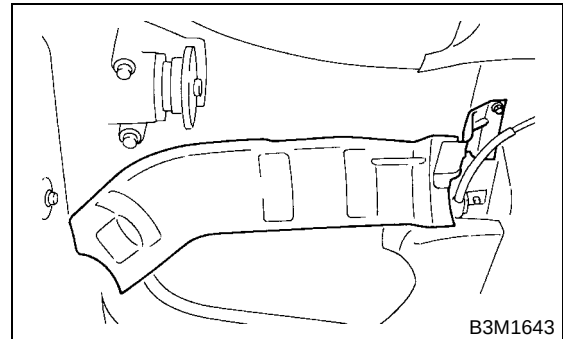


- 10) Remove self-locking nut while holding companion flange with ST.

ST 498427200 FLANGE WRENCH

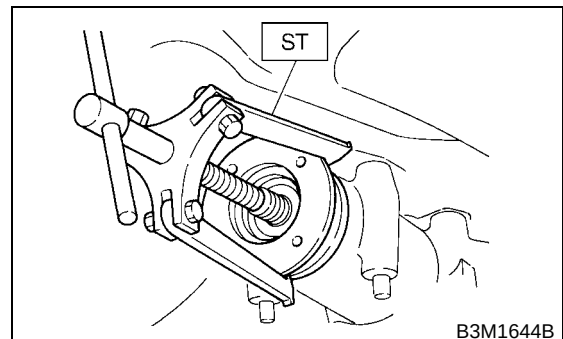


- 11) Remove tank cover.



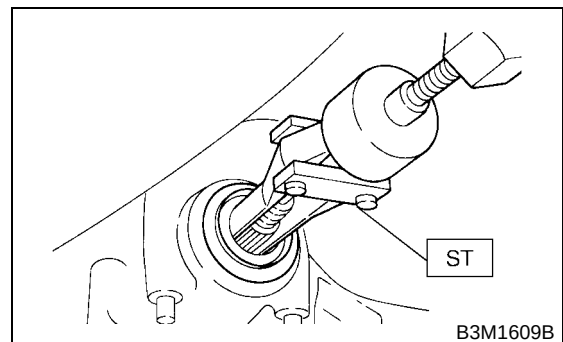
- 12) Extract companion flange using ST.

ST 399703602 PULLEY ASSY



- 13) Remove oil seal using ST.

ST 499705401 PULLER ASSY

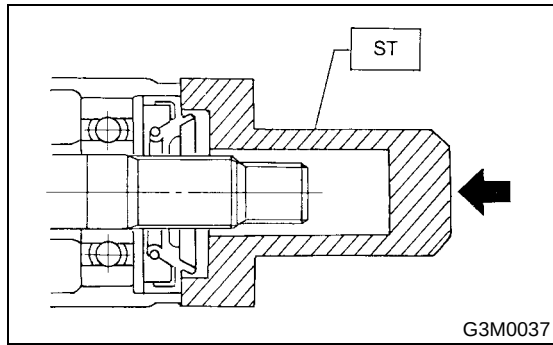


REAR DIFFERENTIAL FRONT OIL SEAL

DIFFERENTIALS

14) Fit a new oil seal using ST.

ST 498447120 DRIFT



15) Install companion flange.

NOTE:

Use a plastic hammer to install companion flange.

16) 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.

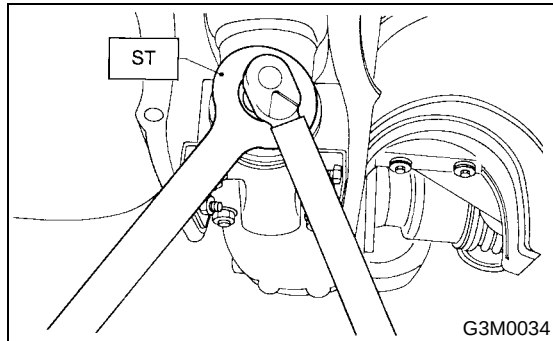
ST 498427200 FLANGE WRENCH

NOTE:

Use a new self-locking nut.

Tightening torque:

181.4 N·m (18.50 kgf-m, 133.8 ft-lb)



17) Reassembling procedure hereafter is the reverse of the disassembling.

7. Rear Differential Side Oil Seal

A: REPLACEMENT

1. T-TYPE

- 1) Disconnect ground terminal from battery.
- 2) Move select lever or gear shift lever to "N".
- 3) Release the parking brake.
- 4) Loosen both wheel nuts.
- 5) Jack-up the vehicle and support it with rigid racks.

6) Remove wheels.

7) Remove rear exhaust pipe and muffler.

Non-turbo model without OBD

<Ref. to EX(SOHCw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, REMOVAL, Muffler.>

Non-turbo model with OBD

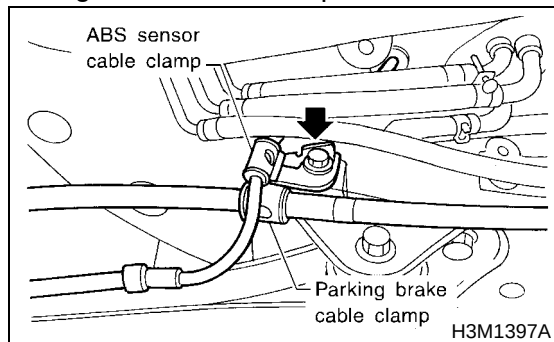
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, REMOVAL, Muffler.>

Turbo model

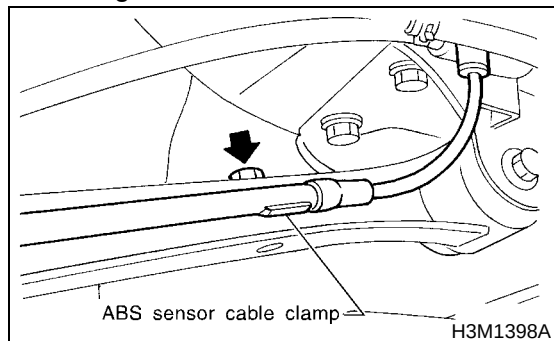
<Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>

8) Remove the DOJ of rear drive shaft from rear differential.

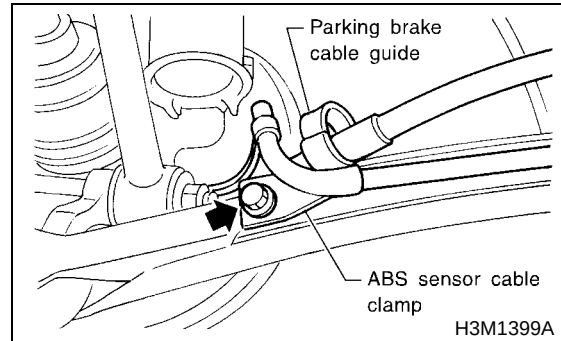
- (1) Remove the ABS sensor cable clamp and parking brake cable clamp from bracket.



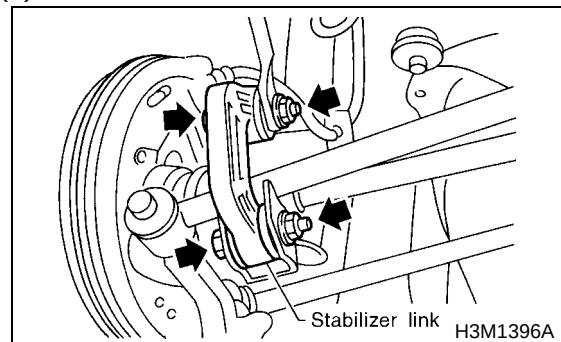
- (2) Remove the ABS sensor cable clamp from the trailing link.



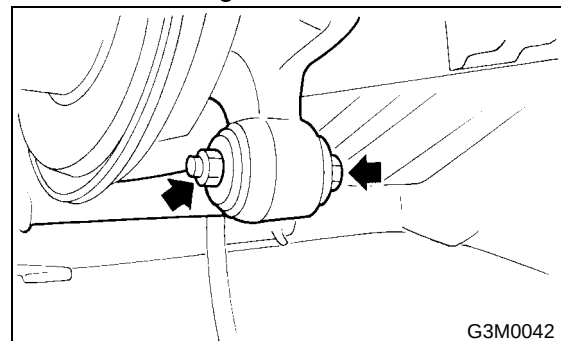
- (3) Remove the ABS sensor cable clamp and parking brake cable guide from the trailing link.



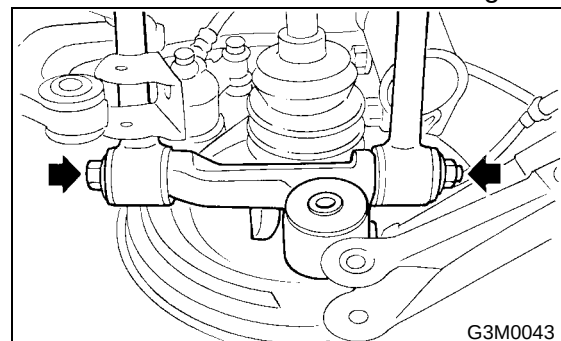
- (4) Remove the rear stabilizer link.



- (5) Remove the bolts which secure the trailing link to the housing.



- (6) Remove the bolts which secure the front and rear lateral link to the rear housing.



REAR DIFFERENTIAL SIDE OIL SEAL

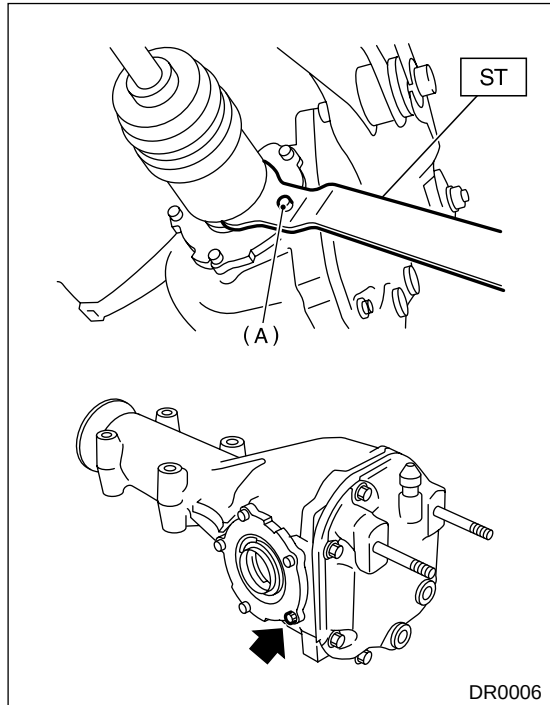
DIFFERENTIALS

- (7) Remove the DOJ from the rear differential by using ST.

CAUTION:

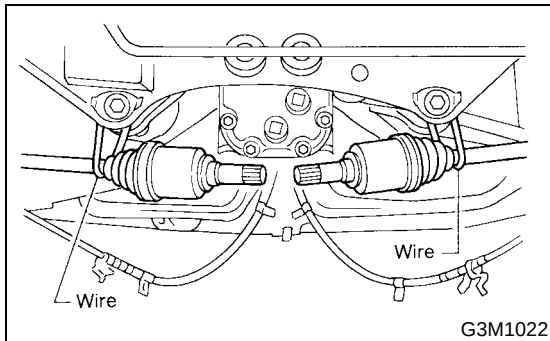
When removing the DOJ from the rear differential, fit ST to the bolts as shown in figure so as not to damage the side bearing retainer.

ST 208099PA100 DRIVE SHAFT REMOVER

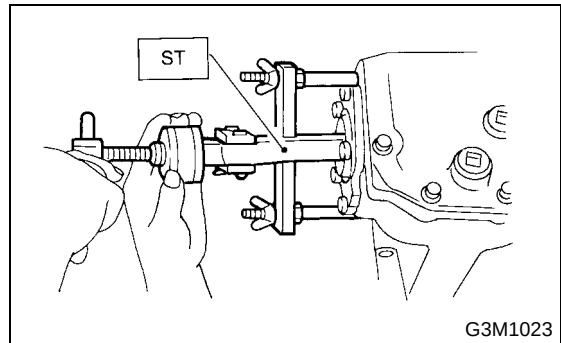


(A) Bolt

- 9) Remove rear drive shaft to rear crossmember using wire.



- 10) Remove nut of protector.
ST 398527700 PULLER ASSY

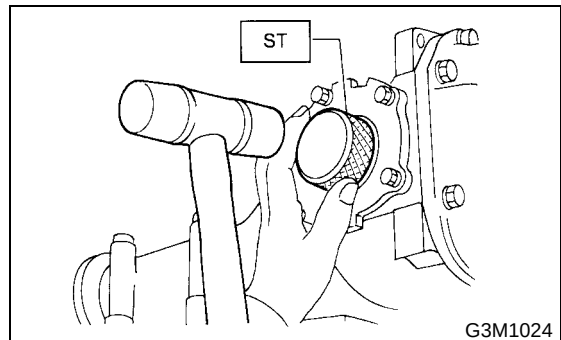


- 11) Drive in a new side oil seal with ST.

CAUTION:

Apply chassis grease between the oil seal lips.

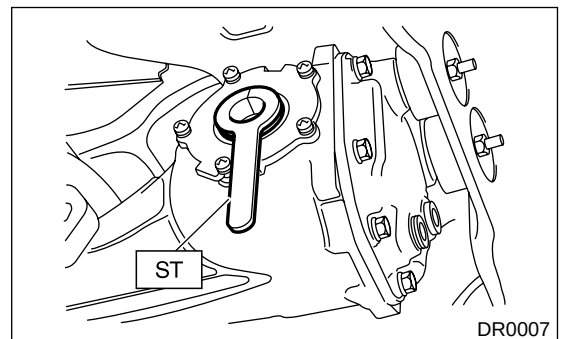
ST 398437700 DRIFT



- 12) Insert the DOJ into rear differential.

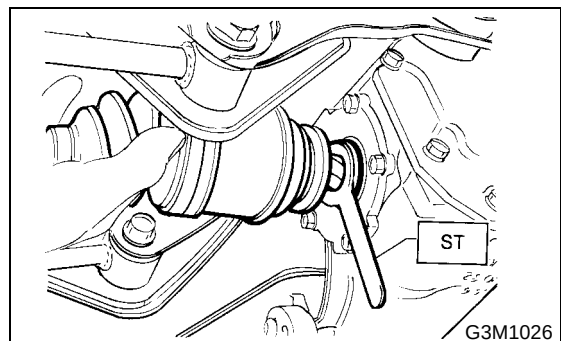
(1) Install ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal using ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(3) Remove ST.
ST 28099PA090 SIDE OIL SEAL PROTECTOR

13) Hereafter, re-assemble in reverse order of disassembly.

2. VA-TYPE

- 1) Disconnect ground terminal from battery.
- 2) Move select lever or gear shift lever to "N".
- 3) Release the parking brake.
- 4) Loosen both wheel nuts.
- 5) Jack-up the vehicle and support it with rigid racks.

6) Remove wheels.

7) Remove rear exhaust pipe and muffler.

Non-turbo model without OBD

<Ref. to EX(SOHCw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, REMOVAL, Muffler.>

Non-turbo model with OBD

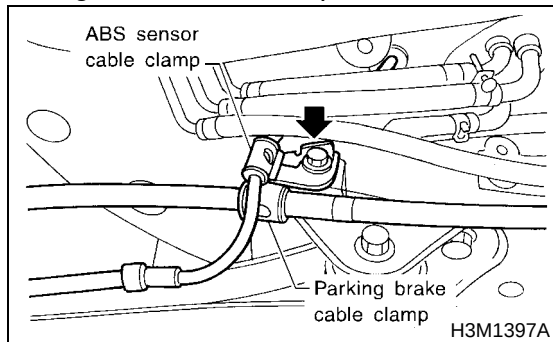
<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, REMOVAL, Muffler.>

Turbo model

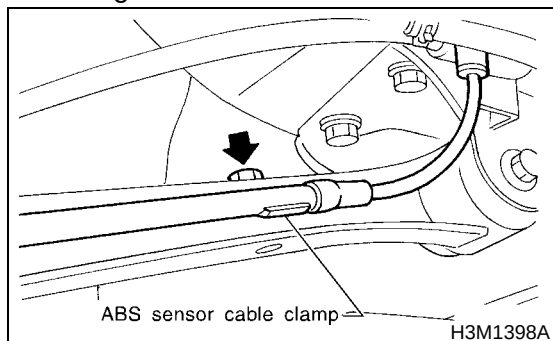
<Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>

8) Remove the DOJ of rear drive shaft from rear differential.

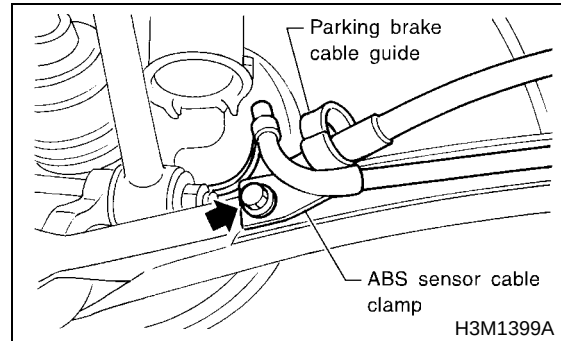
- (1) Remove the ABS sensor cable clamp and parking brake cable clamp from bracket.



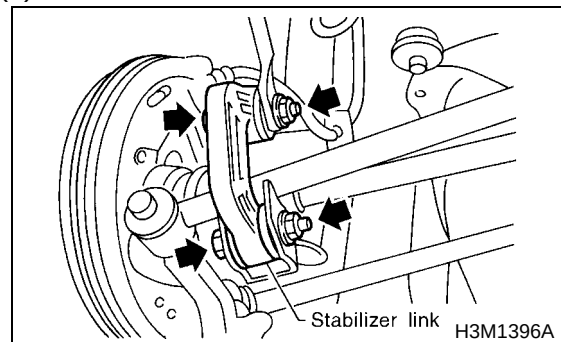
- (2) Remove the ABS sensor cable clamp from the trailing link.



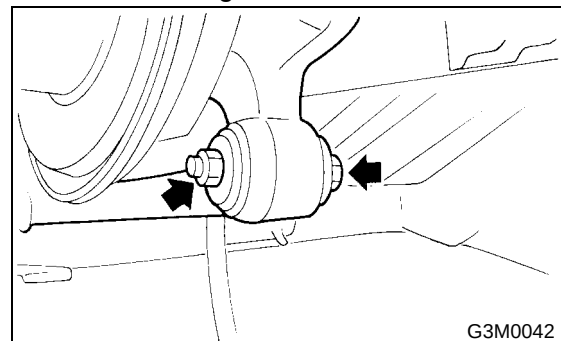
- (3) Remove the ABS sensor cable clamp and parking brake cable guide from the trailing link.



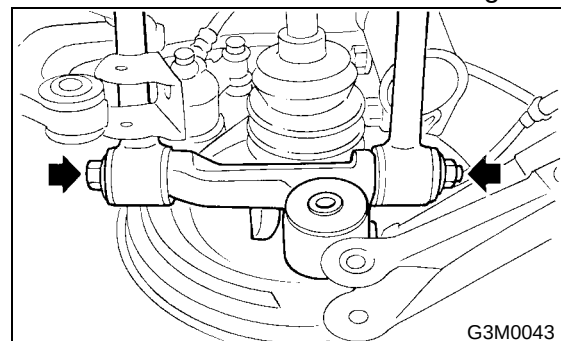
- (4) Remove the rear stabilizer link.



- (5) Remove the bolts which secure the trailing link to the housing.



- (6) Remove the bolts which secure the front and rear lateral link to the rear housing.



- (7) Remove the DOJ from the rear differential with tire lever.

CAUTION:

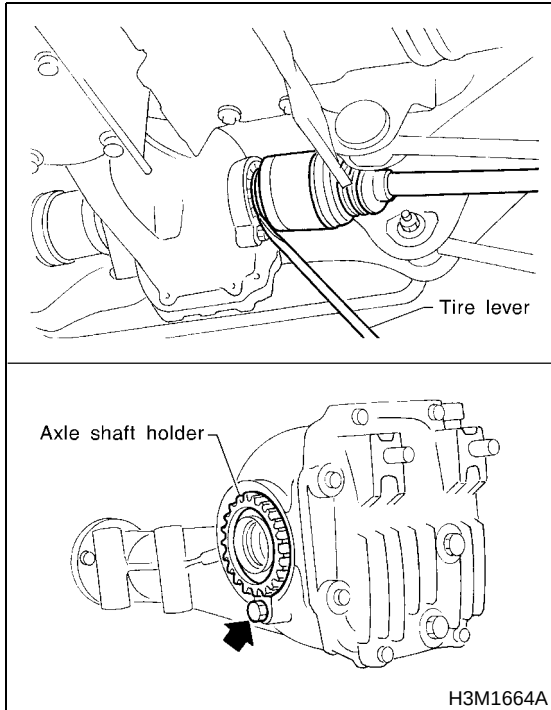
When removing the DOJ from the rear differential, fit tire lever to the bolt as shown in figure so as not to damage the axle shaft holder.

REAR DIFFERENTIAL SIDE OIL SEAL

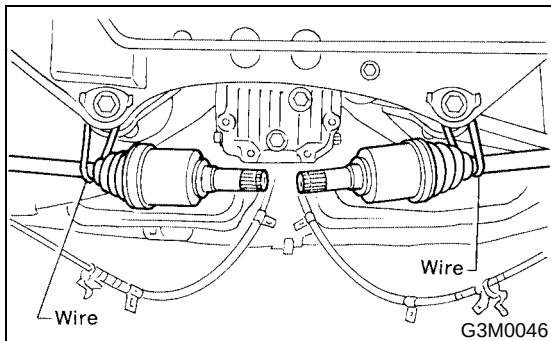
DIFFERENTIALS

NOTE:

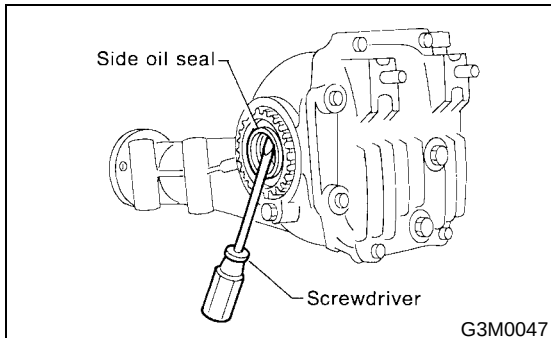
The side spline shaft circlip comes out together with the shaft.



9) Secure rear drive shaft to rear crossmember using wire.



10) Remove oil seal with screwdriver.

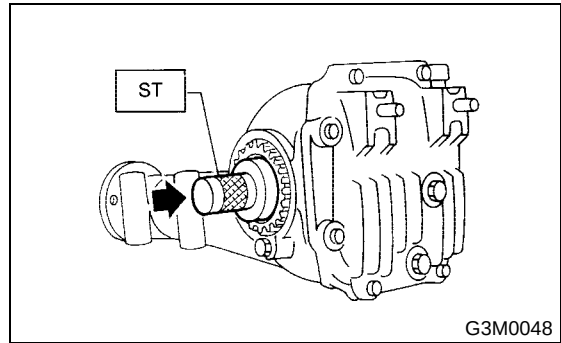


11) Drive in a new side oil seal with ST.

CAUTION:

Apply chassis grease between the oil seal lips.

ST 498447100 OIL SEAL INSTALLER



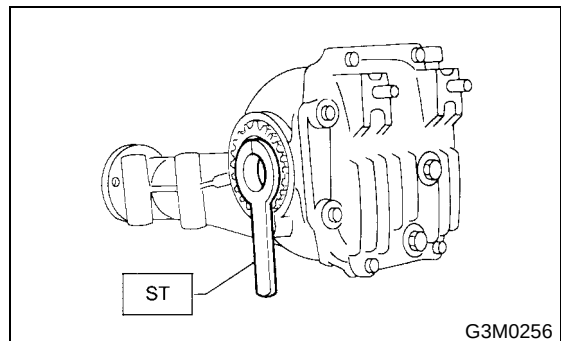
12) Insert the DOJ into rear differential.

CAUTION:

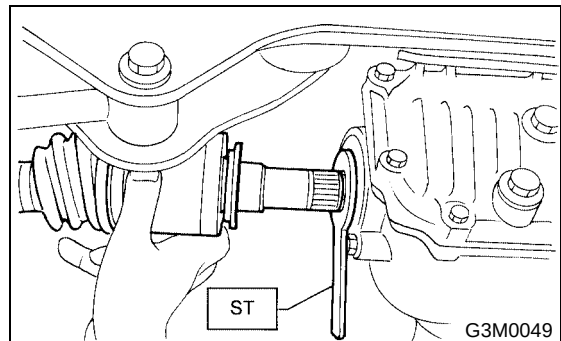
Before inserting, replace the circlip at the end of the spline shaft with a new one.

(1) Install ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal.



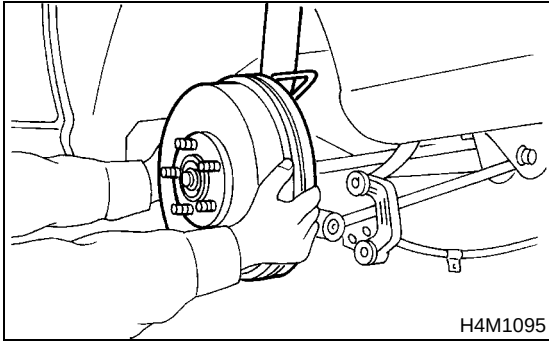
(3) Remove ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

(4) Completely insert DOJ into rear differential by pressing rear housing.

NOTE:

Make sure that oil seal lip is not folded over inward.



13) Hereafter, re-assemble in reverse order of dis-assembly.

8. Rear Differential Member

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Move selector lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Loosen wheel nuts.
- 6) Jack-up vehicle and support it with study racks.
- 7) Remove wheels.
- 8) Remove rear exhaust pipe and muffler.

Non-turbo model without OBD

<Ref. to EX(SOHCw/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHCw/oOBD)-14, REMOVAL, Muffler.>

Non-turbo model with OBD

<Ref. to EX(SOHC)-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(SOHC)-12, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(DOHC TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(DOHC TURBO)-14, REMOVAL, Muffler.>

- 9) Remove rear differential front member.

NOTE:

When removing rear differential front member, work the removal procedure as rear differential.

T-type

<Ref. to DI-25, REMOVAL, Rear Differential for T-type.>

VA-type

<Ref. to DI-40, REMOVAL, Rear Differential for VA-type.>

- 10) Remove differential rear member.

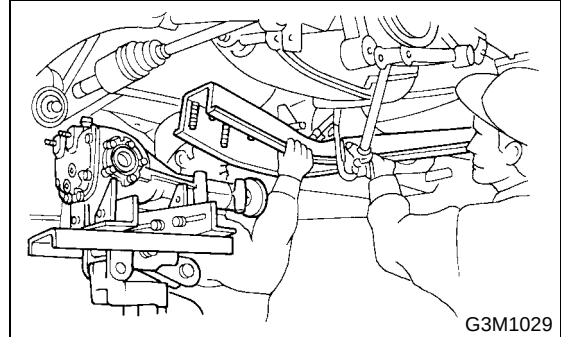
B: INSTALLATION

To install, reverse the removal sequence.

- 1) Position front member on body by passing it under parking brake cable and securing to rear differential.

NOTE:

When installing rear differential front member, do not confuse the installation sequence of the stopper.

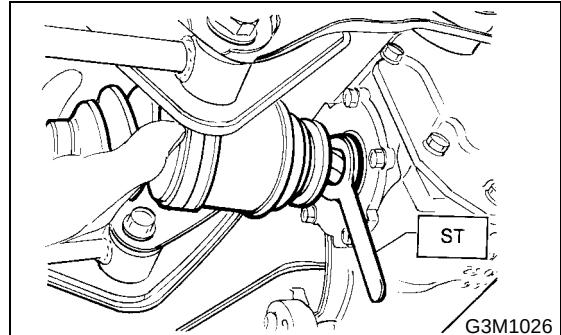


- 2) Insert DOJ of rear drive shaft into rear differential. <Ref. to DI-59, REPLACEMENT, Rear Differential Side Oil Seal.>

CAUTION:

Before inserting, replace the differential side oil seal with a new one.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



- 3) Installing procedure hereafter is in the reverse order of removal.

C: INSPECTION

- 1) Check rear differential member for damage, bend, or corrosion.

If damage, bend, or corrosion is excessive, replace rear differential member.

- 2) Check bushings of rear differential member for cracking, hardening, or damage.

If cracking, hardening, or damage is excessive, replace rear differential member.

9. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	(1) Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered, or excessively worn sliding surface of companion flange.	Repair or replace.
	(2) Clogged or damaged air breather.	Clean, repair or replace.
	(3) Loose bolts on differential spindle or side retainer, or incorrectly fitted O-ring.	Tighten bolts to specified torque. Replace O-ring.
	(4) Loose rear cover attaching bolts or damaged gasket.	Tighten bolts to specified torque. Replace gasket and apply liquid packing.
	(5) Loose oil filler or drain plug.	Retighten and apply liquid packing.
	(6) Wear, damage or incorrectly fitting for spindle, 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.	(1) Insufficient backlash for hypoid gear.	Readjust or replace.
	(2) Excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) 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.	(1) Improper backlash for hypoid gear.	Replace.
	(2) Insufficient or excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) Excessive backlash for differential gear.	Replace gear or thrust washer.
	(4) Loose bolts and nuts such as crown gear bolt.	Retighten.
	(5) 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.	(1) Excessive backlash for hypoid gear.	Readjust.
	(2) Excessive backlash for differential gear.	Replace gear or thrust washer.
	(3) Insufficient preload for front or rear bearing.	Readjust.
	(4) Loose drive pinion nut.	Tighten to specified torque.
	(5) Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace.
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Seized or damaged side bearing.	Replace.

GENERAL DIAGNOSTIC TABLE

DIFFERENTIALS

Symptom or trouble	Possible cause	Remedy
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.	(1) Improper tooth contact of hypoid gear.	Readjust or replace hypoid gear set.
	(2) Improper backlash for hypoid gear.	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
	(4) Seized hypoid gear.	Replace hypoid gear set.
	(5) Improper preload for front or rear bearings.	Readjust.
	(6) Seized, scored, or chipped front or rear bearing.	Replace.
	(7) Seized, scored, or chipped side bearing.	Replace.
	(8) Vibrating differential carrier.	Replace.

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

TRANSFER CASE

TC

	Page
1. General Description	2
2. Transfer Case and Extension for MT	3
3. Transfer Clutch and Extension for AT	4
4. Oil Seal.....	5
5. Transfer Drive Gear (MT).....	6
6. Transfer Driven Gear (MT).....	7
7. Reduction Drive Gear without VTD	8
8. Reduction Driven Gear without VTD	9
9. Center Differential	10
10. Transfer Clutch Pressure Test	11
11. Transfer Duty Solenoid and Valve Body	12

1. General Description

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE) and "AT" 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-50, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch and Extension for AT

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE).

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to "AT" or "MT" section.

AT model:

<Ref. to AT-27, Extension Case Oil Seal.>

MT model:

<Ref. to MT-45, Oil Seal.>

5. Transfer Drive Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-55, Transfer Drive Gear.>

6. Transfer Driven Gear (MT)**A: NOTE**

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-57, Transfer Driven Gear.>

7. Reduction Drive Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE).

8. Reduction Driven Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE).

9. Center Differential

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-59, Center Differential.>

10. Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to “AT” section. <Ref. to AT-18, Transfer Clutch Pressure Test.>

11. Transfer Duty Solenoid and Valve Body

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0853ZE).

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DRIVE SHAFT SYSTEM

DS

	Page
1. General Description	2
2. Propeller Shaft	16
3. Front Axle	19
4. Rear Axle	24
5. Front Drive Shaft	32
6. Rear Drive Shaft.....	37
7. General Diagnostic Table.....	41

GENERAL DESCRIPTION

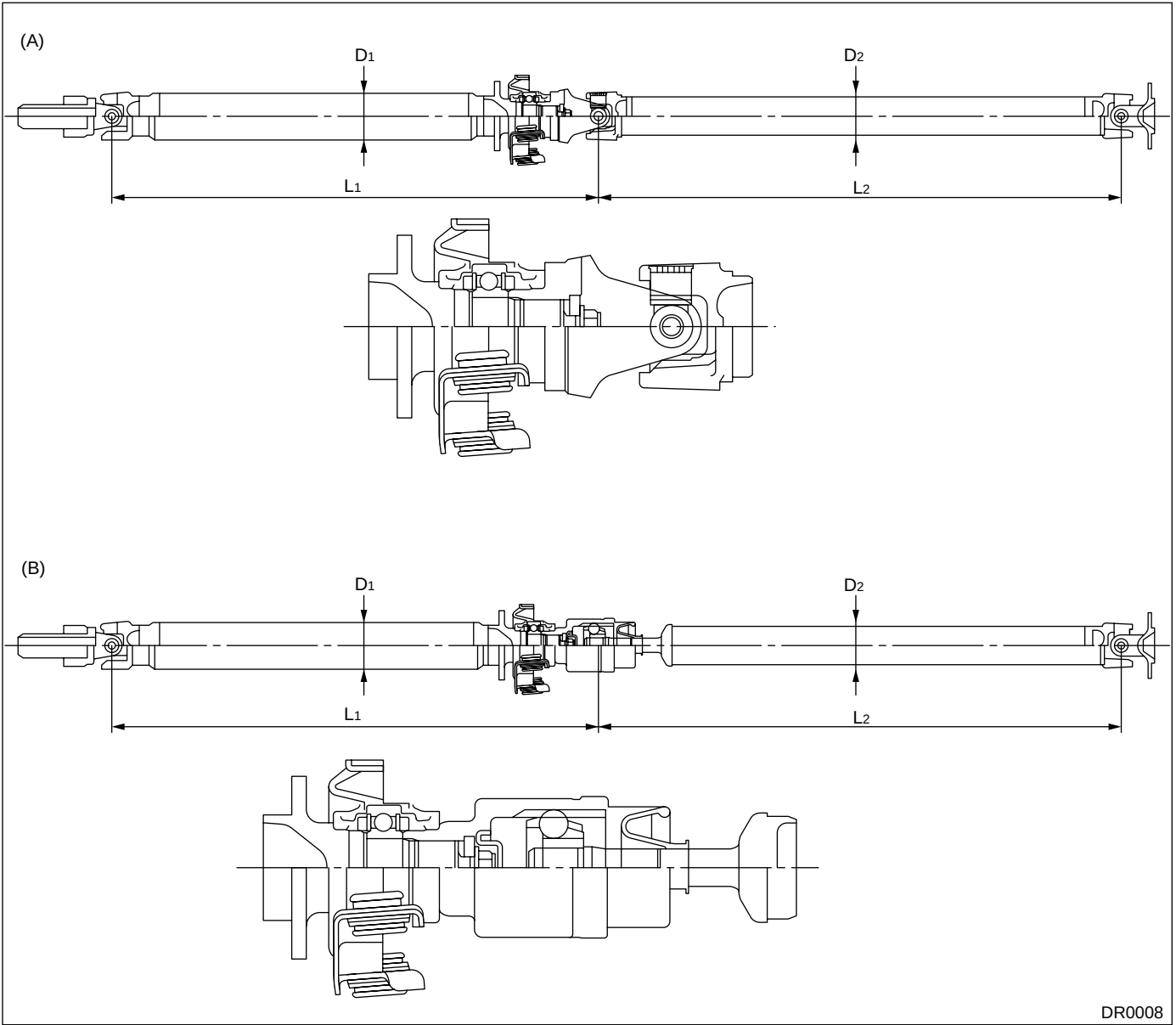
DRIVE SHAFT SYSTEM

1. General Description

A: SPECIFICATIONS

1. PROPELLER SHAFT

Propeller shaft type		DOJ type	UJ type
Front propeller shaft Joint-to-joint length: L ₁ mm (in)	AT	—	584 (22.99)
	MT	638 (25.12)	643 (25.32)
Rear propeller shaft Joint-to-joint length: L ₂ mm (in)		713 (28.07)	708 (27.87)
Outside diameter of tube: mm (in)	D ₁	63.5 (2.500)	
	D ₂	57.0 (2.244)	



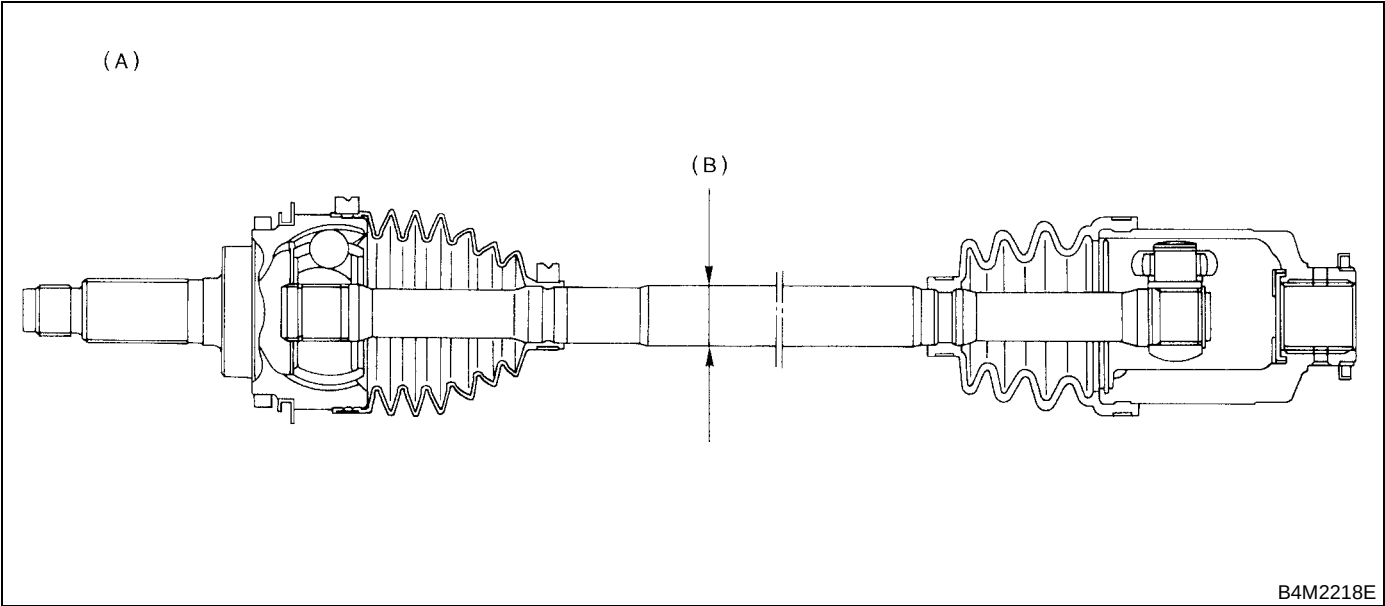
DR0008

(A) UJ type (Non-turbo model)

(B) DOJ type (Turbo model)

2. FRONT DRIVE SHAFT ASSEMBLY

Type of drive shaft assembly	SHAFT	
	Shaft diameter	
EBJ87+SFJ82	Non-turbo	26 mm (1.02 in)
	Turbo	28 mm (1.10 in)



(A) EBJ87+SFJ82

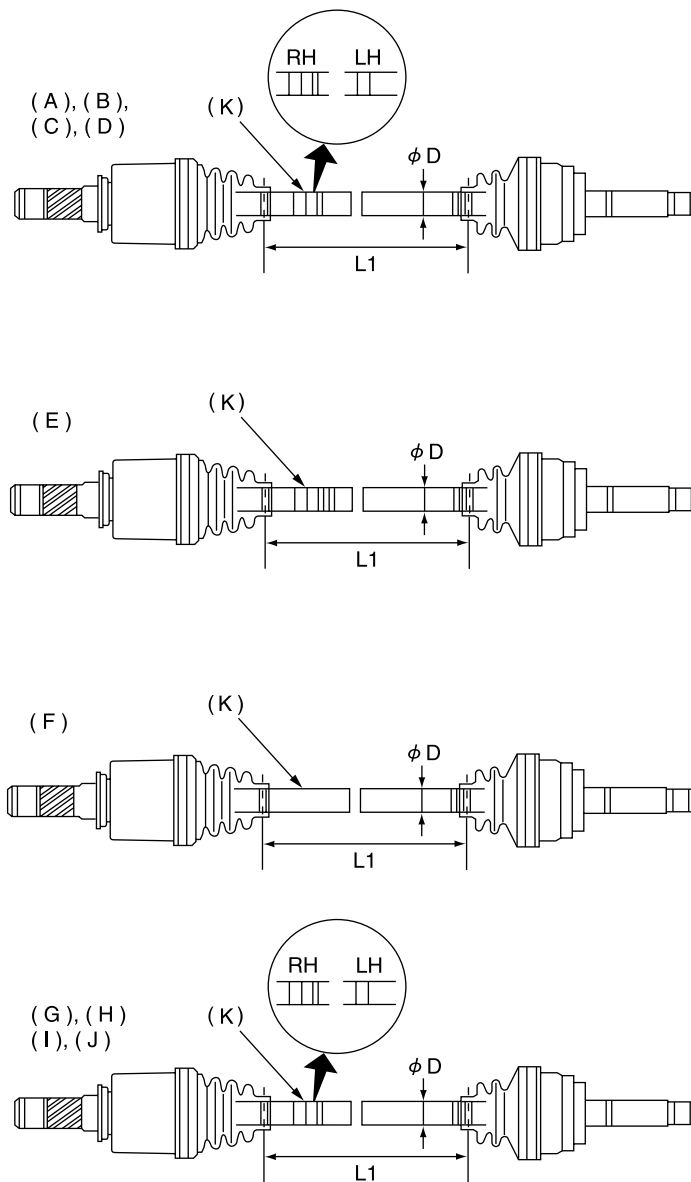
(B) Measuring point

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

3. REAR DRIVE SHAFT ASSEMBLY

	Size	Model	No. of identification protrusion on shaft	L1 (mm)	ϕ D (mm)
A	EBJ82/DOJ82 Sedan RH	Sedan Turbo	2 (Two)	363	24
B	EBJ82/DOJ82 Sedan LH		1 (One)	353	24
C	BJ79/DOJ79 Sedan R160RH	Sedan 2.0L NA MT	2 (Two)	368	23
D	BJ79/DOJ79 Sedan R160LH		1 (One)	358	23
E	BJ79/DOJ79 Sedan R152R/L	Sedan 1.6L, 2.0L NA AT	3 (Three)	363	23
F	BJ79/DOJ79 Wagon R152R/L	Wagon 1.6L, 2.0L NA AT	None	355	23
G	EBJ82/DOJ82 Wagon RH	Wagon Turbo	2 (Two)	353	24
H	EBJ82/DOJ82 Wagon LH		1 (One)	343	24
I	BJ79/DOJ79 Wagon R160RH	Wagon 2.0L NA MT	2 (Two)	358	23
J	BJ79/DOJ79 Wagon R160LH		1 (One)	348	23



DR0009

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

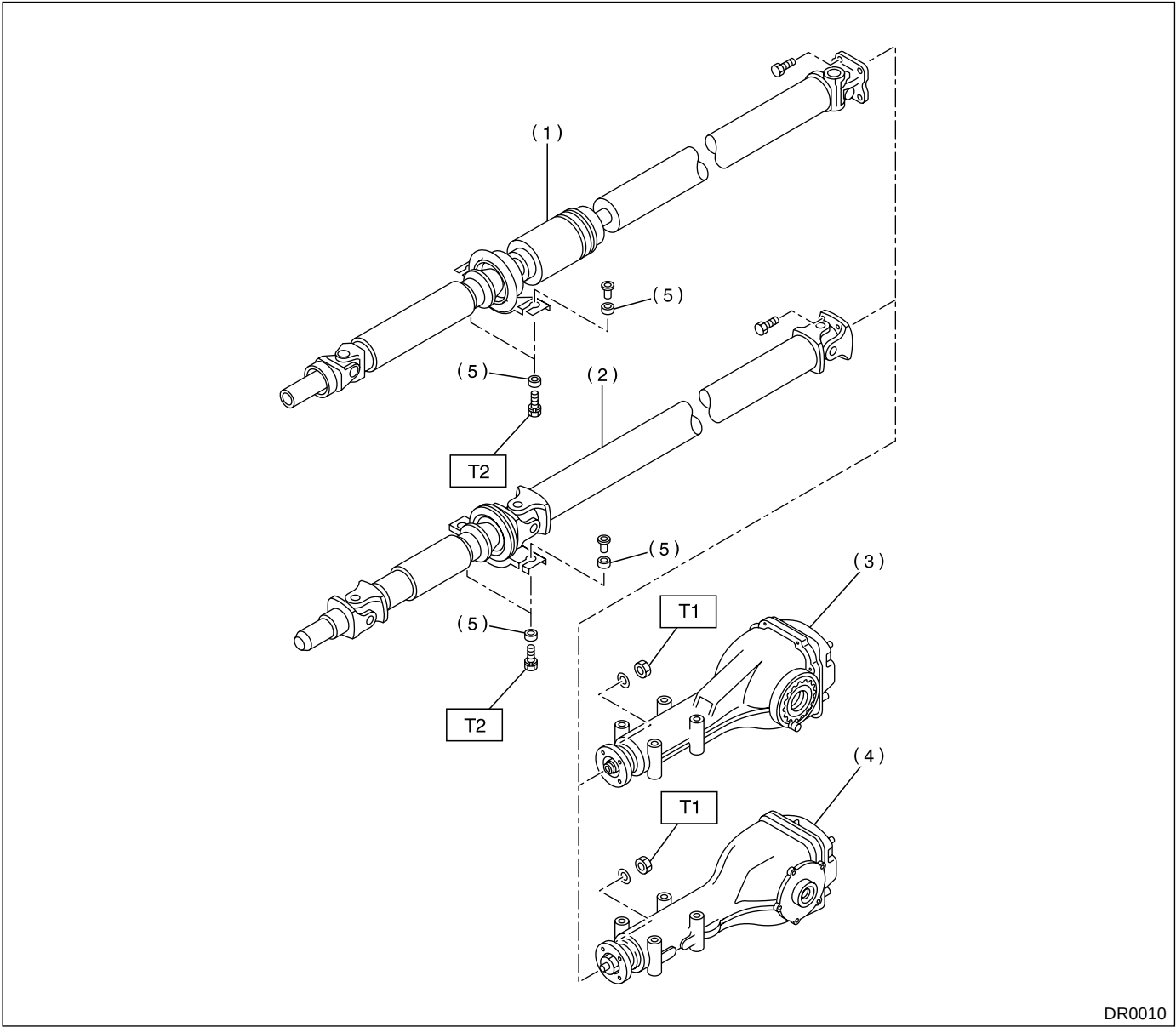
(A)	EBJ82/DOJ82 Sedan RH	(E)	BJ79/DOJ79 Sedan R152R/L	(I)	BJ79/DOJ79 Wagon R160RH
(B)	EBJ82/DOJ82 Sedan LH	(F)	BJ79/DOJ79 Wagon R152R/L	(J)	BJ79/DOJ79 Wagon R160LH
(C)	BJ79/DOJ79 Sedan R160RH	(G)	EBJ82/DOJ82 Wagon RH	(K)	Identification protrusion
(D)	BJ79/DOJ79 Sedan R160LH	(H)	EBJ82/DOJ82 Wagon LH		

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

B: COMPONENT

1. PROPELLER SHAFT



DR0010

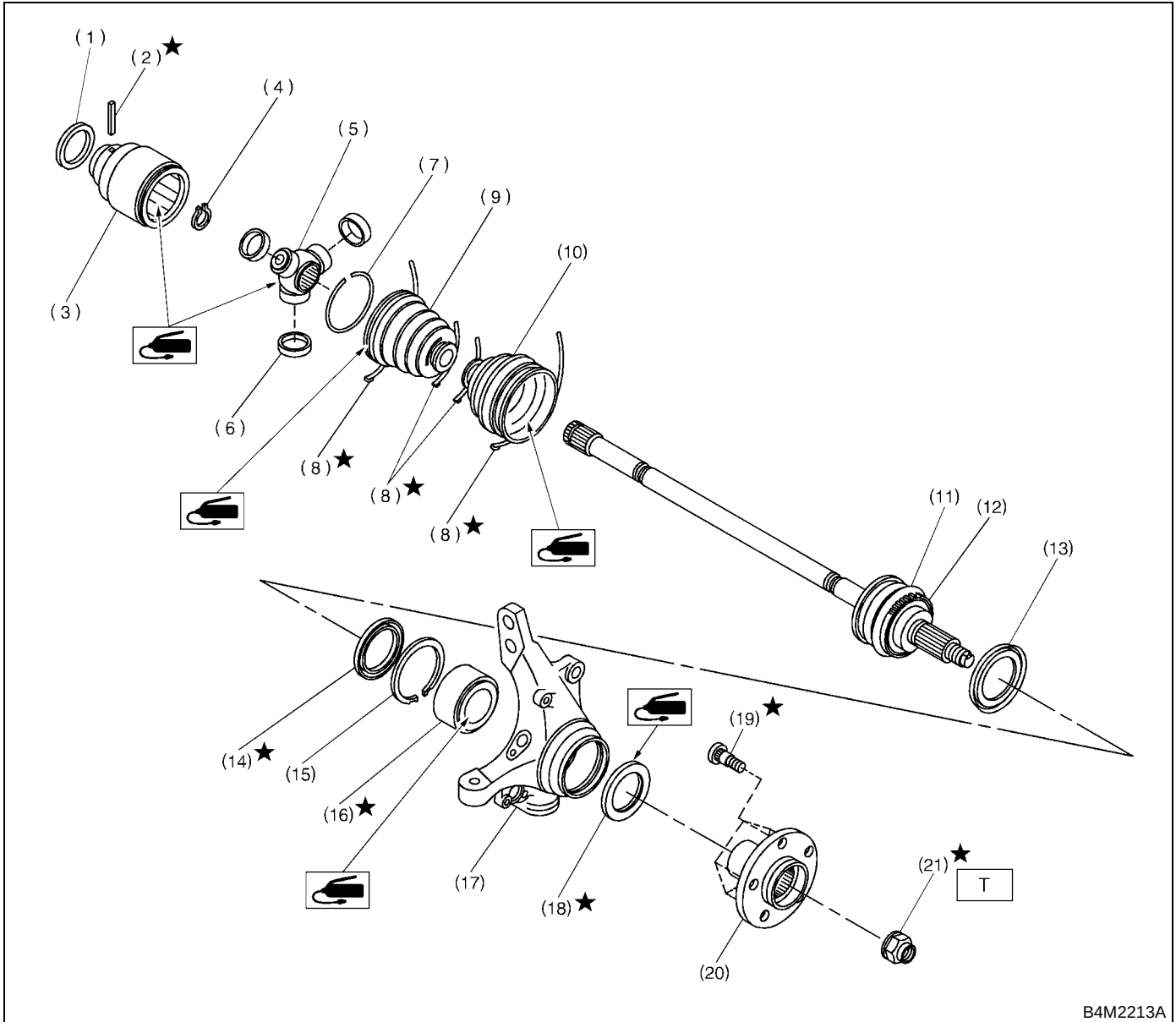
- | | |
|---------------------------------------|--------------------------------|
| (1) Propeller shaft (Turbo model) | (4) Rear differential (T-type) |
| (2) Propeller shaft (Non-Turbo model) | (5) Bush |
| (3) Rear differential (VA-type) | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 31 (3.2, 23.1)

T2: 52 (5.3, 38.3)

2. FRONT AXLE



B4M2213A

- (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 (EBJ)
- (11) EBJ ASSY
- (12) Tone wheel (With ABS)
- (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

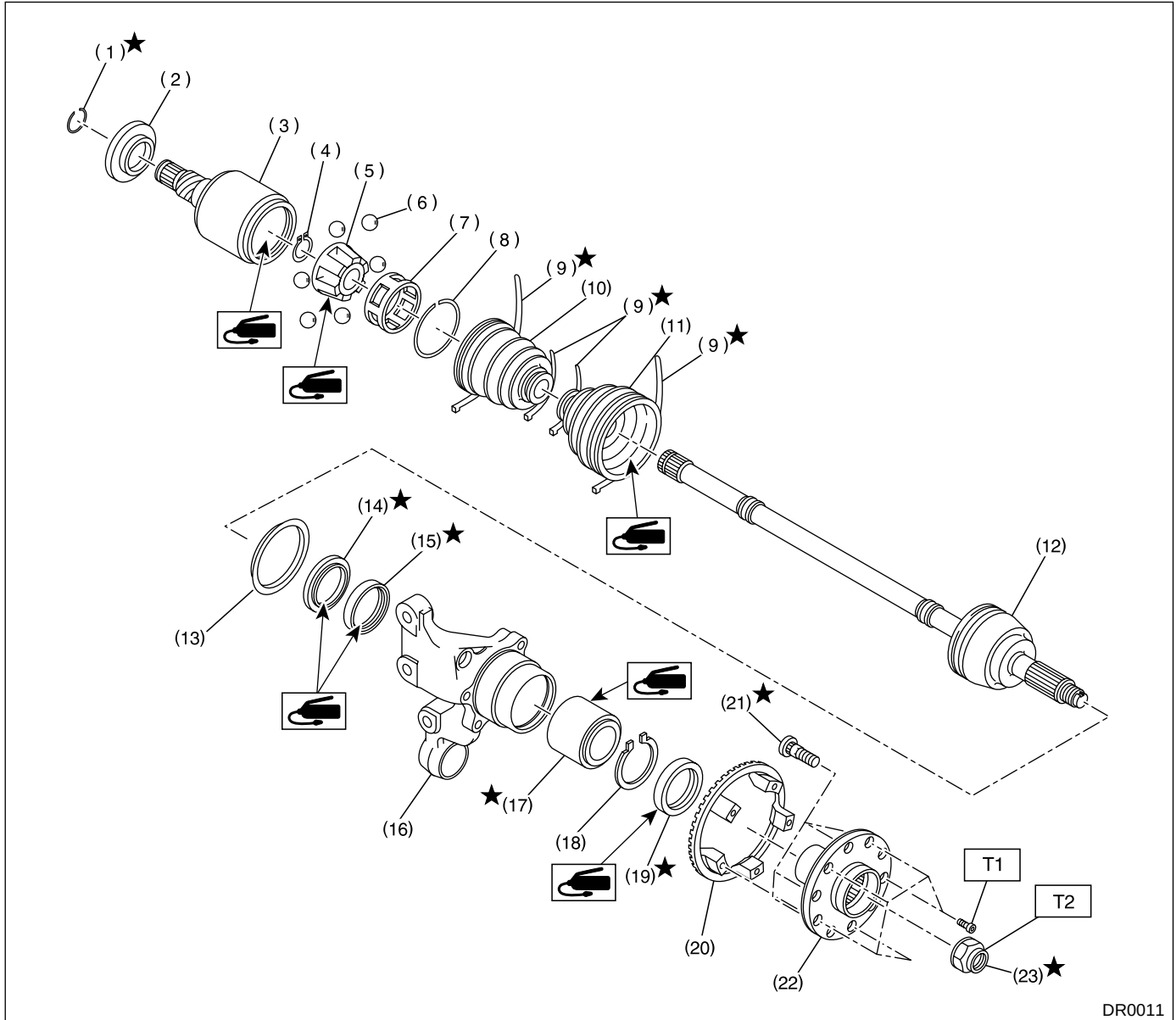
Tightening torque: N·m (kgf-m, ft-lb)
T1: 186 (19, 137)

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

3. REAR AXLE

• AWD Model



- | | |
|------------------------|--|
| (1) Circlip | (12) Non-Turbo: BJ ASSY
Turbo: EBJ ASSY |
| (2) Baffle plate (DOJ) | |
| (3) Outer race (DOJ) | (13) Baffle plate (*) |
| (4) Snap ring | (14) Oil seal (IN. No. 2) |
| (5) Inner race | (15) Oil seal (IN. No. 3) |
| (6) Ball | (16) Housing |
| (7) Cage | (17) Bearing |
| (8) Circlip | (18) Snap ring |
| (9) Boot band | (19) Oil seal (OUT) |
| (10) Boot (DOJ) | (20) Tone wheel (With ABS) |
| (11) Boot (*) | (21) Hub bolt |

- | |
|---------------|
| (22) Hub |
| (23) Axle nut |

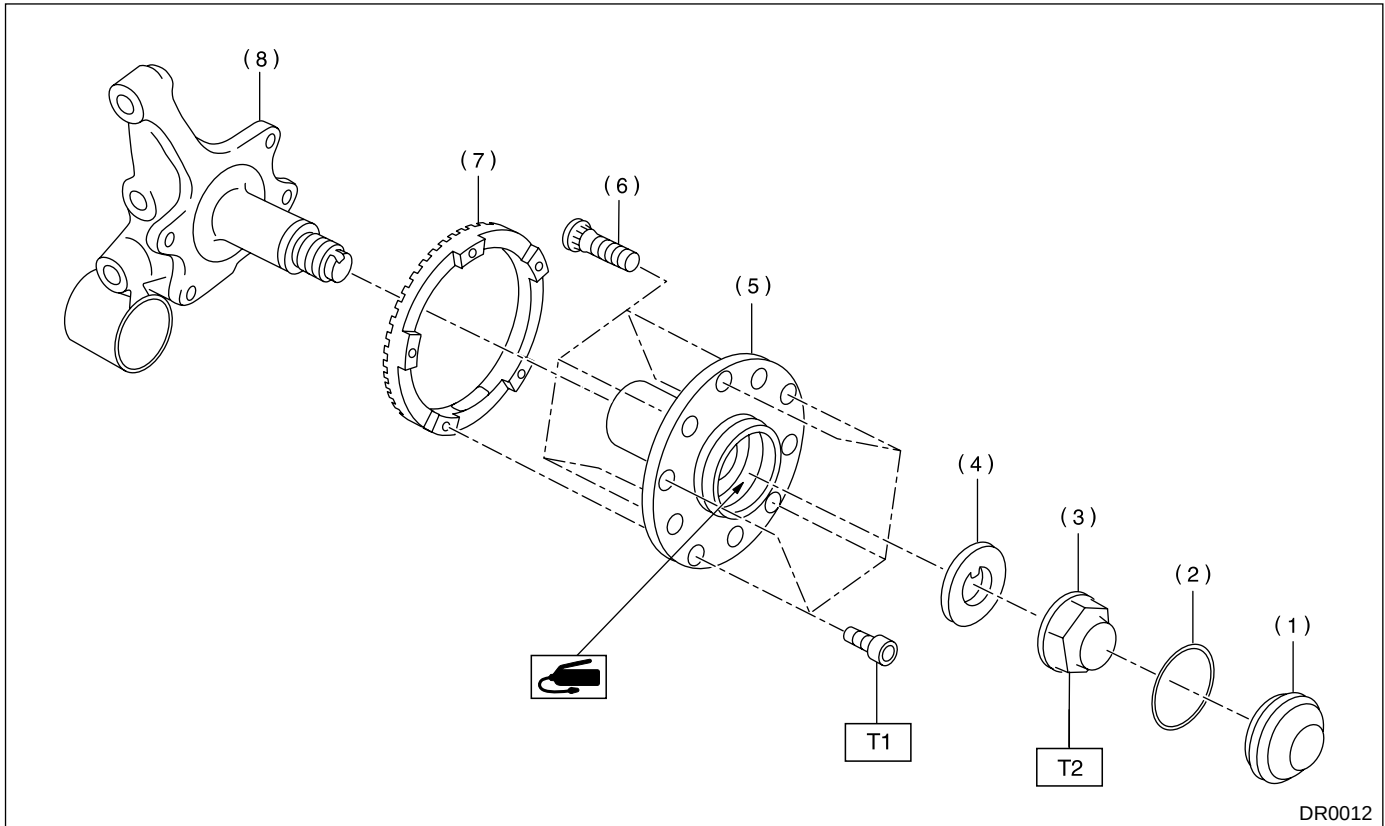
Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.4)

T2: 186 (19, 137)

* Non-Turbo model: BJ
Turbo model: EBJ

• FWD Model



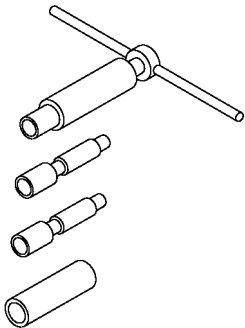
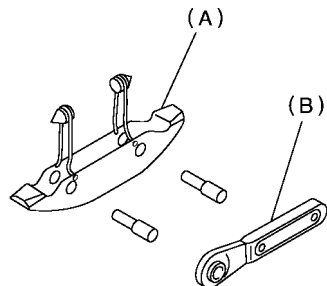
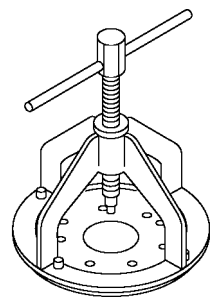
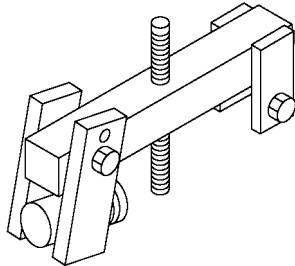
- | | |
|--------------|---------------------------|
| (1) Hub cap | (5) Hub unit |
| (2) O-ring | (6) Hub bolt |
| (3) Axle nut | (7) Tone wheel (With ABS) |
| (4) Washer | (8) Spindle |

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6 (0.6, 4.4)
T2: 186 (19, 137)

C: CAUTION

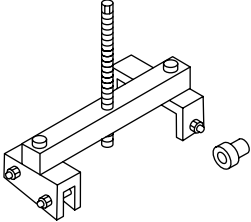
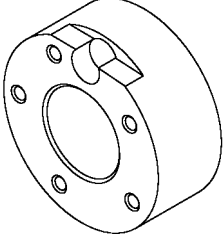
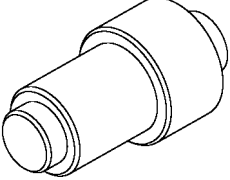
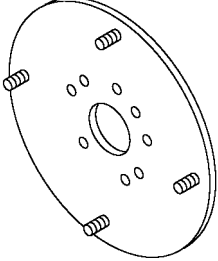
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.

D: PREPARATION TOOL**1. SPECIAL TOOLS**

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2386	922431000	AXLE SHAFT INSTALLER	- Used for installing axle shaft into housing. - Used with ADAPTER (927390000).
 B4N2387A	925091000	BAND TIGHTENING TOOL	- Used for tightening boot band. (A) Jig for band (B) Ratchet wrench
 B4M2388	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 B4M2389	927060000	HUB REMOVER	- Used for removing front hub. - Used with HUB STAND (927080000).

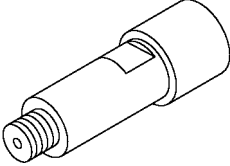
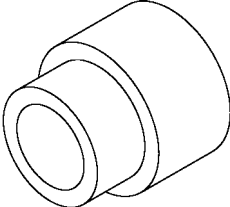
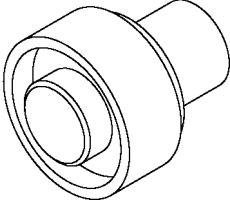
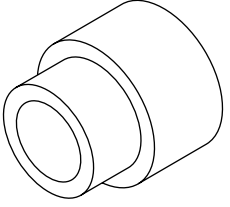
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 H5M0981	927420000	HUB REMOVER	- Used for removing rear hub. - Used with HUB STAND (927080000).
 B4M2390	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.
 B4M2391	927100000	BEARING PULLER	- Used for disassembling and assembling front housing bearing. - Used with HOUSING STAND (927400000).
 B4M2392	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).

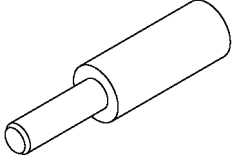
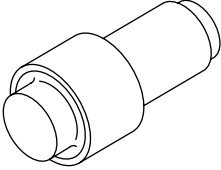
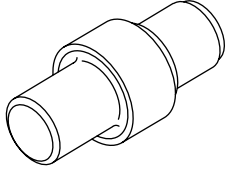
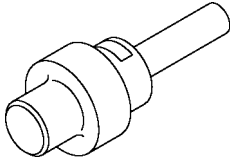
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2393	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).
 B4M2394	927400000	HOUSING STAND	• Used for disassembling and assembling front housing bearing. • Used with BEARING PULLER (927100000).
 B4M2395	927410000	OIL SEAL INSTALLER	• Used for installing oil seal into front housing. • Used with HOUSING STAND (927400000).
 H5M0982	927430000	HOUSING STAND	• Used for disassembling and assembling rear housing bearing. • Used with BEARING PULLER (927440000).

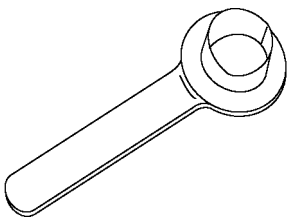
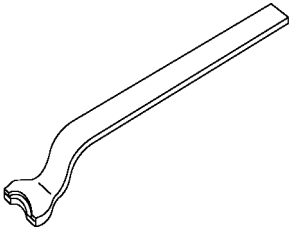
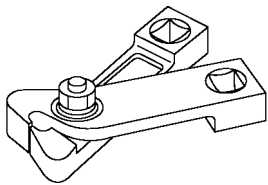
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2399	927120000	HUB INSTALLER	Used for installing hub.
 H5M0983	927440000	BEARING REMOVER	• Used for disassembling and assembling rear housing bearing. • Used with HOUSING STAND (927430000).
 H5M0984	927460000	OIL SEAL INSTALLER	• Used for installing outer bearing and sub bearing into housing. • Used with HOUSING STAND (927430000).
 B4M2400	927450000	HUB INSTALLER	• Used for installing hub unit into hub ASSY. • Used with BEARING SPACER (28499AE000) and HUB STAND (927080000).

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2401	28099PA090	OIL SEAL PROTECTOR	- Used for installing rear drive shaft into rear differential. - For protecting oil seal.
 B4M2402	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.
 B4M2403	28099AC000	BOOT BAND PLIERS	Used for tightening front BJ boot band.

2. GENERAL PURPOSE TOOLS

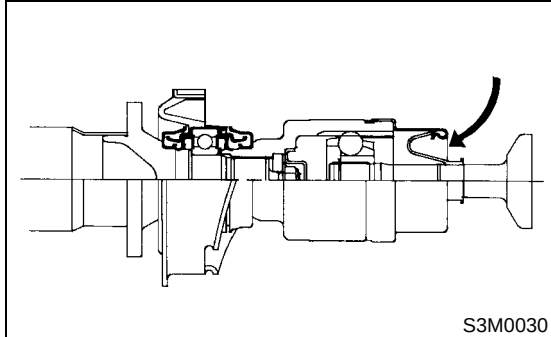
TOOL NAME	REMERKS
Puller	Used for removing ball joint from knuckle arm.
Dial gauge	Used for inspecting propeller shaft run-out.
Snap ring pliers	Used for installing and removing snap ring.

2. Propeller Shaft

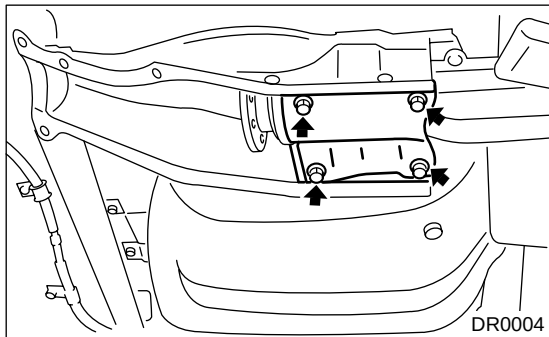
A: REMOVAL

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.



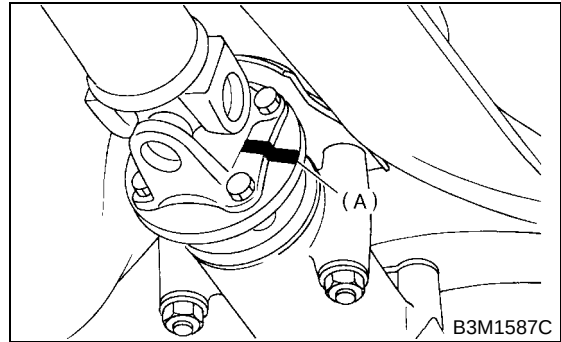
- 1) Disconnect ground terminal from battery.
- 2) Move select lever or gear shift lever to "N".
- 3) Release the parking brake.
- 4) Jack-up vehicle and support it with sturdy racks.
- 5) Remove center exhaust pipes.
- 6) Remove rear exhaust pipe and muffler.
- 7) Remove differential mount front cover.



- 8) Remove the four bolts which hold propeller shaft to rear differential.

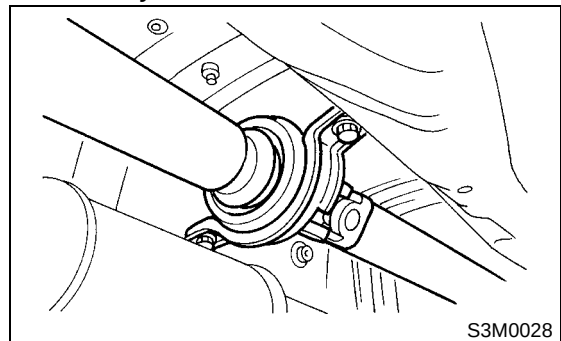
NOTE:

- Put matching mark on affected parts before removal.
- Remove all but one bolt.



(A) Matching mark

- 9) Remove the two bolts which hold center bearing to vehicle body.



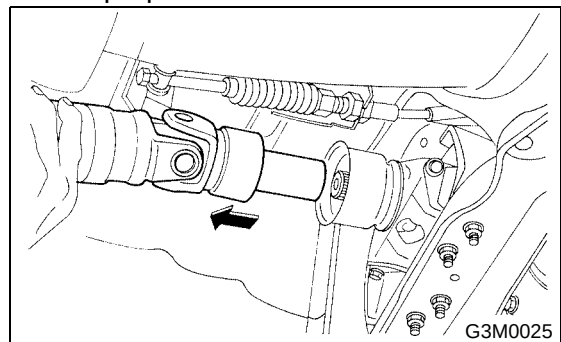
- 10) Remove propeller shaft from transmission.

CAUTION:

- not to damage oil seals and frictional surface of sleeve yoke.
- Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing propeller shaft.

NOTE:

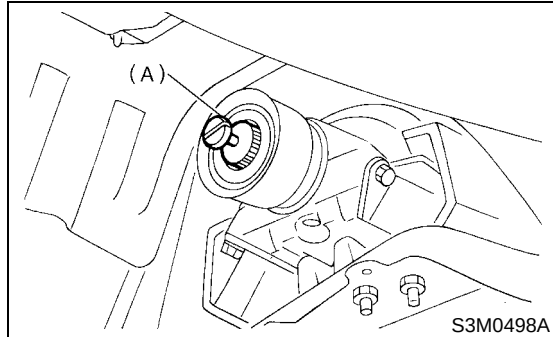
- Be sure to use an empty oil can to catch oil flowing out when removing propeller shaft.
- Be sure to plug the opening in transmission after removal of propeller shaft.



11) Install the extension cap to transmission.

NOTE:

If extension cap is not available, place vinyl bag over opening and fasten with string to prevent gear oil or ATF from leaking.



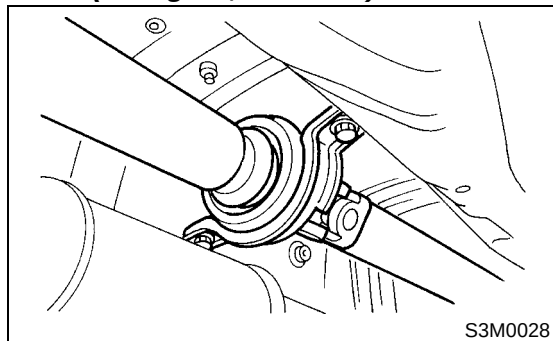
(A) Extension cap

B: INSTALLATION

1) Insert sleeve yoke into transmission and attach center bearing to body.

Tightening torque:

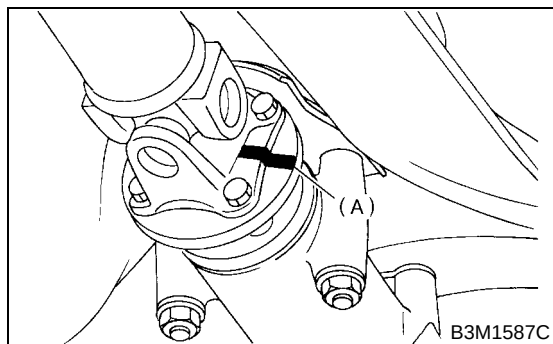
52 N·m (5.3 kgf-m, 38.3 ft-lb)



2) Align matching marks and connect flange yoke and rear differential.

Tightening torque:

31 N·m (3.2 kgf-m, 23.1 ft-lb)

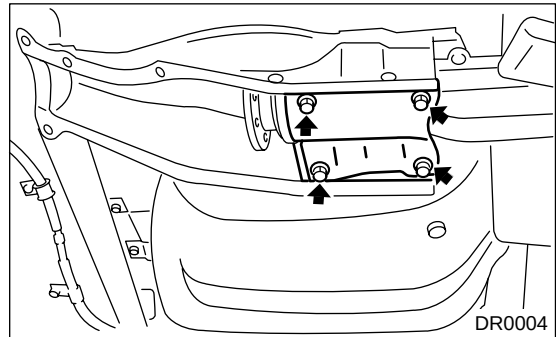


(A) Matching mark

3) Install differential mount front cover.

Tightening torque:

88 N·m (9.0 kgf-m, 65 ft-lb)



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.

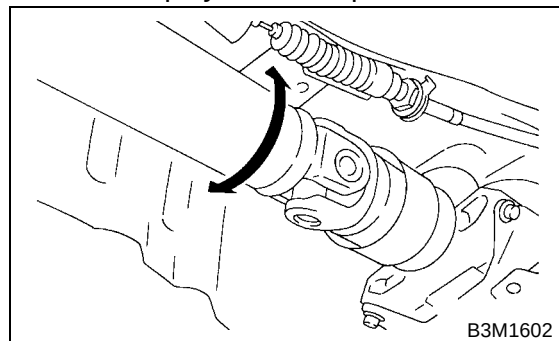
- 1) Tube surfaces for dents or cracks
 - 2) Splines for deformation or abnormal wear
 - 3) Joints for non-smooth operation or abnormal noise
 - 4) Center bearing for free play, noise or non-smooth operation
 - 5) Oil seals for abnormal wear or damage
 - 6) Center bearing for breakage
- Check the following 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.



3. RUNOUT OF PROPELLER SHAFT

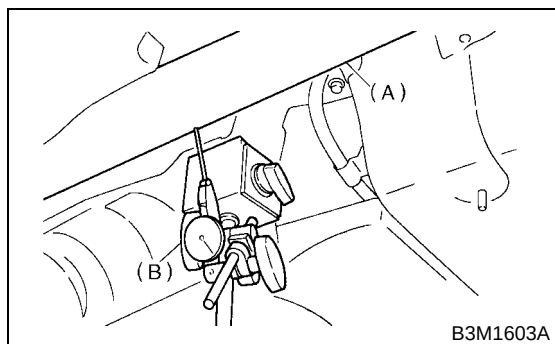
- 1) Remove center exhaust pipes.
- 2) Remove rear exhaust pipe and muffler.
- 3) Remove heat shield cover.
- 4) Turn rear wheels by hand to check for "runout" of propeller shaft.

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)

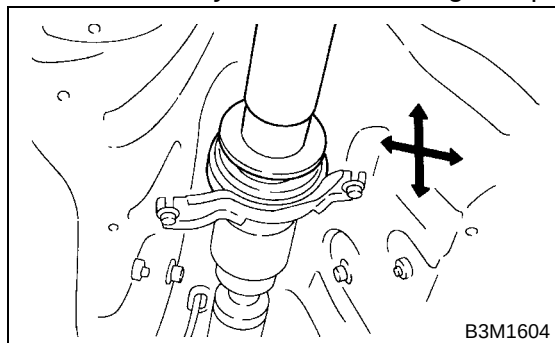


(A) Propeller shaft

(B) Dial gauge

4. CENTER BEARING FREE PLAY

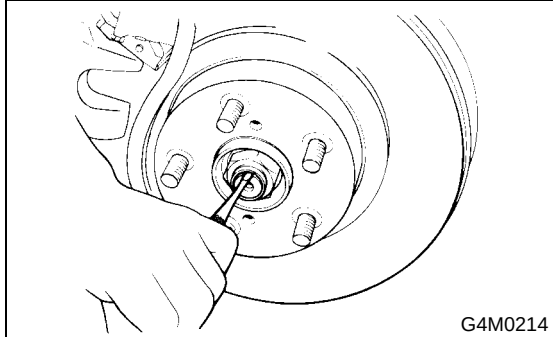
- 1) Remove front and center exhaust pipes.
- 2) Remove rear exhaust pipe and muffler.
- 3) Remove heat shield cover.
- 4) While holding propeller shaft near center bearing with your hand, move it up and down, and left and right to check for any abnormal bearing free play.



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.

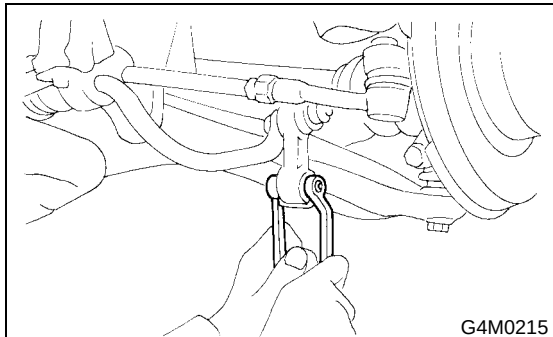


- 4) Remove axle nut using a socket wrench.

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.

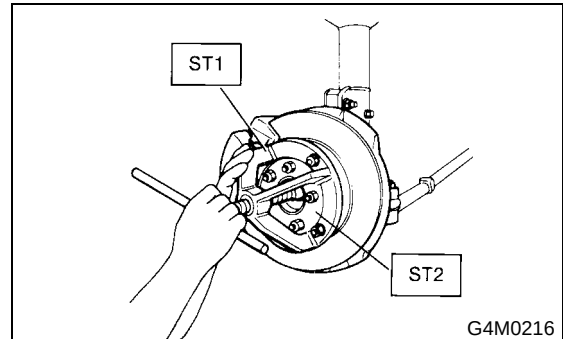


- 6) Remove disc brake caliper from housing, and suspend it from strut using a wire.
- 7) Remove front drive shaft assembly from hub. If it is hard to remove, use STs.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

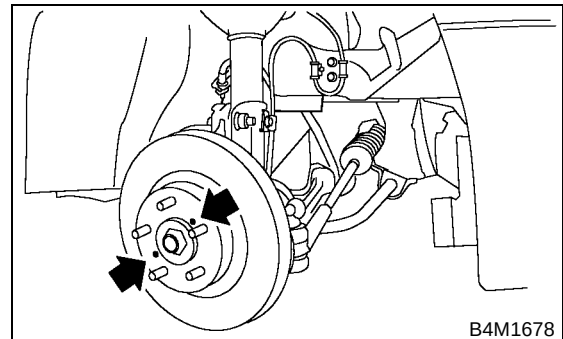
CAUTION:

- Be careful not to damage oil seal lip when removing front drive shaft.
- When replacing front drive shaft, also replace inner oil seal.

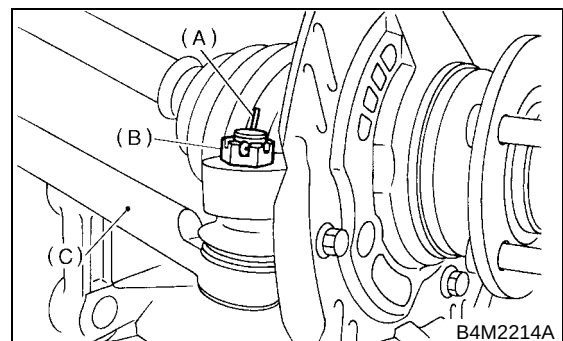


- 8) Remove disc rotor from hub.

If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on the rotor.

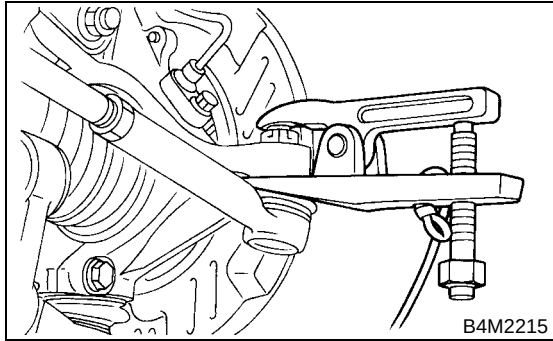


- 9) Remove cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

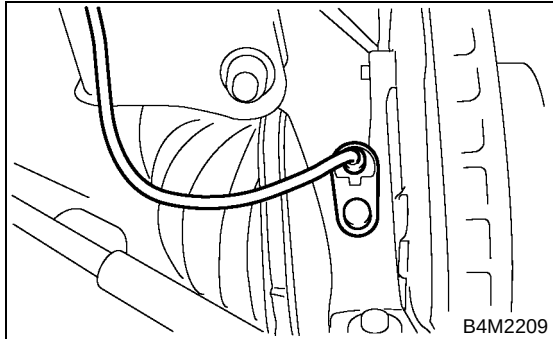


- (A) Cotter pin
(B) Castle nut
(C) Tie-rod

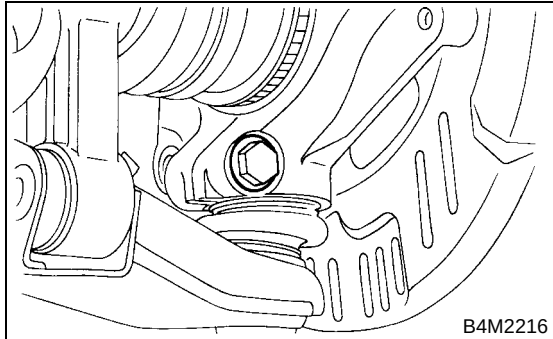
10) Using a puller, remove tie-rod ball joint from knuckle arm.



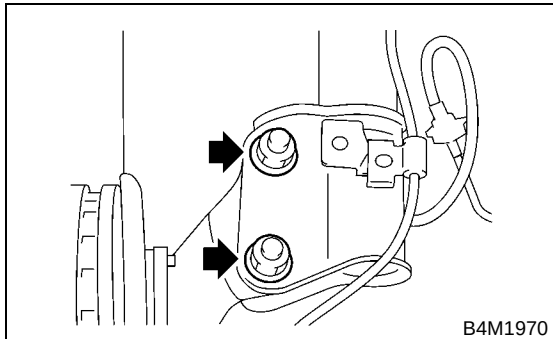
11) On ABS equipped models, remove ABS sensor assembly and harness in advance.



12) Remove transverse link ball joint from housing.



13) 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) Install transverse link ball joint to housing.

Tightening torque:

49 N·m (5.0 kgf-m, 36 ft-lb)

2) While aligning alignment mark on camber adjusting bolt head, connect housing and strut.

CAUTION:

Use a new self-locking nut.

Tightening torque:

152 N·m (15.5 kgf-m, 112 ft-lb)

3) Install ABS sensor on housing (only vehicle equipped with ABS).

Tightening torque:

32 N·m (3.3 kgf-m, 23.9 ft-lb)

4) Install disc rotor on hub.

5) Install disc brake caliper on housing.

Tightening torque:

78 N·m (8 kgf-m, 57.9 ft-lb)

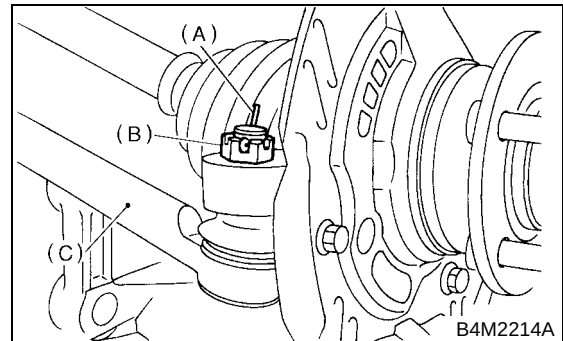
6) Install front drive shaft. <Ref. to DS-32, INSTALLATION, Front Drive Shaft.>

7) Connect stabilizer link.

8) 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

9) While depressing brake pedal, tighten axle nut and lock it securely.

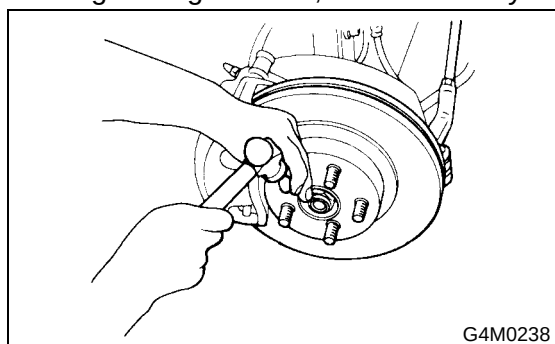
Tightening torque:

186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:

- Use a new axle nut.
- 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.

10) After tightening axle nut, lock it securely.



11) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:

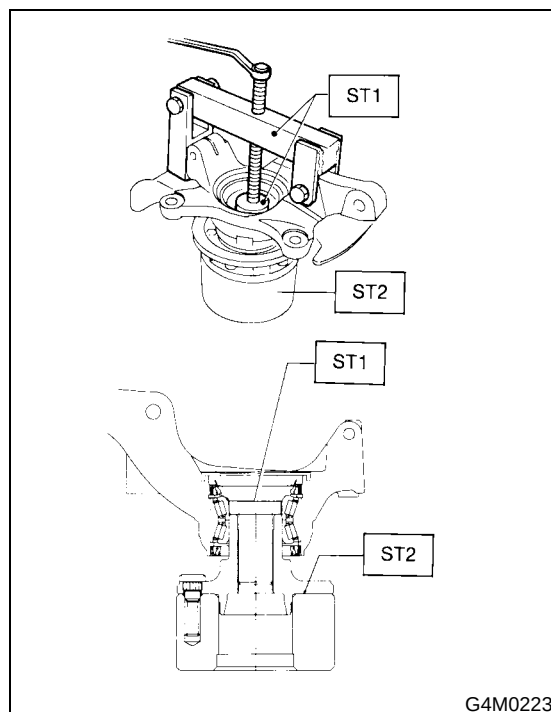
88 N·m (9 kgf-m, 65 ft-lb)

C: DISASSEMBLY

- 1) Using ST1, support housing and hub securely.
- 2) Attach ST2 to housing and drive hub out.

ST1 927060000 HUB REMOVER

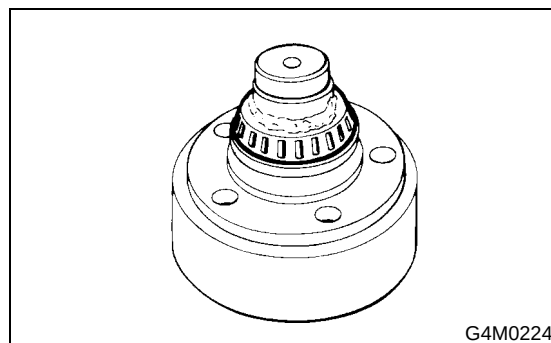
ST2 927080000 HUB STAND



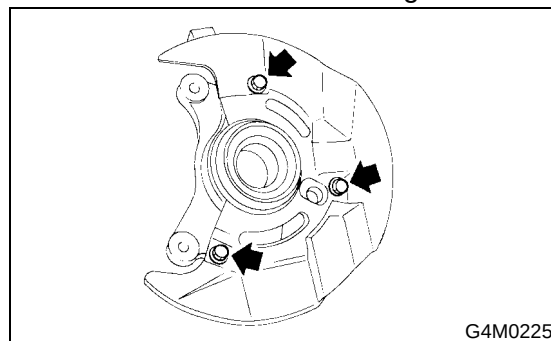
If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

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.



3) Remove disc cover from housing.



FRONT AXLE

DRIVE SHAFT SYSTEM

4) Using a standard screwdriver, remove outer and inner oil seals.

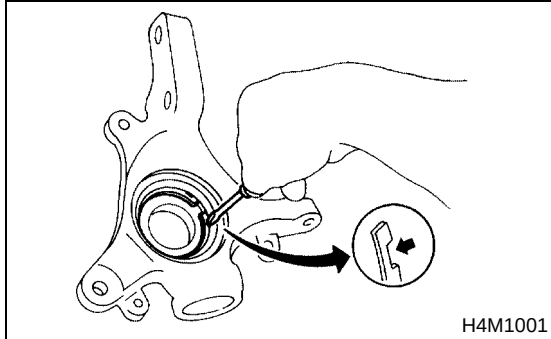
CAUTION:

Do not use old oil seals.

5) Using flat bladed screwdriver, remove snap ring.

CAUTION:

Be careful not to damage housing at removal.



6) Using ST1, support housing securely.

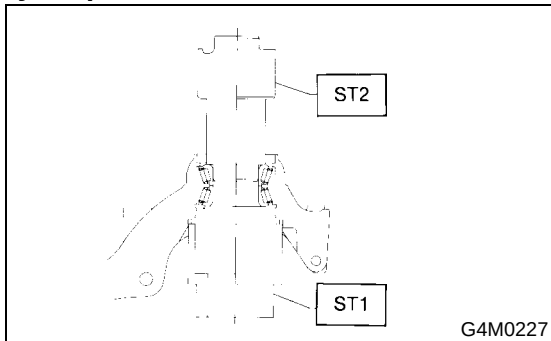
7) Using ST2, press inner race to drive out outer bearing.

ST1 927400000 HOUSING STAND

ST2 927100000 BEARING PULLER

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.

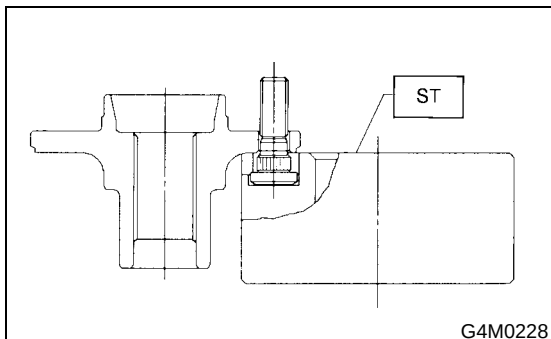


8) Using ST and a hydraulic press, drive hub bolts out.

ST 927080000 HUB STAND

CAUTION:

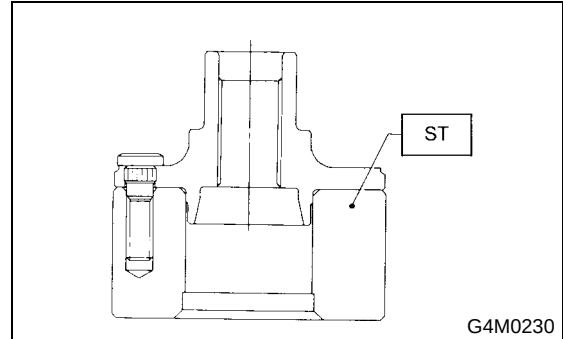
Be careful not to hammer hub bolts. This may deform hub.



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

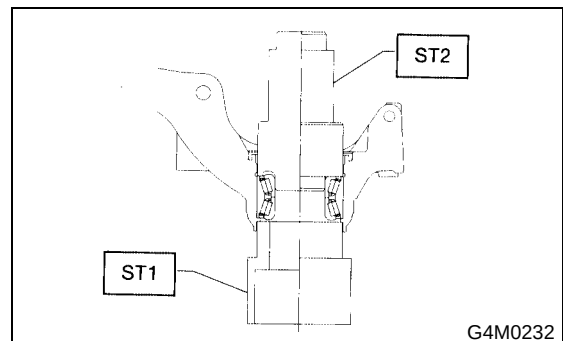
ST2 927100000 BEARING PULLER

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:

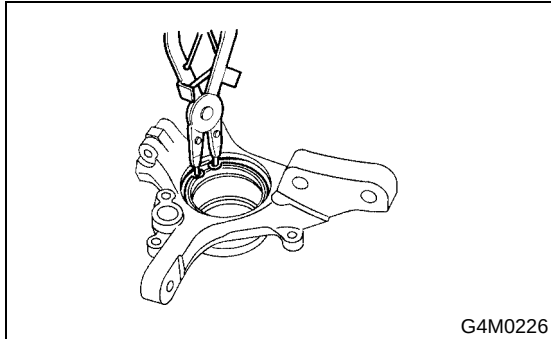
SHELL 6459N



5) Using pliers, install snap ring in its groove.

CAUTION:

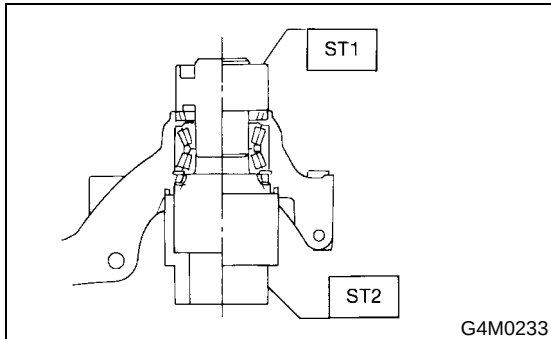
Make sure to install it firmly to groove.



6) Using ST1 and ST2, press outer oil seal until it contacts the bottom of housing.

ST1 927410000 OIL SEAL INSTALLER

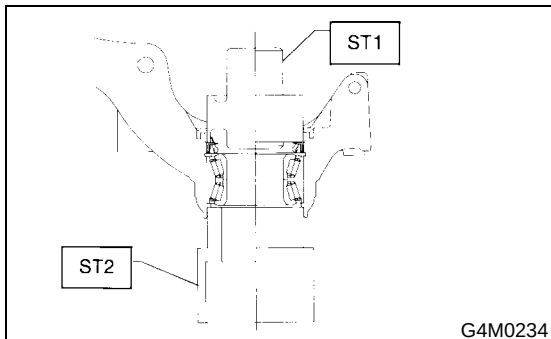
ST2 927400000 HOUSING STAND



7) Using ST1 and ST2, press inner oil seal until it contacts circlip.

ST1 927410000 OIL SEAL INSTALLER

ST2 927400000 HOUSING STAND



8) Invert ST and housing.

ST 927400000 HOUSING STAND

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)

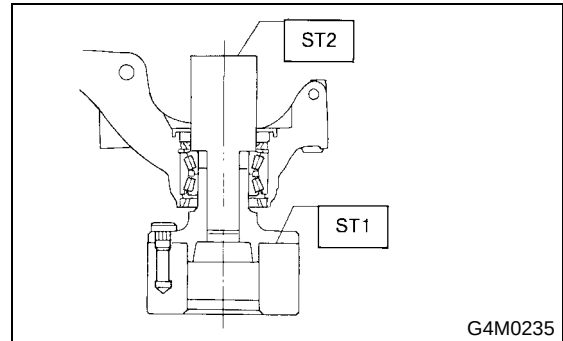
11) Attach hub to ST1 securely.

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

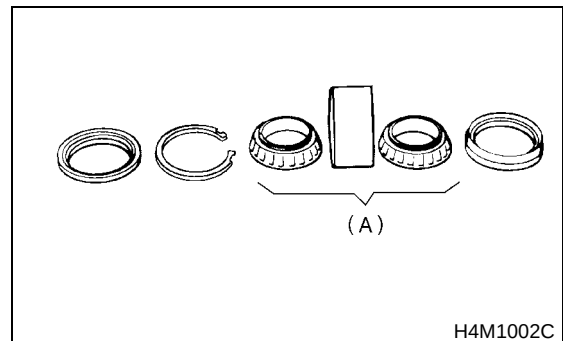


E: INSPECTION

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. Rear Axle

A: REMOVAL

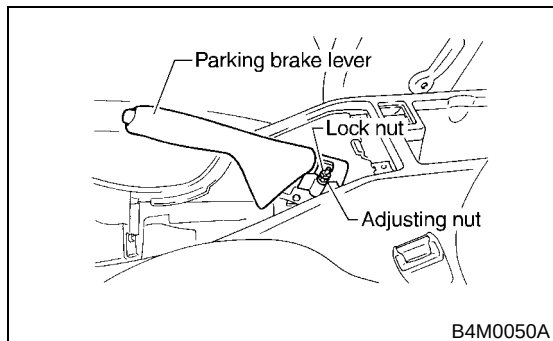
1. DISC BRAKE

- 1) Disconnect ground cable from battery.
- 2) Jack-up vehicle, and remove rear wheel cap and wheels.

CAUTION:

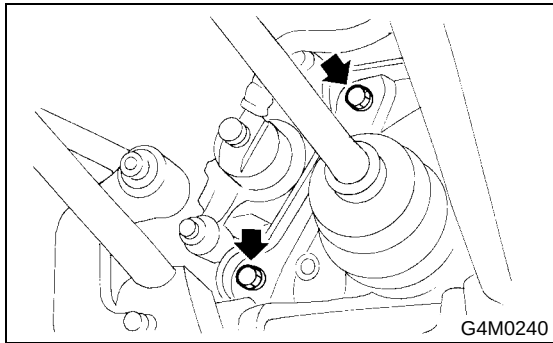
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

- 3) Unlock axle nut.
- 4) Remove axle nut using a socket wrench.
- 5) Return parking brake lever and loosen adjusting nut.



B4M0050A

- 6) Remove disc brake caliper from back plate, and suspend it from strut using a piece of wire.



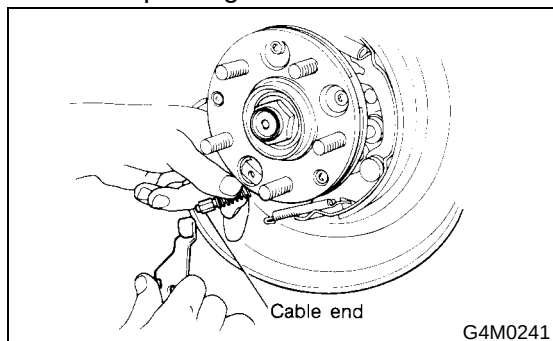
G4M0240

- 7) Remove disc rotor from hub.

NOTE:

If disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

- 8) Disconnect parking brake cable end.

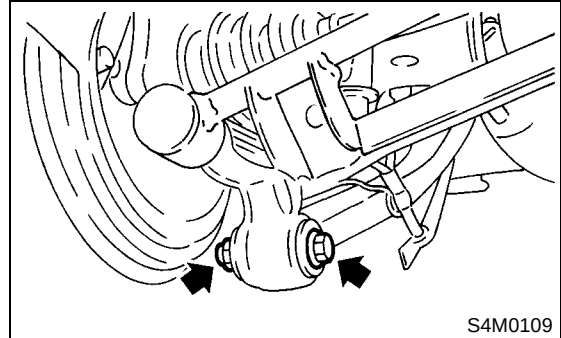


G4M0241

- 9) Disconnect rear stabilizer from rear lateral link.
- 10) Remove bolts which secure trailing link assembly to rear housing.

CAUTION:

Discard old self-locking nut. Replace with a new one.

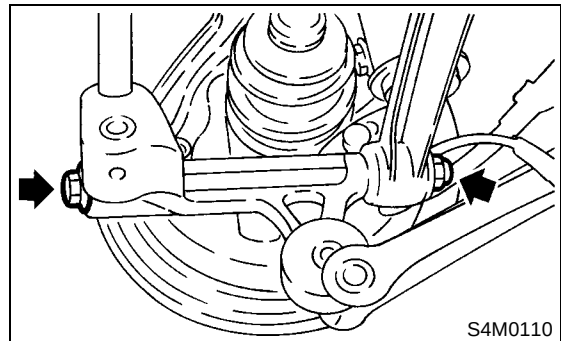


S4M0109

- 11) Remove bolts which secure lateral assembly to rear housing.

CAUTION:

Discard old self-locking nut. Replace with a new one.



S4M0110

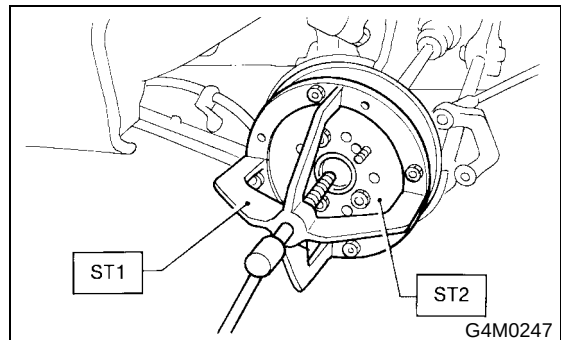
- 12) Disengage BJ from housing splines, and remove rear drive shaft assembly.

If it is hard to remove, use STs.

- | | | |
|-----|-----------|-------------------------|
| ST1 | 926470000 | AXLE SHAFT PULLER |
| ST2 | 927140000 | AXLE SHAFT PULLER PLATE |

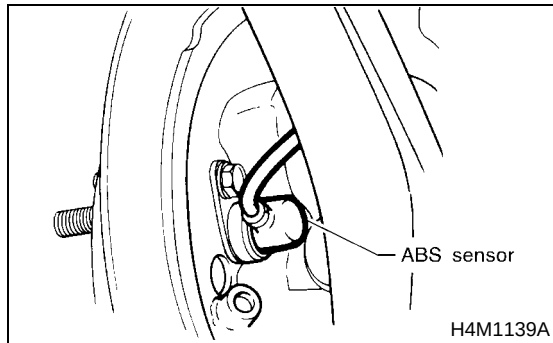
CAUTION:

- Be careful not to damage oil seal lip when removing rear drive shaft.
- When rear drive shaft is to be replaced, also replace inner oil seal with a new one.

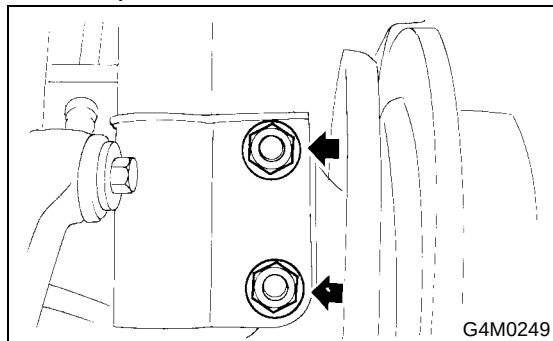


G4M0247

- 13) Remove rear ABS sensor from back plate (only vehicle equipped with ABS).



- 14) Remove bolts which secure rear housing to strut, and separate the two.



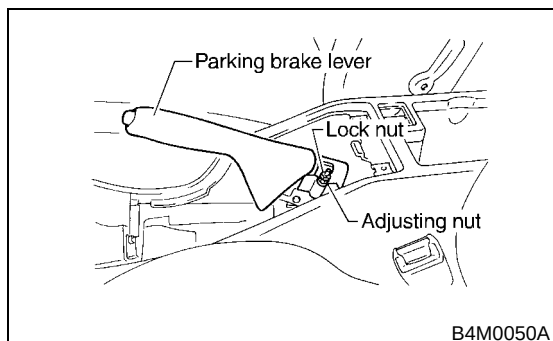
2. DRUM BRAKE

- 1) Disconnect ground cable from battery.
- 2) Jack-up vehicle, and remove rear wheel cap and wheels.

CAUTION:

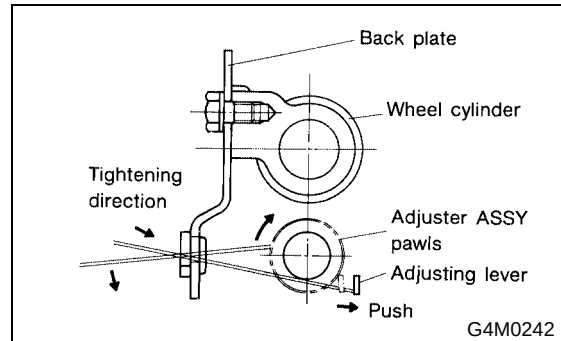
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

- 3) Unlock axle nut.
- 4) Remove axle nut using a socket wrench.
- 5) Return parking brake lever and loosen adjusting nut.



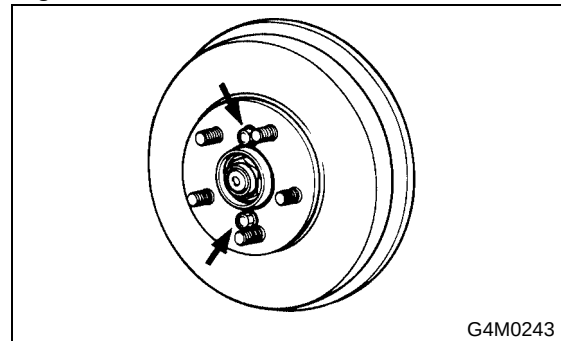
- 6) Remove brake drum from hub.

- 7) If it is difficult to remove brake drum, remove adjusting hole cover from back plate, and then turn adjusting screw using a slot-type screwdriver until brake shoe separates from the drum.



NOTE:

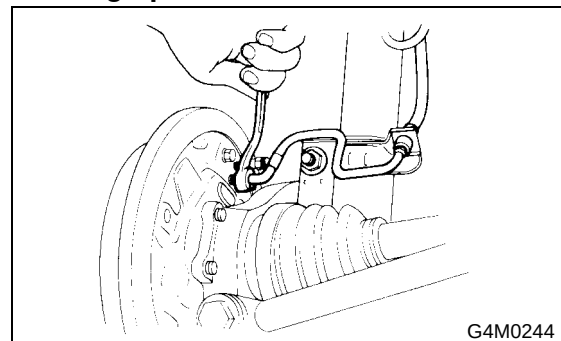
If brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.



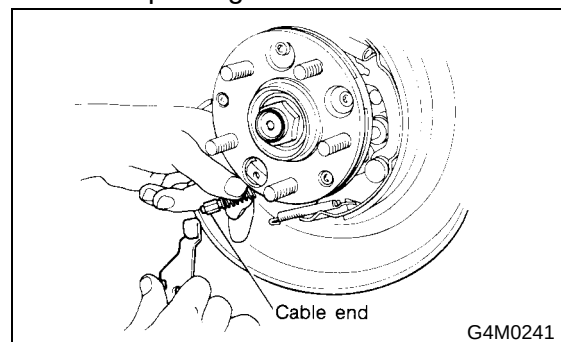
- 8) Using a flare-net wrench, disconnect brake pipe from wheel cylinder.

CAUTION:

Cover open end of wheel cylinder to prevent entry of foreign particles.



- 9) Disconnect parking brake cable end.



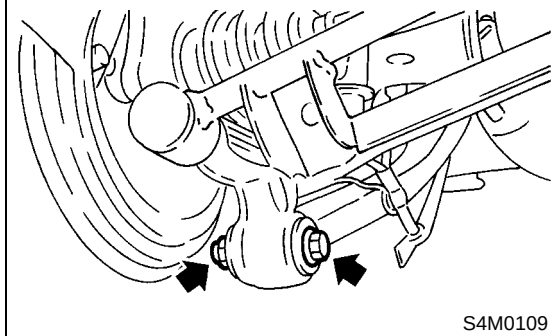
REAR AXLE

DRIVE SHAFT SYSTEM

- 10) Disconnect rear stabilizer from rear lateral link.
11) Remove bolts which secure trailing link assembly to rear housing.

CAUTION:

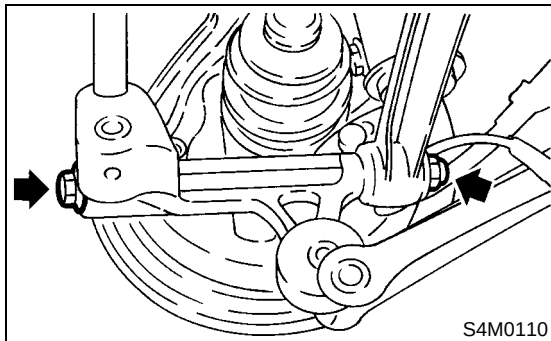
Discard old self-locking nut. Replace with a new one.



- 12) Remove bolts which secure lateral link assembly to rear housing.

CAUTION:

Discard old self-locking nut. Replace with a new one.

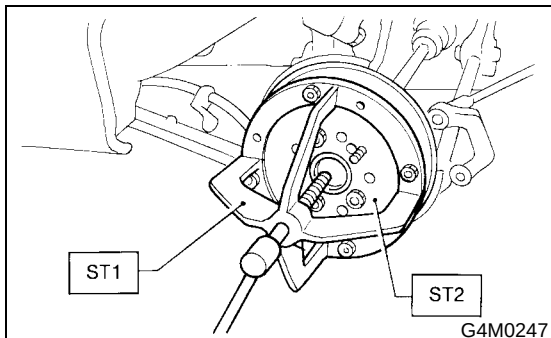


- 13) Disengage BJ from housing splines, and remove rear drive shaft assembly.
If it is hard to remove, use STs.

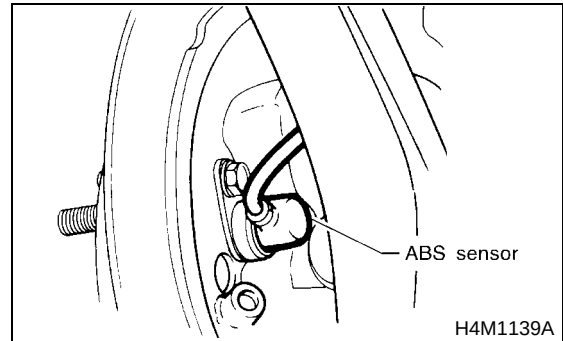
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER
PLATE

CAUTION:

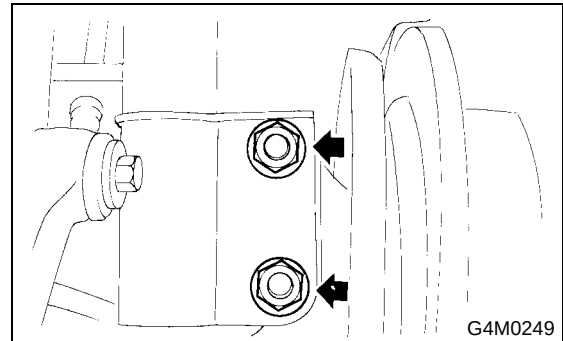
- Be careful not to damage oil seal lip when removing rear drive shaft.
- When rear drive shaft is to be replaced, also replace inner oil seal with a new one.



- 14) Remove rear ABS sensor from back plate (only vehicle equipped with ABS).



- 15) Remove bolts which secure rear housing to strut, and separate the two.



B: INSTALLATION

1. DISC BRAKE

1) Connect rear housing assembly and strut assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

196 N·m (20 kgf-m, 145 ft-lb)

2) Fit BJ (bell joint) to rear housing splines.

CAUTION:

Be careful not to damage inner oil seal lip.

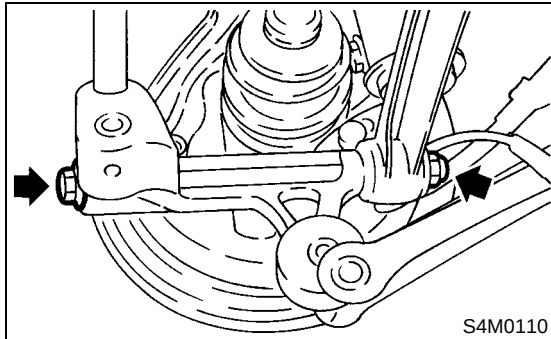
3) Connect rear housing assembly to lateral link assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

137 N·m (14 kgf-m, 101 ft-lb)



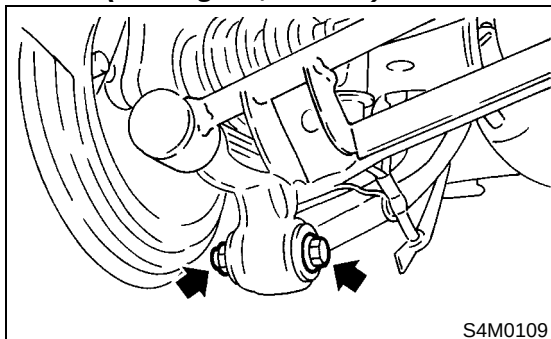
4) Connect rear housing assembly to trailing link assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

113 N·m (11.5 kgf-m, 83 ft-lb)



5) Connect rear stabilizer to rear lateral link.

CAUTION:

Use a new self-locking nut.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)

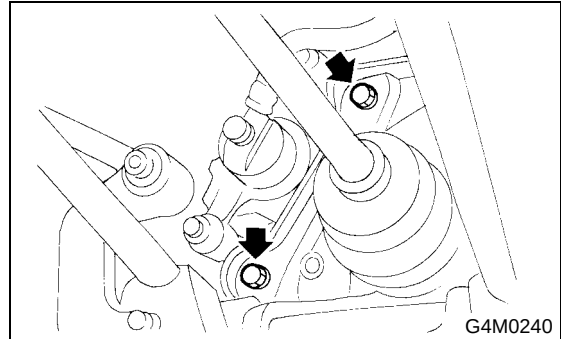
6) Connect parking brake cable to parking brake.

7) Install disc rotor on rear housing assembly.

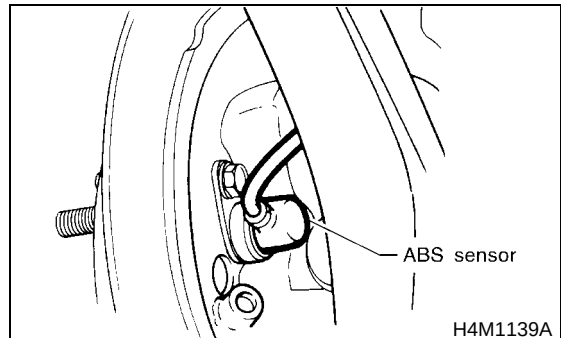
8) Install disc brake caliper on back plate.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 ft-lb)



9) Install rear ABS sensor and brake cable bracket (only vehicle equipped with ABS).



10) Bleed air from brake system. <Ref. to BR-62, REPLACEMENT, Brake Fluid.>

11) Adjust parking brake lever stroke by turning adjuster.

12) 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.
- 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.

13) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:

88 N·m (9 kgf-m, 65 ft-lb)

2. DRUM BRAKE

1) Connect rear housing assembly and strut assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

196 N·m (20 kgf-m, 145 ft-lb)

2) Fit BJ (bell joint) to rear housing splines.

CAUTION:

Be careful not to damage inner oil seal lip.

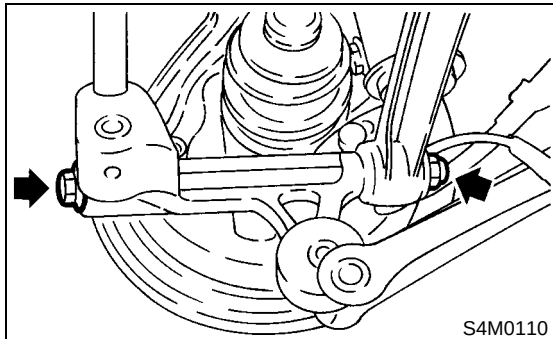
3) Connect rear housing assembly to lateral link assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

137 N·m (14 kgf-m, 101 ft-lb)



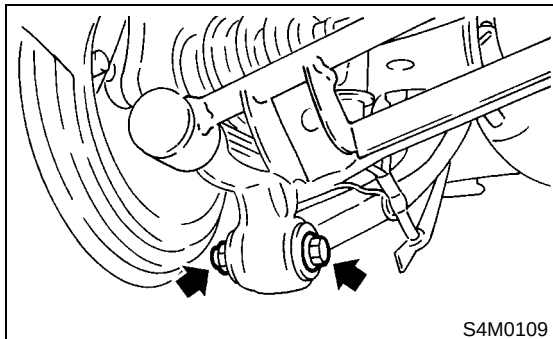
4) Connect rear housing assembly to trailing link assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

113 N·m (11.5 kgf-m, 83 ft-lb)



5) Connect rear stabilizer to rear lateral link.

CAUTION:

Use a new self-locking nut.

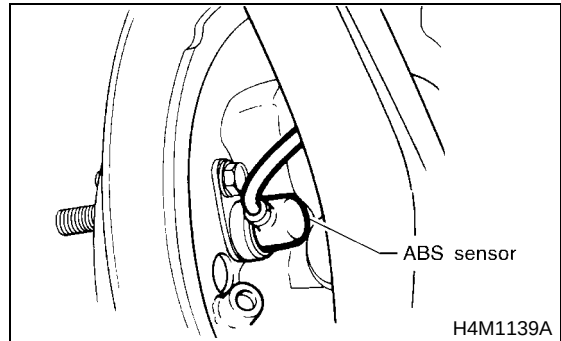
Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)

6) Connect parking brake cable to parking brake.

7) Clean brake pipe connection. Using a flare-nut wrench, connect brake pipe to wheel cylinder.

8) Connect rear ABS sensor to back plate (only vehicle equipped with ABS).



9) Connect parking brake cable to lever.

10) Install brake drum on rear housing assembly.

11) Bleed air from brake system. <Ref. to BR-62, REPLACEMENT, Brake Fluid.>

12) Adjust parking brake lever stroke by turning adjuster.

13) 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.
- 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.

14) Install wheel and tighten wheel nuts to specified torque.

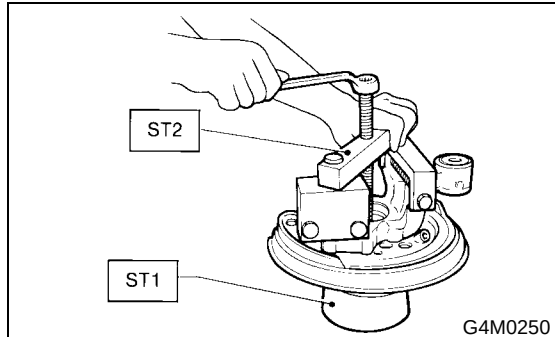
Tightening torque:

88 N·m (9 kgf-m, 65 ft-lb)

C: DISASSEMBLY

1) Using ST1 and ST2, remove hub from rear housing.

ST 927080000 HUB STAND
ST 927420000 HUB REMOVER



2) Remove back plate from rear housing
3) Using a standard screwdriver, remove outer and inner oil seals.

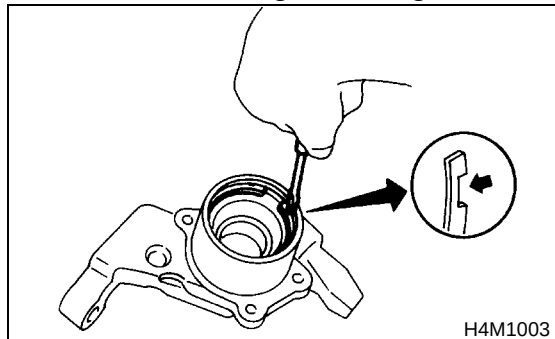
CAUTION:

Use new oil seals.

4) Using flat bladed screwdriver, remove snap ring.

CAUTION:

Be careful not to damage housing at removal.

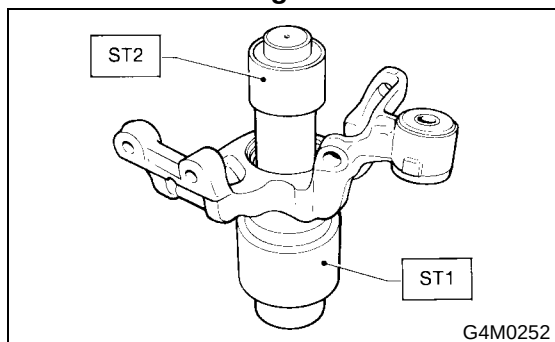


5) Using ST1 and ST2, remove bearing by pressing inner race.

ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:

- Do not remove bearing unless damaged.
- Do not re-use bearing after removal.



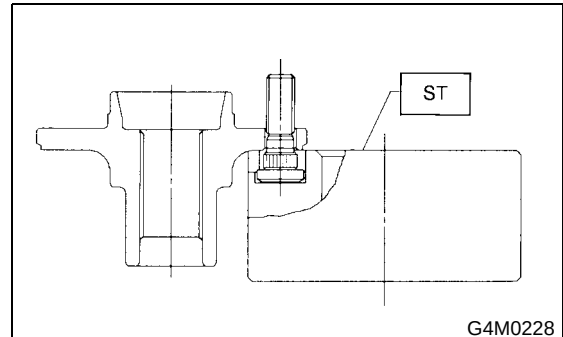
6) Remove tone wheel bolts and remove tone wheel from hub (only vehicle equipped with ABS).

7) Using ST, press hub bolt out.

ST 927080000 HUB STAND

CAUTION:

Be careful not to hammer hub bolts. This may deform hub.



REAR AXLE

DRIVE SHAFT SYSTEM

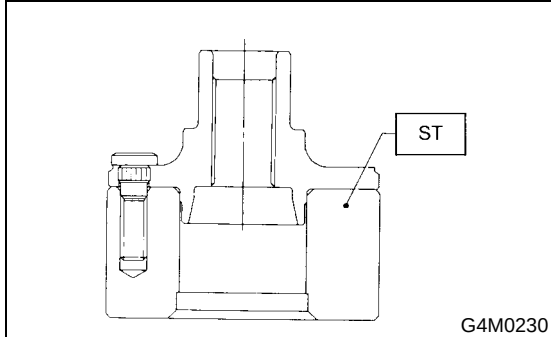
D: ASSEMBLY

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.

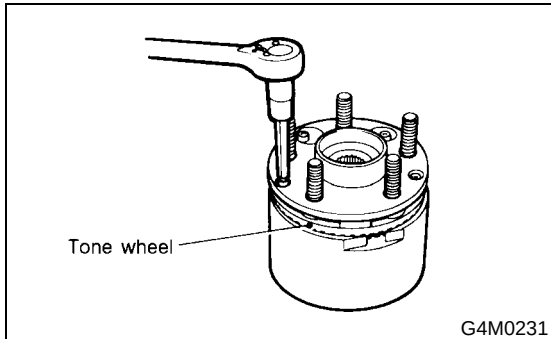
ST 927080000 HUB STAND



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of hub tone wheel, and install tone wheel to hub (only vehicle equipped with ABS).

CAUTION:

- Ensure tone wheel closely contacts hub.
- Be careful not to damage tone wheel teeth.



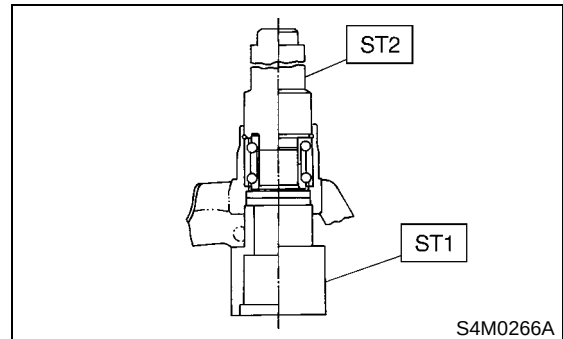
3) Clean housing interior completely. Using ST1 and ST2, press bearing into housing.

ST1 927430000 HOUSING STAND

ST2 927440000 BEARING REMOVER

CAUTION:

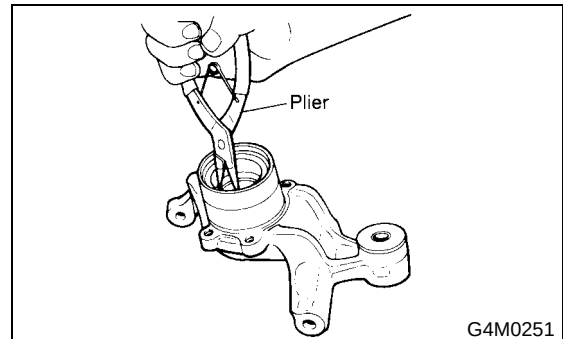
- Always press iouter race when installing bearing.
- Be careful not to remove plastic lock from inner race when installing bearing.
- Charge bearing with new grease when outer race is not removed.



4) Using plier, install snap ring.

CAUTION:

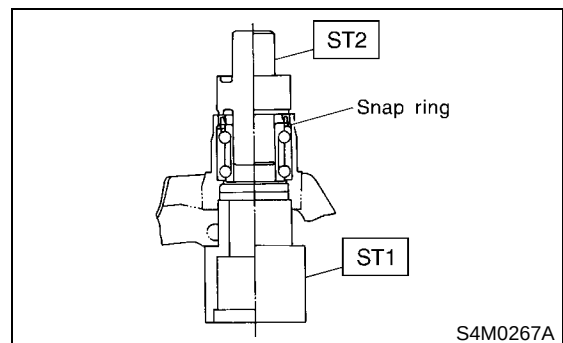
Ensure snap ring fits in groove properly.



5) Using ST1 and ST2, press outer oil seal unit it comes in contact with snap ring.

ST1 927430000 HOUSING STAND

ST2 927460000 OIL SEAL INSTALLER

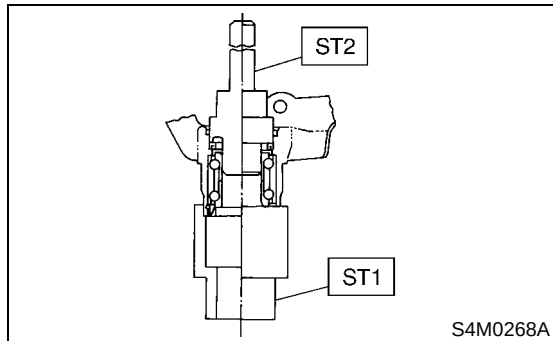


6) Invert both ST1 and housing.

7) Using ST2, press inner oil seal into housing until it touches bottom.

ST1 927430000 HOUSING STAND

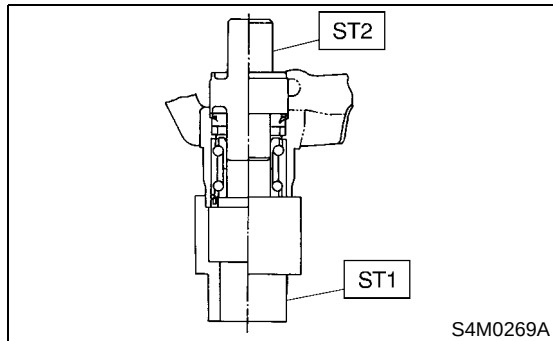
ST2 927460000 OIL SEAL INSTALLER



8) Using ST1 and ST2, press sub seal into place.

ST1 927430000 HOUSING STAND

ST2 927460000 OIL SEAL INSTALLER



9) Apply sufficient grease to oil seal lip.

Specified grease:

SHELL 6459N

CAUTION:

- If specification grease is not available, remove bearing grease and apply Auto Rex A instead.
- Do not mix different types of grease.

10) Install back plate to rear housing.

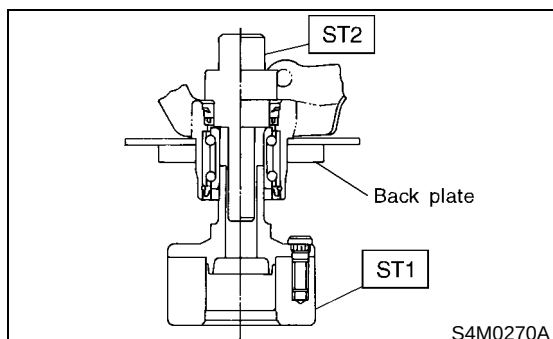
Tightening torque:

52 N·m (5.3 kgf-m, 38 ft-lb)

11) Using ST1 and ST2, press bearing into hub.

ST1 927080000 HUB STAND

ST2 927450000 HUB INSTALLER



E: INSPECTION

Check the removed parts for wear and damage. If defective, replace with a new one.

CAUTION:

- If a bearing is faulty, replace it as the bearing set.
- Be sure to replace oil seal at every overhaul.

5. Front Drive Shaft

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Jack-up vehicle, support it with safety stands (rigid racks), and remove front wheel cap and wheels.
- 3) Unlock axle nut.
- 4) Depress brake pedal and remove axle nut using a socket wrench.

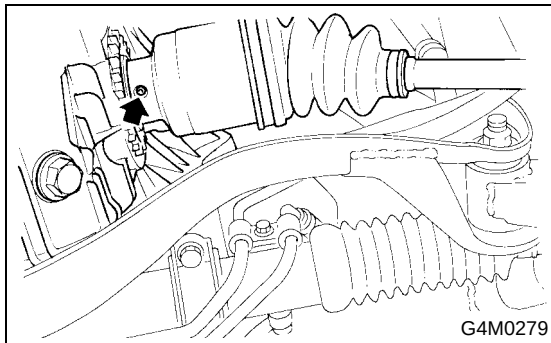
CAUTION:

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.

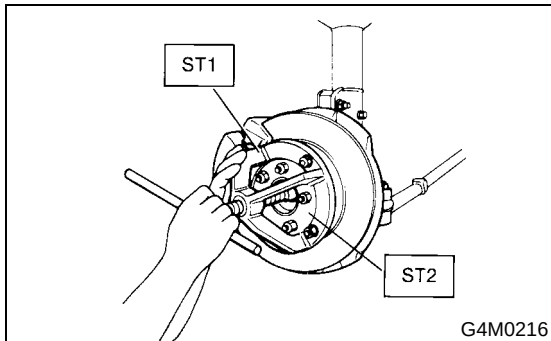


- 8) Remove front drive shaft assembly. If it is hard to remove, use ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER 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.

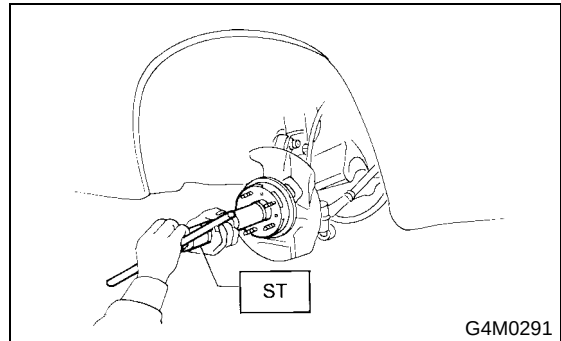
- 2) Using ST1 and ST2, pull drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER

ST2 927390000 ADAPTER

CAUTION:

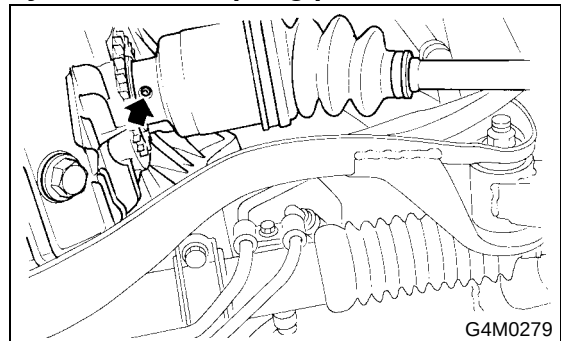
Do not hammer drive shaft when installing it.



- 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:

186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:

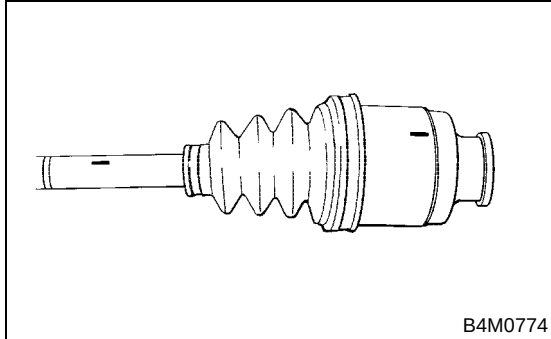
- Use a new axle nut.
- Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.

- 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

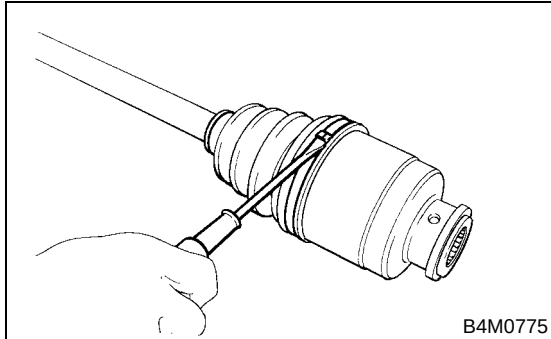
1) Place alignment marks on shaft and outer race.



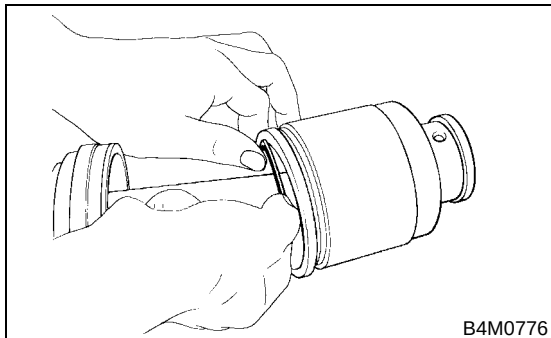
2) Remove SFJ boot band and boot.

CAUTION:

Be careful not to damage boot.



3) Remove circlip from SFJ outer race using screw-driver.



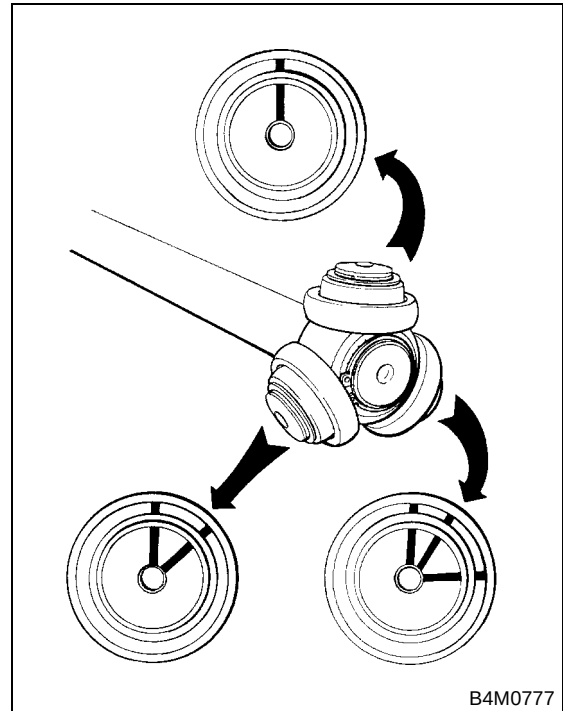
4) Remove SFJ outer race from shaft assembly.

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.

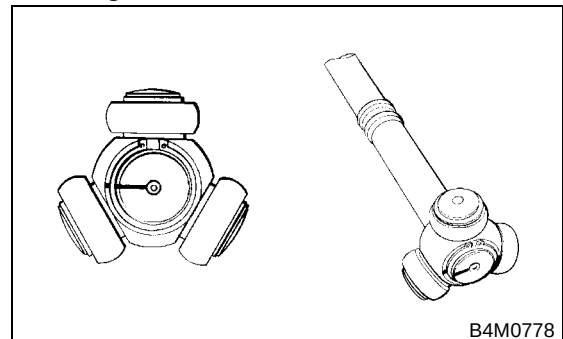


7) Remove free ring from trunnion.

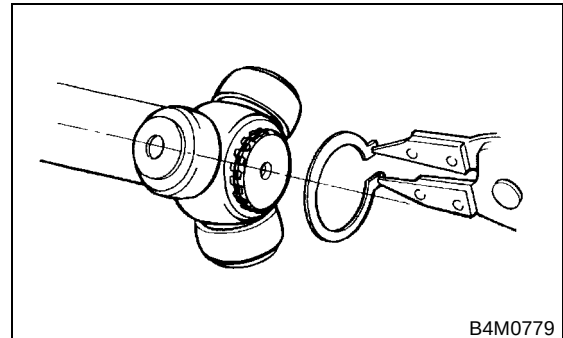
CAUTION:

Be careful with the free ring position.

8) Place alignment mark on trunnion and shaft.



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.

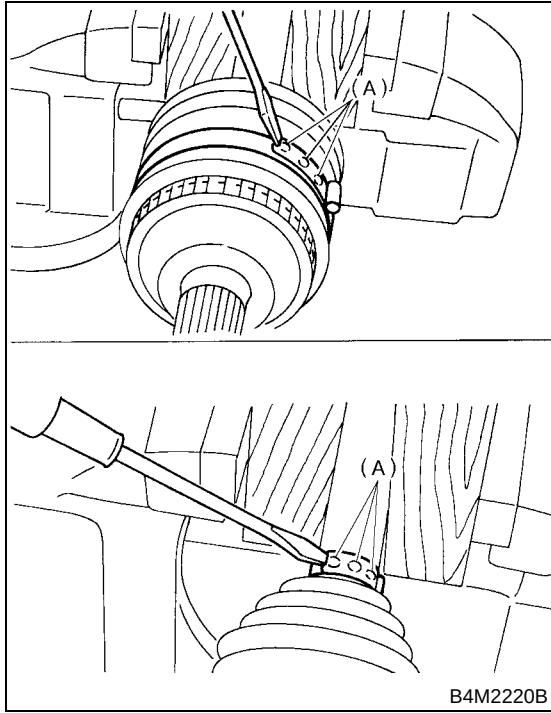
FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

CAUTION:

Do not place drive shaft directly in the vise; use wooden block.

12) Raise boot band claws by means of screwdriver and hammer.

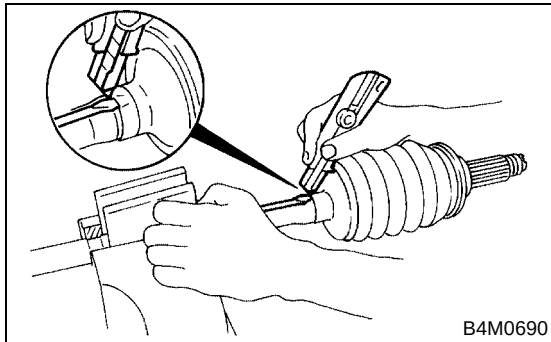


(A) Boot band claws

13) Cut and remove the boot.

CAUTION:

The boot must be replaced with a new one whenever it is removed.



14) Thus, disassembly of axle is completed, but 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.

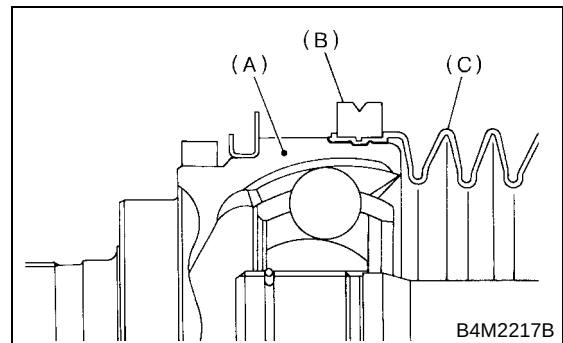
3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to BJ.

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.

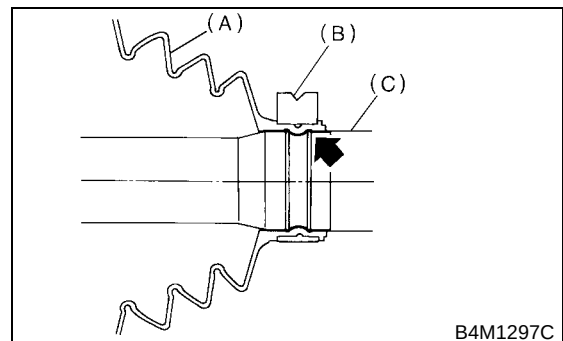
5) Install boot projecting portion to BJ groove.



(A) BJ
(B) Large boot band
(C) Boot

6) Set large boot band in place.

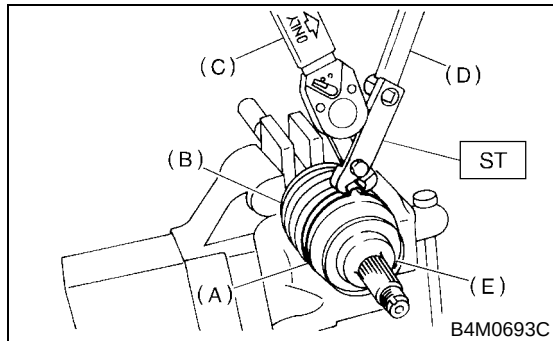
7) Install boot projecting portion to shaft groove.



(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

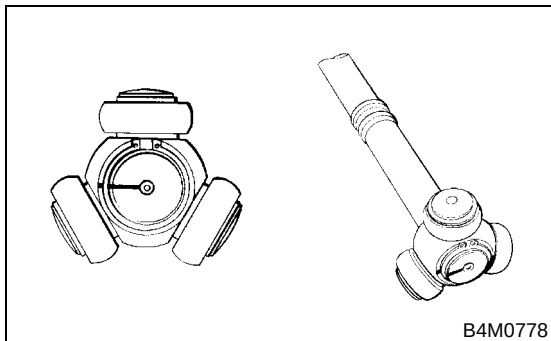
157 N·m (16.0 kgf-m, 116 ft-lb) or more

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.



11) Install snap ring to shaft.

CAUTION:

Confirm that the snap ring is completely fitted in the shaft groove.

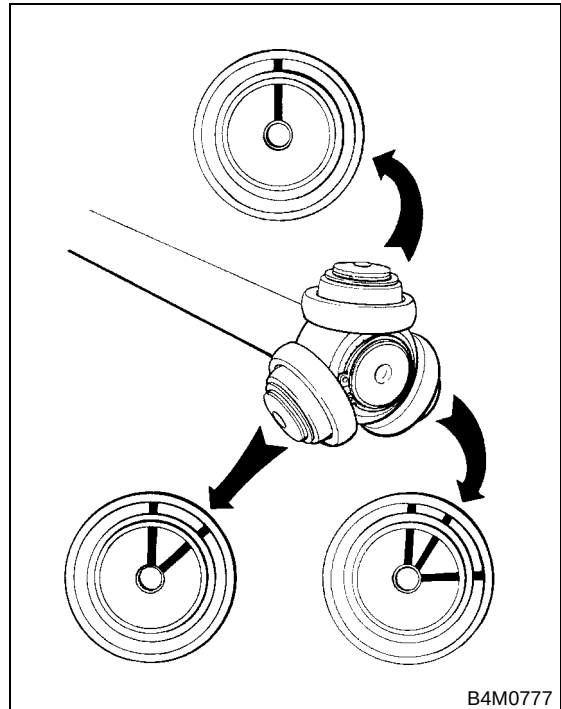
12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of SFJ outer race.

13) Apply a coat of specified grease to free ring and trunnion.

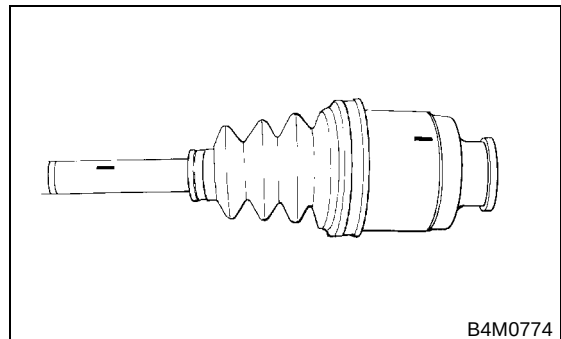
14) Align alignment marks on free ring and trunnion and install free ring.

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.

FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

20) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:

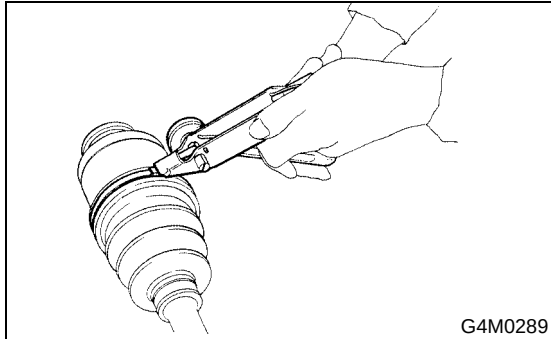
When tightening boot, exercise care so that the air within the boot is appropriate.

21) Tighten band by using ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten band until it cannot be moved by hand.

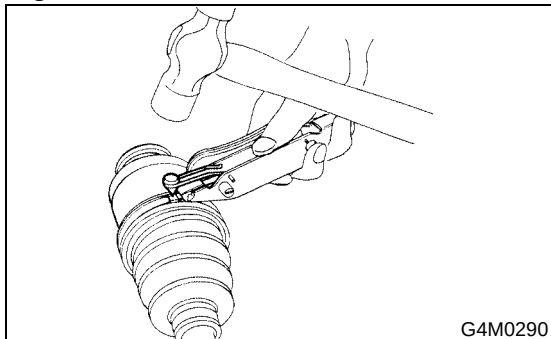


22) Tap on the clip with the punch provided at the end of ST.

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 Freering 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.

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.

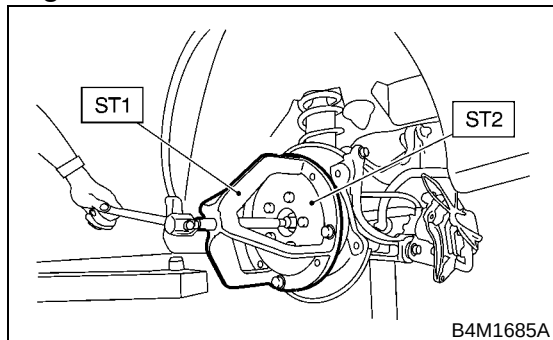
- 3) Unlock axle nut.
- 4) Remove axle nut using a socket wrench.
- 5) Remove rear differential assembly.
with T-type
<Ref. to DI-25, REMOVAL, Rear Differential for T-type.>
with VA-type
<Ref. to DI-40, REMOVAL, Rear Differential for VA-type.>

- 6) Remove axle nut and drive shaft. If it is hard to remove, use ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER
PLATE

CAUTION:

Be careful not to damage tone wheel when removing rear drive shaft.



B: INSTALLATION

- 1) Insert BJ into rear hub splines.

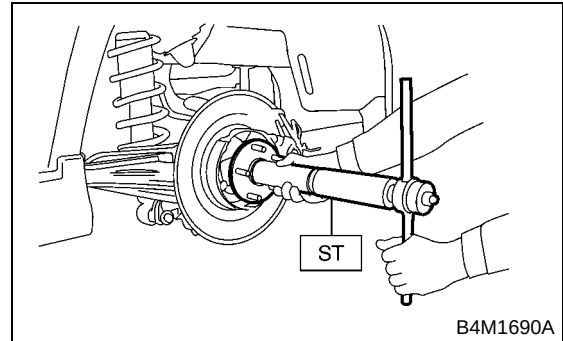
CAUTION:

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-27, 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:

235 N·m (24 kgf-m, 174 ft-lb)

CAUTION:

- Use a new axle nut for rear use only.
- 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.

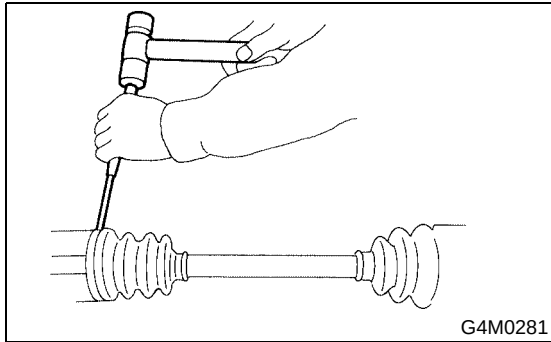
- 6) After tightening axle nut, lock it securely.

REAR DRIVE SHAFT

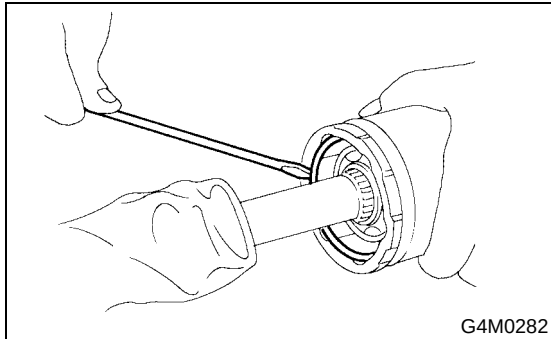
DRIVE SHAFT SYSTEM

C: DISASSEMBLY

- 1) Straighten bent claw of larger end of DOJ boot.
- 2) Loosen band by means of screwdriver or pliers with care of not damaging 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.



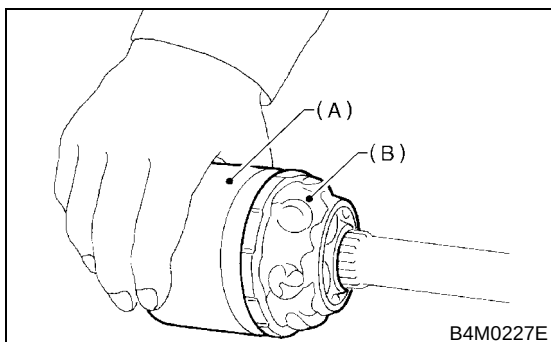
- 6) Take out DOJ outer race from shaft assembly.
- 7) Wipe off grease and take out balls.

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) Thus, disassembly of axle is completed, but BJ is unable to be disassembled.

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.

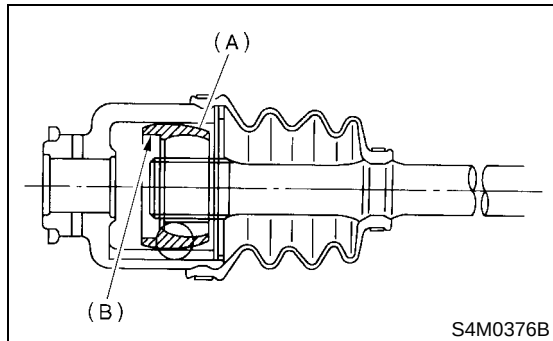
CAUTION:

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.

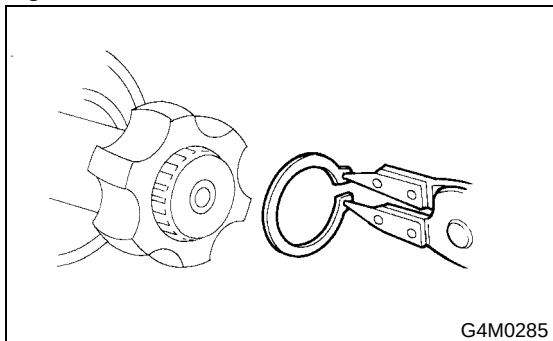


- (A) Cage
(B) Cut-out portion

- 4) Install DOJ inner race on shaft and fit snap ring with pliers.

NOTE:

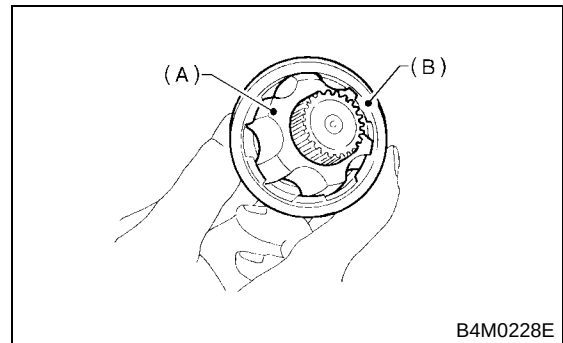
Confirm that the snap ring is completely fitted in the shaft groove.



- 5) Install cage, which was previously fitted, to inner race fixed upon shaft.

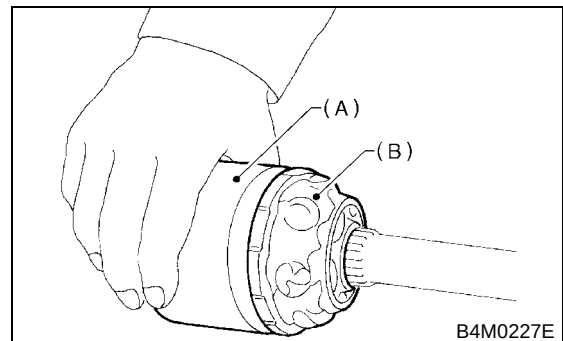
NOTE:

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

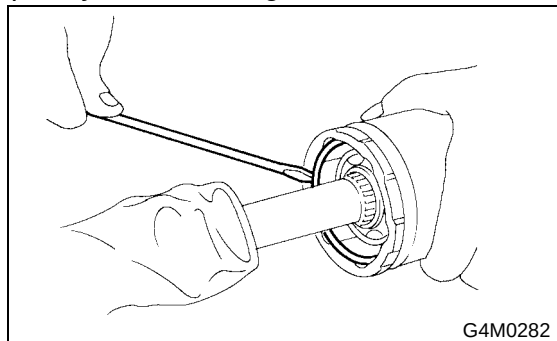
REAR DRIVE SHAFT

DRIVE SHAFT SYSTEM

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:

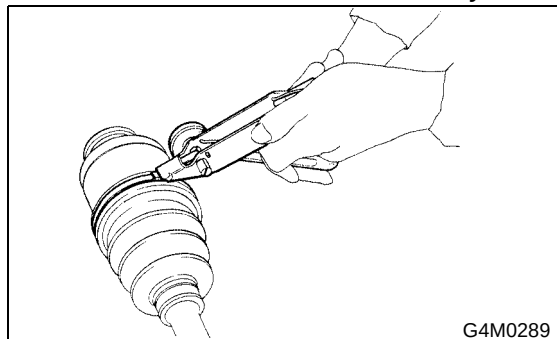
When tightening boot, exercise care so that the air within the boot is appropriate.

15) Tighten band by using ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten band until it cannot be moved by hand.

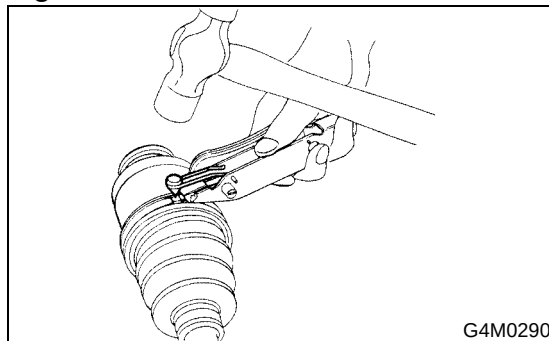


16) Tap on the clip with the punch provided at the end of ST.

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 Freering 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.

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 increase 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.

GENERAL DIAGNOSTIC TABLE

DRIVE SHAFT SYSTEM

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

	Page
1. General Description	2
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)	7
3. ABS Sequence Control	11
4. Front ABS Sensor	14
5. Rear ABS Sensor	17
6. Front Tone Wheel	20
7. Rear Tone Wheel	21
8. G Sensor	22

GENERAL DESCRIPTION

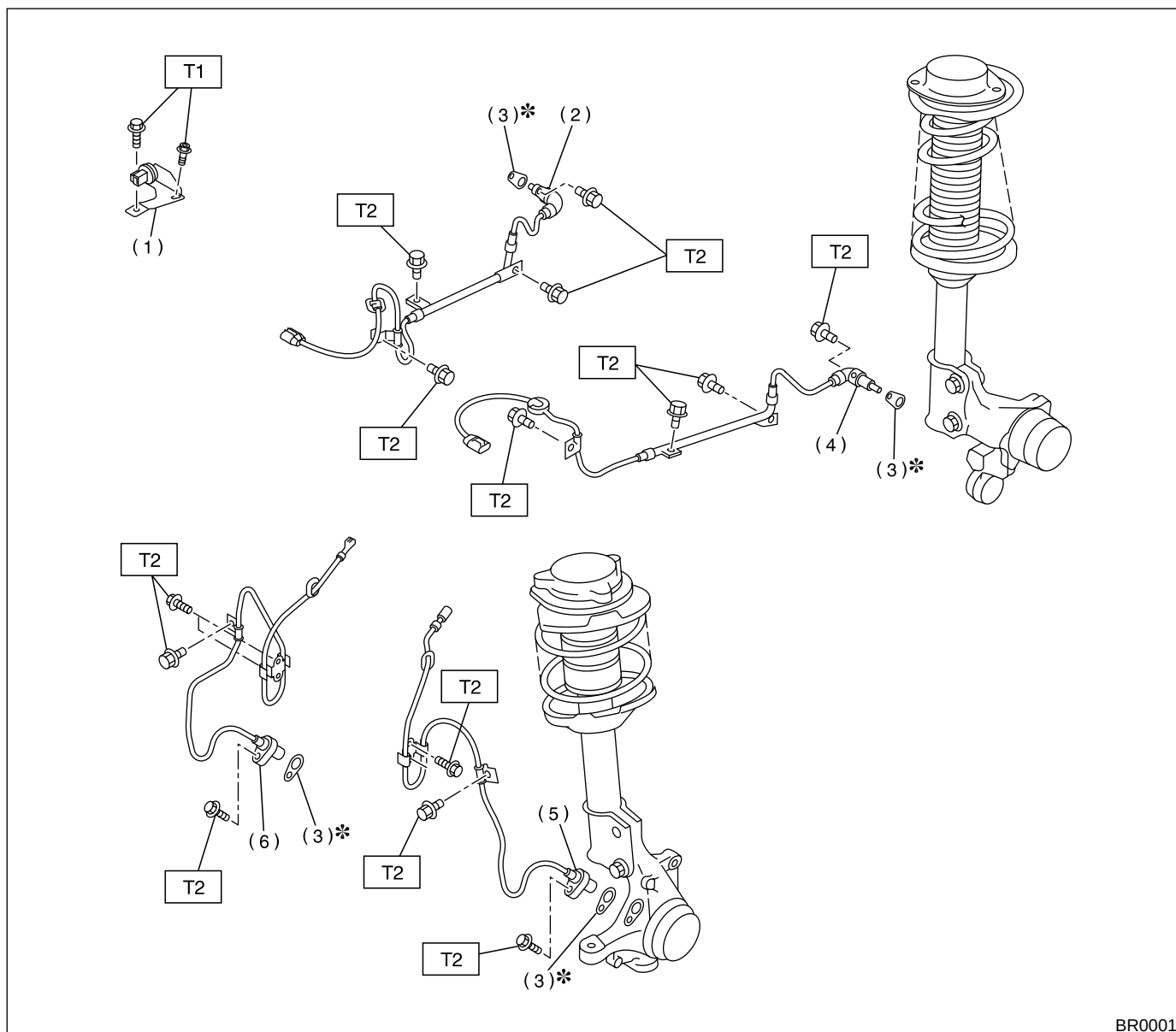
ABS

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	0.7 — 1.2 mm (0.028 — 0.047 in)	
	ABS sensor resistance		Front	1.25±0.25 kΩ	
			Rear	1.0±0.2 kΩ	
	Marks of the harness	Front	RH	White	
			LH	Yellow	
		Rear	RH	Light blue	
			LH	Brown	
G sensor	G sensor voltage			2.3±0.2 V	
ABS control module and hydraulic control unit (ABSCM&H/U) marks	FWD model		AT	CA	
			MT	CB	
	AWD model		AT	CC	
			MT	CD	

1. SENSOR



BR0001

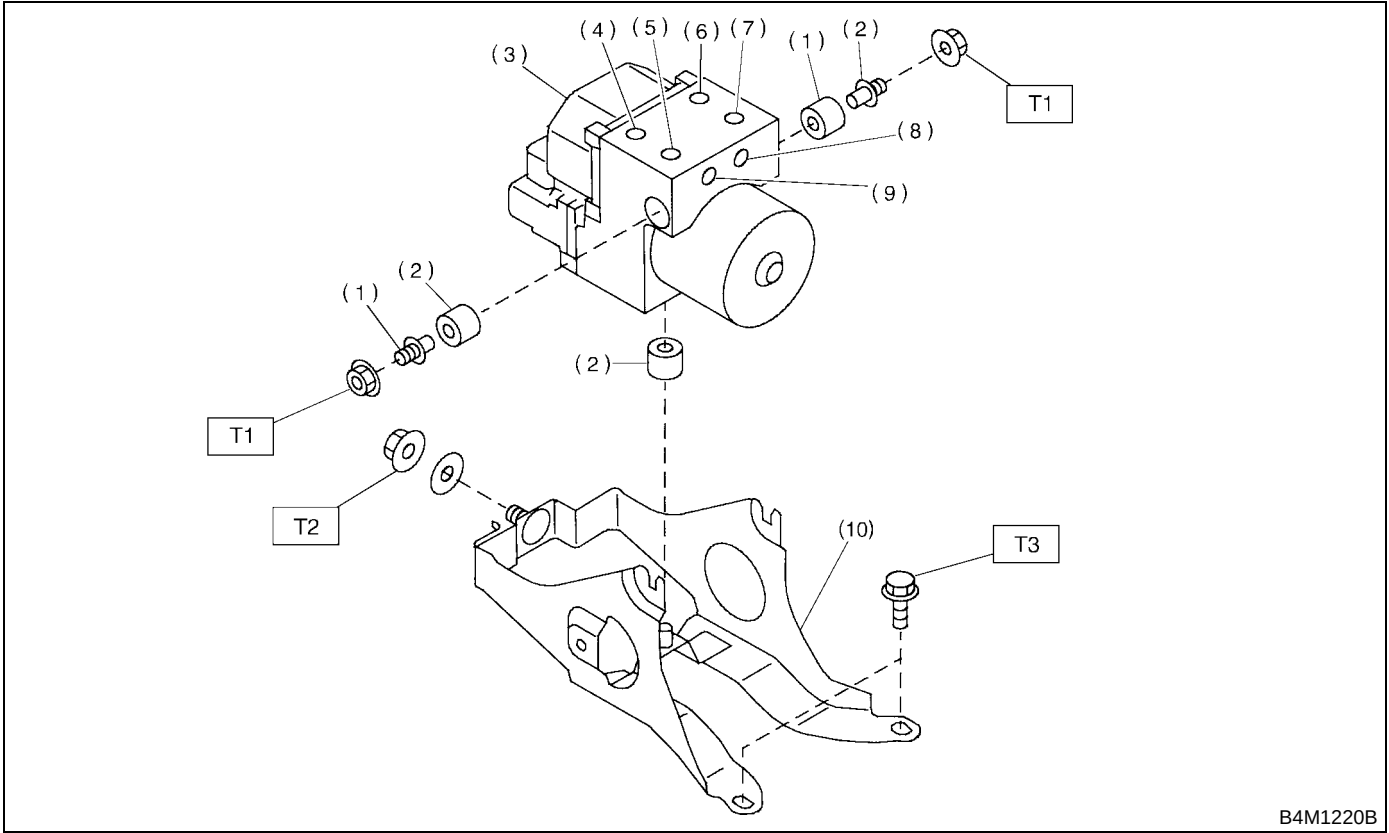
- | | |
|------------------------|-------------------------|
| (1) G sensor | (4) Rear ABS sensor LH |
| (2) Rear ABS sensor RH | (5) Front ABS sensor LH |
| (3) ABD spacer | (6) Front ABS sensor RH |

T2: 32 (3.3, 24)

GENERAL DESCRIPTION

ABS

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



B4M1220B

- | | |
|---|---------------------|
| (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, 13.0)

T2: 29 (3.0, 21.7)

T3: 32 (3.3, 24)

C: CAUTION

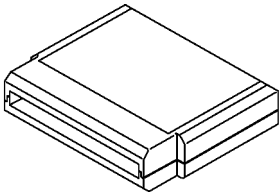
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 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 negative terminal from battery.

GENERAL DESCRIPTION

ABS

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • 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.

2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

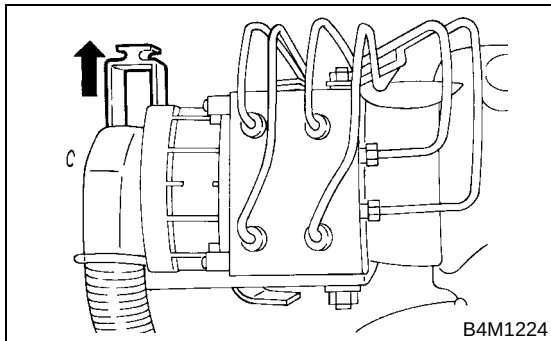
A: REMOVAL

- 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:

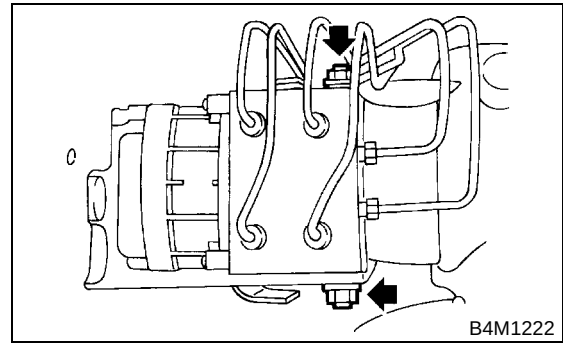
Wrap brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

- 8) Remove ABSCM&H/U 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.



ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

ABS

B: INSTALLATION

1) Install ABSCM&H/U bracket.

Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)

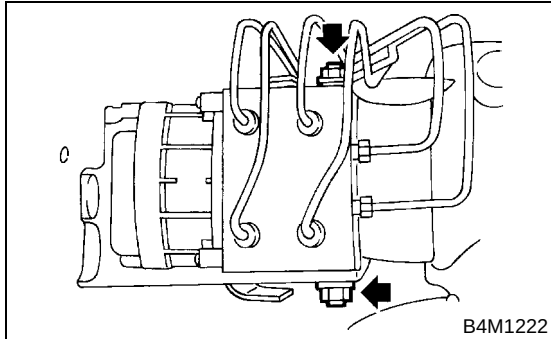
2) Install ABSCM&H/U.

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)



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.

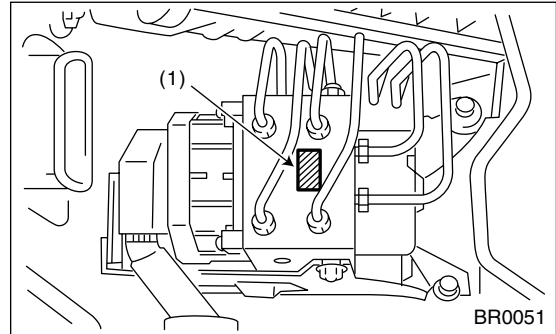
7) Bleed air from the brake system.

C: INSPECTION

1) Check connected and fixed condition of connector.

2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
CA	AT (FWD)
CB	MT (FWD)
CC	AT (AWD)
CD	MT (AWD)



(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.

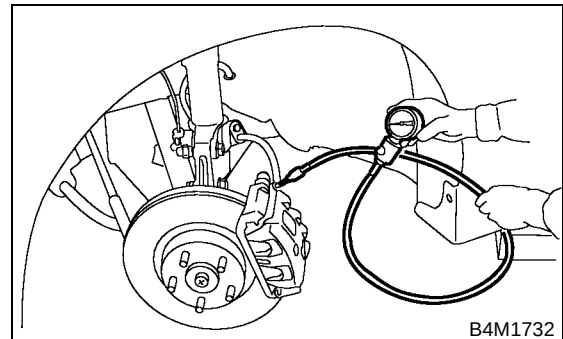
3) Connect two pressure gauges to the FL and FR caliper bodies.

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.



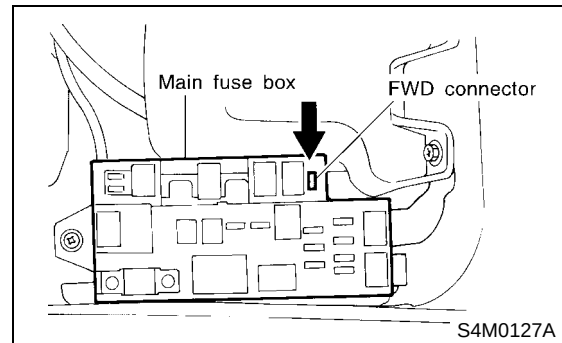
- 4) Bleed air from the pressure gauges.
- 5) Perform ABS sequence control.
<Ref. to ABS-11, ABS Sequence Control.>
- 6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
- 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 kgf/cm ² , 498 psi)	3,432 kPa (35 kgf/cm ² , 498 psi)
When decompressed	490 kPa (5 kgf/cm ² , 71 psi) or less	490 kPa (5 kgf/cm ² , 71 psi) or less
When compressed	3,432 kPa (35 kgf/cm ² , 498 psi) or more	3,432 kPa (35 kgf/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-11, 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.
- 17) Connect the air bleeder screws to RL and RR caliper bodies.
- 18) Bleed air from brake line.

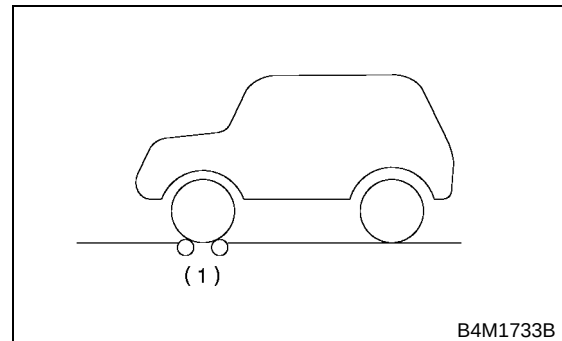
2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

- 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.

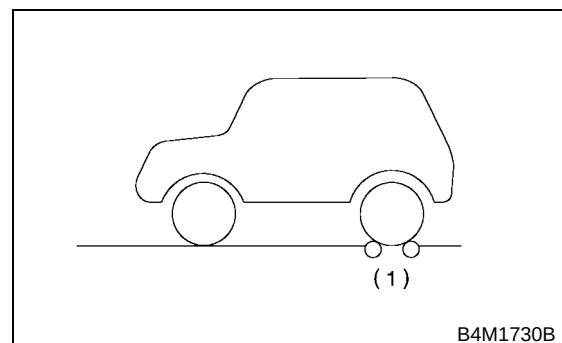


(1) FWD connector

- 2) Prepare for operating ABS sequence control.
<Ref. to ABS-11, ABS Sequence Control.>
- 3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "neutral".



B4M1733B



B4M1730B

(1) Brake tester

- 4) Operate the brake tester.
- 5) Perform ABS sequence control.
<Ref. to ABS-11, 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.

ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

ABS

(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

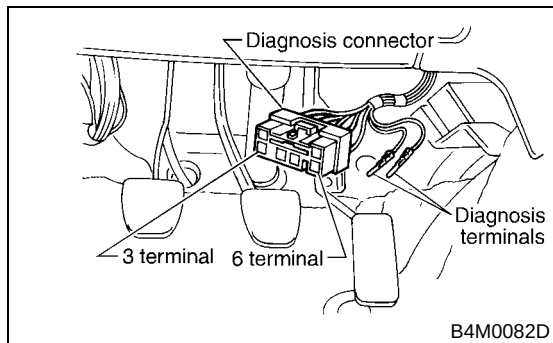
A: OPERATION

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. 3 and No. 6 of the diagnosis connector beside driver's seat heater unit.



2) Set the speed of all wheels at 4 km/h (2 MPH) or less.

3) Turn ignition switch OFF.

4) Within 0.5 seconds after the ABS 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 ABS-11, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, 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.

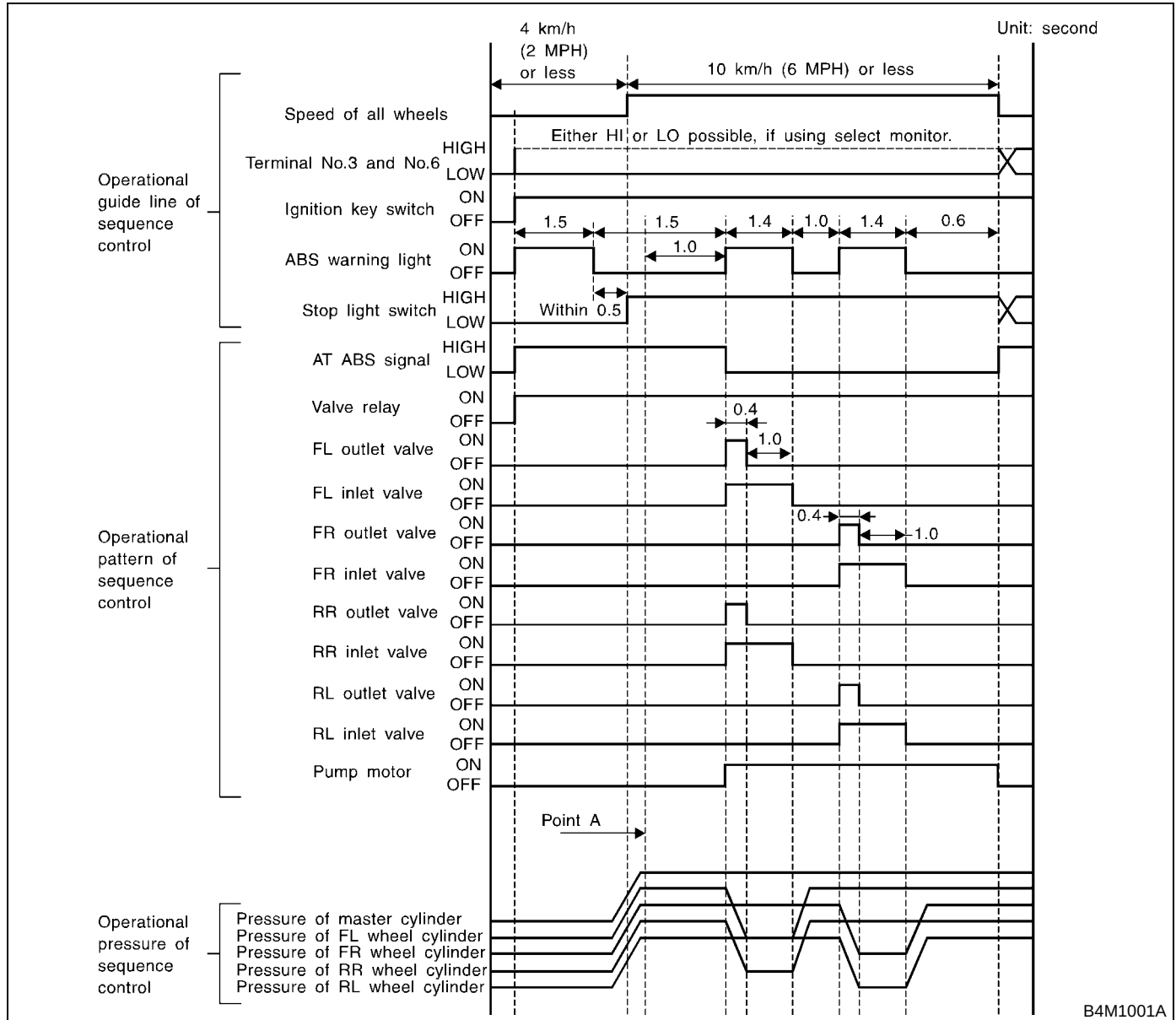
7) When the message "Press YES" is displayed, press YES key.

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

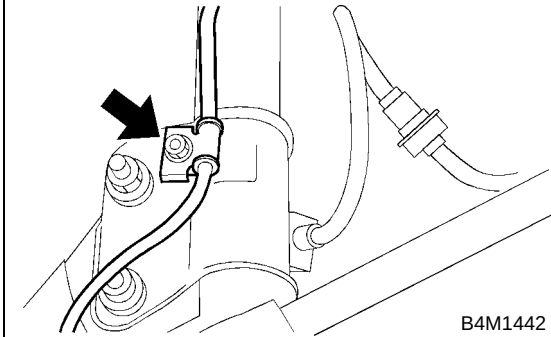
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

- 1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
- 2) When terminal No. 3 or No. 6 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.)

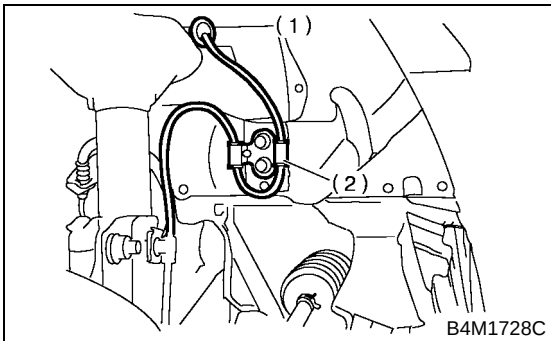
4. Front ABS Sensor

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.

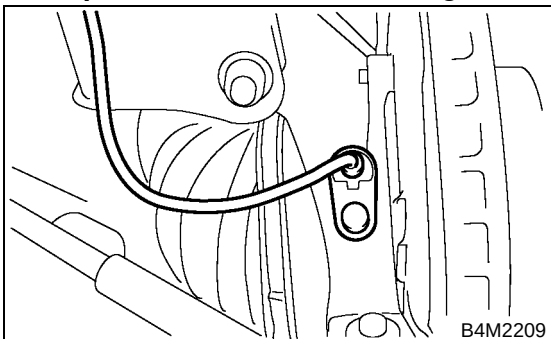


- (1) To front ABS sensor connector
- (2) Bracket

- 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.

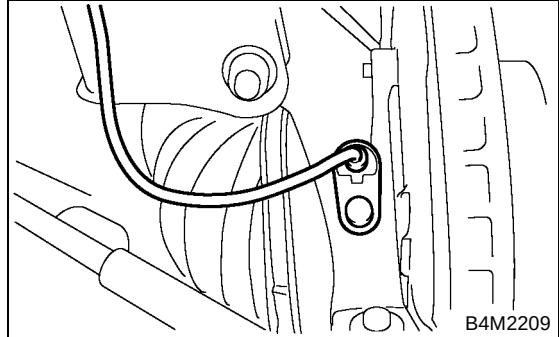


B: INSTALLATION

- 1) Temporarily install front ABS sensor on housing.

CAUTION:

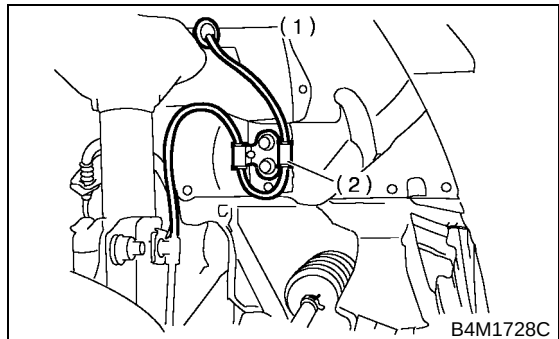
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.



- 2) Install front ABS sensor on strut and wheel apron bracket.

Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)

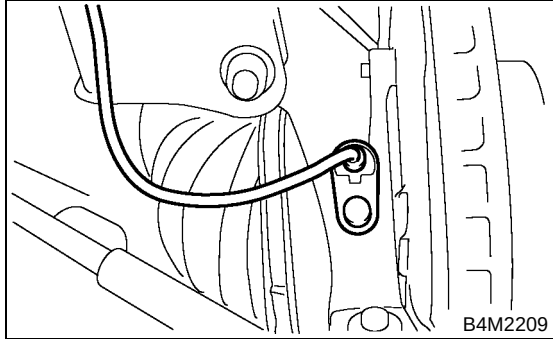


- (1) To front ABS sensor connector
- (2) Bracket

3) Place a thickness gauge between ABS sensor's 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:
32 N·m (3.3 kgf-m, 24 ft-lb)



CAUTION:
 Check the marks on the harness to make sure that no distortion exists.

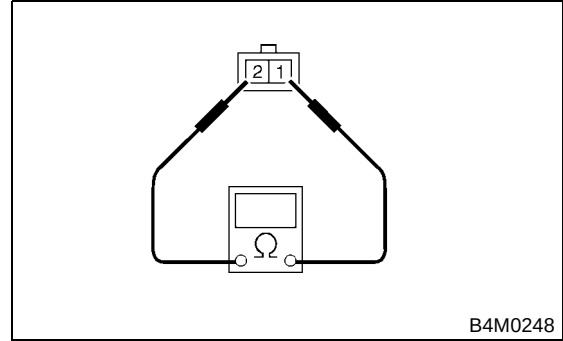
RH: White
LH: Yellow

NOTE:
 If the clearance is outside specifications, readjust.
 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.



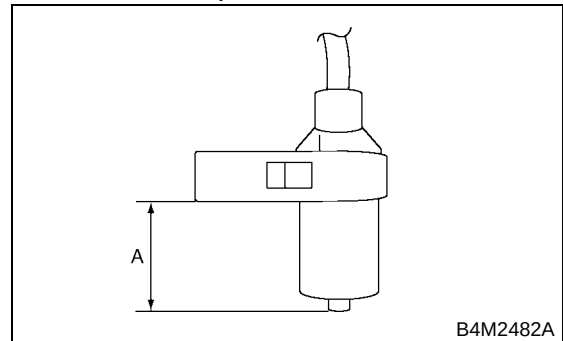
Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

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.

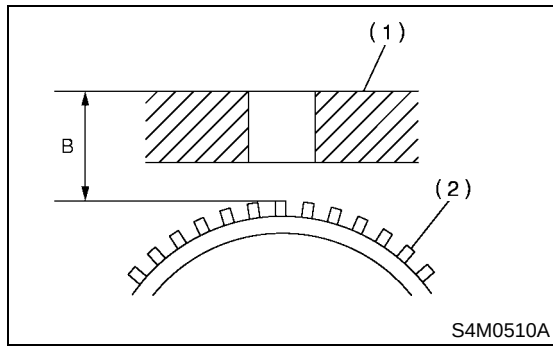
2. SENSOR GAP

- 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

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755A000).

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 mm (0.012 — 0.031 in)

NOTE:

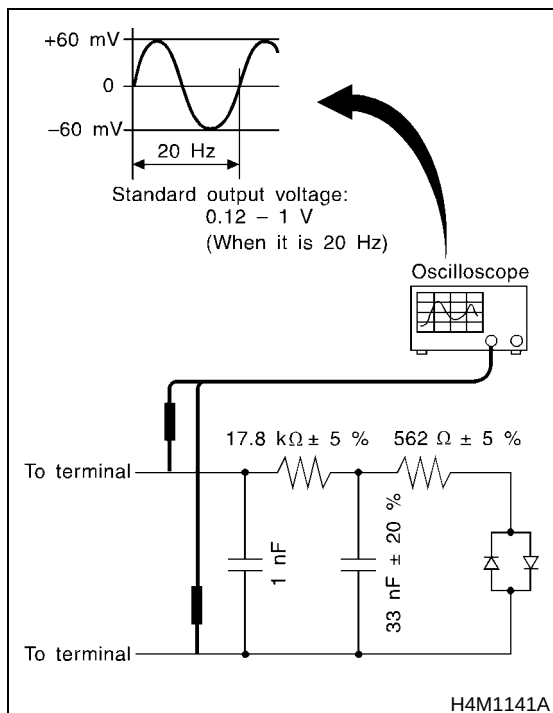
If the clearance is outside specifications, readjust.

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:

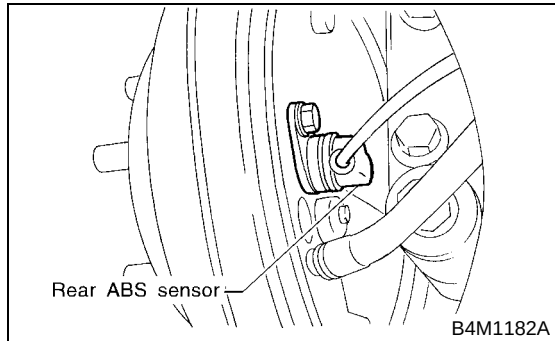
Regarding terminal No., please refer to item 1. ABS SENSOR.



5. Rear ABS Sensor

A: REMOVAL

- 1) Disconnect battery ground cable.
- 2) Lift-up the vehicle.
- 3) Remove rear seat and disconnect rear ABS sensor connector.
- 4) Remove rear sensor harness bracket from rear trailing link and bracket.
- 5) Remove rear ABS sensor from back plate.



- 6) Remove rear tone wheel while removing hub from housing and hub assembly.<Ref. to DS-24, REMOVAL, Rear Axle.>

CAUTION:

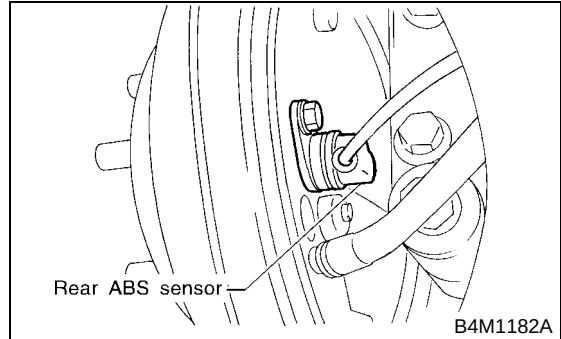
- Be careful not to damage pole piece located at tip of the sensor and teeth faces during removal.
- Do not pull sensor harness during removal.

B: INSTALLATION

- 1) Install rear tone wheel on hub, then rear housing on hub.<Ref. to DS-30, ASSEMBLY, Rear Axle.>
- 2) Temporarily install rear ABS sensor on back plate.

CAUTION:

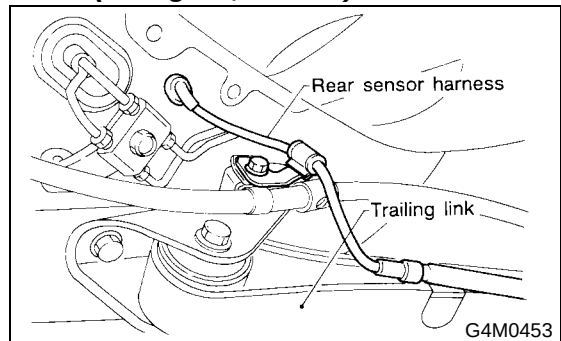
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.



- 3) Install rear drive shaft to rear housing and rear differential spindle.<Ref. to DS-27, INSTALLATION, Rear Axle.>
- 4) Install rear sensor harness on rear trailing link.

Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)



REAR ABS SENSOR

ABS

5) 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:
0.7 — 1.2 mm (0.028 — 0.047 in)

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

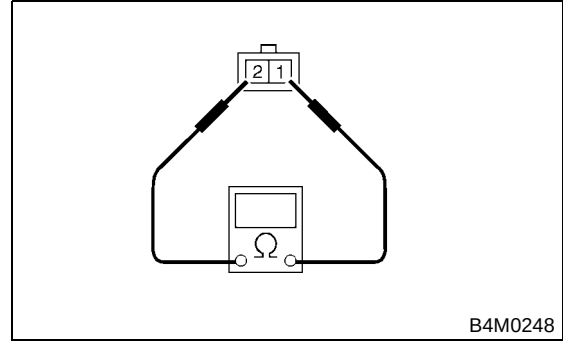
CAUTION:
Check the marks on the harness to make sure that no distortion exists. (RH: white, LH: yellow)

NOTE:
If the clearance is outside specifications, readjust.
6) After confirmation of the ABS sensor clearance, connect connector to ABS sensor.
7) 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	1.0±0.2 kΩ

CAUTION:

- If resistance is outside the standard value, replace ABS sensor with new one.
- Check the marks on the harness to make sure that no distortion exists.

RH: Light blue

LH: Brown

NOTE:
Check ABS sensor cable for discontinuity. If necessary, replace with a new one.

2. SENSOR GAP

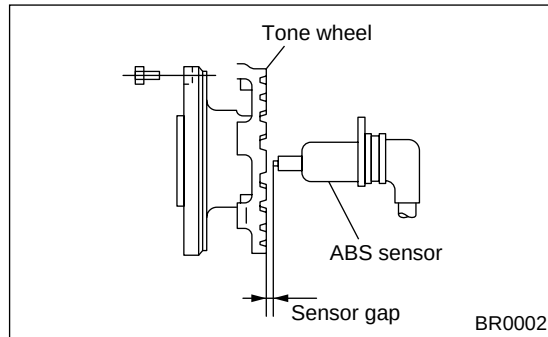
Clearances (sensor gaps) should be measured one by one to ensure tone wheel and speed sensor are installed correctly.

NOTE:

- If clearance is narrow, adjust by using spacer (Part No. 26755AA000).
- If clearance is wide, check the outputted voltage then replace ABS sensor or tone wheel if the outputted voltage is outside the specification.

ABS sensor clearance:

0.7 — 1.2 mm (0.028 — 0.047 in)

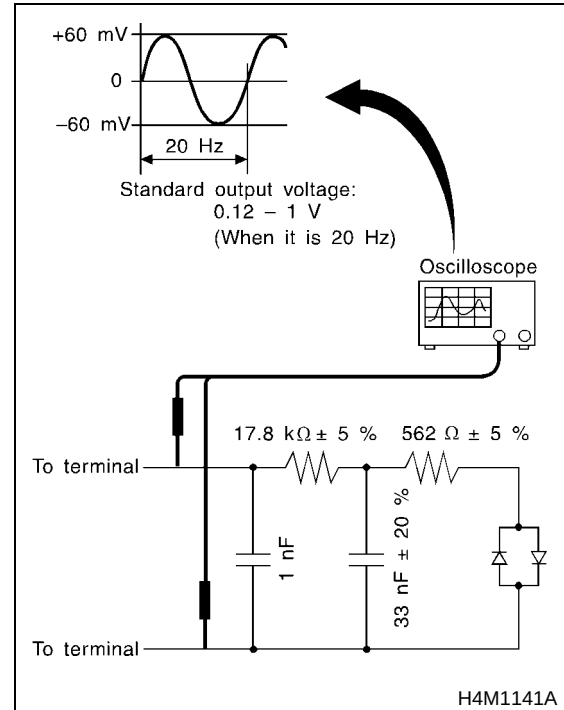


3. OUTPUT VOLTAGE

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.



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-32, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.

<Ref. to DS-32, 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 hub.

<Ref. to DS-37, REMOVAL, Rear Drive Shaft.>

B: INSTALLATION

Refer to Rear Drive Shaft, because rear tone wheel is integrated with hub.

<Ref. to DS-37, INSTALLATION, Rear Drive Shaft.>

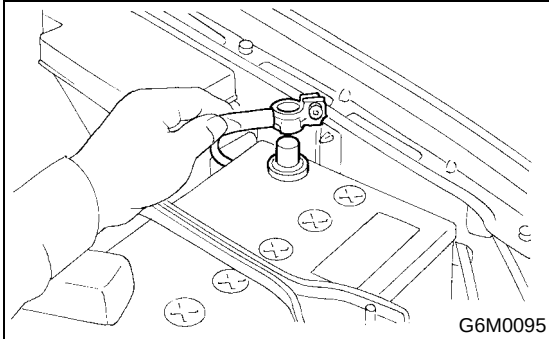
C: INSPECTION

Visually check tone wheels teeth (44 pieces) for cracks or dents. If necessary, replace tone wheel with a new one.

8. G Sensor

A: REMOVAL

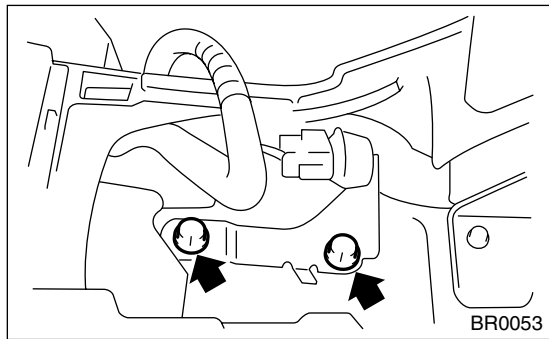
- 1) Disconnect battery ground terminal.



- 2) Remove console cover.
<Ref. to EI-24, 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.

CAUTION:

Do not drop or bump G sensor.

C: INSPECTION

	Step	Check	Yes	No
1	CHECK SUBARU SELECT MONITOR.	Do you have SUBARU SELECT MONITOR?	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 2.3 ± 0.2 V when G sensor is horizontal?	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 3.9 ± 0.2 V when G sensor is inclined forwards to 90° ?	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 0.7 ± 0.2 V when G sensor is inclined backwards to 90° ?	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 2.3 ± 0.2 V when the vehicle is in horizontal position?	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 indicated reading 3.9 ± 0.2 V when G sensor is inclined forwards to 90° ?	Go to step 7.	Replace G sensor.
7	CHECK G SENSOR. Read the select monitor display.	Is the indicated reading 0.7 ± 0.2 V when G sensor is inclined backwards to 90° ?	G sensor is normal.	Replace G sensor.

G SENSOR

ABS

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

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 trouble code indicated by ABS warning light.

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1)Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS-6, Check List for Interview.> 2)Before performing diagnosis, inspect unit which might influence the ABS problem. <Ref. to ABS-9, INSPECTION, General Description.>	Is unit that might influence the ABS problem normal?	Go to step 2.	Repair or replace each unit.
2 CHECK INDICATION OF TROUBLE CODE. Calling up trouble code. <Ref. to ABS-20, Read Diagnostic Trouble Code.>	Is trouble code readable?	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 trouble code again after inspecting ABS warning light. <Ref. to ABS-20, Read Diagnostic Trouble Code.>
3 CHECK TROUBLE CODE. NOTE: Record all trouble codes.	Is only the start code issued?	Go to step 4.	Go to step 5.
4 PERFORM THE GENERAL DIAGNOSTICS. 1)Inspect using "General Diagnostics Table". <Ref. to ABS-186, 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 trouble code. <Ref. to ABS-20, Read Diagnostic Trouble Code.>	Is only the start code issued?	Complete the diagnosis.	Go to step 5.

BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

Step	Check	Yes	No
5 PERFORM THE DIAGNOSIS. 1)Inspect using "Diagnostics Chart with Diagnostic Connector".<Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.> NOTE: For trouble code list, refer to "List of Diagnostics Trouble Code".<Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code.> 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 trouble code. <Ref. to ABS-20, Read Diagnostic Trouble Code.>	Is only the start code issued?	Complete the diagnosis.	Inspect using "Diagnostics Chart with Diagnostic Connector". <Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.>

BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

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-26, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code.>

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1)Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS-6, Check List for Interview.> 2)Before performing diagnosis, inspect unit which might influence the ABS problem. <Ref. to ABS-9, INSPECTION, General Description.>	Is unit that might influence the ABS problem 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. NOTE: If the communication function of the select monitor cannot be executed normally, check the communication circuit. <Ref. to ABS-96, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.> 4)Read diagnostic trouble code. <Ref. to ABS-19, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5)Record all trouble codes and frame data.	Is the corresponding trouble encoding?	Go to step 3.	Go to step 4.
3 PERFORM THE GENERAL DIAGNOSTICS. 1)Inspect using "General Diagnostics Table". <Ref. to ABS-186, General Diagnostics Table.> 2)Perform the clear memory mode. <Ref. to ABS-19, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3)Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 4)Calling up the trouble code. <Ref. to ABS-18, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>	Is no trouble code designated and ABS warning light goes out after turning on?	Complete the diagnosis.	Go to step 4.

BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

Step	Check	Yes	No
4 PERFORM THE DIAGNOSIS. 1)Inspect using "Diagnostics Chart with Subaru Select Monitor".<Ref. to ABS-96, Diagnostics Chart with Subaru Select Monitor.> NOTE: For trouble code list, refer to "List of Diagnostics Trouble Code".<Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code.> 2)Repair trouble cause. 3)Perform the clear memory mode. <Ref. to ABS-19, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4)Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 5)Calling up the trouble code. <Ref. to ABS-18, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>	Is no trouble code designated and does ABS warning light go out after turning on?	Complete the diagnosis.	Inspect using "Diagnostics Chart with Subaru Select Monitor". <Ref. to ABS-96, 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.	☐ Always ☐ Sometimes ☐ Only once ☐ Does not come on • When / how long does it come on?:		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (before starting engine) ☐ START ☐ On after starting (Engine is running) ☐ On after starting (Engine is stop)		
Timing	☐ Immediately after ignition is ON. ☐ Immediately after ignition starts.		
	☐ When advancing	km/h to km/h MPH to MPH	
	☐ While traveling at a constant speed	km/h	MPH
	☐ When decelerating	km/h to km/h MPH to MPH	
	☐ When turning to right	Steering angle :	deg
		Steering time :	sec
	☐ When turning to left	Steering angle :	deg
		Steering time :	sec
	☐ When moving other electrical parts • Parts name : • Operating condition :		

2. SYMPTOMS

ABS operating condition	☐ Performs no work.		
	☐ Operates only when abruptly applying brakes.	Vehicle speed :	km/h MPH
	• How to step on brake pedal :		
	a) Operating time :	sec	
	b) Operating noise : ☐ Produce / ☐ Does not produce		
	• What kind of noise?	☐ Knock ☐ Gong gong ☐ Bong ☐ Buzz ☐ Gong gong buzz ☐ Others :	
	c) Reaction force of brake pedal		
		☐ Stick ☐ Press down once with a clunk ☐ Press and released ☐ Others :	

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

Behavior of vehicle	a) Directional stability cannot be obtained or steering arm refuses to work when applying brakes : ☐ Yes / ☐ No	
	• When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	b) Directional stability cannot be obtained or steering arm refuses to work when accelerating : ☐ Yes / ☐ No	
	• When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	c) Brakes are out of order : ☐ Yes / ☐ No	
	• What :	☐ Braking distance is long ☐ Brakes lock or drag ☐ Pedal stroke is long ☐ Pedal sticks ☐ Others :
	d) Poor acceleration : ☐ Yes / ☐ No	
	• What :	☐ Fails to accelerate ☐ Engine stalls ☐ Others :
	e) Occurrence of vibration : ☐ Yes / ☐ No	
	• Where • What kind :	
	f) Occurrence of abnormal noise : ☐ Yes / ☐ No	
	• Where • What kind :	
g) Occurrence of other phenomena : ☐ Yes / ☐ No		
• What kind :		

3. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others :
	b) Ambient temperature	°F (°C)
	c) Road	☐ Urban area ☐ Suburbs ☐ Highway ☐ General road ☐ Ascending slope ☐ Descending slope ☐ Paved road ☐ Gravel road ☐ Muddy road ☐ Sandy place ☐ Others :
	d) Road surface	☐ Dry ☐ Wet ☐ New-fallen snow ☐ Compressed snow ☐ Frozen slope ☐ Others :

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

Condition	a) Brakes	Deceleration : g	
		☐ Continuous / ☐ Intermittent	
	b) Accelerator	Acceleration : g	
		☐ Continuous / ☐ Intermittent	
	c) Vehicle speed	km/h	MPH
		☐ Advancing ☐ Accelerating ☐ Reducing speed ☐ Low speed ☐ Turning ☐ 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. : ☐ Yes / ☐ No		
	g) Chain is passed around tires. : ☐ Yes / ☐ No		
	h) T tire is used. : ☐ Yes / ☐ No		
	i) Condition of suspension alignment :		
j) Loading state :			
k) Repair parts are used. : ☐ Yes / ☐ 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-9, 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-8, 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-24, INSPECTION, Front Brake Pad.> and <Ref. to BR-27, INSPECTION, Front Disc Rotor.>
- Rear <Ref. to BR-35, INSPECTION, Rear Brake Pad.> and <Ref. to BR-38, INSPECTION, Rear Disc Rotor.> or <Ref. to BR-45, INSPECTION, Rear Drum Brake Shoe.> and <Ref. to BR-47, INSPECTION, Rear Drum Brake Drum.>

6. TIRE

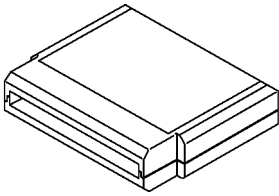
Check tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATIONS, General Description.>

GENERAL DESCRIPTION

ABS (DIAGNOSTICS)

C: PREPARATION TOOL

1. SPECIAL TOOLS

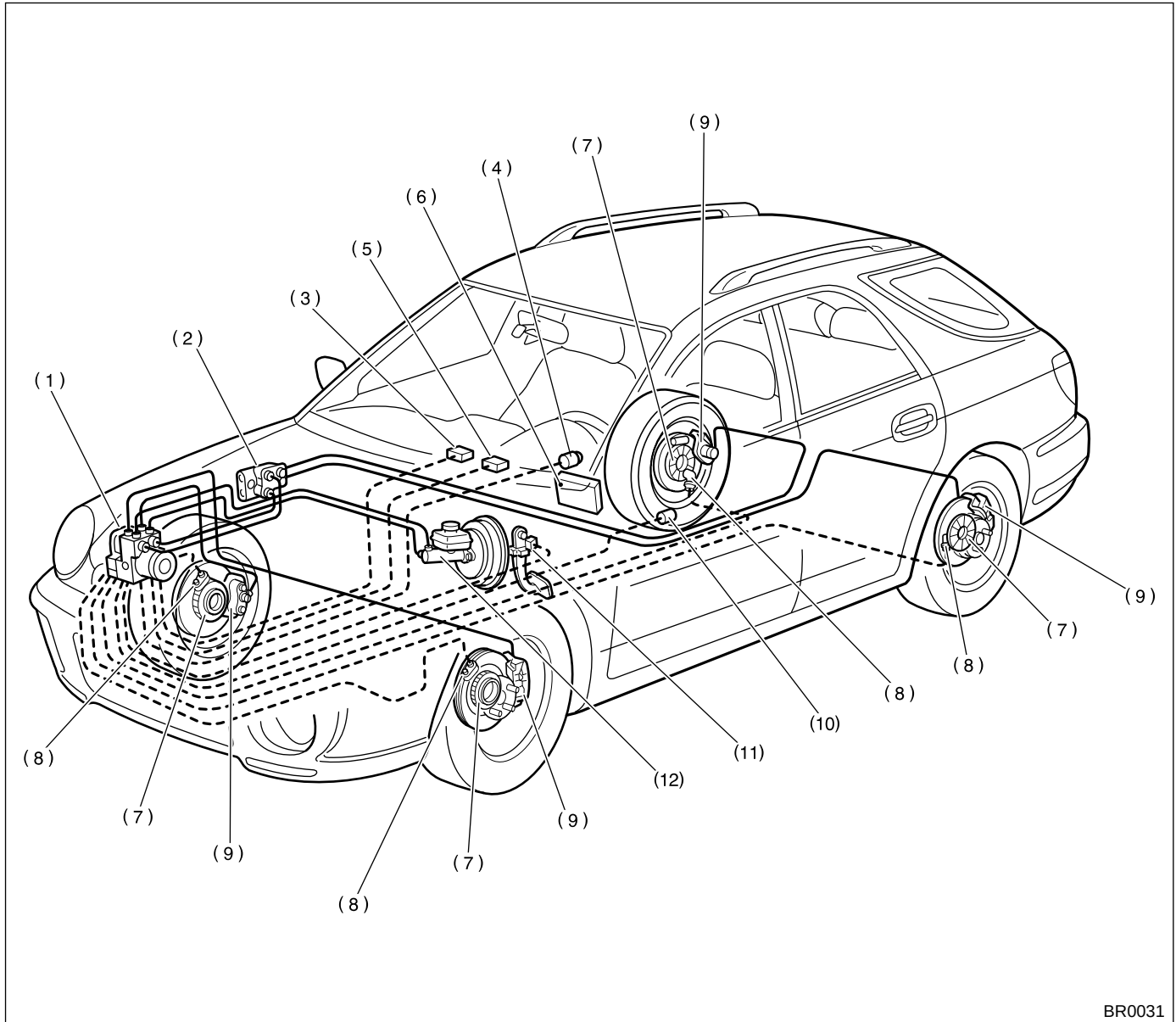
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. - English: 22771AA030 (Without printer) - German: 22771AA070 (Without printer) - French: 22771AA080 (Without 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.

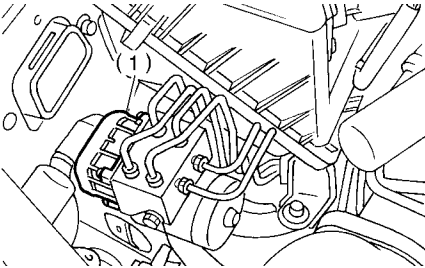
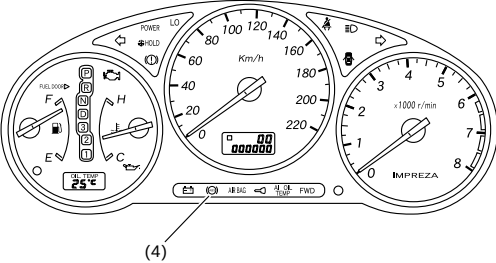
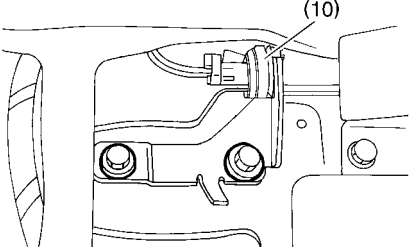
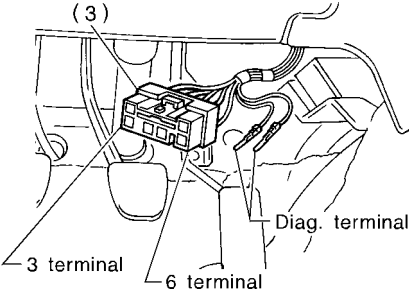
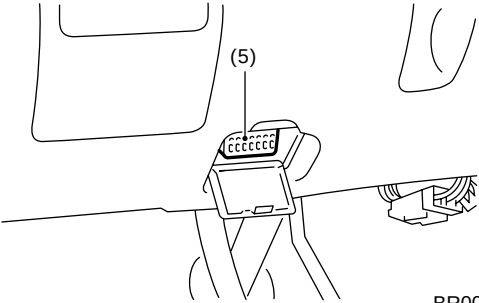
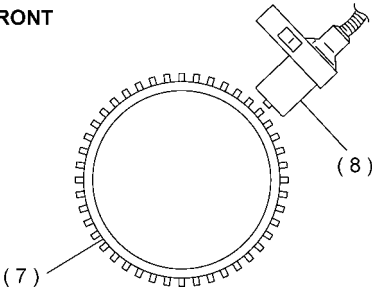
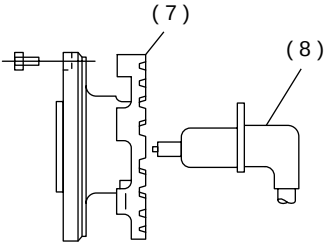
4. Electrical Components Location

A: LOCATION



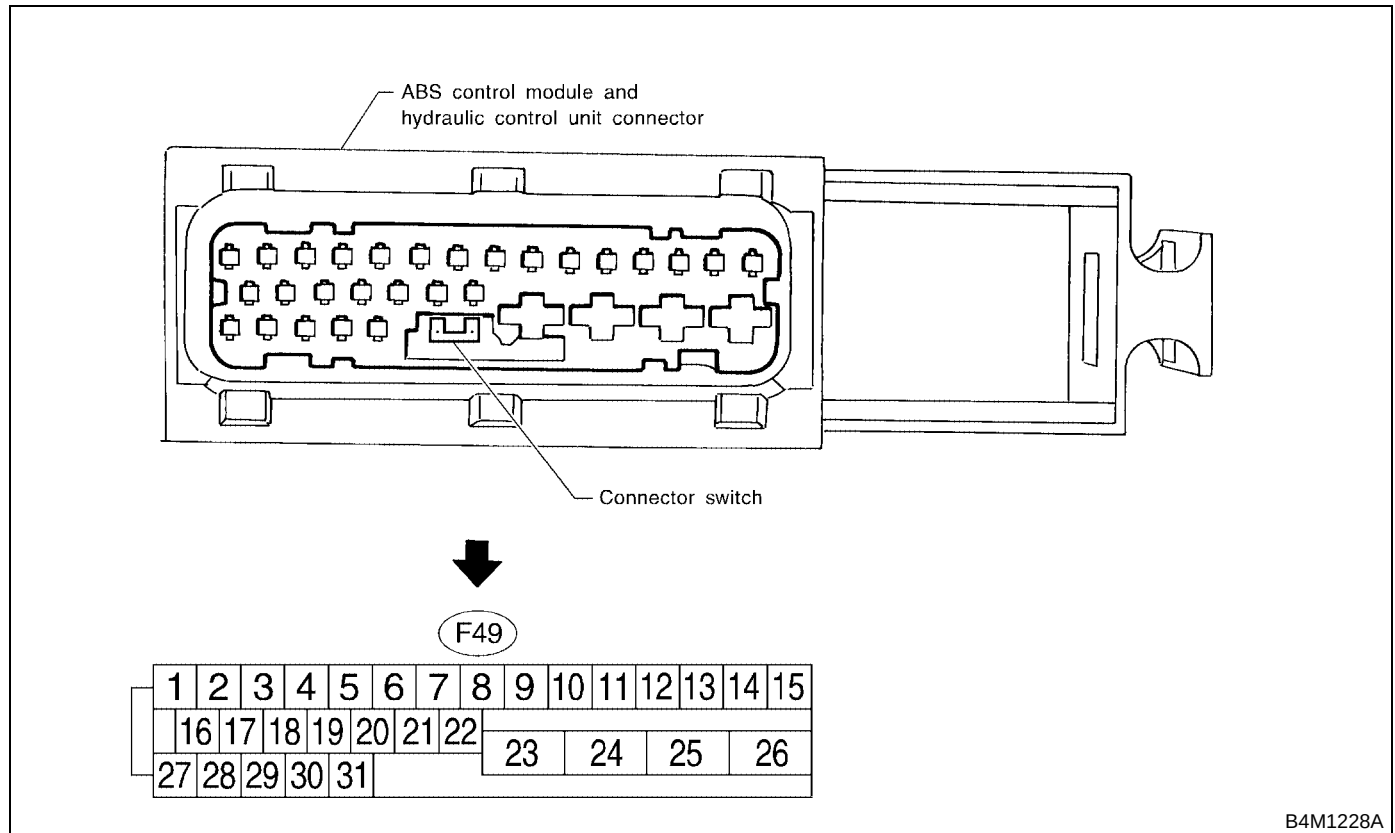
BR0031

- | | | |
|---|---|------------------------|
| (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 |

 B4M1226B	 BR0032
 BR0056	 B4M0231E
 BR0033	FRONT  BR0057
REAR  BR0058	SUBARU.

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:

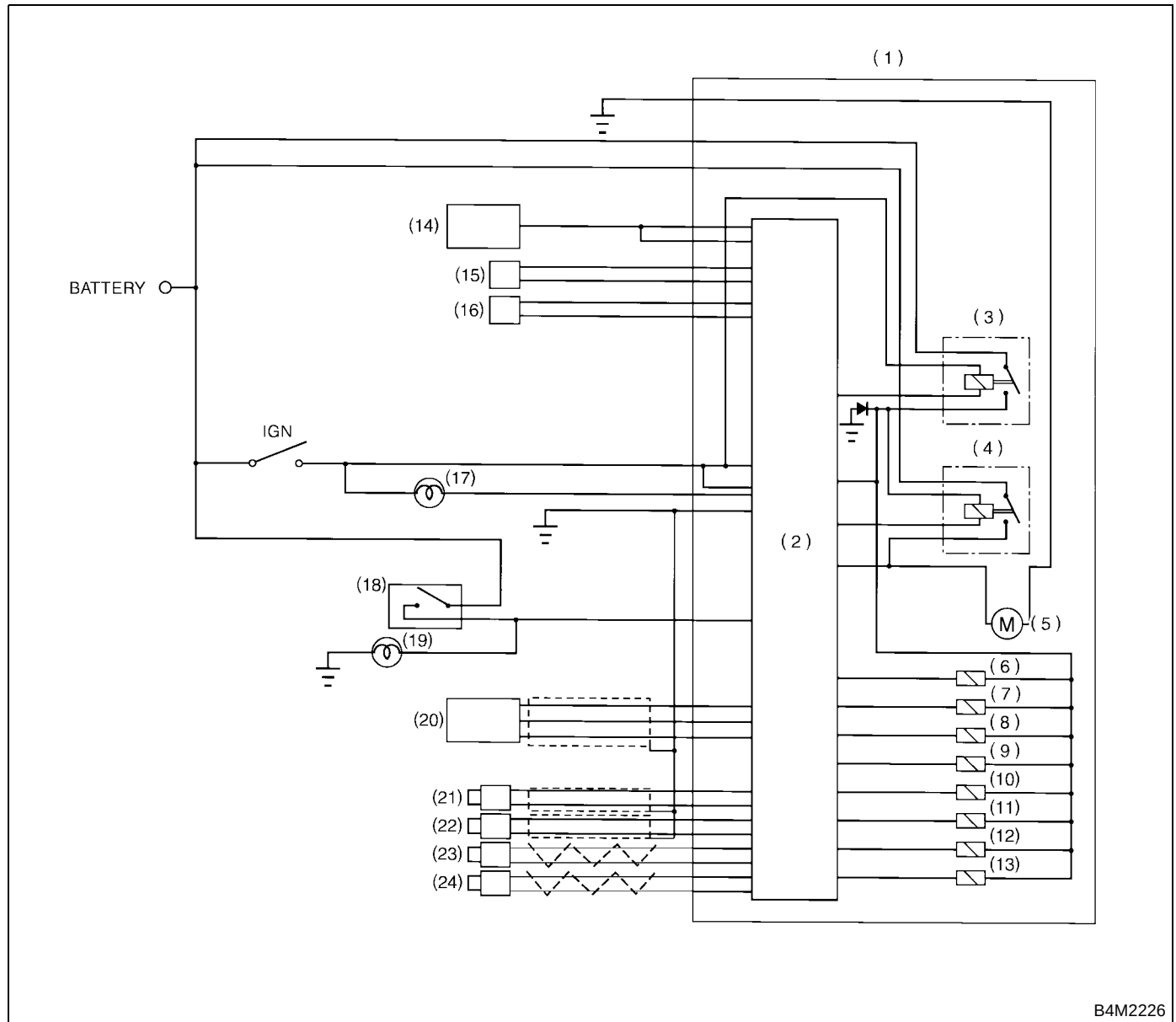
- The terminal numbers in the ABS control module and hydraulic control unit connector are as shown in the figure.
- When the connector is removed from the ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

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 (AWD model only)	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.

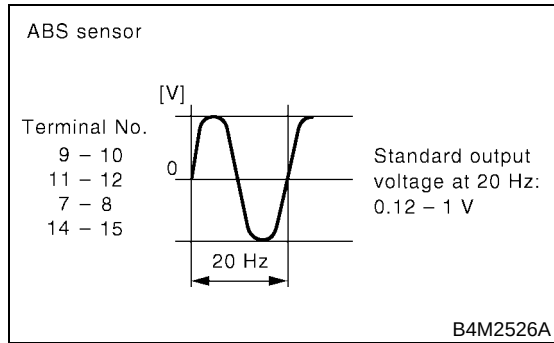
*2: Measure the I/O signal voltage at connector (B200) or (F74).

B: SCHEMATIC



B4M2226

- | | | |
|---|--|-----------------------------|
| (1) ABS control module and hydraulic control unit (ABSCM&H/U) | (9) Front right outlet solenoid valve | (17) ABS warning light |
| (2) ABS control module area | (10) Rear left inlet solenoid valve | (18) Stop light switch |
| (3) Valve relay | (11) Rear left outlet solenoid valve | (19) Stop light |
| (4) Motor relay | (12) Rear right inlet solenoid valve | (20) G sensor |
| (5) Motor | (13) Rear right outlet solenoid valve | (21) Front left ABS sensor |
| (6) Front left inlet solenoid valve | (14) Transmission control module (only AT model) | (22) Front right ABS sensor |
| (7) Front left outlet solenoid valve | (15) Diagnosis connector | (23) Rear left ABS sensor |
| (8) Front right inlet solenoid valve | (16) Data link connector | (24) Rear right ABS sensor |

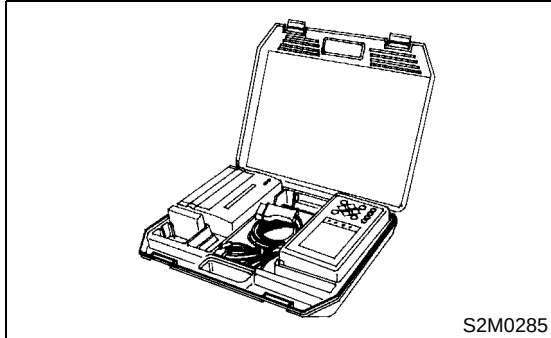
C: WAVEFORM

6. Subaru Select Monitor

A: OPERATION

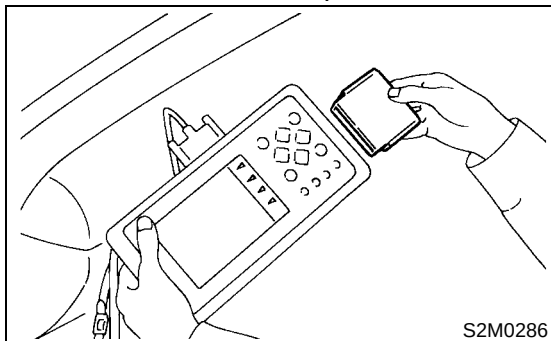
1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare Subaru Select Monitor kit.



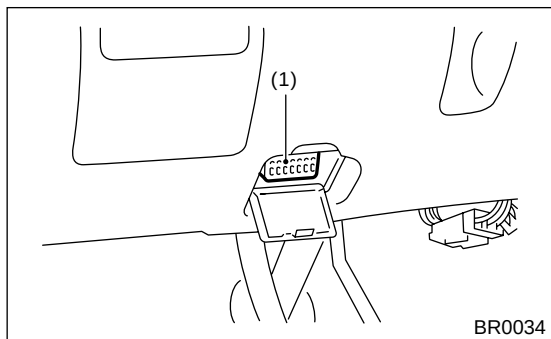
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor.
<Ref. to ABS-10, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

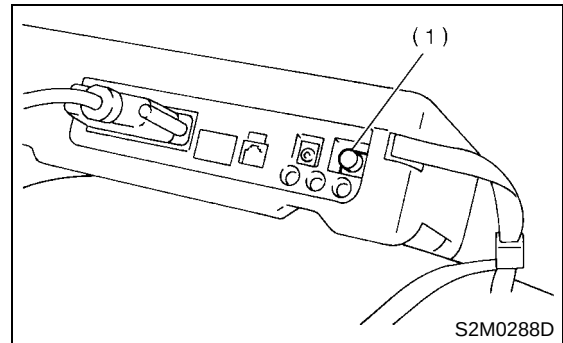
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(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 «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.>

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.	High or Low
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 engine type.
- 4) On the «Brake Control 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

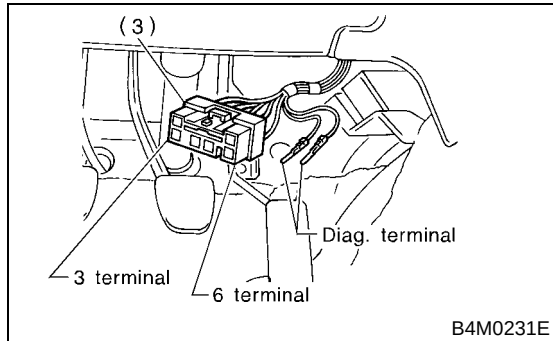
ABS (DIAGNOSTICS)

7. Read Diagnostic Trouble Code

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 6 to diagnosis terminal.
- 4) Turn ignition switch ON.
- 5) ABS warning light is set in the diagnostic mode and blinks to identify trouble code.
- 6) After the start code (11) is shown, the trouble codes will be shown in order of the last information first.

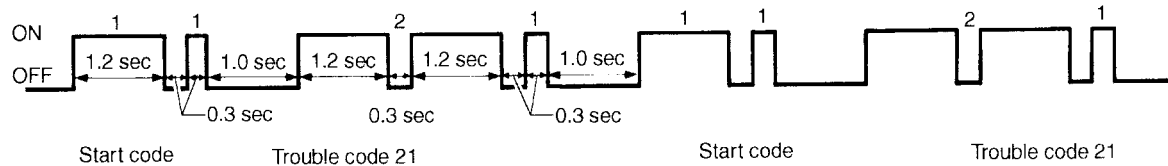
These repeat for a maximum of 3 minutes.

NOTE:

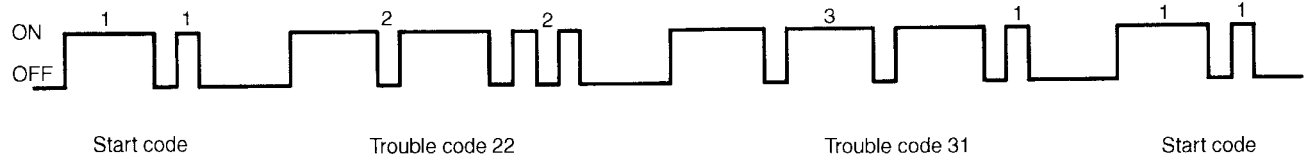
- When there are no trouble codes in memory, only the start code (11) is shown.
- When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in the EEPROM as a trouble code. When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)

Example of code indication

Trouble code: 21



Trouble code: 22, 31



2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand trouble codes.
<Ref. to ABS-18, Subaru Select Monitor.>

8. Inspection Mode

A: OPERATION

Reproduce the condition under which the problem has occurred as much as possible.

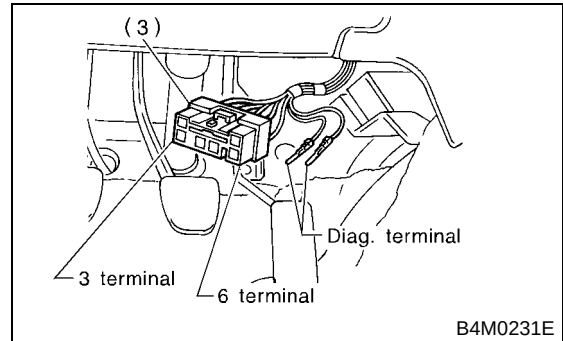
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

9. Clear Memory Mode

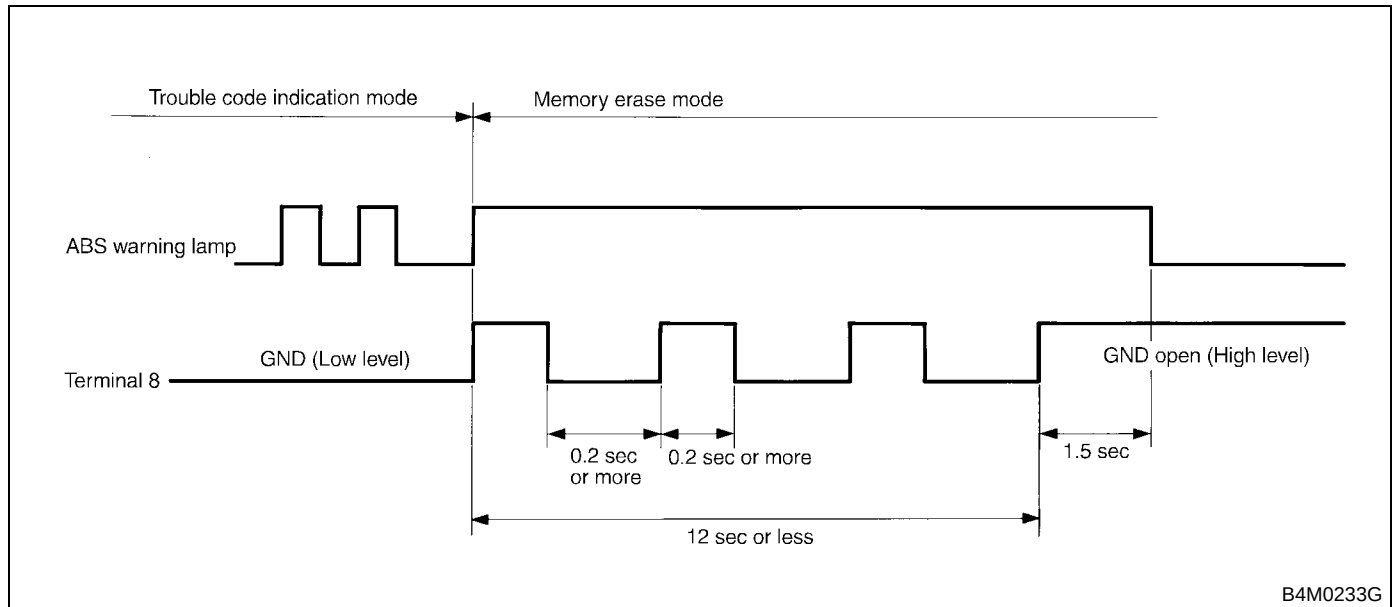
A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a trouble code, disconnect diagnosis connector terminal 6 from diagnosis terminal.



2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 6 and diagnosis terminal for at least 0.2 seconds each time.



NOTE:

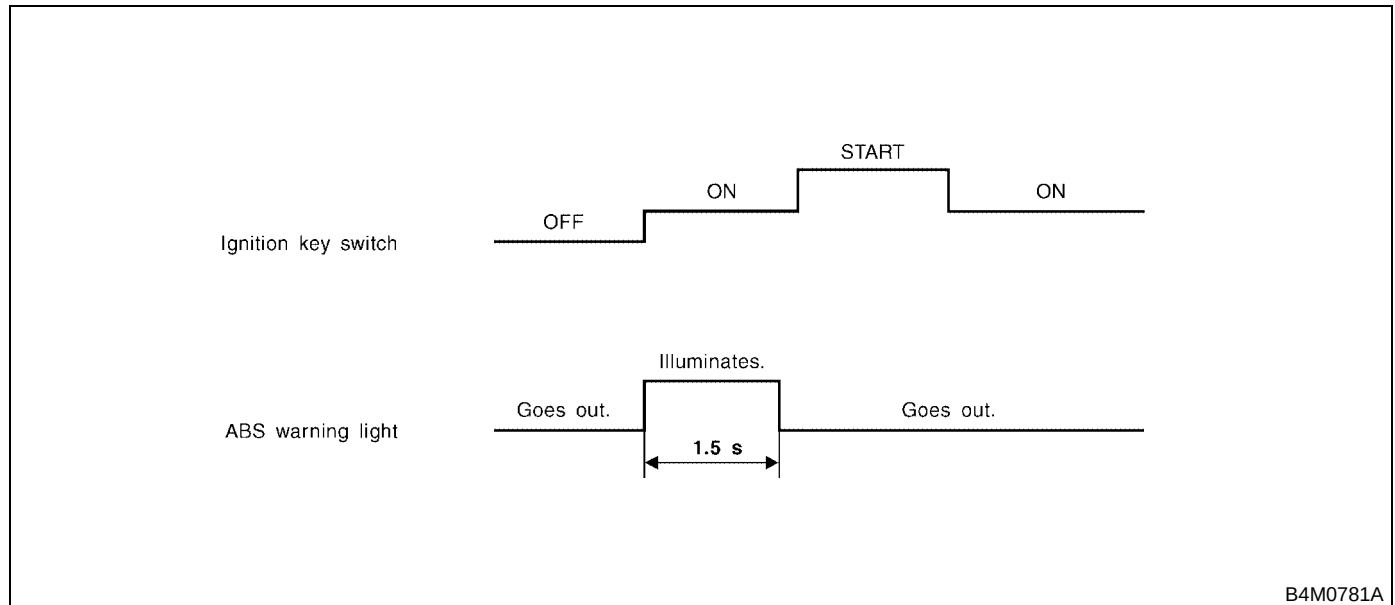
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear trouble codes. <Ref. to ABS-18, Subaru Select Monitor.>

10.ABS Warning Light Illumination Pattern

A: INSPECTION



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

ABS (DIAGNOSTICS)

11.List of Diagnostics Trouble Code

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

Trouble code	Contents of diagnosis		Index No.
11	Start code		—
	• Trouble code 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-39, TROUBLE CODE 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-39, TROUBLE CODE 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-39, TROUBLE CODE 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, TROUBLE CODE 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-46, TROUBLE CODE 22 — ABNORMAL ABS SENSOR (FRONT RH) —, Diagnostics Chart with Diagnosis Connector.>
24		Front left ABS sensor	<Ref. to ABS-46, TROUBLE CODE 24 — ABNORMAL ABS SENSOR (FRONT LH) —, Diagnostics Chart with Diagnosis Connector.>
26		Rear right ABS sensor	<Ref. to ABS-46, TROUBLE CODE 26 — ABNORMAL ABS SENSOR (REAR RH) —, Diagnostics Chart with Diagnosis Connector.>
28		Rear left ABS sensor	<Ref. to ABS-48, TROUBLE CODE 28 — ABNORMAL ABS SENSOR (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>
29		Any one of four	<Ref. to ABS-54, TROUBLE CODE 29 — ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR) —, Diagnostics Chart with Diagnosis Connector.>

LIST OF DIAGNOSTICS TROUBLE CODE

ABS (DIAGNOSTICS)

Trouble code	Contents of diagnosis		Index No.
31	Abnormal solenoid valve circuit(s) in ABS control module and hydraulic unit	Front right inlet valve	<Ref. to ABS-58, TROUBLE CODE 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-63, TROUBLE CODE 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-58, TROUBLE CODE 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-63, TROUBLE CODE 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-58, TROUBLE CODE 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-63, TROUBLE CODE 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-59, TROUBLE CODE 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-65, TROUBLE CODE 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>
41	Abnormal ABS control module		<Ref. to ABS-70, TROUBLE CODE 41 — ABNORMAL ABS CONTROL MODULE —, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.		<Ref. to ABS-72, TROUBLE CODE 42 — SOURCE VOLTAGE IS ABNORMAL. —, Diagnostics Chart with Diagnosis Connector.>
44	A combination of AT control abnormal		<Ref. to ABS-76, TROUBLE CODE 44 — A COMBINATION OF AT CONTROL ABNORMAL —, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay		<Ref. to ABS-79, TROUBLE CODE 51 — ABNORMAL VALVE RELAY —, Diagnostics Chart with Diagnosis Connector.>
52	Abnormal motor and/or motor relay		<Ref. to ABS-83, TROUBLE CODE 52 — ABNORMAL MOTOR AND/OR MOTOR RELAY —, Diagnostics Chart with Diagnosis Connector.>
54	Abnormal stop light switch		<Ref. to ABS-88, TROUBLE CODE 54 — ABNORMAL STOP LIGHT SWITCH —, Diagnostics Chart with Diagnosis Connector.>
56	Abnormal G sensor output voltage		<Ref. to ABS-90, TROUBLE CODE 56 — ABNORMAL G SENSOR OUTPUT VOLTAGE —, Diagnostics Chart with Diagnosis Connector.>

LIST OF DIAGNOSTICS TROUBLE CODE

ABS (DIAGNOSTICS)

2. WITH SUBARU SELECT MONITOR

Code	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Select monitor communication failure	<Ref. to ABS-96, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.>
—	No trouble code	Although no trouble code appears on the select monitor display, the ABS warning light remains on.	<Ref. to ABS-100, 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-104, TROUBLE CODE 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-112, TROUBLE CODE 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-104, TROUBLE CODE 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-112, TROUBLE CODE 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-104, TROUBLE CODE 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-112, TROUBLE CODE 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-106, TROUBLE CODE 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-114, TROUBLE CODE 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-120, TROUBLE CODE 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-124, TROUBLE CODE 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-129, TROUBLE CODE 32 — FRONT RIGHT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
33	Front left inlet valve malfunction	Front left inlet valve malfunction	<Ref. to ABS-124, TROUBLE CODE 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-129, TROUBLE CODE 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-124, TROUBLE CODE 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-129, TROUBLE CODE 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-126, TROUBLE CODE 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

LIST OF DIAGNOSTICS TROUBLE CODE

ABS (DIAGNOSTICS)

Code	Display screen	Contents of diagnosis	Index No.
38	Rear left outlet valve malfunction	Rear left outlet valve malfunction	<Ref. to ABS-130, TROUBLE CODE 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-134, TROUBLE CODE 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-136, TROUBLE CODE 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-138, TROUBLE CODE 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-142, TROUBLE CODE 44 — ABS-AT CONTROL (NON CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.>
44	ABS-AT control (Controlled)	ABS-AT control (Controlled)	<Ref. to ABS-144, TROUBLE CODE 44 — ABS-AT CONTROL (CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS-147, TROUBLE CODE 51 — VALVE RELAY MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay ON failure	Valve relay ON failure	<Ref. to ABS-151, TROUBLE CODE 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-155, TROUBLE CODE 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-159, TROUBLE CODE 52 — MOTOR RELAY ON FAILURE —, Diagnostics Chart with Subaru Select Monitor.>
52	Motor malfunction	Motor malfunction	<Ref. to ABS-163, TROUBLE CODE 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-166, TROUBLE CODE 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-168, TROUBLE CODE 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-172, TROUBLE CODE 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-178, TROUBLE CODE 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-182, TROUBLE CODE 56 — DETECTION OF G SENSOR STICK —, Diagnostics Chart with Subaru Select Monitor.>

NOTE:

High μ means high friction coefficient against road surface.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

12. Diagnostics Chart with Diagnosis Connector

A: ABS WARNING LIGHT DOES NOT COME ON.

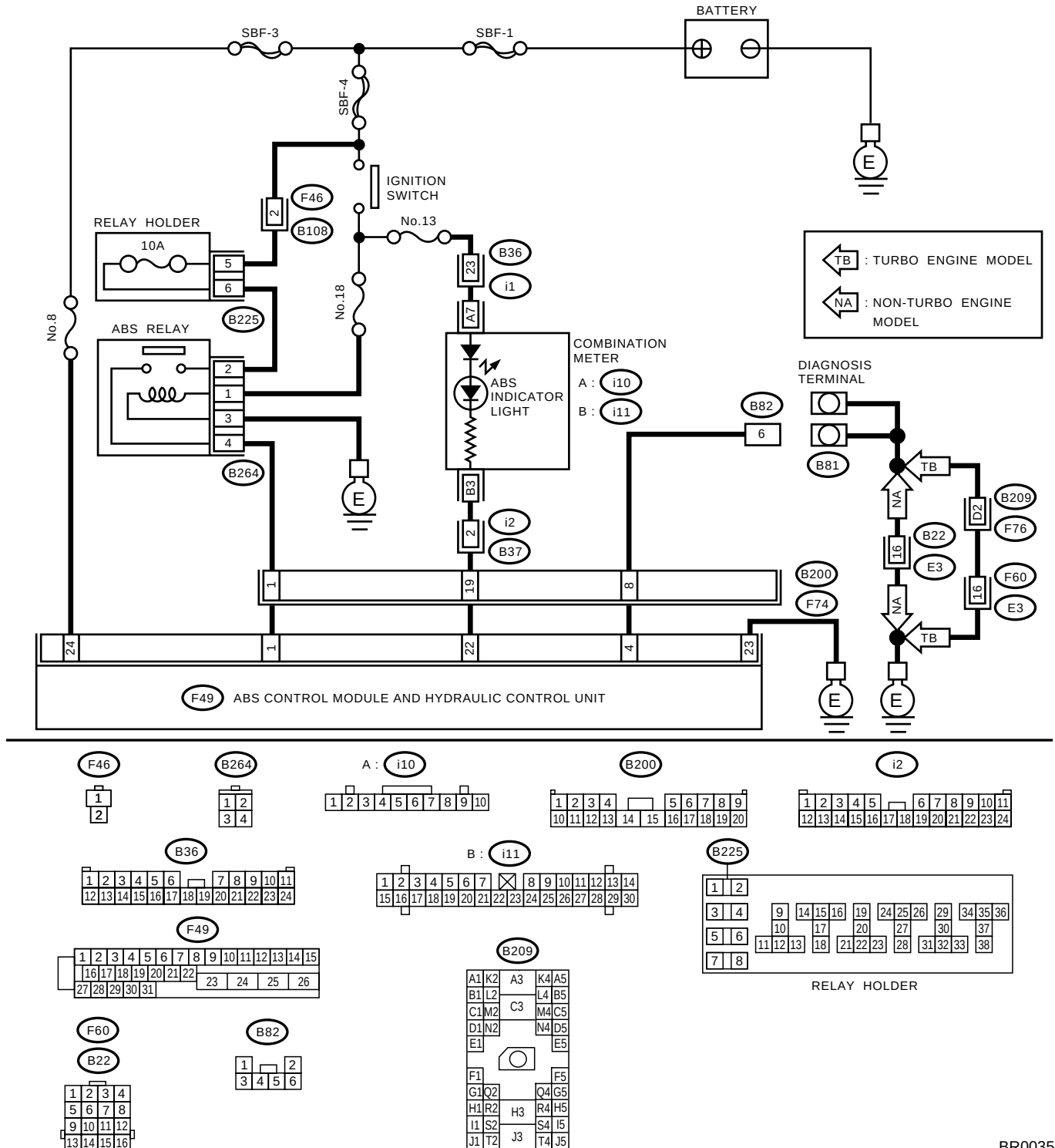
DIAGNOSIS:

- 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: LHD MODEL

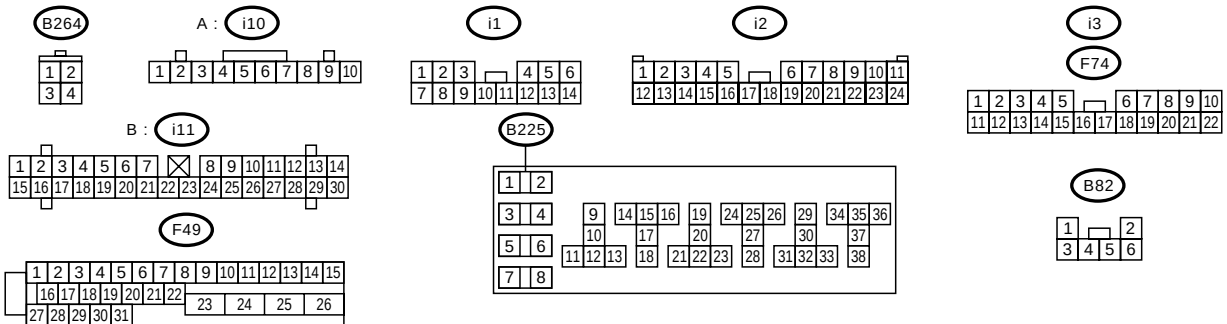
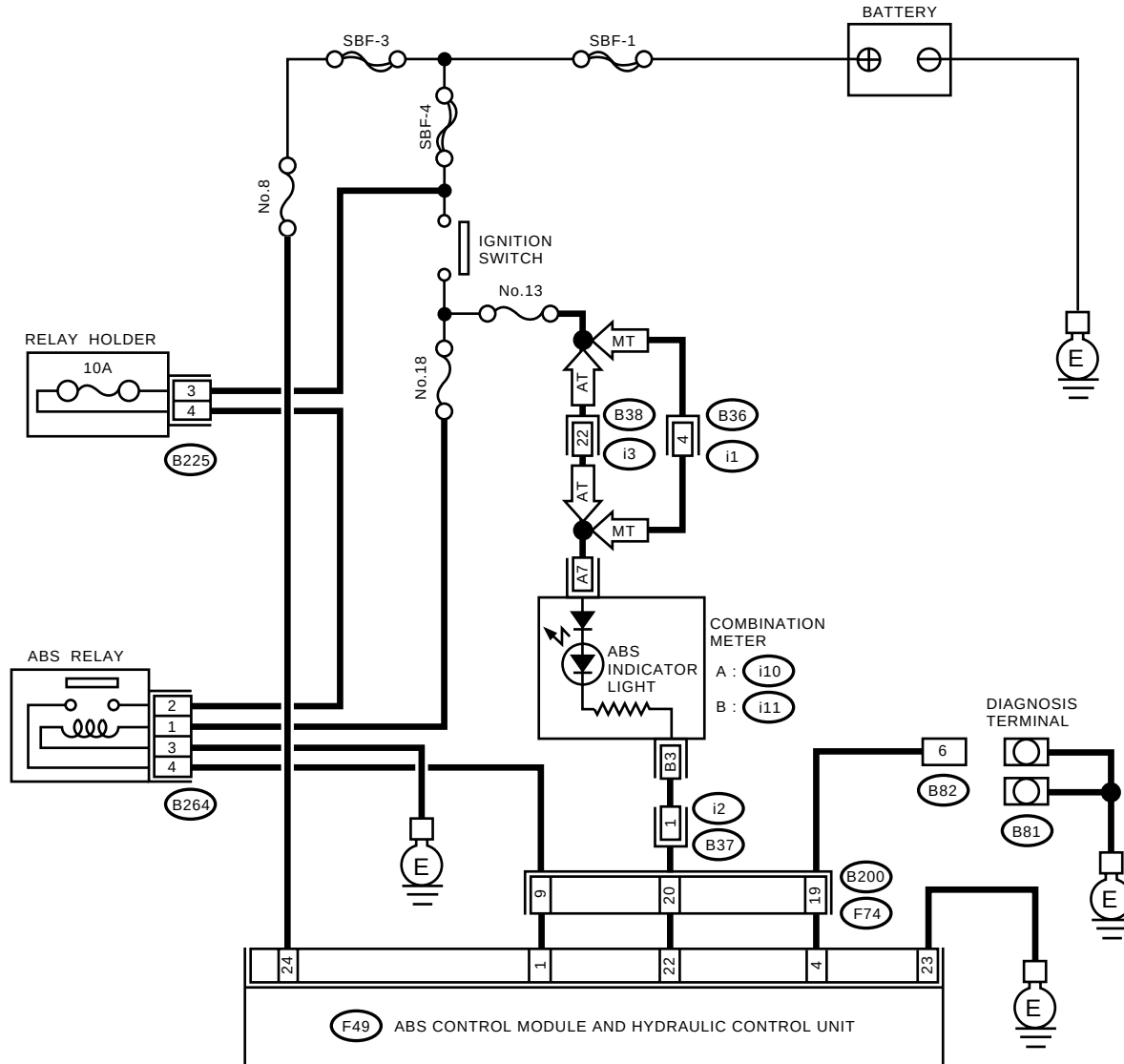


BR0035

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0036

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK IF OTHER WARNING LIGHTS TURN ON. Turn ignition switch to ON (engine OFF).	Do other warning lights turn on?	Go to step 2.	Repair combination meter. <Ref. to IDI-19, Combination Meter Assembly.>
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?	Go to step 3.	Replace ABS warning light bulb. <Ref. to IDI-19, Combination Meter Assembly.>
3	CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS. 1)Disconnect connector (B200) from connector (F74). 2)Measure voltage between connector (B200) and chassis ground. Connector & terminal LHD: (B200) No. 19 (+) — Chassis ground (-): RHD: (B200) No .20 (+) — Chassis ground (-):	Is the voltage less than 3 V?	Go to step 4.	Repair warning light harness.
4	CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS. 1)Turn ignition switch to ON. 2)Measure voltage between connector (B200) and chassis ground. Connector & terminal LHD: (B200) No. 19 (+) — Chassis ground (-): RHD: (B200) No .20 (+) — Chassis ground (-):	Is the voltage less than 3 V?	Go to step 5.	Repair warning light harness.
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 (B200) and chassis ground. Connector & terminal LHD: (B200) No. 19 (+) — Chassis ground (-): RHD: (B200) No .20 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 6.	Repair wiring harness.
6	CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS. 1)Turn ignition switch to OFF. 2)Measure voltage between connector (F74) and chassis ground. Connector & terminal LHD: (F74) No. 19 (+) — Chassis ground (-): RHD: (F74) No .20 (+) — Chassis ground (-):	Is the voltage less than 3 V?	Go to step 7.	Repair wiring harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS. 1) Turn ignition switch to ON. 2) Measure voltage between connector (F74) and chassis ground. Connector & terminal LHD: (F74) No. 19 (+) — Chassis ground (-): RHD: (F74) No. 20 (+) — Chassis ground (-):	Is the voltage less than 3 V?	Go to step 8.	Repair wiring harness.
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 resistance less than 0.5 Ω ?	Go to step 9.	Repair ABSCM&H/U ground harness.
9 CHECK WIRING HARNESS. Measure resistance between connector (F74) and chassis ground. Connector & terminal LHD: (F74) No. 19 (+) — Chassis ground (-): RHD: (F74) No. 20 (+) — Chassis ground (-):	Is the resistance less than 0.5 Ω ?	Go to step 10.	Repair harness/connector.
10 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF.	Is there poor contact in connectors between combination meter and ABSCM&H/U?	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

B: ABS WARNING LIGHT DOES NOT GO OFF.

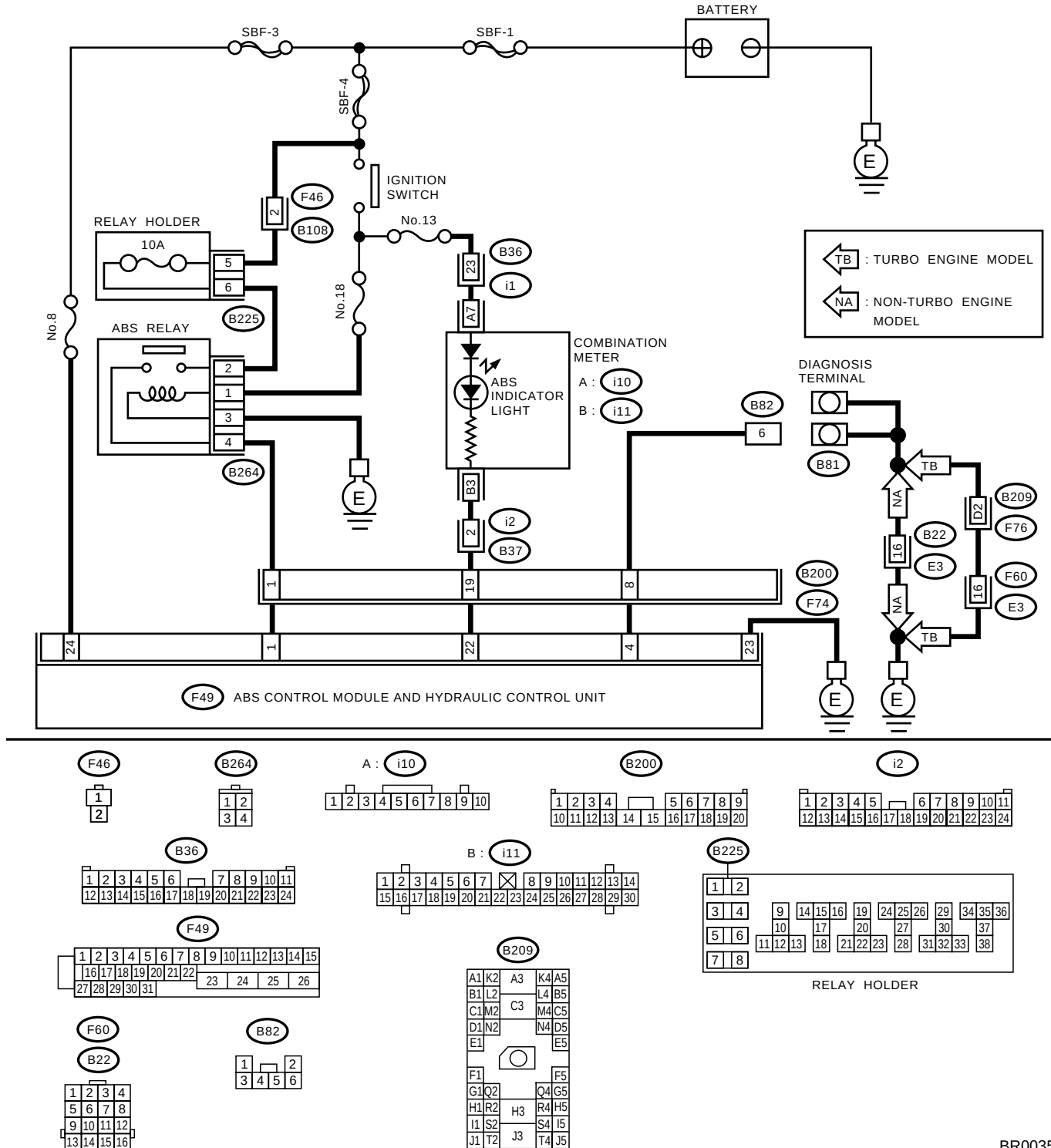
DIAGNOSIS:

- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while ABS warning light is kept ON.

WIRING DIAGRAM: LHD MODEL

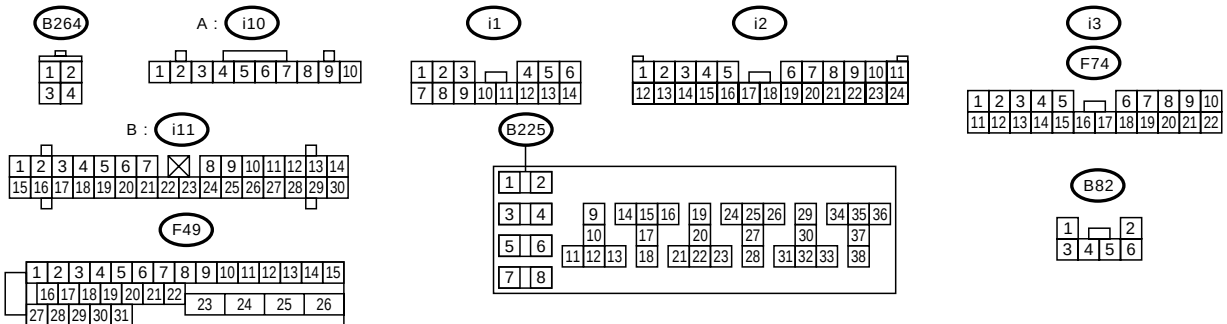
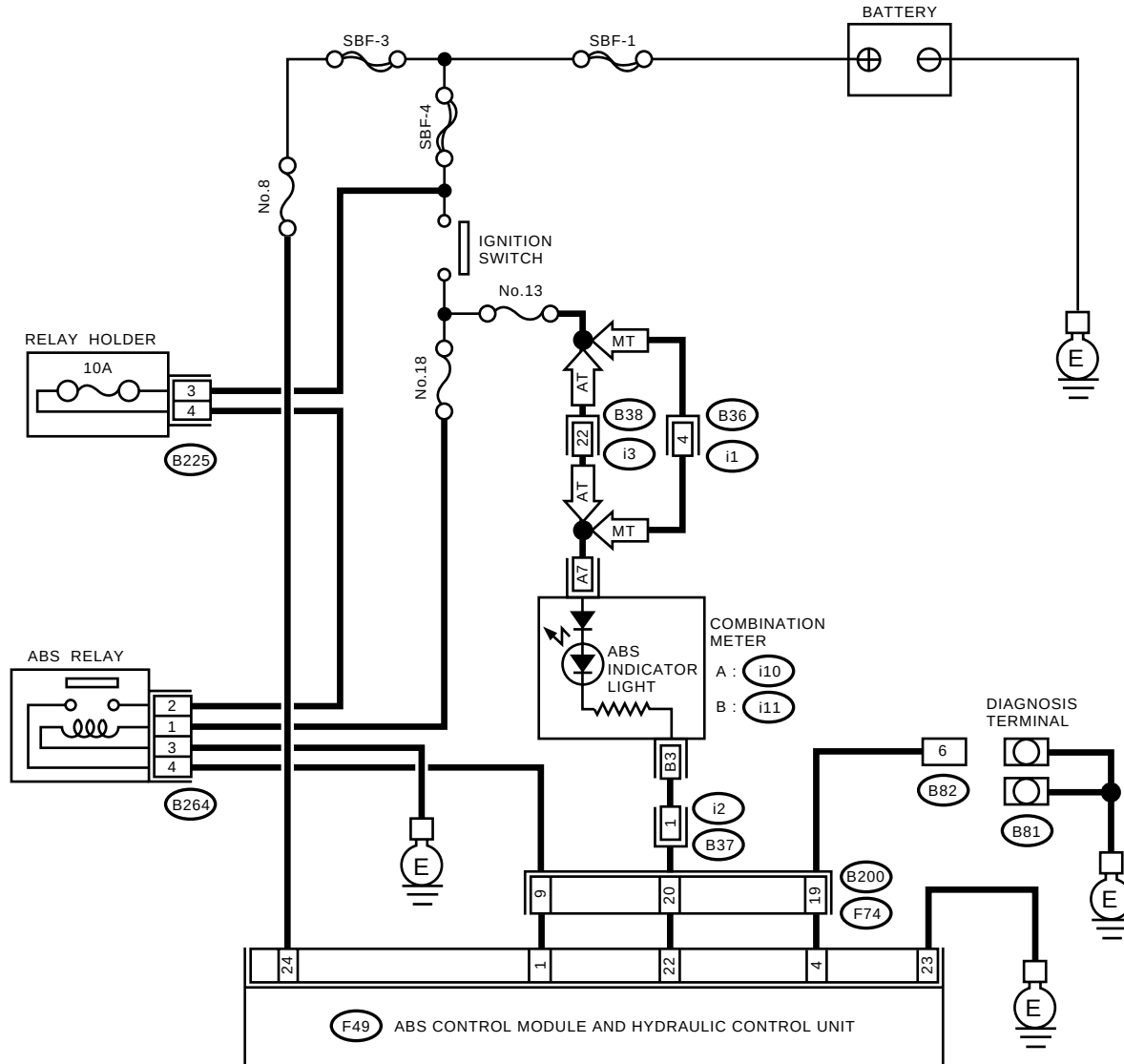


BR0035

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0036

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
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?	Go to step 2.	Insert ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.
2	CHECK DIAGNOSIS TERMINAL. Measure resistance between diagnosis terminals (B81) and chassis ground. <i>Terminals</i> <i>Diagnosis terminal (A) — Chassis ground:</i> <i>Diagnosis terminal (B) — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair diagnosis terminal harness.
3	CHECK DIAGNOSIS LINE. 1)Turn ignition switch to OFF. 2)Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 6. 3)Disconnect connector from ABSCM&H/U. 4)Measure resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>(F49) No. 4 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 4.	Repair harness connector between ABSCM&H/U and diagnosis connector.
4	CHECK GENERATOR. 1)Start the engine. 2)Idle the engine. 3)Measure voltage between generator and chassis ground. <i>Terminal</i> <i>Generator B terminal (+) — Chassis ground (-):</i>	Is the voltage between 10 and 15 V?	Go to step 5.	Repair generator. <Ref. to SC-12, Generator.>
5	CHECK BATTERY TERMINAL. Turn ignition switch to OFF.	Is there poor contact at battery terminal?	Repair battery terminal.	Go to step 6.
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. <i>Connector & terminal</i> <i>(F49) No. 1 (+) — Chassis ground (-):</i>	Is the voltage between 10 and 15 V?	Go to step 7.	Repair ABSCM&H/U power supply circuit.
7	CHECK WIRING HARNESS. 1)Disconnect connector (F74) from connector (B200). 2)Turn ignition switch to ON.	Does the ABS warning light remain off?	Go to step 8.	Repair front wiring harness.
8	CHECK PROJECTION AT ABSCM&H/U. 1)Turn ignition switch to OFF. 2)Check for broken projection at the ABSCM&H/U terminal.	Are the projection broken?	Go to step 9.	Replace ABSCM&H/U. <Ref. to ABS-7, 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>	Is the resistance more than 1 M Ω ?	Go to step 10.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK WIRING HARNESS. Measure resistance between connector (F74) and chassis ground. Connector & terminal (F74) No. 20 — Chassis ground:	Is the resistance less than 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 (F74) and chassis ground. Connector & terminal (F74) No. 20 — Chassis ground:	Is the resistance more than 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?	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

C: TROUBLE CODE DOES NOT APPEAR.

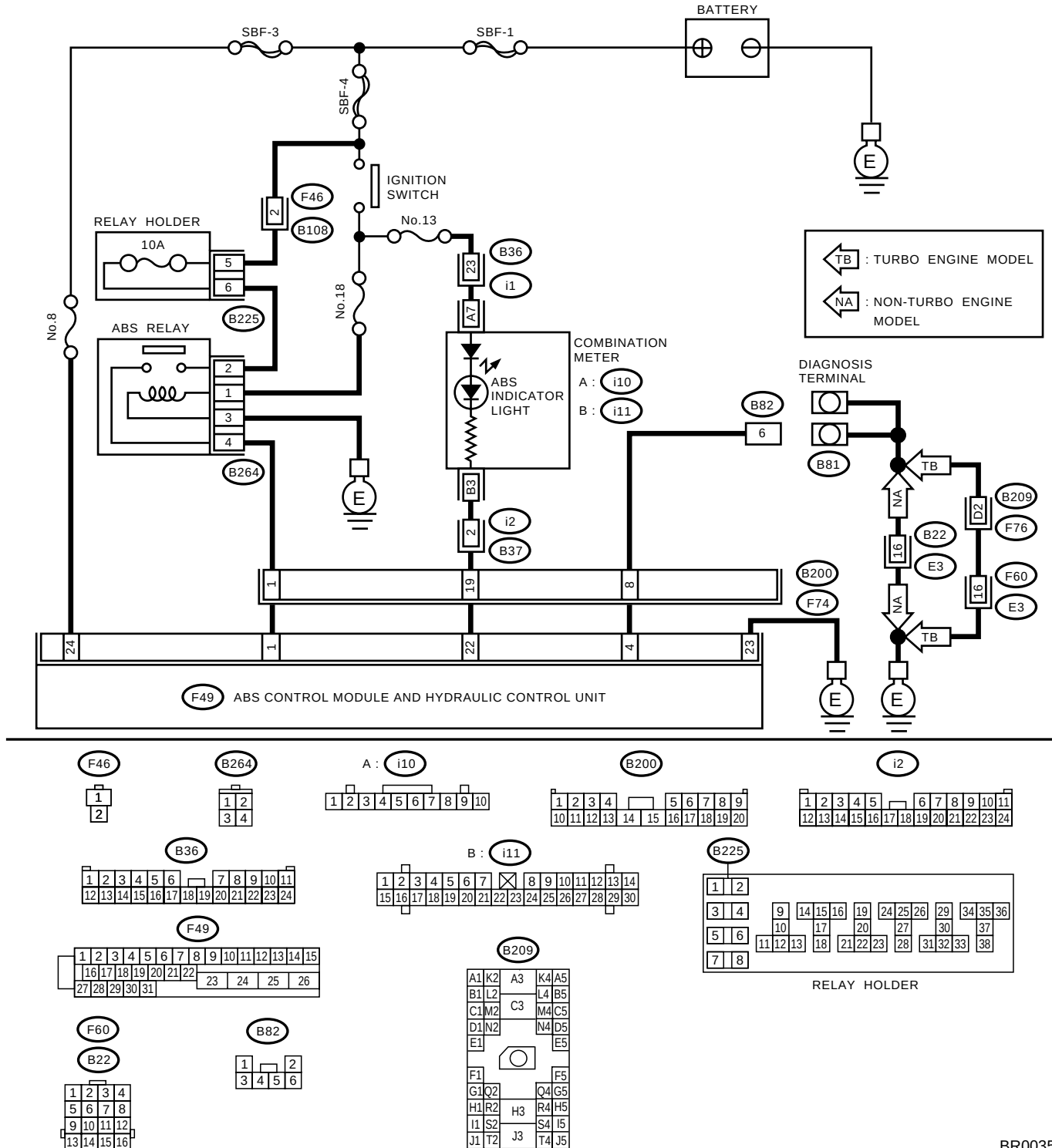
DIAGNOSIS:

- 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: LHD MODEL

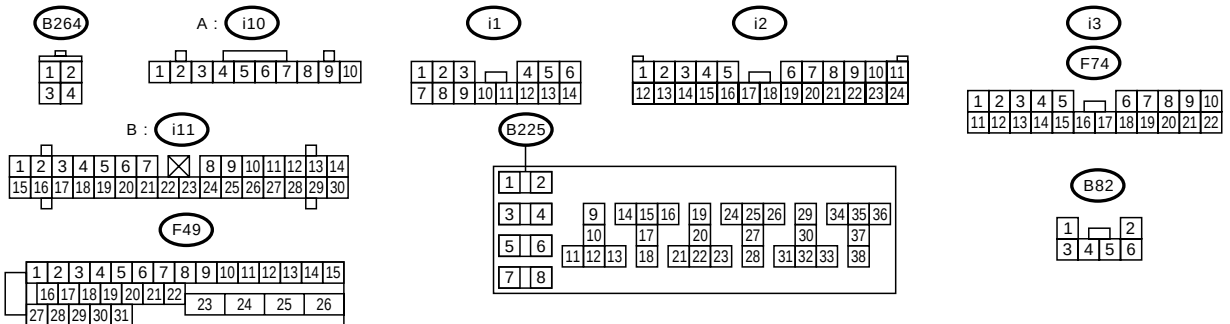
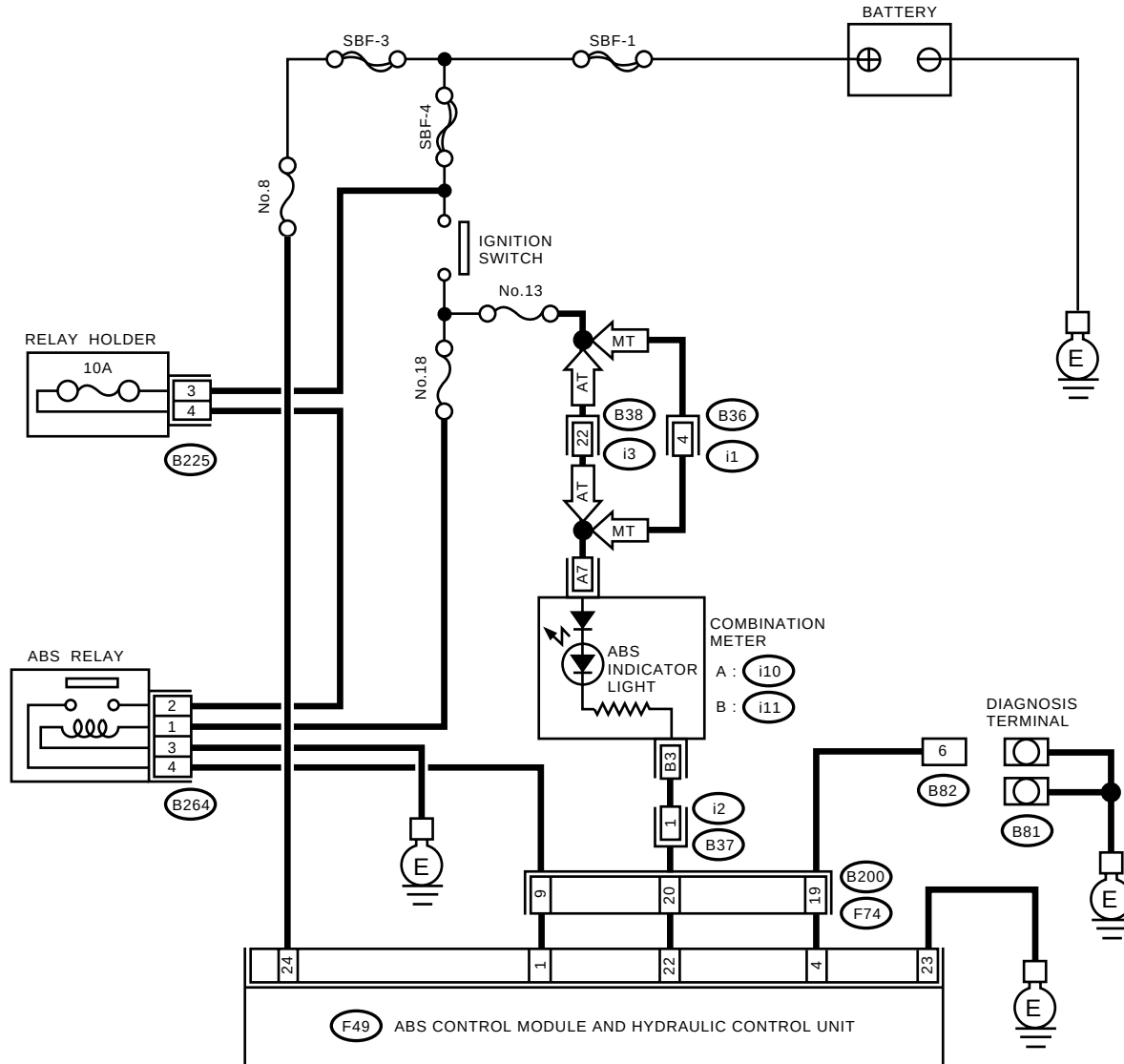


BR0035

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0036

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK DIAGNOSIS TERMINAL. 1) Turn ignition switch to OFF. 2) Measure resistance between diagnosis terminals (B81) and chassis ground. Terminals Diagnosis terminal (A) — Chassis ground: Diagnosis terminal (B) — Chassis ground:	Is the resistance less than 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. 6. 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 resistance less than 0.5 Ω ?	Go to step 3.	Repair harness connector between ABSCM&H/U and diagnosis connector.
3 CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.	Is there poor contact in ABSCM&H/U connector?	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: TROUBLE CODE 21

— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH) —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 27. <Ref. to ABS-40, TROUBLE CODE 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

E: TROUBLE CODE 23

— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH) —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 27. <Ref. to ABS-40, TROUBLE CODE 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

F: TROUBLE CODE 25

— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH) —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 27. <Ref. to ABS-40, TROUBLE CODE 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)

G: TROUBLE CODE 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

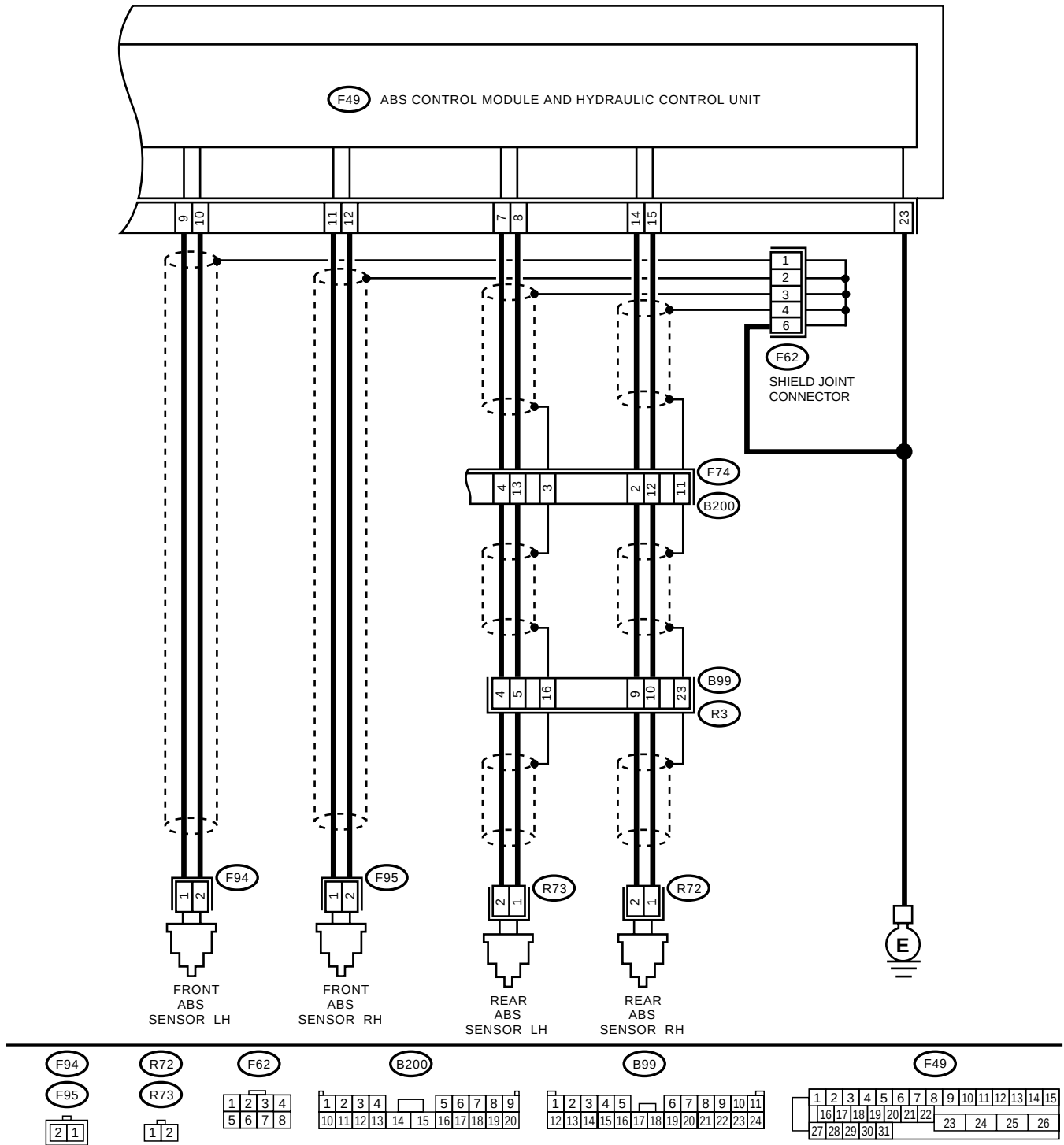
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: LHD MODEL

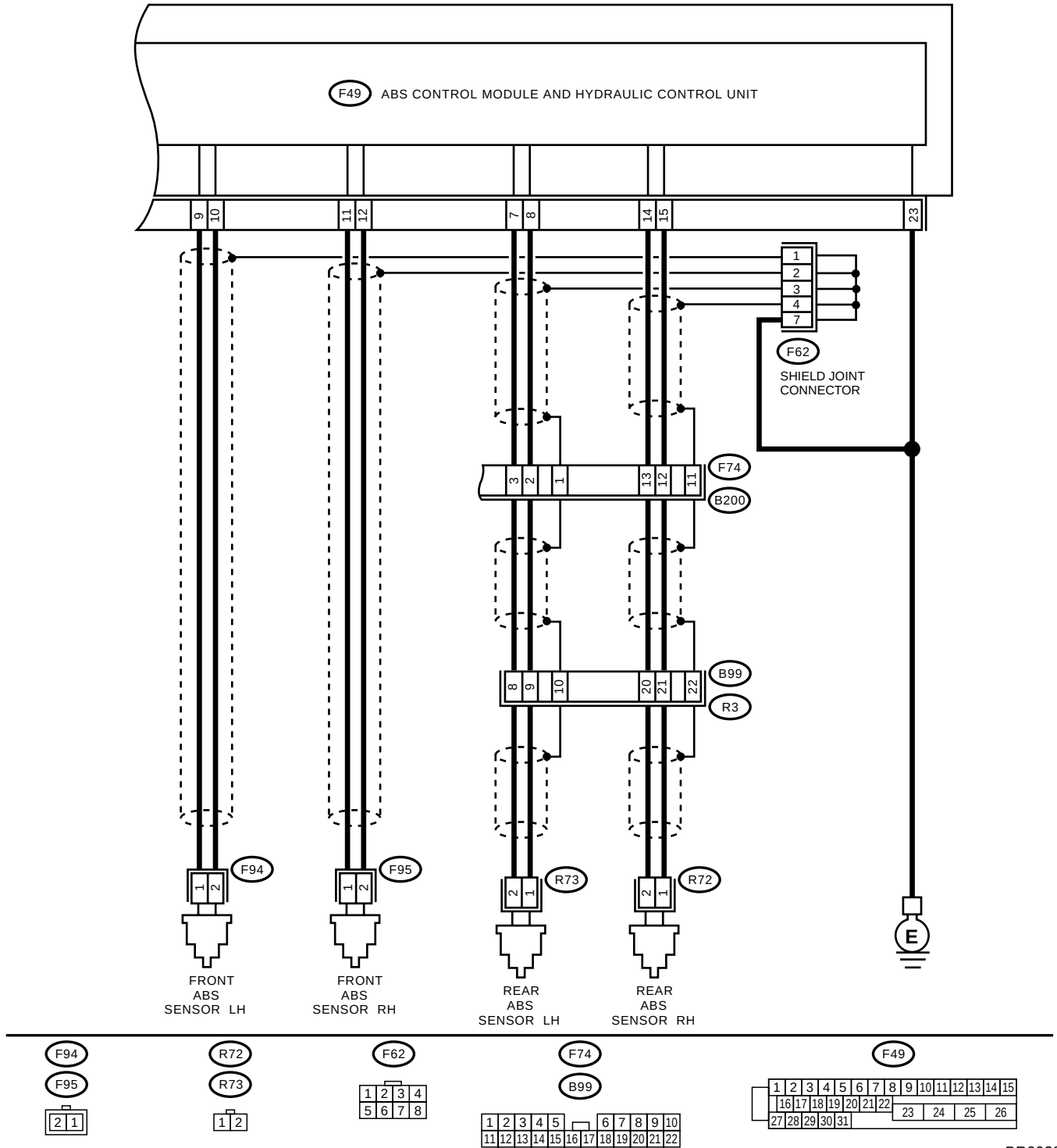


BR0037

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0038

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ABS SENSOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from ABS sensor. 3)Measure resistance of ABS sensor connector terminals. <i>Terminal</i> <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 resistance between 1 and 1.5 kΩ?	Go to step 2.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
2 CHECK BATTERY SHORT OF ABS SENSOR. 1)Disconnect connector from ABSCM&H/U. 2)Measure voltage between ABS sensor and chassis ground. <i>Terminal</i> <i>Front RH No. 1 (+) — Chassis ground (-):</i> <i>Front LH No. 1 (+) — Chassis ground (-):</i> <i>Rear RH No. 2 (+) — Chassis ground (-):</i> <i>Rear LH No. 2 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 3.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
3 CHECK BATTERY SHORT OF ABS SENSOR. 1)Turn ignition switch to ON. 2)Measure voltage between ABS sensor and chassis ground. <i>Terminal</i> <i>Front RH No. 1 (+) — Chassis ground (-):</i> <i>Front LH No. 1 (+) — Chassis ground (-):</i> <i>Rear RH No. 2 (+) — Chassis ground (-):</i> <i>Rear LH No. 2 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 4.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
4 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. <i>Connector & terminal</i> <i>Trouble code 21 / (F49) No. 11 — No. 12:</i> <i>Trouble code 23 / (F49) No. 9 — No. 10:</i> <i>Trouble code 25 / (F49) No. 14 — No. 15:</i> <i>Trouble code 27 / (F49) No. 7 — No. 8:</i>	Is the resistance between 1 and 1.5 kΩ?	Go to step 5.	Repair harness/connector between ABSCM&H/U and ABS sensor.
5 CHECK BATTERY SHORT OF HARNESS. Measure voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>Trouble code 21 / (F49) No. 11 (+) — Chassis ground (-):</i> <i>Trouble code 23 / (F49) No. 9 (+) — Chassis ground (-):</i> <i>Trouble code 25 / (F49) No. 14 (+) — Chassis ground (-):</i> <i>Trouble code 27 / (F49) No. 7 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 6.	Repair harness between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
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 <i>Trouble code 21 / (F49) No. 11 (+) — Chassis ground (-):</i> <i>Trouble code 23 / (F49) No. 9 (+) — Chassis ground (-):</i> <i>Trouble code 25 / (F49) No. 14 (+) — Chassis ground (-):</i> <i>Trouble code 27 / (F49) No. 7 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 7.	Repair harness between ABSCM&H/U and ABS sensor.
7 CHECK INSTALLATION OF ABS SENSOR. Turn ignition switch to OFF. Tightening torque: 32 N·m (3.3 kgf-m, 24 ft-lb)	Are the ABS sensor installation bolts tightened securely?	Go to step 8.	Tighten ABS sensor installation bolts securely.
8 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Is the gap within the specifications?	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.
9 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 10.	Replace tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
10 CHECK GROUND SHORT OF ABS SENSOR. 1) Turn ignition switch to ON. 2) 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:	Is the resistance more than 1 MΩ?	Go to step 11.	Replace ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
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 Trouble code 21 / (F49) No. 11 — Chassis ground: Trouble code 23 / (F49) No. 9 — Chassis ground: Trouble code 25 / (F49) No. 14 — Chassis ground: Trouble code 27 / (F49) No. 7 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 12.	Repair harness between ABSCM&H/U and ABS sensor. Replace ABSCM&H/U. <Ref. to ABS-7, 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?	Repair connector.	Go to step 13.
13 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 14.
14 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

H: TROUBLE CODE 22

— ABNORMAL ABS SENSOR (FRONT RH) —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 28. <Ref. to ABS-48, TROUBLE CODE 28 — ABNORMAL ABS SENSOR (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

I: TROUBLE CODE 24

— ABNORMAL ABS SENSOR (FRONT LH) —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 28. <Ref. to ABS-48, TROUBLE CODE 28 — ABNORMAL ABS SENSOR (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

J: TROUBLE CODE 26

— ABNORMAL ABS SENSOR (REAR RH) —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 28. <Ref. to ABS-48, TROUBLE CODE 28 — ABNORMAL ABS SENSOR (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

K: TROUBLE CODE 28 — ABNORMAL ABS SENSOR (REAR LH) —

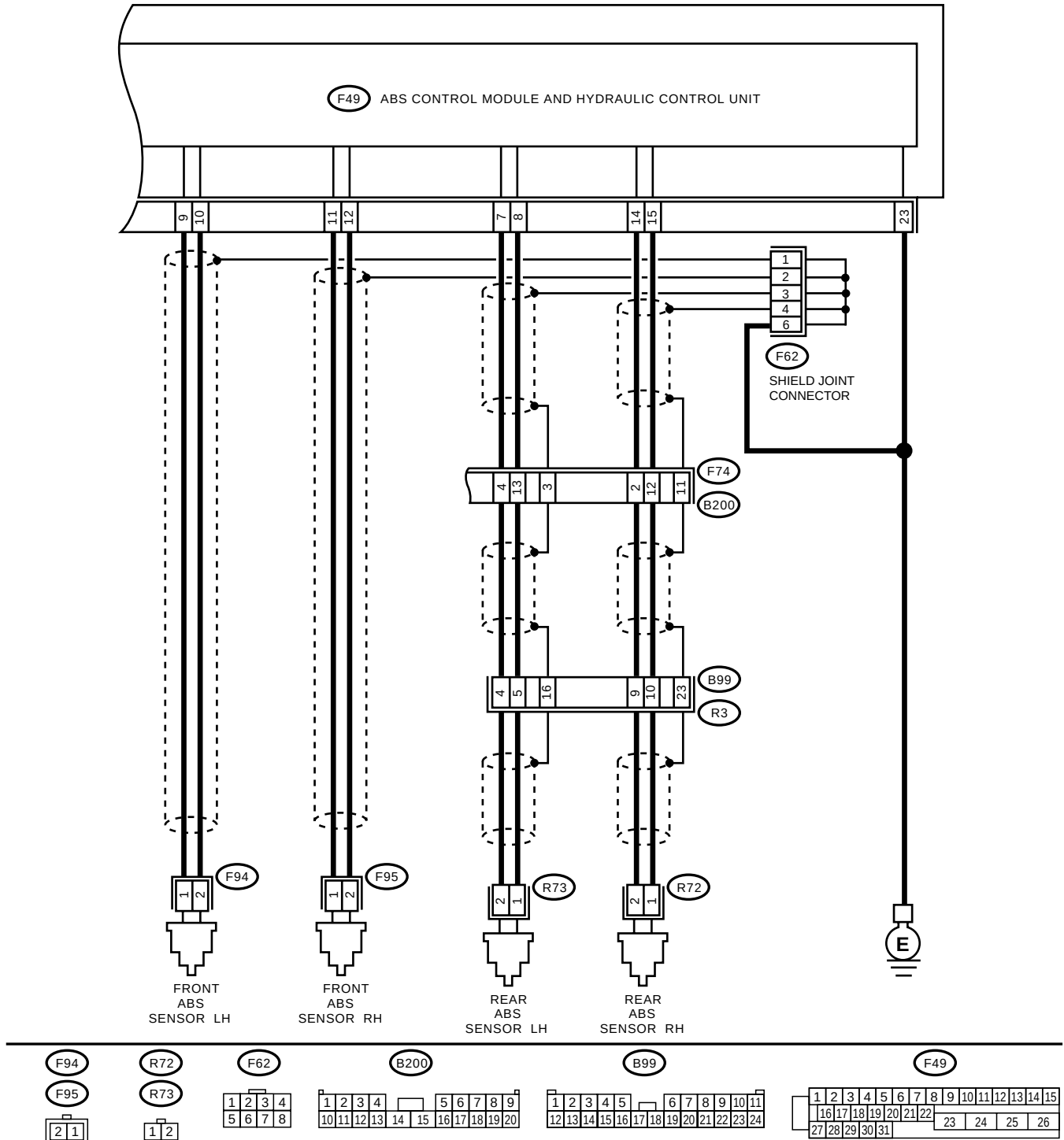
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

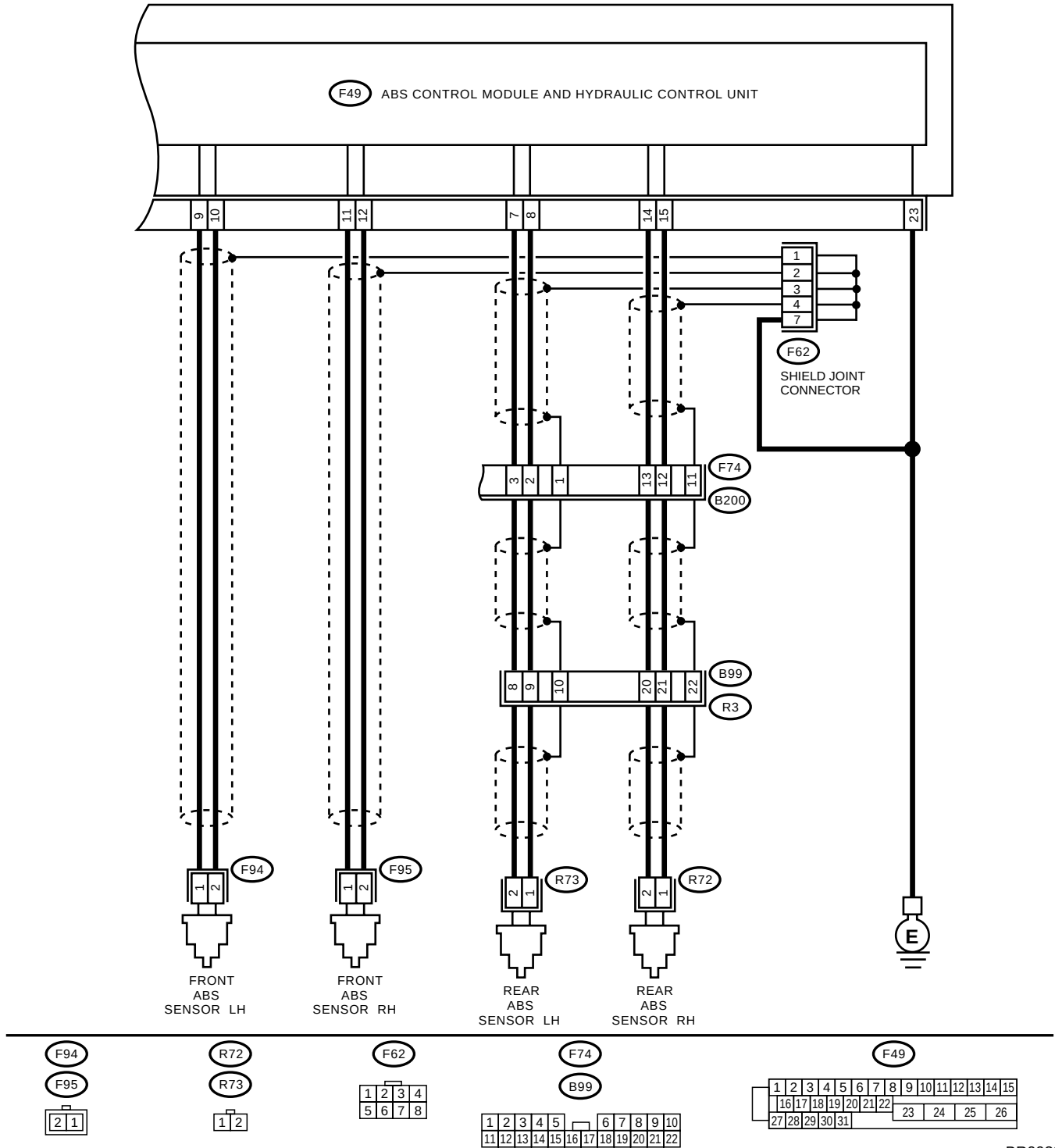


BR0037

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0038

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK INSTALLATION OF ABS SENSOR. Turn ignition switch to OFF. Tightening torque: 32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Are the ABS sensor installation bolts tightened securely?	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. Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Is the gap within the specifications?	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?	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)Connect the oscilloscope to the connector. 4)Turn ignition switch ON. 5)Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-17, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS control module sometimes stores the trouble code 29. Connector & terminal Trouble code 22 / (F95) No. 1 (+) — No. 2 (-): Trouble code 24 / (F94) No. 1 (+) — No. 2 (-): Trouble code 26 / LHD: (B99) No. 9 (+) — No. 10 (-): RHD: (B99) No. 20 (+) — No. 21 (-): Trouble code 28 / LHD: (B99) No. 4 (+) — No. 5 (-): RHD: (B99) No. 8 (+) — No. 9 (-):	Is oscilloscope pattern smooth, as shown 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 dirt or other foreign matter?	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 piece or the tone wheel?	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>	Go to step 7.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK TONE WHEEL RUNOUT. Measure tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 8.	Replace tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, 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 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 resistance between 1 and 1.5 kΩ?	Go to step 9.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
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:	Is the resistance more than 1 MΩ?	Go to step 10.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, 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 Trouble code 22 / (F49) No. 11 — No. 12: Trouble code 24 / (F49) No. 9 — No. 10: Trouble code 26 / (F49) No. 14 — No. 15: Trouble code 28 / (F49) No. 7 — No. 8:	Is the resistance between 1 and 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 Trouble code 22 / (F49) No. 11 — Chassis ground: Trouble code 24 / (F49) No. 9 — Chassis ground: Trouble code 26 / (F49) No. 14 — Chassis ground: Trouble code 28 / (F49) No. 7 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 12.	Repair harness/connector between ABSCM&H/U and ABS sensor.
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 resistance less than 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?	Repair connector.	Go to step 14.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or the wireless transmitter properly installed?	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?	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 Trouble code 26 / (B200) No. 11 — Chassis ground: Trouble code 28 / RHD: (B200) No. 1 — Chassis ground: Trouble code 28 / LHD: (B200) No. 3 — Chassis ground: NOTE: For the Trouble code 22 and 24 : Go to step 17 .	Is the resistance less than 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 trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 18 .
18 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary noise interference.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

L: TROUBLE CODE 29

— ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR) —

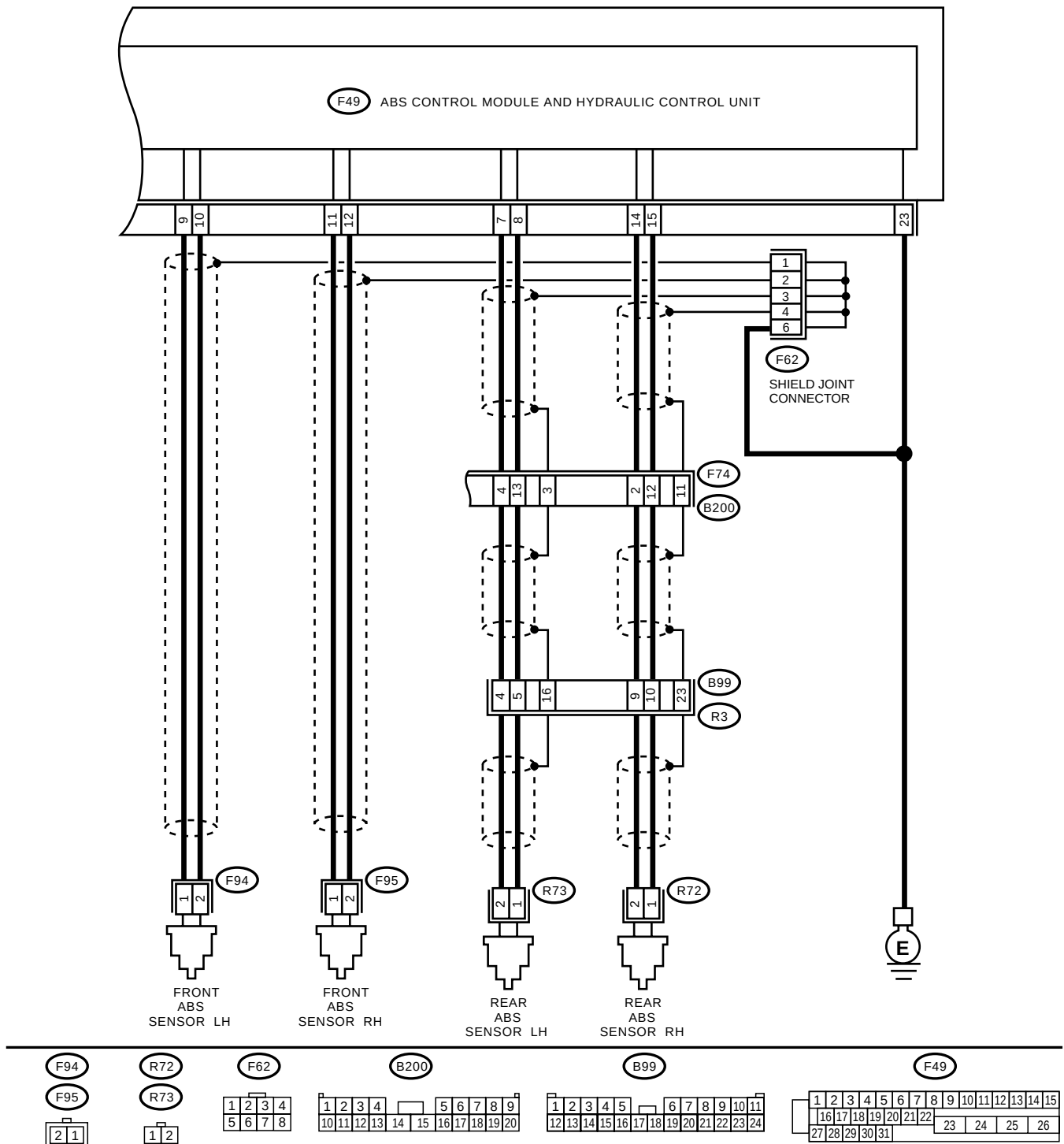
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

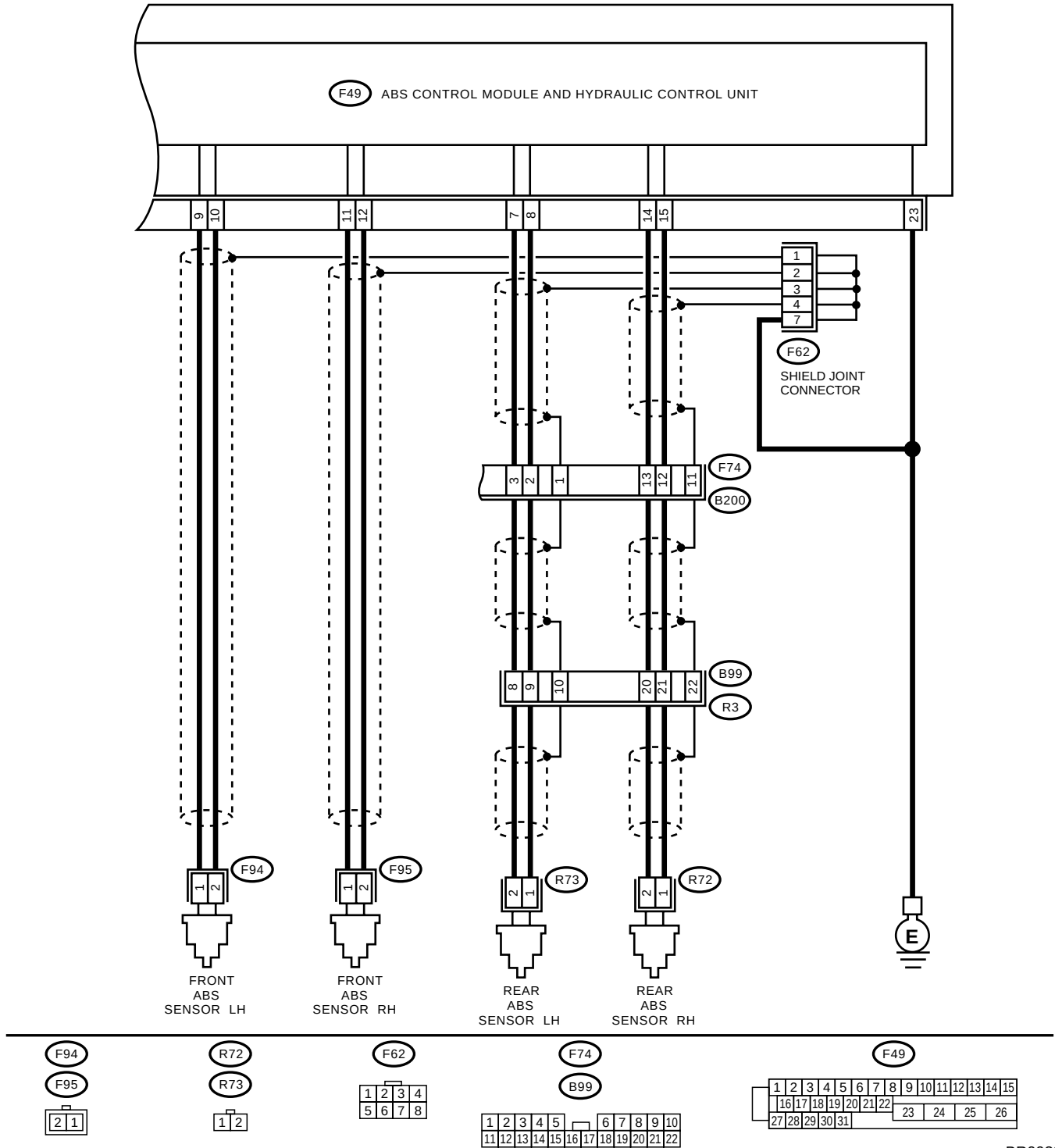


BR0037

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0038

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.	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.	The ABS is normal. Erase the 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.
2 CHECK TIRE SPECIFICATIONS. Turn ignition switch to OFF.	Are the tire specifications correct?	Go to step 3.	Replace tire.
3 CHECK WEAR OF TIRE.	Is the tire worn excessively?	Replace tire.	Go to step 4.
4 CHECK TIRE PRESSURE.	Is the tire pressure correct?	Go to step 5.	Adjust tire pressure.
5 CHECK INSTALLATION OF ABS SENSOR. <i>Tightening torque:</i> 32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Are the ABS sensor installation bolts tightened securely?	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. Specifications Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Is the gap within the specifications?	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?	Go to step 8.	Go to step 9.
8 CHECK ABS SENSOR SIGNAL. 1) Raise all four wheels of ground. 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-17, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS/SCM&H/U sometimes stores the trouble code 29. Connector & terminal Front RH (F95) No. 1 (+) — No. 2 (-): Front LH (F94) No. 1 (+) — No. 2 (-): Rear RH LHD: (B99) No. 9 (+) — No. 10 (-): RHD: (B99) No. 20 (+) — No. 21 (-): Rear LH LHD: (B99) No. 4 (+) — No. 5 (-): RHD: (B99) No. 8 (+) — No. 9 (-):	Is oscilloscope pattern smooth, as shown in figure?	Go to step 12.	Go to step 9.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL. Remove disc rotor from hub.	Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	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 piece or the tone wheel?	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>	Go to step 11 .
11 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 12 .	Replace tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
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 trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13 .
13 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

M: TROUBLE CODE 31

**— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(FRONT RH) —**

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 37. <Ref. to ABS-59, TROUBLE CODE 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

N: TROUBLE CODE 33

**— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(FRONT LH) —**

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 37. <Ref. to ABS-59, TROUBLE CODE 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

O: TROUBLE CODE 35

**— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(REAR RH) —**

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 37. <Ref. to ABS-59, TROUBLE CODE 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

P: TROUBLE CODE 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

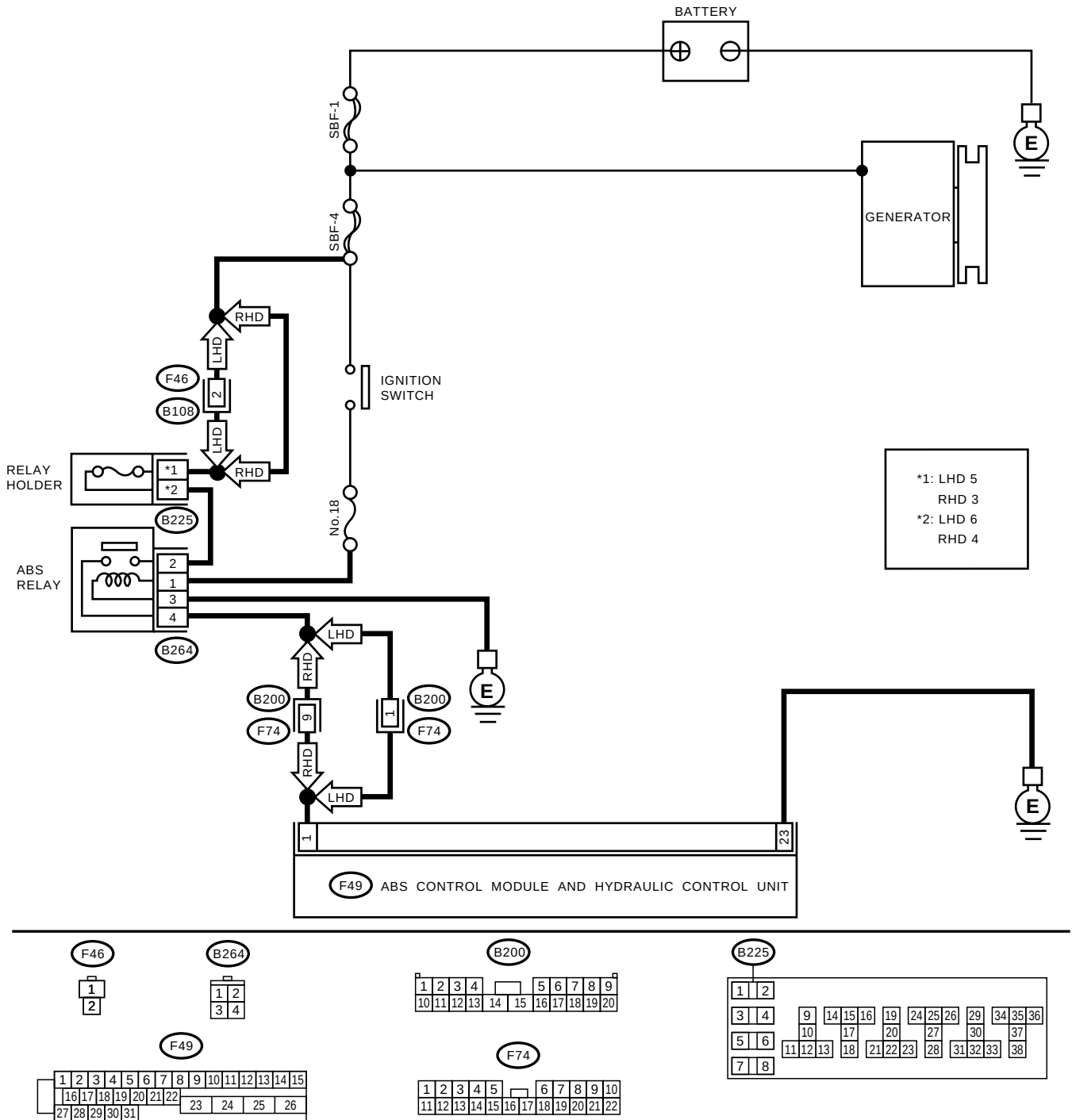
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0039

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn ignition switch to OFF. 2) Remove fuse. 3) Measure voltage between ABS relay connector and chassis ground. Connector & terminal LHD model (B225) No. 5 (+) — Chassis ground (-): RHD model (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair open circuit in harness between battery and Relay holder connector.
2 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 3.
3 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install fuse. 2) Remove ABS relay. 3) Turn ignition switch to ON. 4) Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between battery and Relay holder connector.
4 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair harness connector between battery, ignition switch and ABS relay.
5 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between ABS relay connector and chassis ground. Connector & terminal (B264) No. 3 (+) — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair open circuit between ABS relay and chassis ground.
6 CHECK ABS RELAY. 1) Connect battery to ABS relay terminal No. 1 and 3. 2) Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace ABS relay.
7 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 voltage between 10 and 15 V?	Go to step 8.	Repair harness connector between ABS relay and ABSCM&H/U.
8 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 resistance less than 0.5 Ω ?	Go to step 9.	Repair ABSCM&H/U ground harness.
9 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step 10.
10 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 11.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
11	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

Q: TROUBLE CODE 32

**— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(FRONT RH) —**

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 38. <Ref. to ABS-65, TROUBLE CODE 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

R: TROUBLE CODE 34

**— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(FRONT LH) —**

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 38. <Ref. to ABS-65, TROUBLE CODE 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

S: TROUBLE CODE 36

**— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U
(REAR RH) —**

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 38. <Ref. to ABS-65, TROUBLE CODE 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)

T: TROUBLE CODE 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

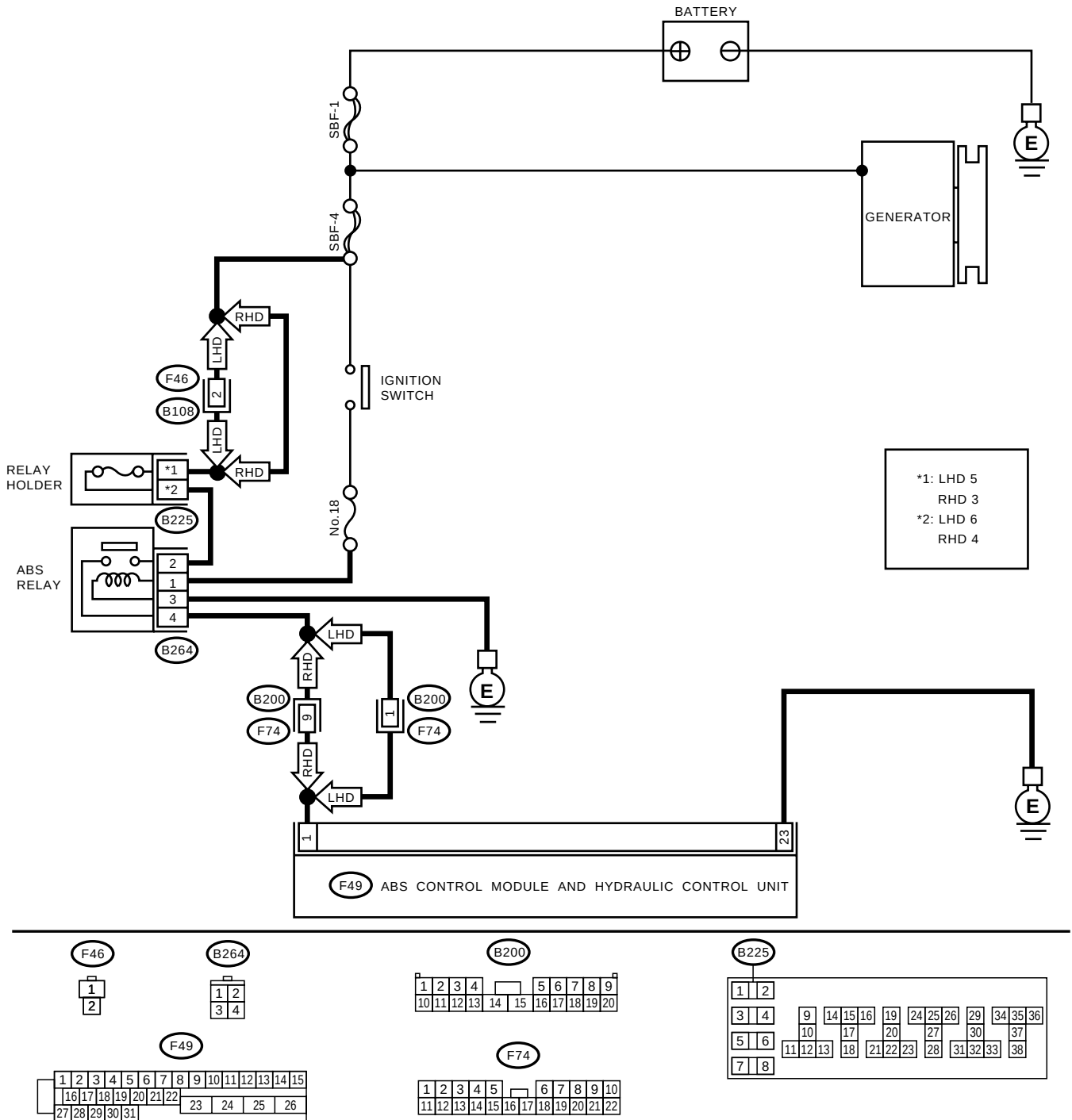
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0039

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn ignition switch to OFF. 2) Remove fuse. 3) Measure voltage between ABS relay connector and chassis ground. Connector & terminal LHD model (B225) No. 5 (+) — Chassis ground (-): RHD model (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair open circuit in harness between battery and Relay holder connector.
2 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 3.
3 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install fuse. 2) Remove ABS relay. 3) Turn ignition switch to ON. 4) Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between battery and Relay holder connector.
4 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair harness connector between battery, ignition switch and ABS relay.
5 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between ABS relay connector and chassis ground. Connector & terminal (B264) No. 3 (+) — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair open circuit between ABS relay and chassis ground.
6 CHECK ABS RELAY. 1) Connect battery to ABS relay terminal No. 1 and 3. 2) Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace ABS relay.
7 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 voltage between 10 and 15 V?	Go to step 8.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
8 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 resistance less than 0.5 Ω ?	Go to step 9.	Repair ABSCM&H/U ground harness.
9 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step 10.
10 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 11.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
11	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

U: TROUBLE CODE 41 — ABNORMAL ABS CONTROL MODULE —

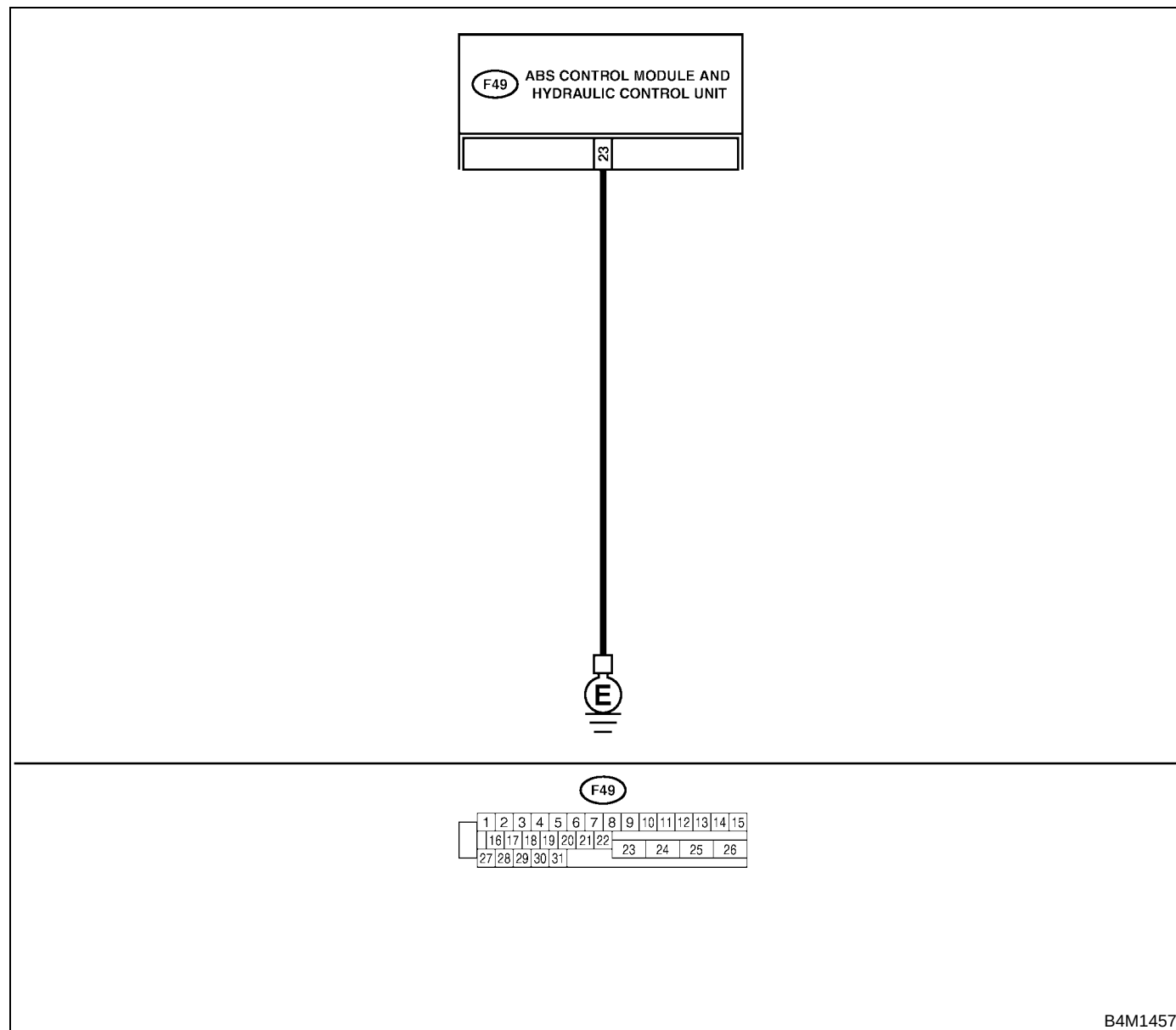
DIAGNOSIS:

- Faulty ABSCM&H/U.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



B4M1457

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	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 resistance less than 0.5 Ω ?	Go to step 2.	Repair ABSCM&H/U ground harness.
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or the wireless transmitter properly installed?	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?	Install the noise sources apart from the sensor harness.	Go to step 5.
5 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 6.
6 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

V: TROUBLE CODE 42

— SOURCE VOLTAGE IS ABNORMAL. —

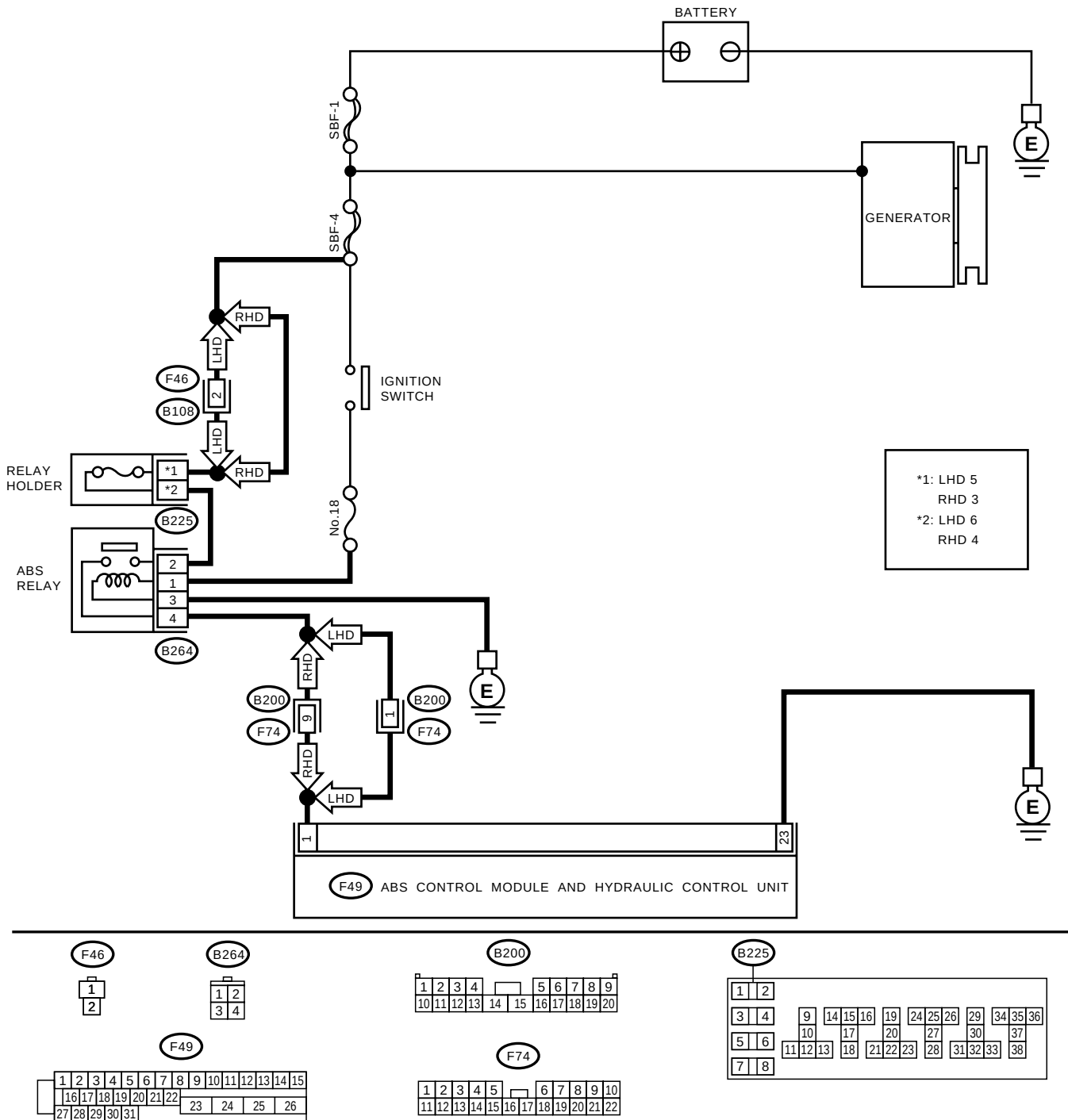
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low or high.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0039

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1)Start engine. 2)Idling after warm-up. 3)Measure voltage between generator B terminal and chassis ground. <i>Terminal</i> <i>Generator B terminal — Chassis ground:</i>	Is the voltage between 10 and 17 V?	Go to step 2.	Repair generator. <Ref. to SC-12, Generator.>
2 CHECK BATTERY TERMINAL. Turn ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step 3.	Tighten the clamp of terminal.
3 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1)Turn ignition switch to OFF. 2)Remove fuse. 3)Measure voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>LHD model</i> <i>(B225) No. 5 (+) — Chassis ground (-):</i> <i>RHD model</i> <i>(B225) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between battery and Relay holder connector.
4 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 5.
5 CHECK INPUT VOLTAGE OF ABS RELAY. 1)Install fuse. 2)Remove ABS relay. 3)Turn ignition switch to ON. 4)Measure voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>(B264) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 6.	Repair open circuit in harness between battery and Relay holder connector.
6 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>(B264) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 7.	Repair harness connector between battery, ignition switch and ABS relay.
7 CHECK GROUND CIRCUIT OF ABS RELAY. 1)Turn ignition switch to OFF. 2)Measure resistance between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>(B264) No. 3 (+) — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 8.	Repair open circuit between ABS relay and chassis ground.
8 CHECK ABS RELAY. 1)Connect battery to ABS relay terminal No. 1 and 3. 2)Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 9.	Replace ABS relay.
9 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. <i>Connector & terminal</i> <i>(F49) No. 1 (+) — Chassis ground (-):</i>	Is the voltage between 10 and 17 V?	Go to step 10.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
10 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1)Turn ignition switch to OFF. 2)Measure resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>(F49) No. 23 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 11.	Repair ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

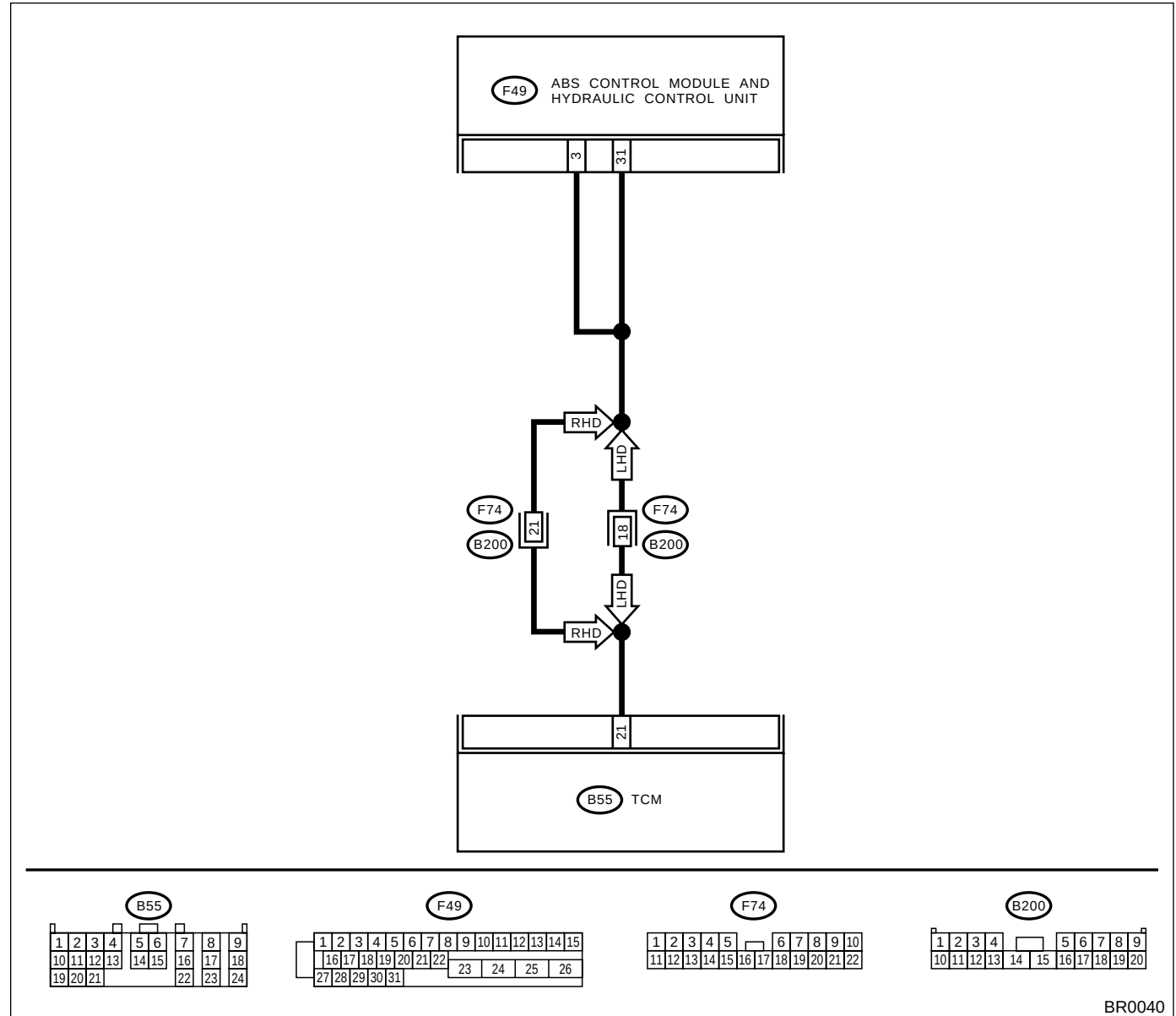
ABS (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step 12 .
12 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13 .
13 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

ABS (DIAGNOSTICS)

— A COMBINATION OF AT CONTROL ABNORMAL —

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPECIFICATIONS OF THE AB-SCM&H/U. Check specifications of the mark to the ABSCM&H/U. CA: AT (FWD) CB: MT (FWD) CC: AT (AWD) CD: MT (AWD)	Is an ABSCM&H/U for AT model installed on a MT model?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 2.
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:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair harness between TCM and ABSCM&H/U.
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 voltage less than 1 V?	Go to step 4.	Repair harness between TCM and ABSCM&H/U.
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 voltage less than 1 V?	Go to step 5.	Repair harness between TCM and ABSCM&H/U.
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 voltage between 10 and 15 V?	Go to step 7.	Go to step 6.
6 CHECK AT.	Is the AT functioning normally?	Replace TCM.	Repair AT.
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 voltage between 10 and 15 V?	Go to step 8.	Repair harness/connector between TCM and ABSCM&H/U.
8 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair connector.	Go to step 9.
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 trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 10.
10 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

X: TROUBLE CODE 51
— ABNORMAL VALVE RELAY —

DIAGNOSIS:

- Faulty valve relay

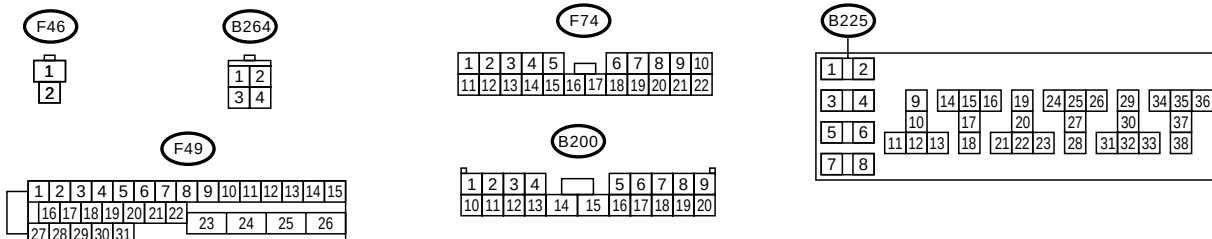
TROUBLE SYMPTOM:

- ABS does not operate.

ABS (DIAGNOSTICS)

The diagram illustrates the electrical system for the ABS. Key components and their connections include:

- BATTERY**: Connected to the system via **SBF-1** and **SBF-3**.
- IGNITION SWITCH**: Controls the power flow through **SBF-4** to the **RELAY HOLDER**.
- RELAY HOLDER**: Contains the **ABS RELAY** and **SOLENOID VALVE**.
- ABS RELAY**: Labeled with **B225**, it has four terminals (1, 2, 3, 4) and is connected to the solenoid valve and pump motor.
- SOLENOID VALVE**: Labeled with **F49**, it has eight terminals: **FL INLET**, **FL OUTLET**, **FR INLET**, **FR OUTLET**, **RL INLET**, **RL OUTLET**, **RR INLET**, and **RR OUTLET**.
- PUMP MOTOR**: Labeled with **M**, it is connected to the **RR INLET** and **RR OUTLET** terminals of the solenoid valve.
- Fuses and Switches**: Various components like **F46**, **B108**, **B264**, **B200**, and **F74** are shown, along with switches **No.8** and **No.18**.



ABS-80

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn ignition switch to OFF. 2) Remove fuse. 3) Measure voltage between ABS relay connector and chassis ground. Connector & terminal LHD model (B225) No. 5 (+) — Chassis ground (-): RHD model (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair open circuit in harness between battery and Relay holder connector.
2 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 3.
3 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install fuse. 2) Remove ABS relay. 3) Turn ignition switch to ON. 4) Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between battery and Relay holder connector.
4 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair harness connector between battery, ignition switch and ABS relay.
5 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between ABS relay connector and chassis ground. Connector & terminal (B264) No. 3 (+) — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 6.	Repair open circuit between ABS relay and chassis ground.
6 CHECK ABS RELAY. 1) Connect battery to ABS relay terminal No. 1 and 3. 2) Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω?	Go to step 7.	Replace ABS relay.
7 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 voltage between 10 and 15 V?	Go to step 8.	Repair harness connector between battery, ABS relay and ABSCM&H/U.
8 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 resistance less than 0.5 Ω?	Go to step 9.	Repair ABSCM&H/U ground harness.
9 CHECK VALVE RELAY IN ABSCM&H/U. Measure resistance between ABSCM&H/U and terminals. Terminals No. 23 (+) — No. 24 (-):	Is the resistance more than 1 MΩ?	Go to step 10.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step 11 .
11 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 12 .
12 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

Y: TROUBLE CODE 52

— ABNORMAL MOTOR AND/OR MOTOR RELAY —

DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

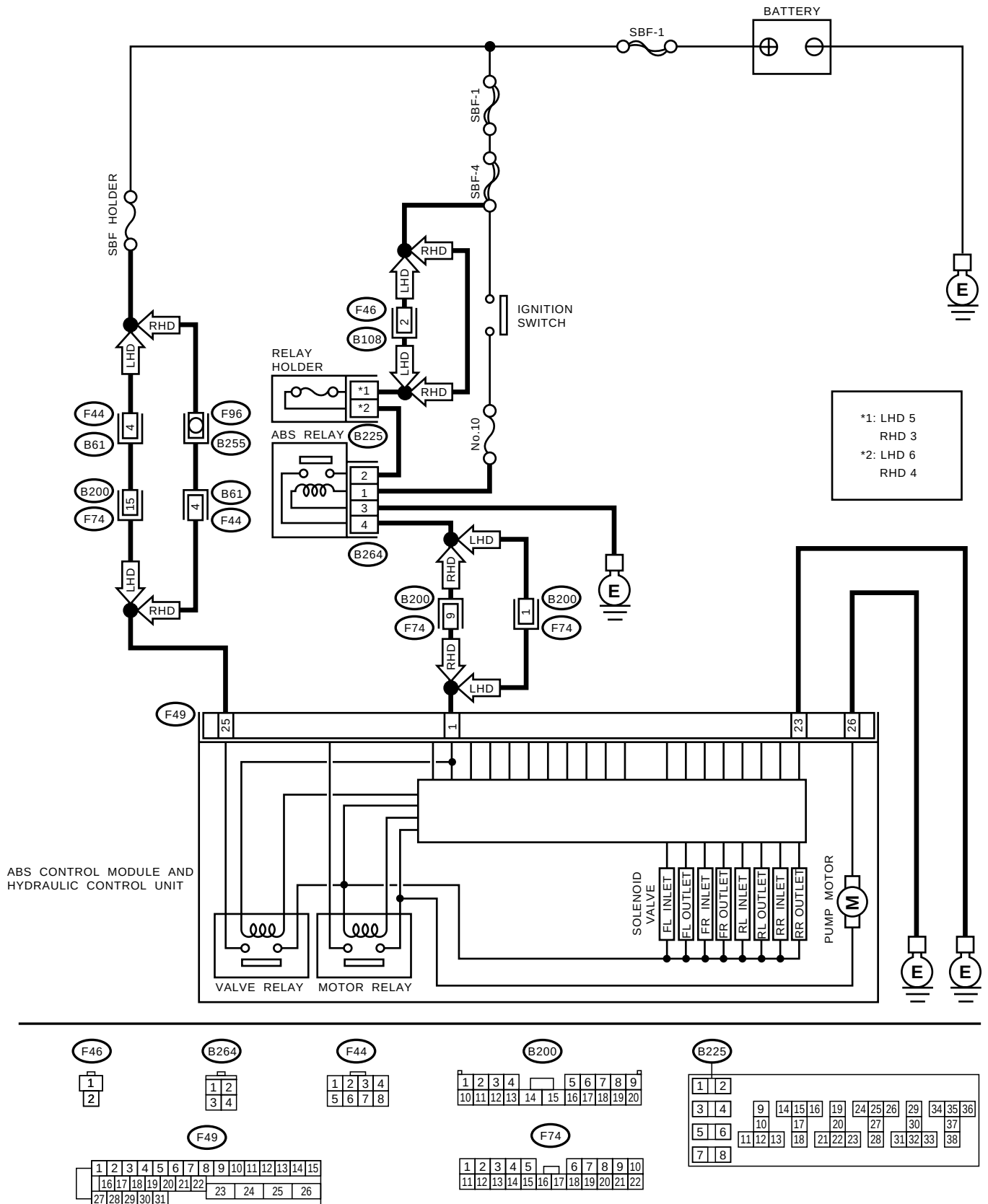
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0042

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	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 voltage between 10 and 15 V?	Go to step 2.	Repair harness/connector between battery and ABSCM&H/U and check fuse SBF-holder.
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 resistance less than 0.5 Ω ?	Go to step 3.	Repair ABSCM&H/U ground harness.
3 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn ignition switch to OFF. 2) Remove fuse. 3) Measure voltage between ABS relay connector and chassis ground. Connector & terminal LHD model (B225) No. 5 (+) — Chassis ground (-): RHD model (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between battery and Relay holder connector.
4 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 5.
5 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install fuse. 2) Remove ABS relay. 3) Turn ignition switch to ON. 4) Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Repair open circuit in harness between battery and Relay holder connector.
6 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair harness connector between battery, ignition switch and ABS relay.
7 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between ABS relay connector and chassis ground. Connector & terminal (B264) No. 3 (+) — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 8.	Repair open circuit between ABS relay and chassis ground.
8 CHECK ABS RELAY. 1) Connect battery to ABS relay terminal No. 1 and 3. 2) Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 9.	Replace ABS relay.
9 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 voltage between 10 and 15 V?	Go to step 10.	Repair harness connector between battery, ignition switch and ABSCM&H/U.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 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 resistance less than 0.5 Ω ?	Go to step 11.	Repair ABSCM&H/U ground harness.
11 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-11, 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?	Go to step 12.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
12 CHECK POOR CONTACT IN CONNECTORS. Turn ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair connector.	Go to step 13.
13 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 14.
14 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Z: TROUBLE CODE 54 — ABNORMAL STOP LIGHT SWITCH —

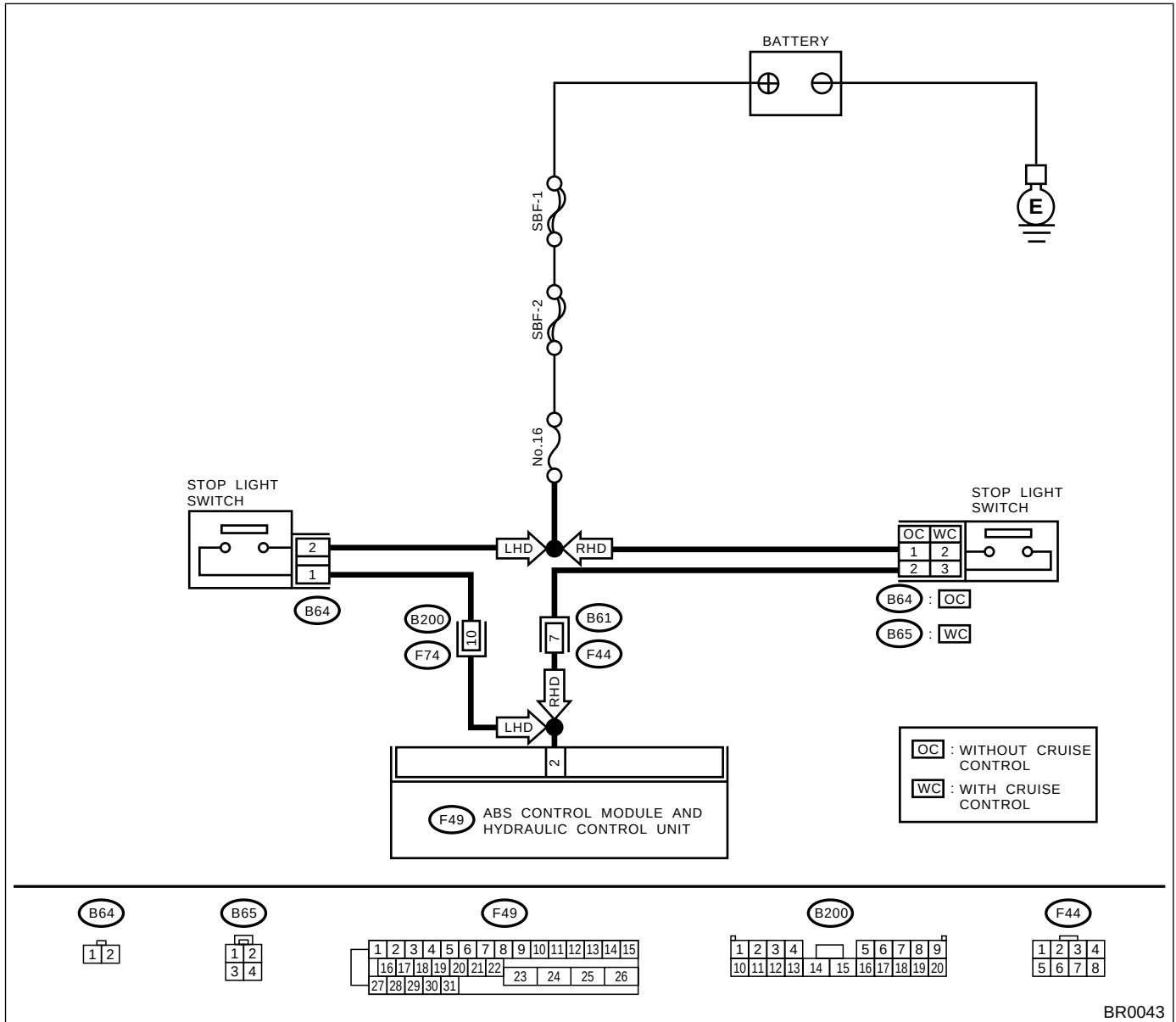
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0043

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK STOP LIGHTS COME ON. Depress the brake pedal.	Do 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 voltage between 10 and 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?	Repair connector.	Go to step 4.
4	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 5.
5	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

AA:TROUBLE CODE 56

— ABNORMAL G SENSOR OUTPUT VOLTAGE —

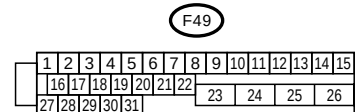
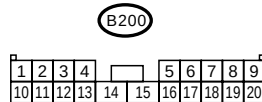
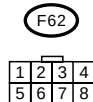
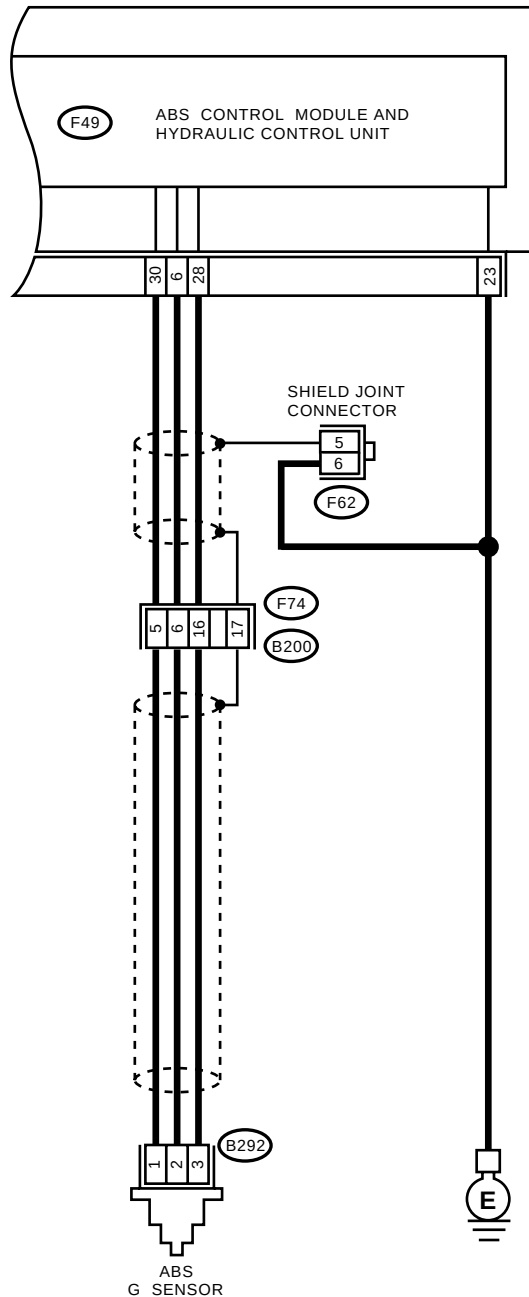
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

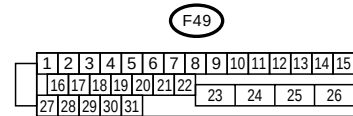
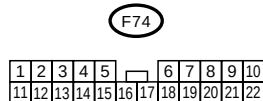
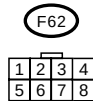
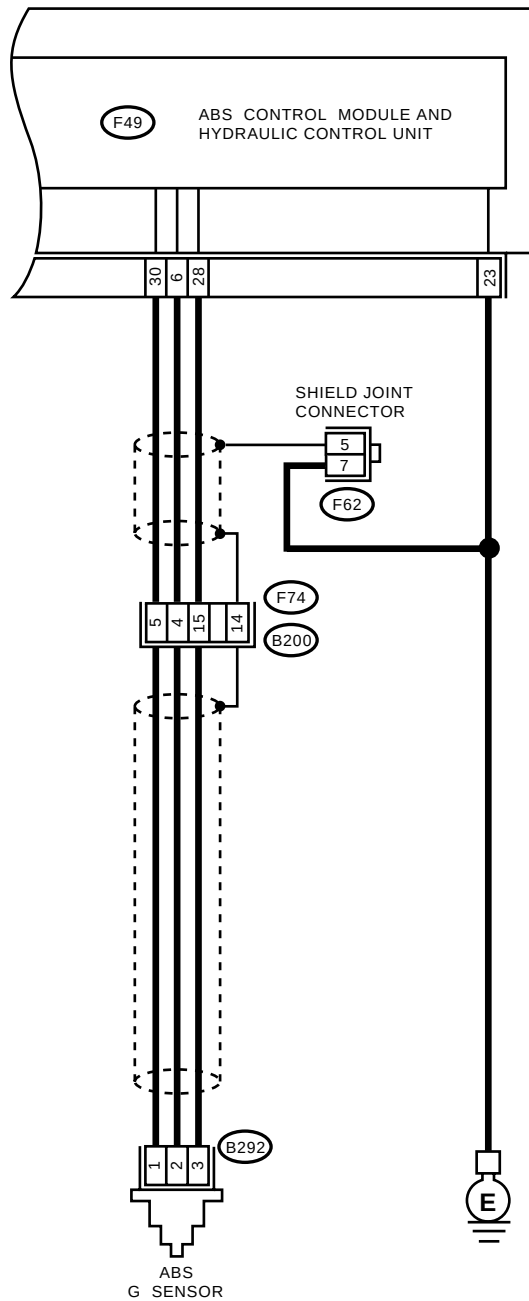


BR0044

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ALL FOUR WHEELS FOR FREE TURNING.	Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the trouble code.	Go to step 2.
2	CHECK SPECIFICATIONS OF ABSCM&H/U. Check specifications of the mark to the ABSCM&H/U. CA: AT (FWD) CB: MT (FWD) CC: AT (AWD) CD: MT (AWD)	Does the vehicle specification and the ABSCM&H/U specification match?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> CAUTION: Be sure to turn ignition switch to OFF when removing ABSCM&H/U.	Go to step 3.
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 (B292) No. 1 (+) — No. 3 (-):	Is the voltage between 4.75 and 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 resistance between 4.3 and 4.9 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:	Is the resistance more than 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 voltage less than 1 V?	Go to step 7.	Repair harness between G sensor and ABSCM&H/U.
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 voltage less than 1 V?	Go to step 8.	Repair harness between G sensor and ABSCM&H/U.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK GROUND SHORT OF HARNESS. Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal (F49) No. 28 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 9.	Repair harness between G sensor and ABSCM&H/U. Replace ABSCM&H/U. <Ref. to ABS-7, 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 (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 2.1 and 2.4 V when G sensor is horizontal?	Go to step 10.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
10 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step 11.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
11 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step 12.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
12 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step 13.
13 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 14.
14 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

AB:SELECT MONITOR

Applicable cartridge of select monitor: <Ref. to ABS-10, SPECIAL TOOLS, PREPARATION TOOL, General Description.>

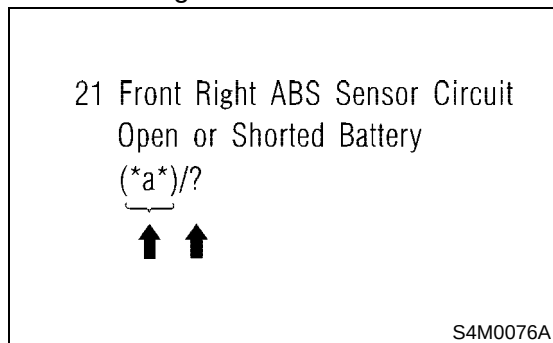
NOTE:

For basic handling of the select monitor, refer to its Operation Manual.

AC:TROUBLE CODES ARE DISPLAYED.

A maximum of 3 trouble codes are displayed in order of occurrence.

- If a particular trouble code is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the trouble code, followed by a question mark "?", appears on the select monitor display. This shows it may be an unreliable reading.



- *a* refers to the troubles in order of occurrence (Latest, Old, Older and Reference).

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 proceeding trouble code appears on the select monitor display.

AD:CLEAR MEMORY

Display screen	Contents to be monitored
Clear memory?	Function of clearing trouble code and freeze frame data.

AE: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.

AF: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

AG: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-11, ABS Sequence Control.>

AH: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.
- Freeze frame data will be memorized maximum to three.
- If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a trouble code, preceded by a question mark "?", appears on the select monitor display. This shows it may be an unreliable reading.

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.
ABSCM power voltage	Power (in volts) supplied to ABSCM&H/U appears on the select monitor display.
G sensor output voltage	Refers to vehicle acceleration detected by the analog G sensor. It appears on the select monitor display in volts.
Motor relay monitor	Motor relay operation monitor signal
Stop light switch	Stop light switch signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS-AT control	ABS operation signal from ABS control module to TCM
ABS operation signal	ABS operation signal

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK IGNITION SWITCH.	Is ignition switch 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.	Is voltage more than 11 V?	Go to step 3.	Charge or replace battery.
3 CHECK BATTERY TERMINAL.	Is there poor contact at battery terminal?	Repair or tighten battery terminal.	Go to step 4.
4 CHECK COMMUNICATION OF SELECT MONITOR. 1)Turn ignition switch to OFF. 2)Using the select monitor, check whether communication to other system (such as engine, TCM, etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step 10.	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 (such as TCM, engine etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step 10.	Go to step 6.
6 CHECK COMMUNICATION OF SELECT MONITOR. 1)Turn ignition switch to OFF. 2)Connect ABSCM&H/U connector. 3)Disconnect ECM connector. 4)Check whether communication to other systems (such as TCM, engine etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Inspect ECM.	Go to step 7.
7 CHECK COMMUNICATION OF SELECT MONITOR. 1)Turn ignition switch to OFF. 2)Connect ECM connector. 3)Disconnect TCM connector. 4)Check whether communication to other systems (such as engine etc.) can be executed normally.	Are the name and year of the system displayed on the select monitor?	Inspect TCM.	Go to step 8.
8 CHECK COMMUNICATION OF SELECT MONITOR. 1)Turn ignition switch to OFF. 2)Connect TCM connector. 3)Disconnect cruise control module connector. 4)Check whether communication to other systems (such as engine, TCM etc.) can be executed normally. NOTE: If the vehicle is not equipped with cruise control: Go to step 9.	Are the name and year of the system displayed on the select monitor?	Inspect cruise control module.	Go to step 9.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect TCM, ECM, ABSCM&H/U, and, cruise control module connectors. 3) Measure resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>(B40) No. 5 — Chassis ground:</i> <i>(B40) No. 4 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 10.	Repair harness and connector between each control module and data link connector.
10 CHECK OUTPUT SIGNAL FOR ABSCM&H/U. 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U and chassis ground. <i>Connector & terminal</i> <i>(B40) No. 5 (+) — Chassis ground (-):</i> <i>(B40) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 1 V?	Repair harness and connector between each control module and data link connector.	Go to step 11.
11 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR. Measure resistance between ABSCM&H/U connector and data link connector. <i>Connector & terminal</i> <i>(F49) No. 20 — (B40) No. 5:</i> <i>(F49) No. 5 — (B40) No. 4:</i>	Is the resistance less than 0.5 Ω ?	Repair harness and connector between ABSCM&H/U and data link connector.	Go to step 12.
12 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?	Go to step 13.	Insert ABSCM&H/U connector into ABSCM&H/U.
13 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn ignition switch to OFF. 2) Remove fuse. 3) Measure voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>LHD model</i> <i>(B225) No. 5 (+) — Chassis ground (-):</i> <i>RHD model</i> <i>(B225) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 14.	Repair open circuit in harness between battery and Relay holder connector.
14 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 15.
15 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install fuse. 2) Remove ABS relay. 3) Turn ignition switch to ON. 4) Measure voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>(B264) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 16.	Repair open circuit in harness between battery and Relay holder connector.
16 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>(B264) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 17.	Repair harness connector between battery, ignition switch and ABS relay.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
17 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between ABS relay connector and chassis ground. Connector & terminal (B264) No. 3 (+) — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 18 .	Repair open circuit between ABS relay and chassis ground.
18 CHECK ABS RELAY. 1) Connect battery to ABS relay terminal No. 1 and 3. 2) Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 19 .	Replace ABS relay.
19 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 (-):	Is the voltage more than 10 V?	Go to step 20 .	Repair open circuit in harness between ABSCM&H/U and battery.
20 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 resistance less than 1 Ω ?	Go to step 21 .	Repair open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
21 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in control module power supply, ground line and data link connector?	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

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.

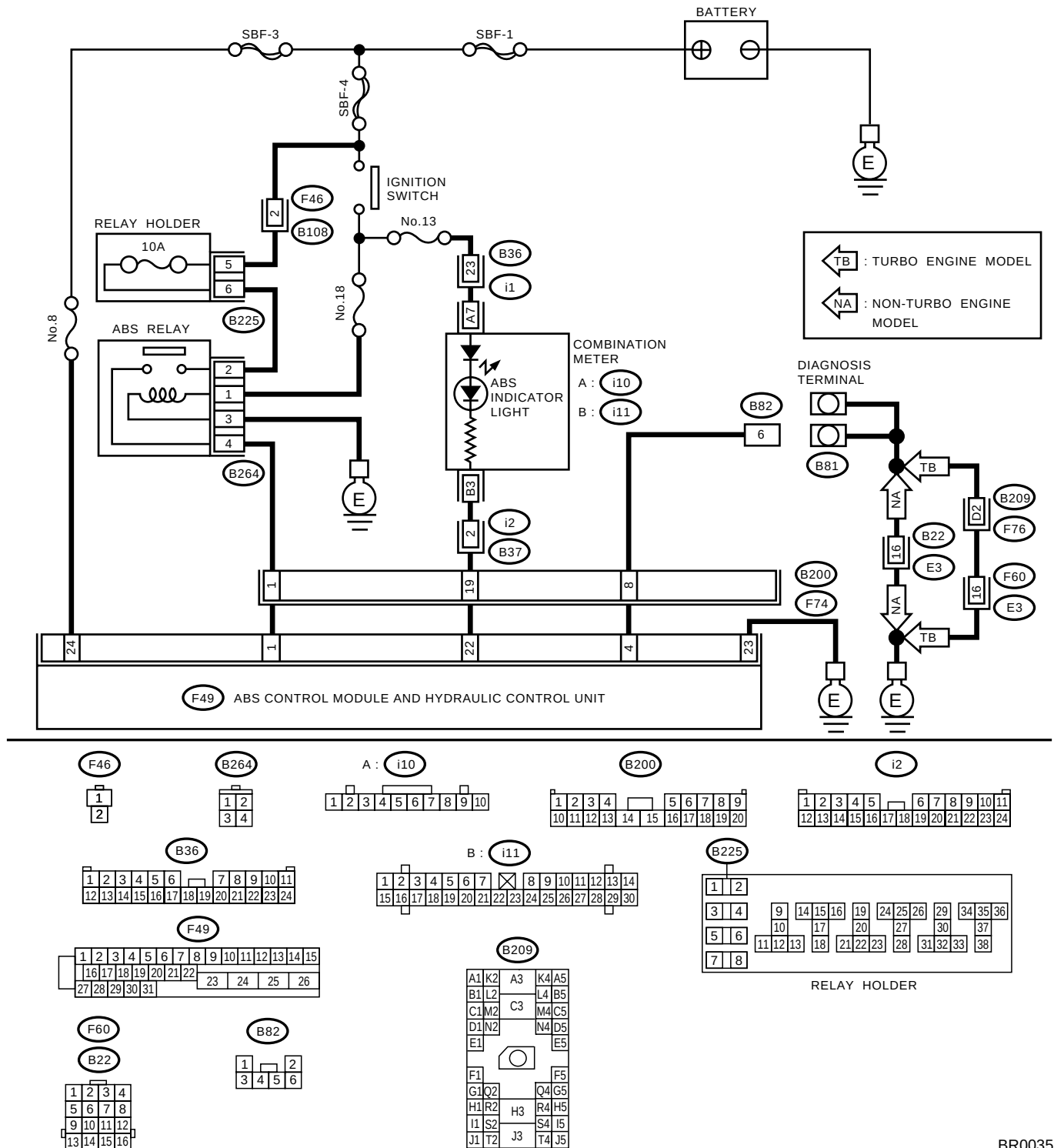
NOTE:

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: LHD MODEL

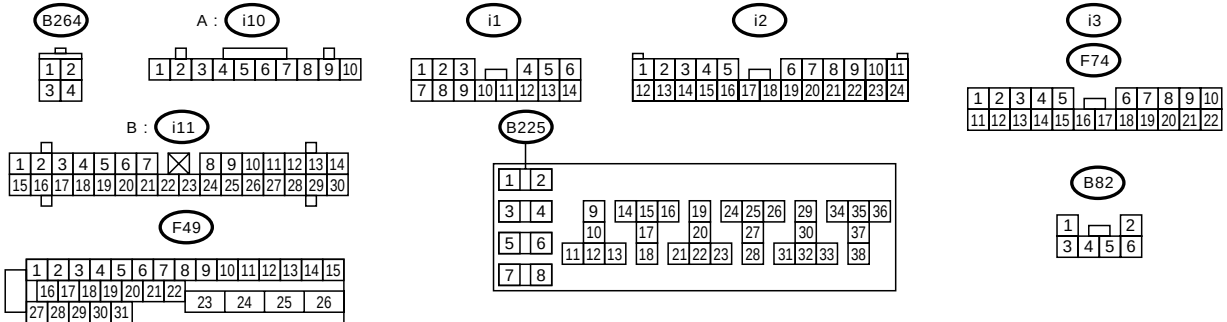
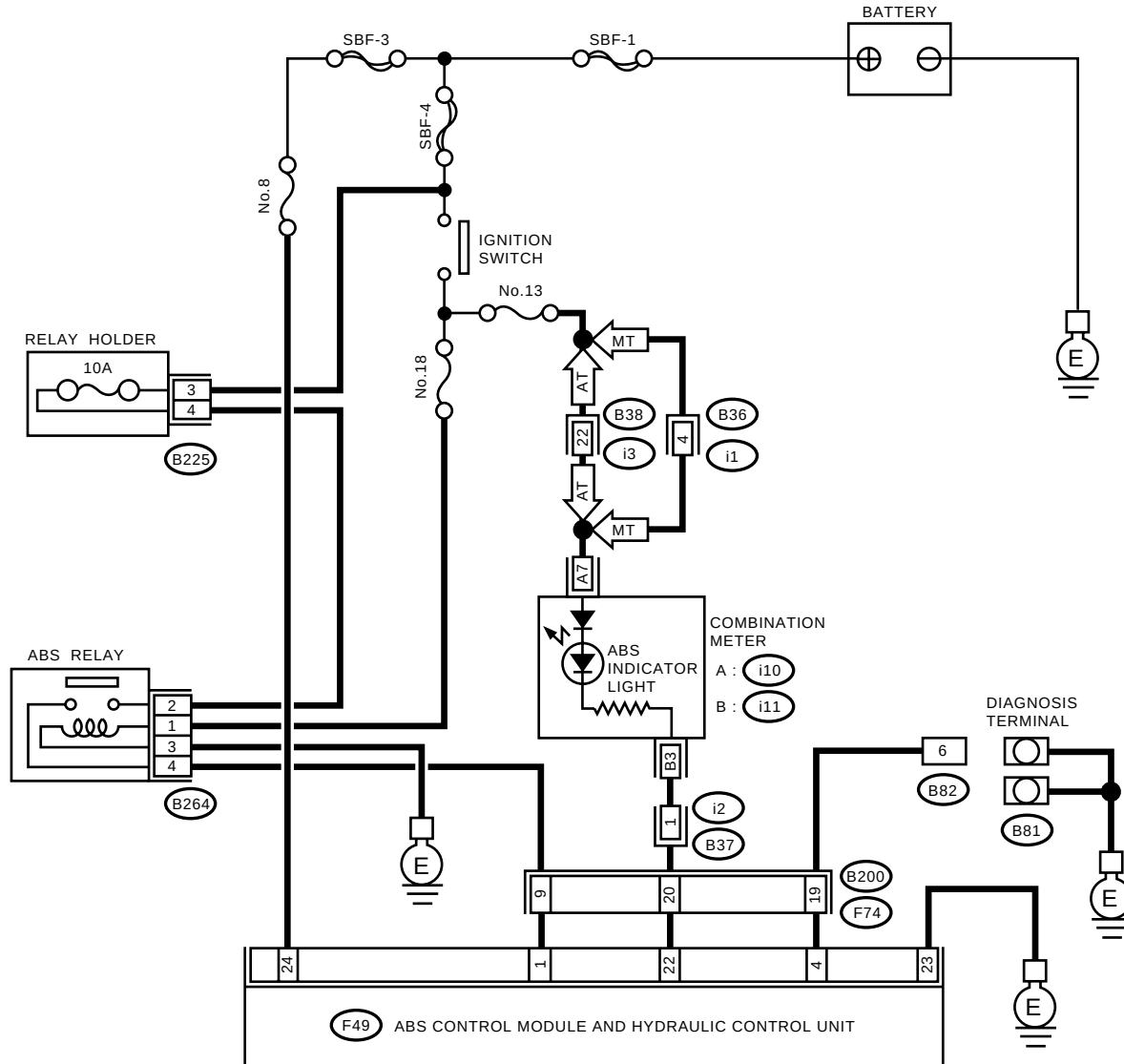


BR0035

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0036

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK WIRING HARNESS. 1)Turn ignition switch to OFF. 2)Disconnect connector (F74) from connector (B200). 3)Turn ignition switch to ON.	Does the ABS warning light remain off?	Go to step 2.	Repair front wiring harness.
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.	Are the projection broken?	Go to step 3.	Replace ABSCM&H/U. <Ref. to ABS-7, 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:	Is the resistance more than 1 MΩ?	Go to step 4.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	CHECK WIRING HARNESS. Measure resistance between connector (F45) and chassis ground. Connector & terminal (F74) No. 19 — Chassis ground:	Is the resistance less than 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) and chassis ground. Connector & terminal (F74) No. 19 — Chassis ground:	Is the resistance more than 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?	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

C: TROUBLE CODE 21

— OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 27. <Ref. to ABS-106, TROUBLE CODE 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>

D: TROUBLE CODE 23

— OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 27. <Ref. to ABS-106, TROUBLE CODE 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>

E: TROUBLE CODE 25

— OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 27. <Ref. to ABS-106, TROUBLE CODE 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)

F: TROUBLE CODE 27

— OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —

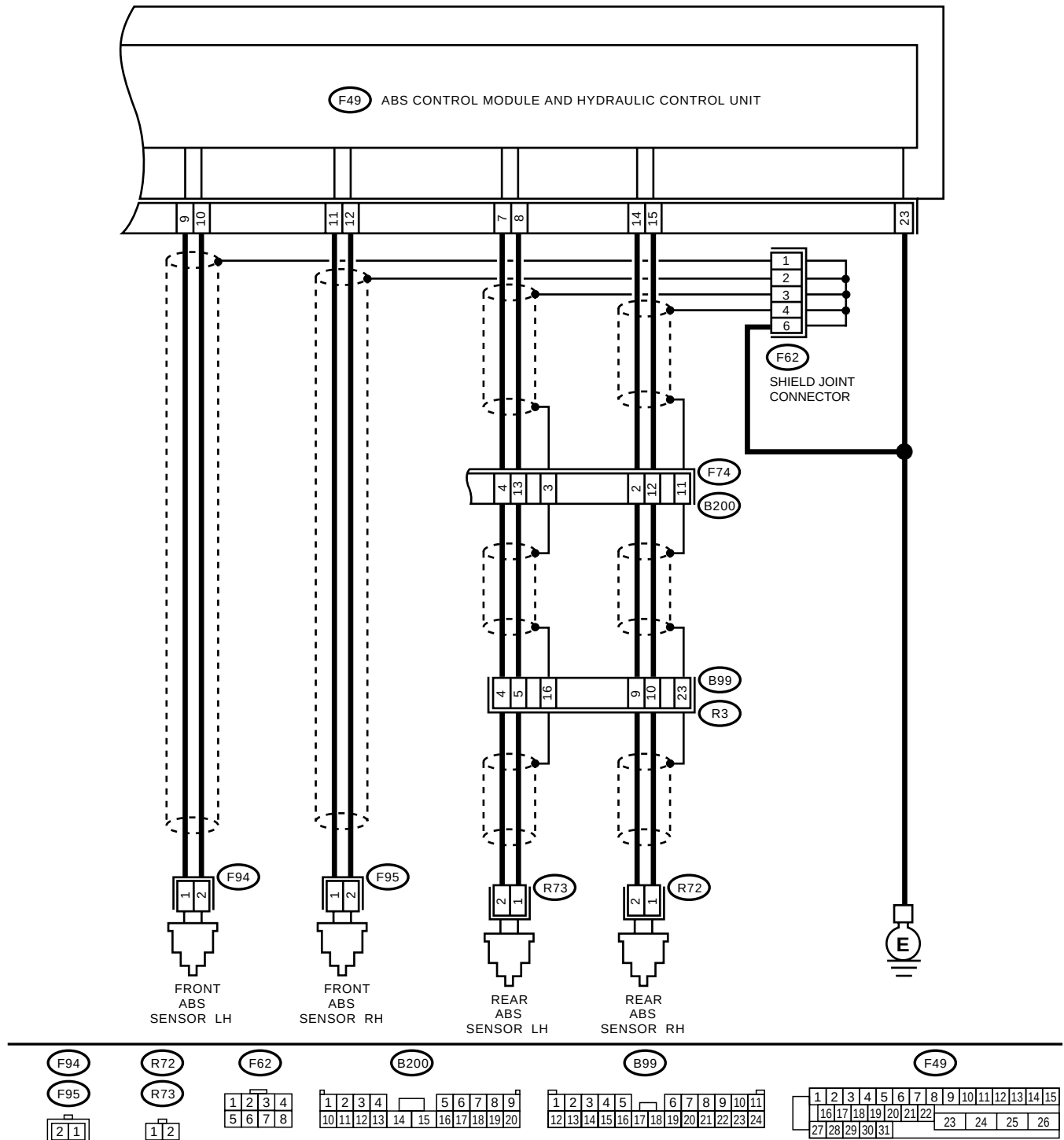
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

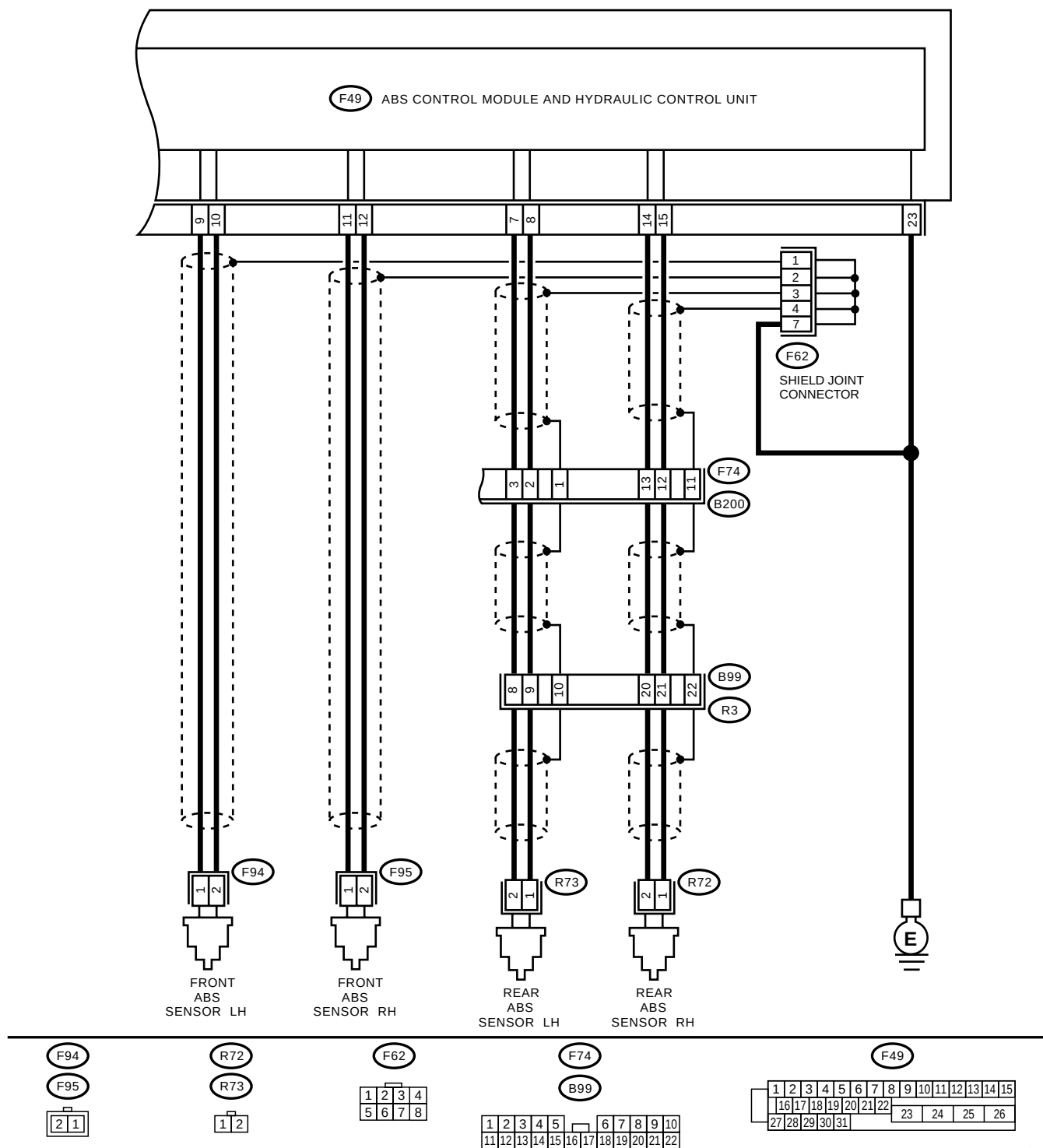


BR0037

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0038

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

	Step	Check	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?	Go to step 2.	Go to step 8.
2	CHECK INSTALLATION OF ABS SENSOR. <i>Tightening torque:</i> 32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Are the ABS sensor installation bolts tightened securely?	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. <i>Front wheel</i> 0.3 — 0.8 mm (0.012 — 0.031 in) <i>Rear wheel</i> 0.7 — 1.2 mm (0.028 — 0.047 in)	Is the gap within the specifications?	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 runout less than 0.05 mm (0.0020 in)?	Go to step 5.	Replace tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, 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?	Repair connector.	Go to step 6.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.
8	CHECK ABS SENSOR. 1)Turn ignition switch to OFF. 2)Disconnect connector from ABS sensor. 3)Measure resistance of ABS sensor connector terminals. <i>Terminal</i> 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 resistance between 1 and 1.5 kΩ?	Go to step 9.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK BATTERY SHORT OF ABS SENSOR. 1) Disconnect connector from ABSCM&H/U. 2) Measure voltage 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>	Is the voltage less than 1 V?	Go to step 10.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
10 CHECK BATTERY SHORT OF ABS SENSOR. 1) Turn ignition switch to ON. 2) Measure voltage 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>	Is the voltage less than 1 V?	Go to step 11.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
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. Connector & terminal <i>Trouble code 21 / (F49) No. 11 — No. 12:</i> <i>Trouble code 23 / (F49) No. 9 — No. 10:</i> <i>Trouble code 25 / (F49) No. 14 — No. 15:</i> <i>Trouble code 27 / (F49) No. 7 — No. 8:</i>	Is the resistance between 1 and 1.5 kΩ?	Go to step 12.	Repair harness/connector between ABSCM&H/U and ABS sensor.
12 CHECK BATTERY SHORT OF HARNESS. Measure voltage between ABSCM&H/U connector and chassis ground. Connector & terminal <i>Trouble code 21 / (F49) No. 11 (+) — Chassis ground (-):</i> <i>Trouble code 23 / (F49) No. 9 (+) — Chassis ground (-):</i> <i>Trouble code 25 / (F49) No. 14 (+) — Chassis ground (-):</i> <i>Trouble code 27 / (F49) No. 7 (+) — Chassis ground (-):</i>	Is the voltage less than 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>Trouble code 21 / (F49) No. 11 (+) — Chassis ground (-):</i> <i>Trouble code 23 / (F49) No. 9 (+) — Chassis ground (-):</i> <i>Trouble code 25 / (F49) No. 14 (+) — Chassis ground (-):</i> <i>Trouble code 27 / (F49) No. 7 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 14.	Repair harness between ABSCM&H/U and ABS sensor.
14 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?	Go to step 15.	Tighten ABS sensor installation bolts securely.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
15 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. <i>Front wheel</i> 0.3 — 0.8 mm (0.012 — 0.031 in) <i>Rear wheel</i> 0.7 — 1.2 mm (0.028 — 0.047 in)	Is the gap within the specifications?	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 runout less than 0.05 mm (0.0020 in)?	Go to step 17.	Replace tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
17 CHECK GROUND SHORT OF ABS SENSOR. 1)Turn ignition switch to ON. 2)Measure resistance between ABS sensor and chassis ground. <i>Terminal</i> <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>	Is the resistance more than 1 MΩ?	Go to step 18.	Replace ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and <Ref. to ABS-7, 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. <i>Connector & terminal</i> <i>Trouble code 21 / (F49) No. 11 — Chassis ground:</i> <i>Trouble code 23 / (F49) No. 9 — Chassis ground:</i> <i>Trouble code 25 / (F49) No. 14 — Chassis ground:</i> <i>Trouble code 27 / (F49) No. 7 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	Go to step 19.	Repair harness between ABSCM&H/U and ABS sensor. And replace ABSCM&H/U. <Ref. to ABS-7, 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?	Repair connector.	Go to step 20.
20 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U.	Go to step 21.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
21 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact. NOTE: Check harness and connectors between AB-SCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

G: TROUBLE CODE 22

— FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 28. <Ref. to ABS-114, TROUBLE CODE 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>

H: TROUBLE CODE 24

— FRONT LEFT ABNORMAL ABS SENSOR SIGNAL —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 28. <Ref. to ABS-114, TROUBLE CODE 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>

I: TROUBLE CODE 26

— REAR RIGHT ABNORMAL ABS SENSOR SIGNAL —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 28. <Ref. to ABS-114, TROUBLE CODE 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

J: TROUBLE CODE 28

— REAR LEFT ABNORMAL ABS SENSOR SIGNAL —

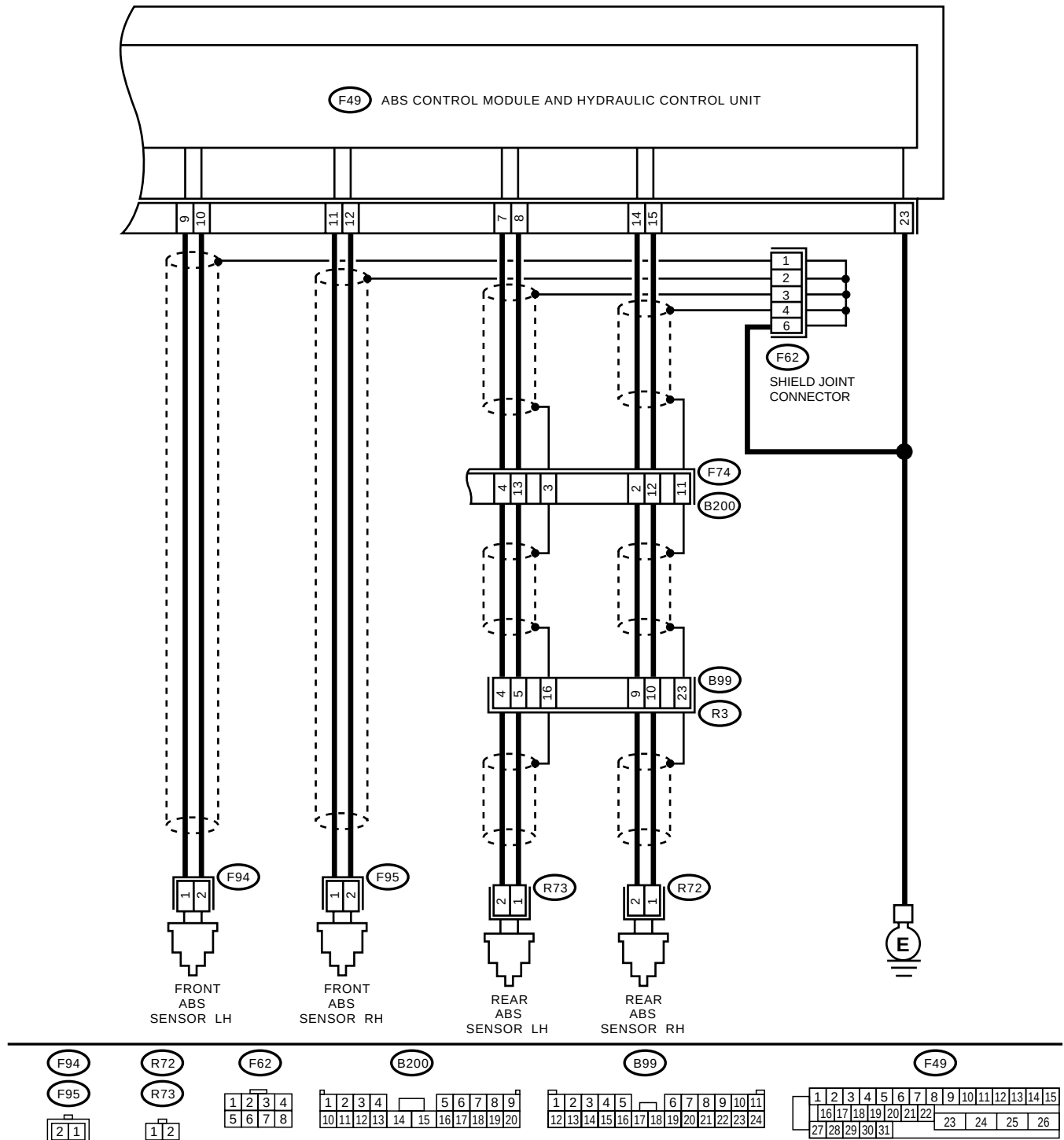
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

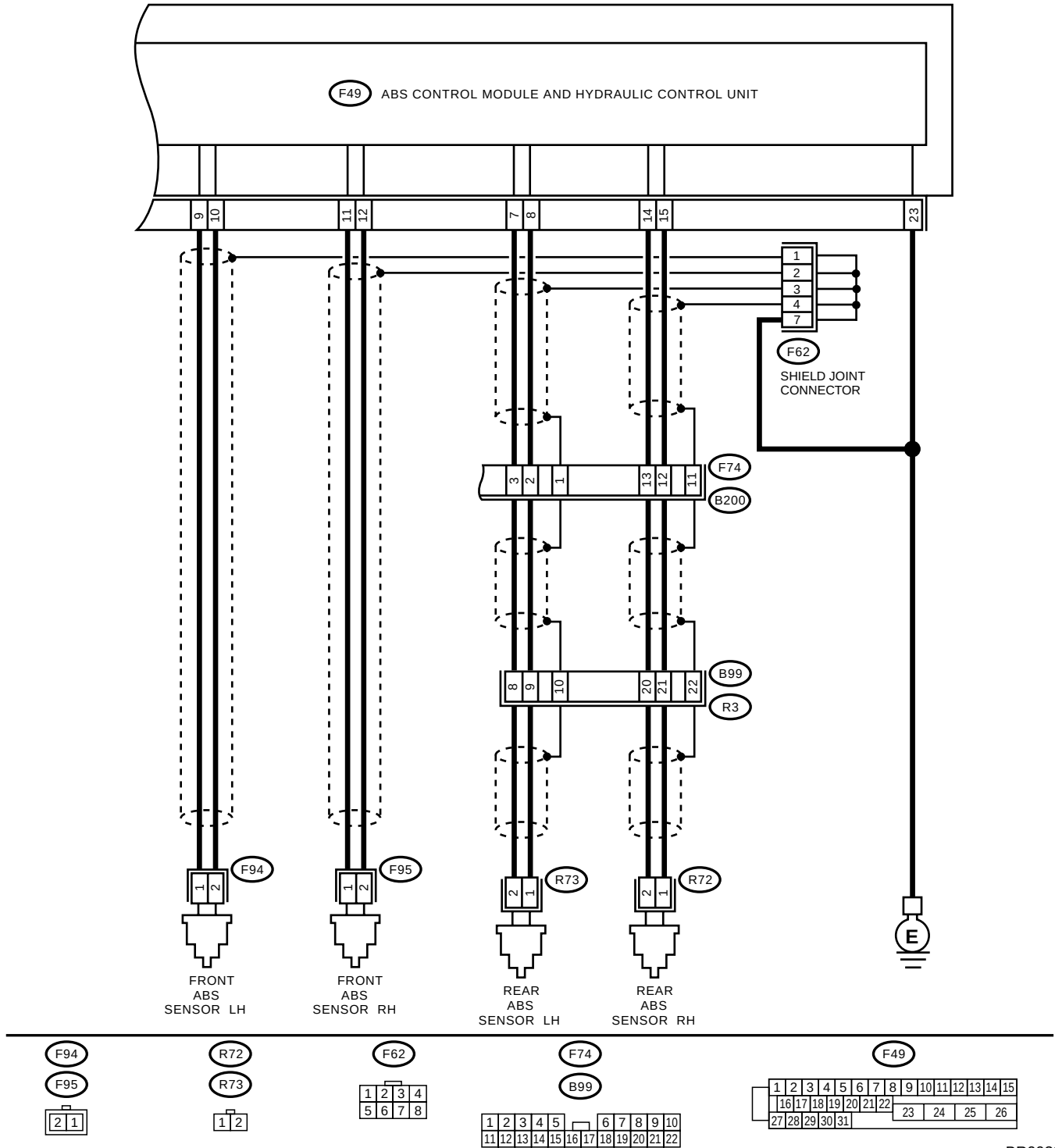


BR0037

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0038

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	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?	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?	Repair connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or the wireless transmitter properly installed?	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?	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 Trouble code 26 / (B200) No. 11 — Chassis ground: Trouble code 28 / RHD: (B200) No. 1 — Chassis ground: Trouble code 28 / LHD: (B200) No. 3 — Chassis ground: NOTE: For the Trouble code 22 and 24: Go to step 6.	Is the resistance less than 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 trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary noise interference.
8 CHECK INSTALLATION OF ABS SENSOR. Tightening torque: 32$\pm$10 N·m (3.3$\pm$1.0 kgf-m, 24$\pm$7 ft-lb)	Are the ABS sensor installation bolts tightened securely?	Go to step 9.	Tighten ABS sensor installation bolts securely.
9 CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Is the gap within the specifications?	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?	Go to step 11.	Go to step 12.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK ABS SENSOR SIGNAL. 1)Raise all four wheels of ground. 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-17, 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 Trouble code 22 / (F95) No. 1 (+) — No. 2 (-): Trouble code 24 / (F94) No. 1 (+) — No. 2 (-): Trouble code 26 / LHD: (B99) No. 9 (+) — No. 10 (-): RHD: (B99) No. 20 (+) — No. 21 (-): Trouble code 28 / LHD: (B99) No. 4 (+) — No. 5 (-): RHD: (B99) No. 8 (+) — No. 9 (-):	Is oscilloscope pattern smooth, as shown in figure?	Go to step 15.	Go to step 12.
12 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 dirt or other foreign matter?	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 piece or the tone wheel?	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>	Go to step 14.
14 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 15.	Replace tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
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. 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 resistance between 1 and 1.5 kΩ?	Go to step 16.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
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:	Is the resistance more than 1 MΩ?	Go to step 17.	Replace ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
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 Trouble code 22 / (F49) No. 11 — No. 12: Trouble code 24 / (F49) No. 9 — No. 10: Trouble code 26 / (F49) No. 14 — No. 15: Trouble code 28 / (F49) No. 7 — No. 8:	Is the resistance between 1 and 1.5 kΩ?	Go to step 18.	Repair harness/connector between ABSCM&H/U and ABS sensor.
18 CHECK GROUND SHORT OF HARNESS. Measure resistance between ABSCM&H/U connector and chassis ground. Connector & terminal Trouble code 22 / (F49) No. 11 — Chassis ground: Trouble code 24 / (F49) No. 9 — Chassis ground: Trouble code 26 / (F49) No. 14 — Chassis ground: Trouble code 28 / (F49) No. 7 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 19.	Repair harness/connector between ABSCM&H/U and ABS sensor.
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 resistance less than 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?	Repair connector.	Go to step 21.
21 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or the wireless transmitter properly installed?	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?	Install the noise sources apart from the sensor harness.	Go to step 23.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
23 CHECK SHIELD CIRCUIT. 1)Connect all connectors. 2)Measure resistance between shield connector and chassis ground. Connector & terminal Trouble code 26 / (B200) No. 11 — Chassis ground: Trouble code 28 / RHD: (B200) No. 1 — Chassis ground: Trouble code 28 / LHD: (B200) No. 3 — Chassis ground: NOTE: For the Trouble code 22 and 24: Go to step 24 .	Is the resistance less than 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 trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 25 .
25 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary noise interference.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

K: TROUBLE CODE 29

— ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR —

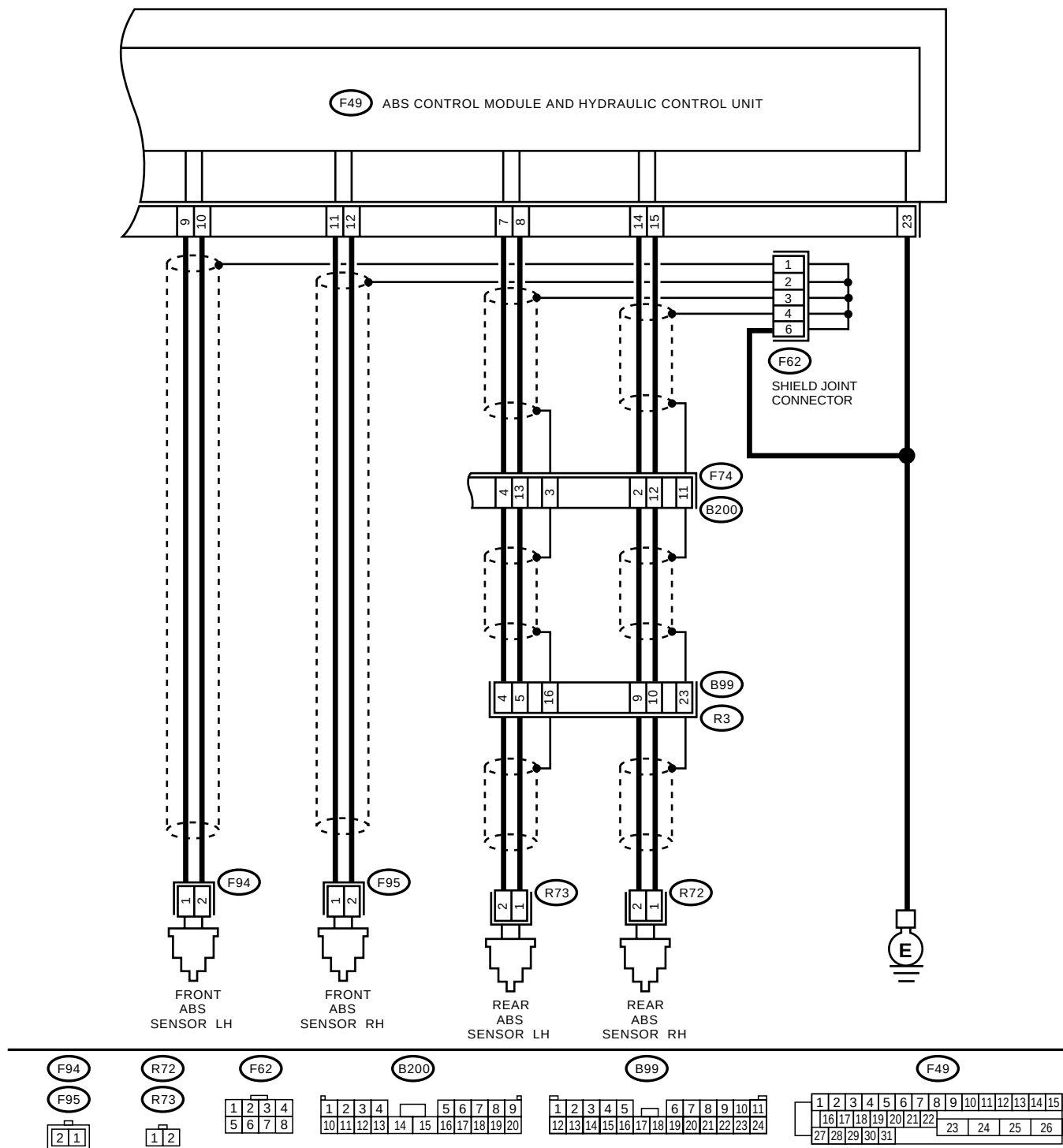
DIAGNOSIS:

- 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: LHD MODEL

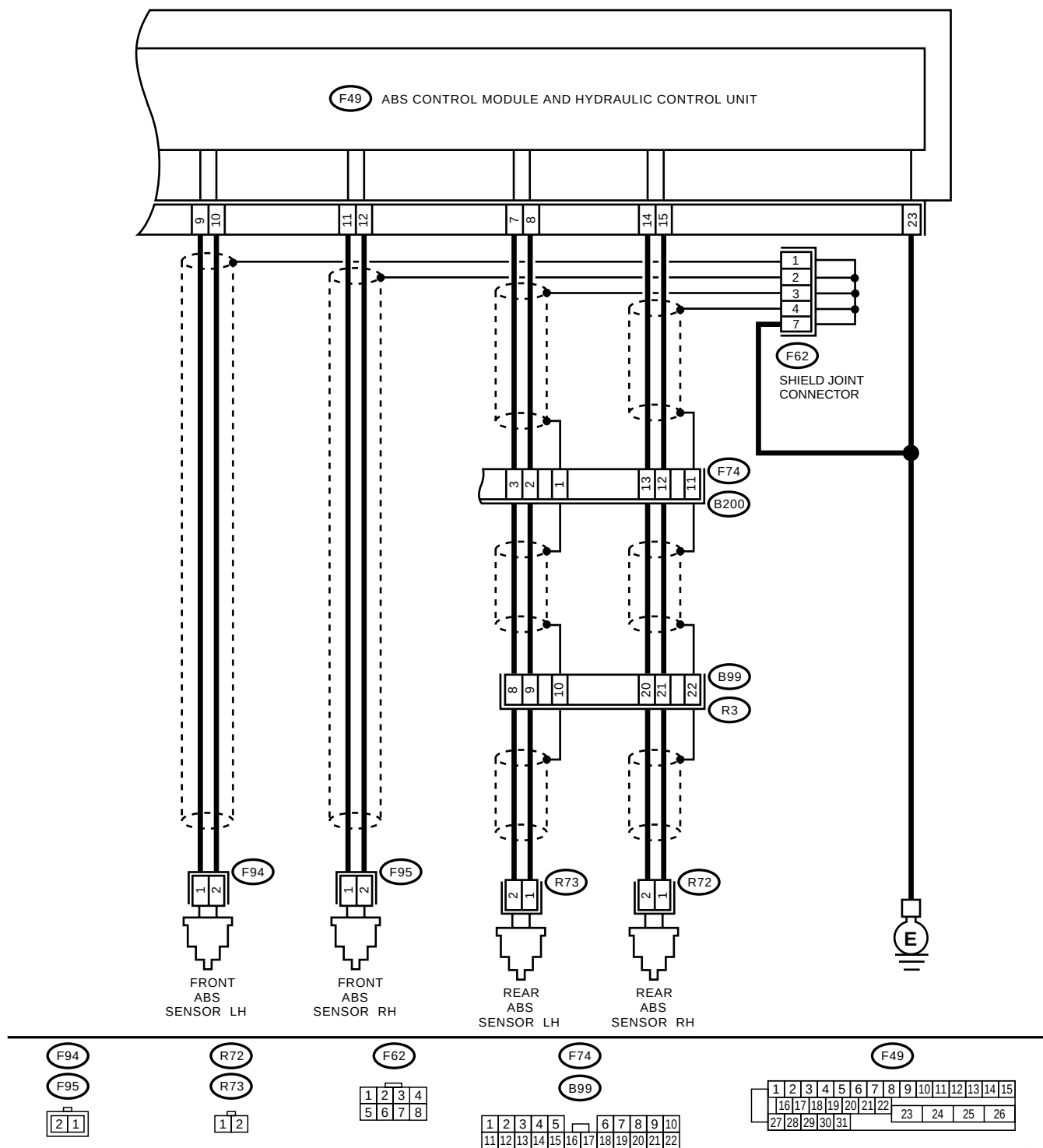


BR0037

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0038

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.	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.	The ABS is normal. Erase the 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?	Go to step 3.
3	CHECK WEAR OF TIRE.	Is the tire worn excessively?	Replace tire.
4	CHECK TIRE PRESSURE.	Is the tire pressure correct?	Go to step 5.
5	CHECK INSTALLATION OF ABS SENSOR. <i>Tightening torque:</i> 32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)	Are the ABS sensor installation bolts tightened securely?	Replace tire.
6	CHECK ABS SENSOR GAP. Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. <i>Front wheel</i> 0.3 — 0.8 mm (0.012 — 0.031 in) <i>Rear wheel</i> 0.7 — 1.2 mm (0.028 — 0.047 in)	Is the gap within the specifications?	Go to step 6. Tighten ABS sensor installation bolts securely.
7	PREPARE OSCILLOSCOPE.	Is the gap within the specifications?	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.
8	CHECK ABS SENSOR SIGNAL. 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Connect the oscilloscope to the connector (B99), (F95) or (F94) in accordance with trouble code. 4) Turn ignition switch ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-17, 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>Front RH</i> (F95) No. 1 (+) — No. 2 (-): <i>Front LH</i> (F94) No. 1 (+) — No. 2 (-): <i>Rear RH</i> LHD: (B99) No. 9 (+) — No. 10 (-): RHD: (B99) No. 20 (+) — No. 21 (-): <i>Rear LH</i> LHD: (B99) No. 4 (+) — No. 5 (-): RHD: (B99) No. 8 (+) — No. 9 (-):	Is an oscilloscope available?	Go to step 8.
		Is oscilloscope pattern smooth, as shown in figure?	Go to step 9.
		Go to step 12.	Go to step 9.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL. Remove disc rotor from hub.	Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	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 piece or the tone wheel?	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>	Go to step 11 .
11 CHECK TONE WHEEL RUNOUT. Measure tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 12 .	Replace tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
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 trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13 .
13 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

L: TROUBLE CODE 31

— FRONT RIGHT INLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 37. <Ref. to ABS-126, TROUBLE CODE 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

M: TROUBLE CODE 33

— FRONT LEFT INLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 37. <Ref. to ABS-126, TROUBLE CODE 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

N: TROUBLE CODE 35

— REAR RIGHT INLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 37. <Ref. to ABS-126, TROUBLE CODE 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

O: TROUBLE CODE 37

— REAR LEFT INLET VALVE MALFUNCTION —

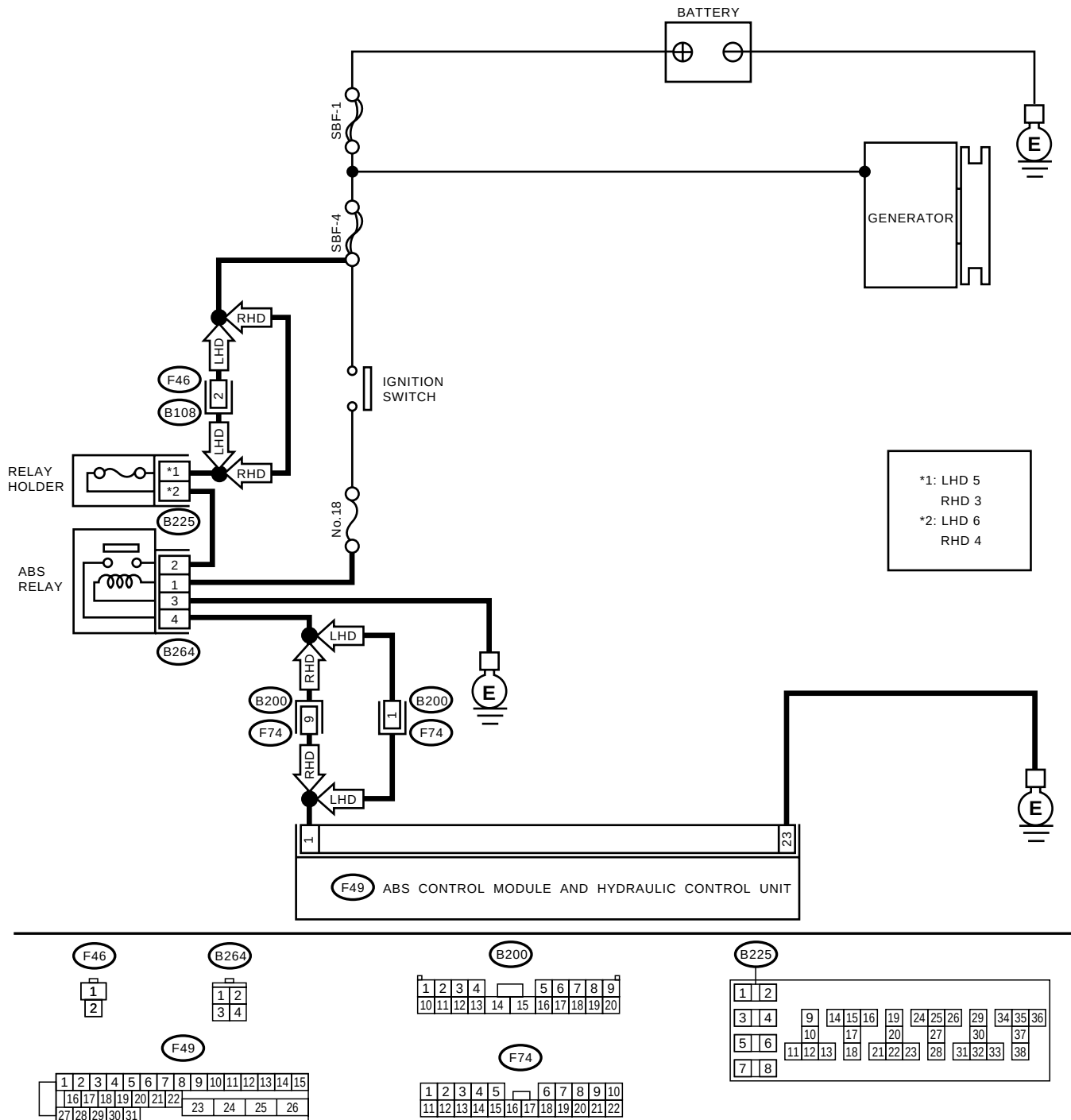
DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0039

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn ignition switch to OFF. 2) Remove fuse. 3) Measure voltage between ABS relay connector and chassis ground. Connector & terminal LHD model (B225) No. 5 (+) — Chassis ground (-): RHD model (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair open circuit in harness between battery and Relay holder connector.
2 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 3.
3 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install fuse. 2) Remove ABS relay. 3) Turn ignition switch to ON. 4) Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between battery and Relay holder connector.
4 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair harness connector between battery, ignition switch and ABS relay.
5 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between ABS relay connector and chassis ground. Connector & terminal (B264) No. 3 (+) — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair open circuit between ABS relay and chassis ground.
6 CHECK ABS RELAY. 1) Connect battery to ABS relay terminal No. 1 and 3. 2) Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace ABS relay.
7 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 voltage between 10 and 15 V?	Go to step 8.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
8 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 resistance less than 0.5 Ω ?	Go to step 9.	Repair ABSCM&H/U ground harness.
9 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step 10.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
10	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 11 .
11	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

P: TROUBLE CODE 32

— FRONT RIGHT OUTLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 38. <Ref. to ABS-130, TROUBLE CODE 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

Q: TROUBLE CODE 34

— FRONT LEFT OUTLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 38. <Ref. to ABS-130, TROUBLE CODE 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

R: TROUBLE CODE 36

— REAR RIGHT OUTLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to TROUBLE CODE 38. <Ref. to ABS-130, TROUBLE CODE 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

S: TROUBLE CODE 38

— REAR LEFT OUTLET VALVE MALFUNCTION —

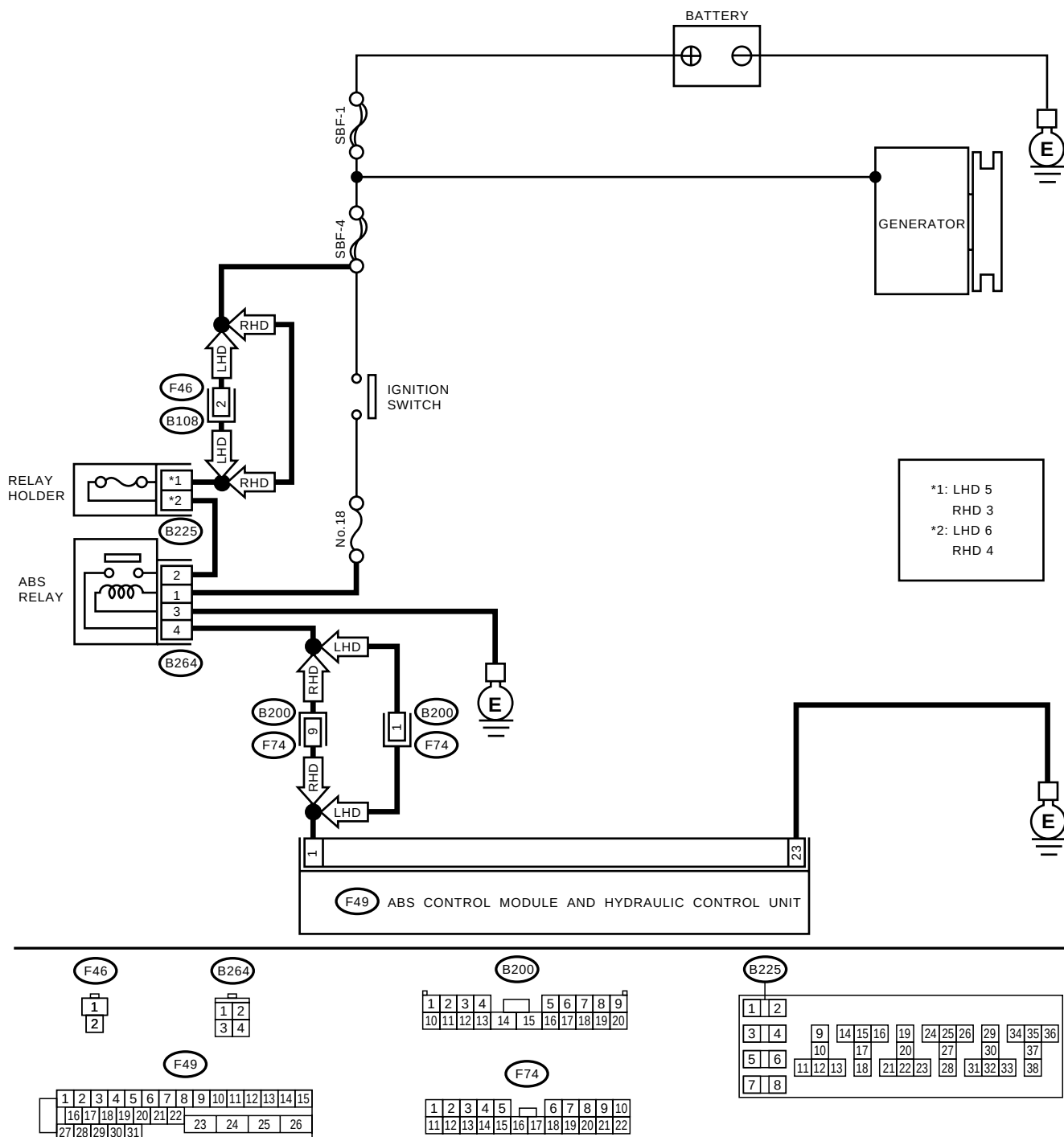
DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0039

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn ignition switch to OFF. 2) Remove fuse. 3) Measure voltage between ABS relay connector and chassis ground. Connector & terminal LHD model (B225) No. 5 (+) — Chassis ground (-): RHD model (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair open circuit in harness between battery and Relay holder connector.
2 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 3.
3 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install fuse. 2) Remove ABS relay. 3) Turn ignition switch to ON. 4) Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between battery and Relay holder connector.
4 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair harness connector between battery, ignition switch and ABS relay.
5 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between ABS relay connector and chassis ground. Connector & terminal (B264) No. 3 (+) — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair open circuit between ABS relay and chassis ground.
6 CHECK ABS RELAY. 1) Connect battery to ABS relay terminal No. 1 and 3. 2) Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace ABS relay.
7 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 voltage between 10 and 15 V?	Go to step 8.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
8 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 resistance less than 0.5 Ω ?	Go to step 9.	Repair ABSCM&H/U ground harness.
9 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step 10.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
10	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 11 .
11	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

T: TROUBLE CODE 41
— ABS CONTROL MODULE MALFUNCTION —

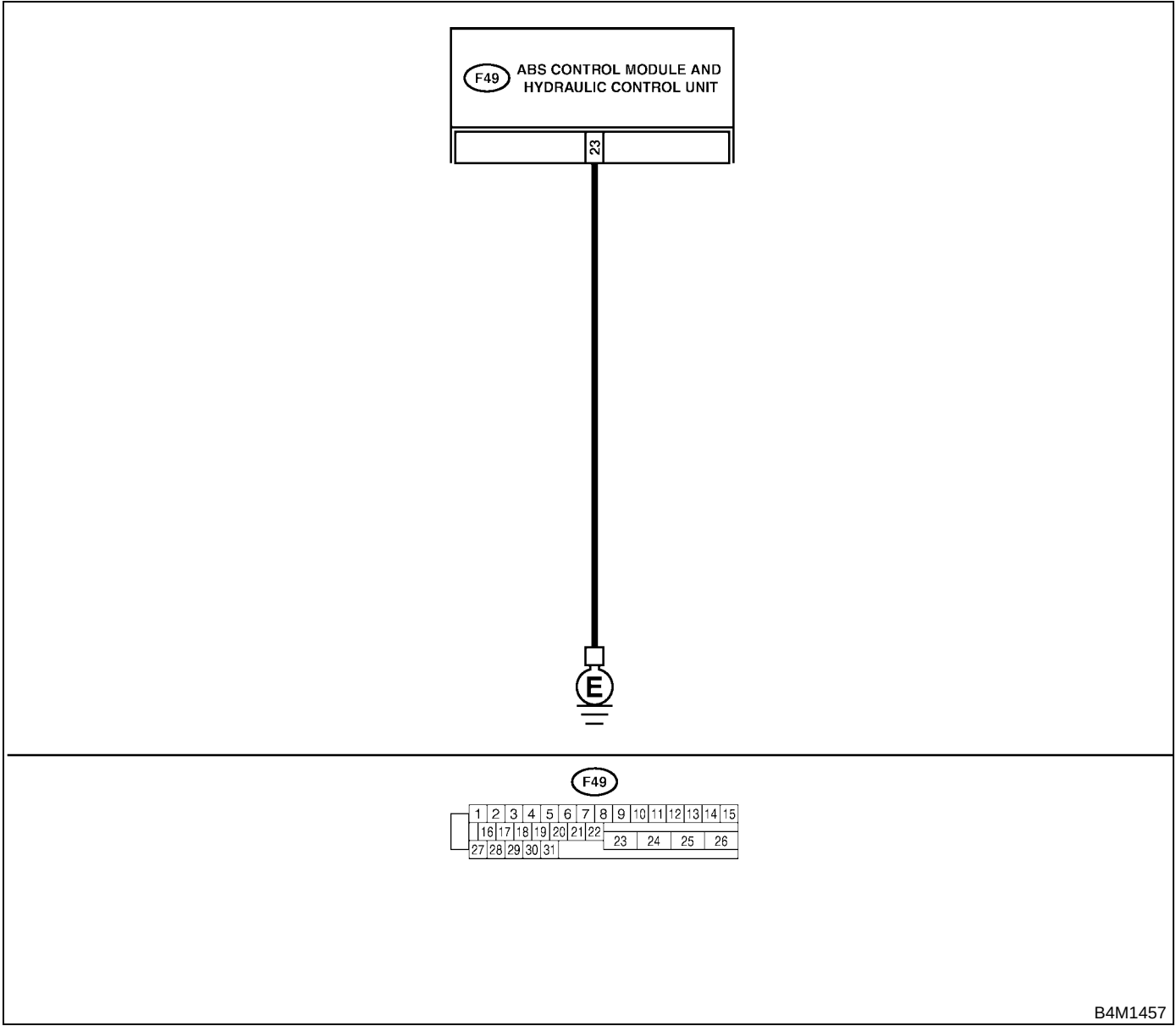
DIAGNOSIS:

- Faulty ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



B4M1457

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	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 resistance less than 0.5 Ω ?	Go to step 2.	Repair ABSCM&H/U ground harness.
2 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair connector.	Go to step 3.
3 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or the wireless transmitter properly installed?	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?	Install the noise sources apart from the sensor harness.	Go to step 5.
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 trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 6.
6 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

U: TROUBLE CODE 42

— POWER SUPPLY VOLTAGE TOO LOW —

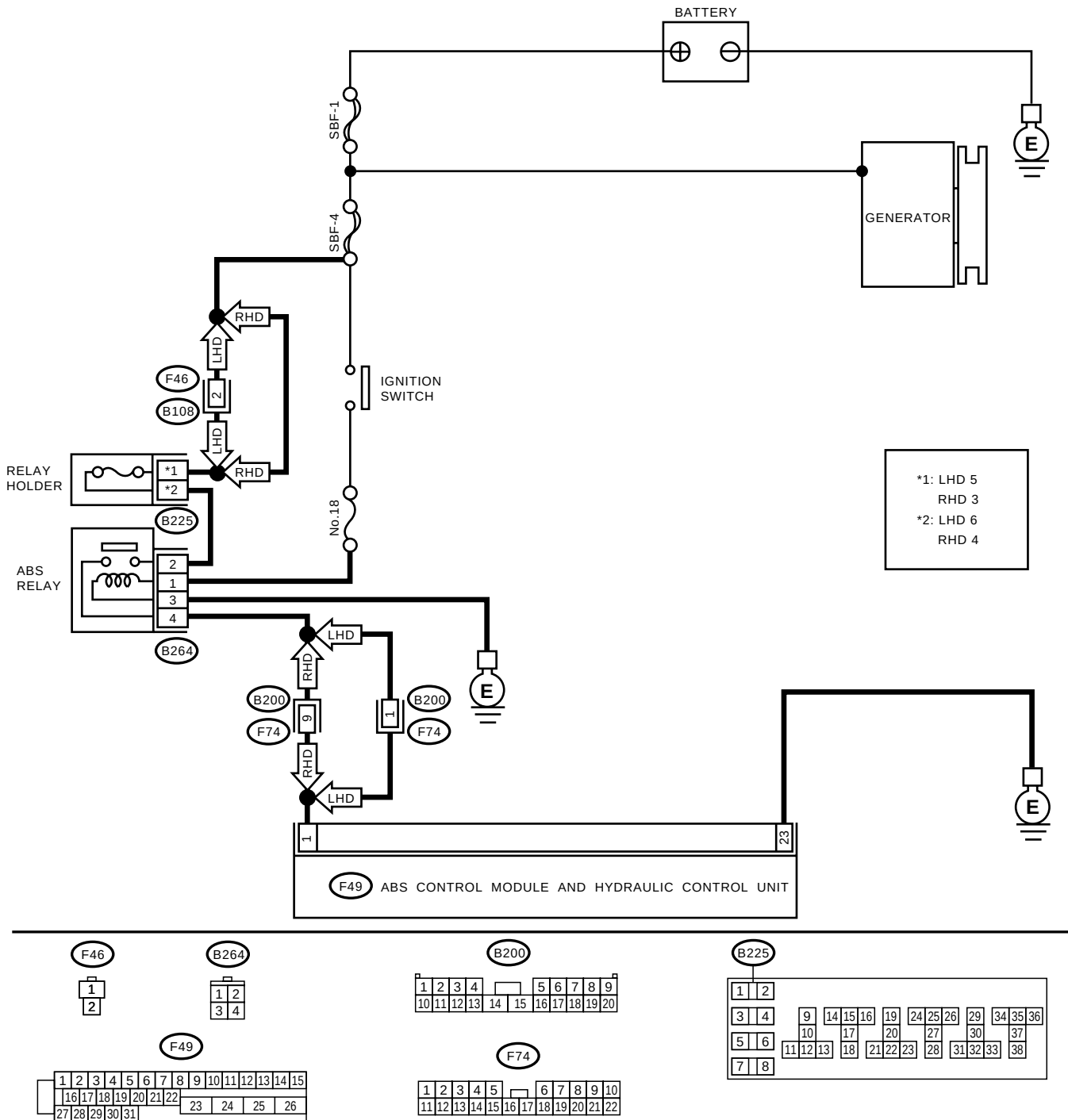
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0039

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1)Start engine. 2)Idling after warm-up. 3)Measure voltage between generator B terminal and chassis ground. <i>Terminal</i> <i>Generator B terminal — Chassis ground:</i>	Is the voltage between 10 and 15 V?	Go to step 2.	Repair generator. <Ref. to SC-12, Generator.>
2 CHECK BATTERY TERMINAL. Turn ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	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. <i>Connector & terminal</i> <i>(F49) No. 1 (+) — Chassis ground (-):</i>	Is the voltage between 10 and 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. <i>Connector & terminal</i> <i>(F49) No. 23 — Chassis ground:</i>	Is the resistance less than 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?	Repair connector.	Go to step 6.
6 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

V: TROUBLE CODE 42

— POWER SUPPLY VOLTAGE TOO HIGH —

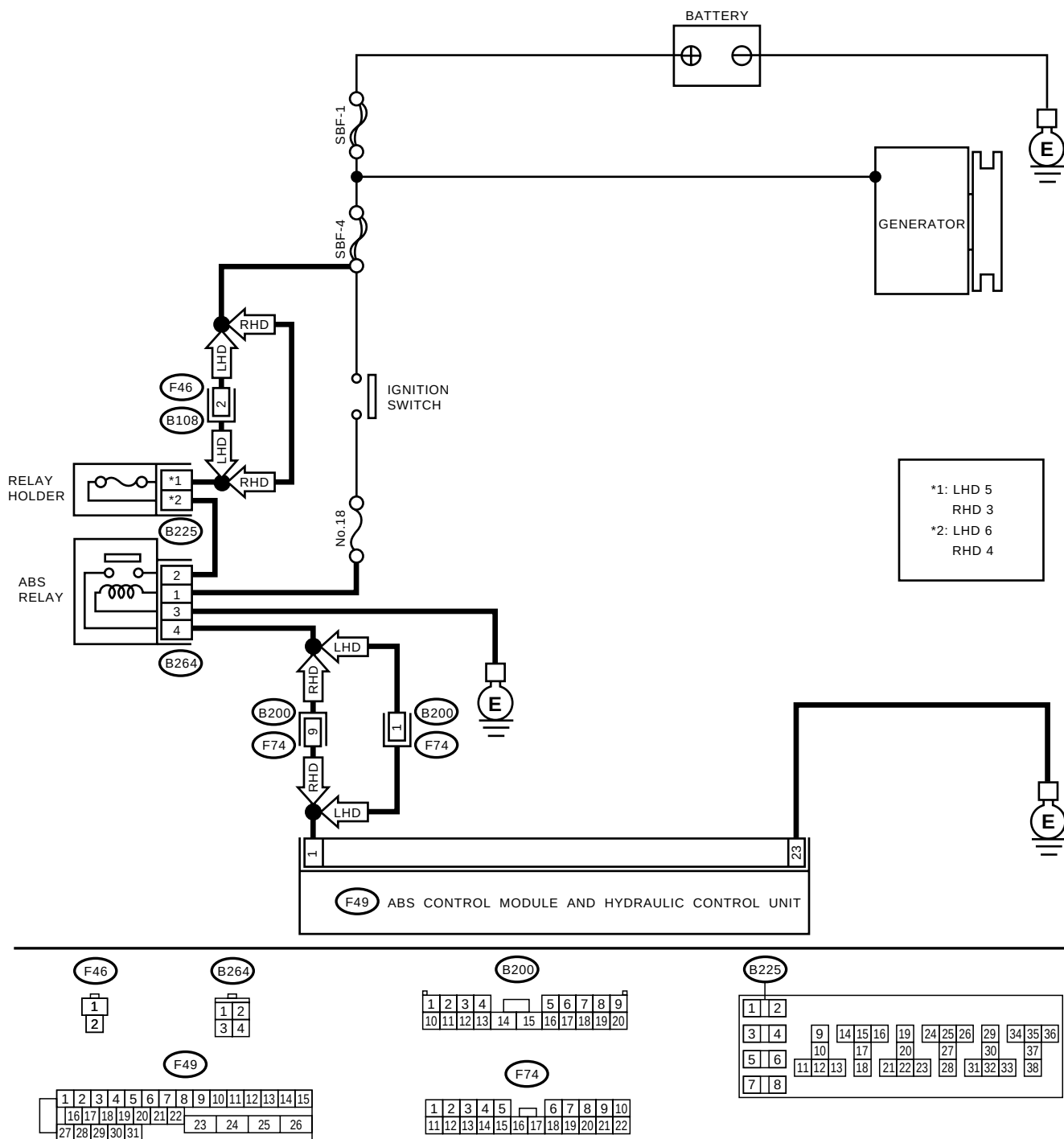
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is high.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0039

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1)Start engine. 2)Idling after warm-up. 3)Measure voltage between generator B terminal and chassis ground. <i>Terminal</i> <i>Generator B terminal — Chassis ground:</i>	Is the voltage between 10 and 17 V?	Go to step 2.	Repair generator. <Ref. to SC-12, Generator.>
2 CHECK BATTERY TERMINAL. Turn ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step 3.	Tighten the clamp of terminal.
3 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1)Turn ignition switch to OFF. 2)Remove fuse. 3)Measure voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>LHD model</i> <i>(B225) No. 5 (+) — Chassis ground (-):</i> <i>RHD model</i> <i>(B225) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between battery and Relay holder connector.
4 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 5.
5 CHECK INPUT VOLTAGE OF ABS RELAY. 1)Install fuse. 2)Remove ABS relay. 3)Turn ignition switch to ON. 4)Measure voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>(B264) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 6.	Repair open circuit in harness between battery and Relay holder connector.
6 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>(B264) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 7.	Repair harness connector between battery, ignition switch and ABS relay.
7 CHECK GROUND CIRCUIT OF ABS RELAY. 1)Turn ignition switch to OFF. 2)Measure resistance between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>(B264) No. 3 (+) — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 8.	Repair open circuit between ABS relay and chassis ground.
8 CHECK ABS RELAY. 1)Connect battery to ABS relay terminal No. 1 and 3. 2)Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 9.	Replace ABS relay.
9 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. <i>Connector & terminal</i> <i>(F49) No. 1 (+) — Chassis ground (-):</i>	Is the voltage between 10 and 17 V?	Go to step 10.	Repair harness connector between battery, ignition switch and ABSCM&H/U.
10 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1)Turn ignition switch to OFF. 2)Measure resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>(F49) No. 23 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 11.	Repair ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step 12 .
12 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13 .
13 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

W: TROUBLE CODE 44

— ABS-AT CONTROL (NON CONTROLLED) —

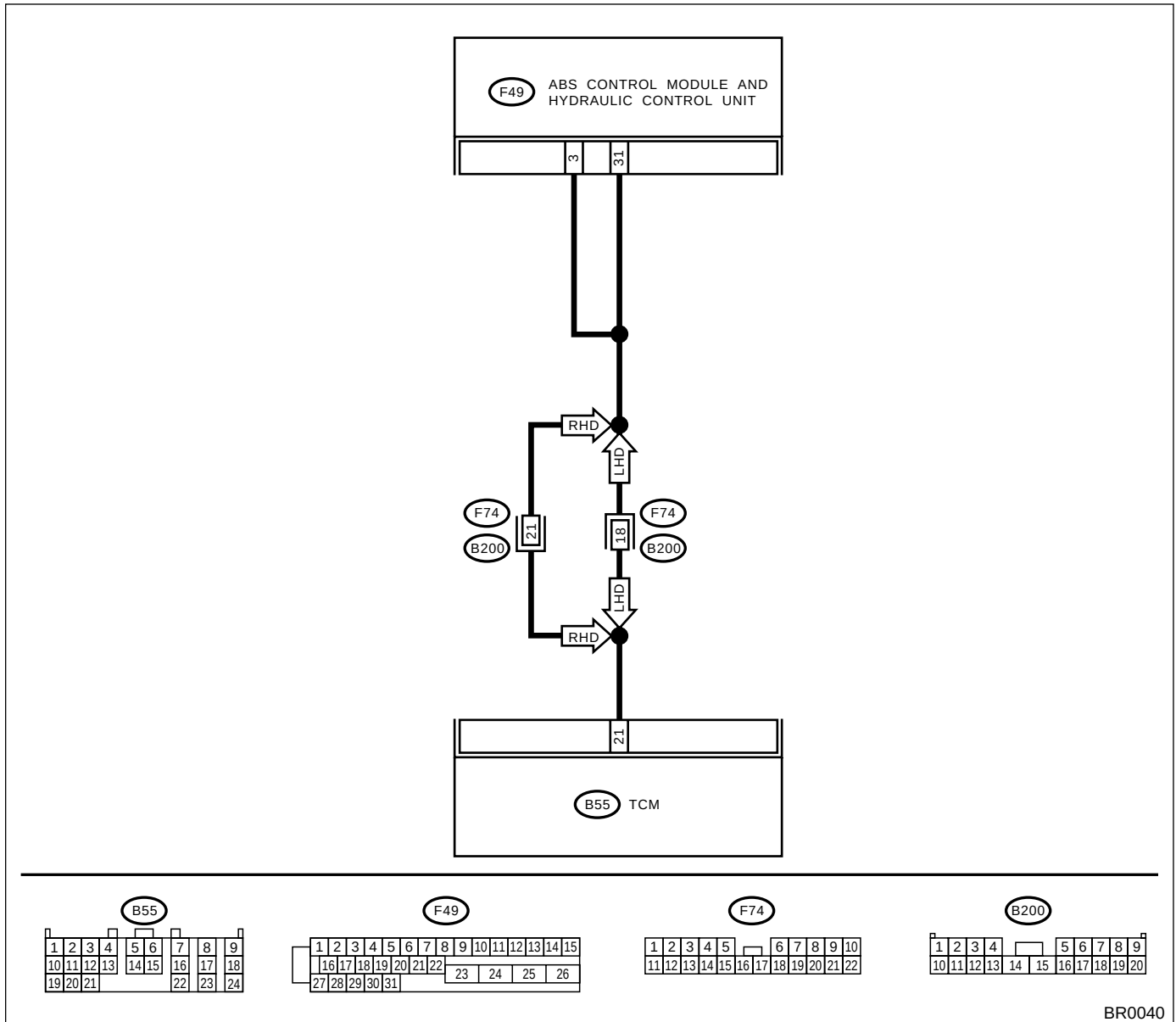
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0040

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPECIFICATIONS OF THE ABSCM&H/U. Check specifications of the mark to the ABSCM&H/U. CA: AT (FWD) CB: MT (FWD) CC: AT (AWD) CD: MT (AWD)	Is an ABSCM&H/U for AT model installed on a MT model?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 2.
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:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair harness between TCM and ABSCM&H/U.
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 (-):	Is the voltage between 10 and 15 V?	Go to step 5.	Go to step 4.
4 CHECK AT.	Is the AT functioning normally?	Replace TCM.	Repair AT.
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 (-):	Is the voltage more than 10 V?	Go to step 6.	Repair harness/connector between TCM and ABSCM&H/U.
6 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair connector.	Go to step 7.
7 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 8.
8 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

X: TROUBLE CODE 44

— ABS-AT CONTROL (CONTROLLED) —

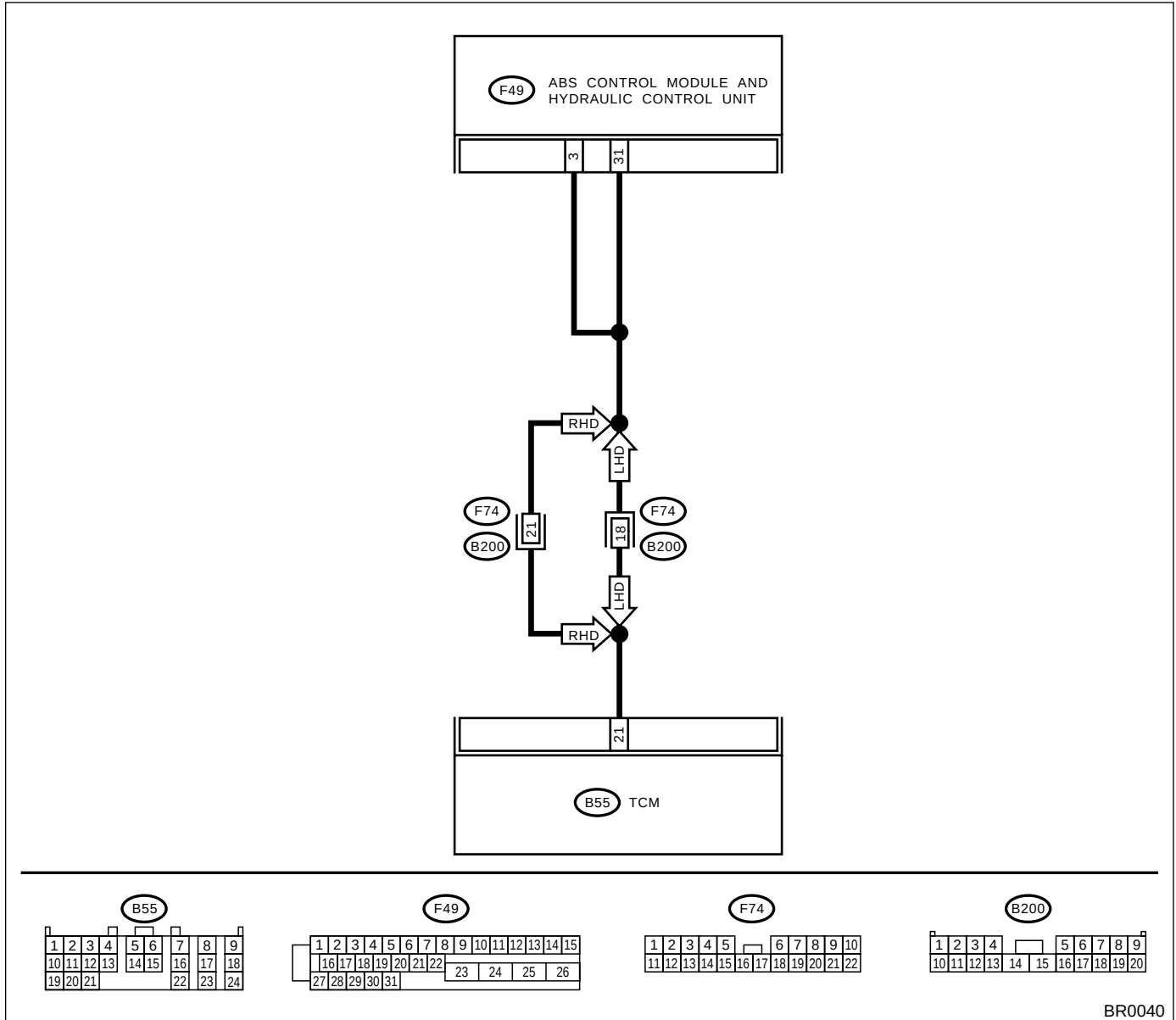
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0040

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	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 voltage less than 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 voltage less than 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 voltage between 10 and 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?	Repair connector.	Go to step 5.
5 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 6.
6 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Y: TROUBLE CODE 51

— VALVE RELAY MALFUNCTION —

DIAGNOSIS:

- Faulty valve relay

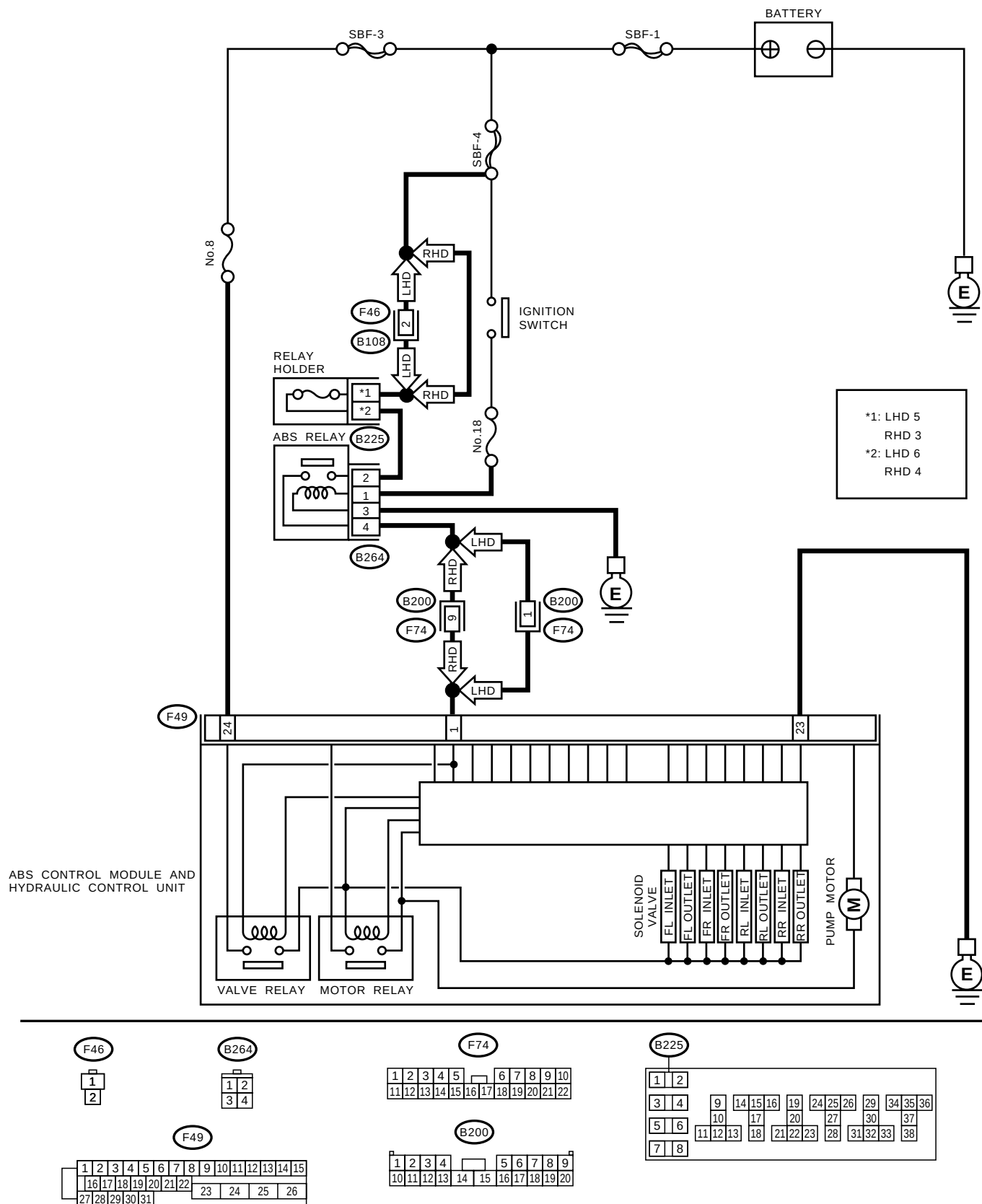
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0041

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn ignition switch to OFF. 2) Remove fuse. 3) Measure voltage between ABS relay connector and chassis ground. Connector & terminal LHD model (B225) No. 5 (+) — Chassis ground (-): RHD model (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair open circuit in harness between battery and Relay holder connector.
2 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace fuse.	Go to step 3.
3 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install fuse. 2) Remove ABS relay. 3) Turn ignition switch to ON. 4) Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between battery and Relay holder connector.
4 CHECK INPUT VOLTAGE OF ABS RELAY. Measure voltage between ABS relay connector and chassis ground. Connector & terminal (B264) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair harness connector between battery, ignition switch and ABS relay.
5 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn ignition switch to OFF. 2) Measure resistance between ABS relay connector and chassis ground. Connector & terminal (B264) No. 3 (+) — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair open circuit between ABS relay and chassis ground.
6 CHECK ABS RELAY. 1) Connect battery to ABS relay terminal No. 1 and 3. 2) Measure resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace ABS relay.
7 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 voltage between 10 and 15 V?	Go to step 8.	Repair harness connector between battery and ABSCM&H/U.
8 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 resistance less than 0.5 Ω ?	Go to step 9.	Repair ABSCM&H/U ground harness.
9 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step 10.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
10	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 11 .
11	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

Z: TROUBLE CODE 51 **— VALVE RELAY ON FAILURE —**

DIAGNOSIS:

- Faulty valve relay

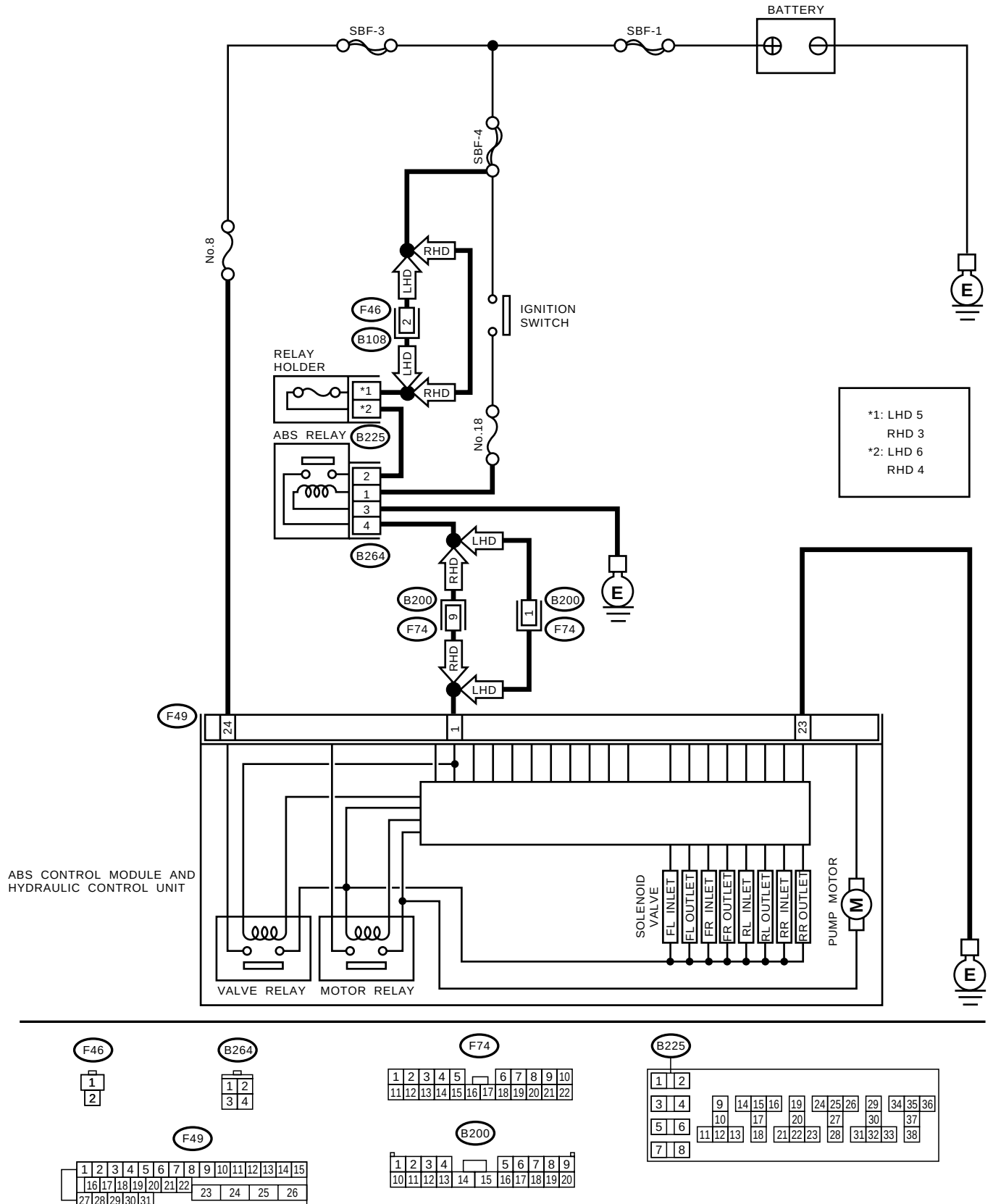
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0041

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK VALVE RELAY IN ABSCM&H/U. Measure resistance between ABSCM&H/U terminals. Terminals No. 23 (+) — No. 24 (-):	Is the resistance more than 1 MΩ?	Go to step 2.	Replace ABSCM&H/U. <Ref. to ABS-7, 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?	Repair connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AA:TROUBLE CODE 52

— OPEN CIRCUIT IN MOTOR RELAY CIRCUIT —

DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

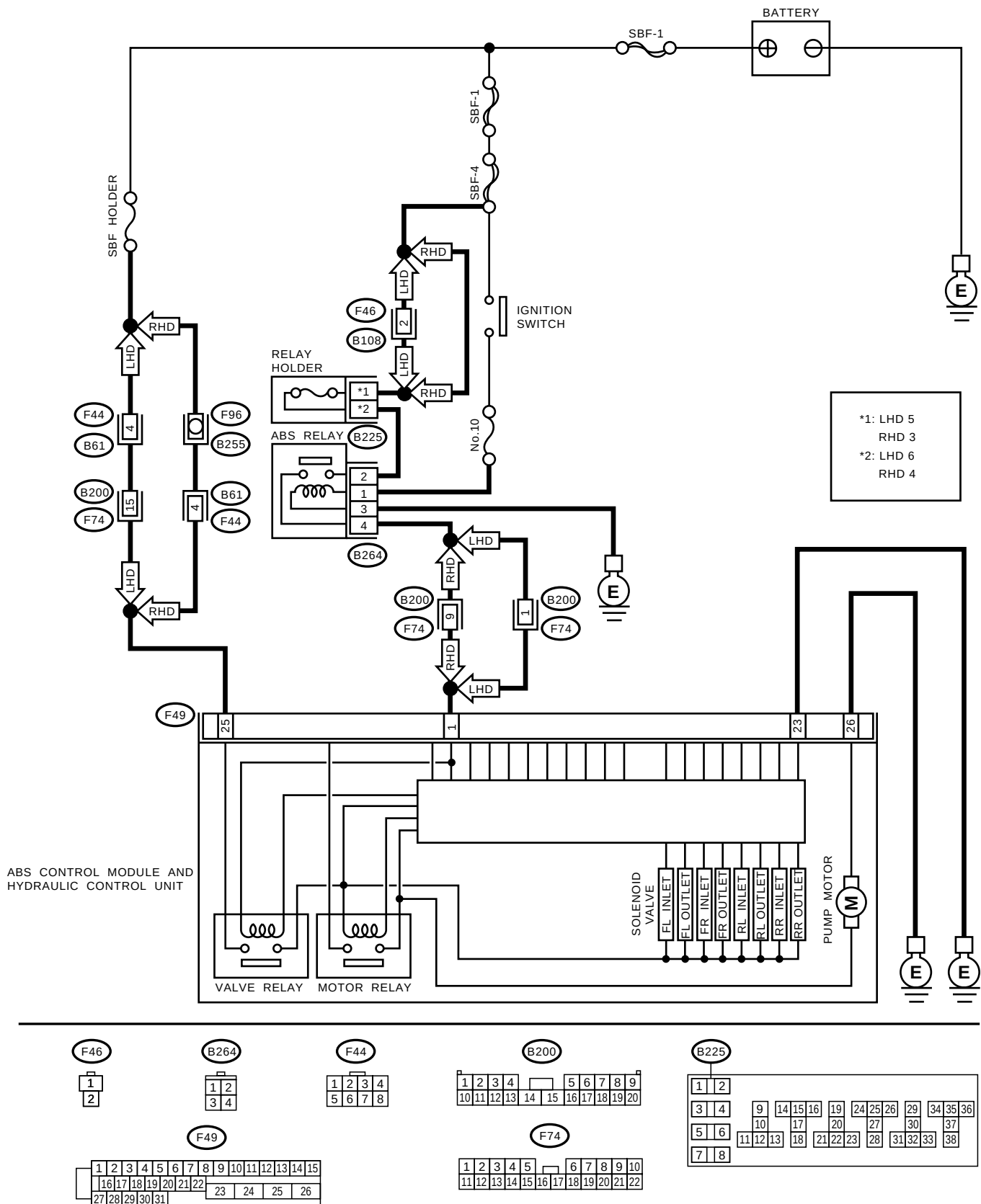
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0042

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	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 voltage between 10 and 13 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 resistance less than 0.5 Ω ?	Go to step 3.	Repair ABSCM&H/U ground harness.
3 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-11, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control.	Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Go to step 4.	Replace ABSCM&H/U. <Ref. to ABS-7, 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 hydraulic unit, relay box and ABSCM&H/U?	Repair connector.	Go to step 5.
5 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 6.
6 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AB:TROUBLE CODE 52

— MOTOR RELAY ON FAILURE —

DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

ABS (DIAGNOSTICS)

The diagram illustrates the electrical system for the ABS, including the battery, ignition switch, relay holder, ABS relay, solenoid valve, pump motor, and various fuses and connectors. The system is divided into LHD (Left Hand Drive) and RHD (Right Hand Drive) sections.

Legend:

- *1: LHD 5, RHD 3
- *2: LHD 6, RHD 4

Components and Connections:

- BATTERY:** Connected to the system via SB-F-1.
- IGNITION SWITCH:** Connected to the system via SB-F-1 and SB-F-4.
- RELAY HOLDER:** Contains the ABS RELAY and a No.10 relay.
- ABS RELAY:** Labeled B225, it controls the solenoid valve and pump motor.
- SOLENOID VALVE:** Labeled B264, it controls the flow of brake fluid.
- PUMP MOTOR:** Labeled B200, it maintains system pressure.
- VALVE RELAY:** Controls the solenoid valve.
- MOTOR RELAY:** Controls the pump motor.
- Fuses:** F46, B108, F96, B255, B61, B200, F74, F49, B264, B200, F74, B225.
- Connectors:** 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.

ABS-160

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK MOTOR RELAY IN ABSCM&H/U. Measure resistance between ABSCM&H/U terminals. Terminals No. 25 — No. 26:	Is the resistance more than 1 MΩ?	Go to step 2.	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-11, 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?	Go to step 3.	Replace ABSCM&H/U. <Ref. to ABS-7, 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 hydraulic unit, relay box and ABSCM&H/U?	Repair connector.	Go to step 4.
4 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 5.
5 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AC:TROUBLE CODE 52 **— MOTOR MALFUNCTION —**

DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

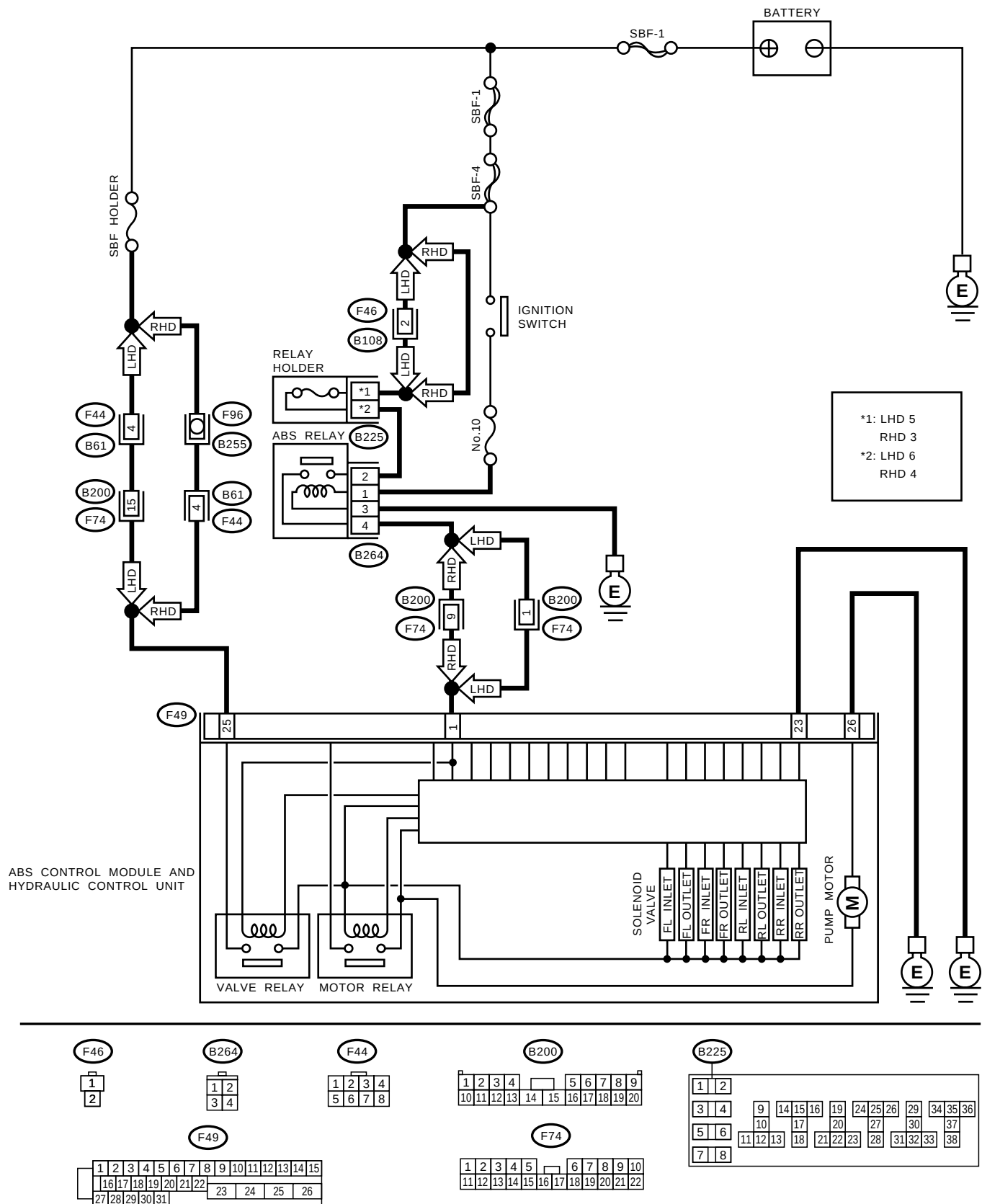
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0042

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	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 voltage between 10 and 13 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 resistance less than 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 voltage between 10 and 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 resistance less than 0.5 Ω ?	Go to step 5.	Repair ABSCM&H/U ground harness.
5 CHECK MOTOR OPERATION. Operate the sequence control. <Ref. to ABS-11, 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?	Go to step 6.	Replace ABSCM&H/U. <Ref. to ABS-7, 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?	Repair connector.	Go to step 7.
7 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 8.
8 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AD:TROUBLE CODE 54

— STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION —

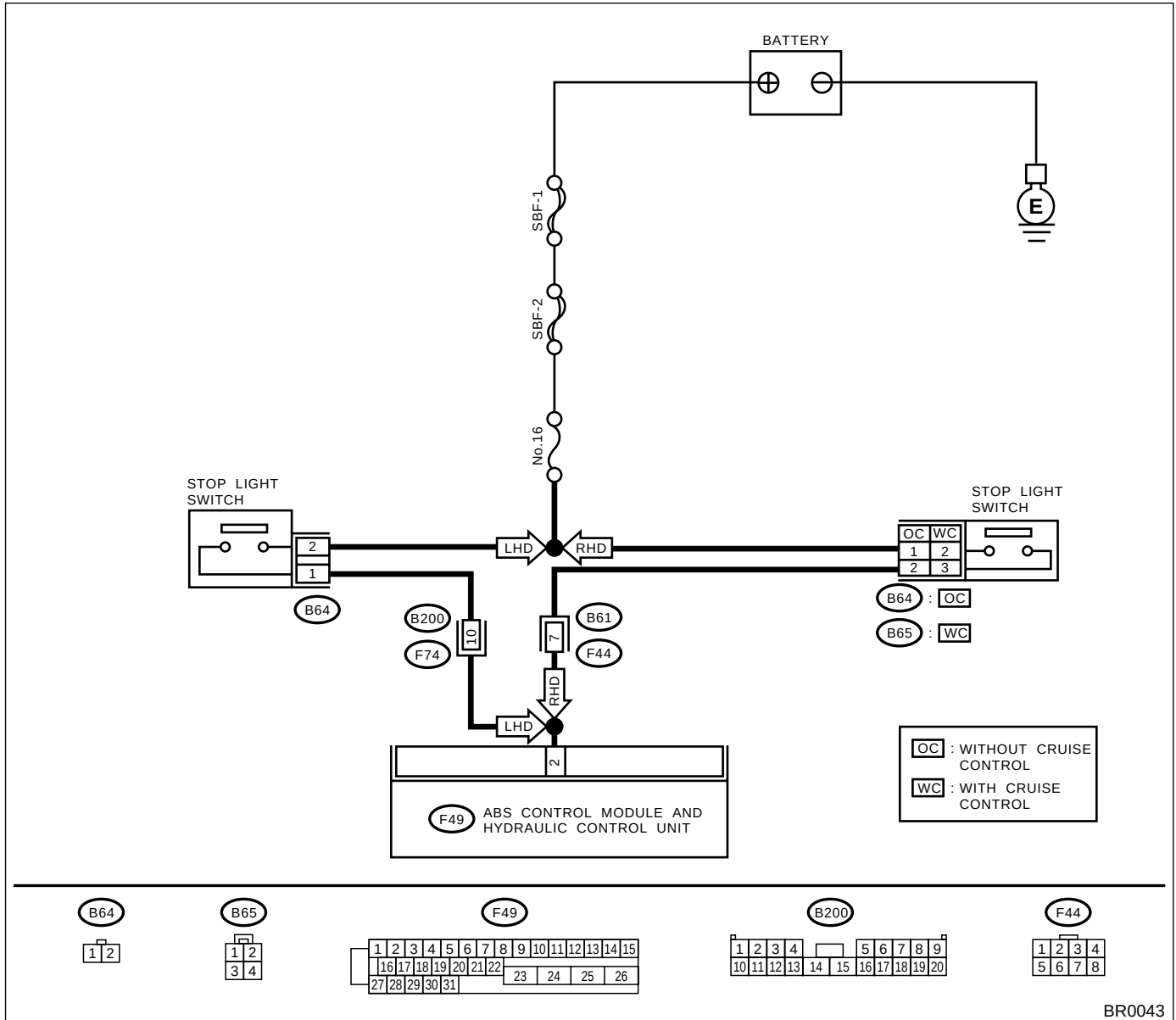
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0043

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	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 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 between 10 and 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?	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 voltage between 10 and 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?	Repair connector.	Go to step 6.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AE:TROUBLE CODE 56

— OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT —

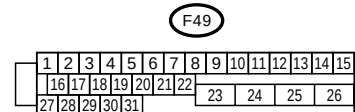
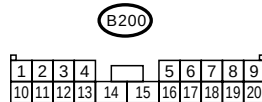
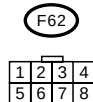
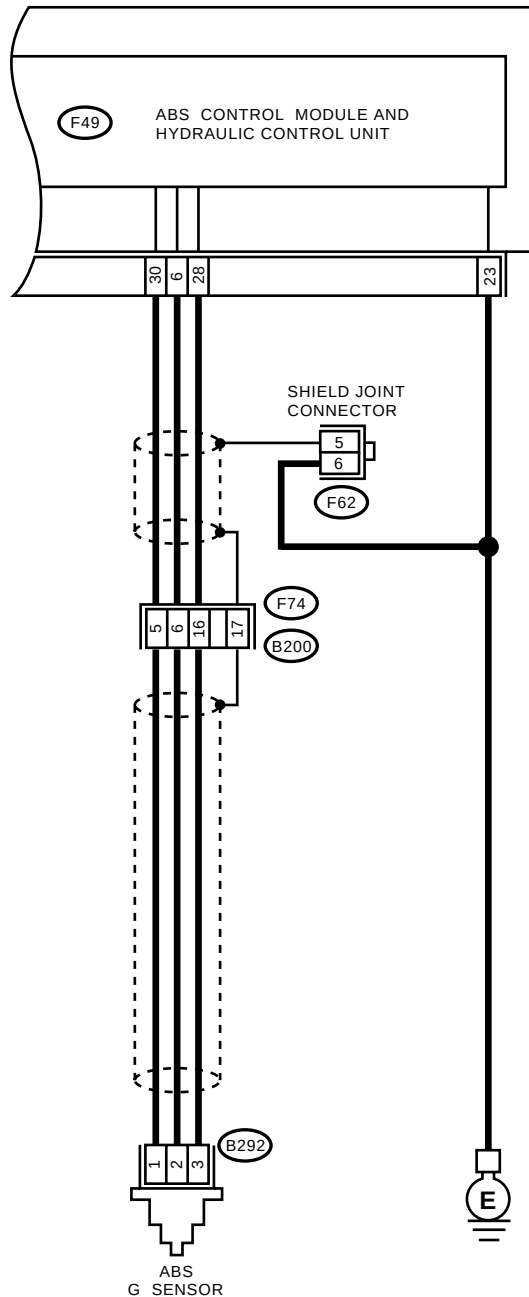
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

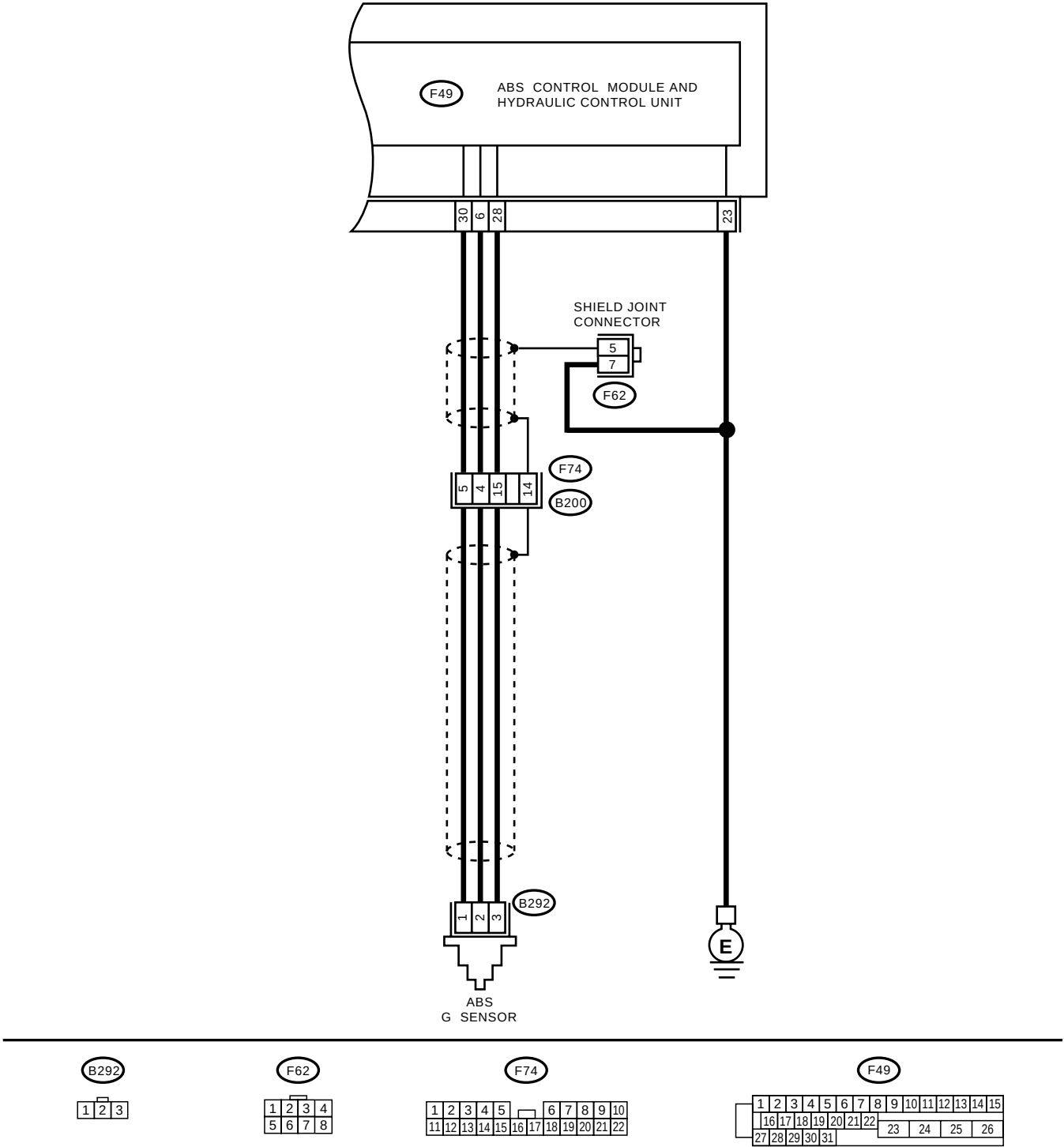


BR0044

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

	Step	Check	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 2.1 and 2.5 V when the G sensor is in horizontal position?	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?	Repair connector.	Go to step 3.
3	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.
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 (B292) No. 1 (+) — No. 3 (-):	Is the voltage between 4.75 and 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 resistance between 4.3 and 4.9 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:	Is the resistance more than 1 MΩ?	Go to step 8.	Repair harness between G sensor and ABSCM&H/U.
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 (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?	Go to step 9.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
9	CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step 10.	Replace G sensor. <Ref. to ABS-22, G Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step 11 .	Replace G sensor. <Ref. to ABS-22, 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?	Repair connector.	Go to step 12 .
12 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13 .
13 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AF:TROUBLE CODE 56

— BATTERY SHORT IN G SENSOR CIRCUIT —

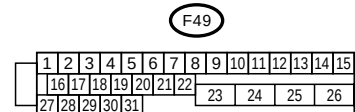
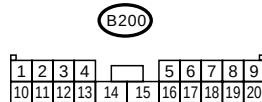
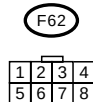
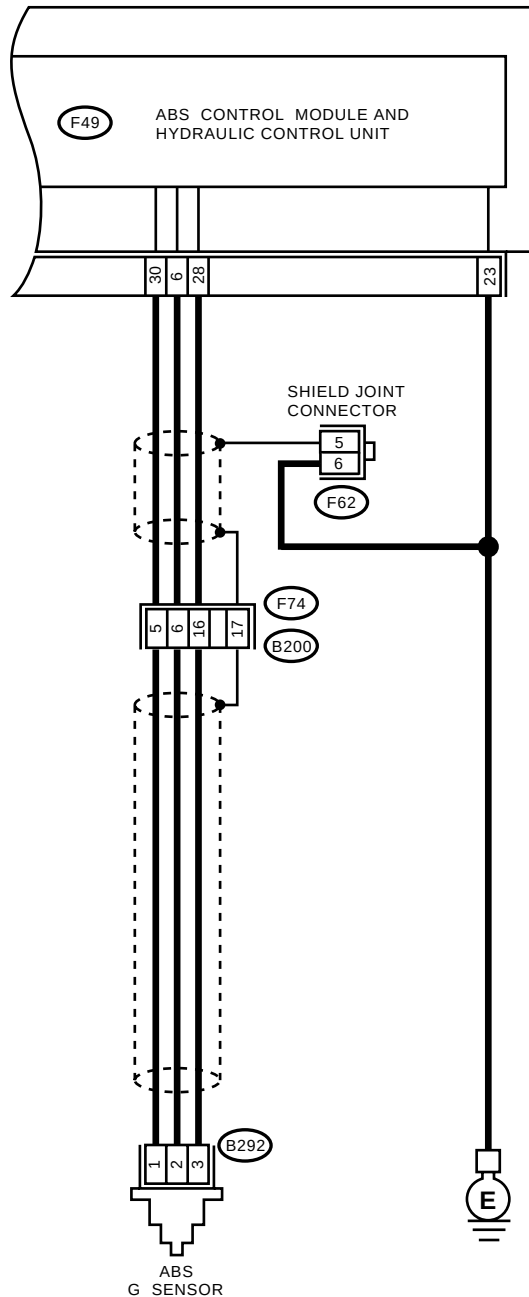
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

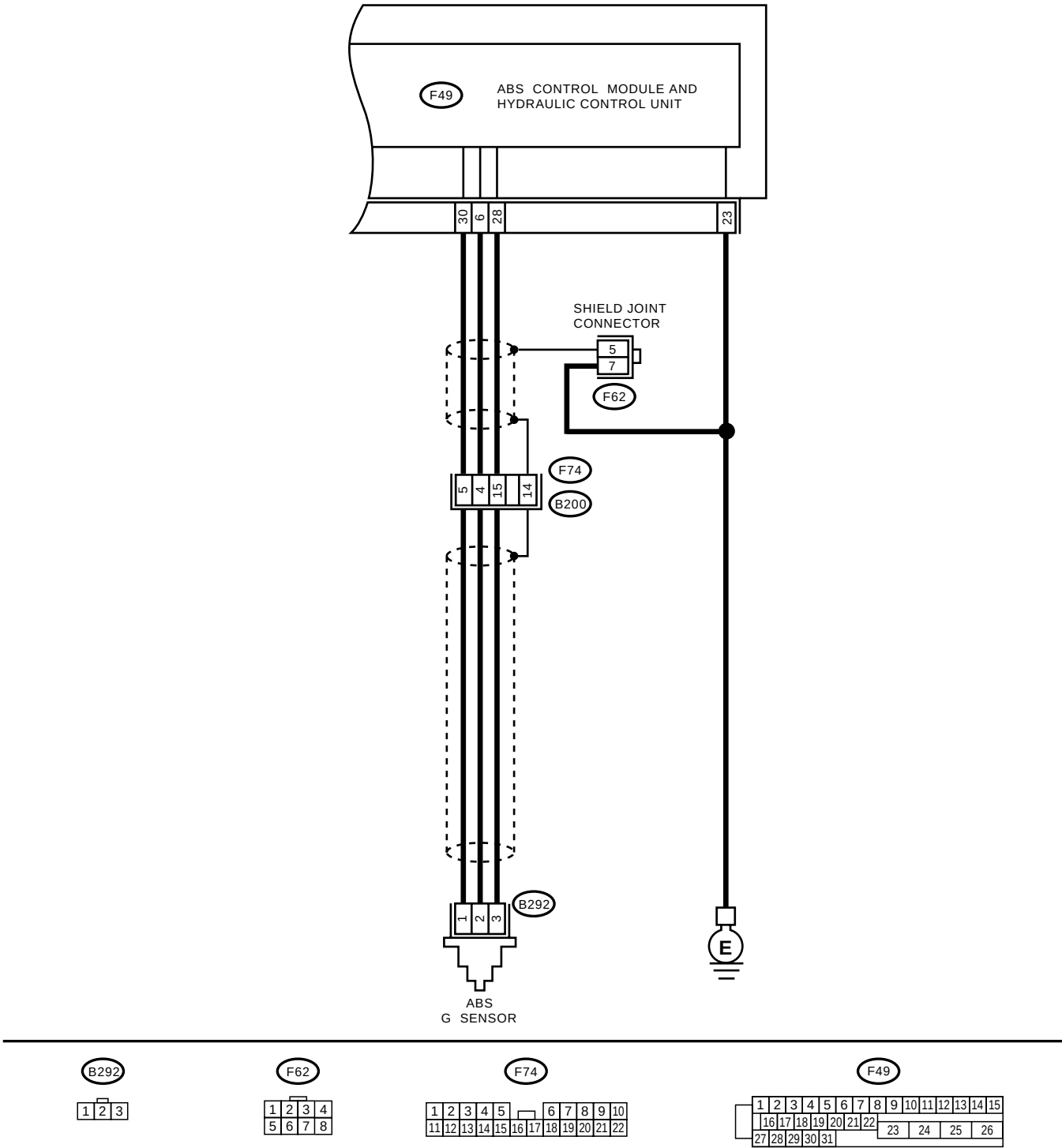


BR0044

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	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 2.1 and 2.5 V when the G sensor is in horizontal position?	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?	Repair connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.
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 0 km?	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 0 km?	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 0 km?	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 0 km?	Go to step 9.	Go to step 16.
9 CHECK FREEZE FRAME DATA. Read G sensor output on the select monitor display.	Is the G sensor output on monitor display more than 3.65 V?	Go to step 10.	Go to step 16.
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 resistance between 4.3 and 4.9 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 voltage less than 1 V?	Go to step 12.	Repair harness between G sensor and ABSCM&H/U.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
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 voltage less than 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?	Repair connector.	Go to step 14.
14 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 15.
15 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.
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 (B292) No. 1 (+) — No. 3 (-):	Is the voltage between 4.75 and 5.25 V?	Go to step 17.	Repair harness/connector between G sensor and ABSCM&H/U.
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 resistance between 4.3 and 4.9 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 (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?	Go to step 19.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
19 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step 20.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
20 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step 21.	Replace G sensor. <Ref. to ABS-22, 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?	Repair connector.	Go to step 22.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step		Check	Yes	No
22	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 23 .
23	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AG:TROUBLE CODE 56

— ABNORMAL G SENSOR HIGH μ OUTPUT —

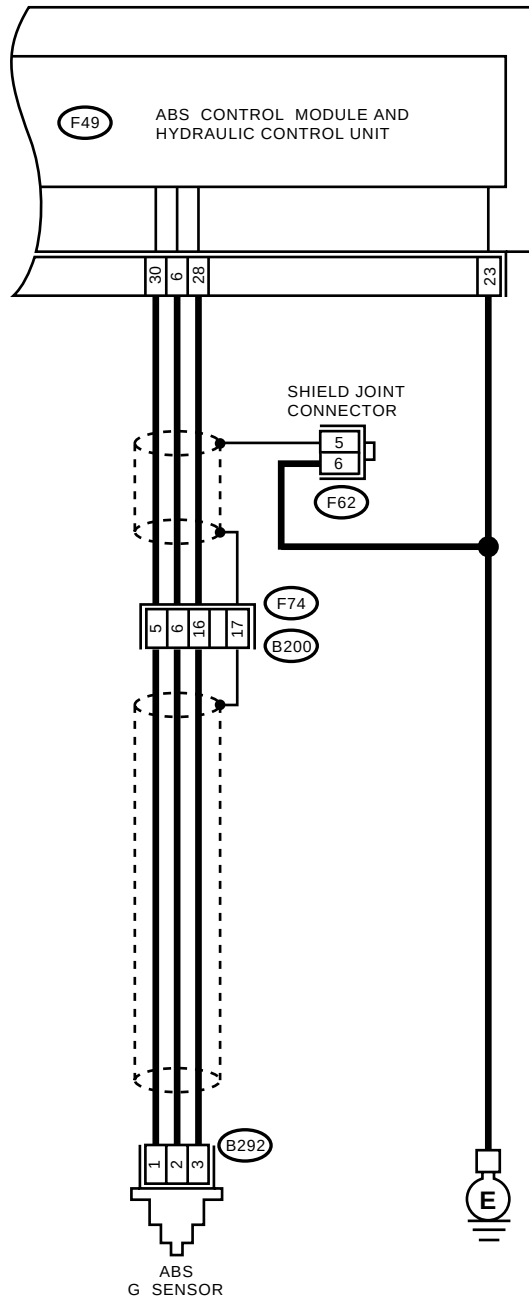
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL



B292		
1	2	3

F62			
1	2	3	4
5	6	7	8

B200																			
1	2	3	4			5	6	7	8	9									
10	11	12	13	14	15	16	17	18	19	20									

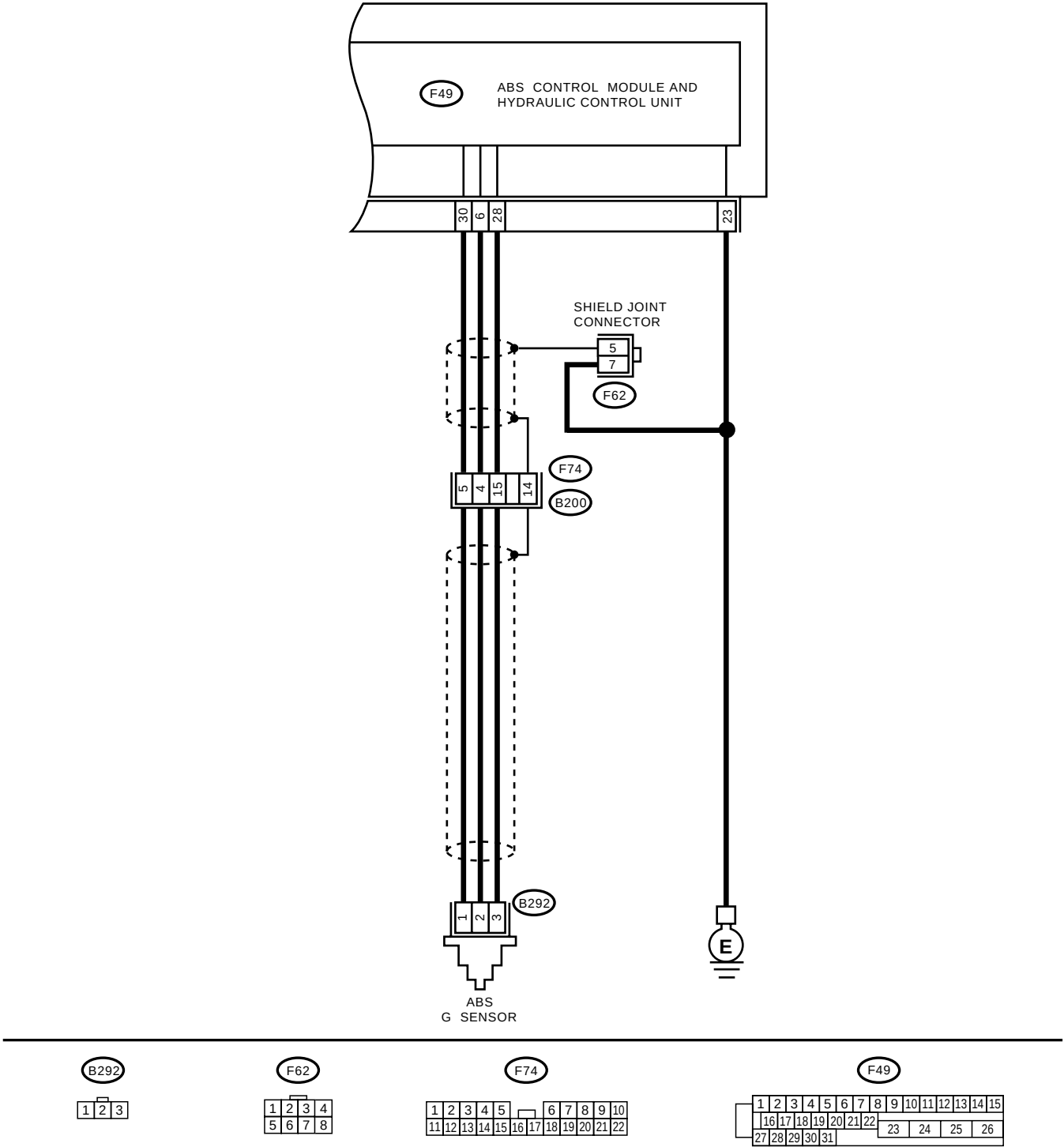
F49														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22								
23	24	25	26											
27	28	29	30	31										

BR0044

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	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 2.3 ± 0.2 V when the G sensor is in horizontal position?	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?	Repair connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 4.
4 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.
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 resistance between 4.3 and 4.9 k Ω ?	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:	Is the resistance more than 1 M Ω ?	Go to step 7.	Repair harness between G sensor and ABSCM&H/U. Replace ABSCM&H/U. <Ref. to ABS-7, 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 (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?	Go to step 8.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
8 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step 9.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
9 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step 10.	Replace G sensor. <Ref. to ABS-22, G Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
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 trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 11 .
11 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AH:TROUBLE CODE 56

— DETECTION OF G SENSOR STICK —

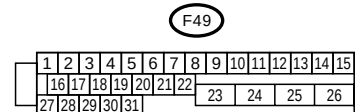
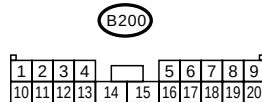
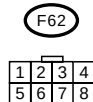
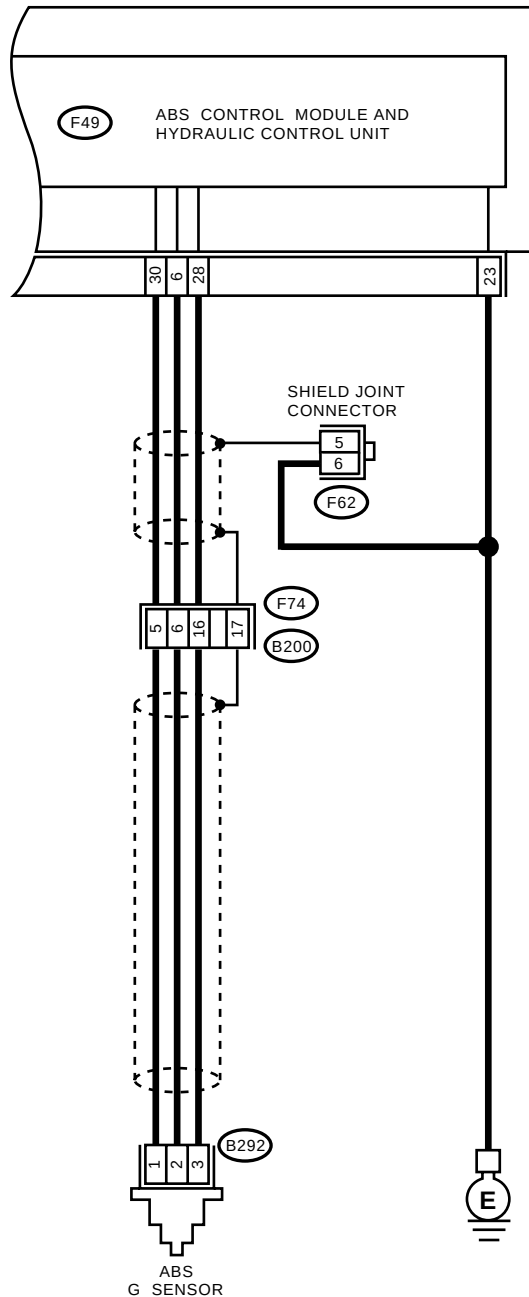
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

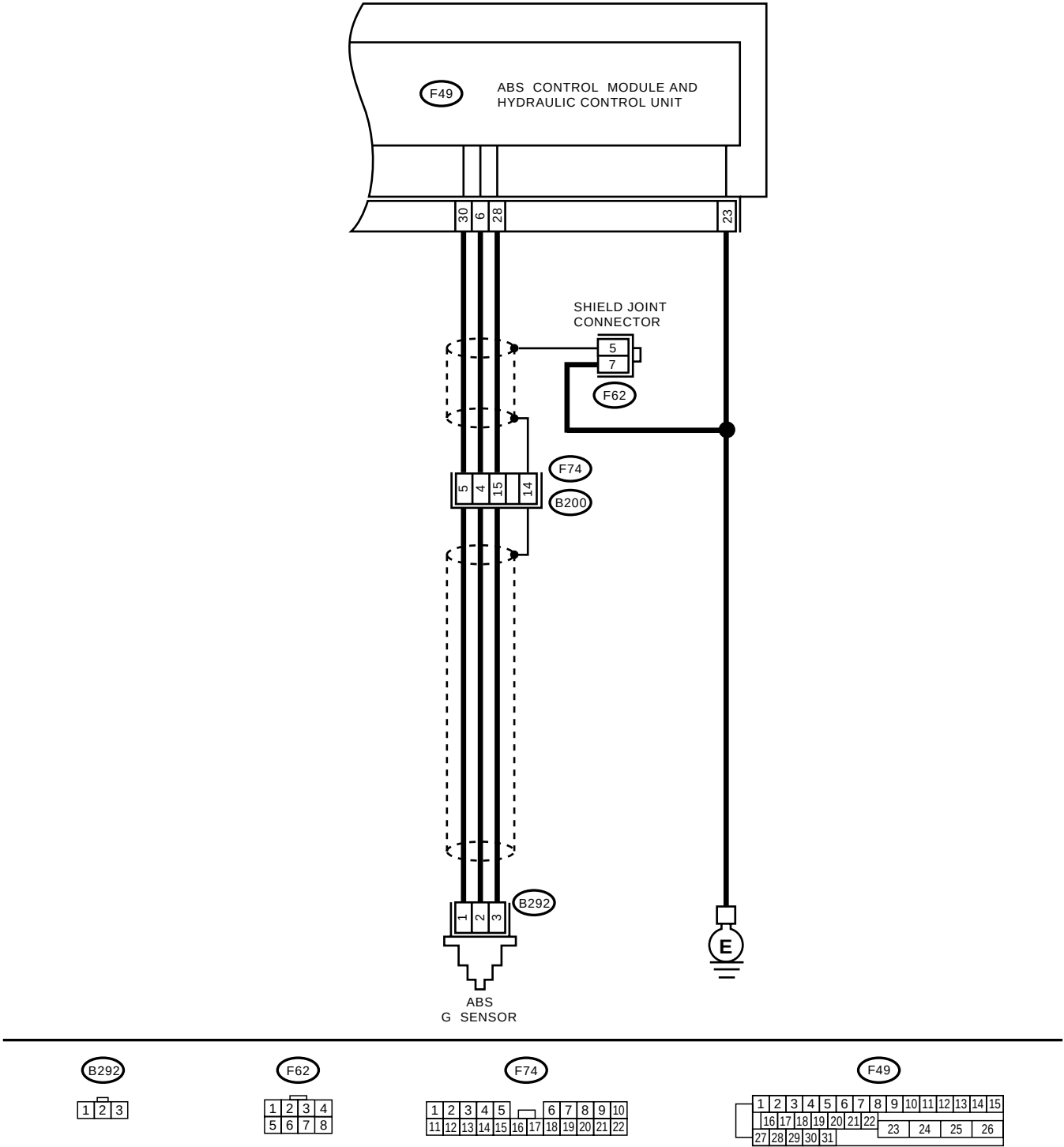


BR0044

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ALL FOUR WHEELS FOR FREE TURNING.	Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the trouble code.	Go to step 2.
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 between 2.1 and 2.5 V when the vehicle is in horizontal position?	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 between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step 4.	Replace G sensor. <Ref. to ABS-22, 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 between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step 5.	Replace G sensor. <Ref. to ABS-22, 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?	Repair connector.	Go to step 6.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform inspection mode. 4)Read out the trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.
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 resistance between 4.3 and 4.9 kΩ?	Go to step 9.	Repair harness/connector between G sensor and ABSCM&H/U.
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 (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?	Go to step 10.	Replace G sensor. <Ref. to ABS-22, G Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step 11 .	Replace G sensor. <Ref. to ABS-22, G Sensor.>
11 CHECK G SENSOR. Measure voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step 12 .	Replace G sensor. <Ref. to ABS-22, 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 trouble code.	Is the same trouble code as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13 .
13 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other trouble codes being output?	Proceed with the diagnosis corresponding to the trouble code.	A temporary poor contact.

GENERAL DIAGNOSTICS TABLE

ABS (DIAGNOSTICS)

14. General Diagnostics Table

A: INSPECTION

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either side.	• 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.	• 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	• 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.	• ABSCM&H/U (solenoid valve, motor) • ABS sensor • Incorrect wiring or piping connections
	Brake dragging	• ABSCM&H/U (solenoid valve) • ABS sensor • Master cylinder • Brake (caliper & piston) • Parking brake • Axle & wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle pitching	• Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	• 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)

GENERAL DIAGNOSTICS TABLE

ABS (DIAGNOSTICS)

Symptom		Probable faulty units/parts
Vibration and/or noise (while driving on slippery roads)	Excessive pedal vibration	• Incorrect wiring or piping connections • Road surface (uneven)
	Noise from ABSCM&H/U	• ABSCM&H/U (mount bushing) • ABS sensor • Brake piping
	Noise from front of vehicle	• 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	• ABS sensor • Brake (caliper & piston, pads, rotor) • Parking brake • Brake piping • Suspension play or fatigue

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

BRAKE

BR

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GENERAL DESCRIPTION

BRAKE

1. General Description

A: SPECIFICATIONS

Front disc brake	Size	14 inch type	15 inch type	16 inch type
	Type	Disc (Floating type, ventilated)		
	Effective disc diameter	210 mm (8.27 in)	228 mm (8.98 in)	255 mm (10.04 in)
	Disc thickness × Outer diameter	24 × 260 mm (0.94 × 10.24 in)	24 × 277 mm (0.94 × 10.91 in)	24 × 294 mm (0.94 × 11.57 in)
	Effective cylinder diameter	57.2 mm (2.252 in)	42.8 mm (1.685 in) × 2	40.4 mm (1.591 in) × 4
	Pad dimensions (length × width × thickness)	112.4 × 44.3 × 11.0 mm (4.425 × 1.744 × 0.433 in)	112.3 × 50.0 × 11.0 mm (4.421 × 1.969 × 0.433 in)	116.0 × 48.3 × 10.0 mm (4.567 × 1.902 × 0.344 in)
	Clearance adjustment	Automatic adjustment		
Rear disc brake	Type	—	Disc (Floating type)	
	Effective disc diameter	—	230 mm (9.06 in)	261 mm (10.28 in)
	Disc thickness × Outer diameter	—	10 × 266 mm (0.39 × 10.47 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)	71.8 × 35.0 × 11.5 mm (2.827 × 1.378 × 0.453 in)
	Clearance adjustment	—	Automatic adjustment	
Rear drum brake	Type	Drum (Leading-Trailing type)	—	—
	Effective drum diameter	228.6 mm (9 in)	—	—
	Effective cylinder diameter	17.5 mm (0.689 in)	—	—
	Lining dimensions (length × width × thickness)	218.8 × 35.0 × 4.1 mm (8.61 × 1.378 × 0.161 in)	—	—
	Clearance adjustment	Automatic adjustment	—	—
Master cylinder	Type	Tandem		
	Effective diameter	23.81 mm (0.9374 in) [25.4 mm (1 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	230 mm (9.06 in) [180 + 205 mm (7.09 + 8.07 in)]	205 + 230 mm (8.07 + 9.06 in)	
Proportioning valve	Split point	1,961 kPa (20 kg/cm ² , 285 psi)		
	Reducing ratio	0.3		
Brake line		Dual circuit system		
Brake fluid CAUTION: • 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.		FMVSS No. 116, DOT3 or DOT4		

[] : ABS equipped vehicle.

NOTE:

Refer to “PB section” for parking brake SPECIFICATIONS. <Ref. to PB-2, SPECIFICATIONS, General Description.>

GENERAL DESCRIPTION

BRAKE

ITEM			STANDARD	SERVICE LIMIT
Front brake	Pad thickness (including back metal)	14", 15"	17 mm (0.571 in)	7.5 mm (0.295 in)
		16"	14.5 mm (0.67 in)	6.0 mm (0.236 in)
	Disc thickness		24 mm (0.94 in)	22 mm (0.87 in)
	Disc runout		—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness (including back metal)	14"	14 mm (0.55 in)	6.5 mm (0.256 in)
		15"	16 mm (0.63 in)	6.0 mm (0.236 in)
	Disc thickness	14"	10 mm (0.39 in)	8.5 mm (0.335 in)
		15"	18 mm (0.71 in)	10.0 mm (0.63 in)
	Disc runout		—	0.07 mm (0.0028 in)
Rear brake (Drum type)	Inside diameter		228.6 mm (9 in)	230.6 mm (9.08 in)
	Lining thickness		4.1 mm (0.161 in)	1.5 mm (0.059 in)
Rear brake (Disc type parking)	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)
Parking brake	Lever stroke		7 to 8 notches/196 N (20 kgf, 44 lb)	

		Brake pedal force	Fluid pressure			
			14 inch type		15 inch type	16 inch type
			Without ABS	With ABS		
Brake booster	Brake fluid pressure without engine running	147 N (15 kgf, 33 lb)	686 kPa (7 kg/cm ² , 100 psi)	686 kPa (7 kg/cm ² , 100 psi)	588 kPa (6 kg/cm ² , 85 psi)	
		294 N (30 kgf, 66 lb)	1,961 kPa (20 kg/cm ² , 284 psi)	1,961 kPa (20 kg/cm ² , 284 psi)	1,471 kPa (15 kg/cm ² , 213 psi)	
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lb)	5,982 kPa (61 kg/cm ² , 868 psi)	5,982 kPa (61 kg/cm ² , 868 psi)	5,296 kPa (54 kg/cm ² , 768 psi)	4,707 kPa (48 kg/cm ² , 683 psi)
		294 N (30 kgf, 66 lb)	7,649 kPa (78 kg/cm ² , 1,109 psi)	8,434 kPa (86 kg/cm ² , 1,223 psi)	9,120 kPa (93 kg/cm ² , 1,323 psi)	

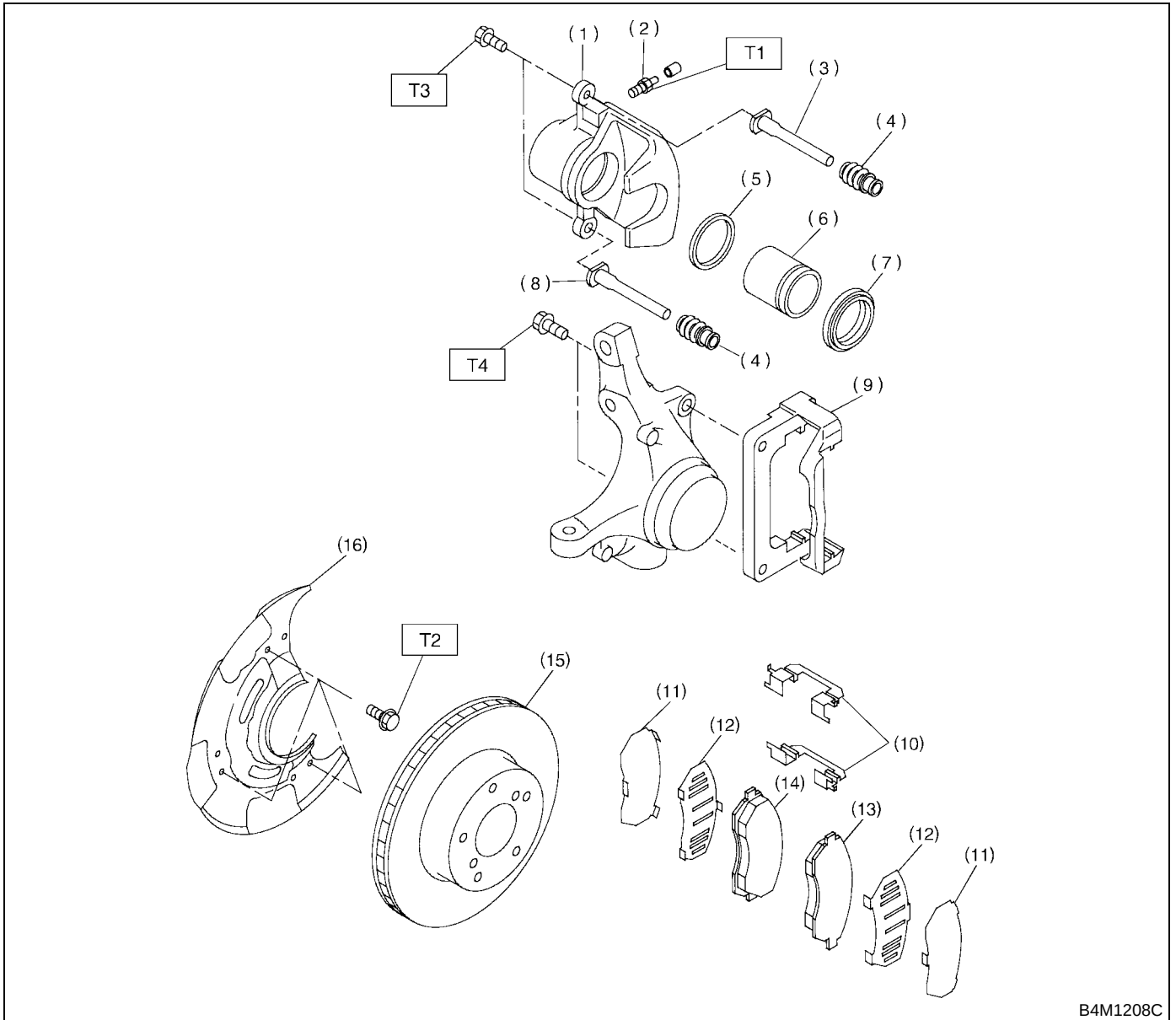
Brake pedal	Free play	1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]
-------------	-----------	--

GENERAL DESCRIPTION

BRAKE

B: COMPONENT

1. 14 INCH TYPE



- | | |
|-----------------------|--------------------|
| (1) Caliper body | (9) Support |
| (2) Air bleeder screw | (10) Pad clip |
| (3) Guide pin (Green) | (11) Outer shim |
| (4) Pin boot | (12) Inner shim |
| (5) Piston seal | (13) Pad (Outside) |
| (6) Piston | (14) Pad (Inside) |
| (7) Piston boot | (15) Disc rotor |
| (8) Lock pin (Yellow) | (16) Disc cover |

Tightening torque: N·m (kgf-m, ft-lb)

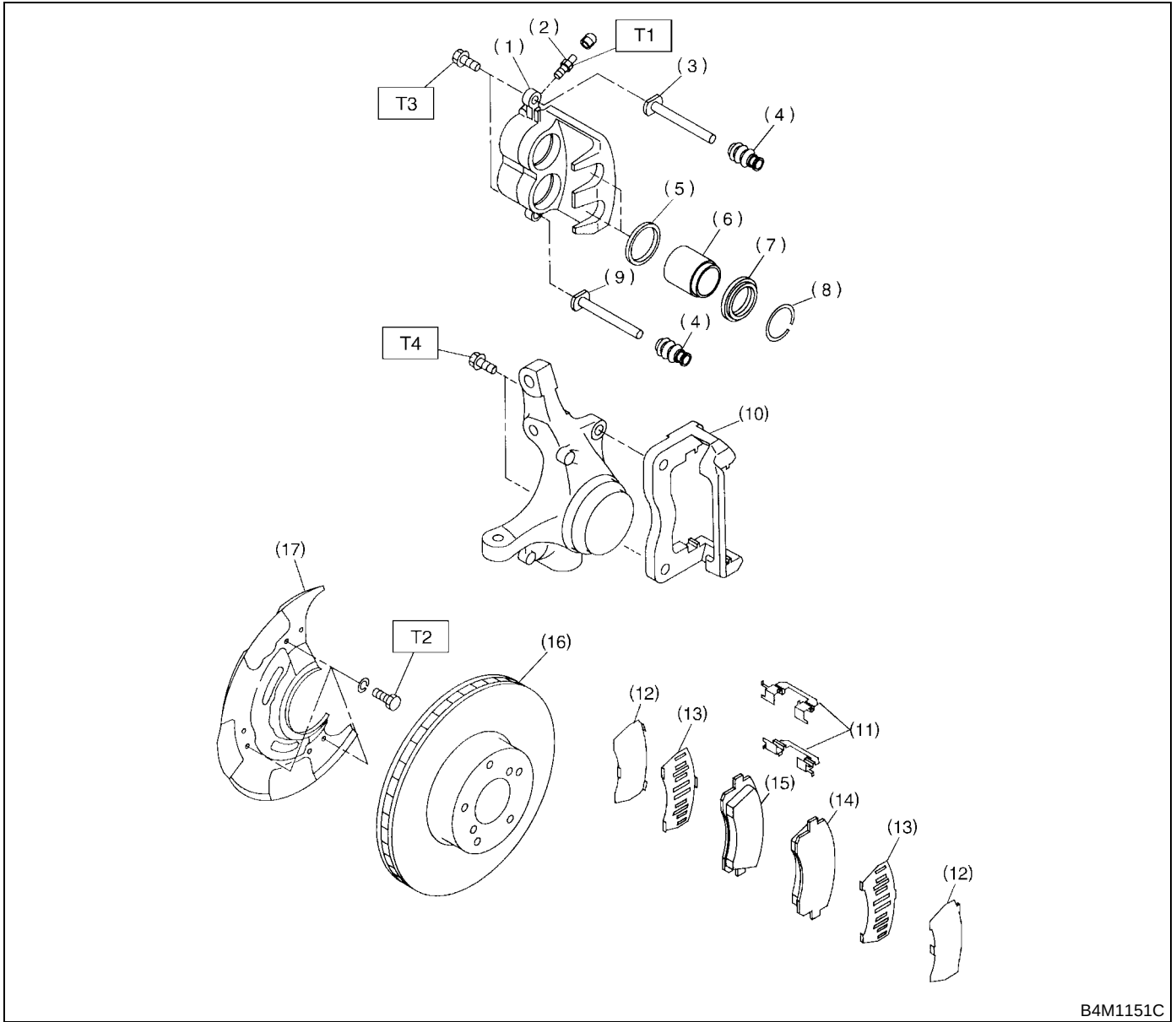
T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 37 (3.8, 27.5)

T4: 80 (8.2, 59)

2. 15 INCH TYPE



B4M1151C

- (1) Caliper body
- (2) Air bleeder screw
- (3) Guide pin (Green)
- (4) Pin boot
- (5) Piston seal
- (6) Piston
- (7) Piston boot
- (8) Boot ring

- (9) Lock pin (Yellow)
- (10) Support
- (11) Pad clip
- (12) Outer shim
- (13) Inner shim
- (14) Pad (Outside)
- (15) Pad (Inside)
- (16) Disc rotor

- (17) Disc cover

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

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

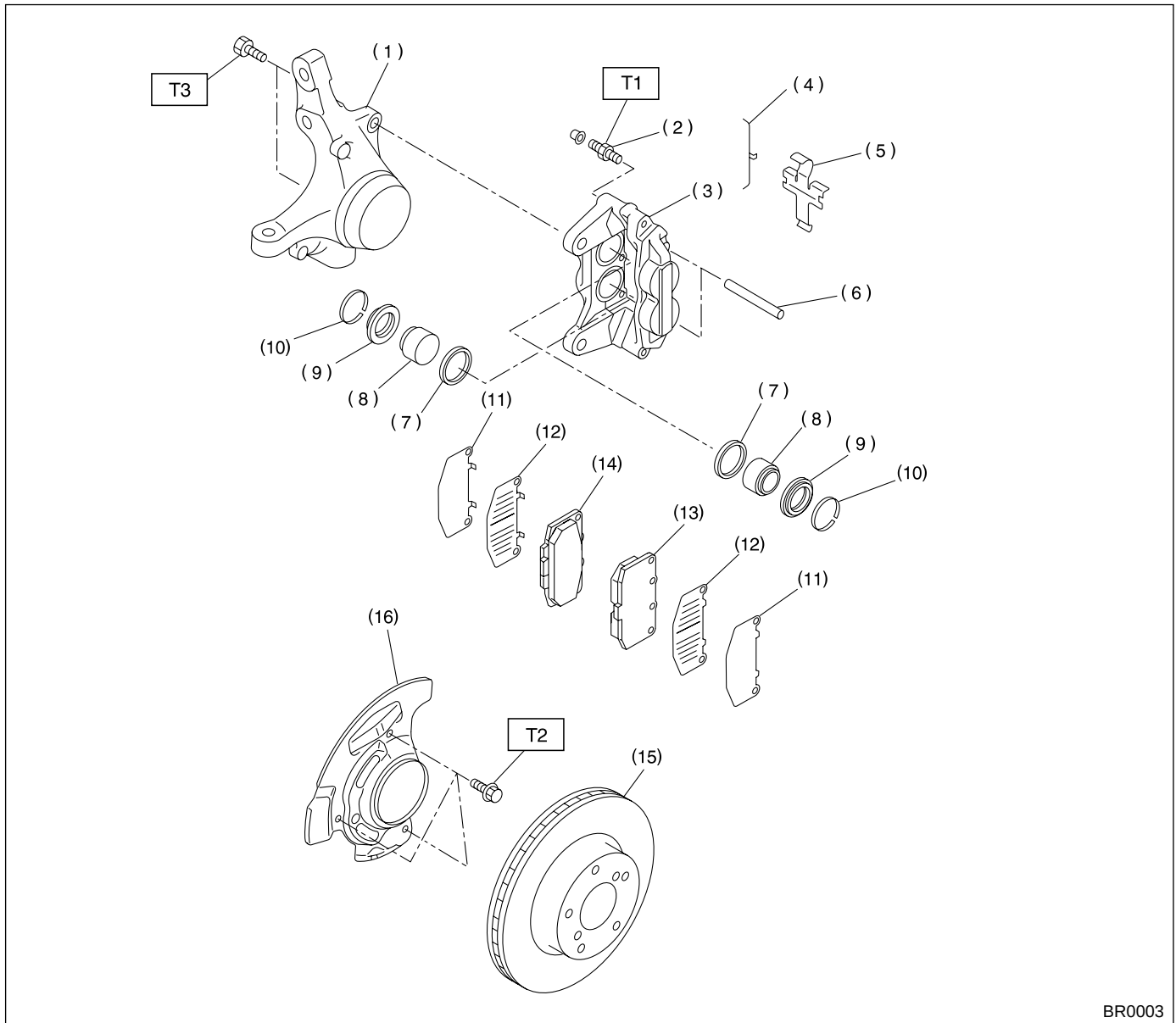
T3: 37 (3.8, 27.5)

T4: 80 (8.2, 59)

GENERAL DESCRIPTION

BRAKE

3. 16 INCH TYPE



- | | |
|-----------------------|--------------------|
| (1) Housing | (9) Piston boot |
| (2) Air bleeder screw | (10) Boot ring |
| (3) Caliper body | (11) Shim A |
| (4) M clip | (12) Shim B |
| (5) Cross spring | (13) Pad (Outside) |
| (6) Pad pin | (14) Pad (Inside) |
| (7) Piston seal | (15) Disc rotor |
| (8) Piston | (16) Disc cover |

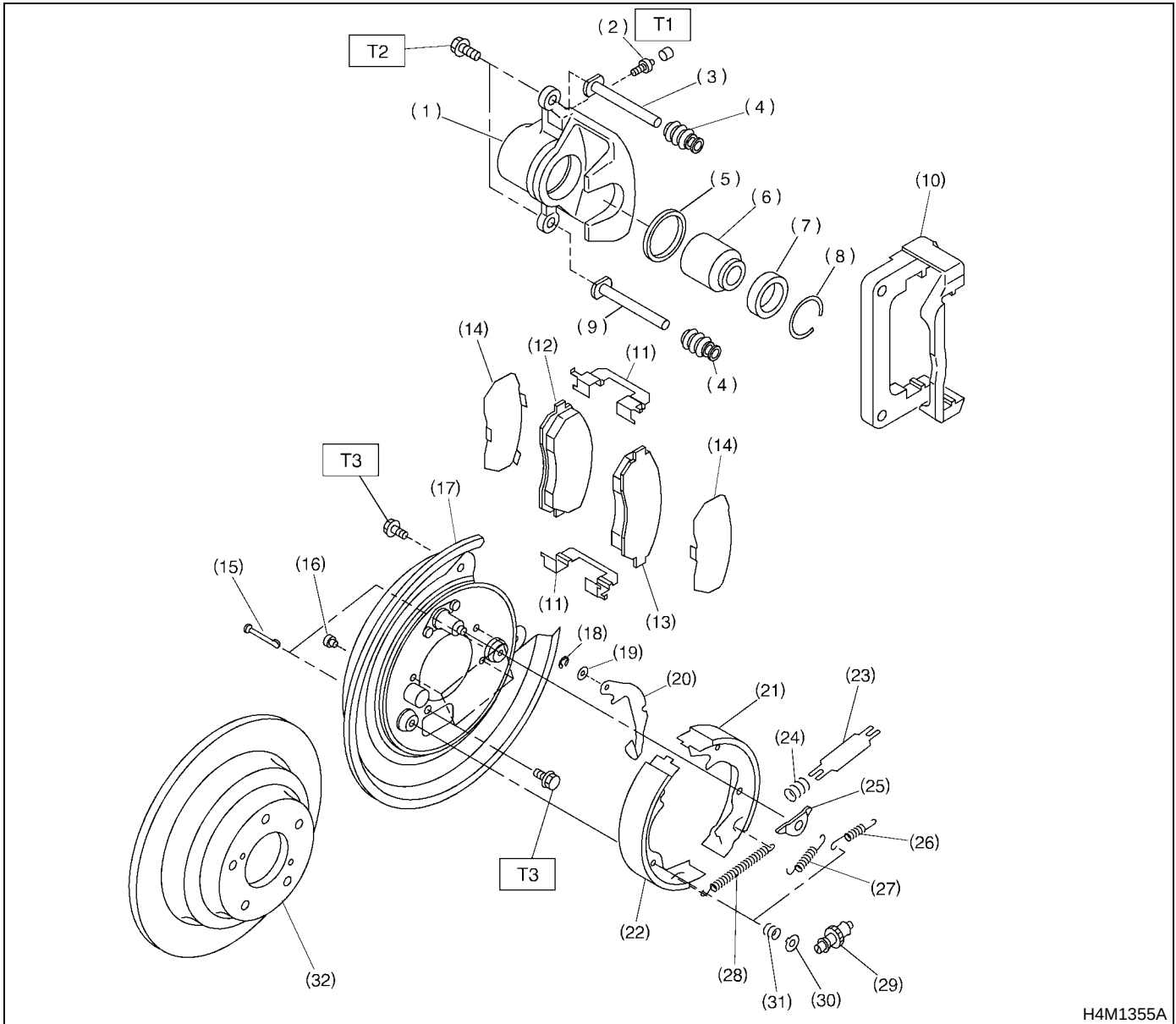
Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 80 (8.2, 59)

4. REAR DISC BRAKE (14 INCH TYPE)



H4M1355A

- | | | |
|-----------------------|-------------------------------------|---------------------------------|
| (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 | |
| (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) Inner pad | (25) Shoe guide plate | |
| (13) Outer pad | (26) Secondary shoe return spring | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

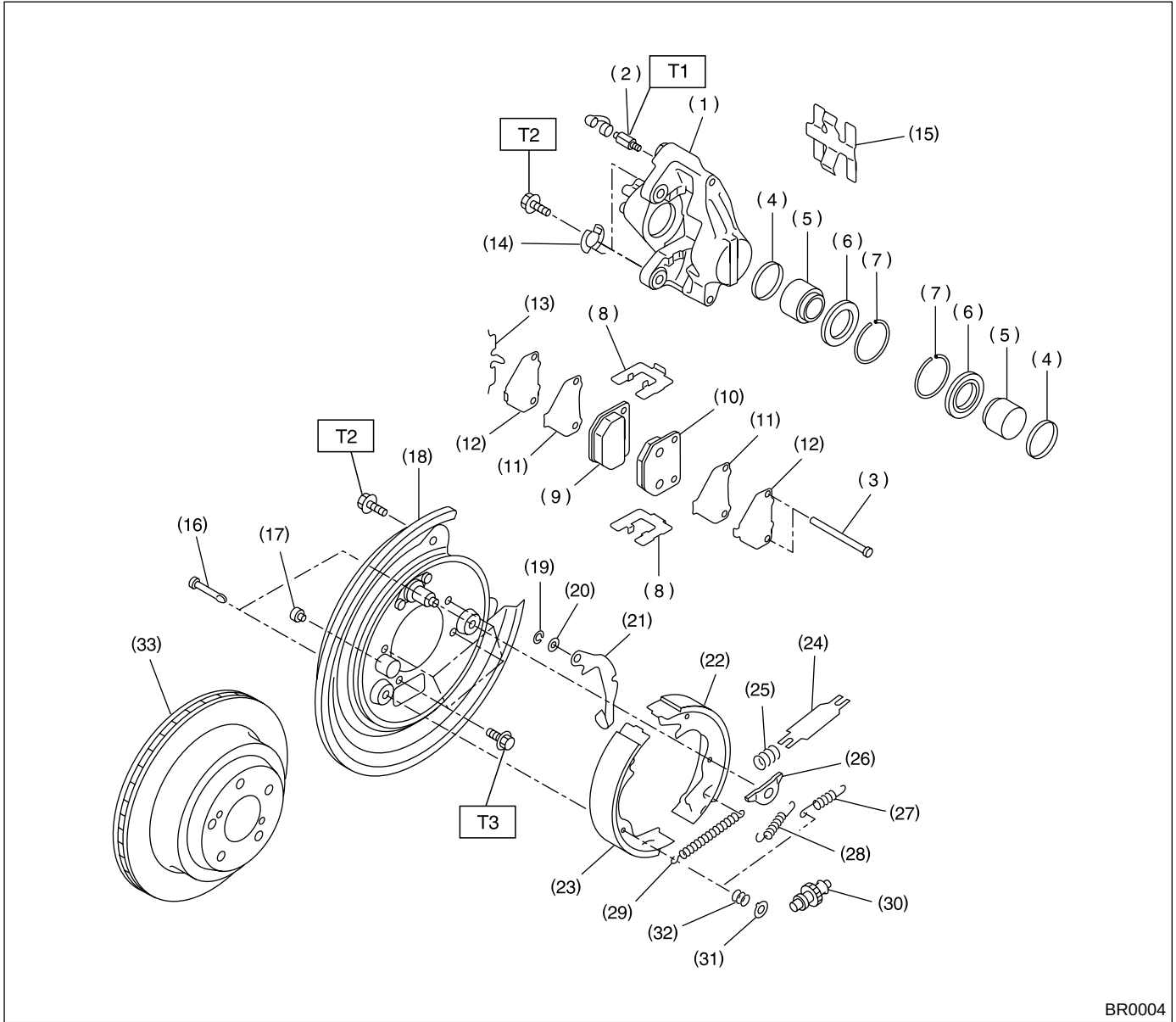
T2: 37 (3.8, 27.5)

T3: 52 (5.3, 38.3)

GENERAL DESCRIPTION

BRAKE

5. REAR DISC BRAKE (15 INCH TYPE)



BR0004

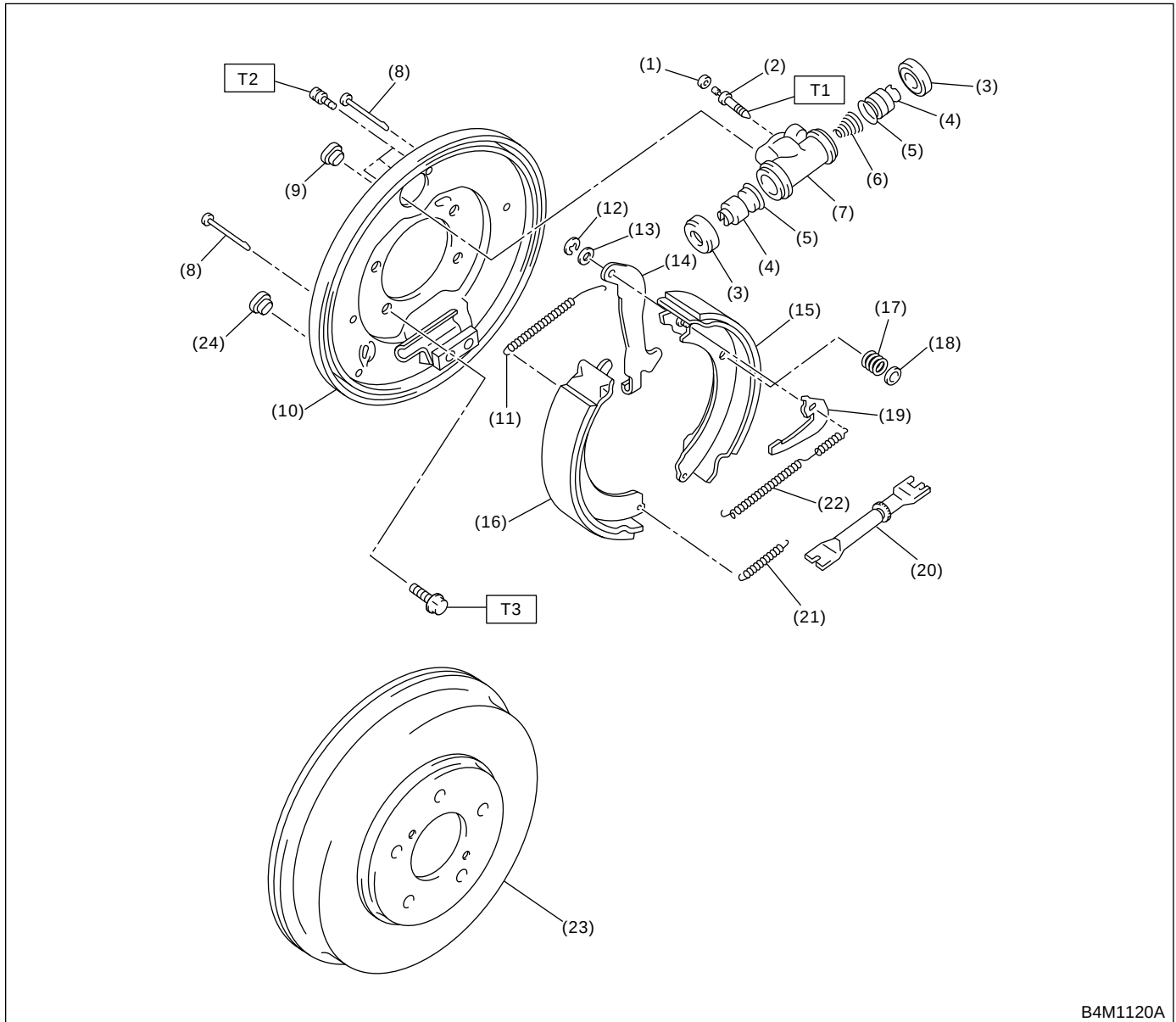
- | | | |
|-----------------------|-------------------------------------|-----------------------------------|
| (1) Caliper body | (14) Washer | (27) Secondary shoe return spring |
| (2) Air bleeder screw | (15) Cross spring | (28) Primary shoe return spring |
| (3) Pad pin | (16) Shoe hold-down pin | (29) Adjusting spring |
| (4) Piston seal | (17) Cover | (30) Adjuster |
| (5) Piston | (18) Back plate | (31) Shoe hold-down cup |
| (6) Piston boot | (19) Retainer | (32) Shoe hold-down spring |
| (7) Boot ring | (20) Spring washer | (33) Disc rotor |
| (8) Pad clip | (21) Parking brake lever | |
| (9) Inner pad | (22) Parking brake shoe (Secondary) | |
| (10) Outer pad | (23) Parking brake shoe (Primary) | |
| (11) Inner shim | (24) Strut | |
| (12) Outer shim | (25) Strut shoe spring | |
| (13) M clip | (26) Shoe guide plate | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 52 (5.3, 38.3)

6. REAR DRUM BRAKE



B4M1120A

- | | | |
|-------------------------|-------------------------------|-------------------------------|
| (1) Air bleeder cap | (11) Upper shoe return spring | (21) Lower shoe return spring |
| (2) Air bleeder screw | (12) Retainer | (22) Adjusting spring |
| (3) Boot | (13) Washer | (23) Drum |
| (4) Piston | (14) Parking brake lever | |
| (5) Cup | (15) Brake shoe (Trailing) | |
| (6) Spring | (16) Brake shoe (Leading) | |
| (7) Wheel cylinder body | (17) Shoe hold-down spring | |
| (8) Pin | (18) Cup | |
| (9) Plug | (19) Adjusting lever | |
| (10) Back plate | (20) Adjuster | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 10 (1.0, 7.2)

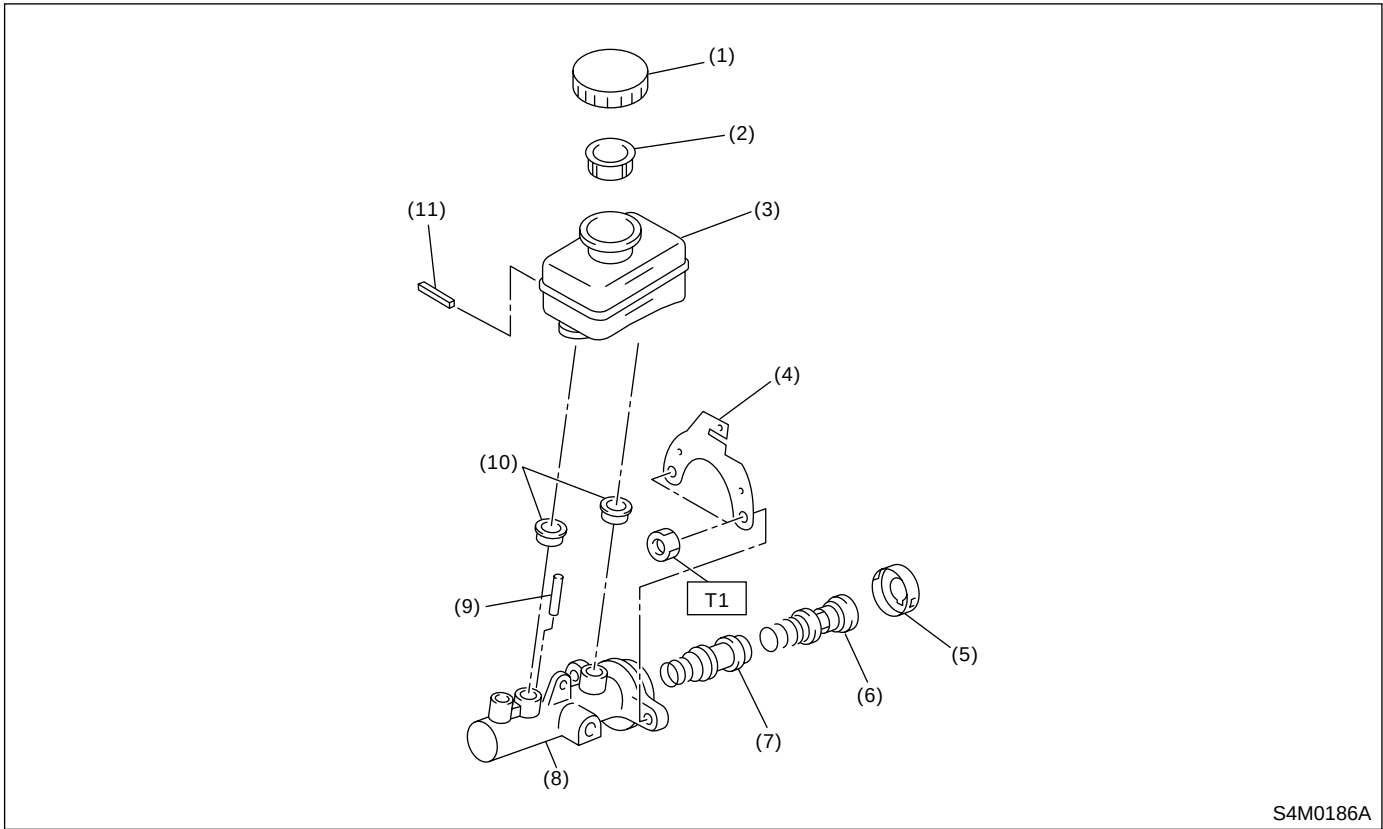
T3: 52 (5.3, 38.3)

GENERAL DESCRIPTION

BRAKE

7. MASTER CYLINDER

• LHD models

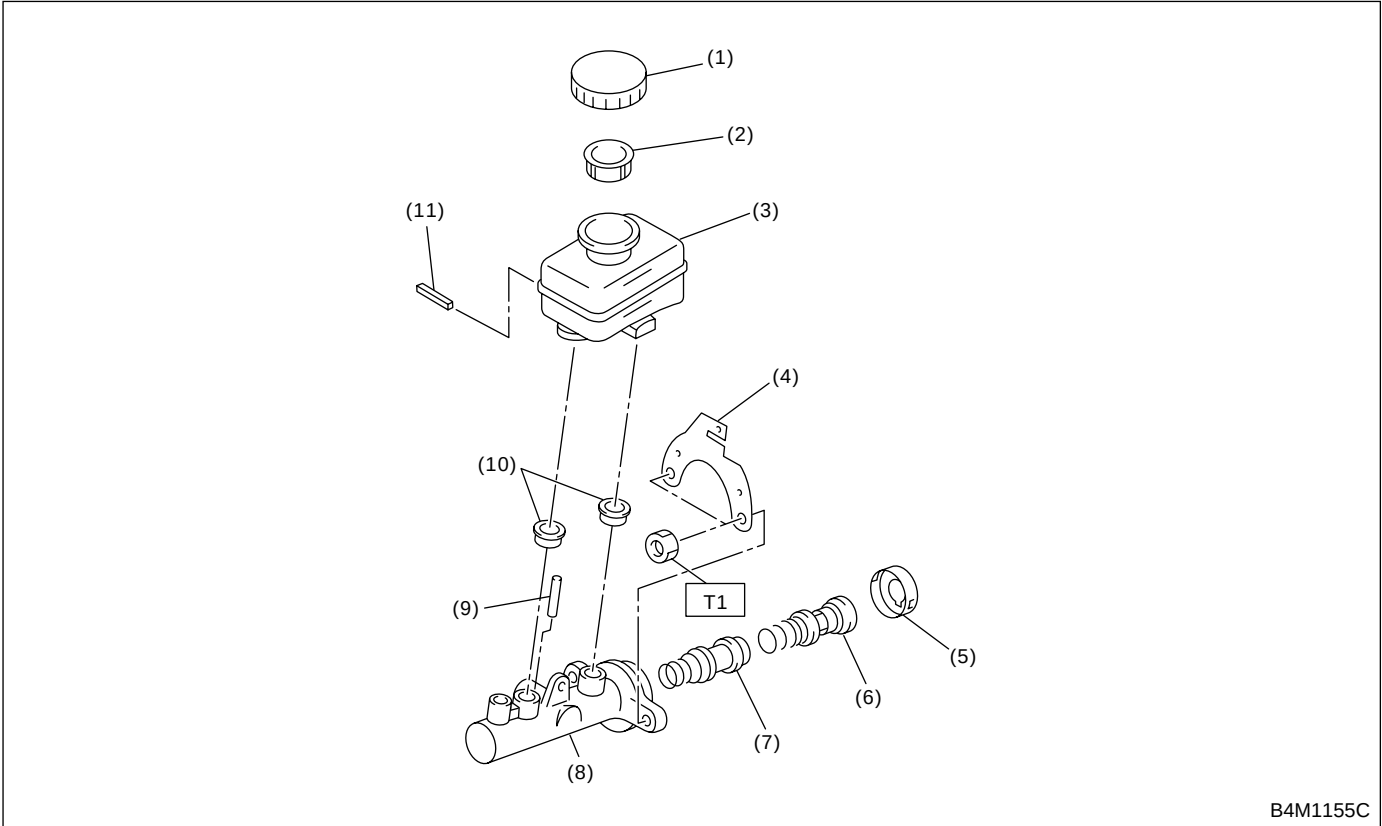


S4M0186A

- | | |
|---------------------|-----------------------------|
| (1) Cap | (7) Secondary piston |
| (2) Filter | (8) Cylinder body |
| (3) Reservoir tank | (9) Cylinder pin (with ABS) |
| (4) Bracket | (10) Seal |
| (5) Piston retainer | (11) Pin |
| (6) Primary piston | |

Tightening torque: N·m (kgf·m, ft·lb)
T1: 14 (1.4, 10.1)

• RHD models



- | | |
|---------------------|-----------------------------|
| (1) Cap | (6) Primary piston |
| (2) Filter | (7) Secondary piston |
| (3) Reservoir tank | (8) Cylinder body |
| (4) Bracket | (9) Cylinder pin (with ABS) |
| (5) Piston retainer | (10) Seal |

(11) Pin

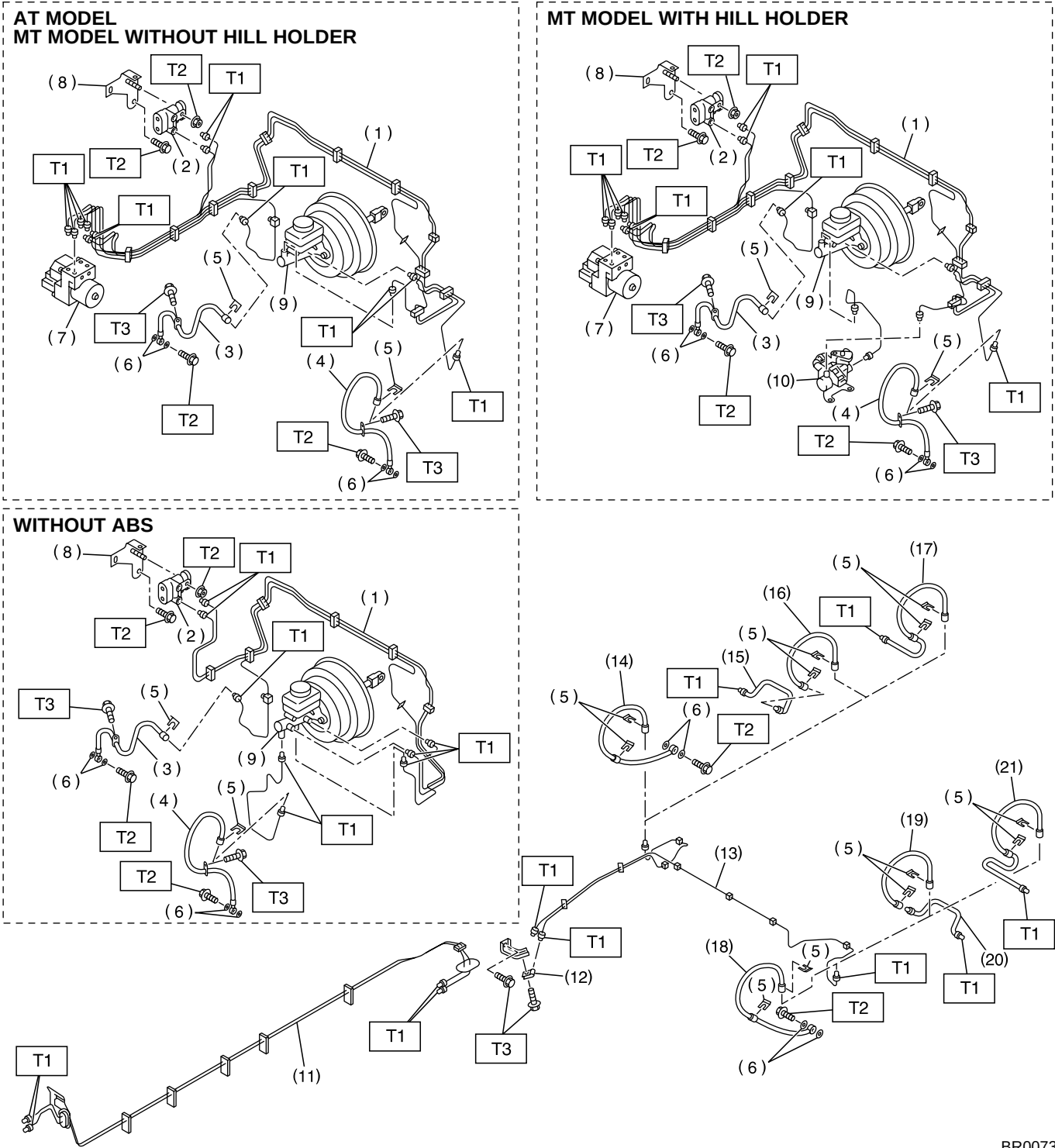
Tightening torque: N·m (kgf-m, ft-lb)
T1: 14 (1.4, 10.1)

GENERAL DESCRIPTION

BRAKE

8. BRAKE PIPES AND HOSE

• LHD model



BR0073

GENERAL DESCRIPTION

BRAKE

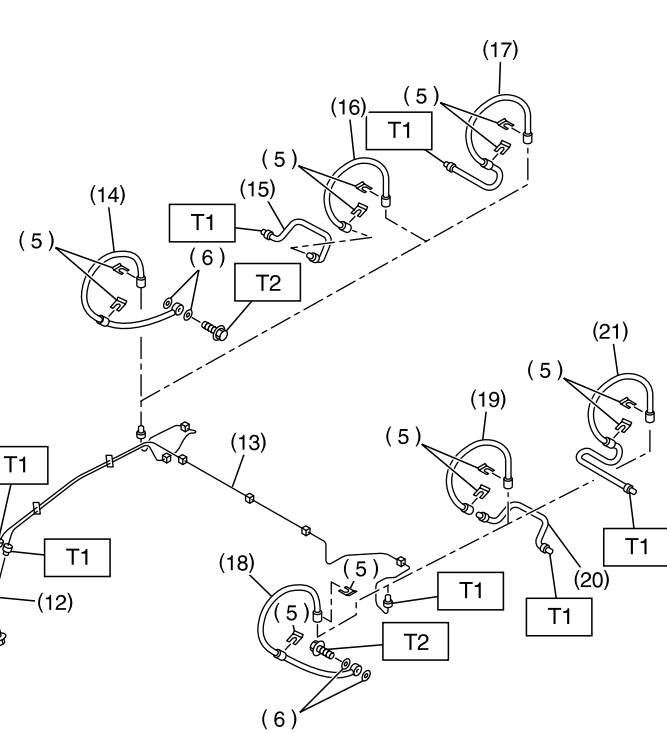
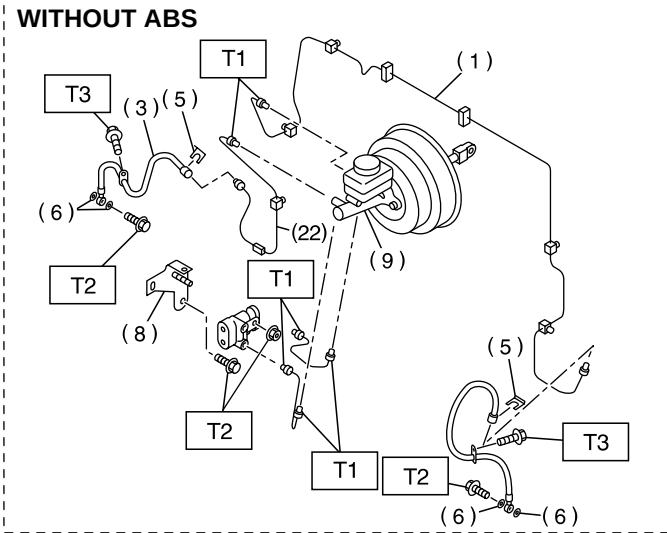
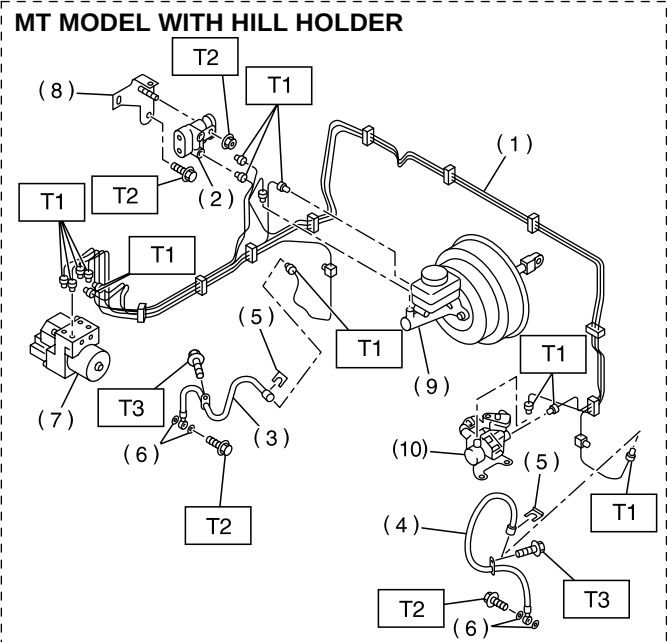
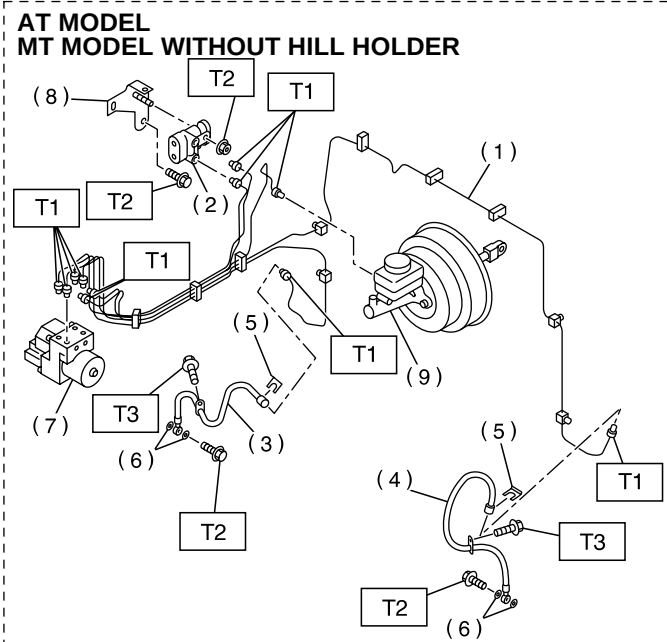
(1) Front brake pipe assembly	(12) Two-way connector	(19) Rear brake hose LH (FWD drum brake model)
(2) Proportioning valve	(13) Rear brake pipe assembly	(20) Rear brake pipe LH (FWD drum brake model)
(3) Front brake hose RH	(14) Rear brake hose RH (Disc brake model)	(21) Rear brake hose LH (AWD drum brake model)
(4) Front brake hose LH	(15) Rear brake pipe RH (FWD drum brake model)	(22) Adapter pipe
(5) Clamp	(16) Rear brake hose RH (FWD drum brake model)	
(6) Gasket	(17) Rear brake hose (AWD drum brake model)	
(7) ABS control module and hydraulic control unit	(18) Rear brake hose LH (Disc brake model)	
(8) Bracket		
(9) Master Cylinder		
(10) Hill holder		
(11) Center brake pipe assembly		

<i>Tightening torque: N·m (kgf-m, ft-lb)</i>		
<i>T1: 15 (1.5, 10.8)</i>		
<i>T2: 18 (1.8, 13.0)</i>		
<i>T3: 32 (3.3, 23.6)</i>		

GENERAL DESCRIPTION

BRAKE

• RHD model



BR0074

GENERAL DESCRIPTION

BRAKE

(1) Front brake pipe assembly	(12) Two-way connector	(19) Rear brake hose LH (FWD drum brake model)
(2) Proportioning valve	(13) Rear brake pipe assembly	(20) Rear brake pipe LH (FWD drum brake model)
(3) Front brake hose RH	(14) Rear brake hose RH (Disc brake model)	(21) Rear brake hose LH (AWD drum brake model)
(4) Front brake hose LH	(15) Rear brake pipe RH (FWD drum brake model)	(22) Adapter pipe
(5) Clamp	(16) Rear brake hose RH (FWD drum brake model)	
(6) Gasket	(17) Rear brake hose (AWD drum brake model)	
(7) ABS control module and hydraulic control unit	(18) Rear brake hose LH (Disc brake model)	
(8) Bracket		
(9) Master Cylinder		
(10) Hill holder		
(11) Center brake pipe assembly		

Tightening torque: N·m (kgf-m, ft-lb)

T1: 15 (1.5, 10.8)

T2: 18 (1.8, 13.0)

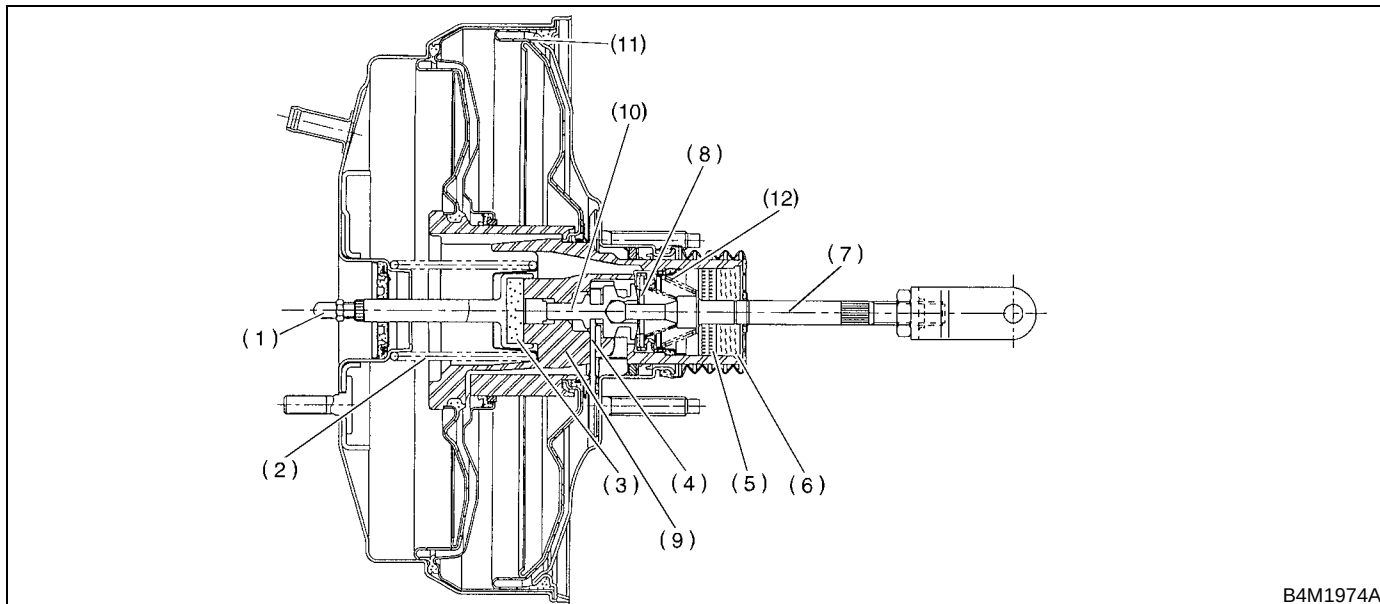
T3: 32 (3.3, 23.6)

GENERAL DESCRIPTION

BRAKE

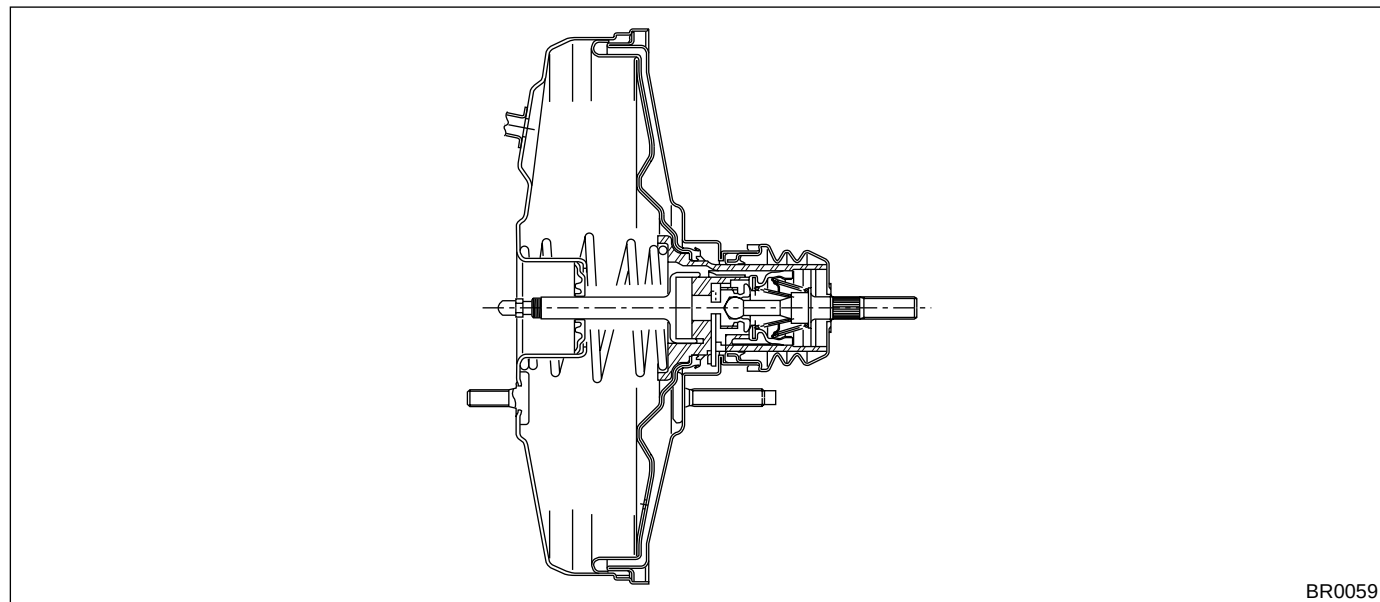
9. BRAKE BOOSTER

• Models with ABS



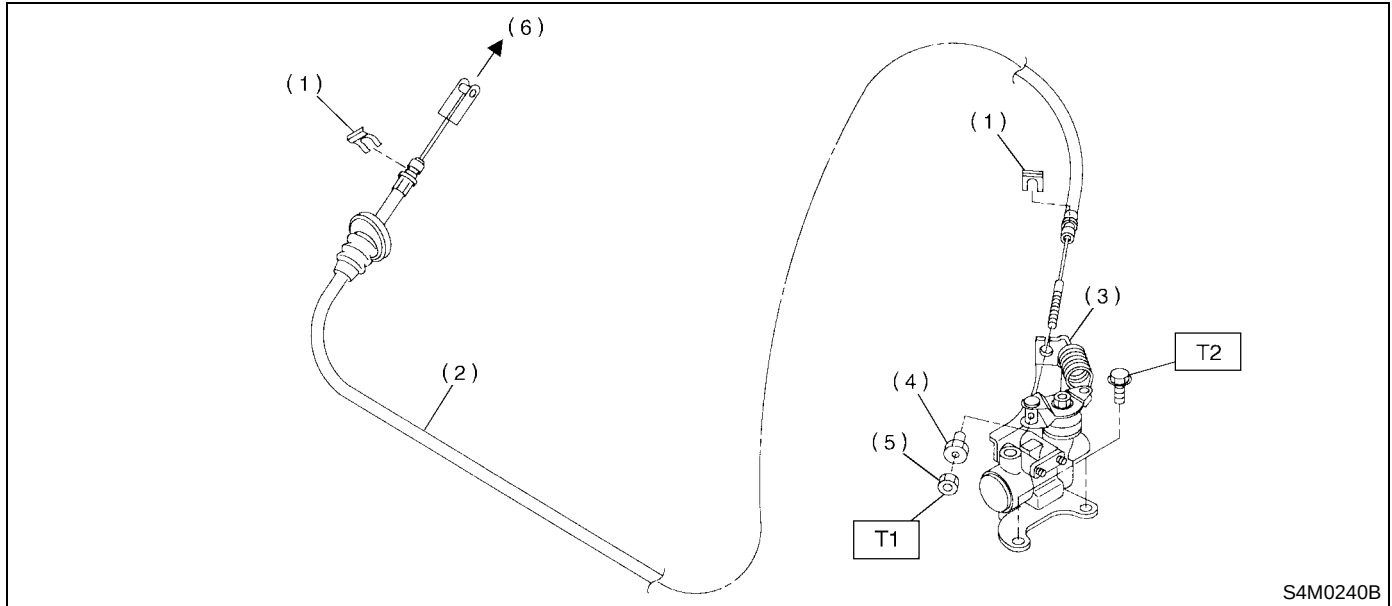
- | | | |
|-------------------|-------------------|--------------------------|
| (1) Push rod | (5) Filter | (9) Valve body |
| (2) Return spring | (6) Silencer | (10) Plunger valve |
| (3) Reaction disc | (7) Operating rod | (11) Diaphragm plate |
| (4) Key | (8) Poppet valve | (12) Valve return spring |

• Models without ABS



- | | | |
|---------------------|-------------------------|-------------------|
| (1) Push rod | (5) Plunger valve | (9) Operating rod |
| (2) Return spring | (6) Key | (10) Silencer |
| (3) Diaphragm plate | (7) Poppet valve | (11) Filter |
| (4) Reaction disc | (8) Valve return spring | (12) Valve body |

10.HILL HOLDER



- | | |
|-------------------------------|---------------------|
| (1) Clamp | (5) Lock nut |
| (2) PHV cable | (6) To clutch pedal |
| (3) PHV (Pressure hold valve) | |
| (4) Adjusting nut | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 3.5 (0.35, 2.5)

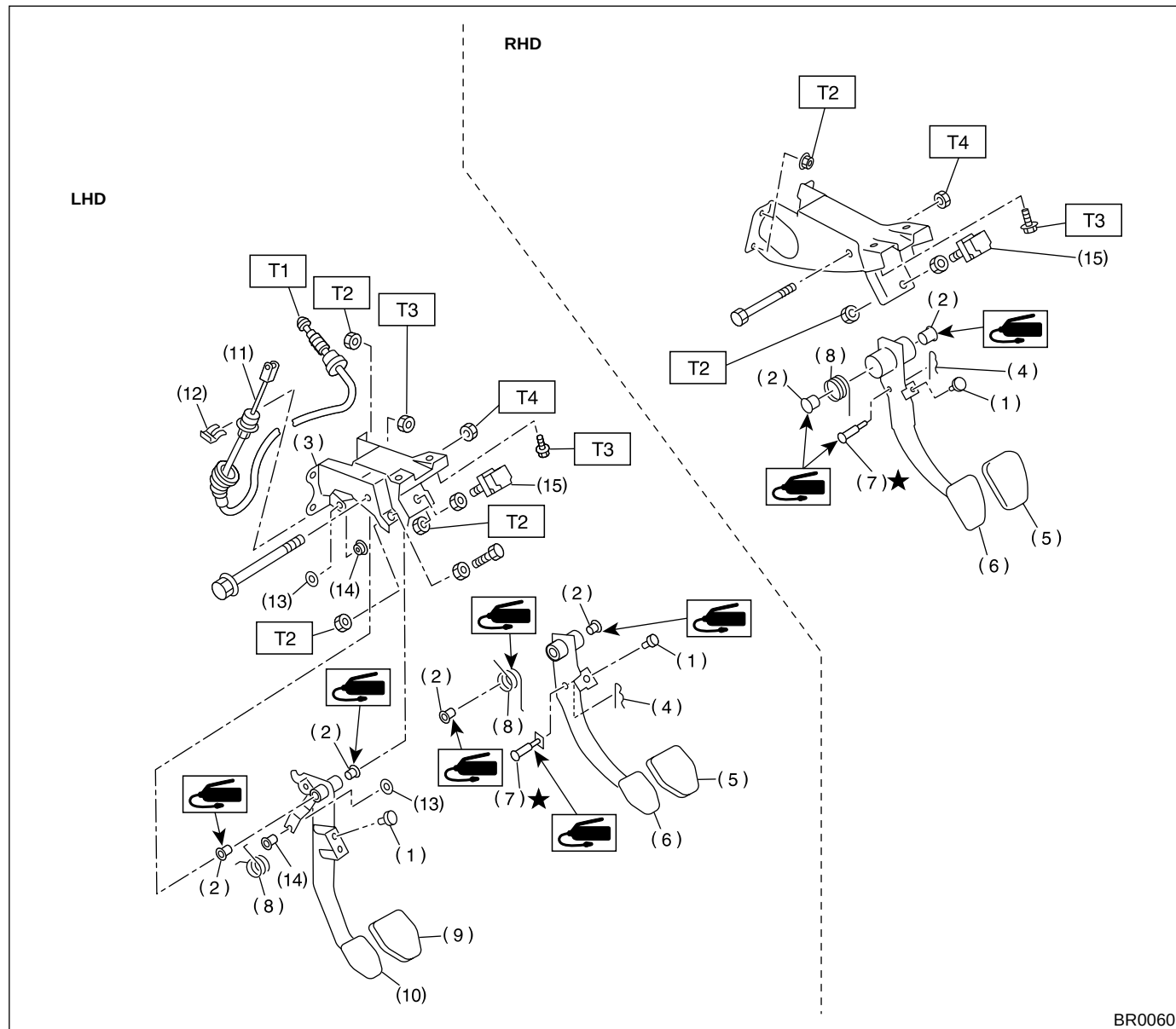
T2: 18 (1.8, 13.0)

GENERAL DESCRIPTION

BRAKE

11.BRAKE PEDAL

• 1.6 L Model



BR0060

- | | |
|--------------------------|-------------------------|
| (1) Stopper | (8) Spring |
| (2) Bushing | (9) Clutch pedal pad |
| (3) Clutch pedal bracket | (10) Clutch pedal |
| (4) Snap pin | (11) Clutch cable |
| (5) Brake pedal pad | (12) Clutch cable clamp |
| (6) Brake pedal | (13) Clip |
| (7) Clevis pin | (14) Spring assist |

- (15) Stop light switch

Tightening torque: N·m (kgf-m, ft-lb)

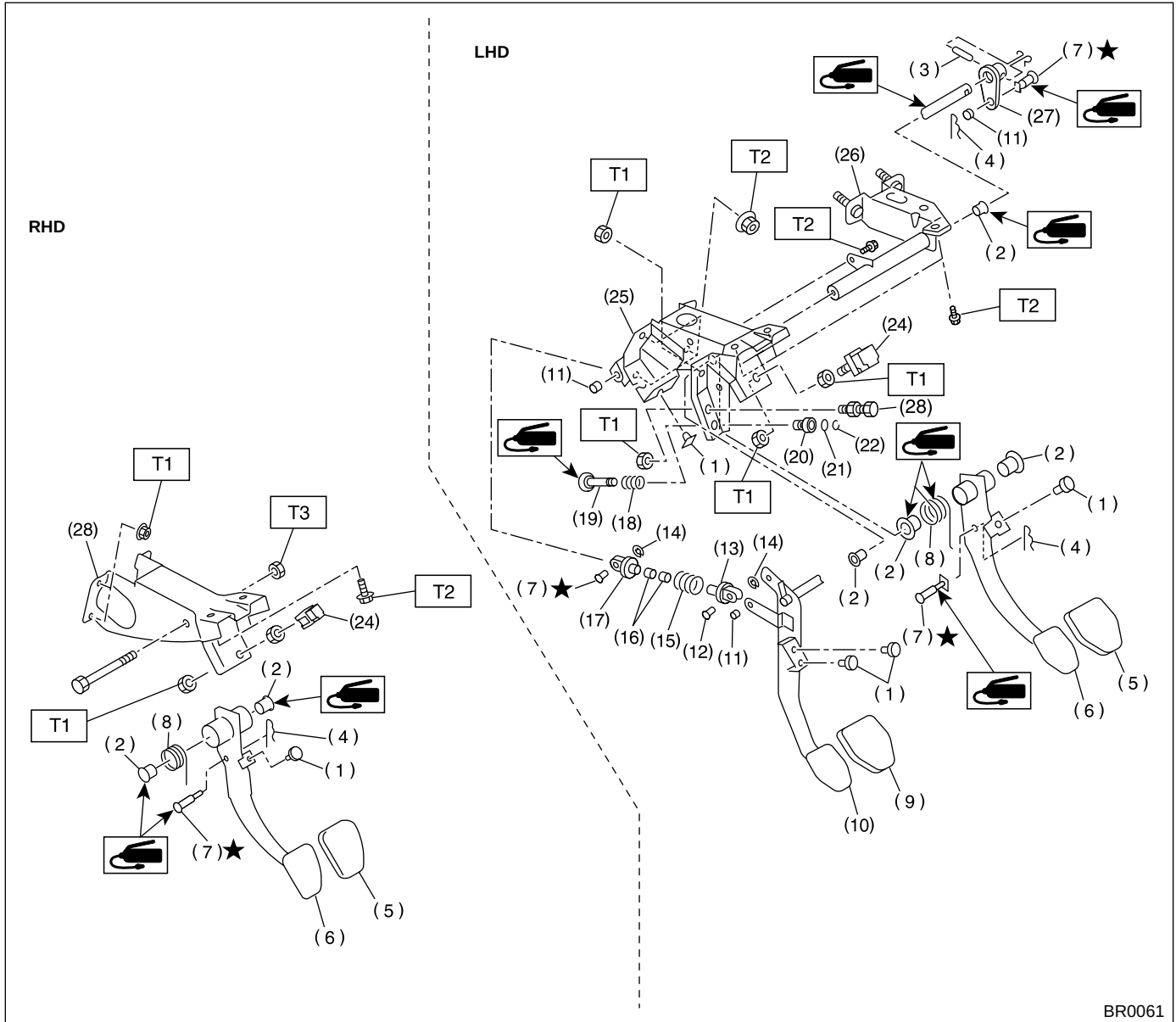
T1: 5.9 (0.6, 4.3)

T2: 8 (0.8, 5.8)

T3: 18 (1.8, 13.0)

T4: 30 (3.1, 22.4)

• 2.0 L Model



BR0061

(1) Stopper	(12) Clutch clevis pin	(23) Clutch switch (With cruise control)
(2) Bushing	(13) Assist rod A	(24) Stop light switch
(3) Spring pin	(14) Clip	(25) Pedal bracket
(4) Snap pin	(15) Assist spring	(26) Clutch master cylinder bracket
(5) Brake pedal pad	(16) Assist bushing	(27) Lever
(6) Brake pedal	(17) Assist rod B	(28) Brake pedal bracket
(7) Clevis pin	(18) Spring S	
(8) Brake pedal spring	(19) Rod S	
(9) Clutch pedal pad	(20) Bushing S	
(10) Clutch pedal	(21) O-ring	
(11) Bushing C	(22) Clip	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

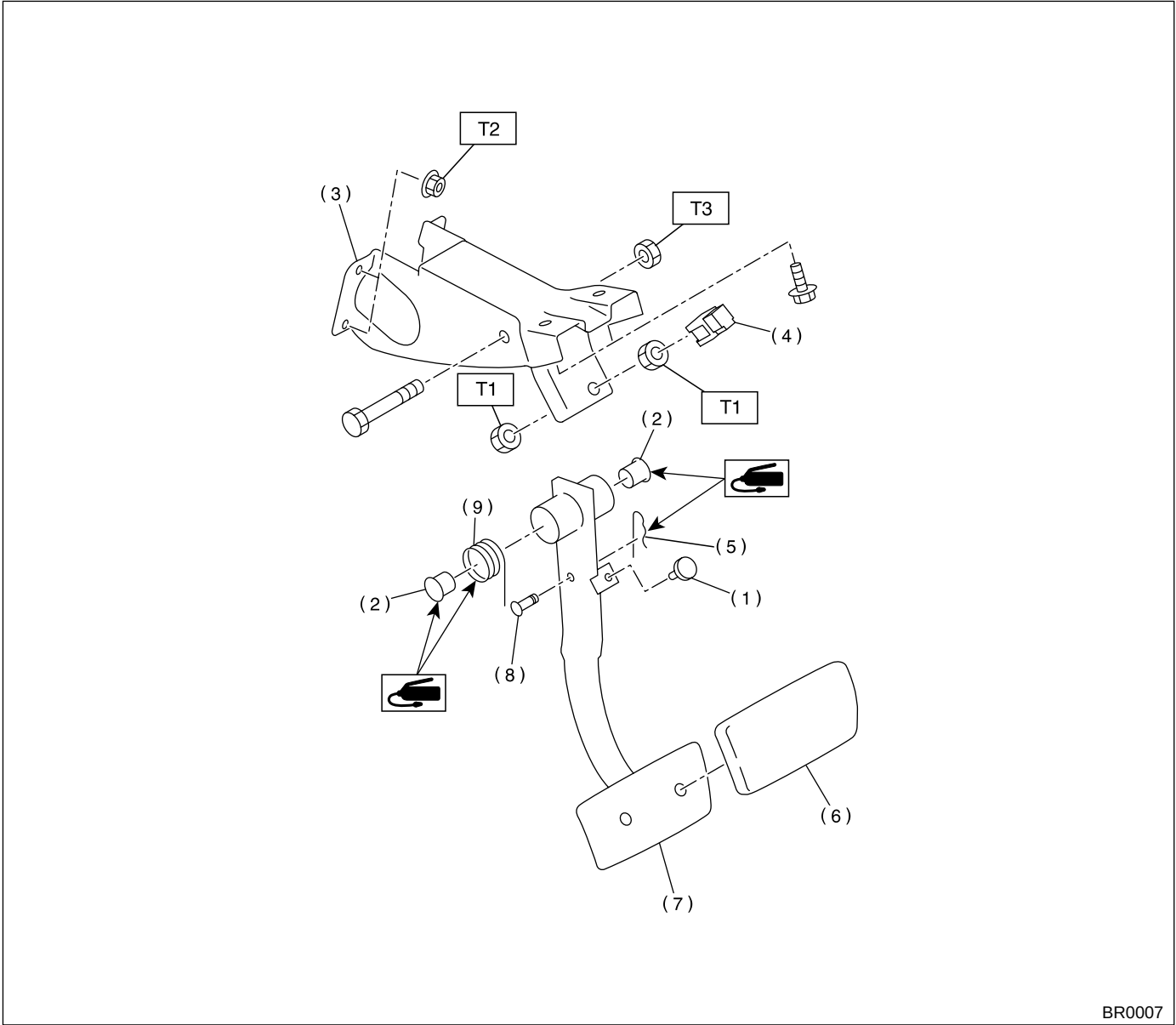
T2: 18 (1.8, 13.0)

T3: 30 (3.1, 22.4)

GENERAL DESCRIPTION

BRAKE

12.BRAKE PEDAL FOR AT MODEL



- (1) Stopper
- (2) Bushing
- (3) Pedal bracket
- (4) Stop light switch
- (5) Snap pin

- (6) Brake pedal pad
- (7) Brake pedal
- (8) Clevis pin
- (9) Brake pedal spring

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)

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 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Do not put fluid on body. If the body is tainted, wash away with water.

1. SPECIAL TOOLS

2. GENERAL PURPOSE TOOLS

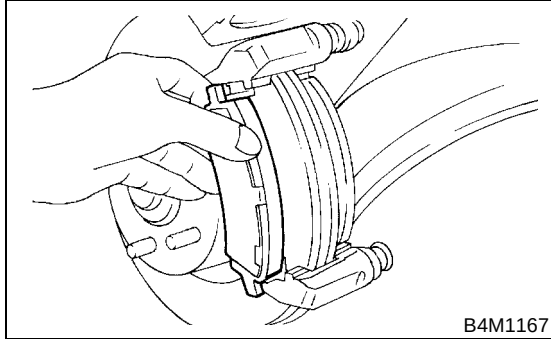
BR-22

2. Front Brake Pad

A: REMOVAL

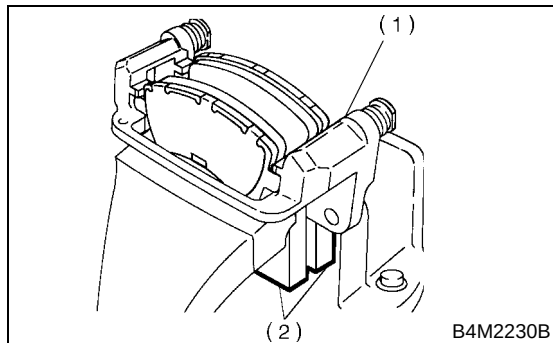
1. 14 INCH AND 15 INCH TYPE

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nuts.
- 4) Jack-up the vehicle, and remove front wheel.
- 5) Remove lock pin.
- 6) Raise caliper body.
- 7) Remove pad.



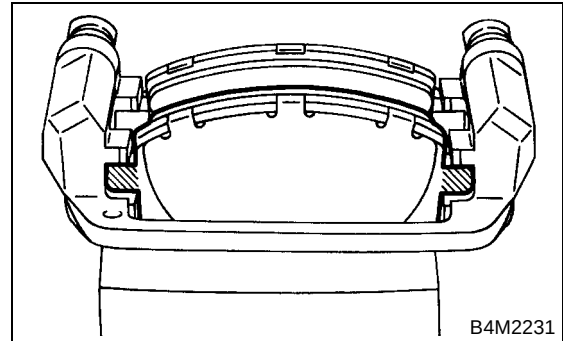
NOTE:
If brake pad is difficult to remove, proceed as follows:

- (1) Remove caliper body and fasten it provisionally to coil spring.
- (2) Remove support.
- (3) Place a support in a vise between wooden blocks.



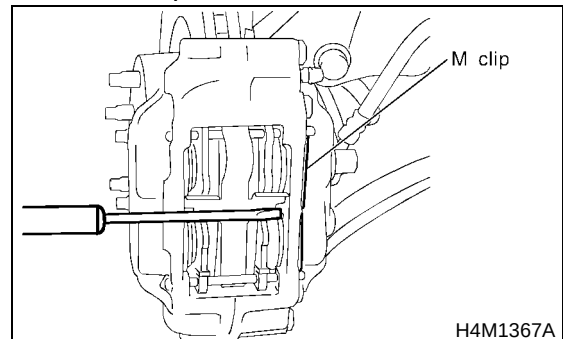
- (1) Support
- (2) Wooden blocks

- (4) Attach a rod of less than 12 mm (0.47 in) dia. to the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.

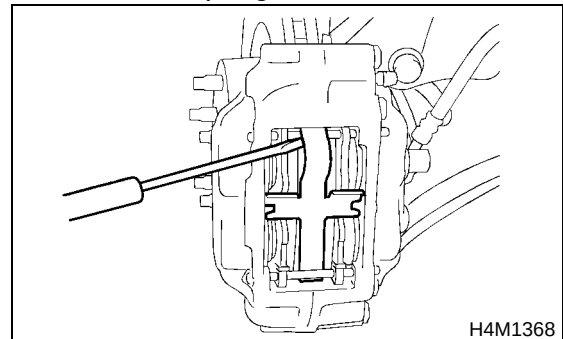


2. 16 INCH TYPE

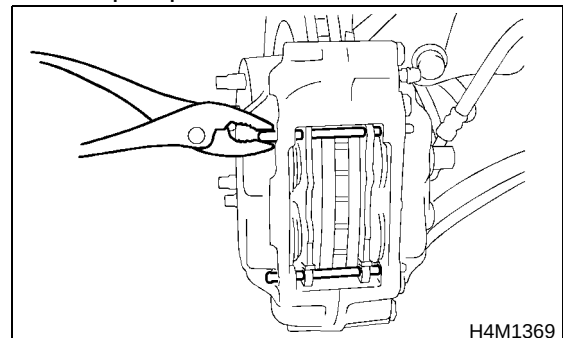
- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nuts.
- 4) Jack-up the vehicle, and remove front wheel.
- 5) Remove M clip.



- 6) Remove cross spring.



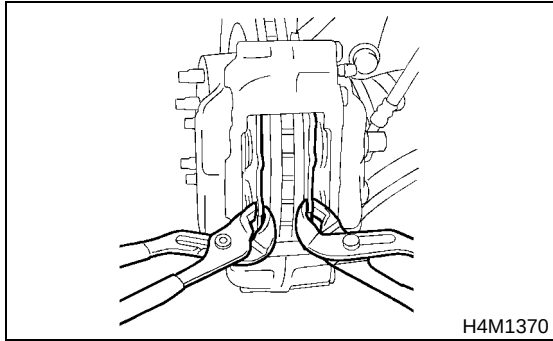
- 7) Remove pad pins.



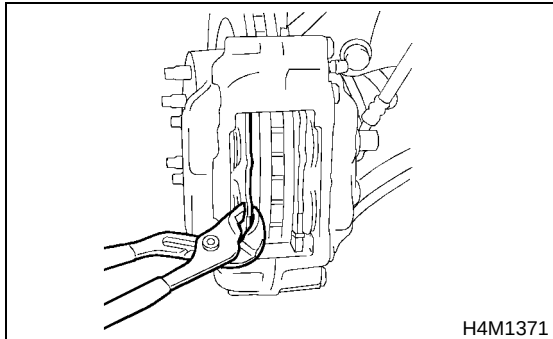
FRONT BRAKE PAD

BRAKE

8) Use a wrench to expand the pads, then push the piston back.



9) Remove pad.

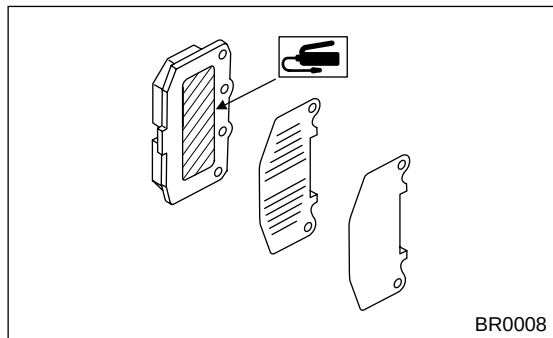


B: INSTALLATION

1. 14 INCH AND 15 INCH TYPE

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) to the frictional portion between pad and pad inner shim.



3) Install pads on support.

4) Install caliper body on support.

Tightening torque:

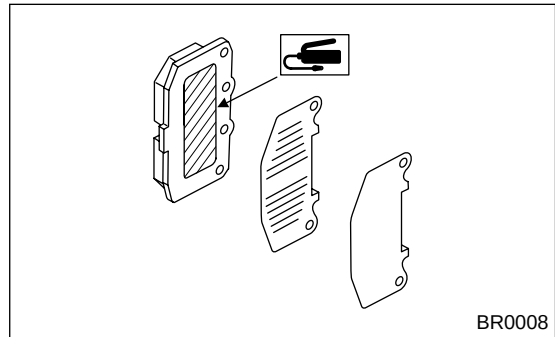
37 N·m (3.8 kgf-m, 27.5 ft-lb)

NOTE:

If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.

2. 16 INCH TYPE

1) Apply thin coat of Molykote AS880N (Part No.26298AC000) to the frictional portion between pad and pad inner shim.



2) Install pads on caliper body.

3) Install pad pins on caliper body.

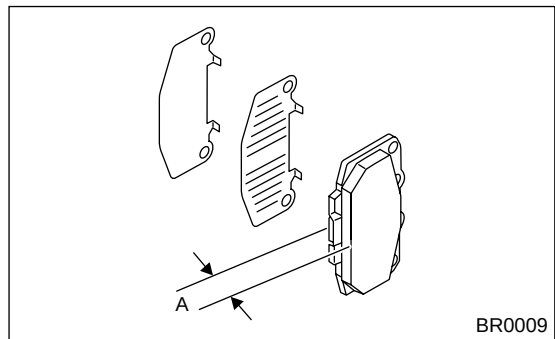
4) Install M clip.

5) Install cross spring.

C: INSPECTION

1. 14 INCH AND 15 INCH TYPE

Check pad thickness A.



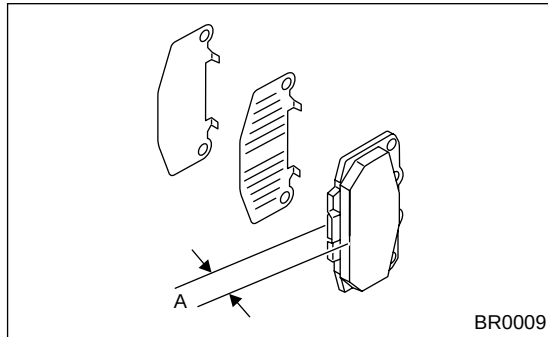
Pad thickness (including back metal)	Standard value	17 mm (0.67 in)
	Wear limit	7.5 mm (0.295 in)

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.

2. 16 INCH TYPE

Check pad thickness A.



Pad thickness (including back metal)	Standard value	14.5 mm (0.571 in)
	Wear limit	6.0 mm (0.236 in)

CAUTION:

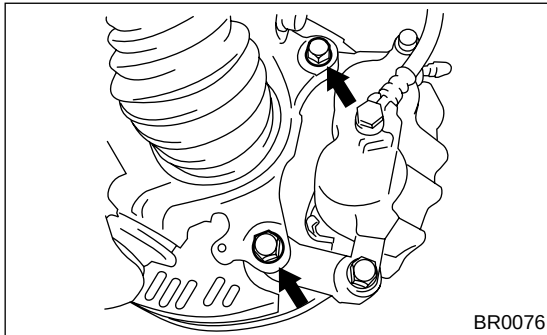
- Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking 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.

3. Front Disc Rotor

A: REMOVAL

1. 14 INCH AND 15 INCH TYPE

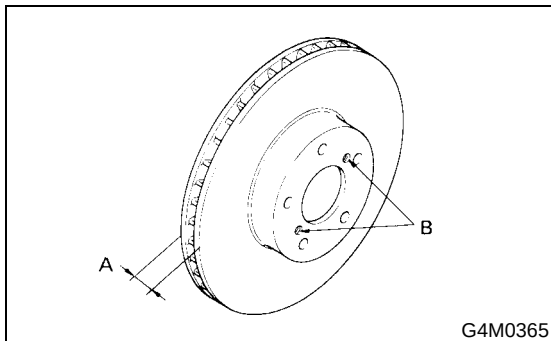
- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nuts.
- 4) Jack-up the vehicle, and remove front wheel.
- 5) Remove caliper body from housing, and suspend it from strut using a wire.



- 6) 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.

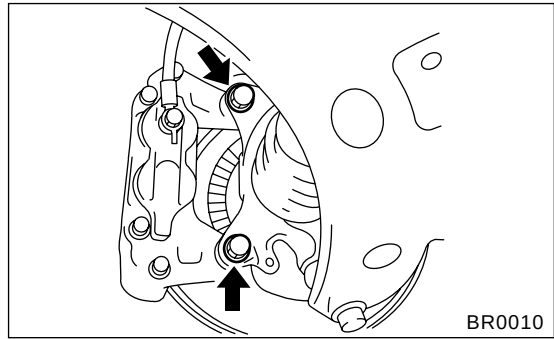


- 7) Clean mud and foreign particles from caliper body assembly and support.

2. 16 INCH TYPE

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nut.
- 4) Jack-up vehicle, and remove front wheel.

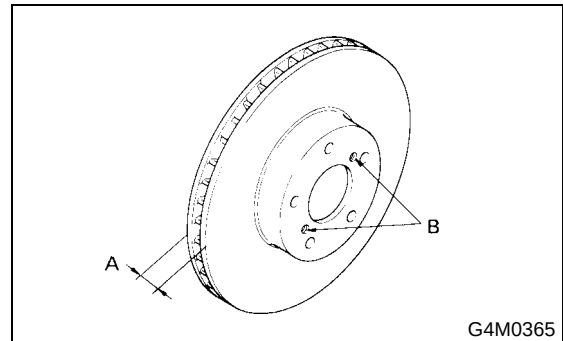
- 5) Remove caliper body from housing and suspend from strut using a wire.



- 6) Remove disc rotor from hub.

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.



- 7) Clean mud and foreign particles from caliper body assembly and support.

B: INSTALLATION

- 1) Install the disc rotor.
- 2) Install caliper body on housing.

Tightening torque:

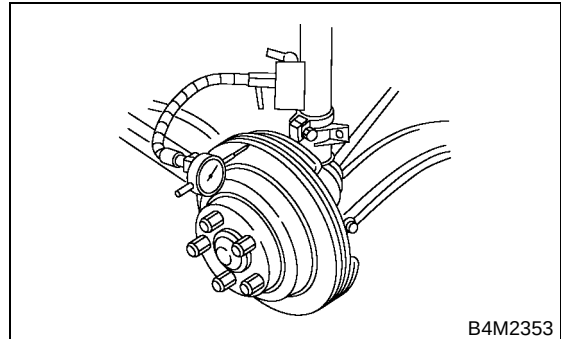
80 N·m (8.2 kgf-m, 59 ft-lb)

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.
 - When replacing the pad, replace pads of the left and right wheels at the same time.
- 3) Install the wheel.

C: INSPECTION

- 1) Install disc rotor by tightening the five wheel nuts.
- 2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.



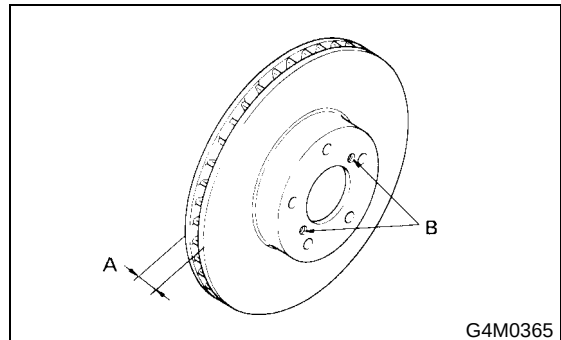
NOTE:

Make sure that dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.

Disc rotor runout limit:

0.075 mm (0.0030 in)

- 3) Measure disc rotor thickness.



NOTE:

Make sure that micrometer is set 5 mm (0.20 in) inward of rotor outer perimeter.

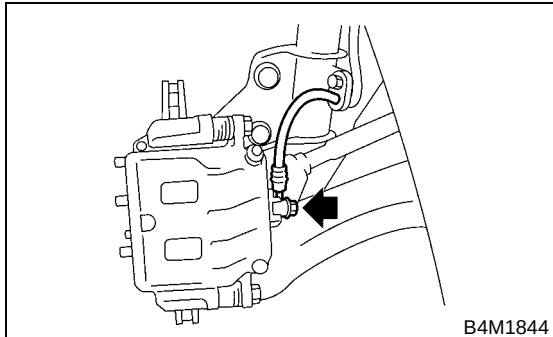
		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	14"	24.0 mm (0.945 in)	22.0 mm (0.866 in)	260 mm (10.24 in)
	15"	24.0 mm (0.945 in)	22.0 mm (0.866 in)	277 mm (10.91 in)
	16"	24.0 mm (0.945 in)	22.0 mm (0.866 in)	294 mm (11.57 in)

4. Front Disc Brake Assembly

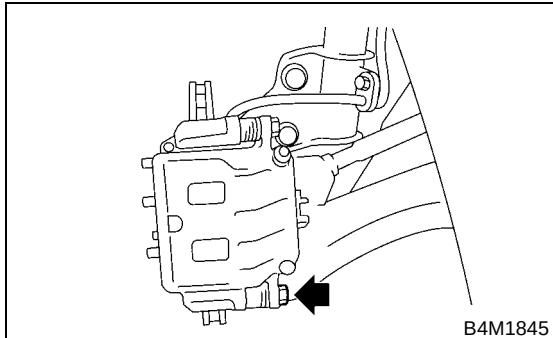
A: REMOVAL

1. 14 INCH AND 15 INCH TYPE

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nuts.
- 4) Jack-up the vehicle, and remove front wheel.
- 5) Remove union bolt and disconnect brake hose from caliper body assembly.



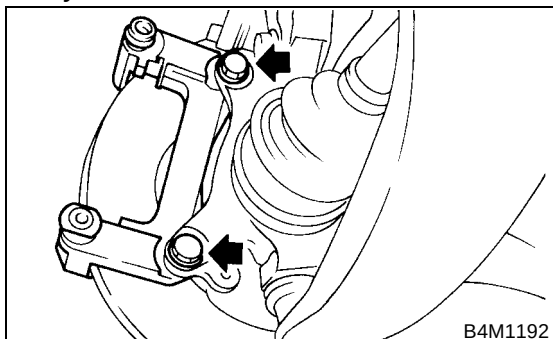
- 6) Remove bolt securing lock pin to caliper body.



- 7) Raise caliper body and move it toward vehicle center to separate it from support.
- 8) Remove support from housing.

NOTE:

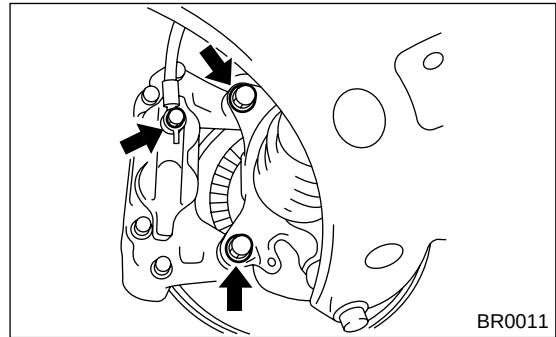
Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.



- 9) Clean mud and foreign particles from caliper body assembly and support.

2. 16 INCH TYPE

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nuts.
- 4) Jack-up the vehicle, and remove front wheel.
- 5) Remove union bolt and disconnect brake hose from caliper body assembly.
- 6) Remove caliper body from housing.



- 7) Clean mud and foreign particles from caliper body assembly and support.

B: INSTALLATION

1. 14 INCH AND 15 INCH TYPE

1) Install support on housing.

Tightening torque:

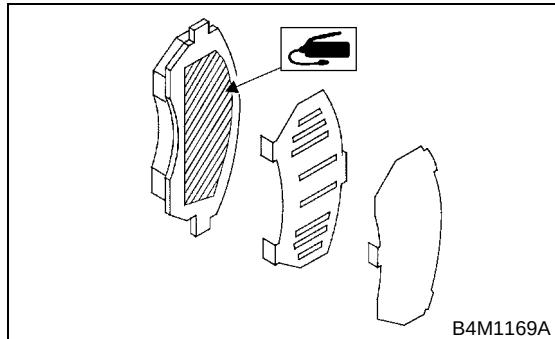
80 N·m (8.2 kgf-m, 59 ft-lb)

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.
- When replacing the pads, replace pads of the right and left wheels at the same time.

2) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.

3) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and inner shim.



4) Install pads on support.

5) Install caliper body on support.

Tightening torque:

37 N·m (3.8 kgf-m, 27.5 ft-lb)

6) Connect brake hose.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:

Replace brake hose gaskets with new ones.

7) Bleed air from brake system.

2. 16 INCH TYPE

1) Install caliper body on housing.

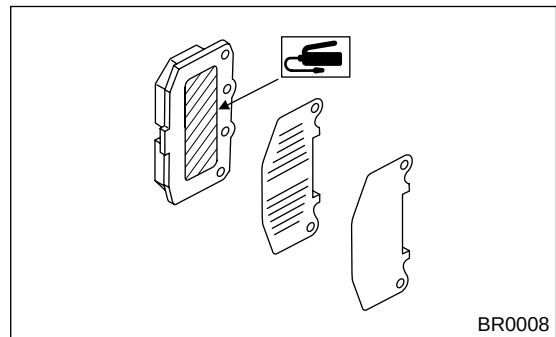
Tightening torque:

80 N·m (8.2 kgf-m, 59 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.
- When replacing the pads, replace pads of the right and left wheels at the same time.

2) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad inner shim.



3) Install pads on caliper body.

4) Install pad pins on caliper body.

5) Install M clip.

6) Install cross spring.

7) Install caliper body on housing.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 ft-lb)

8) Connect brake hose.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:

Replace brake hose gaskets with new ones.

9) Bleed air from brake system.

FRONT DISC BRAKE ASSEMBLY

BRAKE

C: DISASSEMBLY

1. 14 INCH TYPE

1) Clean mud and foreign particles from caliper body assembly and support.

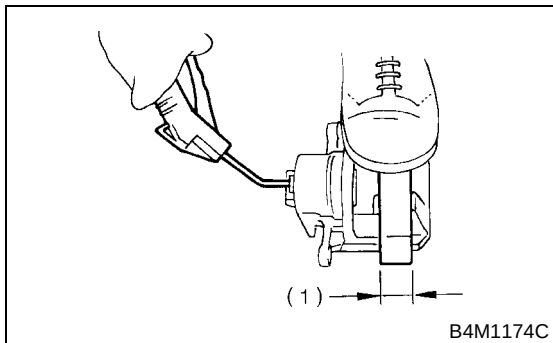
CAUTION:

Be careful not to allow foreign particles to enter inlet (at brake hose connector).

2) Gradually supply compressed air via caliper body brake hose to force piston out.

CAUTION:

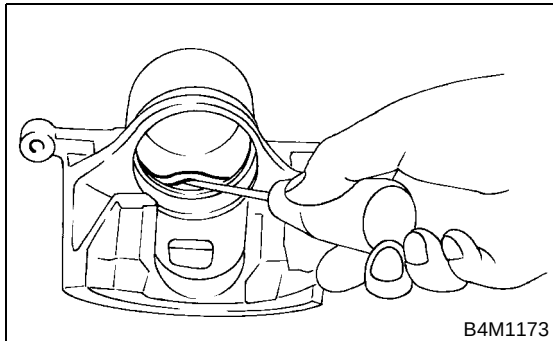
- Place a wooden block as shown in Figure to prevent damage to piston.
- Do not apply excessively high-pressure.



(1) Place a 30 mm (1.18 in) wide wooden block here.

3) Remove piston boot.

4) Remove piston seal from caliper body cylinder.



5) Remove guide pin and boot from caliper body.

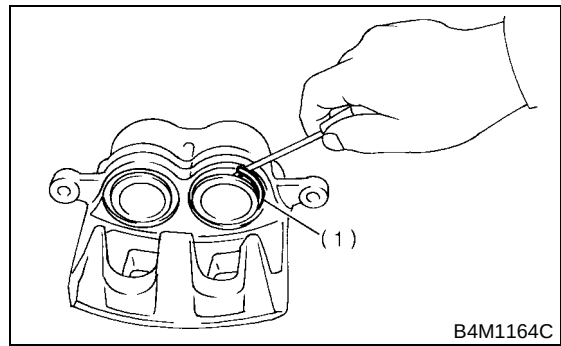
2. 15 INCH TYPE

1) 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).

2) Using a standard screwdriver, remove boot ring from piston.



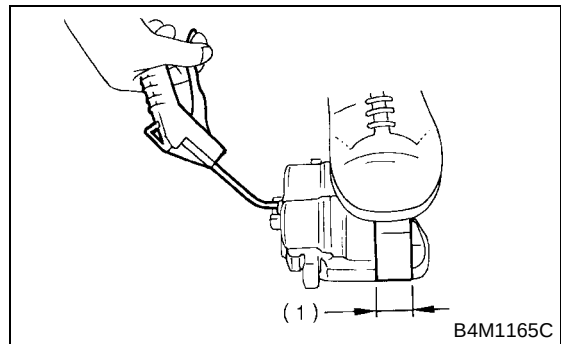
(1) Boot ring

3) Remove boot from piston end.

4) Gradually supply compressed air via caliper body brake hose to force piston out.

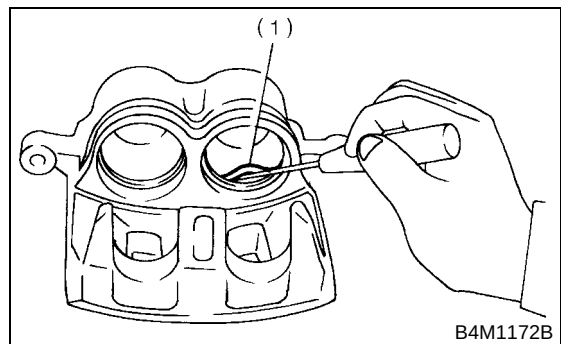
CAUTION:

Place a wooden block as shown in Figure to prevent damage to piston.



(1) Place a 30 mm (1.18 in) wide wooden block here.

5) Remove piston seal from caliper body cylinder.



(1) Piston pin

6) Remove lock pin boot and guide pin boot.

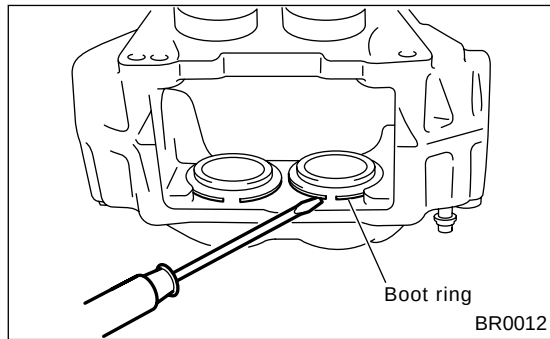
3. 16 INCH TYPE

1) Clean mud and foreign particles from caliper body assembly.

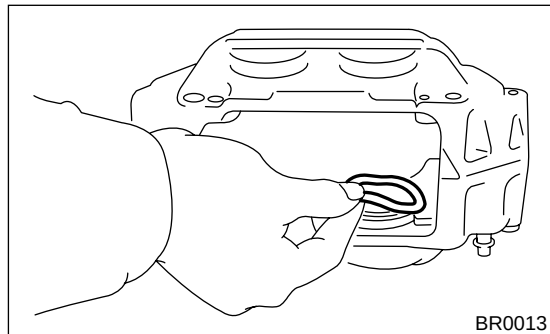
CAUTION:

Be careful not to allow foreign particles to enter inlet (at brake hose connector).

2) Using a standard screwdriver, remove boot ring from piston.



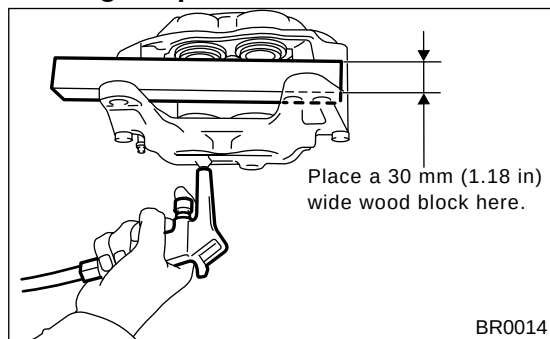
3) Remove boot from piston end.



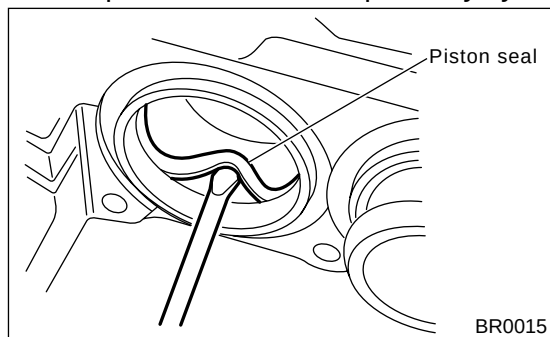
4) Gradually supply compressed air via caliper body brake hose to force piston out.

CAUTION:

Place a wooden block as shown in figure to prevent damage to piston.



5) Remove piston seal from caliper body cylinder.



D: ASSEMBLY

1. 14 INCH TYPE

- 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) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and install piston boot onto cylinder.

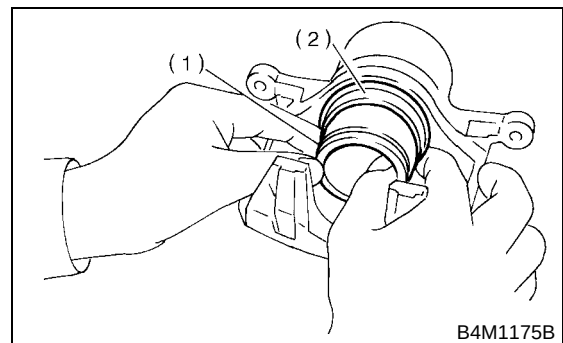
Grease:

NIGLUBE RX-2 (Part No. 003606000)

- 5) Insert piston into cylinder.

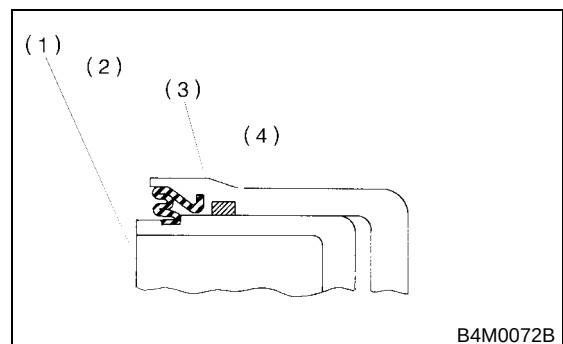
CAUTION:

Do not force piston into cylinder.



- (1) Piston
- (2) Piston boot

6) Position boot in grooves on cylinder and piston.



- (1) Piston
- (2) Piston boot
- (3) Caliper body
- (4) Piston seal

7) Apply a coat of specified grease to lock pin and guide pin outer surface, cylinder inner surface, and boot grooves.

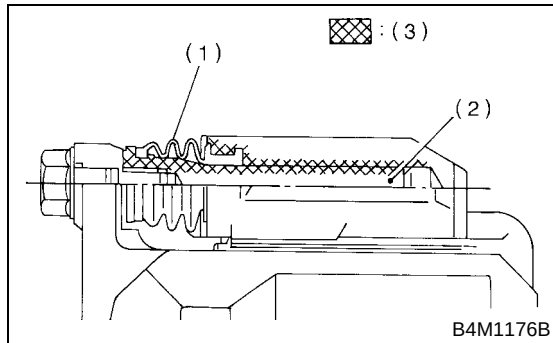
Grease:

NIGLUBE RX-2 (Part No. 003606000)

FRONT DISC BRAKE ASSEMBLY

BRAKE

8) Install lock and guide pin boot on support.



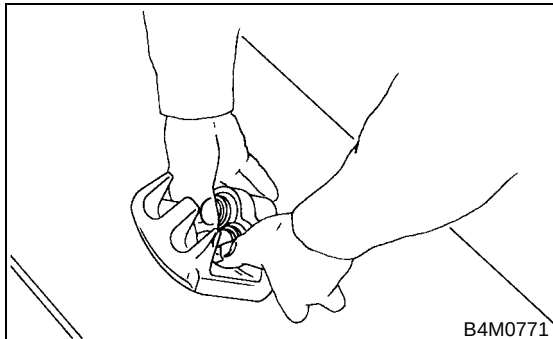
- (1) Pin boot
- (2) Lock pin or guide pin
- (3) Apply grease.

2. 15 INCH TYPE

- 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.

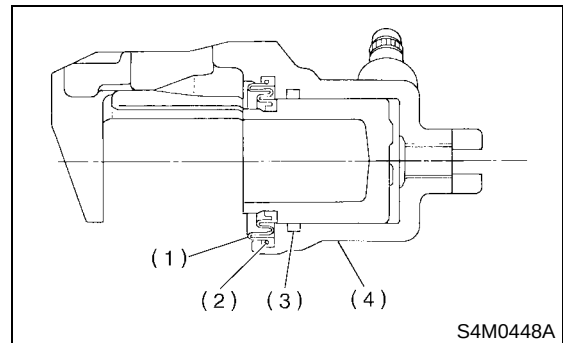


- 5) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and piston.

Grease:

NIGLUBE RX-2 (Part No. 003606000)

To facilitate installation, fit boot starting with piston end.

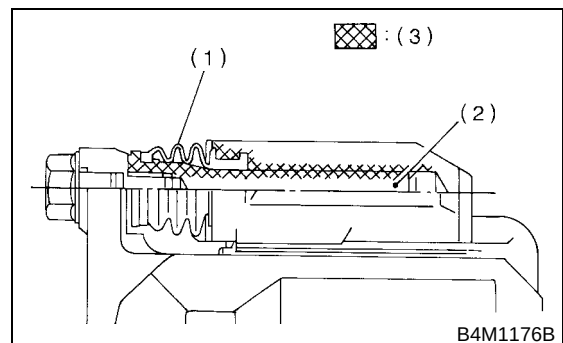


- (1) Piston boot
- (2) Boot ring
- (3) Piston seal
- (4) Caliper body

- 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 lock pin and guide pin, 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.

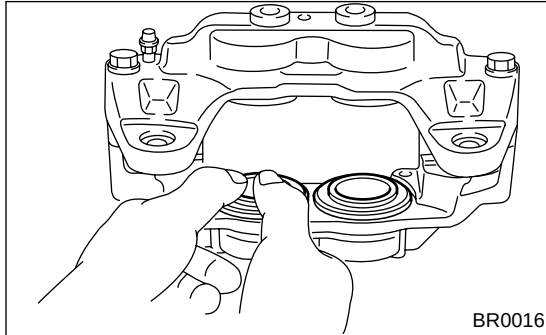
- 9) Install lock pin boot and guide pin boot on support.

3. 16 INCH TYPE

- 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.

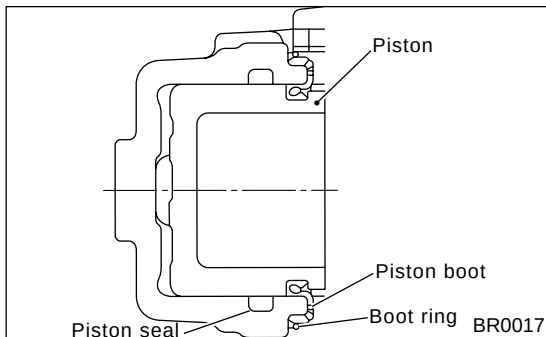


- 5) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and piston.

Grease:

NIGLUBE RX-2 (Part No. 003606000)

To facilitate installation, fit boot starting with piston end.



- 6) Position boot in grooves on cylinder and piston.
- 7) Install boot ring. Be careful not scratch boot.

E: INSPECTION

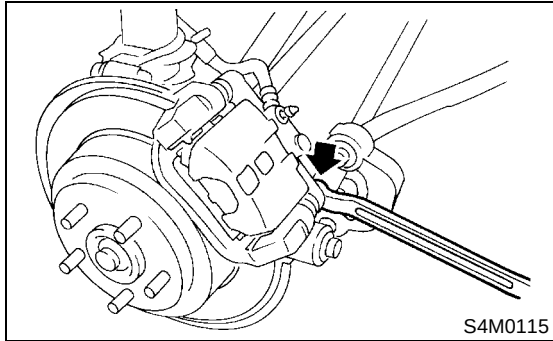
- 1) Repair or replace faulty parts.
- 2) Check caliper body and piston for uneven wear, damage or rust.
- 3) Check rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

1. 14 INCH TYPE

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nuts.
- 4) Jack-up the vehicle, and remove rear wheel.
- 5) Remove lock pin.

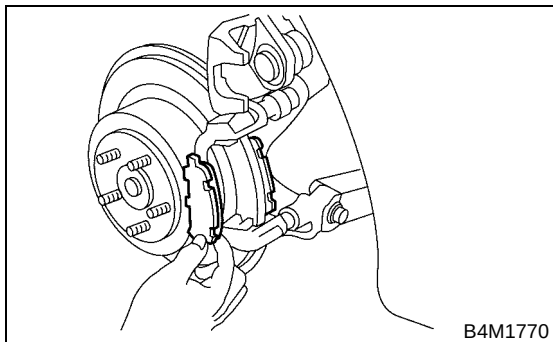


- 6) Raise caliper body.
- 7) Remove pad from support.

NOTE:

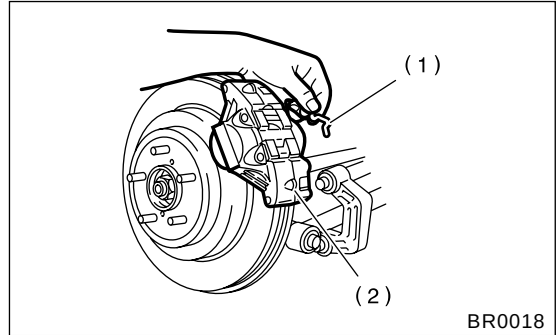
If brake pad is difficult to remove, use the same procedure as for front disc brake pad.

<Ref. to BR-23, REMOVAL, Front Brake Pad.>



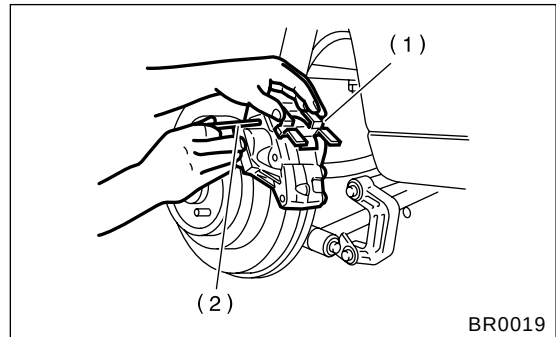
2. 15 INCH TYPE

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nuts.
- 4) Jack-up the vehicle, and remove front wheel.
- 5) Remove M clip.



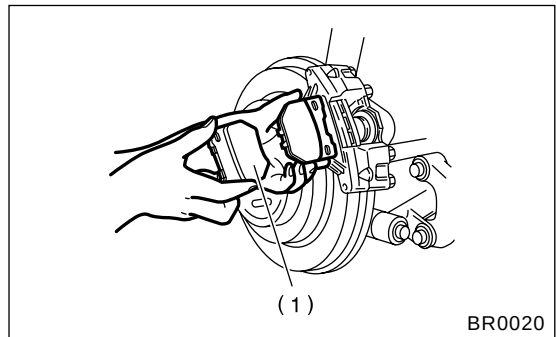
- (1) M clip
- (2) Caliper

- 6) Remove two pad pins.
- 7) Remove cross spring.



- (1) Cross spring
- (2) Pad pin

- 8) Expand the pads and push the piston back.
- 9) Remove pad and shim.



- (1) Brake pad

B: INSTALLATION

1. 14 INCH TYPE

1) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.

2) Install pad on support.

3) 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.

2. 15 INCH TYPE

1) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to frictional portion between pad and pad inner shim.

2) Install pads on caliper body.

3) Install cross spring.

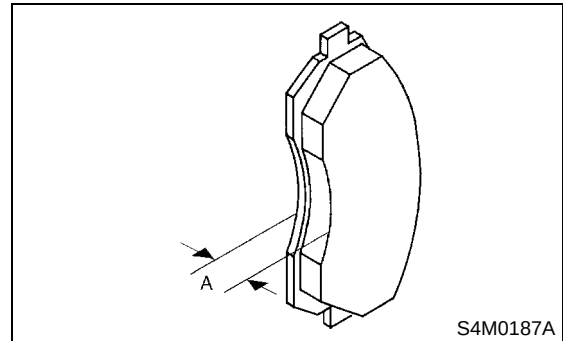
4) Install pad pins on caliper body.

5) Install M clip.

C: INSPECTION

1. 14 INCH TYPE

Check pad thickness A.



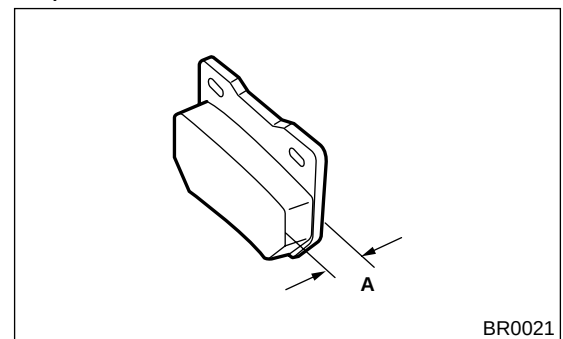
Pad thickness (including back metal)	Standard value	14.0 mm (0.551 in)
	Wear limit	6.5 mm (0.256 in)

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.

2. 15 INCH TYPE

Check pad thickness A.



Pad thickness (including back metal)	Standard value	16 mm (0.63 in)
	Wear limit	6.0 mm (0.236 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

REAR BRAKE PAD

BRAKE

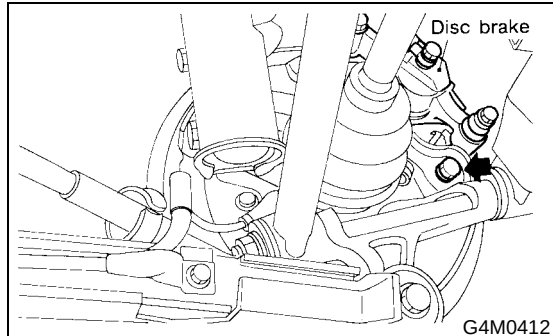
as the wheel rotates. If this sound is heard, replace the pad.

- 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.

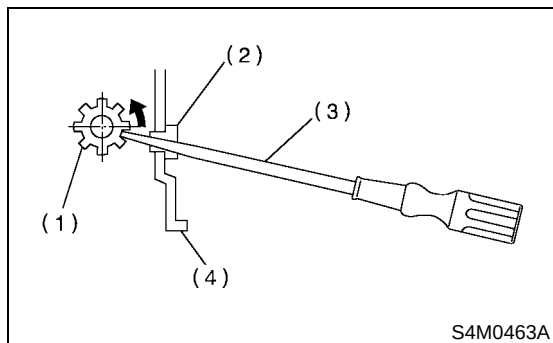


- 3) Suspend the disc brake assembly so that the hose is not stretched.
- 4) Pull down and release parking brake.
- 5) Remove the disc rotor.

NOTE:

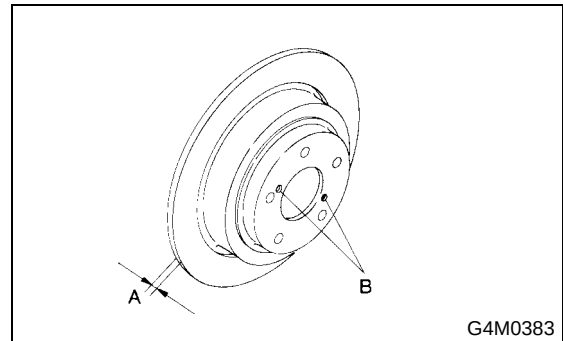
If the disc rotor is difficult to remove try the following two methods in order.

- (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.



REAR DISC ROTOR

BRAKE

B: INSTALLATION

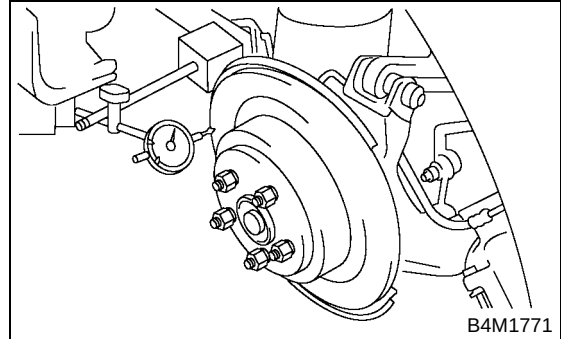
- 1) Install in the reverse order of removal.
- 2) Adjust parking brake. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

C: INSPECTION

- 1) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.

CAUTION:

Securely adjust disc rotor to hub.



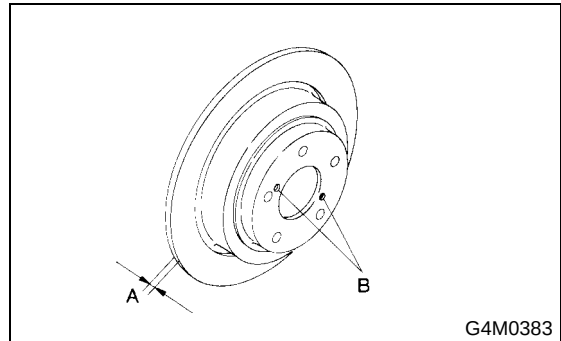
NOTE:

Make sure that dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.

Disc rotor runout limit:

0.075 mm (0.0030 in)

- 2) 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 (14inch type)

Standard value

10 mm (0.39 in)

Service limit

8.5 mm (0.335 in)

Disc rotor thickness: A (15inch type)

Standard value

18 mm (0.71 in)

Service limit

16 mm (0.63 in)

7. Rear Disc Brake Assembly

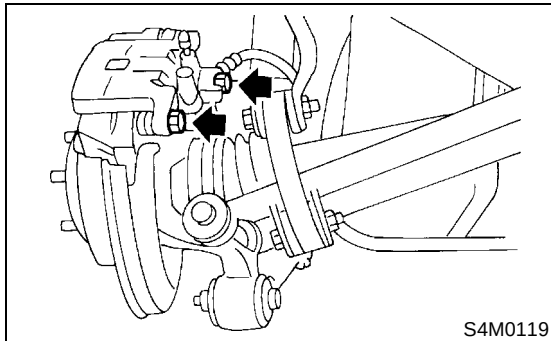
A: REMOVAL

1. 14 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wipe off completely if spilled.

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nuts.
- 4) Lift-up vehicle and remove wheels.
- 5) Disconnect brake hose from caliper body assembly.
- 6) Remove lock pin.



- 7) Raise caliper body and move it toward vehicle center to separate it from support.
- 8) 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.

- 9) Clean mud and foreign particles from caliper body assembly and support.

CAUTION:

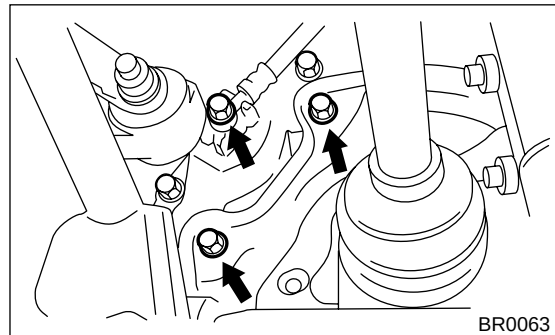
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

2. 15 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wipe off completely if spilled.

- 1) Set the vehicle on the lift.
- 2) Disconnect ground terminal from battery.
- 3) Loosen wheel nuts.
- 4) Lift-up vehicle and remove wheels.
- 5) Remove pads from caliper body. <Ref. to BR-34, REMOVAL, Rear Brake Pad.>
- 6) Disconnect brake hose from caliper body assembly.
- 7) Remove caliper body from housing.



- 8) Remove disc rotor from hub.
- 9) 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).

REAR DISC BRAKE ASSEMBLY

BRAKE

B: INSTALLATION

1. 14 INCH TYPE

- 1) Install disc rotor on hub.
- 2) Install support on back plate.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 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.

- 3) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.
- 4) Install pads on support.
- 5) Install caliper body on support.

Tightening torque:

37 N·m (3.8 kgf-m, 27.5 ft-lb)

- 6) 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.
- 7) Bleed air from brake system.

2. 15 INCH TYPE

- 1) Install disc rotor on hub.
- 2) Install caliper body on housing.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 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.

- 3) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.

- 4) Install pads on caliper body.

- 5) Connect brake hose.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

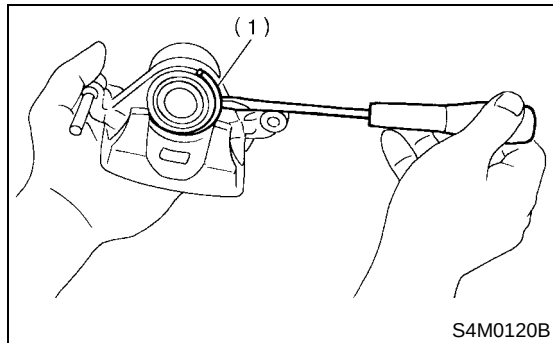
CAUTION:

- The brake hose must be connected without any twist.
 - Replace brake hose gaskets with new ones.
- 6) Bleed air from brake system.

C: DISASSEMBLY

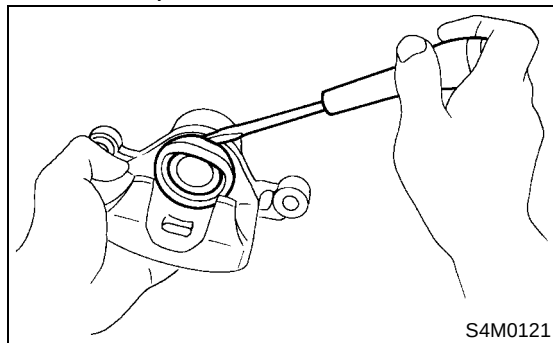
1. 14 INCH TYPE

1) Remove the boot ring.



(1) Boot ring

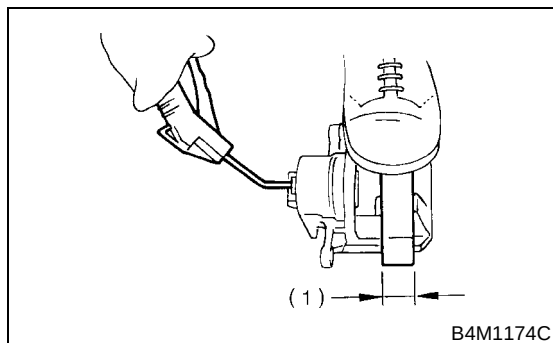
2) Remove the piston boot.



3) Gradually supply compressed air via inlet of caliper body to force piston out.

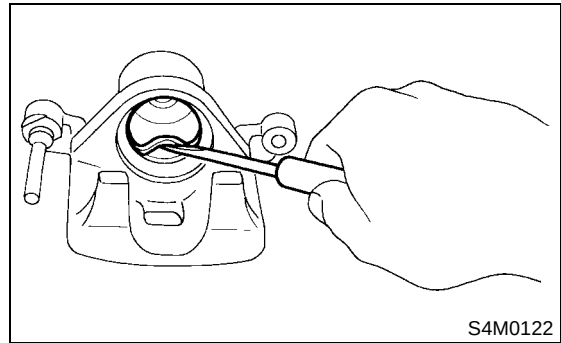
CAUTION:

- 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.

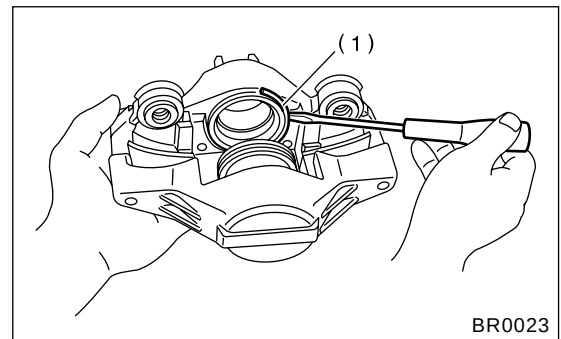


5) Remove lock pin sleeve and boot from caliper body.

6) Remove guide pin boot.

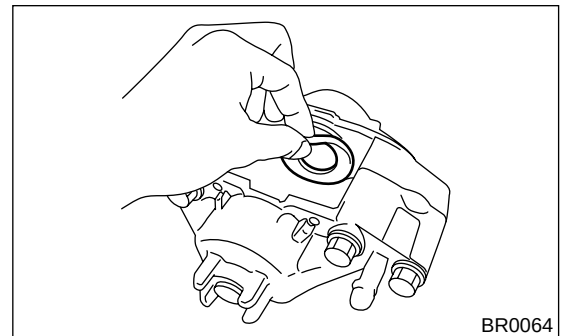
2. 15 INCH TYPE

1) Remove the boot ring.



(1) Boot ring

2) Remove the piston boot.



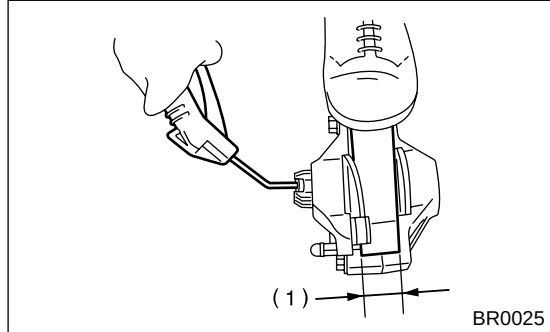
REAR DISC BRAKE ASSEMBLY

BRAKE

3) Gradually supply compressed air via inlet of caliper body to force piston out.

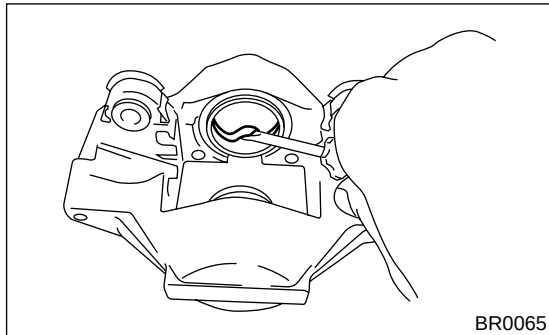
CAUTION:

- 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.



D: ASSEMBLY

1. 14 INCH TYPE

- 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:

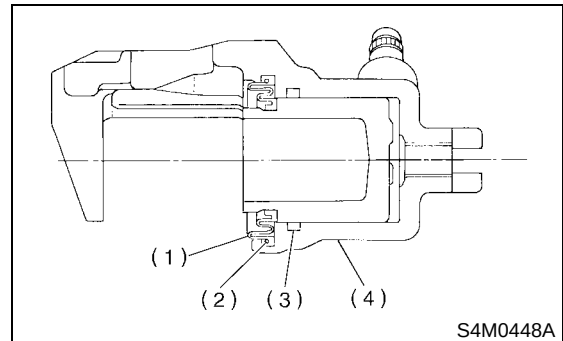
Do not force piston into cylinder.

- 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.

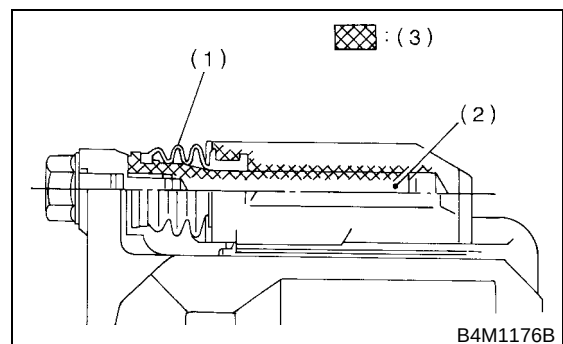


- (1) Piston boot
- (2) Boot ring
- (3) Piston seal
- (4) Caliper body

- 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.

2. 15 INCH TYPE

- 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:

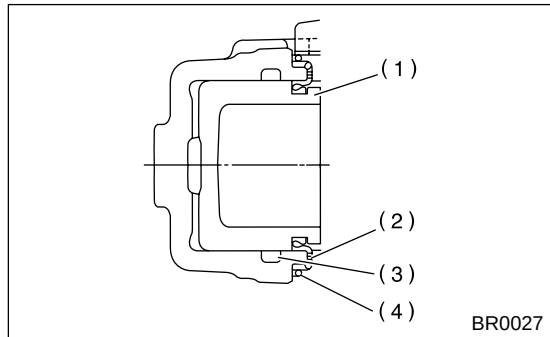
Do not force piston into cylinder.

- 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
- (2) Piston boot
- (3) Piston seal
- (4) Boot ring

- 7) Install shim and brake pad.
- 8) Install pad pin, cross spring, and M clip.

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.

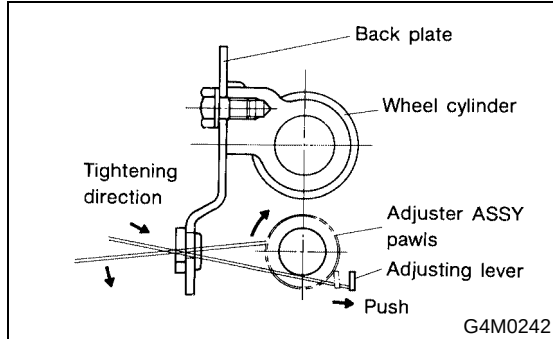
8. Rear Drum Brake Shoe

A: REMOVAL

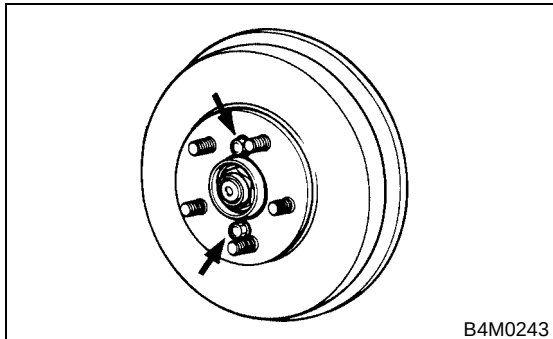
- 1) Loosen wheel nuts, jack-up vehicle, support it with rigid racks, and remove wheel.
- 2) Release parking brake.
- 3) Remove brake drum from brake assembly.

NOTE:

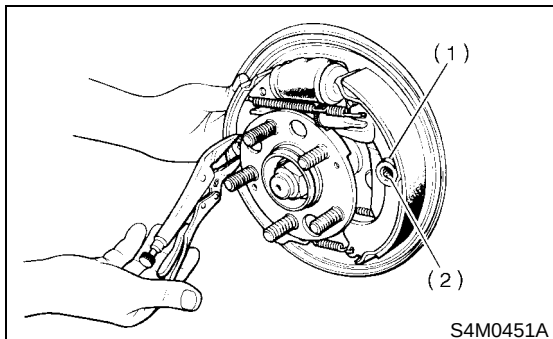
- If it is difficult to remove brake drum, remove adjusting hole cover from back plate, and then turn adjuster assembly pawls using a slot-type screwdriver until brake shoe separates from the drum.



- If brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.



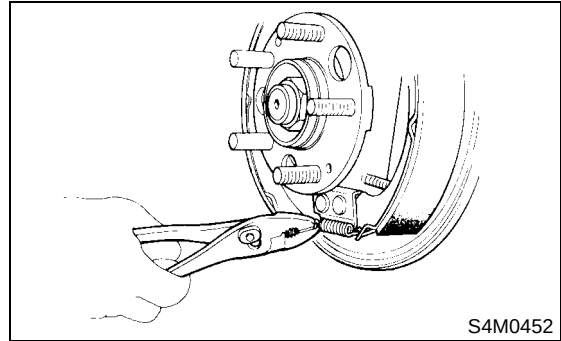
- 4) Hold hold-down pin by securing rear of back plate with your hand.



- (1) Hold-down cup
- (2) Hold-down pin

- 5) Disconnect hold-down cup from hold-down pin by rotating hold-down cup.

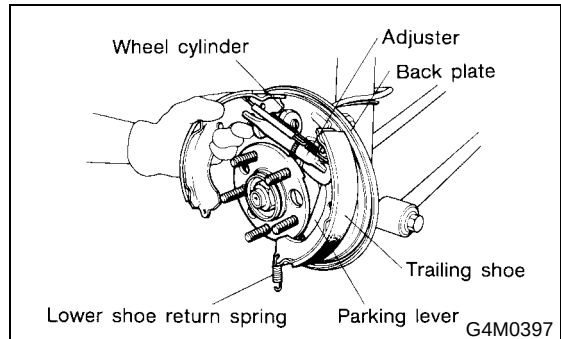
- 6) Disconnect lower shoe return spring from shoes.



- 7) Remove shoes one by one from back plate with adjuster.

CAUTION:

Be careful not to bend parking brake cable excessively when removing brake shoes.



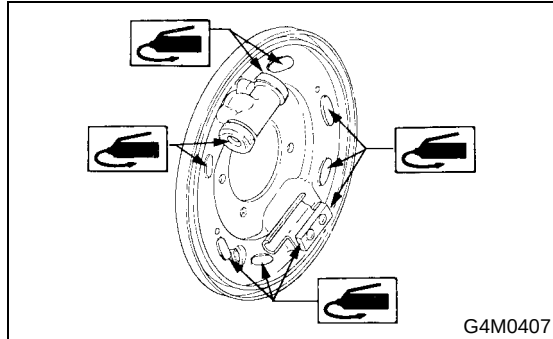
- 8) Disconnect parking brake cable from parking lever.

B: INSTALLATION

- 1) Clean back plate and wheel cylinder.
- 2) Apply grease to portions indicated by arrows in Figure.

Brake grease:

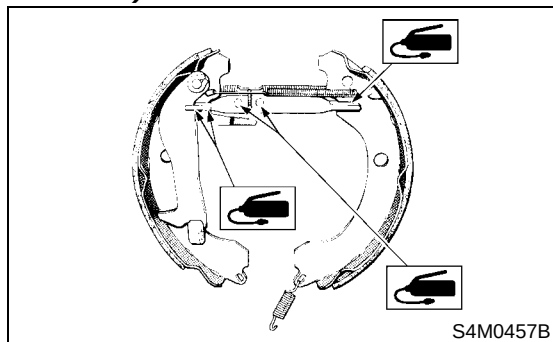
Dow Corning Molykote No. 7439 (Part No. 725191460)



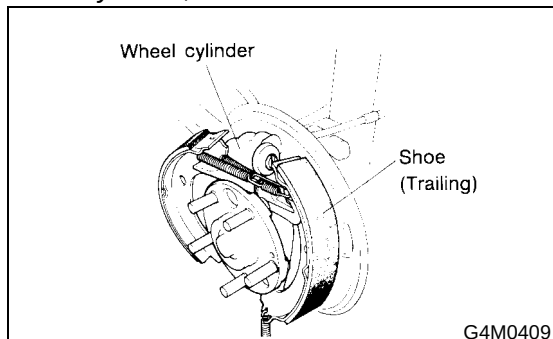
- 3) Apply grease to adjusting screw and both ends of adjuster.

Brake grease:

Dow Corning Molykote No. 7439 (Part No. 725191460)



- 4) Connect upper shoe return spring to shoes.
- 5) Connect parking brake cable to parking lever.
- 6) While positioning shoes (one at a time) in groove on wheel cylinder, secure shoes.



- 7) Fix shoes by connecting hold-down cup to hold-down pin.
- 8) Connect lower shoe return spring.
- 9) Set the outside diameter of brake shoes less than 0.5 to 0.8 mm (0.020 to 0.031 in) in comparison with the inside diameter of brake drum.

C: INSPECTION

- 1) Measure the lining thickness.

Lining thickness:

Standard 4.1 mm (0.161 in)

Service limit 1.5 mm (0.059 in)

- 2) If the deformation or wear of back plate, shoe, etc. are notable, replace them.
- 3) When the shoe return spring tension is excessively weakened, replace it, taking care to identify upper and lower springs.

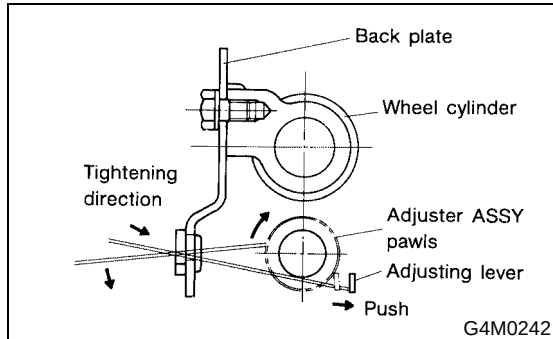
9. Rear Drum Brake Drum

A: REMOVAL

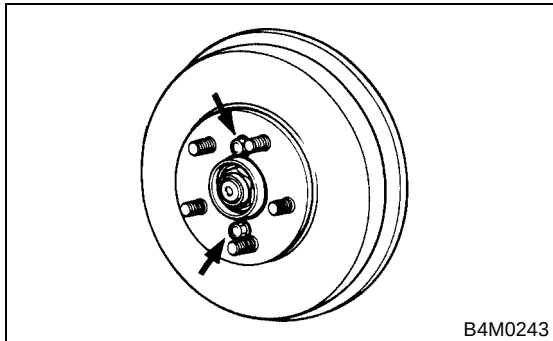
- 1) Loosen wheel nuts, jack-up vehicle, support it with rigid racks, and remove wheel.
- 2) Release parking brake.
- 3) Remove brake drum from brake assembly.

NOTE:

- If it is difficult to remove brake drum, remove adjusting hole cover from back plate, and then turn adjuster assembly pawls using a slot-type screwdriver until brake shoe separates from the drum.



- If brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.



B: INSTALLATION

Set the outside diameter of brake shoes less than 0.5 to 0.8 mm (0.020 to 0.031 in) in comparison with the inside diameter of brake drum.

C: INSPECTION

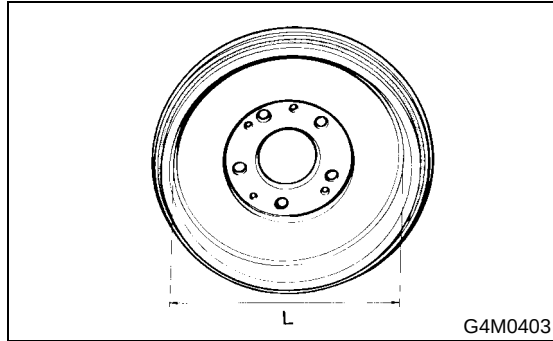
1) If the inside surface of brake drum is streaked, correct the surface. And, if it is unevenly worn, taperingly streaked, or the outside surface of brake drum is damaged, correct or replace it.

2) Measure the drum inner diameter.

Drum inner diameter: "L"

Standard 228 mm (9 in)

Service limit 230.6 mm (9.08 in)



G4M0403

REAR DRUM BRAKE ASSEMBLY

BRAKE

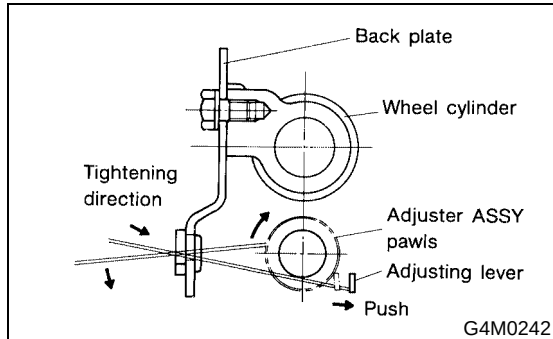
10. Rear Drum Brake Assembly

A: REMOVAL

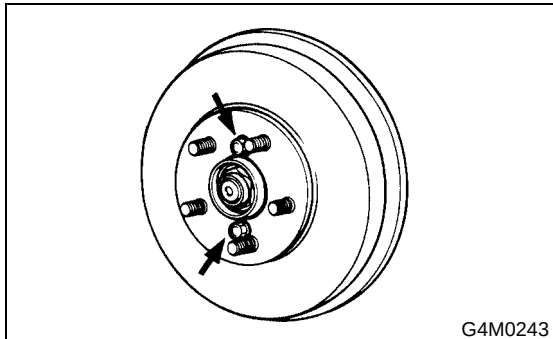
- 1) Loosen wheel nuts, jack-up vehicle, support it with rigid racks, and remove wheel.
- 2) Release parking brake.
- 3) Remove brake drum from brake assembly.

NOTE:

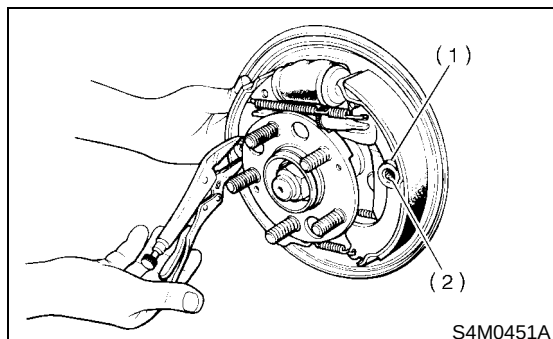
- If it is difficult to remove brake drum, remove adjusting hole cover from back plate, and then turn adjuster assembly pawls using a slot-type screwdriver until brake shoe separates from the drum.



- If brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.



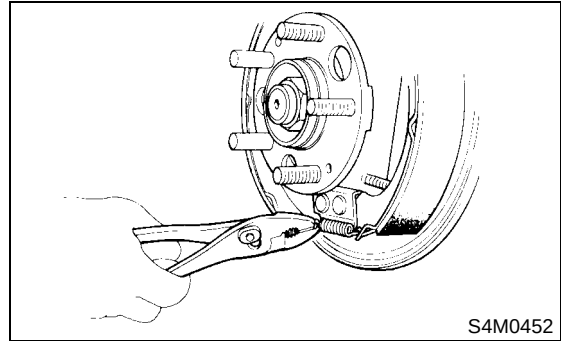
- 4) Hold hold-down pin by securing rear of back plate with your hand.



- (1) Hold-down cup
- (2) Hold-down pin

- 5) Disconnect hold-down cup from hold-down pin by rotating hold-down cup.

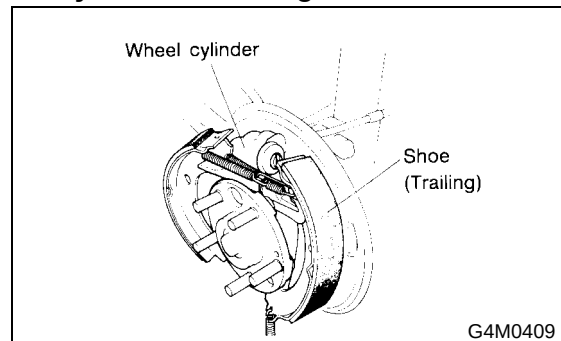
- 6) Disconnect lower shoe return spring from shoes.



- 7) Remove shoes one by one from back plate with adjuster.

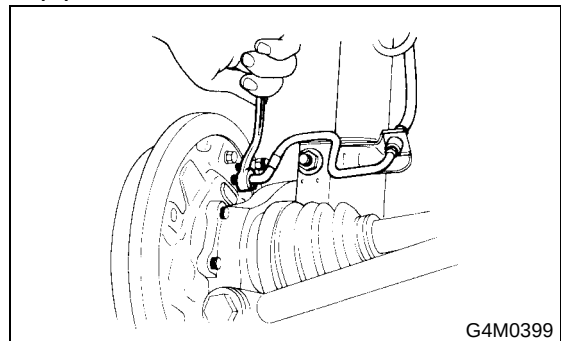
CAUTION:

Be careful not to bend parking brake cable excessively when removing brake shoes.



- 8) Disconnect parking brake cable from parking lever.

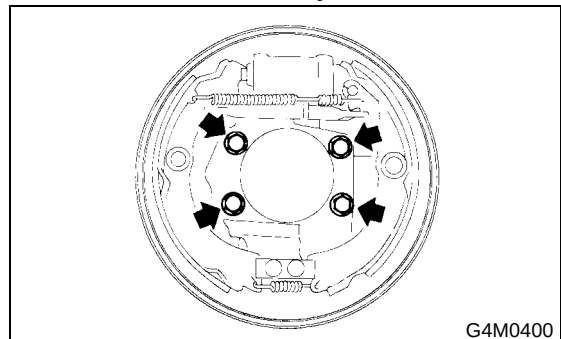
- 9) Unscrew the brake pipe flare nut and disconnect brake pipe.



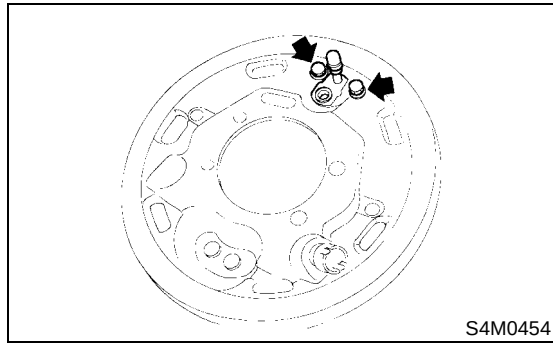
- 10) Remove hub.

<Ref. to DS-24, REMOVAL, Rear Axle.>

- 11) Remove brake assembly.



12) Remove the bolts installing wheel cylinder on back plate, and remove it.

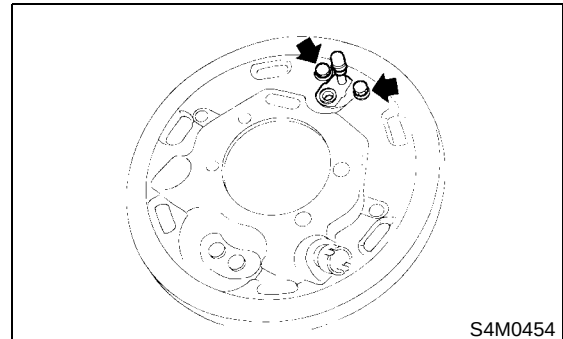


B: INSTALLATION

1) Install wheel cylinder on back plate, and tighten bolts.

Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)

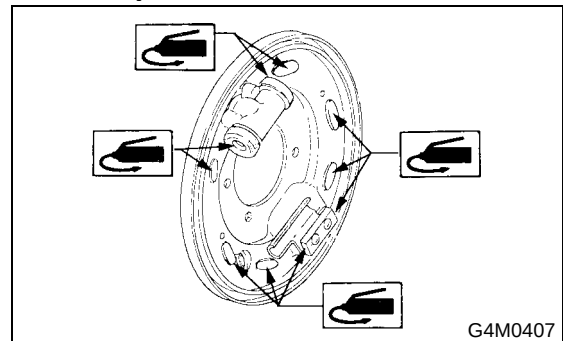


2) Clean back plate and wheel cylinder.

3) Apply grease to portions indicated by arrows in Figure.

Brake grease:

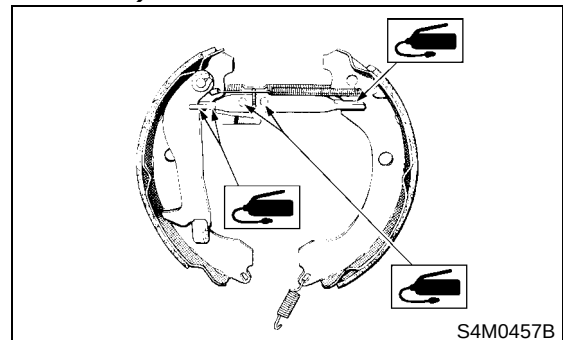
Dow Corning Molykote No. 7439 (Part No. 725191460)



4) Apply grease to adjusting screw and both ends of adjuster.

Brake grease:

Dow Corning Molykote No. 7439 (Part No. 725191460)

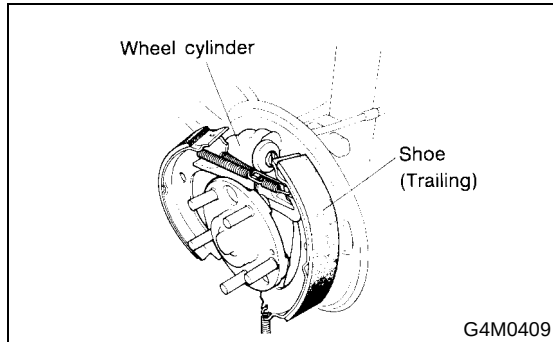


5) Connect upper shoe return spring to shoes.

REAR DRUM BRAKE ASSEMBLY

BRAKE

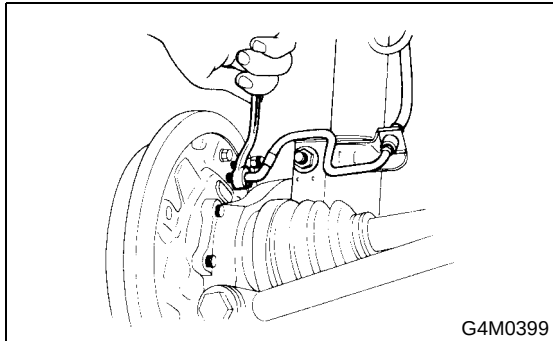
- 6) Connect parking brake cable to parking lever.
- 7) While positioning shoes (one at a time) in groove on wheel cylinder, secure shoes.



- 8) Fix shoes by connecting hold-down cup to hold-down pin.
- 9) Connect lower shoe return spring.
- 10) Set the outside diameter of brake shoes less than 0.5 to 0.8 mm (0.020 to 0.031 in) in comparison with the inside diameter of brake drum.
- 11) Install hub.
- <Ref. to DS-27, INSTALLATION, Rear Axle.>
- 12) Connect brake pipe, and tighten brake pipe flange nut.

Tightening torque:

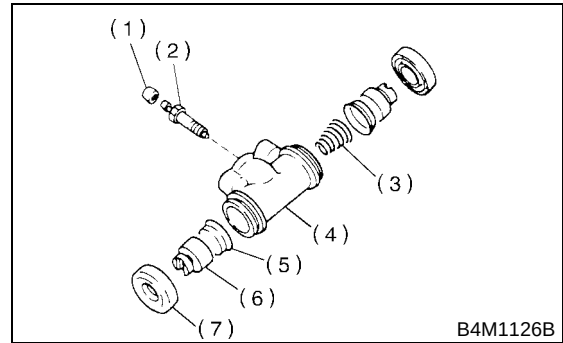
15 N·m (1.5 kgf-m, 10.8 ft-lb)



- 13) Install brake drum.
- 14) After installing brake assembly, bleed air from brake line.

C: DISASSEMBLY

- 1) Remove right and left dust boots from wheel cylinder.



- (1) Bleeder cap
- (2) Bleeder screw
- (3) Spring
- (4) Cylinder
- (5) Cup
- (6) Piston
- (7) Boot

- 2) Remove piston, cup, spring and air bleeder screw and cap.

D: ASSEMBLY

1) Clean all parts in brake fluid. Check and replace faulty parts.

- Cup and boot for damage or fatigue
- Cylinder, piston and spring or damage or rust formation

2) Assembly is the reverse order of disassembly.

(1) When installing the cup, use ST, apply brake fluid to the frictional surface for smooth installation and pay attention to cup direction.

(2) STs are available in different sizes.

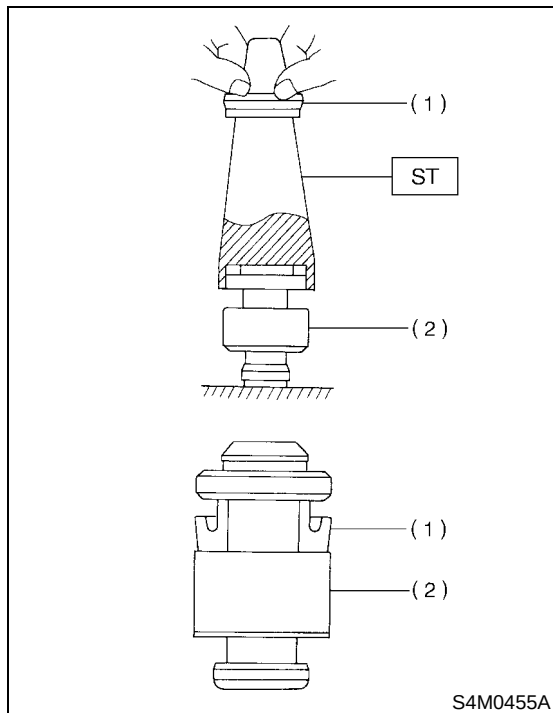
CAUTION:

- When replacing the repair kit, make sure that the sizes of cylinder and cup are the same as those which were replaced.
- Use only the tool of the correct size.

ST: ADAPTER	
Applicable size	Part No.
17.5 mm (11/16 in)	925460000

CAUTION:

While assembling, be careful to prevent any metal chip, dust or dirt from entering the wheel cylinder.



- (1) Cup
(2) Piston

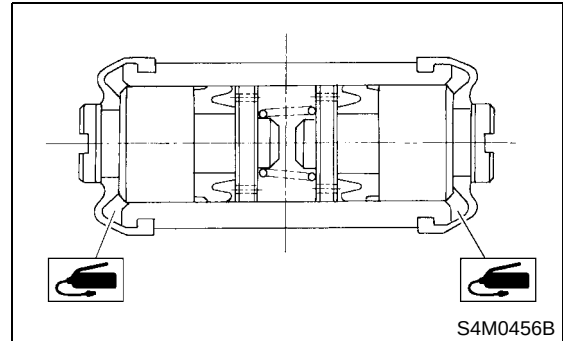
3) Apply rubber grease to the boot inside as shown in Figure.

CAUTION:

Never use brake grease.

Grease:

NIGLUBE RX-2 (Part No. 003606000)



E: INSPECTION

1) If the deformation or wear of back plate, shoe, etc. are notable, replace them.

11.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; wipe 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)

CAUTION:

Be sure to use recommended brake fluid.

- 2) Bleed air from brake system. <Ref. to BR-64, PROCEDURE, Air Bleeding.>

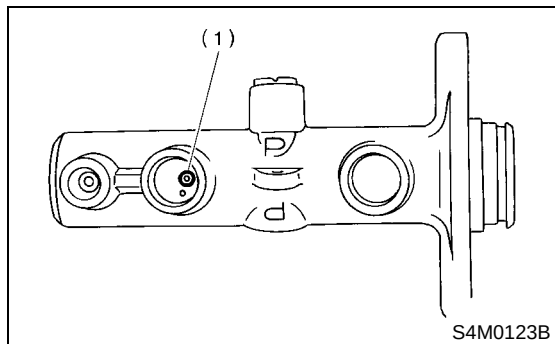
C: DISASSEMBLY

1. PRECAUTIONS FOR DISASSEMBLING

- 1) Remove mud and dirt from the surface of brake master cylinder.
- 2) Prepare tools necessary for disassembly operation, and arrange them neatly on work bench.
- 3) Clean work bench.

2. DISASSEMBLING PROCEDURE

- 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. (with ABS)

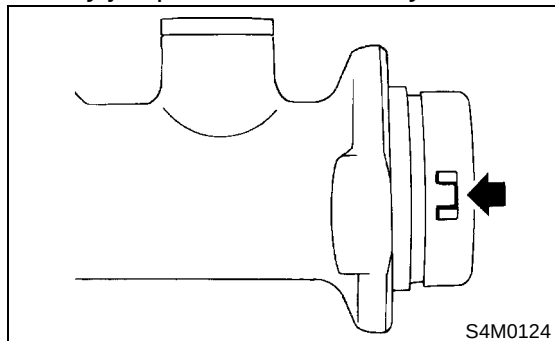


(1) Cylinder pin

- 3) Pry up the pawl and remove the piston retainer.

NOTE:

Piston may jump out from master cylinder.



- 4) 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 or methanol to wash inside wall of cylinder, pistons and piston cups. Be careful not to damage parts when washing. If methanol is used for washing, do not dip rubber parts, such as piston cups, in it for more than 30 seconds; otherwise, they may become swelled.

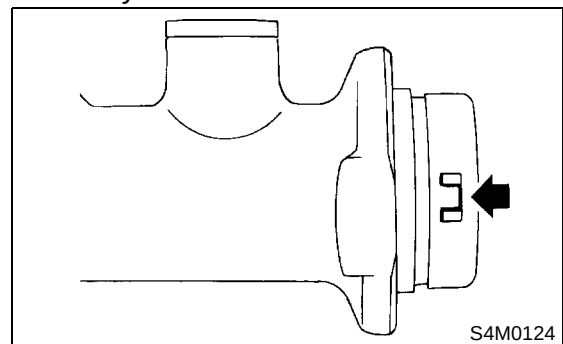
D: ASSEMBLY

1. PRECAUTIONS FOR ASSEMBLING

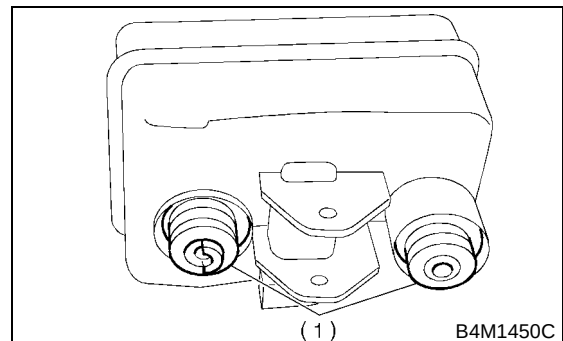
- 1) When assembling, be sure to use recommended brake fluid.
- 2) Ensure that the inside wall of cylinder, pistons, and piston cups are free from dirt when assembling.
- 3) Be extremely careful not to damage, scratch, or dent cylinder inside wall, pistons, and piston cups.
- 4) Do not drop parts. Never attempt to use any part that has been dropped accidentally.

2. ASSEMBLING PROCEDURE

- 1) Assembling piston assembly:
Apply recommended brake fluid to inside wall of cylinder, and to outer surface of piston assembly, and install piston assemblies carefully into cylinder.
- 2) Assembling cylinder pin:
- 3) Press the pawl and install the piston retainer into the master cylinder.



- 4) Install seal to reservoir tank.



(1) Seal

- 5) 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.

12.Brake Booster

A: REMOVAL

1) 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.

2) Remove the following parts from the pedal bracket.

- (1) Snap pin and clevis pin
- (2) Four brake booster installing nuts

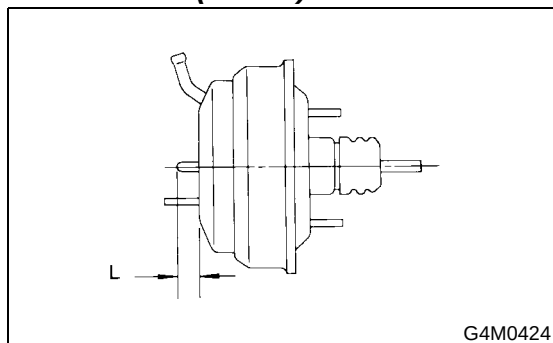
3) Remove brake booster while shunning brake pipes.

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.

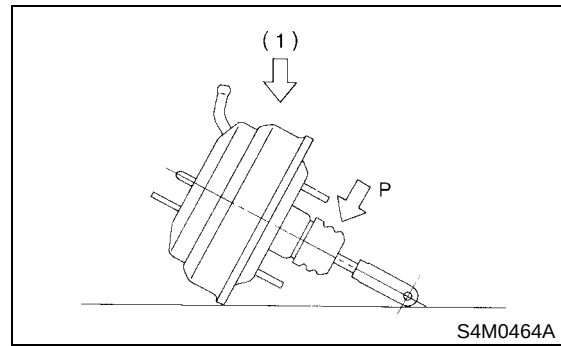
Standard:

L = 10.4 mm (0.41 in)



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.



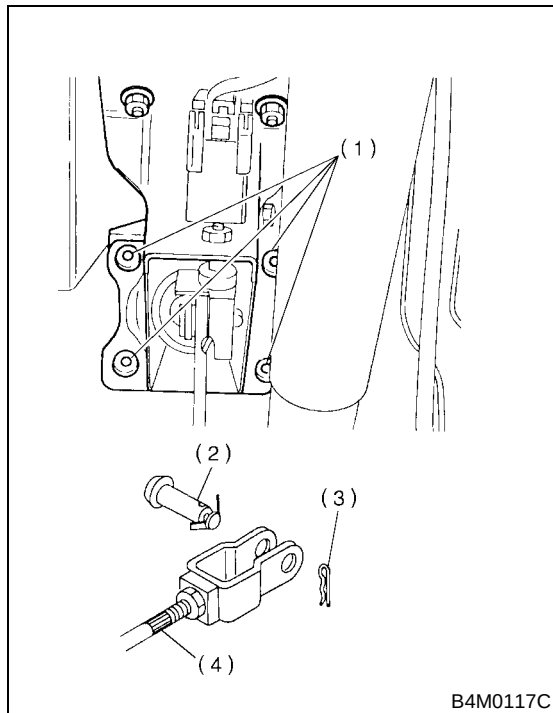
(1) Force

BRAKE BOOSTER

BRAKE

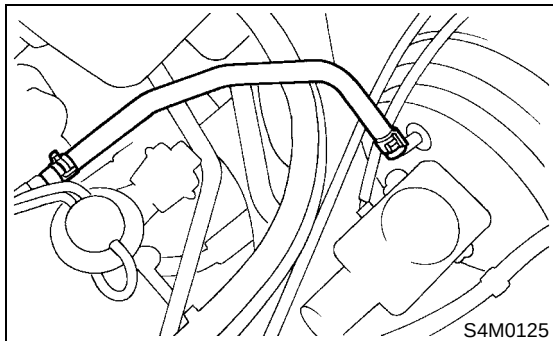
B: INSTALLATION

- 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

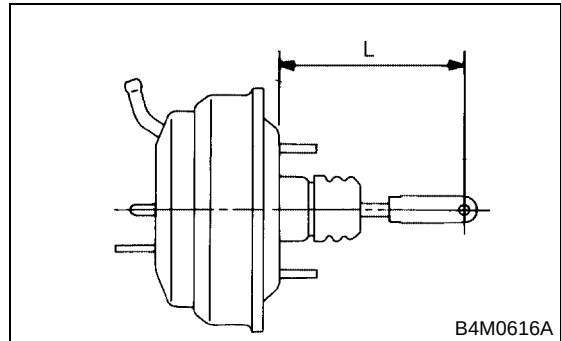
LHD model:

144.6 mm (5.69 in)

RHD model:

173.2 mm (6.82 in)

If it is not in specified value, adjust it by adjusting brake booster operating rod.



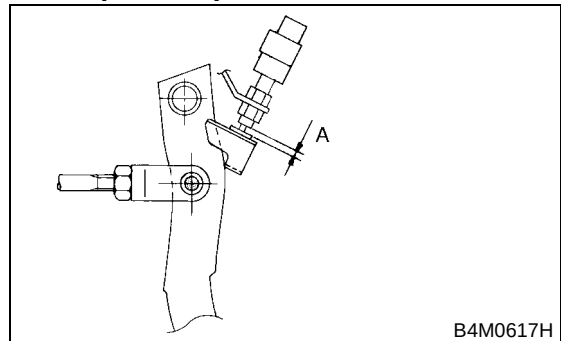
- 8) Measure the clearance between threaded end of stop light switch and stopper. If it is not in specified value, adjust it by adjusting position of stop light switch.

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:**

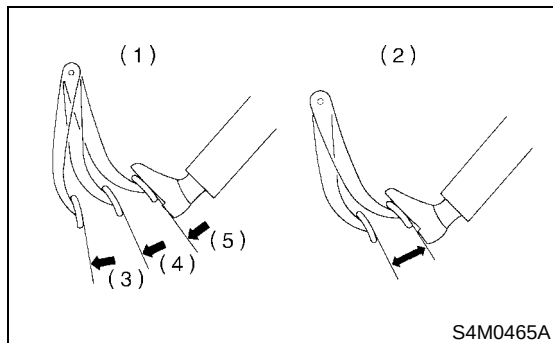
When checking operation, be sure to securely apply the hand brake.

• 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.



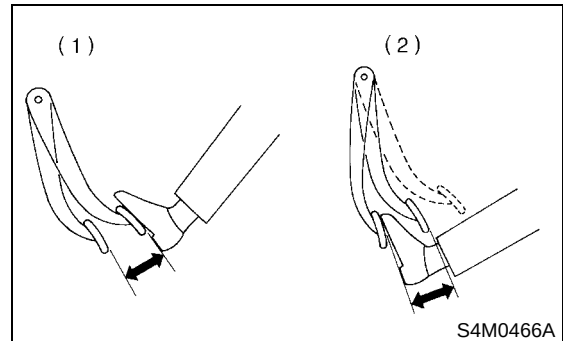
- (1) OK
- (2) NOT OK
- (3) 1st
- (4) 2nd
- (5) 3rd

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.

• 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.

BRAKE BOOSTER

BRAKE

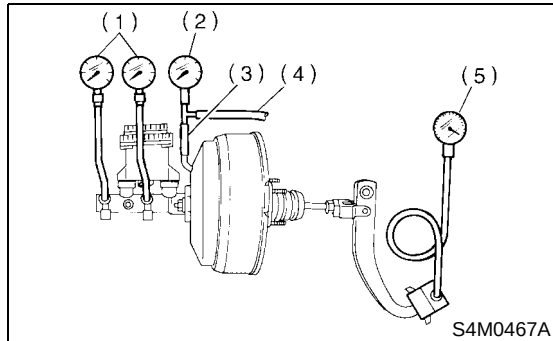
2. OPERATION CHECK (WITH GAUGES)

CAUTION:

When checking operation, be sure to securely apply the hand brake.

• Checking with gauges

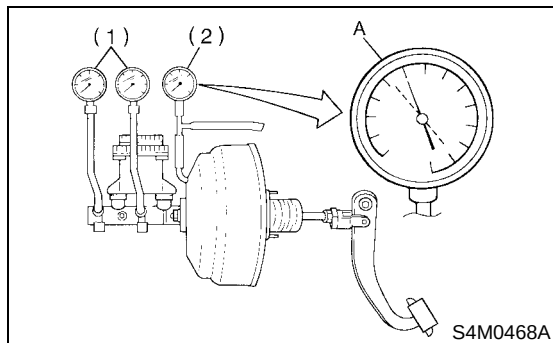
Connect gauges as shown in Figure. After bleeding air from pressure gauges, proceed to each check.



- (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

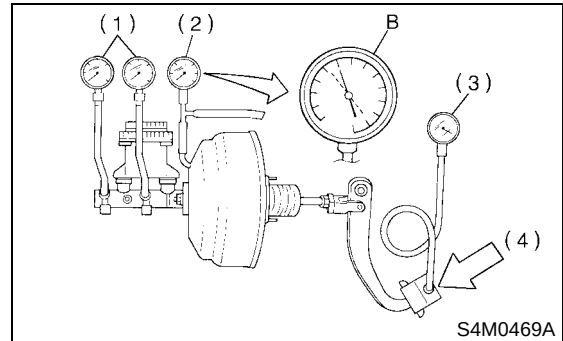
2) Stop engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.

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 inHg) = 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-57, INSPECTION, Brake Booster.>

• Lack of boosting action check

Turn off engine, and set the vacuum gauge reading at "0". Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Brake pedal force		147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	14"	686 kPa (7 kg/cm ² , 100 psi) [588 kPa (6 kg/cm ² , 85 psi)]	1,961 kPa (20 kg/cm ² , 284 psi) [1,667 kPa (17 kg/cm ² , 242 psi)]
	15"	686 kPa	1,715 kPa
	16"	(6 kg/cm ² , 100 psi)	(15 kg/cm ² , 250 psi)

[]: ABS equipped vehicle.

• Boosting action check

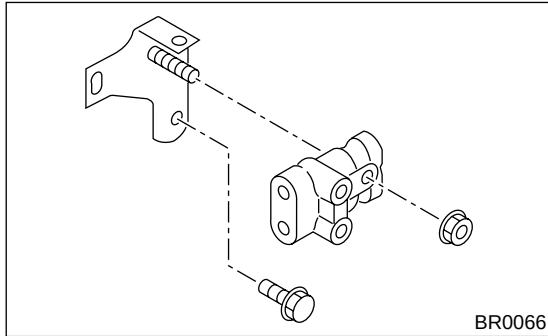
Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Brake pedal force		147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	14"	5,982 kPa (61 kg/cm ² , 868 psi) [7,061 kPa (72 kg/cm ² , 1,024 psi)]	7,649 kPa (78 kg/cm ² , 1,109 psi) [8,434 kPa (86 kg/cm ² , 1,223 psi)]
	15"	5,296 kPa (54 kg/cm ² , 768 psi)	9,120 kPa (93 kg/cm ² , 1,323 psi)
	16"	4,707 kPa (48 kg/cm ² , 683psi)	

[]: ABS equipped vehicle.

13. Proportioning Valve

A: REMOVAL



- 1) Remove brake pipe from proportioning valve at four places.
- 2) 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)

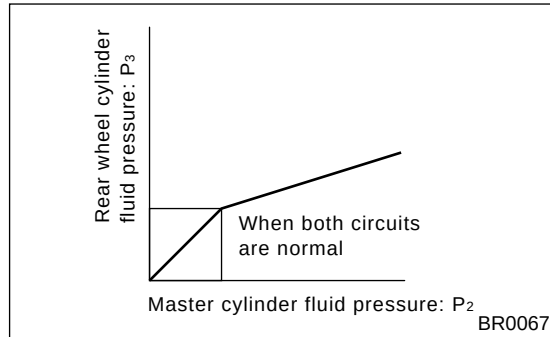
C: INSPECTION

1) Install the 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 the oil pressure gauges.

3) Check the master cylinder fluid pressure and rear wheel cylinder fluid pressure.

The standard values are shown in Figure.



4) For the oil pressure in case of split point, refer to "SPECIFICATIONS".

<Ref. to BR-2, SPECIFICATIONS, General Description.>

14.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:

- 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.

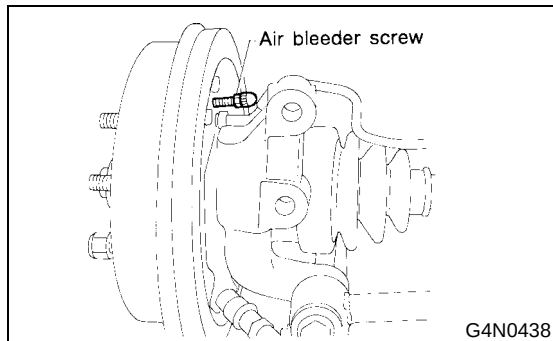
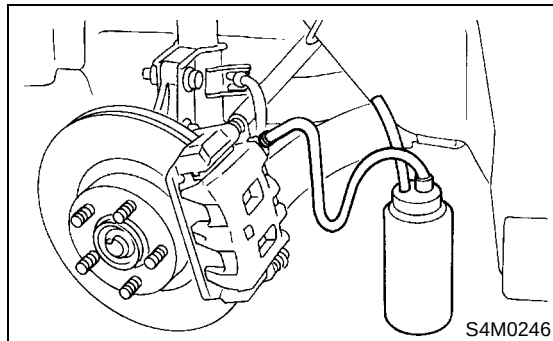
NOTE:

- During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - Brake pedal operating must be very slow.
 - For convenience and safety, two people should do the work.
 - 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.
- 1) Either jack-up vehicle and place a safety stand under it, or left 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 of the tube into a container to collect the brake fluid.



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.

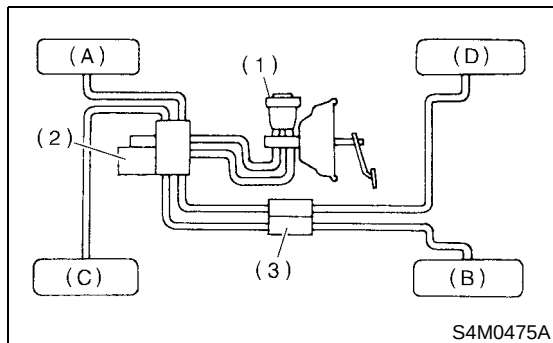
11) Depress brake pedal with a force of approximately 294 N (30 kgf, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it shows any unusual movement.

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.

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.

15. 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.

NOTE:

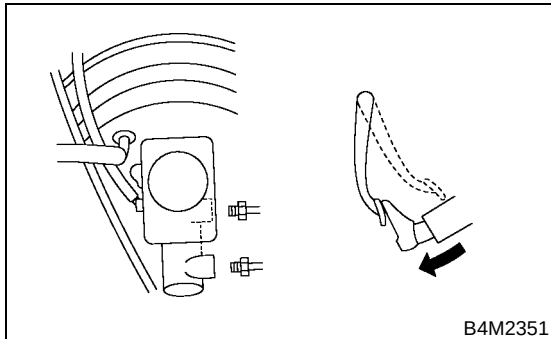
- Start with the brakes (wheels) connected to the secondary chamber of the master cylinder.
- The time interval between two brake pedal operations (from the time when the pedal is released to the time when it is depressed another time) shall be approximately 3 seconds.
- The air bleeder on each brake shall be released for 1 to 2 seconds.

1. MASTER CYLINDER

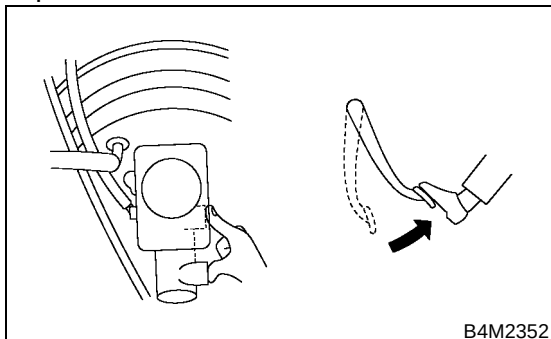
NOTE:

If master cylinder is disassembled or reservoir tank is empty, bleed master cylinder.

- 1) Disconnect brake line at primary and secondary sides.
- 2) Carefully depress and hold brake pedal.



- 3) Close outlet plug with your finger, and release brake pedal.



- 4) Repeat above step2) and 3) until brake fluid is completely bled from outlet plug.

- 5) Install brake pipes to master cylinder.

Tightening torque:

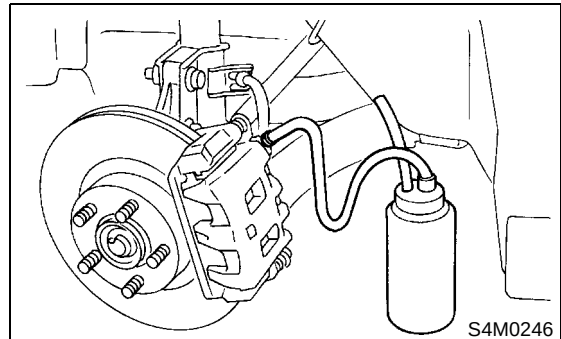
8 N·m (0.8 kgf-m, 5.8 ft-lb)

- 6) Bleed air from brake line. <Ref. to BR-64, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

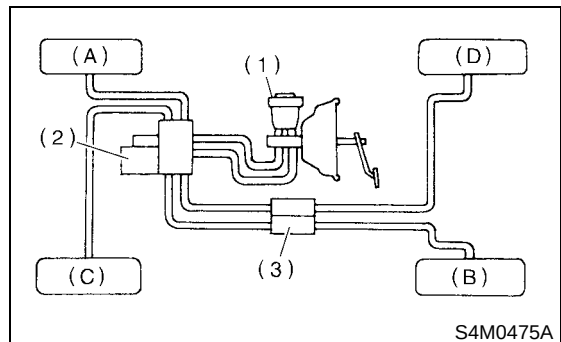
NOTE:

- During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - Brake pedal operating 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.

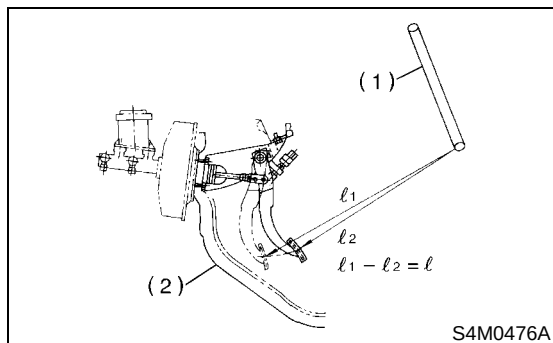
Air bleeder tightening torque:

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) Steering wheel

(2) Toe board

Specified pedal stroke:

Without ABS

90 mm (3.54 in)

With ABS

95 mm (3.74 in)

When depressing brake pedal with a 490 N (50 kg, 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-11, ABS 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.

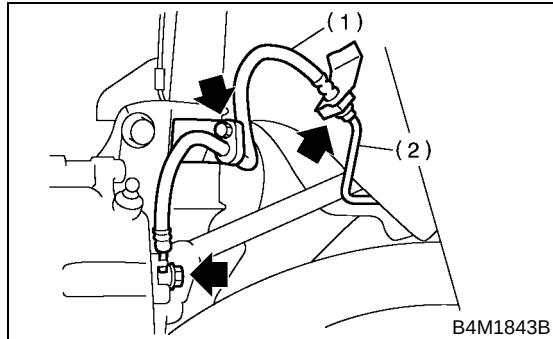
12) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

16.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

- 1) Separate brake pipe from brake hose.
(Always use flare nut wrench and be careful not to deform flare nut.)



- (1) Brake hose
- (2) Brake pipe

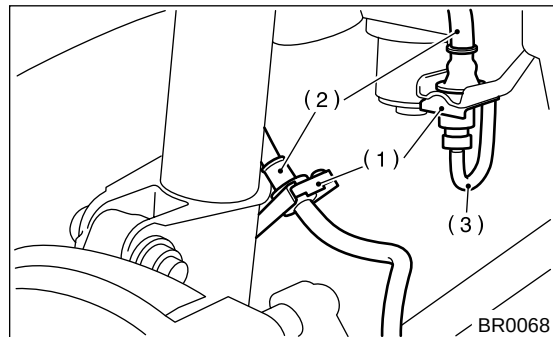
- 2) Pull out clamp to remove brake hose.
- 3) Remove bolt at strut and union bolt.

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 hose clip
- (2) Brake hose
- (3) Brake pipe

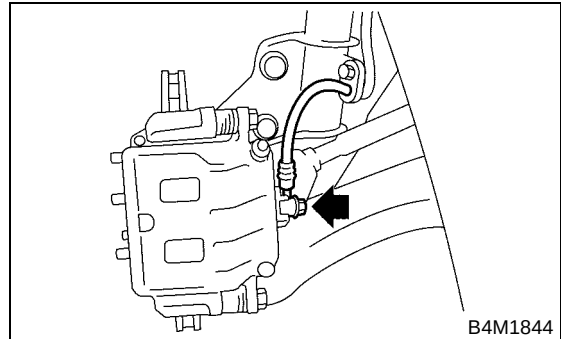
- 2) Pull out clamp to remove brake hose.

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.

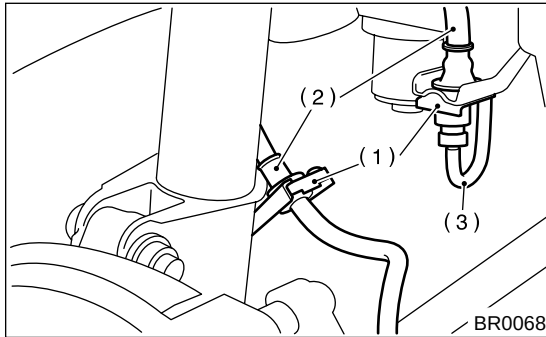
Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

- 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 hose clip
- (2) Brake hose
- (2) 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.

17.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:

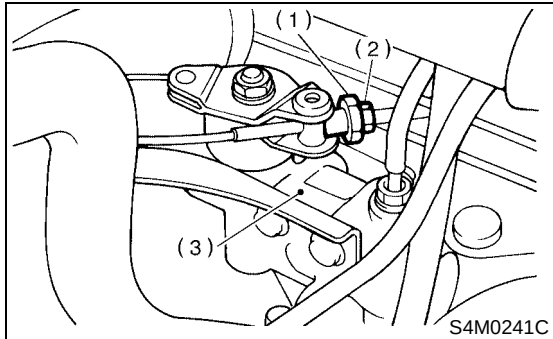
Use a mirror when inspecting low-visible part or back side.

18.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.

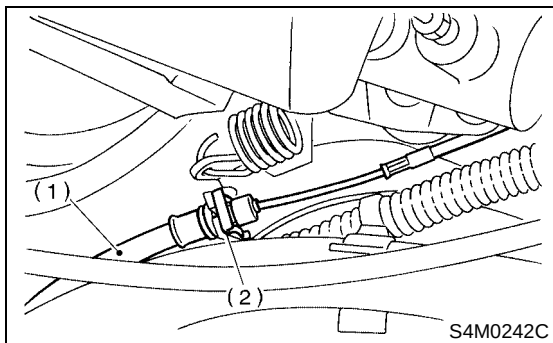


- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 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.

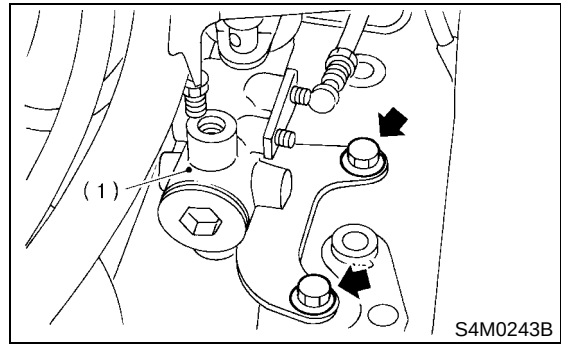
CAUTION:

- 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:

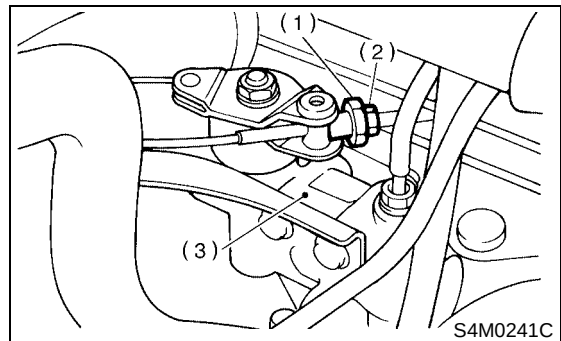
Exercise utmost care to prevent foreign matter from entering into PHV when removing it.



- (1) PHV

2. PHV CABLE

- 1) Remove adjusting nut and lock nut.

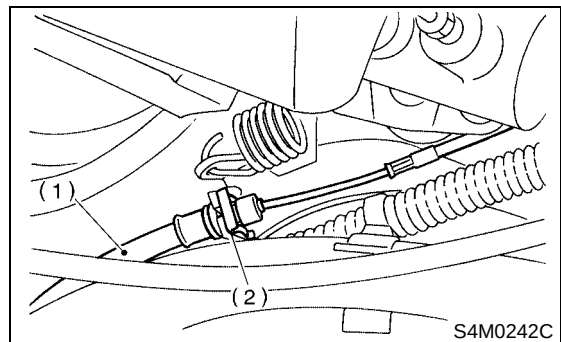


- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 2) Remove cable clamp, and disconnect PHV cable from PHV.

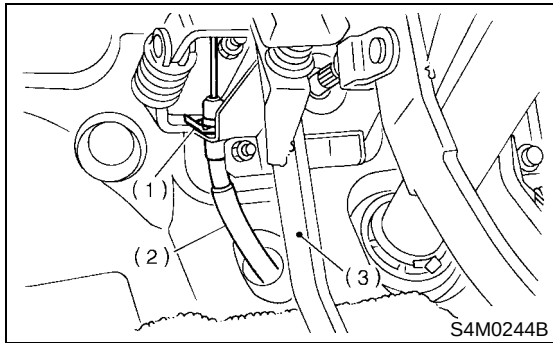
CAUTION:

Carefully protect boot and inner cable from damage when disconnecting PHV cable.



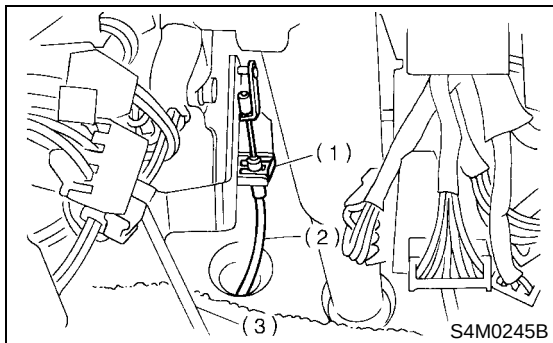
- (1) PHV cable
- (2) Clamp

- 3) Remove cable clamp from clutch pedal bracket.
LHD model



- (1) Clamp
 (2) PHV cable
 (3) Clutch pedal

RHD model



- (1) Clamp
 (2) PHV cable
 (3) Clutch pedal

- 4) Remove PHV cable.

B: INSPECTION

Check up removed parts as follows, and replace defective ones.

- 1) Check if boots of PHV cable are damaged or degraded, and 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.

C: 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-71, PHV CABLE, INSTALLATION, Hill Holder.>

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-72, ADJUSTMENT, Hill Holder.>

CAUTION:

After replacing PHV cable with new one, operate clutch pedal about 30 times as a running-in operation prior to adjustment.

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;

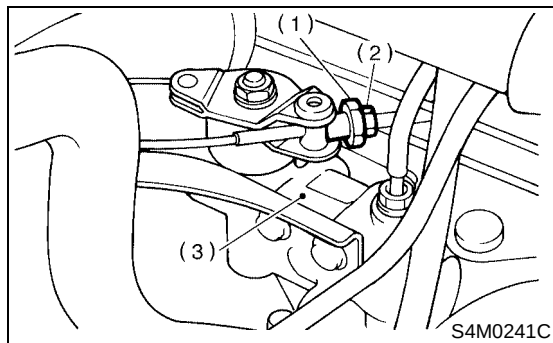
- Case A — When hill holder is released later than engagement of clutch pedal (Engine tends to stall.): Loosen adjusting nut gradually until smooth starting is enabled.

- 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)

19.Brake Pedal

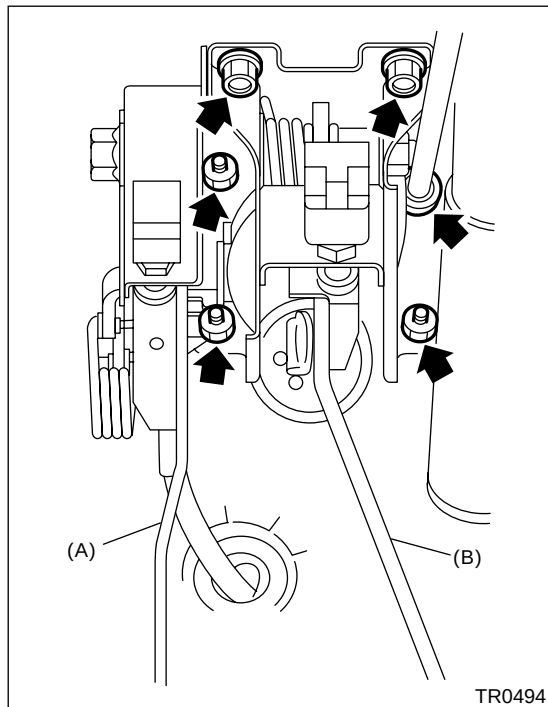
A: REMOVAL

1. LHD 1.6 L MT MODEL

- 1) Disconnect ground cable from battery.
- 2) Disconnect clutch cable from release lever.
- 3) Remove instrument panel lower cover from instrument panel.
- 4) Disconnect the following parts from pedal bracket.
 - Operating rod of brake booster
 - Electrical connectors (for stop light switch, etc.)
- 5) Remove clevis pin which secures pedal to push rod.
- 6) Remove bolts and nuts which secure brake and clutch pedals, and remove pedal bracket and clutch cable as a unit.

CAUTION:

Before removing clutch cable from toe board, remove grommet. Slowly remove clutch cable, being careful not to scratch it.



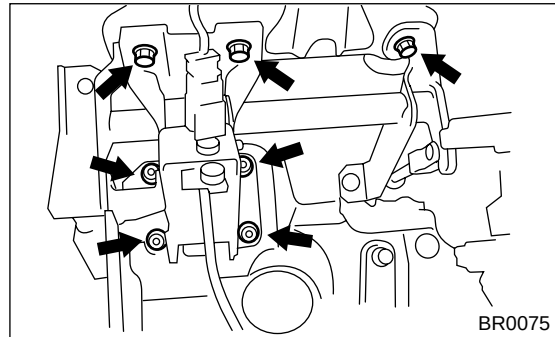
- (1) Clutch pedal
- (2) Brake pedal

- 7) Depress clutch pedal, disconnect clutch cable from clutch pedal.

2. LHD 2.0 L MT MODEL

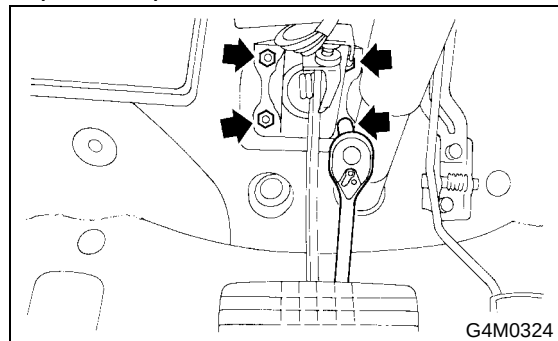
- 1) Remove steering bolts.
- 2) Raise vehicle on hoist and remove the two bolts which secure steering unit to underside of body.
- 3) Lower vehicle to floor.

- 4) Remove instrument panel lower cover from instrument panel.
- 5) Disconnect the following parts from pedal bracket.
 - Operating rod of brake booster
 - Electrical connectors (for stop light switch, etc.)
- 6) Remove clevis pin which secures lever to push rod.
- 7) Remove nut which secures clutch master cylinder.
- 8) Remove steering assembly.
- 9) Remove accelerator pedal.
- 10) Remove bolts and nuts which secure pedal bracket.



3. AT MODEL AND RHD MT MODEL

- 1) Disconnect ground cable from battery.
- 2) Remove instrument panel lower cover from instrument panel.
- 3) Remove clevis pin which secures brake pedal to brake booster operating rod. Also disconnect stop light switch connector.
- 4) Remove two bolts and four nuts which secure brake pedal to 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 CL-36, ADJUSTMENT, Clutch Pedal.>

3) Inspect after pedal installation <Ref. to BR-76, INSPECTION, Brake Pedal.>

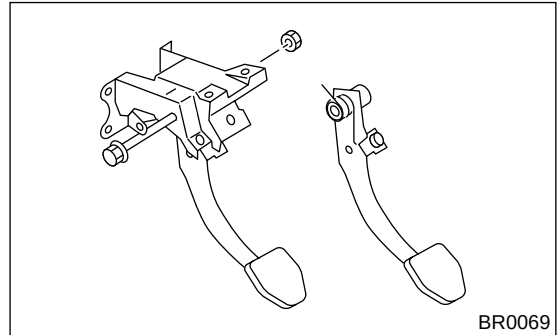
C: DISASSEMBLY

1. LHD 1.6 L MT MODEL

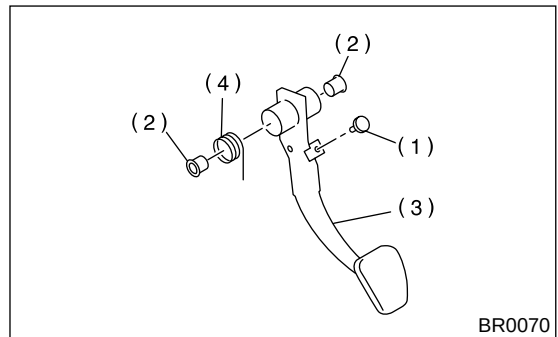
1) Remove the stop light switch.

<Ref. to BR-77, REMOVAL, Stop Light Switch.>

2) Remove nut and pull out the bolt until brake pedal is able to remove, then remove brake pedal.



3) Remove bush, spring and stopper.



- (1) Stopper
- (2) Bushing
- (3) Brake pedal
- (4) Brake pedal spring

4) Remove the brake pad.

2. LHD 2.0 L MT MODEL

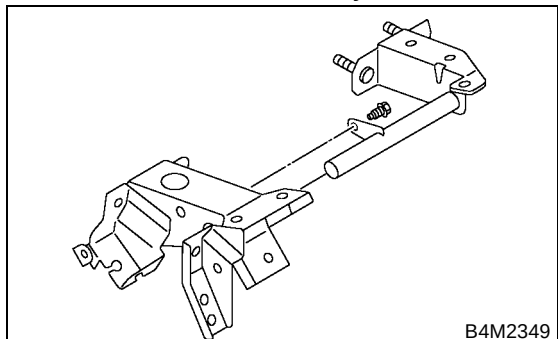
1) Remove the brake switch.

<Ref. to BR-77, REMOVAL, Stop Light Switch.>

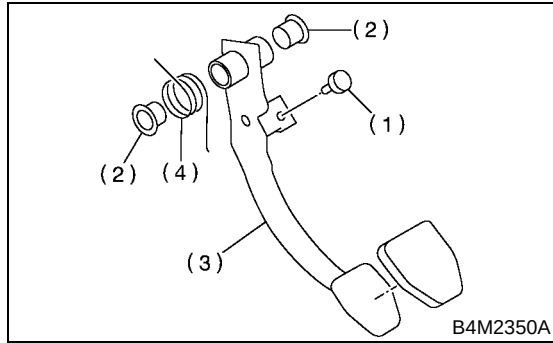
2) Remove the clutch pedal.

<Ref. to CL-34, DISASSEMBLY, Clutch Pedal.>

3) Remove the clutch master cylinder bracket.



4) Remove bush, spring and stopper.

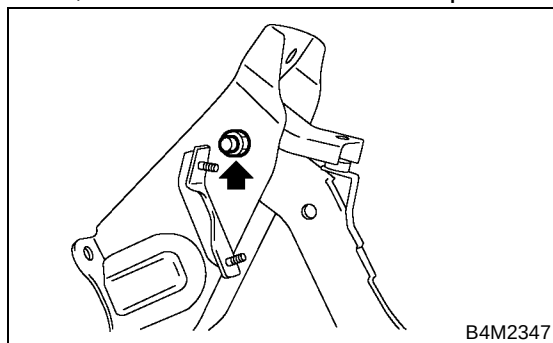


- (1) Stopper
- (2) Bushing
- (3) Brake pedal
- (4) Brake pedal spring

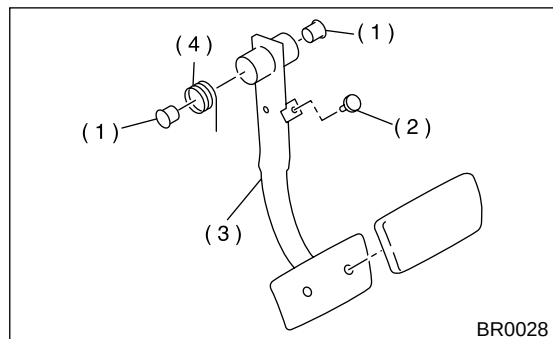
5) Remove the brake pedal pad.

3. AT MODEL AND RHD MT MODEL

- 1) Remove the brake switch.
- 2) Unbolt, and then remove the brake pedal.



3) Remove bush, spacer and spring.



- (1) Plug
- (2) Stopper
- (3) Brake pedal
- (4) Brake pedal spring

4) Remove the brake pedal pad.

D: ASSEMBLY

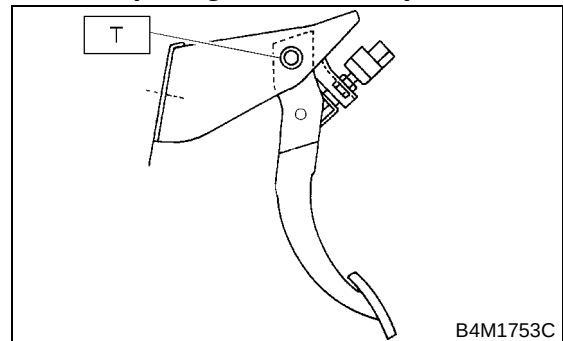
- 1) Attach stop light switch, etc. to pedal bracket temporarily.
- 2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.
- 3) Align bores of pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring and clutch pedal effort reducing spring (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)



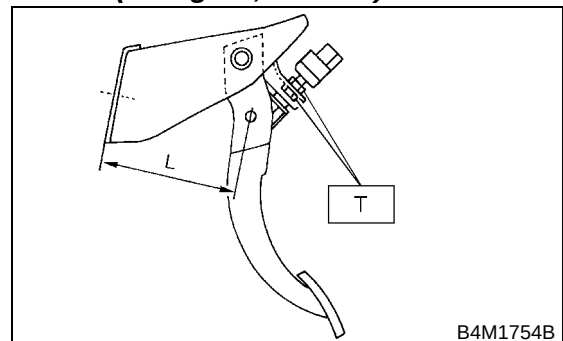
4) Set brake pedal position by adjusting position of stop light switch.

Pedal position: L

125.9 mm (4.96 in)

Tightening torque:

T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



BRAKE PEDAL

BRAKE

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.

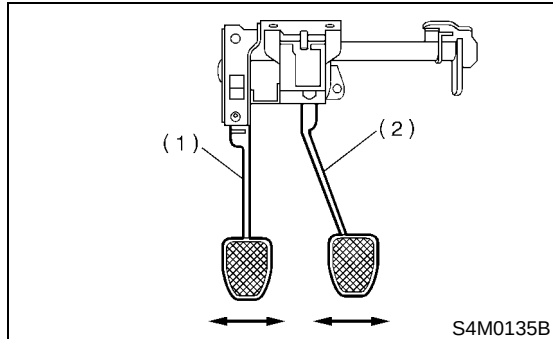
CAUTION:

If excessive deflection is noted, replace bushings with new ones.

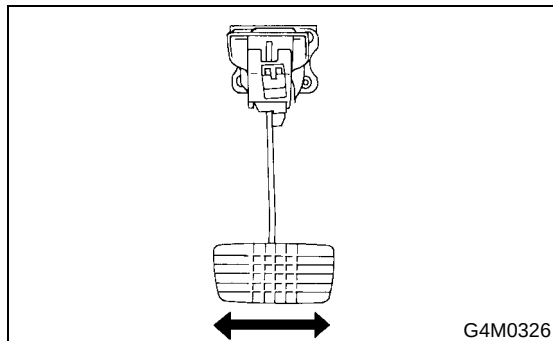
Deflection of brake and clutch pedal:

Service limit

5.0 mm (0.197 in) or less



- (1) Clutch pedal
- (2) Brake pedal



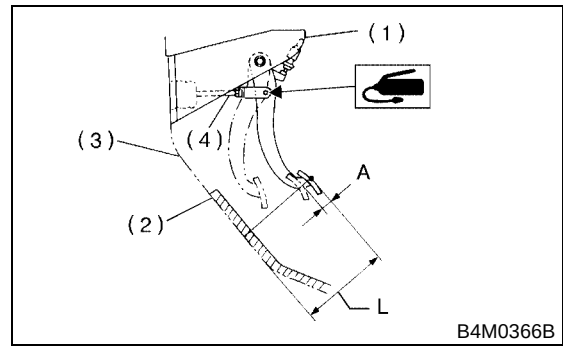
2) Check position of pedal pad.

Pedal height: L

148 mm (5.83 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).]



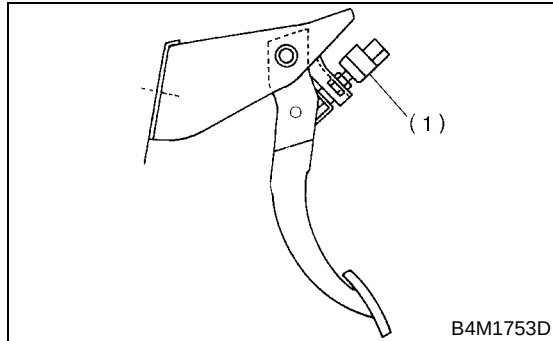
- (1) Stop light switch
- (2) Mat
- (3) Toe board
- (4) Brake booster operating rod

3) If it is not in specified value, adjust it by adjusting brake booster operating rod length.

20. Stop Light Switch

A: REMOVAL

- 1) Disconnect ground terminal from battery.
- 2) Disconnect stop light switch connector.
- 3) Loosen nuts, and unscrew stop light switch to remove.



(1) Stop light switch

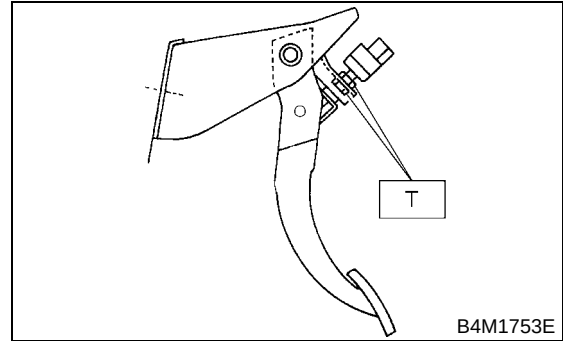
B: INSTALLATION

- 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-78, ADJUSTMENT, Stop Light Switch.>

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



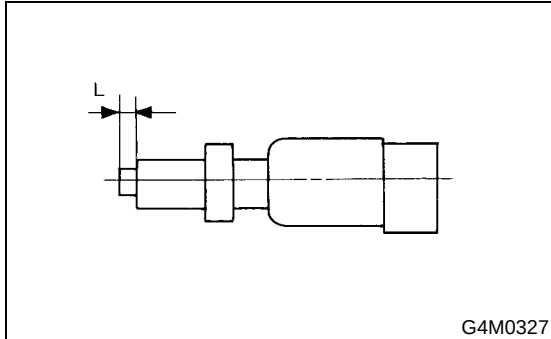
STOP LIGHT SWITCH

BRAKE

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 mm (0.079 in)

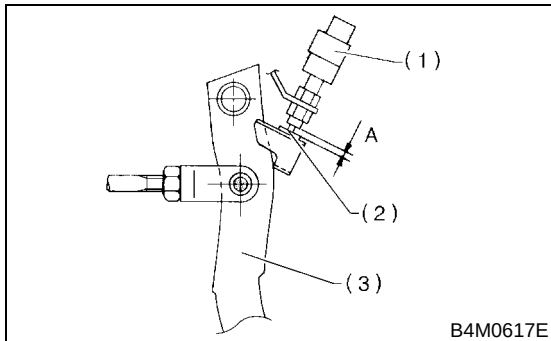


2) Measure the clearance between threaded end of stop light switch and stopper.

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

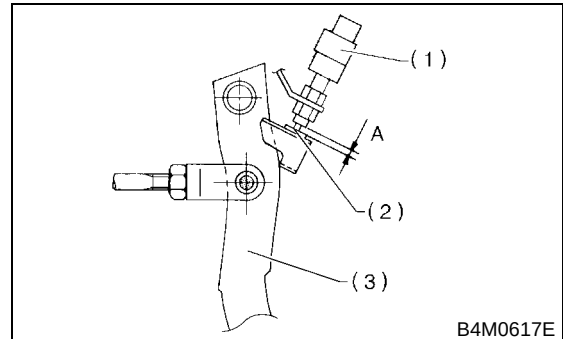
3) If it is not in specified value, adjust it by adjusting position of stop light switch.

CAUTION:

Be careful not to rotate stop light switch.

D: ADJUSTMENT

Loosen the lock nut, and adjust stop light switch position until the clearance between threaded end of the stop light switch and the stopper becomes 0.3 mm (0.012 in). Then, tighten the lock nut.



21. General Diagnostics

A: INSPECTION

	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, drum or rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Drum or rotor eccentricity	Correct or replace the drum or rotor.
	(3) Worn brake drum, or damage to the drum caused by sand	Correct by grinding, or replace.
	(4) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(5) Deformed back plate	Correct or replace.
	(6) Improper tire inflation	Inflate to correct pressure.
	(7) Disordered wheel alignment	Adjust alignment.
	(8) Loosened back plate or the support installing bolts	Retighten.
	(9) Loosened wheel bearing	Retighten to normal tightening torque or replace.
	(10) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
	(11) 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) Improperly adjusted shoe clearance	Adjust.
	(5) Improper lining contact or worn lining	Correct or replace.
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) (creek 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 drum or rotor	Clean the drum or 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 drum or rotor	Retighten or replace.

GENERAL DIAGNOSTICS

BRAKE

	Trouble and possible cause	Corrective action
7. Brake noise (3) (click sound)	In the case of the disc brake:	
	(1) Excessively worn pad or the support	Replace the pad or the support.
	In the case of the drum brake:	
	(1) Excessively worn shoe ridge	Replace the back plate.
	(2) Lack of oil on the shoe ridge surface and anchor	Add more grease.

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

PARKING BRAKE

PB

	Page
1. General Description	2
2. Parking Brake Lever.....	6
3. Parking Brake Cable	7
4. Parking Brake Assembly (Rear Disc Brake)	9
5. General Diagnostic Table.....	12

GENERAL DESCRIPTION

PARKING BRAKE

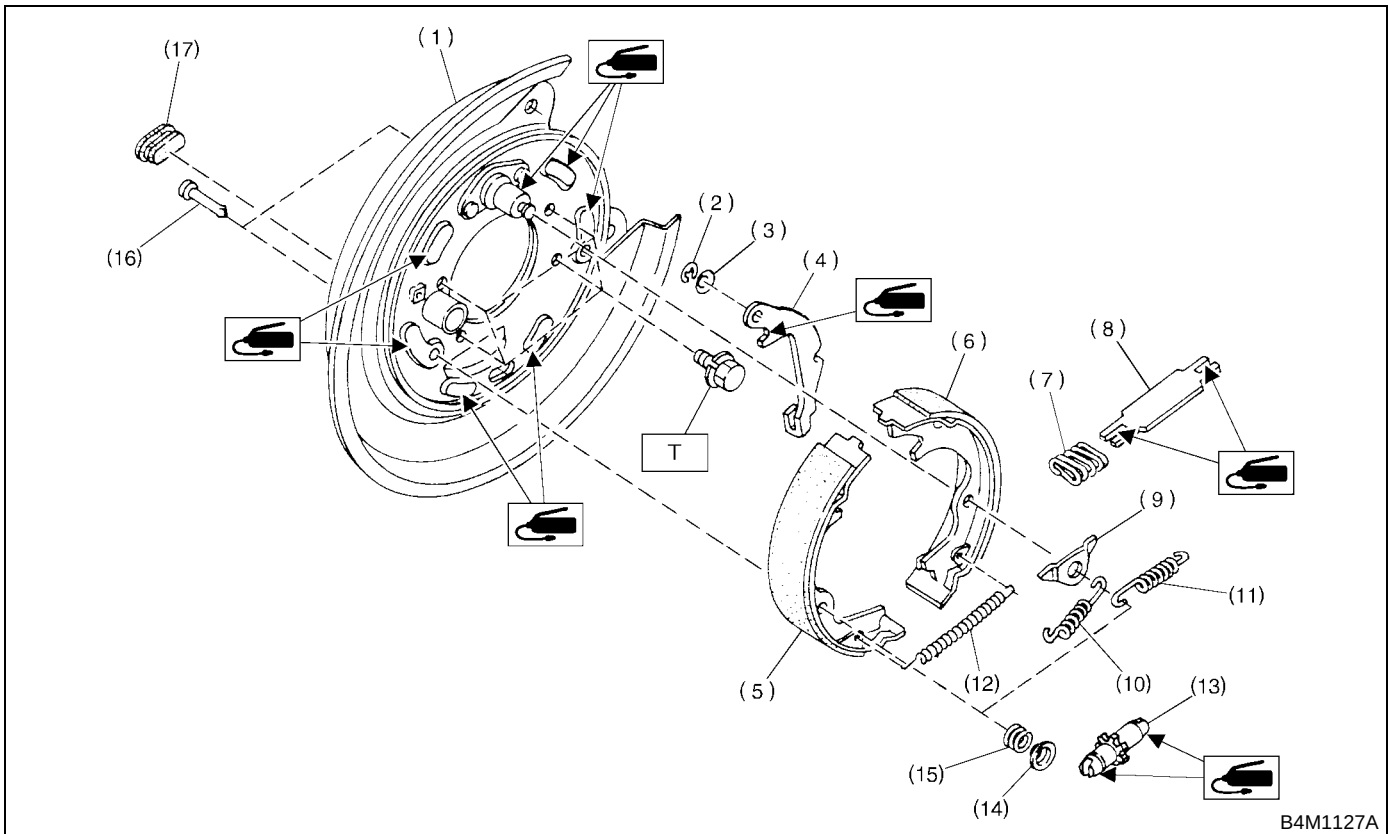
1. General Description

A: SPECIFICATIONS

Model	Rear drum brake	Rear disc brake
Type	Mechanical on rear brakes, drum in disc	
Effective drum diameter mm (in)	228.6 (9)	170 (6.69)
Lining dimensions (length × width × thickness) mm (in)	218.8 × 35.0 × 4.1 (8.61 × 1.378 × 0.161)	162.6 × 30.0 × 3.2 (6.40 × 1.181 × 0.126)
Clearance adjustment	Automatic adjustment	Manual adjustment
Lever stroke notches/N (kgf, lb)	7 to 8/196 (20, 44)	

B: COMPONENT

1. PARKING BRAKE (REAR DISC BRAKE)



B4M1127A

- | | |
|------------------------------------|------------------------------|
| (1) Back plate | (10) Primary return spring |
| (2) Retainer | (11) Secondary return spring |
| (3) Spring washer | (12) Adjusting spring |
| (4) Lever | (13) Adjuster |
| (5) Parking brake shoe (Primary) | (14) Shoe hold-down cup |
| (6) Parking brake shoe (Secondary) | (15) Shoe hold down spring |
| (7) Strut spring | (16) Shoe hold down pin |
| (8) Strut | (17) Adjusting hole cover |
| (9) Shoe guide plate | |

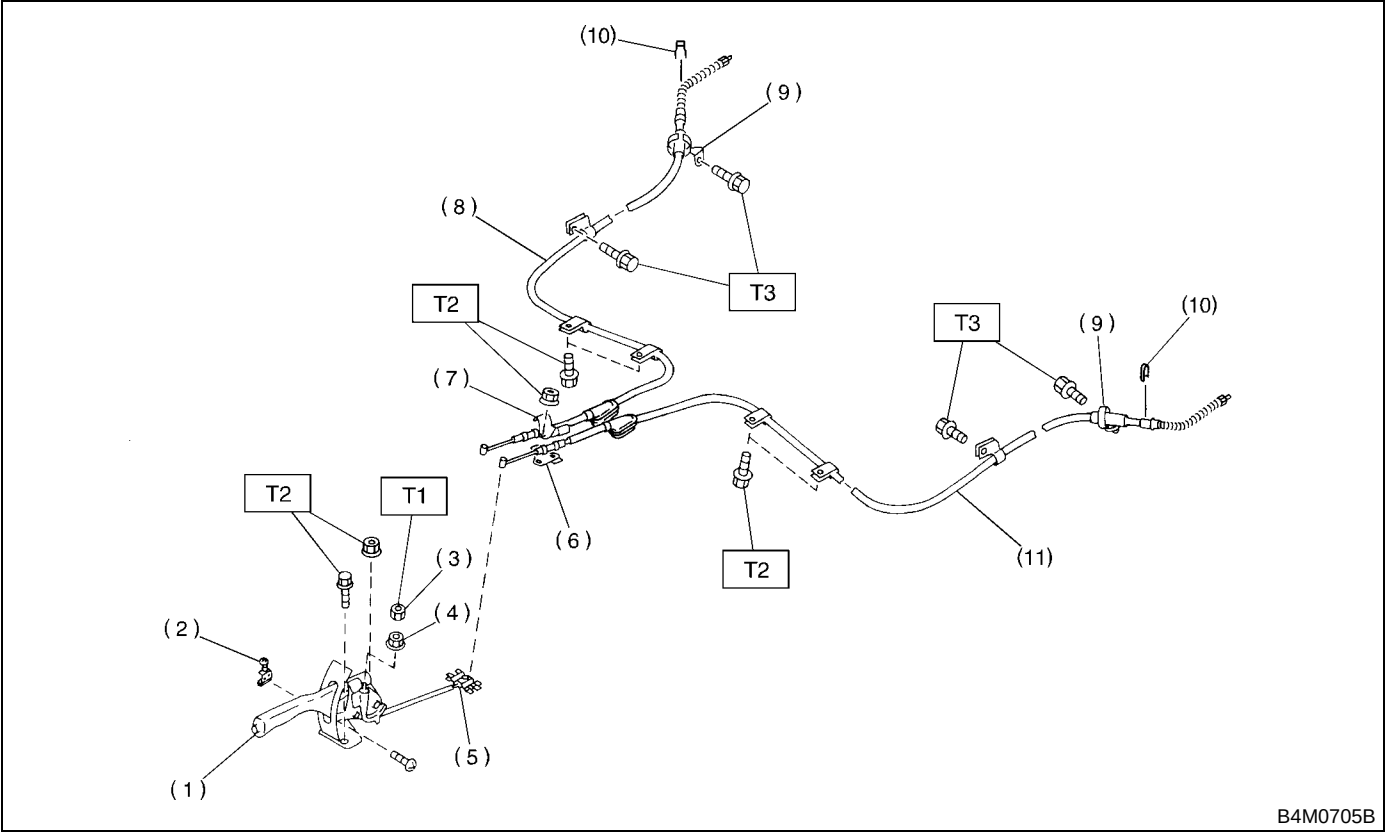
Tightening torque: N·m (kgf-m, ft-lb)

T: 53 (5.4, 39)

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) Cable guide |
| (4) Adjusting nut | (10) Clamp (Rear disc brake model only) |
| (5) Equalizer | (11) Parking brake cable LH |
| (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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Keep grease etc. away from parking brake shoes.

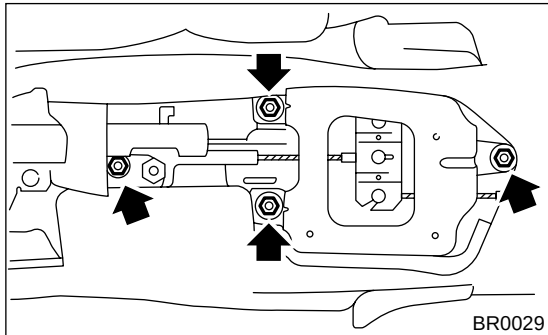
PARKING BRAKE LEVER

PARKING BRAKE

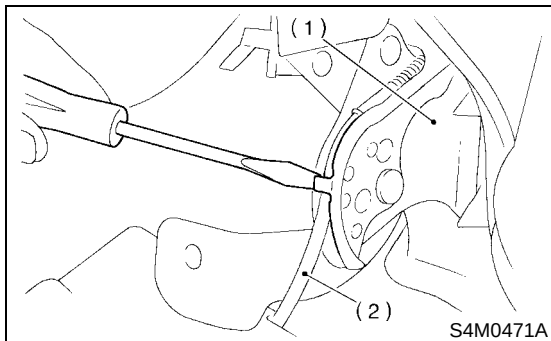
2. Parking Brake Lever

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove rear tire and wheel.
- 3) Remove rear cushion.
- 4) Remove console box.
- 5) Loosen parking cable adjusting nut and console bracket.
- 6) Disconnect connector parking brake switch.
- 7) Remove parking brake lever.



- 8) 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)

Adjusting 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 (Rear Disc Brake).>

D: ADJUSTMENT

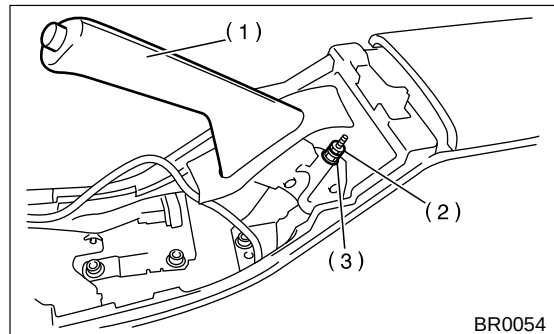
- 1) Remove console cover.
- 2) Forcibly pull parking brake lever 3 to 5 times.
- 3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).
- 4) Tighten lock nut.

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)



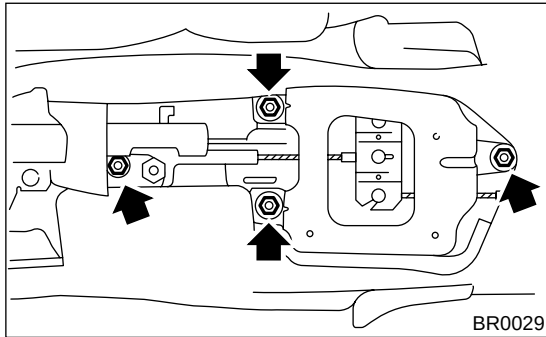
- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

- 5) Install console cover.

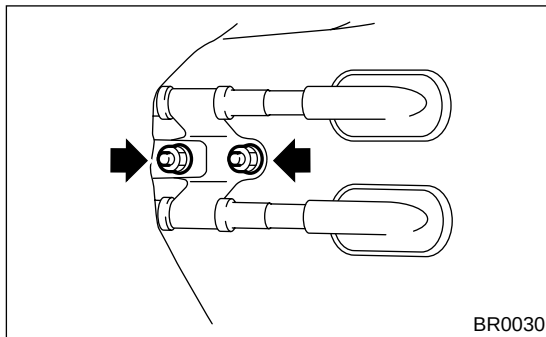
3. Parking Brake Cable

A: REMOVAL

- 1) Lift-up vehicle.
- 2) Remove rear tires and wheels.
- 3) Remove rear cushion.
- 4) Remove console box from front floor.
- 5) Loosen parking cable adjusting nut and console bracket.
- 6) Remove parking brake lever.

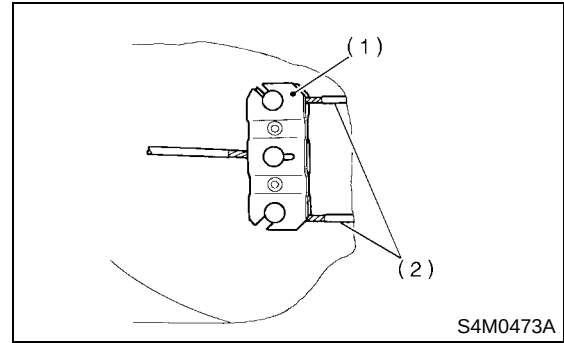


- 7) Roll up floor mat and remove clamps.



- 8) Remove equalizer cover.

- 9) Remove inner cable end from equalizer.



- (1) Equalizer
- (2) Inner cable end

- 10) Pull out parking brake cable from rear brake.

Disc brake

<Ref. to PB-9, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>

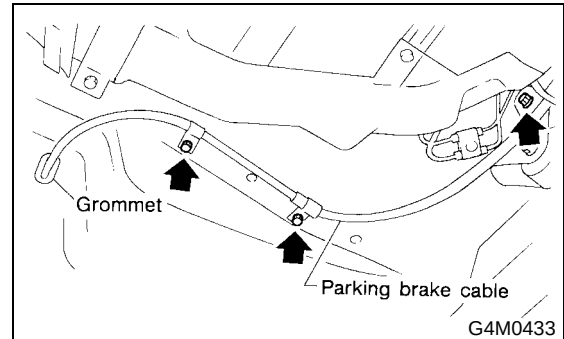
Drum brake

<Ref. to BR-48, Rear Drum Brake Assembly.>

- 11) Pull out clamp from rear brake.

- 12) Remove bolt and bracket from trailing link bracket.

- 13) Remove bolt and clamp from rear floor.



- 14) Detach grommet from rear floor.

- 15) Remove cable assembly from cabin by forcibly pulling it backward.

- 16) Detach parking brake cable from cable guide at rear trailing link.

PARKING BRAKE CABLE

PARKING BRAKE

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.>

C: INSPECTION

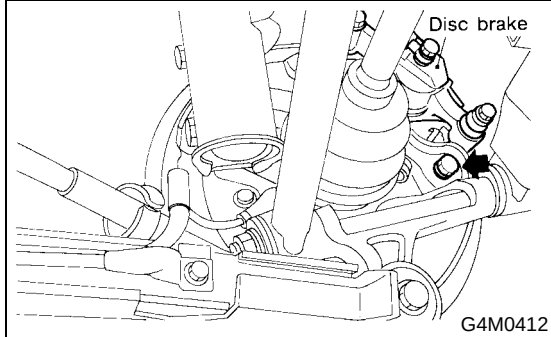
Check the removed cable and replace if damaged, rusty, or malfunctioning.

- 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 (Rear Disc Brake)

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.

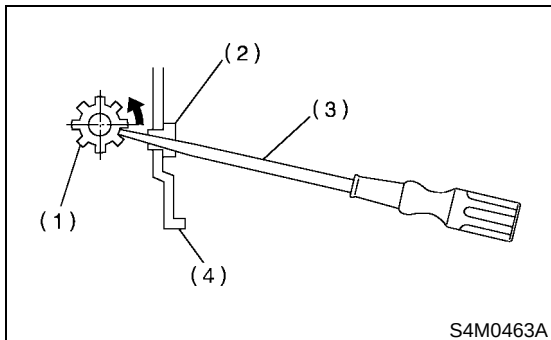
3) Pull down and release parking brake.

4) Remove the disc rotor.

NOTE:

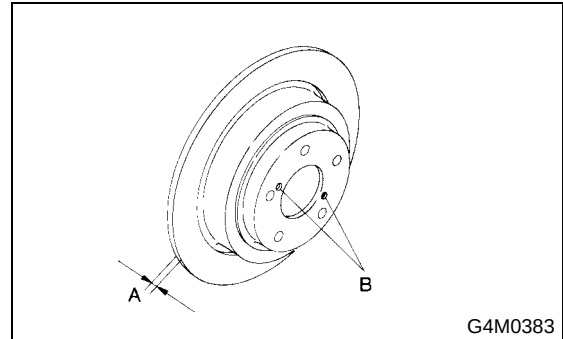
If the disc rotor is difficult to remove try the following two methods in order.

(1) Turn adjusting screw using a slot-type screwdriver until brake shoe gets away enough from the disc rotor.



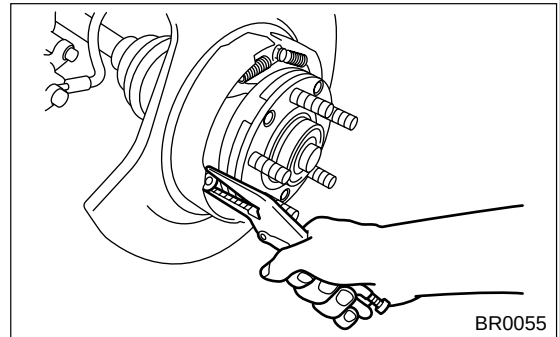
- (1) Adjusting screw
- (2) Cover (rubber)
- (3) Slot-type screwdriver
- (4) Back plate

(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) Remove front shoe hold down spring and pin with pliers.



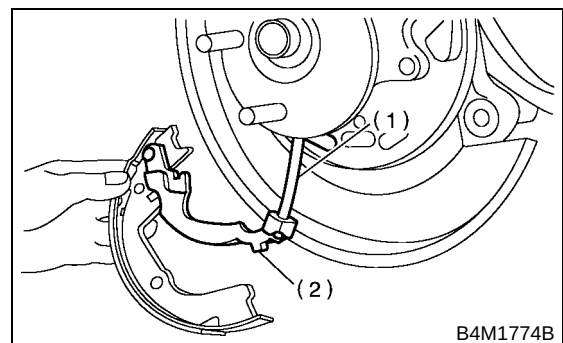
7) Remove strut and strut spring.

8) Remove adjuster assembly from parking brake assembly.

9) Remove brake shoe.

10) Remove rear shoe hold-down spring and pin with pliers.

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 (REAR DISC BRAKE)

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

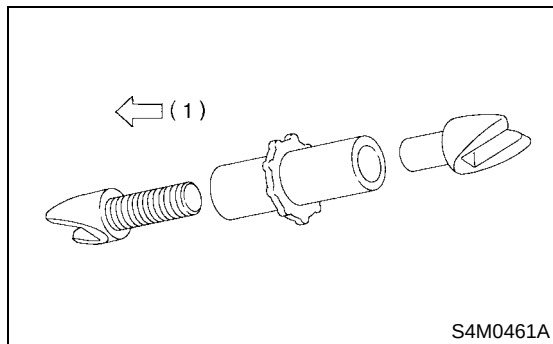
2) Install in reverse order of removal.

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:

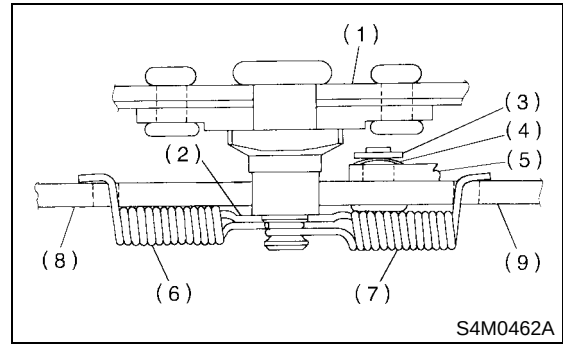
Ensure that adjuster assembly is securely installed with screw in the left side, facing vehicle front.



(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 (Rear Disc Brake).>

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)

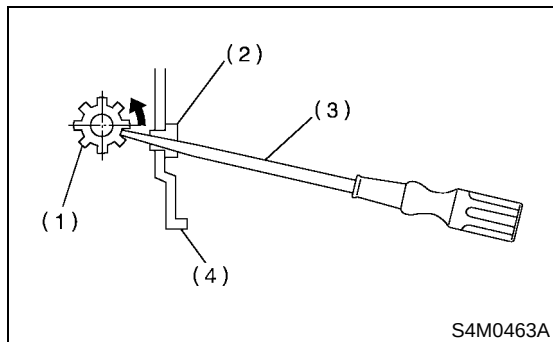
CAUTION:

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.



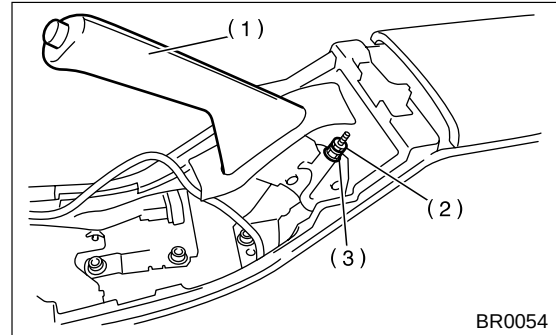
- (1) Adjusting screw
- (2) Cover (rubber)
- (3) Slot-type screwdriver
- (4) Back plate

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 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).



- (1) Parking brake lever
- (2) Lock nut
- (3) 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)

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.

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
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

POWER ASSISTED SYSTEM (POWER STEERING)

PS

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GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

1. General Description

A: SPECIFICATIONS

Model			1.6 L	2.0 L		
				Except OUT- BACK	OUTBACK	TURBO
		LHD	RHD			
Whole system	Minimum turning radius m (ft)		5.1 (16.7)		5.4 (17.7)	
	Steering angle (Inside-Outside)		37° 20' — 34° 25'		34° 30' — 30° 20'	
	Steering wheel diameter mm (in)		385 (15.16)			
	Overall gear ratio (Turns, lock to lock Gear box)		3.22		3.02 2.69	
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.		7.8		7.2	
	Relief pressure kPa (kg/cm ² , psi)		6,174 — 6,860 (63 — 70, 896 — 994)	7,164 — 7,840 (73 — 80, 1,040 — 1,165)		7,350 — 8,036 (75 — 82, 1,067 — 1,165)
	Hydraulic fluid control		Dropping in response to increased engine revolutions			
	Hydraulic fluid ℓ (US qt, Imp qt)		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)		7.5 (7.9, 6.6)* ¹ 7 (7.4, 6.2)* ²	
	Range of revolution rpm		700 — 9,000			
	Revolving direction		Clockwise			
Working fluid (Power steering system)	Name		ATF DEXRON IIE or III			
	Capacity ℓ (US qt, Imp qt)	Oil tank	0.3 (0.3, 0.3)			
		Total	0.7 (0.7, 0.6)			

*1: With maximum load.

*2: With no load.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

Model				LHD	RHD	
Steering wheel	Free play mm (in)			17 (0.67)		
Turning angle	Inner tire & wheel	TURBO, OUTBACK		34°30'±1.5°		
		Except TURBO, OUTBACK		37°20'±1.5°		
	Outer tire & wheel	TURBO, OUTBACK		30°20'±1.5°		
		Except TURBO, OUTBACK		32°25'±1.5°		
Steering shaft	Clearance between steering wheel and column cover mm (in)			3.0 (0.118)		
Steering gear-box (Power steering system)	Sliding resistance N (kgf, lb)			304.0 (31.0, 68.4) or less		
	Rack shaft play in radial direction	Right-turn steering mm (in)	0.19 (0.0075) or less	Horizontal movement: 0.19 (0.0075) or less Vertical movement: 0.3 (0.012) or less		
		Left-turn steering mm (in)	Horizontal movement: 0.15 (0.0059) or less Vertical movement: 0.3 (0.012) or less	0.19 (0.0075) or less		
	Input shaft play	In radial direction mm (in)	0.18 (0.0071) or less			
		In axial direction mm (in)	0.27 (0.0106) 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			Non-TURBO mm (in)	0.4 (0.016) or less		
			TURBO mm (in)	0.8 (0.031) 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		1.6 L kPa (kg/cm ² , psi)	6,374 (65, 925)			
		2.0 L Non-TURBO kPa (kg/cm ² , psi)	7,355 (75, 1,067)			
	2.0 L TURBO kPa (kg/cm ² , psi)	7,845 (80, 1,138)				
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road N (kgf, lb)			31.4 (3.2, 7.1) 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 IIE or III	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

GENERAL DESCRIPTION

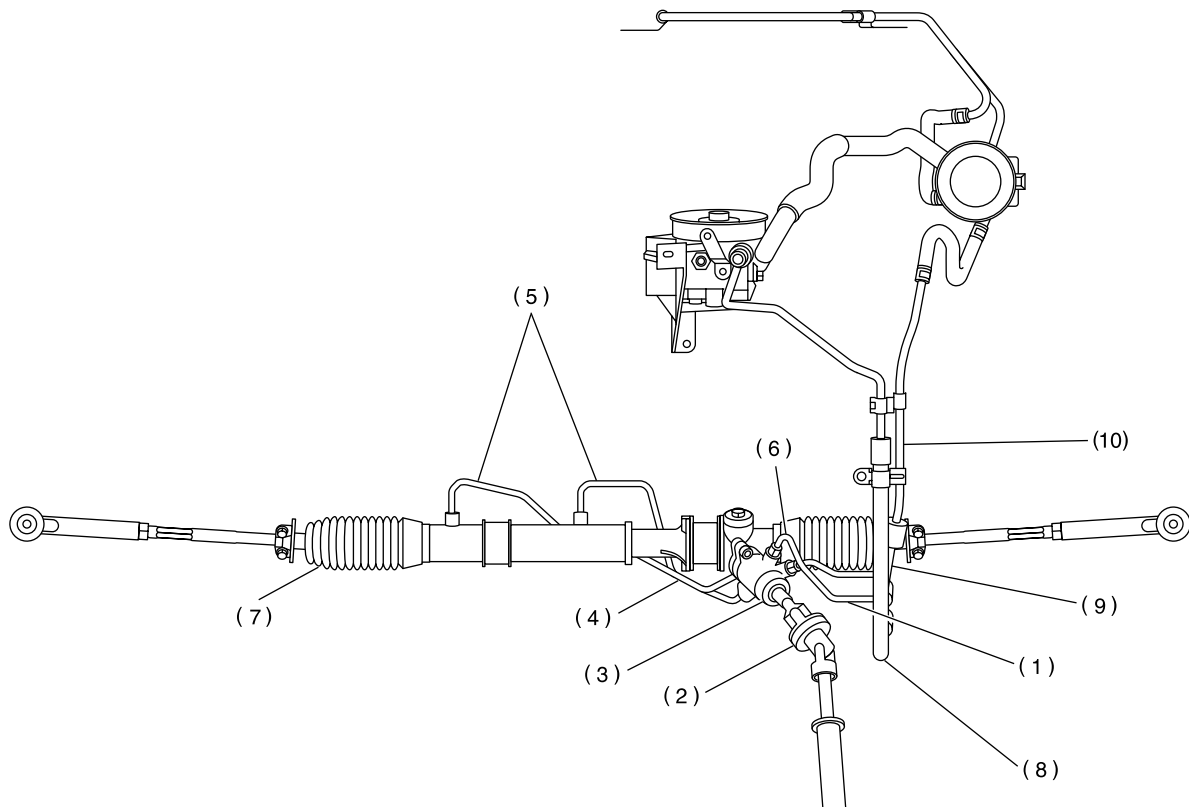
POWER ASSISTED SYSTEM (POWER STEERING)

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
(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	11 mm (0.43 in)
(7) Exhaust pipe — Gearbox bolt	15 mm (0.59 in)
(8) Side frame — Hose A and B	10 mm (0.39 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)

RHD MODEL

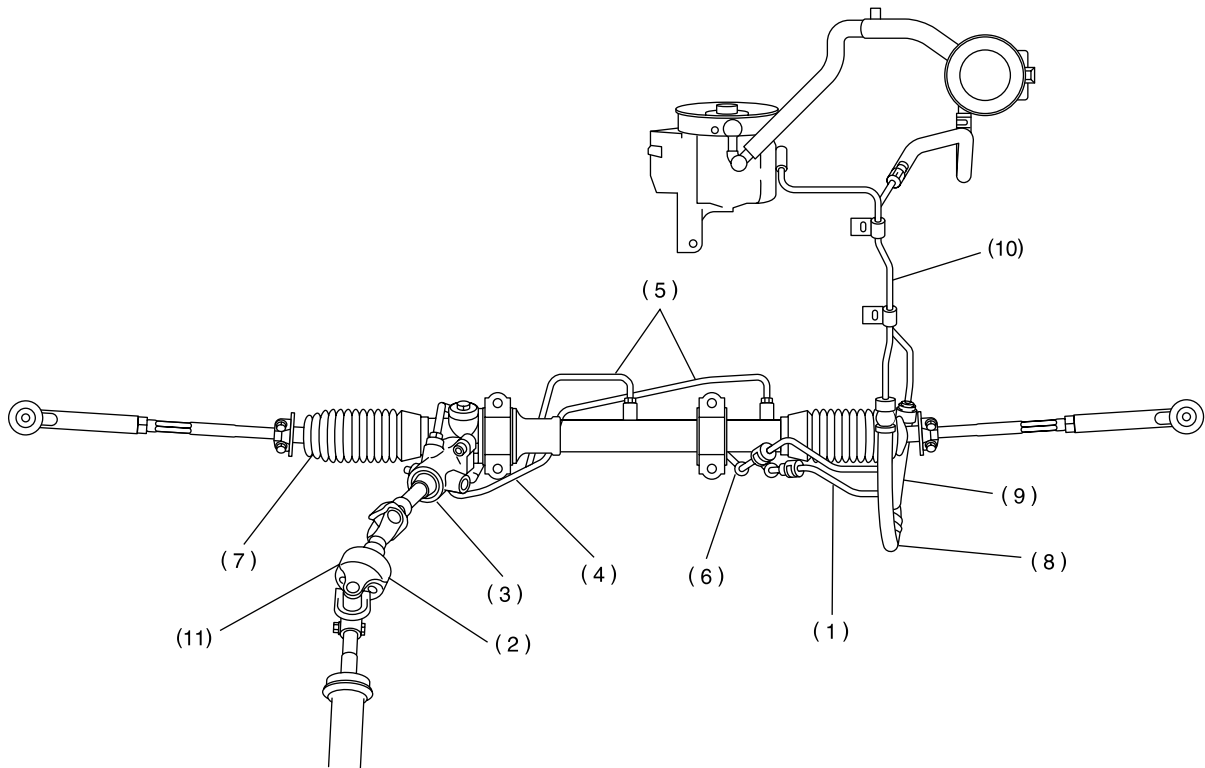


ST0001

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

LHD MODEL



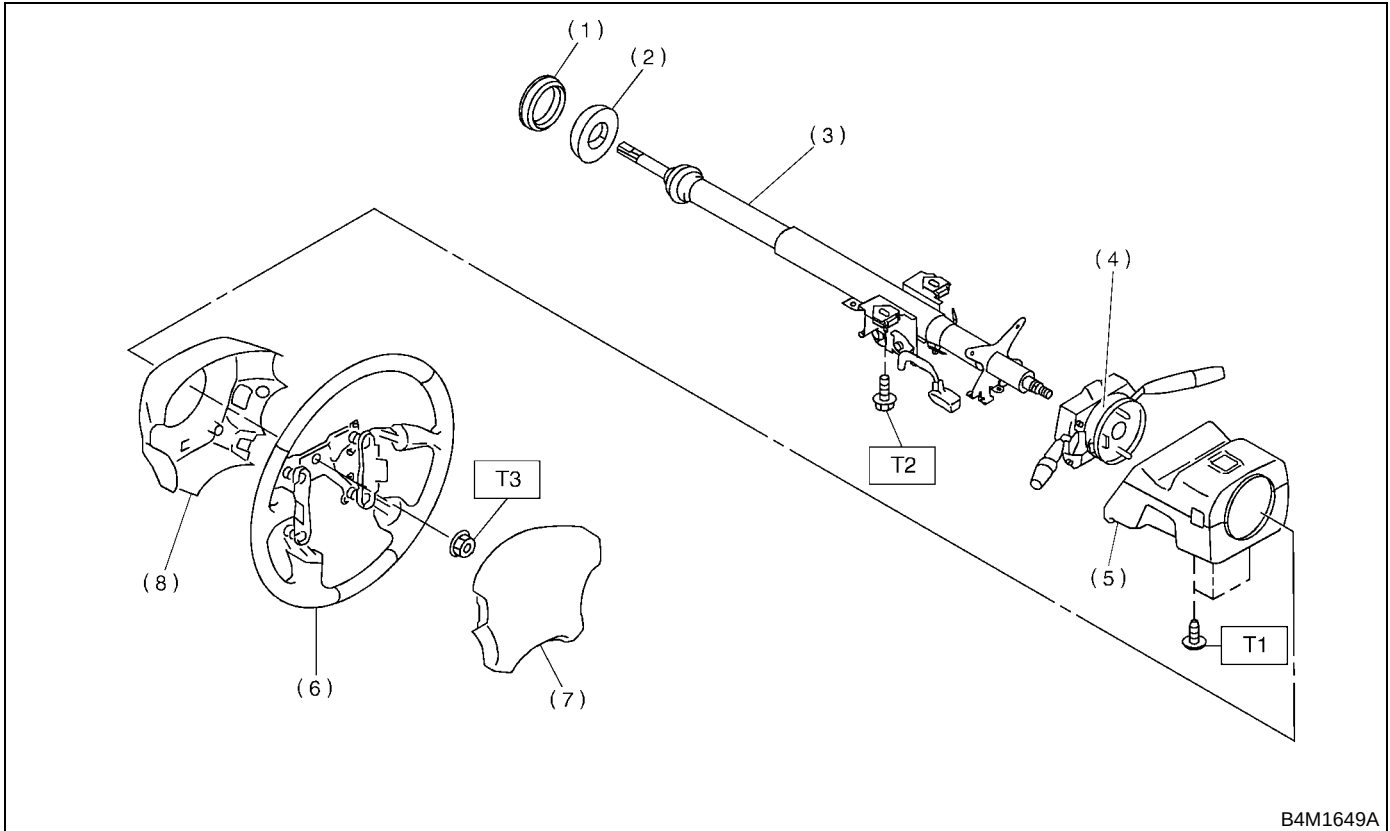
ST0002

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

B: COMPONENT

1. STEERING WHEEL AND COLUMN



- | | |
|-----------------------------|--------------------------------|
| (1) Bushing | (6) Steering wheel |
| (2) Seal | (7) Airbag module |
| (3) Steering shaft | (8) Lower steering wheel cover |
| (4) Steering roll connector | |
| (5) Column 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

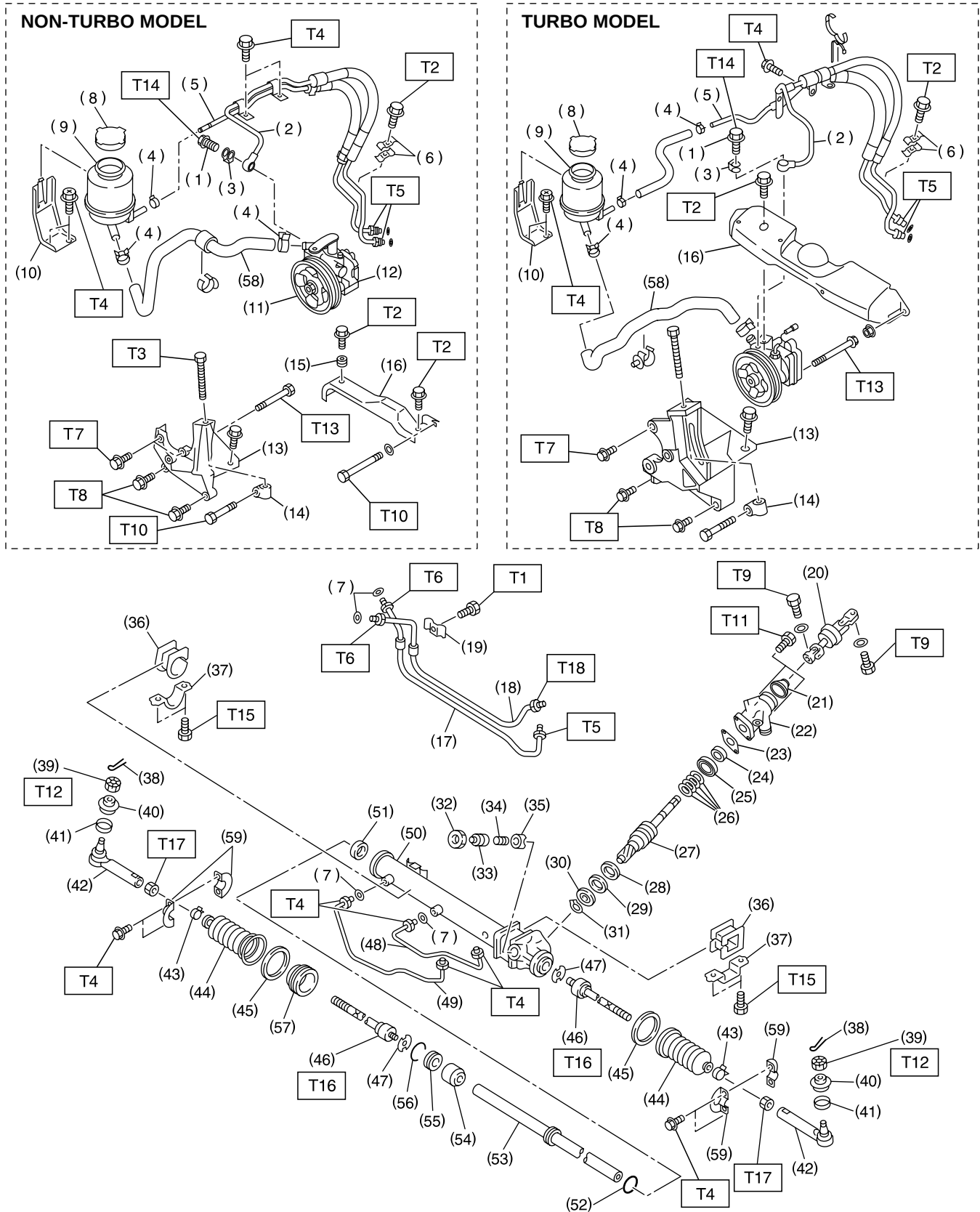
POWER ASSISTED SYSTEM (POWER STEERING)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

2. POWER ASSISTED SYSTEM

LHD MODEL



ST0003

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

(1) Eye bolt	(27) Pinion and valve ASSY	(53) Rack
(2) Pipe C	(28) Oil seal	(54) Rack bushing
(3) Gasket	(29) Back-up washer	(55) Rack stopper
(4) Clip	(30) Ball bearing	(56) Circlip
(5) Pipe D	(31) Snap ring	(57) Spacer
(6) Clamp E	(32) Lock nut	(58) Suction hose
(7) O-ring	(33) Adjusting screw	(59) Tie-rod end plate
(8) Cap	(34) Spring	
(9) Reservoir tank	(35) Sleeve	
(10) Reservoir tank bracket	(36) Adapter	
(11) Pulley	(37) Clamp	
(12) Oil pump	(38) Cotter pin	
(13) Bracket	(39) Castle nut	
(14) Belt tension nut	(40) Dust cover	
(15) Bush	(41) Clip	
(16) Belt cover	(42) Tie-rod end	
(17) Pipe E	(43) Clip	
(18) Pipe F	(44) Boot	
(19) Clamp plate	(45) Band	
(20) Universal joint	(46) Tie-rod	
(21) Dust seal	(47) Lock washer	
(22) Valve housing	(48) Pipe B	
(23) Gasket	(49) Pipe A	
(24) Oil seal	(50) Steering body	
(25) Ball bearing	(51) Oil seal	
(26) Seal ring	(52) Piston ring	

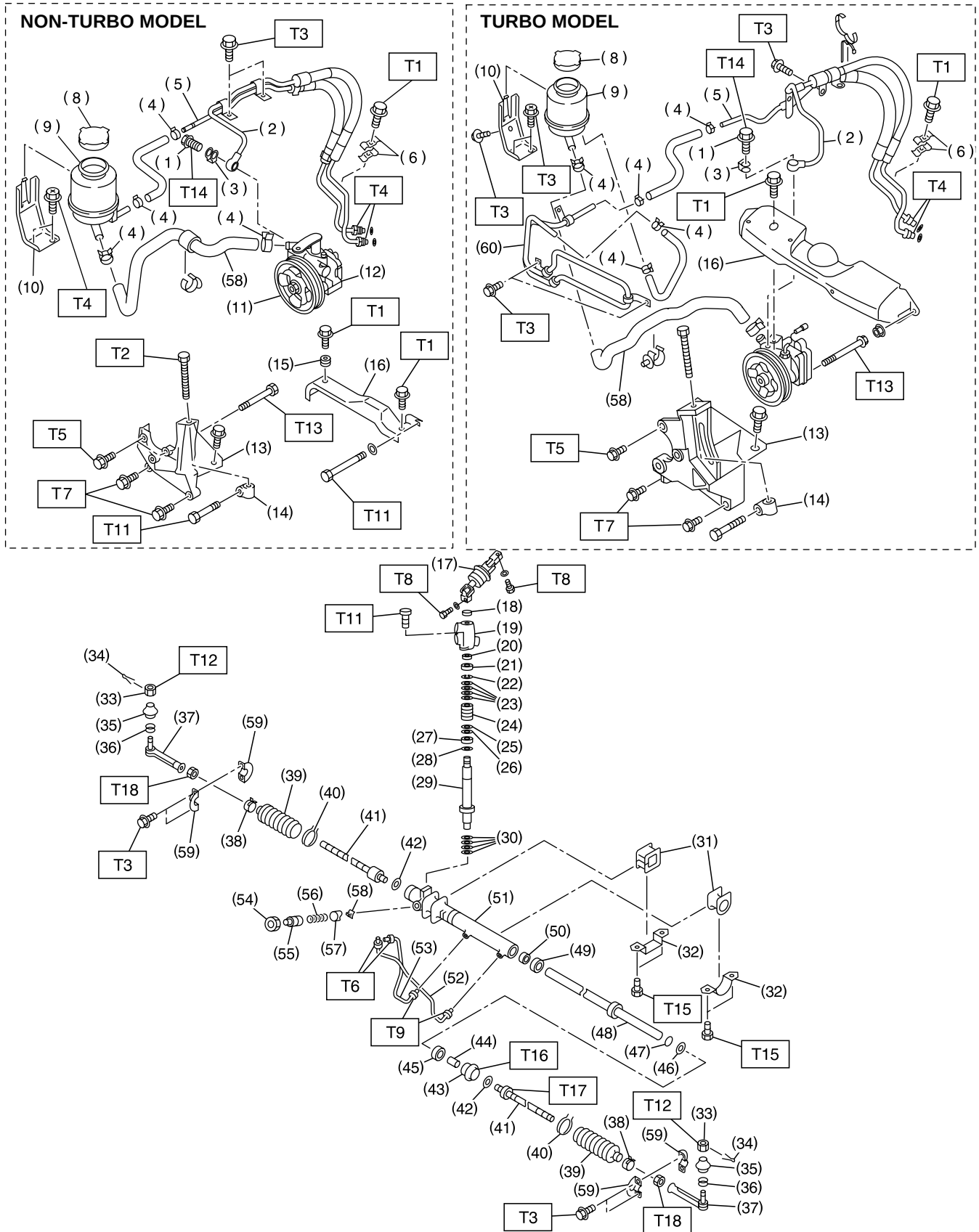
Tightening torque: N·m (kgf-m, ft-lb)

<i>T1:</i>	<i>6 (0.6, 4.3)</i>
<i>T2:</i>	<i>7.4 (0.75, 5.4)</i>
<i>T3:</i>	<i>8 (0.8, 5.8)</i>
<i>T4:</i>	<i>13 (1.3, 9.4)</i>
<i>T5:</i>	<i>15 (1.5, 10.8)</i>
<i>T6:</i>	<i>15 (1.5, 10.8)</i>
<i>T7:</i>	<i>15.7 (1.6, 11.6)</i>
<i>T8:</i>	<i>22 (2.2, 15.9)</i>
<i>T9:</i>	<i>24 (2.4, 17.4)</i>
<i>T10:</i>	<i>25 (2.5, 18.1)</i>
<i>T11:</i>	<i>25 (2.5, 18.1)</i>
<i>T12:</i>	<i>27 (2.75, 19.9)</i>
<i>T13:</i>	<i>37.3 (3.8, 27.5)</i>
<i>T14:</i>	<i>39 (4.0, 28.9)</i>
<i>T15:</i>	<i>59 (6.0, 43)</i>
<i>T16:</i>	<i>78 (8.0, 58)</i>
<i>T17:</i>	<i>83 (8.5, 61.5)</i>
<i>T18:</i>	<i>25 (2.5, 18.1)</i>

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

RHD MODEL



ST0004

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

(1) Eye bolt	(28) Spacer	(55) Adjusting screw
(2) Pipe C	(29) Pinion	(56) Spring
(3) Gasket	(30) Shim	(57) Sleeve
(4) Clip	(31) Adapter	(58) Seat pad
(5) Pipe D	(32) Clamp	(59) Tie-rod end plate
(6) Clamp E	(33) Castle nut	(60) Oilcooler
(7) O-ring	(34) Cotter pin	
(8) Cap	(35) Dust seal	
(9) Reservoir tank	(36) Clip	
(10) Reservoir tank bracket	(37) Tie-rod end	
(11) Pulley	(38) Clip	
(12) Oil pump	(39) Boot	
(13) Bracket	(40) Wire	
(14) Belt tension nut	(41) Tie-rod	
(15) Bush	(42) Lock washer	
(16) Belt cover	(43) Holder	
(17) Universal joint	(44) Bush	
(18) Dust cover	(45) Oil seal	
(19) Valve housing	(46) Oil seal	
(20) Oil seal	(47) O-ring	
(21) Ball bearing	(48) Rack	
(22) Retaining ring	(49) Oil seal	
(23) Seal ring	(50) Back-up washer	
(24) Valve sleeve	(51) Steering body	
(25) Seal ring	(52) Pipe A	
(26) O-ring	(53) Pipe B	
(27) Oil seal	(54) Lock nut	

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 (1.5, 10.8)

T5: 15.7 (1.6, 11.6)

T6: 20 (2.0, 14.5)

T7: 22 (2.2, 15.9)

T8: 24 (2.4, 17.4)

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: 37.3 (3.8, 27.5)

T14: 39 (4.0, 28.9)

T15: 59 (6.0, 43)

T16: 64 (6.5, 47)

T17: 78 (8.0, 58)

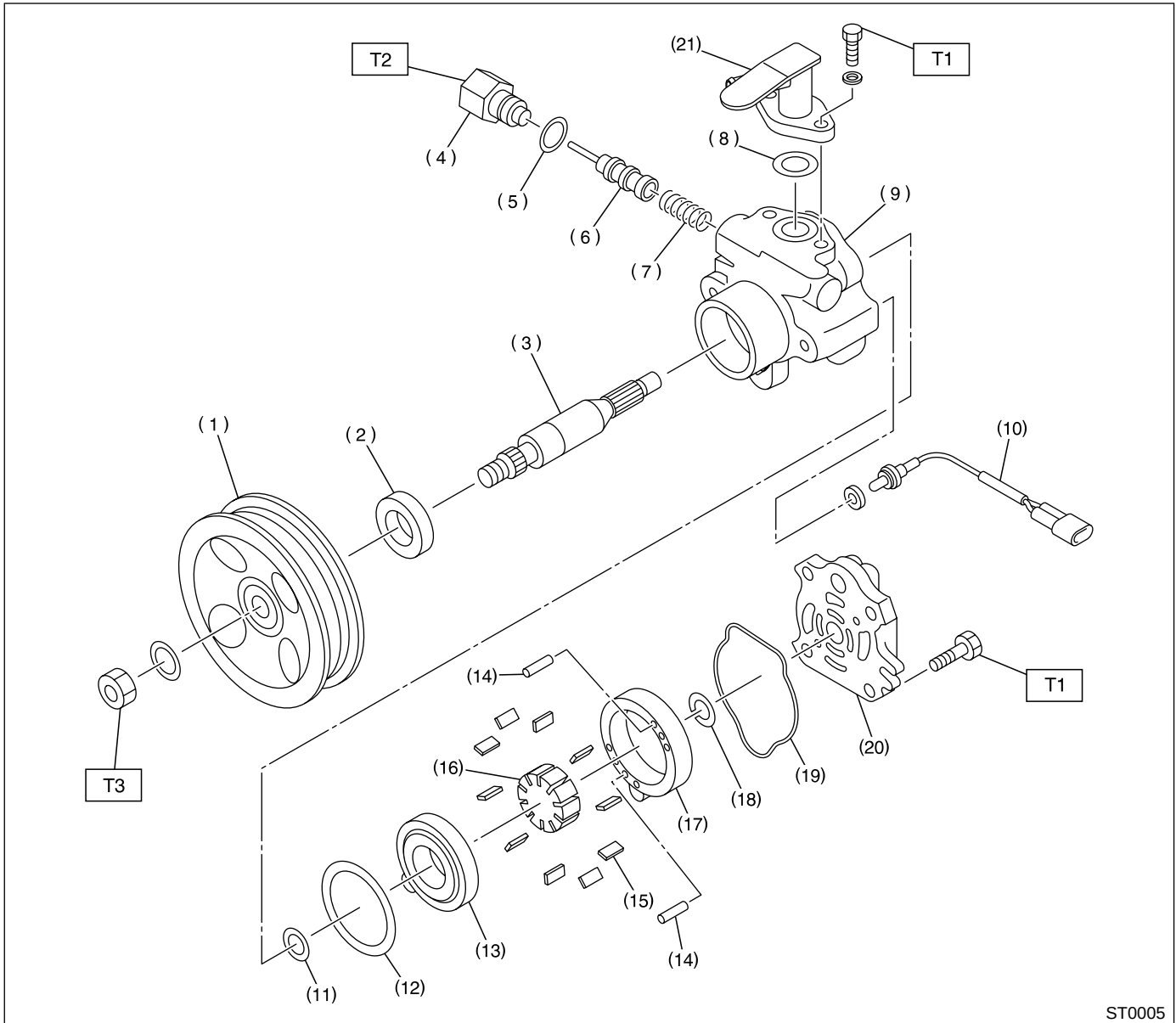
T18: 83 (8.5, 61.5)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

3. OIL PUMP

NON-TURBO MODEL



ST0005

- | | | |
|------------------|----------------------|------------------------|
| (1) Pulley | (10) Pressure switch | (19) O-ring |
| (2) Oil seal | (11) O-ring | (20) Rear cover |
| (3) Shaft | (12) O-ring | (21) Suction connector |
| (4) Connector | (13) Pressure plate | |
| (5) O-ring | (14) Straight pin | |
| (6) Spool valve | (15) Vane | |
| (7) Spring | (16) Rotor | |
| (8) O-ring | (17) Cam ring | |
| (9) Front casing | (18) Retaining ring | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 21 (2.14, 15.5)

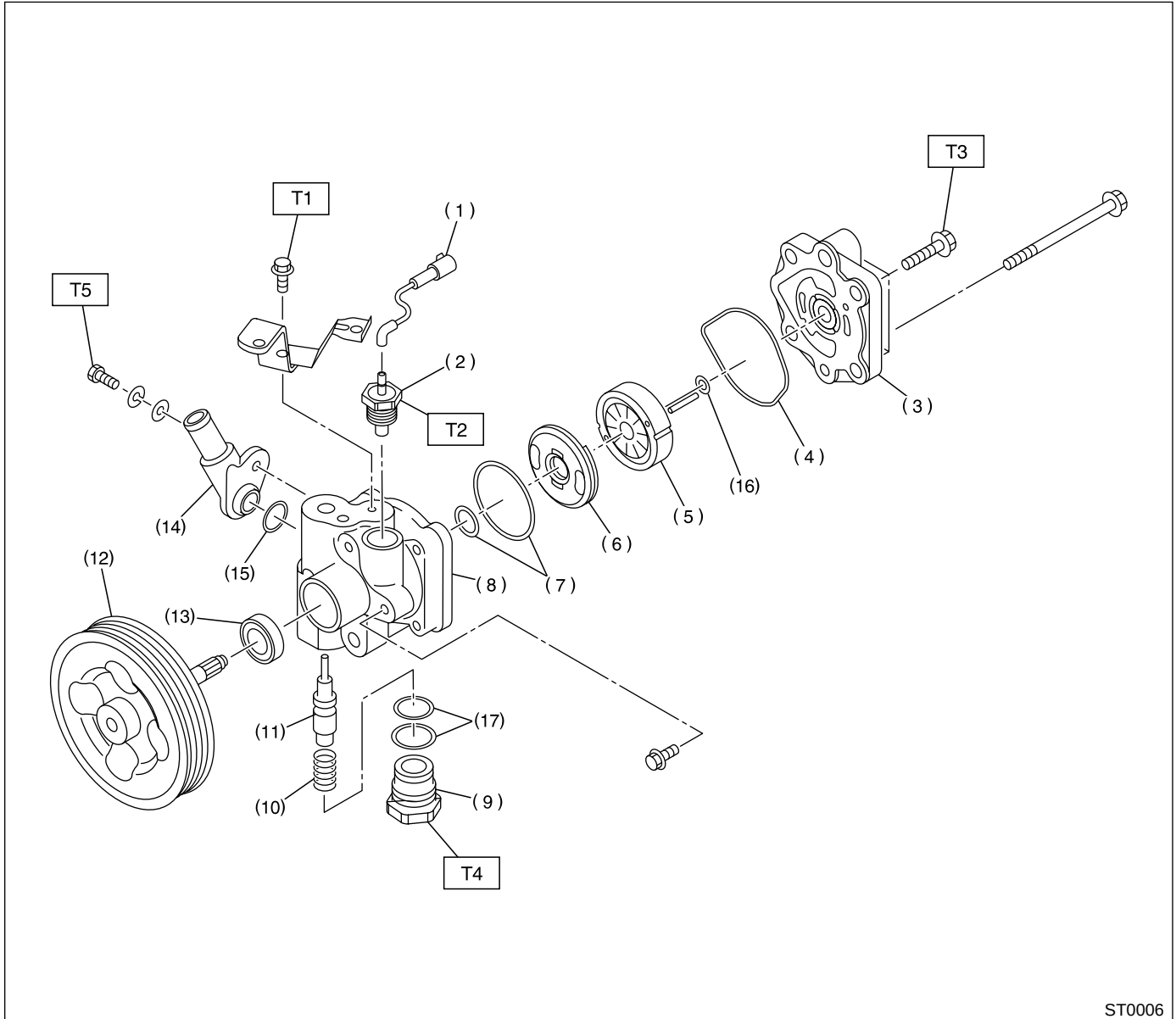
T2: 49 (5.0, 36.2)

T3: 52 (5.3, 38)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

TURBO MODEL



ST0006

- | | |
|--------------------|--------------------------|
| (1) Lead wire | (9) Front casing |
| (2) Pump switch | (10) Flow control spring |
| (3) Rear cover | (11) Flow control valve |
| (4) O-ring | (12) Pulley |
| (5) Cam | (13) Oil seal |
| (6) Pressure plate | (14) Suction connector |
| (7) O-ring | (15) O-ring |
| (8) Front casing | (16) Retaining ring |

- (17) O-ring

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

T1: 9.8 (1.0, 7.2)

T2: 27 (2.75, 19.9)

T3: 27.4 (2.8, 20.3)

T4: 59 (6.0, 43)

T5: 11.8 (1.2, 8.7)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

C: CAUTION

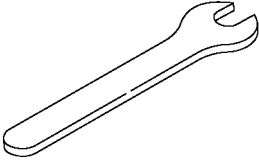
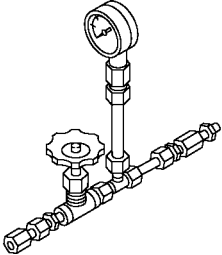
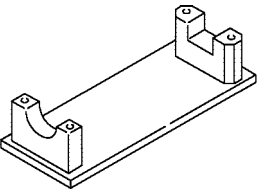
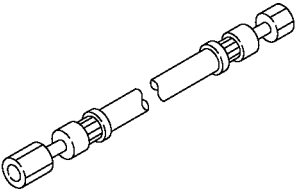
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 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 vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

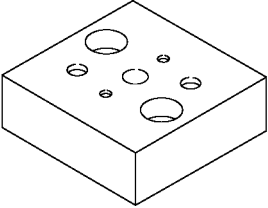
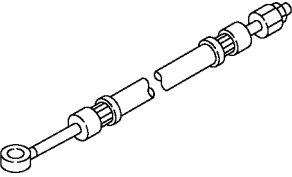
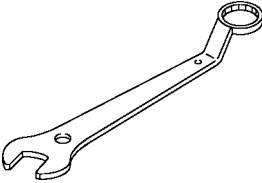
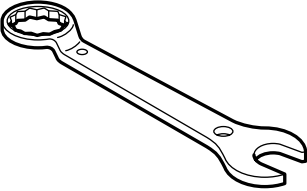
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2411	925700000	WRENCH	- Used for removing and installing tie-rod. - Apply this tool to rack.
 B4M2412	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 B4M2413	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 B4M2414	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

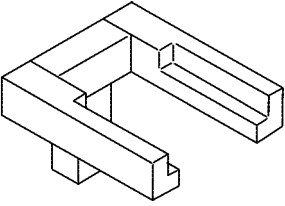
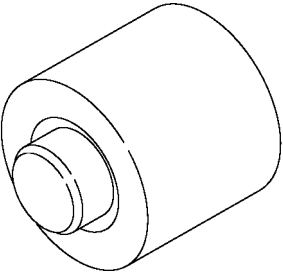
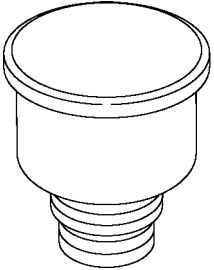
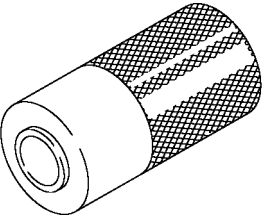
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 G1H0273	34099FA100	STAND BASE	- Used for assembling power steering gearbox. - For LHD model.
 B4M2415	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 B4M2416	926230000	SPANNER	For the lock nut when adjusting backlash of gearbox.
 ST0047	34099PA100	SPANNER	Measurement of rotating resistance of gear-box assembly.

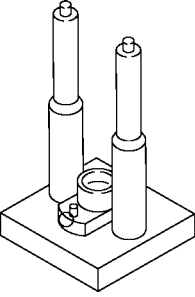
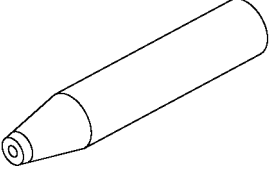
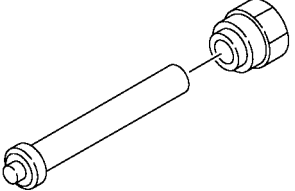
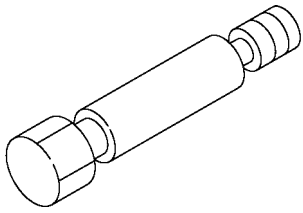
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2417	34199AE020	MOUNT	- Used for disassembling oil pump. - For TURBO model.
 B4M2418	34199AE030	INSTALLER	Used for installing oil seal into oil pump.
 B4M2419	34199AE040	OIL CHARGE GUIDE	Used for charging power steering oil.
 B4M2420	927640000	INSTALLER B	- Used for installing ball bearing into housing. - For LHD model.

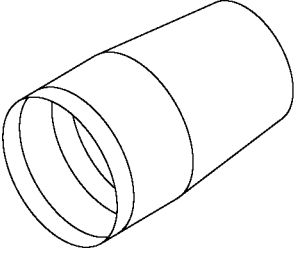
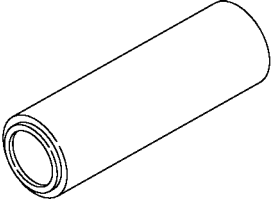
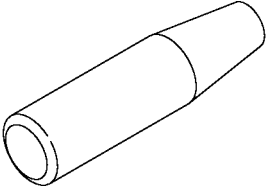
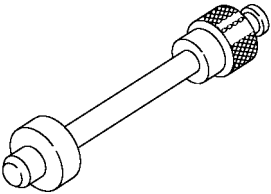
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2421	926370000	INSTALLER A	- Used for installing valve assembly into valve housing assembly. - Used with STAND BASE (927630000). - For LHD model.
 B4M2422	926390001	COVER & REMOVER ASSY	- Used for assembling rack assembly. - For LHD model.
 B4M2423	926420000	PLUG	When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.
 B4M2424	926400000	GUIDE	- Right side of rack when installing rack bush. - Used with GUIDE (927660000). - For LHD model.

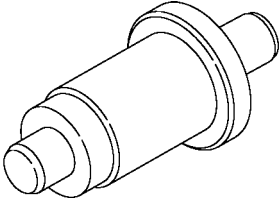
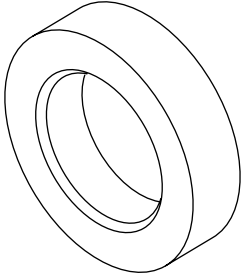
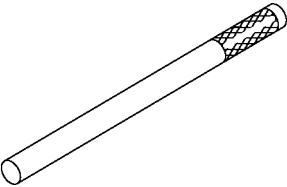
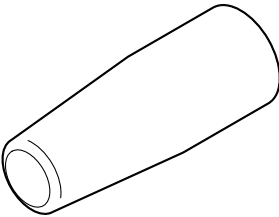
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2425	927660000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (926400000). • For LHD model.
 B4M2426	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).
 B4M2428	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000).
 B4M2429	34099FA110	INSTALLER	Used for installing oil seal.

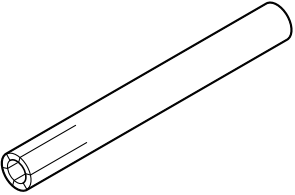
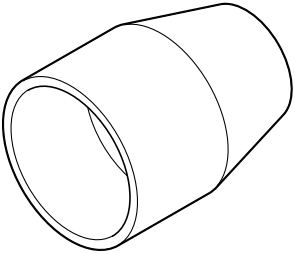
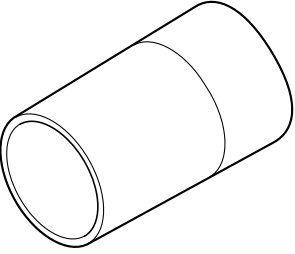
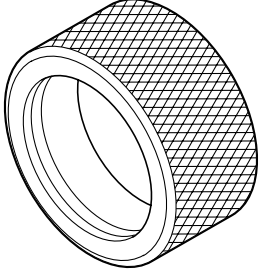
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 S1H0030	34099FA120	INSTALLER AND REMOVER SEAL	Used for installing and removing valve housing oil seal.
 ST0007	34099FA130	INSTALLER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER AND REMOVER SEAL (34099FA120).
 B4M2432	34199AE050	REMOVER OIL SEAL	Used for removing back-up ring and oil seal.
 H4M1408	34099AC030	INSTALLER A	• Used for installing retaining ring. • Used with INSTALLER B (34099AC040). • For non-turbo model.

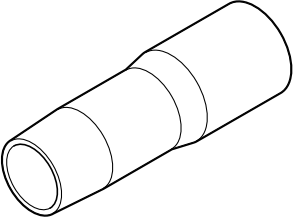
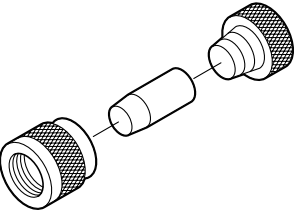
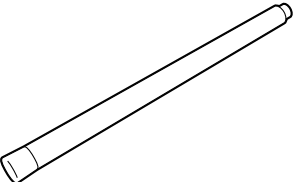
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 H4M1409	34099AC040	INSTALLER B	- Used for installing retaining ring. - Used with INSTALLER A (34099AC030). - For non-turbo model.
 ST0059	926250000	GUIDE	- Used for installing holder ASSY into rack housing. - For RHD model.
 ST0060	926270000	COVER	- Used for installing oil seal to pinion. - For RHD model.
 ST0061	926280000	FORMER	- Used for installing seal ring to pinion. - For RHD model.

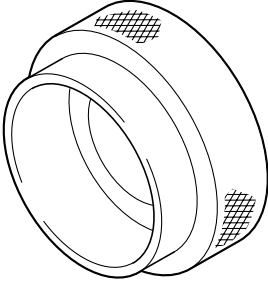
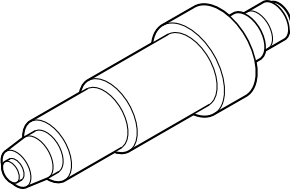
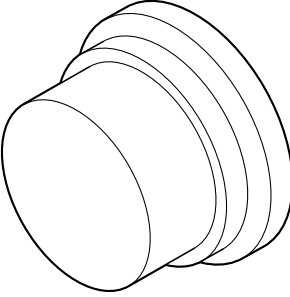
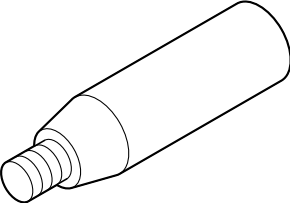
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST0062	926450000	COVER	• Used for installing oil seal to pinion. • For RHD model.
 ST0063	927490000	INSTALLER A, B, C	• Used for installing oil seal into rack ASSY. • For RHD model.
 ST0066	927580000	REMOVER	• Used for removing back-up ring and oil seal. • For RHD model.
 ST0067	927590000	WRENCH	• Used for removing wire from boot. • For RHD model.

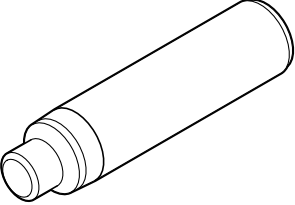
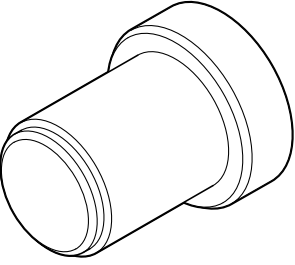
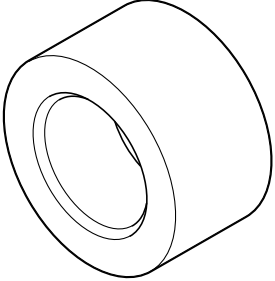
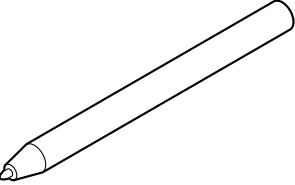
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST0068	926060000	FORMER	- Used for installing seal ring to rack pinion. - For RHD model.
 ST0069	34099FA000	INSTALLER & REMOVER	- Used for removing and installing Y-packing. - For RHD model.
 ST0070	34099FA010	GUIDE	- Used for installing rack and seal into housing assembly. - For RHD model.
 ST0071	34099FA020	GUIDE	- Used for installing valve assembly into valve housing assembly. - For RHD model.

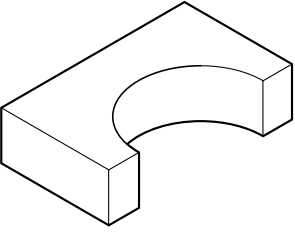
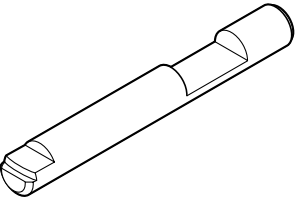
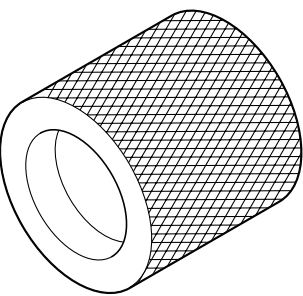
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST0072	34099FA030	INSTALLER & REMOVER	- Used for removing and installing rack oil seal (outer & inner). - For RHD model.
 ST0073	34099FA040	INSTALLER	- Used for installing rack oil seal (outer). - For RHD model.
 ST0074	34099FA050	SPACER	- Used for installing bearing into valve housing. - For RHD model.
 ST0075	34099FA060	PUNCH HOLDER	- Used for caulking. - For RHD model.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST0076	34099FA070	BASE	- Used for supporting housing assembly. - For RHD model.
 ST0077	34099FA080	PUNCH	- Used for removing caulking. - For RHD model.
 ST0078	926050000	FORMER	- Used for installing seal ring to rack pinion. - For RHD model.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

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 terminal from battery.
- 2) Set tires to straight-ahead position.
- 3) Remove airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

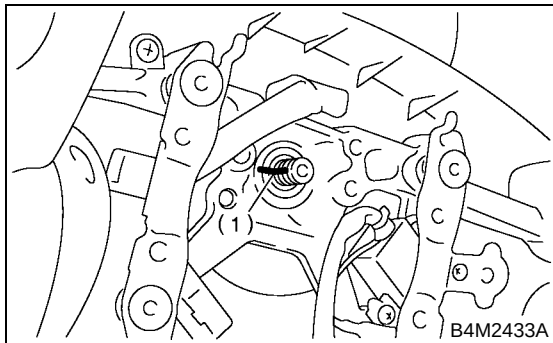
WARNING:

Always refer to "Air Bag System" before performing airbag module service. <Ref. to AB-12, CAUTION, 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-18, 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 "Air Bag System" before performing airbag module service. <Ref. to AB-12, CAUTION, 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)

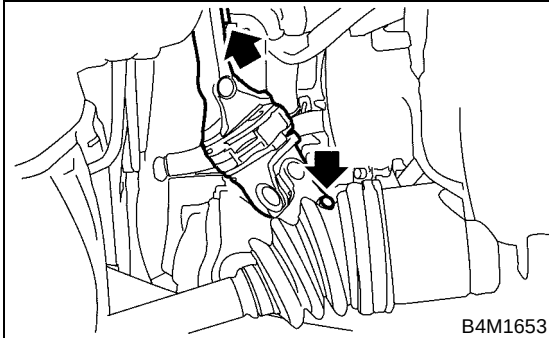
3. Universal Joint

A: REMOVAL

- 1) Remove the steering wheel. <Ref. to PS-27, REMOVAL, Steering Wheel.>
- 2) Remove universal joint bolts and then remove universal joint.

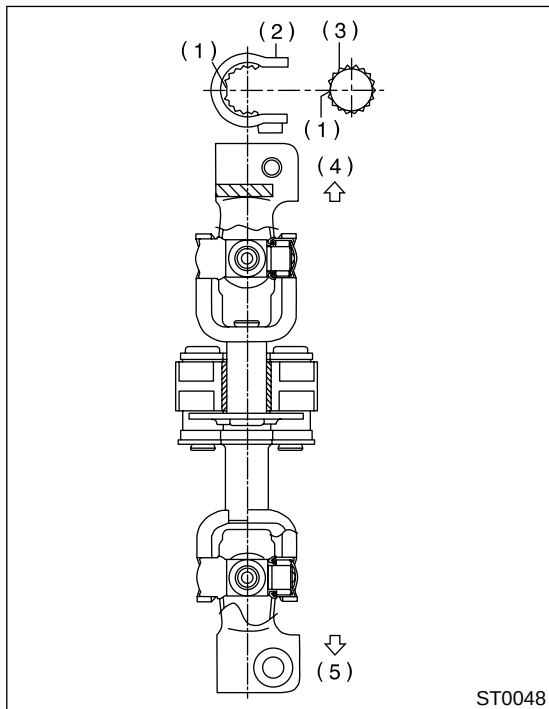
CAUTION:

Scribe alignment marks on universal joint so that it can be reassembled at the original serration.



B: INSTALLATION

- 1) Install universal joint.
 - (1) Align cutout at serrated section of the column shaft and yoke, then insert the universal joint into column shaft.



- (1) Cutout
- (2) Yoke
- (3) Column shaft
- (4) Column shaft side
- (5) Gearbox side

- (2) Align bolt hole on the gearbox side of universal joint with the cutout at the serrated section of gearbox assembly. Lower universal joint completely.

- (3) Temporarily tighten bolt on the gearbox side. Raise universal joint to make sure the bolt is properly passing through the cutout at the serrated section.

- (4) Tighten bolt.

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 14 mm (0.55 in)

- 2) Align center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure that front wheel are set straight forward direction.

- 3) Install steering wheel and airbag module. <Ref. to PS-27, INSTALLATION, Steering Wheel.>

WARNING:

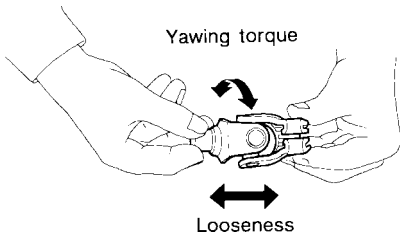
Always refer to "Air Bag System" before performing airbag module service. <Ref. to AB-12, CAUTION, Driver's Airbag Module.> and <Ref. to AB-13, INSTALLATION, Driver's Airbag Module.>

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
- Free play - Swinging torque - Yawing torque - Looseness  Yawing torque Looseness G4M0089 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)	Replace if faulty.

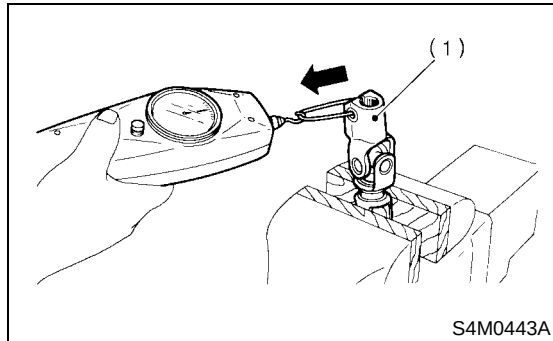
Measurement of folding torque of universal joint is as shown in the figures.

Service limit:

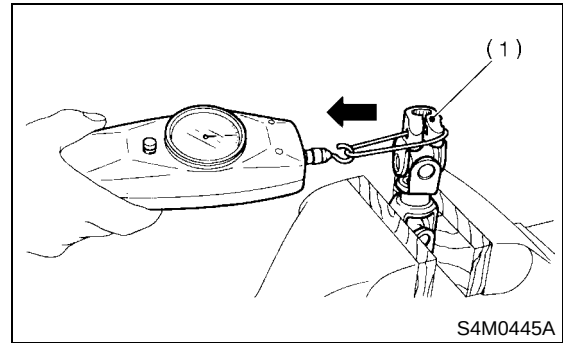
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less

Service limit:

Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (gearbox side)



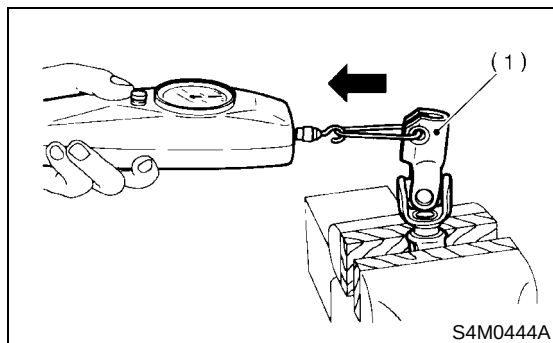
(1) Yoke (Steering column side)

Service limit:

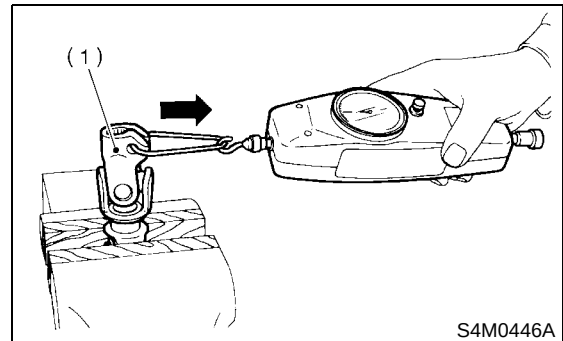
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less

Service limit:

Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (gearbox side)



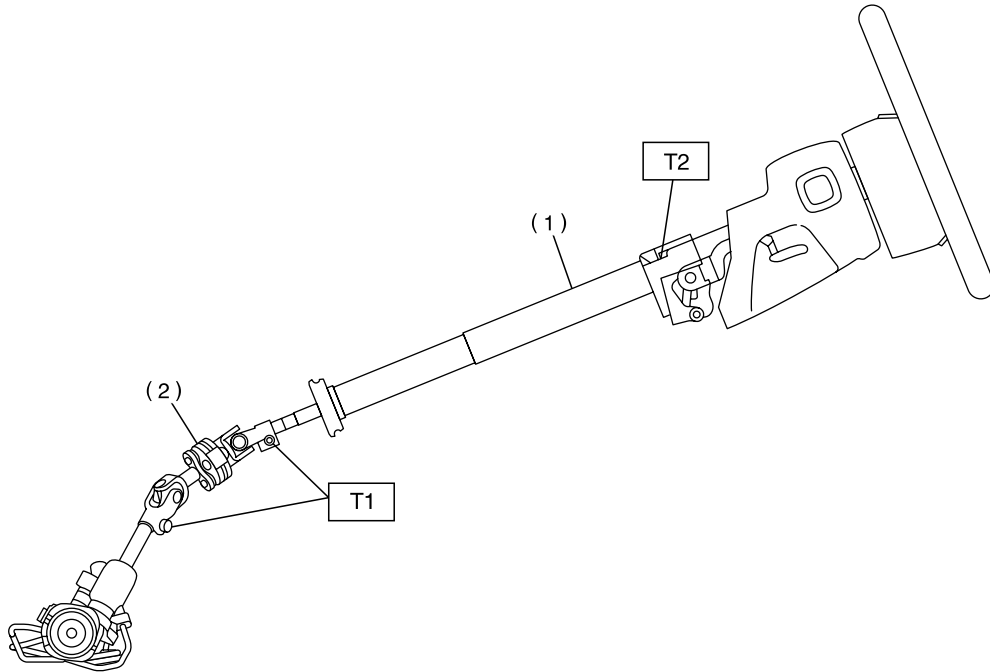
(1) Yoke (Steering column side)

TILT STEERING COLUMN

POWER ASSISTED SYSTEM (POWER STEERING)

4. Tilt Steering Column

A: REMOVAL



ST0023

- (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)

- 1) Set the vehicle on the lift.
- 2) Disconnect battery minus terminal.
- 3) Remove airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

WARNING:

Always refer to "Air Bag System" before performing airbag module service. <Ref. to AB-12, CAUTION, Driver's Airbag Module.>

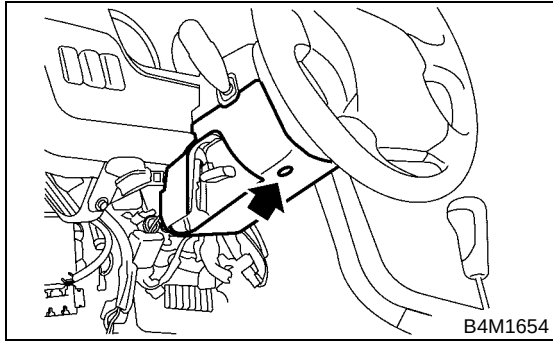
- 4) Remove steering wheel. <Ref. to PS-27, REMOVAL, Steering Wheel.>

- 5) Remove universal joint. <Ref. to PS-28, REMOVAL, Universal Joint.>
- 6) Remove trim panel under instrument panel.

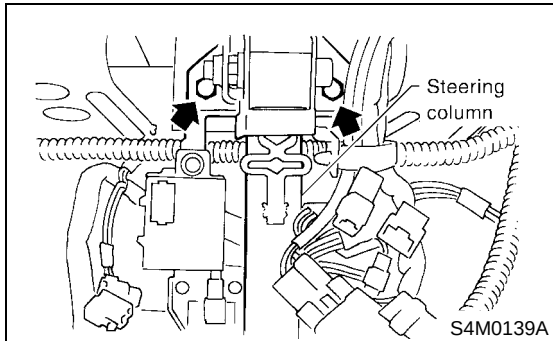
TILT STEERING COLUMN

POWER ASSISTED SYSTEM (POWER STEERING)

- 7) Remove the screw securing lower steering column cover.



- 8) Remove all connectors from steering column.
9) Remove the two bolts under instrument panel securing steering column.



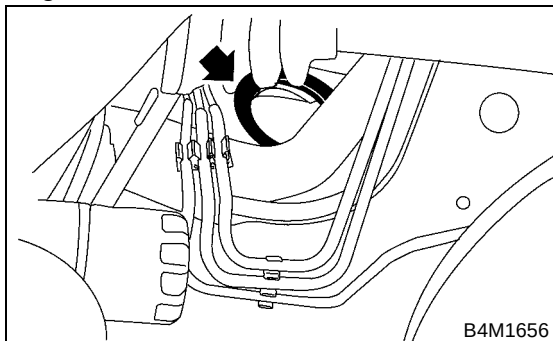
- 10) Pull out steering shaft assembly from hole on toe board.

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-28, INSTALLATION, Universal Joint.>

- 8) Align center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure that front wheels are set in straight forward direction.

- 9) Install steering wheel. <Ref. to PS-27, 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 "Air Bag System" before performing the service operation. <Ref. to AB-12, CAUTION, Driver's Airbag Module.>

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.

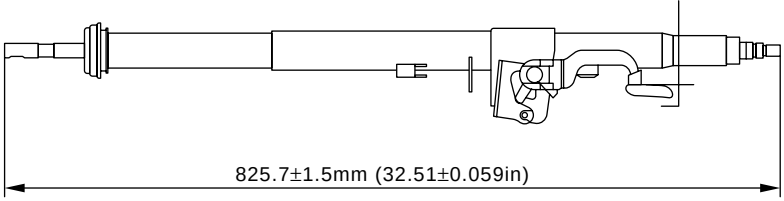
TILT STEERING COLUMN

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

1. BASIC 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
Overall length of steering column Measure overall length of steering column. Standard overall length of steering column:  825.7±1.5mm (32.51±0.059in) ST0024	Replace steering column assembly.

2. AIRBAG MODEL INSPECTION

WARNING:

For airbag model inspection procedures, refer to "Air Bag System". <Ref. to AB-12, CAUTION, Driver's Airbag Module.> and <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

5. Steering Gearbox [LHD MODEL]

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect battery minus terminal.
- 3) Loosen front wheel nut.
- 4) Lift vehicle and remove front wheels.
- 5) Remove under cover.
- 6) Remove sub frame.
- 7) Remove front exhaust pipe assembly. (Non-TURBO model)

Non-TURBO model without OBD

<Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

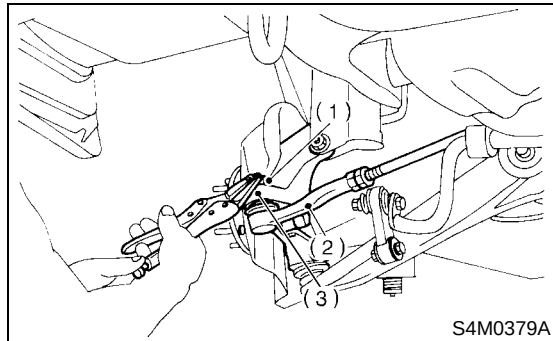
Non-TURBO model with OBD

<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>

WARNING:

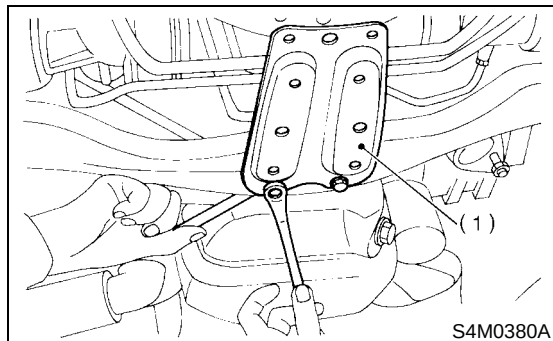
Be careful, exhaust pipe is hot.

- 8) Using a puller, remove tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



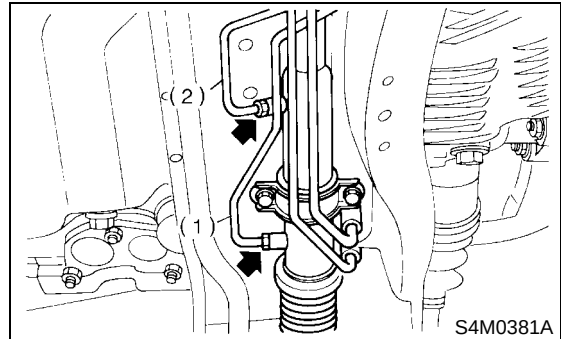
- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

- 9) Remove jack-up plate and front stabilizer.



- (1) Jack-up plate

- 10) 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

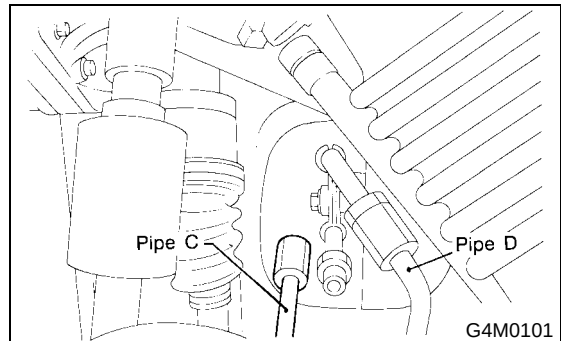
- 11) Remove universal joint. <Ref. to PS-28, REMOVAL, Universal Joint.>
- 12) Disconnect pipes C and D from pipe of gearbox.

CAUTION:

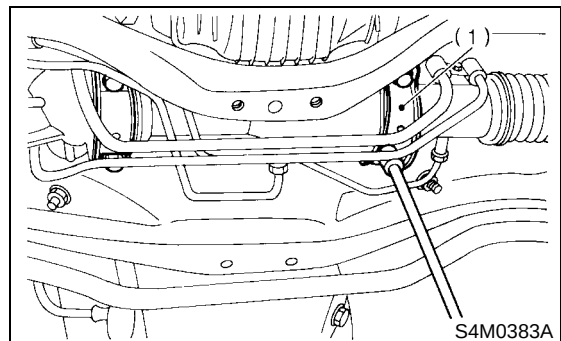
Be careful not to damage these pipes.

NOTE:

Disconnect upper pipe D first, and lower pipe C second.



- 13) Remove clamp bolts securing gearbox to crossmember, and remove gearbox.



- (1) Clamp

STEERING GEARBOX [LHD MODEL]

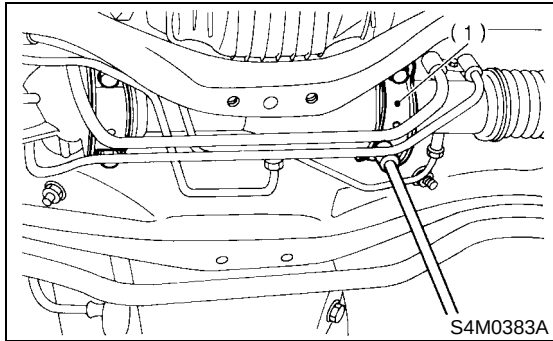
POWER ASSISTED SYSTEM (POWER STEERING)

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)



(1) Clamp

- 3) 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.

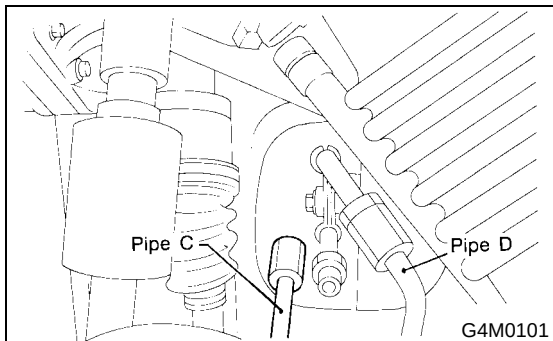
Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

- (2) Connect pipes C and D to gearbox.
Connect upper pipe D first, and lower pipe C second.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)



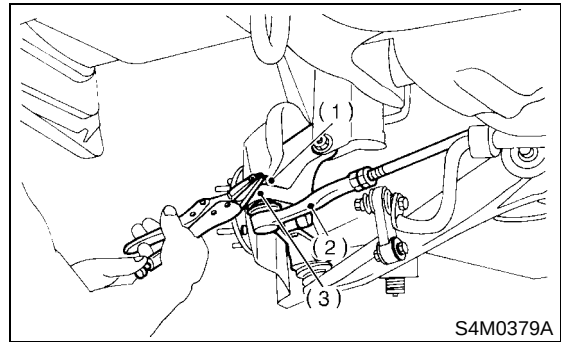
- 4) Install universal joint. <Ref. to PS-28, INSTALLATION, Universal Joint.>
- 5) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

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) Install sub frame.

Tightening torque:

45 N·m (4.6 kgf-m, 33 ft-lb)

- 9) Align center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure that front wheels are set in straight forward direction.

- 10) Install steering wheel. <Ref. to PS-27, INSTALLATION, Steering Wheel.>
- 11) Install tires.
- 12) Tighten wheel nuts to the specified torque.

Tightening torque:

90 N·m (9.1 kgf-m, 66 ft-lb)

- 13) Connect ground terminal to battery.
- 14) Pour fluid into oil tank, and bleed air. <Ref. to PS-103, Power Steering Fluid.>
- 15) Check for fluid leaks.
- 16) Install jack-up plate.
- 17) Lower vehicle.
- 18) Check fluid level in oil tank.
- 19) After adjusting toe-in and steering angle, tighten lock nut on tie-rod end.

Tightening torque:

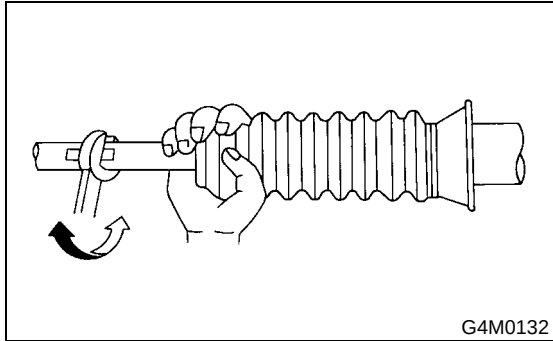
83 N·m (8.5 kgf-m, 61.5 ft-lb)

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

When adjusting toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

1) Disconnect four pipes from gearbox.

NOTE:

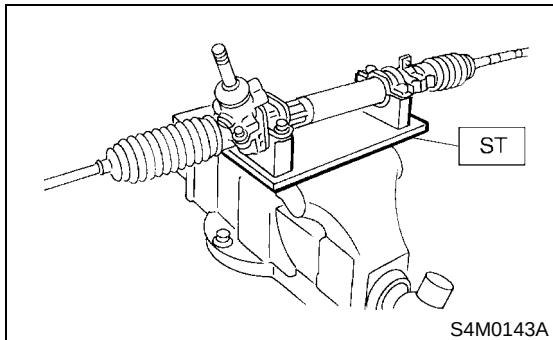
Remove pipes E and F as a single unit being fixed at the clamp plate.

2) Secure gearbox removed from vehicle in vice using ST.

ST 926200000 STAND

CAUTION:

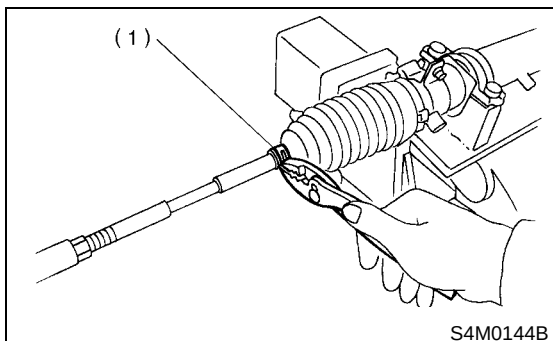
Secure the gearbox in a vice using the ST as shown. Do not attempt to secure it without this ST.



3) Remove tie-rod end plate.

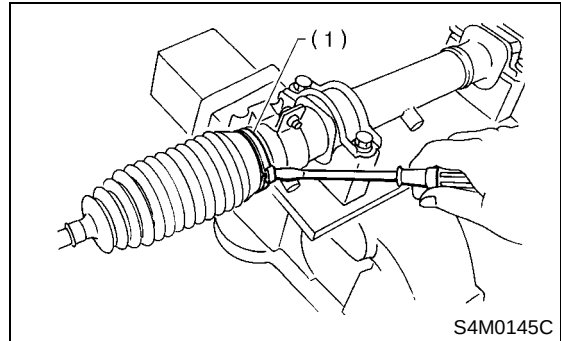
4) Remove tie-rod end and lock nut from gearbox.

5) Remove small clip from boot using pliers, and move boot to tie-rod end side.



(1) Clip

6) Using standard screwdriver, remove band from boot.

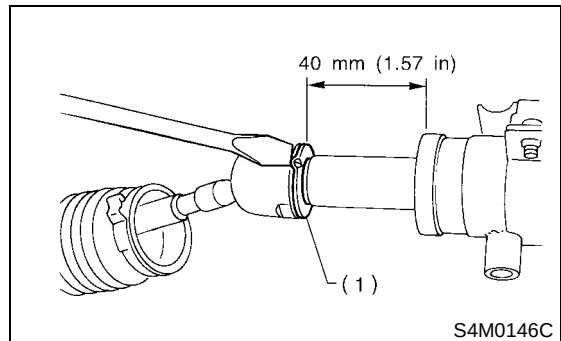


(1) Band

7) 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:

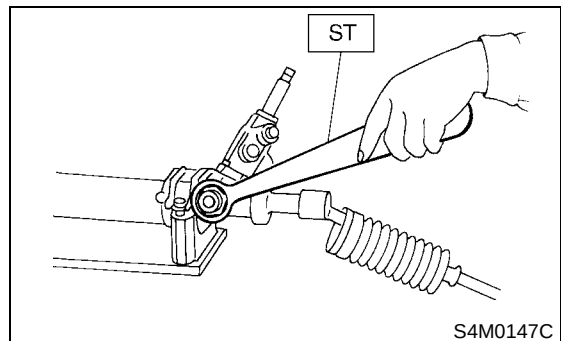
Be careful not to scratch rack surface as oil leaks may result.



(1) Lock washer

8) Using ST, loosen lock nut.

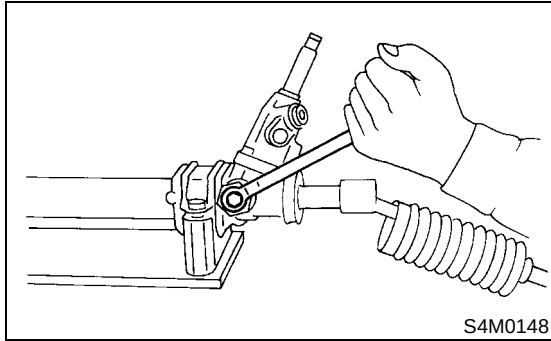
ST 926230000 SPANNER



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

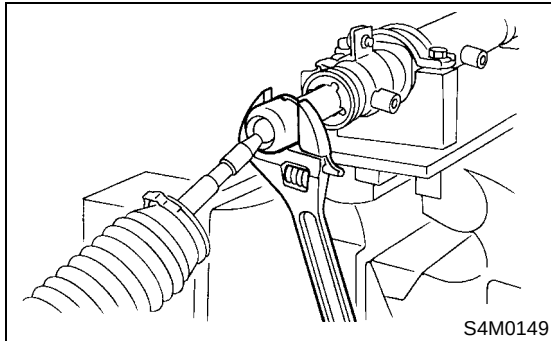
9) Tighten adjusting screw until it no longer tightens.



10) 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.

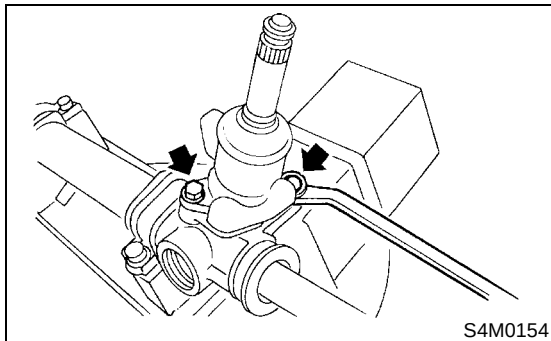


11) Loosen adjusting screw and remove spring and sleeve.

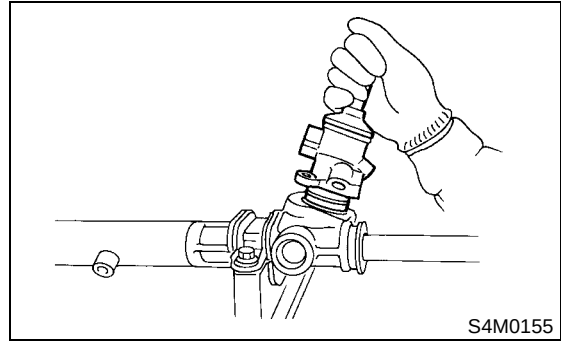
CAUTION:

Replace spring and/or sleeve if damaged.

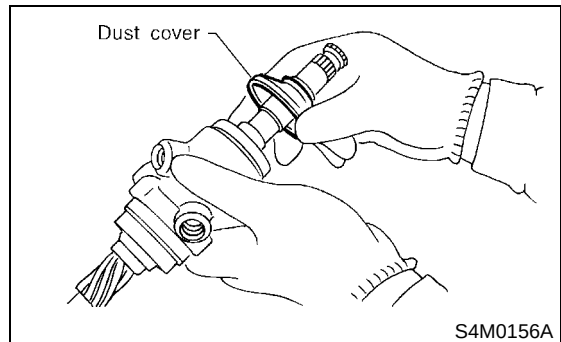
12) Remove two bolts securing valve assembly.



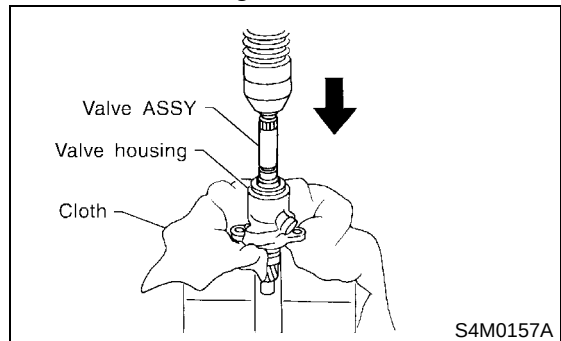
13) Carefully draw out input shaft and remove valve assembly.



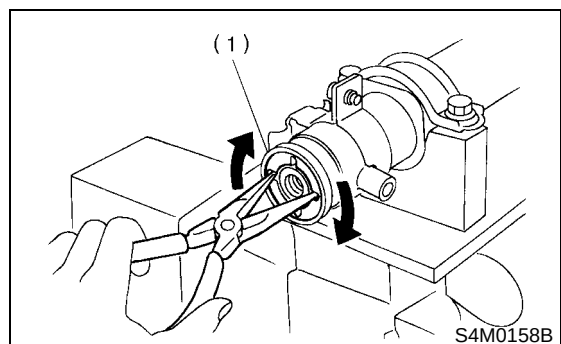
14) Slide dust cover out.



15) Using a press remove pinion and valve assembly from valve housing.



16) 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.



(1) Rack stopper

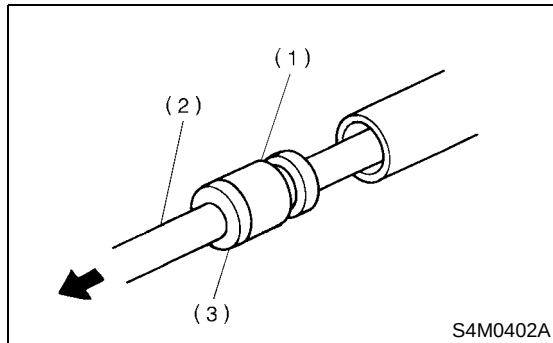
17) Pull rack assembly from cylinder side, and draw out rack bushing and rack stopper together with rack assembly.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

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

18) Remove rack bushing and rack stopper from rack assembly.

CAUTION:

Do not reuse removed rack bushing and circlip.

D: ASSEMBLY

CAUTION:

Use only SUBARU genuine grease for gearbox.

Specified grease for gearbox:

VALIANT GREASE M2 (Part No. 003608001)

1) Fixing rack housing

Fix rack housing in vice using ST.

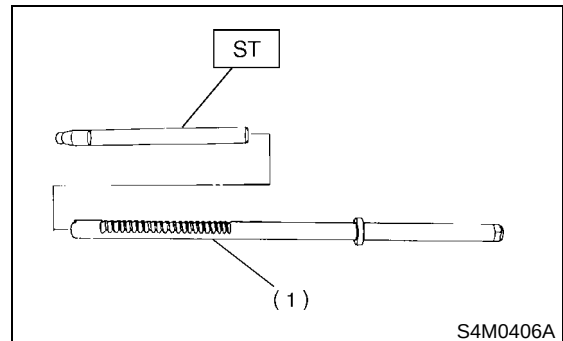
ST 926200000 STAND

CAUTION:

- When fixing rack housing in vice, be sure to use this special tool. Do not fix rack housing in vice 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.

2) 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

3) 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 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.

4) 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

5) Fit ST1 and ST2 over the end of rack, and install rack bushing.

ST1 926400000 GUIDE

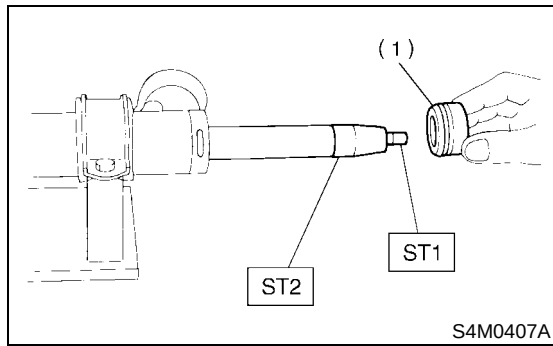
ST2 927660000 GUIDE

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.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)



(1) Rack bushing ASSY

6) 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.

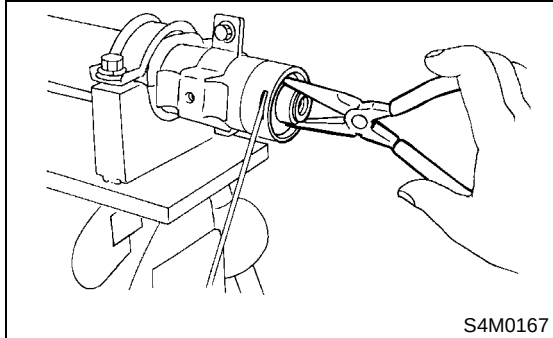
7) Insert rack stopper into rack housing, and wrap circlip using a sharp pointed pliers to secure rack stopper in position.

CAUTION:

Be careful not to scratch rack while winding circlip.

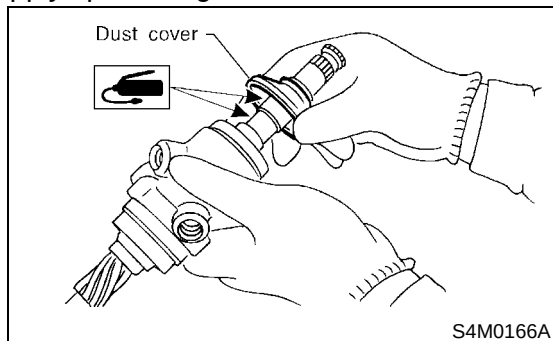
NOTE:

Rotate wrench another 90 to 180° after the end of circlip has been wrapped in.



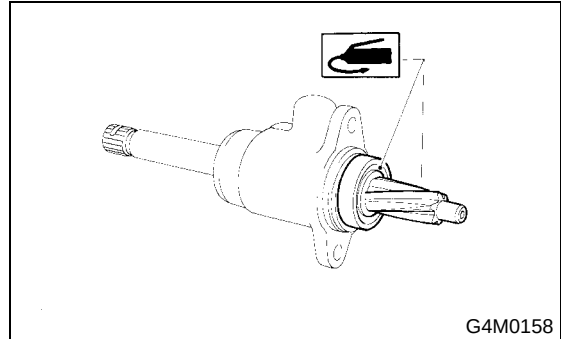
8) Fit mounting rubber onto rack housing.

9) Apply specified grease to dust cover.



10) Install dust cover on valve assembly.

11) Apply genuine grease to pinion gear and bearing of valve assembly.



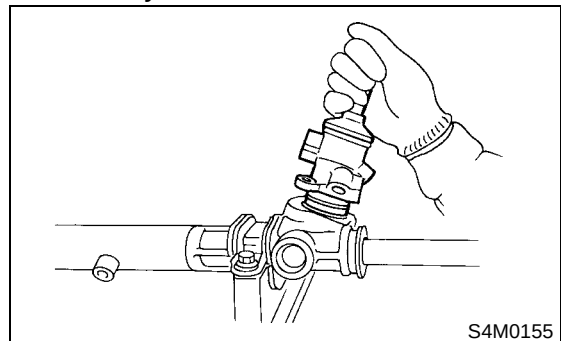
12) Install gasket on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

CAUTION:

Be sure to use a new gasket.

NOTE:

Do not allow packing to be caught when installing valve assembly.



13) 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.

14) Clean all parts and tools before reassembling.

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.

STEERING GEARBOX [LHD MODEL]

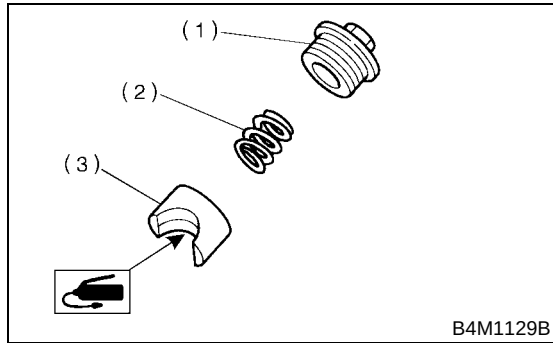
POWER ASSISTED SYSTEM (POWER STEERING)

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

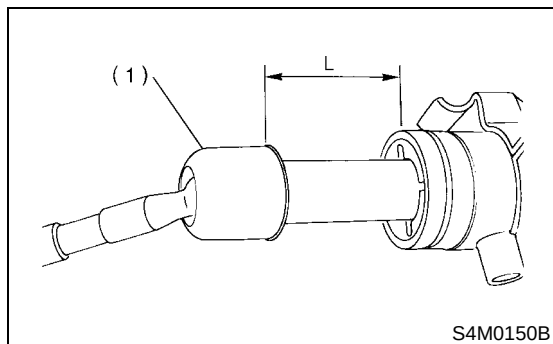
19) Install lock washers and tighten left and right tie-rods into rack ends.

On condition

L: Approximately 40 mm (1.57 in)

Tightening torque:

78 N·m (8.0 kgf·m, 58 ft·lb)

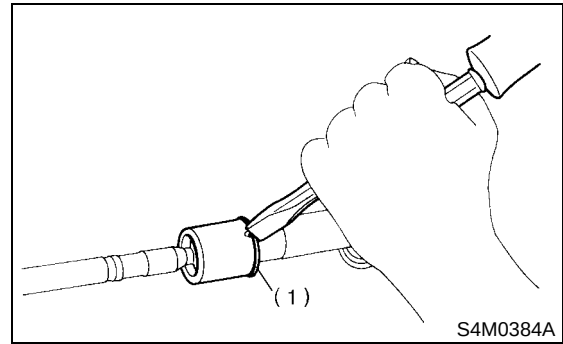


- (1) Tie-rod

20) Bend lock washer using a chisel.

CAUTION:

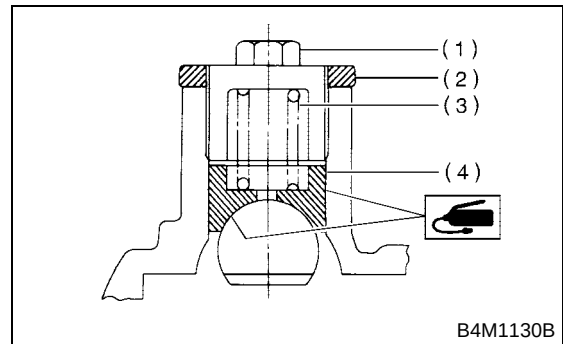
Be careful not to scratch rack when bending lock washer.



- (1) Lock washer

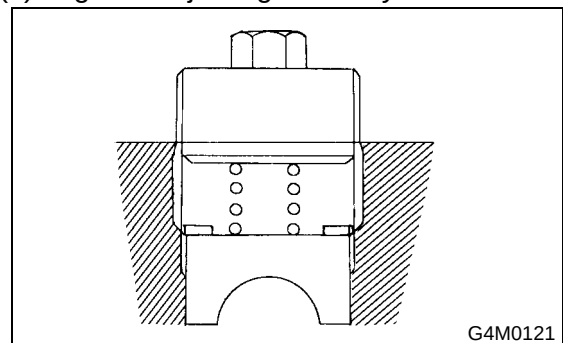
21) Rack and pinion backlash adjustment

- (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 two threads.

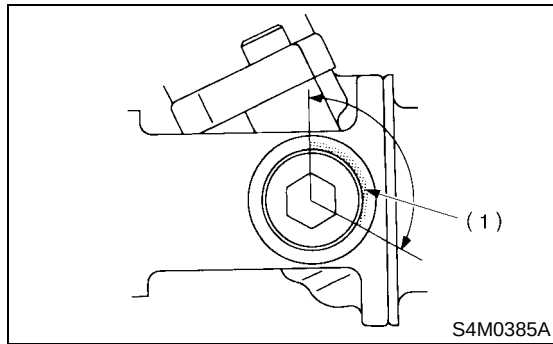


STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

- (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.

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.

22) Check for service limit as per article of "Service limit".<Ref. to PS-42, INSPECTION, Steering Gearbox [LHD MODEL].> Make replacement and adjustment if necessary.

- 23) Install boot to housing.

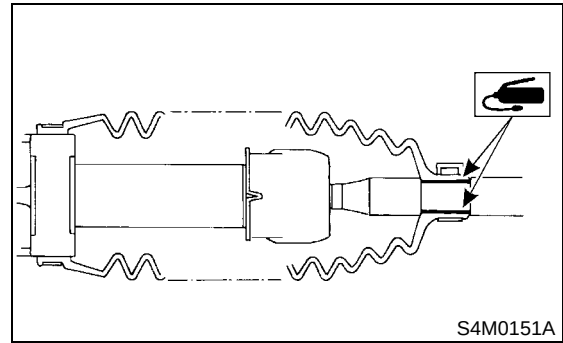
NOTE:

- 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.

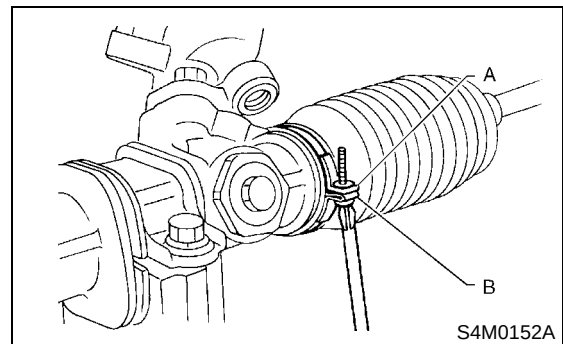


- 24) Using a screwdriver, tighten the screw until the ends "A" and "B" of the band come into contact with each other.

CAUTION: Use a new band.

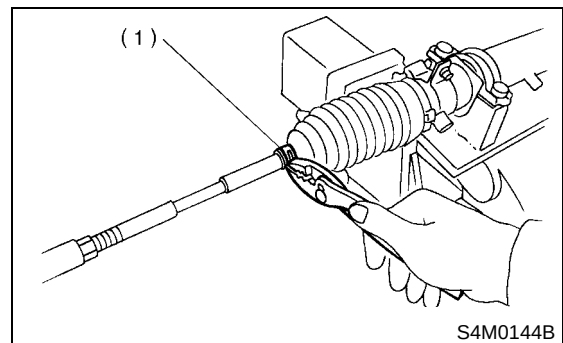
NOTE:

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.

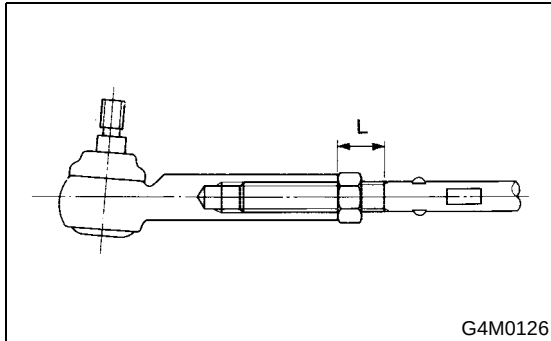
**Installed tie-rod length: L
15 mm (0.59 in)**

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:

Pay attention to difference between right and left tie-rod ends.



27) Install tie-rod end plate.

Tightening torque:

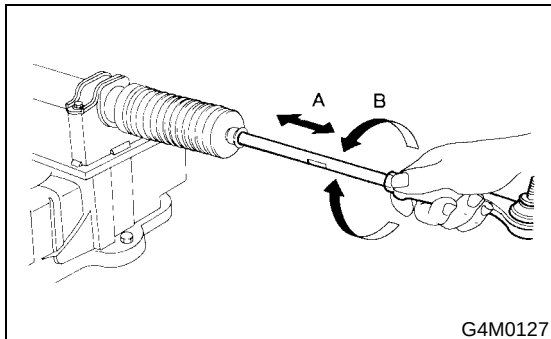
13 N·m (1.3 kgf-m, 9.4 ft-lb)

28) 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.



29) Remove gearbox from ST.

ST 926200000 STAND

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:

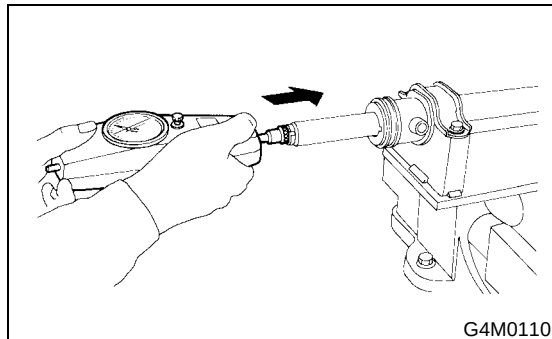
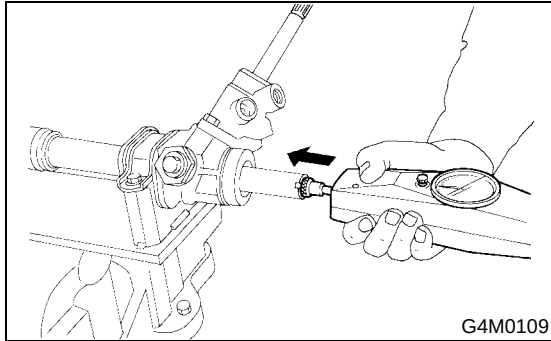
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit

235 N (24 kgf, 53 lb) or less



3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

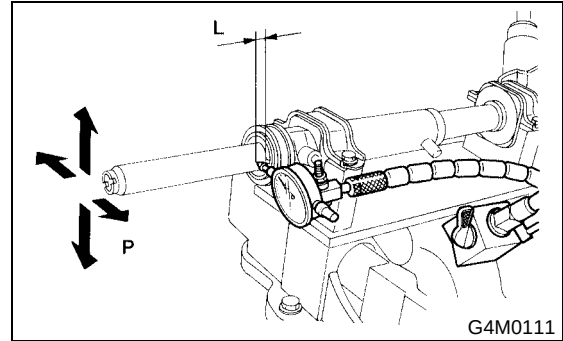
Service limit

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:

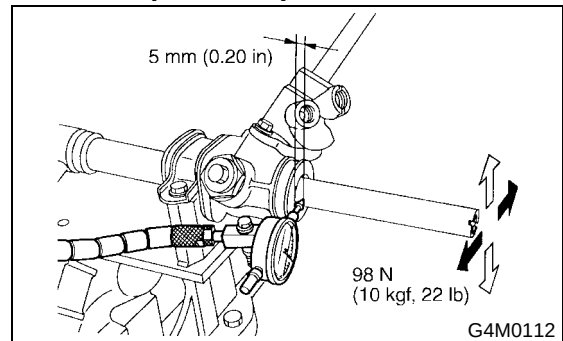
Service limit

Direction $\leftrightarrow$

0.3 mm (0.012 in) or less

Direction $\leftrightarrow$

0.15 mm (0.0059 in) or less



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

4. INPUT SHAFT PLAY

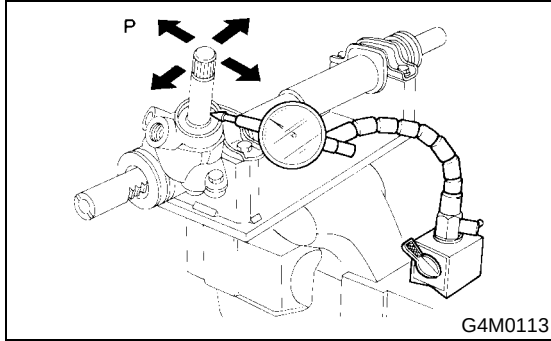
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

On condition

P: 98 N (10 kgf, 22 lb)



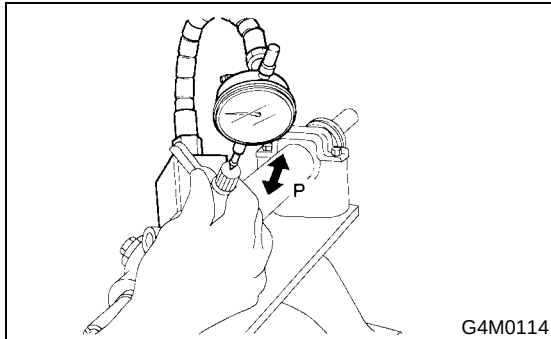
In axial direction:

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

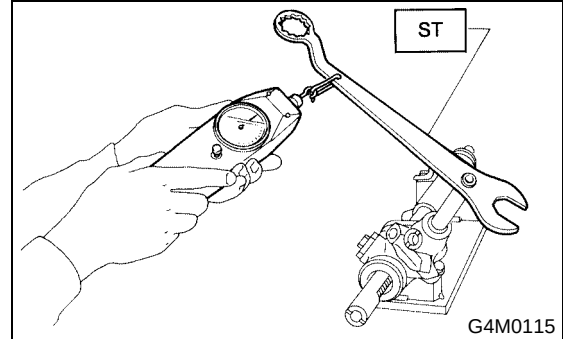
Using ST, measure gearbox turning resistance.

ST 34099PA100 SPANNER

Service limit

Maximum allowable resistance

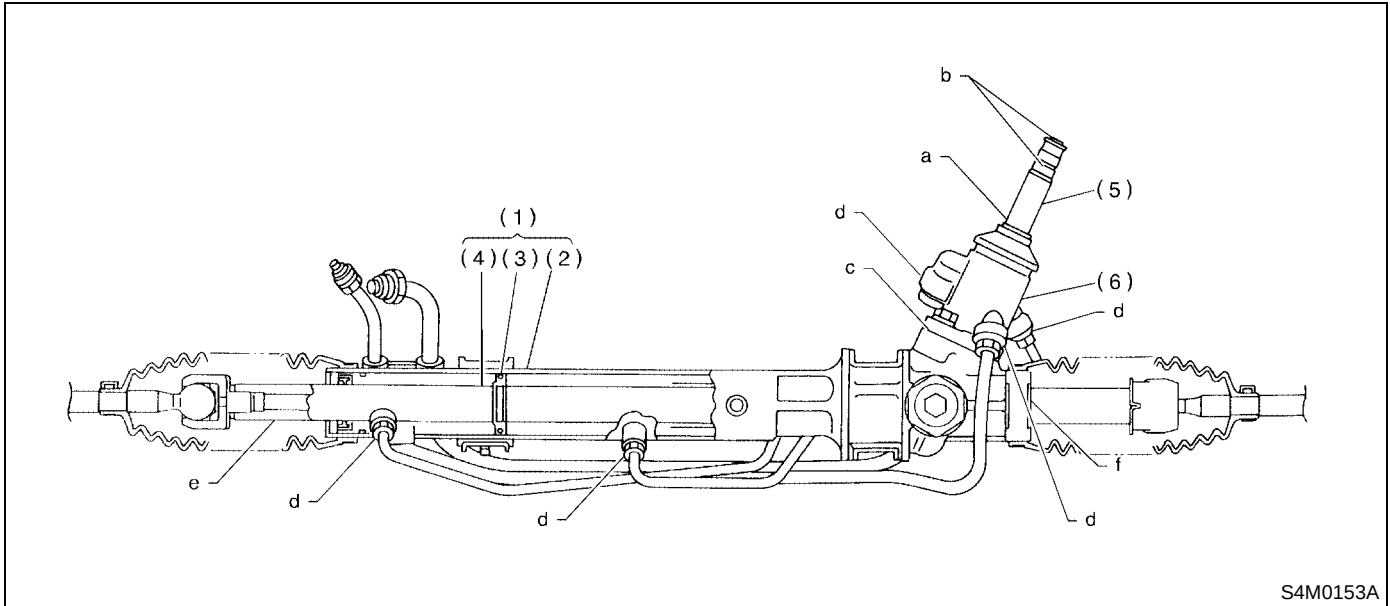
Less than 9.33 N (0.95 kgf, 2.10 lb)



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":

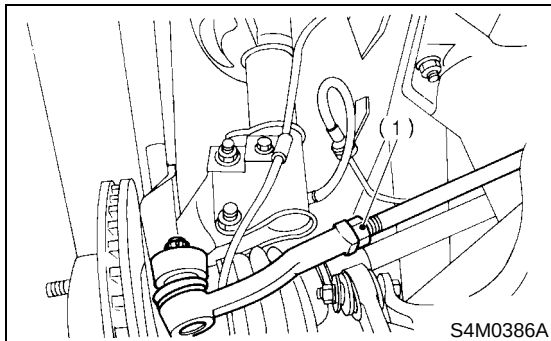
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust front toe.

Standard of front toe:

IN 3 — OUT 1 mm (IN 0.12 — OUT 0.039 in)



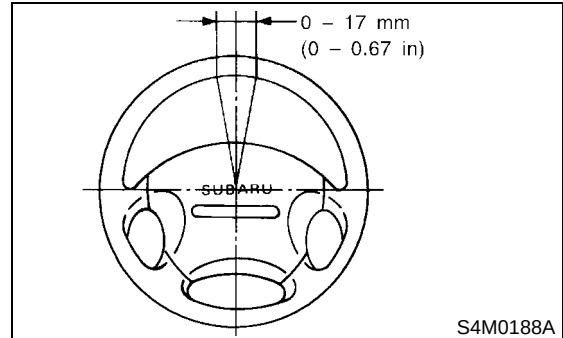
(1) Lock nut

2) Adjust steering angle of wheels.

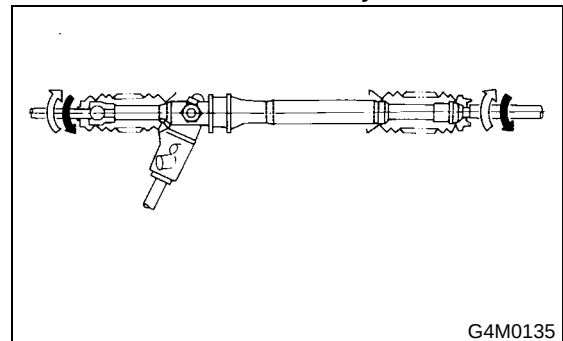
Standard of steering angle:

Model	TURBO and OUTBACK	Others
Inner wheel	$34^{\circ}30' \pm 1.5^{\circ}$	$37^{\circ}20' \pm 1.5^{\circ}$
Outer wheel	$30^{\circ}20' \pm 1.5^{\circ}$	$32^{\circ}25' \pm 1.5^{\circ}$

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 minus terminal.
- 3) Loosen front wheel nut.
- 4) Lift vehicle and remove front wheels.
- 5) Remove under cover.
- 6) Remove sub frame.
- 7) Remove front exhaust pipe assembly. (Non-TURBO model)

Non-TURBO model without OBD

<Ref. to EX(SOHCw/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

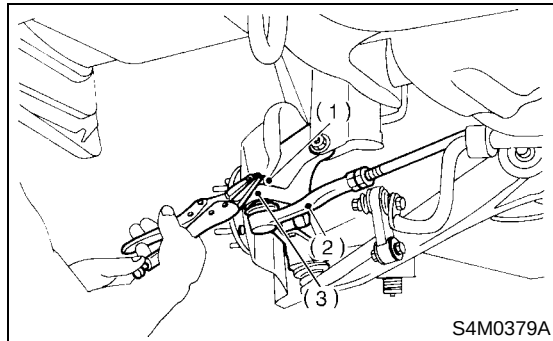
Non-TURBO model with OBD

<Ref. to EX(SOHC)-7, REMOVAL, Front Exhaust Pipe.>

WARNING:

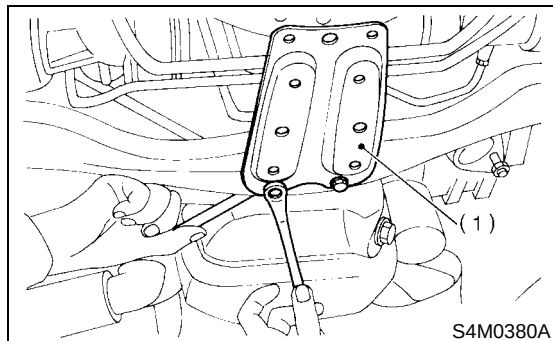
Be careful, exhaust pipe is hot.

- 8) 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

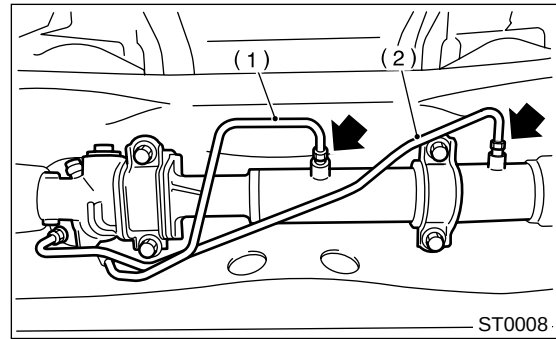
- 9) Remove jack-up plate and front stabilizer.



- (1) Jack-up plate

- 10) 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

- 11) Remove universal joint. <Ref. to PS-28, REMOVAL, Universal Joint.>

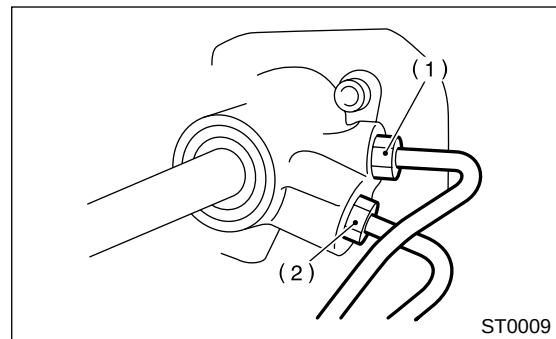
- 12) Disconnect pipes C and D from pipe of gearbox.

CAUTION:

Be careful not to damage these pipes.

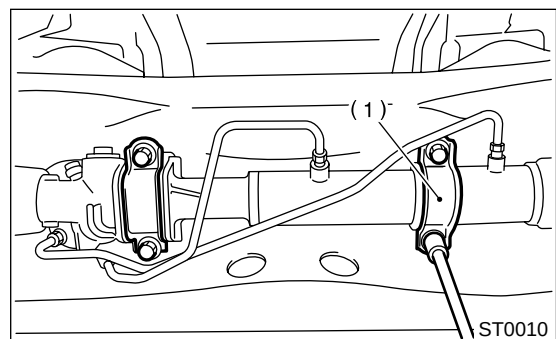
NOTE:

Disconnect lower pipe C first, and upper pipe D second.



- (1) Pipe C
- (2) Pipe D

- 13) Remove clamp bolts securing gearbox to crossmember, and remove gearbox.



- (1) Clamp

STEERING GEARBOX [RHD MODEL]

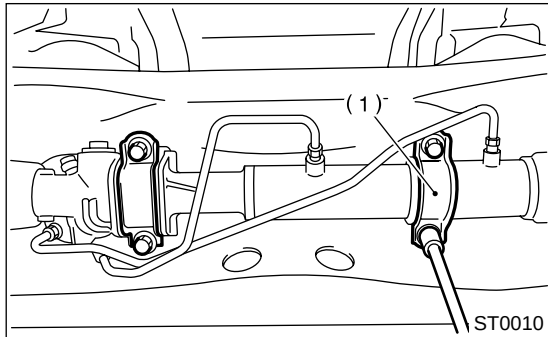
POWER ASSISTED SYSTEM (POWER STEERING)

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)

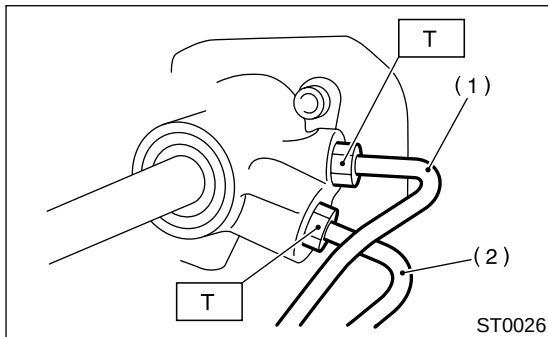


(1) Clamp

- 3) Connect pipe D first from control valve, and pipe C second.

Tightening torque:

T: 15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Pipe C

(2) Pipe D

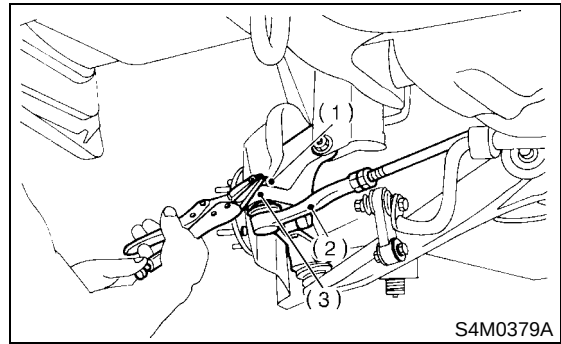
- 4) Install universal joint. <Ref. to PS-28, INSTALLATION, Universal Joint.>
- 5) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

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) Install sub frame.

Tightening torque:

45 N·m (4.6 kgf-m, 33 ft-lb)

- 9) Install under cover.
- 10) Align center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure that front wheels are set in straight forward direction.

- 11) Install steering wheel. <Ref. to PS-27, INSTALLATION, Steering Wheel.>
- 12) Install tires.
- 13) Tighten wheel nuts to the specified torque.

Tightening torque:

90 N·m (9.1 kgf-m, 66 ft-lb)

- 14) Connect ground terminal to battery.
- 15) Pour fluid into oil tank, and bleed air. <Ref. to PS-103, Power Steering Fluid.>
- 16) Check for fluid leaks.
- 17) Install jack-up plate.
- 18) Lower vehicle.
- 19) Check fluid level in oil tank.
- 20) After adjusting toe-in and steering angle, tighten lock nut on tie-rod end.

Tightening torque:

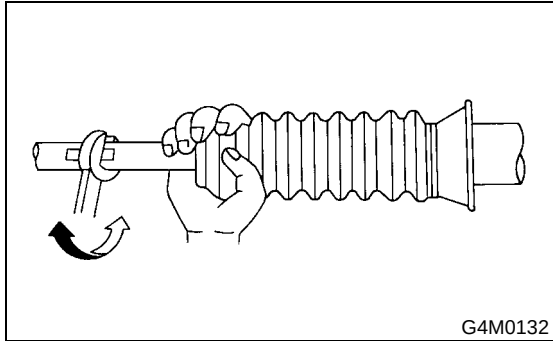
83 N·m (8.5 kgf-m, 61.5 ft-lb)

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

When adjusting toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

1) Disconnect four pipes from gearbox.

NOTE:

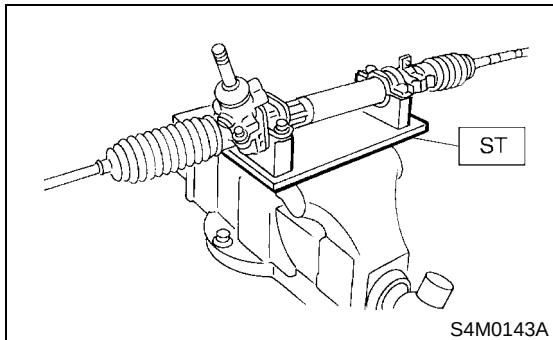
Remove pipes E and F as a single unit being fixed at the clamp plate.

2) Secure gearbox removed from vehicle in vice using ST.

ST 926200000 STAND

CAUTION:

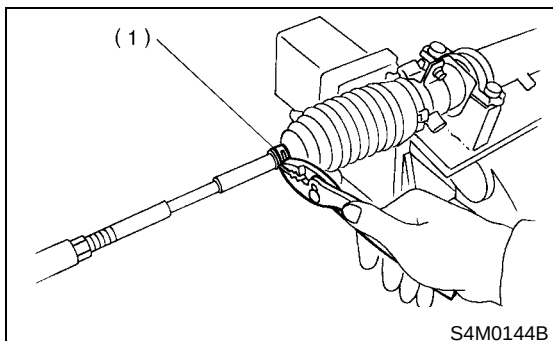
Secure the gearbox in a vice using the ST as shown. Do not attempt to secure it without this ST.



3) Remove tie-rod end plate.

4) Remove tie-rod end and lock nut from gearbox.

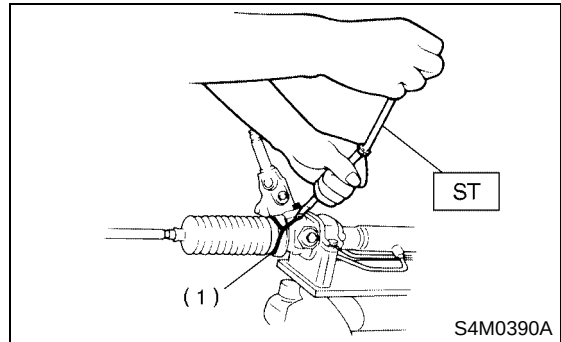
5) Remove small clip from boot using pliers, and move boot to tie-rod end side.



(1) Clip

6) Using ST, remove lock wire from inner end of boot, and remove boot.

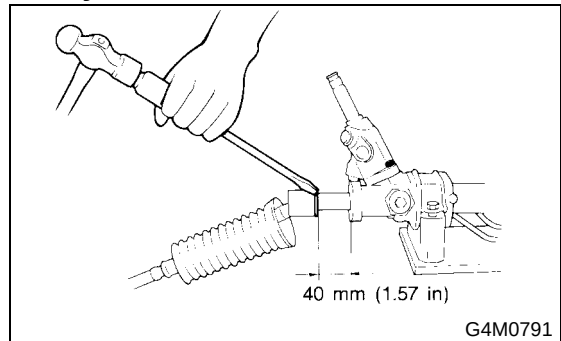
ST 927590000 WRENCH



7) 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.

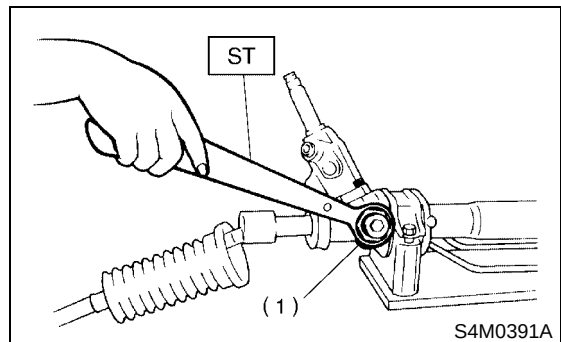
CAUTION:

Be careful not to scratch rack surface as oil leaks may result.



8) Using ST, loosen lock nut.

ST 926230000 SPANNER

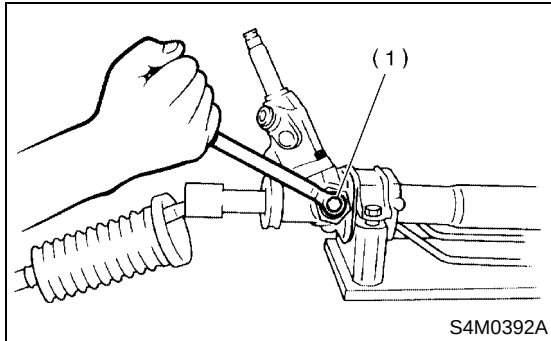


(1) Lock nut

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

9) Tighten adjusting screw until it no longer tightens.

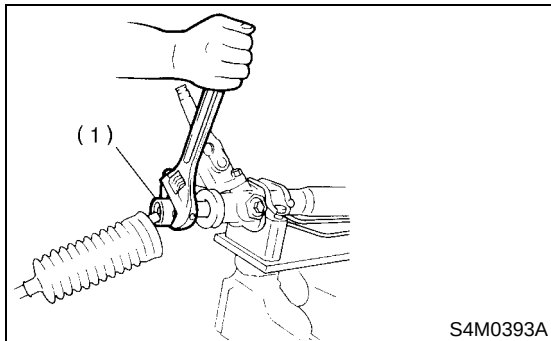


(1) Adjusting screw

10) 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

11) Loosen adjusting screw and remove spring and sleeve.

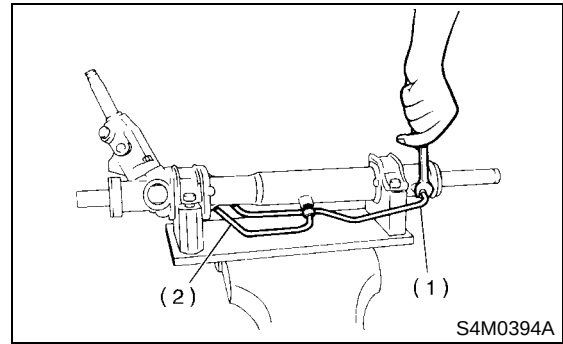
CAUTION:

Replace spring and/or sleeve if damaged.

12) Disconnect pipes A and B from steering body and control valve housing.

CAUTION:

Replace pipes and/or flare nuts if damaged.



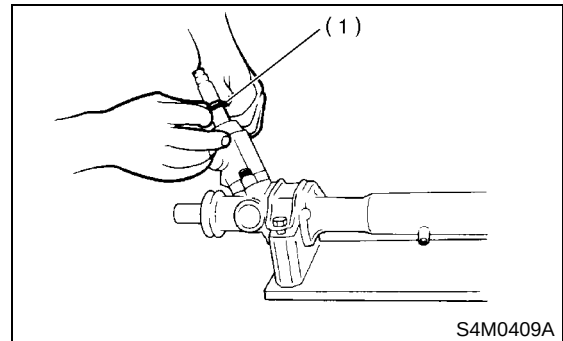
(1) Pipe A

(2) Pipe B

13) Slide dust cover out.

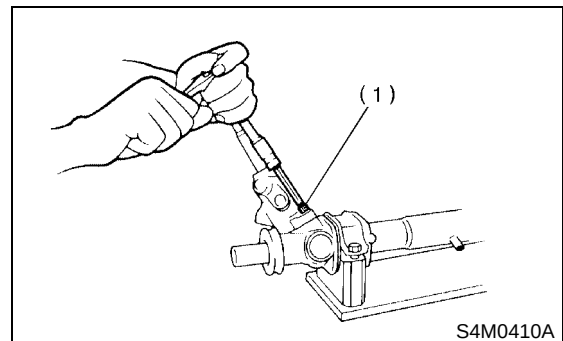
CAUTION:

- 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

14) Remove the two bolts securing valve housing.

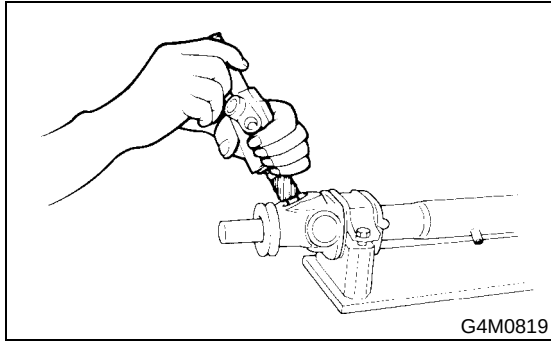


(1) Socket bolt

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

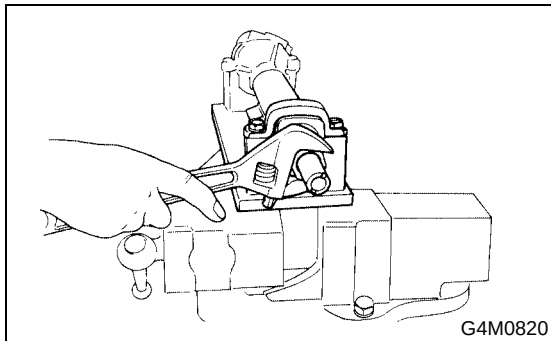
15) Remove valve housing, pinion and valve as a unit.



16) Remove holder using a 32 mm wrench or adjustable wrench.

CAUTION:

Discard old holder and replace with new one.

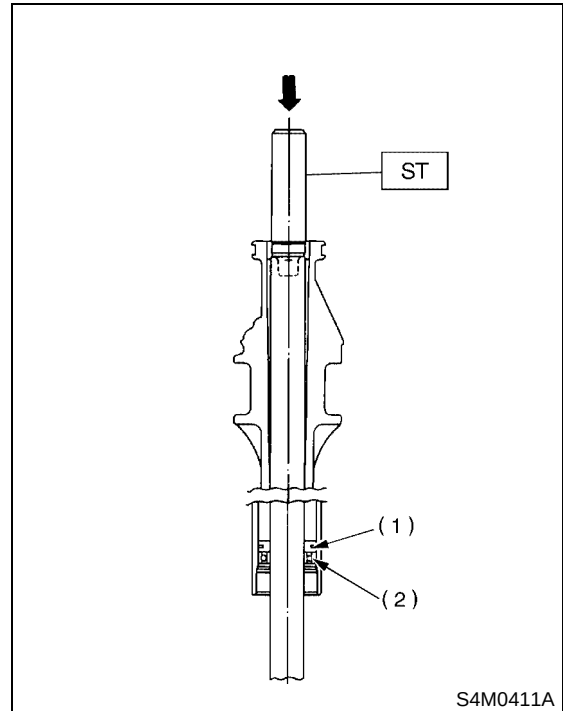


17) Install ST on valve side of rack and press outer side oil seal out.

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

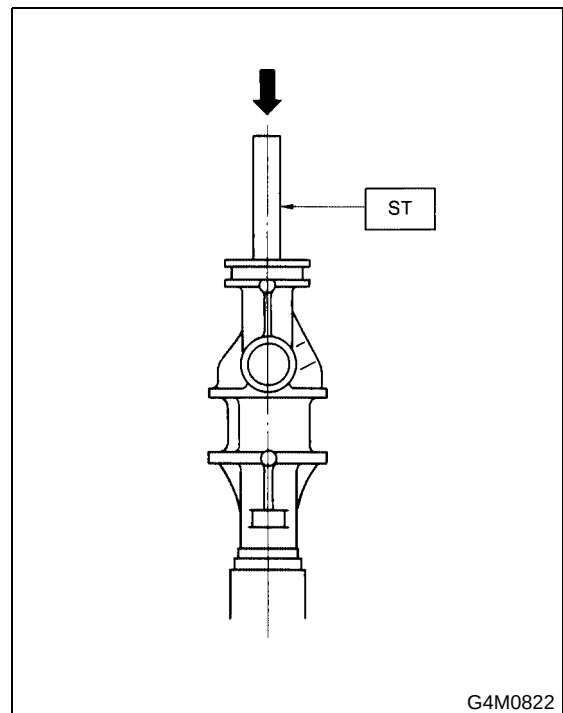
(2) Outer side oil seal

18) 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



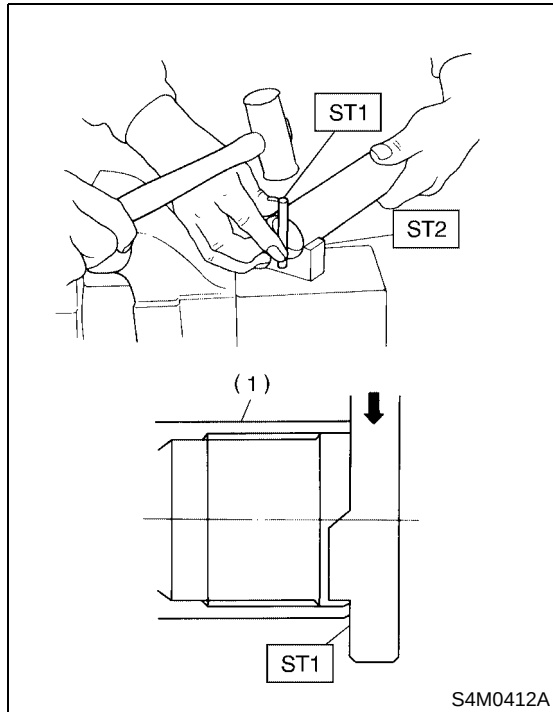
STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

19) Using ST1 and ST2, repair cylinder's clinched sections.

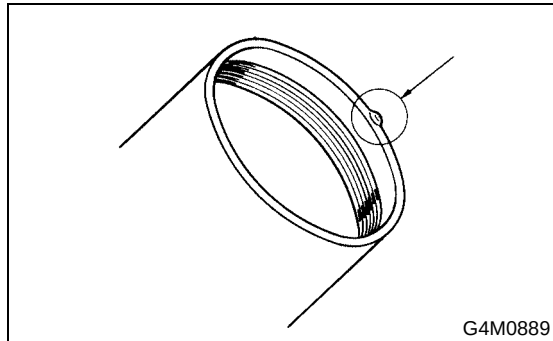
ST1 34099FA080 PUNCH

ST2 34099FA070 BASE



(1) Cylinder

20) If cylinder edge is deformed in a convex shape, repair using an oil stone.



D: ASSEMBLY

Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

1) Attach steering body to ST as shown. Apply a coat of grease to needle bearing.

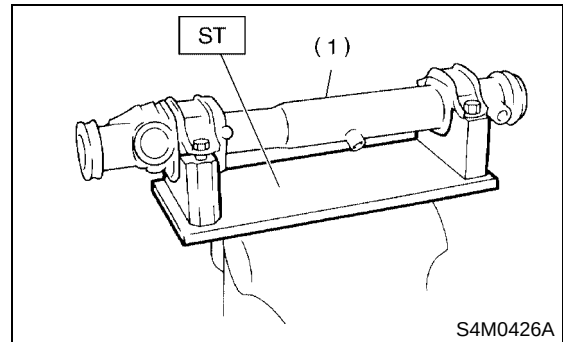
ST 926200000 STAND

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.



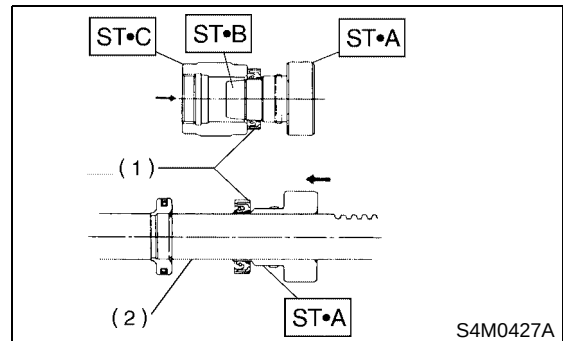
(1) Steering body

2) 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:

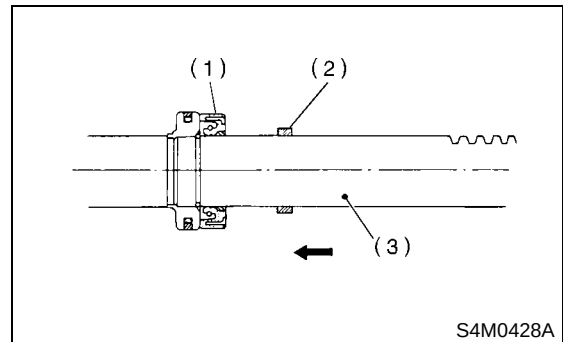
Face oil seal in the direction shown in figure.



(1) Oil seal

(2) Rack

3) Install back-up ring from gear side of rack.



(1) Oil seal

(2) Back-up ring

(3) Rack

STEERING GEARBOX [RHD MODEL]

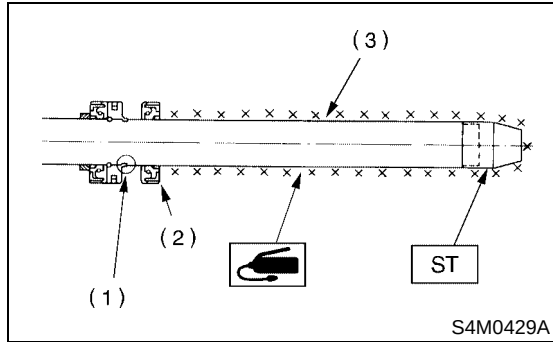
POWER ASSISTED SYSTEM (POWER STEERING)

4) 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 knurl section.



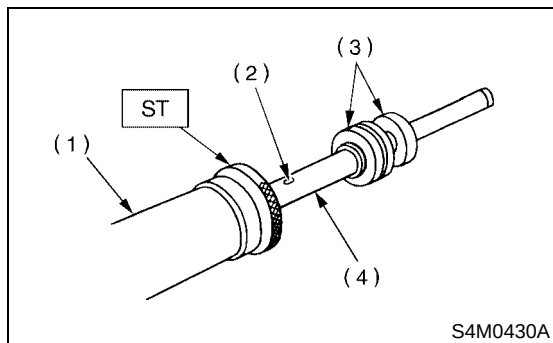
- (1) Rack piston inner ring
- (2) Outer side oil seal
- (3) Rack

5) 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 34099FA010 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.



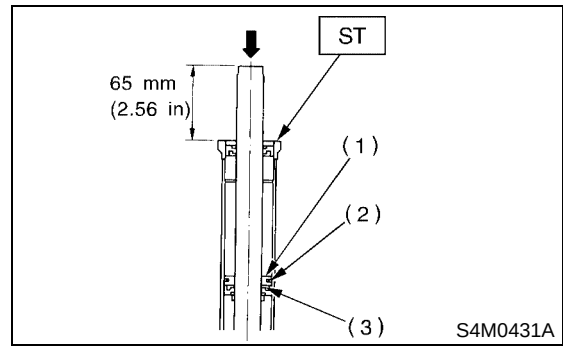
- (1) Cylinder side of steering body
- (2) Air vent hole
- (3) Oil seal
- (4) Rack

6) Slowly press inner side oil seal until distance between ST and end of rack is 65 mm (2.56 in).

ST 34099FA010 GUIDE (Oil seal)

CAUTION:

Ensure ST's inner wall is free of scratches. Otherwise, it may damage oil seal during installation.

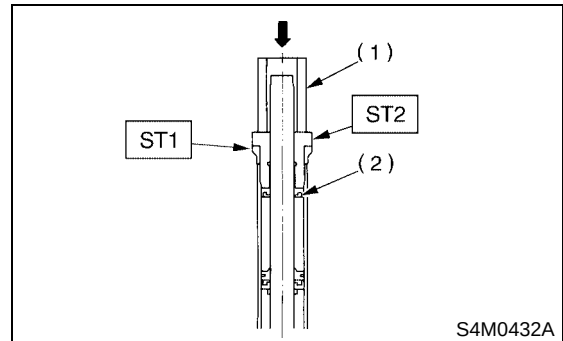


- (1) Rack piston
- (2) Inner side oil seal
- (3) Back-up ring

7) Pass ST2 and pipe through rack and press outer side oil seal until ST1 is in contact with ST2.

ST1 34099FA010 GUIDE (Oil seal)

ST2 34099FA040 INSTALLER (Oil seal)

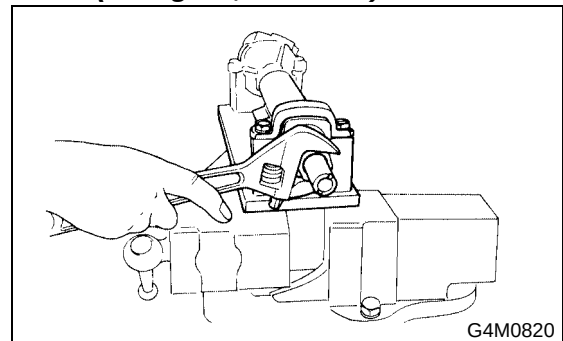


- (1) Pipe
- (2) Outer side oil seal

8) Install holder from cylinder side of steering body.

Tightening torque:

64 N·m (6.5 kgf-m, 47.0 ft-lb)



9) Attach ST to rack cylinder. Using a press, install back-up ring and oil seal.

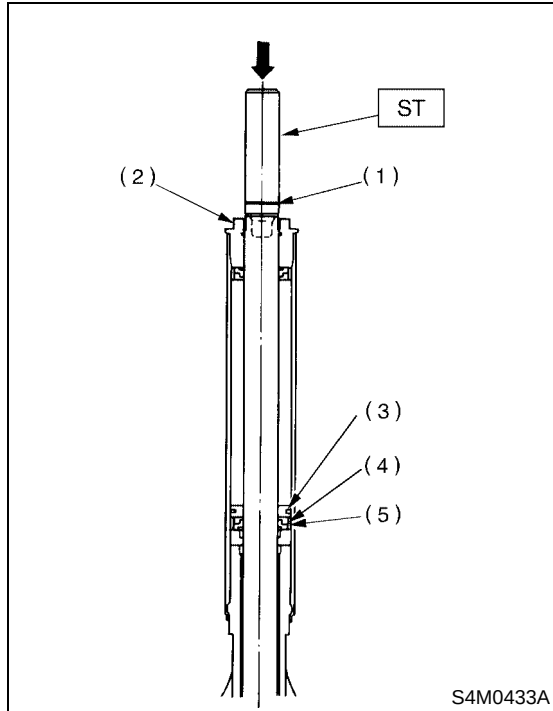
NOTE:

Press ST until its groove is aligned with end of holder.

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

ST 34099FA030 INSTALLER & REMOVER



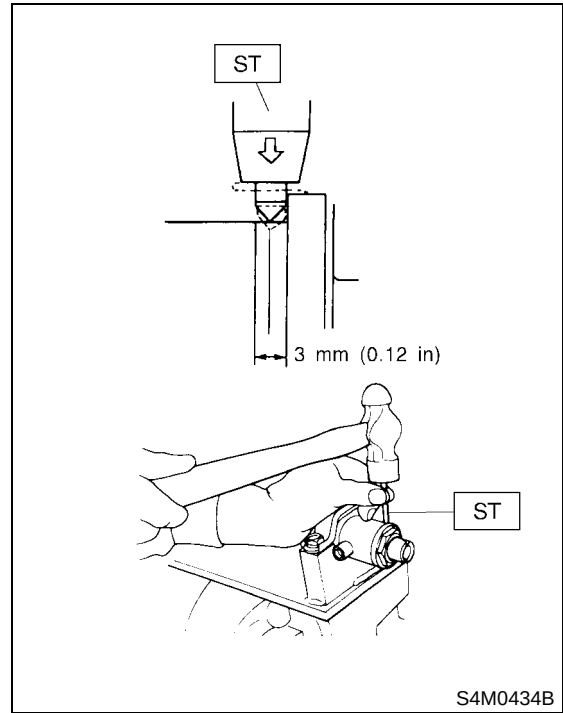
- (1) Installer guide
- (2) Holder
- (3) Rack piston
- (4) Oil seal
- (5) Back-up ring

10) Using ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

CAUTION:

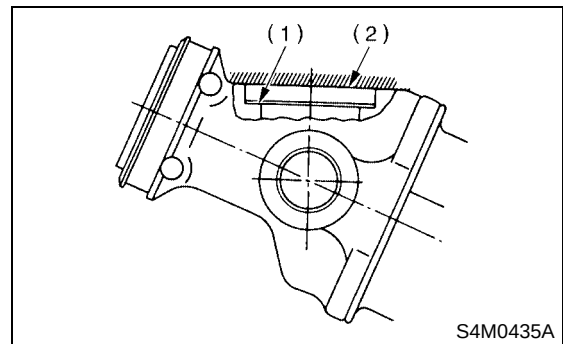
Be careful not to deform holder.

ST 34099FA060 PUNCH HOLDER



11) Remove traces of sealer, oil, rust, etc., from mating surfaces of valve housing and steering body.

12) Position a shim in graded portion of steering body pinion housing, and apply an even coat of sealer (Fuji Bond C: 004403004) to end of pinion housing.



- (1) Shim
- (2) Fuji Bond C

13) Use the same number of shims as that used when steering body was removed.

14) If steering body, valve housing or pinion and valve is replaced with a new one, add two or three shims, install valve on pinion housing and tighten with two bolts to 25 N·m (2.5 kgf·m, 18.1 ft·lb). Then, measure clearance between steering body and valve housing using a thickness gauge. Remove shims so that the clearance is zero.

STEERING GEARBOX [RHD MODEL]

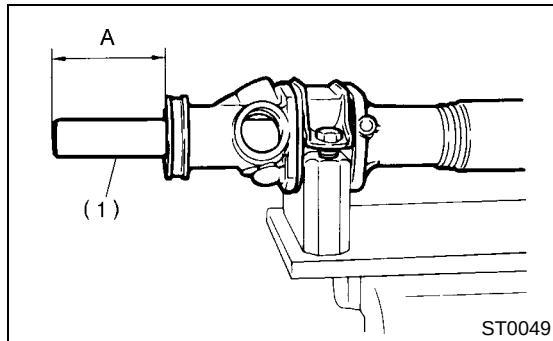
POWER ASSISTED SYSTEM (POWER STEERING)

15) Extend rack A beyond pinion side of steering body.

A:

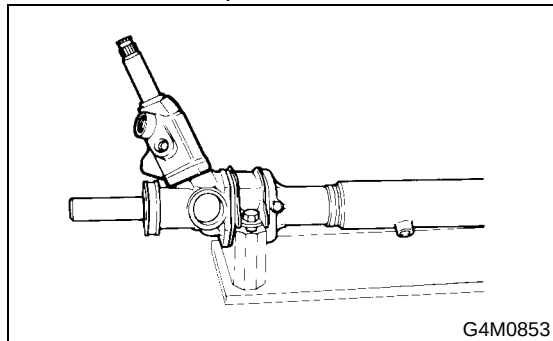
TURBO and OUTBACK : 66.6 mm (2.622 in)

Others : 70.8 mm (2.787 in)



(1) Rack

16) Apply grease to pinion gear teeth and ball bearing. Insert valve into place.



17) Alternately and slowly tighten socket bolts.

NOTE:

Replace faulty parts before installing valve. Otherwise, valve may not be installed properly.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

18) Move rack shaft fully to the left and right two or three times to lubricate shaft ends with grease.

Remove excess grease, being careful not to block air vent hole.

CAUTION:

- When rack is fully moved to its stroke ends with tie-rod removed, be careful not to bump rack ends.

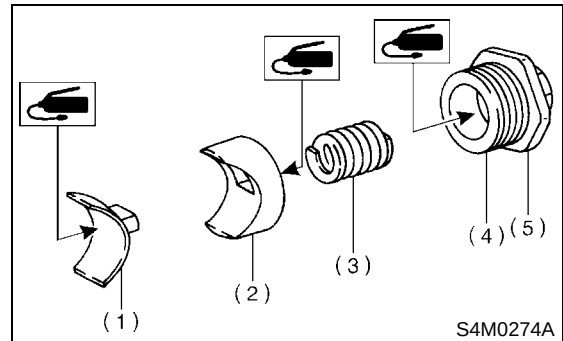
- Ensure that screw located at end of rack shaft is free from grease.

19) Apply grease to bore wall which accommodates sleeve.

CAUTION:

Ensure that hands are clean when applying grease.

20) Apply a coat of grease to sliding surface of seat pad, sleeve and seating surface of spring, and insert sleeve into steering body. Charge adjusting screw with grease, insert spring into adjusting screw and install on steering body.



(1) Seat pad

(2) Sleeve

(3) Spring

(4) Adjusting screw

(5) Lock nut

21) Installation of tie-rod.

(1) Tighten adjusting screw until it will no longer tighten.

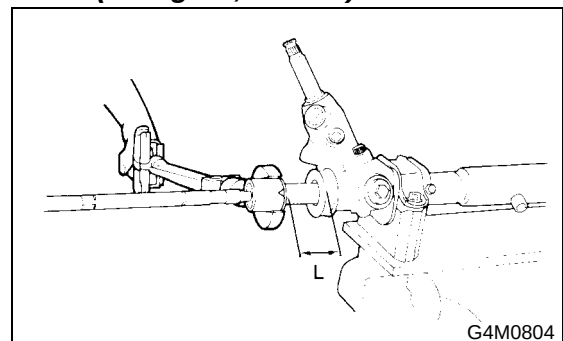
(2) Install lock washers and tighten left and right tie-rods into rack ends.

On condition

L: Approximately 40 mm (1.57 in)

Tightening torque:

78 N·m (8.0 kgf-m, 58 ft-lb)



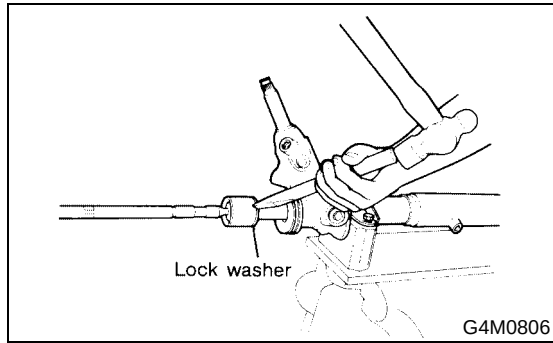
22) Using a chisel and hammer, bend lock washers (at two places).

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

Be careful not to scratch rack.



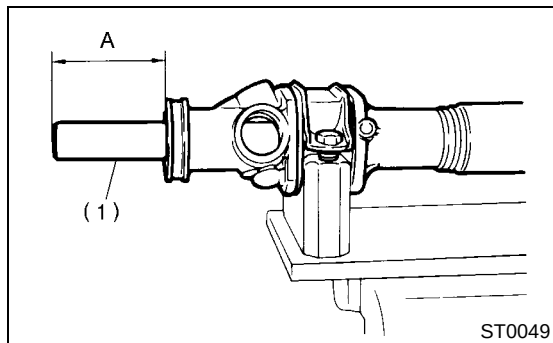
23) Rack and pinion backlash adjustment.

- (1) Loosen adjustment plug.
- (2) Rotate input shaft so that rack is in the straight ahead direction. (Ensure that distance between rack end and stopper is A.)

A:

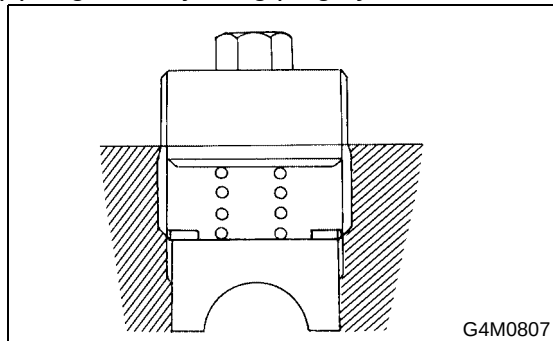
TURBO and OUTBACK: 66.6 mm (2.622 in)

Others: 70.8 mm (2.787 in)



(1) Rack

(3) Tighten adjusting plug by two threads.



- (4) Turn adjusting screw so that entire thread area is coated with liquid packing.

Liquid packing:

THREE BOND 1102 or equivalent

NOTE:

- Apply liquid packing of approximately 1.5 grams (0.053 oz) to adjusting screw thread area.
- Also turn plug to ensure that its entire contact area is coated with liquid packing.

- (5) Tighten adjusting plug to 5 N·m (0.5 kgf-m, 3.6 ft-lb) and loosen, then tighten to 5 N·m (0.5 kgf-m, 3.6 ft-lb) and loosen, and finally tighten to 5 N·m (0.5 kgf-m, 3.6 ft-lb) and loosen 30°.

- (6) While holding adjusting plug using a closed wrench, tighten lock nut using ST.

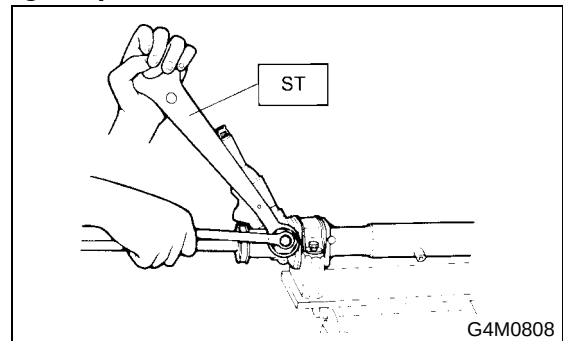
ST 926300000 SPANNER

Tightening torque:

39 N·m (4 kgf-m, 29 ft-lb)

CAUTION:

- Do not allow liquid packing to come in contact with sleeve.
- While rotating input shaft to fully move rack shaft to the left and right, ensure that rack moves smoothly without binding, and that rotating torque is constant.



24) Installation of boot.

- (1) Apply a coat of grease to inner wall of boot small end.
- (2) Position boot large end in rubber mount groove and gearbox, and small end in groove of tie-rod.

CAUTION:

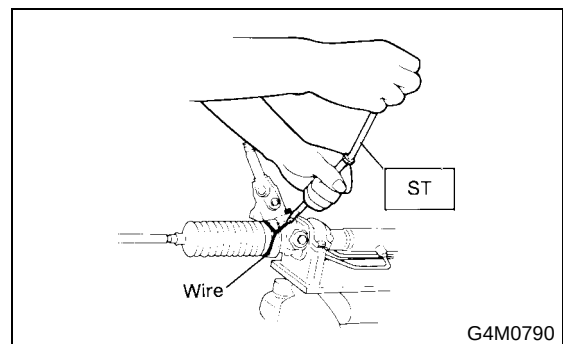
- Ensure that both ends of boot are properly situated in grooves.
- Ensure that boot is free from abnormal swelling or dents.

- 25) Attach lock wire to boot large end, and twist it while pulling it upward (with a force of approximately 39 N (4 kgf, 9 lb)).

ST 927590000 WRENCH

CAUTION:

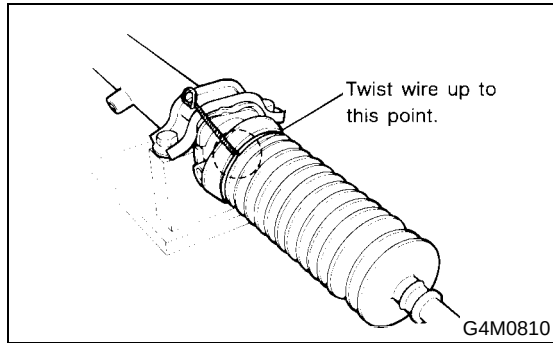
- Ensure that lock wire is not loose.



STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

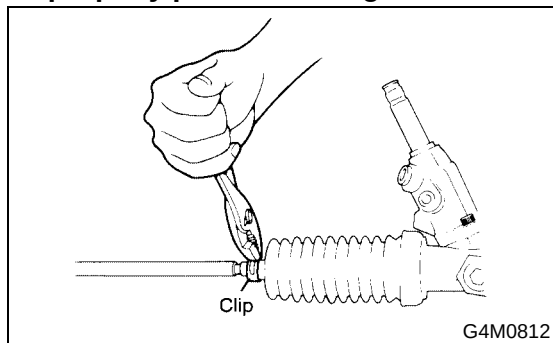
26) Then bend wire end along boot as shown.



27) Install clip using pliers.

CAUTION:

After installing clip, ensure that boot's small end is properly positioned in groove on tie-rod.



28) Install pipes A and B.

Tightening torque:

Valve housing side

20 N·m (2.0 kgf-m, 14.5 ft-lb)

Steering body side

24 N·m (2.4 kgf-m, 17.4 ft-lb)

29) Install tie-rod end plate.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

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:

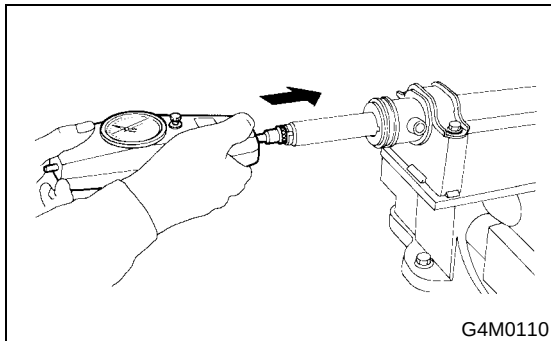
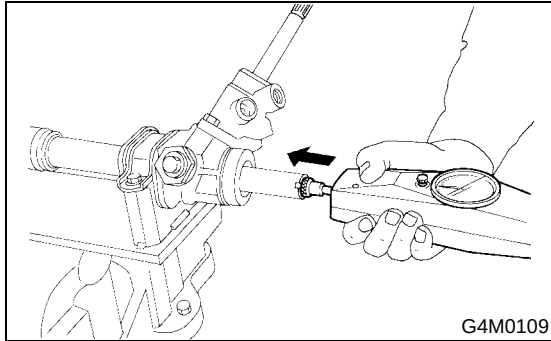
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit

304 N (31 kgf, 68 lb) or less



3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

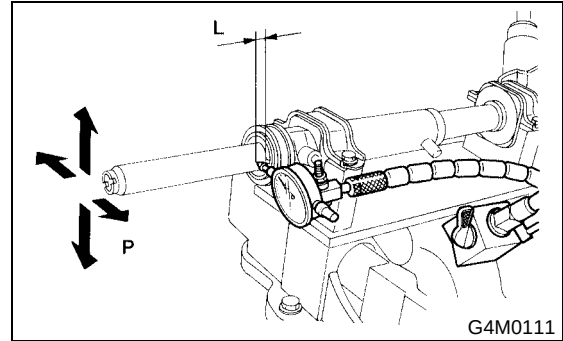
Service limit

0.19 mm (0.0075 in) or less

On condition

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lb)



Left-turn steering:

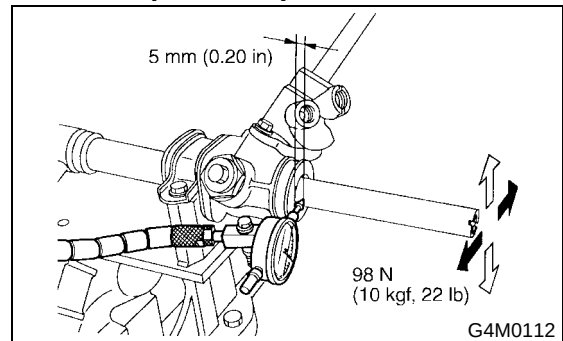
Service limit

Direction ⇐⇒

0.3 mm (0.012 in) or less

Direction ⇐⇒

0.15 mm (0.0059 in) or less



STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

4. INPUT SHAFT PLAY

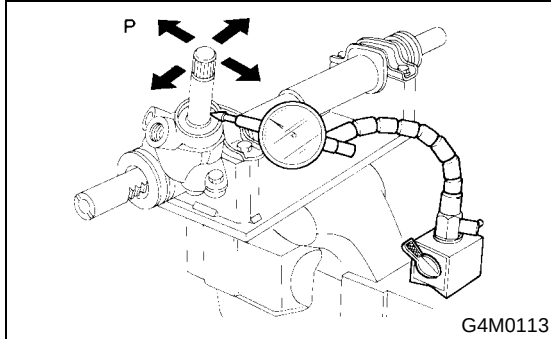
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

On condition

P: 98 N (10 kgf, 22 lb)



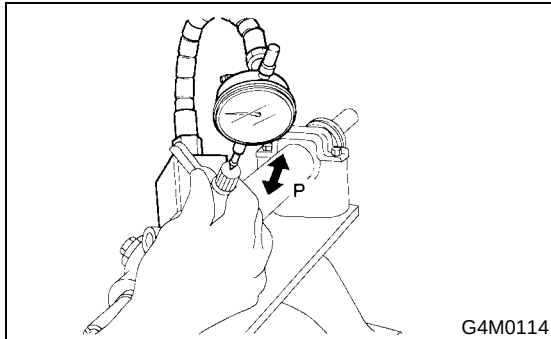
In axial direction:

Service limit

0.5 mm (0.020 in) or less

On condition

P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



5. TURNING RESISTANCE OF GEARBOX

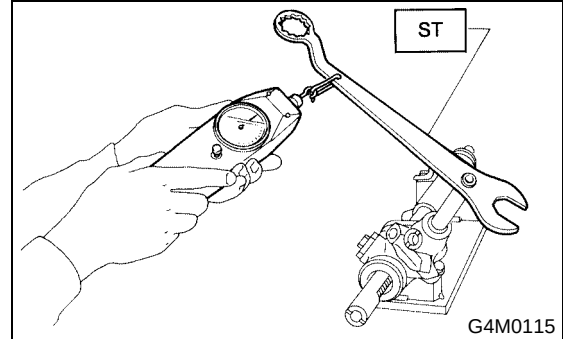
Using ST, measure gearbox turning resistance.

ST 34099PA100 SPANNER

Service limit

Maximum allowable resistance

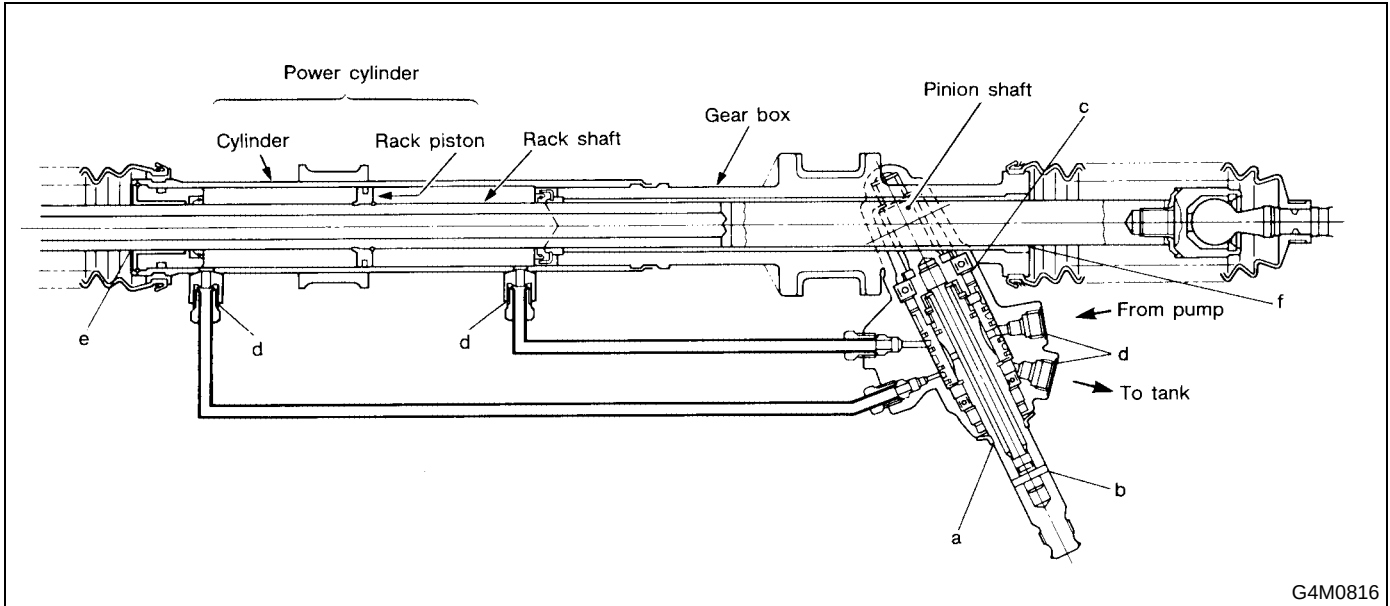
13 N (1.3 kgf, 2.9 lb)



STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6. OIL LEAKING



• 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 [RHD 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":

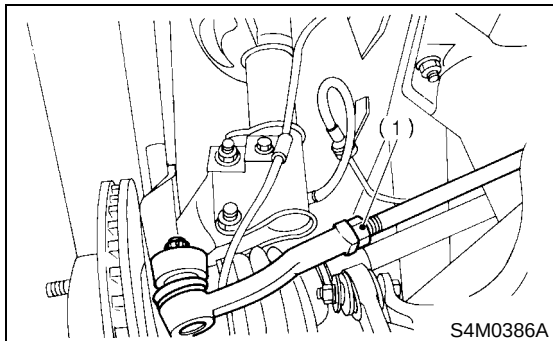
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust front toe.

Standard of front toe:

IN 3 — OUT 1 mm (IN 0.12 — OUT 0.039 in)



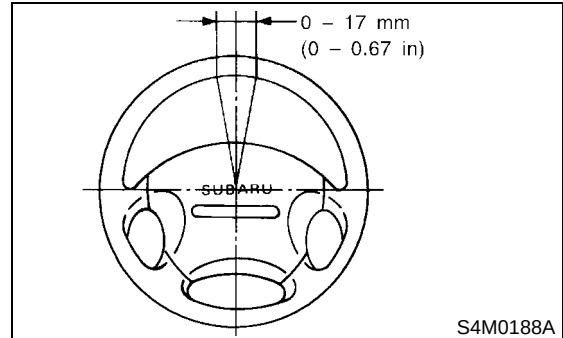
(1) Lock nut

2) Adjust steering angle of wheels.

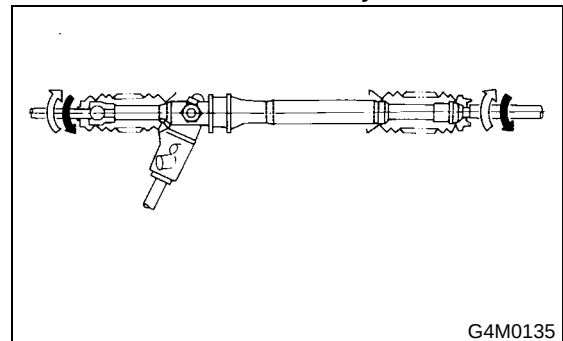
Standard of steering angle:

Model	TURBO and OUTBACK	Others
Inner wheel	$34^{\circ}30' \pm 1.5^{\circ}$	$37^{\circ}20' \pm 1.5^{\circ}$
Outer wheel	$30^{\circ}20' \pm 1.5^{\circ}$	$32^{\circ}25' \pm 1.5^{\circ}$

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.



VALVE HOUSING OIL SEAL

POWER ASSISTED SYSTEM (POWER STEERING)

7. Valve Housing Oil Seal

A: REPLACEMENT

1. LHD MODEL

Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

1) Remove steering gearbox assembly <Ref. to PS-33, REMOVAL, Steering Gearbox [LHD MODEL].>

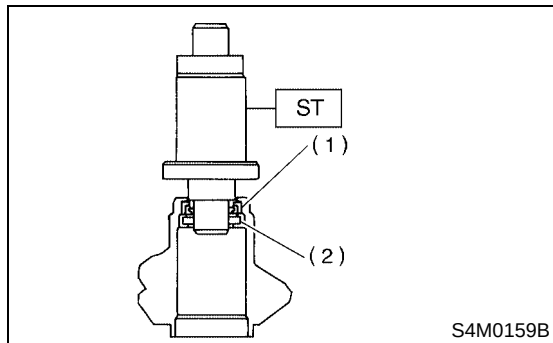
2) Remove and assemble control valve assembly <Ref. to PS-35, DISASSEMBLY, Steering Gearbox [LHD MODEL].>

3) Using ST and press, remove dust seal, oil seal and special bearing from valve housing.

ST 34099FA120 INSTALLER & REMOVER SEAL

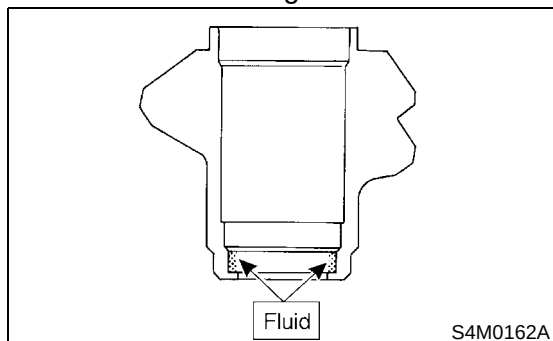
CAUTION:

- Do not apply a force to end surface of valve housing.
- Do not reuse oil seal after removal.



- (1) Oil seal
(2) Special bearing

4) Apply a coat of specified power steering fluid to inner wall of valve housing.



5) Attach ST2 to ST1, and press oil seal into place using a press.

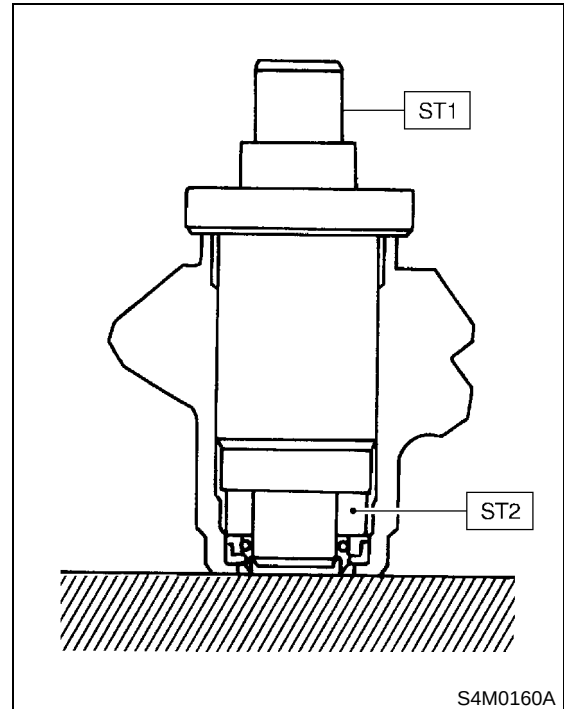
ST1 34099FA120 INSTALLER & REMOVER SEAL

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.

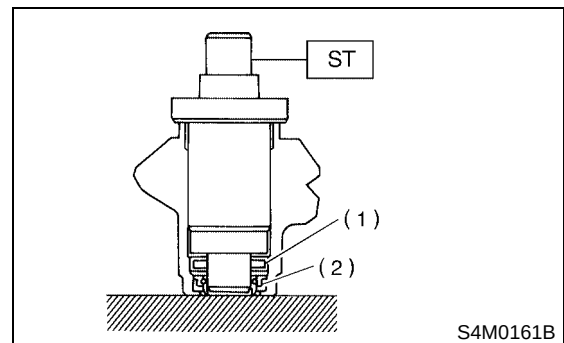


6) Using ST and press, install special bearing in valve housing.

ST 34099FA120 INSTALLER & REMOVER SEAL

NOTE:

To facilitate installation, attach ball bearing to remover and position in valve housing before pressing it into place.



- (1) Special bearing
(2) Oil seal

7) Assemble steering gearbox assembly. <Ref. to PS-37, ASSEMBLY, Steering Gearbox [LHD MODEL].>

8) Install steering gearbox assembly. <Ref. to PS-34, INSTALLATION, Steering Gearbox [LHD MODEL].>

VALVE HOUSING OIL SEAL

POWER ASSISTED SYSTEM (POWER STEERING)

2. RHD MODEL

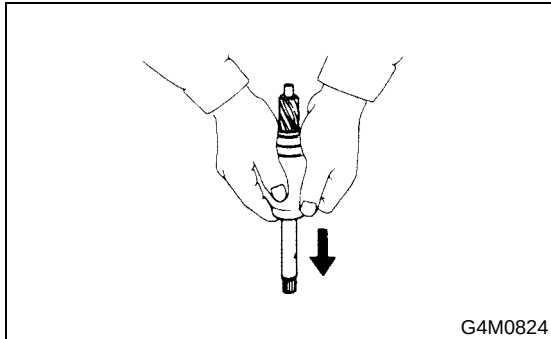
Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

- 1) Remove steering gearbox assembly. <Ref. to PS-33, REMOVAL, Steering Gearbox [LHD MODEL].>
- 2) Remove and disassemble control valve assembly. <Ref. to PS-49, DISASSEMBLY, Steering Gearbox [RHD MODEL].>
- 3) After removing dust cover, extract pinion and valve from valve housing.

CAUTION:

- If pinion and valve is difficult to remove, use a press.
- Discard oil seal after removal and replace with a new one.
- Check rotor for bends and serrations for damage and replace as required.

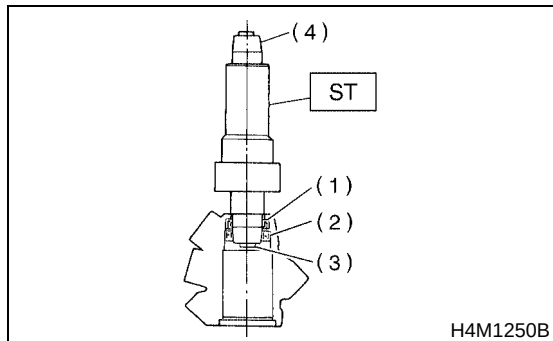


- 4) Using ST and press, remove dust seal, back-up washer, oil seal and ball bearing from valve housing.

CAUTION:

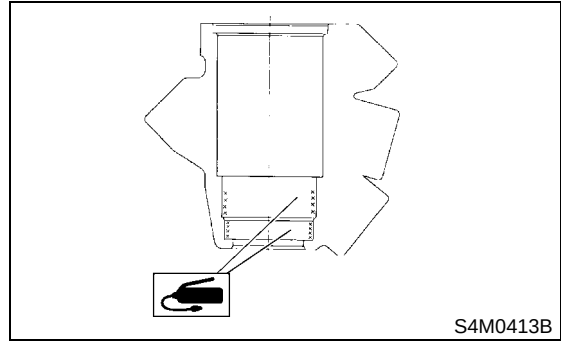
- Use the "A" end of remover.
- Do not apply a force to end surface of valve housing.
- Do not reuse oil seal after removal.

ST 34099FA000 INSTALLER & REMOVER



- (1) Oil seal
- (2) Ball bearing
- (3) A side
- (4) B side

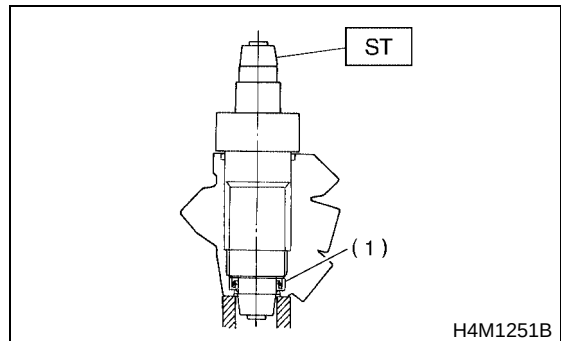
- 5) Apply a coat of grease to inner wall of valve housing, oil seal and outer perimeter of dust seal.



- 6) Using ST and press, install oil seal in valve housing.

- (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.

ST 34099FA000 INSTALLER & REMOVER



- (1) Oil seal

- 7) Attach ST2 to ST1, and press ball bearing into place using a press.

VALVE HOUSING OIL SEAL

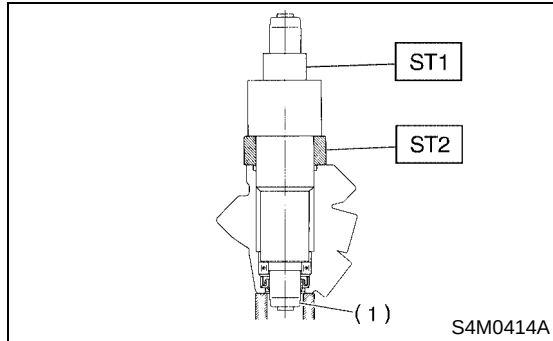
POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:

- To facilitate installation, attach ball bearing to remover and position in valve housing before pressing it into place.
- Use the "B" end of remover.

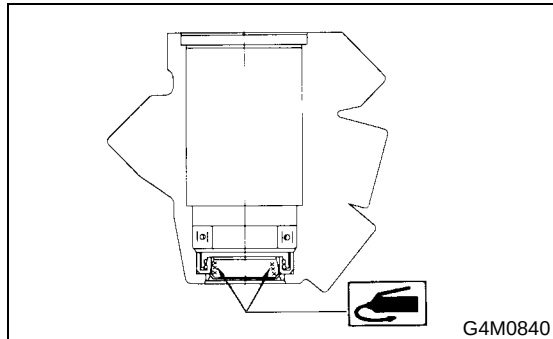
ST1 34099FA000 INSTALLER & REMOVER

ST2 34099FA050 SPACER



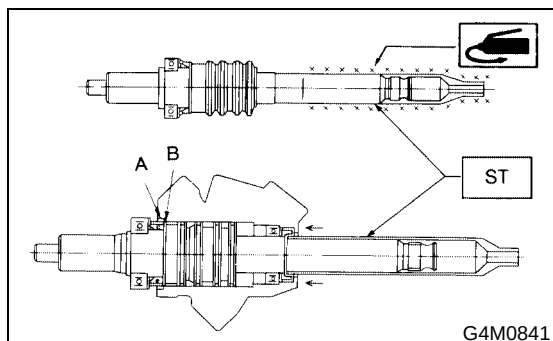
(1) B side

8) Charge oil seal with specified steering grease.



9) Apply a coat of specified steering grease to ST surface, and install ST onto end of input shaft. Insert pinion and valve until "A" of oil seal contacts "B" of valve housing. The ST is used to prevent scratching oil seal.

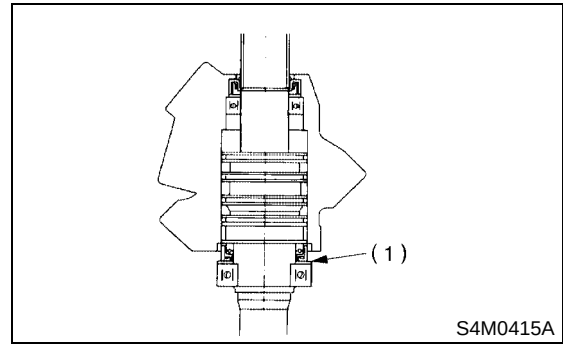
ST 34099FA020 GUIDE



10) While supporting pinion and valve, push end of pinion until bearing contacts brazed end of valve housing.

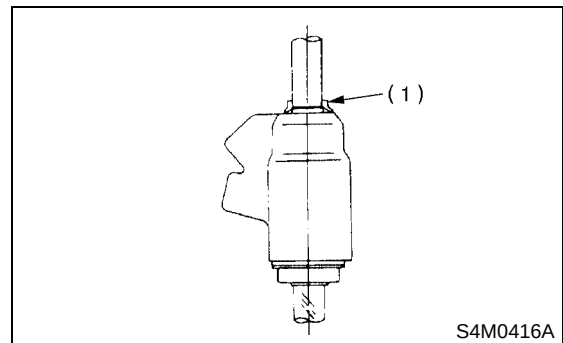
CAUTION:

Do not allow spacer to extend beyond brazed end. Otherwise, pinion cannot be inserted properly.



(1) Spacer

11) Apply a coat of grease to sealing lips of dust cover, and insert dust cover until it contacts staged portion of input shaft.



(1) Dust cover

12) Adjust sealing lip-to-housing end clearance to 0 to 0.5 mm (0 to 0.020 in). If sealing lip is too close to housing end, steering wheel will not return smoothly; if it is too far from housing end, dust or dirt will enter the clearance.

NOTE:

Ensure that pinion and valve is properly positioned in valve housing before adjustment.

13) Assemble and install control valve assembly. <Ref. to PS-52, ASSEMBLY, Steering Gearbox [RHD MODEL].>

14) Install steering gearbox assembly. <Ref. to PS-47, REMOVAL, Steering Gearbox [RHD MODEL].>

PINION AND VALVE OIL SEAL

POWER ASSISTED SYSTEM (POWER STEERING)

8. Pinion and Valve Oil Seal

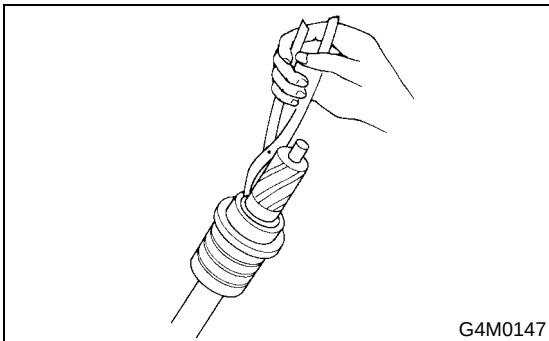
A: REPLACEMENT

1. LHD MODEL

- 1) Remove steering gearbox assembly. <Ref. to PS-47, REMOVAL, Steering Gearbox [RHD MODEL].>
- 2) Remove and disassemble control valve assembly. <Ref. to PS-35, DISASSEMBLY, Steering Gearbox [LHD MODEL].>
- 3) Remove snap ring using snap ring pliers.

CAUTION:

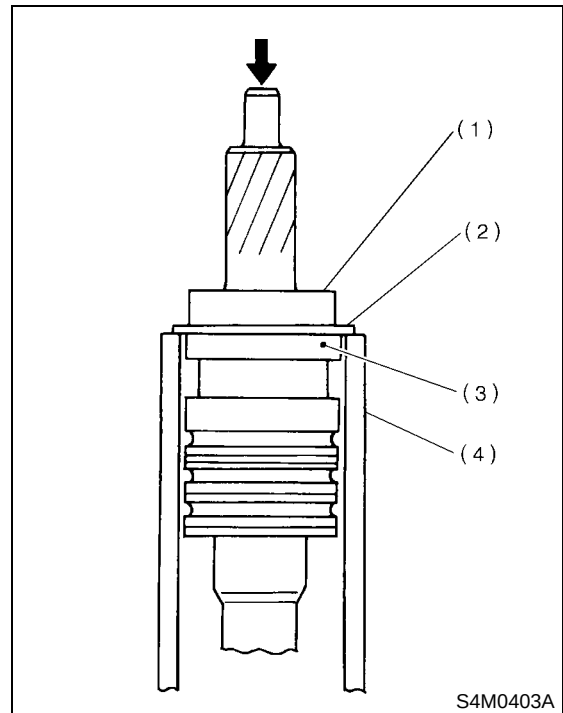
- Do not reuse removed snap ring.
- Be careful not to scratch pinion and valve assembly.



- 4) 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

- 5) Remove oil seal.

CAUTION:

Do not reuse removed oil seal.

- 6) Put vinyl tape around pinion shaft splines to protect oil seal from damage.
- 7) 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.

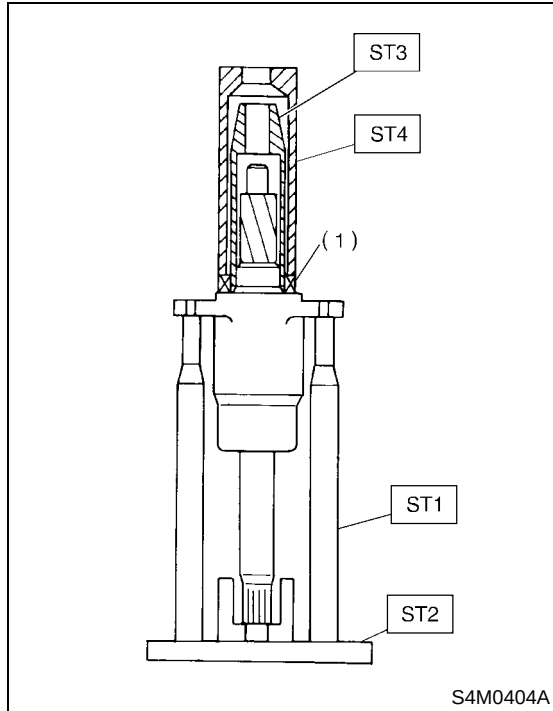
- 8) Secure valve assembly to ST1 and ST2.

PINION AND VALVE OIL SEAL

POWER ASSISTED SYSTEM (POWER STEERING)

9) Put ST3 over pinion, and insert oil seal, then force-fit oil seal into housing using ST4.

ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 926360000 INSTALLER A
ST4 927620000 INSTALLER B



(1) Oil seal

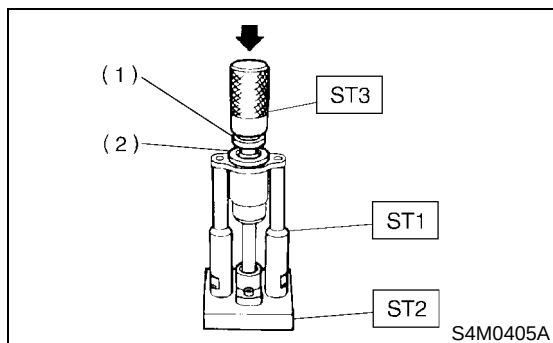
NOTE:

- 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.

10) Remove ST3, and fit backing washer.

11) 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.

12) Install snap ring using snap ring pliers.

NOTE:

Rotate snap ring to check for proper installation.

13) Assemble and install control valve assembly. <Ref. to PS-35, DISASSEMBLY, Steering Gearbox [LHD MODEL].>

14) Install steering gearbox assembly. <Ref. to PS-34, INSTALLATION, Steering Gearbox [LHD MODEL].>

2. RHD MODEL

Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

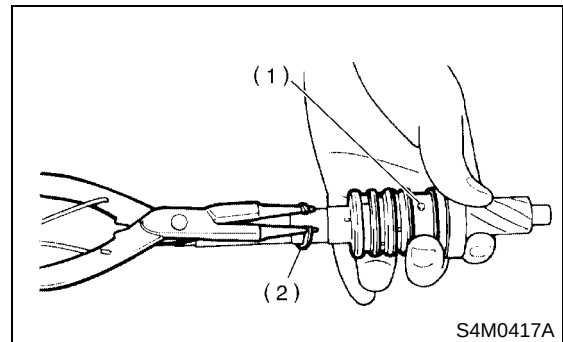
1) Remove steering gearbox assembly. <Ref. to PS-47, REMOVAL, Steering Gearbox [RHD MODEL].>

2) Remove and disassemble control valve assembly. <Ref. to PS-49, DISASSEMBLY, Steering Gearbox [RHD MODEL].>

3) Remove snap ring securing valve sleeve to pinion and valve, and remove valve sleeve.

CAUTION:

Be careful not to scratch pinion and valve when removing snap ring.



(1) Valve sleeve
(2) Retaining ring

4) Remove oil seal and spacer.

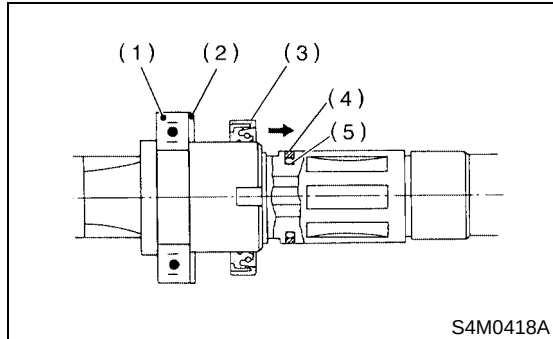
5) Using a long rod, remove seal ring and O-ring from pinion.

PINION AND VALVE OIL SEAL

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

Be careful not to scratch outer surface and seal ring groove of input shaft. If scratched, sealing effect will be lost, resulting in a malfunctioning valve.

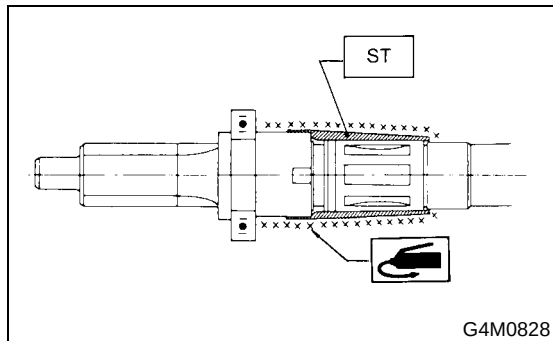


- (1) Ball bearing
- (2) Spacer
- (3) Oil seal
- (4) Seal ring
- (5) O-ring

6) Wash and clean pinion & valve and valve housing.

7) Attach ST to pinion, and apply grease to outer perimeter of the cover and mating surface of oil seal.

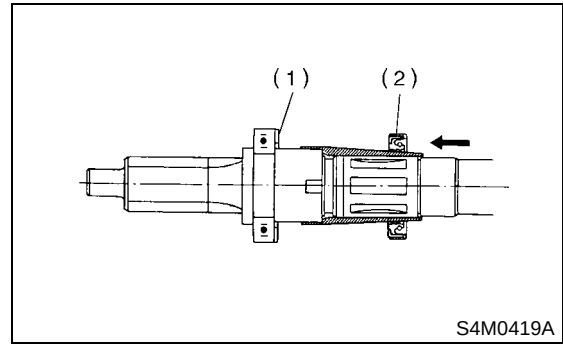
ST 926270000 COVER



8) Apply a coat of grease to spacer and sealing lips of oil seal, and install spacer and oil seal.

CAUTION:

- Face chamfered side of spacer toward oil seal.
- Face oil seal in correct direction.



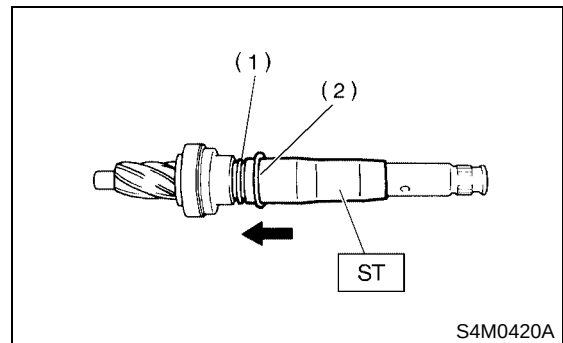
- (1) Spacer
- (2) Oil seal

9) Install ST to input shaft, and apply a coat of grease to the cover surface. Install O-ring and seal ring.

CAUTION:

Do not expand O-ring and seal ring more than necessary.

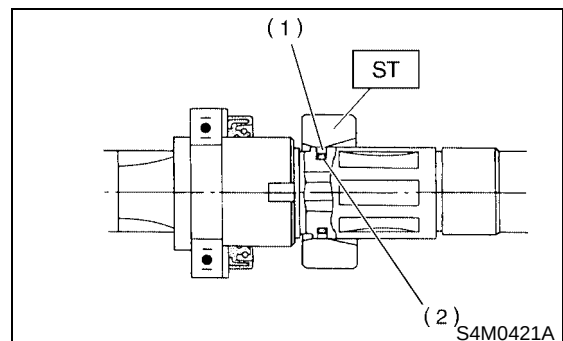
ST 926450000 COVER



- (1) O-ring
- (2) Seal ring

10) Apply a coat of grease to inner wall of ST, and secure seal ring assembled in the former procedure as shown. Leave seal ring unattended for approximately 10 minutes until it settles down.

ST 926280000 FORMER



- (1) Seal ring
- (2) O-ring

PINION AND VALVE OIL SEAL

POWER ASSISTED SYSTEM (POWER STEERING)

11) Remove the four seal rings from the valve sleeve using a sharp-pointed tool.

CAUTION:

Be careful not to scratch seal ring grooves on the valve sleeve. A scratch may reduce the sealing effect, resulting in faulty valve operation.

12) Clean the valve sleeve.

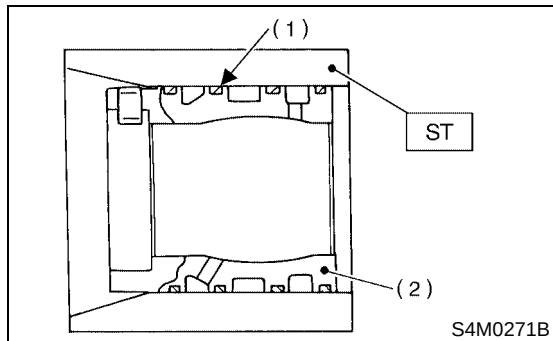
13) Attach the four seal rings to the valve sleeve grooves.

CAUTION:

Do not expand the seal rings more than necessary.

14) Apply a coat of grease to the inner wall of the ST. Secure the four seal rings (installed in the former procedure) using the ST as shown in the figure. Leave the seal rings for approximately 10 minutes until they have properly set.

ST 926050000 FORMER

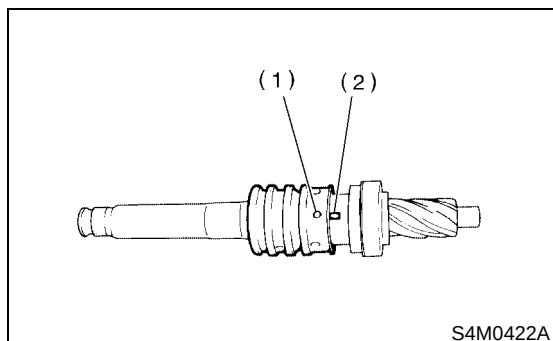


- (1) Seal ring
- (2) Valve sleeve

15) While aligning valve sleeve pin with groove on pinion, secure with snap ring.

CAUTION:

- **Be careful not to damage inner wall of valve sleeve and contact surface of pinion.**
- **Before assembling valve sleeve and pinion, clean in kerosene and dry with compressed air.**



- (1) Pin
- (2) Groove on pinion

16) Assemble and install control valve assembly. <Ref. to PS-52, ASSEMBLY, Steering Gearbox [RHD MODEL].>

17) Install steering gearbox assembly. <Ref. to PS-48, INSTALLATION, Steering Gearbox [RHD MODEL].>

RACK HOUSING OIL SEAL

POWER ASSISTED SYSTEM (POWER STEERING)

9. Rack Housing Oil Seal

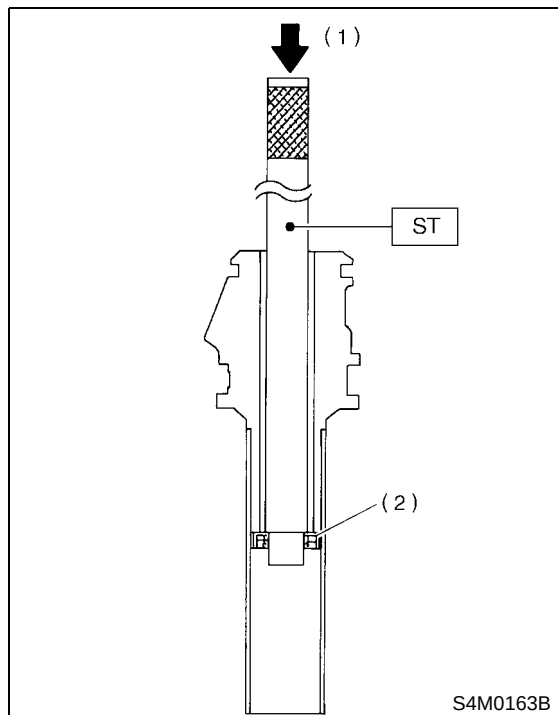
A: REPLACEMENT

1) Remove steering gearbox assembly. <Ref. to PS-33, REMOVAL, Steering Gearbox [LHD MODEL].>

2) Disassemble steering gearbox assembly. <Ref. to PS-35, DISASSEMBLY, Steering Gearbox [LHD MODEL].>

3) Insert ST from pinion housing side and remove oil seal using a press.

ST 34099FA110 INSTALLER



- (1) Press
(2) Oil seal

NOTE:

Discard removed oil seal.

4) Force-fit oil seal using ST.

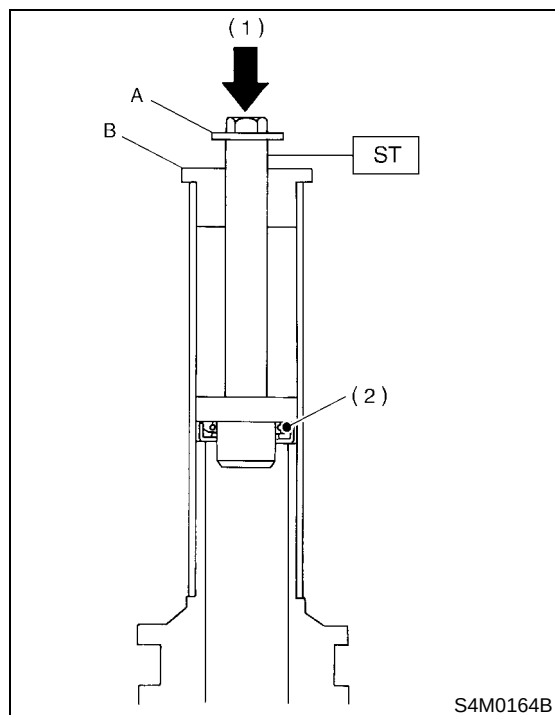
ST 34099FA110 INSTALLER

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

5) Assemble steering gearbox assembly. <Ref. to PS-37, ASSEMBLY, Steering Gearbox [LHD MODEL].>

6) Install steering gearbox assembly. <Ref. to PS-34, INSTALLATION, Steering Gearbox [LHD MODEL].>

RACK PISTON SEAL RING AND O-RING

POWER ASSISTED SYSTEM (POWER STEERING)

10. Rack Piston Seal Ring and O-ring

A: REPLACEMENT

Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

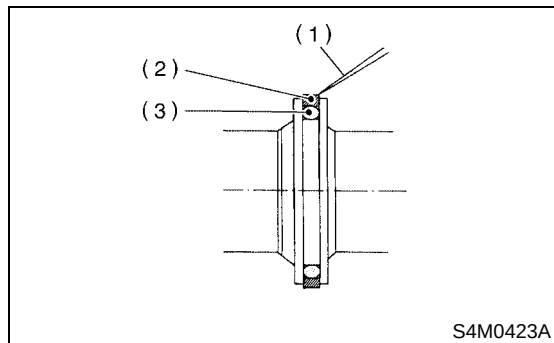
1) Remove steering gearbox assembly. <Ref. to PS-47, REMOVAL, Steering Gearbox [RHD MODEL].>

2) Disassemble steering gearbox assembly. <Ref. to PS-49, DISASSEMBLY, Steering Gearbox [RHD MODEL].>

3) Using a sharp-edged, long rod, remove seal ring and O-ring from rack piston.

CAUTION:

Be careful not to scratch outer surface of rack piston and seal ring groove. A scratch may reduce the sealing effect, resulting in faulty piston operation.



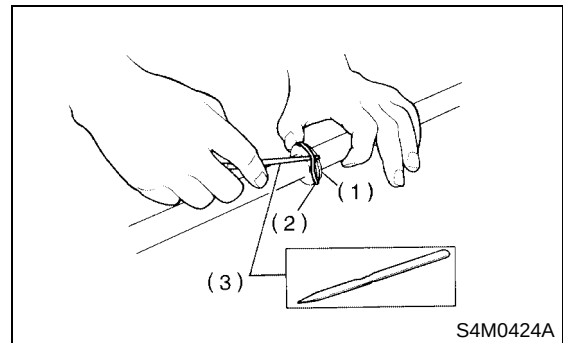
- (1) Sharp-edged, long rod
- (2) Seal ring
- (3) O-ring

4) Wash clean rack piston.

5) Install O-ring and seal ring in groove on rack piston.

CAUTION:

- Do not expand O-ring and seal ring more than necessary.
- To facilitate installation of seal ring, first position one half of entire seal ring in groove. Then slowly position the second half using a spatula, as shown.



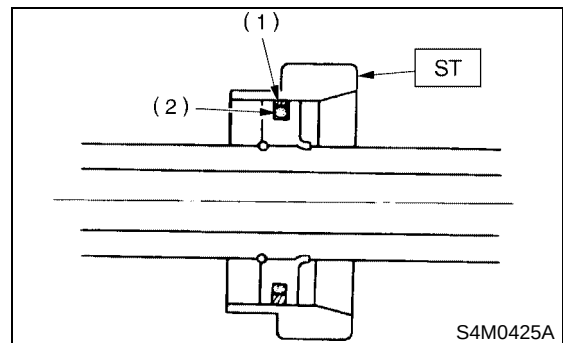
- (1) O-ring
- (2) Seal ring
- (3) Spatula

6) Apply a coat of grease to inner surface of ST and insert rack piston into it. Leave ST at least 10 minutes until seal ring settles down in place.

CAUTION:

Be careful not to scratch rack, piston and seal ring during installation.

ST 926060000 FORMER



- (1) Seal ring
- (2) O-ring

7) Assemble steering gearbox assembly. <Ref. to PS-52, ASSEMBLY, Steering Gearbox [RHD MODEL].>

8) Install steering gearbox assembly. <Ref. to PS-48, INSTALLATION, Steering Gearbox [RHD MODEL].>

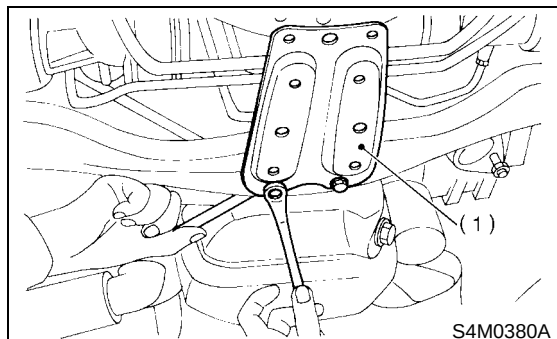
PIPE ASSEMBLY [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

11. Pipe Assembly [LHD MODEL]

A: REMOVAL

- 1) Disconnect battery minus terminal.
- 2) Lift vehicle and remove jack-up plate.

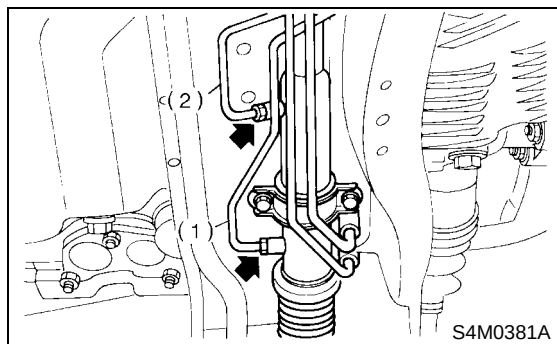


(1) Jack-up plate

- 3) 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.

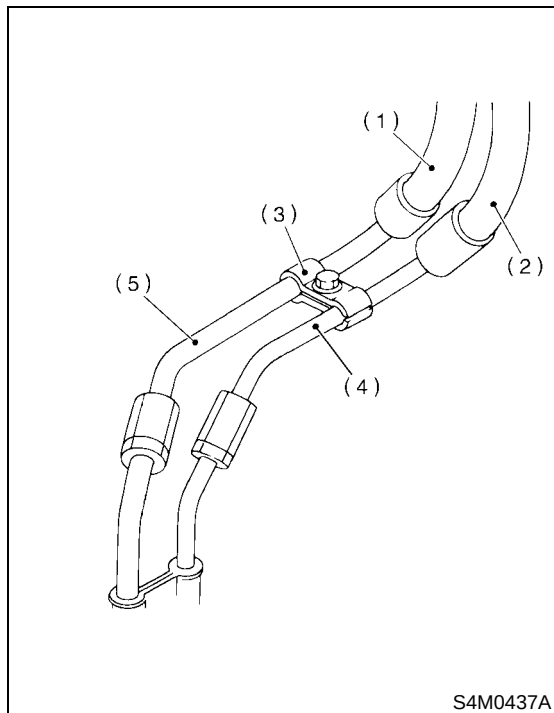
CAUTION:

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.



(1) Pipe A
(2) Pipe B

- 4) Remove clamp E from pipes C and D.

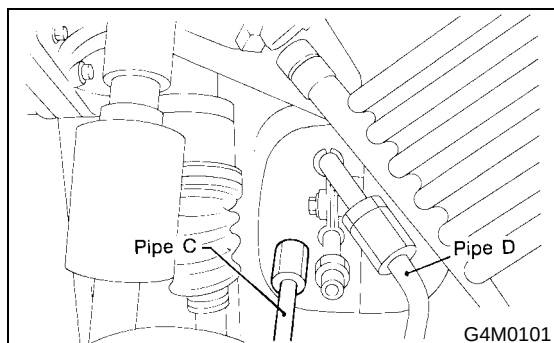


(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

- 5) 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.



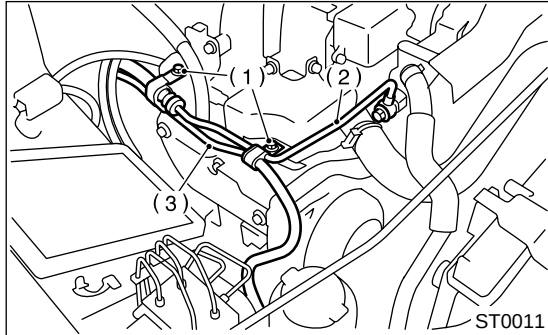
- 6) Non-TURBO model:
 - (1) Remove air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
 - (2) Remove bolt A.
 - (3) Disconnect pipe C from oil pump. Disconnect pipe D from return hose.

PIPE ASSEMBLY [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

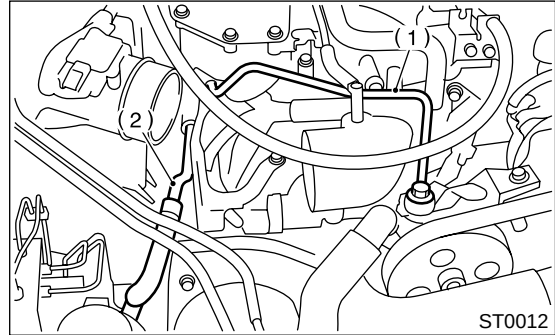
- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

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) Pipe C
- (2) Pipe D

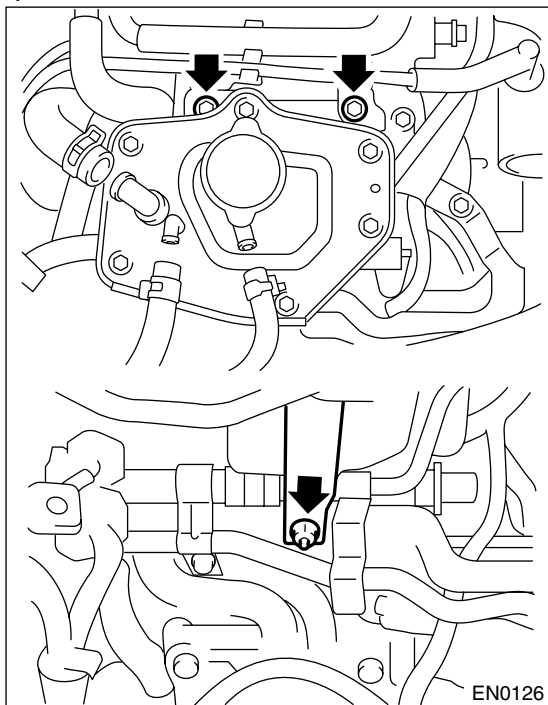
7) TURBO model:

(1) Remove air intake duct, air cleaner upper cover and air intake boot.

<Ref. to IN(DOHC TURBO)-8, REMOVAL, Air Intake Duct.> and <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>

(2) Remove two bolts fixing pipe C and D.

(3) Remove coolant filler tank.



(4) Disconnect pipe C from oil pump. Disconnect pipe D from return hose.

PIPE ASSEMBLY [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

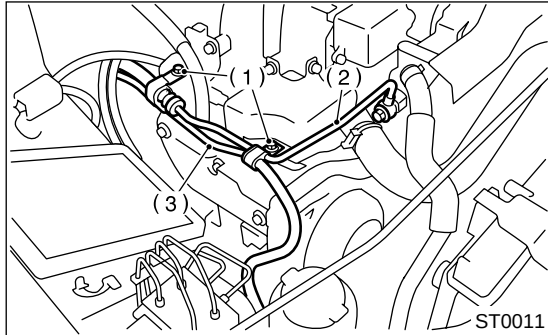
B: INSTALLATION

1) Temporarily tighten two bolts fixing pipe C and D. (bolt A for Non-TURBO model.)

CAUTION:

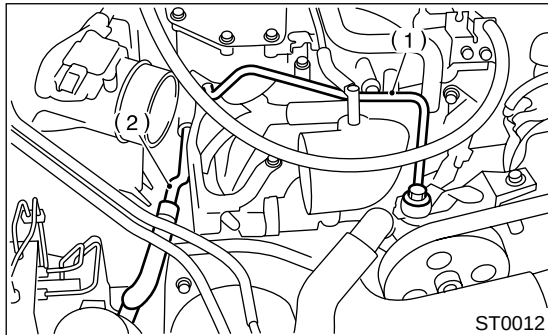
Visually check that hose between tank and pipe D is free from bending or twisting.

Non-TURBO model



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

TURBO model



- (1) Pipe C
- (2) Pipe D

- (1) Connect pipe D to oil tank.
- (2) Install pipe C to oil pump.

CAUTION:

Use a new gasket.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

- (3) Tighten two bolts fixing pipe C and D. (bolt A for Non-TURBO model.)

Tightening torque:

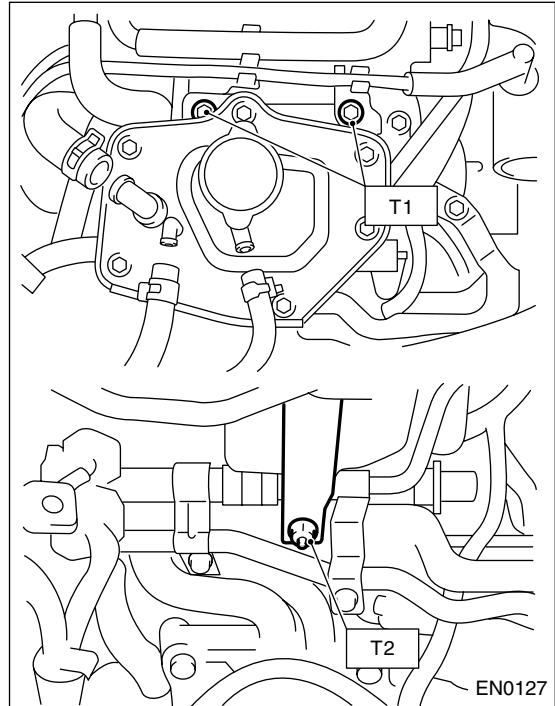
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install coolant filler tank. (Turbo model)

Tightening torque:

T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)

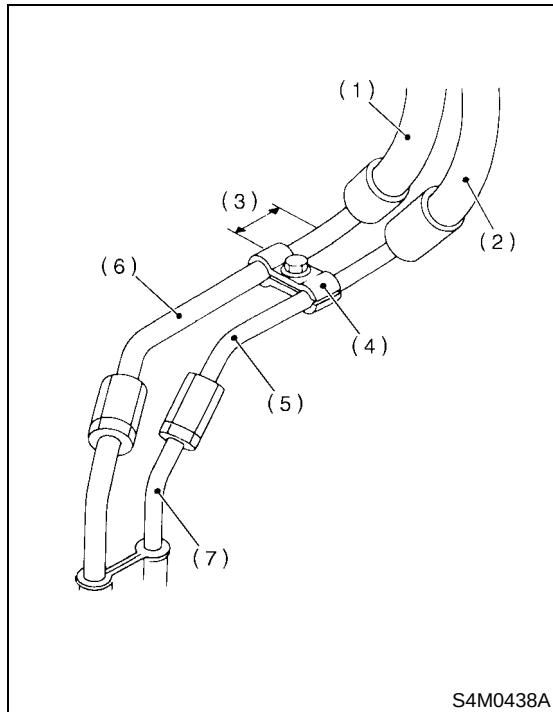
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



PIPE ASSEMBLY [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

3) Temporarily connect pipes C and D to pipes (on the gearbox side).

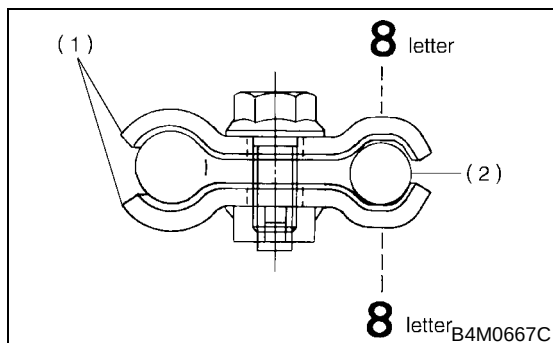


- (1) Return hose
- (2) Pressure hose
- (3) Approx. 30 mm (1.18 in)
- (4) Clamp E
- (5) Pipe C
- (6) Pipe D
- (7) Pipe (on gearbox side)

4) Temporarily install clamp E on pipes C and D.

CAUTION:

Ensure that the letter "8" on each clamp are diagonally opposite each other as shown in figure.



- (1) Clamp E
- (2) Pipe C

5) Tighten clamp E firmly.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten joint nut.

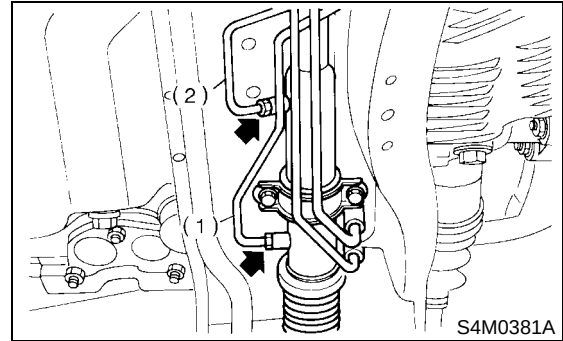
Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A second.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



- (1) Pipe A
- (2) Pipe B

8) Install jack-up plate.

9) Install air intake duct. (Non-TURBO model).

<Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>

10) Install air intake duct, air intake boot and air cleaner upper cover. (TURBO model)

<Ref. to IN(DOHC TURBO)-7, INSTALLATION, Air Cleaner.> and <Ref. to IN(DOHC TURBO)-8, INSTALLATION, Air Intake Duct.>

11) Connect battery minus terminal.

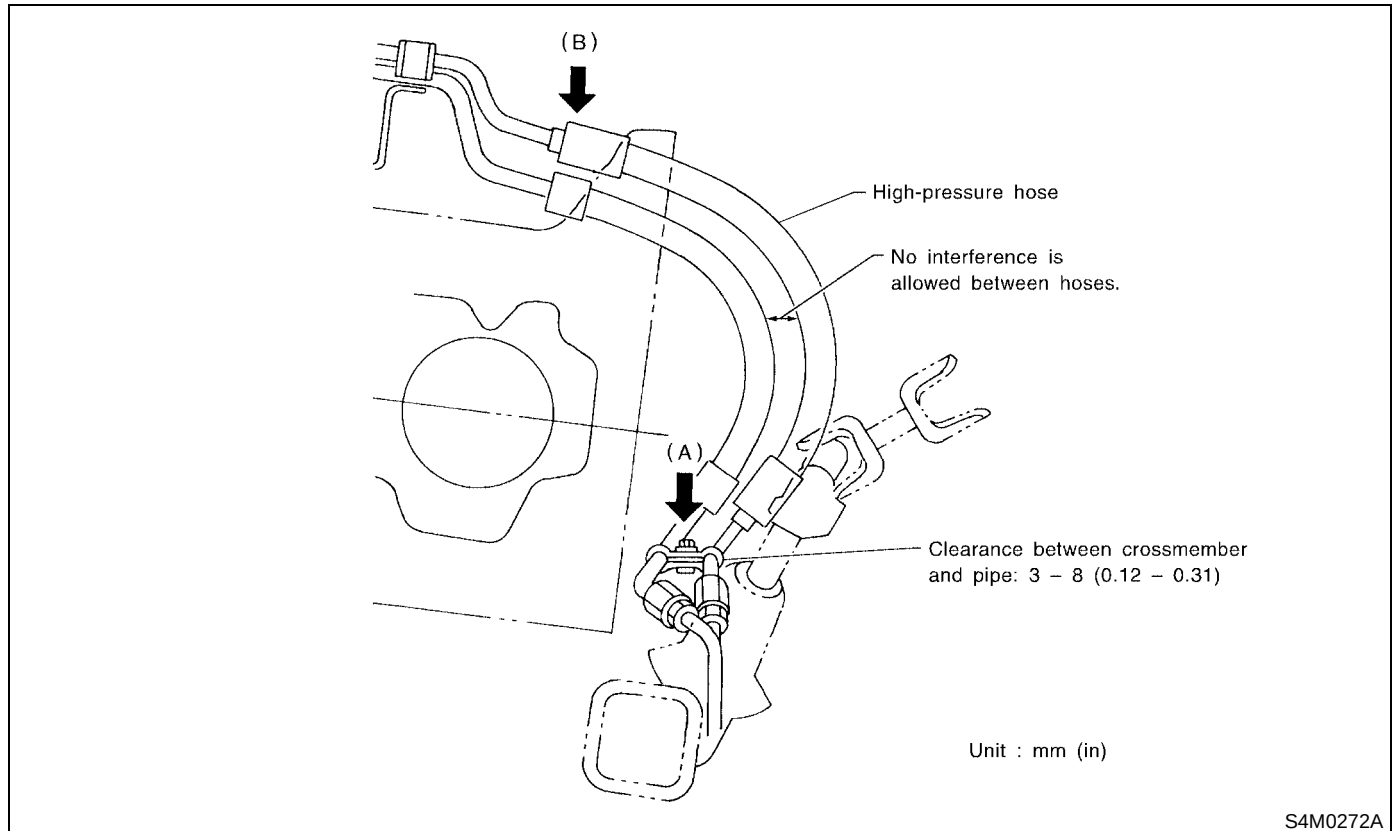
PIPE ASSEMBLY [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

12) Feed the specified fluid.

NOTE:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.



13) 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 [LHD MODEL]

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	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with new one.
Clamp B	• Clamps for weak clamping force	Replace with new one.
Clamp C		
Clamp E		
Hose	• 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.

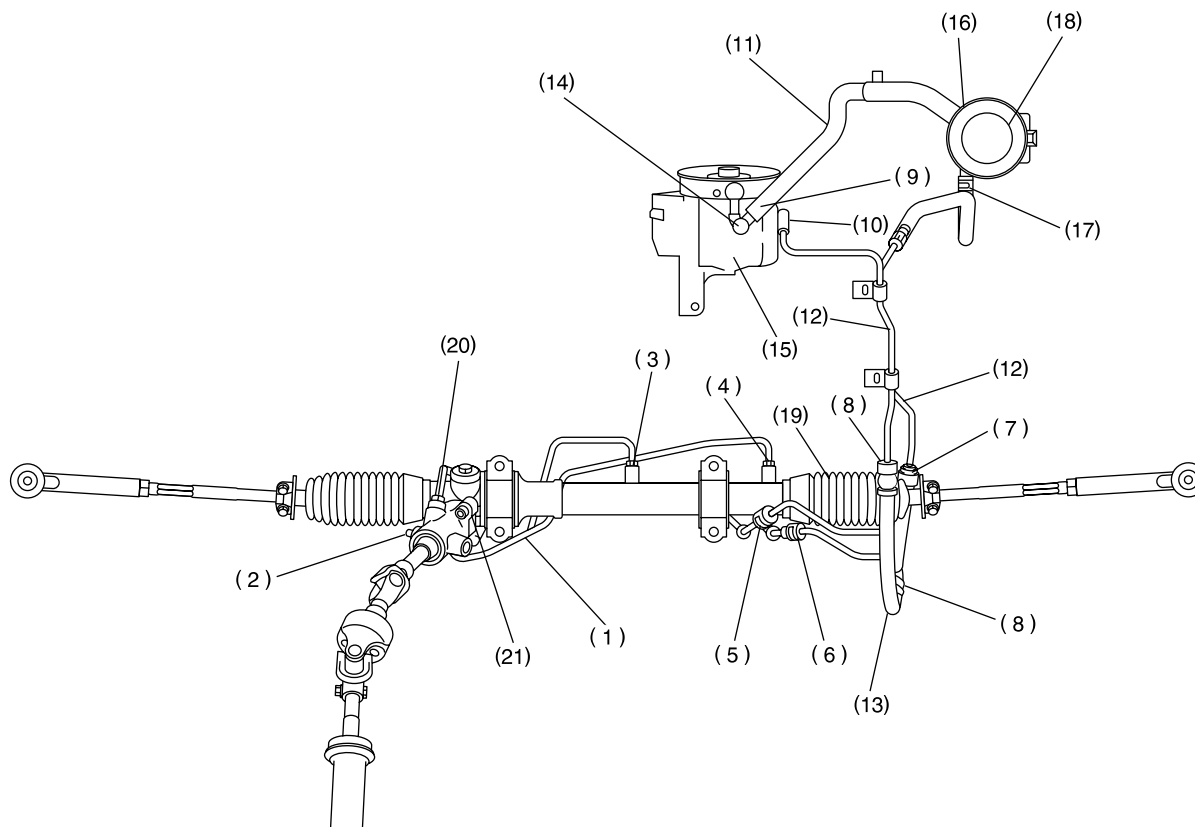
Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor 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 [LHD MODEL]

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.



ST0014

PIPE ASSEMBLY [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) 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 gear-box also.
Leakage from hose (11), (12) and (13) 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 (14) and (15) in figure	Damaged O-ring	Replace oil pump.
	Damaged gasket	Replace oil pump.
Leakage from oil tank (16) and (17) in figure	Crack in oil tank	Replace oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace cap.
	Crack in root of filler neck	Replace oil tank.
	High fluid level	Adjust fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace oil seal.
Leakage from control valve of gear-box (20) and (21) 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.

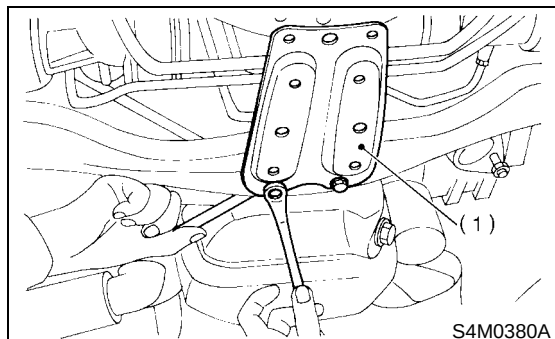
PIPE ASSEMBLY [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

12. Pipe Assembly [RHD MODEL]

A: REMOVAL

- 1) Disconnect battery minus terminal.
- 2) Lift vehicle and remove jack-up plate.

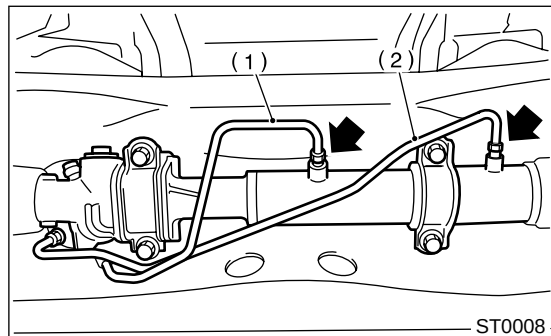


(1) Jack-up plate

- 3) 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.

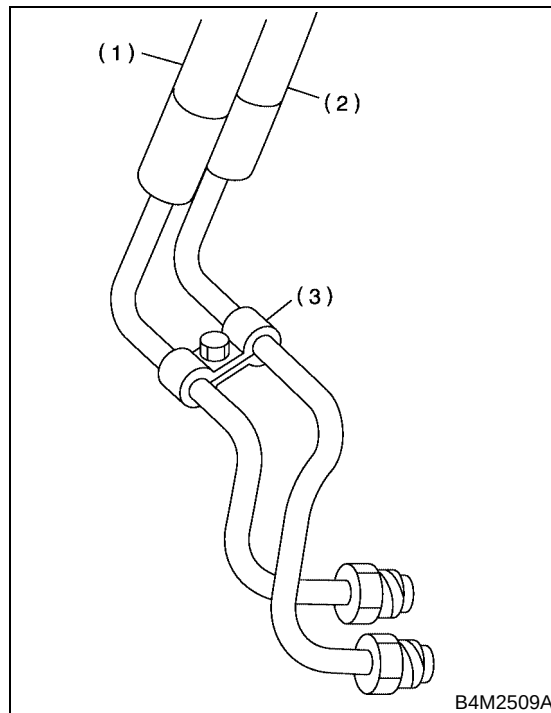
CAUTION:

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.



(1) Pipe A
(2) Pipe B

- 4) Remove clamp E from pipes C and D.

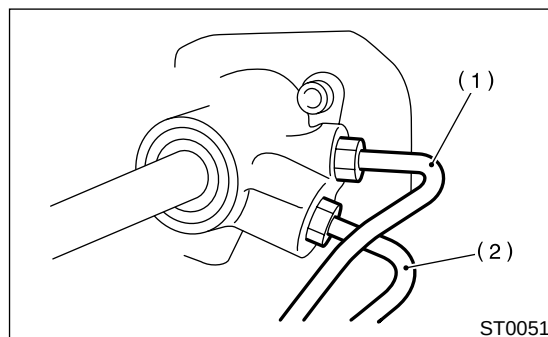


(1) Return hose
(2) Pressure hose
(3) Clamp E

- 5) 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

- 6) Non-TURBO model:

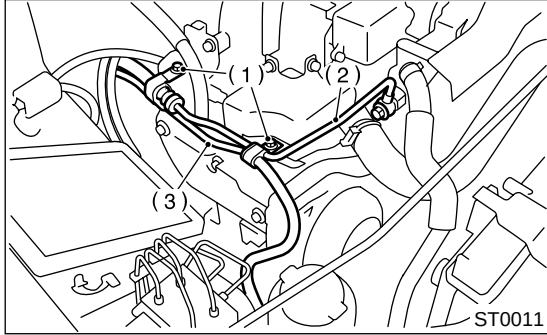
- (1) Remove air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- (2) Remove bolt A.
- (3) Disconnect pipe C from oil pump. Disconnect pipe D from return hose.

PIPE ASSEMBLY [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

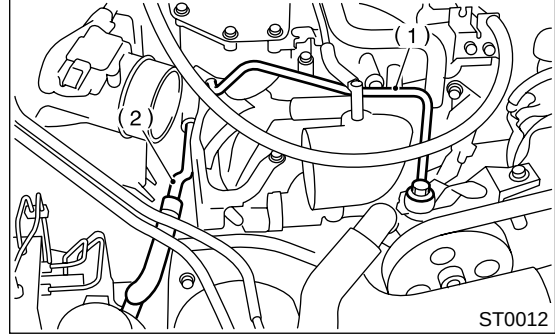
- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

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) Pipe C
- (2) Pipe D

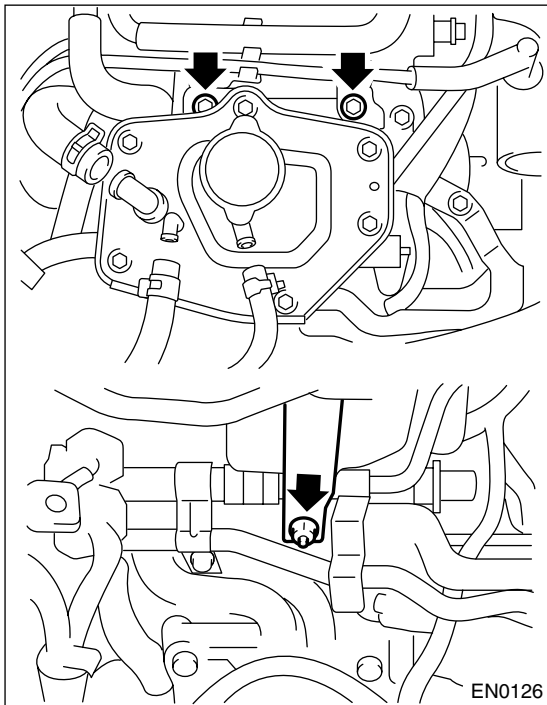
7) TURBO model:

(1) Remove air intake duct, air cleaner upper cover and air intake boot.

<Ref. to IN(DOHC TURBO)-8, REMOVAL, Air Intake Duct.> and <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>

(2) Remove two bolts fixing pipe C and D.

(3) Remove coolant filler tank.



(4) Disconnect pipe C from oil pump. Disconnect pipe D from return hose.

PIPE ASSEMBLY [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

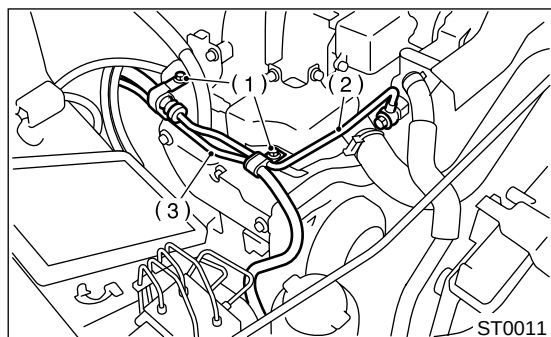
B: INSTALLATION

1) Temporarily tighten two bolts fixing pipe C and D. (bolt A for Non-TURBO model.)

CAUTION:

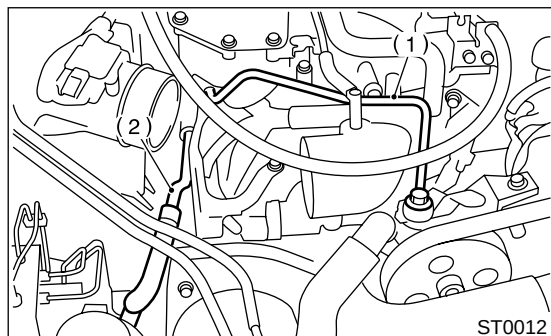
Visually check that hose between tank and pipe D is free from bending or twisting.

Non-TURBO model



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

TURBO model



- (1) Pipe C
- (2) Pipe D

- (1) Connect pipe D to oil tank.
- (2) Install pipe C to oil pump.

CAUTION:

Use a new gasket.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

- (3) Tighten two bolts fixing pipe C and D. (bolt A for Non-TURBO model.)

Tightening torque:

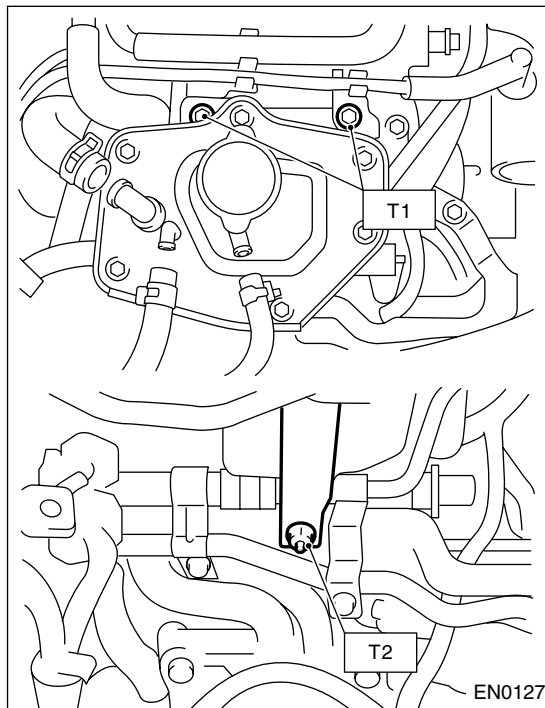
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install coolant filler tank. (Turbo model)

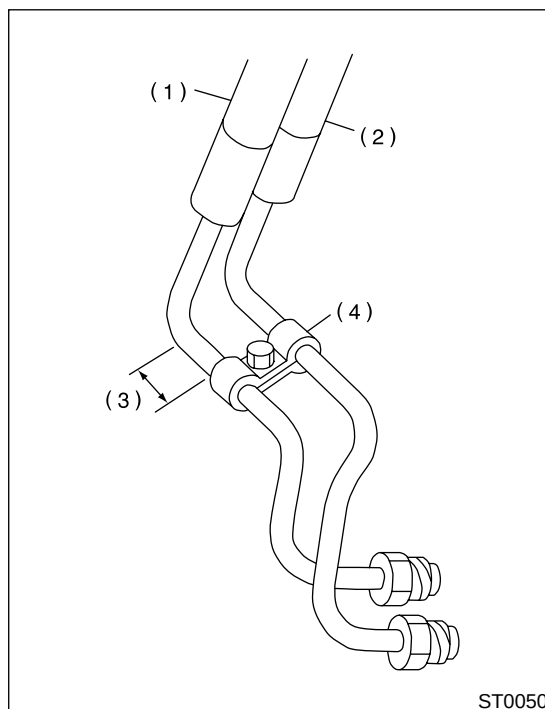
Tightening torque:

T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)

T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Temporarily connect pipes C and D to pipes (on the gearbox side).

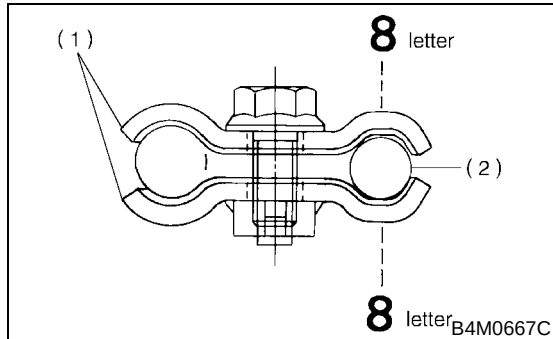


- (1) Return hose
- (2) Pressure hose
- (3) Approx. 30 mm (1.18 in)
- (4) Clamp E

4) Temporarily install clamp E on pipes C and D.

CAUTION:

Ensure that the letter "8" on each clamp are diagonally opposite each other as shown in figure.



(1) Clamp E

(2) Pipe C

5) Tighten clamp E firmly.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten joint nut.

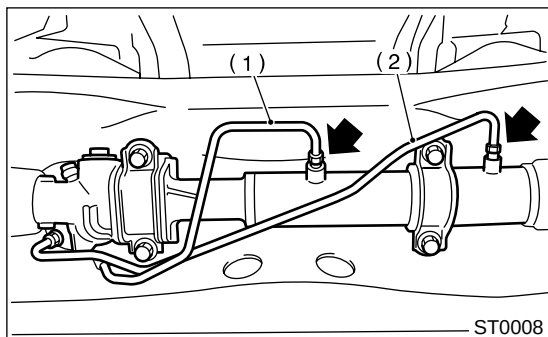
Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect pipes A and B to four pipe joints of gear-box. Connect upper pipe B first, and lower pipe A second.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



(1) Pipe A

(2) Pipe B

8) Install jack-up plate.

9) Install air intake duct. (Non-TURBO model)
<Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>

10) Install air intake duct, air cleaner upper cover and air intake boot.

<Ref. to IN(DOHC TURBO)-7, INSTALLATION, Air Cleaner.> and <Ref. to IN(DOHC TURBO)-8, INSTALLATION, Air Intake Duct.>

11) Connect battery minus terminal.

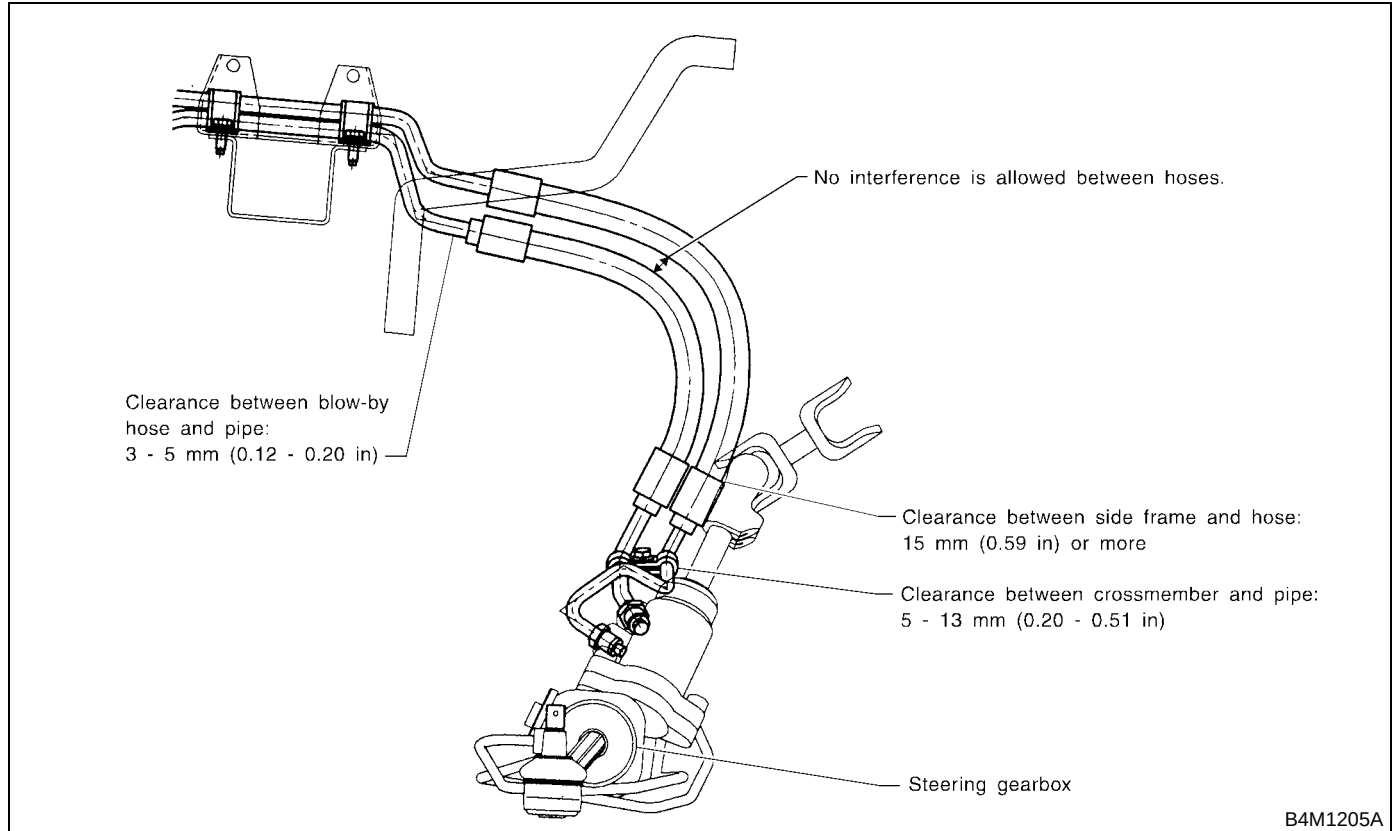
PIPE ASSEMBLY [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

12) Feed the specified fluid.

NOTE:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.



13) Finally check clearance between pipes and/or hoses, as shown above.

Pipe-to-crossmember clearance:

10 mm (0.39 in), min.

(1) 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 [RHD MODEL]

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	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with new one.
Clamp B	• Clamps for weak clamping force	Replace with new one.
Clamp C		
Clamp E		
Hose	• 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.

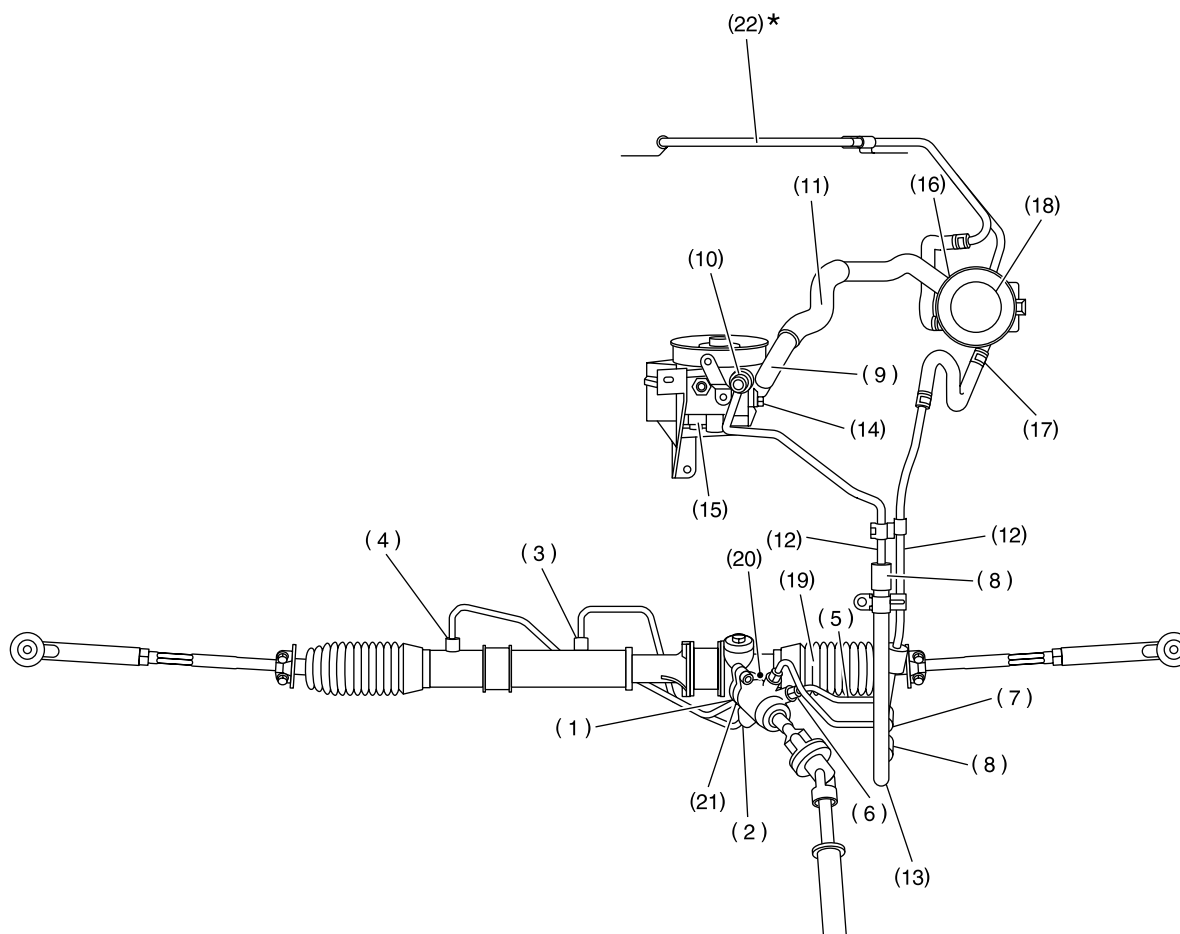
Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor 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 [RHD MODEL]

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.



ST0013

*: Turbo model only.

PIPE ASSEMBLY [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) 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 gear-box also.
Leakage from hose (11), (12) and (13) and oilcooler (22) 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 (14) and (15) in figure	Damaged O-ring	Replace oil pump.
	Damaged gasket	Replace oil pump.
Leakage from oil tank (16) and (17) in figure	Crack in oil tank	Replace oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace cap.
	Crack in root of filler neck	Replace oil tank.
	High fluid level	Adjust fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace oil seal.
Leakage from control valve of gear-box (20) and (21) 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

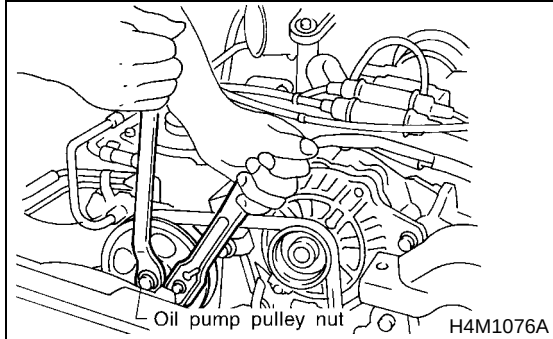
POWER ASSISTED SYSTEM (POWER STEERING)

13.Oil Pump

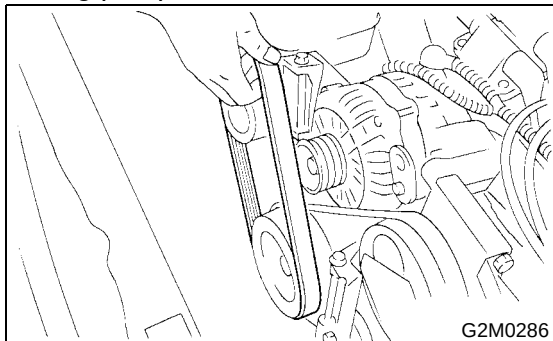
A: REMOVAL

1. NON-TURBO MODEL

- 1) Remove ground cable from battery.
- 2) Remove pulley belt cover.
- 3) Loosen oil pump pulley nut, then remove bolts which secure alternator.



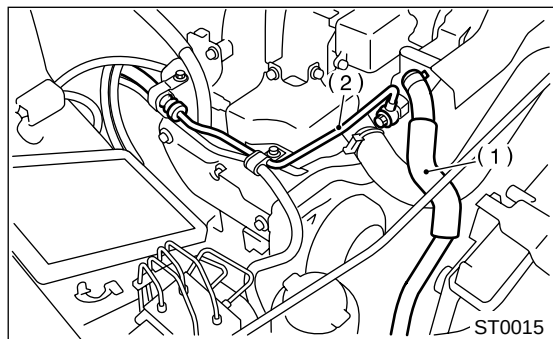
- 4) Loosen lock bolt and slider bolt and remove power steering pump drive V-belt.



- 5) Disconnect connector from power steering pump switch.
- 6) Disconnect pipe C and suction hose from oil pump.

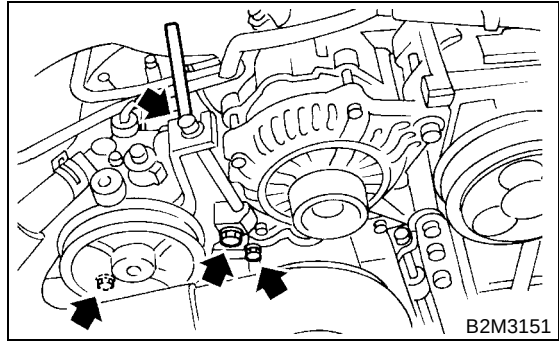
CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



- (1) Suction hose
- (2) Pipe C

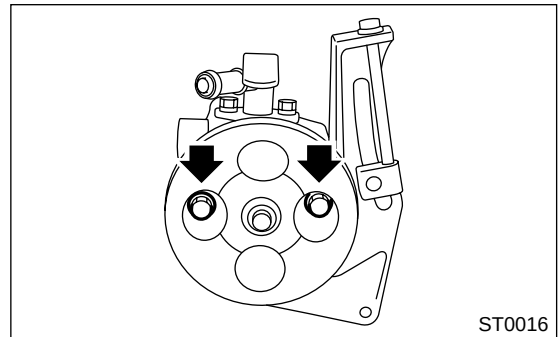
- 7) Remove bolts, which install power steering pump bracket.



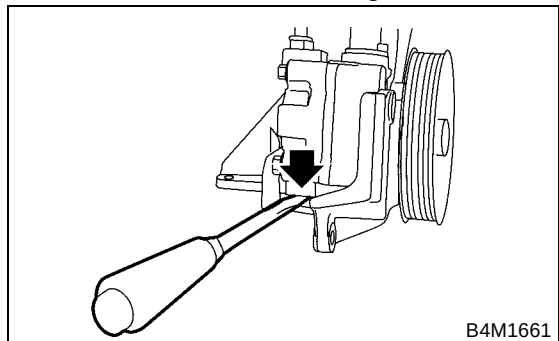
- 8) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

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) Disassemble oil pump and bracket by inserting a screwdriver as shown in the figure.



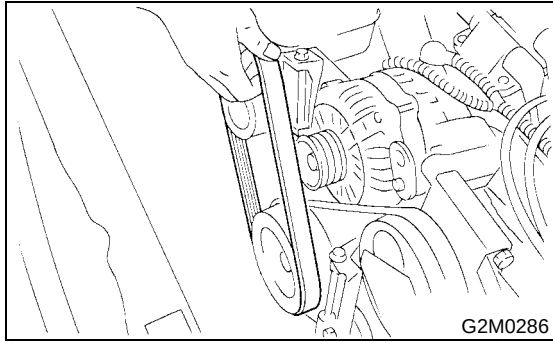
2. TURBO MODEL

- 1) Remove ground terminal from battery.
- 2) Remove pulley belt cover.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

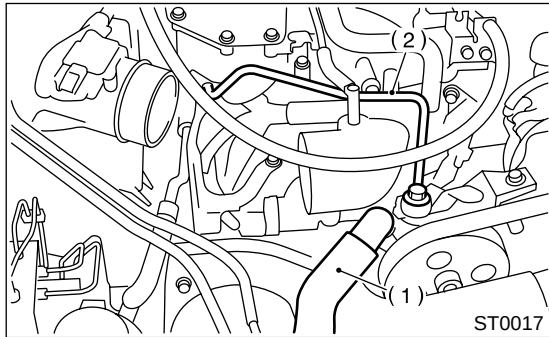
- 3) Loosen lock bolt and slider bolt and remove power steering pump drive V-belt.



- 4) Disconnect connector from power steering pressure switch.
5) Disconnect pipe C and suction hose from oil pump.

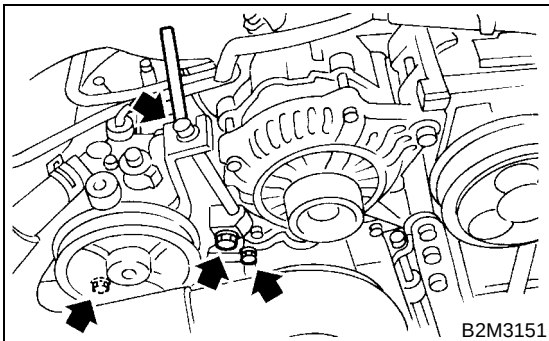
CAUTION:

- 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

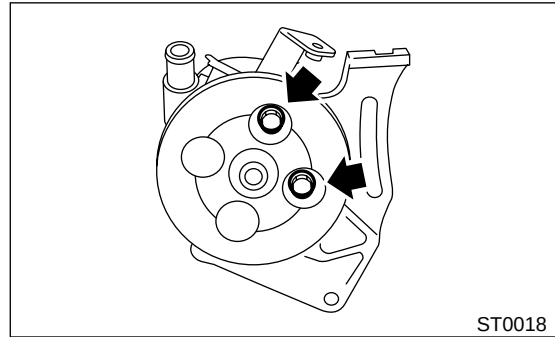
- 6) Remove bolts which install power steering pump bracket.



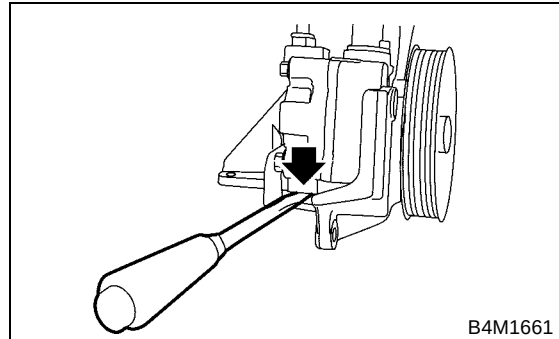
- 7) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

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 bolt from the rear side of oil pump.
9) Disassemble oil pump and bracket by inserting a screwdriver as shown in the figure.



OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

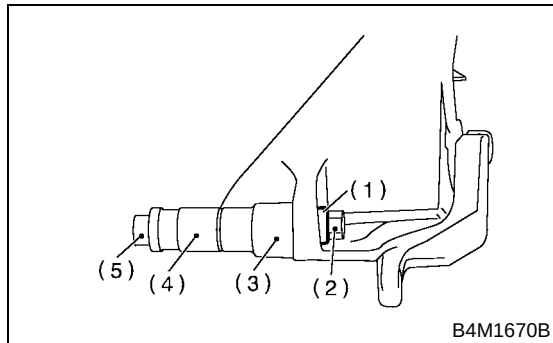
1. NON-TURBO MODEL

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.

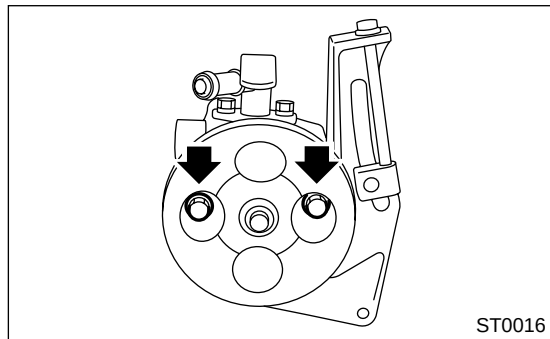


- (1) Bush
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

(2) Tighten bolt which installs oil pump to bracket.

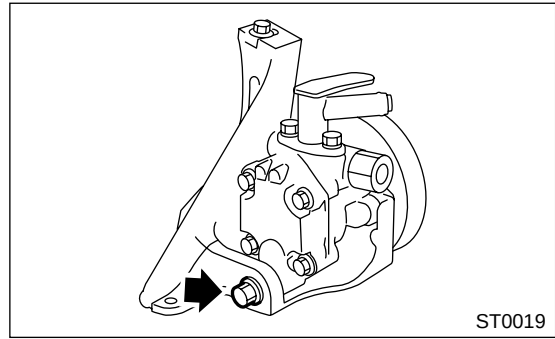
Tightening torque:

15.7 (1.6 kgf-m, 11.6 ft-lb)



Tightening torque:

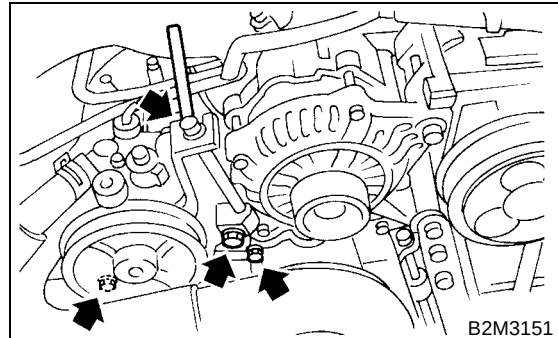
37.3 (3.8 kgf-m, 27.5 ft-lb)



2) Tighten bolt which installs power steering pump bracket.

Tightening torque:

33.3 (3.4 kgf-m, 24.5 ft-lb)



3) Interconnect pipe C and suction hose.

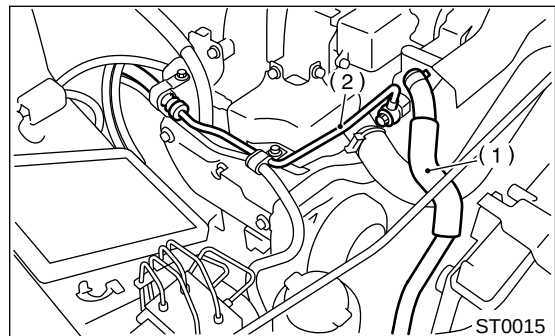
Tightening torque:

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

4) Connect connector to power steering pump switch.

5) Install pulley belt to oil pump.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

6) Tighten oil pump pulley nut to the specified torque.

Tightening torque:

52 N·m (5.3 kgf-m, 38 ft-lb)

7) Check pulley belt tension.

<Ref. to ME(SOHC)-43, INSPECTION, V-belt.>

8) Tighten bolt belt tension.

Tightening torque:

8 (0.8 kgf-m, 5.8 ft-lb)

9) Install pulley belt cover.

10) Connect ground terminal of battery.

11) Feed the specified power steering fluid. <Ref. to PS-103, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

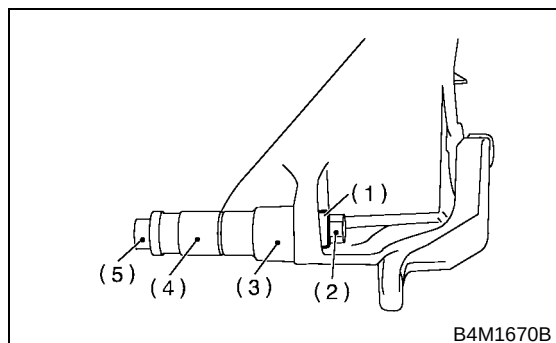
2. TURBO MODEL

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.

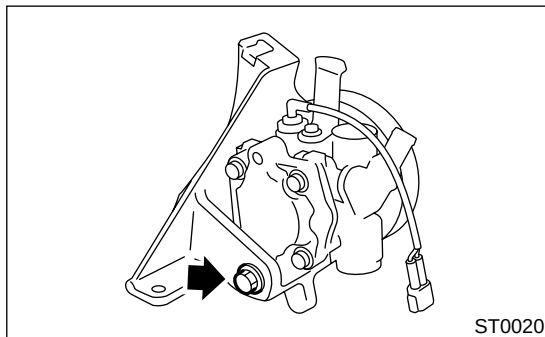


- (1) Bush
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

(2) Tighten bolt which installs oil pump to bracket.

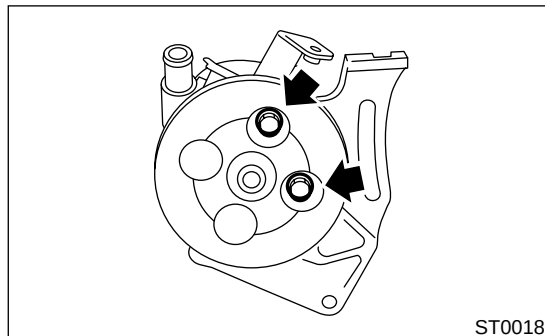
Tightening torque:

37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



Tightening torque:

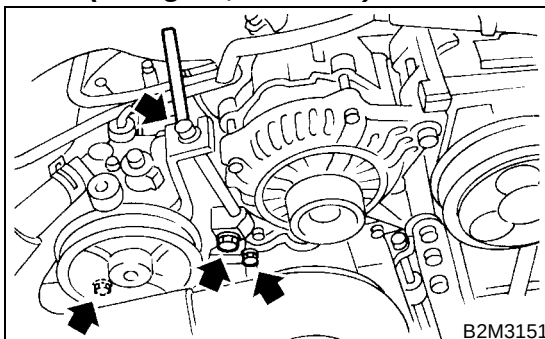
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



2) Tighten bolt 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)

3) Interconnect pipes C and suction hose.

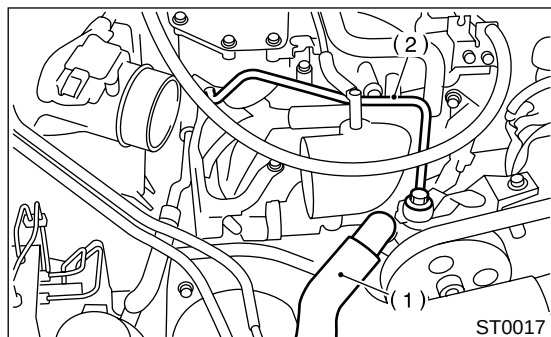
Tightening torque:

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

4) Connect connector to power steering oil pressure switch.

5) Install pulley belt to oil pump.

6) Check pulley belt tension. <Ref. to ME(DOHC TURBO)-44, INSPECTION, V-belt.>

7) Tighten belt tension.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

8) Install pulley belt cover.

9) Connect ground terminal of battery.

10) Feed the specified power steering fluid <Ref. to PS-103, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

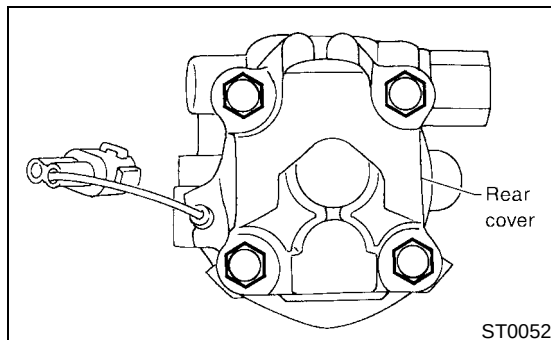
C: DISASSEMBLY

1. NON-TURBO MODEL

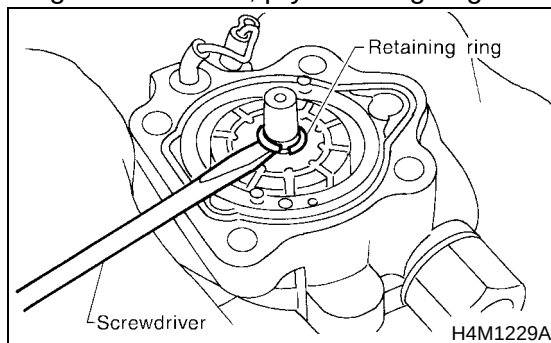
1) Remove the nut and detach oil pump pulley.

2) Remove stay from oil pump.

3) Remove four bolts which secure rear cover.



4) Using a screwdriver, pry retaining ring off.

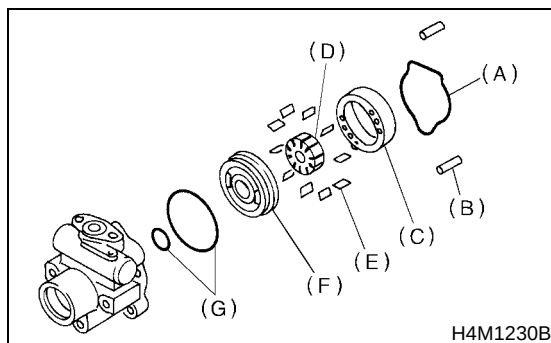


5) Extract shaft from front casing.

6) Remove the following parts from front casing.

CAUTION:

Discard old seal washer; replace with a new one.



- (A) O-ring
- (B) Straight pin (2 ea.)
- (C) Cam ring
- (D) Rotor
- (E) Vane (10 ea.)
- (F) Pressure plate
- (G) O-ring (2 ea.)

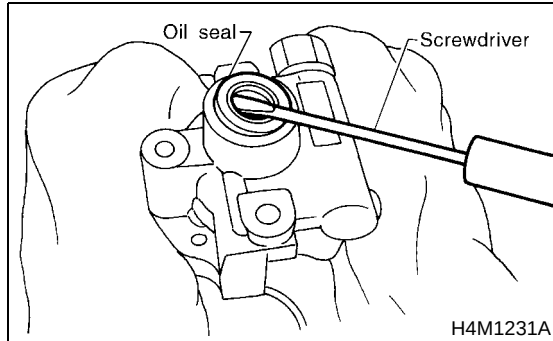
7) Pry oil seal off using a screwdriver.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

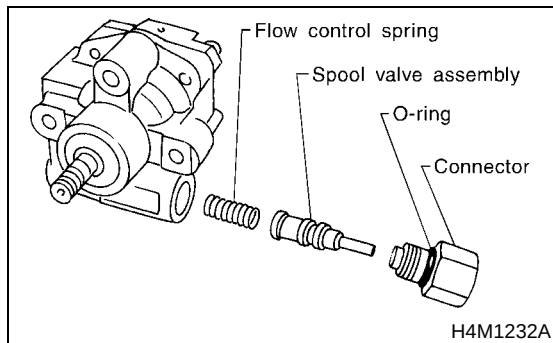
CAUTION:

Be careful not to scratch inner surface of casing.



8) Remove pressure switch.

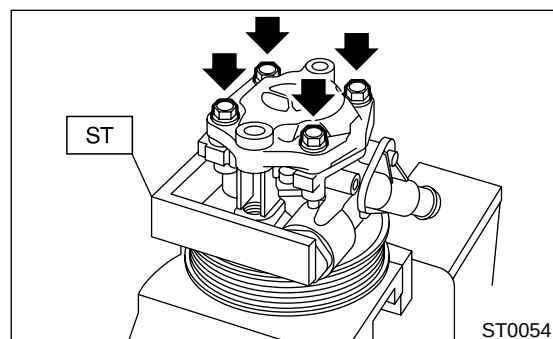
9) Slightly loosen outlet connector, and remove connector.



2. TURBO MODEL

1) Using ST, place oil pump in a vise and remove four bolts which secure rear cover.

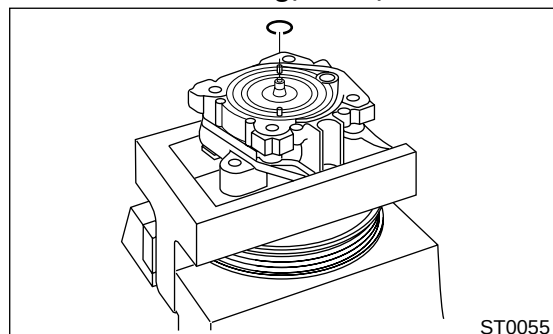
ST 34199AE020 MOUNT



2) Using a screwdriver, pry retaining ring off.

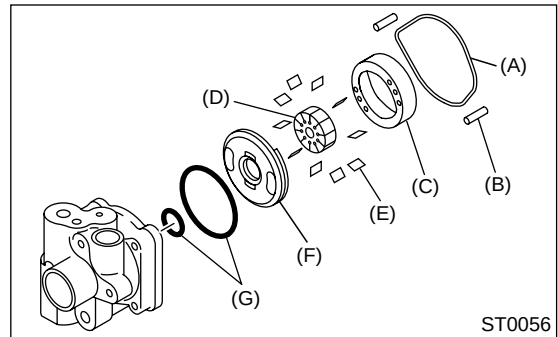
CAUTION:

Do not remove cam ring, rotor, etc.



3) Extract oil pump pulley from front casing.

4) Remove the following parts from front casing.



- (A) O-ring
- (B) Straight pin (2 ea.)
- (C) Cam ring
- (D) Rotor
- (E) Vane (10 ea.)
- (F) Pressure plate
- (G) O-ring (2 ea.)

5) Place oil pump in a vise.

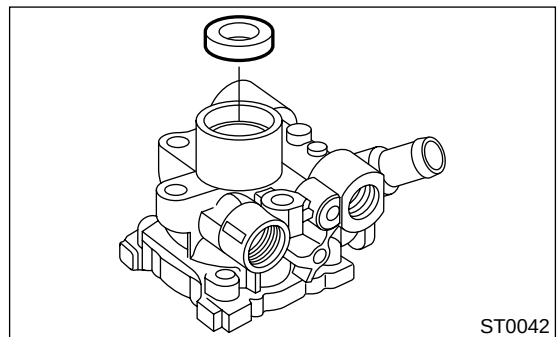
CAUTION:

Do not place oil pump directly in the vise, use soft pads and hold oil pump lightly to protect the pump.

6) Pry oil seal off using a screwdriver.

CAUTION:

Be careful not to scratch inner surface of casing.



D: ASSEMBLY

1. NON-TURBO MODEL

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.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

(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.

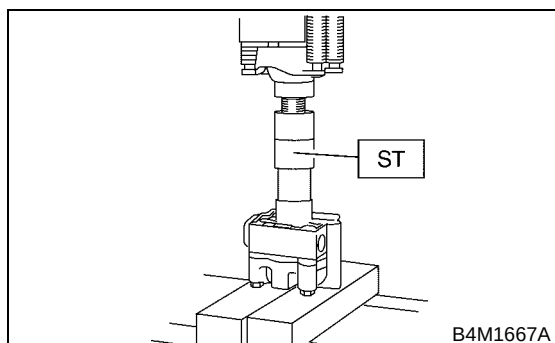
2) Apply grease to oil seal and inner surface of front casing (at bearing location).

CAUTION:

Make sure that the front body internal surfaces are free from damage.

3) Attach ST to front body Using a press, install oil seal.

ST 34199AE030



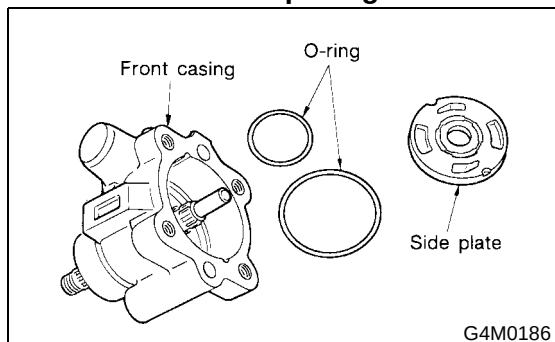
4) Press-fit shaft assembly into front body.

5) Apply specified hydraulic oil to O-rings and fit them into front casing.

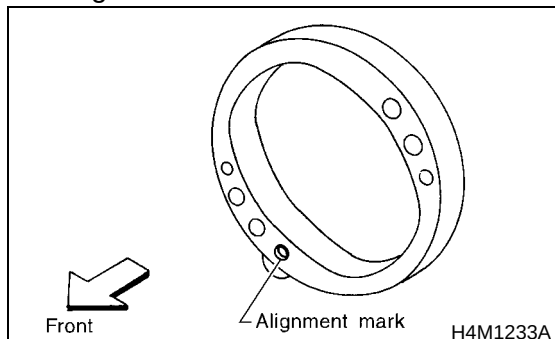
6) Install side plate to front casing.

CAUTION:

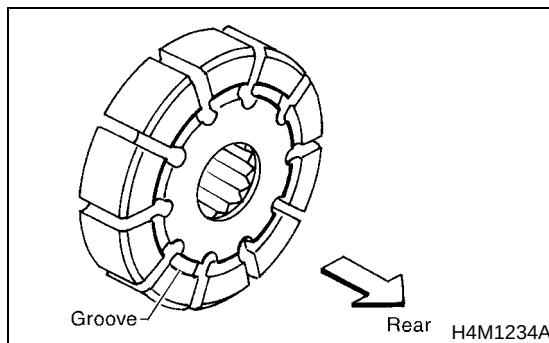
Use care not to let side plate gall.



7) Install cam ring to front casing with alignment mark facing forward.



8) Install rotor to front casing with groove facing rearward.



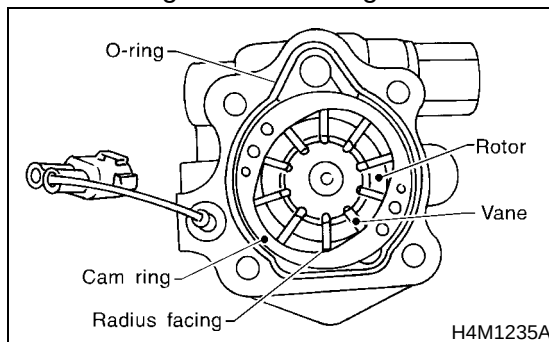
9) Install 10 vanes into rotor with their nose radius facing toward cam ring.

10) Install cam ring to front casing, securing with knock pins.

CAUTION:

Do not use hammer to fit knock pins in position.

11) Mount O-ring on front casing.



12) Using STs, press retaining ring into shaft groove.

CAUTION:

Discard retaining ring and replace with a new one.

OIL PUMP

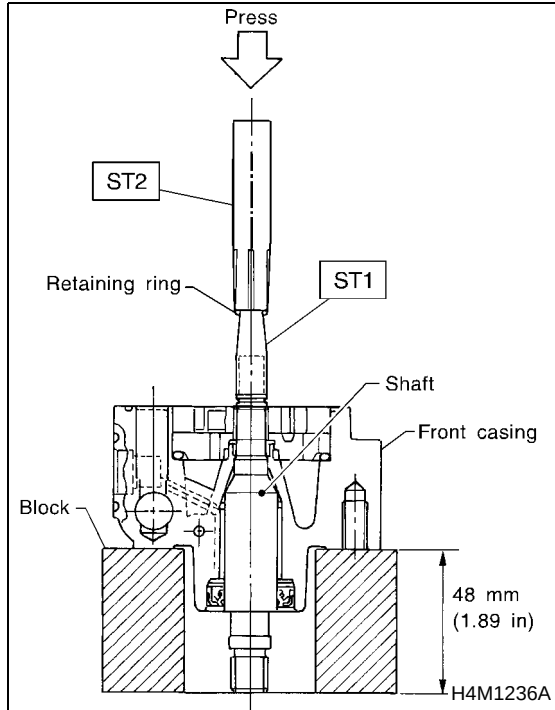
POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:

Use ST2, bending its top edge slightly toward the inside.

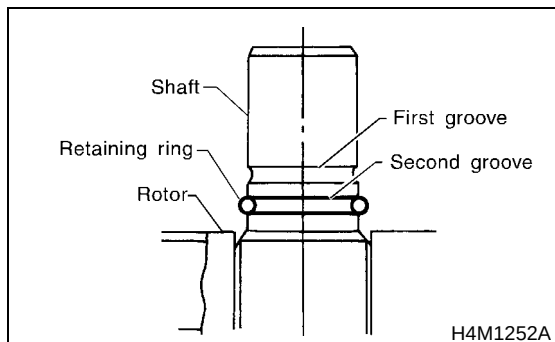
ST1 34099AC030 INSTALLER RETAINING RING CAP

ST2 34099AC040 INSTALLER RETAINING RING PIPE



CAUTION:

Make sure the retaining ring is fit in the second groove of the shaft.



13) Mount on pressure switch on front casing.

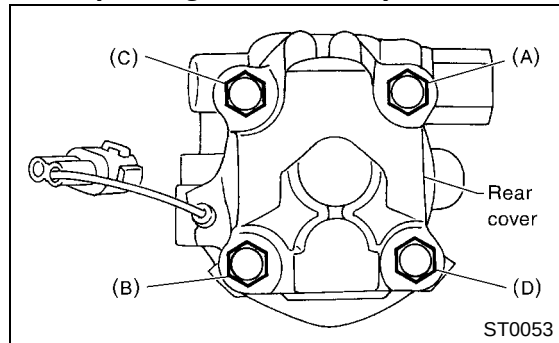
14) With knock pin positions aligned, install rear cover.

CAUTION:

Loosely tighten bolts in the sequence (A), (B), (C), and (D) shown in figure. Then, tighten in the same sequence.

Tightening torque:

21 N·m (2.14 kgf-m, 15.5 ft-lb)



15) Install spring into front casing. Then, with spool valve dipped in specified hydraulic oil, install it into the front casing.

16) Using a 5-mm dia. round bar, ensure that valve moves smoothly.

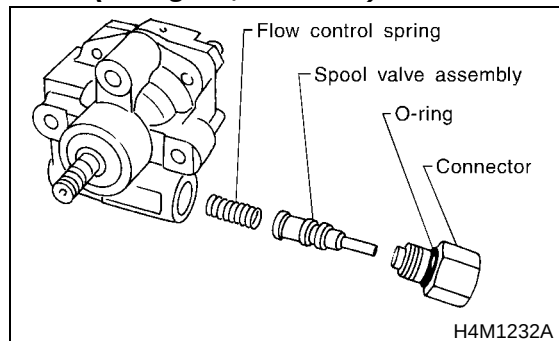
17) Set O-ring, with grease applied to it, onto connector and secure connector to front casing.

CAUTION:

- Use care to prevent damage to O-ring at installation.
- When tightening connector, ensure that O-ring does not protrude or get caught.

Tightening torque:

49 N·m (5.0 kgf-m, 36.2 ft-lb)



18) Fix oil pump pulley temporarily.

19) 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.

20) 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)

2. TURBO MODEL

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.

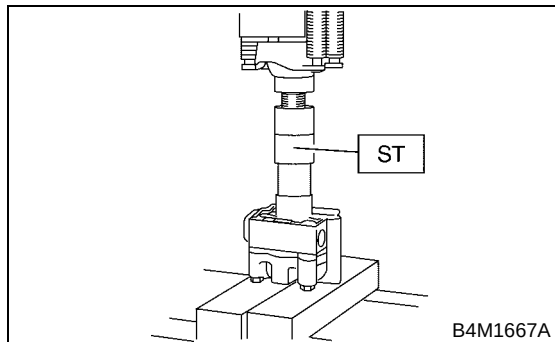
2) Apply grease to oil seal and inner surface of front casing (at bearing location).

CAUTION:

Make sure that the front body internal surfaces are free from damage.

3) Attach ST to front body. Using a press, install oil seal.

ST 34199AE030 INSTALLER



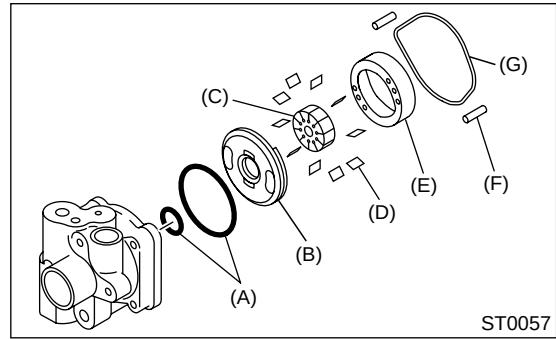
4) Install pump pulley to front body.

5) Using ST, place oil pump in a vise.

ST 34199AE020 MOUNT

6) Remove rear cover.

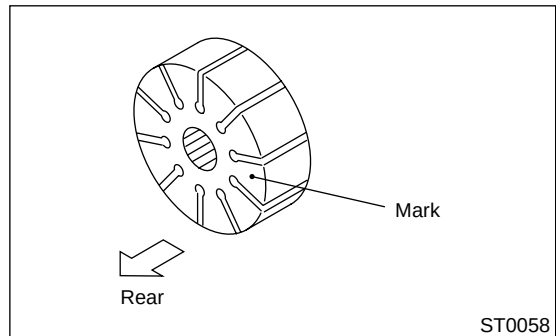
7) Install following parts to casing.



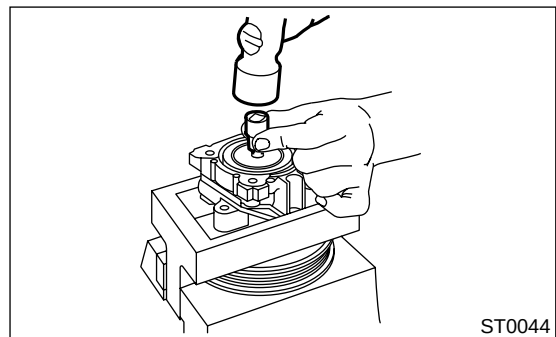
- (A) O-ring
- (B) Pressure plate
- (C) Rotor
- (D) Vane
- (E) Cam ring
- (F) Straight pin
- (G) O-ring

NOTE:

Install rotor with the mark facing the rear case side.



8) Using 8-mm box wrench, tap retaining ring into shaft groove.



9) Install O-ring to rear cover.

10) Install rear cover.

Tightening torque:

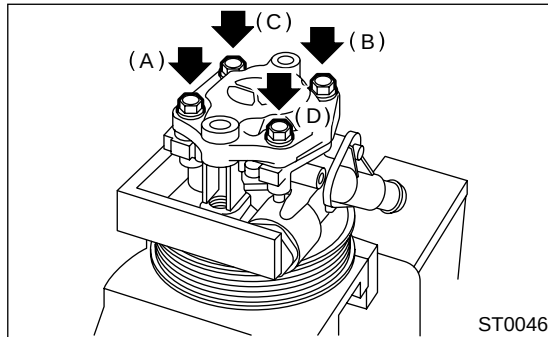
27.5 N·m (2.8 kgf-m, 20.3 ft-lb)

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

Loosely tighten bolts in the sequence (A), (B), (C), and (D) shown in figure. Then, tighten in the same sequence.



11) 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.

12) 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	Replace with a new one.
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.

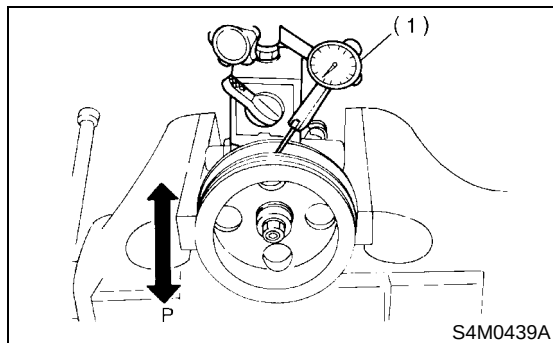
1) Play of pulley shaft

On condition:

P: 9.8 N (1.0 kgf, 2.2 lb)

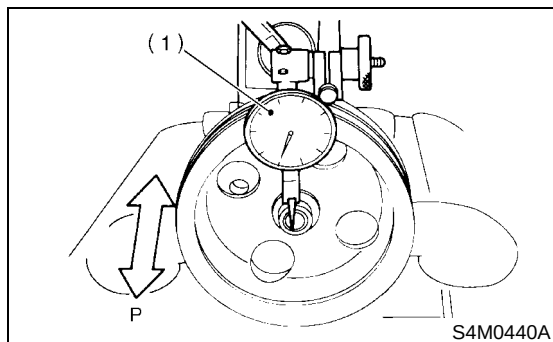
Service limit:

Radial play (Direction $\longleftrightarrow$)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction $\longleftrightarrow$)
Non-TURBO model
0.4 mm (0.016 in) or less
TURBO model
0.8 mm (0.031 in) or less



(1) Dial indicator

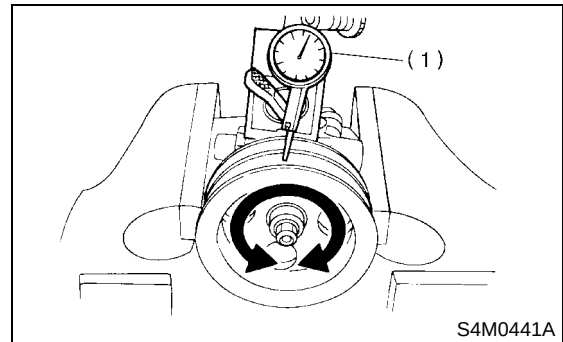
2) Ditch deflection of pulley

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

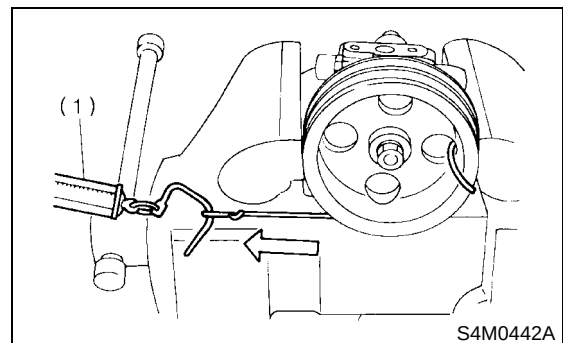
3) Resistance to rotation of pulley

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

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-104, 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 spilt fluid thoroughly after the measurement.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:

Keep engine idling during the measurement.

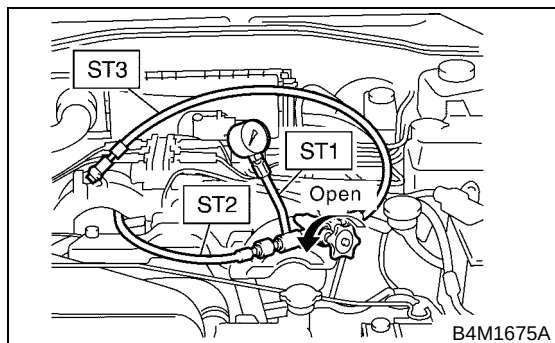
1) MEASURE REGULAR PRESSURE.

- (1) Remove two bolts securing power steering pipes to engine.
- (2) Install ST1, 2 and 3 between power steering pump and pipes using gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010).
- (3) Replenish power steering fluid up to specified level.
- (4) Open valve, and start the engine.
- (5) 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

- (6) 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.

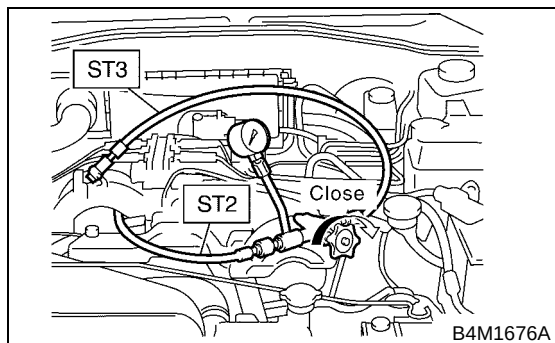
2) Measure relief pressure.

- (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:

2.0 L TURBO model

7,350 — 8,036 kPa

(75 — 82 kg/cm², 1,067 — 1,165 psi)

2.0 L Non-TURBO model

7,164 — 7,840 kPa

(73 — 80 kg/cm², 1,040 — 1,137 psi)

1.6 L model

6,174 — 6,860 kPa

(63 — 70 kg/cm², 896 — 994 psi)

- (4) If it is not within the specified value, replace the oil pump.

3) Measure working pressure.

- (1) Using STs, measure working pressure.

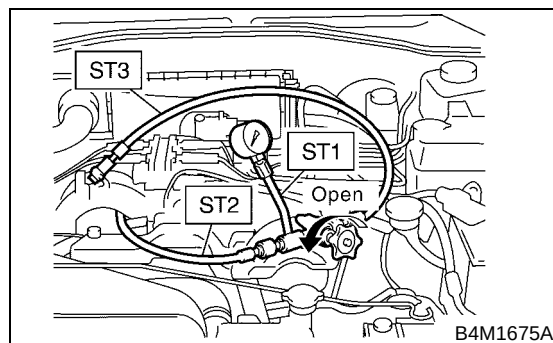
- (2) Open valve.

- (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:

2.0 L TURBO model

7,350 — 8,036 kPa

(75 — 82 kg/cm², 1,067 — 1,165 psi)

2.0 L Non-TURBO model

7,164 — 7,840 kPa

(73 — 80 kg/cm², 1,040 — 1,137 psi)

1.6 L model

6,174 — 6,860 kPa

(63 — 70 kg/cm², 896 — 994 psi)

- (4) If it is within the specified value, measure steering effort. <Ref. to PS-108, 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)

14. Reservoir Tank

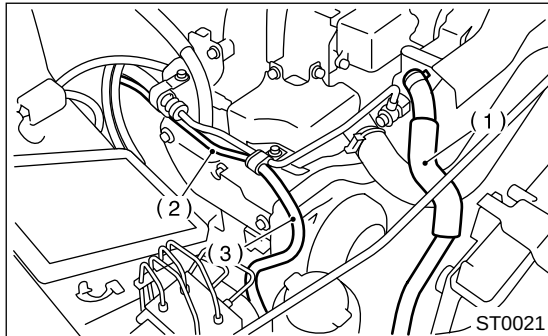
A: REMOVAL

1. NON-TURBO MODEL

- 1) Remove air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
- 2) Drain fluid from the reservoir tank.
- 3) 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

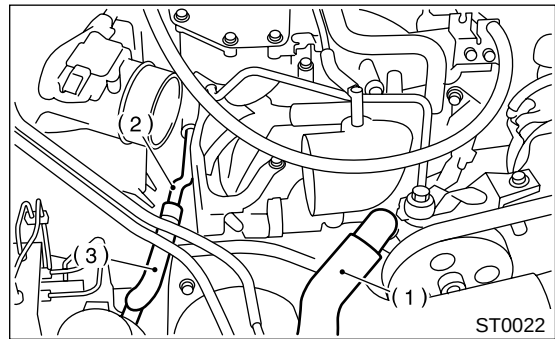
- 4) Remove reservoir tank from bracket by pulling it upwards.

2. TURBO MODEL

- 1) Remove air intake duct. <Ref. to IN(DOHC TURBO)-9, REMOVAL, Intake Duct.>
- 2) Drain fluid from the reservoir tank.
- 3) 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.



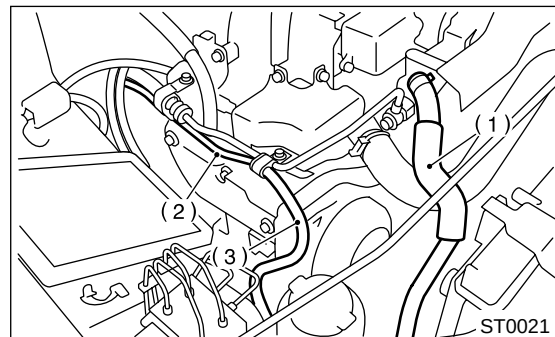
- (1) Suction hose
- (2) Pipe D
- (3) Return hose

- 4) Remove reservoir tank from bracket by pulling it upwards.

B: INSTALLATION

1. NON-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

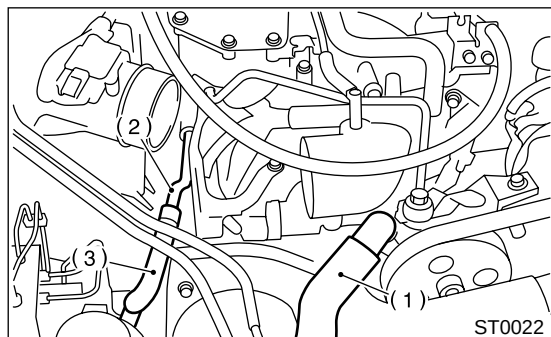
- 3) Feed the specified power steering fluid. <Ref. to PS-103, Power Steering Fluid.>

RESERVOIR TANK

POWER ASSISTED SYSTEM (POWER STEERING)

2. TURBO MODEL

- 1) Install reservoir tank to bracket.
- 2) Connect pressure 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-103, 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)

15. Power Steering Fluid

A: SPECIFICATION

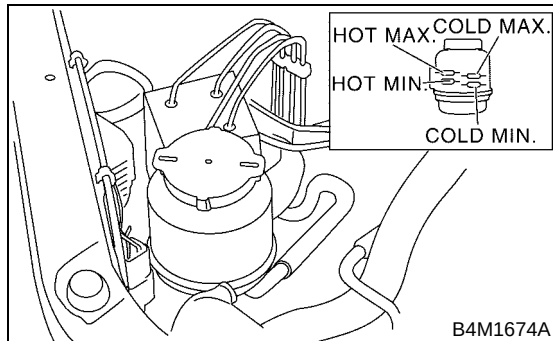
Recommended power steering fluid	Manufacturer
DEXRON IIE or III	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

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.

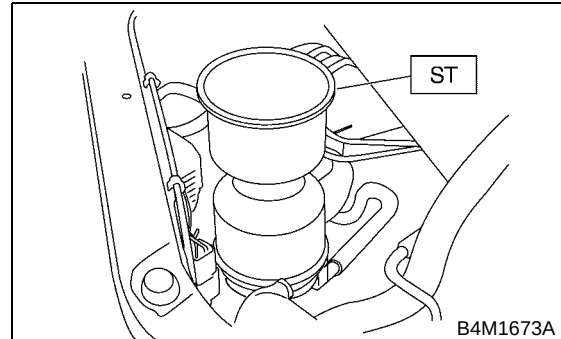
(2) Check at temperature 80°C (176°F) on reservoir surface of oil pump; read the fluid level on the "HOT" side.



C: INSTALLATION

- 1) Set ST on top of reservoir tank and fill it about half way with the specified fluid.

ST 34199AE040 OIL CHARGE



- 2) Continue to turn steering wheel slowly from lock to lock until bubbles stop appearing in the tank while keeping the fluid at that level.
- 3) 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.
- 4) Start, and idle the engine.
- 5) 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.
- 6) 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.
- 7) Stop the engine, and take out safety stands after jacking up vehicle again.
Then lower the vehicle, and idle the engine.
- 8) 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).
- 9) 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.

- 10) 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.
- So remove the flare nut, tighten again it to the specified torque after cleaning flare and tapered seat. If flare or tapered seat is damaged, replace it with a new one.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

16.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
- Heavy steering effort in all ranges - Heavy steering effort at stand still - Steering wheel surges when turning.	1. Pulley belt - 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 - Improper tires out of specification - Improper rims out of specification - Tires not properly inflated*1	Replace or reinflate.
	3. Fluid - 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 - 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-98, INSPECTION, Oil Pump.>	Replace problem parts.
	6. Measure steering effort.<Ref. to PS-104, INSPECTION, General Diagnostic Table.>	Adjust or replace.
- Vehicle leads to one side or the other. - Poor return of steering wheel to center - Steering wheel surges when turning.	1. Fluid line - Folded hose - Flattened pipe	Reform or replace.
	2. Tire and rim - 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 - Improper or unbalance caster - Improper or unbalance toe-in - Loose connection of suspension	Adjust or retighten.
	4. Others - Damaged joint assembly - Unbalanced height - One-sided weight	Replace, adjust or instruct customer.
	5. Measure steering effort.<Ref. to PS-104, 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 stand-still, 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-77, INSPECTION, Pipe Assembly [LHD MODEL].><Ref. to PS-85, INSPECTION, Pipe Assembly [RHD MODEL].>
	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.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

Trouble	Possible cause	Corrective action
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	Check	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. 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.	Is the steering effort 29.4 N (3.0 kgf, 6.6 lb) or less?	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 31.4 N (3.5 kgf, 7.7 lb) or less?	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 2.26 N (0.23 kgf, 0.51 lb) or less?	Go to step 4.	Check, adjust and replace if necessary.
4 CHECK STEERING WHEEL EFFORT. Measure steering wheel effort.	Is the fluctuation width 1.08 N (0.11 kgf, 0.24 lb) or less?	Go to step 5.	Check, adjust and replace if necessary.
5 CHECK UNIVERSAL JOINT. Measure folding torque of the joint (yoke of steering column side). <Ref. to PS-29, INSPECTION, Universal Joint.>	Is the folding torque 7.3 N (0.74 kgf, 1.64 lb) or less?	Go to step 6.	Replace with new one.
6 CHECK UNIVERSAL JOINT. Measure folding torque of the joint (yoke of gearbox side). <Ref. to PS-29, INSPECTION, Universal Joint.>	Is the folding torque 7.3 N (0.74 kgf, 1.64 lb) or less?	Go to step 7.	Replace with new one.
7 CHECK FRONT WHEEL.	Are front wheels for unsteady revolution or rattling and brake for dragging?	Inspect, readjust and replace if necessary.	Go to step 8.
8 CHECK TIE-ROD ENDS. Remove the tie-rod ends.	Are tie-rod ends of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 9.
9 CHECK BALL JOINT.	Are ball joints of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 10.
10 CHECK GEARBOX. Measure rotating of gearbox. LHD: <Ref. to PS-44, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [LHD MODEL].> RHD: <Ref. to PS-60, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [RHD MODEL].>	Is rotating resistance 12.7 N (1.3 kgf, 2.9 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.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

Step	Check	Yes	No
11 CHECK GEARBOX. Measure sliding of gearbox. LHD: <Ref. to PS-43, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].> RHD: <Ref. to PS-59, SERVICE LIMIT, INSPECTION, Steering Gearbox [RHD MODEL].>	Is rotating resistance 304 N (31 kgf, 68 lb) or less with 20% difference between left and right direction?	Steering effort is normal.	Readjust back-lash, and if ineffective, replace bad parts.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

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		5.0 kW (4,300 kcal/h, 17,062 BTU/h) or more	• 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
Air flow rate		280 m ³ (9,888 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
Max air flow rate		450 m ³ (15,892 cu ft)/h	• Temperature control switch: FULL COLD • Blower fan speed: 4th position • Mode selector lever: RECIRC
Heater core size (height × length × width)	LHD model	163.9 × 200 × 25.0 mm (6.45 × 7.87 × 0.984 in)	—
	RHD model	181.5 × 160 × 27 mm (7.15 × 6.30 × 1.06 in)	
Blower motor	Type	Magnet motor 200 W or less	at 12 V
	Fan type and size (diameter × width)	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	—

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

2. A/C SYSTEM

• LHD Model:

Item		Specifications
Type of air conditioner		Reheat air-mix type
Cooling capacity		5.1 kW (4,385 kcal/h, 17,402 BTU/h)
Refrigerant		HFC-134a (CH ₂ FCF ₃) [0.5±0.05 kg (0.99±0.11 lb)]
Compressor	Type	Vane rotary, fix volume (CR-14)
	Discharge	144 cm ³ (8.79 cu in)/rev
	Max. permissible speed	7,000 rpm
Magnet clutch	Type	Dry, single-disc type
	Power consumption	47 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 (Sub cool type)
	Core face area	0.21 m ² (2.26 sq ft)
	Core thickness	16 mm (0.63 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)	255 × 200 × 48 mm (10 × 7.87 × 1.89 in)
Blower fan	Fan type	Sirocco fan
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
	Power consumption	200 W at 12 V
Condenser fan (Sub fan)	Motor type	Magnet
	Power consumption	70 W at 12 V
	Fan outer diameter	320 mm (12.6 in)
Radiator fan (Main fan)	Motor type	Magnet
	Power consumption	70 W at 12 V
	Fan outer diameter	320 mm (12.6 in)
Idling speed (A/C ON)		MPFI model 850±100 rpm
Dual switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF 278±29 kPa (2.83±0.3 kg/cm ² , 40.3±4.2 psi)
		OFF → ON 287 ⁺³⁹ / ₋₂₅ kPa (2.9 ^{+0.4} / _{-0.25} kg/cm ² , 42 ^{+5.7} / _{-3.6} psi)
	High-pressure switch operating pressure	ON → OFF 2,800±100 kPa (29±1 kg/cm ² , 406±15 psi)
		DIFF 600±200 kPa (6.12±2 kg/cm ² , 87±29 psi)
Thermo control amplifier working temperature (Evaporator outlet air)		

HV0045

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• RHD Model:

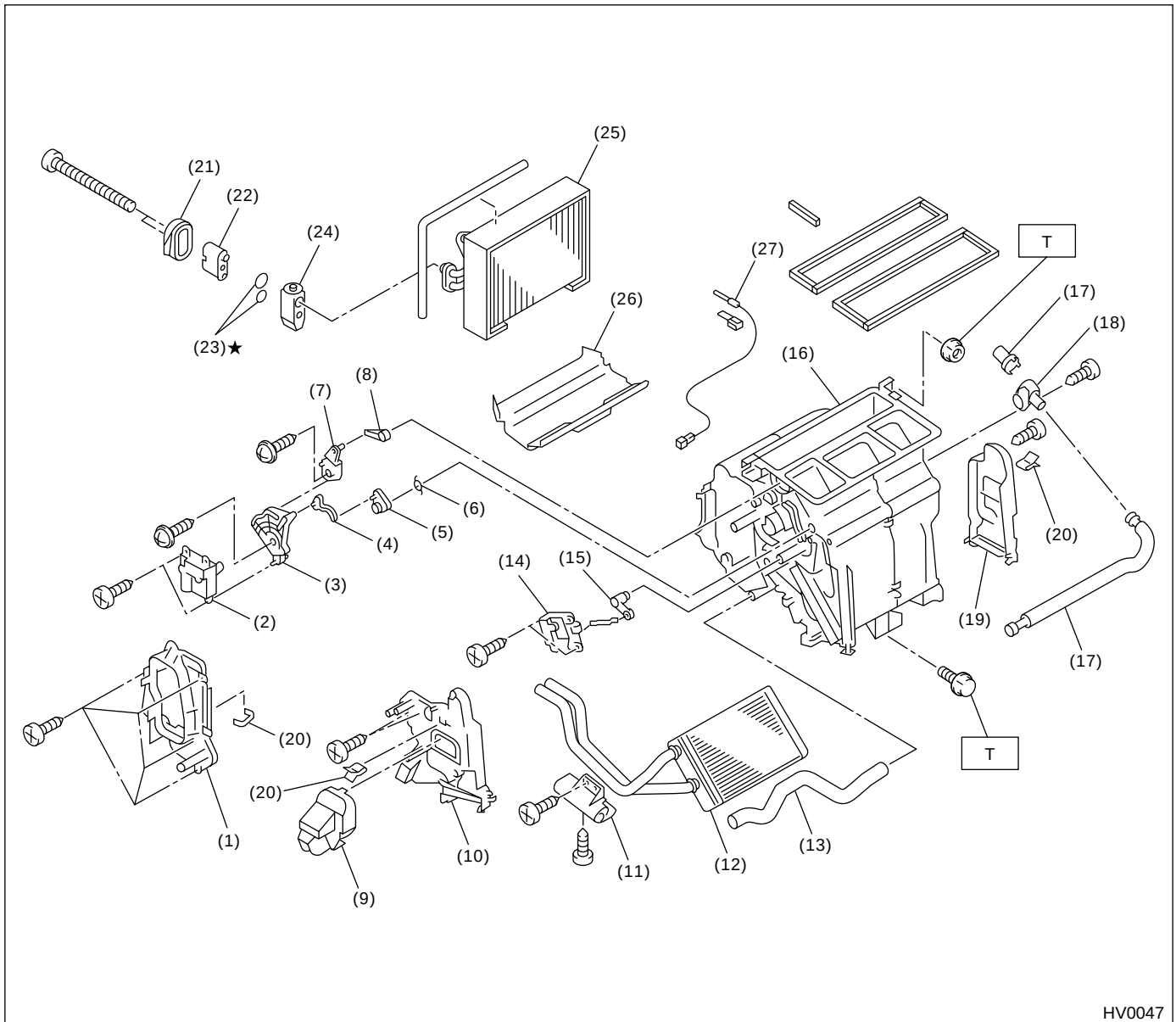
Item		Specifications	
Type of air conditioner		Reheat air-mix type	
Cooling capacity		5.1 kW (4,385 kcal/h, 17,402 BTU/h)	
Refrigerant		HFC-134a (CH ₂ FCF ₃) [0.5±0.05 kg (1.10±0.11 lb)]	
Compressor	Type	Vane rotary, fix volume (CR-14)	
	Discharge	144 cm ³ (8.79 cu in)/rev	
	Max. permissible speed	7,000 rpm	
Magnet clutch	Type	Dry, single-disc type	
	Power consumption	47 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 (Sub cool type)	
	Core face area	0.21 m ² (2.26 sq ft)	
	Core thickness	16 mm (0.63 in)	
	Radiation area	5.34 m ² (57.48 sq ft)	
Receiver drier	Effective inner capacity	250 cm ³ (15.26 cu in)	
Expansion valve	Type	Externally equalizing	
Evaporator	Type	Single tank	
	Dimensions (W × H × T)	255 × 200 × 48 mm (10 × 7.87 × 1.89 in)	
Blower fan	Fan type	Sirocco fan	
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)	
	Power consumption	200 W at 12 V	
Condenser fan (Sub fan)	Motor type	Magnet	
	Power consumption	70 W at 12 V	
	Fan outer diameter	320 mm (12.6 in)	
Radiator fan (Main fan)	Motor type	Magnet	
	Power consumption	70 W at 12 V	
	Fan outer diameter	320 mm (12.6 in)	
Idling speed (A/C ON)		MPFI model	850±100 rpm
Dual switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	278±29 kPa (2.83±0.3 kg/cm ² , 40.3±4.2 psi)
		OFF → ON	287 ⁺³⁹ / ₋₂₅ kPa (2.9 ^{+0.4} / _{-0.25} kg/cm ² , 42 ^{+5.7} / _{-3.6} psi)
	High-pressure switch operating pressure	ON → OFF	2,800±100 kPa (29±1 kg/cm ² , 406±15 psi)
		DIFF	600±200 kPa (6.12±2 kg/cm ² , 87±29 psi)
Thermo control amplifier working temperature (Evaporator outlet air)		</	

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

B: COMPONENT

1. HEATER COOLING UNIT



HV0047

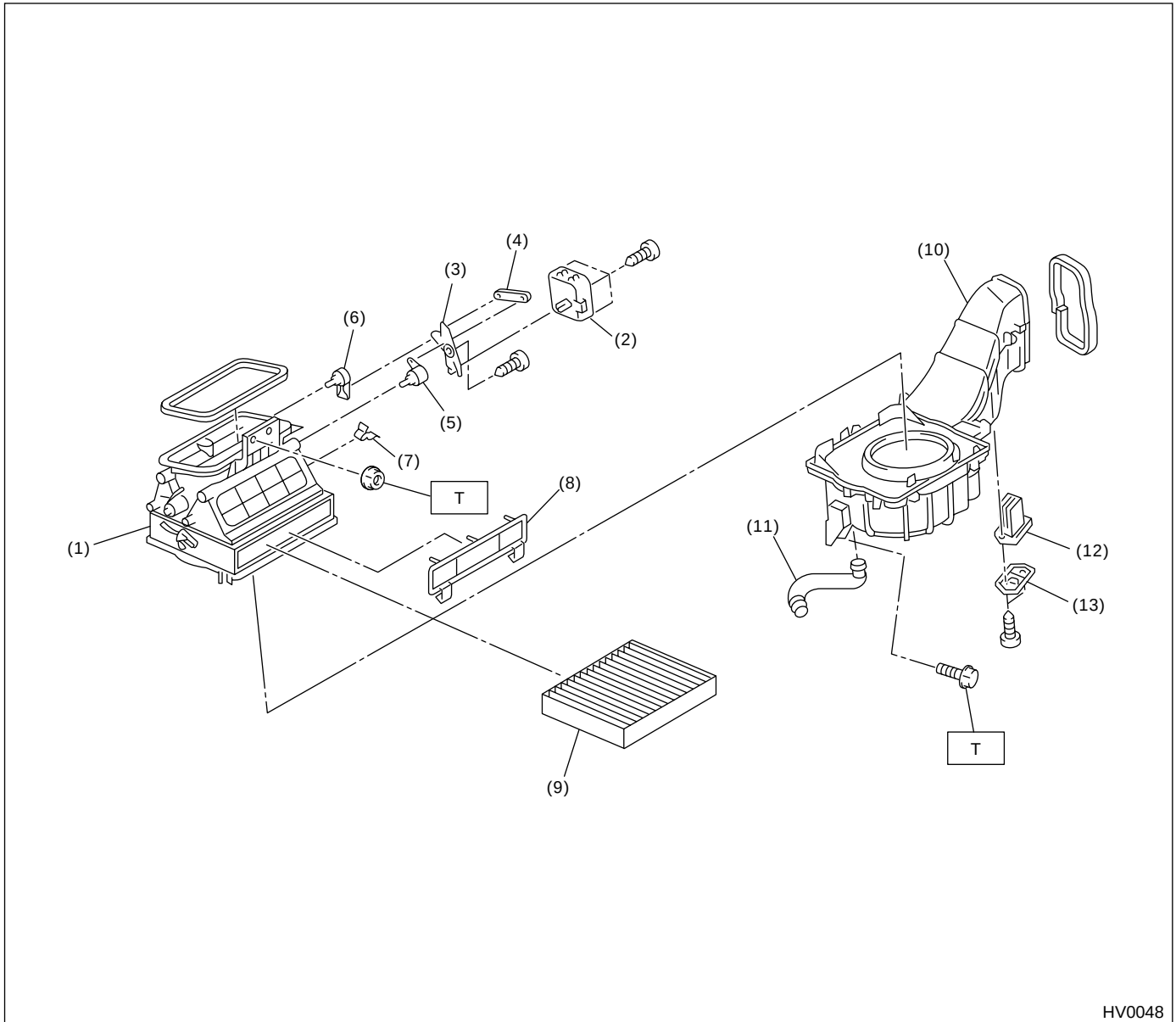
- | | | |
|------------------------|------------------------|-------------------------|
| (1) Unit cover | (11) Heater core clamp | (21) Packing |
| (2) Mode acuator | (12) Heater core | (22) Cooling unit block |
| (3) Side link | (13) Drain hose | (23) O-ring |
| (4) Mode acuator lever | (14) Mix acuator | (24) Expansion valve |
| (5) Foot lever | (15) Mix acuator lever | (25) Evaporator |
| (6) Spring | (16) Unit assembly | (26) Evaporator cover |
| (7) Mode acuator link | (17) Aspirator hose | (27) Thermistor |
| (8) Defroster lever | (18) Aspirator | |
| (9) Foot nozzle | (19) Foot duct | |
| (10) Unit duct cover | (20) Clip | |

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. BLOWER MOTER UNIT



HV0048

- | | |
|-------------------------|----------------------------|
| (1) Upper case | (7) Clip |
| (2) Servo motor | (8) Filter cover |
| (3) Blower link | (9) Filter |
| (4) Blower link lever A | (10) Blower motor assembly |
| (5) Blower link lever B | (11) Hose |
| (6) Blower link lever C | (12) Power transistor |

- (13) Power transistor cover

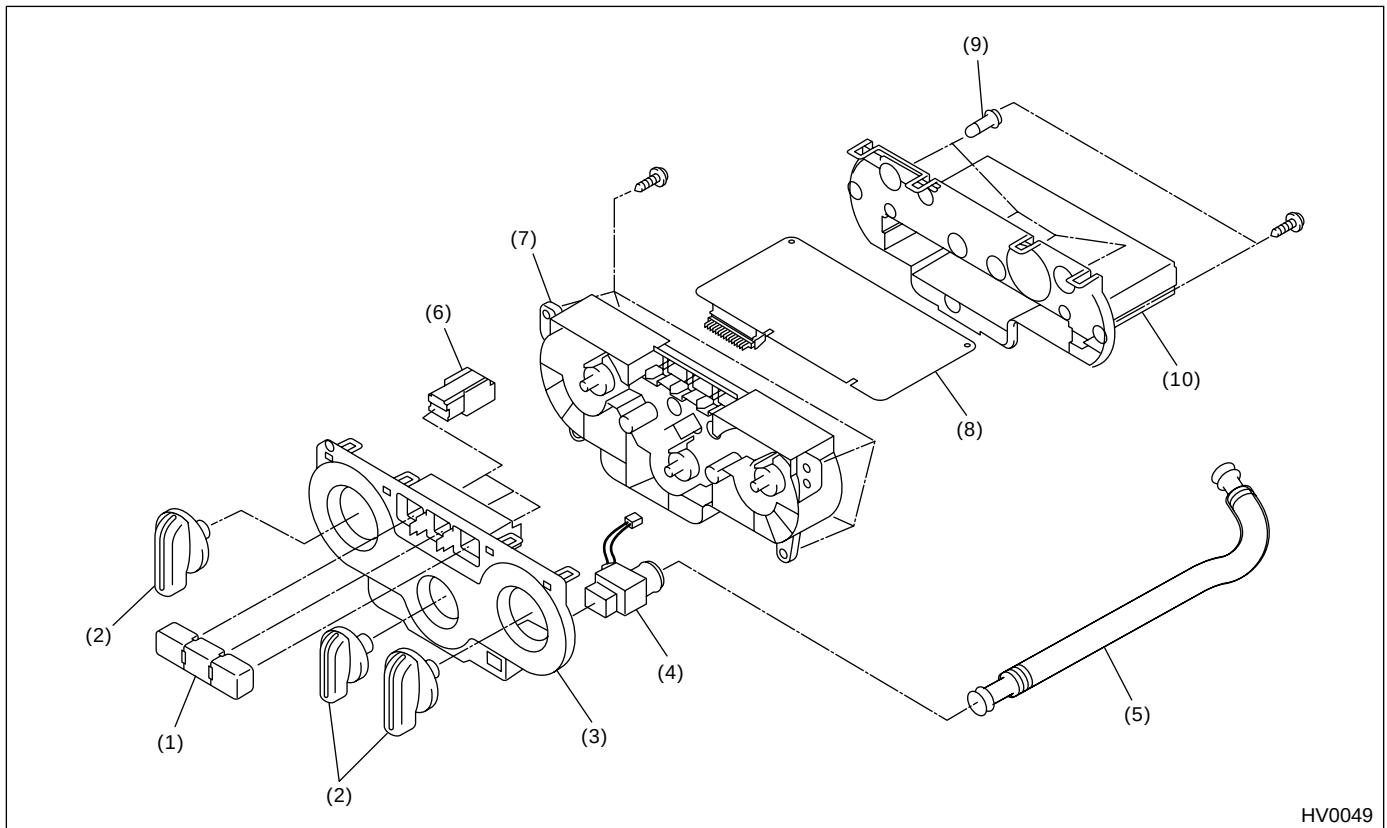
Tightening torque: N·m (kgf-m, ft-lb)

T: 7.35 (0.750, 5.421)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

3. CONTROL UNIT



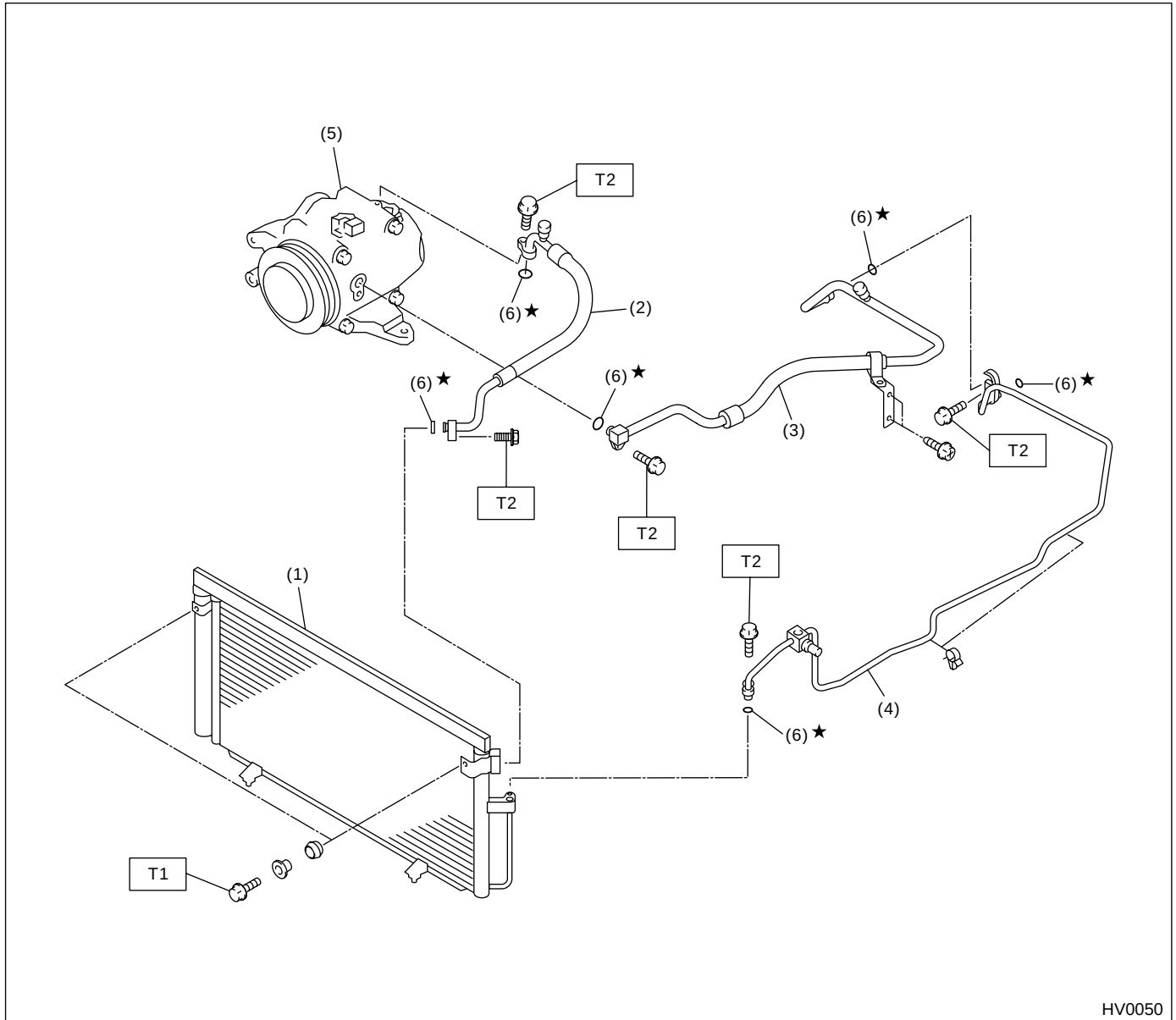
HV0049

- | | |
|-------------------|-----------------------------|
| (1) Switch | (6) Switch assembly |
| (2) Control lever | (7) Control base |
| (3) Control panel | (8) Electronic control unit |
| (4) In-car sensor | (9) Bulb |
| (5) Hose | (10) Control case |

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

4. AIR CONDITIONING UNIT



- | | |
|----------------------------|----------------|
| (1) Condenser | (4) Tube |
| (2) Hose (High — pressure) | (5) Compressor |
| (3) Hose (Low — pressure) | (6) O-ring |

Tightening torque: N·m (kgf-m, ft-lb)

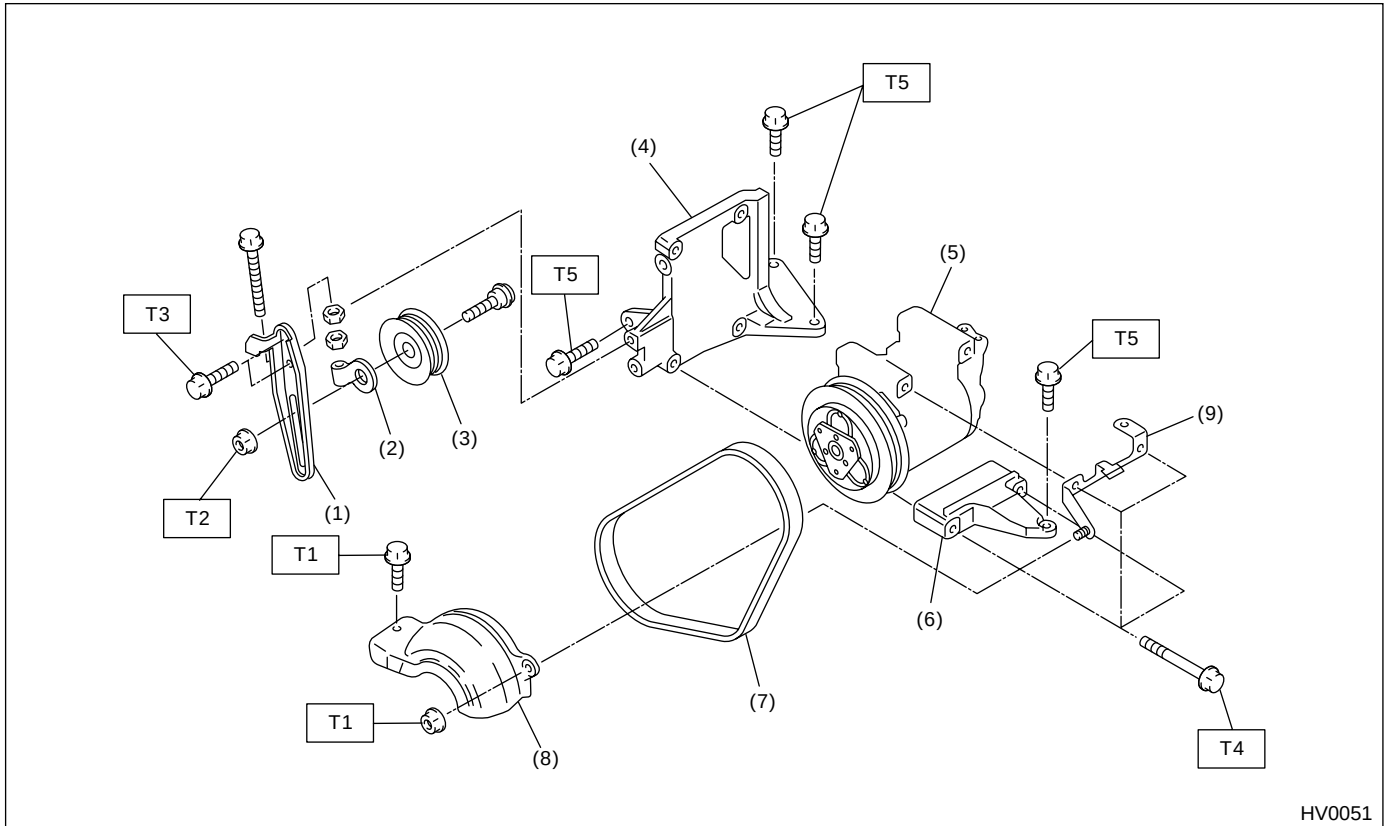
T1: 7.4 (0.75, 5.4)

T2: 15 (1.5, 10.8)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

5. COMPRESSOR



- | | |
|------------------------------|---------------------------|
| (1) Idler pulley bracket | (7) V-belt |
| (2) Idler pulley adjuster | (8) Compressor belt cover |
| (3) Idler pulley | |
| (4) Compressor bracket upper | |
| (5) Compressor | |
| (6) Compressor bracket lower | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 7.4 (0.75, 5.4)

T2: 22.6 (2.3, 16.6)

T3: 23.0 (2.35, 17.0)

T4: 28.9 (2.95, 21.3)

T5: 35 (3.6, 26)

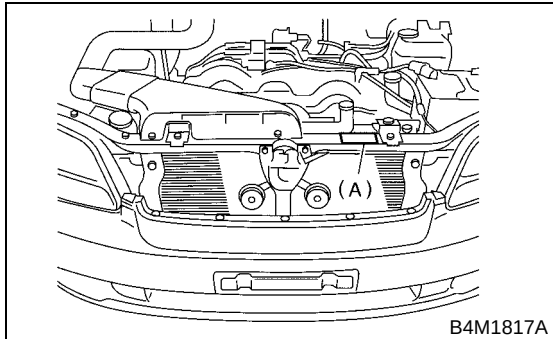
GENERAL DESCRIPTION

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 DH-PR.
- 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.

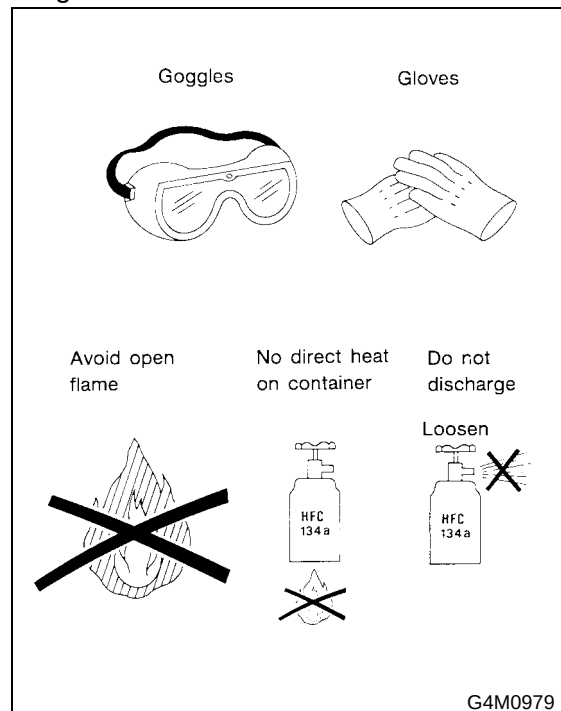
- HFC-134a compressor oil is very hygroscopic. When replacing or installing/removing A/C parts, immediately isolate the oil from the atmosphere using a plug or tape. In order to avoid moisture, store the oil in a container with its cap tightly closed.

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.
- 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.

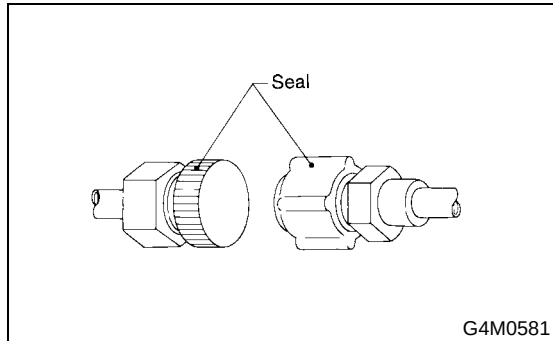


GENERAL DESCRIPTION

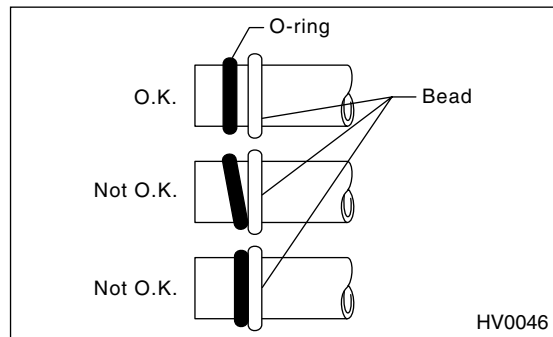
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

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.

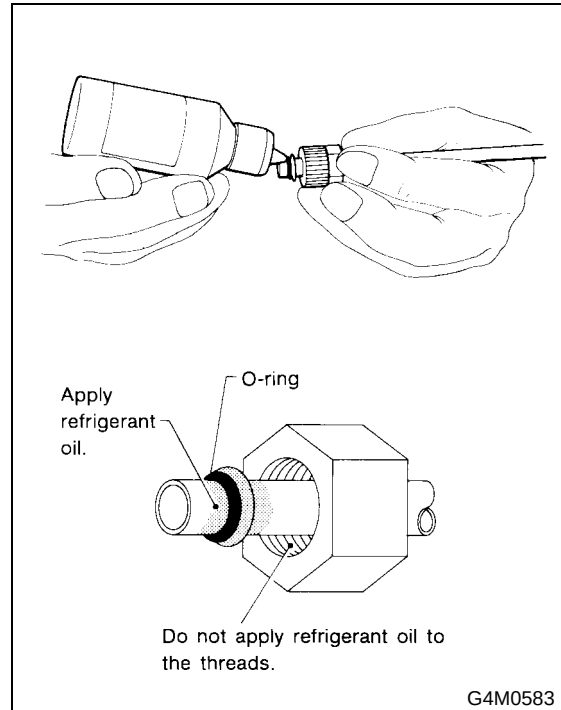


- Visually check the surfaces and mating surfaces of O-rings, threads, and connecting points. If a failure is found, replace the applicable parts.
- Install the O-rings at right angle to the tube beads.



- 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.



- 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.
- 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.

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

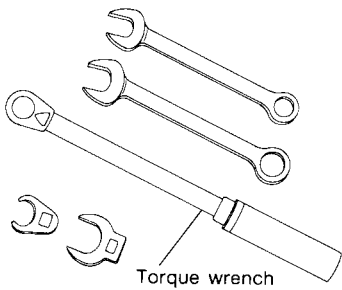
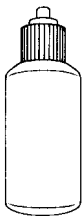
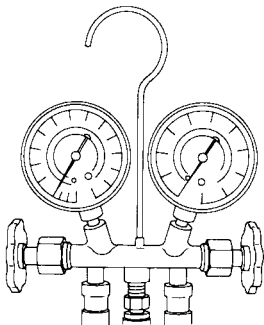
D: PREPARATION TOOL

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.

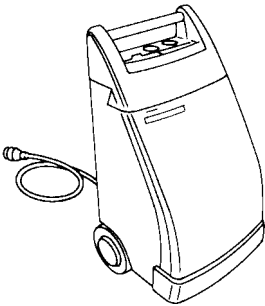
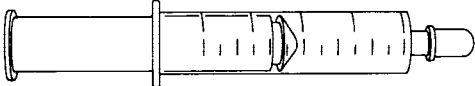
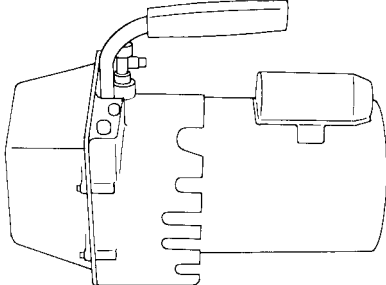
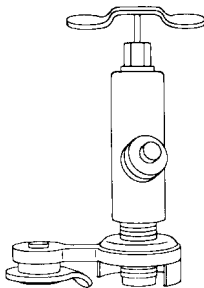
In order to help prevent mixing HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.

	HFC-134a	CFC-12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

Tools and Equipment	Description
Wrench 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 crow-foot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.	 G4M0571
Applicator bottle A small APPLICATOR BOTTLE is recommended to apply refrigerant oil to the various parts. They can be obtained at a hardware or drug store.	 G4M0572
Manifold gauge set A MANIFOLD GAUGE SET (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.	 G4M0573

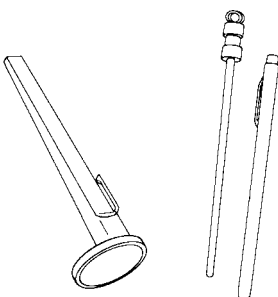
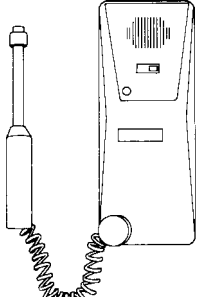
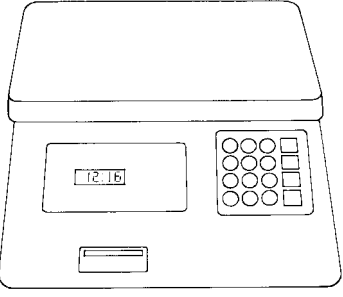
GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Tools and Equipment	Description
Refrigerant recovery system 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.	 G4M0574
Syringe 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.	 G4M0575
Vacuum pump 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.	 G4M0576
Can tap A CAN TAP for the 397 g (14 oz) can is available from an auto supply store.	 G4M0577

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Tools and Equipment	Description
Thermometer Pocket THERMOMETERS are available from either industrial hardware store or commercial refrigeration supply houses.	 G4M0578
Electronic leak detector An ELECTRONIC LEAK DETECTOR can be obtained from either a specialty tool supply or an A/C equipment supplier.	 G4M0579
Weight scale 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.	 G4M0580

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 rpm to 1,500.
- 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.	• Defective condenser fan motor • Clogged condenser fan • Too much refrigerant • Air inside the system • Defective receiver dryer	• Replace the fan motor. • Clean the condenser fin. • Discharge refrigerant. • Replace the receiver dryer.
High-pressure side is unusually low.	• Defective compressor • Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture	• Replace the compressor. • Check for leaks. • Replace the expansion valve.
Low-pressure side is unusually high.	• Defective compressor • Defective expansion valve • Too much refrigerant	• Replace the compressor. • Replace the expansion valve. • Discharge refrigerant.
Low-pressure side is unusually low.	• Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture • Saturated receiver dryer	• 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:

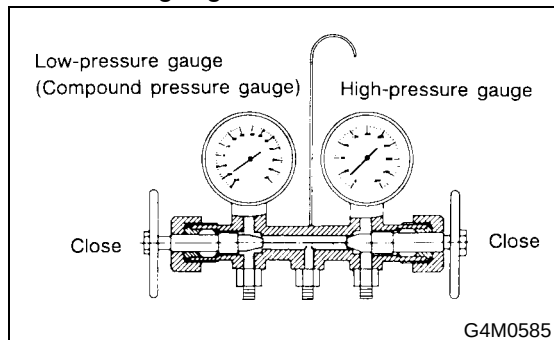
- During operation, be sure to wear safety goggles and protective gloves.
- Connect the refrigerant recovery system with the manifold gauge set to discharge the refrigerant from the A/C system and reuse it.
- When reusing the discharged refrigerant, keep service cans on hand. Because the discharge rate 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) Turn the A/C switch ON.

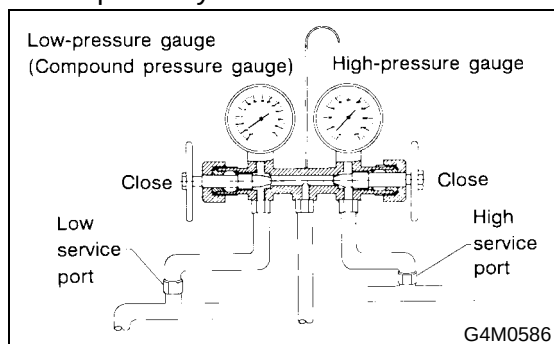
Leave the engine running for approx. 5 minutes to activate the compressor. Perform the refrigerating cycle with the refrigerant to discharge the compressor oil remaining on the functional parts into the compressor as much as possible.

2) Stop the engine.

3) Close the valves on the low-/high-pressure sides of the manifold gauge set.



4) Install the low-/high-pressure hoses to the service ports on the low-/high-pressure sides of the vehicle respectively.



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:

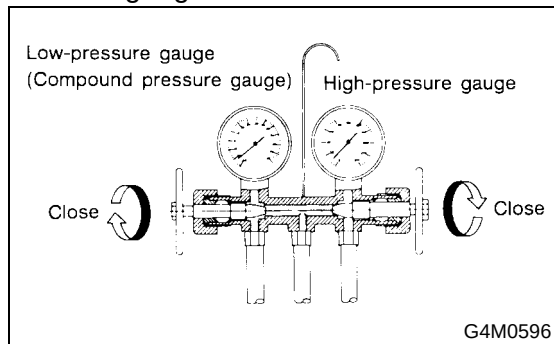
- During operation, be sure to wear safety goggles and protective gloves.
- Before charging the refrigerant, evacuate the system to remove small amounts of moisture remaining in the system.

The moisture in the system can be completely evacuated only under the minimum vacuum level. The minimum vacuum level affects the temperature in the system.

- The list below shows the vacuum values necessary to boil water in various temperature. In addition, the vacuum levels indicated on the gauge are approx. 3.3 kPa (25 mmHg, 0.98 inHg) lower than those measured at 304.8 m (1,000 ft) above sea level.

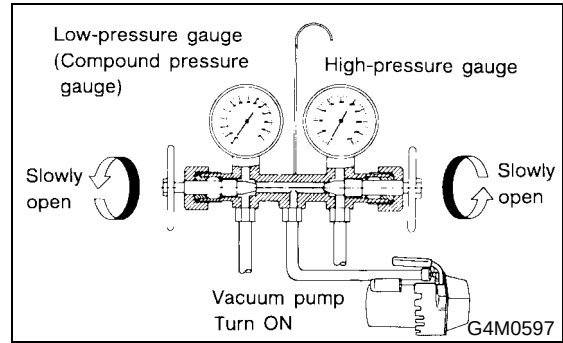
Vacuum level required to boil water (at sea level)	
Temperature	Vacuum
1.7°C (35°F)	100.9 kPa (757 mmHg, 29.8 inHg)
7.2°C (45°F)	100.5 kPa (754 mmHg, 29.7 inHg)
12.8°C (55°F)	99.8 kPa (749 mmHg, 29.5 inHg)
18.3°C (65°F)	99.2 kPa (744 mmHg, 29.3 inHg)
23.9°C (75°F)	98.5 kPa (739 mmHg, 29.1 inHg)
29.4°C (85°F)	97.2 kPa (729 mmHg, 28.7 inHg)
35°C (95°F)	95.8 kPa (719 mmHg, 28.3 inHg)

- 1) Close the valves on low-/high-pressure sides of the manifold gauge.

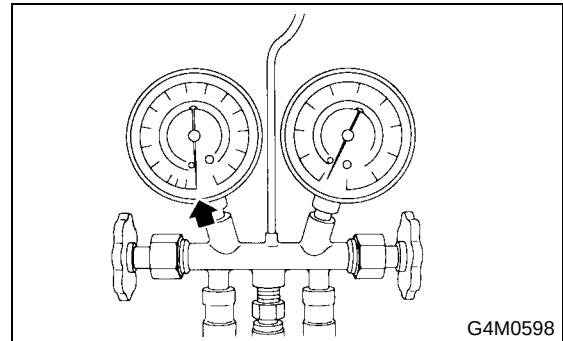


- 2) Install the low-/high-pressure hoses to the corresponding service ports on the vehicle respectively.
- 3) Connect the center hose of the manifold gauge set with the vacuum pump.

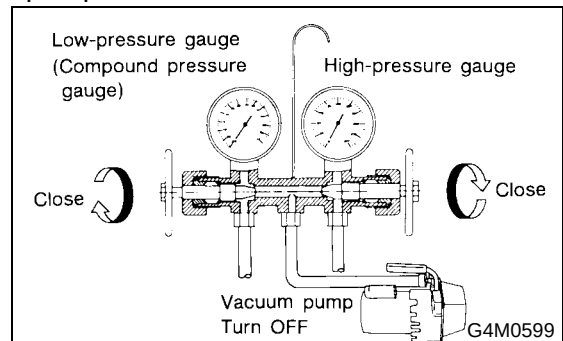
- 4) Carefully open the valves on the low-/high-pressure sides to activate the vacuum pump.



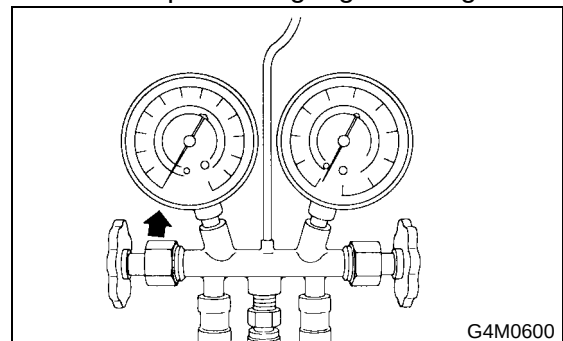
- 5) After the low-pressure gauge reaches 100.0 kPa (750 mmHg, 29.5 inHg) or higher, evacuate the system for approx. 15 minutes.



- 6) After 15 minutes of evacuation, if the reading shows 100.0 kPa (750 mmHg, 29.5 inHg) or higher, close the valves on the both sides to stop the vacuum pump.



- 7) Note the low-pressure gauge reading.

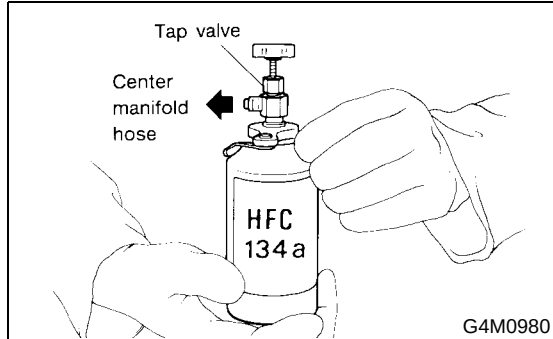


REFRIGERANT CHARGING PROCEDURE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

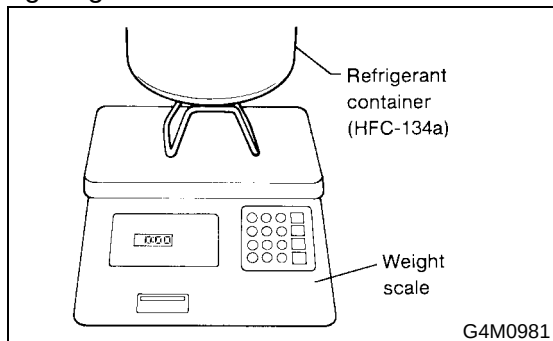
8) Leave it at least 5 minutes, and then check the low-pressure gauge reading for any changes. When a gauge indicator shows near to zero point, this is a sign of leakage. Check pipe connector points, repair them, make sure there is no leakage by air bleeding.

9) Following the can tap operation manual instructions, install it to the refrigerant can.

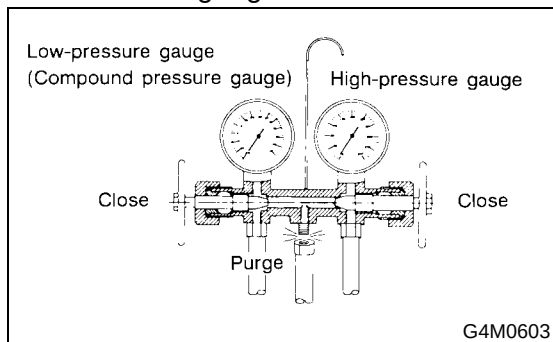


10) Disconnect the center manifold hose from the vacuum pump, and connect the hose to the tap valve.

11) When a 13.6 kg (30 lb) refrigerant container is used, measure the refrigerant amount in use using a weighing scale.



12) Confirm that all the 3 hoses are tightly connected to the manifold gauge set.



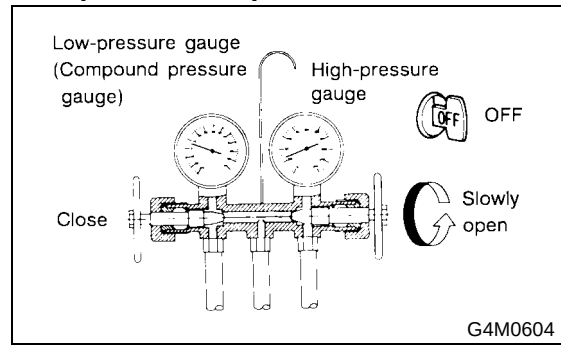
13) Open the valve on the HFC-134a source.

14) Loosen the center hose connection on the manifold gauge set (if applicable, press a purge valve on the manifold gauge set) only for a couple of seconds to allow the air in the center hose to escape by the refrigerant.

15) Carefully open the high-pressure valve with the engine stopping.

CAUTION:

Do not open the low-pressure valve.



CAUTION:

Never run the engine during charging from the high-pressure side.

16) Close the high-pressure valve when the low-pressure gauge reaches 98 kPa (1 kg/cm², 14 psi). Using a leak tester, check the system for leaks.

If any leakage is found after the refrigerant recovery is completed, repair the applicable area.

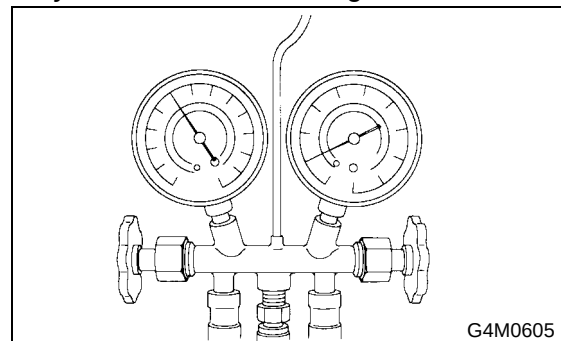
17) After confirming that there are no leaks with the leak test, charge the required amount of refrigerant.

CAUTION:

Never run the engine during charging from the high-pressure side.

18) Close the high-pressure valve when;

- the readings of low- and high-pressure gauges become almost equal, after the charging speed is reduced,
- the HFC-134a source becomes empty, or
- the system is filled with the gas.

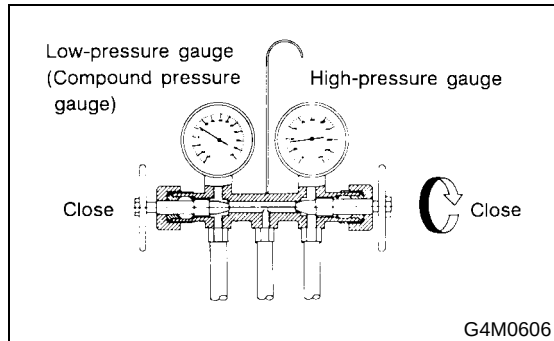


REFRIGERANT CHARGING PROCEDURE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

19) If the HFC-134a source is empty, close the high-pressure valve, close the valve on the can tap, and replace the HFC-134a source with a new one to restart the operation.

27) Disconnect the hose from the service port, and install the service port cap.



20) Confirm that both the low- and high-pressure valves can be closed. Start the engine with the A/C switch OFF.

21) Quickly repeat ON-OFF cycles a few times to prevent initial compressor damage.

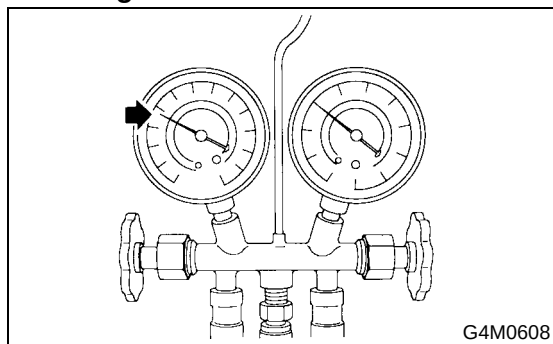
22) Set up the vehicle to the following status:

- 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"
- Windows open

23) While reading the low-pressure gauge, carefully open the low-pressure valve with the refrigerant source connected and the service hose plugged.

CAUTION:

Never open the high-pressure valve with the engine running.



24) Adjust the refrigerant flow to maintain the pressure on the low-pressure side at 276 kPa (2.81 kg/cm², 40 psi) max.

25) After the system is fully charged, close the low-pressure valve.

26) Close the valve on the refrigerant source.

Refrigerant amount			
Refrigerant		Minimum	Maximum
HFC-134a	LHD	0.6 kg (1.3 lb)	0.7 kg (1.5 lb)
	RHD	0.4 kg (0.9 lb)	0.5 kg (1.1 lb)

REFRIGERANT LEAK CHECK

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

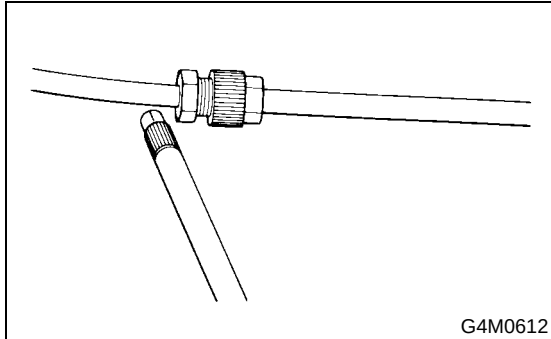
5. Refrigerant Leak Check

A: INSPECTION

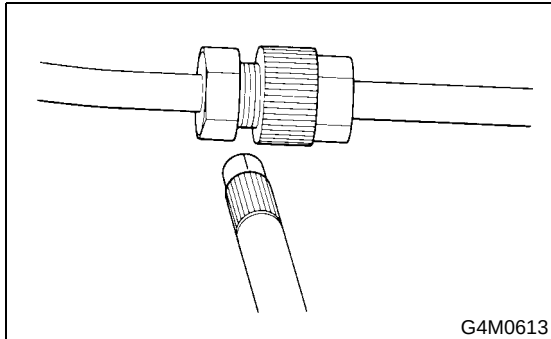
1) Operate the A/C system for approx. 10 minutes, and confirm that the high-side pressure shows at least 690 kPa (7.03 kg/cm², 100 psi). Then stop the engine to start the leak test.

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.

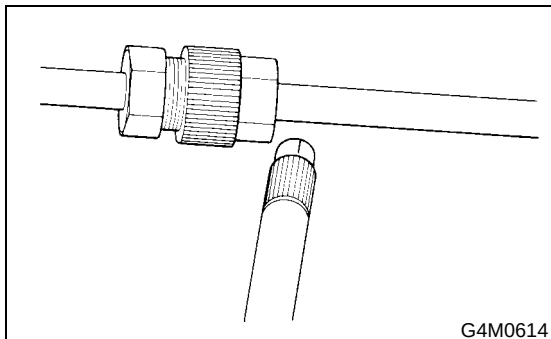
- Connection between the tube and tube fitting



- 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.

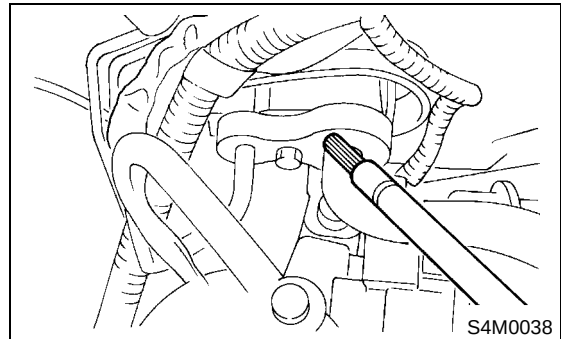
7) Check the thermal limiter (if equipped) on the compressor housing.

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

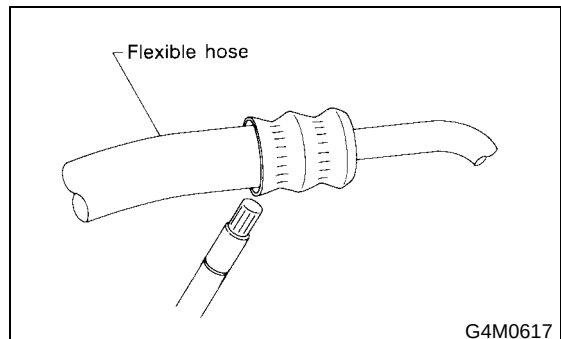


10) Visually check the rubber area of the flexible hose for cracks.

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.



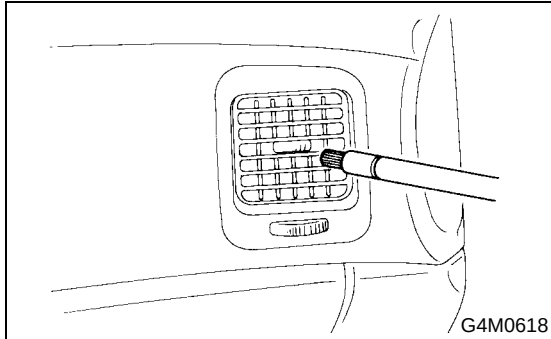
11) Disconnect the drain hose from the evaporator case, and check the hose end for at least 10 seconds.

After the test is finished, reconnect the drain hose.

REFRIGERANT LEAK CHECK

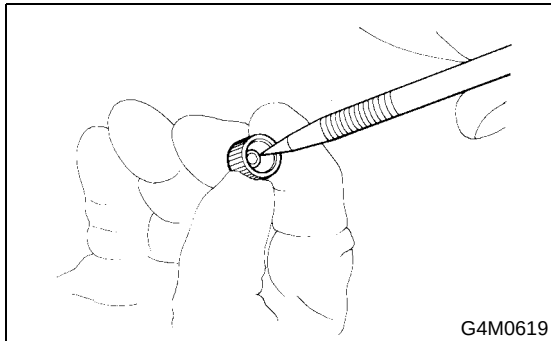
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

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 grill on the instrument panel. While moving the tester closer to the grill, run the blower for 1 or 2 seconds, then stop it. Check the grill 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.



COMPRESSOR OIL

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

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 rpm to 1,500.
- 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)
Condenser	7 m ℓ (0.24 US fl oz, 0.25 Imp fl oz)
Hose	1 m ℓ (0.03 US fl oz, 0.04 Imp fl oz)

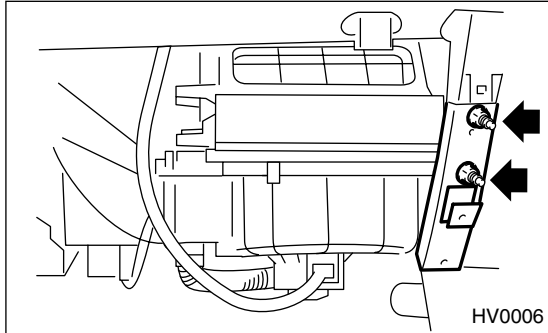
BLOWER MOTOR UNIT ASSEMBLY

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

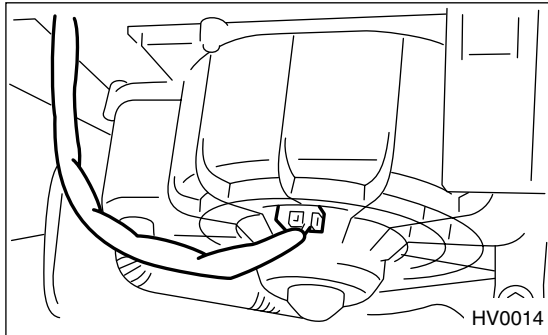
7. Blower Motor Unit Assembly

A: REMOVAL

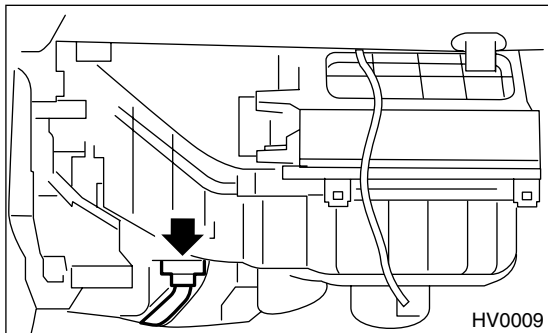
- 1) Disconnect ground cable from battery.
- 2) Remove glove box. <Ref. to EI-22, REMOVAL, Glove Box.>
- 3) Loosen nut to remove support beam stay.



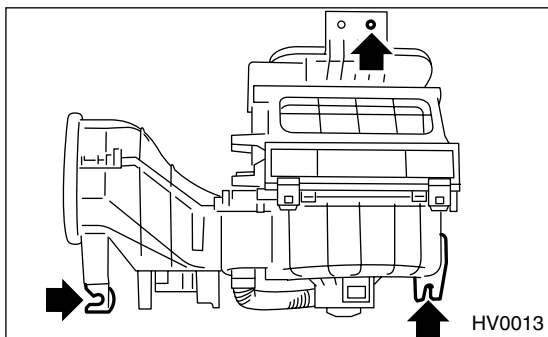
- 4) Disconnect motor connector.



- 5) Disconnect resistor connector.



- 6) Loosen bolt and nut to remove blower motor unit assembly.

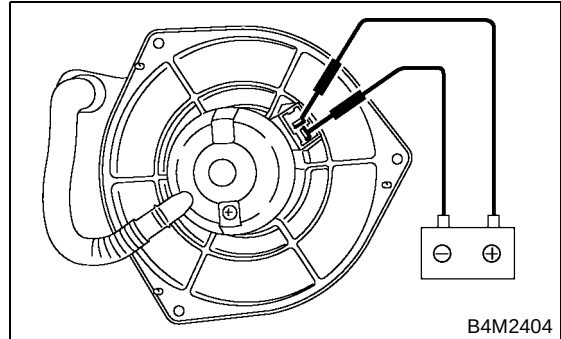


B: INSTALLATION

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.



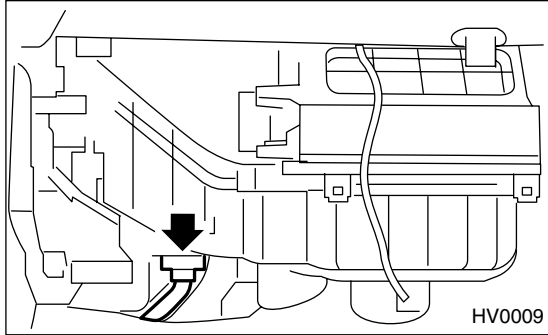
POWER TRANSISTOR (HEATER BLOWER RESISTOR)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

8. Power Transistor (Heater Blower Resistor)

A: REMOVAL

- 1) Remove glove box. <Ref. to EI-22, 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.

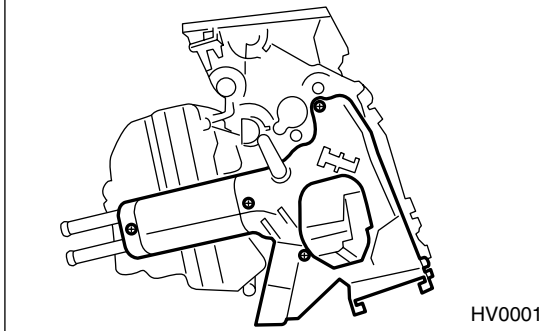
HEATER CORE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

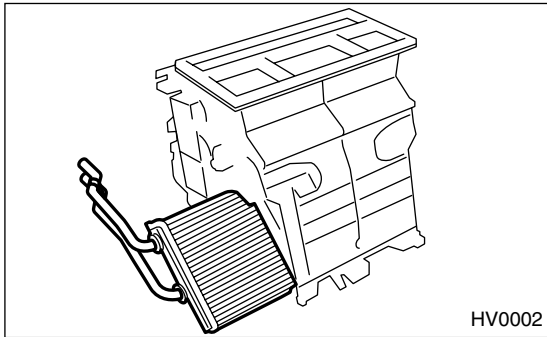
9. Heater Core

A: REMOVAL

- 1) Remove heater and cooling unit. <Ref. to AC-29, REMOVAL, Heater and Cooling Unit.>
- 2) Loosen screws to remove heater core cover.



- 3) Remove heater core.



B: INSTALLATION

Install in the reverse order of removal.

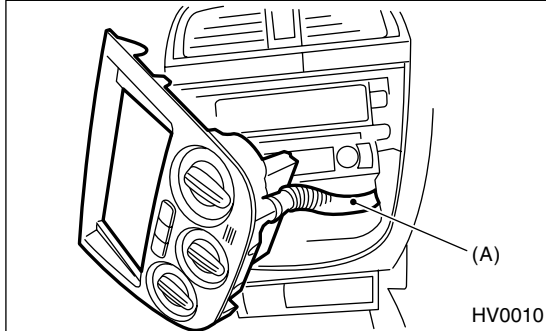
CONTROL UNIT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

10. Control Unit

A: REMOVAL

- 1) Disconnect Battery ground cable.
- 2) Remove center console panel.
- 3) Disconnect connector and aspirator hose (A).



B: INSTALLATION

Install in the reverse order of removal.

COMPRESSOR

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

11.Compressor

A: INSPECTION

1. MAGNETIC CLUTCH CLEARANCE

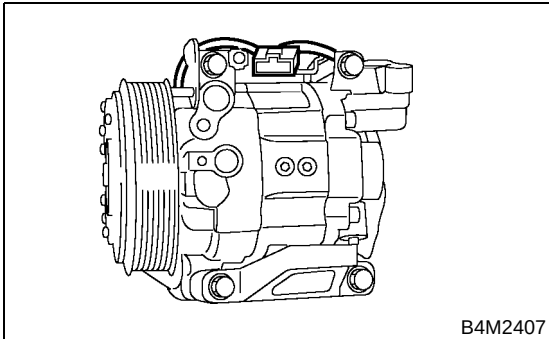
1) Check the clearance of the entire circumference around the drive plate and pulley.

Standard:

0.45 ± 0.15 mm (0.0177 ± 0.0059 in)

2. MAGNETIC CLUTCH OPERATION

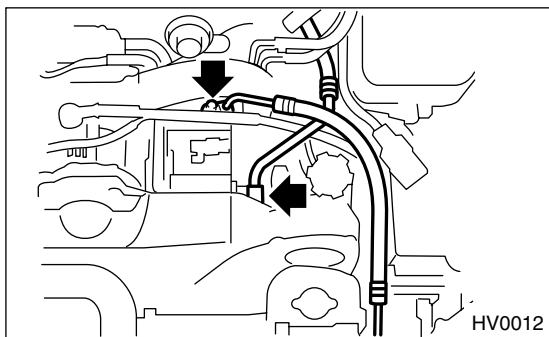
1) Disconnect the compressor connector.
2) Connect the battery positive terminal to the NO.3 terminal of the compressor connector.



3) Make sure the magnet clutch engages.
If NG, replace the compressor.

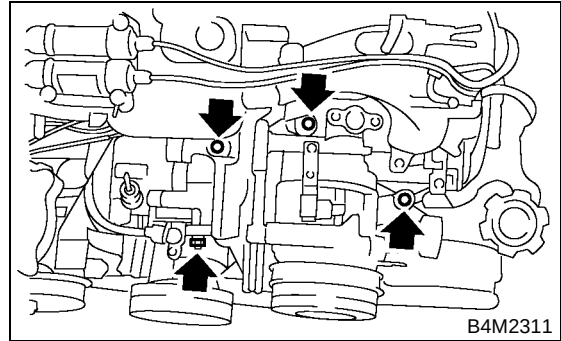
B: REMOVAL

1) Perform compressor oil return operation. <Ref. to AC-22, OPERATION, Compressor Oil.>
2) Turn A/C switch OFF and stop the engine.
3) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-16, OPERATION, Refrigerant Recovery Procedure.>
4) Disconnect ground cable from battery.
5) Remove V-belt. <Ref. to ME(SOHC)-42, REMOVAL, V-belt.> or <Ref. to ME(DOHC TURBO)-43, REMOVAL, V-belt.>
6) Remove generator. <Ref. to SC-12, REMOVAL, Generator.>
7) Remove low-pressure hose and high-pressure hose.

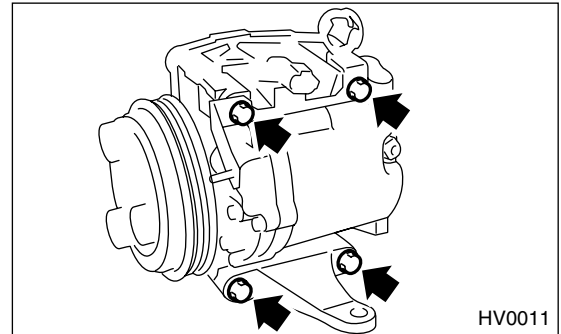


8) Disconnect compressor harness from body harness.

9) Loosen bolts to remove compressor bracket.



10) Remove bolts and then separate compressor and 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-22, OPERATION, Compressor Oil.>
4) Charge refrigerant. <Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>

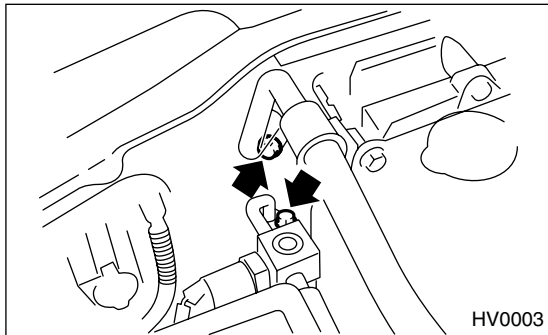
CONDENSER

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

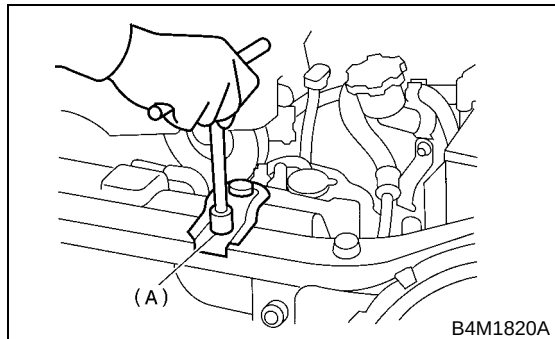
12. Condenser

A: REMOVAL

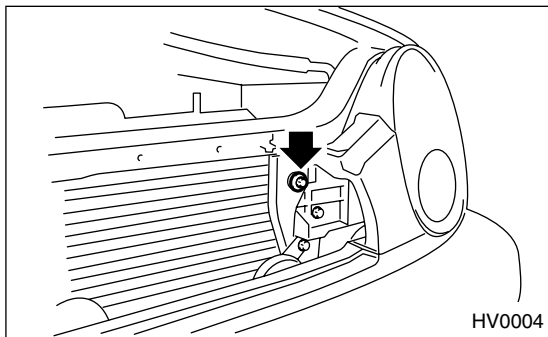
- 1) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-16, OPERATION, Refrigerant Recovery Procedure.>
- 2) Disconnect ground cable from battery.
- 3) Disconnect pressure hose and pipe from condenser.



- 4) Remove radiator bracket (A).



- 5) Remove two bolts. While lifting condenser, pull it out through 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.

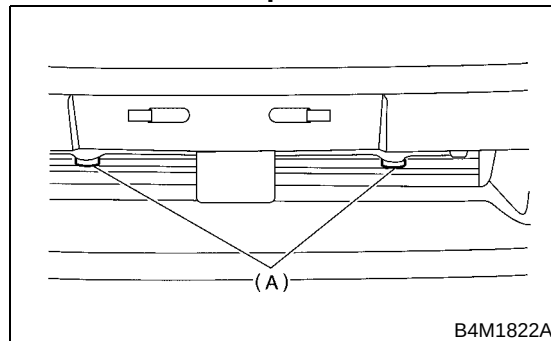
If condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-22, REPLACEMENT, Compressor Oil.>

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-17, OPERATION, Refrigerant Charging Procedure.>

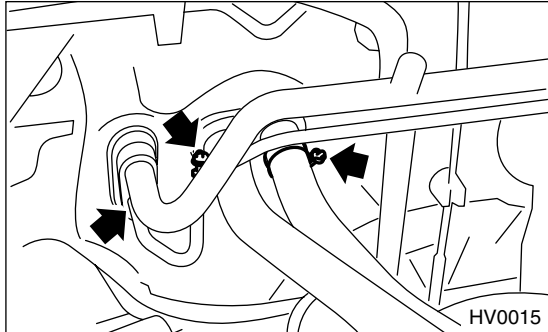
C: INSPECTION

- 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.

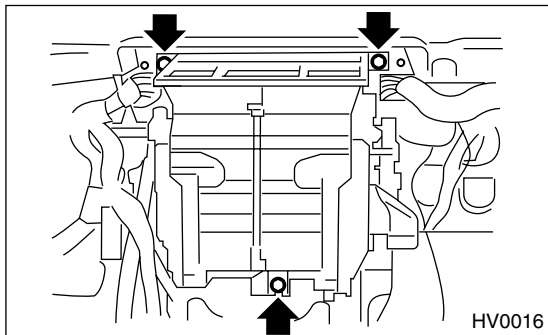
13.Heater and Cooling Unit

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-16, OPERATION, Refrigerant Recovery Procedure.>
- 3) Drain LLC from radiator.
- 4) Removes bolt securing expansion valve and pipe in engine compartment. Release heater hose clamps in engine compartment to remove the hoses.



- 5) Remove instrument panel. <Ref. to EI-25, REMOVAL, Instrument Panel Assembly.>
- 6) Remove support beam.
- 7) Remove blower motor unit assembly. <Ref. to AC-23, REMOVAL, Blower Motor Unit Assembly.>
- 8) Disconnect servo motor connectors.
- 9) Loosen bolt and nuts to remove heater and cooling unit.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Charge refrigerant. <Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>

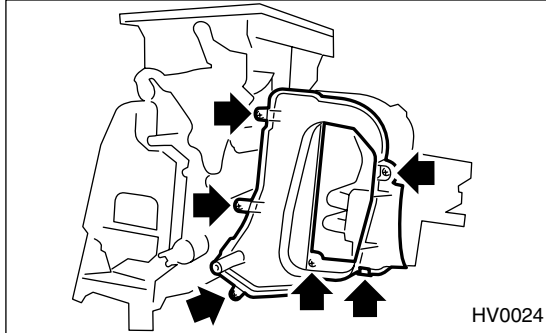
EVAPORATOR

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

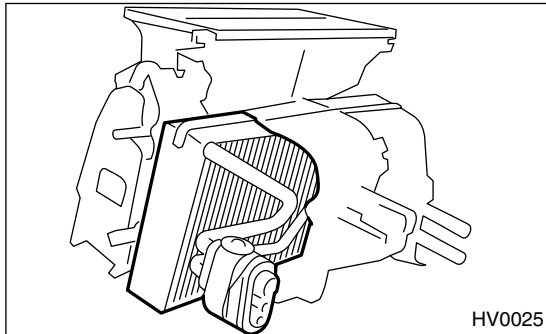
14. Evaporator

A: REMOVAL

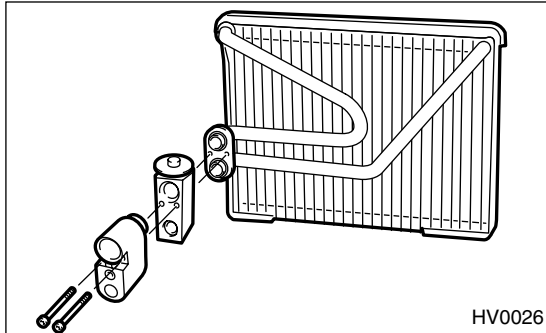
- 1) Remove heater and cooling unit. <Ref. to AC-29, REMOVAL, Heater and Cooling Unit.>
- 2) Loosen screws and clip to remove evaporator cover.



- 3) Remove evaporator.



- 4) Loosen two bolts to remove expansion valve.



CAUTION:

If evaporator is replaced, add appropriate amount of compressor oil to evaporator. <Ref. to AC-22, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

Install in the reverse order of removal.

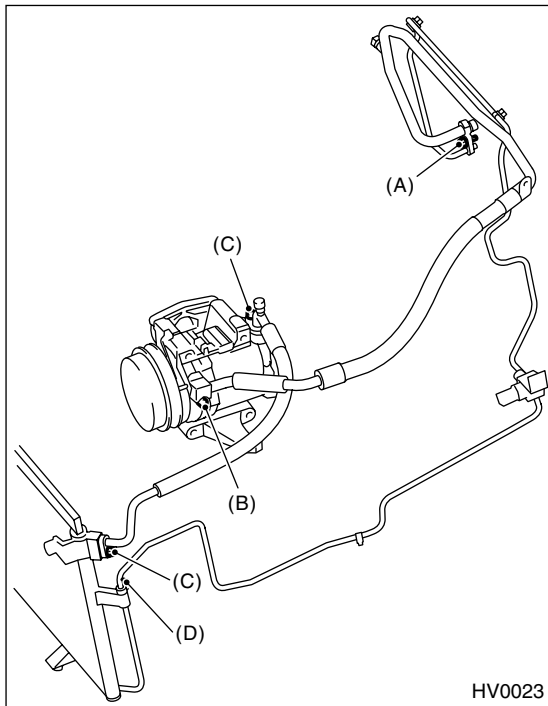
15.Hose and Tube

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-16, OPERATION, Refrigerant Recovery Procedure.>
- 3) Remove evaporator unit mounting bolt (A).
- 4) Remove low-pressure hose attaching bolts (B).
- 5) Disconnect low-pressure hose from evaporator unit.
- 6) Disconnect low-pressure hose from compressor.
- 7) Remove low-pressure hose from the vehicle.
- 8) Remove high-pressure hose attaching bolts (C).
- 9) Disconnect high-pressure hose from compressor.
- 10) Disconnect high-pressure hose from condenser.
- 11) Remove high-pressure hose from the vehicle.
- 12) Remove high-pressure tube attaching bolt (D).
- 13) Remove high-pressure tube from the vehicle.



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-17, OPERATION, Refrigerant Charging Procedure.>

C: INSPECTION

NOTE:

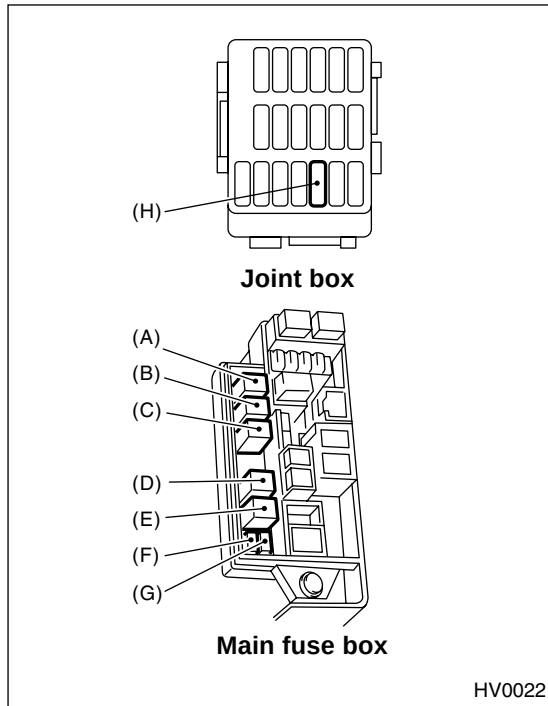
If cracking, damage, or swelling is found on a hose, replace it with a new one.

RELAY AND FUSE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

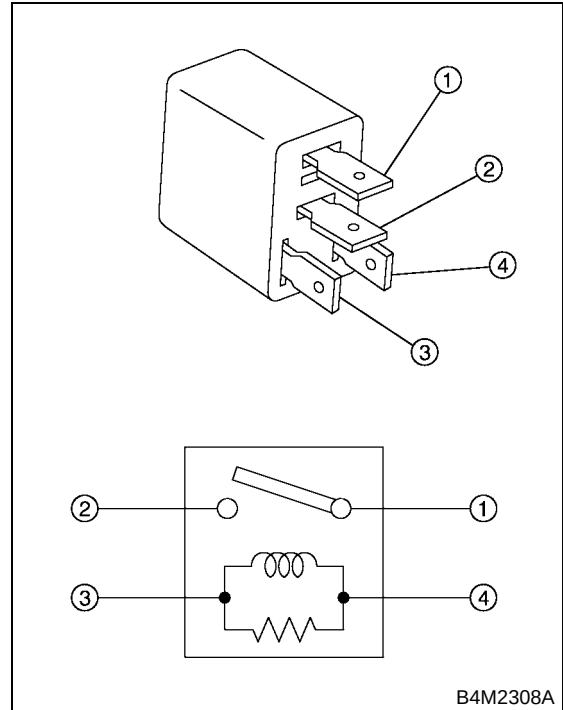
16. Relay and Fuse

A: LOCATION



Main Fan Relay 1	A
Main Fan Relay 2	B
Sub Fan Relay 1	C
Sub Fan Relay 2	E
A/C Relay	D
Main Fan Fuse	F
Sub Fan Fuse	G
A/C Fuse	H

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)

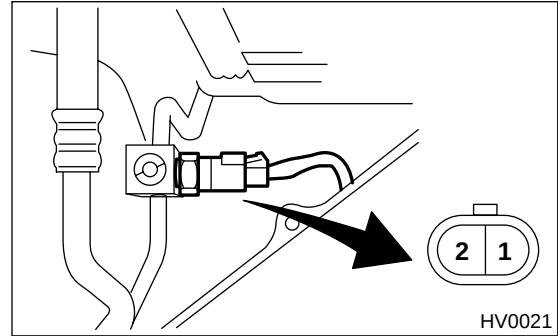
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

17. 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.



	Tester connection	Operation	Specified condition kPa (kg/cm ² , psi)
High and low pressure switch	1 — 2	Turns OFF.	Increasing to 2,800±100 (29±1, 406±15)
			Decreasing to 278±29 (2.83±0.3, 40.3±4.2)
		Turns ON.	Increasing to 287 ⁺³⁹ / ₋₂₅ (2.9 ^{+0.4} / _{-0.25} , 42 ^{+5.7} / _{-3.6})
			Decreasing to 2,200±200 (22.4±2, 319±29)

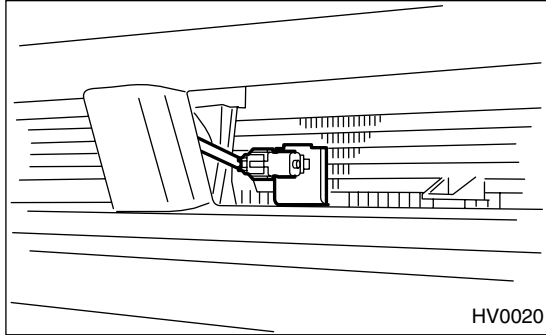
AMBIENT SENSOR (AUTO A/C)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

18.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.

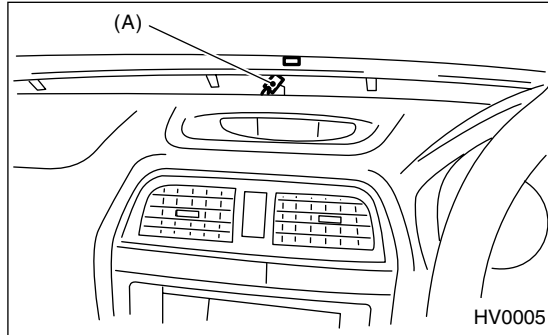
C: INSPECTION

<Ref. to AC-36, AMBIENT SENSOR, Diagnostic Procedure for Sensors.>

19.Sun-load Sensor (Auto A/C)

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove front defroster grille.
- 3) Disconnect sunload sensor connector (A).



CAUTION:

Be careful not to damage sensors and interior trims when removing them.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

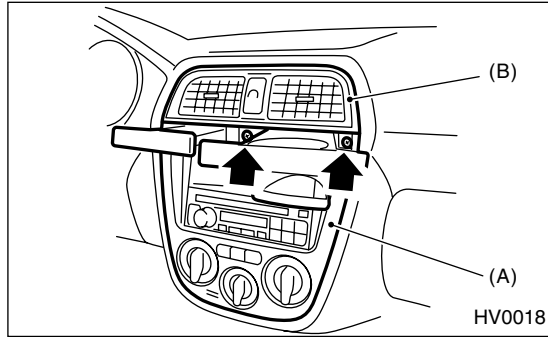
<Ref. to AC-43, SUNLOAD SENSOR, Diagnostic Procedure for Sensors.>

20. Air Vent Grille

A: REMOVAL

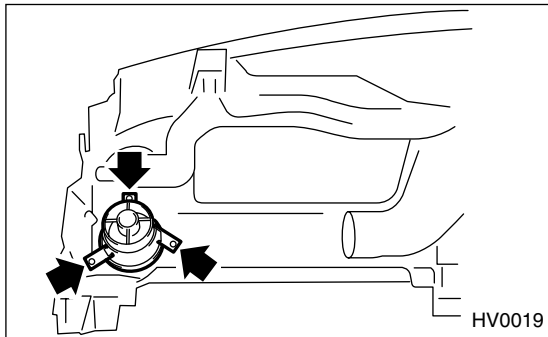
1. CENTER GRILLE

- 1) Disconnect ground cable from battery.
- 2) Remove center console panel (A).
- 3) Loosen two screws to remove center air vent grille (B).



2. SIDE GRILLE

- 1) Disconnect ground cable from battery.
- 2) Remove heater vent duct. <Ref. to AC-38, REMOVAL, Heater Vent Duct.>
- 3) Loosen screws to remove side air vent grille.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

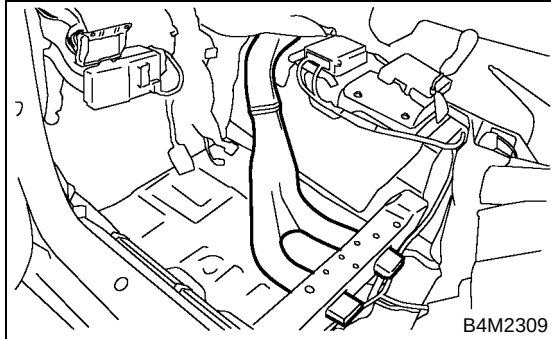
The direction and amount of air should be adjusted smoothly.

The adjustment should be kept in each position.

21.Heater Duct

A: REMOVAL

- 1) Remove heater unit. <Ref. to AC-29, Removal.>
- 2) Remove front seat. <Ref. to SE-6, 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.

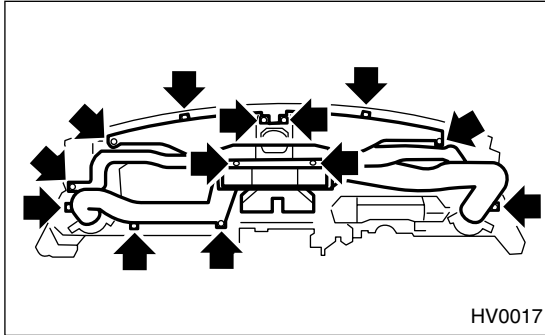
HEATER VENT DUCT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

22.Heater Vent Duct

A: REMOVAL

- 1) Remove instrument panel. <Ref. to EI-25, REMOVAL, Instrument Panel Assembly.>
- 2) Remove screws.
- 3) Remove heater vent duct.



B: INSTALLATION

Install in the reverse order of removal.

GENERAL DIAGNOSTICS

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

23.General Diagnostics

A: INSPECTION

Symptom		Repair order
Blower motor	Doesn't move.	Fuse
		Blower motor relay
		Blower motor
		Blower motor resister
		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

GENERAL DIAGNOSTICS

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

AC

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4. A/C Control Module I/O Signal	8
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BASIC DIAGNOSTIC PROCEDURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Check	Yes	No
1 START INSPECTIONS. 1)Perform pre-inspection. 2)Perform self-diagnosis. <Ref. to AC-18, SELF-DIAGNOSIS MODE, Diagnostics Chart for Diagnosis System.>	Dose self-diagnosis operate?	Go to step 2.	<Ref. to AC-22, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure.>
2 CONFIRM MALFUNCTION PART. Confirm malfunction part with self-diagnosis.	Can the malfunction part be confirmed?	Repair the malfunction part according to each diagnostics chart.	Go to step 3.
3 CHECK COMPARTMENT TEMPERATURE. 1)Turn A/C switch ON. 2)Set temperature at maximum cold position. 3)Check compartment temperature changes.	Is the compartment temperature changed?	Go to step 4.	<Ref. to AC-26, COMPARTMENT TEMPERATURE IS NOT CHANGED OR A/C SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure.>
4 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 is OK.	<Ref. to AC-26, COMPARTMENT TEMPERATURE IS NOT CHANGED OR A/C SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure.>

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 will be destroyed instantly.
- 2) Do not disconnect the battery terminals while the engine is running.
 - A large counter electro motive 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

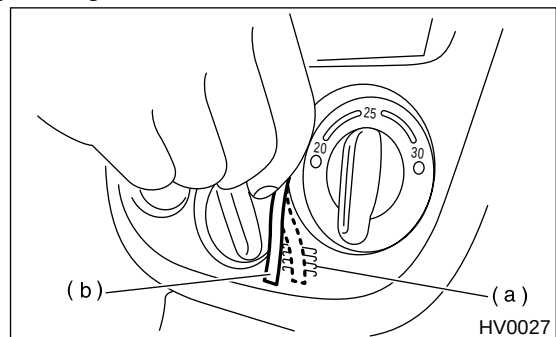
- 2) Check the condition of the fuses for A/C, heater and other fuses.
- 3) Check the condition of the harnesses and harness connectors connection.

2. ASPIRATOR HOSE

- 1) Make sure that the aspirator hose is securely connected to the heater unit by inserting a hand from the driver's compartment and secure as necessary.
- 2) Turn ignition switch to ON and push "A/C" switch.
- 3) Turn temperature control dial to maximum hot position.
- 4) Turn air flow control dial to "DEF" position.
- 5) Turn fan speed control dial to 4TH position.
- 6) 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:

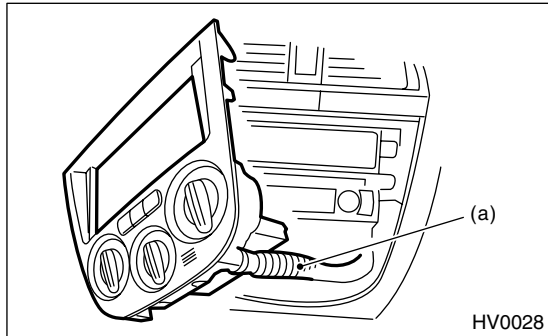
- Ensure the thread does not get sucked into the port.
- Hold the thread approximately 5 mm (0.02 in) away from the port when the suction force is not very strong.



GENERAL DESCRIPTION

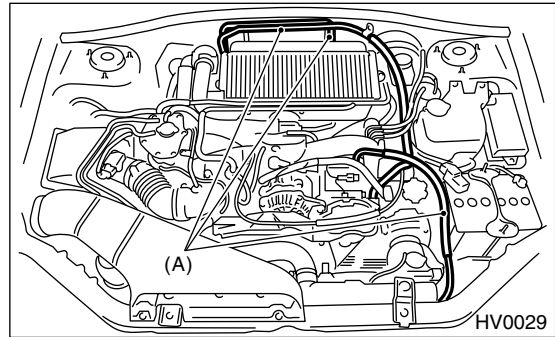
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

7) If the thread does not move at all, remove the auto A/C control unit <Ref. to AC-26, REMOVAL, Control Unit.> and check for improper connection of the aspirator hose (a) and auto A/C control unit and secure as necessary.



3. REFRIGERANT LINE

Check contact for refrigerant line (A).



4. CONTROL LINKAGE

- 1) Check state of mode door linkage.
- 2) Check state of air mix door linkage.
- 3) Check state of intake door linkage.

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	Fan speed control dial	OFF position	A/C switch LED goes out. • Fan speed: OFF • Compressor: OFF
		Fan speed control dial 1st → 2nd → 3rd → 4th	Fan speed changes 1st → 2nd → 3rd → 4th
2	Fan speed control dial and temperature control dial	A. Fan speed control dial auto position. B. Temperature control dial maximum cold position	• Outlet air: Cool • Fan speed: 4th • Compressor: ON
		C. Turn temperature control dial from maximum cold position to maximum hot position gradually.	• Outlet air: Cool → Hot • Fan speed: AUTO • Compressor: ON
		D. Temperature control dial maximum hot position	• Outlet air: Hot • Fan speed: 4th • Compressor: ON
3	Air flow control dial	Air flow control dial VENT → BI-LEVEL → HEAT → DEF/HEAT → DEF	Air flow outlet changes from VENT → BI-LEVEL → HEAT → DEF/HEAT → DEF.
4	FRESH/RECIRC switch	FRESH/RECIRC switch ON	Changes from RECIRC → FRESH, or FRESH → RECIRC.

2) Compressor operation inspection

No.	Point to check	Switch operation	Judgement standard
1	Compressor	A. A/C switch ON B. Fan speed control dial 1st-4th	Compressor: ON

3) Illumination control inspection

No.	Point to check	Switch operation	Judgement standard
1	Illumination	Lighting switch ON	Illumination light illuminates.

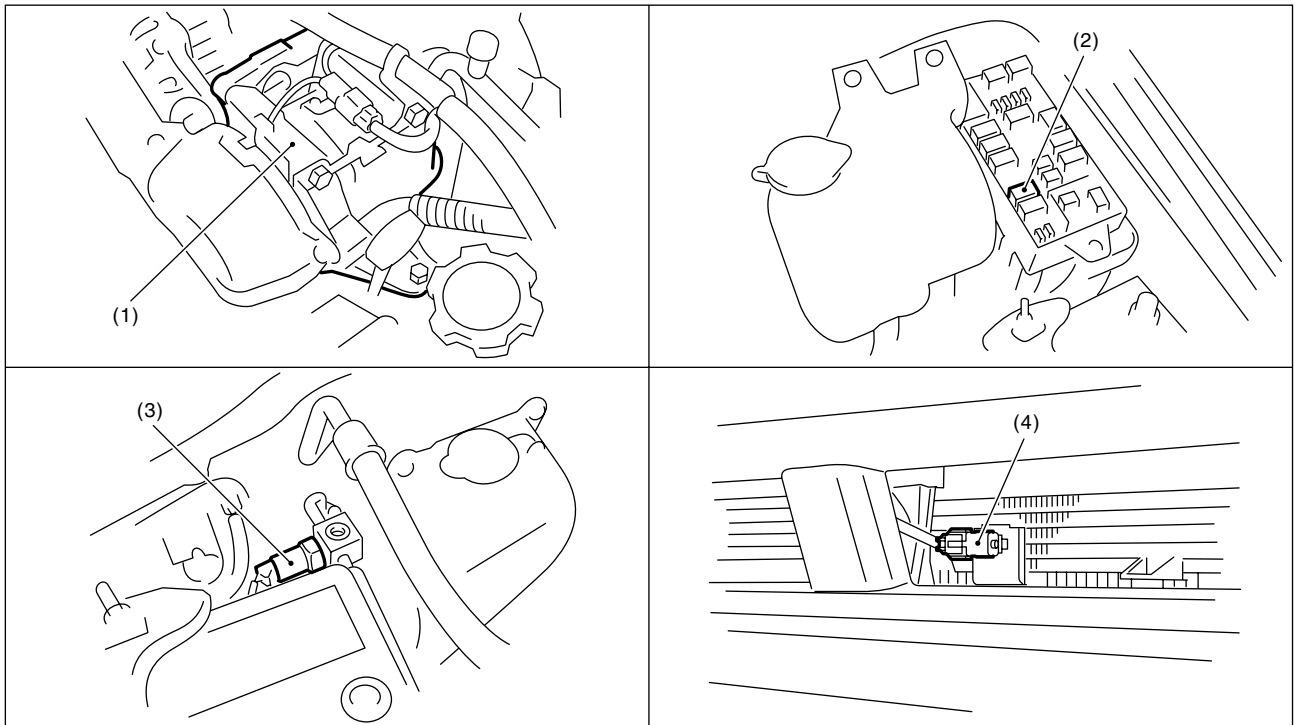
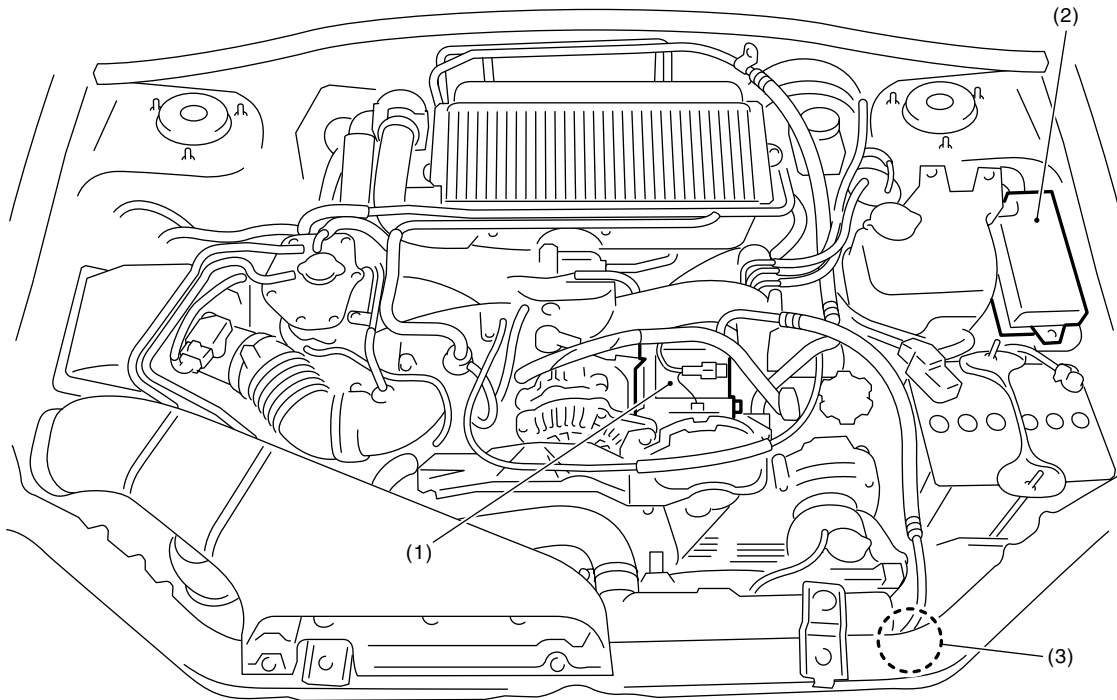
ELECTRICAL COMPONENTS LOCATION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

3. Electrical Components Location

A: LOCATION

1. ENGINE COMPARTMENT



HV0030

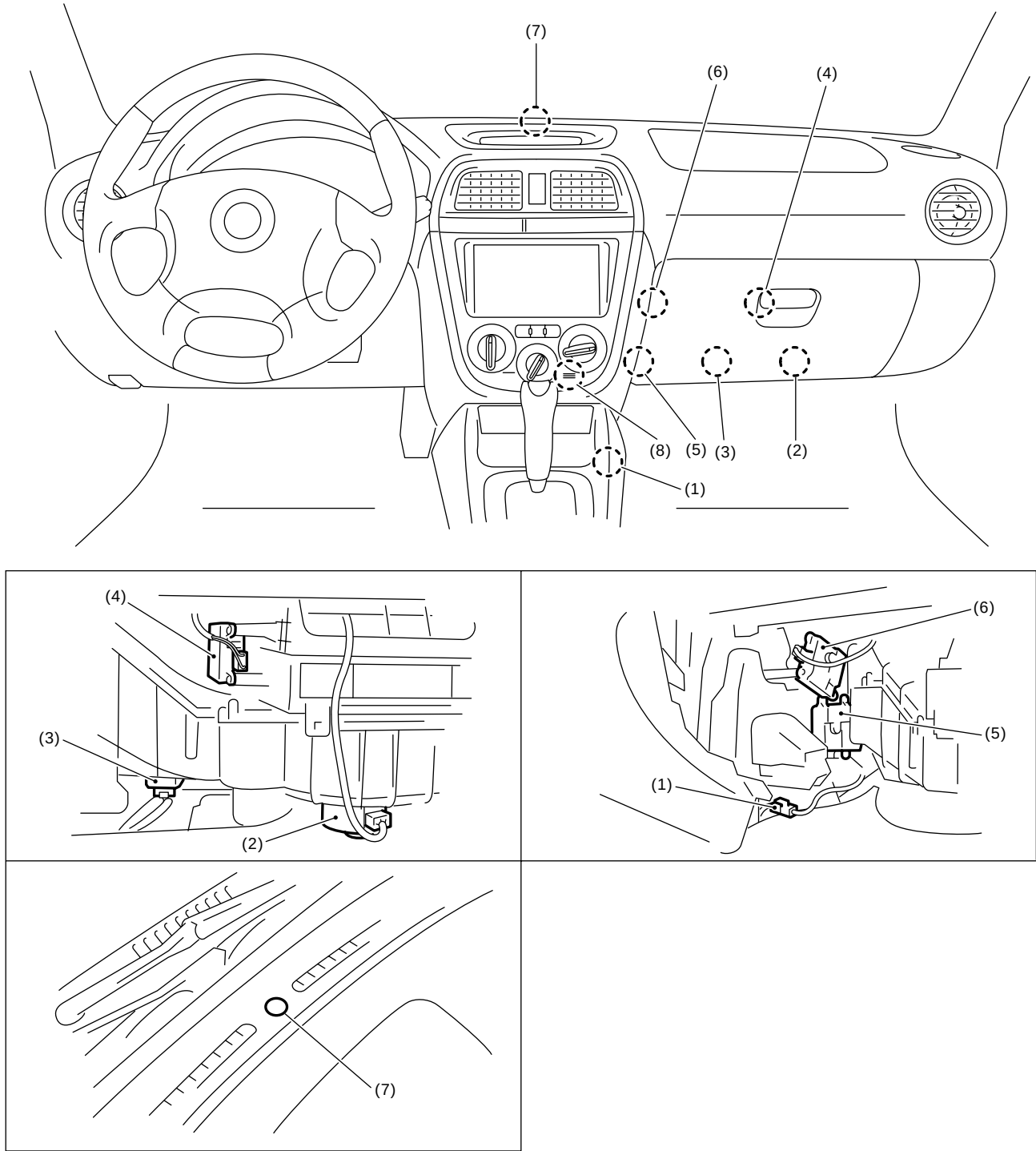
- (1) A/C compressor
- (2) A/C relay

- (3) Pressure switch
- (4) Ambient sensor

ELECTRICAL COMPONENTS LOCATION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

2. PASSENGER COMPARTMENT



HV0031

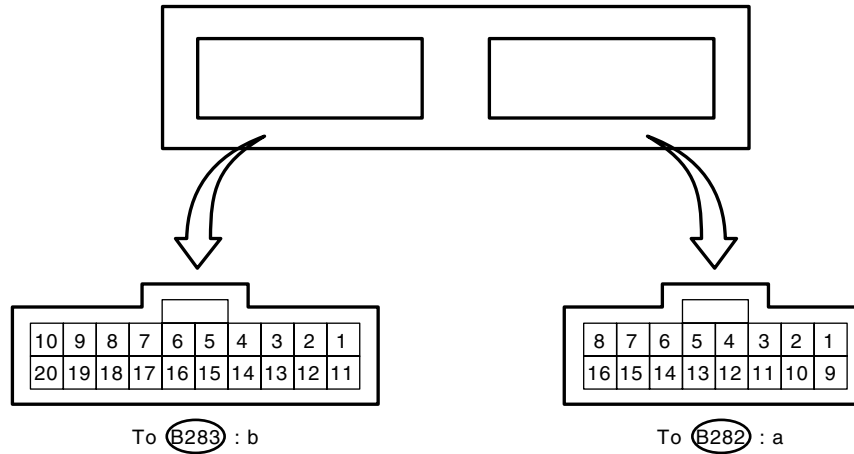
- | | | |
|---------------------------|---------------------------|------------------------------------|
| (1) Evaporator sensor | (4) Intake door actuator | (7) Sunload sensor |
| (2) Blower motor | (5) Air mix door actuator | (8) In-vehicle sensor |
| (3) Blower motor resistor | (6) Mode door actuator | (built-in Auto A/C control module) |

A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

4. A/C Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



HV0032

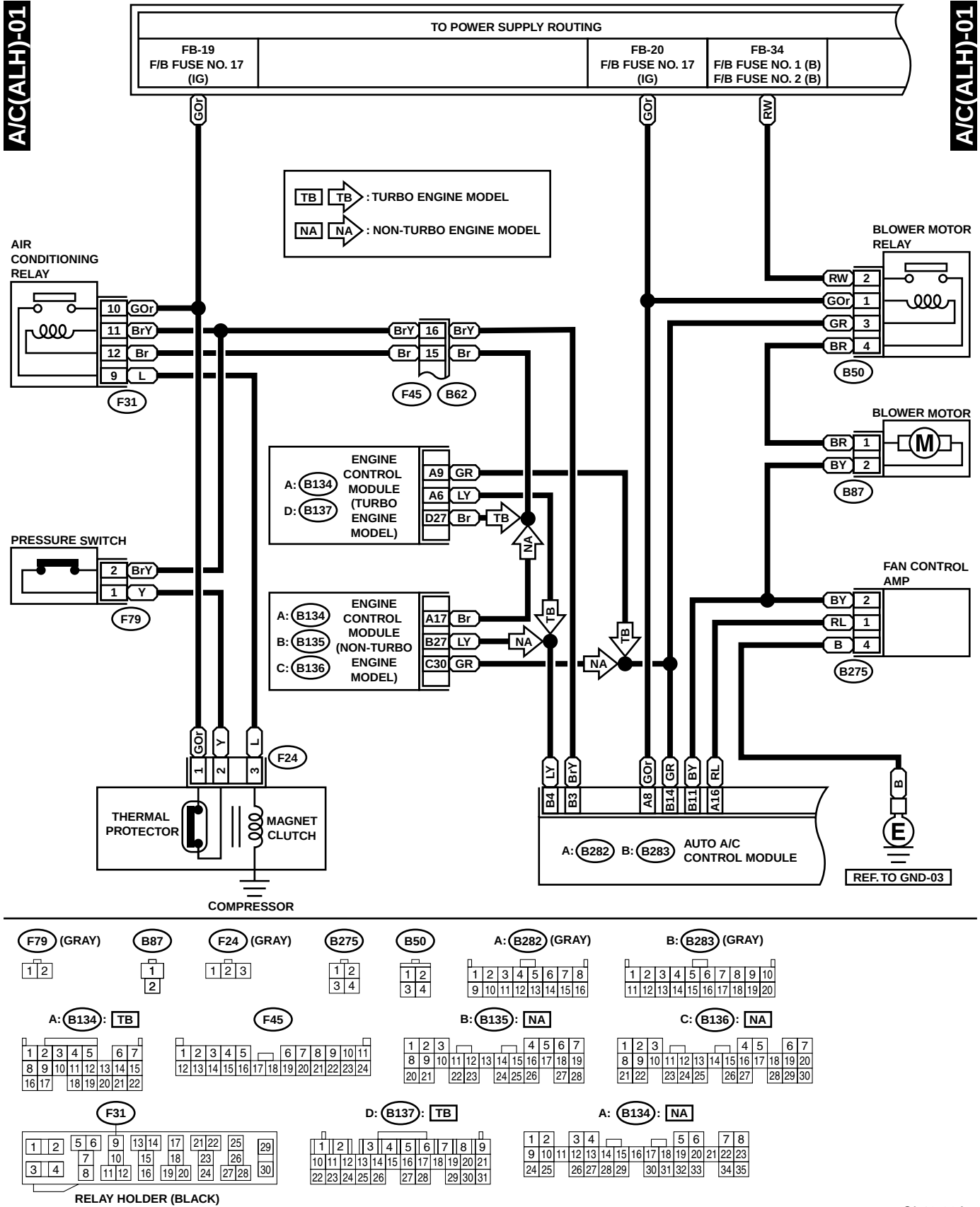
Content	Connector & Terminal No.	Signal (V)
Battery power supply (Memory back-up)	b1—b12	Battery voltage, 13 — 14 (engine running)
IGN power supply	a8—b12	Battery voltage (ignition switch ON), 13 — 14 (engine running)
ACC power supply (OFF: ignition in START or diagnosis system reset)	b2—b12	Battery voltage, 0 (engine cranking), Battery 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) — continuity exists
Ambient sensor	b9—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	b5—b1	Battery voltage (ignition switch ON)
Air mix door actuator P.B.R.	a4—b17	Approx. 5.5
Mode door actuator	b6—b17	Battery voltage (ignition switch ON)
Mode door actuator P.B.R.	a12—b17	Approx. 5.5
Intake door FRS voltage	a15—a7	Battery voltage (CIRC switch OFF)
Intake door CIRC voltage	a7—a15	Battery voltage (CIRC switch ON)
Blower fan relay	b14—body	Battery voltage (ignition switch ON)
A/C relay	b3—b12	0 (ignition and A/C switches ON) Battery voltage (A/C switch OFF)
Illumination control signal	b10—b20	Battery 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)

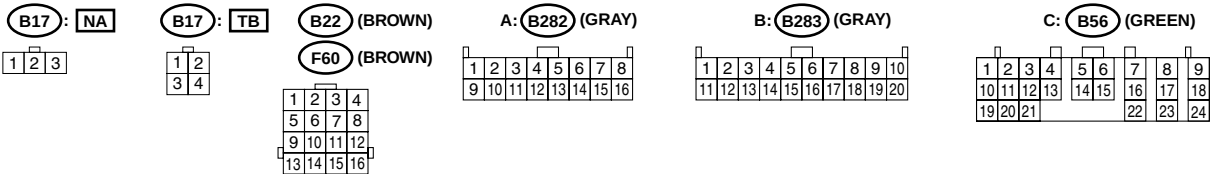
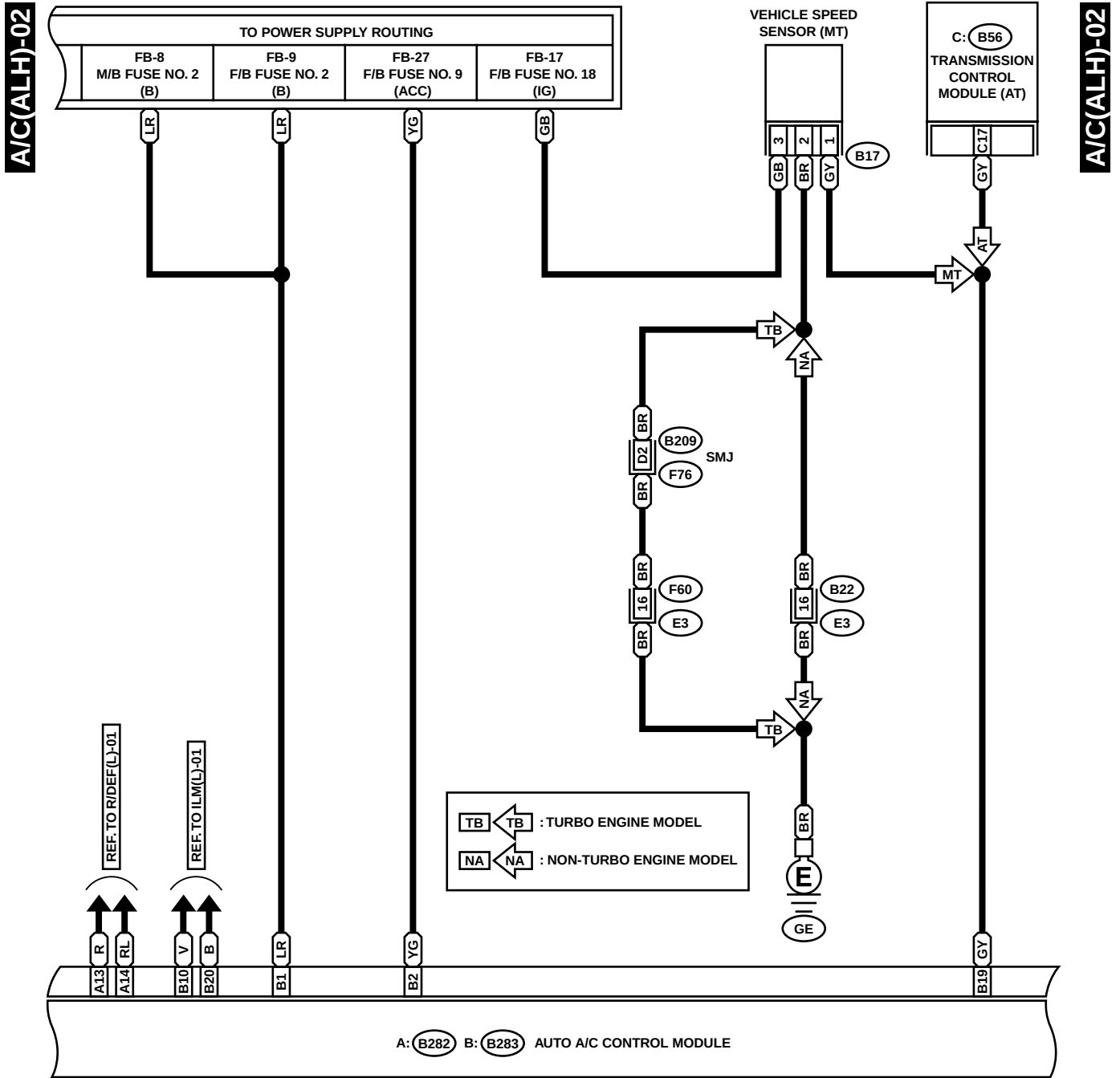
B: SCHEMATIC

1. AIR CONDITIONER AUTO A/C LHD MODEL



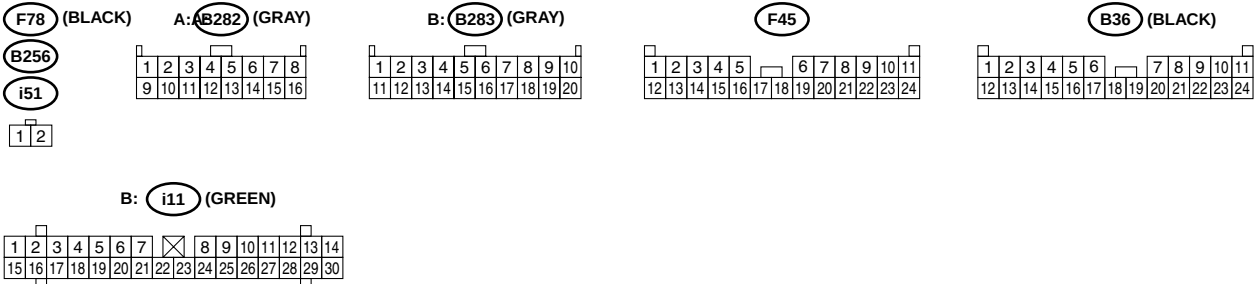
A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)



GL46-20B

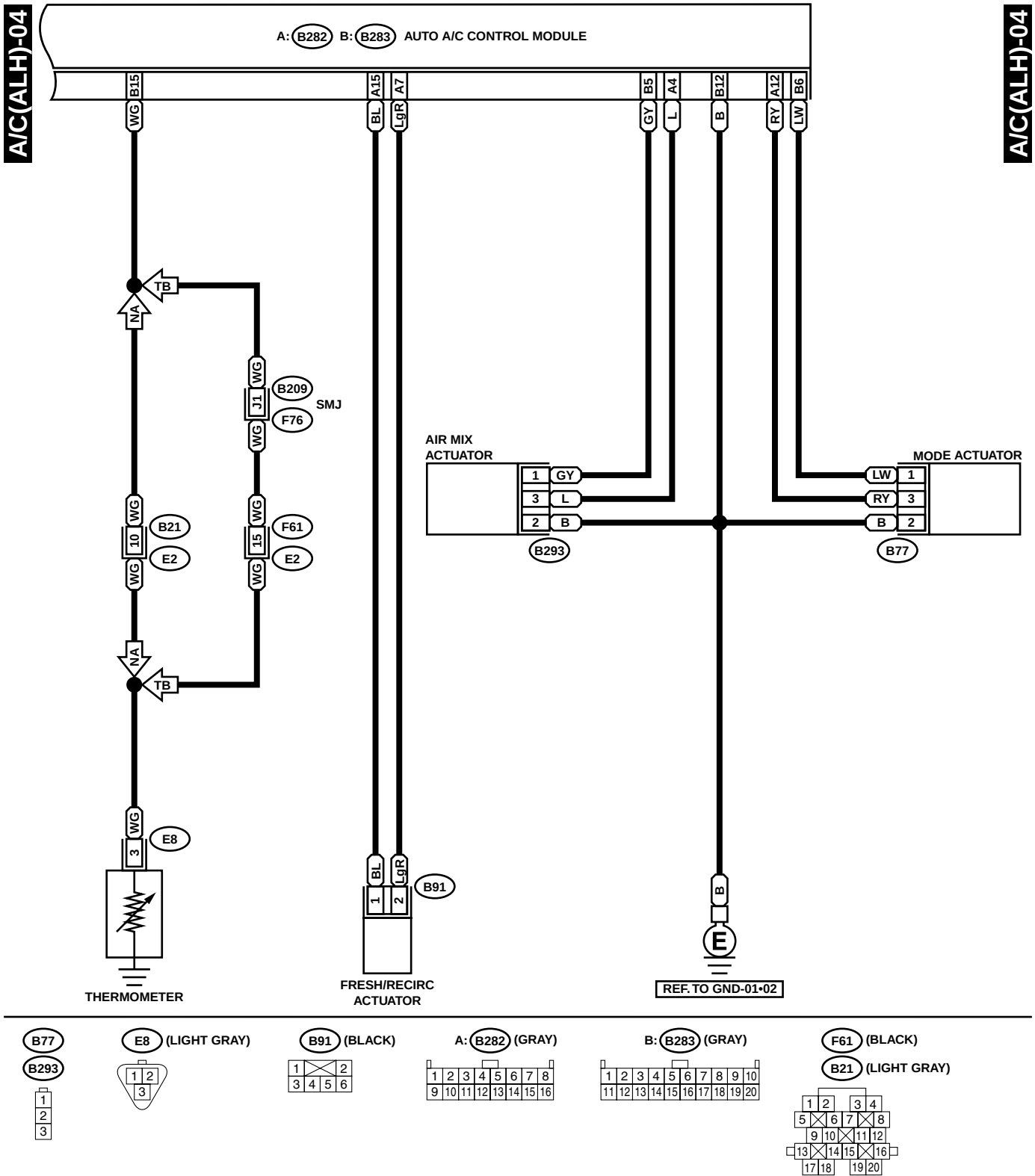
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)



AC-11

A/C CONTROL MODULE I/O SIGNAL

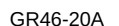
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)



GL46-20D

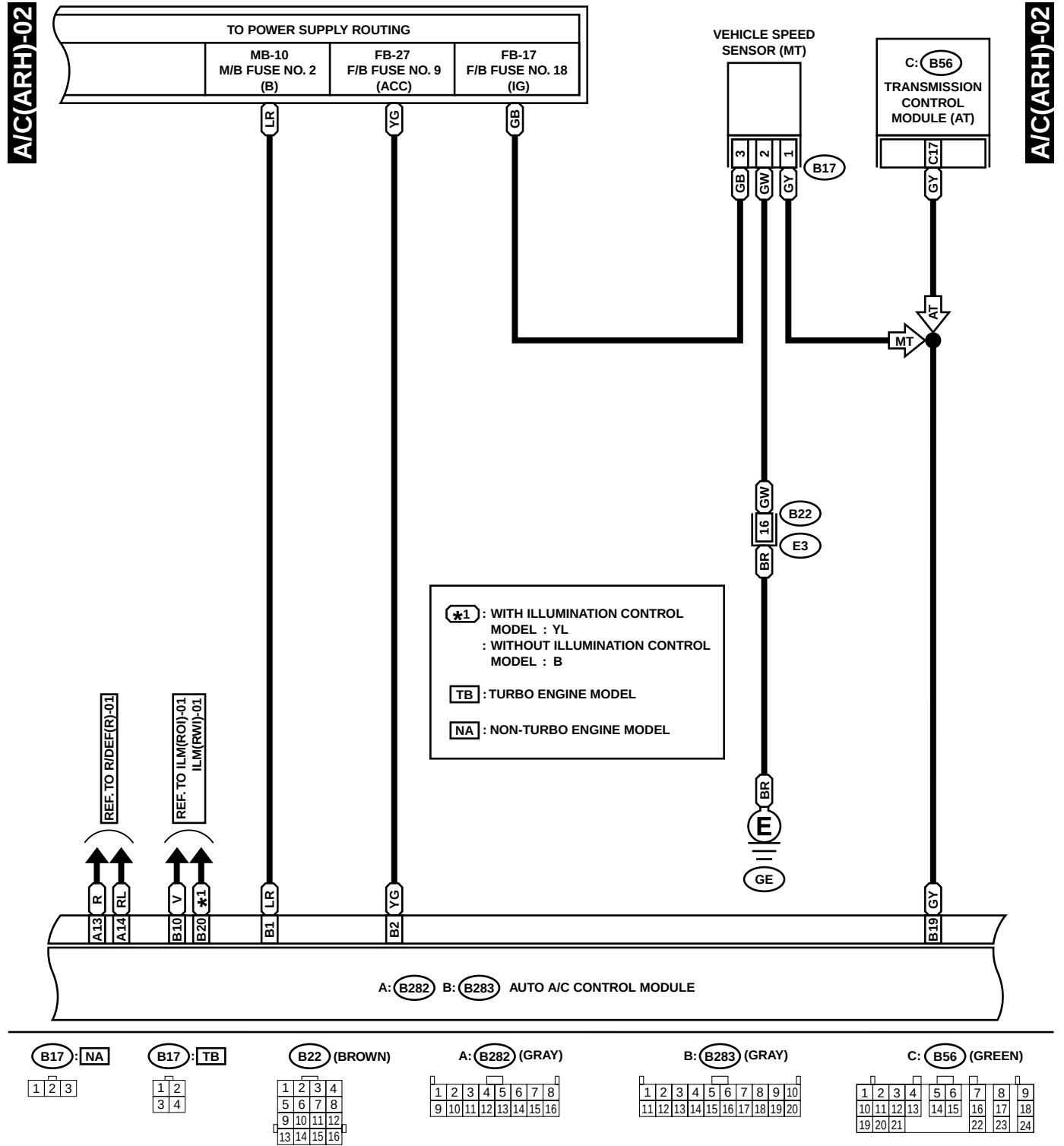
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

A/C(ARH)-01



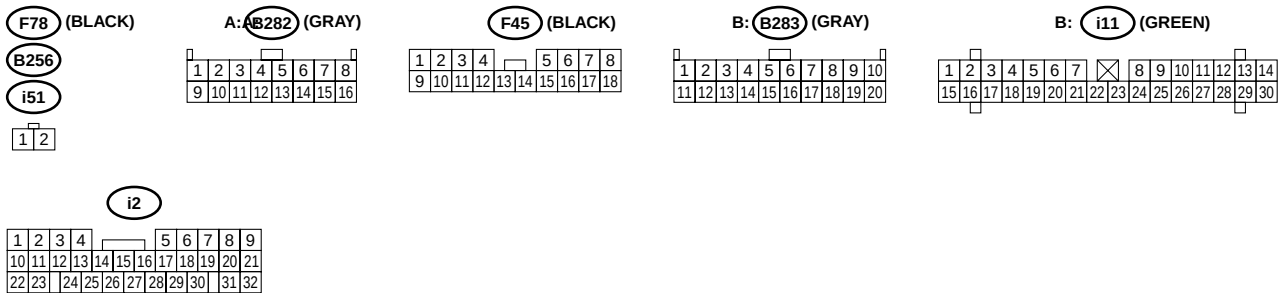
A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)



GR46-20B

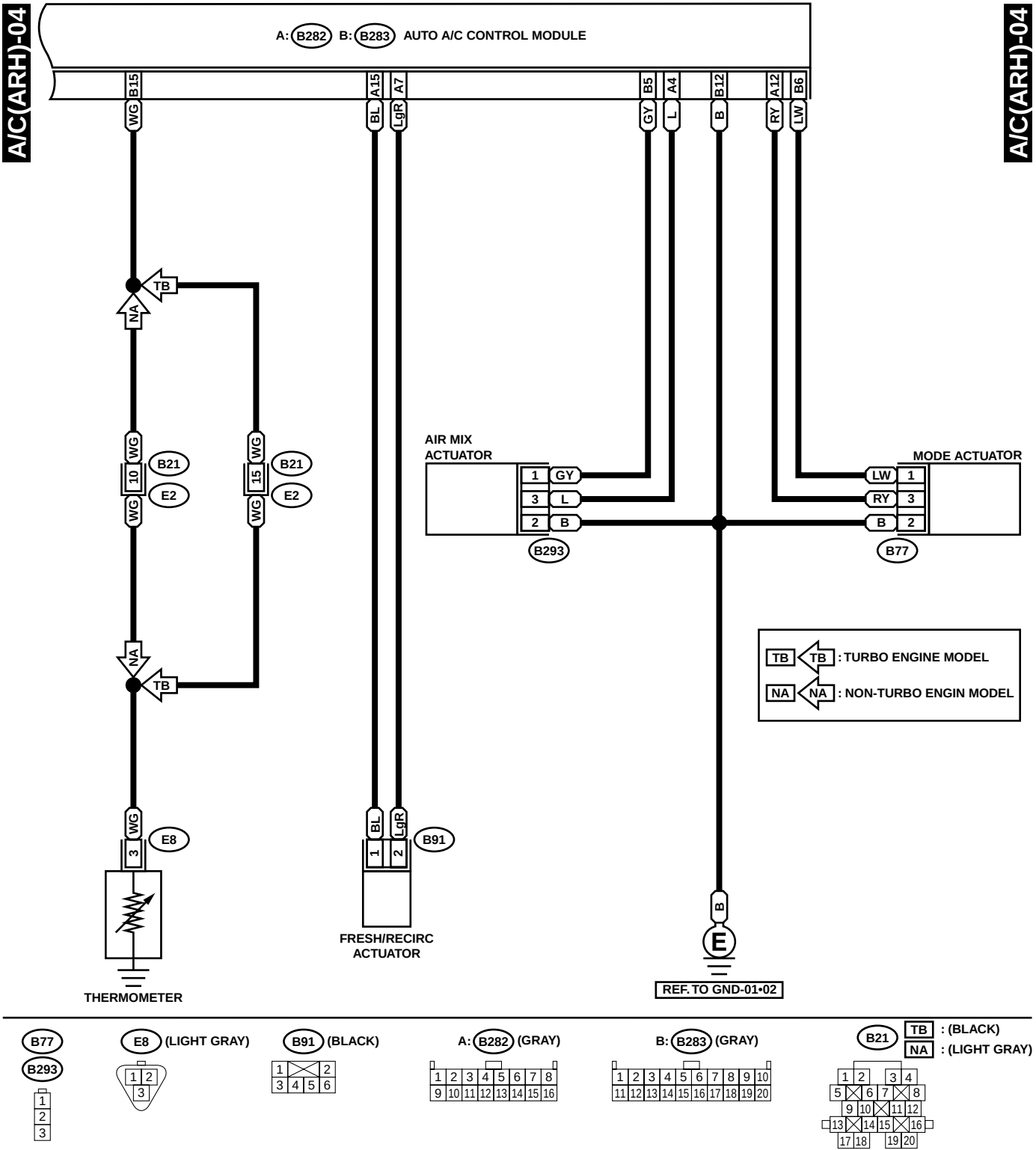
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)



AC-15

A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)



A/C CONTROL MODULE I/O SIGNAL

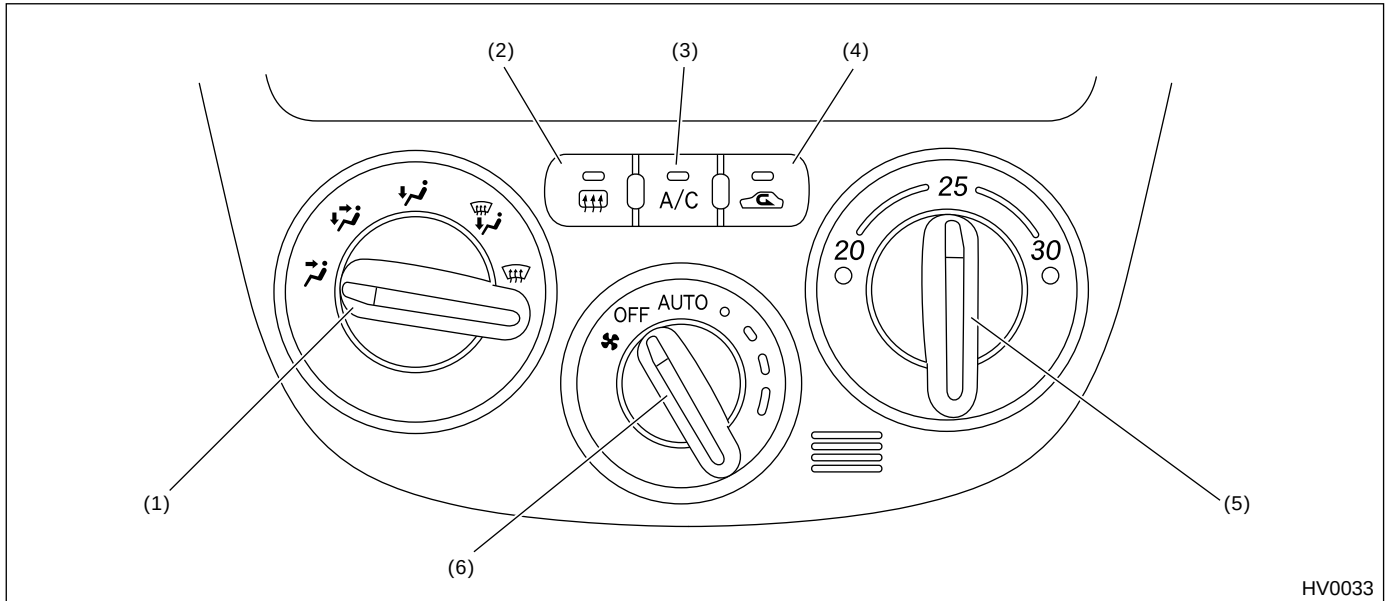
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

DIAGNOSTICS CHART FOR DIAGNOSIS SYSTEM

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

5. Diagnostics Chart for Diagnosis System

A: SELF-DIAGNOSIS MODE



HV0033

- | | | |
|---------------------------------|-------------------------|------------------------------|
| (1) Air flow control dial | (3) A/C switch | (5) Temperature control dial |
| (2) Rear window defogger switch | (4) FRESH/RECIRC switch | (6) Fan speed control dial |

Step	Check	Yes	No
1 SELECT CONTROL PANEL TO SELF-DIAGNOSIS MODE. 1) Turn fan speed control dial to OFF position. 2) Start engine and press rear window defogger switch for at least 5 seconds. The rear window defogger switch must be pressed within 10 seconds after starting engine.	Does the self-diagnosis mode operate?	Go to step 2.	<Ref. to AC-22, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure.>
2 CHECK LED ILLUMINATION. Make sure that all switch LED illuminate (RHD model) or blink (LHD model) on control panel.	Do all LED illuminate or blink?	Go to step 3.	Check the switch LED.
3 CHECK SENSORS MALFUNCTION. 1) Turn fan speed control dial to AUTO position. 2) If system has the trouble for each sensor, rear window defogger switch LED is turned off. 3) If system has no trouble, rear window defogger switch LED is illuminated.	Does rear window defogger switch LED illuminate?	Go to step 5.	Go to step 4.
4 CONFIRM MALFUNCTIONING SENSOR. 1) Turn fan speed control dial to 1st position. 2) Turn air flow control dial to each mode position, check each switch LED illumination according to sensor check table. <Ref. to AC-20, SENSOR CHECK TABLE, SELF-DIAGNOSIS MODE, Diagnostics Chart for Diagnosis System.>	Do FRESH/RECIRC and A/C switch LED illuminate when turning the dial to each mode position?	Go to step 5.	Repair malfunctioning sensor. <Ref. to AC-36, Diagnostic Procedure for Sensors.>

DIAGNOSTICS CHART FOR DIAGNOSIS SYSTEM

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK MODE DOOR POSITION SIGNAL. 1) Turn fan speed control dial to 2nd position. 2) If system has the trouble for mode door position signal, rear window defogger switch LED is turned off. 3) If system has no trouble, rear window defogger switch LED is illuminated.	Does rear window defogger switch LED illuminate?	Go to step 6.	Check mode door actuator circuit. <Ref. to AC-32, MODE DOOR ACTUATOR, Diagnostic Procedure for Actuators.>
6 CHECK BLOWER FAN OPERATION. 1) Turn fan speed control dial to 3rd position. 2) Turn temperature control dial, check that blower fan speed changes depending on set temperature.	Does blower fan speed change?	Go to step 7.	Check blower motor circuit. <Ref. to AC-24, BLOWER MOTOR IS NOT ROTATED, Diagnostics for A/C System Failure.>
7 CHECK OPERATION OF EACH ACTUATOR, BLOWER FAN AND COMPRESSOR CLUTCH. 1) Turn fan speed control dial to 4TH position. 2) Select operating mode by turning air flow control dial. 3) Check the operation of each mode according to operating mode table. <Ref. to AC-20, OPERATING MODE TABLE, SELF-DIAGNOSIS MODE, Diagnostics Chart for Diagnosis System.> •Air inlet: •Air outlet: •Air mix door: •Blower fan: •A/C compressor:	Does the operation of each mode match to the operating mode table?	Push A/C switch or turn ignition switch OFF, and finish the self-diagnosis.	Repair the malfunction part according to each diagnostics chart.

DIAGNOSTICS CHART FOR DIAGNOSIS SYSTEM

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

1. SENSOR CHECK TABLE

NOTE:

When the sunload sensor is checked indoors or in the shade, open circuit might be indicated. Always check the sunload sensor at a place where sun shines directly on it.

Air flow control dial position	Checked sensor	No trouble	Short circuit	Open circuit
VENT	Ambient sensor	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	FRESH/RECIRC switch LED illuminate
BI-LEVEL	In-vehicle sensor	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	FRESH/RECIRC switch LED illuminate
HEAT	Evaporator sensor	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	FRESH/RECIRC switch LED illuminate
DEF/HEAT	Sunload sensor	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	FRESH/RECIRC switch LED illuminate
DEF	Air mix door motor (Potentiometer balance resistor)	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	

2. OPERATING MODE TABLE

Operation	Air flow control dial position				
	VENT	BI-LEVEL	HEAT	DEF/HEAT	DEF
Air outlet	VENT	BI-LEVEL	HEAT	DEF/HEAT	DEF
Air inlet	RECIRC	RECIRC	RECIRC	FRESH	FRESH
Air mix door	FULL COOL	FULL COOL	FULL HOT	FULL HOT	FULL COOL
Blower fan	5V	5V	8V	10V	Power supply voltage
A/C compressor	ON	OFF	OFF	ON	ON

DIAGNOSTICS CHART FOR DIAGNOSIS SYSTEM

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

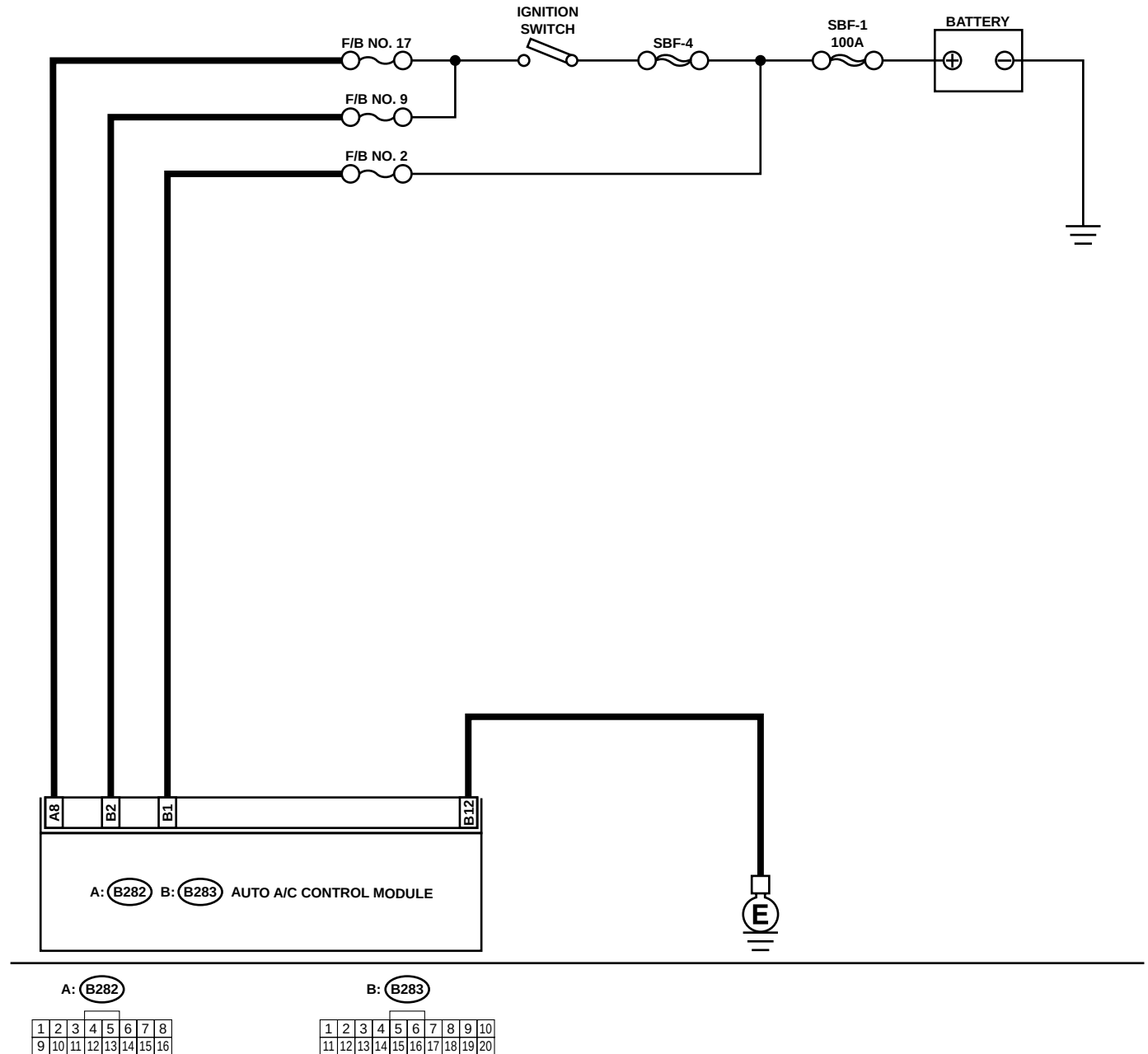
6. Diagnostics for A/C System Failure

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:



HV0034

DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step		Check	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?	Replace fuse.	Go to step 2.
2	CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuses No. 9 and No. 17 from fuse & relay box. 3) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 3.
3	CHECK A/C CONTROL MODULE POWER CIRCUIT. 1) Pull out 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 (B283) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair short circuit in 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 (B283) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair short circuit in 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 (B282) No. 8 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Repair short circuit in 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 (B283) No. 12 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 7.	Repair short circuit in harness for ground line.
7	CHECK POOR CONTACT. Check poor contact in A/C control module.	Is there poor contact in A/C control module?	Repair poor contact in A/C control module.	Contact with your Subaru distributor.

DIAGNOSTICS FOR A/C SYSTEM FAILURE

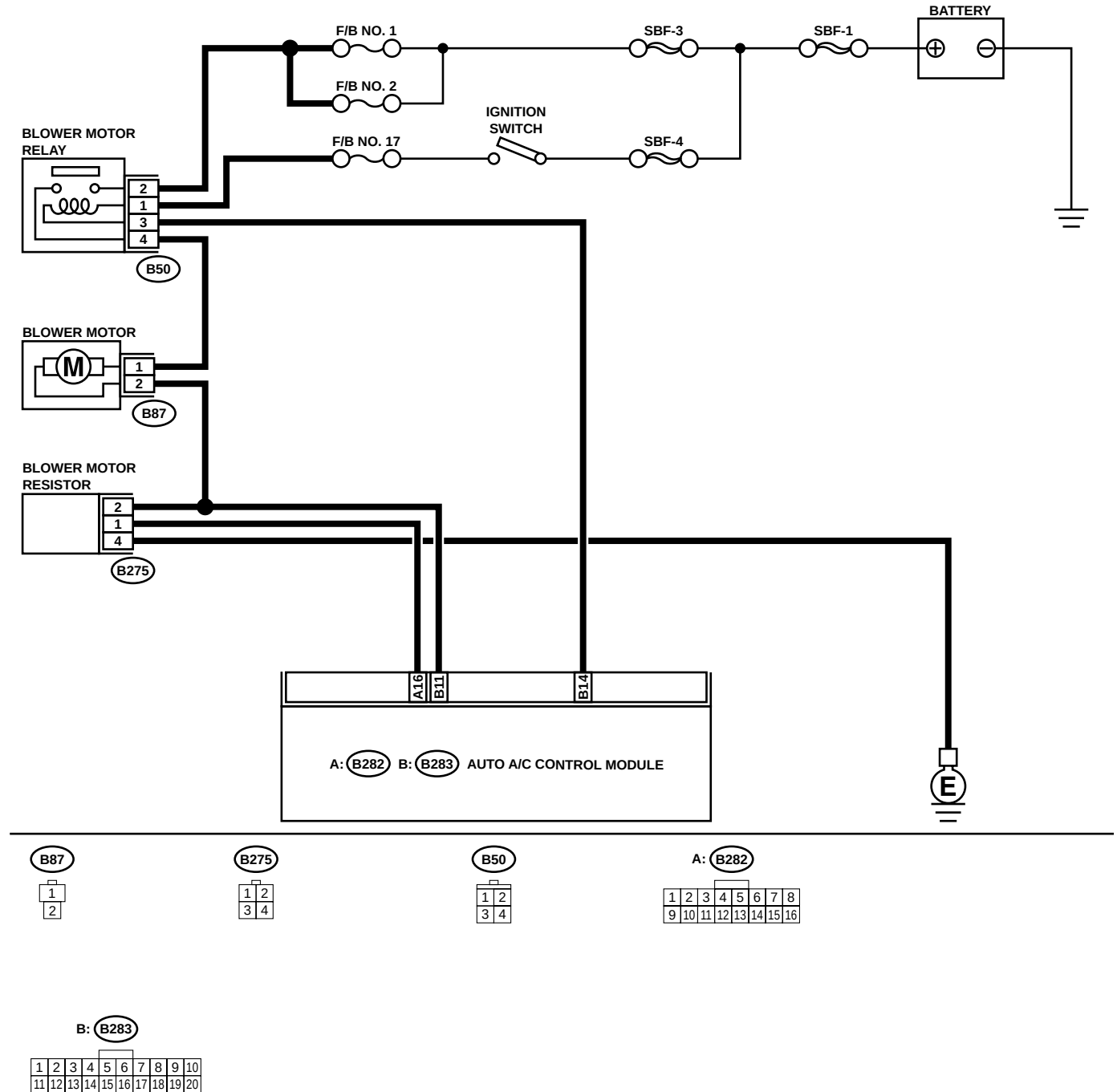
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: BLOWER MOTOR IS NOT ROTATED

TROUBLE SYMPTOM:

- Blower motor is not rotated.
- Blower motor is not rotated in "HI".

WIRING DIAGRAM:



HV0035

DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

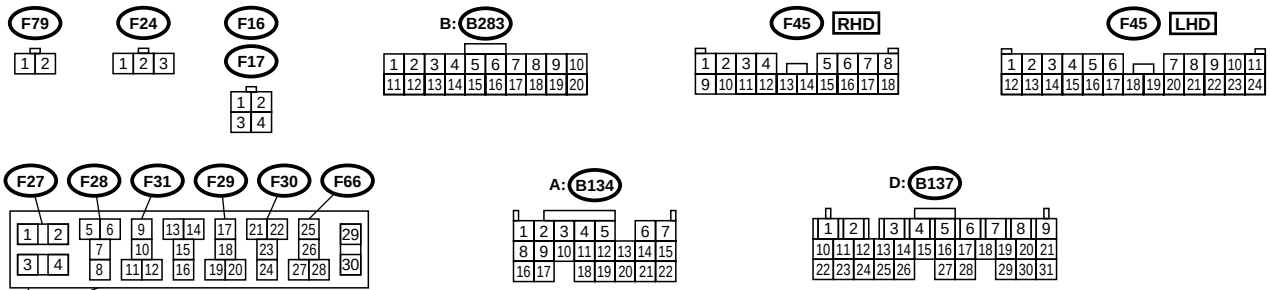
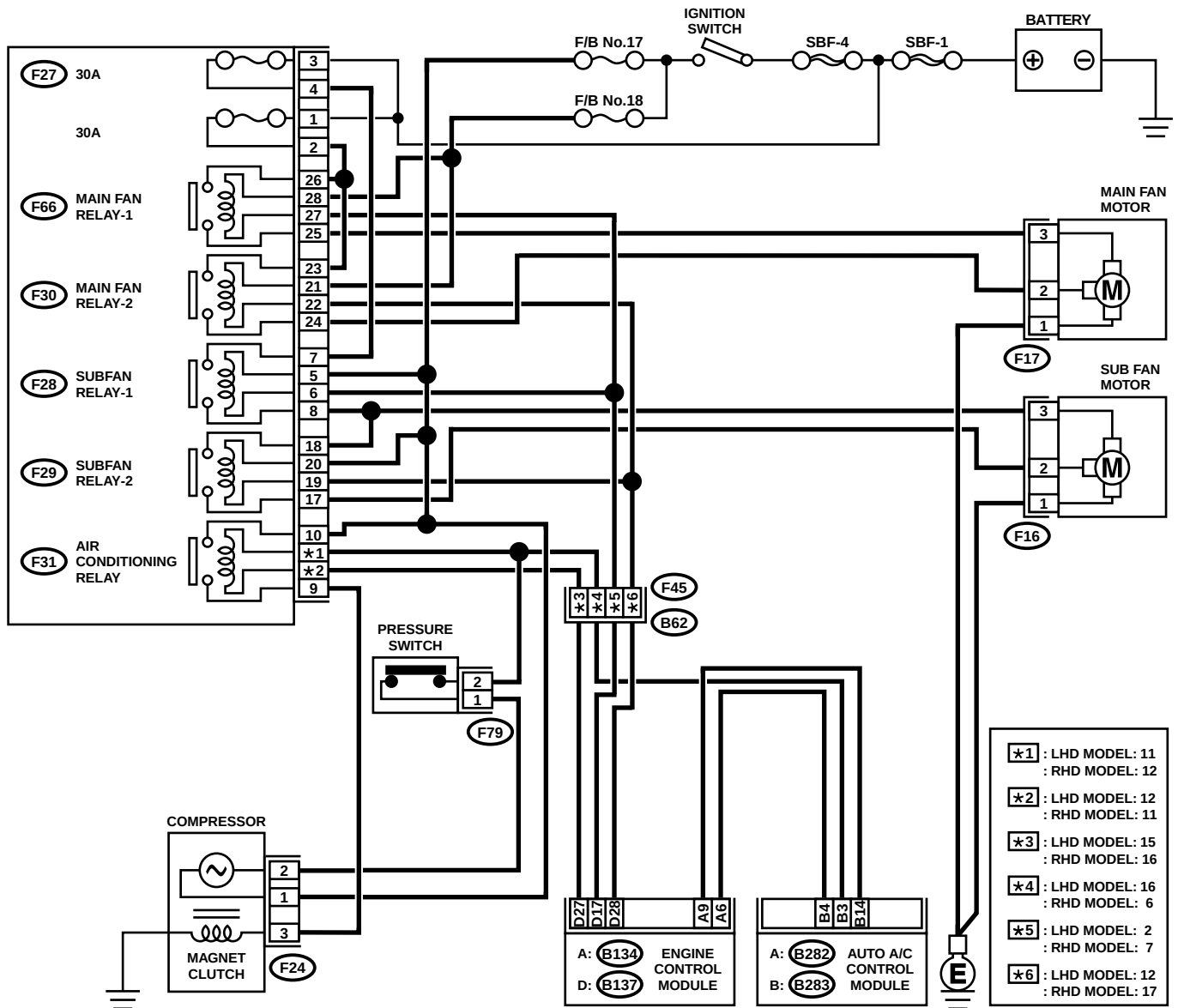
Step	Check	Yes	No
1 CHECK FUSE. 1)Remove No.1, No. 2 and No. 17 fuses in fuse & relay box. 2)Check condition of fuses.	Are any of the fuses blown-out?	Replace fuse.	Go to step 2.
2 CHECK POWER SUPPLY TO BLOWER FAN MOTOR. 1)Turn ignition switch to ON. 2)Turn blower switch to ON. 3)Measure voltage between blower fan motor and chassis ground. Connector & terminal (B87) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair open circuit in 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 battery to No. 1 and No. 3 terminals of blower fan motor connector. 4)Measure resistance between No. 2 and No. 4 terminals. Terminals: No. 2 — No. 4	Is the resistance less than 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 battery to connector terminals of blower fan motor. 3)Make sure that blower fan motor is operated.	Does the blower fan motor operate?	Go to step 5.	Replace blower fan motor.
5 CHECK POOR CONTACT. Check poor contact in A/C control module.	Is there poor contact in A/C control module?	Repair poor contact in A/C control module.	Contact with your Subaru distributor.

DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: COMPARTMENT TEMPERATURE IS NOT CHANGED OR A/C SYSTEM DOES NOT RESPOND QUICKLY

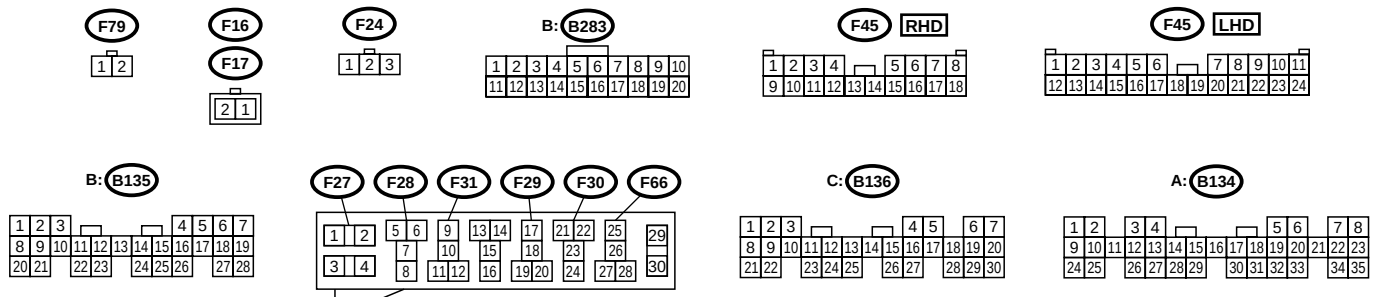
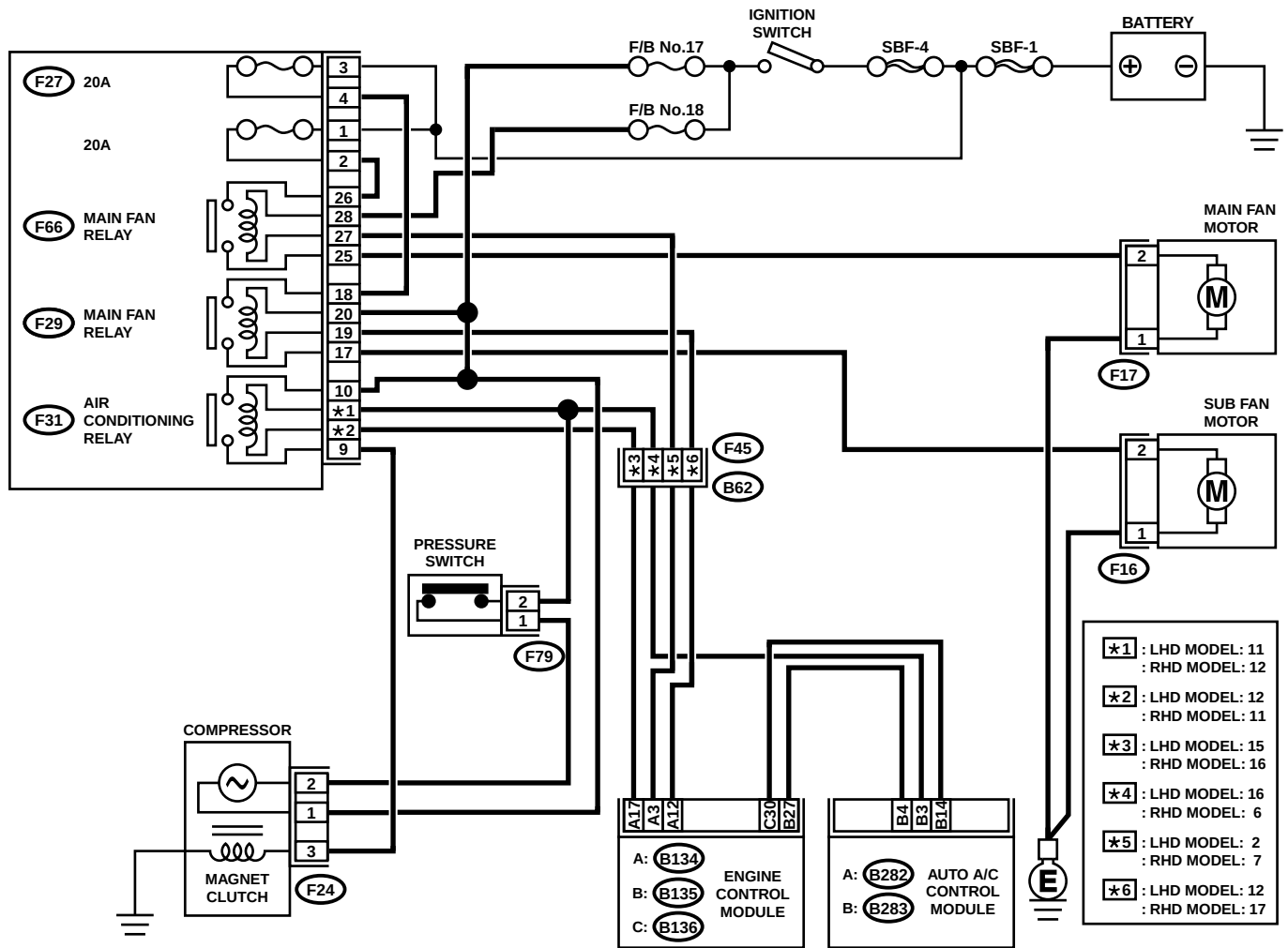
WIRING DIAGRAM FOR TURBO ENGINE MODEL:



DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

WIRING DIAGRAM FOR NON-TURBO ENGINE MODEL:



HV0037

DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	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?	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 temperature control dial to maximum cold position. 3) Measure voltage between magnet clutch connector and chassis ground. Connector & terminal (F24) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair open circuit in harness for power supply line of the A/C compressor.
3 CHECK SIGNAL VOLTAGE TO A/C RELAY. 1) Turn ignition switch to ON. 2) Turn A/C switch to ON. 3) Measure signal voltage to A/C relay and chassis ground. Connector & terminal (F31) No. 9 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in 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-32, INSPECTION, Relay and Fuse.>	Is the operation of the relay 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 radiator main fan operate?	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 Turbo engine model: (F17) No. 2, 3 (+) — Chassis ground (-): Non-turbo engine model: (F17) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair open circuit in harness for power supply circuit.
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. Connector & terminal (F17) No. 1 — Chassis ground:	Is the resistance less than 1 Ω?	Go to step 8.	Repair open circuit in harness between main fan motor connector and chassis ground.
8 CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step 9.

DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK MAIN FAN MOTOR. Connect battery positive (+) terminal to terminal No. 2 and 3 (turbo engine model) or 2 (non-turbo engine model), and negative (–) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
10 CHECK OPERATION OF SUB FAN MOTOR. Check operation of sub fan motor.	Does the radiator sub fan operate?	Go to step 15.	Go to step 11.
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. Connector & terminal Turbo engine model: (F16) No. 2, 3 (+) — Chassis ground (–): Non-turbo engine model: (F16) No. 2 (+) — Chassis ground (–):	Is the voltage more than 10 V?	Go to step 12.	Repair open circuit in harness for power supply circuit.
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 (F16) No. 1 — Chassis ground:	Is the resistance less than 1 Ω?	Go to step 13.	Repair open circuit in harness between sub fan motor connector and chassis ground.
13 CHECK POOR CONTACT. Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step 14.
14 CHECK SUB FAN MOTOR. Connect battery positive (+) terminal to terminal No. 2 and 3 (turbo engine model) or 2 (non-turbo engine model), and negative (–) terminal to terminal No. 1 of sub fan motor connector.	Does the sub fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
15 CHECK EACH SENSOR AND POTENTION METER. Check the sensors and potention meter for proper operation using the self-diagnostic function. <Ref. to AC-18, Diagnostics Chart for Diagnosis System.>	Is the operation of each sensor and potention meter normal?	Go to step 16.	Check the sensor and circuit. <Ref. to AC-36, Diagnostic Procedure for Sensors.>
16 CHECK CONNECTION OF ASPIRATOR DUCT. Make sure that the connection of aspirator duct is correct.	Is the connection of aspirator duct correct?	Repair aspirator duct connection.	Go to step 17.
17 CHECK EACH ACTUATOR. Check the actuators for proper operation using the self-diagnostic function. <Ref. to AC-18, Diagnostics Chart for Diagnosis System.>	Is the operation of each actuator normal?	Go to step 18.	Check the actuator and circuit. <Ref. to AC-30, Diagnostic Procedure for Actuators.>
18 CHECK POOR CONTACT. Check poor contact in A/C control module.	Is there poor contact in A/C control module?	Repair poor contact in A/C control module.	Contact with your Subaru distributor.

DIAGNOSTIC PROCEDURE FOR ACTUATORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

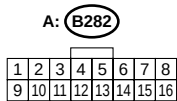
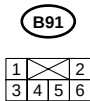
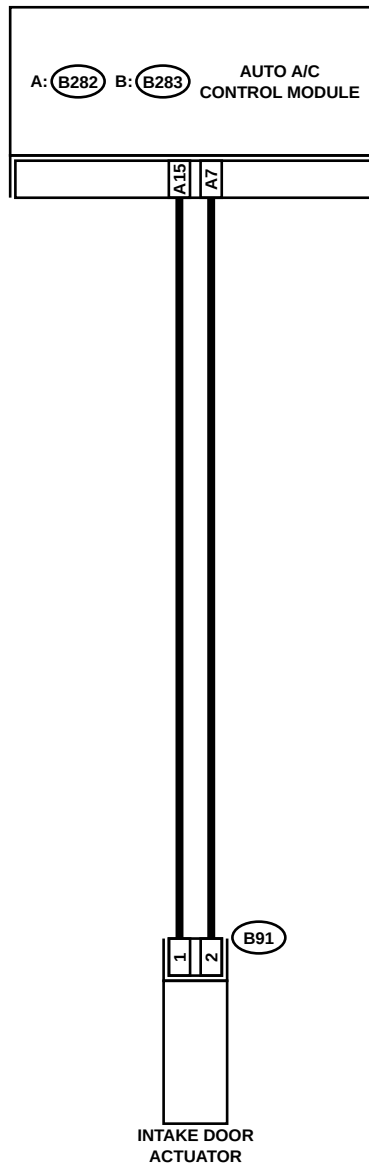
7. Diagnostic Procedure for Actuators

A: INTAKE DOOR ACTUATOR

TROUBLE SYMPTOM:

FRESH/RECIRC mode is not changed.

WIRING DIAGRAM:



HV0038

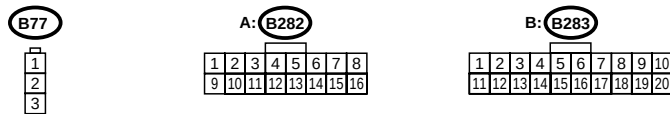
DIAGNOSTIC PROCEDURE FOR ACTUATORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FUSE. 1) Remove No. 17 fuse in fuse & relay box. 2) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 2.
2 CHECK SIGNAL VOLTAGE. 1) Change air intake to RECIRC by pushing FRESH/RECIRC switch. 2) Measure voltage between A/C control module and chassis ground. Connector & terminal (B282) No. 15 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Repair short circuit in harness for power supply line.
3 CHECK SIGNAL VOLTAGE. 1) Change air intake to FRESH with pushing FRESH/RECIRC switch. 2) Measure voltage between A/C control module and chassis ground. Connector & terminal (B282) No. 7 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Repair short circuit in harness for power supply line.
4 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND FRESH/RECIRC ACTUATOR. 1) Turn ignition switch to OFF. 2) Disconnect connector from A/C control module and intake door actuator. 3) Measure resistance of harness between A/C control module and intake door actuator. Connector & terminal: (B282) No. 15 — (B91) No. 1	Is the resistance less than 1 Ω ?	Go to step 5.	Repair open circuit in harness between A/C control module and intake door actuator.
5 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND FRESH/RECIRC ACTUATOR. Measure resistance of harness between A/C control module and intake door actuator. Connector & terminal: (B282) No. 7 — (B91) No. 2	Is the resistance less than 1 Ω ?	Go to step 6.	Repair open circuit in harness between A/C control module and intake door actuator.
6 CHECK POOR CONTACT. Check poor contact in A/C control module.	Is there poor contact in A/C control module?	Repair poor contact in A/C control module.	Contact with your Subaru distributor.

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR ACTUATORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE. 1) Turn ignition switch ON. 2) Turn A/C switch ON. 3) Measure voltage between auto A/C control module harness connector terminal and chassis ground. Connector & terminal (B283) No. 6 (+) — Chassis ground (-):	Is the voltage more than 10V?	Go to step 2.	Replace auto A/C control module.
2 CHECK POWER SUPPLY FOR ACTUATOR SIDE. Measure voltage between mode door actuator harness connector terminal and chassis ground. Connector & terminal (B77) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10V?	Go to step 3.	Repair open circuit in harness between auto A/C control module and mode door actuator.
3 CHECK SIGNAL FOR AUTO A/C CONTROL MODULE SIDE. Measure voltage between auto A/C control module harness connector terminal and chassis ground with oscilloscope. Connector & terminal (B282) No. 12 (+) — Chassis ground (-):	Is the voltage approx. 5.5V?	Go to step 4.	Replace auto A/C control module.
4 CHECK SIGNAL FOR ACTUATOR SIDE. Measure voltage between mode door actuator harness connector terminal and chassis ground. Connector & terminal (B77) No. 3 (+) — Chassis ground (-):	Is the voltage approx. 5.5V?	Go to step 5.	Repair open circuit in harness between auto A/C control module and mode door actuator.
5 CHECK GROUND CIRCUIT OF ACTUATOR. 1) Turn ignition switch and A/C switch OFF. 2) Measure resistance between mode door actuator harness connector terminal and chassis ground. Connector & terminal (B77) No. 2 (+) — Chassis ground (-):	Is the resistance less than 1 Ω ?	Go to step 6.	Repair open circuit in harness between mode door actuator and chassis ground.
6 CHECK POOR CONTACT. Check poor contact in auto A/C control module and mode door actuator.	Is there poor contact?	Repair poor contact.	Contact with your Subaru distributor.

DIAGNOSTIC PROCEDURE FOR ACTUATORS

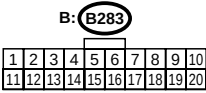
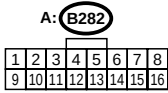
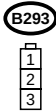
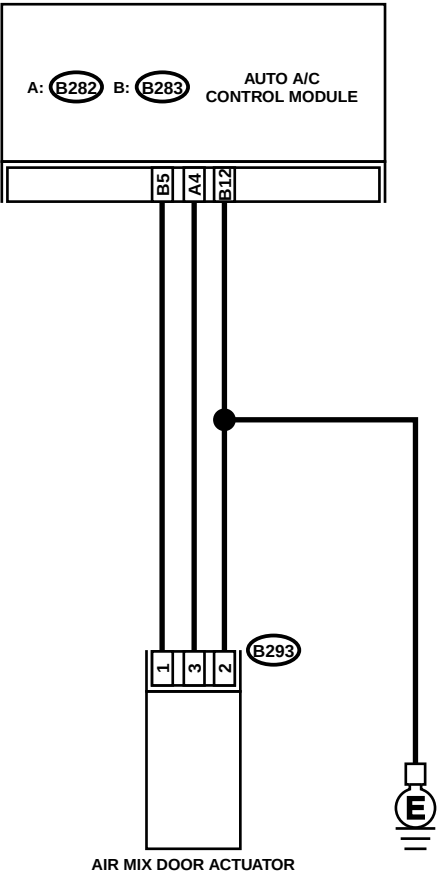
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: AIR MIX DOOR ACTUATOR

TROUBLE SYMPTOM:

Outlet air temperature is not changed.

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR ACTUATORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE. 1) Turn ignition switch ON. 2) Turn A/C switch ON. 3) Measure voltage between auto A/C control module harness connector terminal and chassis ground. Connector & terminal (B283) No. 5 (+) — Chassis ground (-):	Is the voltage more than 10V?	Go to step 2.	Replace auto A/C control module.
2 CHECK POWER SUPPLY FOR ACTUATOR SIDE. Measure voltage between air mix door actuator harness connector terminal and chassis ground. Connector & terminal (B293) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10V?	Go to step 3.	Repair open circuit in harness between auto A/C control module and air mix door actuator.
3 CHECK SIGNAL FOR AUTO A/C CONTROL MODULE SIDE. Measure voltage between auto A/C control module harness connector terminal and chassis ground with oscilloscope. Connector & terminal (B282) No. 4 (+) — Chassis ground (-):	Is the voltage approx. 5.5V?	Go to step 4.	Replace auto A/C control module.
4 CHECK SIGNAL FOR ACTUATOR SIDE. Measure voltage between air mix door actuator harness connector terminal and chassis ground with oscilloscope. Connector & terminal (B293) No. 3 (+) — Chassis ground (-):	Is the voltage approx. 5.5V?	Go to step 5.	Repair open circuit in harness between auto A/C control module and air mix door actuator.
5 CHECK GROUND CIRCUIT OF ACTUATOR. 1) Turn ignition switch and A/C switch OFF. 2) Measure resistance between air mix door actuator harness connector terminal and chassis ground. Connector & terminal (B293) No. 2 (+) — Chassis ground (-):	Is the resistance less than 1 Ω ?	Go to step 6.	Repair open circuit in harness between air mix door actuator and chassis ground.
6 CHECK POOR CONTACT. Check poor contact in auto A/C control module and air mix door actuator.	Is there poor contact?	Repair poor contact.	Contact with your Subaru distributor.

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

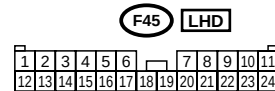
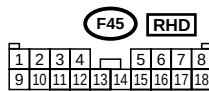
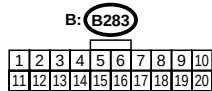
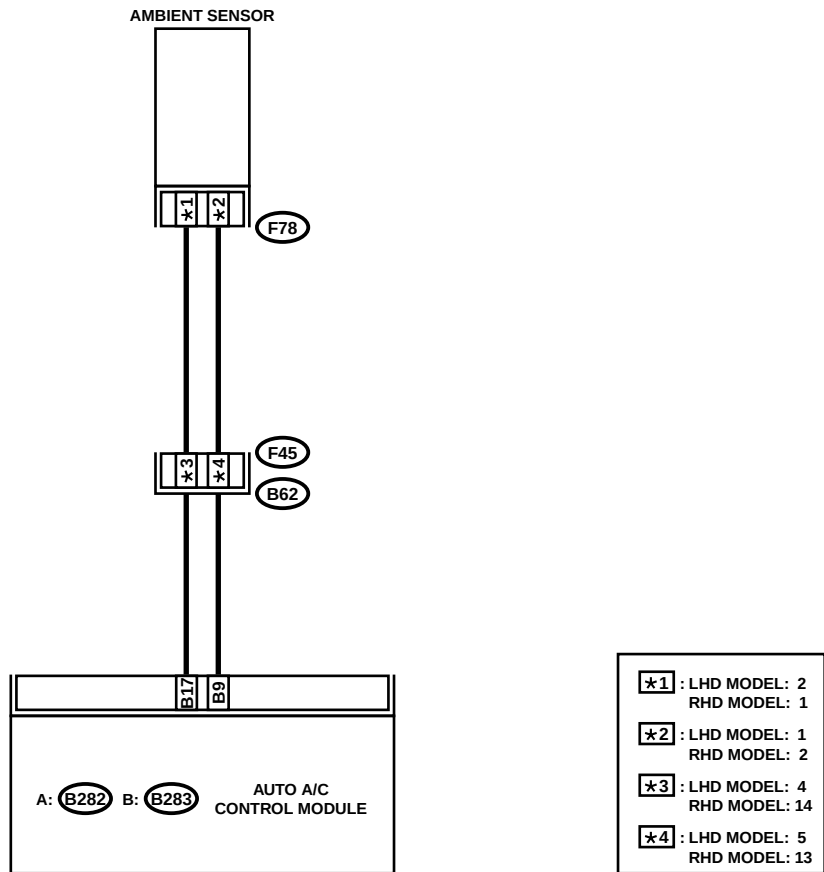
8. Diagnostic Procedure for Sensors

A: AMBIENT SENSOR

TROUBLE SYMPTOM:

Fan speed is not switched when the fan speed control dial is in AUTO position.

WIRING DIAGRAM:



HV0041

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	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. <i>Terminals:</i> No. 1 — No. 2	Is the resistance approx. 2.2 k Ω at 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 (F78) connector terminals. <i>Connector & terminal:</i> (F78) No. 1 — No. 2	Is the voltage 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. <i>Connector & terminal:</i> (B283) No. 9 (+) — No. 17 (-)	Is the voltage approx. 4.5 V?	Go to step 6.	Go to step 4.
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. <i>Connector & terminal</i> <i>LHD model:</i> (F78) No. 1 — (B283) No. 9 <i>RHD model:</i> (F78) No. 2 — (B283) No. 9	Is the resistance less than 1 Ω ?	Go to step 5.	Repair open circuit in 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. <i>Connector & terminal</i> <i>LHD model:</i> (F78) No. 2 — (B283) No. 17 <i>RHD model:</i> (F78) No. 1 — (B283) No. 17	Is the resistance less than 1 Ω ?	Go to step 6.	Repair open circuit in harness between A/C control module and ambient sensor.
6 CHECK POOR CONTACT. Check poor contact in A/C control module.	Is there poor contact in A/C control module?	Repair poor contact in A/C control module.	Contact with your Subaru distributor.

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: IN-VEHICLE SENSOR

TROUBLE SYMPTOM:

When turning AUTO switch to ON, blower fan speed, outlet port and inlet port is not changed.

If switch LED indicates that the sensor is malfunctioning, 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 FOR SENSORS

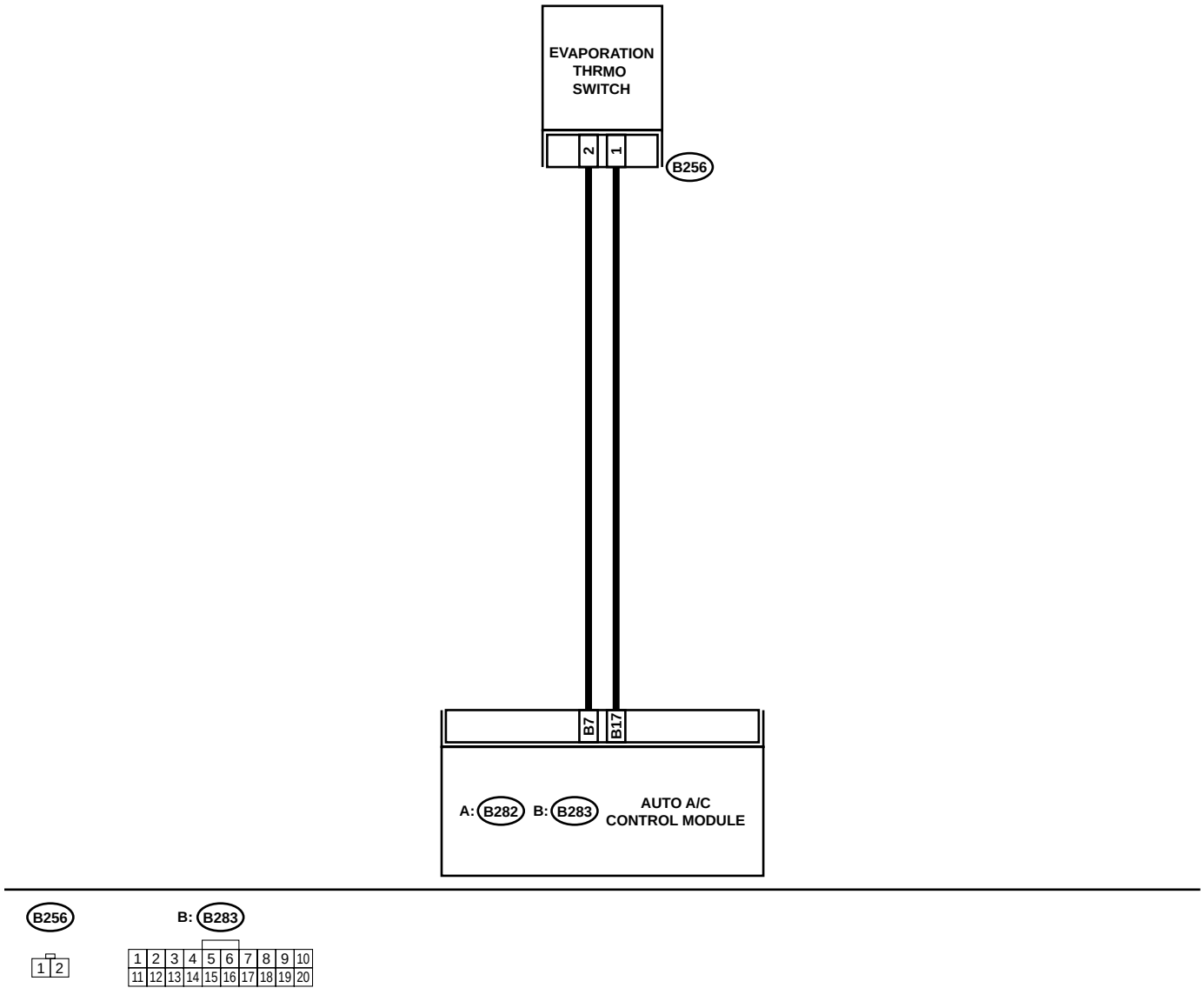
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: EVAPORATOR SENSOR

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK EVAPORATOR SENSOR. 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. Terminals: No. 1 — No. 2	Is the resistance approx. 3.3 k Ω at 20°C (68°F)?	Go to step 2.	Replace evaporator sensor.
2 CHECK INPUT SIGNALS FOR EVAPORATOR SENSOR. 1) Turn ignition switch to "ON". 2) Measure voltage between (B88) connector terminal and chassis ground. Connector & terminal (B256) No. 2 (+) — Chassis ground (-):	Is the voltage approx. 4.5 V?	Go to step 3.	Replace evaporator sensor.
3 CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE. 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. Connector & terminal: (B283) No. 7 (+) — No. 17 (-)	Is the voltage approx. 4.5 V?	Go to step 4.	Go to step 6.
4 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR 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 evaporator sensor. Connector & terminal: (B256) No. 2 — (B283) No. 7	Is the resistance less than 1 Ω ?	Go to step 5.	Repair open circuit in harness between A/C control module and evaporator sensor.
5 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR. Measure resistance of harness between A/C control module and evaporator sensor. Connector & terminal: (B256) No. 1 — (B283) No. 17	Is the resistance less than 1 Ω ?	Go to step 6.	Repair open circuit in harness between A/C control module and evaporator sensor.
6 CHECK POOR CONTACT. Check poor contact in A/C control module.	Is there poor contact in A/C control module?	Repair poor contact in A/C control module.	Contact with your Subaru distributor.

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

D: 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.

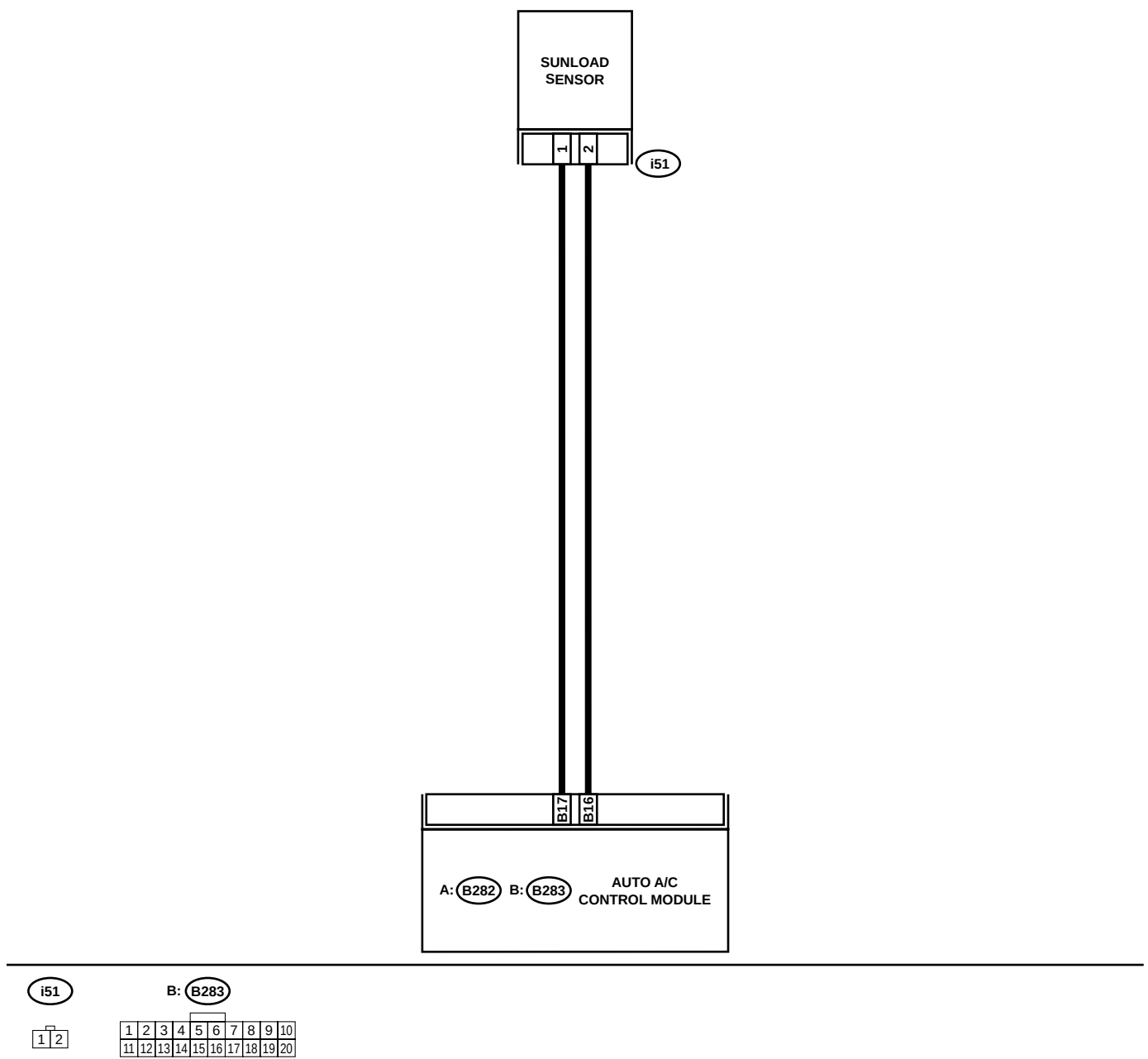
NOTE:

When the sunload sensor is checked indoors or in the shade, open circuit might be indicated. Always check the sunload sensor at a place where sun shines directly on it.

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

WIRING DIAGRAM:



HV0043

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SUNLOAD SENSOR. 1) Turn ignition switch to OFF. 2) Remove sunload sensor. <Ref. to AC-35, INSTALLATION, Sun-load Sensor (Auto A/C).> 3) Measure resistance between sunload sensor terminals. Terminals: No. 2 — No. 1	Is the resistance less than 1 Ω ?	Go to step 2.	Replace sunload sensor.
2 CHECK SUNLOAD SENSOR. Make sure that there is no resistance in the reverse side terminals. Terminals: No. 1 — No. 2	Is the resistance more than 1 M Ω ?	Go to step 3.	Replace sunload sensor.
3 CHECK INPUT VOLTAGE TO SUNLOAD SENSOR. 1) Turn ignition switch to ON. 2) Measure input voltage to sunload sensor. Connector & terminal: (i51) No. 2 (+) — No. 1 (-)	Is the voltage approx. 4.5 V?	Go to step 6.	Go to step 4.
4 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. 2 — (B283) No. 16	Is the resistance less than 1 Ω ?	Go to step 5.	Repair open circuit in harness between A/C control module and sunload sensor.
5 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. 1 — (B283) No. 17	Is the resistance less than 1 Ω ?	Go to step 6.	Repair open circuit in harness between A/C control module and sunload sensor.
6 CHECK POOR CONTACT. Check poor contact in A/C control module.	Is there poor contact in A/C control module?	Repair poor contact in A/C control module.	Contact with your Subaru distributor.

SYMPTOM RELATED DIAGNOSTIC

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

9. Symptom Related Diagnostic

A: GENERAL DIAGNOSTICS TABLE

Symptom	A/C system fails to operate when IG SW is turned "ON" .	Burned-out fuse.	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 outlet 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. 5, F/B No. 17)	☐	☐	☐	☐							
Poor connector contacts	☐	☐	☐	☐	☐	☐	☐	☐			
Ground	☐			☐							
A/C control module	☐		☐	☐	☐	☐	☐	☐	☐		
Air mix door actuator and potention meter (including links)							☐	☐	☐	☐	
Mode door actuator and potention meter (including links)						☐					
Intake door actuator and potention meter (including links)					☐						
Blower fan motor				☐							
Blower fan relay				☐							
A/C relay								☐			
Magnet clutch								☐			
Radiator fan motors (Main and sub)											☐
Radiator fan relays (Main and sub)											☐
Sensors (In-vehicle, ambient, water temperature, evaporator, sunload, etc.)							☐	☐	☐	☐	
In-vehicle sensor aspirator duct									☐		

HV0044

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

AIRBAG SYSTEM

AB

	Page
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2. Airbag Connector	8
3. Inspection Locations After a Collision	10
4. Driver's Airbag Module	12
5. Passenger's Airbag Module	14
6. Side Airbag Module	15
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8. Side Airbag Sensor	17
9. Roll Connector	18
10. Front Sub Sensor	19
11. Disposal of Airbag Module (Deploying While Installed in Vehicle)	20
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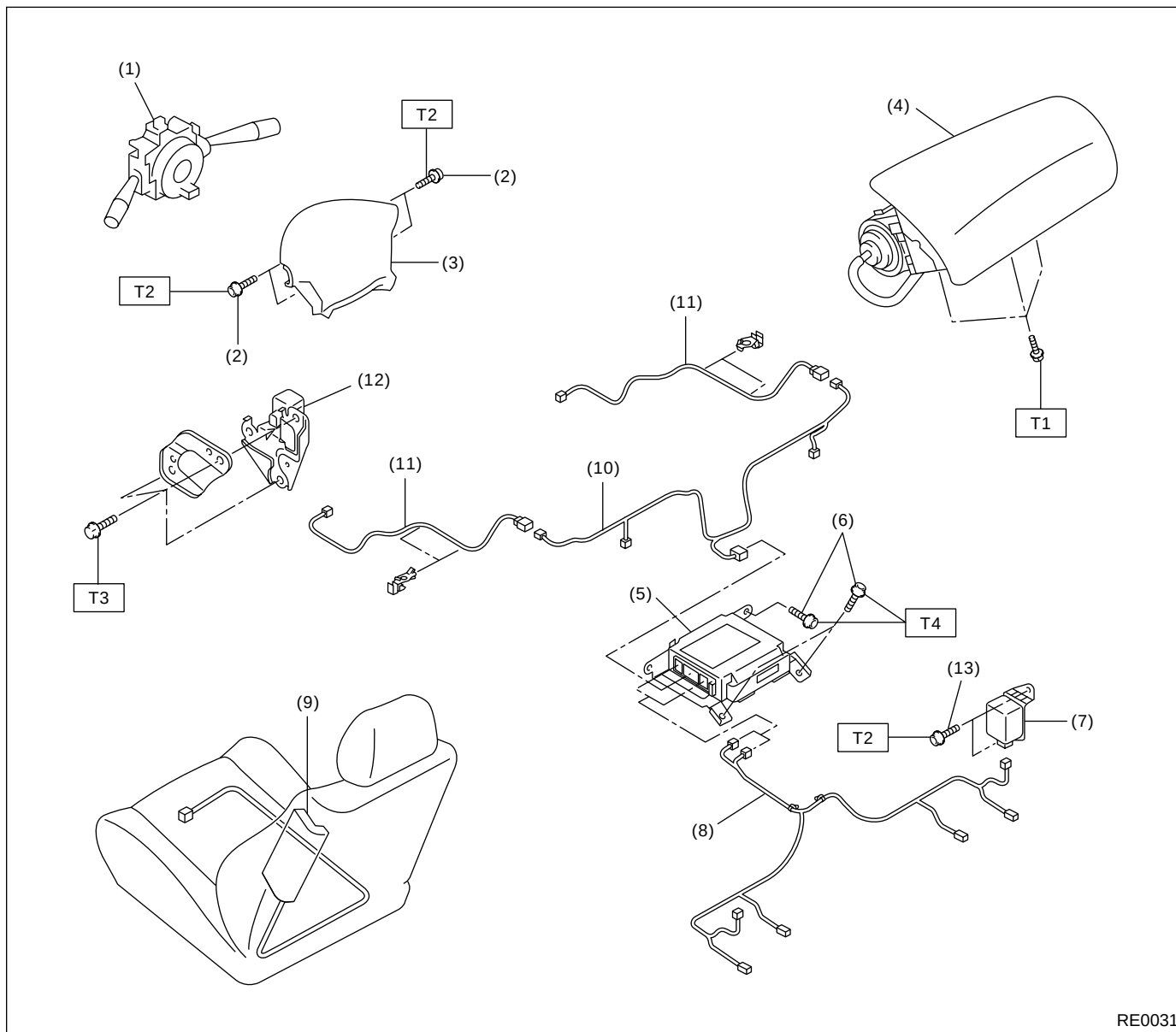
GENERAL DESCRIPTION

AIRBAG SYSTEM

1. General Description

A: COMPONENT

1. SRS AIRBAG



RE0031

- | | |
|---|-------------------------------|
| (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 |
| | (13) TORX® bolt T30 |

Tightening torque: N·m (kg-m, ft-lb)

T1: 7.4 (0.75, 5.4)

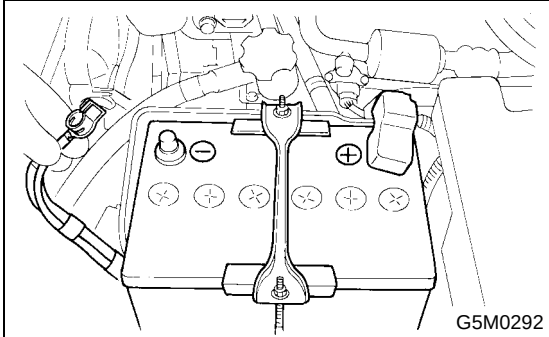
T2: 10 (1.0, 7.2)

T3: 20 (2.0, 14.5)

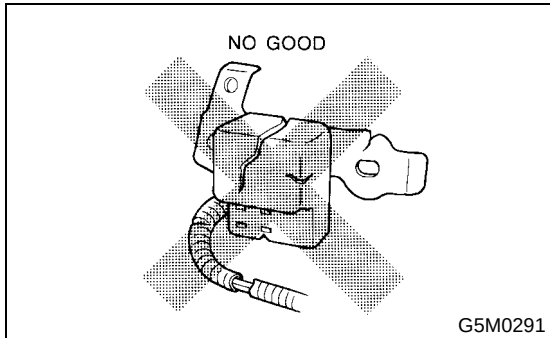
T4: 25 (2.5, 18.1)

B: CAUTION

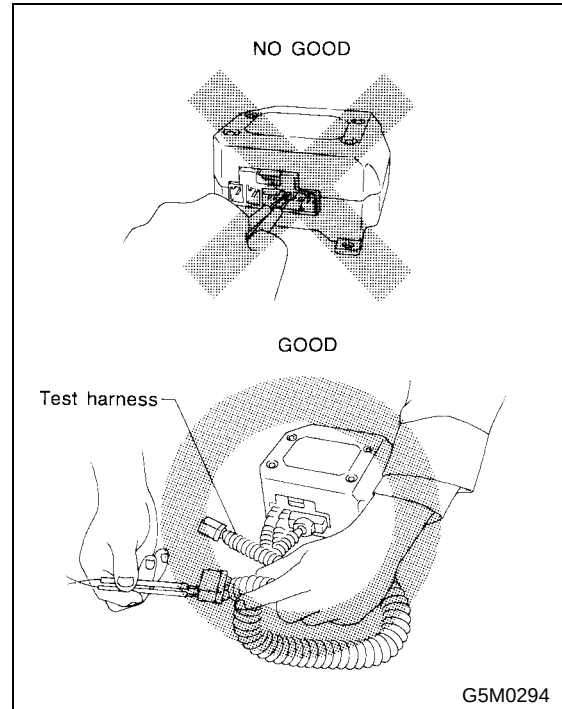
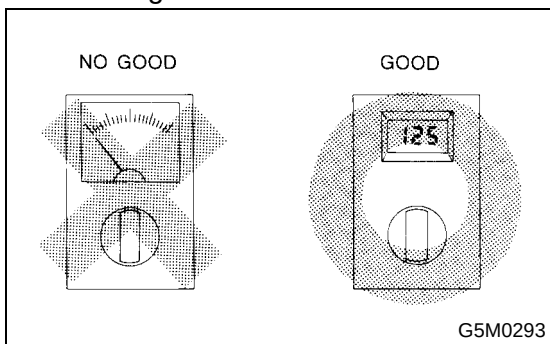
- When servicing a vehicle, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait for more than 20 seconds before starting work.
- The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.



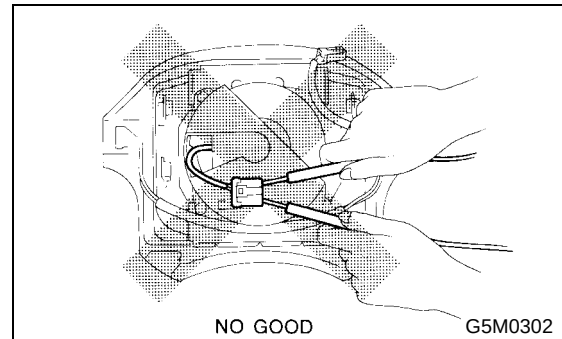
- If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.



- 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.



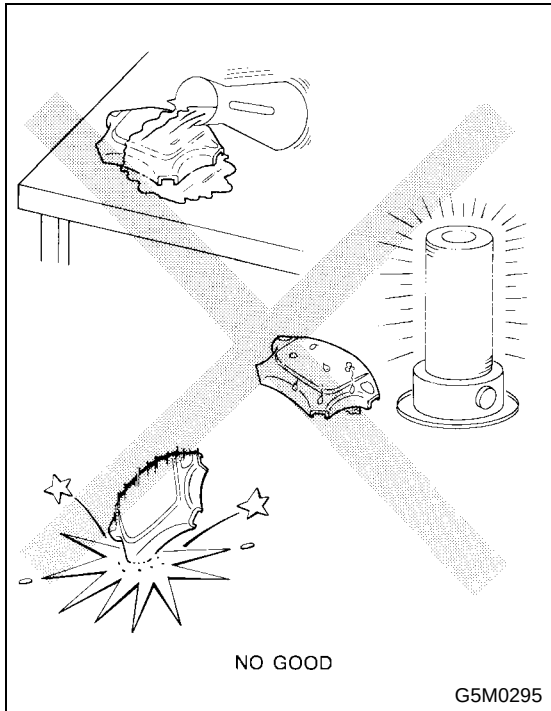
- Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.



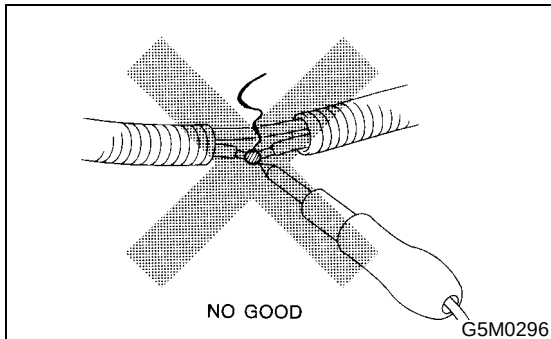
GENERAL DESCRIPTION

AIRBAG SYSTEM

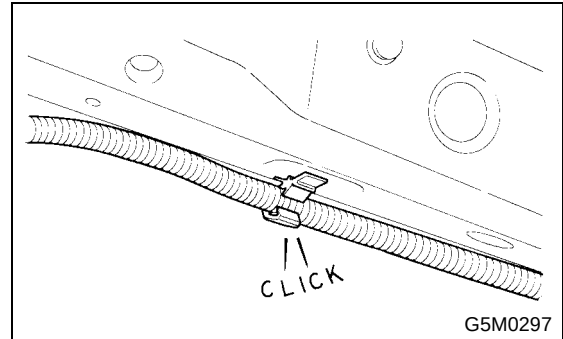
- Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



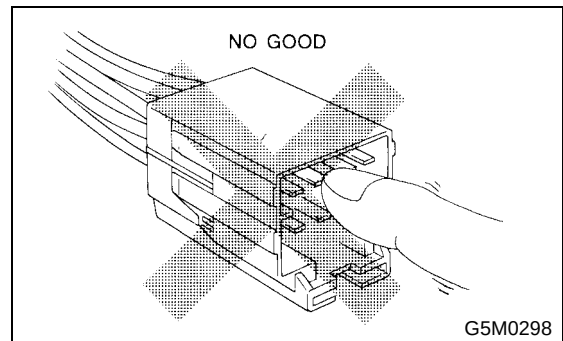
- If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



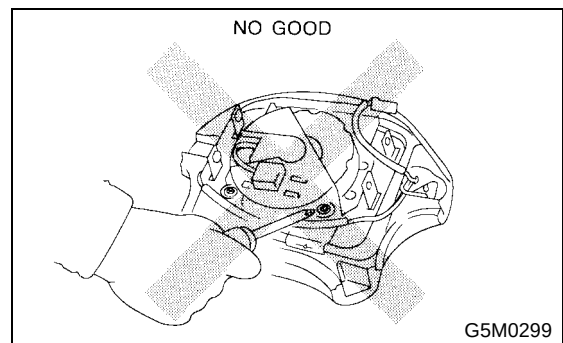
- Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



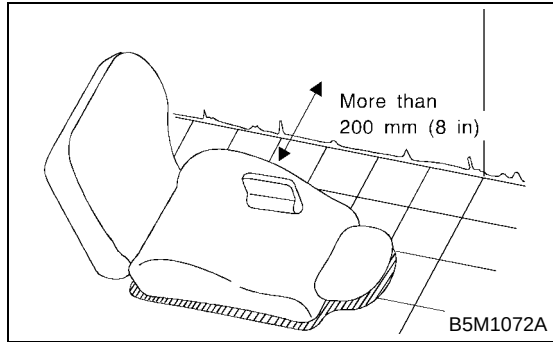
- Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



- Either of the airbag modules for driver, passenger or side, or pretensioner must not be disassembled.

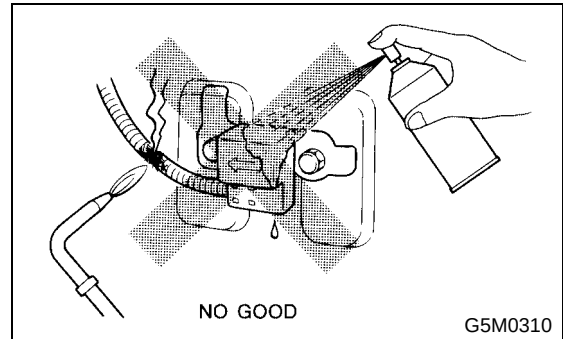


- The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



- 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 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.



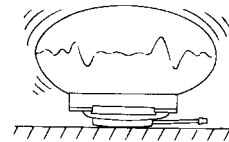
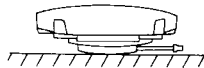
- When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.

GENERAL DESCRIPTION

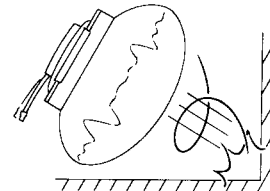
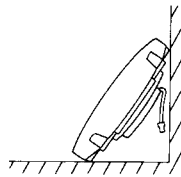
AIRBAG SYSTEM

Driver side

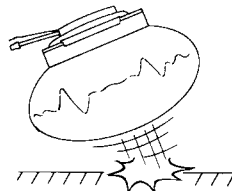
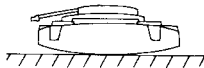
GOOD



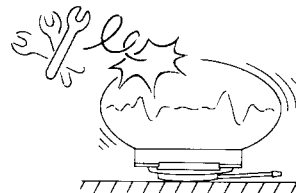
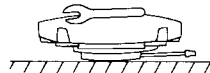
NO GOOD



NO GOOD

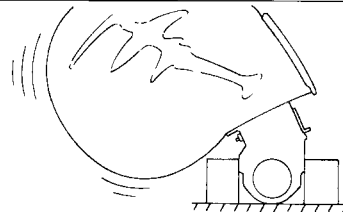
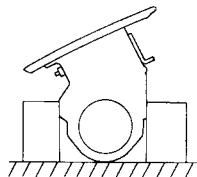


NO GOOD

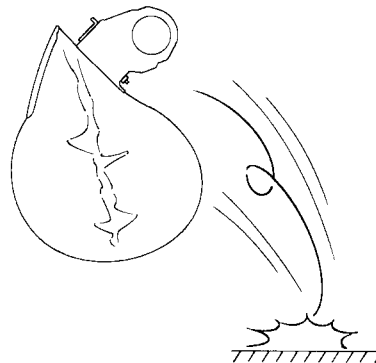
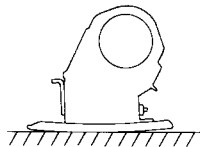


Passenger side

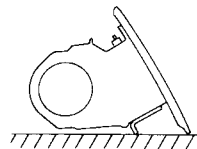
GOOD



NO GOOD



NO GOOD



G5M0604

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of drivers airbag module
TORX® T40 (Tamper resistant type)	Used for removal/installation of airbag control module
TORX® T30 (Tamper resistant type)	Used for removal of side airbag sensor.

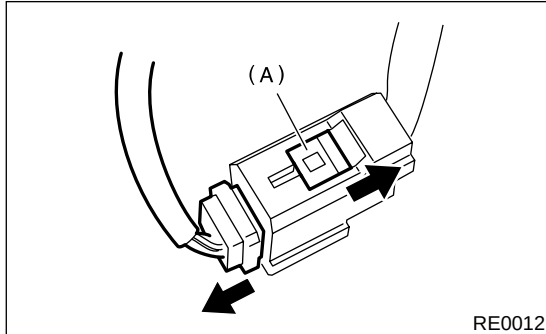
2. Airbag Connector

A: OPERATION

1. POWER SUPPLY

• How to disconnect:

- 1) Move slide lock (A) in the direction of the arrow.
- 2) Pull female connector in the direction of the arrow with slide lock (A) moved.

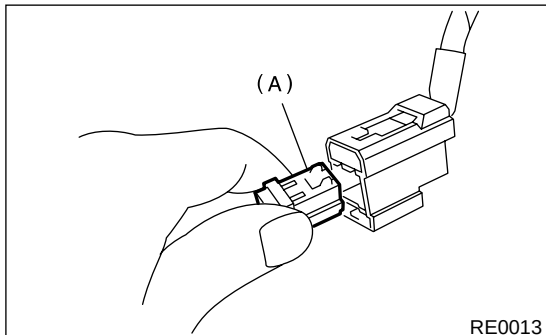


CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

• How to connect:

Holding connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:

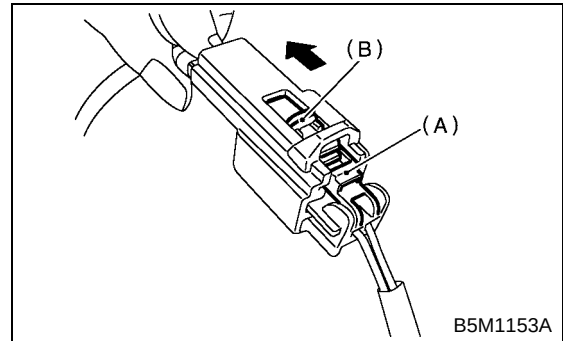
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

2. DRIVER'S AIRBAG, PASSENGER'S AIRBAG, SIDE AIRBAG

• How to disconnect:

- 1) Push lock arm (A).

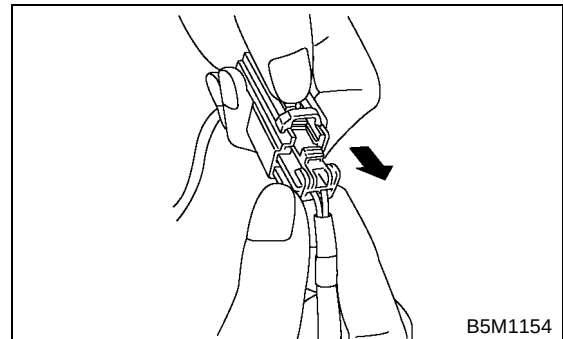
- 2) With lock arm (A) pushed in, move slide lock (B) in the direction of the arrow.



- 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.

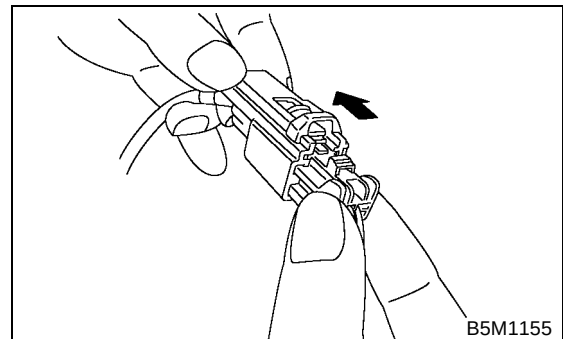


• How to connect:

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.



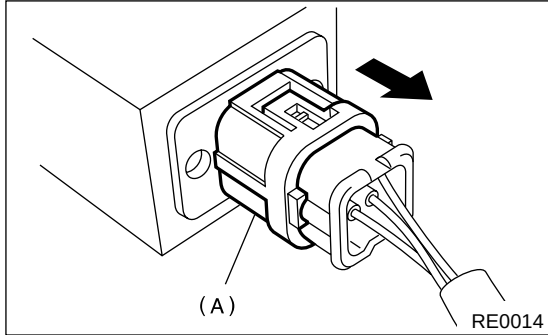
3. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR

• 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.

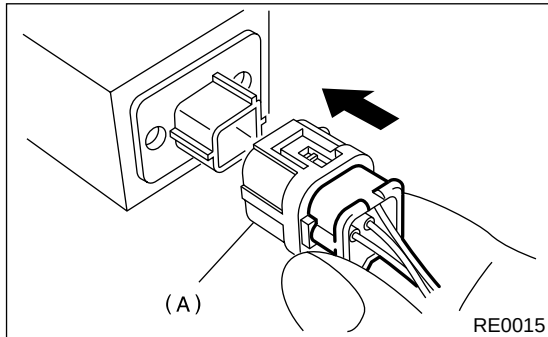


• How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

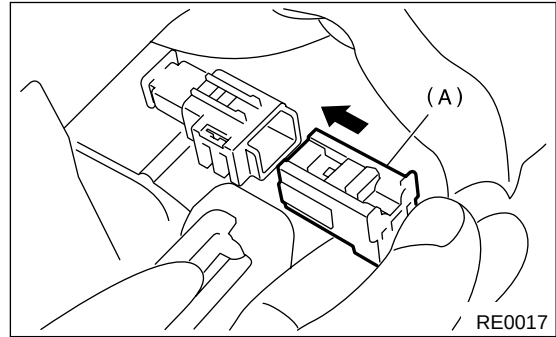
CAUTION:

- 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.



• How to connect:

Holding connector (A), and push it in carefully until a connecting sound is heard.



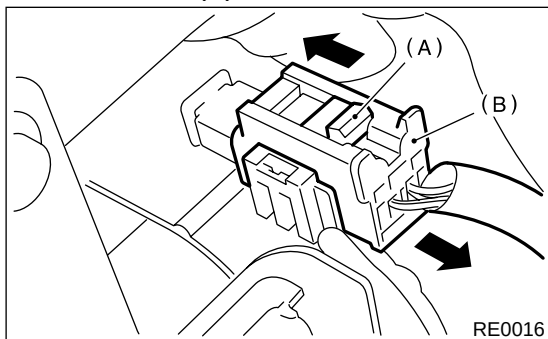
CAUTION:

- Be sure to insert the connector in until it locks.
- Then pull on it gently to make sure that it is locked.

4. PRETENSIONER

• How to disconnect:

- 1) Move slide lock (A) in the direction of the arrow.
- 2) Pull the connector (B) 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.

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 steering wheel is in the way, making it difficult to install the airbag module.
- 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.

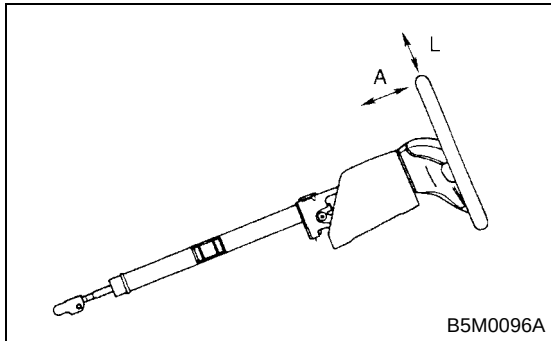
Specifications:

Axial free play A

Less than 6 mm (0.24 in)

Radial free play L

Less than 17 mm (0.67 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.

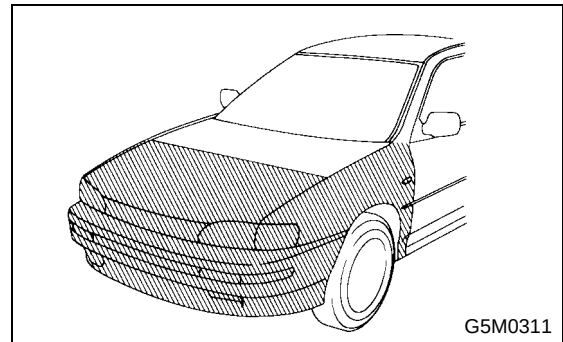
4. AIRBAG CONTROL MODULE

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.

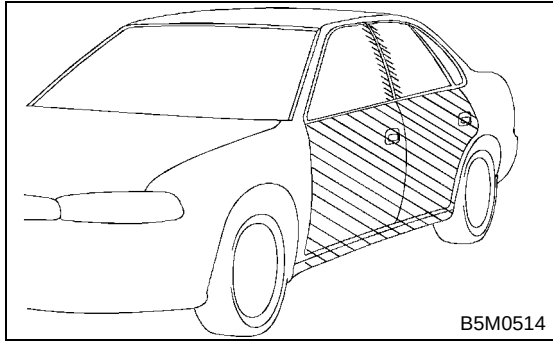
6. FRONT SUB SENSOR HARNESS

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)

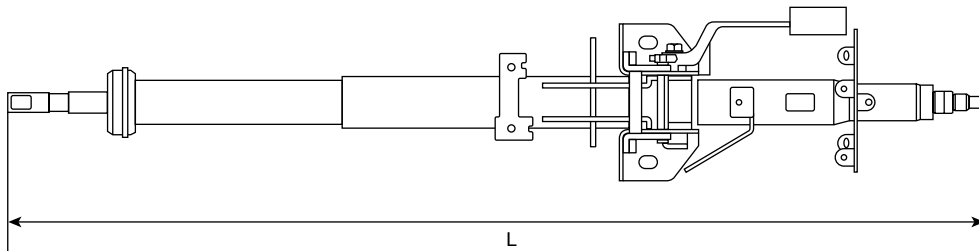
11. STEERING SHAFT

Check for the following, and replace damaged parts with new parts.
Overall length of steering column should be within specifications.

Specifications:

Overall length L

825.7±1.5 mm (32.5±0.06 in)



RE0032

If necessary, replace it with new part.

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

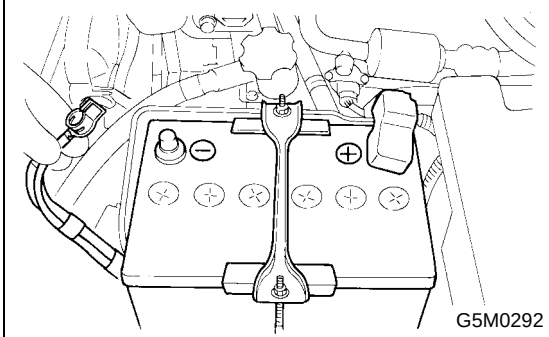
Check for the following, and replace damaged parts with new parts.

- Combination switch or steering roll connector is cracked or deformed.

4. Driver's Airbag Module

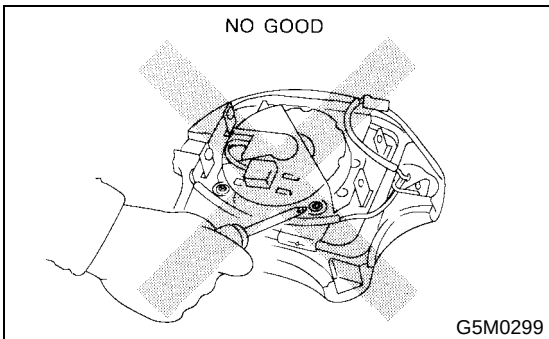
A: CAUTION

When disconnecting and connecting the airbag connector, 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.

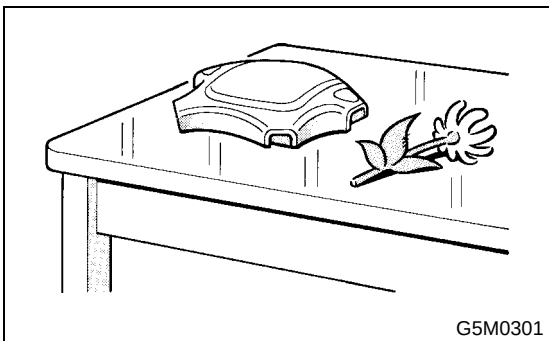


The airbag module (driver, passenger, and side) must not be disassembled.

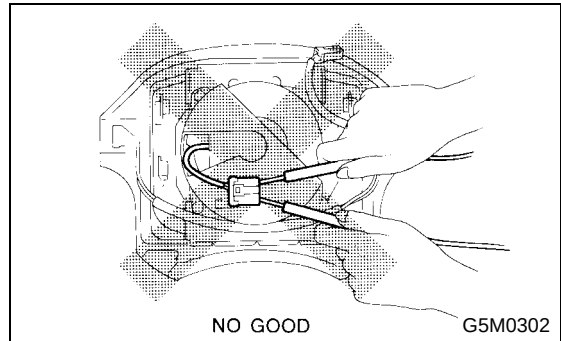
The airbag module cannot be used again once inflated.



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.



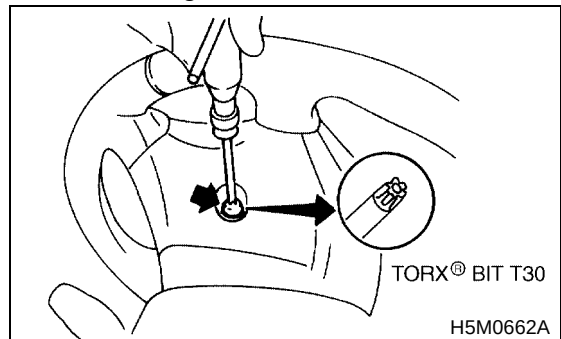
Do not check continuity of the airbag module (driver, passenger, and side).



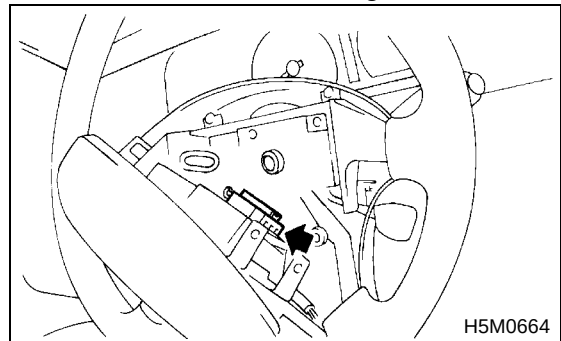
Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.

B: REMOVAL

- 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.>

C: 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.

D: INSPECTION

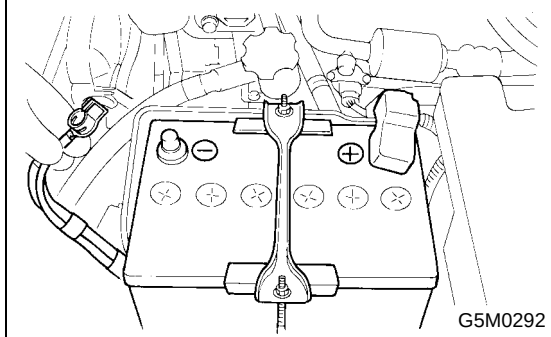
Check for the following, and replace damaged parts with new parts.

- Airbag module, harness, connector, and mounting bracket are damaged.

5. Passenger's Airbag Module

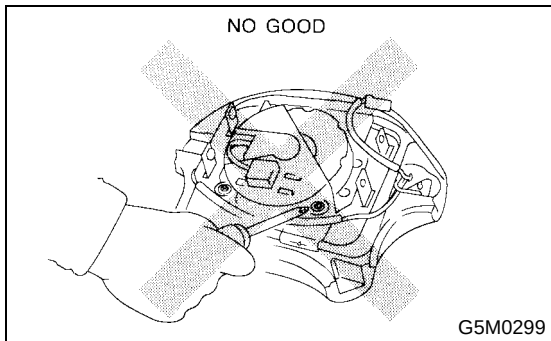
A: CAUTION

When disconnecting and connecting the airbag connector, 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.

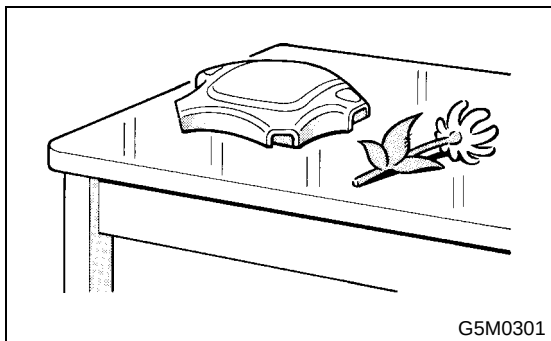


The airbag module (driver, passenger, and side) must not be disassembled.

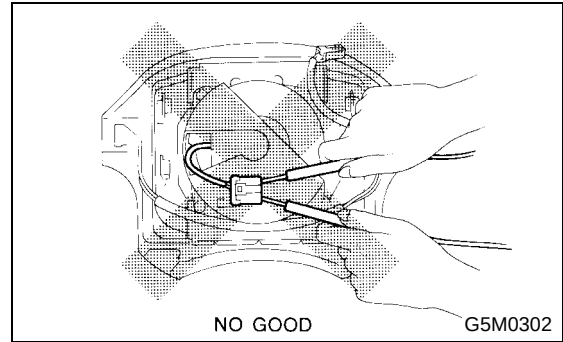
The airbag module cannot be used again once inflated.



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.

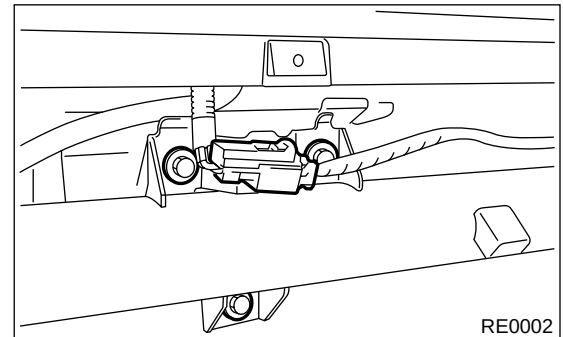


Do not check continuity of the airbag module (driver, passenger, and side) with airbag removed from the vehicle.



B: 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 glove box. <Ref. to EI-22, REMOVAL, Glove Box.>
- 4) Detach airbag connector from support beam bracket, and then disconnect airbag connector.
- 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.>

C: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Do not allow harness and connectors to interfere or get tangled up with other parts.

D: INSPECTION

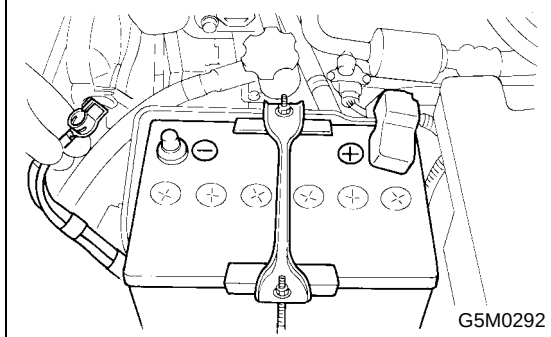
Check for the following, and replace damaged parts with new parts.

- Airbag module, harness, connector, and mounting bracket are damaged.

6. Side Airbag Module

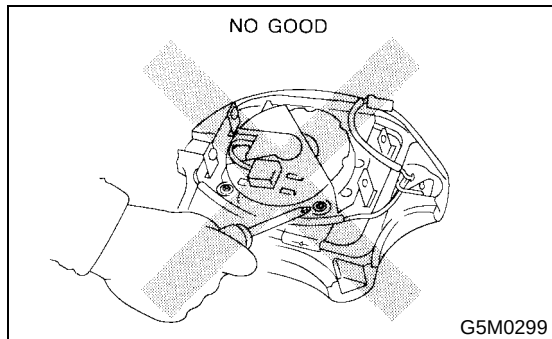
A: CAUTION

When disconnecting and connecting airbag connector, 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.

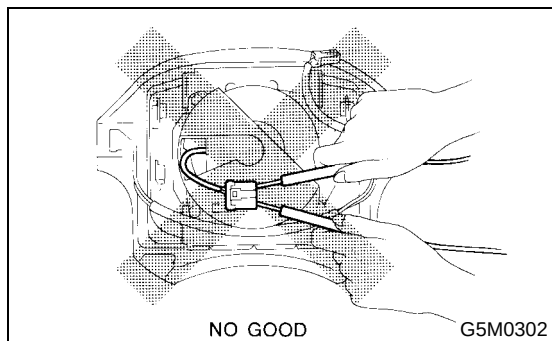


The airbag module (driver, passenger, and side) must not be disassembled.

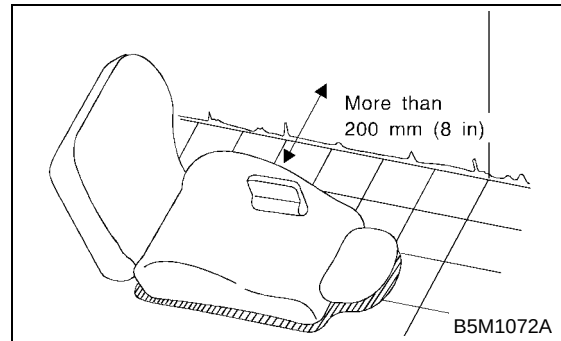
The airbag module cannot be used again once inflated.



Do not check continuity of the airbag module (driver, passenger, and side) with airbag removed from the vehicle.



The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



B: REMOVAL

CAUTION:

- The side airbag module cannot be detached from the front seat assembly.
- When replacing side airbag module, replace front seat assembly.

<Ref. to SE-6, REMOVAL, Front Seat.>

C: INSTALLATION

<Ref. to SE-6, INSTALLATION, Front Seat.>

D: INSPECTION

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.

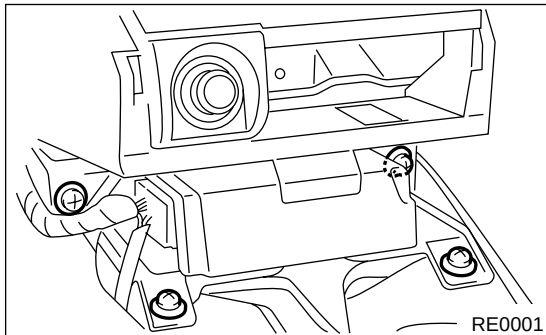
7. Airbag Control Module

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-24, 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

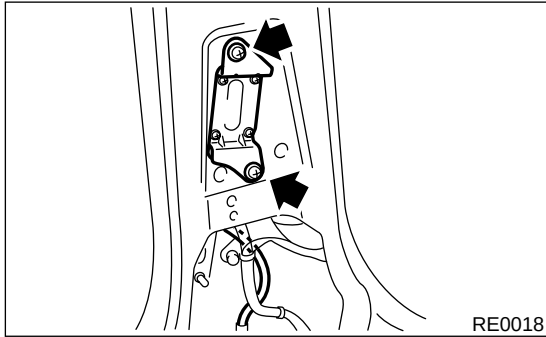
Check for the following, and replace damaged parts with new parts.

- Control module, connector, and mounting bracket are damaged.
- Airbag is deployed.
- Side airbag is deployed.

8. 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 outer belt (FRONT). <Ref. to SB-8, OUTER BELT (FRONT), REMOVAL, Front Seat Belt.>
- 4) Using T30 TORX® bit (Tamper resistant type), remove two TORX® bolts.
- 5) Detach side airbag sensor, and then disconnect airbag connector.



B: INSTALLATION

CAUTION:

Use new TORX® bolts during re-assembly.
Install in the reverse order of removal.

C: INSPECTION

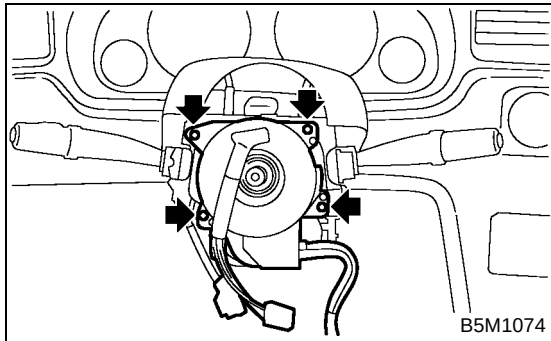
Check for the following, and replace damaged parts with new parts.

- Bracket connector for side airbag sensor is damaged.

9. 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 driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- 4) Remove steering wheel. <Ref. to PS-27, REMOVAL, Steering Wheel.>
- 5) Remove steering column cover.
- 6) Remove screws, and then remove roll connector.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Before install steering wheel, be sure the direction of roll connector is adjusted with steering. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>

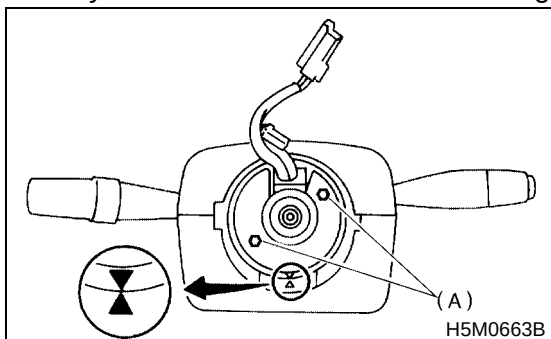
C: INSPECTION

Check for the following, and replace damaged parts with new parts.

- Combination switch and roll connector is cracked or deformed.

D: ADJUSTMENT

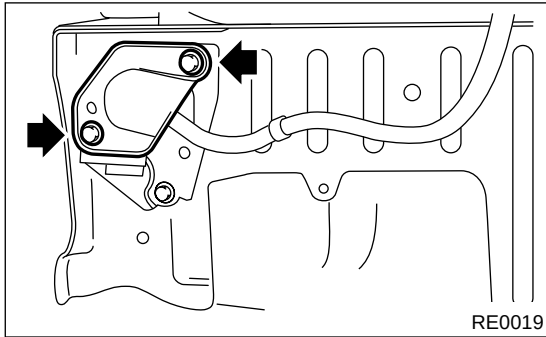
- 1) Check that front wheels are positioned in straight ahead direction.
- 2) Turn roll connector pin (A) clockwise until it stops.
- 3) Turn roll connector pin (A) counterclockwise approximately 2.65 turns until "▲" marks are aligned.



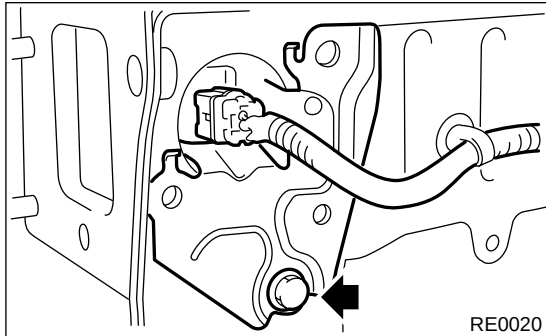
10.Front Sub Sensor

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-8, REMOVAL, Front Bumper.>
- 4) Loosen two bolts to remove sensor cover.



- 5) Remove bolt, and then detach front sub sensor.
- 6) Disconnect connector from front sub sensor.



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.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

11. Disposal of Airbag Module (Deploying While Installed in Vehicle)

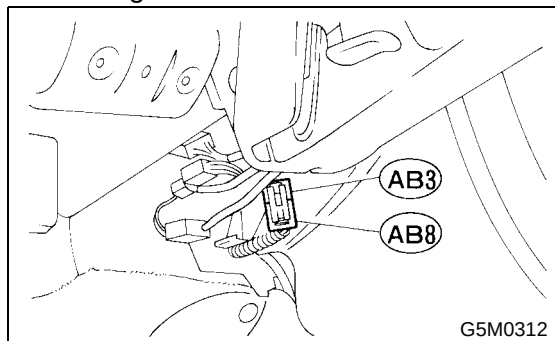
A: OPERATION

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.
- 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 lower cover.
- 4) Disconnect airbag connector (AB3) and (AB8) below steering column.



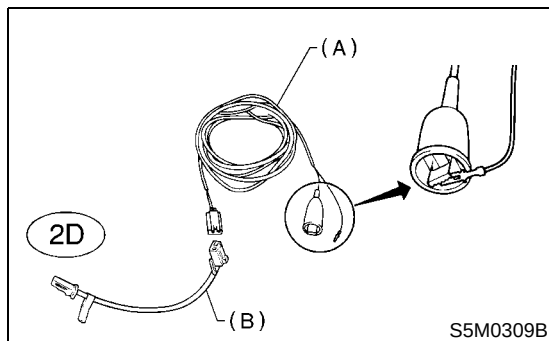
- 5) Short terminal to alligator clip furnished as deployment tool (A).
- 6) Connect the deployment tool and adapter A (deployment) (B).

Deployment tool: (Part No. 98299PA030)

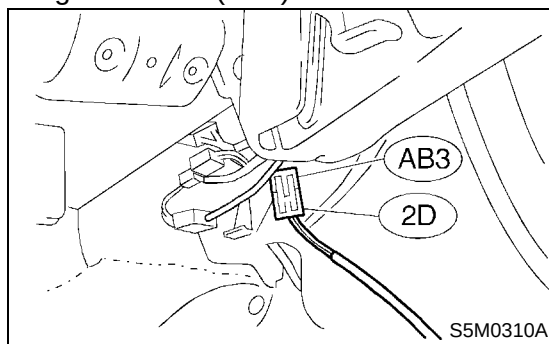
Adapter A (deployment): (Part No. 98299FC030)

CAUTION:

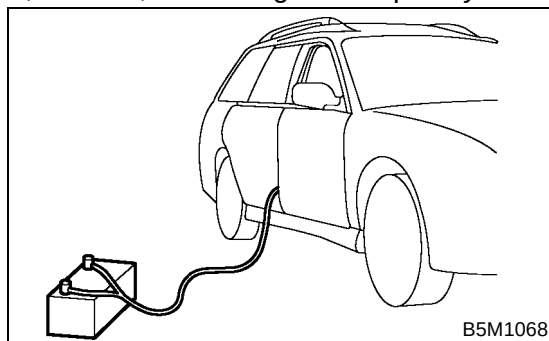
The deployment tool should be kept shorted until just before deployment of the airbag module.



- 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.

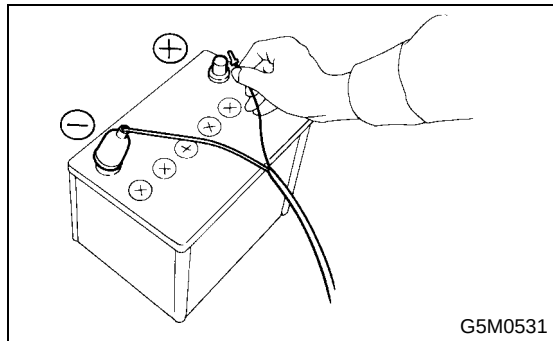


- 9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

10) Connect the other terminal of the deployment tool to the battery plus terminal. Then, deploy the airbag module.

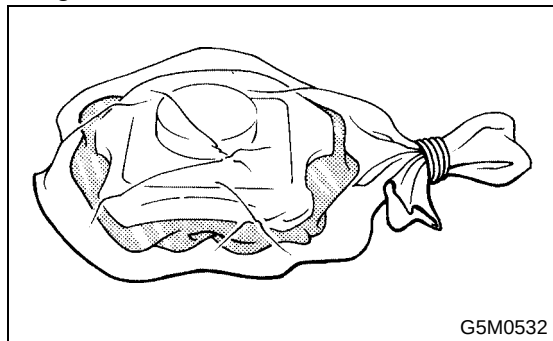


CAUTION:

- 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, Driver's Airbag Module.>

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



2. AIRBAG MODULE (PASSENGER)

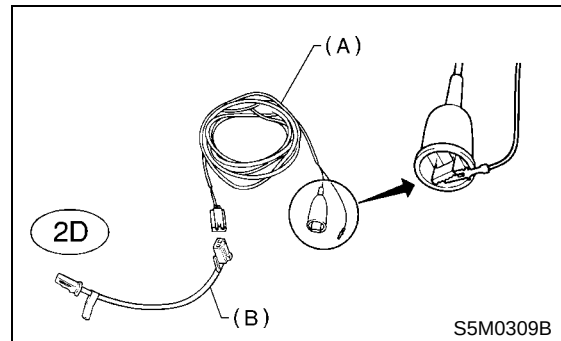
- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Remove the glove box.
- 4) Disconnect airbag connectors (AB9) and (AB10).
- 5) Short terminal to alligator clip furnished as deployment tool (A).
- 6) Connect the deployment tool and adapter A (deployment) (B).

Deployment tool: (Part No. 98299PA030)

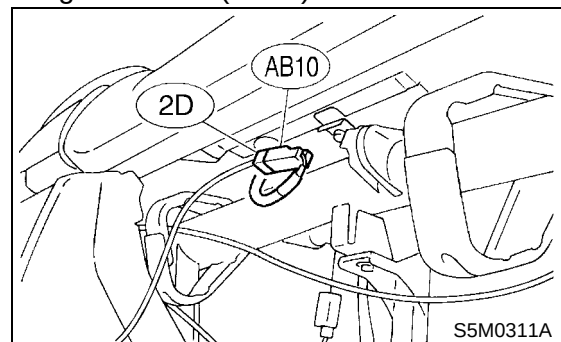
Adapter A (deployment): (Part No. 98299FC030)

CAUTION:

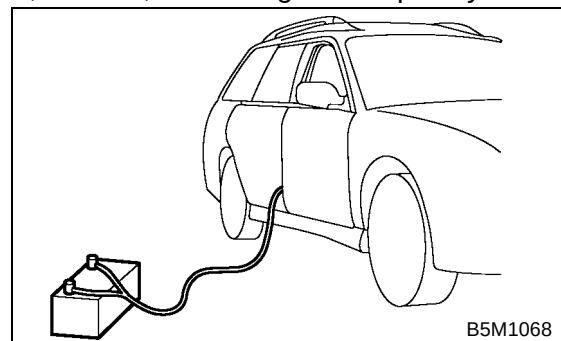
The deployment tool should be kept shorted until just before deployment of the airbag module.



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.

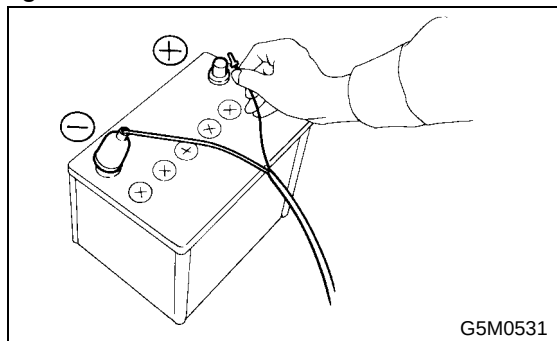


9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

10) Connect the other terminal of the deployment tool to the battery plus terminal. Then, deploy the airbag module.

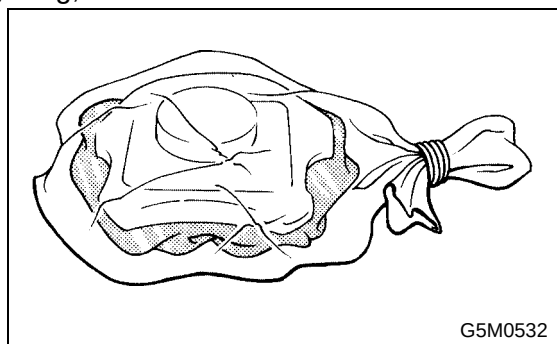


CAUTION:

- 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-14, Passenger's Airbag Module.>

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



3. AIRBAG MODULE (SIDE)

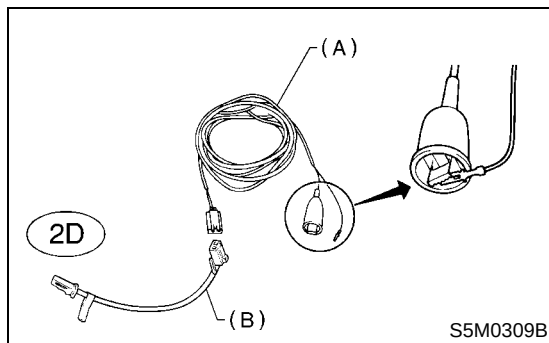
- 1) Turn ignition switch OFF.
- 2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
- 3) Disconnect the side airbag module connector (yellow) under the front seat cushion.
- 4) Adjust both the front seat and front seat backrest to center positions.
- 5) Short terminal to alligator clip furnished as deployment tool (A).
- 6) Connect the deployment tool and adapter A (deployment) (B).

Deployment tool: (Part No. 98299PA030)

Adapter A (deployment): (Part No. 98299FC030)

CAUTION:

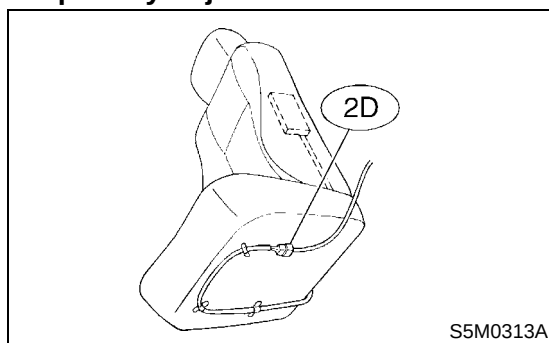
The deployment tool should be kept shorted until just before deployment of the airbag module.



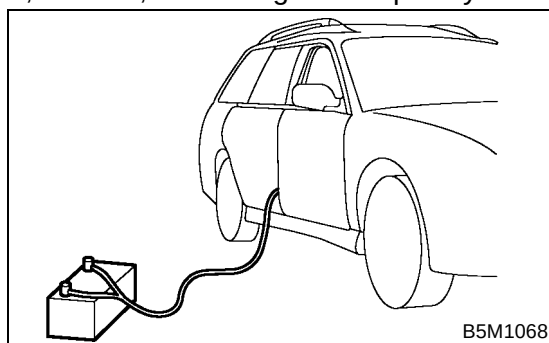
7) Connect adapter A (deployment) connector (2D) to side airbag module connector (yellow).

CAUTION:

Do not put any objects on the front seat.



8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.

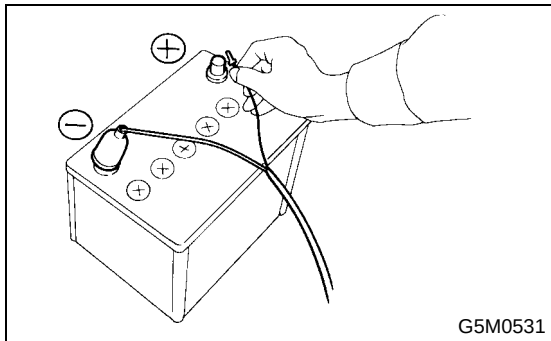


9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery minus terminal.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

10) Connect the other terminal of the deployment tool to the battery plus terminal. Then, deploy the airbag module.

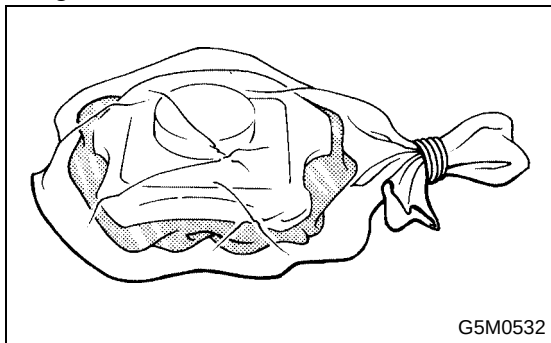


CAUTION:

- 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.

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

12. Disposal of Airbag Module (Deploying After Removal from Vehicle)

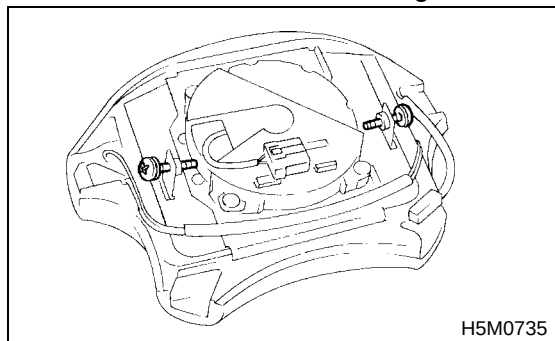
A: OPERATION

CAUTION:

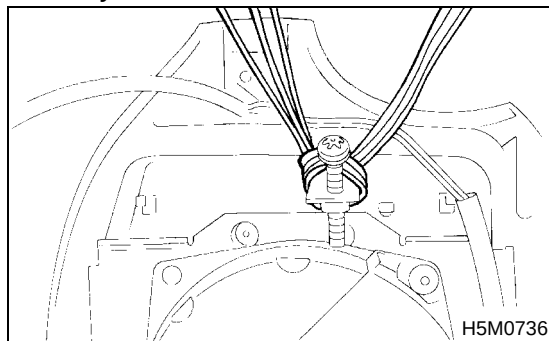
- Do not discard undeployed airbag module because it may cause serious personal injury when accidentally deployed.
- As a rule, the airbag module should be deployed while still installed in the vehicle. Do not remove it unless necessary.
- Deployment of the airbag module should be done on a flat place free from any possible danger. Avoid deploying outdoors during rainy or windy weather.
- Do not damage the airbag module or drop it.
- 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, 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.



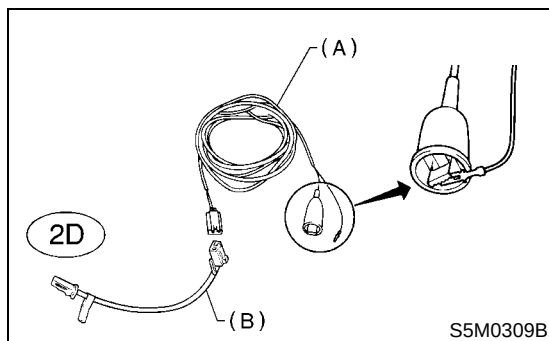
- 6) Short terminal to alligator clip furnished as deployment tool (A).
- 7) Connect the deployment tool and adapter A (deployment) (B).

Deployment tool: (Part No. 98299PA030)

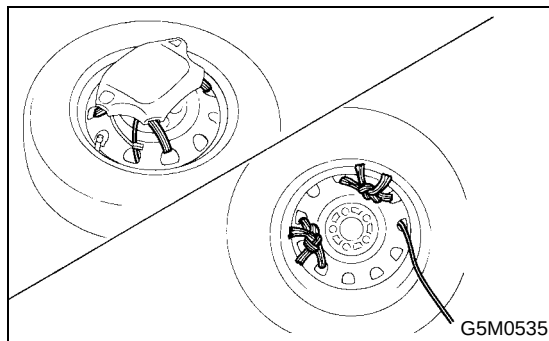
Adapter A (deployment): (Part No. 98299FC030)

CAUTION:

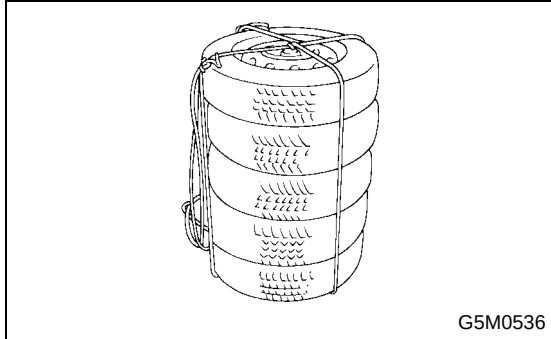
The deployment tool should be kept shorted until just before deployment of the airbag module.



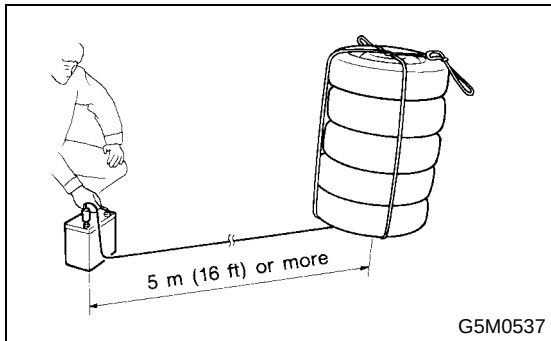
- 8) Connect adapter A (deployment) connector (2D) to airbag module.
- 9) Install airbag module with pad side facing upward on the wheel with the tire.



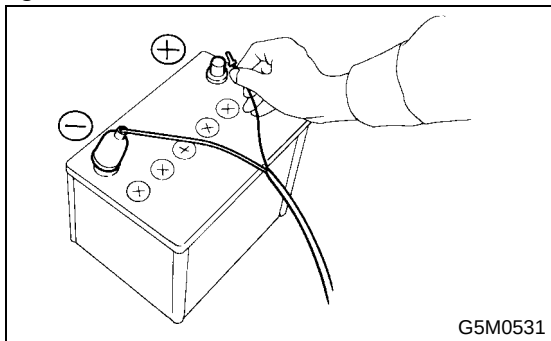
10) Put three tires without the wheel on the tire installed with the airbag module. Put on an additional tire with the wheel, and then fasten them tight with rope.



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.



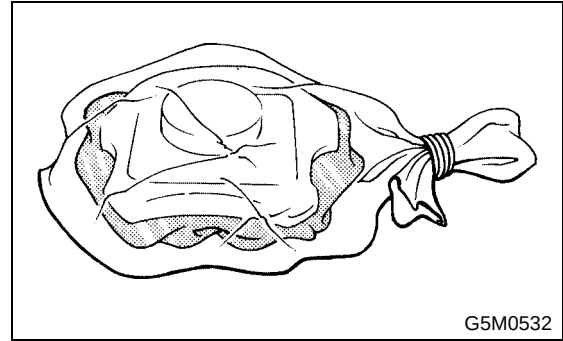
12) Connect the other terminal of the deployment tool to the battery plus terminal. Then, deploy the airbag module.



CAUTION:

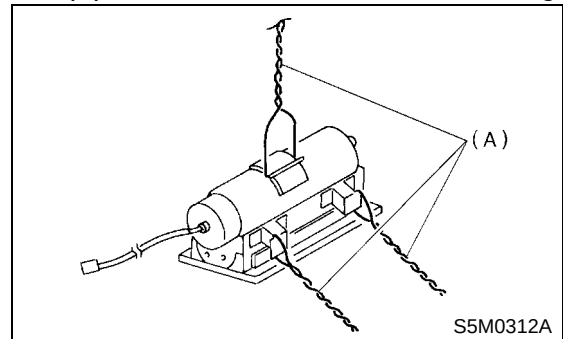
- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

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-14, 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.



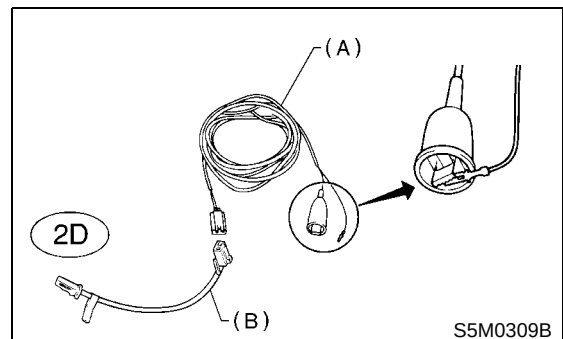
- 5) Short terminal to alligator clip furnished as deployment tool (A).
- 6) Connect the deployment tool and adapter A (deployment) (B).

Deployment tool: (Part No. 98299PA030)

Adapter A (deployment): (Part No. 98299FC030)

CAUTION:

The deployment tool should be kept shorted until just before deployment of the airbag module.

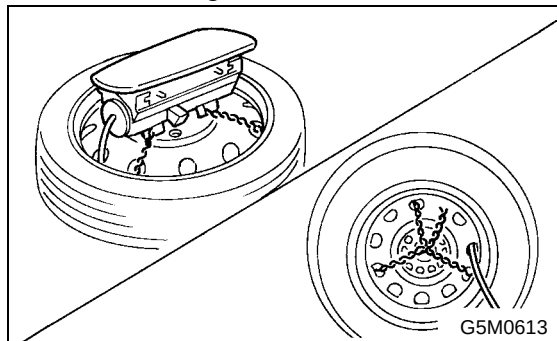


DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

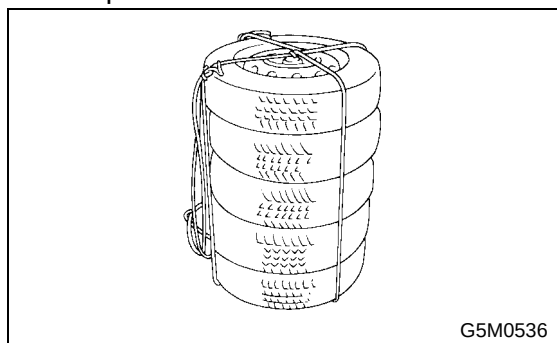
AIRBAG SYSTEM

7) Connect adapter A (deployment) connector (2D) to airbag module.

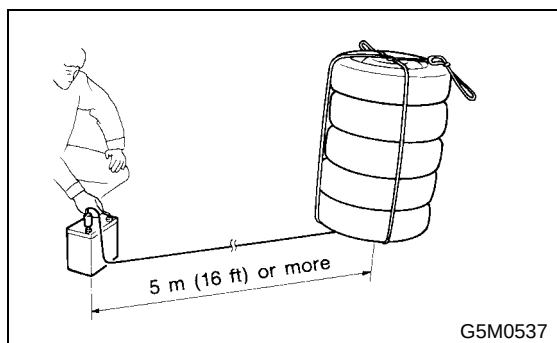
8) Install airbag module with pad side facing upward on 14 inch or greater size wheel with the tire.



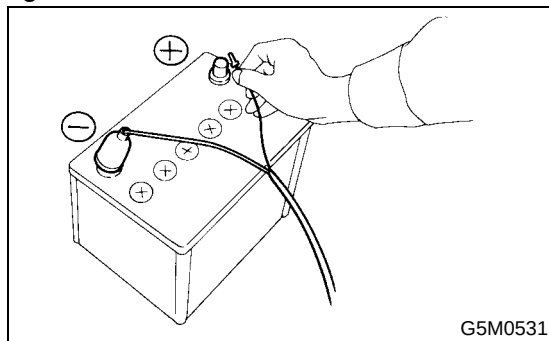
9) Put three tires without the wheel on the tire installed with the airbag module. Put on an additional tire with the wheel on top, and then fasten them tight with rope.



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.



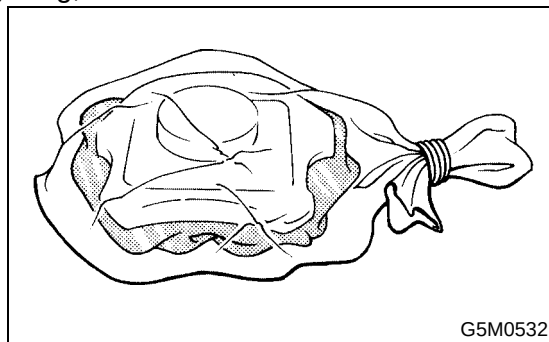
11) Connect the other terminal of the deployment tool to the battery plus terminal. Then, deploy the airbag module.



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.



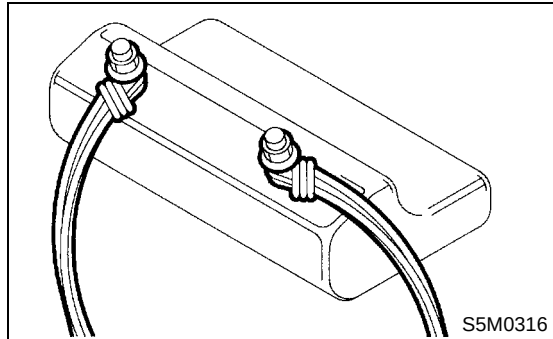
3. AIRBAG MODULE (SIDE)

- 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-6, REMOVAL, Front Seat.>
- 4) Remove side airbag module. <Ref. to SE-6, DISASSEMBLY, Front Seat.>
- 5) Install nuts to side airbag module.

DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

6) Bundle three wire automotive harnesses [each with a sectional area of 1.25 mm^2 (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 (A).

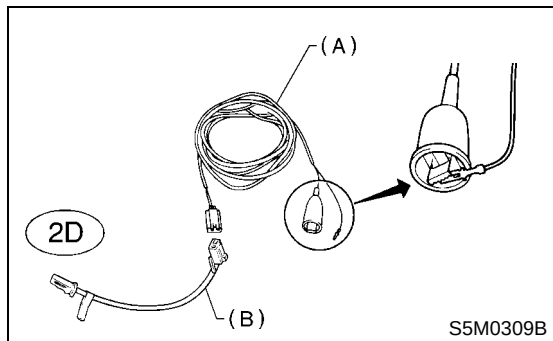
8) Connect the deployment tool and adapter A (deployment) (B).

Deployment tool: (Part No. 98299PA030)

Adapter A (deployment): (Part No. 98299FC030)

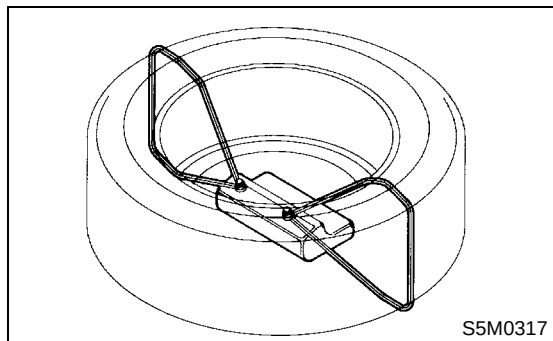
CAUTION:

The deployment tool should be kept shorted until just before deployment of the airbag module.

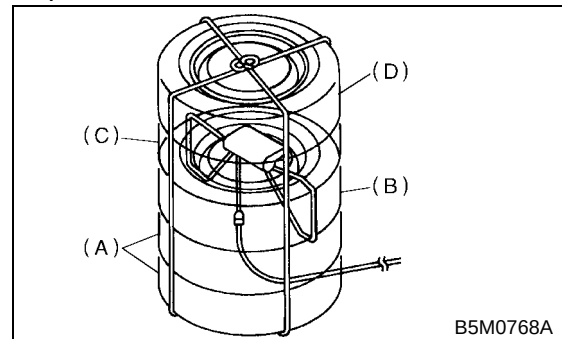


9) Connect adapter A (deployment) connector (2D) to airbag module.

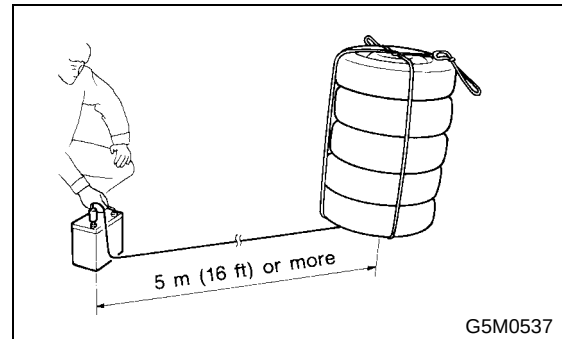
10) Install side airbag module on 14 inch or greater size tire without disk wheel.



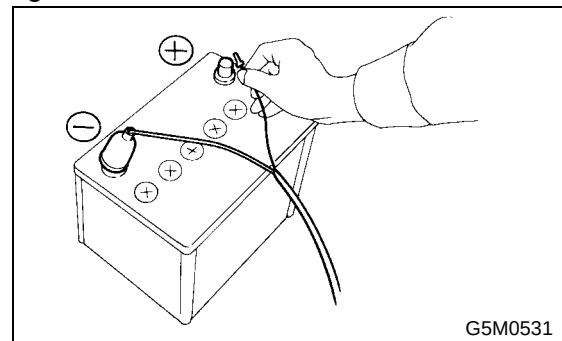
Put two tires without the wheel (A) under the tire installed with the side airbag module (B). Put on an additional tire without disk wheel (C), and then put a tire with the wheel (D) on top. Fasten them tight with rope.



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.



12) Connect the other terminal of the deployment tool to the battery plus terminal. Then, deploy the airbag module.



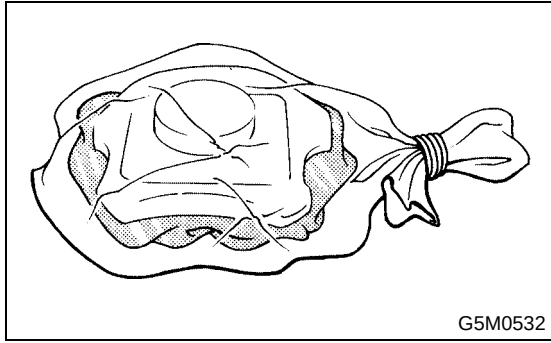
CAUTION:

- 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.

DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

13) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



G5M0532

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

AIRBAG SYSTEM (DIAGNOSTICS)

AB

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4. Electrical Components Location.....	17
5. A/B Control Module I/O Signal	19
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9. Inspection Mode.....	30
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BASIC DIAGNOSTIC PROCEDURE

AIRBAG SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	Read Diagnostic Trouble Code. <Ref. to AB-29, Read Diagnostic Trouble Code.>	Is the normal code being detected?	Finish the diagnosis.	Go to step 2.
2	Read Diagnostic Trouble Code. <Ref. to AB-29, Read Diagnostic Trouble Code.>	Is the trouble code being detected?	Go to step 3.	Go to "Airbag Warning Light Failure".<Ref. to AB-33, Airbag Warning Light Failure.>
3	Perform the diagnosis. 1) Judge the possible cause from "List of Diagnostic Trouble Code" <Ref. to AB-38, List of Diagnostic Trouble Code.> . 2) Inspect using "Diagnostic Chart with Trouble Code". (DTC) 3) Repair the cause of the trouble. 4) Perform the clear memory mode. <Ref. to AB-31, Clear Memory Mode.> 5) Perform the inspection mode. <Ref. to AB-30, Inspection Mode.> 6) Read diagnostic trouble code.	Is the trouble code 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	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other:		
Temperature	°C (°F)		
Road Condition	☐ Level road ☐ Uphill ☐ Downhill ☐ Rough road ☐ Others:		
Vehicle Operation	☐ Starting ☐ Idling ☐ Driving (☐ Constant Speed ☐ Acceleration ☐ Deceleration) ☐ Steering wheel turn ☐ Other:		
Details of Problem			
Check Airbag Warning Light	☐ Remains ON ☐ Remains OFF		
Check DTC	☐ Normal Code ☐ Trouble Code: (Code:)		

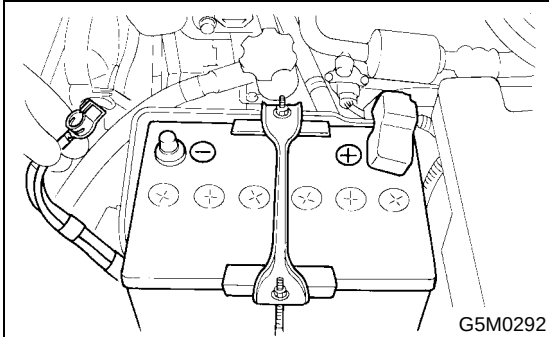
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

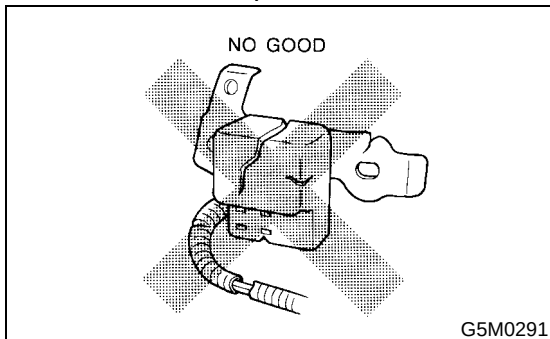
3. General Description

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.

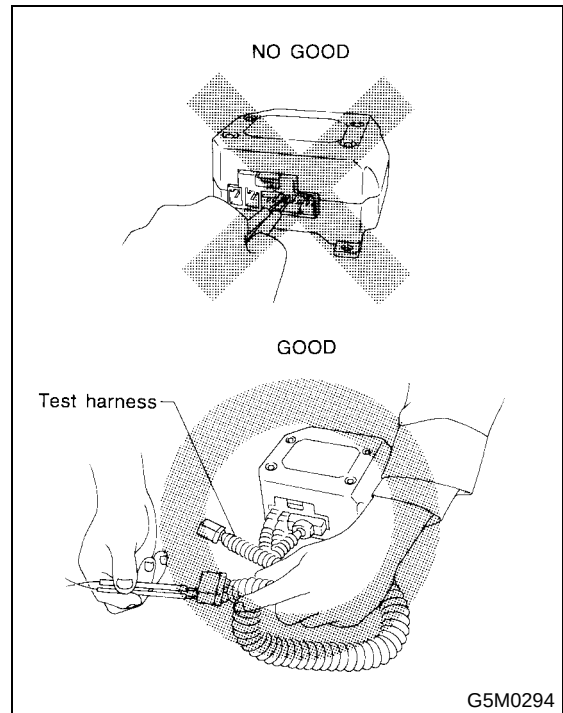
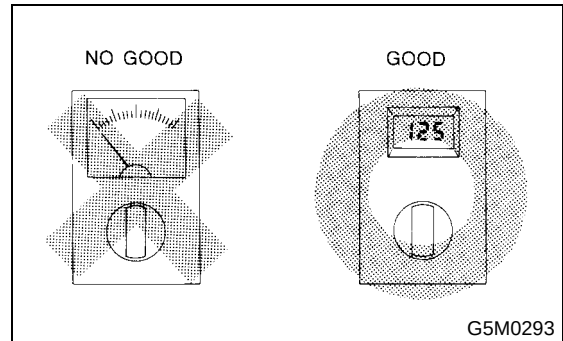


- If sensors, airbag module, airbag control module pretensioner, and harness are deformed or damaged, replace them with new genuine parts.
- Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.



- 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.

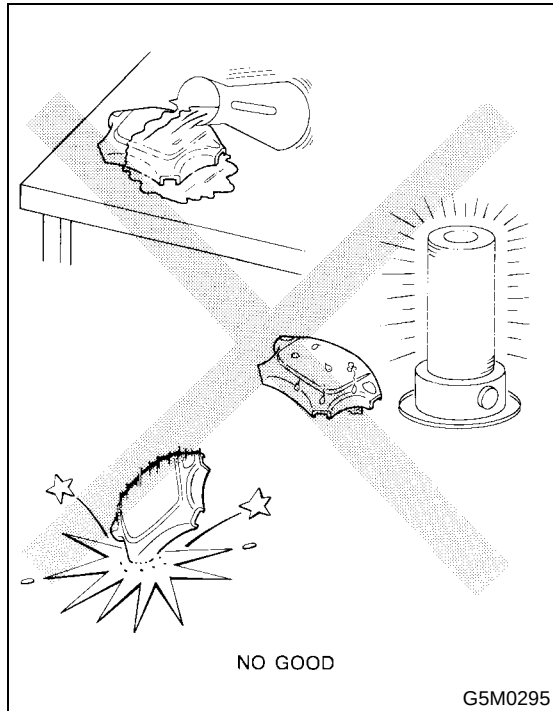
- When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.



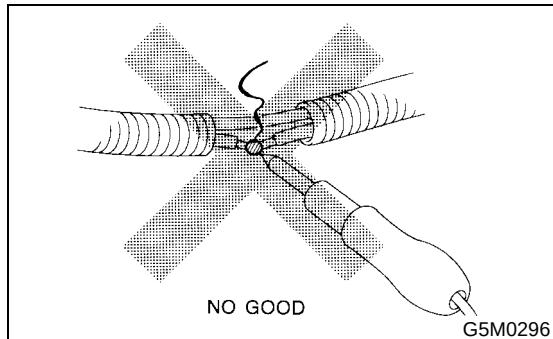
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

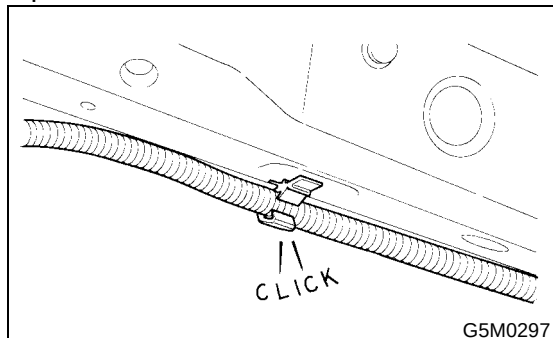
- Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



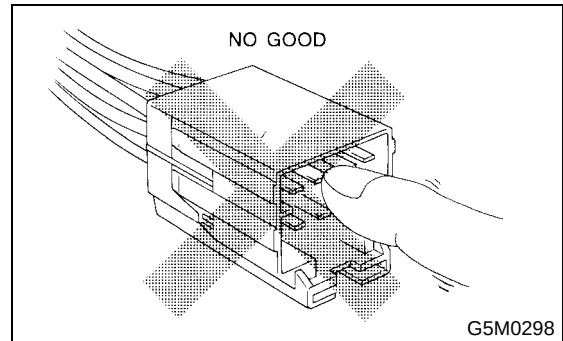
- If any damage, opening or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



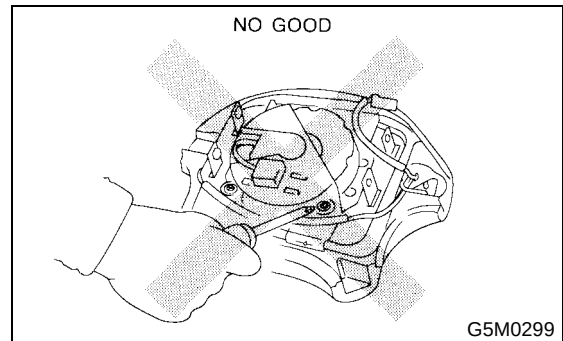
- Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



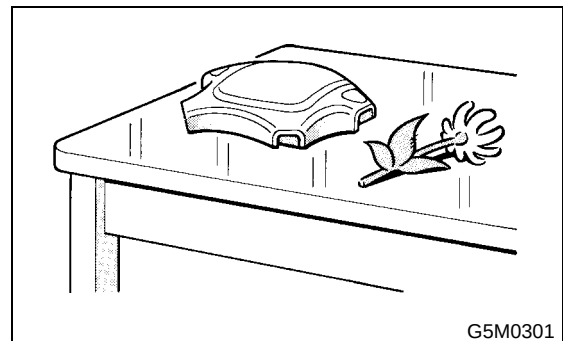
- Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



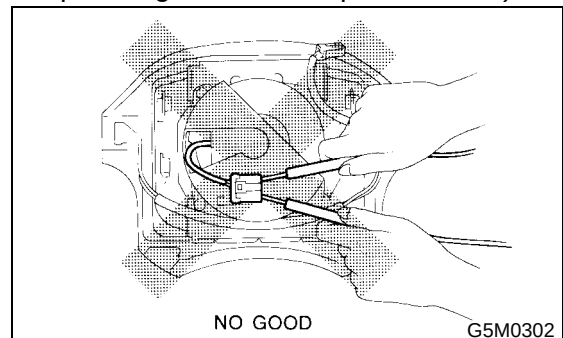
- The airbag module (driver, passenger, and side, pretensioner) must not be disassembled.
- The airbag module cannot be used again once inflated.



- 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.



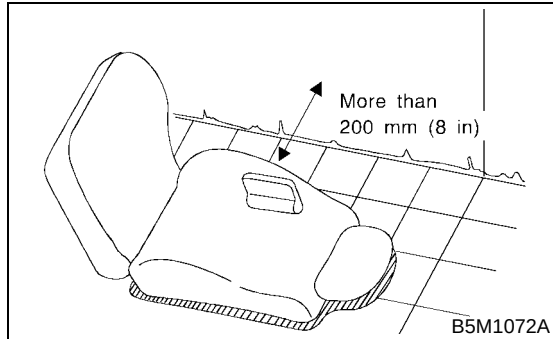
- Do not check continuity of the airbag module (driver, passenger, and side, pretensioner).



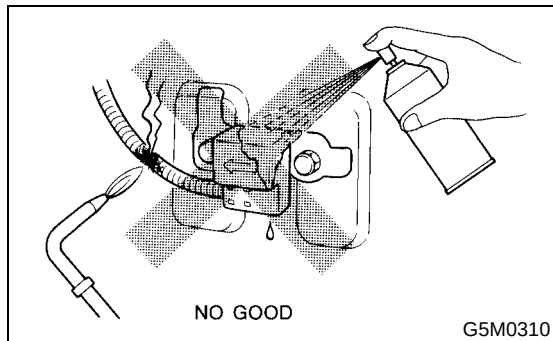
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

- The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



- 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.



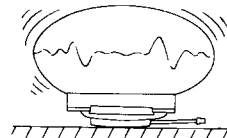
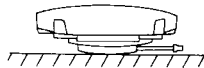
- When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.

GENERAL DESCRIPTION

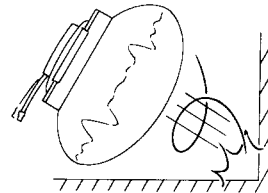
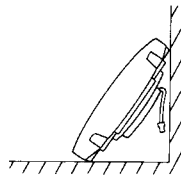
AIRBAG SYSTEM (DIAGNOSTICS)

Driver side

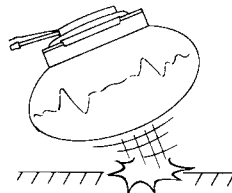
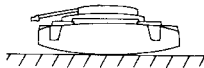
GOOD



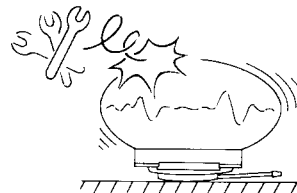
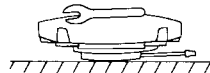
NO GOOD



NO GOOD

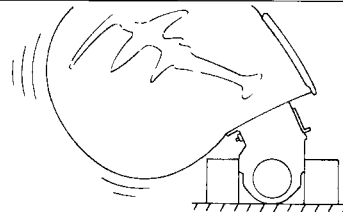
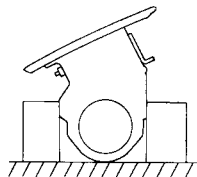


NO GOOD

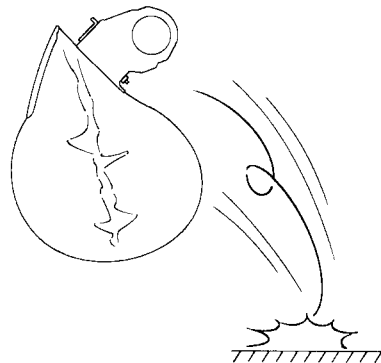
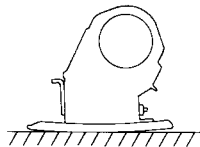


Passenger side

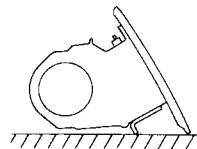
GOOD



NO GOOD



NO GOOD



G5M0604

GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

- 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.

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: 12V

Specific gravity: Above 1.260

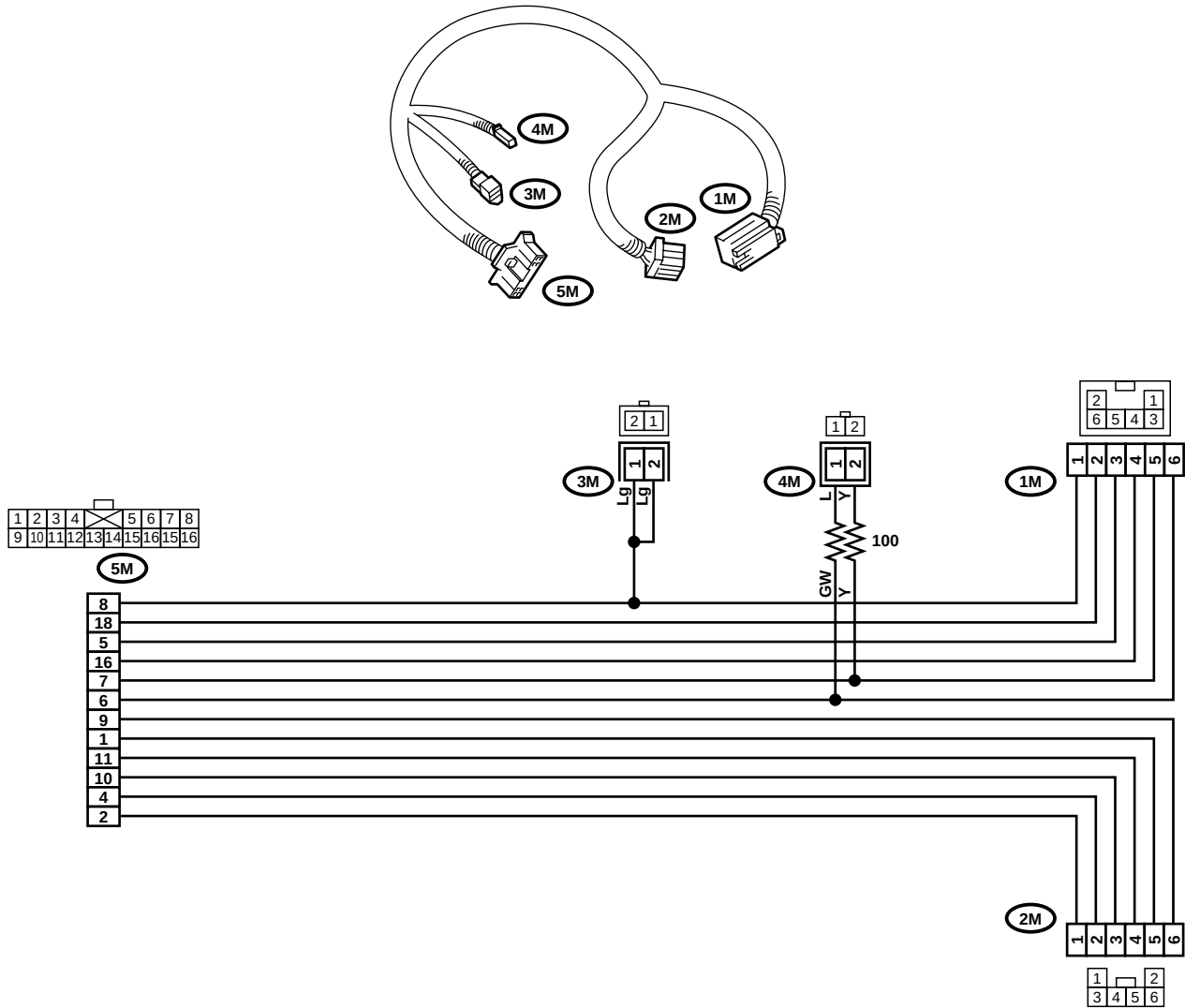
C: PREPARATION TOOL

CAUTION:

Be sure to use specified test harness M, F, G, H, L and I or I2 when measuring voltage, resistance, etc. of AIRBAG system component parts.

1. TEST HARNESS M

PN 98299FE020

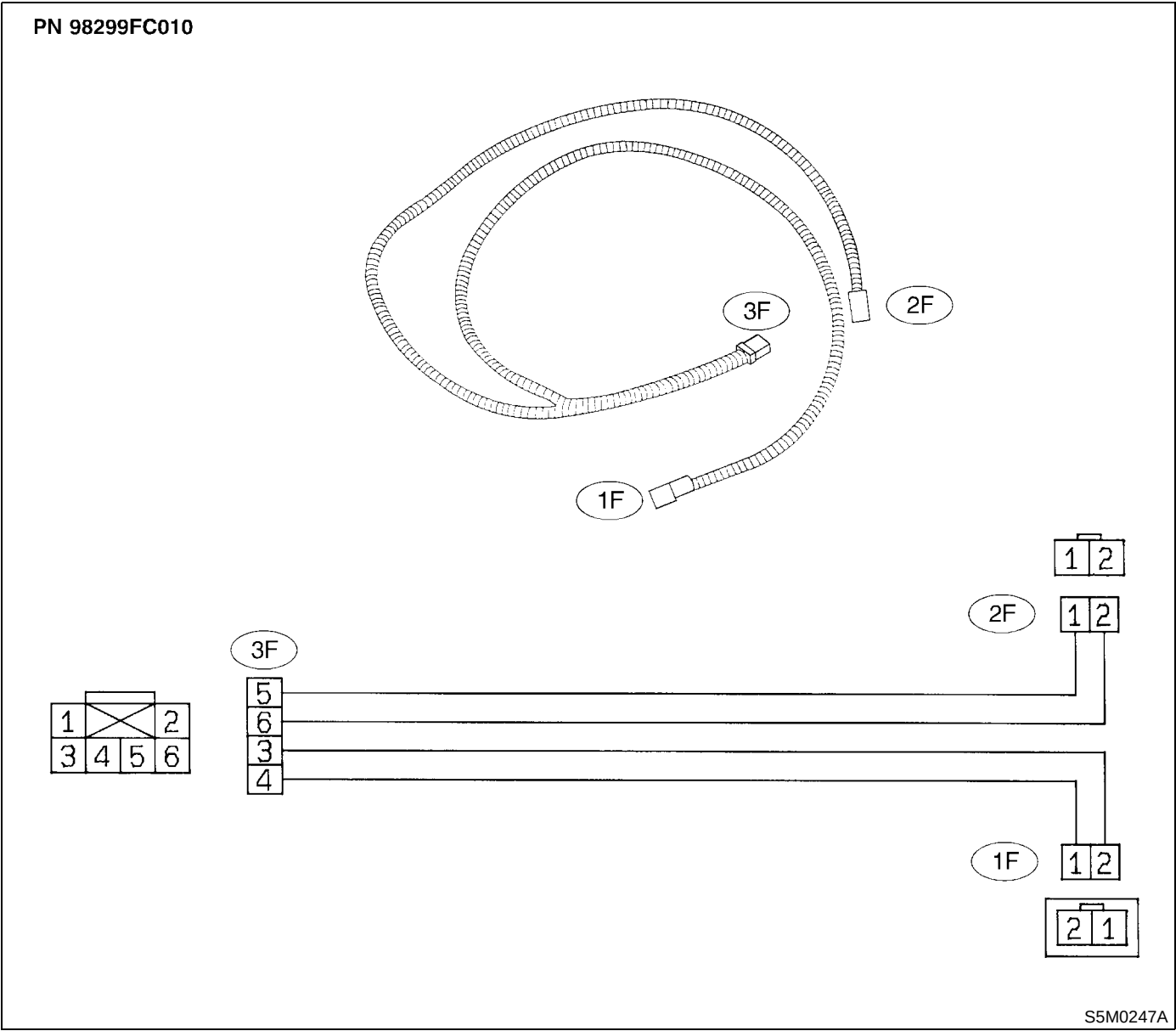


RE0021

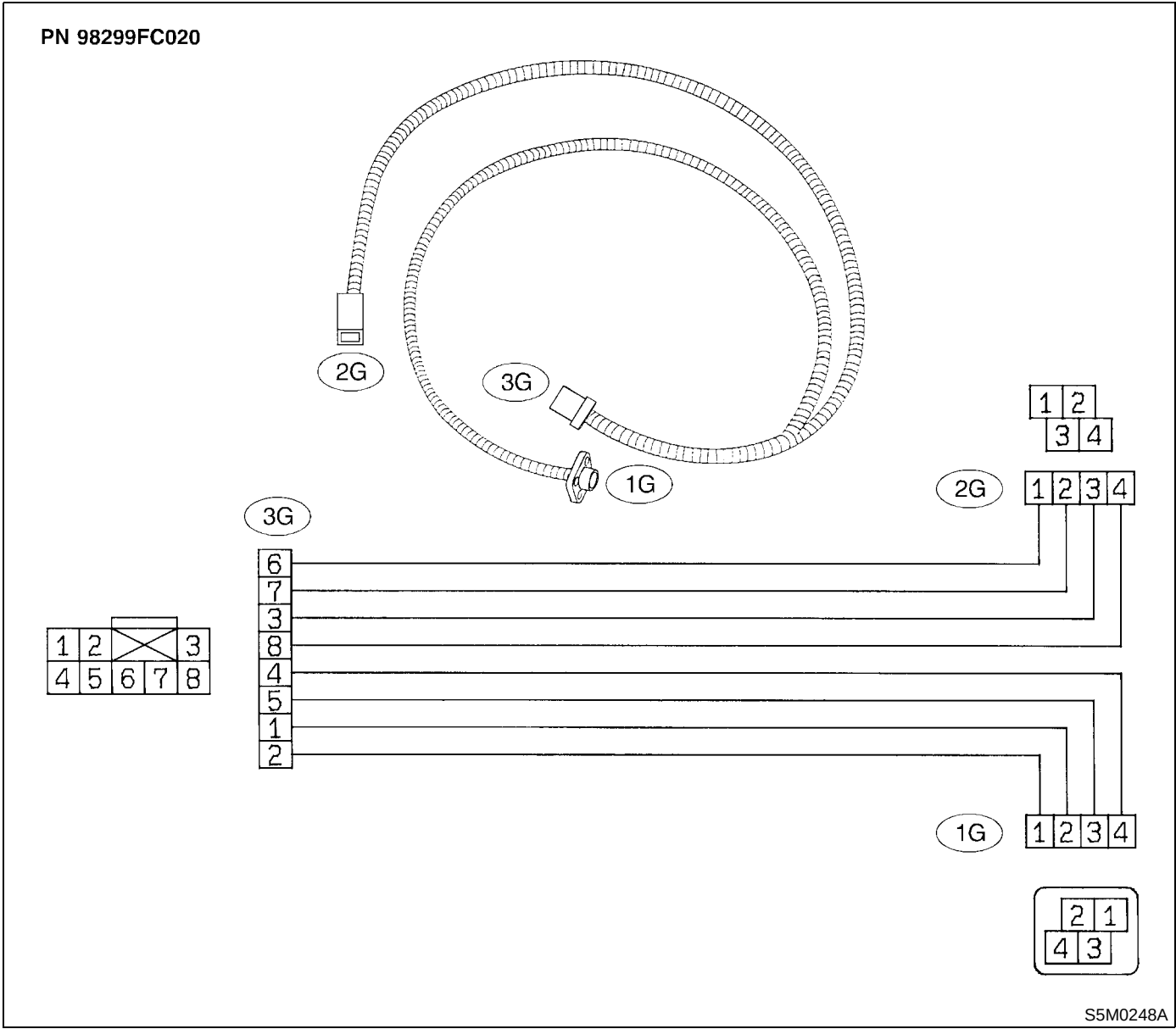
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

2. TEST HARNESS F



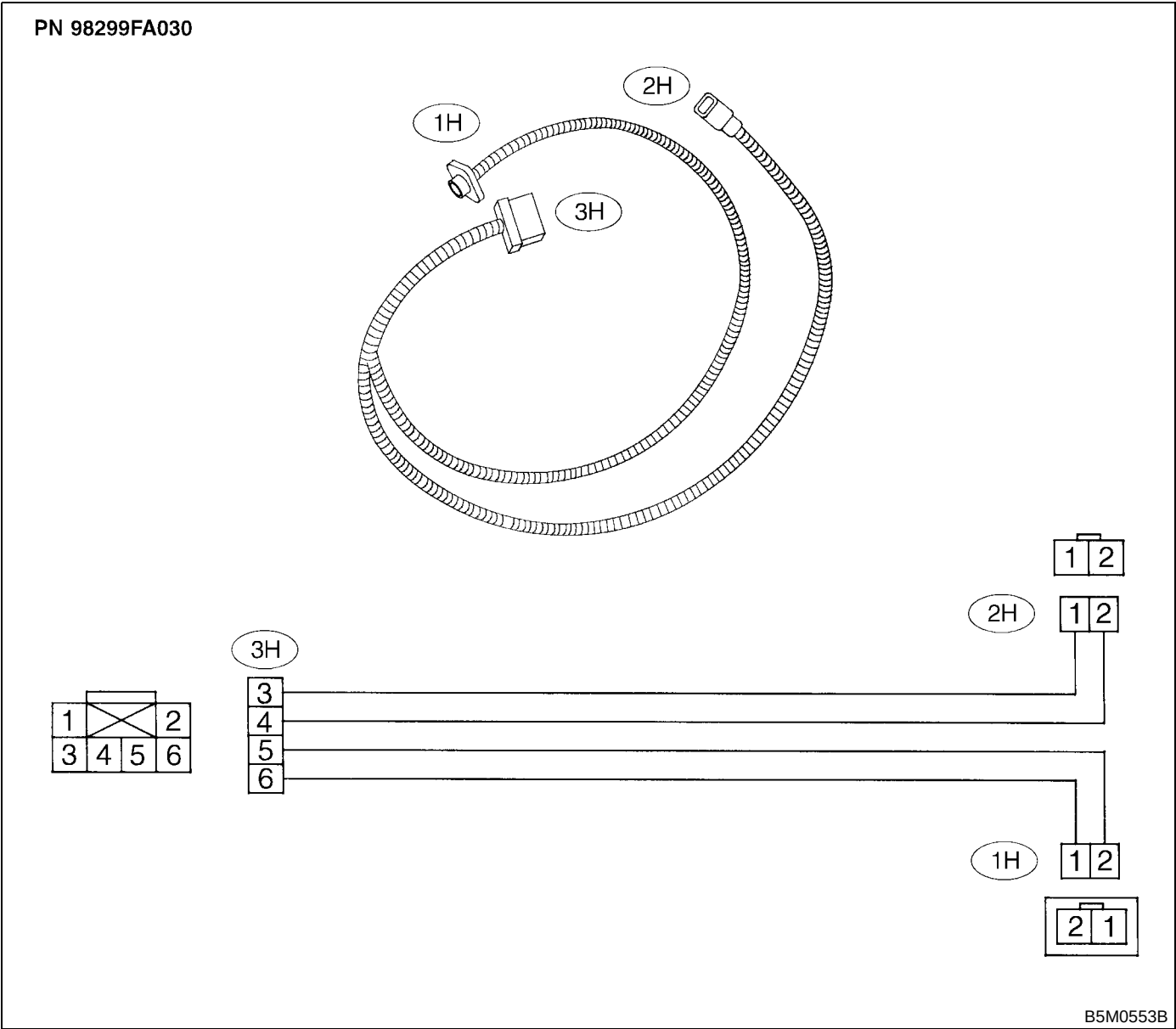
3. TEST HARNESS G



GENERAL DESCRIPTION

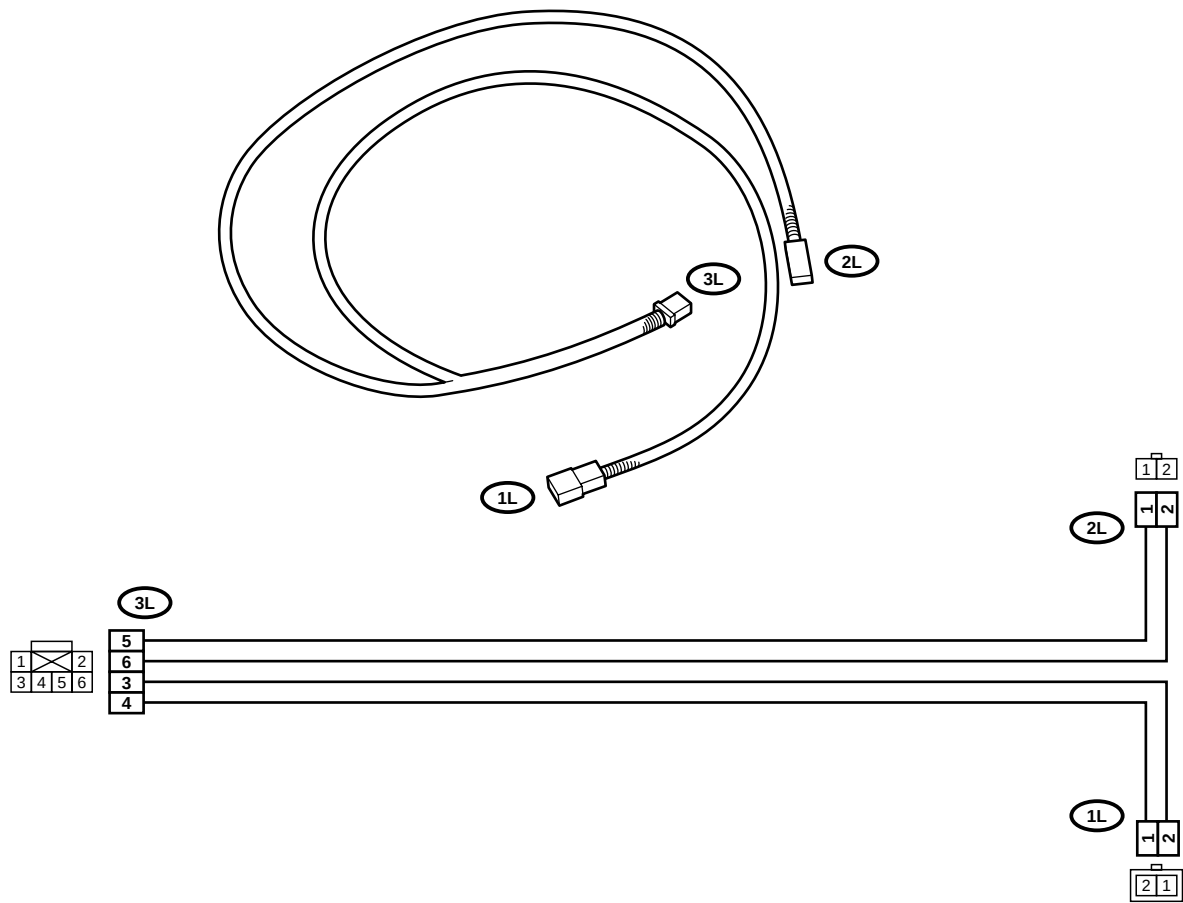
AIRBAG SYSTEM (DIAGNOSTICS)

4. TEST HARNESS H



5. TEST HARNESS L

PN 28299FE000



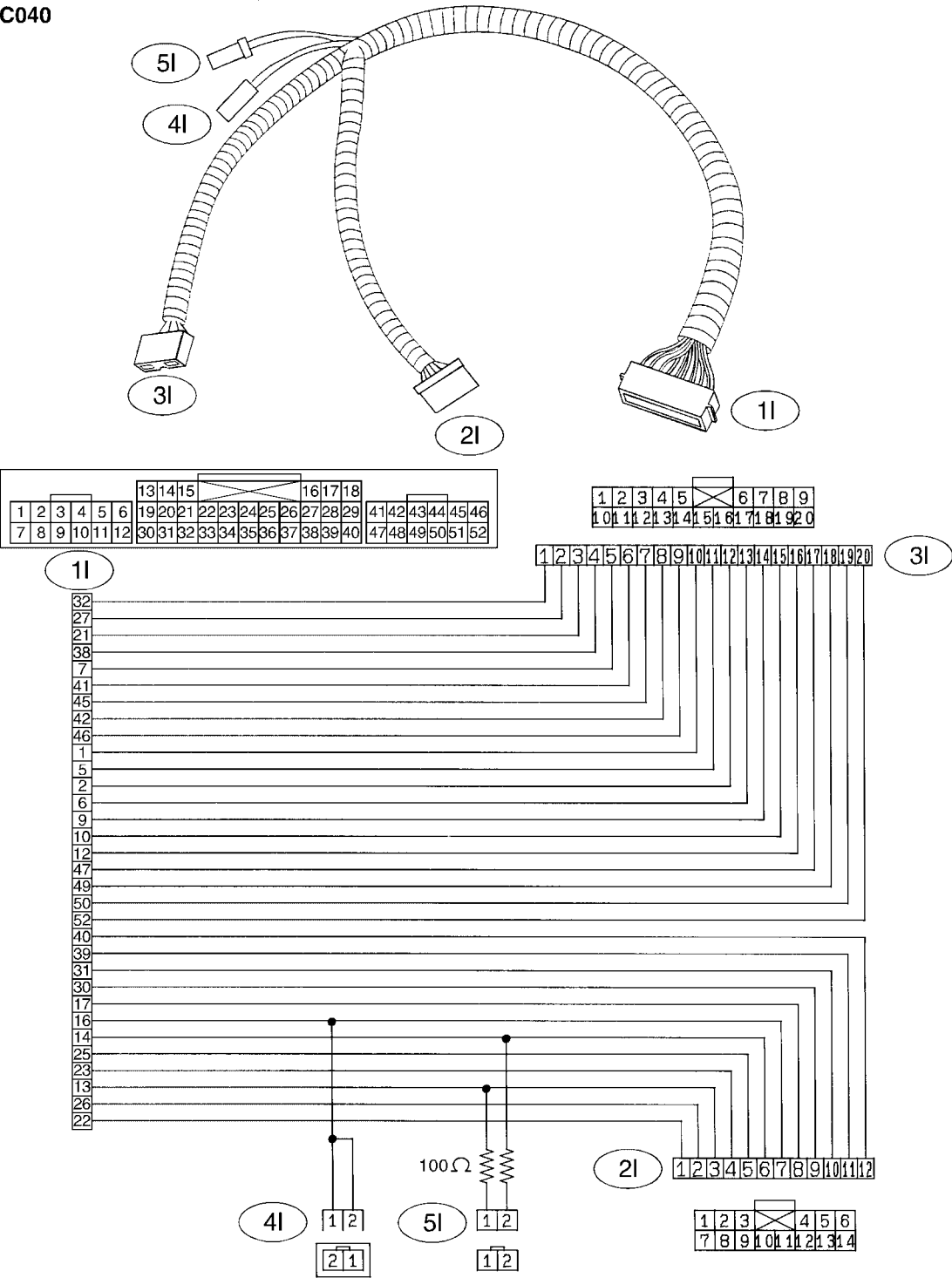
RE0022

GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

6. TEST HARNESS I

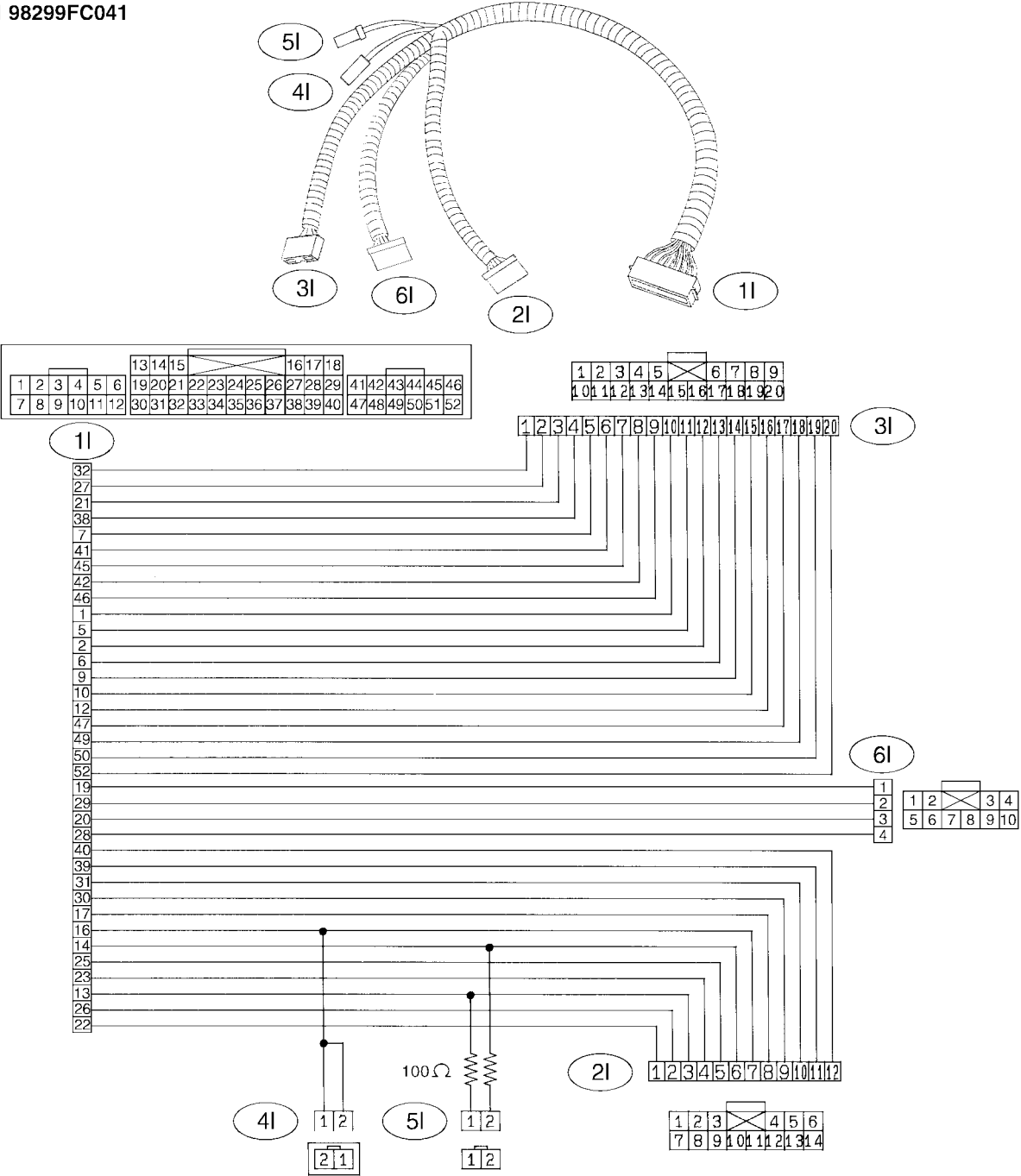
PN 98299FC040



S5M0340A

7. TEST HARNESS I2

PN 98299FC041



B5M0927A

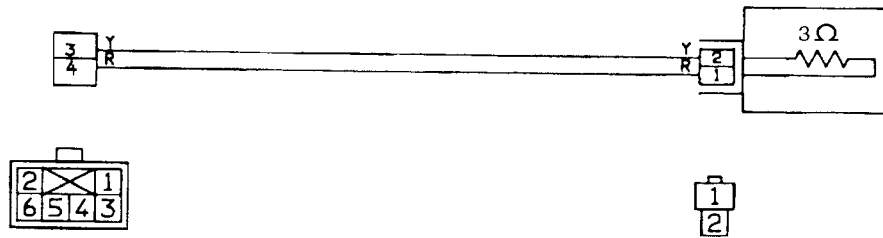
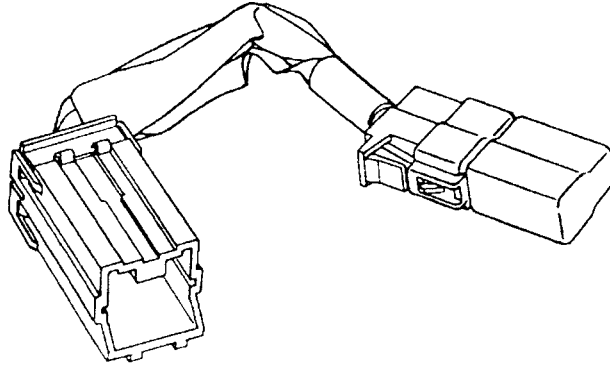
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

8. 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.

PN 98299PA040



B5M0114A

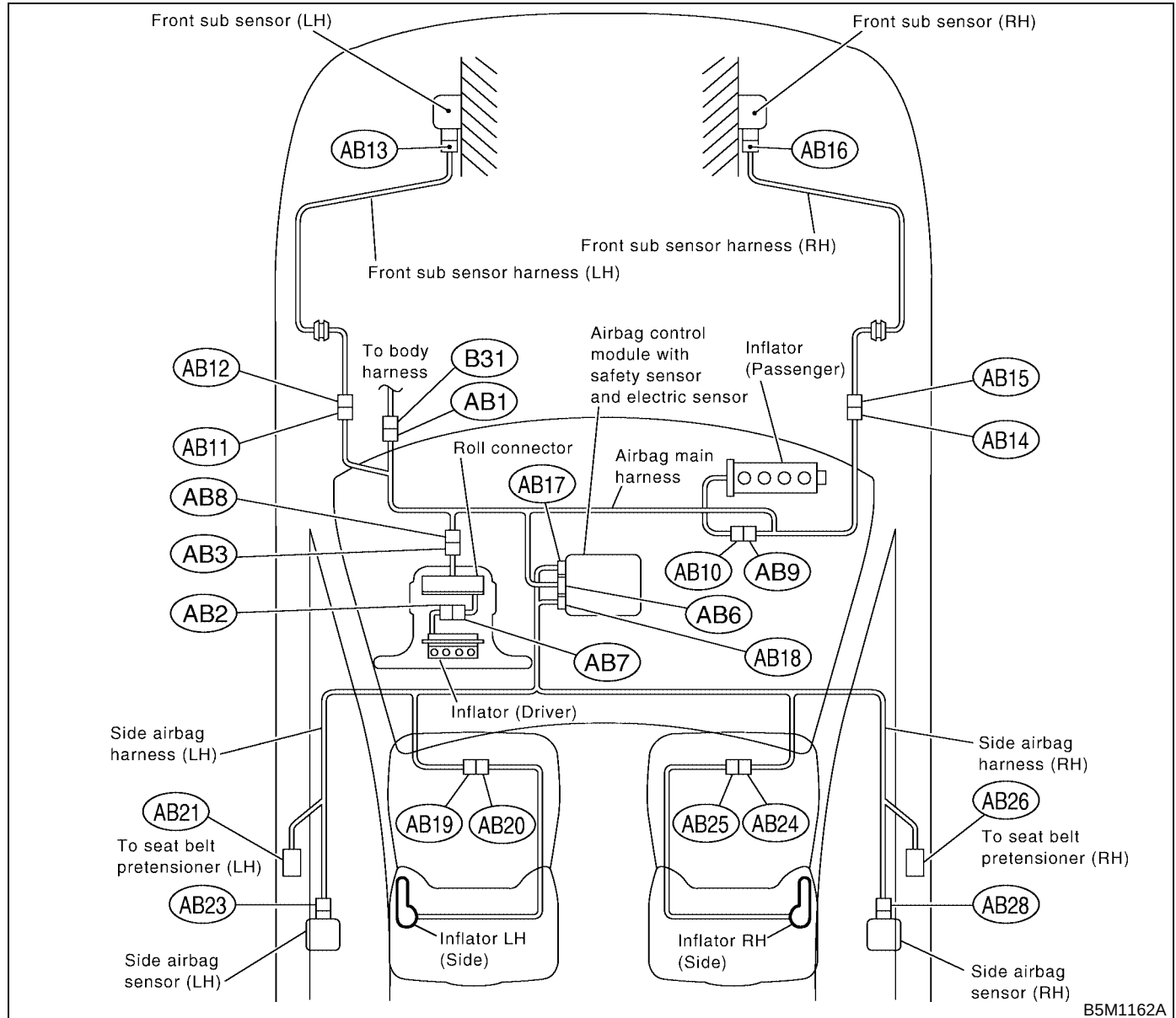
ELECTRICAL COMPONENTS LOCATION

AIRBAG SYSTEM (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

1. LHD MODEL



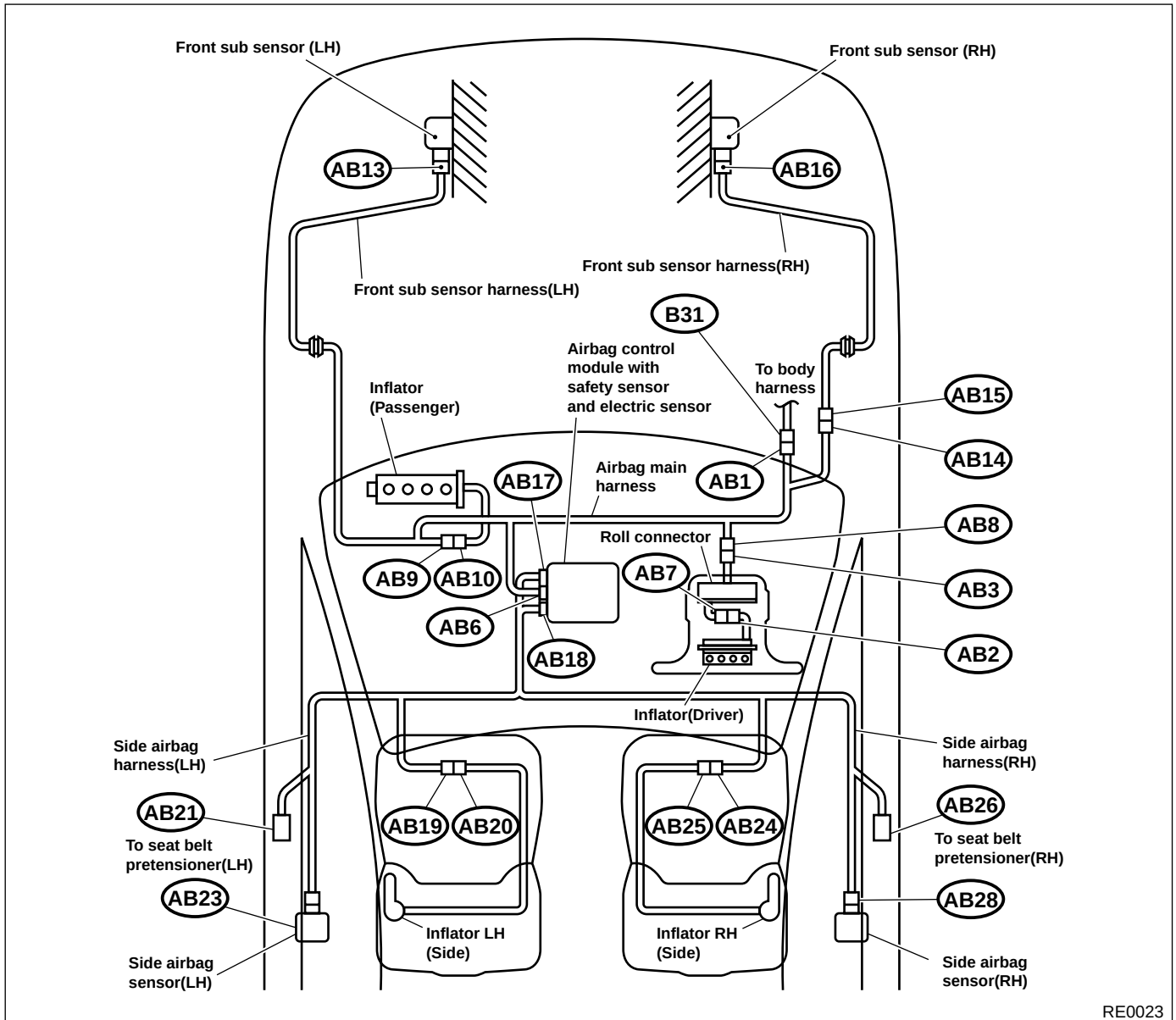
Connector No.	(AB1)	(AB2)	(AB3)	(AB6)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	6	2	2	28	2	2	2	2	2	2	2	2
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Blue	Blue	Yellow	Blue
Male/Female	Male	Male	Male	Female	Female	Female	Female	Male	Male	Female	Female	Male

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



Connector No.	(AB1)	(AB2)	(AB3)	(AB6)	(AB7)	(AB8)	(AB9)	(AB10)	(AB13)	(AB14)		
Pole	6	2	2	28	2	2	2	2	2	2		
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Blue		
Male/Female	Male	Male	Male	Female	Female	Female	Female	Male	Female	Female		
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	Male	Female	Female	Female	Female	Male	Female	Female	Female	Male	Female	Female

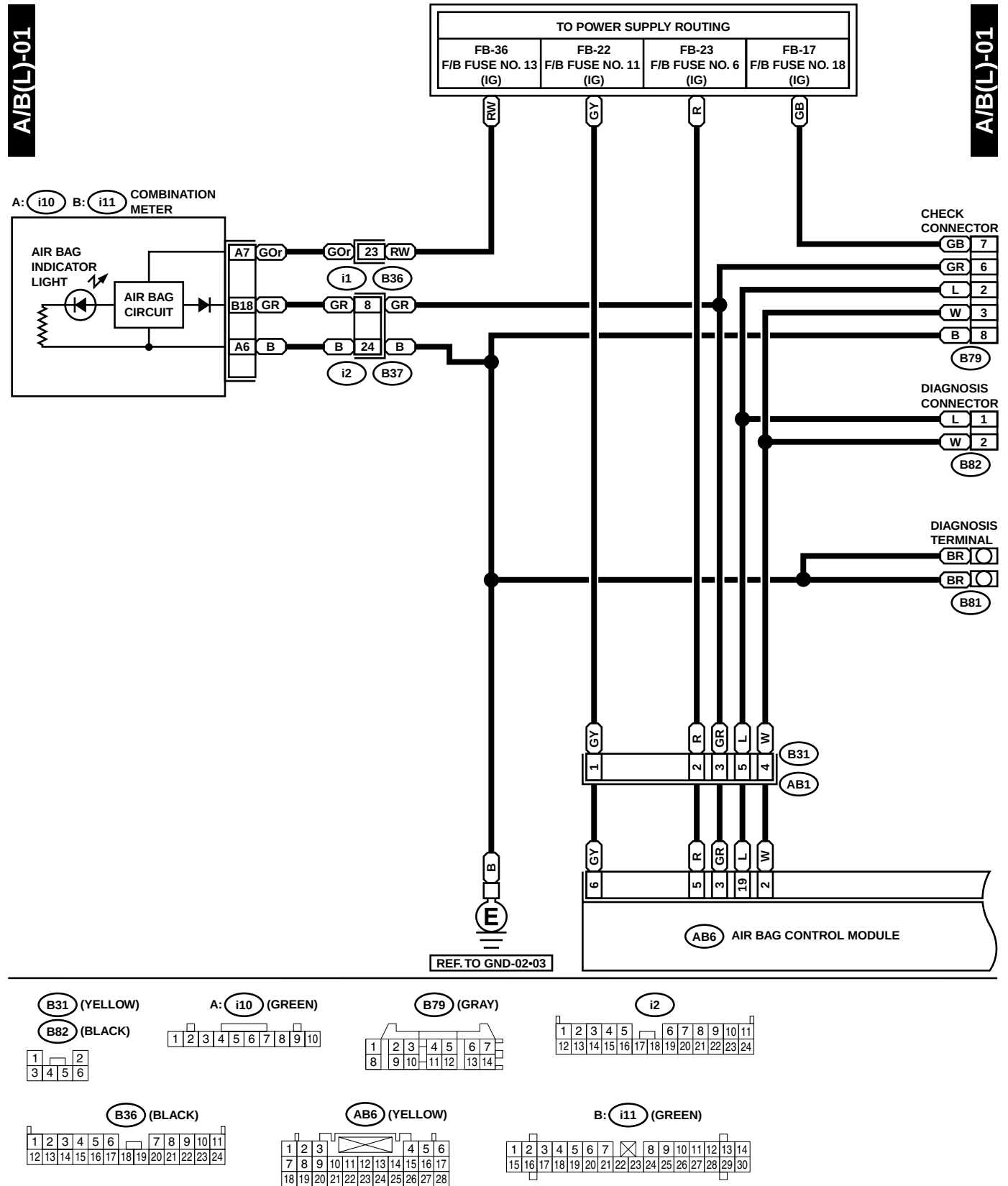
5. A/B Control Module I/O Signal

A: SCHEMATIC

A/B CONTROL MODULE I/O SIGNAL

AIRBAG SYSTEM (DIAGNOSTICS)

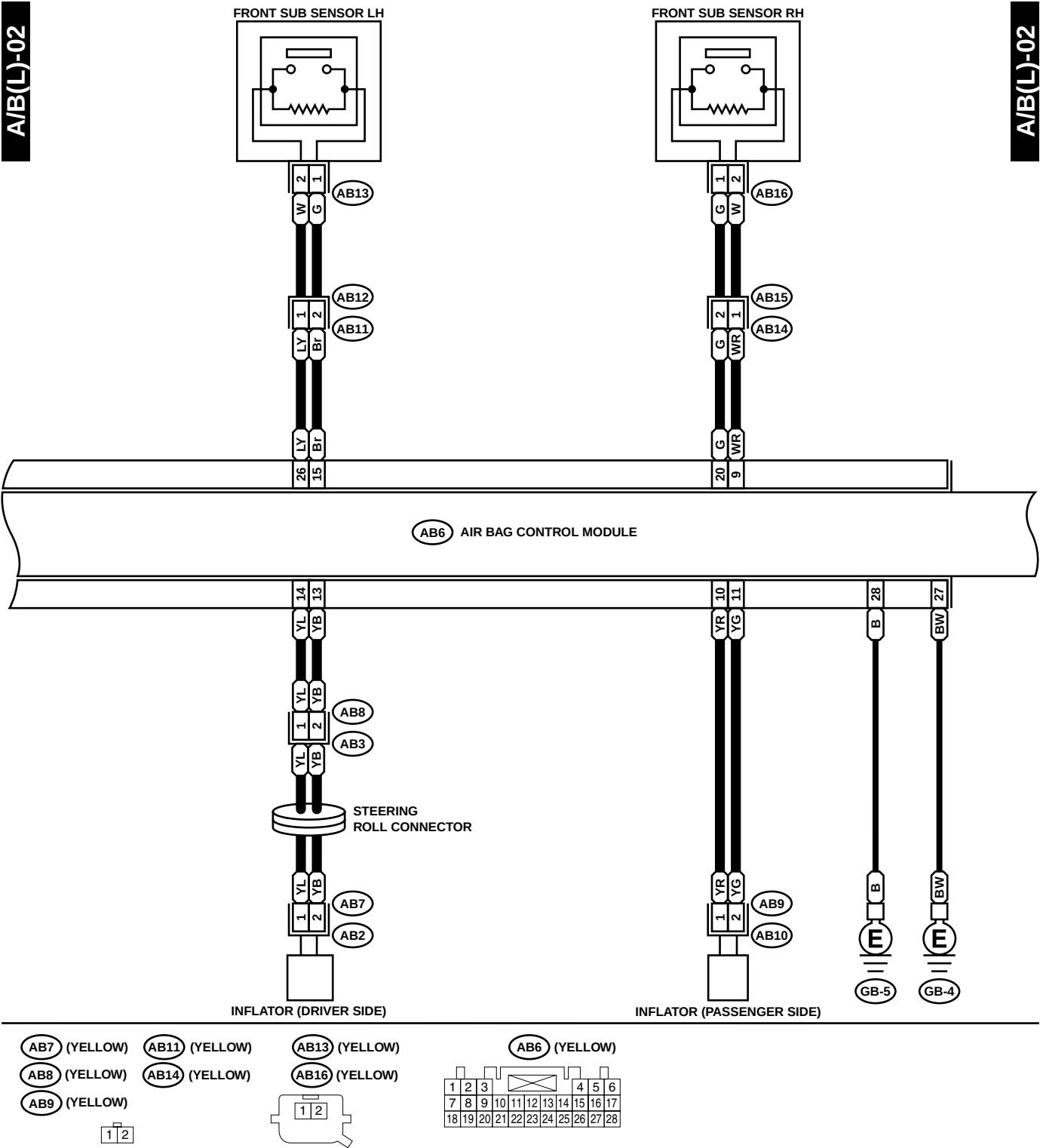
1. AIRBAG LHD MODEL



GL86-20A

A/B CONTROL MODULE I/O SIGNAL

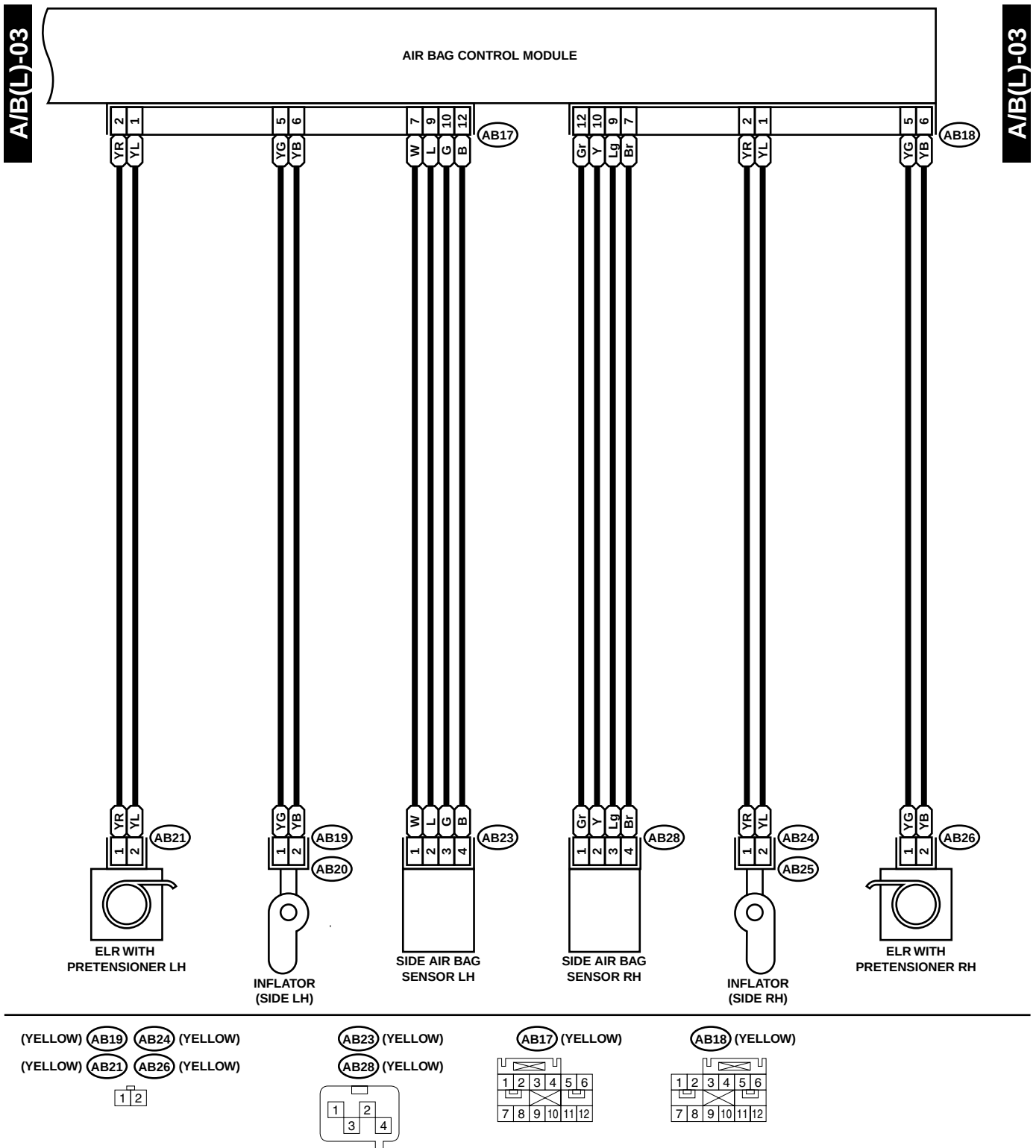
AIRBAG SYSTEM (DIAGNOSTICS)



GL86-20B

A/B CONTROL MODULE I/O SIGNAL

AIRBAG SYSTEM (DIAGNOSTICS)

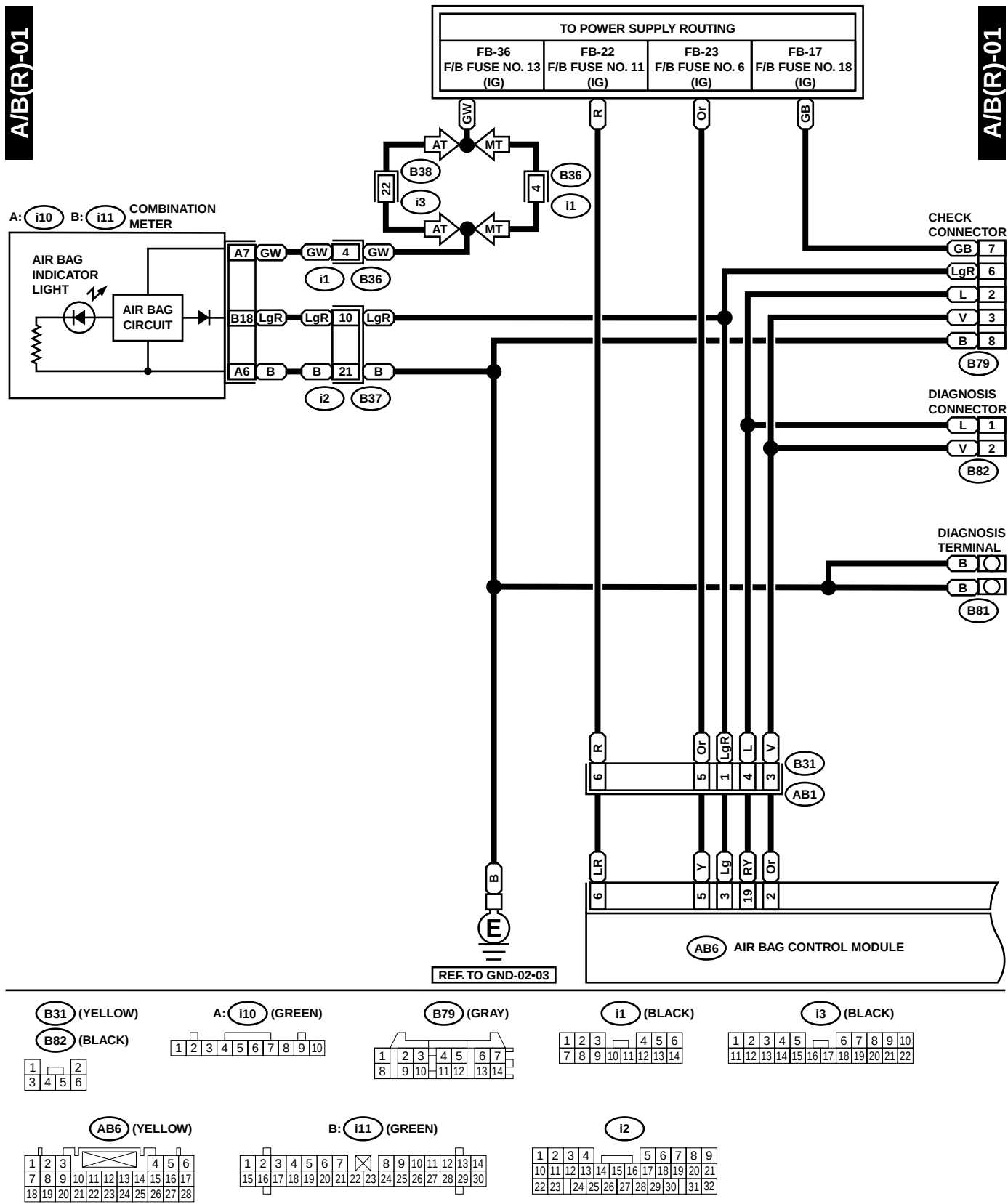


GL86-20C

A/B CONTROL MODULE I/O SIGNAL

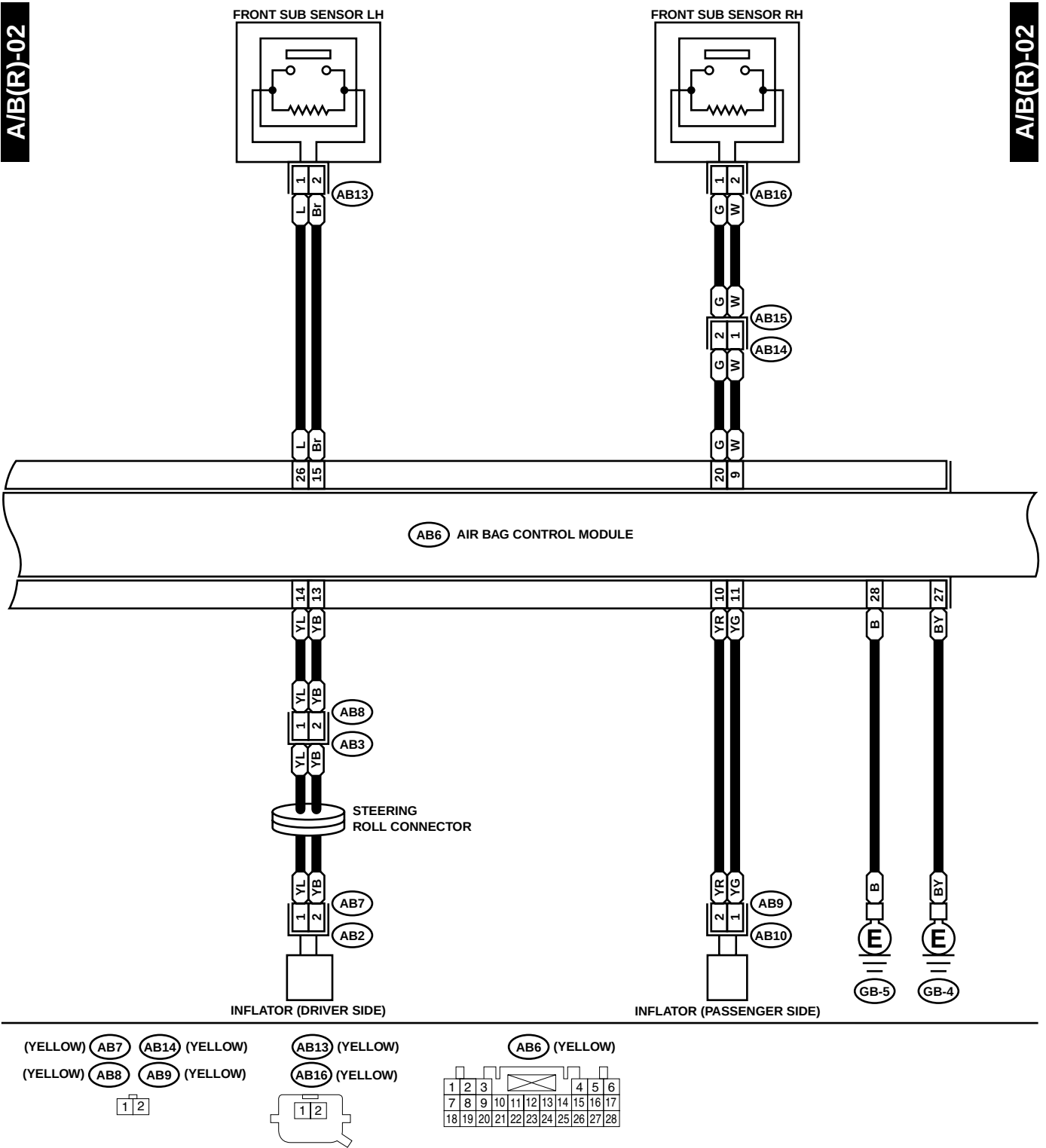
AIRBAG SYSTEM (DIAGNOSTICS)

2. AIRBAG RHD MODEL



A/B CONTROL MODULE I/O SIGNAL

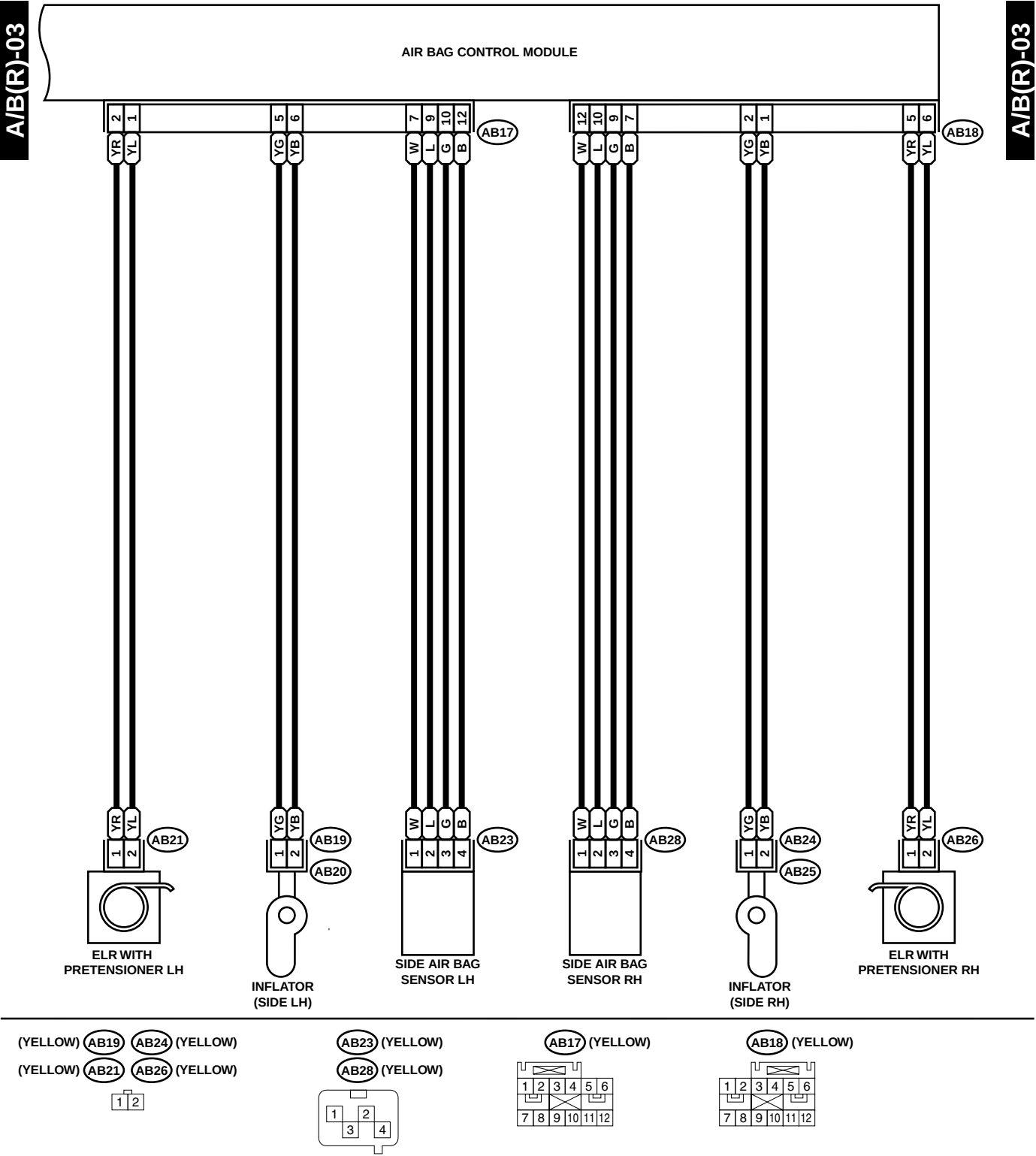
AIRBAG SYSTEM (DIAGNOSTICS)



GR86-20B

A/B CONTROL MODULE I/O SIGNAL

AIRBAG SYSTEM (DIAGNOSTICS)



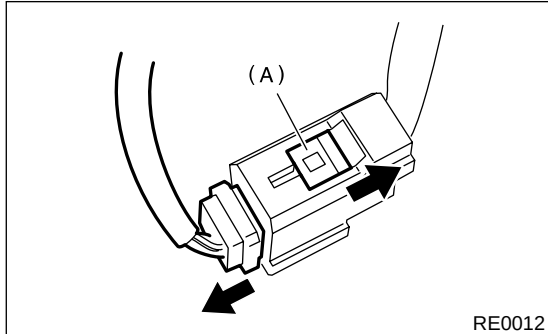
6. Airbag Connector

A: OPERATION

1. POWER SUPPLY

• How to disconnect:

- 1) Move slide lock (A) in the direction of the arrow.
- 2) Pull female connector in the direction of the arrow with slide lock (A) moved.

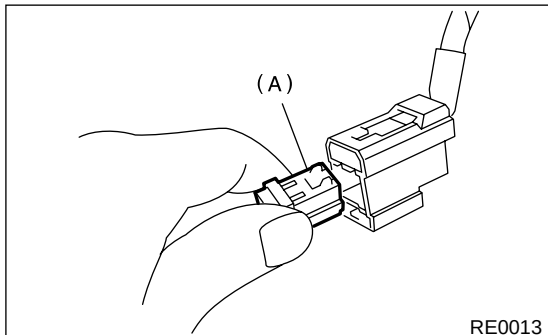


CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

• How to connect:

Holding connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:

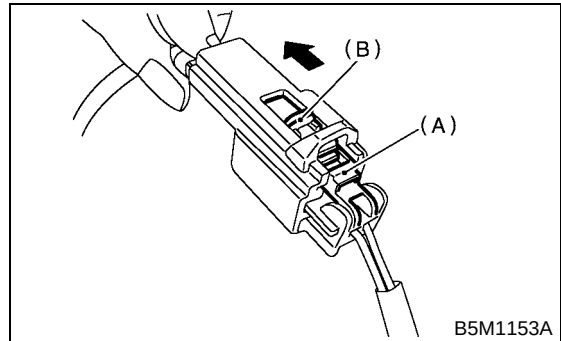
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

2. DRIVER'S AIRBAG, PASSENGER'S AIRBAG, AND SIDE AIRBAG

• How to disconnect:

- 1) Push lock arm (A).

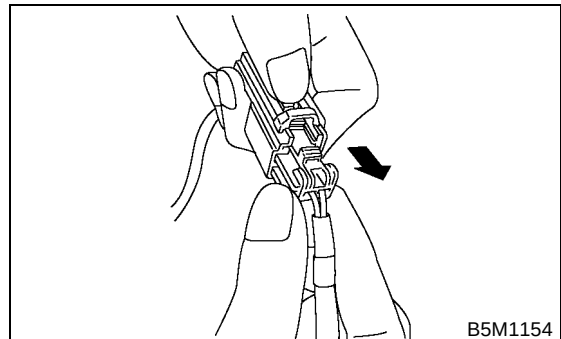
- 2) With lock arm (A) pushed in, move slide lock (B) in the direction of the arrow.



- 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.

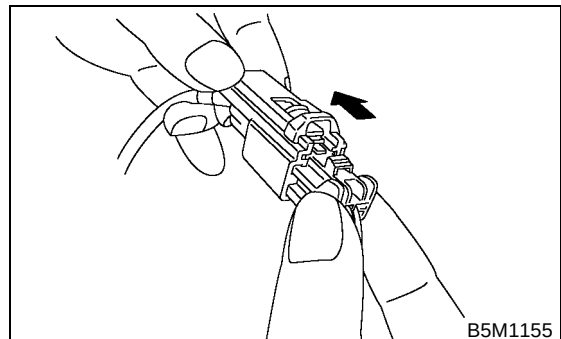


• How to connect:

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.



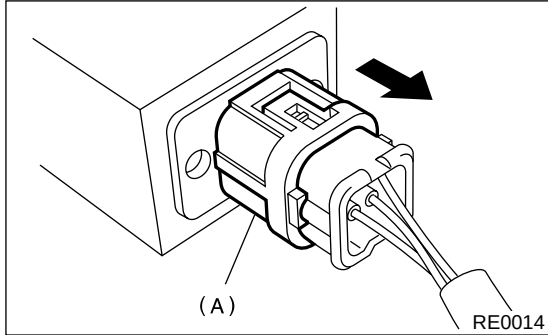
3. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR

• 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.

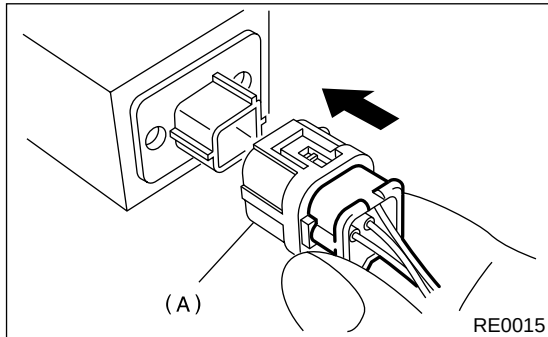


• How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:

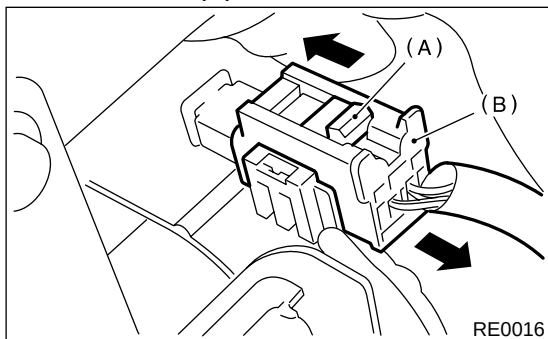
- Outer (A) moves back, and so do not put your hand on the outer part.
- Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



4. PRETENSIONER

• How to disconnect:

- 1) Move slide lock (A) in the direction of the arrow.
- 2) Pull the connector (B) in the direction of the arrow with slide lock (A) moved.

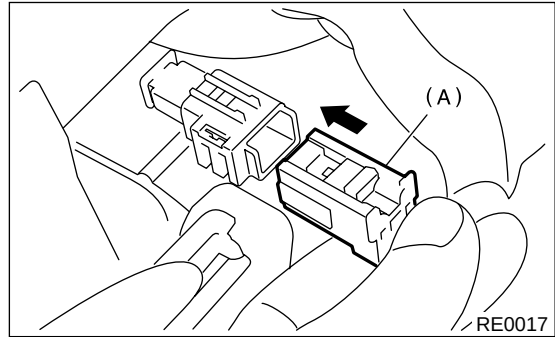


CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

• How to connect:

Holding 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.

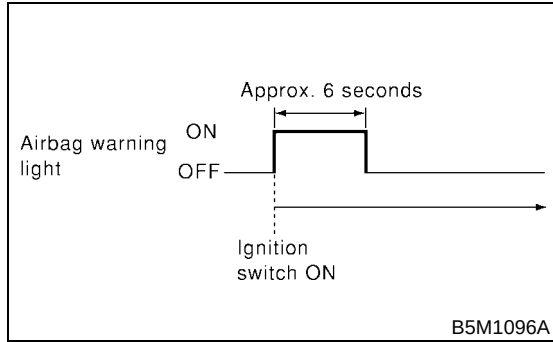
AIRBAG WARNING LIGHT ILLUMINATION PATTERN

AIRBAG SYSTEM (DIAGNOSTICS)

7. 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.



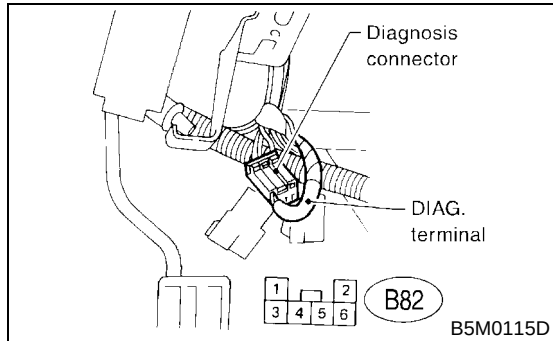
READ DIAGNOSTIC TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

8. Read Diagnostic Trouble Code

A: OPERATION

- 1) Turn the ignition switch ON.
- 2) Connect the diagnosis terminal to diagnosis connector terminal No. 1 in the driver's seat lower cover area.



3) Read trouble code by identifying the way the air bag warning light flashes.

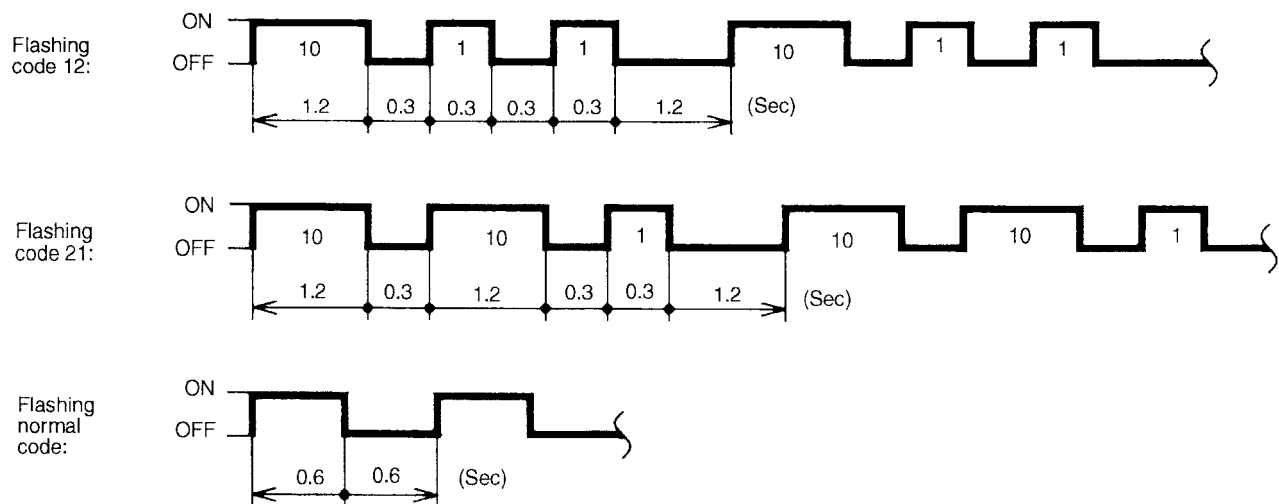
The airbag warning light flashes a code corresponding to the faulty parts.

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" <Ref. to AB-38, List of Diagnostic Trouble Code.>
- "Airbag Warning Light Failure" <Ref. to AB-33, Airbag Warning Light Failure.>

Example:



B5M0117A

- 4) Turn the ignition switch OFF, and disconnect the diagnosis terminal from the diagnosis connector terminal No 1.
- 5) Wind tape around the diagnosis terminal and return it to its original position.

9. Inspection Mode

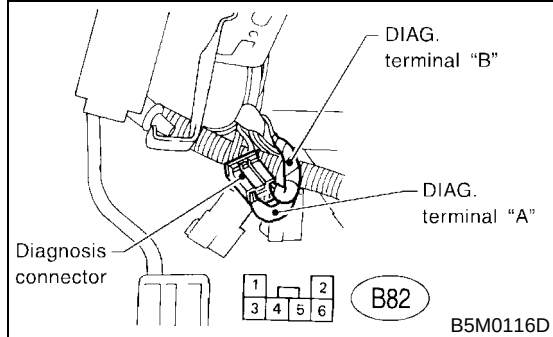
A: OPERATION

Recreate the circumstance by referring to the conditions described in the checklist.

10. Clear Memory Mode

A: OPERATION

- 1) Turn the ignition switch ON.
- 2) Connect the diagnosis terminal (DIAG, terminal "A") to diagnosis connector terminal No. 1 in the driver's seat lower cover area.



- 3) While the warning light flashes, connect another diagnosis terminal (DIAG, terminal "B") to diagnosis connector terminal No.2.
- 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.

CLEAR MEMORY MODE

AIRBAG SYSTEM (DIAGNOSTICS)

11. 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.

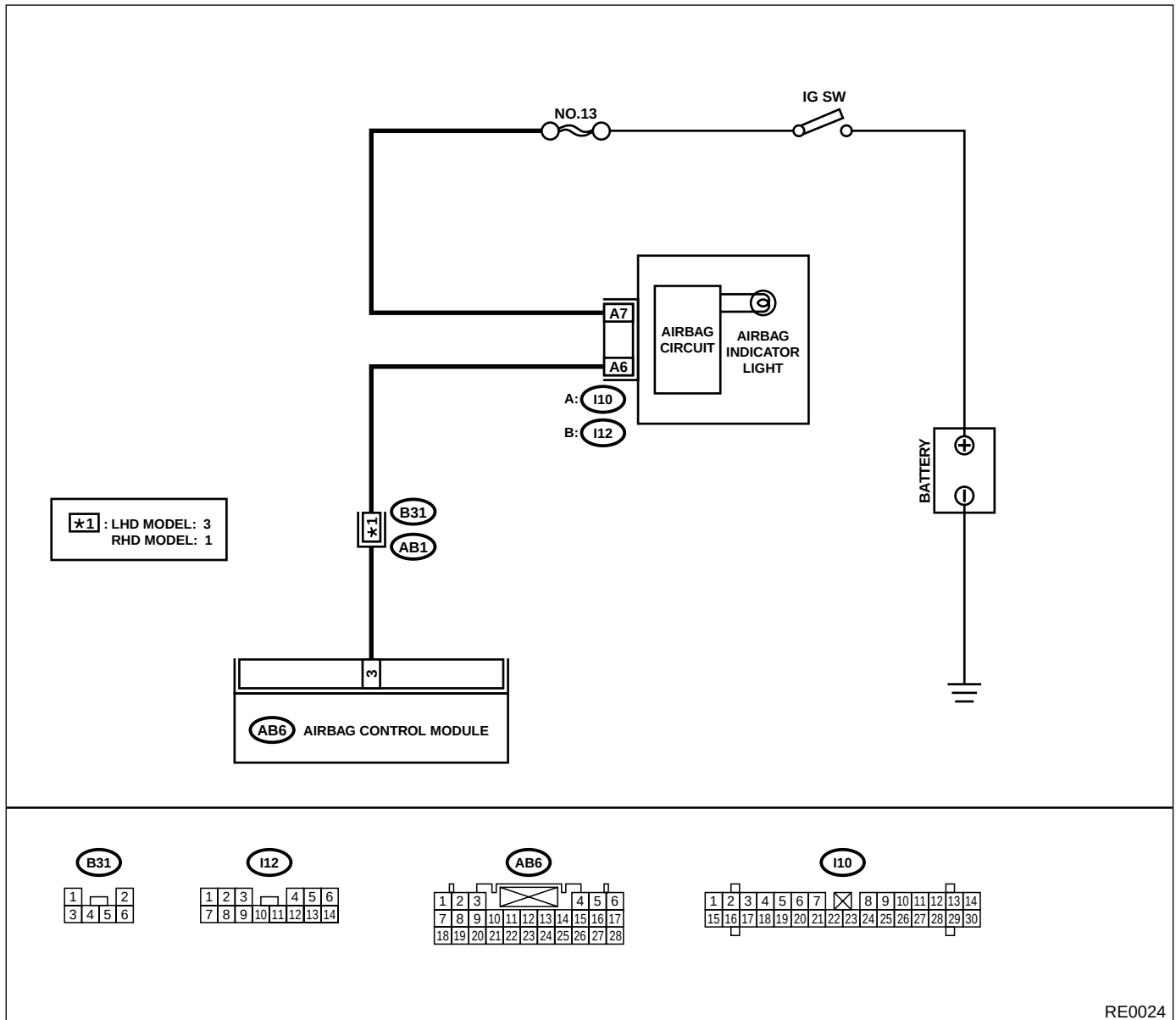
CAUTION:

- 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.

AIRBAG WARNING LIGHT FAILURE

AIRBAG SYSTEM (DIAGNOSTICS)

WIRING DIAGRAM:



RE0024

Step	Check	Yes	No
1	CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31). 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove side sill cover. (Driver's side) 3) Confirm that firm contact is secured between connectors (AB1) and (B31).	Repair the body harness or replace the body harness with airbag main harness.	Go to step 2.

AIRBAG WARNING LIGHT FAILURE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK AIRBAG WARNING LIGHT. 1)Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2)Connect the connector (1M) in test harness M to the body harness connector (B31). 3)Connect the battery ground cable and turn the ignition switch ON. 4)Connect two connectors, (3M) and (4M) in test harness M.	Is the airbag warning light turned off?	Go to step 4.	Go to step 3.
3 CHECK BODY HARNESS. Check the body harness. NOTE: After problem has been eliminated, disconnect connectors (3M) and (4M).	Is the anything unusual to body harness?	Repair the body harness.	Replace combination meter printed circuit. <Ref. to IDI-19, Combination Meter Assembly.>
4 CHECK POOR CONTACT. Confirm that firm contact is secured between the airbag control module and the connector (AB6). <Ref. to AB-16, Airbag Control Module.>	Is the poor contact in connector (AB6)?	Replace the body harness with airbag main harness or Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step 5.
5 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 connectors (AB3) and (AB8). 4)Remove glove box and disconnect connectors (AB10) and (AB9). 5)Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I or I2. <Ref. to AB-16, Airbag Control Module.> 6)Connect the battery ground cable and turn the ignition switch ON. 7)Connect connectors (4I) and (5I) in test harness I or I2. NOTE: After problem has been eliminated, disconnect connectors (4I) and (5I).	Is the airbag warning light turned off?	Go to step 6.	Replace the body harness with airbag main harness.
6 CHECK GROUNDING CIRCUIT. 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. 3)Connect the connector (1I) in test harness I or I2 to body harness connector (AB6). 4)Measure the resistance between connector (2I) in test harness I or I2 and the chassis ground. Connector & terminal (2I) No. 9 — Chassis ground: (2I) No. 10 — Chassis ground:	Is the resistance less than 10 Ω?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Repair body-grounding circuit.

AIRBAG SYSTEM (DIAGNOSTICS)

DIAGNOSIS:

- Fuse No. 13 (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	Check	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?	Go to step 2.	Repair combination meter power supply. <Ref. to IDI-4, Combination Meter System.>
2 CHECK FUSE NO. 13 (IN MAIN FUSE BOX). Remove fuse No. 13 and perform visual inspection.	Is fuse No. 13 (in main fuse box) blown?	Replace fuse No. 13. If fuse No. 13 blows again, go to step 3.	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?	Go to step 4.	Replace airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-19, Combination Meter Assembly.>
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-16, Airbag Control Module.> 4)Connect the battery ground cable and turn the ignition switch ON.	Is the airbag warning light turned on?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

LIST OF DIAGNOSTIC TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

12.List of Diagnostic Trouble Code

A: LIST

Trouble code/ Contents of troubles	Memory function	Contents of diagnosis	Index No.
11	Provided.	- 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-42, TROUBLE CODE 11, Diagnostic Chart with Trouble Code.>
12	Provided.	- 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-44, TROUBLE CODE 12, Diagnostic Chart with Trouble Code.>
15	Provided.	- 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-46, TROUBLE CODE 15, Diagnostic Chart with Trouble Code.>
16	Provided.	- 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-48, TROUBLE CODE 16, Diagnostic Chart with Trouble Code.>
21	Provided.	Airbag control module is faulty.	<Ref. to AB-49, TROUBLE CODE 21, Diagnostic Chart with Trouble Code.>
22	Provided.	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB-50, TROUBLE CODE 22, Diagnostic Chart with Trouble Code.>
23	Not provided.	(AB6), (AB17) and (AB18) are not connected properly to airbag control module.	<Ref. to AB-51, TROUBLE CODE 23, Diagnostic Chart with Trouble Code.>
24	Not provided.	- 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-52, TROUBLE CODE 24, Diagnostic Chart with Trouble Code.>
25	Provided.	- 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-54, TROUBLE CODE 25, Diagnostic Chart with Trouble Code.>
31	Provided.	- 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-56, TROUBLE CODE 31, Diagnostic Chart with Trouble Code.>

LIST OF DIAGNOSTIC TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Trouble code/ Contents of troubles	Memory func- tion	Contents of diagnosis	Index No.
32	Provided.	• 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-60, TROUBLE CODE 32, Diagnostic Chart with Trouble Code.>
41	Provided.	• Side airbag harness (RH) is faulty. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-64, TROUBLE CODE 41, Diagnostic Chart with Trouble Code.>
42	Provided.	• Side airbag harness (LH) is faulty. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-66, TROUBLE CODE 42, Diagnostic Chart with Trouble Code.>
45	Provided.	• Side airbag harness (RH) is shorted to power supply. • Airbag control module is faulty.	<Ref. to AB-68, TROUBLE CODE 45, Diagnostic Chart with Trouble Code.>
46	Provided.	• Side airbag harness (LH) is shorted to power supply. • Airbag control module is faulty.	<Ref. to AB-70, TROUBLE CODE 46, Diagnostic Chart with Trouble Code.>
51	Provided.	• Side airbag sensor (RH) is faulty. • Side airbag harness (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-72, TROUBLE CODE 51, Diagnostic Chart with Trouble Code.>
52	Provided.	• Side airbag sensor (LH) is faulty. • Side airbag harness (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-74, TROUBLE CODE 52, Diagnostic Chart with Trouble Code.>
53	Provided.	Side airbag sensor (RH) is faulty.	<Ref. to AB-75, TROUBLE CODE 53, Diagnostic Chart with Trouble Code.>
54	Provided.	Side airbag sensor (LH) is faulty.	<Ref. to AB-75, TROUBLE CODE 54, Diagnostic Chart with Trouble Code.>
55	Provided.	Side airbag module is inflated.	<Ref. to AB-75, TROUBLE CODE 55, Diagnostic Chart with Trouble Code.>
61	Provided.	• 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-76, TROUBLE CODE 61, Diagnostic Chart with Trouble Code.>
62	Provided.	• 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-78, Trouble Code 62, Diagnostic Chart with Trouble Code.>

LIST OF DIAGNOSTIC TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Trouble code/ Contents of troubles	Memory func- tion	Contents of diagnosis	Index No.
65	Provided.	• 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-80, TROUBLE CODE 65, Diagnostic Chart with Trouble Code.>
66	Provided.	• 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-82, TROUBLE CODE 66, Diagnostic Chart with Trouble Code.>

LIST OF DIAGNOSTIC TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

13.Diagnostic Chart with Trouble Code

A: TROUBLE CODE 11

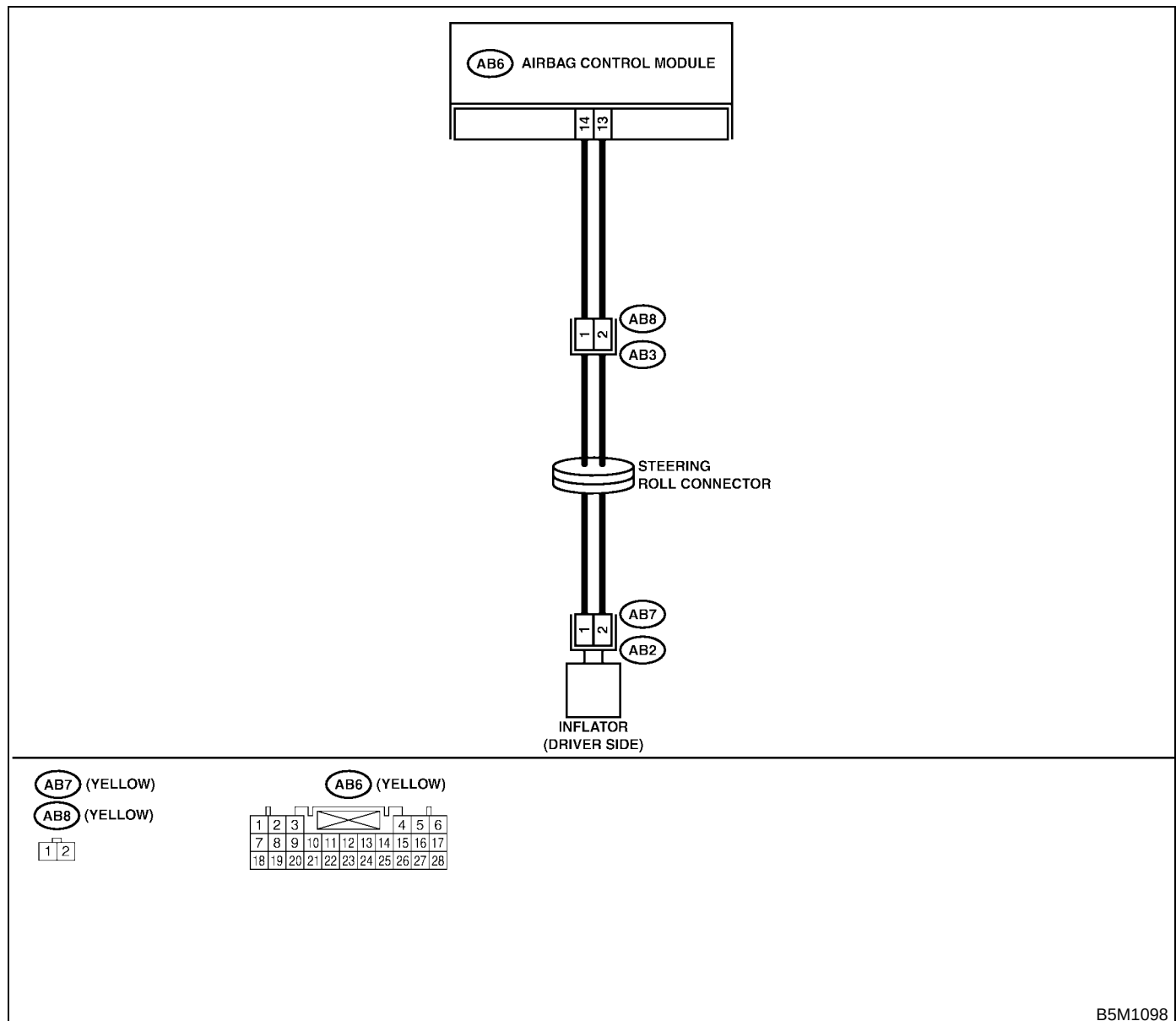
DIAGNOSIS:

- 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:



B5M1098

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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?	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 F 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?	Replace the roll connector. <Ref. to AB-18, 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-14, 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 I or I2. <Ref. to AB-16, Airbag Control Module.> 5) Measure the resistance between connector (2I) in test harness I or 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 resistance less than 10 Ω ?	Go to step 4.	Replace the body harness with airbag main harness.
4 CHECK AIRBAG MAIN HARNESS. Measure the resistance of the connector (2I) in test harness I or I2. Connector & terminal (2I) No. 1 — No. 4: (2I) No. 4 — Chassis ground: (2I) No. 1 — Chassis ground:	Is the resistance more than 1 M Ω ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

B: TROUBLE CODE 12

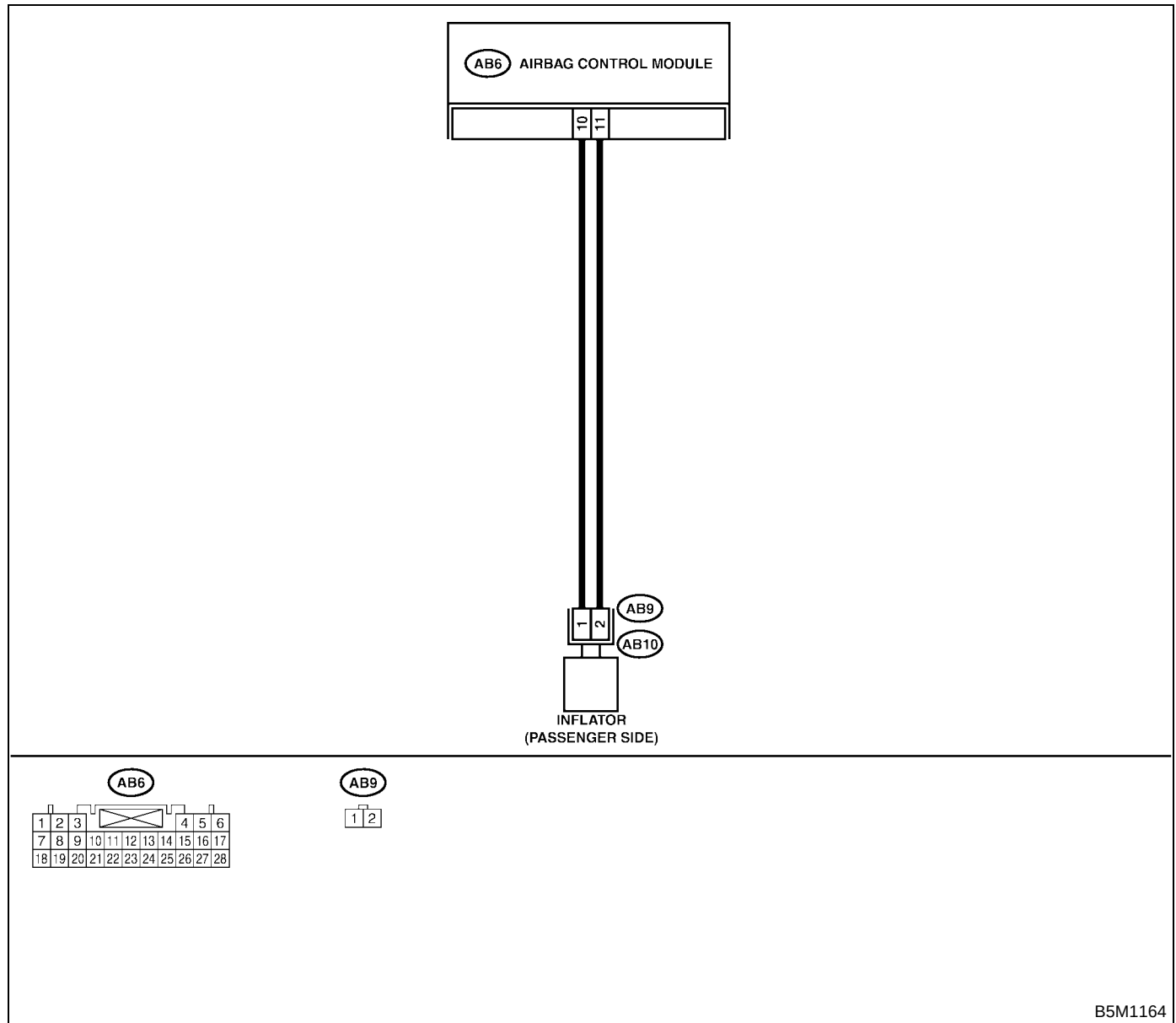
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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 (1F) in test harness F to connector (AB9). 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?	Replace the passenger airbag module. <Ref. to AB-14, 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 the airbag resistor from the connector (3F) in test harness F. 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 I or I2. <Ref. to AB-16, Airbag Control Module.> 5) Measure the resistance between connector (2I) in test harness I or I2 and the connector (3F) in test harness F. Connector & terminal (2I) No. 2 — (3F) No. 4: (2I) No. 5 — (3F) No. 3:	Is the resistance less than 10 Ω ?	Go to step 3.	Replace the body harness with airbag main harness.
3 CHECK AIRBAG MAIN HARNESS. Measure the resistance of the connector (2I) in test harness I or I2. Connector & terminal (2I) No. 2 — No. 5: (2I) No. 2 — Chassis ground: (2I) No. 5 — Chassis ground:	Is the resistance more than 1 M Ω ?	Replace airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

C: TROUBLE CODE 15

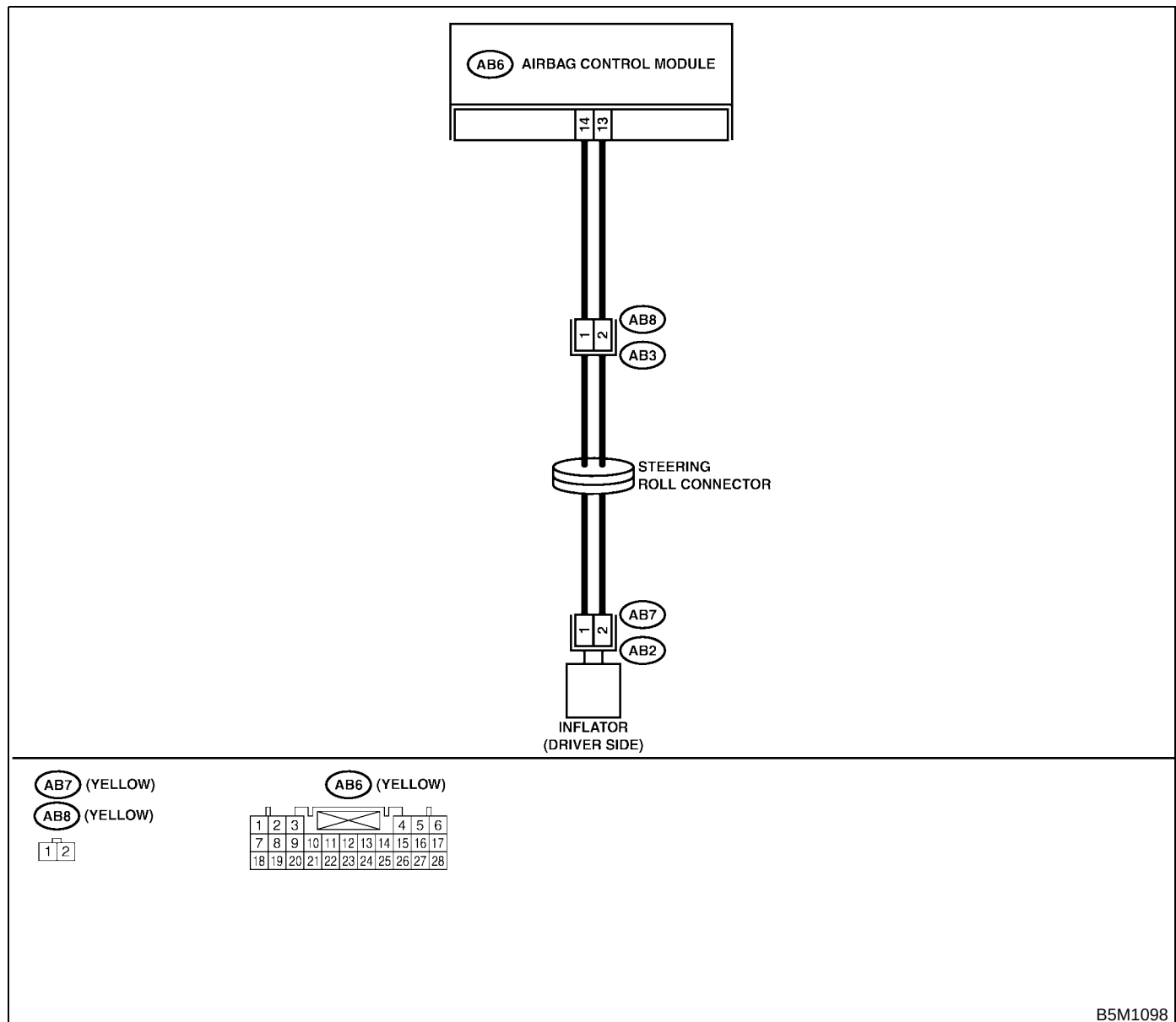
DIAGNOSIS:

- 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 TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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, 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?	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 seconds. 2) Disconnect the test harness F 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?	Replace the roll connector. <Ref. to AB-18, 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) Remove 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 I or I2. <Ref. to AB-16, 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 I or I2 and the chassis ground. Connector & terminal (2I) No. 4 (+) — Chassis ground (-): (2I) No. 1 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

D: TROUBLE CODE 16

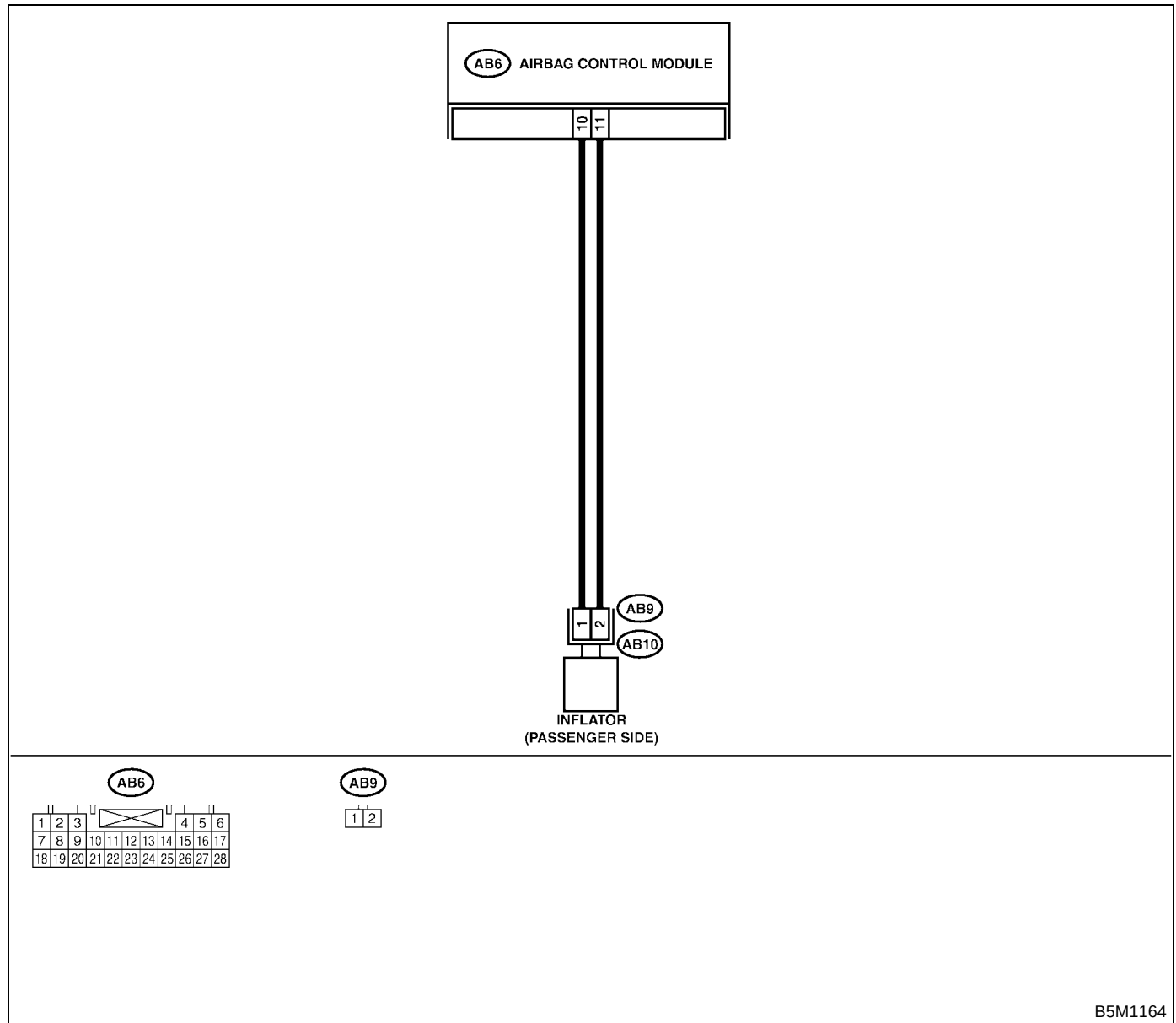
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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) Remove the glove box. 3) Disconnect the connector (AB10) from (AB9). 4) Connect the connector (1F) in test harness F to connector (AB9). 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?	Replace the passenger airbag module. <Ref. to AB-14, 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 the airbag resistor from the connector (3F) in test harness F. 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 I or I2. <Ref. to AB-16, Airbag Control Module.> 5) Measure the voltage between connector (2I) in test harness I or I2 and the chassis ground. Connector & terminal (2I) No. 2 — Chassis ground: (2I) No. 5 — Chassis ground:	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

E: TROUBLE CODE 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.

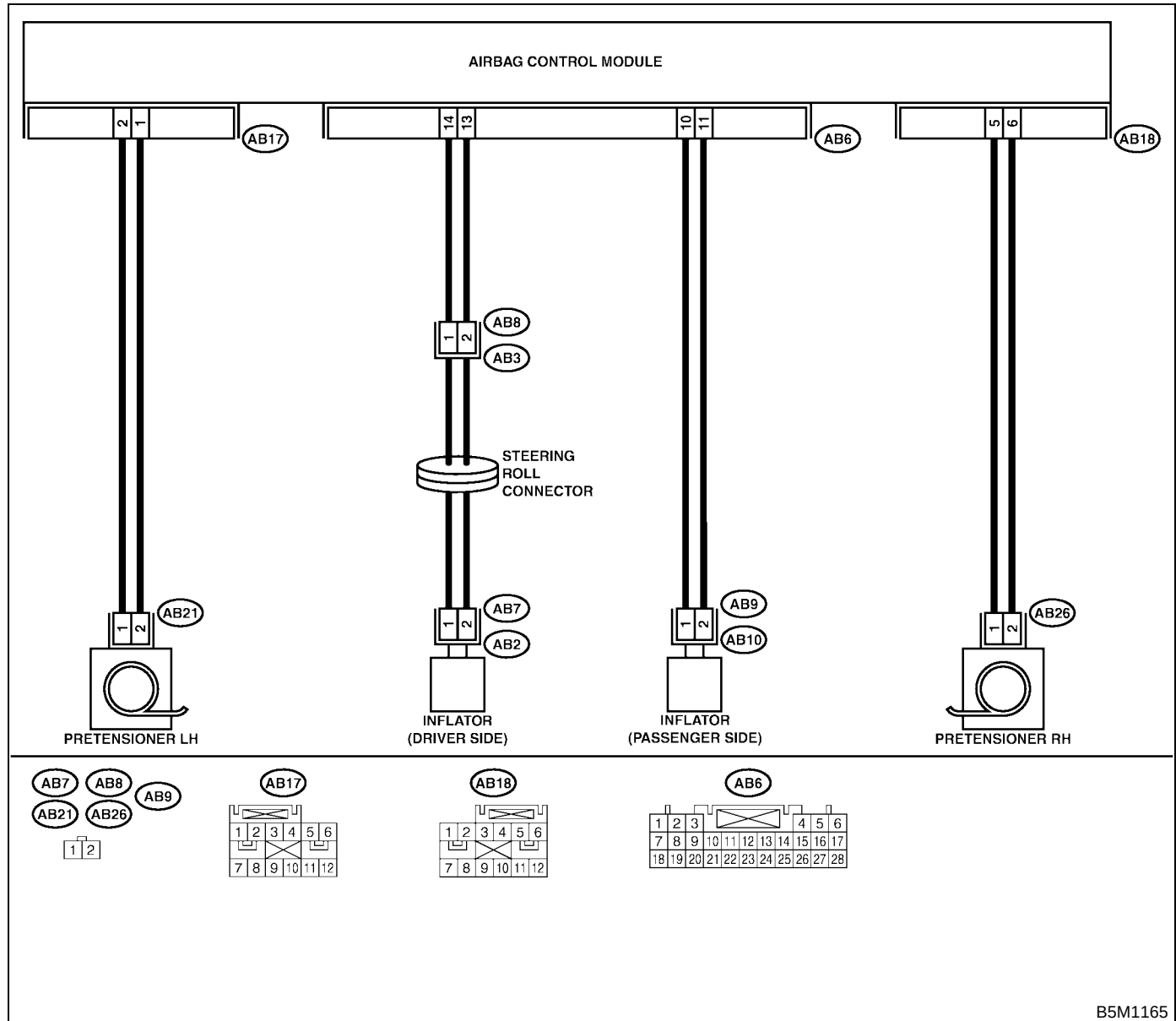
Step	Check	Yes	No
1 CHECK IF TROUBLE CODE 21 IS INDICATED. Read Diagnostic Trouble Code. <Ref. to AB-29, Read Diagnostic Trouble Code.>	Is airbag warning light trouble code 21 indicated?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Perform clear memory. <Ref. to AB-31, Clear Memory Mode.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

F: TROUBLE CODE 22

WIRING DIAGRAM:



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-16, Airbag Control Module.>
- Driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- Passenger's airbag module. <Ref. to AB-14, Passenger's Airbag Module.>
- Front sub-sensor of both sides. <Ref. to AB-19, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides. <Ref. to SB-8, Front Seat Belt.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

G: TROUBLE CODE 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	Check	Yes	No
1 CHECK POOR CONTACT IN CONECTORS (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-16, Airbag Control Module.>	Check if rust or damage appear on the harness connector and the control module connector.	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.> Replace the body harness with airbag main harness. Replace the body harness with side airbag harness.	Go to step 2.
2 CHECK POOR CONTACT IN CONECTORS (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 airbag warning light operate properly?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

H: TROUBLE CODE 24

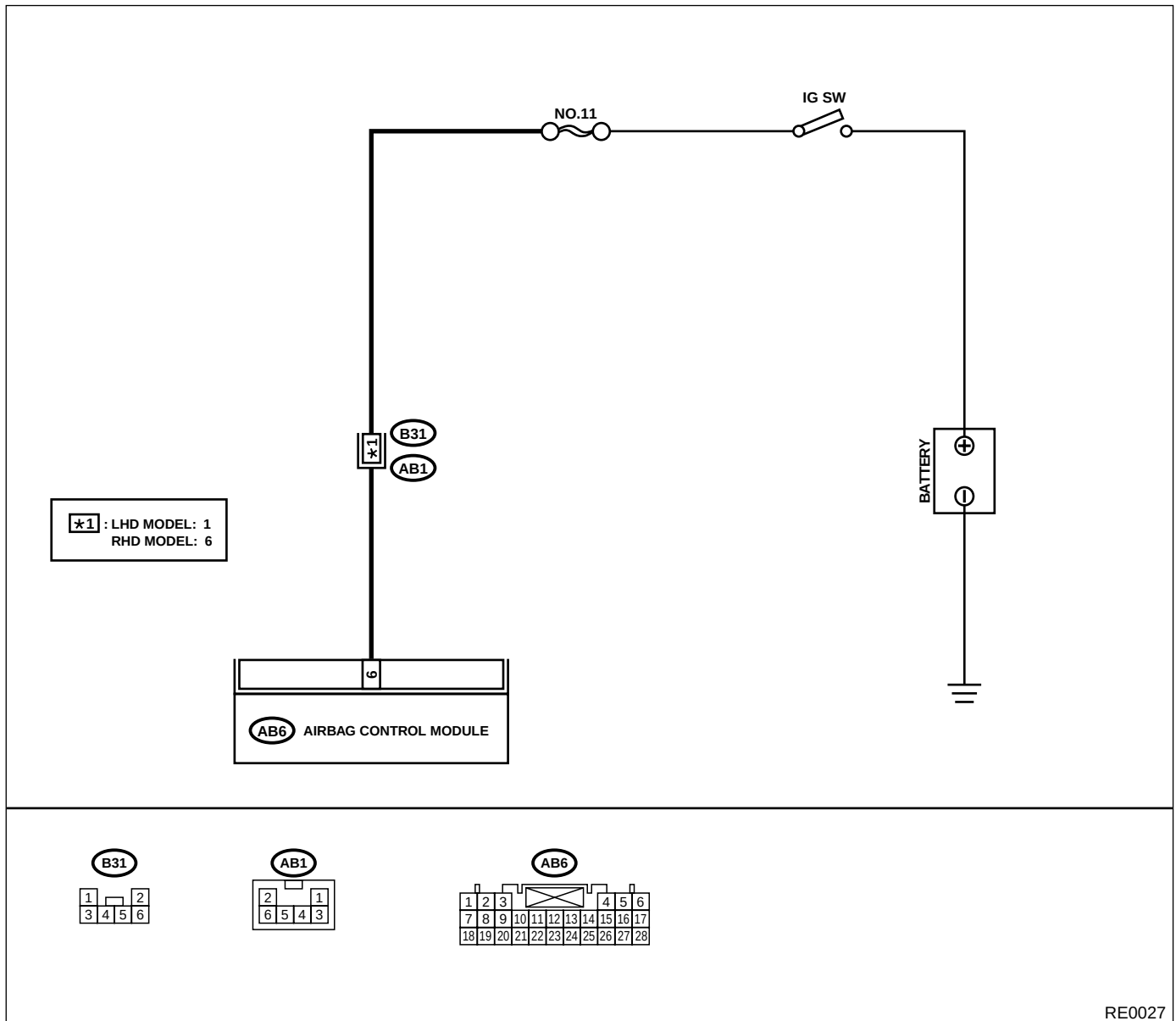
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 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-16, Airbag Control Module.> 3) Connect the connector (1I) in test harness I or I2 to connector (AB6). 4) Connect the battery ground cable and turn the ignition switch ON. 5) Measure the voltage between connector (2I) in test harness I or I2 and chassis ground. Connector & terminal (2I) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step 2.
2 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) Connect the connector (2M) in test harness M to connector (AB1). 4) Measure the resistance between connector (5M) in test harness M and the connector (2I) in test harness I or I2. Connector & terminal LHD MODEL: (5M) No. 2 — (2I) No. 3: RHD MODEL: (5M) No. 9 — (2I) No. 3:	Is the resistance less than 10 Ω?	Go to step 3.	Replace the body harness with airbag main harness.
3 CHECK AIRBAG MAIN HARNESS. Measure the following resistance with the above-mentioned condition maintained. Connector & terminal LHD MODEL: (5M) No. 2 — Chassis ground: (2I) No. 3 — Chassis ground: RHD MODEL: (5M) No. 9 — Chassis ground: (2I) No. 3 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4.	Replace the body harness with airbag main harness.
4 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?	Replace fuse No. 11. If fuse No. 11 blows again, repair the body harness.	Repair the body harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

I: TROUBLE CODE 25

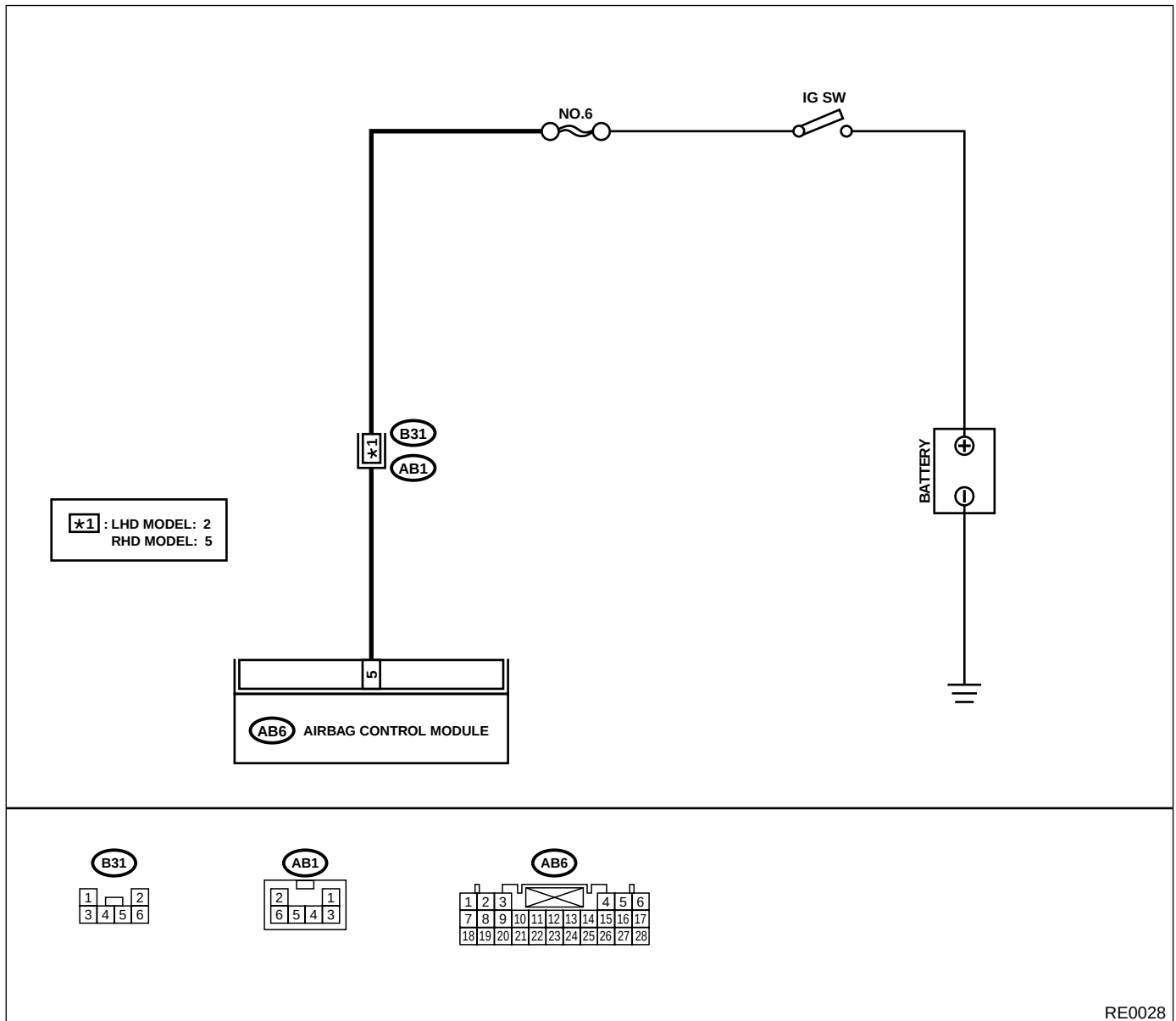
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 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-16, Airbag Control Module.> 3) Connect the connector (1I) in test harness I or 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 I or I2 and the chassis ground. Connector & terminal (2I) No. 6 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step 2.
2 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) Connect the connector (2M) in test harness M to the airbag connector (AB1). 4) Measure the resistance between the connector (5M) in test harness M and the connector (2I) in test harness I or I2. Connector & terminal LHD MODEL: (5M) No. 2 — (2I) No. 6: RHD MODEL: (5M) No. 1 — (2I) No. 6:	Is the resistance less than 10 Ω?	Go to step 3.	Replace the body harness with airbag main harness.
3 CHECK AIRBAG MAIN HARNESS. Measure the following resistance with the above-mentioned condition maintained. Connector & terminal LHD MODEL: (5M) No. 2 — Chassis ground: (2I) No. 6 — Chassis ground: RHD MODEL: (5M) No. 1 — Chassis ground: (2I) No. 6 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4.	Replace the body harness with airbag main harness.
4 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?	Replace fuse No. 6. If fuse No. 6 is blown again, repair the body harness.	Repair the body harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

J: TROUBLE CODE 31

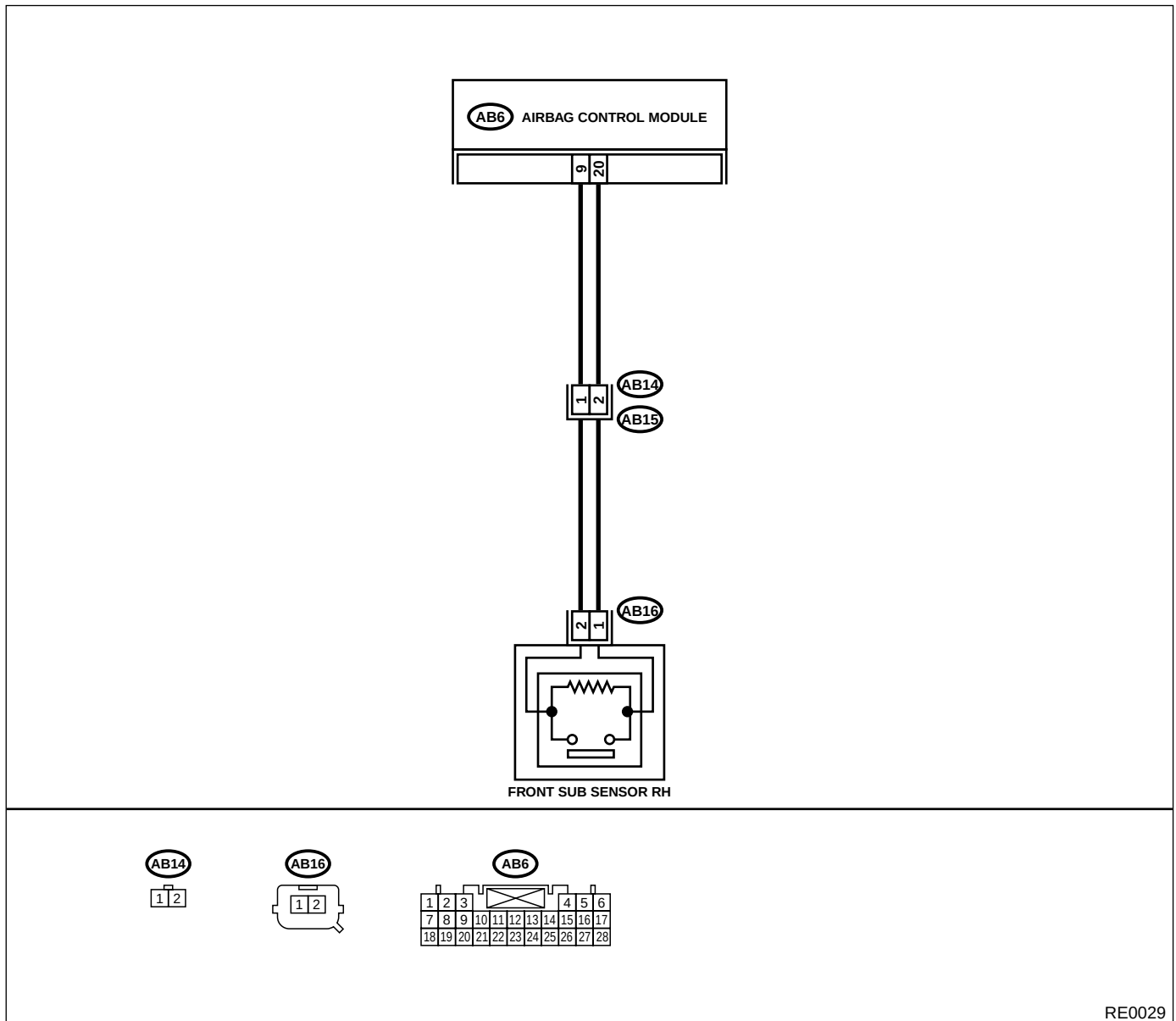
DIAGNOSIS:

- 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:



RE0029

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH). 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, and connect the connector (1I) in test harness I or I2. <Ref. to AB-16, Airbag Control Module.> 3) Measure the resistance of the connector (3I) in test harness I or I2. Connector & terminal (3I) No. 2 — No. 4:	Is the resistance between 750Ω and 1 KΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step 2.
2 CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 2 — Chassis ground: (3I) No. 4 — Chassis ground:	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH). 1) Disconnect connector (AB16) from the front sub-sensor. <Ref. to AB-19, Front Sub Sensor.> 2) Connect connector (IH) in test harness H to connector (AB16). 3) Measure the resistance between connector (3I) in test harness I or I2 and connector (3H) in test harness H. Connector & terminal (3I) No. 2 — (3H) No. 5: (3I) No. 4 — (3H) No. 6:	Is the resistance less than 10Ω?	Go to step 4.	Go to step 5.
4 CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 2 — Chassis ground: (3I) No. 4 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 9.	Go to step 5.
5 CHECK AIRBAG MAIN HARNESS 1) Disconnect connector (AB15) from (AB14), and connect connector (1F) in test harness F to connector (AB14). 2) Measure the resistance between connector (3I) in test harness I or I2 and connector (3F) in test harness F. Connector & terminal (3I) No. 2 — (3F) No. 4: (3I) No. 4 — (3F) No. 3:	Is the resistance less than 10 Ω?	Go to step 6.	Replace the body harness with airbag main harness.
6 CHECK AIRBAG MAIN HARNESS Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 2 — Chassis ground: (3I) No. 4 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 7.	Replace the body harness with airbag main harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK FRONT SUB-SENSOR HARNESS (RH). 1)Connect connector (2F) 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. <i>Connector & terminal</i> <i>(3F) No. 5 — (3H) No. 5:</i> <i>(3F) No. 6 — (3H) No. 6:</i>	Is the resistance less than 10 Ω ?	Go to step 8 .	Replace the body harness with front sub-sensor harness (RH).
8 CHECK FRONT SUB-SENSOR HARNESS (RH). Measure the resistance between connector (3F) in test harness F and the chassis ground. <i>Connector & terminal</i> <i>(3F) No. 5 — Chassis ground:</i> <i>(3F) No. 6 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 9 .	Replace the body harness with front sub-sensor harness (RH).
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. <i>Connector & terminal</i> <i>(3H) No. 3 — No. 4:</i>	Is the resistance between 750 Ω and 1 K Ω ?	Go to step 10 .	Replace the front sub-sensor (RH). <Ref. to AB-19, Front Sub Sensor.>
10 CHECK FRONT SUB-SENSOR (RH). Measure the resistance between connector (3H) in test harness H and the chassis ground. <i>Connector & terminal</i> <i>(3H) No. 3 — Chassis ground:</i> <i>(3H) No. 4 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Finish the diagnosis.	Replace the front sub-sensor (RH). <Ref. to AB-19, Front Sub Sensor.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

K: TROUBLE CODE 32

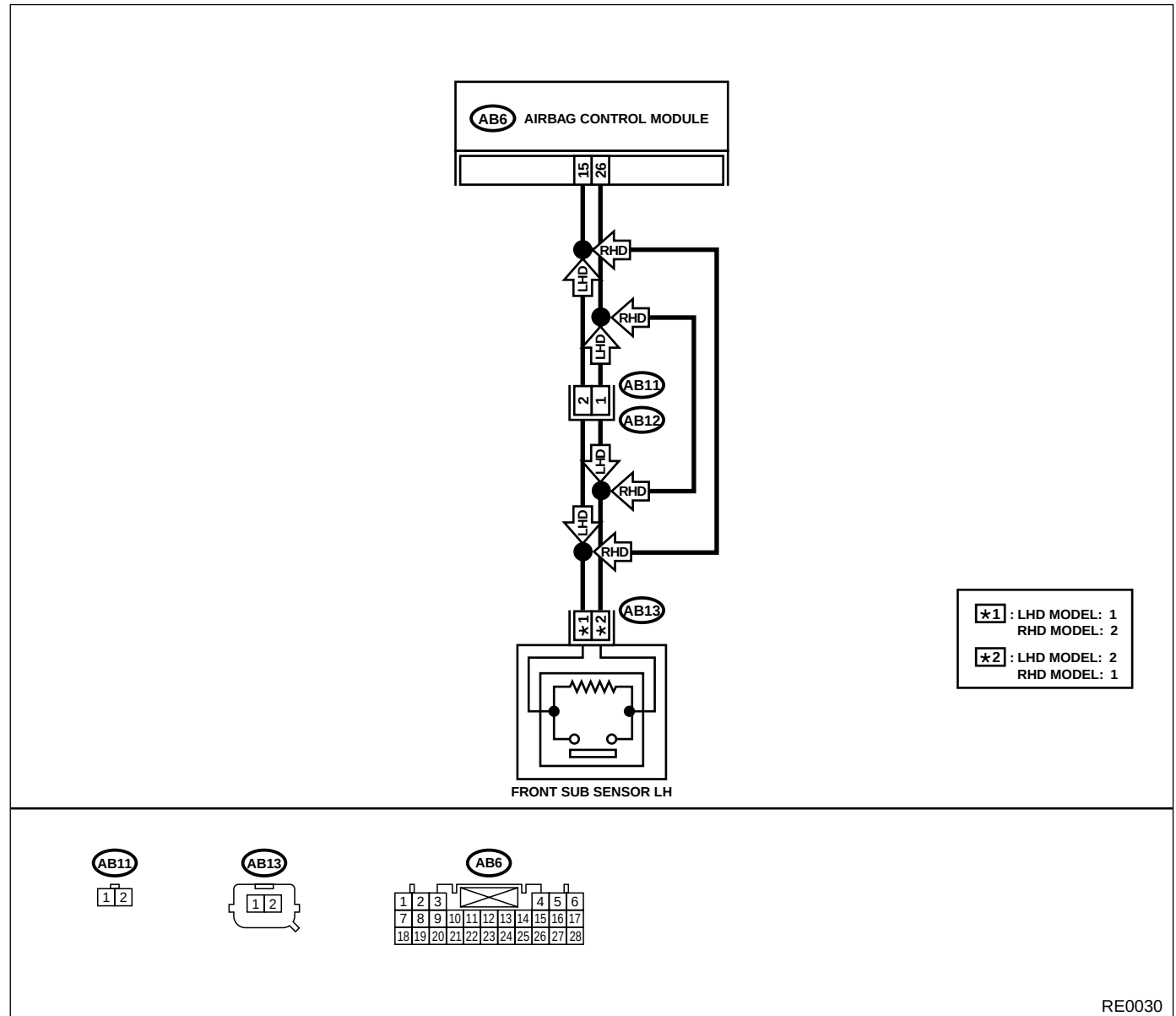
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (RH). 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB6) from the airbag control module, and connect connector (1I) in the test harness I or I2 to connector (AB6). <Ref. to AB-16, Airbag Control Module.> 3) Measure the resistance of the connector (3I) in the test harness I or I2. Connector & terminal (3I) No. 1 — No. 3:	Is the resistance between 750Ω and 1 KΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step 2.
2 CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 1 — Chassis ground: (3I) No. 3 — Chassis ground:	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH). 1) Disconnect the connector (AB13) from the front sub-sensor. <Ref. to AB-19, Front Sub Sensor.> 2) Connect connector (1H) in test harness H to connector (AB13). 3) Measure the resistance between connector (3I) in test harness I or I2 and connector (3H) in test harness H. Connector & terminal LHD MODEL: (3I) No. 3 — (3H) No. 6: (3I) No. 1 — (3H) No. 5: RHD MODEL: (3I) No. 3 — (3H) No. 5: (3I) No. 1 — (3H) No. 6:	Is the resistance less than 10 Ω?	Go to step 4.	Go to step 5.
4 CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 3 — Chassis ground: (3I) No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	LHD MODL: Go to step 9. RHD MODEL: Finish the diagnosis.	LHD MODL: Go to step 5. RHD MODEL: Replace the front sub-sensor (LH). <Ref. to AB-19, Front Sub Sensor.>
5 CHECK AIRBAG MAIN HARNESS. 1) Disconnect connector (AB11) from (AB12), and connect connector (1F) in test harness F to (AB11). 2) Measure the resistance between connector (3I) in test harness I or I2 and connector (3F) in test harness F. Connector & terminal (3I) No. 3 — (3F) No. 3: (3I) No. 1 — (3F) No. 4:	Is the resistance less than 10 Ω?	Go to step 6.	Replace the body harness with airbag main harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK AIRBAG MAIN HARNESS. Measure the resistance between connector (3I) in the test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 3 — Chassis ground: (3I) No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 7.	Replace the body harness with air-bag main harness.
7 CHECK FRONT SUB-SENSOR HARNESS (LH). 1)Connect connector (2F) in test harness F to connector (AB12). 2)Measure the resistance between connector (3H) in test harness H and connector (3F) in test harness F. Connector & terminal (3F) No. 5 — (3H) No. 5: (3F) No. 6 — (3H) No. 6:	Is the resistance less than 10 Ω?	Go to step 8.	Replace the body harness with front sub-sensor harness (LH).
8 CHECK FRONT SUB-SENSOR HARNESS (LH). Measure the resistance between connector (3F) in test harness F and the chassis ground. Connector & terminal (3F) No. 5 — Chassis ground: (3F) No. 6 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 9.	Replace the body harness with front sub-sensor harness (LH).
9 CHECK FRONT SUB-SENSOR (LH). 1)Connect connector (2H) in test harness H to front sub-sensor (LH). 2)Measure the resistance of the connector (3H) in test harness H. Connector & terminal (3H) No. 3 — No. 4:	Is the resistance between 750Ω and 1 KΩ?	Go to step 10.	Replace the front sub-sensor (LH). <Ref. to AB-19, Front Sub Sensor.>
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:	Is the resistance more than 1 MΩ?	Finish the diagnosis.	Replace the front sub-sensor (LH). <Ref. to AB-19, Front Sub Sensor.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

L: TROUBLE CODE 41

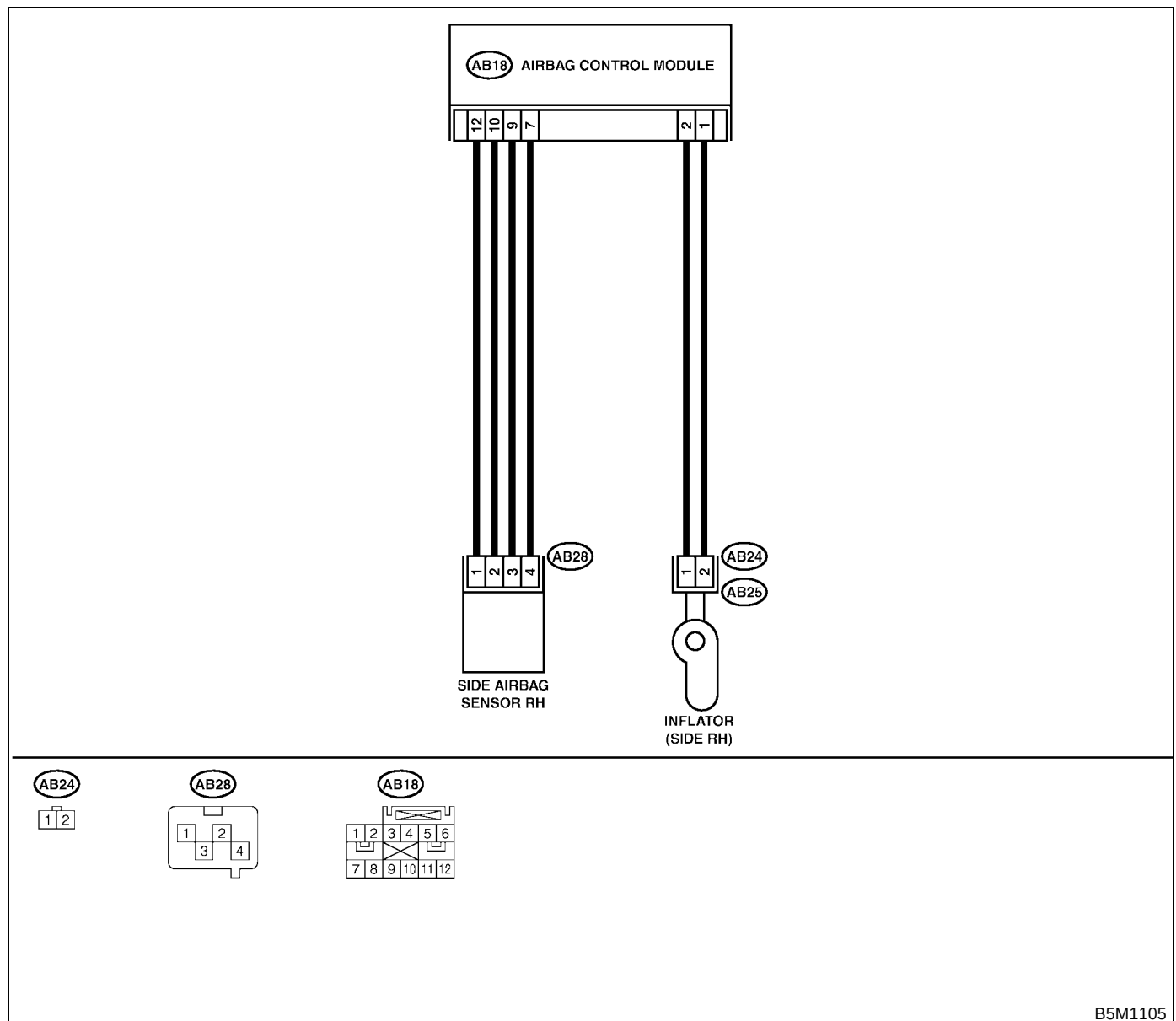
DIAGNOSIS:

- 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:



B5M1105

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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 (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect 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.	Does the airbag warning light operate properly?	Replace front seat with side airbag module (RH). <Ref. to SE-6, Front Seat.>	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 airbag resistor from test harness F. 3) Disconnect the connector (AB18) from air bag control module. <Ref. to AB-16, Airbag Control Module.> 4) Connect connector (1I) in test harness I or I2 to connector (AB18). 5) Measure the resistance between connector (3I) in test harness I or I2 and connector (3F) in test harness F. Connector & terminal (3I) No. 7 — (3F) No. 4: (3I) No. 9 — (3F) No. 3:	Is the resistance less than 10 Ω?	Go to step 3.	Replace the body harness with side airbag harness.
3 CHECK SIDE AIRBAG HARNESS (RH). Measure the resistance of the connector (3I) in test harness I or I2. Connector & terminal (3I) No. 7 — No. 9:	Is the resistance more than 1 MΩ?	Go to step 4.	Replace the body harness with side airbag harness.
4 CHECK SIDE AIRBAG HARNESS (RH). Measure the resistance of the connector (3F) in test harness F. Connector & terminal (3F) No. 3 — No. 4:	Is the resistance more 1MΩ?	Go to step 5.	Replace the body harness with side airbag harness.
5 CHECK SIDE AIRBAG 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:	Is the resistance more than 1 MΩ?	Go to step 6.	Replace the body harness with side airbag harness.
6 CHECK SIDE AIRBAG HARNESS (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 7 — Chassis ground: (3I) No. 9 — Chassis ground:	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

M: TROUBLE CODE 42

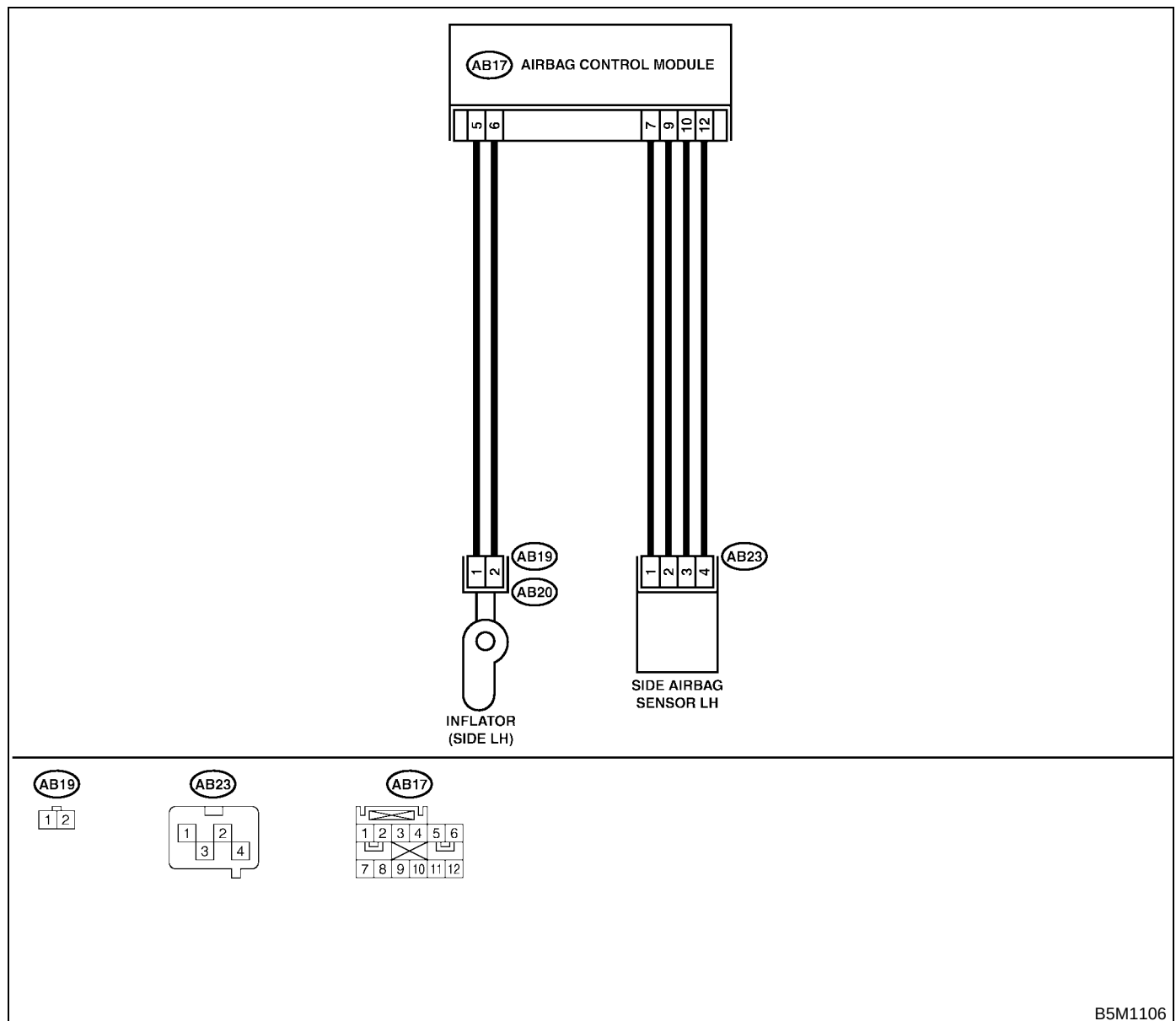
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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 SB-8, Front Seat Belt.> 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 airbag warning light operate properly?	Replace front seat with side airbag module (LH). <Ref. to SE-6, Front Seat.>	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-16, Airbag Control Module.> 4) Connect connector (1I) in test harness I or I2 to connector (AB17). 5) Measure the resistance between connector (3I) in test harness I or I2 and connector (3F) in test harness F. Connector & terminal (3I) No. 10 — (3F) No. 3: (3I) No. 12 — (3F) No. 4:	Is the resistance less than 10 Ω ?	Go to step 3.	Replace the body harness with side airbag harness.
3 CHECK SIDE AIRBAG HARNESS (LH). Measure the resistance of the connector (3I) in test harness I or I2. Connector & terminal (3I) No. 10 — No. 12:	Is the resistance more than 1 M Ω ?	Go to step 4.	Replace the body harness with side airbag harness.
4 CHECK SIDE AIRBAG HARNESS (LH). Measure the resistance of the connector (3F) in test harness F. Connector & terminal (3F) No. 3 — No. 4:	Is the resistance more than 1 M Ω ?	Go to step 5.	Replace the body harness with side airbag harness.
5 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:	Is the resistance more than 1 M Ω ?	Go to step 6.	Replace the body harness with side airbag harness.
6 CHECK SIDE AIRBAG HARNESS (LH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 10 — Chassis ground: (3I) No. 12 — Chassis ground:	Is the resistance more than 1 M Ω ?	Replace airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

N: TROUBLE CODE 45

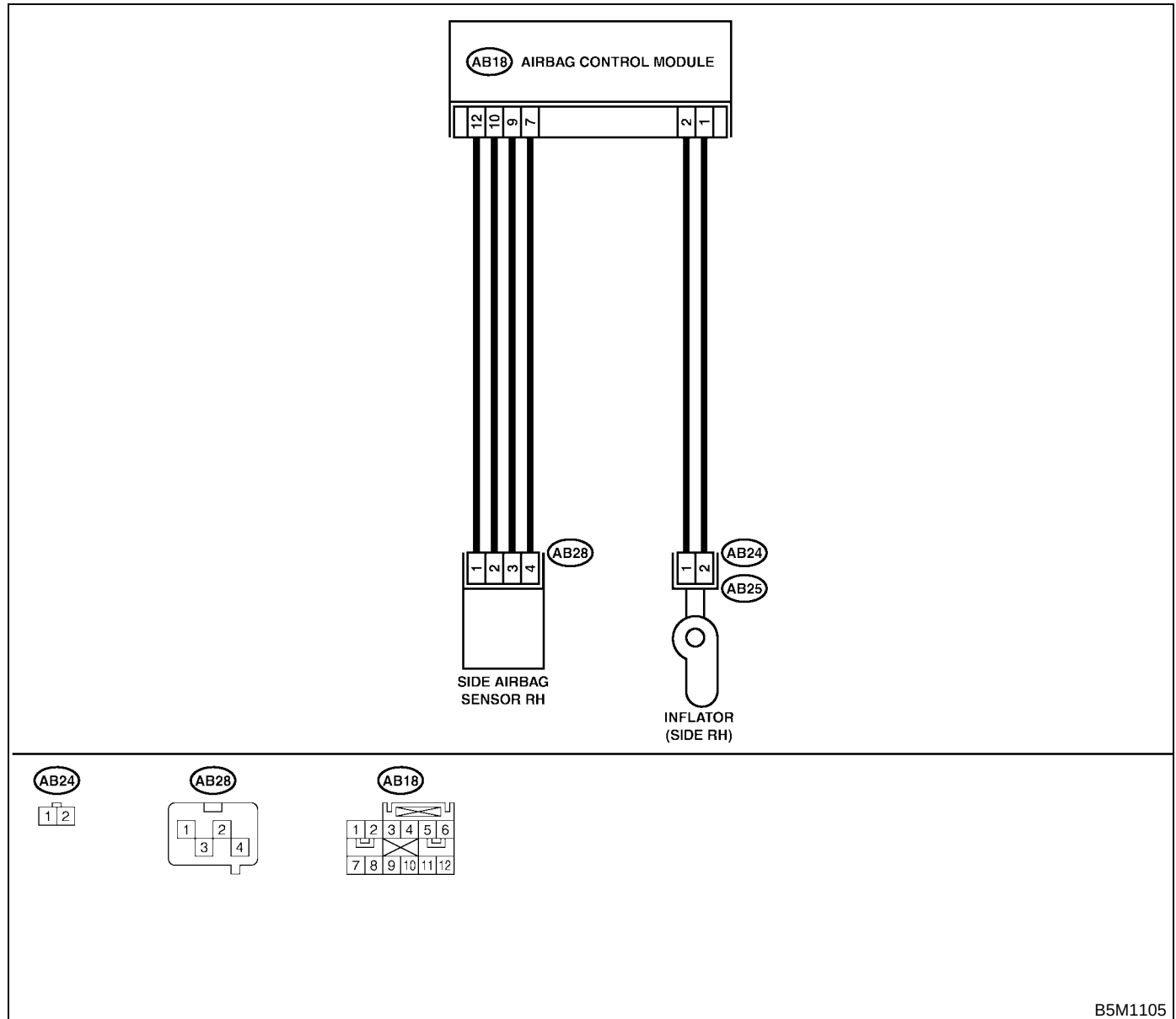
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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 (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 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.	Does airbag warning light operate properly?	Replace front seat with side airbag module (RH). <Ref. to SE-6, Front Seat.>	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 airbag resistor from the test harness. 3) Disconnect the connector (AB18) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 4) Connect connector (1I) in test harness I or 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 I or I2 and the chassis ground. Connector & terminal (3I) No. 7 (+) — Chassis ground (-): (3I) No. 9 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

O: TROUBLE CODE 46

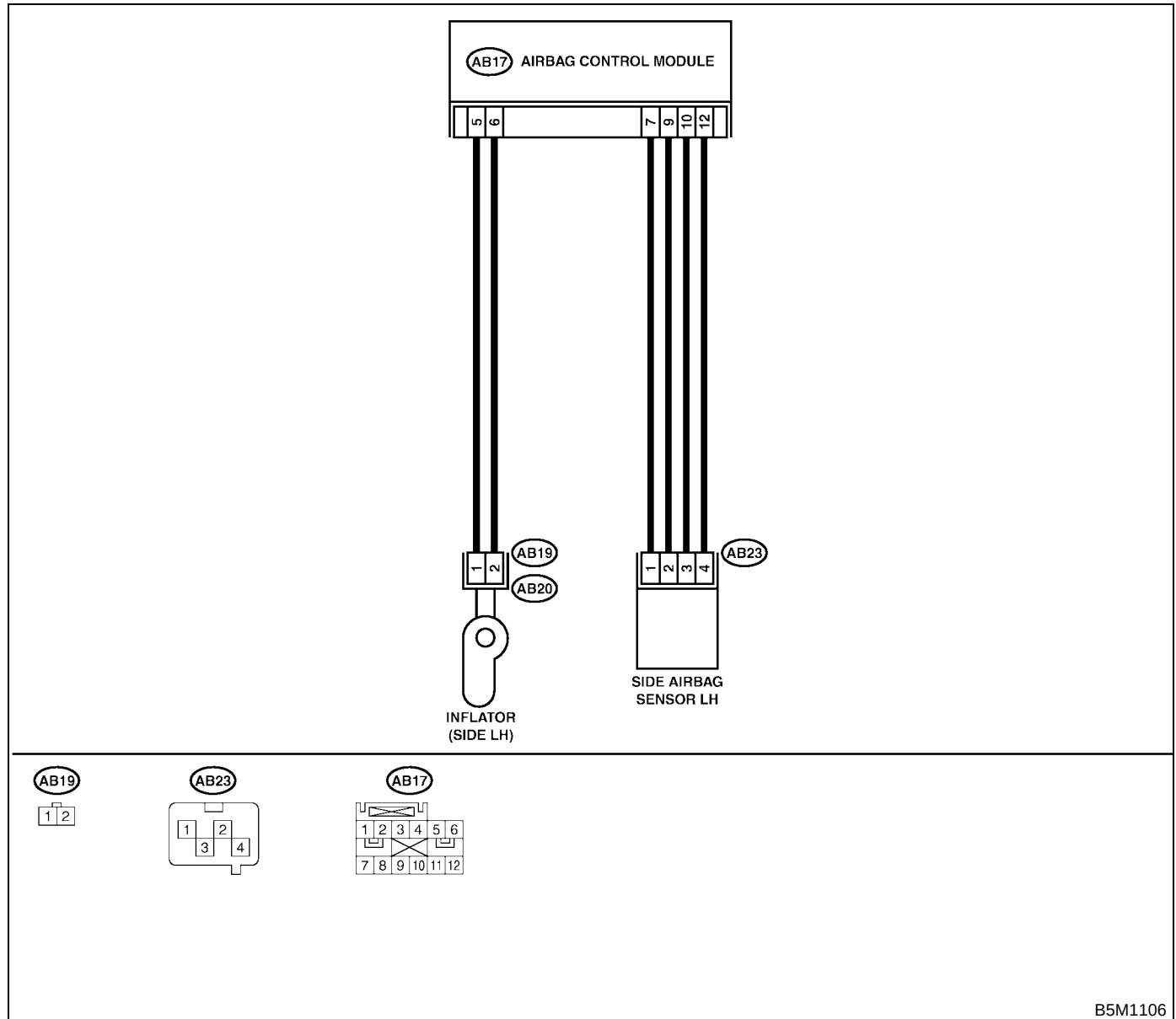
DIAGNOSIS:

- 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:



B5M1106

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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 SB-8, Front Seat Belt.> 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 airbag warning light operate properly?	Replace front seat with side airbag module (LH). <Ref. to SE-6, 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-16, Airbag Control Module.> 4) Connect connector (1I) in test harness I or 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 I or I2 and the chassis ground. Connector & terminal (3I) No. 10 (+) — Chassis ground (-): (3I) No. 12 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

P: TROUBLE CODE 51

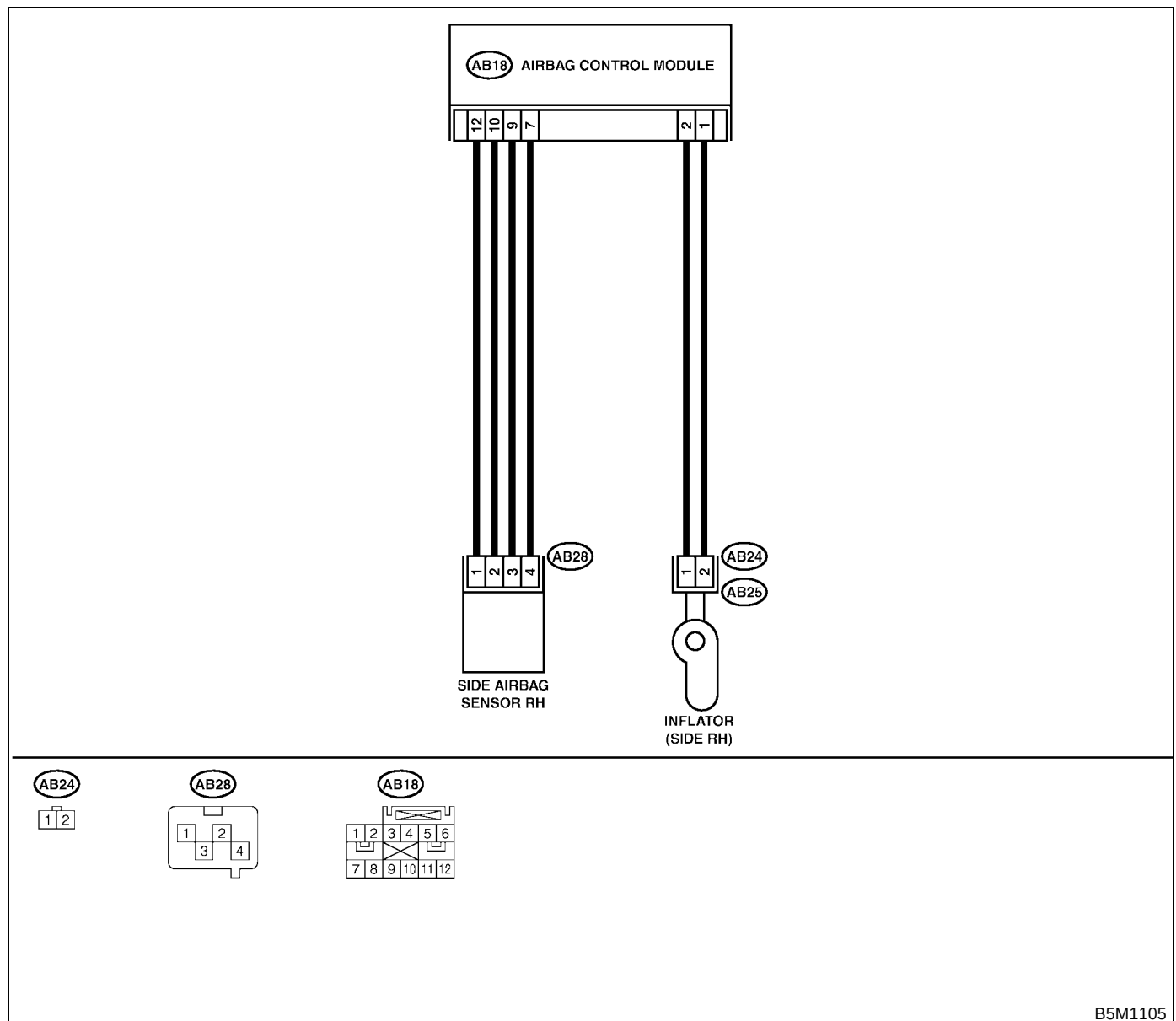
DIAGNOSIS:

- 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:



B5M1105

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SIDE AIRBAG HARNESS (RH). 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-8, Front Seat Belt.> 3) Disconnect connector (AB25) from (AB24). 4) Disconnect connector (AB18) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 5) Connect connector (1I) in test harness I or 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 I or I2 and connector (3G) in test harness G. Connector & terminal (3I) No. 17 — (3G) No. 2: (3I) No. 18 — (3G) No. 1: (3I) No. 19 — (3G) No. 5: (3I) No. 20 — (3G) No. 4:	Is the resistance less than 10 Ω ?	Go to step 2.	Replace the body harness with side airbag harness.
2 CHECK SIDE AIRBAG HARNESS (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 17 — Chassis ground: (3I) No. 18 — Chassis ground: (3I) No. 19 — Chassis ground: (3I) No. 20 — Chassis ground:	Is the resistance more than 1 M Ω ?	Replace side airbag sensor (RH). <Ref. to AB-17, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Q: TROUBLE CODE 52

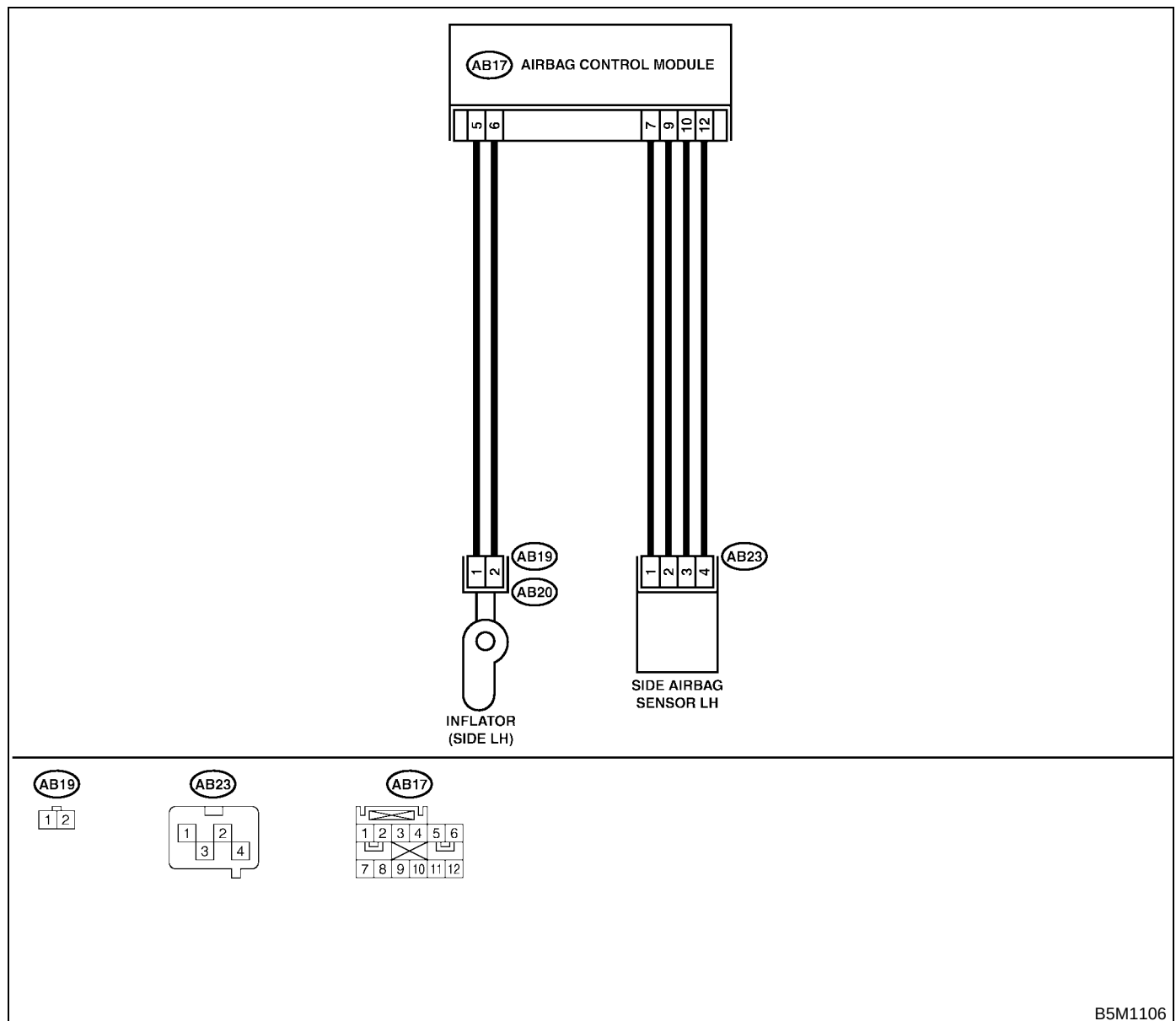
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 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 connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect connector (AB20) from (AB19). 4) Disconnect connector (AB17) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 5) Connect connector (1I) in test harness I or 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 I or I2 and connector (3G) in test harness G. Connector & terminal (3I) No. 5 — (3G) No. 4: (3I) No. 14 — (3G) No. 5: (3I) No. 15 — (3G) No. 1: (3I) No. 16 — (3G) No. 2:	Is the resistance less than 10 Ω?	Go to step 2.	Replace the body harness with side airbag harness.
2 CHECK SIDE AIRBAG HARNESS (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 5 — Chassis ground: (3I) No. 14 — Chassis ground: (3I) No. 15 — Chassis ground: (3I) No. 16 — Chassis ground:	Is the resistance more than 1 MΩ?	Replace side airbag sensor (LH). <Ref. to AB-17, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

R: TROUBLE CODE 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-17, Side Airbag Sensor.>

S: TROUBLE CODE 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-17, Side Airbag Sensor.>

T: TROUBLE CODE 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-16, Airbag Control Module.>
- Front seat with side airbag module. (Operating side) <Ref. to SE-6, Front Seat.>
- Side airbag sensor. (Operating side) <Ref. to AB-17, Side Airbag Sensor.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

U: TROUBLE CODE 61

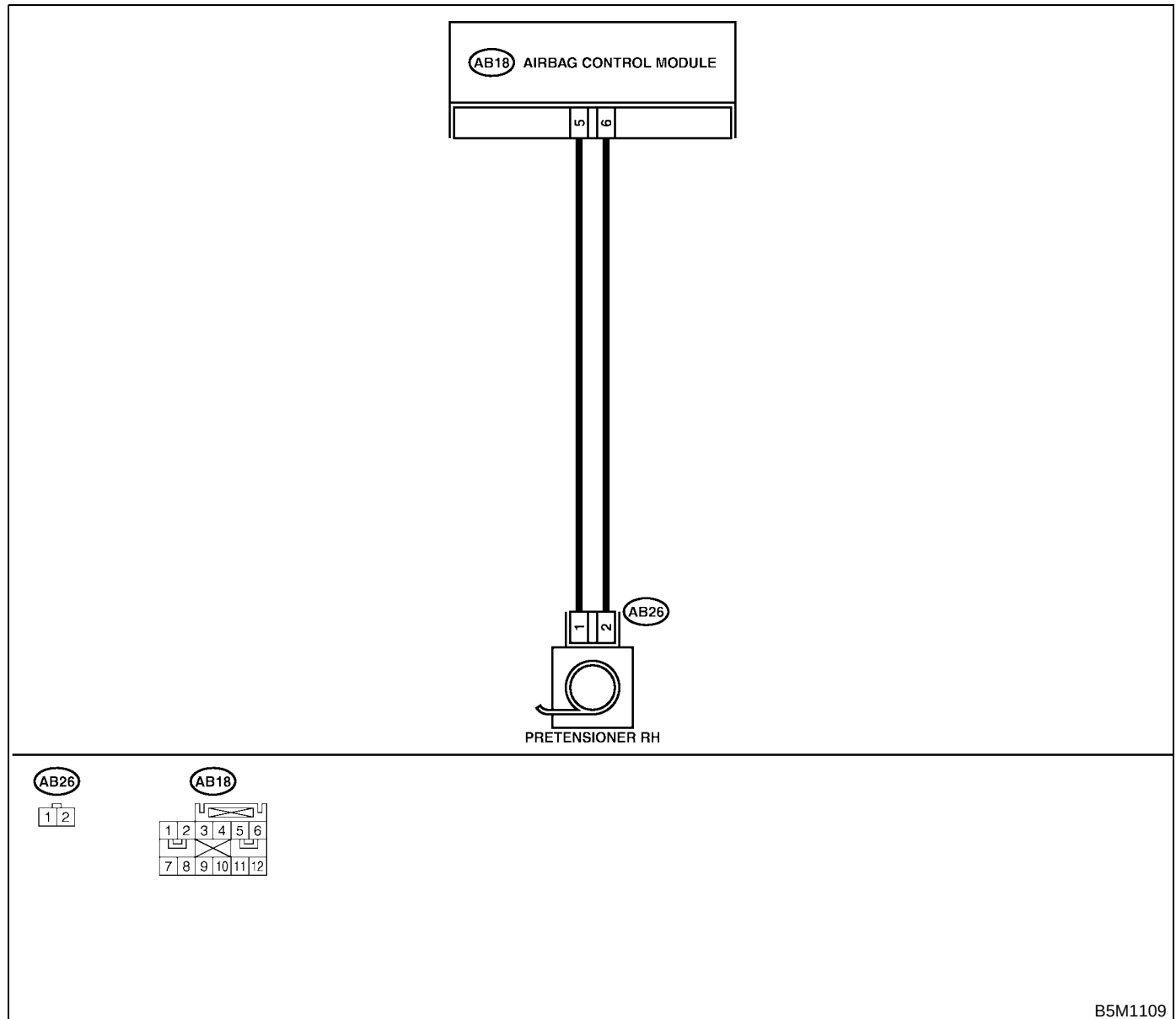
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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-8, Front Seat Belt.> 3) Connect the connector (1L) in test harness L to (AB26). 4) Connect the airbag resistor to connector (3L) in test harness L. 5) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace seat belt pretensioner (RH). <Ref. to SB-8, 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-16, Airbag Control Module.> 5) Connect the connector (1I) in test harness I or I2 to connector (AB18). 6) Measure the resistance between connector (3I) in test harness I or I2 and connector (3L) in test harness L. Connector & terminal (3I) No. 8 — (3L) No. 6: (3I) No. 6 — (3L) No. 5:	Is the resistance less than 10 Ω?	Go to step 3.	Replace the body harness with side airbag harness.
3 CHECK SIDE AIRBAG HARNESS (RH). Measure the resistance of the connector (3I) in test harness I or I2. Connector & terminal (3I) No. 6 — No. 8:	Is the resistance more than 1 MΩ?	Go to step 4.	Replace the body harness with side airbag harness.
4 CHECK SIDE AIRBAG HARNESS (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 6 — Chassis ground: (3I) No. 8 — Chassis ground:	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

V: TROUBLE CODE 62

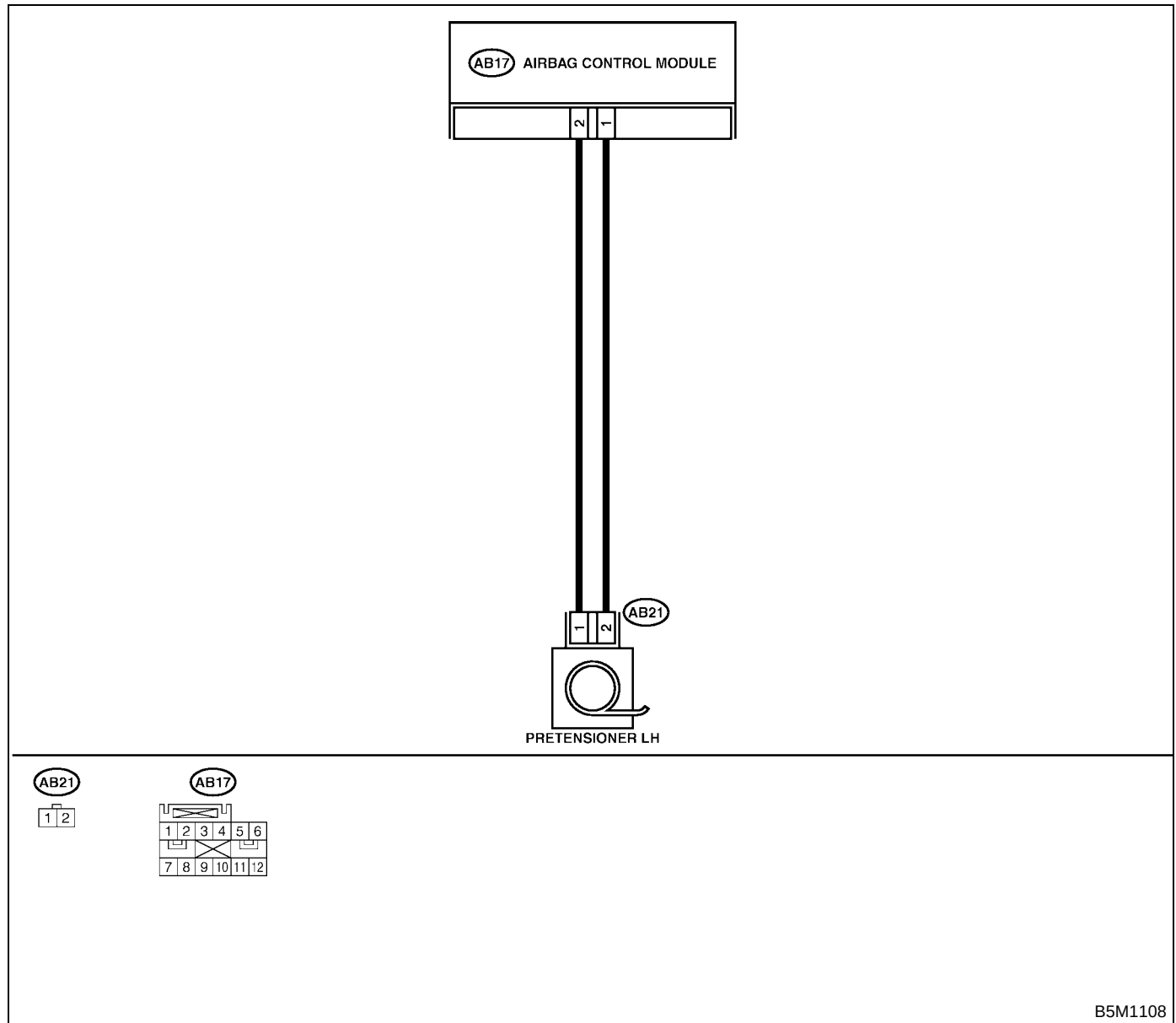
DIAGNOSIS:

- 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:



B5M1108

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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-8, Front Seat Belt.> 3) Connect the connector (1L) in test harness L to (AB21). 4) Connect the airbag resistor to the connector (3L) in test harness L. 5) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace seat belt pretensioner (LH). <Ref. to SB-8, 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-16, Airbag Control Module.> 5) Connect the connector (1I) in test harness I or I2 to the connector (AB17). 6) Measure the resistance between connector (3I) in test harness I or I2 and the connector (3L) in test harness L. Connector & terminal (3I) No. 11 — (3L) No. 6: (3I) No. 13 — (3L) No. 5:	Is the resistance less than 10 Ω ?	Go to step 3.	Replace the body harness with side airbag harness.
3 CHECK SIDE AIRBAG HARNESS (LH). Measure the resistance of the connector (3I) in test harness I or I2. Connector & terminal (3I) No. 11 — No. 13:	Is the resistance more than 1 M Ω ?	Go to step 4.	Replace the body harness with side airbag harness.
4 CHECK SIDE AIRBAG HARNESS (LH). Measure the resistance between the connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal (3I) No. 11 — Chassis ground: (3I) No. 13 — Chassis ground:	Is the resistance more than 1 M Ω ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

W: TROUBLE CODE 65

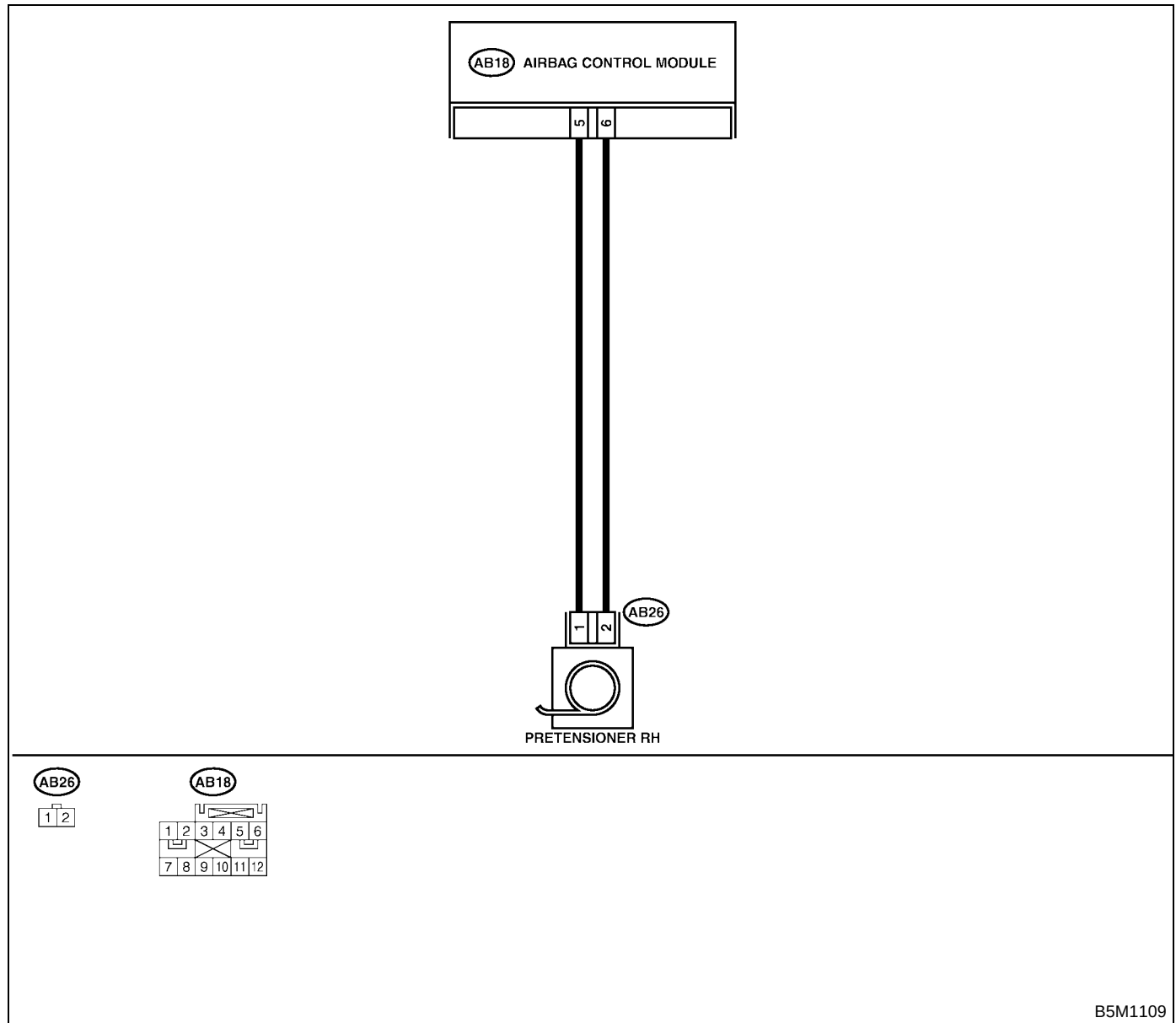
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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-8, Front Seat Belt.> 3) Connect the connector (1L) in test harness L to (AB26). 4) Connect the airbag resistor to connector (3L) in test harness L. 5) Connect the battery ground cable, and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace seat belt pretensioner (RH). <Ref. to SB-8, 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-16, Airbag Control Module.> 5) Connect the connector (1I) in test harness I or 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 I or I2 and the chassis ground. Connector & terminal (3I) No. 6 (+) — Chassis ground (-): (3I) No. 8 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

X: TROUBLE CODE 66

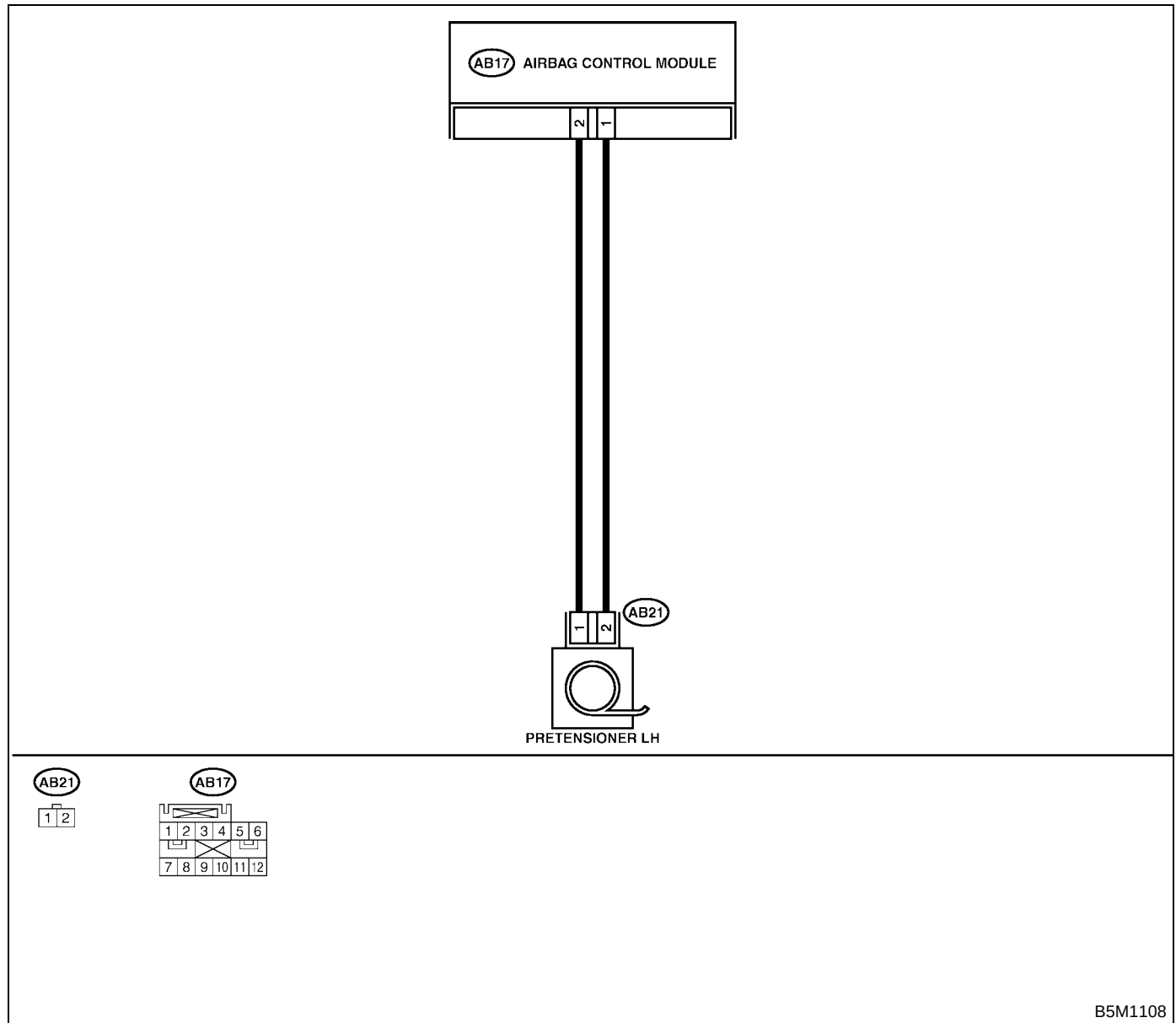
DIAGNOSIS:

- 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:



DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	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 seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Connect the connector (1L) in test harness L to (AB21). 4) Connect the airbag resistor to the connector (3L) in test harness L. 5) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace seat belt pre-tensioner(LH). <Ref. to SB-8, 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-16, Airbag Control Module.> 5) Connect the connector (1I) in test harness I or 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 I or I2 and the chassis ground. Connector & terminal (3I) No. 11 (+) — Chassis ground (-): (3I) No. 13 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

SEAT BELT SYSTEM

SB

	Page
1. General Description	2
2. Inspection Locations After a Collision	7
3. Front Seat Belt	8
4. Rear Seat Belt.....	10
5. Disposal of Pretensioner	13

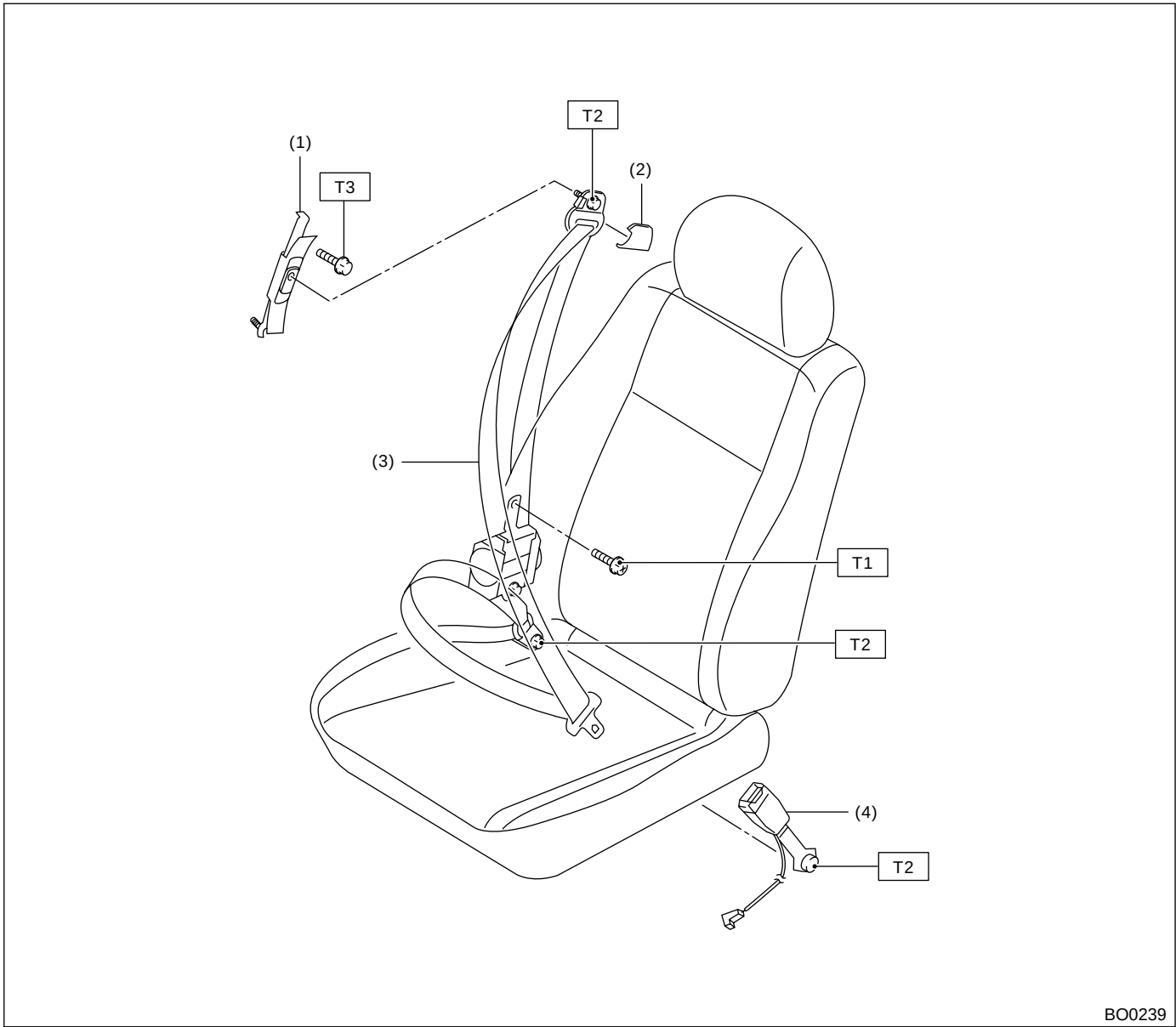
GENERAL DESCRIPTION

SEAT BELT SYSTEM

1. General Description

A: COMPONENT

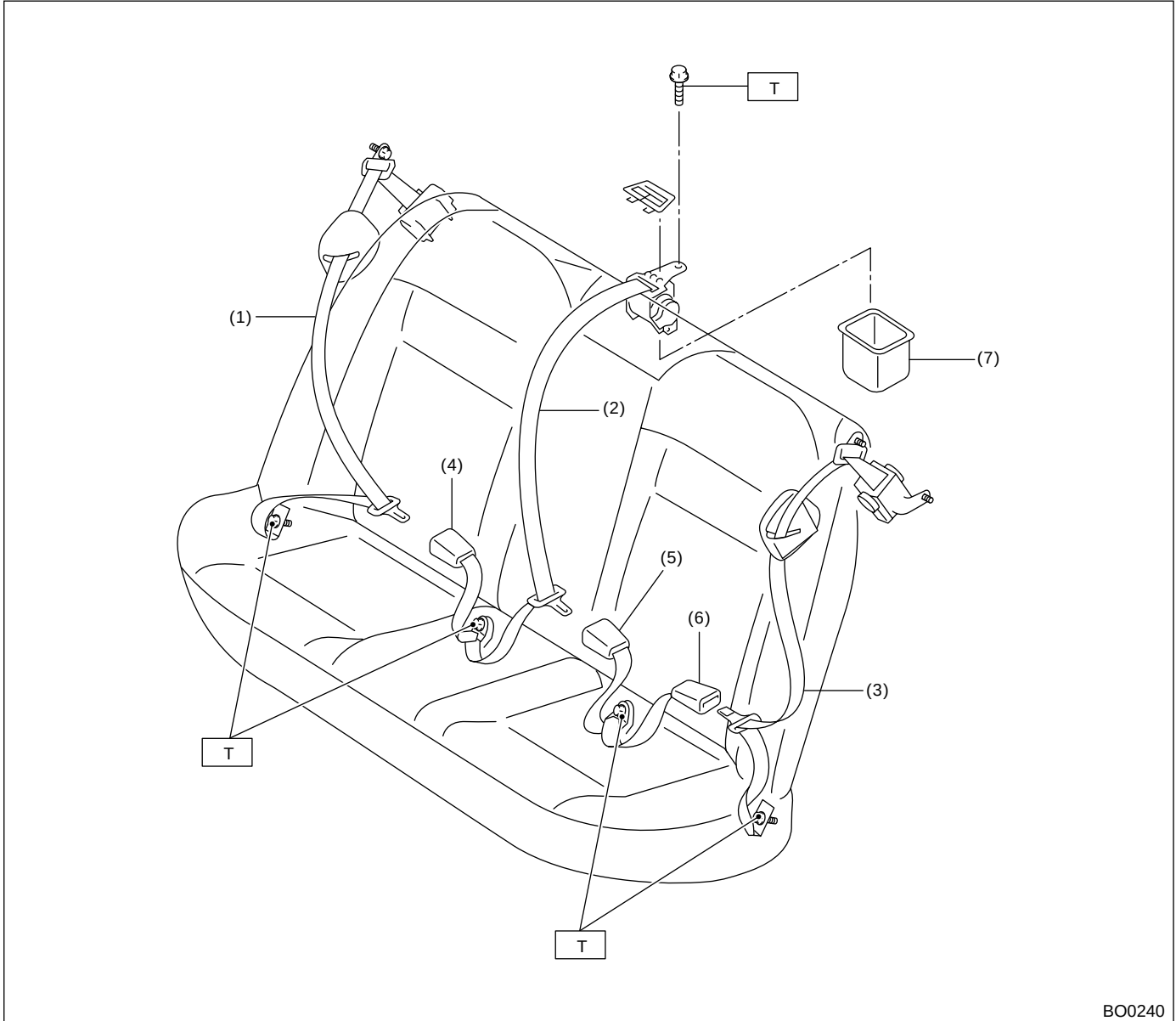
1. FRONT SEAT BELT



- (1) Adjuster anchor ASSY
- (2) Anchor cover
- (3) Outer belt ASSY
- (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)



BO0240

- | | |
|----------------------------|----------------------------|
| (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)

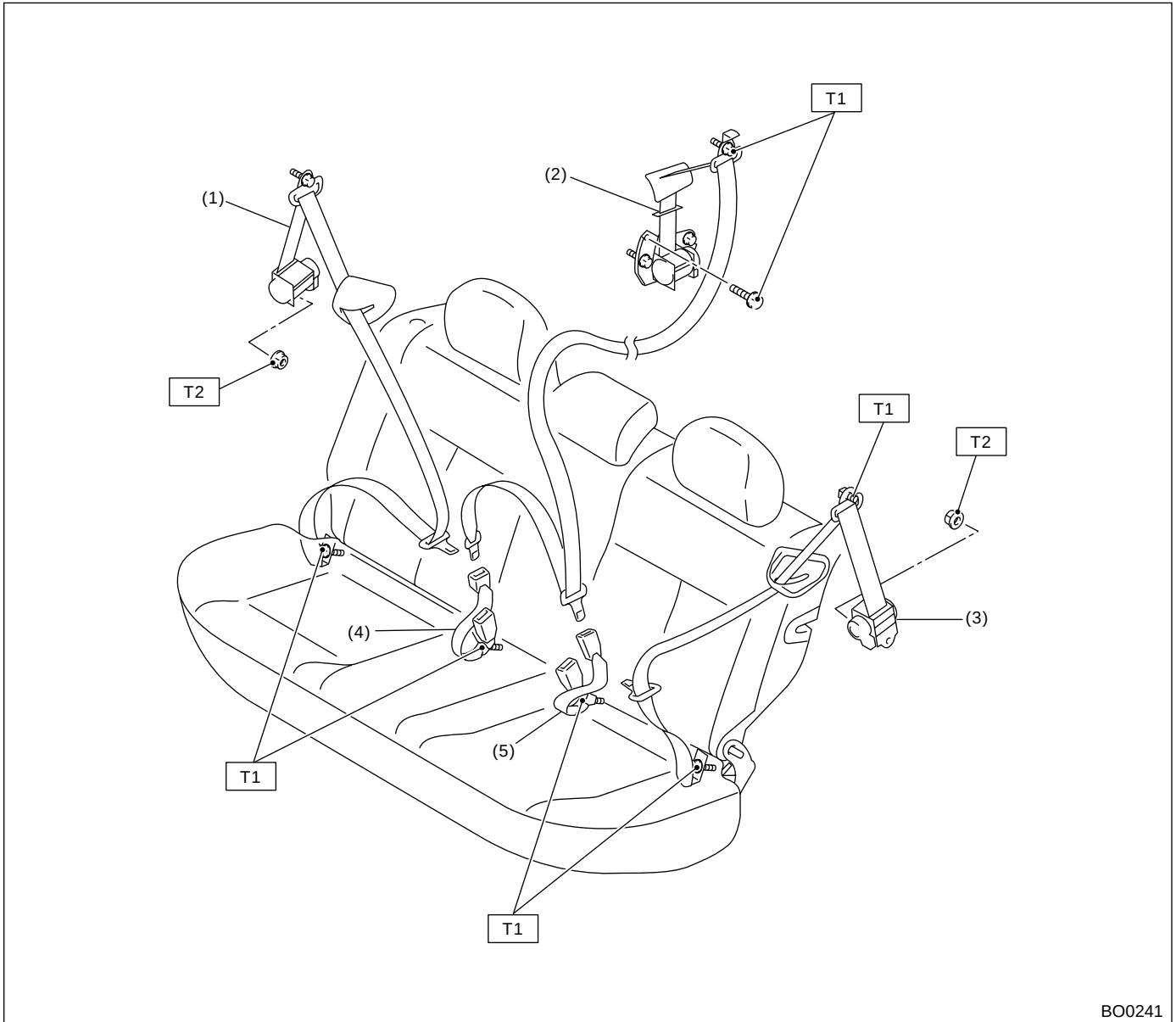
T2: 30 (3.1, 22)

T3: 53 (5.4, 39)

GENERAL DESCRIPTION

SEAT BELT SYSTEM

3. REAR SEAT BELT (WAGON BODY)



- | | |
|----------------------------|------------------------|
| (1) Outer seat belt RH | (5) Inner seat belt LH |
| (2) Outer seat belt CENTER | |
| (3) Outer seat belt LH | |
| (4) Inner seat belt RH | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 30 (3.1, 22)

T2: 53 (5.4, 39)

B: CAUTION

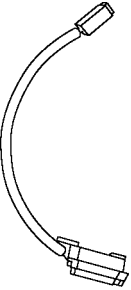
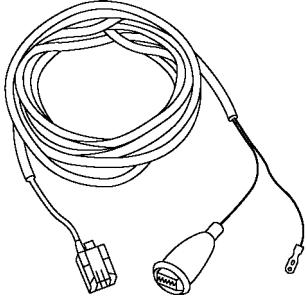
- Before starting, turn the ignition switch OFF, disconnect the battery ground cable and wait for 20 seconds or more.
- The pretension system has a backup power source. The pretensioner might deploy if you do not wait for 20 seconds or more before starting work.
- Do not drop or apply any impact to the 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 air bag 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-13, 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.

GENERAL DESCRIPTION

SEAT BELT SYSTEM

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B5M1114	98299FE010	ADAPTER C (DEPLOYMENT)	• Used for deploying the pretensioner. • Used with DEPLOYMENT TOOL (98299PA030).
 B5M1115	98299PA030	DEPLOYMENT TOOL	• Used for deploying the pretensioner. • Used with ADAPTER A (DEPLOYMENT) (98299FC030).

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.

FRONT SEAT BELT

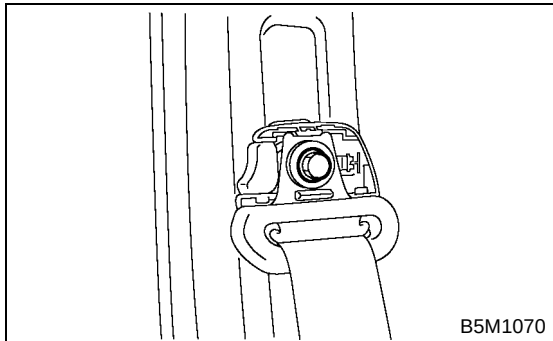
SEAT BELT SYSTEM

3. Front Seat Belt

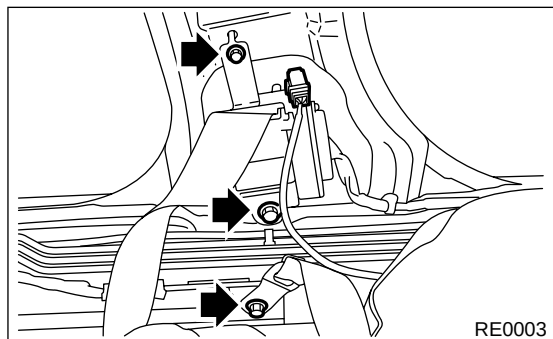
A: REMOVAL

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 20 seconds before starting work.
- 3) Remove center pillar lower trim. <Ref. to EI-29, REMOVAL, Lower Inner Trim.>
- 4) Remove anchor cover. Loosen shoulder anchor bolt, and then detach shoulder anchor from center pillar.



- 5) Turn over the floor mat to remove bolts.



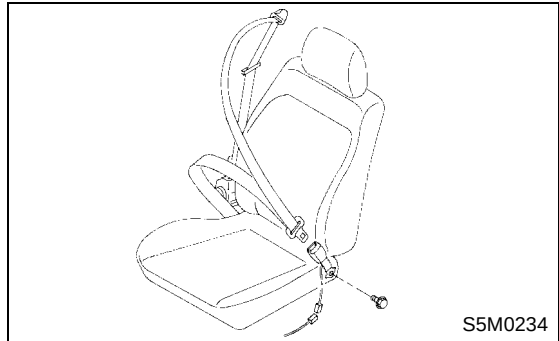
- 6) Disconnect yellow connector of pretensioner harness, and remove outer belt (front).

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.



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.

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.

REAR SEAT BELT

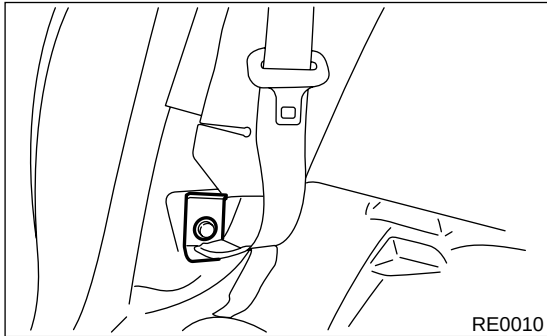
SEAT BELT SYSTEM

4. Rear Seat Belt

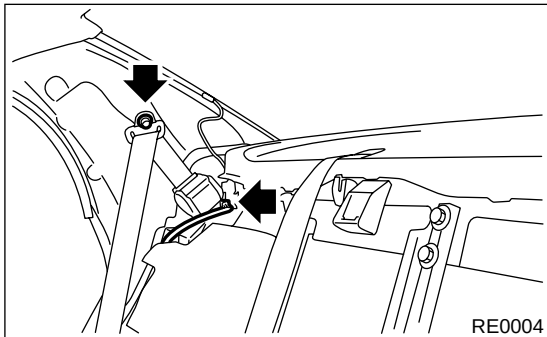
A: REMOVAL

1. OUTER BELT SIDE (SEDAN BODY)

- 1) Remove rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove side sill rear lower cover. <Ref. to EI-29, REMOVAL, Lower Inner Trim.>
- 3) Remove seat belt lower anchor bolt.

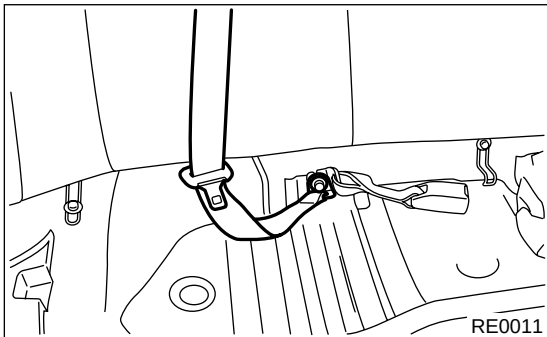


- 4) Remove quarter pillar trim. <Ref. to EI-30, REMOVAL, Rear Quarter Trim.>
- 5) Remove bolts, and then detach seat belt.



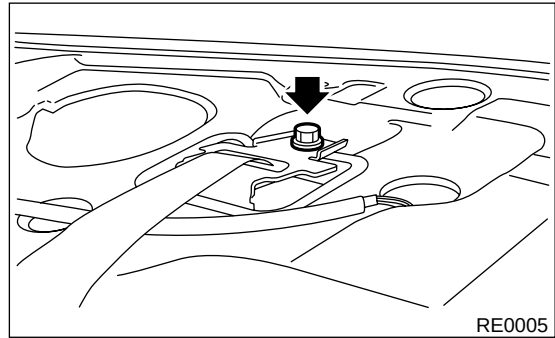
2. OUTER BELT CENTER (SEDAN BODY)

- 1) Remove rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove seat belt lower anchor bolt.



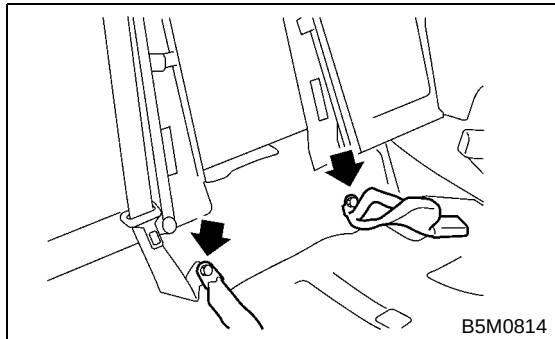
- 3) Remove quarter pillar trim. <Ref. to EI-30, Removal, Rear Quarter Trim.>>
- 4) Remove rear shelf trim. <Ref. to EI-35, REMOVAL, Rear Shelf Trim.>

- 5) Remove bolts, and then detach seat belt.



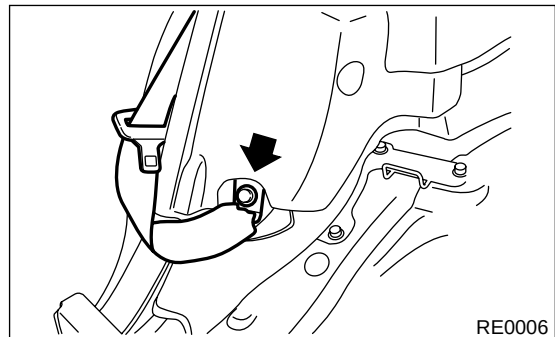
3. INNER BELT (SEDAN BODY)

- 1) Remove the rear cushion. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove bolts, and then detach inner belt.



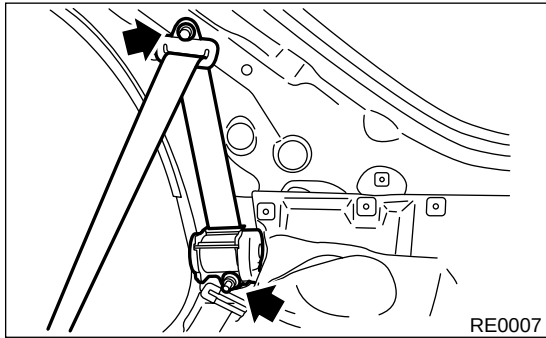
4. OUTER BELT SIDE (WAGON BODY)

- 1) Remove luggage floor mat. <Ref. to EI-38, REMOVAL, Luggage Floor Mat.>
- 2) Remove rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 3) Remove side sill rear lower cover. <Ref. to EI-29, REMOVAL, Lower Inner Trim.>
- 4) Remove seat belt lower anchor bolt.



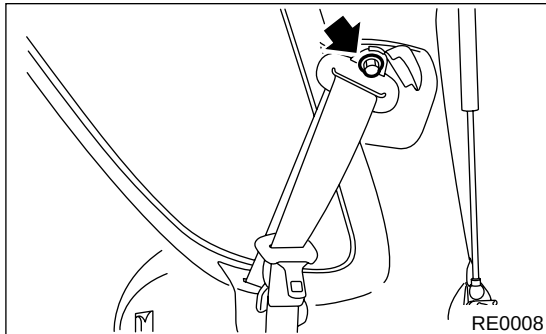
- 5) Remove rear quarter trim. <Ref. to EI-30, REMOVAL, Rear Quarter Trim.>

6) Remove bolts, and then detach outer belt side.



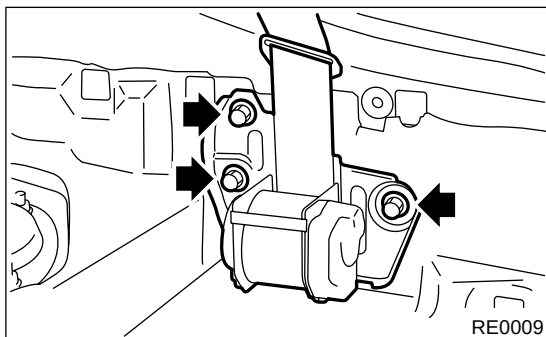
5. OUTER BELT CENTER (WAGON BODY)

1) Loosen shoulder anchor bolt, and then detach shoulder anchor from quarter pillar.



2) Remove quarter trim. <Ref. to EI-30, REMOVAL, Rear Quarter Trim.>

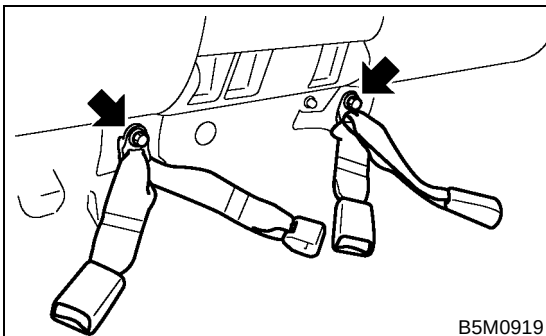
3) Remove three bolts, and then detach outer belt center.



6. INNER BELT (WAGON BODY)

1) Remove the rear cushion.

2) Remove bolt, and then detach inner belt.



REAR SEAT BELT

SEAT BELT SYSTEM

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.

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.

5. Disposal of Pretensioner

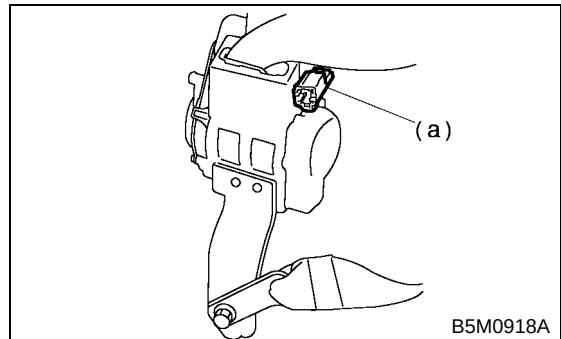
A: CAUTION

- 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.
- If circumstances do not permit pretensioner deployment, contact a SUBARU dealer.

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-29, REMOVAL, Lower Inner Trim.>
- 4) Disconnect yellow connector from pretensioner (a).



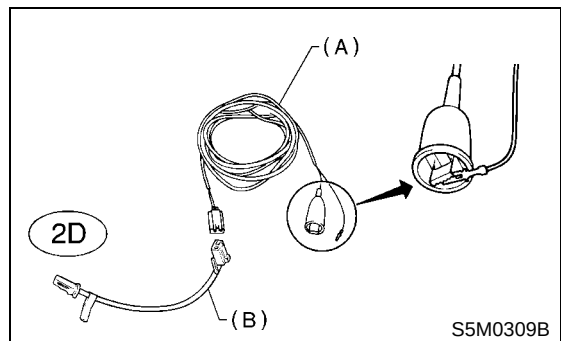
- 5) Short terminal to alligator clip furnished as deployment tool (A).
- 6) Connect the deployment tool and adapter C (deployment) (B).

Deployment tool: (Part No. 98299PA030)

Adapter C (deployment) : (Part No. 98299FE010)

CAUTION:

The deployment tool should be kept shorted until just before deployment of the pretensioner.

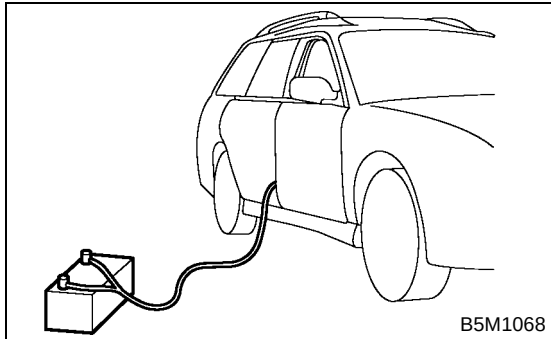


- 7) Connect adapter C (deployment) connector and pretensioner yellow connector.

DISPOSAL OF PRETENSIONER

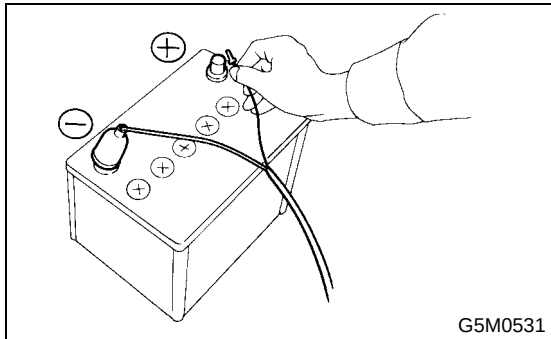
SEAT BELT SYSTEM

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.

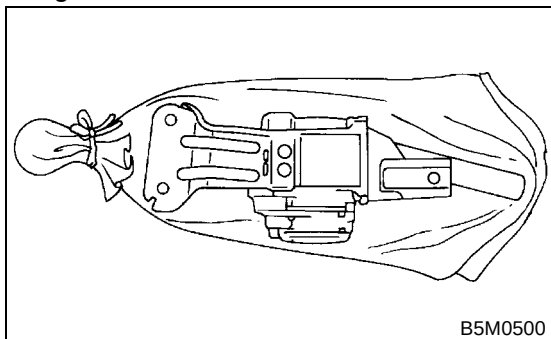


CAUTION:

- 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-8, Removal.>

12) Wrap the deployed pretensioner in an airtight vinyl bag, and then discard it.



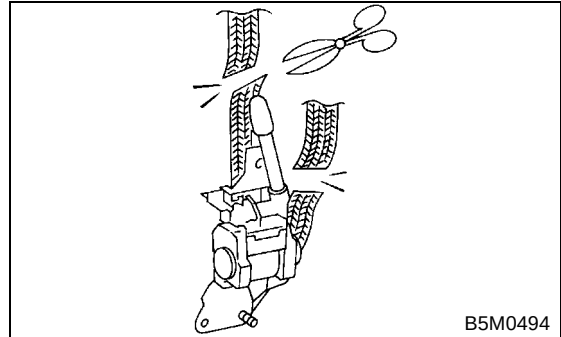
2. DEPLOYING AFTER REMOVAL FROM VEHICLE

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-8, Removal.>

4) Cut off seat belt as close to retractor as possible.



5) Short terminal to alligator clip furnished as a deployment tool (A).

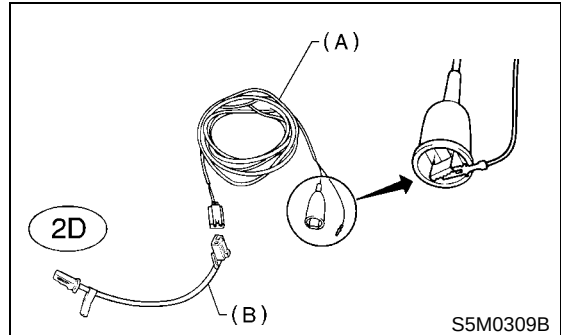
6) Connect the deployment tool and adapter C (deployment) (B).

Deployment tool: (Part No. 98299PA030)

Adapter C (deployment) : (Part No. 98299FE010)

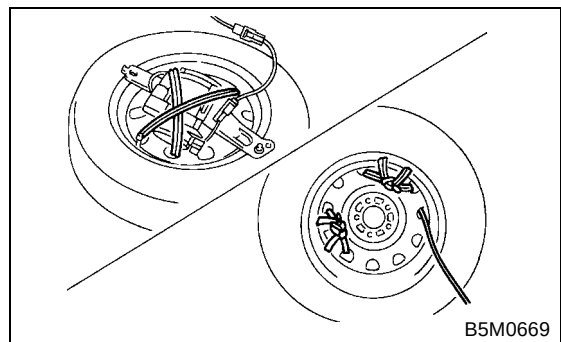
CAUTION:

The deployment tool should be kept shorted until just before deployment of the pretensioner.



7) Connect adapter C (deployment) connector and pretensioner yellow connector.

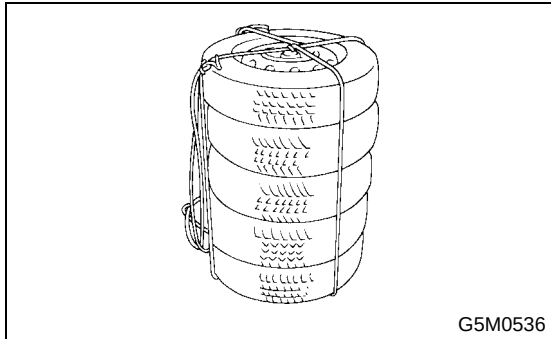
8) Install pretensioner on the wheel with the tire. Then, bundle three wire automotive harness [each with a sectional area of 1.25 mm² (0.00194 sq in) or more], and bind them twofold around the pretensioner bracket and the wheel.



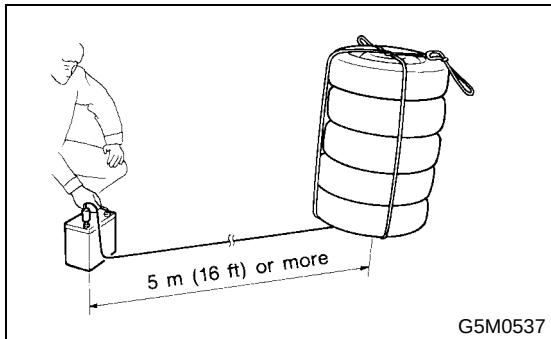
DISPOSAL OF PRETENSIONER

SEAT BELT SYSTEM

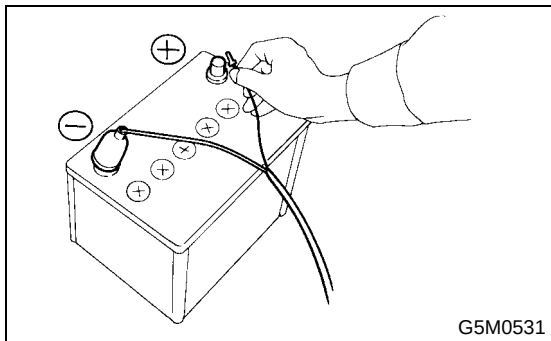
9) Put three tires without the wheel on the tire installed with pretensioner. Put on an additional tire with the wheel on top, and then fasten them tight with rope.



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.



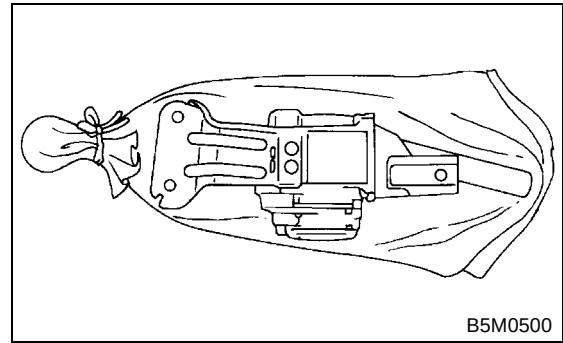
11) Connect the other terminal of deployment tool to the battery plus terminal. Then deploy pretensioner.



CAUTION:

- After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes.
- Do not let water get on the deployed pretensioner.

12) Wrap the deployed pretensioner in an airtight vinyl bag, and discard it.



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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

LIGHTING SYSTEM

LI

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GENERAL DESCRIPTION

LIGHTING SYSTEM

1. General Description

A: SPECIFICATIONS

Headlight			12 V — 55 W/60 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	Standard type	12 V — 21 W		
		Rear spoiler built-in type	12 V — 1.2 W		
	Wagon		12 V — 10 W		
Room light			12 V — 8 W		
Spot light			12 V — 8 W		
Luggage room light			12 V — 13 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:

- **Air bag system wiring harness is routed near electrical parts and switches. All air bag system wiring harnesses and connectors are yellow. Do not use electric test equipment on these circuits.**
- **Be careful not to damage the air bag system wiring harness when servicing electrical parts and switches.**

C: PREPARATION TOOL

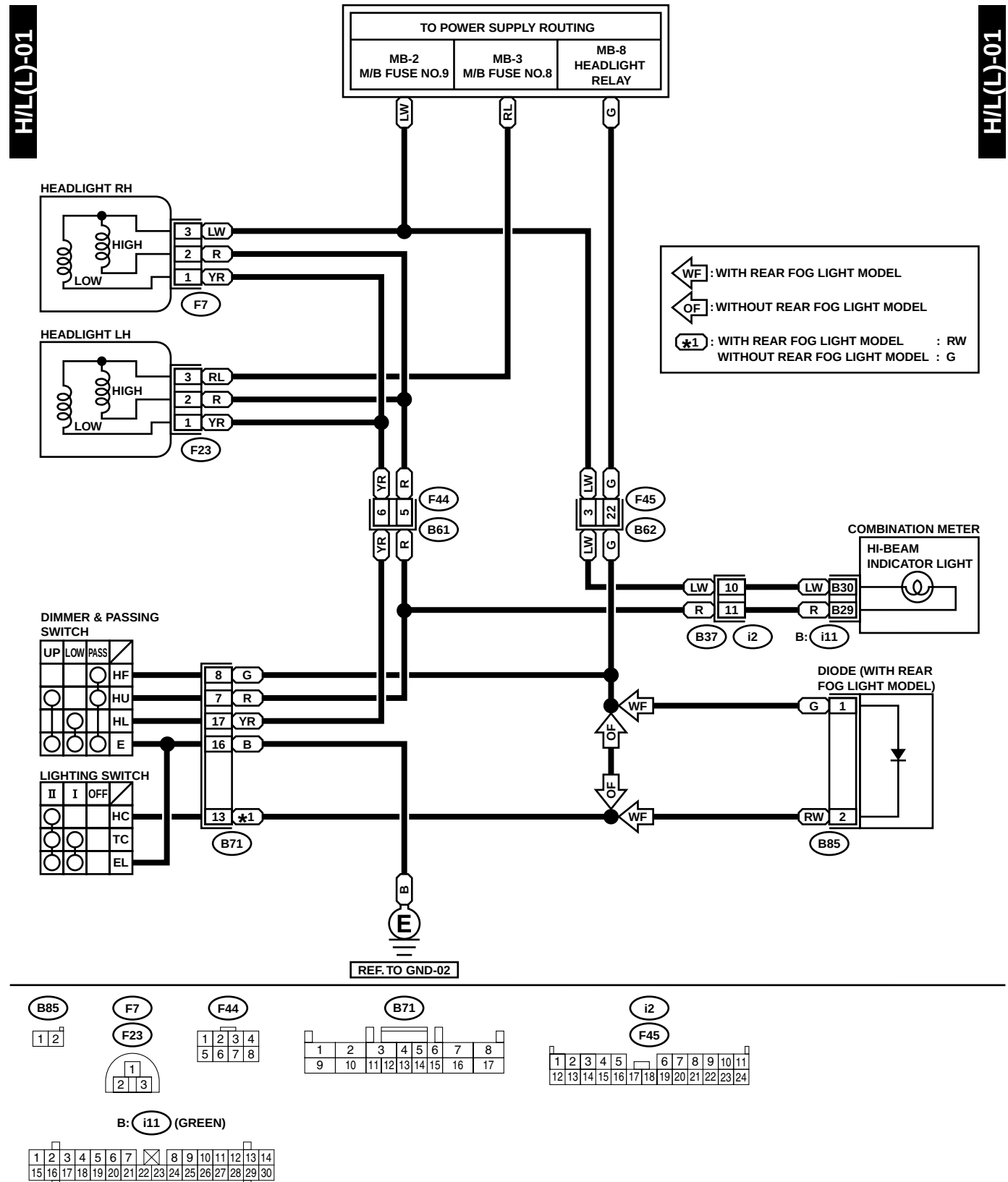
1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Headlight and Tail Light System

A: SCHEMATIC

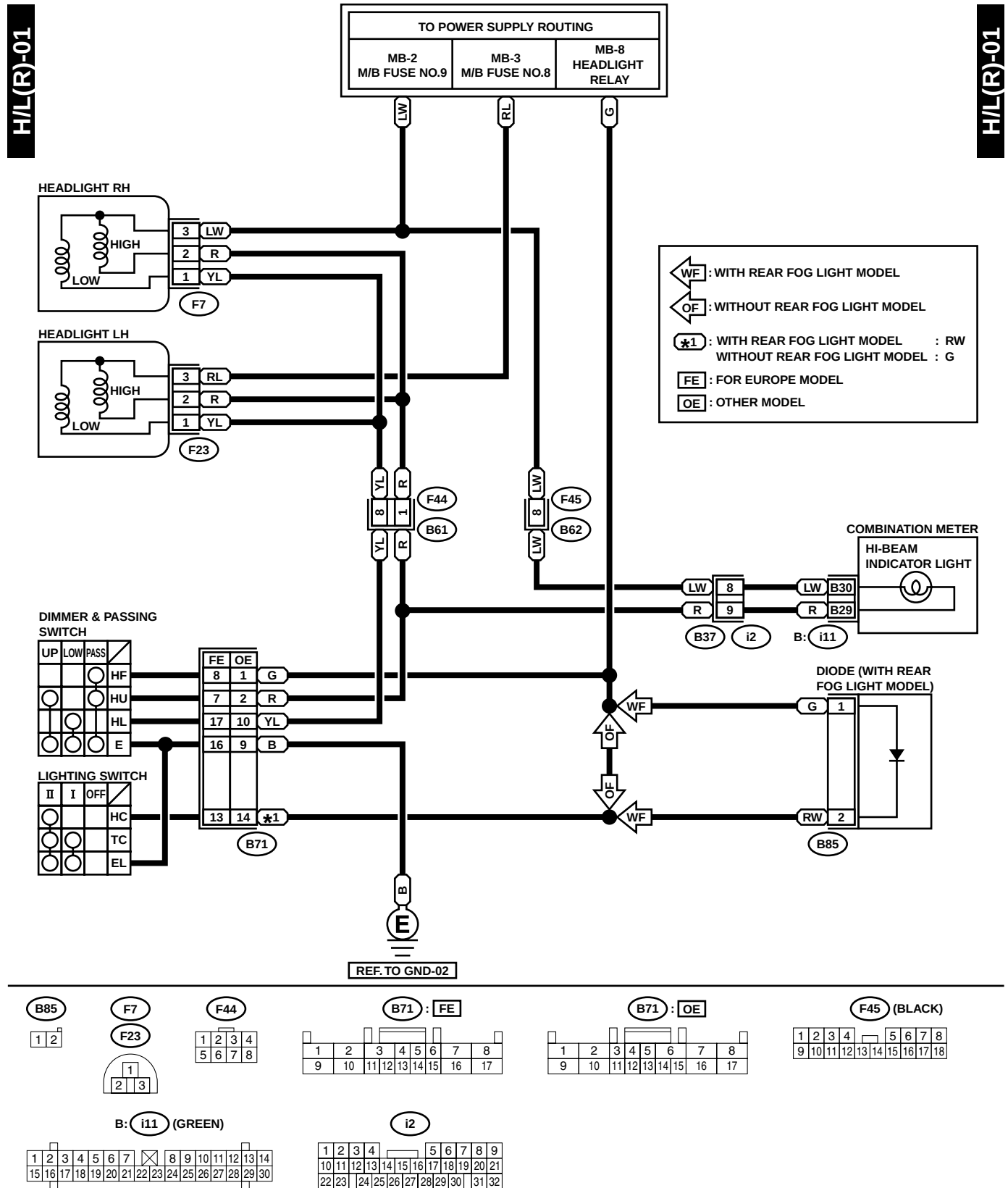
1. HEADLIGHT LHD MODEL



HEADLIGHT AND TAIL LIGHT SYSTEM

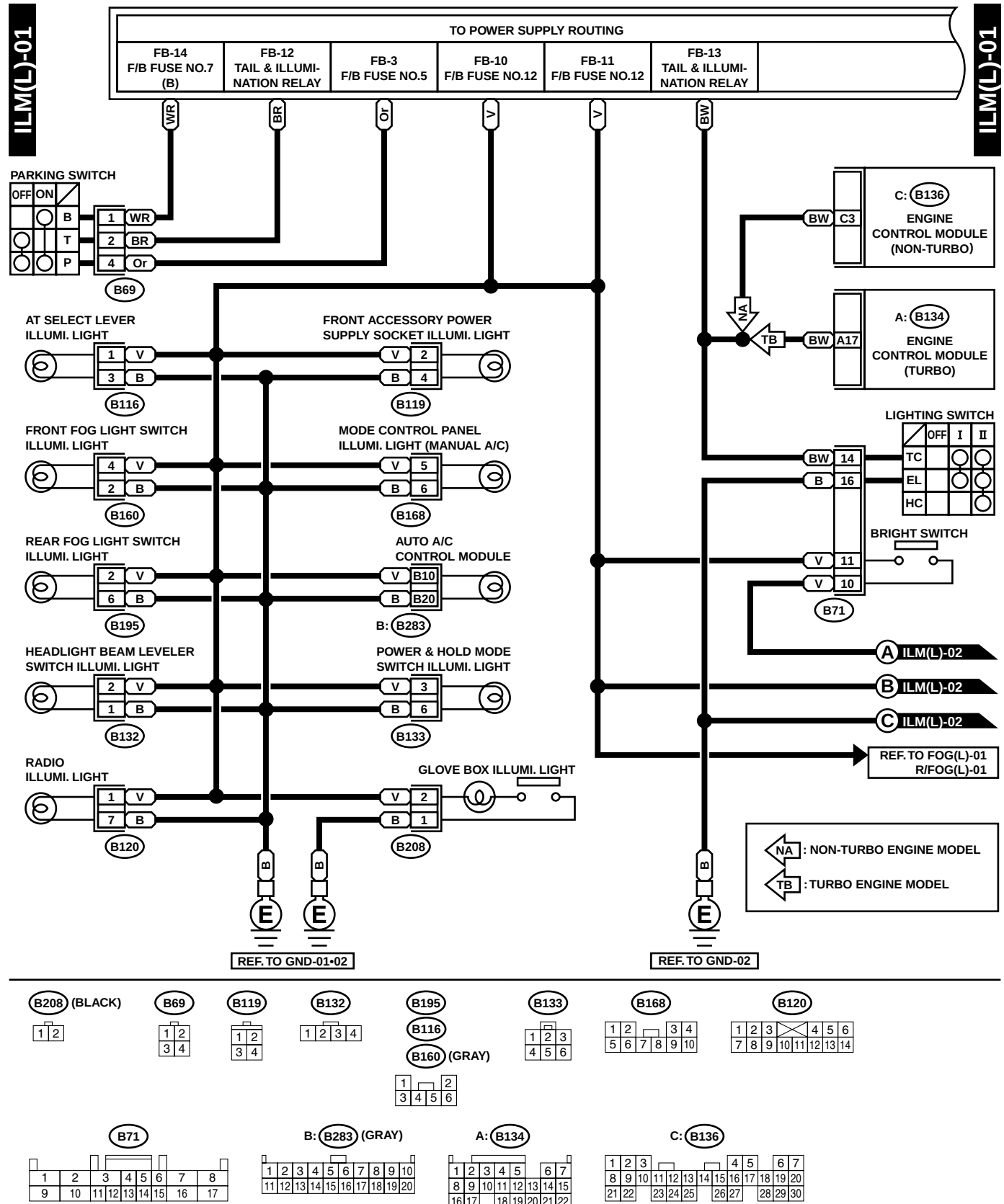
LIGHTING SYSTEM

2. HEADLIGHT RHD MODEL



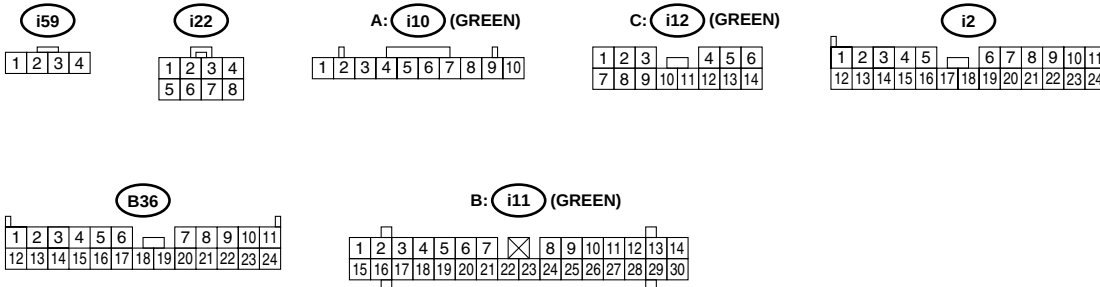
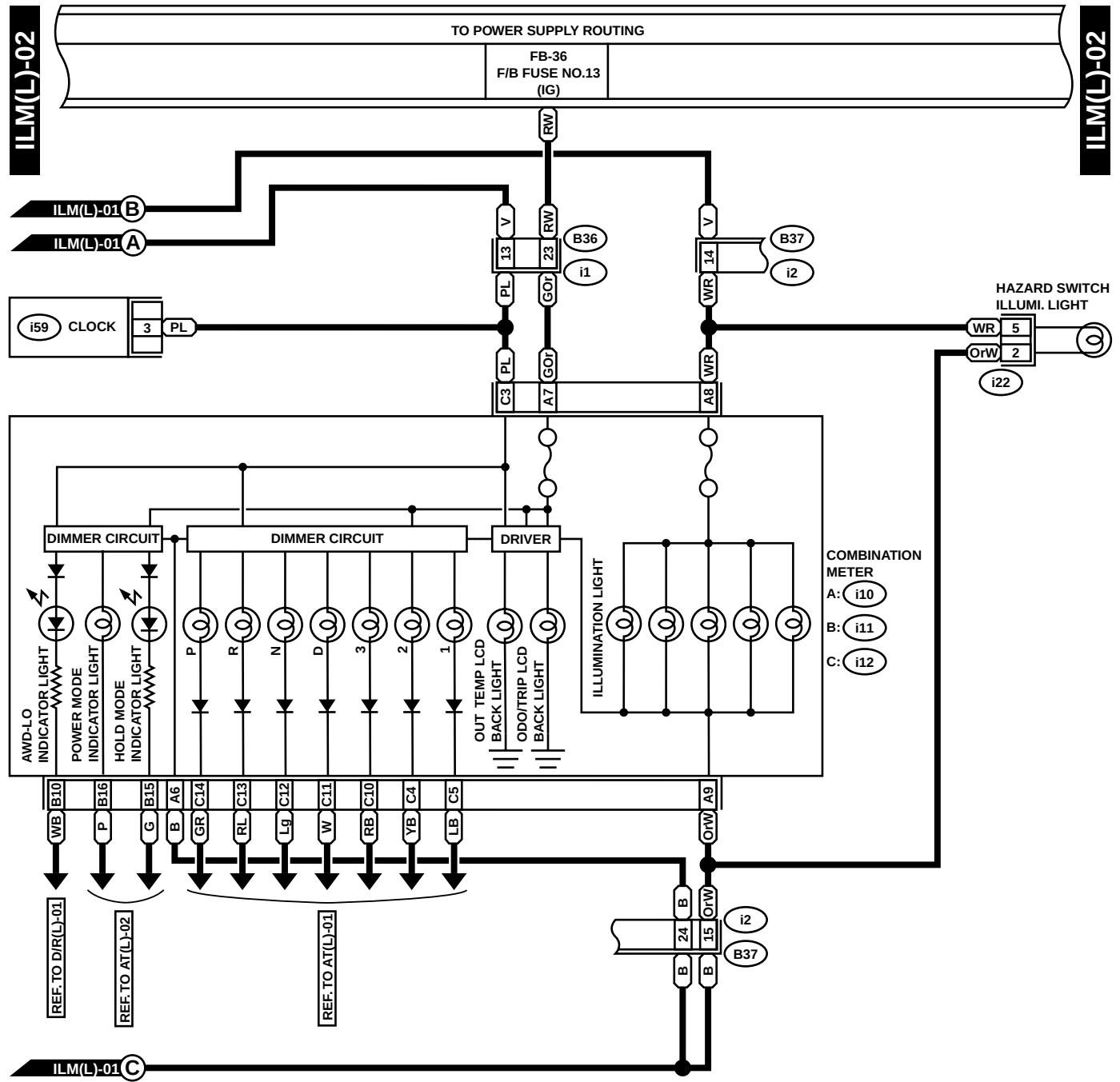
GR19-20

3. CLEARANCE LIGHT AND ILLUMINATION LIGHT LHD MODEL



HEADLIGHT AND TAIL LIGHT SYSTEM

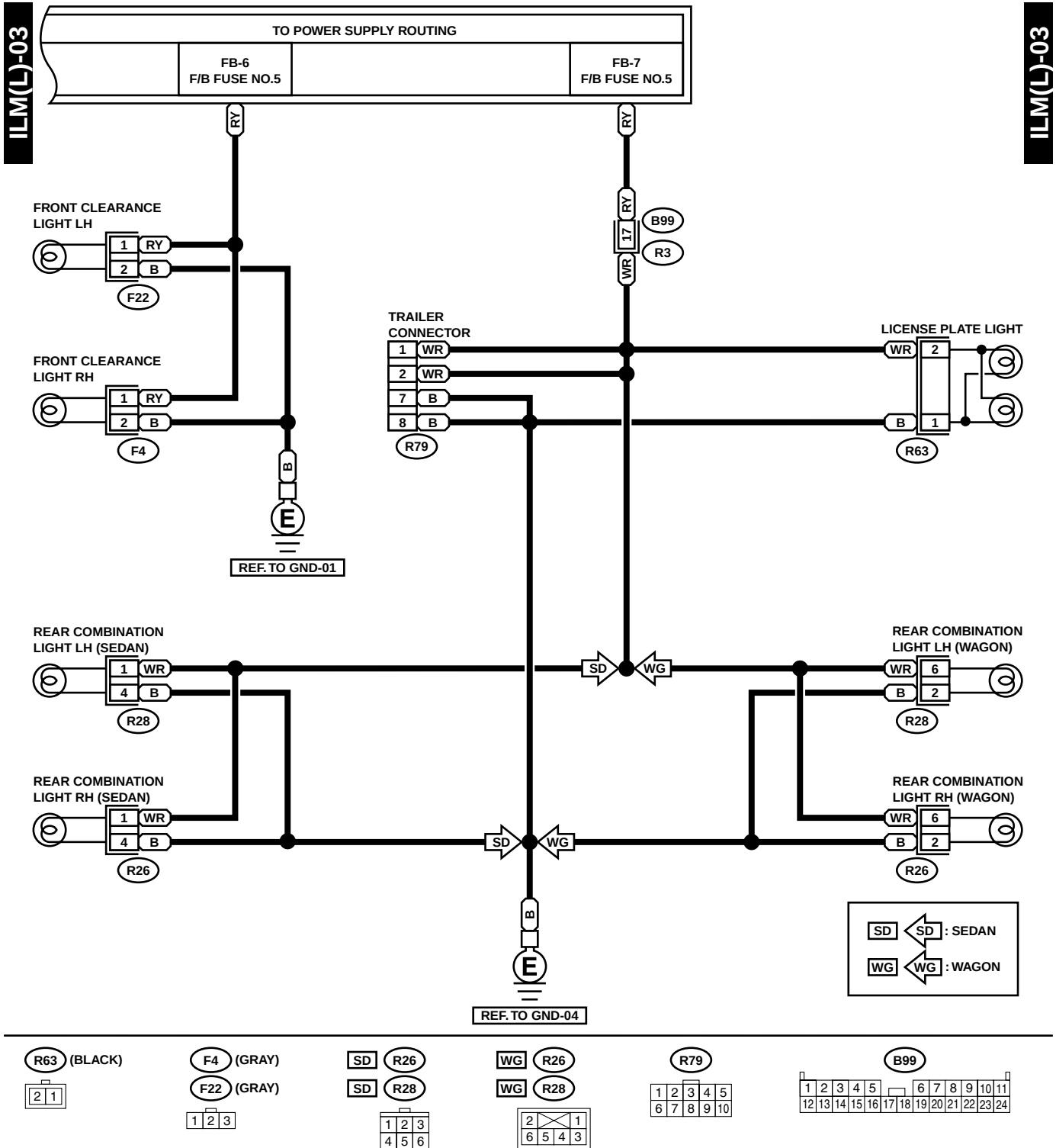
LIGHTING SYSTEM



GL21-21B

HEADLIGHT AND TAIL LIGHT SYSTEM

LIGHTING SYSTEM

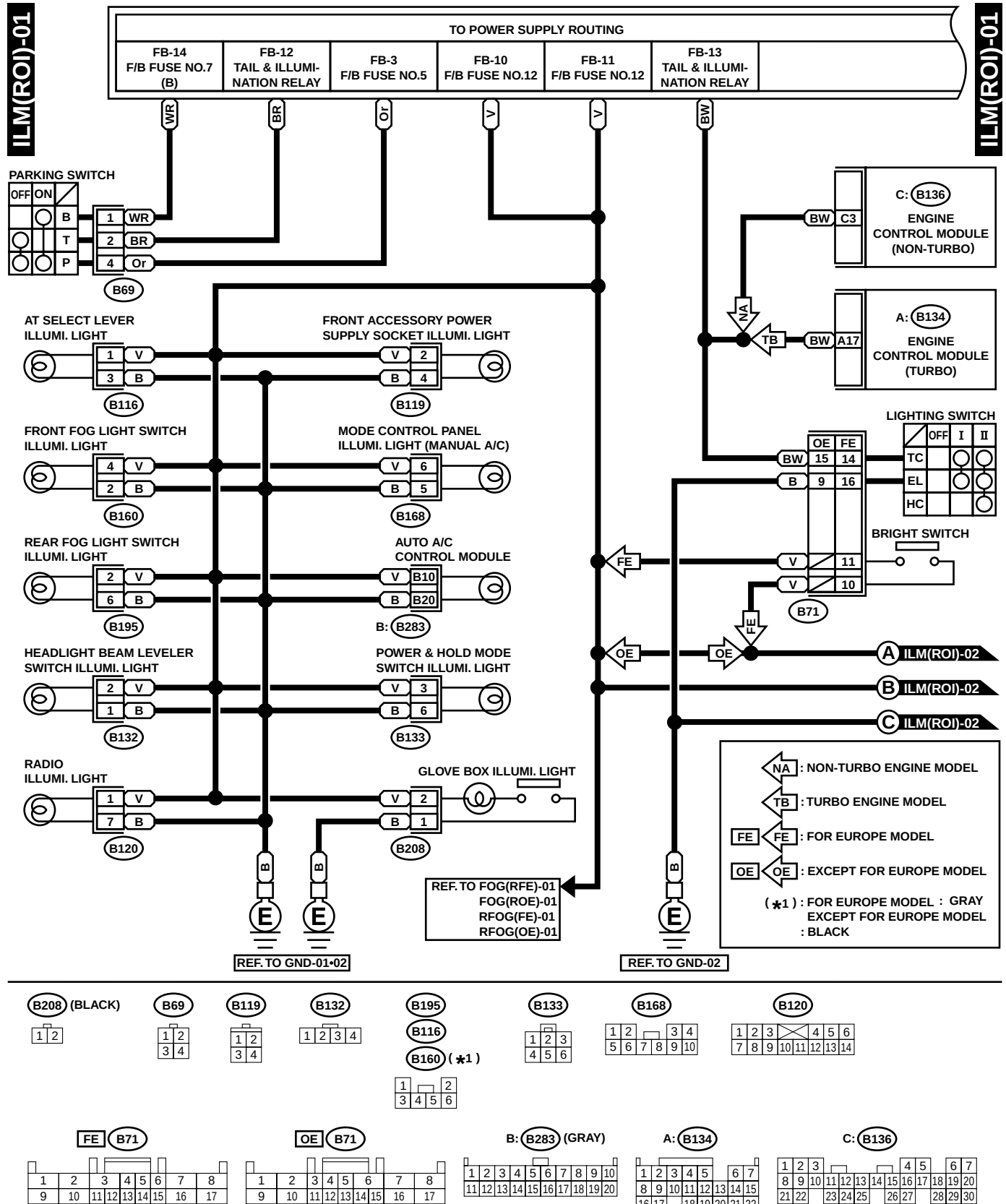


GL21-21C

HEADLIGHT AND TAIL LIGHT SYSTEM

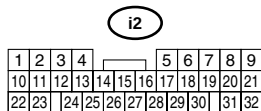
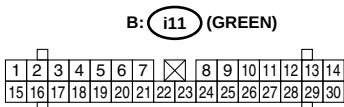
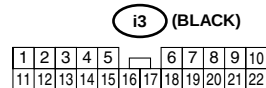
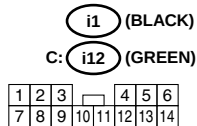
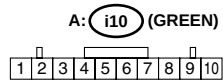
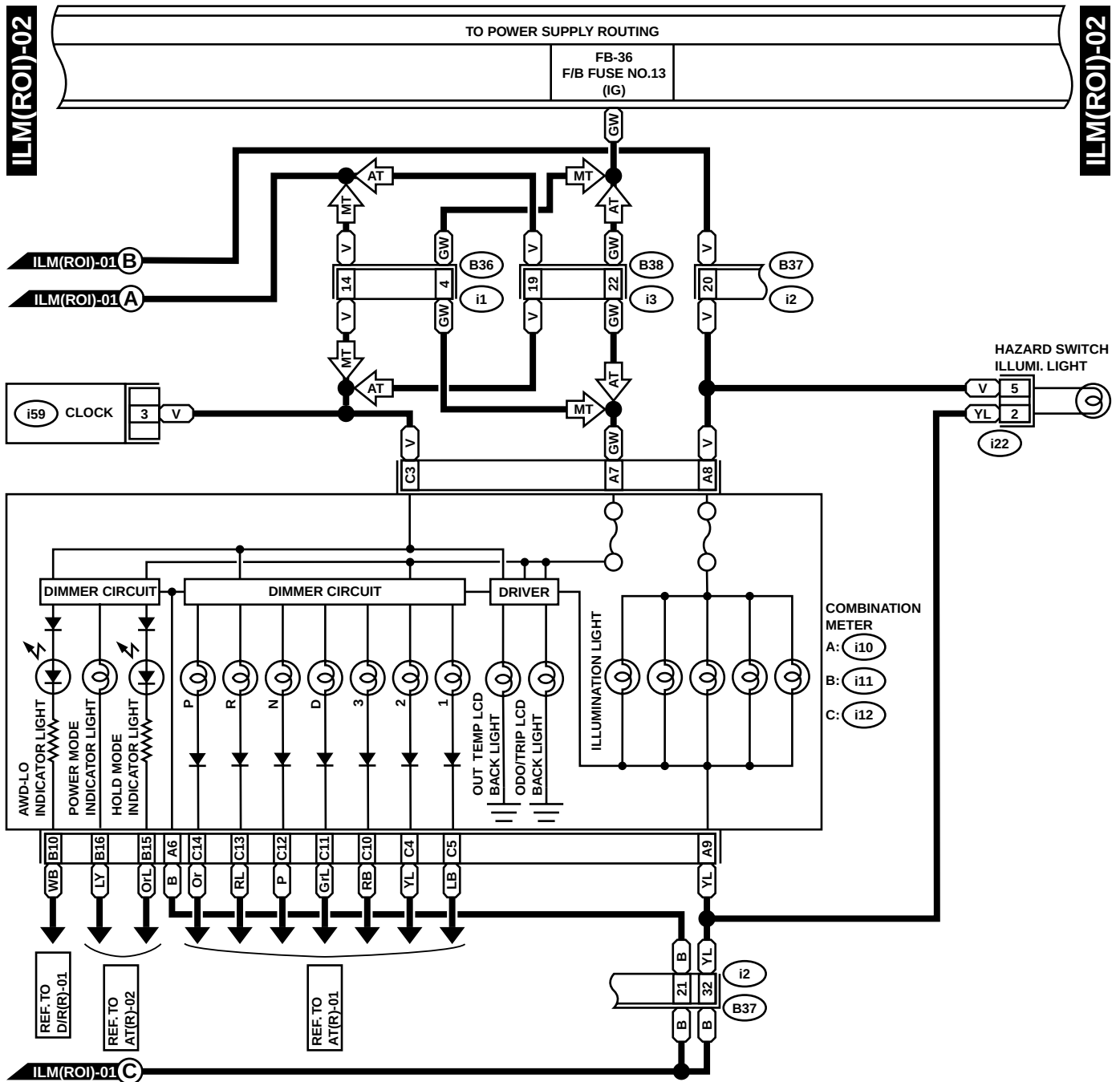
LIGHTING SYSTEM

4. CLEARANCE LIGHT AND ILLUMINATION LIGHT RHD WITHOUT ILLUMINATION CONTROL MODEL



HEADLIGHT AND TAIL LIGHT SYSTEM

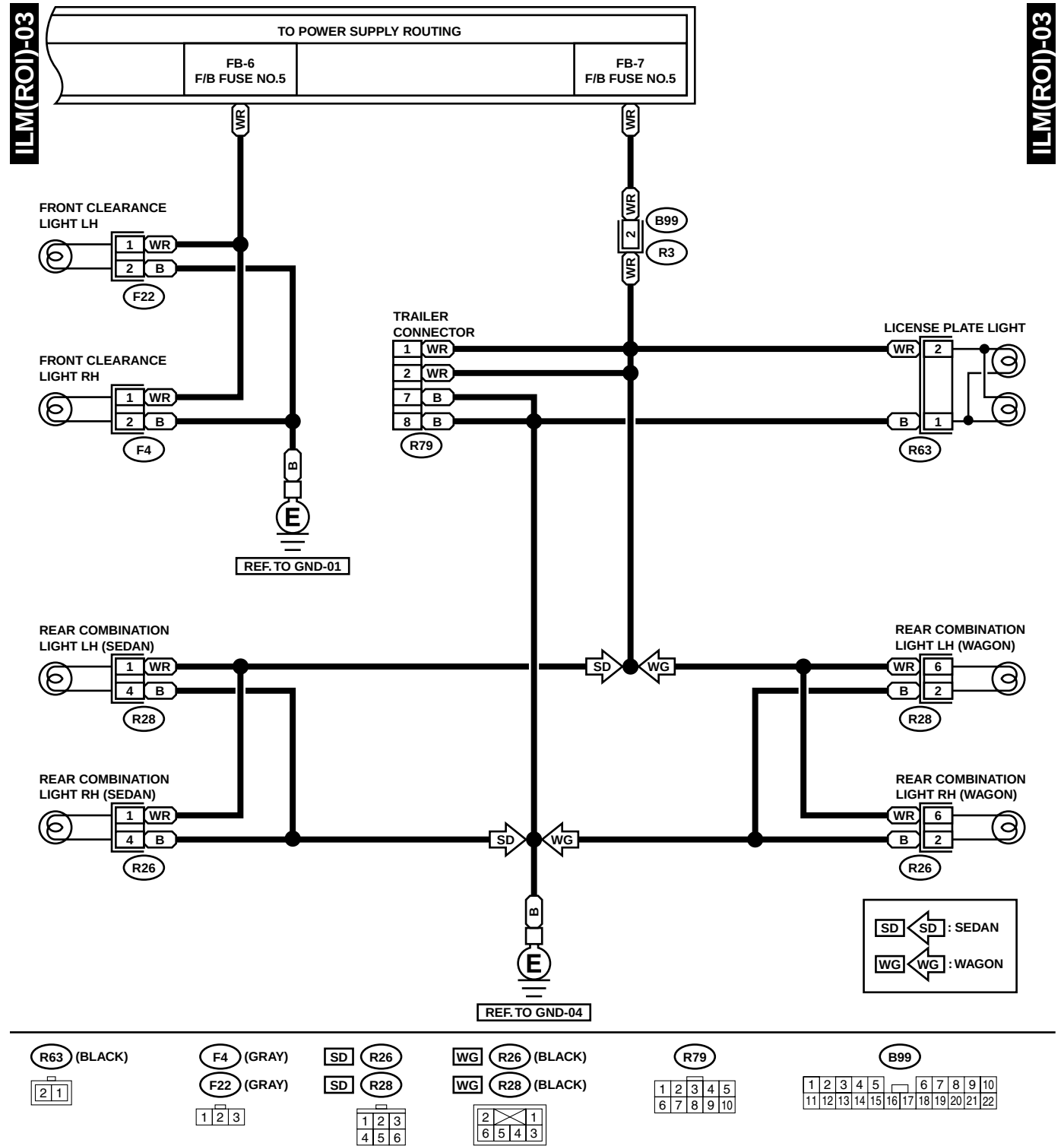
LIGHTING SYSTEM



GR21-21B

HEADLIGHT AND TAIL LIGHT SYSTEM

LIGHTING SYSTEM



GR21-21C

LIGHTING SYSTEM

TO POWER SUPPLY ROUTING

FB-14 F/B FUSE NO.7 (B)	FB-12 TAIL & ILLUMINATION RELAY	FB-3 F/B FUSE NO.5	FB-10 F/B FUSE NO.12	FB-11 F/B FUSE NO.12	FB-13 TAIL & ILLUMINATION RELAY
WR	BR	Or	V	V	BW

PARKING SWITCH

OFF	ON	
○	○	B
○	○	T
○	○	P

AT SELECT LEVER ILLUMI. LIGHT

1	V
3	YL

FRONT ACCESSORY POWER SUPPLY SOCKET ILLUMI. LIGHT

V	2
YL	4

FRONT FOG LIGHT SWITCH ILLUMI. LIGHT

4	V
2	YL

MODE CONTROL PANEL ILLUMI. LIGHT (MANUAL A/C)

V	6
YL	5

REAR FOG LIGHT SWITCH ILLUMI. LIGHT

4	V
2	YL

AUTO A/C CONTROL MODULE

V	B10
YL	B20

CRUISE CONTROL MAIN SWITCH ILLUMI. LIGHT

4	V
2	YL

POWER & HOLD MODE SWITCH ILLUMI. LIGHT

V	3
YL	6

RADIO ILLUMI. LIGHT

1	V
7	YL

GLOVE BOX ILLUMI. LIGHT

V	2
B	1

ENGINE CONTROL MODULE (NON-TURBO)

ENGINE CONTROL MODULE (TURBO)

LIGHTING SWITCH

OFF	I	II
○	○	○
○	○	○
○	○	○
○	○	○

ILLUMINATION CONTROL MODULE

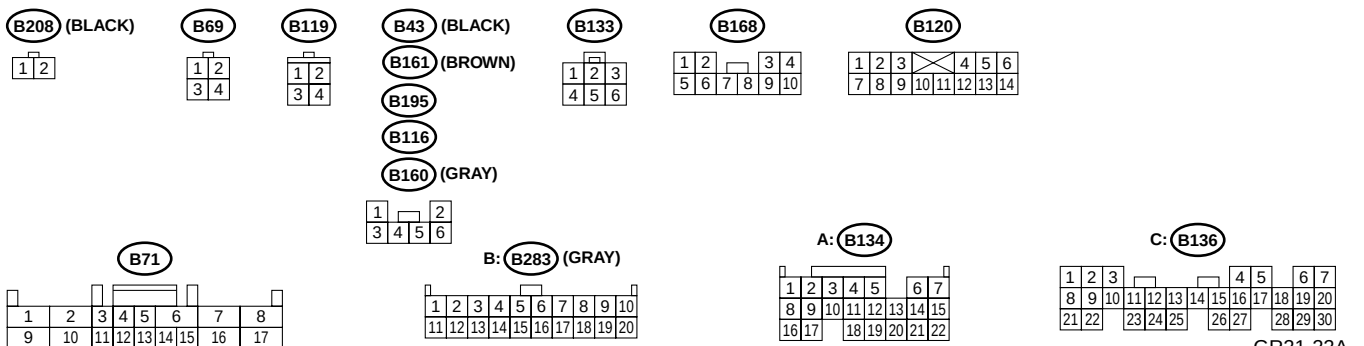
GY	3
L	4
LG	1
V	5
YL	2
B	6

Legend:

- NA : NON-TURBO ENGINE MODEL
- TB : TURBO ENGINE MODEL

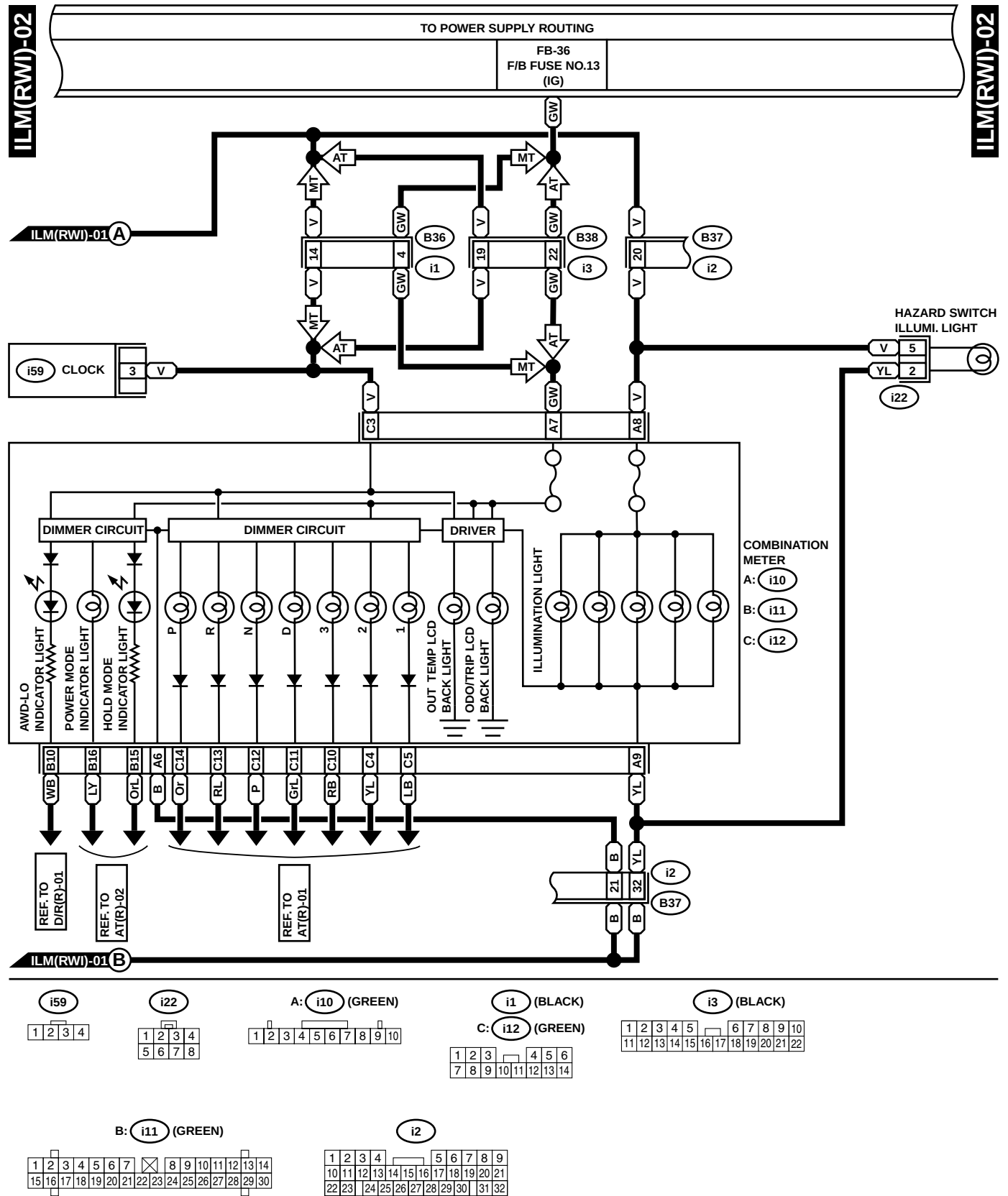
References:

- REF. TO FOG(RFE)-01
- REF. TO FOG(ROE)-01
- REF. TO FOG(FE)-01
- REF. TO FOG(OE)-01
- REF. TO GND-02



HEADLIGHT AND TAIL LIGHT SYSTEM

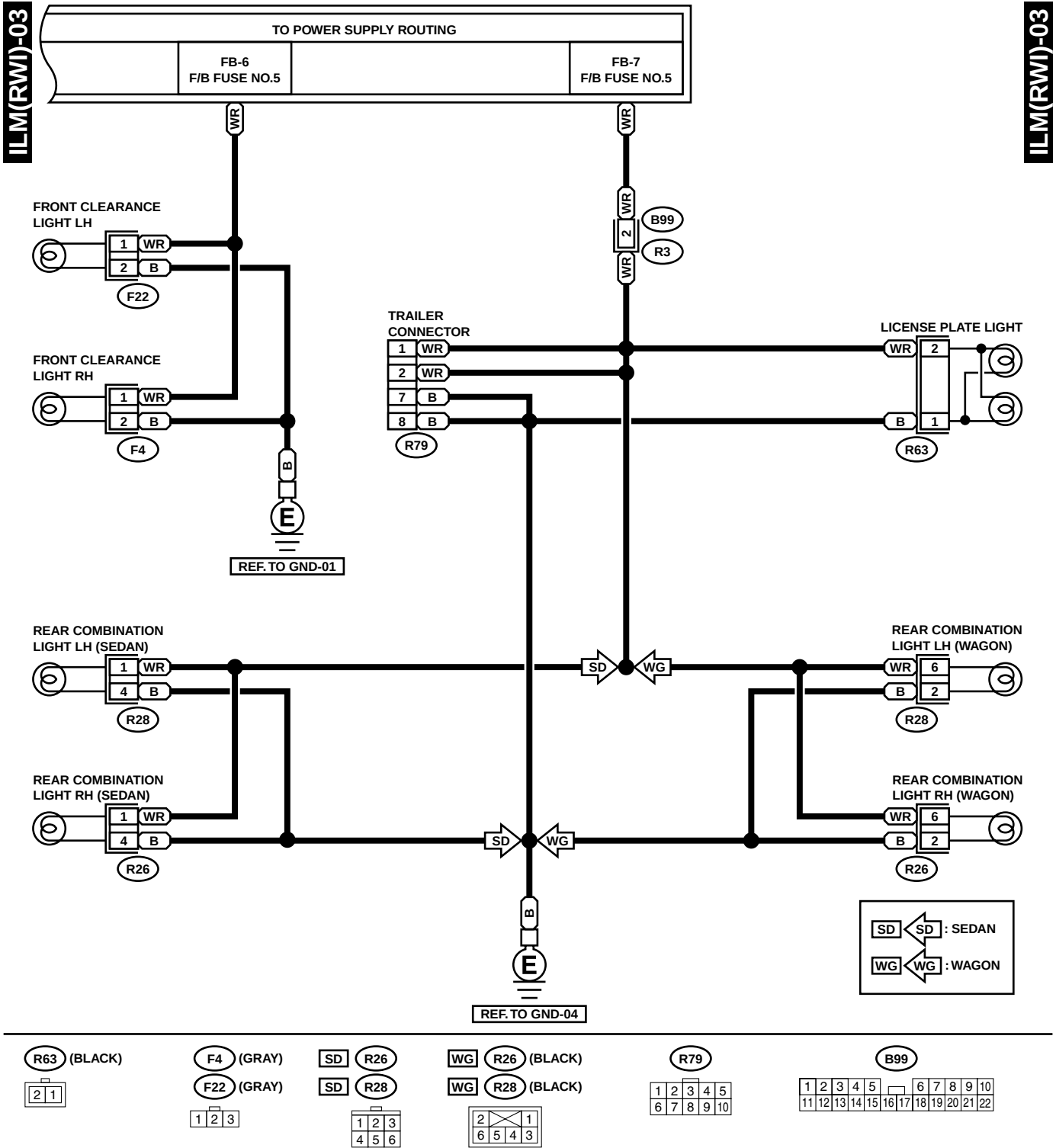
LIGHTING SYSTEM



GR21-22B

HEADLIGHT AND TAIL LIGHT SYSTEM

LIGHTING SYSTEM



GR21-22C

HEADLIGHT AND TAIL LIGHT SYSTEM

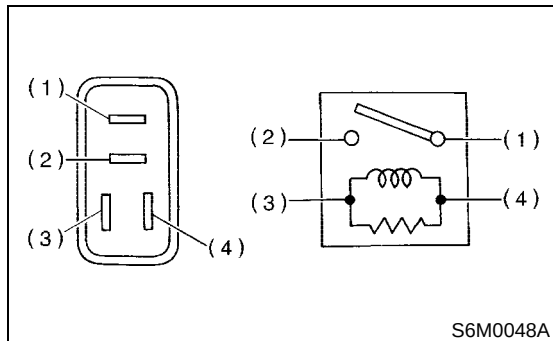
LIGHTING SYSTEM

B: INSPECTION

1. HEADLIGHT RELAY

Check continuity between terminals when terminal No. 4 is connected to battery and terminal No. 3 is grounded.

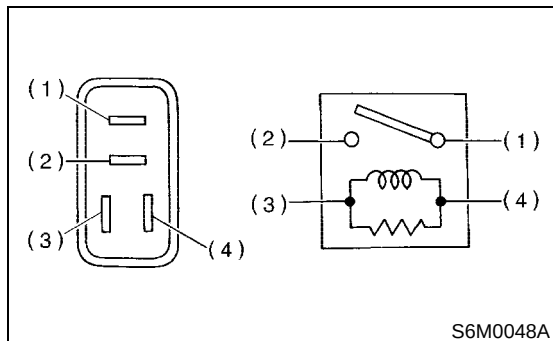
When current flows.	Between terminals No. 1 and No. 2	Continuity exists.
When current does not flow.	Between terminals No. 1 and No. 2	Continuity does not exist.
	Between terminals No. 3 and No. 4	Continuity exists.



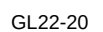
2. TAIL AND ILLUMINATION RELAY

Check continuity between terminals (indicated in table below) when terminal No. 4 is connected to battery and terminal No. 3 is grounded.

When current flows.	Between terminals No. 1 and No. 2	Continuity exists.
When current does not flow.	Between terminals No. 1 and No. 2	Continuity does not exist.
	Between terminals No. 3 and No. 4	Continuity exists.



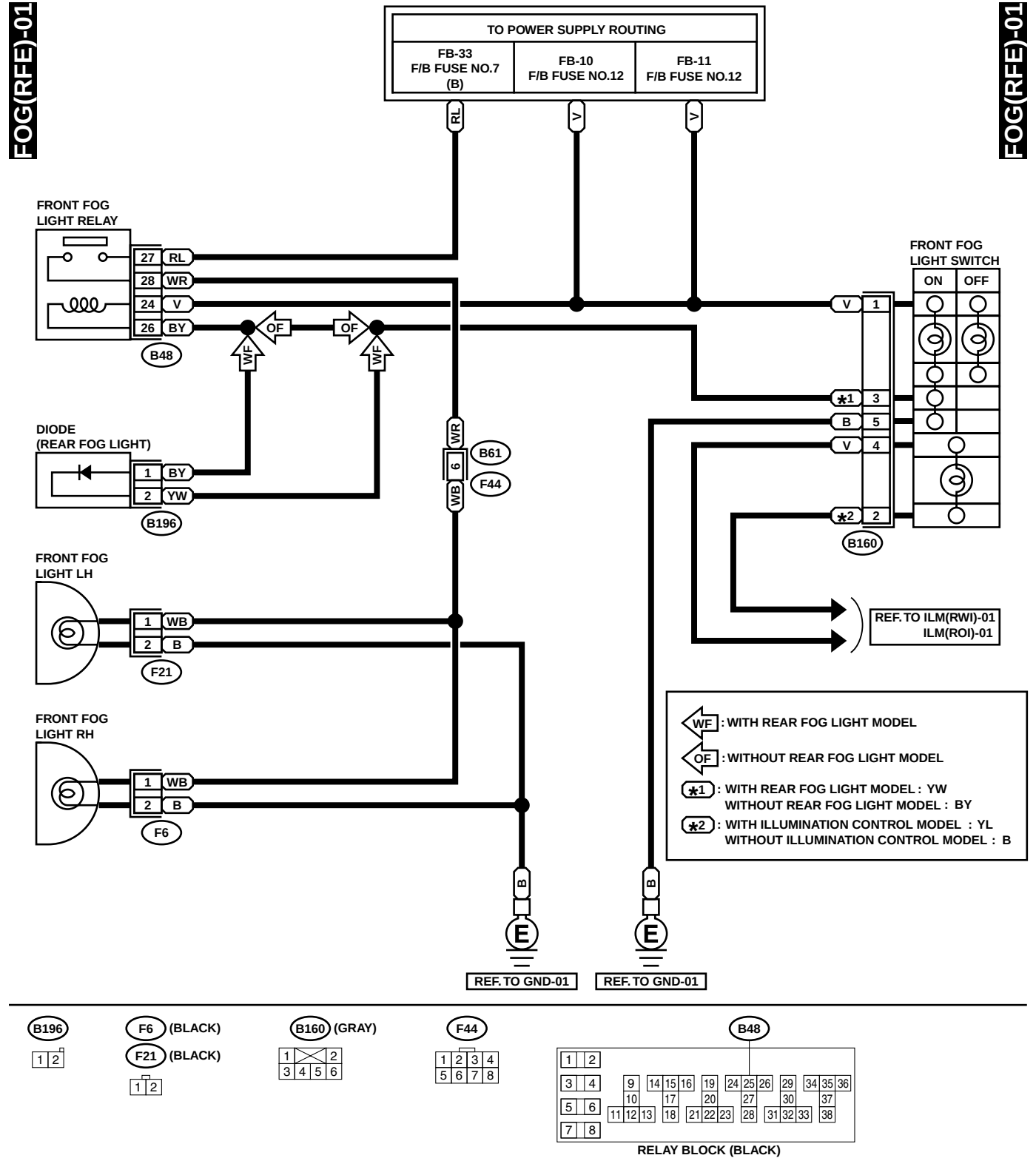
1. FRONT FOG LIGHT LHD MODEL



FRONT FOG LIGHT SYSTEM

LIGHTING SYSTEM

2. FRONT FOG LIGHT RHD FOR EUROPEHD 6 CYLINDER ENGINE MODEL



GR22-20

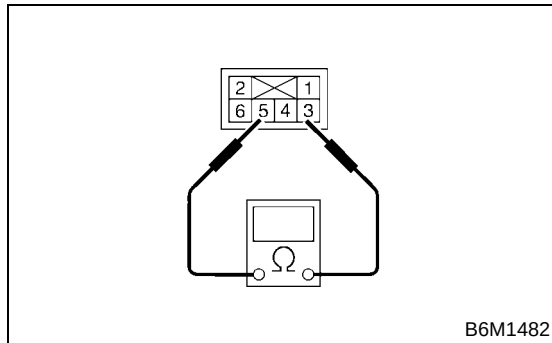
LIGHTING SYSTEM

FOG(ROE)01



B: INSPECTION

1. FRONT FOG LIGHT SWITCH



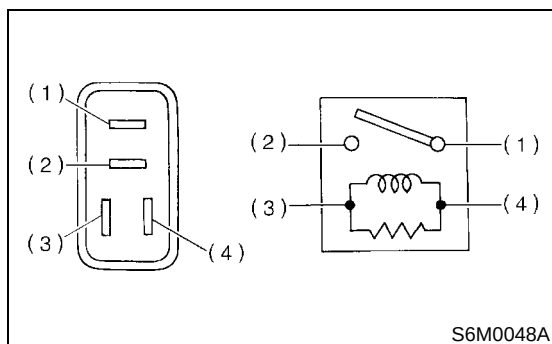
Check continuity between terminals when operating the switch.

Switch position	Tester connection	Specified condition
OFF	—	No continuity
ON	3 - 5	Continuity

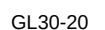
2. FRONT FOG LIGHT RELAY

Check continuity between terminals (indicated in table below) when terminal No. 4 is connected to battery and terminal No. 3 is grounded.

When current flows.	Between terminals No. 1 and No. 2	Continuity exists.
When current does not flow.	Between terminals No. 1 and No. 2	Continuity does not exist.
	Between terminals No. 3 and No. 4	Continuity exists.

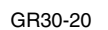


1. REAR FOG LIGHT LHD MODEL



LIGHTING SYSTEM

RFOG(FE)-01



LIGHTING SYSTEM

RFOG(OE)-01



LI-21

B: INSPECTION

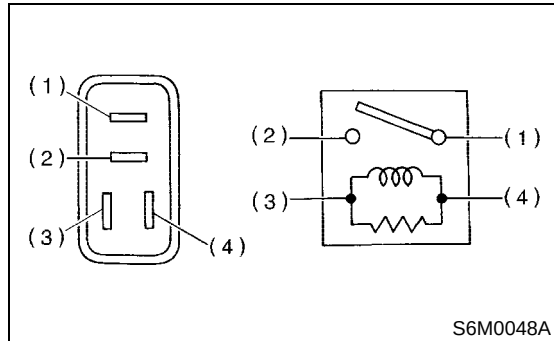
1. REAR FOG LIGHT SWITCH

- 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.

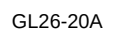
2. REAR FOG LIGHT RELAY

Check continuity between terminals (indicated in table below) when terminal No. 4 is connected to battery and terminal No. 3 is grounded.

When current flows.	Between terminals No. 1 and No. 2	Continuity exists.
When current does not flow.	Between terminals No. 1 and No. 2	Continuity does not exist.
	Between terminals No. 3 and No. 4	Continuity exists.

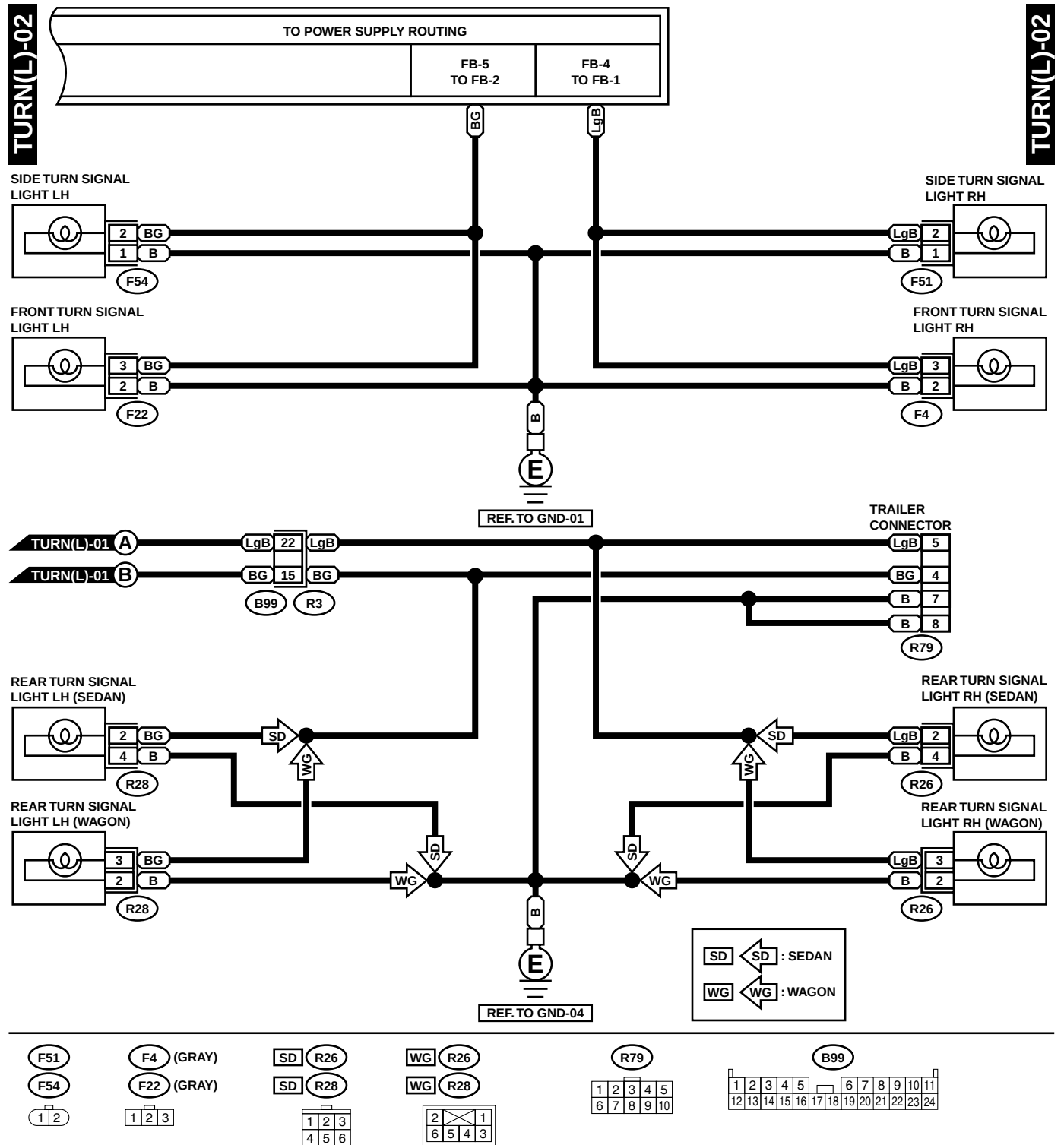


1. TURN SIGNAL LIGHT AND HAZARD LIGHT LHD MODEL



TURN SIGNAL AND HAZARD LIGHT SYSTEM

LIGHTING SYSTEM

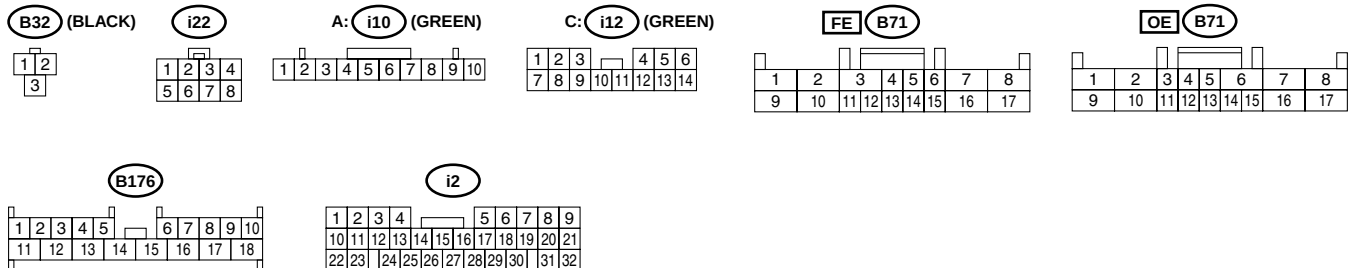
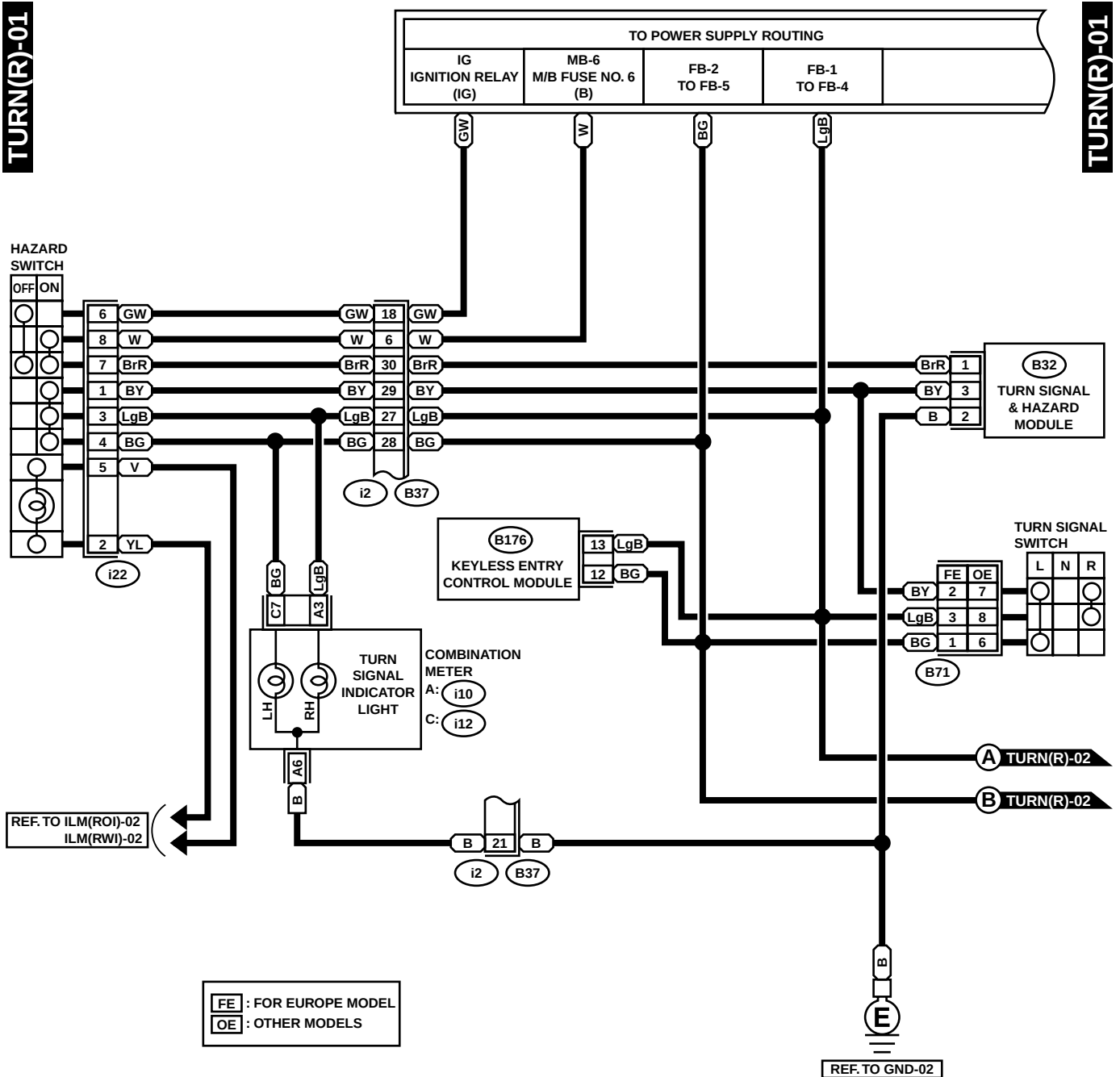


GL26-20B

TURN SIGNAL AND HAZARD LIGHT SYSTEM

LIGHTING SYSTEM

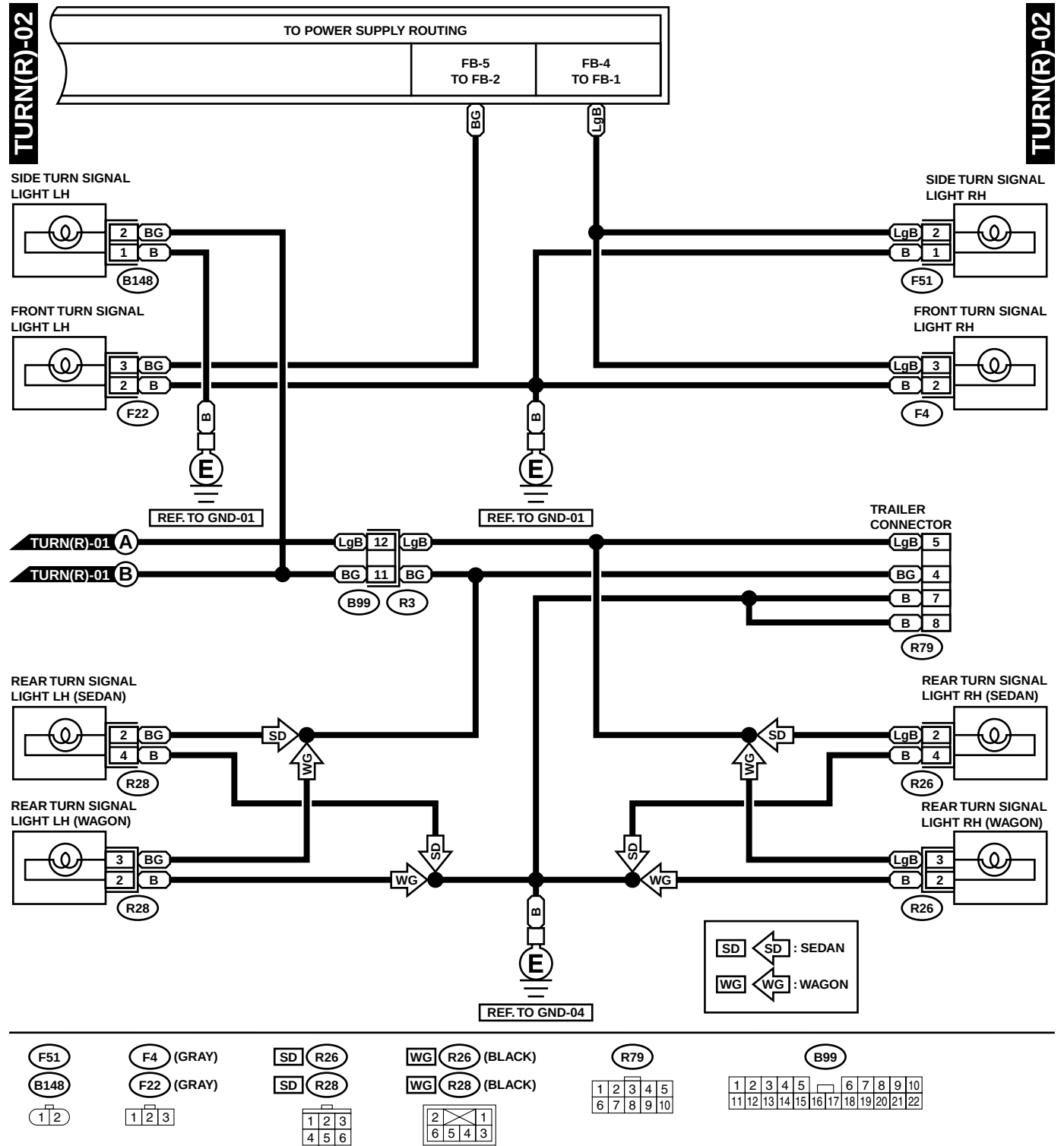
2. TURN SIGNAL LIGHT AND HAZARD LIGHT RHD MODEL



GR26-20A

TURN SIGNAL AND HAZARD LIGHT SYSTEM

LIGHTING SYSTEM



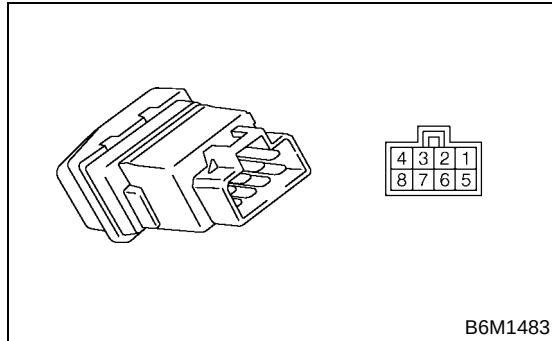
GR26-20B

B: INSPECTION

1. TURN SIGNAL SWITCH

<Ref. to LI-39, INSPECTION, Combination Switch (Light).>

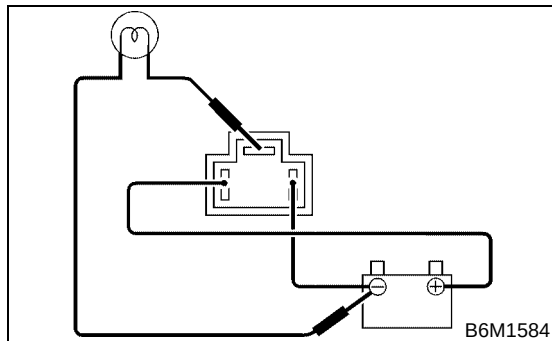
2. HAZARD SWITCH



Check continuity between terminals when operating the switch.

Switch position	Tester connection	Specified condition
OFF	6 - 7	Continuity
ON	1 - 3 - 4, 7 - 8	Continuity

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.

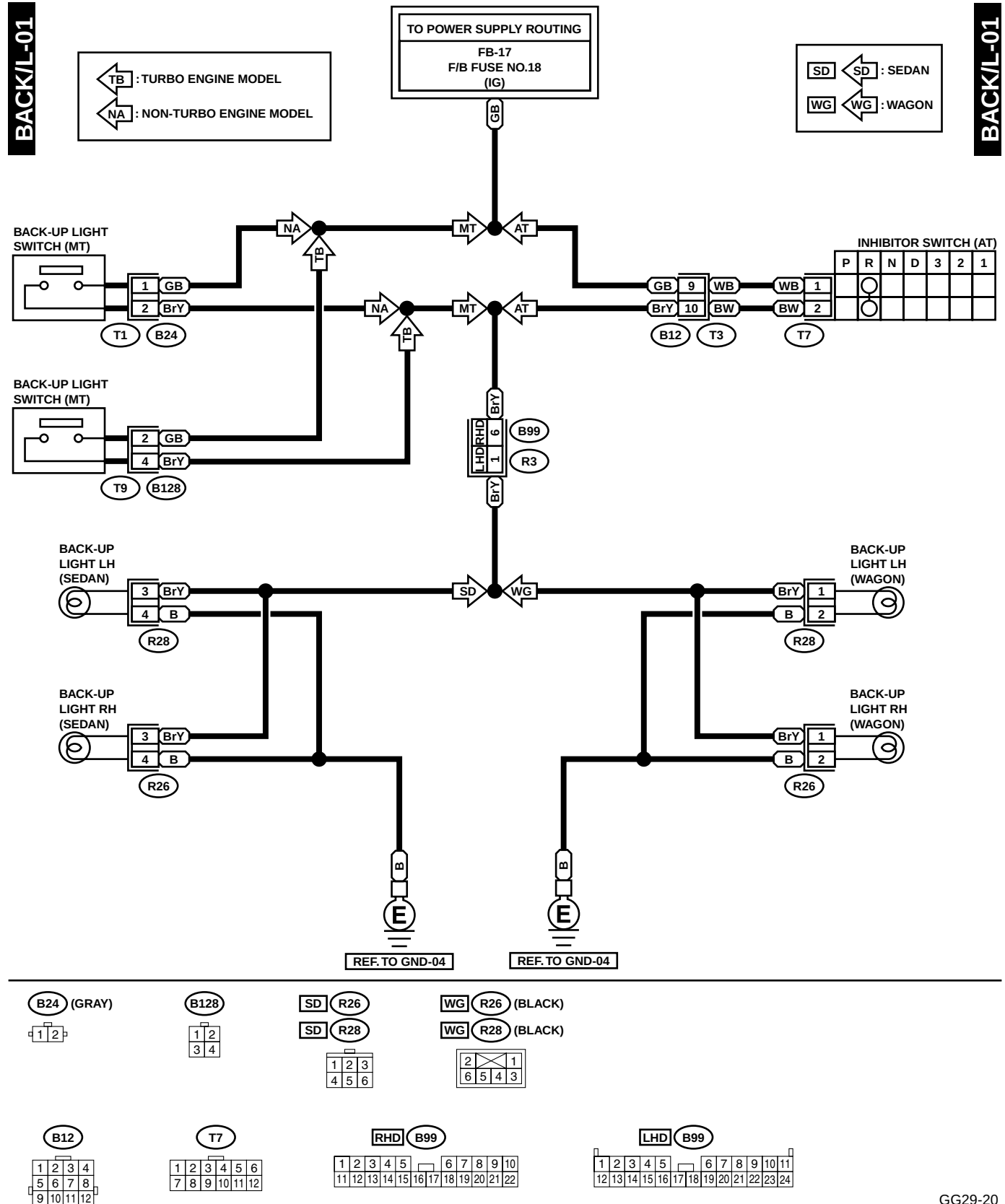
BACK-UP LIGHT SYSTEM

LIGHTING SYSTEM

6. Back-up Light System

A: SCHEMATIC

1. BACK-UP LIGHT



GG29-20

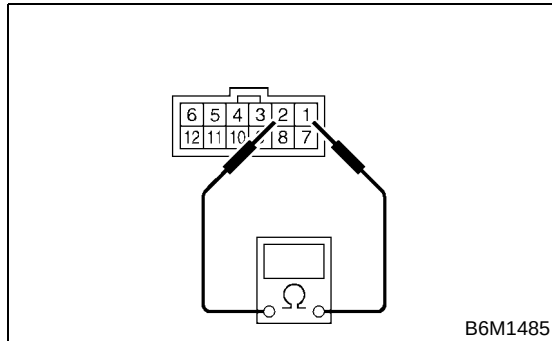
B: INSPECTION

1. BACK-UP LIGHT SWITCH (M/T)

Check continuity between terminals.

Switch position	Tester connection	Specified condition
When shift lever is set in reverse position	Turbo engine model: 2 - 4 Non-turbo engine model: 1 - 2	Continuity
Other positions		No continuity

2. INHIBITOR SWITCH (A/T)



Check continuity between terminals.

Switch position	Tester connection	Specified condition
When select lever is set in "R" position	1 - 2	Continuity
Other positions		No continuity

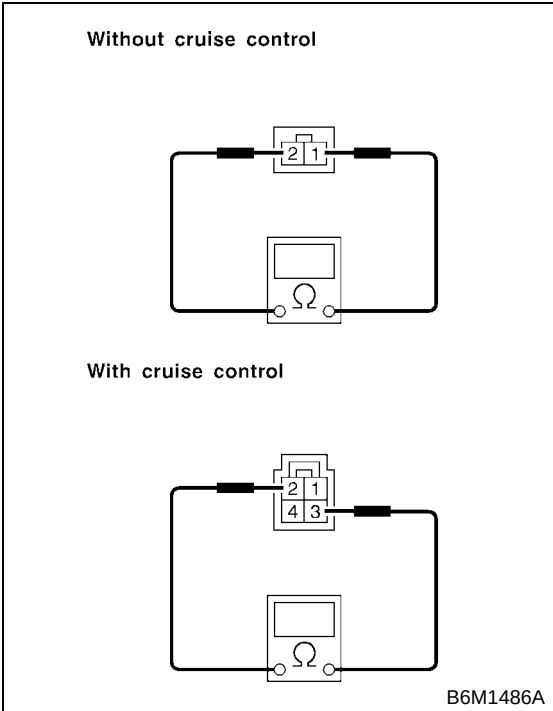
LIGHTING SYSTEM

1. STOP LIGHT



B: INSPECTION

1. STOP LIGHT SWITCH



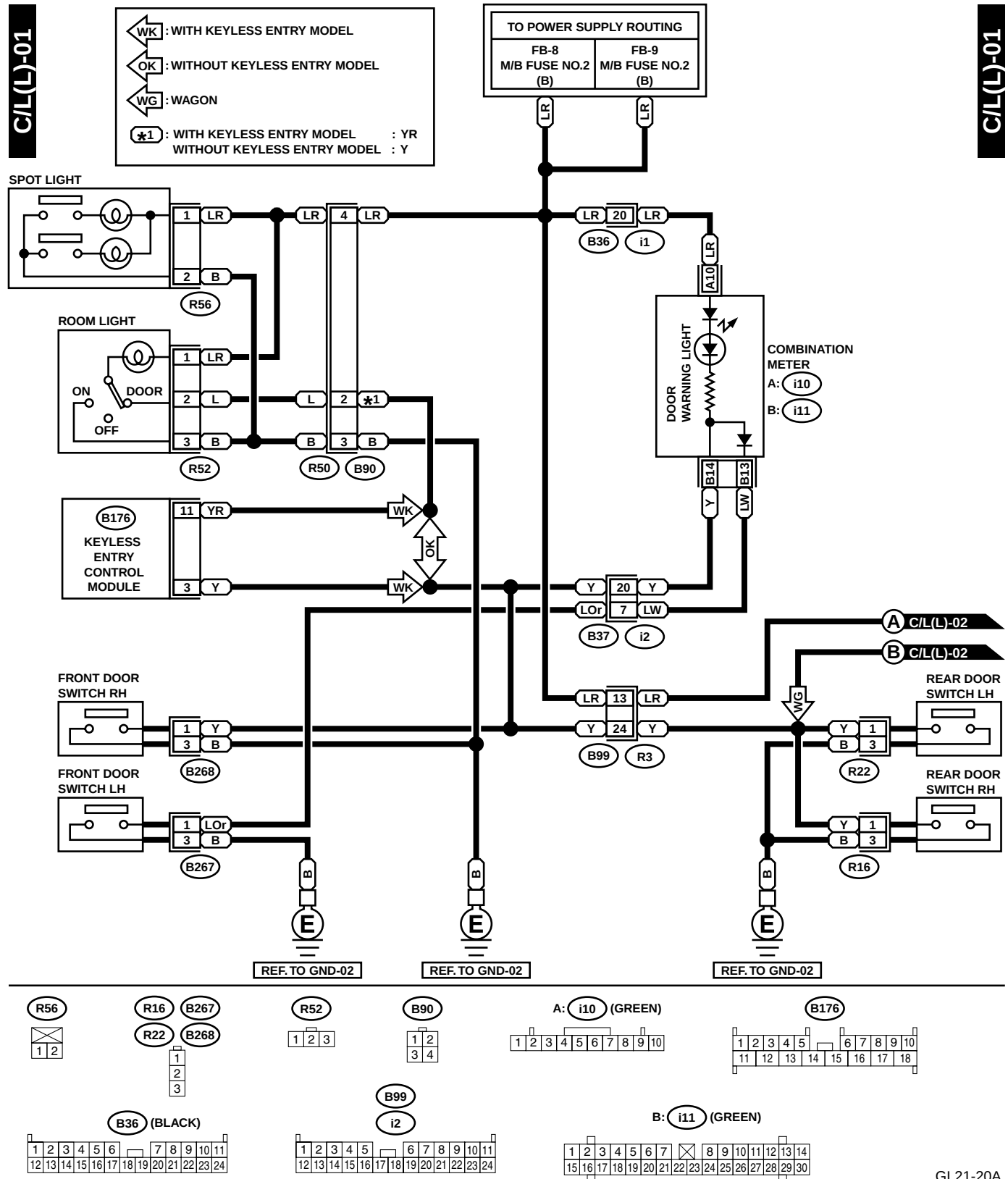
Check continuity between terminals.

Switch position	Tester connection	Specified condition
When brake pedal is depressed	1 - 2: Without cruise control	Continuity
When brake pedal is released	2 - 3: With cruise control	No continuity

8. Interior Light System

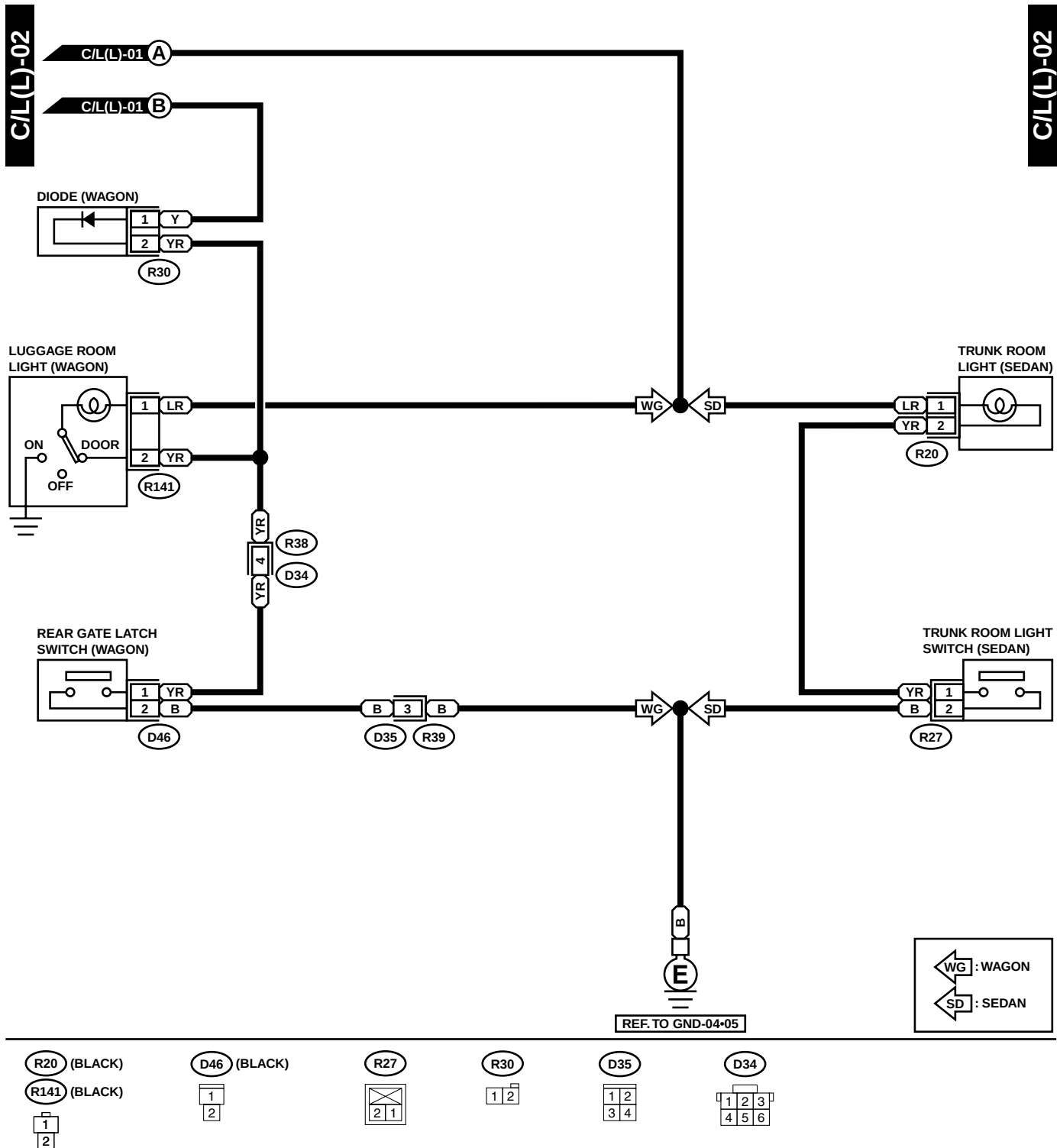
A: SCHEMATIC

1. INTERIOR LIGHT LHD MODEL



INTERIOR LIGHT SYSTEM

LIGHTING SYSTEM

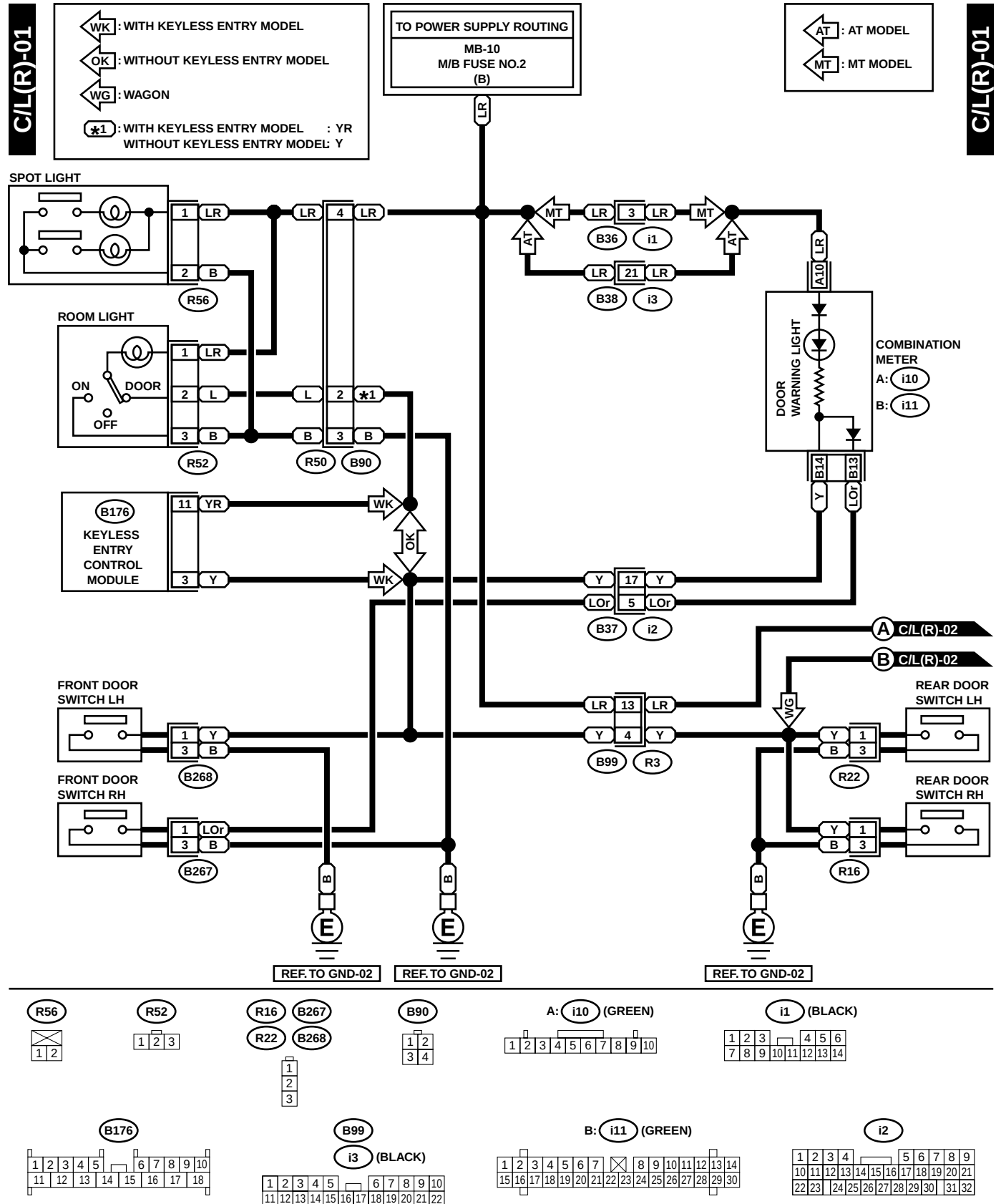


GL21-20B

INTERIOR LIGHT SYSTEM

LIGHTING SYSTEM

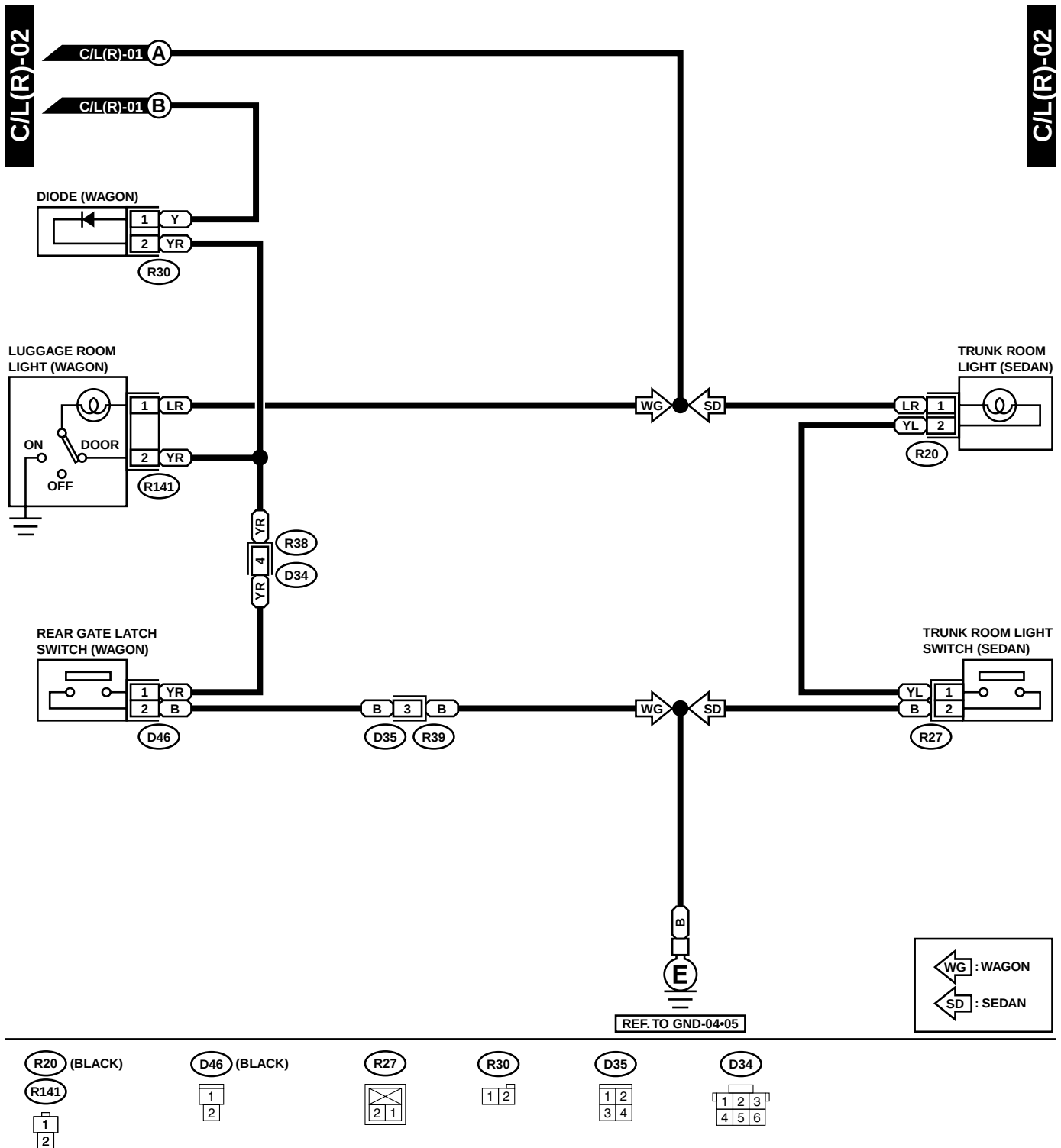
2. INTERIOR LIGHT RHD MODEL



GR21-20A

INTERIOR LIGHT SYSTEM

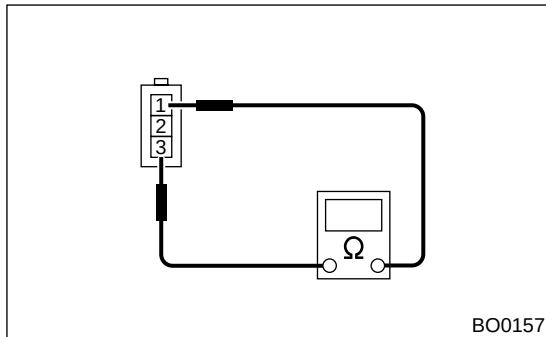
LIGHTING SYSTEM



GR21-20B

B: INSPECTION

1. DOOR SWITCH



Check continuity between terminals.

Switch position	Tester connection	Specified condition
When door is opened	1 - 3	Continuity
When door is closed		No continuity

2. REAR GATE LATCH SWITCH

Check continuity between terminals.

Switch position	Tester connection	Specified condition
When rear gate is opened	1 - 2	Continuity
When rear gate is closed		No continuity

3. TRUNK ROOM LIGHT SWITCH

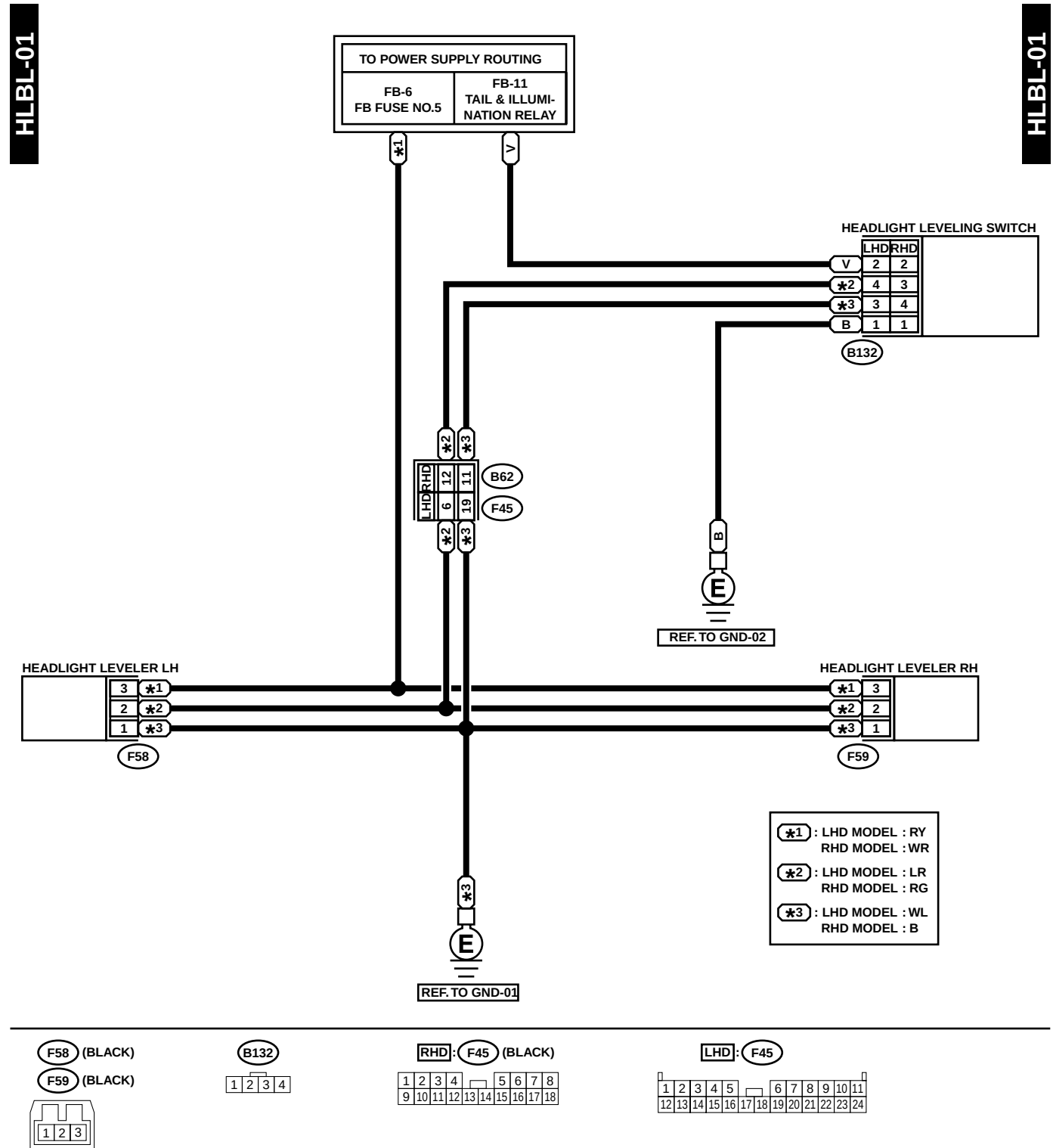
Check continuity between terminals.

Switch position	Tester connection	Specified condition
When trunk lid is opened	1 - 2	Continuity
When trunk lid is closed		No continuity

9. Headlight Beam Leveler System

A: SCHEMATIC

1. HEADLIGHT BEAM LEVELER



HEADLIGHT BEAM LEVELER SYSTEM

LIGHTING SYSTEM

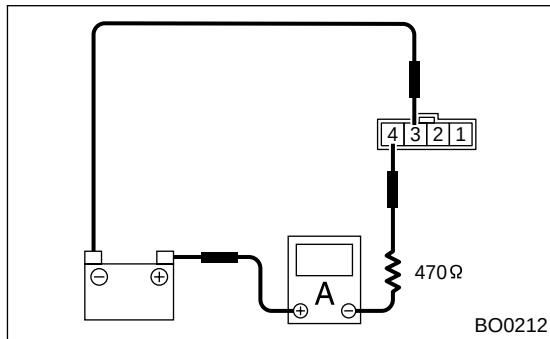
B: INSPECTION

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.

2. HEADLIGHT BEAM LEVELER SWITCH

Connect battery, headlight beam leveler switch connector, circuit tester and resistor (470 Ω) as shown in the figure. Measure the current at each switch position.

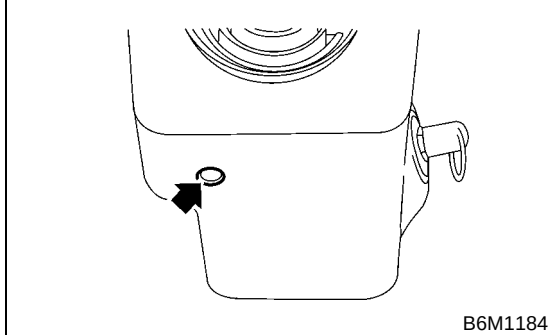


Switch position	Current (mA)
0	25.5
1	20.3
2	9.8
3	3.5

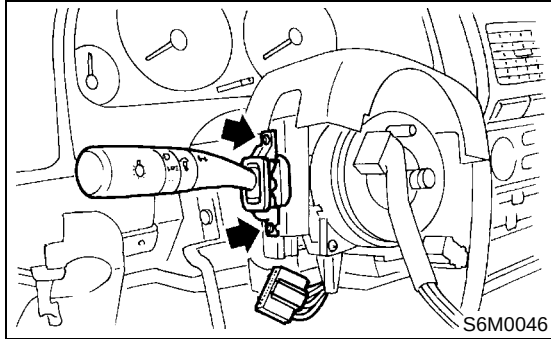
10. Combination Switch (Light)

A: REMOVAL

- 1) Remove instrument panel lower cover. <Ref. to EI-25, REMOVAL, Instrument Panel Assembly.>
- 2) Remove screws which secure upper column cover to lower column cover.



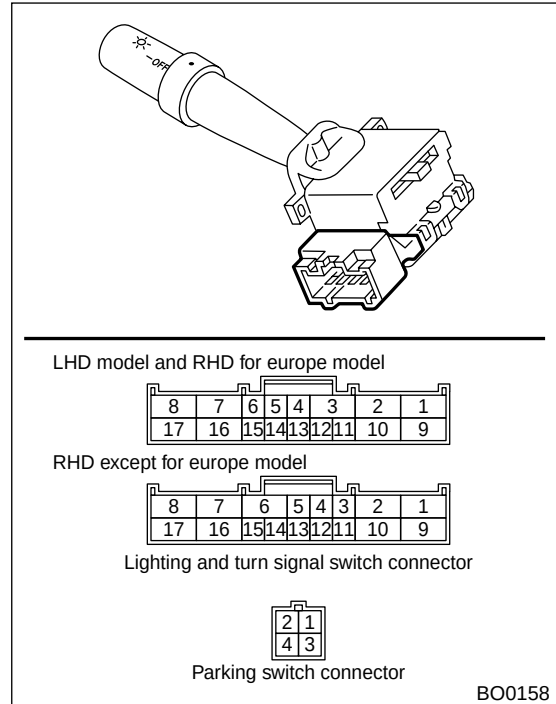
- 3) Disconnect connector from combination switch.
- 4) Remove screws which secure switch and remove switch.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Move combination switch to respective positions and check continuity between terminals.

1. LIGHTING SWITCH

LHD model and RHD for europe model:

Switch position	Tester connection	Specified condition
OFF	—	No continuity
Tail	14 - 16	Continuity
Head	13 - 14 - 16	Continuity

RHD except for europe model:

Switch position	Tester connection	Specified condition
OFF	—	No continuity
Tail	9 - 15	Continuity
Head	9 - 14 - 15	Continuity

2. DIMMER AND PASSING SWITCH

LHD model and RHD for europe model:

Switch position	Tester connection	Specified condition
Passing	7 - 8 - 16	Continuity
Low beam	16 - 17	Continuity
High beam	7 - 16	Continuity

COMBINATION SWITCH (LIGHT)

LIGHTING SYSTEM

RHD except for europe model:

Switch position	Tester connection	Specified condition
Passing	1 - 2 - 9	Continuity
Low beam	9 - 10	Continuity
High beam	2 - 9	Continuity

3. TURN SIGNAL SWITCH

LHD model and RHD for europe model:

Switch position	Tester connection	Specified condition
Left	1 - 2	Continuity
Neutral	—	No continuity
Right	2 - 3	Continuity

RHD except for europe model:

Switch position	Tester connection	Specified condition
Left	6 - 7	Continuity
Neutral	—	No continuity
Right	7 - 8	Continuity

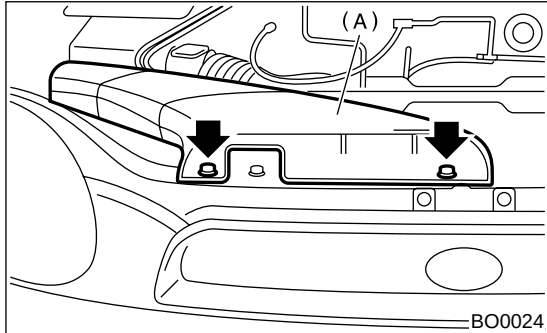
4. PARKING SWITCH

Switch position	Tester connection	Specified condition
OFF	2 - 4	Continuity
ON	1 - 4	Continuity

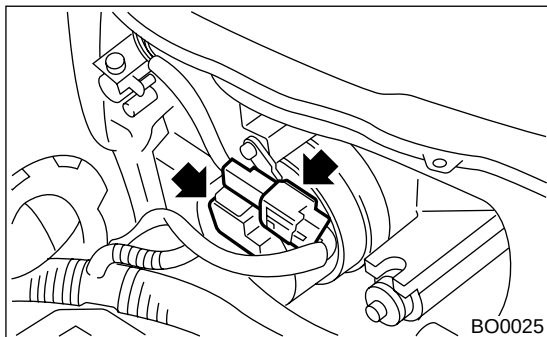
11. Headlight Assembly

A: REMOVAL

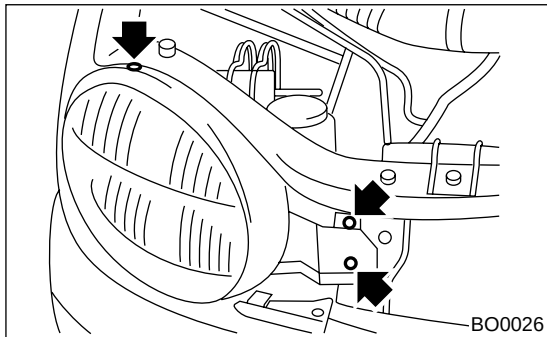
1) Remove duct (A) (when right side headlight is removed).



2) Disconnect headlight bulb connector.



3) Remove three bolts and disconnect connectors, and then detach headlight assembly.



B: INSTALLATION

Install in the reverse order of removal.

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:

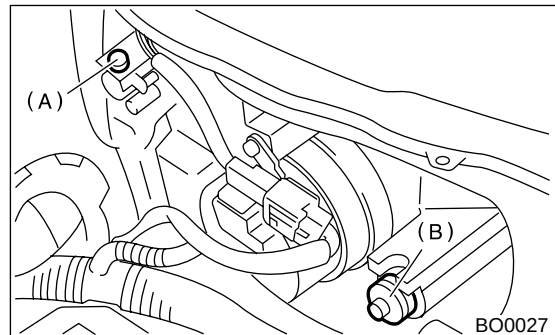
Before checking the headlight aiming, be sure of the following:

- 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.

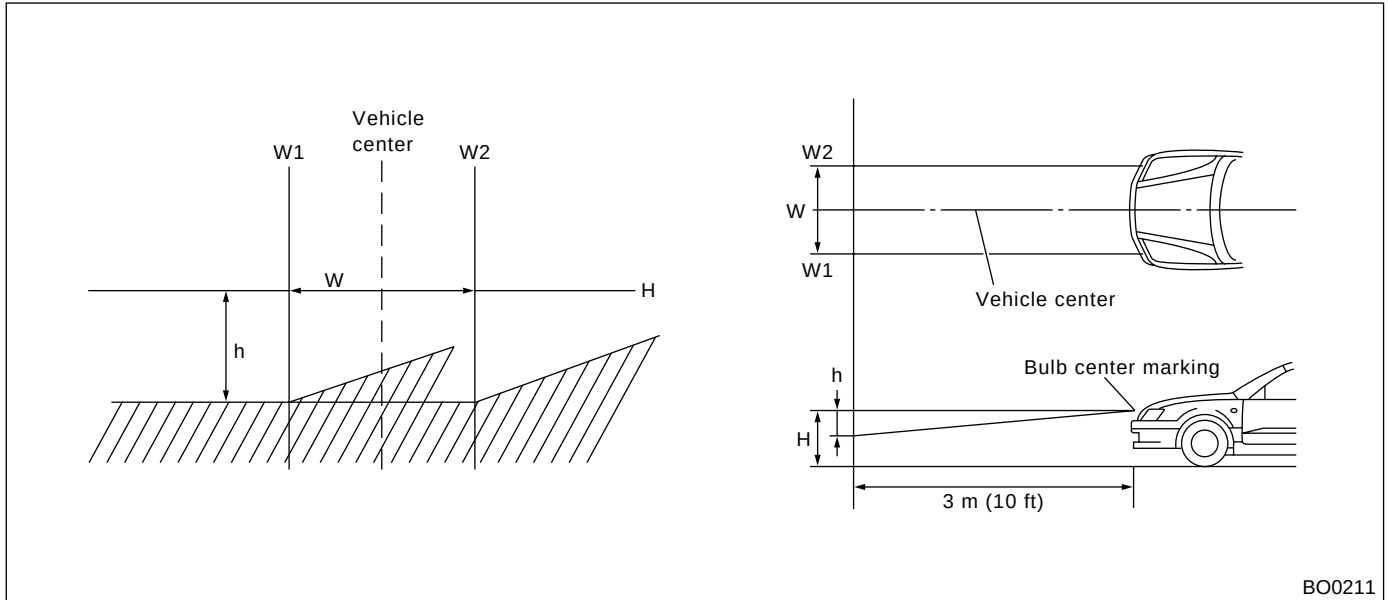
NOTE:

- Set the headlight leveler switch to "0" position.
- Adjust vertical aim (A) first, then horizontal aim (B).



HEADLIGHT ASSEMBLY

LIGHTING SYSTEM



BO0211

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			
	I, TS	GX, WRX	I, TS	GX, WRX	Outback	
1,170 (46.06)	625 (24.60)	620 (24.41)	625 (24.60)	620 (24.41)	630 (24.80)	30 (1.18)

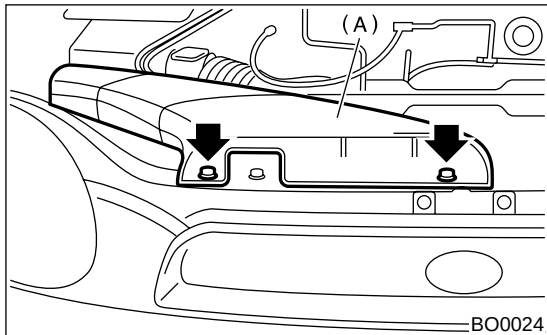
12. Headlight Bulb

A: REMOVAL

CAUTION:

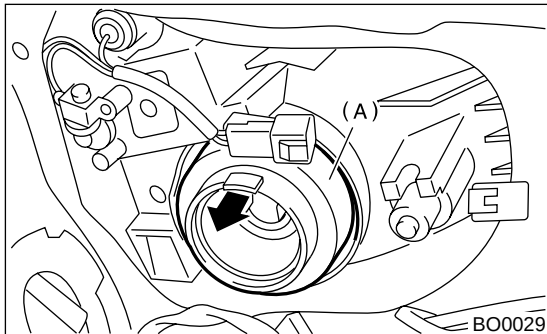
- Because the tungsten halogen bulb operates at a high temperature, dirt and oil on the bulb surface reduces the bulb's service life. Hold the flange portion when replacing the bulb. Never touch the glass portion.
- Do not leave the headlight without a bulb for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

1) Remove duct (A) (when right side headlight is removed).

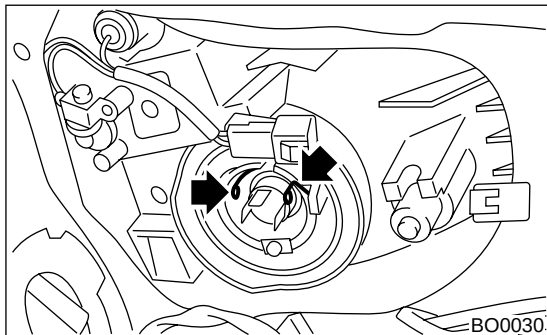


2) Disconnect harness connector.

3) Remove rubber cap (A).



4) Remove the light bulb retaining spring to remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

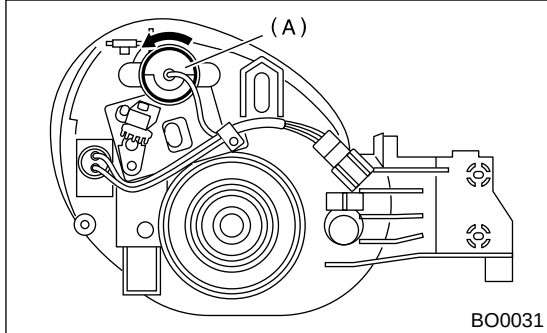
CAUTION:

- Attach the rubber cap with letters TOP on the top so the drain hole will be on the lower side.

13.Front Turn Signal Light Bulb

A: REMOVAL

- 1) Remove headlight assembly. <Ref. to LI-41, REMOVAL, Headlight Assembly.>
- 2) Turn the socket (A) and remove the bulb.



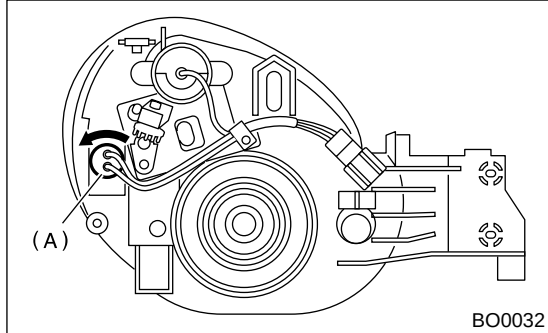
B: INSTALLATION

Install in the reverse order of removal.

14. Clearance/Parking Light Bulb

A: REMOVAL

- 1) Remove headlight assembly. <Ref. to LI-41, REMOVAL, Headlight Assembly.>
- 2) Turn the socket (A) and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

FRONT FOG LIGHT ASSEMBLY

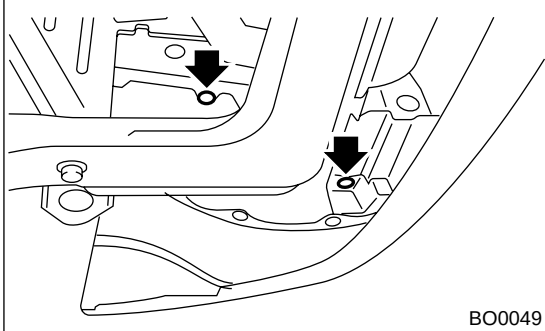
LIGHTING SYSTEM

15. Front Fog Light Assembly

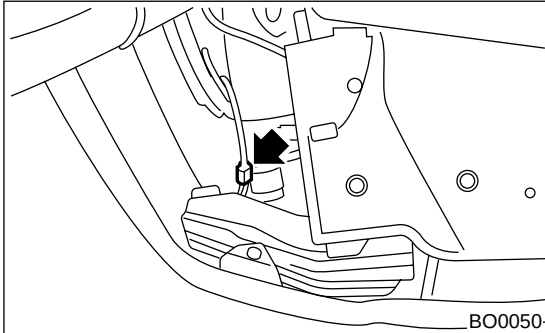
A: REMOVAL

1. TURBO ENGINE MODEL

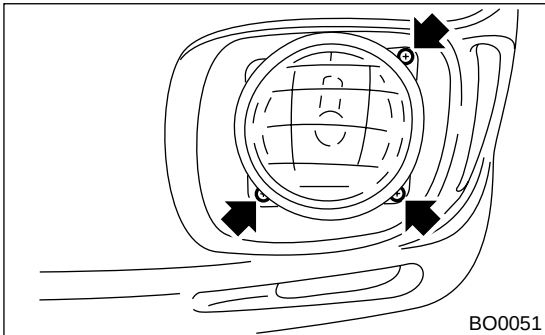
1) Remove two clips and lower the mudguard.



2) Disconnect harness connector.

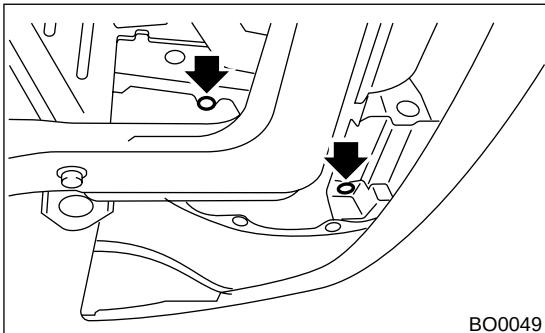


3) Remove mounting bolts, and then detach fog light assembly.



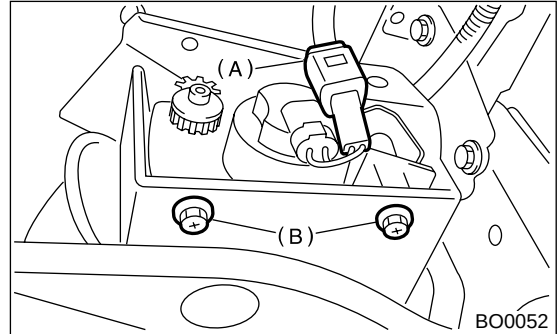
2. NON-TURBO ENGINE MODEL

1) Remove two clips and lower the mudguard.



2) Disconnect harness connector (A).

3) Remove bolts (B) then detach fog light assembly.



B: INSTALLATION

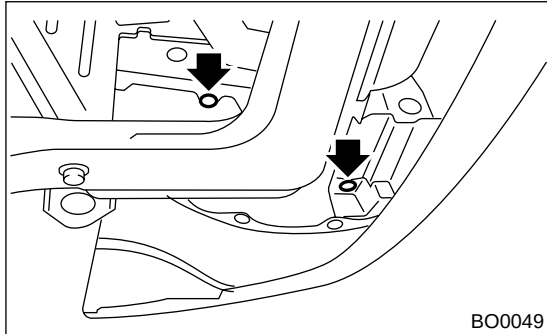
Install in the reverse order of removal.

16. Front Fog Light Bulb

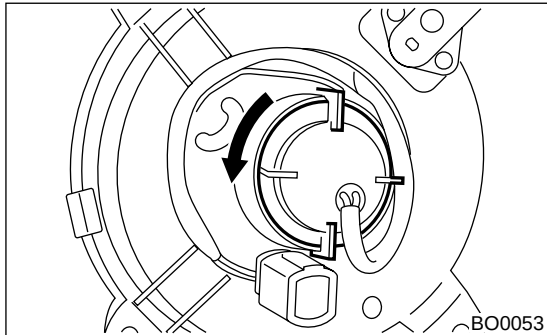
A: REMOVAL

1. TURBO ENGINE MODEL

1) Remove the two clips and lower the mudguard.



2) Remove back cover.



3) Remove spring retainer then detach fog light bulb.

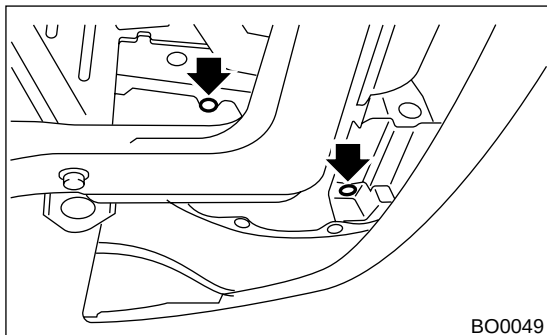
3) Remove spring retainer then detach fog light bulb.

B: INSTALLATION

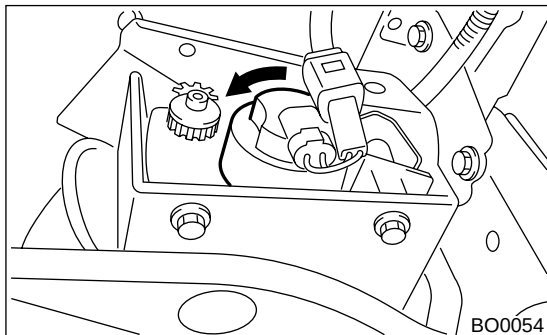
Install in the reverse order of removal.

2. NON-TURBO ENGINE MODEL

1) Remove the two clips and lower the mudguard.



2) Remove back cover.



REAR COMBINATION LIGHT ASSEMBLY

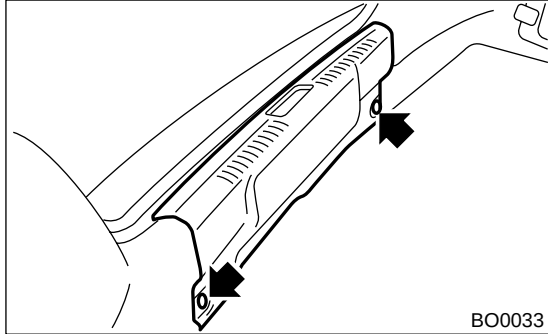
LIGHTING SYSTEM

17. Rear Combination Light Assembly

A: REMOVAL

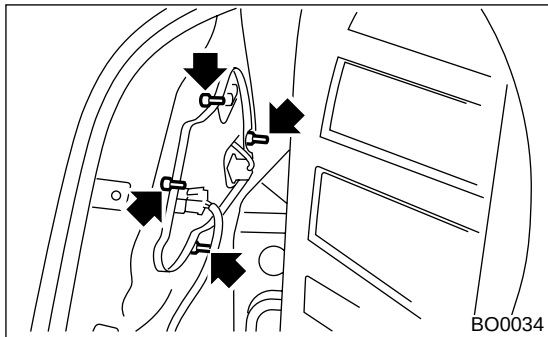
1. SEDAN

1) Remove clips and then detach trunk rear trim.



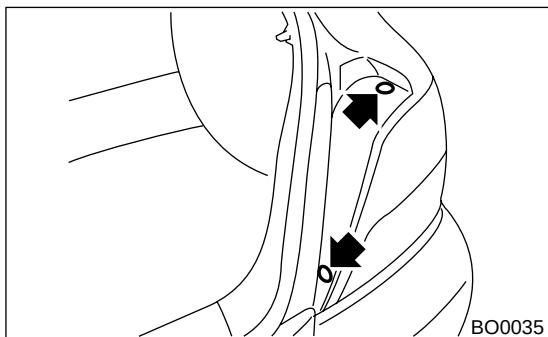
2) Remove the trunk side trim of rear portion.

3) Remove four nuts and then detach rear combination light while disconnecting connector.

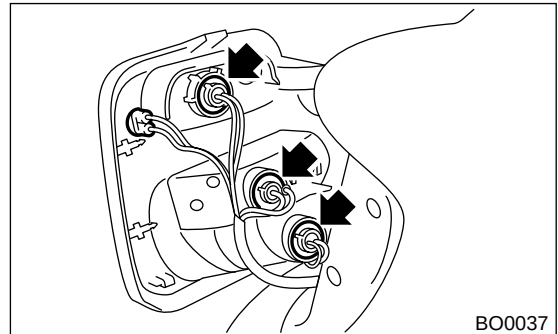
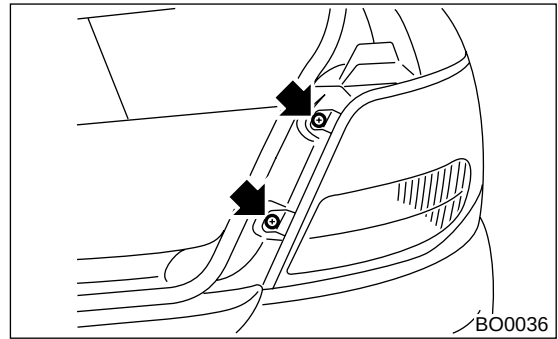


2. WAGON

1) Remove clips and then detach rear combination light covers.



2) Remove two bolts and then remove rear combination light while disconnecting connector.



B: INSTALLATION

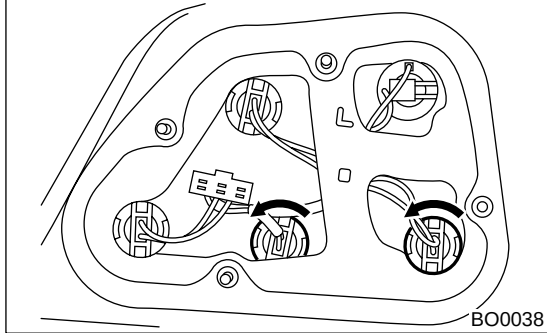
Install in the reverse order of removal.

18.Brake/Tail Light Bulb

A: REMOVAL

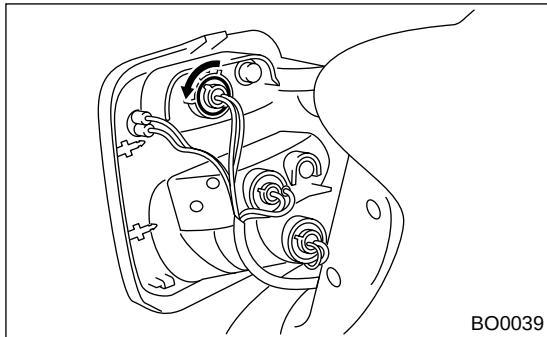
1. SEDAN

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



2. WAGON

- 1) Remove rear combination light assembly. <Ref. to LI-48, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

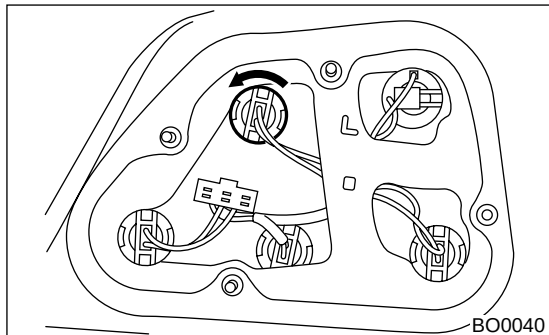
Install in the reverse order of removal.

19.Back-up Light Bulb

A: REMOVAL

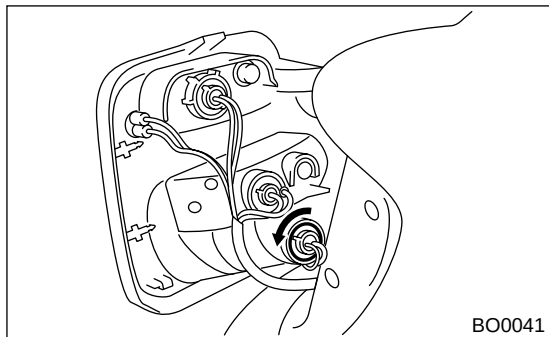
1. SEDAN

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



2. WAGON

- 1) Remove rear combination light assembly. <Ref. to LI-48, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

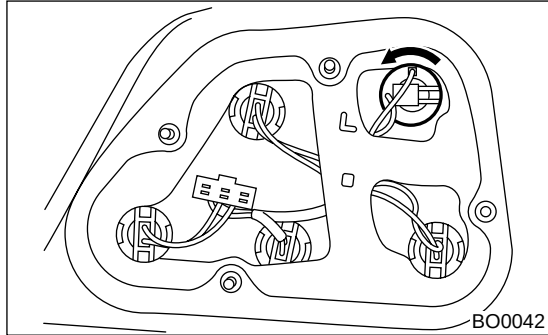
Install in the reverse order of removal.

20.Rear Turn Signal Light Bulb

A: REMOVAL

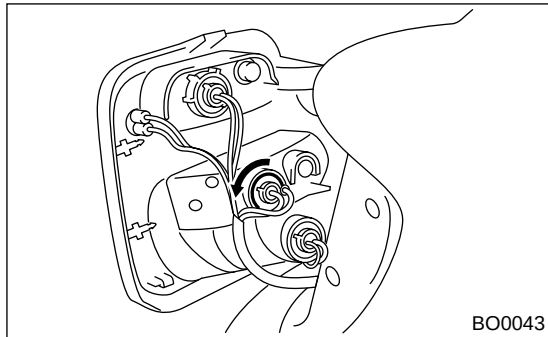
1. SEDAN

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



2. WAGON

- 1) Remove rear combination light assembly. <Ref. to LI-48, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

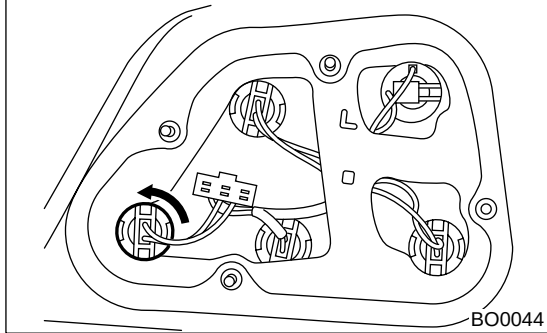
Install in the reverse order of removal.

21.Rear Fog Light Bulb

A: REMOVAL

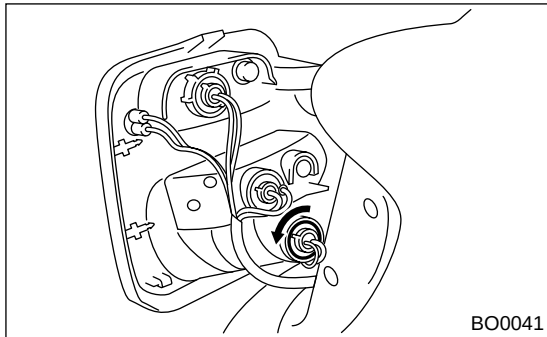
1. SEDAN

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



2. WAGON

- 1) Remove rear combination light assembly. <Ref. to LI-48, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



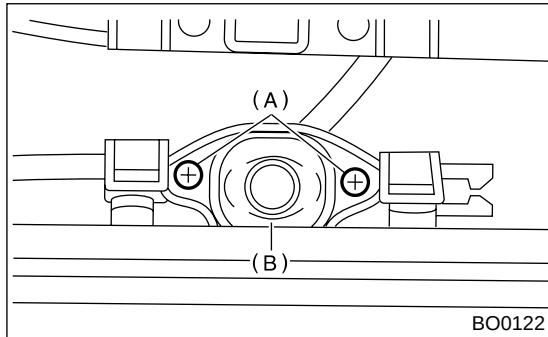
B: INSTALLATION

Install in the reverse order of removal.

22. License Plate Light

A: REMOVAL

- 1) Remove license plate light mounting screw (A) and then remove the lens (B)



- 2) Remove the bulb.

B: INSTALLATION

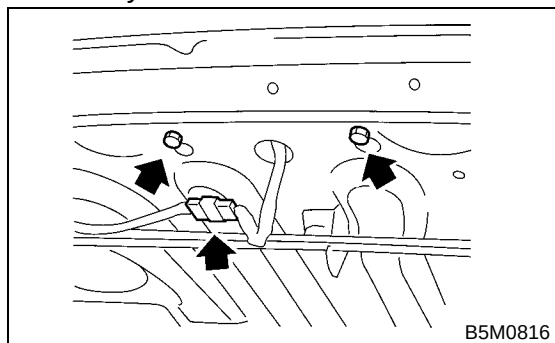
Install in the reverse order of removal.

23.High-mounted Stop Light

A: REMOVAL

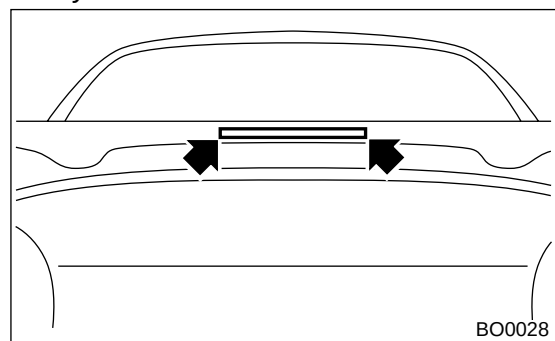
1. SEDAN (STANDARD TYPE)

- 1) Disconnect connector of high-mounted stop light from body harness.
- 2) Remove bolts, then detach high-mounted stop light assembly.



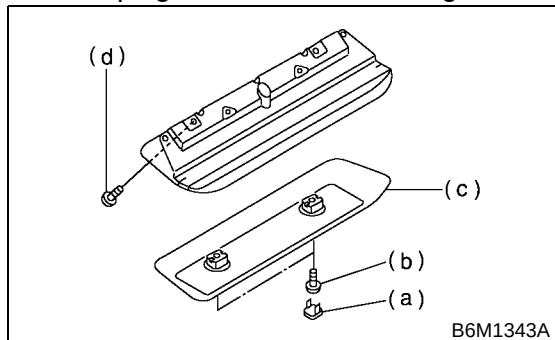
2. SEDAN (REAR SPOILER BUILT-IN TYPE)

- 1) Remove bolts, then detach high-mounted stop light assembly.
- 2) Disconnect connector of high-mounted stop light from body harness.



3. WAGON

- 1) Remove cap (a) by prying on the edge with a screwdriver.
- 2) Remove screws (b) and then detach cover (c).
- 3) Remove screws (d) and then detach high-mounted stop light while disconnecting connector.



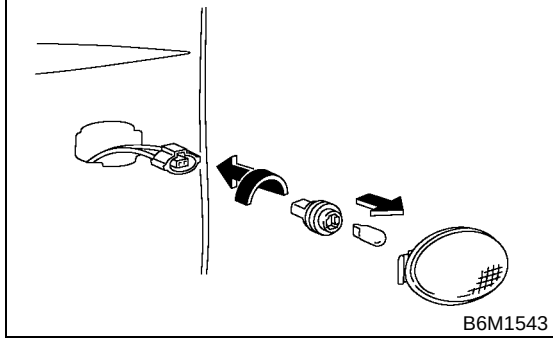
B: INSTALLATION

Install in the reverse order of removal.

24.Side Turn Signal Light

A: REMOVAL

- 1) Pull out the light from body while pushing it in direction of vehicle front.
- 2) Disconnect harness connector and remove the light.



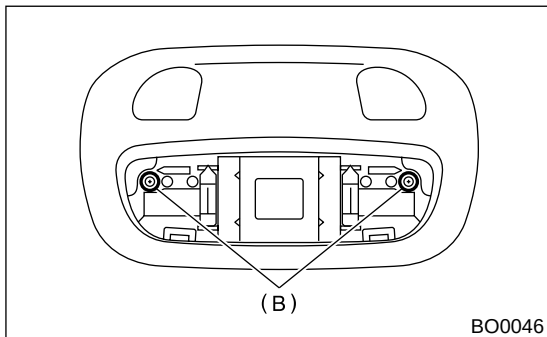
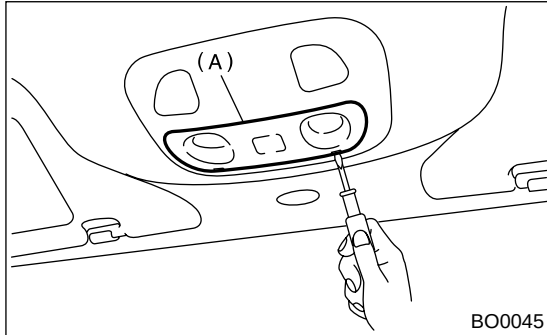
B: INSTALLATION

Install in the reverse order of removal.

25.Spot Light

A: REMOVAL

1) Remove lens (A) and spot light mounting screw (B).



2) Disconnect harness connectors and remove spot light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

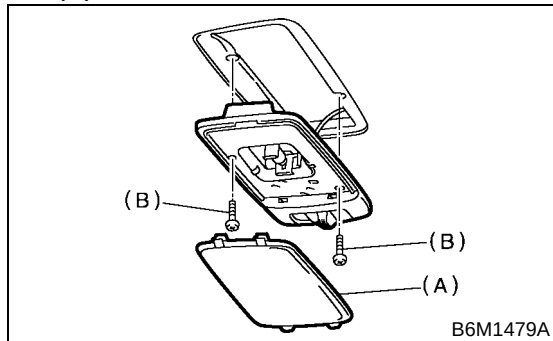
Check continuity between terminals.

Switch position	Tester connection	Specified condition
OFF	—	No continuity
ON	1 - 2	Continuity

26.Room Light

A: REMOVAL

1) Remove lens (A) and room light mounting screws (B).

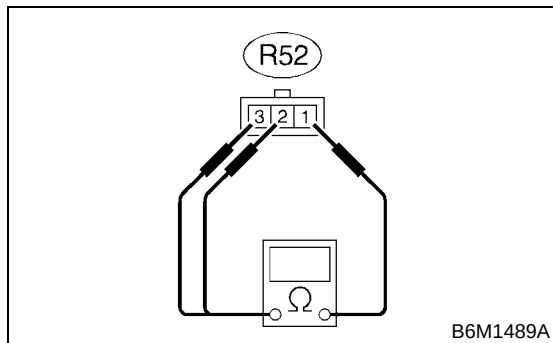


2) Disconnect harness connectors and remove the light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



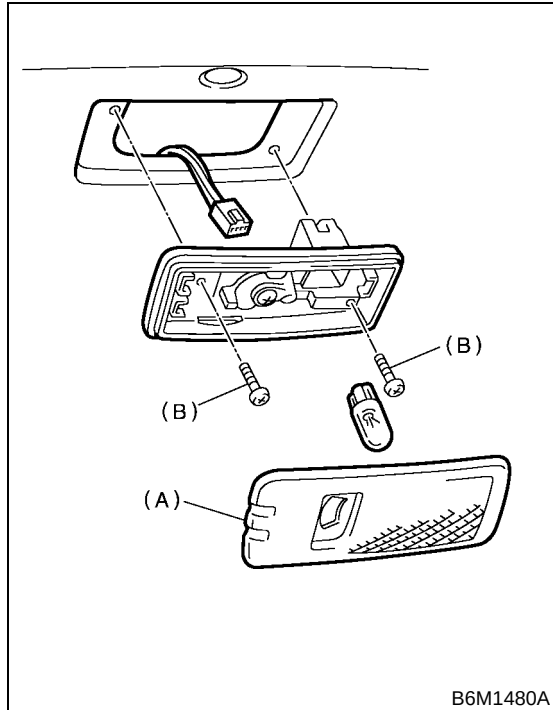
Check continuity between terminals.

Switch position	Tester connection	Specified condition
OFF	—	No continuity
ON	1 - 3	Continuity
DOOR	1 - 2	Continuity

27.Luggage Room Light

A: REMOVAL

1) Remove lens (A) and luggage room light mounting screws (B).

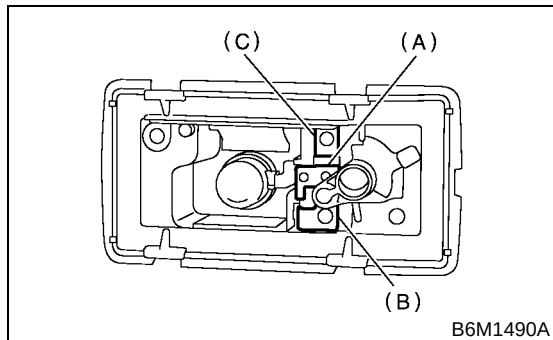


2) Disconnect harness connectors and remove luggage room light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



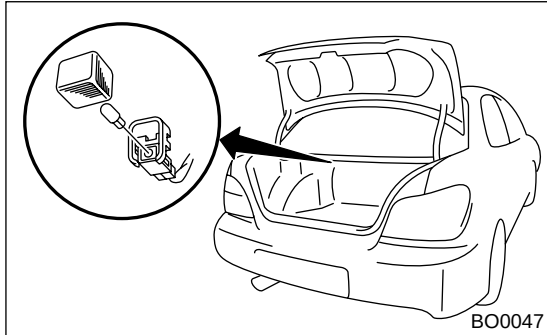
Turn the switch each position and check continuity between terminals.

Switch position	Tester connection	Specified condition
OFF	—	No continuity
ON	(A) - (C)	Continuity
DOOR	(A) - (B)	Continuity

28.Trunk Room Light

A: REMOVAL

Disconnect harness connectors and remove trunk room light.



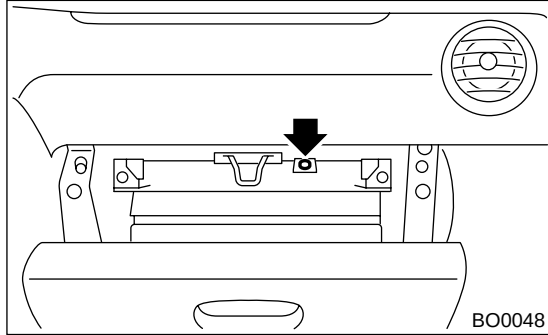
B: INSTALLATION

Install in the reverse order of removal.

29. Glove Box Light

A: REMOVAL

- 1) Remove glove box. <Ref. to EI-22, REMOVAL, Glove Box.>
- 2) Disconnect harness connector.
- 3) Remove glove box light.



B: INSTALLATION

Install in the reverse order of removal.

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

WIPER AND WASHER SYSTEMS



	Page
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2. Wiper and Washer System	5
3. Combination Switch (Wiper).....	11
4. Wiper Blade.....	13
5. Washer Tank and Motor.....	15
6. Front Wiper Arm.....	16
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9. Rear Wiper Arm	20
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11. Rear Washer	22
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GENERAL DESCRIPTION

WIPER AND WASHER SYSTEMS

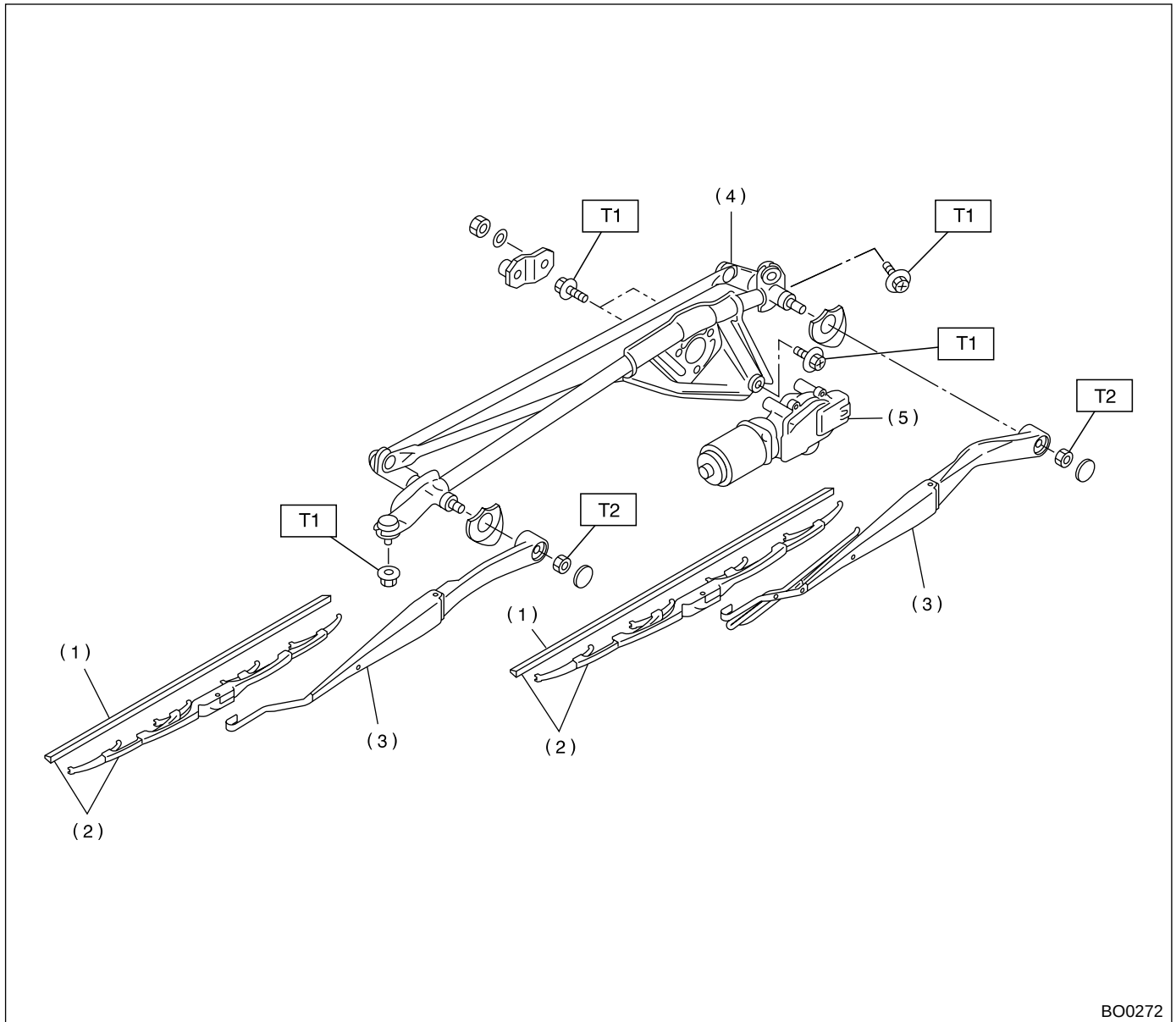
1. General Description

A: SPECIFICATIONS

Front wiper motor	Input	12 V — 72 W or less
Rear wiper motor	Input	12 V — 42 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

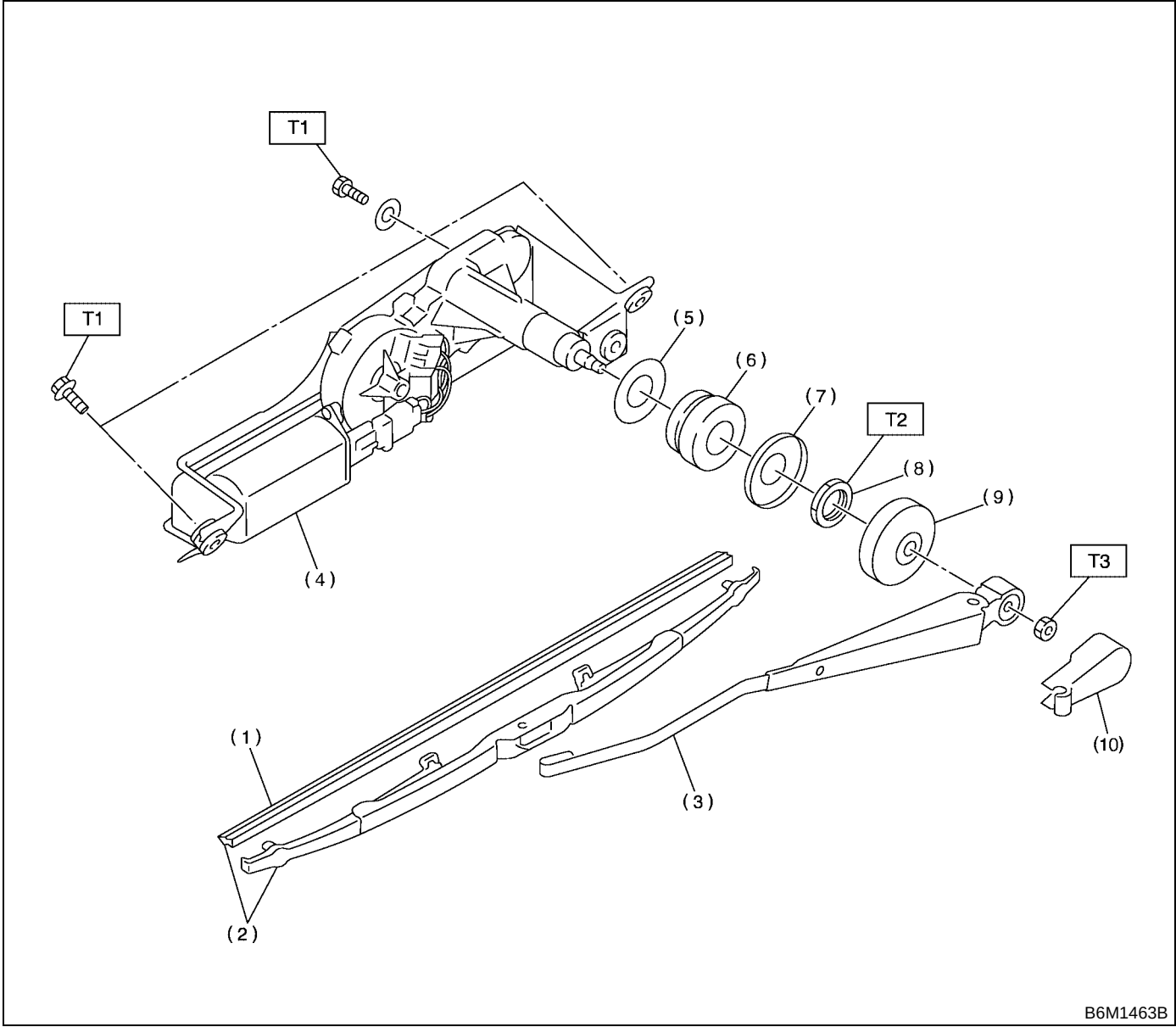


- (1) Wiper rubber
- (2) Wiper blade ASSY
- (3) Wiper arm

- (5) Wiper motor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.4)
T2: 20 (2.0, 14.5)

2. REAR WIPER



- | | |
|----------------------|----------------------|
| (1) Wiper rubber | (7) Spacer B |
| (2) Wiper blade ASSY | (8) Nut |
| (3) Wiper arm | (9) Cap |
| (4) Wiper motor | (10) Wiper arm cover |
| (5) Spacer A | |
| (6) Cushion | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5.9 (0.6, 4.3)

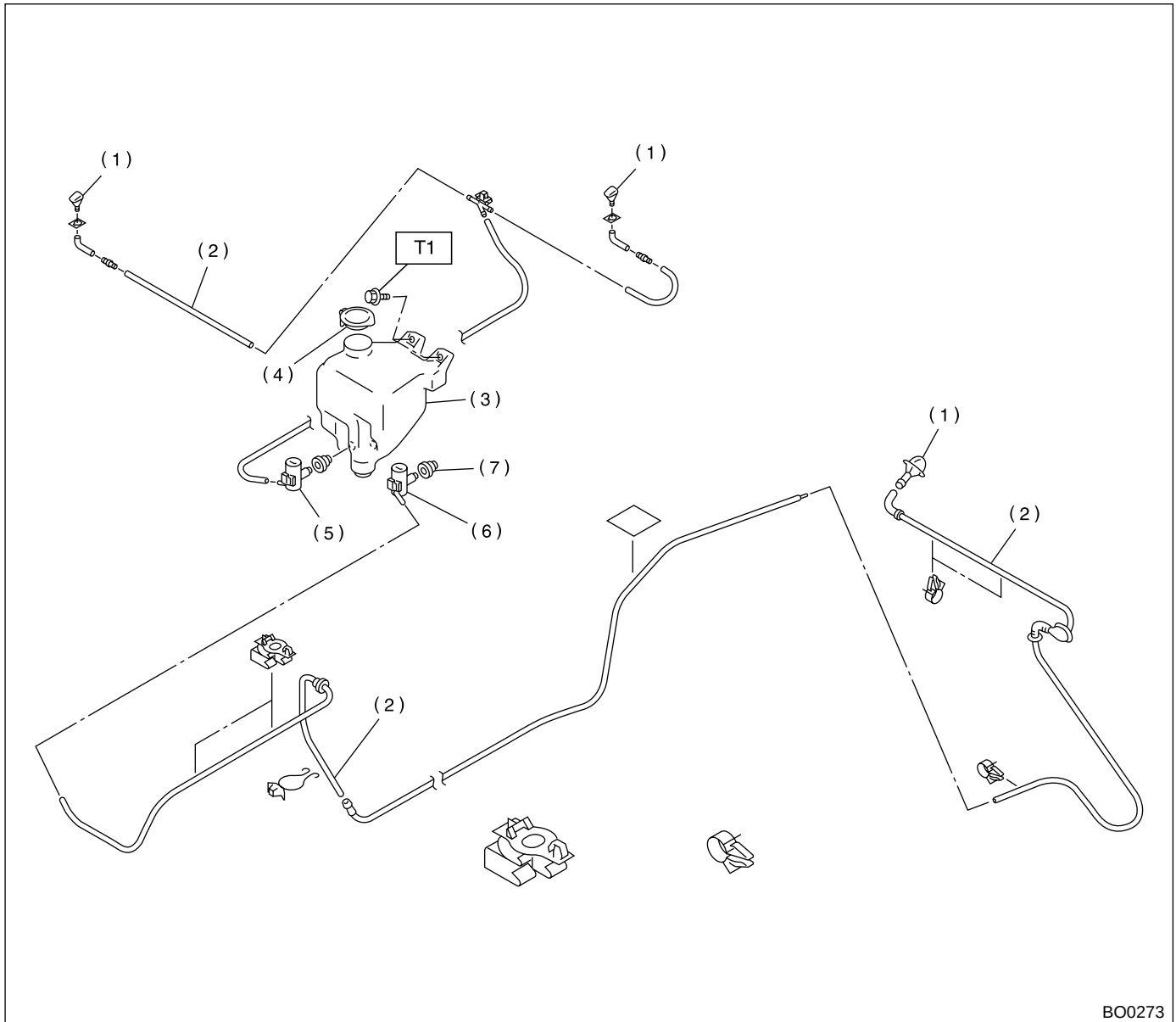
T2: 7.4 (0.75, 5.4)

T3: 7.8 (0.8, 5.6)

GENERAL DESCRIPTION

WIPER AND WASHER SYSTEMS

3. WASHER TANK



BO0273

- | | |
|---------------------|------------------------|
| (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)

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.

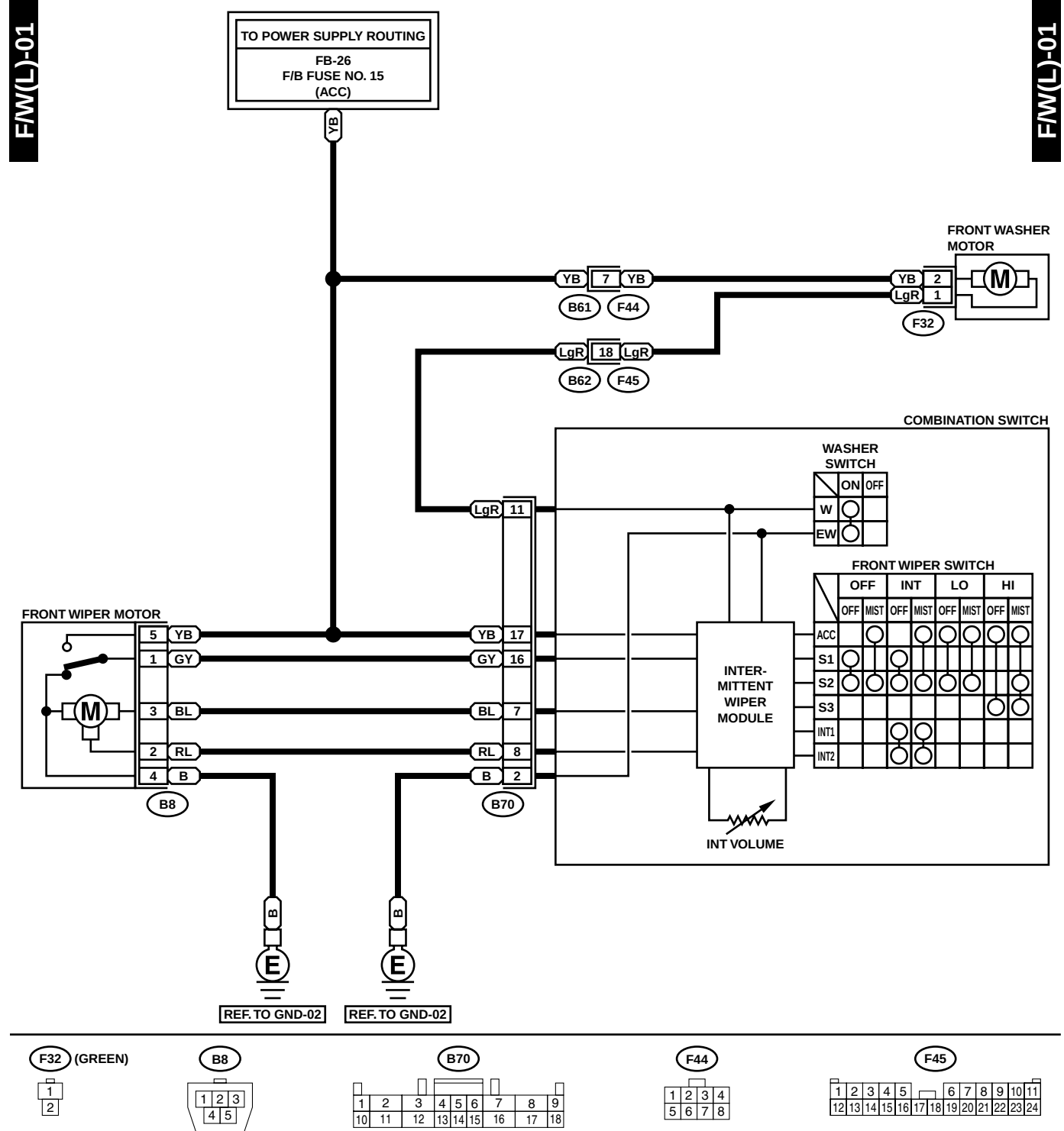
2. Wiper and Washer System

A: SCHEMATIC

WIPER AND WASHER SYSTEM

WIPER AND WASHER SYSTEMS

1. WIPER AND WASHER (FRONT) LHD MODEL



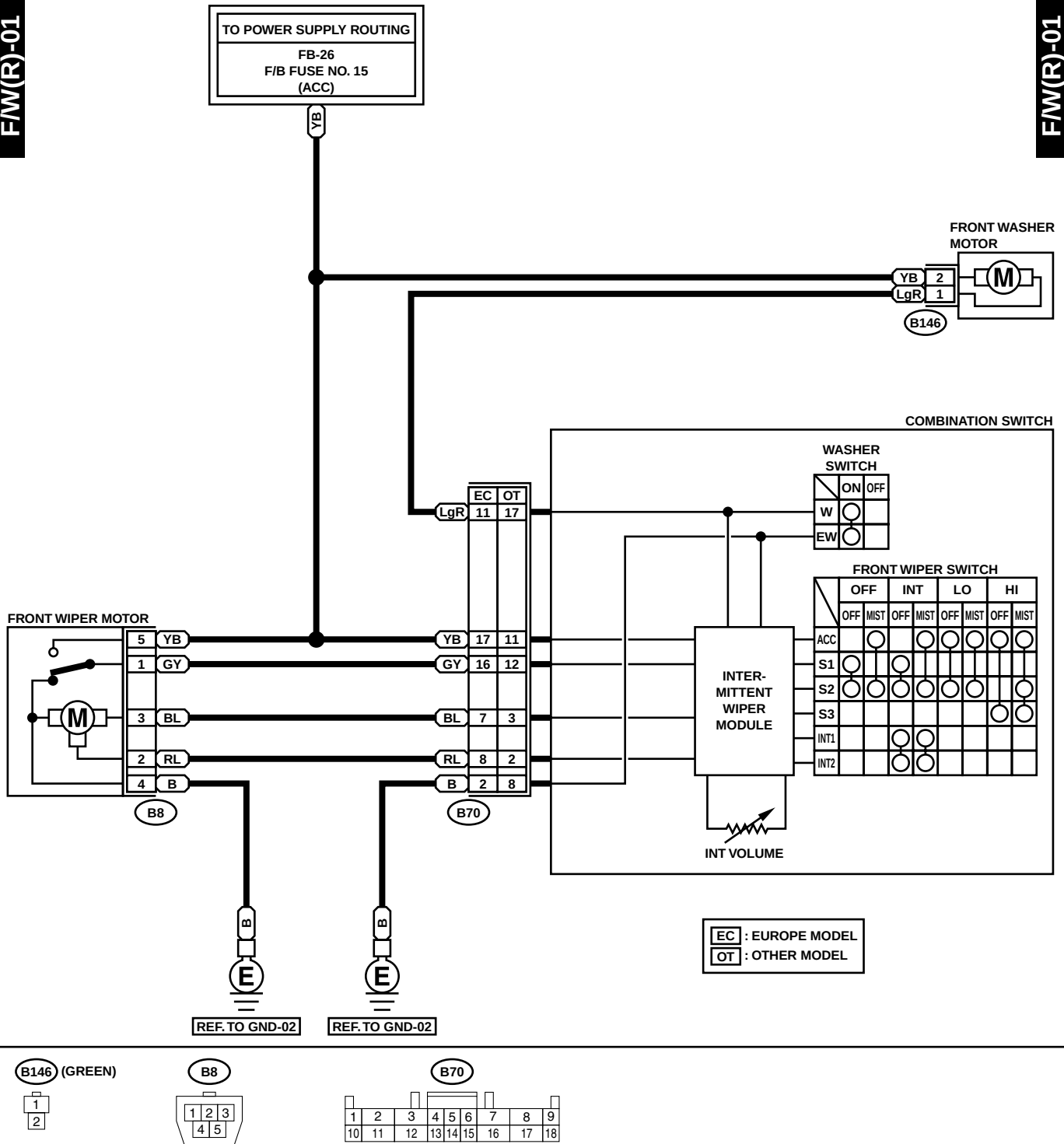
WIPER AND WASHER SYSTEM

WIPER AND WASHER SYSTEMS

2. WIPER AND WASHER (FRONT) RHD MODEL

F/W(R)-01

F/W(R)-01

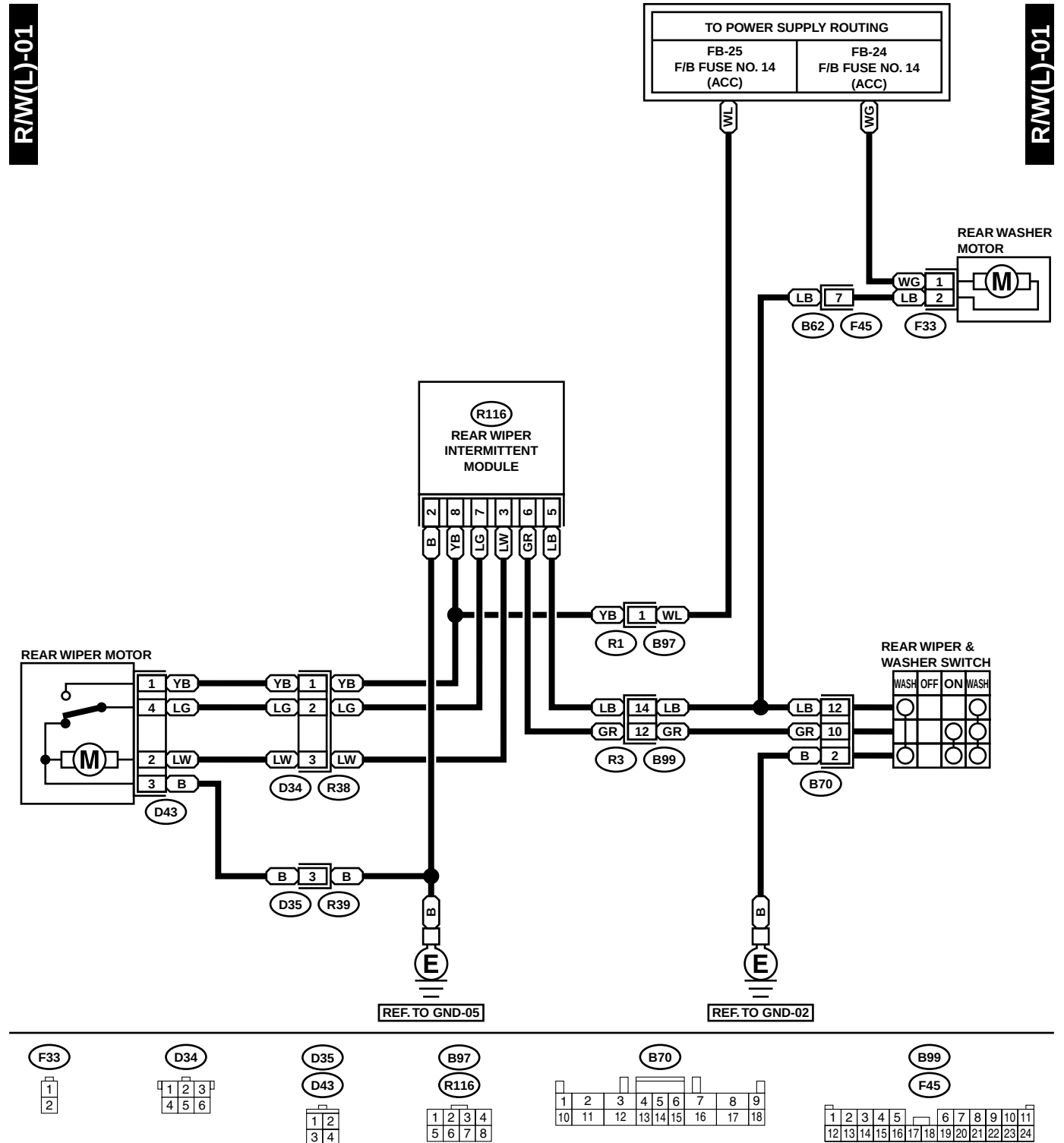


GR50-20

WIPER AND WASHER SYSTEM

WIPER AND WASHER SYSTEMS

3. WIPER AND WASHER (REAR) LHD MODEL



WIPER AND WASHER SYSTEM

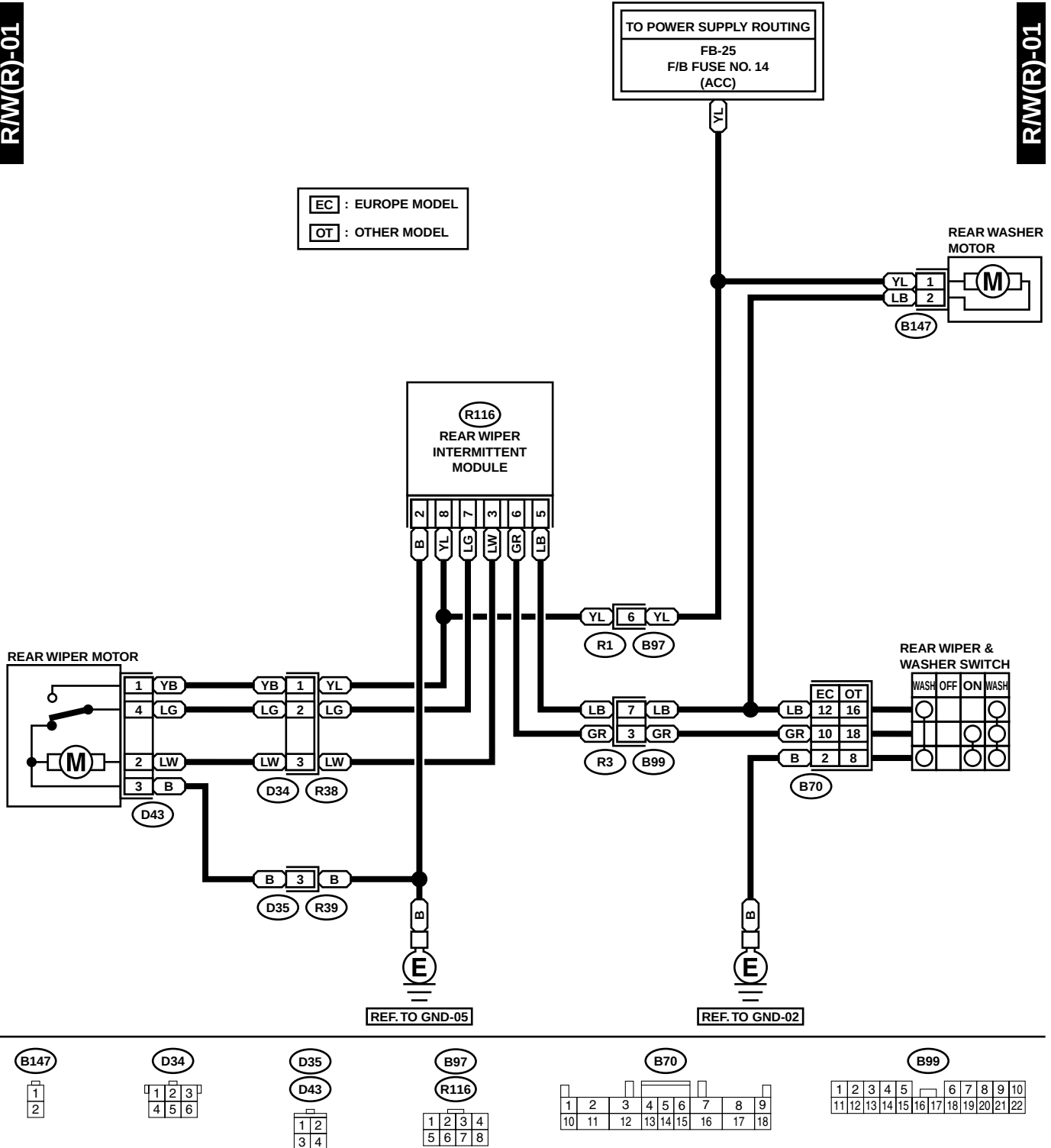
WIPER AND WASHER SYSTEMS

4. WIPER AND WASHER (REAR) RHD MODEL

R/W(R)-01

R/W(R)-01

EC : EUROPE MODEL
OT : OTHER MODEL



GR51-20

WIPER AND WASHER SYSTEM

WIPER AND WASHER SYSTEMS

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 hose and nozzle

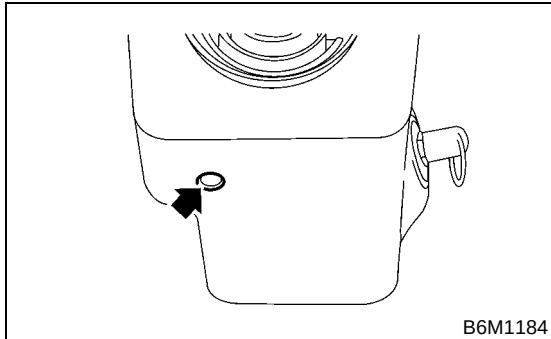
COMBINATION SWITCH (WIPER)

WIPER AND WASHER SYSTEMS

3. Combination Switch (Wiper)

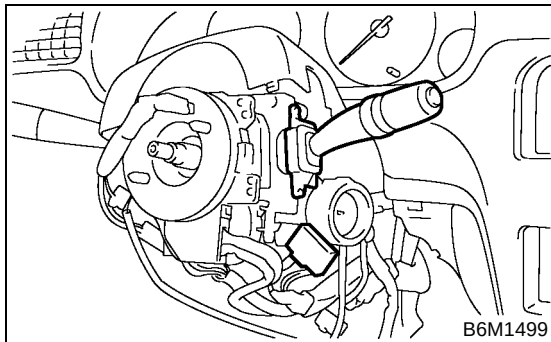
A: REMOVAL

- 1) Loosen screw to remove a steering column cover.



- 2) Disconnect connectors from combination switch.

- 3) Loosen screw to remove combination switch.

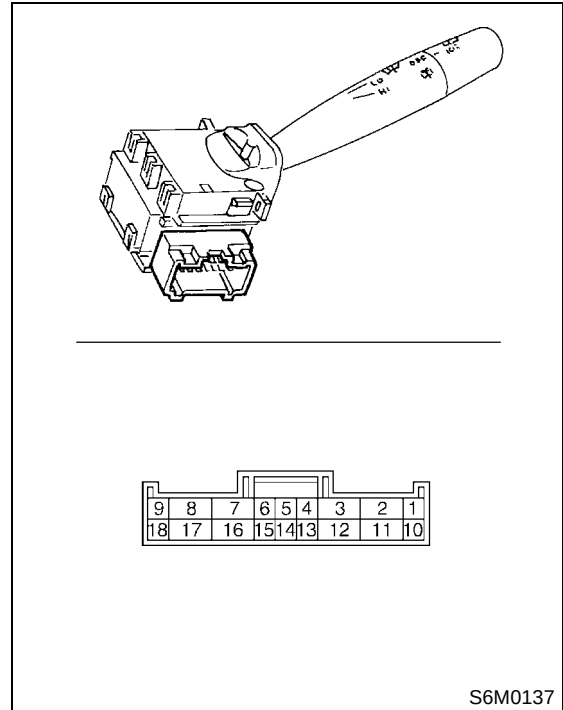


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- Inspect the continuity between each connector terminal.



LHD model and RHD model (Europe model):

	Switch position	Test connection	Specified condition
FRONT	OFF	7 — 16	Continuity
	INT	7 — 16	Continuity
	LO	7 — 17	Continuity
	HI	8 — 17	Continuity
	Washer ON	2 — 11	Continuity
REAR	Washer ON	2 — 10 — 12	Continuity
	OFF	—	No continuity
	ON	2 — 10	Continuity
	Washer ON	2 — 10 — 12	Continuity

If continuity is not as specified, replace the switch.

RHD model (Except Europe model):

	Switch position	Test connection	Specified condition
FRONT	OFF	3 — 12	Continuity
	INT	3 — 12	Continuity
	LO	3 — 11	Continuity
	HI	2 — 11	Continuity
	Washer ON	8 — 17	Continuity
REAR	Washer ON	8 — 16 — 18	Continuity
	OFF	—	No continuity
	ON	8 — 18	Continuity
	Washer ON	8 — 16 — 18	Continuity

If continuity is not as specified, replace the switch.

COMBINATION SWITCH (WIPER)

WIPER AND WASHER SYSTEMS

- 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.)

Switch position	Voltage
MIN.	12 V 0 V Approx. 2 sec.
MAX.	12 V 0 V 11±5 sec.
Non variable type	12 V 0 V 3±1 sec.

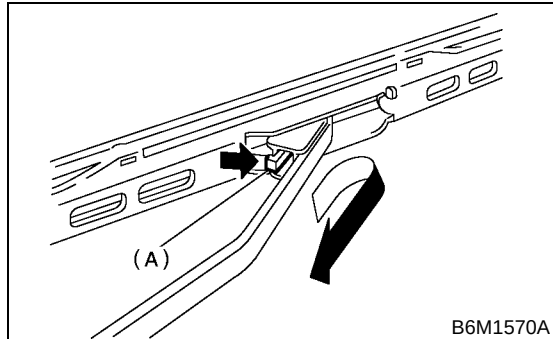
B6M1465A

If operation is not as specified, replace the switch.

4. Wiper Blade

A: REMOVAL

While pushing locking clip (A) up, pull out blade from arm to arrow direction.



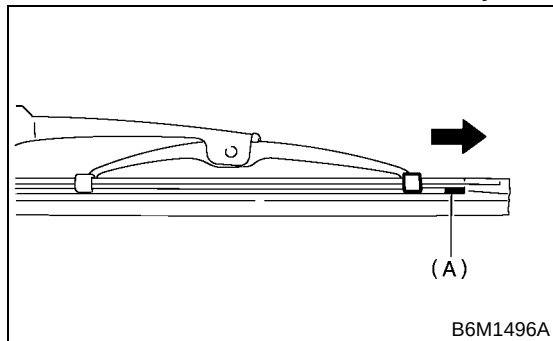
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Confirm that clip was locked securely.

C: DISASSEMBLY

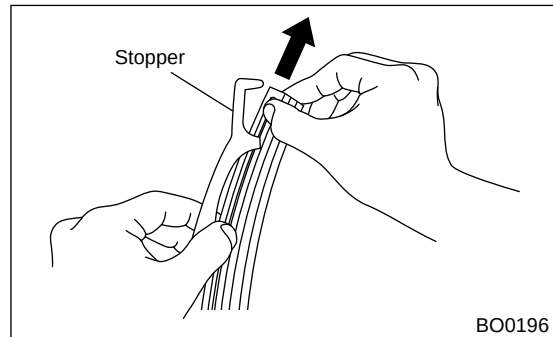
1. METAL TYPE

Pull on side (A) of the wiper rubber stopper and remove the rubber from the blade assembly.



2. RESIN TYPE

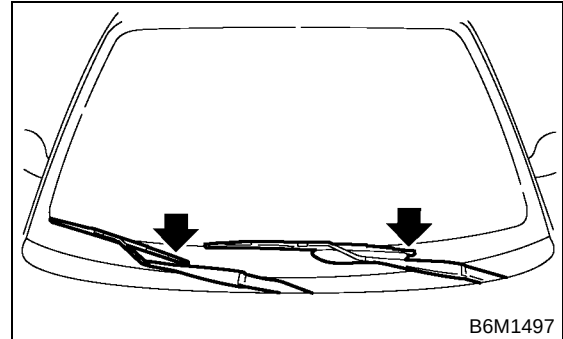
Pull the wiper rubber top slightly from the stopper and pull out fully.



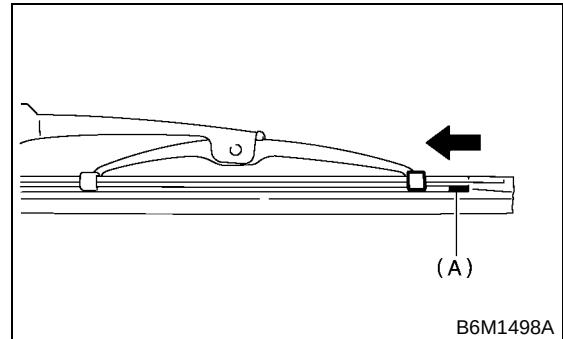
D: ASSEMBLY

1. METAL TYPE

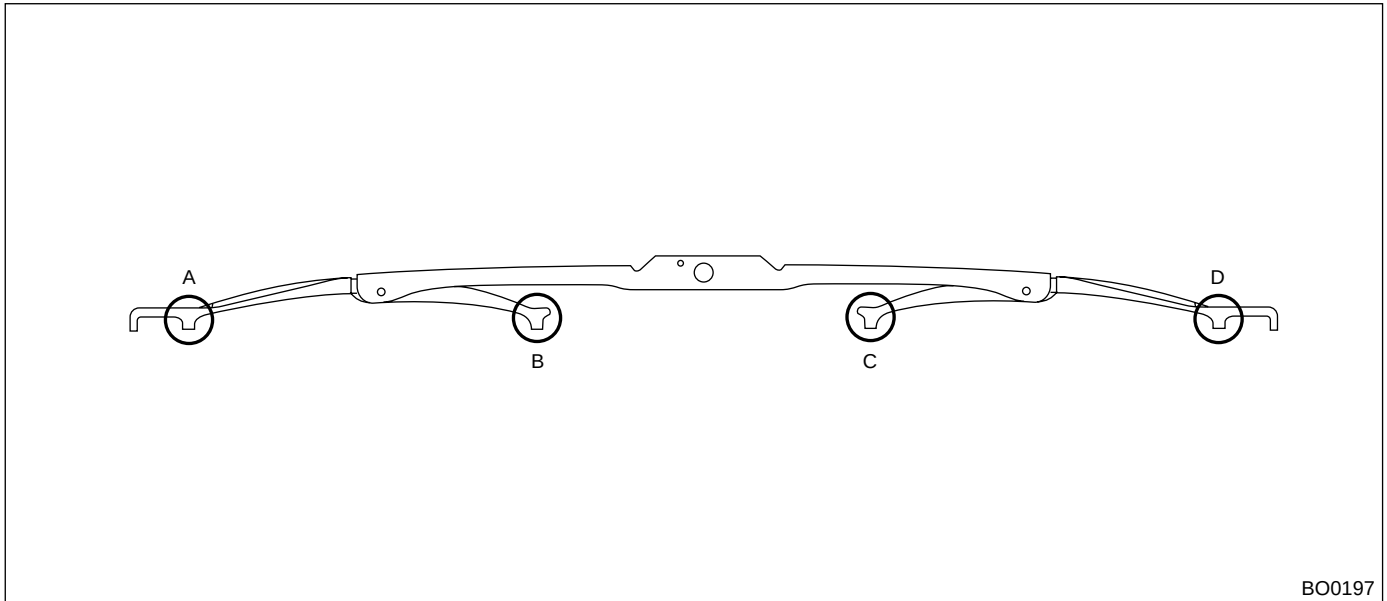
- 1) Insert the wiper rubber onto the blade so that the stopper is in the position shown.



- 2) Make sure the wiper rubber is securely fastened to the pull stopper (A).

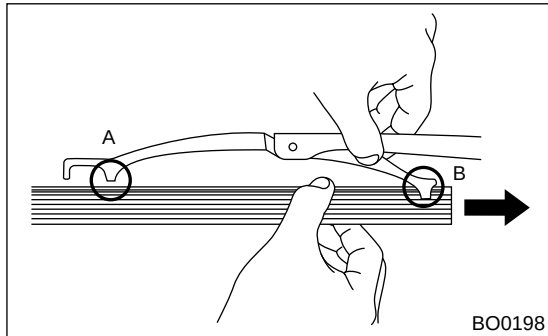


2. RESIN TYPE



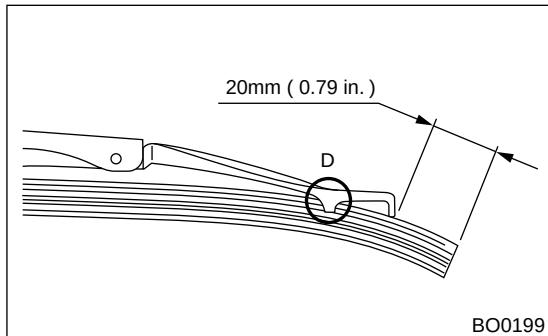
BO0197

1) Insert the wiper rubber through the claw (B).



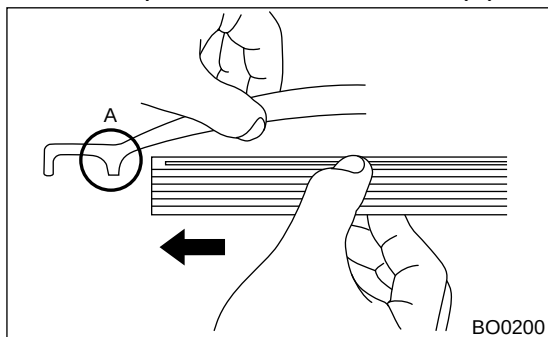
BO0198

2) Insert the wiper rubber top until it protrudes about 20mm (0.79 in) from the stopper (D).



BO0199

3) Insert the wiper rubber into the claw (A).



BO0200

E: INSPECTION

1) When the wiper does not perform well, inspect the following:

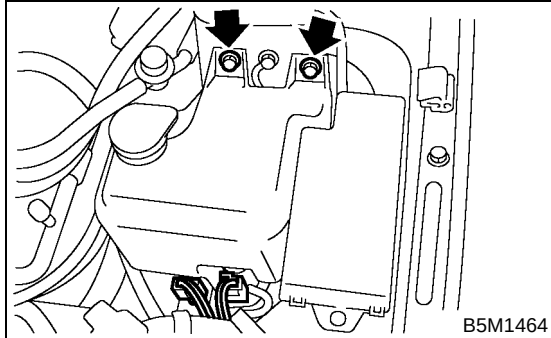
- Make sure the movable part of the blade assembly moves smoothly.
- Make sure the wiper rubber is not deformed or damaged.

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.

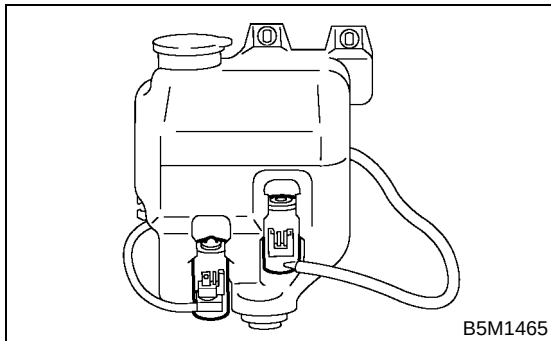


B: INSTALLATION

Install in the reverse order of removal.

C: DISASSEMBLY

Pull out washer motor from tank.

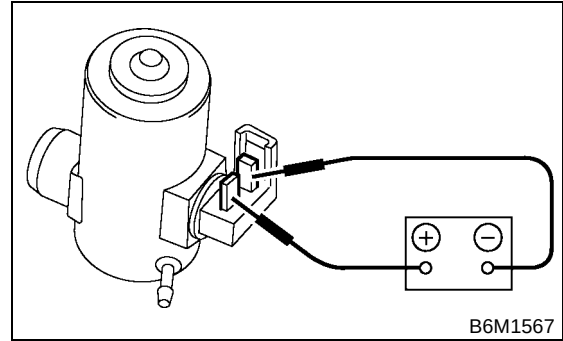


D: ASSEMBLY

- 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.



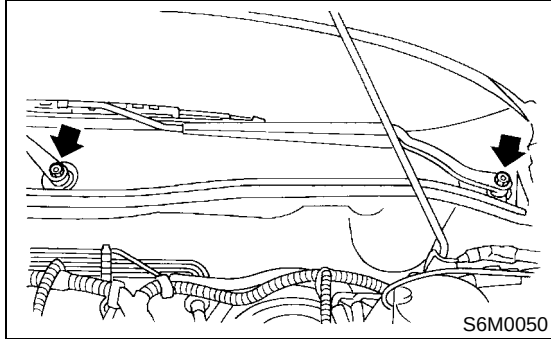
6. Front Wiper Arm

A: REMOVAL

NOTE:

The positions for RHD model are symmetrically opposite.

- 1) Open hood.
- 2) Remove cap.
- 3) Loosen nut to remove arm.

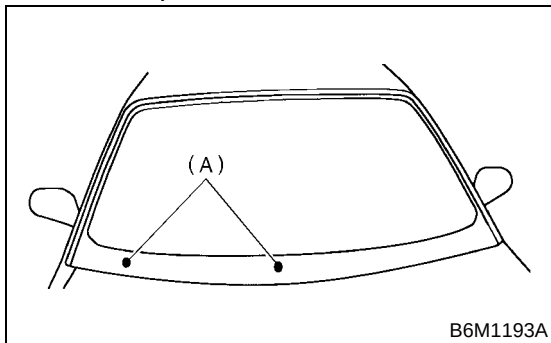


B: INSTALLATION

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.

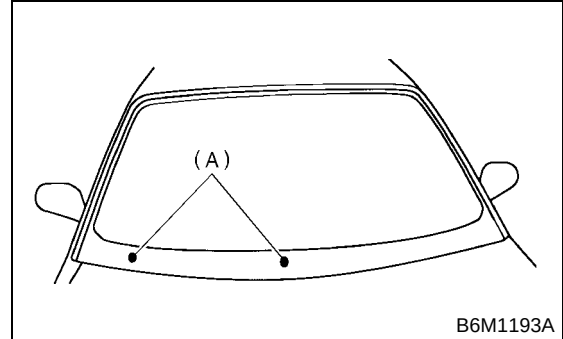


C: ADJUSTMENT

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.



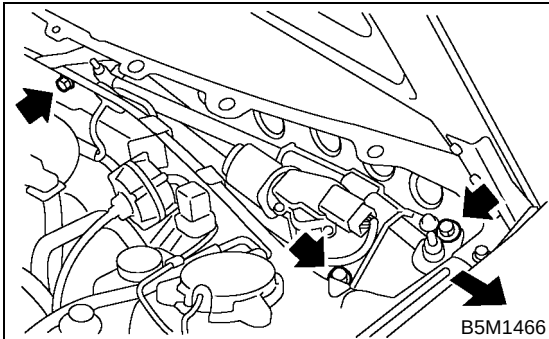
7. Front Wiper Motor and Link

A: REMOVAL

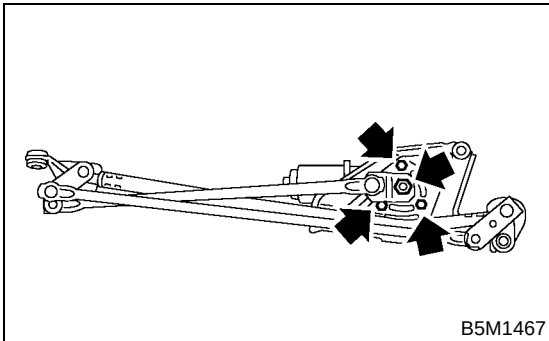
NOTE:

The positions for RHD model are symmetrically opposite.

- 1) Remove cowl panel. <Ref. to EI-17, REMOVAL, Cowl Panel.>
- 2) Disconnect connector of motor.
- 3) Loosen bolts and nuts to remove wiper link.

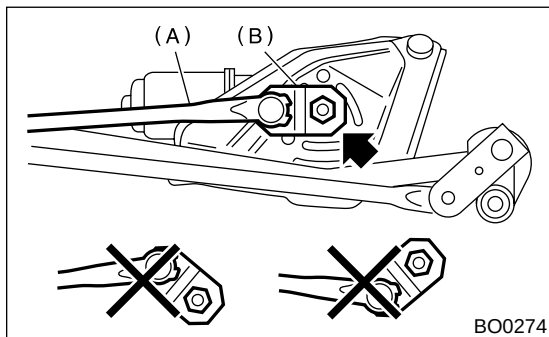


- 4) Loosen bolts and nuts to remove motor.



B: INSTALLATION

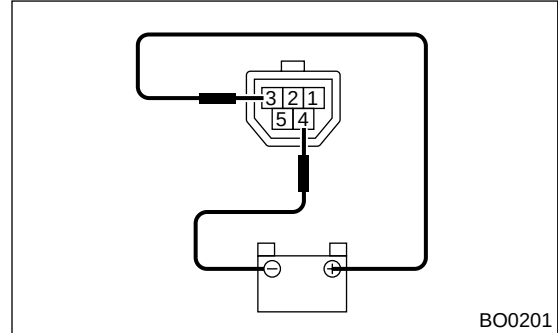
- 1) Tighten the nut where rod (A) and link plate (B) is aligned in straight line.



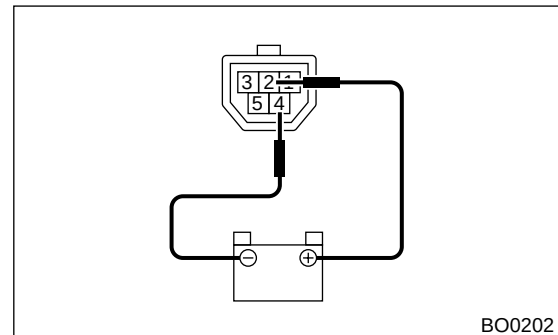
- 2) Install in the reverse order of removal.

C: INSPECTION

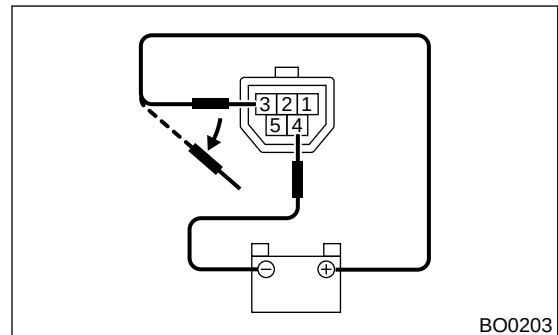
- 1) When battery is connected to terminal of connectors, confirm that motor operates at low speed.



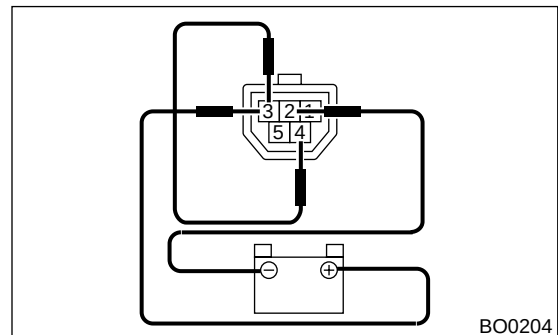
- 2) When battery is connected to terminal of connectors, confirm that motor operates at high speed.



- 3) Connect battery to terminals of connector, and remove terminal connection with motor rotated at low speed, and stop wiper motor through operation.

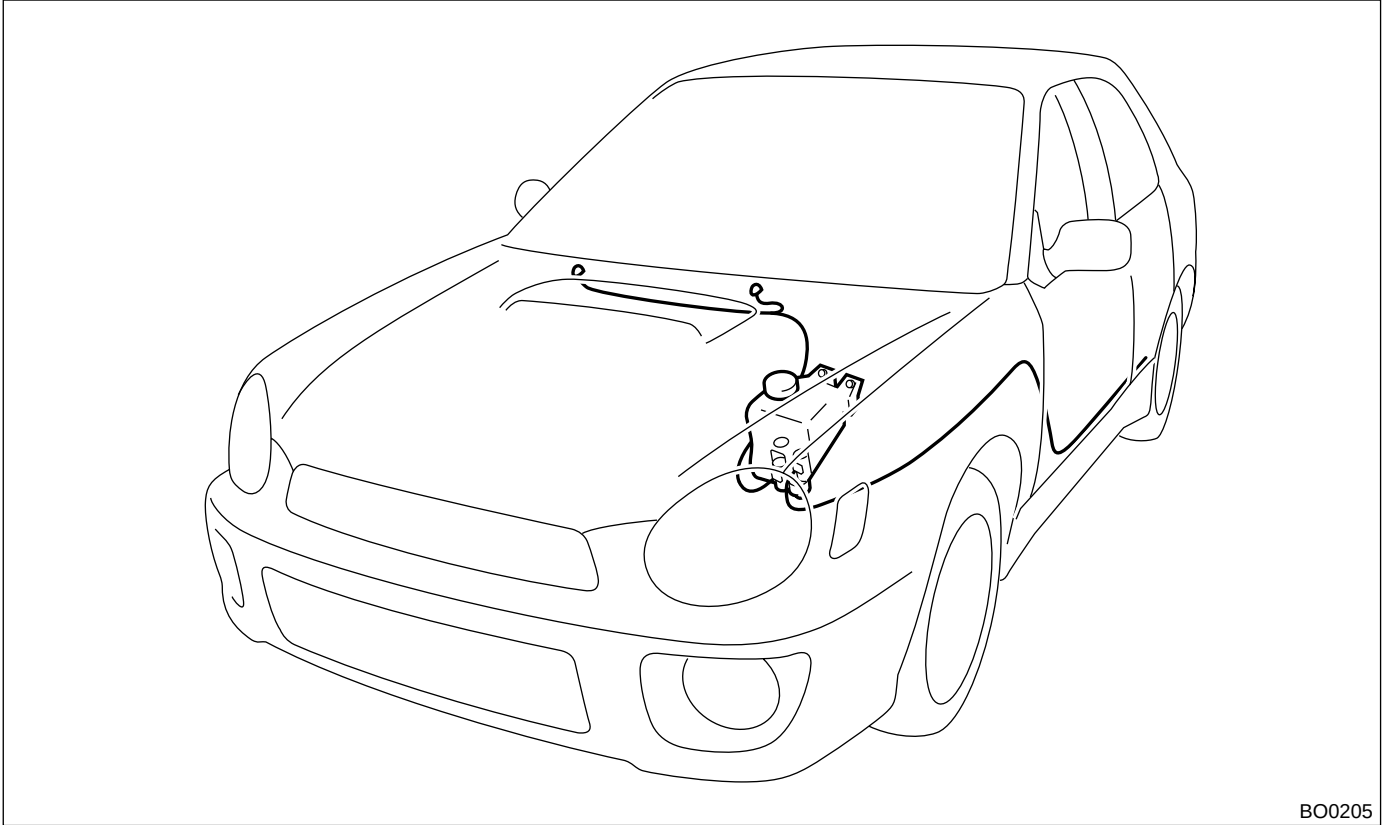


- 4) Connect battery and confirm that motor stops at automatic stop position after motor operates at low speed again.



8. Front Washer

A: LOCATION

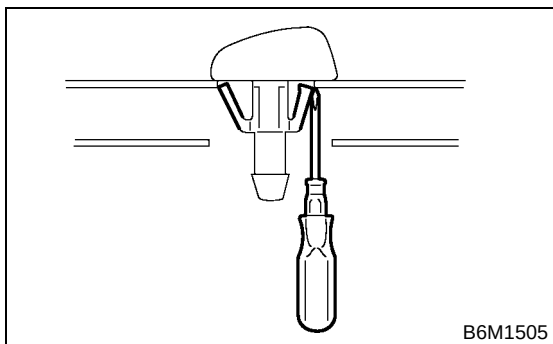


BO0205

B: REMOVAL

1. NOZZLE

- 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.



B6M1505

C: INSTALLATION

1. NOZZLE

- 1) Install in the reverse order of removal.
- 2) Adjust the position of the washer liquid sprayer.
<Ref. to WW-19, ADJUSTMENT, Front Washer.>

D: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

E: 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.

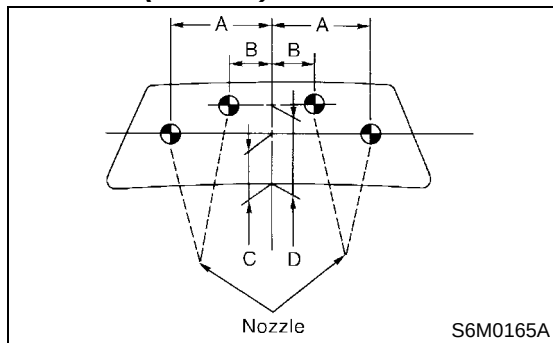
Injection position:

A: 350 mm (13.78 in)

B: 162 mm (6.38 in)

C: 300 mm (11.81 in)

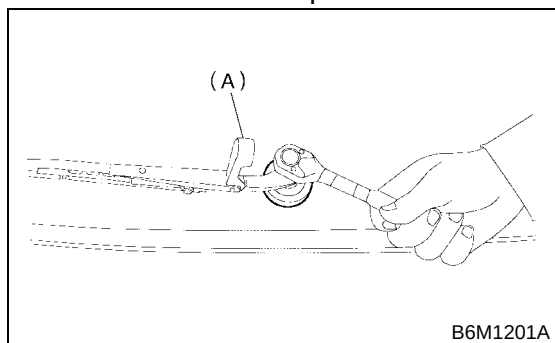
D: 500 mm (19.69 in)



9. Rear Wiper Arm

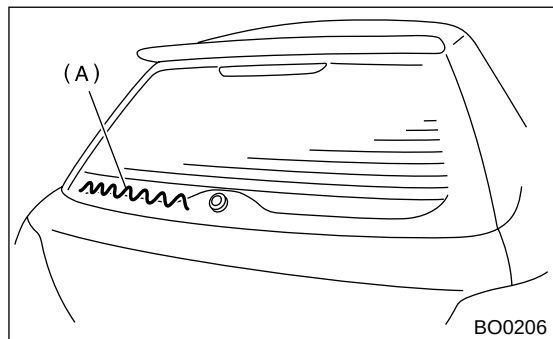
A: REMOVAL

- 1) Raise wiper arm cover (A).
- 2) Loosen nut to remove wiper arm.



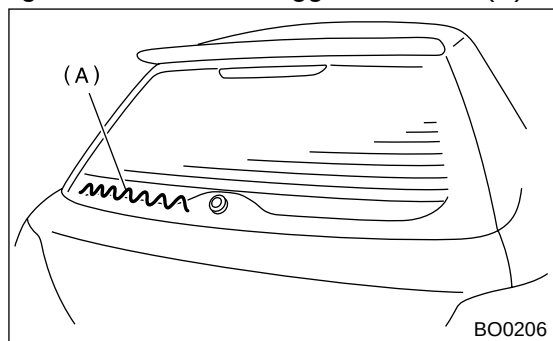
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Operate rear wiper once.
- 3) Align blade to rear defogger heat wire (A).



C: ADJUSTMENT

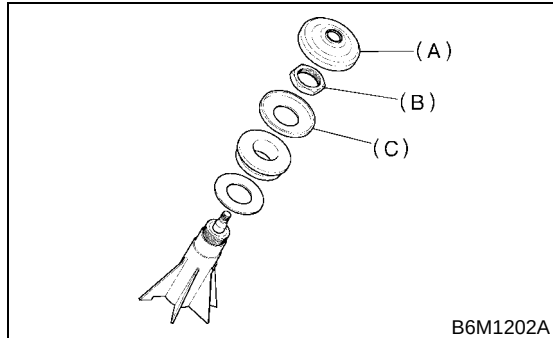
- 1) Operate rear wiper once.
- 2) Align blade to rear defogger heat wire (A).



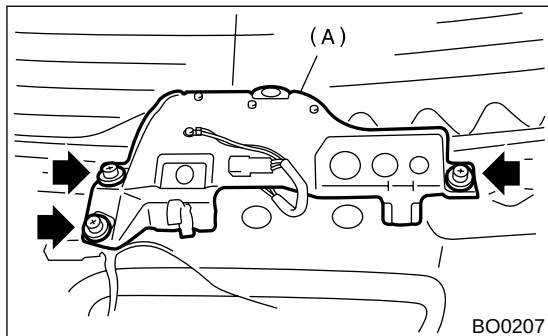
10. Rear Wiper Motor

A: REMOVAL

- 1) Remove rear wiper arm.
- 2) Remove cap (A), nut (B), and spacer (C) from rear wiper shaft.

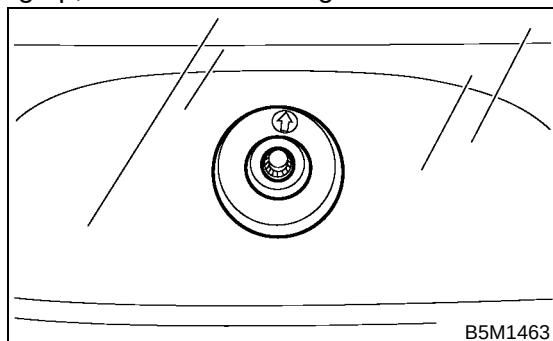


- 3) Remove rear gate lower trim. <Ref. to EI-34, REMOVAL, Rear Gate Trim.>
- 4) Unclip clip of harness and disconnect connector of wiper motor.
- 5) Loosen bolts to remove wiper motor assembly (A).



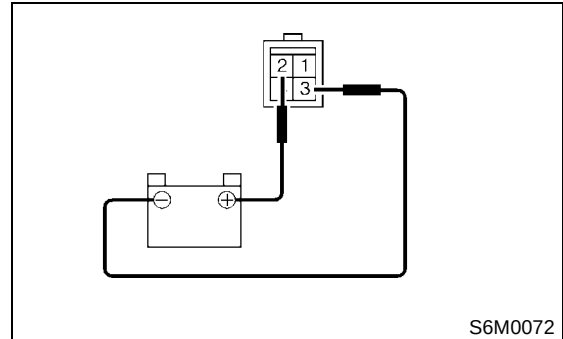
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Install rear wiper cushion with the arrow mark facing up, as shown in the figure.

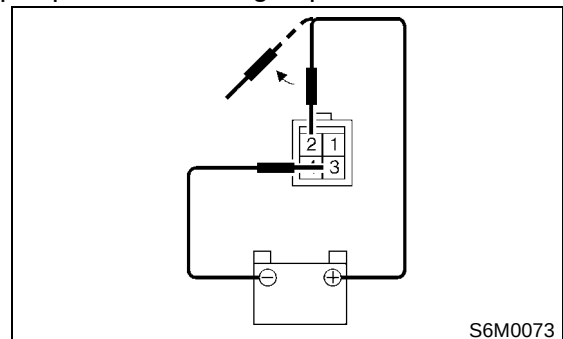


C: INSPECTION

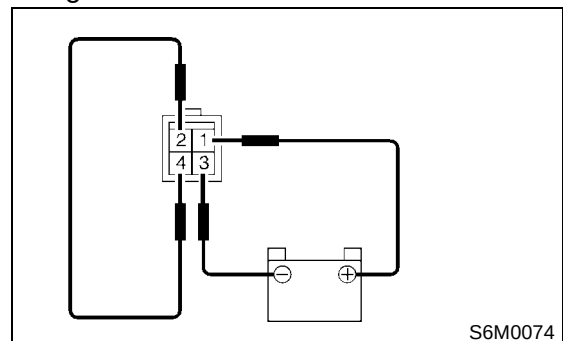
- 1) Connect battery to wiper motor connector and confirm that wiper motor operates.



- 2) Connect battery to terminal of connector and remove terminal connections with motor rotated, and stop wiper motor through operation.

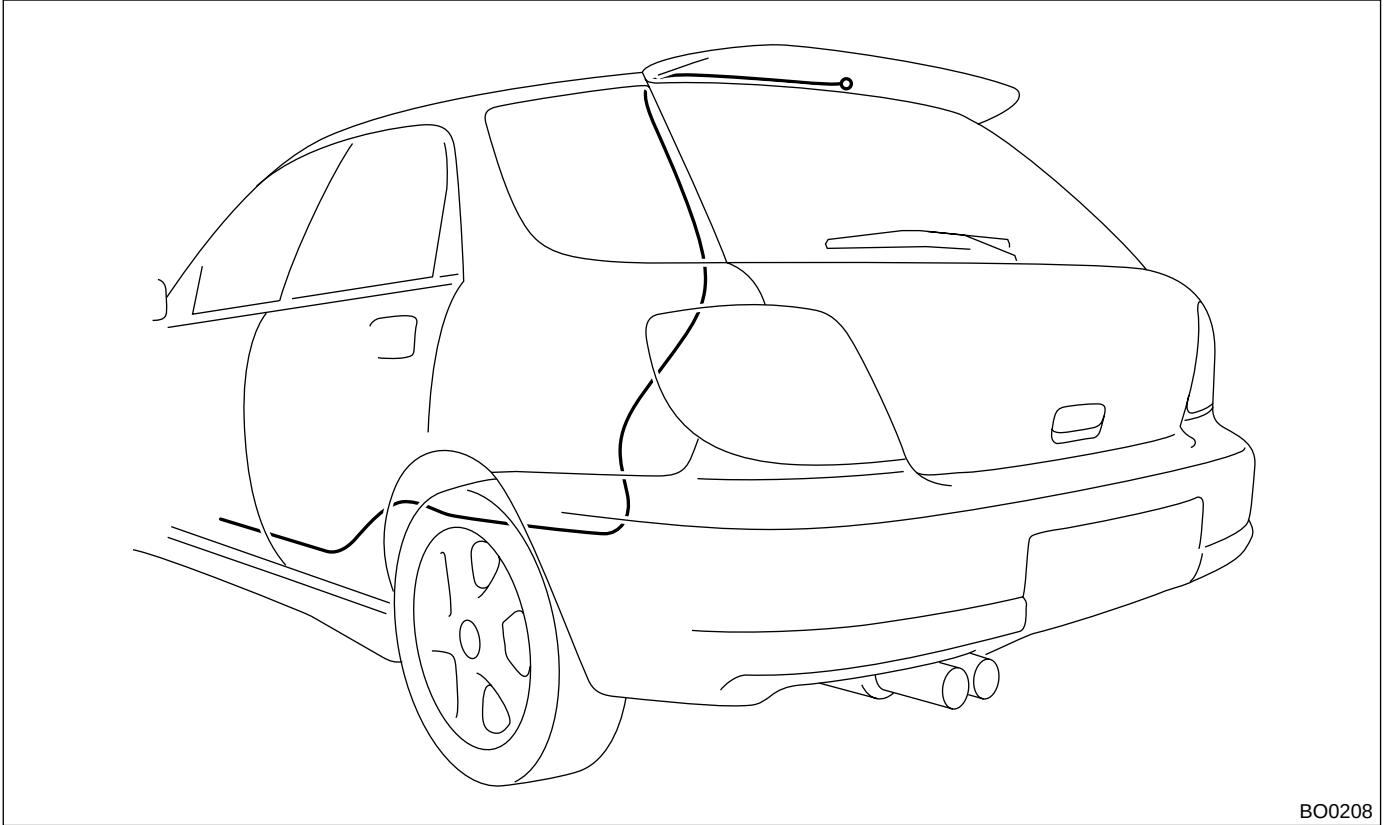


- 3) Connect battery and confirm that motor stops at automatic stop position after motor operates at low speed again.



11.Rear Washer

A: LOCATION

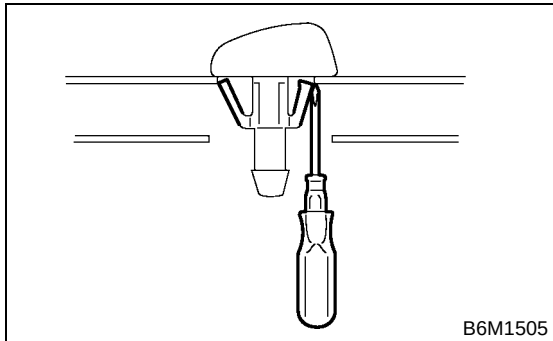


BO0208

B: REMOVAL

1. NOZZLE

- 1) Remove the high-mount stop light. <Ref. to LI-54, REMOVAL, High-mounted Stop Light.>
- 2) Remove the washer hose from the washer nozzle.
- 3) Open the clips on the underside of the hood with a thin screwdriver or other tool, and remove the washer nozzle.



B6M1505

C: INSTALLATION

1. NOZZLE

- 1) Install in the reverse order of removal.
- 2) Adjust the position of the washer liquid sprayer. <Ref. to WW-23, ADJUSTMENT, Rear Washer.>

D: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

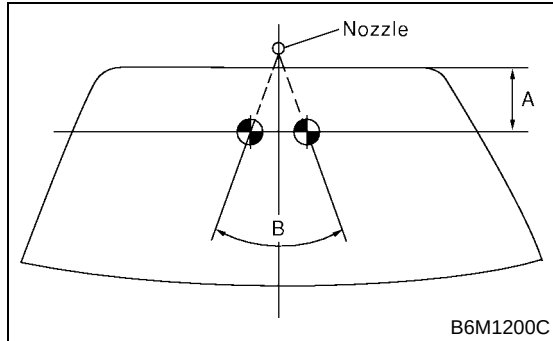
E: ADJUSTMENT

- 1) Turn wiper switch to OFF position.
- 2) When vehicle stops, adjust washer injection position as shown in the figure.

Injection position:

A: 39 mm (1.54 in)

B: 72°



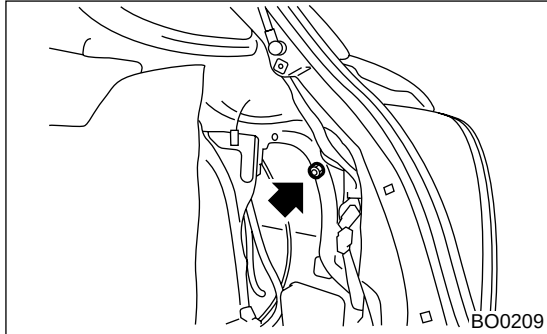
12.Wiper Control Relay

If operation is not as specified, replace the switch.

A: REMOVAL

1. WAGON

- 1) Remove right quarter lower trim. <Ref. to EI-30, REMOVAL, Rear Quarter Trim.>
- 2) Loosen nut to remove control unit.



B: INSTALLATION

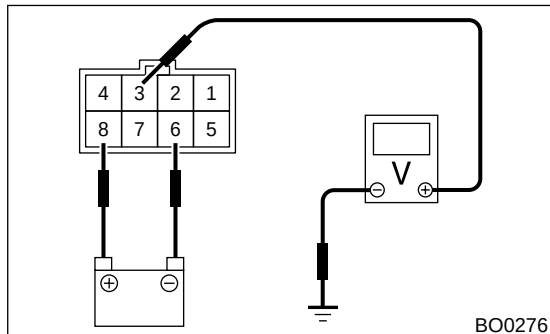
1. WAGON

Install in the reverse order of removal.

C: INSPECTION

1. WAGON

- 1) Disconnect the connector from the wiper control relay.
- 2) Connect the positive (+) lead from the battery to terminal 8 and the negative (-) lead to terminal 6. Connect the positive (+) lead from the voltmeter to terminal 3 and negative lead to ground.



- 3) Measure the voltage when the wiper relay is operated.

Switch position	Voltage
ON	12 V 0 V

BODY SECTION

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HVAC SYSTEM
(HEATER, VENTILATOR AND A/C) AC

HVAC SYSTEM (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

ENTERTAINMENT

ET

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2. Radio System	3
3. Cigarette Lighter System.....	8
4. Radio Body.....	9
5. Front Speaker	10
6. Tweeter	11
7. Rear Speaker	12
8. Antenna.....	13
9. Cigarette Lighter.....	14

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

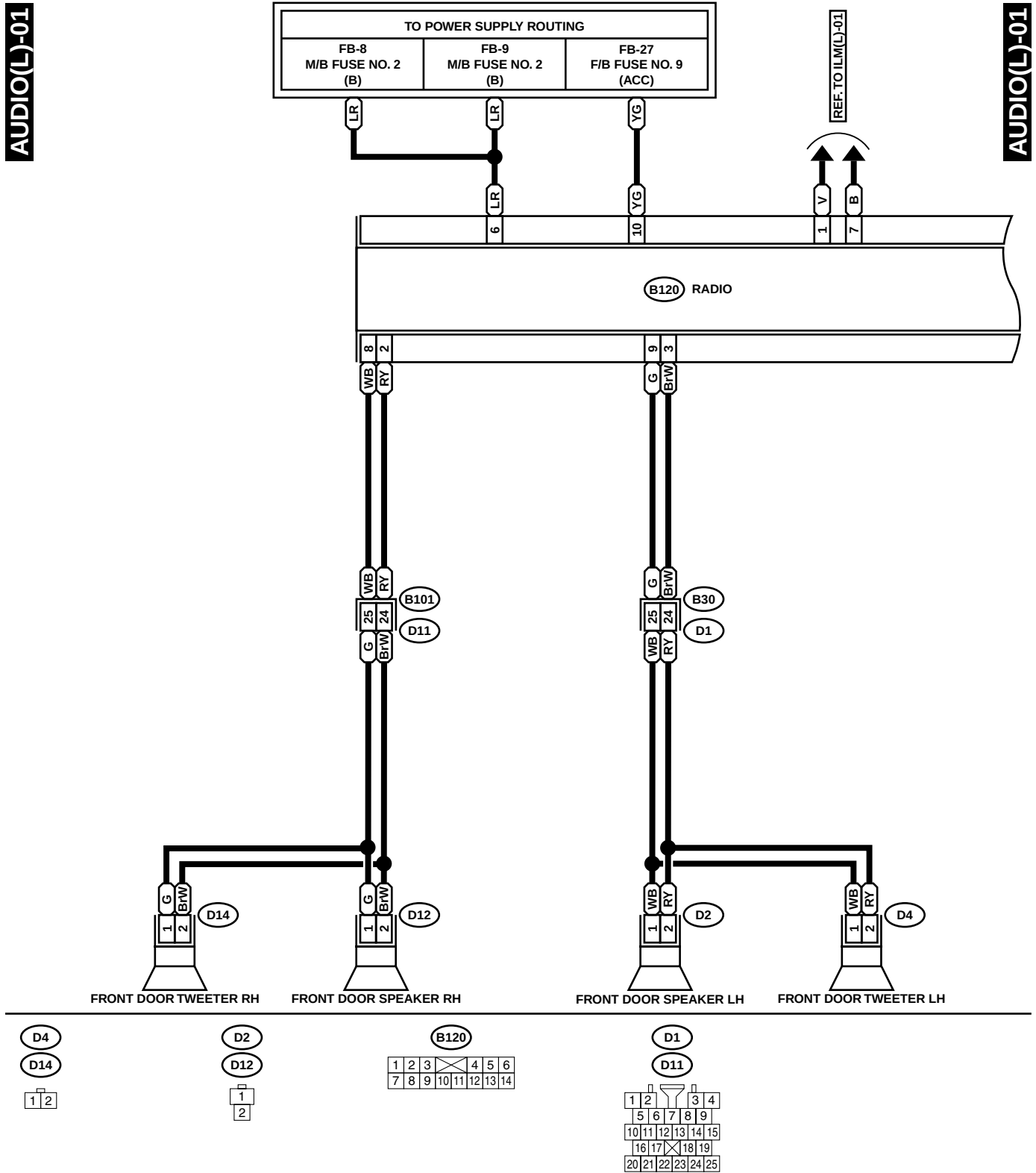
1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Radio System

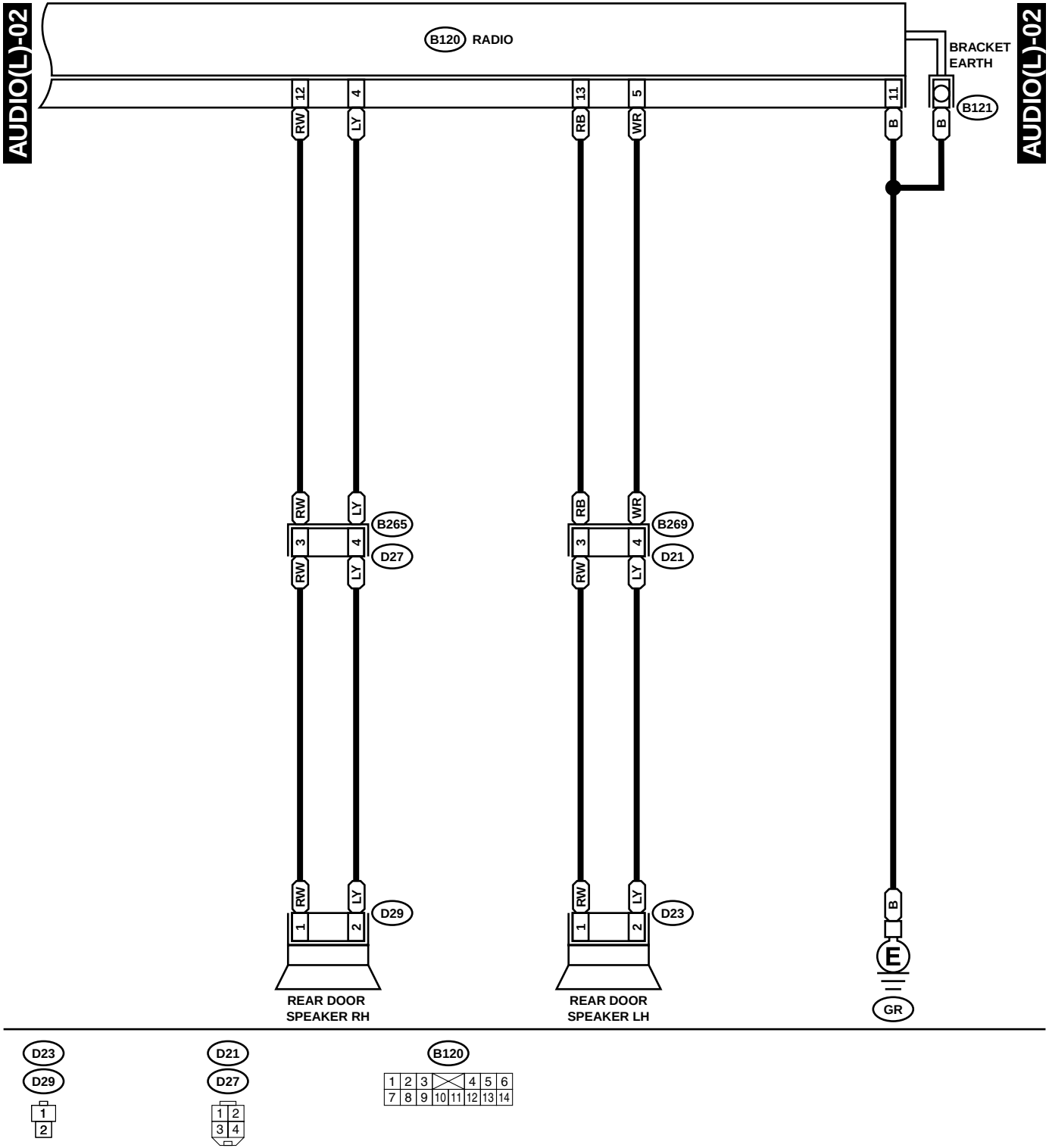
A: SCHEMATIC

1. RADIO LHD MODEL



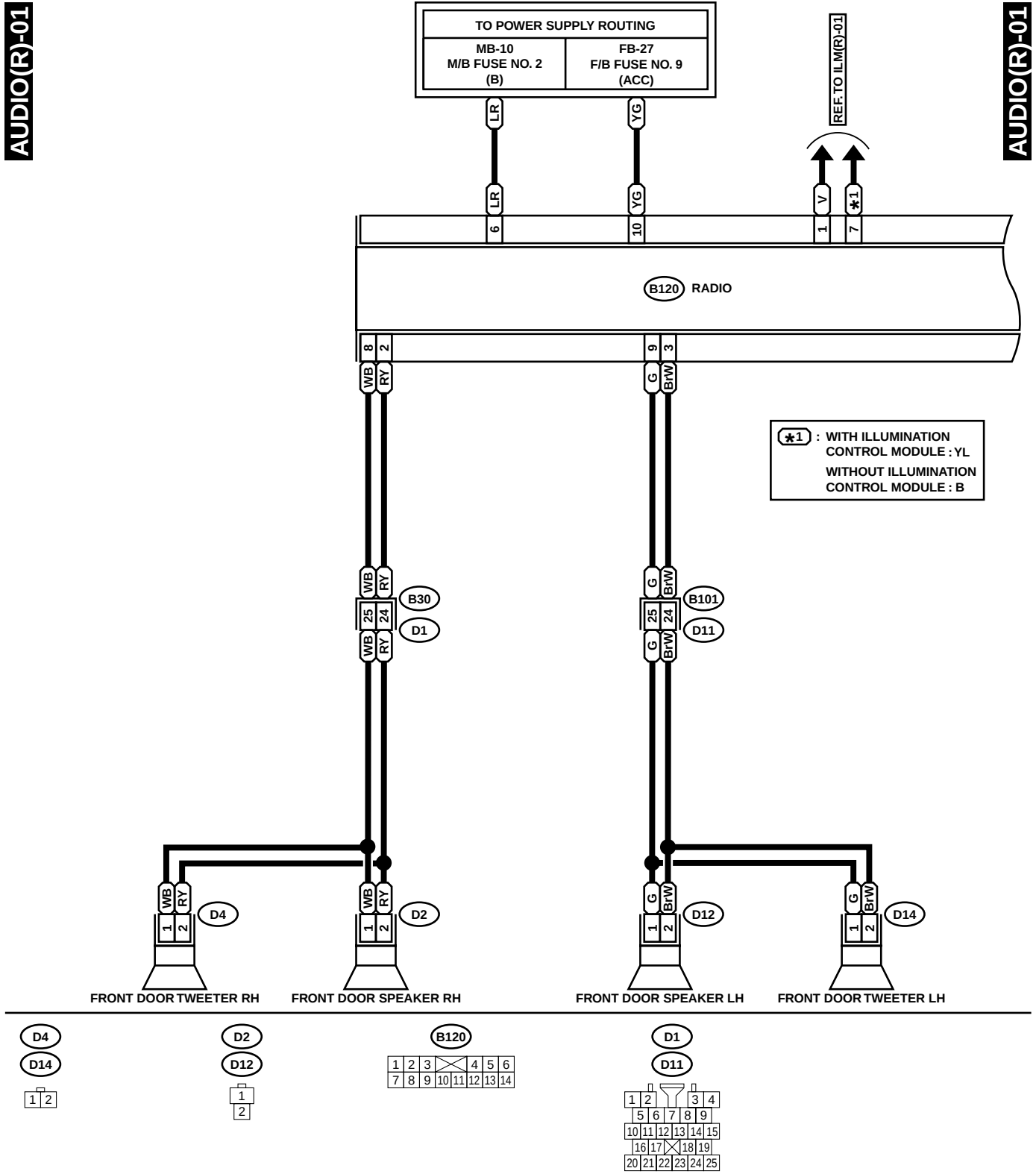
RADIO SYSTEM

ENTERTAINMENT



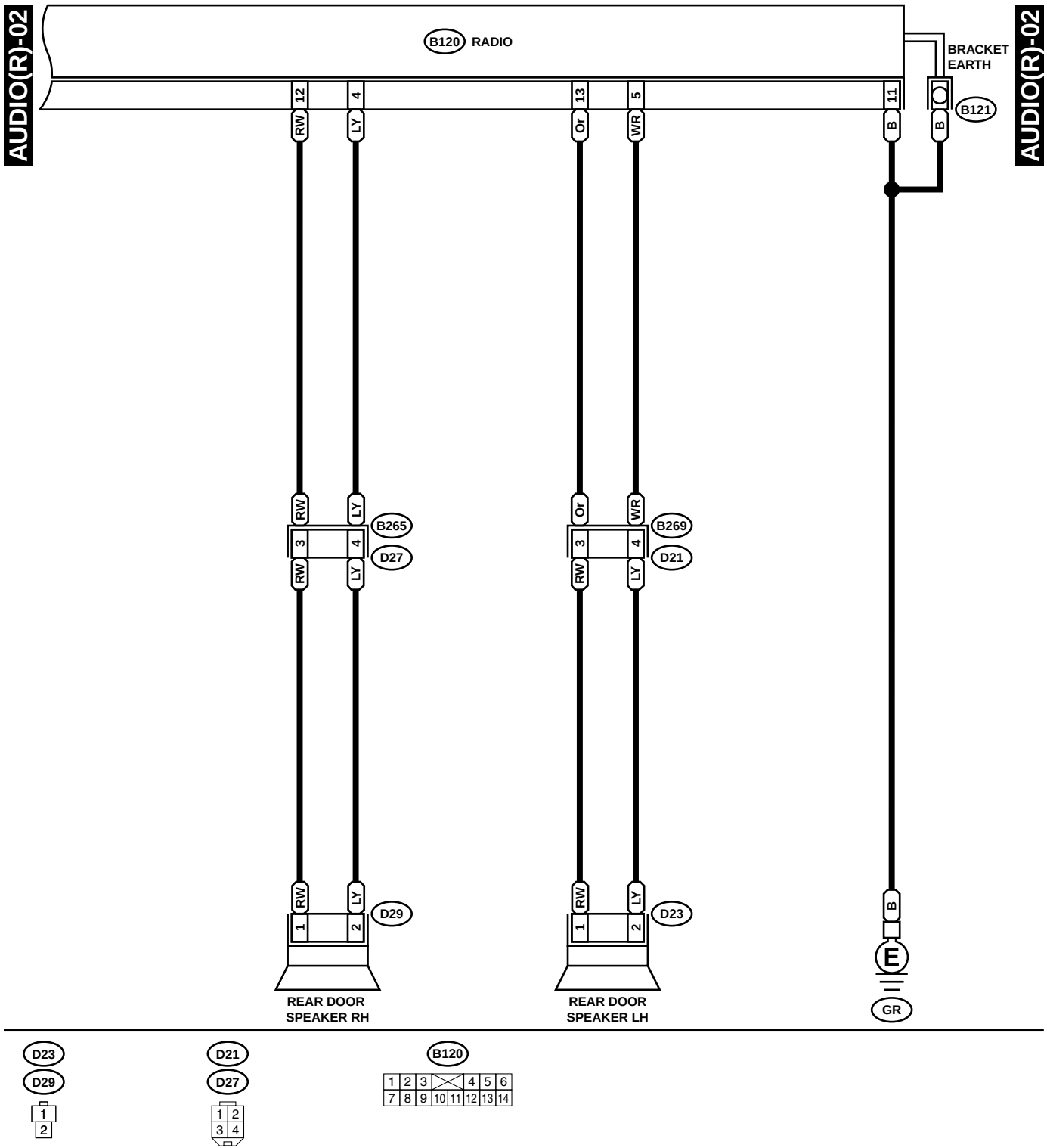
GL76-20B

2. RADIO RHD MODEL



RADIO SYSTEM

ENTERTAINMENT



GR76-20B

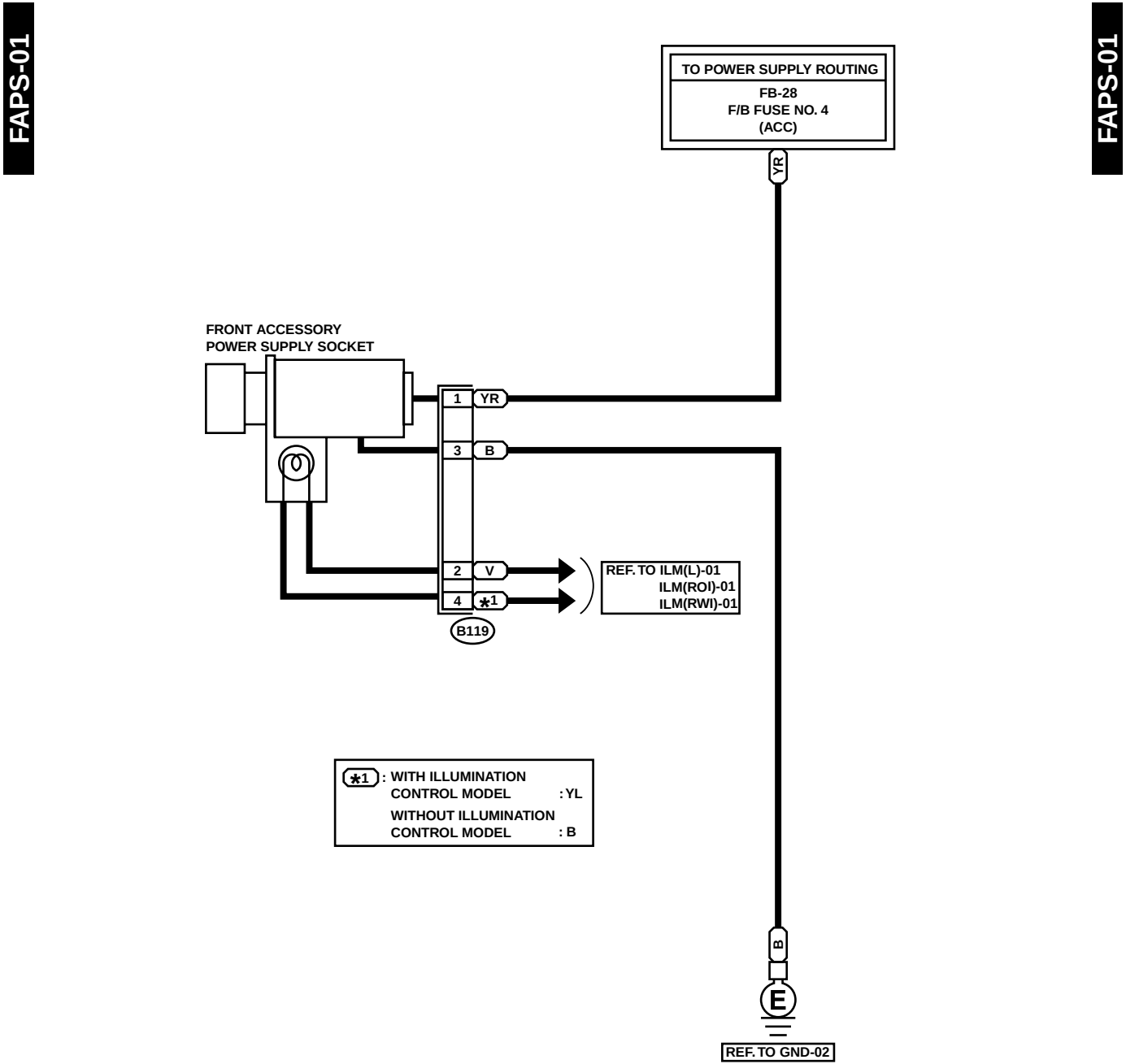
B: INSPECTION

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 radio ground. (3) Remove radio for repair.

3. Cigarette Lighter System

A: SCHEMATIC

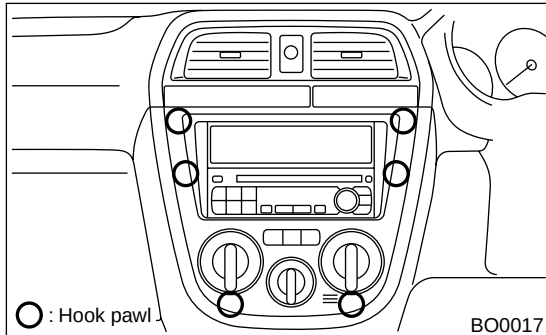
1. CIGARETTE LIGHTER



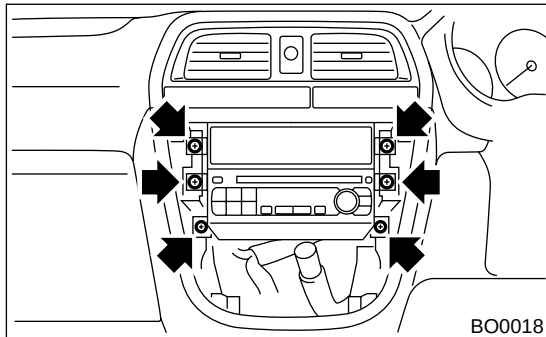
4. Radio Body

A: REMOVAL

1) Remove center panel while disconnecting connector.



2) Remove fitting screws, and slightly pull radio out from center console.



3) Disconnect electric connectors and antenna feeder cord.

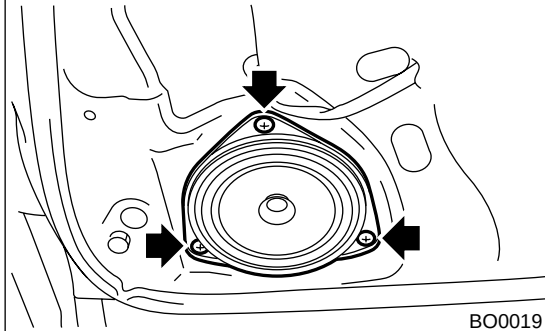
B: INSTALLATION

Install in the reverse order of removal.

5. Front Speaker

A: REMOVAL

- 1) Remove front door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 2) Remove front speaker mounting screws.



- 3) Disconnect harness connector and remove front speaker.

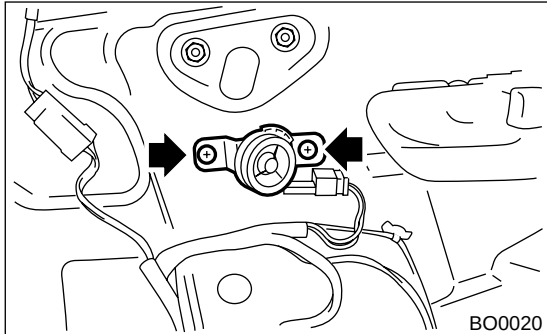
B: INSTALLATION

Install in the reverse order of removal.

6. Tweeter

A: REMOVAL

- 1) Remove front door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 2) Remove tweeter mounting screws.



- 3) Disconnect harness connector and remove tweeter.

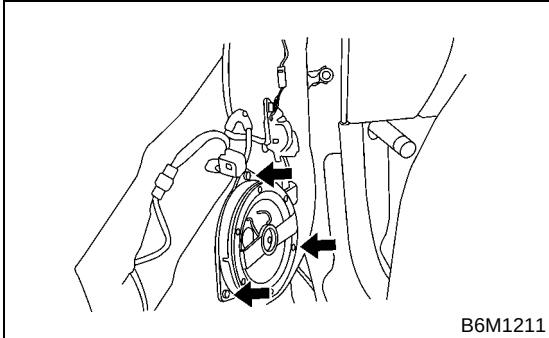
B: INSTALLATION

Install in the reverse order of removal.

7. Rear Speaker

A: REMOVAL

- 1) Remove rear door trim. <Ref. to EI-21, REMOVAL, Rear Door Trim.>
- 2) Remove rear speaker mounting screws.



- 3) Disconnect harness connector and remove rear speaker.

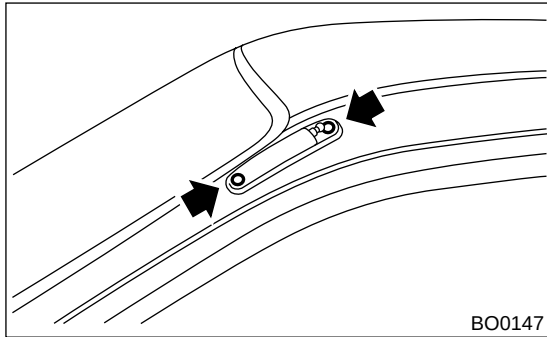
B: INSTALLATION

Install in the reverse order of removal.

8. Antenna

A: REMOVAL

- 1) Remove mounting screws and detach antenna.
- 2) Disconnect harness connector.



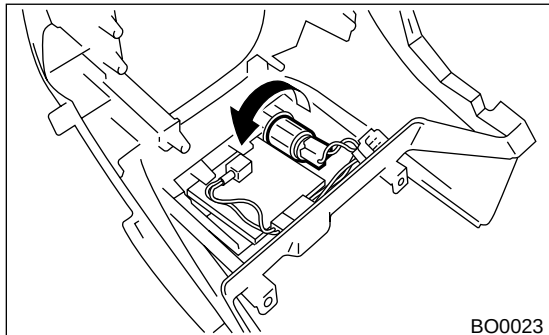
B: INSTALLATION

Install in the reverse order of removal.

9. Cigarette Lighter

A: REMOVAL

- 1) Remove center panel. <Ref. to ET-9, REMOVAL, Radio Body.>
- 2) Disconnect harness connectors and remove cigarette lighter.



B: INSTALLATION

Install in the reverse order of removal.

BODY SECTION

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(DIAGNOSTICS) AC

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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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

COMMUNICATION SYSTEM

COM

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2. Horn System	3
3. Horn	5
4. Horn Switch.....	6



1. General Description

A: PREPARATION TOOL

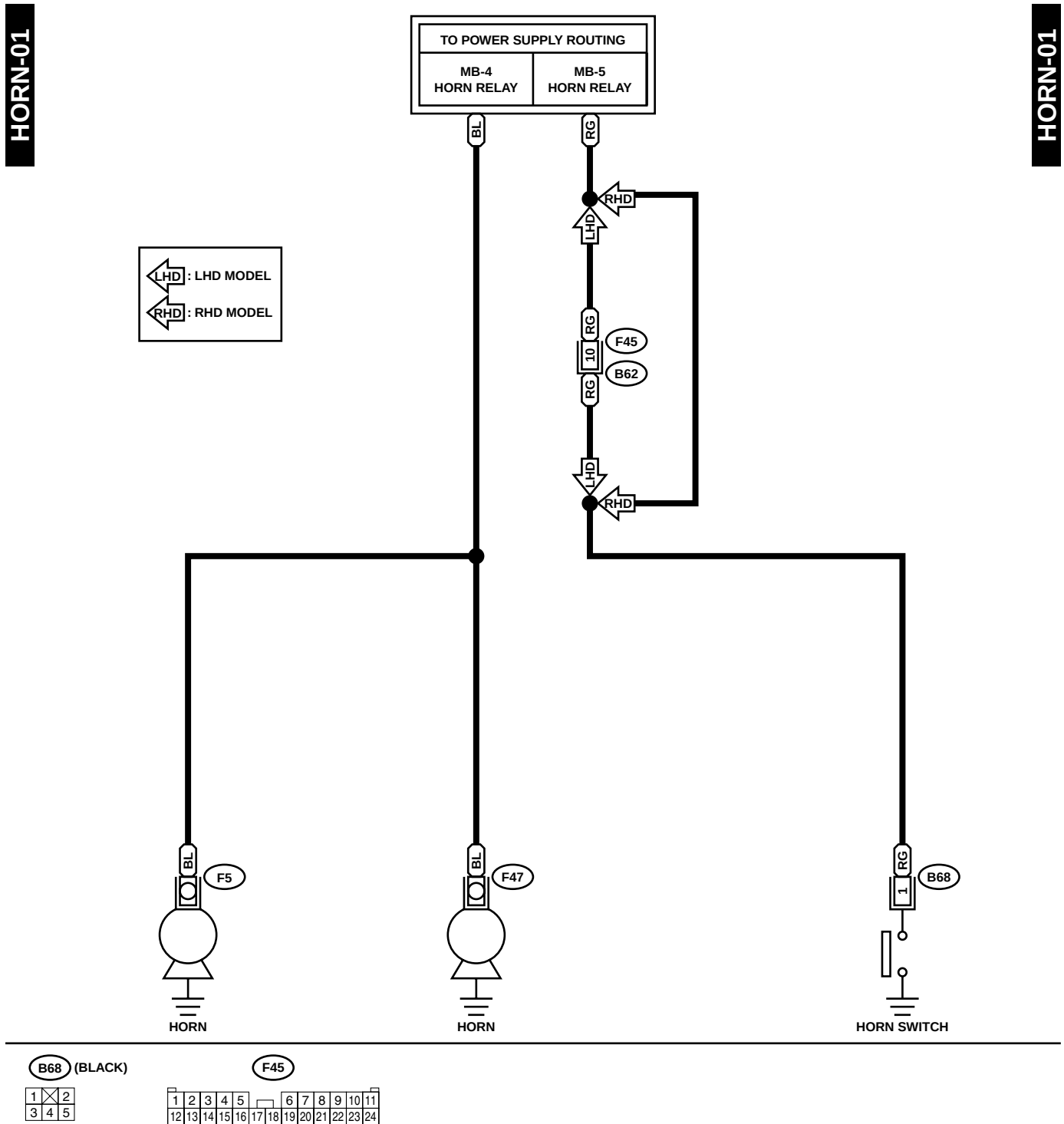
1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Horn System

A: SCHEMATIC

1. HORN

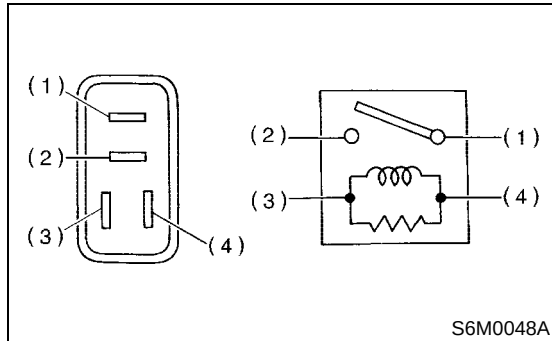


B: INSPECTION

1. HORN RELAY

Check continuity between terminals (indicated in table below) when terminal No. 4 is connected to battery and terminal No. 3 is grounded.

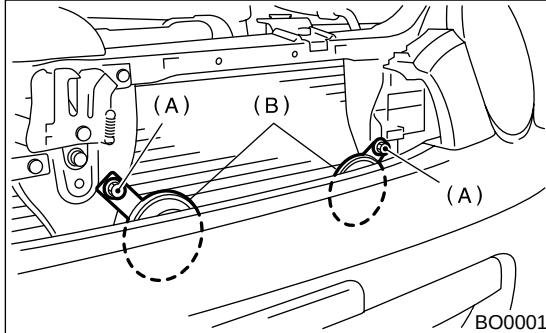
When current flows.	Between terminals No. 1 and No. 2	Continuity exists.
When current does not flow.	Between terminals No. 1 and No. 2	Continuity does not exist.
	Between terminals No. 3 and No. 4	Continuity exists.



3. Horn

A: REMOVAL

- 1) Remove horn bracket mounting bolt (A).
- 2) Disconnect harness connector and remove horn assembly (B).

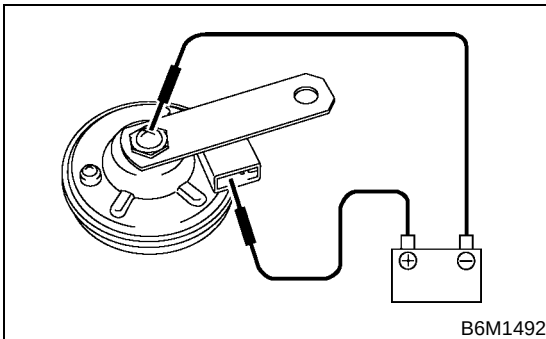


B: INSTALLATION

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.



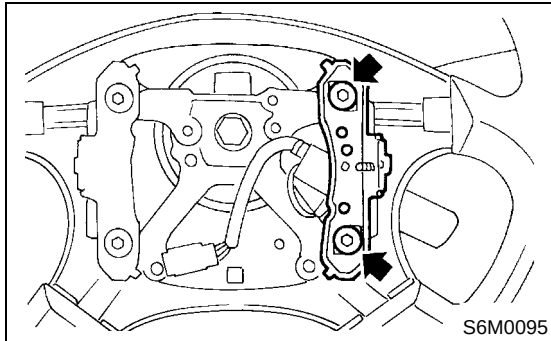
4. Horn Switch

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) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- 2) Remove horn switch from steering wheel as shown.

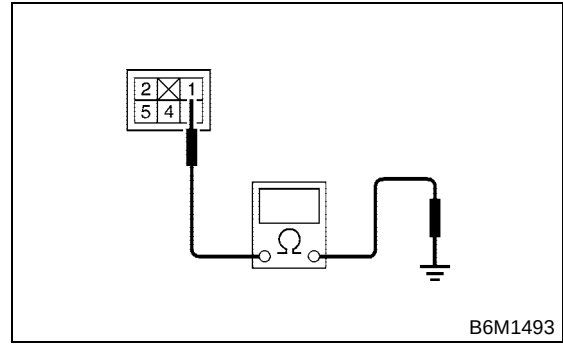


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check continuity between terminals.



Switch position	Tester connection	Specified condition
When horn switch is pushed.	1—Body ground	Continuity
When horn switch is not pushed.		No continuity

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EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

GLASS/WINDOWS/MIRRORS

GW

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15. Power Window Control Switch	43
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17. Outer Mirror Assembly	46
18. Outer Mirror	48
19. Remote Control Mirror Switch	49

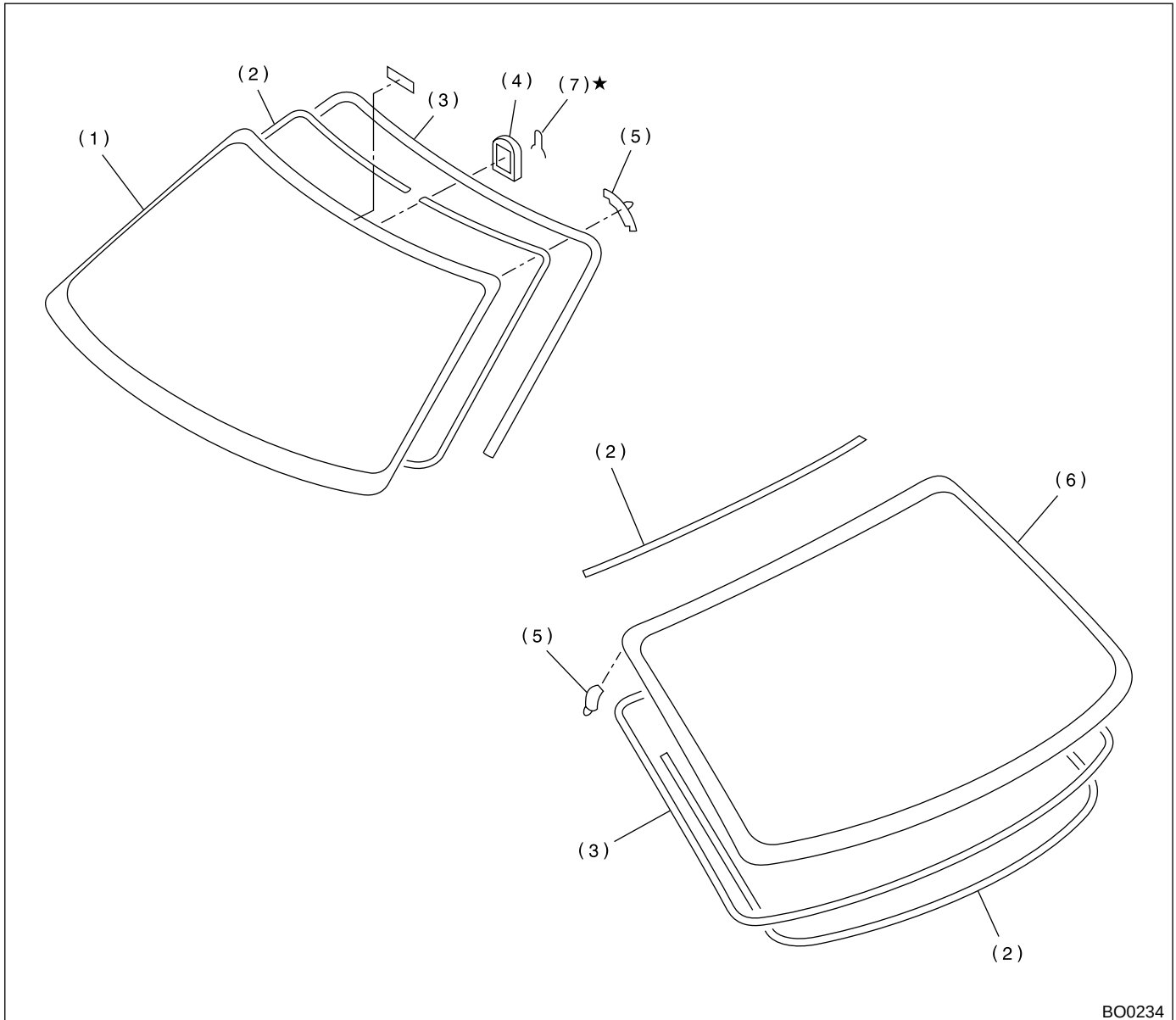
GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

1. General Description

A: COMPONENT

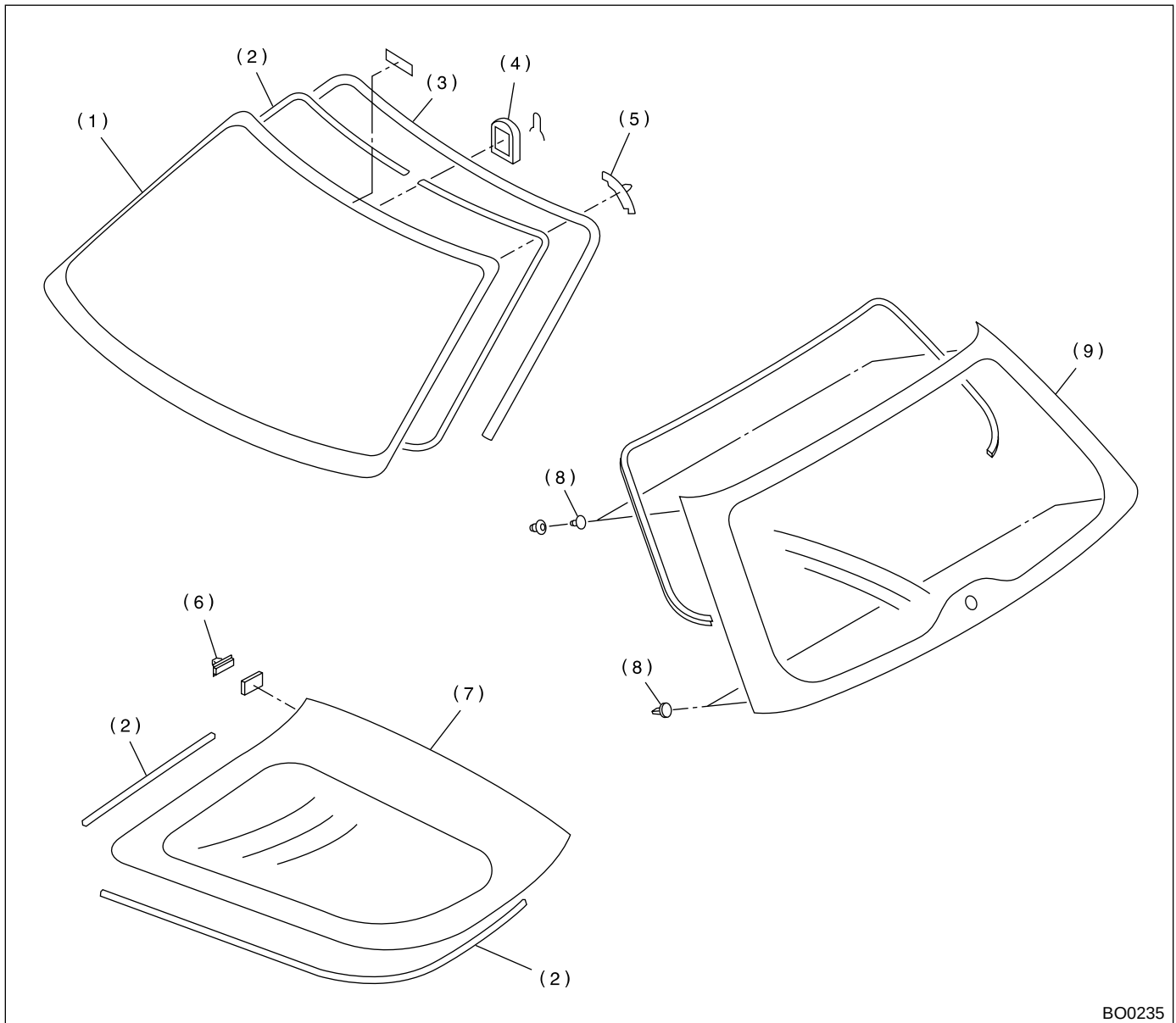
1. FIXED GLASS (SEDAN)



BO0234

- | | | |
|----------------------|---------------------------|------------|
| (1) Windshield glass | (4) Rearview mirror mount | (7) Spring |
| (2) Dam rubber | (5) Locate pin | |
| (3) Molding | (6) Rear window glass | |

2. FIXED GLASS (WAGON)



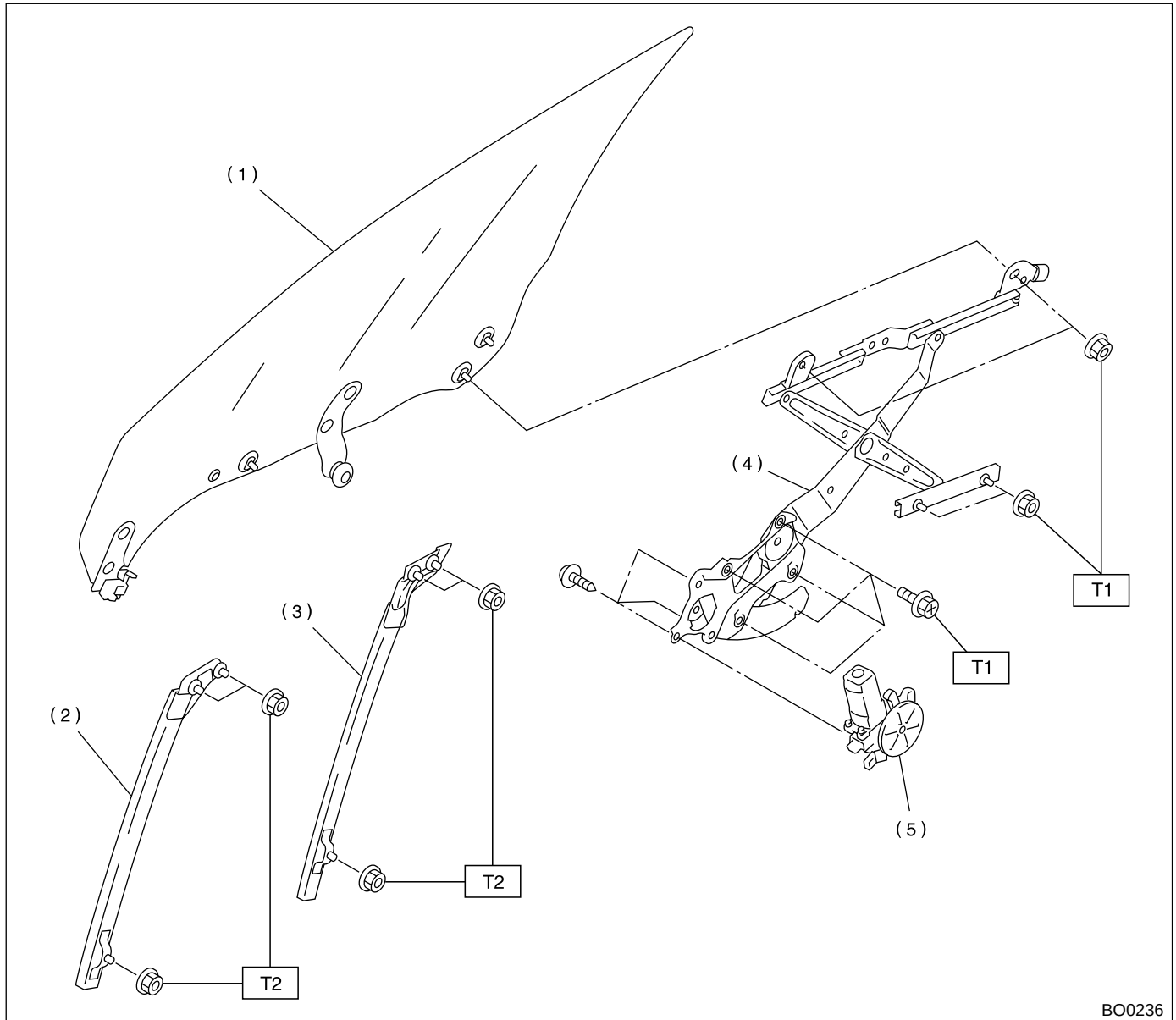
BO0235

- | | | |
|----------------------|---------------------------|------------------------|
| (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) Glass |

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

3. FRONT DOOR GLASS



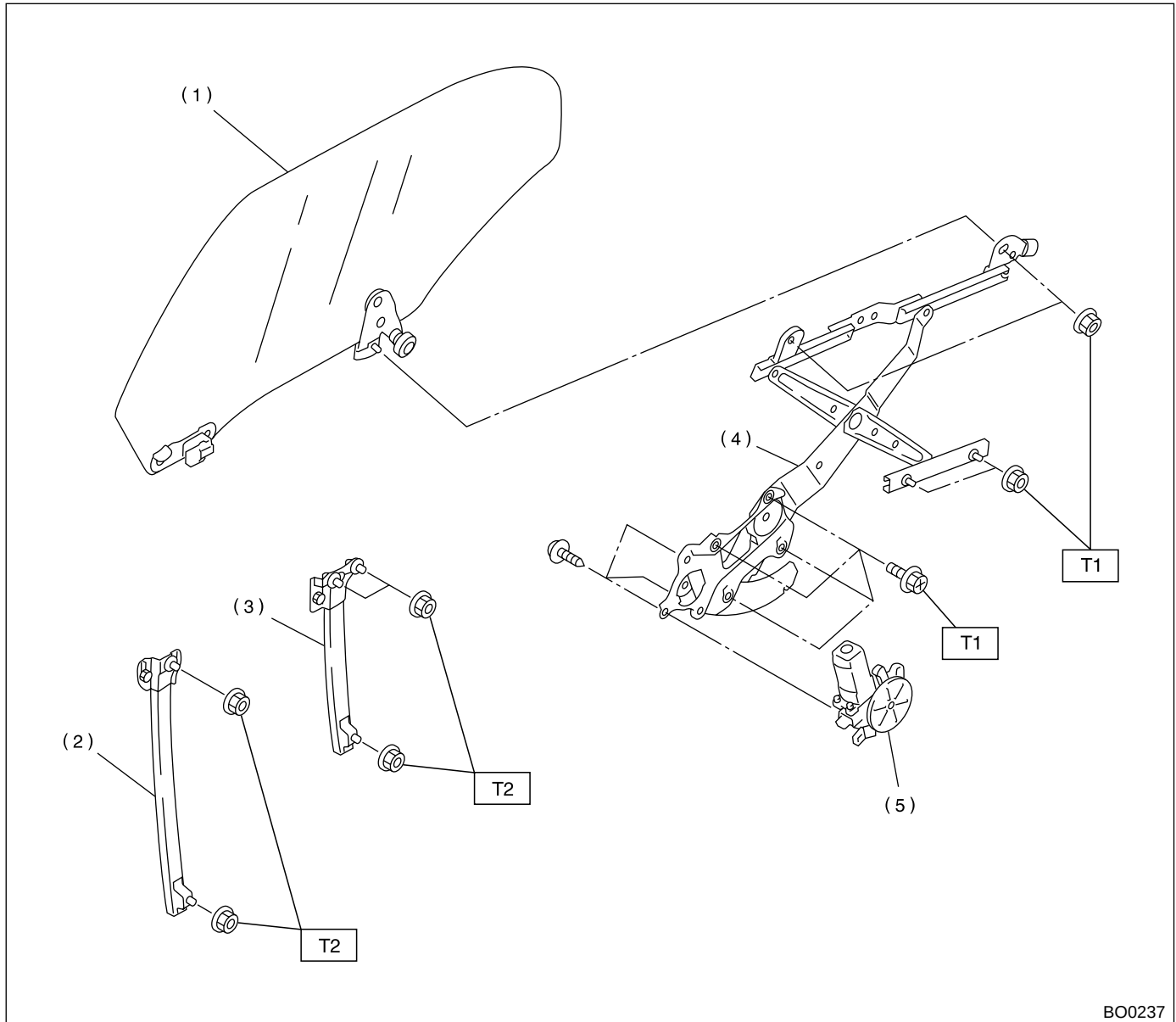
- (1) Glass
- (2) Door sash (Front)
- (3) Door sash (Rear)
- (4) Regulator ASSY
- (5) Motor ASSY

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 | (5) Motor ASSY |
| (2) Door sash (Front) | |
| (3) Door sash (Rear) | |
| (4) Regulator ASSY | |

Tightening torque: N·m (kgf-m, ft-lb)

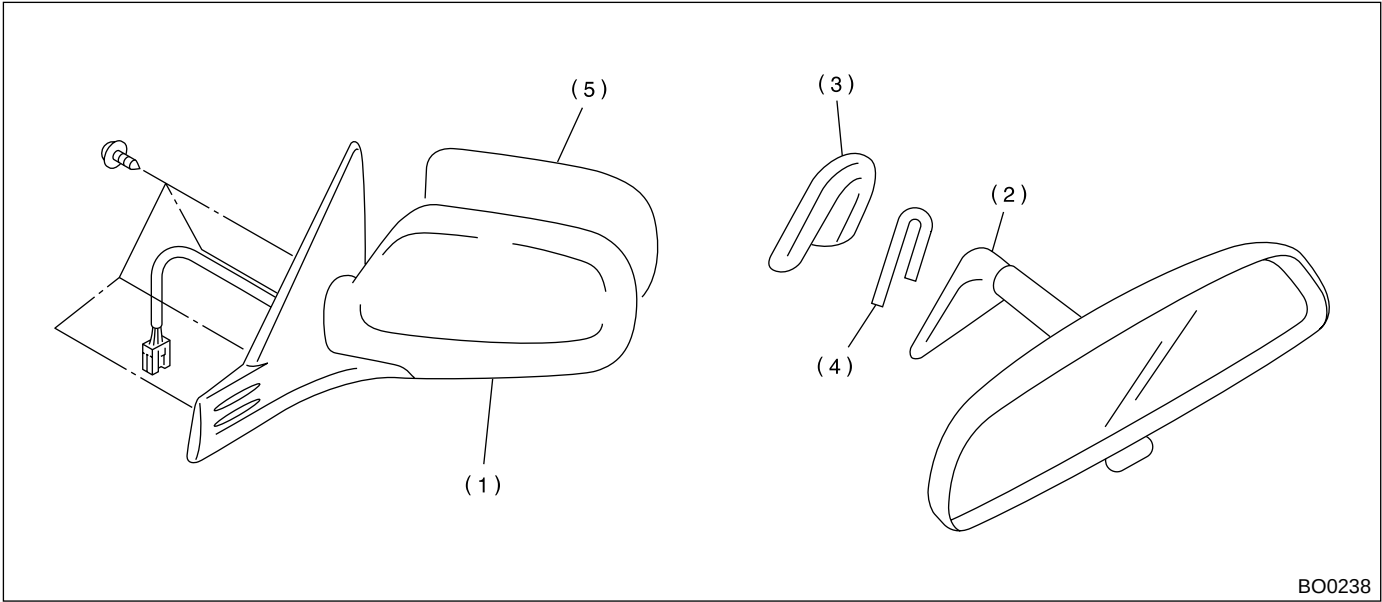
T1: 7.35 (0.75, 5.4)

T2: 14 (1.4, 10.1)

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

5. MIRRORS



BO0238

- | | | |
|---------------------------|------------|------------|
| (1) Outer mirror | (3) Mount | (5) Mirror |
| (2) Inner rearview mirror | (4) Spring | |

B: CAUTION

- When electrical connectors are disconnected, always conduct an operational check after connecting them again.
- Avoid impact and damage to the glass.

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

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.

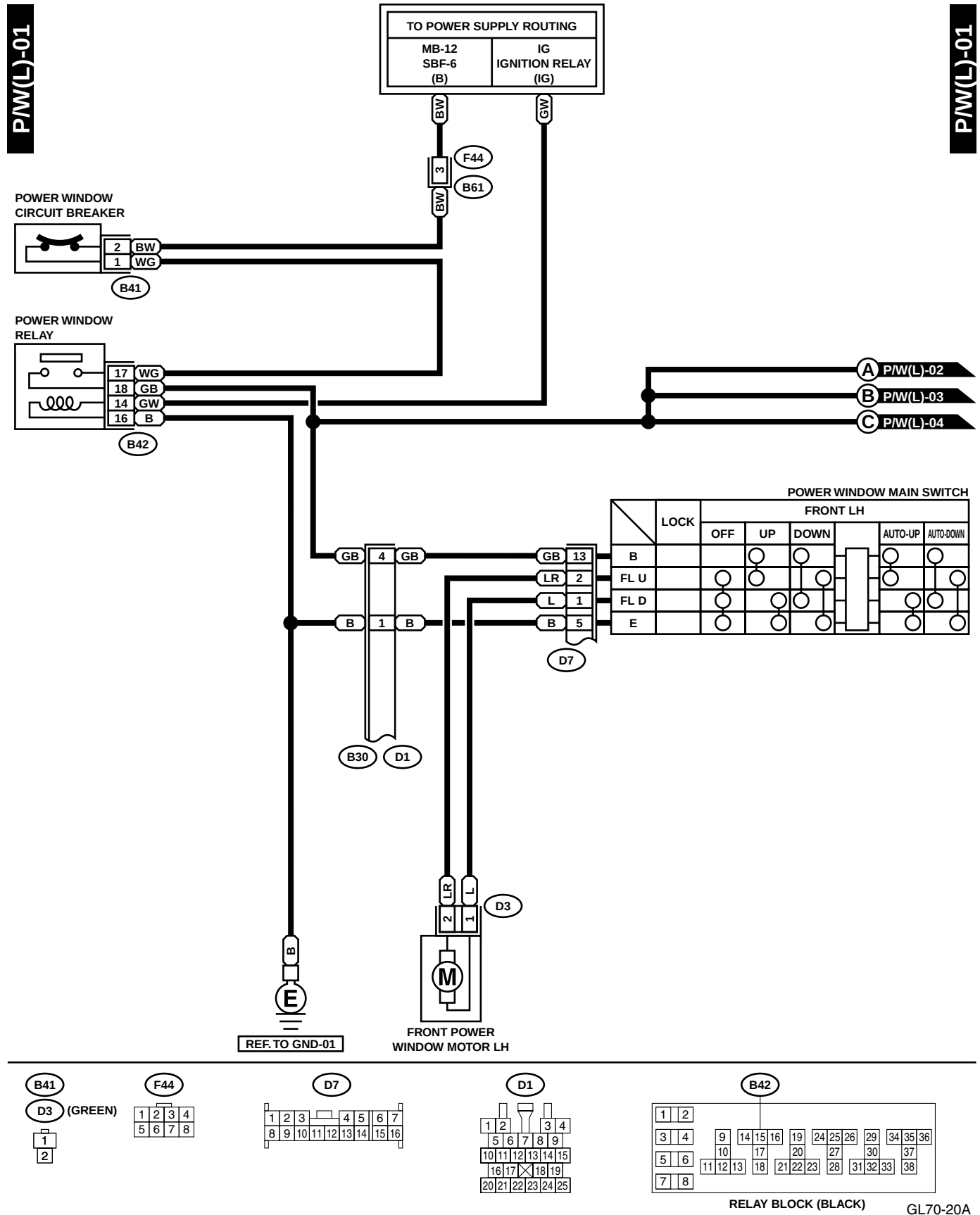
2. Power Window System

A: SCHEMATIC

POWER WINDOW SYSTEM

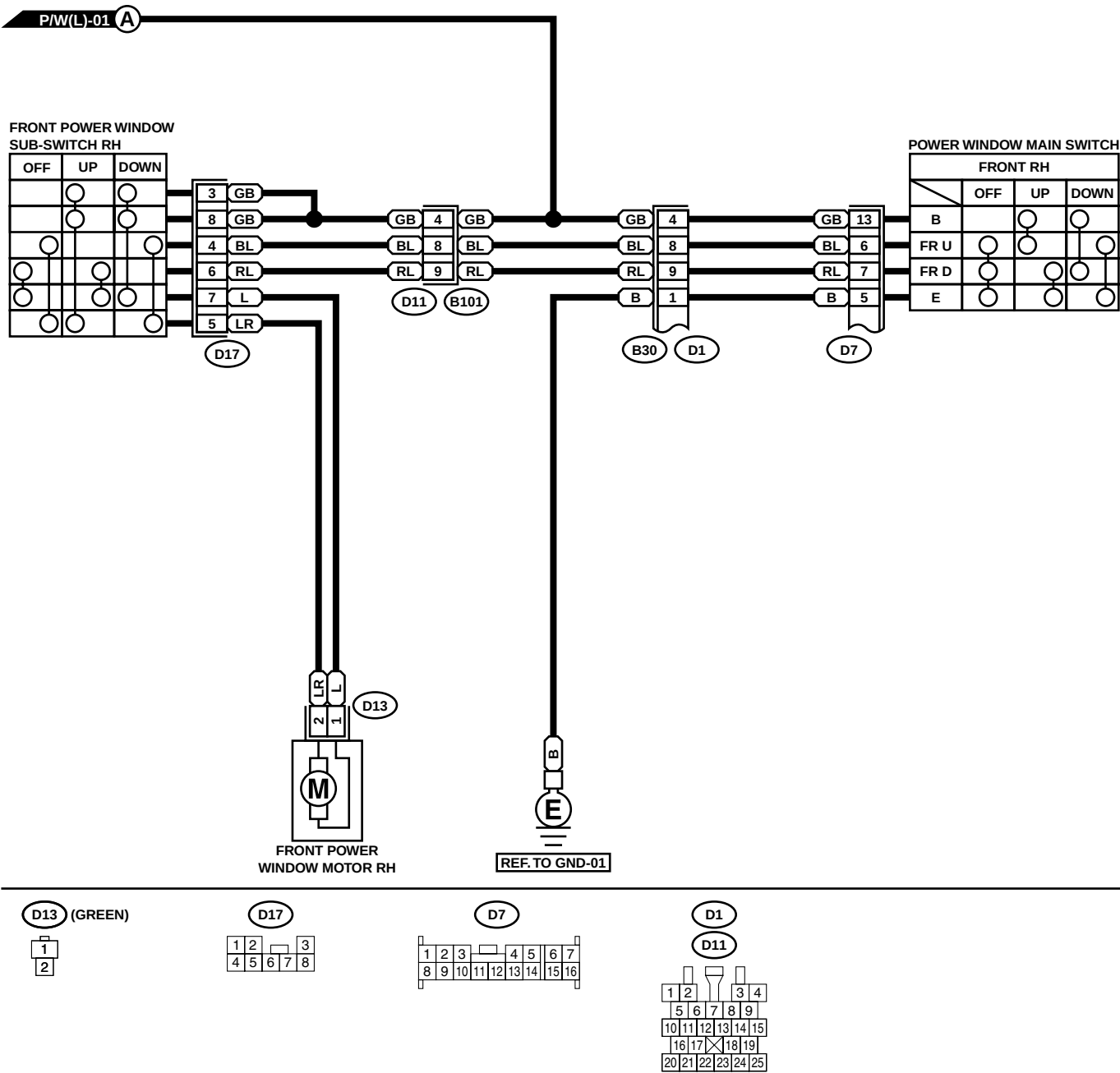
GLASS/WINDOWS/MIRRORS

1. POWER WINDOW LHD MODEL



P/W(L)-02

P/W(L)-02

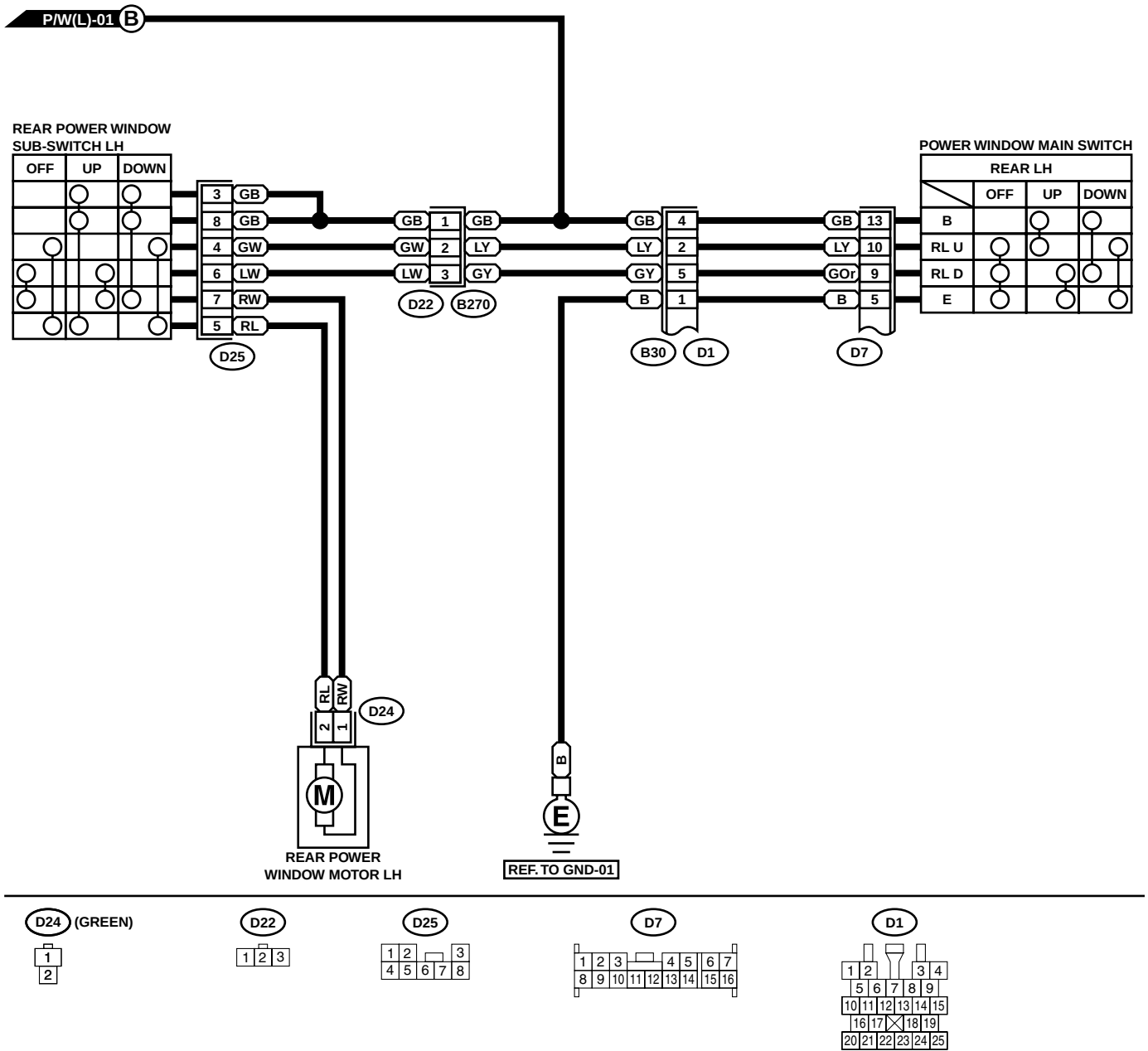


POWER WINDOW SYSTEM

GLASS/WINDOWS/MIRRORS

P/W(L)-03

P/W(L)-03



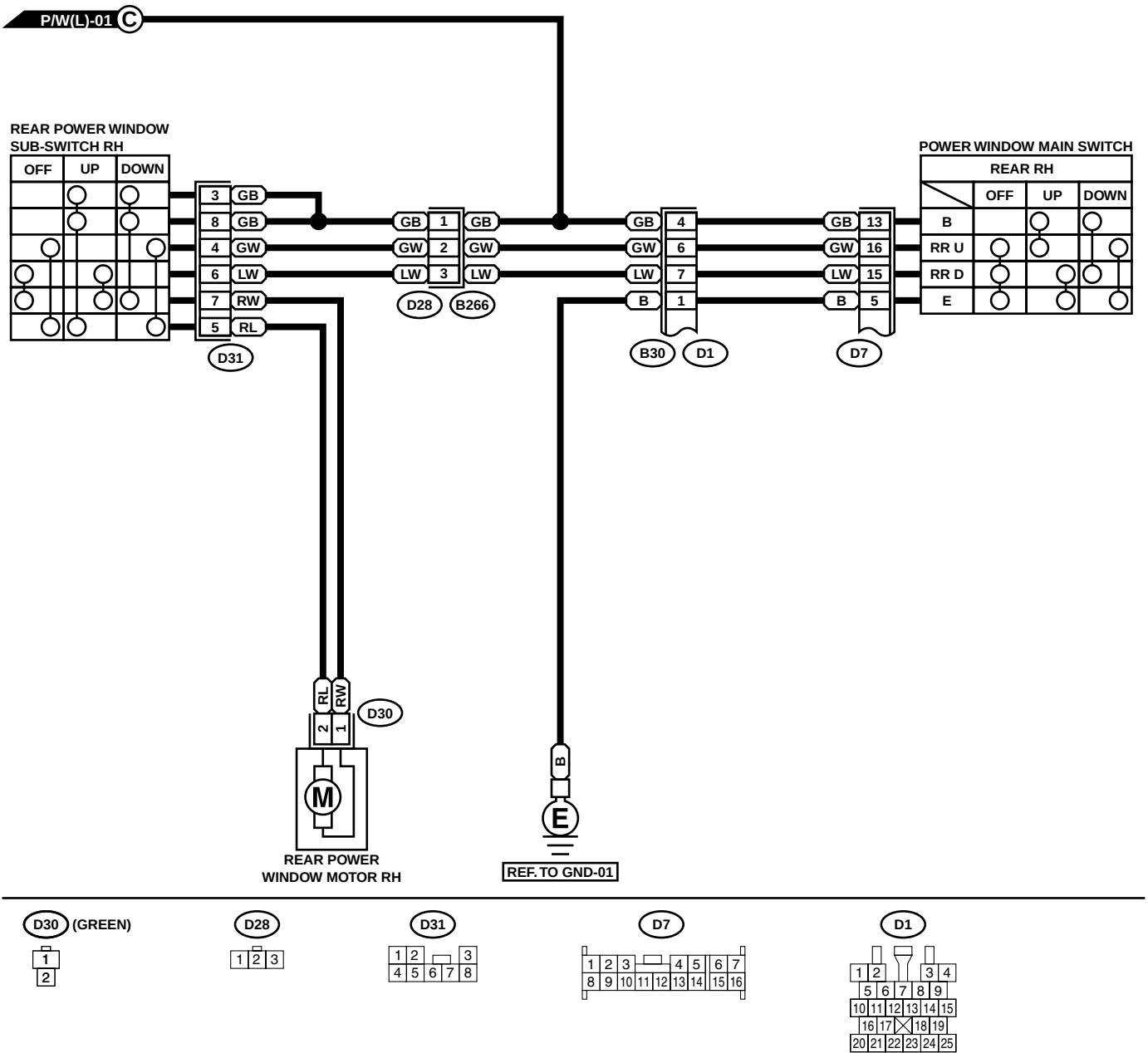
GL70-20C

POWER WINDOW SYSTEM

GLASS/WINDOWS/MIRRORS

P/W(L)-04

P/W(L)-04



GL70-20D

GLASS/WINDOWS/MIRRORS

P/W(R)-01

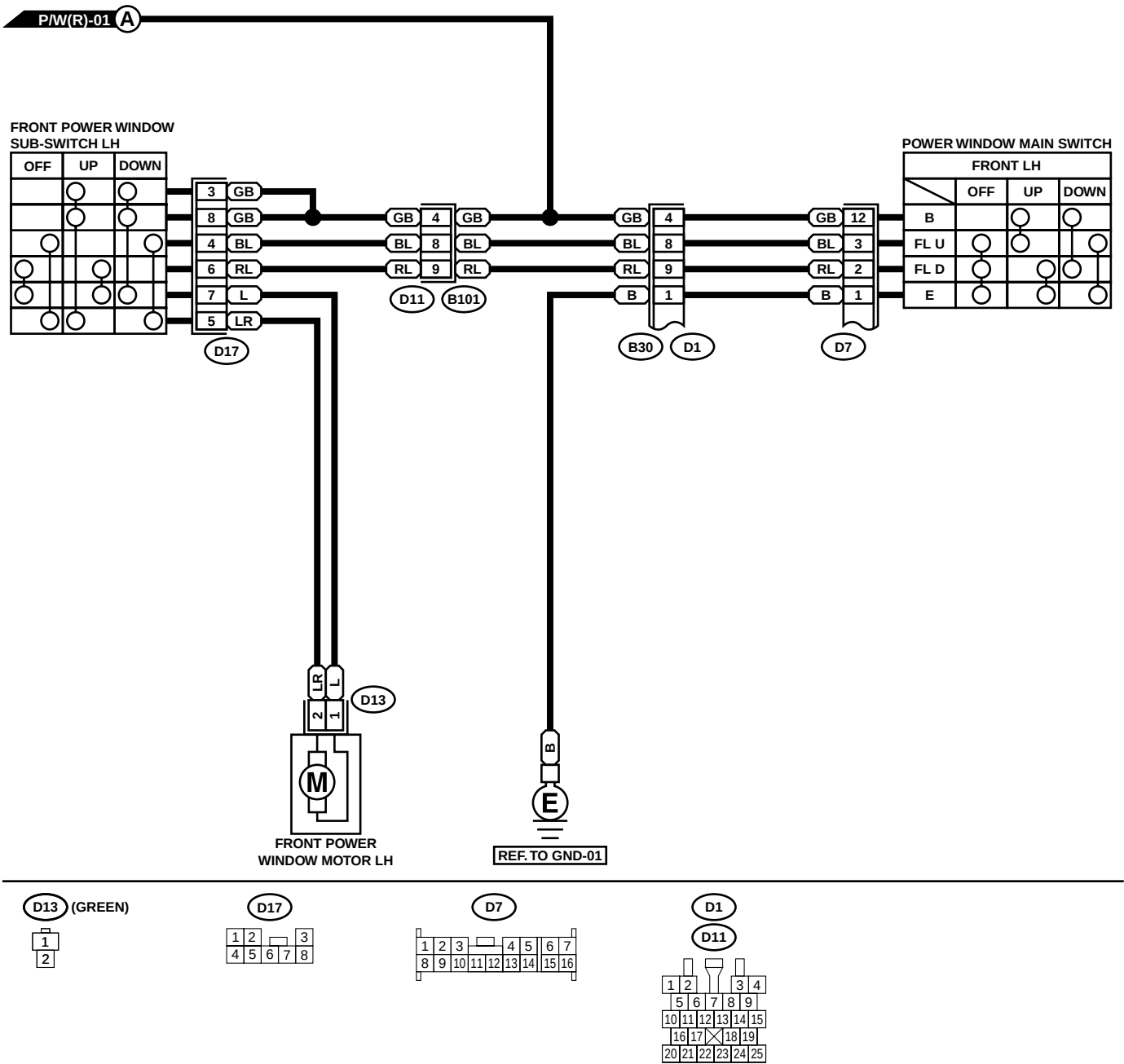


POWER WINDOW SYSTEM

GLASS/WINDOWS/MIRRORS

P/W(R)-02

P/W(R)-02



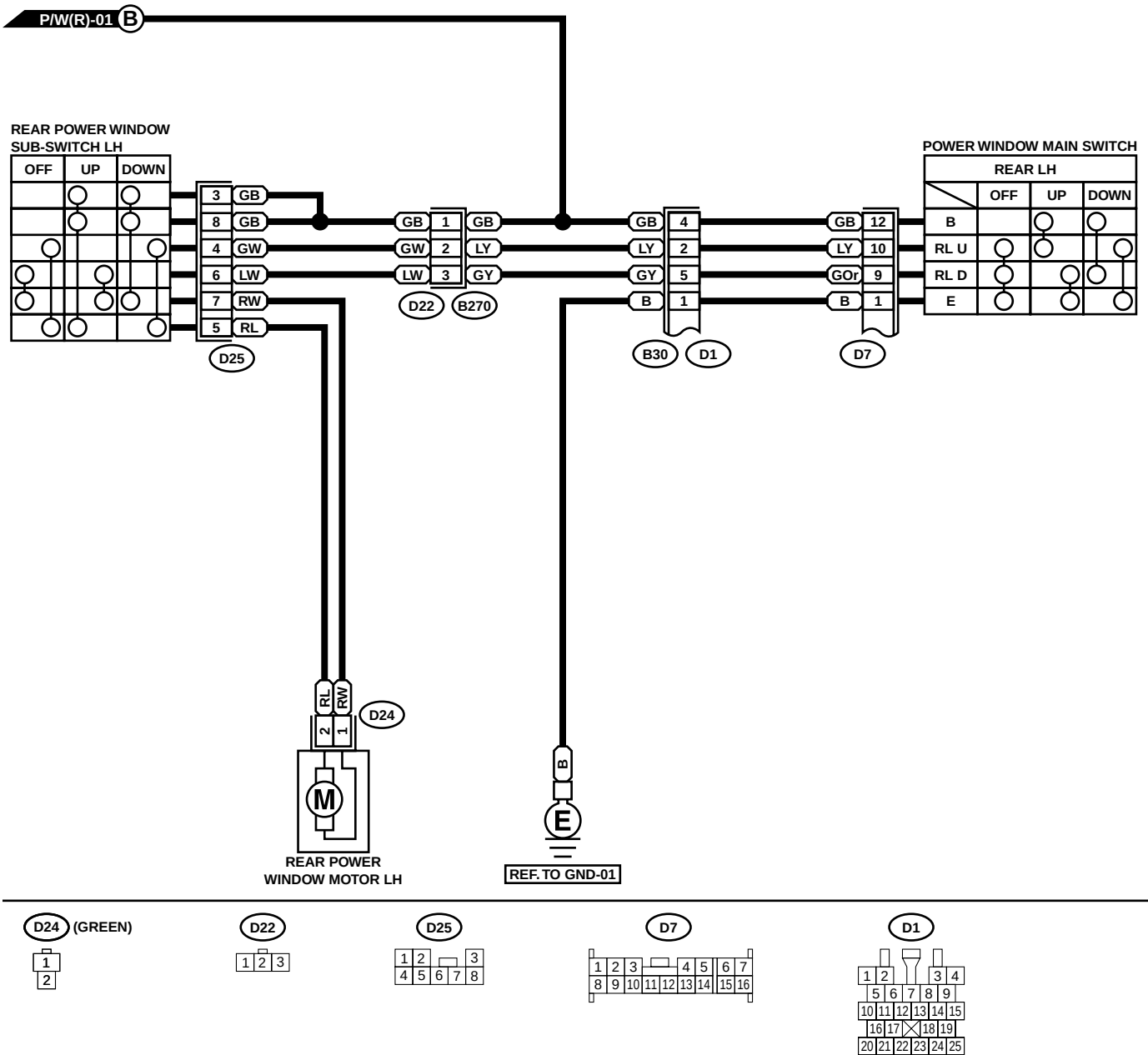
GR70-20B

POWER WINDOW SYSTEM

GLASS/WINDOWS/MIRRORS

P/W(R)-03

P/W(R)-03



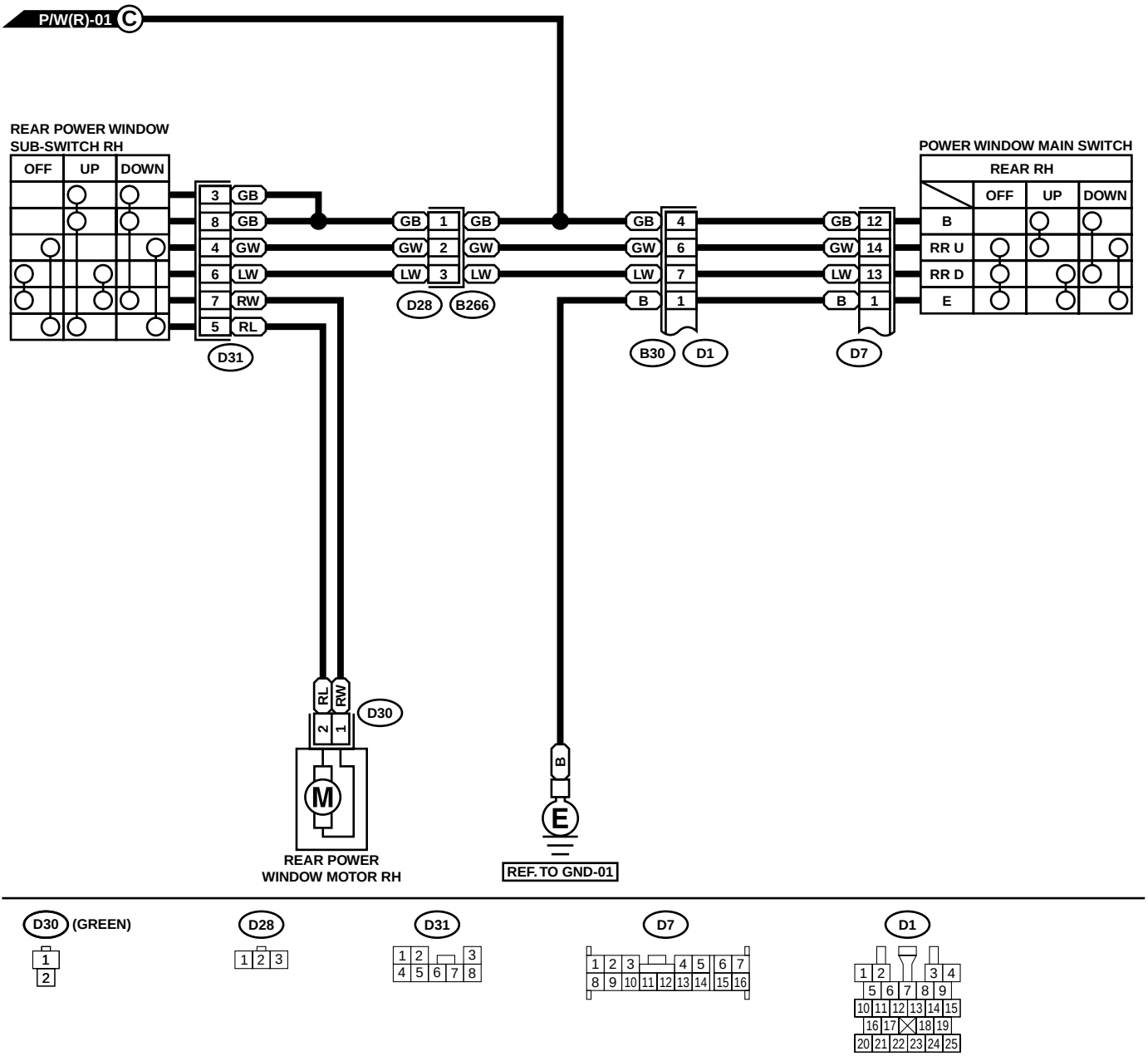
GR70-20C

POWER WINDOW SYSTEM

GLASS/WINDOWS/MIRRORS

P/W(R)-04

P/W(R)-04



GR70-20D

POWER WINDOW SYSTEM

GLASS/WINDOWS/MIRRORS

B: INSPECTION

Symptom	Repair order
All power windows does not operate.	(1) Fuse (SBF-6) (F/B No. 18: RHD model) (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

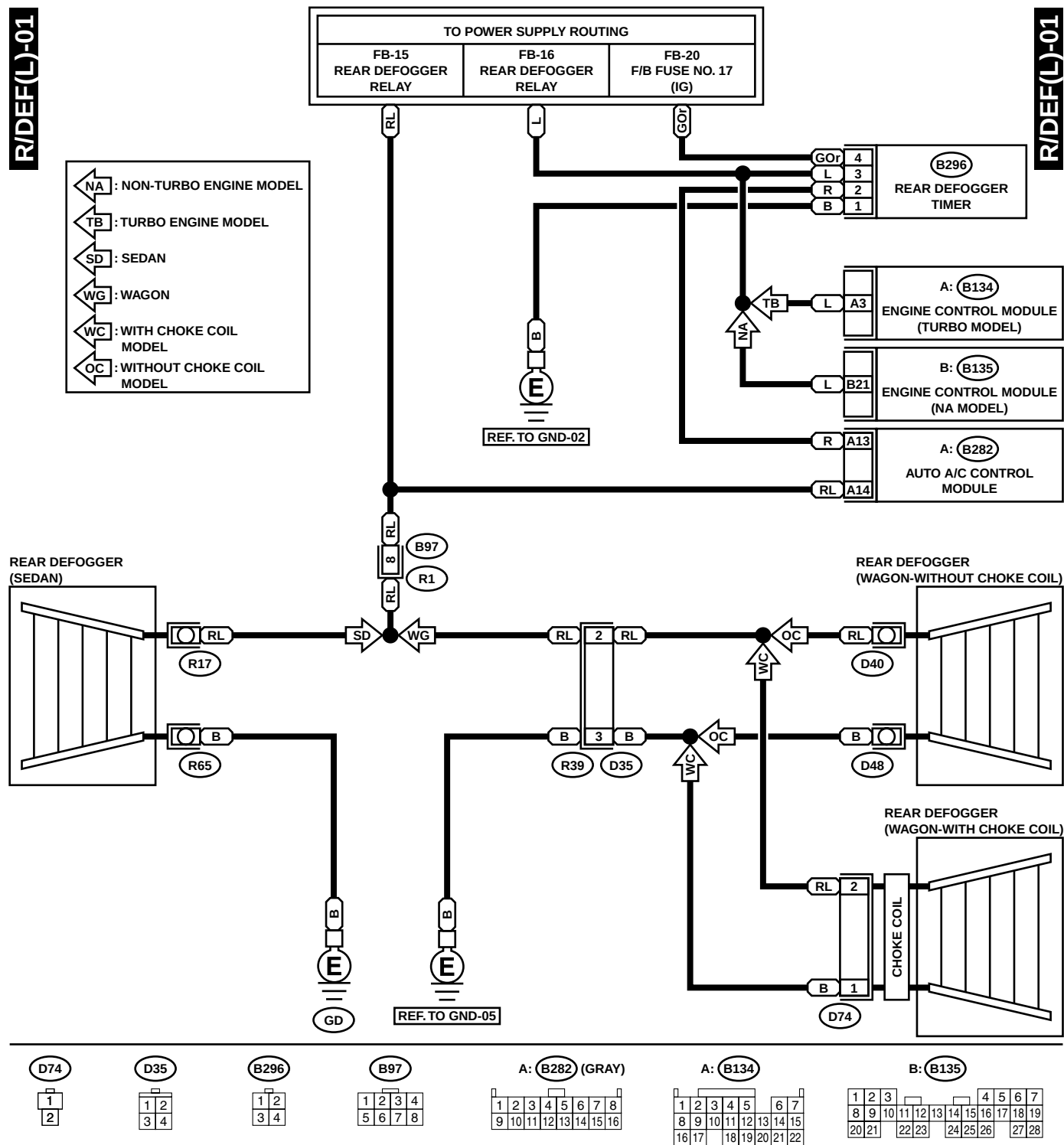
3. Rear Window Defogger System

A: SCHEMATIC

REAR WINDOW DEFOGGER SYSTEM

GLASS/WINDOWS/MIRRORS

1. REAR WINDOW DEFOGGER LHD MODEL

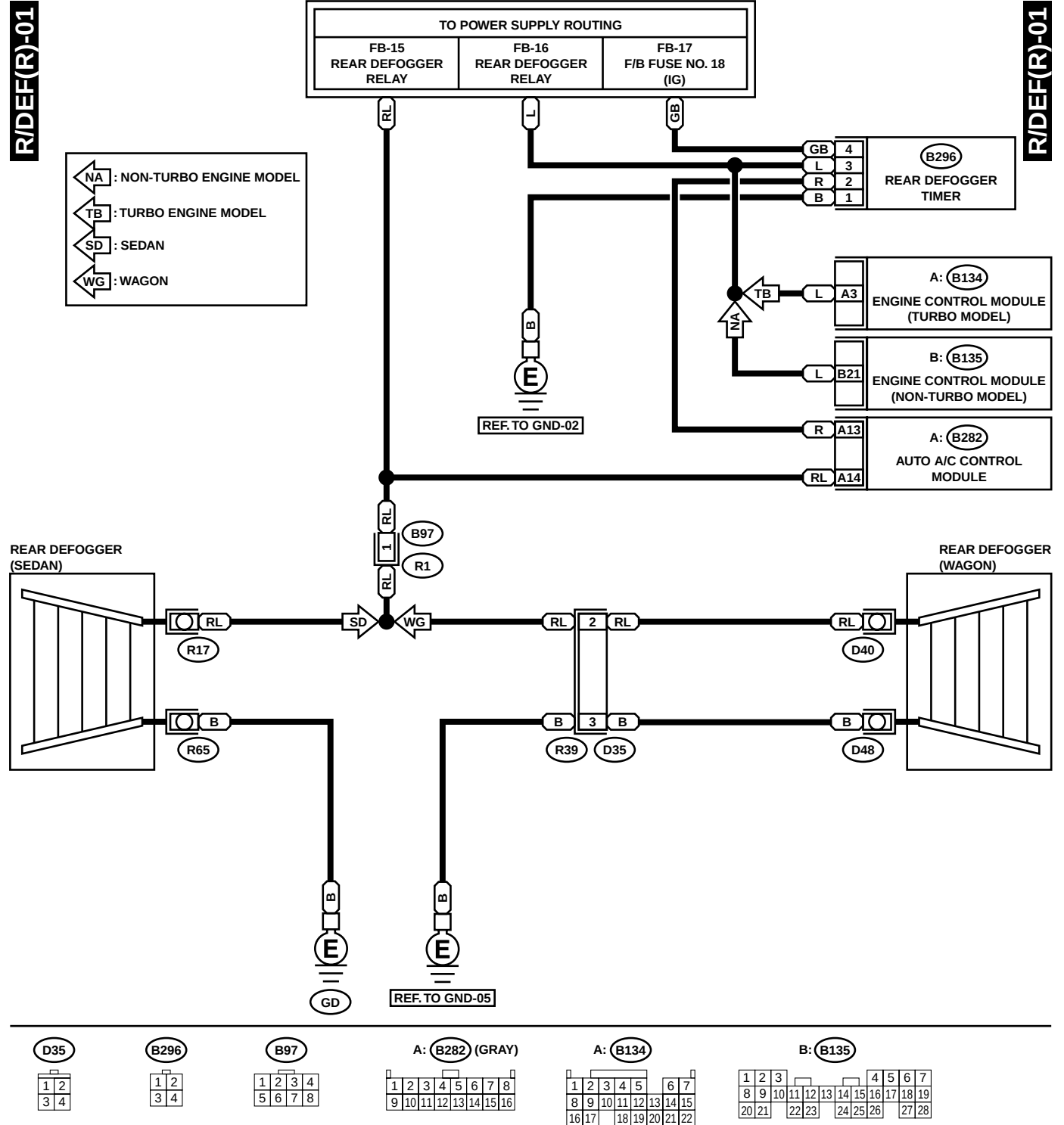


GL52-20

REAR WINDOW DEFOGGER SYSTEM

GLASS/WINDOWS/MIRRORS

2. REAR WINDOW DEFOGGER RHD MODEL



GR52-20

REAR WINDOW DEFOGGER SYSTEM

GLASS/WINDOWS/MIRRORS

B: INSPECTION

Symptom	Repair order
Rear window defogger does not operate.	(1) Fuse (M/B No. 1) (F/B No. 17) (2) Rear defogger relay (3) Rear defogger timer (4) Defogger switch (5) Rear defogger condenser (6) Deffogger wire (7) Wire harness

4. Remote Control Mirror System

A: SCHEMATIC

GLASS/WINDOWS/MIRRORS

R/M(L)-01



GLASS/WINDOWS/MIRRORS

R/M(R)-01



REMOTE CONTROL MIRROR SYSTEM

GLASS/WINDOWS/MIRRORS

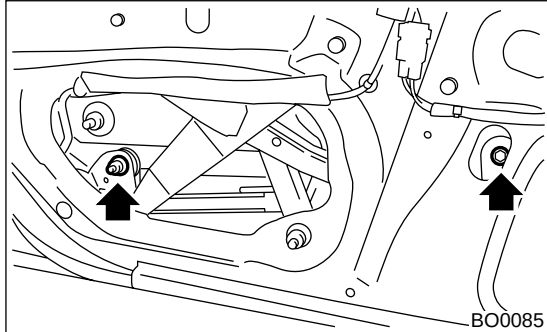
B: INSPECTION

Symptom	Repair order
All function does not operate.	(1) Fuse (F/B No. 1) (F/B No. 4) (F/B No. 19) (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

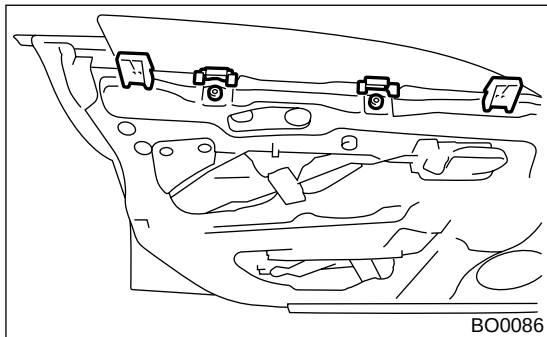
5. Front Door Glass

A: REMOVAL

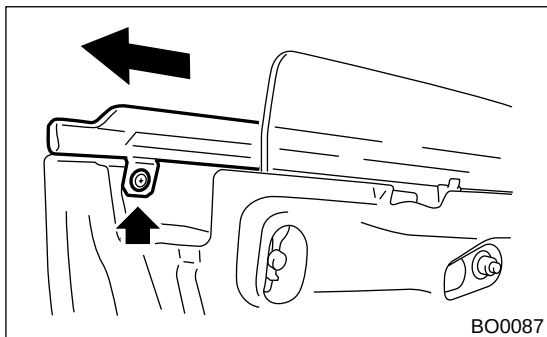
- 1) Remove front door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 2) Remove sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 3) Remove outer mirror assembly. <Ref. to GW-46, REMOVAL, Outer Mirror Assembly.>
- 4) Operate the power window switch to move glass to position shown in the figure, and then remove the two nuts from service holes.



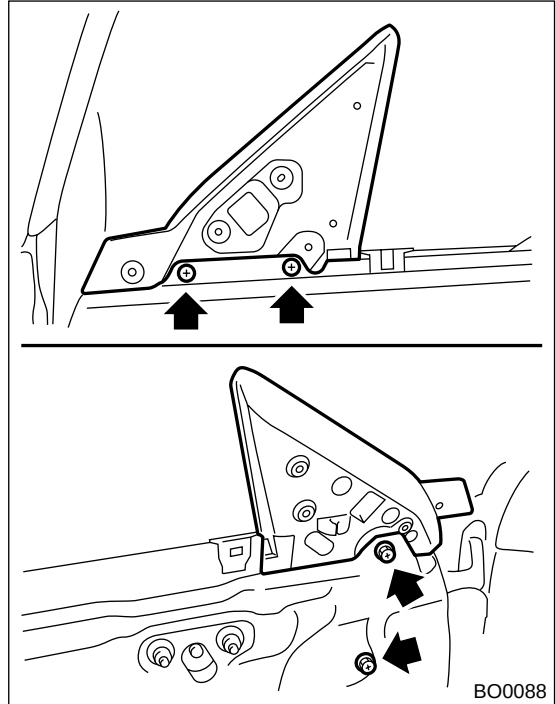
- 5) Remove stabilizers.



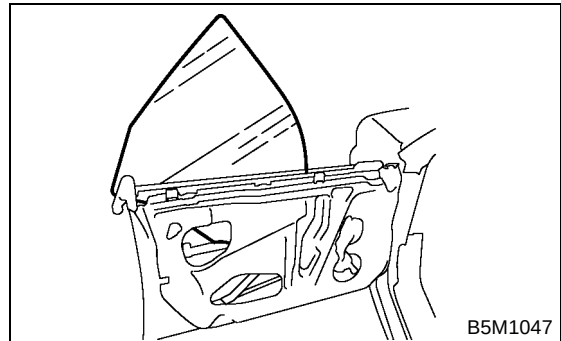
- 6) Remove weather strip outer.



- 7) Remove gusset.



- 8) Take out door glass.



CAUTION:

- Do not turn regulator in the closing direction after removal of the glass. Otherwise gear may be disengaged.
- Avoid impact and damage to the glass.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:

Make sure that glass stay is placed securely in sash.

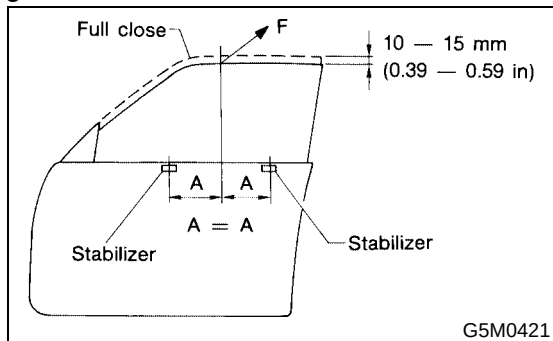
2) Adjust front door glass. <Ref. to GW-29, ADJUSTMENT, Front Door Glass.>

C: ADJUSTMENT

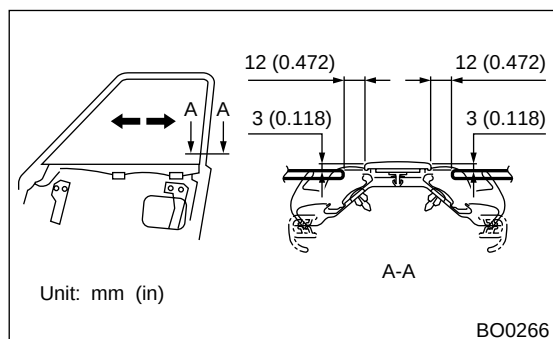
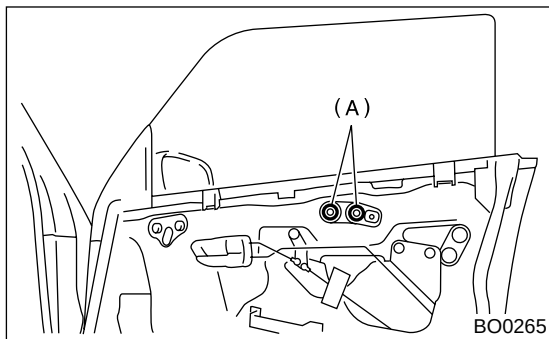
NOTE:

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.

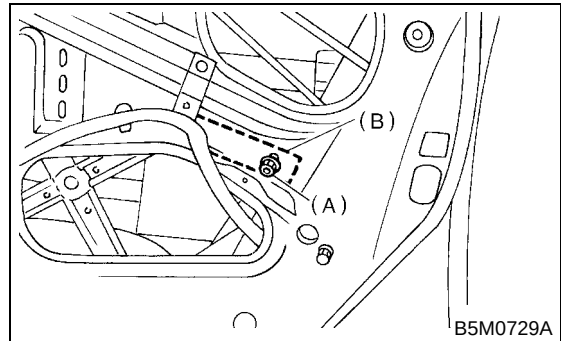
- 1) Temporarily tighten one adjusting bolt on one side of rear sash at the midpoint of slotted hole in the inner panel.
- 2) Temporarily tighten regulator B-channel in a position slightly lower than midpoint of slotted hole.
- 3) Lower door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure of 49.0 ± 4.9 N (5.0 ± 0.5 kg, 11.0 ± 1.1 lb) (F) to upper edge of glass above midpoint of two outer stabilizers, press inner stabilizer until it just touches the glass, then secure it.



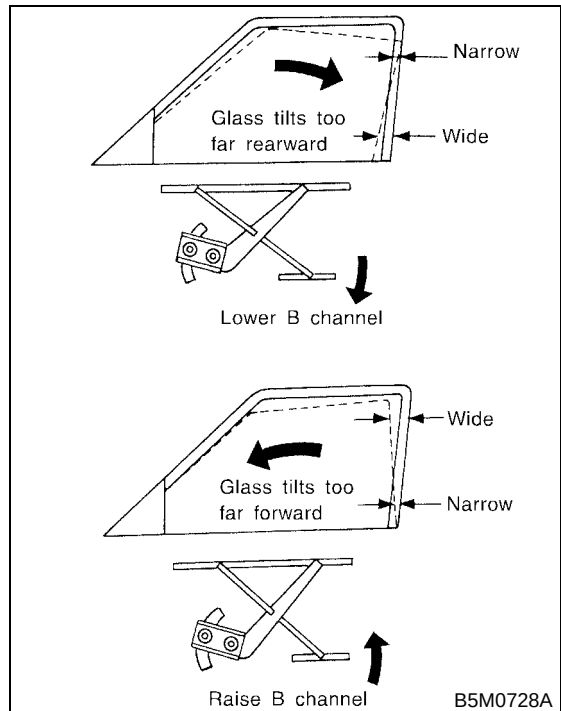
- 4) For adjustment of clearance between front and rear glasses, loosen nuts (A), and move glass sash back and forward until clearance becomes the value shown.



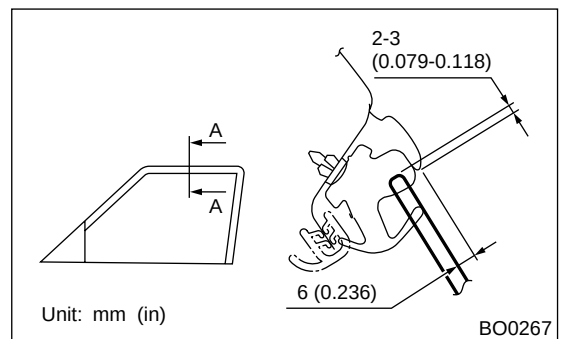
- 5) For adjustment of upper and lower ends of center pillar, loosen adjusting nut (A) of B-channel (B).



- 6) Adjust so that upper and lower ends of center pillar are the same size.



- 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.



FRONT DOOR GLASS

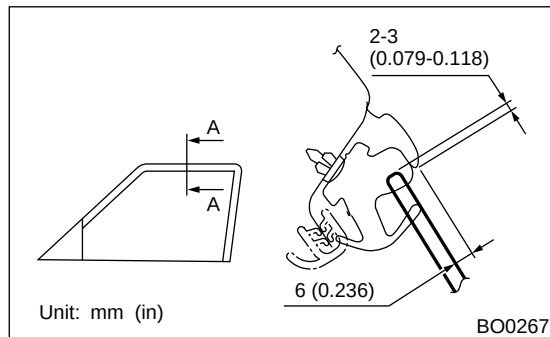
GLASS/WINDOWS/MIRRORS

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:

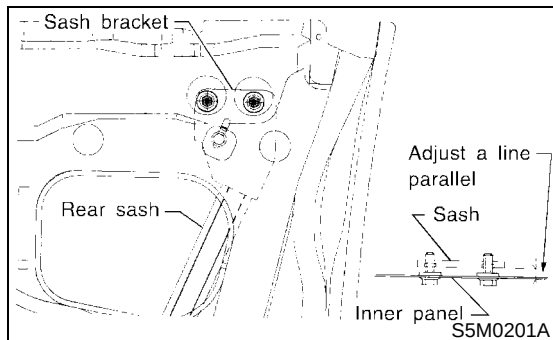
If two nuts are loosened at the same time, sash moves back and forth. Therefore, when one nut is adjusted, secure the other.

9) Make the same adjustment of two adjusting bolts of rear sash.



CAUTION:

Do not tilt sash bracket to inner panel during adjustment. Otherwise smooth regulator operation cannot be achieved.



10) Make adjustment of front sash in the same manner as that of rear sash.

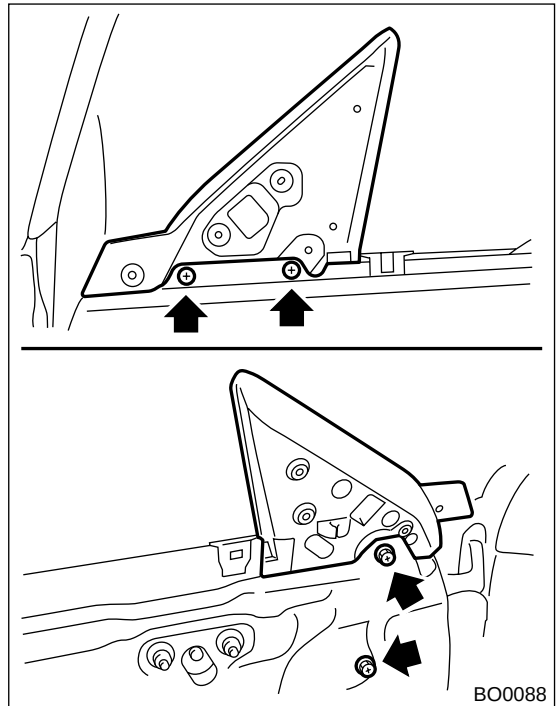
CAUTION:

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.

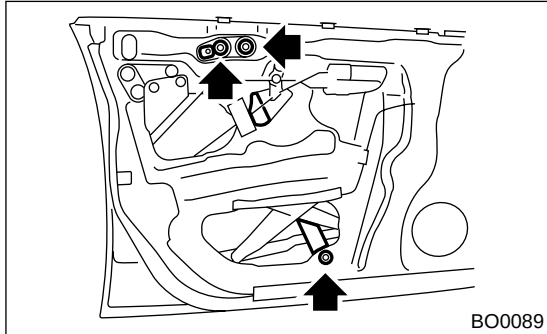


14) After adjustment, tighten bolts and nuts.

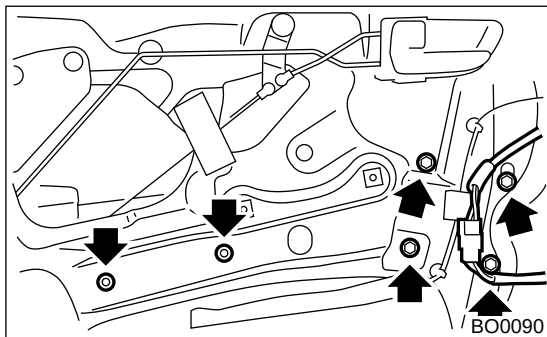
6. Front Regulator and Motor Assembly

A: REMOVAL

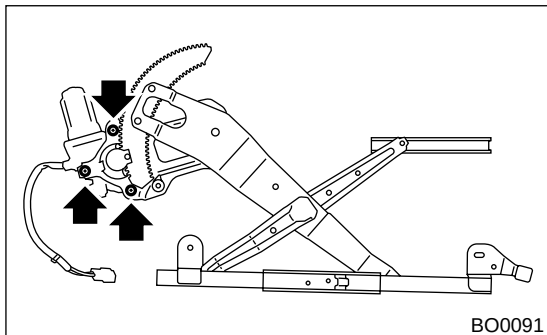
- 1) Remove door glass. <Ref. to GW-27, REMOVAL, Front Door Glass.>
- 2) Loosen nuts to remove rear sash.



- 3) Disconnect motor connector.
- 4) Loosen four bolts and two nuts to remove regulator assembly.



- 5) Loosen screw to remove motor assembly.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust front door glass. <Ref. to GW-29, ADJUSTMENT, Front Door Glass.>

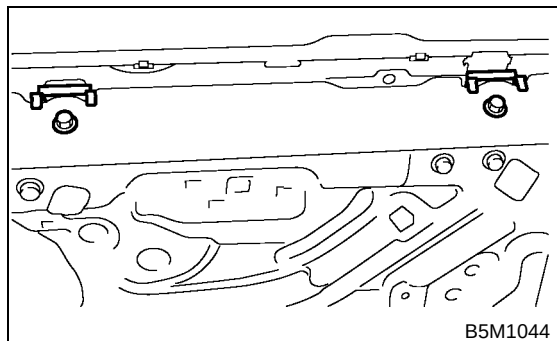
C: INSPECTION

- 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.

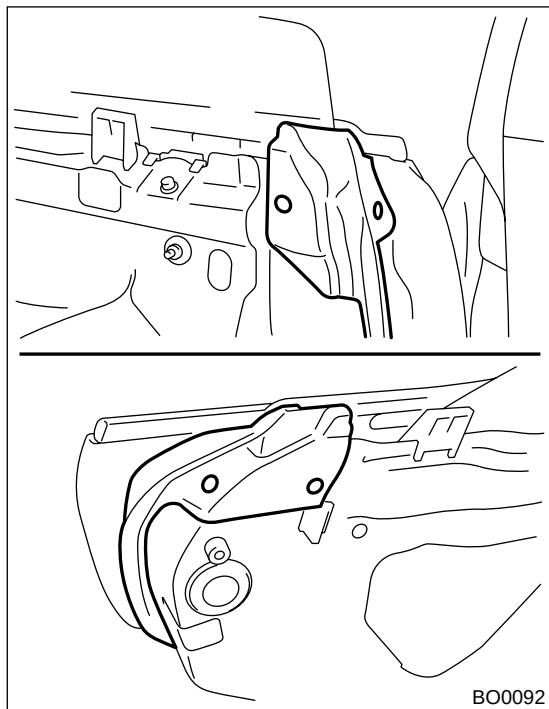
7. Rear Door Glass

A: REMOVAL

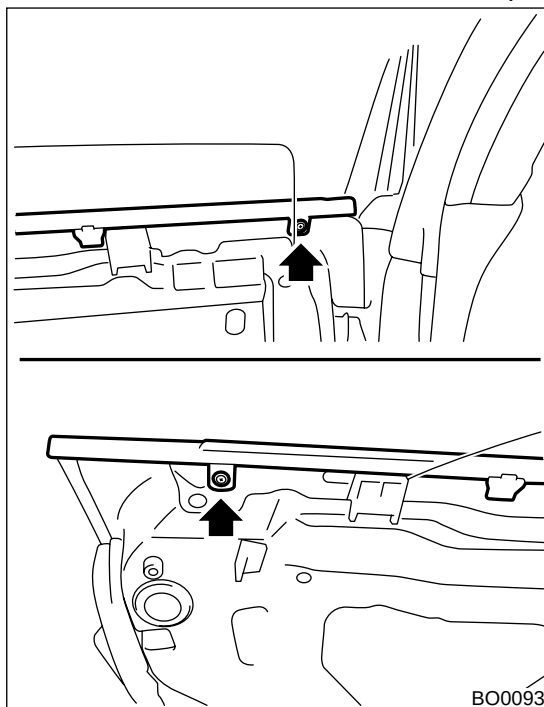
- 1) Remove rear door trim. <Ref. to EI-21, REMOVAL, Rear Door Trim.>
- 2) Remove sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 3) Remove stabilizer.



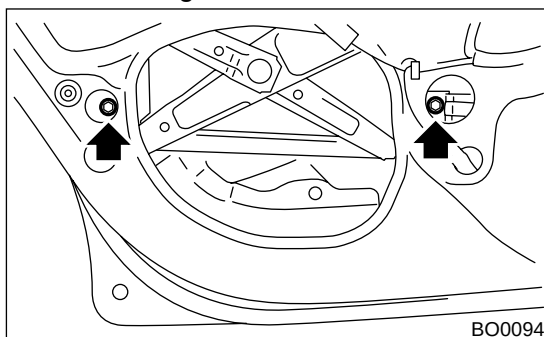
- 4) Remove door weather strip.



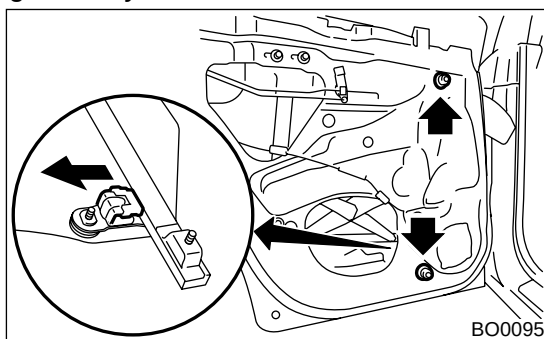
- 5) Loosen two screw to remove weather strip outer.



- 6) Operate power window switch to remove glass as shown in the figure, and remove two nuts.



- 7) Remove two nuts, and then separate front sash and glass stay.



- 8) Pull out glass.

CAUTION:
Avoid impact and damage to the glass.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:

Make sure that glass stay is placed securely in sash.

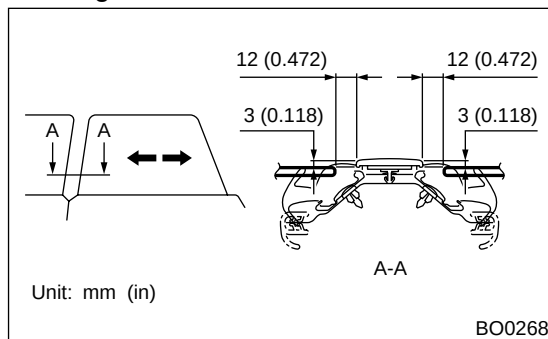
2) Adjust rear door glass. <Ref. to GW-33, ADJUSTMENT, Rear Door Glass.>

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.

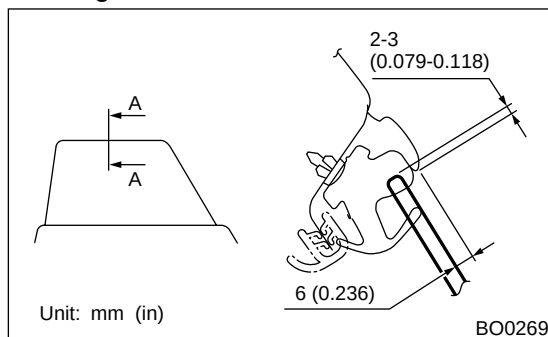
1) Adjust glass position using the following dimensions as a guide line.



CAUTION:

- If dimensions are smaller than the given dimensions, glass may get caught in weather-strip 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.



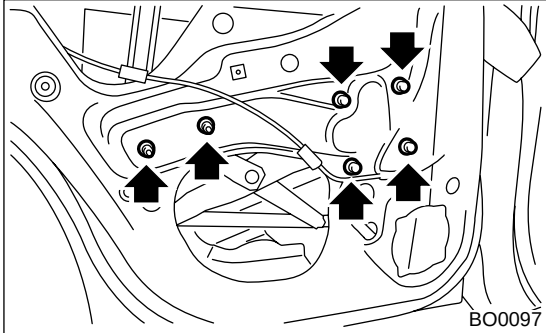
CAUTION:

- 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.

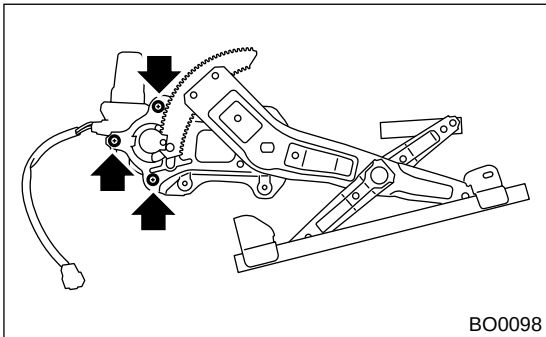
8. Rear Regulator and Motor Assembly

A: REMOVAL

- 1) Remove door glass. <Ref. to GW-32, REMOVAL, Rear Door Glass.>
- 2) Disconnect motor connector.
- 3) Loosen four bolts and two nuts to remove regulator assembly.



- 4) Loosen screws to remove motor assembly.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust rear door glass. <Ref. to GW-33, 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.

9. Windshield Glass

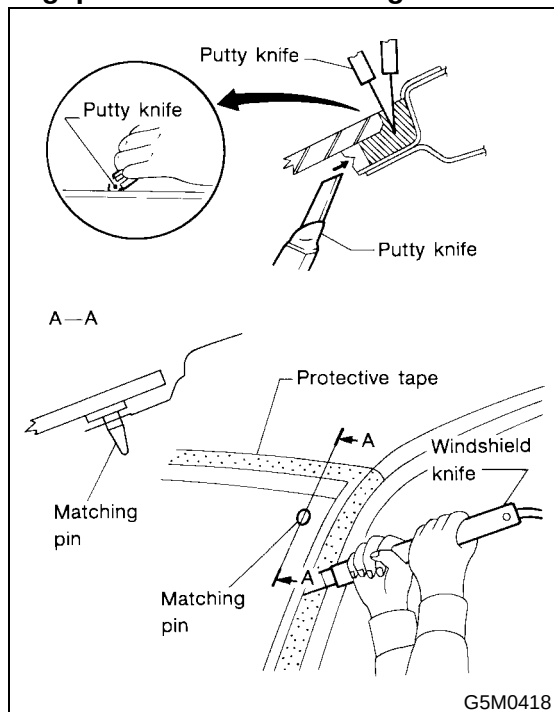
A: REMOVAL

1. USING WINDSHIELD KNIFE

- 1) Remove cowl panel. <Ref. to EI-17, REMOVAL, Cowl Panel.>
- 2) Remove glass 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.

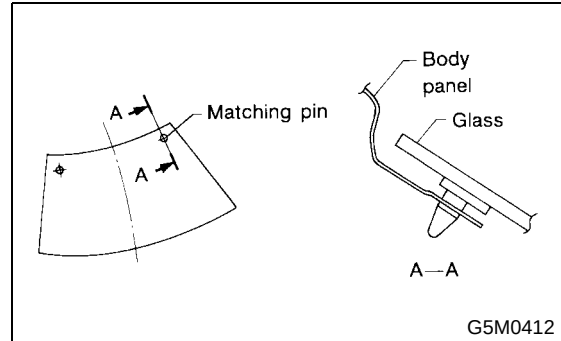
CAUTION:

- Do not twist windshield knife.
- Cutting of adhesive layer shall be started with wider gap between windshield glass and body.



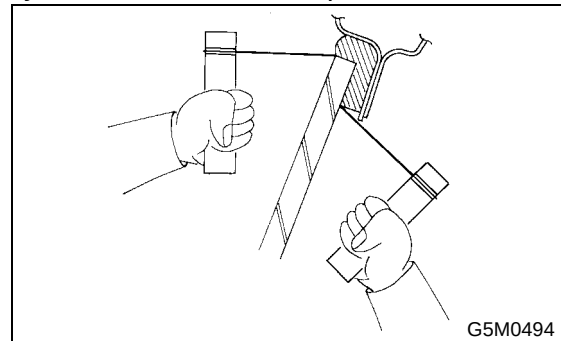
NOTE:

Because matching pins are bonded to the corners of glass, use piano wire to cut the pin.



2. USING PIANO WIRE

- 1) Remove cowl panel. <Ref. to EI-17, 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.

CAUTION:

- Do not tightly pull the piano wire against the windshield glass edge.
- Be careful not to damage interior and exterior parts.
- When removal is made with area close to instrument panel, place a protection plate over it. Pay particular attention to the removal.
- Do not cross piano wires. Otherwise they may be cut.

WINDSHIELD GLASS

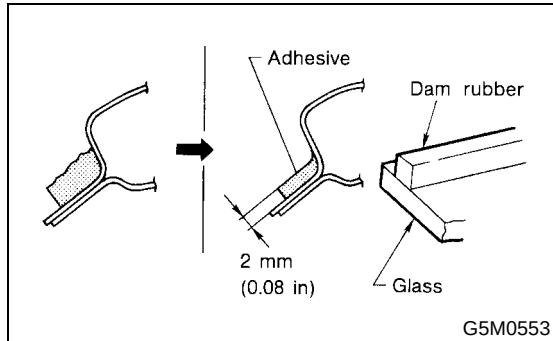
GLASS/WINDOWS/MIRRORS

B: INSTALLATION

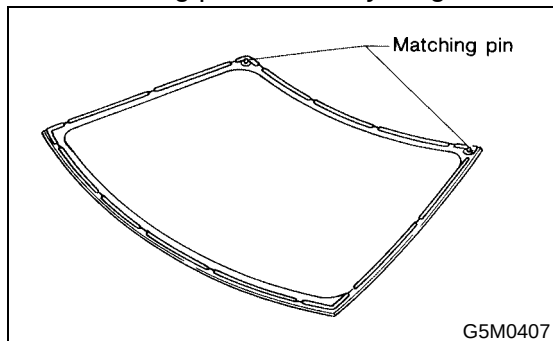
- 1) Clean external circumference of windshield glass with alcohol or white gasoline.
- 2) Remove adhesive layer on the body using cutter knife to obtain smooth face 2 mm (0.08 in) thick.

CAUTION:

Be careful not to damage the body and paint surface.

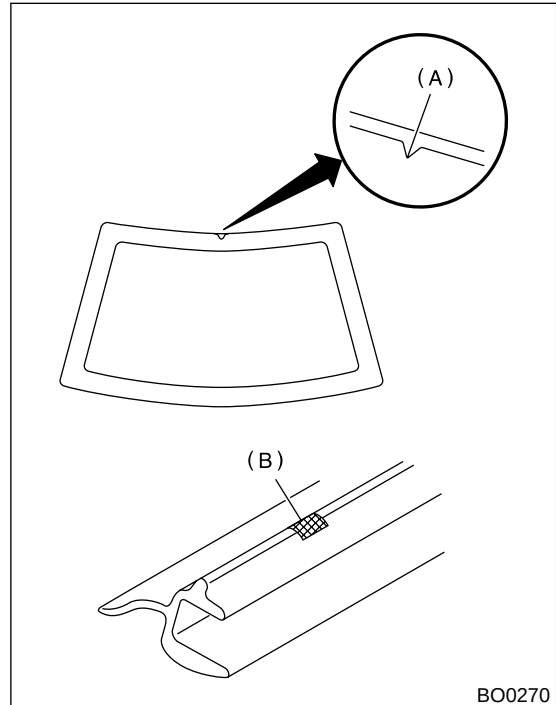


- 3) Clean body with alcohol or white gasoline to remove thoroughly chips, dusts, and dirt from body face.
- 4) Place glass on body.
- 5) Adjust glass position to make uniform clearance between body and glass in four corners.
- 6) Place matching pins and body on glass.



- 7) Remove glass from body.

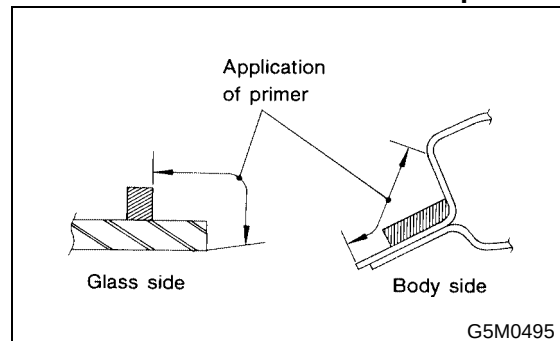
- 8) Fit molding mark (B) to notch (A).



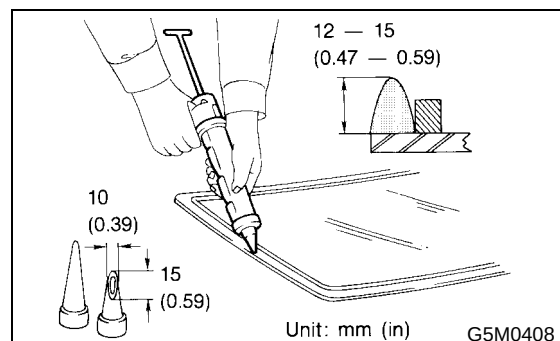
- 9) Apply primer to adhesive layer of glass using sponge.
- 10) Apply primer to adhesive layer of body.

CAUTION:

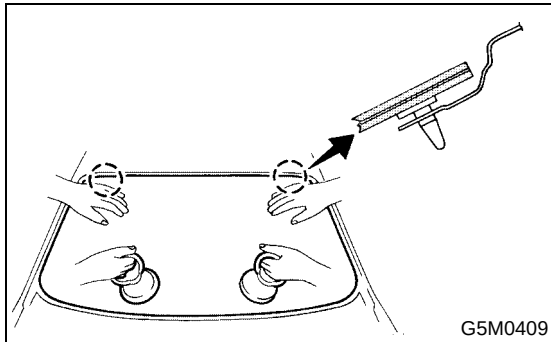
- Primer once attached to the painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such areas.
- Let primer dry for about ten minutes before installing the glass.
- Do not touch surface coated with primer.



- 11) Cut off cartridge nozzle tip and set it in sealant gun as shown.



- 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.

CAUTION:

- When door is opened/closed after glass is bonded, always lower door glass and then open/close it carefully.
- Move vehicle slowly.

- 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.

CAUTION:

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-17, INSTALLATION, Cowl Panel.>

10. Rear Gate Glass

A: REMOVAL

- 1) Remove rear wiper motor. <Ref. to WW-21, REMOVAL, Rear Wiper Motor.>
- 2) Remove electrical connector from rear defogger terminal.
- 3) Remove glass in the same procedure as for windshield glass. <Ref. to GW-35, REMOVAL, Windshield Glass.>

B: INSTALLATION

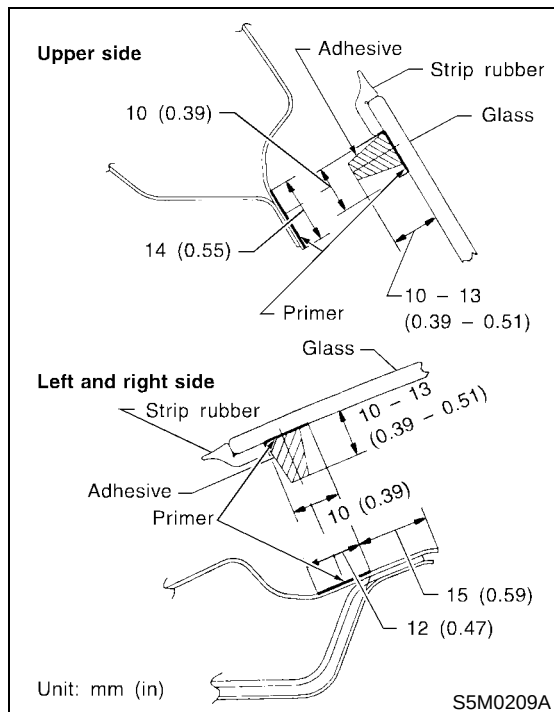
- 1) Apply adhesive evenly to the glass attachment area.
- 2) Insert the glass clip pin into the rear gate hole, and after pushing on the area around the clip pin to secure it, push lightly all around the area to seal it.
- 3) About one hour after installation, conduct a leak test.

CAUTION:

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-21, INSTALLATION, Rear Wiper Motor.>



CAUTION:

- When door is opened/closed after glass is bonded, always lower door glass and then open/close it carefully.
- Move vehicle slowly.

4) After completion of all work, allow vehicle to stand for about 24 hours.

NOTE:

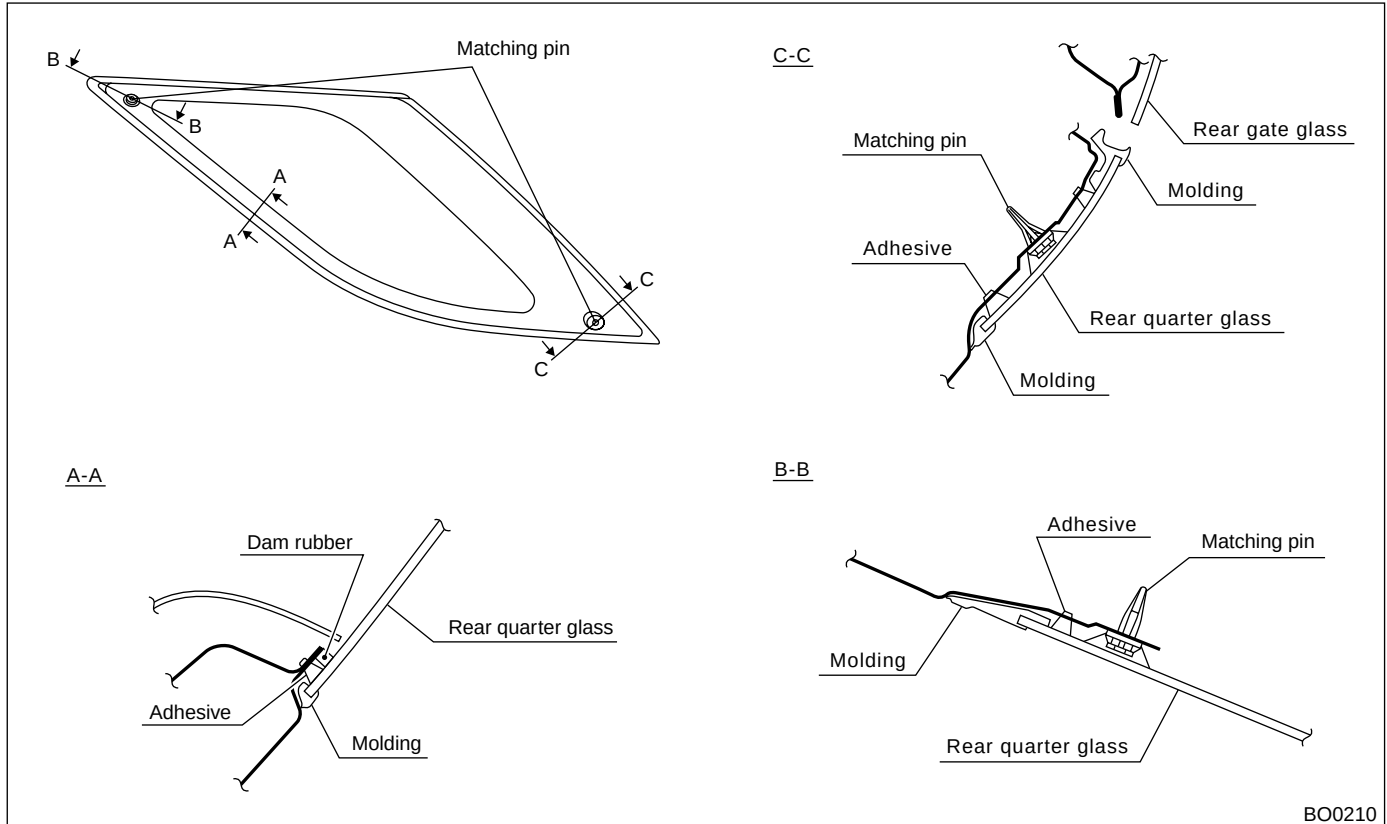
For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

11. Rear Quarter Glass

A: REMOVAL

1. SEDAN

Remove glass in the same procedure as for windshield glass. <Ref. to GW-35, REMOVAL, Windshield Glass.>

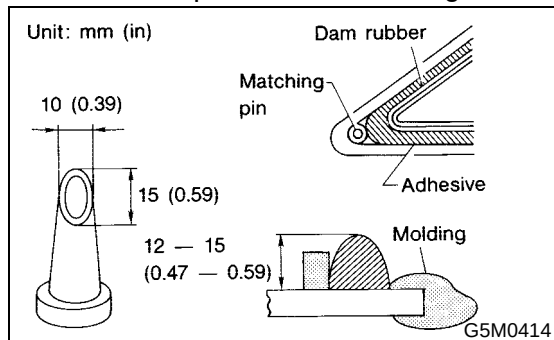


2. WAGON

Remove glass in the same procedure as for windshield glass. <Ref. to GW-35, REMOVAL, Windshield Glass.>

B: INSTALLATION

1) Cut off nozzle tip as shown in the figure.



2) Install glass in the same procedure as for windshield glass. <Ref. to GW-36, INSTALLATION, Windshield Glass.>

CAUTION:

- When door is opened/closed after glass is bonded, always lower door glass and then open/close it carefully.

- Move vehicle slowly.

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.

CAUTION:

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.

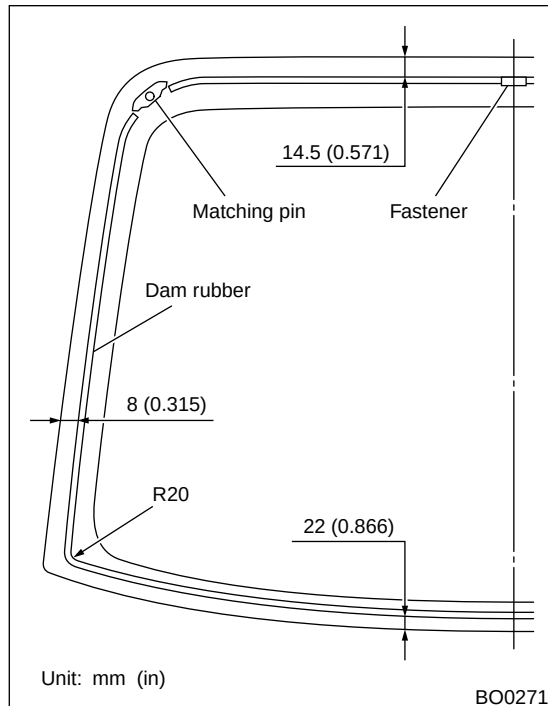
12.Rear Window Glass

A: REMOVAL

- 1) Disconnect electrical connectors from rear defogger terminals.
- 2) Remove glass in the same procedure as for windshield glass. <Ref. to GW-35, REMOVAL, Windshield Glass.>

B: INSTALLATION

- 1) Bond dam rubber and matching pin.



- 2) Install glass in the same procedure as for windshield glass. <Ref. to GW-36, INSTALLATION, Windshield Glass.>
- 3) Connect rear defogger terminals.

CAUTION:

- When door is opened/closed after glass is bonded, always lower door glass and then open/close door carefully.
- Move vehicle slowly.

- 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.

CAUTION:

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.

13.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.>

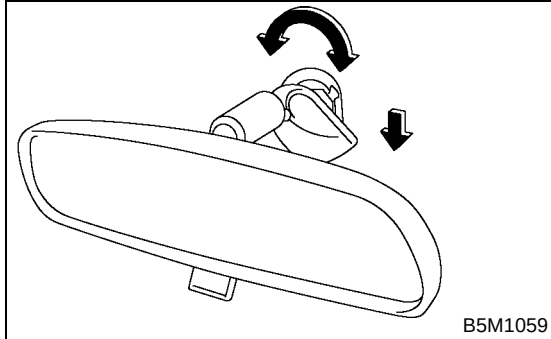
14.Inner Rearview Mirror

A: REMOVAL

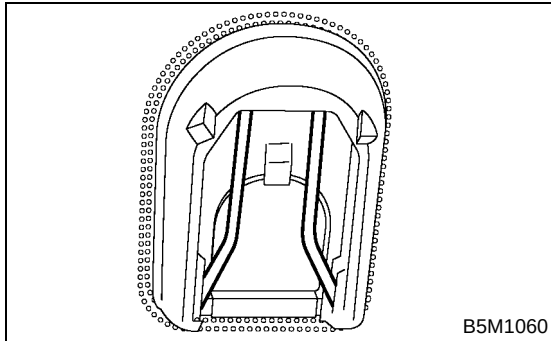
NOTE:

The spring cannot be reused. Prepare a new spring before 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.

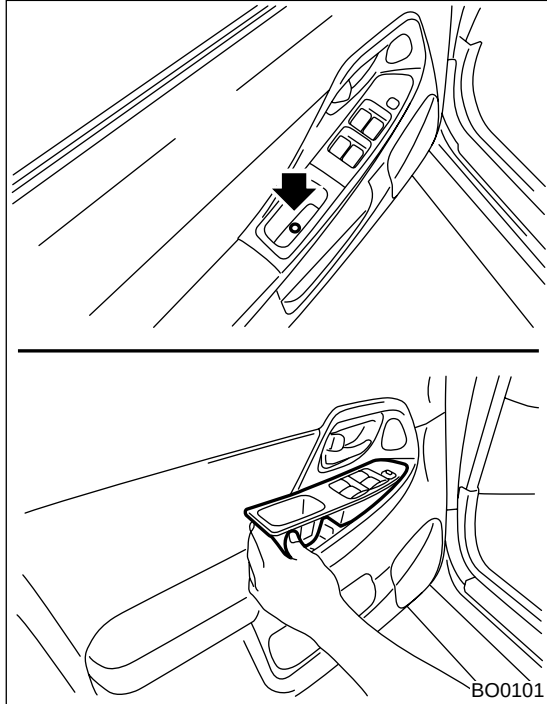
Do not let spring deteriorate.

15. Power Window Control Switch

A: REMOVAL

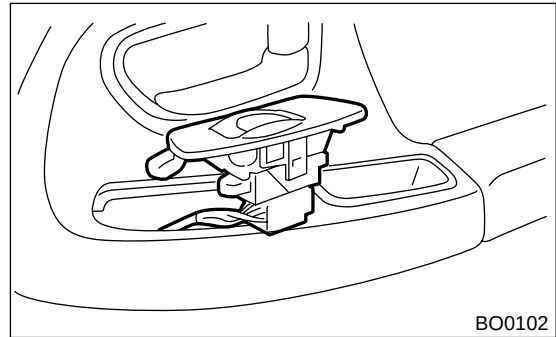
1. MAIN SWITCH

- 1) Loosen screw to remove power window main switch.
- 2) Disconnect the connector.



2. SUB-SWITCH

- 1) Remove switch panel.
- 2) Disconnect the connector.



B: INSTALLATION

1. MAIN SWITCH

Install in the reverse order of removal.

2. SUB-SWITCH

Install in the reverse order of removal.

C: INSPECTION

1. MAIN SWITCH LHD MODEL

Check continuity between connector terminals.

Driver's switch:

Switch position	Tester connection	Specified condition
AUTO UP	13 — 2, 1 — 5	Continuity
UP	13 — 2, 1 — 5	Continuity
OFF	2 — 1 — 5	Continuity
DOWN	13 — 1, 2 — 5	Continuity
AUTO DOWN	13 — 1, 2 — 5	Continuity

Front passenger's switch:

Switch position	Tester connection	Specified condition
UP	13 — 6, 7 — 5	Continuity
OFF	6 — 7 — 5	Continuity
DOWN	13 — 7, 6 — 5	Continuity

Rear left switch:

Switch position	Tester connection	Specified condition
UP	10 — 13, 9 — 5	Continuity
OFF	10 — 9 — 5	Continuity
DOWN	13 — 9, 10 — 5	Continuity

POWER WINDOW CONTROL SWITCH

GLASS/WINDOWS/MIRRORS

Rear right switch:

Switch position	Tester connection	Specified condition
UP	13 — 16, 15 — 5	Continuity
OFF	16 — 15 — 5	Continuity
DOWN	13 — 15, 16 — 5	Continuity

If NG, replace the main switch.

2. MAIN SWITCH RHD MODEL

Check continuity between connector terminals.

Driver's switch:

Switch position	Tester connection	Specified condition
AUTO UP	12 — 6, 7 — 1	Continuity
UP	12 — 6, 7 — 1	Continuity
OFF	6 — 7 — 1	Continuity
DOWN	12 — 7, 6 — 1	Continuity
AUTO DOWN	12 — 7, 6 — 1	Continuity

Front passenger's switch:

Switch position	Tester connection	Specified condition
UP	12 — 3, 2 — 1	Continuity
OFF	3 — 2 — 1	Continuity
DOWN	12 — 2, 3 — 1	Continuity

Rear left switch:

Switch position	Tester connection	Specified condition
UP	12 — 10, 9 — 1	Continuity
OFF	10 — 9 — 1	Continuity
DOWN	12 — 9, 10 — 1	Continuity

Rear right switch:

Switch position	Tester connection	Specified condition
UP	12 — 14, 1 — 13	Continuity
OFF	14 — 13 — 1	Continuity
DOWN	12 — 13, 14 — 1	Continuity

If NG, replace the main switch.

3. SUB-SWITCH

Check continuity between connector terminals.

Front passenger's door switch and rear door switch:

Switch position	Tester connection	Specified condition
UP	8 — 5, 6 — 7	Continuity
OFF	4 — 5, 6 — 7	Continuity
DOWN	8 — 7, 4 — 5	Continuity

If NG, replace the sub-switch.

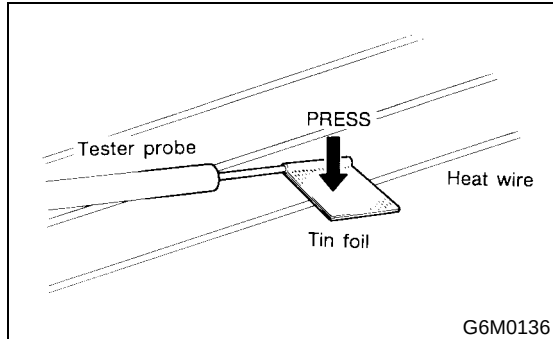
16.Rear Window Defogger

A: INSPECTION

CAUTION:

When wiping stain on glass off with cloth, use a dry and soft cloth and move it in the direction of the heat wire extension to avoid damage to the heat wire.

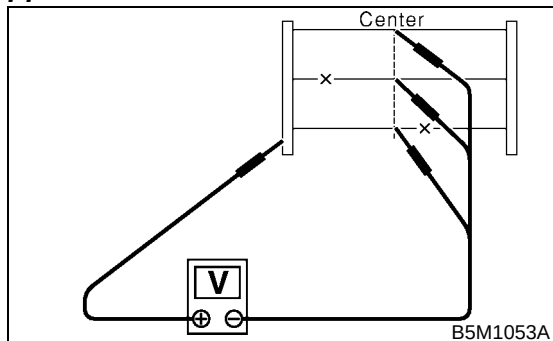
- 1) Turn ignition switch to ON.
- 2) Turn defogger switch to ON.
- 3) Wrap tips of tester pins with aluminum foil to avoid damage to heat wire.



- 4) Measure voltage at wire center with DC voltmeter.

Standard voltage:

Approx. 6 volts



Voltage	Criteria
Approx. 6 V	OK
Approx. 12 V or 0 V	Broken

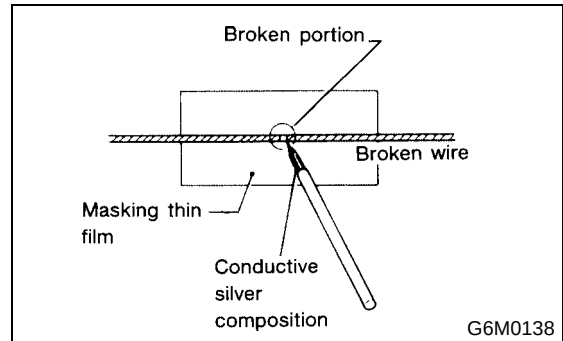
NOTE:

- 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.



- 4) After repair, check wire.

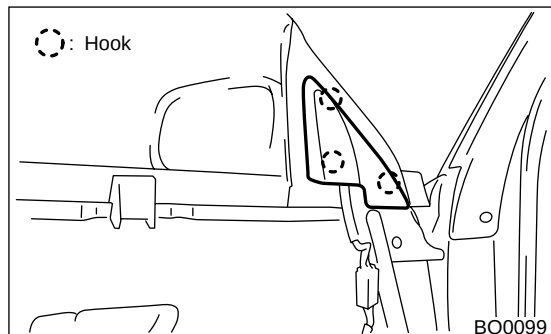
OUTER MIRROR ASSEMBLY

GLASS/WINDOWS/MIRRORS

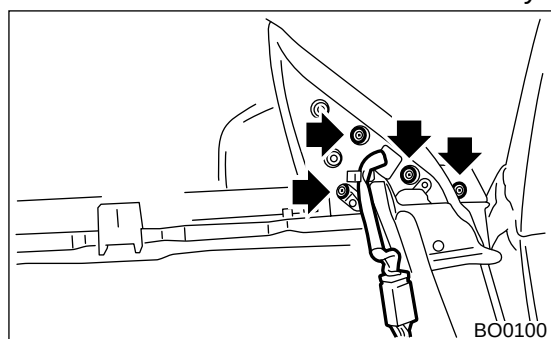
17. Outer Mirror Assembly

A: REMOVAL

- 1) Remove door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 2) Remove mirror gusset cover.



- 3) Disconnect the mirror connector.
- 4) Loosen screws to remove mirror assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check to ensure that rearview mirror moves properly when battery voltage is applied to terminals.

Mirror heater not-equipped model:

Switch position	Terminal connection
OFF	—
UP	4 (+) — 6 (—)
DOWN	6 (+) — 4 (—)
LEFT	5 (+) — 6 (—)
RIGHT	6 (+) — 5 (—)

If NG, replace the mirror.

Mirror heater equipped model:

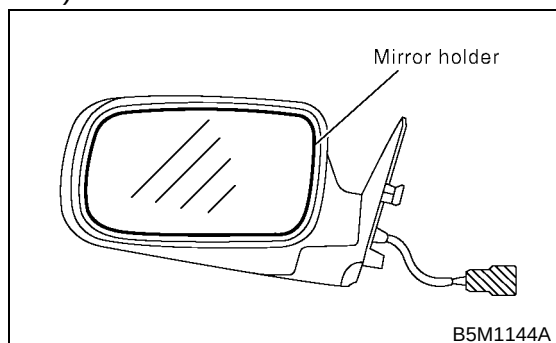
Switch position	Terminal connection
OFF	—
UP	6 (+) — 8 (—)
DOWN	8 (+) — 6 (—)
LEFT	7 (+) — 8 (—)
RIGHT	8 (+) — 7 (—)

If NG, replace the mirror.

18. Outer Mirror

A: REPLACEMENT

- 1) Remove the door mirror assembly. <Ref. to GW-46, REMOVAL, Outer Mirror Assembly.>
- 2) Warm the area around the mirror holder 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. (Also remove the connector from the back of mirrors with heaters.)



- 4) Warm the area around the mirror holder with a hair drier until the edges of the mirror holder 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.

CAUTION:

Unless the mirror holder is warmed sufficiently, the mirror holder edges may be damaged or the mirror cracked.

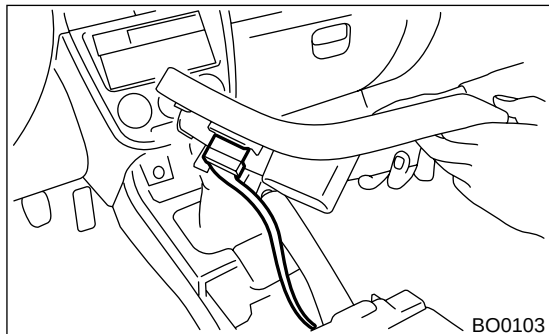
19.Remote Control Mirror Switch

B: INSTALLATION

Install in the reverse order of removal.

A: REMOVAL

- 1) Remove console cover.
- 2) Disconnect the connector.

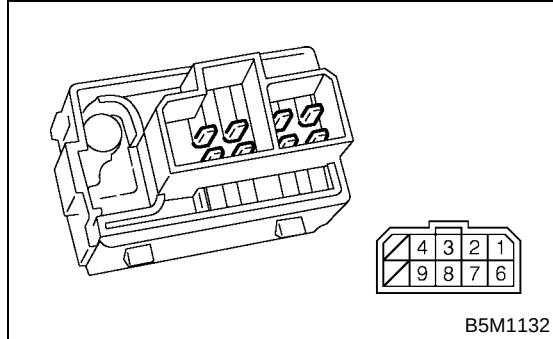


REMOTE CONTROL MIRROR SWITCH

GLASS/WINDOWS/MIRRORS

C: INSPECTION

Move rearview mirror switch to each position and check continuity between terminals.



Change over switch left position:

Switch position	Tester connection	Specified condition
OFF	—	No continuity
UP	4 — 6, 2 — 1	Continuity
DOWN	6 — 2, 4 — 1	Continuity
LEFT	4 — 8, 2 — 1	Continuity
RIGHT	8 — 2, 4 — 1	Continuity

Change over switch right position:

Switch position	Tester connection	Specified condition
OFF	—	No continuity
UP	4 — 7, 2 — 1	Continuity
DOWN	7 — 2, 4 — 1	Continuity
LEFT	4 — 9, 2 — 1	Continuity
RIGHT	9 — 2, 4 — 1	Continuity

If NG, replace the switch.

BODY STRUCTURE

BS

Refer to G1831GE SUPPLEMENT for this section.

Page

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

INSTRUMENTATION/DRIVER INFO



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6. Fuel Gauge	23
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GENERAL DESCRIPTION

INSTRUMENTATION/DRIVER INFO

1. General Description

A: SPECIFICATIONS

Combination meter	Speedometer	Electric pulse type
	Temperature gauge	Thermistor cross coil type
	Fuel gauge	Resistance cross coil type
	Tachometer	Electric impulse type
	Turn signal indicator light	14 V — 1.4 W
	Charge indicator light	LED
	Oil pressure indicator light	LED
	ABS warning light	LED
	CHECK ENGINE warning light (Malfunction indicator light)	LED
	HI-beam indicator light	14 V — 1.4 W
	Door open warning light	LED
	Seat belt warning light	LED
	Brake fluid and parking brake warning light	LED
	FWD indicator light	LED
	AIRBAG warning light	LED
	Meter illumination light	14 V — 3 W, 14 V — 2 W
	AT OIL TEMP. warning light	LED
	LO indicator light	LED
	HOLD indicator light	LED
	Immobilizer indicator light	LED
	POWER indicator light	14 V — 2 W
	Low fuel warning light	LED
	AT select lever position indicator light	14 V — 100 mA
	LCD back light	14 V — 1.4 W

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 circuit plate.
- 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

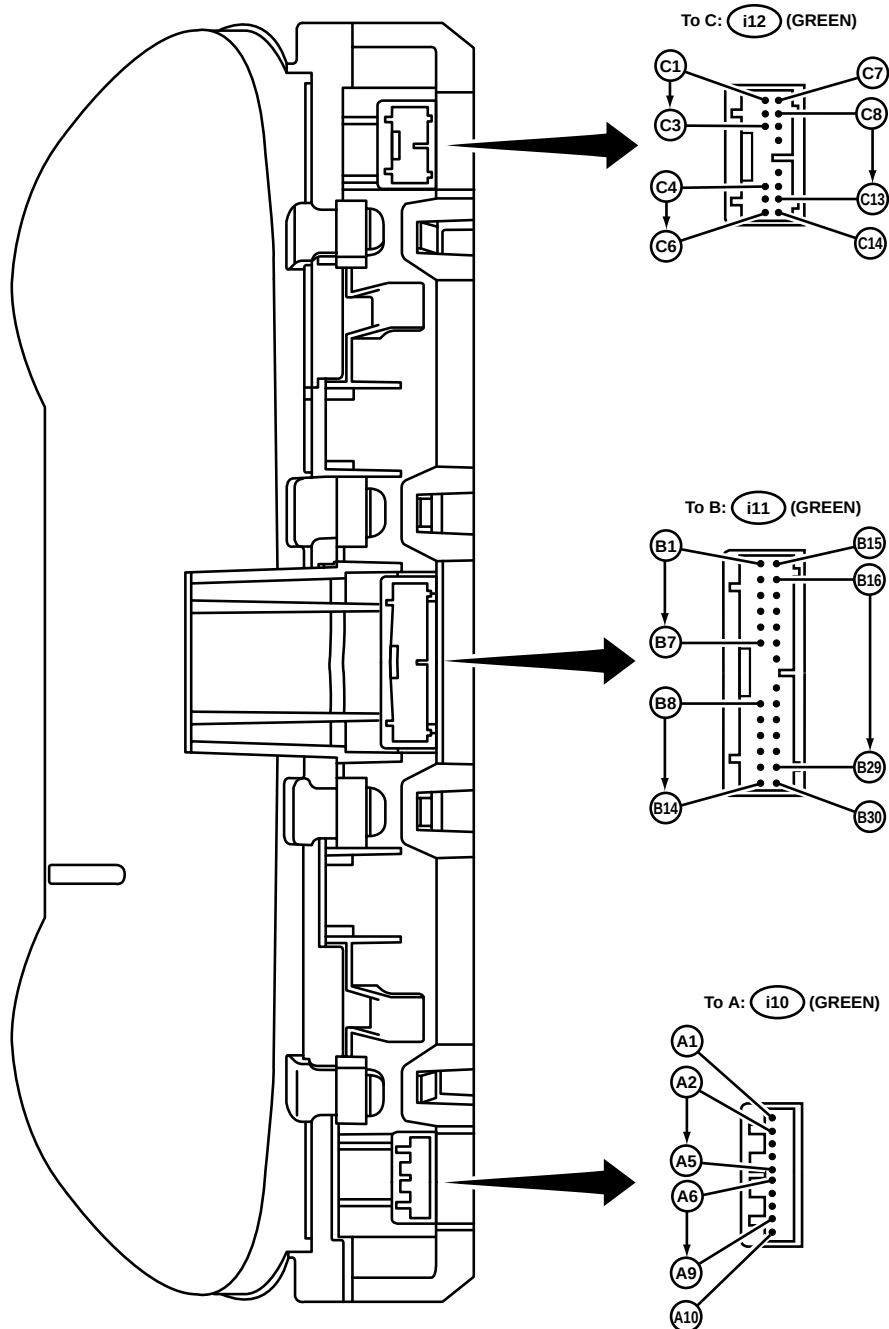
INSTRUMENTATION/DRIVER INFO

2. Combination Meter System

A: SCHEMATIC

1. COMBINATION METER

METER-01



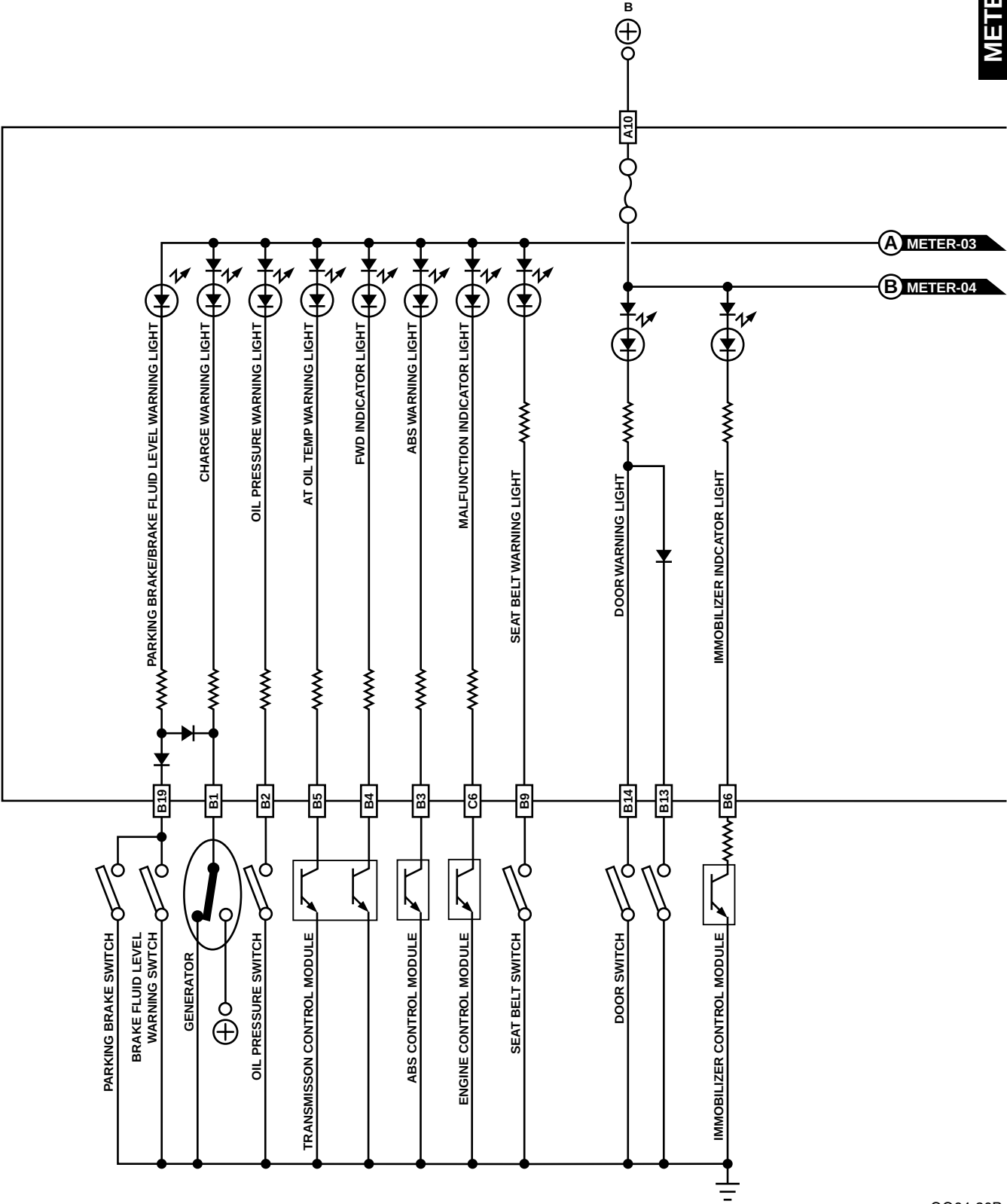
METER-01

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

METER-02

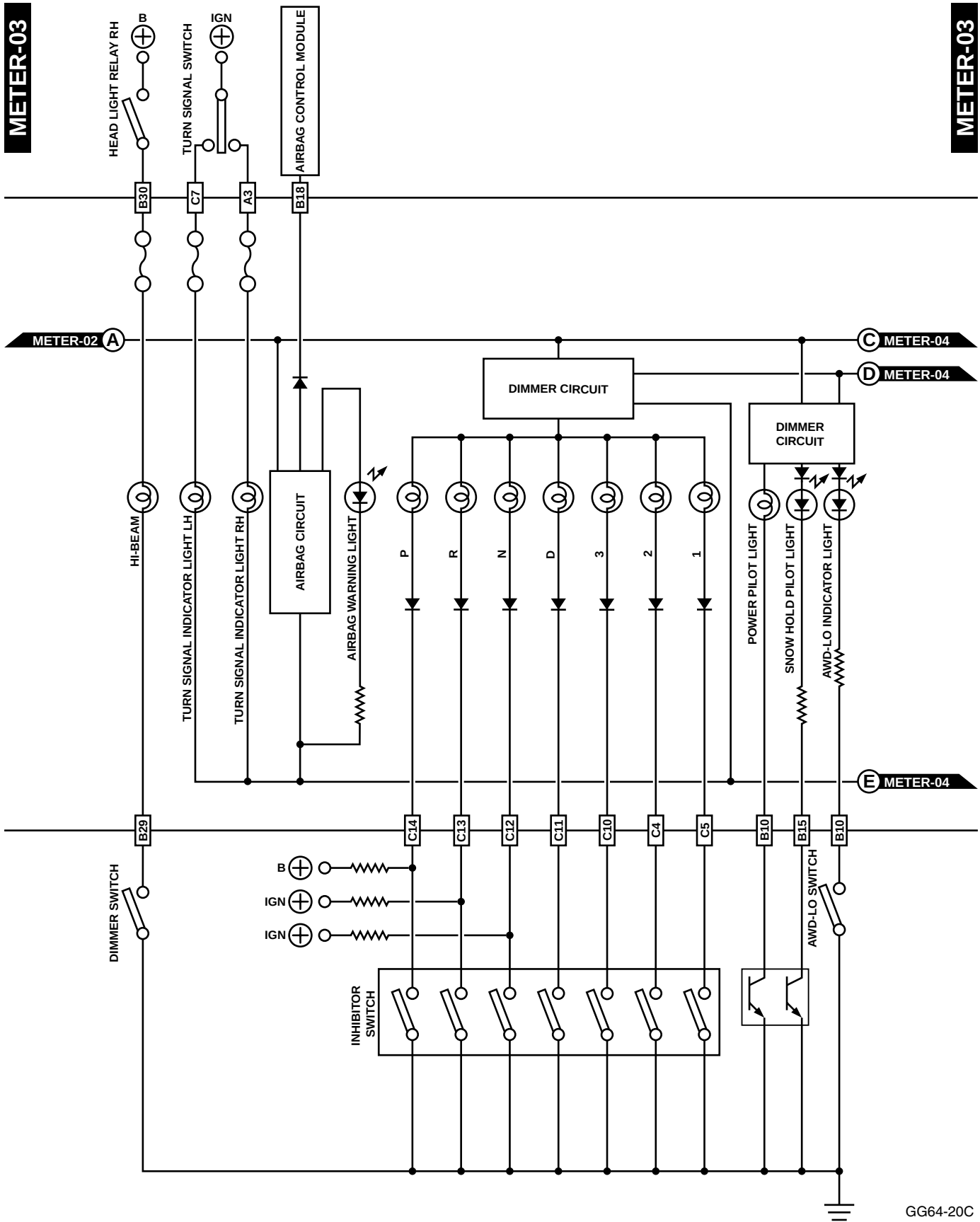
METER-02



GG64-20B

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

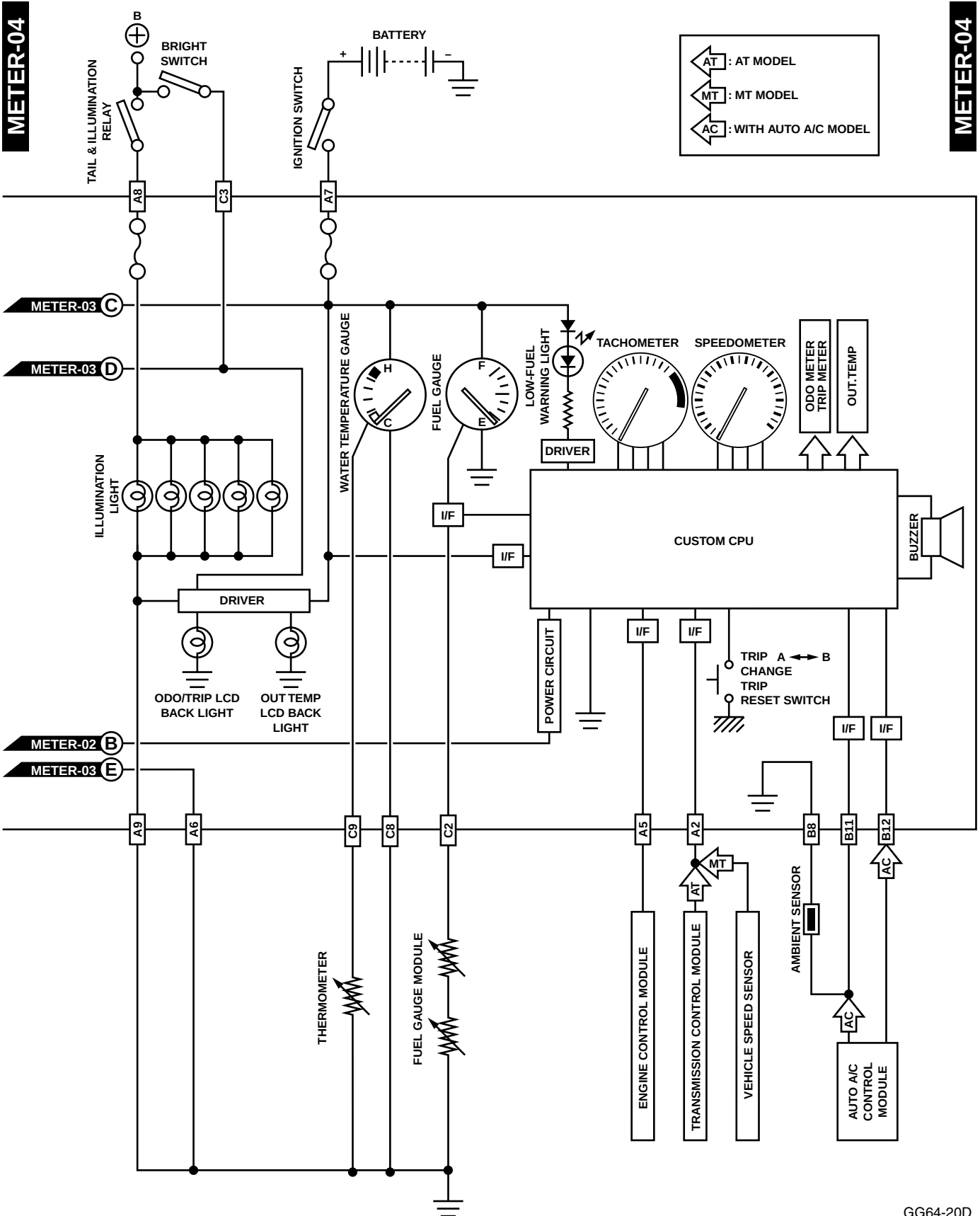


GG64-20C

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

METER-04



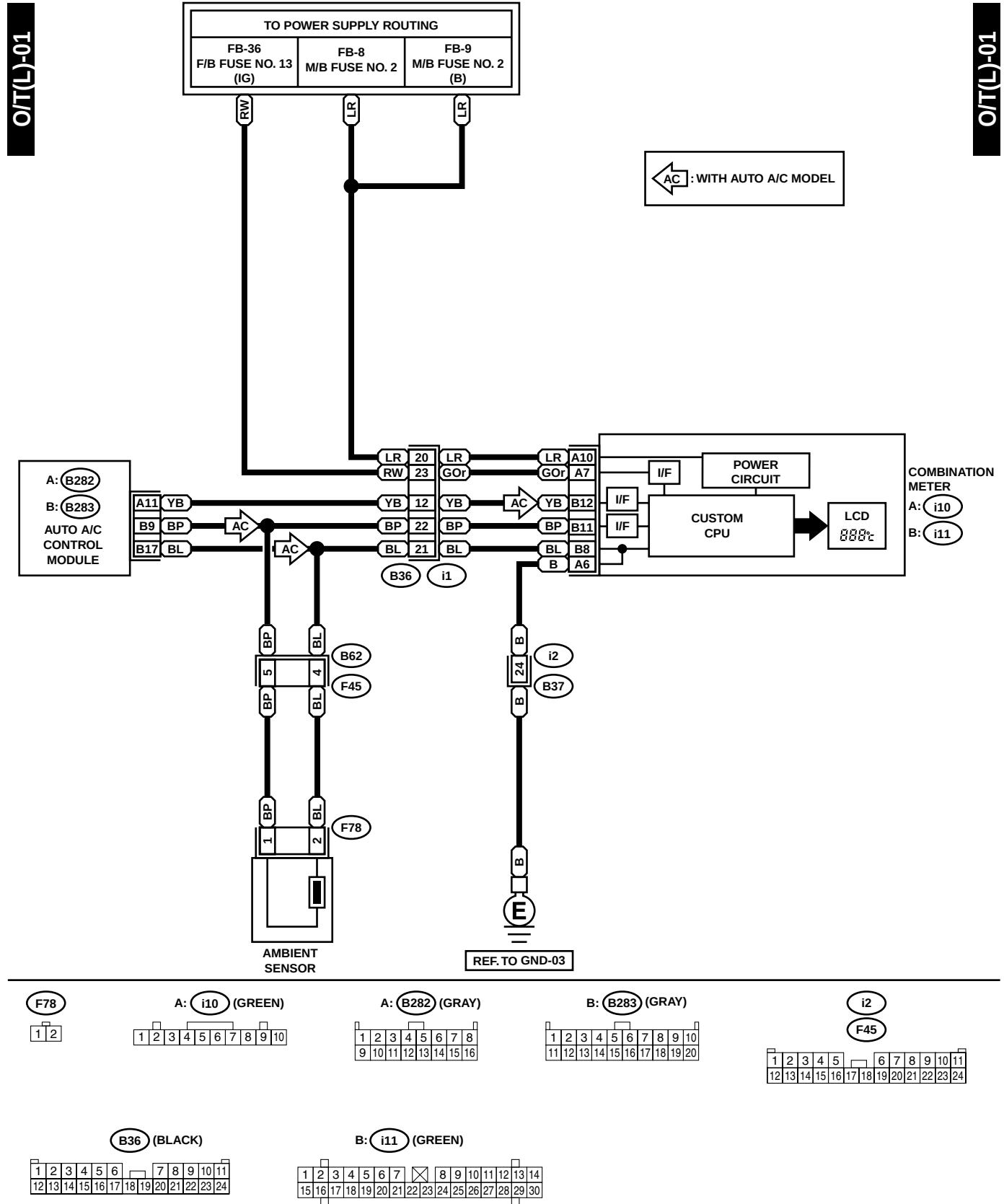
METER-04

GG64-20D

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

2. OUTSIDE TEMPERATURE INDICATOR LHD MODEL



GL96-20

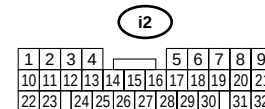
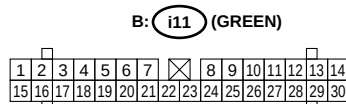
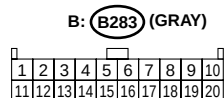
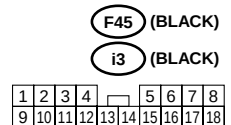
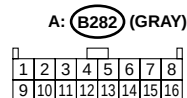
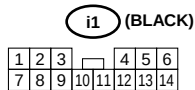
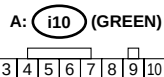
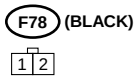
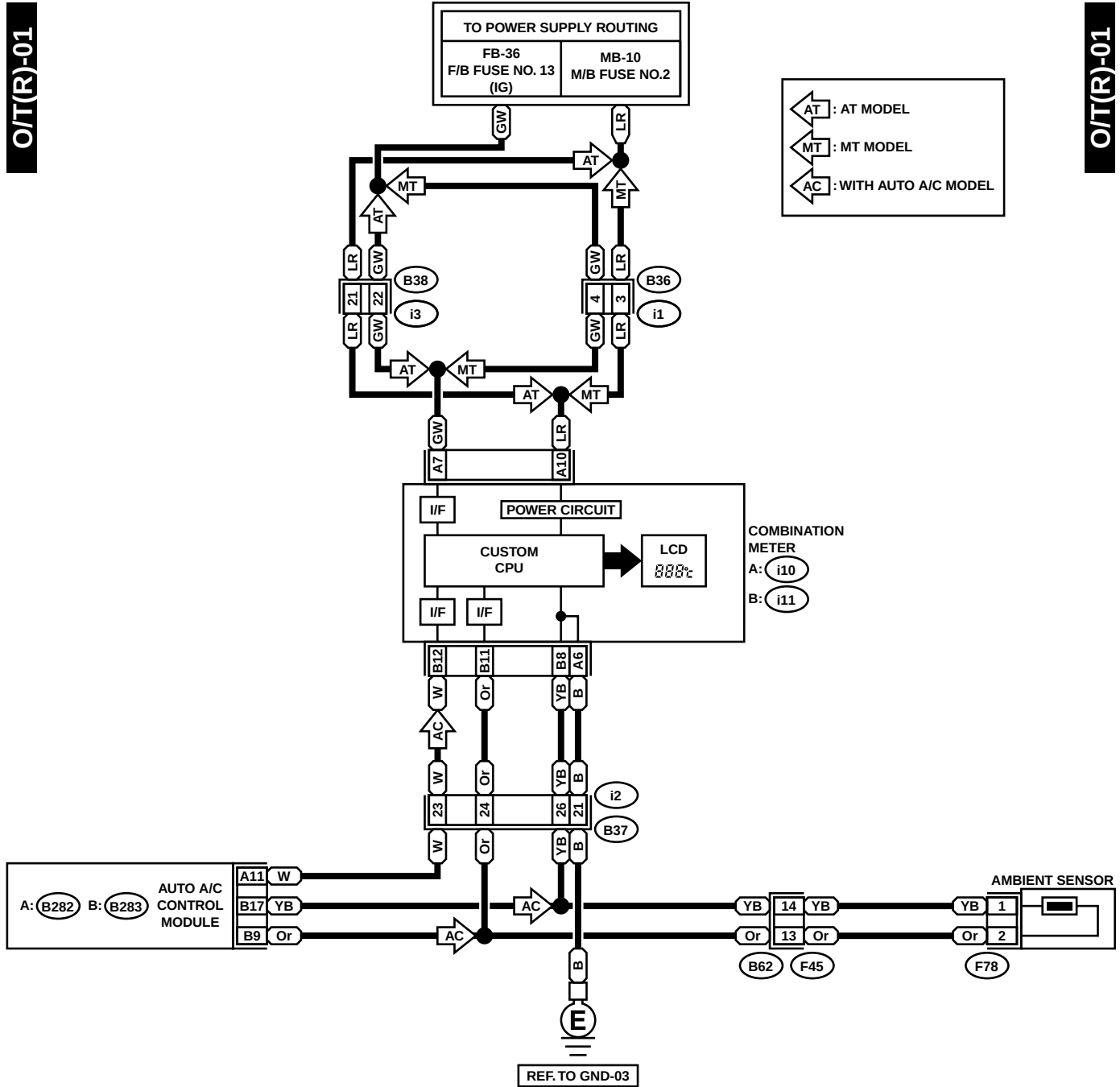
COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

3. OUTSIDE TEMPERATURE INDICATOR RHD MODEL

O/T(R)-01

O/T(R)-01



GR96-20

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

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).

1. SYMPTOM CHART

Symptom	Repair order	Reference
Combination meter assembly does not operate.	(1) Power supply (2) Ground circuit	<Ref. to IDI-11, 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-12, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>
		AT: <Re. to IDI-<Ref. to IDI-13, CHECK TRANSMISSION CONTROL MODULE, INSPECTION, Combination Meter System.>
Tachometer does not operate.	(1) Engine control module (2) Harness (3) Tachometer	<Ref. to IDI-14, 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-15, 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-16, CHECK ENGINE COOLANT TEMPERATURE SENSOR, INSPECTION, Combination Meter System.>
Outside temperature indicator does not operate.	(1) Ambient sensor (2) Harness (3) Combination meter (4) Auto A/C control module	<Ref. to IDI-17, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Check	Yes	No
1 CHECK POWER SUPPLY FOR COMBINATION METER. 5)Remove combination meter. <Ref. to IDI-19, REMOVAL, Combination Meter Assembly.> 6)Disconnect combination meter harness connector. 7)Turn ignition switch to ON. 8)Measure voltage between combination meter connector (i10) and chassis ground. <i>Connector & terminal</i> <i>(i10) No. 7 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	Check harness for open or short between ignition switch and combination meter.
2 CHECK POWER SUPPLY FOR COMBINATION METER. Measure voltage between combination meter connector (i10) and chassis ground. <i>Connector & terminal</i> <i>(i10) No. 10 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 3.	Check harness for open or short between fuse and combination meter.
3 CHECK GROUND CIRCUIT OF COMBINATION METER. 1)Turn ignition switch to OFF. 2)Measure resistance of harness between combination meter connector (i10) and chassis ground. <i>Connector & terminal</i> <i>(i10) No. 6 (+) — Chassis ground (-):</i>	Is the resistance less than 10 Ω ?	Replace combination meter printed circuit.	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

3. CHECK VEHICLE SPEED SENSOR

Step	Check	Yes	No
1 CHECK VEHICLE SPEED SENSOR. 1)Set the vehicle on a free roller, or lift-up the vehicle and support it with safety stands. 2)Remove the combination meter with harness connector. Warning: Be careful not to get caught in the running wheels. 3)Drive the vehicle at a speed greater than 20 km/h (12 MPH). 4)Measure voltage between combination meter connector (i10) and chassis ground. Connector & terminal (i10) No. 2 (+) — Chassis ground (-):	Is the voltage less than 1V ←→ more than 4 V?	Check speedometer. <Ref. to IDI-21, REMOVAL, Speedometer.>	Go to step 2.
2 CHECK VEHICLE SPEED SENSOR POWER SUPPLY. 1)Turn ignition switch to OFF. 2)Disconnect vehicle speed sensor harness connector. 3)Turn ignition switch to ON. 4)Measure voltage between vehicle speed sensor connector (B17) and engine ground. Connector & terminal (B17) No. 3 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Check harness for open or short between ignition switch and vehicle speed sensor.
3 CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND. 1)Turn ignition switch to OFF. 2)Measure resistance between vehicle speed sensor connector (B17) and engine ground. Connector & terminal (B17) No. 2 (+) — Engine ground (-):	Is the resistance less than 10 Ω?	Go to step 4.	Repair wiring harness.
4 CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND COMBINATION METER. 1)Disconnect connector from combination meter. 2)Measure resistance between vehicle speed sensor harness connector and combination meter harness connector. Connector & terminal (B17) No. 1 — (i10) No. 2:	Is the resistance less than 10 Ω?	Replace vehicle speed sensor.	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

4. CHECK TRANSMISSION CONTROL MODULE

Step	Check	Yes	No
1 CHECK TRANSMISSION CONTROL MODULE SIGNAL. 1)Set the vehicle on a free roller, or lift-up the vehicle and support it with safety stands. Warning: Be careful not to get caught in the running wheels. 2)Drive the vehicle faster than 10 km/h (6 MPH). 3)Measure voltage between transmission control module connector (B56) and chassis ground. Connector & terminal (B56) No. 17 (+) — Chassis ground (-):	Is the voltage less than 1 V ←→ more than 4 V?	Go to step 2.	Check transmission control module. <Ref. to AT-2, Basic Diagnostic Procedure.>
2 CHECK HARNESS BETWEEN TRANSMISSION CONTROL MODULE AND COMBINATION METER. 1)Turn ignition switch to OFF. 2)Disconnect connector from transmission control module and combination meter. 3)Measure resistance between transmission control module harness connector (B56) and combination meter harness connector (i10). Connector & terminal (B56) No. 17 — (i10) No. 2:	Is the resistance less than 10 Ω?	Check speed meter. <Ref. to IDI-21, REMOVAL, Speedometer.>	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

5. CHECK ENGINE CONTROL MODULE

Step	Check	Yes	No
1 CHECK ENGINE CONTROL MODULE SIGNAL. 1)Start the engine. 2)Measure voltage between engine control module connector (B136: turbo engine model) or (B134: non-turbo engine model) and engine ground. Connector & terminal Turbo engine model: (B136) No. 9 (+) — Engine ground (-): Non-turbo engine model: (B134) No. 30 (+) — Engine ground (-):	Is the voltage 0 $\longleftrightarrow$ 13 V or more?	Go to step 2.	Check engine control module. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(SOHCw/oOBD)-2, Basic Diagnostic Procedure.> or <Ref. to EN(DOHC TURBO)-2, Basic Diagnostic Procedure.>
2 CHECK HARNESS BETWEEN COMBINATION METER AND ENGINE CONTROL MODULE. 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 (B136: turbo engine model) or (B134: non-turbo engine model) and combination meter harness connector (i10). Connector & terminal Turbo engine model: (B136) No. 9 — (i10) No. 5: Non-turbo engine model: (B134) No. 30 — (i10) No. 5:	Is the resistance less than 10 Ω ?	Check tachometer. <Ref. to IDI-22, REMOVAL, Tachometer.>	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

6. CHECK FUEL LEVEL SENSOR

Step	Check	Yes	No	
1	CHECK ENGINE TYPE.	Is the engine type SOHC without OBD?	Go to step 3.	Go to step 2.
2	CHECK FUEL LEVEL SENSOR. 1)Check fuel level sensor. <Ref. to EN(SOHC)-186, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(DOHC TURBO)-190, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is the fuel level sensor OK?	Check fuel gauge. <Ref. to IDI-23, REMOVAL, Fuel Gauge.>	Replace the fuel level sensor.
3	CHECK FUEL LEVEL SENSOR. 1)Remove fuel level sensor. <Ref. to FU(SOHCw/oOBD)-56, REMOVAL, Fuel Level Sensor.> 2)Measure resistance between fuel level sensor terminals when setting the float to FULL and EMPTY position. Terminals No. 3 — No. 5:	Is the resistance 2 to 5 Ω (FULL) and 92 to 95 Ω (EMPTY)?	Go to step 4.	Replace the fuel level sensor.
4	CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND COMBINATION METER. 1)Disconnect connector from combination meter. 2)Measure resistance between fuel level sensor harness connector terminal and combination meter harness connector terminal. Connector & terminal (R58) No. 3 — (i12) No. 2:	Is the resistance less than 10 Ω?	Go to step 5.	Repair wiring harness.
5	CHECK FUEL LEVEL SENSOR GROUND CIRCUIT. Measure resistance between fuel level sensor harness connector terminal and chassis ground. Connector & terminal (R58) No. 5 — Chassis ground:	Is the resistance less than 10 Ω?	Fuel level sensor is OK.	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Step	Check	Yes	No
1 CHECK ENGINE COOLANT TEMPERATURE SENSOR. Check engine coolant temperature sensor. <Ref. to EN(SOHC)-122, DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(SOHCw/oOBD)-76, DTC 21 ENGINE COOLANT TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(DOHC TURBO)-114, DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is engine coolant temperature sensor OK?	Go to step 2.	Replace engine coolant temperature sensor.
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 (E8) and combination meter harness connector (i12). Connector & terminal (E8) No. 3 — (i12) No. 9:	Is the resistance less than 10 Ω?	Check water temperature gauge. <Ref. to IDI-24, REMOVAL, Water Temperature Gauge.>	Repair wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

8. CHECK OUTSIDE TEMPERATURE INDICATOR

Step	Check	Yes	No
1	CHECK AIR CONDITIONER TYPE.	Go to step 6.	Go to step 2.
2	CHECK POWER SUPPLY FOR AMBIENT SENSOR. 1) Turn ignition switch OFF. 2) Disconnect connector from combination meter. 3) Turn ignition switch ON. 4) Measure voltage between combination meter terminal and chassis ground. Connector & terminal (i11) No. 11 (+) — Chassis ground (-):	Go to step 3.	Replace combination meter printed circuit.
3	CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER. 1) Turn ignition switch OFF. 2) Disconnect connector from ambient sensor. 3) Measure resistance between ambient sensor harness connector terminal and combination meter harness connector terminal. Connector & terminal LHD model: (F78) No. 1 — (i11) No. 11: (F78) No. 2 — (i11) No. 8: RHD model: (F78) No. 2 — (i11) No. 11: (F78) No. 1 — (i11) No. 8:	Go to step 4.	Repair wiring harness.
4	CHECK AMBIENT SENSOR. 1) Remove ambient sensor. 2) Check ambient sensor. <Ref. to IDI-25, INSPECTION, Ambient Sensor.>	Go to step 5.	Replace the ambient sensor.
5	CHECK OUTSIDE TEMPERATURE INDICATOR. 1) Connect combination meter harness connector. 2) Connect a resistor (2.2 kΩ) between terminals of ambient sensor harness connector. 3) Turn ignition switch ON and check the outside temperature indicator display.	Repair poor contact of ambient sensor harness connector.	Replace combination meter printed circuit.
6	CHECK POWER SUPPLY FOR COMBINATION METER. 1) Turn ignition switch OFF. 2) Disconnect connector from auto A/C control module. 3) Turn ignition switch ON. 4) Measure voltage between auto A/C control module terminal and chassis ground. Connector & terminal (B282) No. 11 (+) — chassis ground (-):	Go to step 7.	Replace auto A/C control module.

COMBINATION METER SYSTEM

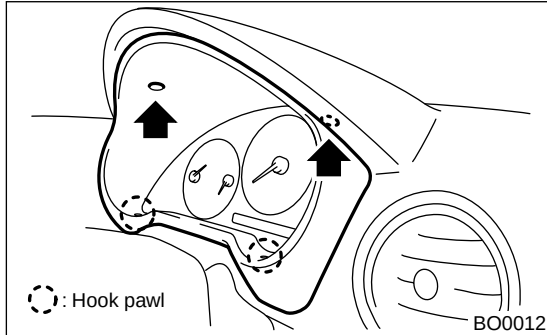
INSTRUMENTATION/DRIVER INFO

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND COMBINATION METER. 1) Turn ignition switch OFF. 2) Disconnect connector from combination meter. 3) Measure resistance between auto A/C control module harness connector terminal and combination meter harness connector terminal. Connector & terminal (B282) No. 11 — (i11) No. 12:	Is the resistance less than 10 Ω ?	Go to step 8.	Repair wiring harness.
8 CHECK POWER SUPPLY FOR AMBIENT SENSOR. 1) Turn ignition switch ON. 2) Measure voltage between auto A/C control module terminal and chassis ground. Connector & terminal (B283) No. 9 (+) — chassis ground (-):	Is the voltage more than 4V?	Go to step 9.	Replace auto A/C control module.
9 CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER. 1) Turn ignition switch OFF. 2) Disconnect connector from ambient sensor. 3) Measure resistance between ambient sensor harness connector terminal, combination meter harness connector terminal and auto A/C control module harness connector terminal. Connector & terminal LHD model: (F78) No. 1 — (i11) No. 11: (F78) No. 1 — (B283) No. 9: (F78) No. 2 — (i11) No. 8: RHD model: (F78) No. 2 — (i11) No. 11: (F78) No. 2 — (B283) No. 9: (F78) No. 1 — (i11) No. 8:	Is the resistance less than 10 Ω ?	Go to step 10.	Repair wiring harness.
10 CHECK AMBIENT SENSOR. 1) Remove ambient sensor. 2) Check ambient sensor. <Ref. to IDI-25, INSPECTION, Ambient Sensor.>	Is the ambient sensor OK?	Go to step 11.	Replace the ambient sensor.
11 CHECK OUTSIDE TEMPERATURE INDICATOR. 1) Connect combination meter and auto A/C control module harness connector. 2) Connect a resistor (2.2 k Ω) 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 25°C (77°F)?	Repair poor contact of ambient sensor harness connector.	Replace combination meter printed circuit.

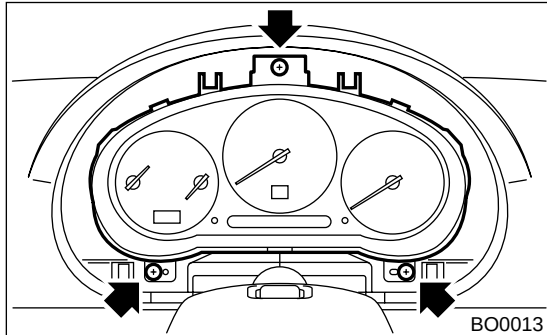
3. Combination Meter Assembly

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Set tilt steering at the lowest position.
- 3) Remove screws and detach meter visor.



- 4) Remove screws of combination meter and pull out the meter toward you.



- 5) Disconnect connector in the upper area of combination meter to remove meter.

CAUTION:

- Be careful not to damage meter or instrument panel.
- Pay particular attention to avoid damaging the meter glass.

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.

COMBINATION METER ASSEMBLY

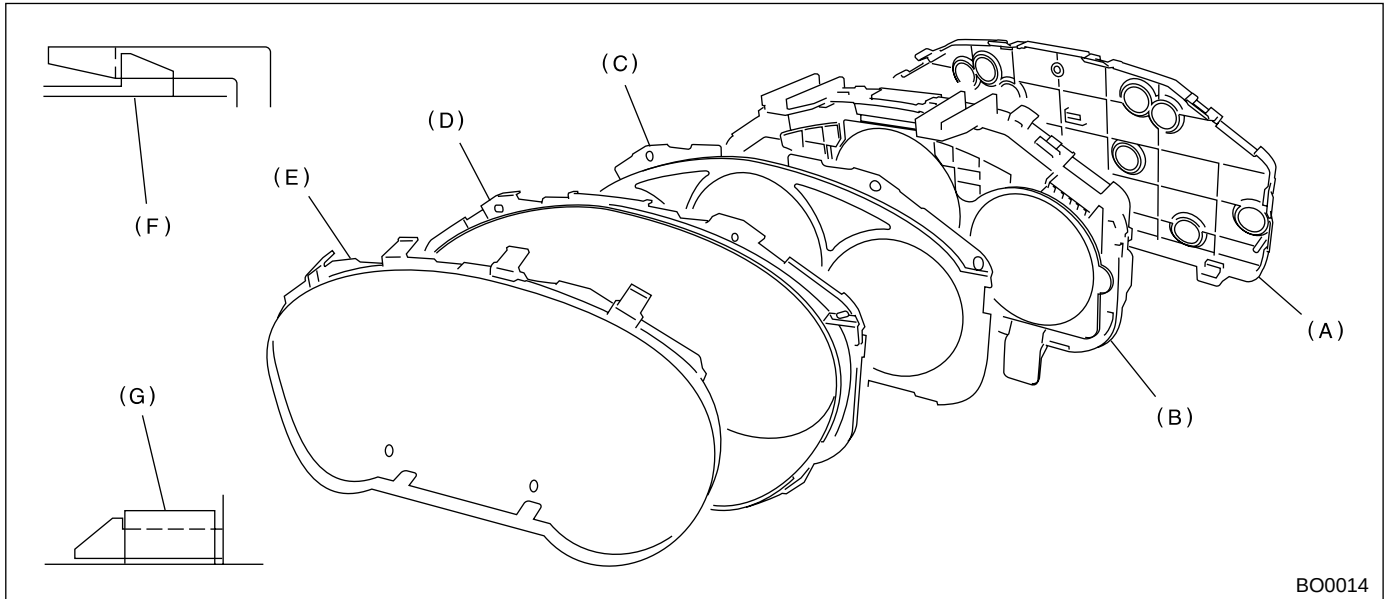
INSTRUMENTATION/DRIVER INFO

C: DISASSEMBLY

CAUTION:

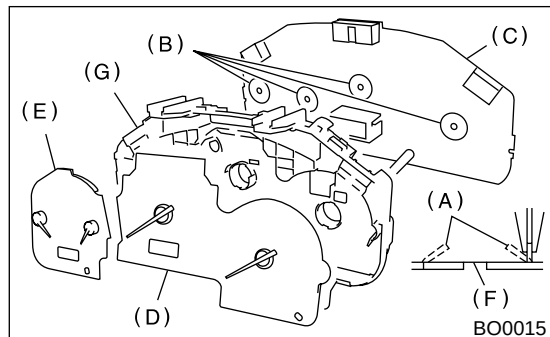
Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

- 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.

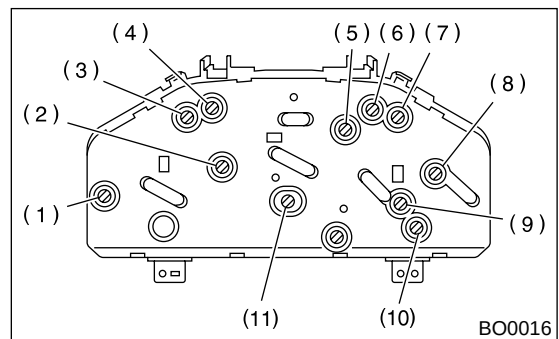


3) Pull up claw (A) in portion (B) of combination meter printed circuit (C) with combination pliers. Push out speedometer and tachometer assembly (D) and fuel gauge and water temperature gauge assembly (E) using hole (F).

4) Pull up claw in the center of combination meter printed circuit (C), and remove circuit plate from case (G).



1. BULB REPLACEMENT



- (1) Tachometer
- (2) Speedometer and tachometer
- (3) Turn RH
- (4) HI-beam
- (5) Speedometer
- (6) POWER
- (7) Turn LH
- (8) Fuel gauge
- (9) Temperature gauge
- (10) LCD (Outside temperature indicator)
- (11) LCD (Odometer and tripmeter)

D: ASSEMBLY

Assemble in the reverse order of disassembly.

4. Speedometer

A: REMOVAL

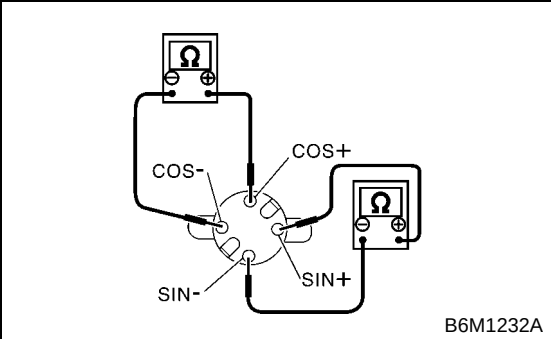
Disassemble combination meter, and then remove speedometer and tachometer assembly. <Ref. to IDI-20, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure resistance between speedometer terminals.



Tester connection	Resistance
Terminals SIN+ —SIN—	200±8 Ω
Terminals COS+ —COS—	200±8 Ω

If NG, replace speedometer and tachometer assembly.
If OK, replace combination meter printed circuit.

5. Tachometer

A: REMOVAL

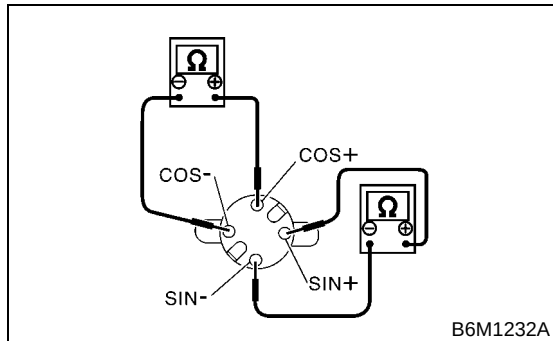
Disassemble combination meter, and then remove speedometer and tachometer assembly. <Ref. to IDI-20, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure resistance between tachometer terminals.



Tester connection	Resistance
Terminals SIN+ —SIN—	$200 \pm 8 \Omega$
Terminals COS+ —COS—	$200 \pm 8 \Omega$

If NG, replace speedometer and tachometer assembly.

If OK, replace combination meter printed circuit.

6. Fuel Gauge

A: REMOVAL

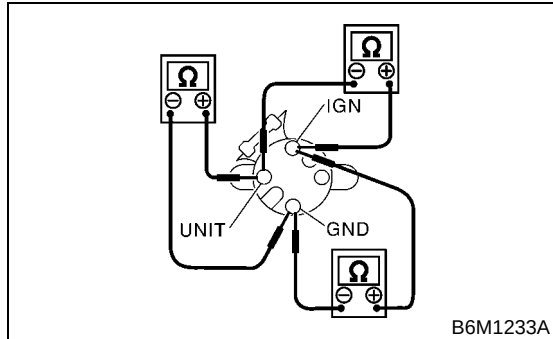
Disassemble combination meter, and then remove water temperature gauge and fuel gauge assembly. <Ref. to IDI-20, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure resistance between fuel gauge terminals.



Tester connection	Resistance
Terminals IGN — GND	$170 \pm 10 \Omega$
Terminals IGN — UNIT	$35 \pm 10 \Omega$
Terminals UNIT — GND	$136 \pm 10 \Omega$

If NG, replace water temperature gauge and fuel gauge assembly.

If OK, replace combination meter printed circuit.

WATER TEMPERATURE GAUGE

INSTRUMENTATION/DRIVER INFO

7. Water Temperature Gauge

A: REMOVAL

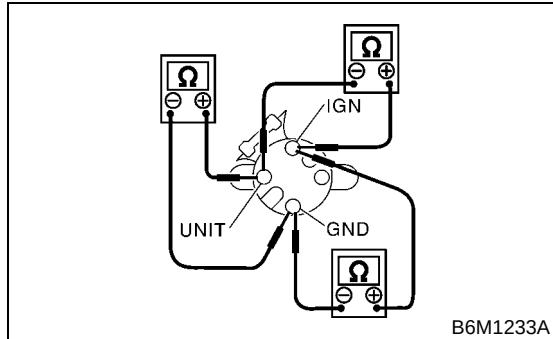
Disassemble combination meter, and then remove tachometer and water temperature gauge and fuel gauge assembly. <Ref. to IDI-20, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure resistance between fuel gauge terminals.



Tester connection	Resistance
Terminals IGN — GND	208±10 Ω
Terminals IGN — UNIT	56±10 Ω
Terminals UNIT — GND	264±10 Ω

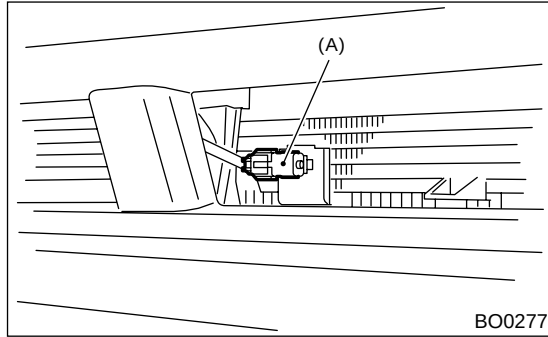
If NG, replace water temperature gauge and fuel gauge assembly.

If OK, replace combination meter printed circuit.

8. Ambient Sensor

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Disconnect ambient sensor connector.
- 3) Remove ambient sensor (A) from radiator lower panel.

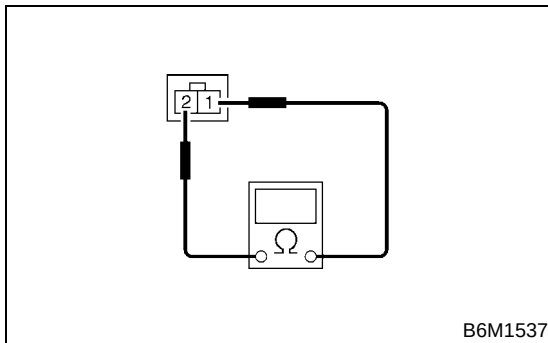


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure resistance between ambient sensor terminals.



Tester connection	Resistance
1 — 2	2.2 kΩ/25°C (77°F)

If NG, replace the ambient sensor.

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

SEATS

SE

	Page
1. General Description	2
2. Front Seat	6
3. Rear Seat	11



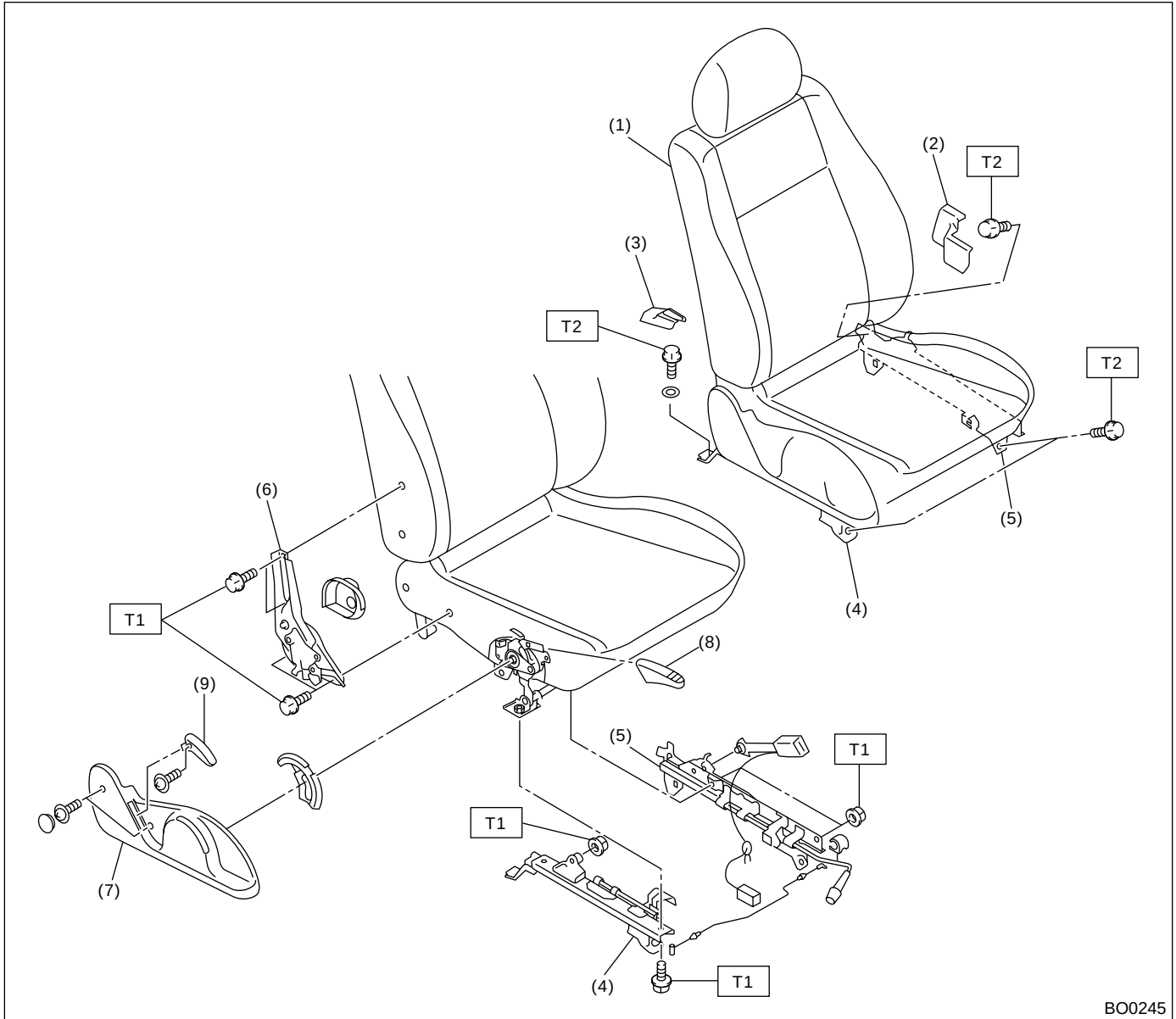
GENERAL DESCRIPTION

SEATS

1. General Description

A: COMPONENT

1. FRONT SEAT



BO0245

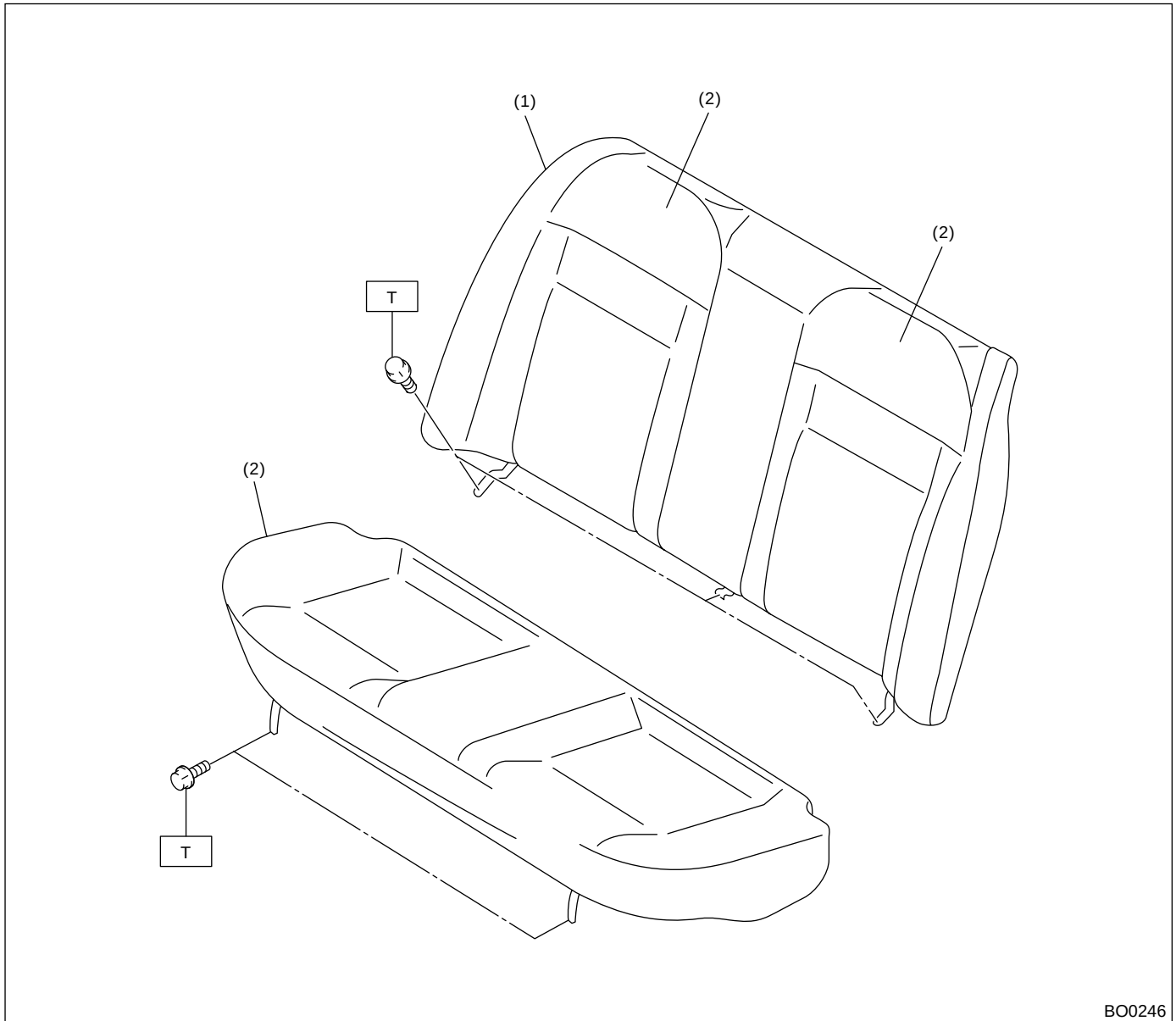
- | | |
|---------------------|-----------------------|
| (1) Front seat ASSY | (6) Seat hinge |
| (2) Rail cover IN | (7) Seat hinge cover |
| (3) Rail cover OUT | (8) Seat lifter lever |
| (4) Slide rail OUT | (9) Reclining lever |
| (5) Slide rail IN | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 30 (3.1, 22)

T2: 53 (5.4, 39)

2. REAR SEAT (SEDAN)



- (1) Backrest
- (2) Head restraint

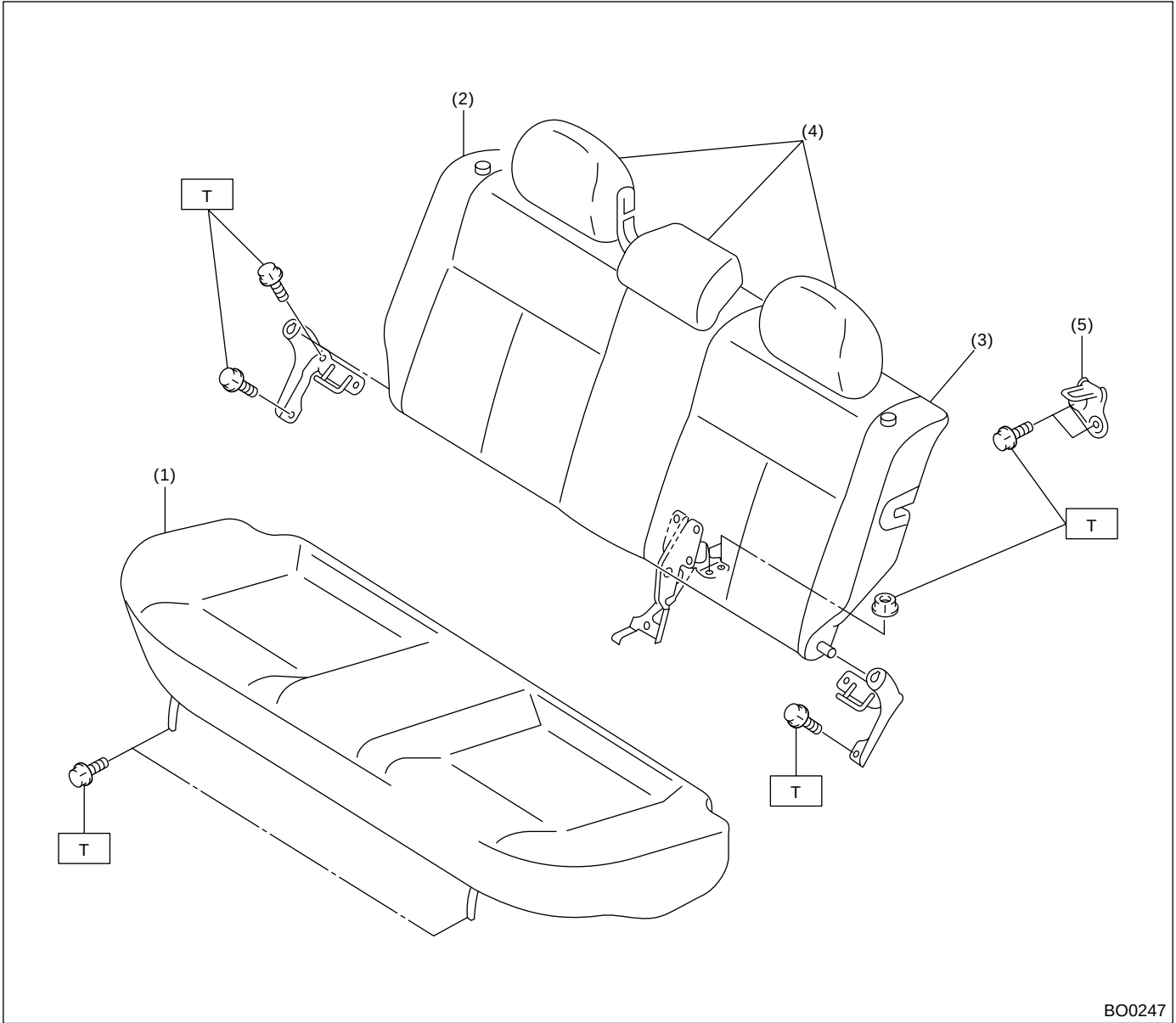
- (3) Cushion

Tightening torque: N·m (kgf-m, ft-lb)
T: 24.5 (2.5, 18.1)

GENERAL DESCRIPTION

SEATS

3. REAR SEAT (WAGON)



- (1) Cushion
- (2) Backrest RH
- (3) Backrest LH

- (4) Head restraint
- (5) Striker

Tightening troque:*N·m (kgf-m, ft-lb)*
T: 24.5 (2.5, 18.1)

B: CAUTION

- Take care not to contaminate or damage seat surface.
- While loading to or unloading to vehicle, take care not to contact body.
- When removing front seat from a side airbag loaded vehicle, follow cautions given in the airbag section.

C: PREPARATION TOOL

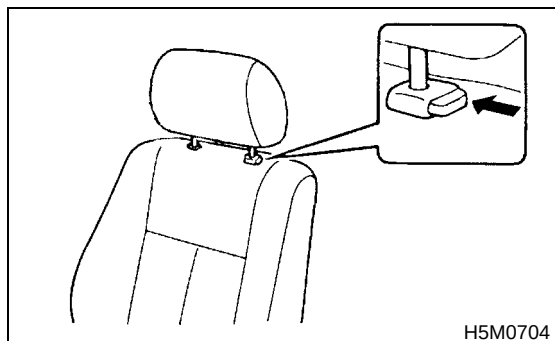
1. GENERAL TOOL

TOOL NAME	REMARKS
Long Nose Pliers	Used for removing and installing hog ring

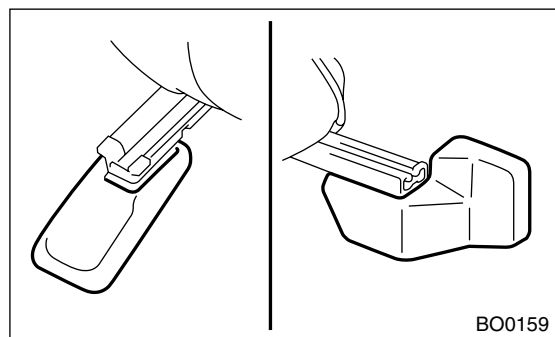
2. Front Seat

A: REMOVAL

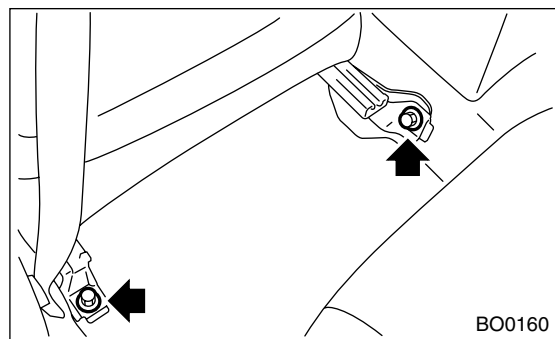
- 1) Disconnect ground cable from the battery.
- 2) While pressing headrest lock button, remove headrest.



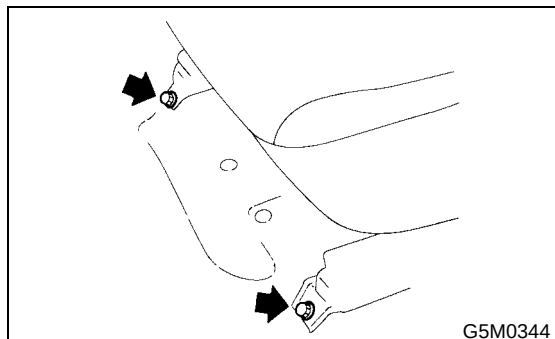
- 3) Tilt forward backrest.
- 4) Move seat to full front end.
- 5) Remove bolt cover at rear end of slide rail.



- 6) Remove two bolts at rear side of seat rail.

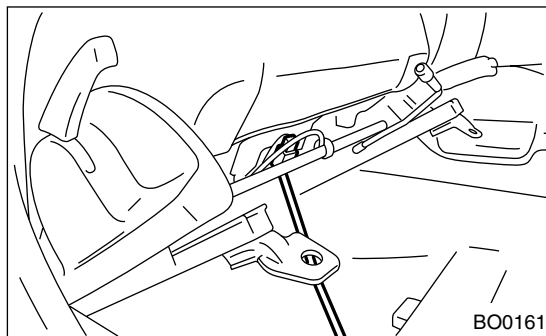


- 7) Move seat to full rear end.
- 8) Remove two bolts at front side of seat rail.



- 9) Disconnect side airbag connector under the seat. (Side airbag equipped vehicle)

- 10) Disconnect connector of seatbelt warning.



- 11) Remove front seat from vehicle.

CAUTION:

When removing seat from vehicle, take care not to damage body, seat, or trim.

B: INSTALLATION

Install in the reverse order of removal.

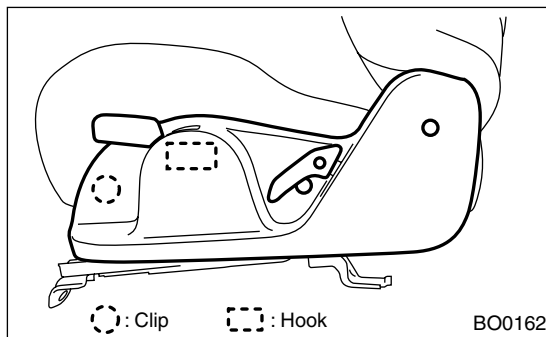
CAUTION:

Confirm that seat can move smoothly and be locked securely at any position.

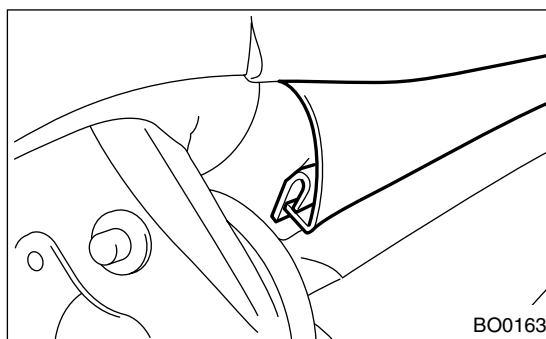
C: DISASSEMBLY

1. DRIVER'S SEAT

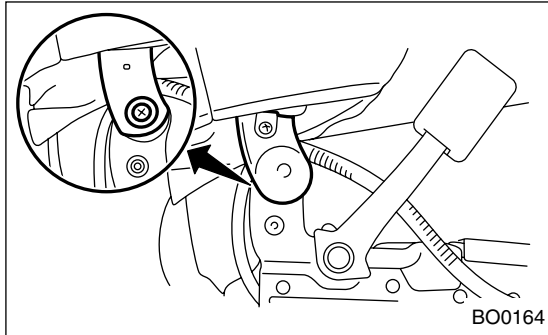
- 1) Remove seat from the vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
- 2) Remove reclining hinge cover.



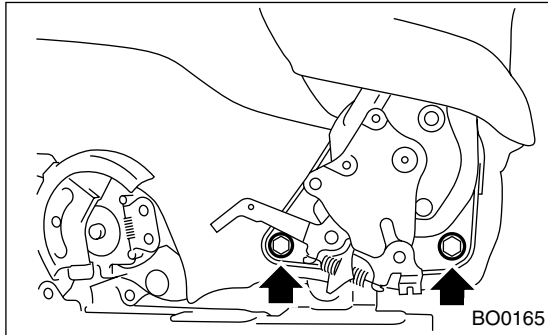
- 3) Remove hook at bottom of seat backrest.



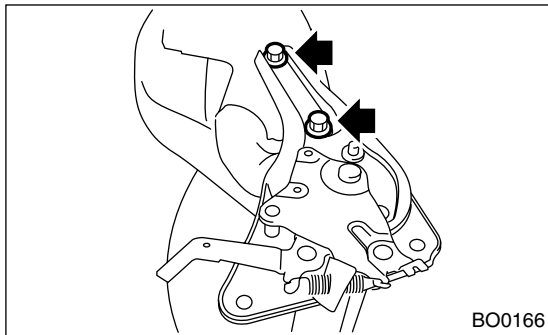
4) Remove hinge cover and screw.



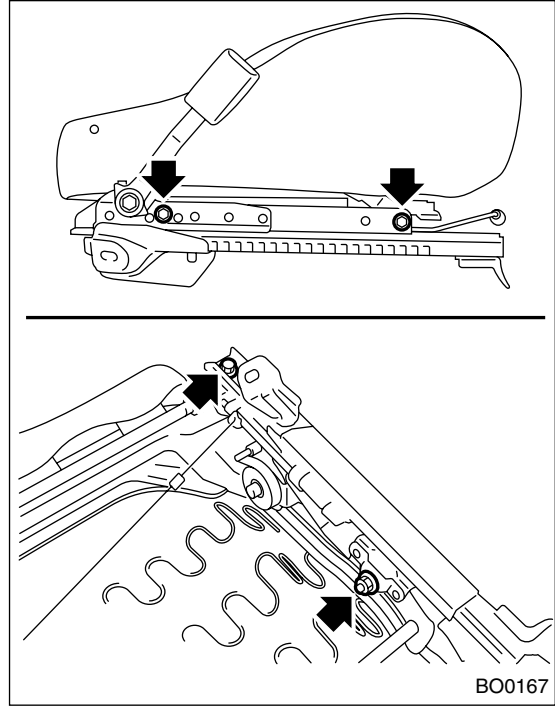
5) Remove two bolts.



6) Turn cover, and remove the two bolts from hinge.

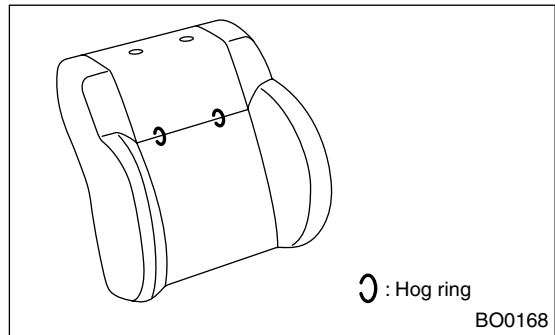


7) Loosen bolt and nuts to remove slide rail.

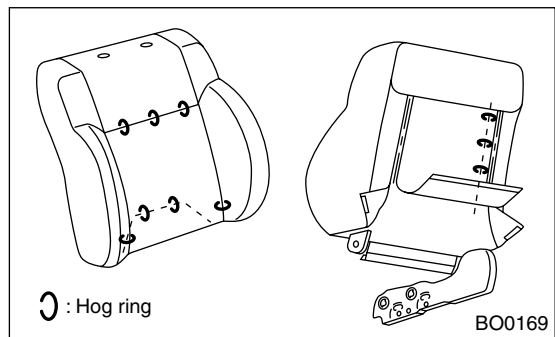


8) Remove hog rings, and then remove seat back rest cover.

Without side airbag model:



With side airbag model:

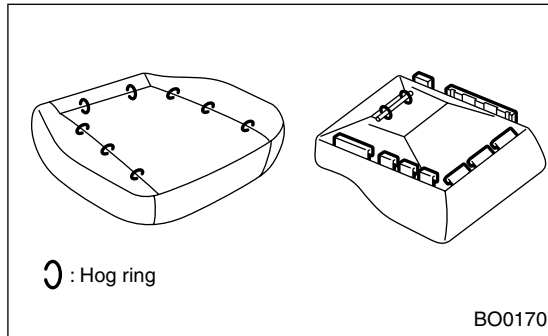


FRONT SEAT

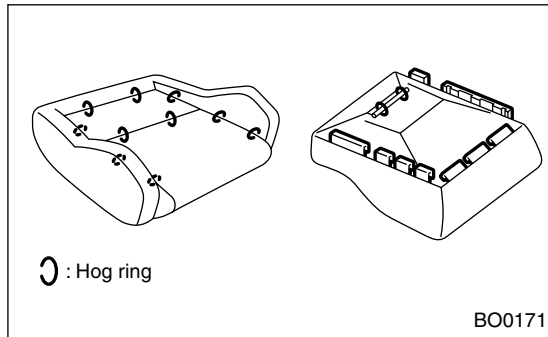
SEATS

9) Remove hog rings, and then remove seat cushion cover.

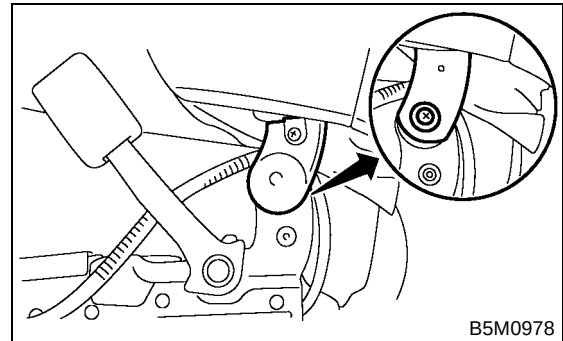
Standard type model:



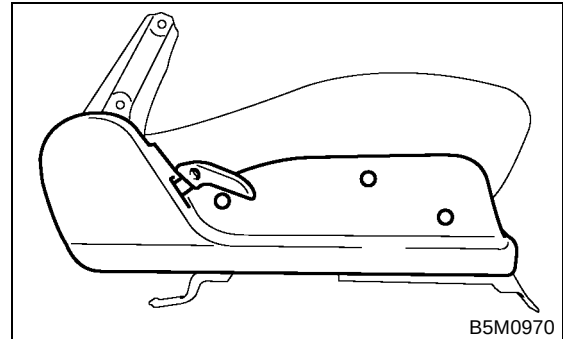
Sporty type model:



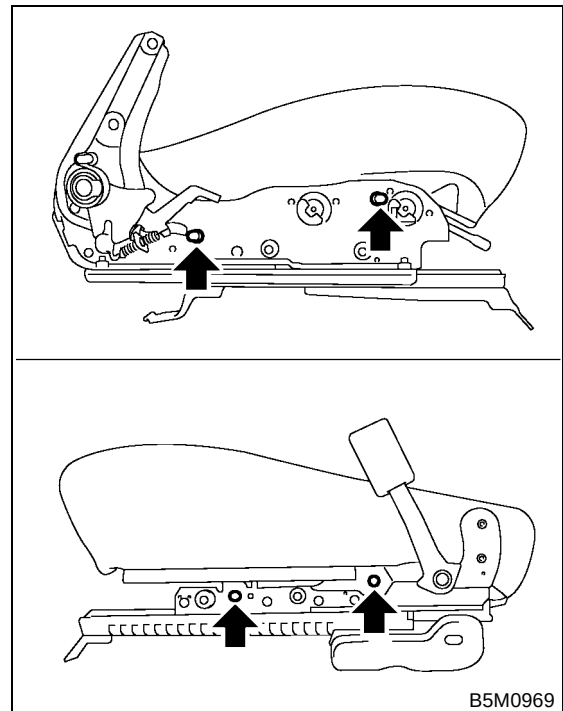
4) Remove hinge screw cover and screw, and remove seat back rest from hinge.



5) Remove reclining lever cover and hinge cover.



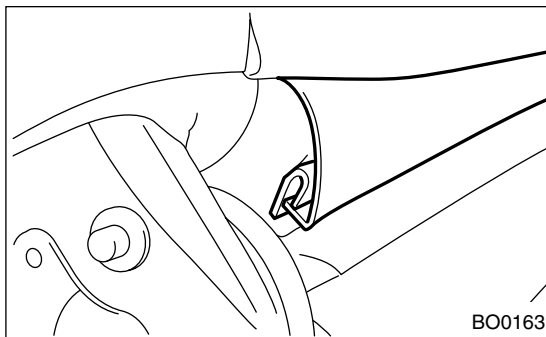
6) Loosen 4 bolts to remove seat cushion.



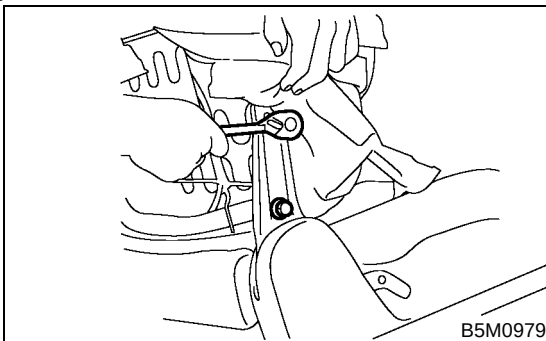
2. PASSENGER'S SEAT

1) Remove seat from the vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>

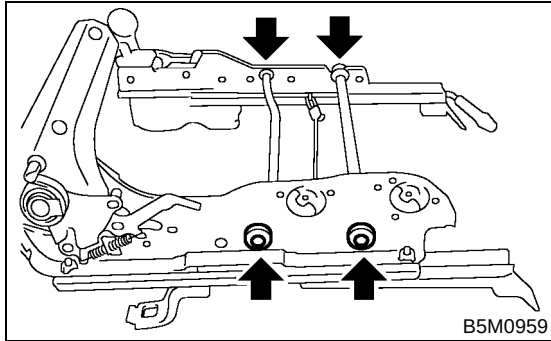
2) Remove hook at bottom of seat back rest.



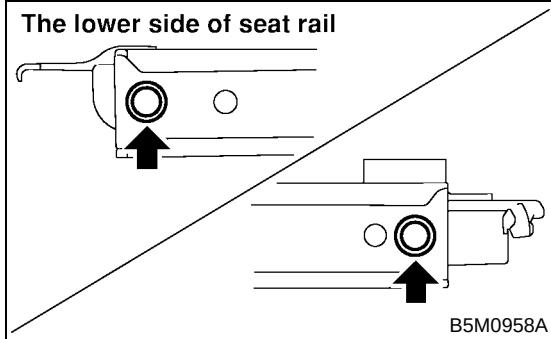
3) Turn cover, and remove the two bolts from hinge.



7) Loosen 4 screws to remove hinge.

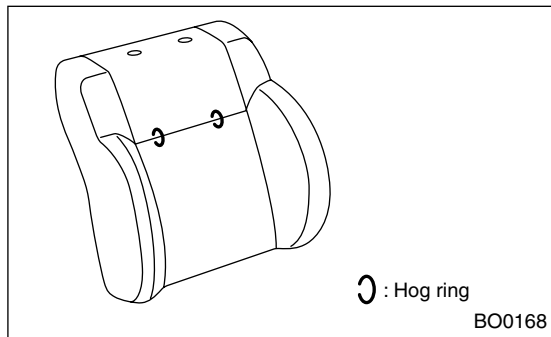


8) Loosen two bolts to remove slide rail.

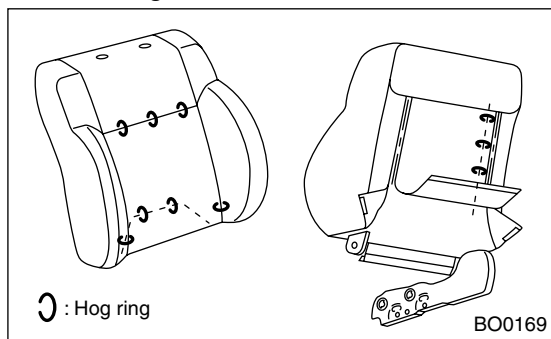


9) Remove hog rings, and then remove seat back rest cover.

Without side airbag model:

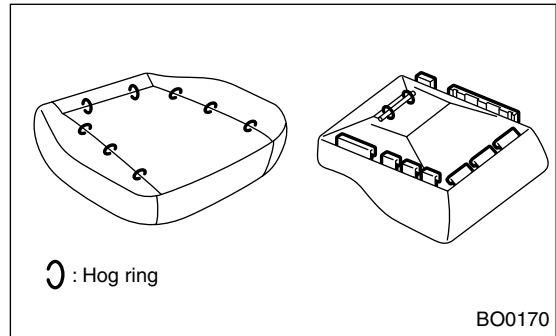


With side airbag model:

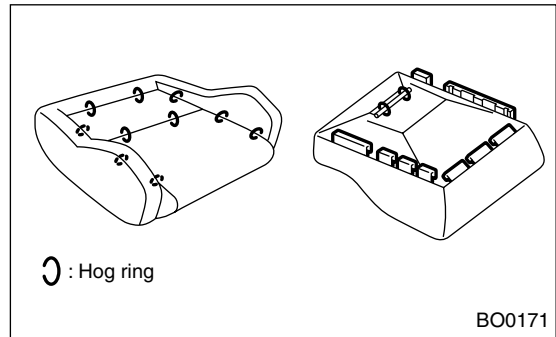


10) Remove hog rings, and then remove seat cushion cover.

Standard type model:



Sporty type model:



D: ASSEMBLY

1. DRIVER'S SEAT

Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.

2. PASSENGER'S SEAT

Assemble in the reverse order of disassembly.

NOTE:

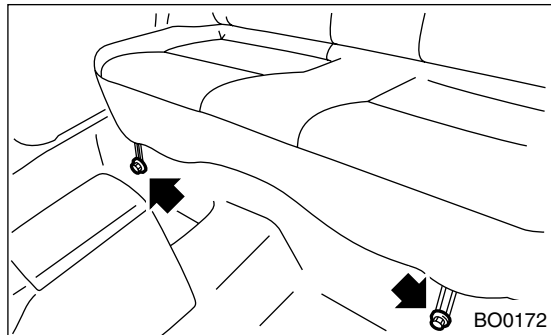
- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.

3. Rear Seat

A: REMOVAL

1. WAGON

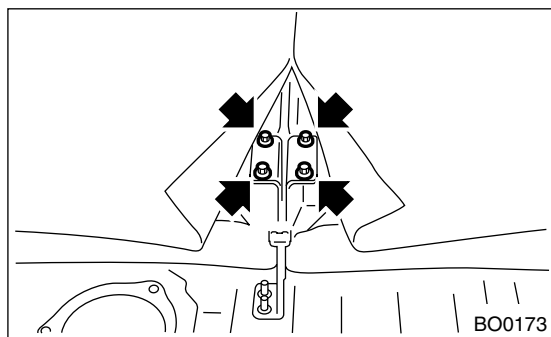
1) Remove bolts, and then detach rear seat cushion.



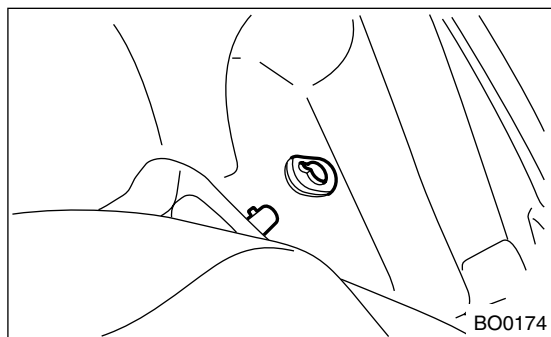
2) Remove headrest.

3) Remove the luggage floor mat. <Ref. to EI-38, REMOVAL, Luggage Floor Mat.>

4) Turn over the mat to remove bolts.

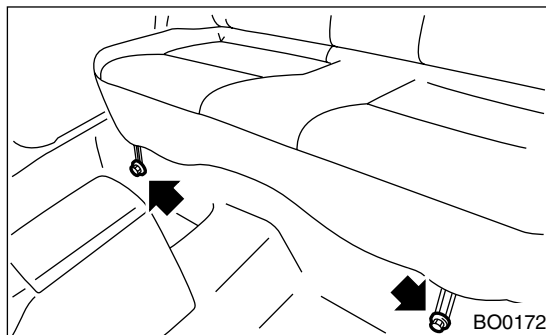


5) Remove rear seat backrest.

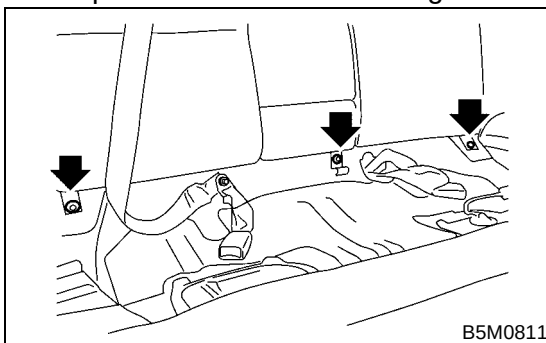


2. SEDAN

1) Remove bolts, and then detach rear seat cushion.



2) Remove bolts securing lower portion of backrest and then open the center trunk through lid.



3) Lift rear seat backrest and then remove it.

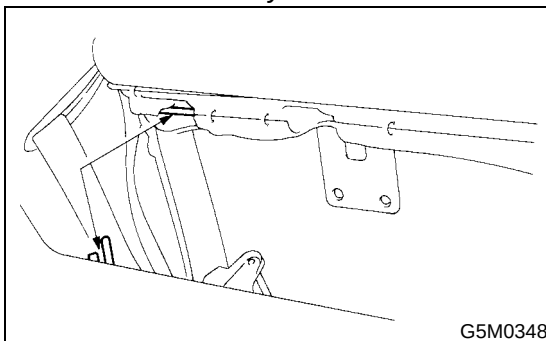
B: INSTALLATION

1. WAGON

Install in the reverse order of removal.

2. SEDAN

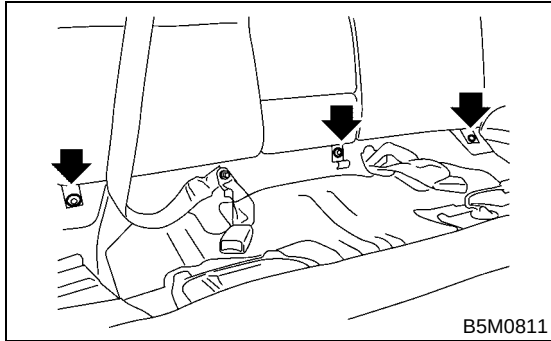
1) Hook and fasten the upper-back side of the rear seat backrest to the body hook.



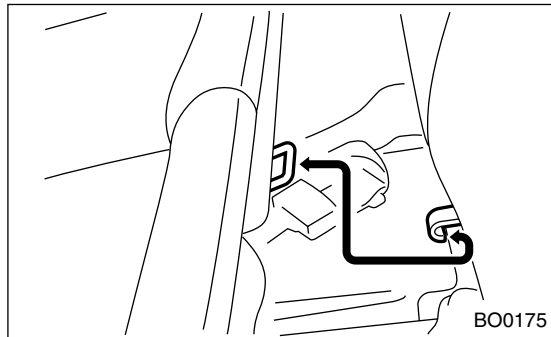
REAR SEAT

SEATS

2) Tighten the bolts.



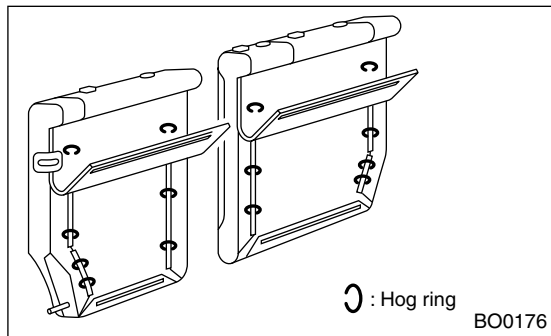
3) Hook and fasten the seat cushion to the hook on the lower part of the rear seat backrest.



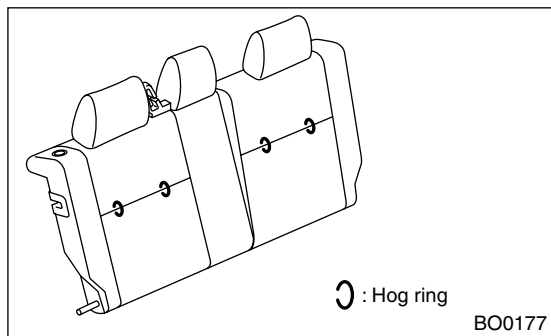
C: DISASSEMBLY

1. WAGON

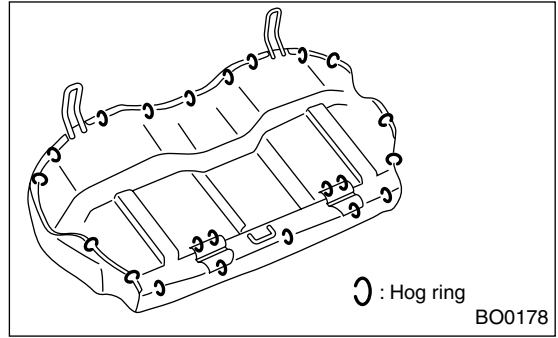
- 1) Remove rear seat. <Ref. to SE-11, WAGON, REMOVAL, Rear Seat.>
- 2) Remove hog rings from around the seat backrest.



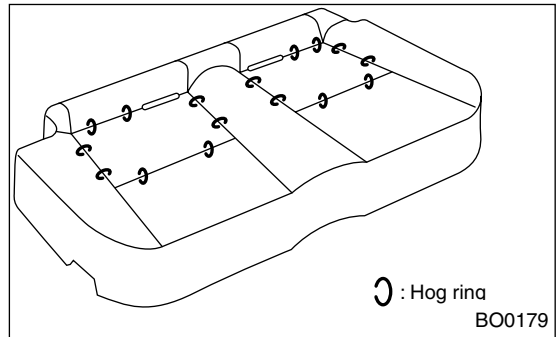
3) Remove the hog rings on front side of cushion pad, and then remove cover.



4) Remove hog rings from around the seat cushion.



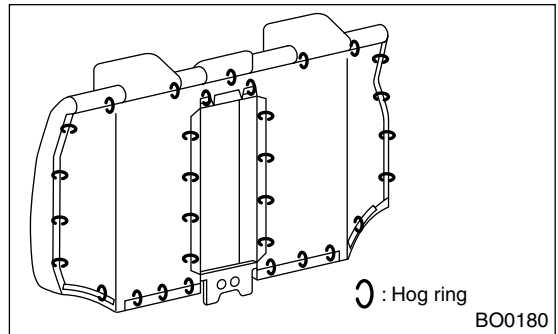
5) Remove the hog rings, and then remove the cover.



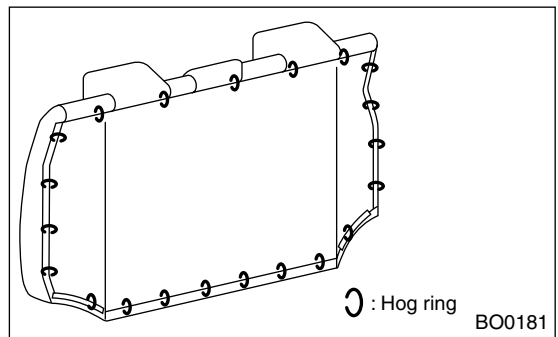
2. SEDAN

- 1) Remove rear seat. <Ref. to SE-11, SEDAN, REMOVAL, Rear Seat.>
- 2) Remove the hog rings from around the seat backrest.

Armrest through type model:

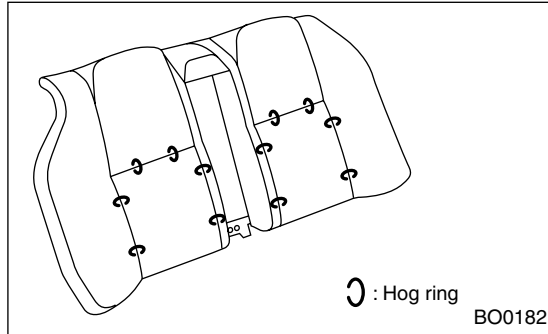


Unified type model:

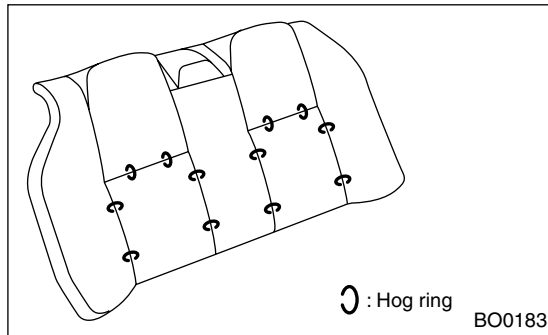


3) Remove the hog rings, and then remove the seat cover.

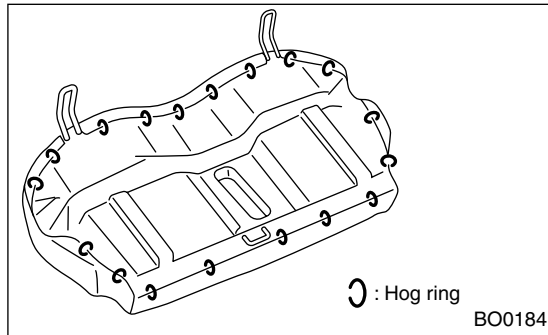
Armrest through type model:



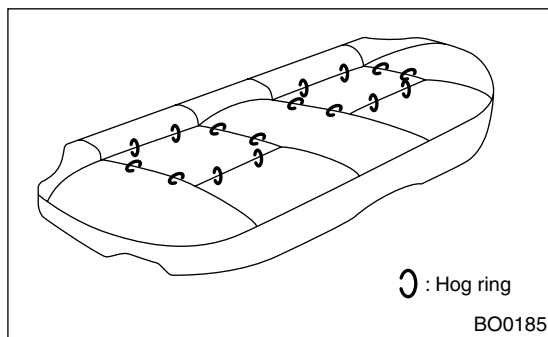
Unified type model:



4) Remove the hog rings around the seat cushion.



5) Remove the hog rings, and then remove the seat cover.



D: ASSEMBLY

1. WAGON

Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.

2. SEDAN

Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.

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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.

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HVAC SYSTEM
(HEATER, VENTILATOR AND A/C) AC

HVAC SYSTEM (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

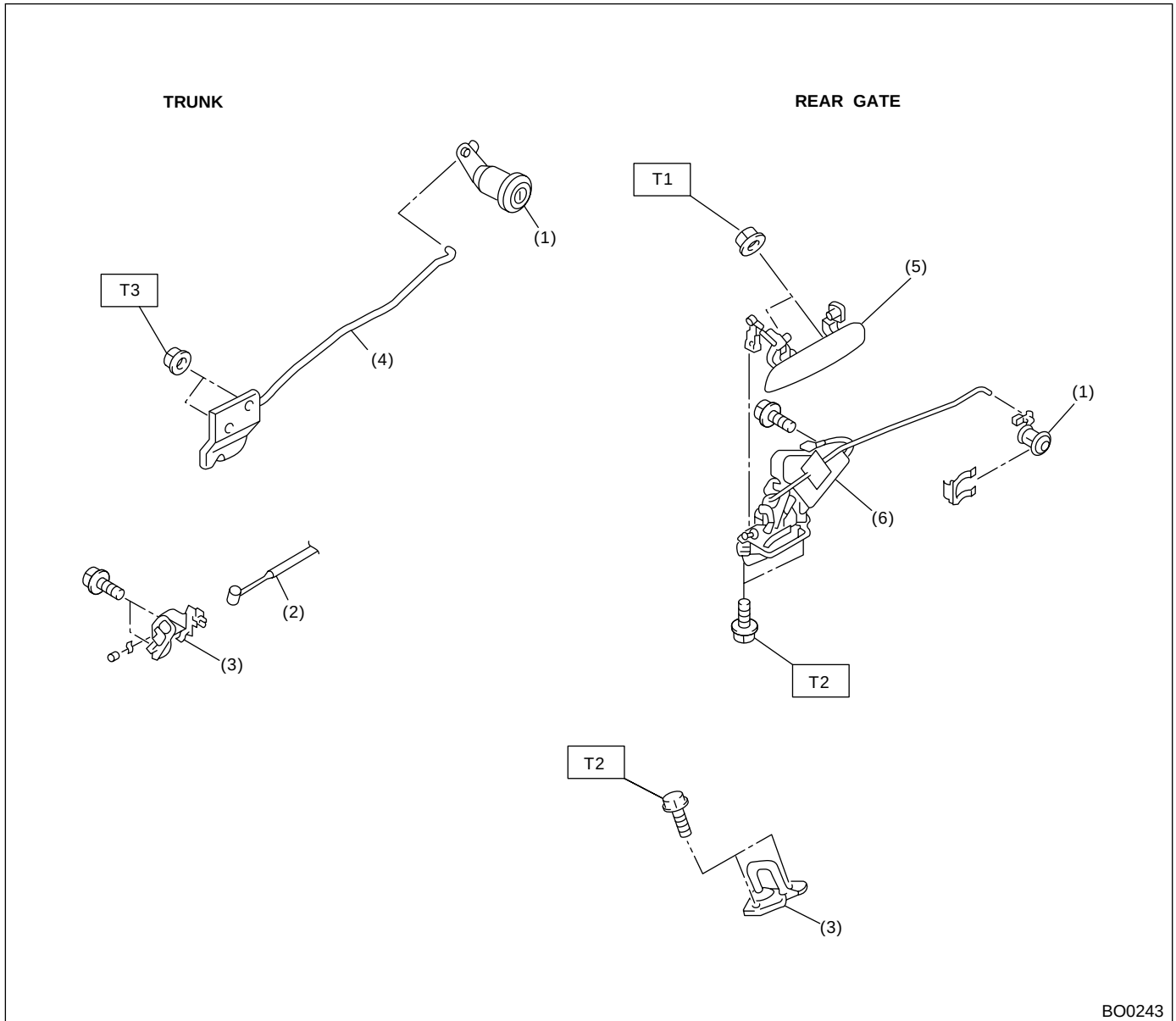
EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

SECURITY AND LOCKS

SL

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2. TRUNK LID AND REAR GATE LOCK



BO0243

- | | |
|-------------------------|----------------------------|
| (1) Key cylinder | (5) Rear gate outer handle |
| (2) Cable | (6) Rear gate actuator |
| (3) Striker | |
| (4) Trunk lid lock ASSY | |

Tightening torque: N·m (kgf-m, ft-lb)

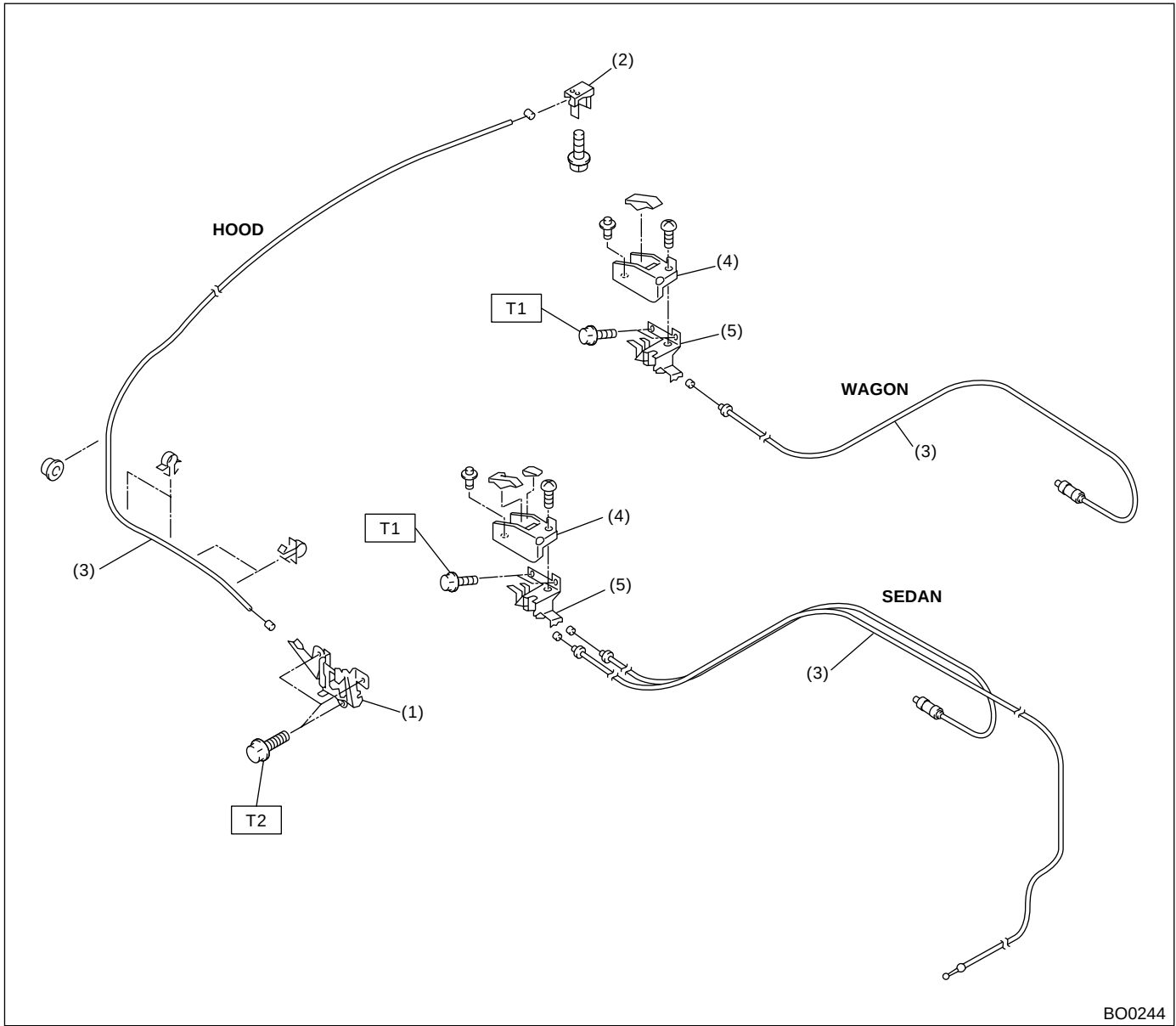
T1: 7.4 (0.75, 5.4)

T2: 25 (2.5, 18.1)

GENERAL DESCRIPTION

SECURITY AND LOCKS

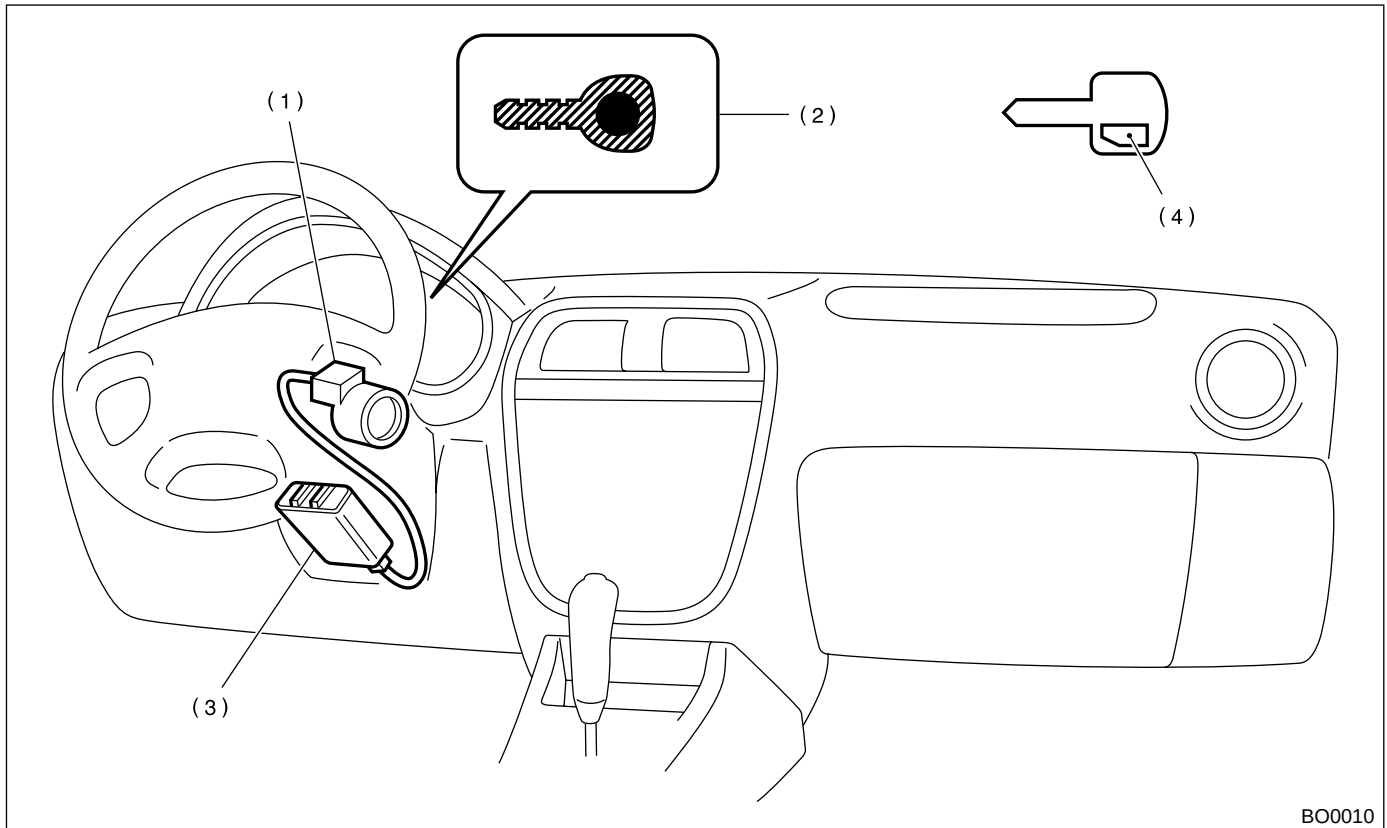
3. HOOD LOCK AND REMOTE OPENERS



- (1) Hood lock ASSY
- (2) Lever ASSY
- (3) Cable
- (4) Cover

- (5) Pull handle ASSY

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)

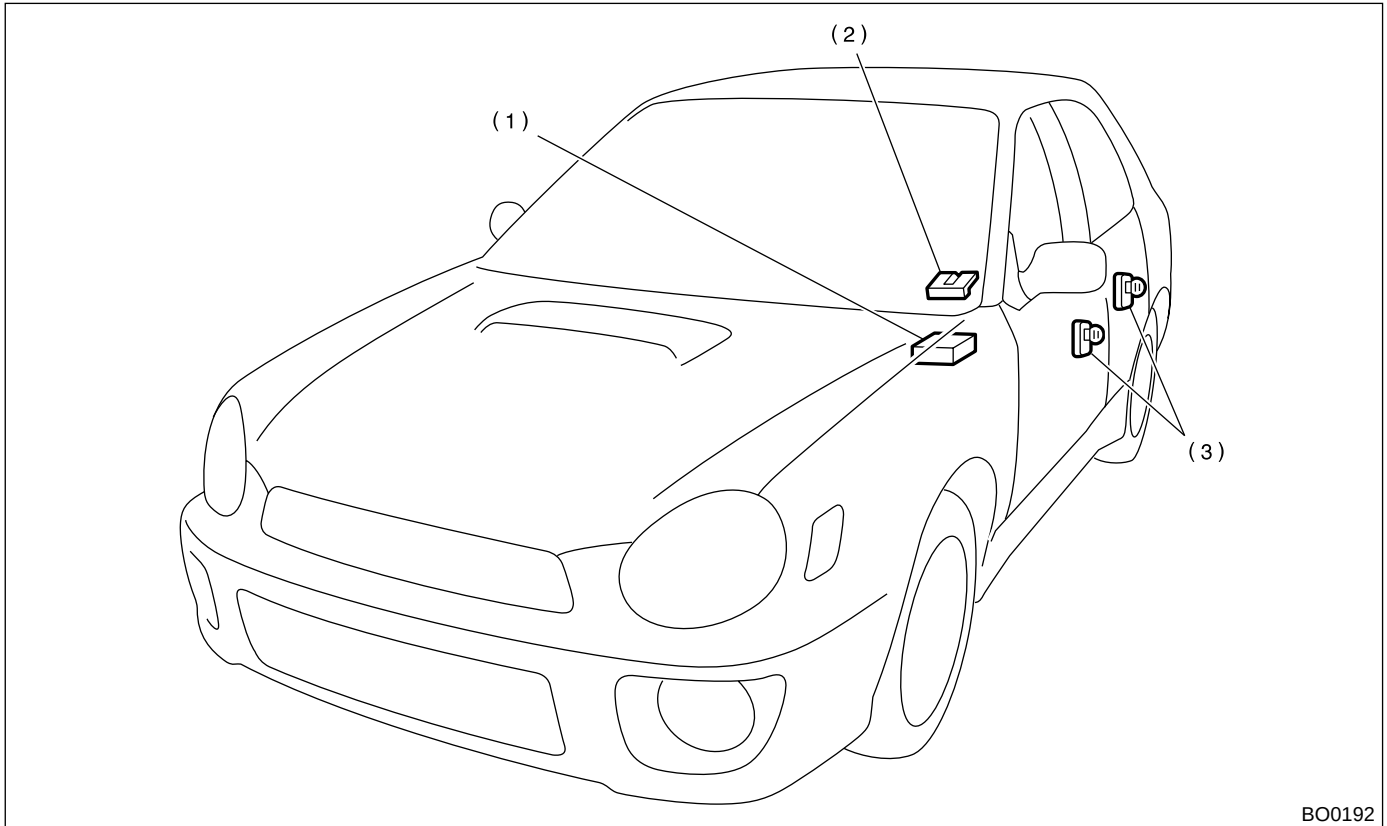
(3) Immobilizer control module (IMM ECM)

(4) Transponder

NOTE:

IMM ECM location for RHD model is symmetrically opposite.

5. KEYLESS ENTRY SYSTEM



BO0192

(1) Keyless entry control module

(2) Rear gate latch switch (Wagon)

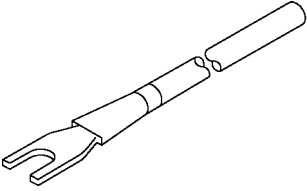
(3) Door switch

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. Otherwise, these contents are cancelled upon disconnection.
- 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 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
 B5M1120	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.

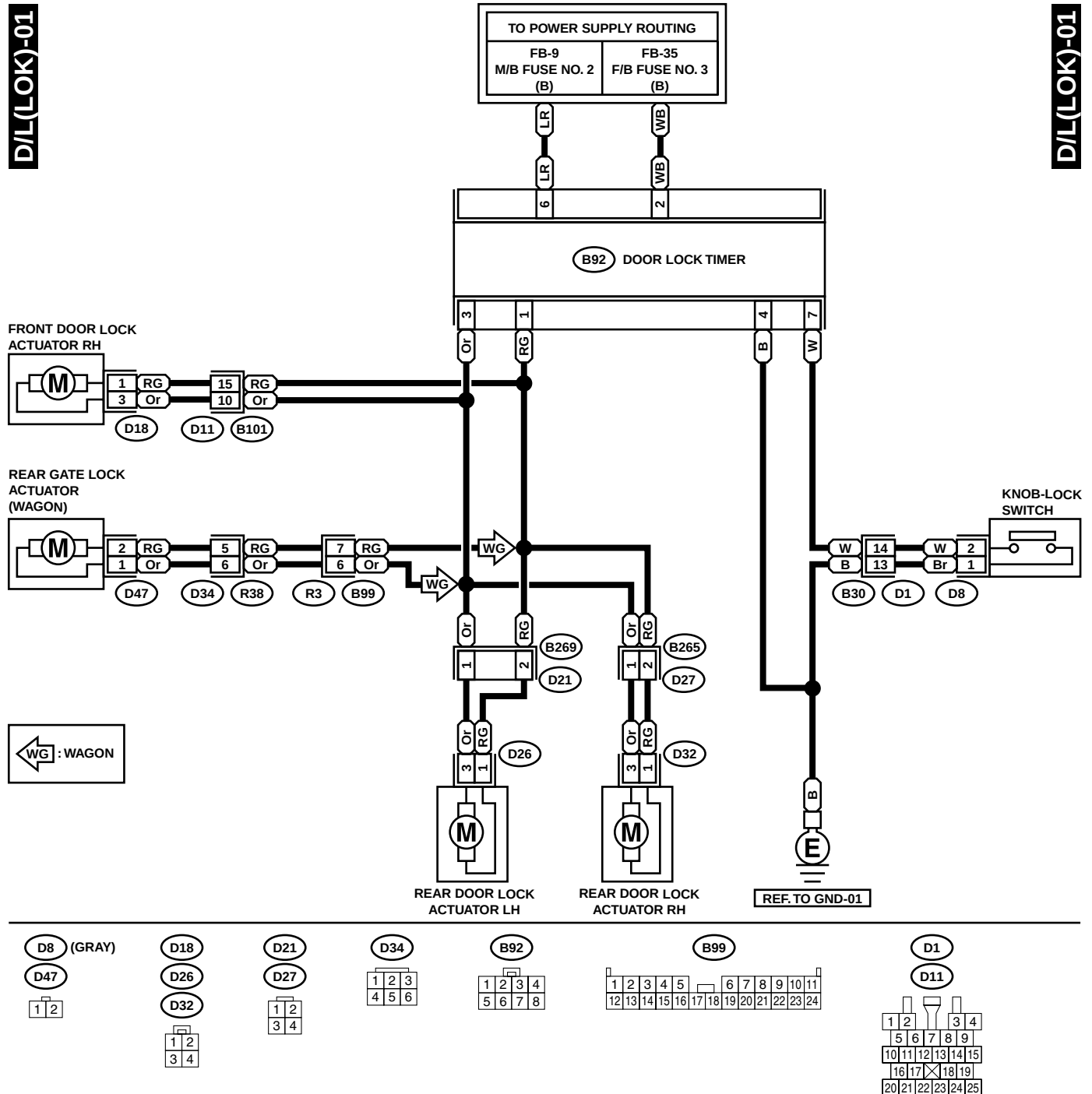
DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

2. Door Lock Control System

A: SCHEMATIC

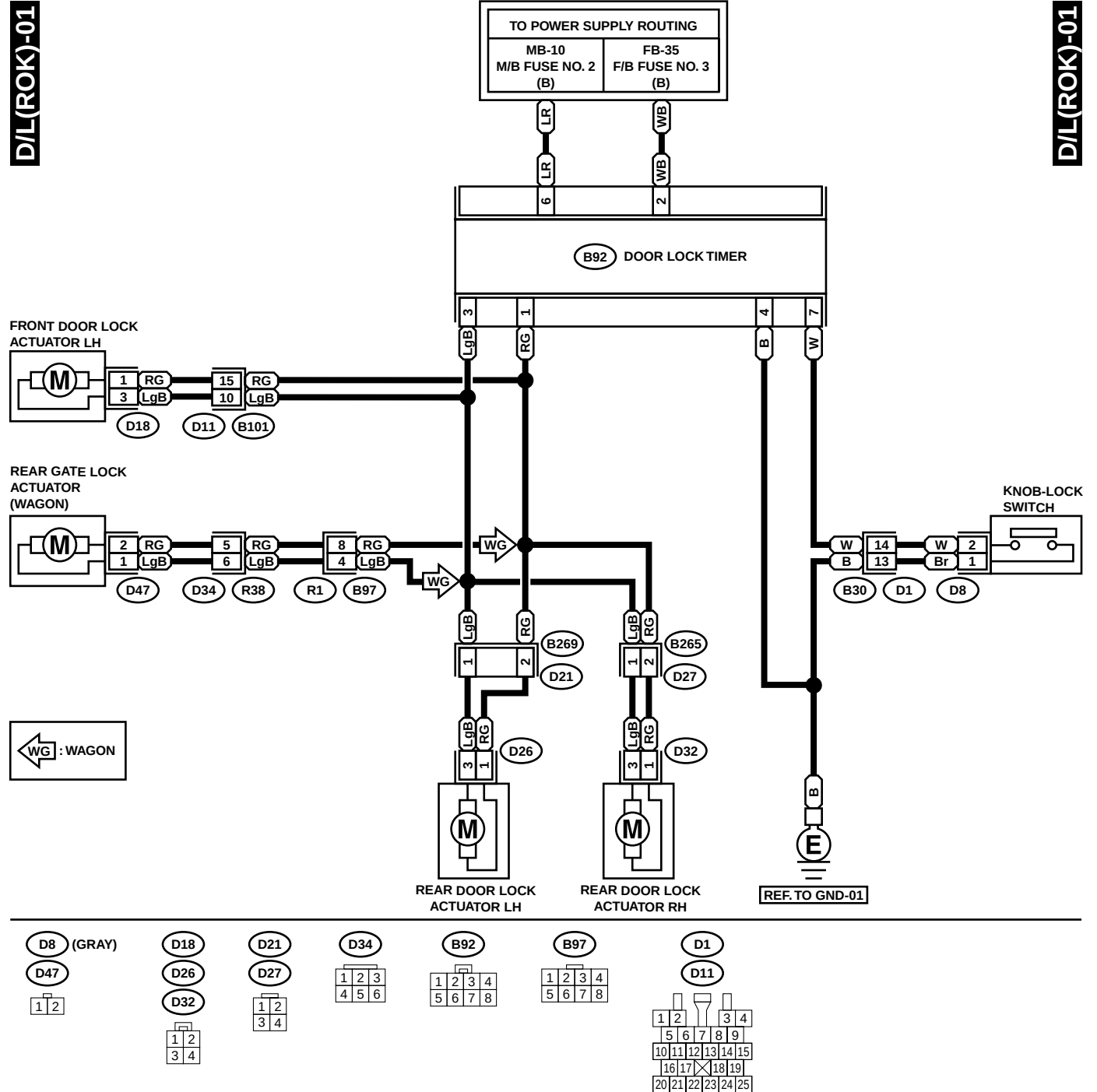
1. DOOR LOCK CONTROL LHD WITHOUT KEYLESS ENTRY MODEL



DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

2. DOOR LOCK CONTROL RHD WITHOUT KEYLESS ENTRY MODEL



GR73-21

SECURITY AND LOCKS

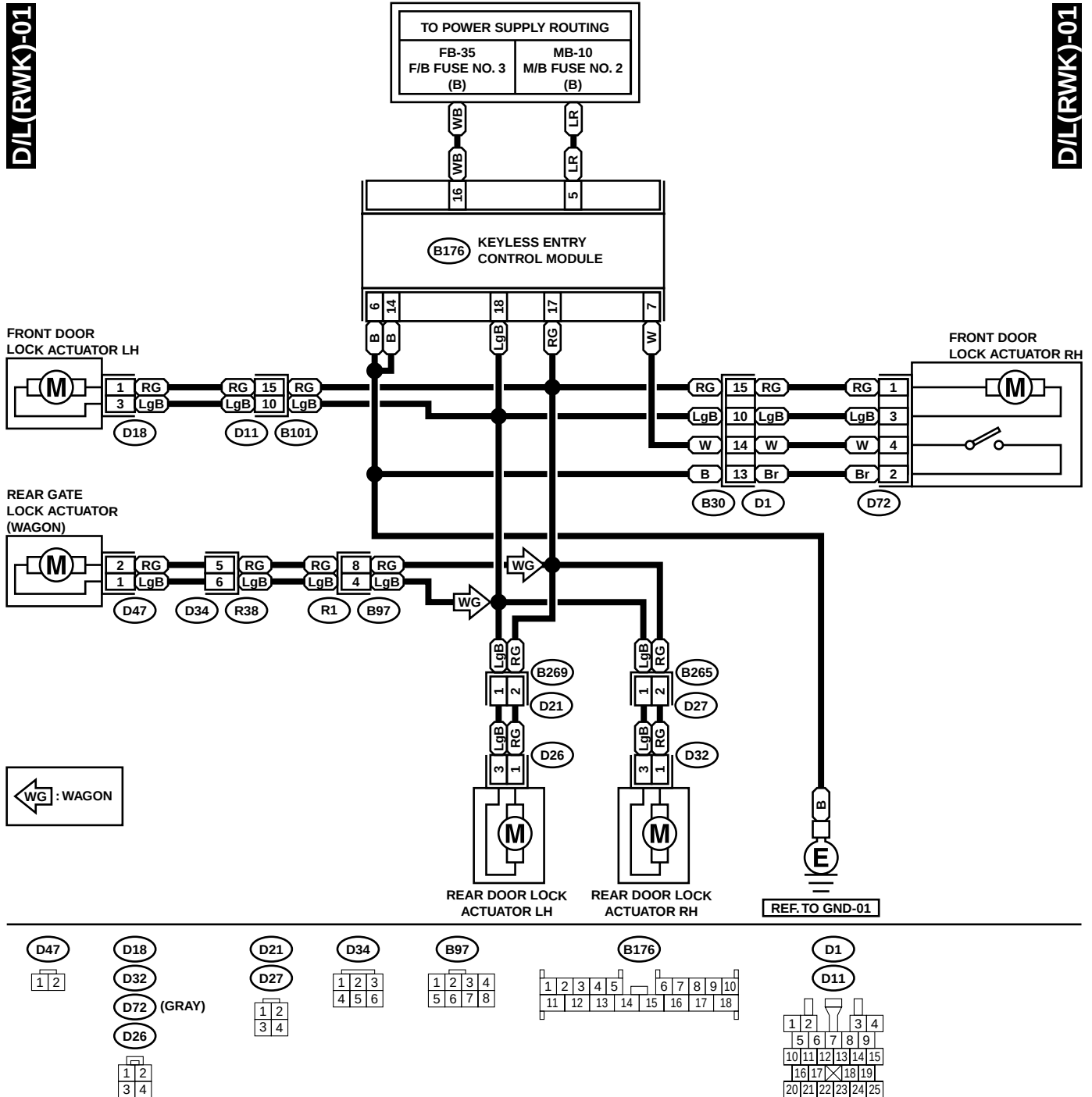
D/L(LWK)-01



4. DOOR LOCK CONTROL RHD WITH KEYLESS ENTRY MODEL

D/L(RWK)-01

D/L(RWK)-01



DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

B: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
The door lock control system does not operate.	1. Check the fuse.	<Ref. to SL-12, CHECK FUSE, INSPECTION, Door Lock Control System.>
	2. Check the power supply and ground circuit for the door lock timer (without keyless entry) or keyless entry control module (with keyless entry).	<Ref. to SL-12, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the door lock switch and the circuit.	<Ref. to SL-13, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
	4. Check the door lock actuator and the circuit.	<Ref. to SL-14, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
The door lock switch (knob) does not operate.	Check the door lock switch and the circuit.	<Ref. to SL-13, 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-14, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>

2. CHECK FUSE

Step	Check	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 (15A)?	Replace the fuse with a new one.	Check power supply and ground circuit. <Ref. to SL-12, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Check	Yes	No
1 CHECK POWER SUPPLY. 1) Disconnect the door lock timer or keyless entry control module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. Connector & terminal Without keyless entry: (B92) No. 2 (+) — Chassis ground (-): (B92) No. 6 (+) — Chassis ground (-): With keyless entry: (B176) No. 5 (+) — Chassis ground (-): (B176) No. 16 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Check the harness for open circuits or shorts between the door lock timer or keyless entry control module and the fuse.

DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

Step	Check	Yes	No
2 CHECK GROUND CIRCUIT. Measure the resistance between the harness connector terminal and chassis ground. Connector & terminal Without keyless entry: (B92) No. 4 (+) — Chassis ground (-): With keyless entry: (B176) No. 6 (+) — Chassis ground (-): (B176) No. 14 (+) — Chassis ground (-):	Is the resistance less than 10 Ω ?	Power supply and ground circuit is OK.	Repair harness.

4. CHECK DOOR LOCK SWITCH AND CIRCUIT

Step	Check	Yes	No
1 CHECK DOOR LOCK CONTROL SYSTEM TYPE.	Is the vehicle equipped with keyless entry system?	Go to step 6.	Go to step 2.
2 CHECK DOOR LOCK SWITCH CIRCUIT. 1)Disconnect the door lock timer 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 (B92) No. 7 (+) — Chassis ground (-):	Is the resistance less than 10 Ω ?	Go to step 3.	Go to step 4.
3 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 (B92) No. 7 (+) — Chassis ground (-):	Is the resistance less than 10 Ω ?	Go to step 4.	The door lock switch is OK.
4 CHECK DOOR LOCK SWITCH. 1)Disconnect the driver's door lock switch harness connector. 2)Check the continuity between the door lock switch terminals when moving the door lock knob to UNLOCK. Terminal No. 1 — No. 2:	Does continuity exist?	Go to step 5.	Replace the door lock switch.
5 CHECK DOOR LOCK SWITCH. Check the continuity between the door lock switch terminals when moving the door lock knob to LOCK. Terminal No. 1 — No. 2:	Does continuity exist?	Replace the door lock switch.	Check the harness for open circuits or shorts between the door lock timer and the door lock switch.
6 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 resistance less than 10 Ω ?	Go to step 7.	Go to step 8.

DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

Step	Check	Yes	No
7 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 (-):	Is the resistance less than 10 Ω ?	Go to step 8.	The door lock switch is OK.
8 CHECK DOOR LOCK SWITCH. 1) Disconnect the driver's door lock switch (actuator) harness connector. 2) Check the continuity between the door lock switch terminals when moving the door lock knob to UNLOCK. Terminal No. 2 — No. 4:	Does continuity exist?	Go to step 9.	Replace the door lock switch (actuator).
9 CHECK DOOR LOCK SWITCH. Check the continuity between the door lock switch terminals when moving the door lock knob to LOCK. Terminal No. 2 — No. 4:	Does continuity exist?	Replace the door lock switch (actuator).	Check the harness for open circuits or shorts between the keyless entry control module and the door lock switch.

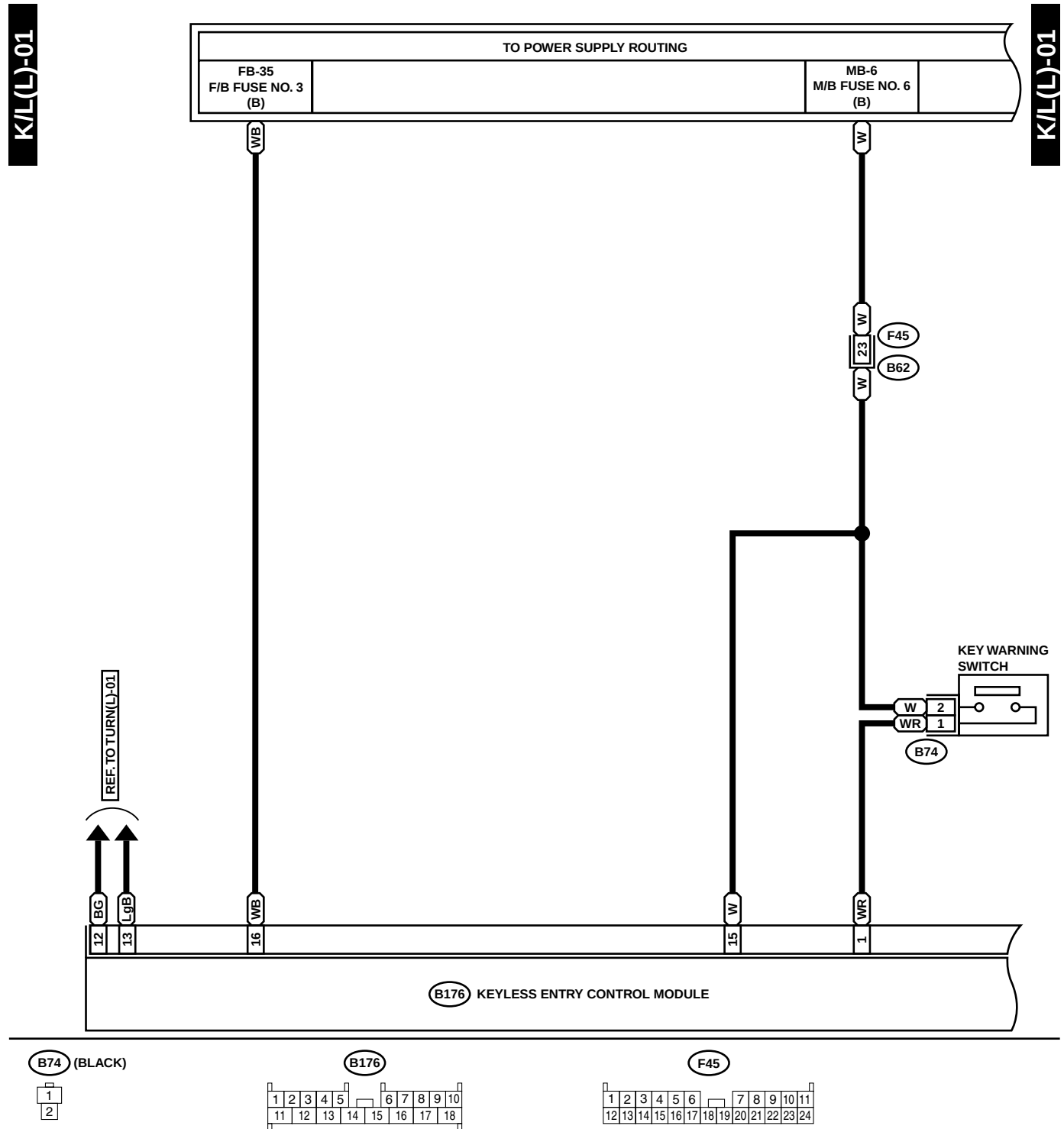
5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL. Measure the voltage between the harness connector terminal and chassis ground when moving the door lock knob to LOCK. Connector & terminal Without keyless entry: (B92) No. 3 — Chassis ground: With keyless entry: (B176) No. 18 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Replace the door lock timer or keyless entry control module.
2 CHECK OUTPUT SIGNAL. Measure the voltage between the harness connector terminal and chassis ground when moving the door lock knob to UNLOCK. Connector & terminal Without keyless entry: (B92) No. 1 — Chassis ground: With keyless entry: (B176) No. 17 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Replace the door lock timer or keyless entry control module.
3 CHECK DOOR LOCK ACTUATOR. Check the door lock actuator. Front door lock actuator: <Ref. to SL-31, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-35, Rear Door Lock Actuator.> Rear gate latch lock actuator: <Ref. to SL-38, Rear Gate Latch Lock Actuator.>	Is the door lock actuator OK?	Check the harness for open circuits or shorts between the door lock timer or keyless entry control module and the door lock actuator.	Replace the door lock actuator.

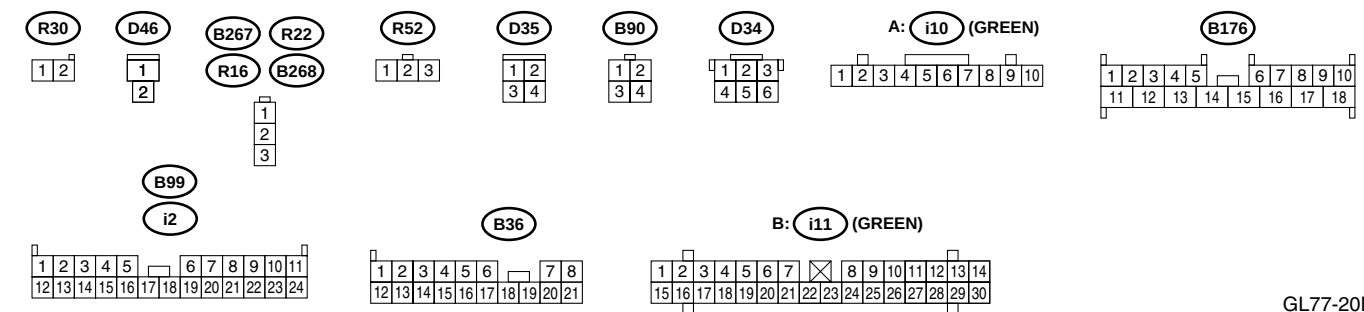
3. Keyless Entry System

A: SCHEMATIC

1. KEYLESS ENTRY LHD MODEL

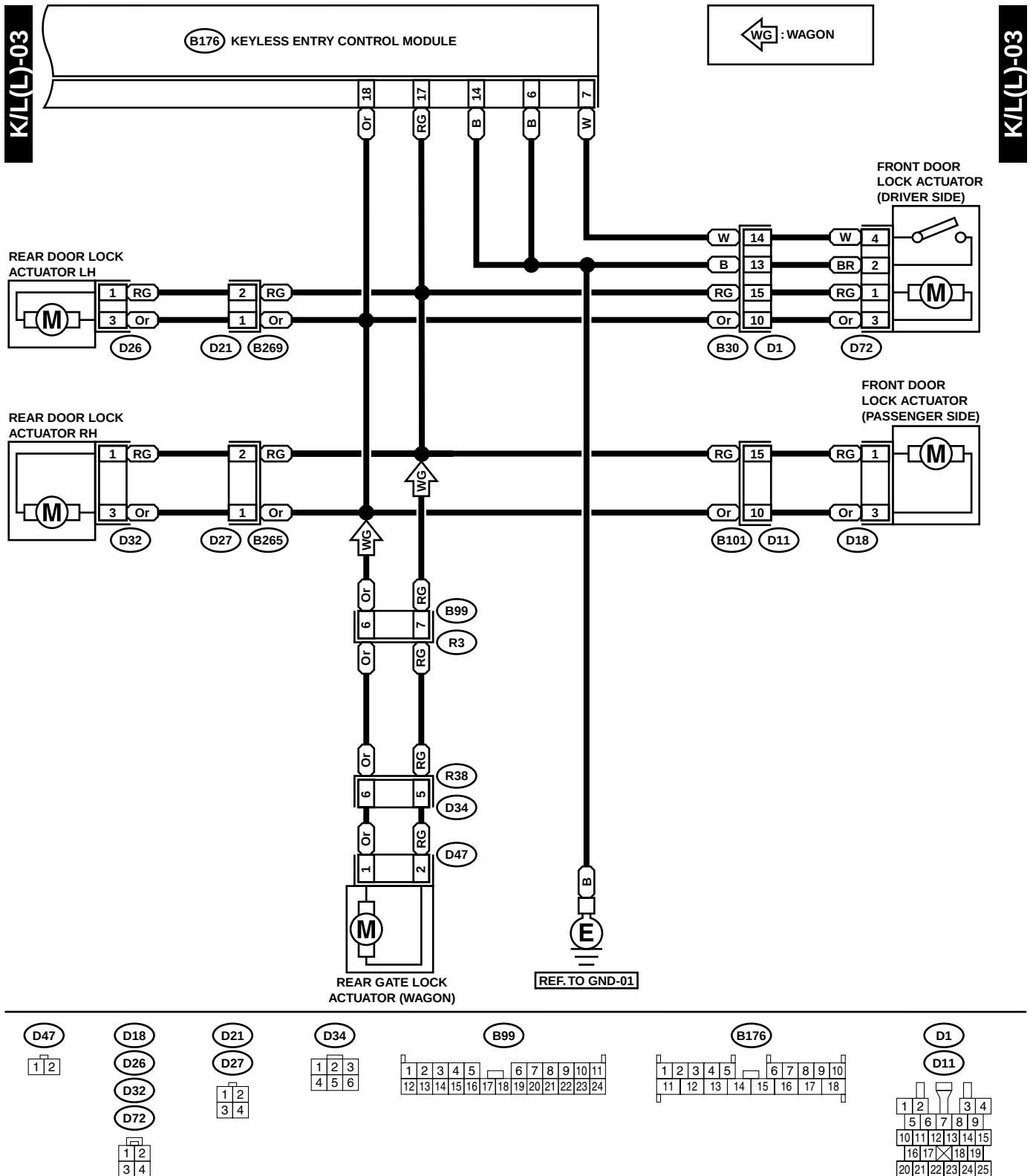


SECURITY AND LOCKS



KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

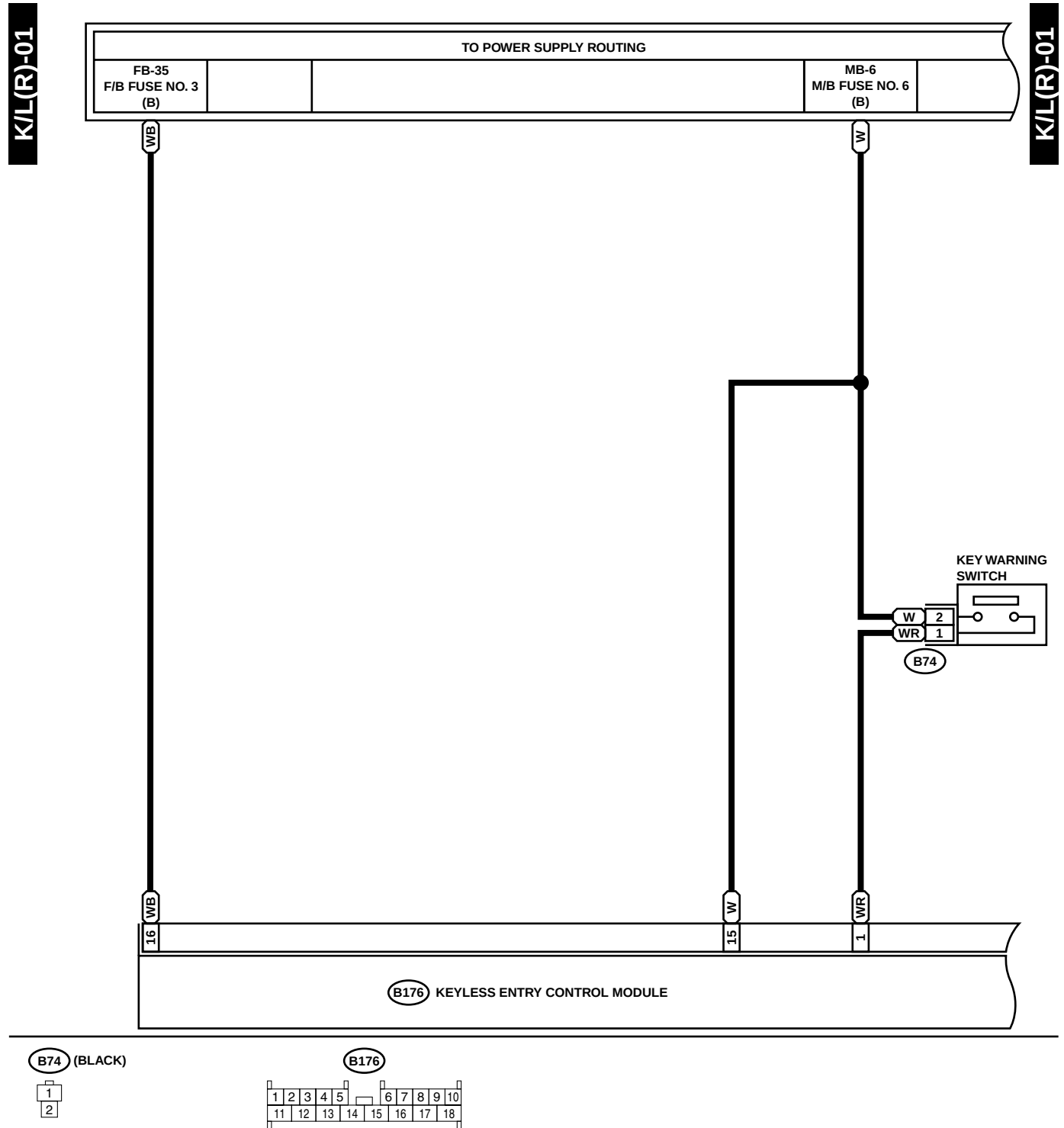


GL77-20C

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

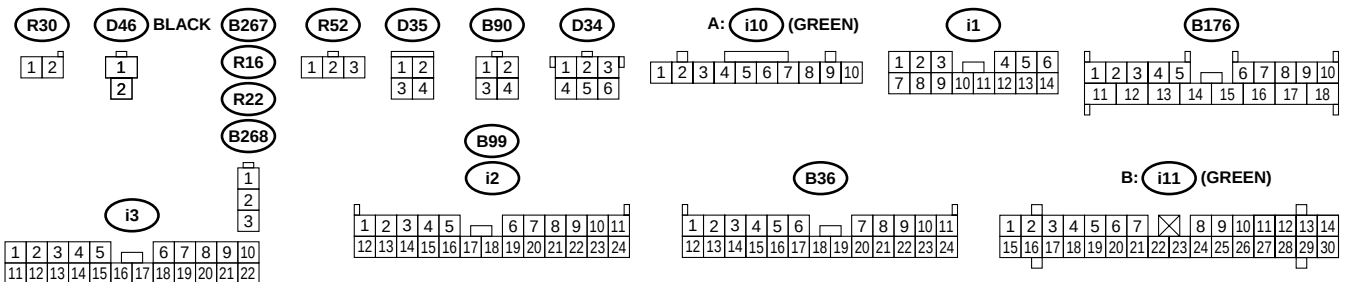
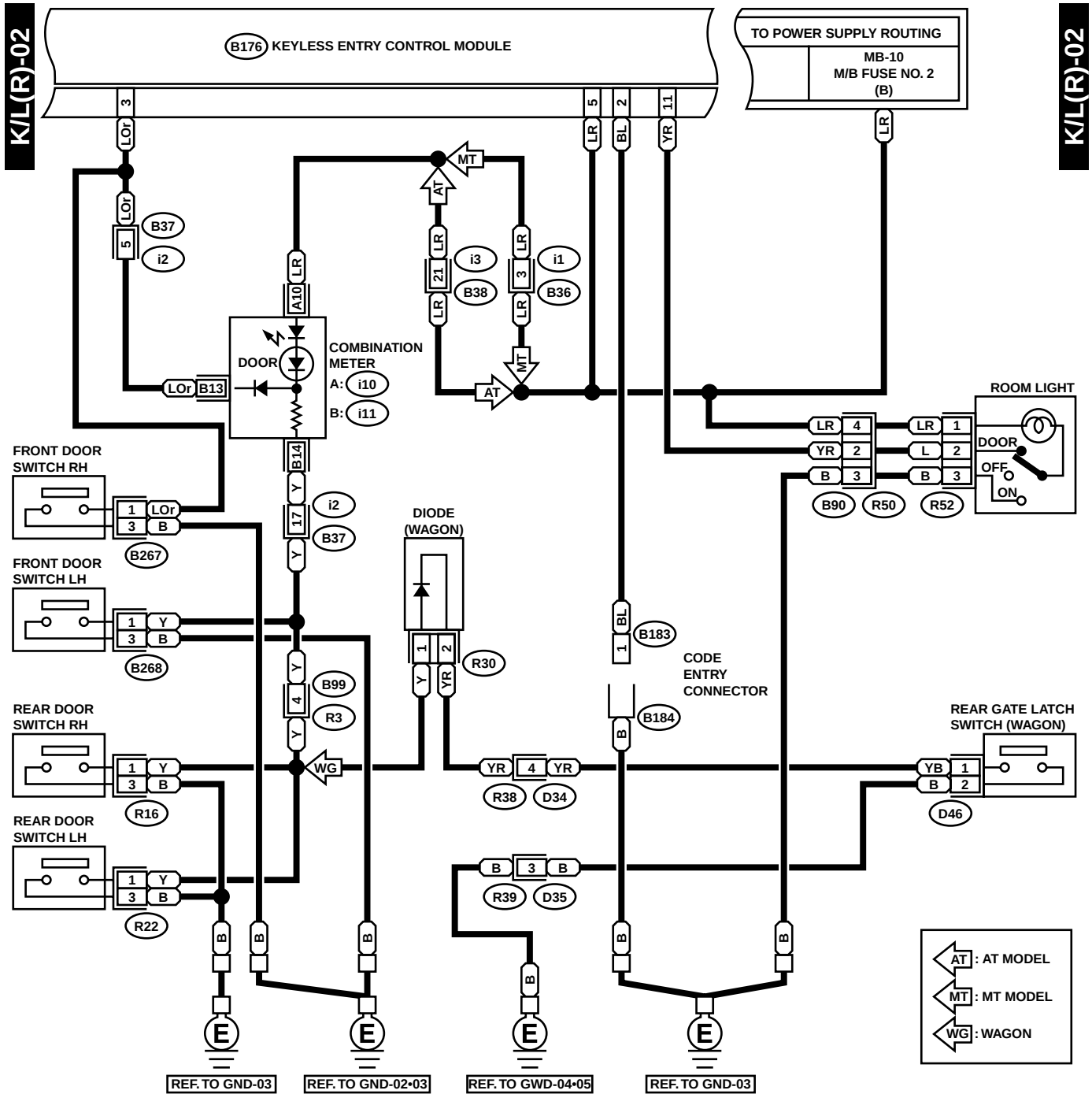
2. KEYLESS ENTRY RHD MODEL



GR77-20A

KEYLESS ENTRY SYSTEM

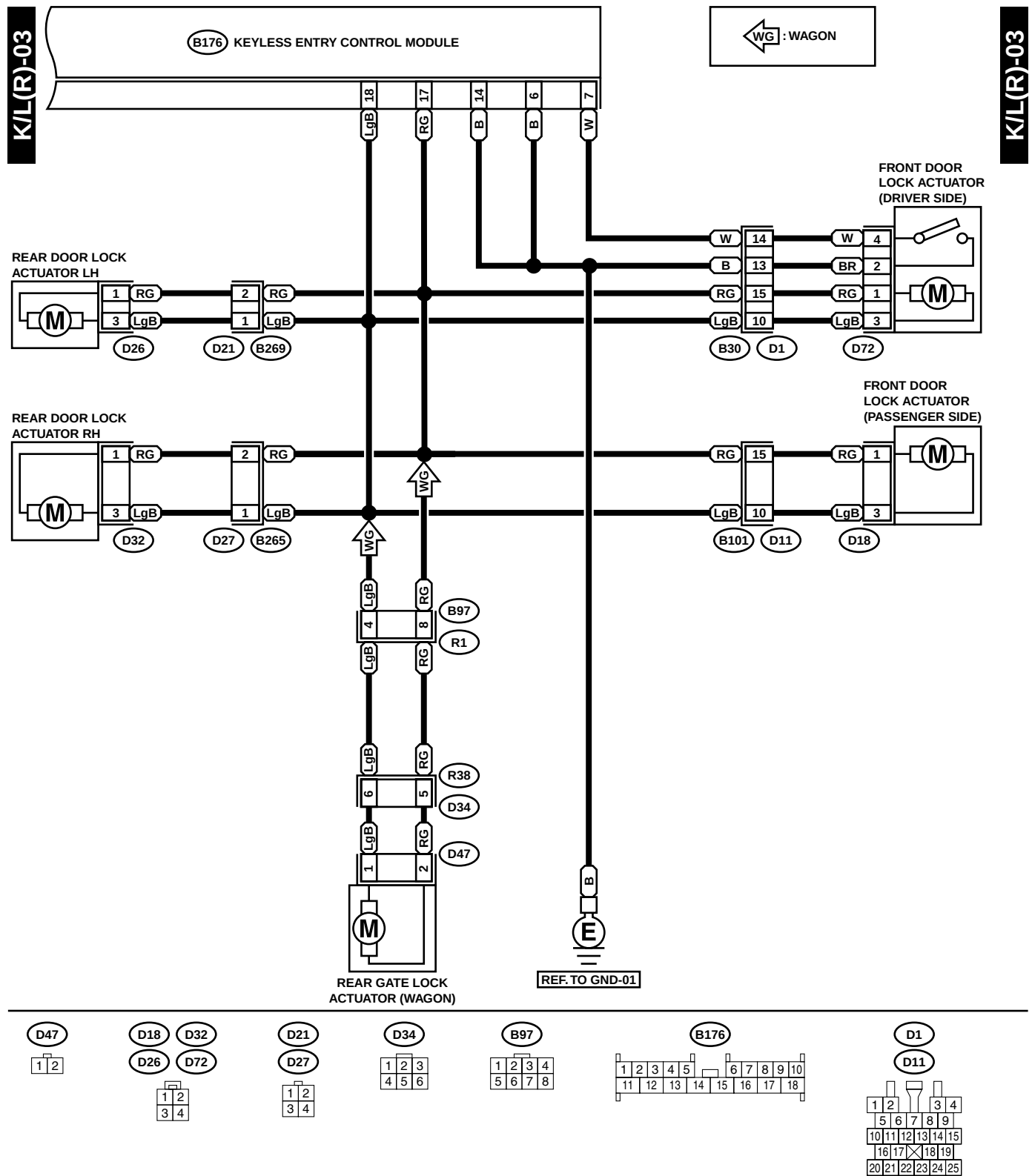
SECURITY AND LOCKS



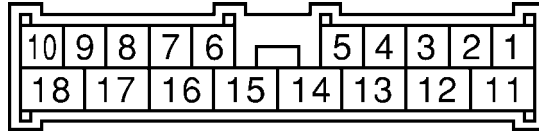
GR77-20B

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS



GR77-20C

B: ELECTRICAL SPECIFICATION

B5M1141

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 present when connecting the registration connector.
Door switch	3 (INPUT)	0 V is present when any door is open.
Power supply	5	Battery voltage is constantly present.
Ground	6	0 V is constantly present.
Door lock switch	7 (INPUT)	0 V is present when driver's door is unlocked.
Empty	8	—
Empty	9	—
Empty	10	—
Room light	11 (OUTPUT)	• 0 V is present when pressing the transmitter OPEN button. • 0 V is present when any door is open.
Turn signal light (Right)	12 (OUTPUT)	Battery voltage is present when pressing the transmitter OPEN or LOCK button.
Turn signal light (Left)	13 (OUTPUT)	Battery voltage is present when pressing the transmitter OPEN or LOCK button.
Ground	14	0 V is constantly present.
Power supply (Hazard light)	15	Battery voltage is constantly present.
Power supply	16	Battery voltage is constantly present.
Door and rear gate lock actuator (Unlock)	17 (OUTPUT)	Battery voltage is present when pressing the transmitter OPEN button.
Door and rear gate lock actuator (Lock)	18 (OUTPUT)	Battery voltage is present 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-23, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the fuse.	<Ref. to SL-23, CHECK FUSE, INSPECTION, Keyless Entry System.>
	3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-24, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-46, Keyless Entry Control Module.>
The transmitter cannot be registered.	1. Check the transmitter battery.	<Ref. to SL-23, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the registration connector circuit.	<Ref. to SL-24, CHECK REGISTRATION CONNECTOR CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.	<Ref. to SL-46, Keyless Entry Control Module.>
The 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-12, INSPECTION, INSPECTION, Door Lock Control System.>	1. Check the transmitter battery.	<Ref. to SL-23, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-26, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-24, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-46, Keyless Entry Control Module.>
The hazard light does not operate.	1. Check the transmitter battery	<Ref. to SL-23, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-26, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-24, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the hazard light operation.	<Ref. to SL-26, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	5. Replace the keyless entry control module.	<Ref. to SL-46, Keyless Entry Control Module.>

Symptom	Repair order	Reference
The room light does not activate.	1. Check the transmitter battery.	<Ref. to SL-23, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the room light operation.	<Ref. to SL-27, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	3. Check the key warning switch.	<Ref. to SL-26, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the door switch.	<Ref. to SL-24, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	5. Replace the keyless entry control module.	<Ref. to SL-46, Keyless Entry Control Module.>

2. CHECK TRANSMITTER BATTERY

Step	Check	Yes	No
1 CHECK TRANSMITTER BATTERY. 1) Remove the battery from the transmitter. <Ref. to SL-47, REMOVAL, Keyless Transmitter.> 2) Check the battery voltage. <Ref. to SL-47, INSPECTION, Keyless Transmitter.>	Is the battery voltage OK?	Further inspection is necessary, refer to "SYMPTOM CHART". <Ref. to SL-22, SYMPTOM CHART, INSPECTION, Keyless Entry System.>	Replace the transmitter battery.

3. CHECK FUSE

Step	Check	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? (15 A and 30 A)	Replace the fuse with a new one.	Check power supply and ground circuit. <Ref. to SL-24, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

4. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Check	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. 15, No. 16 (+) — Chassis ground (-):	Is the voltage more than 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 resistance less than 10 Ω ?	The power supply and ground circuit are OK.	Repair the harness.

5. CHECK REGISTRATION CONNECTOR CIRCUIT

Step	Check	Yes	No
1 REGISTRATION CONNECTOR INPUT VOLTAGE INSPECTION 1) Disconnect registration connector. 2) Measure voltage between keyless entry control module harness connector and chassis ground. Connector & terminal (B176) No. 2 (+) — Chassis ground (-):	Is the voltage more than 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 voltage 0 V?	Registration connector circuit is OK.	Repair harness, and (or) connector.

6. CHECK DOOR SWITCH

Step	Check	Yes	No
1 CHECK DOOR SWITCH CIRCUIT. Measure the voltage between the keyless entry control module harness connector terminal and chassis ground. Connector & terminal (B176) No. 3 (+) — Chassis ground (-):	Is the voltage 0 V when each door and rear gate is opened?	Go to step 2.	Go to step 3.
2 CHECK DOOR SWITCH CIRCUIT. Measure the voltage between the keyless entry control module harness connector terminal and chassis ground. Connector & terminal (B176) No. 3 (+) — chassis ground (-):	Is the voltage more than 10 V when each door and rear gate is closed?	The door switch is OK.	Go to step 3.

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

Step	Check	Yes	No
3 CHECK DOOR SWITCH. 1) Disconnect the door switch harness connector. 2) Check the continuity between the door switch terminals. <i>Terminal</i> <i>Front LH No. 1 — No. 3:</i> <i>Front RH No. 1 — No. 3:</i> <i>Rear LH No. 1 — No. 3:</i> <i>Rear RH No. 1 — No. 3:</i> <i>Rear gate No. 1 — No. 2:</i>	Does continuity exist when the door switch is pushed?	Replace the door switch.	Go to step 4.
4 CHECK DOOR SWITCH. Check continuity between the door switch terminals. <i>Terminal</i> <i>Front LH No. 1 — No. 3:</i> <i>Front RH No. 1 — No. 3:</i> <i>Rear LH No. 1 — No. 3:</i> <i>Rear RH No. 1 — No. 3:</i> <i>Rear gate No. 1 — No. 2:</i>	Does continuity exist when the door switch is released?	Check the harness for open circuits and 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	Check	Yes	No
1 CHECK FUSE. Remove and visually check fuse No. 6 (in the main fuse box).	Is the fuse blown? (15A)	Replace the fuse with a new one.	Go to step 2.
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 (-):	Is the voltage more than 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 voltage 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)Check the continuity between the key warning switch terminals. Terminal No. 1 — No. 2:	Does continuity exist?	Go to step 5.	Replace key warning switch.
5 CHECK KEY WARNING SWITCH. 1)Remove the key from the ignition switch. 2)Check the continuity between the key warning switch terminals. Terminal No. 1 — No. 2:	Does continuity exist?	Replace key warning switch.	Check the following: • Harness for open circuits or shorts between the key warning switch and fuse • Harness for open circuits and shorts between the keyless entry control module and key warning switch

8. CHECK HAZARD LIGHT OPERATION

Step	Check	Yes	No
1 CHECK HAZARD LIGHT OPERATION. Make sure the hazard light blinks when hazard switch is turned ON.	Does hazard light blink?	Go to step 2.	Check hazard light circuit.

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

Step	Check	Yes	No
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 (-):	Is the voltage more than 10 V?	Check harness for open or short between keyless entry control module and turn signal lights.	Replace the keyless entry control module.

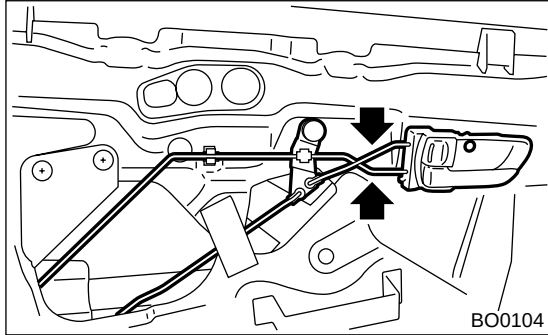
9. CHECK ROOM LIGHT OPERATION

Step	Check	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?	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 resistance less than 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.

4. Front Inner Remote

A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 3) Remove screw and the two rod joints.
- 4) Remove the front inner remote.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Make sure the lock works properly after installation.

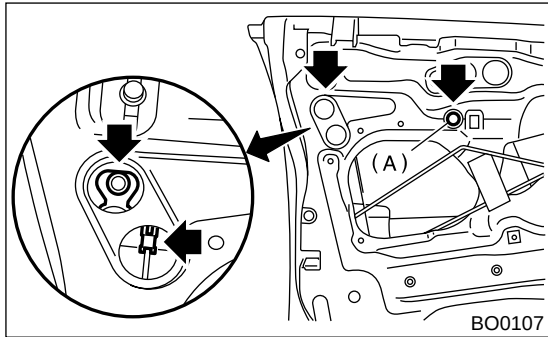
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

5. Front Outer Handle

A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 3) Remove bolt (A).
- 4) Move front door glass downward. Remove bolt and rod clamp.
- 5) Remove the front 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.

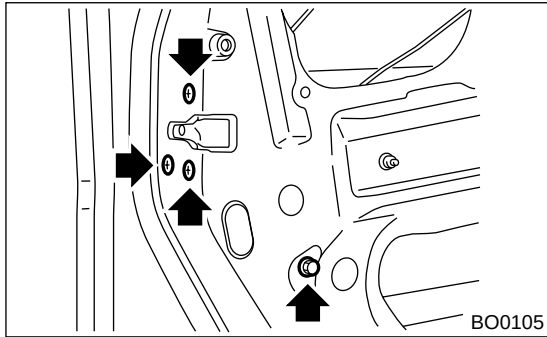
C: INSPECTION

- 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) Remove the front door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 3) Remove the front inner remote. <Ref. to SL-28, REMOVAL, Front Inner Remote.>
- 4) Remove the 3 screws and bolt.



- 5) Disconnect the connector. Remove the front door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Make sure the lock works properly after installation.

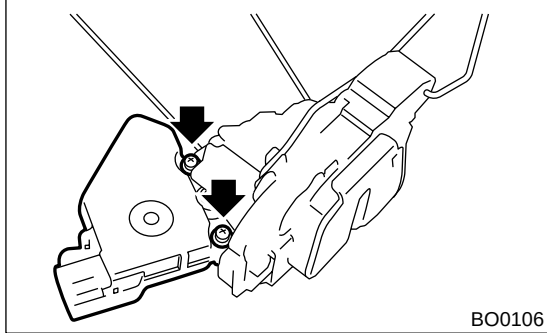
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

7. Front Door Lock Actuator

A: REMOVAL

- 1) Remove the front door latch assembly. <Ref. to SL-28, REMOVAL, Front Inner Remote.>
- 2) Loosen 2 screws to remove the front door lock actuator.

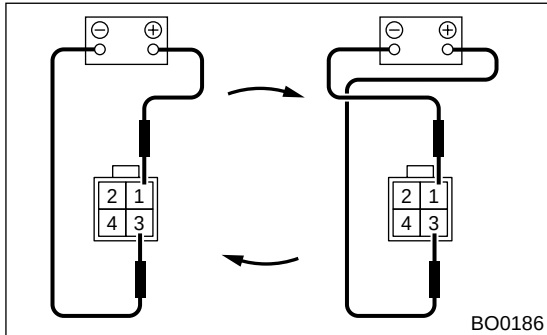


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to the door lock actuator terminals.



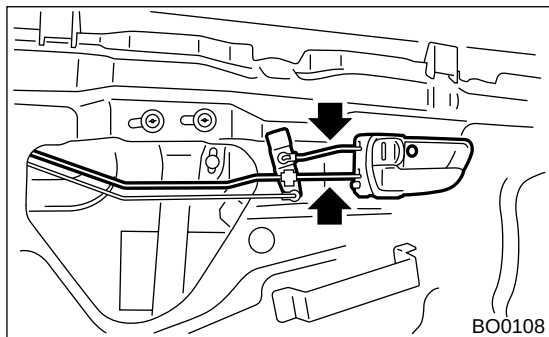
Battery connection	Actuator operation
No. 3 (+) — No. 1 (—)	Unlocked → Locked
No. 1 (+) — No. 3 (—)	Locked → Unlocked

If NG, replace the door lock actuator.

8. Rear Inner Remote

A: REMOVAL

- 1) Remove the rear door trim. <Ref. to EI-21, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 3) Remove screw and the two rod joints.
- 4) Remove the inner remote.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Make sure the lock works properly after installation.

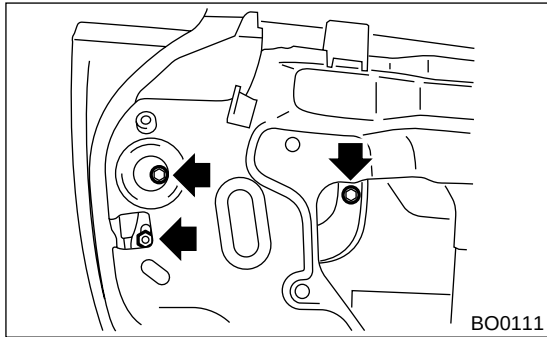
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.
- 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-21, 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-32, REMOVAL, Rear Inner Remote.>
- 4) Remove the rear door latch assembly. <Ref. to SL-34, REMOVAL, Rear Door Latch Assembly.>
- 5) Loosen 2 bolts and nut to remove 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.

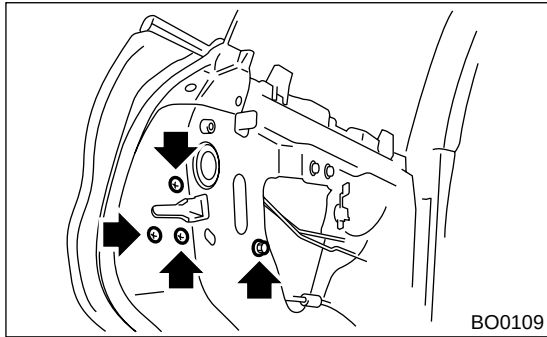
C: INSPECTION

- 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) Remove the rear door trim. <Ref. to EI-21, 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-32, REMOVAL, Rear Inner Remote.>
- 4) Remove the 3 screws and bolt.



- 5) Disconnect the connector, and then remove the rear door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Make sure the lock works properly after installation.

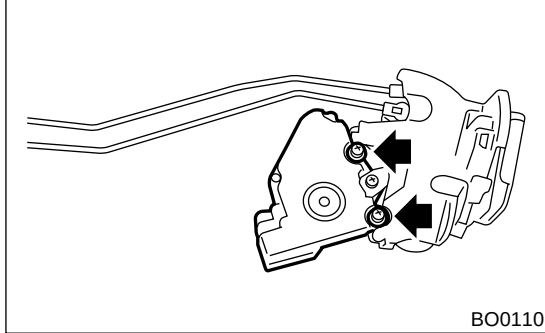
C: INSPECTION

- 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-34, REMOVAL, Rear Door Latch Assembly.>
- 2) Loosen 2 screws to remove rear door lock acutu-ator.



B: INSTALLATION

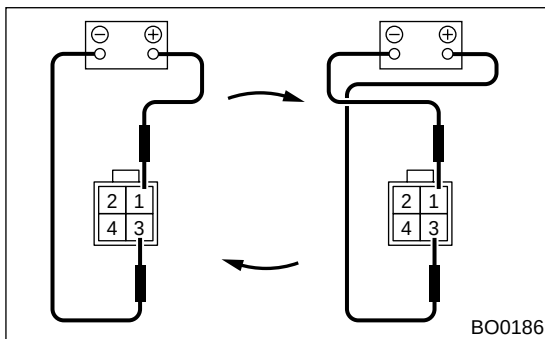
Install in the reverse order of removal.

CAUTION:

Make sure the lock works properly after instal-lation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness con-ector.
- 2) Connect the battery to the door lock actuator ter-minals.



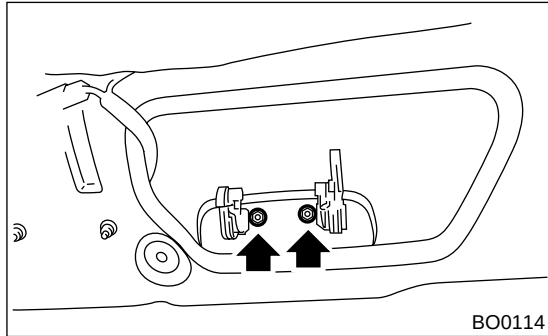
Battery connection	Actuator operation
No. 3 (+) — No. 1 (-)	Unlocked → Locked
No. 1 (+) — No. 3 (-)	Locked → Unlocked

If NG, replace the door lock actuator.

12.Rear Gate Outer Handle

A: REMOVAL

- 1) Remove the rear gate trim. <Ref. to EI-34, REMOVAL, Rear Gate Trim.>
- 2) Remove the rear gate latch assembly. <Ref. to SL-37, REMOVAL, Rear Gate Latch Assembly.>
- 3) Loosen 2 nuts to remove rear gate outer handle.



B: INSTALLATION

Install in the reverse order of removal.

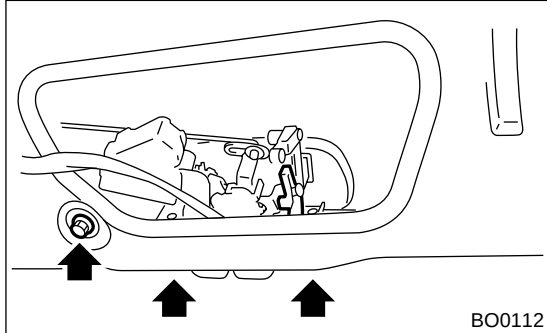
C: INSPECTION

- 1) Inspect the rod for deformation.
- 2) Make sure the lever and rod move smoothly.

13.Rear Gate Latch Assembly

A: REMOVAL

- 1) Remove the rear gate trim. <Ref. to EI-34, REMOVAL, Rear Gate Trim.>
- 2) Remove the rear gate key cylinder rod clamp.
- 3) Remove the 3 bolts.



- 4) Disconnect connectors, and then remove rear gate latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Make sure the lock works properly after installation.

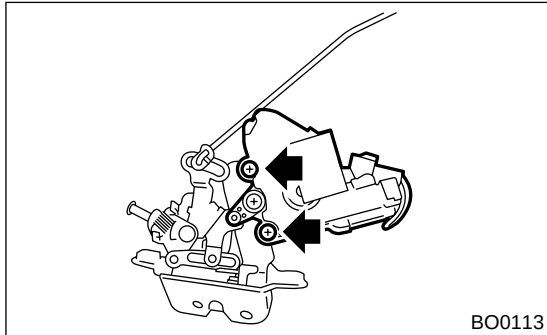
C: INSPECTION

- 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-37, REMOVAL, Rear Gate Latch Assembly.>
- 2) Loosen 2 screws to remove rear gate lock actuator.

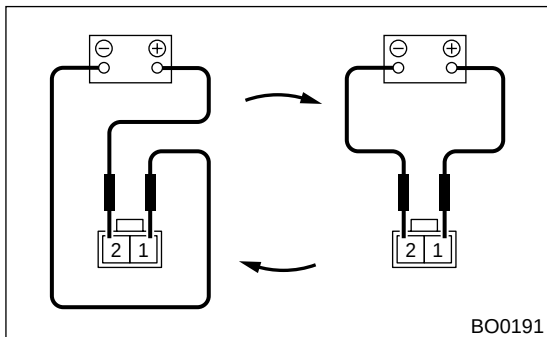


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to the door lock actuator terminals.



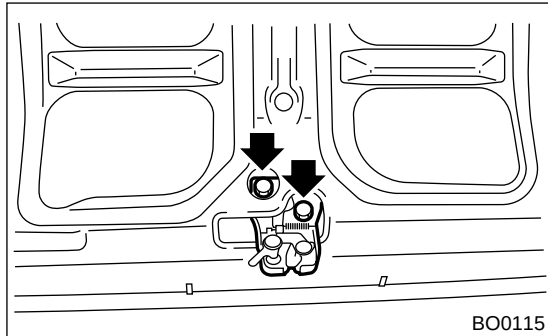
Battery connection	Actuator operation
No. 1 (+) — No. 2 (—)	Unlocked → Locked
No. 2 (+) — No. 1 (—)	Locked → Unlocked

If NG, replace the rear gate latch lock actuator.

15. Trunk Lid Lock Assembly

A: REMOVAL

- 1) Remove the trunk lid key cylinder rod clamp.
- 2) Loosen 2 bolts to remove trunk lid lock assembly.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

- Apply grease to parts that rub.
- Make sure the lock works properly after installation.

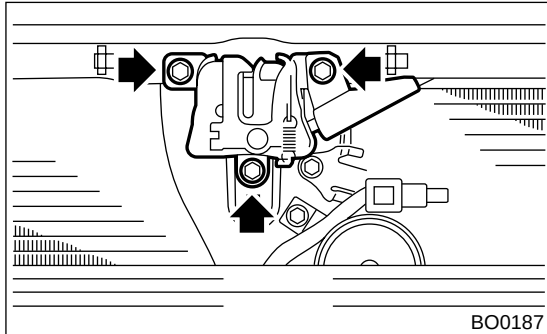
C: INSPECTION

- 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

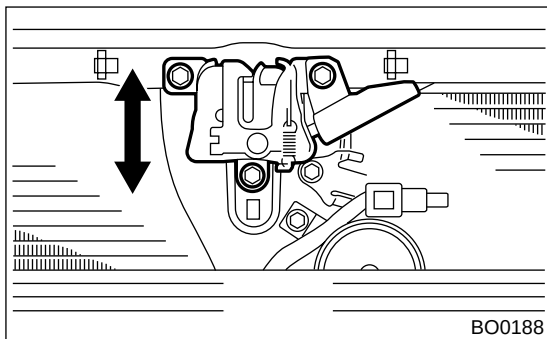
Install in the reverse order of removal.

CAUTION:

- 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

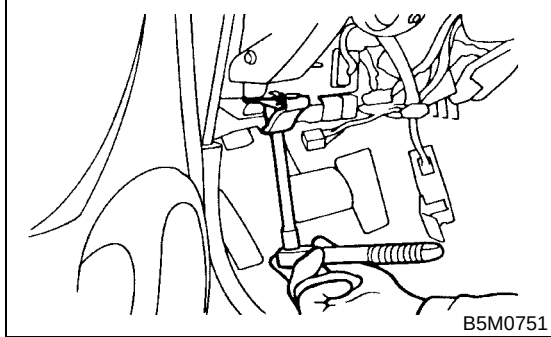
- 1) Check the striker for bending or abnormal wear.
- 2) Check the safety lever for improper movement.
- 3) Check other levers and the spring for rust formation and unsmooth movement.

17. Remote Openers

A: REMOVAL

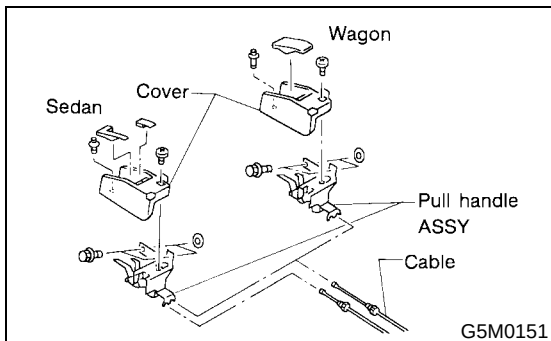
1. HOOD OPENER

- 1) Remove the release cable from the hood lock.
- 2) Remove the bolt. Remove the opener lever.

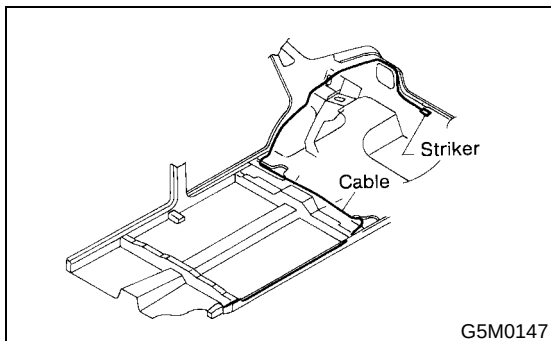


2. TRUNK LID OPENER

- 1) Remove the rear seat. <Ref. to SE-11, 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.

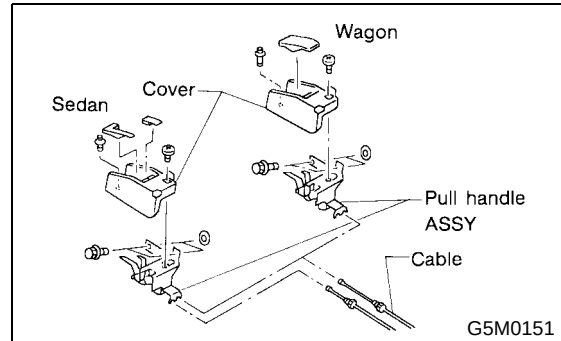


- 4) Remove the cable from the opener pull handle.
- 5) Remove the striker from the trunk lid.
- 6) Remove the cable from the striker.

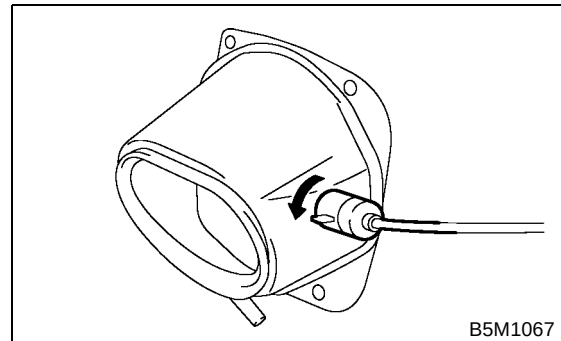


3. FUEL FLAP OPENER

- 1) Remove the rear seat. <Ref. to SE-11, 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.



- 4) Remove the cable from the opener pull handle.
- 5) Remove the right rear quarter trim. <Ref. to EI-30, 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.

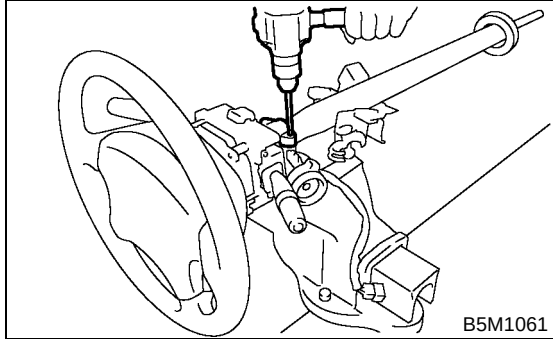
C: INSPECTION

Make sure the fuel flap opens and closes smoothly.

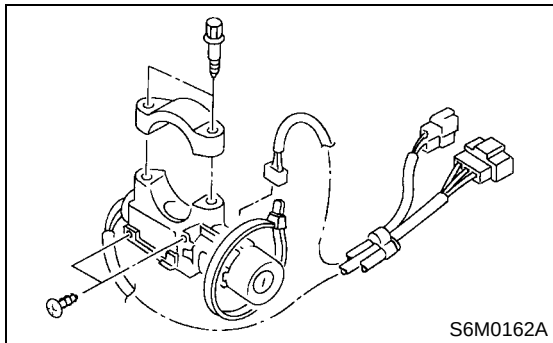
18. Ignition Key Lock

A: REPLACEMENT

- 1) Remove the battery ground cable.
- 2) Remove the steering column. <Ref. to PS-30, 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 holddown 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	Tester connection	Specified condition
LOCK		
ACC	No. 1 — No. 2	Continuity
ON	No. 1 — No. 2 — No. 4	Continuity
ST	No. 1 — No. 3 — No. 4	Continuity

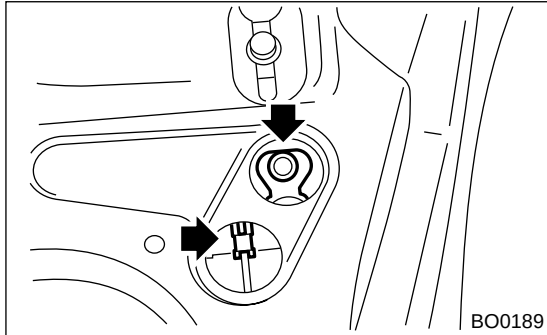
If NG, replace the ignition switch.

19.Key Lock Cylinders

A: REPLACEMENT

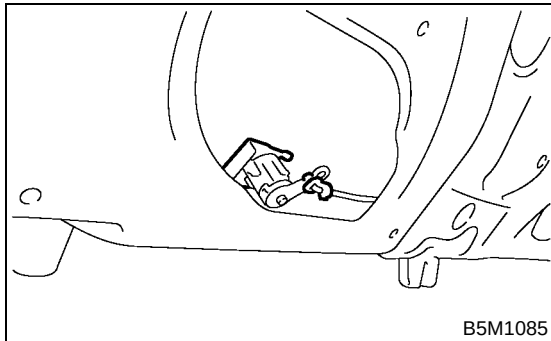
1. FRONT DOOR

- 1) Remove the door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 2) Pull back the sealing cover.
- 3) Move front door glass downward.
- 4) Remove the rod clamp. Remove the bolt. Replace the key cylinder.



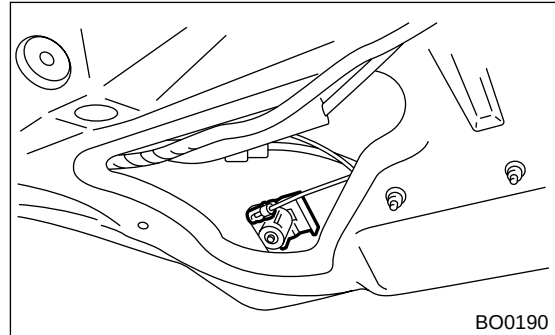
2. TRUNK LID

- 1) Remove the trunk trim. <Ref. to EI-36, REMOVAL, Trunk Trim.>
- 2) Remove the rod clamp. Remove the lock plate. Replace the key cylinder.



3. REAR GATE

- 1) Remove the rear gate trim. <Ref. to EI-34, REMOVAL, Rear Gate Trim.>
- 2) Remove the rod clamp. Remove the lock plate. Replace the key cylinder.



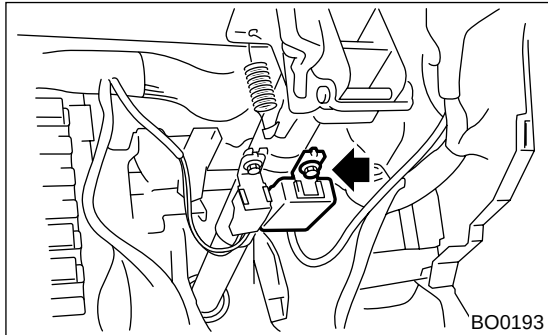
20. Immobilizer Control Module

A: REMOVAL

NOTE:

The following positions for removal and installation are for LHD models. The positions for RHD models are symmetrically opposite.

- 1) Disconnect GND cable from battery.
- 2) Remove instrument panel lower cover. <Ref. to EI-25, REMOVAL, Instrument Panel Assembly.>
- 3) Disconnect connector from immobilizer control module.
- 4) Remove immobilizer control module.



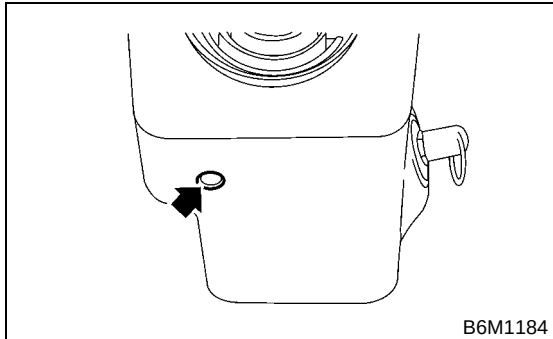
B: INSTALLATION

Install in the reverse order of removal.

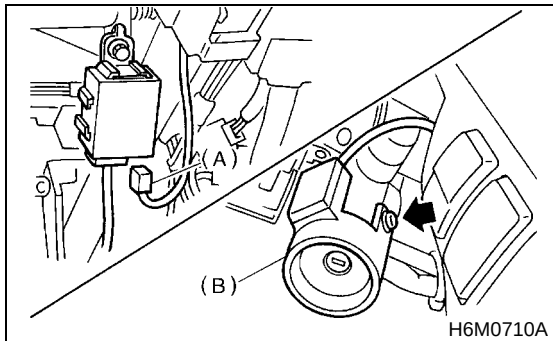
21. Immobilizer Antenna

A: REMOVAL

- 1) Disconnect GND cable from battery.
- 2) Remove instrument panel lower cover. <Ref. to EI-25, 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).



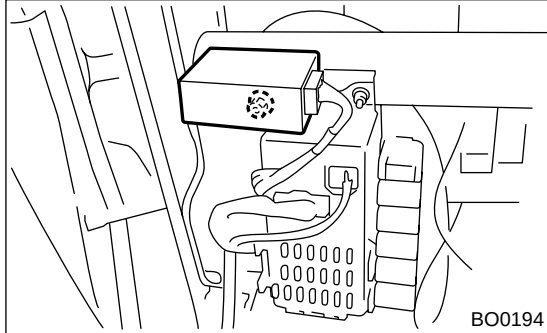
B: INSTALLATION

Install in the reverse order of removal.

22.Keyless Entry Control Module

A: REMOVAL

- 1) Disconnect battery ground cable.
- 2) Remove instrument panel lower cover. <Ref. to EI-25, REMOVAL, Instrument Panel Assembly.>
- 3) Remove nut, then remove keyless entry control module 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

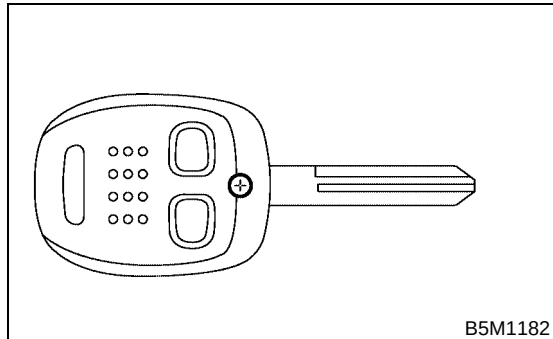
A: REMOVAL

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.

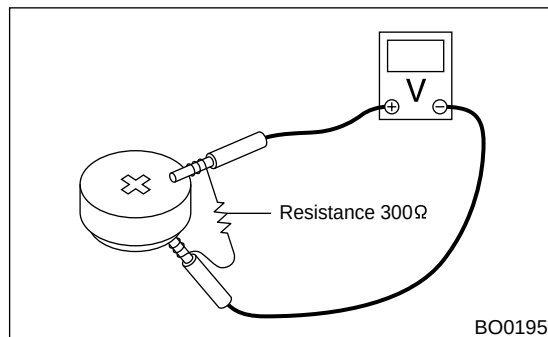
C: INSPECTION

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.



Tester connection		Voltage (V)
(+)	(-)	
Battery (+) terminal	Battery (-) terminal	2.5 — 3.0

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 the OPEN button of the transmitter to be registered. Immediately afterwards, press the LOCK button.
- 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 a second transmitter is now to be carried out, press the OPEN button of that transmitter. Immediately afterwards, press the LOCK button.
- 6) The door lock will automatically lock and unlock in sequence. This indicates the completion of transmitter registration for the second transmitter.
- 7) 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

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

IMMOBILIZER (DIAGNOSTICS)



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10. Diagnostics Chart with Trouble Code.....	21

BASIC DIAGNOSTIC PROCEDURE

IMMOBILIZER (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

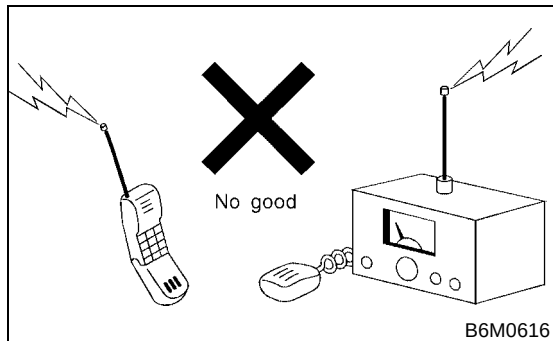
	Step	Check	Yes	No
1	CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT. Turn ignition switch ON.	Does immobilizer indicator light illuminate?	Go to step 2.	Go to step 3.
2	CHECK ENGINE START. Turn ignition switch to START position.	Is the engine hard to start?	Go to step 5.	Go to step 3.
3	CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT. 1)Turn ignition switch to OFF or ACC position. 2)Wait at least 60 seconds.	Does immobilizer indicator light blink?	Go to step 4.	Check immobilizer indicator light circuit. <Ref. to IM-16, CHECK IMMOBILIZER INDICATOR CIRCUIT, Diagnostics Chart for Immobilizer Indicator Light.>
4	CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT. Remove key from ignition switch.	Does immobilizer indicator light begin to blink 5 seconds after the key is removed?	The immobilizer system is OK.	Check key switch circuit. <Ref. to IM-18, CHECK KEY SWITCH CIRCUIT, Diagnostics Chart for Immobilizer Indicator Light.>
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-10, Subaru Select Monitor.> 3)Turn ignition switch and Subaru Select Monitor switch ON. 4)Read DTC on the display.	Is trouble code indicated on display?	Go to step 6.	Repair the related parts.
6	PERFORM THE DIAGNOSIS. 1)Inspect using "Diagnostics Chart with Trouble Code". <Ref. to IM-21, Diagnostics Chart with Trouble Code.> 2)Repair the trouble cause. 3)Perform clear memory mode. 4)Read DTC again.	Is trouble code indicated on display?	Inspect using "Diagnostic Chart with Trouble Code". <Ref. to IM-21, Diagnostics Chart with Trouble Code.>	Finish the diagnostics.

2. General Description

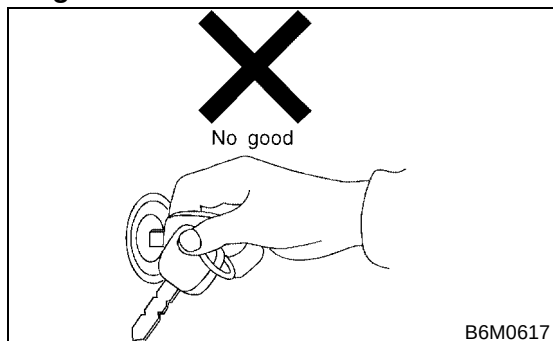
A: CAUTION

CAUTION:

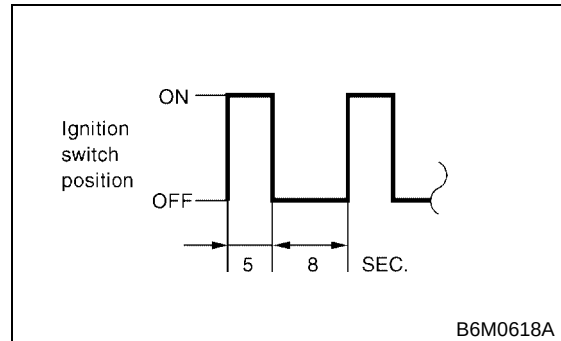
- Airbag system wiring harness is routed near the immobilizer control module. All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage airbag system wiring harness when servicing the immobilizer control module.
- 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.



- 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

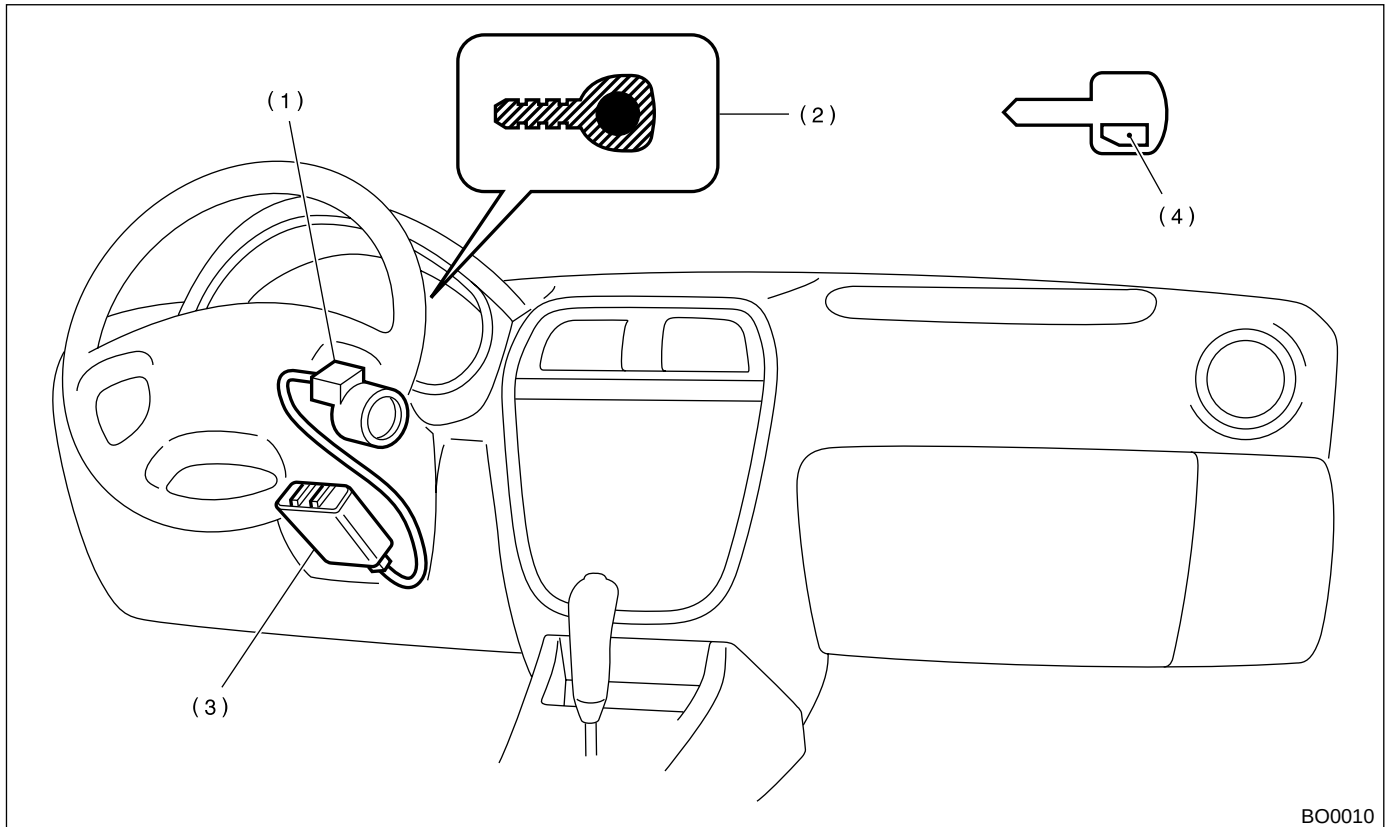
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

3. Electrical Components Location

A: LOCATION



BO0010

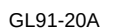
- (1) Antenna
- (2) Immobilizer indicator light (LED bulb)
- (3) Immobilizer control module (IMM ECM)
- (4) Transponder

NOTE:
IMM ECM location for RHD model is symmetrically opposite.

IMMOBILIZER (DIAGNOSTICS)

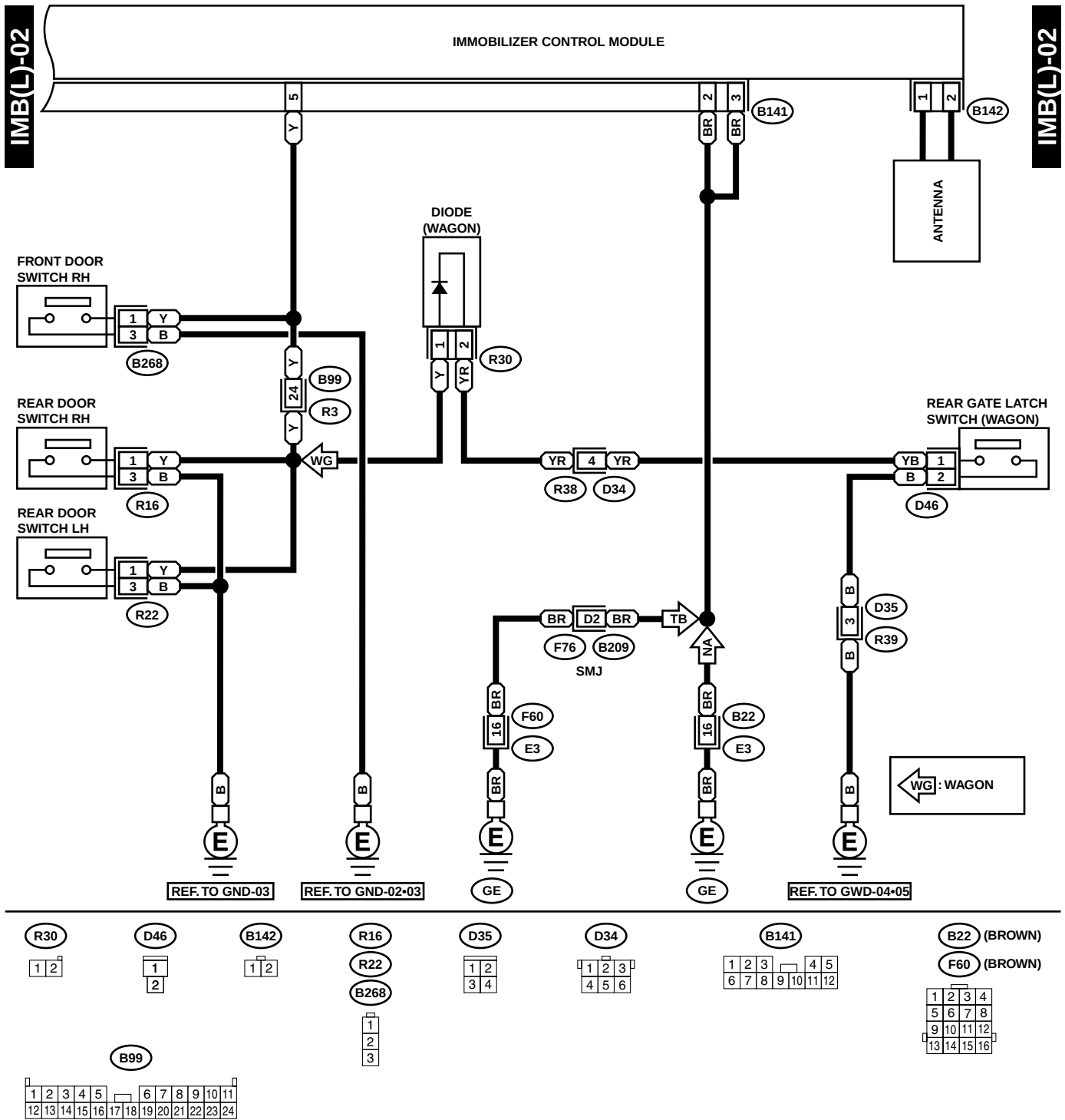
A: SCHEMATIC

IMB(L)-01



IMMOBILIZER CONTROL MODULE I/O SIGNAL

IMMOBILIZER (DIAGNOSTICS)

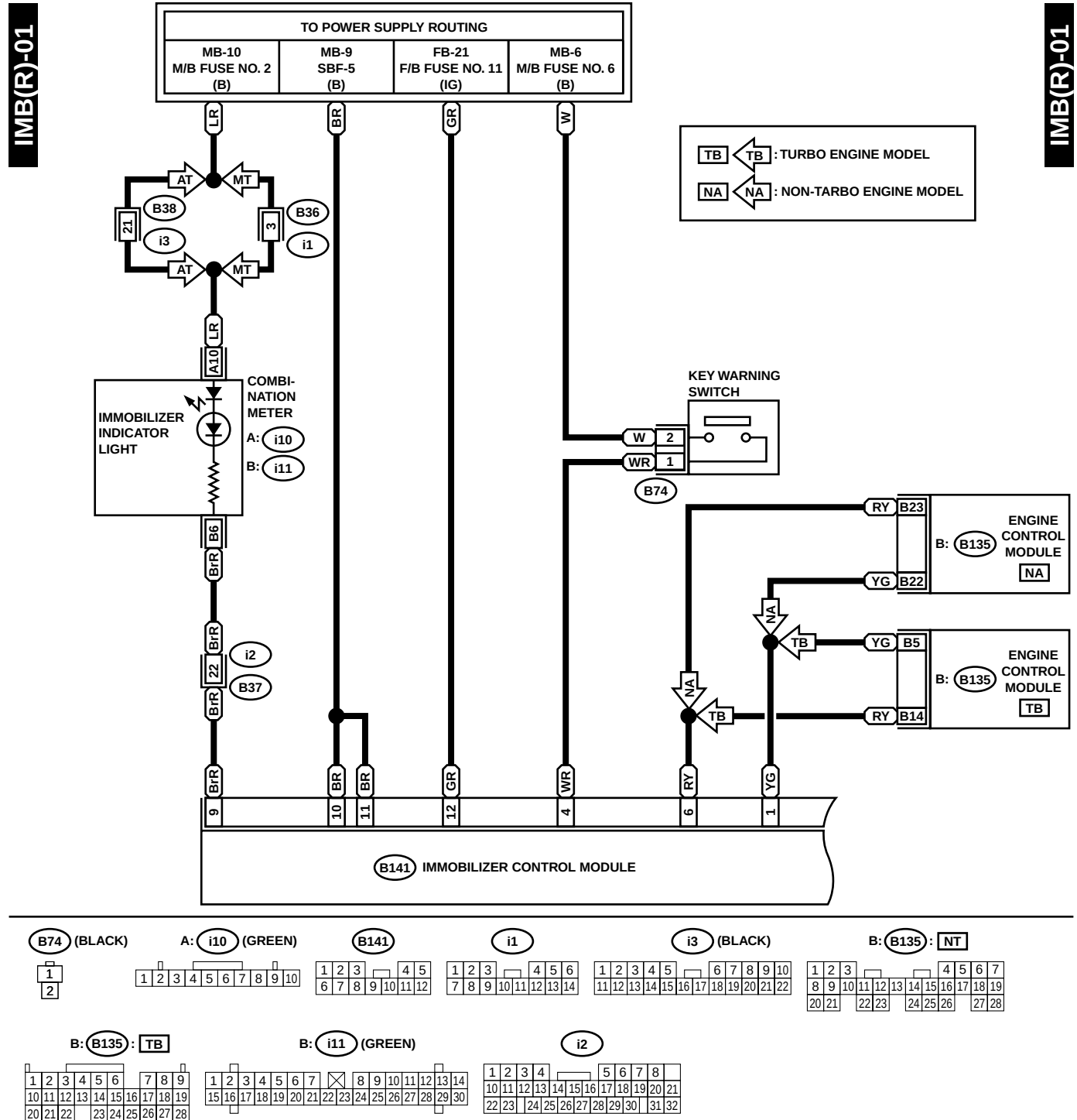


GL91-20B

IMMOBILIZER CONTROL MODULE I/O SIGNAL

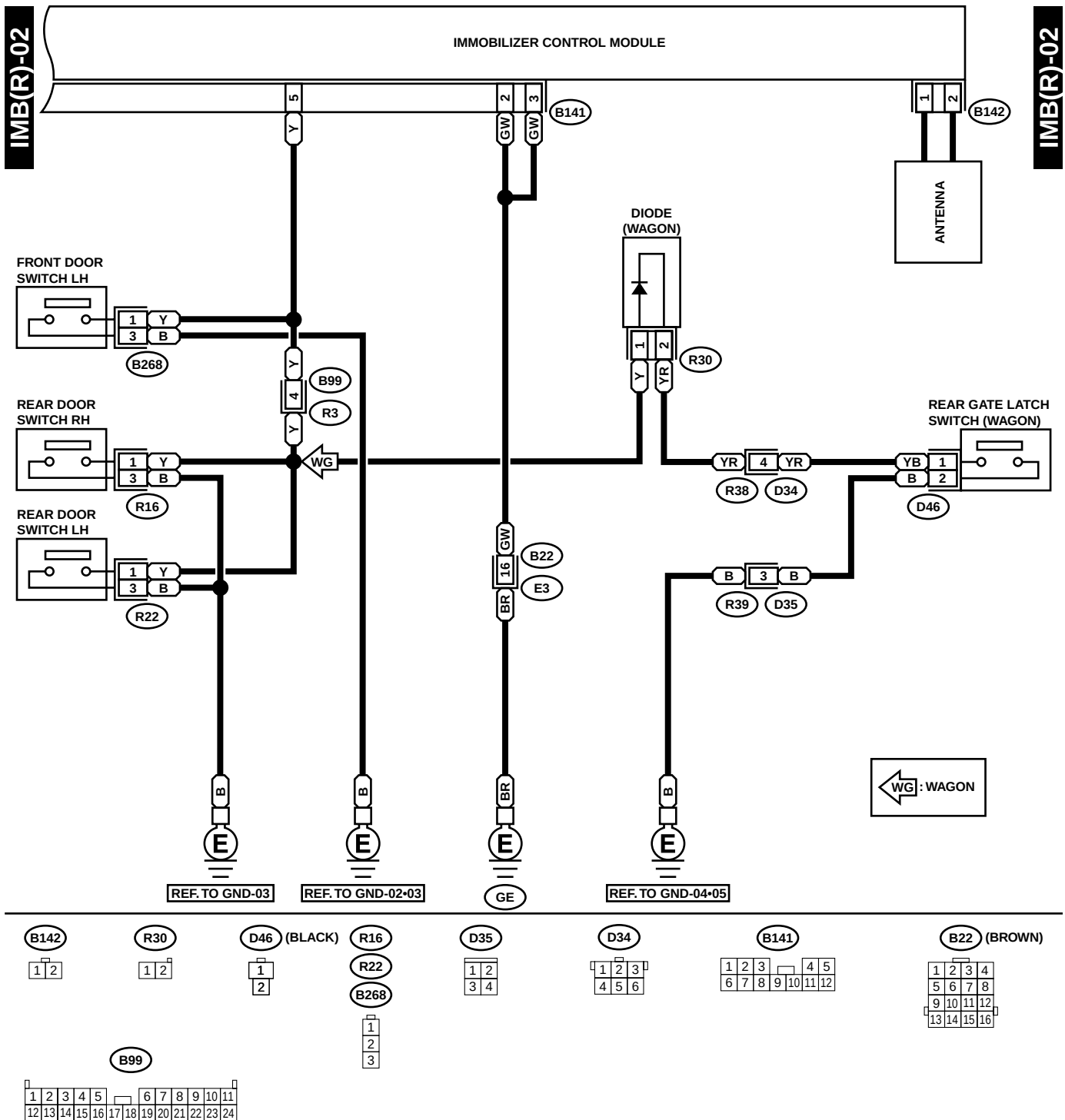
IMMOBILIZER (DIAGNOSTICS)

2. IMMOBILIZER RHD MODEL



IMMOBILIZER CONTROL MODULE I/O SIGNAL

IMMOBILIZER (DIAGNOSTICS)



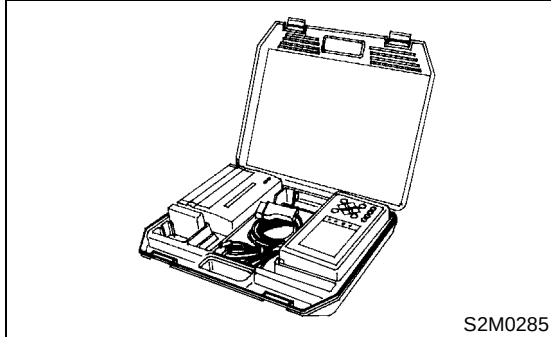
GR91-20B

5. Subaru Select Monitor

A: OPERATION

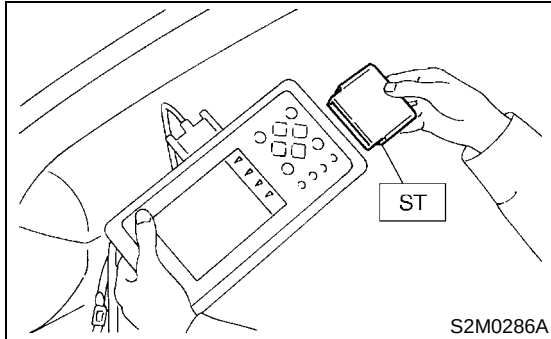
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru Select Monitor kit.



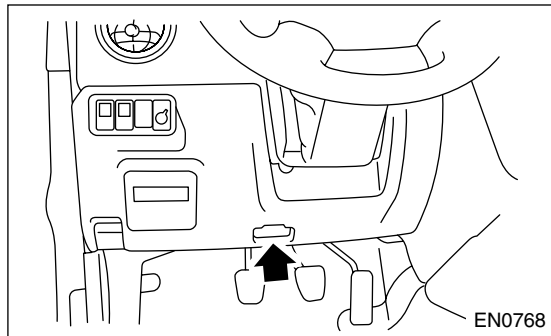
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor.



4) Connect Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).

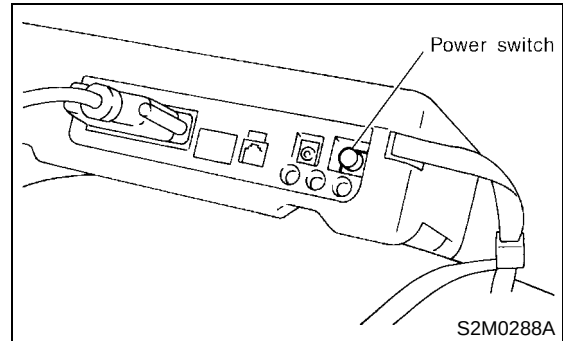


(2) Connect diagnosis cable to data link connector.

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.



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 IM-12, Read Diagnostic Trouble Code.>

3. INTERFACE CHECK

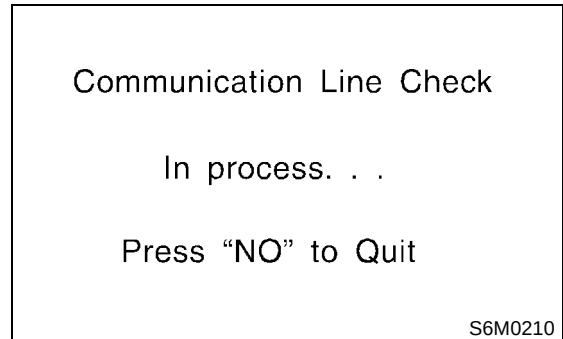
NOTE:

Communication line between ECM and IMM ECM can be checked in «System Operation Check Mode». This is referred to as "interface check".

1) Connect select monitor.

2) Set the «System Operation Check Mode» menu display screen then select «Immobilizer System».

3) Screen indicates as shown.

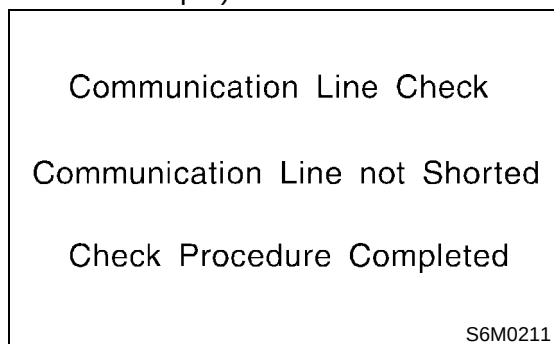


4) Start interface check.

5) Does "Communication Line not Shorted" appear on screen?

If "YES". Go to step 6).

If "NO". Go to step 7).



6) After diagnostic results, it is determined that short circuit is not a diagnostic item. This completes interface check.

7) If a problem is detected, repair. <Ref. to IM-22, DTC P1572 — IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT) —, Diagnostics Chart with Trouble Code.>

READ DIAGNOSTIC TROUBLE CODE

IMMOBILIZER (DIAGNOSTICS)

6. Read Diagnostic Trouble Code

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:

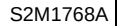
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to IM-20, LIST, List of Diagnostic Trouble Code (DTC).>

2. WITHOUT SUBARU SELECT MONITOR

Step	Check	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(SOHCw/oOBD)-10, LOCATION, Electrical Components Location.> 3) Turn ignition switch to ON.	Does the MIL come on?	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).	Does the MIL indicate diagnostic trouble code (DTC)?	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.

IMMOBILIZER (DIAGNOSTICS)

- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to IM-20, LIST, List of Diagnostic Trouble Code (DTC).>



7. 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

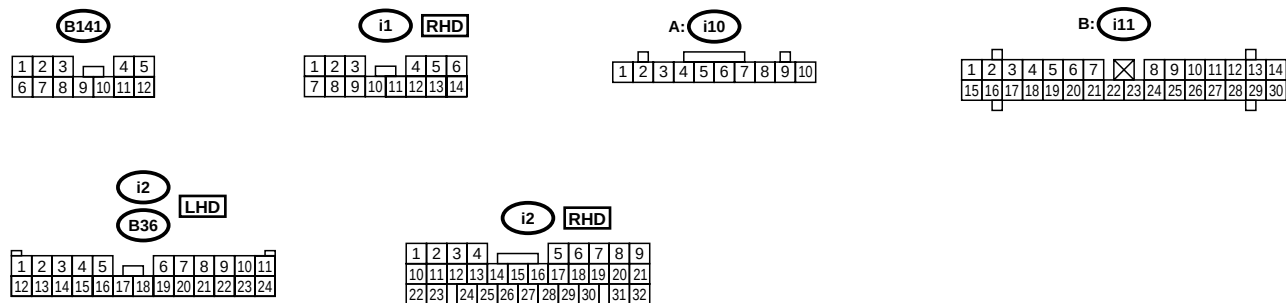
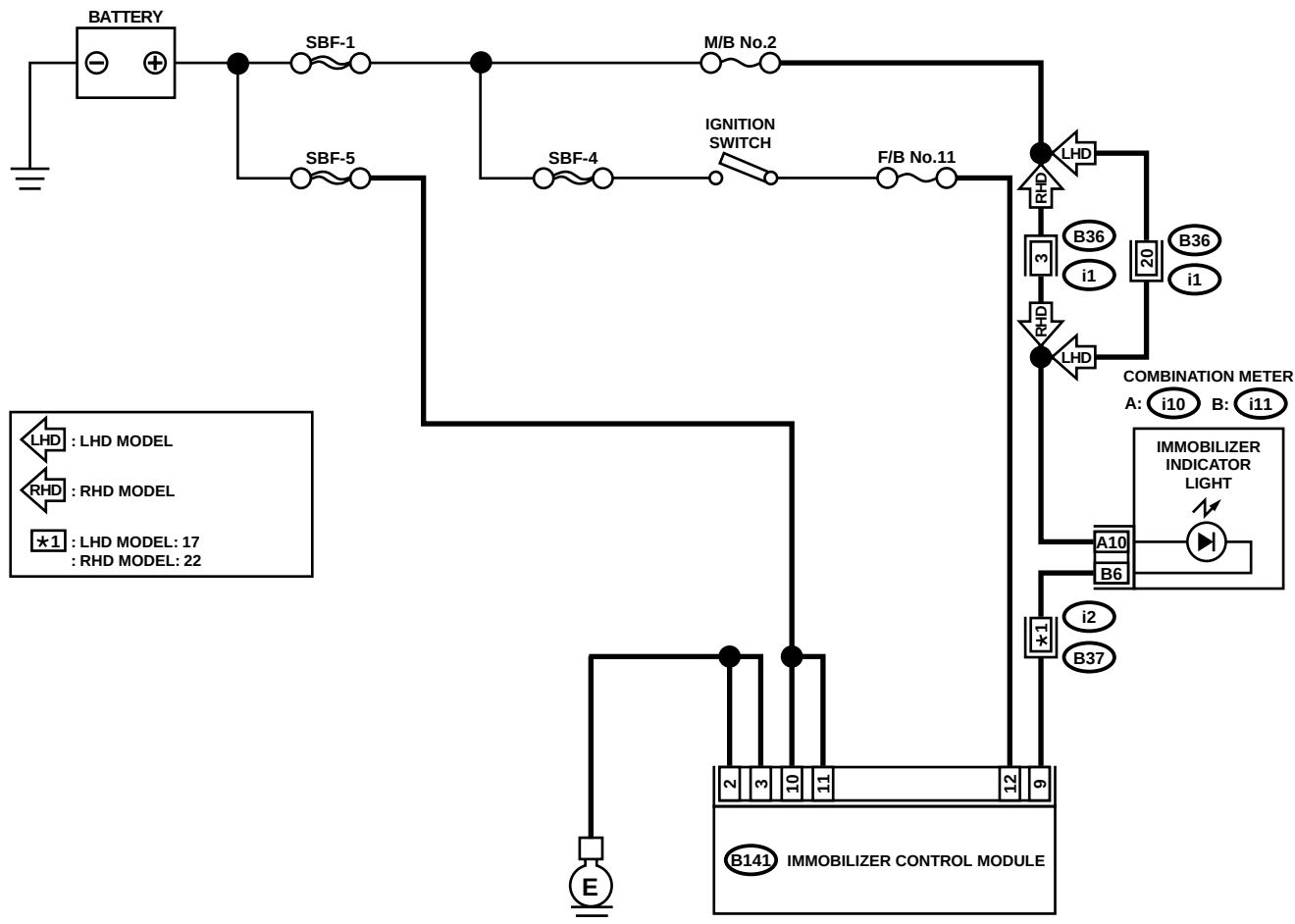
Step	Check	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 1) Turn ignition switch to OFF. 2) Set shift lever to neutral position (MT vehicles), or set selector lever to "P" position (AT vehicles). 3) Connect test mode connector and read memory connector. 4) Turn ignition switch to ON.	Does the MIL come on?	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. 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 IM-20, LIST, List of Diagnostic Trouble Code (DTC).>	Record diagnostic trouble code. Repair the trouble cause.	Turn ignition switch to OFF. Disconnect read memory connector and test mode connector. Complete clear memory mode.

8. Diagnostics Chart for Immobilizer Indicator Light

A: INSPECTION

1. CHECK IMMOBILIZER INDICATOR CIRCUIT

WIRING DIAGRAM:



DIAGNOSTICS CHART FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

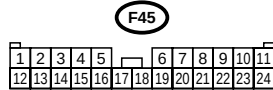
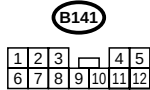
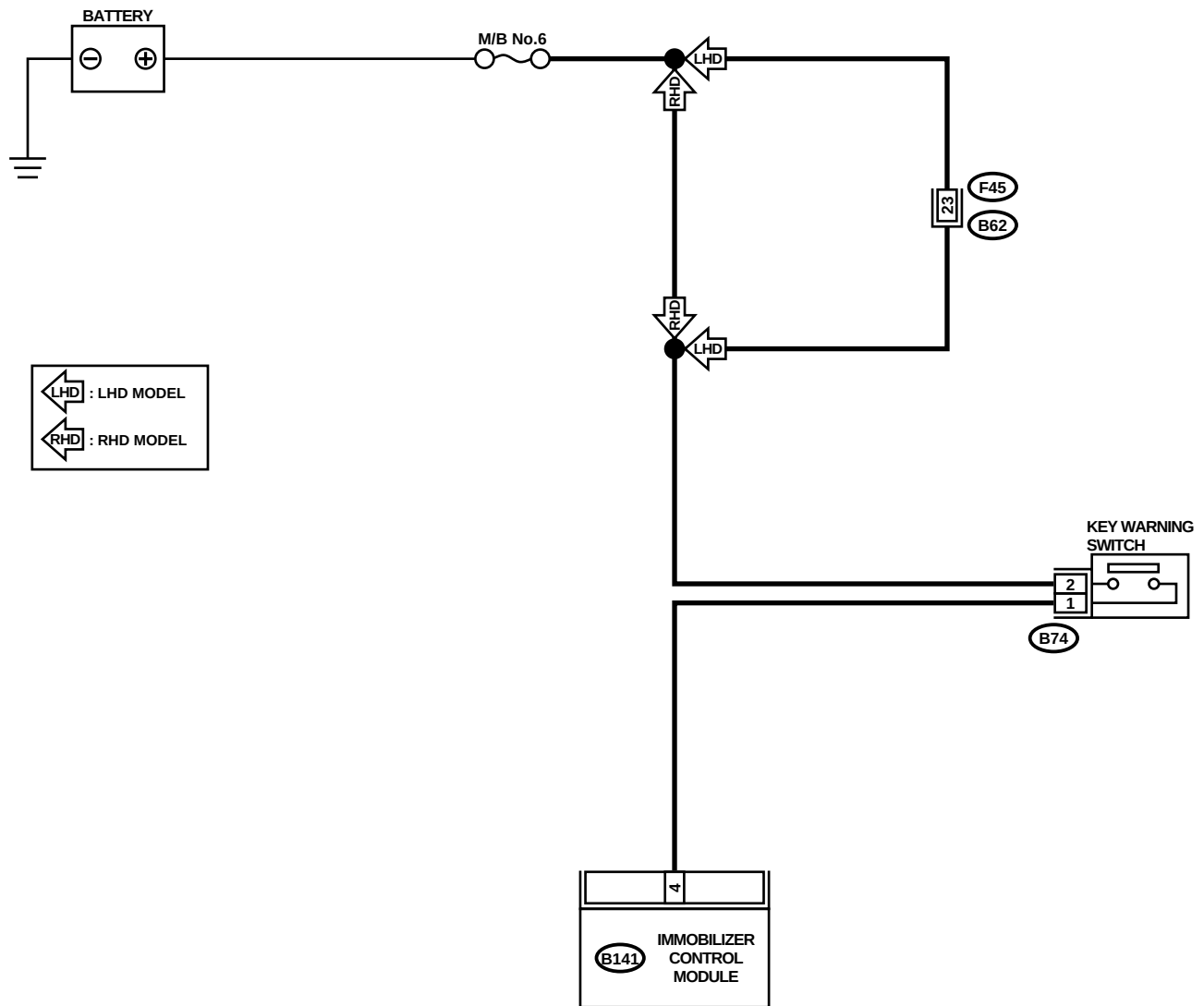
Step	Check	Yes	No
1 CHECK IMMOBILIZER INDICATOR LIGHT COMES ON. 1) Turn ignition switch OFF. 2) Disconnect harness connector from IMM ECM. 3) Connect a resistor (750 Ω) between IMM ECM harness connector terminal No. 9 and chassis ground.	Does indicator light comes on?	Go to step 2.	Go to step 5.
2 CHECK 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 resistance less than 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 (-):	Is the voltage more than 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 (-):	Is the voltage more than 10 V?	Replace IMM ECM <Ref. to SL-44, 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-19, Combination Meter Assembly.> 2) Measure voltage between combination meter harness connector terminal and chassis ground. Connector & terminal (i10) No. 10 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Check harness for open or short between combination meter and fuse.
6 CHECK COMBINATION METER CIRCUIT. Measure resistance between IMM ECM harness connector terminal and combination meter harness connector terminal. Connector & terminal (B141) No. 9 — (i11) No. 6:	Is the resistance less than 10 Ω ?	Faulty LED bulb. Replace combination meter printed circuit. <Ref. to IDI-20, DISASSEMBLY, Combination Meter Assembly.>	Repair harness or connector.

DIAGNOSTICS CHART FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

2. CHECK KEY SWITCH CIRCUIT

WIRING DIAGRAM:



BO0150

DIAGNOSTICS CHART FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY CIRCUIT. 1)Disconnect harness connector from key warning switch. 2)Turn ignition switch ACC or LOCK position (The key inserted). 3)Measure voltage between key warning switch harness connector terminal and chassis ground. Connector & terminal (B74) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Check harness for open or short between key warning switch and fuse.
2 CHECK KEY SWITCH. 1)Insert the ignition key to the ignition switch. (OFF or ACC position) 2)Check continuity between key warning switch connector terminals. Connector & terminal No. 1 — No. 2:	Does continuity exist?	Go to step 3.	Replace key warning switch.
3 CHECK KEY SWITCH. 1)Remove the ignition key from the ignition switch. 2)Check continuity between key warning switch connector terminals. Connector & terminal No. 1 — No. 2:	Does continuity exist?	Replace key warning switch.	Go to step 4.
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 resistance less than 10 Ω ?	Replace IMM ECM <Ref. to SL-44, 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

DTC		Item	Contents of diagnosis	Index No.
Without OBD	With OBD			
53	P1571	Reference Code Incompatibility	Reference code incompatibility between IMM ECM and ECM	<Ref. to IM-21, DTC P1571 — REFERENCE CODE INCOMPATIBILITY —, Diagnostics Chart with Trouble Code.>
	P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between IMM ECM and ECM	<Ref. to IM-22, DTC P1572 — IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT) —, Diagnostics Chart with Trouble Code.>
	P1574	Key Communication Failure	Failure of IMM ECM to verify key (transponder) ID code	<Ref. to IM-26, DTC P1574 — KEY COMMUNICATION FAILURE —, Diagnostics Chart with Trouble Code.>
	P0153	Use of Unregistered Key	Incorrect immobilizer key (Use of unregistered key in IMM ECM)	<Ref. to IM-27, DTC P0153 — INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY) —, Diagnostics Chart with Trouble Code.>
	P1576	EGI Control Module EEPROM	ECM malfunctioning	<Ref. to IM-27, DTC P1576 — EGI CONTROL MODULE EEPROM —, Diagnostics Chart with Trouble Code.>
	P1577	IMM Control Module EEPROM	IMM ECM malfunctioning	<Ref. to IM-27, DTC P1577 — IMM CONTROL MODULE EEPROM —, Diagnostics Chart with Trouble Code.>
	P1570	ANTENNA	Faulty antenna	<Ref. to IM-28, DTC P1570 — ANTENNA —, Diagnostics Chart with Trouble Code.>

NOTE:

- When reading diagnostic trouble code except with SUBARU SELECT MONITOR, the item cannot be specified. Therefore diagnose for all items.
- When a diagnostic trouble code except for the above immobilizer trouble code has been output, carry out diagnosis for the engine trouble code. <Ref. to EN(SOHC)-81, List of Diagnostic Trouble Code (DTC).> or <Ref. to EN(SOHCw/oOBD)-66, List of Diagnostic Trouble Code (DTC).> or <Ref. to EN(DOHC TURBO)-69, List of Diagnostic Trouble Code (DTC).>

10.Diagnostics Chart with Trouble Code

A: DTC P1571 — REFERENCE CODE INCOMPATIBILITY —

DIAGNOSIS:

- Reference code incompatibility between IMM ECM and ECM

Step	Check	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?	END	Replace ECM <Ref. to FU(SOHC)-48, Engine Control Module.>, <Ref. to FU(SOHCw/ oOBD)-44, Engine Control Module.> or <Ref. to FU(DOHC TURBO)-45, Engine Control Module.>, IMM ECM <Ref. to SL- 44, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTICS CHART WITH TROUBLE CODE

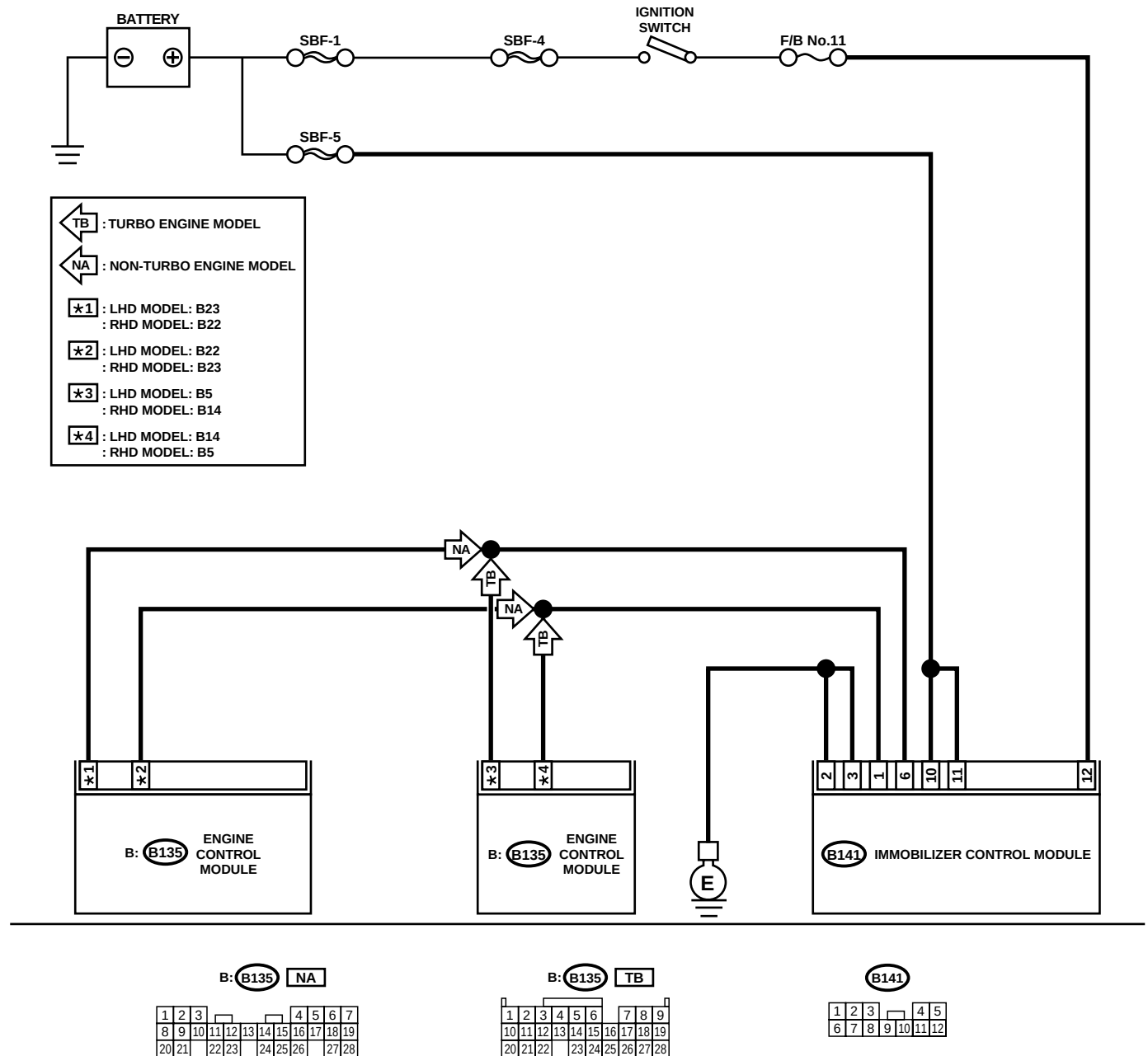
IMMOBILIZER (DIAGNOSTICS)

B: DTC P1572 — IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT) —

DIAGNOSIS:

- Communication failure between IMM ECM and ECM

WIRING DIAGRAM:



BO0151

DIAGNOSTICS CHART WITH TROUBLE CODE

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY CIRCUIT OF IMM ECM. 1) Turn ignition switch OFF. 2) Disconnect harness connector from IMM ECM. 3) Measure voltage between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 10, No.11 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Check harness for open or short between IMM ECM and fuse.
2 CHECK POWER SUPPLY CIRCUIT OF IMM ECM. 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 (-):	Is the voltage more than 10 V?	Go to step 3.	Check harness for open or short between IMM ECM and ignition switch.
3 CHECK GROUND CIRCUIT OF IMM ECM. 1) Turn ignition switch OFF. 2) Measure resistance between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 2, No.3 (+) — Chassis ground (-):	Is the resistance less than 10 Ω ?	Go to step 4.	Repair open circuit of IMM ECM ground circuit.
4 CHECK HARNESS BETWEEN IMM ECM AND ECM. 1) Disconnect harness connector from ECM and IMM ECM. 2) Measure resistance between IMM ECM harness connector terminal and ECM harness connector terminal. Connector & terminal LHD non-turbo engine model: (B141) No. 1 — (B135) No. 22: RHD non-turbo engine model: (B141) No. 1 — (B135) No. 23: LHD turbo engine model: (B141) No. 1 — (B135) No. 14: RHD turbo engine model: (B141) No. 1 — (B135) No. 5:	Is the resistance less than 10 Ω ?	Go to step 5.	Repair open circuit of harness between IMM ECM and ECM.
5 CHECK HARNESS BETWEEN IMM ECM AND ECM. Measure resistance between IMM ECM harness connector terminal and ECM harness connector terminal. Connector & terminal LHD non-turbo engine model: (B141) No. 6 — (B135) No. 23: RHD non-turbo engine model: (B141) No. 6 — (B135) No. 22: LHD turbo engine model: (B141) No. 6 — (B135) No. 5: RHD non-turbo engine model: (B141) No. 6 — (B135) No. 14:	Is the resistance less than 10 Ω ?	Go to step 6.	Repair open circuit of harness between IMM ECM and ECM.

DIAGNOSTICS CHART WITH TROUBLE CODE

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
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. Connector & terminal (B141) No. 1, No.6 (+) — Chassis ground (-):	Is the voltage 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.
7 CHECK HARNESS OF COMMUNICATION LINE. Measure voltage between ECM harness connector terminal and engine ground. Connector & terminal Non-turbo engine model: (B135) No. 22, No.23 (+) — Engine ground (-): Turbo engine model: (B135) No. 5, No.14 (+) — Engine ground (-):	Is the voltage 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.
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-10, INTERFACE CHECK, Subaru Select Monitor.>	Does "Commun. Line Shorted to Ground" appear on screen?	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>, <Ref. to FU(SOHCw/oOBD)-44, Engine Control Module.> or <Ref. to FU(DOHC TURBO)-45, 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?	Replace ECM. <Ref. to FU(SOHC)-48, Engine Control Module.>, <Ref. to FU(SOHCw/oOBD)-44, Engine Control Module.> or <Ref. to FU(DOHC TURBO)-45, Engine Control Module.> Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Go to step 10.

DIAGNOSTICS CHART WITH TROUBLE CODE

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK ECM BY INTERFACE CHECK. Perform interface check.	Does "Communication Line not Shorted" appear on screen?	Replace IMMECM <Ref. to SL-44, 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.

DIAGNOSTICS CHART WITH TROUBLE CODE

IMMOBILIZER (DIAGNOSTICS)

C: DTC P1574 — KEY COMMUNICATION FAILURE —

DIAGNOSIS:

- Failure of IMM ECM to verify key (transponder) ID code

Step		Check	Yes	No
1	CHECK IMM ECM FUNCTION. Insert the key to ignition switch (LOCK position), measure changes in voltage between Antenna connector. Connector & terminal (B142) No. 1 — No. 2:	Is the voltage –30 to 30 V? (Approximately 0.1 second after inserting the key.) Is the voltage 0 V? (Approximately 1 second after inserting the key.)	Go to step 2.	Replace IMM ECM <Ref. to SL-44, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).
2	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?	Replace ignition key (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Replace IMM ECM <Ref. to SL-44, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTICS CHART WITH TROUBLE CODE

IMMOBILIZER (DIAGNOSTICS)

D: DTC P0153 — INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY) —

DIAGNOSIS:

- Use of unregistered key in IMM ECM

Step		Check	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?	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?	END	Replace IMM ECM <Ref. to SL-44, 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(SOHC)-48, Engine Control Module.>, <Ref. to FU(SOHCw/oOBD)-44, Engine Control Module.> or <Ref. to FU(DOHC TURBO)-45, 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-44, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTICS CHART WITH TROUBLE CODE

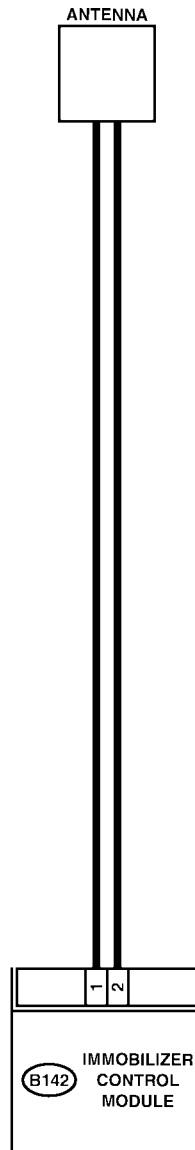
IMMOBILIZER (DIAGNOSTICS)

G: DTC P1570 — ANTENNA —

DIAGNOSIS:

- Faulty antenna

WIRING DIAGRAM:



(B142)

1 2

B6M1534

DIAGNOSTICS CHART WITH TROUBLE CODE

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANTENNA CIRCUIT. 1) Turn ignition switch OFF. 2) Disconnect harness antenna connector from IMM ECM. <Ref. to SL-45, Immobilizer Antenna.> 3) Measure resistance of antenna circuit. Connector & terminal (B142) No. 1 — No. 2:	Is the resistance less than 10 Ω ?	Go to step 2.	Replace antenna. <Ref. to SL-45, Immobilizer Antenna.>
2 CHECK ANTENNA CIRCUIT. Measure resistance between antenna harness connector and chassis ground. Connector & terminal (B142) No. 1 (+) — Chassis ground (-):	Is the resistance less than 10 Ω ?	Replace antenna. <Ref. to SL-45, 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 resistance less than 10 Ω ?	Replace antenna. <Ref. to SL-45, 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 voltage 0 V?	Go to step 5.	Replace antenna. <Ref. to SL-45, Immobilizer Antenna.>
5 CHECK ANTENNA CIRCUIT. Measure voltage between antenna harness connector and chassis ground. Connector & terminal (B142) No. 2 (+) — Chassis ground (-):	Is the voltage 0 V?	Go to step 6.	Repair harness between IMM ECM and antenna, because there is short circuit in battery voltage line or ignition switch "ON" line.
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. Connector & terminal (B142) No. 1 — No. 2:	Is the voltage -30 to 30 V? (Approximately 0.1 second after inserting the key.) Is the voltage 0 V? (Approximately 1 second after inserting the key.)	Go to step 7.	Replace IMM ECM <Ref. to SL-44, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).
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?	Replace ignition key (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Replace IMM ECM <Ref. to SL-44, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTICS CHART WITH TROUBLE CODE

IMMOBILIZER (DIAGNOSTICS)

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

SR

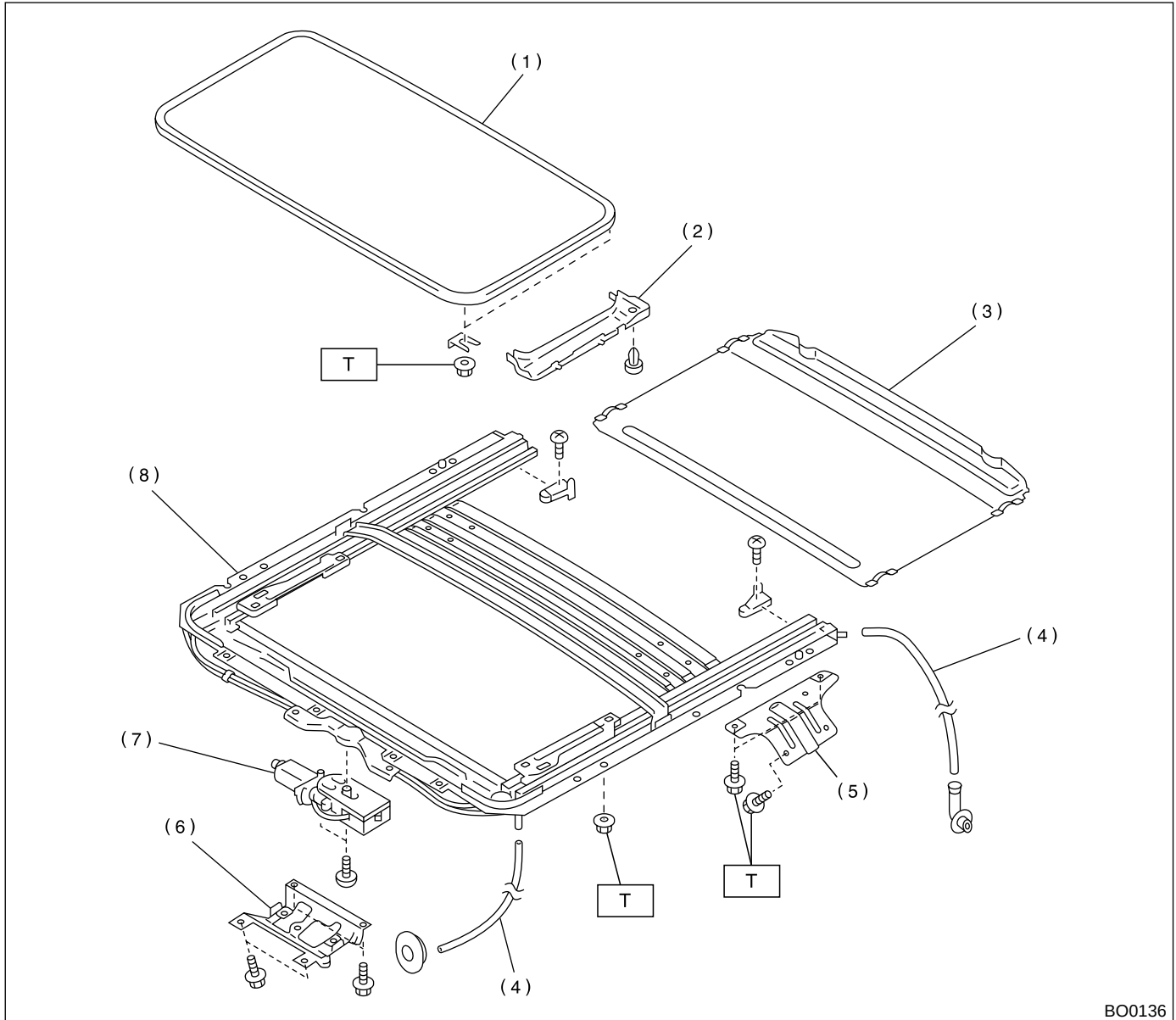
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2. Sunroof Control System	4
3. Sunroof Lid	6
4. Sunroof Assembly	7
5. Sunroof Motor	9
6. Sunroof Switch	11

GENERAL DESCRIPTION

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

1. General Description

A: COMPONENT



BO0136

- (1) Glass lid
- (2) Guide rail cover
- (3) Sunshade
- (4) Drain tube
- (5) Sunroof bracket

- (6) Motor cover
- (7) Motor ASSY
- (8) Frame ASSY

Tightening torque: N·m (kgf-m, ft-lb)

T: 7.4 (0.75, 5.4)

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 functional parts operate smoothly.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

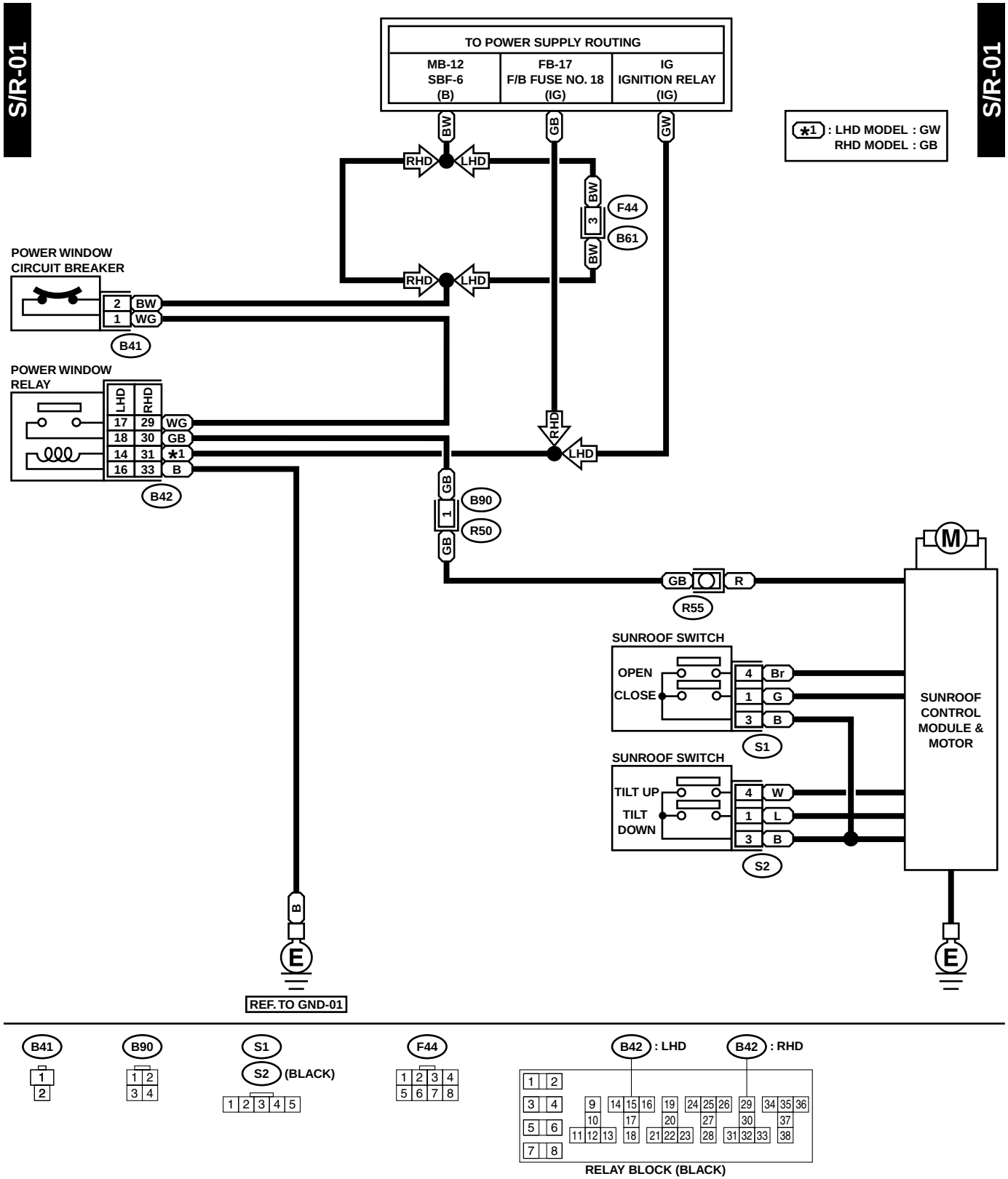
SUNROOF CONTROL SYSTEM

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

2. Sunroof Control System

A: SCHEMATIC

1. SUNROOF



SUNROOF CONTROL SYSTEM

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

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.

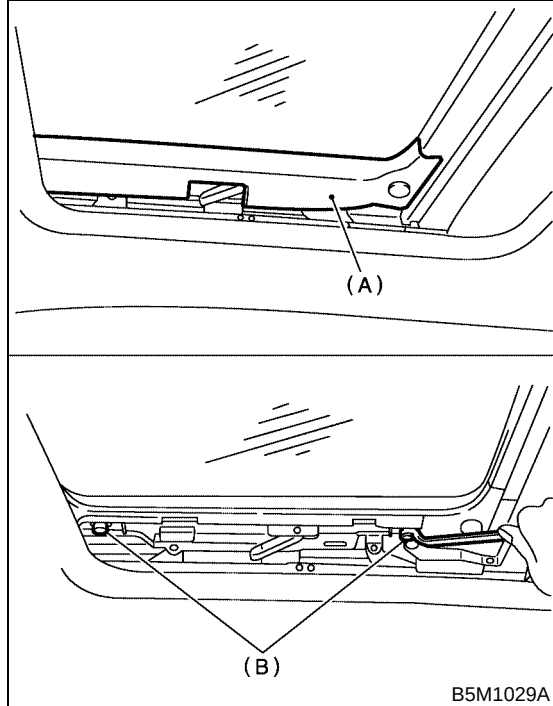
SUNROOF LID

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

3. Sunroof Lid

A: REMOVAL

- 1) Completely close rear sunroof lid and open sunshade.
- 2) Disconnect ground cable from battery.
- 3) Remove covers (A) then remove nuts (B).



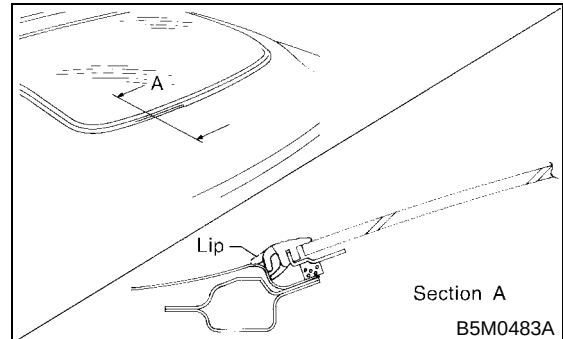
- 4) Remove the sunroof lid carefully.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

When installing sunroof lid, be careful not to pinch the lip of lid.



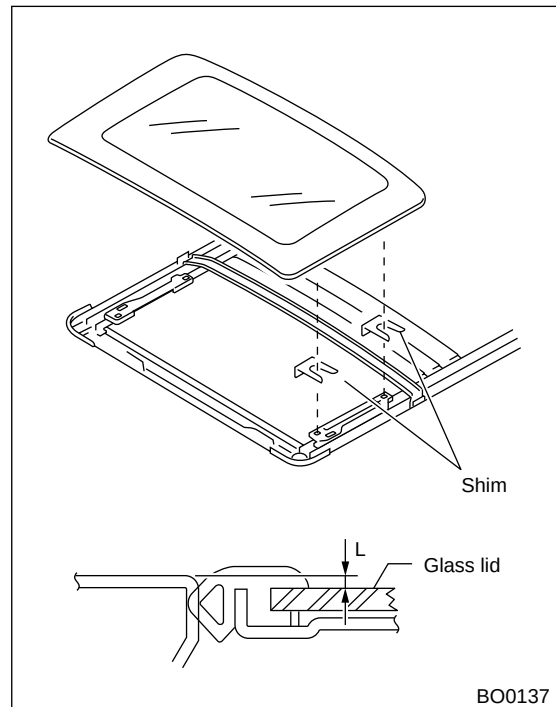
C: ADJUSTMENT

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 (standard: one piece) between sunroof lid and body.

Difference in height between sunroof lid and roof panel: L

L: 2.0 ± 0.5 mm (0.079 ± 0.020 in)



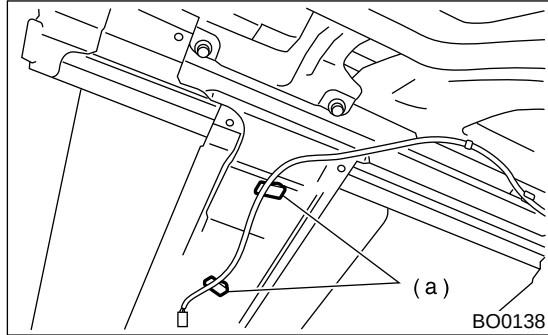
SUNROOF ASSEMBLY

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

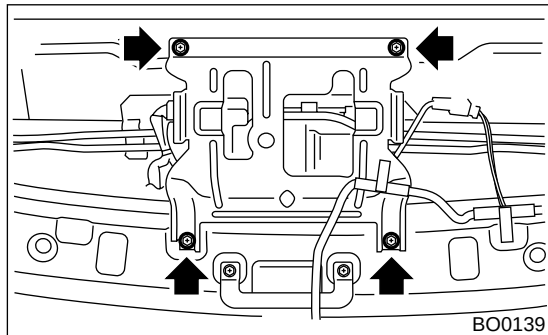
4. Sunroof Assembly

A: REMOVAL

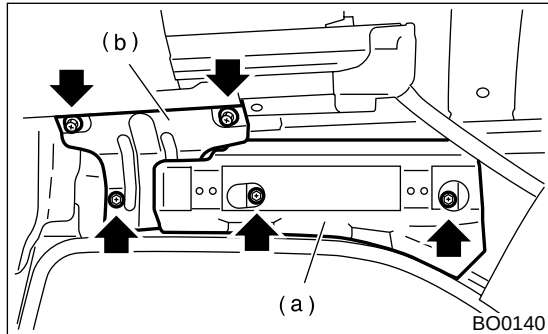
- 1) Remove roof trim. <Ref. to EI-33, REMOVAL, Roof Trim.>
- 2) Remove sunroof lid. <Ref. to SR-6, REMOVAL, Sunroof Lid.>
- 3) Disconnect drain tubes from sunroof frame.
- 4) Remove room lamp harness clip (a).



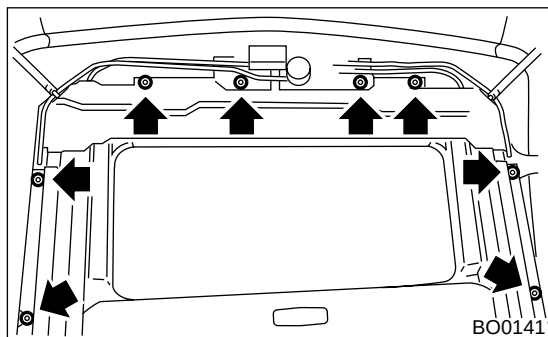
- 5) Disconnect sunroof harness connector.
- 6) Remove motor cover.



- 7) Remove assist grip bracket (a) and sunroof bracket (b).



- 8) Remove nuts then detach the sunroof frame.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

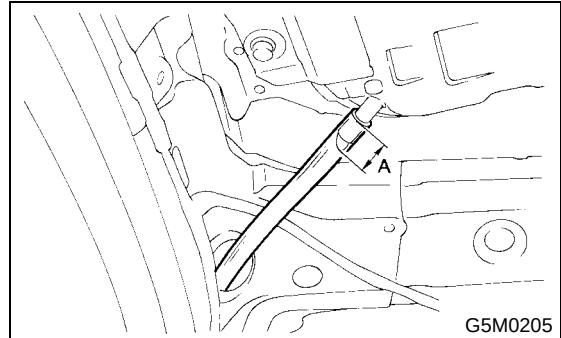
Be careful not to snag the harness.

NOTE:

- Make sure to connect harness connector.
- When installing drain tube, insert it securely onto drain pipe.

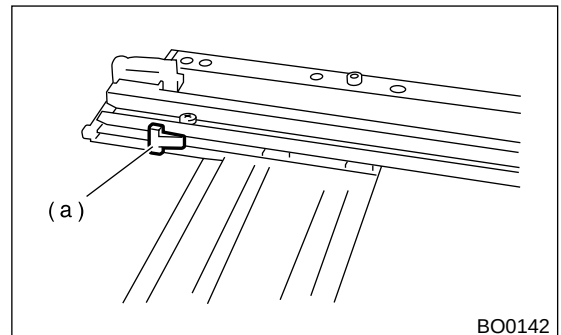
Length A:

15 mm (0.59 in) or more

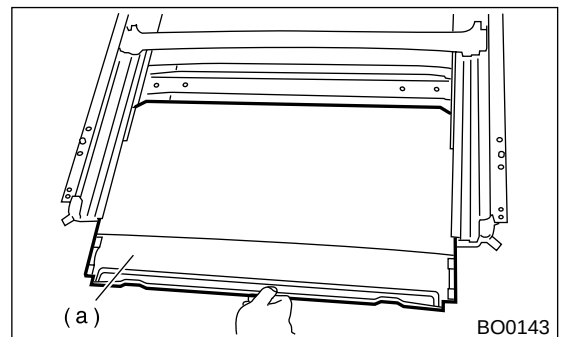


C: DISASSEMBLY

- 1) Remove sunroof frame.
- 2) Remove rail stoppers (a).



- 3) Pull out the sunshade (a) from sunroof frame.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

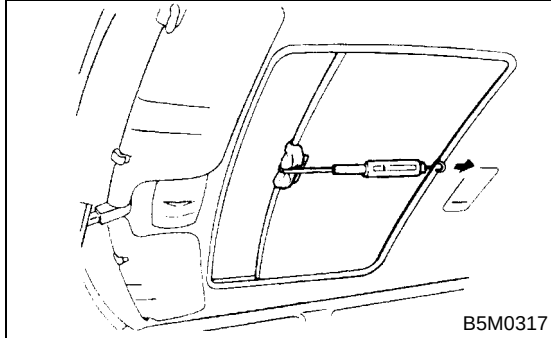
SUNROOF ASSEMBLY

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, 55 ± 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

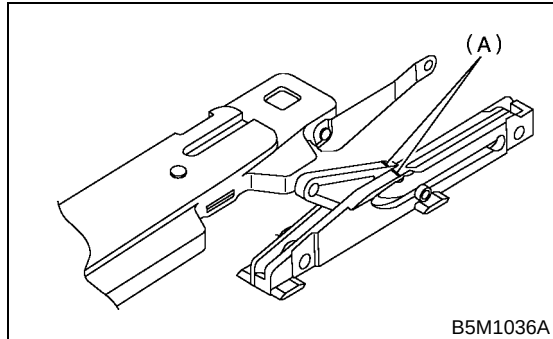
5. Sunroof Motor

A: REMOVAL

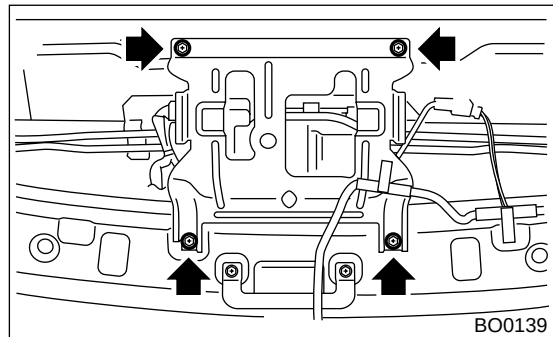
CAUTION:

When removing clip, use great care to not damage the roof trim.

- 1) Completely close the sunroof.
- 2) Remove sunroof lid. <Ref. to SR-6, REMOVAL, Sunroof Lid.>
- 3) Confirm the matching mark of sunroof bracket link and the guide from sunroof opening. (If the mark does not match, adjust to match the mark.)



- 4) Remove roof trim. <Ref. to EI-33, REMOVAL, Roof Trim.>
- 5) Remove motor cover.



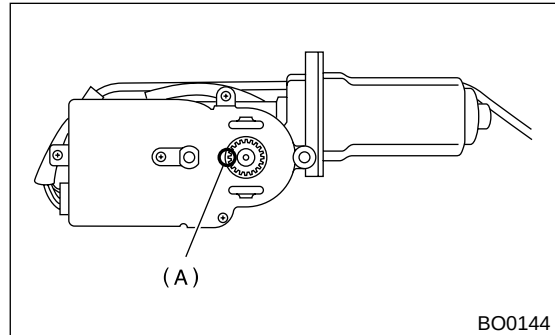
- 6) Disconnect harness connector and remove sunroof motor mounting screw.

B: INSTALLATION

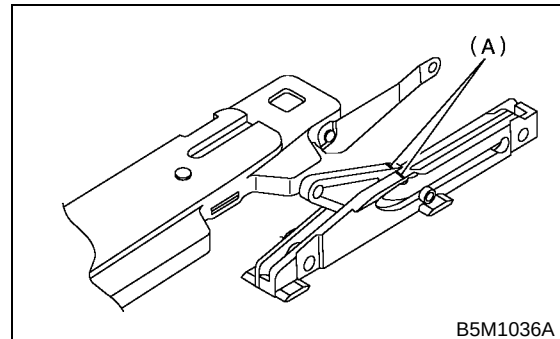
CAUTION:

- 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.

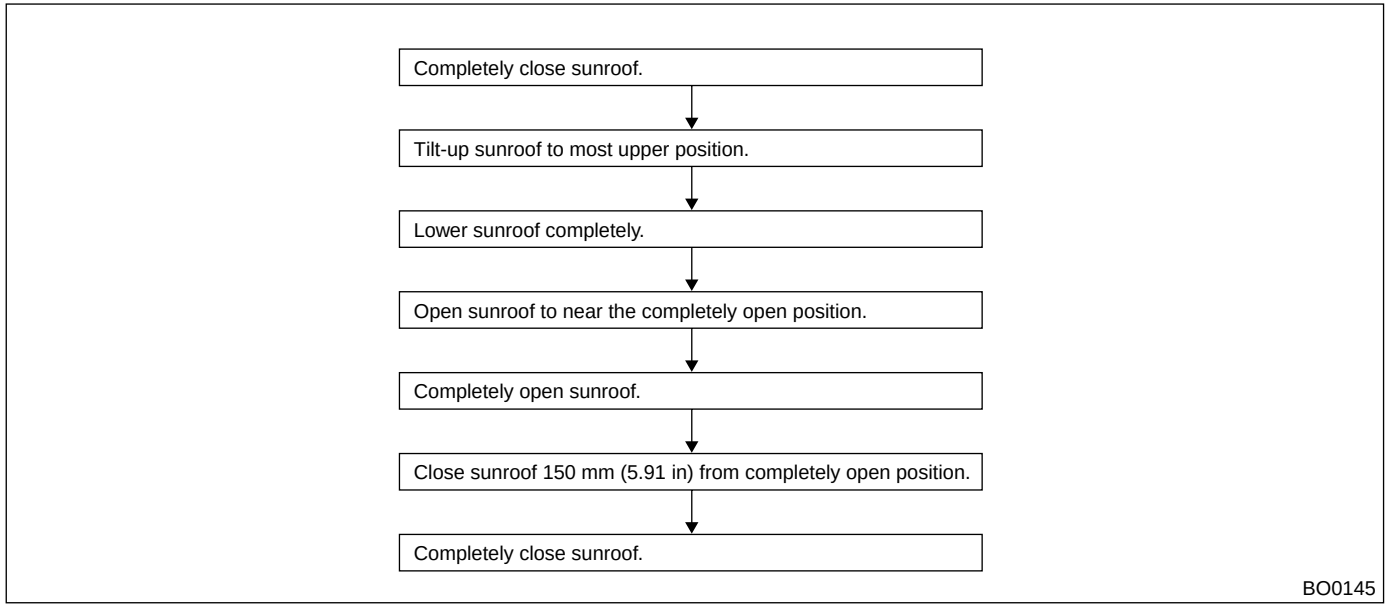


- 3) Install sunroof motor.
- 4) After installing the motor, reconfirm the matching marks of motor side and sunroof bracket link side.
- 5) Connect sunroof motor harness connector and then connect battery ground cable.
- 6) Operate the sunroof switch, and check the sunroof stop position.
- 7) Move sunroof to completely closed position and install sunroof lid.

SUNROOF MOTOR

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

8) Check the sunroof operation with the procedure as shown in the figure.

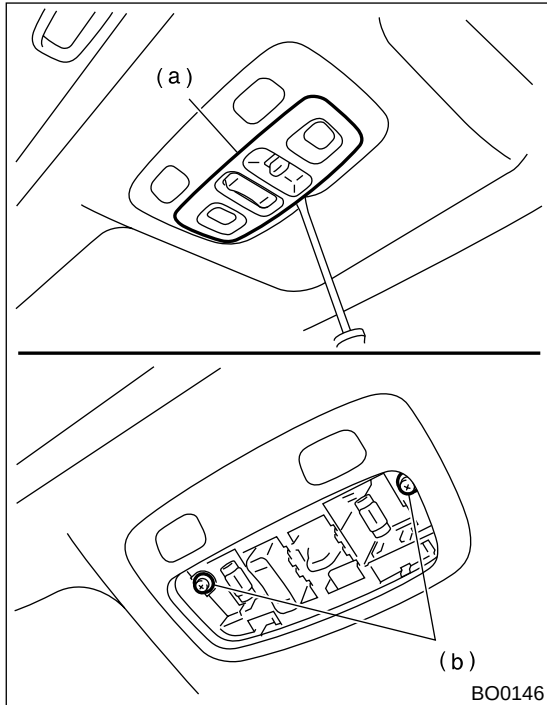


9) Install trims in the reverse order of removal.

6. Sunroof Switch

A: REMOVAL

- 1) Disconnect ground cable from battery.
- 2) Remove spot light lens (A) and sunroof switch mounting screw (B).

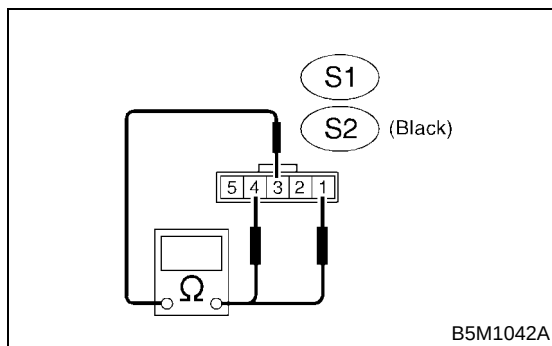


- 3) Disconnect harness connectors and remove sunroof switch.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Check continuity between terminals when operating the switch.

Switch position	Tester connection	Specified condition
Open	S1: 3 — 4	Continuity
Close	S1: 1 — 3	Continuity
Tilt-up	S2: 3 — 4	Continuity
Tilt-down	S2: 1 — 3	Continuity

SUNROOF SWITCH

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

BODY SECTION

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HVAC SYSTEM
(HEATER, VENTILATOR AND A/C) AC

HVAC SYSTEM (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

EXTERIOR/INTERIOR TRIM



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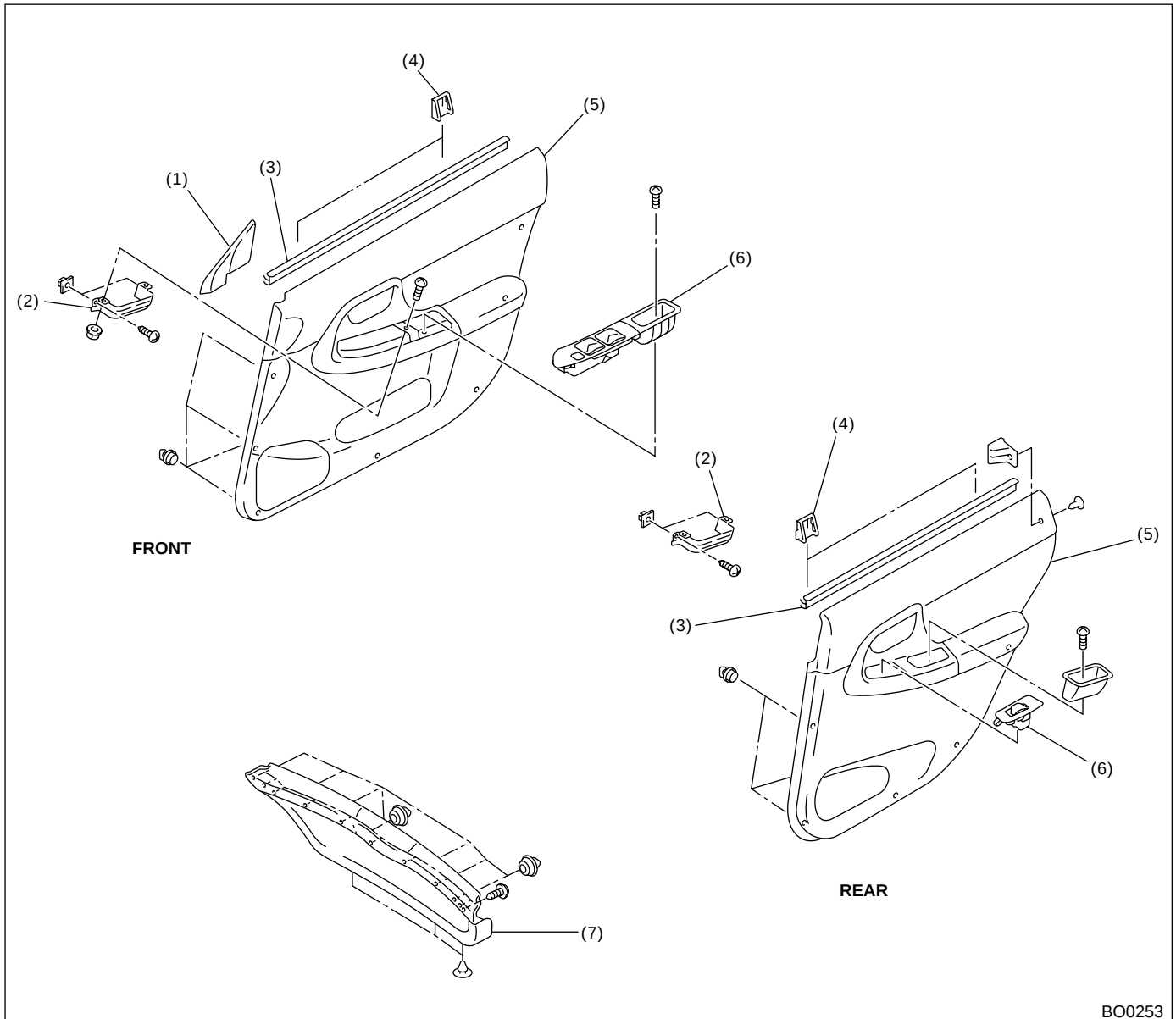
GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

1. General Description

A: COMPONENT

1. DOOR TRIM



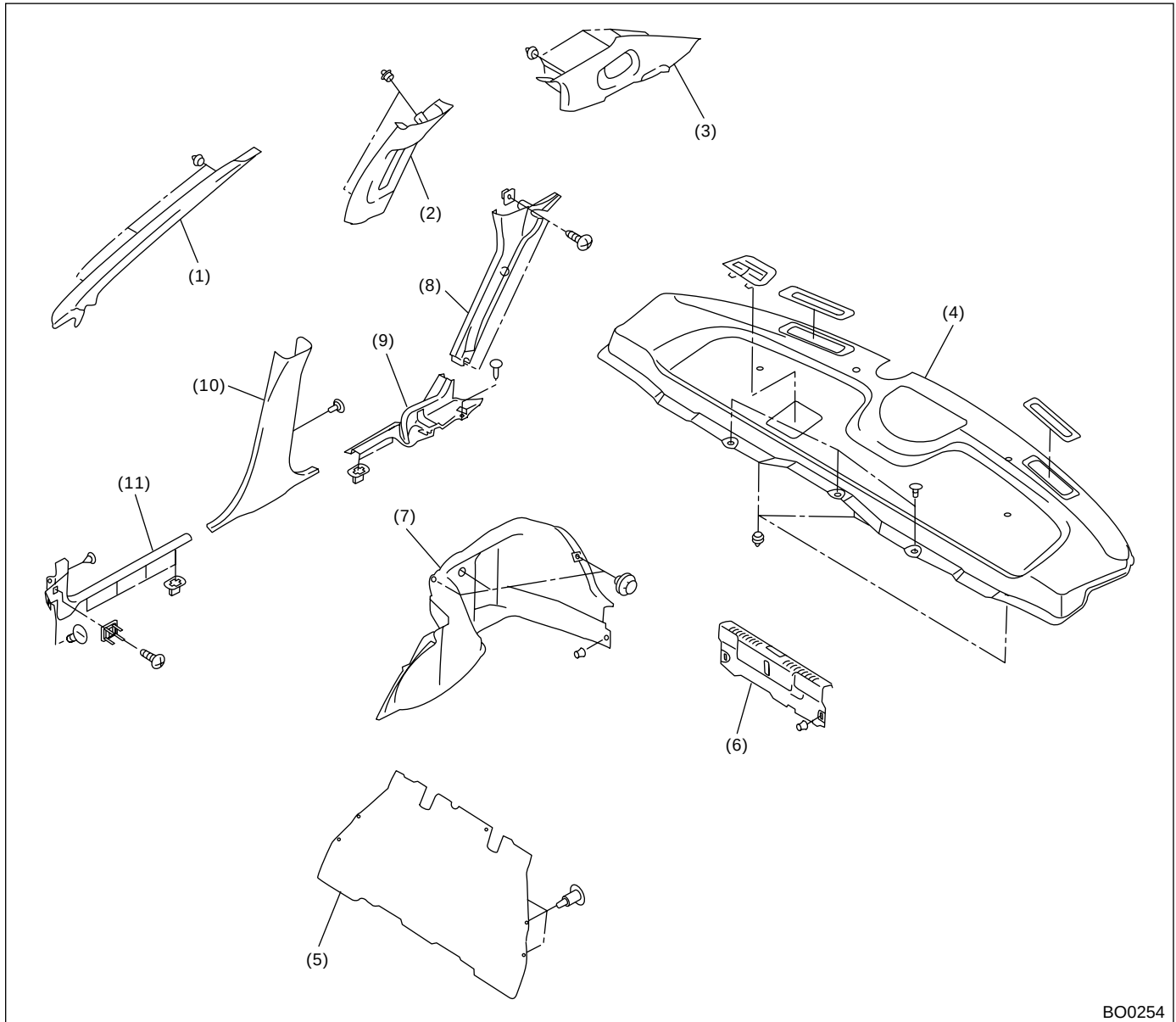
BO0253

- (1) Gusset cover
- (2) Bracket
- (3) Weatherstrip upper

- (4) Clip
- (5) Trim panel
- (6) Power window switch cover

- (7) Lower trim

2. INNER TRIM (SEDAN)



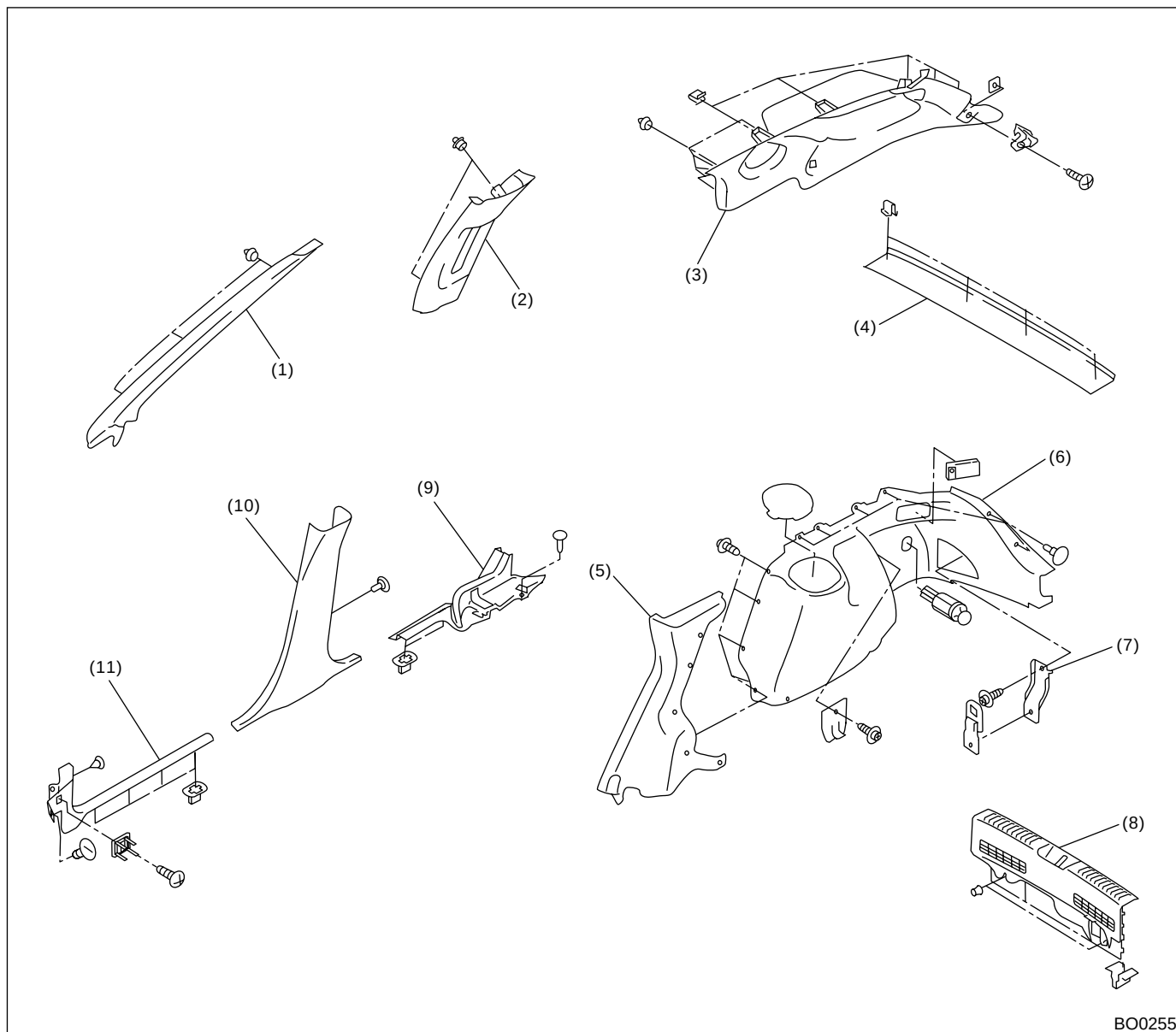
BO0254

- | | | |
|------------------------------|----------------------------|-------------------------------|
| (1) Front pillar upper trim | (5) Rear bulk trim | (9) Side sill rear cover |
| (2) Center pillar upper trim | (6) Trunk rear trim | (10) Center pillar lower trim |
| (3) Rear pillar upper trim | (7) Trunk side trim | (11) Side sill front cover |
| (4) Rear shelf trim | (8) Rear pillar lower trim | |

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

3. INNER TRIM (WAGON)



- | | | |
|------------------------------|-----------------------------|-------------------------------|
| (1) Front pillar upper trim | (5) Rear pillar lower trim | (9) Side sill rear cover |
| (2) Center pillar upper trim | (6) Rear quarter lower trim | (10) Center pillar lower trim |
| (3) Rear pillar upper trim | (7) Hook | (11) Side sill front cover |
| (4) Rear rail trim | (8) Rear skirt trim | |

This exploded view diagram illustrates the assembly of a mechanical component. The diagram includes the following parts and callouts:

- Callout (1):** Points to a small, L-shaped bracket that is secured to the main assembly with a screw.
- Callout (2):** Points to a larger, rectangular plate with a central rectangular cutout. This plate is shown being attached to the main assembly using two screws.
- Callout (3):** Points to a long, thin, angled bracket. This bracket is shown being secured to the main assembly with two screws.

The diagram uses dashed lines to indicate the alignment and assembly path for each component. The main assembly is shown in a perspective view, with the callout parts positioned around it to show their relative positions and how they fit together.

BO0256

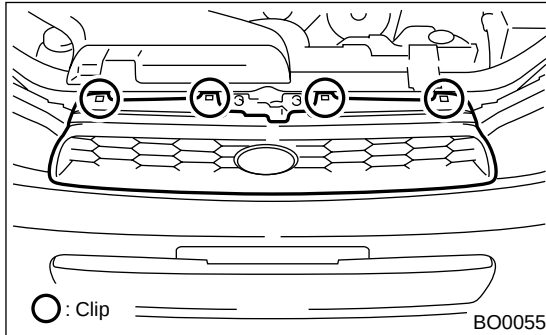
(3) Assist grip

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.

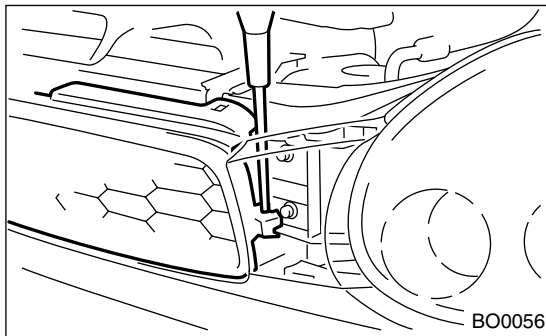
2. Front Grille

A: REMOVAL

- 1) Open hood.
- 2) Remove four clips.



- 3) Remove two hooks.



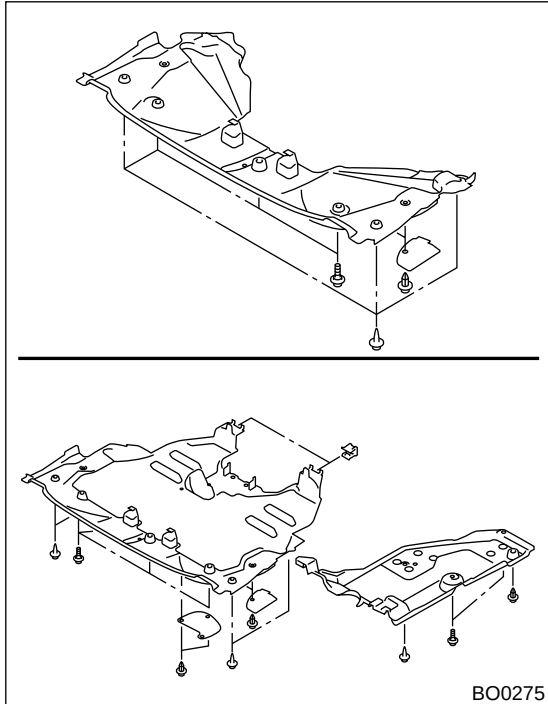
B: INSTALLATION

Install in the reverse order of removal.

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.

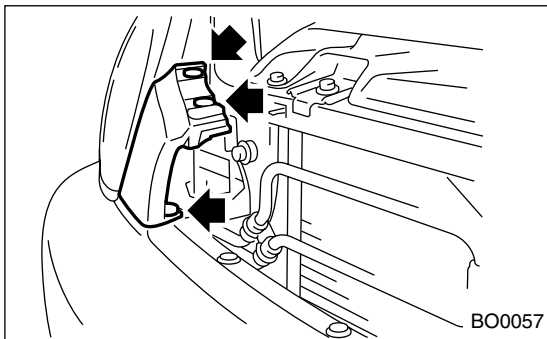
4. Front Bumper

A: REMOVAL

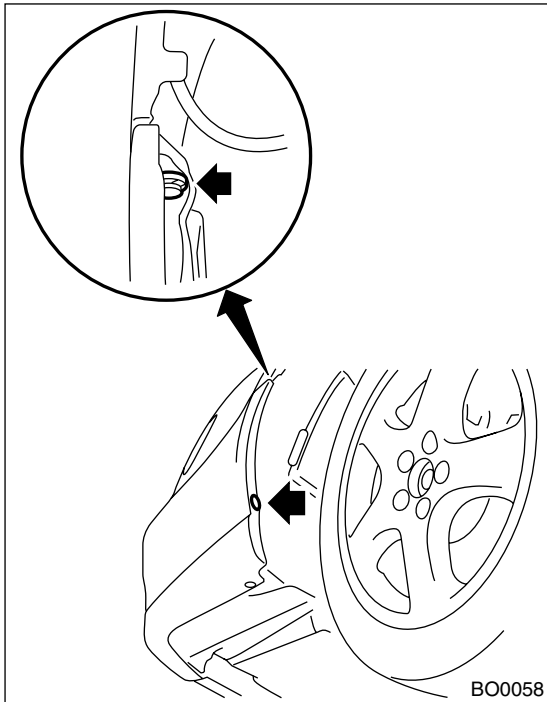
CAUTION:

- Handle bumper carefully to avoid damage to bumper face.
- Do not damage body during removal or installation of bumper.
- To avoid damage to bumper, lay removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

- 1) Disconnect battery ground cable.
- 2) Remove front grille. <Ref. to EI-6, REMOVAL, Front Grille.>
- 3) Loosen three clips to remove front grille side.

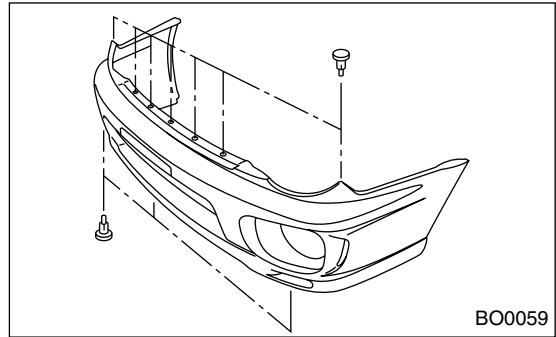


- 4) Pull off front side of front mud guard to remove clip.



- 5) Remove clips, and pull out bumper slightly.

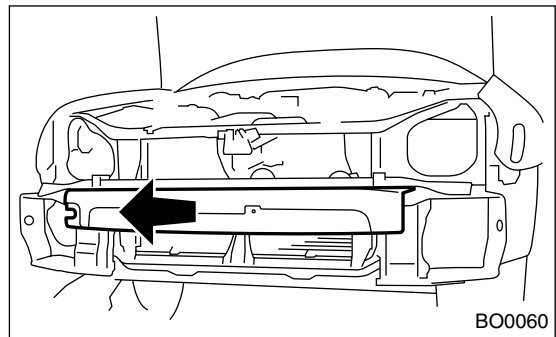
- 6) Disconnect fog light connector to remove bumper.



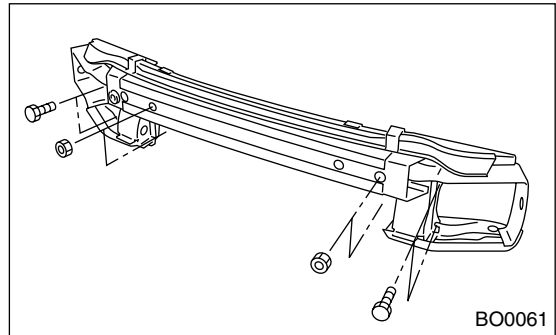
- 7) Remove E/A FORM from bumper beam.

CAUTION:

- E/A FORM is easy to break. Do not apply excessive force to it during removal.



- 8) Remove bumper beam.



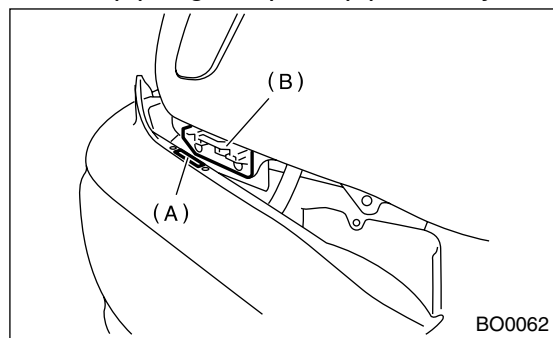
B: INSTALLATION

CAUTION:

- Handle bumper carefully to avoid damage to bumper face.
- Do not damage body during removal or installation of bumper.

- 1) Install in the reverse order of removal.

2) Fit slider (A) to guide plate (B) securely.

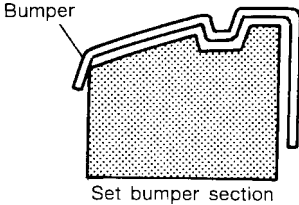


FRONT BUMPER

EXTERIOR/INTERIOR TRIM

C: REPAIR

1. COATING METHOD FOR PP BUMPER

Process No.	Process name	Job contents	
1	Bumper mounting	Set bumper on paint worktable if required. Use paint worktable conforming to inner shape of bumper when possible.	 G5M0164
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.	

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.

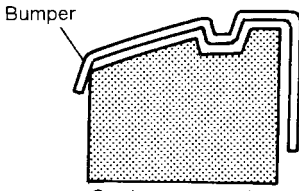
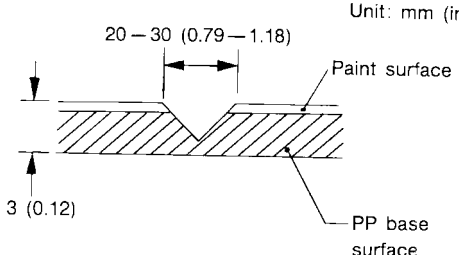
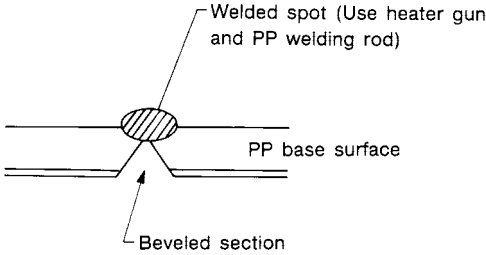
FRONT BUMPER

EXTERIOR/INTERIOR TRIM

• Deep damage such as a break or hole that requires filling

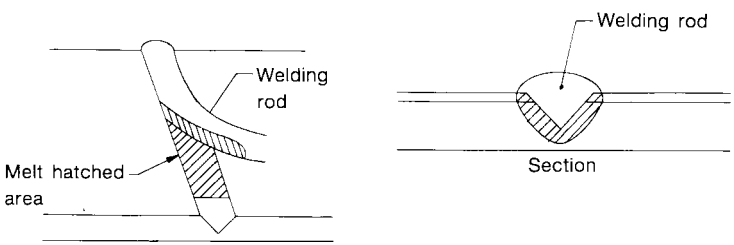
Much of the peripheral grained surface must be sacrificed for repair, and the degree of restoration is not really worth the expense. (The surface, however, will become almost flush with adjacent areas.)

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 on a paint worktable as required. It is recommended that contour of worktable accommodate internal shape of bumper.	 Set bumper section G5M0164
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	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.	 Unit: mm (in) 20 — 30 (0.79 — 1.18) 3 (0.12) Paint surface PP base surface G5M0165
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	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.	 Welded spot (Use heater gun and PP welding rod) PP base surface Beveled section G5M0166 NOTE: • Do not melt welding rod until it flows out. This results in reduced strength. • Leave the welded spot unattended until it cools completely.

FRONT BUMPER

EXTERIOR/INTERIOR TRIM

Process No.	Process name	Job contents
9	Welding	Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.
		 G5M0167 NOTE: • 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.
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.
		 G5M0168 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: • 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.

FRONT BUMPER

EXTERIOR/INTERIOR TRIM

Process No.	Process name	Job contents	
19	Top coat (I)	Solid color	Metallic color
		Use a "block" coating method. • 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/cm ² , 36 — 50 psi)	Use a "block" coating method. • 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/cm ² , 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.
21	Top coat (II)	Not required.	Apply a clear coat three times at an interval of 3 to 5 minutes. • 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/cm ² , 36 — 50 psi)
22	Drying	Allow the coated surface to dry at 20°C (68°F) for two hours or 60°C (140°F) for 30 minutes. NOTE: Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate.	
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.	

5. Rear Bumper

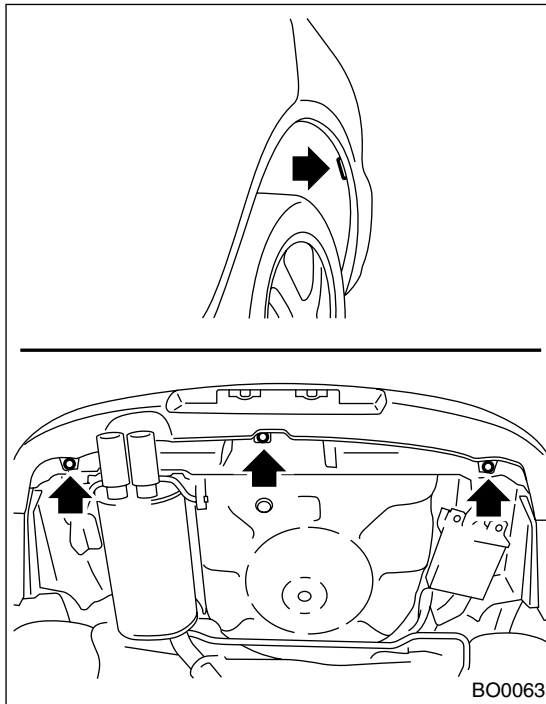
A: REMOVAL

1. WAGON

CAUTION:

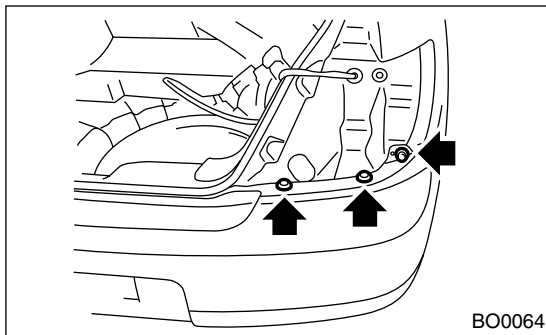
- Handle bumper carefully to avoid damage to bumper face.
- Do not damage body during removal or installation of bumper.
- To avoid damage to bumper, lay removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

1) Remove bolts and clips.



2) Remove Rear combination light assembly. <Ref. to LI-48, REMOVAL, Rear Combination Light Assembly.>

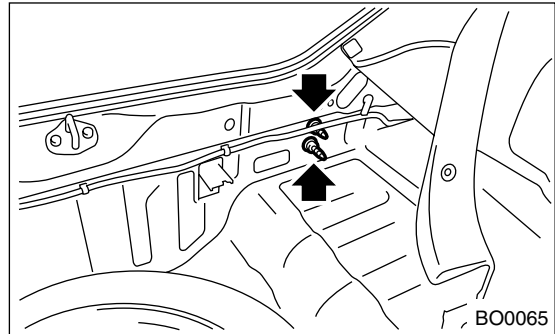
3) Remove screw and two clips from each side.



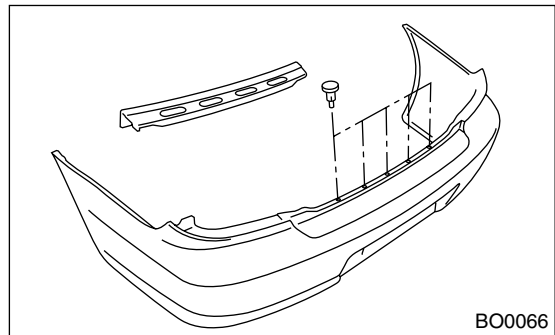
4) Remove floor box.

5) Remove rear skirt trim.

6) Pull off rear end of rear quarter lower trim, and then loosen two nuts from each side to remove rear bumper.



7) Loosen clips to remove bumper beam.



2. SEDAN

Refer to rear bumper removal WAGON. <Ref. to EI-15, WAGON, REMOVAL, Rear Bumper.>

B: INSTALLATION

1. WAGON

CAUTION:

- Handle bumper carefully to avoid damage to bumper face.
- Do not damage body during removal or installation of bumper.

1) Install in the reverse order of removal.

2. SEDAN

CAUTION:

- Handle bumper carefully to avoid damage to bumper face.
- Do not damage body during removal or installation of bumper.

1) Install in the reverse order of removal.

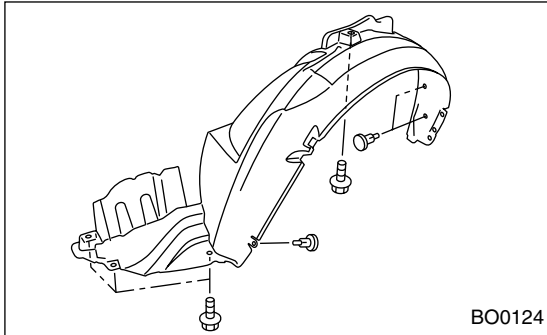
C: REPAIR

Refer to front bumper repair. <Ref. to EI-8, REMOVAL, Front Bumper.>

6. Mud Guard

A: REMOVAL

- 1) Jack-up the vehicle.
- 2) Loosen screws and clips to remove mud guard.



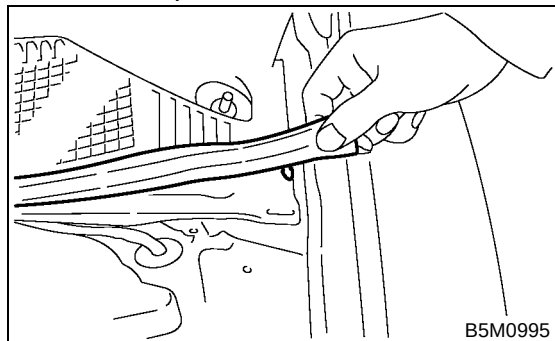
B: INSTALLATION

Insert hook into body, and tighten it with screw and clip.

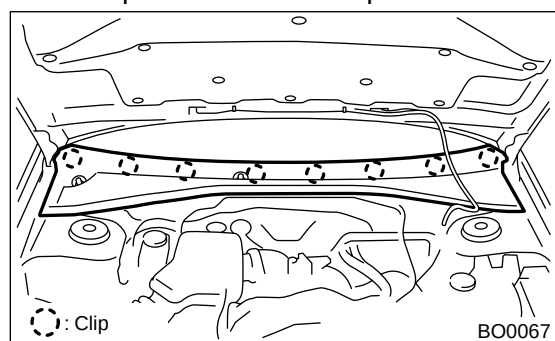
7. Cowl Panel

A: REMOVAL

- 1) Open hood.
- 2) Remove wiper arm. <Ref. to WW-16, REMOVAL, Front Wiper Arm.>
- 3) Remove front panel seal.



- 4) Loosen clips to remove cowl panel.



B: INSTALLATION

Install in the reverse order of removal.

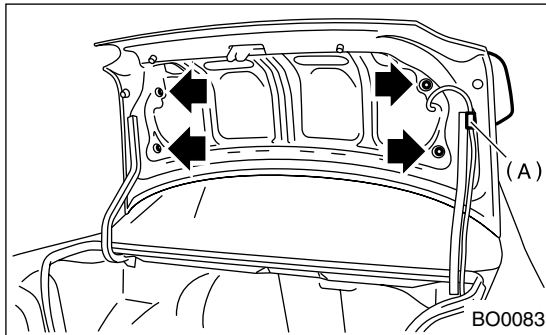
8. Spoiler

A: REMOVAL

- 1) Open trunk lid.
- 2) Remove electrical connector (A) of high-mounted stop light.
- 3) Loosen mounting nut of rear spoiler to remove rear spoiler.

CAUTION:

- When removing nut, do not drop it into trunk lid.
- Pay attention to avoid damage during removal or installation.



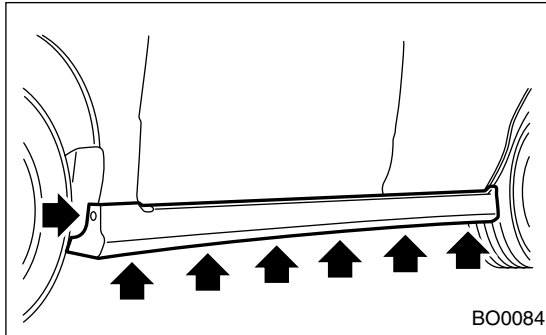
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Clean mounting surfaces of trunk lid and spoiler before installation.

9. Side Sill Spoiler

A: REMOVAL

Remove clips (1 on front, 6 on lower), remove side spoiler.



B: INSTALLATION

Install in the reverse order of removal.

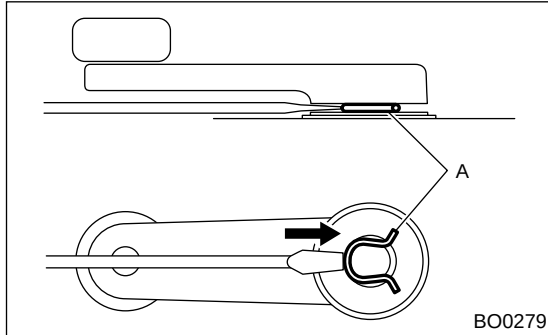
10.Front Door Trim

A: REMOVAL

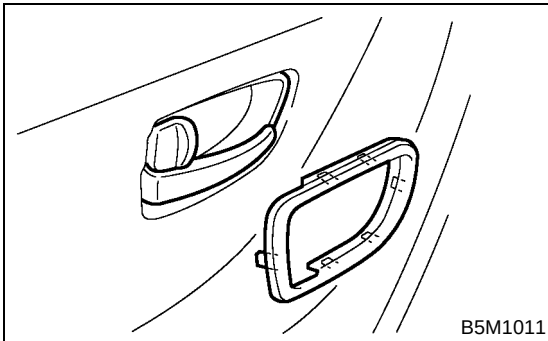
CAUTION:

Do not apply excessive force to clip. Otherwise the clip may be broken.

1) Press retainer spring (A) with a thin flat-bladed screwdriver, remove regulator handle. (for models without power window)



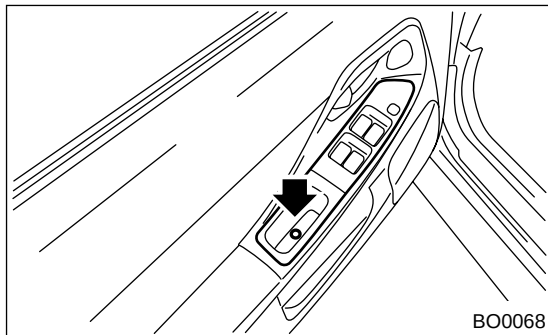
2) Pull up inner remote cover toward you to remove upper hook. Pull down it to remove lower hook. Remove inner remote cover.



3) Remove screw.

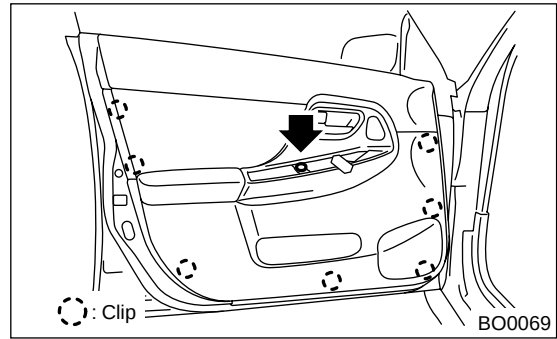
4) Remove power window switch assembly and disconnect the harness connector. (for models with power window)

Remove pull handle and panel. (for models without power window)



5) Remove screw.

6) Remove clips of trim panel using clip remover to remove trim panel.



B: INSTALLATION

Install in the reverse order of removal.

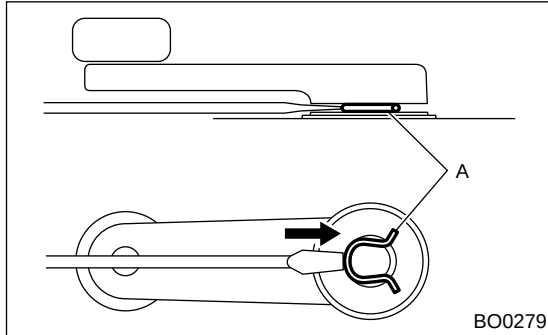
11. Rear Door Trim

A: REMOVAL

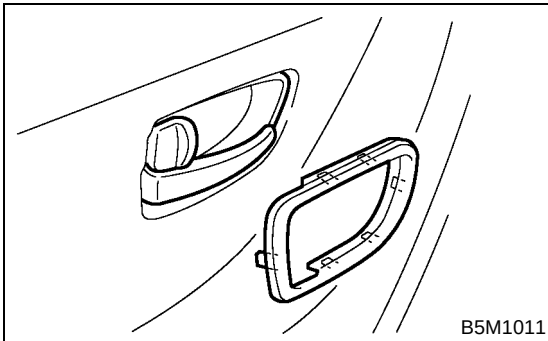
CAUTION:

Do not apply excessive force to clip. Otherwise the clip may be broken.

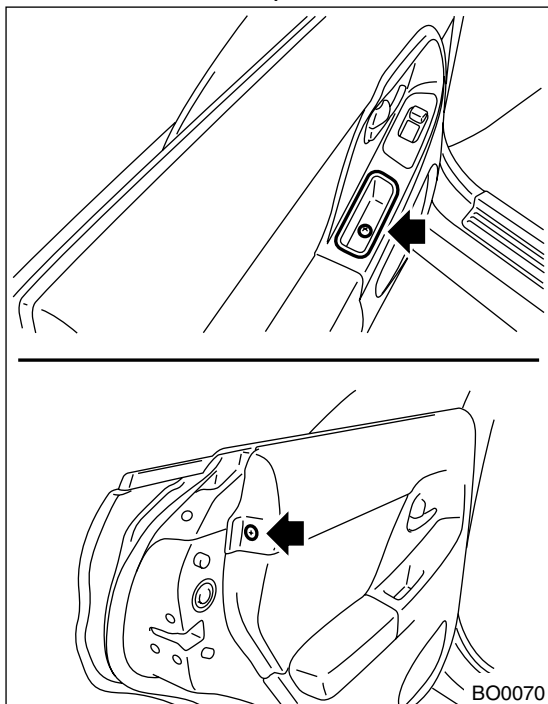
- 1) Press retainer spring (A) with a thin flat-bladed screwdriver, remove regulator handle. (for models without power window)



- 2) Pull up inner remote cover toward you to remove upper hook. Pull down it to remove lower hook. Remove inner remote cover.

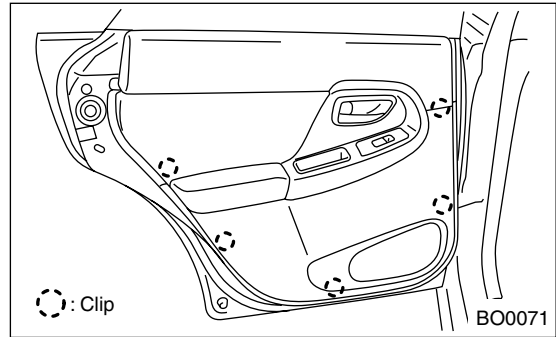


- 3) Remove screw and clip.



- 4) Remove clips of trim panel using clip remover to remove trim panel.

- 5) Disconnect power window harness connector. (for models with power window)



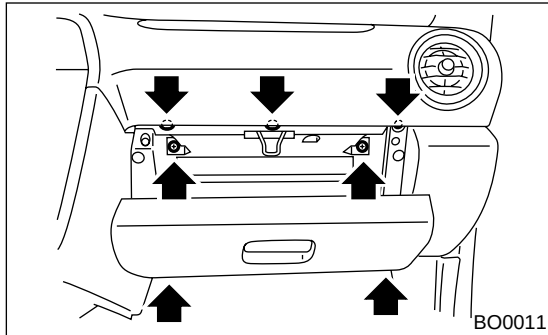
B: INSTALLATION

Install in the reverse order of removal.

12. Glove Box

A: REMOVAL

- 1) Open the glove box.
- 2) Loosen screws to remove glove box.



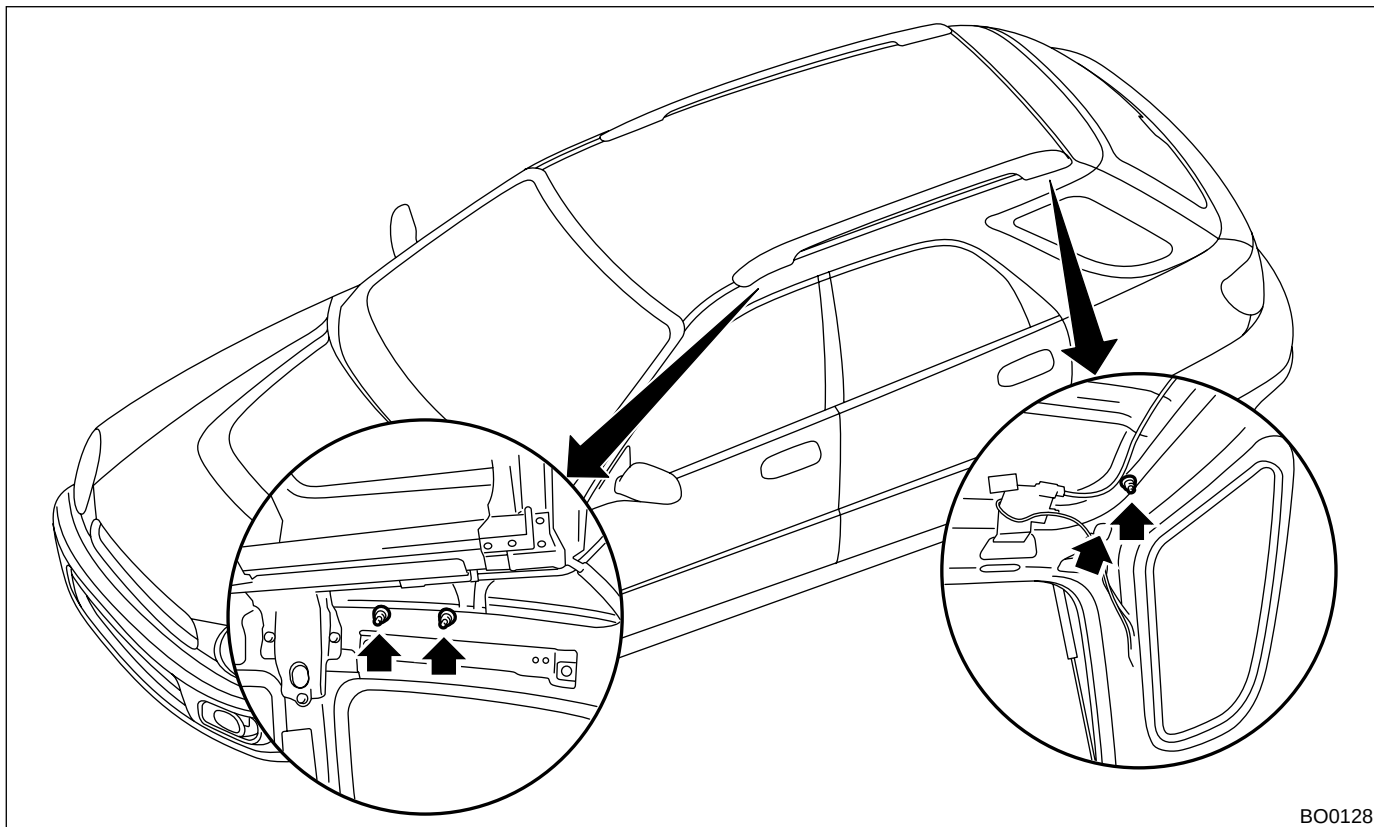
B: INSTALLATION

Install in the reverse order of removal.

13. Roof Rail

A: REMOVAL

- 1) Remove roof trim. <Ref. to EI-33, REMOVAL, Roof Trim.>
- 2) Remove four mounting nuts and then detach roof rail carefully.



BO0128

B: INSTALLATION

Install in the reverse order of removal.

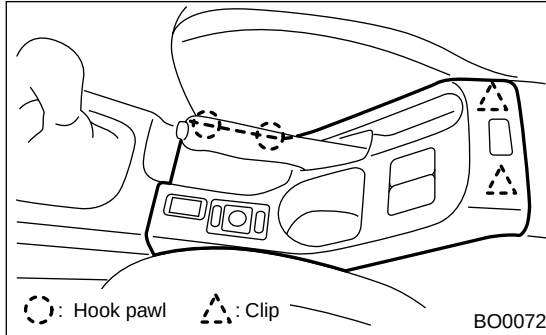
CAUTION:

Be careful not to scratch body panels with roof rail stud bolts when removing and installing them.

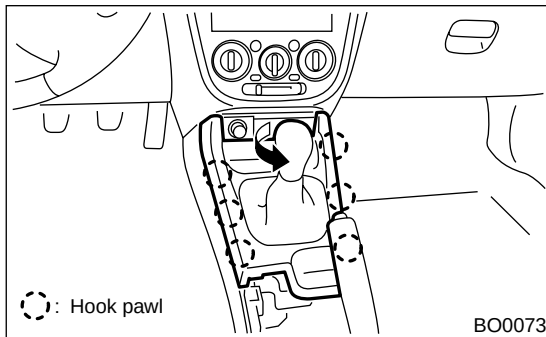
14. Console Box

A: REMOVAL

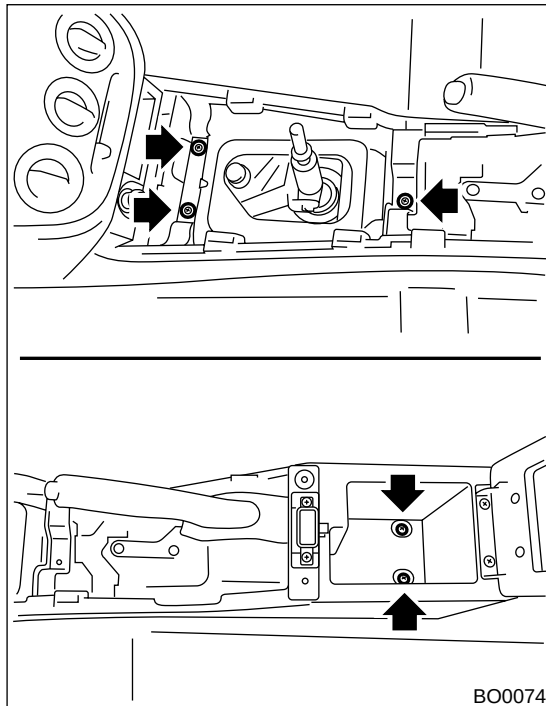
1) Remove console cover.



2) Remove shift knob (MT model) and front cover.



3) Loosen screws to remove console box.



B: INSTALLATION

Install in the reverse order of removal.

15. Instrument Panel Assembly

A: REMOVAL

WARNING:

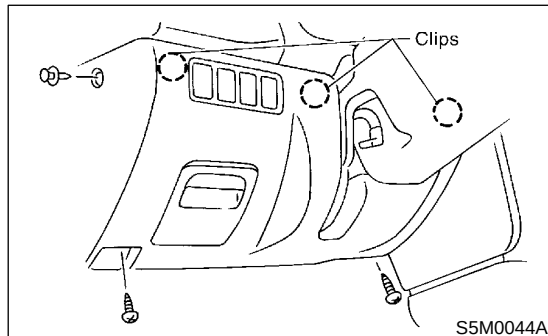
- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage airbag system harness when servicing the instrument panel.

NOTE:

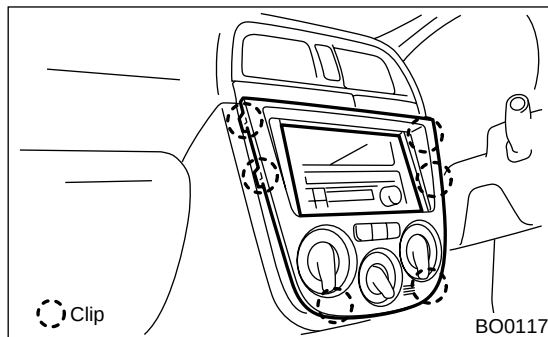
The following location are for LHD model.

The locations for RHD model are symmetrically opposite.

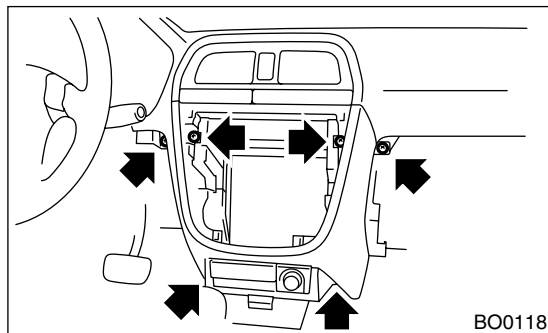
- 1) Disconnect ground cable from battery.
- 2) Loosen screws and clips to remove lower cover.



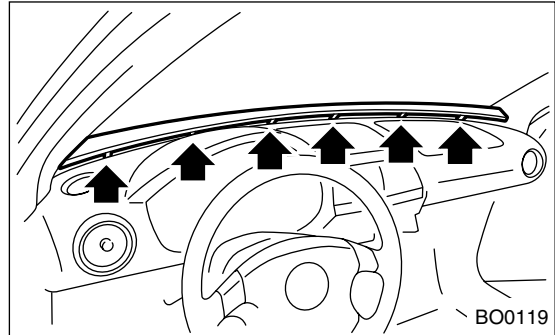
- 3) Loosen clips to remove center console panel.



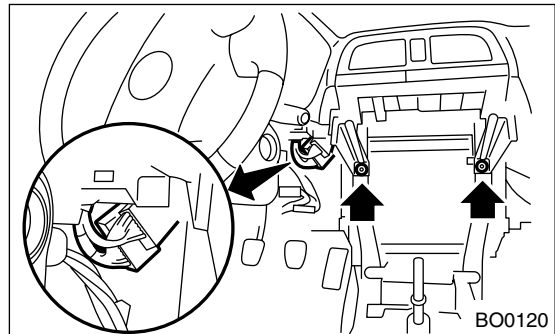
- 4) Remove glove box. <Ref. to EI-22, REMOVAL, Glove Box.>
- 5) Remove passenger airbag module. <Ref. to AB-14, Passenger's Airbag Module.>
- 6) Loosen four screws and two nuts to remove lower console panel.



- 7) Loosen hooks to remove defroster panel.



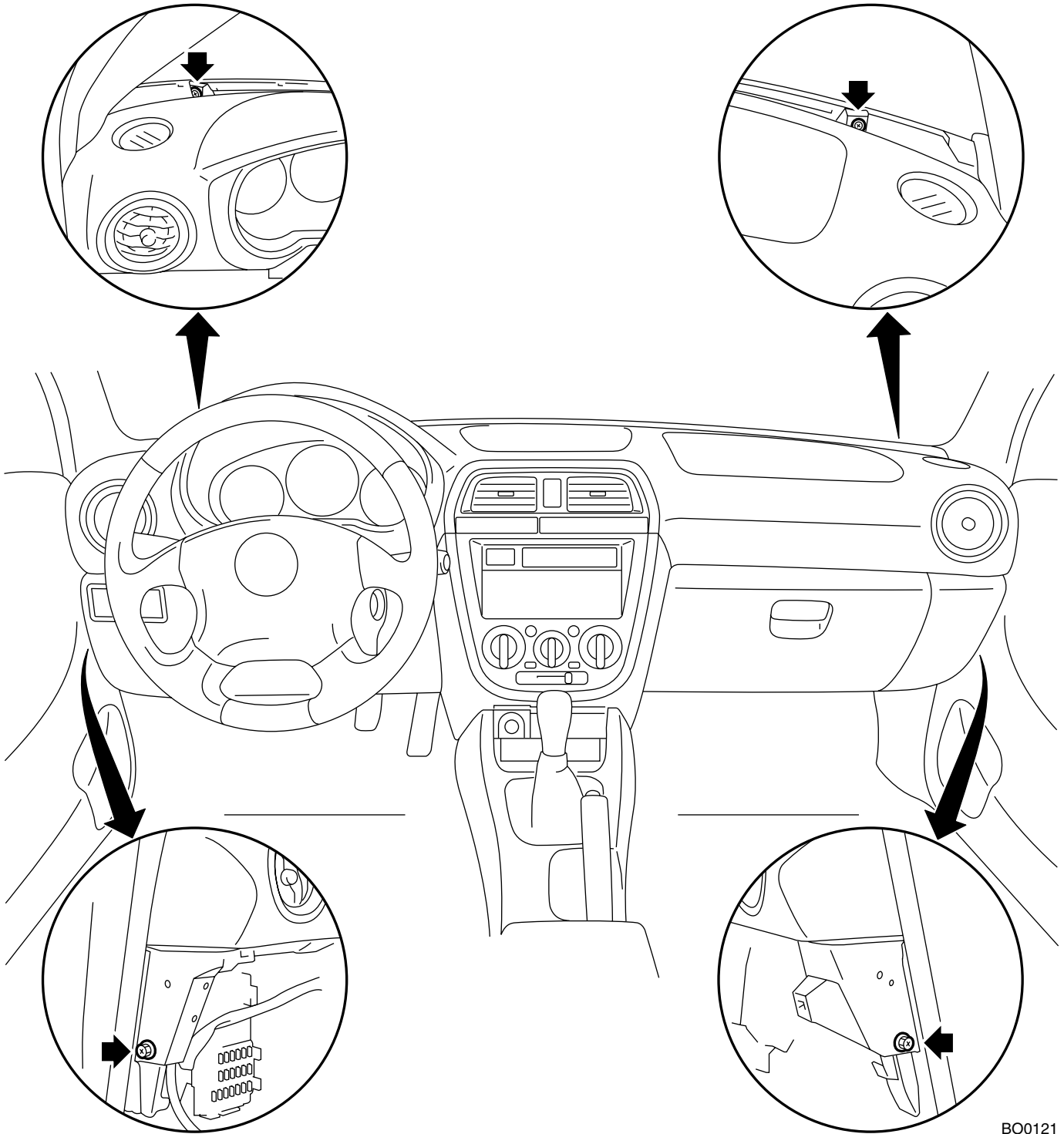
- 8) Remove two nuts and disconnect two connectors.



INSTRUMENT PANEL ASSEMBLY

EXTERIOR/INTERIOR TRIM

9) Remove instrument panel mounting bolts.



BO0121

10) Remove instrument panel.

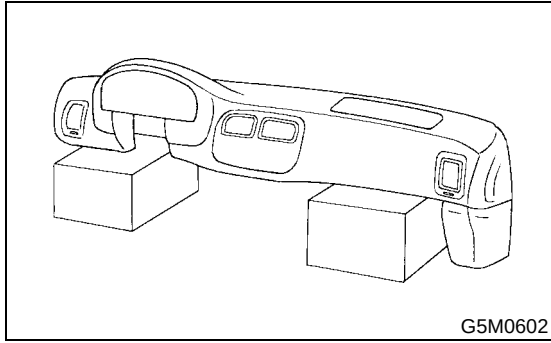
CAUTION:
Do not pull the harness when disconnecting the connector.

NOTE:
If necessary, make matching marks for easy reassembly.

CAUTION:

- Take care not to scratch the instrument panel and related parts.

- When storing the removed instrument panel, place it standing up on the floor.



B: INSTALLATION

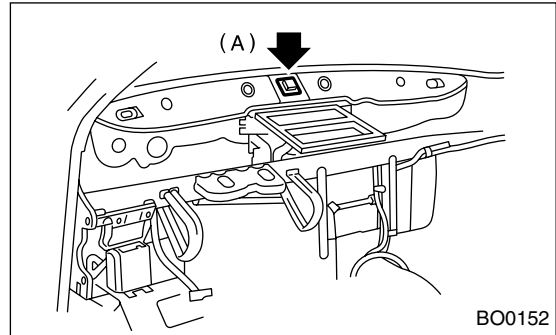
Install in the reverse order of removal.

CAUTION:

- Be careful not to snag the harness.
- Make sure to connect harness connector.
- Take care not to scratch the instrument panel and related parts.

NOTE:

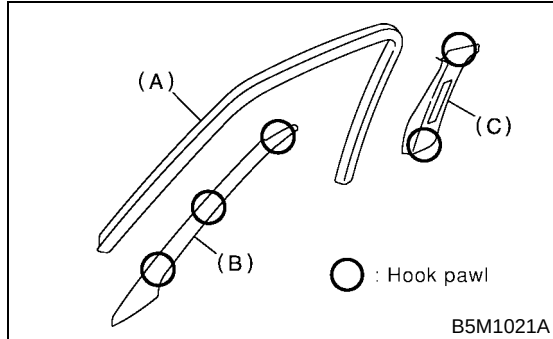
When setting the instrument panel into position, push the hook into grommet (A) on the body panel.



16.Upper Inner Trim

A: REMOVAL

- 1) Remove lower inner trim. <Ref. to EI-29, REMOVAL, Lower Inner Trim.>
- 2) Remove front mole (A).
- 3) Remove front pillar upper trim (B).
- 4) Detach front seat belt shoulder anchor, then remove center pillar upper trim (C).



B: INSTALLATION

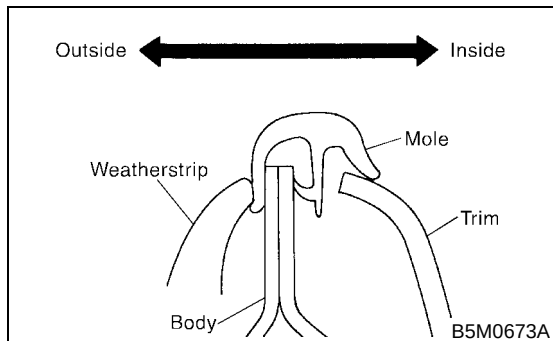
Install in the reverse order of removal.

CAUTION:

Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:

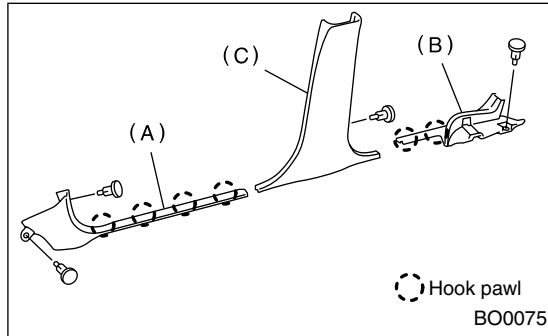
When installing center pillar upper trim and front pillar upper trim, be sure to set front mole as shown in figure.



17.Lower Inner Trim

A: REMOVAL

- 1) Remove side sill front cover (A).
- 2) Remove rear seat cushion <Ref. to SE-11, REMOVAL, Rear Seat.>, then remove side sill rear cover (B).
- 3) Remove center pillar lower trim (C).



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

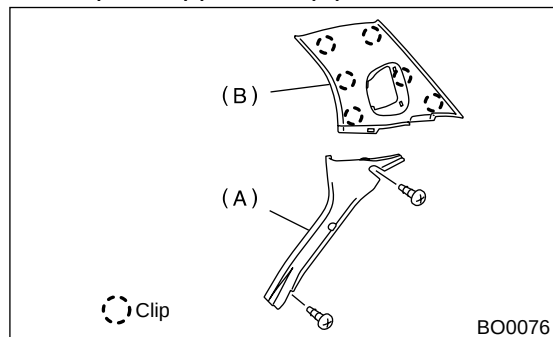
Be sure to securely hook pawls of inner trim panel to body flange.

18.Rear Quarter Trim

A: REMOVAL

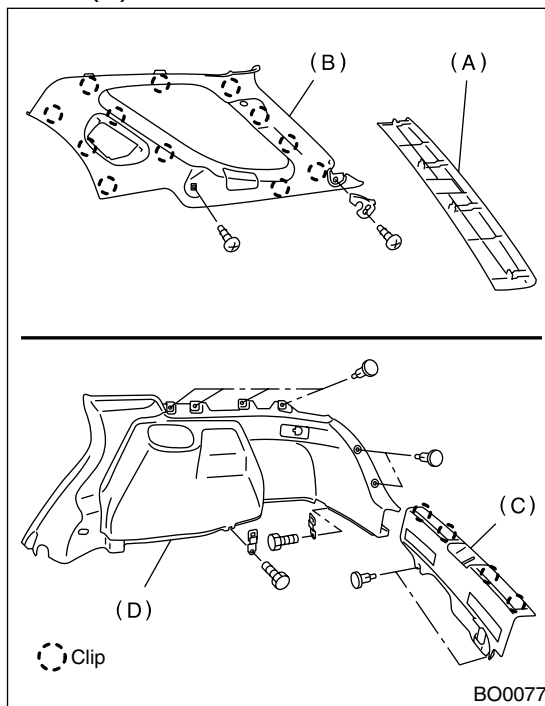
1. SEDAN

- 1) Remove rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove side sill rear cover. <Ref. to EI-29, REMOVAL, Lower Inner Trim.>
- 3) Remove rear pillar lower cover (A).
- 4) Remove seatbelt lower anchor bolt. And then remove rear pillar upper trim (B).



2. WAGON

- 1) Remove rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove side sill rear cover.
- 3) Remove rear rail trim (A).
- 4) Loosen screws and clips to remove rear quarter upper trim (B).
- 5) Remove rear skirt trim (C).
- 6) Loosen bolts and clips to remove rear quarter lower trim (D).



B: INSTALLATION

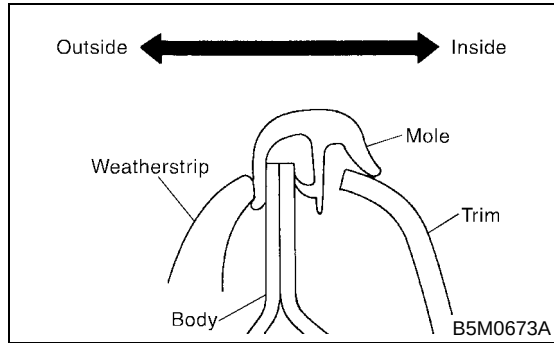
Install in the reverse order of removal.

CAUTION:

Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:

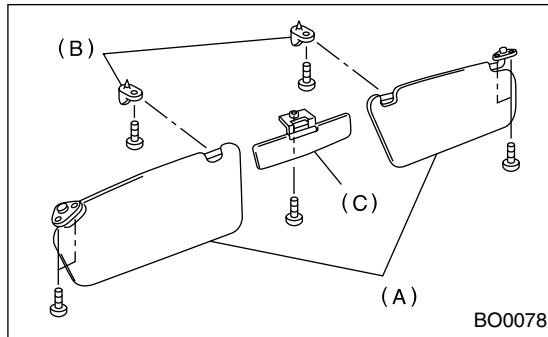
When installing rear quarter upper trim, be sure to set rear mole as shown in the figure.



19.Sun Visor

A: REMOVAL

Remove mounting screws then detach sun visor (A), hook (B) and center visor (C).



B: INSTALLATION

Install in the reverse order of removal.

20. Roof Trim

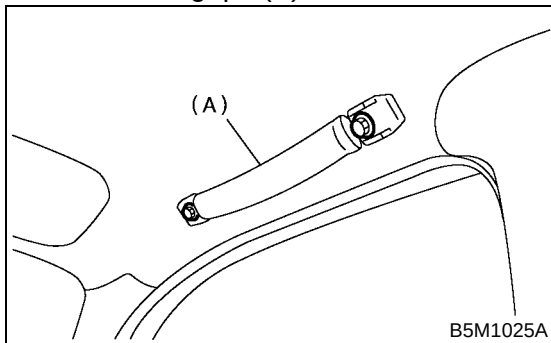
A: REMOVAL

CAUTION:

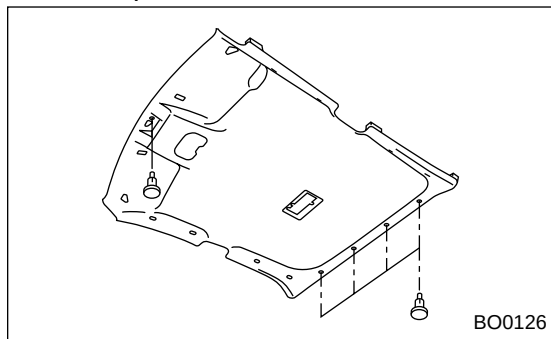
When removing clip, use great care not to damage the roof trim.

1. SEDAN

- 1) Disconnect battery ground cable.
- 2) Remove spots light. <Ref. to LI-56, REMOVAL, Spot Light.>
- 3) Remove room light. <Ref. to LI-57, REMOVAL, Room Light.>
- 4) Remove sun visor and hook or both sides. <Ref. to EI-32, REMOVAL, Sun Visor.>
- 5) Remove assist-grips (A).



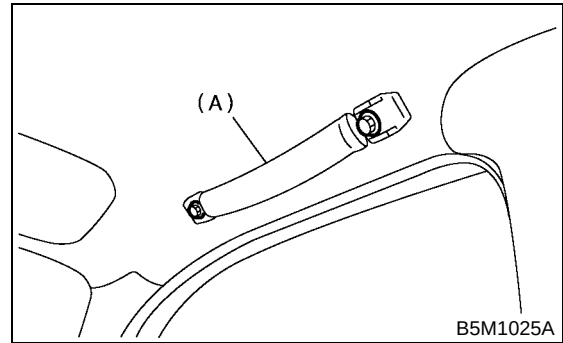
- 6) Remove upper inner trim. <Ref. to EI-28, REMOVAL, Upper Inner Trim.>
- 7) Remove quarter upper trim. <Ref. to EI-30, SEDAN, REMOVAL, Rear Quarter Trim.>
- 8) Remove clips, and then remove roof trim.



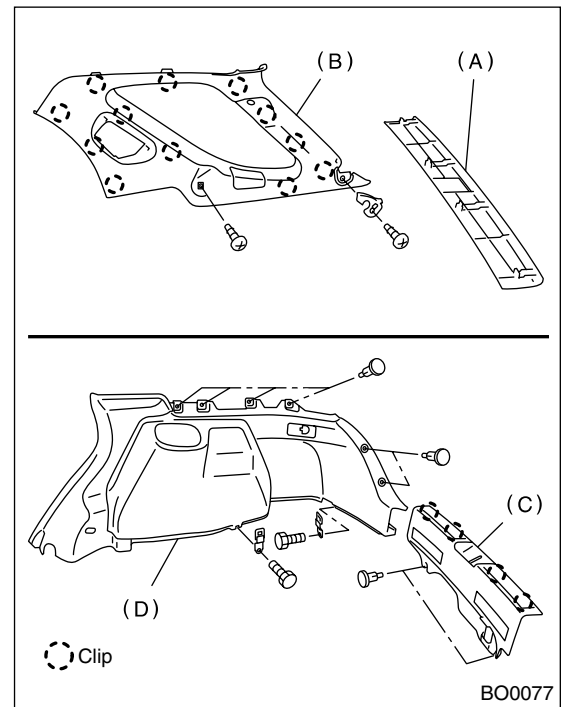
2. WAGON

- 1) Disconnect battery ground cable.
- 2) Remove sunroof switch. (Sunroof equipped model) <Ref. to SR-11, REMOVAL, Sunroof Switch.>
- 3) Remove room light. <Ref. to LI-57, REMOVAL, Room Light.>
- 4) Remove sun visor and hook or both sides. <Ref. to EI-32, REMOVAL, Sun Visor.>

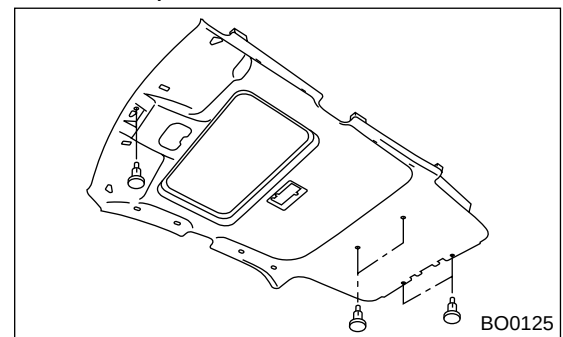
- 5) Remove assist-grips (A).



- 6) Remove upper inner trim. <Ref. to EI-28, REMOVAL, Upper Inner Trim.>
- 7) Remove rear quarter upper trim shown in the figure.
- 8) Remove rear rail trim (A).
- 9) Remove rear quarter upper trim (B) of both sides.



- 10) Remove clips, and then remove roof trim.



B: INSTALLATION

Install in the reverse order of removal.

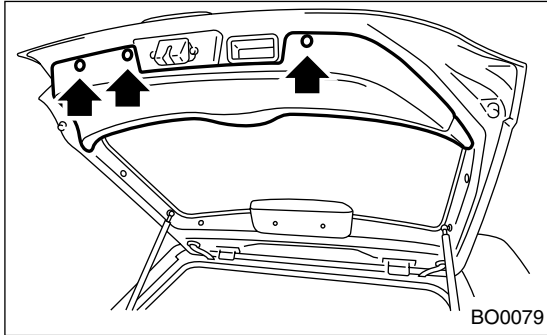
21.Rear Gate Trim

A: REMOVAL

CAUTION:

Be careful not to damage clips or their holes.

1) Remove clips and detach rear gate trim.



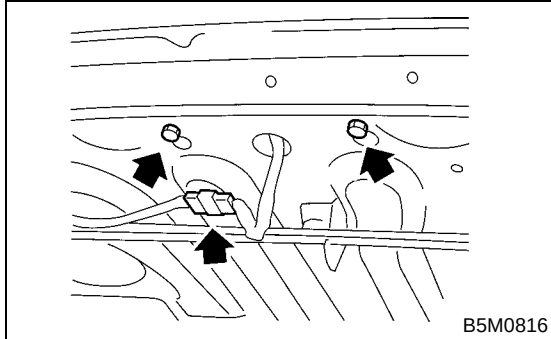
B: INSTALLATION

Install in the reverse order of removal.

22.Rear Shelf Trim

A: REMOVAL

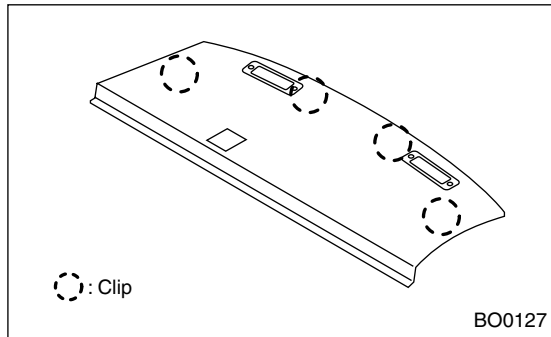
1) Remove high-mounted stop light.



2) Remove rear quarter upper trim. <Ref. to EI-30, REMOVAL, Rear Quarter Trim.>

3) Remove seat belt center lower anchor bolt.

4) Remove rear shelf trim.



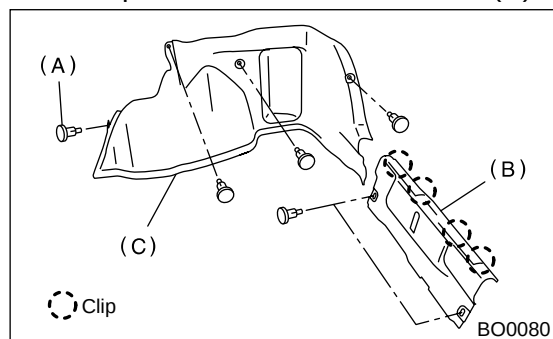
B: INSTALLATION

Install in the reverse order of removal.

23. Trunk Trim

A: REMOVAL

- 1) Remove rear seat backrest. <Ref. to SE-11, SEDAN, REMOVAL, Rear Seat.>
- 2) Remove clip (A).
- 3) Loosen clips, and then detach trunk rear trim (B).
- 4) Loosen clips to remove trunk side trim (C).



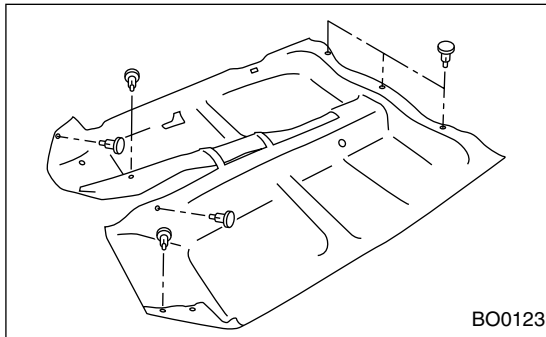
B: INSTALLATION

Install in the reverse order of removal.

24.Floor Mat

A: REMOVAL

- 1) Remove front seats. <Ref. to SE-6, REMOVAL, Front Seat.>
- 2) Remove rear seat cushion. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 3) Remove console box. <Ref. to EI-24, Console Box.>
- 4) Remove side sill front cover, side sill rear cover and center pillar lower trim. <Ref. to EI-29, REMOVAL, Lower Inner Trim.>
- 5) Remove clips from floor mat.
- 6) Remove mat hook.
- 7) Remove mat from toe board 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.

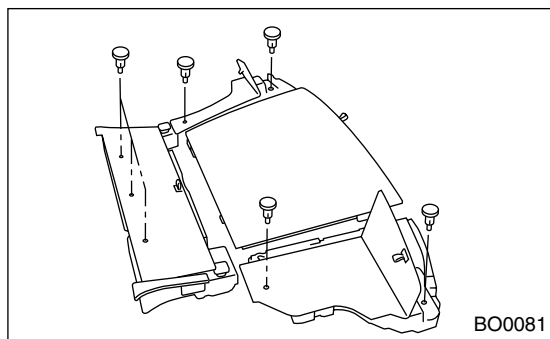
NOTE:

- Secure mat firmly with hook and Velcro tape.
- Insert mat edge firmly into the groove of side sill cover.

25.Luggage Floor Mat

A: REMOVAL

Remove clips, then detach rear floor mats and boxes.



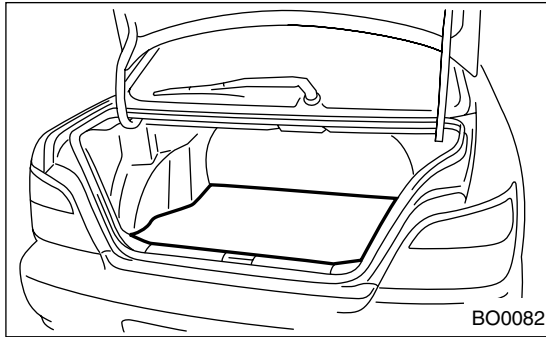
B: INSTALLATION

Install in the reverse order of removal.

26.Trunk Room Mat

A: REMOVAL

Draw out trunk room mat.



B: INSTALLATION

Install in the reverse order of removal.

TRUNK ROOM MAT

EXTERIOR/INTERIOR TRIM

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

EXTERIOR BODY PANELS



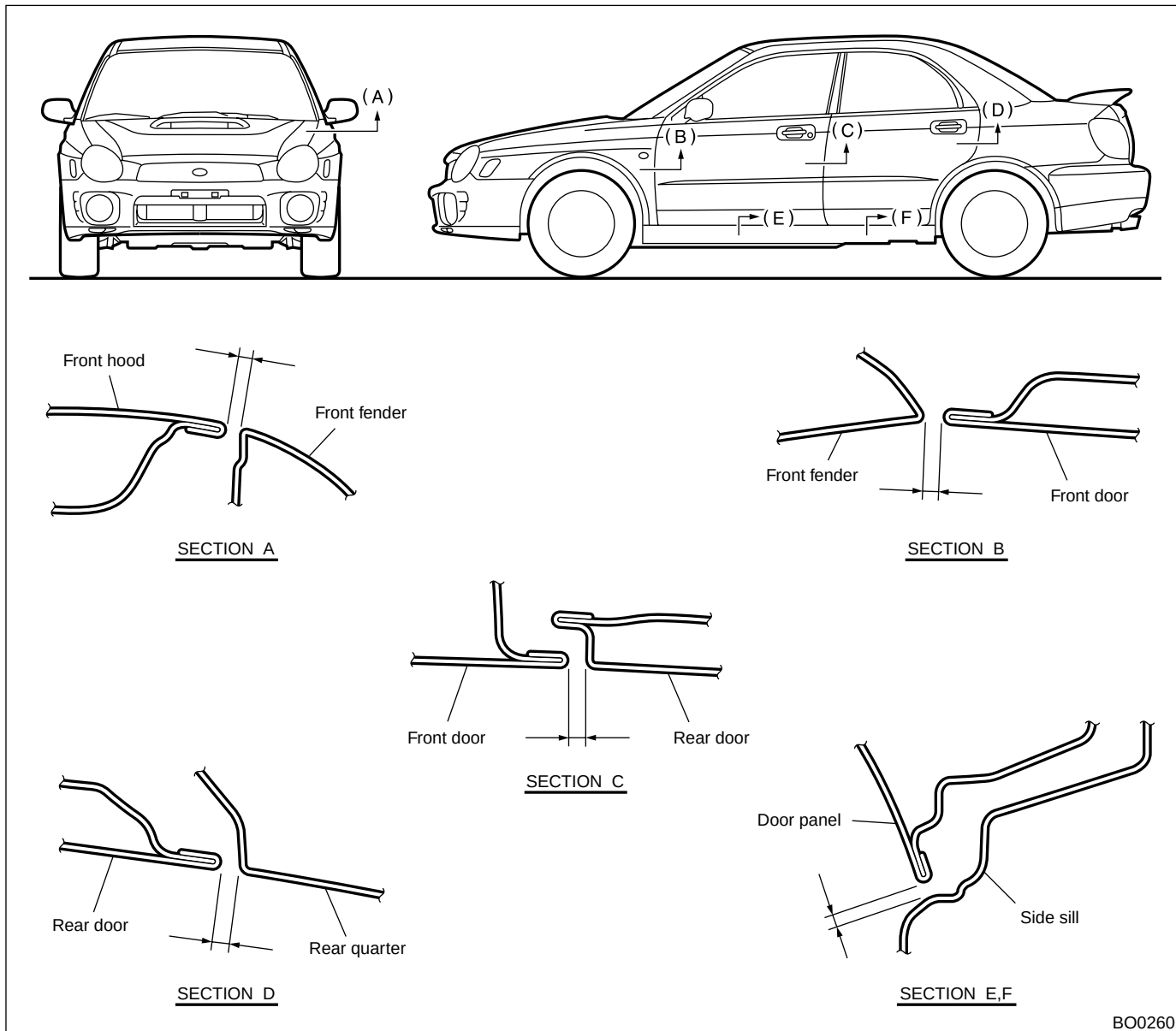
	Page
1. General Description	2
2. Front Hood	9
3. Fender Panel.....	10
4. Front Door Panel.....	11
5. Front Sealing Cover	13
6. Rear Door Panel	14
7. Rear Sealing Cover	16
8. Trunk Lid Panel	17
9. Rear Gate Panel	18

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

1. General Description

A: SPECIFICATIONS

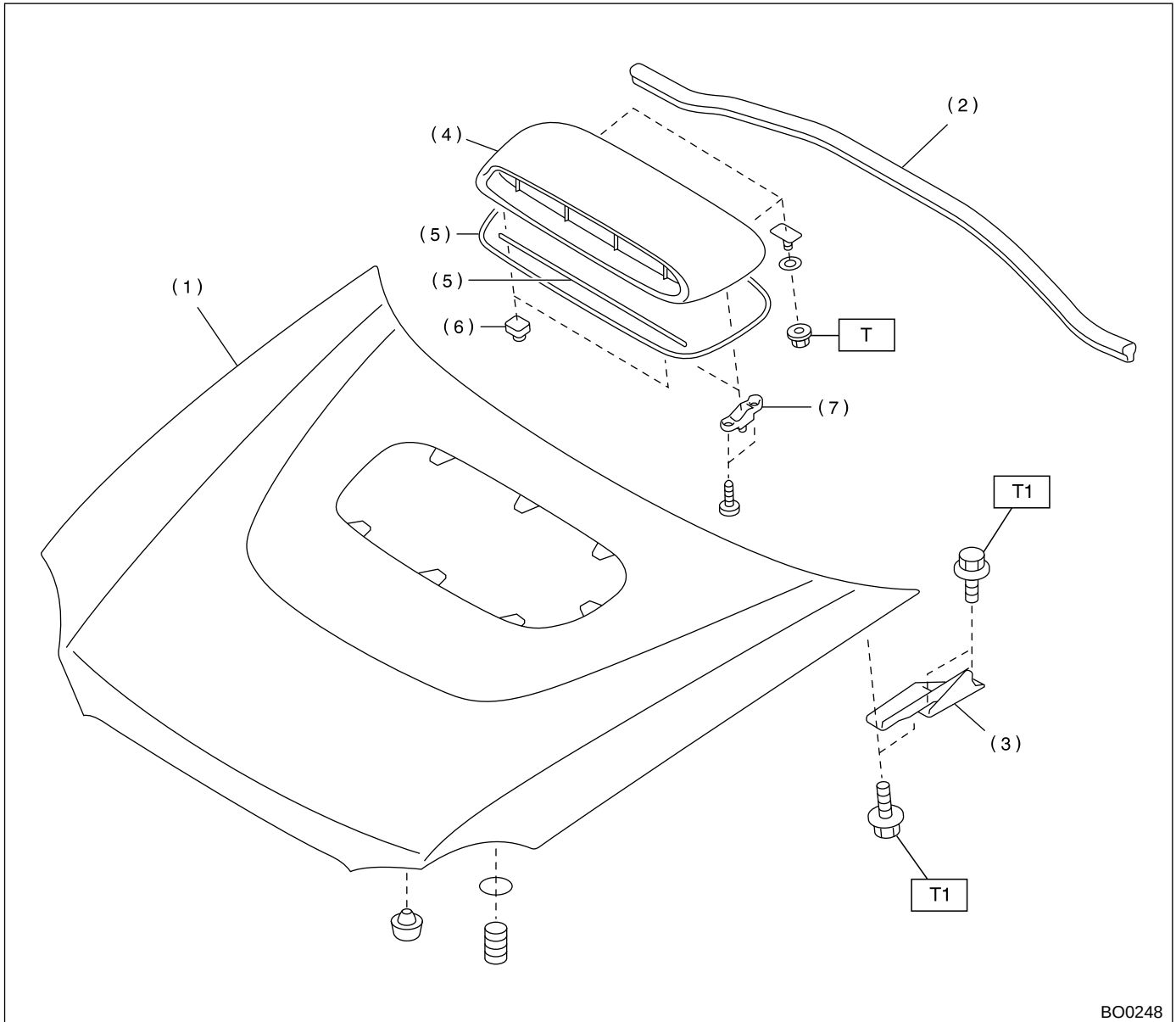


BO0260

Section	Part	Specification
A	Front hood to Front fender	NA: 4.0 ± 1.0 (0.16 ± 0.04 in) TURBO: 3.7 ± 1.0 (0.15 ± 0.04 in)
B	Front fender to Front door	4.7 ± 1.0 (0.19 ± 0.04 in)
C	Front door to Rear door	5.1 (0.20 in)
D	Rear door to Rear quarter	4.6 (0.18 in)
E, F	Door panel to Side sill	5.9 (0.23 in)

B: COMPONENT

1. FRONT HOOD



BO0248

- | | |
|-----------------------|-------------------|
| (1) Front hood | (5) Packing |
| (2) Seal (Front hood) | (6) Clip |
| (3) Hinge | (7) Locking piece |
| (4) Hood grille | |

Tightening torque: N·m (kg-m, ft-lb)

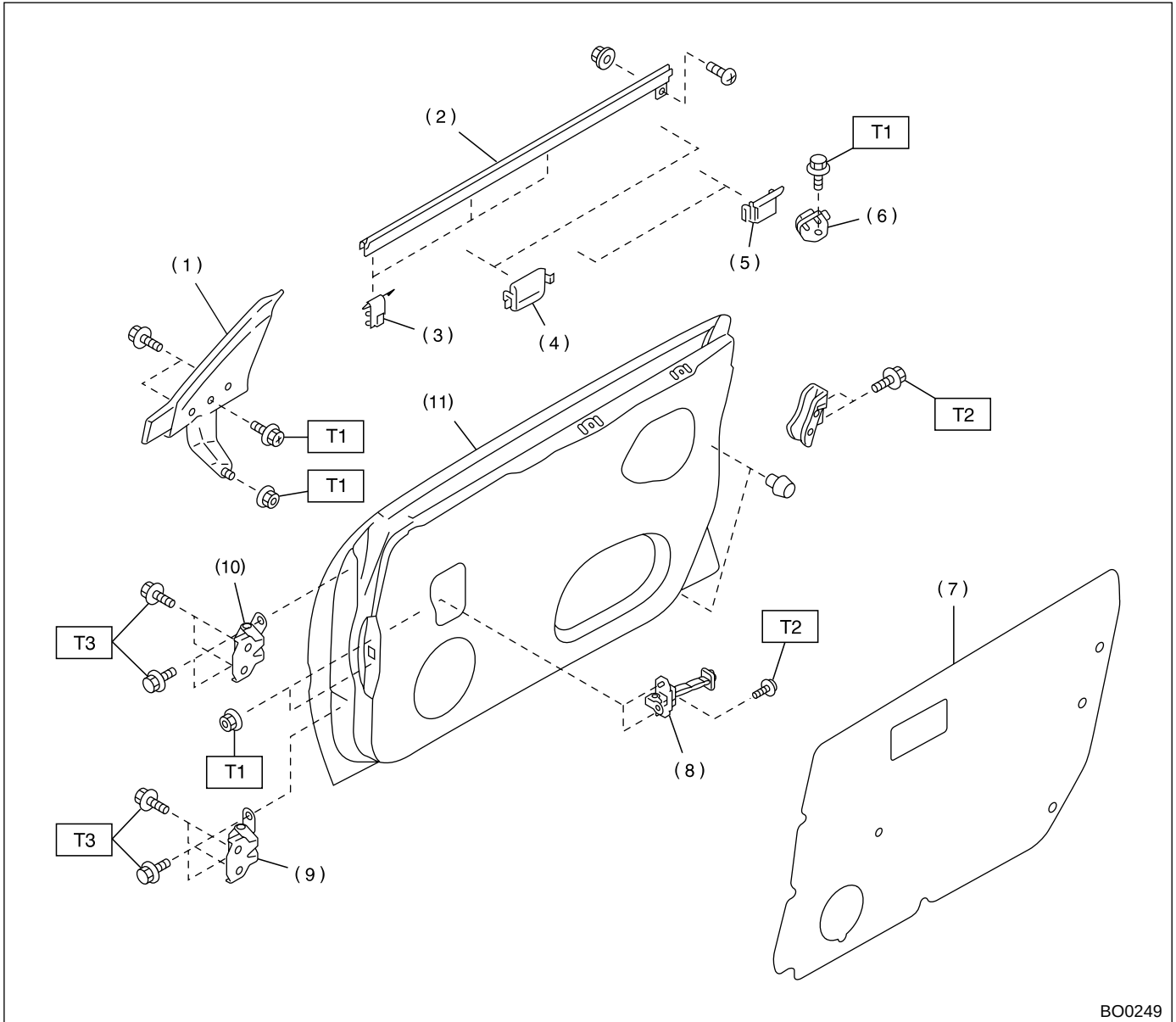
T: 7.35 (0.75, 5.4)

T1: 24.5 (2.5, 18.1)

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

2. FRONT DOOR PANEL



BO0249

- | | |
|--------------------------------|-------------------|
| (1) Gusset | (7) Sealing cover |
| (2) Weatherstrip (Outer) | (8) Checker |
| (3) Clip (Weatherstrip, outer) | (9) Lower hinge |
| (4) Stabilizer (Lifter) | (10) Upper hinge |
| (5) Stabilizer (Outer) | (11) Door panel |
| (6) Stabilizer (Inner) | |

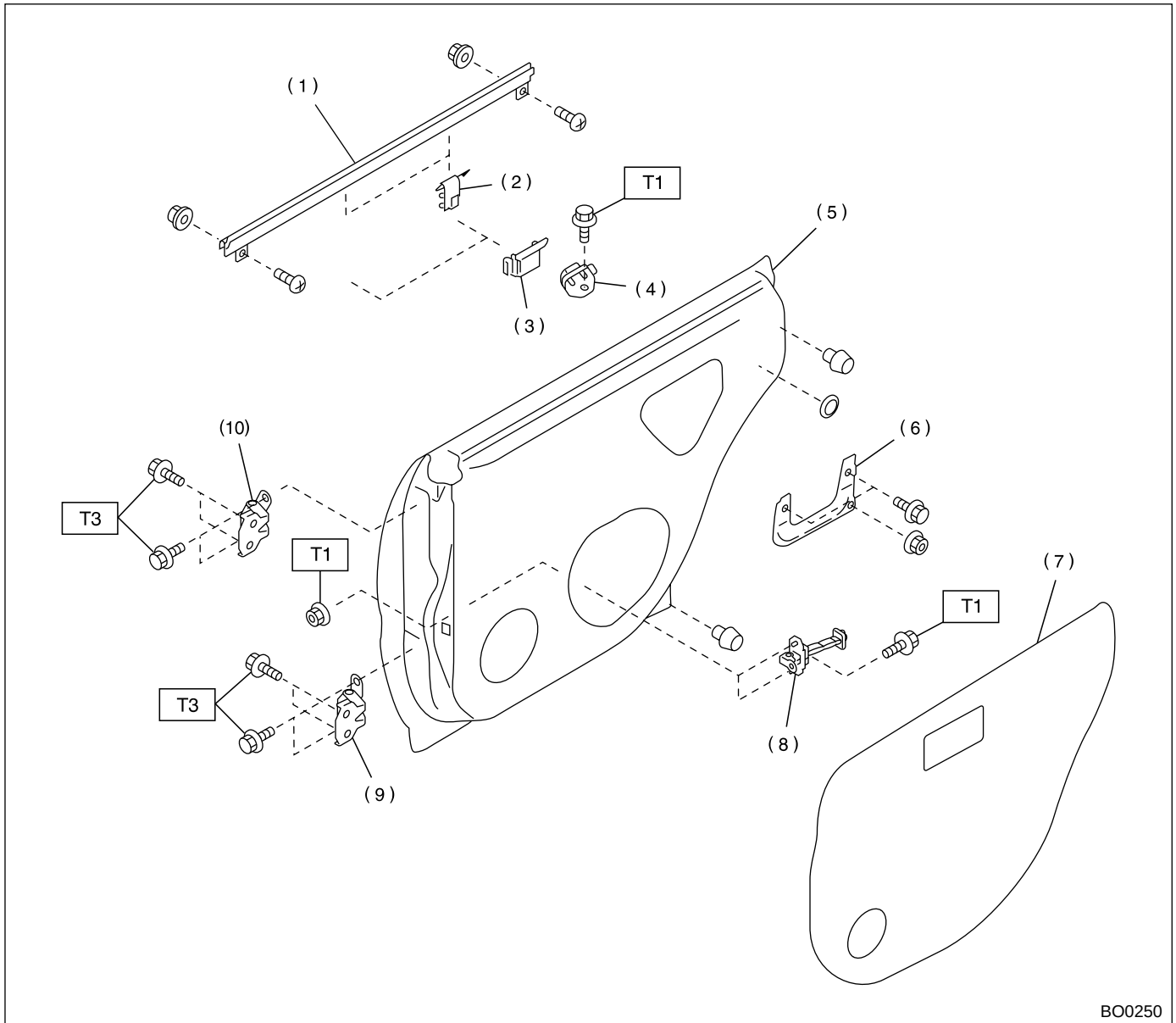
Tightening torque: N·m (kg·m, ft·lb)

T1: 7.35 (0.75, 5.4)

T2: 18 (1.8, 13)

T3: 30 (3.1, 2.2)

3. REAR DOOR PANEL



- | | |
|--------------------------------|-------------------|
| (1) Weatherstrip (Outer) | (7) Sealing cover |
| (2) Clip (Weatherstrip, outer) | (8) Checker |
| (3) Stabilizer (Outer) | (9) Lower hinge |
| (4) Stabilizer (Inner) | (10) Upper hinge |
| (5) Door panel | |
| (6) Bracket | |

Tightening torque: N·m (kg·m, ft·lb)

T1: 7.35 (0.75, 5.4)

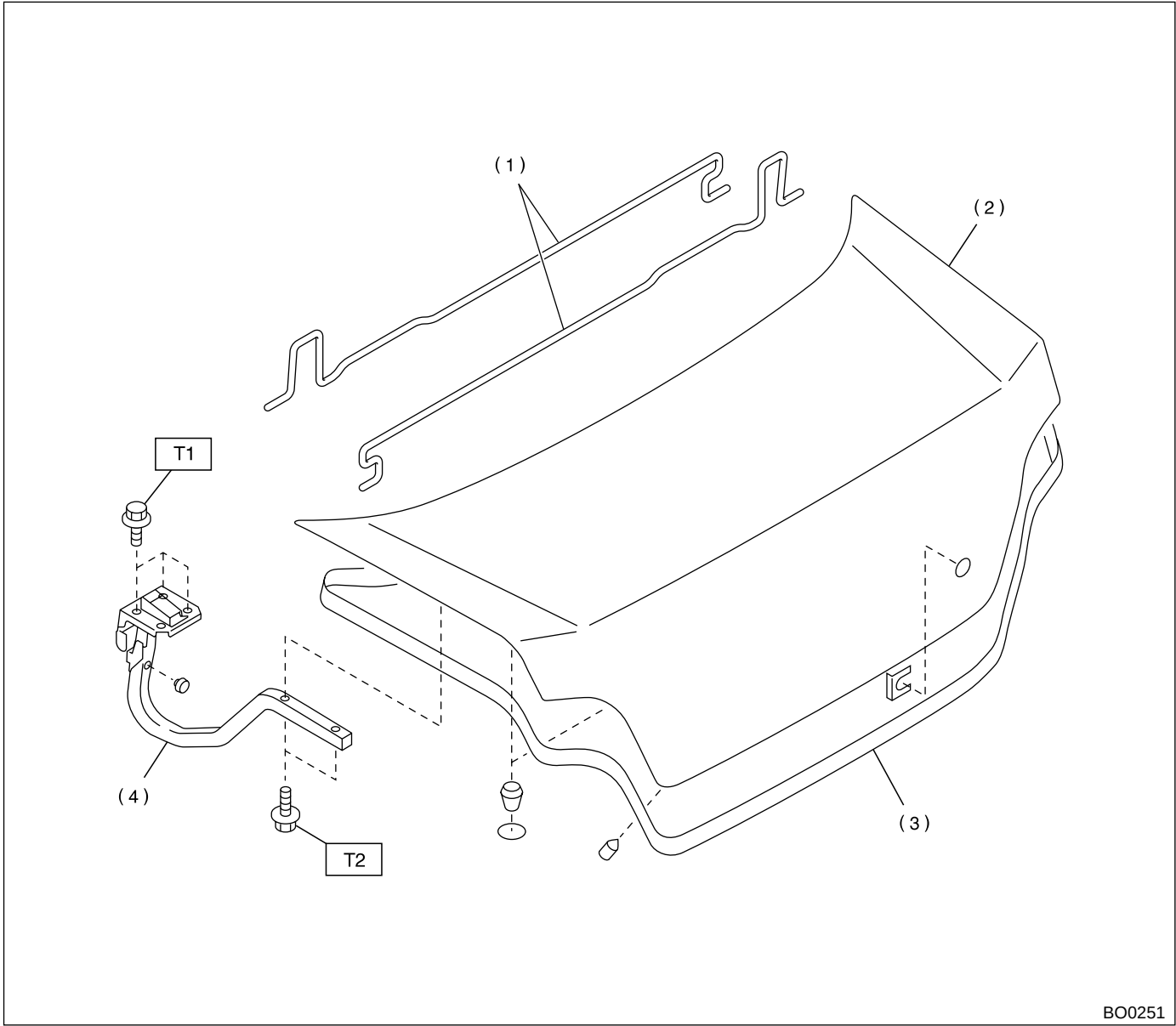
T2: 18 (1.8, 13)

T3: 30 (3.1, 2.2)

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

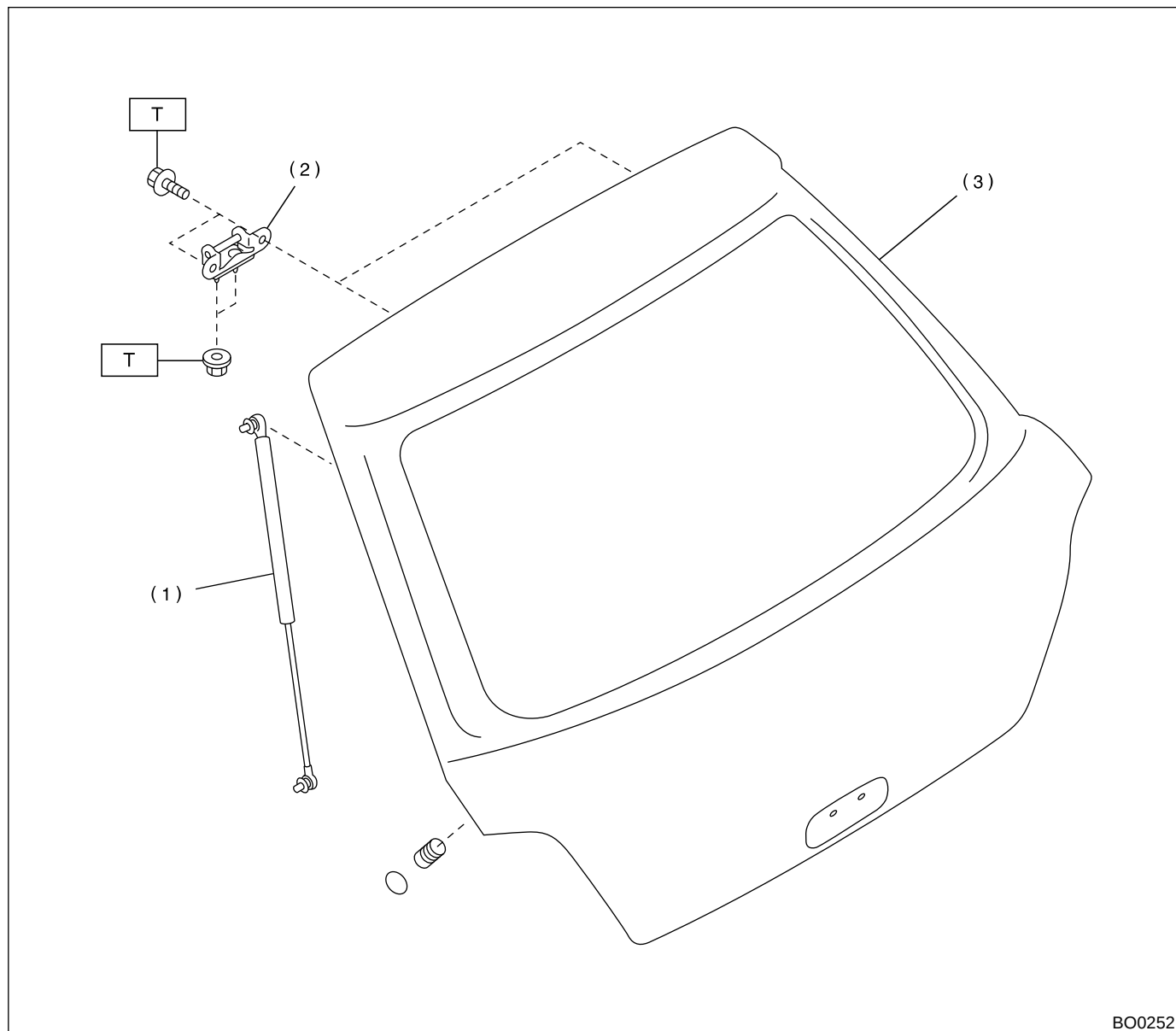
4. TRUNK LID PANEL



- (1) Torsion bar
- (2) Trunk lid
- (3) Weatherstrip

- (4) Hinge ASSY
- (5) Cover

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 14 (1.8, 13)

5. REAR GATE PANEL

- (1) Gas stay
- (2) Hinge
- (3) Rear gate

Tightening torque: N·m (kg-m, ft-lb)

T: 25 (2.5, 18.1)

C: CAUTION

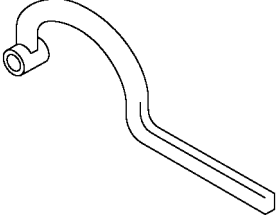
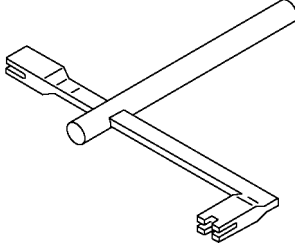
- Exterior body panels are heavy. Do not drop and damage the panels. During removal and installation, do not damage the panel painting surface.
- While removing mounting bolts, using assistance devices such as a support jack will help support the panel.
- Be careful not to lose small parts.

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B5M1117	925610000	WRENCH	Used for removing and installing door hing.
 B5M1118	927780000	REMOVER	Used for removing and installing trunk torsion bar.

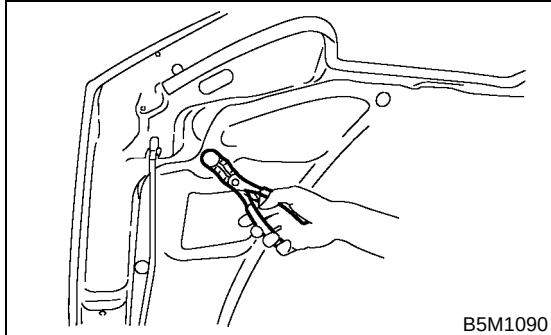
2. GENERAL TOOL

TOOL NAME	REMARKS
Support Jack	Used for supporting door panel.

2. Front Hood

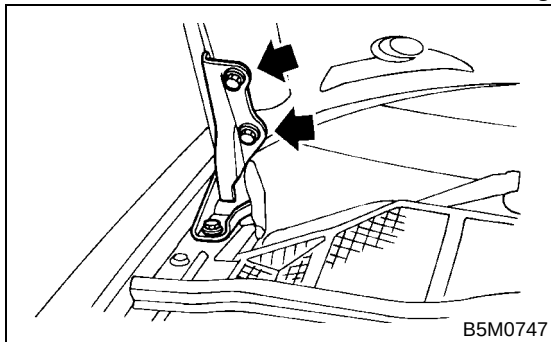
A: REMOVAL

- 1) Open front hood to remove washer nozzles.
- 2) Release clips to remove hood insulator.



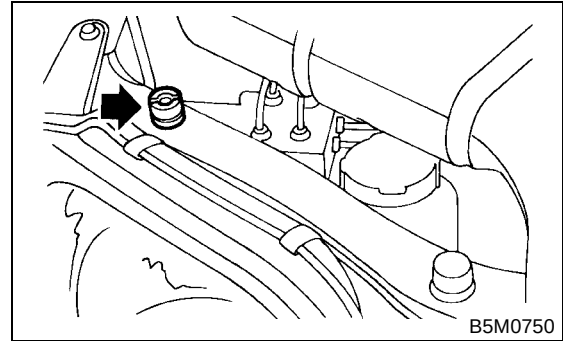
B5M1090

- 3) Remove bolts to disconnect hood from hinges.



B5M0747

- 3) Rotate hood buffer to adjust lateral height.



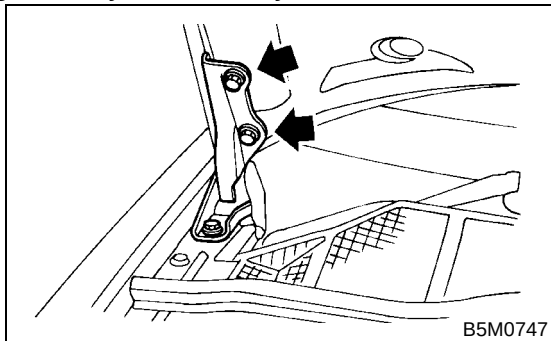
B5M0750

B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust clearance between hood and fender. Clearance must be equal at both sides.

C: ADJUSTMENT

- 1) Use hinge mounting holes to align front hood longitudinally and laterally.



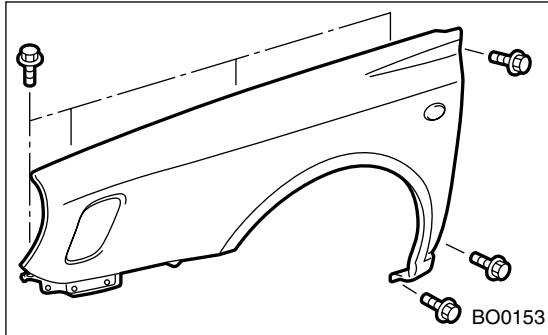
B5M0747

- 2) Adjust height at front end of hood. <Ref. to SL-40, ADJUSTMENT, Front Hood Lock Assembly.>

3. Fender Panel

A: REMOVAL

- 1) Disconnect ground (-) cable from battery.
- 2) Remove side sill spoilers. <Ref. to EI-19, Side Sill Spoiler.> (If fitted)
- 3) Remove front bumper face. <Ref. to EI-8, REMOVAL, Front Bumper.>
- 4) Remove mud guard. <Ref. to EI-16, REMOVAL, Mud Guard.>
- 5) Loosen bolts to remove front fender.



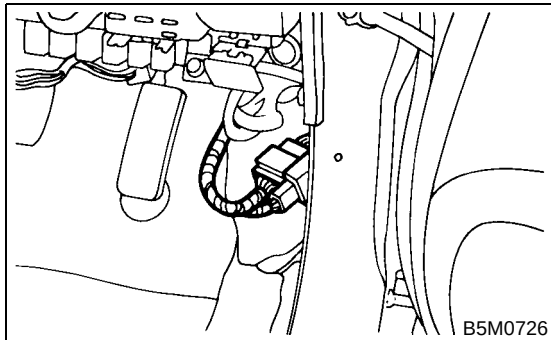
B: INSTALLATION

- 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.

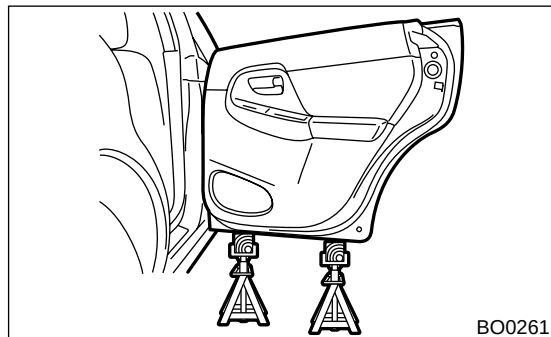
4. Front Door Panel

A: REMOVAL

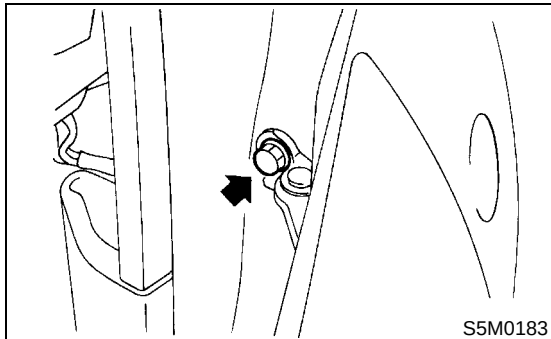
- 1) Disconnect ground cable from battery.
- 2) Remove front door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 3) Remove outer mirror assembly. <Ref. to GW-46, REMOVAL, Outer Mirror Assembly.>
- 4) Remove front door regulator and motor. <Ref. to GW-31, REMOVAL, Front Regulator and Motor Assembly.>
- 5) Remove front door latch assembly. <Ref. to SL-30, REMOVAL, Front Door Latch Assembly.>
- 6) Remove front outer handle. <Ref. to SL-29, REMOVAL, Front Outer Handle.>
- 7) Remove front pillar lower trim to disconnect connector from body harness.



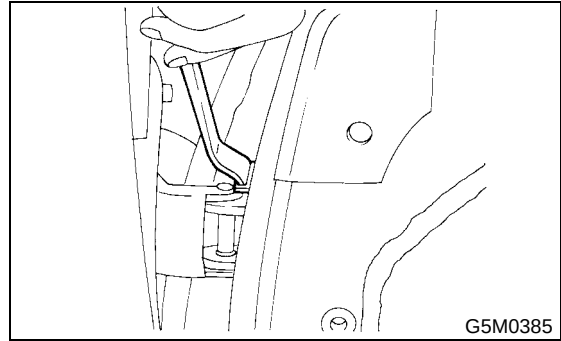
- 8) Put wooden block on jack and place jack under door. Support door with a support jack to protect it from damage.



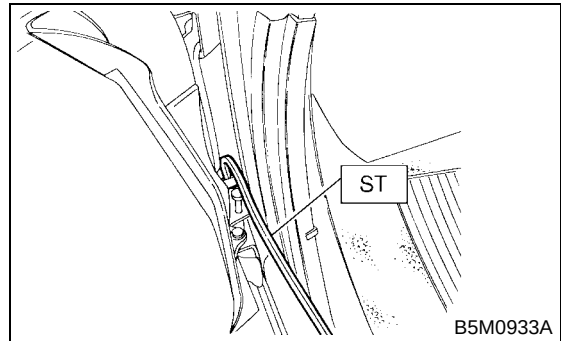
- 9) Remove checker bolts.



- 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



CAUTION:

- During removal and installation of doors, do not damage body.
- Doors are heavy. Be careful not to drop and damage them.

B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Apply grease to sliding area of door hinges.

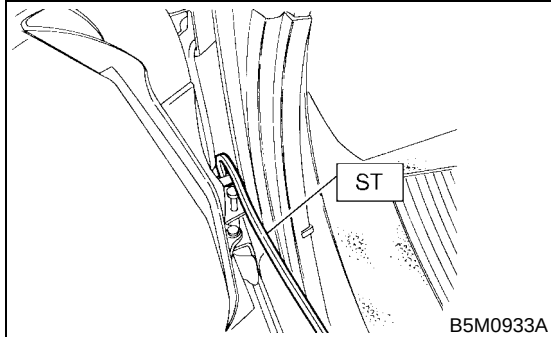
FRONT DOOR PANEL

EXTERIOR BODY PANELS

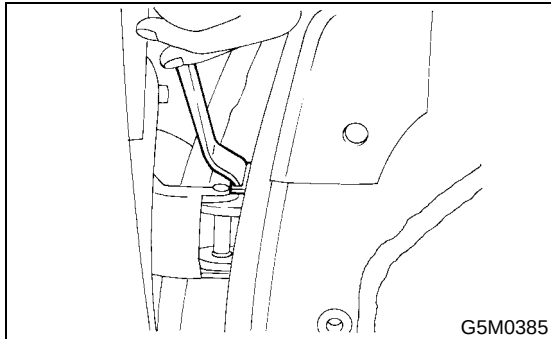
C: ADJUSTMENT

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



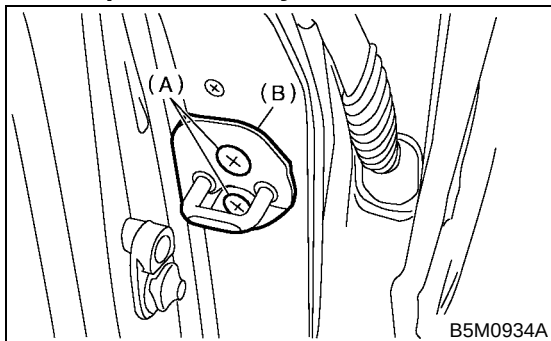
2) Loosen door-side bolts of upper and lower hinges to align the position of front door panel vertically and laterally at the front end.



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.



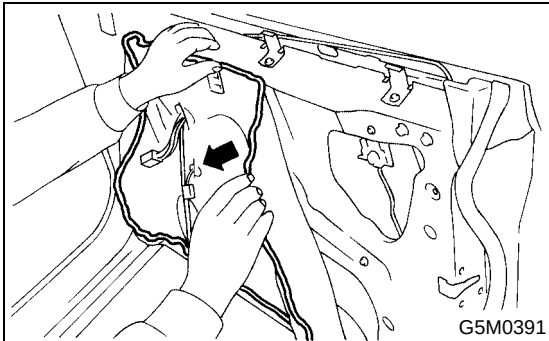
5. Front Sealing Cover

A: REMOVAL

- 1) Remove front door trim. <Ref. to EI-20, REMOVAL, Front Door Trim.>
- 2) Remove front speaker. <Ref. to ET-10, REMOVAL, Front Speaker.>
- 3) Using a spatula, remove sealer.

CAUTION:

- Carefully remove sealer. 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 CEMEDINE 5430L sealer.
- 3) Press sealer-applied area firmly to prevent any floating on surface.

Sealer:

CEMEDINE 5430L or equivalent

CAUTION:

- Apply a uniform bead of sealer.
- 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.

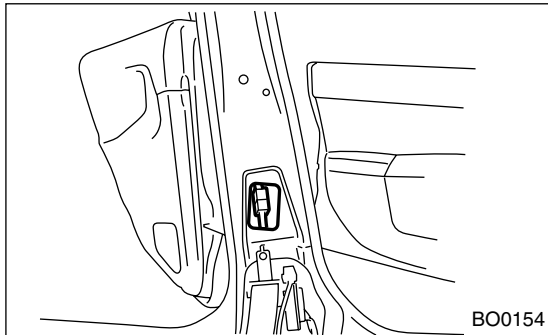
6. Rear Door Panel

A: REMOVAL

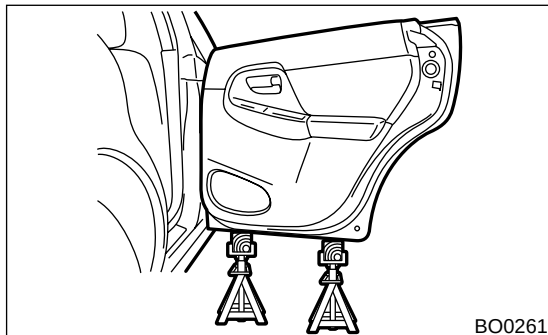
CAUTION:

- During removal and installation of doors, do not damage body.
- Doors are heavy. Be careful not to drop and damage them.

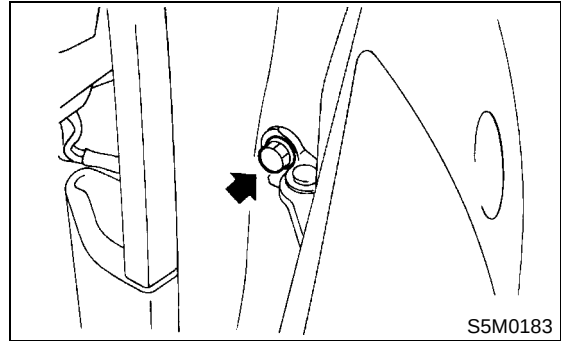
- 1) Disconnect ground cable from battery.
- 2) Remove rear door trim. <Ref. to EI-21, REMOVAL, Rear Door Trim.>
- 3) Remove rear door regulator and motor assembly. <Ref. to GW-34, REMOVAL, Rear Regulator and Motor Assembly.>
- 4) Remove rear door latch. <Ref. to SL-34, REMOVAL, Rear Door Latch Assembly.>
- 5) Remove rear outer handle. <Ref. to SL-33, REMOVAL, Rear Outer Handle.>
- 6) Remove center pillar lower trim. <Ref. to EI-29, REMOVAL, Lower Inner Trim.>
- 7) Disconnect connector of door harness.



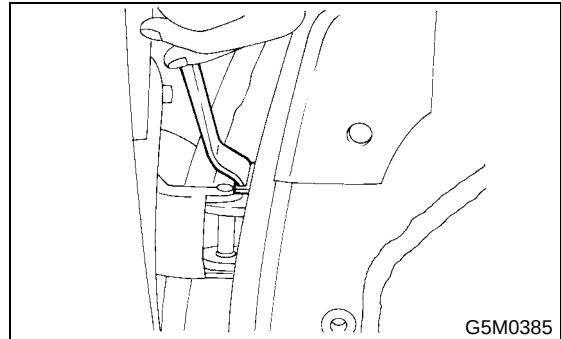
- 8) Put a wooden block on the jack and place the jack under the door. Support the door with the jack to protect it.



- 9) Remove checker bolts.



- 10) Remove door-side bolts for upper and lower hinges to remove door.



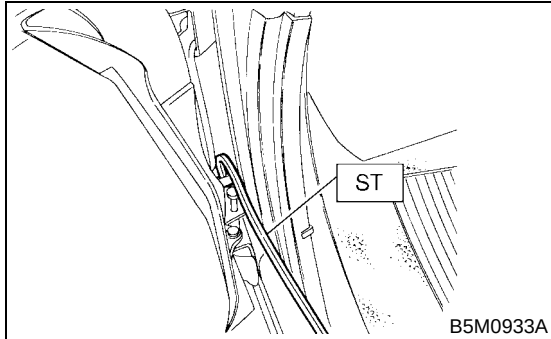
- 11) Using special tool, remove body-side bolts for upper and lower hinges, and remove door hinges.

B: INSTALLATION

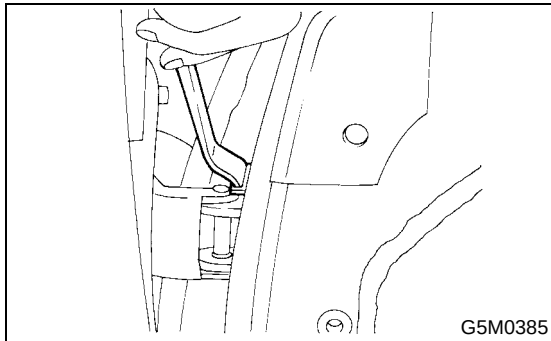
- 1) Install in the reverse order of removal.
- 2) Apply grease to sliding area of door hinges.

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.



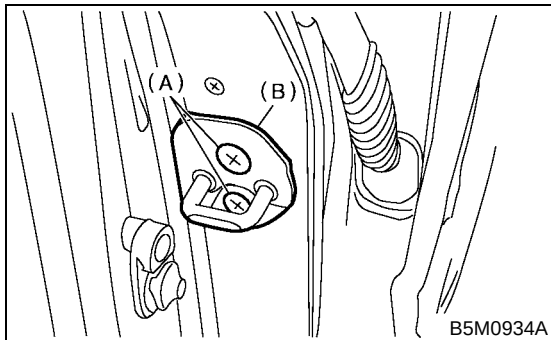
2) Loosen door-side bolts of upper and lower hinges to align the position of rear door panel vertically and laterally at front-end.



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.



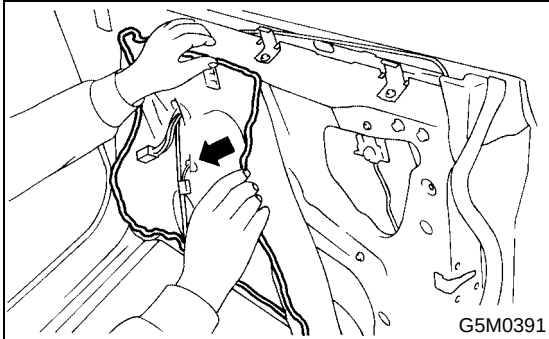
7. Rear Sealing Cover

A: REMOVAL

- 1) Remove rear door trim. <Ref. to EI-21, REMOVAL, Rear Door Trim.>
- 2) Remove rear speaker. <Ref. to ET-12, REMOVAL, Rear Speaker.>
- 3) Using a spatula, remove sealer.

CAUTION:

- Carefully remove sealer. 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 CEMEDINE 5430L sealer.
- 3) Press sealer-applied area firmly to prevent any floating on surface.

Sealer:

CEMEDINE 5430L or equivalent

CAUTION:

- Apply an uniform bead of sealer.
- Attach sealing cover, keeping it from becoming wrinkled.
- Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

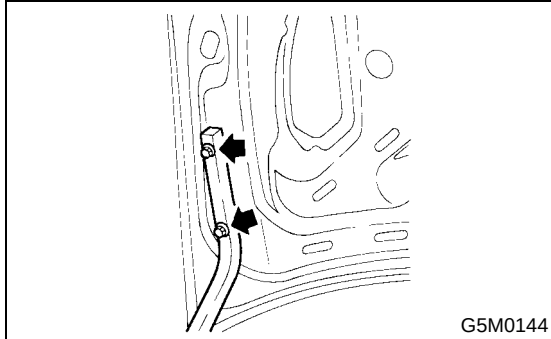
If sealing cover gets damaged, replace it with a new one.

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.



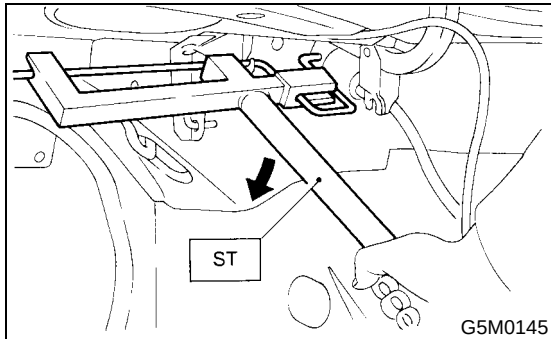
2. TORSION BAR

- 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.

CAUTION:

After the torsion bar is removed, the trunk lid will slam shut. Be careful not to get hit by the trunk lid.

B: INSTALLATION

1. TRUNK LID

- 1) Install in the reverse order of removal.
- 2) Install trunk lid with uniform clearance.

2. TORSION BAR

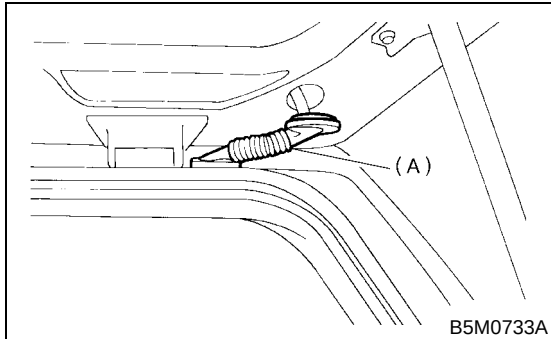
- 1) Install in the reverse order of removal.
- 2) Apply grease to rotating area of hinges and mating surface of torsion bar.

9. Rear Gate Panel

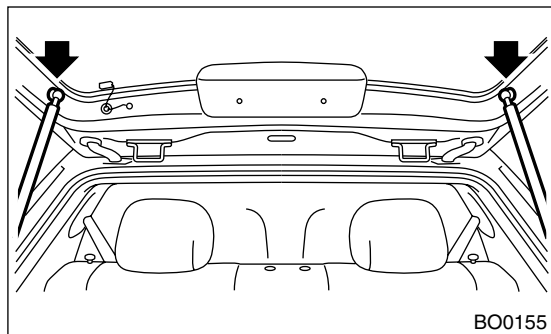
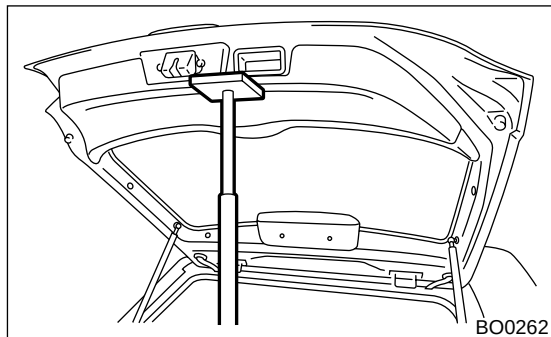
A: REMOVAL

1. REAR GATE PANEL

- 1) Open rear gate.
- 2) Remove rear gate outer handle. <Ref. to SL-36, REMOVAL, Rear Gate Outer Handle.>
- 3) Remove rear gate latch assembly. <Ref. to SL-37, REMOVAL, Rear Gate Latch Assembly.>
- 4) Remove rear gate key lock cylinders. <Ref. to SL-43, REAR GATE, REPLACEMENT, Key Lock Cylinders.>
- 5) Remove rear wiper. <Ref. to WW-21, REMOVAL, Rear Wiper Motor.>
- 6) Disconnect connectors of rear wiper, rear defogger, and other lighting devices.
- 7) Disconnect washer hose.
- 8) Remove rubber duct (A) connection, and pull out harness and washer hose from rear gate.



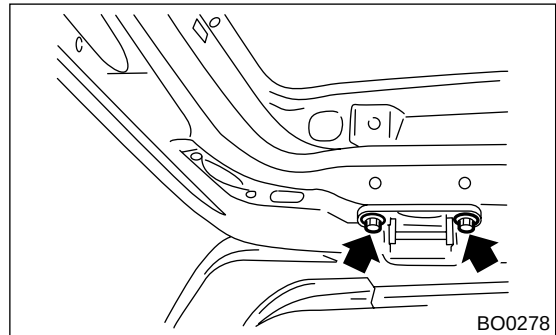
- 9) Using a support, support the rear gate while removing gas stay mounting bolts.



CAUTION:

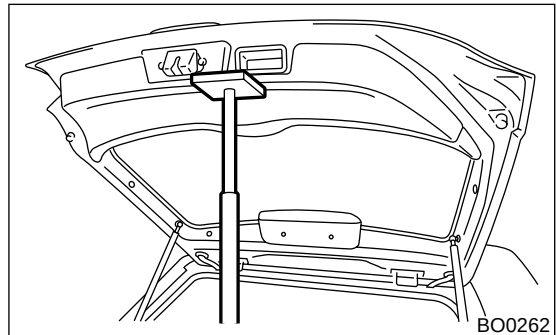
When the rear gate is released, it may hit and damage the body. To prevent this, place a shop cloth between body and gate.

- 10) Loosen rear gate bolts to remove rear gate.



2. GAS STAY

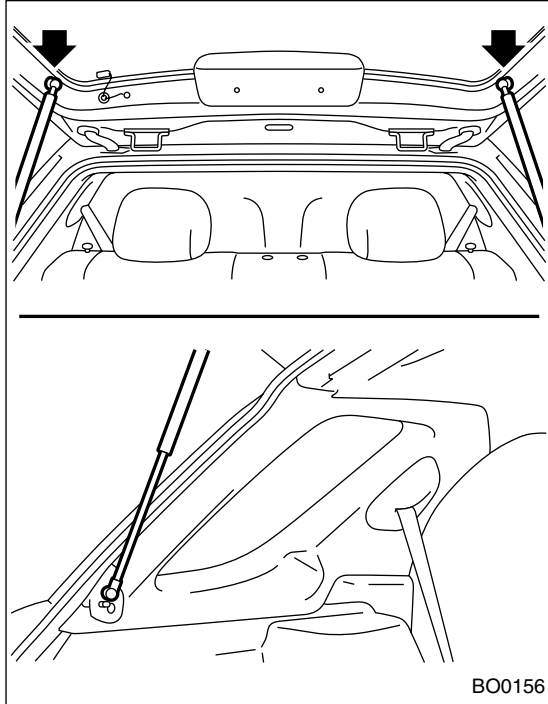
- 1) Open rear gate. Using a support jack to support the rear gate.



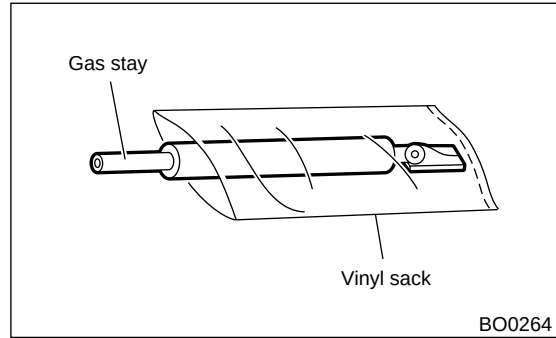
CAUTION:

- 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.



1) Cover with a vinyl case as shown in the figure.

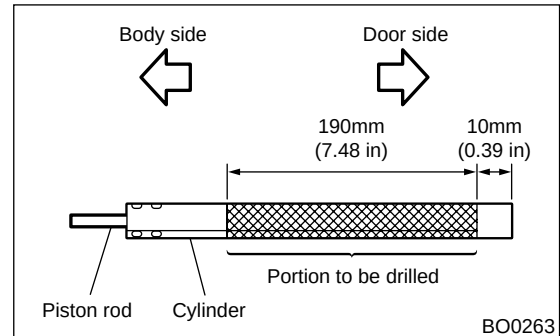


CAUTION:

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.



B: INSTALLATION

1. REAR GATE PANEL

- 1) Install in the reverse order of removal.
- 2) Install rear gate panel with uniform clearance to body.

CAUTION:

Do not damage painted surfaces of body and rear gate.

2. GAS STAY

Install in the reverse order of removal.

CAUTION:

After supporting rear gate with a jack, start operation.

C: DISPOSAL

1. GAS STAY

CAUTION:

Gas is colorless, odorless, and harmless. However, gas pressure may spray cutting powder or oil. Be sure to wear dust-resistant goggles.

REAR GATE PANEL

EXTERIOR BODY PANELS

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 (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

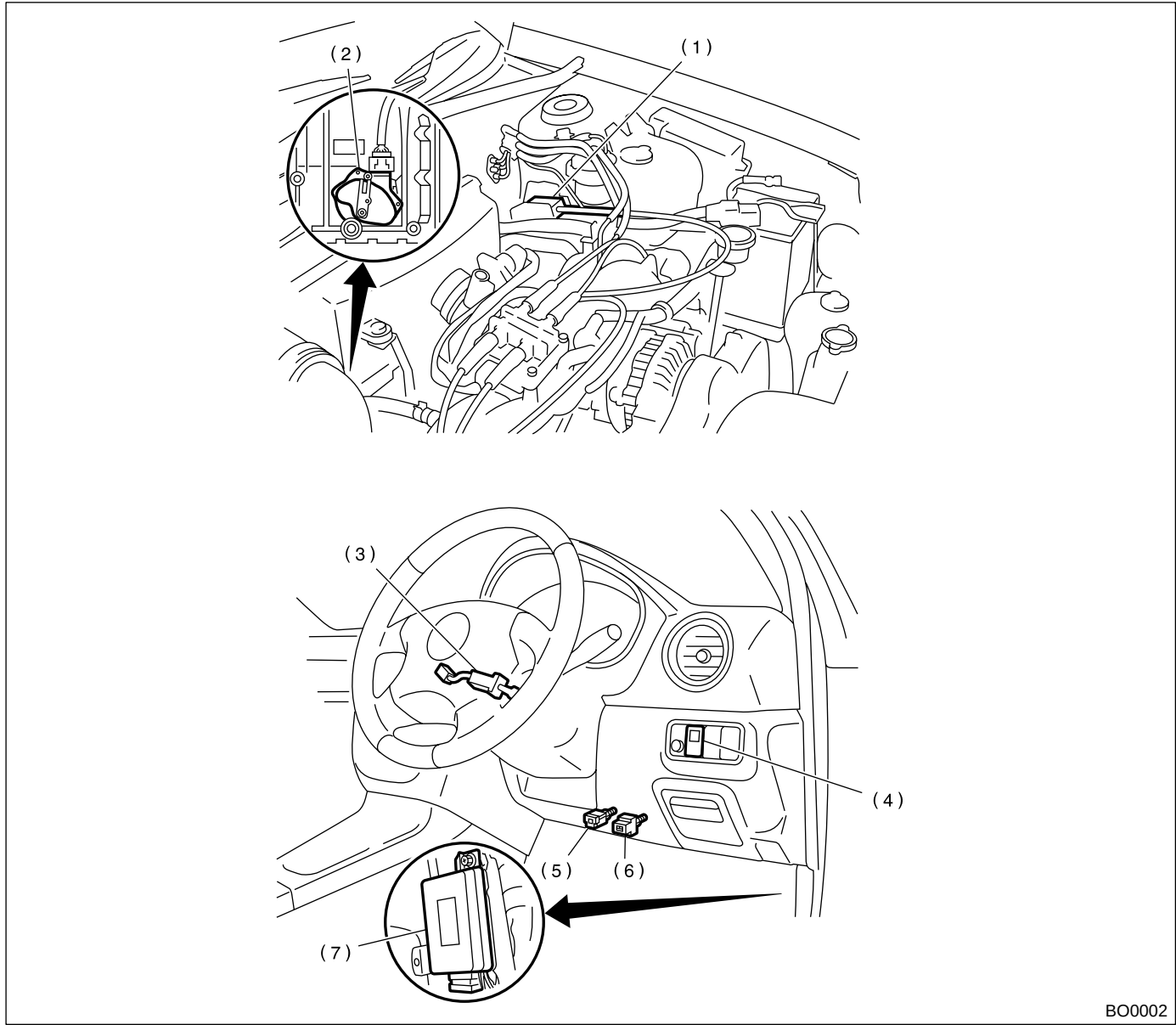
CRUISE CONTROL SYSTEM

CC

	Page
1. General Description	2
2. Actuator.....	3
3. Cruise Control Module	4
4. Cruise Control Main Switch.....	5
5. Cruise Control Command Switch	6
6. Stop and Brake Switch.....	7
7. Clutch Switch	8
8. Inhibitor Switch.....	9

1. General Description

A: COMPONENT



BO0002

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, make note of the memory before disconnecting the battery ground cable. All 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.

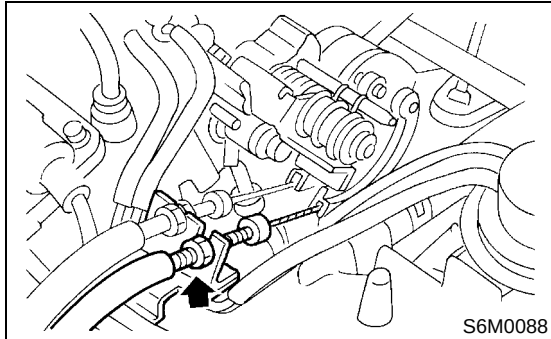
2. Actuator

A: REMOVAL

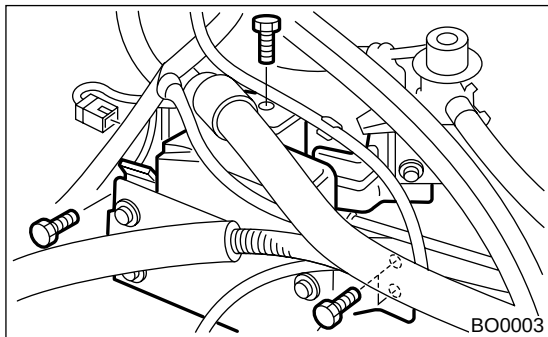
CAUTION:

- 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) Remove clip bands from cruise control cable.
- 2) Loosen nut which secures cruise control cable end to throttle cam and then remove cable from throttle cam.



- 3) Remove actuator attaching bolts.
- 4) Remove actuator while disconnecting connector.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

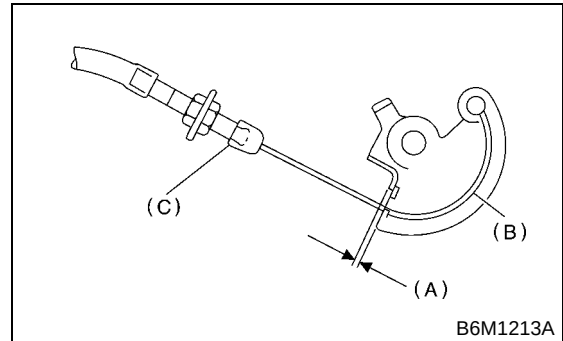
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

NOTE:

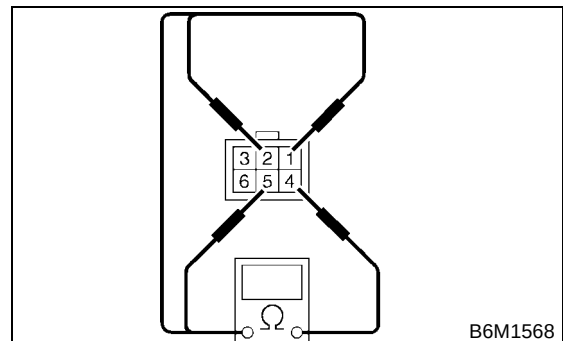
(A): Must be adjusted when cable end outer is fixed in place, so that gap between throttle cam and lever is 0 — 1 mm (0 — 0.04 in).
(Must be attached while throttle cam is being pulled by wire cable.)

(B): Must be coated evenly on cam end inner connection.

(C): Cover must be inserted securely, until tip of cable touches cover stopper.



C: INSPECTION



Measure resistance between cruise control actuator terminals.

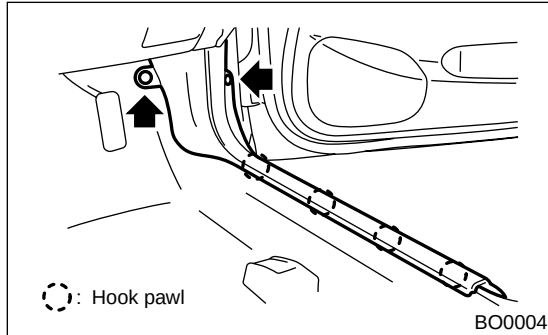
Tester connection	Resistance (Ω)
4 — 1	Approx. 5
4 — 2	Approx. 5
4 — 5	Approx. 5
3 — 6	Approx. 39

If NG, replace cruise control actuator.

3. Cruise Control Module

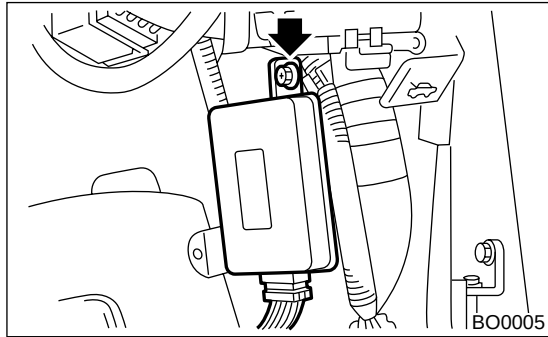
A: REMOVAL

1) Remove side sill front cover.



2) Disconnect connector from cruise control module.

3) Remove the volt, then detach cruise control module.



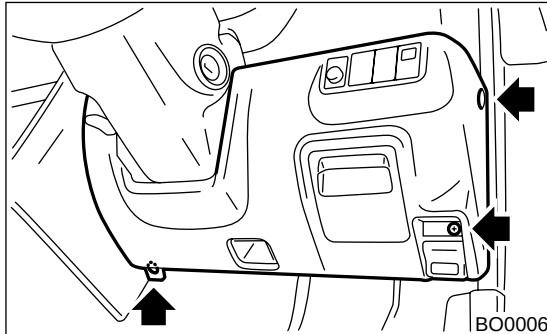
B: INSTALLATION

Install is in the reverse order of removal.

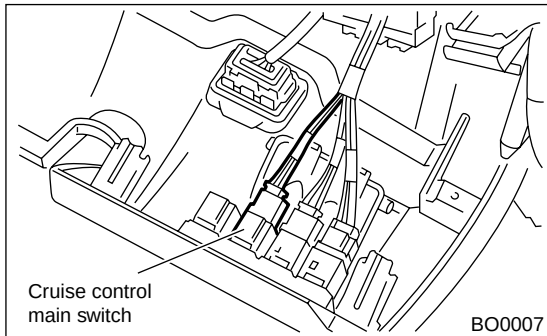
4. Cruise Control Main Switch

A: REMOVAL

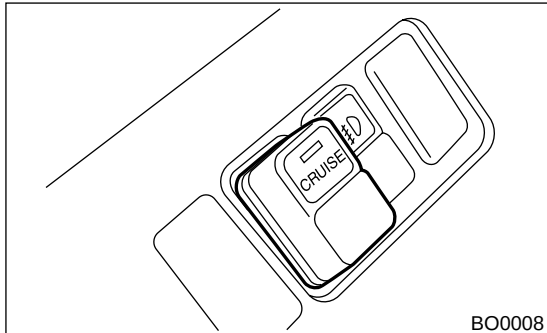
- 1) Remove screws and clip from instrument panel lower cover.
- 2) Remove instrument panel lower cover.



- 3) Disconnect connector from cruise control main switch.



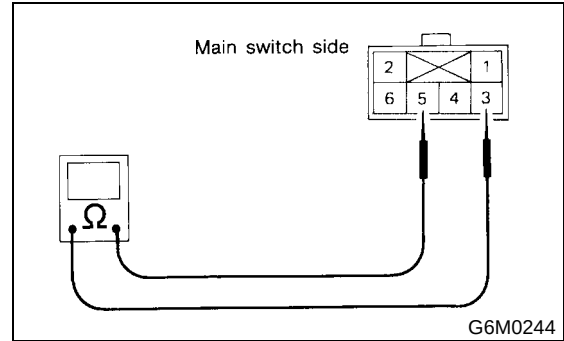
- 4) Remove main switch by pushing it outward.



B: INSTALLATION

Install is in the reverse order of removal.

C: INSPECTION



Check continuity between cruise control main switch terminals.

Switch position	Tester connection	Specified condition
OFF	3 — 5	No continuity
ON	3 — 5	Continuity

If NG, replace cruise control main switch.

CRUISE CONTROL COMMAND SWITCH

CRUISE CONTROL SYSTEM

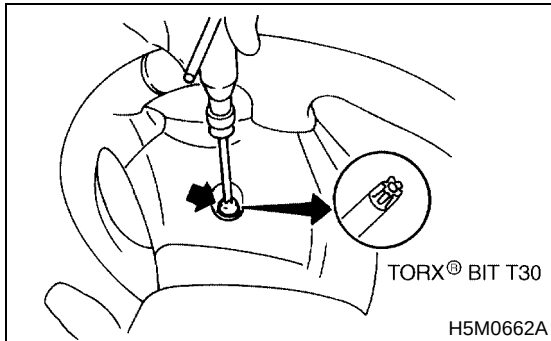
5. Cruise Control Command Switch

A: REMOVAL

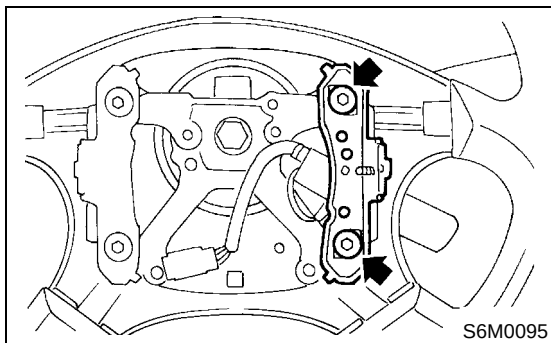
WARNING:

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.>

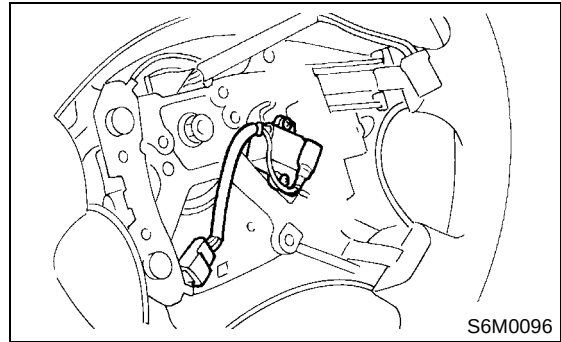
- 1) Set front wheels in straight ahead position.
- 2) Turn ignition switch OFF.
- 3) Disconnect battery ground cable from battery and wait for at least 20 seconds before starting work.
- 4) Using TORX® BIT T30 (Tamper resistant type), loosen two TORX® bolts which secure driver's airbag module.



- 5) Disconnect airbag module connector on back of airbag module.
- 6) Remove horn switch from steering wheel as shown.



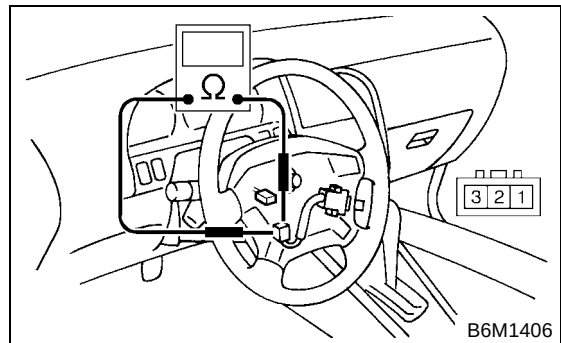
- 7) Disconnect horn and cruise control command switch connector, then remove cruise control command switch.



B: INSTALLATION

Install is in the reverse order of removal.

C: INSPECTION



Check continuity between cruise control command switch terminals.

Switch	Position	Tester connection	Specified condition
CANCEL	ON	1 (+) — 2 (-)	Continuity
	ON	1 (+) — 3 (-)	Continuity
SET/COAST	OFF	1 — 3	No continuity
	ON	1 — 3	Continuity
RESUME/ACCEL	OFF	1 — 2	No continuity
	ON	1 — 2	Continuity

If NG, replace cruise control command switch.

6. Stop and Brake Switch

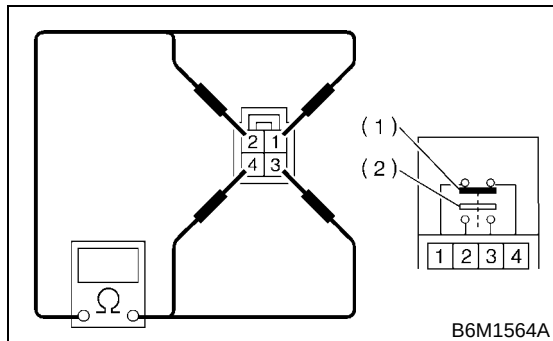
A: REMOVAL

Disconnect connector from switch, and then remove the switch. <Ref. to BR-77, REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Check continuity brake switch (1) and stop light switch (2) between terminals.

Switch	Pedal	Tester connection	Specified condition
Brake	Released	1 — 4	Continuity
	Depressed	1 — 4	No continuity
Stop light	Released	2 — 3	No continuity
	Depressed	2 — 3	Continuity

If NG, replace stop and brake switch.

7. Clutch Switch

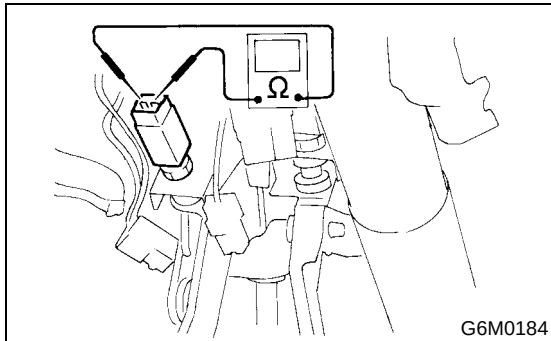
A: REMOVAL

Disconnect the connector from the switch, and then remove the switch. <Ref. to CL-34, DISASSEMBLY, Clutch Pedal.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Check continuity between clutch switch terminals.

Switch	Pedal	Tester connection	Specified condition
Clutch	Released	1 — 2	Continuity
	Depressed	1 — 2	No continuity

If NG, replace the clutch switch.

8. Inhibitor Switch

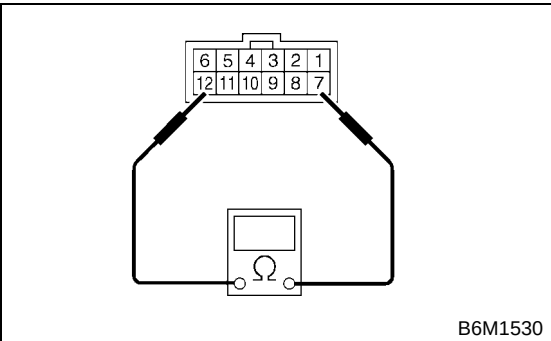
A: REMOVAL

Disconnect connector from switch, and then remove the switch. <Ref. to AT-29, REMOVAL, Inhibitor Switch.>

B: INSTALLATION

Installation is in the reverse order of removal.

C: INSPECTION



Check continuity between inhibitor switch terminals.

Selector lever position	Tester connection	Specified condition
P	7 — 12	Continuity
N		Continuity
Except P and N		No continuity

If NG, replace inhibitor switch.

INHIBITOR SWITCH

CRUISE CONTROL SYSTEM

BODY SECTION

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HVAC SYSTEM
(HEATER, VENTILATOR AND A/C) AC

HVAC SYSTEM (AUTO A/C)
(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

IMMOBILIZER (DIAGNOSTICS) IM

SUNROOF/T-TOP/CONVERTIBLE TOP
(SUNROOF) SR

EXTERIOR/INTERIOR TRIM EI

BODY SECTION

EXTERIOR BODY PANELS	EB
CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC

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2. General Description	3
3. Electrical Components Location.....	5
4. Cruise Control Module I/O Signal.....	6
5. Subaru Select Monitor.....	11
6. Diagnostics Chart with Symptom	13
7. Diagnostics Chart with Trouble Code.....	28

BASIC DIAGNOSTIC PROCEDURE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Check	Yes	No
1 START DIAGNOSIS. 1)Perform pre-inspection. <Ref. to CC-3, INSPECTION, General Description.> 2)Check cruise control main switch operation.	Is cruise control main switch turned ON?	Go to step 2.	Go to symptom 1. <Ref. to CC-13, SYMPTOM CHART, Diagnostics Chart with Symptom.>
2 PREPARE SUBARU SELECT MONITOR.	Is the select monitor available?	Go to step 3.	Go to step 4.
3 PERFORM CRUISE CANCEL CONDITIONS DIAGNOSIS. Perform cruise cancel conditions diagnosis. <Ref. to CC-11, Subaru Select Monitor.>	Is trouble code indicated?	Go to "Diagnostics Chart with Trouble Code".	Go to step 4.
4 CHECK CRUISE CONTROL SET OPERATION. Check cruise control set operation.	Can cruise control be set while driving at 40 km/h (25 MPH)?	Go to step 5.	Go to symptom 2. <Ref. to CC-13, 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) ?	Go to step 6.	Go to symptom 3. <Ref. to CC-13, 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?	Go to step 7.	Go to symptom 4. <Ref. to CC-13, 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?	Go to step 8.	Go to symptom 5. <Ref. to CC-13, SYMPTOM CHART, Diagnostics Chart with Symptom.>
8 CHECK CANCEL OPERATION. Check CANCEL operation.	Is cruise control released after CANCEL switch has been pressed?	Go to step 9.	Go to symptom 6. <Ref. to CC-13, 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?	Go to step 10.	Go to symptom 7. <Ref. to CC-13, SYMPTOM CHART, Diagnostics Chart with Symptom.>
10 CHECK CRUISE CONTROL RELEASE OPERATION. Check cruise control release operation.	Is cruise control released after clutch pedal has been depressed? (MT)	Finish the diagnostics.	Go to symptom 8. <Ref. to CC-13, 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.

B: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • 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.

C: INSPECTION

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

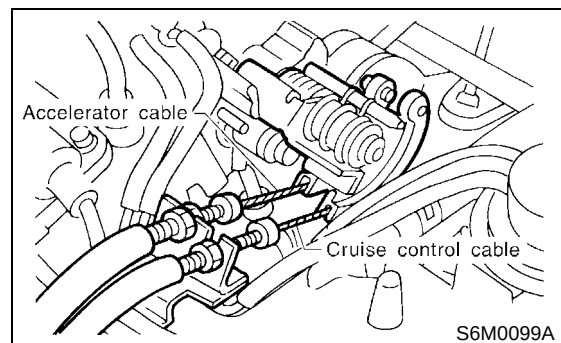
Standard voltage:

12 V, or more

Specific gravity:

Above 1.260

2. CRUISE CONTROL CABLE

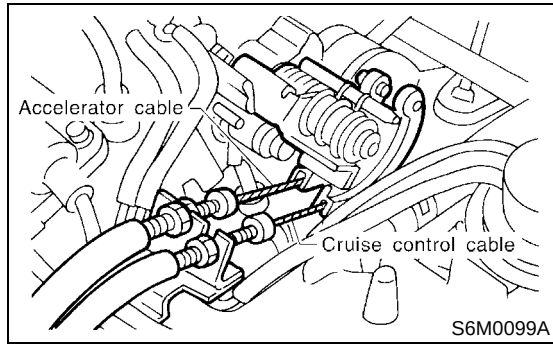


Check the cruise control cable installation.
If NG, install the cable securely.

GENERAL DESCRIPTION

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

3. ACCELERATOR CABLE



Check movement of the accelerator cable when the cruise control throttle is moved by hand.

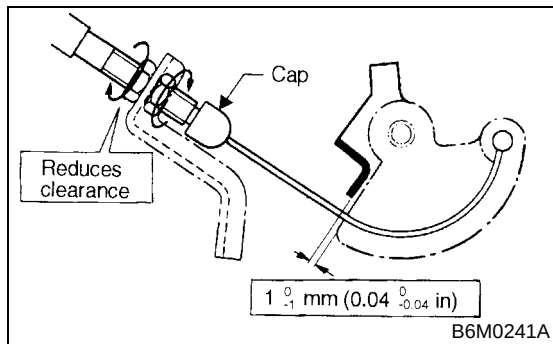
If NG, check throttle cam.

4. THROTTLE CAM

Check that the throttle cam moves smoothly.

If NG, repair throttle cam.

5. CABLE FREE PLAY



Check that the throttle cam-to-lever clearance is within specifications.

Throttle cam-to-lever clearance:

0 — 1 mm (0 — 0.04 in)

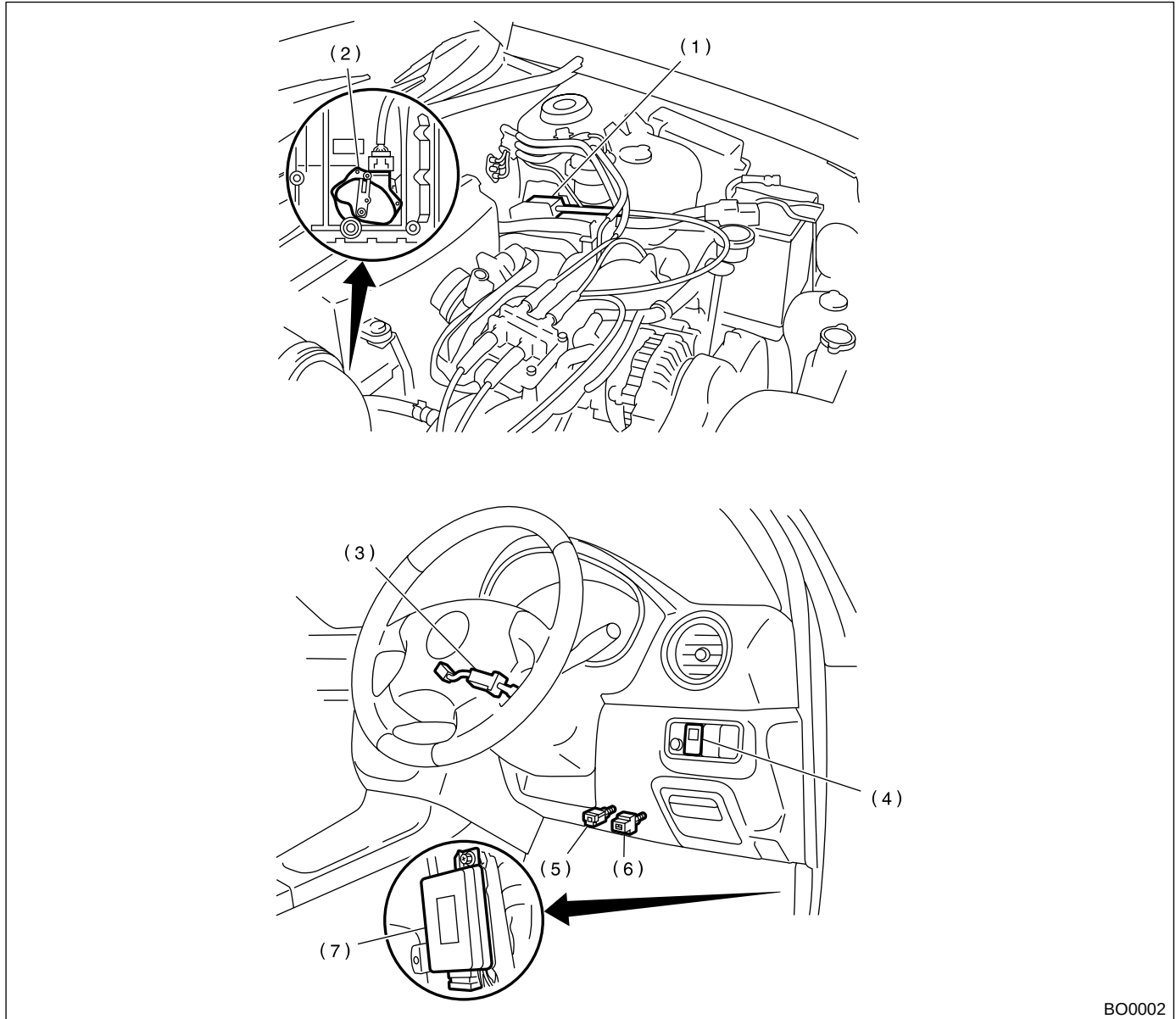
If NG, adjust the clearance with the adjust nut.

NOTE:

Check that the cap is positioned in the groove.

3. Electrical Components Location

A: LOCATION



BO0002

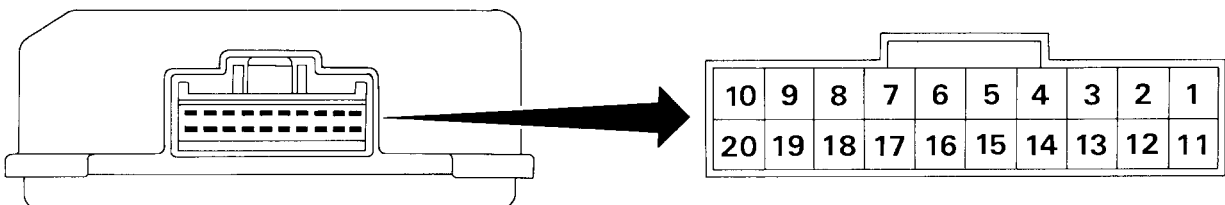
- | | | |
|-----------------------------------|--------------------------------|---------------------------|
| (1) Actuator | (4) Cruise control main switch | (7) Cruise control module |
| (2) Inhibitor switch (AT) | (5) Clutch switch (MT) | |
| (3) Cruise control command switch | (6) Stop and brake switch | |

CRUISE CONTROL MODULE I/O SIGNAL

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

4. Cruise Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



G6M0015

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Main light	1	- Battery voltage is present when main switch is turned OFF. "0" volt is present when main switch is turned ON.
Inhibitor switch (AT)	4	- 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	- 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	- 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	- 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	- 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	- Battery voltage is present when main power is turned ON. "0" volt is present when main power is turned OFF.
Ignition switch	12	- Battery voltage is present when ignition switch is turned ON. "0" volt is present when ignition switch is turned OFF.
Motor C	13	- 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	- 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	- Battery voltage is present during pressing the cruise control main switch, and then battery voltage is present while main switch is turned ON. "0" volt is present when main switch is turned OFF.

CRUISE CONTROL MODULE I/O SIGNAL

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

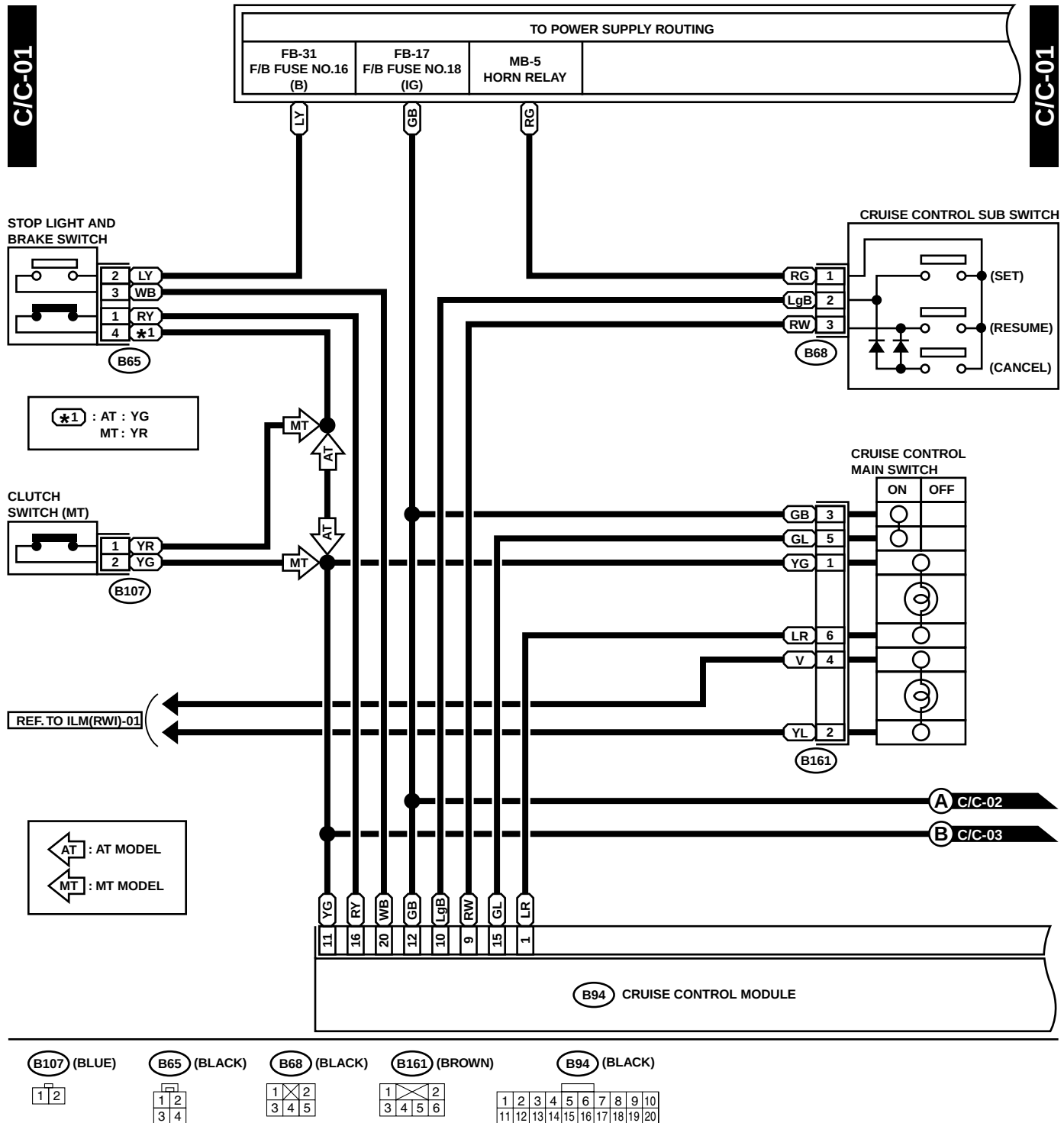
Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Brake switch	16	Leave clutch pedal released (MT), while cruise control main switch is turned ON. Then check that; • Battery voltage is present when brake pedal is released. • "0" volt is present when brake pedal is depressed. Additionally only in MT vehicle, keep the cruise control main switch to ON and leave brake pedal released. Then check that; • 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	—
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; • 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.		

CRUISE CONTROL MODULE I/O SIGNAL

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

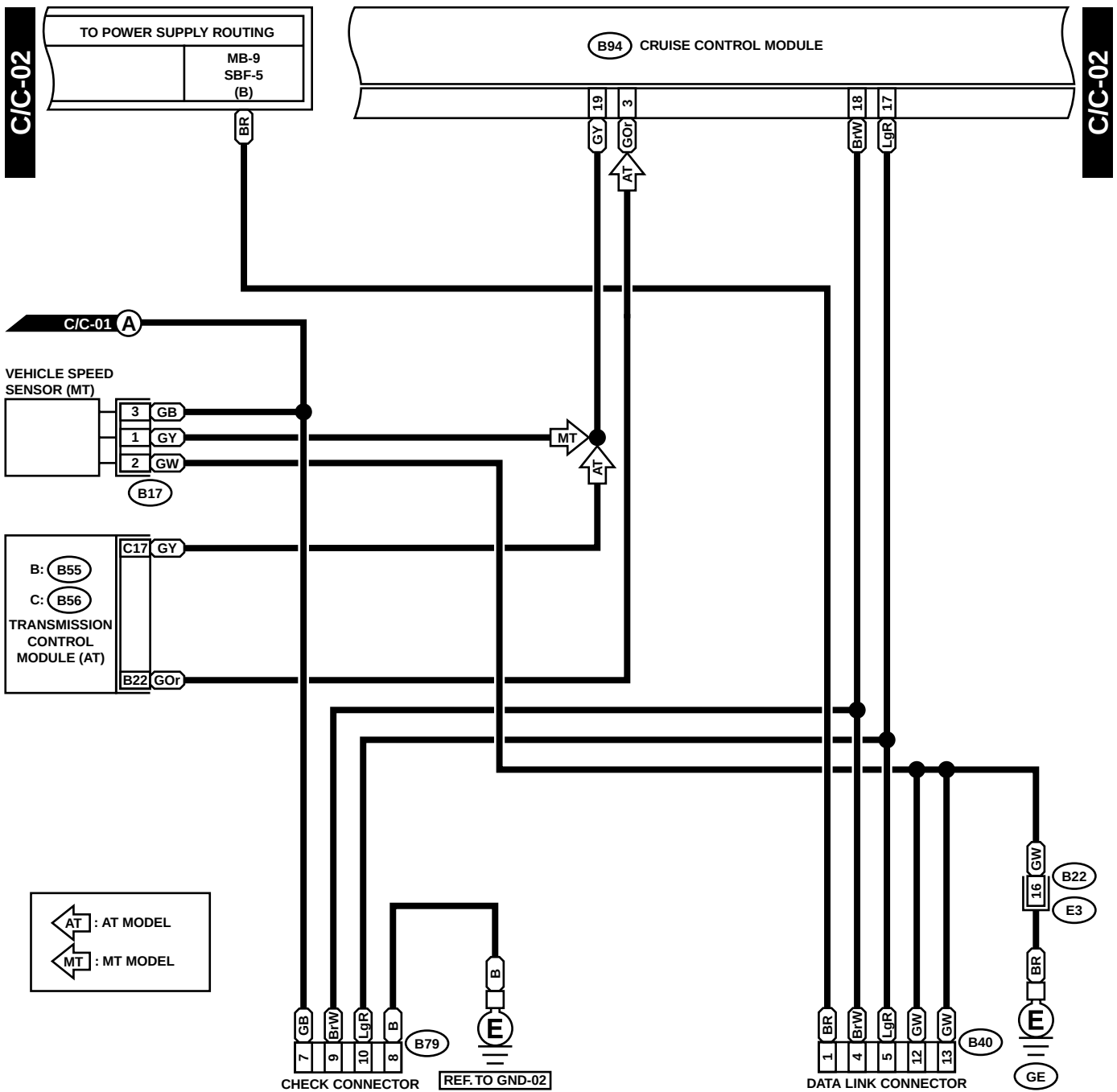
B: SCHEMATIC

1. CRUISE CONTROL



CRUISE CONTROL MODULE I/O SIGNAL

CRUISE CONTROL SYSTEM (DIAGNOSTICS)



B17 (BLACK)

1	2	3
---	---	---

F44

1	2	3	4
5	6	7	8

B79 (GRAY)

1	2	3	4	5	6	7
8	9	10	11	12	13	14

B40 (GRAY)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

B22 (BROWN)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

B94 (BLACK)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

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			

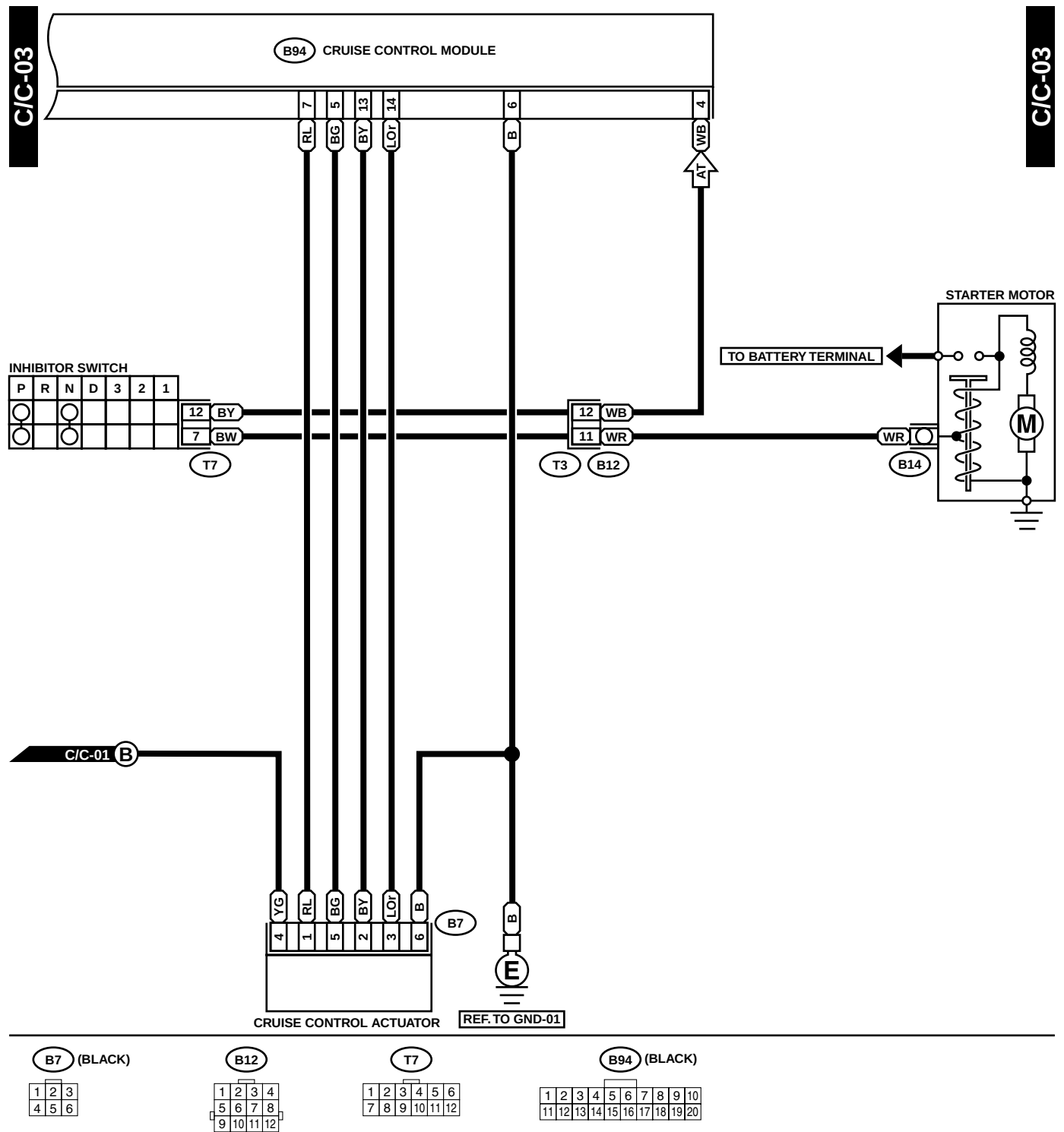
C: B56 (GREEN)

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24			

GG71-20B

CRUISE CONTROL MODULE I/O SIGNAL

CRUISE CONTROL SYSTEM (DIAGNOSTICS)



GG71-20C

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

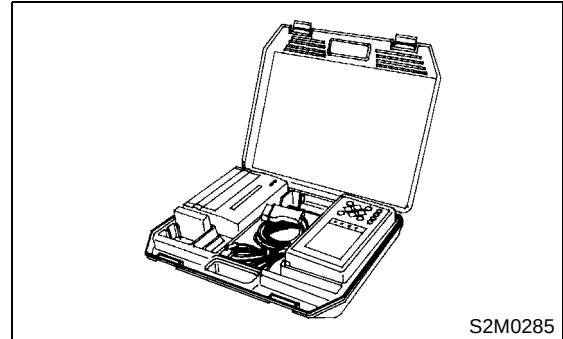
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.

(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.



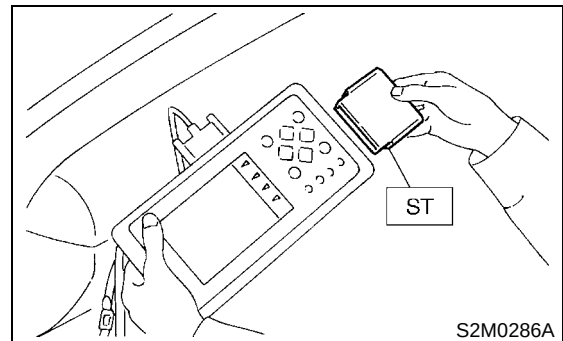
S2M0285

2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor.

NOTE:

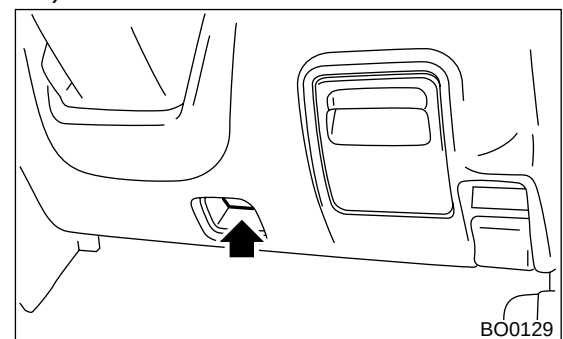
Subaru Select Monitor cartridge:
No. 24082AA150



S2M0286A

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).



BO0129

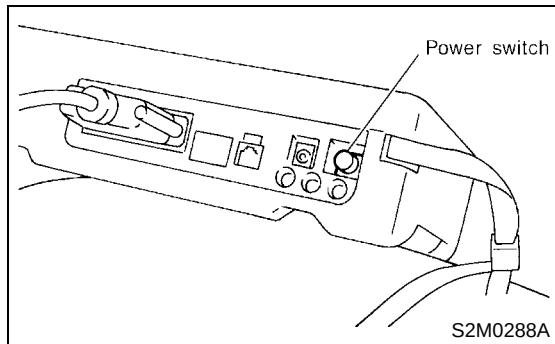
(2) Connect diagnosis cable to data link connector.

SUBARU SELECT MONITOR

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

5) Start engine and turn cruise control main switch to ON.

6) Turn Subaru Select Monitor switch to ON.



7) On the Main Menu display screen, select the {All System Diagnosis} and press the [YES] key.

NOTE:

The diagnostic trouble code is also shown in the {Each System Check} mode. This mode is called up on the Cruise Control Diagnosis 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 will appear on select monitor display.

CAUTION:

- A diagnostic trouble code 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 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.)
- Turn ON the "SET/COAST" switch.
- Turn ON 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, refer to the LIST OF DIAGNOSTIC TROUBLE CODE.

<Ref. to CC-28, LIST OF DIAGNOSTIC TROUBLE CODE, Diagnostics Chart with Trouble Code.>

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-16, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>
		(2) Check cruise control main switch.	<Ref. to CC-18, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics Chart with Symptom.>
2	Cruise control cannot be set.	(1) Check SET/COAST switch.	<Ref. to CC-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check stop light switch and brake switch.	<Ref. to CC-22, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(3) Check clutch switch (MT).	<Ref. to CC-24, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(4) Check inhibitor switch (AT).	<Ref. to CC-26, CHECK INHIBITOR SWITCH (AT), Diagnostics Chart with Symptom.>
		(5) Check vehicle speed sensor.	<Ref. to CC-30, DIAGNOSTIC TROUBLE CODE 22—VEHICLE SPEED SENSOR —, Diagnostics Chart with Trouble Code.>
		(6) Check motor drive system.	<Ref. to CC-34, DIAGNOSTIC TROUBLE CODE 35—ACTUATOR MOTOR —, Diagnostics Chart with Trouble Code.>
		(7) Check motor clutch drive system.	<Ref. to CC-36, DIAGNOSTIC TROUBLE CODE 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-30, DIAGNOSTIC TROUBLE CODE 22—VEHICLE SPEED SENSOR —, Diagnostics Chart with Trouble Code.>
		(2) Check motor drive system.	<Ref. to CC-34, DIAGNOSTIC TROUBLE CODE 35—ACTUATOR MOTOR —, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DIAGNOSTIC TROUBLE CODE 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-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DIAGNOSTIC TROUBLE CODE 35—ACTUATOR MOTOR —, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DIAGNOSTIC TROUBLE CODE 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-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DIAGNOSTIC TROUBLE CODE 35—ACTUATOR MOTOR —, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DIAGNOSTIC TROUBLE CODE 37—ACTUATOR MOTOR CLUTCH —, Diagnostics Chart with Trouble Code.>

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

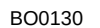
Symptom		Repair area	Reference
6	Cruise control is not released after CANCEL switch has been pressed.	(1) Check CANCEL switch.	<Ref. to CC-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DIAGNOSTIC TROUBLE CODE 35—ACTUATOR MOTOR —, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DIAGNOSTIC TROUBLE CODE 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-22, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DIAGNOSTIC TROUBLE CODE 35—ACTUATOR MOTOR —, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DIAGNOSTIC TROUBLE CODE 37—ACTUATOR MOTOR CLUTCH —, Diagnostics Chart with Trouble Code.>
8	Cruise control is not released after clutch pedal has been depressed (MT).	(1) Check clutch switch.	<Ref. to CC-24, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC-34, DIAGNOSTIC TROUBLE CODE 35—ACTUATOR MOTOR —, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC-36, DIAGNOSTIC TROUBLE CODE 37—ACTUATOR MOTOR CLUTCH —, Diagnostics Chart with Trouble Code.>

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY. 1)Disconnect cruise control module harness connector. 2)Turn ignition switch ON. 3)Measure voltage between harness connector terminal and chassis ground. Connector & terminal (B94) No. 12 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2 .	• 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. Measure resistance between harness connector terminal and chassis ground. Connector & terminal (B94) No. 6 (+) — Chassis ground (-):	Is the resistance less than 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:

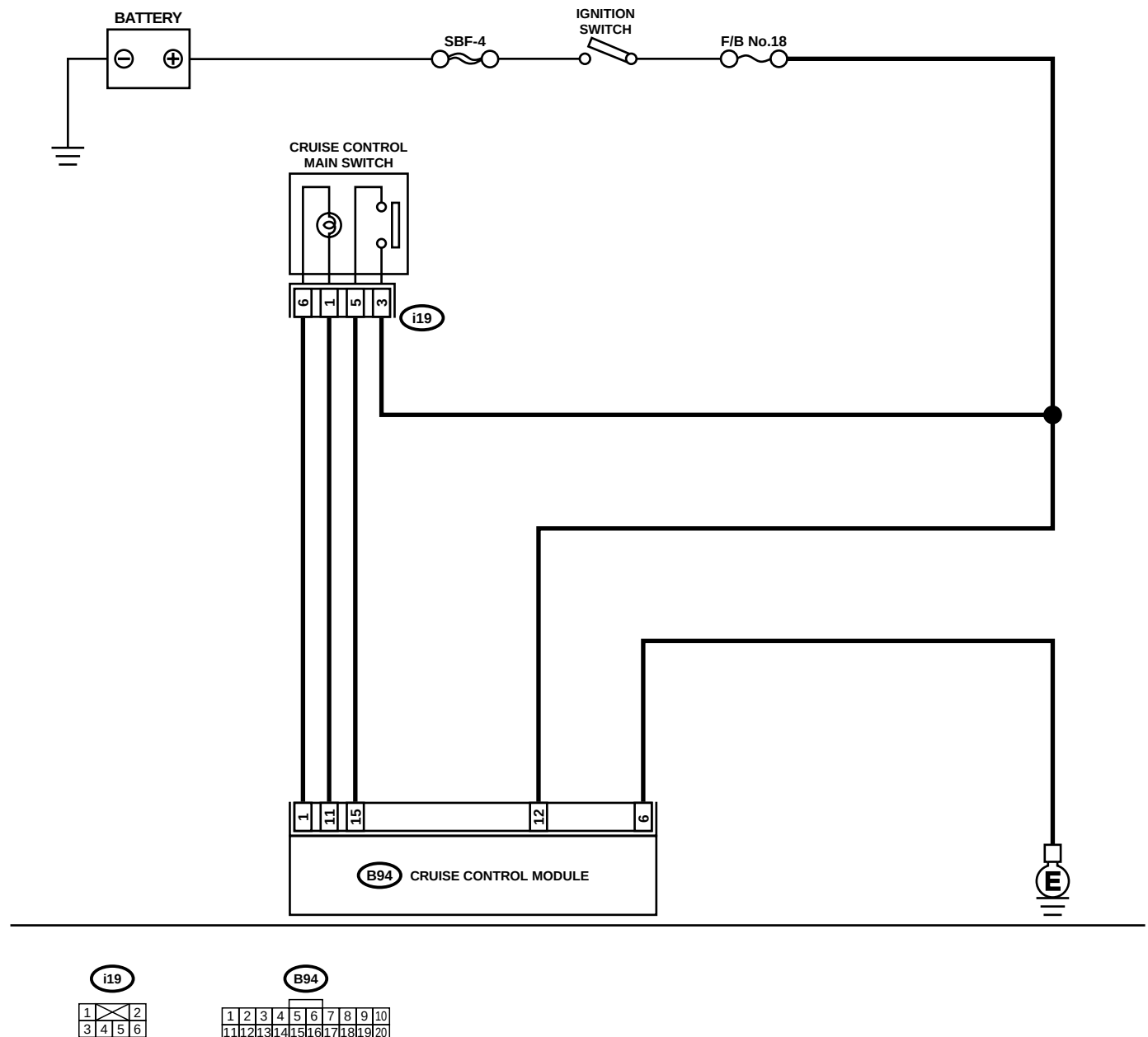
Cruise control main switch is not turned ON and cruise control cannot be set.

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:



DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT. 1)Disconnect cruise control main switch harness connector. 2)Turn ignition switch ON. 3)Measure voltage between harness connector terminal and chassis ground. Connector & terminal (i19) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	• Check fuse No. 18 (in fuse & relay box). • Check harness for open or short between cruise control main switch and fuse & relay box.
2 CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT. 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. Connector & terminal (B94) No. 15 (+) — (i19) No. 5 (-): (B94) No. 1 (+) — (i19) No. 6 (-): (B94) No. 11(+) — (i19) No. 1 (-):	Is the resistance less than 10 Ω?	Go to step 3.	Repair harness.
3 CHECK CRUISE CONTROL MAIN SWITCH. Remove and check cruise control main switch. <Ref. to CC-5, Cruise Control Main Switch.>	Is cruise control main switch OK?	Replace cruise control module.	Replace cruise control main switch.

DIAGNOSTICS CHART WITH SYMPTOM

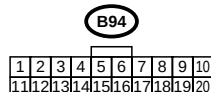
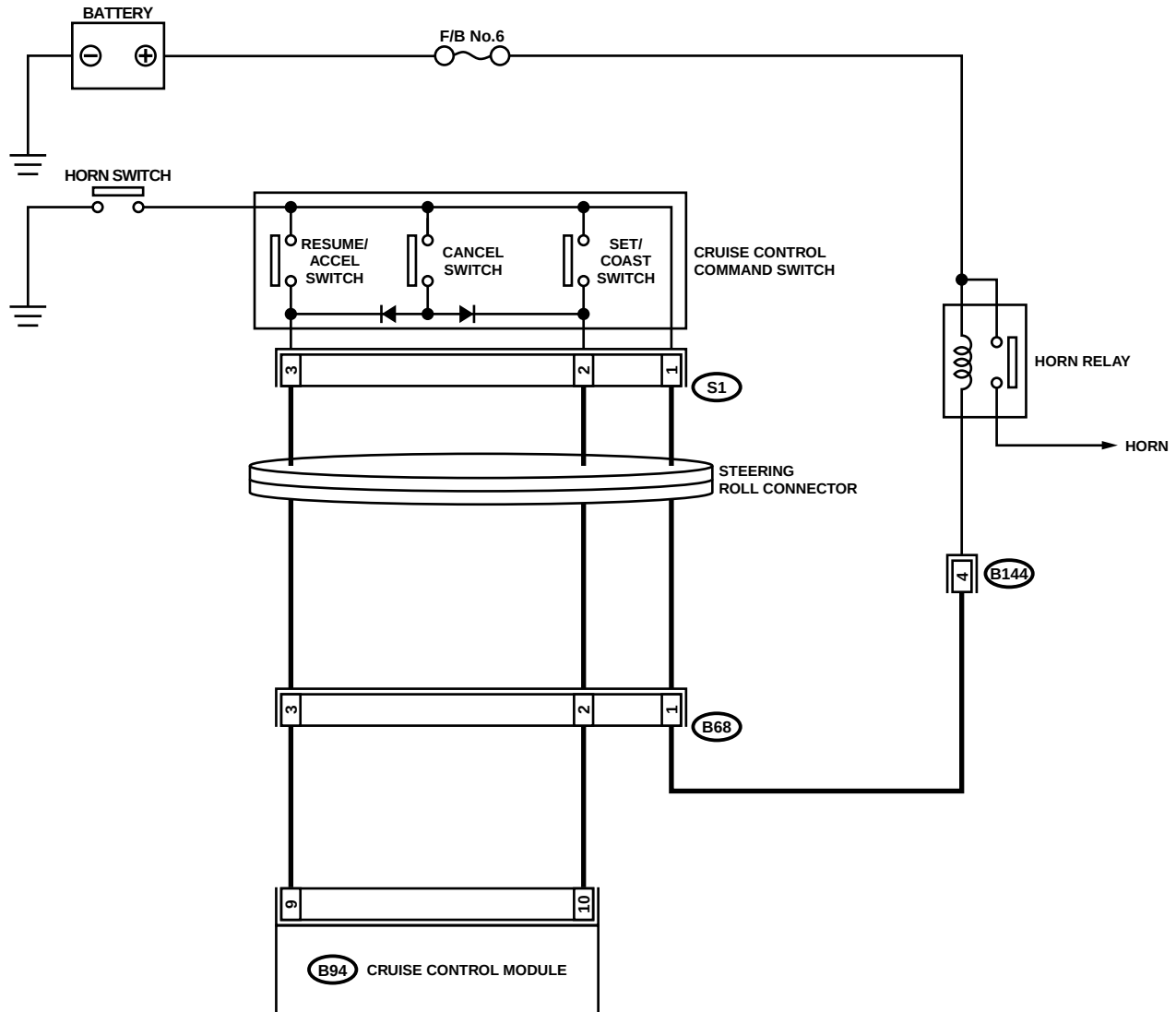
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

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	Check	Yes	No
1 CHECK SET/COAST SWITCH CIRCUIT. 1)Disconnect cruise control module harness connector. 2)Turn ignition switch ON. 3)Measure voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed. Connector & terminal (B94) No. 10 (+) — Chassis ground (-):	Is the voltage 0 V when SET/COAST switch is not pressed? Is the voltage more than 10 V when SET/COAST switch is pressed?	Go to step 2.	Go to step 4.
2 CHECK RESUME/ACCEL SWITCH CIRCUIT. Measure voltage between harness connector terminal and chassis ground when RESUME/ACCEL switch is pressed and not pressed. Connector & terminal (B94) No. 9 (+) — Chassis ground (-):	Is the voltage 0 V when RESUME/ACCEL switch is not pressed? Is the voltage more than 10 V when RESUME/ACCEL switch is pressed?	Go to step 3.	Go to step 4.
3 CHECK CANCEL SWITCH CIRCUIT. Measure voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed. Connector & terminal (B94) No. 9 (+) — Chassis ground (-): (B94) No. 10 (+) — Chassis ground (-):	Is the voltage 0 V when CANCEL switch is not pressed? Is the voltage more than 10 V when CANCEL switch is pressed?	Cruise control command switch circuit is OK.	Go to step 4.
4 CHECK POWER SUPPLY FOR COMMAND SWITCH. Check horn operation.	Does horn sound?	Go to step 5.	• Check fuse No. 6 (in fuse & relay box). • Check horn relay. <Ref. to COM-4, HORN RELAY, INSPECTION, Horn System.> • Check harness for open or short between cruise control command switch and fuse & relay box.
5 CHECK CRUISE CONTROL COMMAND SWITCH. Remove and check cruise control command switch. <Ref. to CC-6, Cruise Control Command Switch.>	Is cruise control command switch OK?	Check harness between cruise control command switch and cruise control module.	Replace cruise control command switch.

DIAGNOSTICS CHART WITH SYMPTOM

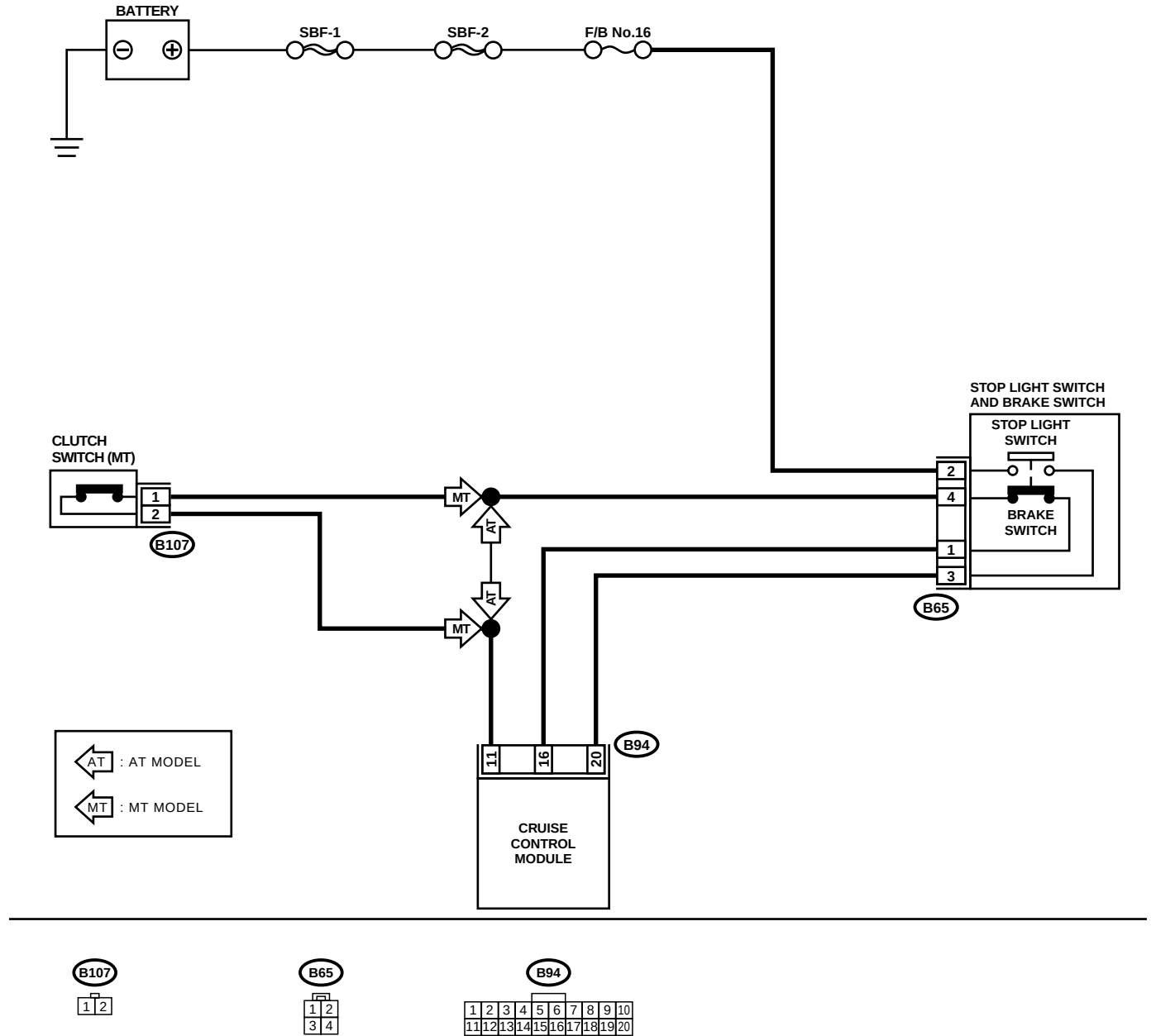
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

E: CHECK STOP LIGHT SWITCH AND BRAKE SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



BO0132

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. 1)Disconnect stop light switch and brake switch harness connector. 2)Turn ignition switch ON. 3)Turn cruise control main switch ON. 4)Measure voltage between harness connector terminal and chassis ground. Connector & terminal (B65) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	• Check fuse No. 16 (in fuse & relay box). • Check harness for open or short between stop light/brake switch and fuse & relay box.
2 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. Measure voltage between harness connector terminal and chassis ground. Connector & terminal (B65) No. 4 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	• Check harness for open or short between stop light/brake switch and cruise control module (AT). • Check clutch switch and the circuit (MT).
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. Connector & terminal (B94) No. 20 (+) — (B65) No. 3 (-): (B94) No. 16 (+) — (B65) No. 1 (-):	Is the resistance less than 10 Ω ?	Go to step 4.	Repair harness.
4 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH. Remove and check stop light switch and brake switch. <Ref. to CC-7, Stop and Brake Switch.>	Are stop light switch and brake switch OK?	Stop light switch and brake switch circuit are OK.	Replace stop light switch and brake switch.

DIAGNOSTICS CHART WITH SYMPTOM

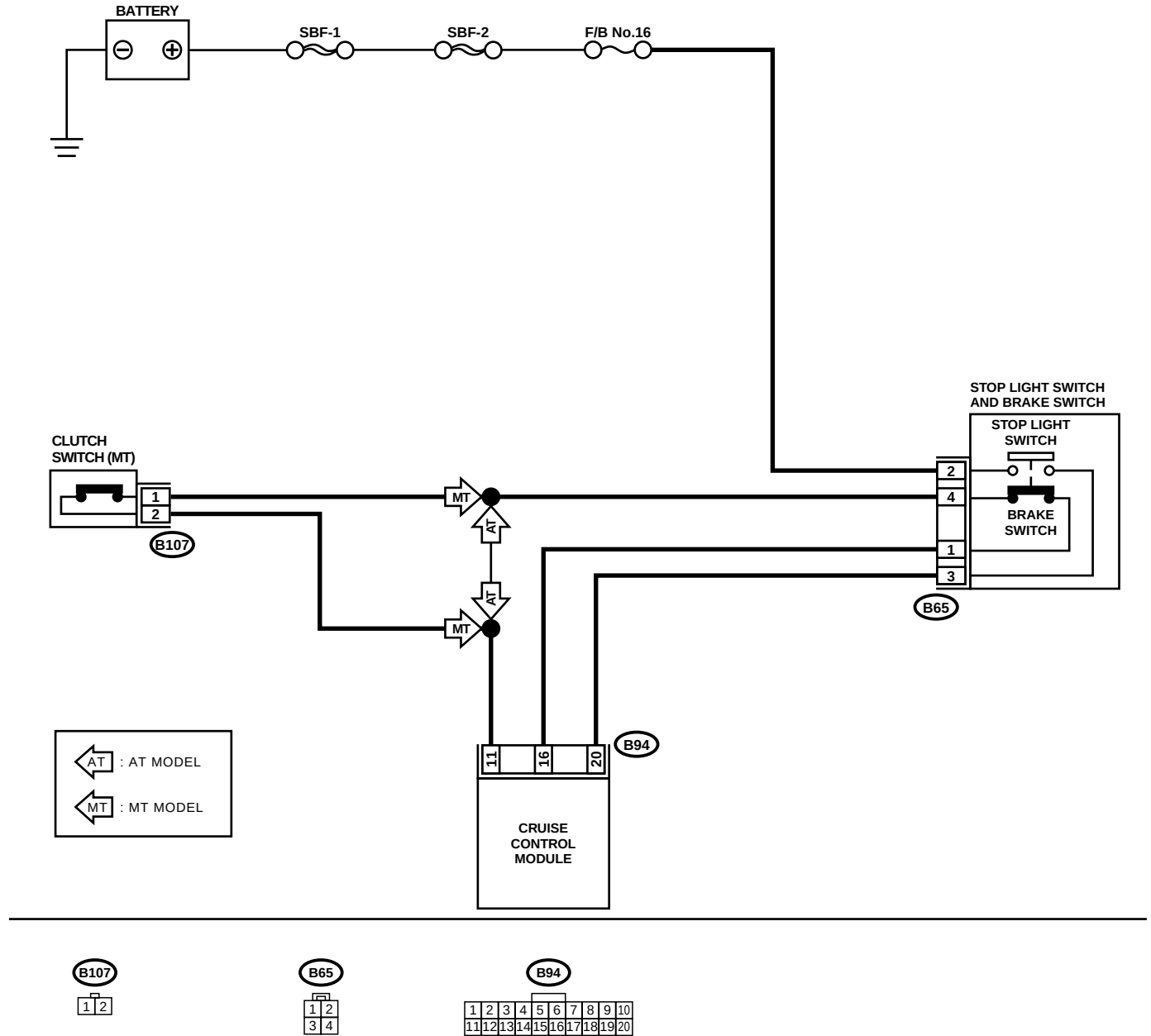
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

F: CHECK CLUTCH SWITCH (MT)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



BO0132

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CLUTCH SWITCH CIRCUIT. 1)Disconnect clutch switch harness connector. 2)Turn ignition switch ON. 3)Turn cruise control main switch ON. 4)Measure voltage between harness connector terminal and chassis ground. Connector & terminal (B107) No. 2 (+) — Chassis ground (-):	Is the voltage more than 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. 4 (-):	Is the resistance less than 10 Ω ?	Go to step 3.	Repair harness.
3 CHECK CLUTCH SWITCH. Remove and check clutch switch. <Ref. to CC-8, Clutch Switch.>	Is clutch switch OK?	Clutch switch circuit is OK.	Replace clutch switch.

DIAGNOSTICS CHART WITH SYMPTOM

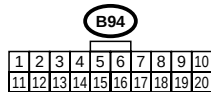
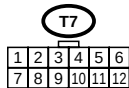
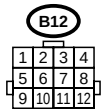
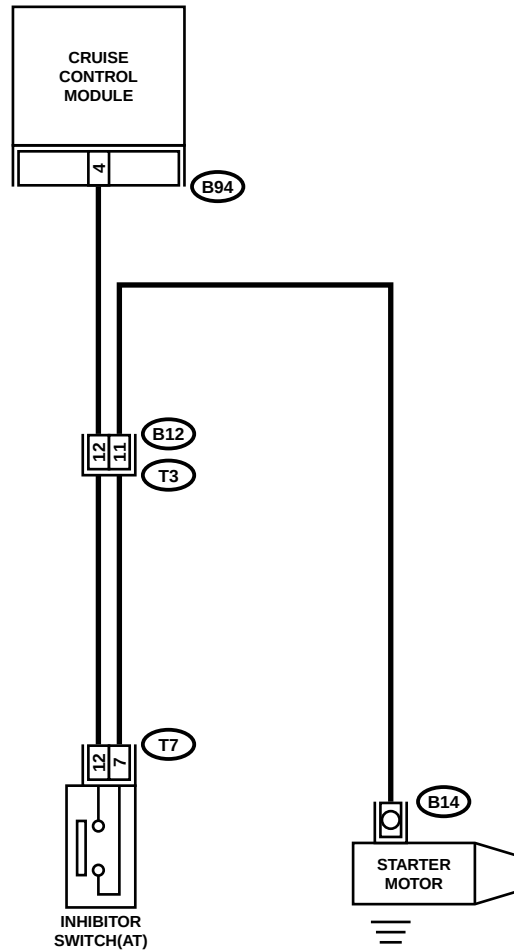
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

G: CHECK INHIBITOR SWITCH (AT)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INHIBITOR SWITCH CIRCUIT. 1)Disconnect inhibitor switch harness connector. 2)Turn ignition switch ON. 3)Turn cruise control main switch ON. 4)Measure voltage between harness connector terminal and chassis ground. Connector & terminal (T7) No. 12 (+) — Chassis ground (-):	Is the voltage more than 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 resistance less than 10 Ω ?	Go to step 3.	Repair harness.
3 CHECK INHIBITOR SWITCH. Remove and check inhibitor switch. <Ref. to CC-9, Inhibitor Switch.>	Is inhibitor switch OK?	Inhibitor switch circuit is OK.	Replace inhibitor switch.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

7. Diagnostics Chart with Trouble Code

A: LIST OF DIAGNOSTIC TROUBLE CODE

Diagnostic trouble code	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-29, DIAGNOSTIC TROUBLE CODE 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-30, DIAGNOSTIC TROUBLE CODE 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-29, DIAGNOSTIC TROUBLE CODE 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-29, DIAGNOSTIC TROUBLE CODE 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-33, DIAGNOSTIC TROUBLE CODE 28— WIRING HARNESS OPENED. —, Diagnostics Chart with Trouble Code.>
35	Motor drive system is abnormal.	- Motor output circuit is open or shorted. - Motor drive circuit is open or shorted.	<Ref. to CC-34, DIAGNOSTIC TROUBLE CODE 35— ACTUATOR MOTOR —, Diagnostics Chart with Trouble Code.>
37	Motor clutch drive system is abnormal.	- Motor clutch output circuit is open or shorted. - Motor clutch drive circuit is open or shorted.	<Ref. to CC-36, DIAGNOSTIC TROUBLE CODE 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-38, DIAGNOSTIC TROUBLE CODE 38 — MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY. —, Diagnostics Chart with Trouble Code.>

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Diagnostic trouble code	Item	Contents of diagnosis	Reference
39	Motor is overloaded.	Current flows through motor more frequently than under normal conditions.	<Ref. to CC-38, DIAGNOSTIC TROUBLE CODE 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-29, DIAGNOSTIC TROUBLE CODE 21, 24, 25 AND 2A— CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM —, Diagnostics Chart with Trouble Code.>

B: DIAGNOSTIC TROUBLE CODE 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)

C: DIAGNOSTIC TROUBLE CODE 22— VEHICLE SPEED SENSOR —

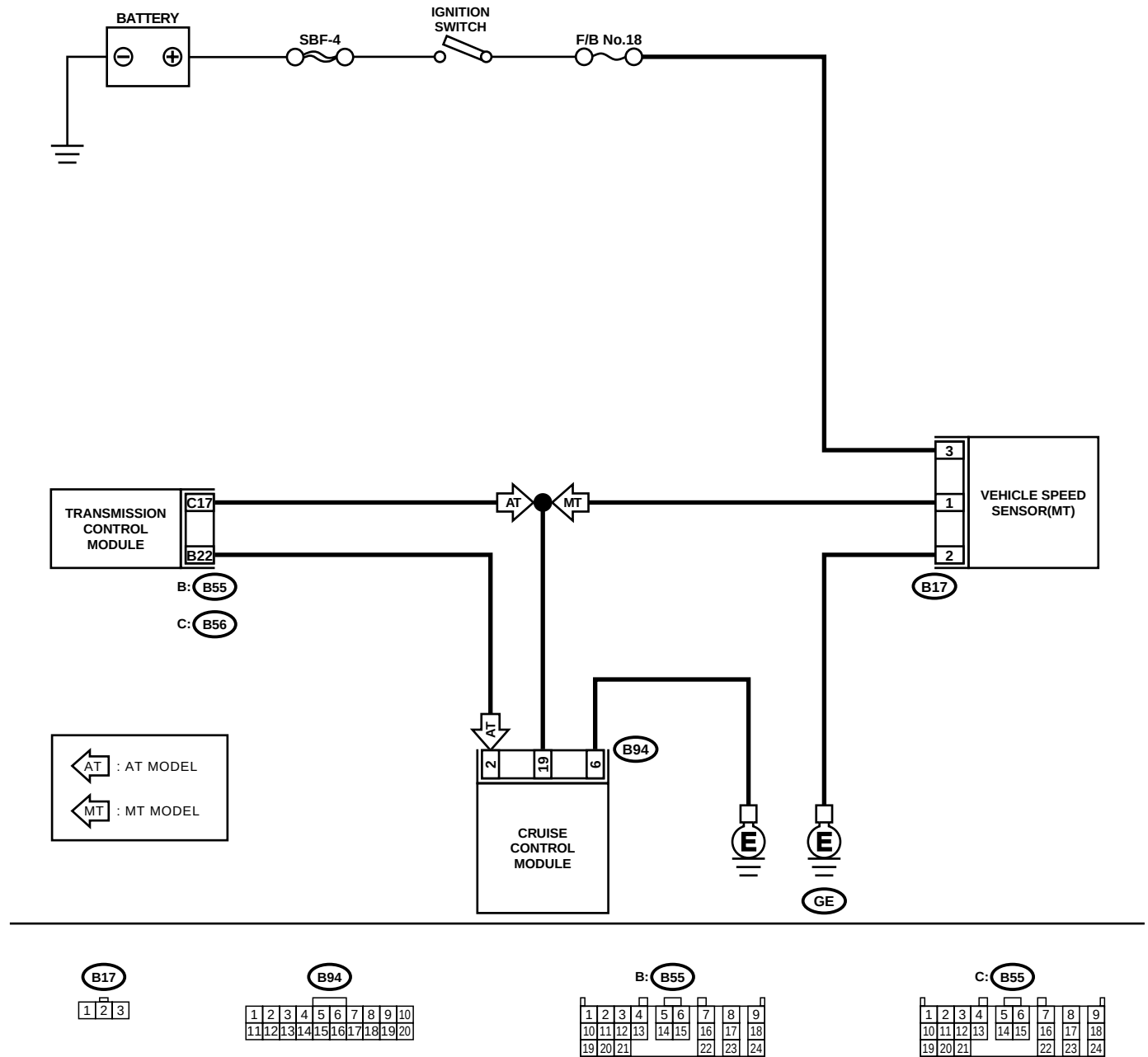
DIAGNOSIS:

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	Check	Yes	No
1	CHECK TRANSMISSION TYPE. Is the transmission type MT?	Go to step 2.	Go to step 6.
2	CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR. 1)Disconnect harness connector from vehicle speed sensor. 2)Turn ignition switch to ON. 3)Measure voltage between vehicle speed sensor harness connector terminal and chassis ground. Connector & terminal (B17) No. 3 (+) — Chassis ground (-):	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)Disconnect harness connector from cruise control module. 2)Measure resistance between vehicle speed sensor harness connector terminal and cruise control module harness connector terminal. Connector & terminal (B17) No. 1 — (B94) No. 19:	Go to step 4.	Repair harness.
4	CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND. 1)Turn ignition switch to OFF. 2)Measure resistance between vehicle speed sensor harness connector terminal and engine ground. Connector & terminal (B17) No. 2 (+) — Engine ground (-):	Go to step 5.	Repair harness.
5	CHECK VEHICLE SPEED SENSOR. 1)Connect harness connector to vehicle speed sensor. 2)Set the vehicle on free roller, or lift-up the vehicle and support with safety stands. Warning: Be careful not to be caught up by the running wheels. 3)Drive the vehicle at speed greater than 20 km/h (12 MPH). 4)Measure voltage between cruise control module harness connector terminal and chassis ground. Connector & terminal (B94) No. 19 (+) — Chassis ground (-):	Is the voltage less than 1V ←→ more than 4 V? Replace cruise control module. <Ref. to CC-4, Cruise Control Module.>	Replace vehicle speed sensor.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND TRANSMISSION CONTROL MODULE. 1) Disconnect harness connector from transmission control module and cruise control module. 2) Measure resistance between cruise control module harness connector terminal and transmission control module harness connector terminal. CAUTION: To measure the voltage and/or resistance, 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). Connector & terminal (B94) No. 19 — (B56) No. 17:	Is the resistance less than 10 Ω ?	Go to step 7.	Repair harness connector between cruise control module and transmission control module.
7 CHECK TRANSMISSION CONTROL MODULE. 1) Connect harness connector to transmission control module. 2) Set the vehicle on free roller, or lift-up the vehicle and support with safety stands. Warning: Be careful not to be caught by the running wheels. 3) Drive the vehicle faster than 10 km/h (6 MPH). 4) Measure voltage between transmission control module harness connector terminal and chassis ground. CAUTION: To measure the voltage and/or resistance, 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). Connector & terminal (B56) No. 17 (+) — Chassis ground (-):	Is the voltage less than 1 V $\longleftrightarrow$ more than 4 V?	Replace cruise control module. <Ref. to CC-4, Cruise Control Module.>	Replace transmission control module. <Ref. to AT-44, Transmission Control Module (TCM).>

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

D: DIAGNOSTIC TROUBLE CODE 28— WIRING HARNESS OPENED. —

Step		Check	Yes	No
1	CHECK BATTERY. Measure battery specific gravity of electrolyte.	Is battery specific gravity more than 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?	Repair or replace faulty parts.	End of inspection.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

E: DIAGNOSTIC TROUBLE CODE 35— ACTUATOR MOTOR —

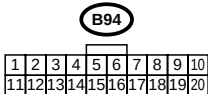
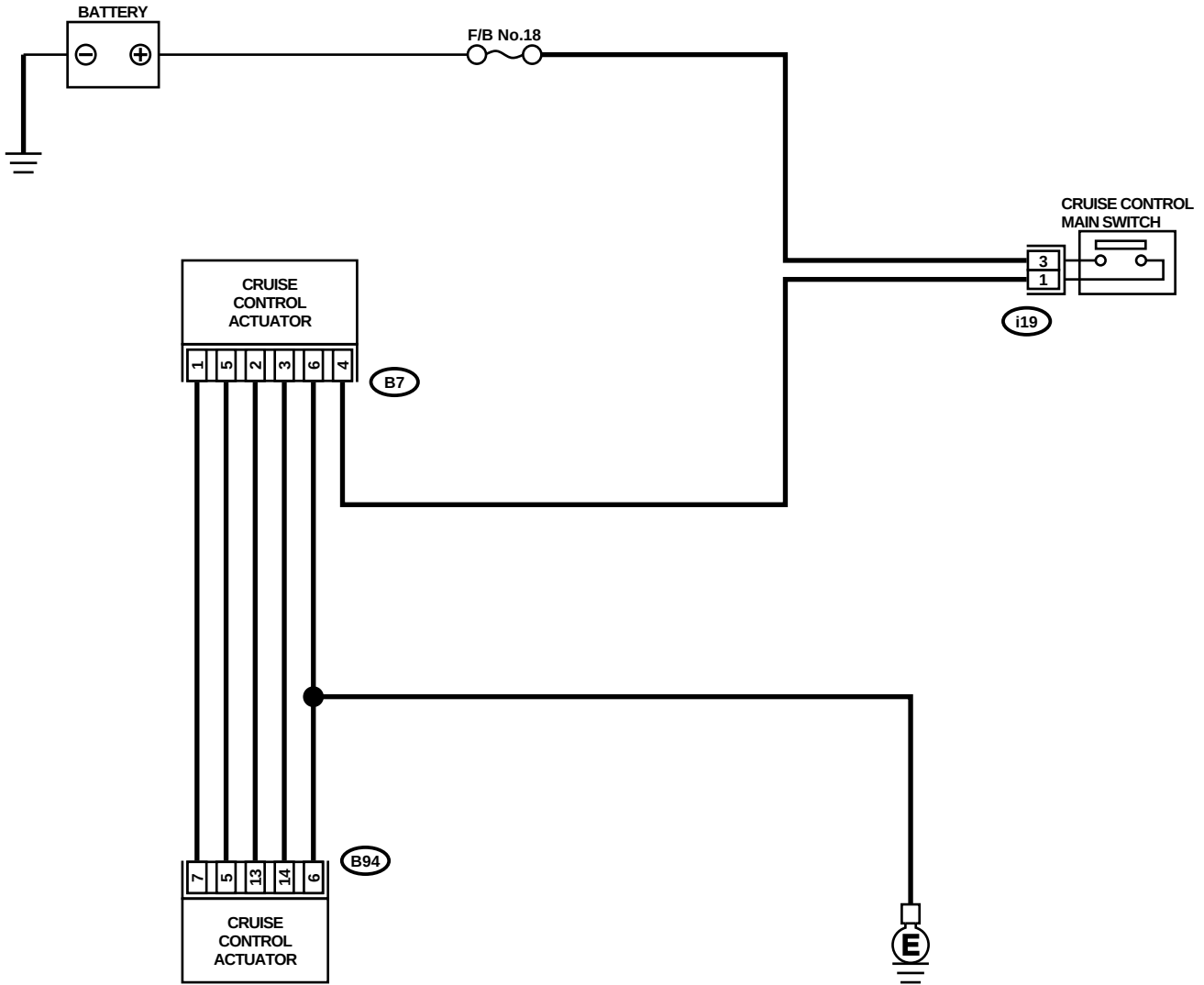
DIAGNOSIS:

Open or poor contact of cruise control actuator motor.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
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. Terminals (B7) No. 4 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Check harness for open or short between cruise control main switch and cruise control actuator.
2 CHECK GROUND CIRCUIT OF ACTUATOR. Measure resistance between cruise control actuator harness connector terminal and chassis ground. Terminals (B7) No. 6 (+) — Chassis ground (-):	Is resistance less than 10 Ω ?	Go to step 3.	Repair harness.
3 MEASURE RESISTANCE OF ACTUATOR. Measure resistance of cruise control actuator motor. Terminals No. 4 — No. 1: No. 4 — No. 2: No. 4 — No. 5:	Is resistance approximately 5 Ω ?	Go to step 4.	Replace cruise control actuator. <Ref. to CC-3, Actuator.>
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. Connector & terminal (B7) No. 1 — (B94) No. 7:	Is resistance less than 10 Ω ?	Go to step 5.	Repair harness.
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. Connector & terminal (B7) No. 5 — (B94) No. 5:	Is resistance less than 10 Ω ?	Replace cruise control module. <Ref. to CC-4, Cruise Control Module.>	Repair harness.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

F: DIAGNOSTIC TROUBLE CODE 37— ACTUATOR MOTOR CLUTCH —

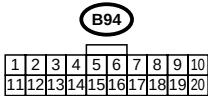
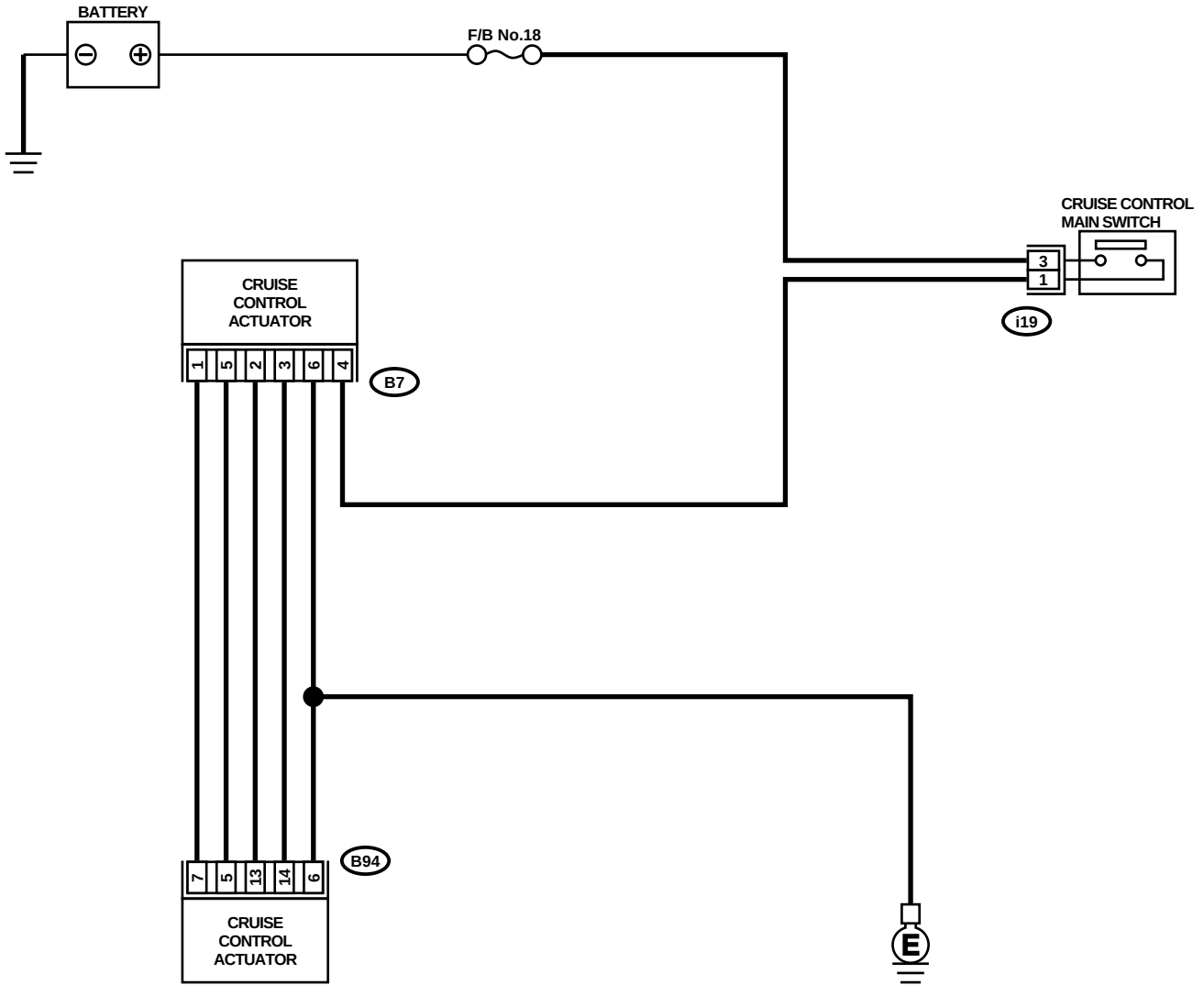
DIAGNOSIS:

Open or poor contact of cruise control actuator motor clutch.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
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. Terminals (B7) No. 4 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Check harness for open or short between cruise control main switch and cruise control actuator.
2 CHECK GROUND CIRCUIT OF ACTUATOR. Measure resistance between cruise control actuator harness connector terminal and chassis ground. Terminals (B7) No. 6 — Chassis ground:	Is resistance less than 10 Ω ?	Go to step 3.	Repair harness.
3 MEASURE RESISTANCE OF ACTUATOR CLUTCH. Measure resistance of cruise control actuator clutch. Terminals No. 3 — No. 6:	Is resistance approximately 39 Ω ?	Go to step 4.	Replace cruise control actuator. <Ref. to CC-3, Actuator.>
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. Connector & terminal (B7) No. 2 — (B94) No. 13:	Is resistance less than 10 Ω ?	Go to step 5.	Repair harness.
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. Connector & terminal (B7) No. 3 — (B94) No. 14:	Is resistance less than 10 Ω ?	Replace cruise control module. <Ref. to CC-4, Cruise Control Module.>	Repair harness.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

G: DIAGNOSTIC TROUBLE CODE 38 — MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY. —

Step	Check	Yes	No
1 CHECK ACTUATOR MOTOR. 1)Disconnect harness connector from cruise control actuator. 2)Remove cruise control actuator from mounting bracket. 3)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?	Replace cruise control actuator. <Ref. to CC-3, Actuator.>	Check the cruise control cable adjustment.<Ref. to CC-4, CABLE FREE PLAY, General Description.>

H: DIAGNOSTIC TROUBLE CODE 39— MOTOR IS OVERLOADED. —

Step	Check	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)Check the operation current to the cruise control actuator motor.	Is current more than 10A?	Replace cruise control module. <Ref. to CC-4, Cruise Control Module.>	Check the power supply circuit. <Ref. to CC-16, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>

WIRING SYSTEM SECTION

WIRING SYSTEM	WI
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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.

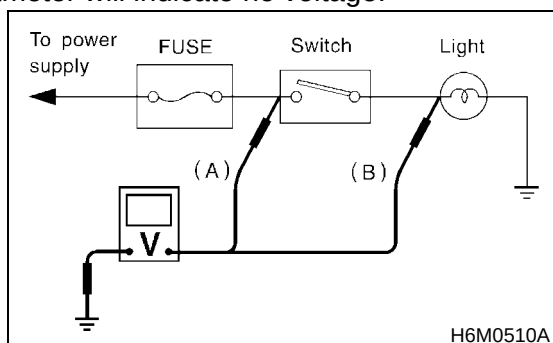
5. CONFIRMATION OF SYSTEM OPERATION

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.

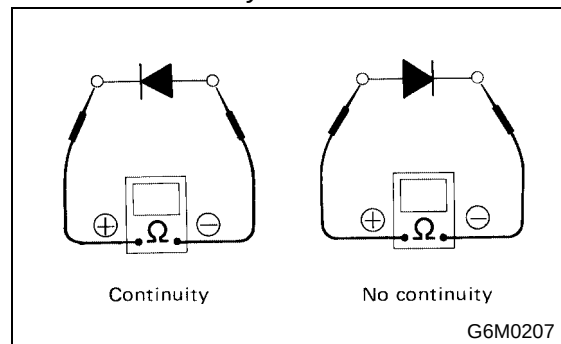
2. CIRCUIT CONTINUITY CHECKS

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.

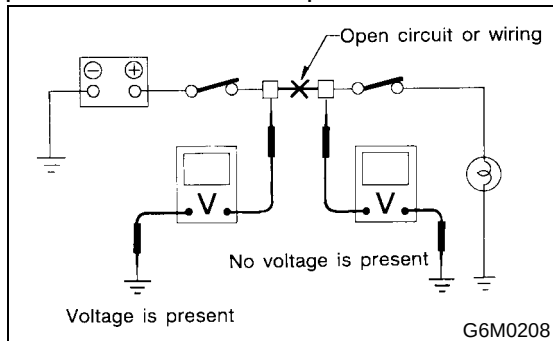
Terminal	1	2	3	4	5	6
Switch Position						
OFF						
1	○—○				○—○	
2	○—○			○—○		○—○
3	○—○		○—○			○—○
4	○—○	○—○				○—○

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3. HOW TO DETERMINE AN OPEN CIRCUIT

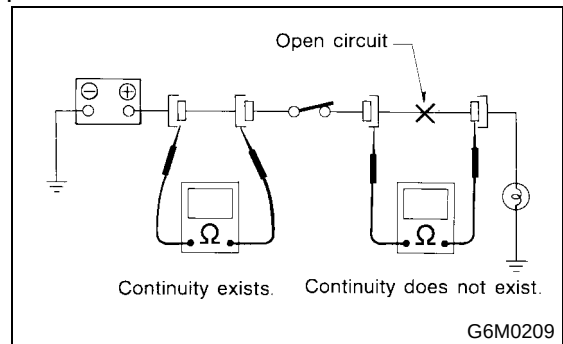
1) Voltmeter Method:

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:

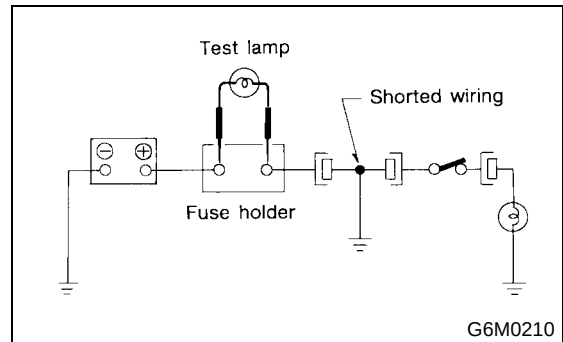
Disconnect all connectors affected, and check continuity in the wiring between adjacent connectors. When the ohmmeter indicates "infinite", the wiring is open.



4. HOW TO DETERMINE A SHORT CIRCUIT

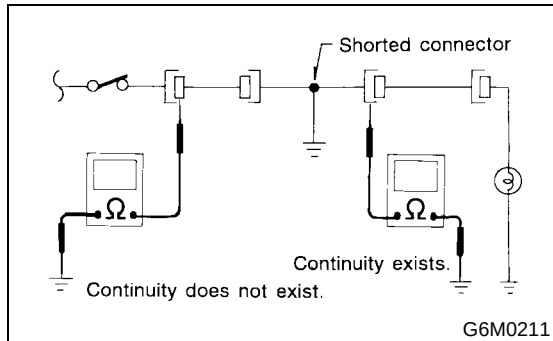
1) Test lamp method:

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.



BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

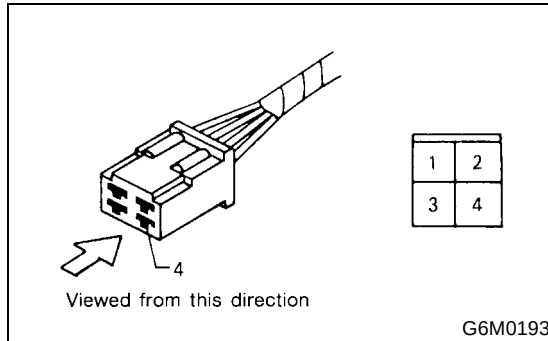
C: HOW TO READ WIRING DIAGRAMS

1. WIRING DIAGRAM

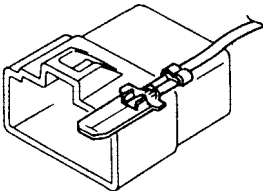
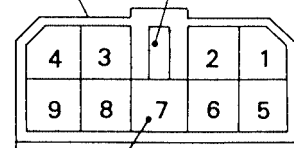
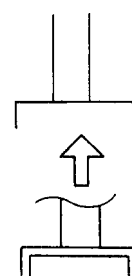
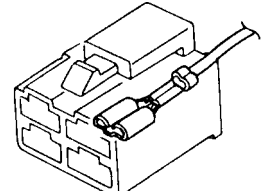
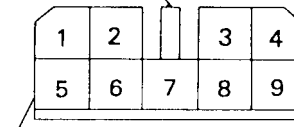
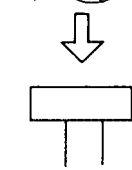
The wiring diagram of each system is illustrated so that you can understand the path through which the electric current flows from the battery.

Sketches and codes are used in the diagrams. They should read as follows:

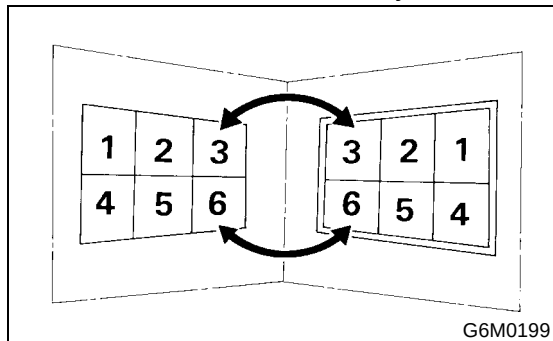
- Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from the front.



- 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
 G6M0194	Double frames Indicates a lock is included.  Indicates the number of poles. G6M0196		Numbered in order from upper right to lower left.
 G6M0195	Indicates a lock is included.  Single frame G6M0197		Numbered in order from upper left to lower right.
		G6M0198	

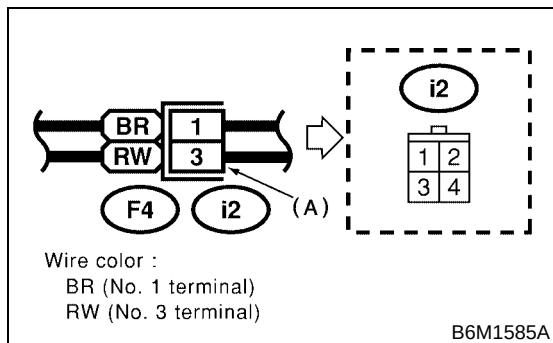
- When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of the other. When these two connectors are connected as a unit, the poles which have the same number are joined.



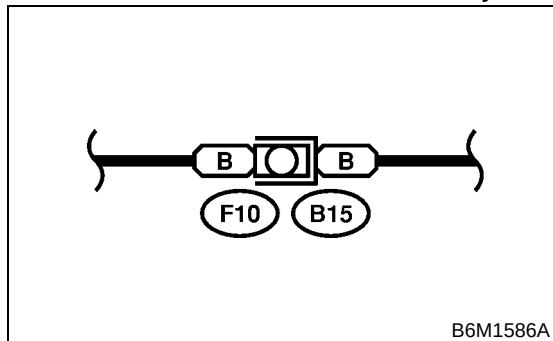
- Electrical wiring harness:**
The connectors are numbered along with the number of poles, external colors, and mating connections in the accompanying list.
- The sketch of each connector in the wiring diagram usually shows the (A) side of the connector. The relationship between the wire color, terminal 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.

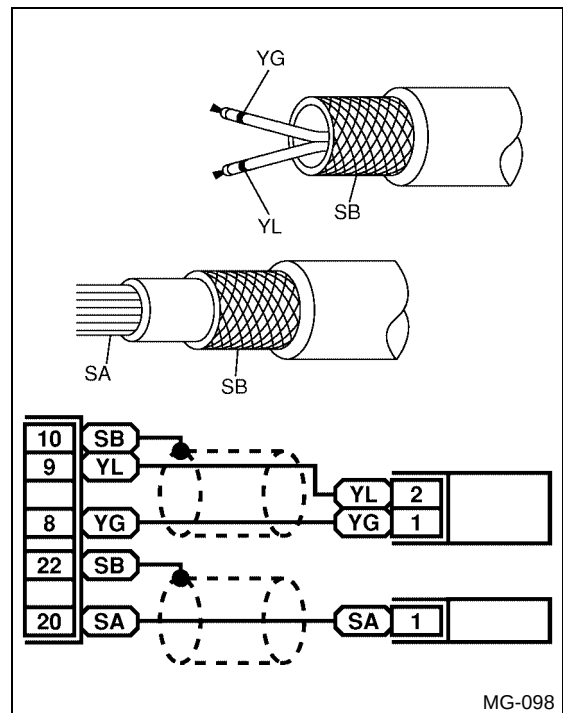


- In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.



- The following color codes are used to indicate the colors of the wires used.

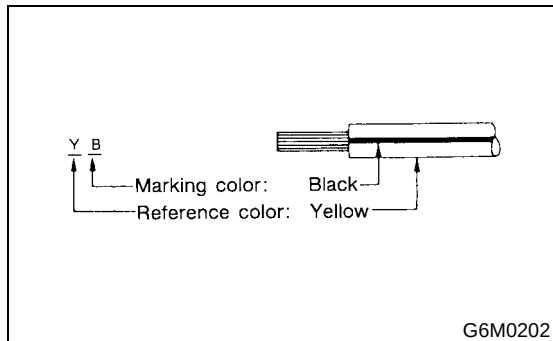
Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

- 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:

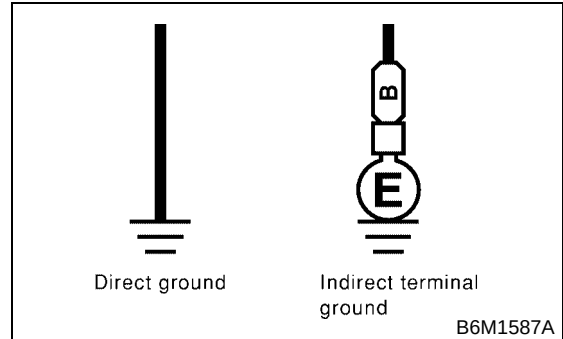
When replacing or repairing a wire, be sure to use the same size and type of the wire which was originally used.

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

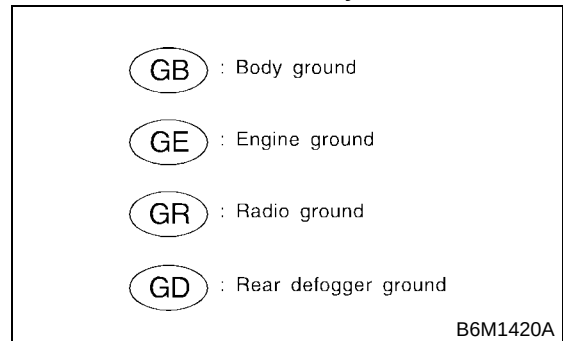
- Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.



- The ground points shown in the wiring diagram refer to the following:

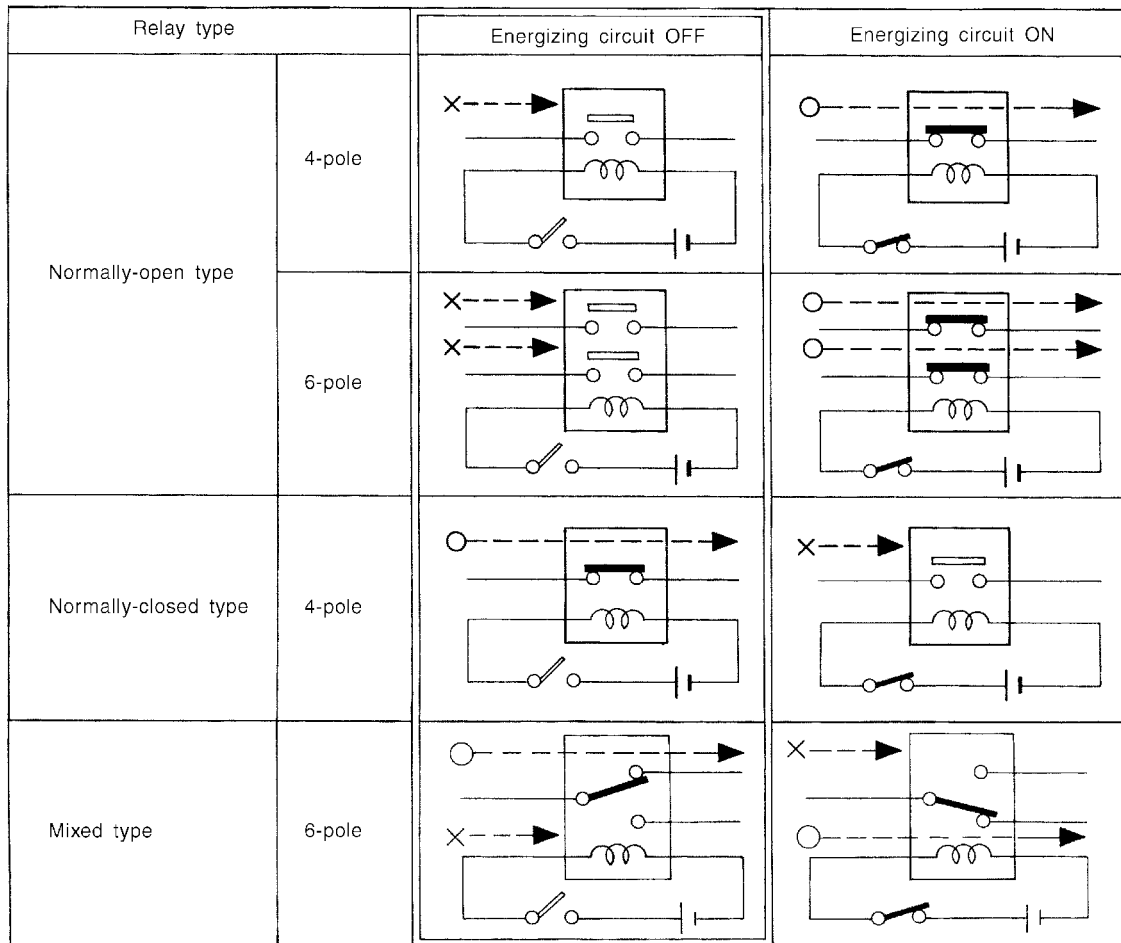
NOTE:

All wiring harnesses are provided with a ground point which should be securely connected.



- 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.

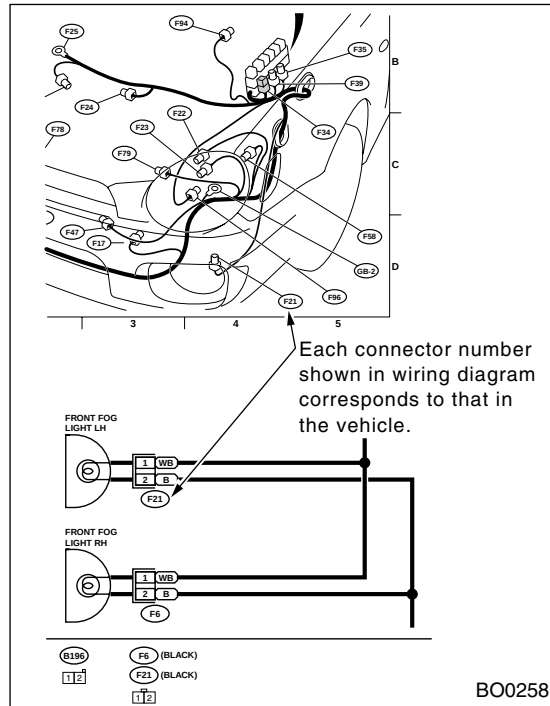
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BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

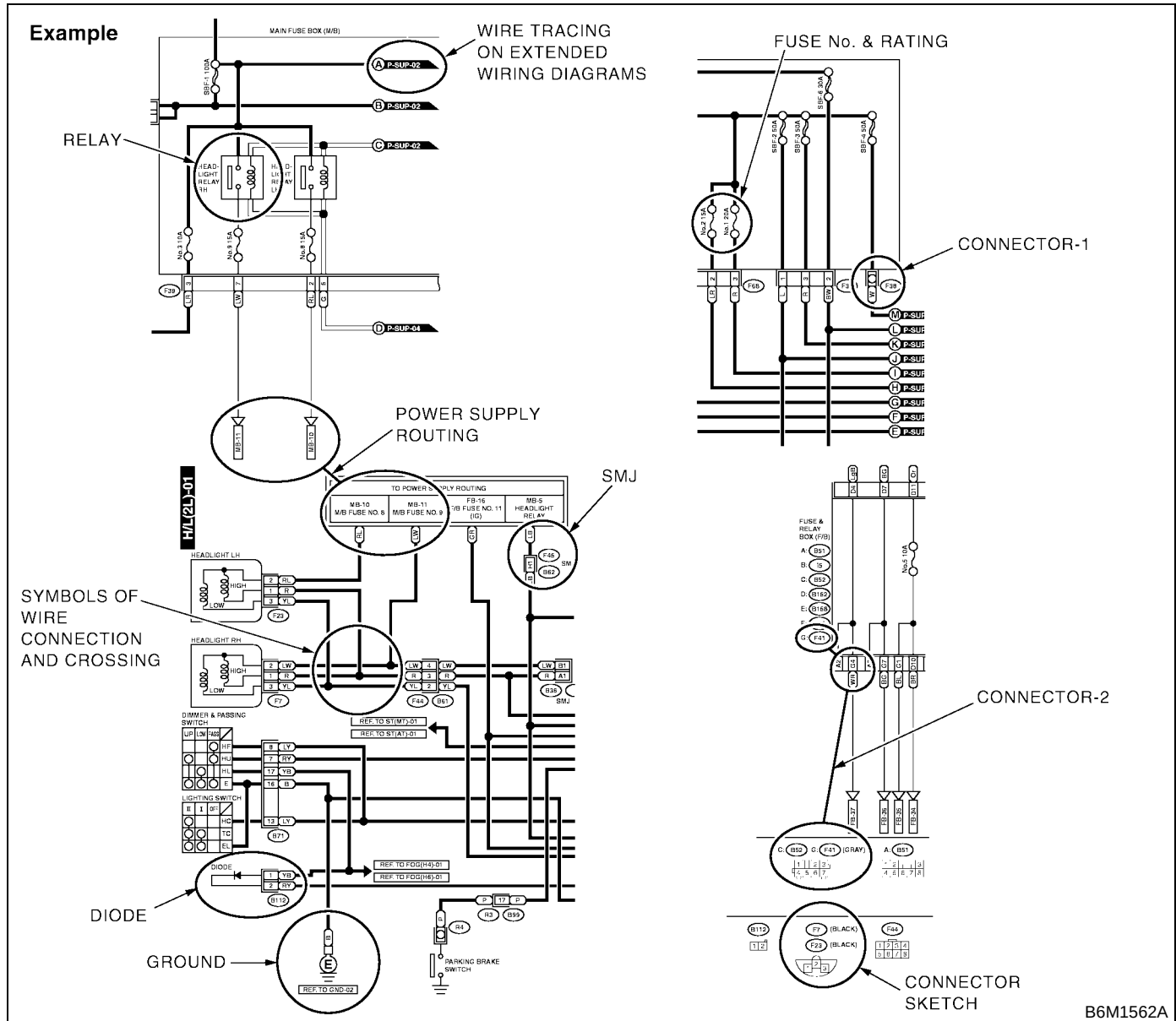
- Each connector number shown in the wiring diagram corresponds to that in the wiring harness. The location of each connector in the actual vehicle is determined by reading the first character of the connector (for example, a "F" for F8, "i" for i16, etc.) and the type of wiring harness. The first character 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, ORVR cord



D: SYMBOLS IN WIRING DIAGRAMS

A number of symbols are used in each wiring diagram to easily identify parts or circuits.



B6M1562A

1. RELAY

A symbol used to indicate a relay.

2. CONNECTOR-1

The sketch of the connector indicates the one-pole types.

3. WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols (as when two pages are needed for clear indication).

4. FUSE NO. & RATING

The "FUSE No. & RATING" corresponds with that used in the fuse box (main fuse box, fuse and joint box).

5. CONNECTOR-2

- Each connector is indicated by a symbol.
- Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
- For example, terminal number "C2" refers to No. 2 terminal of connector (C: F41) shown in the connector sketch.

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

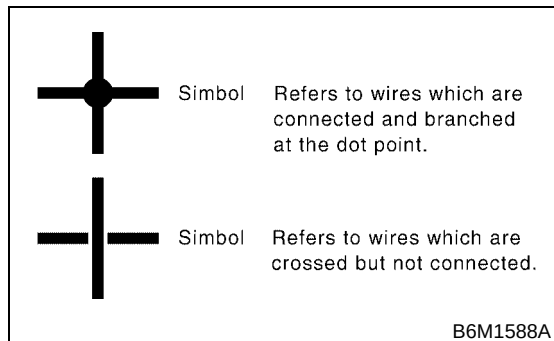
A symbol is used to indicate a diode.

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.

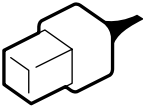
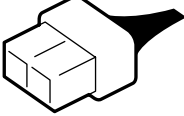
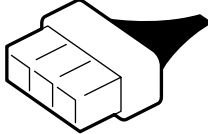
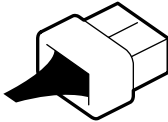
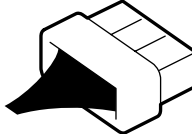
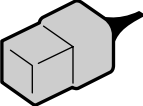
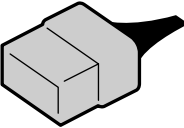
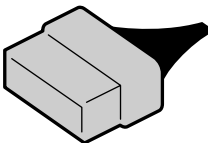
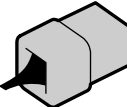
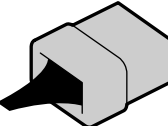
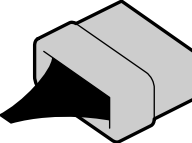
Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

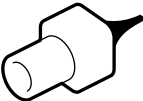
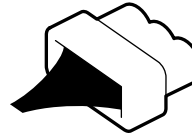
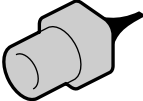
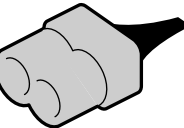
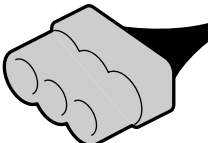
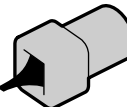
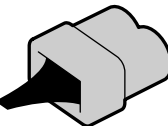
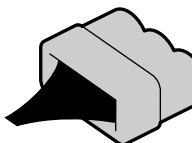
E: CONNECTOR SYMBOL IN WIRING HARNESS

Main symbols of connector (in wiring harness) are indicated in the below.

BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

Standard type: Female		
Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
		
		
Standard type: Male		
		
		

Water proof type: Female		
Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
		
		
Water proof type: Male		
		
		

BO0257

F: ABBREVIATION IN WIRING DIAGRAMS

Abbr.	Full name
ABS	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AD	Auto Down
A/S	Air suspension
AT	Automatic Transmission
AU	Auto Up
+B	Battery
DN	Down
E	Ground
F/B	Fuse & Joint Box
FL1.5	Fusible link 1.5 mm ²
IG	Ignition
Illumi.	Illumination
LH	Left Hand
Lo	Low
M	Motor
M/B	Main Fuse Box
MG	Magnet
Mi	Middle
OP	Optional Parts
PASS	Passing
RH	Right Hand
SBF	Slow Blow Fuse
ST	Starter
SW	Switch
UP	Up
WASH	Washer

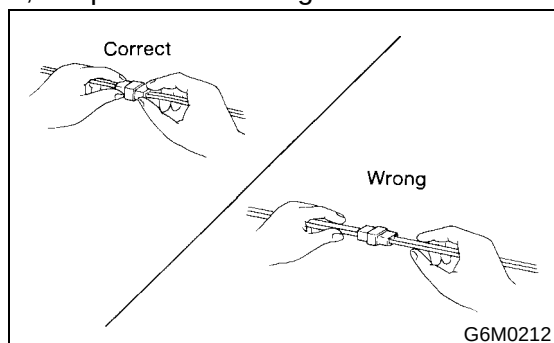
2. Working Precautions

A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

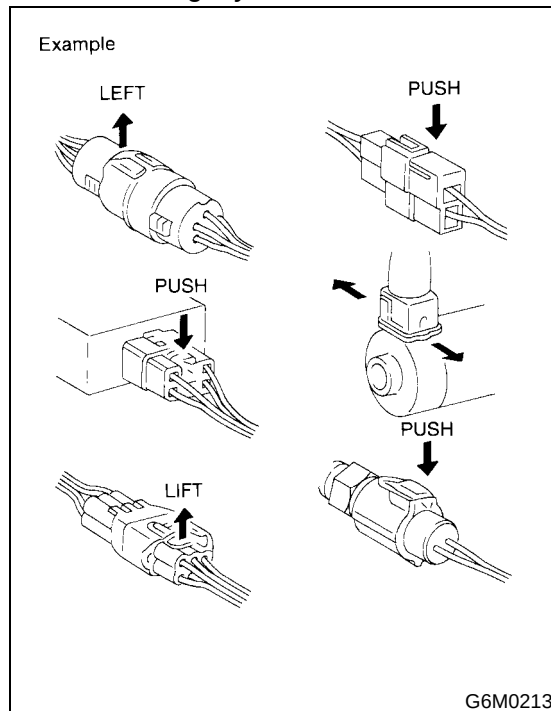
- 1) When working under a vehicle which is jacked-up, always be sure to use safety stands.
- 2) The parking brake must always be applied during working. Also, in automatic transmission vehicles, keep the select lever set to the P (Parking) range.
- 3) Be sure the workshop is properly ventilated when 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.

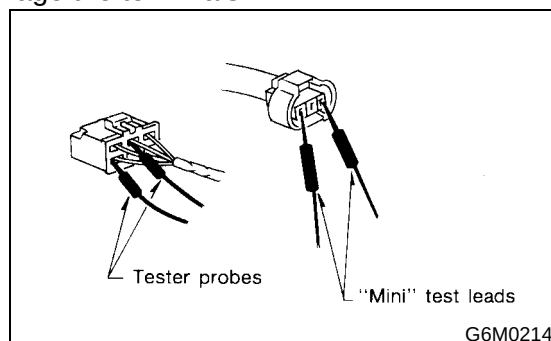


- 5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector. To connect, insert the connector until it snaps and confirm 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.



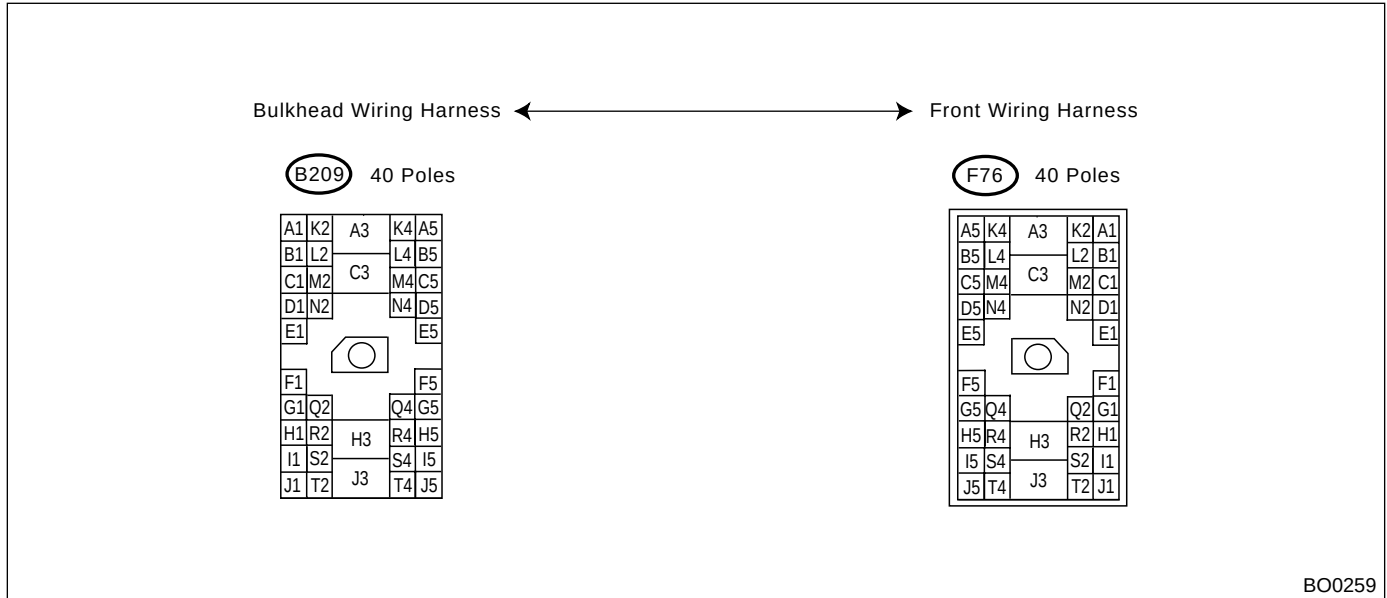
- 7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts. Handle them with care so that they are not dropped or mishandled.

3. Super Multiple Junction (SMJ)

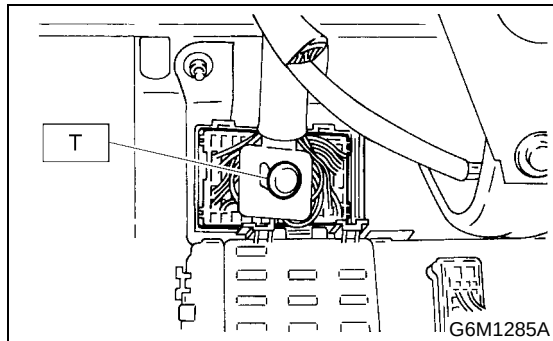
A: HOW TO USE SUPER MULTIPLE JUNCTION (SMJ)

The "SMJ" indicated in wiring diagrams is shown in a simplified form.

B: TERMINAL ARRANGEMENT



C: INSTALLATION



Tightening torque:

T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

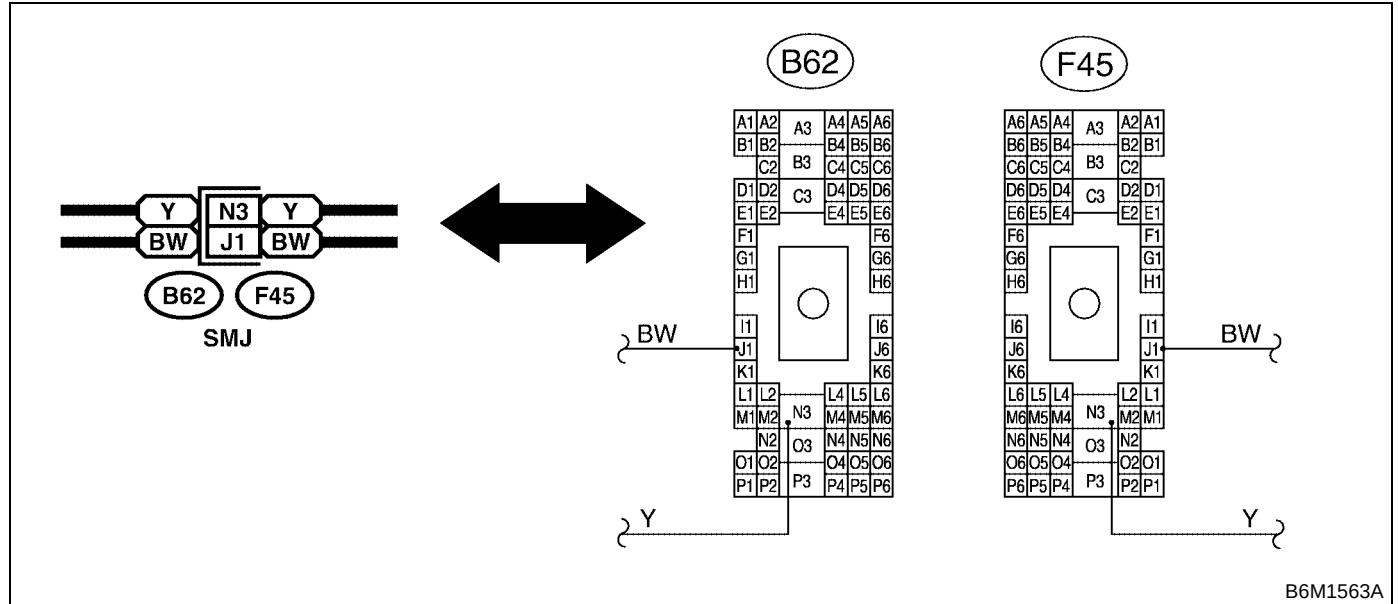
NOTE:

- 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.

SUPER MULTIPLE JUNCTION (SMJ)

WIRING SYSTEM

D: EXPLANATION OF SMJ SHOWN IN THE WIRING DIAGRAM



4. Power Supply Routing

A: SCHEMATIC

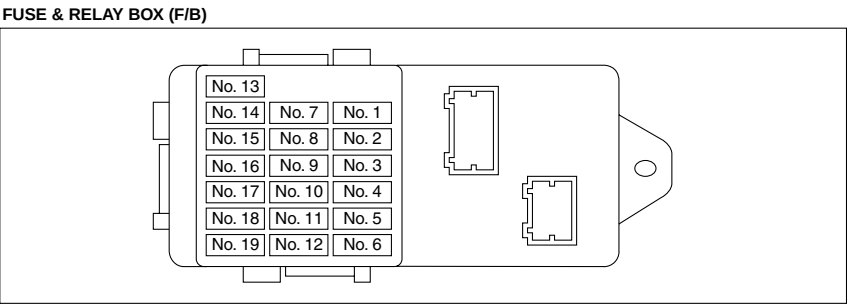
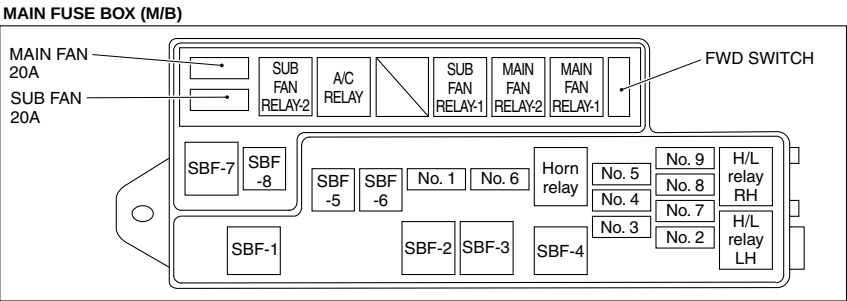
POWER SUPPLY ROUTING

WIRING SYSTEM

1. LHD MODEL

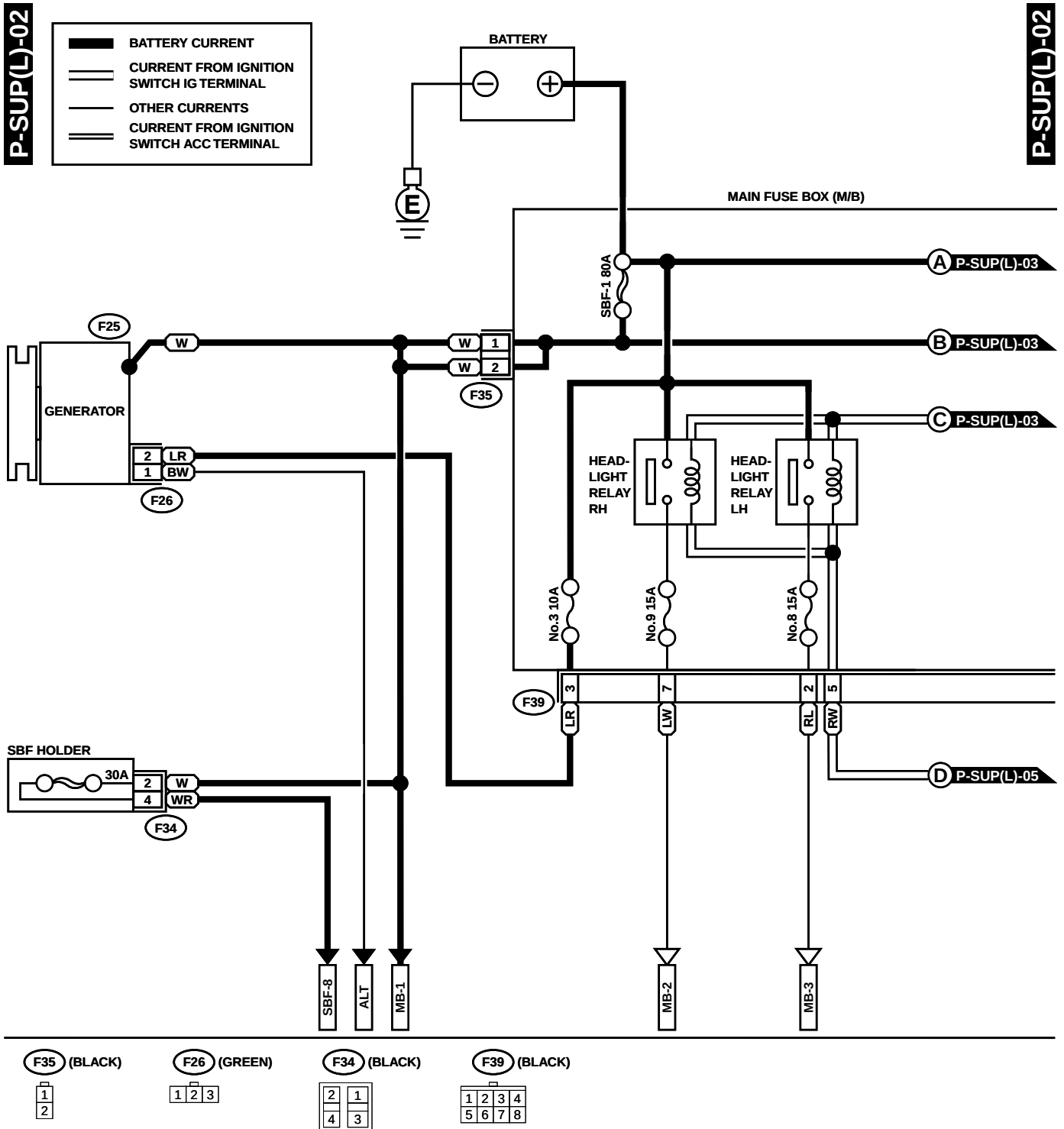
P-SUP(L)-01

P-SUP(L)-01



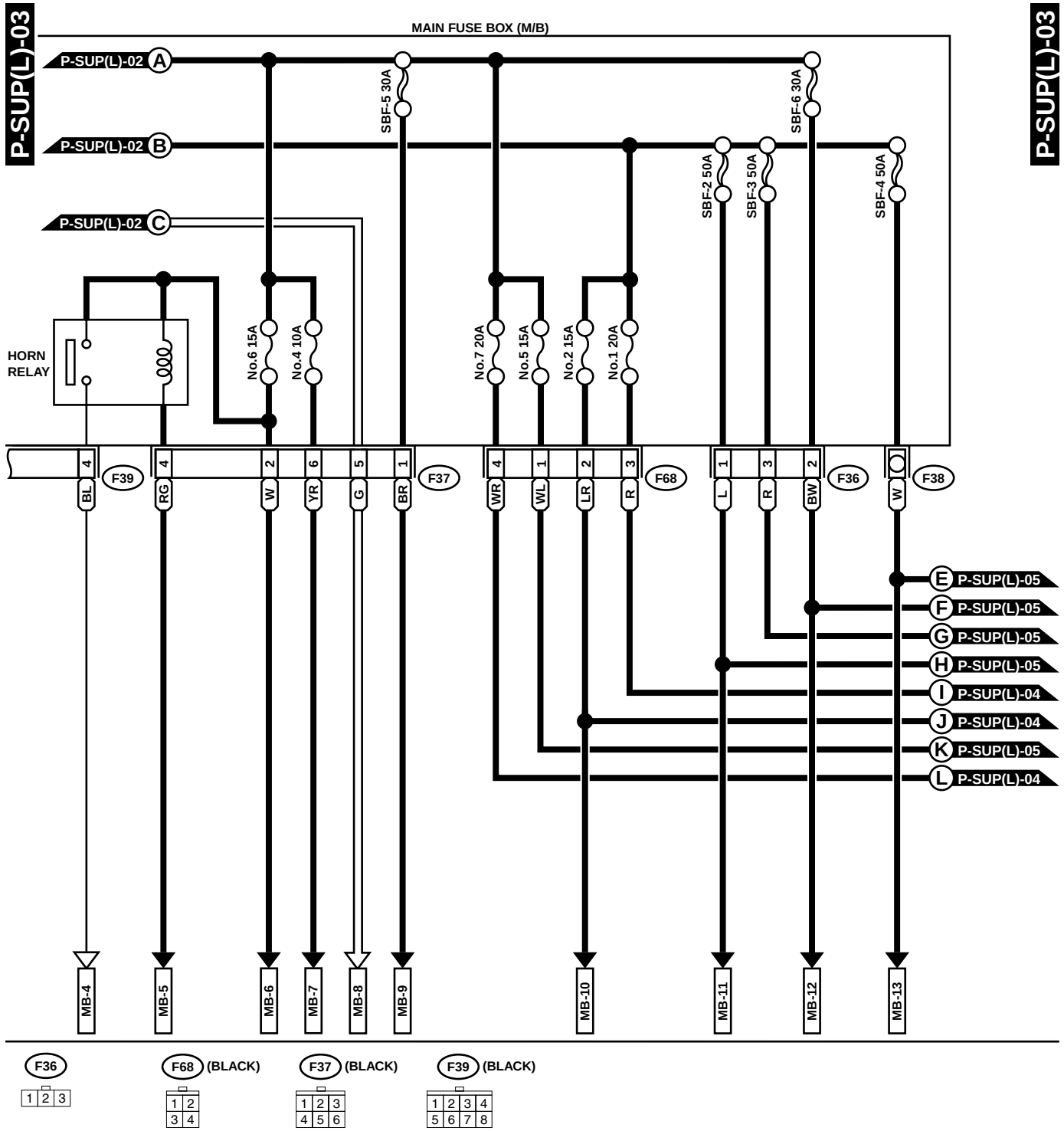
WIRING SYSTEM

WIRING SYSTEM



POWER SUPPLY ROUTING

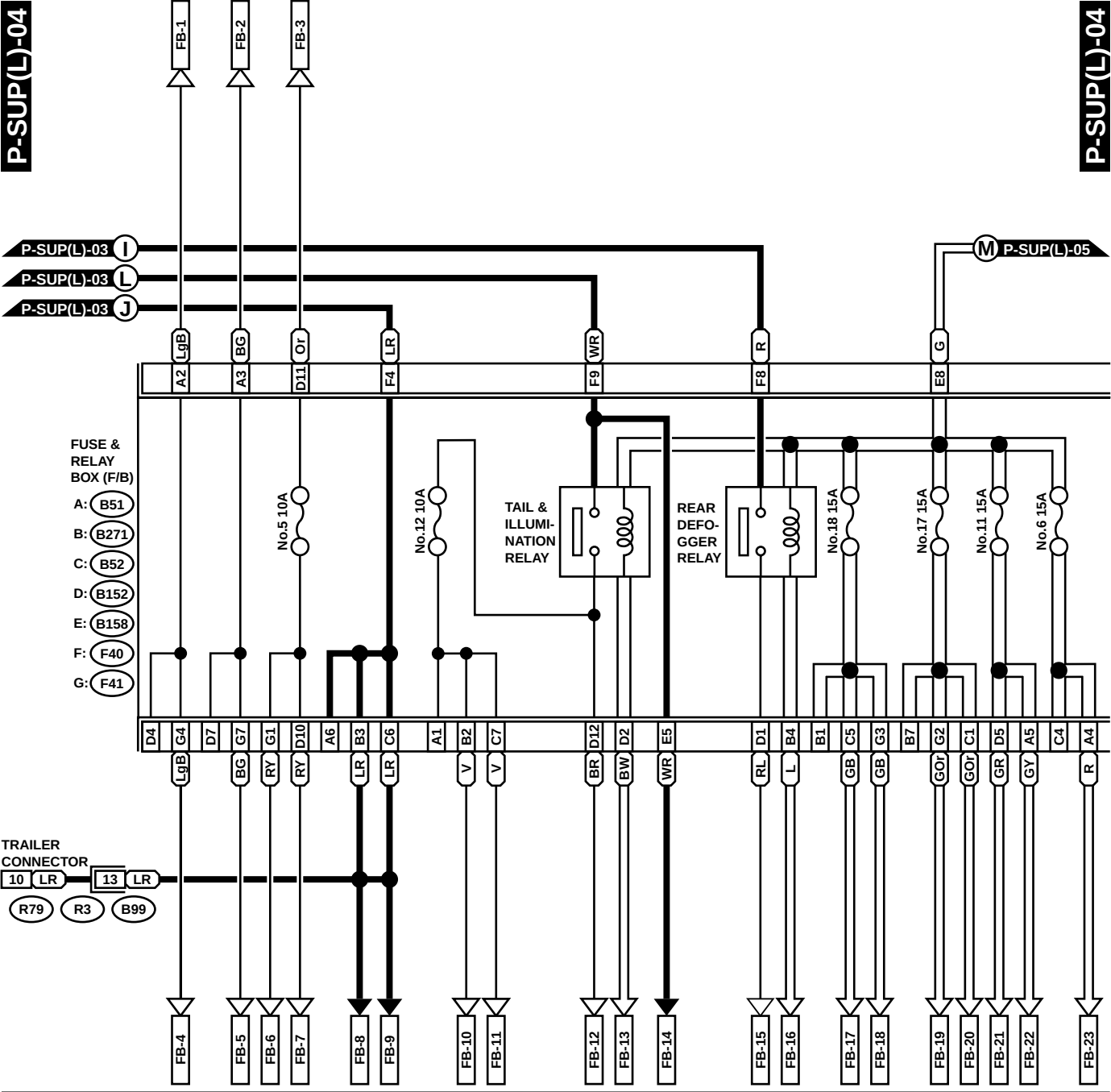
WIRING SYSTEM



GL01-20C

POWER SUPPLY ROUTING

WIRING SYSTEM



C: B52

G: F41 (GRAY)

1	2	3
4	5	6

A: B51 (BLUE)

1	2	3
4	5	6

F: F40 (BROWN)

1	2	3	4
5	6	7	8

E: B158 (GRAY)

1	2	3	4	5
6	7	8	9	10

R79

1	2	3	4	5
6	7	8	9	10

B: B271 (BLUE)

D: B152

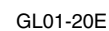
1	2	3	4	5
6	7	8	9	10

B99

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

GL01-20D

WIRING SYSTEM



POWER SUPPLY ROUTING

WIRING SYSTEM

No.	Load
MB-1	Air conditioning relay holder
MB-2	Combination meter Headlight RH
MB-3	Headlight LH
MB-4	Horn
MB-5	Cruise control sub switch Horn switch
MB-6	Hazard switch Key warning switch
MB-7	Transmission control module
MB-8	Diode (With rear fog light model) Lighting switch
MB-9	Data link connector Engine control module Fuel pump relay Immobilizer control module Main relay
MB-12	Power window circuit breaker
MB-13	Relay holder
SBF-8	ABS control module
IG	Hazard switch Power window relay
ST	Engine control module Inhibitor switch (AT) Starter motor (MT)
FB-1	Hazard switch Rear turn signal light RH Trailer connector Turn signal switch
FB-2	Hazard switch Rear turn signal light LH Trailer connector Turn signal switch
FB-3	Parking switch
FB-4	Front turn signal light RH Side turn signal light RH
FB-5	Front turn signal light LH Side turn signal light LH
FB-6	Front clearance light LH Front clearance light RH Headlight leveler LH Headlight leveler RH
FB-7	License plate light Tail light LH Tail light RH Trailer connector
FB-8 FB-9	Auto A/C control module Combination meter Door lock timer Keyless entry control module Luggage room light (Wagon) Radio Room light Spot light Trunk room light (Sedan)

No.	Load
FB-10 FB-11	Bright switch Combination meter Front fog light relay Front fog light switch Headlight leveling switch Illumination light Rear fog light relay Rear fog light switch
FB-12	Parking switch
FB-13	Engine control module Lighting switch
FB-14	Parking switch
FB-15	Mirror heater relay Rear defogger Rear defogger switch
FB-16	Engine control module Rear defogger timer
FB-17	ABS relay Back-up light switch (MT) Check connector Cruise control actuator Cruise control main switch Cruise control module Inhibitor switch (AT) Seat belt timer Vehicle speed sensor (MT)
FB-18	Main relay
FB-19	Air conditioning relay Sub fan relay Thermal protector
FB-20	AUTO A/C control module Blower motor relay Rear defogger timer
FB-21	Engine control module Fuel pump relay Ignition coil and ignitor Immobilizer control module Transmission control module
FB-22	Airbag control module
FB-23	Airbag control module
FB-24	Rear washer motor
FB-25	Rear wiper intermittent module Rear wiper motor
FB-26	Front washer motor Front wiper motor Front wiper switch
FB-27	Auto A/C control module Radio
FB-28	Front accessory power supply socket Remote controlled rearview mirror switch
FB-29	Rear fog light relay
FB-30	Mirror heater relay
FB-31	Stop light switch
FB-32	ABS control module
FB-33	Front fog light relay
FB-34	Blower motor relay

POWER SUPPLY ROUTING

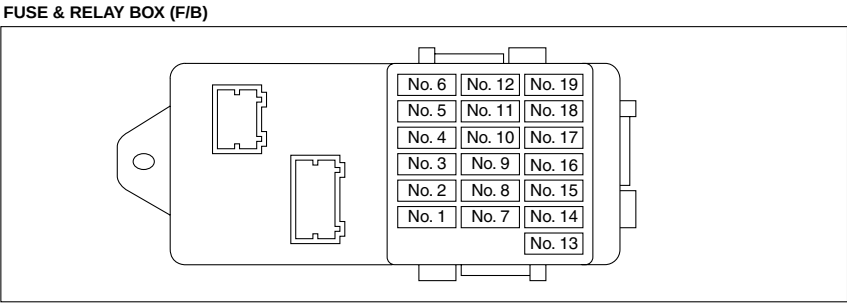
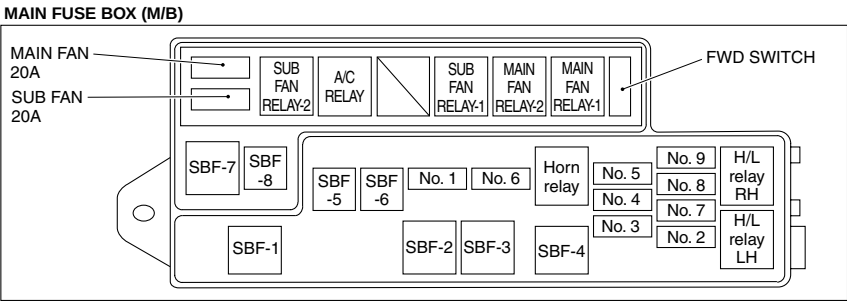
WIRING SYSTEM

No.	Load
FB-35	Door lock timer Keyless entry control module
FB-36	Combination meter

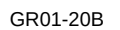
2. RHD MODEL

P-SUP(R)-01

P-SUP(R)-01

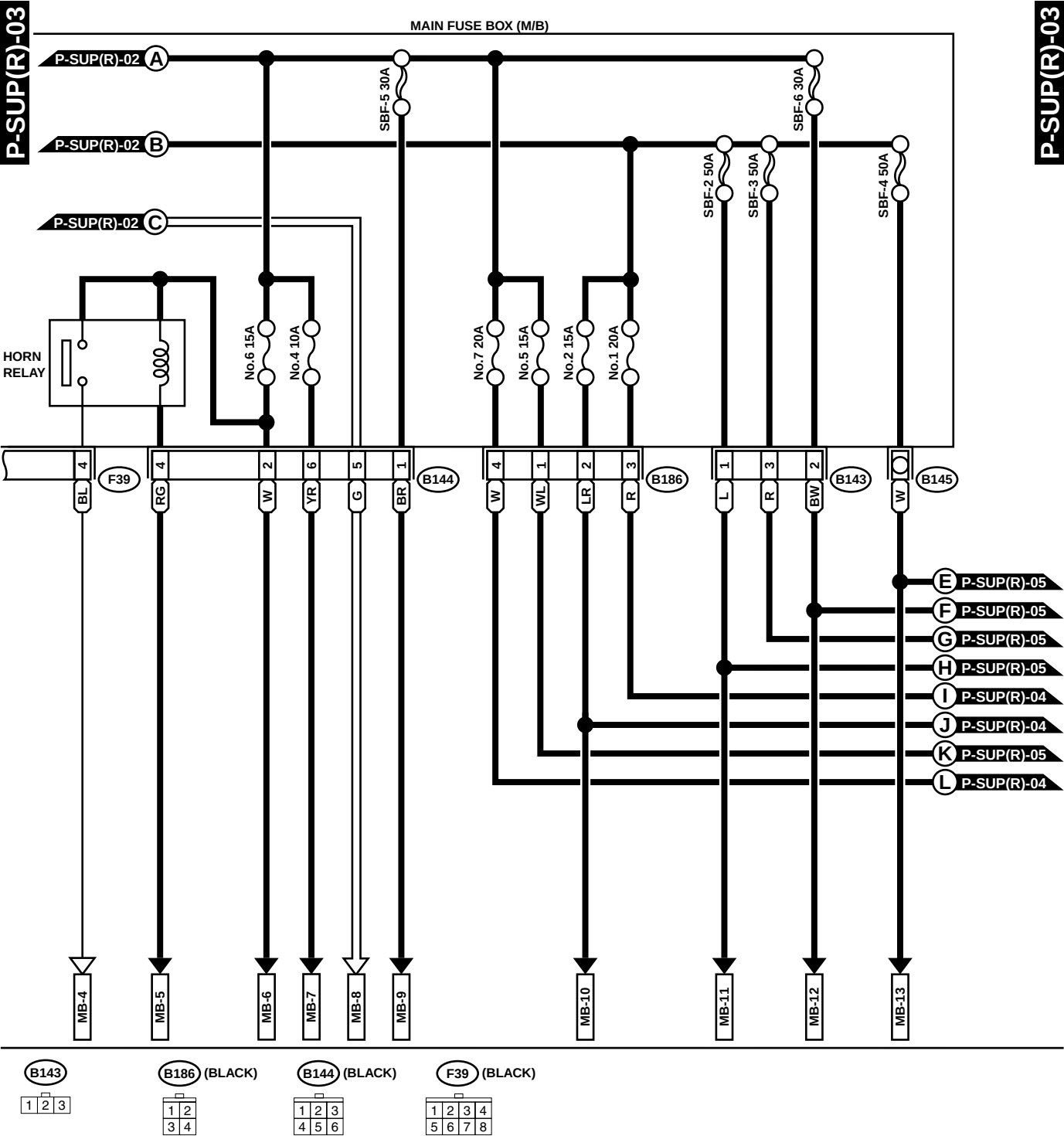


WIRING SYSTEM



POWER SUPPLY ROUTING

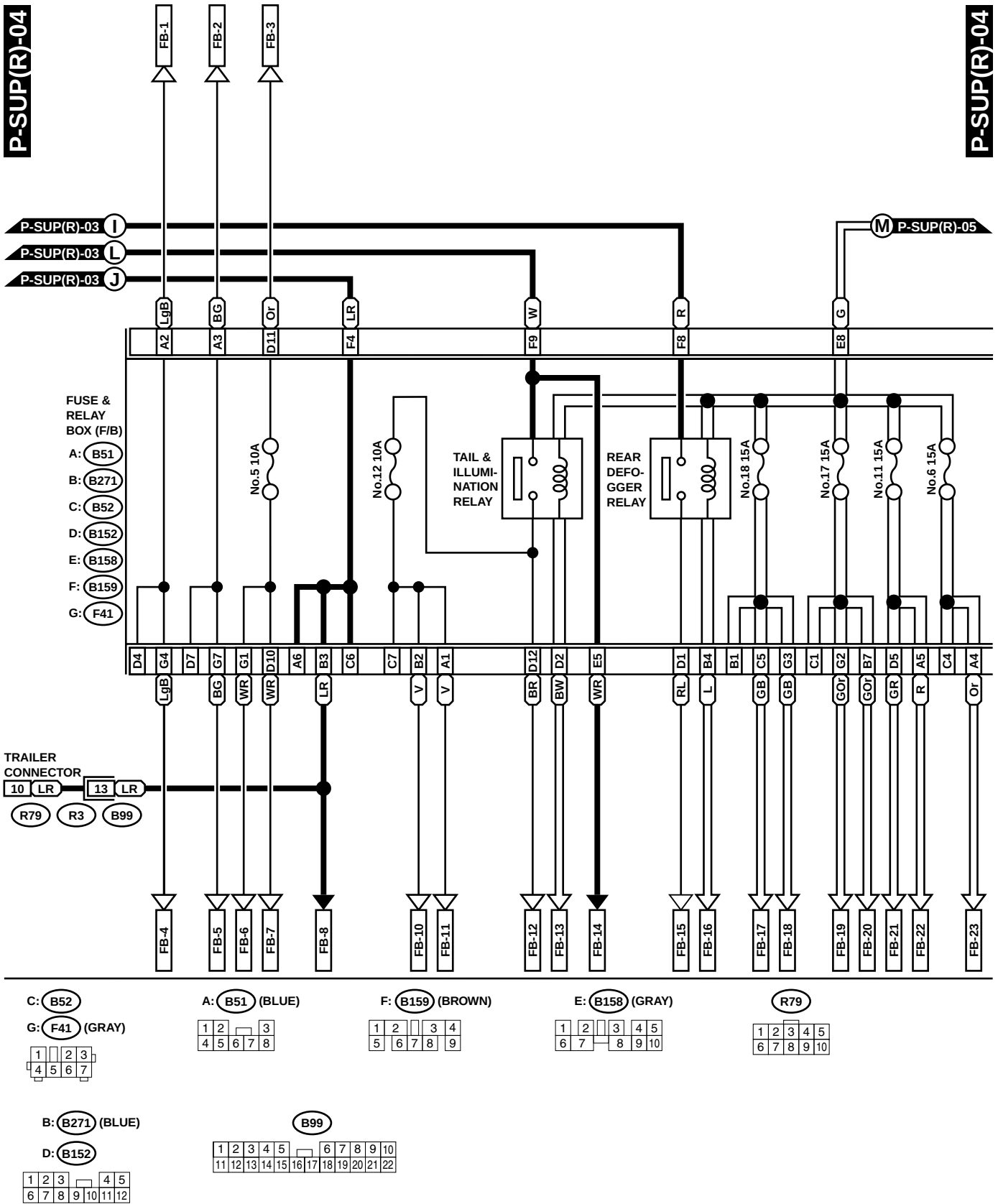
WIRING SYSTEM



GR01-20C

POWER SUPPLY ROUTING

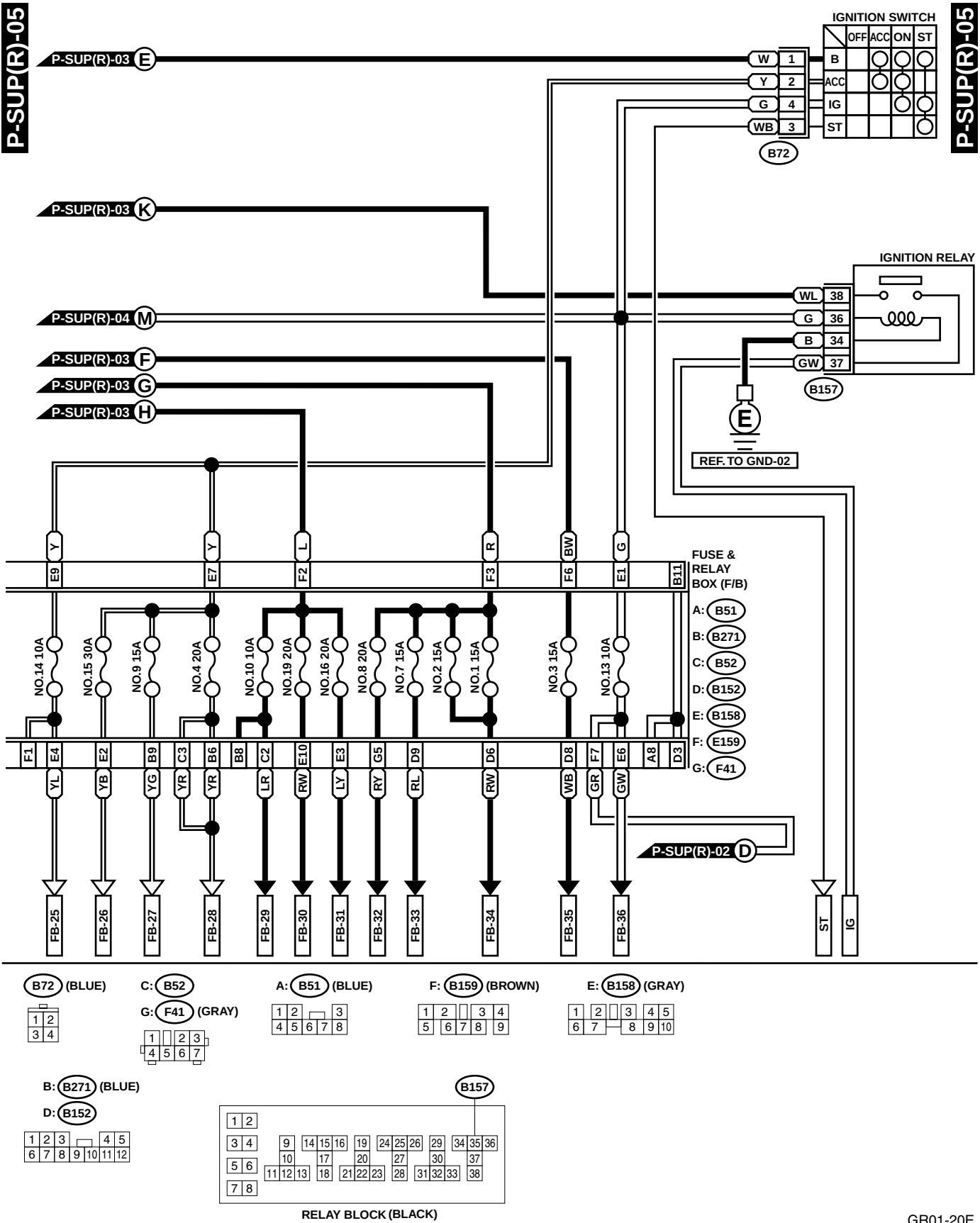
WIRING SYSTEM



GR01-20D

POWER SUPPLY ROUTING

WIRING SYSTEM



POWER SUPPLY ROUTING

WIRING SYSTEM

No.	Load
MB-1	Air conditioning relay holder
MB-2	Combination meter Headlight RH
MB-3	Headlight LH
MB-4	Horn
MB-5	Cruise control sub switch Horn switch
MB-6	Hazard switch Keyless entry control module Key warning switch
MB-7	Transmission control module
MB-8	Diode (With rear fog light model) Lighting switch
MB-9	Data link connector Engine control module Fuel pump relay Immobilizer control module Main relay
MB-10	Auto A/C Control module Combination meter Door lock timer Keyless entry control module Luggage room light (Wagon) Radio Room light Spot light Trunk room light (Sedan)
MB-12	Power window circuit breaker
MB-13	Relay holder
SBF-8	ABS control module
IG	Hazard switch
ST	Engine control module Inhibitor switch (AT) Starter motor (MT)
FB-1	Hazard switch Rear turn signal light RH Trailer connector Turn signal switch
FB-2	Hazard switch Rear turn signal light LH Side turn signal light LH Trailer connector Turn signal switch
FB-3	Parking switch
FB-4	Front turn signal light RH Side turn signal light RH
FB-5	Front turn signal light LH
FB-6	Front clearance light LH Front clearance light RH Headlight leveler LH Headlight leveler RH
FB-7	License plate light Tail light LH Tail light RH Trailer connector

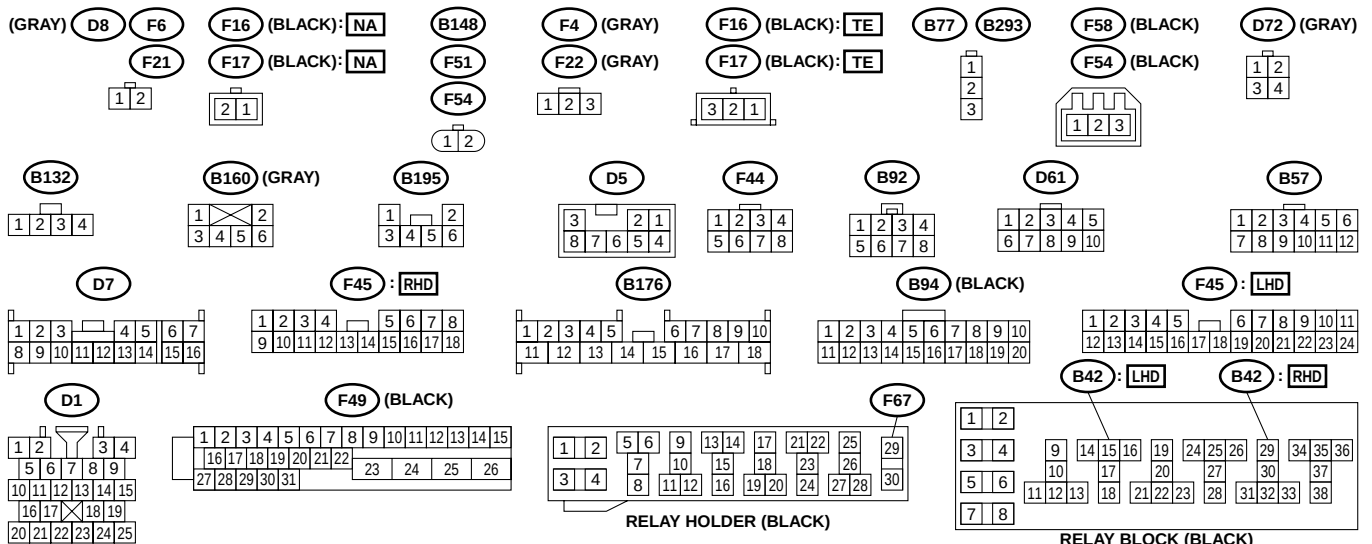
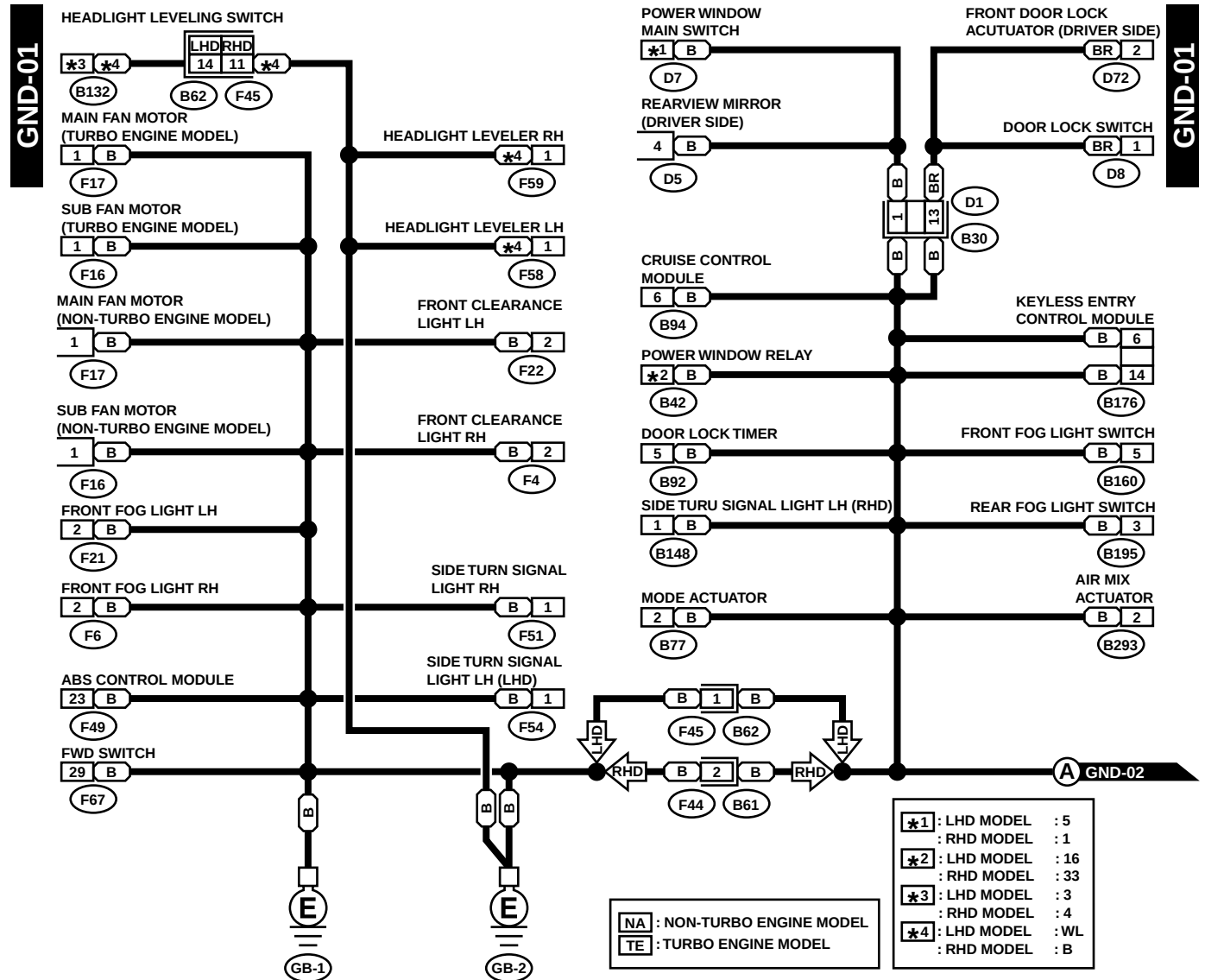
No.	Load
FB-10 FB-11	Bright switch Combination meter Front fog light relay Front fog light switch Headlight leveling switch Illumination control module Illumination light Rear fog light relay Rear fog light switch
FB-12	Parking switch
FB-13	Engine control module Lighting switch
FB-14	Parking switch
FB-15	Mirror heater relay Rear defogger Rear defogger switch
FB-16	Engine control module Rear defogger timer
FB-17	ABS relay Back-up light switch (MT) Check connector Cruise control actuator Cruise control main switch Cruise control module Inhibitor switch (AT) Power window relay Rear defogger timer Vehicle speed sensor (MT)
FB-18	Main relay
FB-19	Air conditioning relay Pressure switch Sub fan relay
FB-20	AUTO A/C control module Blower motor relay
FB-21	Engine control module Fuel pump relay Ignition coil and ignitor Immobilizer control module Transmission control module
FB-22	Airbag control module
FB-23	Airbag control module
FB-25	Rear washer motor Rear wiper intermittent module Rear wiper motor
FB-26	Front washer motor Front wiper motor Front wiper switch
FB-27	Auto A/C control module Radio
FB-28	Front accessory power supply socket Remote controlled rearview mirror switch
FB-29	Rear fog light relay
FB-30	Mirror heater relay
FB-31	Stop light switch
FB-32	ABS control module
FB-33	Front fog light relay
FB-34	Blower motor relay

No.	Load
FB-35	Door lock timer Keyless entry control module
FB-36	Combination meter

5. Ground Distribution

A: SCHEMATIC

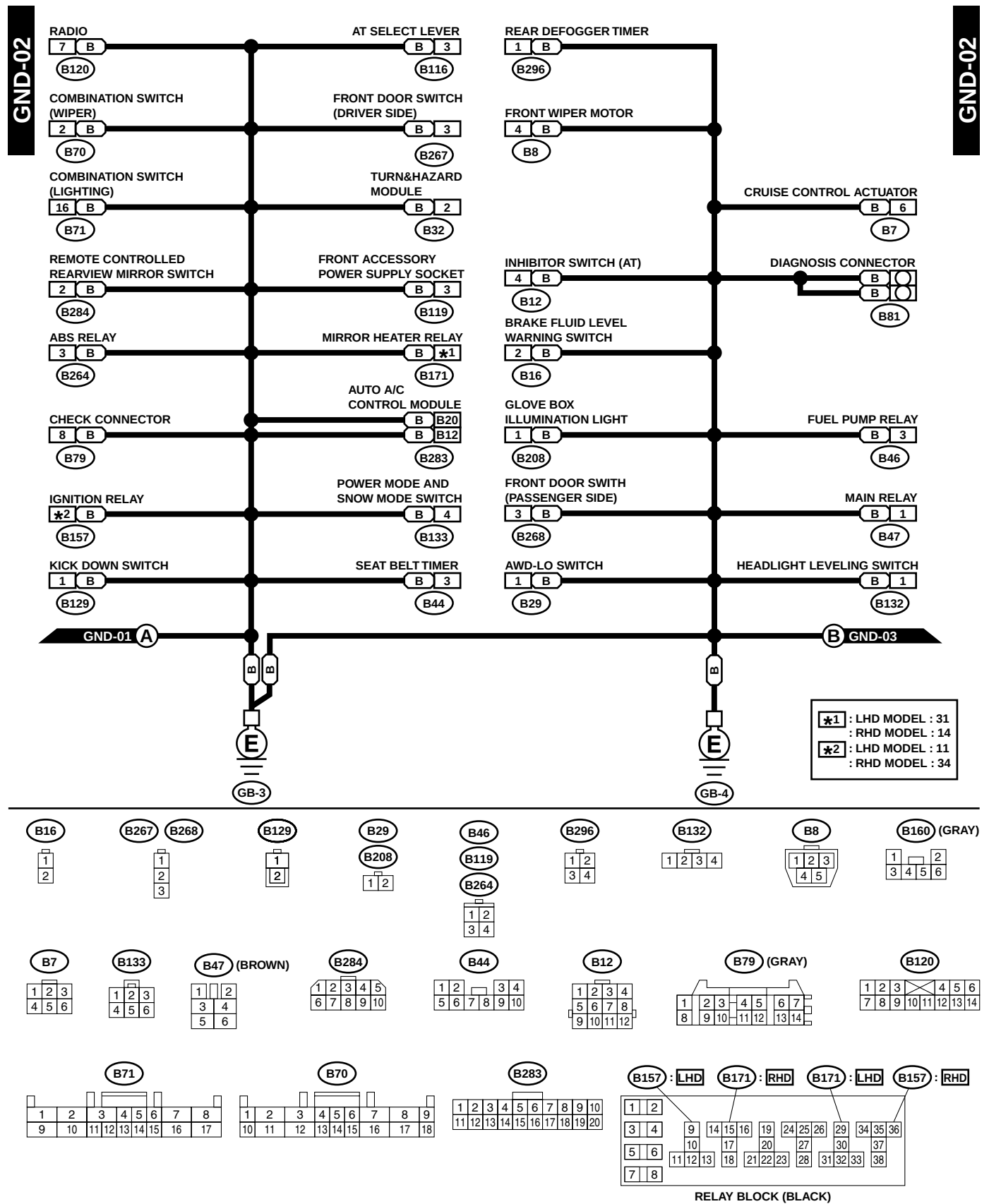
1. ALL MODEL



GG04-20A

GROUND DISTRIBUTION

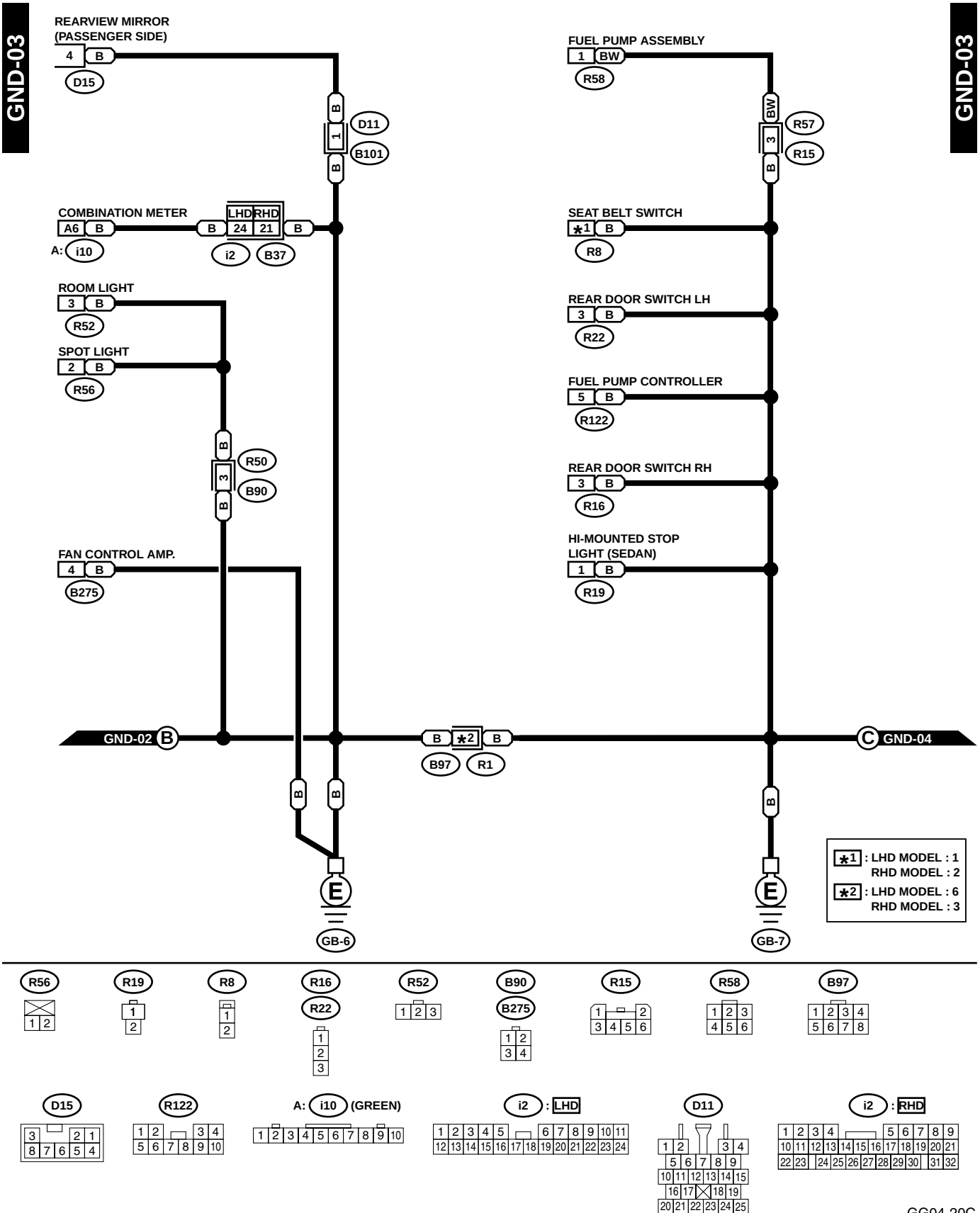
WIRING SYSTEM



GG04-20B

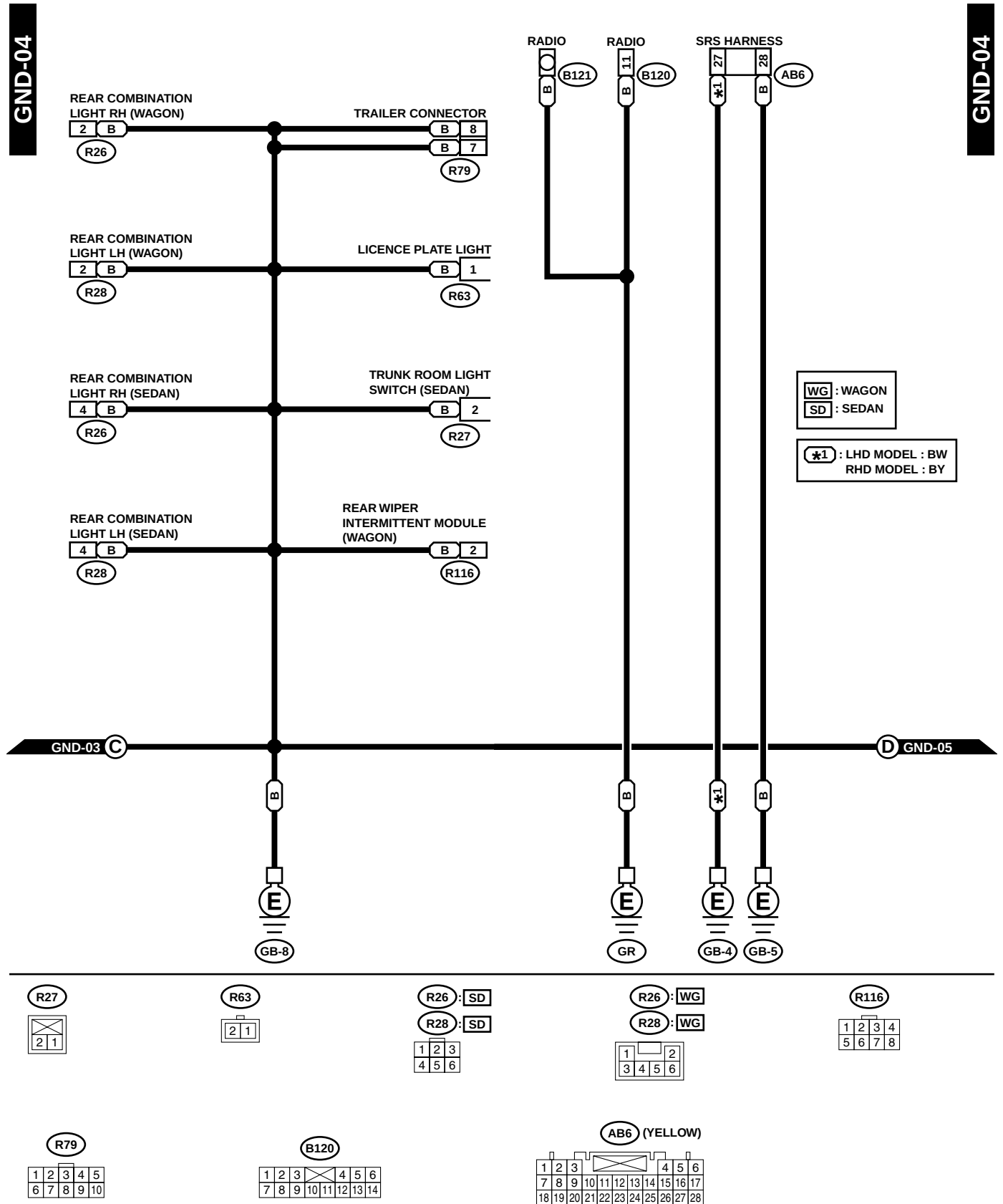
GROUND DISTRIBUTION

WIRING SYSTEM



GROUND DISTRIBUTION

WIRING SYSTEM



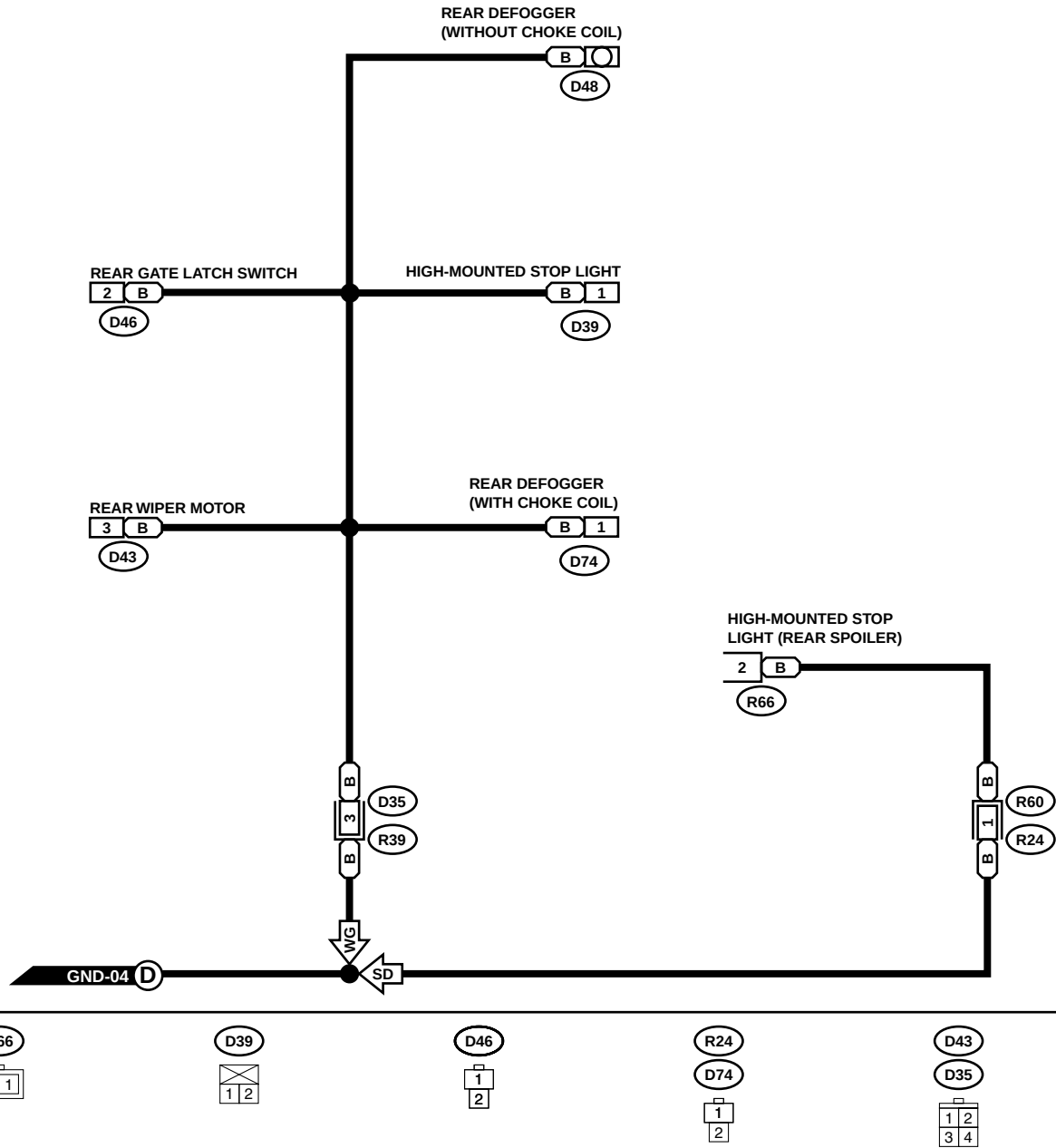
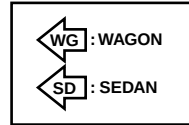
GG04-20D

GROUND DISTRIBUTION

WIRING SYSTEM

GND-05

GND-05

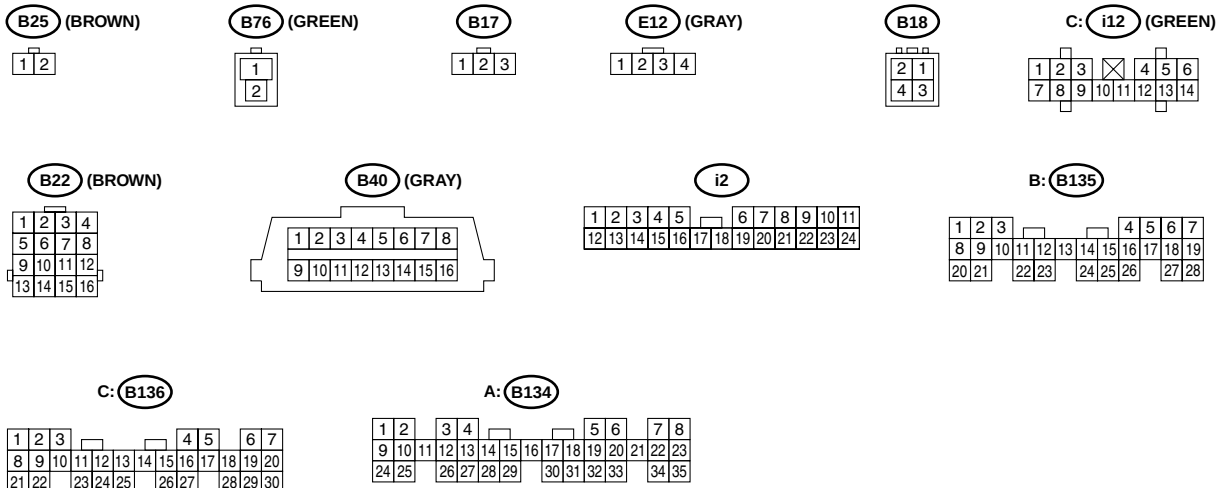
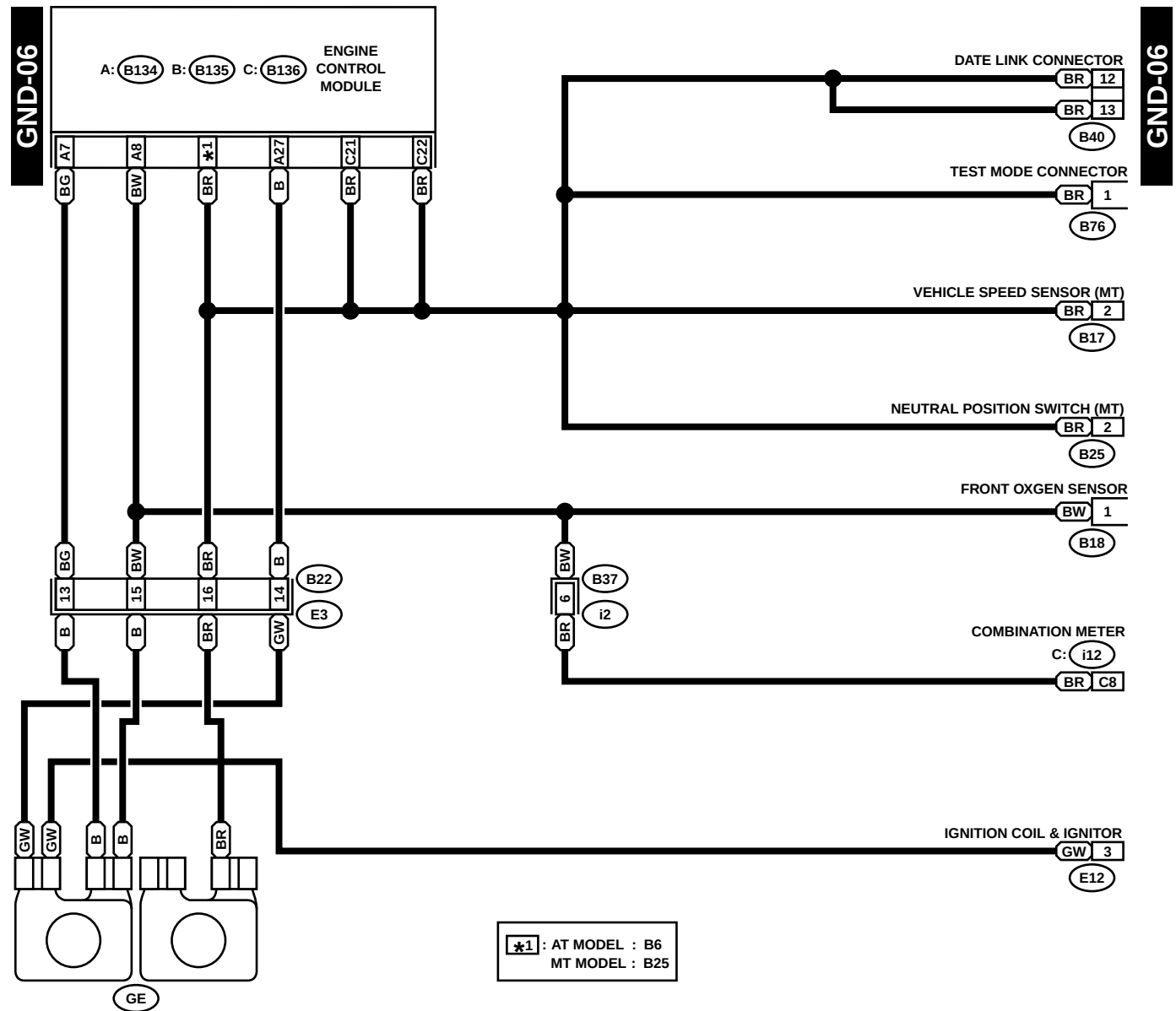


GG04-20E

GROUND DISTRIBUTION

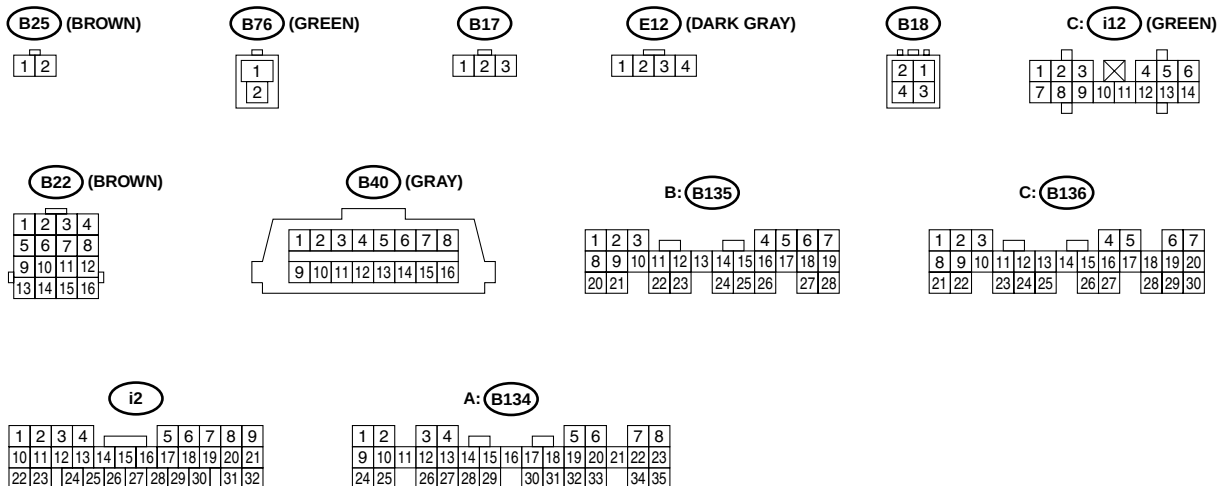
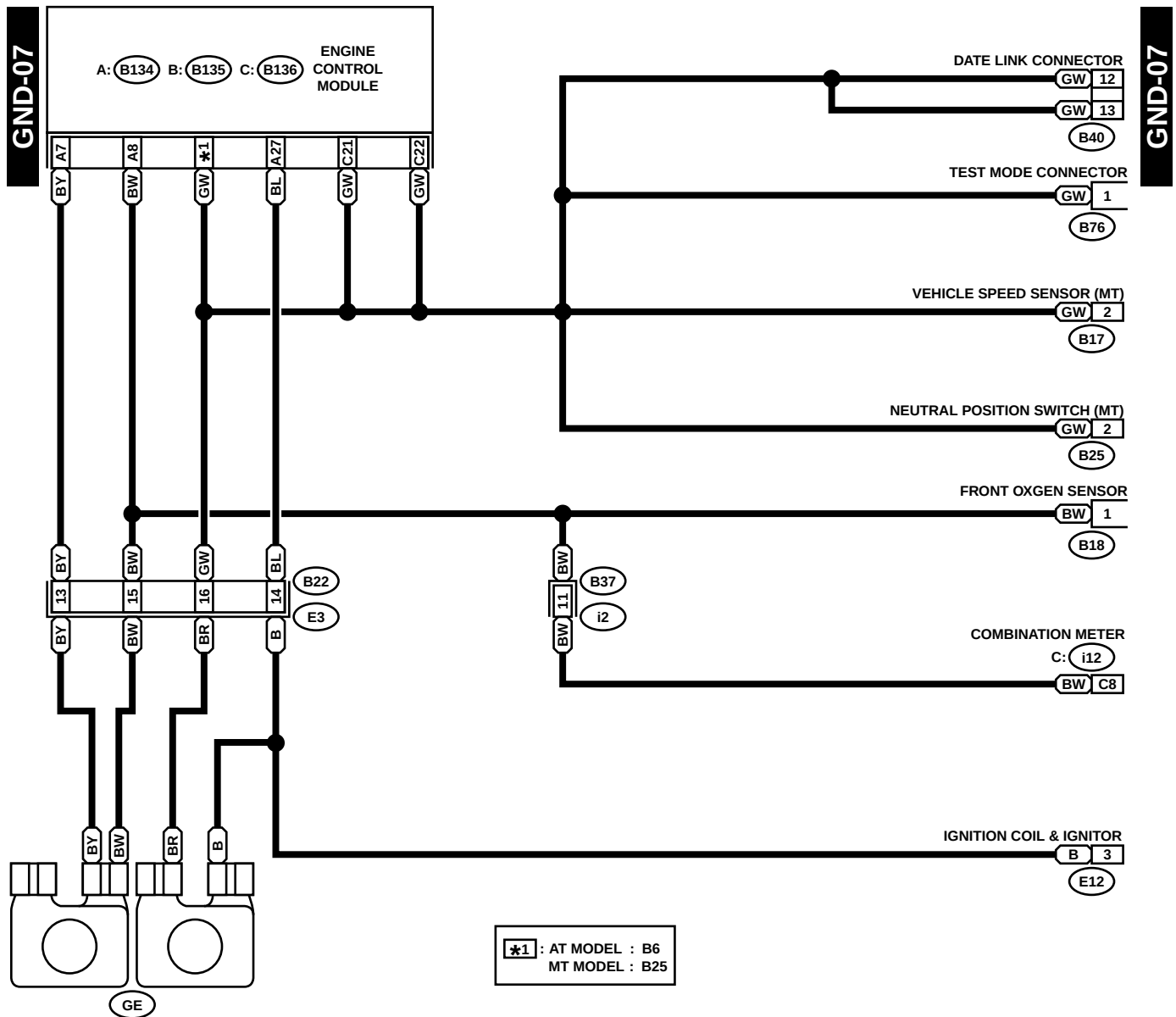
WIRING SYSTEM

2. LHD SOHC W/O OBD ENGINE MODEL



GG04-20F

3. RHD SOHC W/O OBD ENGINE MODEL



WIRING SYSTEM

ENGINE CONTROL MODULE

A: (B134) C: (B136) D: (B137) E: (B84)

DATA LINK CONNECTOR

BR 12
BR 13
B40

TEST MODE CONNECTOR

BR 1
B76

VEHICLE SPEED SENSOR (MT)

BR 2
B17

NEUTRAL POSITION SWITCH

BR 3
B128

COMBINATION METER

C: i12
BW C8

FUEL PUMP ASSEMBLY

B 3
R58

IDLE AIR CONTROL SOLENOID VALVE

BW 3
E7

IGNITION COIL No.4

2 E34

IGNITION COIL No.2

2 E32

IGNITION COIL No.3

2 E33

IGNITION COIL No.1

2 E31

GE

B209 SMJ

F76

F60

B99

i2

R15

R57

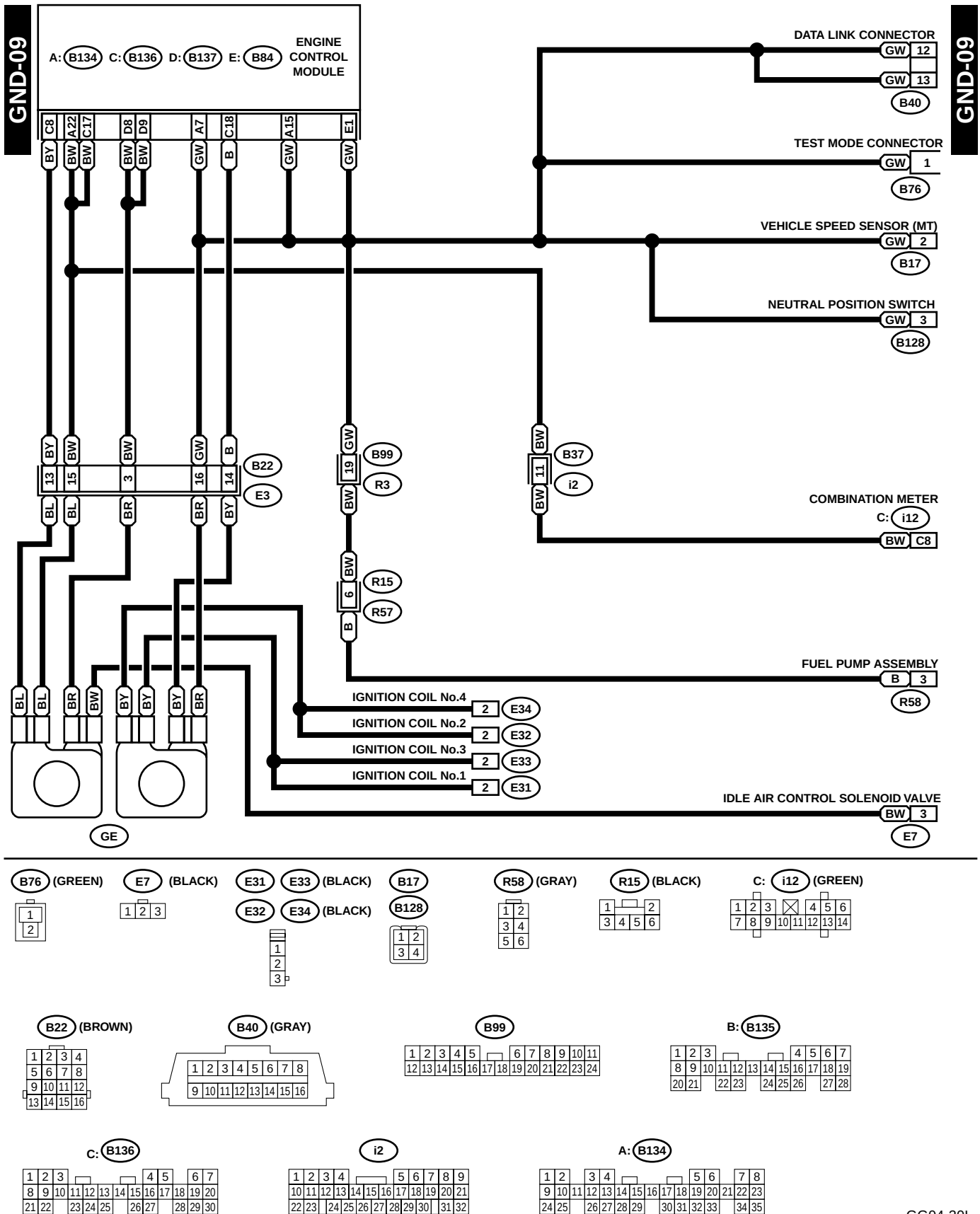
R3

B37

Pinout:

- B25 (BROWN): 1 2
- B76 (GREEN): 1 2
- E7 (BLACK): 1 2 3
- E31, E33 (BLACK): 1 2 3 4
- E12: 1 2 3 4
- B17, B128: 1 2 3 4
- R15 (BLACK): 1 2 3 4 5 6
- R58 (GRAY): 1 2 3 4 5 6
- C: i12 (GREEN): 1 2 3 4 5 6 7 8 9 10 11 12 13 14
- F60 (BROWN): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
- B40 (GRAY): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
- B99, i2: 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
- 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

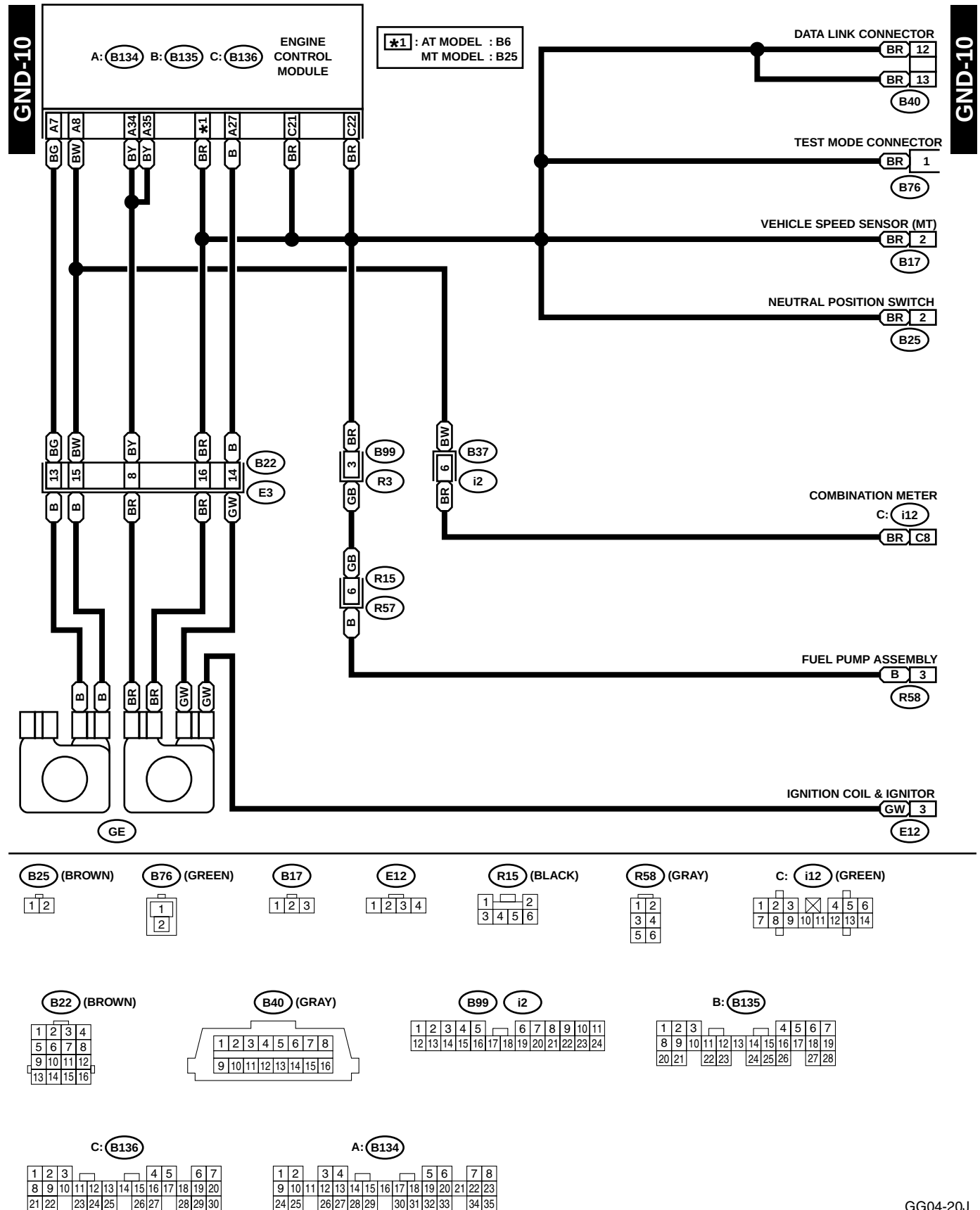
5. RHD TURBO ENGINE MODEL



GROUND DISTRIBUTION

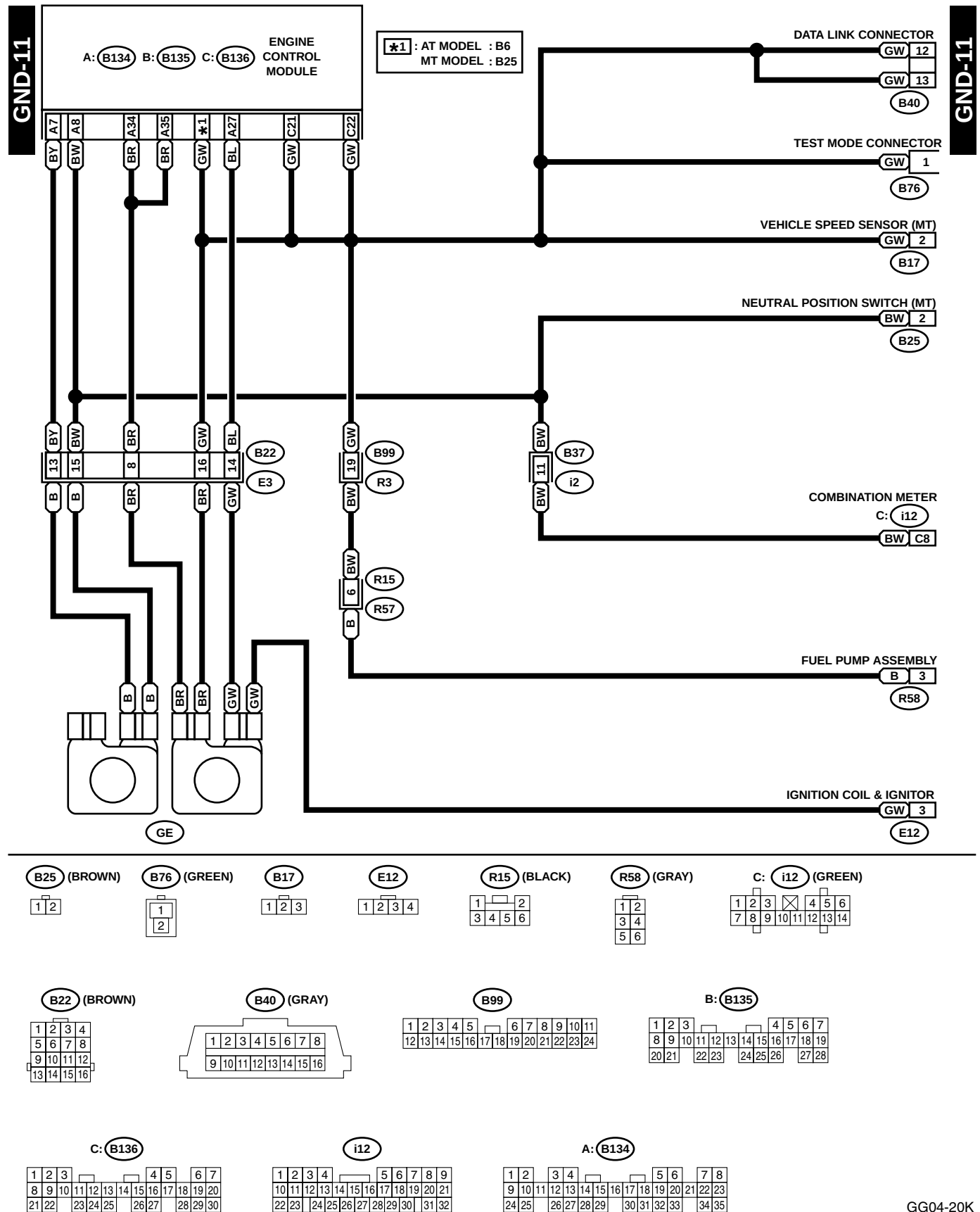
WIRING SYSTEM

6. LHD SOHC MODEL



GG04-20J

7. RHD SOHC MODEL



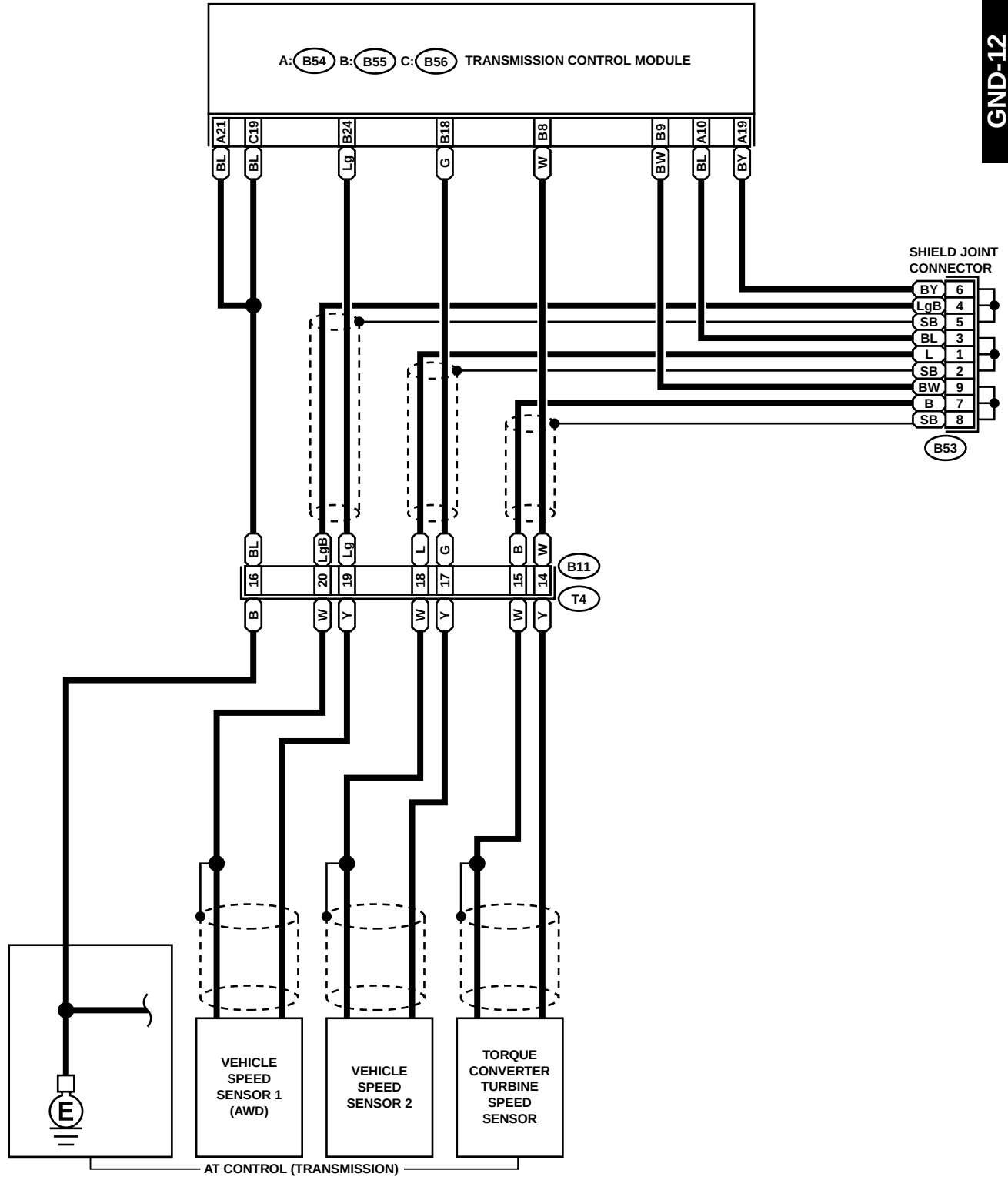
GROUND DISTRIBUTION

WIRING SYSTEM

8. LHD MODEL

GND-12

GND-12



B53 (BLACK)

B11

A: B54

B: B55 (GRAY)

C: B56 (GREEN)

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

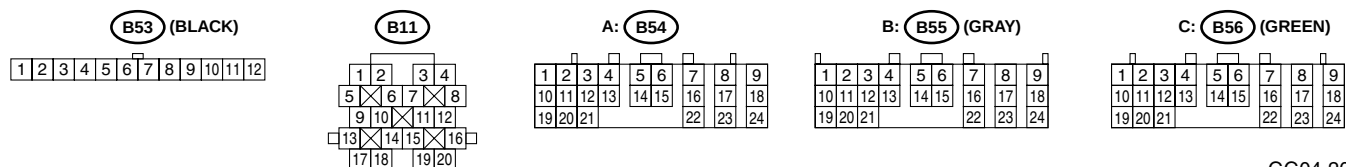
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21				22	23	24

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21				22	23	24

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21				22	23	24

GG04-20L

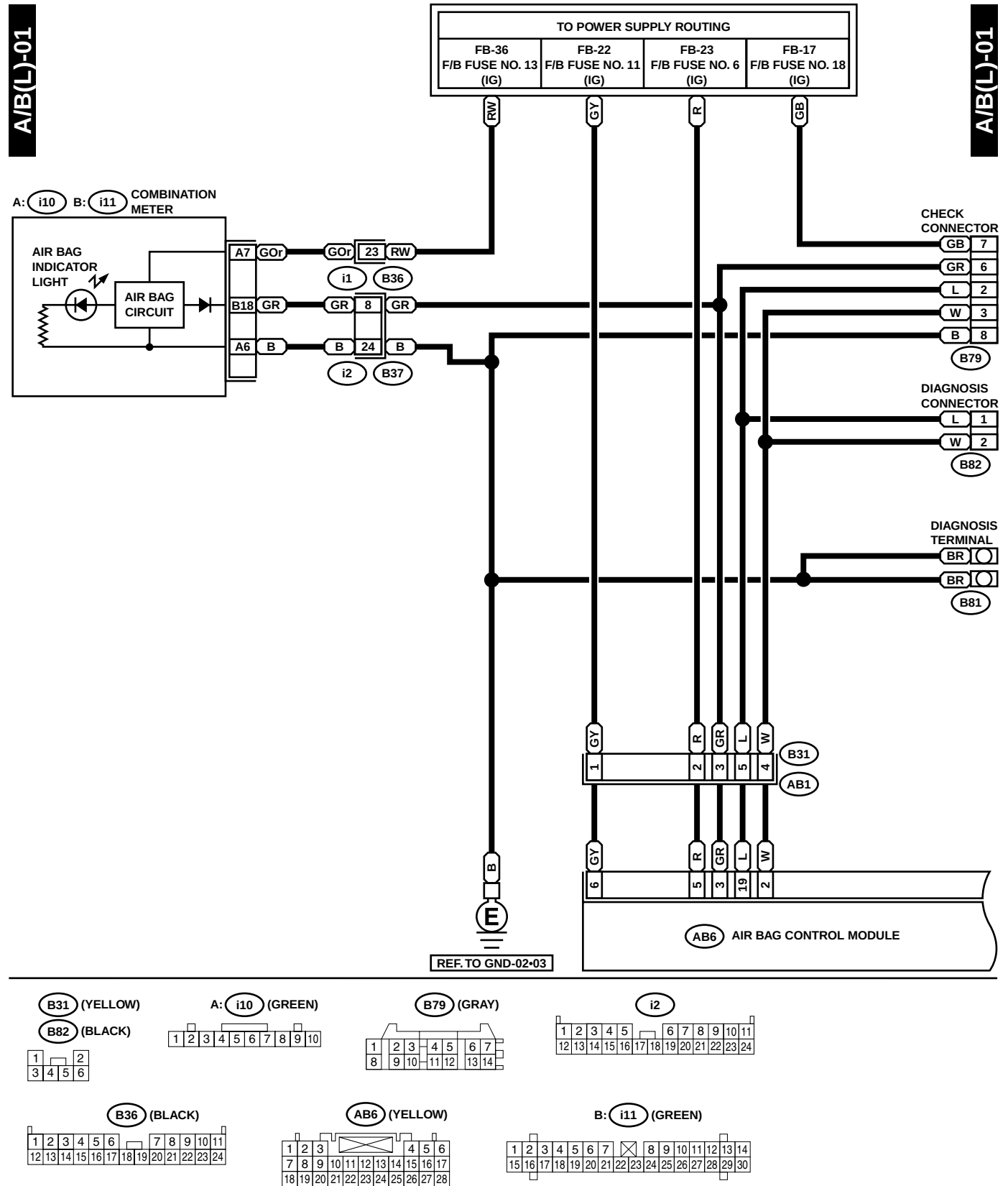
GND-13



6. Airbag System

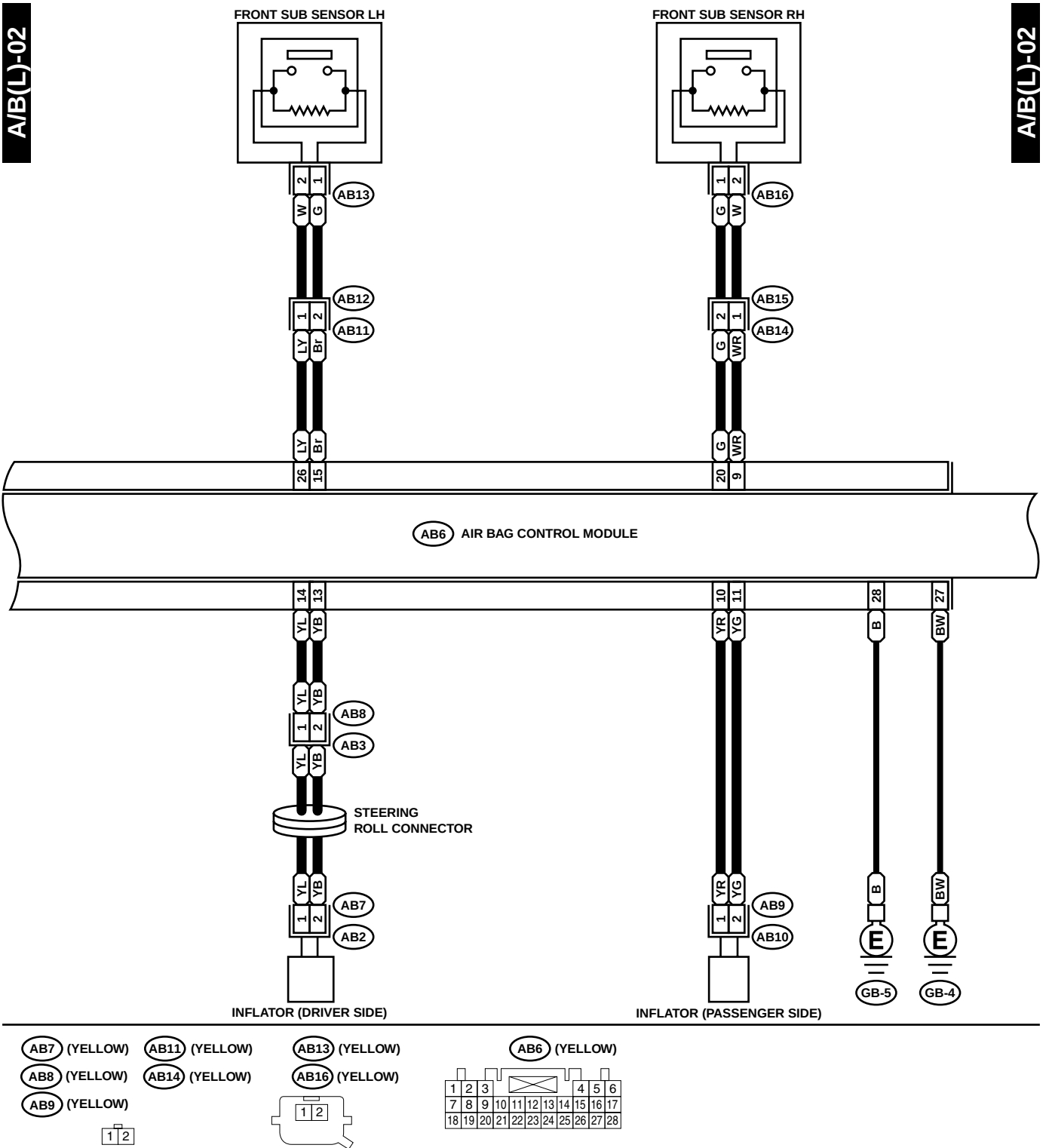
A: SCHEMATIC

1. LHD MODEL



AIRBAG SYSTEM

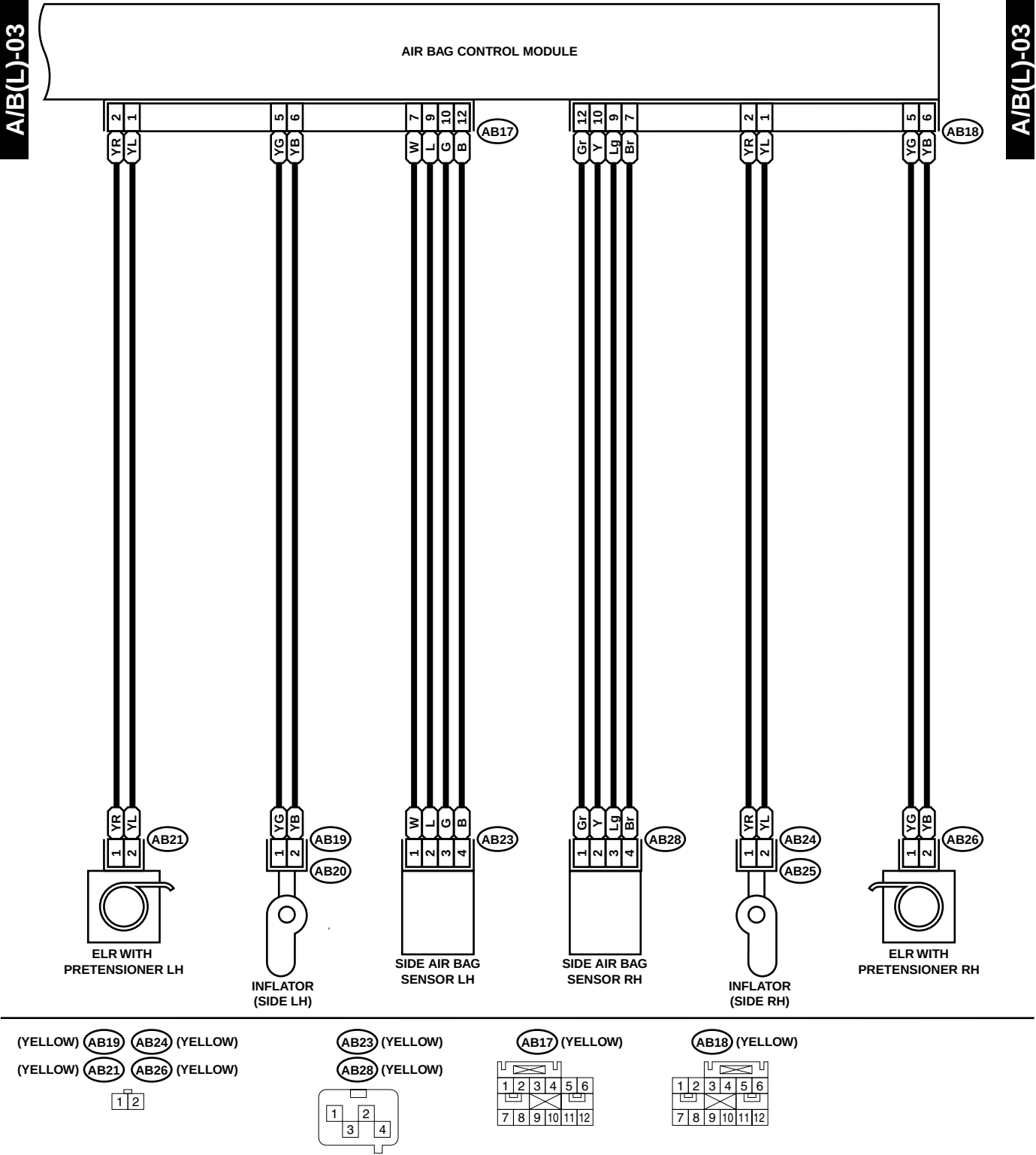
WIRING SYSTEM



GL86-20B

AIRBAG SYSTEM

WIRING SYSTEM

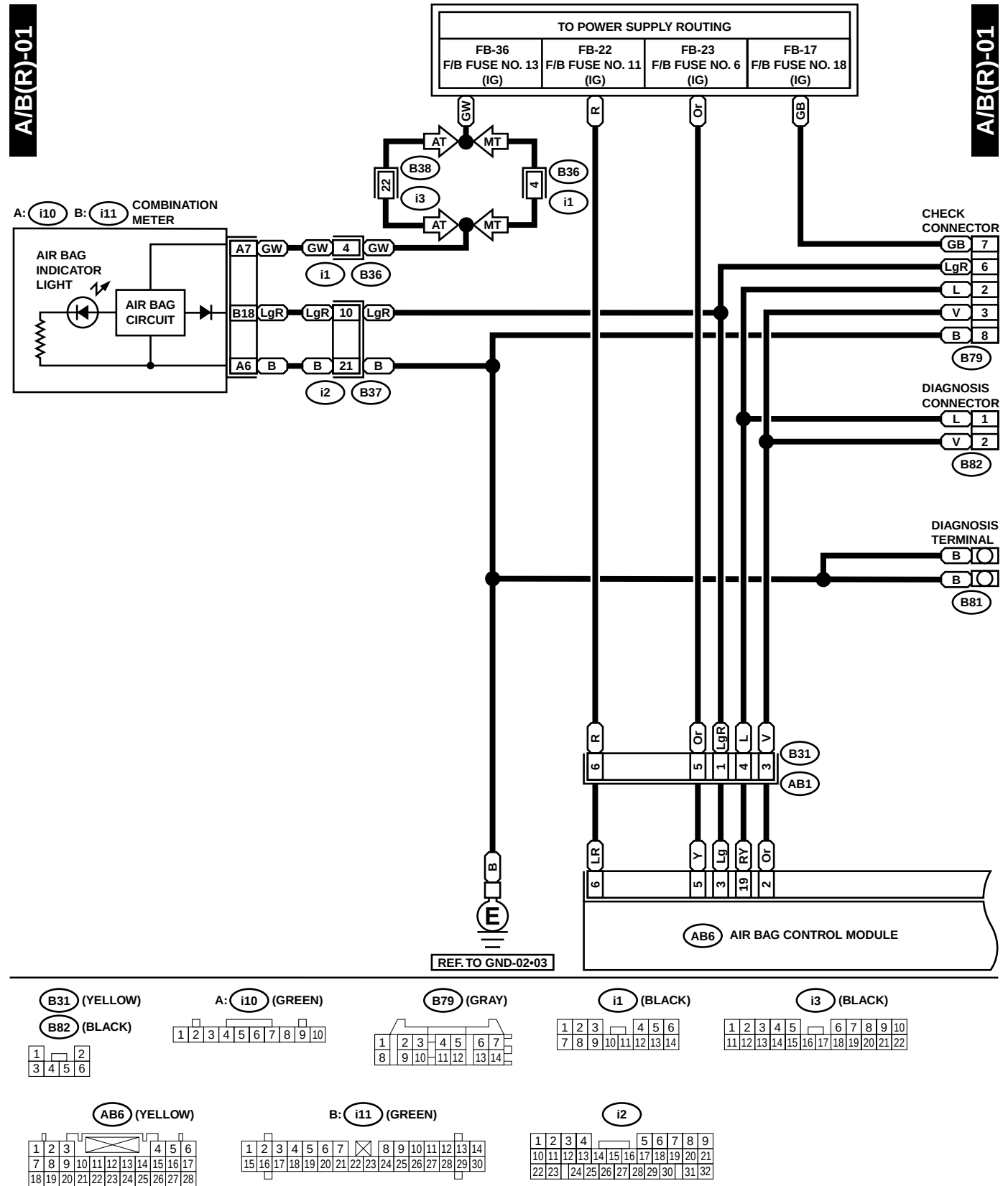


GL86-20C

AIRBAG SYSTEM

WIRING SYSTEM

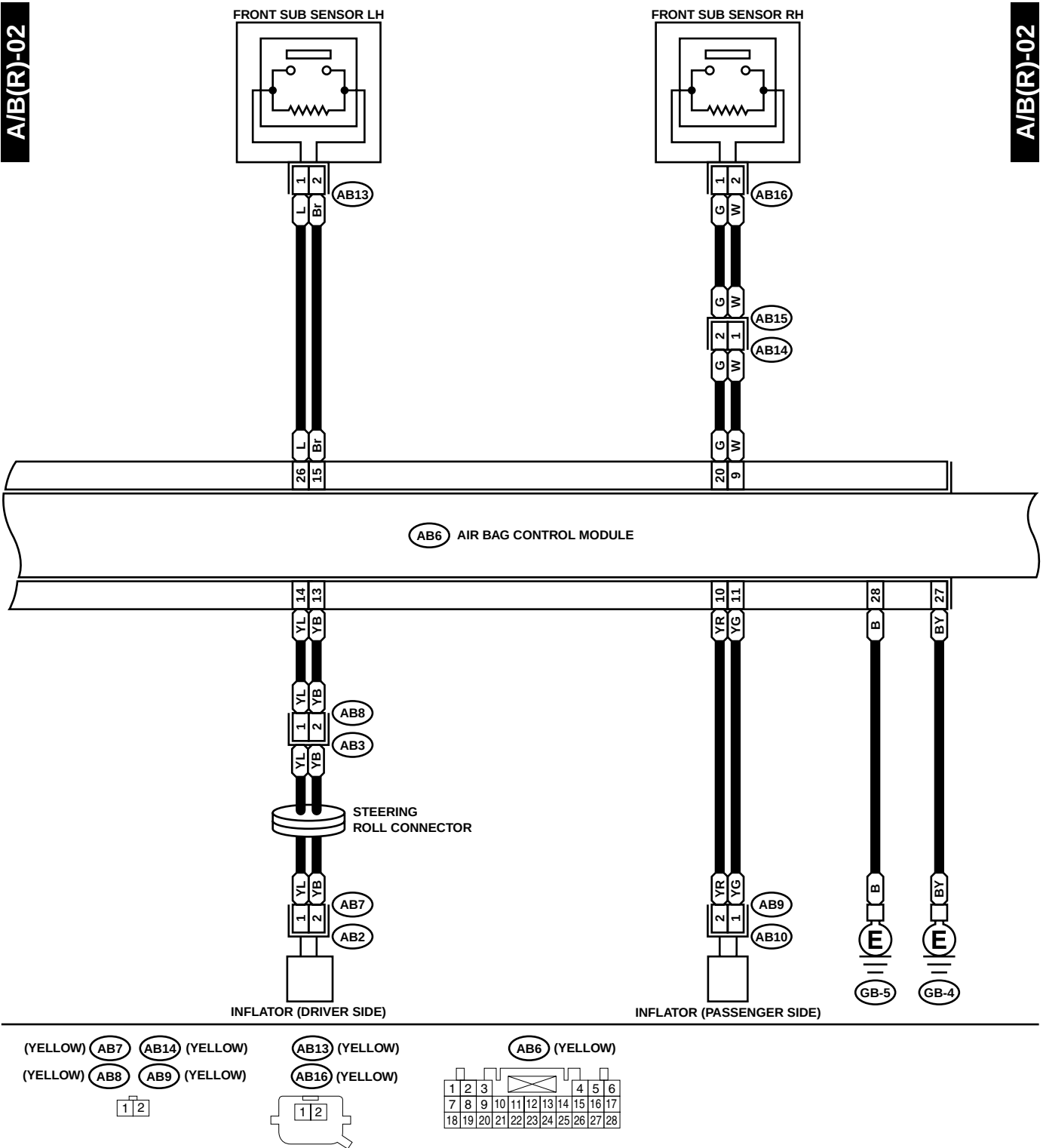
2. RH MODEL



GR86-20A

AIRBAG SYSTEM

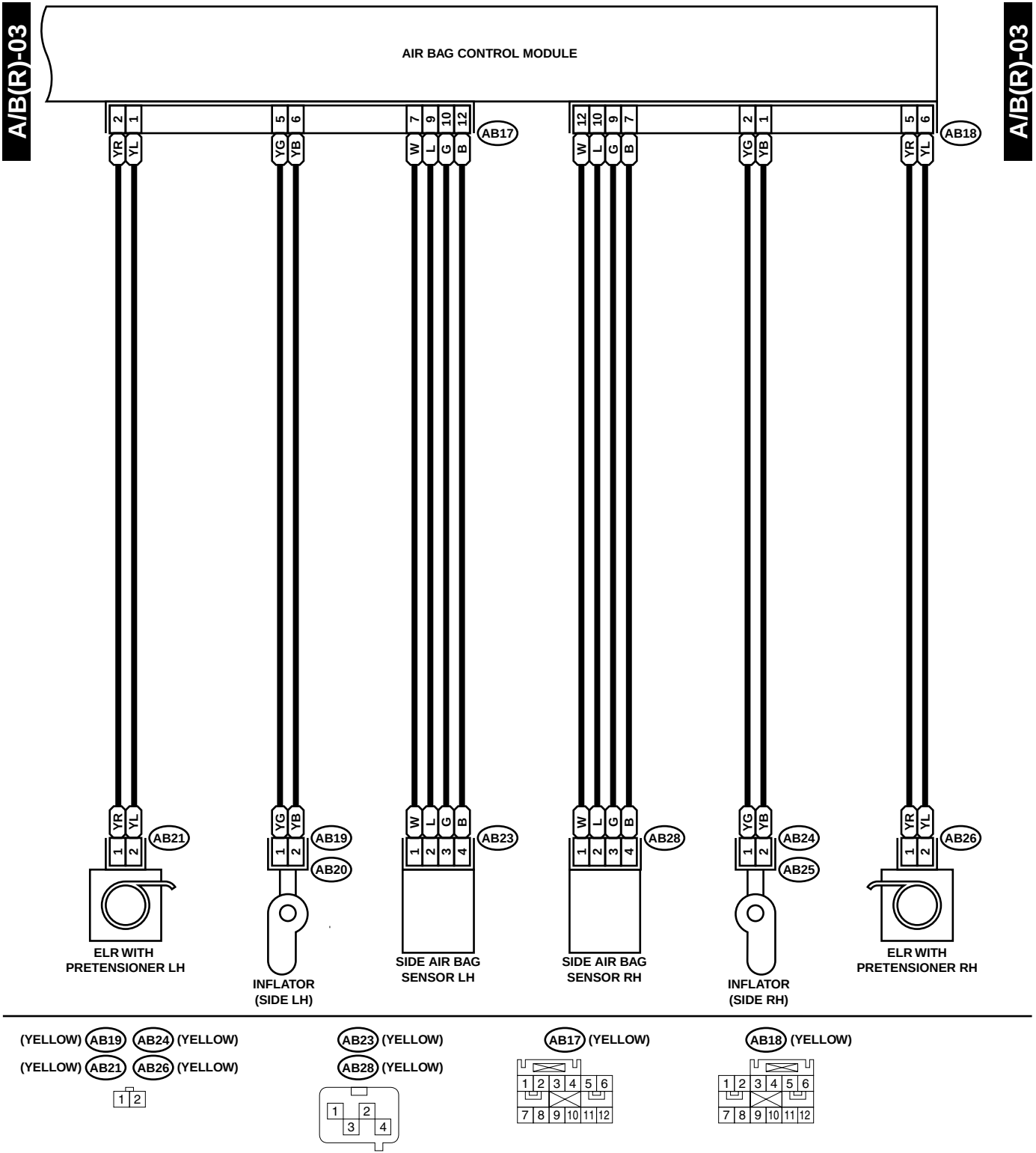
WIRING SYSTEM



GR86-20B

AIRBAG SYSTEM

WIRING SYSTEM



GR86-20C

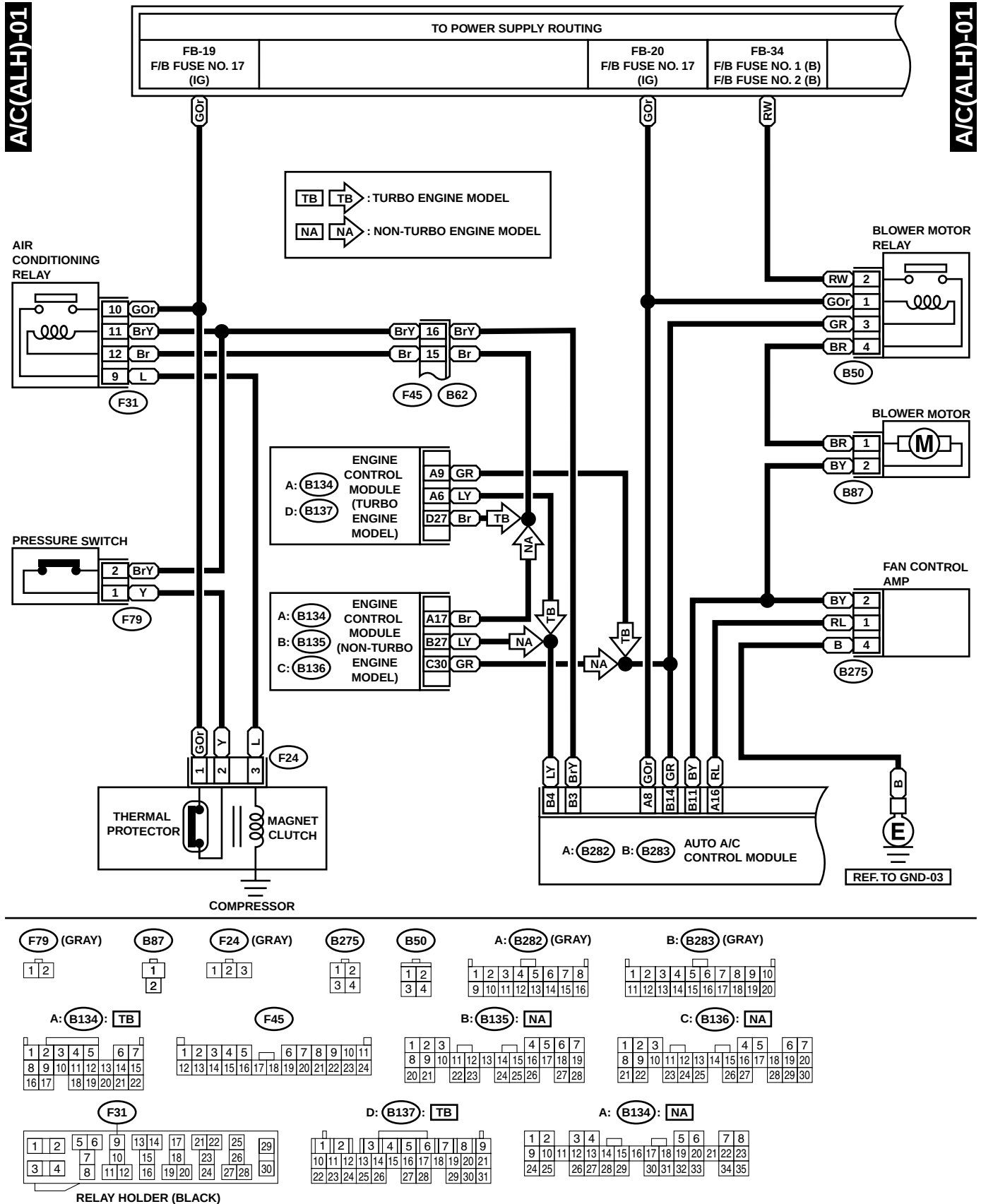
7. Air Conditioning System

A: SCHEMATIC

AIR CONDITIONING SYSTEM

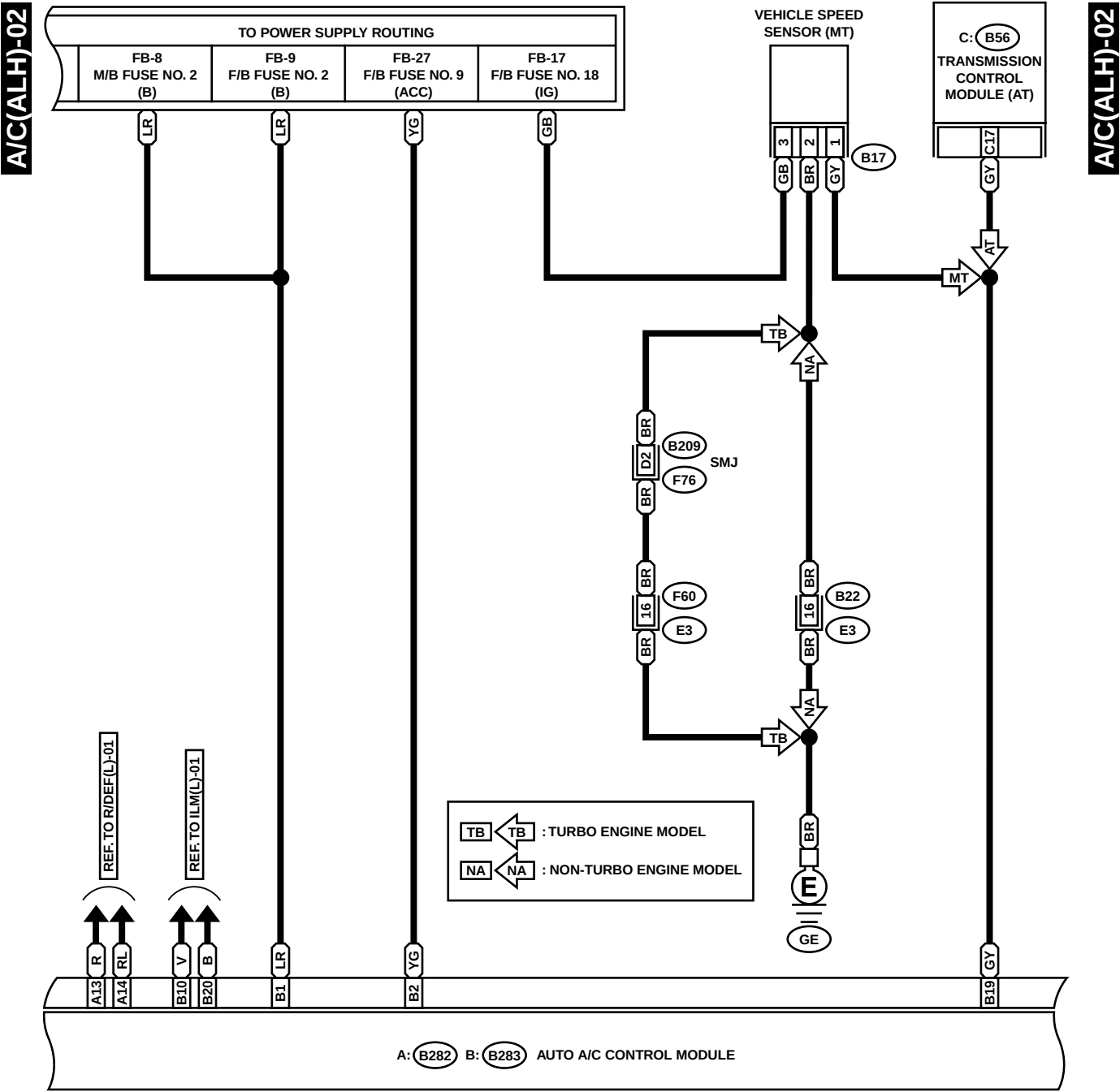
WIRING SYSTEM

1. AUTO A/C LHD MODEL



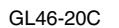
AIR CONDITIONING SYSTEM

WIRING SYSTEM

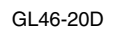


B17 : NA	B17 : TB	B22 (BROWN)	A: B282 (GRAY)	B: B283 (GRAY)	C: B56 (GREEN)
1 2 3	1 2 3 4	F60 (BROWN)	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

WIRING SYSTEM



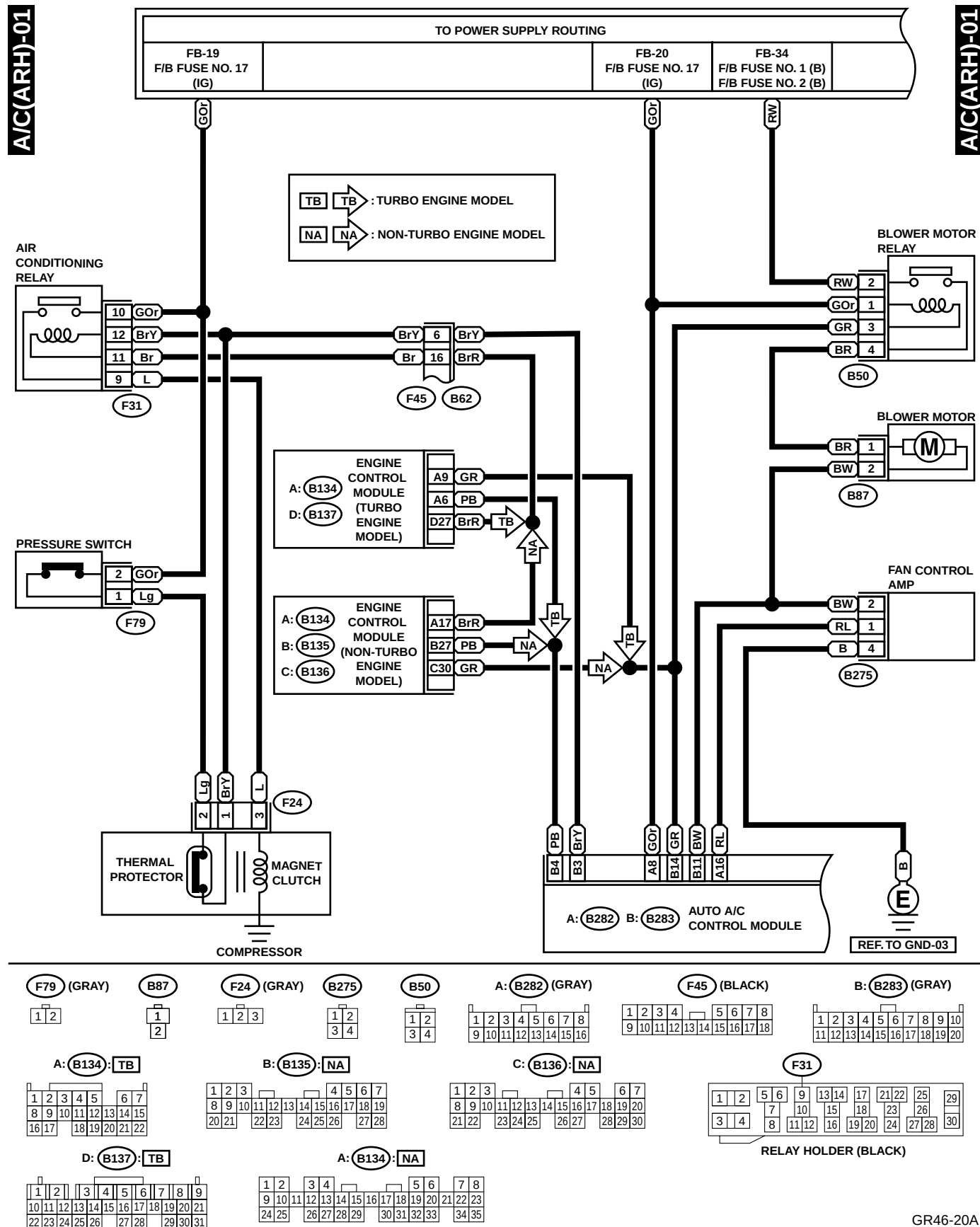
WIRING SYSTEM



AIR CONDITIONING SYSTEM

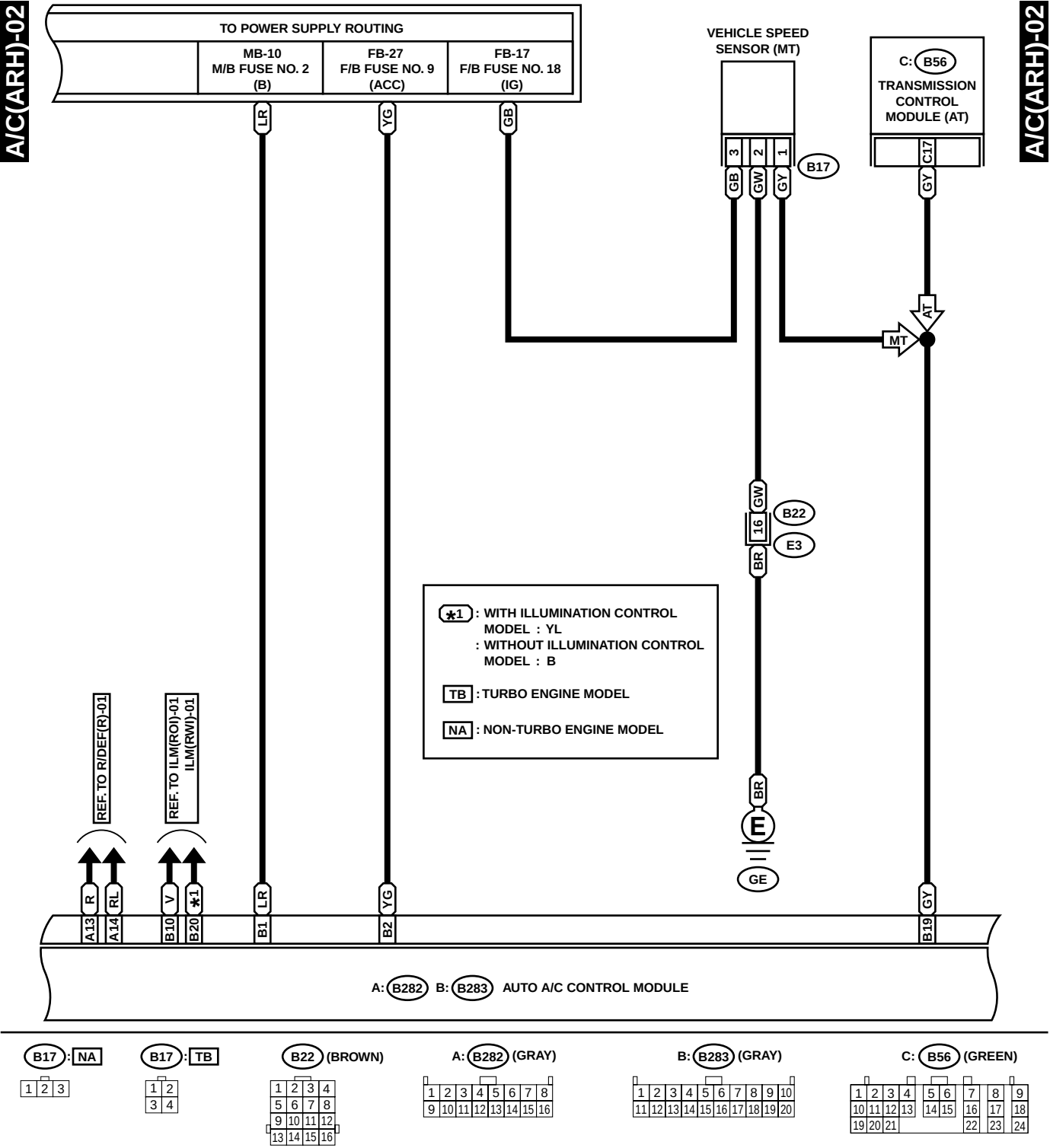
WIRING SYSTEM

2. AUTO A/C RHD MODEL



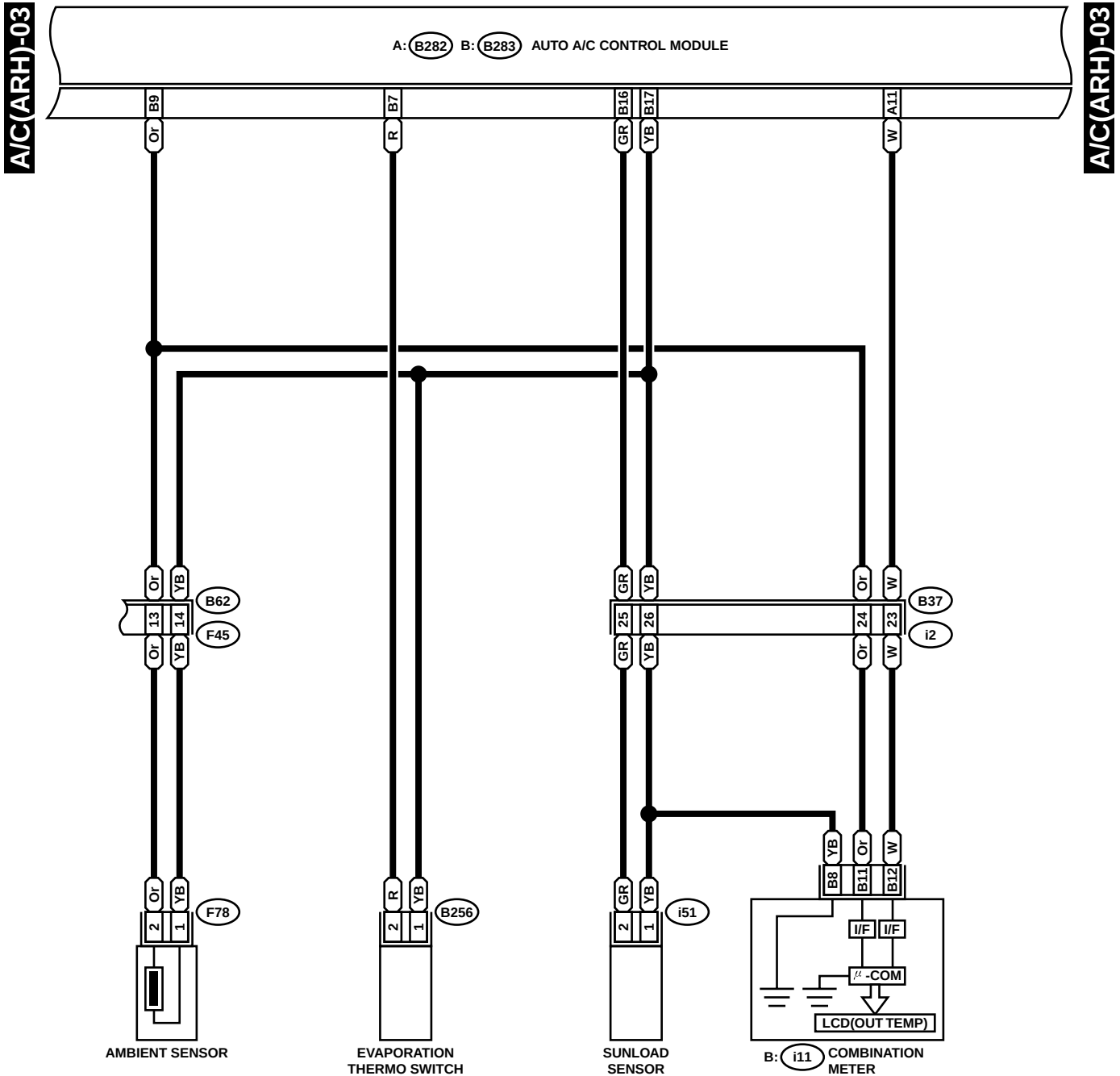
AIR CONDITIONING SYSTEM

WIRING SYSTEM



AIR CONDITIONING SYSTEM

WIRING SYSTEM



F78 (BLACK)

A: B282 (GRAY)

F45 (BLACK)

B: B283 (GRAY)

B: i11 (GREEN)

B256

i51

1 2

i2

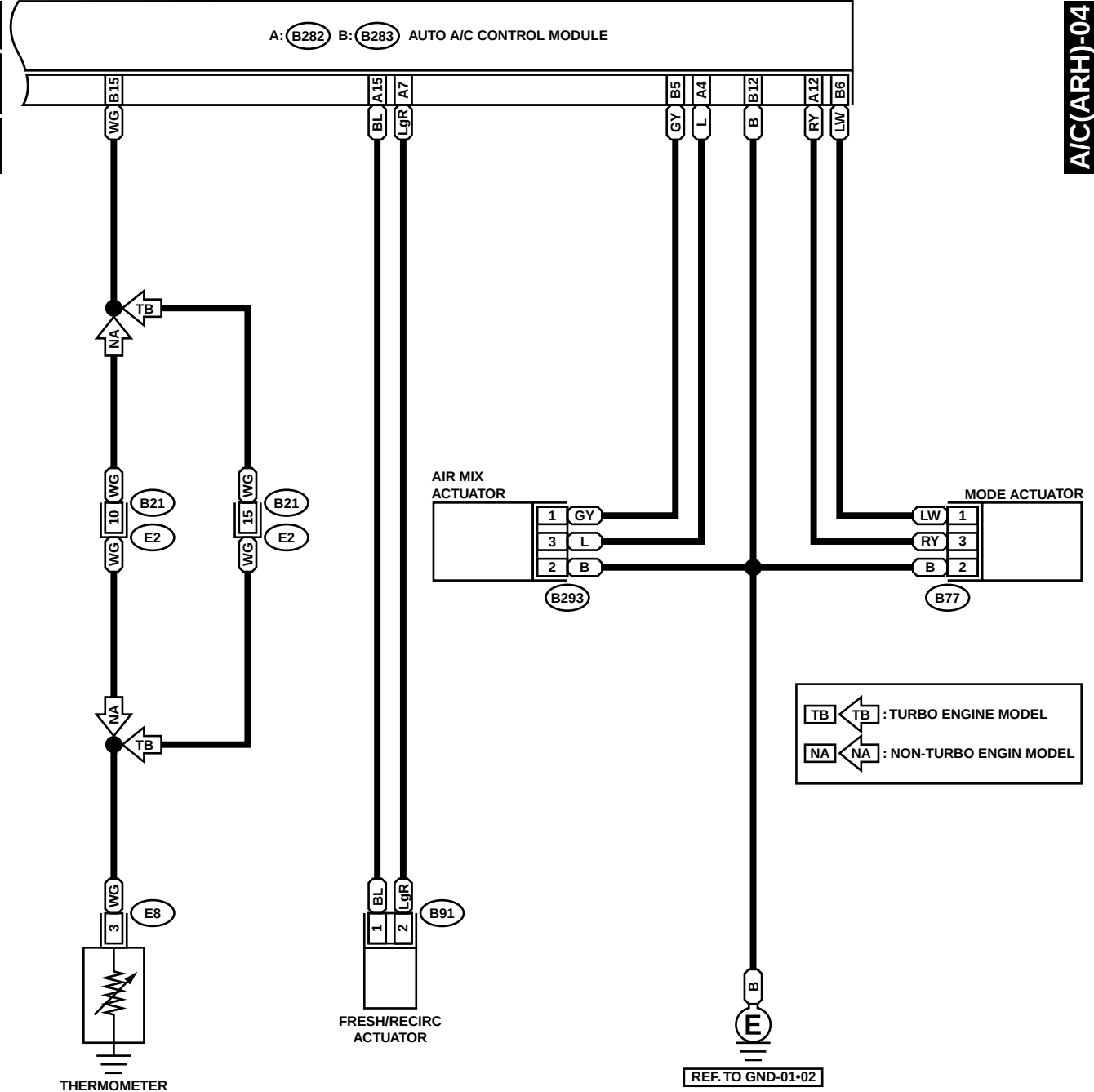
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32				

AIR CONDITIONING SYSTEM

WIRING SYSTEM

A/C(ARH)-04

A/C(ARH)-04



TB : TURBO ENGINE MODEL
NA : NON-TURBO ENGIN MODEL

B77

B293

1

2

3

E8 (LIGHT GRAY)

1

2

3

B91 (BLACK)

1

2

3

4

5

6

A: B282 (GRAY)

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

B: B283 (GRAY)

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

B21

TB : (BLACK)

NA : (LIGHT GRAY)

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

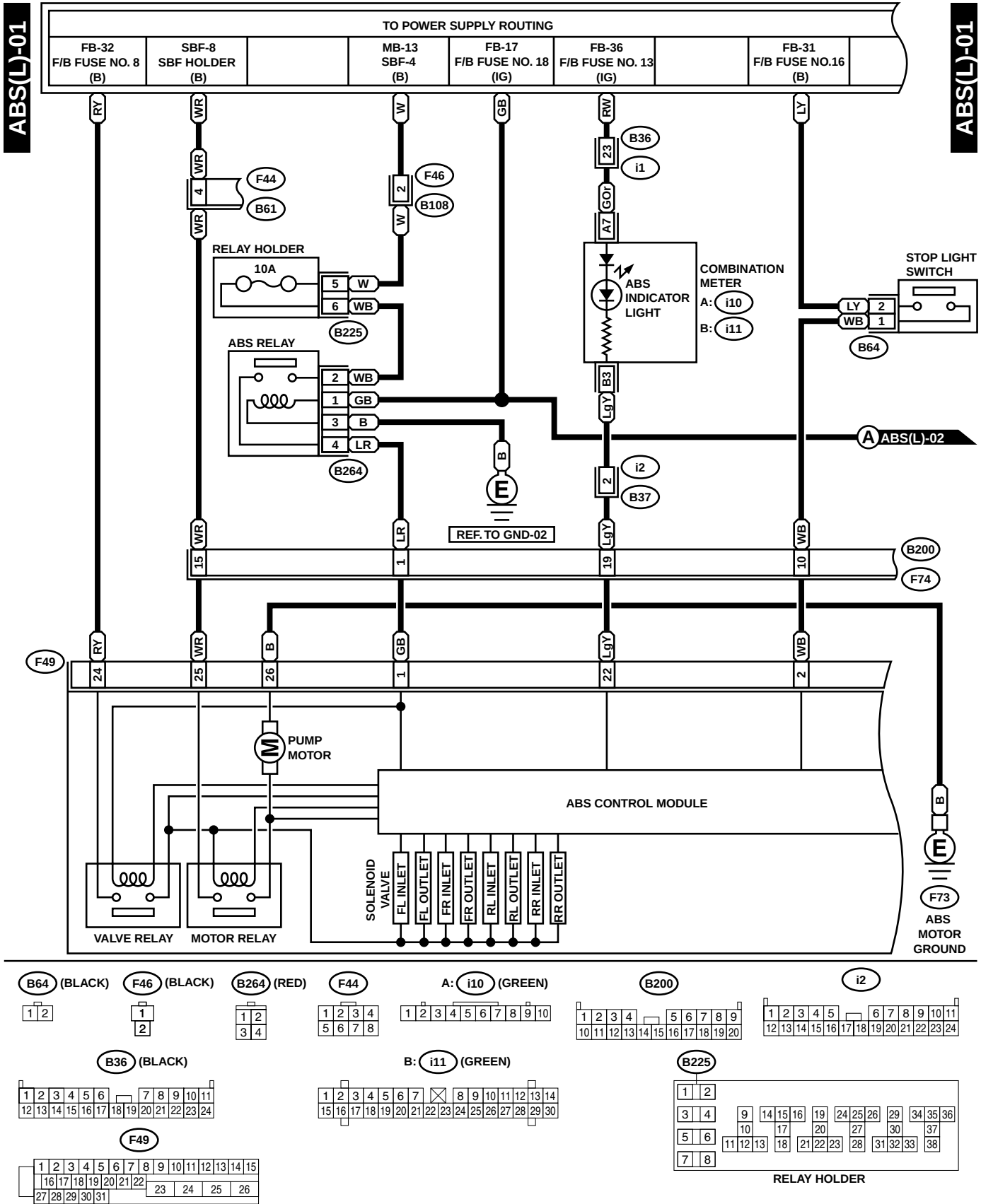
8. Anti-lock Brake System

A: SCHEMATIC

ANTI-LOCK BRAKE SYSTEM

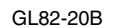
WIRING SYSTEM

1. LHD MODEL

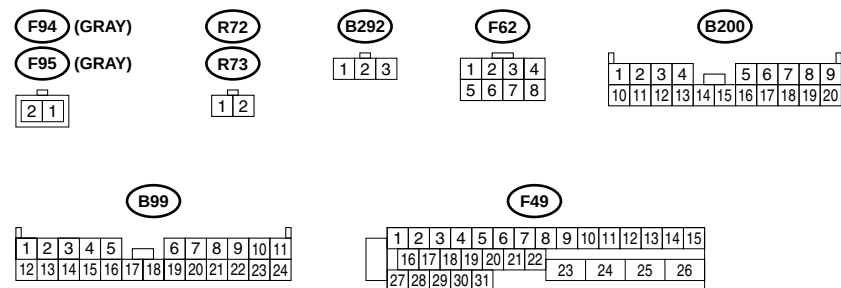


GL82-20A

WIRING SYSTEM



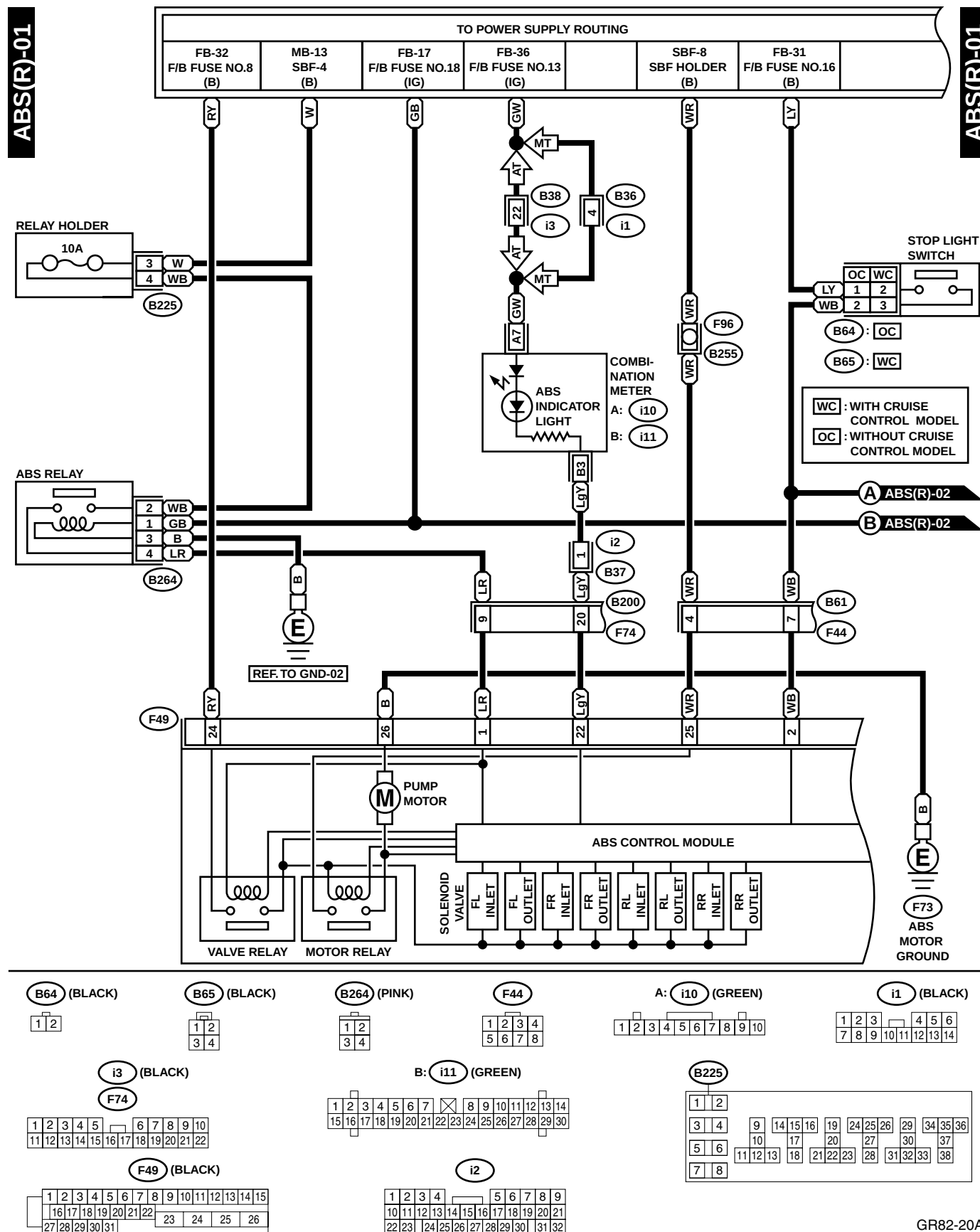
WIRING SYSTEM



ANTI-LOCK BRAKE SYSTEM

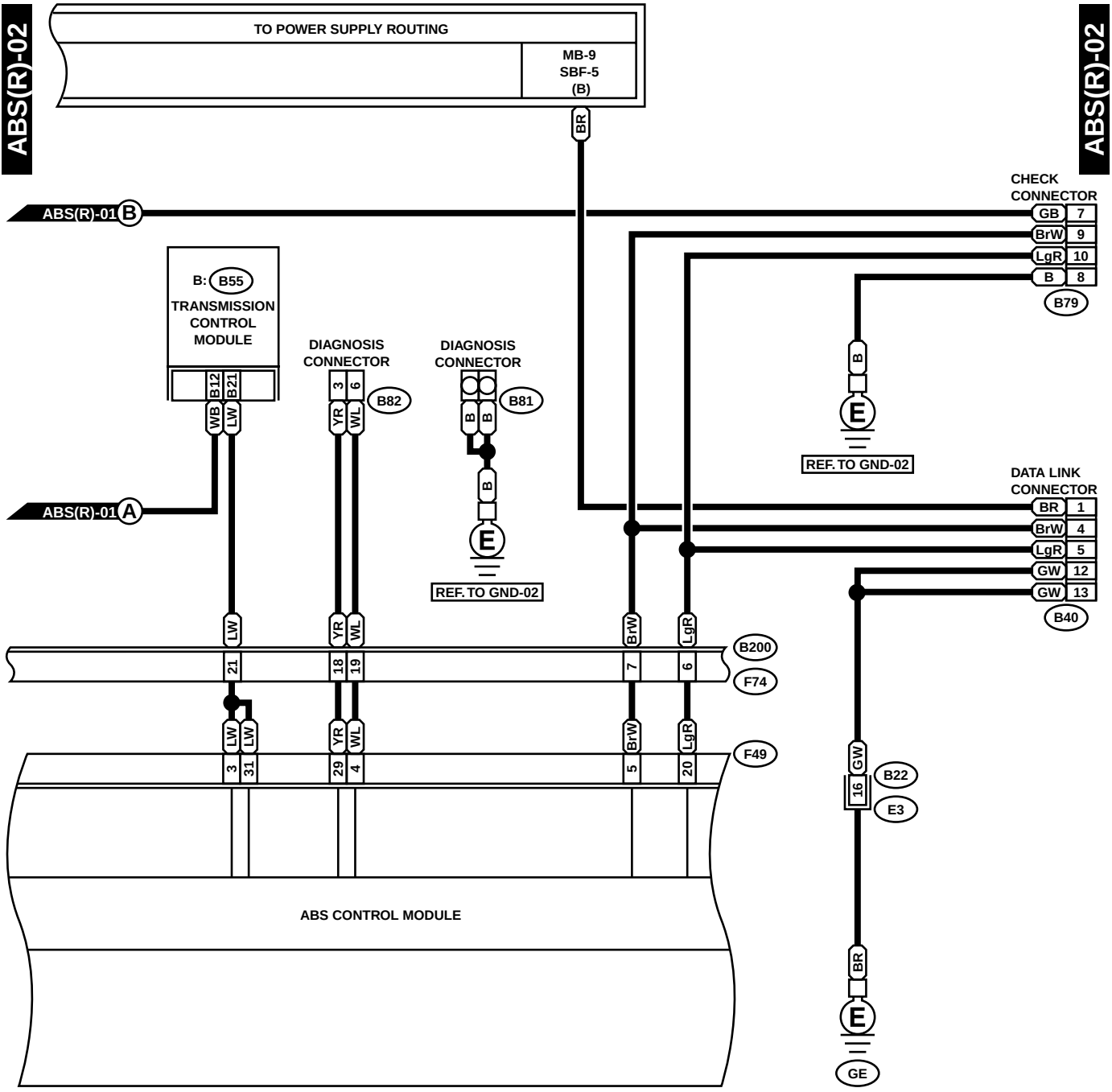
WIRING SYSTEM

2. RHD MODEL



ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM



B82 (BLACK)

1	2
3	4

B79 (GRAY)

1	2	3	4	5	6	7
8	9	10	11	12	13	14

B40 (GRAY)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

B22 (BROWN)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

F74

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22								

B: B55 (GRAY)

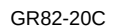
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21				22	23	24

F49 (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											

GR82-20B

WIRING SYSTEM



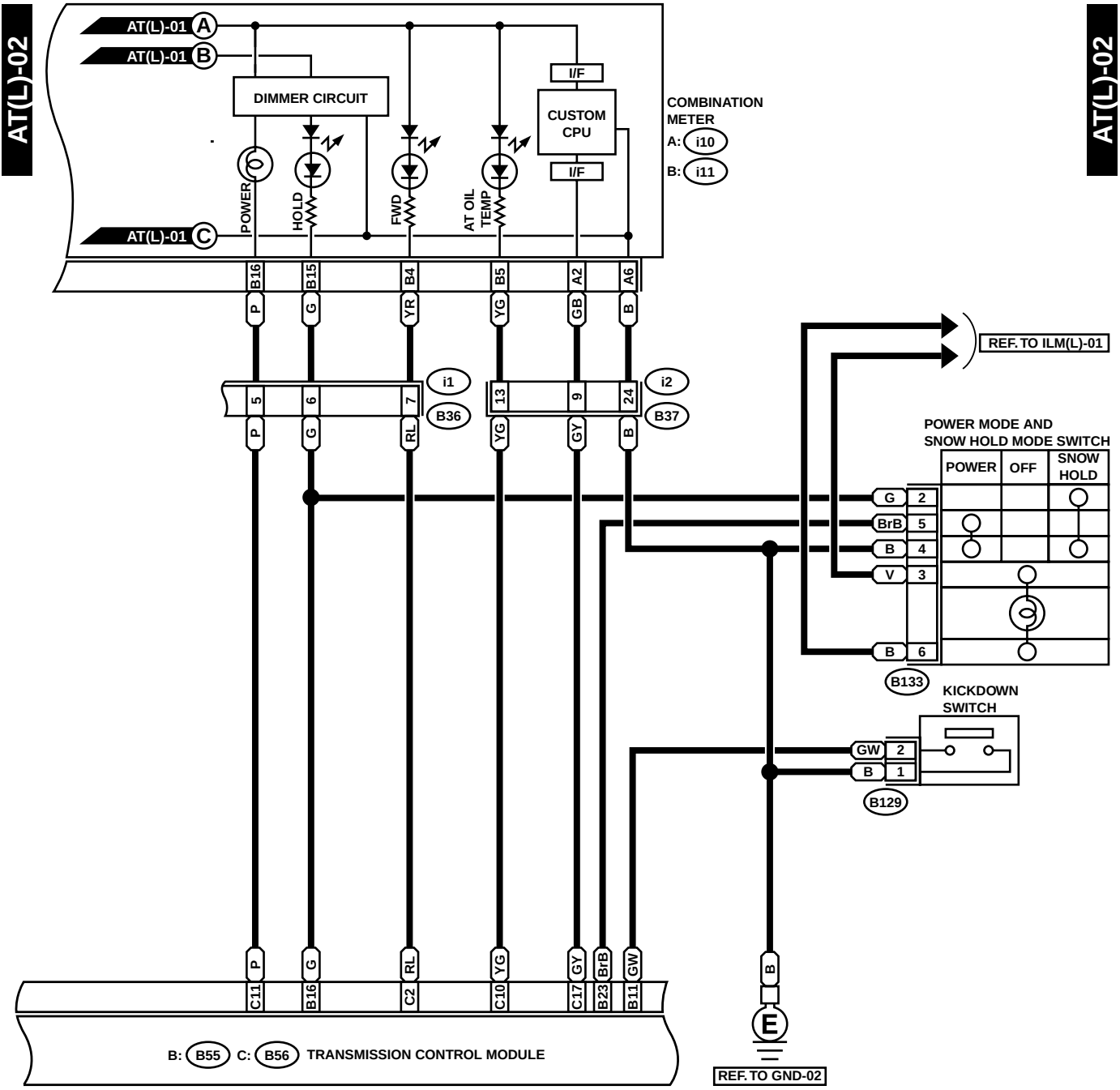
9. A/T Control System

A: SCHEMATIC

WIRING SYSTEM

AT(L)-01





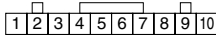
B129 (BLACK)



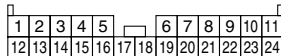
B133 (BLUE)



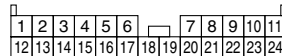
A: i10 (GREEN)



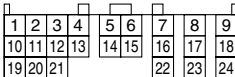
i2



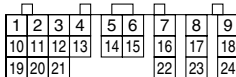
B36 (BLACK)



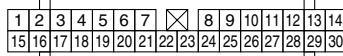
B: B55 (GRAY)



C: B56 (GREEN)

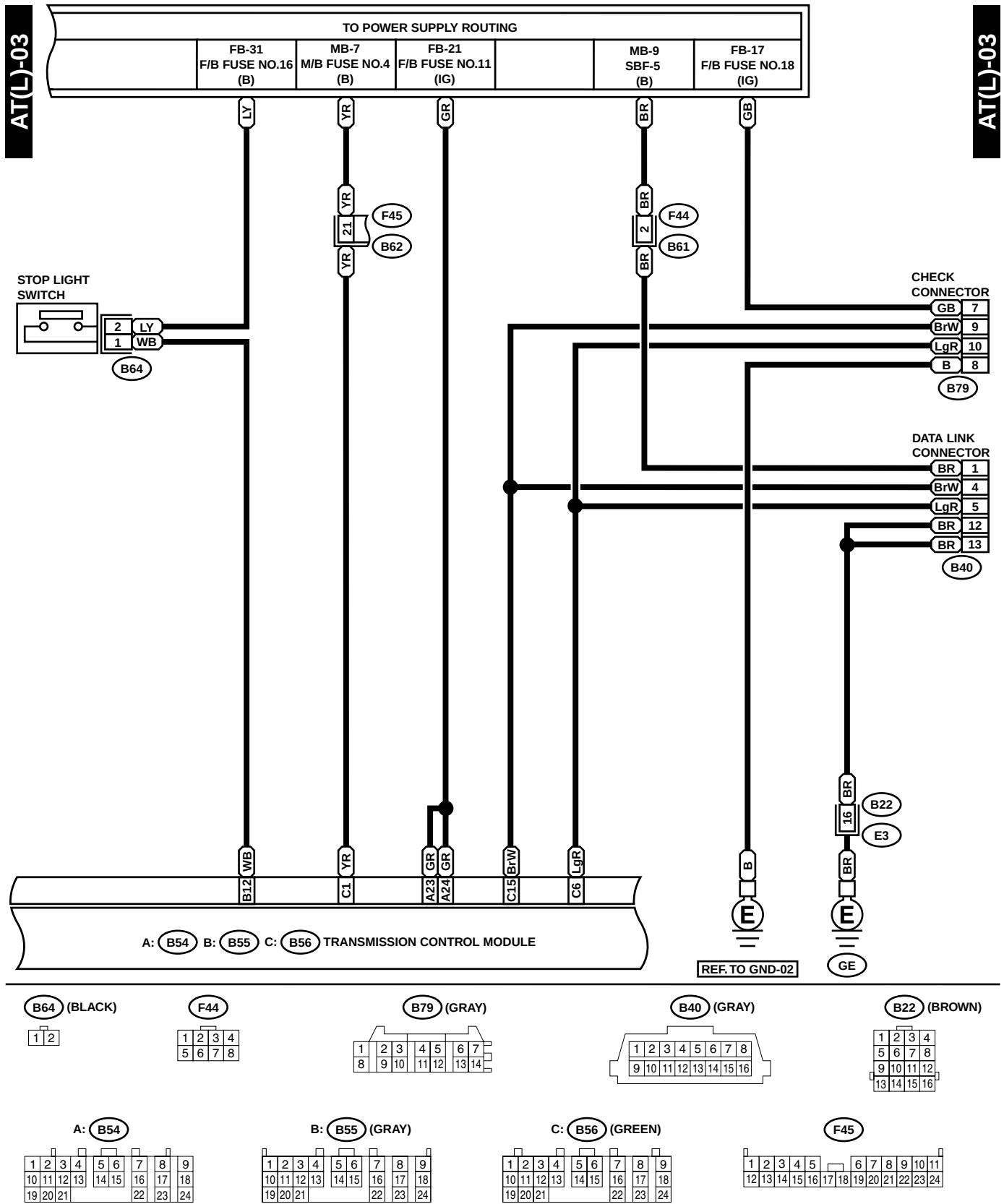


B: i11 (GREEN)



A/T CONTROL SYSTEM

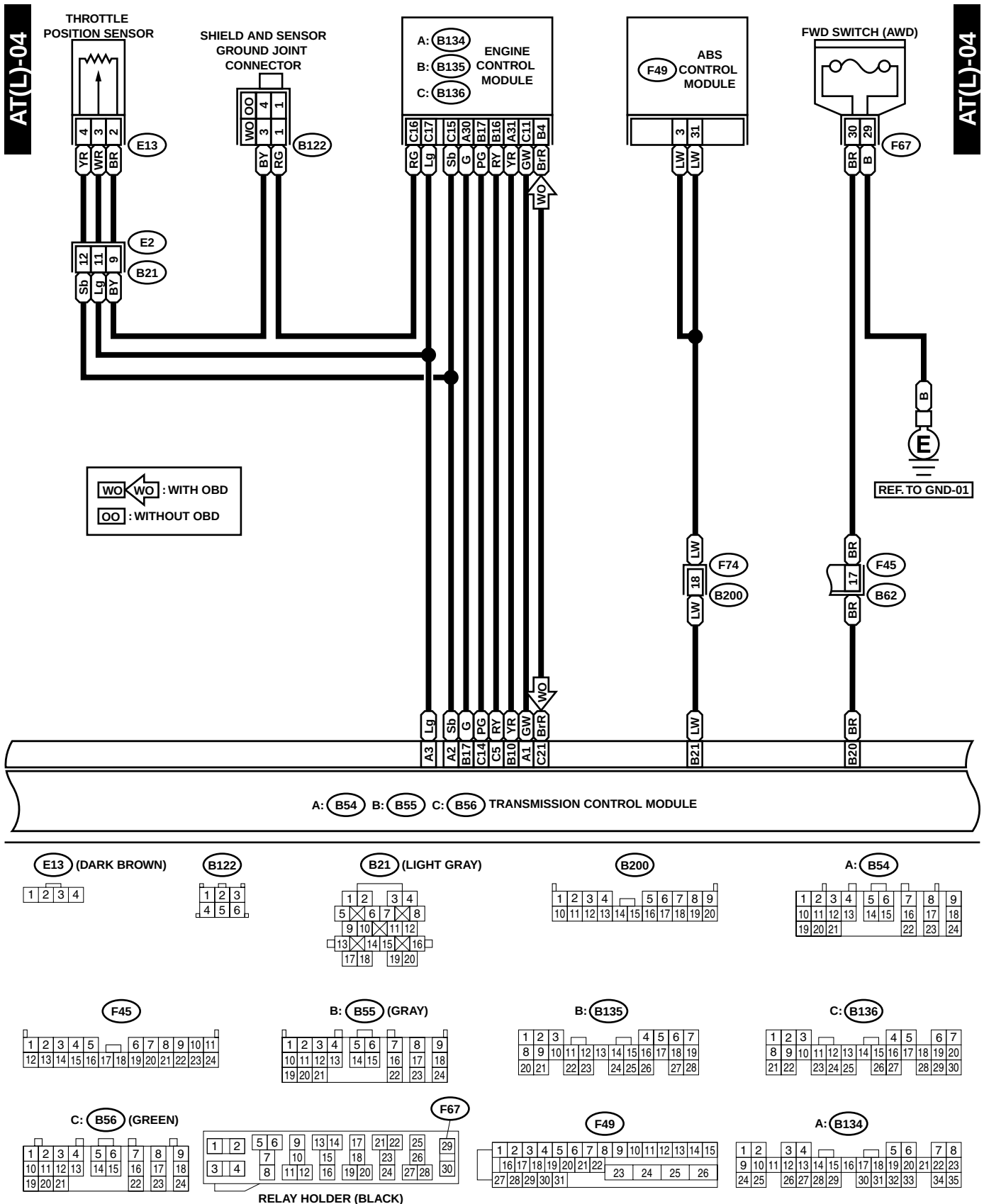
WIRING SYSTEM



GL41-20C

A/T CONTROL SYSTEM

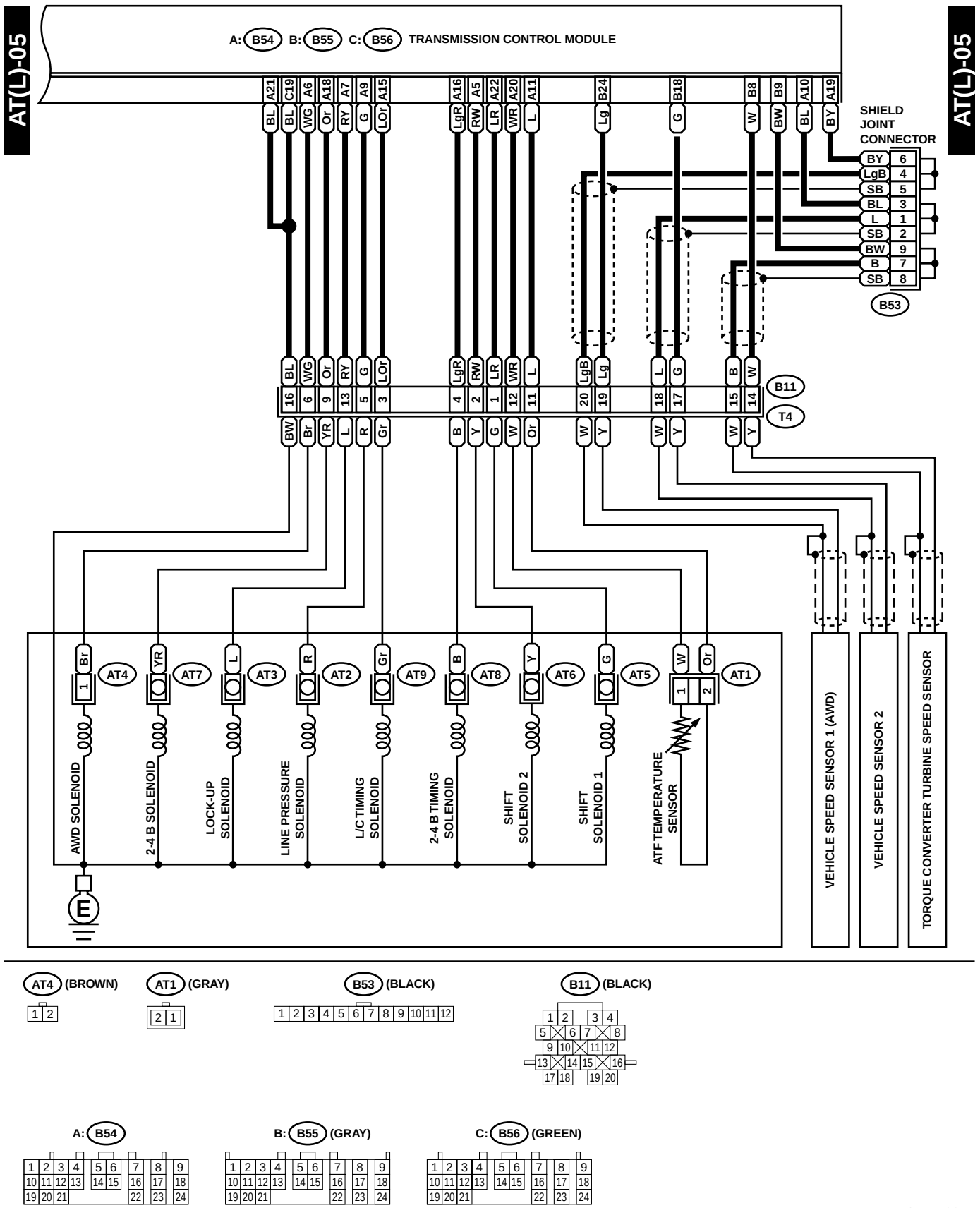
WIRING SYSTEM



GL41-20D

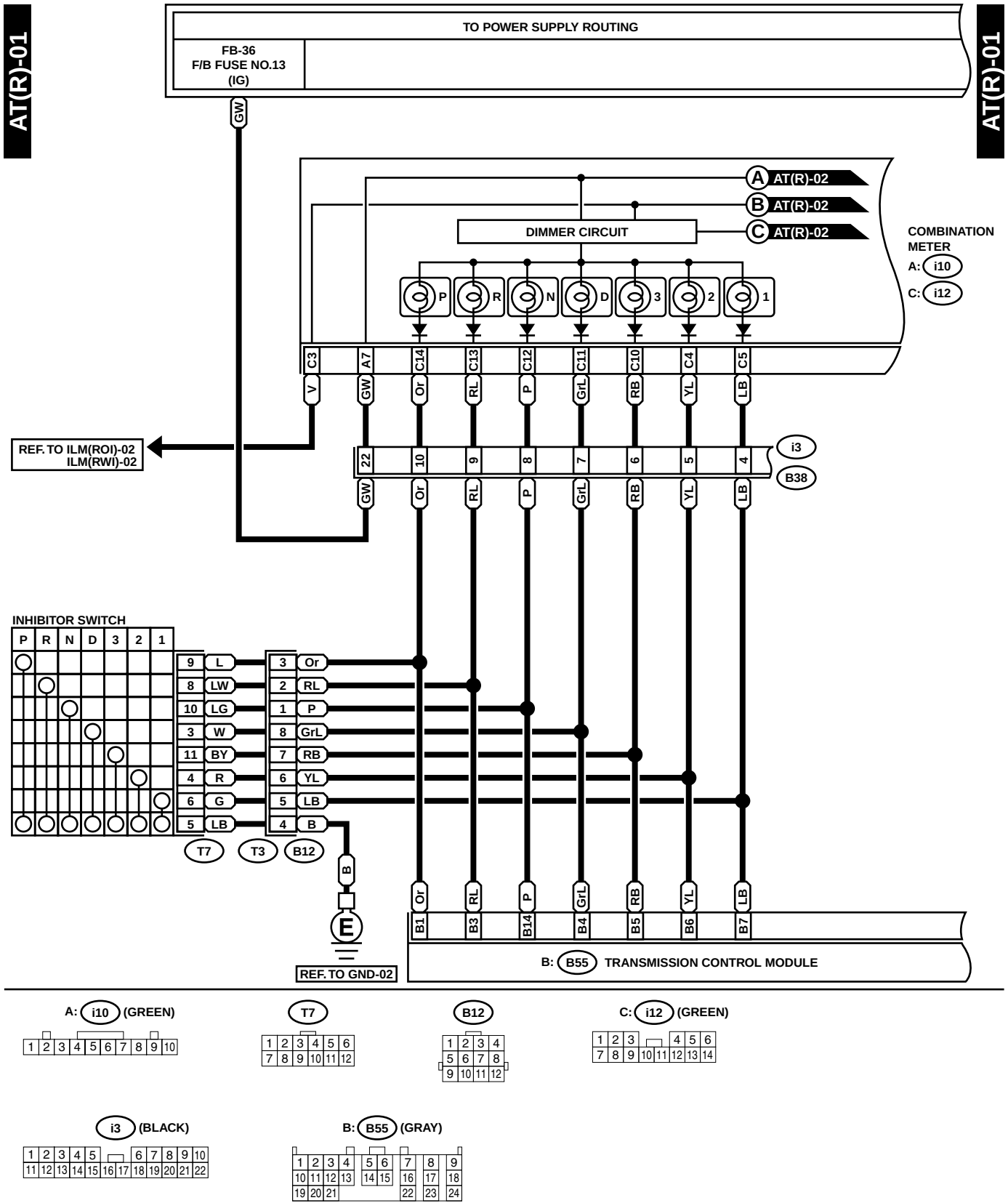
A/T CONTROL SYSTEM

WIRING SYSTEM



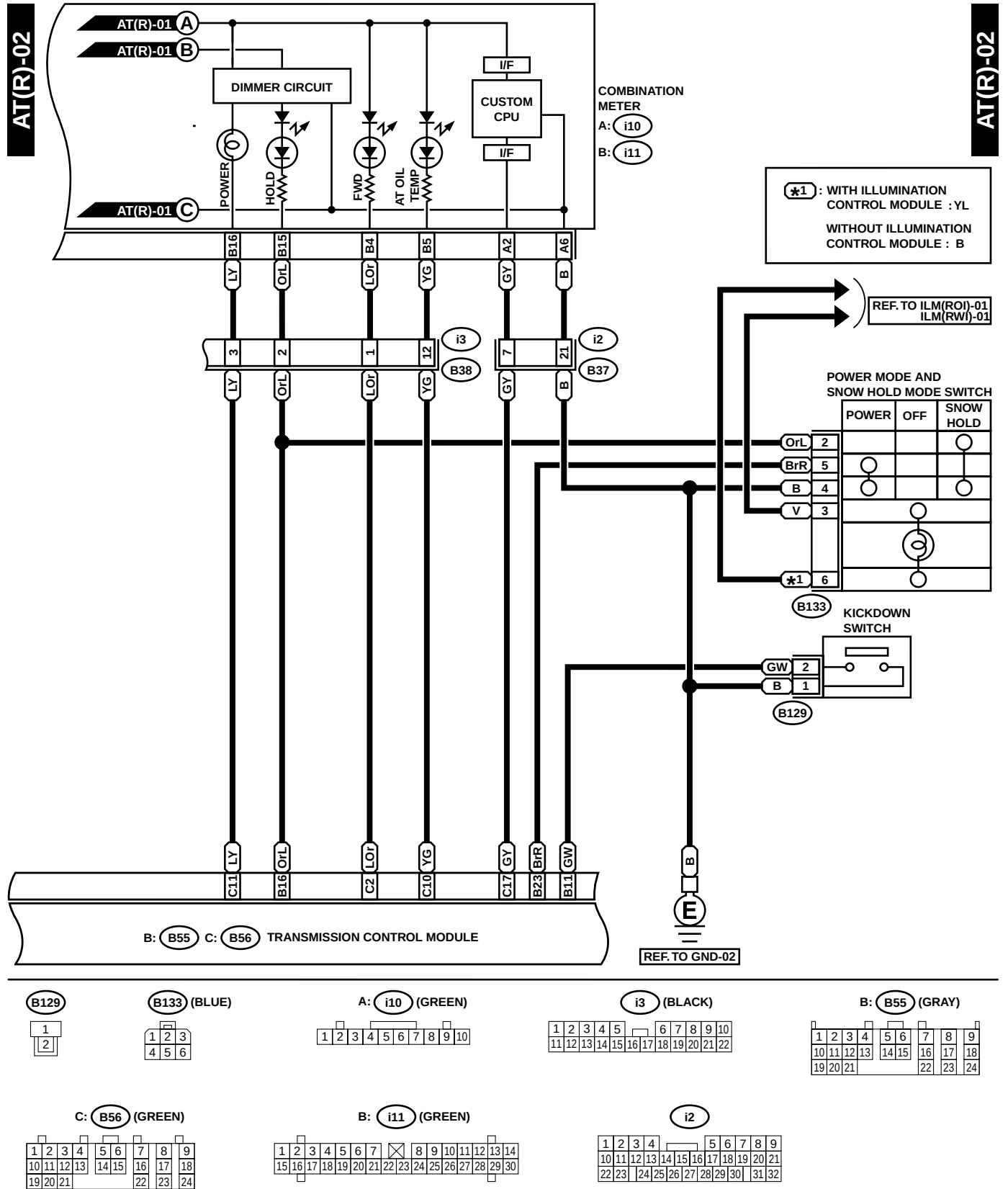
GL41-20E

2. RHD MODEL

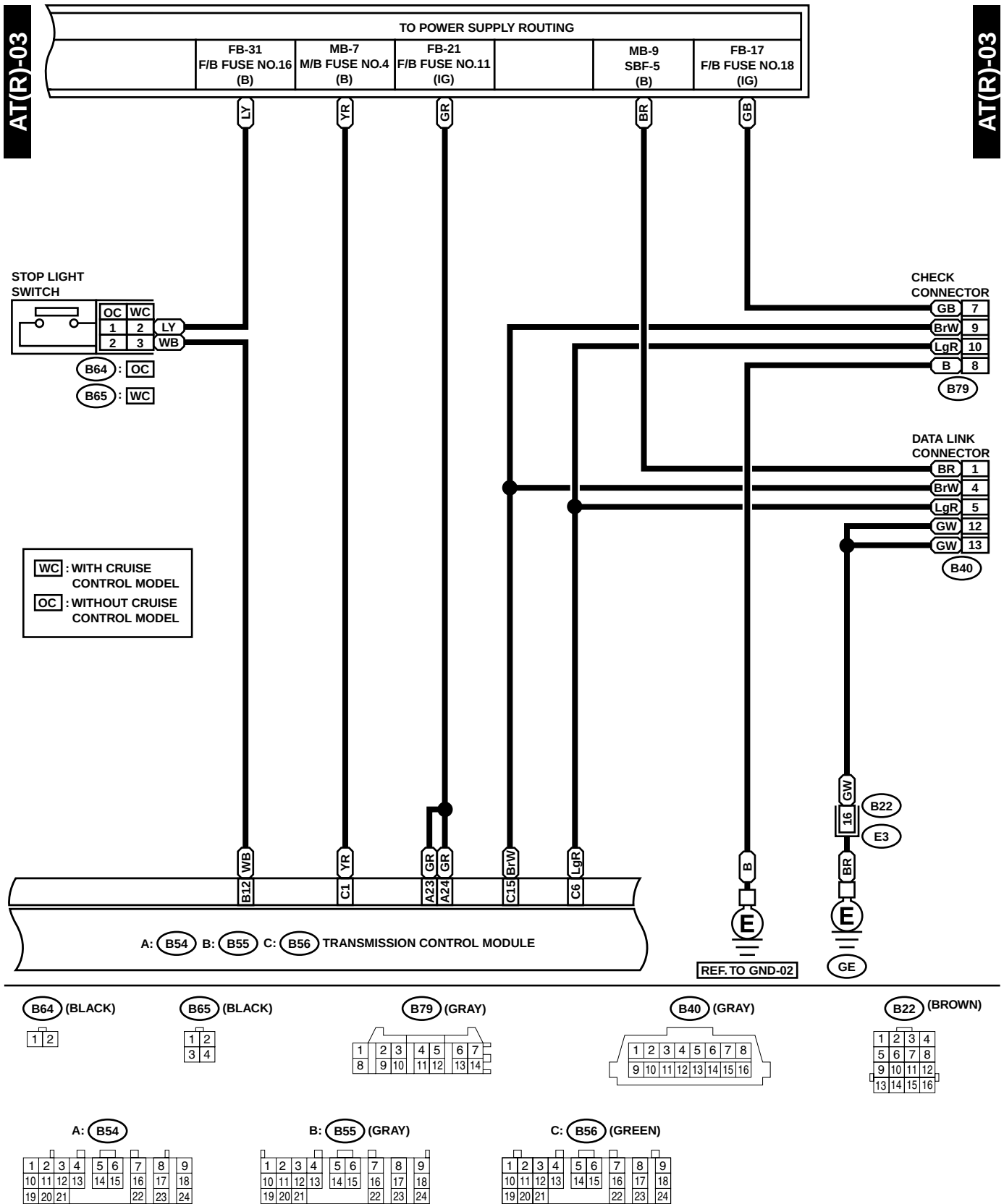


A/T CONTROL SYSTEM

WIRING SYSTEM

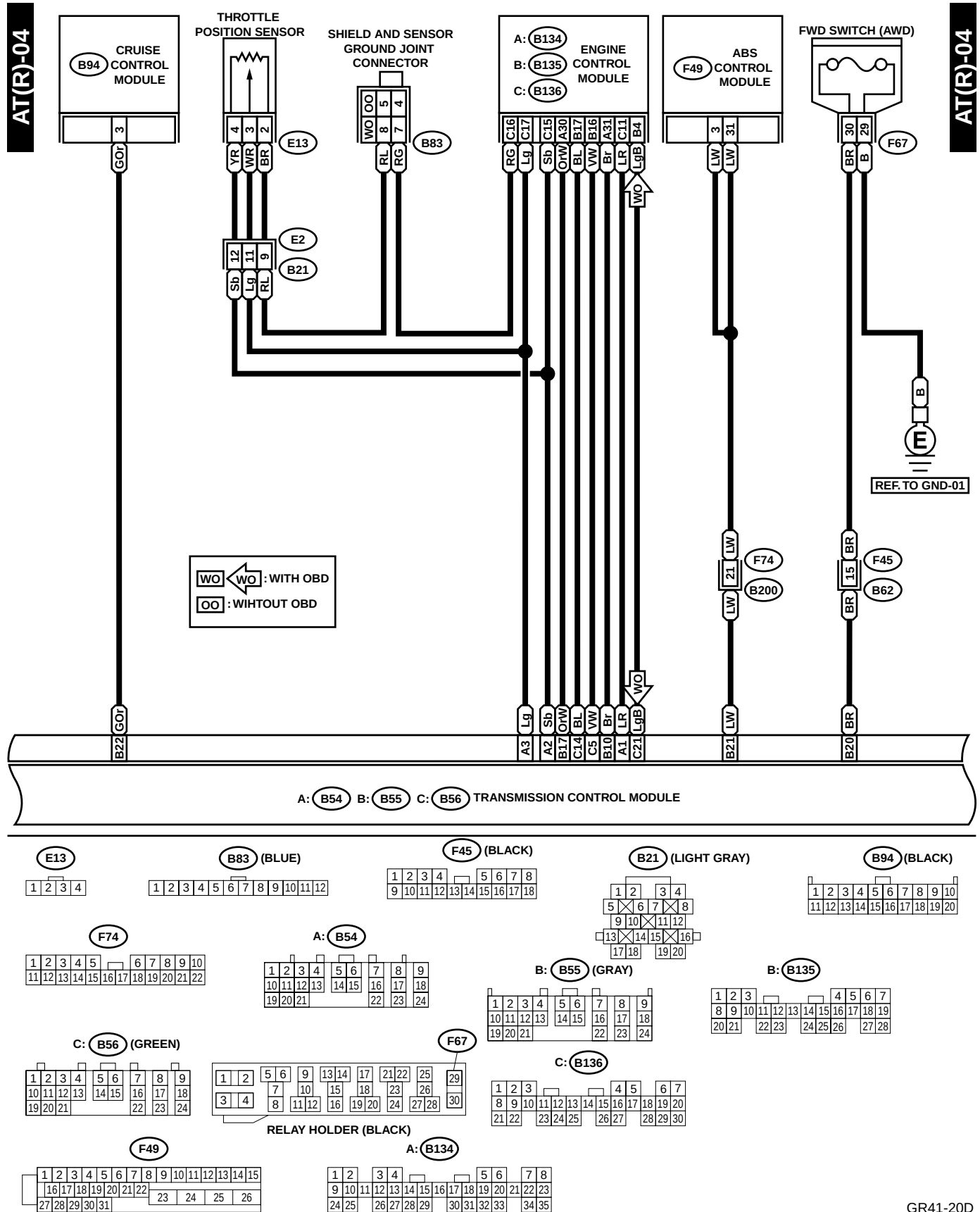


GR41-20B

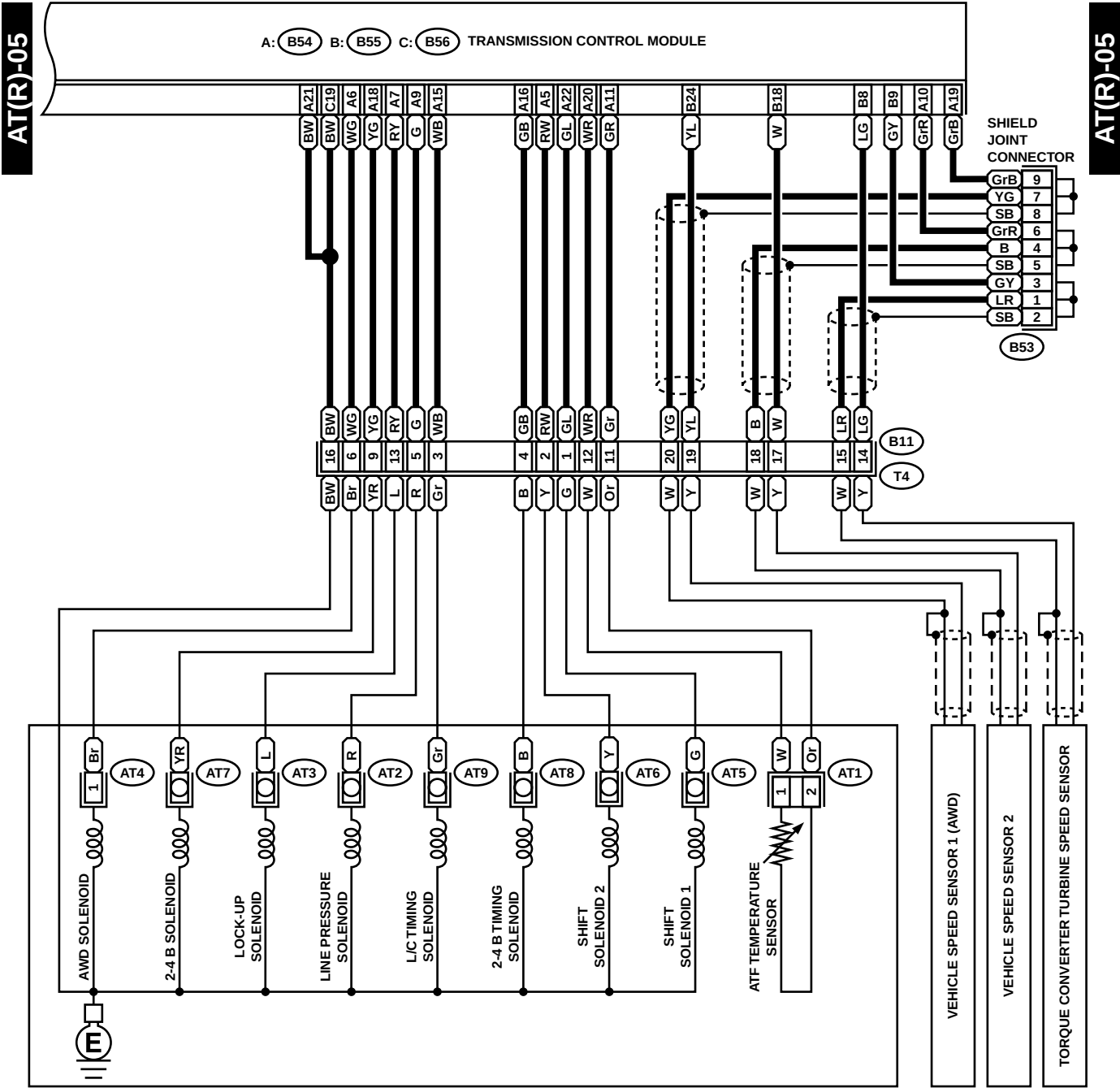


A/T CONTROL SYSTEM

WIRING SYSTEM



GR41-20D



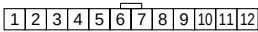
AT4 (BROWN)



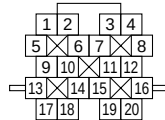
AT1 (GRAY)



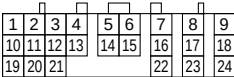
B53 (BLACK)



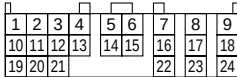
B11 (BLACK)



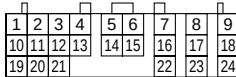
A: B54



B: B55 (GRAY)



C: B56 (GREEN)

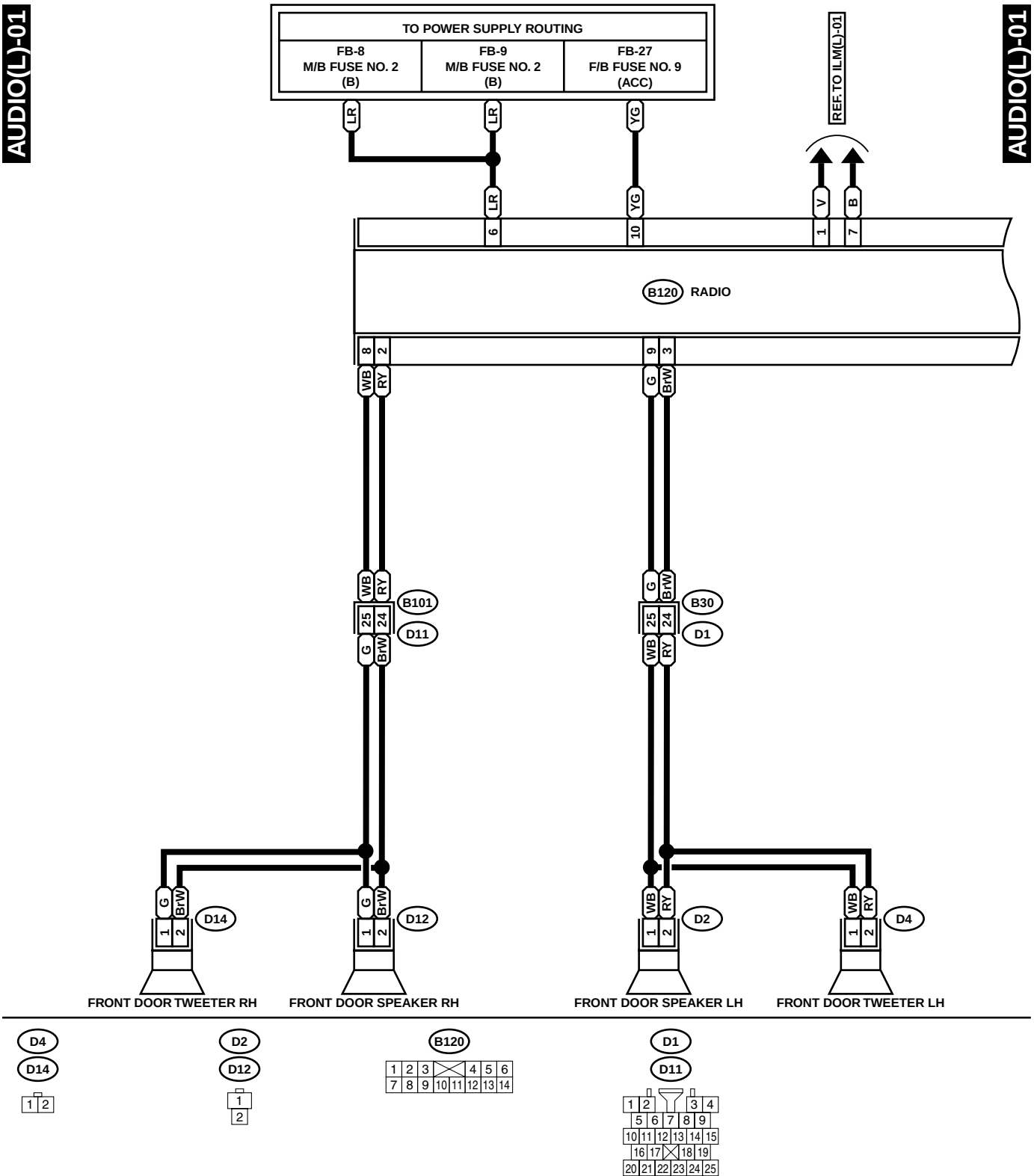


10.Audio System

A: SCHEMATIC

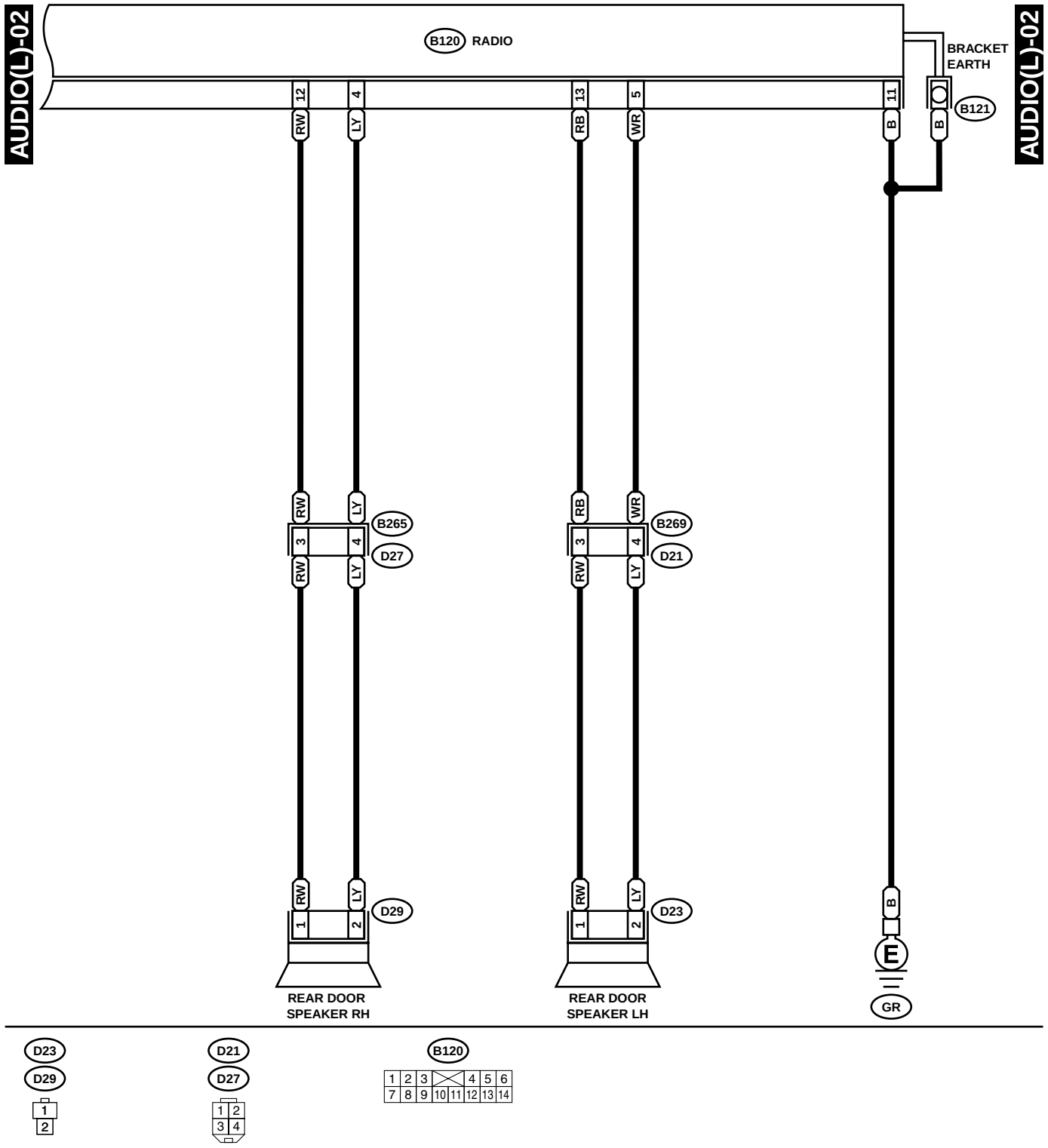
WIRING SYSTEM

AUDIO(L)-01

**WI-83**

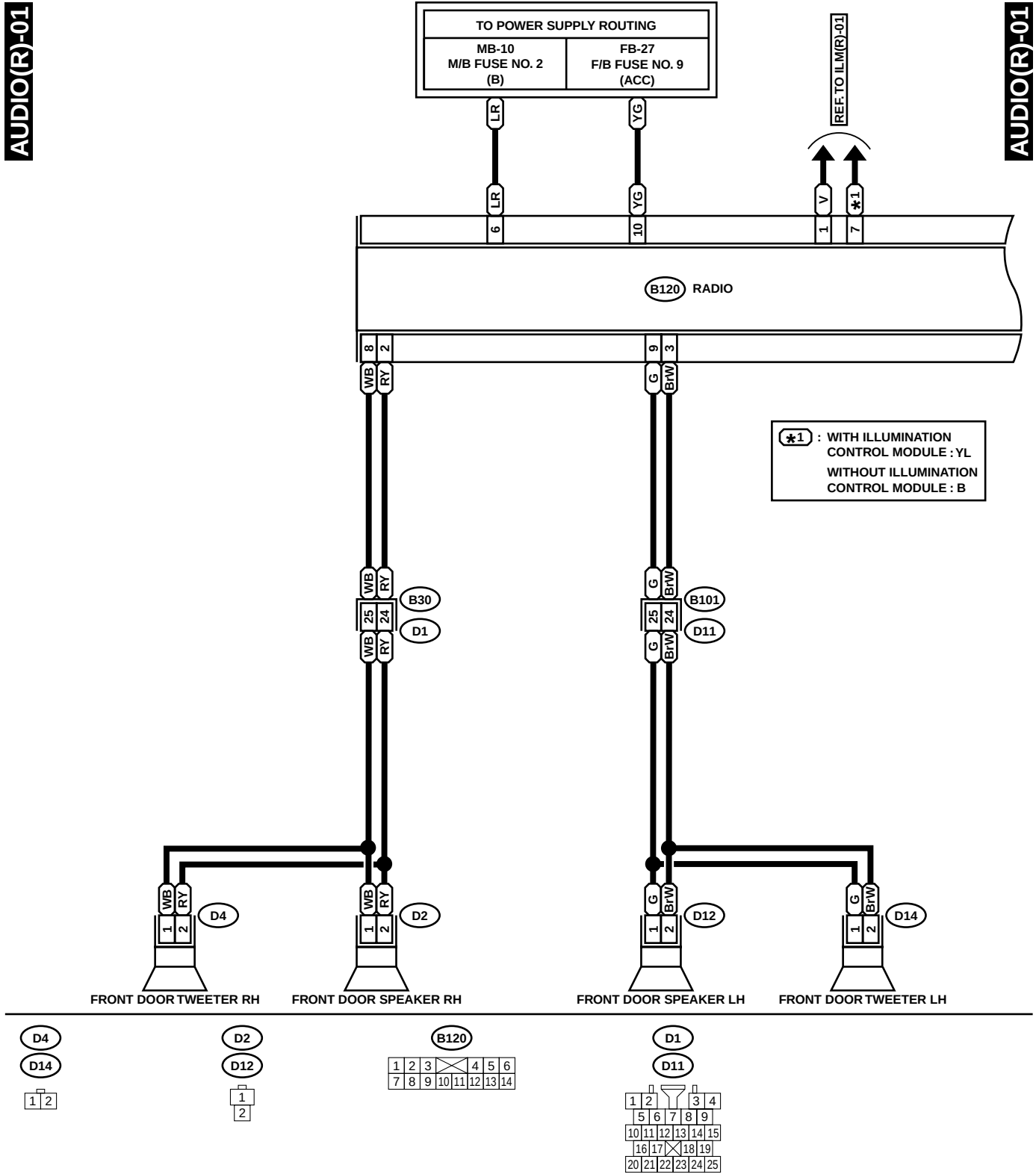
AUDIO SYSTEM

WIRING SYSTEM



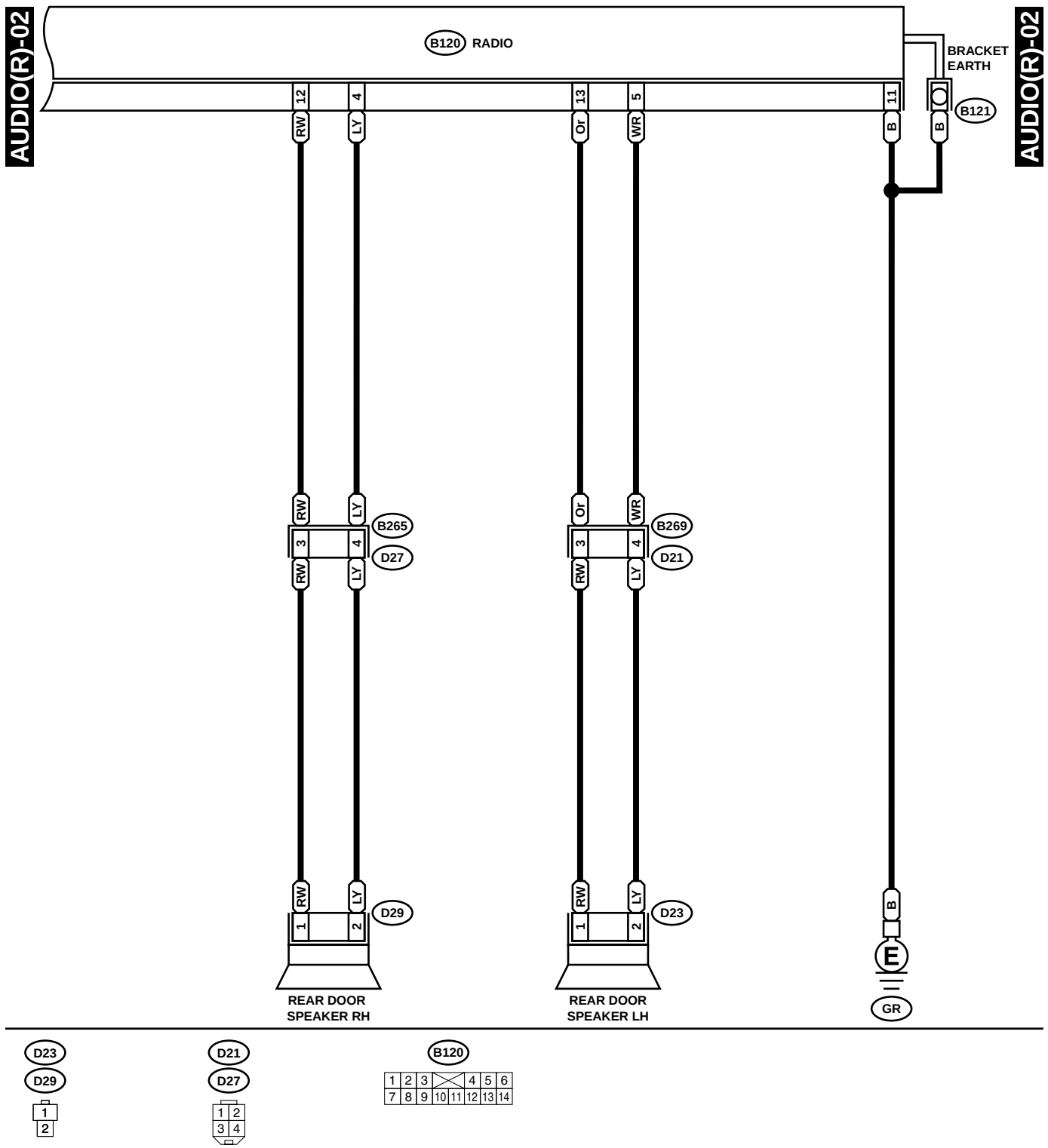
GL76-20B

2. RHD MODEL



AUDIO SYSTEM

WIRING SYSTEM



GR76-20B

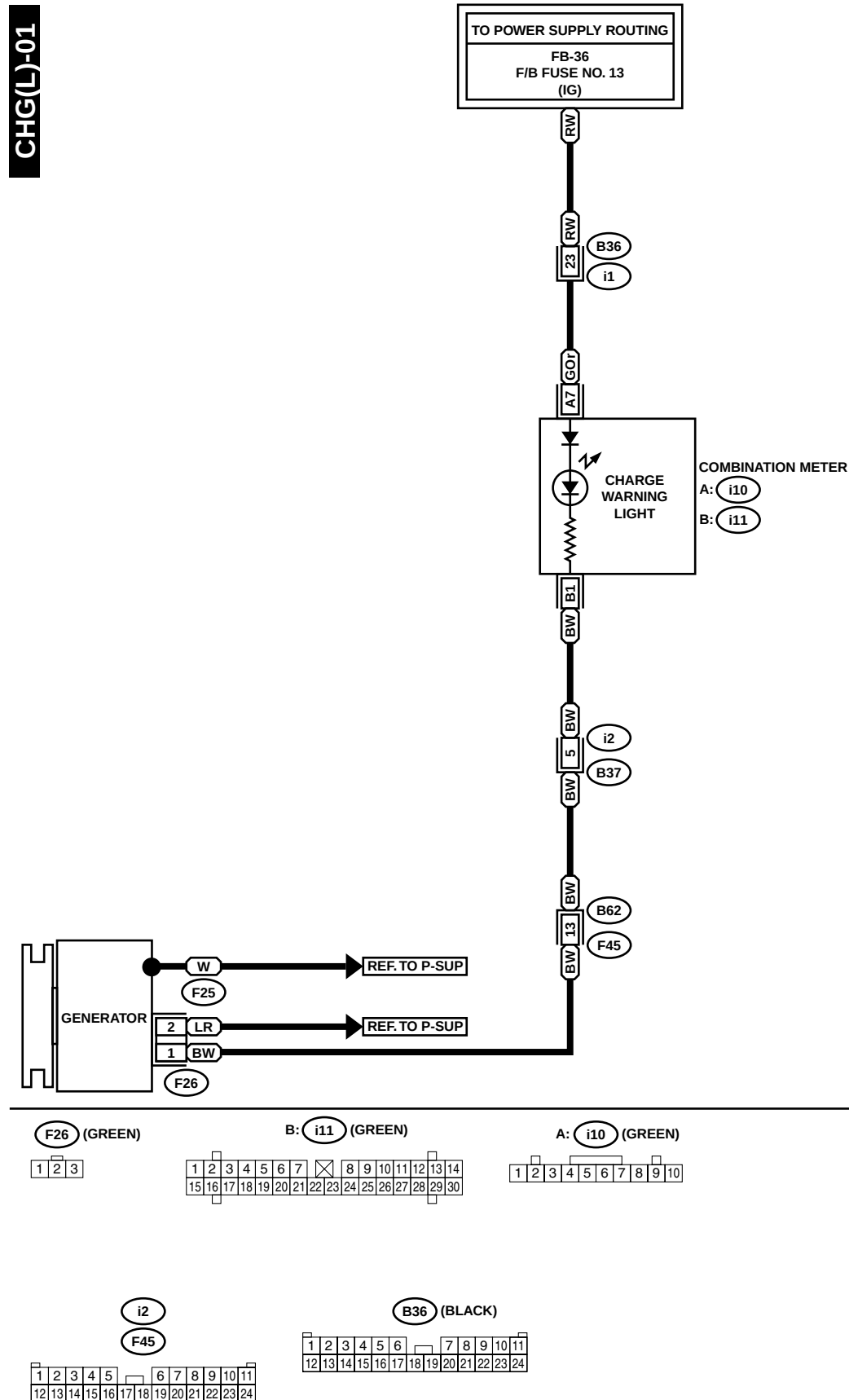
11.Charging System

A: SCHEMATIC

CHARGING SYSTEM

WIRING SYSTEM

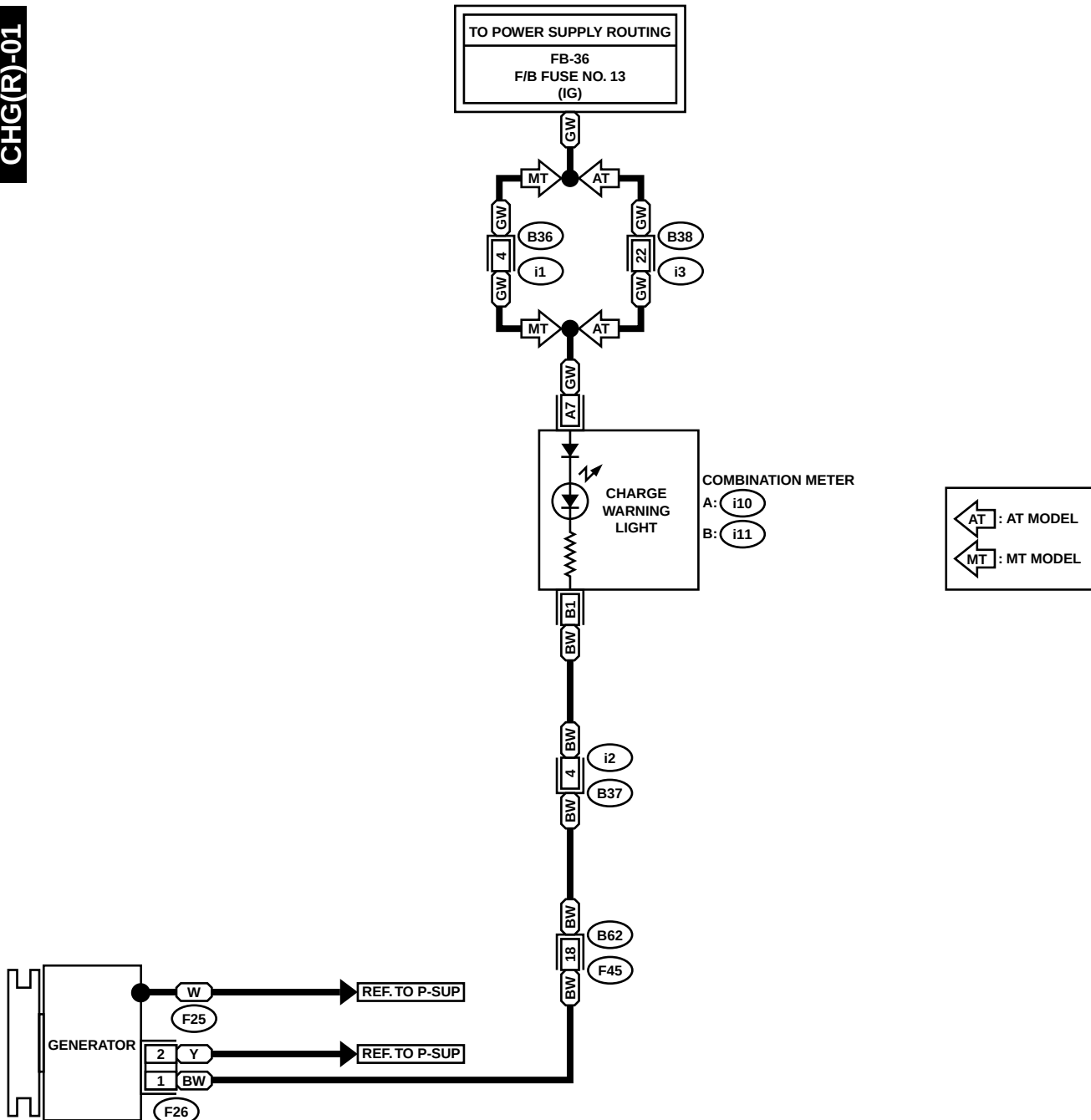
1. LHD MODEL



2. RHD MODEL

CHG(R)-01

CHG(R)-01



F26 (GREEN)

1	2	3
---	---	---

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	24	25	26	27	28	29	30

A: i10 (GREEN)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

i1 (BLACK)

1	2	3			4	5	6
7	8	9	10	11	12	13	14

i2

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

i3 (BLACK)

1	2	3	4	5		6	7	8	9	10	
11	12	13	14	15	16	17	18	19	20	21	22

F45 (BLACK)

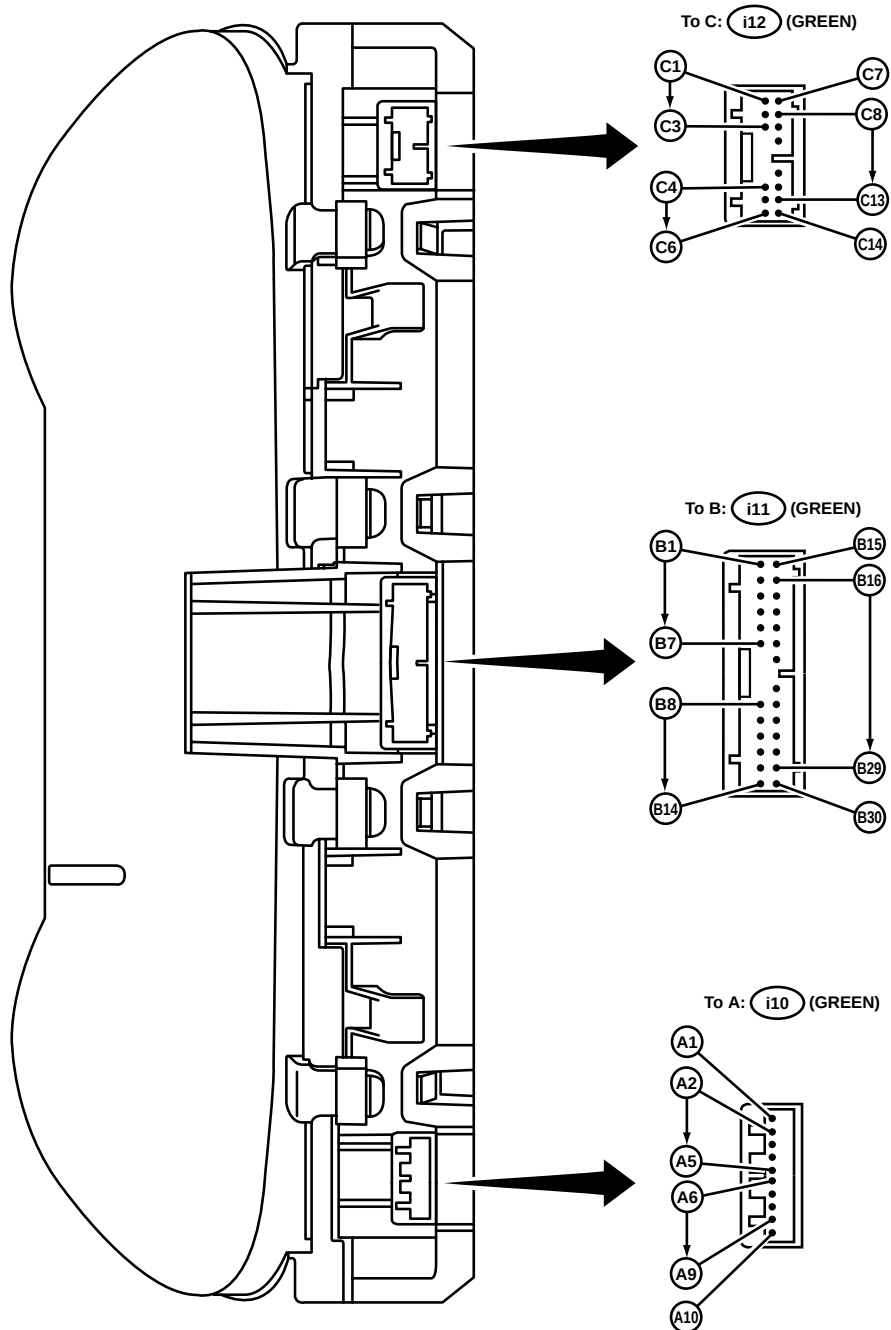
1	2	3	4		5	6	7	8	
9	10	11	12	13	14	15	16	17	18

12. Combination Meter

A: SCHEMATIC

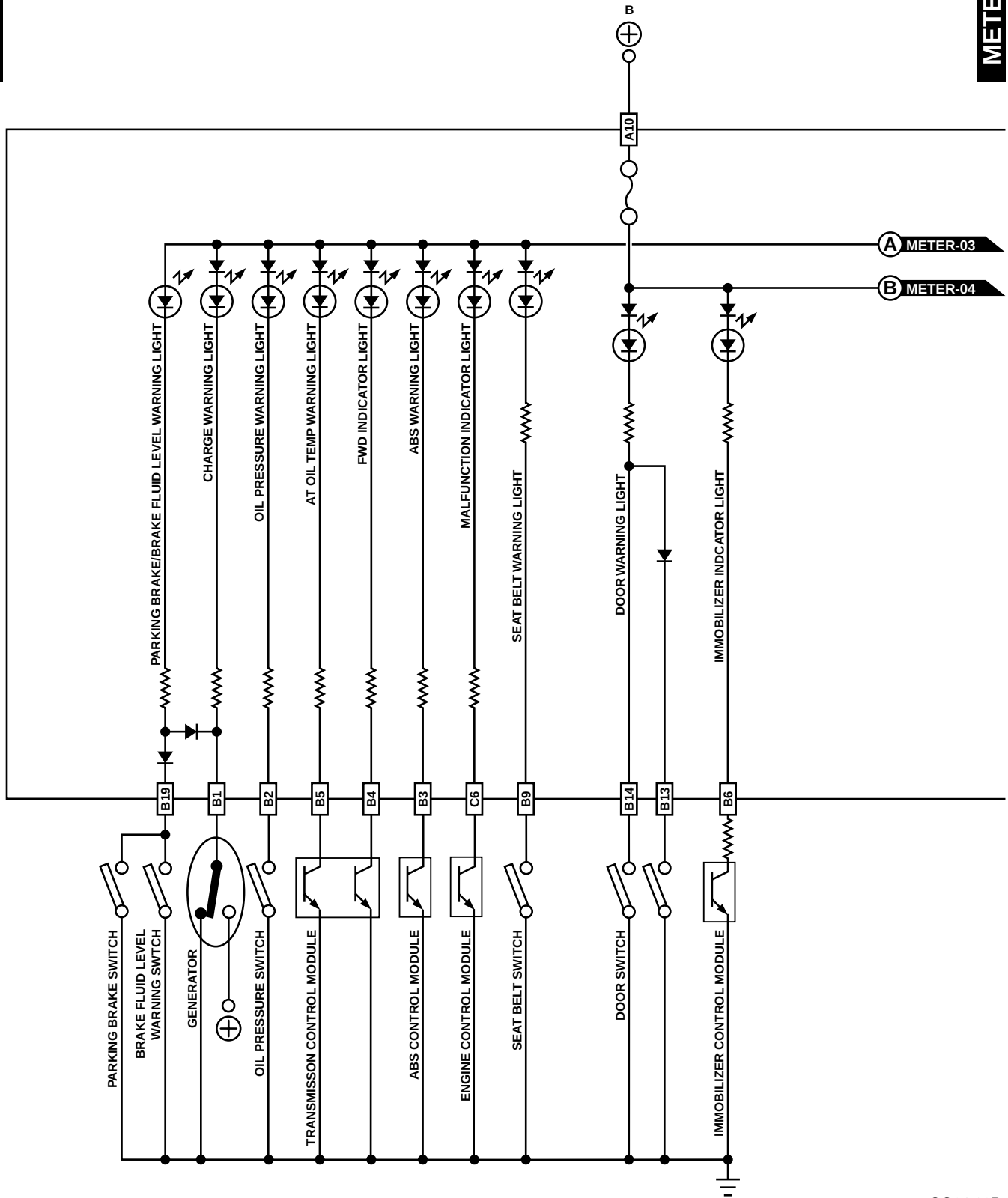
METER-01

METER-01



METER-02

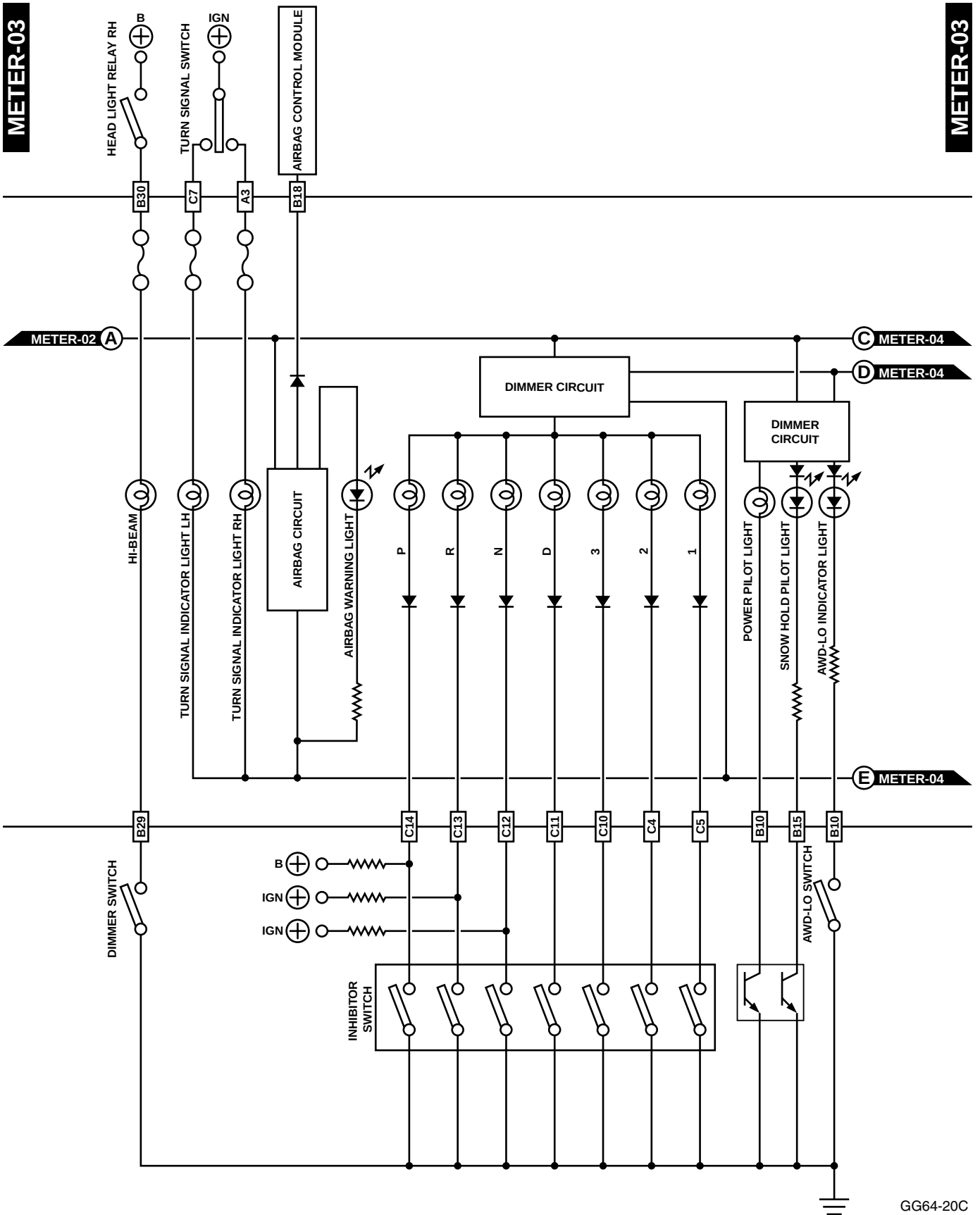
METER-02



GG64-20B

COMBINATION METER

WIRING SYSTEM

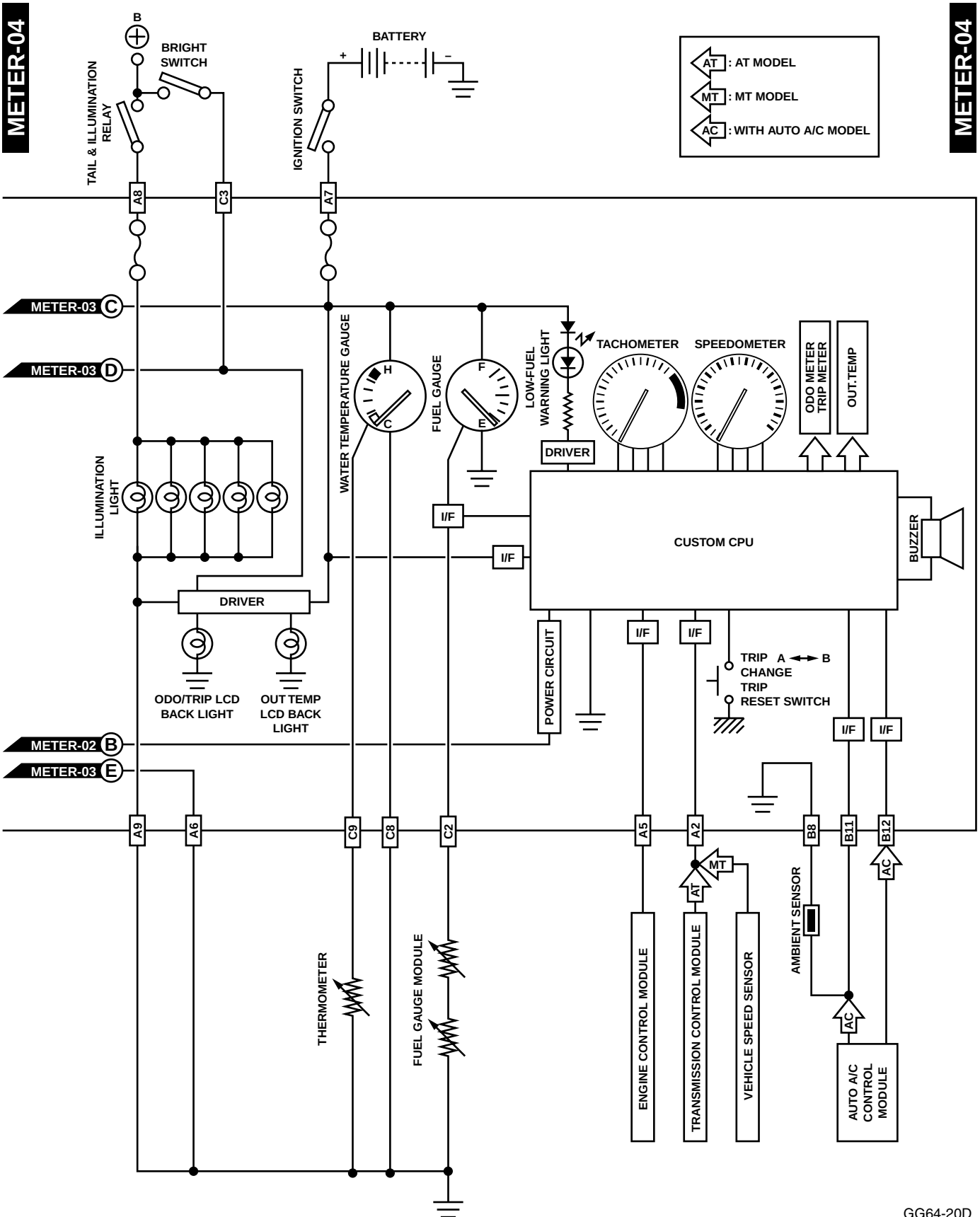


GG64-20C

COMBINATION METER

WIRING SYSTEM

METER-04



METER-04

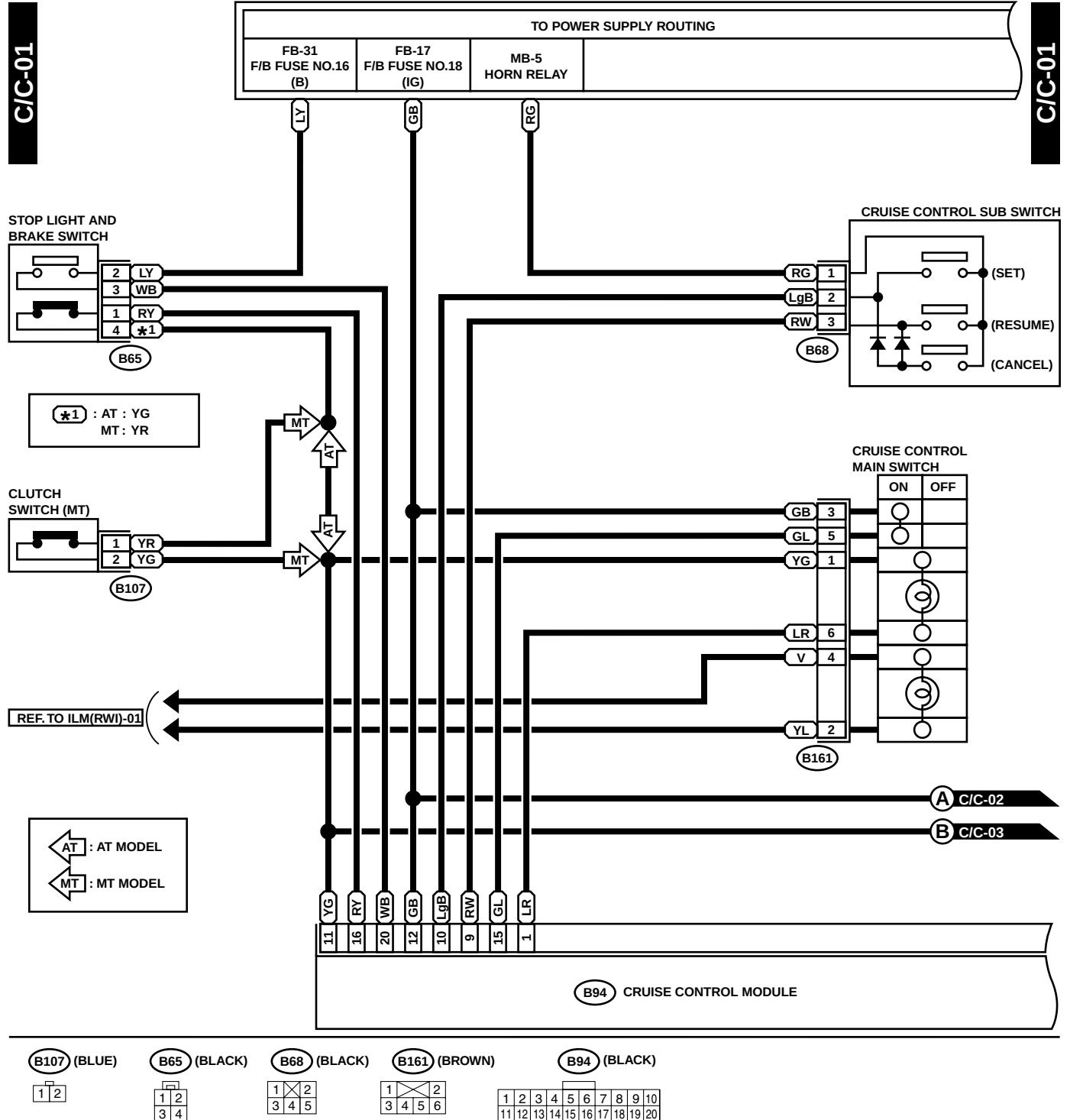
GG64-20D

CRUISE CONTROL SYSTEM

WIRING SYSTEM

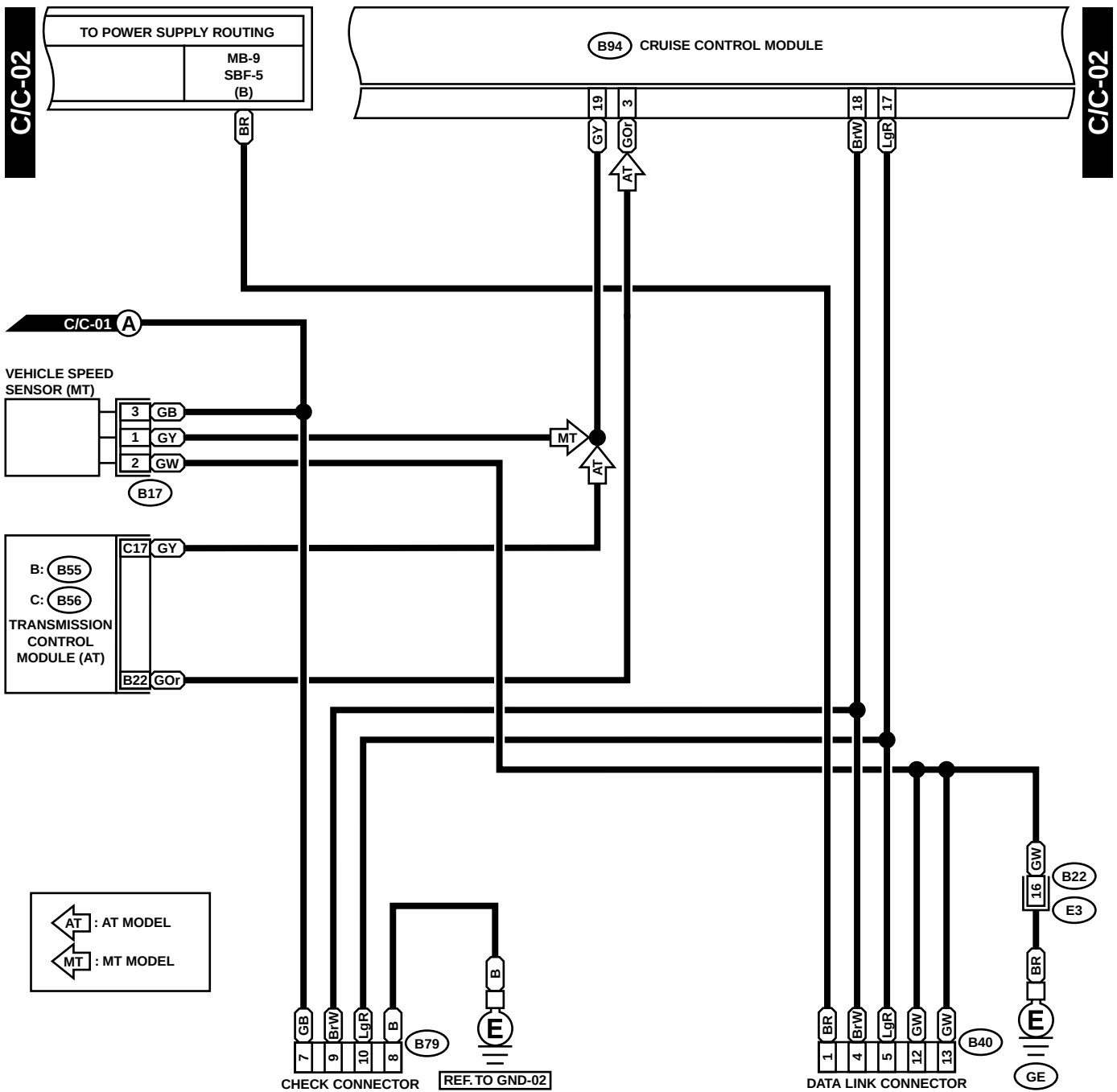
13. Cruise Control System

A: SCHEMATIC



CRUISE CONTROL SYSTEM

WIRING SYSTEM



(B17) (BLACK)

1	2	3
---	---	---

(F44)

1	2	3	4
5	6	7	8

(B79) (GRAY)

1	2	3	4	5	6	7
8	9	10	11	12	13	14

(B40) (GRAY)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

(B22) (BROWN)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

(B94) (BLACK)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

B: (B55) (GRAY)

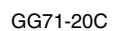
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24			

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			

GG71-20B

WIRING SYSTEM



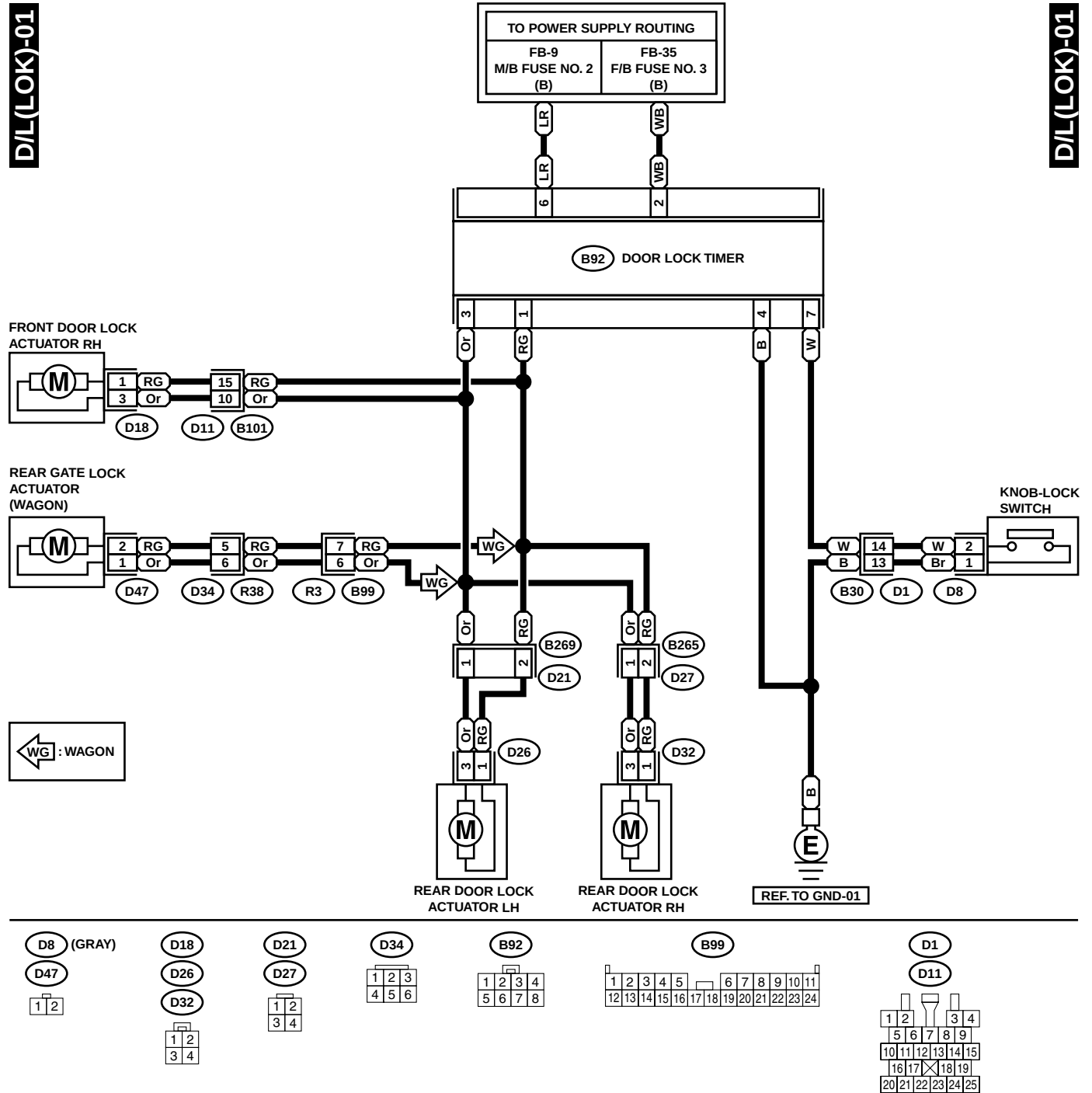
14.Door Lock System

A: SCHEMATIC

DOOR LOCK SYSTEM

WIRING SYSTEM

1. LHD WITHOUT KEYLESS ENTRY MODEL



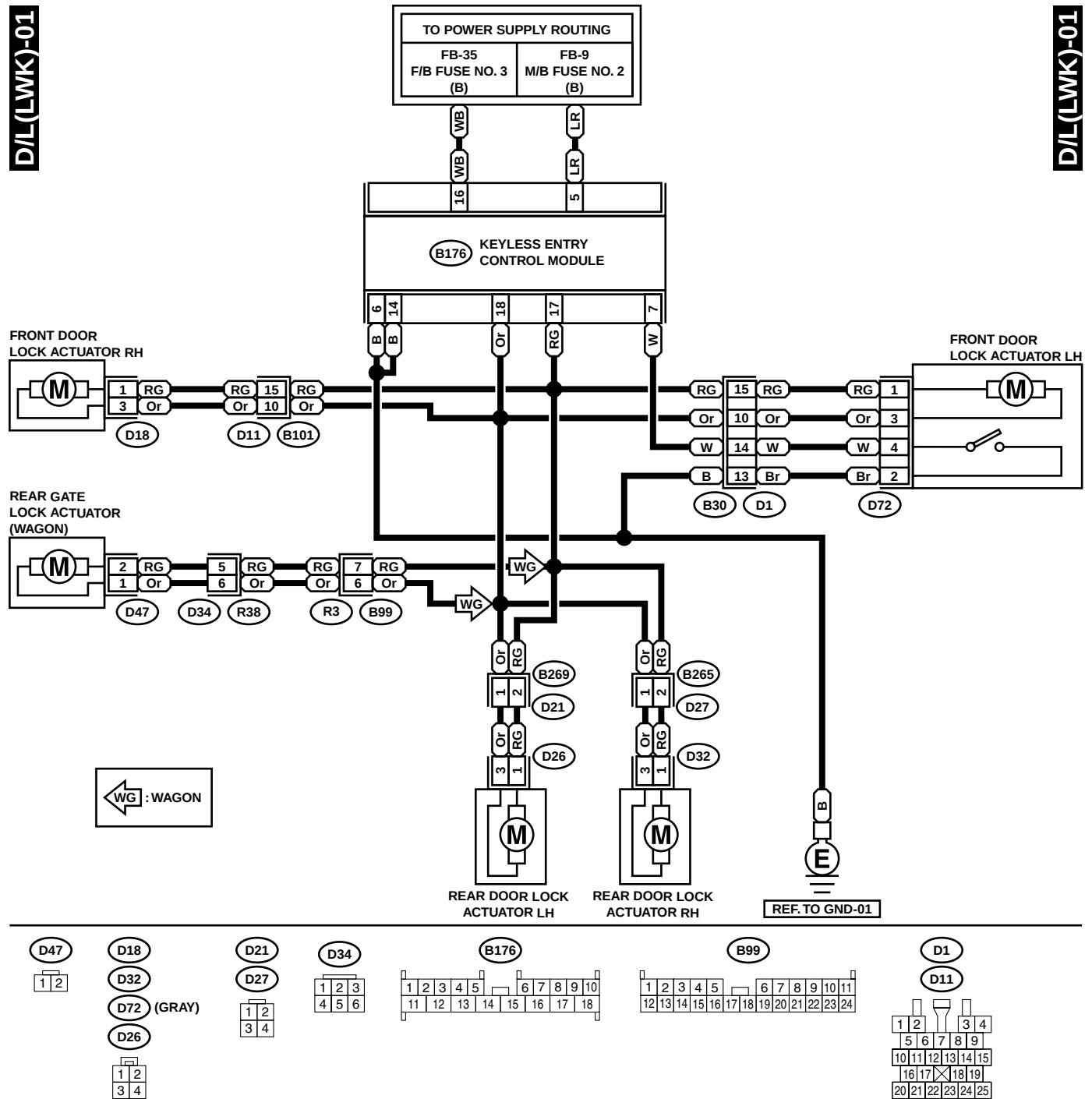
WIRING SYSTEM

WIRING SYSTEM

2. LHD WITH KEYLESS ENTRY MODEL

D/L(LWK)-01

D/L(LWK)-01



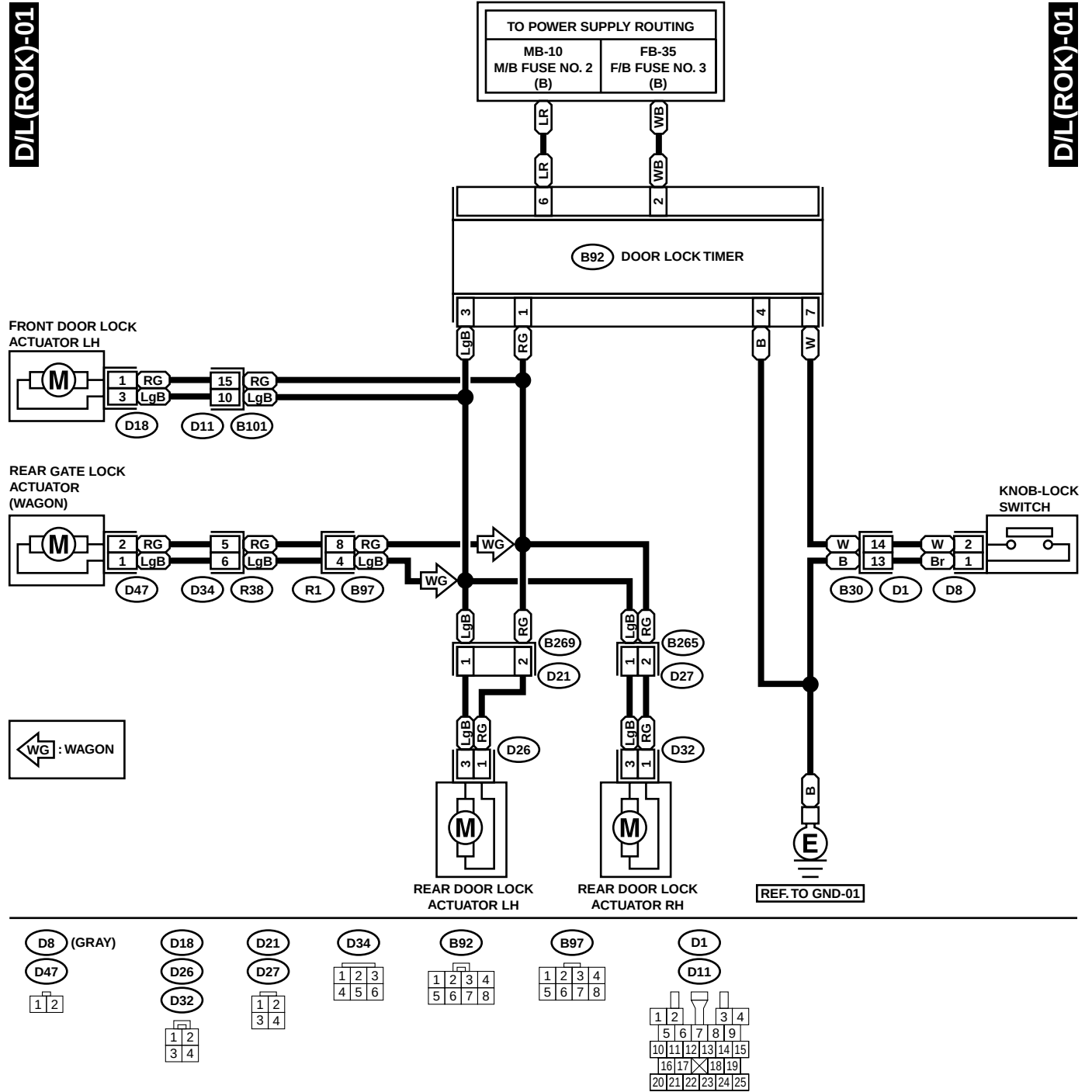
DOOR LOCK SYSTEM

WIRING SYSTEM

3. RHD WITHOUT KEYLESS ENTRY MODEL

D/L(ROK)-01

D/L(ROK)-01

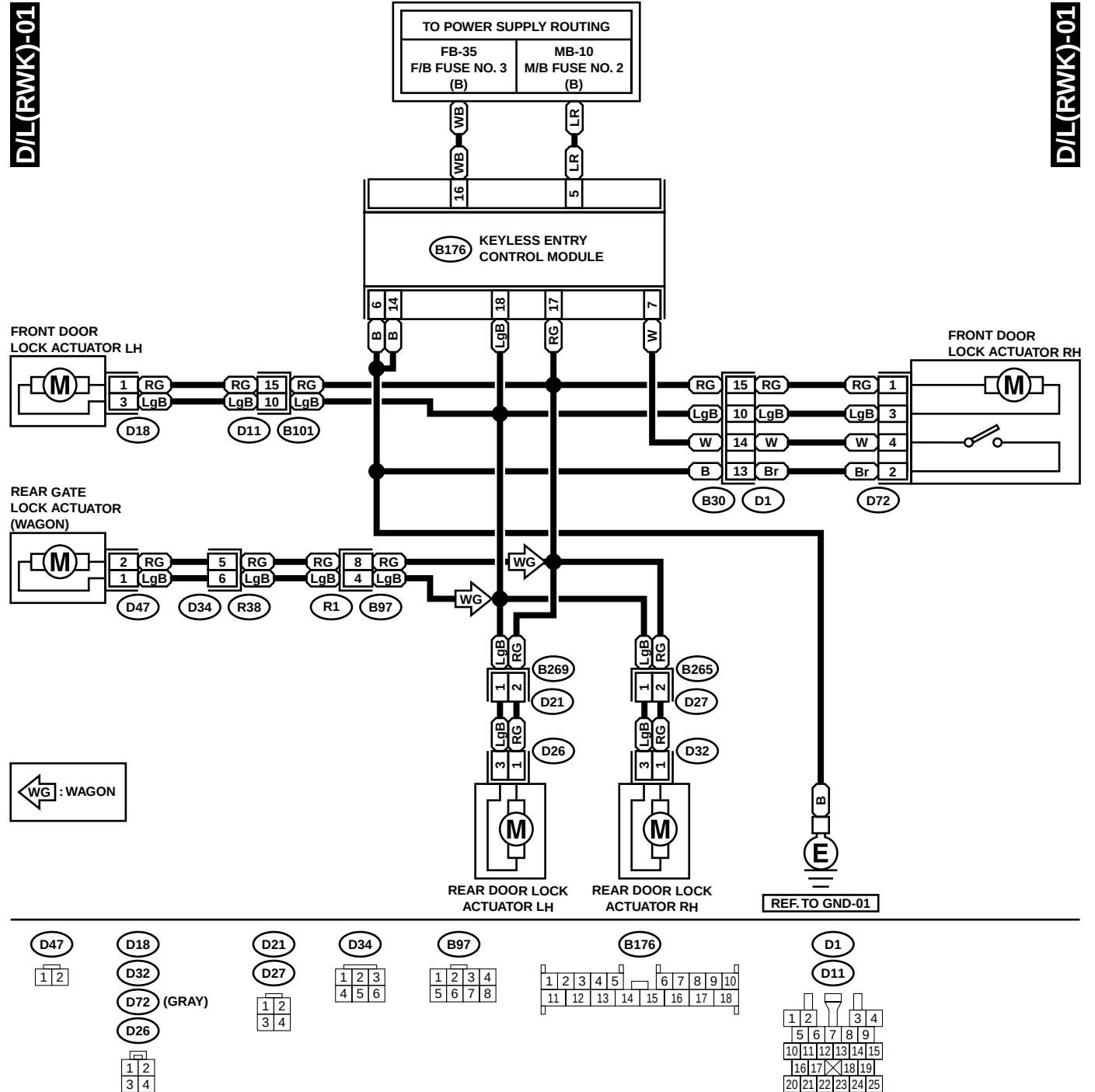


GR73-21

DOOR LOCK SYSTEM

WIRING SYSTEM

4. RHD WITH KEYLESS ENTRY MODEL



WIRING SYSTEM SECTION

WIRING SYSTEMWI

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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15.Engine Coolant Temperature Gauge System

A: SCHEMATIC

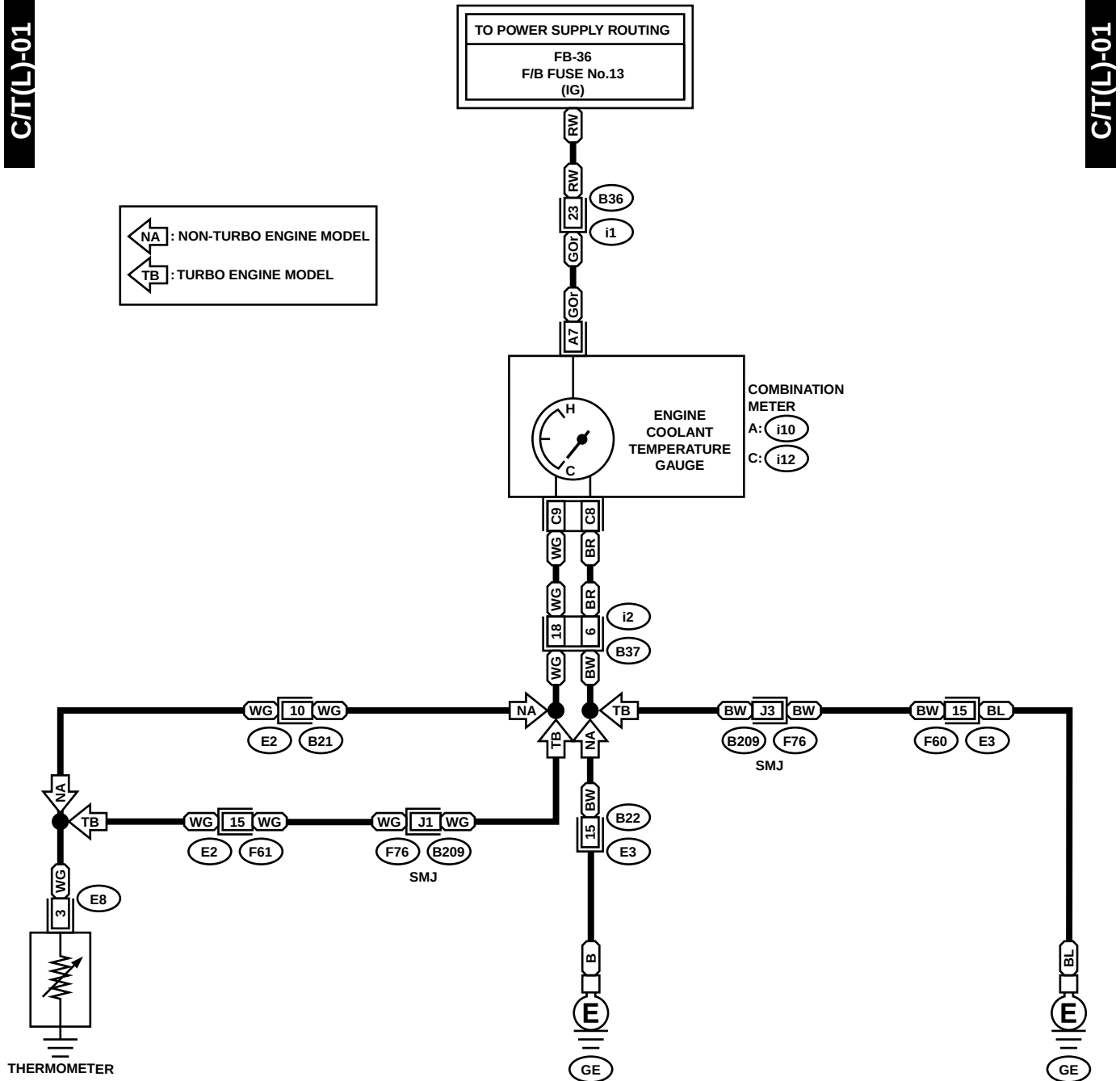
ENGINE COOLANT TEMPERATURE GAUGE SYSTEM

WIRING SYSTEM

1. LHD MODEL

C/T(L)-01

C/T(L)-01



E8 (LIGHT GRAY)



C: i12 (GREEN)



B22 (BROWN) : NA



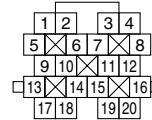
F60 (BROWN) : TB



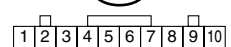
B21 (LIGHT GRAY) : NA



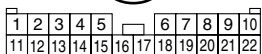
F61 (BLACK) : TB



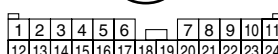
A: i10 (GREEN)



i2



B36 (BLACK)



GL68-20

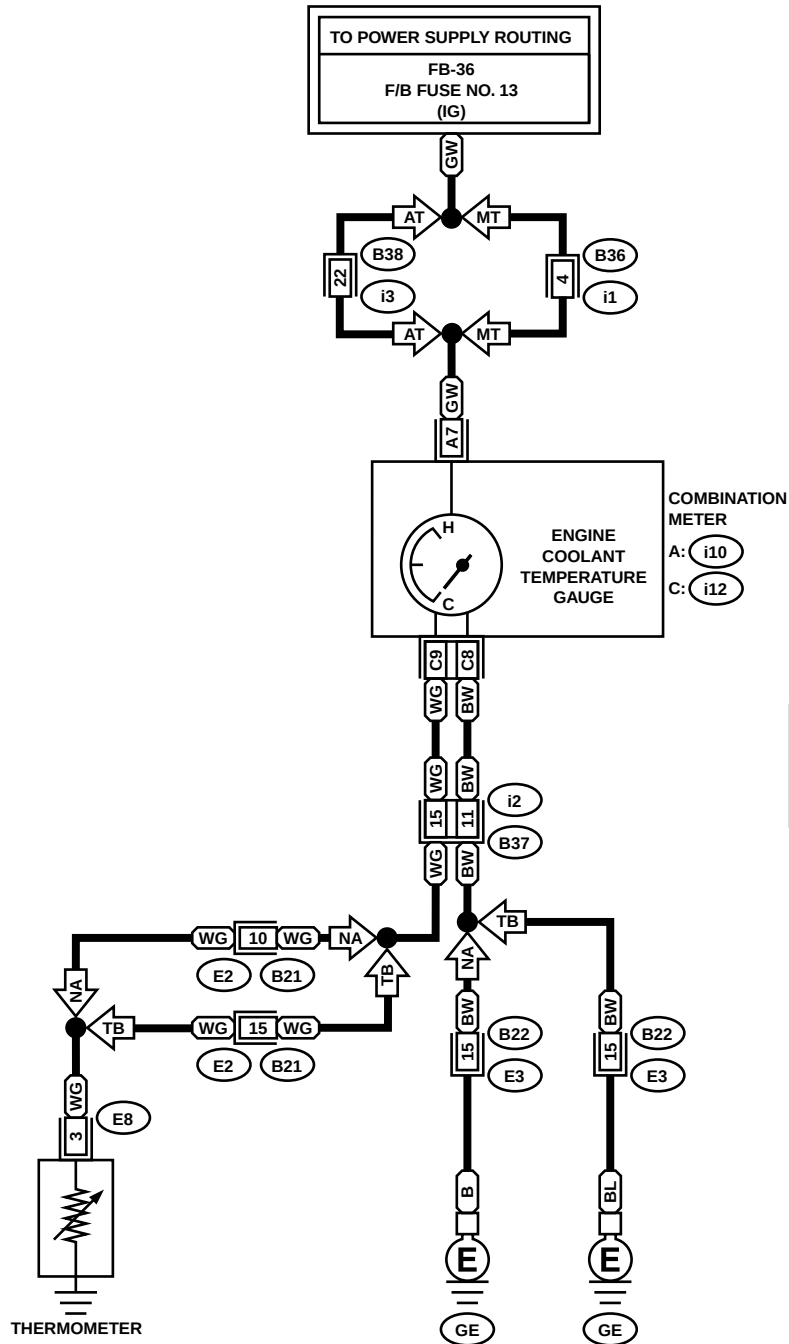
ENGINE COOLANT TEMPERATURE GAUGE SYSTEM

WIRING SYSTEM

2. RHD MODEL

C/T(R)-01

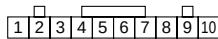
C/T(R)-01



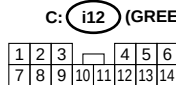
E8 (LIGHT GRAY)



A: i10 (GREEN)



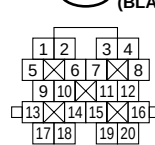
i1 (BLACK)
C: i12 (GREEN)



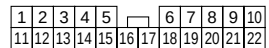
B22 (BROWN)



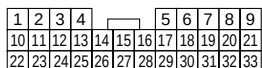
B21 (LIGHT GRAY) : NA
(BLACK) : TB



i3 (BLACK)



i2



GR68-20

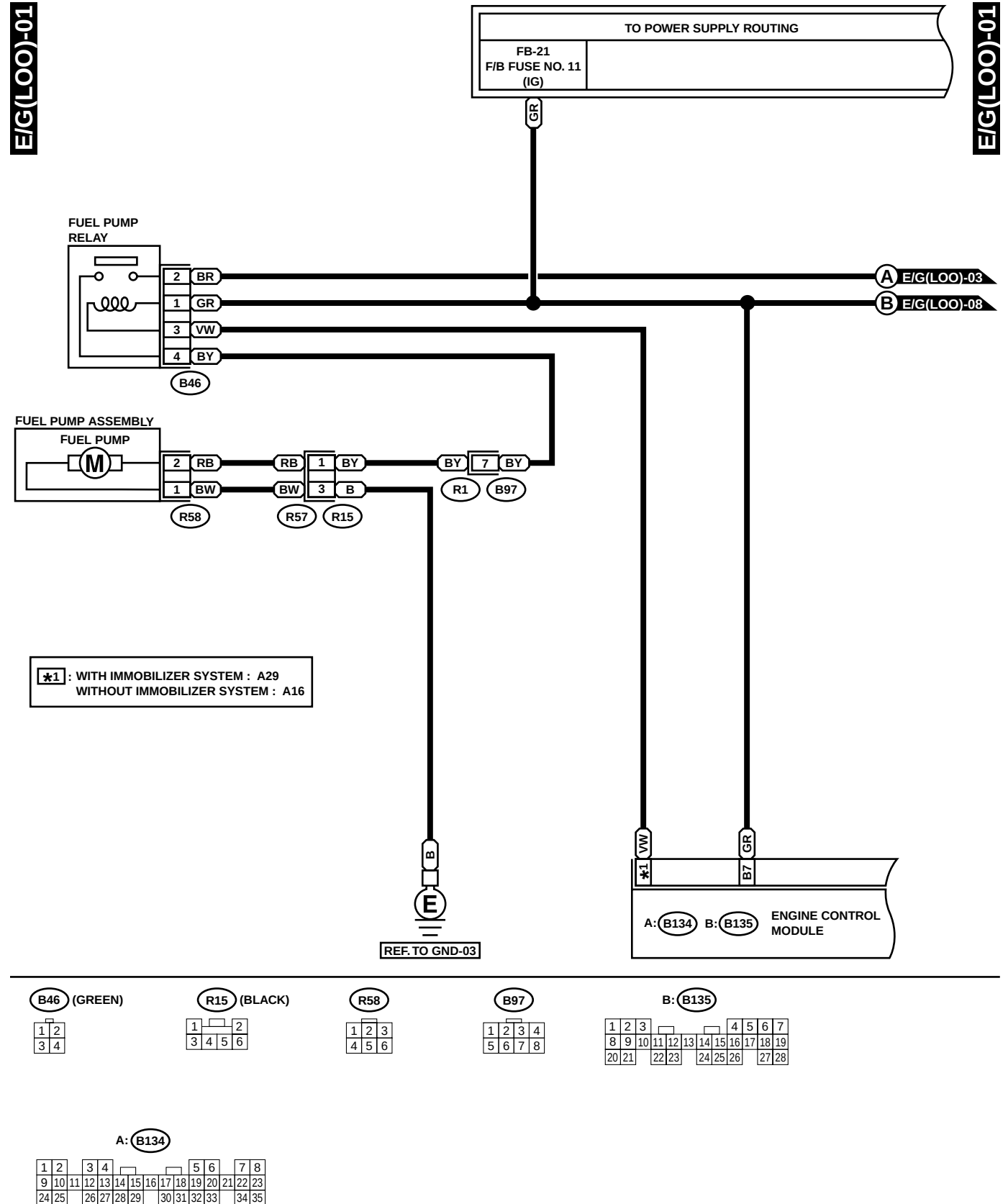
16.Engine Electrical System

A: SCHEMATIC

ENGINE ELECTRICAL SYSTEM

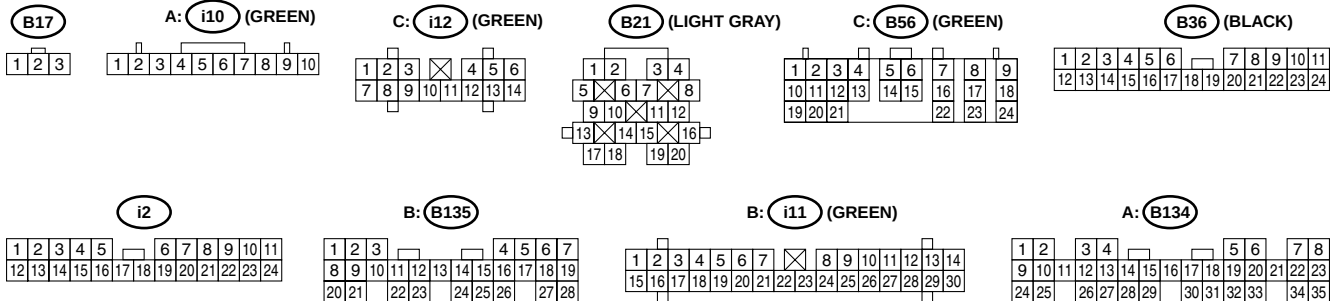
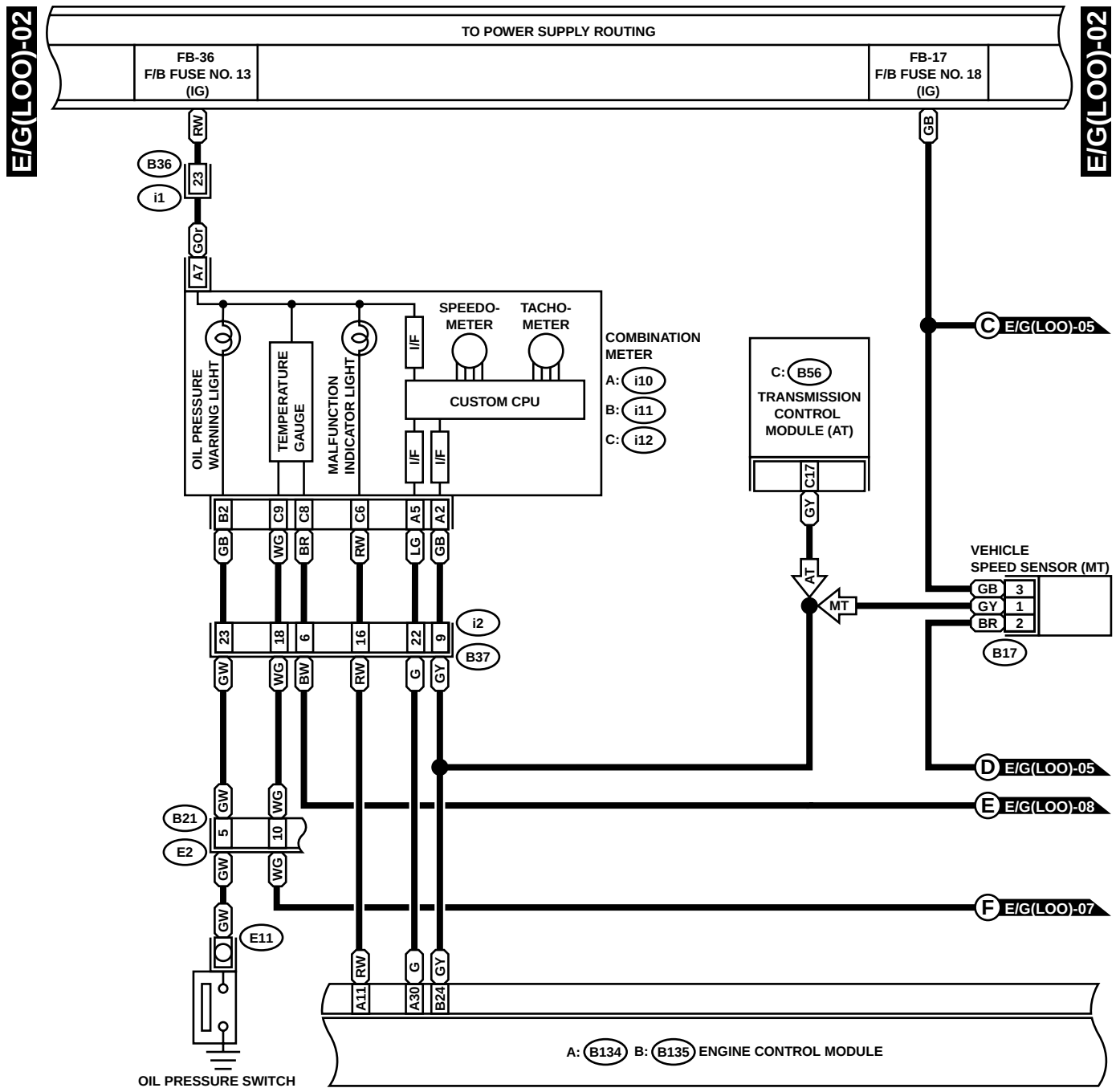
WIRING SYSTEM

1. LHD SOHC W/O OBD MODEL



ENGINE ELECTRICAL SYSTEM

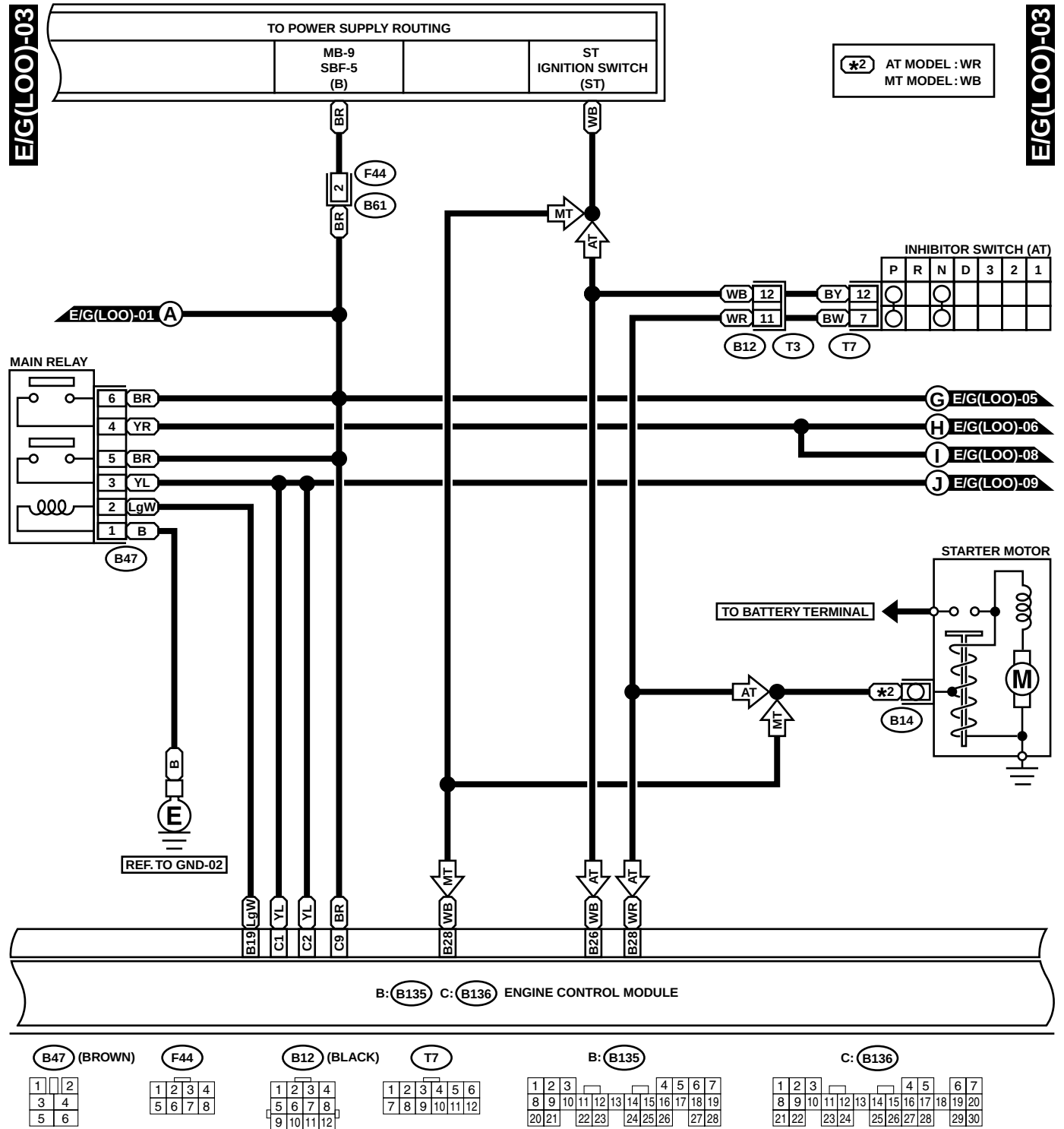
WIRING SYSTEM



GL10-20B

ENGINE ELECTRICAL SYSTEM

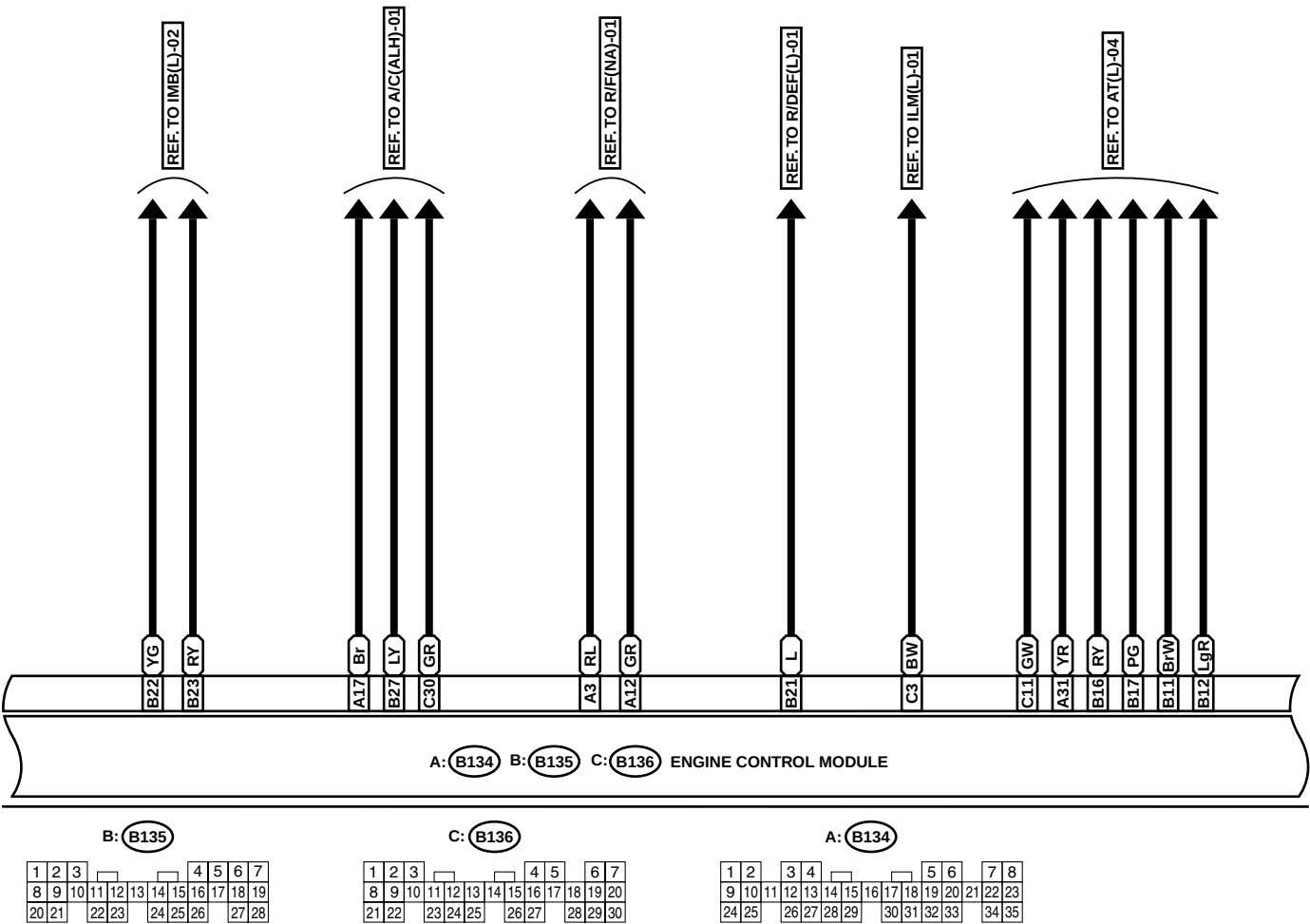
WIRING SYSTEM



GL10-20C

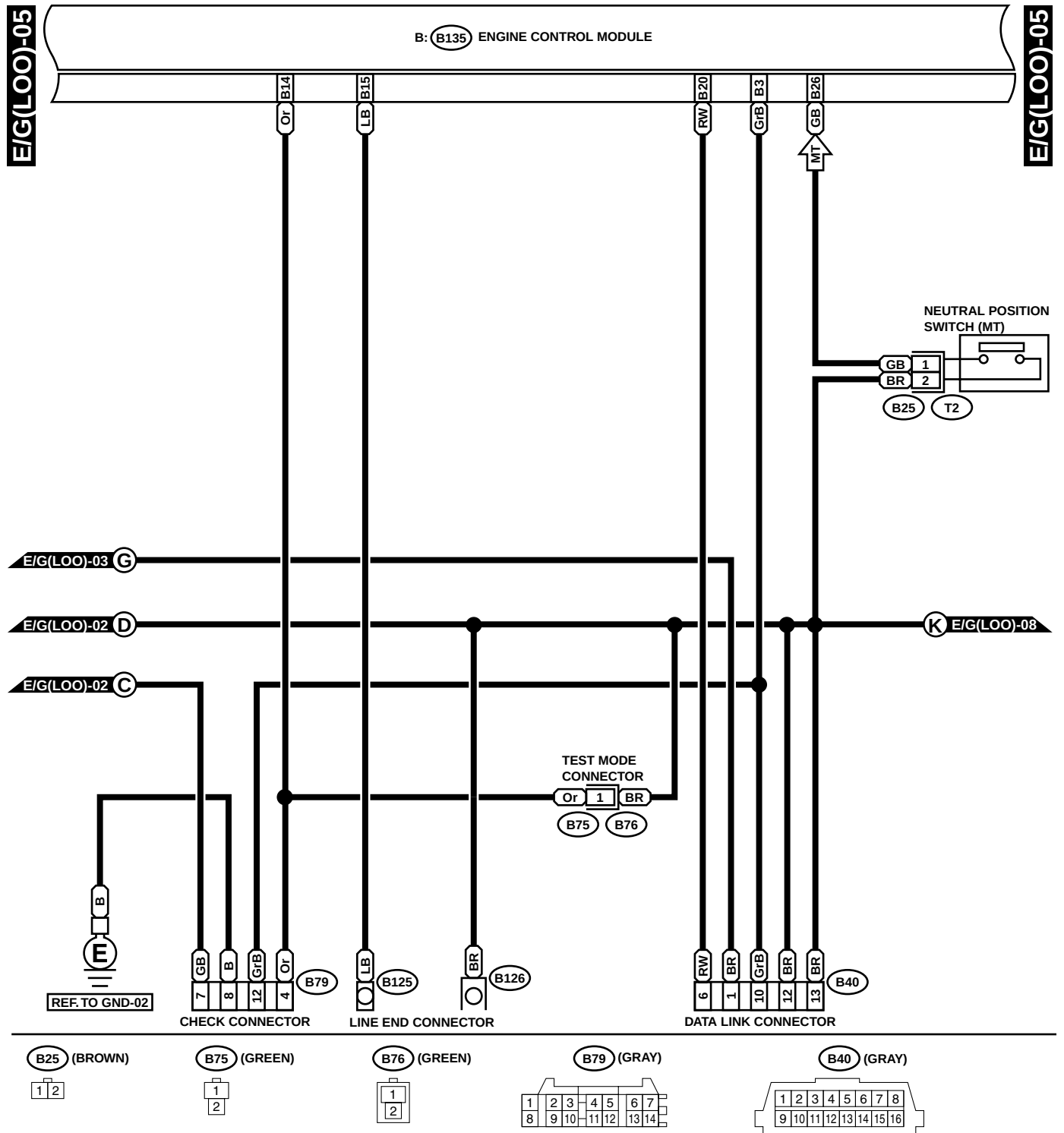
E/G(LOO)-04

E/G(LOO)-04



ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



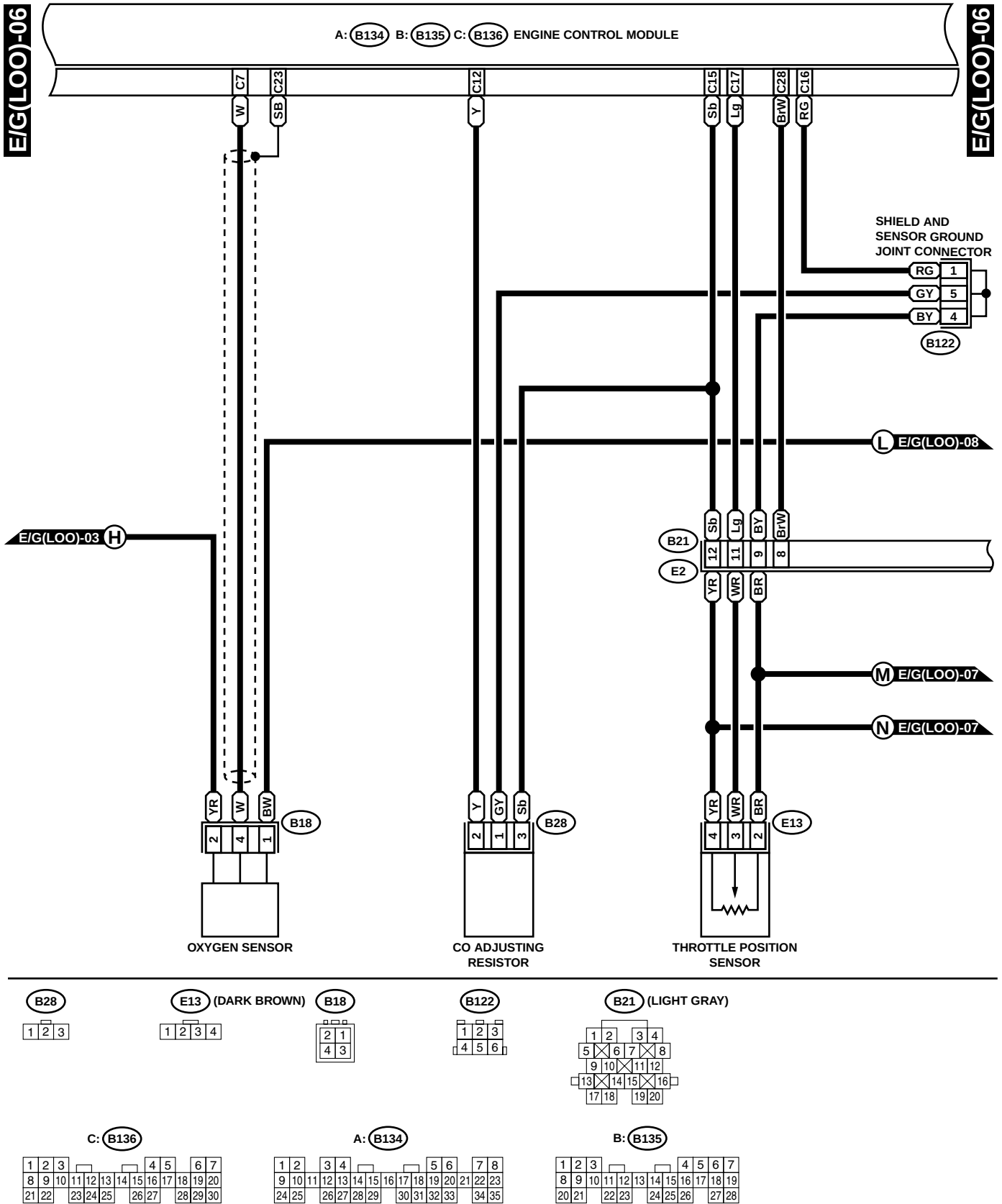
B: (B135)

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						

GL10-20E

ENGINE ELECTRICAL SYSTEM

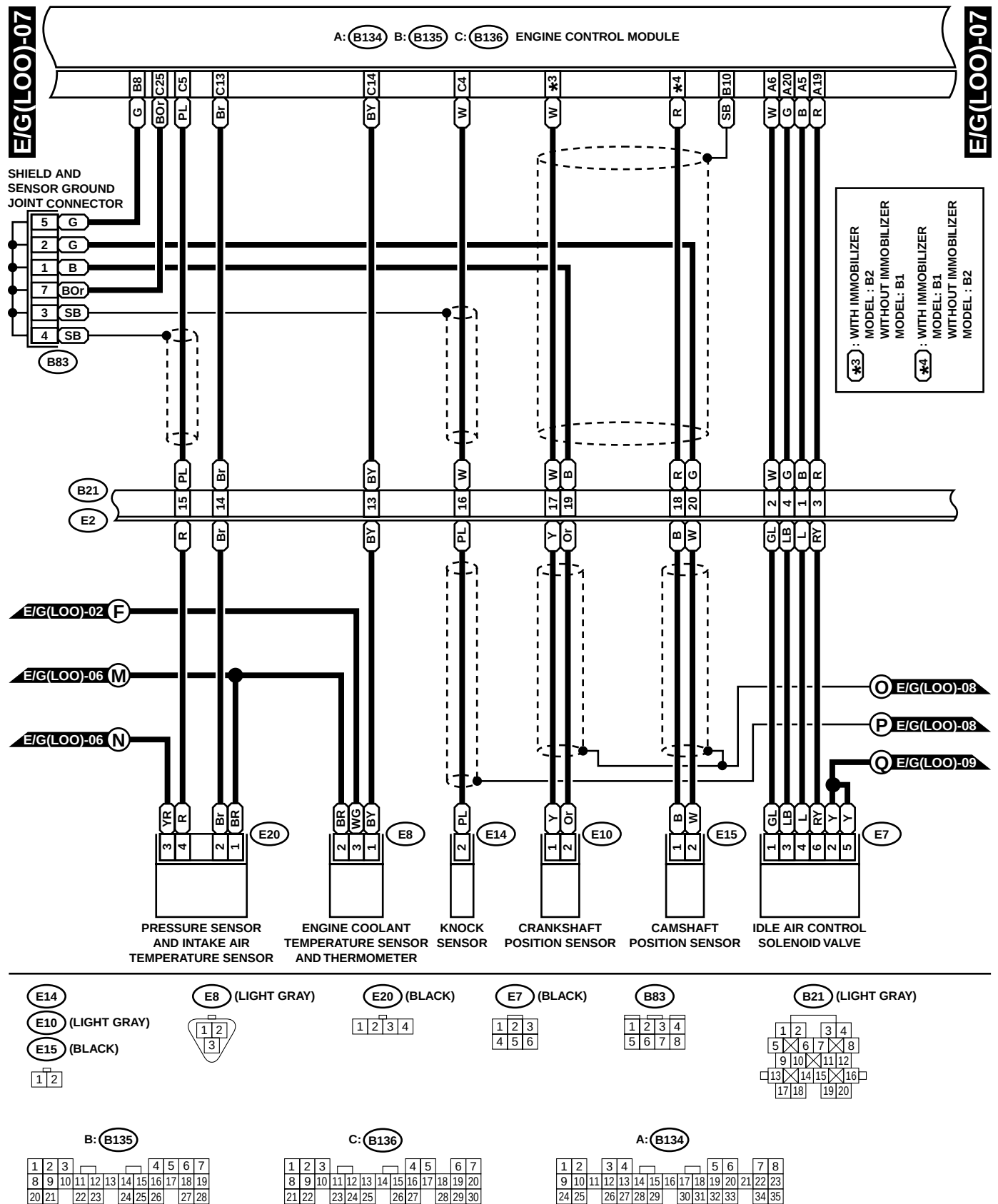
WIRING SYSTEM



GL10-20F

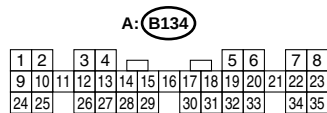
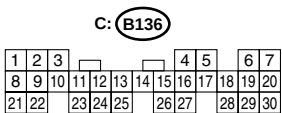
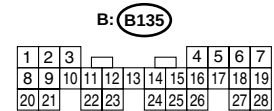
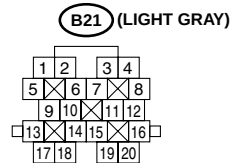
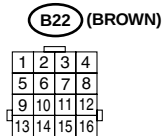
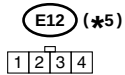
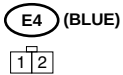
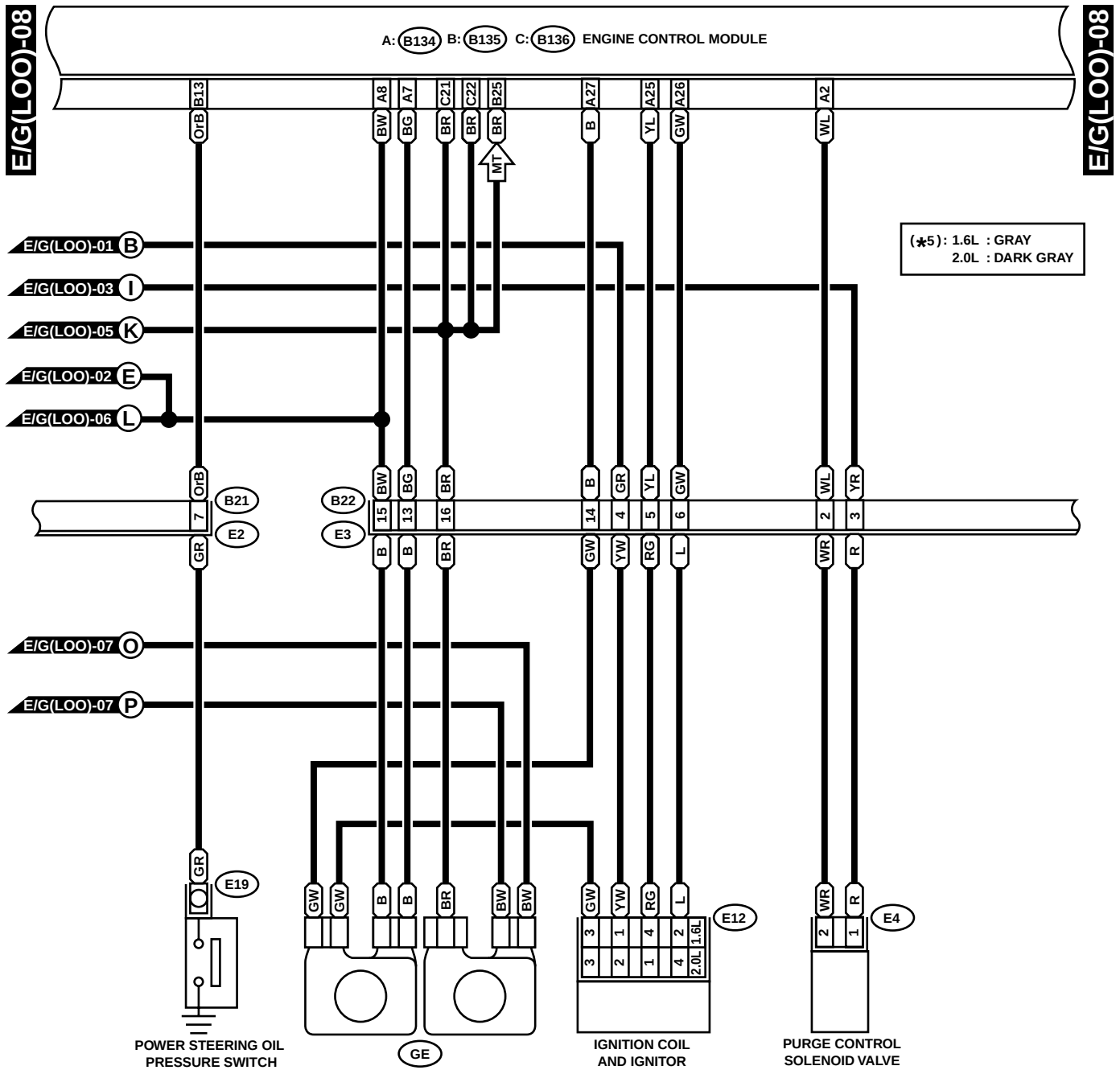
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



ENGINE ELECTRICAL SYSTEM

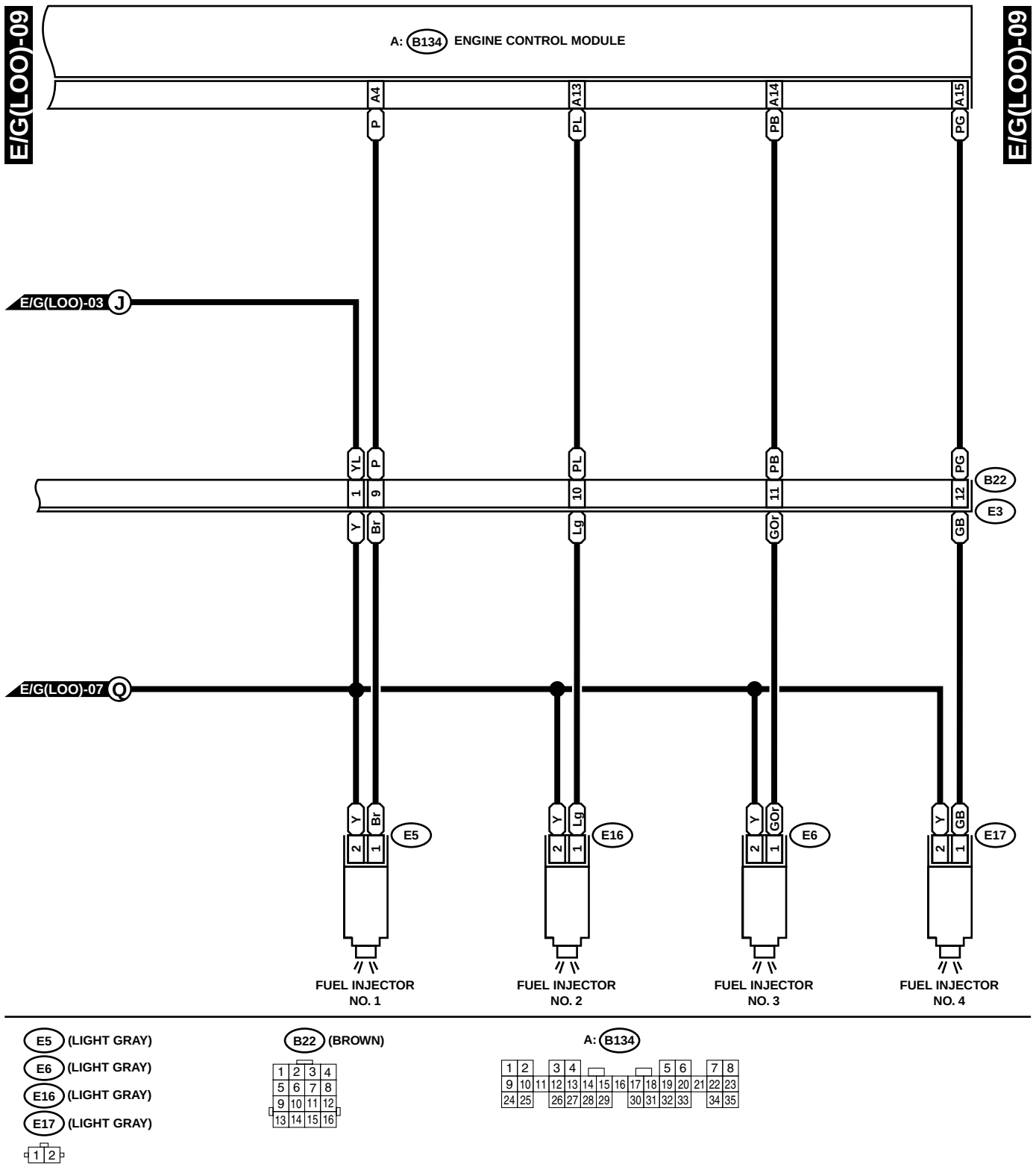
WIRING SYSTEM



GL10-20H

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

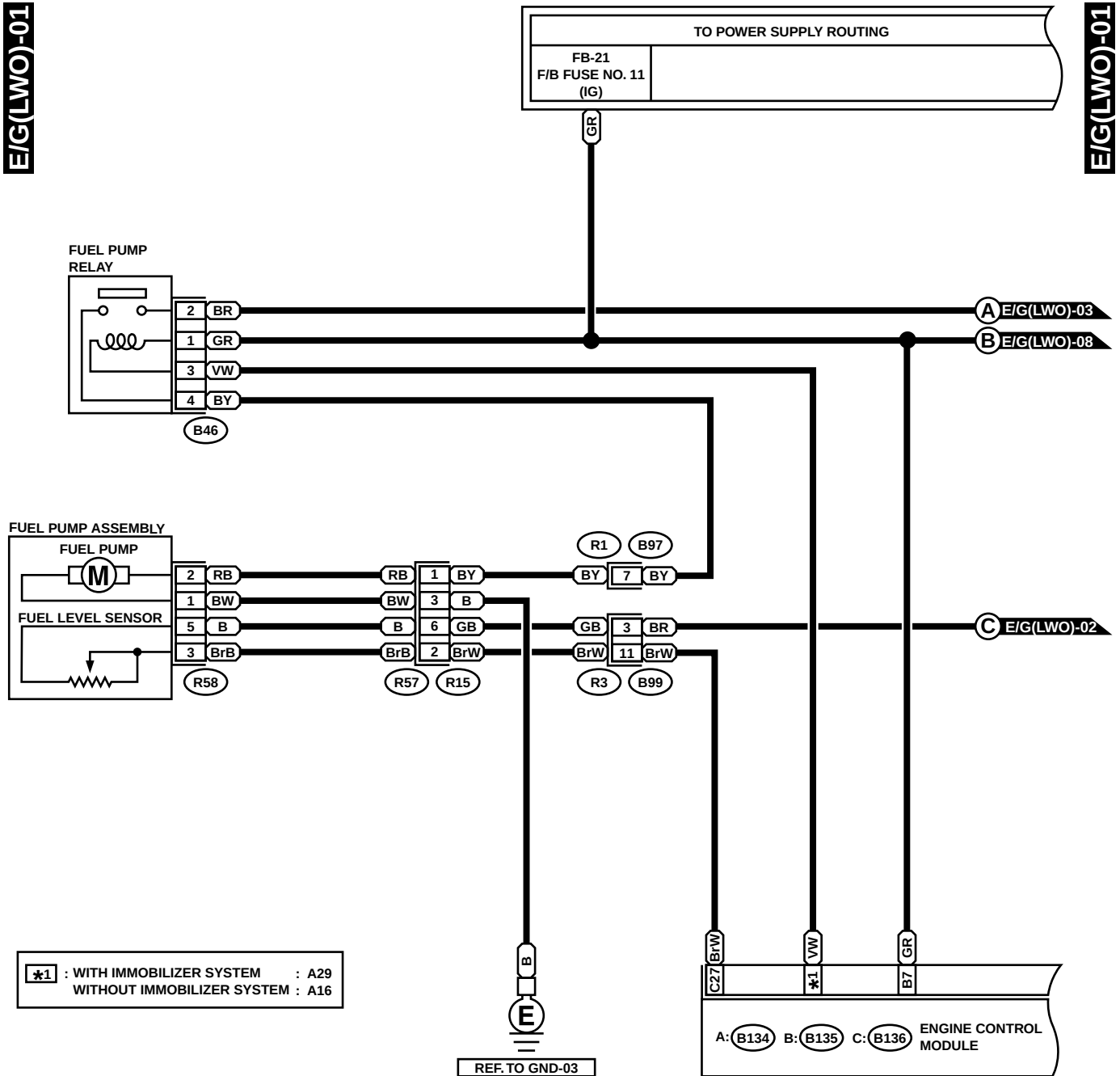


GL10-20I

2. LHD SOHC MODEL

E/G(LWO)-01

E/G(LWO)-01



(B46) (GREEN)

1	2
3	4

(R15) (BLACK)

1	2
3	4

(R58)

1	2	3
4	5	6

(B97)

1	2	3	4
5	6	7	8

(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	33
34	35	36	37	38	39	40	41	42	43	44

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

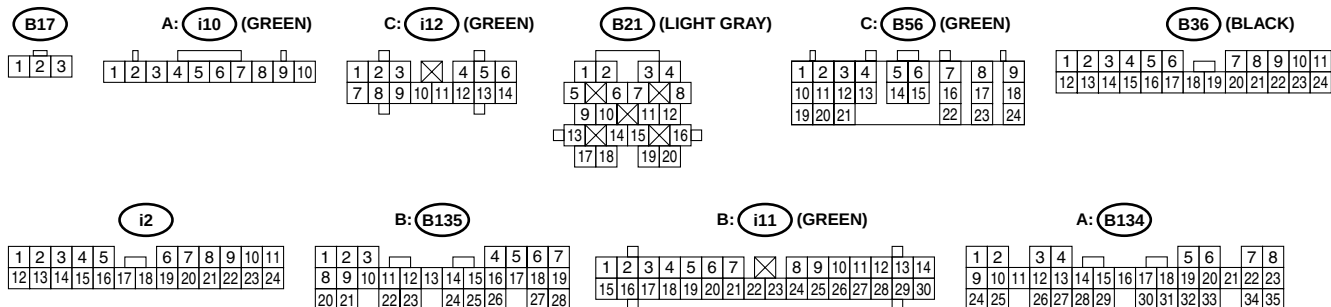
C: (B136)

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

A: (B134)

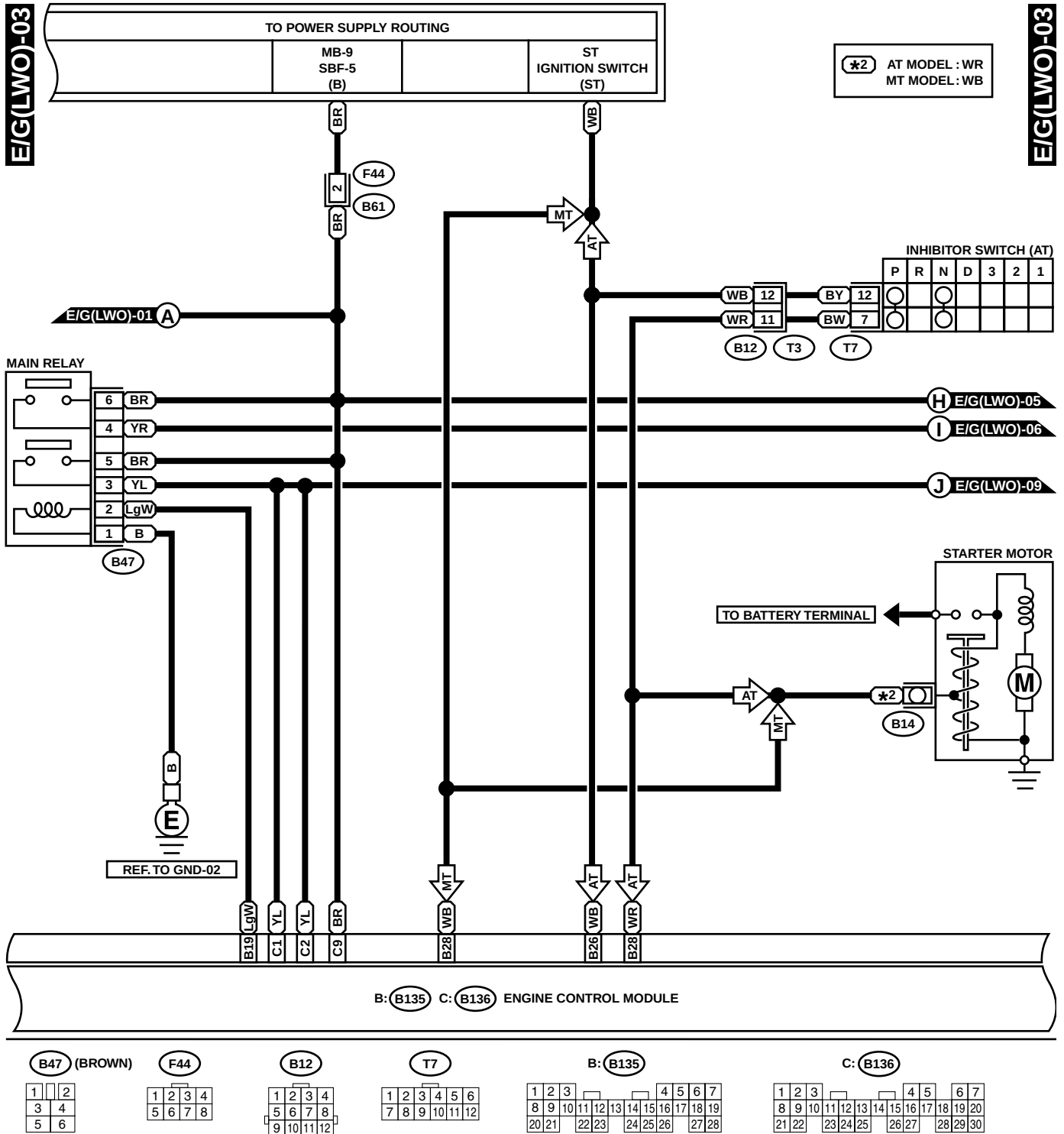
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32

WIRING SYSTEM

**WI-116**

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



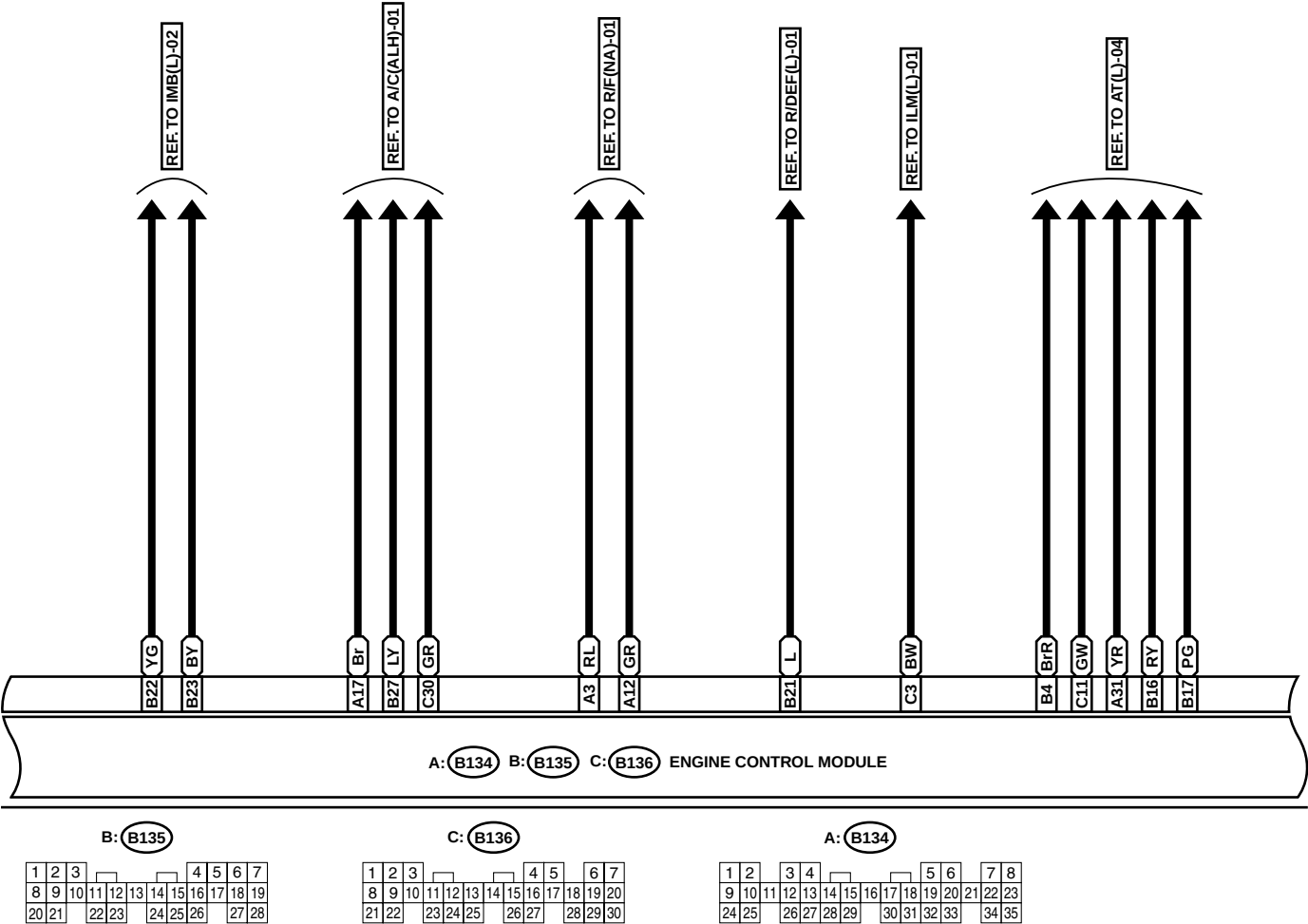
GL10-22C

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(LWO)-04

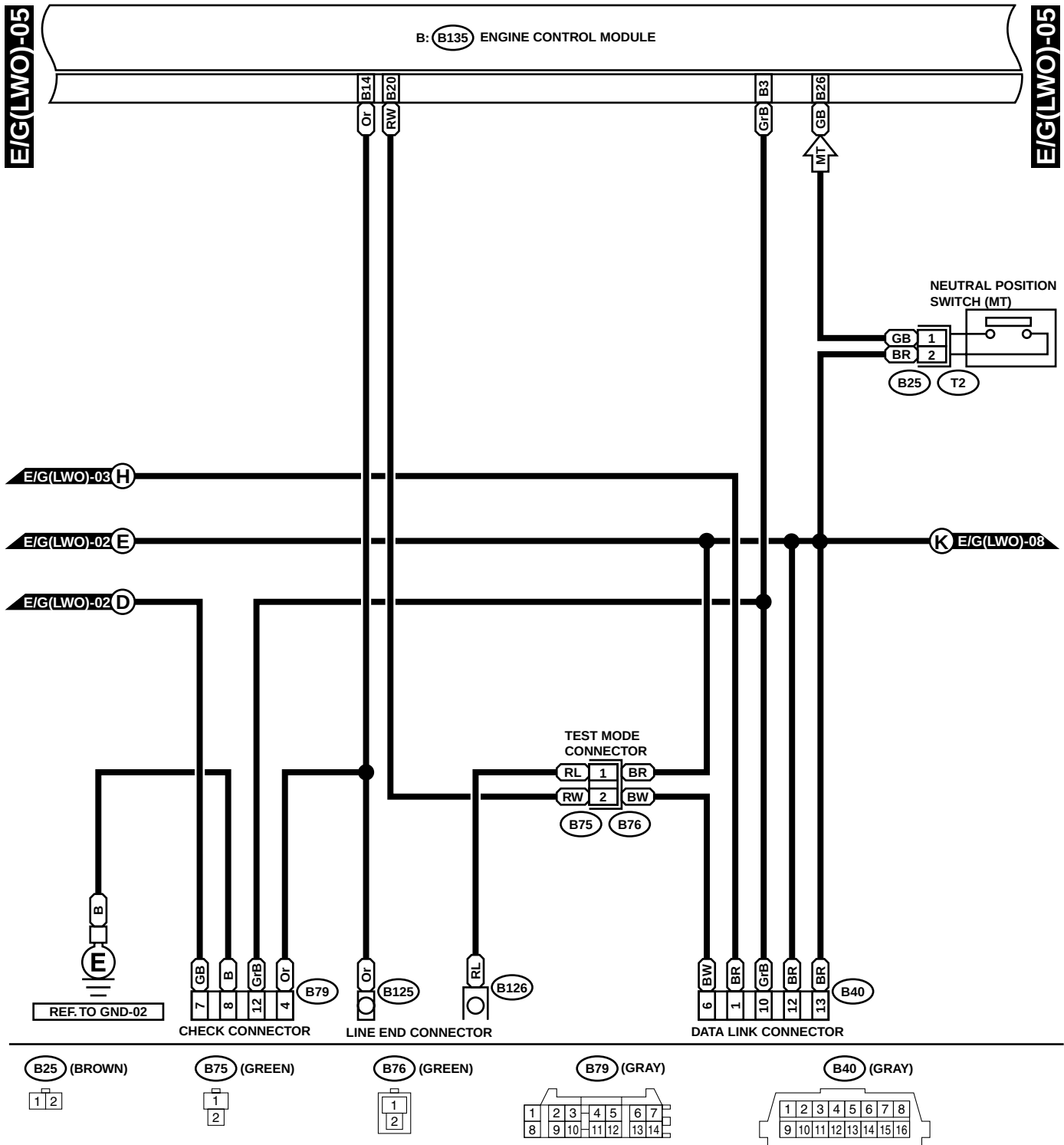
E/G(LWO)-04



GL10-22D

ENGINE ELECTRICAL SYSTEM

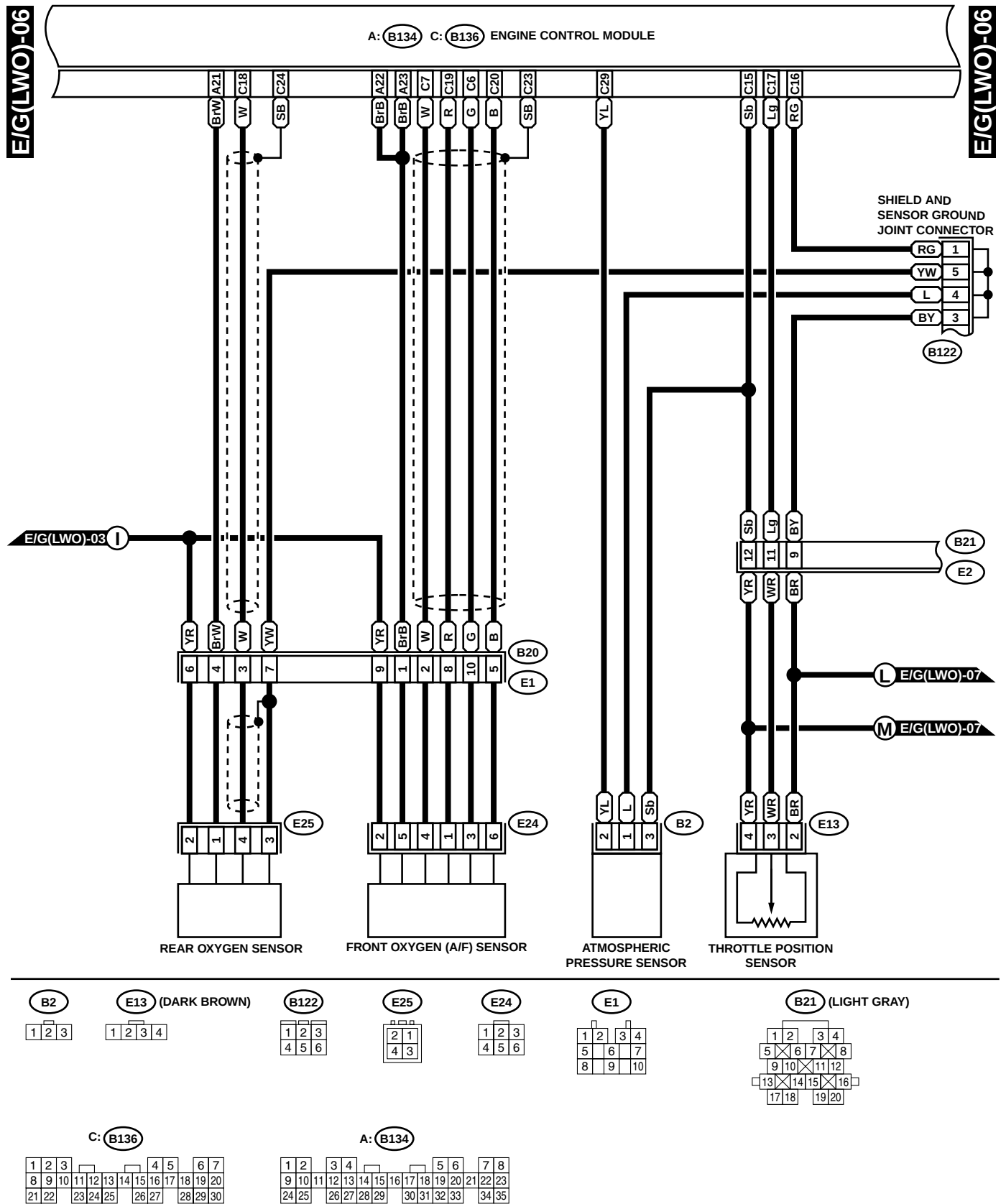
WIRING SYSTEM



GL10-22E

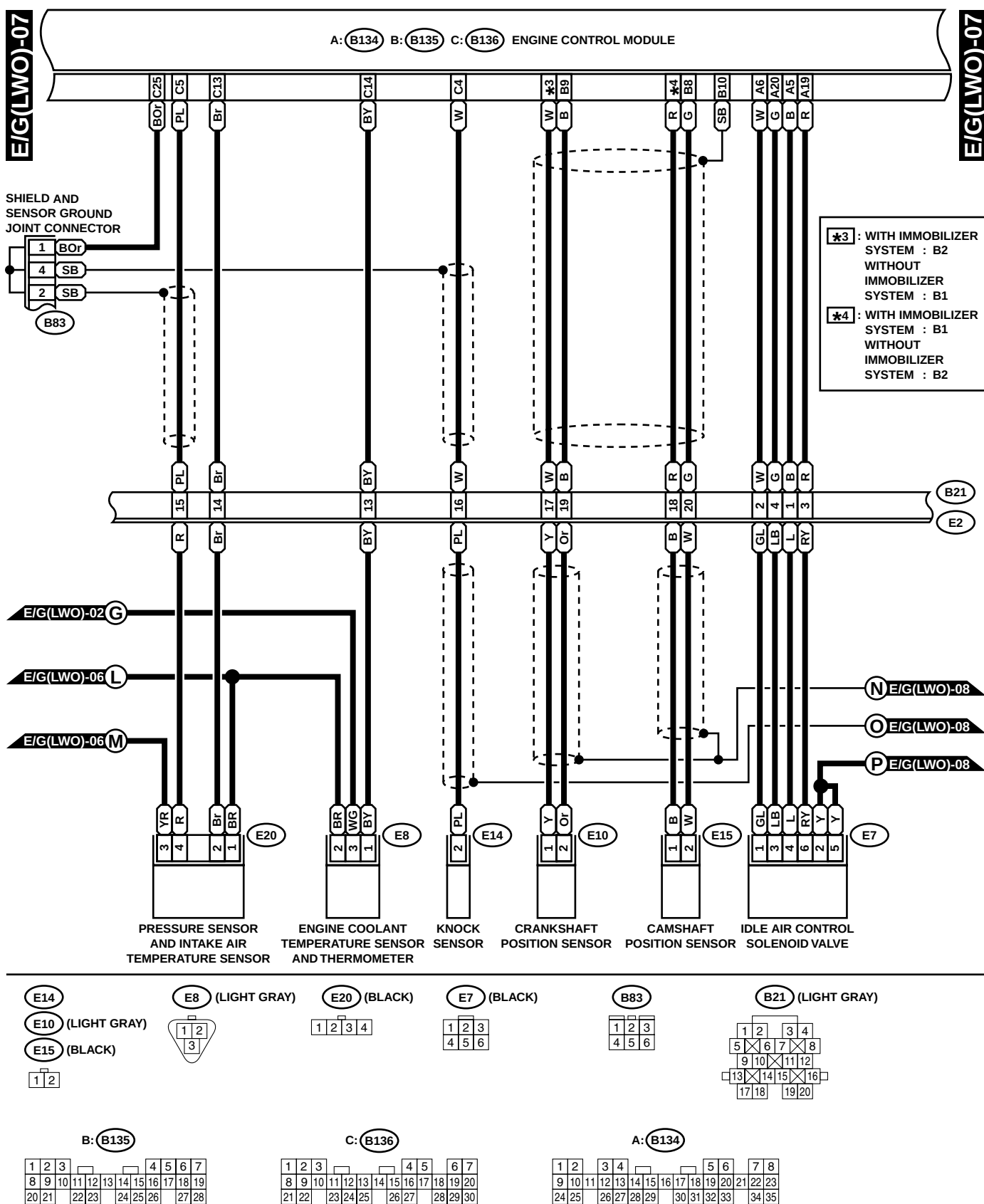
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

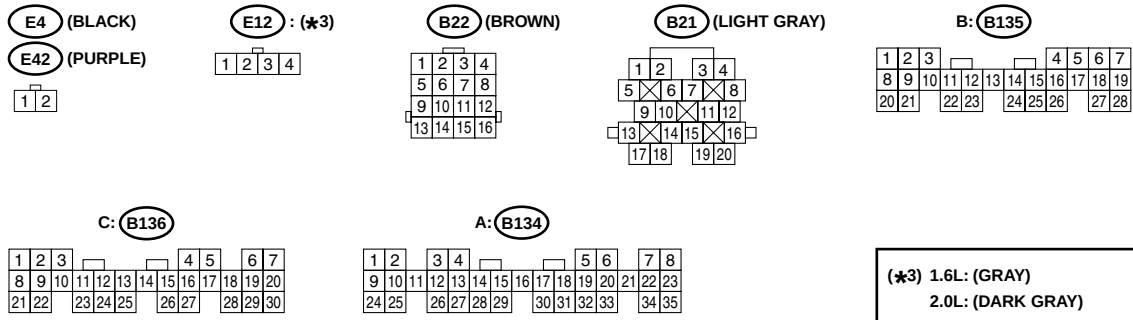


GL10-22F

WIRING SYSTEM

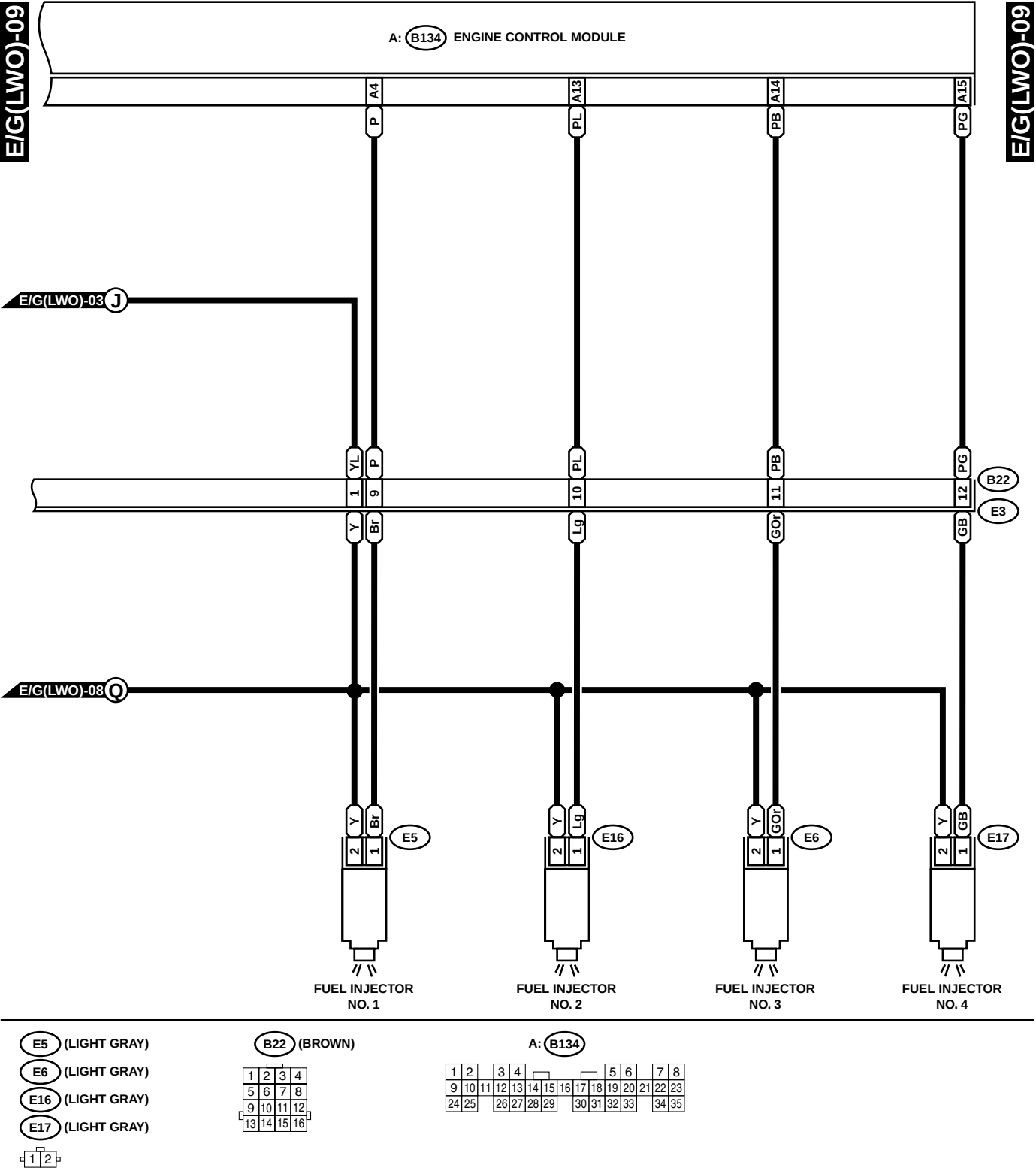


WIRING SYSTEM

**WI-122**

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

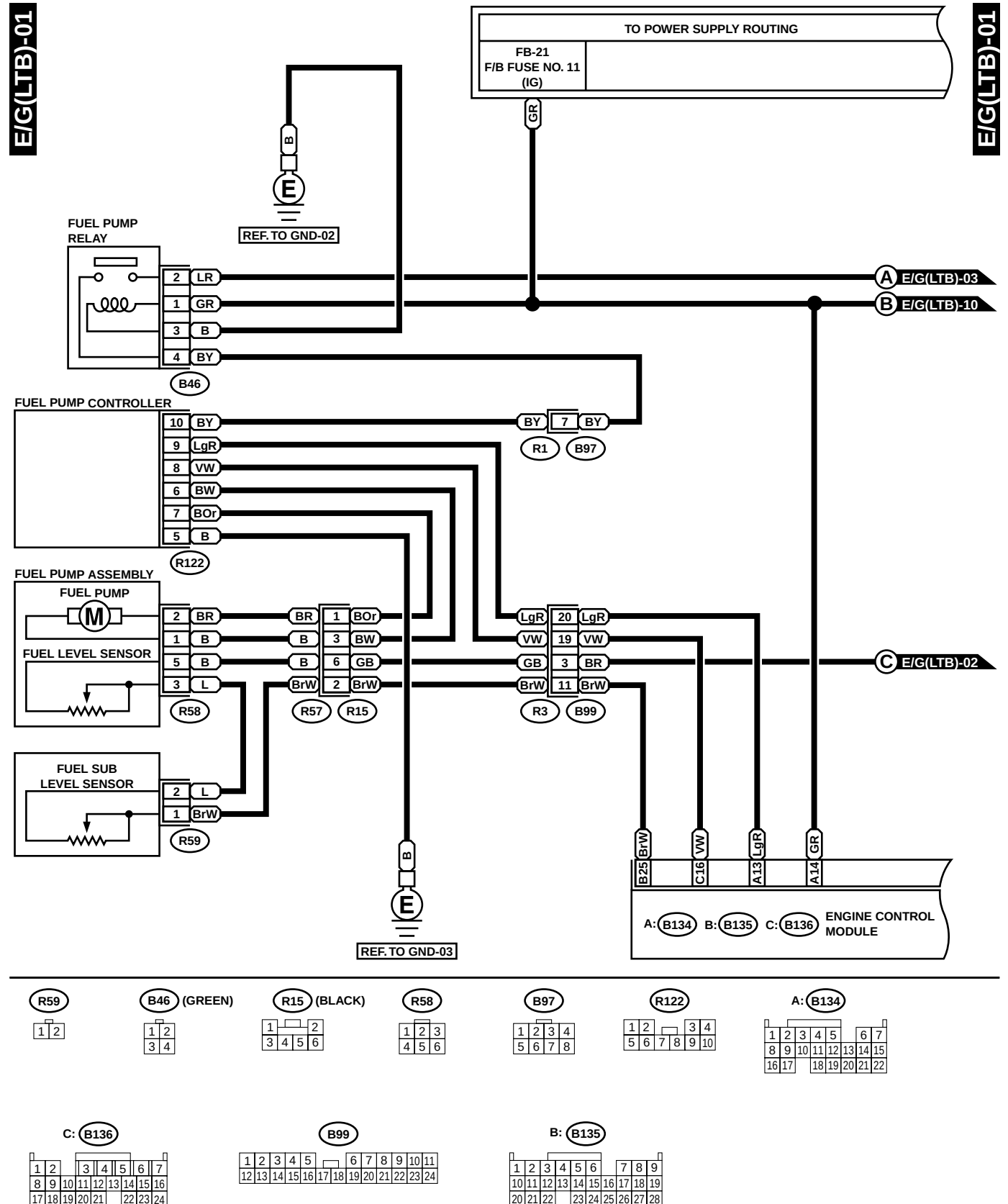


GL10-22I

ENGINE ELECTRICAL SYSTEM

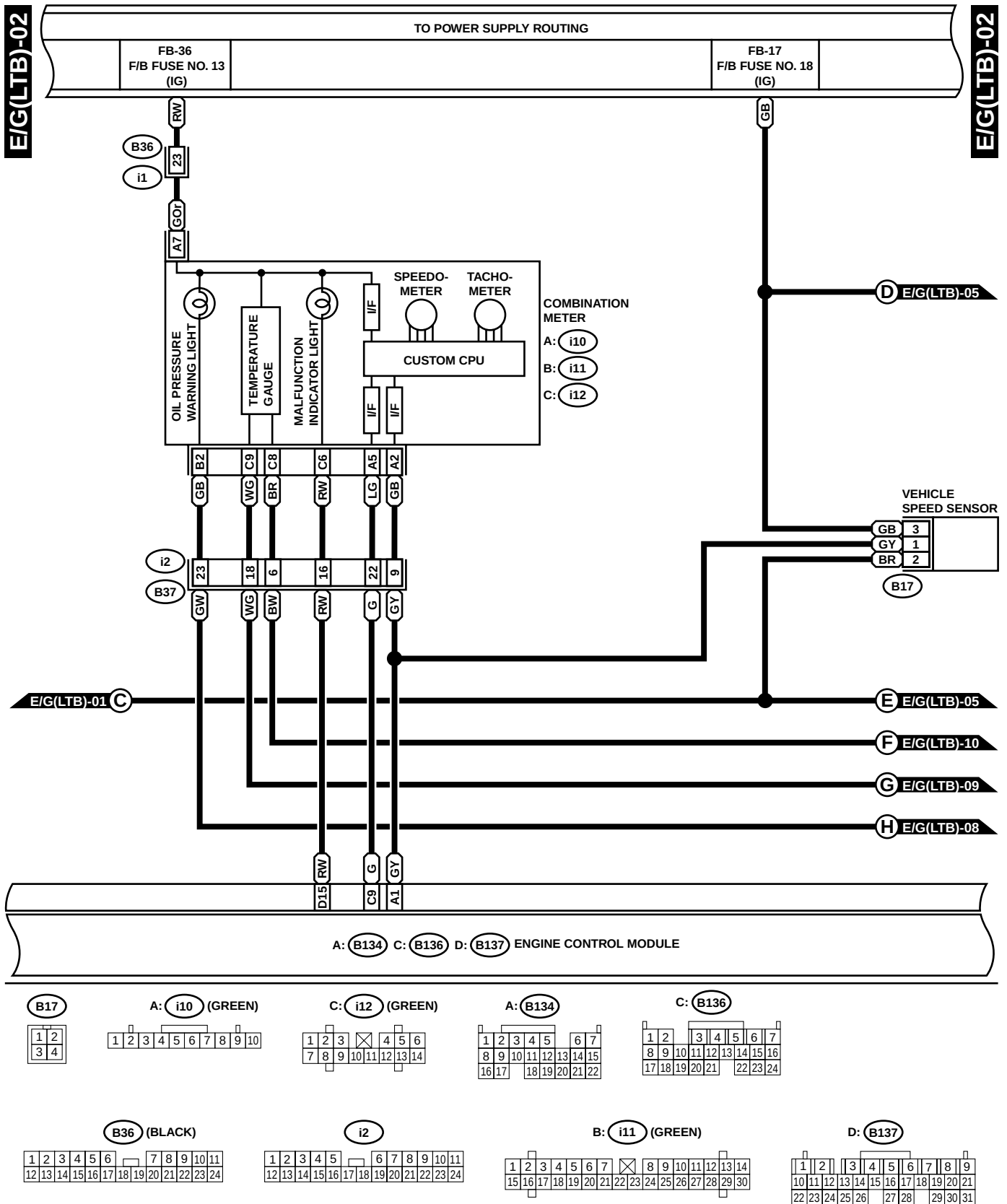
WIRING SYSTEM

3. LHD DOHC TURBO MODEL



ENGINE ELECTRICAL SYSTEM

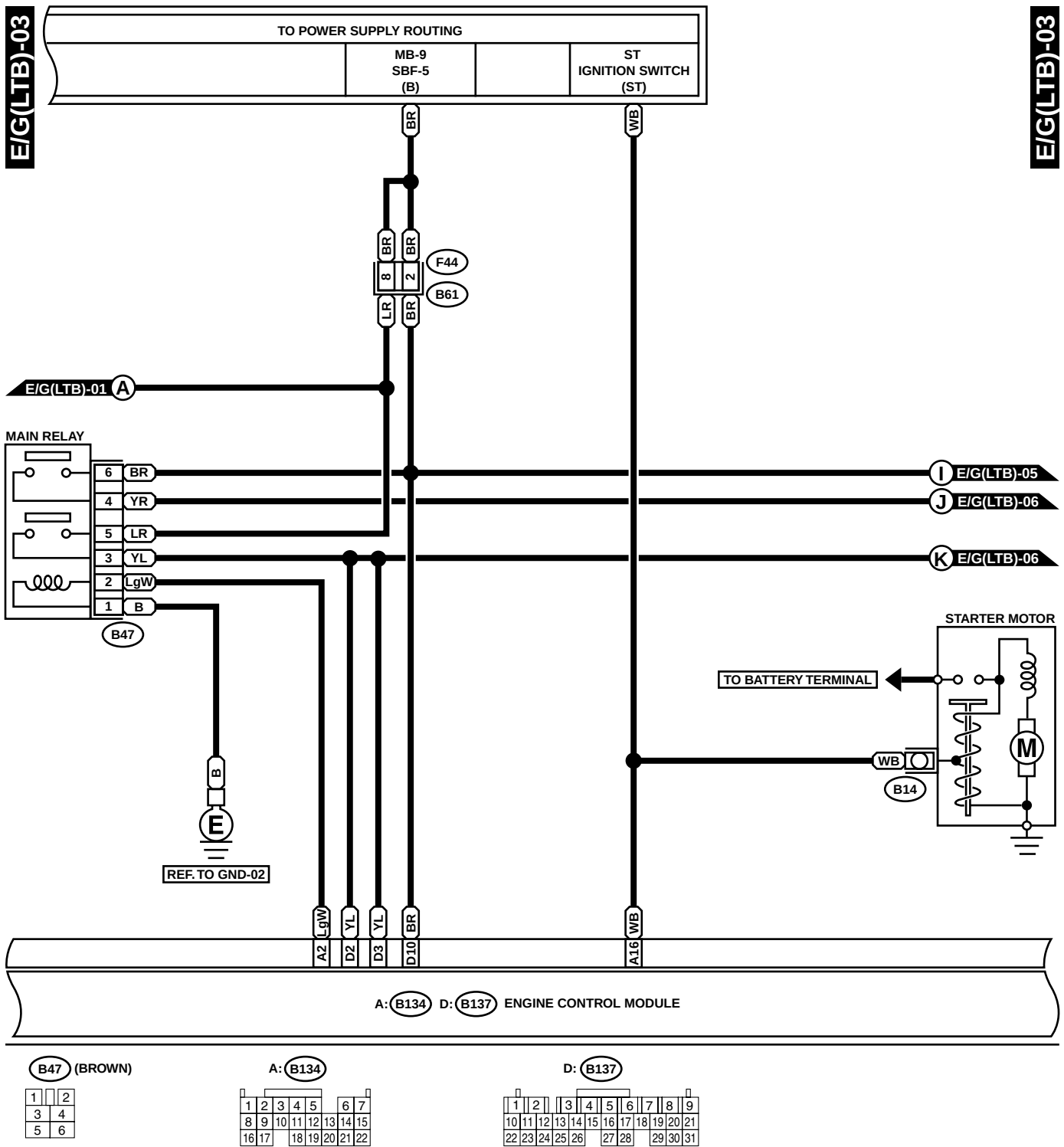
WIRING SYSTEM



GL10-21B

ENGINE ELECTRICAL SYSTEM

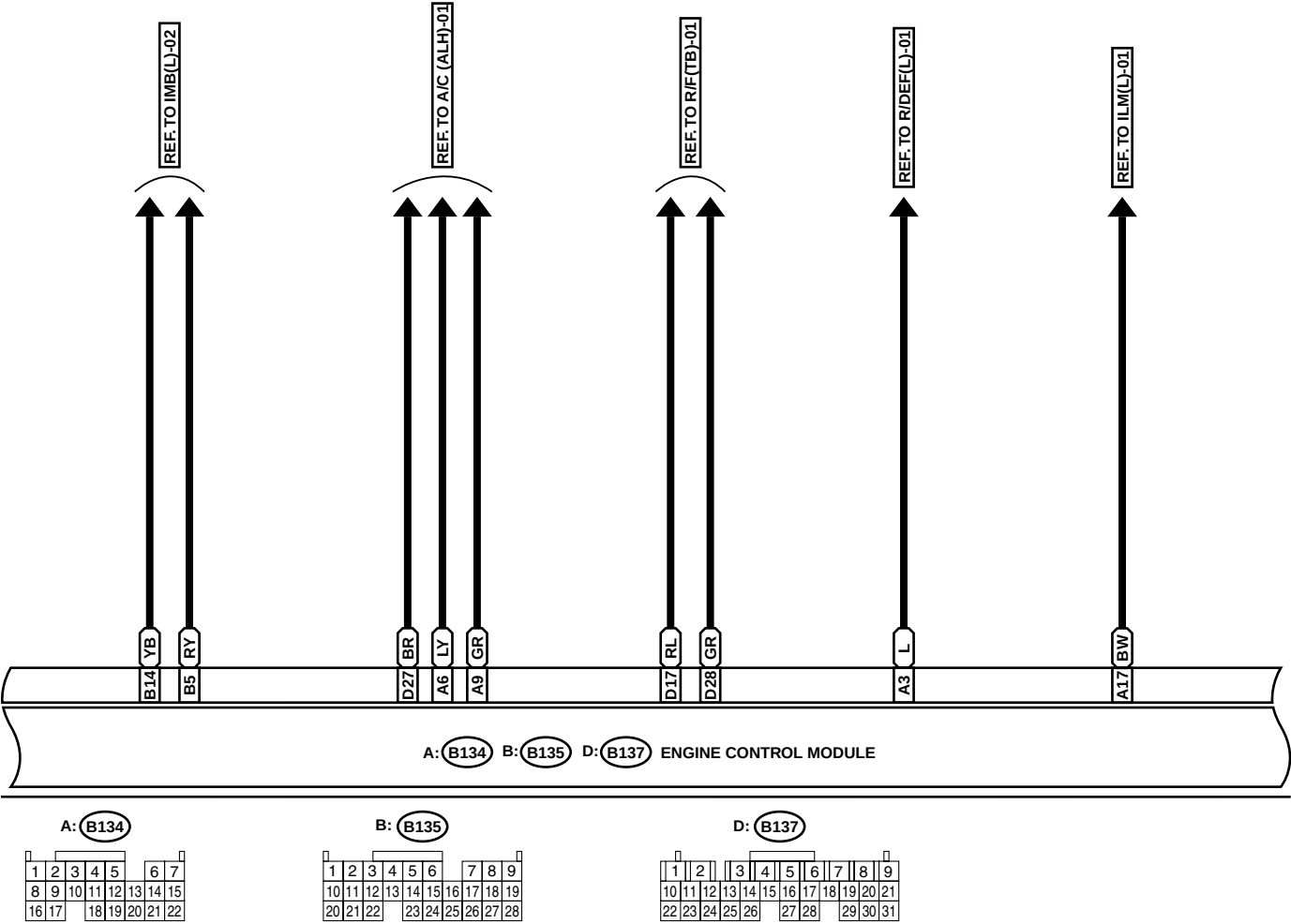
WIRING SYSTEM



GL10-21C

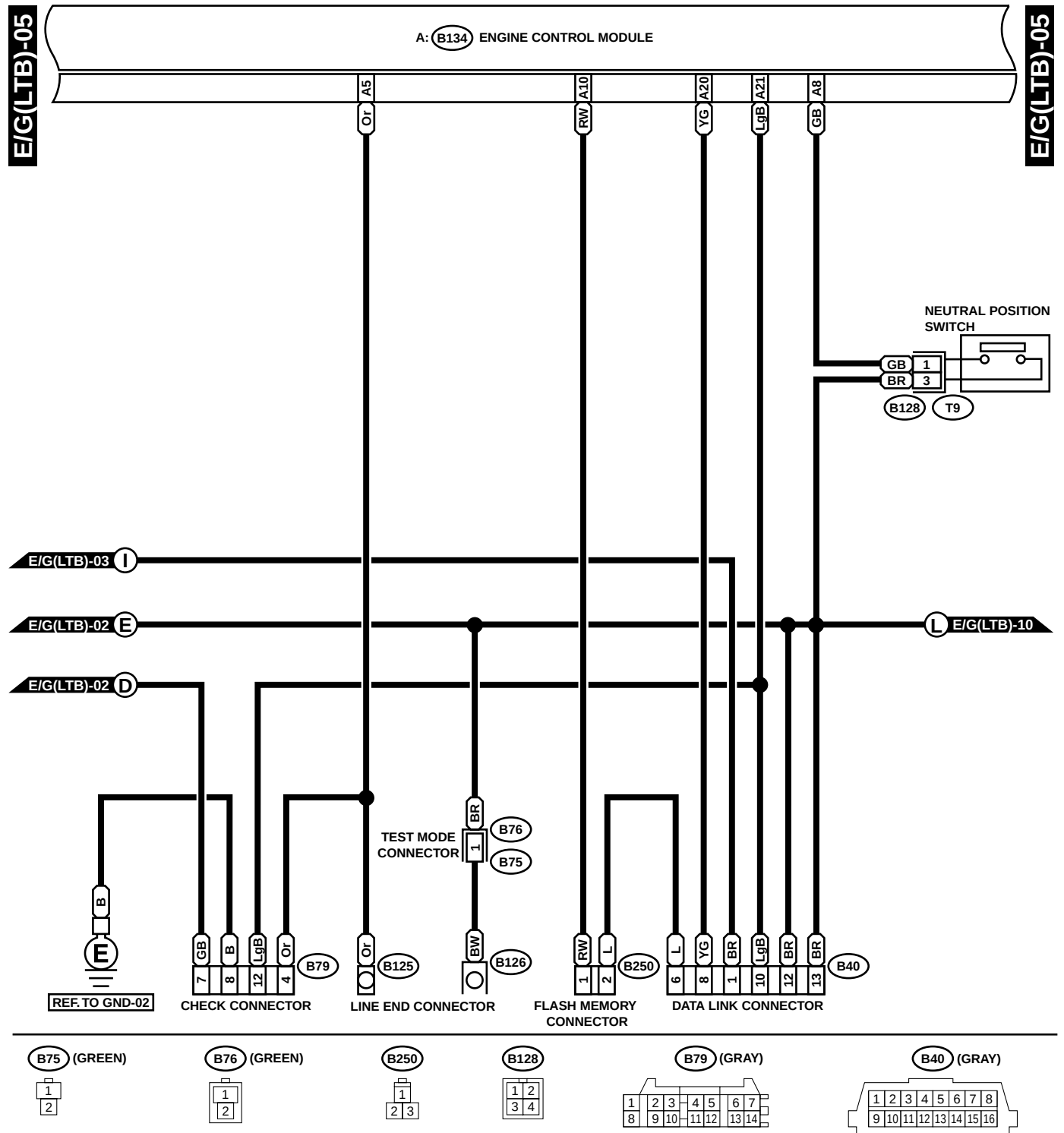
E/G(LTB)-04

E/G(LTB)-04



ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



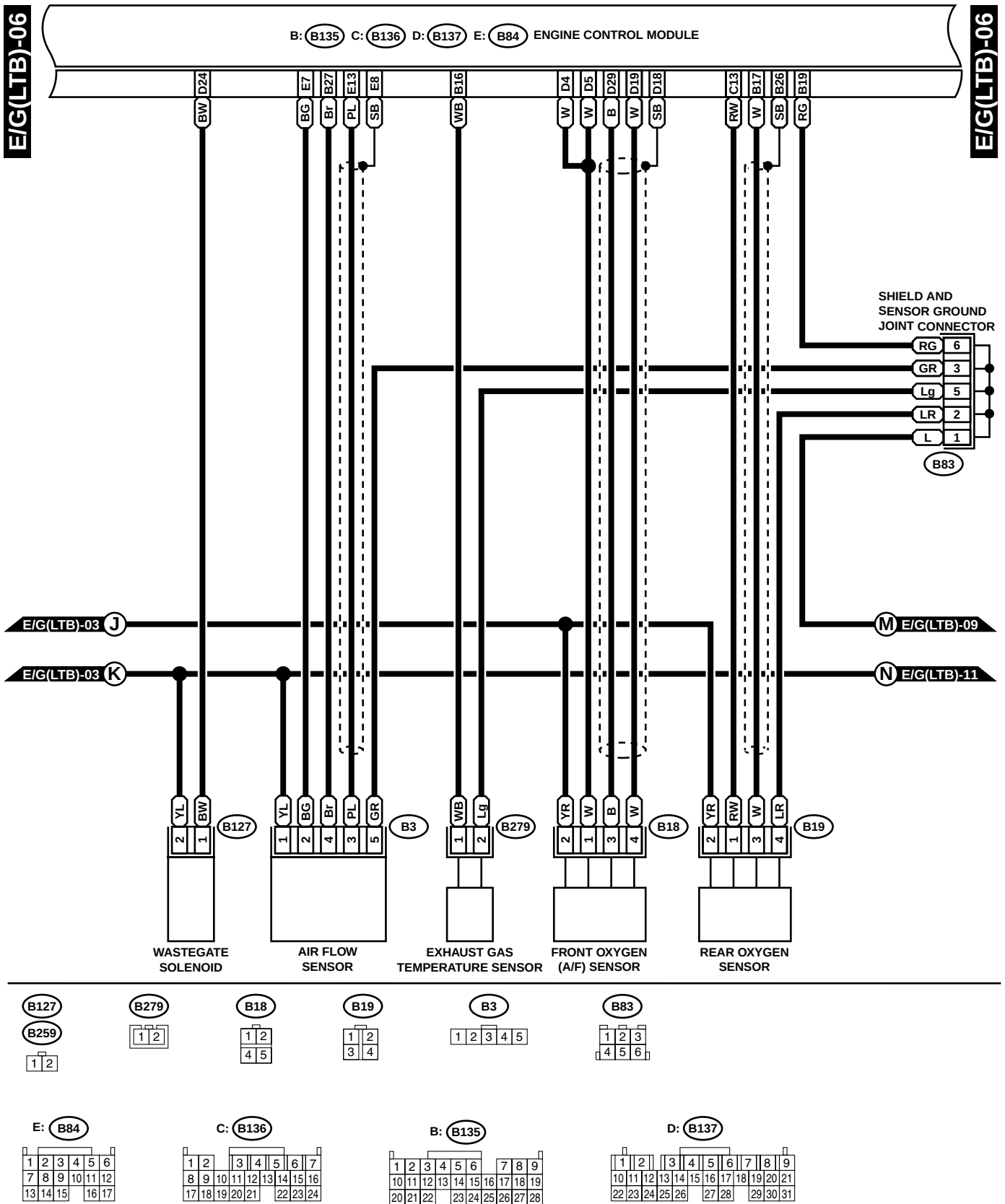
A: B134

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22						

GL10-21E

ENGINE ELECTRICAL SYSTEM

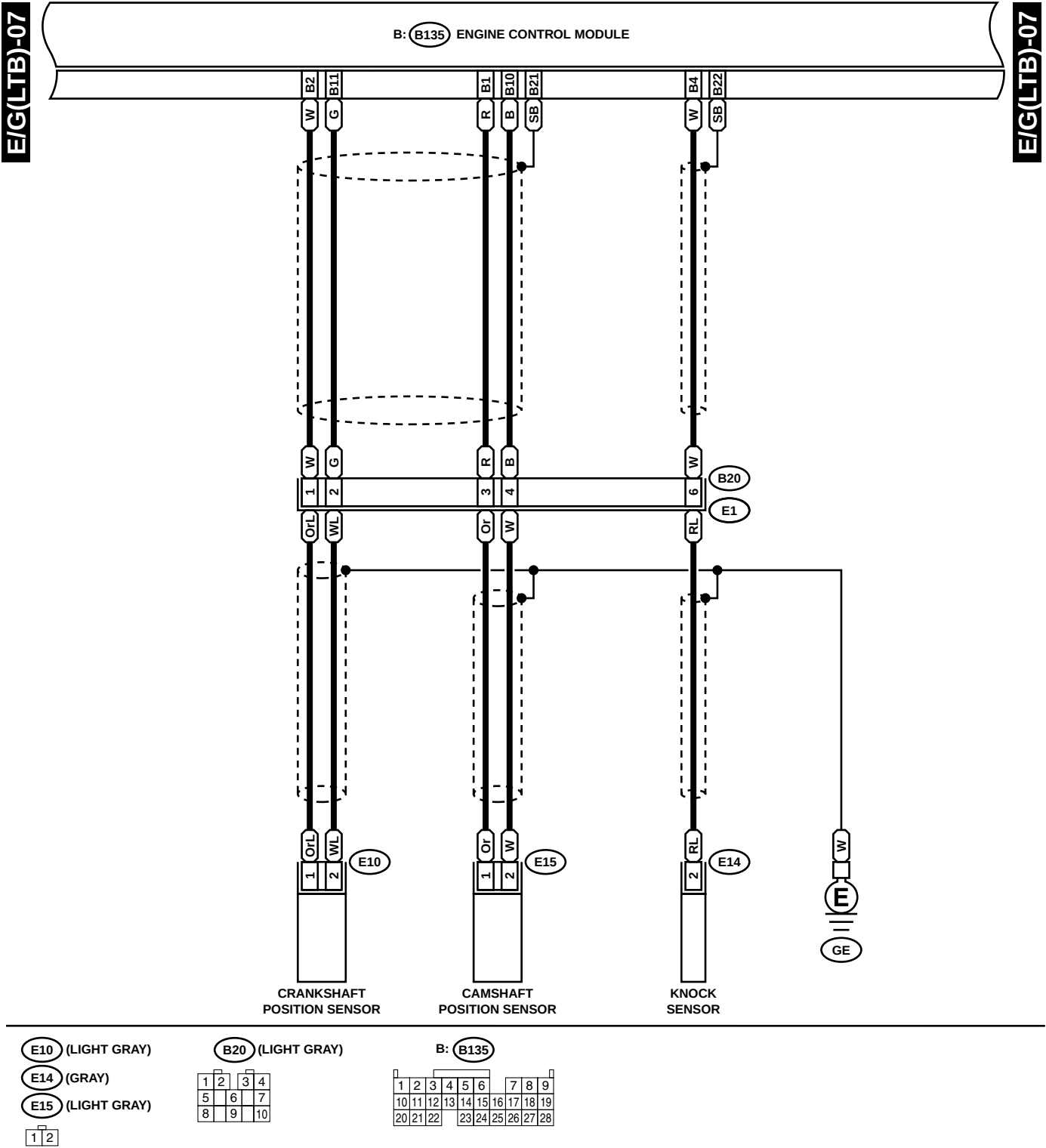
WIRING SYSTEM



GL10-21F

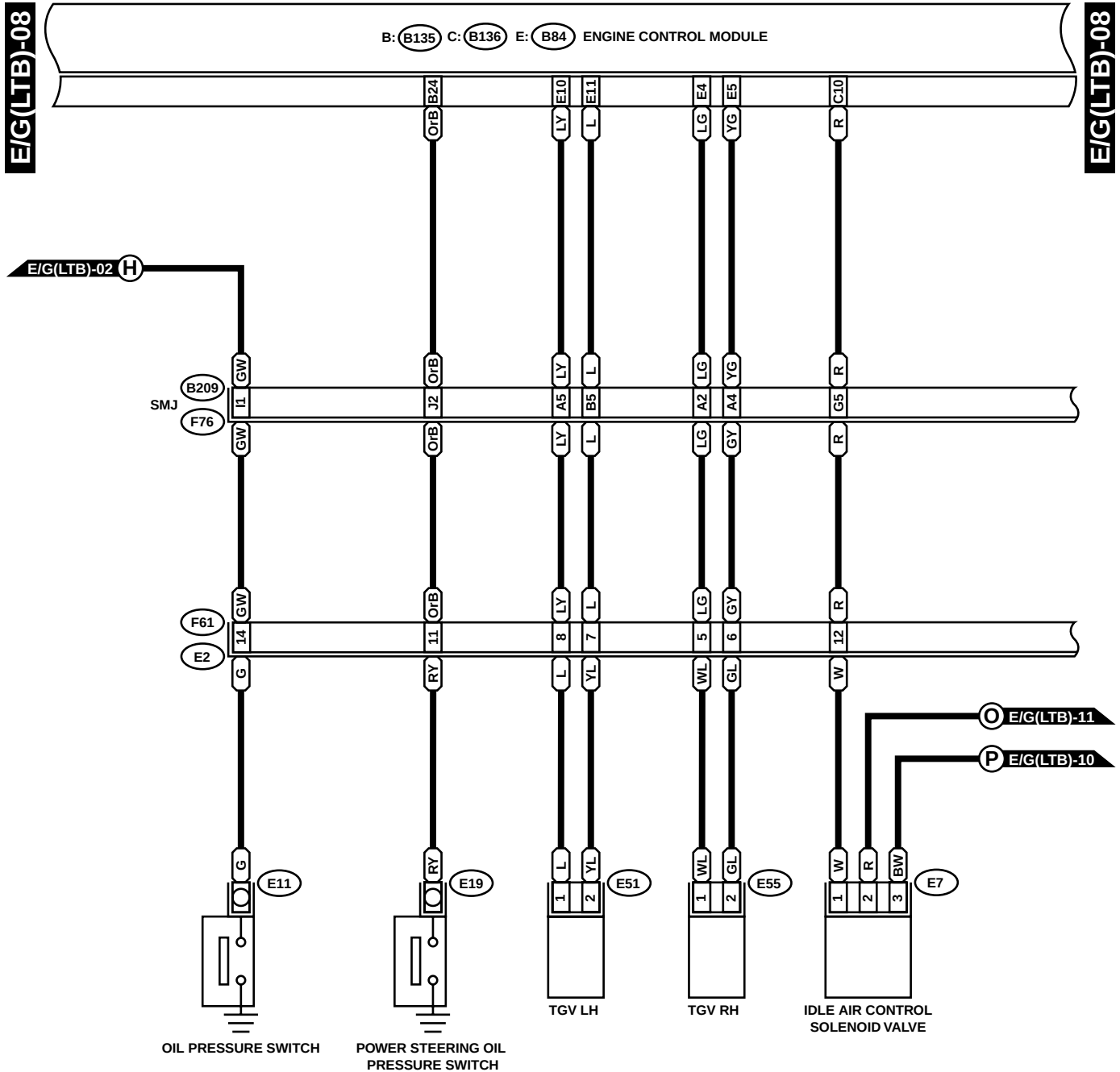
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E51 (BLACK)
E55 (BLACK)
1 2

E7 (BLACK)
1 2 3

F61 (BLACK)
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

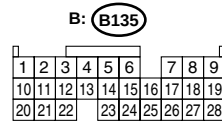
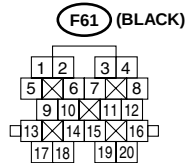
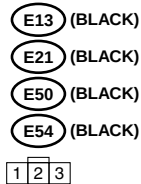
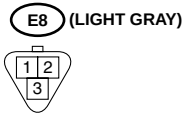
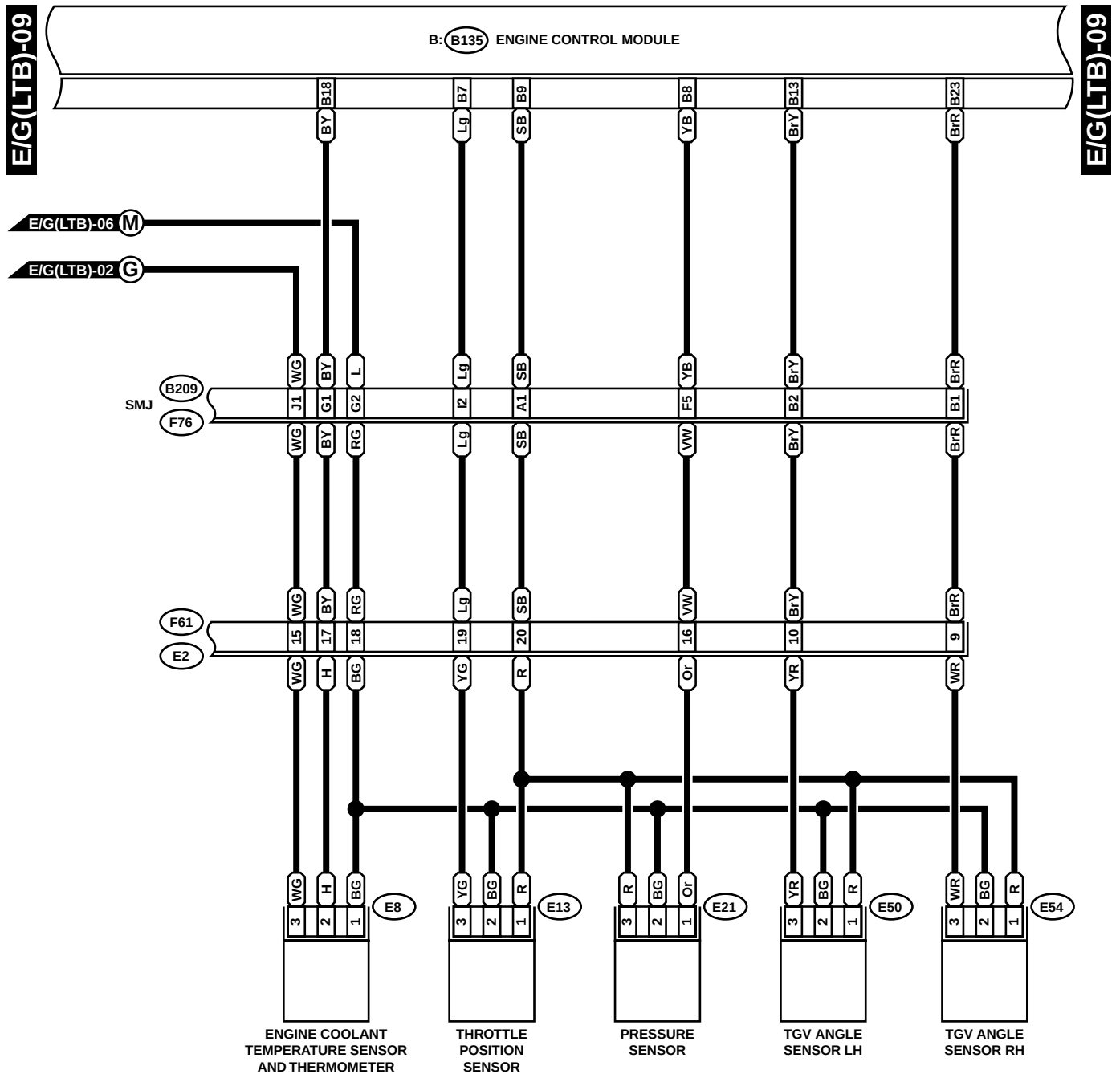
C: (B136)
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24

E: (B84)
1 2 3 4 5 6
7 8 9 10 11 12
13 14 15 16 17

GL10-21H

ENGINE ELECTRICAL SYSTEM

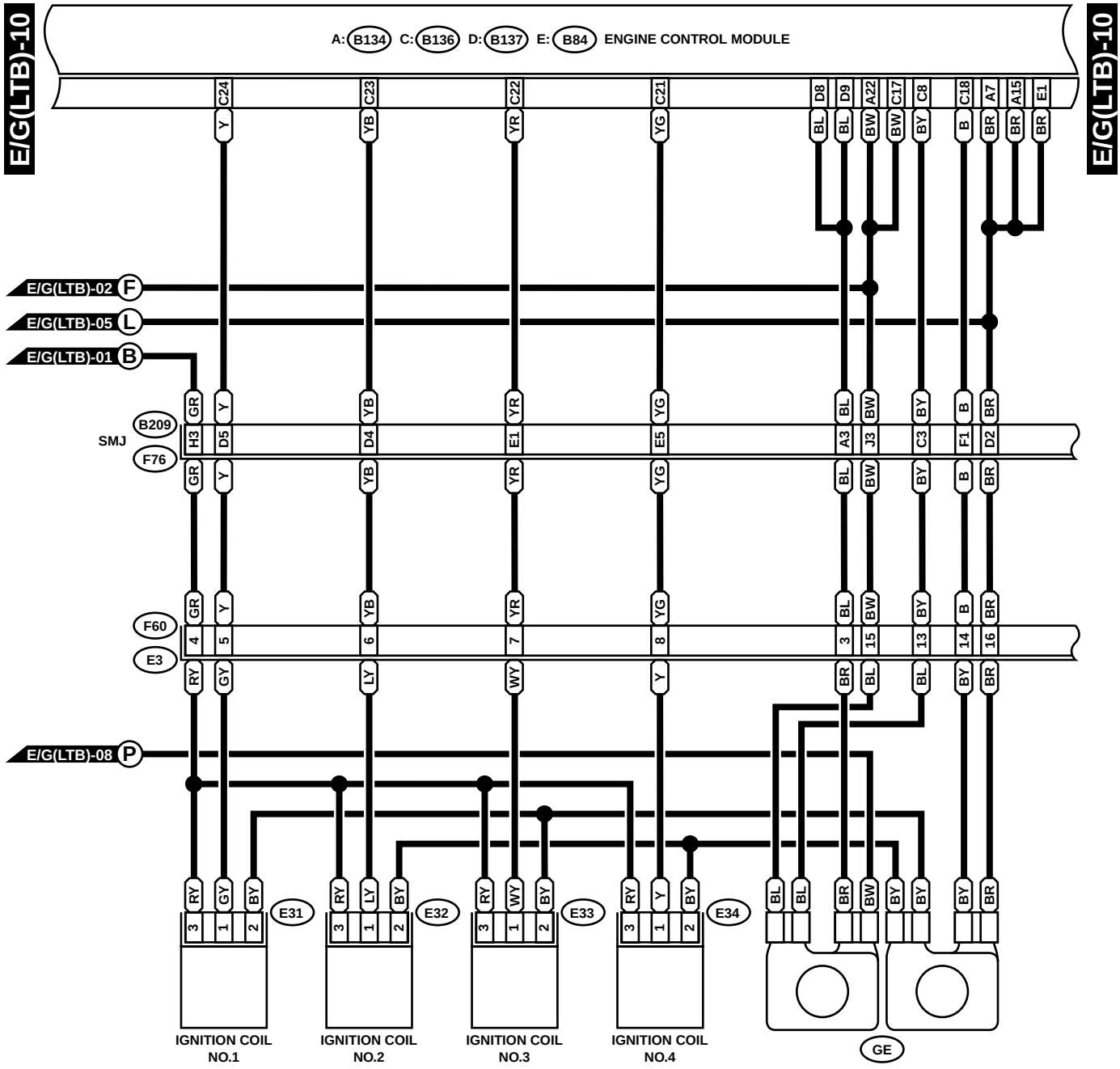
WIRING SYSTEM



GL10-211

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E31

E32

E33 (BLACK)

E34 (BLACK)

1
2
3

F60 (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

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

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

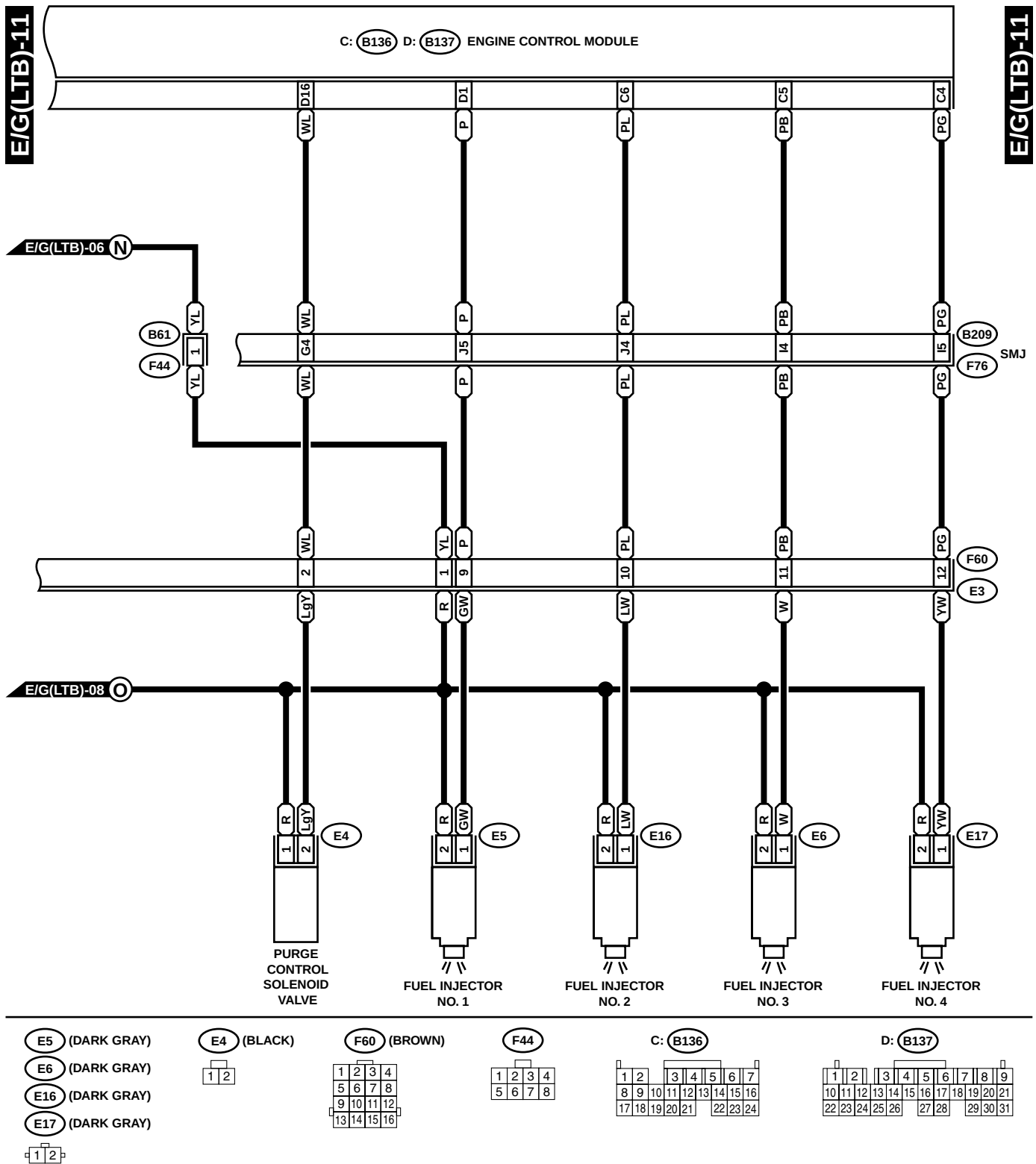
E: B84

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18

GL10-21J

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

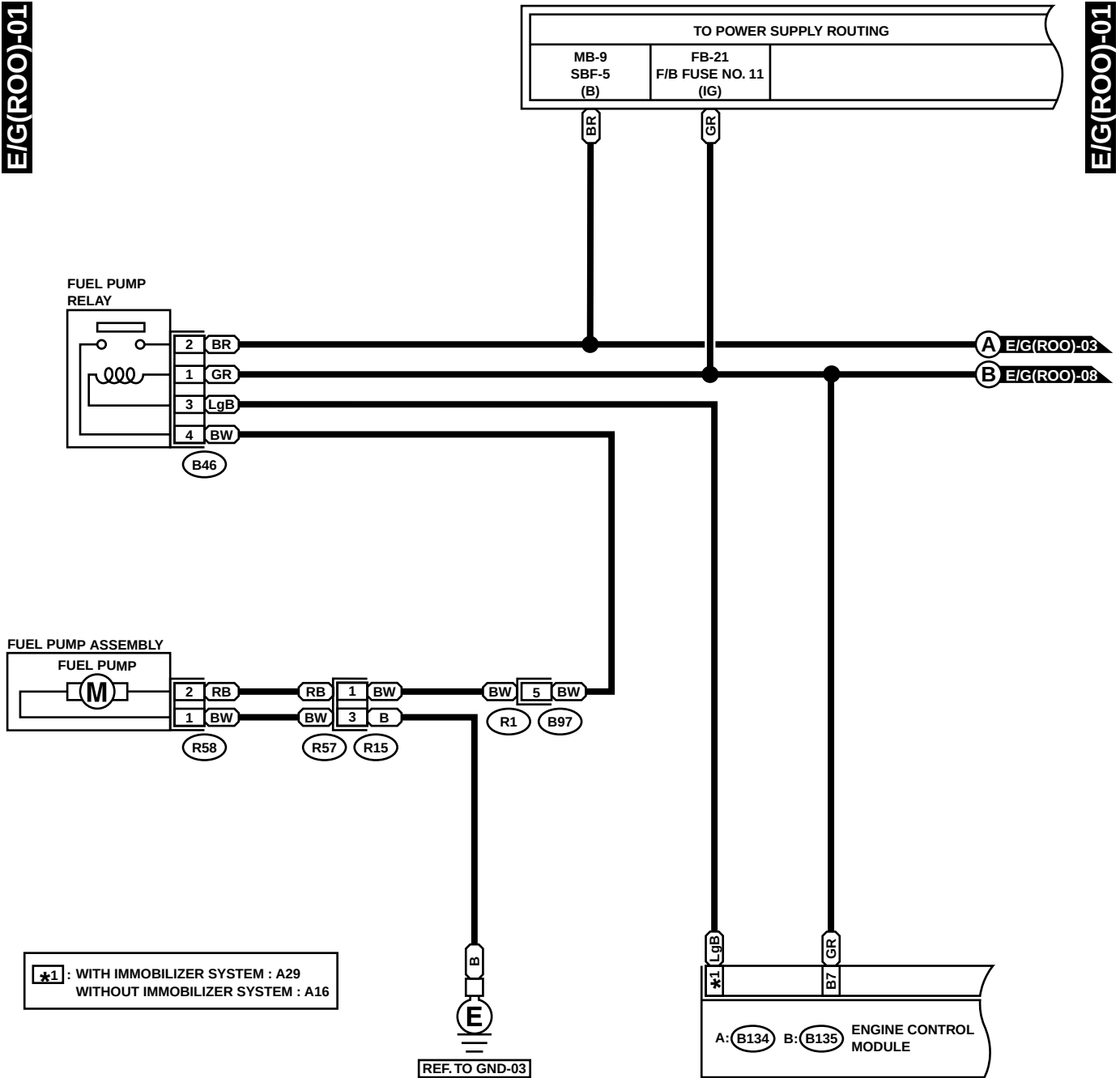


GL10-21K

4. RHD SOHC W/O OBD MODEL

E/G(ROO)-01

E/G(ROO)-01



B46 (GREEN)

1	2
3	4

R15 (BLACK)

1	2
3	4

R58

1	2	3
4	5	6

B97

1	2	3	4
5	6	7	8

B: (B135)

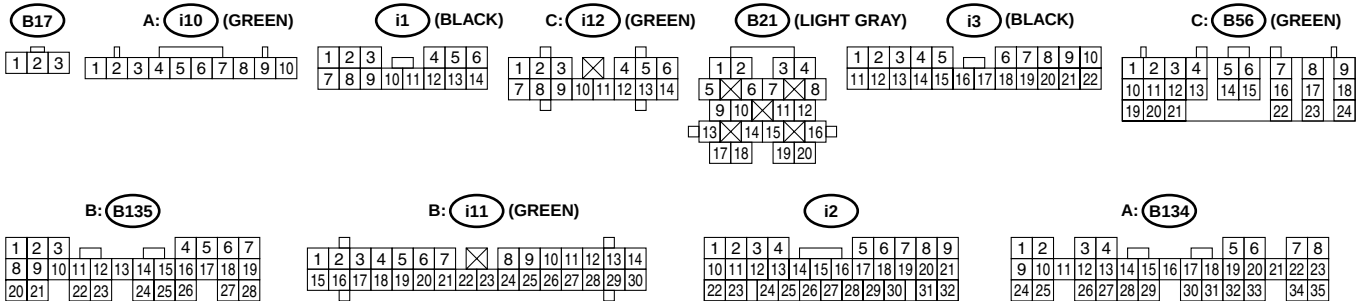
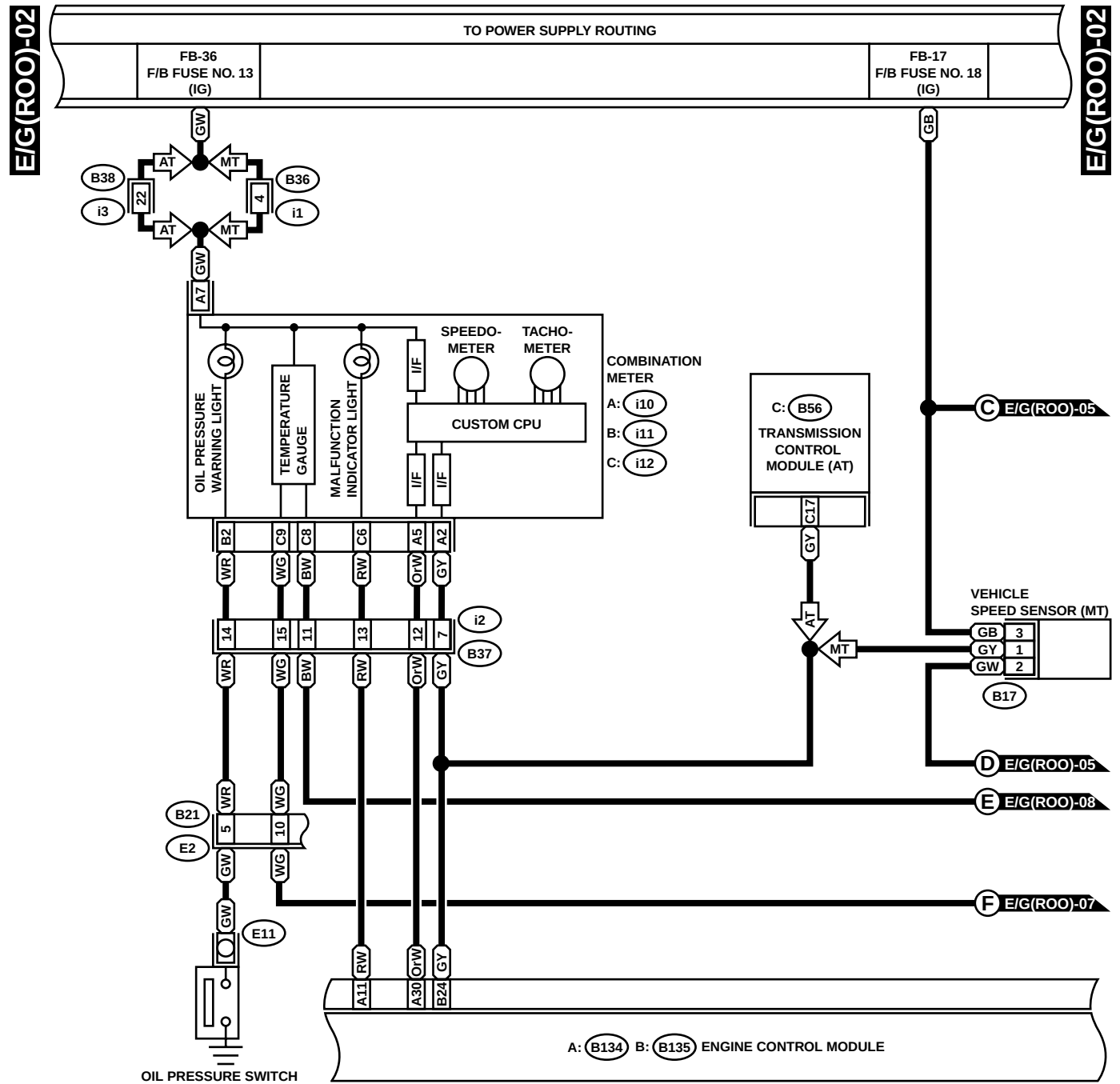
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

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					

ENGINE ELECTRICAL SYSTEM

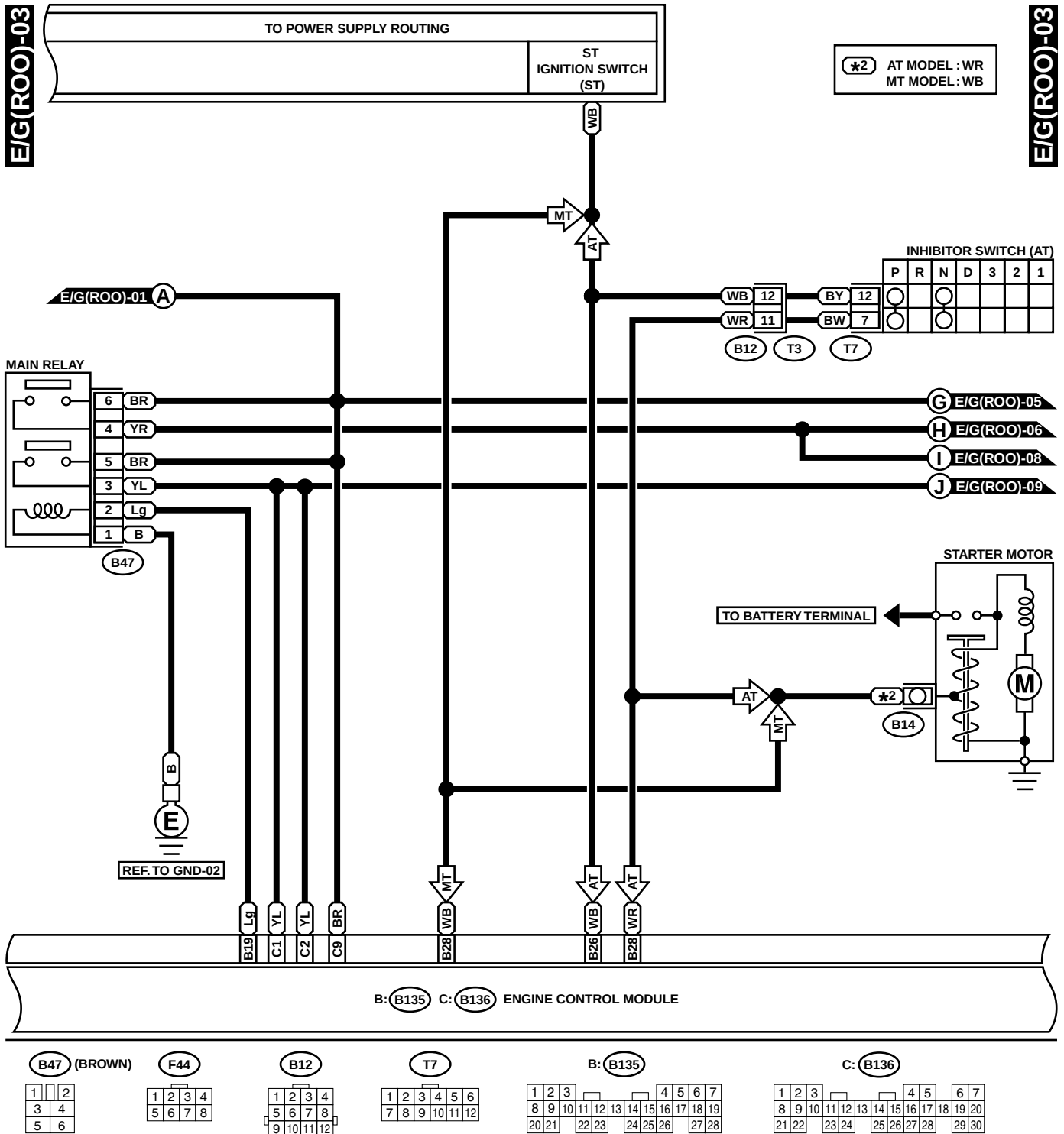
WIRING SYSTEM



GR10-20B

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



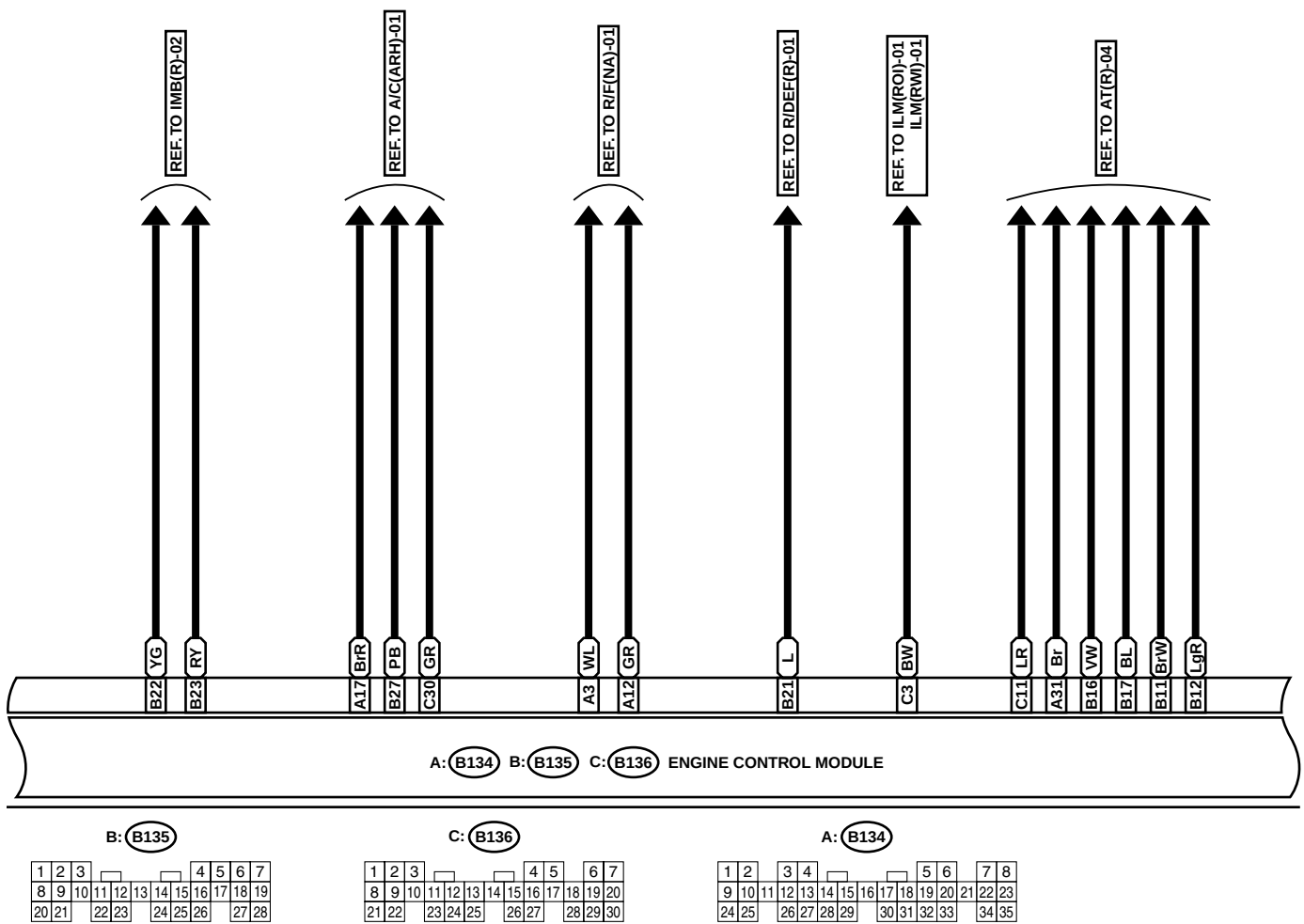
GR10-20C

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(ROO)-04

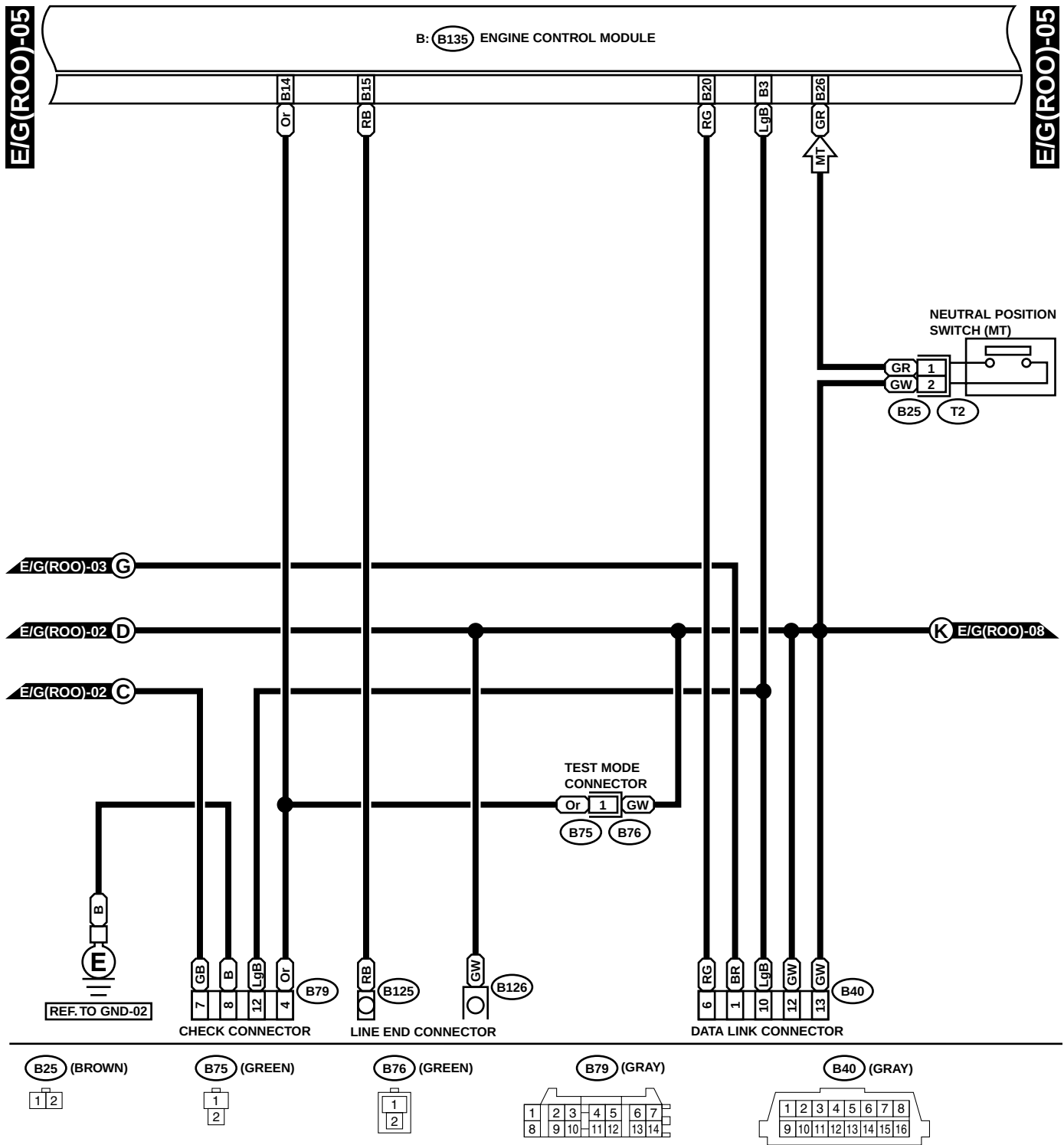
E/G(ROO)-04



GR10-20D

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



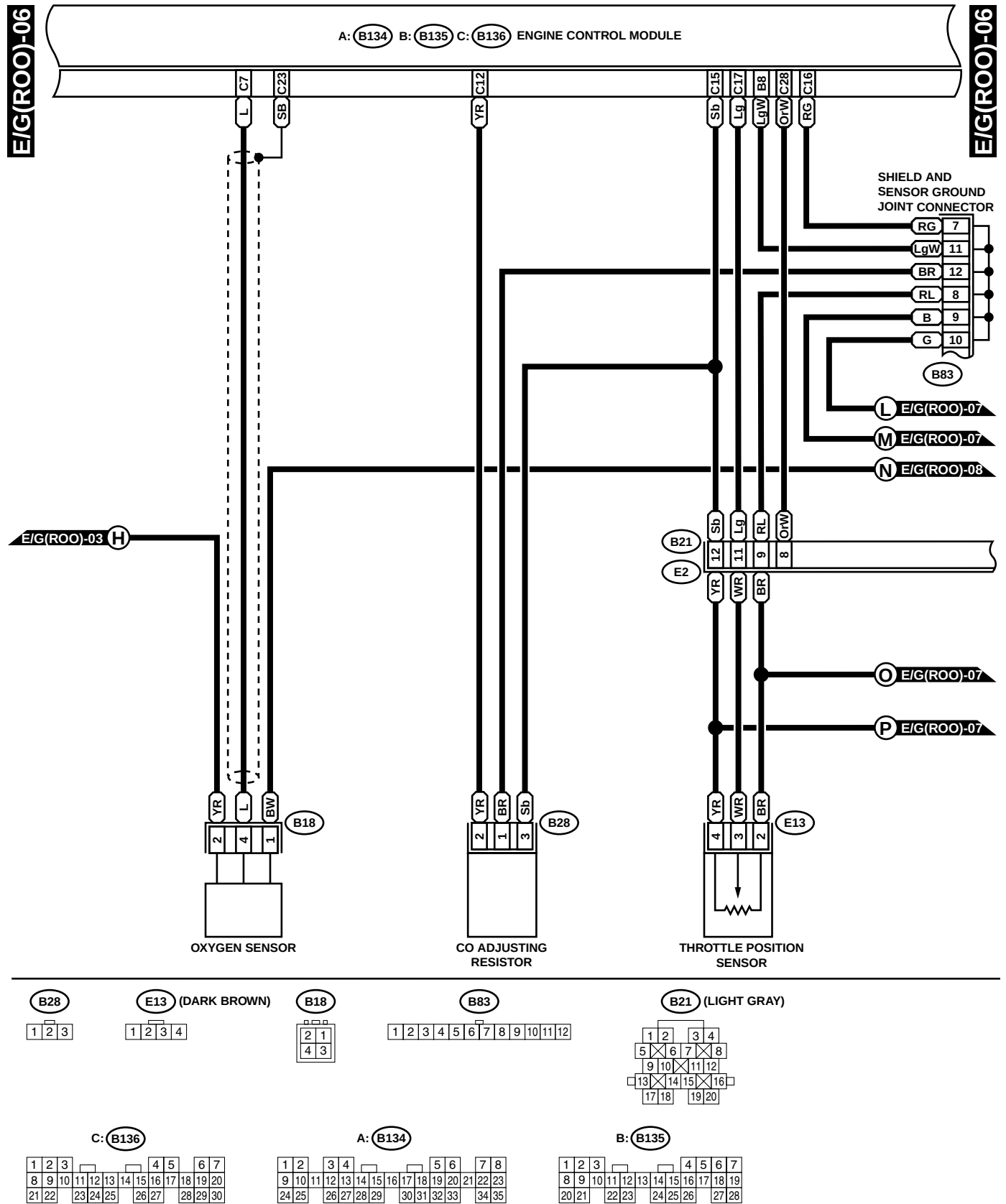
B: B135

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

GR10-20E

ENGINE ELECTRICAL SYSTEM

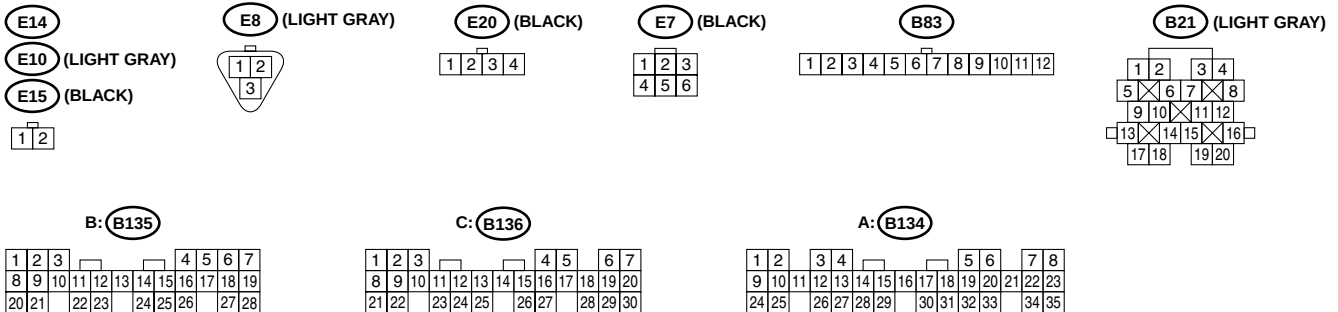
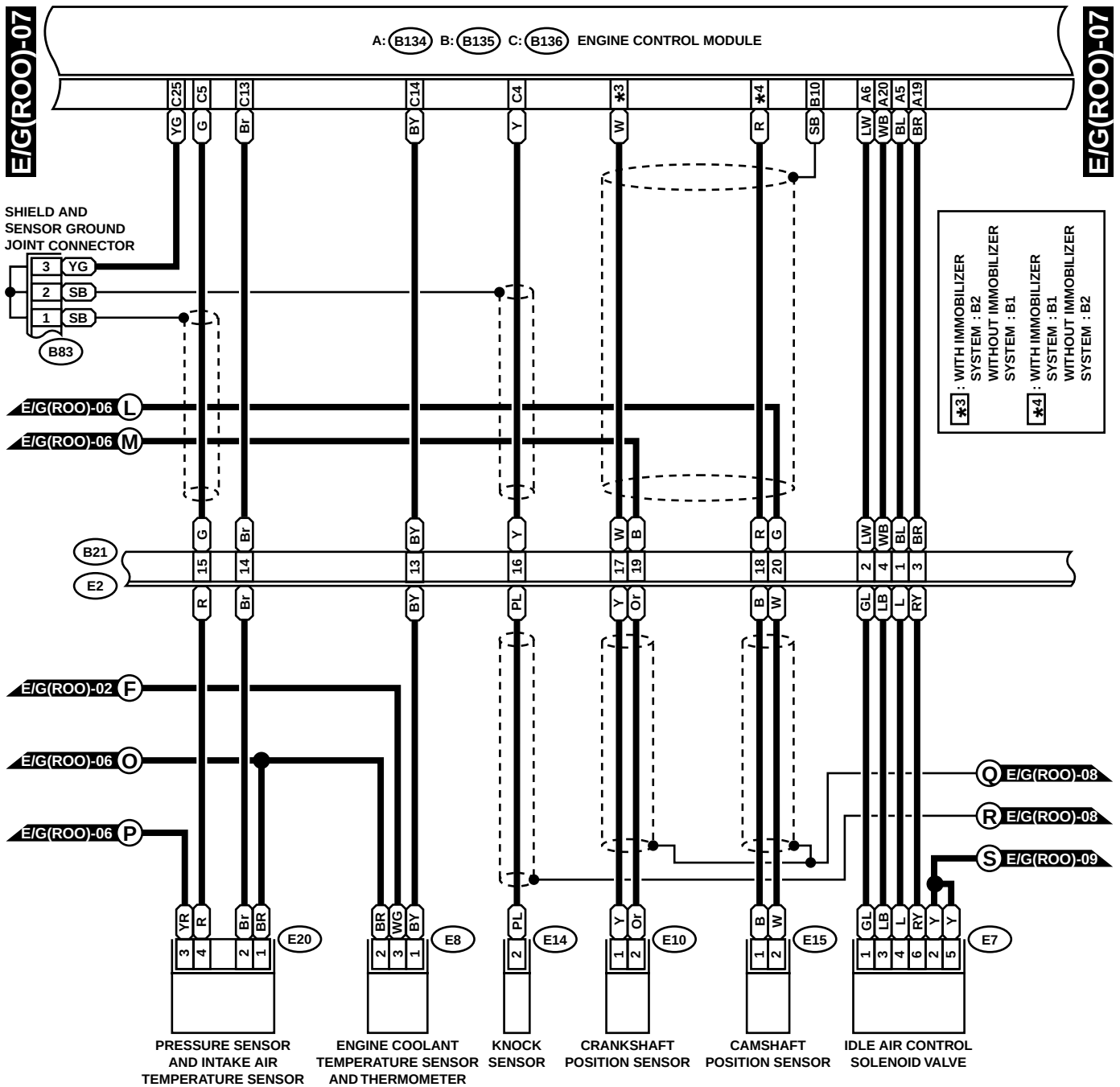
WIRING SYSTEM



GR10-20F

ENGINE ELECTRICAL SYSTEM

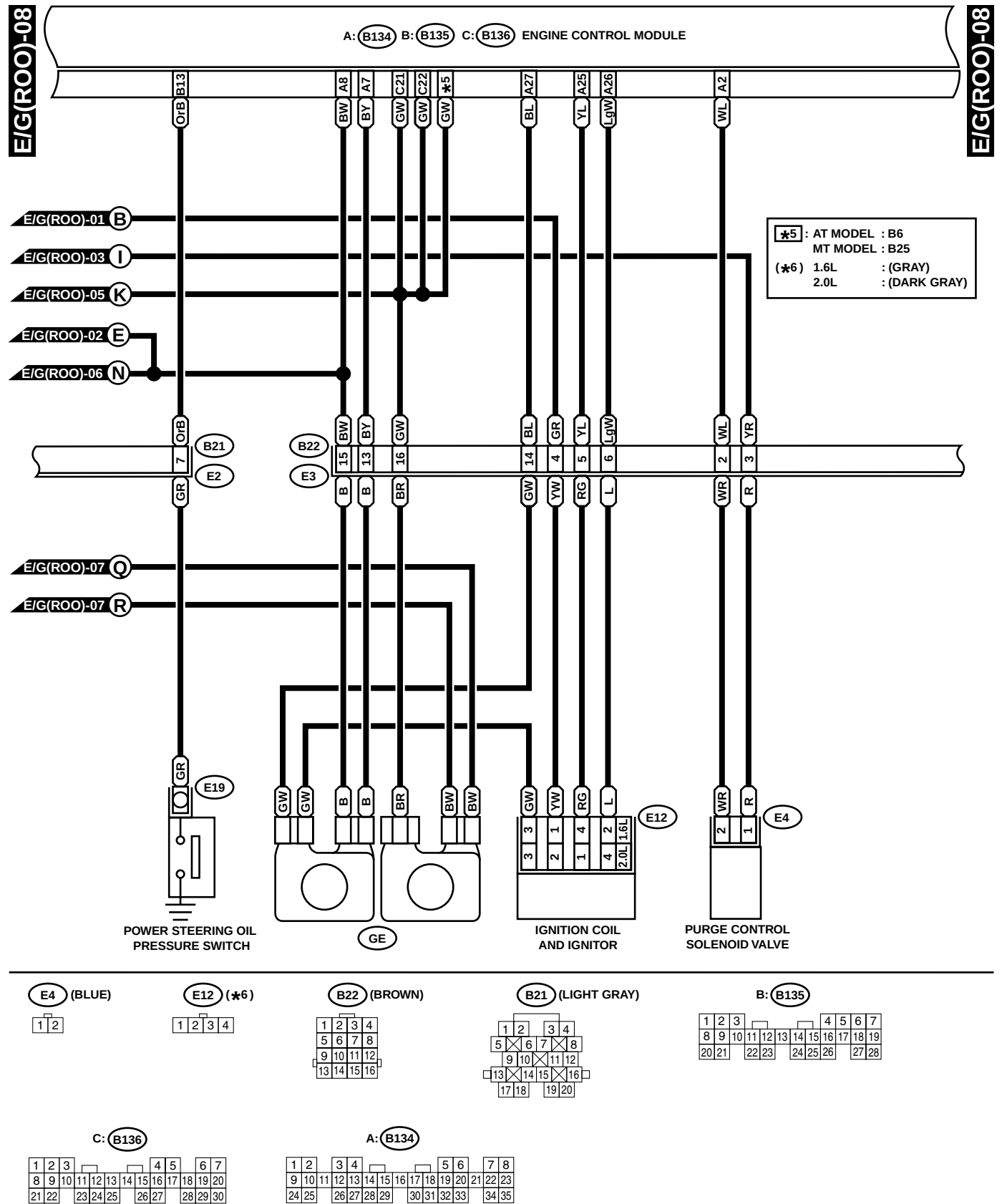
WIRING SYSTEM



GR10-20G

ENGINE ELECTRICAL SYSTEM

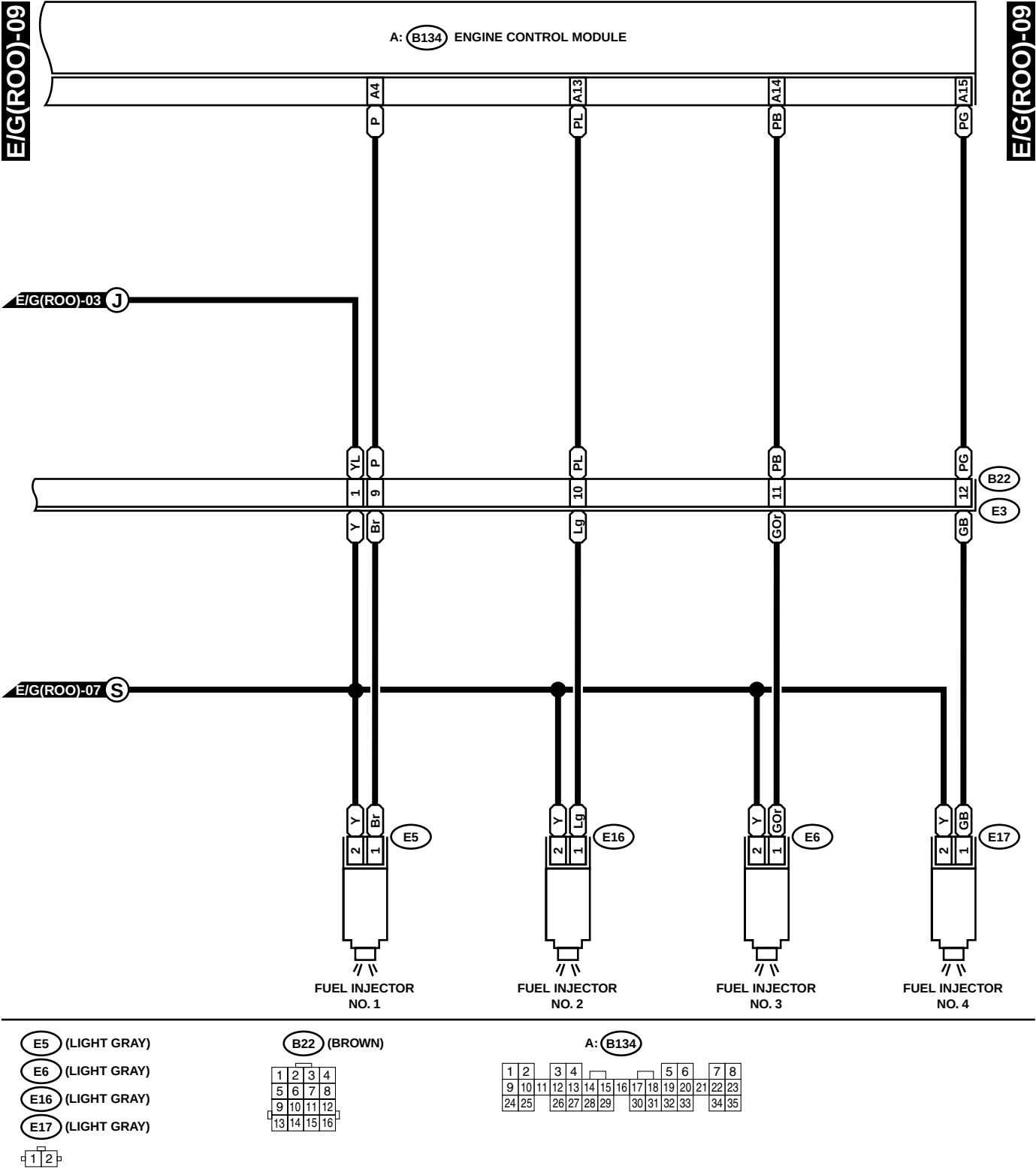
WIRING SYSTEM



GR10-20H

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



GR10-201

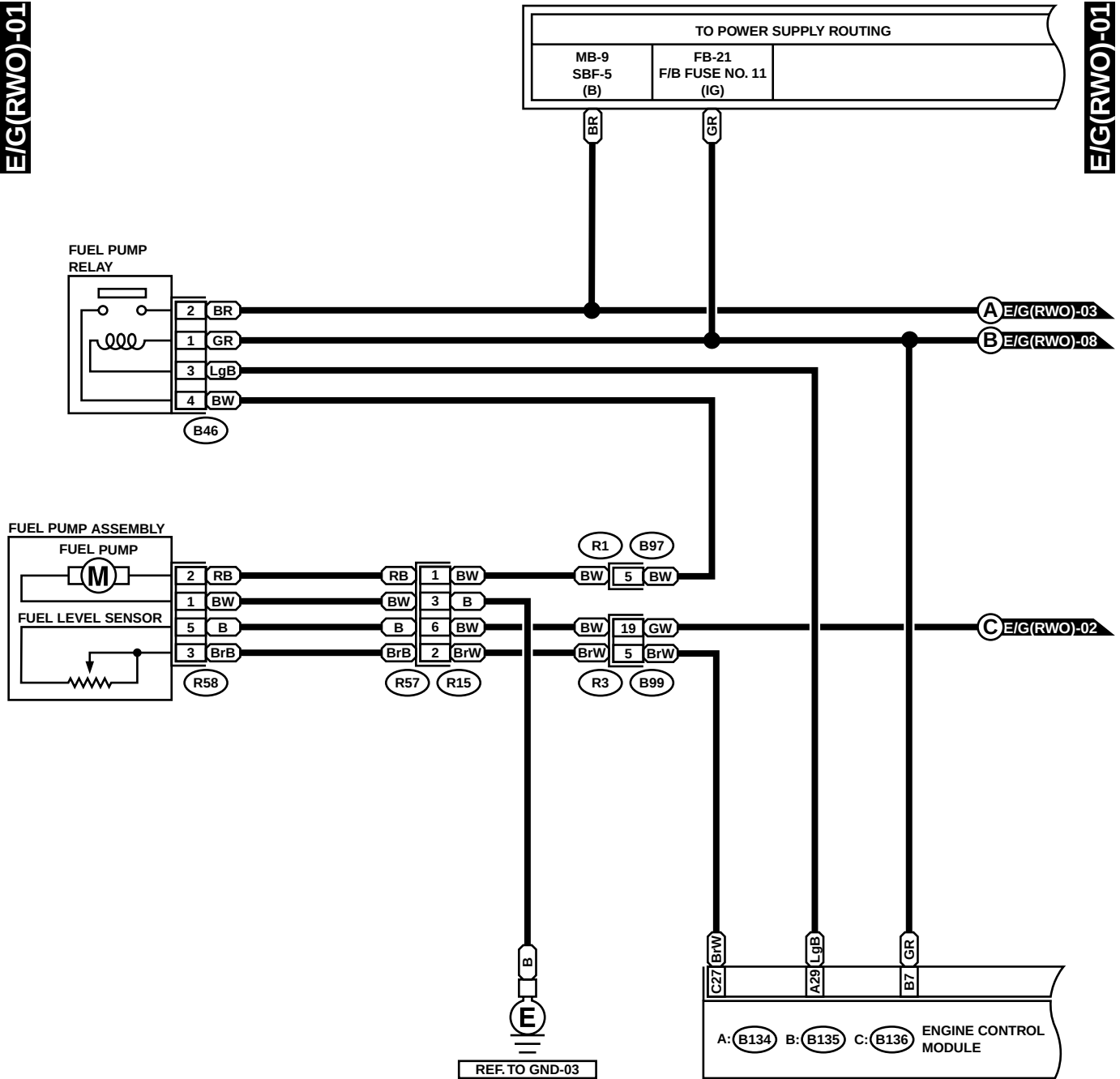
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

5. RHD SOHC MODEL

E/G(RWO)-01

E/G(RWO)-01



B46 (GREEN)



R15 (BLACK)



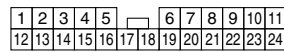
R58



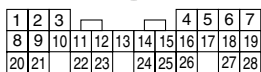
B97



B99



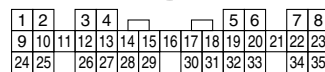
B: B135



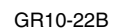
C: B136



A: B134

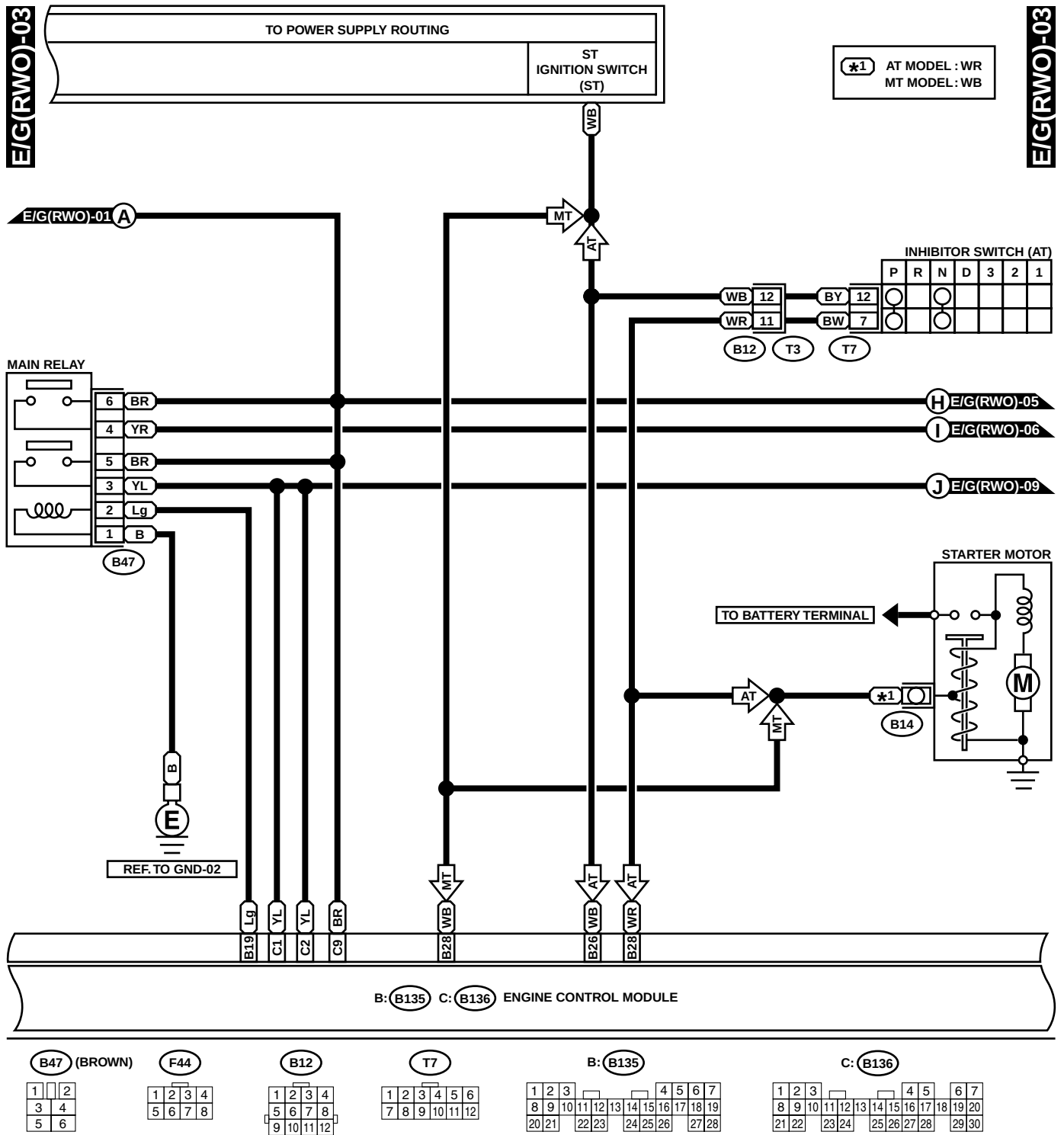


WIRING SYSTEM



ENGINE ELECTRICAL SYSTEM

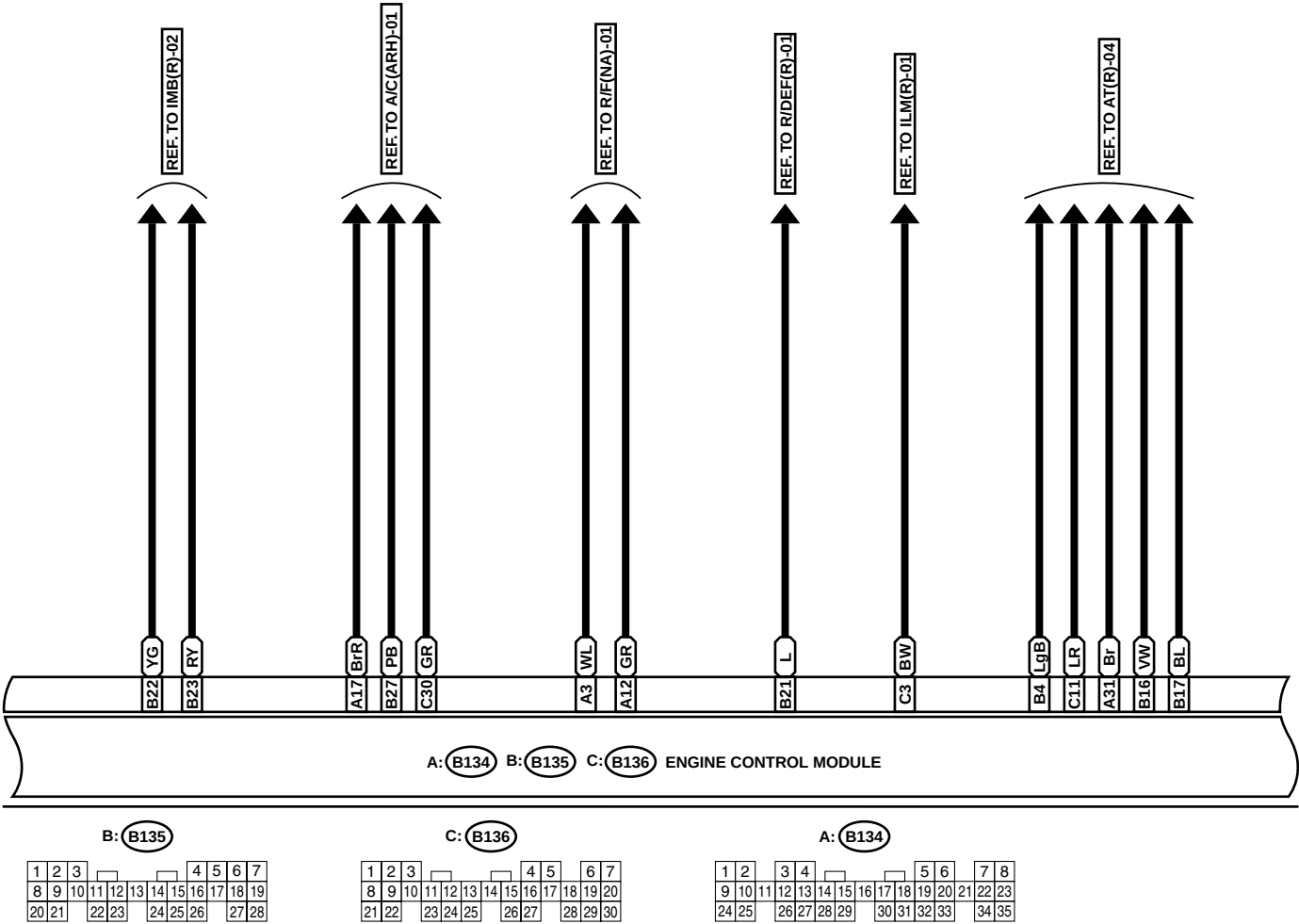
WIRING SYSTEM



GR10-22C

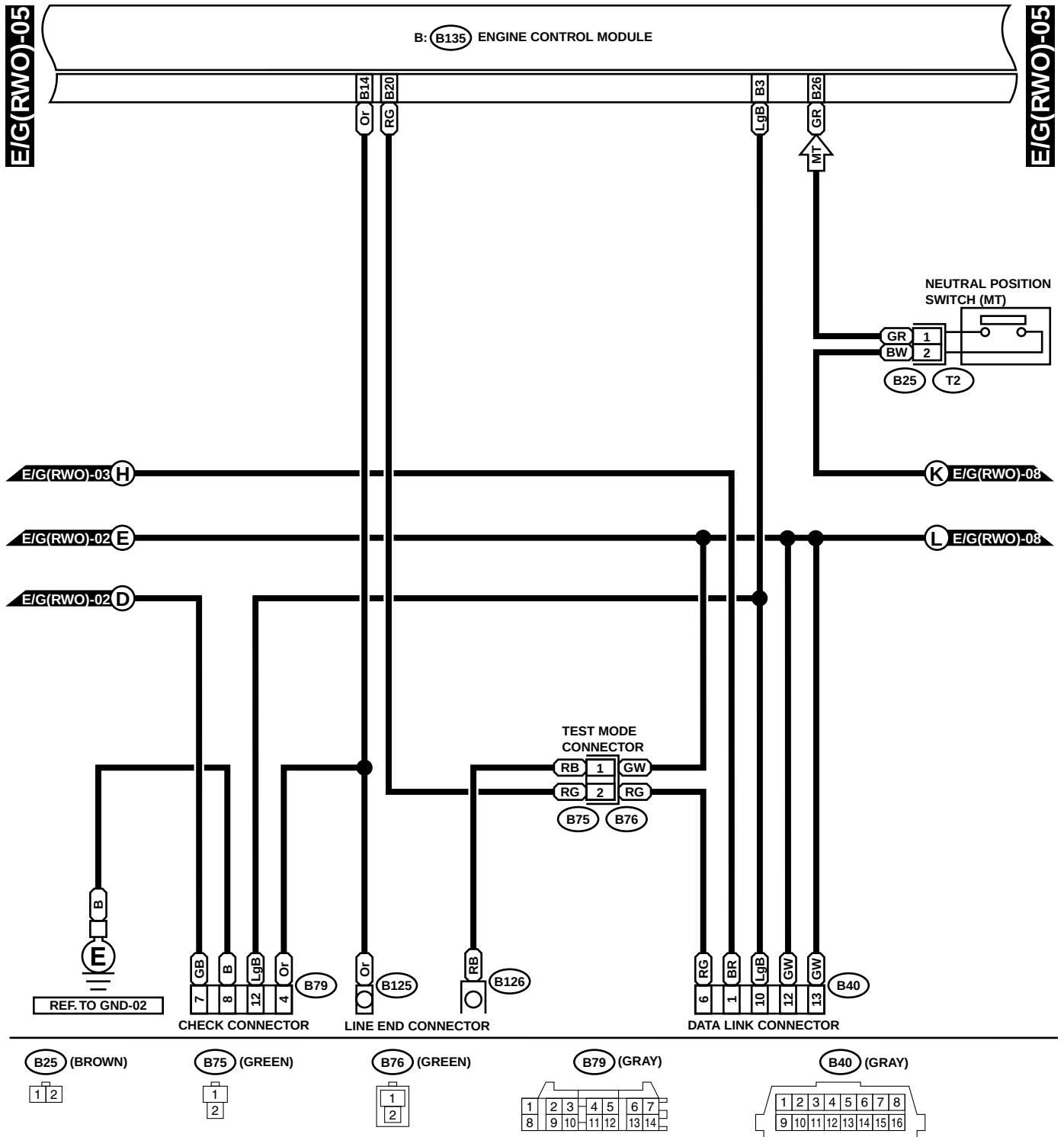
E/G(RWO)-04

E/G(RWO)-04



ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



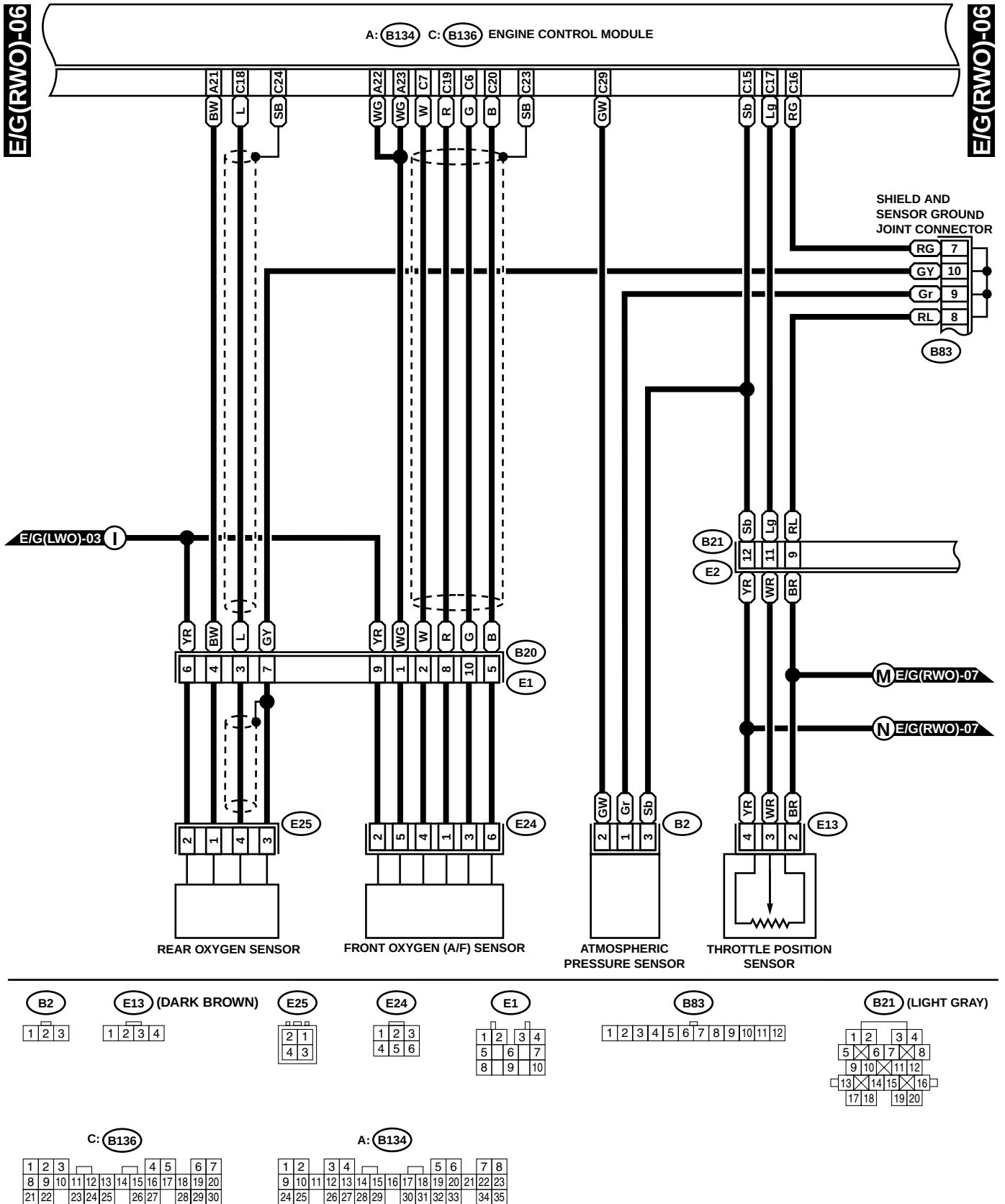
B: (B135)

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			

GR10-22E

ENGINE ELECTRICAL SYSTEM

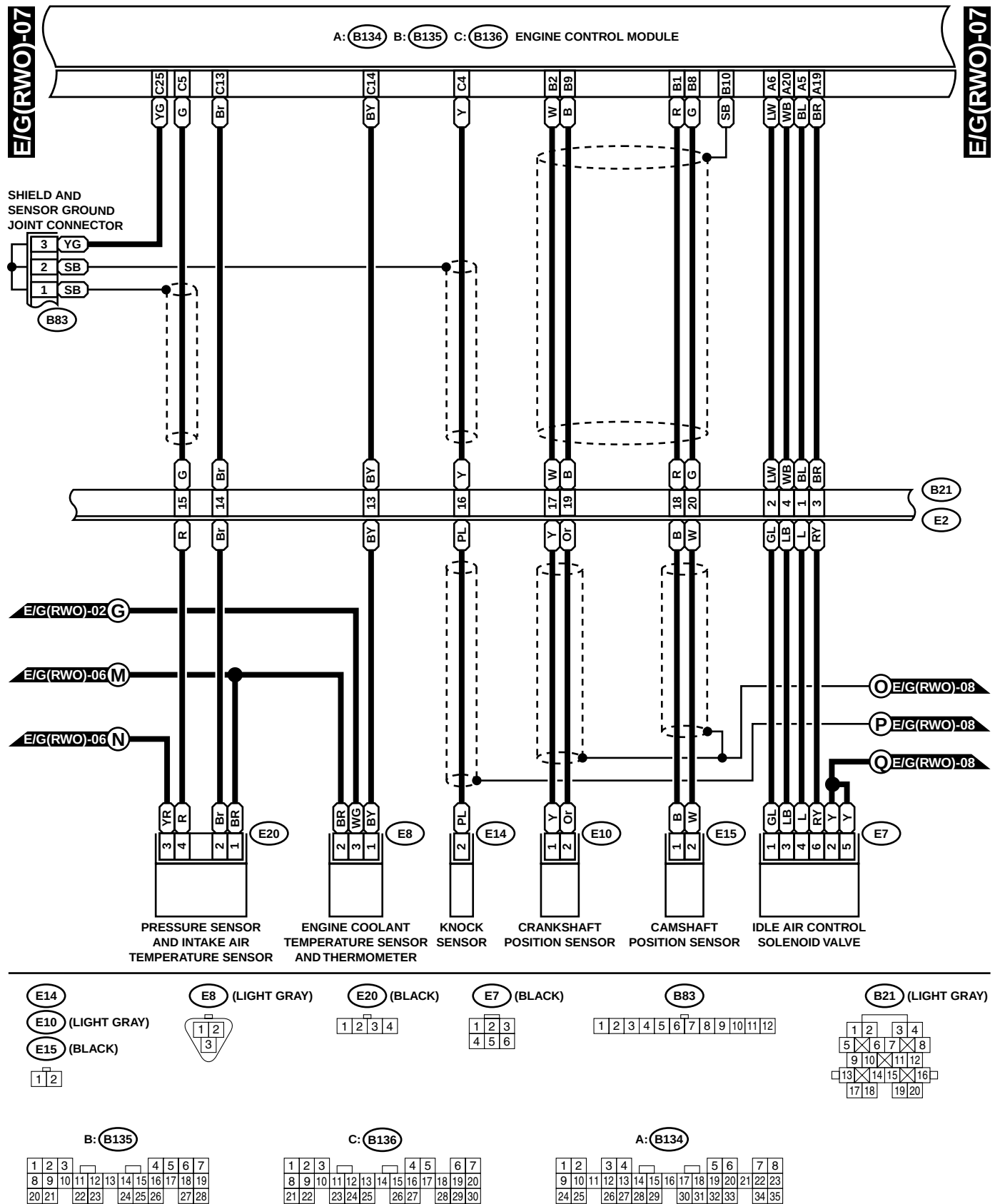
WIRING SYSTEM



GR10-22F

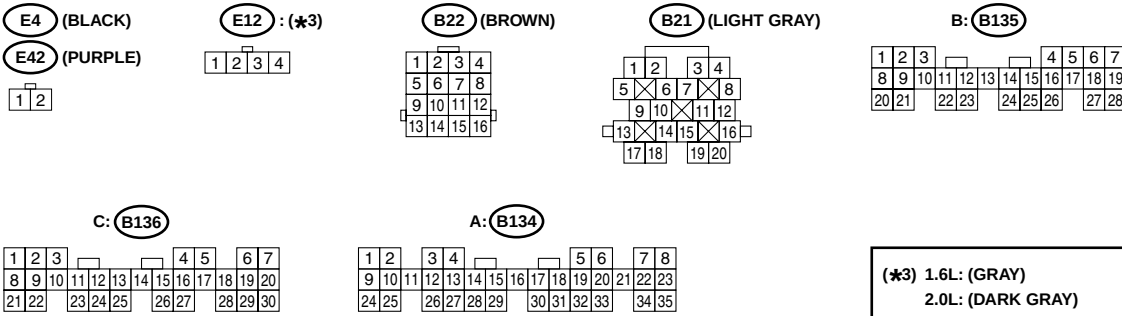
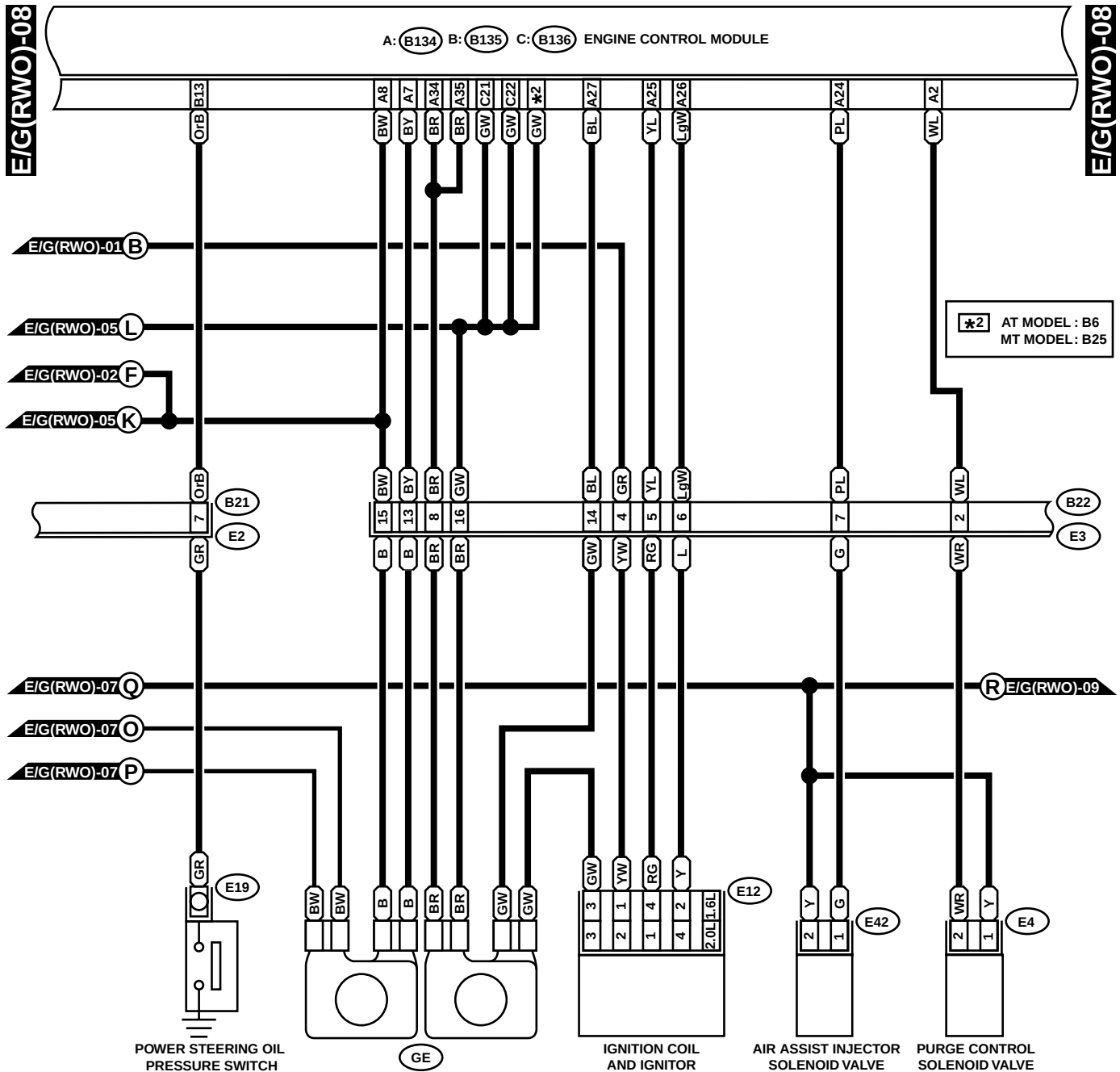
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



ENGINE ELECTRICAL SYSTEM

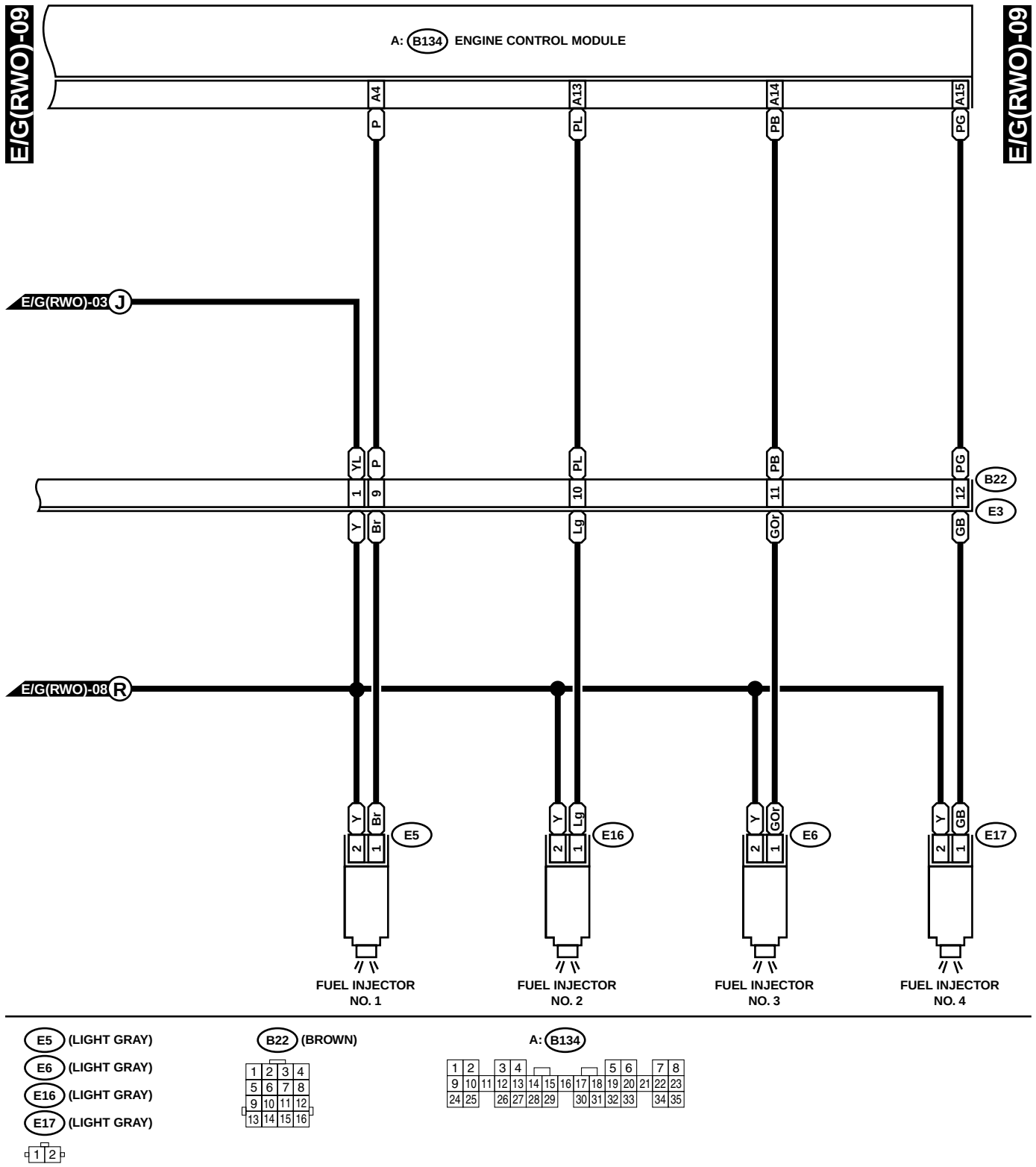
WIRING SYSTEM



GR10-22H

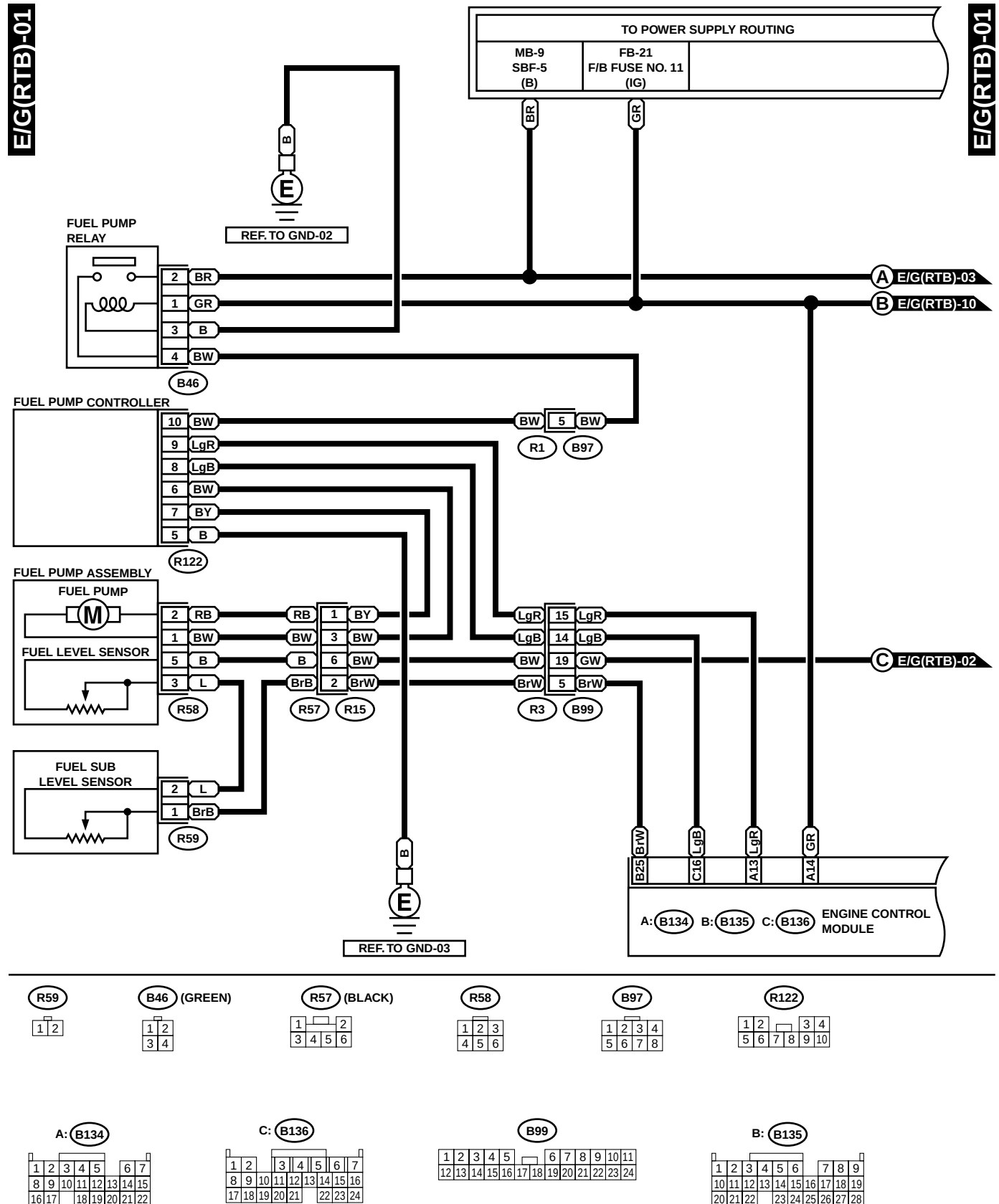
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



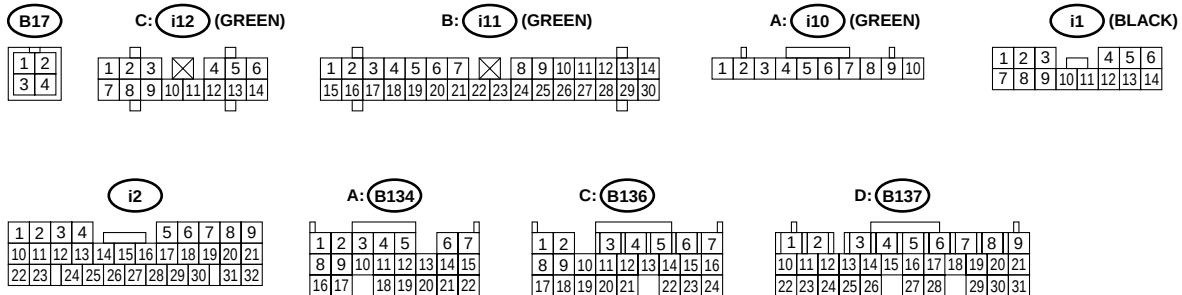
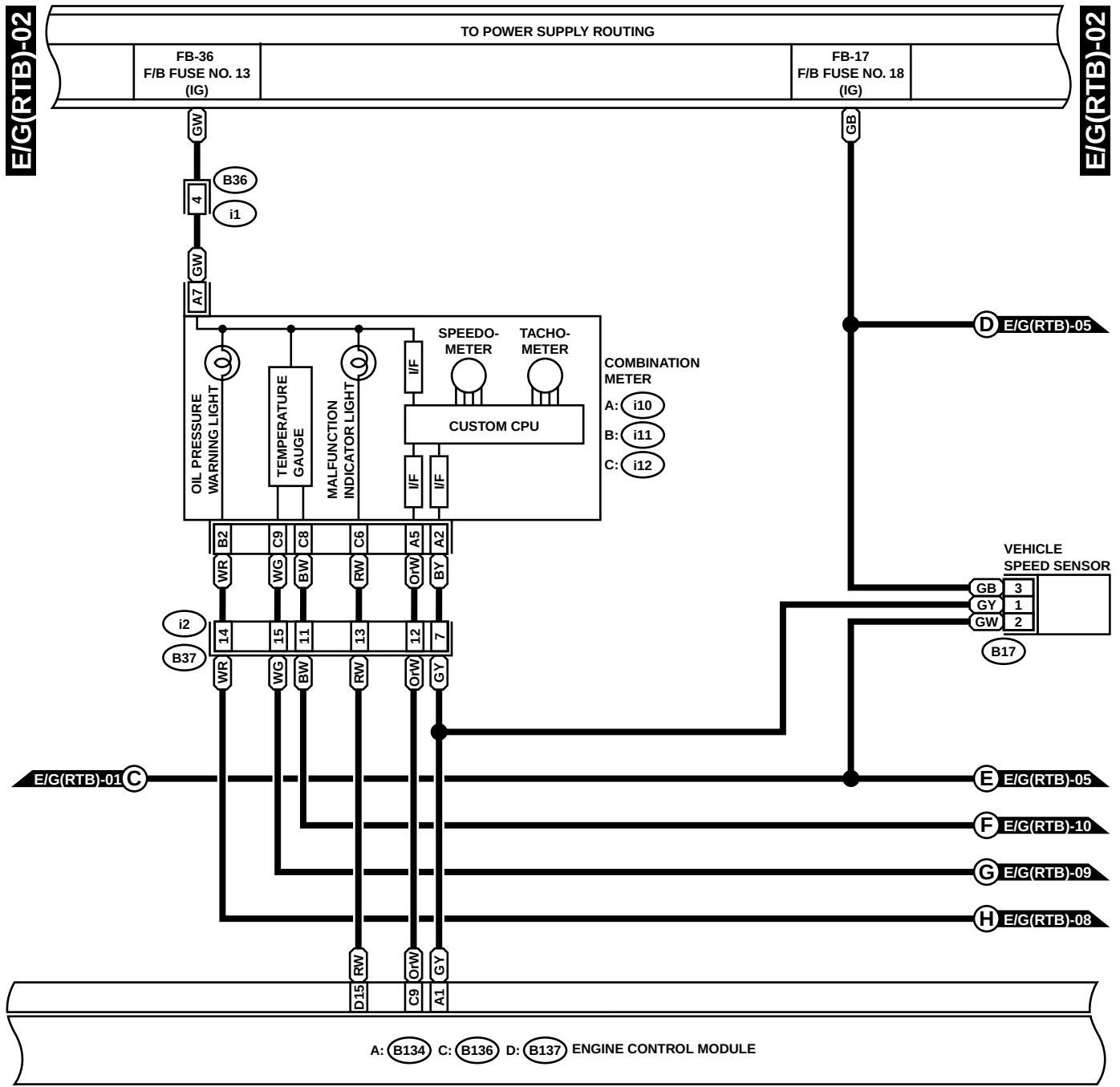
GR10-22I

6. RHD DOHC TURBO MODEL



ENGINE ELECTRICAL SYSTEM

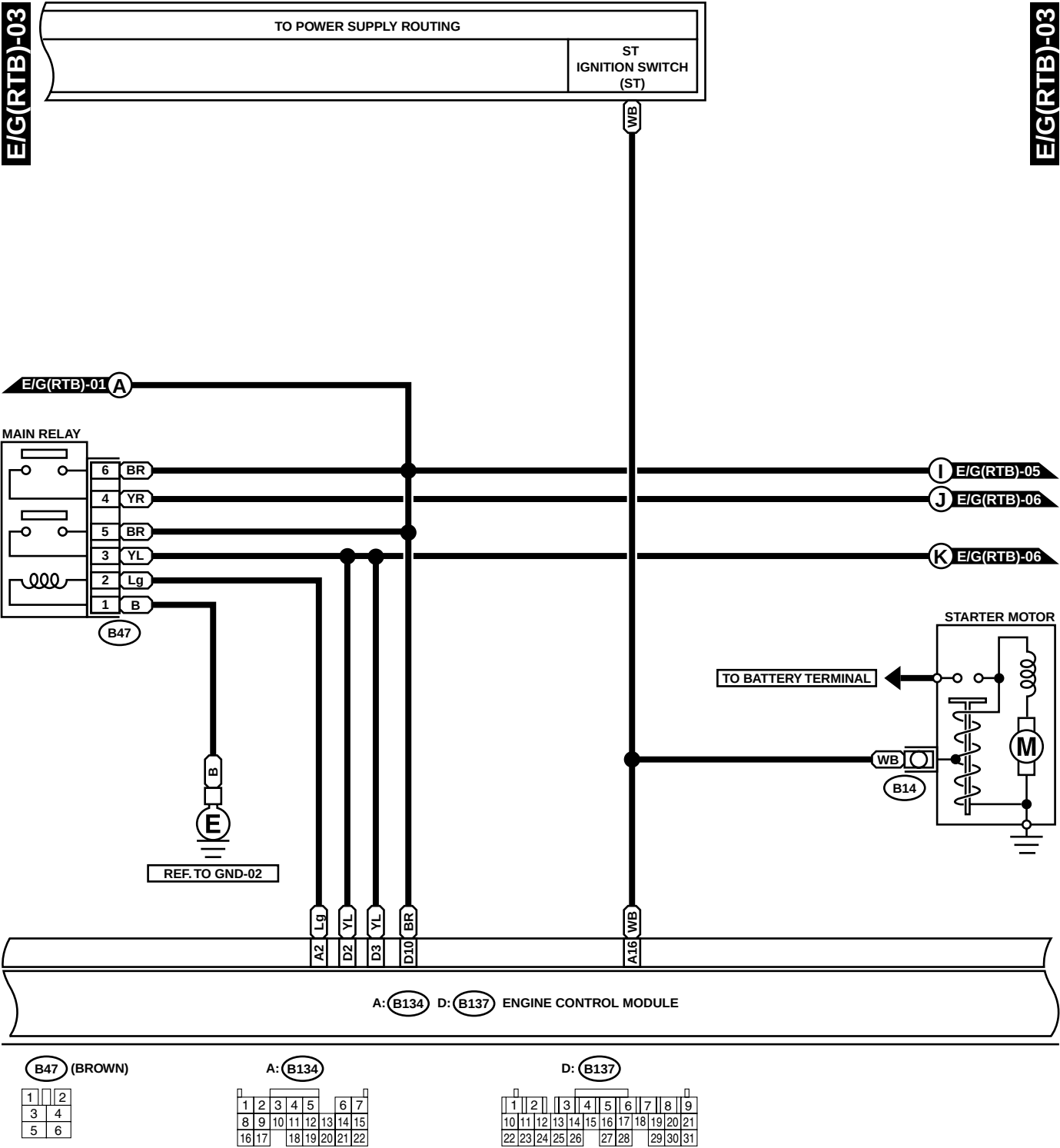
WIRING SYSTEM



GR10-21B

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



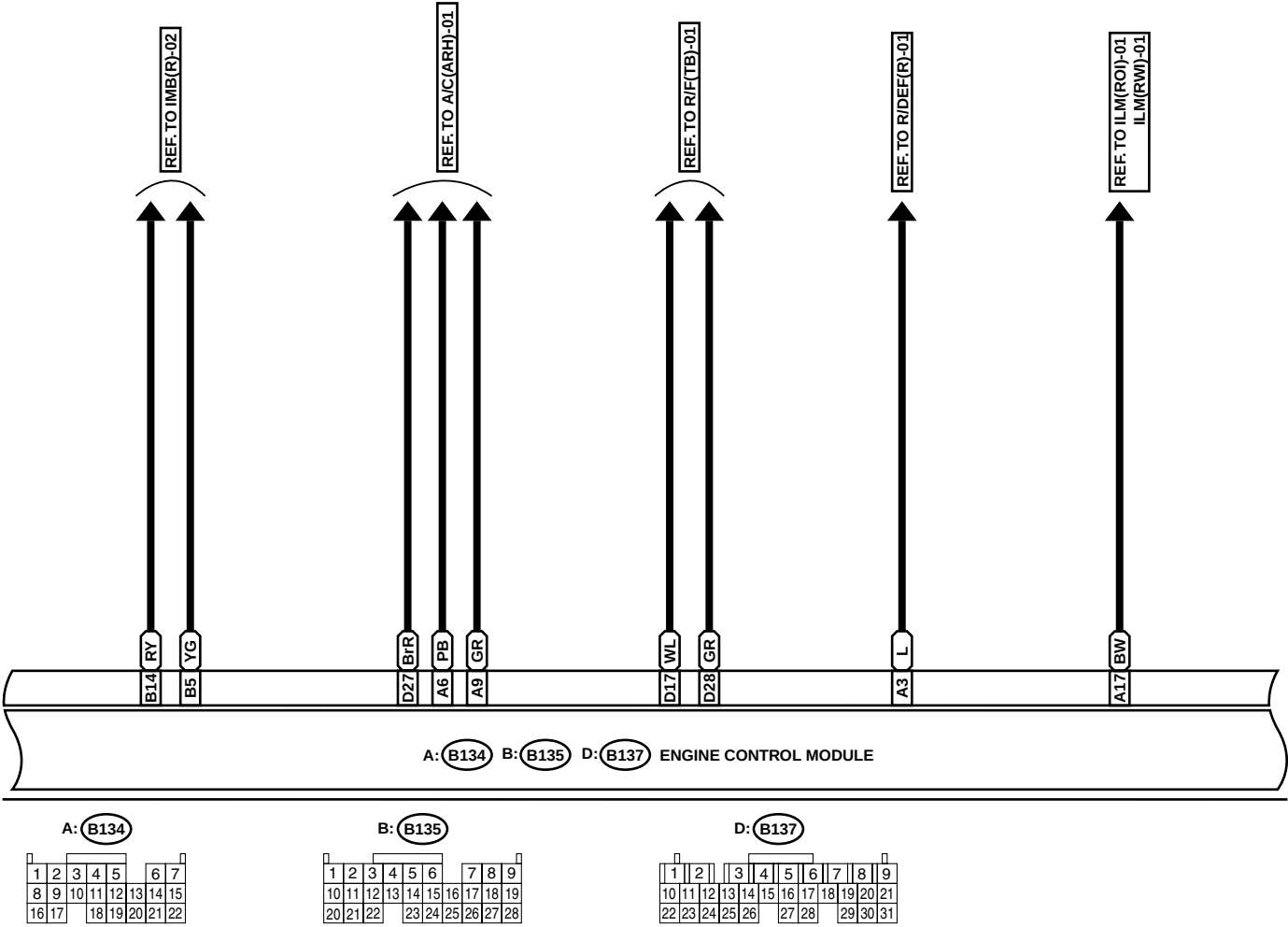
GR10-21C

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(RTB)-04

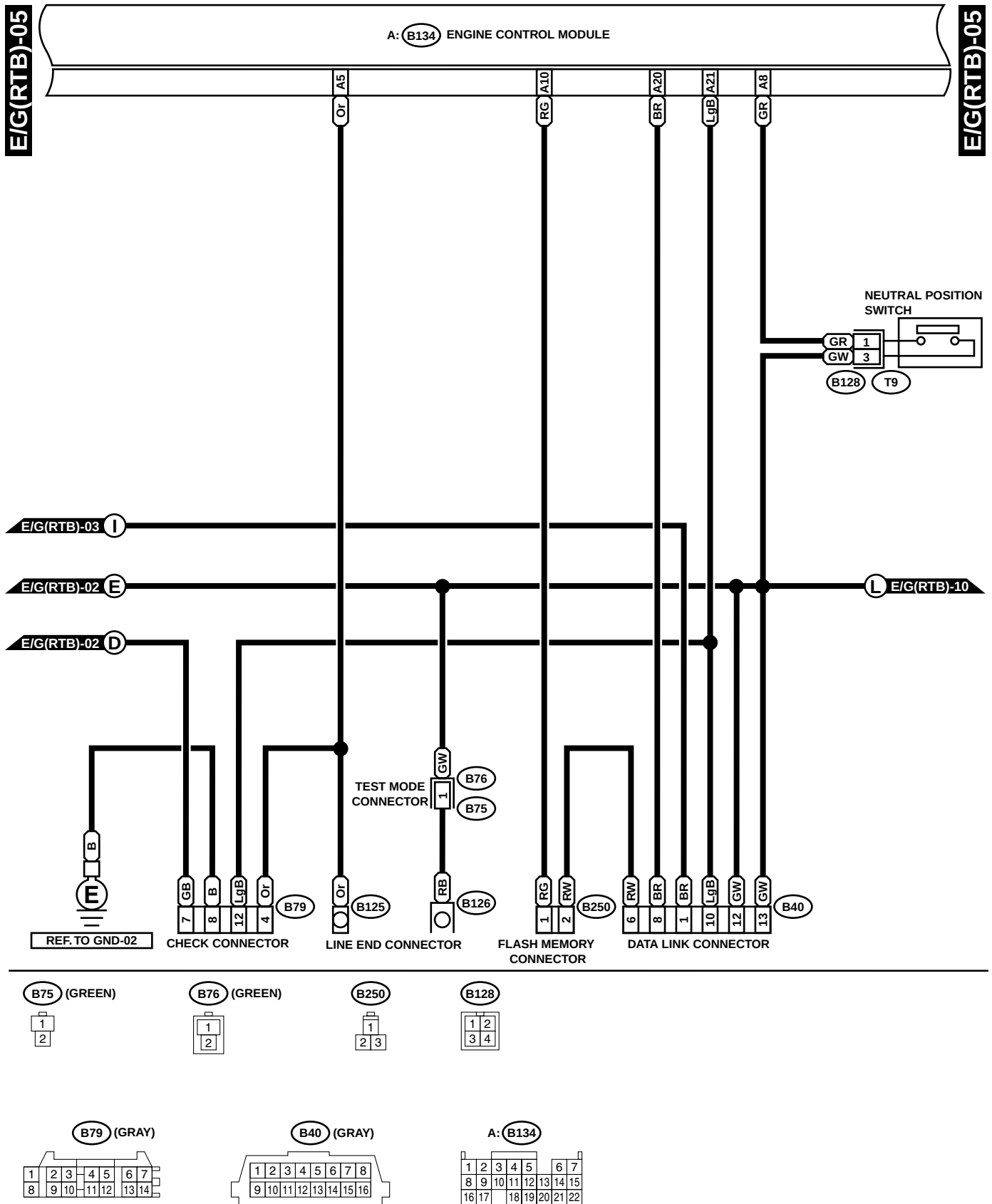
E/G(RTB)-04



GR10-21D

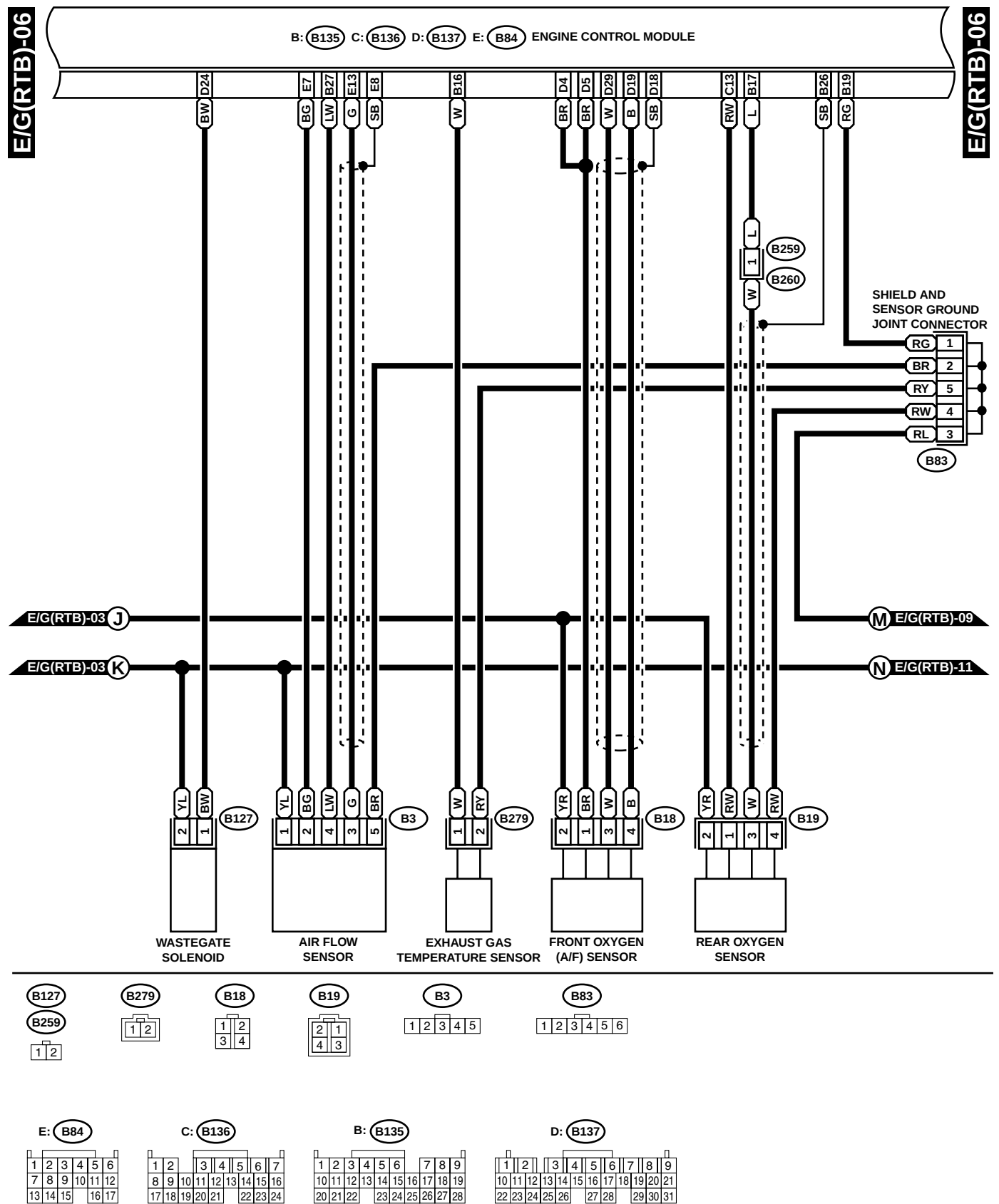
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



ENGINE ELECTRICAL SYSTEM

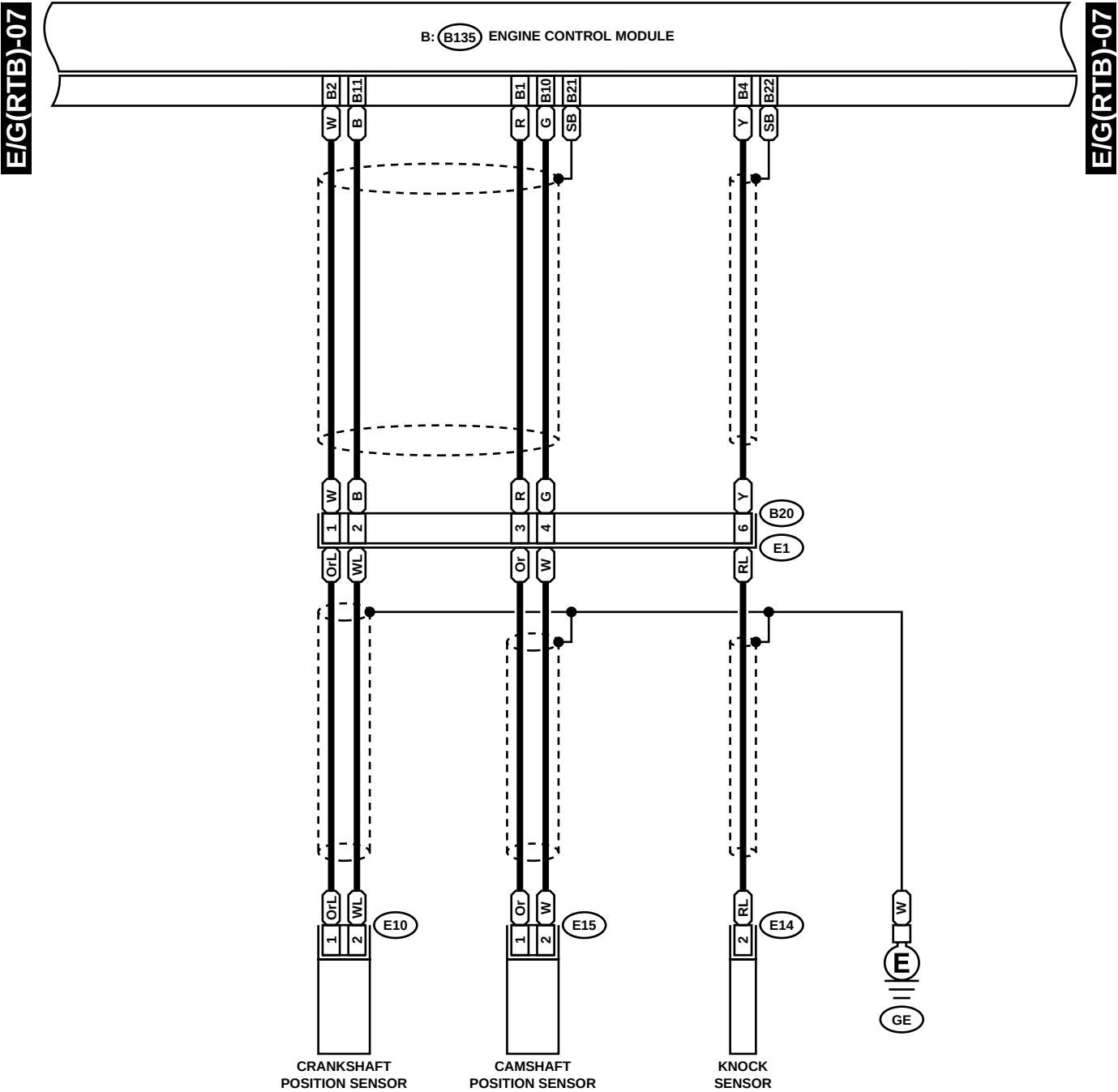
WIRING SYSTEM



GR10-21F

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



- E10** (LIGHT GRAY)
 - E14** (GRAY)
 - E15** (LIGHT GRAY)
- | | |
|---|---|
| 1 | 2 |
| 1 | 2 |

B20 (LIGHT GRAY)

1	2	3	4
5	6	7	
8	9	10	

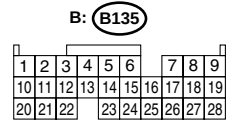
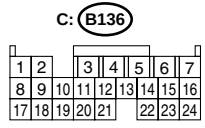
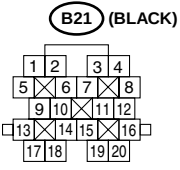
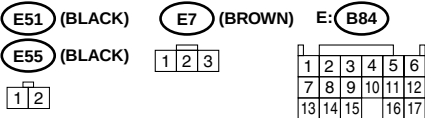
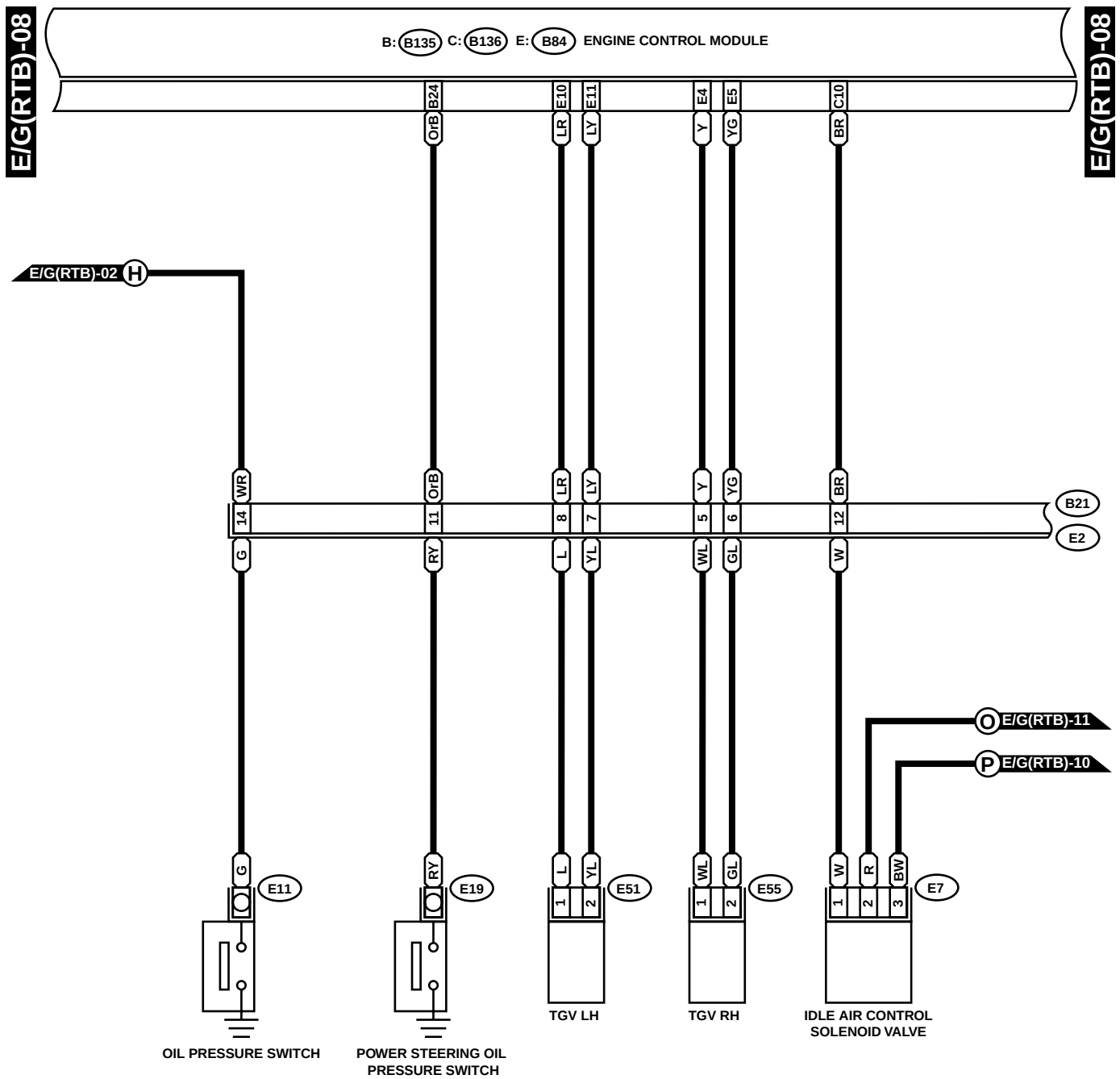
B: (B135)

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								

GR10-21G

ENGINE ELECTRICAL SYSTEM

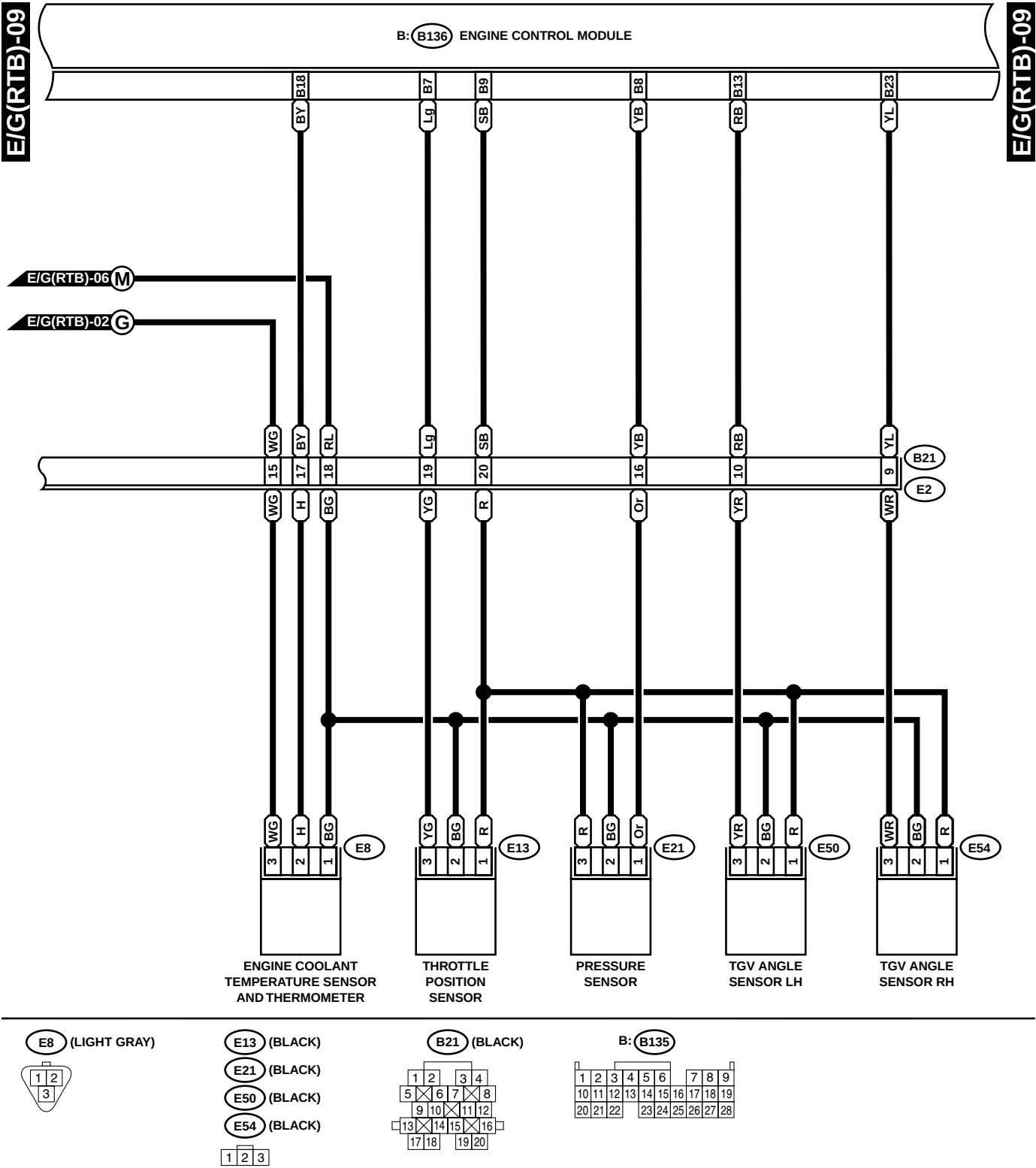
WIRING SYSTEM



GR10-21H

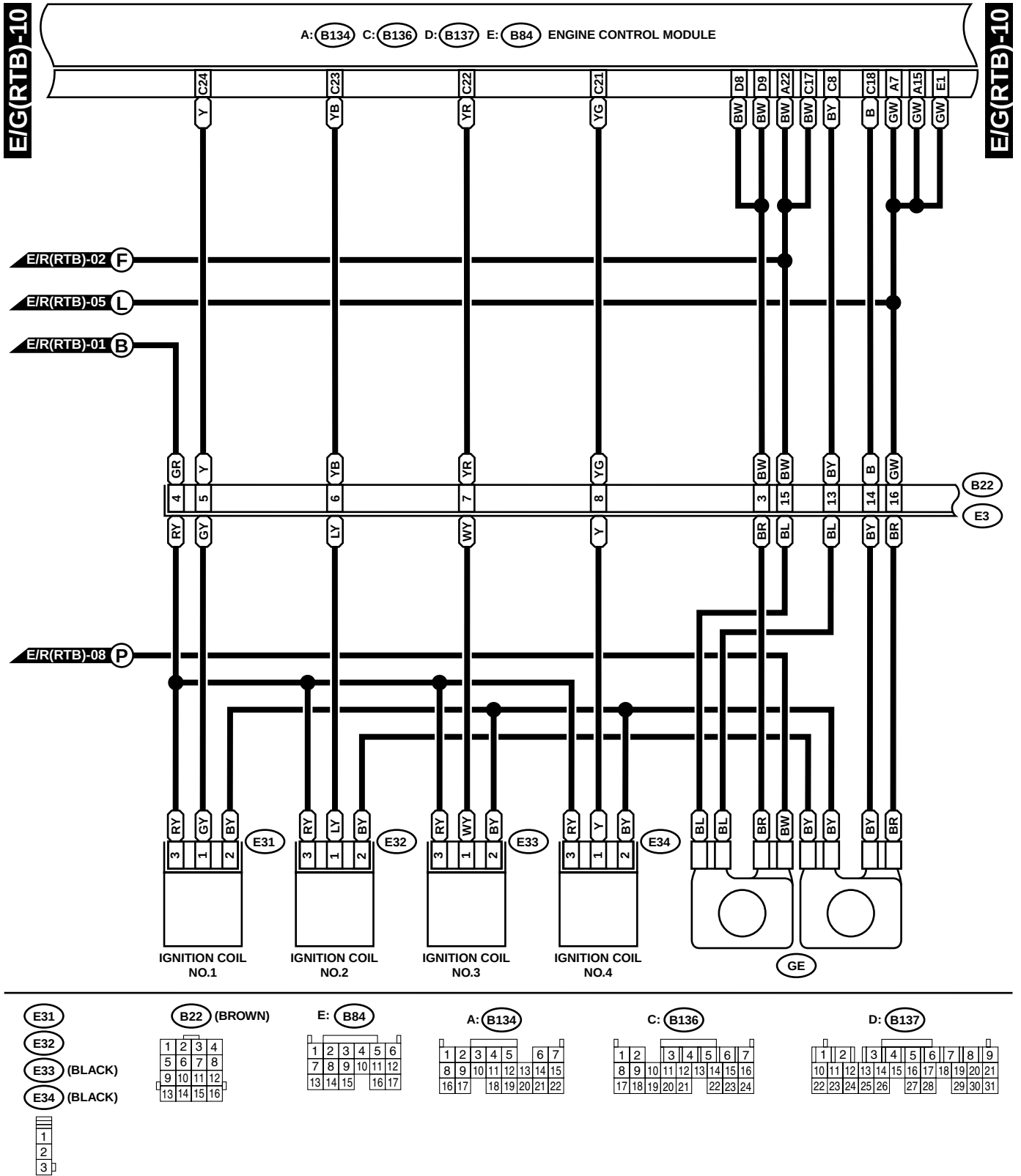
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



ENGINE ELECTRICAL SYSTEM

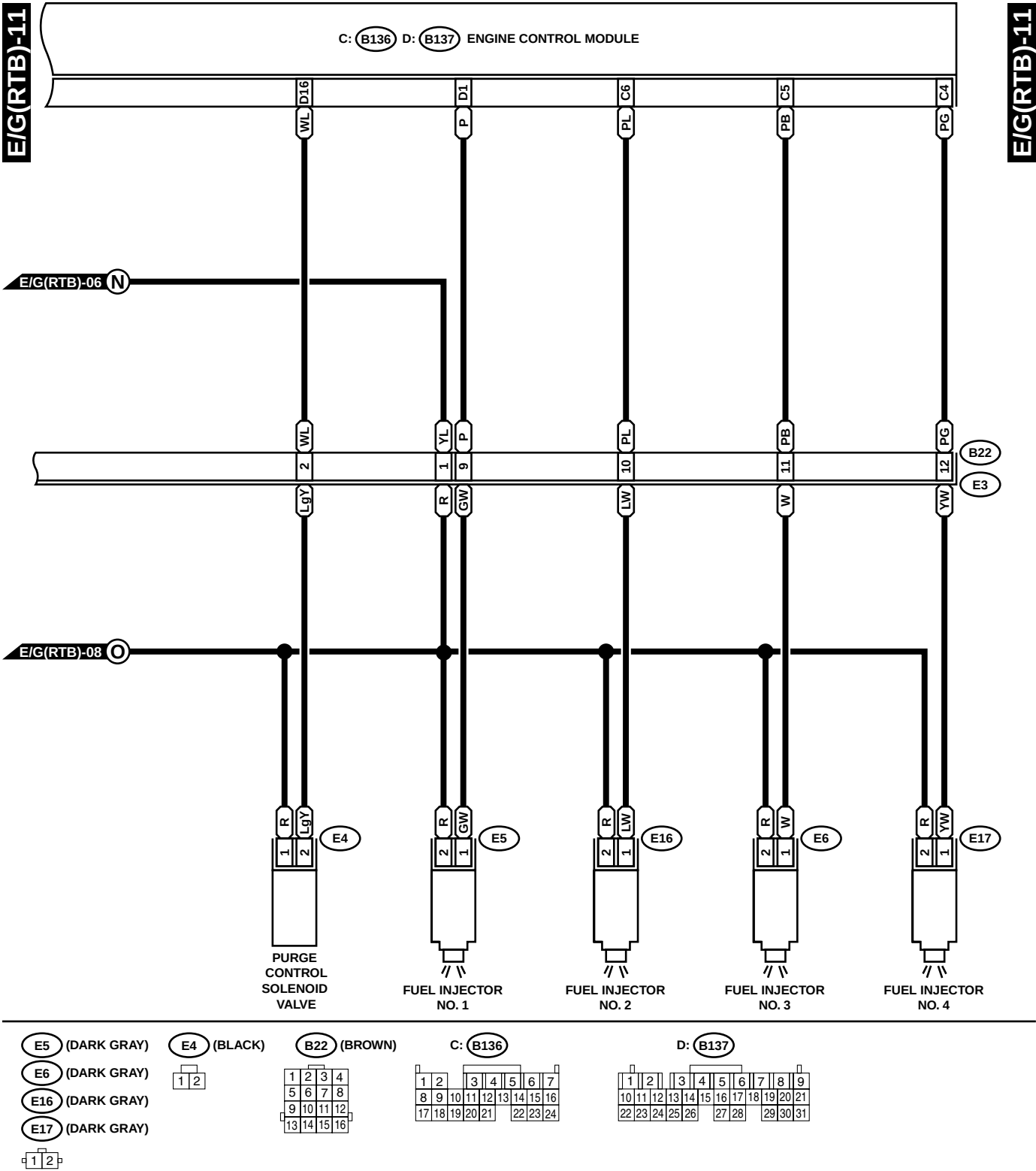
WIRING SYSTEM



GR10-21J

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



GR10-21K

17.Fuel Gauge System

A: SCHEMATIC

WIRING SYSTEM

F/G(L)-01



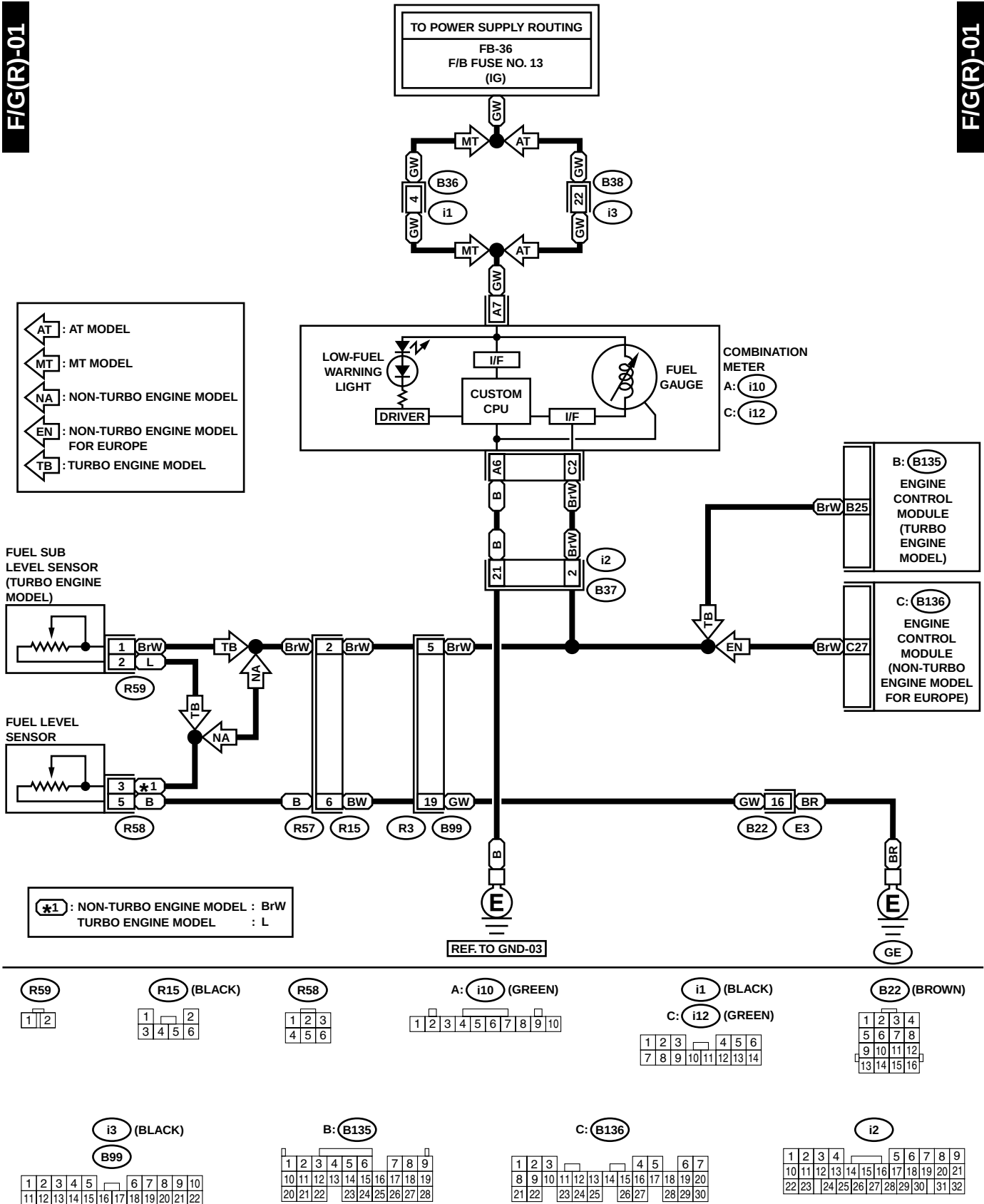
FUEL GAUGE SYSTEM

WIRING SYSTEM

2. RHD MODEL

F/G(R)-01

F/G(R)-01



GR61-20

18.Full-Time Dual-Range System

A: SCHEMATIC

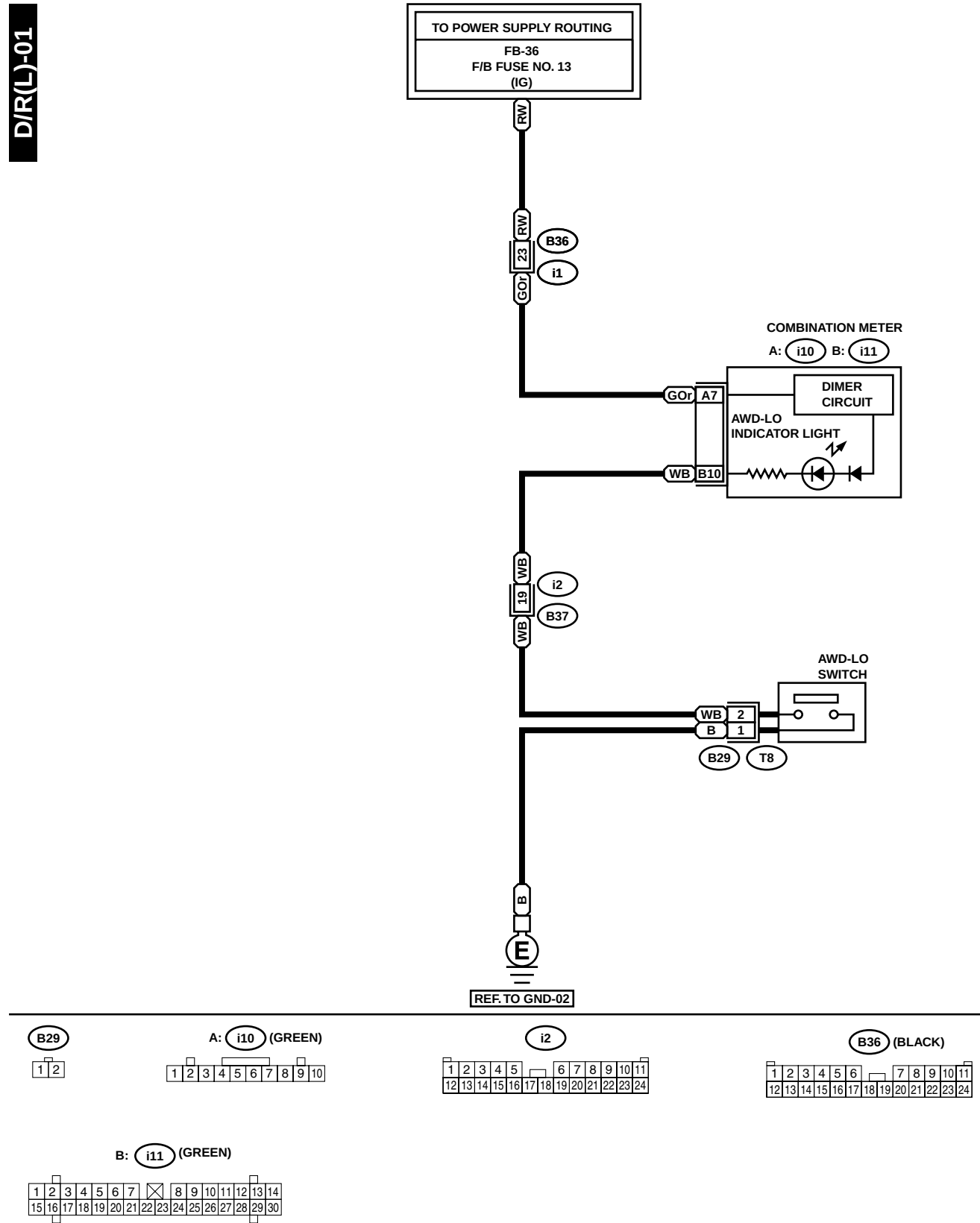
FULL-TIME DUAL-RANGE SYSTEM

WIRING SYSTEM

1. LHD MODEL

D/R(L)-01

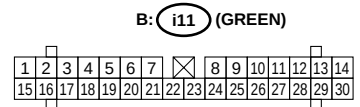
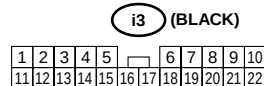
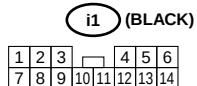
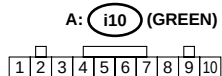
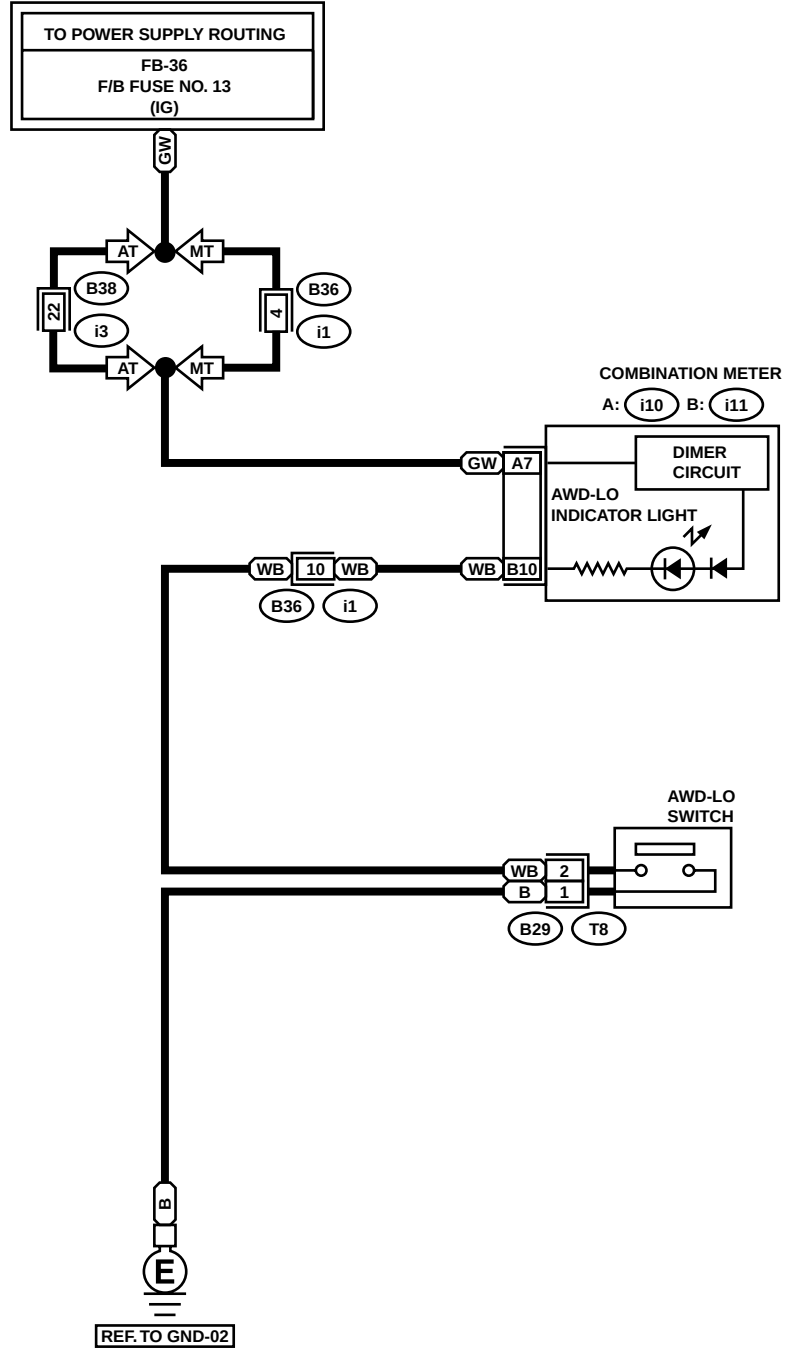
D/R(L)-01



2. RHD MODEL

D/R(R)-01

D/R(R)-01



FRONT ACCESSORY POWER SUPPLY SYSTEM

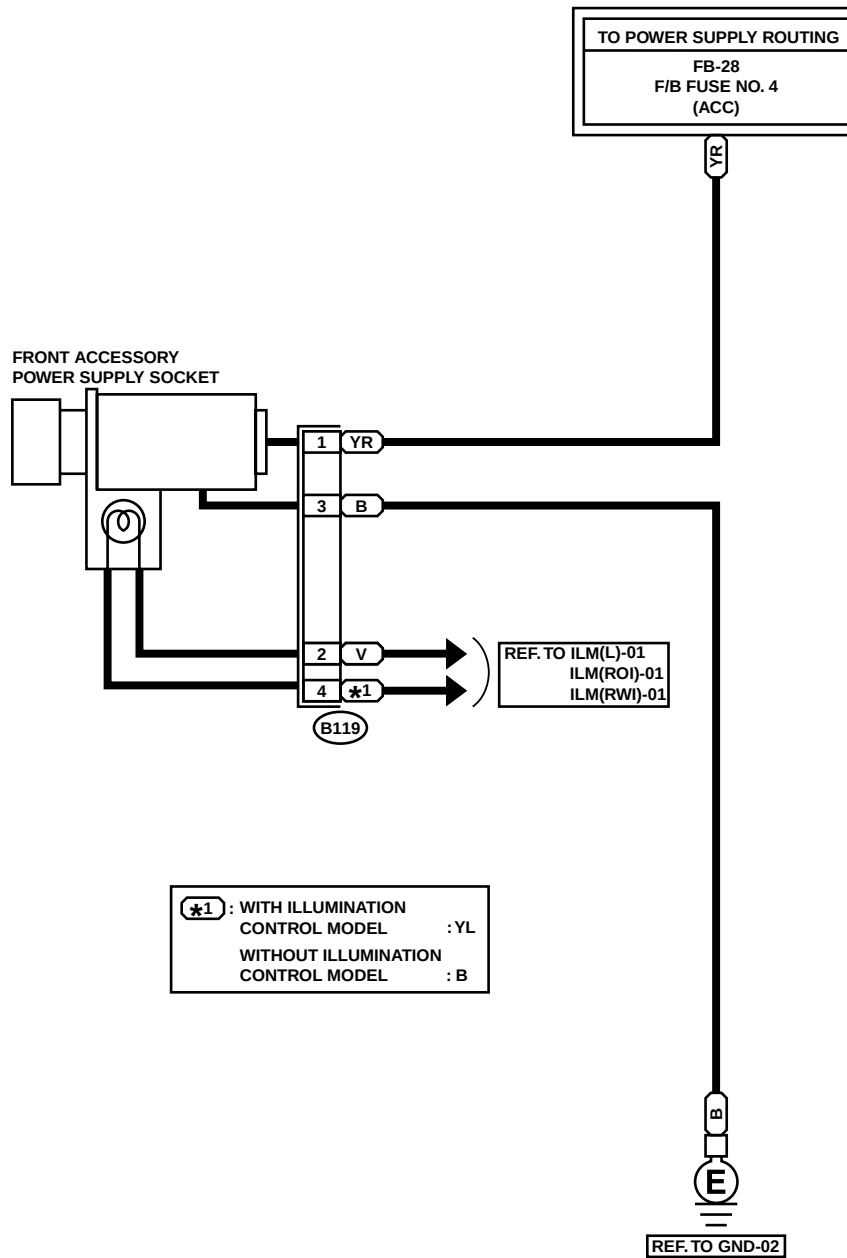
WIRING SYSTEM

19.Front Accessory Power Supply System

A: SCHEMATIC

FAPS-01

FAPS-01

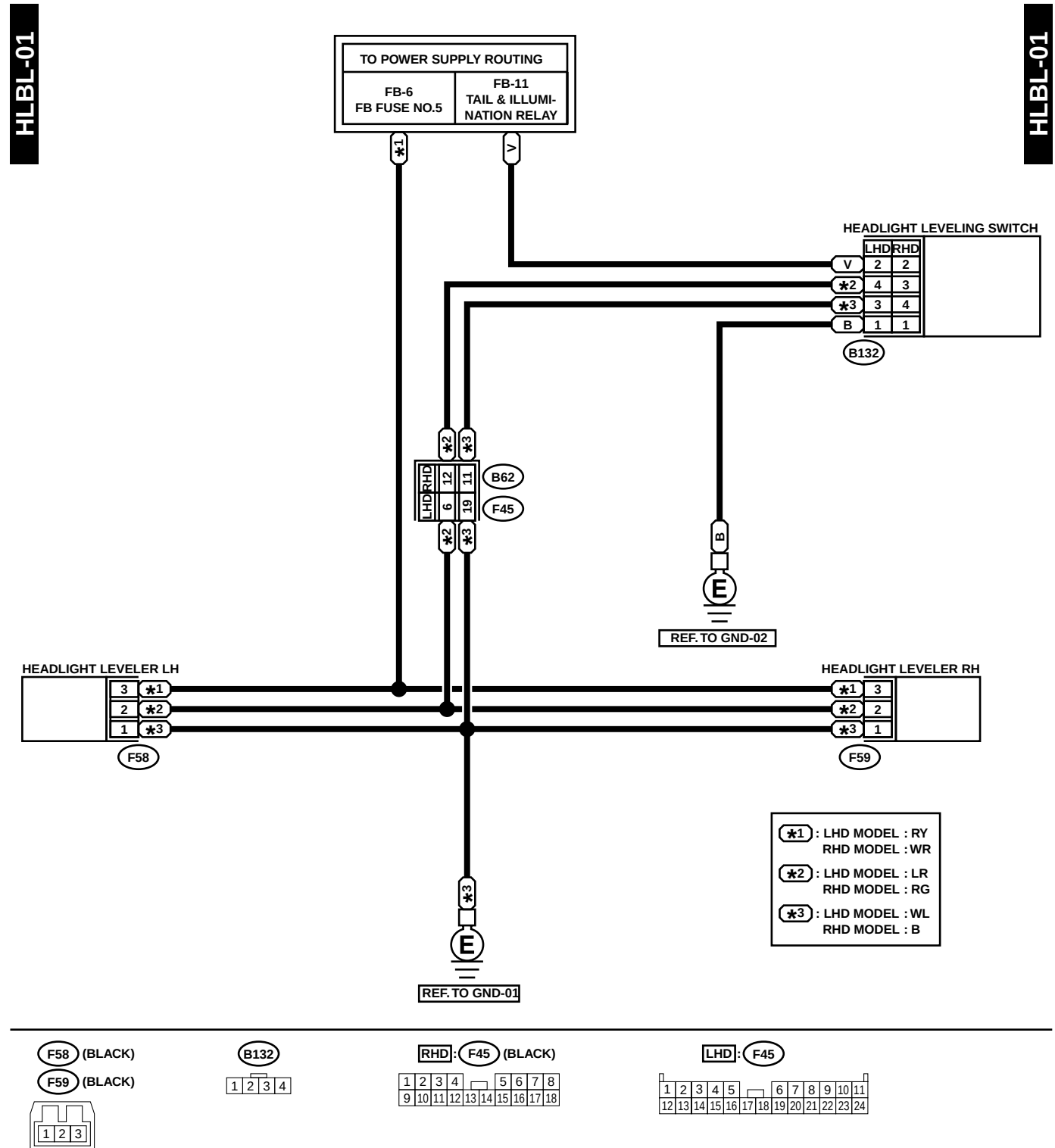


B119

1	2
3	4

20.Headlight Beam Leveler System

A: SCHEMATIC

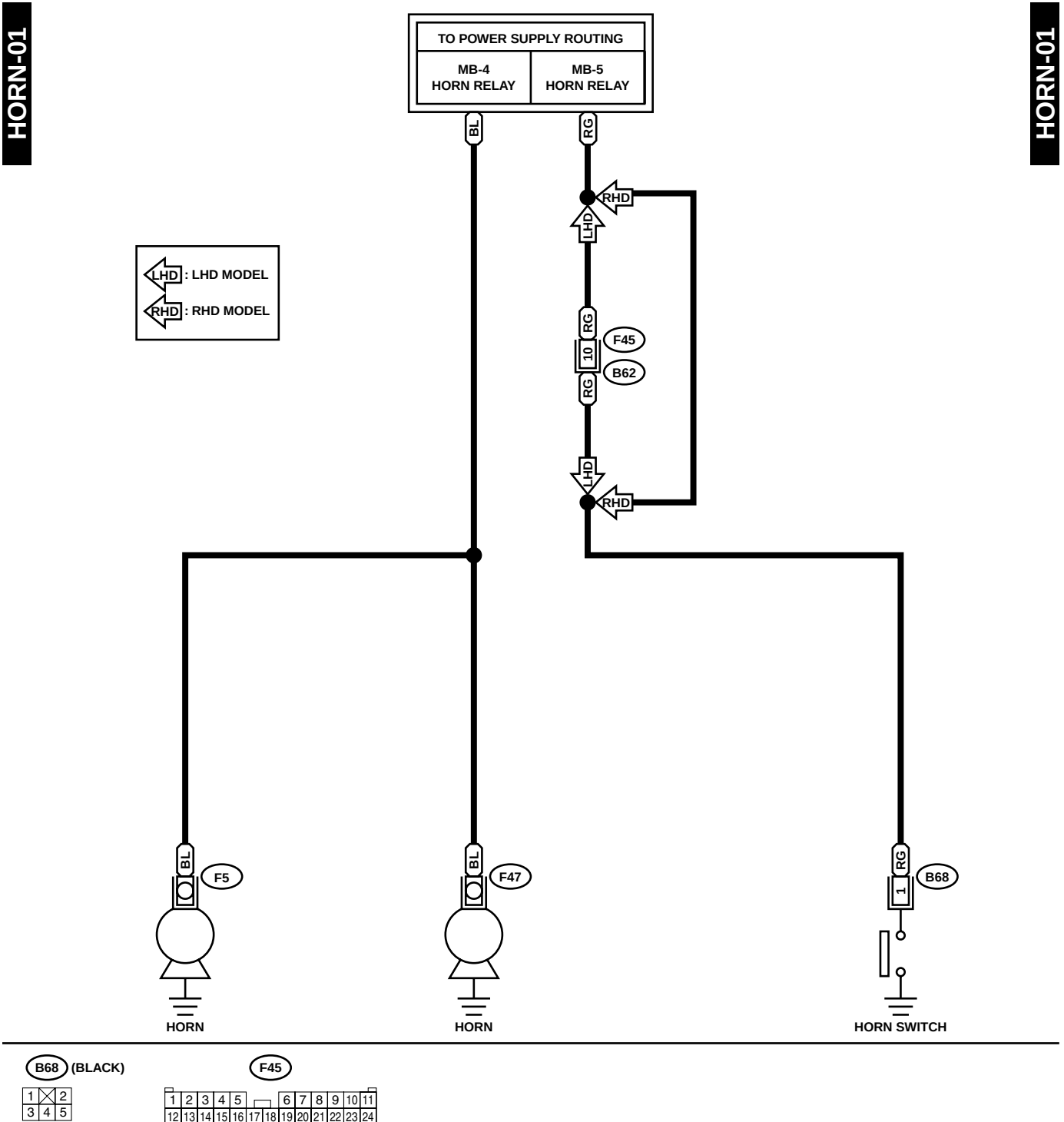


HORN SYSTEM

WIRING SYSTEM

21.Horn System

A: SCHEMATIC



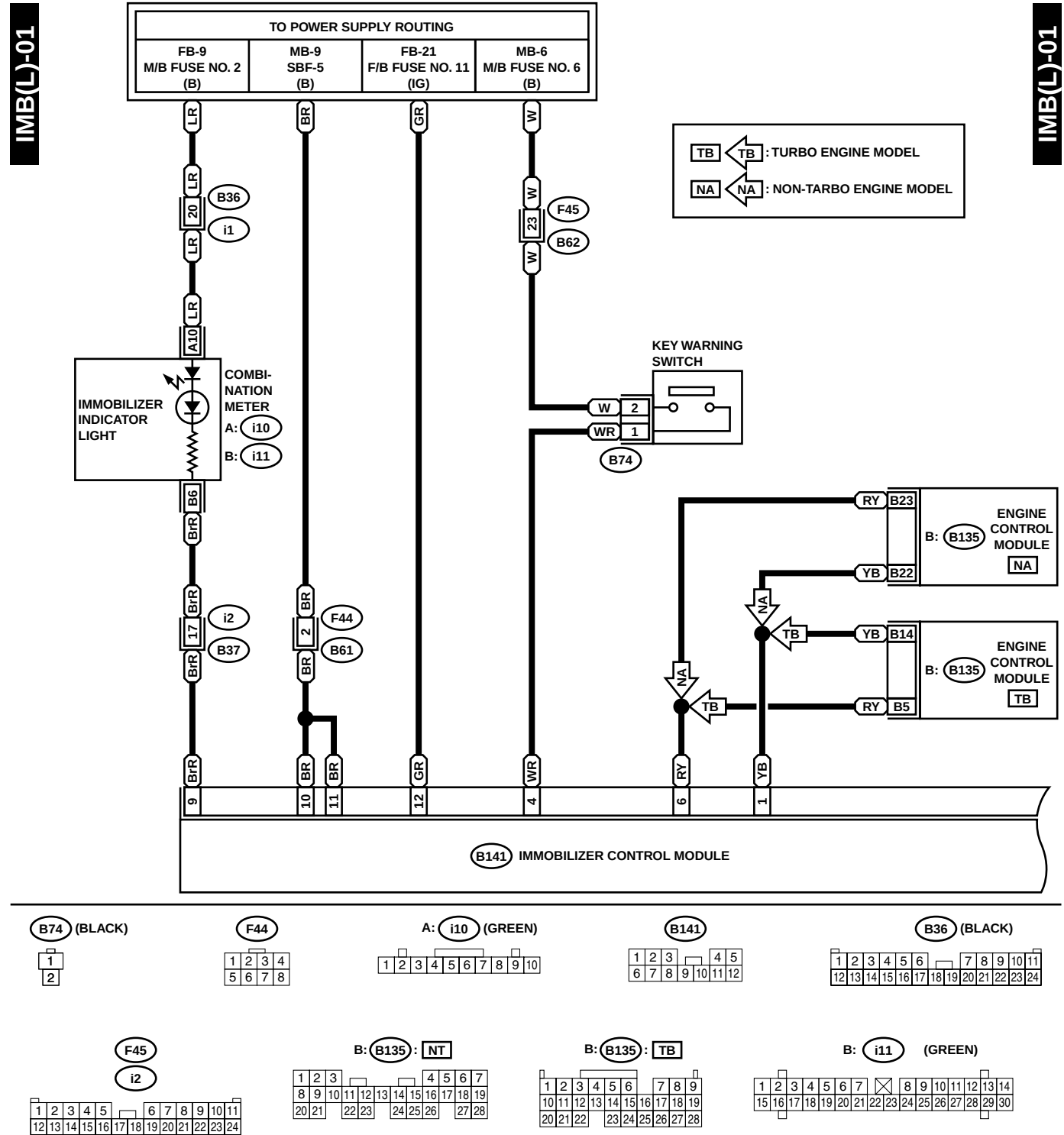
22.Immobilizer System

A: SCHEMATIC

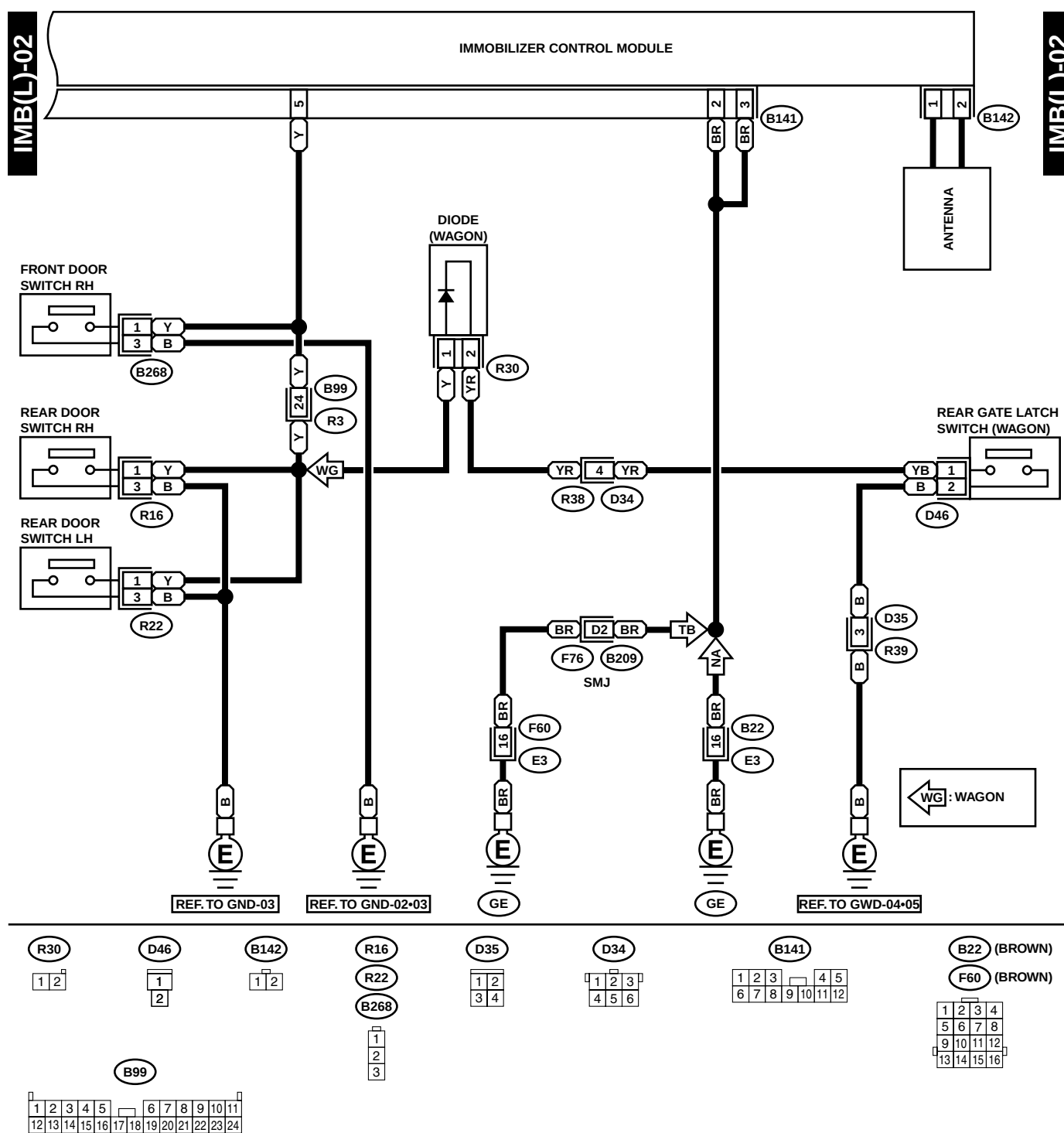
IMMOBILIZER SYSTEM

WIRING SYSTEM

1. LHD MODEL



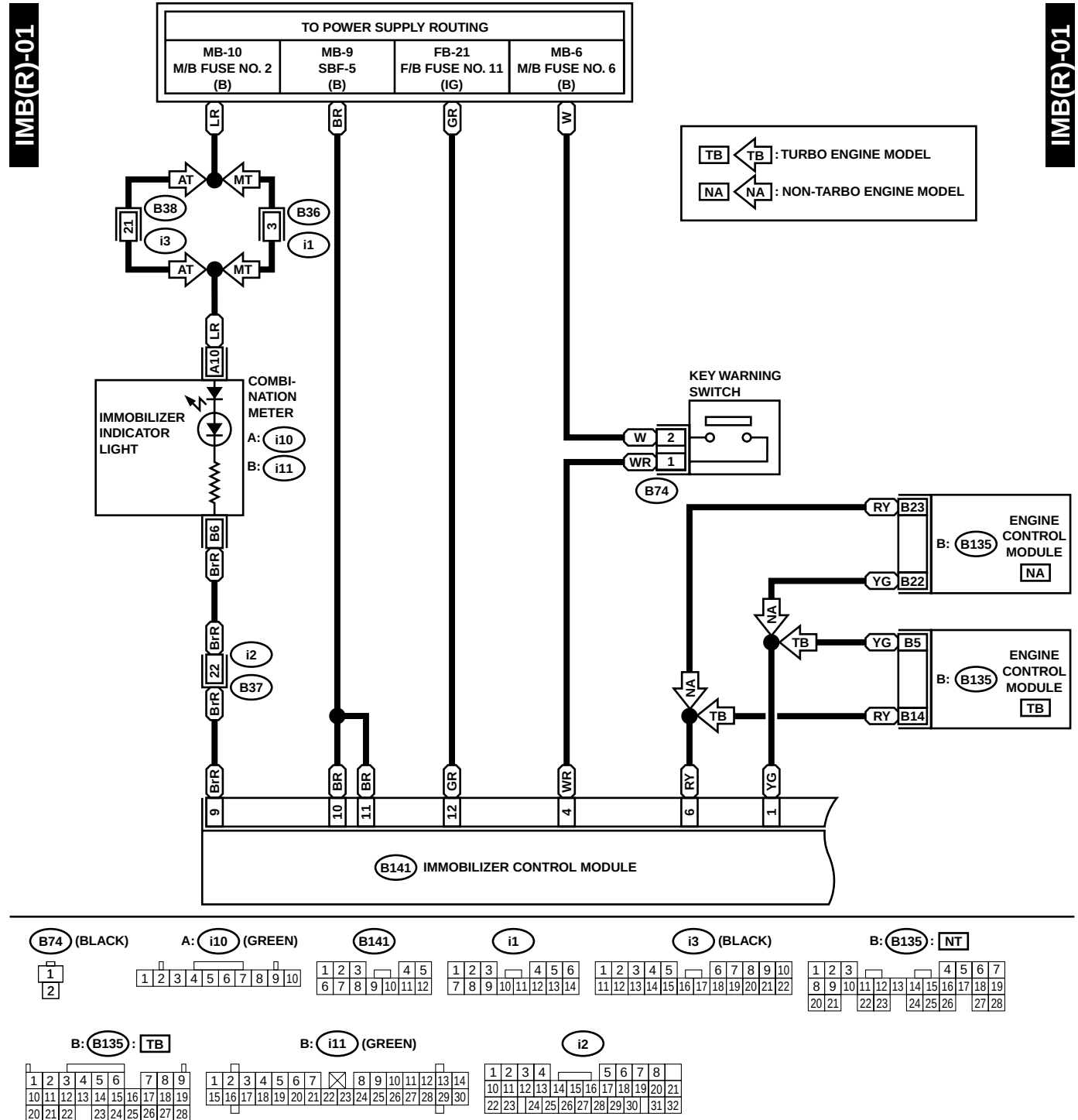
WIRING SYSTEM



IMMOBILIZER SYSTEM

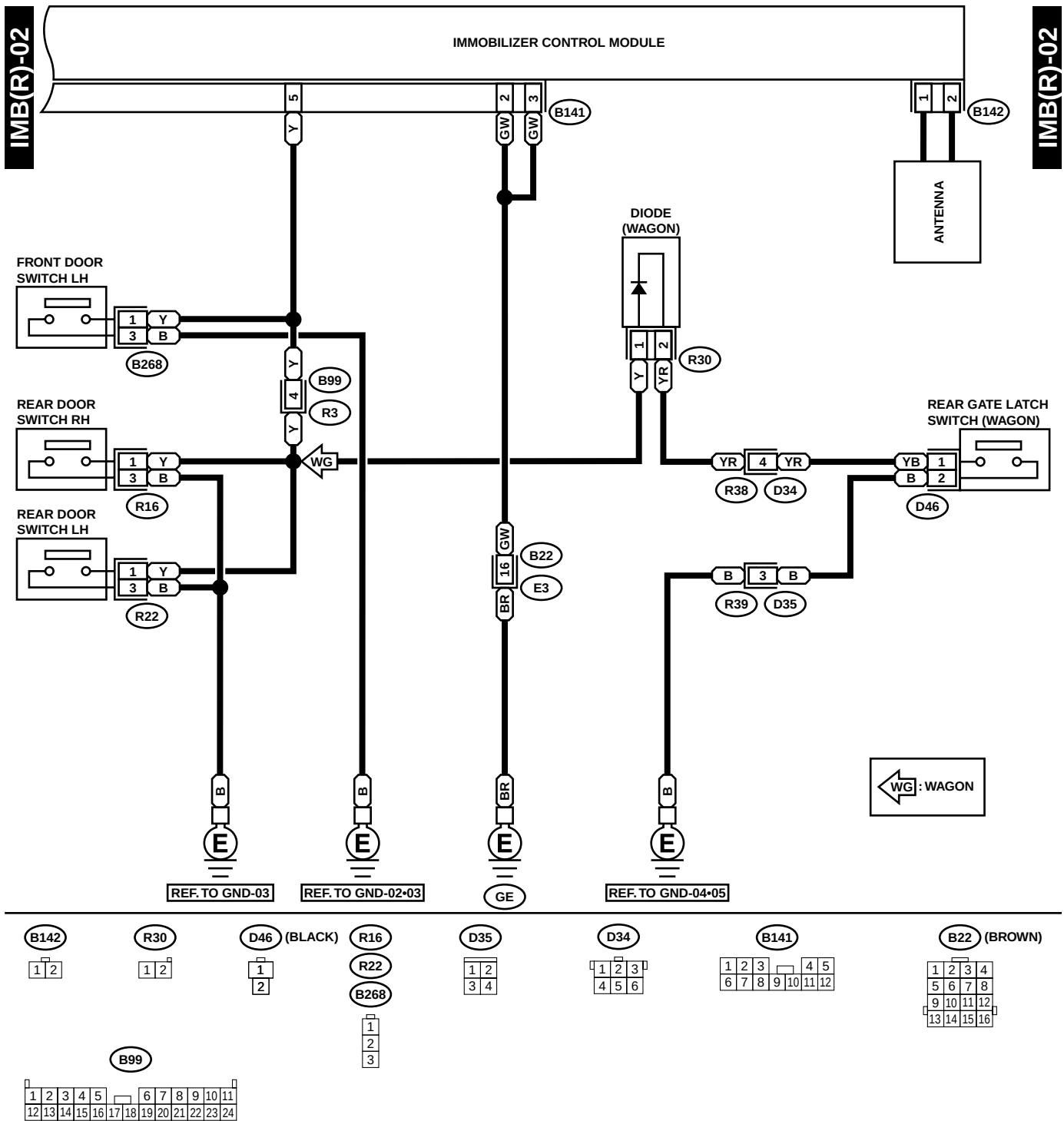
WIRING SYSTEM

2. RHD MODEL



IMMOBILIZER SYSTEM

WIRING SYSTEM



GR91-20B

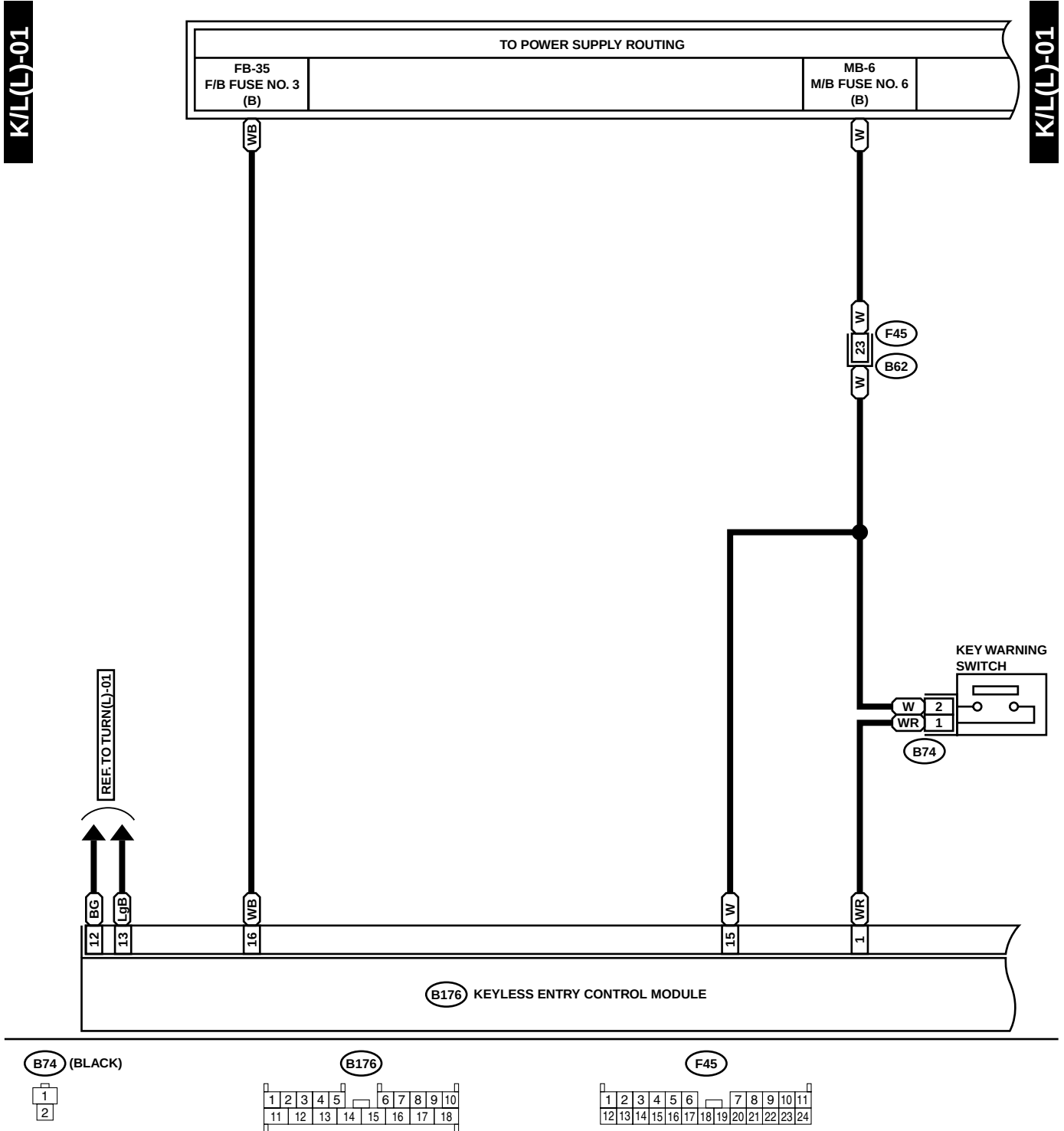
23.Keyless Entry System

A: SCHEMATIC

KEYLESS ENTRY SYSTEM

WIRING SYSTEM

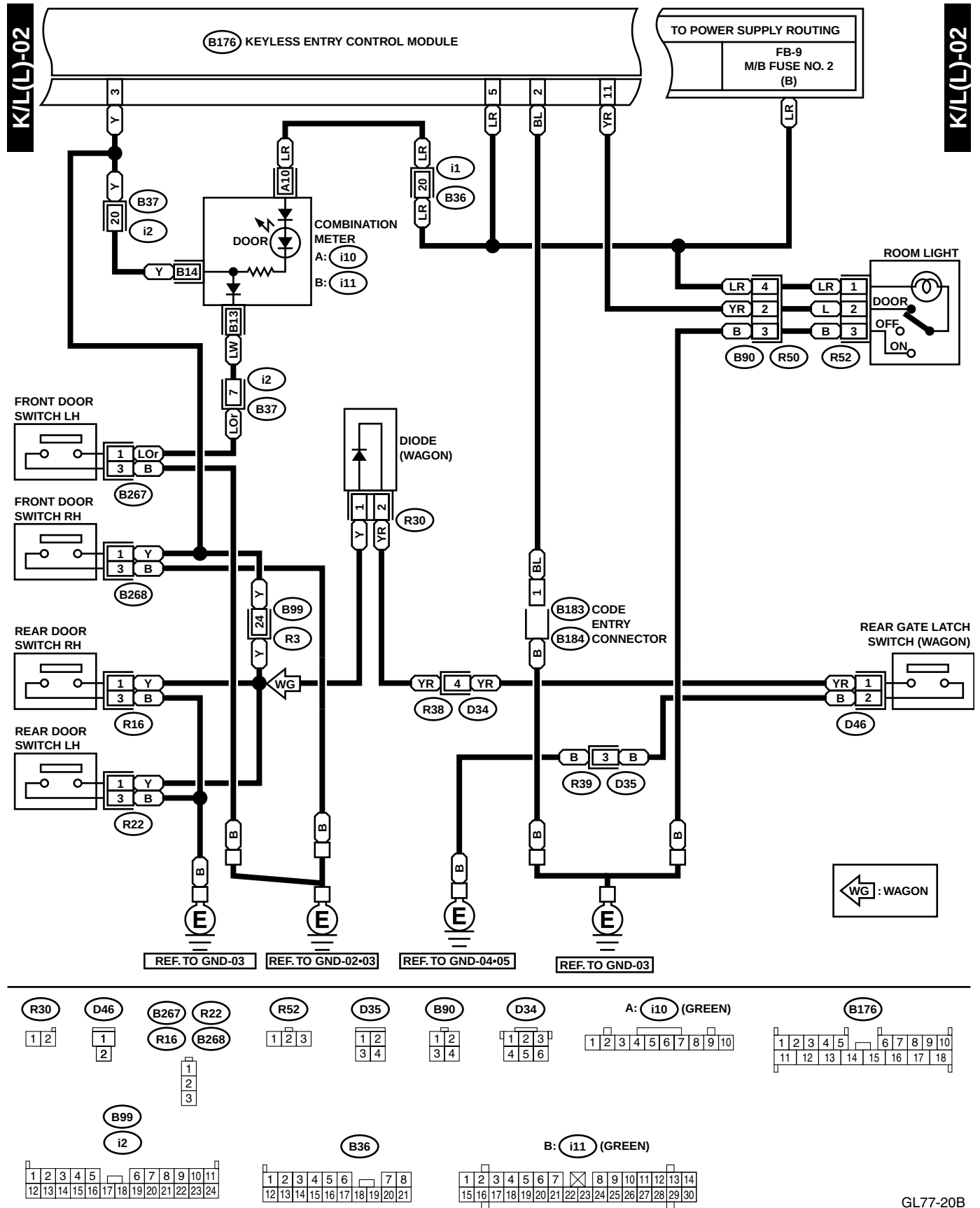
1. LHD MODEL



GL77-20A

KEYLESS ENTRY SYSTEM

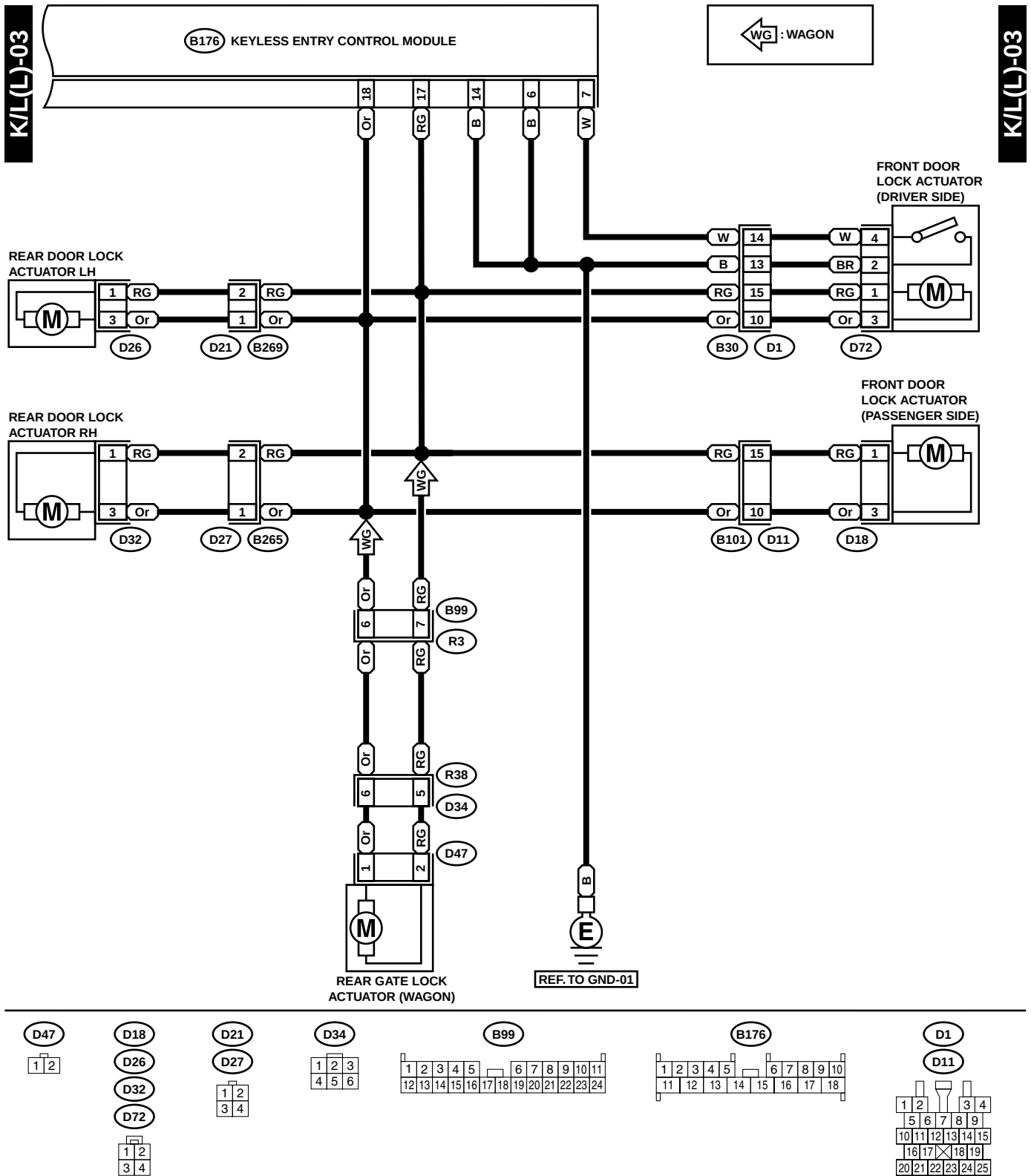
WIRING SYSTEM



GL77-20B

KEYLESS ENTRY SYSTEM

WIRING SYSTEM

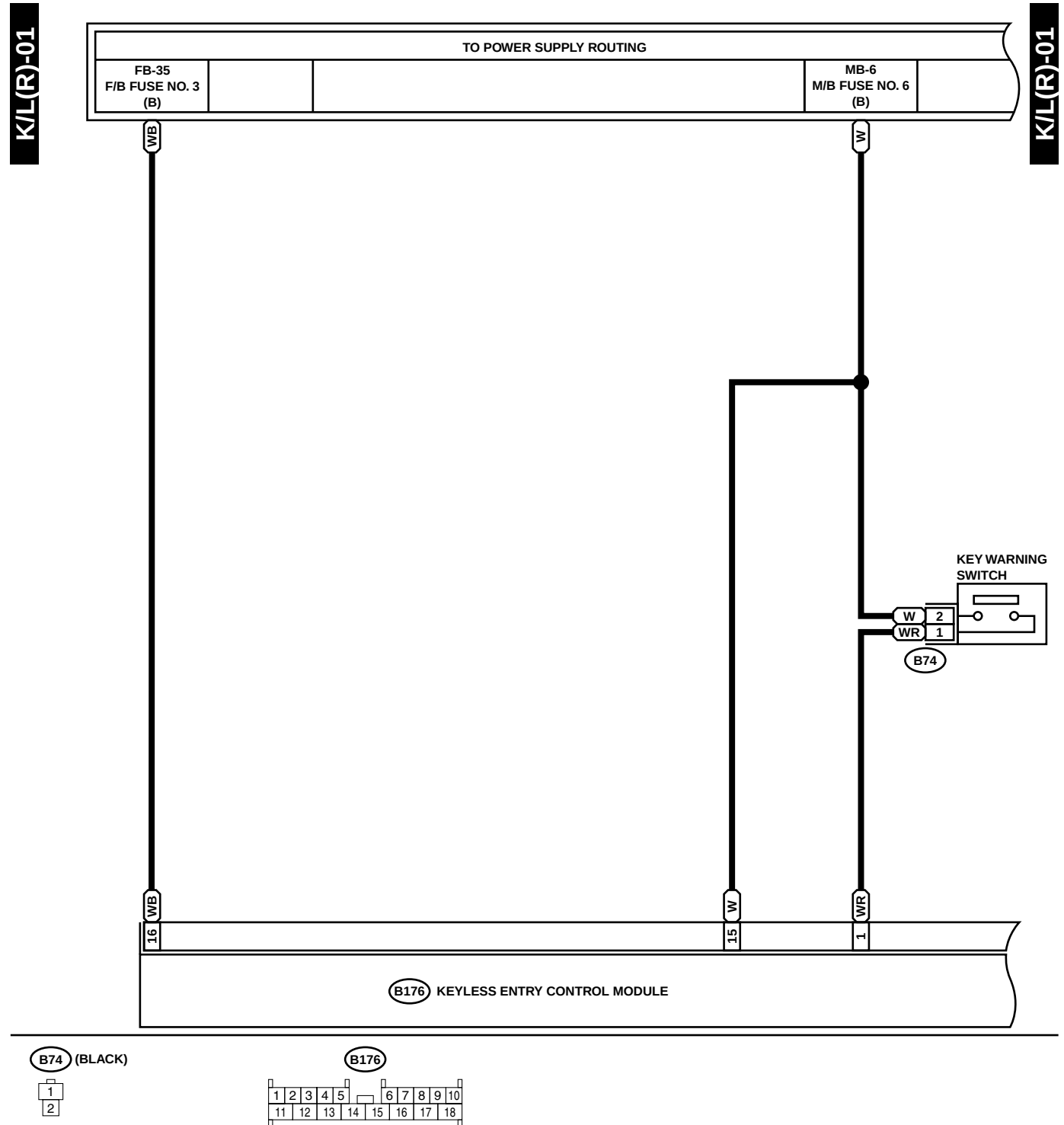


GL77-20C

KEYLESS ENTRY SYSTEM

WIRING SYSTEM

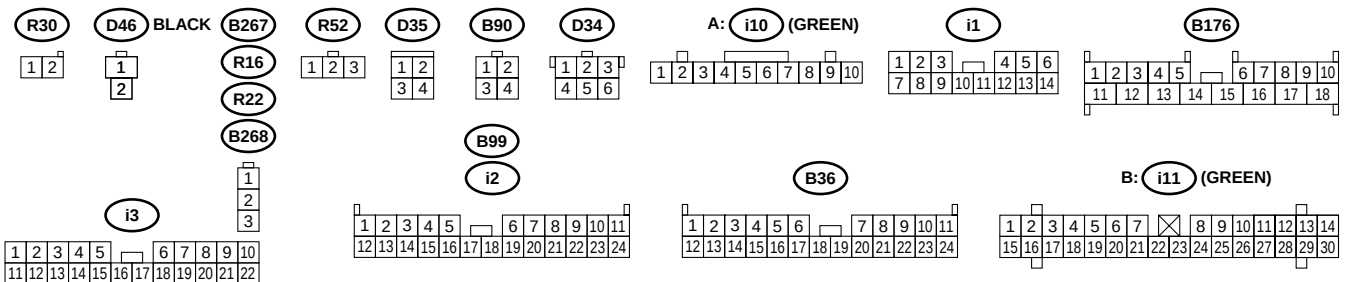
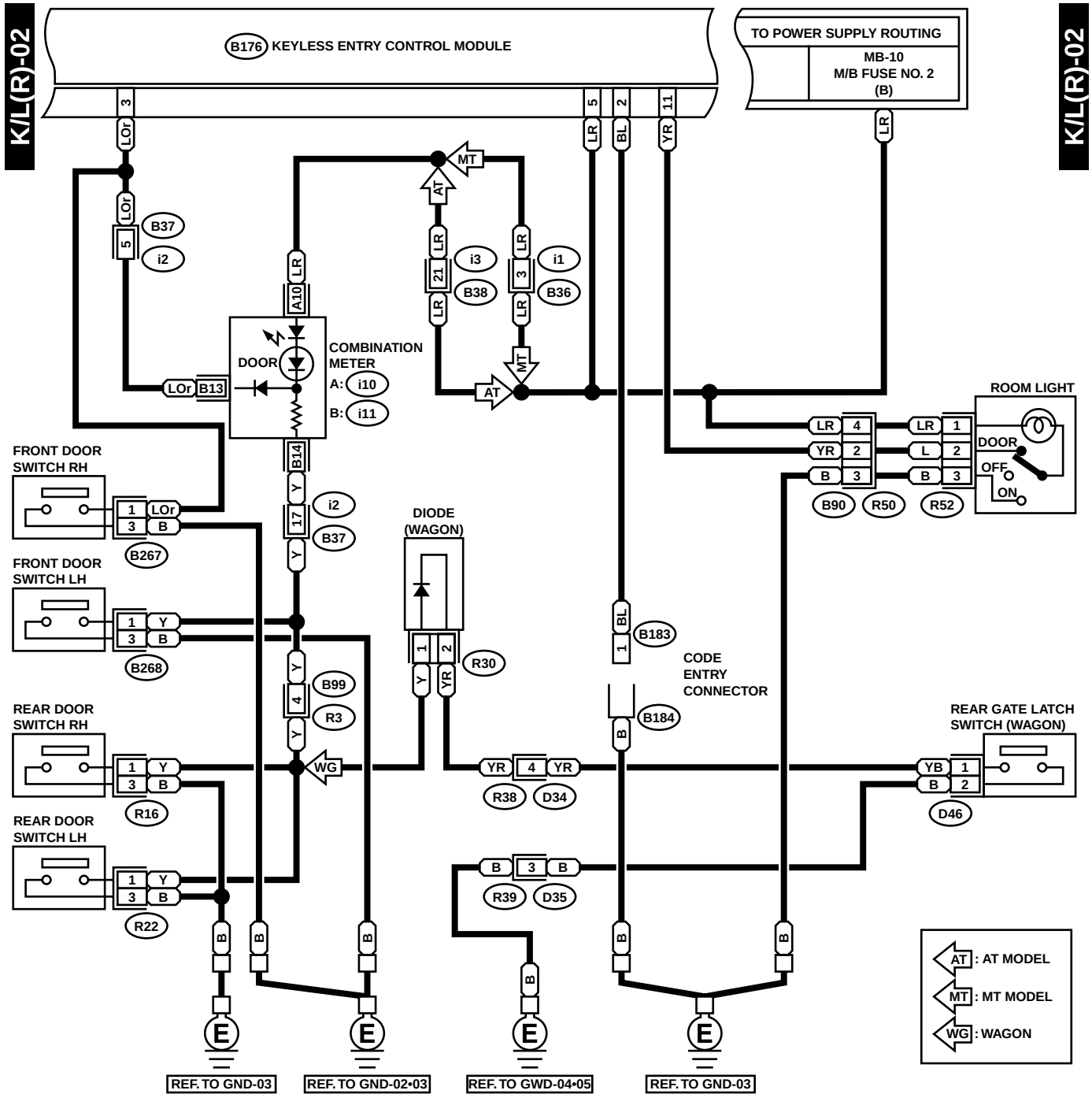
2. RHD MODEL



GR77-20A

KEYLESS ENTRY SYSTEM

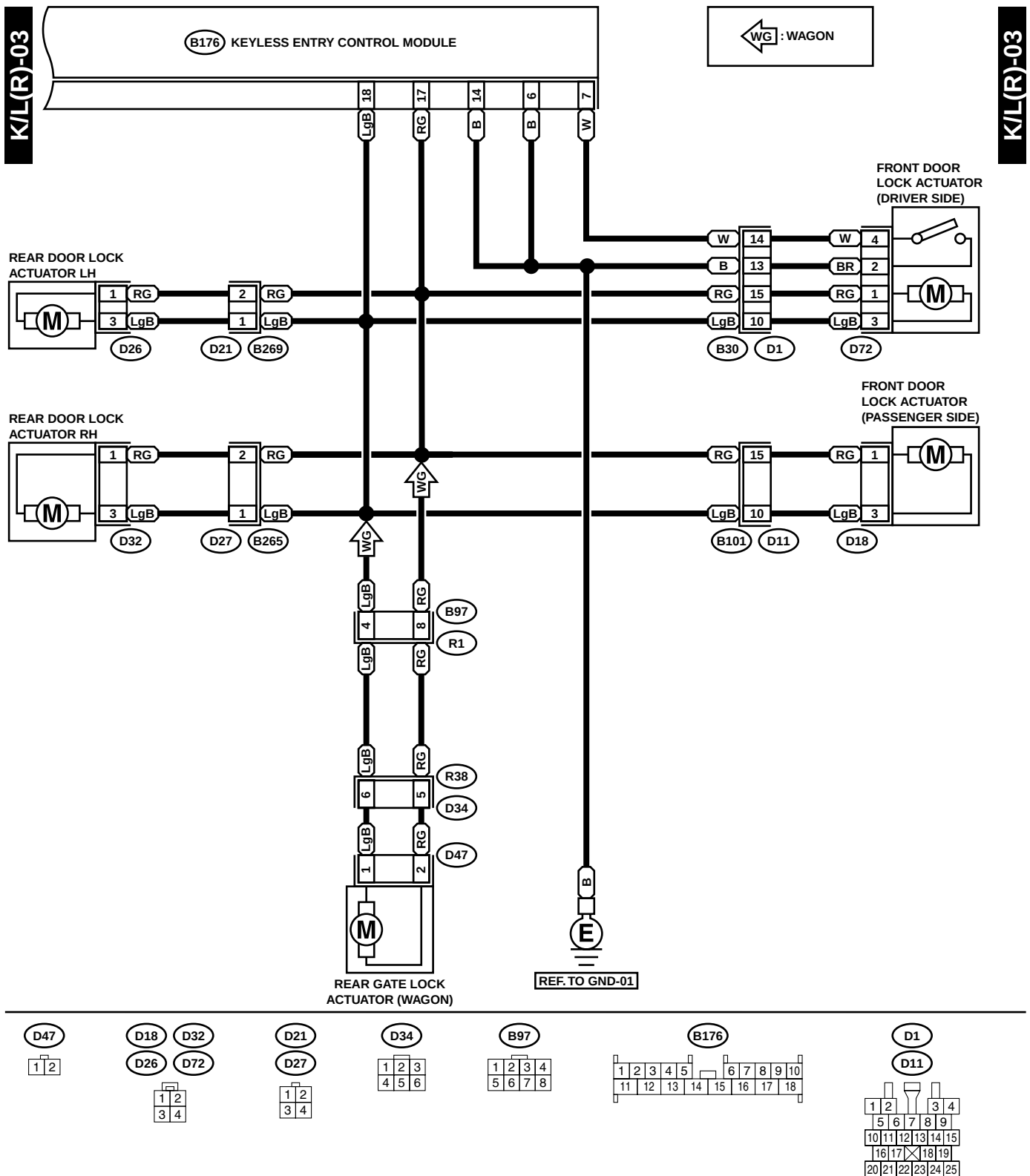
WIRING SYSTEM



GR77-20B

KEYLESS ENTRY SYSTEM

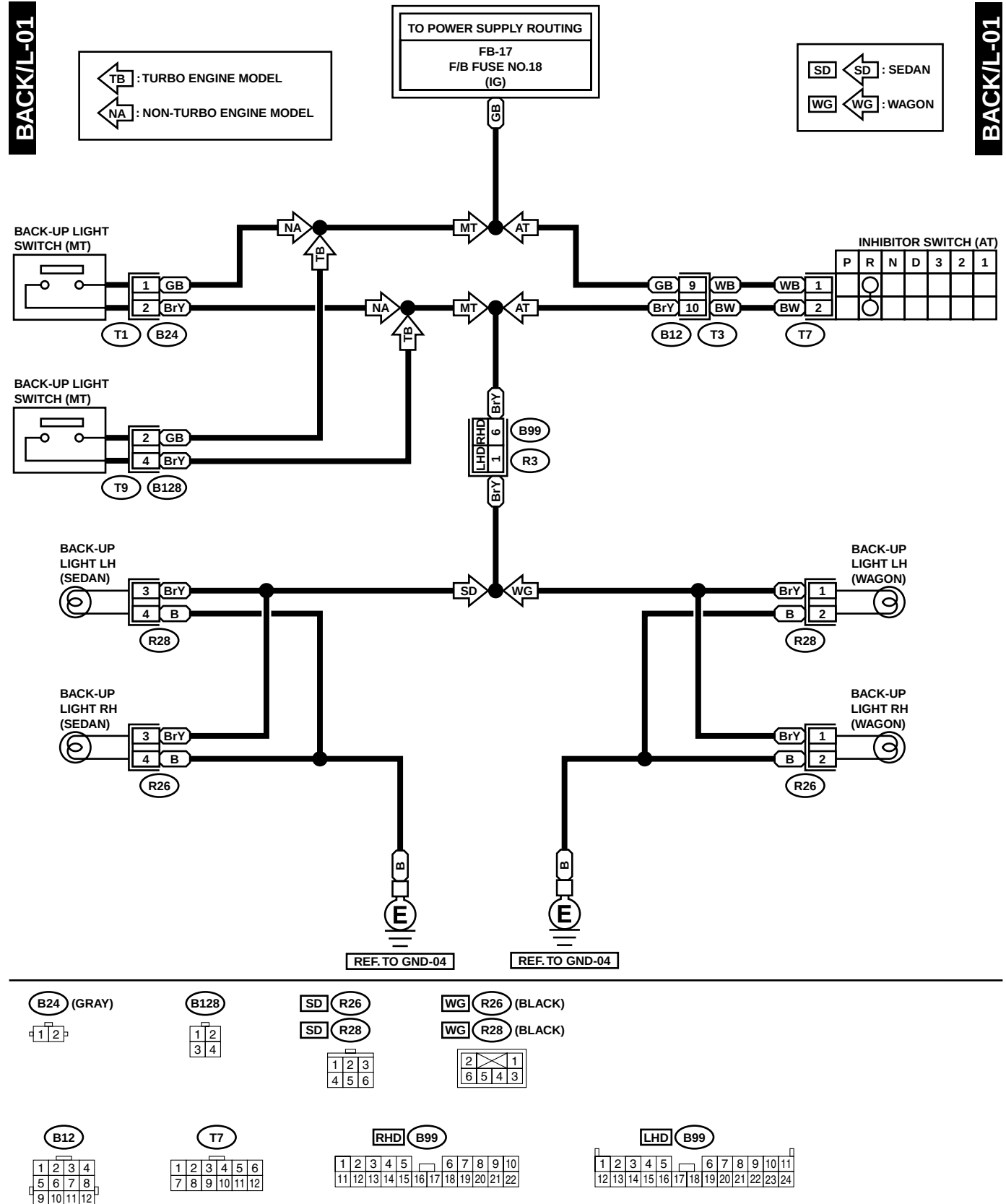
WIRING SYSTEM



GR77-20C

24.Back-up Light System

A: SCHEMATIC



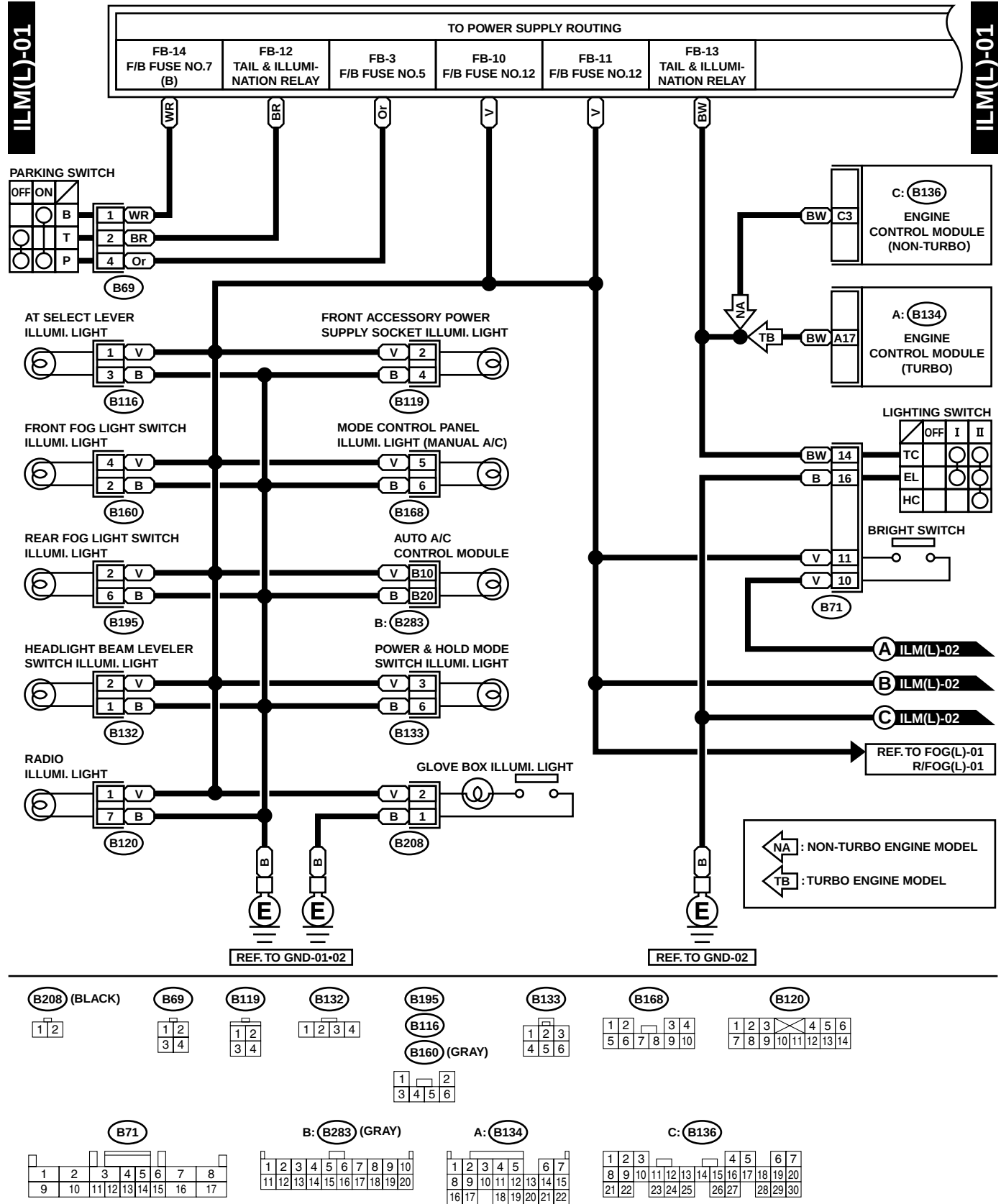
25.Clearance Light and Illumination Light System

A: SCHEMATIC

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

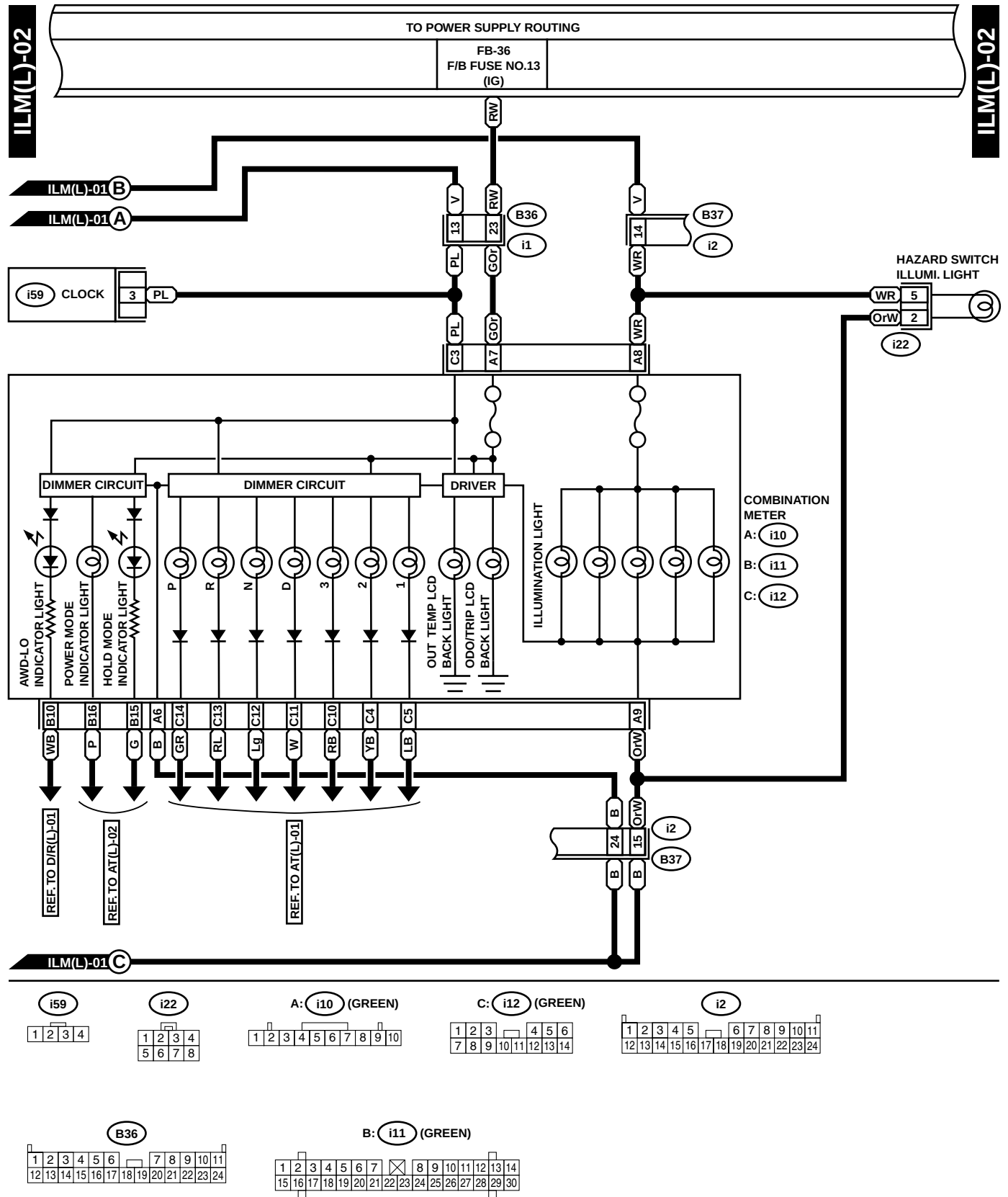
1. LHD MODEL



GL21-21A

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

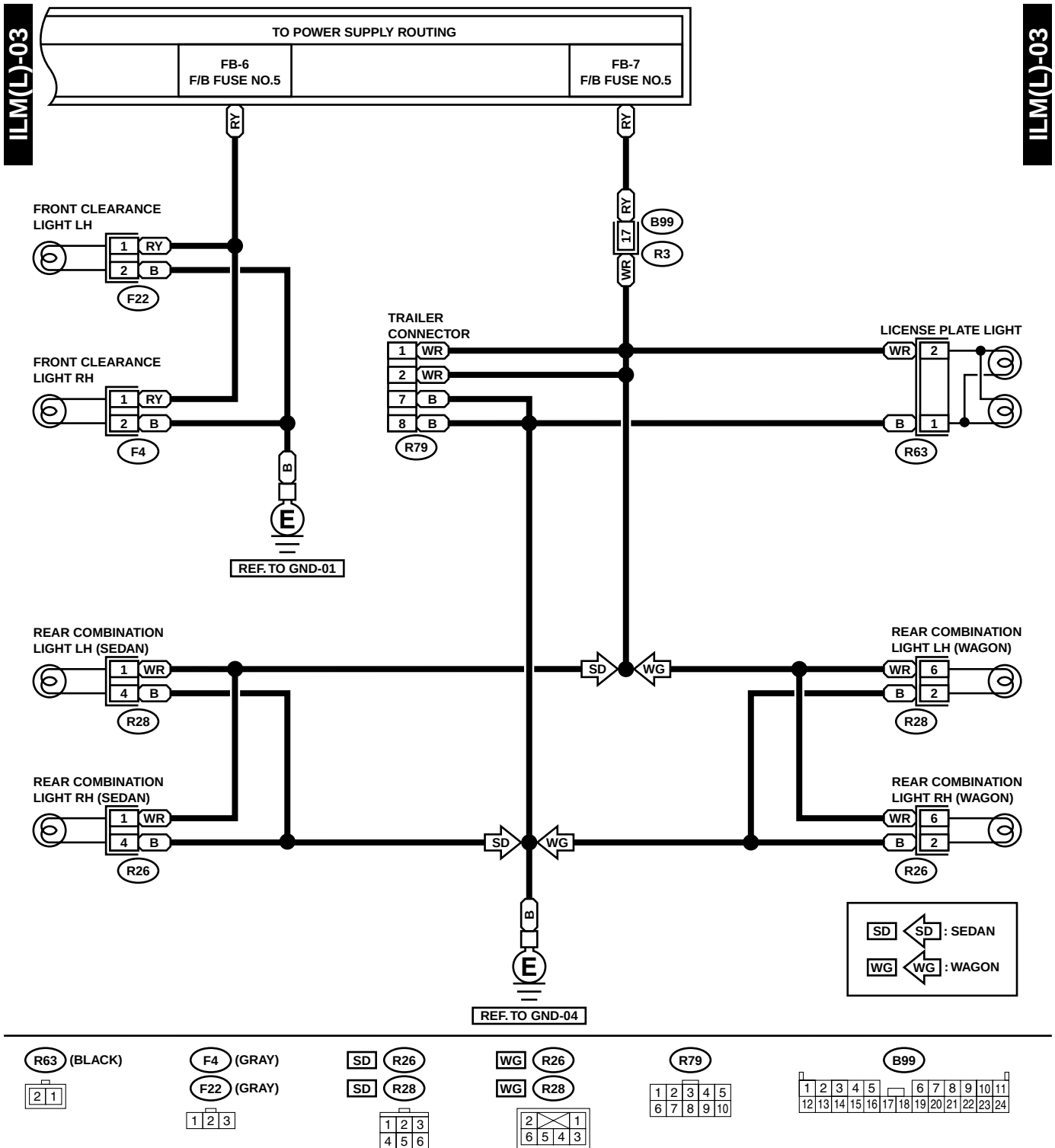
WIRING SYSTEM



GL21-21B

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

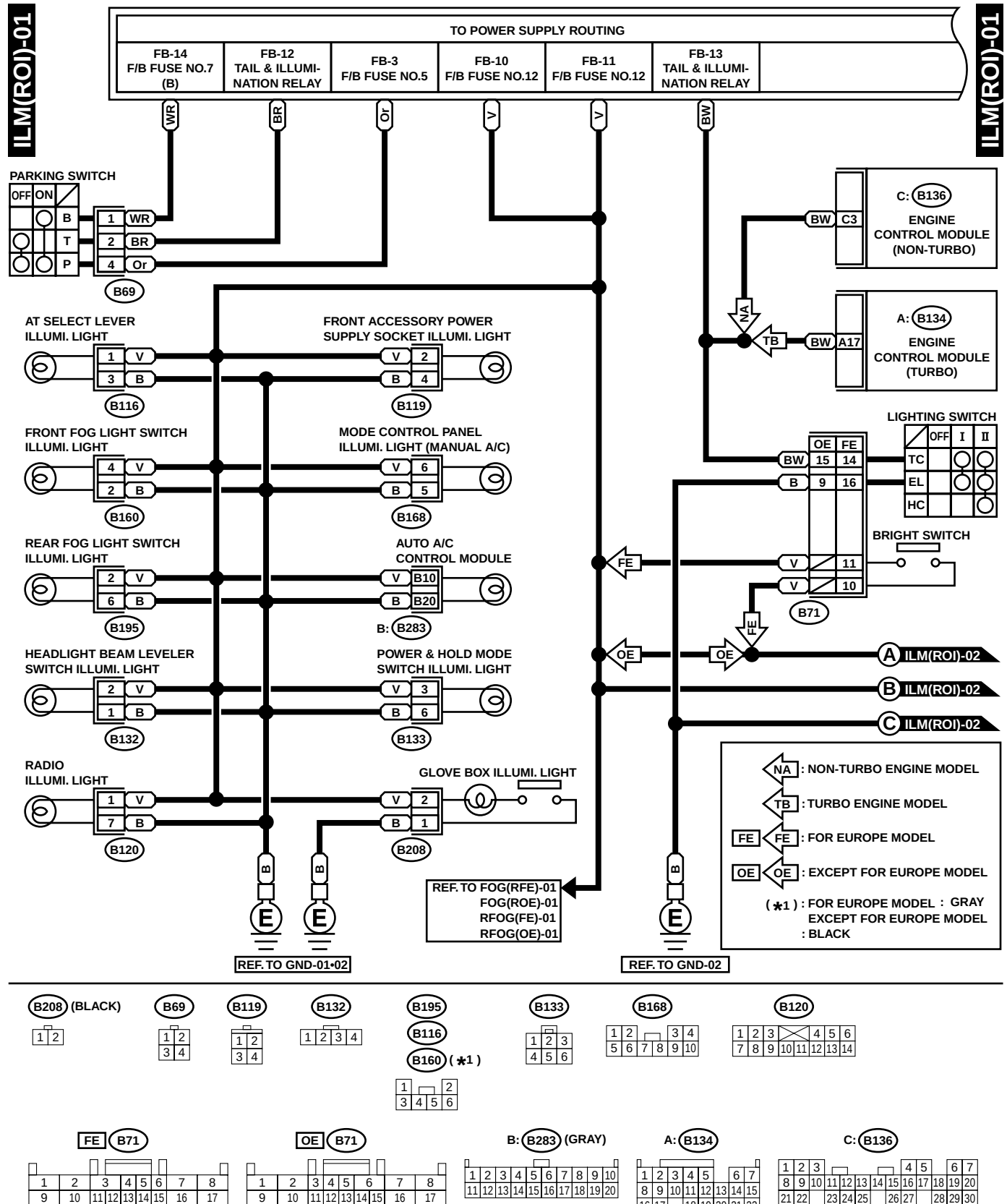


GL21-21C

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

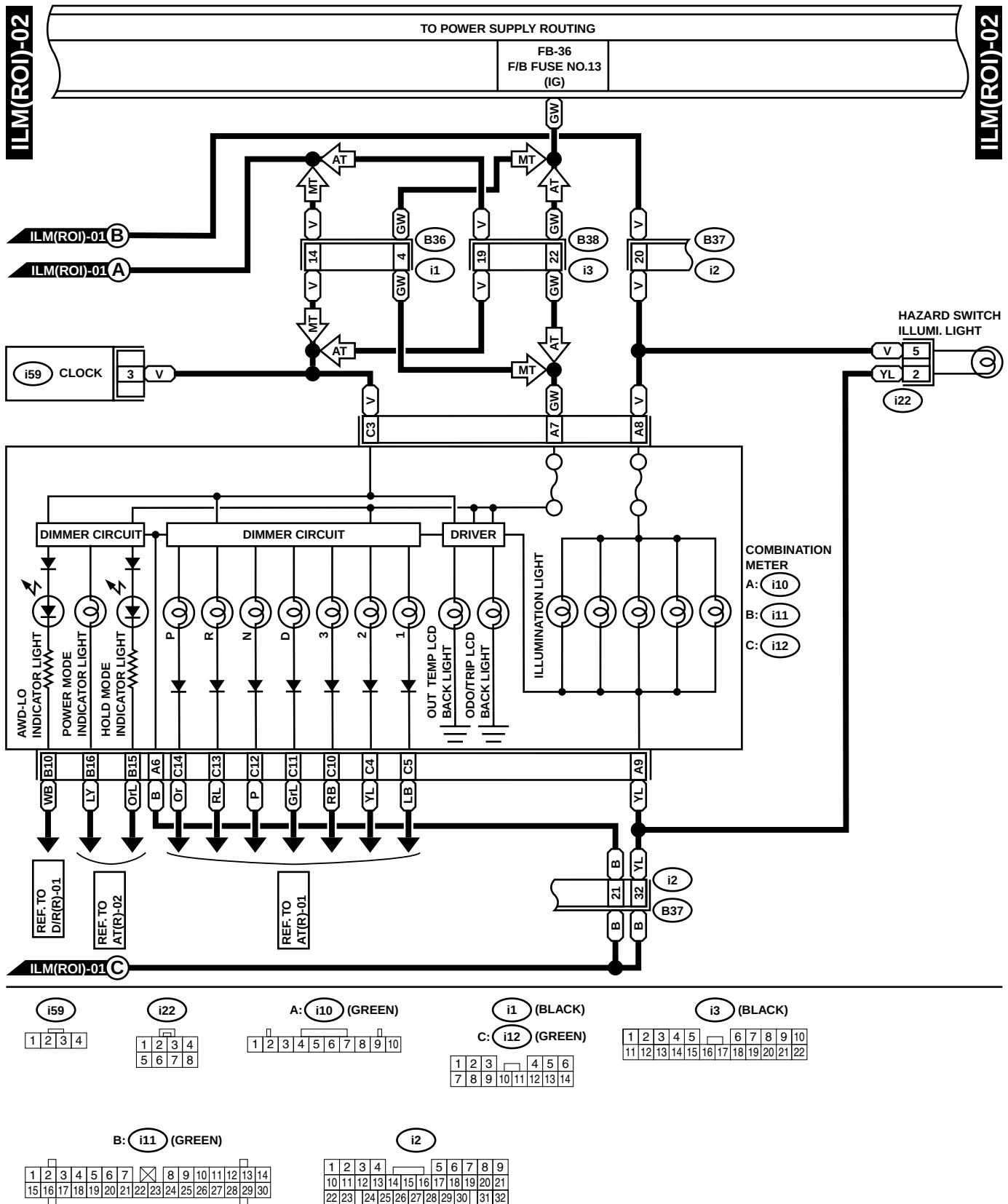
WIRING SYSTEM

2. RHD WITHOUT ILLUMINATION CONTROL MODEL



CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

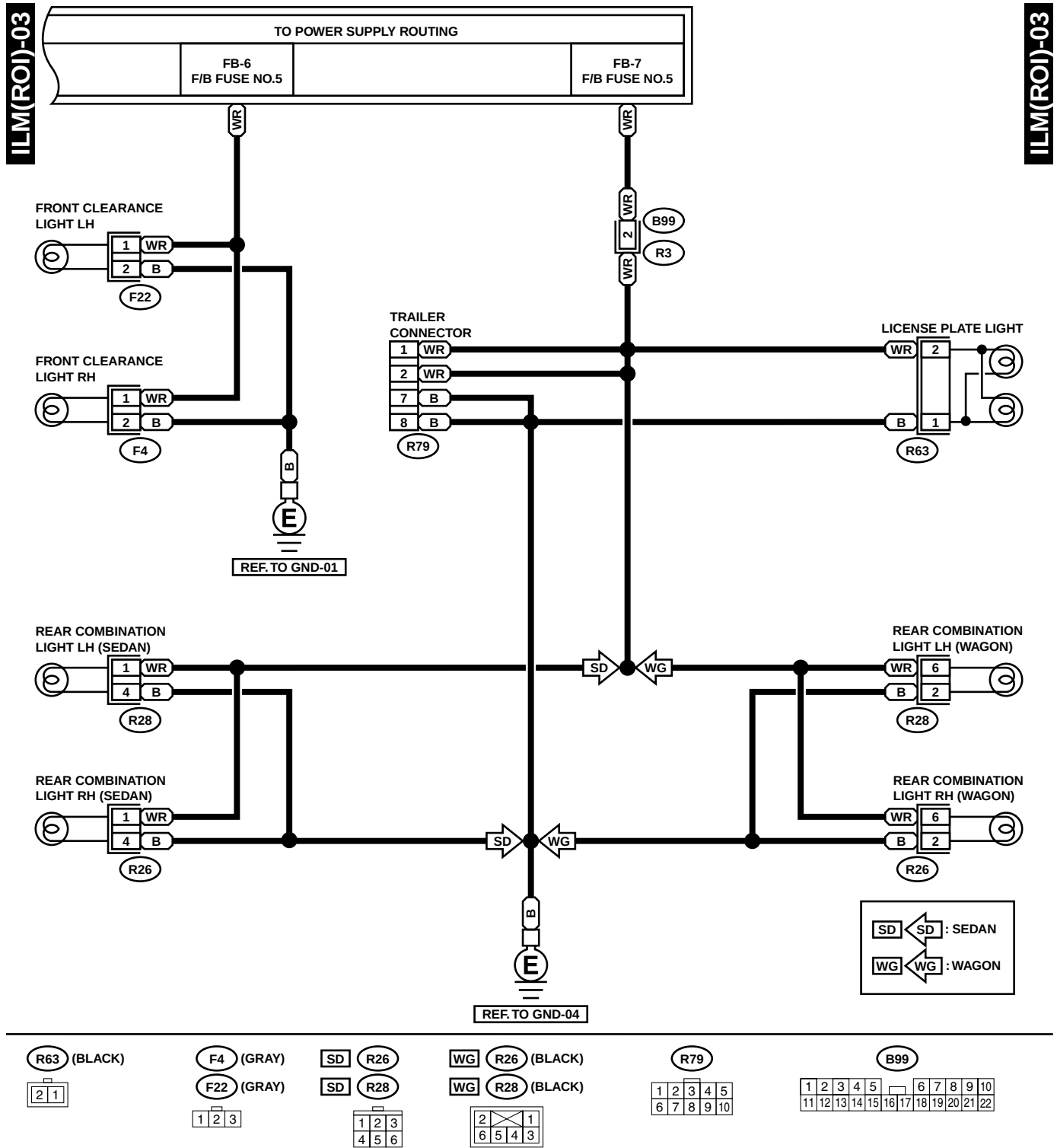
WIRING SYSTEM



GR21-21B

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

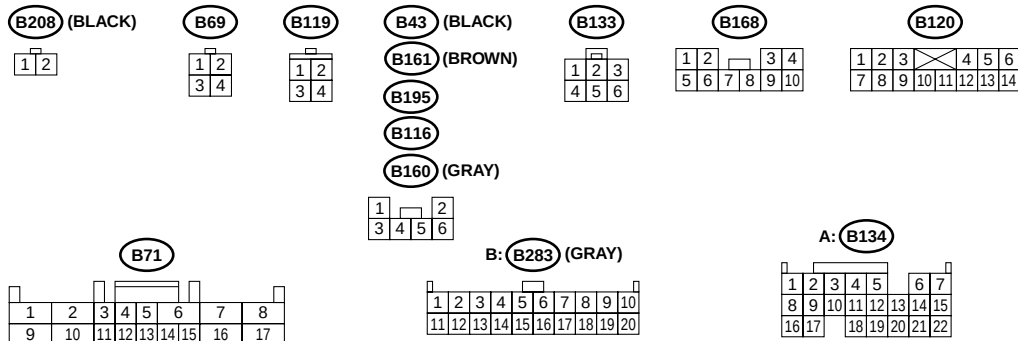
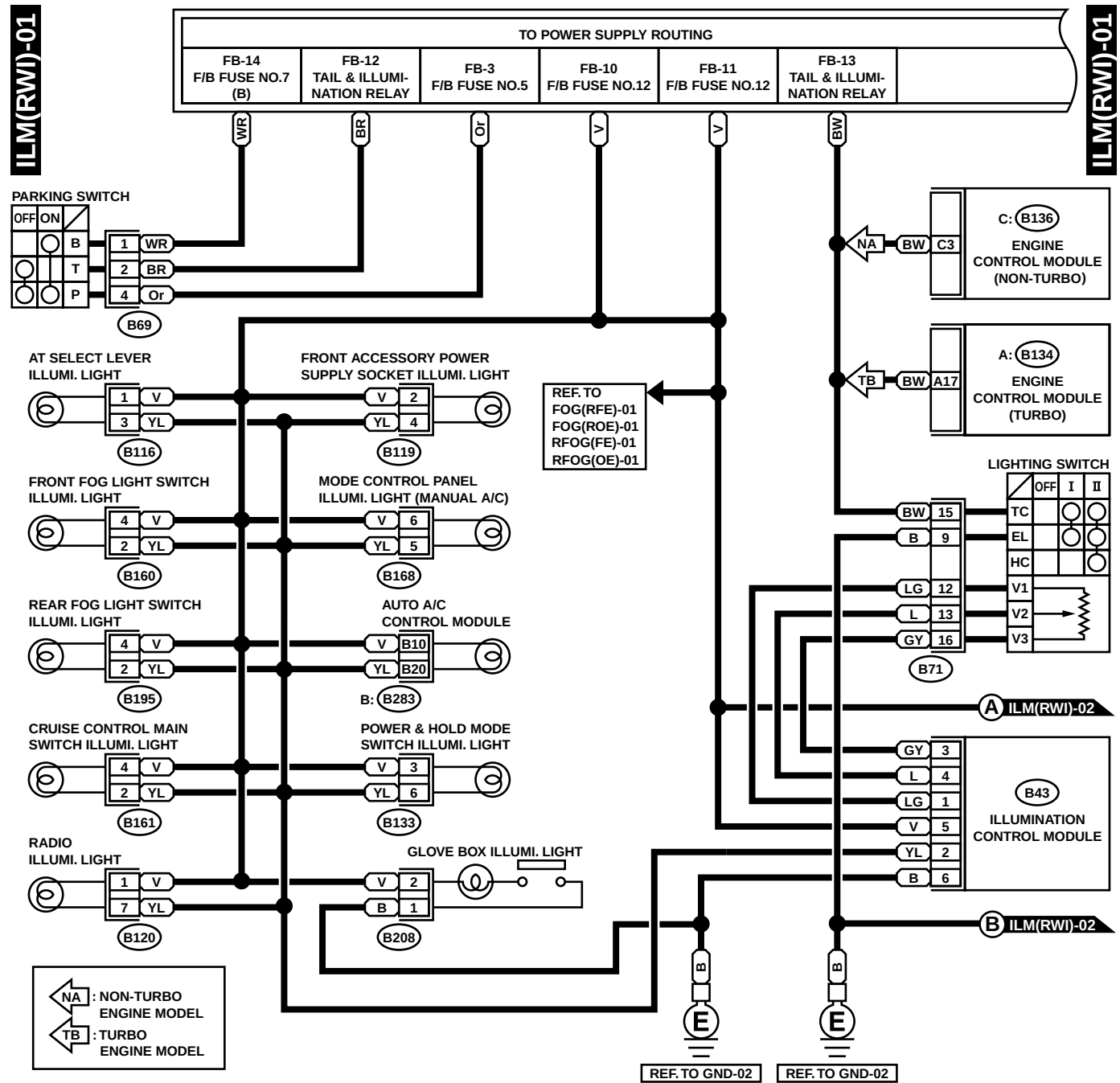


GR21-21C

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

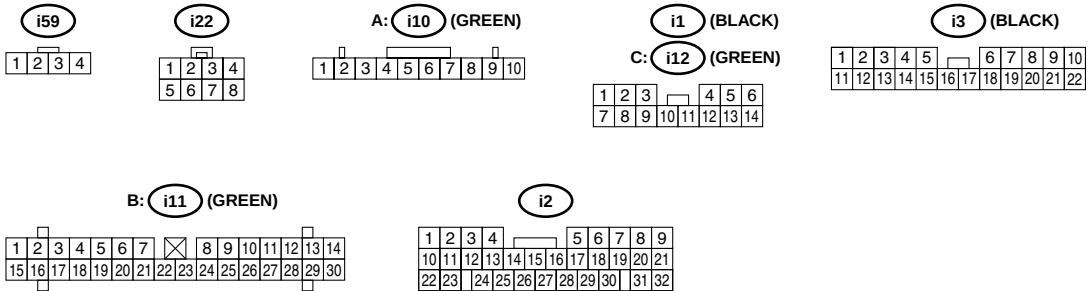
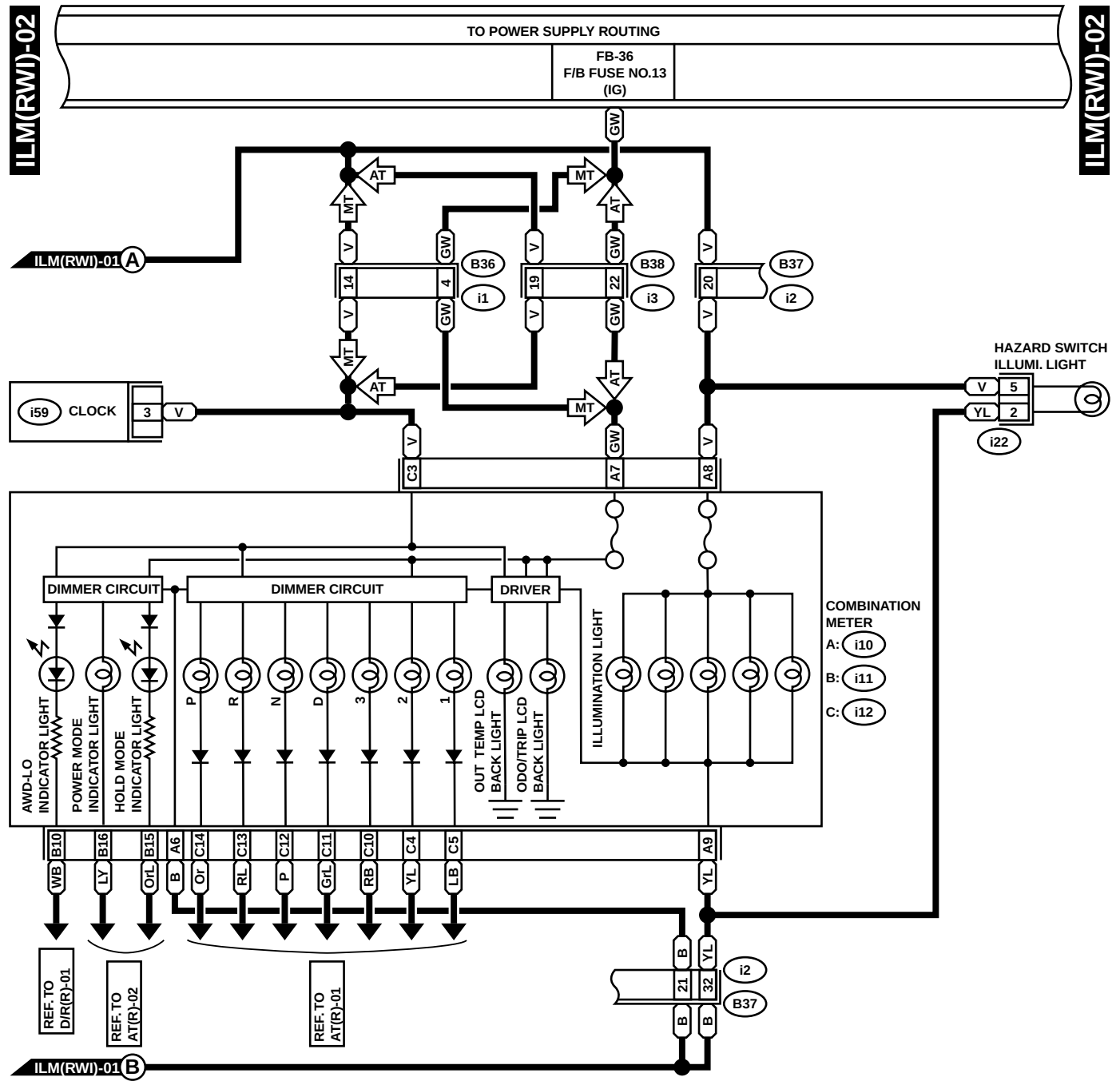
3. RHD WITH ILLUMINATION CONTROL MODEL



GR21-22A

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

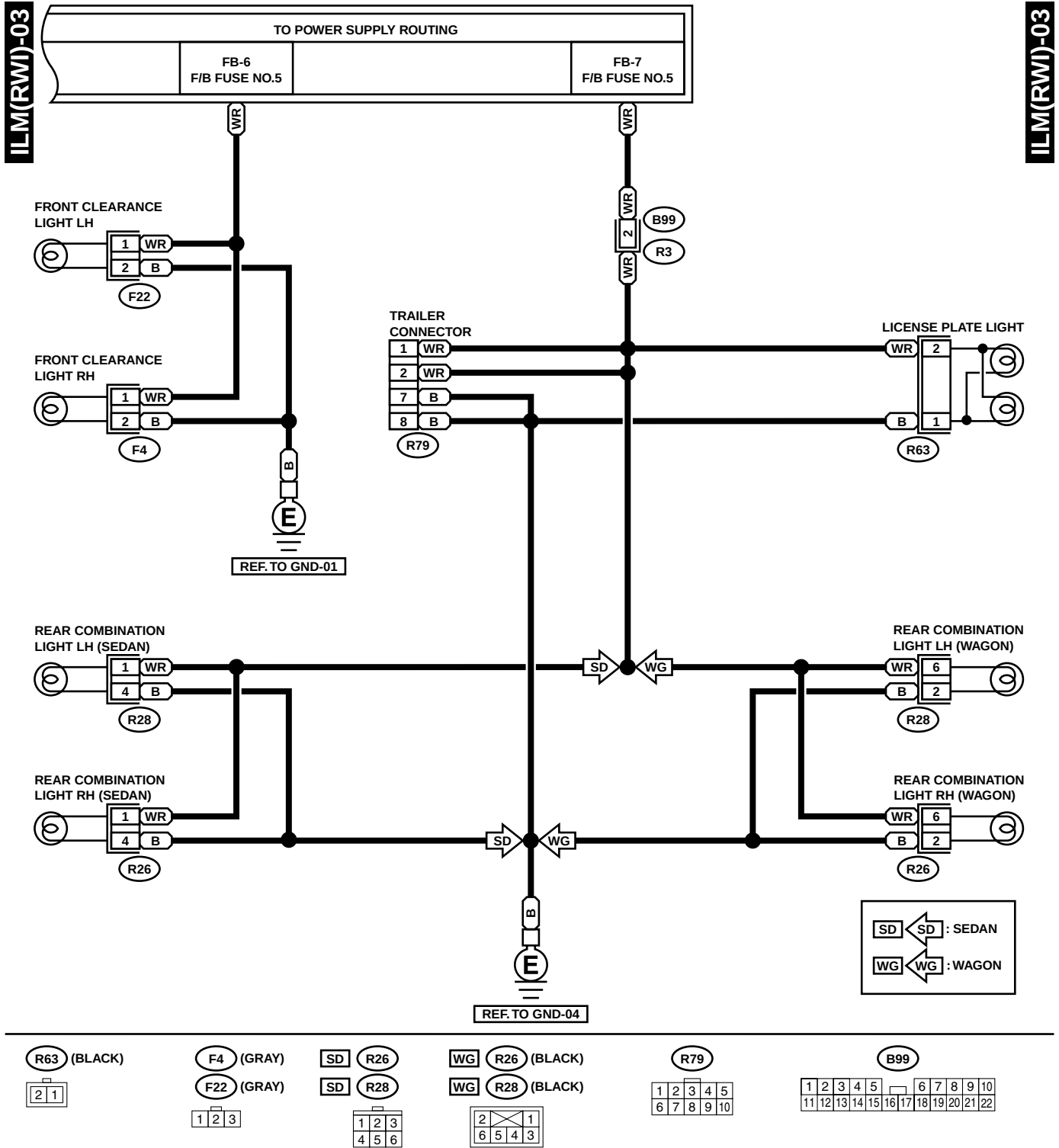
WIRING SYSTEM



GR21-22B

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM



GR21-22C

26.Front Fog Light System

A: SCHEMATIC

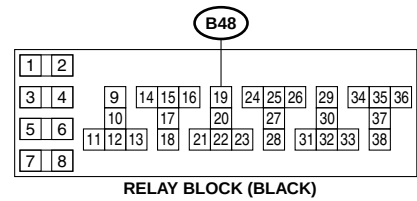
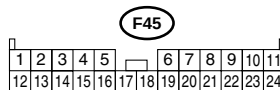
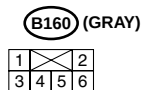
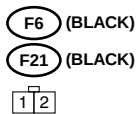
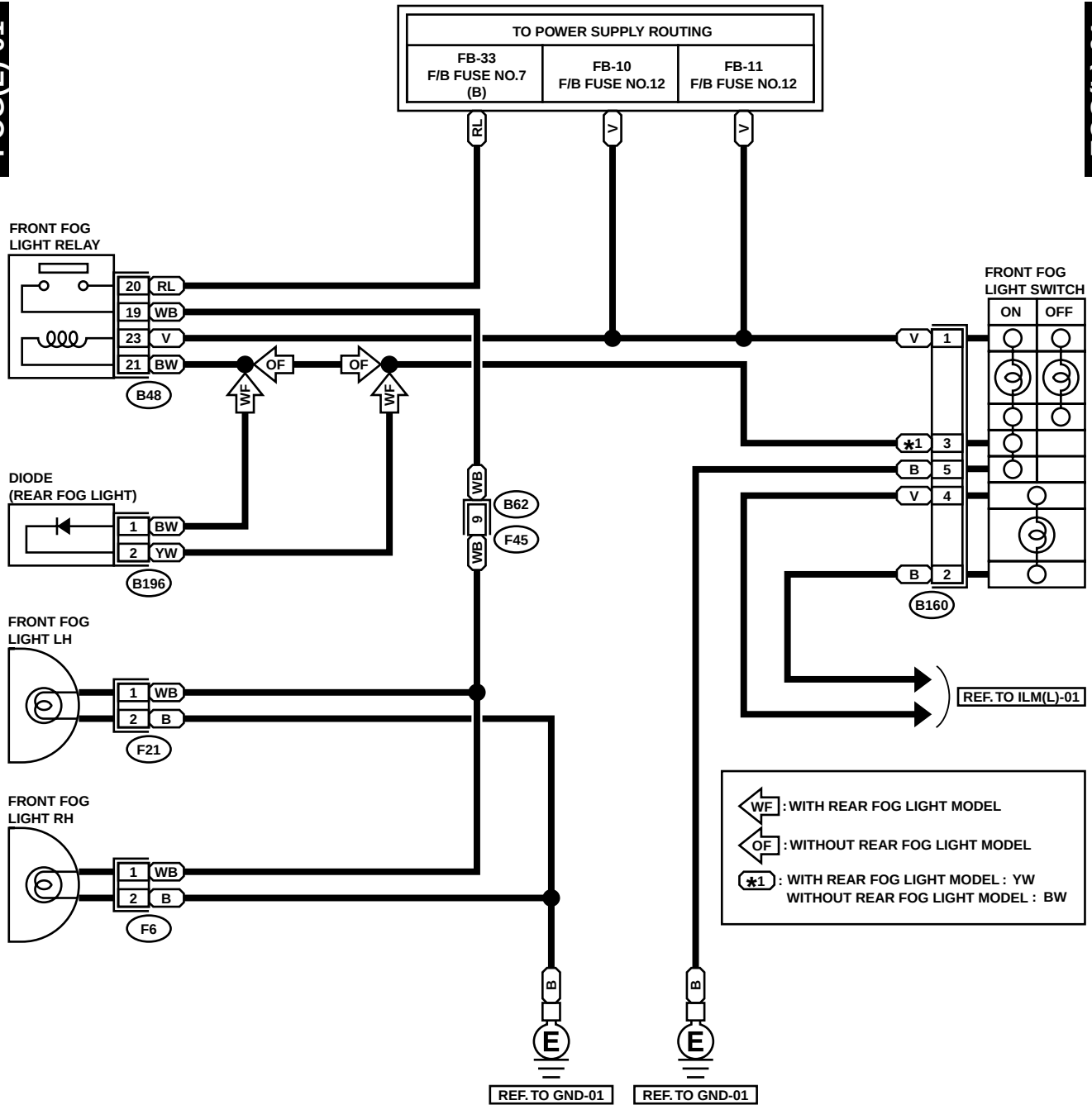
FRONT FOG LIGHT SYSTEM

WIRING SYSTEM

1. LHD MODEL

FOG(L)-01

FOG(L)-01

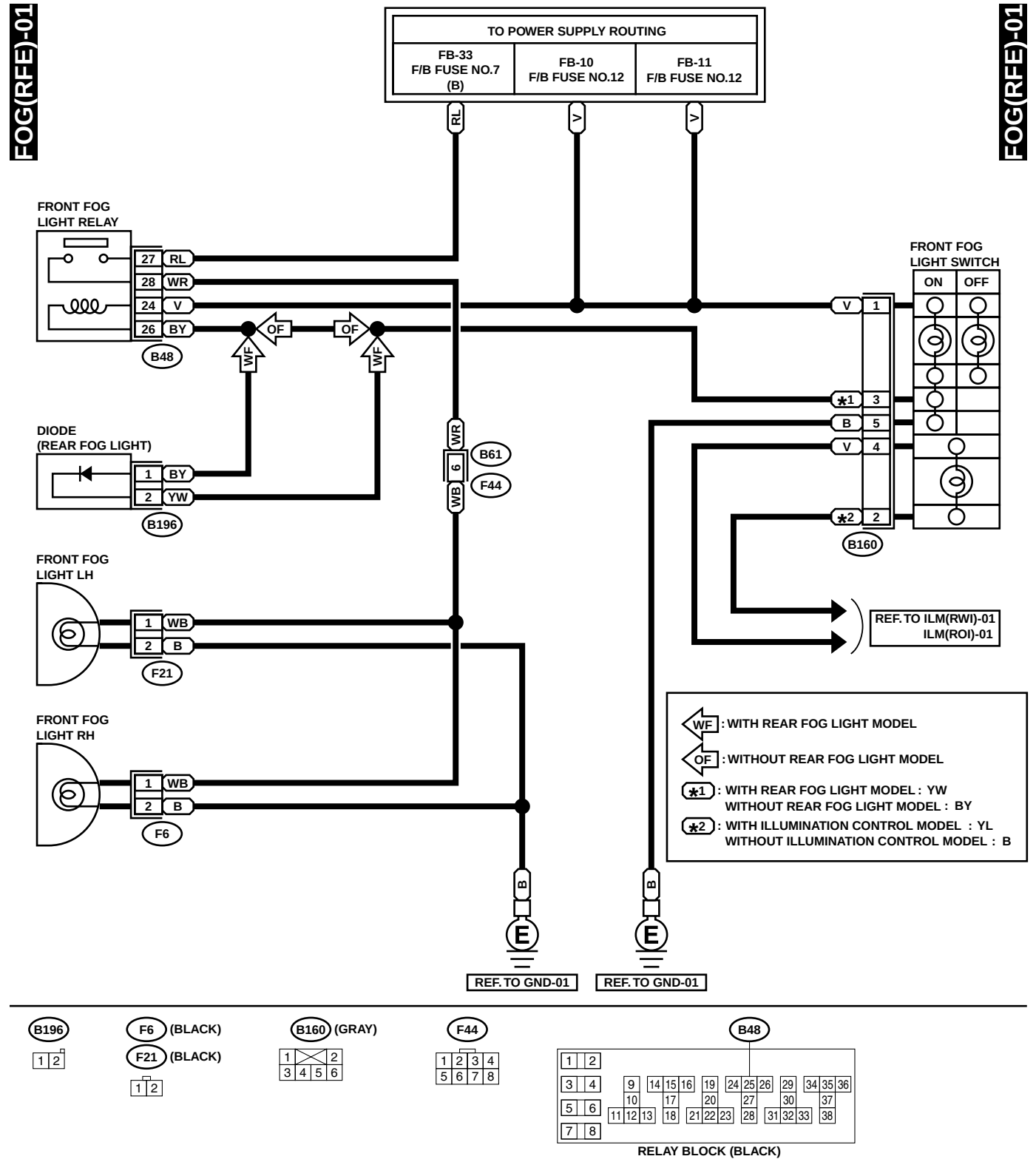


GL22-20

FRONT FOG LIGHT SYSTEM

WIRING SYSTEM

2. RHD FOR EUROPE MODEL



GR22-20

WIRING SYSTEM

FOG(ROE)01



27.Headlight System

A: SCHEMATIC

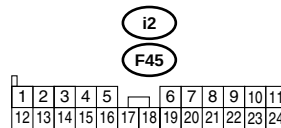
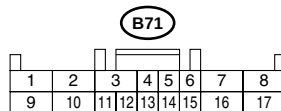
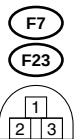
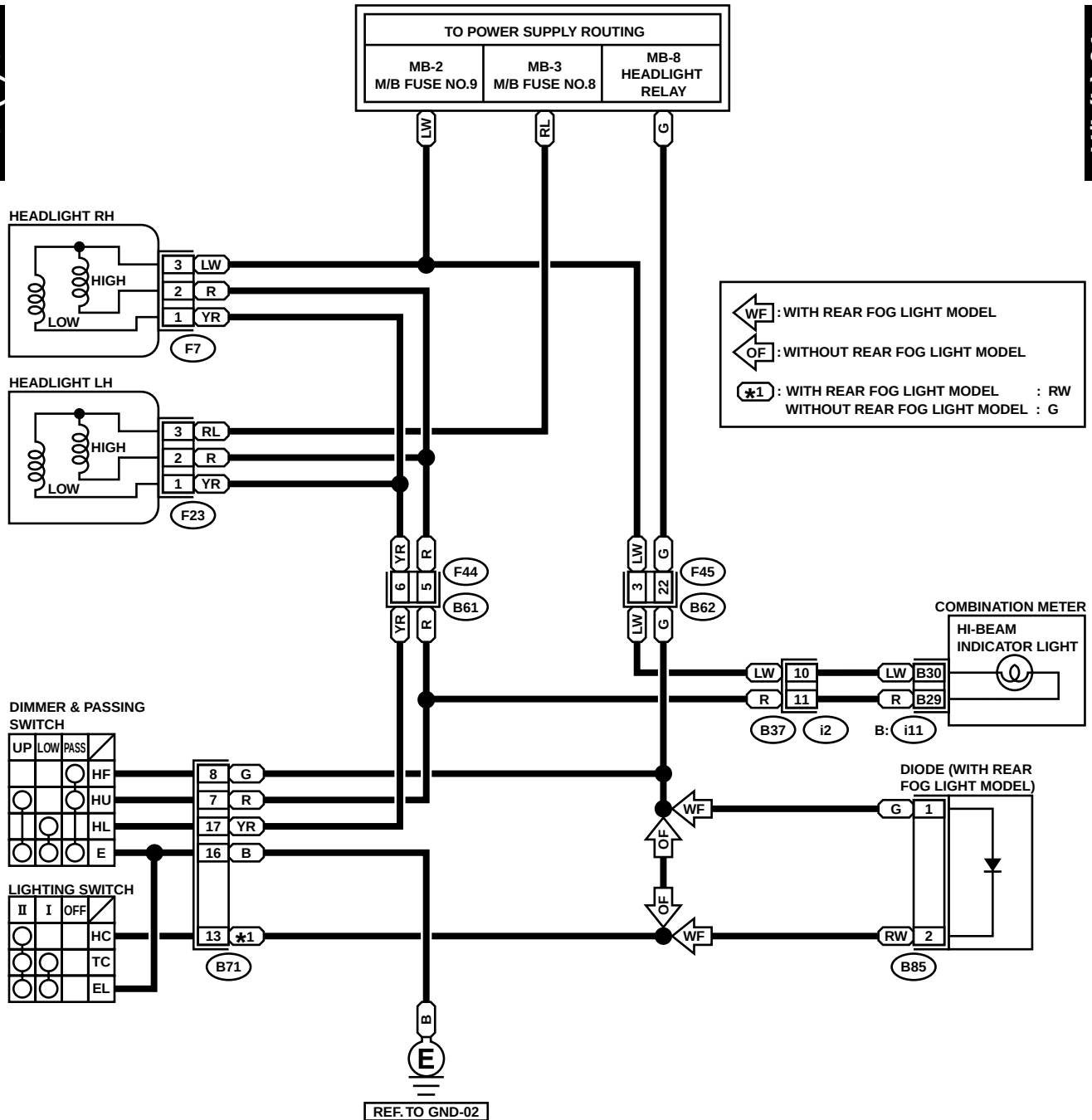
HEADLIGHT SYSTEM

WIRING SYSTEM

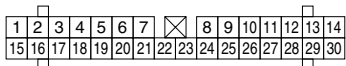
1. LHD MODEL

H/L(L)-01

H/L(L)-01



B: (i11) (GREEN)

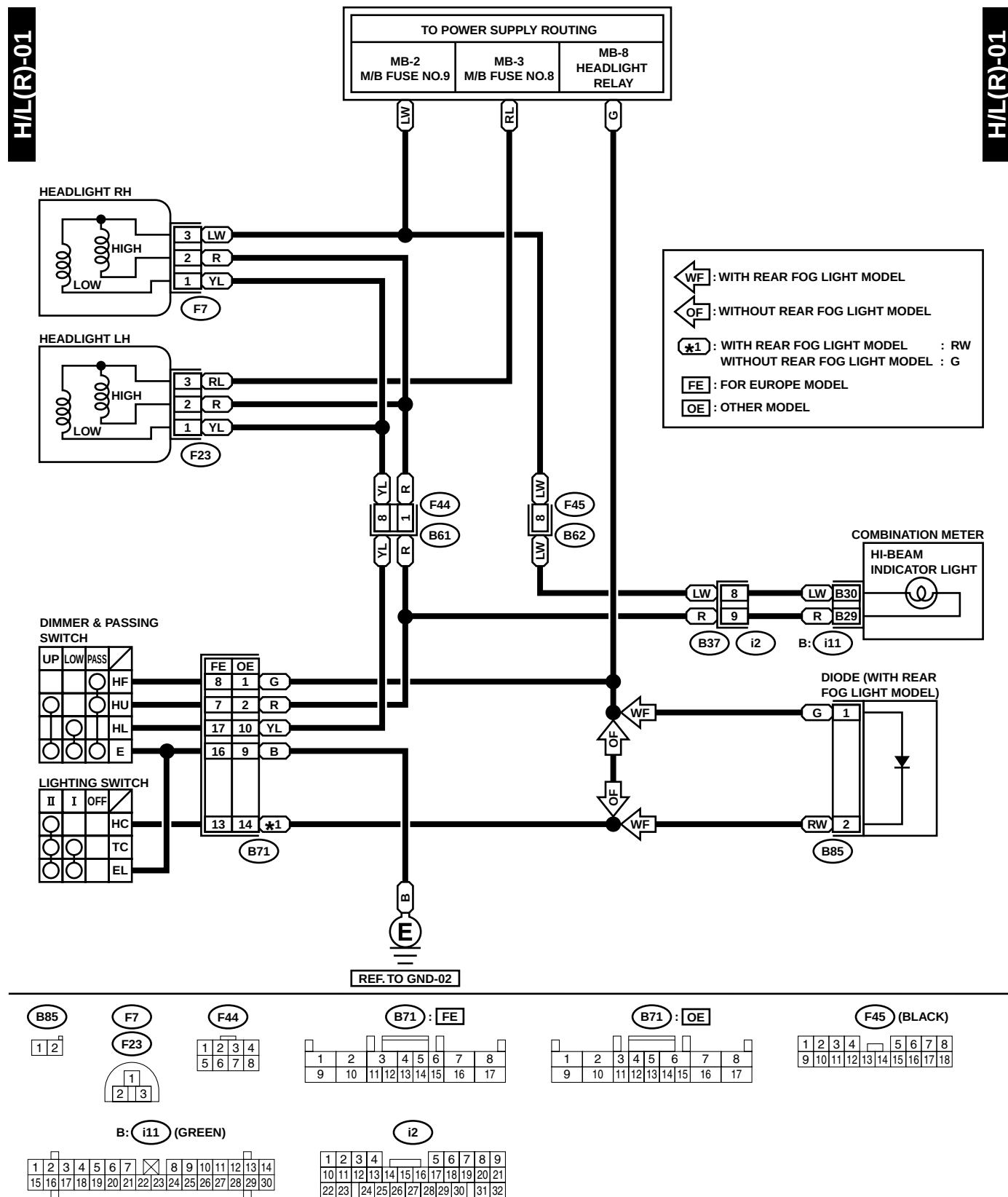


GL19-20

HEADLIGHT SYSTEM

WIRING SYSTEM

2. RHD MODEL



GR19-20

WIRING SYSTEM SECTION

WIRING SYSTEMWI

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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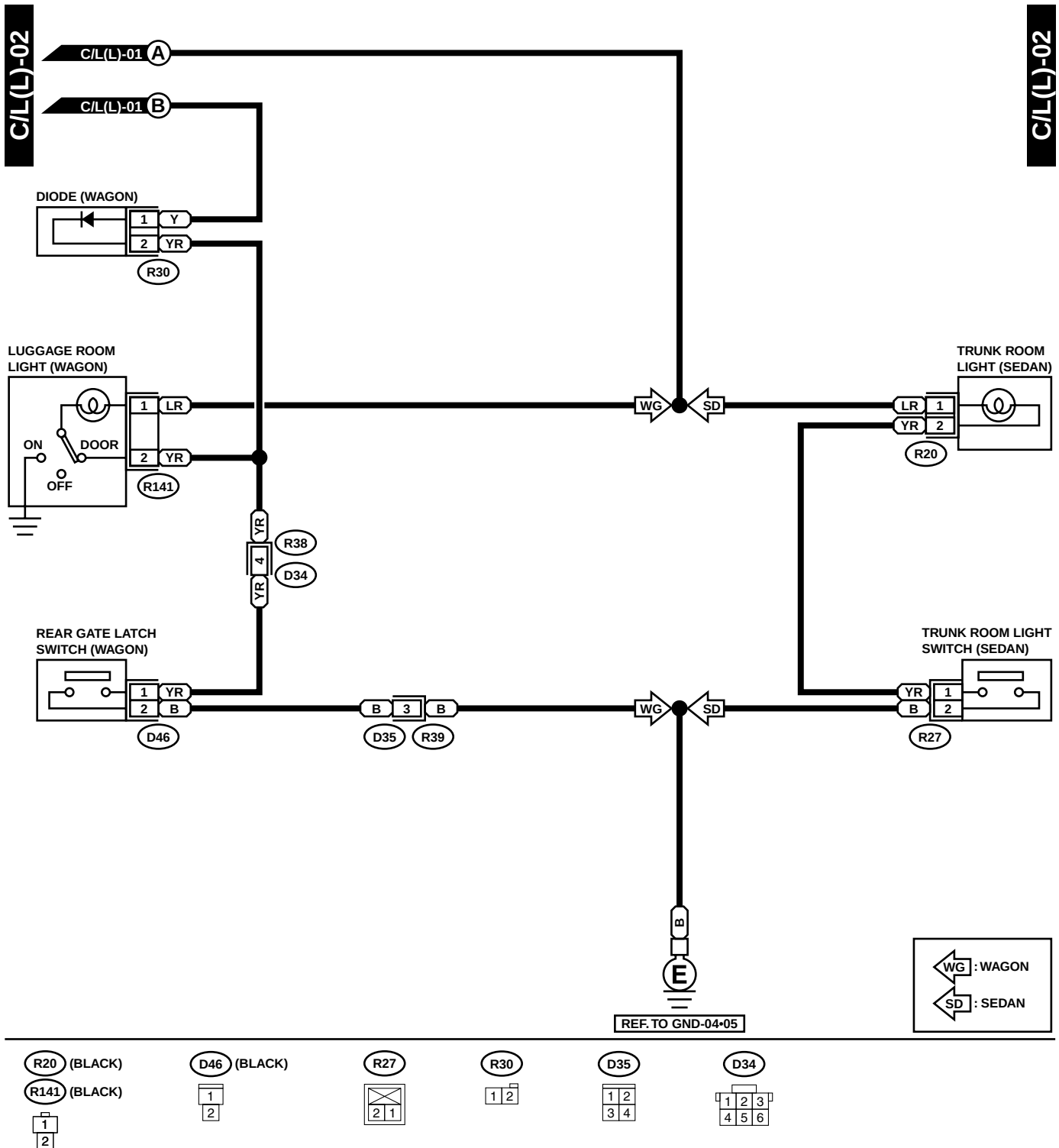
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28.In Compartment Light System

A: SCHEMATIC

IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM

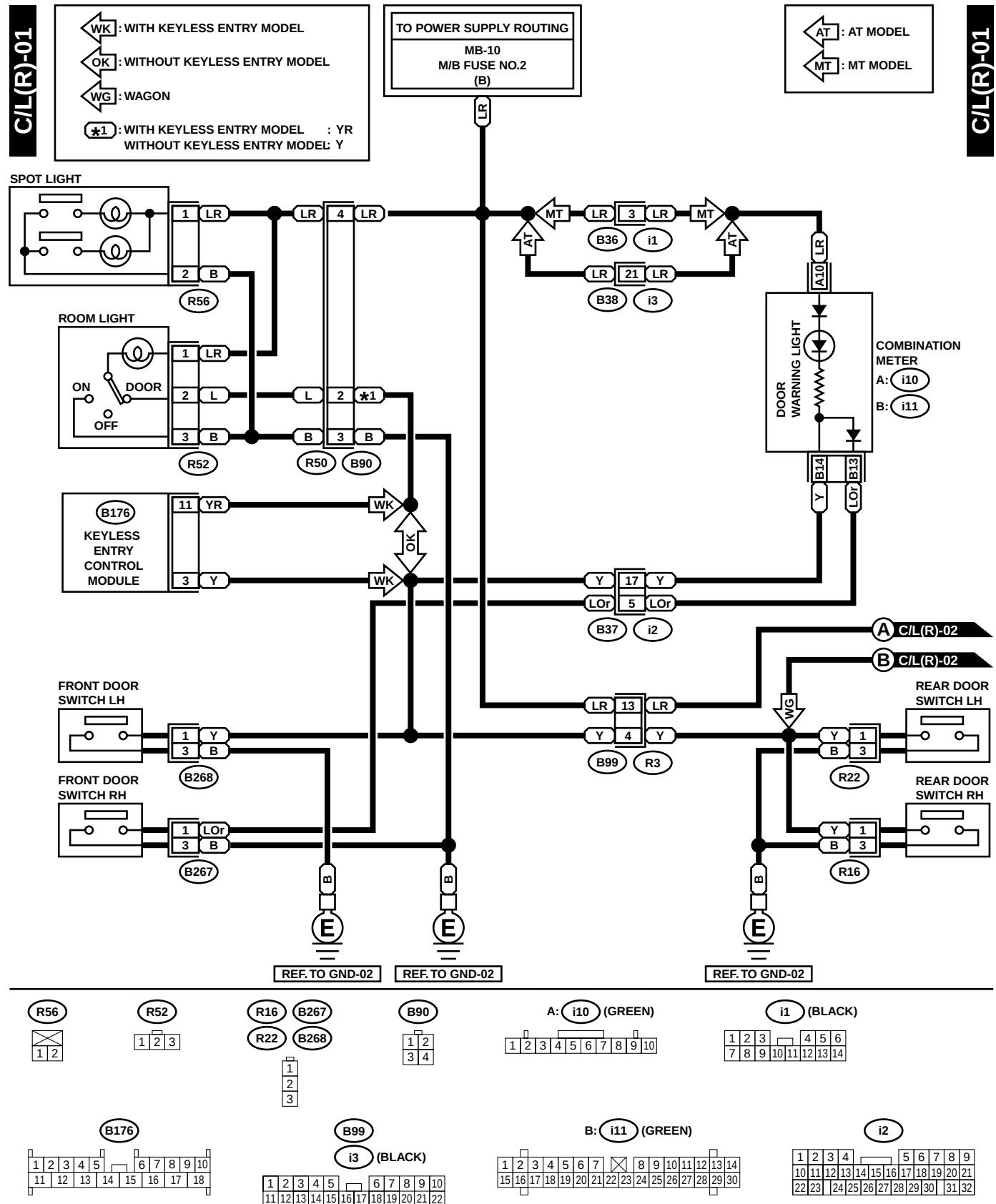


GL21-20B

IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM

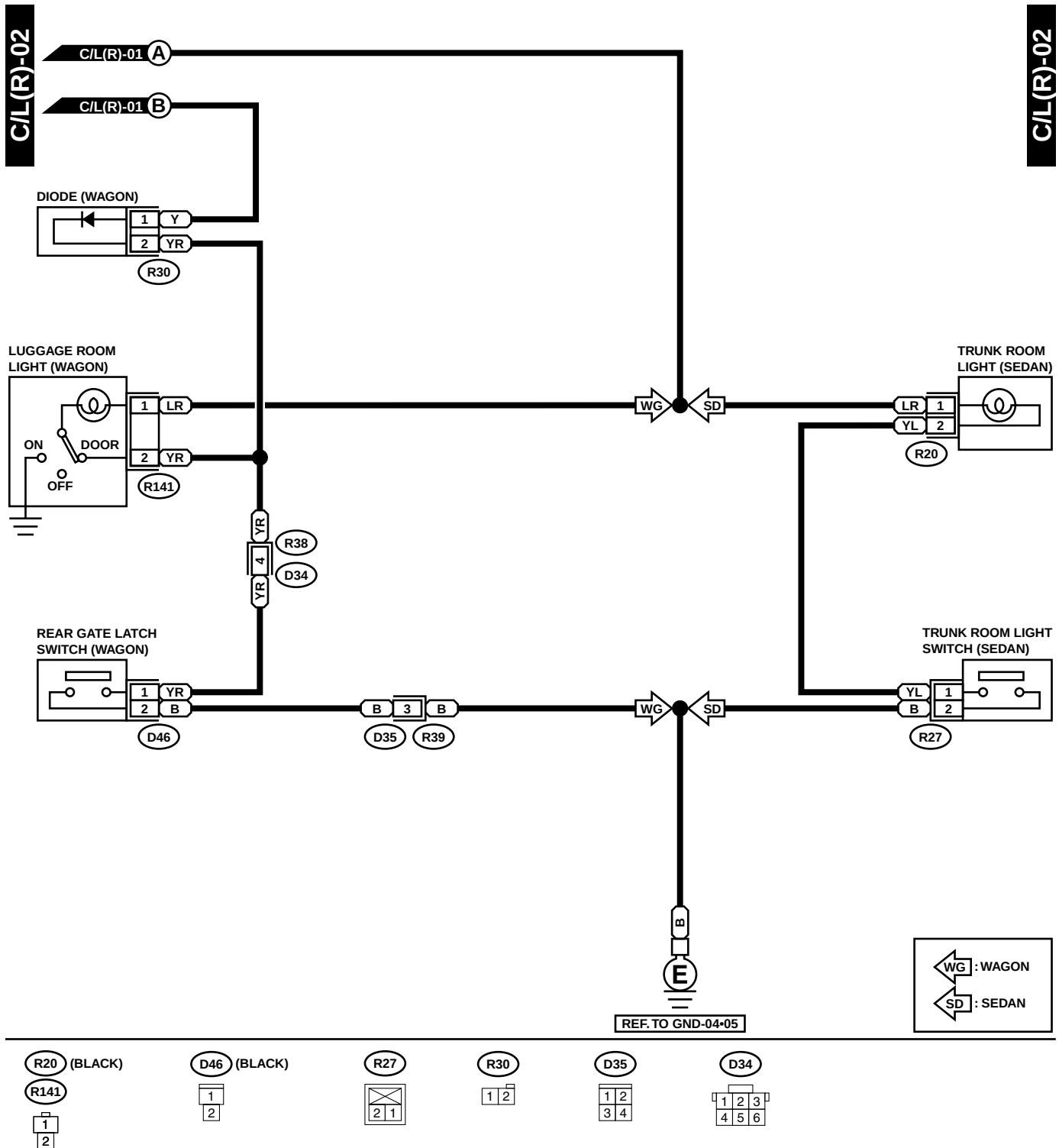
2. RHD MODEL



GR21-20A

IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM



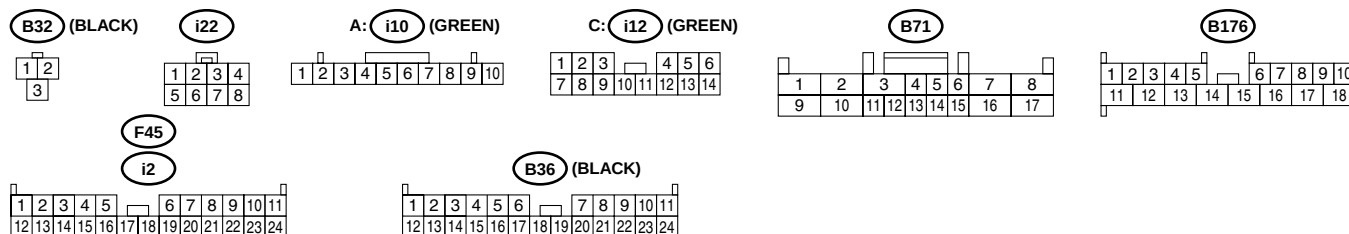
GR21-20B

30.Turn Signal Light and Hazard Light System

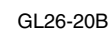
A: SCHEMATIC

WIRING SYSTEM

TURN(L)-01



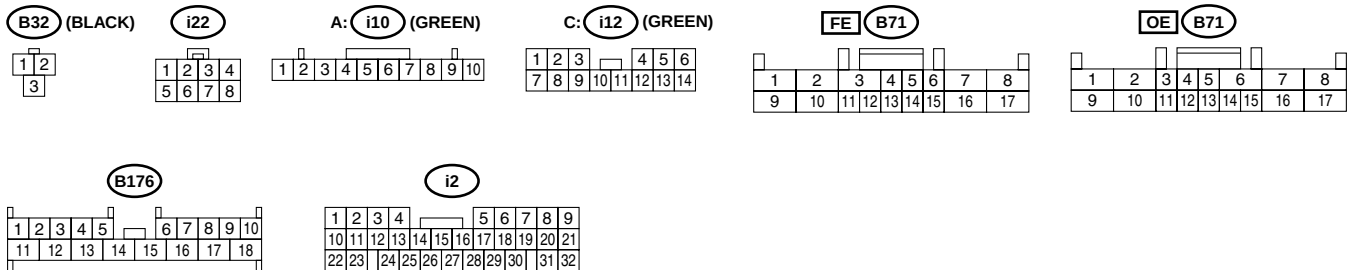
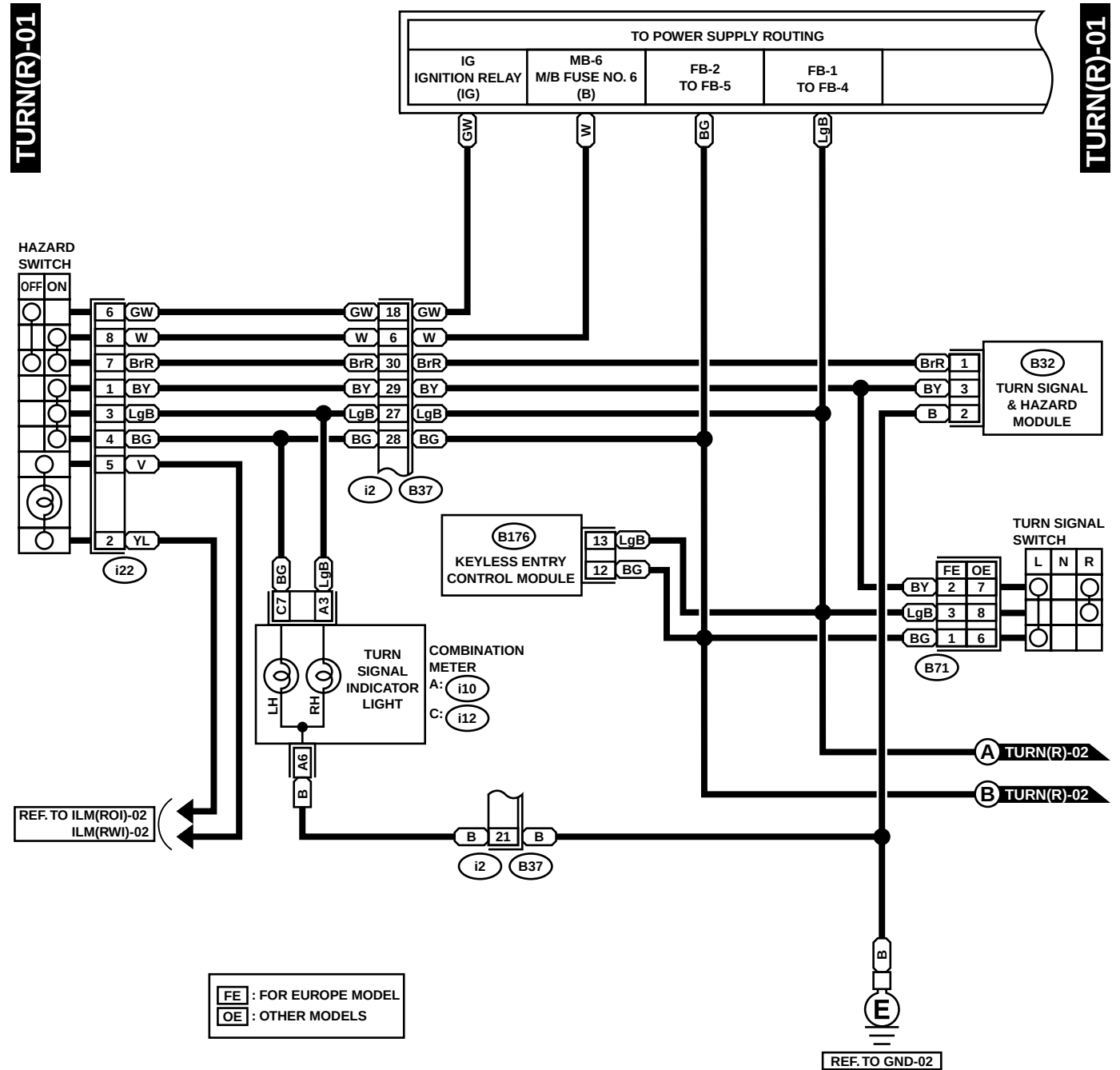
WIRING SYSTEM



TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

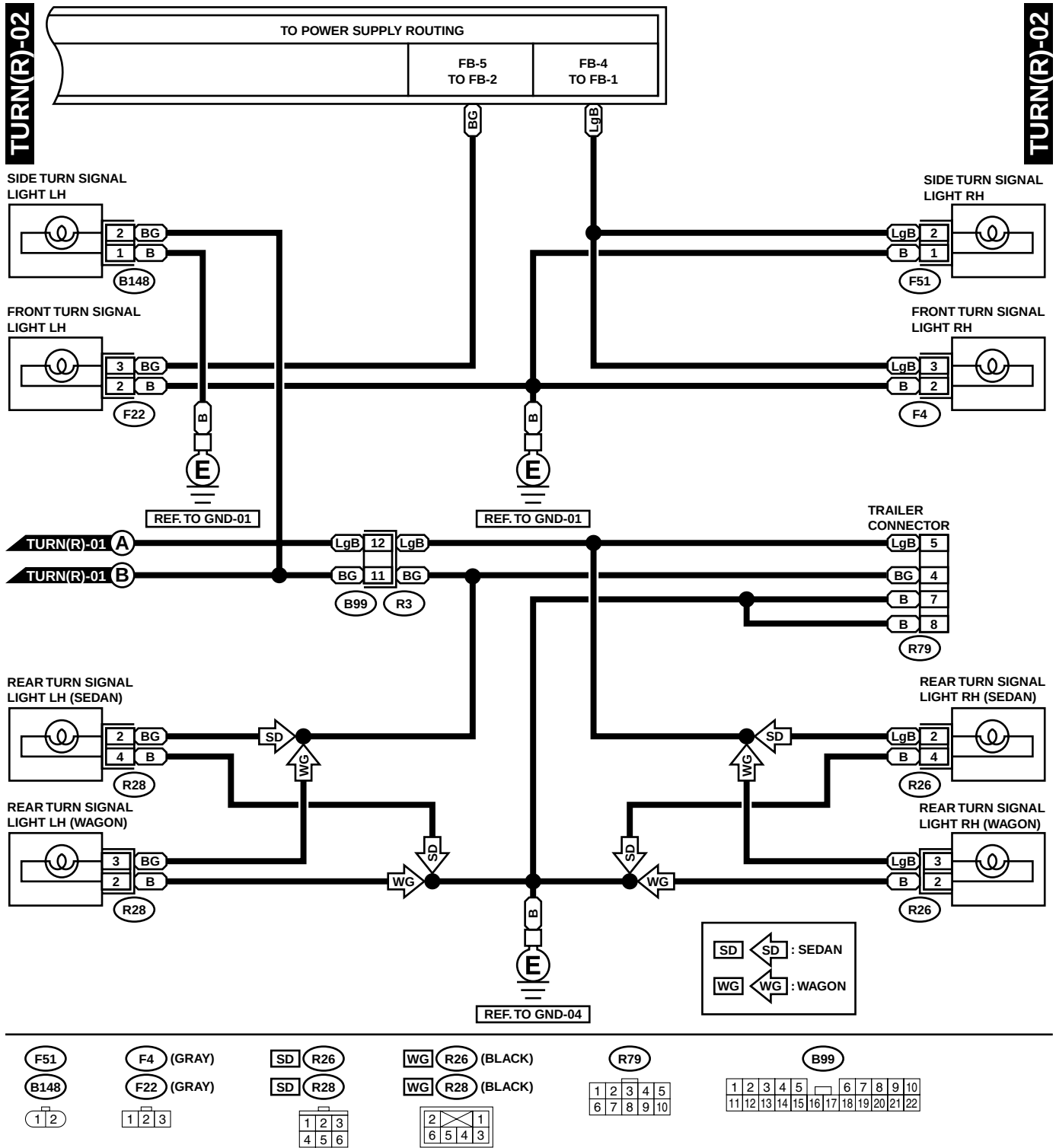
WIRING SYSTEM

2. RHD MODEL



TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

WIRING SYSTEM



GR26-20B

31.Oil Pressure Warning Light System

A: SCHEMATIC

OIL PRESSURE WARNING LIGHT SYSTEM

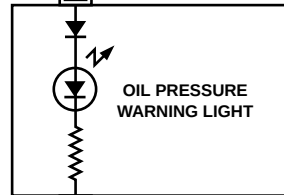
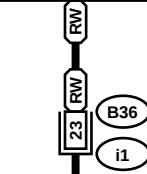
WIRING SYSTEM

1. LHD MODEL

OIL/P(L)-01

OIL/P(L)-01

TO POWER SUPPLY ROUTING
FB-36
F/B FUSE NO. 13
(IG)

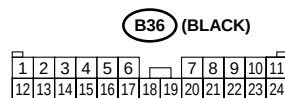
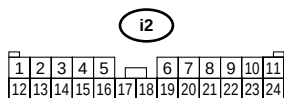
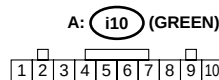
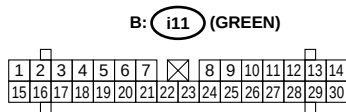
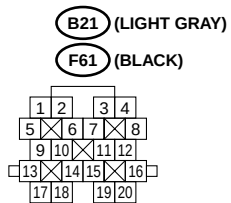


COMBINATION
METER
A: i10
B: i11

NA : NON-TURBO ENGINE MODEL
TB : TURBO ENGINE MODEL

OIL PRESSURE SWITCH

OIL PRESSURE SWITCH



GL66-20

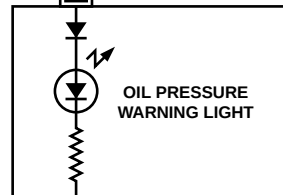
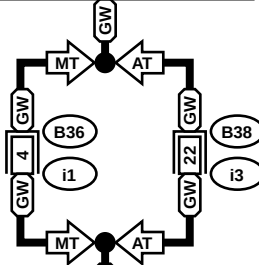
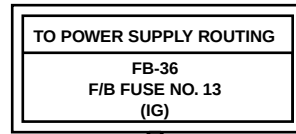
OIL PRESSURE WARNING LIGHT SYSTEM

WIRING SYSTEM

2. RHD MODEL

OIL/P(R)-01

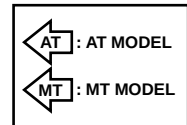
OIL/P(R)-01



COMBINATION
METER

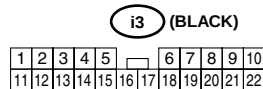
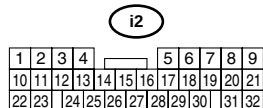
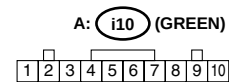
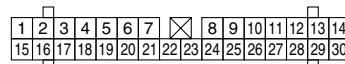
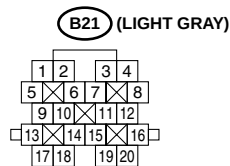
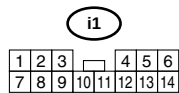
A: i10

B: i11



*1 : NON-TURBO ENGINE MODEL : 5
TURBO ENGINE MODEL : 14
*2 : NON-TURBO ENGINE MODEL : GW
TURBO ENGINE MODEL : G

OIL PRESSURE SWITCH



GR66-20

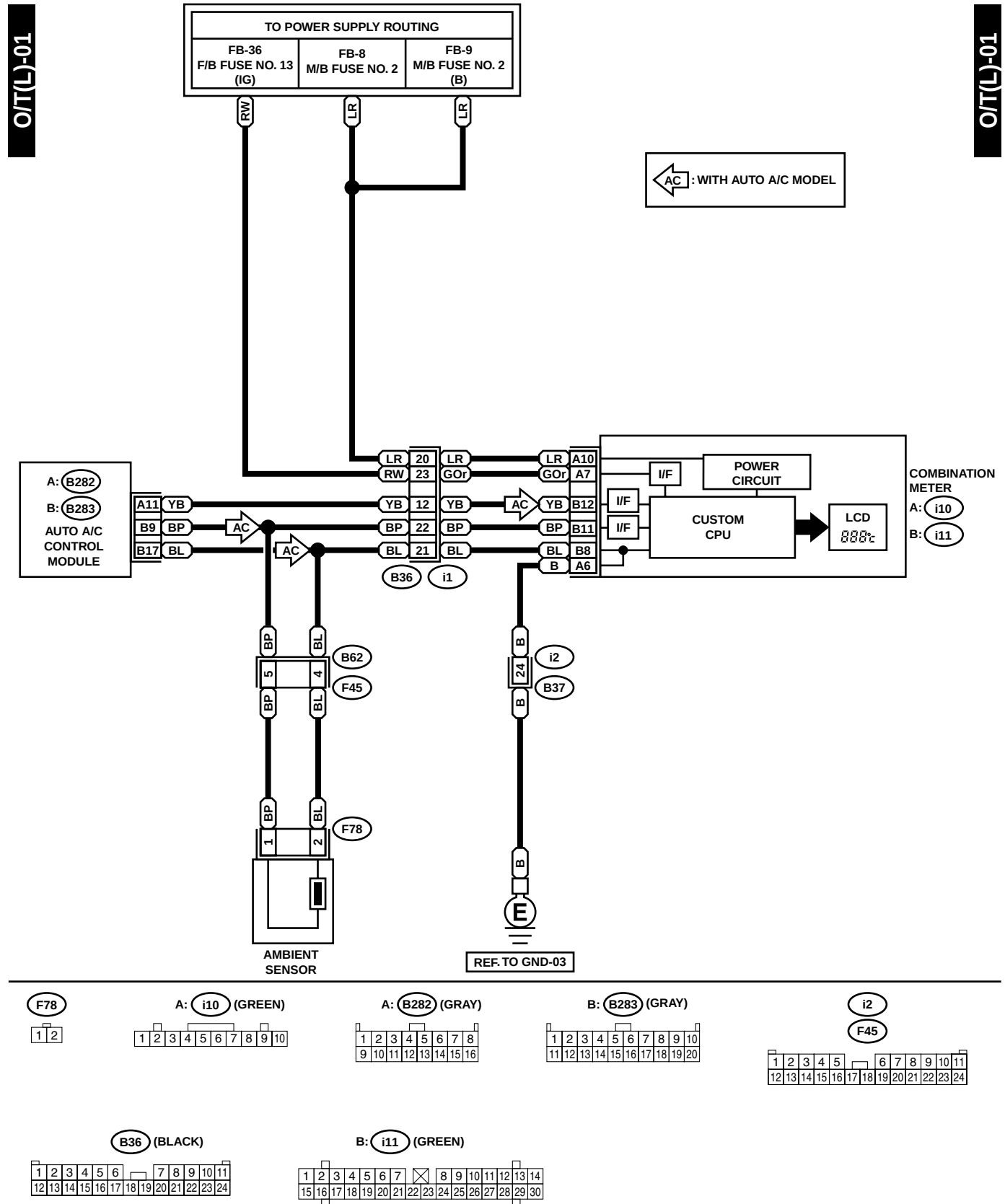
32.Outside Temperature Display System

A: SCHEMATIC

OUTSIDE TEMPERATURE DISPLAY SYSTEM

WIRING SYSTEM

1. LHD MODEL



GL96-20

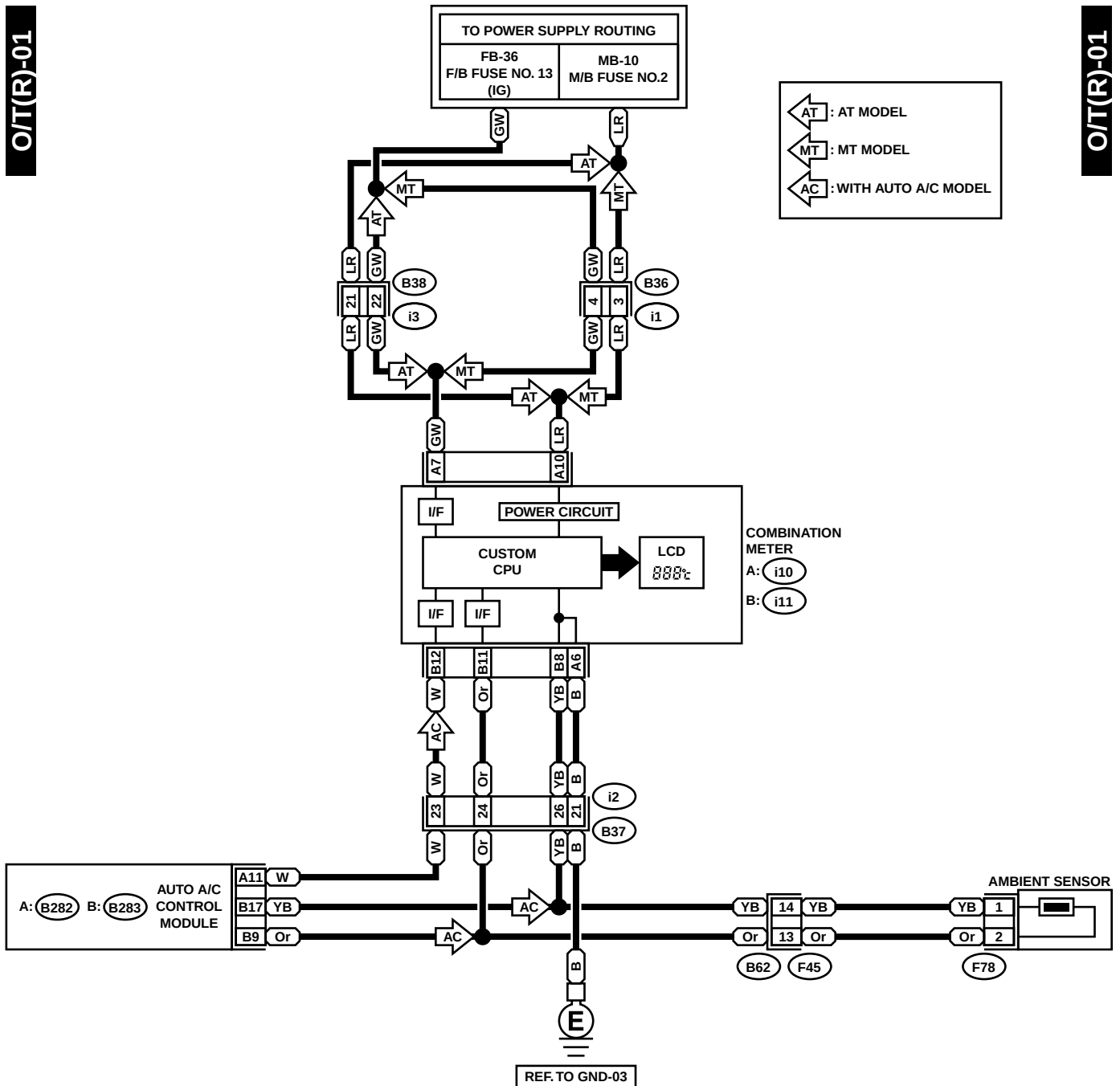
OUTSIDE TEMPERATURE DISPLAY SYSTEM

WIRING SYSTEM

2. RHD MODEL

O/T(R)-01

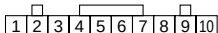
O/T(R)-01



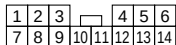
(F78) (BLACK)



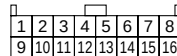
A: i10 (GREEN)



i1 (BLACK)

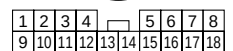


A: (B282) (GRAY)

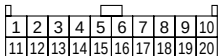


(F45) (BLACK)

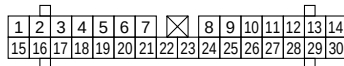
i3 (BLACK)



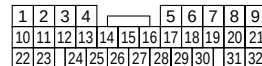
B: (B283) (GRAY)



B: i11 (GREEN)



i2



GR96-20

33. Parking Brake and Brake Fluid Level Warning System

A: SCHEMATIC

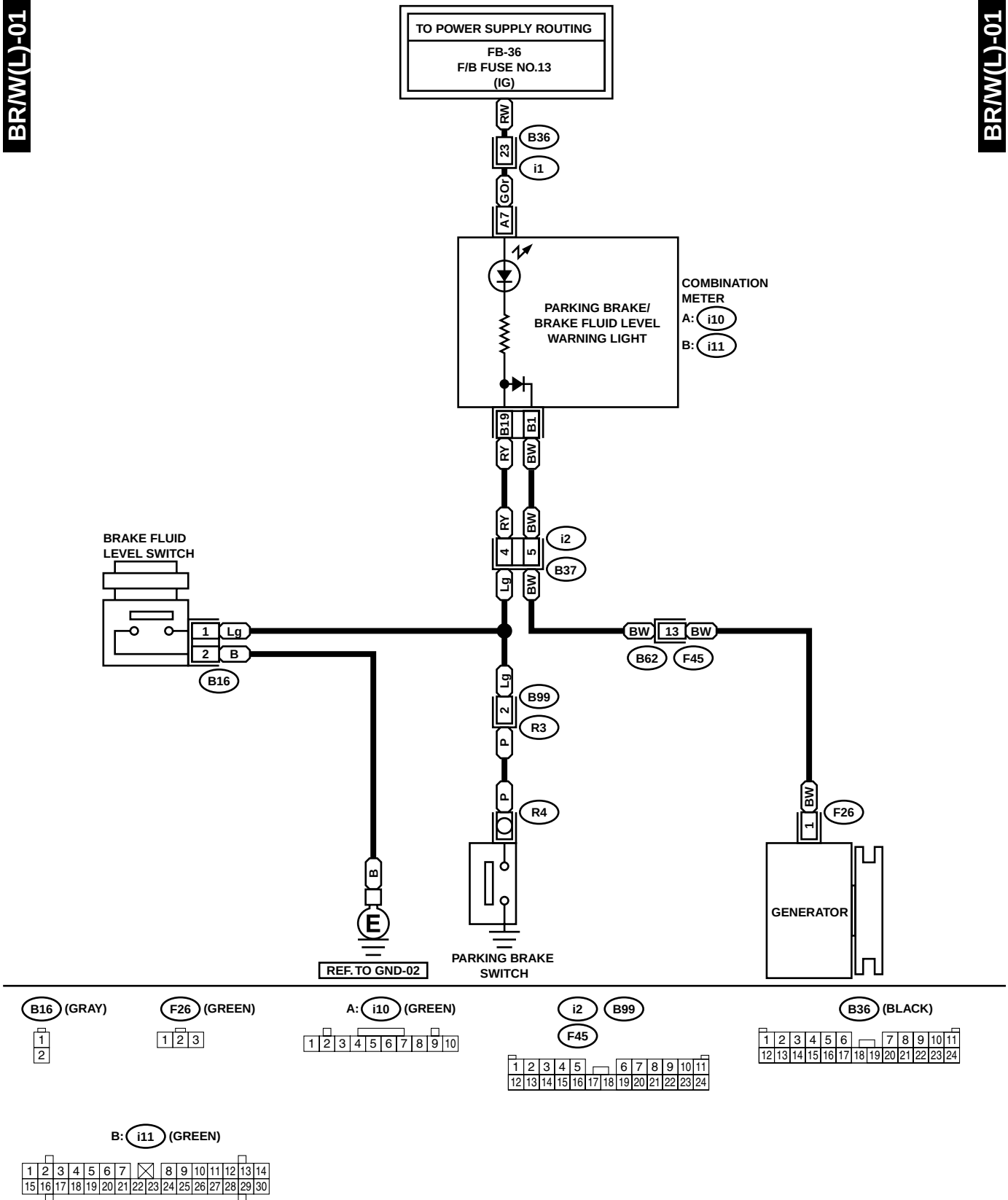
PARKING BRAKE AND BRAKE FLUID LEVEL WARNING SYSTEM

WIRING SYSTEM

1. LHD MODEL

BR/W(L)-01

BR/W(L)-01

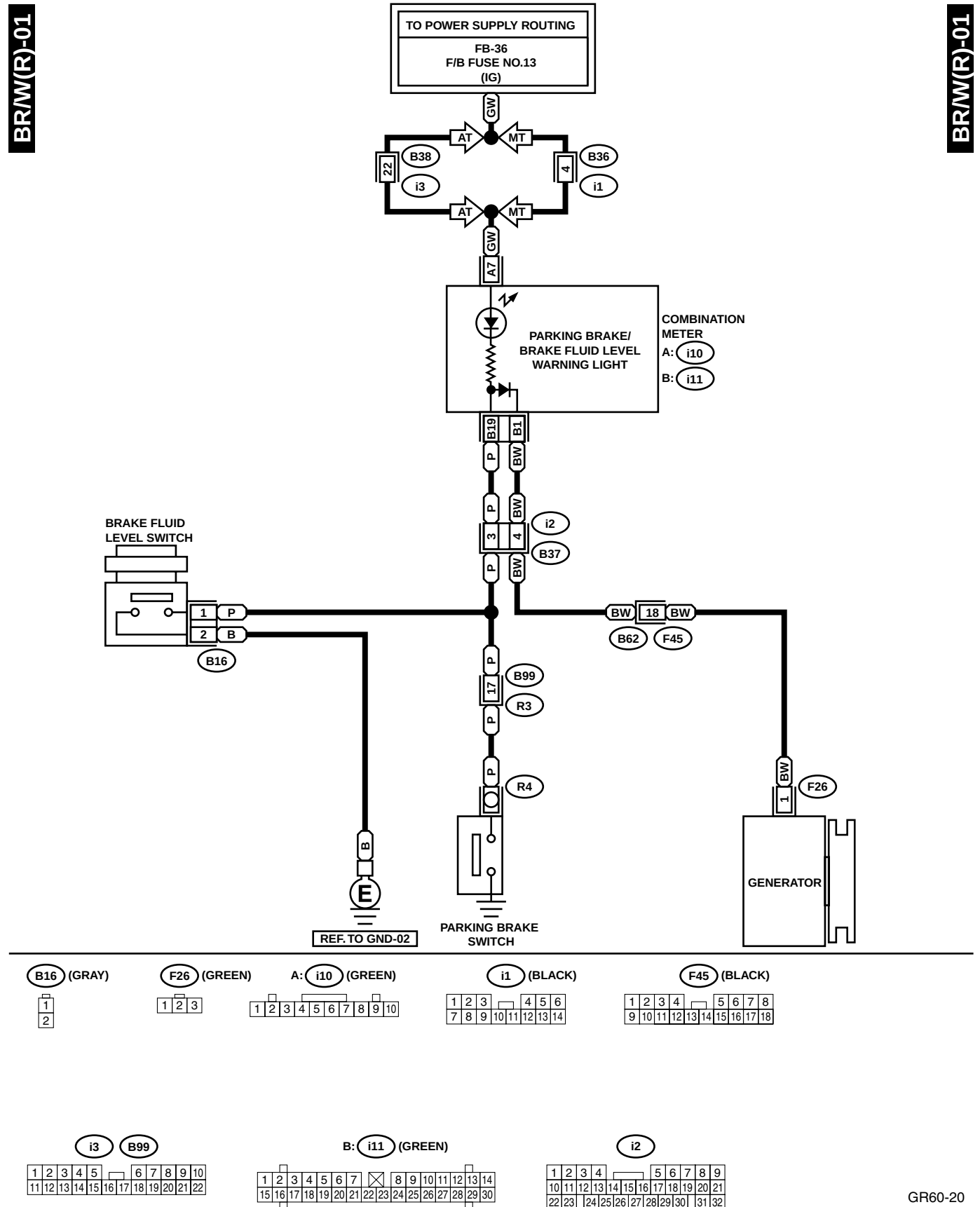


GL60-20

PARKING BRAKE AND BRAKE FLUID LEVEL WARNING SYSTEM

WIRING SYSTEM

2. RHD MODEL



GR60-20

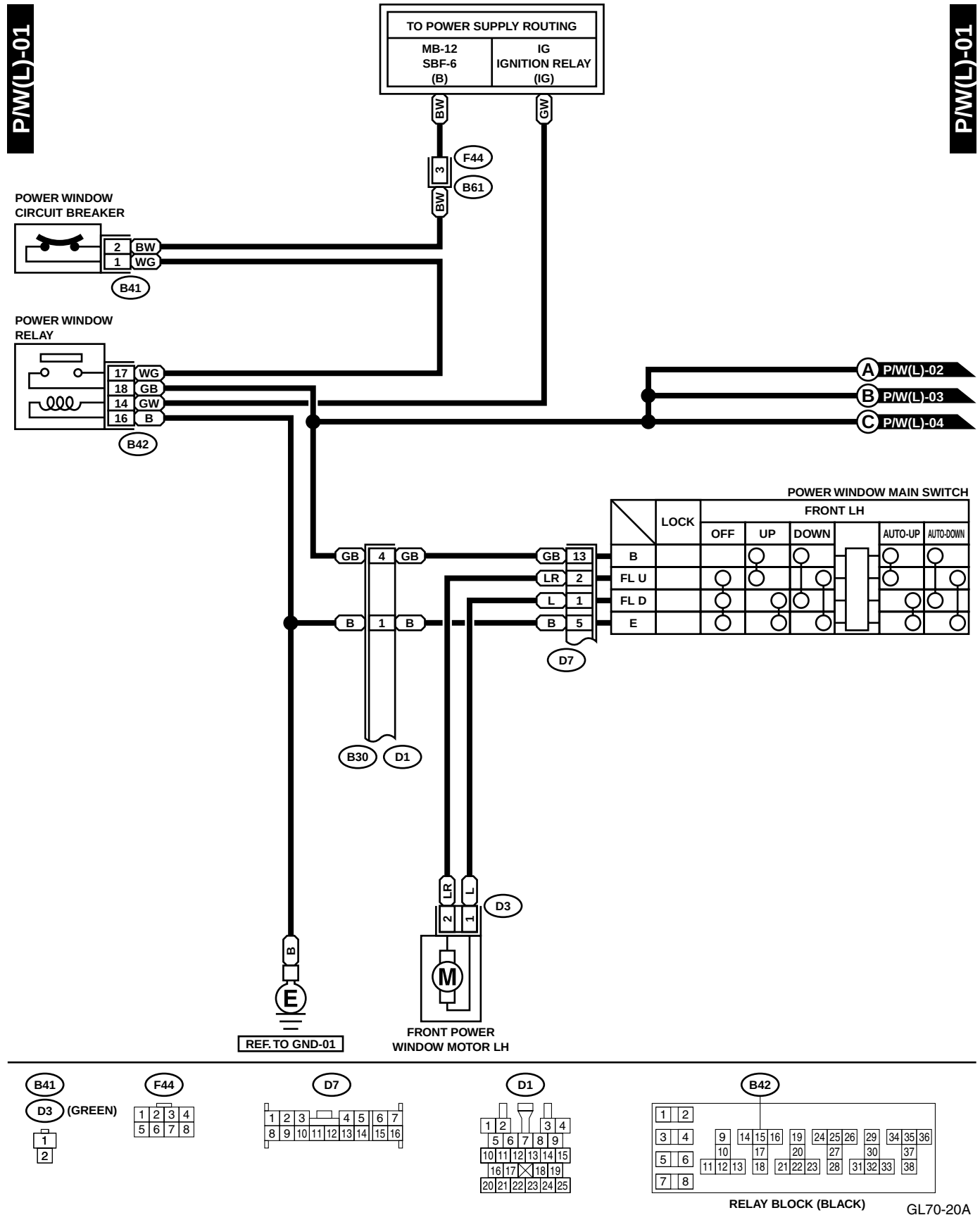
34.Power Window System

A: SCHEMATIC

POWER WINDOW SYSTEM

WIRING SYSTEM

1. LHD MODEL

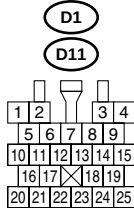
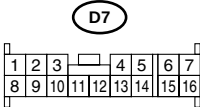
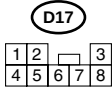
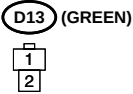
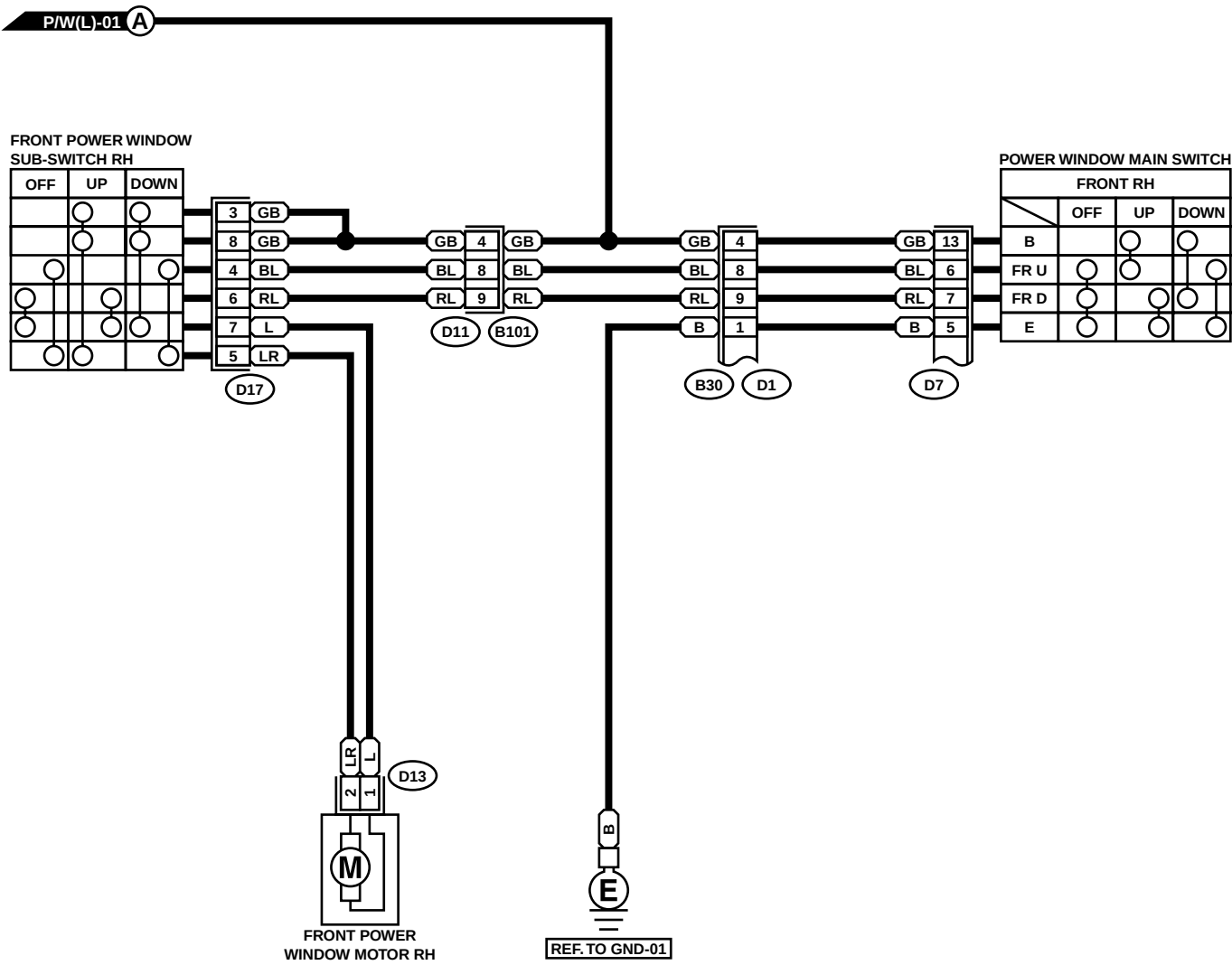


POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(L)-02

P/W(L)-02



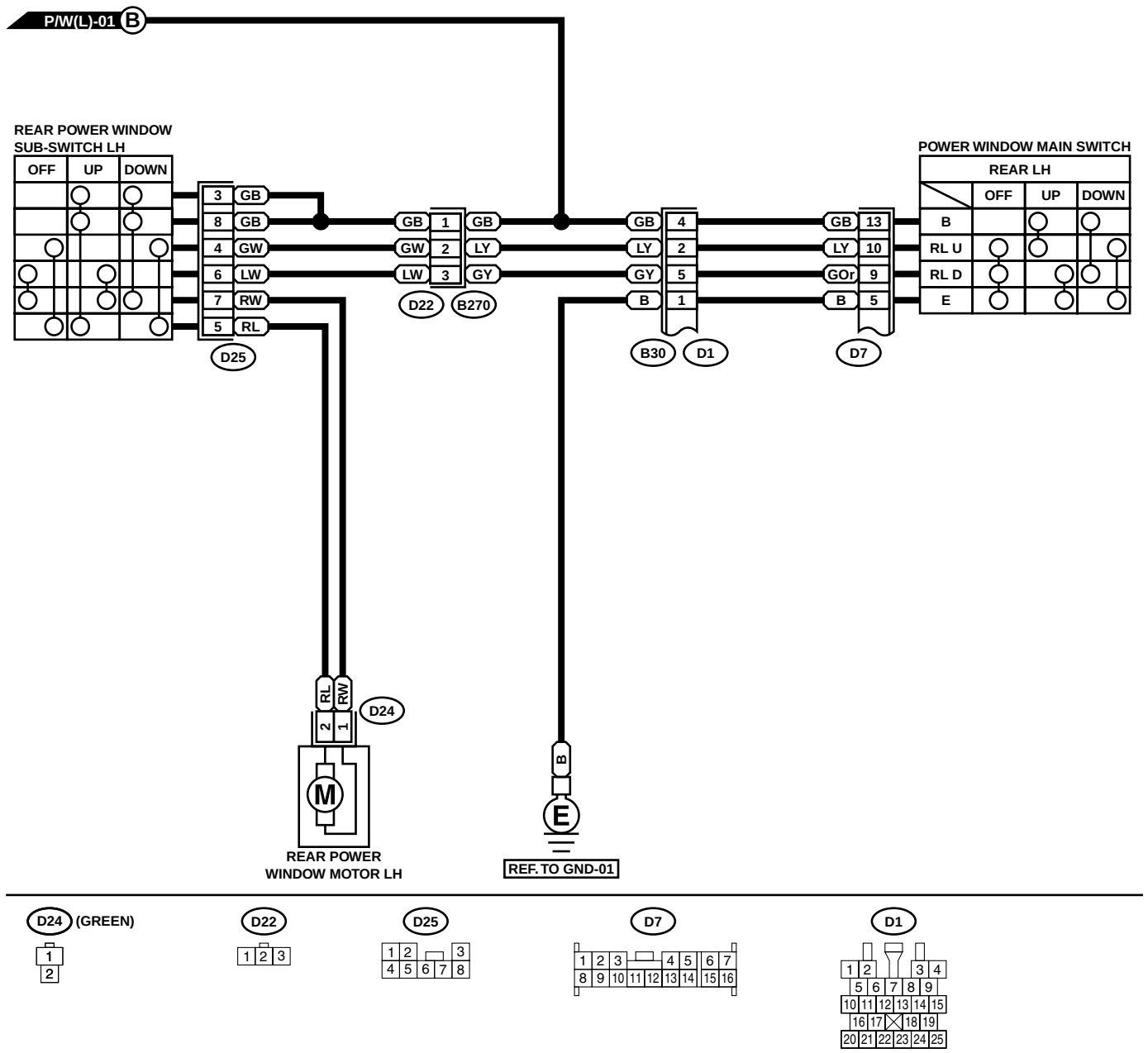
GL70-20B

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(L)-03

P/W(L)-03



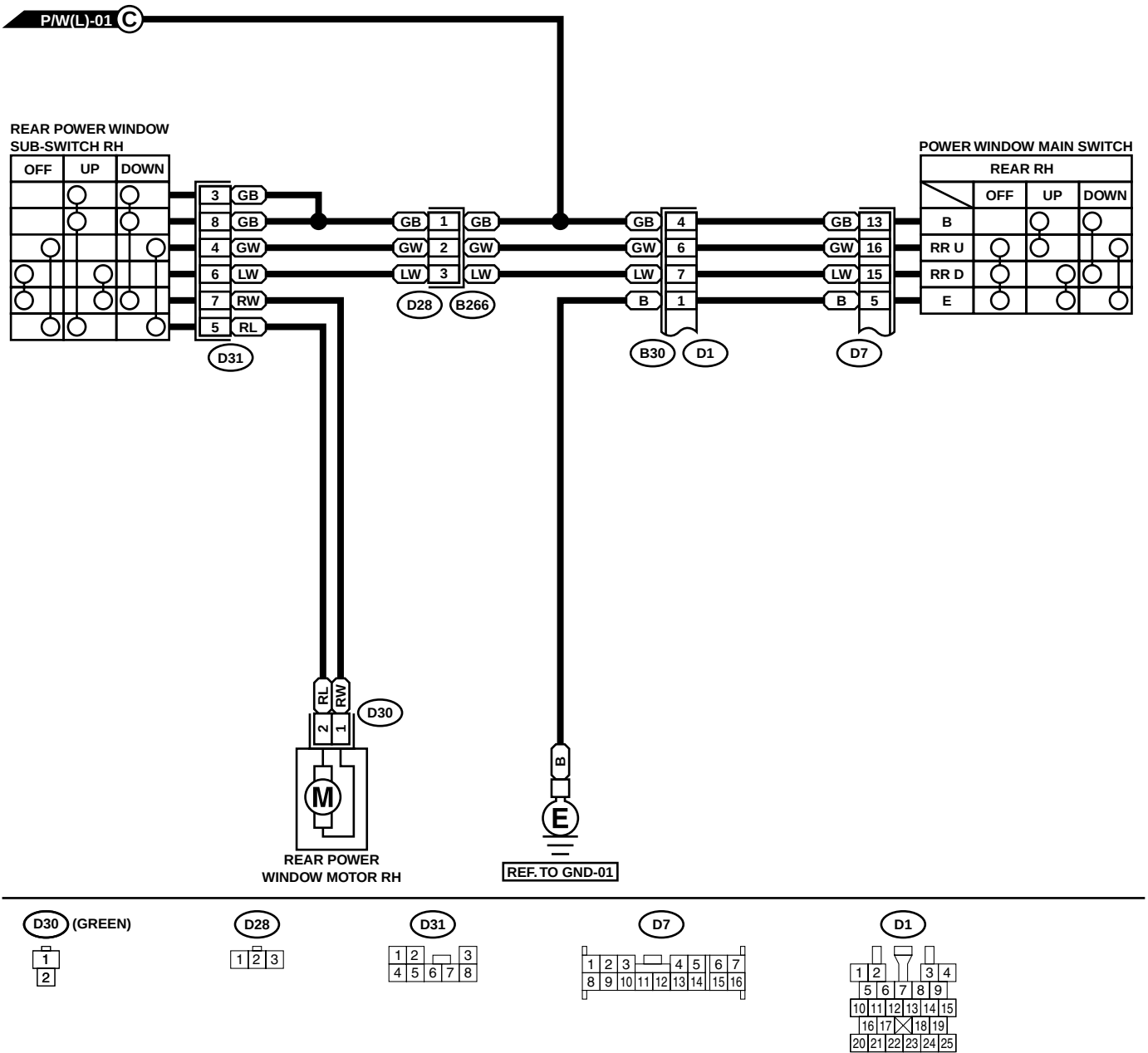
GL70-20C

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(L)-04

P/W(L)-04

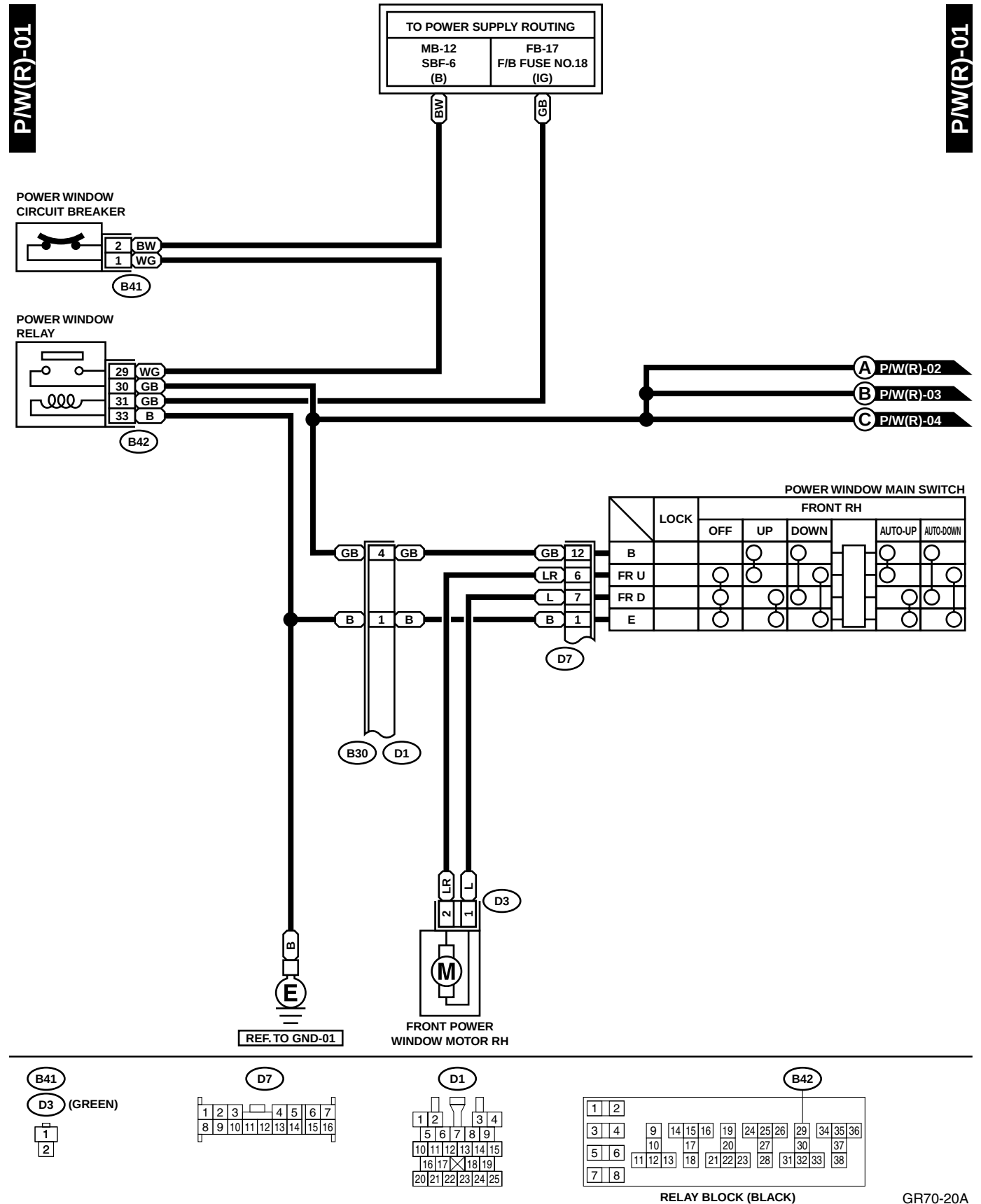


GL70-20D

POWER WINDOW SYSTEM

WIRING SYSTEM

2. RHD MODEL

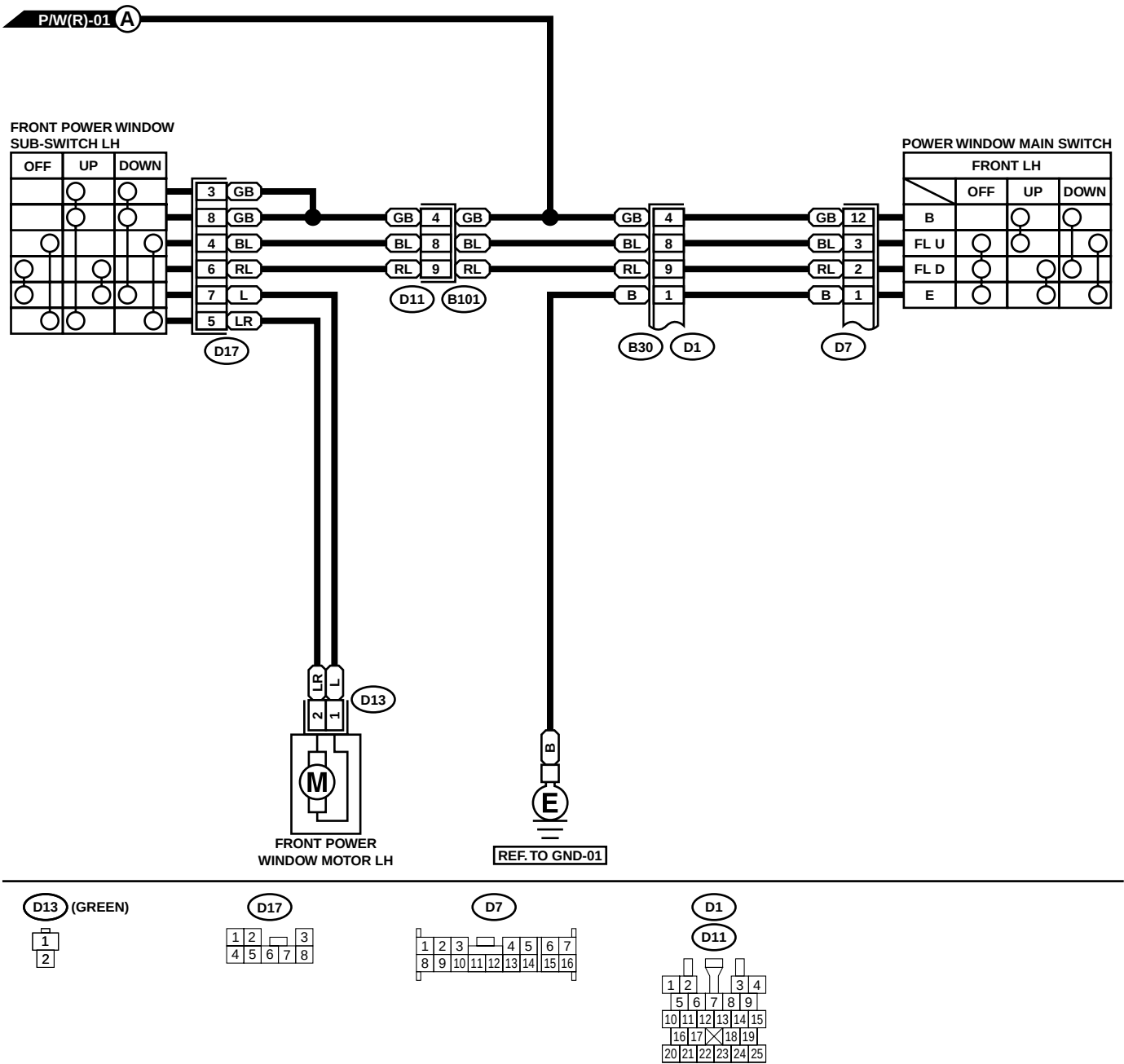


POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(R)-02

P/W(R)-02



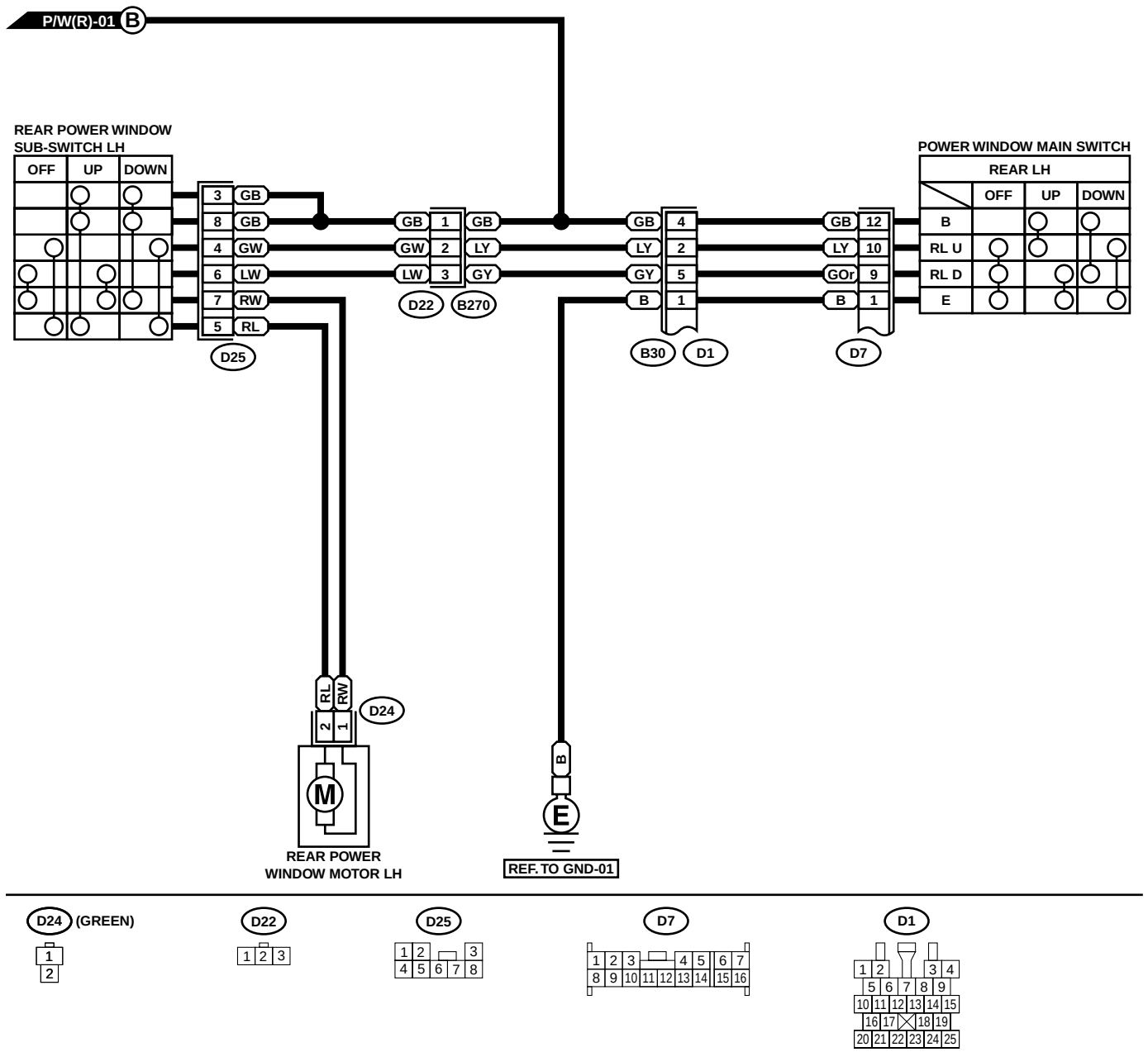
GR70-20B

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(R)-03

P/W(R)-03



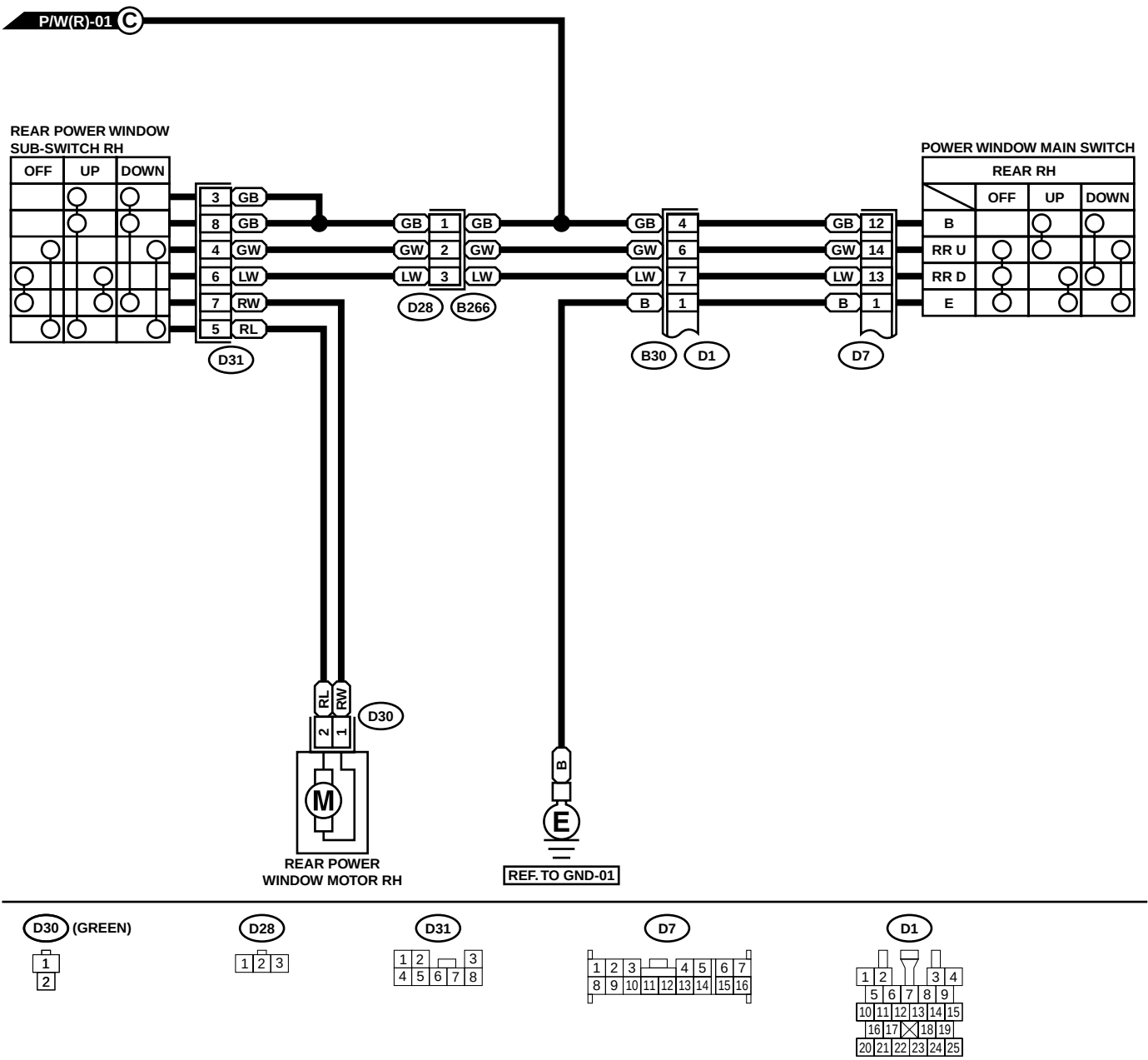
GR70-20C

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(R)-04

P/W(R)-04



GR70-20D

35.Radiator Fan System

A: SCHEMATIC

WIRING SYSTEM

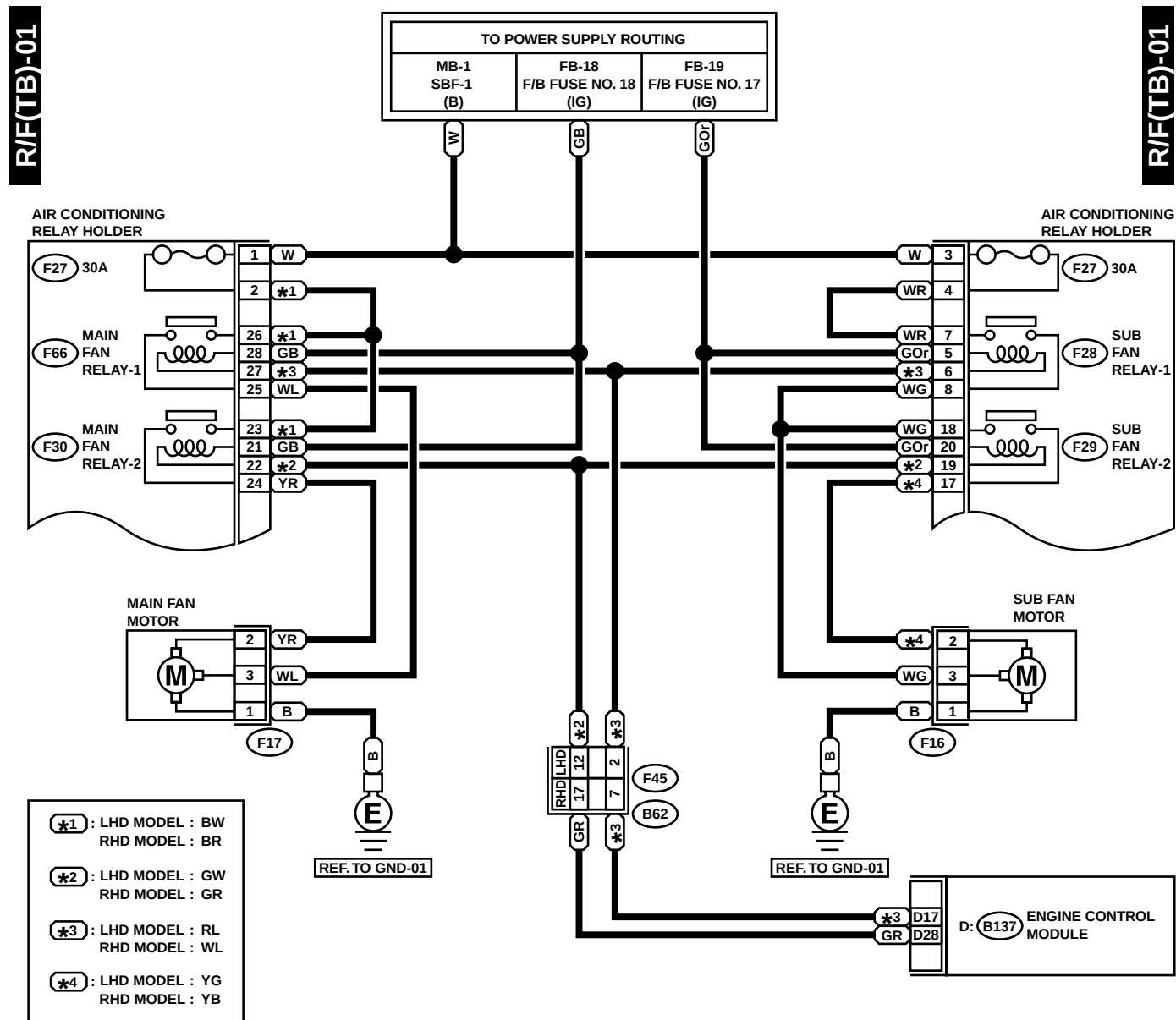
R/F(NA)-01



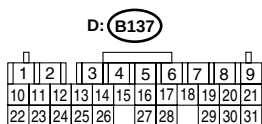
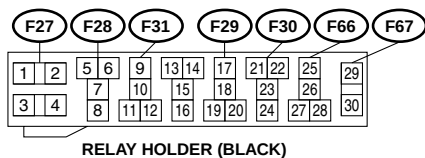
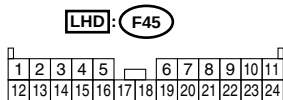
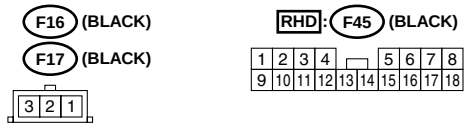
RADIATOR FAN SYSTEM

WIRING SYSTEM

2. TURBO ENGINE MODEL



R/F(TB)-01



GG14-20

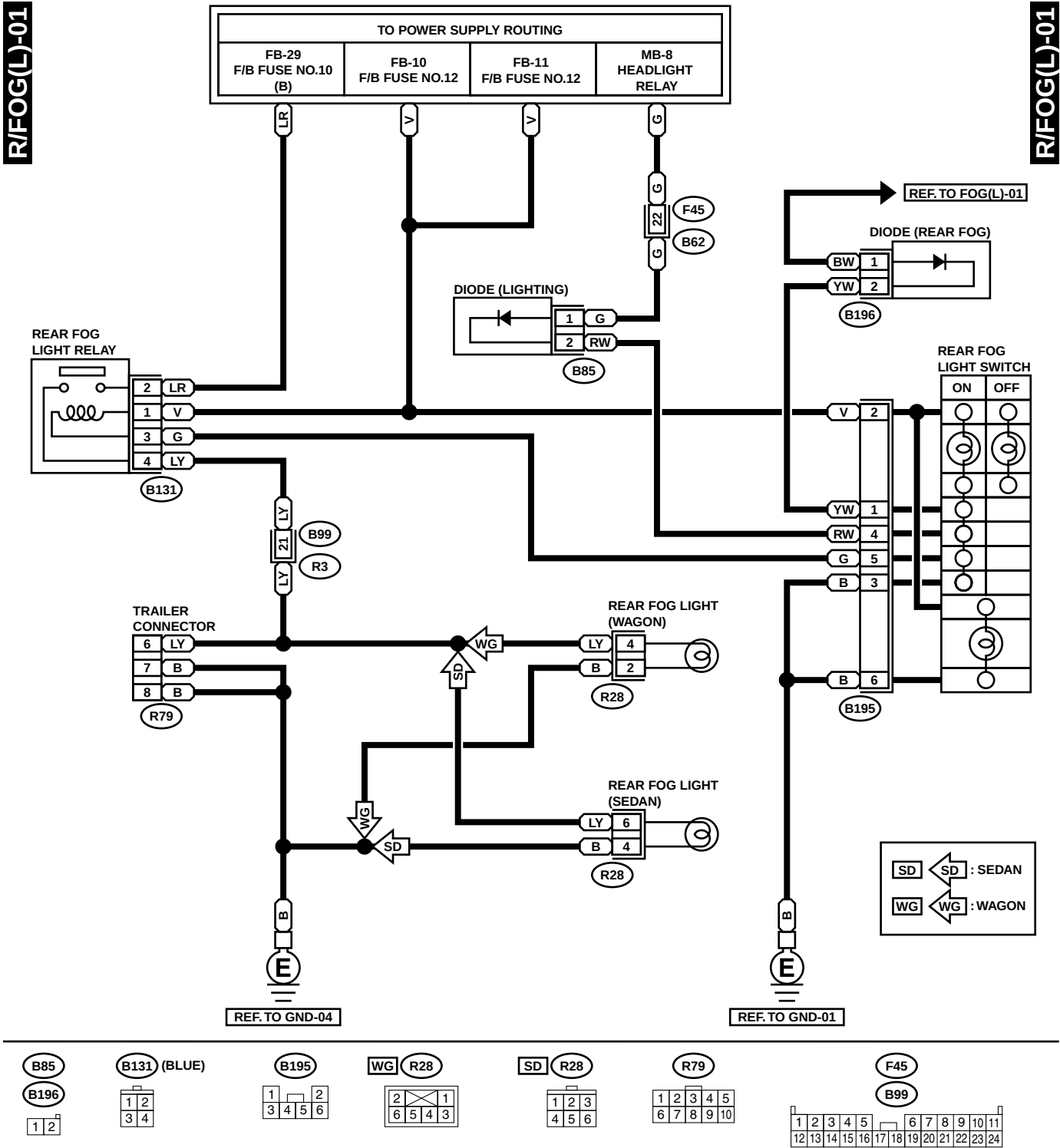
36.Rear Fog Light System

A: SCHEMATIC

REAR FOG LIGHT SYSTEM

WIRING SYSTEM

1. LHD MODEL



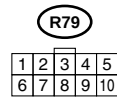
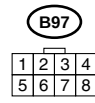
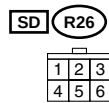
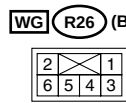
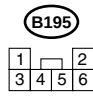
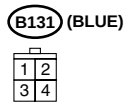
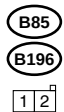
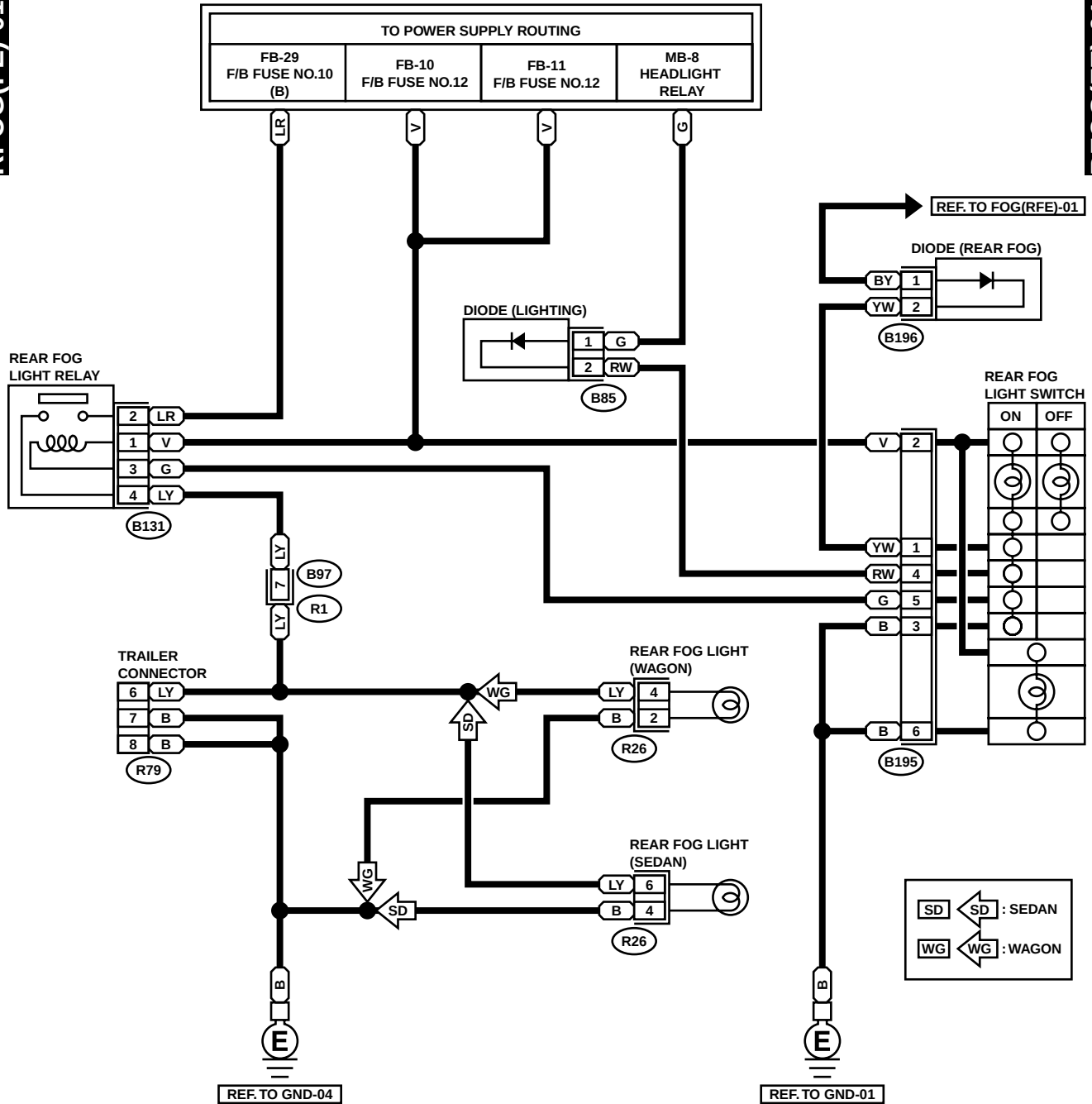
REAR FOG LIGHT SYSTEM

WIRING SYSTEM

2. RHD FOR EUROPE MODEL

RFOG(FE)-01

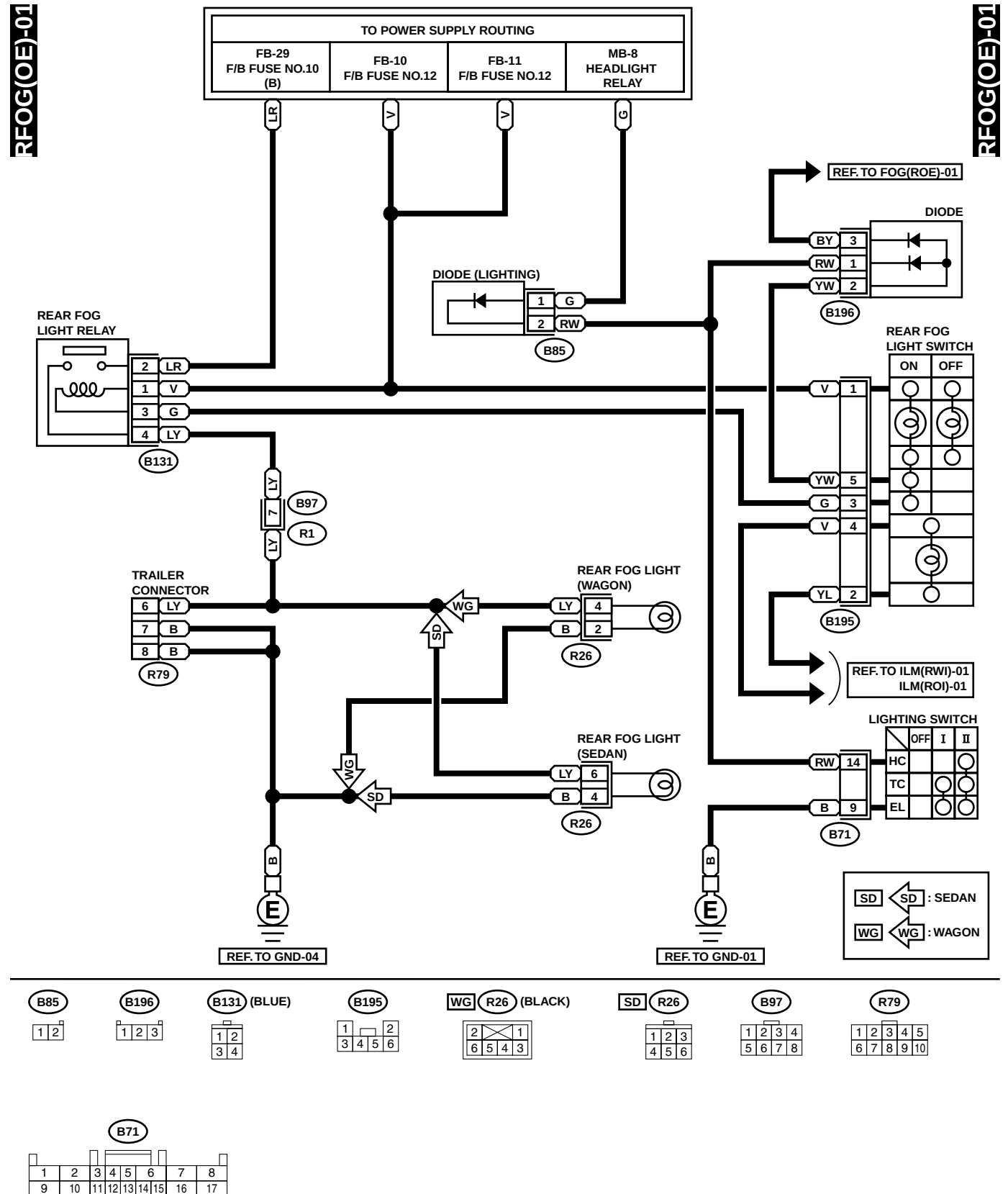
RFOG(FE)-01



REAR FOG LIGHT SYSTEM

WIRING SYSTEM

3. RHD EXCEPT FOR EUROPE MODEL



GR30-21

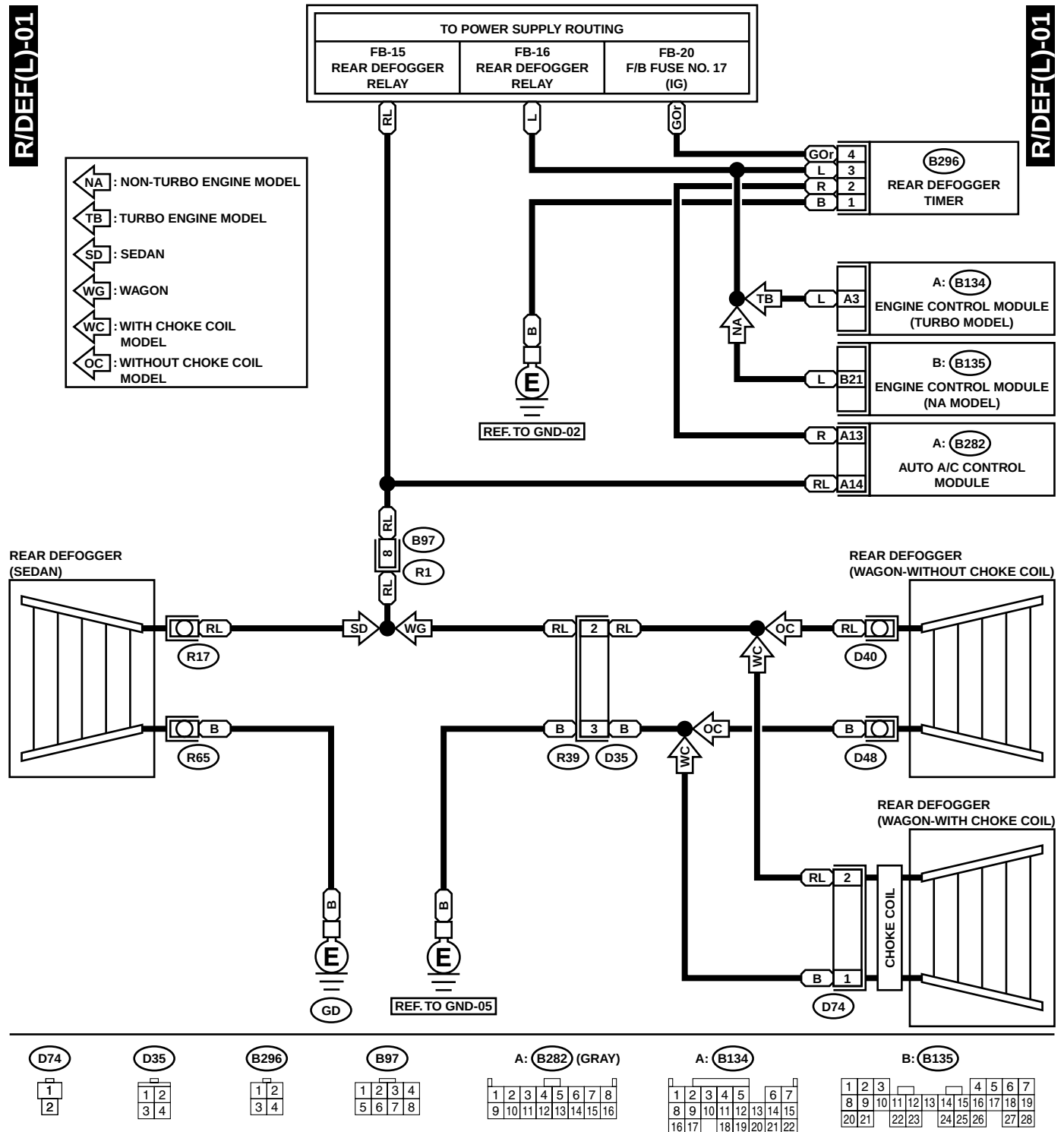
37.Rear Window Defogger System

A: SCHEMATIC

REAR WINDOW DEFOGGER SYSTEM

WIRING SYSTEM

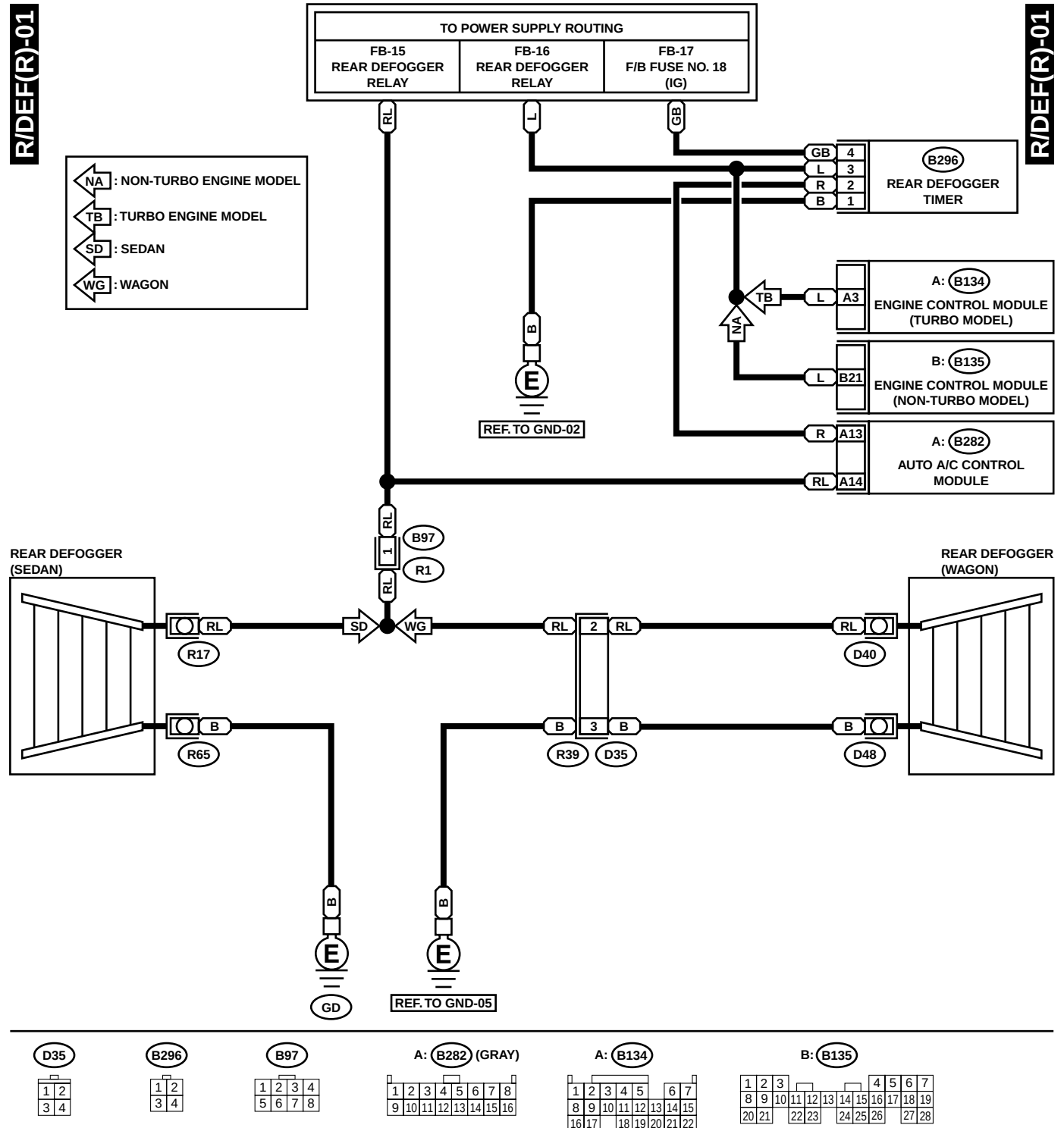
1. LHD MODEL



REAR WINDOW DEFOGGER SYSTEM

WIRING SYSTEM

2. RHD MODEL



GR52-20

38.Remote Controlled Rearview Mirror System

A: SCHEMATIC

WIRING SYSTEM

R/M(L)-01



WIRING SYSTEM

R/M(R)-01



39.Seat Belt Warning System

A: SCHEMATIC

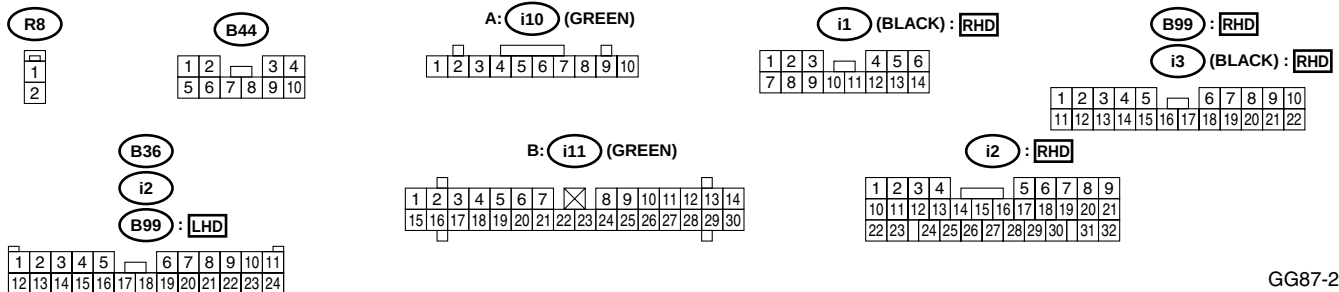
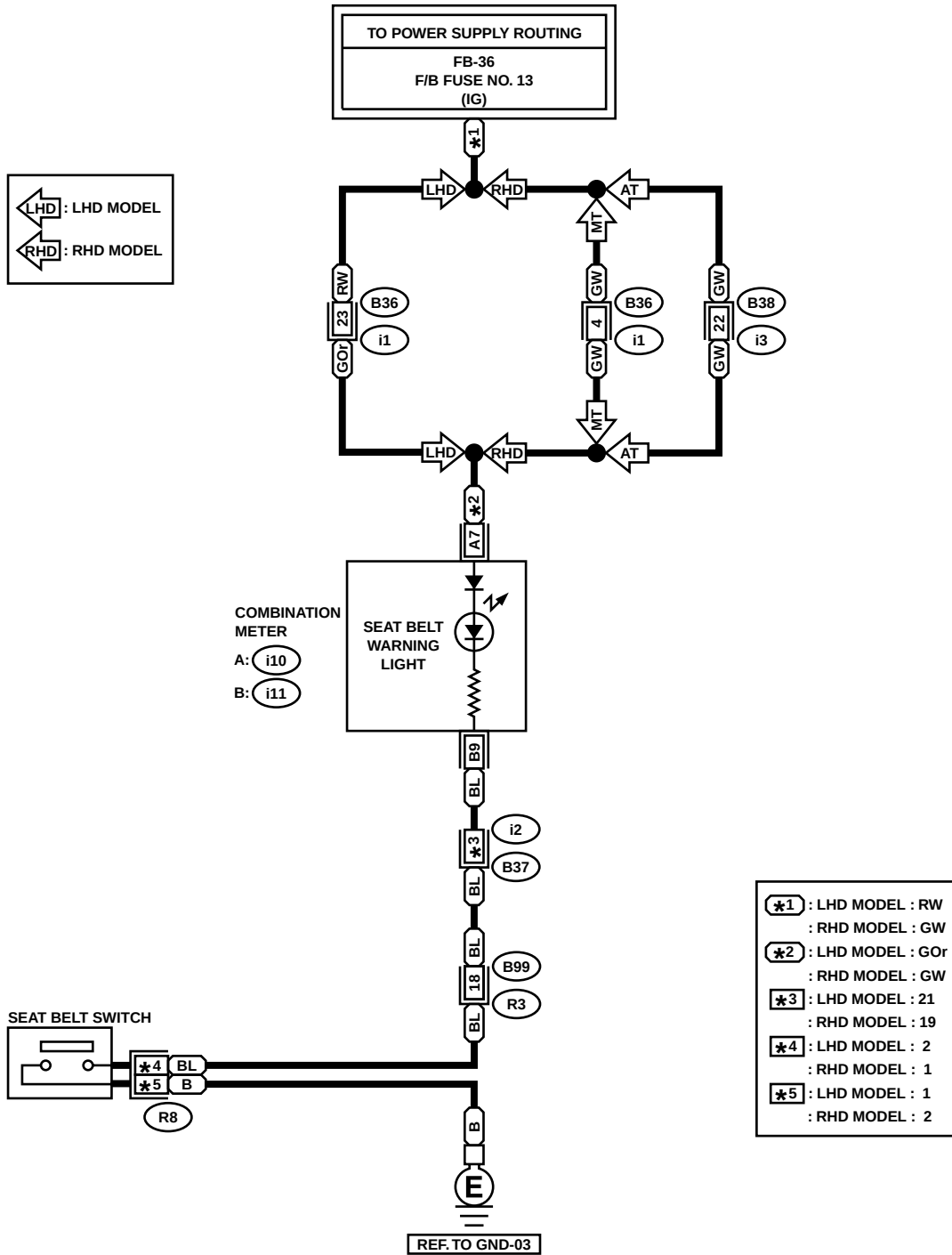
SEAT BELT WARNING SYSTEM

WIRING SYSTEM

1. WITHOUT SEAT BELT TIMER MODEL

S/BELT-01

S/BELT-01



GG87-20

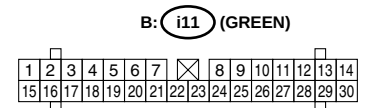
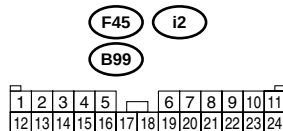
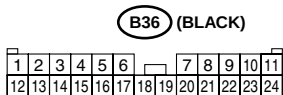
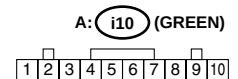
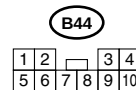
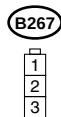
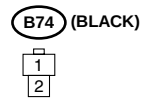
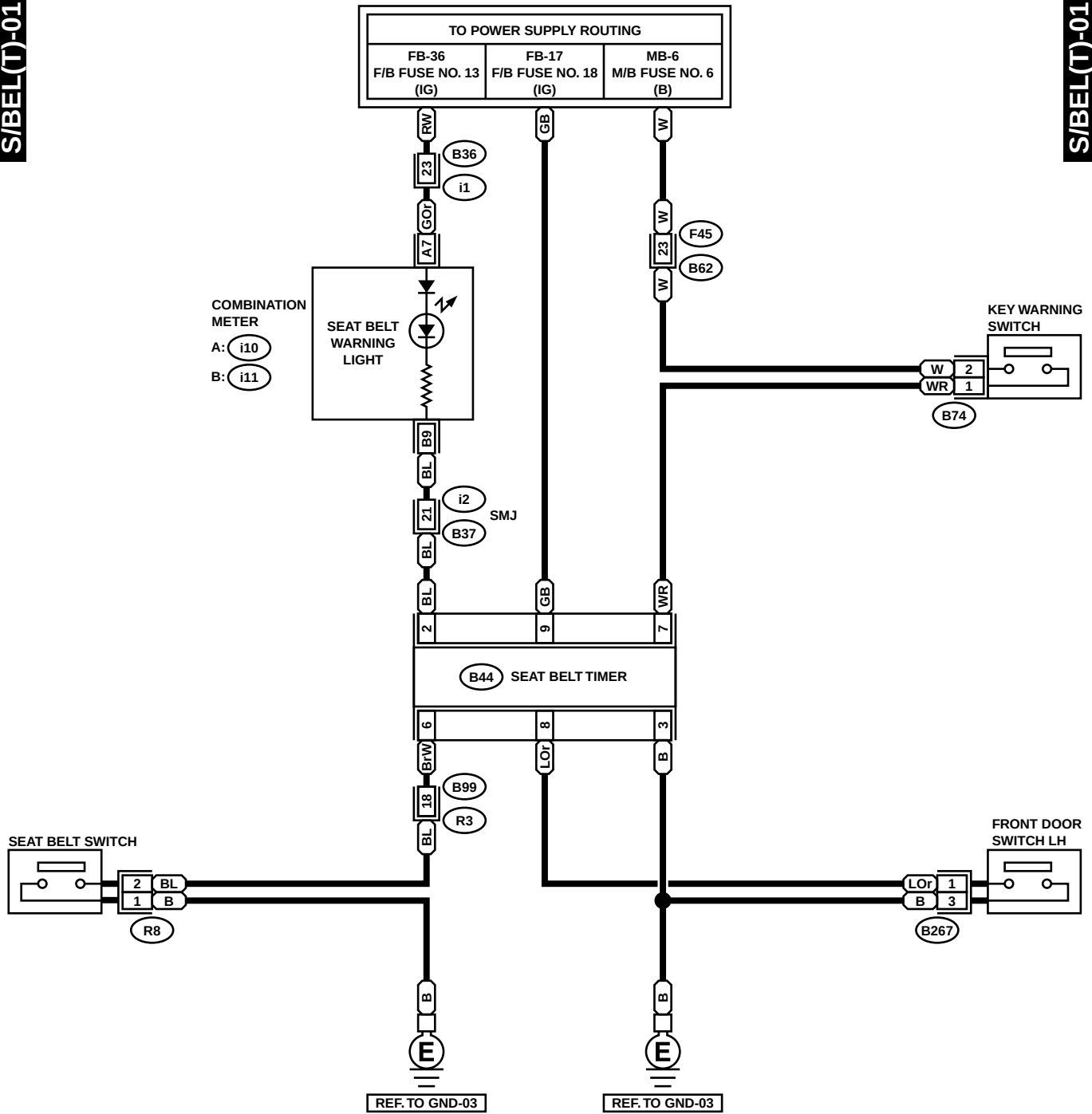
SEAT BELT WARNING SYSTEM

WIRING SYSTEM

2. WITH SEAT BELT TIMER MODEL

S/BEL(T)-01

S/BEL(T)-01



GL87-20

40.Starter System

A: SCHEMATIC

ST(MT)-01

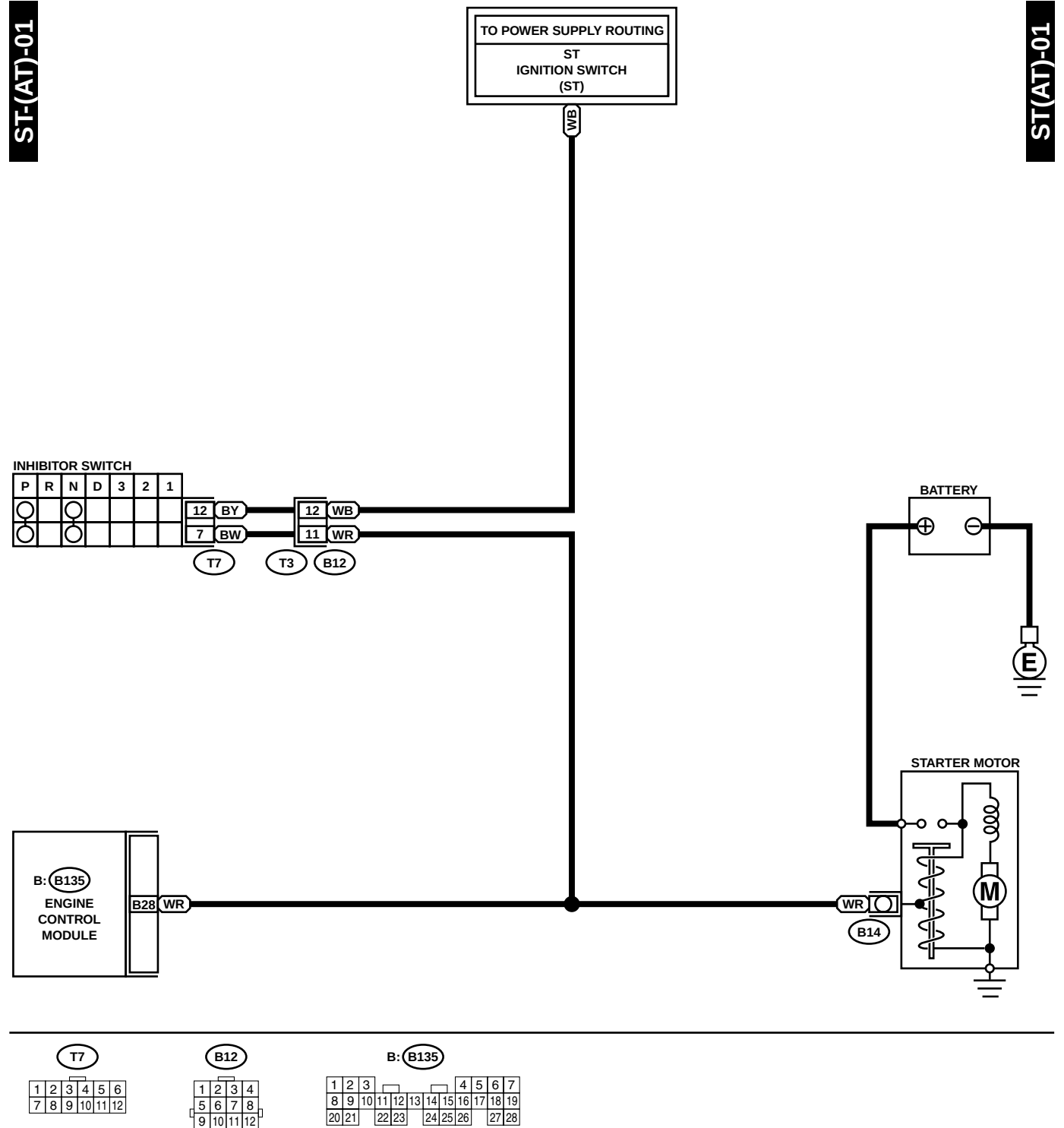


1	2	3							4	5	6	7
8	9	10	11	12	13	14	15	16	17	18	19	
20	21		22	23		24	25	26		27	28	

STARTER SYSTEM

WIRING SYSTEM

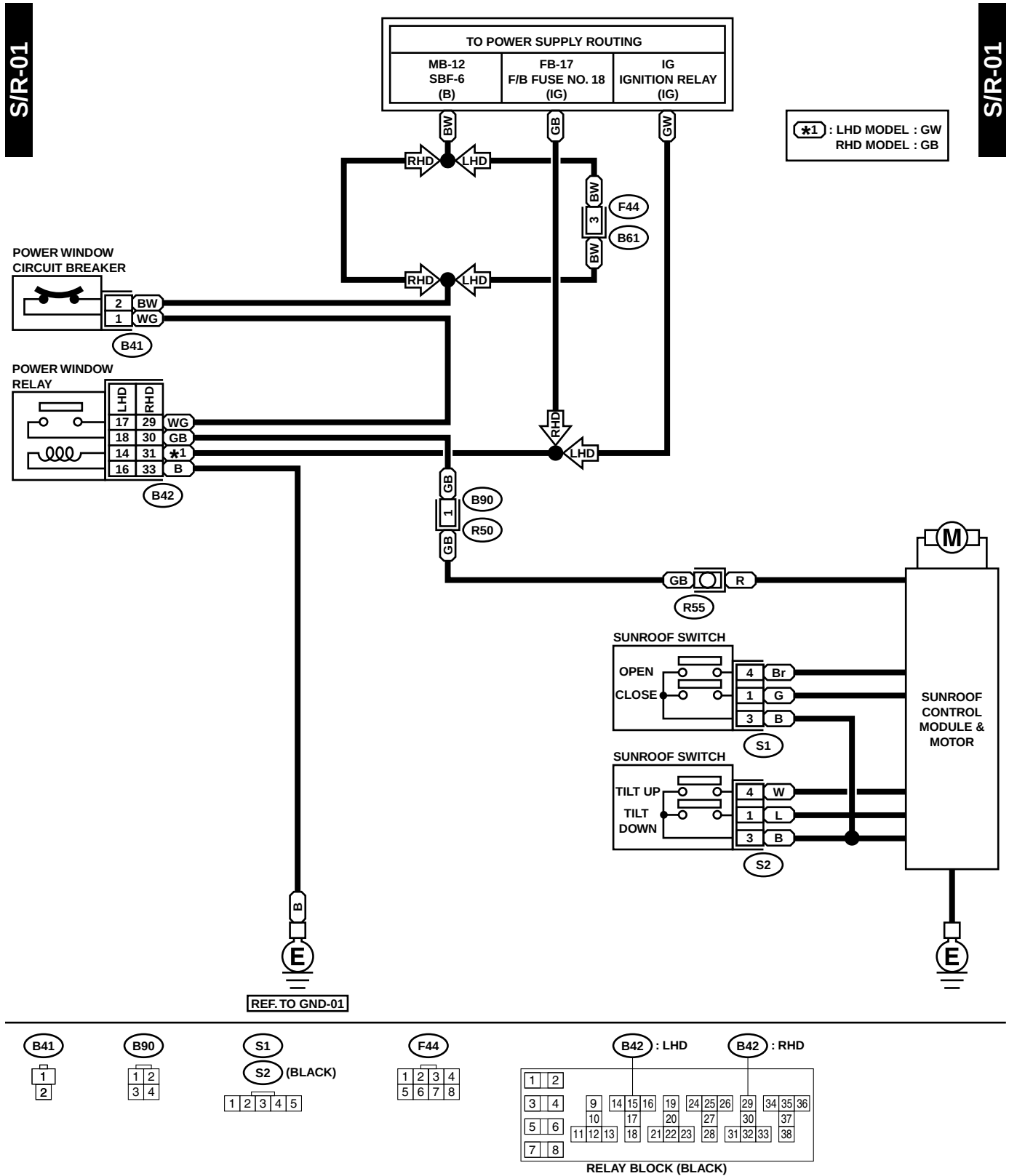
2. AT MODEL



GG03-21

41.Sunroof System

A: SCHEMATIC



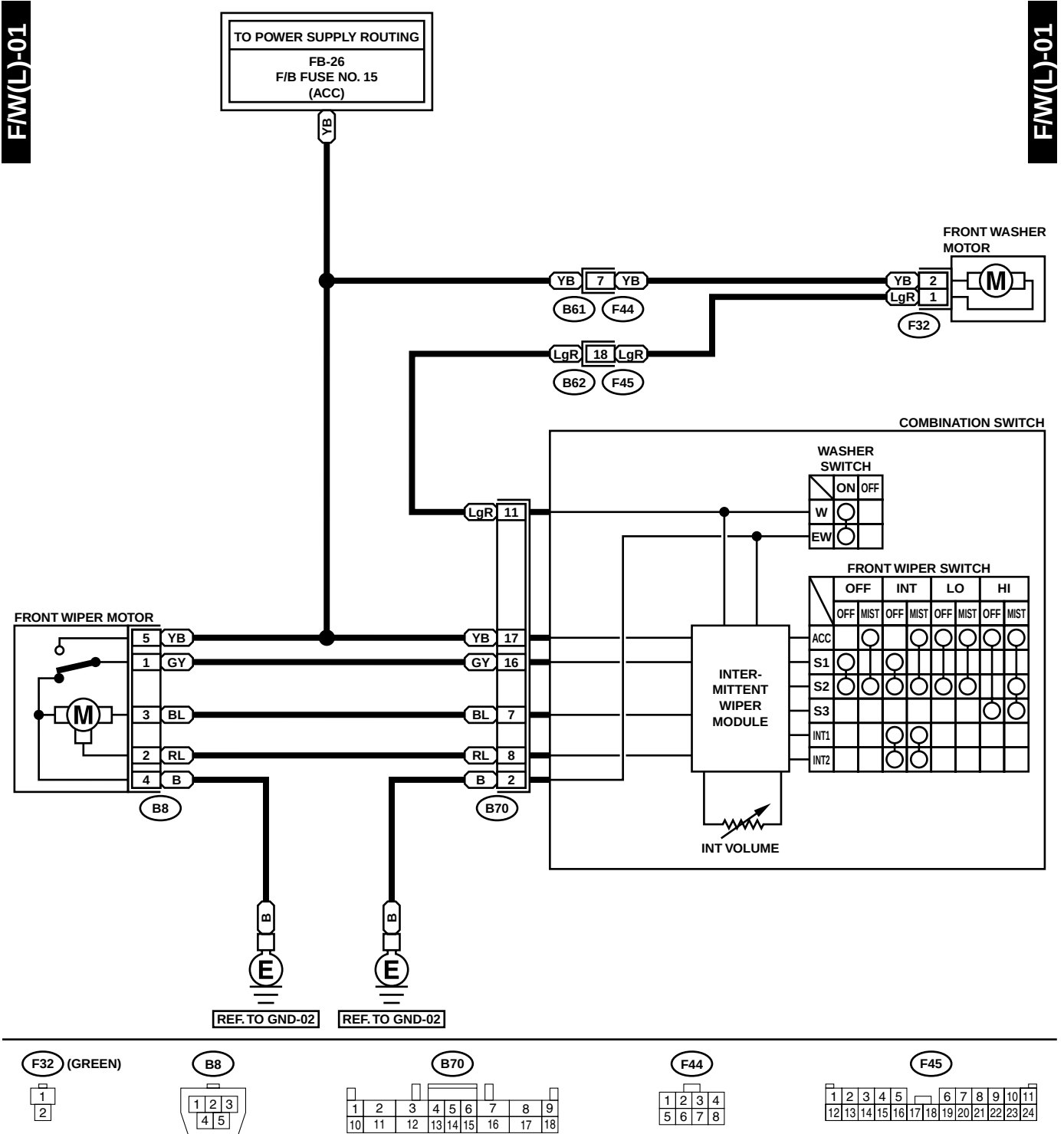
42.Wiper and Washer System (Front)

A: SCHEMATIC

WIPER AND WASHER SYSTEM (FRONT)

WIRING SYSTEM

1. LHD MODEL

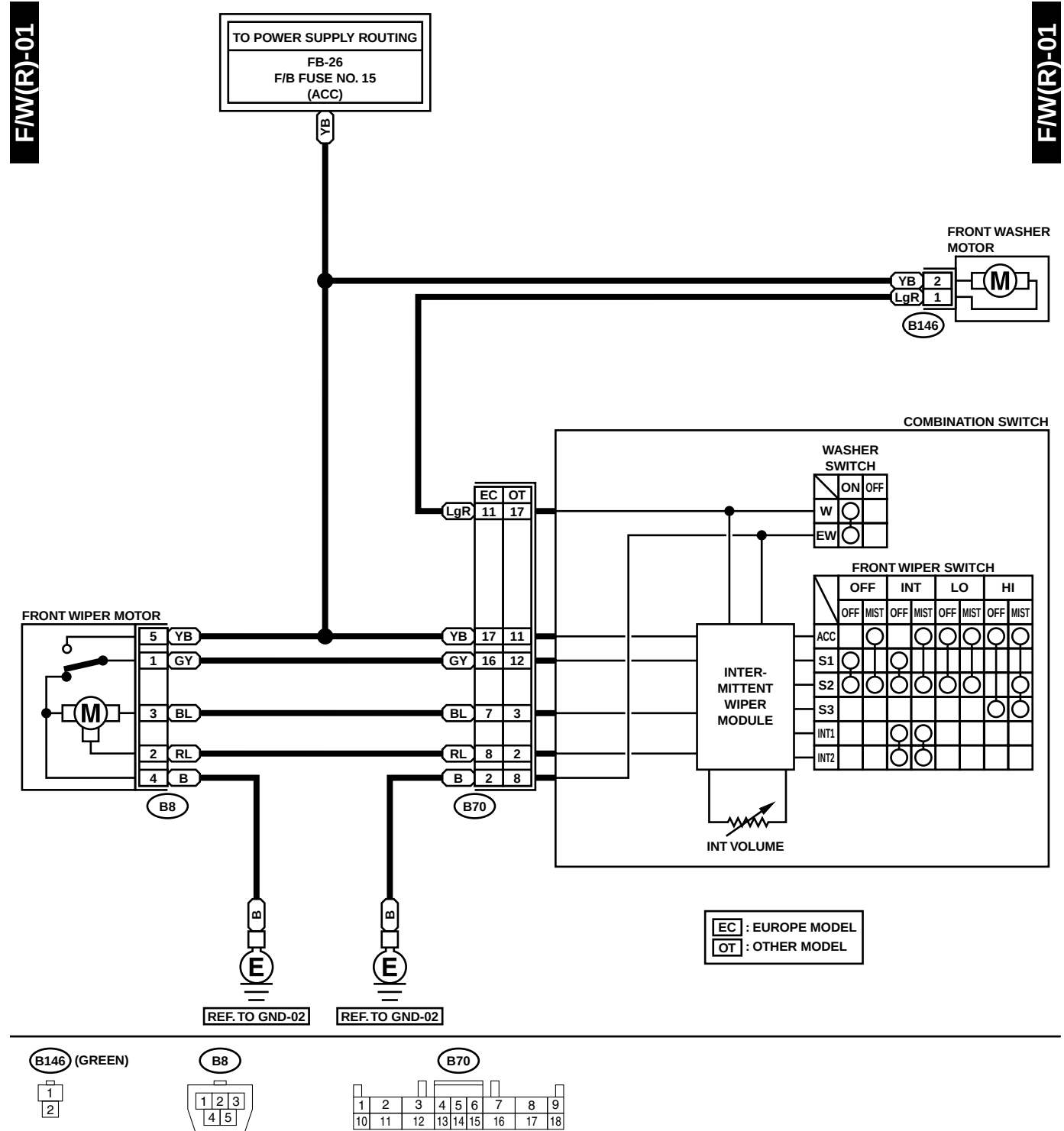


GL50-20

WIPER AND WASHER SYSTEM (FRONT)

WIRING SYSTEM

2. RHD MODEL



GR50-20

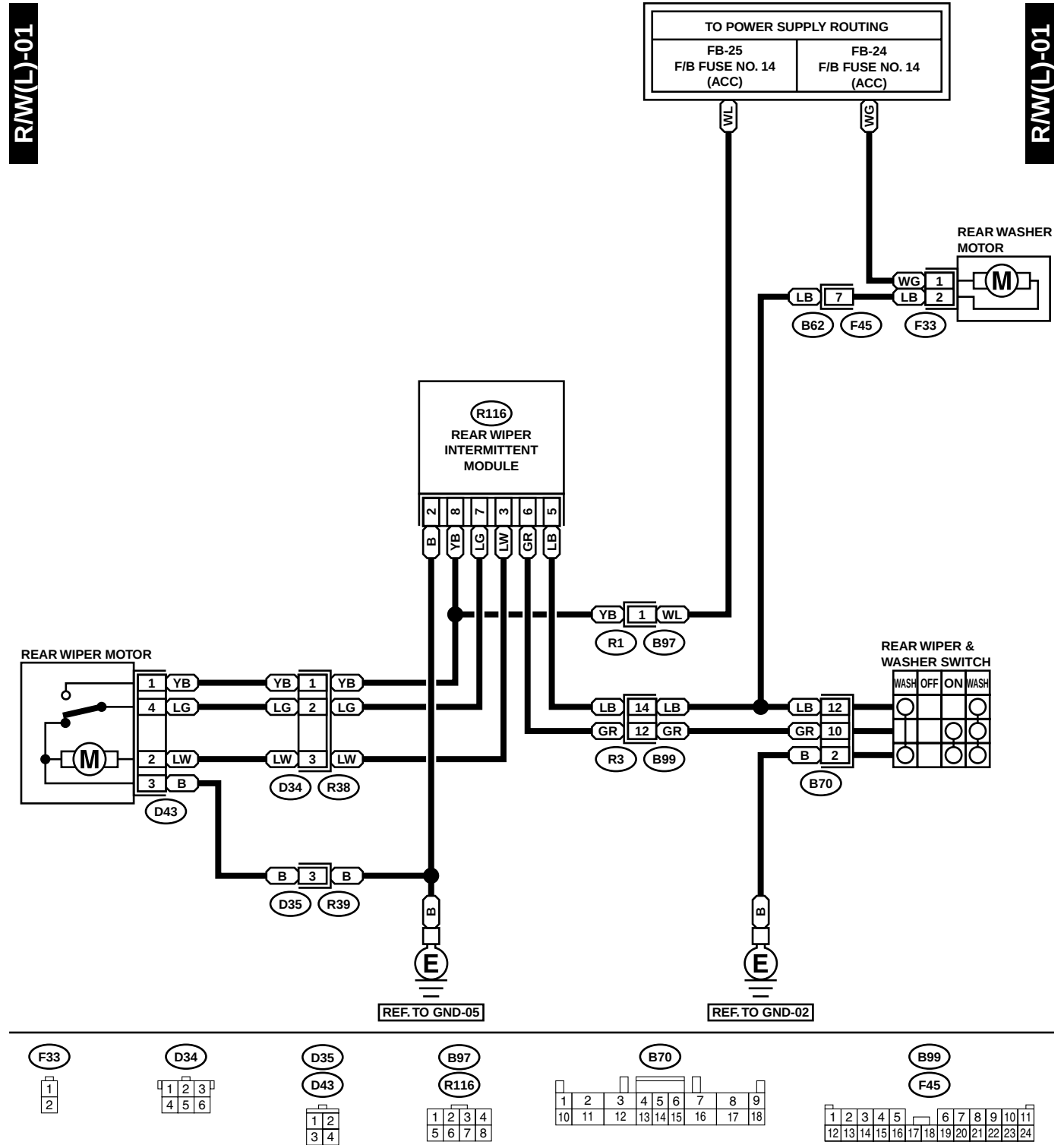
43.Wiper and Washer System (Rear)

A: SCHEMATIC

WIPER AND WASHER SYSTEM (REAR)

WIRING SYSTEM

1. LHD MODEL



WIPER AND WASHER SYSTEM (REAR)

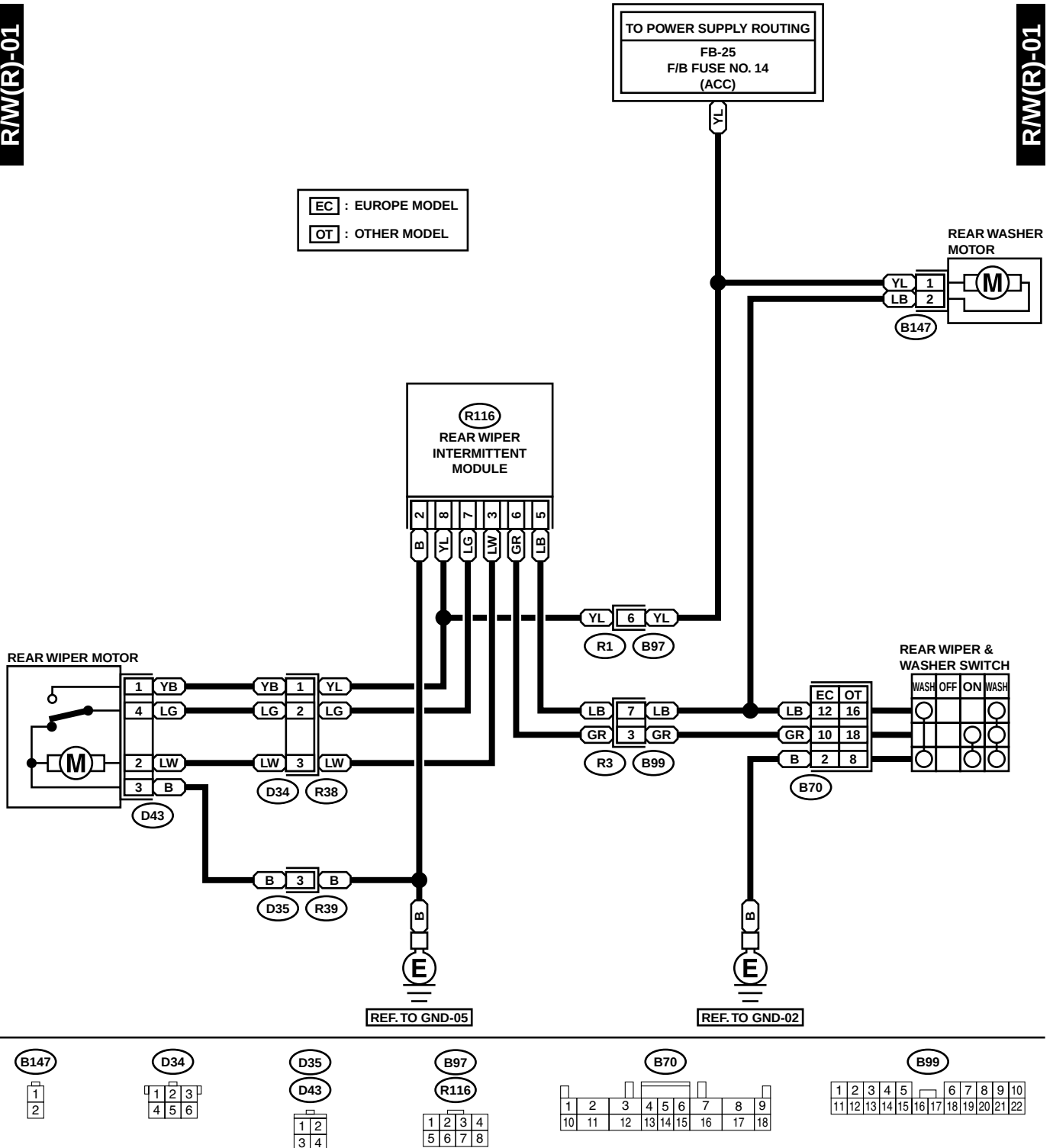
WIRING SYSTEM

2. RHD MODEL

R/W(R)-01

R/W(R)-01

EC : EUROPE MODEL
OT : OTHER MODEL

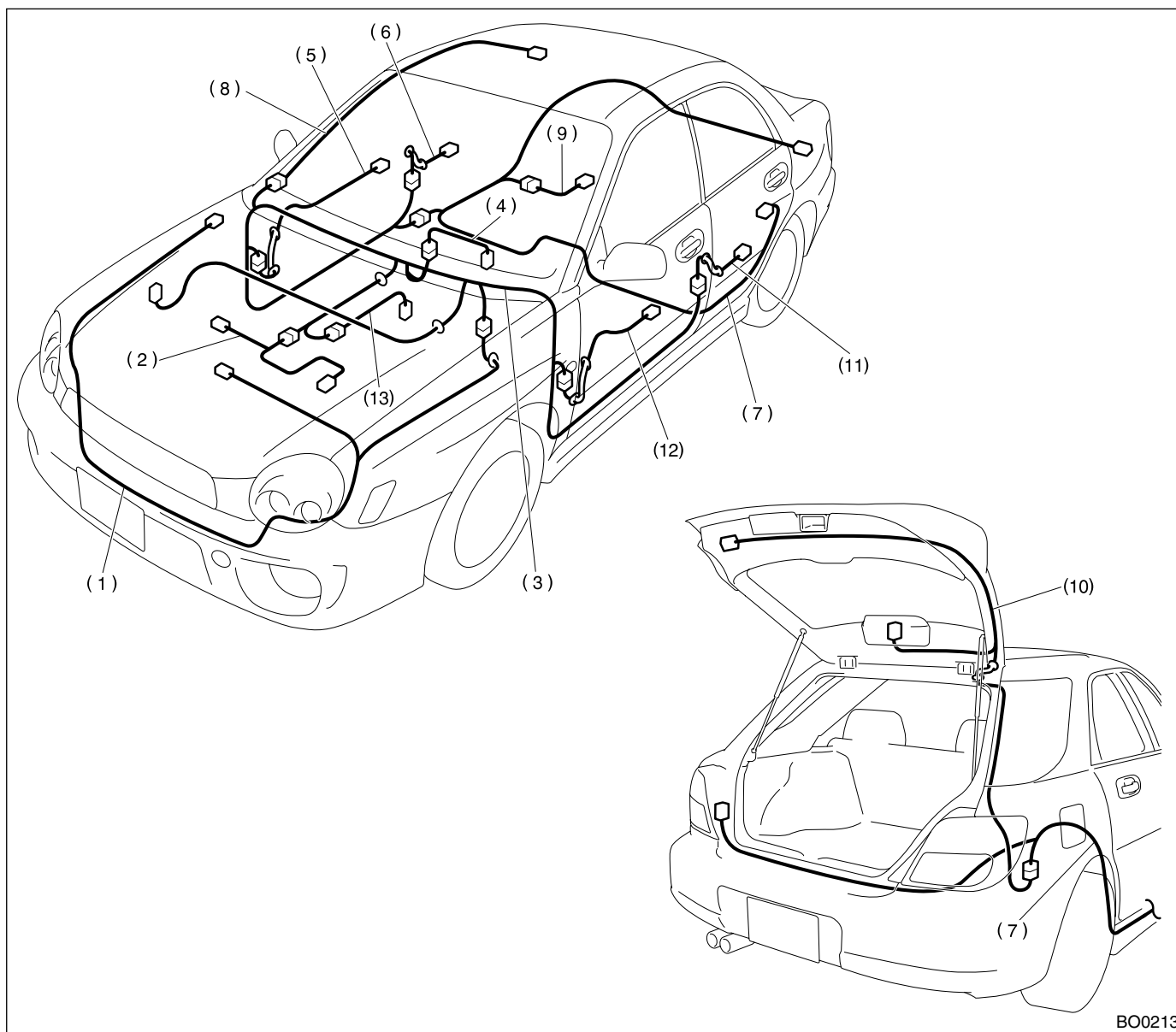


GR51-20

44.Overall Systems

A: LOCATION

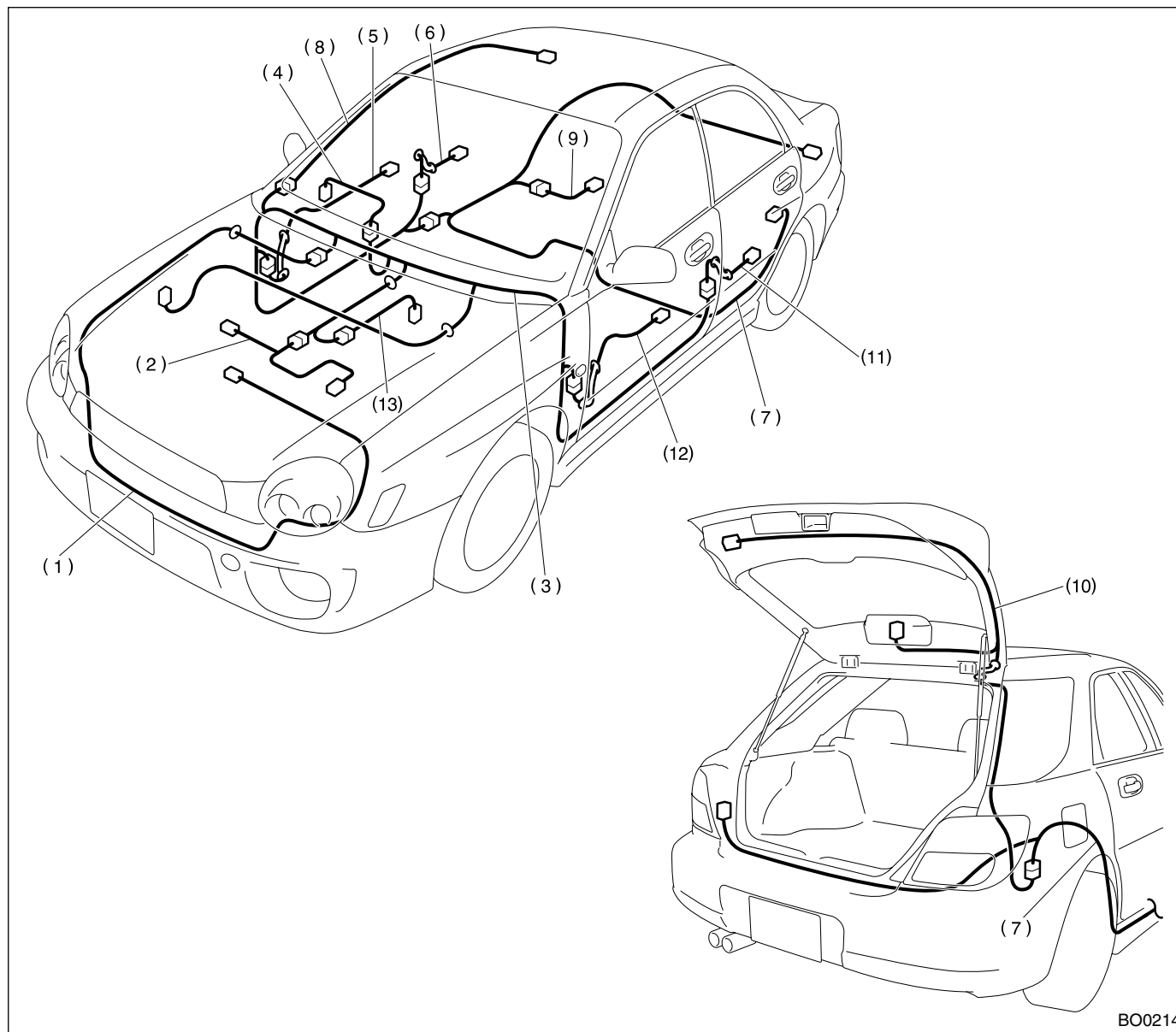
1. LHD MODEL



BO0213

- | | | |
|-------------------------------------|-------------------------|-------------------------|
| (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 | |
| (5) Front door cord RH | (10) Trunk lid cord | |

2. RHD MODEL



BO0214

- | | | |
|-------------------------------------|-------------------------|-------------------------|
| (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 | |
| (5) Front door cord RH | (10) Trunk lid cord | |

FRONT WIRING HARNESS

WIRING SYSTEM

45.Front Wiring Harness

A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F4	3	Gray	B-1		Front clearance light RH and front turn signal light RH
F5	1	Black	C-2		Horn
F6	2	Black	C-1		Front fog light RH
F7	3	★	B-1		Headlight RH
F16	2	Black	D-1		Sub fan motor (Non-turbo model)
	3	Black	D-1		Sub fan motor (Turbo model)
F17	2	Black	C-2		Radiator main fan motor (Non-turbo model)
	3	Black	C-2		Radiator main fan motor (Turbo model)
F21	2	Black	D-3		Front fog light LH
F22	3	Gray	B-3		Front clearance light LH and front turn signal light LH
F23	3	★	C-2		Headlight LH
F24	3	Gray	B-2		A/C compressor
F25	1	★	B-2		Generator
F26	3	Green	B-2		
F27	4	Black	C-4		A/C fuse (Relay holder)
F28	4	Black	C-4		A/C sub fan relay-1 (Relay holder-turbo model)
F29	4	Black	C-4		A/C sub fan relay (Relay holder-non-turbo model)
	4	Black	C-4		A/C sub fan relay-2 (Relay holder-turbo model)
F30	4	Black	C-4		Radiator main fan relay-2 (Relay holder-turbo model)
F31	4	Black	C-4		A/C relay (Relay holder)
F32	2	Green	B-4		Front washer motor
F33	2	★	B-4		Rear washer motor
F34	4	Black	B-4		SBF holder
F35	2	Black	B-3		M/B
F36	3	★	A-3		
F37	6	Black	A-3		
F38	1	★	A-3		
F39	8	Black	B-3		
F40	9	Brown	B-3		F/B
F41	7	Gray	A-4		
F44	8	★	A-3	B61	Bulkhead wiring harness
F45	24	★	B-3	B62	Bulkhead wiring harness
F46	2	Black	B-3	B108	Bulkhead wiring harness
F47	1	Black	C-2		Horn
F49	31	Black	A-1		ABS control module
F51	2	★	A-2		Side turn signal light RH
F54	2	★	B-4		Side turn signal light LH
F58	3	Black	C-4		Headlight beam leveler LH
F59	3	Black	B-1		Headlight beam leveler RH
F60	16	Brown	B-4	E3	Engine wiring harness (Turbo model)
F61	20	Black	B-4	E2	Engine wiring harness (Turbo model)
F62	8	★	B-2		Shield joint connector (ABS)
F66	4	Black	C-4		Radiator main fan relay (Relay holder-non-turbo model)
	4	Black	C-4		Radiator main fan relay-1 (Relay holder-turbo model)
F67	2	Black	C-4		FWD switch (AWD AT model)

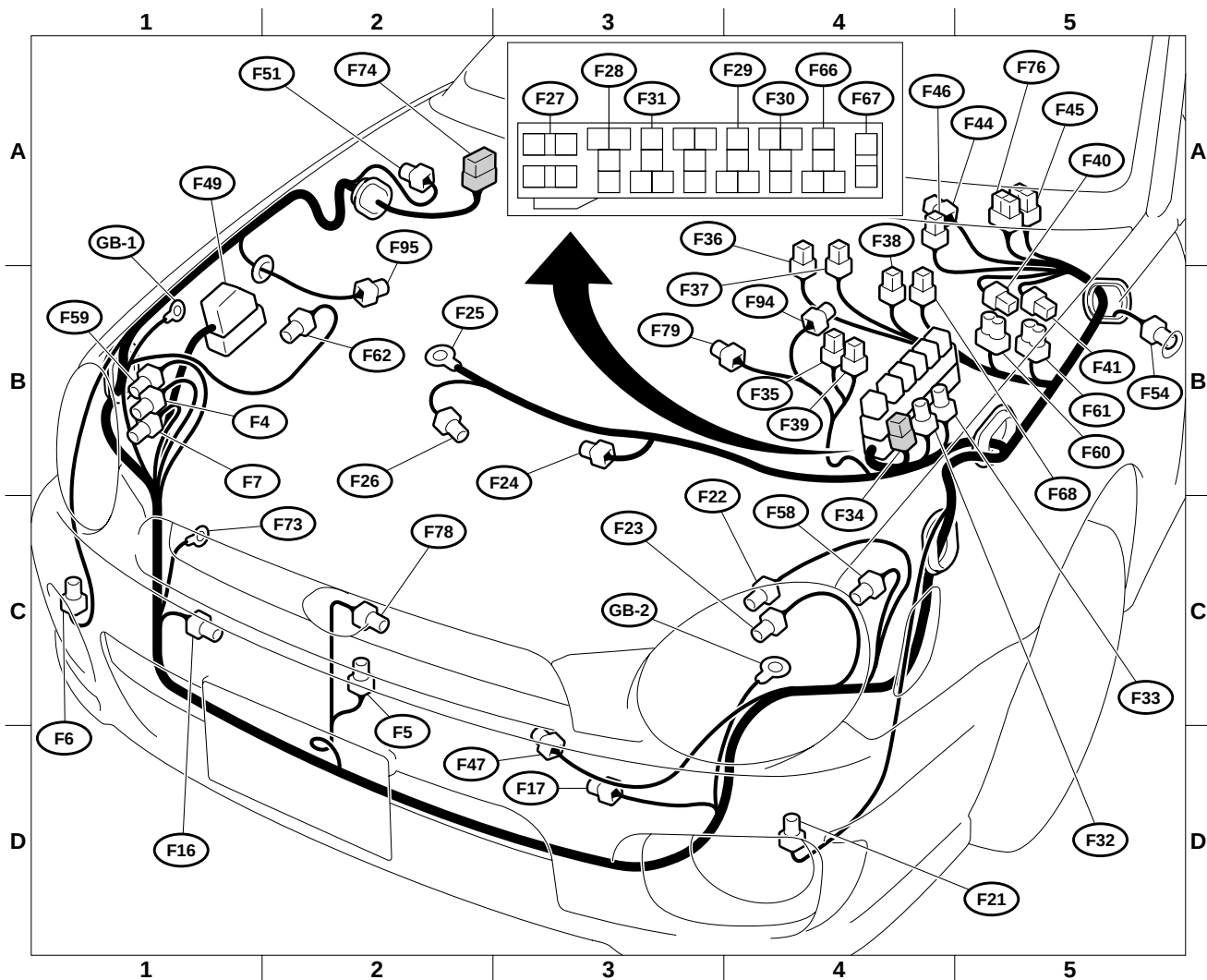
FRONT WIRING HARNESS

WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F68	4	Black	B-3		M/B
F73	1	★	B-1		ABS motor ground
F74	20	★	A-2	B200	Bulkhead wiring harness (ABS)
F76	40	Gray	A-3	B209	Bulkhead wiring harness (SMJ)
F78	2	Black	C-2		Ambient sensor
F79	2	Gray	B-3		A/C pressure switch
F94	2	Gray	A-3		ABS front sensor LH
F95	2	Gray	A-2		ABS front sensor RH
★: Non-colored					

FRONT WIRING HARNESS

WIRING SYSTEM



BO0215

FRONT WIRING HARNESS

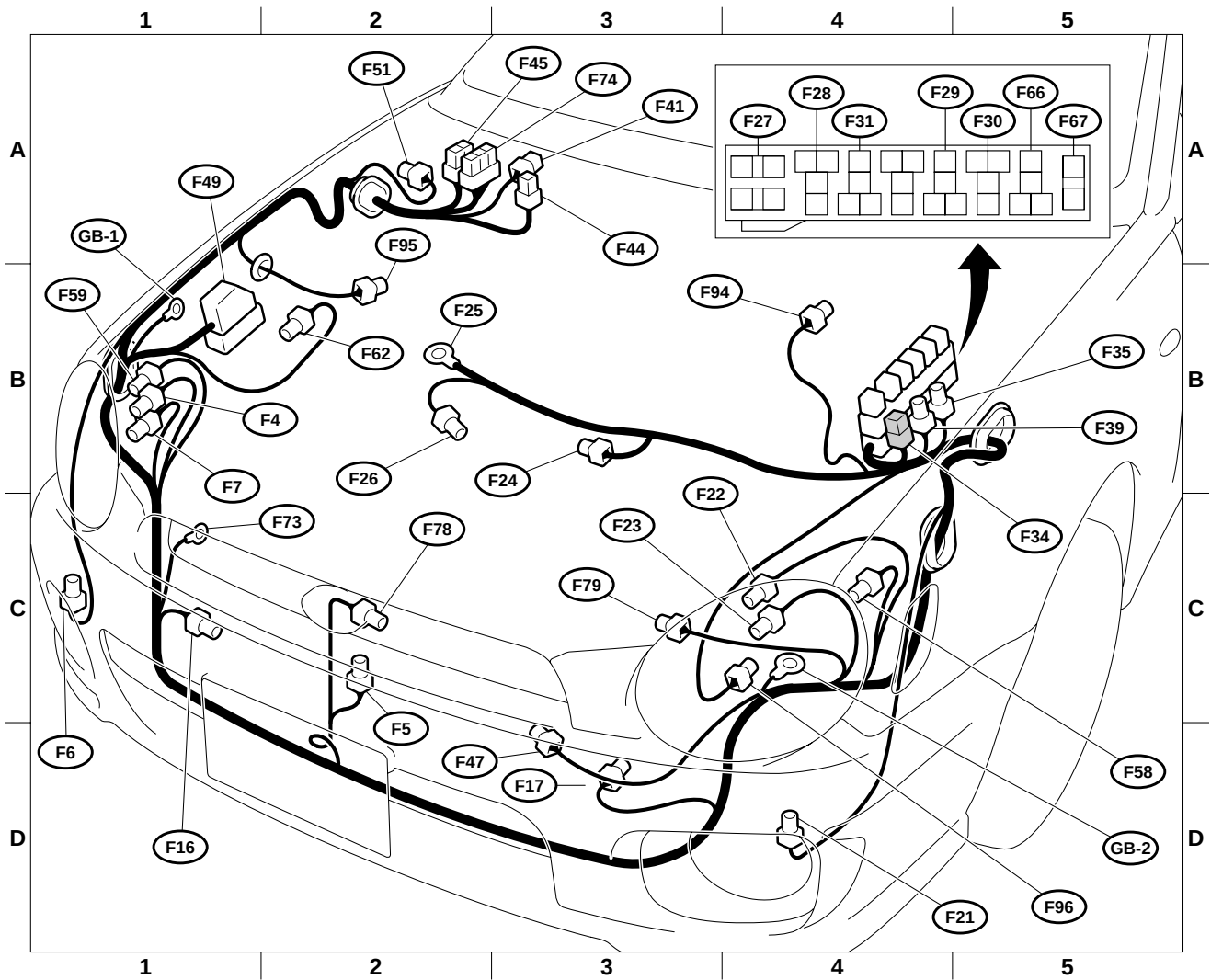
WIRING SYSTEM

2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F4	3	Gray	B-1		Front clearance light RH and front turn signal light RH
F5	1	Black	C-2		Horn
F6	2	Black	C-1		Front fog light RH
F7	3	★	B-1		Headlight RH
F16	2	Black	D-1		Sub fan motor (Non-turbo model)
	3	Black	D-1		Sub fan motor (Turbo model)
F17	2	Black	D-2		Radiator main fan motor (Non-turbo model)
	3	Black	D-2		Radiator main fan motor (Turbo model)
F21	2	Black	D-4		Front fog light LH
F22	3	Gray	C-3		Front clearance light LH and front turn signal light LH
F23	3	★	C-3		Headlight LH
F24	3	Gray	B-2		A/C compressor
F25	1	★	B-2		Generator
F26	3	Green	B-2		
F27	4	Black	A-3		A/C fuse (Relay holder)
F28	4	Black	A-3		A/C sub fan relay-1 (Relay holder-turbo model)
F29	4	Black	A-4		A/C sub fan relay (Relay holder-non-turbo model)
	4	Black	A-4		A/C sub fan relay-2 (Relay holder-turbo model)
F30	4	Black	A-4		Radiator main fan relay-2 (Relay holder-turbo model)
F31	4	Black	A-3		A/C relay (Relay holder)
F34	4	Black	B-4		SBF holder
F35	2	Black	B-4		M/B
F39	8	Black	B-4		
F41	7	Gray	A-3		F/B
F44	8	★	A-3	B61	Bulkhead wiring harness
F45	18	Black	A-2	B62	Bulkhead wiring harness
F47	1	★	C-2		Horn
F49	31	Black	A-1		ABS control module
F51	2	★	A-2		Side turn signal light RH
F58	3	Black	C-4		Headlight beam leveler LH
F59	3	Black	B-1		Headlight beam leveler RH
F62	8	★	B-2		Shield joint connector (ABS)
F66	4	Black	A-4		Radiator main fan relay (Relay holder-non-turbo model)
	4	Black	A-4		Radiator main fan relay-1 (Relay holder)
F67	2	Black	A-4		FWD switch (AWD AT model)
F73	1	★	B-2		ABS motor ground
F74	22	★	A-3	B200	Bulkhead wiring harness (ABS)
F78	2	Black	C-2		Ambient sensor
F79	2	Gray	C-2		A/C pressure switch
F94	2	Gray	A-3		ABS front sensor LH
F95	2	Gray	A-2		ABS front sensor RH
F96	1	White	D-4	B255	Bulkhead wiring harness
★:Non-colored					

FRONT WIRING HARNESS

WIRING SYSTEM



BO0216

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM

46.Bulkhead Wiring Harness (In Engine Room)

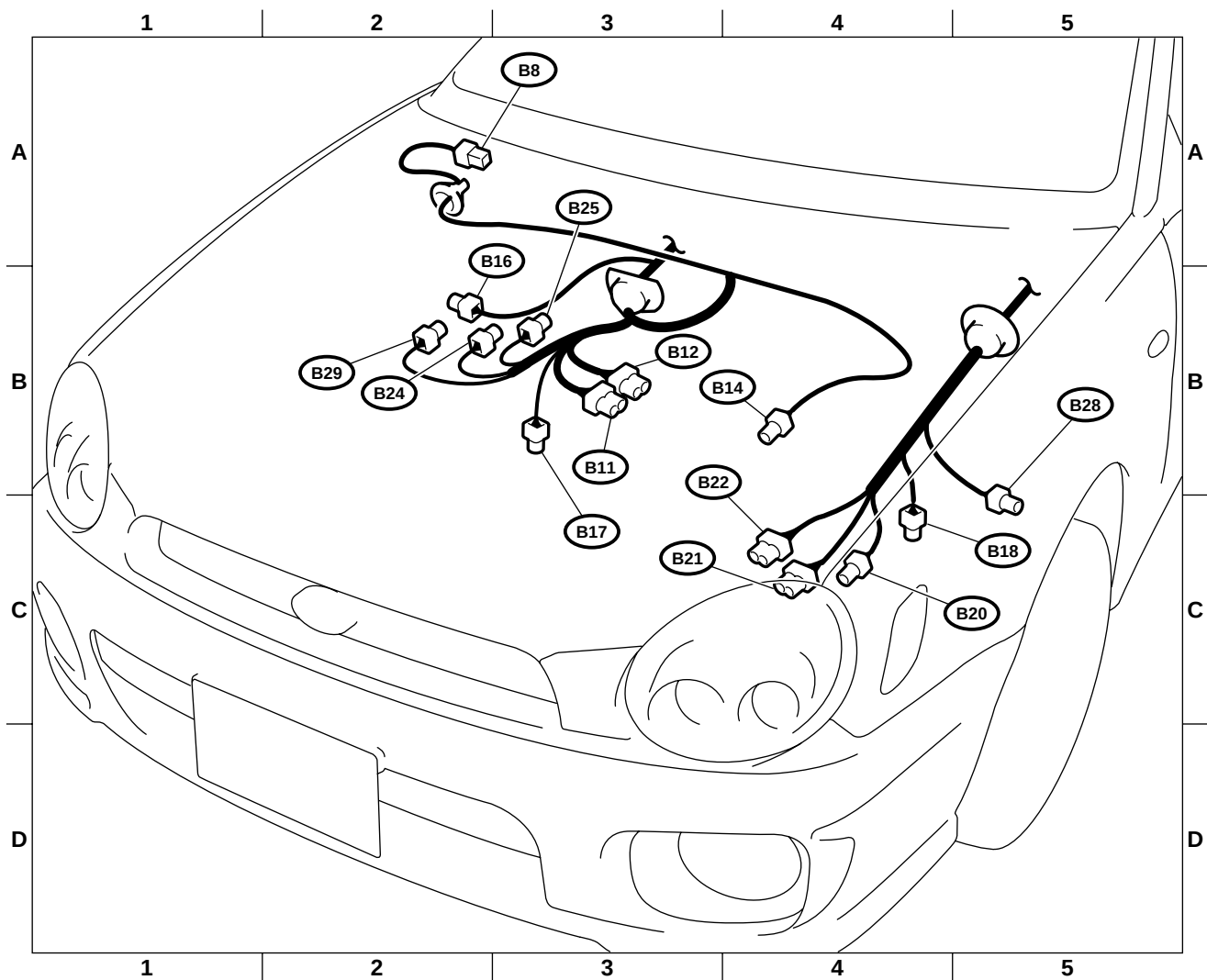
A: LOCATION

1. LHD NON-TURBO ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B8	5	Gray	A-2		Front wiper motor
B11	20	Black	B-2	T4	Transmission (AT)
B12	12	★	B-3	T3	
B14	1	★	B-3		Starter (Magnet)
B16	2	Gray	A-2		Brake fluid level switch
B17	3	★	C-2		Vehicle speed sensor (MT)
B18	4	★	C-4		Oxygen sensor (Catalytic converter equipped vehicle without OBD)
B20	10	★	C-4	E1	Engine wiring harness
B21	20	Light gray	C-3	E2	
B22	16	Brown	C-3	E3	
B24	2	Gray	B-2	T1	Back-up light switch (MT)
B25	2	Brown	A-2	T2	Neutral position switch (MT)
B28	3	★	C-4		CO resistor
B29	2	★	B-2	T8	Lo (AWD) indicator light switch (MT)
★:Non-colored					

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM



BO0218

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

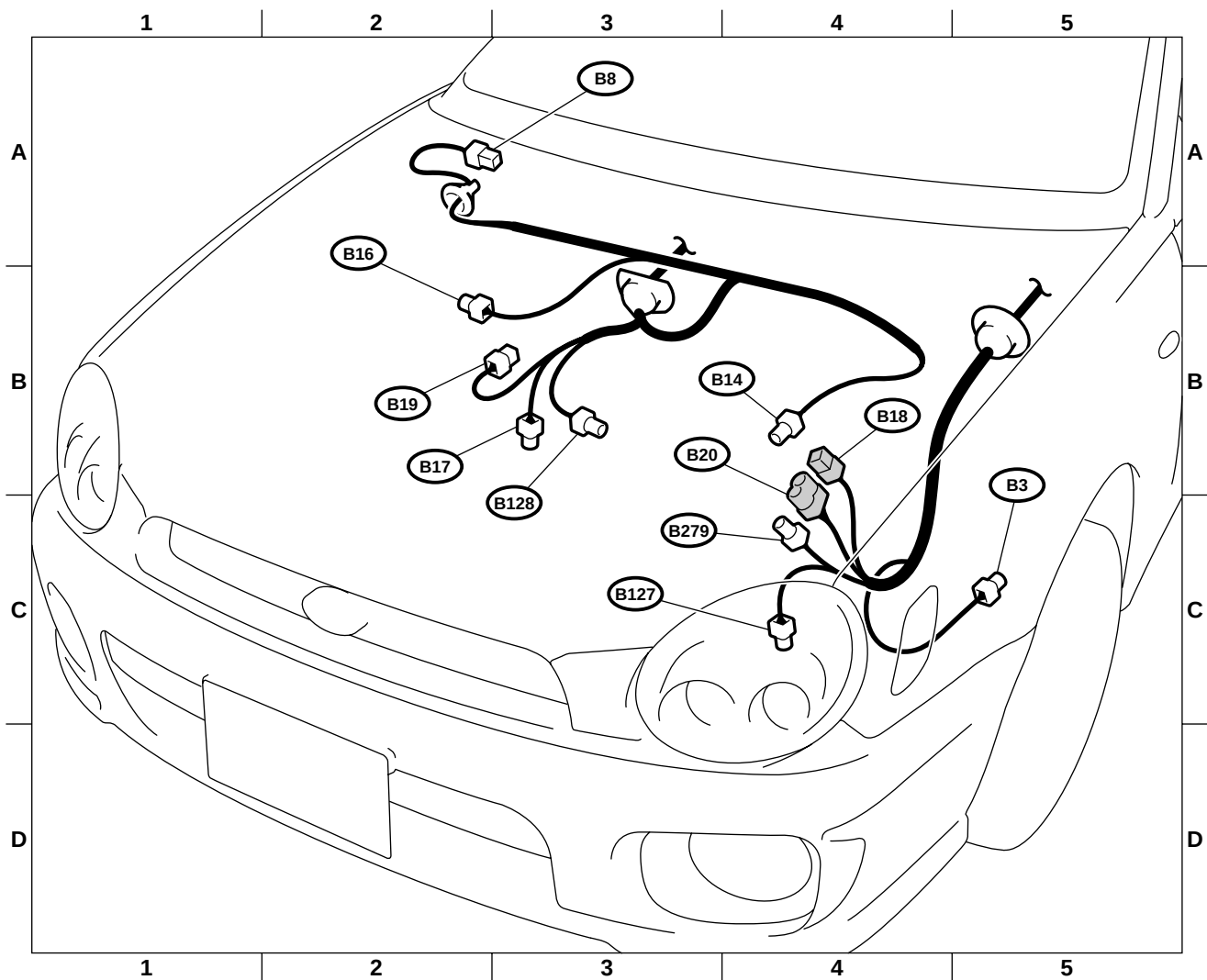
WIRING SYSTEM

2. LHD TURBO ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	Gray	C-4		Mass air flow sensor
B8	5	★	A-2		Front wiper motor
B14	1	★	B-3		Starter (Magnet)
B16	2	Gray	B-2		Brake fluid level switch
B17	4	★	B-2		Vehicle speed sensor (MT)
B18	4	★	C-4		Front oxygen (A/F) sensor
B19	4	★	B-2		Rear oxygen sensor
B20	10	★	C-4	E1	Engine wiring harness
B127	2	★	D-4		Waist gate control solenoid valve
B128	4	★	B-2	T9	Transmission (MT)
B279	2	★	C-4		Exhaust temperature sensor
★:Non-colored					

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM



BO0217

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

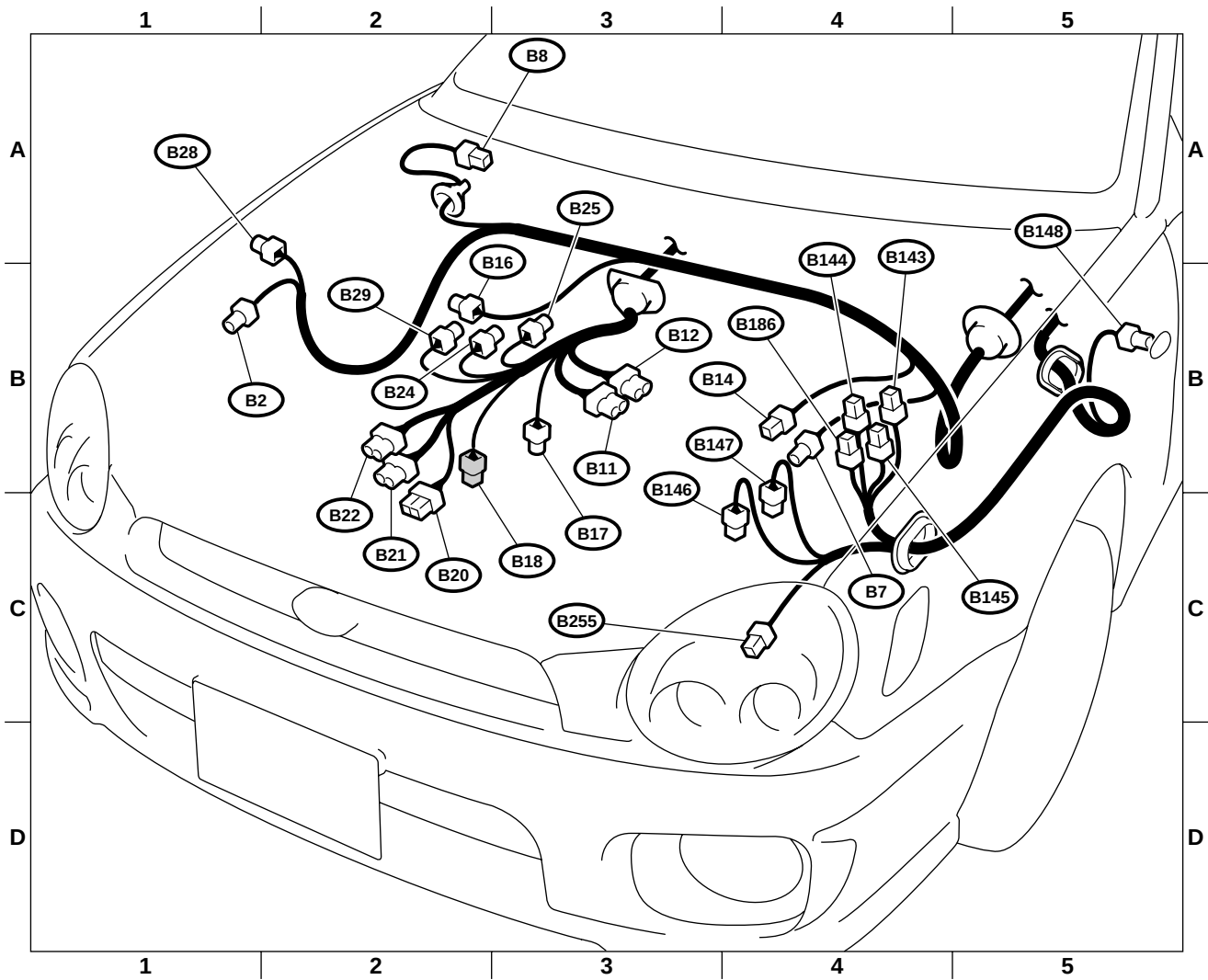
WIRING SYSTEM

3. RHD NON-TURBO ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B2	3	★	B-1		Pressure sensor (With OBD)
B7	6	Black	C-4		Cruise control actuator
B8	5	Gray	A-2		Front wiper motor
B11	20	Black	B-2	T4	Transmission (AT)
B12	12	White	B-3	T3	
B14	1	★	B-3		Starter (Magnet)
B16	2	Gray	A-2		Brake fluid level switch
B17	3	★	C-2		Vehicle speed sensor (MT)
B18	4	★	C-4		Oxygen sensor (Catalytic converter equipped vehicle without OBD)
B20	10	★	C-2	E1	Engine wiring harness
B21	20	Light gray	C-2	E2	
B22	16	Brown	C-2	E3	
B24	2	Gray	B-2	T1	Back-up light switch (MT)
B25	2	Brown	A-2	T2	Neutral position switch (MT)
B28	3	★	A-1		CO resistor (Without catalytic converter)
B29	2	★	B-2	T8	Lo (AWD) indicator light switch (MT)
B143	3	★	B-3		M/B
B144	6	Black	B-3		
B145	1	★	C-4		
B146	2	Green	B-3		Front washer motor
B147	2	★	B-3		Rear washer motor
B148	2	★	A-4		Side turn signal light LH
B186	4	Black	B-3		M/B
B255	1	White	C-2	F96	Front wiring harness (With ABS)
★:Non-colored					

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM



BO0220

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

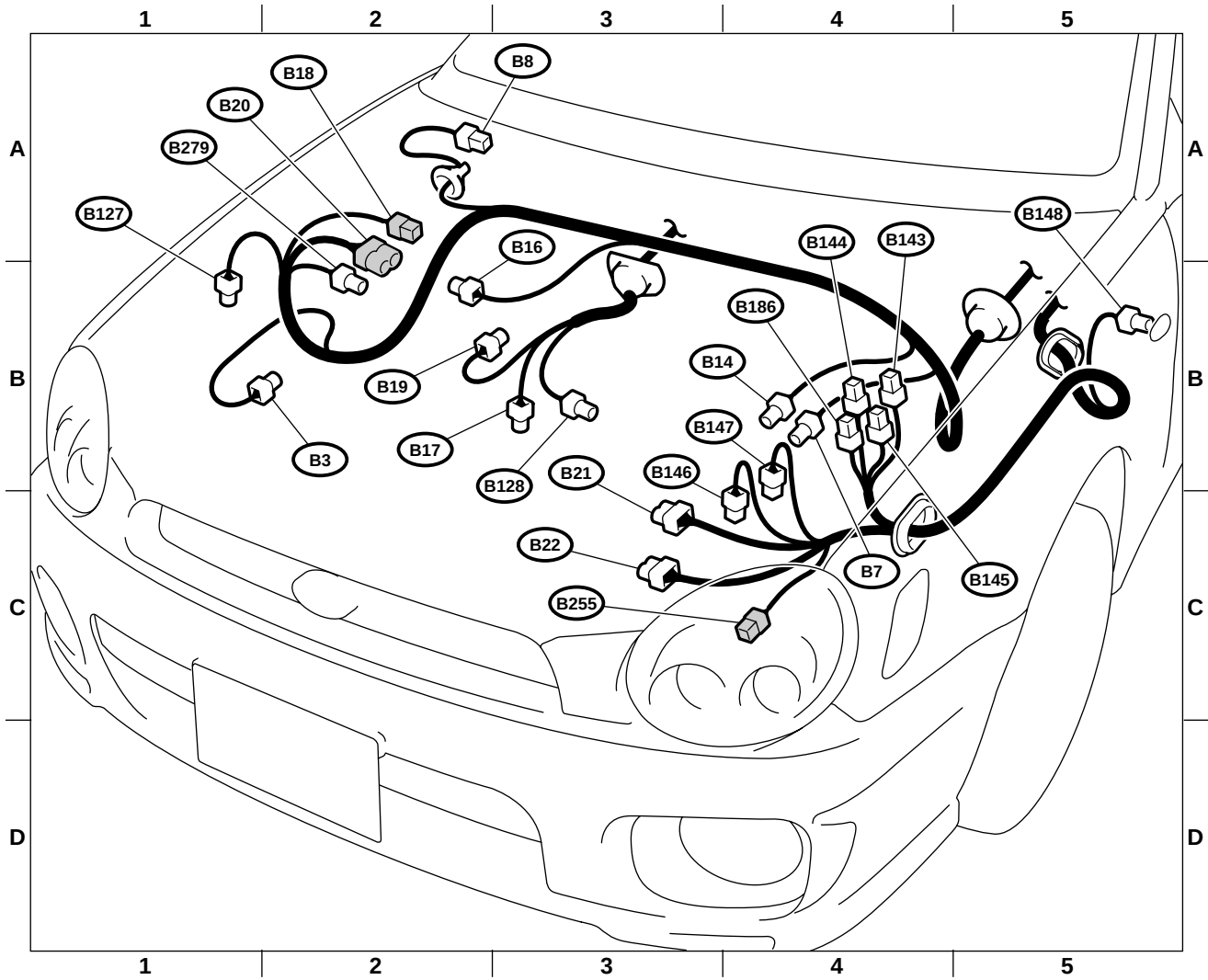
WIRING SYSTEM

4. RHD TURBO ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	Gray	B-2		Mass air flow sensor
B7	6	Black	C-4		Cruise control actuator
B8	5	Gray	A-2		Front wiper motor
B14	1	★	B-3		Starter (Magnet)
B16	2	Gray	B-2		Brake fluid level switch
B17	4	★	B-2		Vehicle speed sensor
B18	4	★	A-1		Front oxygen (A/F) sensor
B19	4	★	B-2		Oxygen sensor
B20	10	★	A-1	E-1	Engine wiring harness
B21	20	Black	B-2	E2	Engine wiring harness
B22	16	Brown	C-2	E3	
B127	2	★	A-1		Waste gate control solenoid valve
B128	4	★	C-2	T9	Transmission (MT)
B143	3	★	A-3		M/B
B144	6	Black	A-3		
B145	1	★	C-4		
B146	2	Green	B-3		Front washer motor
B147	2	★	B-3		Rear washer motor
B148	2	★	A-4		Side turn signal light LH
B186	4	Black	B-3		M/B
B255	1	White	C-2	F96	Front wiring harness (With ABS)
B279	2	★	A-1		Exhaust temperature sensor
★:Non-colored					

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM



BO0219

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM

47. Bulkhead Wiring Harness (In Compartment)

A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	D-1	D1	Front door cord LH
B31	6	Yellow	D-1	AB1	SRS (Airbag) harness
B32	3	Black	B-2		Turn & hazard module
B36	24	Black	B-1	i1	Instrument panel wiring harness
B37	24	★	B-3	i2	
B40	16	Gray	C-2		Data link connector
B41	2	★	C-1		Power window
B42	5	★	C-1		Power window
B43	6	Black	C-3		Illumination control module
B44	10	★			Seat belt warning module
B46	4	Green	C-1		Fuel pump relay
B47	6	Brown	C-4		Main relay
B48	5	★	C-1		Front fog light
B50	4	★	C-1		Blower motor relay
B51	8	Blue	C-1		F/B
B52	7	★	B-1		
B53	12	Black	B-2		Shield joint connector (AT)
B54	24	★	A-2		Transmission control module
B55	24	Gray	A-2		
B56	24	Green	A-2		
B61	8	★	B-1	F44	Front wiring harness
B62	24	★	B-2	F45	
B64	2	Black	B-2		Stop light switch
B68	5	Black	C-3		Steering roll connector
B69	4	★	D-2		Combination switch
B70	18	★	C-2		
B71	17	★	C-2		
B72	4	Blue	C-2		Ignition switch
B74	2	Black	C-2		Key warning switch
B75	2	Green	C-2	B76	Test mode connector
B76	2	Green	C-2	B75	
B77	3	★	B-3		Mode actuator
B79	14	Gray	C-2		Check connector
B81	1×2	★	C-2		Diagnosis terminal (Ground)
B82	6	Black	C-2		Diagnosis connector
B83	6	★	C-4		Shield&sensor ground joint connector (E/G) With OBD
	8	★	C-4		Shield&sensor ground joint connector (E/G) Without OBD
B84	17	★	B-3		Engine control module

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B85	2	★	A-2		Diode (Rear fog light)
B86	4	★	B-3		Blower motor resistor
B87	2	★	B-4		Blower motor
B88	4	★	B-3		Evaporator thermostat switch
B90	4	★	B-4	R50	Roof cord
B91	6	Black	C-4		FRESH/RECIRC actuator
B92	8	★	C-2		Door lock timer
B101	25	★	B-4	D11	Front door cord RH
B108	2	★	B-1	F46	Front wiring harness
B116	6	★	D-3		Select lever illumination
B119	4	★	C-3		Cigarette lighter (Power)
B120	14	★	B-3		Radio
B121		★	B-3		Audio ground
B125	1	Black	C-2	B126	Read memory connector
B126	1	Black	C-2	B125	
B129	2	★	B-1		Kick down switch (AT)
B131	4	★	C-1		Rear fog light relay
B132	4	★	C-2		Head light beam leveler switch
B133	6	★	D-4		AT power mode & hold mode switch
B134	35	★	C-4		Engine control module
B135	28	★	C-4		
B136	30	★	C-4		
B137	31	★	B-3		
B141	12	★	B-2		Immobilizer control module
B152	12	★	C-1		F/B
B157	5	★	C-1		Ignition relay (Relay block)
B158	10	Gray	D-1		F/B
B160	6	Gray	C-1		Front fog light switch
B168	16	★	C-3		Mode control panel (Manual A/C)
B169	6	★	C-3		Fan switch (Manual A/C)
B171	5	★	C-1		Mirror heated relay
B176	18	★	C-4		Keyless entry control module
B183	1	★	D-1	B184	Joint connector (Keyless entry)
B184	1	★	D-1	B183	
B195	6	★	C-1		Rear fog light switch
B196	3	★	B-4		Diode (Rear fog light)

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B200	20	★	B-4	F74	Front wiring harness
B208	2	★	A-4		Glove box light
B209	40	★	B-1	F76	Front wiring harness
B225	8	★	C-1		Fuse (Relay box)
B250	3	★	C-2		Flash memory connector
B256	2	★	B-3		Evaporator sensor
B259	2	★	B-2	B260	Shield joint connector (E/G)Non-turbo model
B260	2	★	B-2	B259	
B264	4	Red	C-1		ABS relay
B271	12	Blue	C-1		F/B
B275	4	★	B-3		Fan control amp
B282	16	Gray	C-3		Auto A/C control module
B283	20	Gray	C-3		
B284	10	★	D-4		Remote control rear-view mirror switch
B292	3	★	D-3		ABS sensor
B293	3	★	B-3		Air mix actuator (Auto A/C)
B296	4	★	B-4		Rear defogger timer
★:Non-colored					

WIRING SYSTEM



BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM

2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	D-4	D1	Front door cord RH
B31	6	Yellow	D-4	AB1	SRS (Airbag) harness
B32	3	Black	B-3		Turn & hazard module
B36	14	Black	B-2	i1	Instrument panel wiring harness
B37	32	★	B-2	i2	
B38	22	Black	B-2	i3	
B40	16	Gray	C-3		Data link connector
B41	2	★	C-4		Power window circuit
B42	5	Black	C-4		Power window relay (Relay block)
B43	6	Black	C-4		Illumination control module
B46	4	Green	C-1		Fuel pump relay
B47	6	★	C-4		Main relay
B48	5	★	C-3		Front fog light relay (Relay block)
B50	4	★	C-4		Blower motor relay
B51	8	Blue	C-4		F/B
B52	7	★	C-4		
B53	12	Black	B-3		Shield joint connector (AT)
B54	24	★	A-3		Transmission control module
B55	24	Gray	A-3		
B56	24	Green	A-3		
B61	8	★	B-4	F44	Front wiring harness
B62	18	Black	B-4	F45	
B64	2	Black	B-3		Stop light switch
B65	4	Black	B-3		Stop&brake switch (with cruise control)
B68	5	Black	C-2		Cruise control sub switch
B69	4	★	B-3		Combination switch
B70	18	★	C-3		
B71	17	★	C-3		
B72	4	Blue	C-3		Ignition switch
B74	2	Black	C-3		Key warning switch
B75	2	Green	C-3	B76	Test mode connector
B76	2	Green	C-3	B75	
B77	3	★	B-2		Mode actuator
B79	14	Gray	C-3		Check connector
B81	1×2	★	C-3		Diagnosis terminal (Ground)
B82	6	Black	C-3		Diagnosis connector
B83	6	★	C-2		Shield&sensor ground joint connector (E/G) non-turbo model
	12	★	C-2		Shield&sensor ground joint connector (E/G) Turbo model
B85	2	★	B-3		Diode (Rear fog light)
B86	4	★	B-4		Blower motor resistor

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B87	2	★	B-1		Blower motor
B88	4	Brown	B-3		Evaporator thermostat switch
B90	6	★	B-4	R50	Roof cord
B91	6	Black	B-2		FRESH/RECIRC actuator
B92	8	★	C-3		Door lock timer
B101	25	★	B-1	D11	Front door cord LH
B107	2	★	A-3		Clutch switch (cruise control)
B116	6	★	D-2		Select lever illumination light (AT)
B119	4	★	C-2		Cigarette lighter (Power)
B120	14	★	B-2		Radio
B121	1	★	B-2		Audio ground
B125	1	Black	C-3	B126	Read memory connector
B126	1	Black	C-3	B125	
B129	2	★	C-4		Kick down switch (AT)
B131	4	Blue	C-4		Rear fog light relay
B132	4	★	C-4		Head light beam leveler switch
B133	6	★	D-1		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	14	★	B-3		Immobilizer control module
B152	12	★	C-4		F/B
B157	4	★	C-4		Ignition relay (Relay block)
B158	10	Gray	D-1		F/B
B159	9	Brown	C-4		F/B
B160	6	Brown	C-4		Front fog light switch
B161	6	Brown	C-4		Cruise sub switch
B168	10	★	C-2		Mode control panel (Manual A/C)
B169	6	★	C-2		Fan switch (Manual A/C)
B171	5	★	C-3		Mirror heated relay
B176	18	★	C-4		Keyless entry control module
B183	1	★	D-4	B184	Joint connector (Keyless entry)
B184	1	★	C-4	B183	
B195	6	★	C-4		Rear fog light switch
B196	3	★	B-3		Diode (Rear fog light)
B198	1	★	B-2	B199	Joint connection (Ground)
B199	1	★	B-2	B198	
B200	22	★	B-4	F74	Front wiring harness

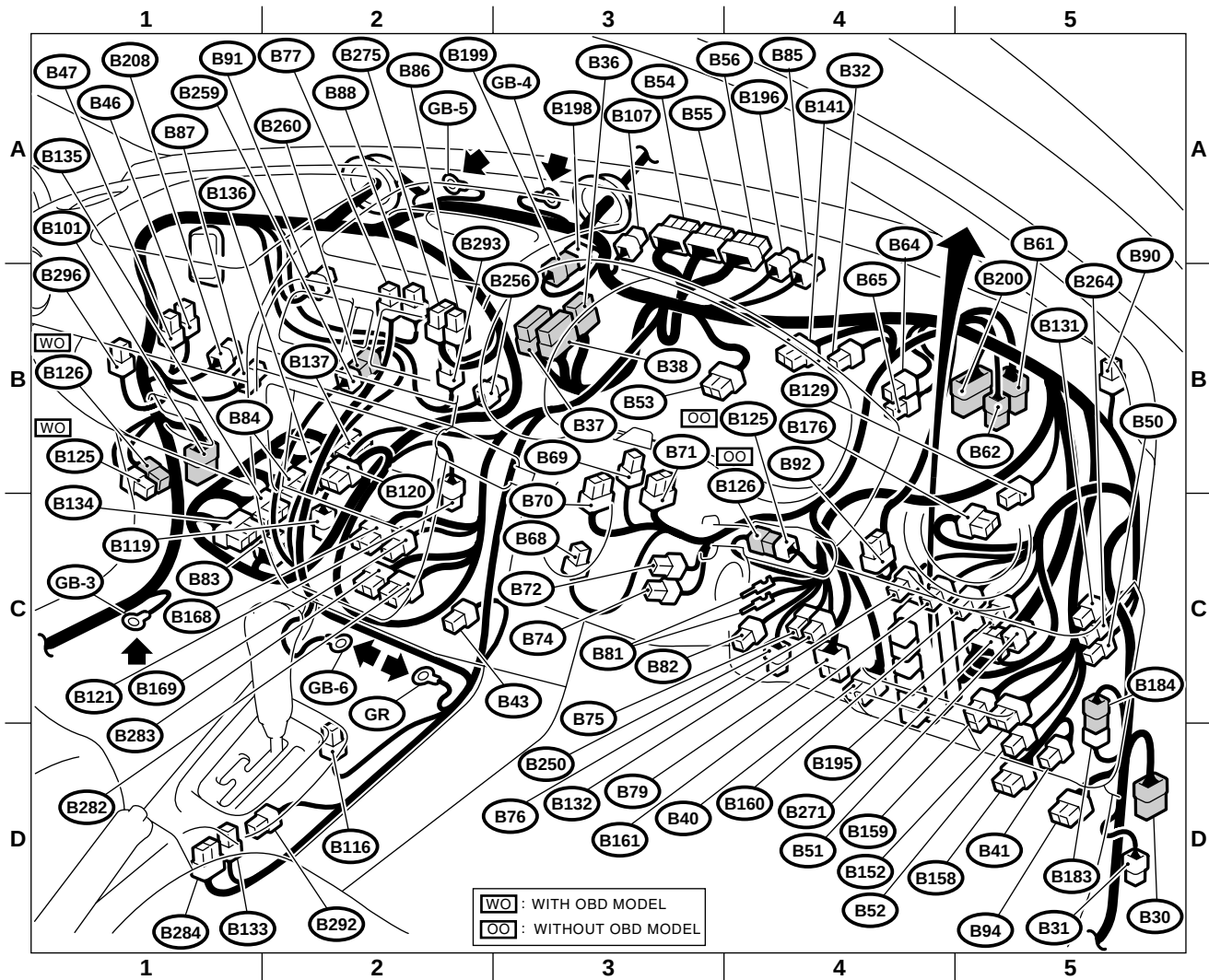
BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B208	2	★	B-1		Glove box light
B225	8	Black	C-3		Fuse (Relay box)
B250	3	★	C-3		Flash memory connector
B256	2	★	B-2		Evaporator sensor
B259	2	★	B-2	B260	Shield joint connector (E/G) NA model
B260	2	★	B-2	B259	
B264	4	Pink	C-4		ABS relay
B271	12	Blue	C-4		F/B
B275	4	★	B-2		Fan control amp
B282	16	Gray	C-2		Auto A/C control module
B283	20	Gray	C-2		
B284	10	★	D-1		Remote control rear-view mirror switch
B292	3	★	D-1		ABS sensor
B293	3	★	B-2		Air mix actuator (Auto A/C)
B296	4	★	B-1		Rear defogger timer
★:Non-colored					

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM



BO0222

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM

48.Engine Wiring Harness and Transmission Cord

A: LOCATION

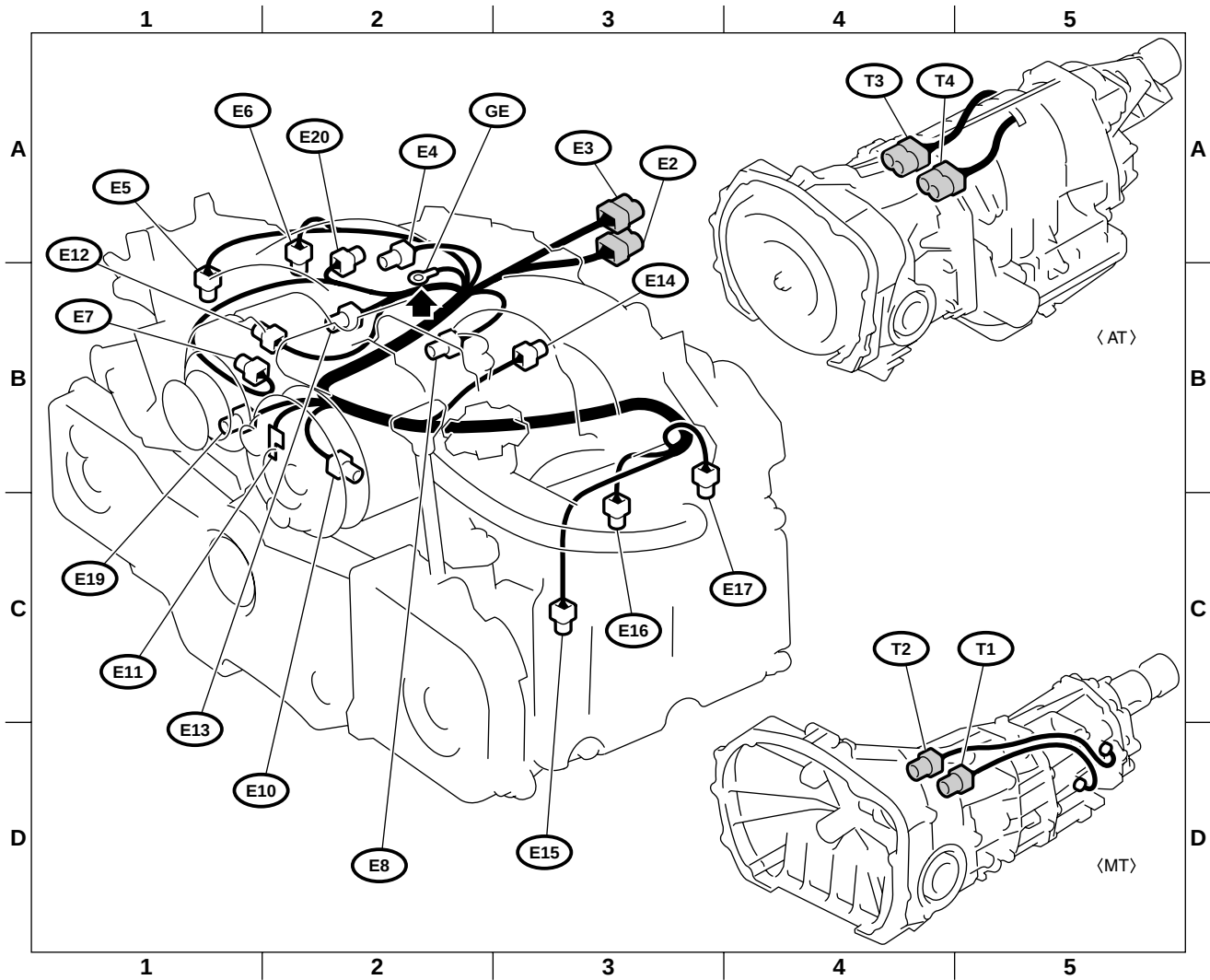
1. SOHC W/O OBD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E2	20	Light gray		B21	Bulkhead wiring harness
E3	16	Brown		B22	Bulkhead wiring harness
E4	2	Blue			Purge control solenoid valve
E5	2	Light gray			Fuel injector No.1
E6	2	Light gray			Fuel injector No.3
E7	6	Black			Idle air control solenoid valve
E8	3	Light gray			Engine coolant temperature sensor and thermometer
E10	2	Light gray			Crank shaft position sensor
E11	1	★			Oil pressure switch
E12	4	Gray			Ignition coil and ignitor (1.6L model)
		Dark gray			Ignition coil and ignitor (2.0L model)
E13	4	Dark brown			Throttle position sensor
E14	2	★			Knock sensor
E15	2	Black			Camshaft position sensor
E16	2	Light gray			Fuel injector No.2
E17	2	Light gray			Fuel injector No.4
E19	1	★			Power steering oil pressure switch
E20	4	Black			Pressure sensor and intake air temperature sensor
★:Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	Gray		B31	Bulkhead wiring harness
T2	2	Brown		B30	Bulkhead wiring harness
T3	28	★		B1	Bulkhead wiring harness
T4	36	Black		B2	Bulkhead wiring harness
★:Non-colored					

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM



BO0224

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM

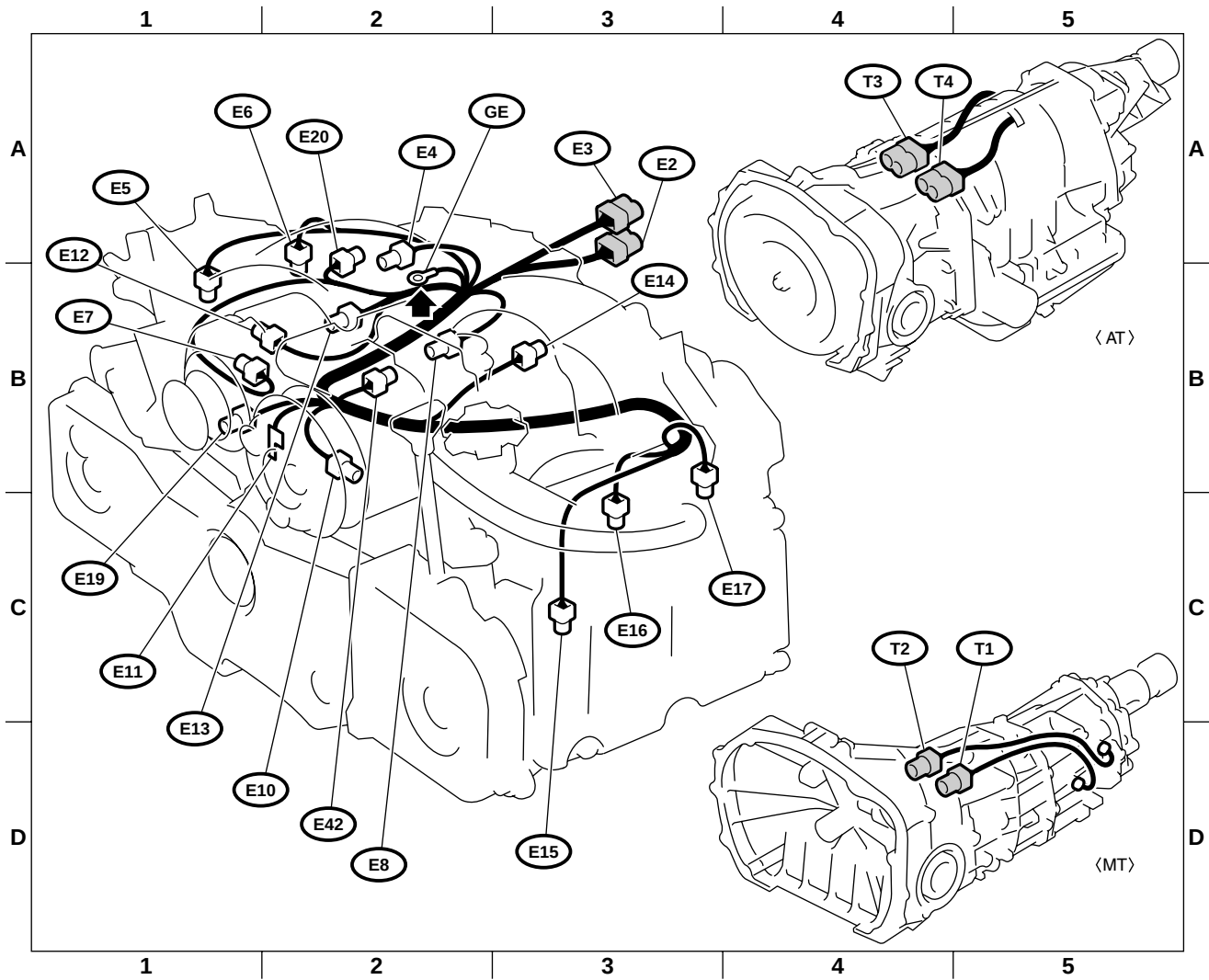
2. SOHC MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E2	20	Light gray		B21	Bulkhead wiring harness
E3	16	Brown		B22	Bulkhead wiring harness
E4	2	Blue			Purge control solenoid valve
E5	2	Light gray			Fuel injector No.1
E6	2	Light gray			Fuel injector No.3
E7	6	Black			Idle air control solenoid valve
E8	3	Light gray			Engine coolant temperature sensor and thermometer
E10	2	Light gray			Crank shaft position sensor
E11	1	★			Oil pressure switch
E12	4	Gray			Ignition coil and ignitor (1.6L model)
		Dark gray			Ignition coil and ignitor (2.0L model)
E13	4	Dark brown			Throttle position sensor
E14	2	★			Knock sensor
E15	2	Black			Camshaft position sensor
E16	2	Light gray			Fuel injector No.2
E17	2	Light gray			Fuel injector No.4
E19	1	★			Power steering oil pressure switch
E20	4	Black			Pressure sensor and intake air temperature sensor
E42	2	Purple			Air assist injector solenoid valve
★:Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	Gray		B31	Bulkhead wiring harness
T2	2	Brown		B30	Bulkhead wiring harness
T3	28	★		B1	Bulkhead wiring harness
T4	36	Black		B2	Bulkhead wiring harness
★:Non-colored					

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM



BO0223

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM

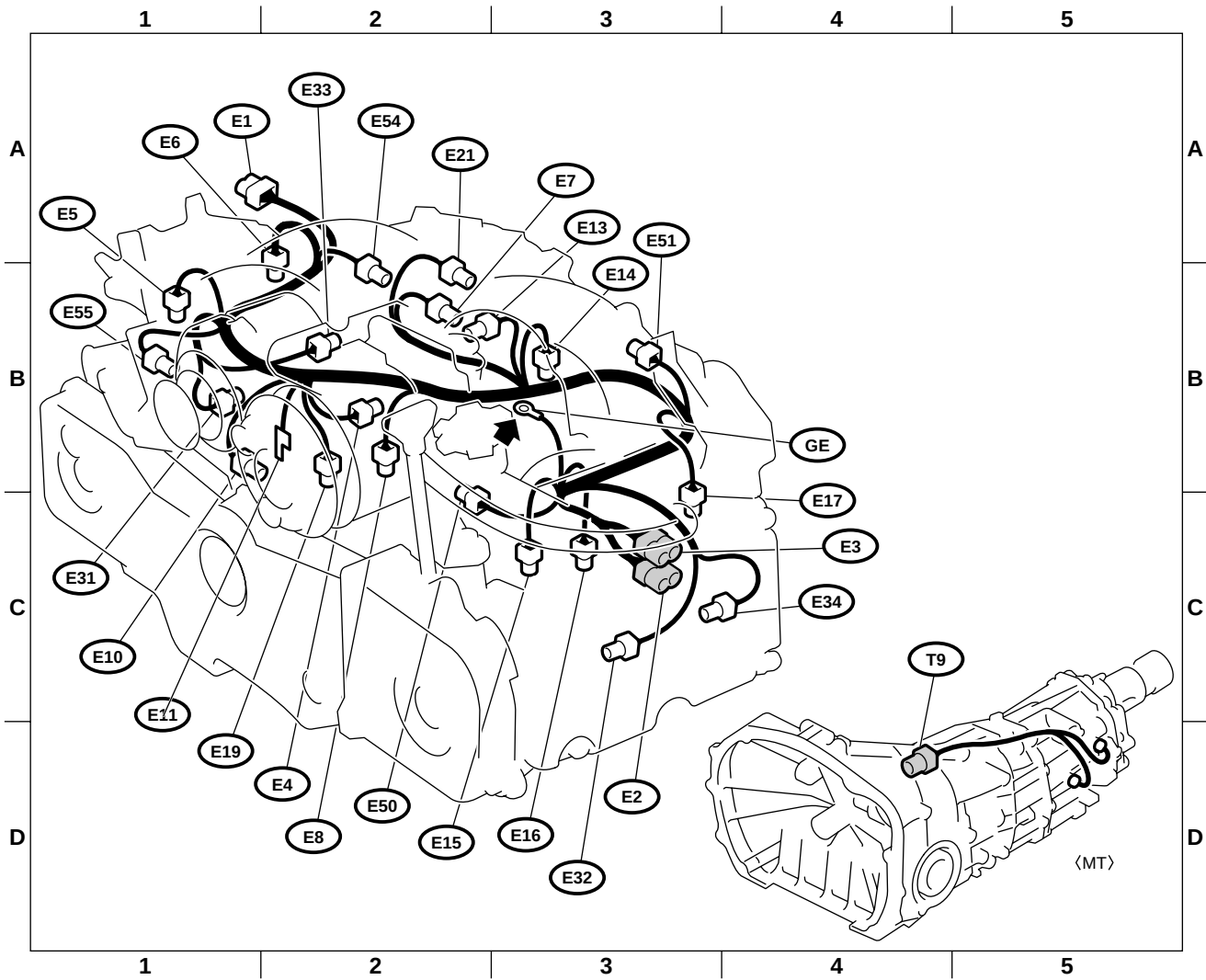
3. DOHC TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	10	Light gray		B20	Bulkhead wiring harness
E2	20	Black		F61	Front wiring harness
E3	16	Brown		F60	Front wiring harness
E4	2	Black			Purge control solenoid valve
E5	2	Dark gray			Fuel injector No.1
E6	2	Dark gray			Fuel injector No.3
E7	3	Black			Idle air control solenoid valve
E8	3	Light gray			Engine coolant temperature sensor and thermometer
E10	2	Light gray			Crank shaft position sensor
E11	1	★			Oil pressure switch
E13	3	Black			Throttle position sensor
E14	2	Gray			Knock sensor
E15	2	Light gray			Camshaft position sensor
E16	2	Dark gray			Fuel injector No.2
E17	2	Dark gray			Fuel injector No.4
E19	1	★			Power steering oil pressure switch
E21	3	Black			Pressure sensor
E31	3	★			Ignition coil No.1
E32	3	★			Ignition coil No.2
E33	3	Black			Ignition coil No.3
E34	3	Black			Ignition coil No.4
E50	3	Black			TGV angle sensor LH
E51	2	Black			TGV LH
E54	3	Black			TGV angle sensor RH
E55	2	Black			TGV RH
★:Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T9	4	★		B128	Bulkhead wiring harness
★:Non-colored					

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM



BO0225

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM

49. Instrument Panel Wiring Harness

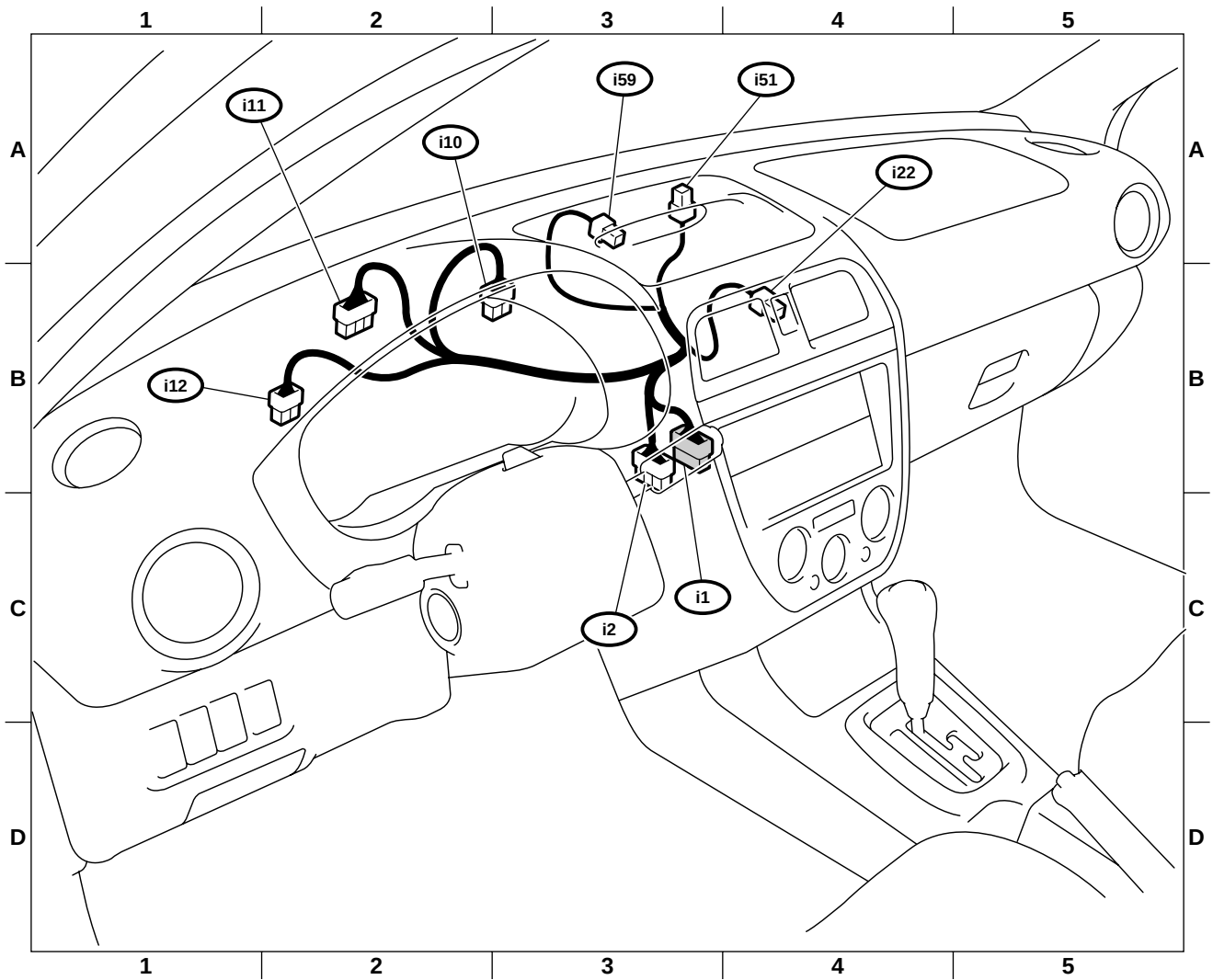
A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i1	24	Black		B36	Bulkhead wiring harness
i2	24	★		B37	
i10	10	Green			Combination meter
i11	30	Green			
i12	14	Green			
i22	8	★			Hazard switch
i51	2	★			Sunload sensor
i59	4	★			Clock

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM



BO0226

INSTRUMENT PANEL WIRING HARNESS

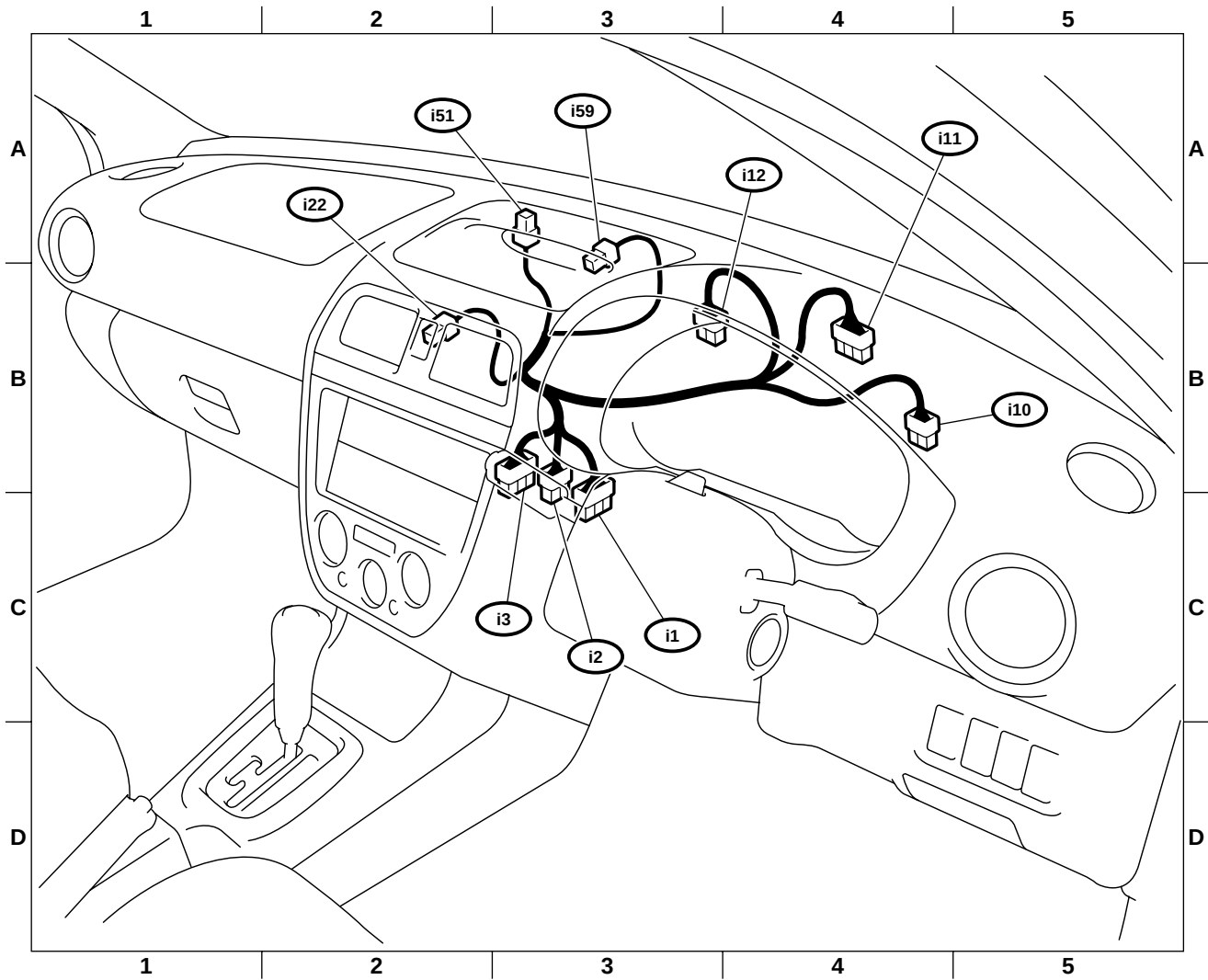
WIRING SYSTEM

2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i1	14	Black		B36	Bulkhead wiring harness
i2	32	★		B37	
i3	22	Black		B38	
i10	10	Green			Combination meter
i11	30	Green			
i12	14	Green			
i22	8	★			Hazard switch
i51	2	★			Sunload sensor
i59	4	★			Clock

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM



BO0227

REAR WIRING HARNESS, BULKHEAD WIRING HARNESS, ROOF CORD AND FUEL TANK CORD

WIRING SYSTEM

50.Rear Wiring Harness, Bulkhead wiring Harness, Roof Cord and Fuel Tank Cord

A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	★		B97	Bulkhead wiring harness
R3	24	★		B99	Bulkhead wiring harness
R4	1	★			Parking brake switch
R8	2	★			Seat belt switch
R15	6	Black		R57	Fuel tank cord
R22	3	★			Rear door switch LH
R72	2	★			Rear ABS sensor RH
R73	2	★			Rear ABS sensor LH
★: Non-colored					

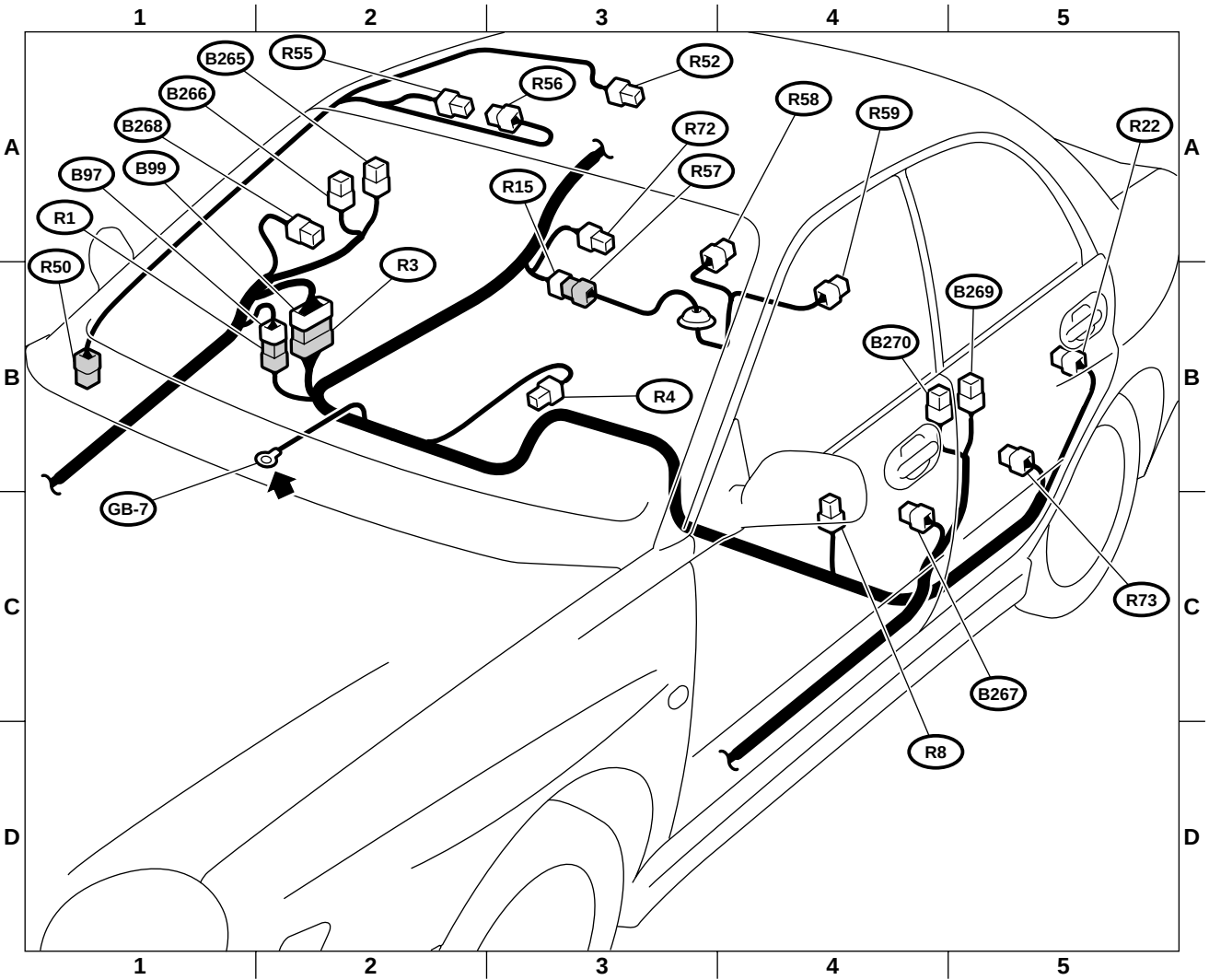
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B97	8	★		R1	Rear wiring harness
B99	24	★		R3	Rear wiring harness
B265	4	★		D27	Rear door cord RH
B266	3	★		D28	Rear door cord RH
R267	3	★			Front door switch LH
R268	3	★			Front door switch RH
B269	4	★		D21	Rear door cord LH
B270	3	★		D22	Rear door cord LH
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R50	4	★		B90	Bulkhead wiring harness
B52	3	★			Room light
B55	1	Gray			Sunroof
R56	2	★			Spot light
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R57	6	Black		R15	Rear wiring harness
R58	6	★			Fuel pump assembly
R59	2	★			Fuel sub level sensor
★: Non-colored					

REAR WIRING HARNESS, BULKHEAD WIRING HARNESS, ROOF CORD AND FUEL TANK CORD

WIRING SYSTEM



BO0228

REAR WIRING HARNESS, BULKHEAD WIRING HARNESS, ROOF CORD AND FUEL TANK CORD

WIRING SYSTEM

2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	★		B97	Bulkhead wiring harness
R3	22	★		B99	Bulkhead wiring harness
R4	1	★			Parking brake switch
R8	2	★			Seat belt switch
R15	6	Black		R57	Fuel tank cord
R22	3	★			Rear door switch LH
R72	2	★			Rear ABS sensor RH
R73	2	★			Rear ABS sensor LH
★: Non-colored					

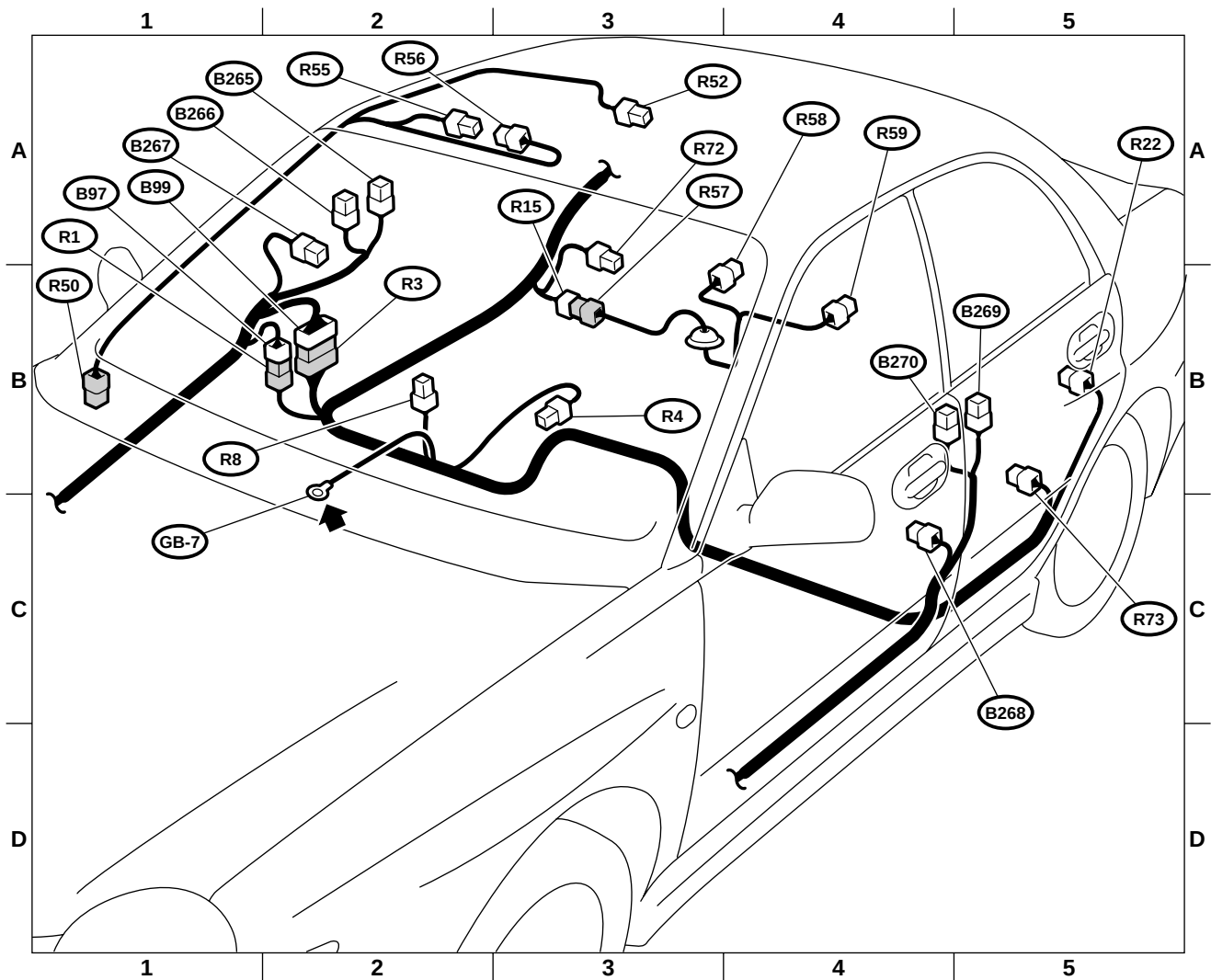
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B97	8	★		R1	Rear wiring harness
B99	22	★		R3	Rear wiring harness
B265	4	★		D27	Rear door cord RH
B266	3	★		D28	Rear door cord RH
R267	3	★			Front door switch RH
R268	3	★			Front door switch LH
B269	4	★		D21	Rear door cord LH
B270	3	★		D22	Rear door cord LH
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R50	4	★		B90	Bulkhead wiring harness
B52	3	★			Room light
B55	1	Gray			Sunroof
R56	2	★			Spot light
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R57	6	Black		R15	Rear wiring harness
R58	6	★			Fuel pump assembly
R59	2	★			Fuel sub level sensor
★: Non-colored					

REAR WIRING HARNESS, BULKHEAD WIRING HARNESS, ROOF CORD AND FUEL TANK CORD

WIRING SYSTEM



BO0229

DOOR CORD

WIRING SYSTEM

51. Door Cord

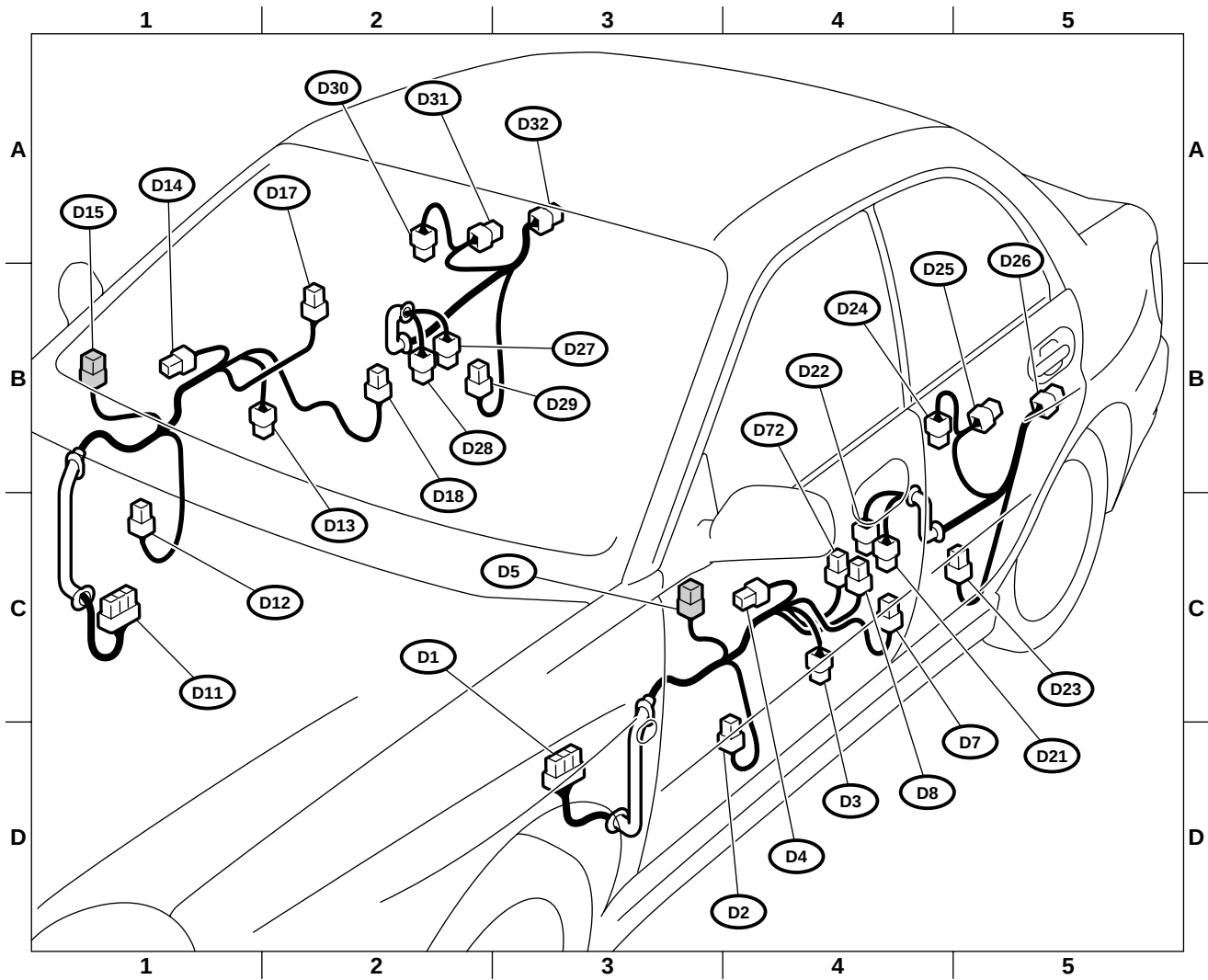
A: LOCATION

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 Driver side
D3	2	Black	C-3		Front power window motor Driver side
D4	2	Black	C-3		Front door tweeter Driver side
D5	6	★	C-3		Remote control rearview mirror Driver side
	8	Black			Remote control rearview mirror Driver side
D7	16	★	C-4		Power window main switch
D8	2	Gray	C-4		Front door lock actuator LH
D10	2	★	C-3		Step light LH
D11	25	★	C-1	B101	Bulkhead wiring harness
D12	2	★	C-1		Front door speaker RH
D13	2	Green	B-2		Front power window motor RH
D14	2	★	B-1		Front door tweeter RH
D15	6	★	B-1		Remote control rearview mirror RH (Without mirror heater)
	8	Black			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-4	B269	Rear wiring harness
D22	3		C-4	B270	Bulkhead wiring harness
D23	2	★	C-4		Rear door speaker LH
D24	2	Black	B-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	4	★	B-2	B265	Bulkhead wiring harness
D28	3			B266	Bulkhead wiring harness
D29	2	Black	B-2		Rear door speaker RH
D30	2	Black	A-2		Rear power window motor RH
D31	6	★	A-2		Rear power window sub switch RH
D32	4	★	A-3		Rear door lock actuator RH
D61	10	★	C-3		Remote control rearview mirror switch
D62	6	Brown	B-2		Front door lock switch RH
D68	2	★	C-3	R99	Rear wiring harness
D69	2	★	C-3	R101	Rear wiring harness
D72	4	★	C-3		Front door lock actuator LH
★: Non-colored					

DOOR CORD

WIRING SYSTEM



BO0230

DOOR CORD

WIRING SYSTEM

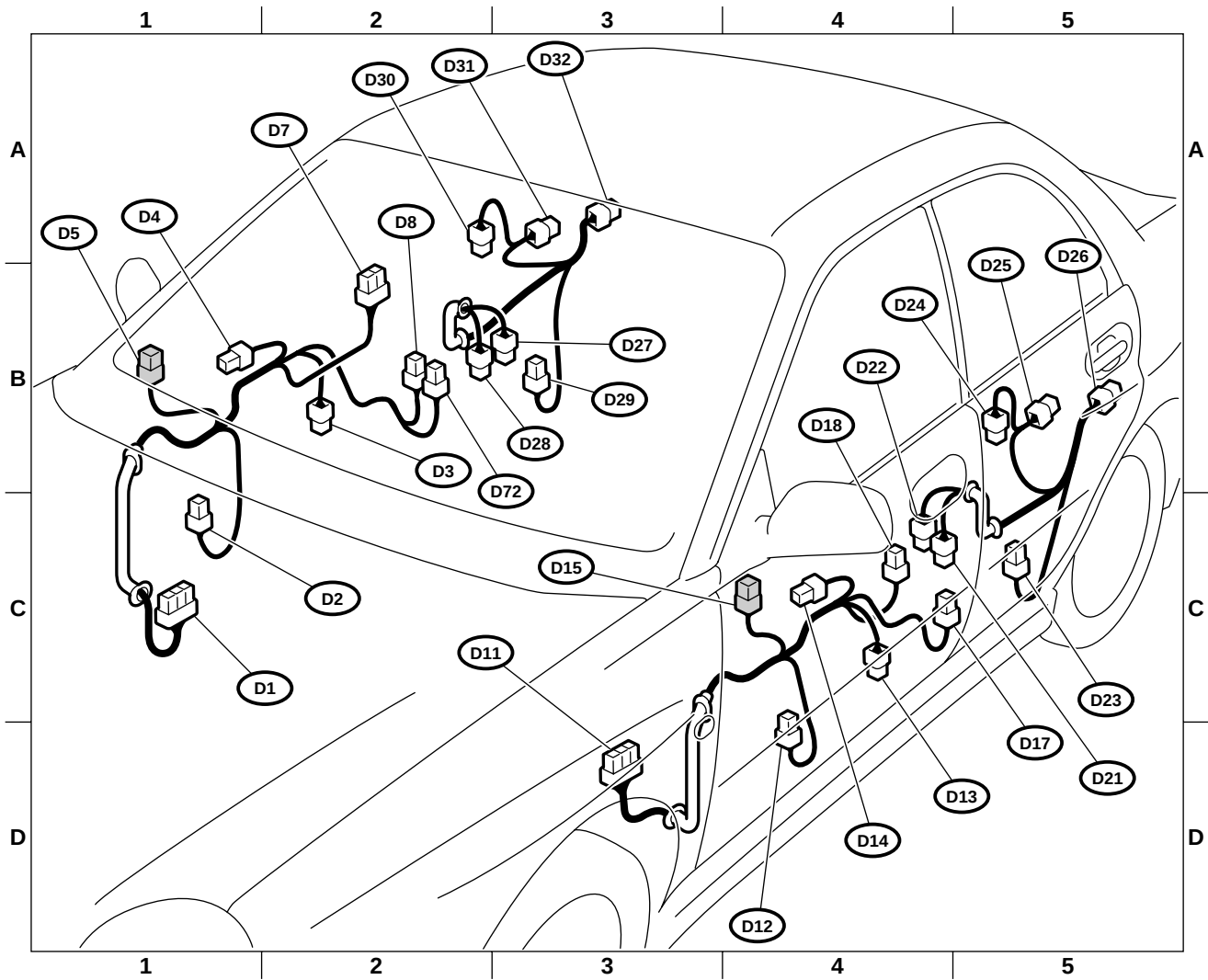
2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D1	25	★	C-1	B30	Bulkhead wiring harness
D2	2	★	C-1		Front door speaker Driver side
D3	2	Black	B-2		Front power window motor Driver side
D4	2	★	B-1		Front door tweeter Driver side
D5	6	★	B-1		Remote control rearview mirror Driver side
	8	Black	B-1		Remote control rearview mirror Driver side
D7	16	★	B-2		Power window main switch
D8	2	Gray	B-2		Front door lock actuator RH
D10	2	★	C-3		Step light LH
D11	25	★	D-3	B101	Bulkhead wiring harness
D12	2	★	D-3		Front door speaker LH
D13	2	Green	C-3		Front power window motor LH
D14	2	★	C-3		Front door tweeter LH
D15	6	★	C-3		Remote control rearview mirror LH (Without mirror heater)
	8	Black	C-3		Remote control rearview mirror LH (With mirror heater)
D17	8	★	C-4		Front power window sub switch LH
D18	4	★	C-3		Front door lock actuator LH
D20	2	★	B-2		Step light RH
D21	4	★	C-4	B269	Bulkhead wiring harness
D22	3		B-3	B270	Bulkhead wiring harness
D23	2	★	C-4		Rear door speaker LH
D24	2	Black	B-4		Rear power window motor LH
D25	8	★	B-4		Rear power window sub switch LH
D26	4	★	B-4		Rear door lock actuator LH
D27	4	★	B-2	B265	Bulkhead wiring harness
D28	3		B-2	B266	Bulkhead wiring harness
D29	2	Black	B-2		Rear door speaker RH
D30	2	Black	A-2		Rear power window motor RH
D31	8	★	A-2		Rear power window sub switch RH
D32	4	★	A-3		Rear door lock actuator RH
D61	10	★	C-3		Remote control rearview mirror switch
D62	6	Brown	B-2		Front door lock switch RH
D68	2	★	C-3	R99	Rear wiring harness
D69	2	★	C-2	R101	Rear wiring harness
D72	4	★	B-2		Front door lock actuator LH

★: Non-colored

DOOR CORD

WIRING SYSTEM



BO0231

REAR WIRING HARNESS AND TRUNK LID CORD

WIRING SYSTEM

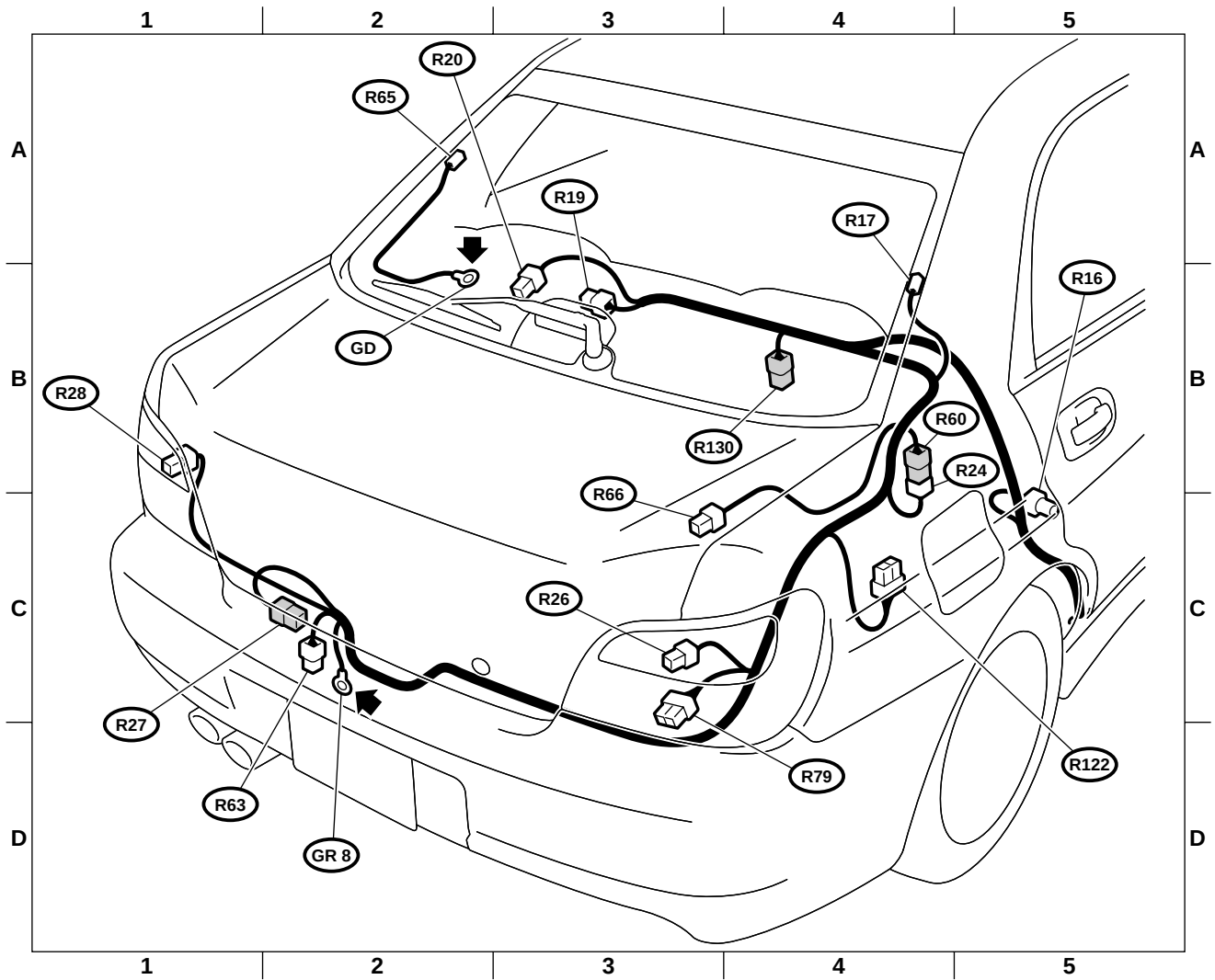
52.Rear Wiring Harness and Trunk Lid Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R16	3	★	C-3		Rear door switch RH
R17	1	Black	B-4		Rear defogger (Power) (Without choke coil model)
R19	2	★	B-2		High-mounted stop light
R20	2	Black	B-2		Trunk room light
R24	2	★	C-4	R60	Trunk lid cord
R26	6	★	C-3		Rear combination light RH
R27	2	★	C-1		Trunk room light switch
R28	6	★	B-1		Rear combination light LH
R60	2	★	B-4	R24	Rear wiring harness
R63	2	★	C-1		License plate light
R65	1	Black	A-2		Rear defogger (Ground) (Without choke coil model)
R66	2	★	C-3		High-mounted stop light (Rear spoiler)
R79	10	★	C-3		Trailer connector
R122	10	★	C-4		Fuel pump control (Turbo Model)
R130	2	★	B-3		Rear defogger (With choke coil model)
★: Non-colored					

REAR WIRING HARNESS AND TRUNK LID CORD

WIRING SYSTEM



BO0232

REAR WIRING HARNESS AND REAR GATE CORD

WIRING SYSTEM

53.Rear Wiring Harness and Rear Gate Cord

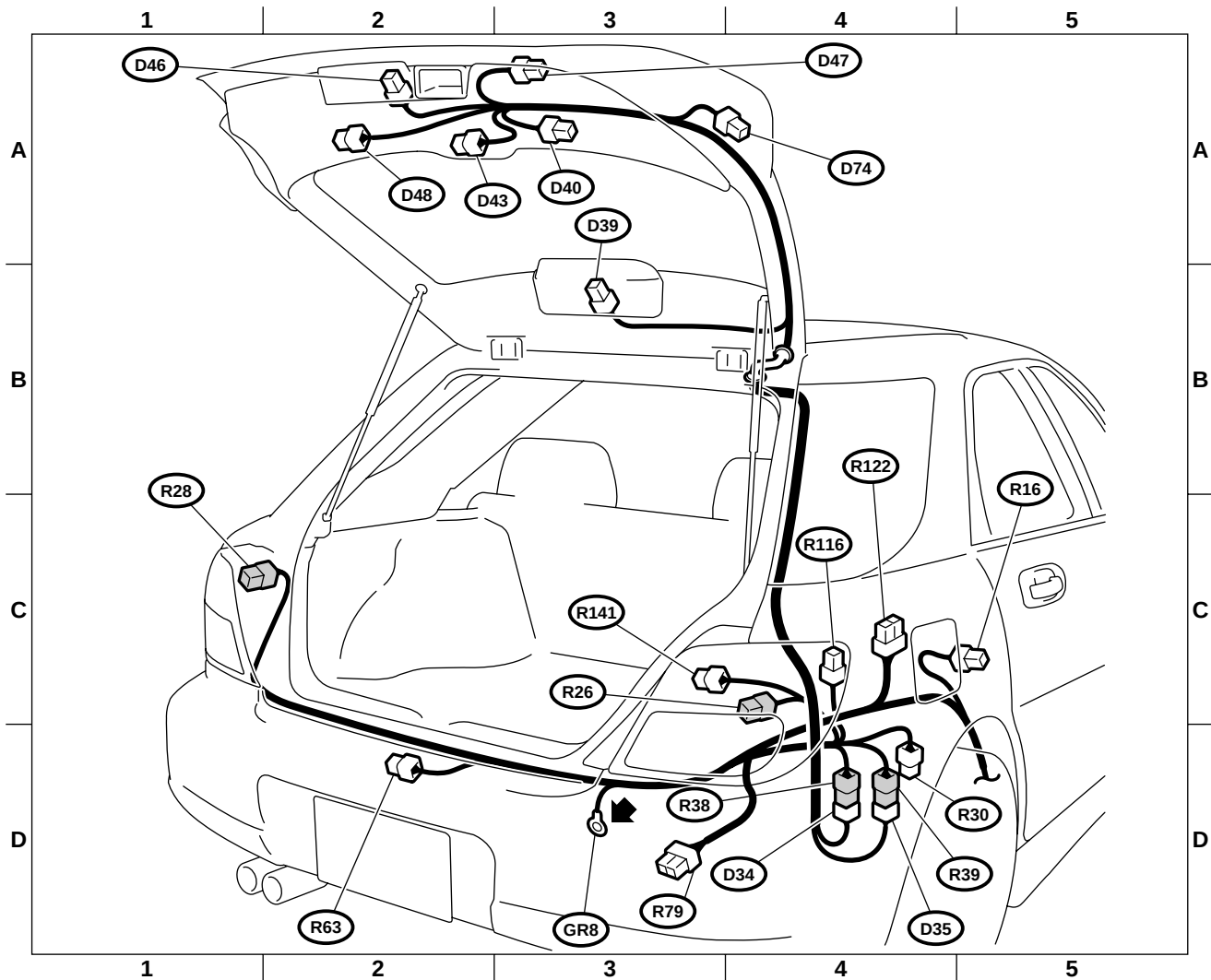
A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R16	3		C-4		Rear door switch RH
R26	6		C-3		Rear combination light RH
R28	4		C-1		Rear combination light LH
R30	2	★	C-4		Diode
R38	8	★	C-3	D34	Rear gate cord
R39	4		D-4	D35	
R63	2	★	C-2		License plate light
R79	10	★	D-3		Trailer connector
R97	2	★	C-1		Antenna amp.
R116	8	★	C-3		Rear wiper intermittent module
R122	10	★	C-4		Fuel pump control (Turbo Model)
R141	2	★	C-3		License plate light
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D34	8	★	C-3	R38	Rear wiring harness
D35	4	Black	D-4	R39	
D39	2	★	B-3		High-mounted stop light
D40	1	Black	A-2		Rear defogger (Power)
D43	4	★	A-2		Rear wiper motor
D46	2	Black	A-2		Rear gate latch switch
D47	4	★	A-2		Rear gate lock actuator cord
D48	1	Black	A-2		Rear defogger (Ground)
D74	2	★	A-3		Rear defogger choke coil
★: Non-colored					

REAR WIRING HARNESS AND REAR GATE CORD

WIRING SYSTEM



BO0233

REAR WIRING HARNESS AND REAR GATE CORD

WIRING SYSTEM
